for Preparation Click here

NOTICE:

Perform the Reset Memory procedures (A/T initialization) after replacing the automatic transmission assembly, valve body assembly or any of the shift solenoid valves (Click here).

HINT:

Reset Memory cannot be completed by only reconnecting the cable to the negative (-) battery terminal.

CAUTION:

When using compressed air, always aim away from yourself to prevent Automatic Transmission Fluid (ATF) or kerosene from spraying on your face.

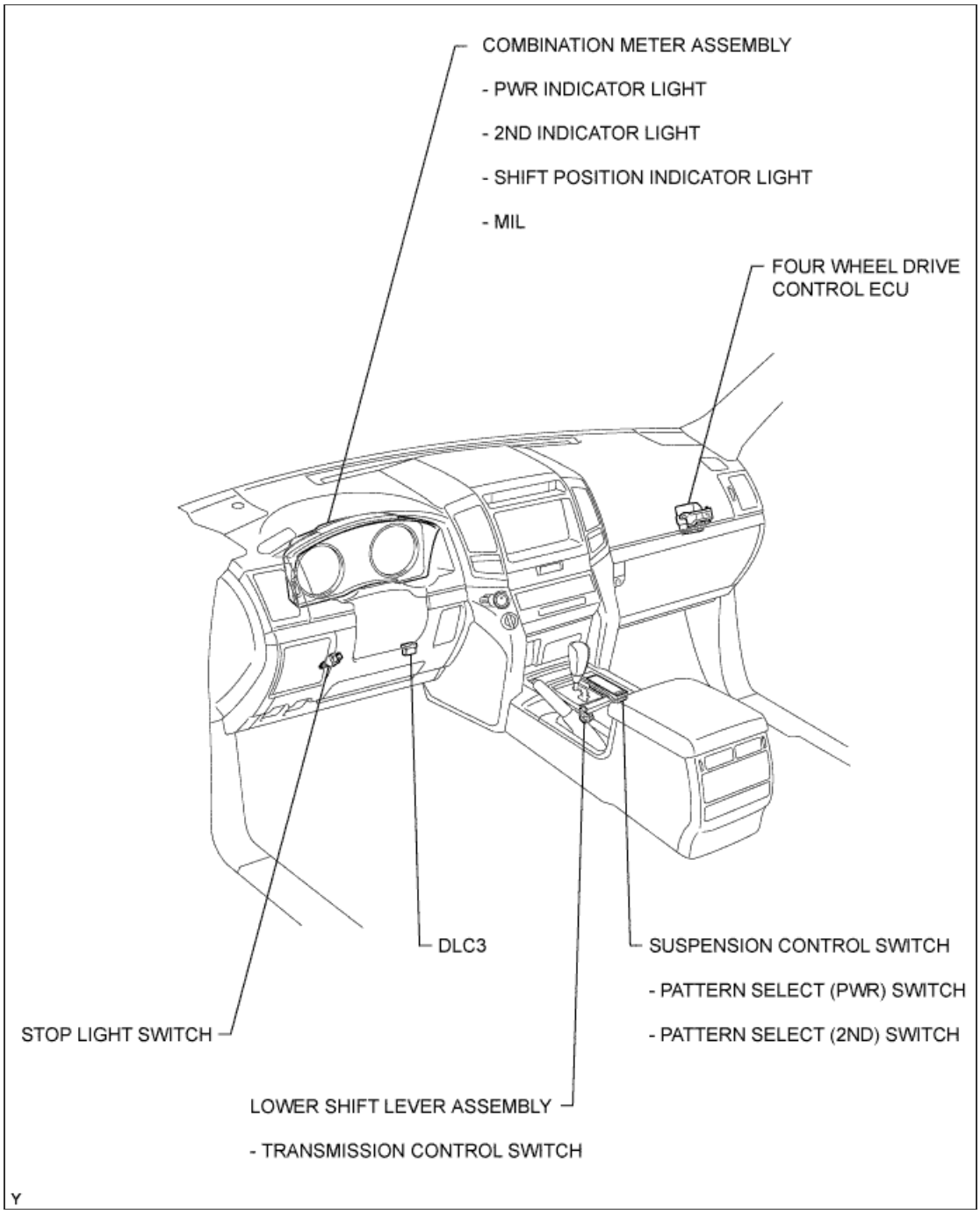
NOTICE:

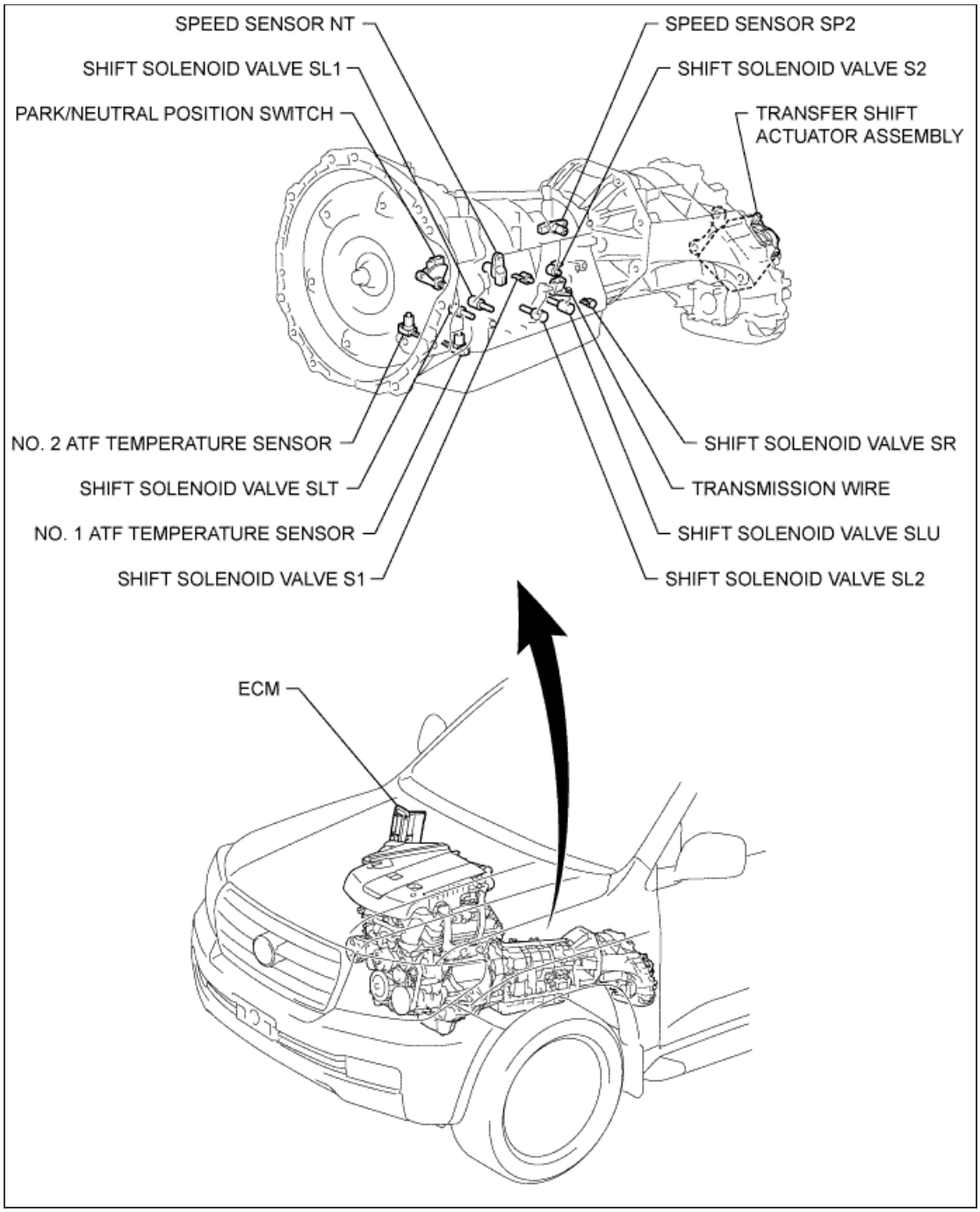
- **The automatic transmission is composed of precision-made parts, necessitating careful inspection before reassembly because even a small nick could cause fluid leakage or affect performance.**
- **The procedures are organized so that you work on only one component group at a time. This will help avoid confusion with similar-looking parts of different sub-assemblies being on your workbench at the same time.**
- **The component groups are inspected and repaired from the converter housing side.**
- **Whenever possible, complete the inspection, repair and reassembly before proceeding to the next component group. If a defect is found in a certain component group during reassembly, inspect and repair this group immediately. If a component group cannot be assembled because parts are being ordered, be sure to keep all parts of the group in a separate container while proceeding with disassembly, inspection, repair and reassembly of other component groups.**
- **Use of Toyota Genuine ATF WS is recommended.**
- **All disassembled parts should be washed clean, and compressed air should be blown through any fluid passages and holes.**
- **Dry all parts with compressed air. Never use cloth.**
- **The recommended ATF or kerosene should be used for cleaning.**
- **After cleaning, the parts should be arranged in the order they were removed for efficient inspection, repairs, and reassembly.**
- **New discs for the brakes and clutches that will be used for replacement must be soaked in ATF for at least 15 minutes before reassembly.**
- **All oil seal rings, clutch discs, clutch plates, rotating parts, and sliding surfaces should be coated with ATF prior to reassembly.**
- **All old gaskets and rubber O-rings must be replaced.**
- **Do not apply adhesive cement to gaskets and similar parts.**
- **Make sure that the ends of the snap rings are not aligned with any cutouts. Also make sure that snap rings are correctly installed into the grooves.**
- **If a worn bushing is to be replaced, the sub-assembly containing the bushing must also be replaced.**
- **Check the thrust bearings and races for wear or damage. Replace them if necessary.**
- **Use petroleum jelly to keep parts in place.**
- **When working with FIPG material, perform the following:**
  Using a razor blade and gasket scraper, remove all old FIPG material from the gasket surface.
  Clean all components thoroughly to remove all foreign matter.
  Clean both sealing surfaces with non-residue solvent.
  Apply FIPG material in a continuous line approximately 1 mm (0.0394 in.) in diameter on the sealing surface.
  Reassemble parts within 10 minutes of applying FIPG material. Failing to do so will require the FIPG material to be removed and reapplied.

for Preparation Click here

Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).

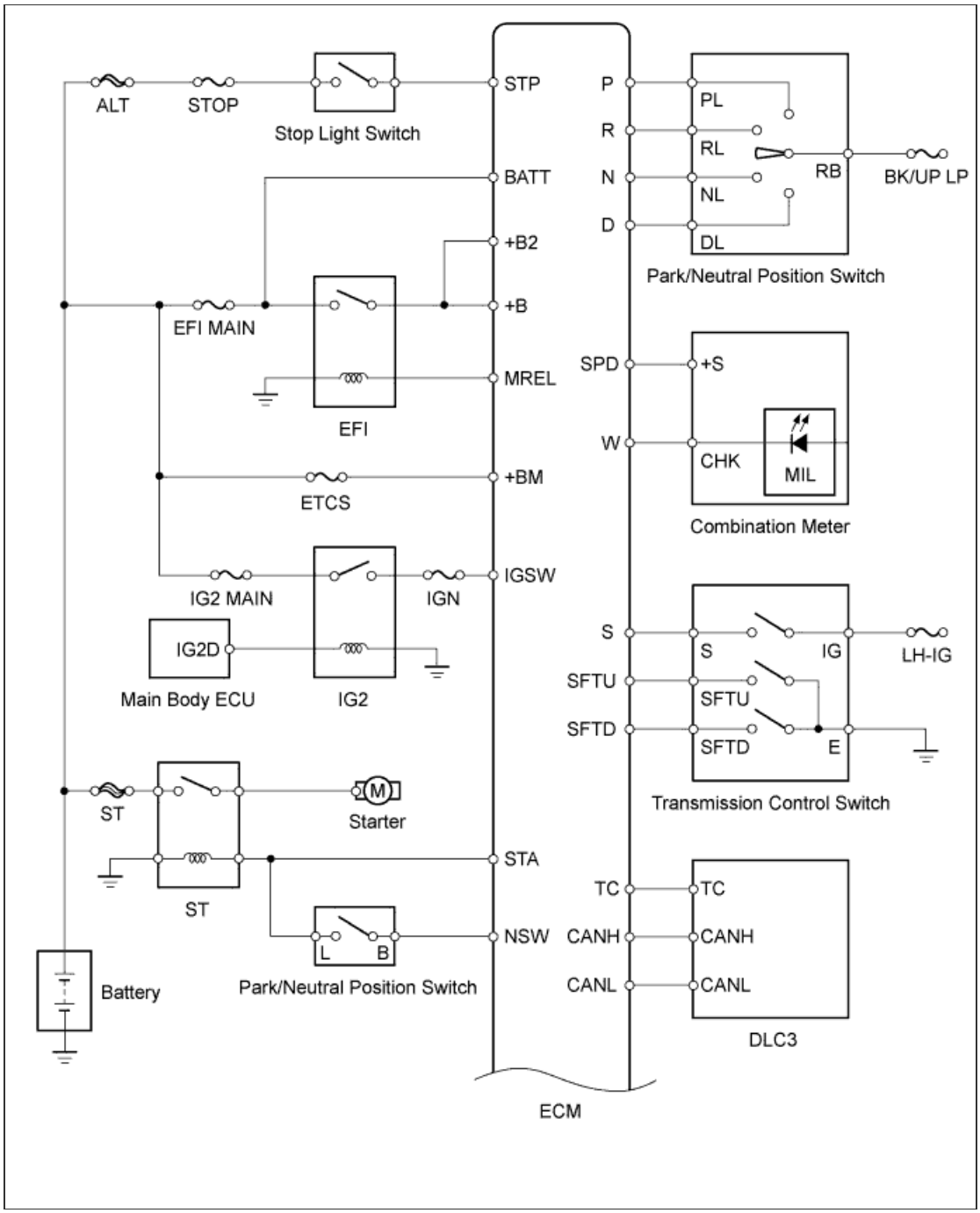
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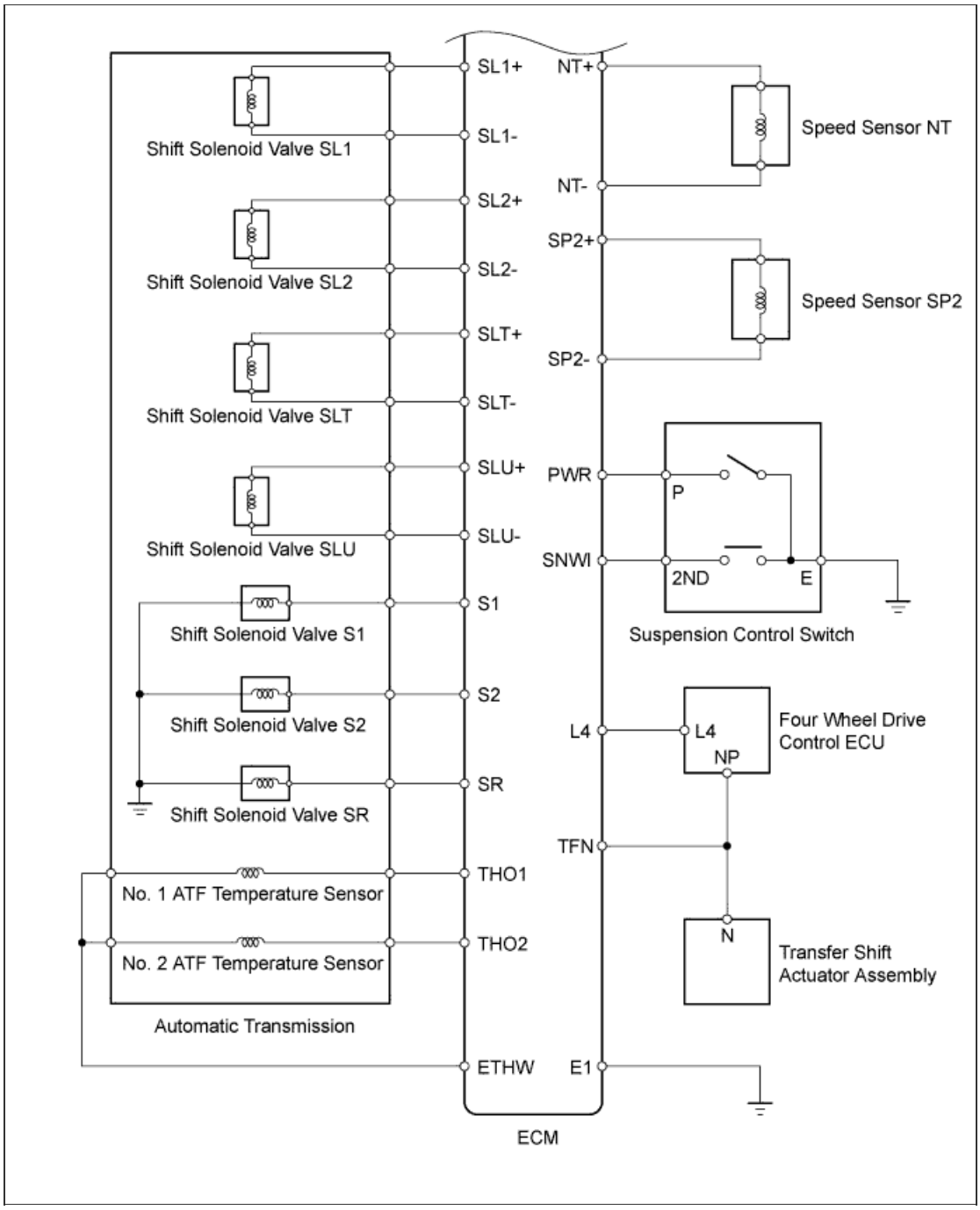



SPEED SENSOR NT
SHIFT SOLENOID VALVE SL1
PARK/NEUTRAL POSITION SWITCH
NO. 2 ATF TEMPERATURE SENSOR
SHIFT SOLENOID VALVE SLT
NO. 1 ATF TEMPERATURE SENSOR
SHIFT SOLENOID VALVE S1
SPEED SENSOR SP2
SHIFT SOLENOID VALVE S2
TRANSFER SHIFT ACTUATOR ASSEMBLY
SHIFT SOLENOID VALVE SR
TRANSMISSION WIRE
SHIFT SOLENOID VALVE SLU
SHIFT SOLENOID VALVE SL2
ECM

for Preparation Click here

The configuration of the electronic control system in the A750F automatic transmission is as shown in the following chart.




SL1+
SL1-
SL2+
SL2-
SLT+
SLT-
SLU+
SLU-
S1
S2
SR
THO1
THO2
ETHW
NT+
NT-
SP2+
SP2-
PWR
SNWI
L4
TFN
E1
Shift Solenoid Valve SL1
Shift Solenoid Valve SL2
Shift Solenoid Valve SLT
Shift Solenoid Valve SLU
Shift Solenoid Valve S1
Shift Solenoid Valve S2
Shift Solenoid Valve SR
No. 1 ATF Temperature Sensor
No. 2 ATF Temperature Sensor
Automatic Transmission
Speed Sensor NT
Speed Sensor SP2
P
2ND
E
Suspension Control Switch
L4
NP
Four Wheel Drive Control ECU
N
Transfer Shift Actuator Assembly
ECM

for Preparation Click here

SYSTEM DESCRIPTION

a. The Electronic Controlled Automatic Transmission (ECT) is an automatic transmission that electronically controls shift timing using the Engine Control Module (ECM). The ECM detects electrical signals that indicate engine and driving conditions, and controls the shift point based on driver habits and road conditions. As a result, fuel efficiency and power transmission performance are improved.
Shift shock is reduced by controlling the engine and transmission simultaneously.
In addition, the ECT has the following features:

- Diagnostic function.
- Fail-safe function when a malfunction occurs.

for Preparation Click here

HINT:

- **The ECM is connected to the CAN communication system. Therefore, before starting troubleshooting, make sure to check that there is no trouble in the CAN communication system.**
- ***: Use the intelligent tester.**

1.VEHICLE BROUGHT TO WORKSHOP

NEXT

2.CUSTOMER PROBLEM ANALYSIS

NEXT

3.INSPECT BATTERY VOLTAGE

Standard Voltage:
11 to 14 V

If the voltage is below 11 V, recharge or replace the battery before proceeding.

NEXT

4.CONNECT INTELLIGENT TESTER TO DLC3*

NEXT

5.CHECK AND CLEAR DTCS AND FREEZE FRAME DATA*

a. Refer to the DTC Check / Clear (Click here).

NEXT

6.VISUAL INSPECTION

NEXT

7.SETTING CHECK MODE DIAGNOSIS*

a. Refer to the Check Mode Procedure (Click here).

NEXT

8.PROBLEM SYMPTOM CONFIRMATION

a. Refer to the Road Test (Click here).

Result

Result	Proceed to
Symptom does not occur	A
Symptom occurs	B

B. → GO TO STEP 10

A

9.SYMPTOM SIMULATION

a. Refer to the Electronic Circuit Inspection Procedure (Click here).

NEXT

10.DTC CHECK*

a. Refer to the DTC Check / Clear (Click here).

Result

Result	Proceed to
DTC is not output	A
DTC is output	B

B. → GO TO STEP 19

A

11.BASIC INSPECTION

a. Refer to the Park/Neutral Position Switch (Click here).

b. Refer to the Shift Lever Assembly (Click here).

NG. → GO TO STEP 22

OK

12.MECHANICAL SYSTEM TESTS

a. Refer to the Mechanical System Tests (Click here).

NG. → GO TO STEP 18

OK

13.HYDRAULIC TEST

a. Refer to the Hydraulic Test (Click here).

NG. → GO TO STEP 18

OK

14.MANUAL SHIFTING TEST

a. Refer to the Manual Shifting Test (Click here).

NG. → GO TO STEP 17

OK

15.PROBLEM SYMPTOMS TABLE CHAPTER 1

a. Refer to the Problem Symptoms Table (Click here).

NG. → GO TO STEP 20

OK

16.PROBLEM SYMPTOMS TABLE CHAPTER 2

a. Refer to the Problem Symptoms Table (Click here).

NG. → GO TO STEP 18

OK

17.PROBLEM SYMPTOMS TABLE CHAPTER 3

a. Refer to the Problem Symptoms Table (Click here).

NEXT

18.PART INSPECTION

NG. → GO TO STEP 22

OK

19.DTC CHART

a. Refer to the Diagnostic Trouble Code Chart (Click here).

NEXT

20.CIRCUIT INSPECTION

NEXT

21.IDENTIFICATION OF PROBLEM

NEXT

22.REPAIR OR REPLACE

NEXT

23.CONFIRMATION TEST

NEXT

END

for Preparation Click here

PROBLEM SYMPTOM CONFIRMATION

a. Based on the result of the customer problem analysis, try to reproduce the symptoms. If the problem is that the transmission does not shift up or down, or that the shift point is too high or too low, conduct the following road test referring to the automatic shift schedule and attempt to duplicate the problem symptoms.

ROAD TEST

a. Perform a road test.

CAUTION:

Check for safety before performing any tests.

NOTICE:

- **Be sure to inspect and adjust the engine before performing these tests.**
- **Perform the road test with the engine coolant temperature between 60 and 100°C (140 and 212°F) and the ATF temperature between 50 and 100°C (122 and 212°F).**
- **Perform these tests with the air conditioning and cruise control off.**

Inspection	Procedure
Transmission Control Switch Test	With the vehicle stationary and the shift lever in D, move the shift lever to S and return it to D. Check that the meter display changes from D to the appropriate S range and then back again.
S Position Test	With the vehicle stationary and the shift lever in S, move the shift lever to "+" and "-". Check that the meter display changes between S ranges properly.
D Position Shift Test	While driving the vehicle normally, check that the transmission shifts up and down through each gear properly.
Lock-up Function	While driving on a level surface at a constant speed in the lock-up range (80 km/h (50 mph) or more) with the shift lever in D, lightly depress the accelerator pedal and check that the engine speed does not change abruptly.
P Position Test	Stop the vehicle on an incline (approximately 5° or more). Then move the shift lever to P and release the parking brake. Check that the parking lock pawl holds the vehicle in place.
Abnormal Noise and Vibration	Check for abnormal noise and vibration while driving the vehicle forward and backward, and during shift operations.
Fluid Leakage	After performing all other road test inspections, check for fluid leakage.

for Preparation Click here

STALL SPEED TEST

HINT:

This test is to check the overall performance of the engine and transmission.

CAUTION:

- **To ensure safety, perform this test in an open and level area that provides good traction.**
- **The stall speed test should always be performed with at least 2 people. One person should observe the condition of the wheels and wheel chocks while the other is performing the test.**

NOTICE:

Do not perform the stall speed test for more than 5 seconds.

a. Connect the intelligent tester to the DLC3.

b. Run the vehicle until the transmission fluid temperature has reached 50 to 80°C (122 to 176°F).

c. Allow the engine to idle with the A/C off.

d. Chock all 4 wheels.

e. Set the parking brake and keep the brake pedal depressed firmly with your left foot.

f. Move the shift lever to D.

g. Depress the accelerator pedal as much as possible with your right foot.

h. Read the engine speed (stall speed) and release the accelerator pedal immediately.

Standard value:
2400 +/-200 rpm

Evaluation

Test Result	Possible Cause
Stall speed is lower than standard value	• Stator one-way clutch is not operating properly • Torque converter is faulty (stall speed is less than standard value by 600 rpm or more) • Engine power may be insufficient
Stall speed is higher than standard value	• Line pressure is low • C1 clutch slipping • F3 one-way clutch is not operating properly

NOTICE:

Perform the test at the normal operating ATF temperature of 50 to 80°C (122 to 176°F).

SHIFT TIME LAG TEST

HINT:

This test is to check the condition of the direct clutch, forward clutch, 1st brake and reverse brake.

a. Connect the intelligent tester to the DLC3.

b. Run the vehicle until the transmission fluid temperature has reached 50 to 80°C (122 to 176°F).

c. Allow the engine to idle with the A/C off.

d. Set the parking brake and keep the brake pedal depressed firmly.

e. Check the D position time lag.

i. Move the shift lever to N and wait for 1 minute.

ii. Move the shift lever to D and measure the time until the shock is felt.

iii. Repeat the 2 procedures above 3 times, and calculate the average time of the 3 tests.

f. Check the R position time lag.

i. Move the shift lever to N and wait for 1 minute.

ii. Move the shift lever to R and measure the time until the shock is felt.

iii. Repeat the 2 procedures above 3 times, and calculate the average time of the 3 tests.

Standard value:
D position time lag is less than 1.2 seconds
R position time lag is less than 1.5 seconds

Evaluation

Test Result	Possible Cause
D position time lag exceeds standard value	• Line pressure is low • C1 clutch is worn • F3 one-way clutch is not operating properly
R position time lag exceeds standard value	• Line pressure is low • C3 clutch is worn • B4 brake is worn • F1 one-way clutch is not operating properly

for Preparation Click here

PERFORM HYDRAULIC TEST

a. Measure the line pressure.

CAUTION:

The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.

NOTICE:

- **Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **This check must be conducted after checking and adjusting the engine.**
- **Perform the check with the A/C turned off.**
- **When conducting the stall test, do not continue for more than 5 seconds.**

i. Warm up the ATF (Automatic Transmission Fluid).

ii. Turn the engine switch off.

iii. Lift the vehicle up.

iv. Remove the test plug on the transmission case center right side and connect SST.

SST
09992-00095 (09992-00231, 09992-00271)

v. Lower the vehicle.

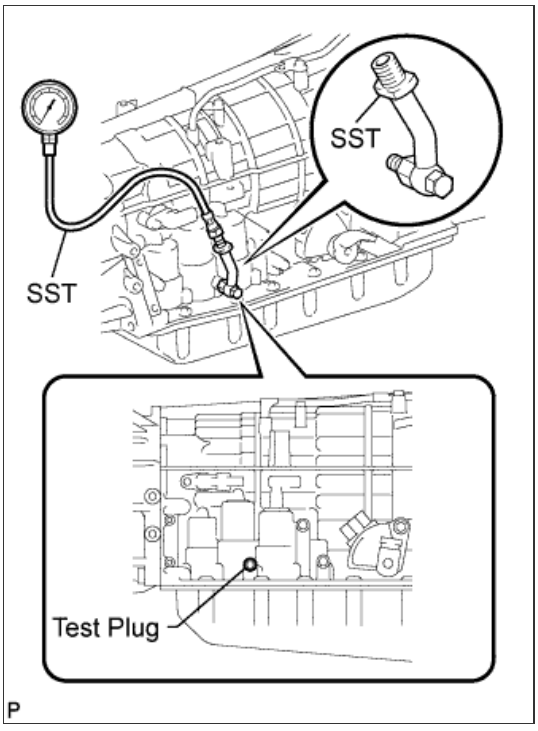
vi. Fully apply the parking brake and chock the 4 wheels.

vii. Start the engine and check the idling speed.

viii. Keep your left foot pressed firmly on the brake pedal and move the shift lever to D.

ix. Fully depress the accelerator pedal with your right foot. Quickly read the highest line pressure when the engine speed reaches stall speed.

x. In the same manner, perform the test with the shift lever in R.



Specified Line Pressure

Condition	D Position	R Position
Stall test	1360 to 1480 kPa (13.9 to 15.1 kgf/cm^2, 197 to 215 psi)	1290 to 1520 kPa (13.2 to 15.5 kgf/cm^2, 187 to 220 psi)

Evaluation

Problem	Possible Cause
Measured values at D and R positions are higher than specified pressure	• Shift solenoid valve SLT defective • Regulator valve defective

Measured values at D and R positions are lower than specified pressure	• Shift solenoid valve SLT defective • Regulator valve defective • Oil pump defective
Pressure is low in D position only	• D position circuit fluid leak • Clutch No. 1 (C1) defective
Pressure is low in R position only	• R position circuit fluid leak • Clutch No. 3 (C3) defective • Brake No. 4 (B4) defective

for Preparation Click here

MANUAL SHIFTING TEST

HINT:

- **Through this test, it can be determined whether the trouble occurs in an electrical circuit or if it is a mechanical problem in the transmission.**
- **If any abnormalities are found in the following test, the problem is in the transmission itself.**

a. Disconnect the connector of the transmission wire.

HINT:

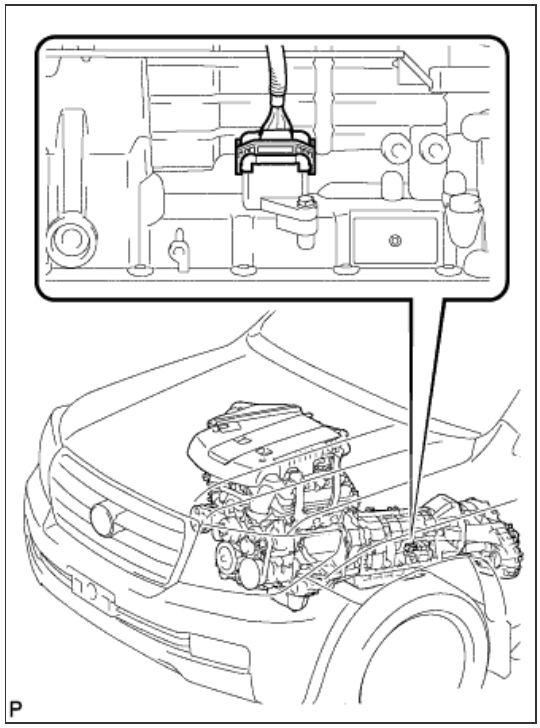
It is possible to deactivate the electrical shift control by disconnecting the transmission wire. The gear positions can then be changed mechanically with the shift lever.

b. Drive with the transmission wire disconnected. Move the shift lever to each position to check whether the gear position changes as shown in the table below.

Shift Lever Position	Gear Position
P	P
R	R
D	4th

c. Connect the connector of the transmission wire.

d. Clear the DTC (Click here).



for Preparation Click here

RESET MEMORY

NOTICE:

- **Perform the Reset Memory (AT initialization) when replacing the automatic transmission assembly, valve body assembly or any of the shift solenoid valves.**
- **The Reset Memory can be performed only with the intelligent tester.**

HINT:

The ECM memorizes the control conditions of the automatic transmission assembly and engine assembly. Therefore, when the automatic transmission assembly, valve body assembly or any of the shift solenoid valves has been replaced, it is necessary to reset the memory so that the ECM can memorize the new information.

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / Utility / Reset Memory.

NOTICE:

After performing the Reset Memory, be sure to perform the Road Test (Click here) described earlier.

HINT:

The ECM learns through the road test.

for Preparation Click here

AUTOMATIC TRANSMISSION MONITOR DRIVE PATTERN

CAUTION:

Perform this drive pattern on a level surface and strictly observe the posted speed limits and traffic laws while driving.

HINT:

Performing this drive pattern is one method to simulate the automatic transmission malfunction detection conditions.

The DTCs may not be stored through ordinary, everyday driving. Also, DTCs may not be stored through this drive pattern.

a. Preparation for driving

i. Warm up the engine sufficiently (engine coolant temperature is 60°C (140°F) or higher).

ii. Drive the vehicle when the atmospheric temperature is -10°C (14°F) or higher.
Malfunctions are not detected when the atmospheric temperature is below -10°C (14°F).

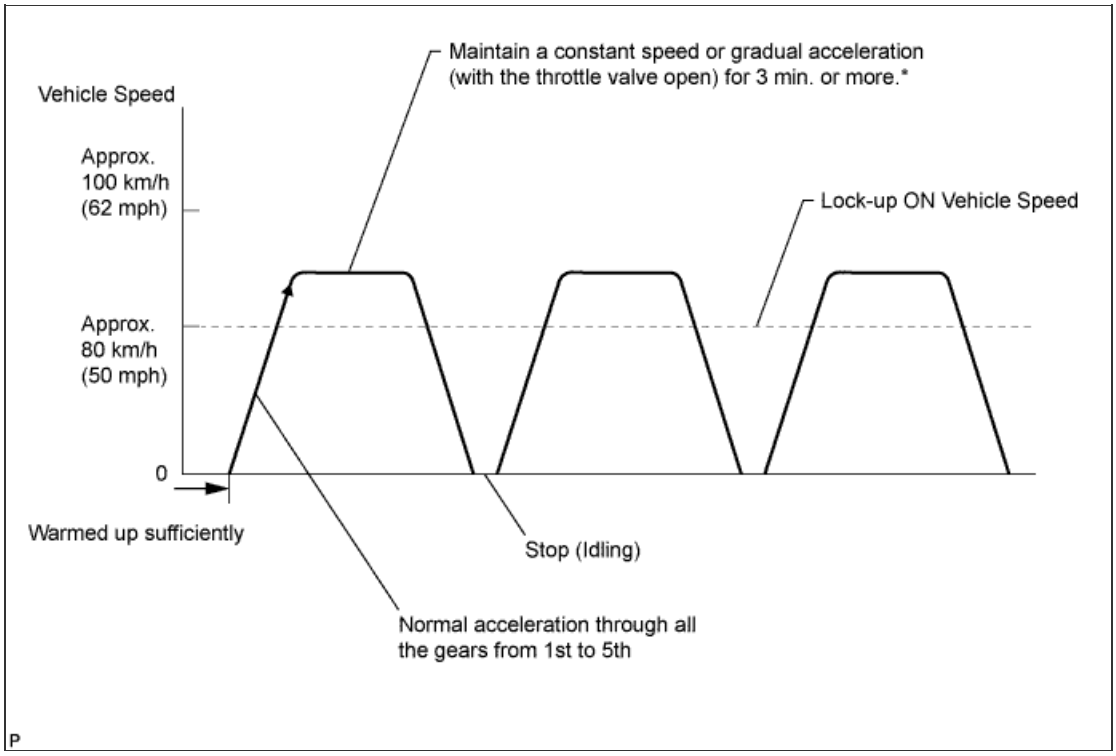
b. Drive pattern

i. Drive the vehicle through all the gears.
Stop → 1st → 2nd → 3rd → 4th → 5th → 5th (lock-up ON).

ii. Repeat the above drive pattern 3 times or more.

NOTICE:

- **When using the intelligent tester, the monitor status can be checked in the Data List (Click here).**
- **In the event that the drive pattern must be interrupted (due to traffic conditions or other factors), the drive pattern can be resumed and, in most cases, the monitor can be completed.**



HINT:

*: Drive at such a speed in the uppermost gear to engage lock-up. The vehicle can be driven at a speed lower than the speed shown in the above diagram under the lock-up condition.

for Preparation Click here

HINT:

- **If a normal code is output during the diagnostic trouble code check although the trouble still occurs, check the electrical circuits for each symptom in the order given in the charts below and proceed to the "See page".**
- **The Matrix Chart is divided into 3 chapters.**
  Chapter 1:
  Refer to the table below when the trouble cause is considered to be electrical.
- **If the instruction "Proceed to next circuit inspection shown in problem symptoms table" is given in the flowchart of each circuit, proceed to the next circuit in the table to continue the check.**
- **If the trouble still occurs even though there are no abnormalities in any of the other circuits, check and replace the ECM.**
- ***: When the circuit is defective, a DTC may be stored.**

1. Chapter 1: Electronic Circuit Matrix Chart

Symptom	Suspected Area	See page
Up-shifts between 1st and 4th gear do not occur	Shift solenoid valve S1 circuit*	Click here
	Shift solenoid valve S2 circuit*	Click here
	ECM	Click here
No up-shift (4th -> 5th)	Engine coolant temperature sensor circuit*	Click here
	Speed sensor NT circuit*	Click here
	Shift solenoid valve SL1 circuit*	Click here
	Shift solenoid valve SL2 circuit*	Click here
	Shift solenoid valve SR circuit*	Click here
	ECM	Click here
No up-shift (3rd -> 4th)	Engine coolant temperature sensor circuit*	Click here
	Shift solenoid valve S2 circuit*	Click here
	ECM	Click here
No up-shift (1st -> 2nd)	ECM	Click here
No down-shift (5th -> 4th)	Shift solenoid valve SL1 circuit*	Click here
	Shift solenoid valve SL2 circuit*	Click here
	Shift solenoid valve SR circuit*	Click here
	ECM	Click here
No down-shift (2nd -> 1st)	Shift solenoid valve S2 circuit*	Click here
	ECM	Click here
Down-shifts between 4th and 1st gear do not occur	Shift solenoid valve S1 circuit*	Click here
	Shift solenoid valve S2 circuit*	Click here
	ECM	Click here
No lock-up	No. 1 ATF temperature sensor circuit*	Click here
	Stop light switch circuit*	Click here
	Speed sensor NT circuit*	Click here
	Shift solenoid valve SLU circuit*	Click here
	Engine coolant temperature sensor circuit*	Click here
	ECM	Click here
No lock-up off	Shift solenoid valve SLU circuit*	Click here
	ECM	Click here
Shift point too high or too low	Shift solenoid valve SLT circuit*	Click here
	Speed sensor NT circuit*	Click here
	Speed sensor SP2 circuit*	Click here
	Throttle position sensor circuit*	Click here
	Pattern select (PWR) switch circuit	Click here
	No. 1 ATF temperature sensor circuit*	Click here
	ECM	Click here
Up-shift to 5th from 4th while engine is cold	Engine coolant temperature sensor circuit*	Click here
	ECM	Click here
	Speed sensor NT circuit*	Click here

Harsh engagement (N -> D)	Shift solenoid valve SL1 circuit*	Click here
	Shift solenoid valve SLT circuit*	Click here
	ECM	Click here
Harsh engagement (Lock-up)	Speed sensor NT circuit*	Click here
	Speed sensor SP2 circuit*	Click here
	Shift solenoid valve SLU circuit*	Click here
	ECM	Click here
Harsh engagement (Any gear position)	ECM	Click here
Poor acceleration	No. 2 ATF temperature sensor circuit*	Click here
	Engine coolant temperature sensor circuit*	Click here
	Shift solenoid valve SLT circuit*	Click here
	Pattern select (2ND) switch circuit	Click here
	ECM	Click here
No engine braking	ECM	Click here
No kick-down	ECM	Click here
Engine stalls when starting off or stopping	Shift solenoid valve SLU circuit*	Click here
	ECM	Click here
ECT 2ND does not operate	Shift solenoid valve SLT circuit*	Click here
	Pattern select (2ND) switch circuit	Click here
	ECM	Click here
ATF temperature warning light remains on, lock-up at 3rd gear and/or shift position too high	No. 2 ATF temperature sensor circuit*	Click here
	Engine coolant temperature sensor circuit*	Click here
	ECM	Click here
No gear change by shifting into "+" or "-" while shift lever in S	Transmission control switch circuit	Click here
	ECM	Click here
Malfunction in shifting	Park/neutral position switch circuit*	Click here
	Transmission control switch circuit	Click here
	ECM	Click here

2. Chapter 2: On-vehicle Repair

Symptom	Suspected Area	See page
Vehicle does not move with shift lever in any forward position and reverse position	Floor shift gear shifting rod sub-assembly	Click here
	Manual valve	Click here
	Parking lock pawl	Click here
	Off-vehicle repair matrix chart	-
Vehicle does not move with shift lever in R	Valve body assembly	Click here
	Off-vehicle repair matrix chart	-
No up-shift (1st -> 2nd)	Valve body assembly	Click here
	Off-vehicle repair matrix chart	-
No up-shift (2nd -> 3rd)	Valve body assembly	Click here
	Off-vehicle repair matrix chart	-
No up-shift (3rd -> 4th)	Valve body assembly	Click here
	Off-vehicle repair matrix chart	-
No up-shift (4th -> 5th)	Valve body assembly	Click here
	Off-vehicle repair matrix chart	-
No down-shift (5th -> 4th)	Valve body assembly	Click here
	Off-vehicle repair matrix chart	-
No down-shift (4th -> 3rd)	Valve body assembly	Click here
	Off-vehicle repair matrix chart	-
No down-shift (3rd -> 2nd)	Valve body assembly	Click here
	Off-vehicle repair matrix chart	-
No down-shift (2nd -> 1st)	Valve body assembly	Click here
	Off-vehicle repair matrix chart	-
No lock-up or no lock-up off	Shift solenoid valve SLU	Click here
	Valve body assembly	Click here
	Off-vehicle repair matrix chart	-

Harsh engagement (N -> D)	Shift solenoid valve SL1	Click here
	Valve body assembly	Click here
	C1 accumulator	Click here
	Off-vehicle repair matrix chart	-
Harsh engagement (Lock-up)	Shift solenoid valve SLU	Click here
	Valve body assembly	Click here
	Off-vehicle repair matrix chart	-
Harsh engagement (N -> R)	Shift solenoid valve SLT	Click here
	Shift solenoid valve SLU	Click here
	Valve body assembly	Click here
	C3 accumulator	Click here
	Off-vehicle repair matrix chart	-
Harsh engagement (1st -> 2nd -> 3rd -> 4th -> 5th)	Shift solenoid valve SLT	Click here
	Shift solenoid valve SL1	Click here
	Valve body assembly	Click here
Harsh engagement (1st -> 2nd)	Valve body assembly	Click here
	B3 accumulator	Click here
	Off-vehicle repair matrix chart	-
Harsh engagement (2nd -> 3rd)	Valve body assembly	Click here
	C3 accumulator	Click here
	Off-vehicle repair matrix chart	-
Harsh engagement (3rd -> 4th)	Valve body assembly	Click here
	C2 accumulator	Click here
	Off-vehicle repair matrix chart	-
Harsh engagement (4th -> 5th)	Shift solenoid valve SL1	Click here
	Shift solenoid valve SL2	Click here
	Valve body assembly	Click here
	Off-vehicle repair matrix chart	-
Harsh engagement (5th -> 4th)	Shift solenoid valve SL1	Click here
	Shift solenoid valve SL2	Click here
	Valve body assembly	Click here
	Off-vehicle repair matrix chart	-
Slip or shudder (Forward and reverse)	Floor shift gear shifting rod sub-assembly	Click here
	Valve body assembly	Click here
	Oil strainer	Click here
	Off-vehicle repair matrix chart	-
No kick-down	Valve body assembly	Click here
Shift point too high or too low	Shift solenoid valve SLT	Click here
	Shift solenoid valve SL1	Click here
	Valve body assembly	Click here
Poor acceleration	Shift solenoid valve SLT	Click here
	Valve body assembly	Click here
Engine stalls when starting off or stopping	Shift solenoid valve SLU	Click here
	Valve body assembly	Click here

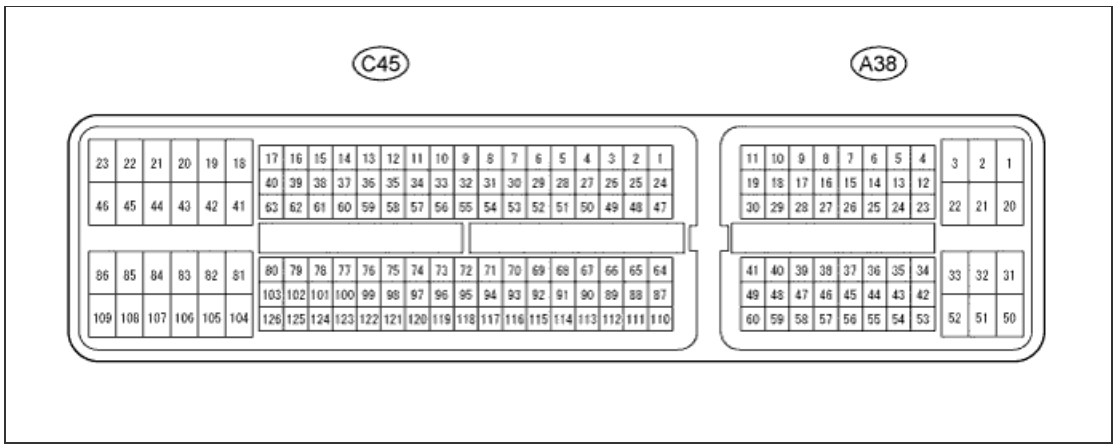
3. Chapter 3: Off-vehicle Repair

Symptom	Suspected Area	See page
Vehicle does not move with shift lever in any forward position and reverse position	Rear planetary gear unit	Click here
	Torque converter clutch	Click here
Vehicle does not move with shift lever in R	Brake No. 4 (B4)	Click here
	Clutch No. 3 (C3)	Click here
	One-way clutch No. 1 (F1)	Click here
No up-shift (1st -> 2nd)	Brake No. 3 (B3)	Click here
	One-way clutch No. 1 (F1)	Click here
	One-way clutch No. 2 (F2)	Click here
No up-shift (2nd -> 3rd)	Clutch No. 3 (C3)	Click here
No up-shift (3rd -> 4th)	Clutch No. 2 (C2)	Click here

No up-shift (4th -> 5th)	Brake No. 1 (B1)	Click here
	Clutch No. 1 (C1)	Click here
No lock-up or no lock-up off	Torque converter clutch	Click here
Harsh engagement (N -> D)	Clutch No. 1 (C1)	Click here
	One-way clutch No. 3 (F3)	Click here
Harsh engagement (N -> R)	Clutch No. 3 (C3)	Click here
	Brake No. 4 (B4)	Click here
	One-way clutch No. 1 (F1)	Click here
Harsh engagement (1st -> 2nd)	Brake No. 3 (B3)	Click here
	One-way clutch No. 1 (F1)	Click here
	One-way clutch No. 2 (F2)	Click here
Harsh engagement (2nd -> 3rd)	Clutch No. 3 (C3)	Click here
Harsh engagement (3rd -> 4th)	Clutch No. 2 (C2)	Click here
Harsh engagement (4th -> 5th)	Brake No. 1 (B1)	Click here
	Clutch No. 1 (C1)	Click here
Harsh engagement (Lock-up)	Torque converter clutch	Click here
Slip or shudder (Forward and reverse: after engine is warmed up)	One-way clutch No. 1 (F1)	Click here
	Clutch No. 3 (C3)	Click here
	Torque converter clutch	Click here
Slip or shudder (Particular position: just after engine starts)	Torque converter clutch	Click here
Slip or shudder (R position)	Brake No. 4 (B4)	Click here
	One-way clutch No. 1 (F1)	Click here
	Clutch No. 3 (C3)	Click here
Slip or shudder (1st)	Clutch No. 1 (C1)	Click here
	One-way clutch No. 3 (F3)	Click here
Slip or shudder (2nd)	Clutch No. 1 (C1)	Click here
	Brake No. 3 (B3)	Click here
	One-way clutch No. 1 (F1)	Click here
	One-way clutch No. 2 (F2)	Click here
Slip or shudder (3rd)	Clutch No. 1 (C1)	Click here
	Clutch No. 3 (C3)	Click here
	One-way clutch No. 1 (F1)	Click here
Slip or shudder (4th)	Clutch No. 1 (C1)	Click here
	Clutch No. 2 (C2)	Click here
Slip or shudder (5th)	Clutch No. 2 (C2)	Click here
	Clutch No. 3 (C3)	Click here
	Brake No. 1 (B1)	Click here
No engine braking (1st to 4th: D position)	Clutch No. 1 (C1)	Click here
Poor acceleration (All positions)	Torque converter clutch	Click here
Poor acceleration (5th)	Clutch No. 1 (C1)	Click here
	Clutch No. 3 (C3)	Click here
	Brake No. 1 (B1)	Click here
	Front planetary gear unit	Click here
Engine stalls when starting off or stopping	Torque converter clutch	Click here

for Preparation Click here

CHECK ECM



HINT:

Each ECM terminal standard voltage is shown in the table below.

In the table, first follow the information under "Condition". Look under "Terminal No. (Symbol)" for the terminals to inspected. The standard voltage between the terminals is shown under "Specified Condition".

Use the illustration above as a reference for the ECM terminals.

Terminal No. (Symbol)	Wiring Color	Terminal Description	Condition	Specified Condition
A38-21 (L4) - C45-81 (E1)	BR-R - BR	Transfer L4 position signal	• Engine switch on (IG) • Transfer position switch on L4	Below 1.5 V
			• Engine switch on (IG) • Transfer position switch not on L4	11 to 14 V
A38-5 (TFN) - C45-81 (E1)	G - BR	Transfer neutral position signal	• Engine switch on (IG) • Transfer position in neutral	Below 1.5 V
			• Engine switch on (IG) • Transfer position not in neutral	11 to 14 V
C45-120 (NSW) - C45-81 (E1)	L - BR	PNP switch signal	• Engine switch on (IG) • Shift lever in P or N	Below 1.5 V
			• Engine switch on (IG) • Shift lever not in P or N	11 to 14 V
			• Engine switch on (IG) • Shift lever in P	11 to 14 V

C45-2 (P) - C45-81 (E1)	G-B - BR	P shift position switch signal	• Engine switch on (IG) • Shift lever not in P	Below 1.5 V
C45-26 (R) - C45-81 (E1)	L-R - BR	R shift position switch signal	• Engine switch on (IG) • Shift lever in R	11 to 14 V
			• Engine switch on (IG) • Shift lever not in R	Below 1.5 V
C45-25 (N) - C45-81 (E1)	G-W - BR	N shift position switch signal	• Engine switch on (IG) • Shift lever in N	11 to 14 V
			• Engine switch on (IG) • Shift lever not in N	Below 1.5 V
C45-27 (D) - C45-81 (E1)	G - BR	D shift position switch signal	• Engine switch on (IG) • Shift lever in D	11 to 14 V
			• Engine switch on (IG) • Shift lever not in D	Below 1.5 V
A38-25 (S) - C45-81 (E1)	W - BR	S shift position switch signal	• Engine switch on (IG) • Shift lever in S	11 to 14 V
			• Engine switch on (IG) • Shift lever not in S	Below 1 V
A38-38 (SFTU) - C45-81 (E1)	V - BR Y - BR*	Up-shift shift position switch signal	• Engine switch on (IG) • Shift lever in S	11 to 14 V
			• Engine switch on (IG) • Shift lever in "+" position (up-shift)	Below 1 V
A38-27 (SFTD) - C45-81 (E1)	L - BR	Down-shift position switch signal	• Engine switch on (IG) • Shift lever in S	11 to 14 V
			• Engine switch on (IG) • Shift lever in "-" position (down-shift)	Below 1 V
A38-36 (STP) - C45-81 (E1)	R - BR	Stop light switch signal	Brake pedal depressed	11 to 14 V
			Brake pedal released	Below 1.5 V
C45-7 (S1) - C45-81 (E1)	R - BR	Shift solenoid valve S1 signal	Engine switch on (IG)	11 to 14 V
			1st or 2nd gear	11 to 14 V
			3rd, 4th or 5th gear	Below 1.5 V
C45-4 (S2) - C45-81 (E1)	W - BR	Shift solenoid valve S2 signal	Engine switch on (IG)	Below 1.5 V
			2nd or 3rd gear	11 to 14 V
			1st, 4th or 5th gear	Below 1.5 V
C45-6 (SR) - C45-81 (E1)	G - BR	Shift solenoid valve SR signal	Engine switch on (IG)	Below 1.5 V
			5th gear	11 to 14 V

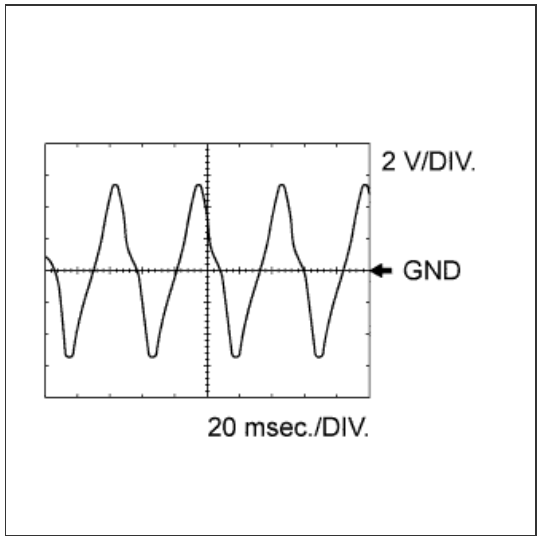
			1st gear	Below 1 V
C45-14 (SL1+) - C45-15 (SL1-)	Y - L	Shift solenoid valve SL1 signal	Engine idling	Pulse generation
C45-12 (SL2+) - C45-13 (SL2-)	G-R - L-W	Shift solenoid valve SL2 signal	Engine idling	Pulse generation
C45-9 (SLT+) - C45-8 (SLT-)	B - G-B	Shift solenoid valve SLT signal	Engine idling	Pulse generation
C45-10 (SLU+) - C45-11 (SLU-)	L-Y - L-R	Shift solenoid valve SLU signal	4th (lock-up) gear or 5th (lock-up) gear	Pulse generation
C45-122 (THO1) - C45-97 (ETHW)	G-Y - BR	No. 1 ATF temperature sensor signal	No. 1 ATF temperature: 115°C (239°F) or higher	Below 1.5 V
C45-99 (THO2) - C45-97 (ETHW)	L - BR	No. 2 ATF temperature sensor signal	No. 2 ATF temperature: 115°C (239°F) or higher	Below 1.5 V
C45-101 (SP2+) - C45-100 (SP2-)	Y - B	Speed sensor SP2 signal	Vehicle speed 20 km/h (12 mph)	Pulse generation (see waveform 1)
C45-124 (NT+) - C45-123 (NT-)	Y - B	Speed sensor NT signal	Engine idling (Shift lever in P or N)	Pulse generation (see waveform 2)
A38-10 (CANH) - C45-81 (E1)	P - BR	CAN communication line	Engine switch on (IG)	Pulse generation (see waveform 3)
A38-11 (CANL) - C45-81 (E1)	B - BR	CAN communication line	Engine switch on (IG)	Pulse generation (see waveform 4)
A38-51 (PWR) - C45-81 (E1)	L-B - BR	Pattern select (PWR) switch signal	• Engine switch on (IG) • Pattern select (PWR) switch off	11 to 14 V
			• Engine switch on (IG) • Pattern select (PWR) switch on	Below 1.5 V
A38-4 (SNWI) - C45-81 (E1)	P - BR R - BR*	Pattern select (2ND) switch signal	• Engine switch on (IG) • Pattern select (2ND) switch off	11 to 14 V
			• Engine switch on (IG) • Pattern select (2ND) switch continuously pressed	Below 1.5 V

*: GRJ200L-GNANKC

a. Using an oscilloscope, check waveform 1.

Reference:

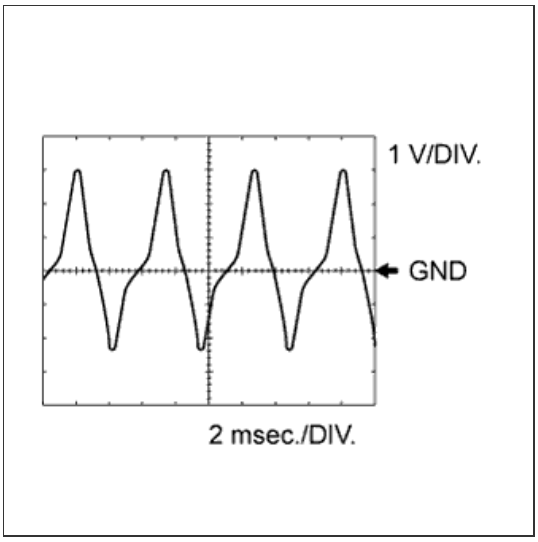
Terminal No. (Symbol)	Tool Setting	Condition
C45-101 (SP2+) - C45-100 (SP2-)	2 V/DIV., 20 msec./DIV.	Vehicle speed 20 km/h (12 mph)



b. Using an oscilloscope, check waveform 2.

Reference:

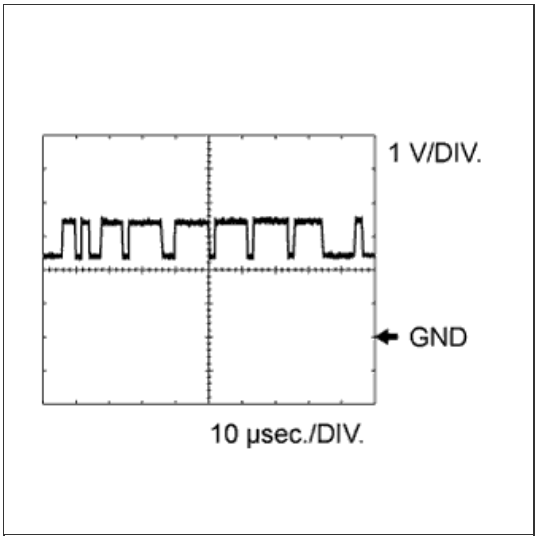
Terminal No. (Symbol)	Tool Setting	Condition
C45-124 (NT+) - C45-123 (NT-)	1 V/DIV., 2 msec./DIV.	Engine idling (Shift lever in P or N)



c. Using an oscilloscope, check waveform 3.

Reference:

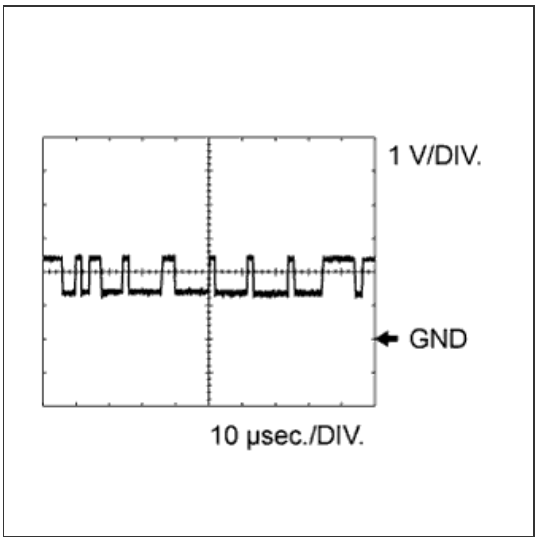
Terminal No. (Symbol)	Tool Setting	Condition
A38-10 (CANH) - C45-81 (E1)	1 V/DIV., 10 µsec./DIV.	Engine switch on (IG)



d. Using an oscilloscope, check waveform 4.

Reference:

Terminal No. (Symbol)	Tool Setting	Condition
A38-11 (CANL) - C45-81 (E1)	1 V/DIV., 10 µsec./DIV.	Engine switch on (IG)

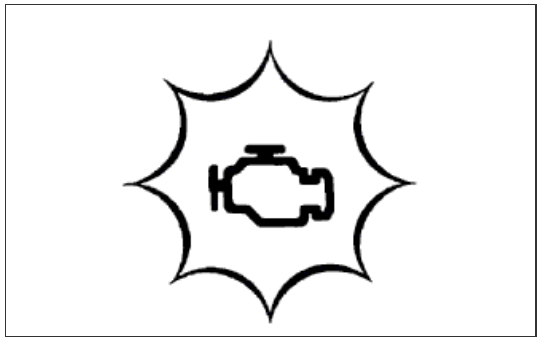


for Preparation Click here

DESCRIPTION

a. When troubleshooting On-Board Diagnostic (OBD II) vehicles, the vehicle must be connected to the OBD II scan tool (complying with SAE J1987). Various data output from the vehicle ECM can then be read.

b. OBD II regulations require that the vehicle on-board computer illuminate the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in:



i. The emission control system/components

ii. The powertrain control components (which affect vehicle emissions)

iii. The computer
In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are stored in the ECM memory.
When the malfunction does not reoccur, the MIL stays illuminated until the engine switch is turned off, and the MIL turns off when the engine is started. However, the DTCs remain stored in the ECM memory.

c. To check DTCs, connect the intelligent tester to the Data Link Connector 3 (DLC3) of the vehicle. The tester displays output DTCs, the freeze frame data and a variety of the engine data.
The DTCs and freeze frame data can be cleared with the tester (Click here).

NORMAL MODE AND CHECK MODE

a. The diagnosis system operates in "normal mode" during normal vehicle use. In normal mode, "2 trip detection logic" is used to ensure accurate detection of malfunctions. "Check mode" is also available to technicians as an option. In check mode, "1 trip detection logic" is used for simulating malfunction symptoms and increasing the system ability to detect malfunctions, including intermittent malfunctions.

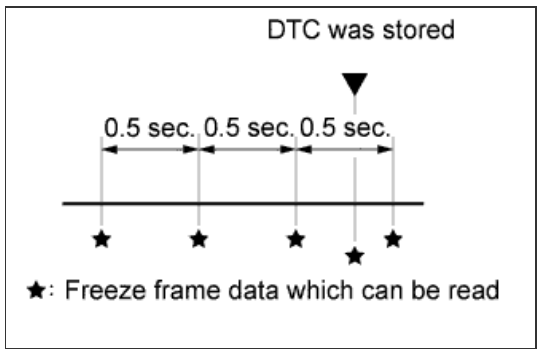
2 TRIP DETECTION LOGIC

a. When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory (1st trip). If the same malfunction is detected during the next drive cycle, the MIL is illuminated (2nd trip).

FREEZE FRAME DATA

a. Freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

b. The ECM records freeze frame data in 5 different instances: 1) 3 times before the DTC is stored, 2) once when the DTC is stored, and 3) once after the DTC is stored. These data can be used to simulate the vehicle condition around the time when the malfunction occurred. The data may help find the cause of the malfunction, or judge if the DTC is being caused by a temporary malfunction or not.



CHECK DATA LINK CONNECTOR 3 (DLC3) (Click here)

CHECK MIL

a. Check that the MIL illuminates when turning the engine switch on (IG).
   If the MIL does not illuminate, there is a problem in the MIL circuit (Click here).

b. When the engine is started, the MIL should turn off.

for Preparation Click here

CHECK DTC

a. DTCs which are stored in the ECM can be output to the intelligent tester.
The tester can display pending DTCs and current DTCs. Some DTCs are not stored unless a malfunction is detected in consecutive driving cycles. When a malfunction is detected in only one driving cycle, it is stored as a pending DTC.

i. Connect the intelligent tester to the DLC3.

ii. Turn the engine switch on (IG).

iii. Turn the intelligent tester on.

iv. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

v. Confirm the DTCs and freeze frame data, and then write them down.

vi. Confirm the details of the DTCs (Click here).

NOTICE:

When simulating a symptom with the scan tool to check for DTCs, use normal mode. For codes on the Diagnostic Trouble Code Chart subject to "2 trip detection logic", perform the following actions:

Turn the engine switch off after the symptom is simulated once. Then repeat the simulation process. When the symptom has been simulated twice, the MIL illuminates and the DTCs are stored in the ECM.

CLEAR DTC (using intelligent tester)

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / DTC / Clear.

CLEAR DTC (without using intelligent tester)

a. Perform either of the following operations.

i. Disconnect the cable from the negative (-) battery terminal for more than 1 minute.

ii. Remove the EFI MAIN and ETCS fuse from the engine room relay block located inside the engine compartment for more than 1 minute.

for Preparation Click here

DESCRIPTION

a. Check mode has a higher sensitivity to malfunctions and can detect malfunctions that normal mode cannot detect. Check mode can also detect all the malfunctions that normal mode can detect. In check mode, DTCs are stored with 1 trip detection logic.

CHECK MODE PROCEDURE

a. Make sure that the following conditions are met:

   i. Battery positive voltage 11 V or higher.

   ii. Throttle valve fully closed.

   iii. Shift lever in P or N.

   iv. A/C turned off.

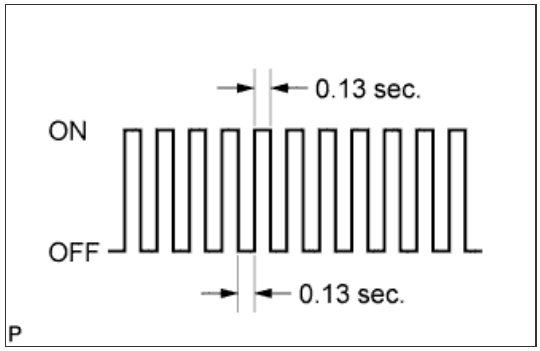
b. Connect the intelligent tester to the DLC3.

c. Turn the engine switch on (IG).

d. Turn the intelligent tester on.

e. Enter the following menus: Powertrain / Engine and ECT / Utility / Check Mode.

f. Check that the MIL flashes as shown in the illustration.



NOTICE:

- **All DTCs and freeze frame data will be cleared if: 1) the intelligent tester is used to change the ECM from normal mode to check mode or vice versa; or 2) during check mode, the engine switch is turned from on (IG) to on (ACC) or off.**
- **Before changing to check mode, make notes of the DTCs and freeze frame data.**

g. Start the engine. The MIL should turn off after the engine starts.

h. Perform the Monitor Drive Pattern for the ECT test (Click here).
(Or, simulate the conditions of the malfunction described by the customer).

i. After simulating the malfunction conditions, use the tester to check the DTC and freeze frame data.

for Preparation Click here

FAIL-SAFE

This function minimizes the loss of the ECT functions when a malfunction occurs in each sensor or solenoid.

Malfunction Part	Function
No. 1 ATF temperature sensor	During a No. 1 ATF temperature sensor malfunction, up-shift to 5th gear and flex lock-up clutch control are prohibited.
Speed sensor SP2	During an output speed sensor malfunction, shift control is performed through the input speed sensor NT signal.
Shift solenoid valve S1, S2 and SR	The current to the malfunctioning solenoid valve is cut off and control is performed by operating the other normal solenoid valves. Shift control is performed depending on the malfunctioning solenoid as described in the table below.
Shift solenoid valve SL1 and SL2	During a solenoid valve SL1 or SL2 malfunction, up-shift to 5th gear is prohibited.
Shift solenoid valve SLT	During a solenoid valve SLT malfunction, the current to the solenoid valve is stopped. This stops line pressure optimal control, and shift shock increases. However, shifting is performed through normal clutch pressure control.
Shift solenoid valve SLU	During a solenoid valve SLU malfunction, the current to the solenoid valve is stopped. This stops lock-up control and flex lock-up control, and fuel economy decreases.

Shift Solenoid Valve Normal Operation Chart:

Shift Lever Position	Gear	Shift Solenoid Valve S1	Shift Solenoid Valve S2	Shift Solenoid Valve SR	Shift Solenoid Valve SL1	Shift Solenoid Valve SL2
D S5	1st	ON	OFF	OFF	OFF	ON
	2nd	ON	ON	OFF	OFF	ON
	3rd	OFF	ON	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
	5th	OFF	OFF	ON	ON	OFF
S4	1st	ON	OFF	OFF	OFF	ON
	2nd	ON	ON	OFF	OFF	ON
	3rd	OFF	ON	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
S3	1st	ON	OFF	OFF	OFF	ON
	2nd	ON	ON	OFF	OFF	ON
	3rd E/B	OFF	ON	OFF	OFF	OFF
S2	1st	ON	OFF	OFF	OFF	ON
	2nd E/B	ON	ON	ON	OFF	OFF
S1	1st E/B	ON	OFF	OFF	OFF	OFF

FAIL-SAFE FUNCTION

If either of the shift solenoid valve circuits has an open or short failure, the ECM turns the other shift solenoid ON and OFF in order to shift into the gear positions shown in the table below.
In case of a short circuit, the ECM stops sending current to the short circuit solenoid.
Even if starting the engine again in the fail-safe mode, the gear position remains in the same position.

HINT:

- **Electrical malfunction: Condition is shown above the "↓".**
- **Fail-safe mode: Condition is shown below the "↓".**
- **E/B: Engine brake.**

Fail-safe Operation when Shift Solenoid Valve S1 is Malfunctioning:

Shift Lever Position	Gear	Shift Solenoid Valve S1	Shift Solenoid Valve S2	Shift Solenoid Valve SR	Shift Solenoid Valve SL1	Shift Solenoid Valve SL2
	4th		OFF			

D S5	↓ 3rd	OFF	↓ ON	OFF	OFF	ON
	3rd	OFF	ON	OFF	OFF	ON
	3rd	OFF	ON	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
	5th	OFF	OFF	ON	ON	OFF
S4	4th ↓ 3rd	OFF	OFF ↓ ON	OFF	OFF	ON
	3rd	OFF	ON	OFF	OFF	ON
	3rd	OFF	ON	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
S3	3rd ↓ 3rd E/B	OFF	OFF ↓ ON	OFF	OFF	ON ↓ OFF
	3rd ↓ 3rd E/B	OFF	ON	OFF	OFF	ON ↓ OFF
	3rd E/B	OFF	ON	OFF	OFF	OFF
S2	1st	OFF	OFF	OFF	OFF	ON
	3rd E/B	OFF	ON	ON	OFF	OFF
S1	1st E/B	OFF	OFF	OFF	OFF	OFF

Fail-safe Operation when Shift Solenoid Valve S2 is Malfunctioning:

Shift Lever Position	Gear	Shift Solenoid Valve S1	Shift Solenoid Valve S2	Shift Solenoid Valve SR	Shift Solenoid Valve SL1	Shift Solenoid Valve SL2
D S5	1st	ON	OFF	OFF	OFF	ON
	1st ↓ 4th	ON ↓ OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
	5th	OFF	OFF	ON	ON	OFF
S4	1st	ON	OFF	OFF	OFF	ON
	1st ↓ 4th	ON ↓ OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
S3	1st	ON	OFF	OFF	OFF	ON
	1st ↓ 3rd E/B	ON ↓ OFF	OFF	OFF	OFF	ON ↓ OFF
	3rd E/B	OFF	OFF	OFF	OFF	OFF
S2	1st	ON	OFF	OFF	OFF	ON
	2nd E/B ↓ 4th	ON ↓ OFF	OFF	ON	OFF	OFF ↓ ON
S1	1st E/B	ON	OFF	OFF	OFF	OFF

Fail-safe Operation when Shift Solenoid Valve SR is Malfunctioning:

Shift Lever Position	Gear	Shift Solenoid Valve S1	Shift Solenoid Valve S2	Shift Solenoid Valve SR	Shift Solenoid Valve SL1	Shift Solenoid Valve SL2
D S5	1st	ON	OFF	OFF	OFF	ON
	2nd	ON	ON	OFF	OFF	ON
	3rd	OFF	ON	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON

	4th	OFF	OFF	OFF	ON	OFF
S4	1st	ON	OFF	OFF	OFF	ON
	2nd	ON	ON	OFF	OFF	ON
	3rd	OFF	ON	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
S3	1st	ON	OFF	OFF	OFF	ON
	2nd	ON	ON	OFF	OFF	ON
	3rd E/B ↓ 3rd	OFF	ON	OFF	OFF	OFF ↓ ON
S2	1st	ON	OFF	OFF	OFF	ON
	2nd	ON	ON	OFF	OFF	OFF
S1	1st E/B	ON	OFF	OFF	OFF	OFF

Fail-safe Operation when Shift Solenoid Valve S1 and S2 are Malfunctioning:

Shift Lever Position	Gear	Shift Solenoid Valve S1	Shift Solenoid Valve S2	Shift Solenoid Valve SR	Shift Solenoid Valve SL1	Shift Solenoid Valve SL2
D S5	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
	5th	OFF	OFF	ON	ON	OFF
S4	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
S3	3rd ↓ 3rd E/B	OFF	OFF	OFF	OFF	ON ↓ OFF
	3rd ↓ 3rd E/B	OFF	OFF	OFF	OFF	ON ↓ OFF
	3rd E/B	OFF	OFF	OFF	OFF	OFF
S2	1st	OFF	OFF	OFF	OFF	ON
	Fail 4th	OFF	OFF	ON	OFF	OFF ↓ ON
S1	1st E/B	OFF	OFF	OFF	OFF	OFF

Fail-safe Operation when Shift Solenoid Valve S2 and SR are Malfunctioning:

Shift Lever Position	Gear	Shift Solenoid Valve S1	Shift Solenoid Valve S2	Shift Solenoid Valve SR	Shift Solenoid Valve SL1	Shift Solenoid Valve SL2
D S5	1st	ON	OFF	OFF	OFF	ON
	1st ↓ 4th	ON ↓ OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	ON ↓ OFF	OFF ↓ ON
S4	1st	ON	OFF	OFF	OFF	ON
	1st ↓ 4th	ON ↓ OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON

	4th	OFF	OFF	OFF	OFF	ON
S3	1st	ON	OFF	OFF	OFF	ON
	1st ↓ 3rd	ON ↓ OFF	OFF	OFF	OFF	ON ↓ ON
	3rd E/B ↓ 3rd	OFF	OFF	OFF	OFF	OFF ↓ ON
S2	1st	ON	OFF	OFF	OFF	ON
	1st E/B ↓ 1st	ON	OFF	OFF	OFF	OFF ↓ ON
S1	1st E/B	ON	OFF	OFF	OFF	OFF

Fail-safe Operation when Shift Solenoid Valve S1 and SR are Malfunctioning:

Shift Lever Position	Gear	Shift Solenoid Valve S1	Shift Solenoid Valve S2	Shift Solenoid Valve SR	Shift Solenoid Valve SL1	Shift Solenoid Valve SL2
D S5	4th ↓ 3rd	OFF	OFF ↓ ON	OFF	OFF	ON
	3rd	OFF	ON	OFF	OFF	ON
	3rd	OFF	ON	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	ON ↓ OFF	OFF ↓ ON
S4	4th ↓ 3rd	OFF	OFF ↓ ON	OFF	OFF	ON
	3rd	OFF	ON	OFF	OFF	ON
	3rd	OFF	ON	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
S3	3rd	OFF	OFF ↓ ON	OFF	OFF	ON ↓ ON
	3rd	OFF	ON	OFF	OFF	ON ↓ ON
	3rd E/B ↓ 3rd	OFF	ON	OFF	OFF	OFF ↓ ON
S2	1st	OFF	OFF	OFF	OFF	ON
	2nd	OFF	ON	OFF	OFF	OFF
S1	1st E/B	OFF	OFF	OFF	OFF	OFF

Fail-safe Operation when Shift Solenoid Valve S1, S2 and SR are Malfunctioning:

Shift Lever Position	Gear	Shift Solenoid Valve S1	Shift Solenoid Valve S2	Shift Solenoid Valve SR	Shift Solenoid Valve SL1	Shift Solenoid Valve SL2
D S5	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	ON ↓ OFF	OFF ↓ ON
S4	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON

S3	3rd	OFF	OFF	OFF	OFF	ON ↓ ON
	3rd	OFF	OFF	OFF	OFF	ON ↓ ON
	3rd E/B ↓ 3rd	OFF	OFF	OFF	OFF	OFF ↓ ON
S2	1st	OFF	OFF	OFF	OFF	ON
	1st E/B ↓ 1st	OFF	OFF	OFF	OFF	OFF ↓ ON
S1	1st E/B	OFF	OFF	OFF	OFF	OFF

for Preparation Click here

READ DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the tester, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
N Range Status	Shift lever N status/ ON or OFF	• ON: Shift lever in N • OFF: Shift lever not in N	-
Neutral Position SW Signal	PNP switch status/ ON or OFF	Shift lever is: • In P or N: ON • Not in P or N: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
Transfer L4	Transfer status/ ON or OFF	• ON: Transfer in L4 • OFF: Transfer not in L4	-
Stop Light Switch	Stop light switch status/ ON or OFF	Brake pedal is: • Depressed: ON • Released: OFF	-
SPD (NT)	Input shaft speed/ Min.: 0 rpm Max.: 12750 rpm	Lock-up is: • ON (after warming up engine): Input turbine speed (NT) equal to engine speed • OFF (idling with shift lever in N): Input turbine speed (NT) nearly equal to engine speed	Data is displayed in increments of 50 rpm.
SPD (SP2)	Output shaft speed/ Min.: 0 km/h (0 mph) Max.: 255 km/h (158 mph)	Vehicle stopped: 0 km/h (0 mph) (output shaft speed is equal to vehicle speed)	-
Shift SW	PNP switch	Shift lever is:	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.

Status (P Range)	status/ ON or OFF	• In P: ON • Not in P: OFF	**HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
Pattern Switch (PWR/M)	Pattern switch (PWR) status/ ON or OFF	• ON: Pattern switch (PWR) is pushed • OFF: Pattern switch (PWR) is not pushed	-
Shift SW Status (R Range)	PNP switch status/ ON or OFF	Shift lever is: • In R: ON • Not in R: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
Shift SW Status (N Range)	PNP switch status/ ON or OFF	Shift lever is: • In N: ON • Not in N: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
Shift SW Status (N, P Range) Supported	Status of PNP switch (N or P) support/ Supp or Unsupp	-	-
Shift SW Status (N, P Range)	PNP switch status/ ON or OFF	• ON: Shift lever in P or N • OFF: Shift lever not in P or N	-
Sports Shift Up SW	Sport shift up switch status/ ON or OFF	• ON: Shift lever held in "+" (up-shift) • OFF: Shift lever not in "+" (up-shift)	-
Sports Shift Down SW	Sport shift down switch status/ ON or OFF	• ON: Shift lever held in "-" (down-shift) • OFF: Shift lever not in "-" (down-shift)	-
Sports Mode Selection SW	Sport mode select switch status/ ON or OFF	Shift lever is: • ON: In S, "+" and "-" • OFF: Not in S, "+" and "-"	-
Shift SW Status (D Range)	PNP switch status/ ON or OFF	Shift lever is: • In D, S, "+" and "-": ON • Not in D, S, "+" and "-": OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
A/T Oil Temperature 1	No. 1 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • Equal to ambient temperature while engine is cold	If the value is -40°C (-40°F) or 150°C (302°F), the No. 1 ATF temperature sensor circuit is open or shorted.
A/T Oil Temperature 2	No. 2 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • Equal to ambient temperature while engine is cold	If the value is -40°C (-40°F) or 150°C (302°F), the No. 2 ATF temperature sensor circuit is open or shorted.
Lock Up	Lock-up/ ON or OFF	Lock-up is: • Operating: ON • Not operating: OFF	-
	ECM gear	• In D: 1st, 2nd, 3rd, 4th,	

Shift Status	shift command/ 1st, 2nd, 3rd, 4th, 5th or 6th	5th or 6th • In S: 1st, 2nd, 3rd, 4th, 5th or 6th	-
SLT Solenoid Status	Shift solenoid SLT status/ ON or OFF	• Accelerator pedal is depressed: OFF • Accelerator pedal is released: ON	-
SLU Solenoid Status	Shift solenoid SLU status/ ON or OFF	Shift solenoid SLU is: • Operating: ON • Not operating: OFF	-
Snow or 2nd Start Mode	2nd Start mode status/ ON or OFF	• ON: 2nd Start mode on • OFF: 2nd Start mode off	-

PERFORM ACTIVE TEST

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLU)	Operate shift solenoid valve SLU	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.
Activate the Solenoid (S1)	Operate shift solenoid valve S1	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.
Activate the Solenoid (S2)	Operate shift solenoid valve S2	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.
	Control shift solenoid valve		It is possible to check the shift solenoid valve SLU operation. [Vehicle Condition] • The throttle valve

Activate the Lock Up	SLU to set automatic transmission to lock-up condition	ON or OFF	opening angle is less than 35%. • The vehicle speed is 80 km/h (50 mph) or more.
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.
Activate the Solenoid (SR)	Operate shift solenoid valve SR	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.
Activate the Solenoid (SL1)	Operate shift solenoid valve SL1	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.
Activate the Solenoid (SL2)	Operate shift solenoid valve SL2	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

for Preparation Click here

HINT:

- **If a DTC is output during the DTC check, check the parts listed in the table below and proceed to the "See page" given.**
- ***1: "Comes on" means the Malfunction Indicator Lamp (MIL) illuminates.**
- ***2: "DTC stored" means the ECM stores the trouble code if the ECM detects the DTC detection condition.**
- ***3: w/ OBD**
- ***4: w/o OBD**
- ***5: The ATF temperature warning light blinks or a message is displayed in the combination meter.**
- **These DTCs may be output when the clutches, brakes, gear components, etc. inside the automatic transmission are damaged.**

Automatic Transmission System

DTC Code	Detection Item	MIL*1	Memory*2	See page
P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	Comes on	DTC stored	Click here
P0711	Transmission Fluid Temperature Sensor "A" Performance	Comes on	DTC stored	Click here
P0712	Transmission Fluid Temperature Sensor "A" Circuit Low Input	Comes on	DTC stored	Click here
P0713	Transmission Fluid Temperature Sensor "A" Circuit High Input	Comes on	DTC stored	Click here
P0717	Turbine Speed Sensor Circuit No Signal	Comes on	DTC stored	Click here
P0722	Output Speed Sensor Circuit No Signal	Comes on	DTC stored	Click here
P0724	Brake Switch "B" Circuit High	Comes on	DTC stored	Click here
P0746	Pressure Control Solenoid "A" Performance (Shift Solenoid Valve SL1)	Comes on	DTC stored	Click here
P0748	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	Comes on	DTC stored	Click here
P0751	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)	Comes on*3 -*4	DTC stored	Click here
P0756	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)	Comes on*3 -*4	DTC stored	Click here
P0771	Shift Solenoid "E" Performance (Shift Solenoid Valve SR)	Comes on*3 -*4	DTC stored	Click here
P0776	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)	Comes on*3 -*4	DTC stored	Click here
P0778	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	Comes on	DTC stored	Click here
P0781	1-2 Shift (1-2 Shift Valve)	Comes on*3 -*4	DTC stored	Click here
P0973	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)	Comes on	DTC stored	Click here
P0974	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)	Comes on	DTC stored	Click here
P0976	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)	Comes on	DTC stored	Click here
P0977	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)	Comes on	DTC stored	Click here
P0985	Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)	Comes on	DTC stored	Click here
P0986	Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)	Comes on	DTC stored	Click here

P2714	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)	Comes on*3 -*4	DTC stored	Click here
P2716	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	Comes on	DTC stored	Click here
P2742	Transmission Fluid Temperature Sensor "B" Circuit Low Input	-*5	DTC stored	Click here
P2743	Transmission Fluid Temperature Sensor "B" Circuit High Input	-*5	DTC stored	Click here
P2757	Torque Converter Clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU)	Comes on	DTC stored	Click here
P2759	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)	Comes on	DTC stored	Click here
P2772	Four Wheel Drive (4WD) Low Switch Circuit Range / Performance	Comes on	DTC stored	Click here

DTC P0705 Transmission Range Sensor Circuit Malfunction (PRNDL Input)

for Preparation Click here

DESCRIPTION

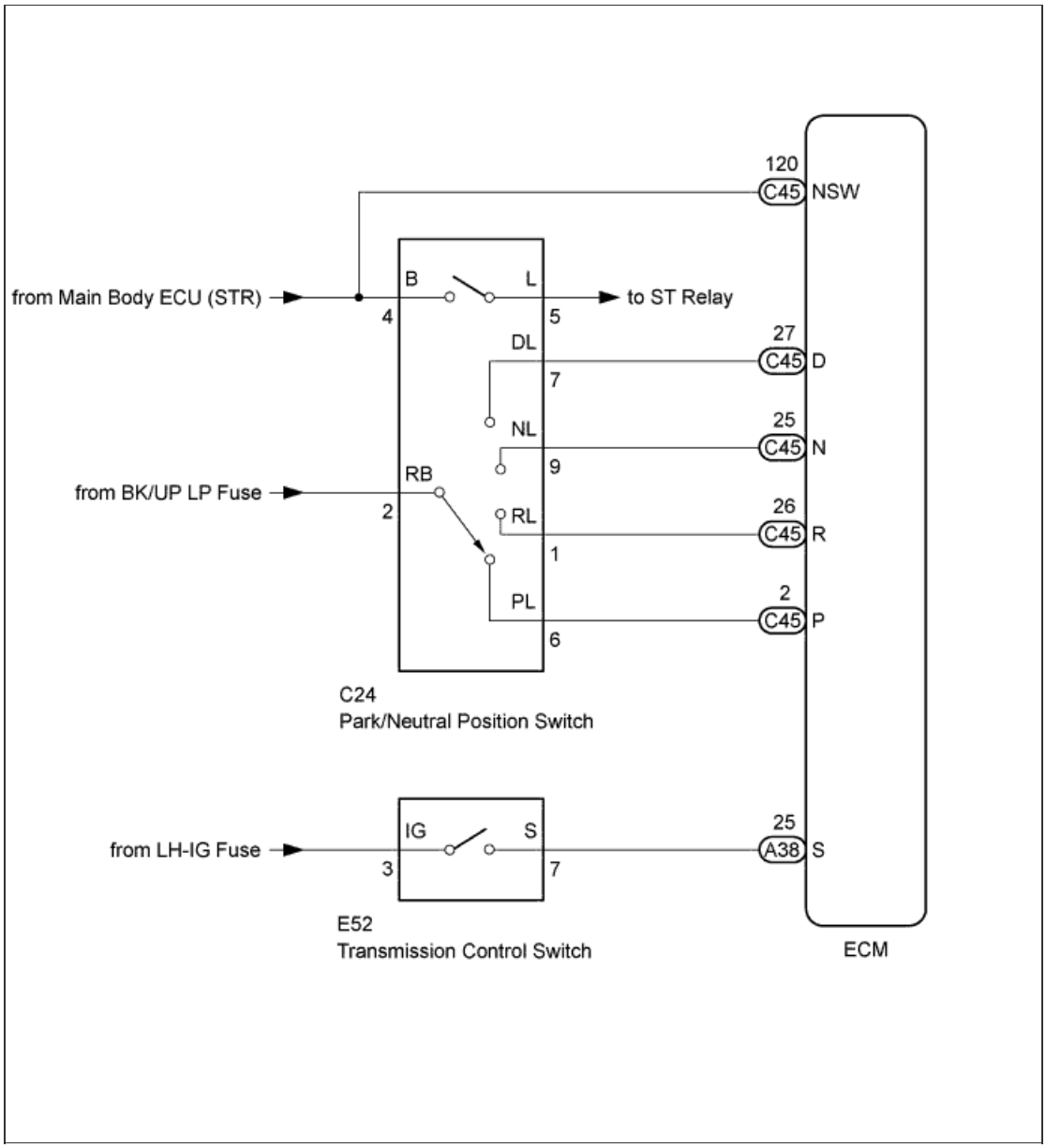
The Park/Neutral Position (PNP) switch detects the shift lever position and sends signals to the ECM.

DTC Code	DTC Detection Condition	Trouble Area
P0705	When one of the following conditions is met: (A) Any 2 or more of the following signals are ON simultaneously (2 trip detection logic). • P input signal • N input signal • R input signal • D input signal (B) Any 2 or more of the following signals are ON simultaneously (2 trip detection logic). • NSW input signal • R input signal • D input signal (C) Any of the following signals are ON for 2.0 sec. or more when the shift lever is in S (2 trip detection logic). • NSW input signal • P input signal • N input signal • R input signal (D) All the signals are OFF simultaneously for the P, R, N and D positions (2 trip detection logic).	• Park/neutral position switch • Transmission control switch (Lower shift lever assembly) • Open or short in park/neutral position switch circuit • ECM

MONITOR DESCRIPTION

This DTC indicates a problem with the park/neutral position switch and the wire harness in the park/neutral position switch circuit.
The park/neutral position switch detects the shift lever position and sends a signal to the ECM.
For security, the park/neutral position switch detects the shift lever position so that the engine can be started only when the shift lever is in P or N.
The park/neutral position switch sends a signal to the ECM according to the shift lever position (P, R, N, D or S).
The ECM determines that there is a problem with the switch or related parts if it receives more than 1 position signal simultaneously. The ECM will illuminate the MIL and store the DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the intelligent tester, read the Data List.

Engine and ECT

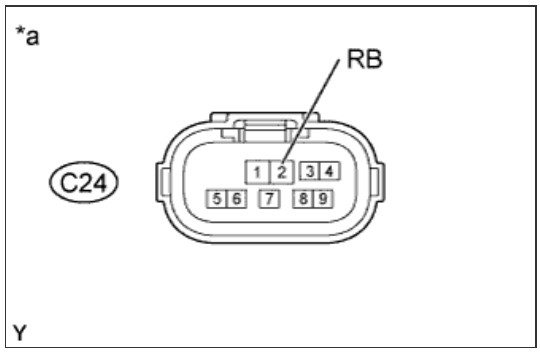
Tester	Measurement	Normal Condition	Diagnostic Note

Display	Item/Range		
Neutral Position SW Signal	PNP switch status/ ON or OFF	Shift lever: • In P or N: ON • Not in P or N: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Shift SW Status (P Range)	PNP switch status/ ON or OFF	Shift lever: • In P: ON • Not in P: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Shift SW Status (R Range)	PNP switch status/ ON or OFF	Shift lever: • In R: ON • Not in R: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Shift SW Status (N Range)	PNP switch status/ ON or OFF	Shift lever: • In N: ON • Not in N: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Sports Shift Up SW	Sport shift up switch status/ ON or OFF	• ON: Shift lever held in "+" (up-shift) • OFF: Shift lever not in "+" (up-shift)	-
Sports Shift Down SW	Sport shift down switch status/ ON or OFF	• ON: Shift lever held in "-" (down-shift) • OFF: Shift lever not in "-" (down-shift)	-
Sports Mode Selection SW	Sport mode select switch status/ ON or OFF	Shift lever position is: • ON: In S, "+" and "-" • OFF: Not in S, "+" and "-"	-
Shift SW Status (D Range)	PNP switch status/ ON or OFF	Shift lever: • In D: ON • Not in D: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.

1.CHECK HARNESS AND CONNECTOR (BK/UP LP FUSE - PARK/NEUTRAL POSITION SWITCH)

a. Disconnect the park/neutral position switch connector.

b. Measure the voltage according to the value(s) in the table below.



Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
C24-2 (RB) - Body ground	Engine switch on (IG)	11 to 14 V
C24-2 (RB) - Body ground	Engine switch off	Below 1 V

Text in Illustration

*a	Front view of wire harness connector (to Park/Neutral Position Switch)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

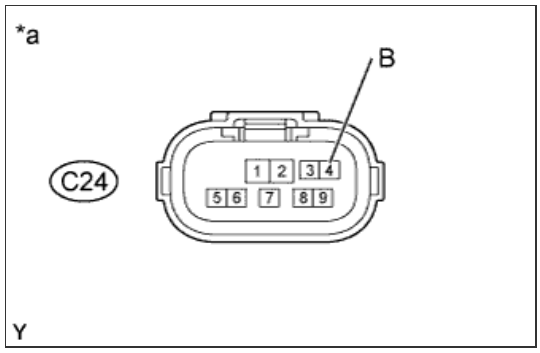
2.CHECK HARNESS AND CONNECTOR (NSW TERMINAL VOLTAGE)

a. Disconnect the park/neutral position switch connector.

b. Measure the voltage according to the value(s) in the table below.

Standard voltage:

Tester Connection	Condition	Specified Condition
C24-4 (B) - Body ground	Engine switch on (IG)	11 to 14 V
C24-4 (B) - Body ground	Engine switch off	Below 1 V



Text in Illustration

*a	Front view of wire harness connector (to Park/Neutral Position Switch)

NG → Go to step 7

OK

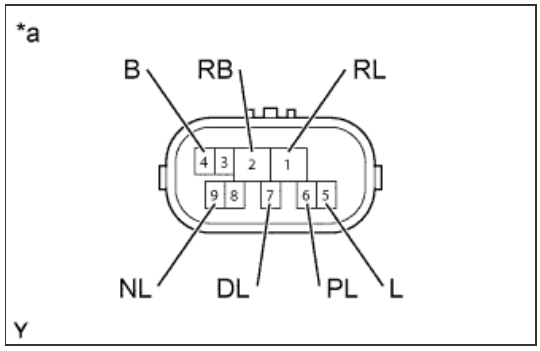
3.INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY

a. Disconnect the park/neutral position switch connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
• 2 (RB) - 6 (PL) • 4 (B) - 5 (L)	Shift lever in P	Below 1 Ω
2 (RB) - 1 (RL)	Shift lever in R	Below 1 Ω
• 2 (RB) - 9 (NL) • 4 (B) - 5 (L)	Shift lever in N	Below 1 Ω
2 (RB) - 7 (DL)	• Shift lever in D • Shift lever in S, "+" or "-"	Below 1 Ω
• 2 (RB) - 6 (PL) • 4 (B) - 5 (L)	Shift lever not in P	10 kΩ or higher
2 (RB) - 1 (RL)	Shift lever not in R	10 kΩ or higher
• 2 (RB) - 9 (NL) • 4 (B) - 5 (L)	Shift lever not in N	10 kΩ or higher



2 (RB) - 7 (DL)	• Shift lever not in D • Shift lever not in S, "+" or "-"	10 kΩ or higher

Text in Illustration

*a	Component without harness connected (Park/Neutral Position Switch)

NG → REPLACE PARK/NEUTRAL POSITION SWITCH ASSEMBLY (Click here)

OK

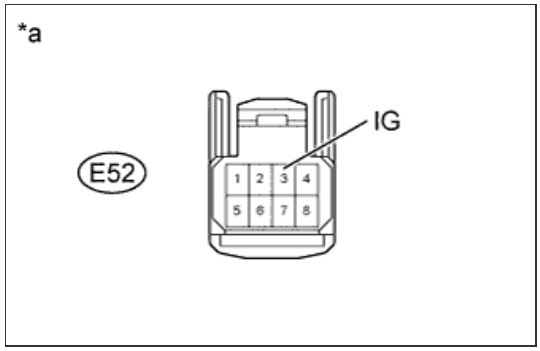
4.CHECK HARNESS AND CONNECTOR (LH ECU-IG FUSE - TRANSMISSION CONTROL SWITCH)

a. Disconnect the transmission control switch connector.

b. Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
E52-3 (IG) - Body ground	Engine switch on (IG)	11 to 14 V
E52-3 (IG) - Body ground	Engine switch off	Below 1 V



Text in Illustration

*a	Front view of wire harness connector (to Transmission Control Switch)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

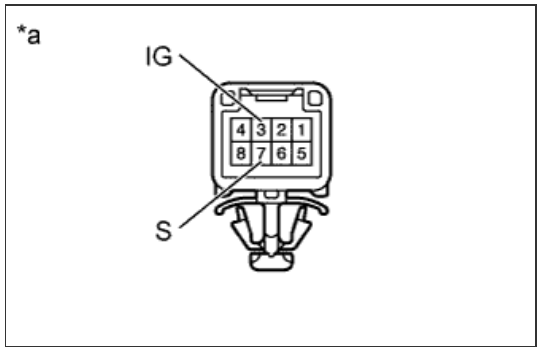
5.INSPECT TRANSMISSION CONTROL SWITCH

a. Disconnect the transmission control switch connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
3 (IG) - 7 (S)	Shift lever in S, "+" or "-"	Below 1 Ω
3 (IG) - 7 (S)	Shift lever not in S, "+" or "-"	10 kΩ or higher



Text in Illustration

*a	Component without harness connected (Transmission Control Switch)

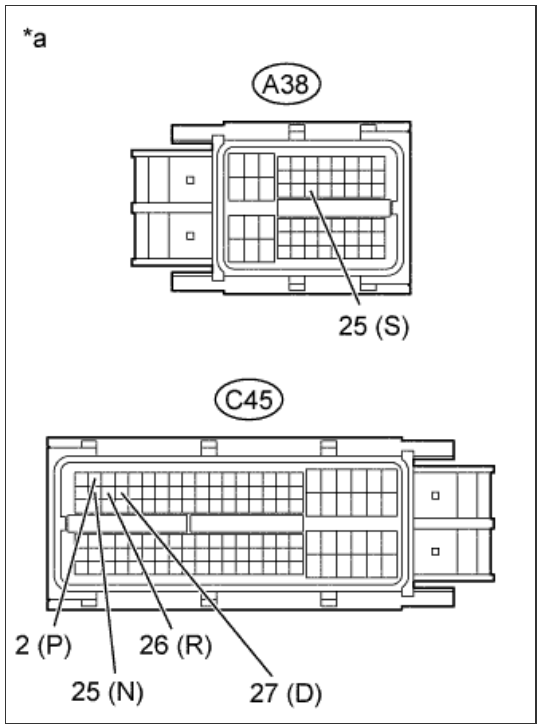
NG → REPLACE TRANSMISSION CONTROL SWITCH (LOWER SHIFT LEVER ASSEMBLY) (Click here)

OK

6.CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH, TRANSMISSION CONTROL SWITCH - ECM)

a. Disconnect the ECM connector.

b. Measure the voltage according to the value(s) in the table below.



Standard Voltage:

Tester Connection	Condition	Specified Condition
C45-2 (P) - Body ground	• Engine switch on (IG) • Shift lever in P	11 to 14 V
C45-26 (R) - Body ground	• Engine switch on (IG) • Shift lever in R	11 to 14 V*
C45-25 (N) - Body ground	• Engine switch on (IG) • Shift lever in N	11 to 14 V
C45-27 (D) - Body ground	• Engine switch on (IG) • Shift lever in D	11 to 14 V
A38-25 (S) - Body ground	• Engine switch on (IG) • Shift lever in S, "+" or "-"	11 to 14 V
C45-2 (P) - Body ground	• Engine switch on (IG) • Shift lever not in P	Below 1 V
C45-26 (R) - Body ground	• Engine switch on (IG) • Shift lever not in R	Below 1 V
C45-25 (N) - Body ground	• Engine switch on (IG) • Shift lever not in N	Below 1 V
C45-27 (D) - Body ground	• Engine switch on (IG) • Shift lever	Below 1 V

	not in D	
A38-25 (S) - Body ground	• Engine switch on (IG) • Shift lever not in S, "+" or "-"	Below 1 V

HINT:

*: The voltage will drop slightly due to the turning on of the back up light.

Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK →

REPLACE ECM (Click here)

7.CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH - ECM)

a. Disconnect the C24 park/neutral position switch connector.

b. Disconnect the C45 ECM connector.

c. Measure the voltage according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C24-4 (B) - C45-120 (NSW)	Always	Below 1 Ω
C24-4 (B) or C45-120 (NSW) - Body ground	Always	10 kΩ or higher

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK →

REPLACE ECM (Click here)

DTC P0781 1-2 Shift (1-2 Shift Valve)

for Preparation Click here

DESCRIPTION

The 1-2 shift valve performs shifting to 1st gear and other gears.

DTC Code	DTC Detection Condition	Trouble Area
P0781	The gear required by the ECM does not match the actual gear when driving (2 trip detection logic*1, 1 trip detection logic*2).	• Valve body is blocked up or stuck (1-2 shift valve) • Shift solenoid valve SLT remains open or closed • Automatic transmission (clutch, brake or gear, etc.)

*1: w/ OBD
*2: w/o OBD

MONITOR DESCRIPTION

This DTC indicates that the 1-2 shift valve in the valve body is locked in the direction that the spring compresses.
The ECM commands gear shifts by turning the shift solenoid valves ON/OFF and controls the oil pressure applied to the valves in the valve body.
The ECM calculates the actual transmission gear by comparing the signals from the input speed sensor NT and the output speed sensor SP2. The ECM can detect mechanical problems in the shift solenoids, valve body and automatic transmission (clutch, brake, gear, etc.). If the ECM detects that the actual gear position and the commanded gear position are different, it will illuminate the MIL and store the DTC.

INSPECTION PROCEDURE

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0781)

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / DTC.

e. Read the DTCs using the tester.

Result

Result	Proceed to
Only P0781 is output	A
P0781 and other DTCs are output	B

HINT:

If any other codes besides P0781 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (RUNNING TEST)

CAUTION:

This test should always be performed with at least 2 people.

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Perform the test with the A/C turned off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Connect the intelligent tester to the DLC3.

b. Clear the DTC (Click here).

c. Warm up the engine.

d. Enter the following menus: Powertrain / Engine and ECT / Active Test.

e. According to the display on the tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th up-shift must be performed with the accelerator pedal released.**
- **The 5th to 4th down-shift must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the tester.**

OK:

Gear position changes in accordance with the tester command.

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)**

OK

3.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

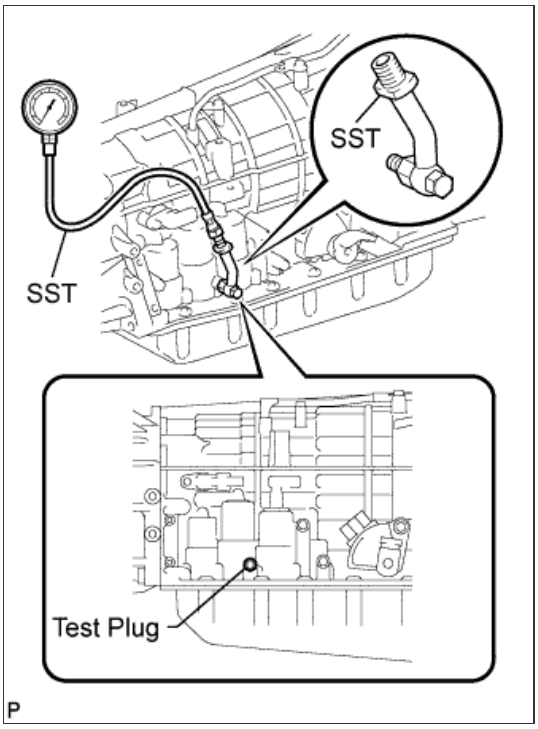
d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

h. Measure the line pressure.



Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:
The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (**Click here**)

OK

4.CLEAR DTC AND PERFORM RUNNING TEST

a. Clear the DTC (Click here).

b. Check for DTC again after conducting the Monitor Drive Pattern (Click here).

OK:
No DTC output

NG → REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (**Click here**)

OK

END

DTC P0711 Transmission Fluid Temperature Sensor "A" Performance

for Preparation Click here

DESCRIPTION

The ATF temperature sensor converts the fluid temperature into a resistance value for use by the ECM.
The ECM applies a voltage to the temperature sensor through terminal THO1 of the ECM.
The sensor resistance changes with the ATF temperature. As the temperature becomes higher, the sensor resistance decreases.
One terminal of the sensor is grounded so that the sensor resistance decreases and the voltage goes down as the temperature becomes higher.
The ECM calculates the fluid temperature based on the voltage signal.

DTC Code	DTC Detection Condition	Trouble Area
P0711	Either condition is met (2-trip detection logic): (a) Certain monitor enabling conditions are met and the ATF temperature is below 20°C (68°F). (b) Certain monitor enabling conditions are met and the ATF temperature is 95°C (203°F) or higher.	Transmission wire (No. 1 ATF temperature sensor)

MONITOR DESCRIPTION

This DTC indicates that there is a problem with the signal from the Automatic Transmission Fluid (ATF) temperature sensor and that the sensor itself is defective. The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature and detects an open or short in the ATF temperature circuit or a fault in the ATF temperature sensor.
After running the vehicle for a certain period, the ATF temperature should increase. If the ATF temperature is below 20°C (68°F) after running the vehicle for a certain period, the ECM interprets this as a fault, and turns on the MIL.

WIRING DIAGRAM

Refer to DTC P0712 (Click here).

INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.
b. Turn the engine switch off.
c. Connect the intelligent tester to the DLC3.
d. Turn the engine switch on (IG).
e. Turn the intelligent tester on.
f. Enter the following menus: Powertrain / Engine and ECT / Data List.
g. According to the display on the tester, read the Data List.

ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 1	No. 1 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 1 ATF temperature sensor circuit is open or shorted.

HINT:

When DTC P0712 is stored and the intelligent tester output is 150°C (302°F) or higher, there is a short circuit.

When DTC P0713 is stored and the intelligent tester output is -40°C (-40°F), there is an open circuit.

Check the temperature displayed on the tester in order to check if a malfunction exists.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or higher	Short circuit

If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately stored (in 0.5 seconds). When P0713 is stored, P0711 cannot be stored. It is not necessary to inspect the circuit when P0711 is stored.

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0711)

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / DTC.

e. Read the DTCs using the tester.

Result

Result	Proceed to
Only P0711 is output	A
P0711 and other DTCs are output	B

HINT:

If any other codes besides P0711 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.CHECK TRANSMISSION FLUID LEVEL

a. Check the transmission fluid level (Click here).

OK:

Automatic transmission fluid level is correct.

NG → ADD FLUID (Click here)

OK

REPAIR OR REPLACE NO. 1 ATF TEMPERATURE SENSOR (TRANSMISSION WIRE) (Click here)

DTC P0973 Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)

DTC P0974 Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)

for Preparation Click here

DESCRIPTION

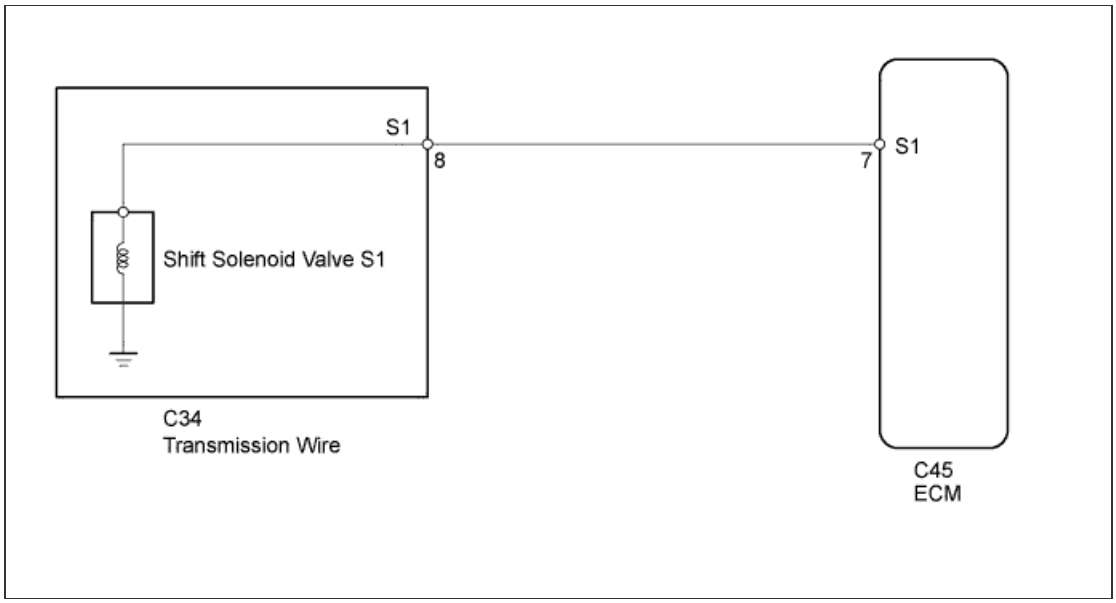
Shifting from 1st to 5th is performed in combination with the "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, S1, S2 and SR which is controlled by the ECM. If an open or short circuit occurs in one of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated smoothly (In case of an open or short circuit, the ECM stops sending current to the circuit. For details, refer to the Fail-Safe Chart (Click here)).

DTC Code	DTC Detection Condition	Trouble Area
P0973	The ECM detects a short in the solenoid valve S1 circuit 2 times when the solenoid valve S1 is operated (1 trip detection logic).	• Short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM
P0974	The ECM detects an open in the solenoid valve S1 circuit 2 times when the solenoid valve S1 is not operated (1 trip detection logic).	• Open in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S1 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S1 is on, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S1 circuit.
When the shift solenoid valve S1 is off, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S1 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve S1 turns ON/OFF normally when the shift lever is in D.

ECM gear shift command	1st	2nd	3rd	4th	5th
Shift solenoid valve S1	ON	ON	OFF	OFF	OFF

1.INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE S1)

a. Disconnect the transmission wire connector.

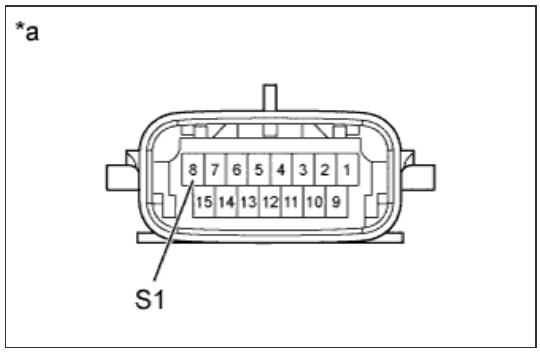
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
8 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (Transmission Wire)



NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

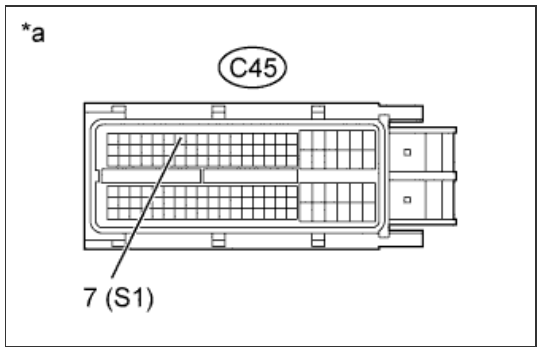
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-7 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

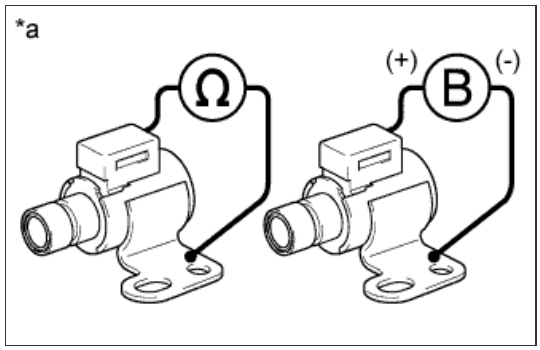
3.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve	

	S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S1)

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

REPAIR OR REPLACE TRANSMISSION WIRE (Click here)

DTC P0712 Transmission Fluid Temperature Sensor "A" Circuit Low Input

DTC P0713 Transmission Fluid Temperature Sensor "A" Circuit High Input

for Preparation Click here

DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.
The ECM applies a voltage to the temperature sensor through the ECM terminal THO1.
The sensor resistance changes with the transmission fluid temperature. As the temperature becomes higher, the sensor resistance decreases.
One terminal of the sensor is grounded so that the sensor resistance decreases and the voltage goes down as the temperature becomes higher.
The ECM calculates the fluid temperature based on the voltage signal.

w/ OBD

DTC Code	DTC Detection Condition	Trouble Area
P0712	The No. 1 ATF temperature sensor resistance is below 79 Ω for 0.5 seconds or more (1 trip detection logic).	• Short in No. 1 ATF temperature sensor circuit • No. 1 transmission wire (No. 1 ATF temperature sensor) • ECM
P0713	The No. 1 ATF temperature sensor resistance is higher than 156 kΩ for 0.5 seconds or more, and one of the following conditions is met (1 trip detection logic). Condition A: 15 minutes or more have elapsed. Condition B: If the conditions needed to detect DTC P0711 have been met, P0713 can be detected immediately following engine start.	• Open in No. 1 ATF temperature sensor circuit • No. 1 transmission wire (No. 1 ATF temperature sensor) • ECM

w/o OBD

DTC Code	DTC Detection Condition	Trouble Area
P0712	The No. 1 ATF temperature sensor resistance is below 79 Ω for 0.5 sec. or more (1 trip detection logic).	• Short in No. 1 ATF temperature sensor circuit • Transmission wire (No. 1 ATF temperature sensor) • ECM
P0713	When 15 min. or more have elapsed after the engine is started, the No. 1 ATF temperature sensor resistance is higher than 156 kΩ for 0.5 sec. or more (1 trip detection logic).	• Open in No. 1 ATF temperature sensor circuit • Transmission wire (No. 1 ATF temperature sensor) • ECM

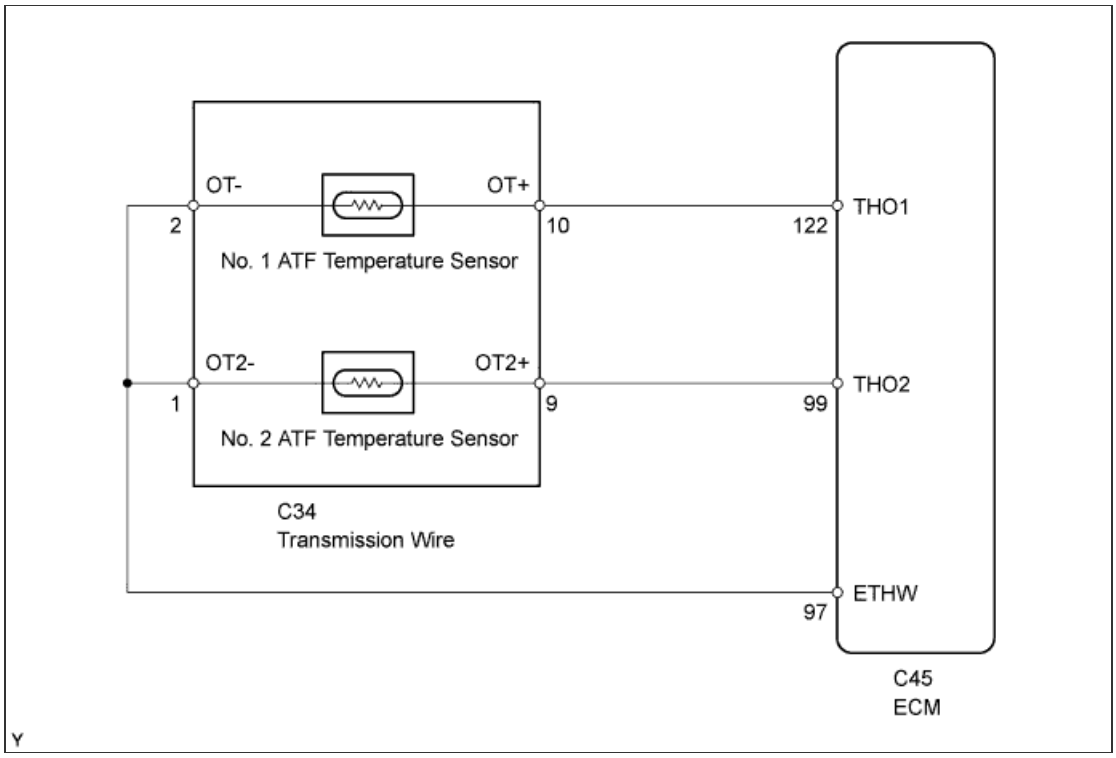
MONITOR DESCRIPTION

These DTCs indicate an open or short in the Automatic Transmission Fluid (ATF) temperature sensor circuit. The ATF temperature sensor converts ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is below 79 Ω*1 or higher than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM will turn on the MIL and store the DTC.

HINT:

- ***1: 150°C (302°F) or higher is indicated regardless of the actual ATF temperature.**
- ***2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.**
- **The ATF temperature can be checked on the intelligent tester display.**

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the tester, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 1	No. 1 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 1 ATF temperature sensor circuit is open or shorted.

HINT:

When DTC P0712 is stored and the intelligent tester output is 150°C (302°F) or higher, there is a short circuit.

When DTC P0713 is stored and the intelligent tester output is -40°C (-40°F), there is an open circuit.

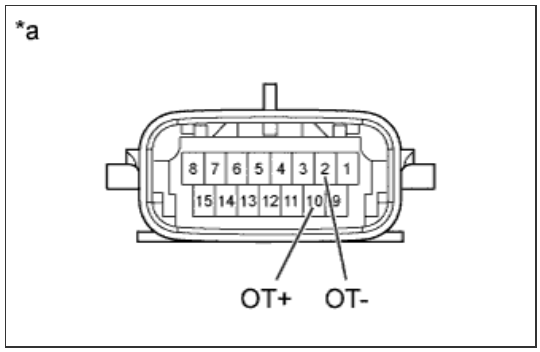
Check the temperature displayed on the tester in order to check if a malfunction exists.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or higher	Short circuit

1.INSPECT TRANSMISSION WIRE (NO. 1 ATF TEMPERATURE SENSOR)

a. Disconnect the transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
2 (OT-) - 10 (OT+)	Always	79 Ω to 156 kΩ
2 (OT-) - Body ground	Always	10 kΩ or higher
10 (OT+) - Body ground	Always	10 kΩ or higher

HINT:

If the resistance is out of the specified range of one of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Resistance (Reference):

ATF Temperature	Specified Condition
10°C (50°F)	5 to 8 kΩ
25°C (77°F)	2.5 to 4.5 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

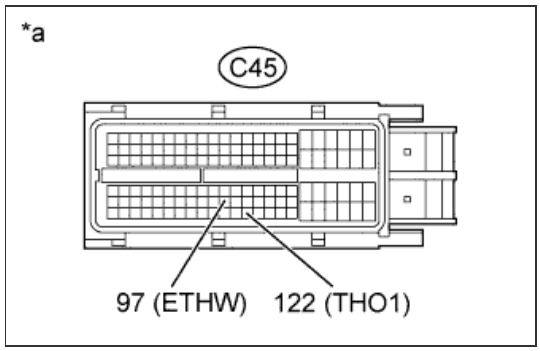
NG → REPAIR OR REPLACE NO. 1 ATF TEMPERATURE SENSOR (TRANSMISSION WIRE) (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-122 (THO1) - C45-97 (ETHW)	Always	79 Ω to 156 kΩ
C45-122 (THO1) - Body ground	Always	10 kΩ or higher
C45-97 (ETHW) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0973 Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)

DTC P0974 Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)

for Preparation Click here

DESCRIPTION

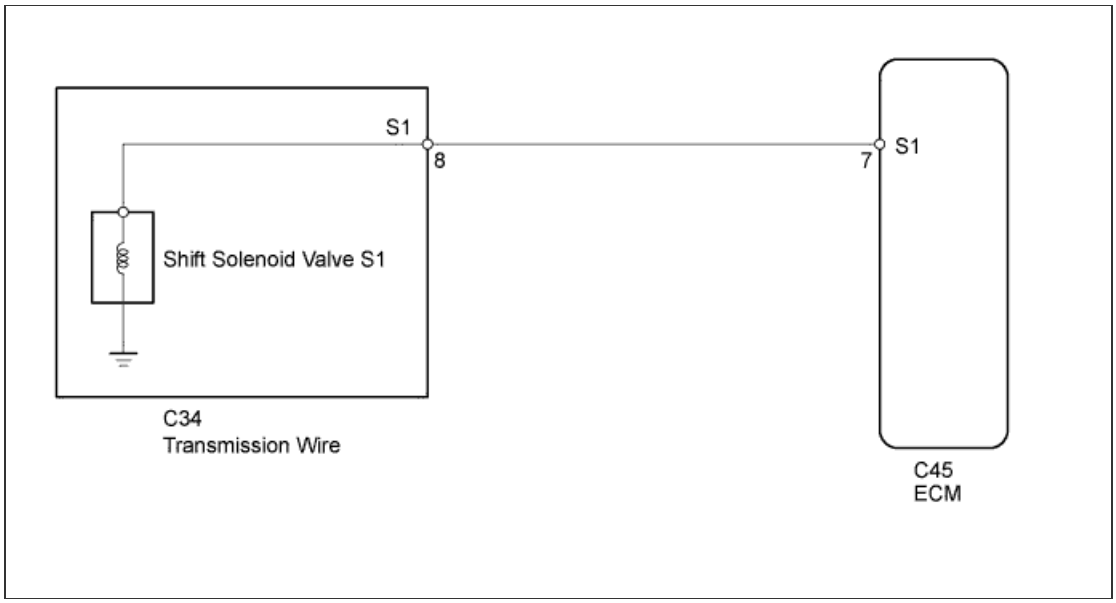
Shifting from 1st to 5th is performed in combination with the "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, S1, S2 and SR which is controlled by the ECM. If an open or short circuit occurs in one of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated smoothly (In case of an open or short circuit, the ECM stops sending current to the circuit. For details, refer to the Fail-Safe Chart (Click here)).

DTC Code	DTC Detection Condition	Trouble Area
P0973	The ECM detects a short in the solenoid valve S1 circuit 2 times when the solenoid valve S1 is operated (1 trip detection logic).	• Short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM
P0974	The ECM detects an open in the solenoid valve S1 circuit 2 times when the solenoid valve S1 is not operated (1 trip detection logic).	• Open in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S1 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S1 is on, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S1 circuit.
When the shift solenoid valve S1 is off, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S1 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve S1 turns ON/OFF normally when the shift lever is in D.

ECM gear shift command	1st	2nd	3rd	4th	5th
Shift solenoid valve S1	ON	ON	OFF	OFF	OFF

1.INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE S1)

a. Disconnect the transmission wire connector.

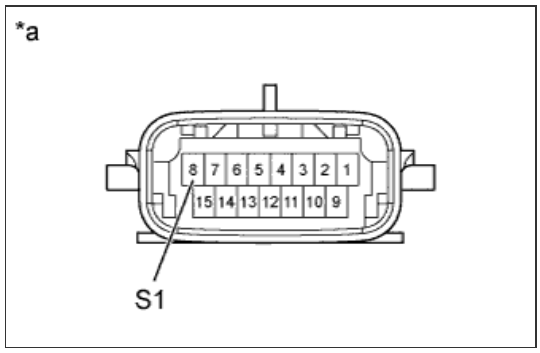
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
8 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (Transmission Wire)



NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

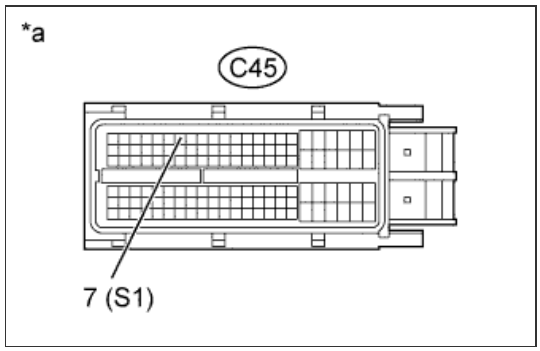
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-7 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

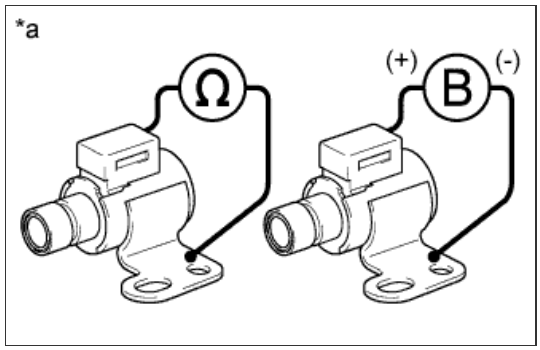
3.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve	

	S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S1)

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

REPAIR OR REPLACE TRANSMISSION WIRE (Click here)

DTC P0712 Transmission Fluid Temperature Sensor "A" Circuit Low Input

DTC P0713 Transmission Fluid Temperature Sensor "A" Circuit High Input

for Preparation Click here

DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.
The ECM applies a voltage to the temperature sensor through the ECM terminal THO1.
The sensor resistance changes with the transmission fluid temperature. As the temperature becomes higher, the sensor resistance decreases.
One terminal of the sensor is grounded so that the sensor resistance decreases and the voltage goes down as the temperature becomes higher.
The ECM calculates the fluid temperature based on the voltage signal.

w/ OBD

DTC Code	DTC Detection Condition	Trouble Area
P0712	The No. 1 ATF temperature sensor resistance is below 79 Ω for 0.5 seconds or more (1 trip detection logic).	• Short in No. 1 ATF temperature sensor circuit • No. 1 transmission wire (No. 1 ATF temperature sensor) • ECM
P0713	The No. 1 ATF temperature sensor resistance is higher than 156 kΩ for 0.5 seconds or more, and one of the following conditions is met (1 trip detection logic). Condition A: 15 minutes or more have elapsed. Condition B: If the conditions needed to detect DTC P0711 have been met, P0713 can be detected immediately following engine start.	• Open in No. 1 ATF temperature sensor circuit • No. 1 transmission wire (No. 1 ATF temperature sensor) • ECM

w/o OBD

DTC Code	DTC Detection Condition	Trouble Area
P0712	The No. 1 ATF temperature sensor resistance is below 79 Ω for 0.5 sec. or more (1 trip detection logic).	• Short in No. 1 ATF temperature sensor circuit • Transmission wire (No. 1 ATF temperature sensor) • ECM
P0713	When 15 min. or more have elapsed after the engine is started, the No. 1 ATF temperature sensor resistance is higher than 156 kΩ for 0.5 sec. or more (1 trip detection logic).	• Open in No. 1 ATF temperature sensor circuit • Transmission wire (No. 1 ATF temperature sensor) • ECM

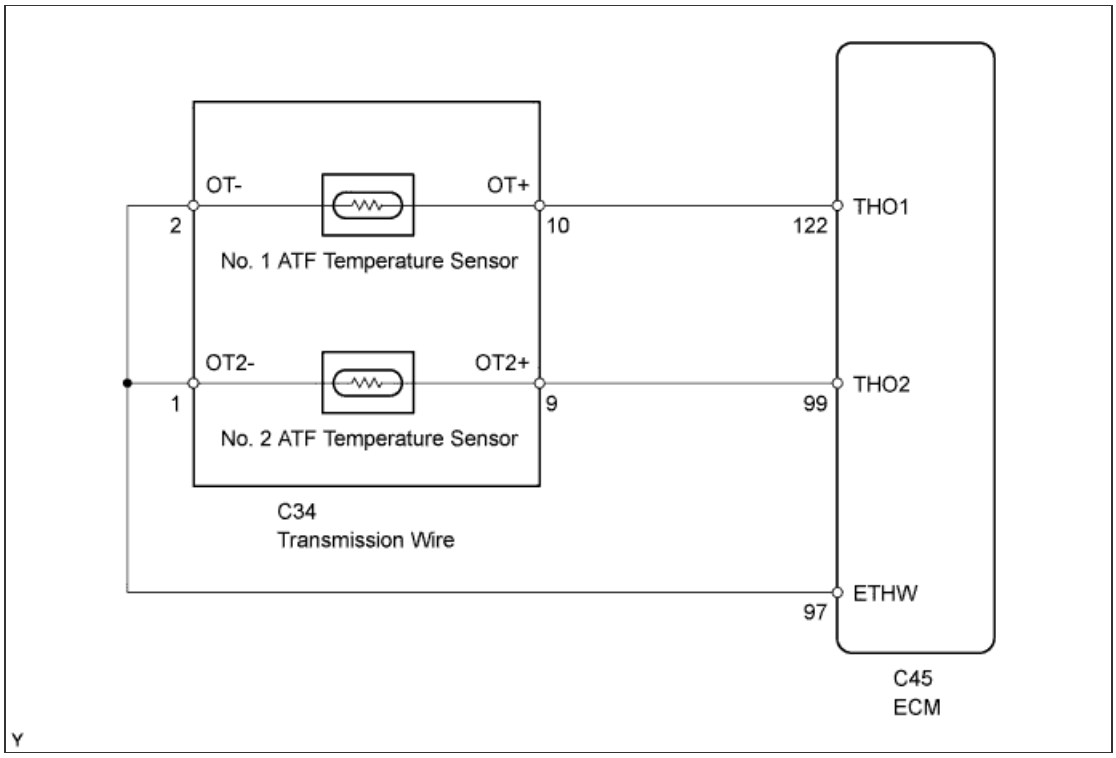
MONITOR DESCRIPTION

These DTCs indicate an open or short in the Automatic Transmission Fluid (ATF) temperature sensor circuit. The ATF temperature sensor converts ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is below 79 Ω*1 or higher than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM will turn on the MIL and store the DTC.

HINT:

- ***1: 150°C (302°F) or higher is indicated regardless of the actual ATF temperature.**
- ***2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.**
- **The ATF temperature can be checked on the intelligent tester display.**

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the tester, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 1	No. 1 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 1 ATF temperature sensor circuit is open or shorted.

HINT:

When DTC P0712 is stored and the intelligent tester output is 150°C (302°F) or higher, there is a short circuit.

When DTC P0713 is stored and the intelligent tester output is -40°C (-40°F), there is an open circuit.

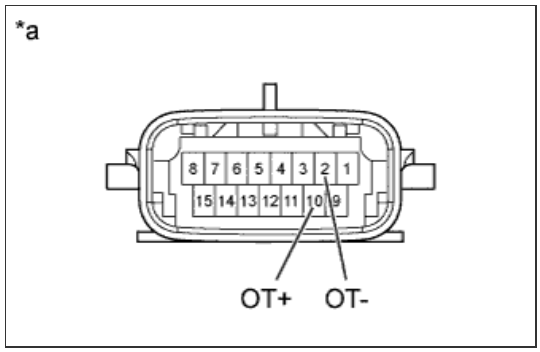
Check the temperature displayed on the tester in order to check if a malfunction exists.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or higher	Short circuit

1.INSPECT TRANSMISSION WIRE (NO. 1 ATF TEMPERATURE SENSOR)

a. Disconnect the transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
2 (OT-) - 10 (OT+)	Always	79 Ω to 156 kΩ
2 (OT-) - Body ground	Always	10 kΩ or higher
10 (OT+) - Body ground	Always	10 kΩ or higher

HINT:

If the resistance is out of the specified range of one of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Resistance (Reference):

ATF Temperature	Specified Condition
10°C (50°F)	5 to 8 kΩ
25°C (77°F)	2.5 to 4.5 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

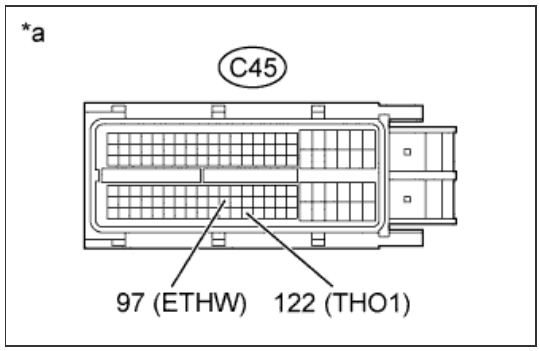
NG → REPAIR OR REPLACE NO. 1 ATF TEMPERATURE SENSOR (TRANSMISSION WIRE) (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-122 (THO1) - C45-97 (ETHW)	Always	79 Ω to 156 kΩ
C45-122 (THO1) - Body ground	Always	10 kΩ or higher
C45-97 (ETHW) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0976 Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)

DTC P0977 Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)

for Preparation Click here

DESCRIPTION

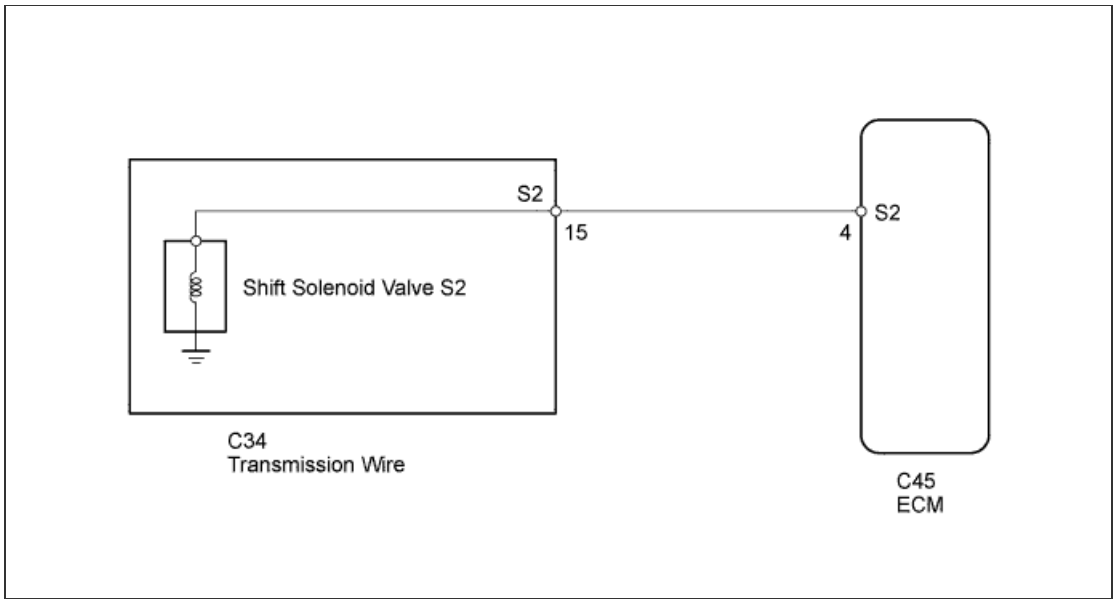
Shifting from 1st to 5th is performed in combination with the "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, S1, S2 and SR which is controlled by the ECM. If an open or short circuit occurs in one of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated smoothly (In case of an open or short circuit, the ECM stops sending current to the circuit. For details, refer to the Fail-Safe Chart (Click here)).

DTC Code	DTC Detection Condition	Trouble Area
P0976	The ECM detects a short in the solenoid valve S2 circuit 2 times when the solenoid valve S2 is operated (1 trip detection logic).	• Short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM
P0977	The ECM detects an open in the solenoid valve S2 circuit 2 times when the solenoid valve S2 is not operated (1 trip detection logic).	• Open in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S2 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S2 is on, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S2 circuit.
When the shift solenoid valve S2 is off, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S2 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve S2 turns ON/OFF normally when the shift lever is in D.

ECM gear shift command	1st	2nd	3rd	4th	5th
Shift solenoid valve S2	OFF	ON	ON	OFF	OFF

1.INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE S2)

a. Disconnect the transmission wire connector.

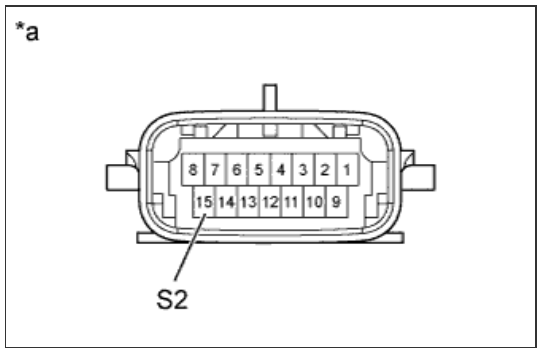
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
15 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (Transmission Wire)



NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

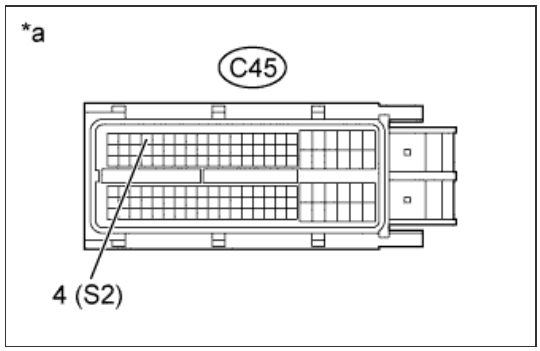
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-4 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

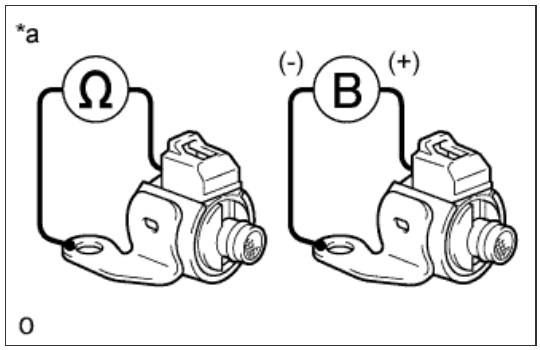
3.INSPECT SHIFT SOLENOID VALVE S2

a. Remove the shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve	

	S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S2)

NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK

REPAIR OR REPLACE TRANSMISSION WIRE (Click here)

DTC P0717 Turbine Speed Sensor Circuit No Signal

for Preparation Click here

DESCRIPTION

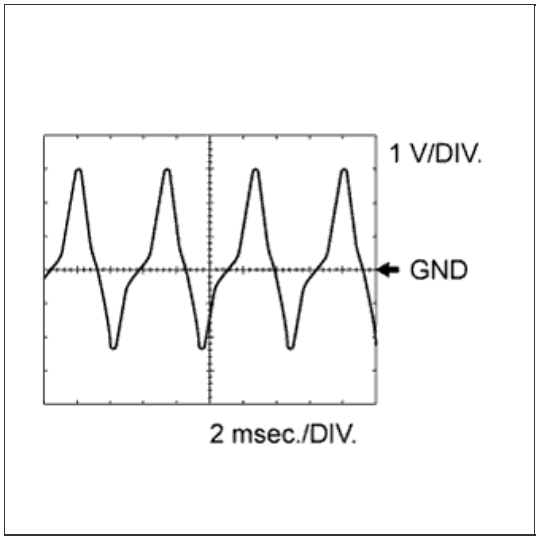
This sensor detects the rotation speed of the turbine which shows the input revolution of the transmission. By comparing the input turbine speed signal NT with the counter gear speed sensor signal SP2, the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure according to various conditions. As a result, the gears shift smoothly.

DTC Code	DTC Detection Condition	Trouble Area
P0717	All the conditions below are detected for 5 sec. or more (1 trip detection logic). (a) Gear change is not performed. (b) The gear position is 4th or 5th. (c) The T/M input shaft rpm is 300 rpm or less. (d) The T/M output shaft rpm is 1000 rpm or more. (e) The park/neutral position switch: • The NSW input signal is OFF. • The R input signal is OFF. (f) The shift solenoid valves and park/neutral position switch are operating normally.	• Open or short in speed sensor NT circuit • Speed sensor NT • ECM • Automatic transmission (clutch, brake or gear, etc.)

Reference: Inspect using an oscilloscope.
Check the waveform of the ECM connector.

Standard:

Terminal No. (Symbol)	Tool Setting	Condition	Specified Condition
C45-124 (NT+) - C45-123 (NT-)	1 V/DIV., 2 msec./DIV.	Engine idling (shift lever in P or N)	Refer to illustration



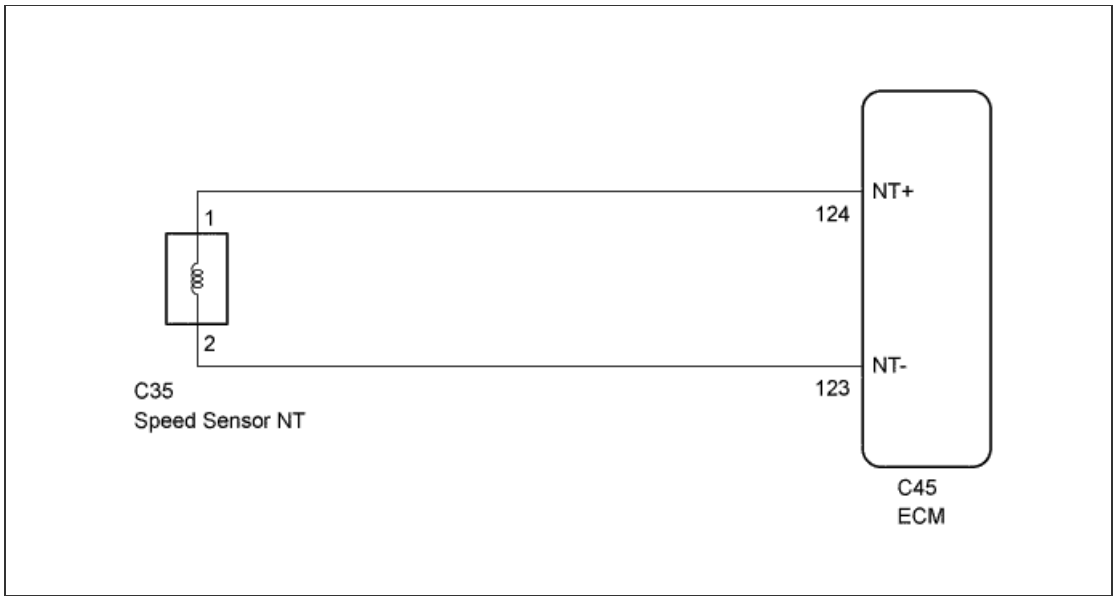
MONITOR DESCRIPTION

This DTC indicates that a pulse is not output from the speed sensor NT (turbine (input) speed sensor) or is output only a little. The NT terminal of the ECM detects the pulse signal from the speed sensor NT (input RPM). The ECM outputs a gear shift signal comparing the input speed sensor NT with the output speed sensor SP2.
While the vehicle is operating in the 4th or 5th gear position with the shift lever in D, if the input shaft revolution is less than 300 rpm*1 although the output shaft revolution is 1000 rpm or more*2, the ECM detects the trouble, illuminates the MIL and stores the DTC.

HINT:

- ***1: Pulse is not output or is irregularly output.**
- ***2: The vehicle speed is approximately 50 km/h (31 mph) or more.**

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the tester, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
SPD (NT)	Input shaft speed/ Min.: 0 rpm Max.: 12750 rpm	Lock-up: • ON (after warming up engine): Input turbine speed (NT) equal to engine speed • OFF (idling with shift lever in N): Input turbine speed (NT) nearly equal to engine speed	The data is displayed in increments of 50 rpm.

HINT:

- **SPD (NT) is always 0 while driving:**
  Open or short in the sensor or circuit.
- **SPD (NT) is always more than 0 and less than 300 rpm while driving the vehicle at 50 km/h (31 mph) or more:**
  Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

1.INSPECT SPEED SENSOR NT INSTALLATION

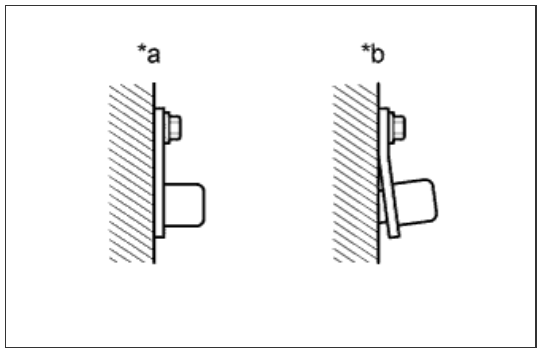
a. Check the speed sensor NT installation.

OK:
The installation bolt is tightened properly and there is no clearance

between the sensor and transmission case.

Text in Illustration

*a	CORRECT
b	INCORRECT



NG → SECURELY INSTALL OR REPLACE SPEED SENSOR NT (Click here)

OK

2.INSPECT SPEED SENSOR NT

a. Disconnect the speed sensor connector.

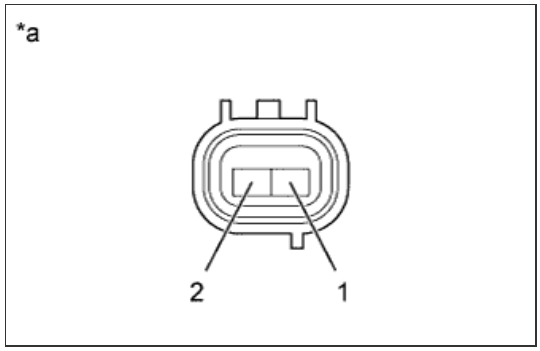
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	560 to 680 Ω

Text in Illustration

*a	Component without harness connected (Speed Sensor NT)



NG → REPLACE SPEED SENSOR NT (Click here)

OK

3.CHECK HARNESS AND CONNECTOR (SPEED SENSOR NT - ECM)

a. Disconnect the ECM connector.

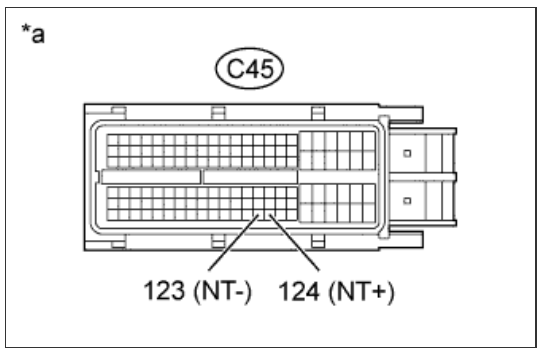
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-124 (NT+) - C45-123 (NT-)	20°C (68°F)	560 to 680 Ω
C45-124 (NT+) - Body ground	Always	10 kΩ or higher
C45-123 (NT-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0976 Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)

DTC P0977 Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)

for Preparation Click here

DESCRIPTION

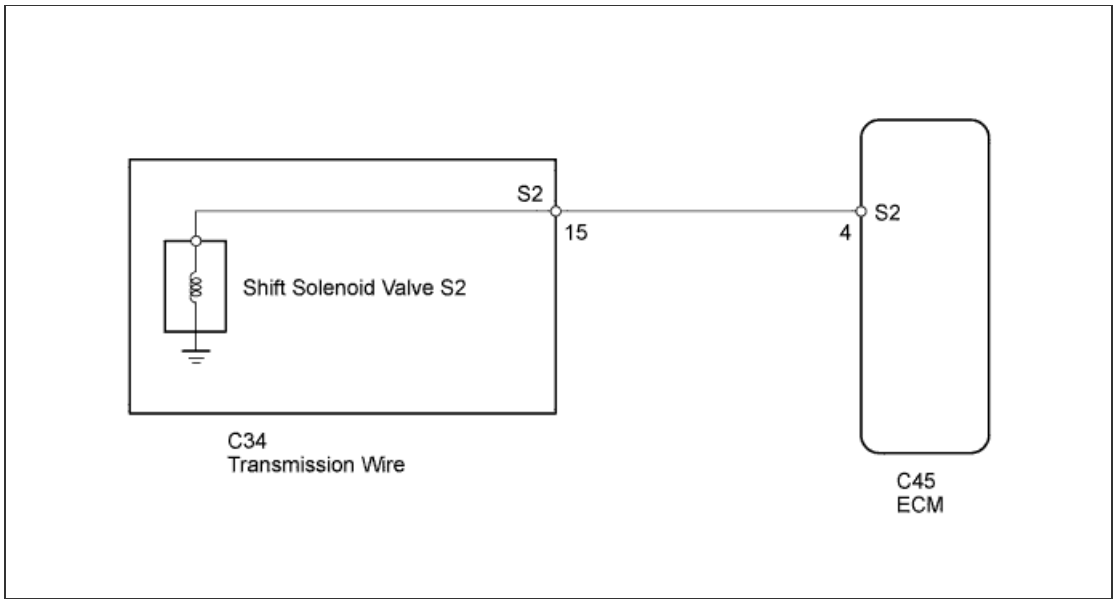
Shifting from 1st to 5th is performed in combination with the "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, S1, S2 and SR which is controlled by the ECM. If an open or short circuit occurs in one of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated smoothly (In case of an open or short circuit, the ECM stops sending current to the circuit. For details, refer to the Fail-Safe Chart (Click here)).

DTC Code	DTC Detection Condition	Trouble Area
P0976	The ECM detects a short in the solenoid valve S2 circuit 2 times when the solenoid valve S2 is operated (1 trip detection logic).	• Short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM
P0977	The ECM detects an open in the solenoid valve S2 circuit 2 times when the solenoid valve S2 is not operated (1 trip detection logic).	• Open in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S2 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S2 is on, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S2 circuit.
When the shift solenoid valve S2 is off, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S2 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve S2 turns ON/OFF normally when the shift lever is in D.

ECM gear shift command	1st	2nd	3rd	4th	5th
Shift solenoid valve S2	OFF	ON	ON	OFF	OFF

1.INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE S2)

a. Disconnect the transmission wire connector.

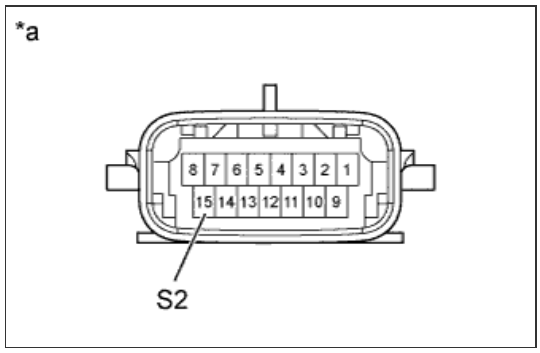
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
15 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (Transmission Wire)



NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

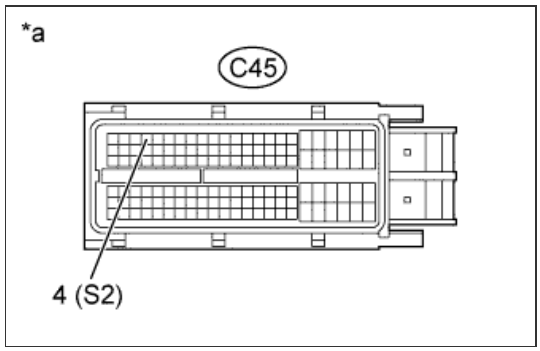
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-4 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

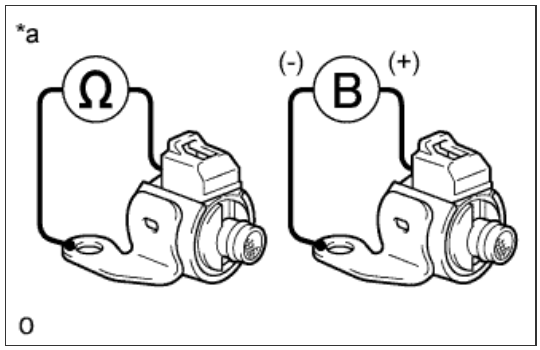
3.INSPECT SHIFT SOLENOID VALVE S2

a. Remove the shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve	

	S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S2)

NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK

REPAIR OR REPLACE TRANSMISSION WIRE (Click here)

DTC P0722 Output Speed Sensor Circuit No Signal

for Preparation Click here

DESCRIPTION

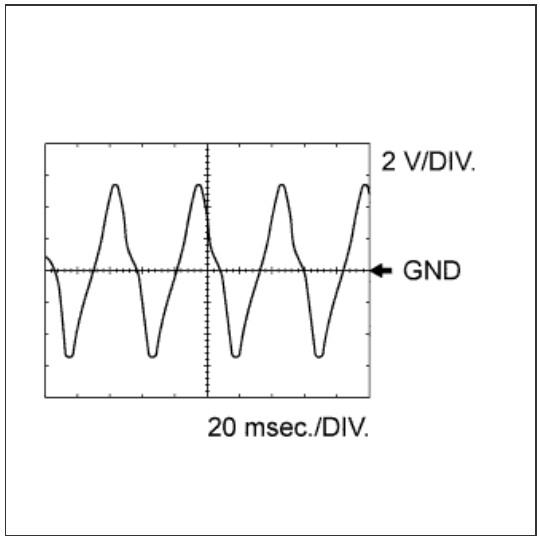
The speed sensor SP2 detects the rotation speed of the transmission output shaft and sends signals to the ECM. The ECM determines the vehicle speed based on these signals. An AC voltage is generated in the speed sensor SP2 coil as the parking gear mounted on the rear planetary gear assembly rotates, and this voltage is sent to the ECM. The parking gear on the rear planetary gear is used as the timing rotor for this sensor.
The gear shift point and lock-up timing are controlled by the ECM based on the signals from this vehicle speed sensor and the throttle position sensor signal.

DTC Code	DTC Detection Condition	Trouble Area
P0722	All the conditions below are detected 500 times or more continuously (2 trip detection logic). (a) No signal from the speed sensor SP2 is input to the ECM while 4 pulses of the No. 1 vehicle speed sensor signal are sent. (b) The vehicle speed is 9 km/h (6 mph) or more for at least 5 sec. (c) The park/neutral position switch is OFF. (d) The transfer position is not in neutral.	• Open or short in speed sensor SP2 circuit • Speed sensor SP2 • ECM • Automatic transmission (clutch, brake or gear, etc.)

Reference: Inspect using an oscilloscope.
Check the waveform of the ECM connector.

Standard:

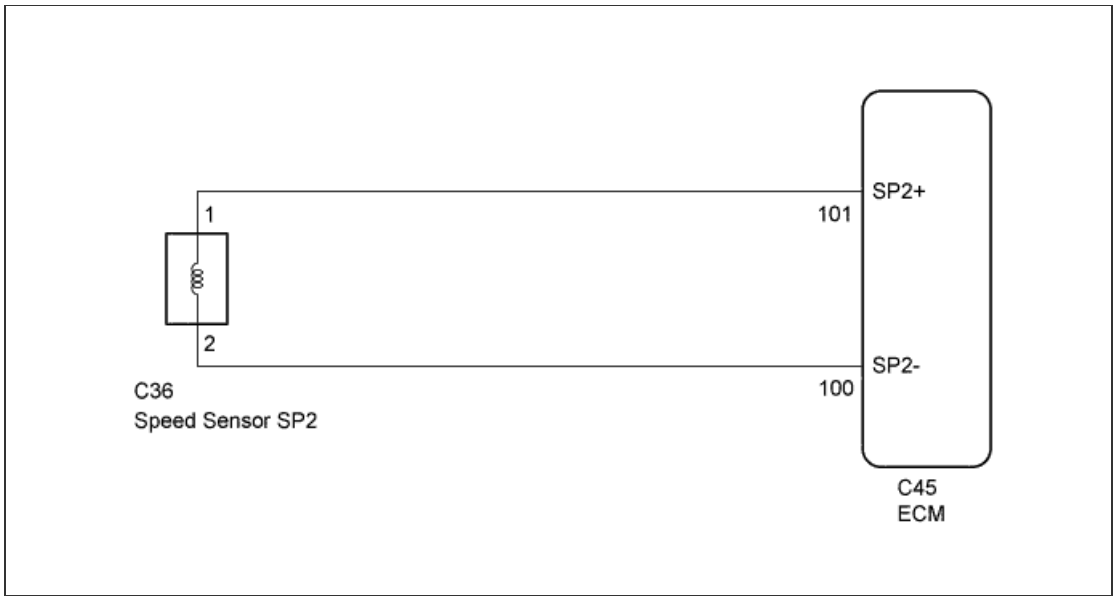
Terminal No. (Symbol)	Tool Setting	Condition	Specified Condition
C45-101 (SP2+) - C45-100 (SP2-)	2 V/DIV., 20 msec./DIV	Vehicle speed 20 km/h (12 mph)	Refer to illustration



MONITOR DESCRIPTION

The output speed sensor SP2 monitors the output shaft speed. The ECM controls the gear shift point and the lock up timing based on the signals from the output speed sensor SP2 and throttle position sensor.
If the ECM detects no signal from the output speed sensor SP2 even while the vehicle is moving, it will conclude that there is a malfunction of the output speed sensor SP2. The ECM will illuminate the MIL and store a DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the tester, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
SPD (SP2)	Output shaft speed/ Min.: 0 km/h (0 mph) Max.: 255 km/h (158 mph)	Vehicle stopped: 0 km/h (0 mph) (output shaft speed equal to vehicle speed)	-

HINT:

- **SPD (SP2) is always 0 while driving:**
  Open or short in the sensor or circuit.
- **The SPD (SP2) value displayed on the tester is much lower than the actual vehicle speed:**
  Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

1.INSPECT SPEED SENSOR SP2 INSTALLATION

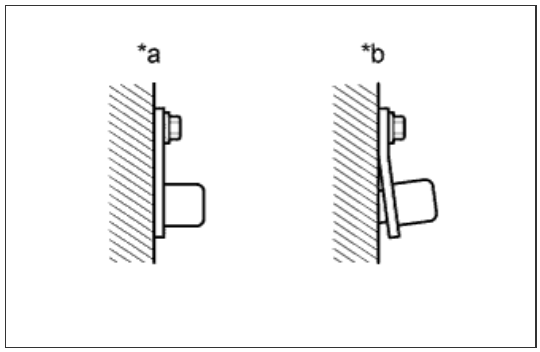
a. Check the speed sensor SP2 installation.

OK:

The installation bolt is tightened properly and there is no clearance between the sensor and transmission case.

Text in Illustration

*a	CORRECT
b	INCORRECT



NG → SECURELY INSTALL OR REPLACE SPEED SENSOR SP2 (Click here)

OK

2.INSPECT SPEED SENSOR SP2

a. Disconnect the speed sensor connector.

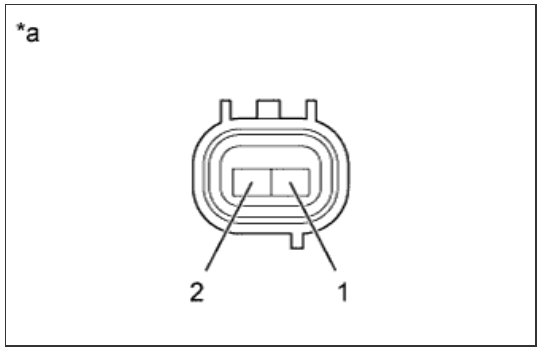
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	560 to 680 Ω

Text in Illustration

*a	Component without harness connected (Speed Sensor SP2)



NG → REPLACE SPEED SENSOR SP2 (Click here)

OK

3.CHECK HARNESS AND CONNECTOR (SPEED SENSOR SP2 - ECM)

a. Disconnect the ECM connector.

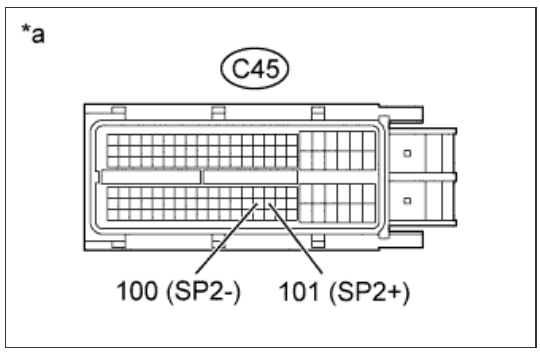
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-101 (SP2+) - C45-100 (SP2-)	20°C (68°F)	560 to 680 Ω
C45-101 (SP2+) - Body ground	Always	10 kΩ or higher
C45-100 (SP2-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0985 Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)

DTC P0986 Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)

for Preparation Click here

DESCRIPTION

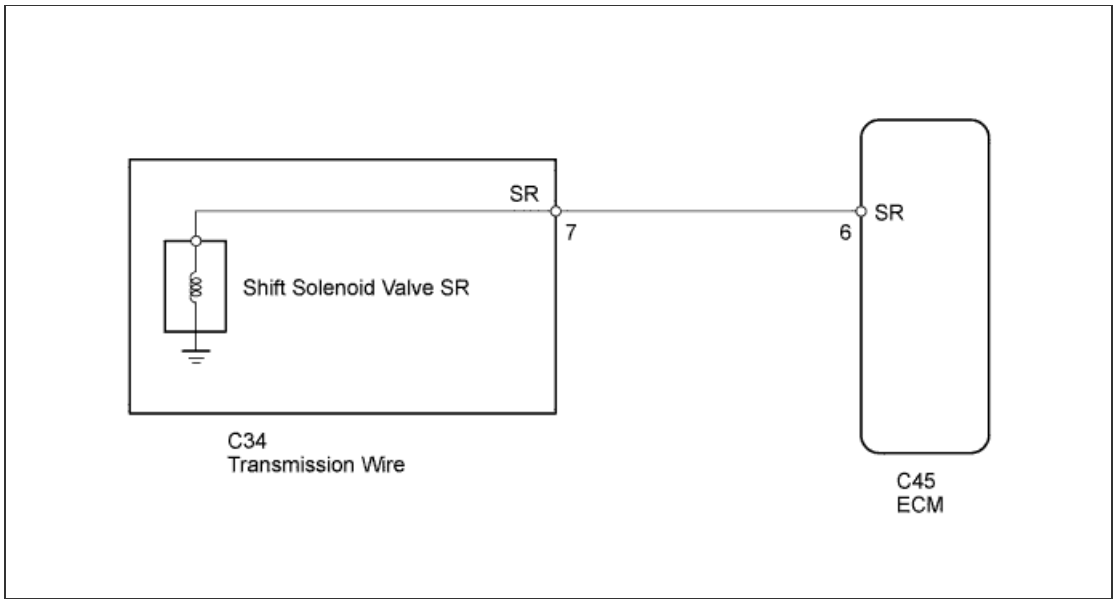
Shifting from 1st to 5th is performed in combination with the "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, S1, S2 and SR which is controlled by the ECM. If an open or short circuit occurs in one of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated smoothly (In case of an open or short circuit, the ECM stops sending current to the circuit. For details, refer to the Fail-Safe Chart (Click here)).

DTC Code	DTC Detection Condition	Trouble Area
P0985	The ECM detects a short in the solenoid valve SR circuit 2 times when the solenoid valve SR is operated (1 trip detection logic).	• Short in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM
P0986	The ECM detects an open in the solenoid valve SR circuit 2 times when the solenoid valve SR is not operated (1 trip detection logic).	• Open in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve SR circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve SR is on, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve SR circuit.
When the shift solenoid valve SR is off, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve SR circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve SR turns ON/OFF normally when the shift lever is in D.

ECM gear shift command	1st	2nd	3rd	4th	5th
Shift solenoid valve SR	OFF	OFF	OFF	OFF	ON

1.INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE SR)

a. Disconnect the transmission wire connector.

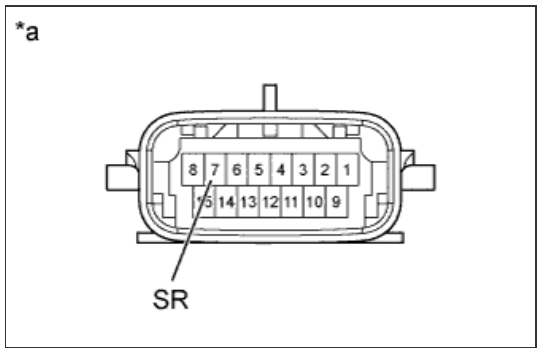
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
7 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (Transmission Wire)



NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

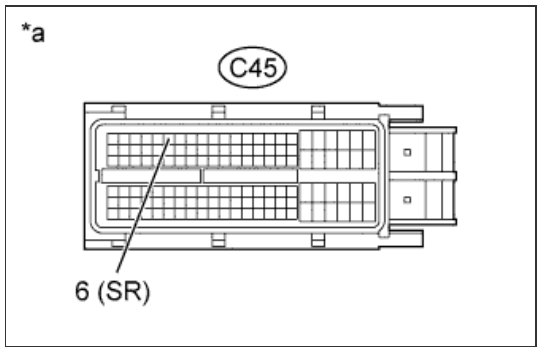
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-6 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

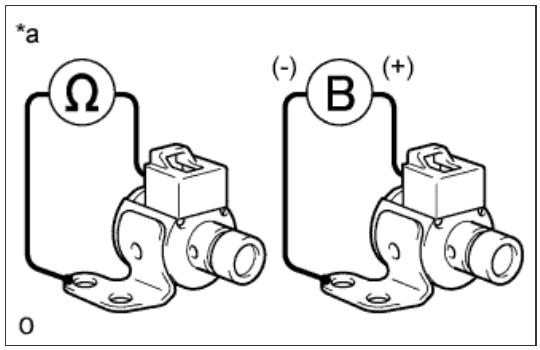
3.INSPECT SHIFT SOLENOID VALVE SR

a. Remove the shift solenoid valve SR.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve SR connector terminal - Shift solenoid valve SR body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve	

	SR connector • Battery negative (-) → Shift solenoid valve SR body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SR)

NG → REPLACE SHIFT SOLENOID VALVE SR (Click here)

OK

REPAIR OR REPLACE TRANSMISSION WIRE (Click here)

DTC P0724 Brake Switch "B" Circuit High

for Preparation Click here

DESCRIPTION

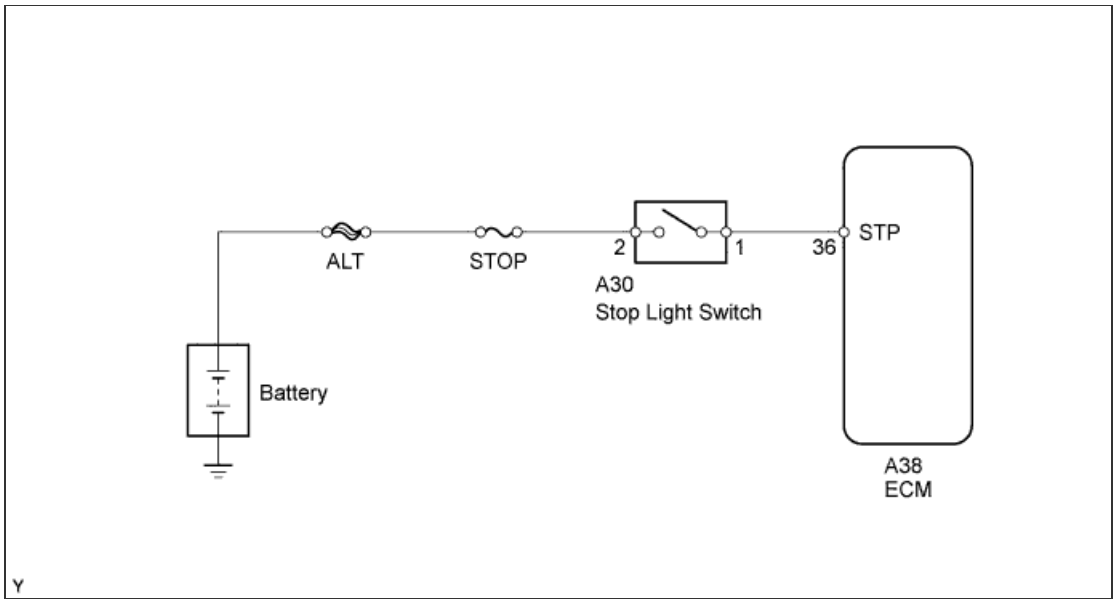
The purpose of this circuit is to prevent the engine from stalling while driving in the lock-up condition when brakes are suddenly applied.
When the brake pedal is depressed, this switch sends a signal to the ECM. Then the ECM cancels the operation of the lock-up clutch while braking is in progress.

DTC Code	DTC Detection Condition	Trouble Area
P0724	The stop light switch remains on even when the vehicle is driven in a STOP (less than 3 km/h (2 mph)) and GO (30 km/h (19 mph) or more) pattern 5 times (2 trip detection logic).	• Short in stop light switch signal circuit • Stop light switch • ECM

MONITOR DESCRIPTION

This DTC indicates that the stop light switch remains on. When the stop light switch remains on during "stop and go" driving, the ECM interprets this as a fault in the stop light switch, the MIL comes on and the ECM stores the DTC. The vehicle must stop (less than 3 km/h (2 mph)) and go (30 km/h (19 mph) or more) five times for 2 driving cycles in order to detect a malfunction.

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the tester, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
Stop Light Switch	Stop light switch status/ ON or OFF	Brake pedal: • Depressed: ON • Released: OFF	-

1.INSPECT STOP LIGHT SWITCH

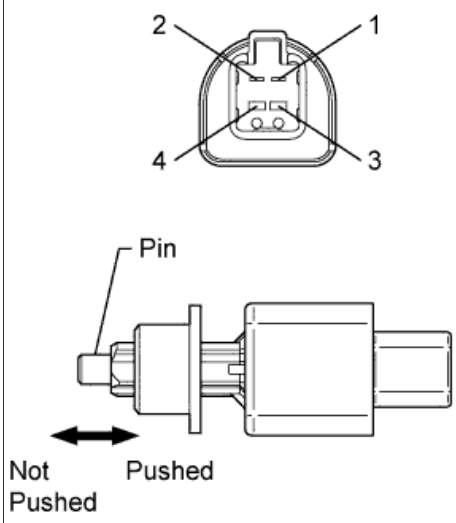
a. Remove the stop light switch (Click here).

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
1 - 2	Pin not pushed	Below 1 Ω
3 - 4	Pin pushed	Below 1 Ω
1 - 2	Pin pushed	10 kΩ or higher
3 - 4	Pin not pushed	10 kΩ or higher

Component without harness connected:
(Stop Light Switch)



NG → REPLACE STOP LIGHT SWITCH (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (BATTERY - ECM)

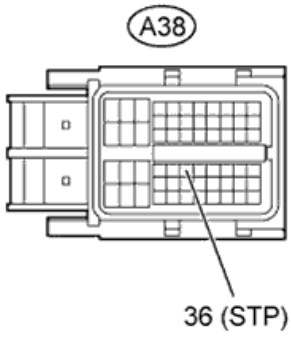
a. Disconnect the A38 ECM connector.

b. Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Condition	Specified Condition
A38-36 (STP) - Body ground	Brake pedal depressed	11 to 14 V
A38-36 (STP) - Body ground	Brake pedal released	Below 1 V

Front view of wire harness connector:
(to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0985 Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)

DTC P0986 Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)

for Preparation Click here

DESCRIPTION

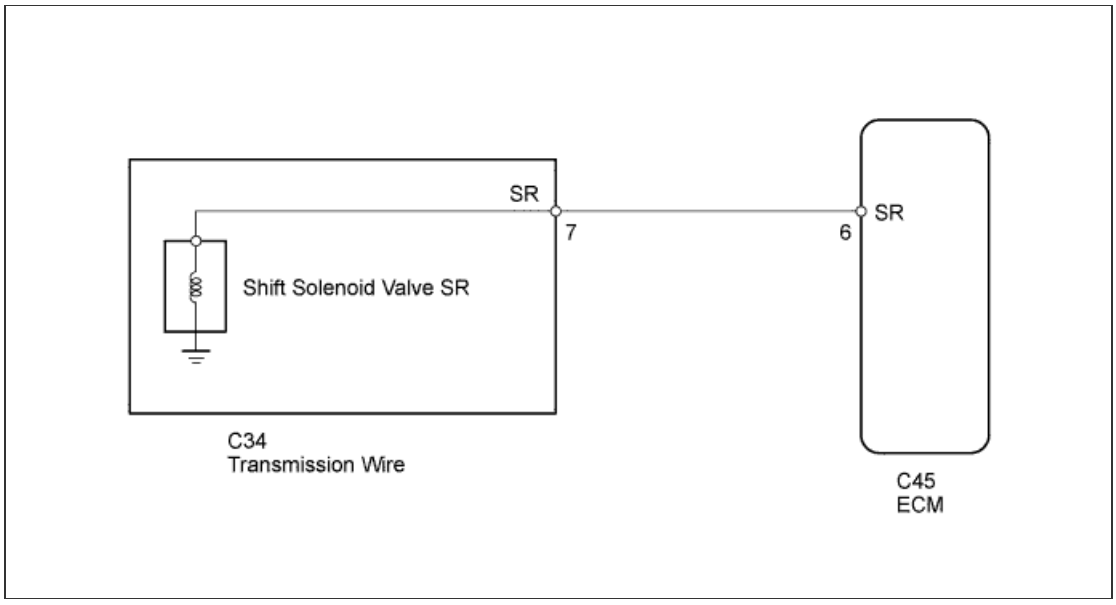
Shifting from 1st to 5th is performed in combination with the "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, S1, S2 and SR which is controlled by the ECM. If an open or short circuit occurs in one of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated smoothly (In case of an open or short circuit, the ECM stops sending current to the circuit. For details, refer to the Fail-Safe Chart (Click here)).

DTC Code	DTC Detection Condition	Trouble Area
P0985	The ECM detects a short in the solenoid valve SR circuit 2 times when the solenoid valve SR is operated (1 trip detection logic).	• Short in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM
P0986	The ECM detects an open in the solenoid valve SR circuit 2 times when the solenoid valve SR is not operated (1 trip detection logic).	• Open in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve SR circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve SR is on, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve SR circuit.
When the shift solenoid valve SR is off, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve SR circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve SR turns ON/OFF normally when the shift lever is in D.

ECM gear shift command	1st	2nd	3rd	4th	5th
Shift solenoid valve SR	OFF	OFF	OFF	OFF	ON

1.INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE SR)

a. Disconnect the transmission wire connector.

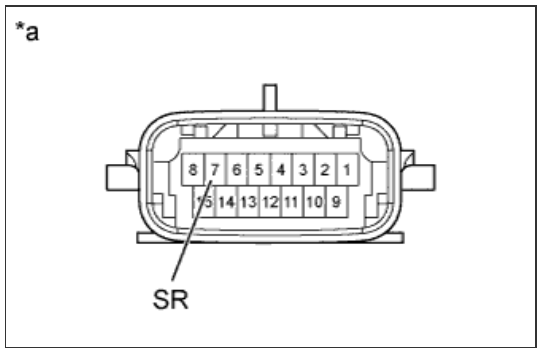
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
7 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (Transmission Wire)



NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

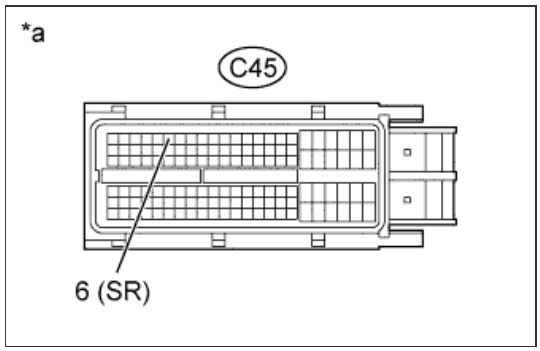
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-6 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

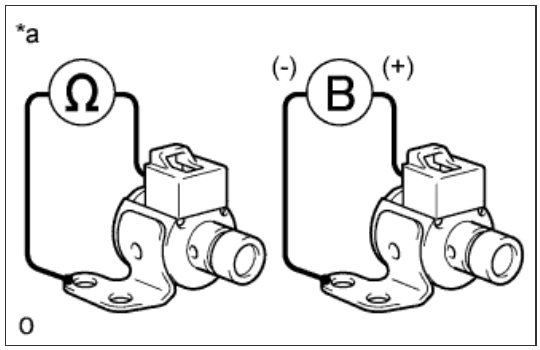
3.INSPECT SHIFT SOLENOID VALVE SR

a. Remove the shift solenoid valve SR.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve SR connector terminal - Shift solenoid valve SR body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve	

	SR connector • Battery negative (-) → Shift solenoid valve SR body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SR)

NG → REPLACE SHIFT SOLENOID VALVE SR (Click here)

OK

REPAIR OR REPLACE TRANSMISSION WIRE (Click here)

DTC P0746 Pressure Control Solenoid "A" Performance (Shift Solenoid Valve SL1)

DTC P0771 Shift Solenoid "E" Performance (Shift Solenoid Valve SR)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems with the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0746	The gear required by the ECM does not match the actual gear when driving (2 trip detection logic).	• Shift solenoid valve SL1 remains closed • Shift solenoid valve SR remains open or closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)
P0771	The gear required by the ECM does not match the actual gear when driving (2 trip detection logic*1, 1 trip detection logic*2).	• Shift solenoid valve SR remains open or closed • Shift solenoid valve SL1 remains closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

*1: w/ OBD
*2: w/o OBD

MONITOR DESCRIPTION

This DTC indicates a stuck ON malfunction or stuck OFF malfunction of the shift solenoid valve SR and SL1.
The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th up-shift must be performed with the accelerator pedal released.**
- **The 5th to 4th down-shift must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the tester.**
- **The shift solenoid valve SL1 and SR turns ON/OFF normally when the shift lever is in D.**

ECM gear shift command	1st	2nd	3rd	4th	5th
Shift solenoid valve SL1	OFF	OFF	OFF	OFF	ON
Shift solenoid valve SR	OFF	OFF	OFF	OFF	ON

1.CHECK DTC OUTPUT (IN ADDITION TO DTCS P0746 AND P0771)

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / DTC.

e. Read the DTCs using the tester.

Result

Result	Proceed to
P0746 and/or P0771 is output	A
P0746, P0771 and other DTCs are output	B

HINT:

If any other codes besides P0746 and P0771 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

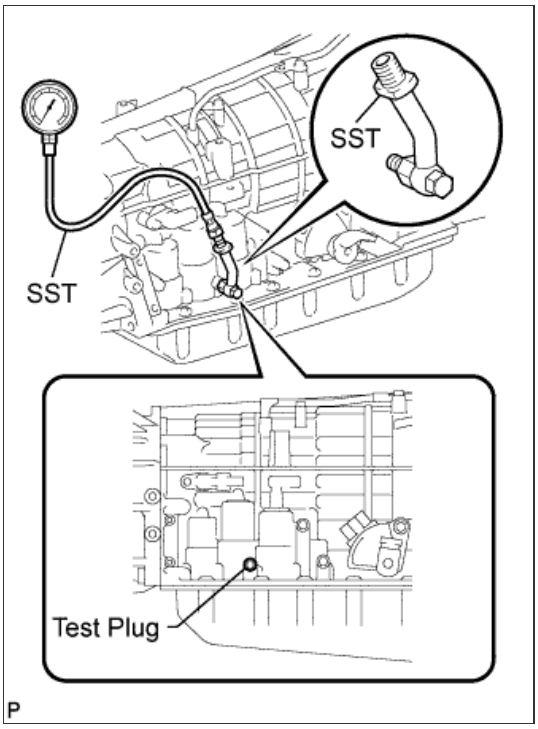
d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

h. Measure the line pressure.



Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (**Click here**)

OK

3.INSPECT SHIFT SOLENOID VALVE SL1

a. Remove the shift solenoid valve SL1.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

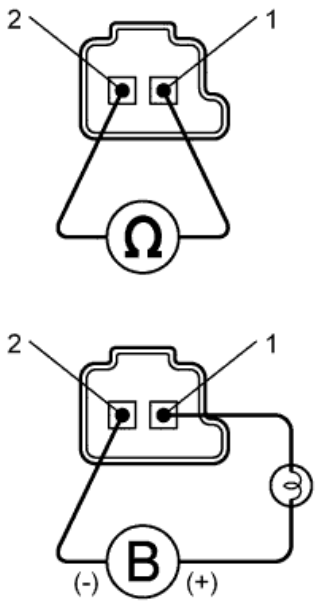
c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive	

(+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Component without harness connected:
(Shift Solenoid Valve SL1)



NG → REPLACE SHIFT SOLENOID VALVE SL1 (Click here)

OK

4.INSPECT SHIFT SOLENOID VALVE SR

a. Remove the shift solenoid valve SR.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

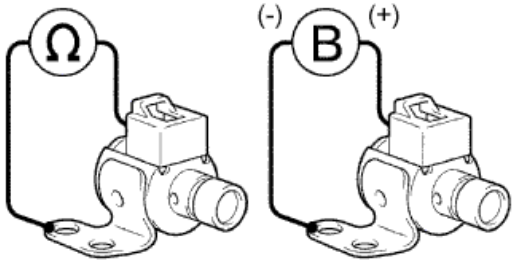
Tester Connection	Condition	Specified Condition
Shift solenoid valve SR connector terminal - Shift solenoid valve SR body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve SR connector • Battery negative (-) → Shift solenoid valve SR body	Valve moves and makes an operating noise

Shift Solenoid Valve SR:



NG → REPLACE SHIFT SOLENOID VALVE SR (Click here)

OK

5.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (**Click here**)

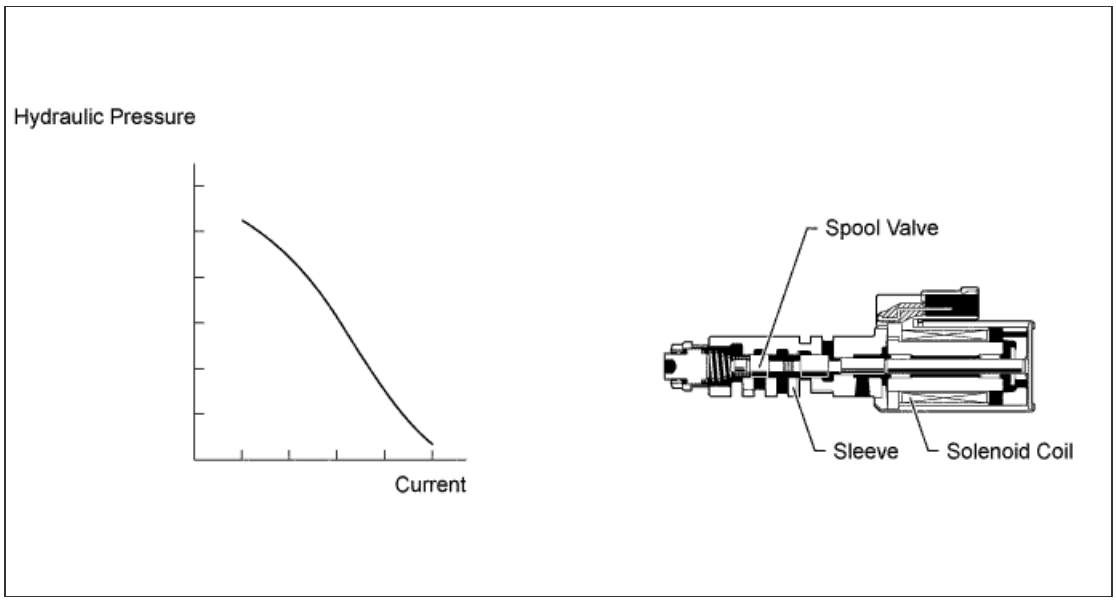
OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (**Click here**)

DTC P2714 Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)

for Preparation Click here

DESCRIPTION



The shift solenoid valve SLT controls the transmission line pressure for smooth transmission operation based on signals from the throttle position sensor and the vehicle speed sensor. The ECM adjusts the current of the SLT solenoid valve to control the hydraulic line pressure coming from the primary regulator valve. Appropriate line pressure assures smooth shifting with varying engine outputs.

DTC Code	DTC Detection Condition	Trouble Area
P2714	The ECM detects a malfunction of the SLT shift solenoid valve (ON side) according to the revolution difference of the turbine and output shaft, and also by the oil pressure (2 trip detection logic*1, 1 trip detection logic*2).	• Shift solenoid valve SLT remains open or closed • Shift solenoid valve S1, S2, SR, SL1 or SL2 remains open or closed • 1-2 shift valve is stuck • Valve body is blocked • Torque convertor clutch • Automatic transmission (clutch, brake or gear, etc.)

*1: w/ OBD
*2: w/o OBD

MONITOR DESCRIPTION

The ECM calculates the amount of heat absorbed by the friction material based on the difference in revolution (clutch slippage) between the turbine and output shaft. The ECM turns on the MIL and stores this DTC when the amount of heat absorption exceeds the specified value.
There are two reasons that make the revolution different.

- When the shift solenoid valve SLT remains on, oil pressure goes down and clutch engagement force decreases.
- When the shift solenoid valve remains on or off, the gear position commanded by the ECM and the actual gear position are not the same.

NOTICE:

If you continue driving under these conditions, the clutch will burn out and the vehicle will no longer be drivable.

INSPECTION PROCEDURE

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P2714)

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / DTC.

e. Read the DTCs using the tester.

Result

Result	Proceed to
Only P2714 is output	A
P2714 and other DTCs are output	B

HINT:

If any other codes besides P2714 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

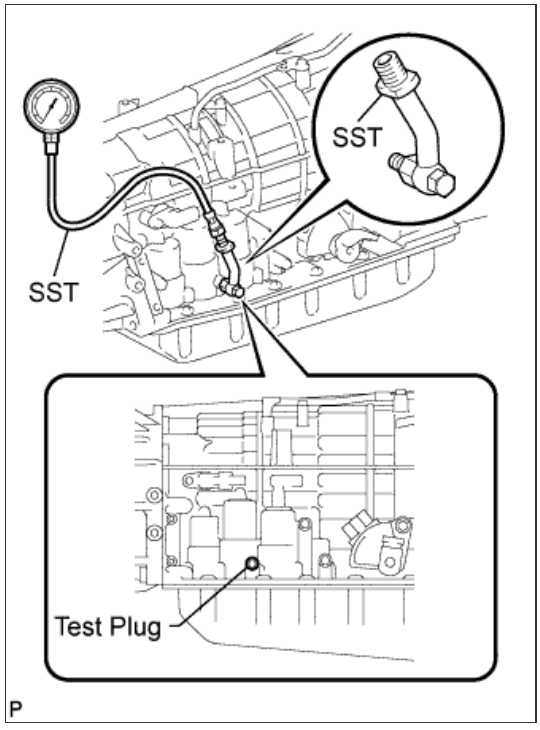
d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

h. Measure the line pressure.



Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → Go to step 17

OK

3.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (RUNNING TEST)

CAUTION:

This test should always be performed with at least 2 people.

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Perform the test with the A/C turned off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Connect the intelligent tester to the DLC3.

b. Clear the DTC (Click here).

c. Warm up the engine.

d. Enter the following menus: Powertrain / Engine and ECT / Active Test.

e. According to the display on the tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th up-shift must be performed with the accelerator pedal released.**
- **The 5th to 4th down-shift must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the tester.**

f. Compare the ECM gear shift command and the actual gear position.

OK:

Gear position changes in accordance with the tester command.

Result

System Condition			ECM Gear Shift Command					Proceed to
			1st	2nd	3rd	4th	5th	
	Shift solenoid valve S1	Stuck ON	1st	2nd	2nd	1st	N*1	A
		Stuck OFF	4th	3rd	3rd	4th	5th	
	Shift solenoid valve S2	Stuck ON*2	2nd	2nd	3rd	3rd	N*1	B
		Stuck						

Malfunction		OFF*3	1st	1st	4th	4th	5th	
	Shift solenoid valve SL2	Stuck ON	1st	2nd	3rd	4th	N*1	C
		Stuck OFF	1st	2nd	3rd	4th	5th	
	Shift solenoid valve SR	Stuck ON*4	1st	2nd	3rd	4th	5th	D
		Stuck OFF*5	1st	2nd	3rd	4th	4th	
Normal			1st	2nd	3rd	4th	5th	E

HINT:

- ***1: Neutral**
- ***2: When shift solenoid valve S2 is stuck ON, the vehicle cannot drive in reverse.**
- ***3: When shift solenoid valve S2 is stuck OFF, the 4th to 5th up-shift will have a large shift shock. Also, the 5th to 4th down-shift will have time lag.**
- ***4: When shift solenoid valve SR is stuck ON, the condition can be determined by checking if shift shock has increased excessively.**
- ***5: When shift solenoid valve SR is stuck OFF, moving the shift lever from N to D will cause a large shift shock.**
- **Gear shift can be determined by paying attention to changes in engine speed.**

B	Go to step 7
C	Go to step 10
D	Go to step 13
E	Go to step 17

A

4.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

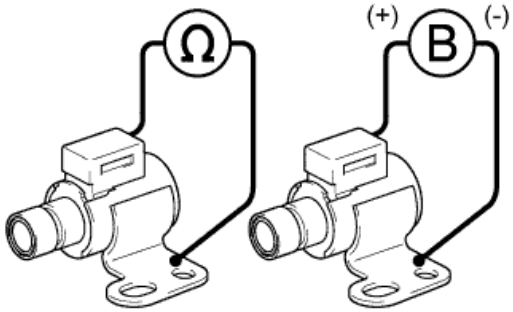
Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

Shift Solenoid Valve S1:



P

NG — REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

5.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK ↓

6.INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

a. Check the torque converter clutch assembly (Click here).

OK:

The torque converter clutch operates normally.

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY (Click here)

OK ↓

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

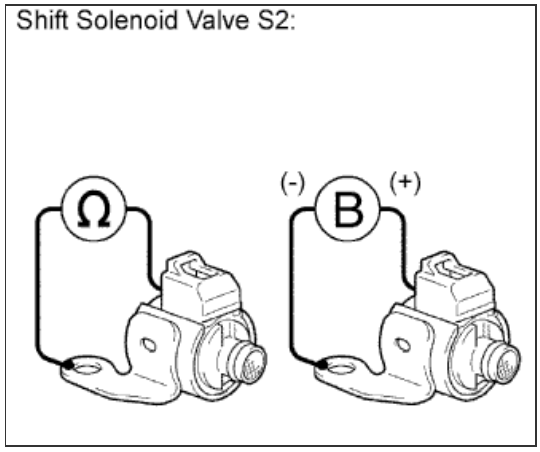
7.INSPECT SHIFT SOLENOID VALVE S2

a. Remove the shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK ↓

8.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

9.INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

a. Check the torque converter clutch assembly (Click here).

OK:

The torque converter clutch operates normally.

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

10.INSPECT SHIFT SOLENOID VALVE SL2

a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

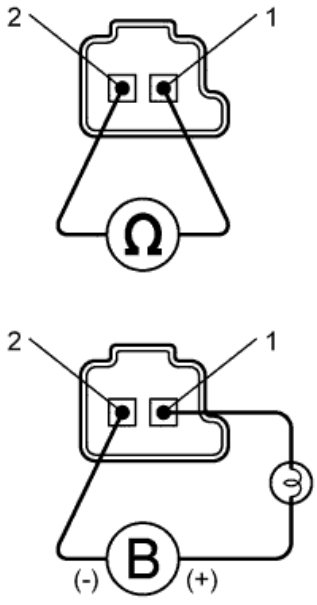
Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Component without harness connected:
(Shift Solenoid Valve SL2)



NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK

11.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

12.INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

a. Check the torque converter clutch assembly (Click here).

OK:

The torque converter clutch operates normally.

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

13.INSPECT SHIFT SOLENOID VALVE SL1

a. Remove the shift solenoid valve SL1.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

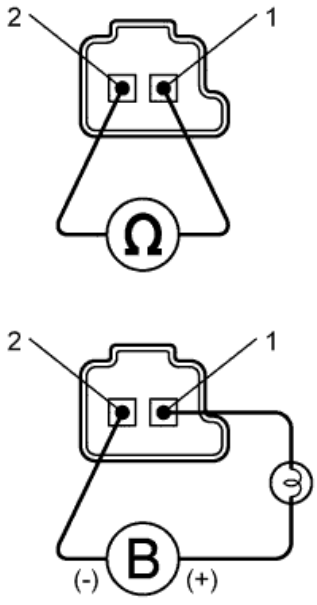
Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Component without harness connected:
(Shift Solenoid Valve SL1)



NG → REPLACE SHIFT SOLENOID VALVE SL1 (Click here)

OK

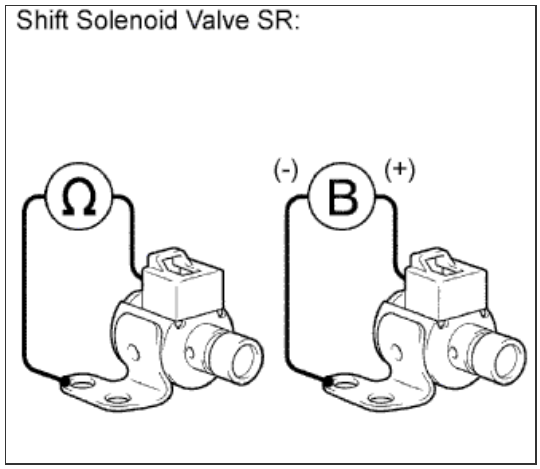
14.INSPECT SHIFT SOLENOID VALVE SR

a. Remove the shift solenoid valve SR.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve SR connector terminal - Shift solenoid valve SR body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve SR connector • Battery negative (-) → Shift solenoid valve SR body	Valve moves and makes an operating noise

NG → REPLACE SHIFT SOLENOID VALVE SR (Click here)

OK

15.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

16.INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

a. Check the torque converter clutch assembly (Click here).

OK:

The torque converter clutch operates normally.

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

17.INSPECT SHIFT SOLENOID VALVE SLT

a. Remove the shift solenoid valve SLT.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition

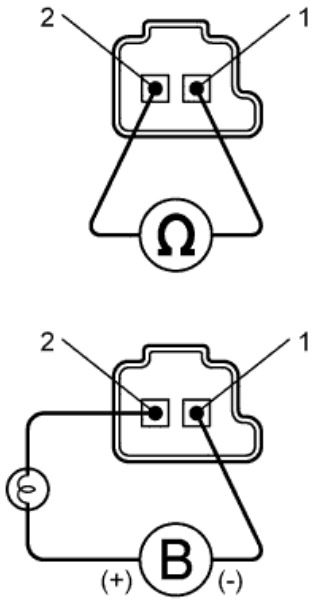
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise

Component without harness connected:
(Shift Solenoid Valve SLT)



NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK ↓

18.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:
There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK ↓

19.INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

a. Check the torque converter clutch assembly (Click here).

OK:
The torque converter clutch operates normally.

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY (Click here)

OK ↓

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P0746 Pressure Control Solenoid "A" Performance (Shift Solenoid Valve SL1)

DTC P0771 Shift Solenoid "E" Performance (Shift Solenoid Valve SR)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems with the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0746	The gear required by the ECM does not match the actual gear when driving (2 trip detection logic).	• Shift solenoid valve SL1 remains closed • Shift solenoid valve SR remains open or closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)
P0771	The gear required by the ECM does not match the actual gear when driving (2 trip detection logic*1, 1 trip detection logic*2).	• Shift solenoid valve SR remains open or closed • Shift solenoid valve SL1 remains closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

*1: w/ OBD
*2: w/o OBD

MONITOR DESCRIPTION

This DTC indicates a stuck ON malfunction or stuck OFF malfunction of the shift solenoid valve SR and SL1.
The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th up-shift must be performed with the accelerator pedal released.**
- **The 5th to 4th down-shift must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the tester.**
- **The shift solenoid valve SL1 and SR turns ON/OFF normally when the shift lever is in D.**

ECM gear shift command	1st	2nd	3rd	4th	5th
Shift solenoid valve SL1	OFF	OFF	OFF	OFF	ON
Shift solenoid valve SR	OFF	OFF	OFF	OFF	ON

1.CHECK DTC OUTPUT (IN ADDITION TO DTCS P0746 AND P0771)

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / DTC.

e. Read the DTCs using the tester.

Result

Result	Proceed to
P0746 and/or P0771 is output	A
P0746, P0771 and other DTCs are output	B

HINT:

If any other codes besides P0746 and P0771 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

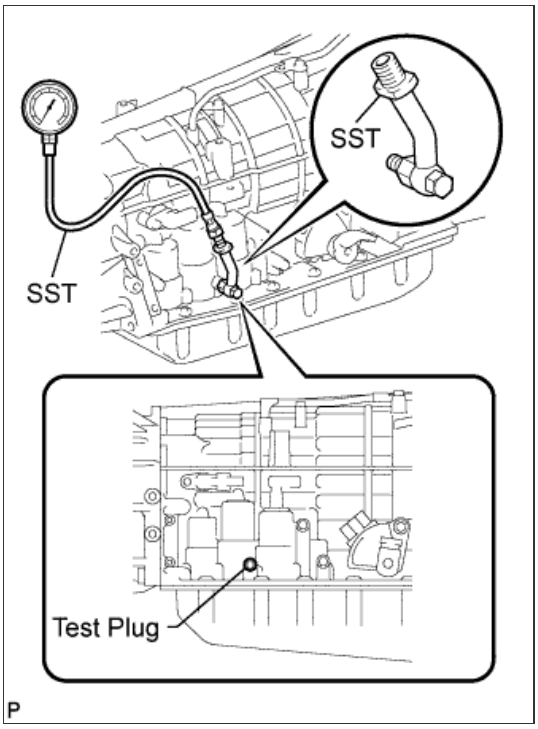
d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

h. Measure the line pressure.



Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (**Click here**)

OK

3.INSPECT SHIFT SOLENOID VALVE SL1

a. Remove the shift solenoid valve SL1.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

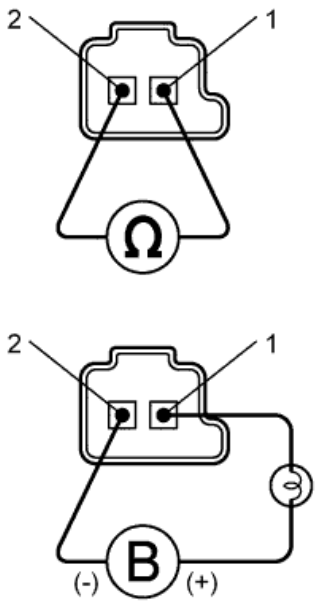
c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive	

(+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Component without harness connected:
(Shift Solenoid Valve SL1)



NG → REPLACE SHIFT SOLENOID VALVE SL1 (Click here)

OK

4.INSPECT SHIFT SOLENOID VALVE SR

a. Remove the shift solenoid valve SR.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

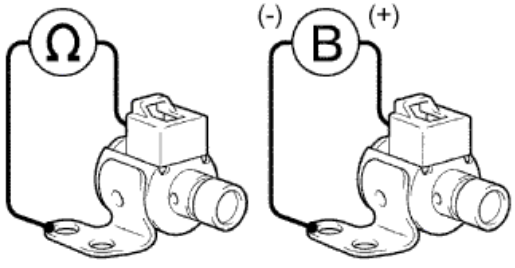
Tester Connection	Condition	Specified Condition
Shift solenoid valve SR connector terminal - Shift solenoid valve SR body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve SR connector • Battery negative (-) → Shift solenoid valve SR body	Valve moves and makes an operating noise

Shift Solenoid Valve SR:



NG → REPLACE SHIFT SOLENOID VALVE SR (Click here)

OK

5.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

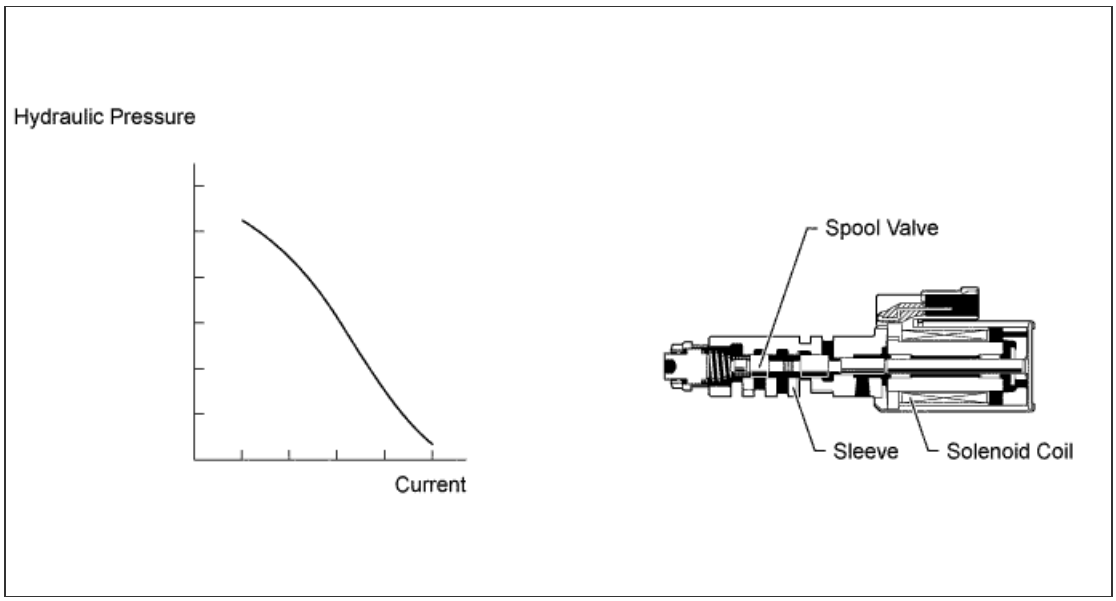
NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (**Click here**)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (**Click here**)

for Preparation Click here

DESCRIPTION



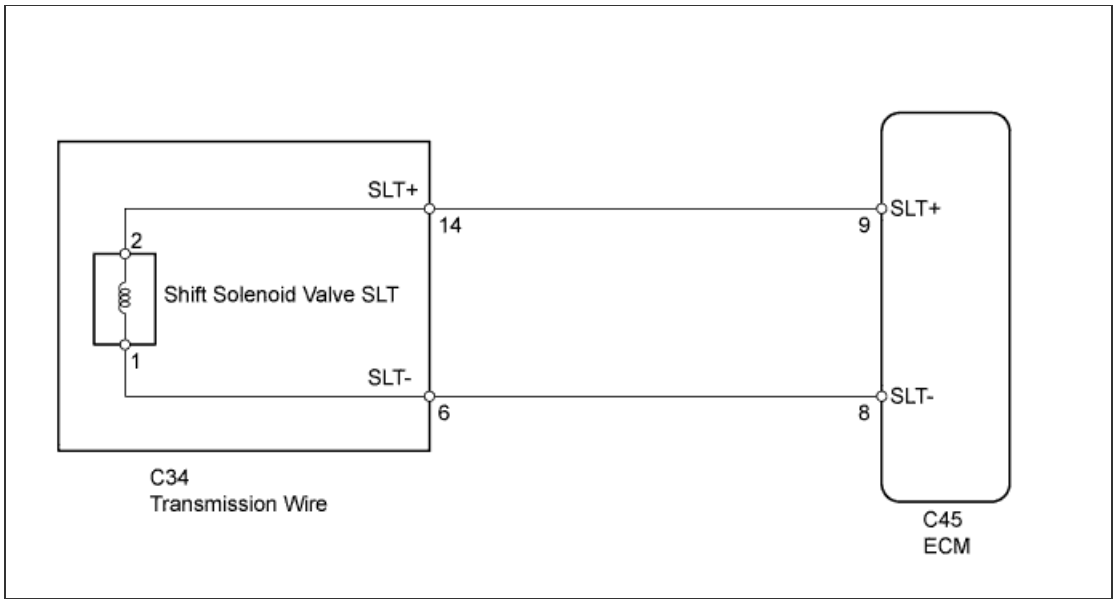
The shift solenoid valve SLT controls the transmission line pressure for smooth transmission operation based on signals from the throttle position sensor and the vehicle speed sensor. The ECM adjusts the current of the SLT solenoid valve to control the hydraulic line pressure coming from the primary regulator valve. Appropriate line pressure assures smooth shifting with varying engine outputs.

DTC Code	DTC Detection Condition	Trouble Area
P2716	An open or short is detected in the shift solenoid valve SLT circuit for 1 sec. or more while driving (1 trip detection logic).	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM

MONITOR DESCRIPTION

When an open or short in the shift solenoid valve SLT circuit is detected, the ECM interprets this as a fault. The ECM will turn on the MIL and store the DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

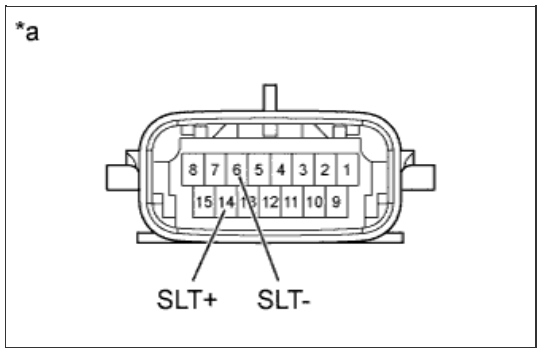
1.INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE SLT)

a. Disconnect the transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
14 (SLT+) - 6 (SLT-)	20°C (68°F)	5.0 to 5.6 Ω
14 (SLT+) - Body ground	Always	10 kΩ or higher
6 (SLT-) - Body ground	Always	10 kΩ or higher



Text in Illustration

*a	Component without harness connected (Transmission Wire)

NG → Go to step 3

OK ↓

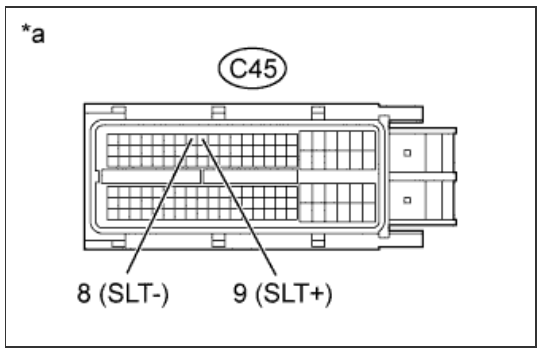
2.CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-9 (SLT+) - C45-8 (SLT-)	20°C (68°F)	5.0 to 5.6 Ω
C45-9 (SLT+) - Body ground	Always	10 kΩ or higher
C45-8 (SLT-) - Body ground	Always	10 kΩ or higher



Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ↓

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SLT

a. Remove the shift solenoid valve SLT.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

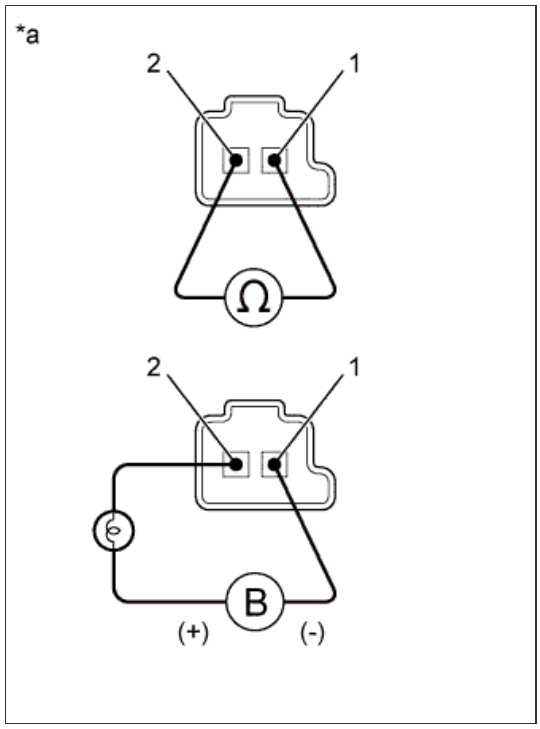
		Specified

Tester Connection	Condition	Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SLT)

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK → REPAIR OR REPLACE TRANSMISSION WIRE (Click here)

DTC P0748 Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)

for Preparation Click here

DESCRIPTION

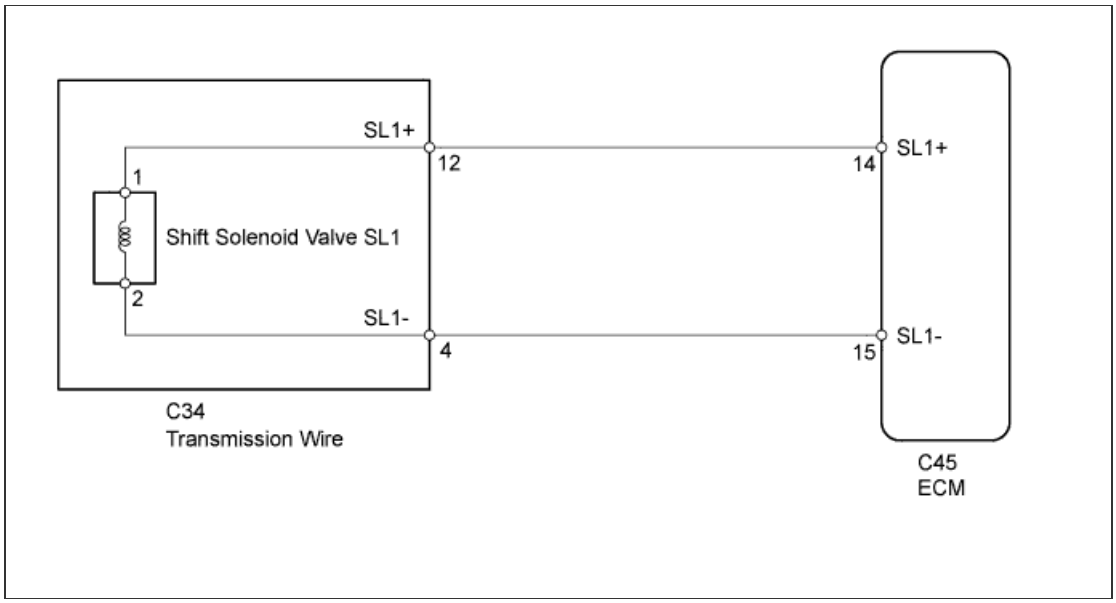
Shifting from 1st to 5th is performed in combination with the "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, S1, S2 and SR which are controlled by the ECM. If an open or short circuit occurs in one of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated smoothly (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0748	• The ECM detects an open or short in the shift solenoid valve SL1 circuit while driving and shifting between 4th and 5th gear (1 trip detection logic). • The output signal duty is 100%. **HINT:** The SL1 output signal duty is less than 100% under normal conditions.	• Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL1 circuit. The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. The ECM performs the fail-safe function and turns the other normal shift solenoid valves "ON/OFF". In case of an open or short circuit, the ECM stops sending current to the circuit.
While driving and shifting between 4th and 5th gears, if the ECM detects an open or short in the shift solenoid valve SL1 circuit, the ECM determines there is a malfunction (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve SL1 is turned ON/OFF normally when the shift lever is in D.

ECM gear shift command	1st	2nd	3rd	4th	5th
Shift solenoid valve SL1	OFF	OFF	OFF	OFF	ON

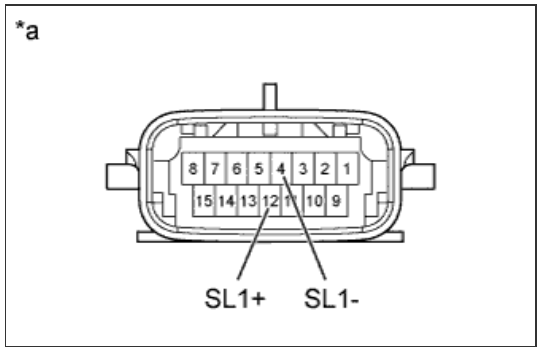
1.INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE SL1)

a. Disconnect the transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
12 (SL1+) - 4 (SL1-)	20°C (68°F)	5.0 to 5.6 Ω
12 (SL1+) - Body ground	Always	10 kΩ or higher
4 (SL1-) - Body ground	Always	10 kΩ or higher



Text in Illustration

*a	Component without harness connected (Transmission Wire)

NG → Go to step 3

OK

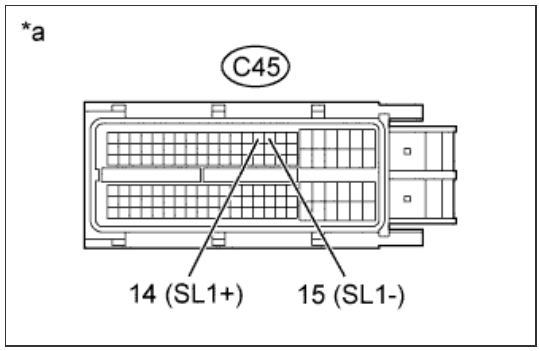
2.CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-14 (SL1+) - C45-15 (SL1-)	20°C (68°F)	5.0 to 5.6 Ω
C45-14 (SL1+) - Body ground	Always	10 kΩ or higher
C45-15 (SL1-) - Body ground	Always	10 kΩ or higher



Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SL1

a. Remove the shift solenoid valve SL1.

b. Measure the resistance according to the value(s) in the table below.

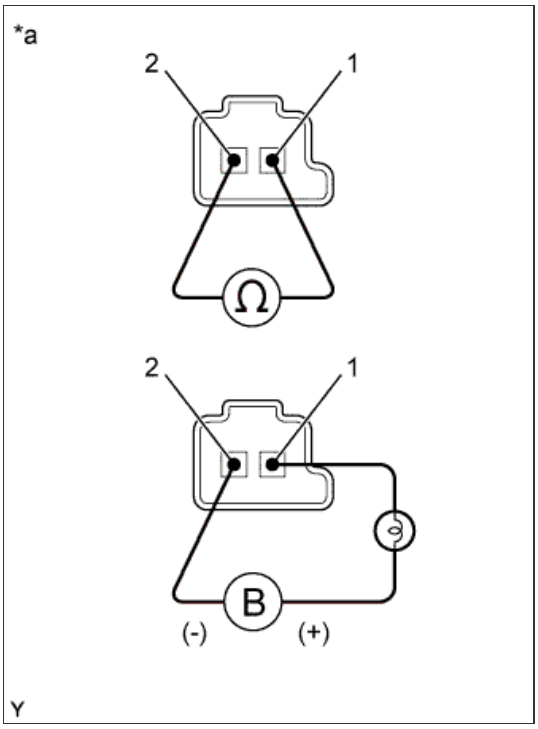
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SL1)

NG → REPLACE SHIFT SOLENOID VALVE SL1 (Click here)

OK → REPAIR OR REPLACE TRANSMISSION WIRE (Click here)

DTC P2742 Transmission Fluid Temperature Sensor "B" Circuit Low Input

DTC P2743 Transmission Fluid Temperature Sensor "B" Circuit High Input

for Preparation Click here

DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor is on the transmission, just in front of the oil cooler inlet pipeline.
If the ECM detects an abnormally high ATF temperature near this sensor, it illuminates the warning light.

HINT:

- **The temperature of ATF easily rises when towing, climbing hills, in traffic, etc.**
- **If the ATF temperature sensor becomes short-circuited, the signal that indicates that the ATF temperature is 150°C (302°F) or higher is input into the ECM.**

Vehicle conditions when the sensor is normal and when the sensor is short-circuited are indicated in the table below.

No. 2 ATF Temperature Sensor State	Detection Condition	Symptom	Recovery Condition
Sensor is normal	ATF temperature higher than 150°C (302°F)	ATF temperature warning light remains ON	ATF temperature less than 135°C (275°F)*1
	ATF temperature higher than 130°C (266°F)	Shift point too high	ATF temperature less than 110°C (230°F)
	When conditions (a) and (b) are satisfied. (a) ATF temperature higher than 130°C (266°F) (b) Engine coolant temperature higher than 95°C (203°F)	Lock-up at 3rd gear*2	ATF temperature less than 110°C (230°F)*1 and engine coolant temperature higher than 95°C (203°F)
Sensor is short-circuited	Any conditions	• ATF temperature warning light blinks or message is displayed in combination meter • Shift point too high	Symptoms still occur
	Engine coolant temperature higher than 95°C (203°F)	Lock-up at 3rd gear*2	Symptoms still occur

HINT:

*1: When the ATF temperature is in the normal range, it decreases to below 135°C (275°F) within 5 minutes with the shift lever in P or N in an idling state.

*2: When the ATF temperature is normal, transmission lock-up occurs in 5th gear with the shift lever in D, and 4th gear with the shift lever in the S4 range.

DTC Code	DTC Detection Condition	Trouble Area
P2742	The No. 2 ATF temperature sensor resistance is below 25 Ω (0.046 V) for 0.5 sec. or more (1 trip detection logic).	• Short in No. 2 ATF temperature sensor circuit • Transmission wire (No. 2 ATF temperature sensor) • ECM
P2743	When 15 min. or more have elapsed after the engine is started, the No. 2 ATF temperature sensor resistance is higher than 156 kΩ (4.915 V) for 0.5 sec. or more (1 trip detection logic).	• Open in No. 2 ATF temperature sensor circuit • Transmission wire (No. 2 ATF temperature sensor) • ECM

MONITOR DESCRIPTION

The ATF temperature sensor converts ATF temperature into an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is below 25 Ω*1 or higher than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM stores a DTC, and the ATF temperature warning light blinks or a message is displayed in the combination meter.

HINT:

- ***1: 150°C (302°F) or higher is indicated regardless of the actual ATF temperature.**
- ***2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.**
- **The ATF temperature can be checked on the intelligent tester display.**

WIRING DIAGRAM

Refer to DTC P0712 (Click here).

INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the tester, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 2	No. 2 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 2 ATF temperature sensor circuit is open or shorted.

HINT:

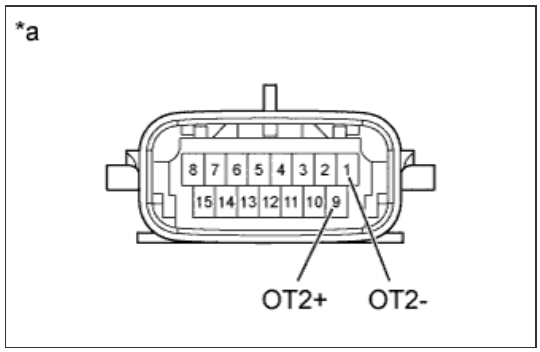
- **When DTC P2742 is stored and the intelligent tester output is 150°C (302°F) or higher, there is a short circuit.**
- **When DTC P2743 is stored and the intelligent tester output is -40°C (-40°F), there is an open circuit.**
  Check the temperature displayed on the tester in order to check if a malfunction exists.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or higher	Short circuit

1.INSPECT TRANSMISSION WIRE (NO. 2 ATF TEMPERATURE SENSOR)

a. Disconnect the transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
1 (OT2-) - 9 (OT2+)	Always	25 Ω to 156 kΩ
1 (OT2-) - Body ground	Always	10 kΩ or higher
9 (OT2+) - Body ground	Always	10 kΩ or higher

HINT:

If the resistance is out of the specified range of one of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Resistance (Reference):

ATF Temperature	Specified Condition
10°C (50°F)	5 to 8 kΩ
25°C (77°F)	2.5 to 4.5 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

Text in Illustration

*a	Component without harness connected (Transmission Wire)

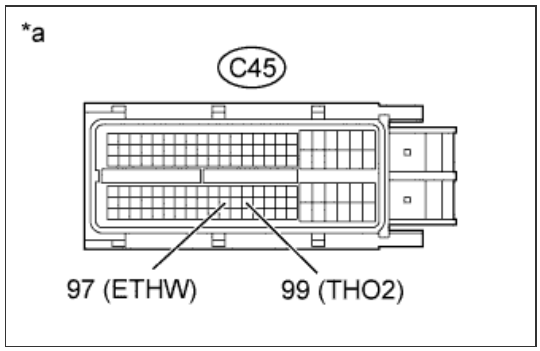
NG → REPAIR OR REPLACE NO. 2 ATF TEMPERATURE SENSOR (TRANSMISSION WIRE) (Click here)

OK →

2.CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-99 (THO2) - C45-97 (ETHW)	Always	25 Ω to 156 kΩ
C45-99 (THO2) - Body ground	Always	10 kΩ or higher
C45-97 (ETHW) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK →

REPLACE ECM (Click here)

DTC P0751 Shift Solenoid "A" Performance (Shift Solenoid Valve S1)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems with the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0751	The gear required by the ECM does not match the actual gear when driving (2 trip detection logic*1, 1 trip detection logic*2).	• Shift solenoid valve S1 remains open or closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

*1: w/ OBD
*2: w/o OBD

MONITOR DESCRIPTION

This DTC indicates a stuck ON malfunction or stuck OFF malfunction of the shift solenoid valve S1.
The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th up-shift must be performed with the accelerator pedal released.**
- **The 5th to 4th down-shift must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**

- **The shift position commanded by the ECM is shown in the Data List display on the tester.**
- **The shift solenoid valve S1 turns ON/OFF normally when the shift lever is in D.**

ECM gear shift command	1st	2nd	3rd	4th	5th
Shift solenoid valve S1	ON	ON	OFF	OFF	OFF

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0751)

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / DTC.

e. Read the DTCs using the tester.

Result

Result	Proceed to
Only P0751 is output	A
P0751 and other DTCs are output	B

HINT:

If any other codes besides P0751 are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART (Click here)**

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

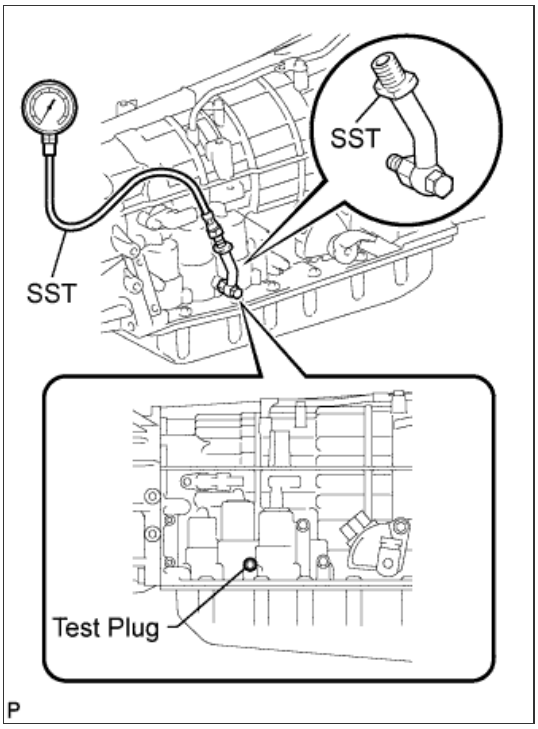
d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

h. Measure the line pressure.



Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → **REPLACE SHIFT SOLENOID VALVE SLT (Click here)**

OK

3.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.

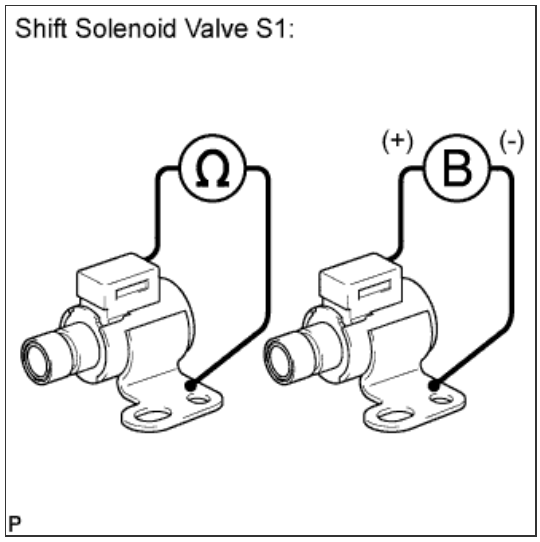
Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise



NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

4.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P2742 Transmission Fluid Temperature Sensor "B" Circuit Low Input

DTC P2743 Transmission Fluid Temperature Sensor "B" Circuit High Input

for Preparation Click here

DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor is on the transmission, just in front of the oil cooler inlet pipeline.
If the ECM detects an abnormally high ATF temperature near this sensor, it illuminates the warning light.

HINT:

- **The temperature of ATF easily rises when towing, climbing hills, in traffic, etc.**
- **If the ATF temperature sensor becomes short-circuited, the signal that indicates that the ATF temperature is 150°C (302°F) or higher is input into the ECM.**

Vehicle conditions when the sensor is normal and when the sensor is short-circuited are indicated in the table below.

No. 2 ATF Temperature Sensor State	Detection Condition	Symptom	Recovery Condition
Sensor is normal	ATF temperature higher than 150°C (302°F)	ATF temperature warning light remains ON	ATF temperature less than 135°C (275°F)*1
	ATF temperature higher than 130°C (266°F)	Shift point too high	ATF temperature less than 110°C (230°F)
	When conditions (a) and (b) are satisfied. (a) ATF temperature higher than 130°C (266°F) (b) Engine coolant temperature higher than 95°C (203°F)	Lock-up at 3rd gear*2	ATF temperature less than 110°C (230°F)*1 and engine coolant temperature higher than 95°C (203°F)
Sensor is short-circuited	Any conditions	• ATF temperature warning light blinks or message is displayed in combination meter • Shift point too high	Symptoms still occur
	Engine coolant temperature higher than 95°C (203°F)	Lock-up at 3rd gear*2	Symptoms still occur

HINT:

*1: When the ATF temperature is in the normal range, it decreases to below 135°C (275°F) within 5 minutes with the shift lever in P or N in an idling state.

*2: When the ATF temperature is normal, transmission lock-up occurs in 5th gear with the shift lever in D, and 4th gear with the shift lever in the S4 range.

DTC Code	DTC Detection Condition	Trouble Area
P2742	The No. 2 ATF temperature sensor resistance is below 25 Ω (0.046 V) for 0.5 sec. or more (1 trip detection logic).	• Short in No. 2 ATF temperature sensor circuit • Transmission wire (No. 2 ATF temperature sensor) • ECM
P2743	When 15 min. or more have elapsed after the engine is started, the No. 2 ATF temperature sensor resistance is higher than 156 kΩ (4.915 V) for 0.5 sec. or more (1 trip detection logic).	• Open in No. 2 ATF temperature sensor circuit • Transmission wire (No. 2 ATF temperature sensor) • ECM

MONITOR DESCRIPTION

The ATF temperature sensor converts ATF temperature into an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is below 25 Ω*1 or higher than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM stores a DTC, and the ATF temperature warning light blinks or a message is displayed in the combination meter.

HINT:

- ***1: 150°C (302°F) or higher is indicated regardless of the actual ATF temperature.**
- ***2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.**
- **The ATF temperature can be checked on the intelligent tester display.**

WIRING DIAGRAM

Refer to DTC P0712 (Click here).

INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the tester, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 2	No. 2 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 2 ATF temperature sensor circuit is open or shorted.

HINT:

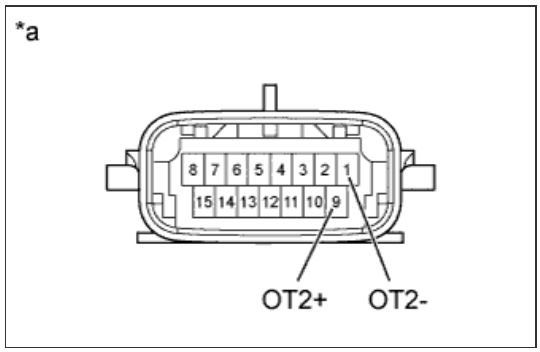
- **When DTC P2742 is stored and the intelligent tester output is 150°C (302°F) or higher, there is a short circuit.**
- **When DTC P2743 is stored and the intelligent tester output is -40°C (-40°F), there is an open circuit.**
  Check the temperature displayed on the tester in order to check if a malfunction exists.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or higher	Short circuit

1.INSPECT TRANSMISSION WIRE (NO. 2 ATF TEMPERATURE SENSOR)

a. Disconnect the transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
1 (OT2-) - 9 (OT2+)	Always	25 Ω to 156 kΩ
1 (OT2-) - Body ground	Always	10 kΩ or higher
9 (OT2+) - Body ground	Always	10 kΩ or higher

HINT:

If the resistance is out of the specified range of one of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Resistance (Reference):

ATF Temperature	Specified Condition
10°C (50°F)	5 to 8 kΩ
25°C (77°F)	2.5 to 4.5 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

Text in Illustration

*a	Component without harness connected (Transmission Wire)

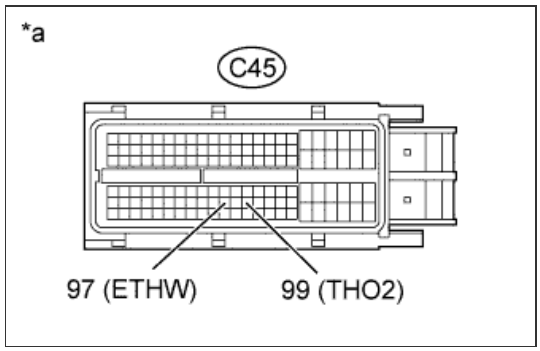
NG → REPAIR OR REPLACE NO. 2 ATF TEMPERATURE SENSOR (TRANSMISSION WIRE) (Click here)

OK →

2.CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-99 (THO2) - C45-97 (ETHW)	Always	25 Ω to 156 kΩ
C45-99 (THO2) - Body ground	Always	10 kΩ or higher
C45-97 (ETHW) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK →

REPLACE ECM (Click here)

DTC P0756 Shift Solenoid "B" Performance (Shift Solenoid Valve S2)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems with the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0756	The gear required by ECM does not match actual gear when driving (2 trip detection logic*1, 1 trip detection logic*2).	• Shift solenoid valve S2 remains open or closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

*1: w/ OBD
*2: w/o OBD

MONITOR DESCRIPTION

This DTC indicates a stuck ON malfunction or stuck OFF malfunction of the shift solenoid valve S2.
The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th up-shift must be performed with the accelerator pedal released.**
- **The 5th to 4th down-shift must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**

- **The shift position commanded by the ECM is shown in the Data List display on the tester.**
- **The shift solenoid valve S2 turns ON/OFF normally when the shift lever is in D.**

ECM gear shift command	1st	2nd	3rd	4th	5th
Shift solenoid valve S2	OFF	ON	ON	OFF	OFF

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0756)

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / DTC.

e. Read the DTCs using the tester.

Result

Result	Proceed to
Only P0756 is output	A
P0756 and other DTCs are output	B

HINT:

If any other codes besides P0756 are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART (Click here)**

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

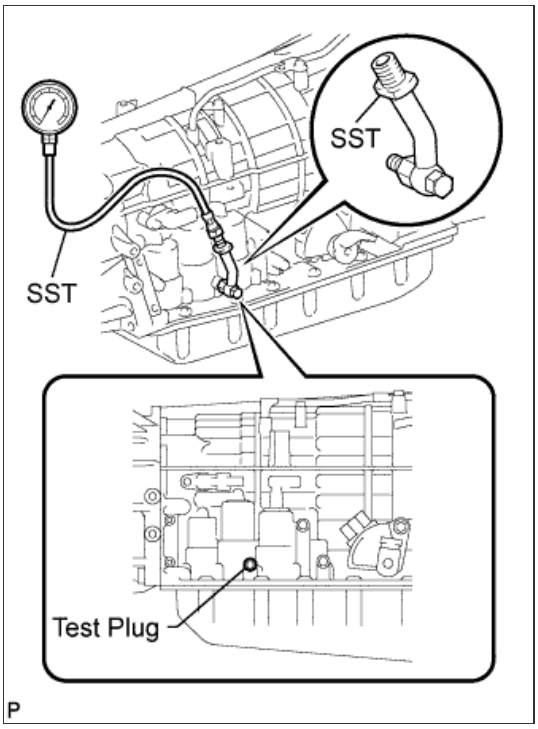
d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

h. Measure the line pressure.



Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (**Click here**)

OK

3.INSPECT SHIFT SOLENOID VALVE S2

a. Remove the shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.

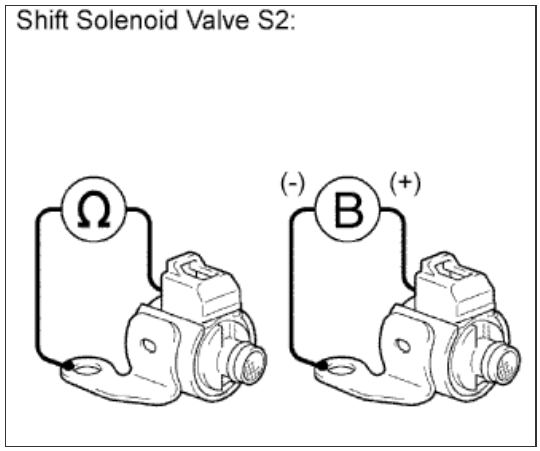
Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise



NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK

4.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

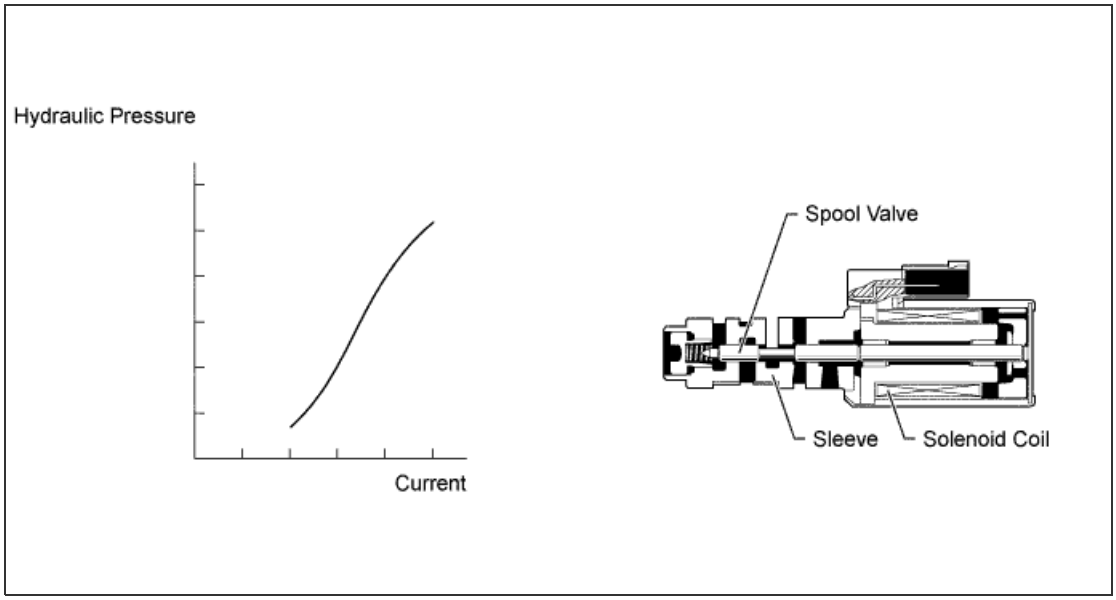
REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P2757 Torque Converter Clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU)

for Preparation Click here

DESCRIPTION

The ECM uses the signals from the throttle position sensor, air-flow meter, turbine (input) speed sensor, output speed sensor and crankshaft position sensor to monitor the engagement condition of the lock-up clutch.



Then the ECM compares the engagement condition of the lock-up clutch with the lock-up schedule in the ECM memory to detect mechanical problems with the shift solenoid valve SLU, valve body and torque converter clutch.

DTC Code	DTC Detection Condition	Trouble Area
P2757	Lock-up does not occur when driving in the lock-up range (normal driving at 80 km/h (50 mph)), or lock-up remains ON in the lock-up OFF range (2 trip detection logic).	• Shift solenoid valve SLU remains open or closed • Valve body is blocked • Torque converter clutch • Automatic transmission (clutch, brake or gear, etc.) • Line pressure is too low

MONITOR DESCRIPTION

Torque converter lock-up is controlled by the ECM based on the turbine (input) speed sensor NT, output speed sensor SP2, engine speed, engine load, engine temperature, vehicle speed, transmission temperature, and gear selection. The ECM determines the lock-up status of the torque converter by comparing the engine speed (NE) to the input turbine rpm (NT). The ECM calculates the actual transmission gear by comparing input turbine rpm (NT) to output shaft rpm (SP2). When conditions are appropriate, the ECM requests "lock-up" by applying control voltage to the shift solenoid SLU. When the shift solenoid SLU is turned on, it applies pressure to the lock-up relay valve and locks the torque converter clutch.
If the ECM detects no lock-up after lock-up has been requested or if it detects lock-up when it is not requested, the ECM interprets this as a fault in the shift solenoid valve SLU or lock-up system performance.
The ECM will turn on the MIL and store the DTC.
Example:
When either of the following is met, the system judges it as a malfunction.

- There is a difference in rotation between the input side (engine speed) and output side (input turbine speed) of the torque converter when the ECM commands lock-up.
  (Engine speed is at least 70 rpm more than input turbine speed).
- There is no difference in rotation between the input side (engine speed) and output side (input turbine speed) of the torque converter when the ECM commands lock-up off.
  (The difference between engine speed and input turbine speed is less than 35 rpm).

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing

Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

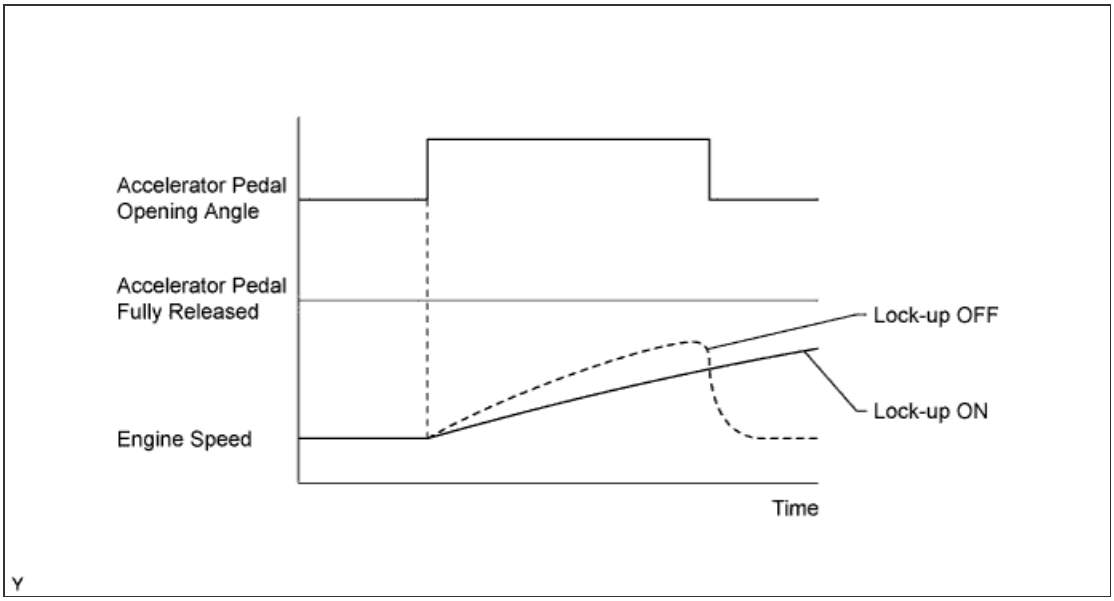
ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Lock Up	Control shift solenoid valve SLU to set automatic transmission to lock-up condition	ON or OFF	It is possible to check the shift solenoid valve SLU operation. [Vehicle Condition] • The throttle valve opening angle is less than 35%. • The vehicle speed is 80 km/h (50 mph) or more.

HINT:

- **This test can be conducted when the vehicle speed is 80 km/h (50 mph) or more.**
- **This test can be conducted with the 5th gear.**

h. Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.



HINT:

- **When changing the accelerator pedal opening angle while driving, if the engine speed does not change, lock-up is on.**
- **Slowly release the accelerator pedal in order to decelerate, but do not fully release the pedal (fully releasing the pedal will close the throttle valve and lock-up may be turned off automatically).**

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P2757)

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / DTC.

e. Read the DTCs using the tester.

Result

Result	Proceed to
Only P2757 is output	A
P2757 and other DTCs are output	B

HINT:

If any other codes besides P2757 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.INSPECT SHIFT SOLENOID VALVE SLU

a. Remove the shift solenoid valve SLU.

b. Measure the resistance according to the value(s) in the table below.

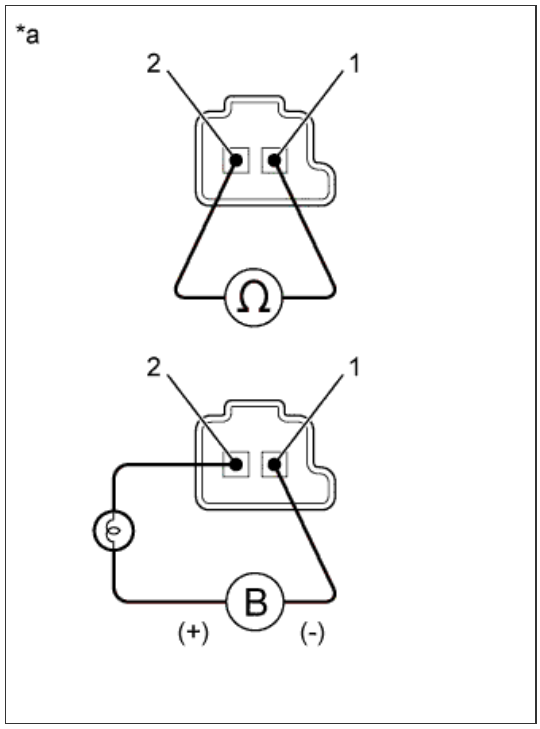
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SLU)

NG → REPLACE SHIFT SOLENOID VALVE SLU (Click here)

OK

3.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

4.INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

a. Check the torque converter clutch assembly (Click here).

OK:

The torque converter clutch operates normally.

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P0776 Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems with the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0776	The gear required by the ECM does not match the actual gear when driving (2 trip detection logic*1, 1 trip detection logic*2).	• Shift solenoid valve SL2 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

*1: w/ OBD
*2: w/o OBD

MONITOR DESCRIPTION

This DTC indicates a stuck ON malfunction of the shift solenoid valve SL2.
The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th up-shift must be performed with the accelerator pedal released.**
- **The 5th to 4th down-shift must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**

- **The shift position commanded by the ECM is shown in the Data List display on the tester.**
- **The shift solenoid valve SL2 turns ON/OFF normally when the shift lever is in D.**

ECM gear shift command	1st	2nd	3rd	4th	5th
Shift solenoid valve SL2	ON	ON	ON	ON	OFF

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0776)

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / DTC.

e. Read the DTCs using the tester.

Result

Result	Proceed to
Only P0776 is output	A
P0776 and other DTCs are output	B

HINT:

If any other codes besides P0776 are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART (Click here)**

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

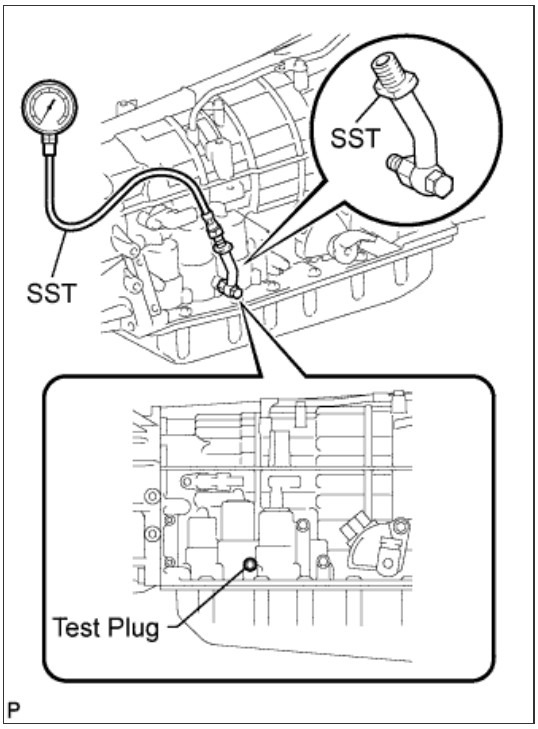
d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

h. Measure the line pressure.



Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (**Click here**)

OK

3.INSPECT SHIFT SOLENOID VALVE SL2

a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

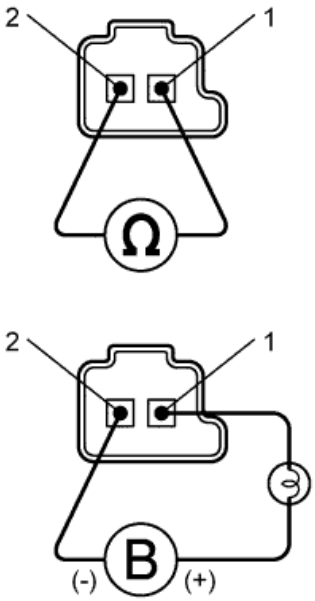
c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1	Valve moves and makes an operating noise

• Battery negative (-) → Terminal 2	

Component without harness connected:
(Shift Solenoid Valve SL2)



NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK

4.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:
There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

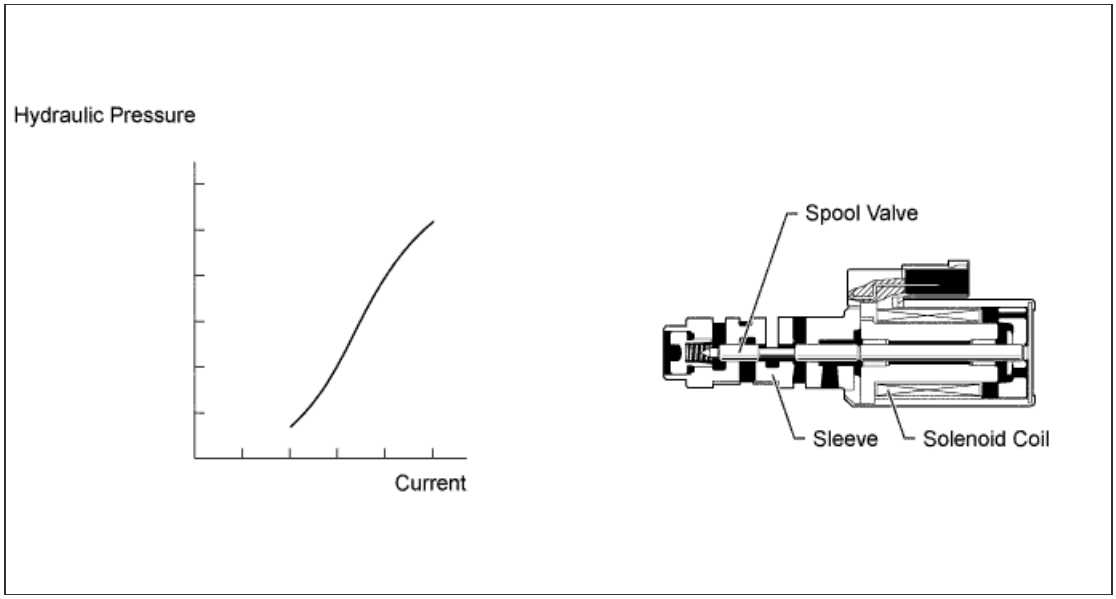
REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P2759 Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)

for Preparation Click here

DESCRIPTION

The amount of current flow to the solenoid is controlled by the current of the ECM output signal. During the lock-up operation, if the duty ratio increases, the lock-up hydraulic pressure increases.

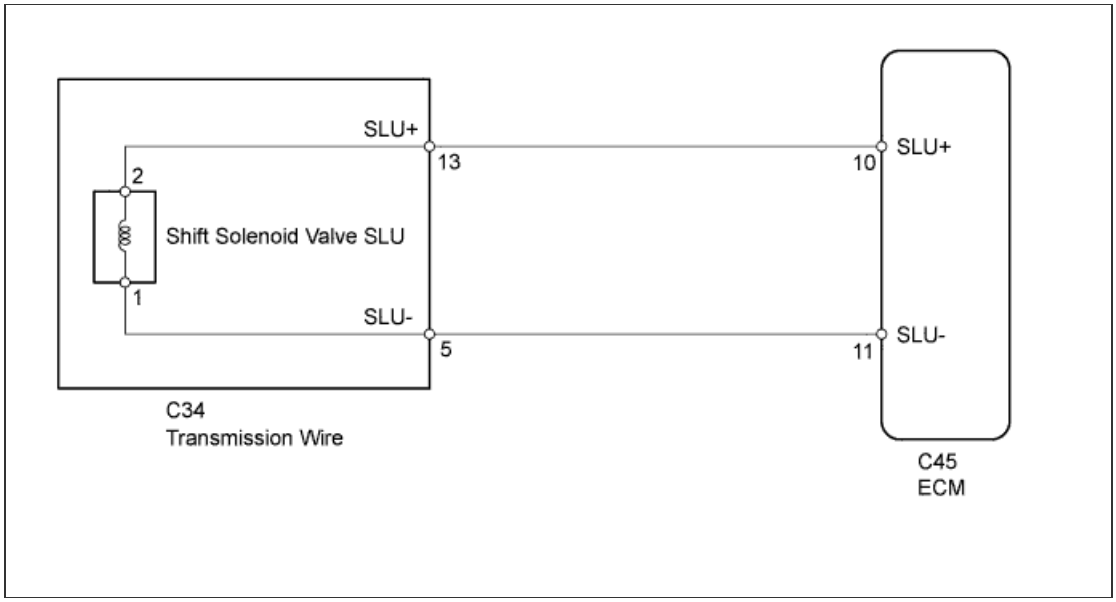


DTC Code	DTC Detection Condition	Trouble Area
P2759	An open or short is detected in the shift solenoid valve SLU circuit for 1 sec. or more while driving (1 trip detection logic).	• Open or short in shift solenoid valve SLU circuit • Shift solenoid valve SLU • ECM

MONITOR DESCRIPTION

When an open or short in the shift solenoid valve (SLU) circuit is detected, the ECM determines there is a malfunction. The ECM will turn on the MIL and store this DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

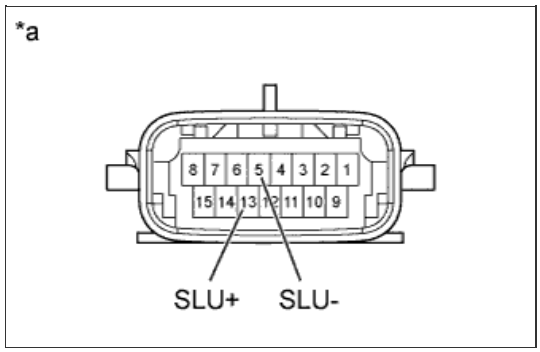
1.INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE SLU)

a. Disconnect the transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
13 (SLU+) - 5 (SLU-)	20°C (68°F)	5.0 to 5.6 Ω
13 (SLU+) - Body ground	Always	10 kΩ or higher
5 (SLU-) - Body ground	Always	10 kΩ or higher



Text in Illustration

*a	Component without harness connected (Transmission Wire)

NG → Go to step 3

OK ↓

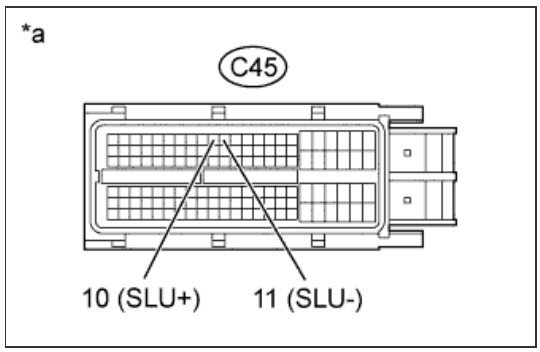
2.CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-10 (SLU+) - C45-11 (SLU-)	20°C (68°F)	5.0 to 5.6 Ω
C45-10 (SLU+) - Body ground	Always	10 kΩ or higher
C45-11 (SLU-) - Body ground	Always	10 kΩ or higher



Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ↓

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SLU

a. Remove the shift solenoid valve SLU.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

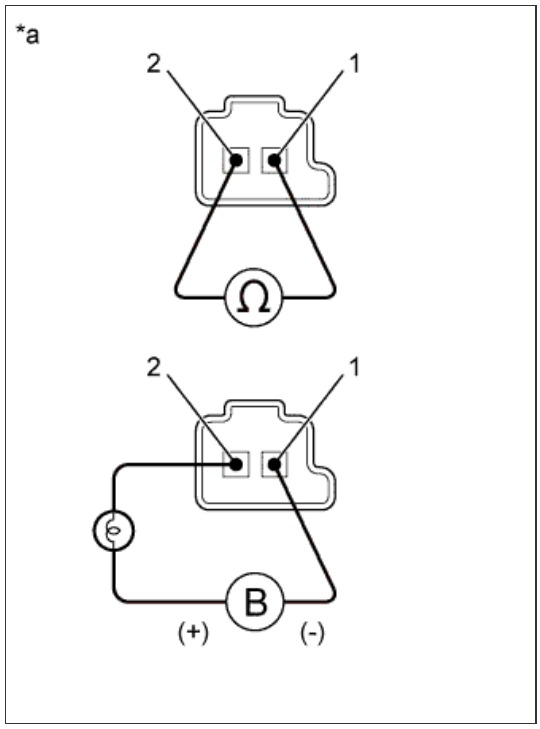
		Specified

Tester Connection	Condition	Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SLU)

NG → REPLACE SHIFT SOLENOID VALVE SLU (Click here)

OK → REPAIR OR REPLACE TRANSMISSION WIRE (Click here)

DTC P0778 Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)

for Preparation Click here

DESCRIPTION

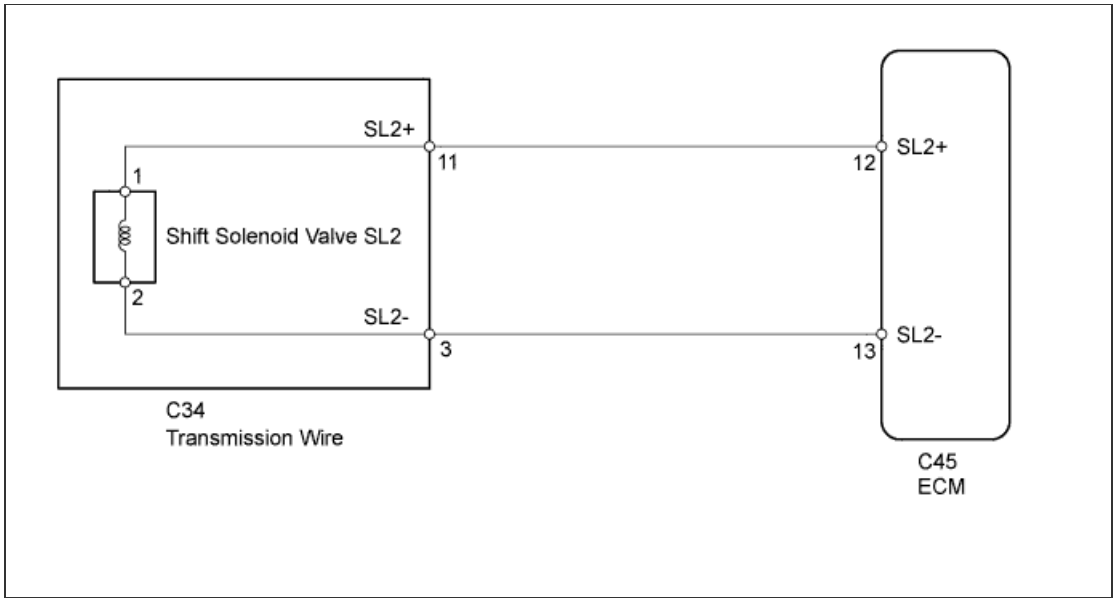
Shifting from 1st to 5th is performed in combination with the "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, S1, S2 and SR which are controlled by the ECM. If an open or short circuit occurs in one of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated smoothly (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0778	• The ECM detects an open or short in the shift solenoid valve SL2 circuit while driving and shifting gears (1 trip detection logic). • The output signal duty is 100%. **HINT:** The SL2 output signal duty is less than 100% under normal conditions.	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL2 circuit. The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. The ECM performs the fail-safe function and turns the other normal shift solenoid valves "ON/OFF" (In case of an open or short circuit, the ECM stops sending current to the circuit).
While driving and shifting gears, if the ECM detects an open or short in the shift solenoid valve SL2 circuit, the ECM determines there is a malfunction (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

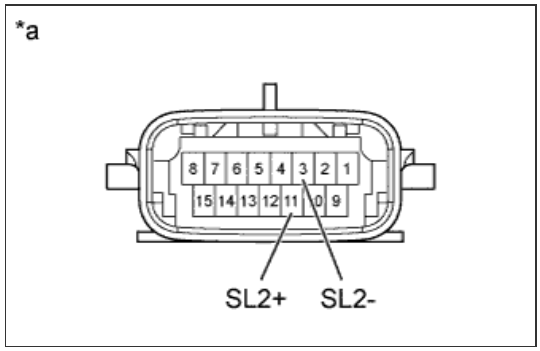
The shift solenoid valve SL2 turns ON/OFF normally when the shift lever is in D.

ECM gear shift command	1st	2nd	3rd	4th	5th
Shift solenoid valve SL2	ON	ON	ON	ON	OFF

1.INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE SL2)

a. Disconnect the transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
11 (SL2+) - 3 (SL2-)	20°C (68°F)	5.0 to 5.6 Ω
11 (SL2+) - Body ground	Always	10 kΩ or higher
3 (SL2-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Component without harness connected (Transmission Wire)

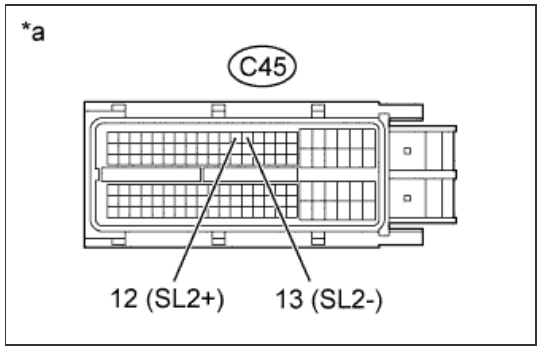
NG → Go to step 3

OK →

2.CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-12 (SL2+) - C45-13 (SL2-)	20°C (68°F)	5.0 to 5.6 Ω
C45-12 (SL2+) - Body ground	Always	10 kΩ or higher
C45-13 (SL2-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK →

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SL2

a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

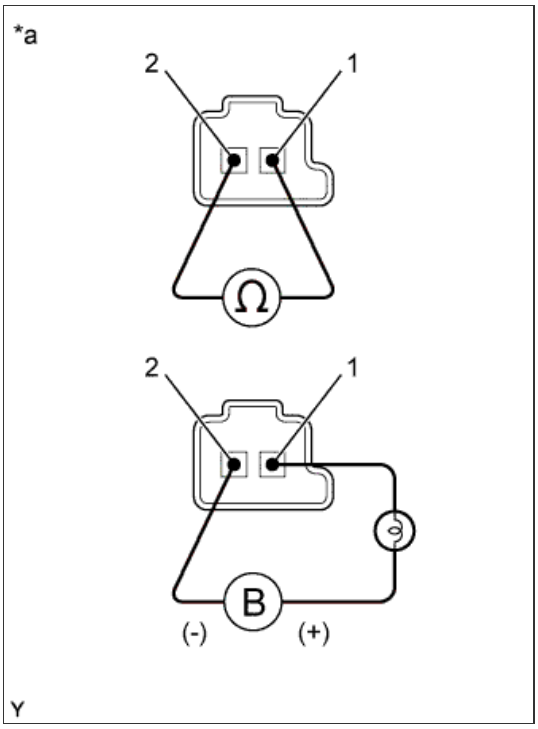
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SL2)

NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK → REPAIR OR REPLACE TRANSMISSION WIRE (Click here)

DTC P2772 Four Wheel Drive (4WD) Low Switch Circuit Range / Performance

for Preparation Click here

DESCRIPTION

The ECM detects the signal from the transfer L4 position switch.
This DTC indicates that the transfer L4 position switch remains on.

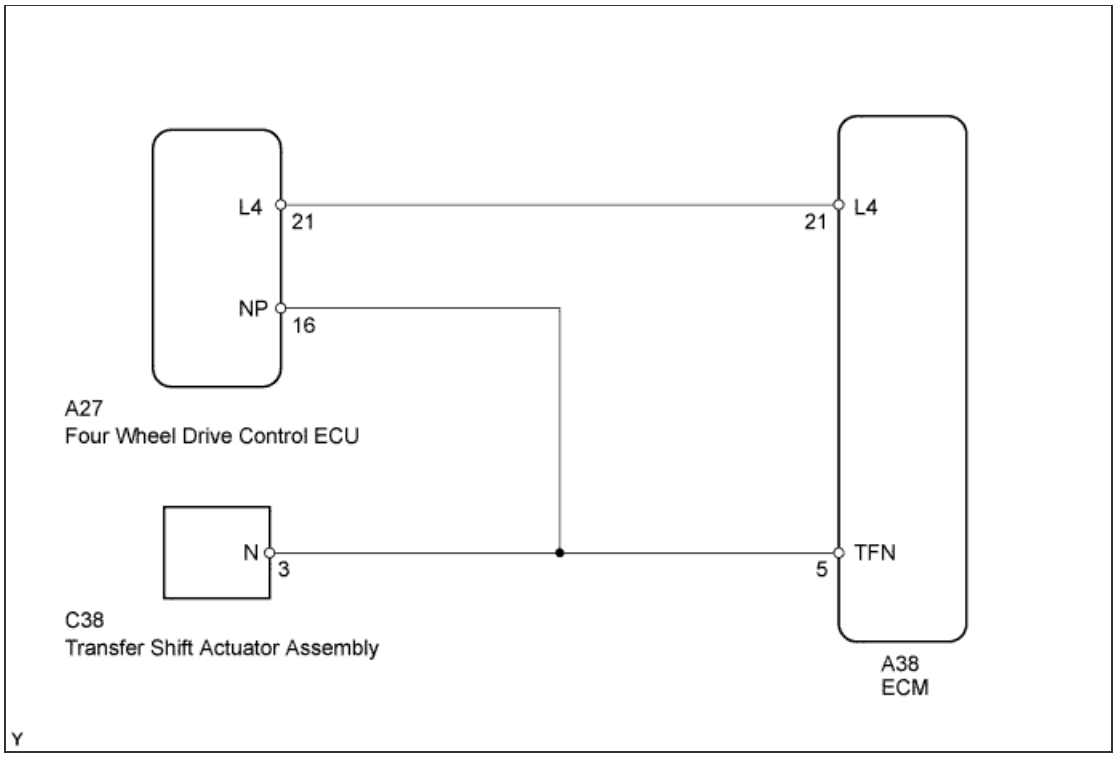
DTC Code	DTC Detection Condition	Trouble Area
P2772	The transfer L4 position switch remains on while the vehicle is running under the following conditions for 1.8 sec. or more (1 trip detection logic): (a) The output shaft speed is between 1000 and 3000 rpm. (b) The transfer position switch is in H4.	• Short in transfer L4 position switch circuit • Four wheel drive control ECU • ECM

MONITOR DESCRIPTION

The ECM monitors the transfer-case L4 position switch to determine when the transfer-case L4 gears are engaged. If the L4 switch indicates that the transfer-case L4 gears remain engaged under the following conditions, the ECM will conclude that there is a malfunction of the L4 position switch, illuminate the MIL and store the DTC:

- The transfer-case shifter is in the "H4" position.
- The transfer-case output shaft rpm is between 1000 and 3000 rpm.
- The specified time period has elapsed.

WIRING DIAGRAM



INSPECTION PROCEDURE

1.CHECK HARNESS AND CONNECTOR (FOUR WHEEL DRIVE CONTROL ECU - BODY GROUND)

a. Disconnect the four wheel drive control ECU connector.

b. Measure the resistance according to the value(s) in the table below.

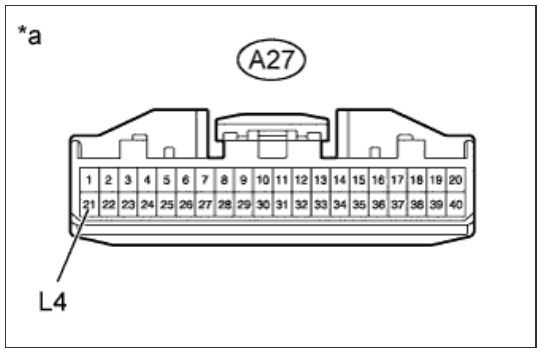
Standard Resistance:

Tester Connection	Condition	Specified Condition

A27-21 (L4) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to Four Wheel Drive Control ECU)



NG → Go to step 2

OK

GO TO TRANSFER SYSTEM INSPECTION (Click here)

2.CHECK HARNESS AND CONNECTOR (FOUR WHEEL DRIVE CONTROL ECU - ECM)

a. Disconnect the ECM connector.

b. Disconnect the A27 four wheel drive control ECU connector.

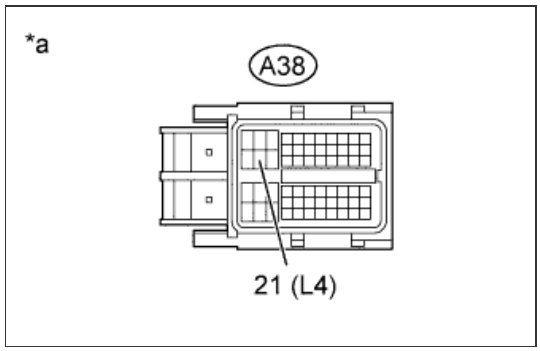
c. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
A38-21 (L4) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

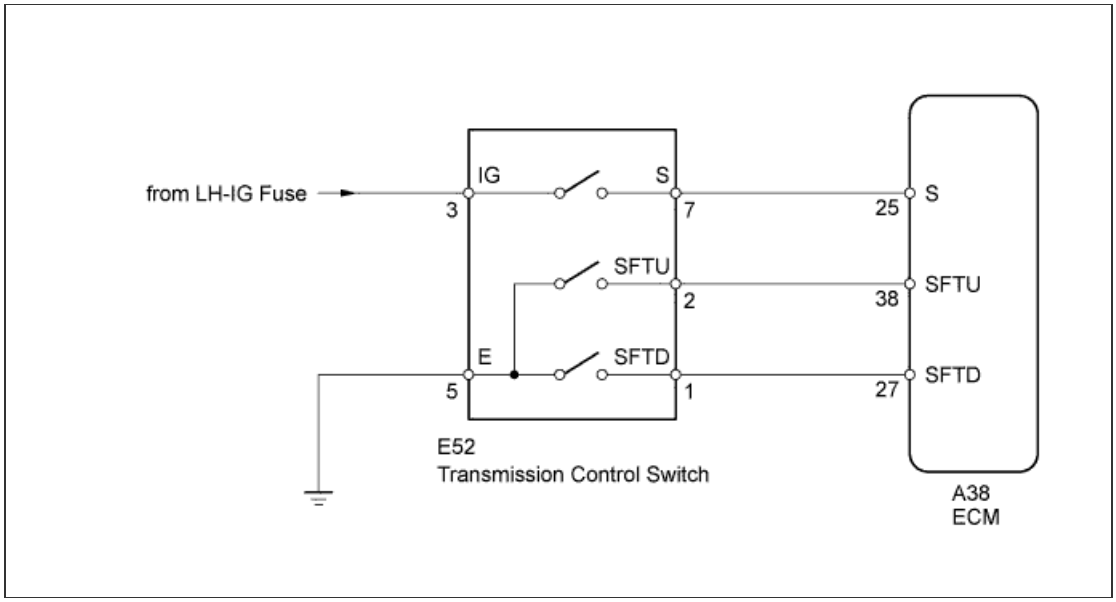
REPLACE ECM (Click here)

for Preparation Click here

DESCRIPTION

When moving the shift lever to S using the transmission control switch, it is possible to switch the shift range between "1" (1st range) and "5" (5th range). Shifting to "+" once raises the shift range by one, and shifting to "-" lowers the shift range by one.

WIRING DIAGRAM

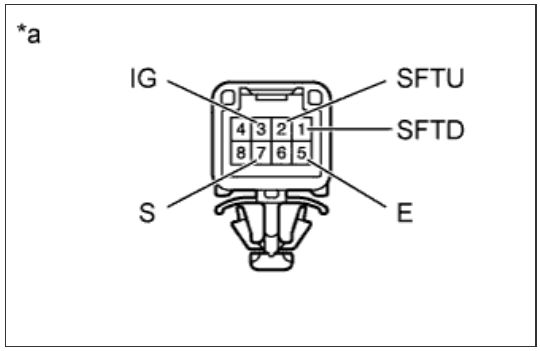


INSPECTION PROCEDURE

1.INSPECT TRANSMISSION CONTROL SWITCH

a. Disconnect the transmission control switch connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
3 (IG) - 7 (S)	Shift lever in S, "+" or "-"	Below 1 Ω
2 (SFTU) - 5 (E)	Shift lever held in "+" (Up-shift)	Below 1 Ω
1 (SFTD) - 5 (E)	Shift lever held in "-" (Down-shift)	Below 1 Ω
3 (IG) - 7 (S)	Shift lever not in S, "+" or "-"	10 kΩ or higher
2 (SFTU) - 5 (E)	Shift lever in S	10 kΩ or higher
1 (SFTD) - 5 (E)	Shift lever in S	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (Transmission Control Switch)

NG → REPLACE TRANSMISSION CONTROL SWITCH (LOWER SHIFT LEVER ASSEMBLY) (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL SWITCH - BATTERY, BODY GROUND)

a. Disconnect the transmission control switch connector.

b. Turn the engine switch on (IG).

c. Measure the voltage according to the value(s) in the table below.

Standard Voltage:

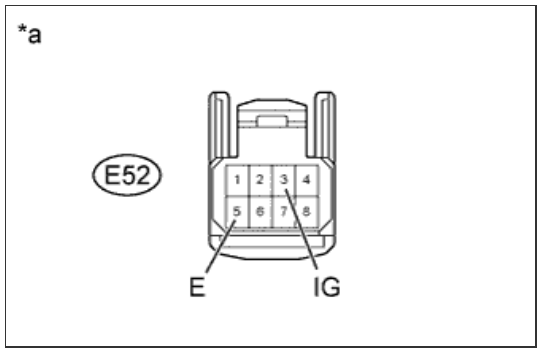
Tester Connection	Condition	Specified Condition
E52-3 (IG) - Body ground	Engine switch on (IG)	11 to 14 V
E52-3 (IG) - Body ground	Engine switch off	Below 1 V

d. Turn the engine switch off.

e. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
E52-5 (E) - Body ground	Always	Below 1 Ω



Text in Illustration

*a	Front view of wire harness connector (to Transmission Control Switch)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3.CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL SWITCH - ECM)

a. Disconnect the ECM connector.

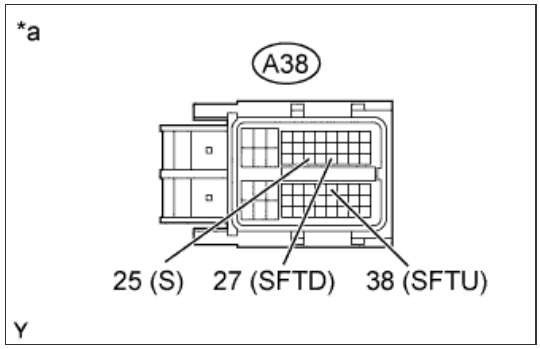
b. Turn the engine switch on (IG).

c. Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Condition	Specified Condition
A38-25 (S) - Body ground	• Engine switch on (IG) • Shift lever in S, "+" or "-"	11 to 14 V
A38-25 (S) - Body ground	• Engine switch on (IG) • Shift lever not in S, "+" or "-"	Below 1 V

d. Turn the engine switch off.



e. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
A38-38 (SFTU) - Body ground	Shift lever held in "+" (Up-shift)	Below 1 Ω
A38-27 (SFTD) - Body ground	Shift lever held in "-" (Down-shift)	Below 1 Ω
A38-38 (SFTU) - Body ground	Shift lever in S	10 kΩ or higher
A38-27 (SFTD) - Body ground	Shift lever in S	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

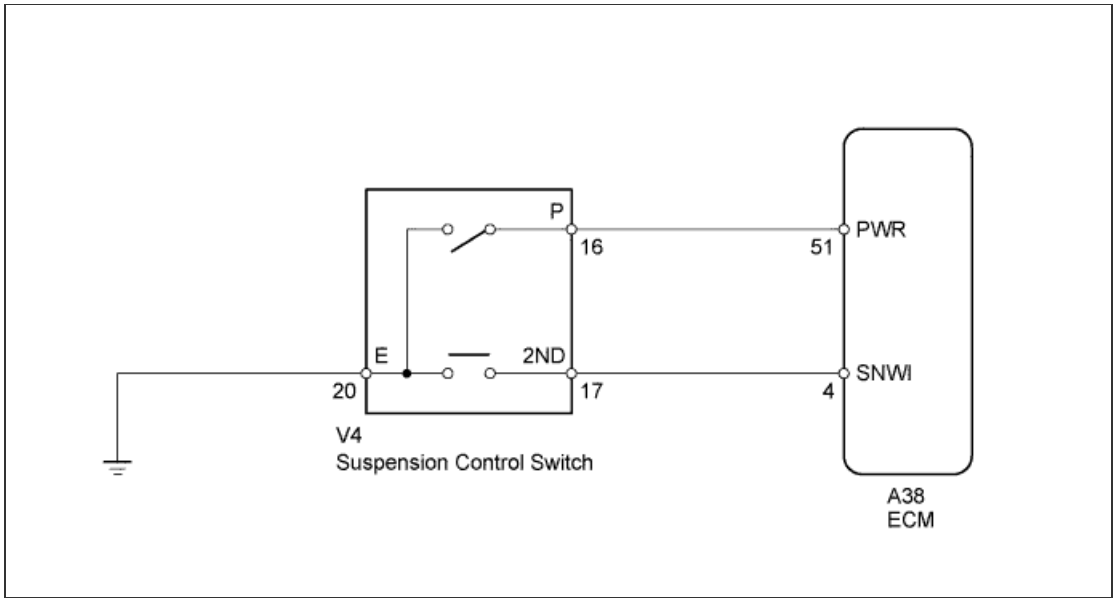
PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (Click here)

for Preparation Click here

DESCRIPTION

The ECM memory contains the programs for the normal and power shift patterns and lock-up pattern.
By following the programs corresponding to the signals from the pattern select switch, the park/neutral position switch and other various sensors, the ECM switches the solenoid valves on and off, and controls the transmission gear change and the lock-up clutch operation.

WIRING DIAGRAM



INSPECTION PROCEDURE

When the pattern select (PWR) switch is pushed, switch contact is made and power mode is selected. To cancel power mode, push the pattern select (PWR) switch once again.

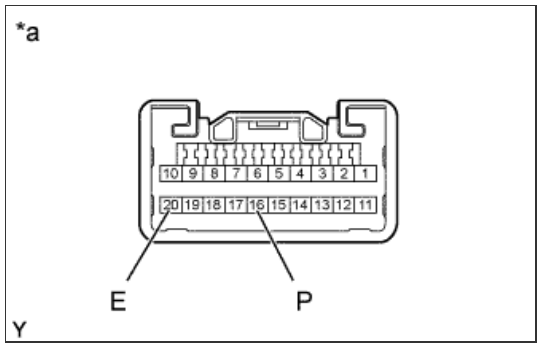
1.INSPECT PATTERN SELECT (PWR) SWITCH

a. Remove the suspension control switch (Click here).

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
16 (P) - 20 (E)	Pattern select (PWR) switch on	Below 1 Ω
16 (P) - 20 (E)	Pattern select (PWR) switch off	10 kΩ or higher



Text in Illustration

*a	Component without harness connected (Suspension Control Switch)

NG → REPLACE PATTERN SELECT (PWR) SWITCH (SUSPENSION CONTROL SWITCH) (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (PATTERN SELECT (PWR) SWITCH - BODY GROUND)

a. Disconnect the suspension control switch connector.

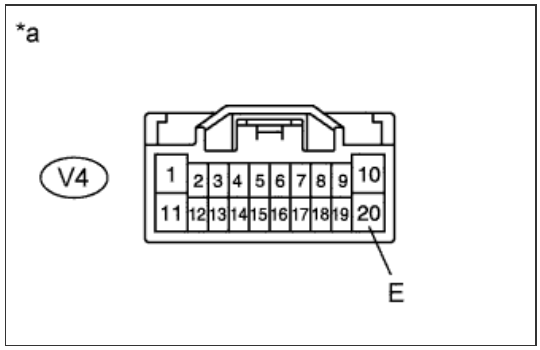
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
V4-20 (E) - Body ground	Always	Below 1 Ω

Text in Illustration

*a	Front view of wire harness connector (to Suspension Control Switch)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3.CHECK HARNESS AND CONNECTOR (PATTERN SELECT (PWR) SWITCH - ECM)

a. Disconnect the ECM connector.

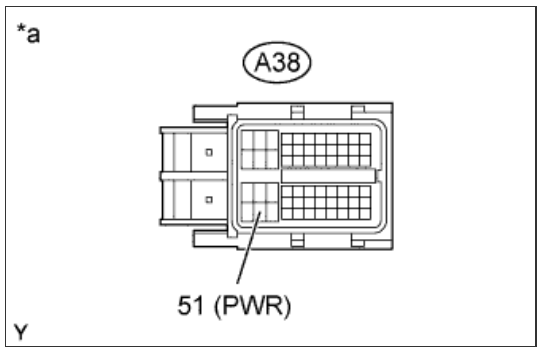
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
A38-51 (PWR) - Body ground	Pattern select (PWR) switch on	Below 1 Ω
A38-51 (PWR) - Body ground	Pattern select (PWR) switch off	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (Click here)

for Preparation Click here

DESCRIPTION

When 2nd mode is selected with the pattern select (2ND) switch, the ECM controls the solenoid valves and the transmission starts from 2nd gear. The 2nd mode is the system that operates the throttle motor to control engine output to reduce skidding of the driving wheels, and guarantee takeoff acceleration, driving straightness and turning stability.
When the shift lever is in D, the transmission automatically shifts up through 3rd to 5th as usual.

WIRING DIAGRAM

Refer to Pattern Select Switch Power Mode Circuit (Click here).

INSPECTION PROCEDURE

When the pattern select (2ND) switch is pushed, switch contact is made and 2nd mode is selected. To cancel 2nd mode, push the pattern select (2ND) switch once again.

HINT:

2nd mode is automatically canceled when the engine switch is turned off.

1.DRIVING TEST

HINT:

The driving test should be performed on a paved road (nonskid road).

a. Start the engine.

b. Turn the 2ND switch off (normal drive mode).

c. Confirm vehicle response by driving from a parked position to fully depressing the accelerator pedal.

d. Turn the 2ND switch on and perform the same check as above.
When driving the vehicle with the 2ND switch on and off, check that there is a difference in acceleration.

OK:
There is a difference in acceleration.

NG → Go to step 2

OK →

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (Click here)

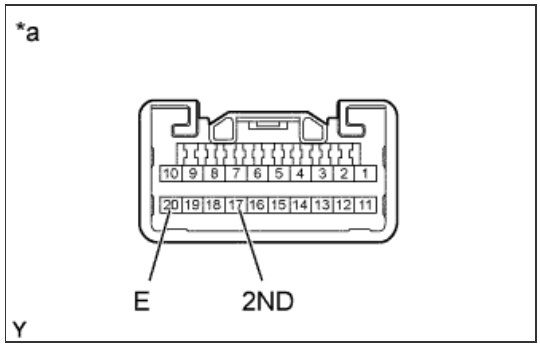
2.INSPECT PATTERN SELECT (2ND) SWITCH

a. Remove the suspension control switch (Click here).

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
17 (2ND) - 20 (E)	Pattern select (2ND) switch continuously pressed	Below 1 Ω
17 (2ND) - 20 (E)	Pattern select (2ND) switch released	10 kΩ or higher



Text in Illustration

*a	Component without harness connected (Suspension Control Switch)

NG → REPLACE PATTERN SELECT (2ND) SWITCH (SUSPENSION CONTROL SWITCH) (Click here)

OK

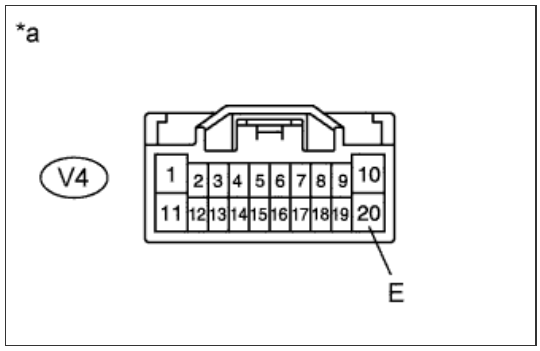
3.CHECK HARNESS AND CONNECTOR (PATTERN SELECT (2ND) SWITCH - BODY GROUND)

a. Disconnect the suspension control switch connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
V4-20 (E) - Body ground	Always	Below 1 Ω



Text in Illustration

*a	Front view of wire harness connector (to Suspension Control Switch)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

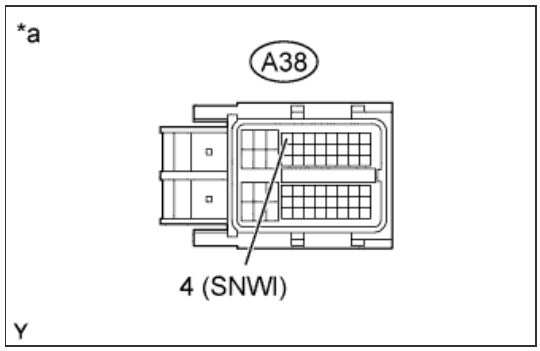
4.CHECK HARNESS AND CONNECTOR (PATTERN SELECT (2ND) SWITCH - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
A38-4 (SNWI) - Body ground	Pattern select (2ND) switch continuously pressed	Below 1 Ω
A38-4 (SNWI) - Body ground	Pattern select (2ND) switch released	10 kΩ or higher



Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (Click here)

for Preparation Click here

DESCRIPTION

The four wheel drive control ECU judges whether the transfer is in the L4 position based on the information from the limit switch inside the transfer shift actuator assembly which is detected by the ECM. The four wheel drive control ECU then inputs a signal to the combination meter assembly via CAN communication and turns on the 4LO indicator.

WIRING DIAGRAM

Refer to DTC P2772 (Click here).

INSPECTION PROCEDURE

1.CHECK HARNESS AND CONNECTOR (FOUR WHEEL DRIVE CONTROL ECU - BODY GROUND)

a. Disconnect the four wheel drive control ECU connector.

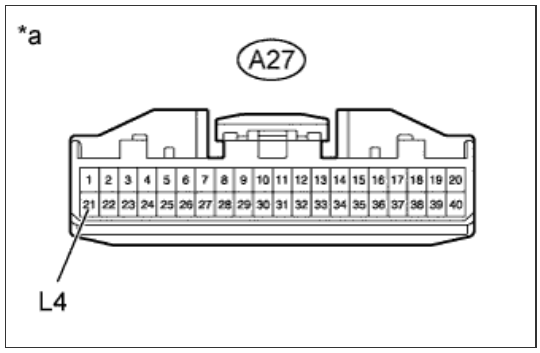
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
A27-21 (L4) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to Four Wheel Drive Control ECU)



NG → Go to step 2

OK →

GO TO TRANSFER SYSTEM INSPECTION (Click here)

2.CHECK HARNESS AND CONNECTOR (FOUR WHEEL DRIVE CONTROL ECU - ECM)

a. Disconnect the ECM connector.

b. Disconnect the A27 four wheel drive control ECU connector.

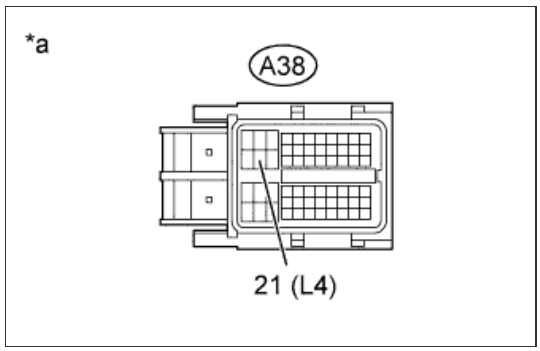
c. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
A38-21 (L4) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

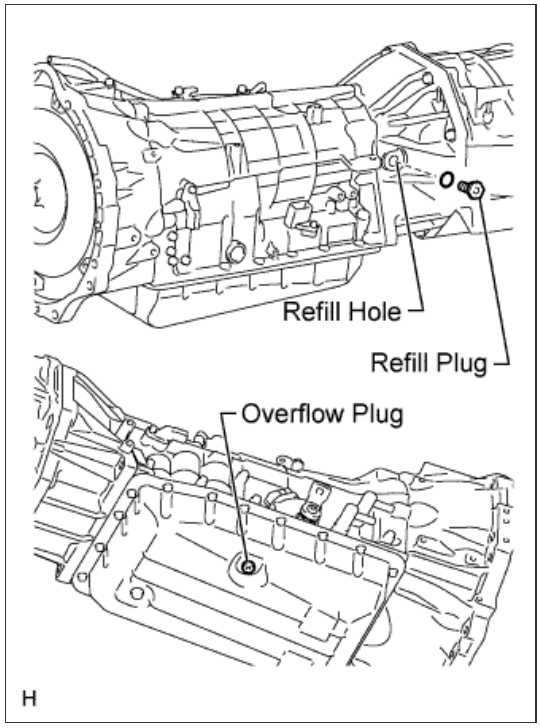
OK →

REPLACE ECM (Click here)

for Preparation Click here

1. BEFORE FILLING TRANSMISSION

- This transmission requires Toyota Genuine ATF WS transmission fluid.
- After servicing the transmission, you must refill the transmission with the correct amount of fluid.
- Keep the vehicle level while adjusting the fluid level.
- Proceed to the "Transmission Pan Fill" procedures if you replaced the entire transmission, transmission pan, drain plug, valve body and/or torque converter.
- Proceed to the "Transmission Fill" procedures after removing the refill plug if you replaced the transmission hose and/or output shaft oil seal.

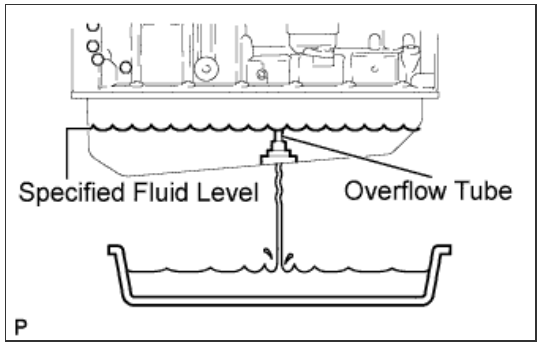


2. TRANSMISSION PAN FILL

a. Remove the refill plug and overflow plug.

b. Fill the transmission through the refill hole until fluid begins to trickle out of the overflow tube.

c. Reinstall the overflow plug.



3. TRANSMISSION FILL

a. Fill the transmission with the amount of fluid listed in the table below.

Standard Capacity:

Repair	Fill Amount
Transmission pan and drain plug removal	1.7 liters (1.8 US qts, 1.5 Imp. qts)
Transmission valve body removal	4.3 liters (4.5 US qts, 3.8 Imp. qts)
Torque converter removal	5.4 liters (5.7 US qts, 4.8 Imp. qts)

b. Reinstall the refill plug to prevent the fluid from splashing.

HINT:

If you cannot add the listed amount of fluid, do the following:

i. Install the refill plug.

ii. Allow the engine to idle with the air conditioning off.

iii. Move the shift lever through the entire gear range to circulate fluid.

iv. Wait for 30 seconds with the engine idling.

v. Stop the engine.

vi. Remove the refill plug and add fluid.

vii. Reinstall the refill plug.

4. ADJUST FLUID TEMPERATURE

NOTICE:

The fluid temperature can be confirmed by checking the indicator light in the meter or by using the GTS. When using the GTS, it is necessary to change to temperature detection mode in order to idle the vehicle appropriately.

a. When using the GTS:

i. Turn the engine switch off.

ii. Connect the GTS to the DLC3.

iii. Turn the engine switch on (IG).

iv. Enter the following menus: Powertrain / Engine and ECT / Active Test / Connect the TC and TE1.

v. Enter the following menus: Powertrain / ECT / Data List / A/T Oil Temperature 1.

vi. Check the ATF temperature.

NOTICE:

- **The ATF temperature must be between 38 to 45°C (100 to 113°F).**
- **If the ATF temperature is not between 38 to 45°C (100 to 113°F), turn the engine switch off and wait until the fluid temperature drops between 38 to 45°C (100 to 113°F).**

vii. According to the display on the GTS, perform the Active Test "Connect the TC and TE1".

HINT:

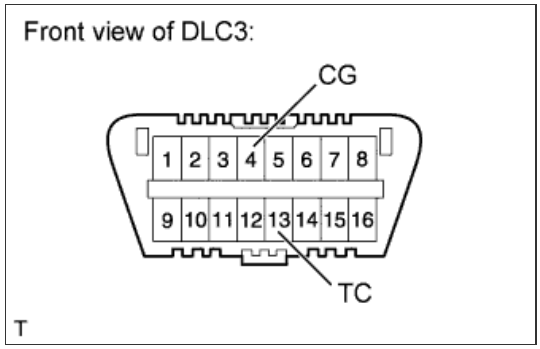
Indicator lights of the meter blink to output DTCs when TC and TE1 are connected.

viii. Start the engine.

NOTICE:

Check that electrical systems such as the air conditioning system, audio system and lighting system are off.

b. When not using the GTS:



i. Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.

SST

09843-18040

ii. Start the engine.

NOTICE:

Check that electrical systems such as the air conditioning system, audio system and lighting system are off.

HINT:

Indicator lights of the meter blink to output DTCs when terminals TC and CG are connected.

c. Slowly move the shift lever from P to S, then change the gears from 1st to 6th. Then return the shift lever to P.

HINT:

Slowly move the shift lever to circulate the fluid through each part of the transmission.

d. Move the shift lever to D, and quickly move back and forth between N and D (once within 1.5 seconds) for at least 6 seconds. This will activate the fluid temperature detection mode.

Standard condition:
Indicator light (D) remains illuminated for 2 seconds and then turns off.

e. When using the GTS:

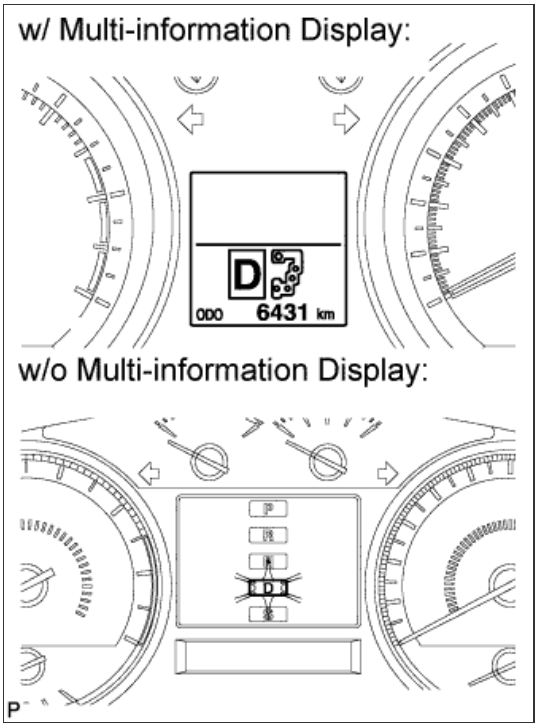
i. Return the shift lever to P and press OFF on the Active Test display.

f. When not using the GTS:

i. Return the shift lever to P and disconnect terminals 13 (TC) and 4 (CG).

g. Allow the engine to idle until the fluid temperature reaches 38 to 45°C (100 to 113°F).

h. The indicator (D) will come on again when the fluid temperature reaches 38°C (100°F) and will blink when it exceeds 46°C (113°F).



Indicator Indication of ATF Temperature:

Below Proper Temperature	Proper Temperature	Higher than Proper Temperature
Data List [A/T Oil Temperature 1] 38°C (100°F) or less	Data List [A/T Oil Temperature 1] 38 to 45°C (100 to 113°F)	Data List [A/T Oil Temperature 1] 45°C (113°F) or higher
Indicator light (D) Turns off	Indicator light (D) Turns on	Indicator light (D) Blinking

NOTICE:

Perform the fluid level inspection while the indicator light is on.

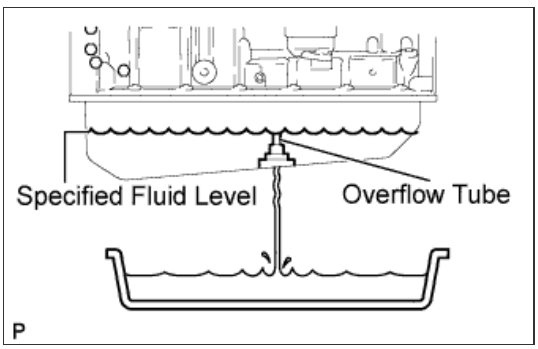
5. FLUID LEVEL CHECK

NOTICE:

The fluid temperature must be between 38 to 45°C (100 to 113°F) to accurately check the fluid level.

a. Remove the overflow plug with the engine idling.

b. Check that fluid comes out of the overflow tube.
If fluid does not come out, proceed to the "Transmission Refill" procedures.
If fluid comes out, wait until the overflow slows to a trickle and proceed to the "Complete" procedures.



6. TRANSMISSION REFILL

a. Remove the overflow plug.

b. Remove the refill plug.

c. Add ATF into the refill hole until ATF flows from the overflow tube.

d. Wait until the overflow slows to a trickle and proceed to the "COMPLETE" procedures.

7. COMPLETE

a. Install a new gasket and the overflow plug.

Torque:
20 N*m{ 204 kgf*cm , 15 ft.*lbf }

b. Stop the engine.

c. Install a new gasket and the refill plug.

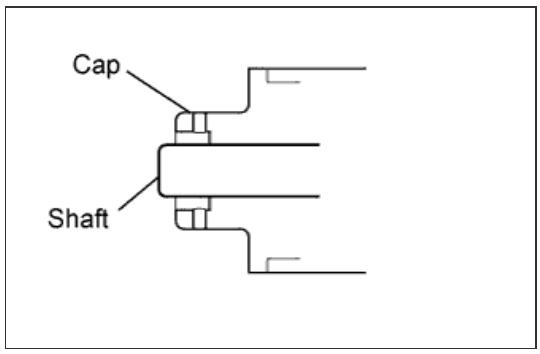
Torque:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }

d. w/o Air Cooled Transmission Oil Cooler (w/ ATF Warmer):

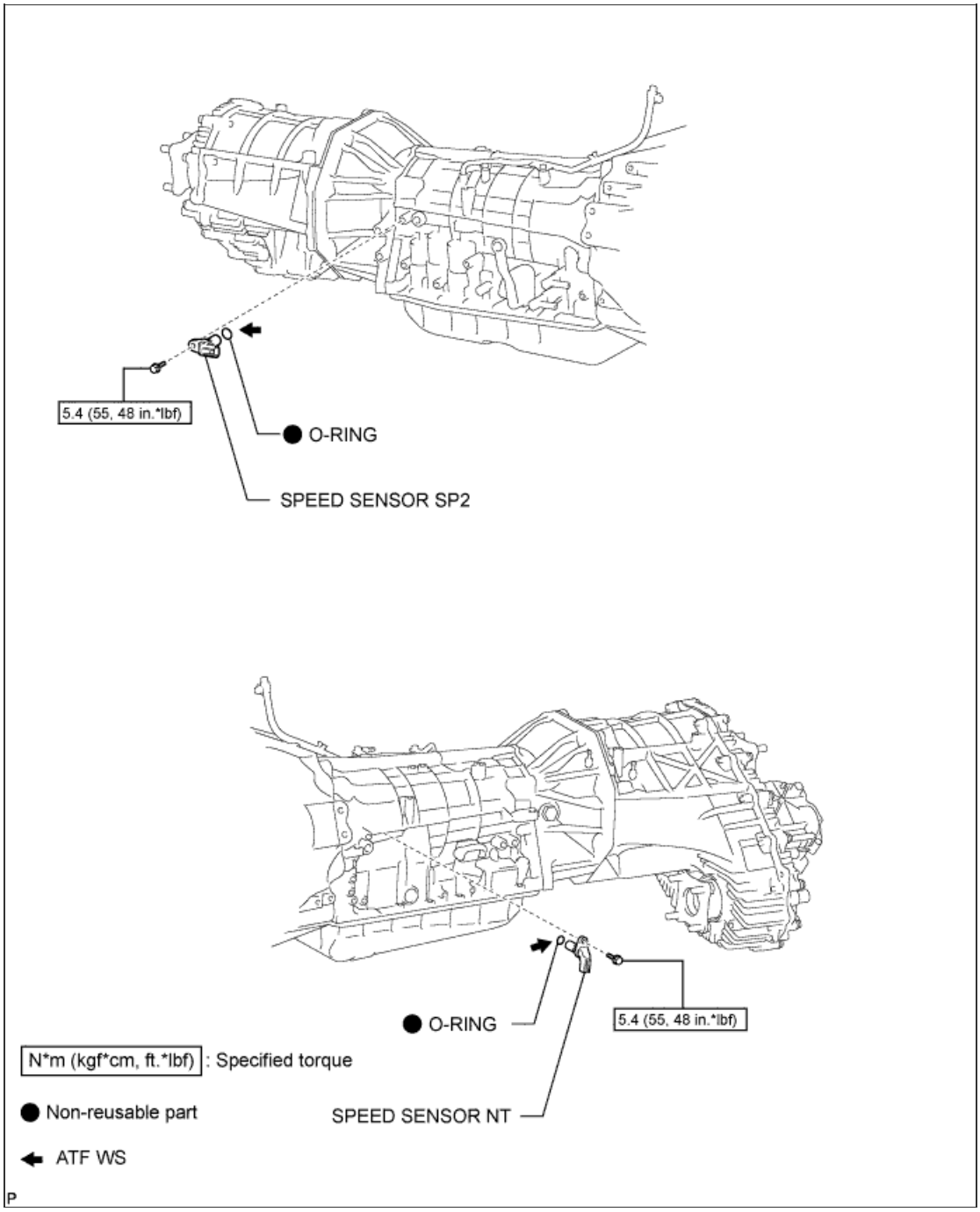
i. Remove the pin.

NOTICE:

- **Make sure the shaft of the thermostat is protruding from the hole of the cap.**
- **Check that there is no ATF leaking from the cap hole.**



for Preparation Click here



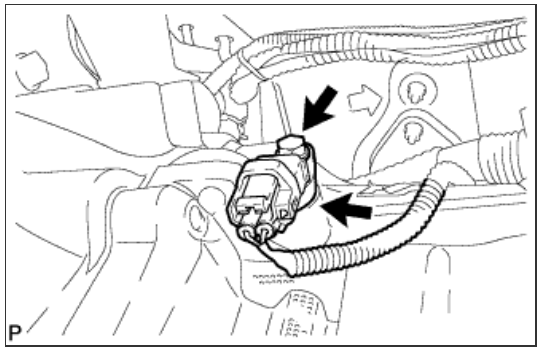
for Preparation Click here

1. REMOVE SPEED SENSOR NT

a. Disconnect the sensor connector.

b. Remove the bolt and sensor.

c. Remove the O-ring from the sensor.

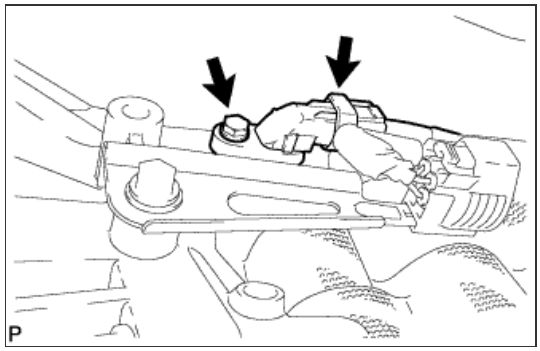


2. REMOVE SPEED SENSOR SP2

a. Disconnect the sensor connector.

b. Remove the bolt and sensor.

c. Remove the O-ring from the sensor.



for Preparation Click here

1. INSPECT SPEED SENSOR NT

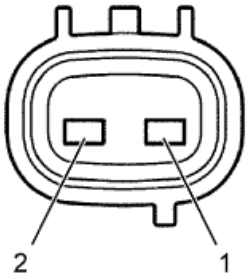
a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	560 to 680 Ω

If the result is not as specified, replace the sensor.

Component without harness connected:
(Speed Sensor NT)



2. INSPECT SPEED SENSOR SP2

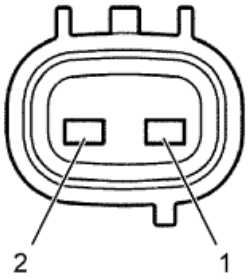
a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	560 to 680 Ω

If the result is not as specified, replace the sensor.

Component without harness connected:
(Speed Sensor SP2)



for Preparation Click here

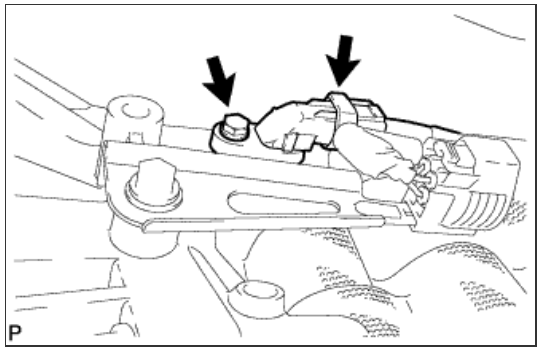
1. INSTALL SPEED SENSOR SP2

a. Coat a new O-ring with ATF and install it to the sensor.

b. Install the sensor with the bolt.

Torque:
5.4 N*m{ 55 kgf*cm , 48 in.*lbf }

c. Connect the sensor connector.



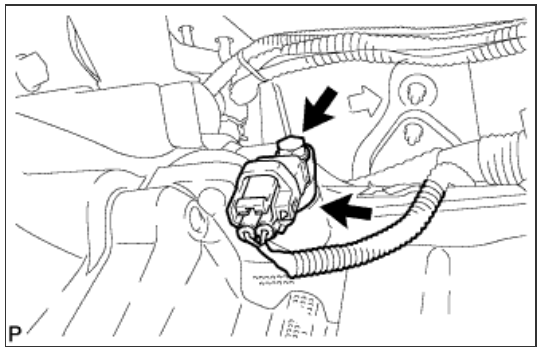
2. INSTALL SPEED SENSOR NT

a. Coat a new O-ring with ATF and install it to the sensor.

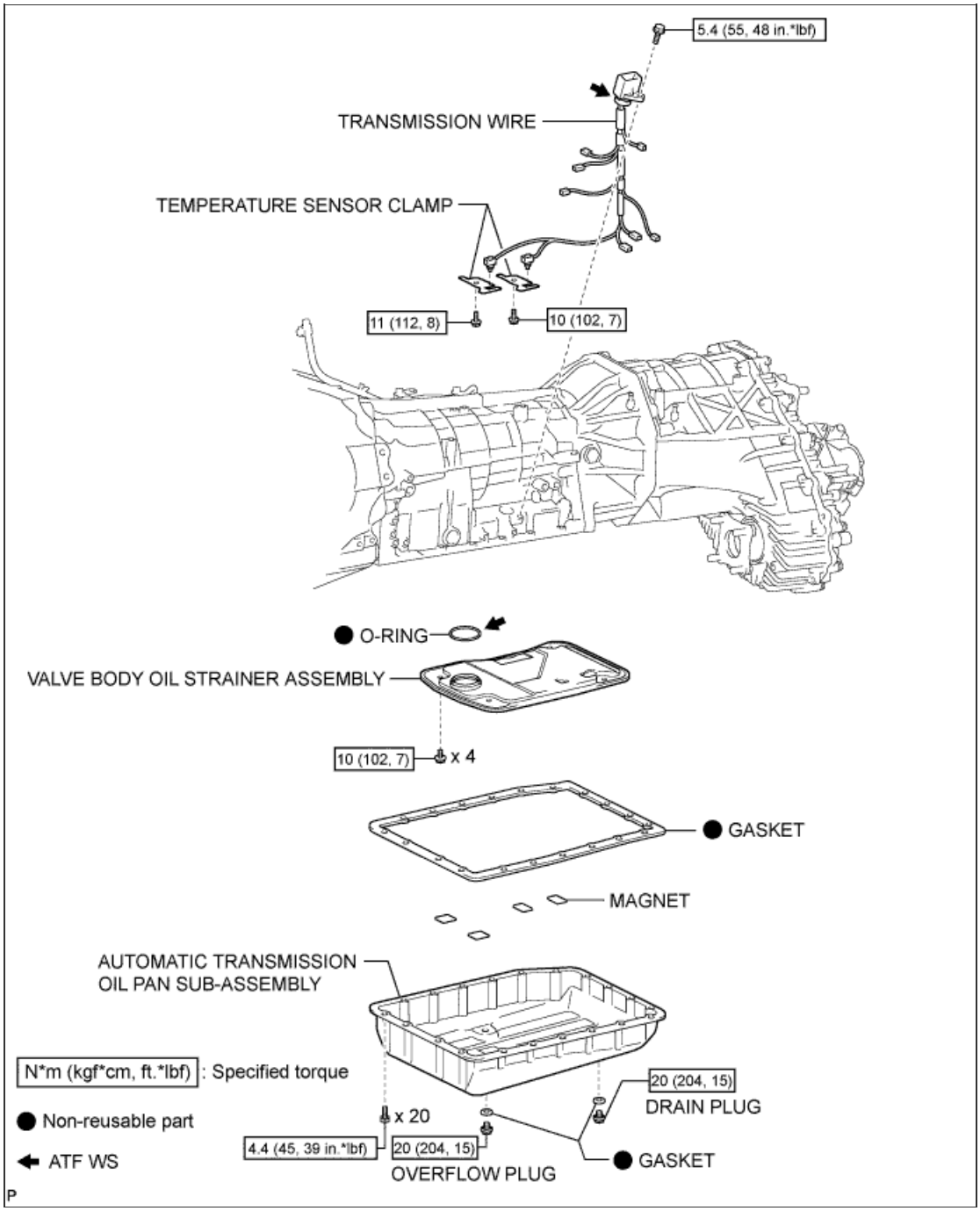
b. Install the sensor with the bolt.

Torque:
5.4 N*m{ 55 kgf*cm , 48 in.*lbf }

c. Connect the sensor connector.



for Preparation Click here



for Preparation Click here

1. DRAIN AUTOMATIC TRANSMISSION FLUID

a. Remove the drain plug and gasket, and drain the ATF.

b. Install a new gasket and the drain plug.

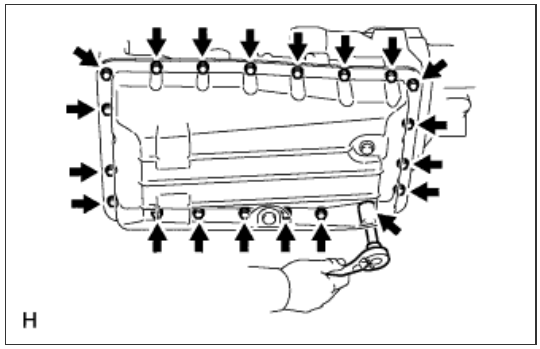
Torque:
20 N*m{ 204 kgf*cm , 15 ft.*lbf }

2. REMOVE AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY

a. Remove the 20 bolts, oil pan and gasket from the transmission.

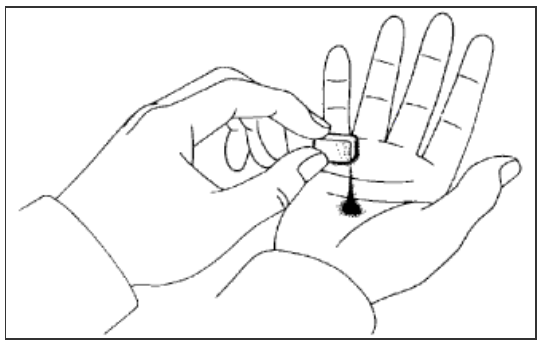
NOTICE:

Some fluid will remain in the oil pan. Remove all the pan bolts, and carefully remove the oil pan assembly.



b. Examine the particles in the pan.

i. Remove the 4 magnets and use them to collect steel particles. Carefully inspect the foreign matter and particles in the pan and on the magnets to anticipate the type of wear you will find in the transmission.
Steel (magnetic): bearing, gear and clutch plate wear
Brass (non-magnetic): bush wear



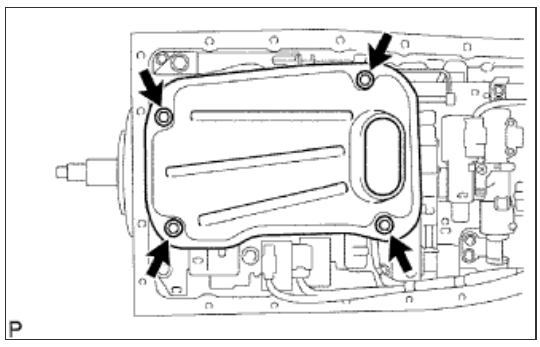
3. REMOVE VALVE BODY OIL STRAINER ASSEMBLY

a. Remove the 4 bolts and oil strainer.

NOTICE:

Be careful as some fluid may leak out of the oil strainer.

b. Remove the O-ring from the oil strainer.

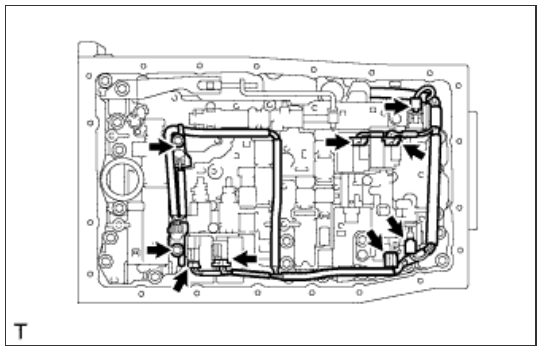


4. DISCONNECT TRANSMISSION WIRE

a. Remove the 2 bolts and 2 temperature sensor clamps.

b. Disconnect the ATF temperature sensors.

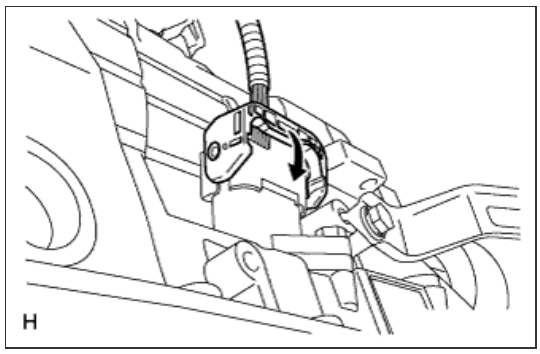
c. Disconnect the 7 connectors from the solenoid valves.



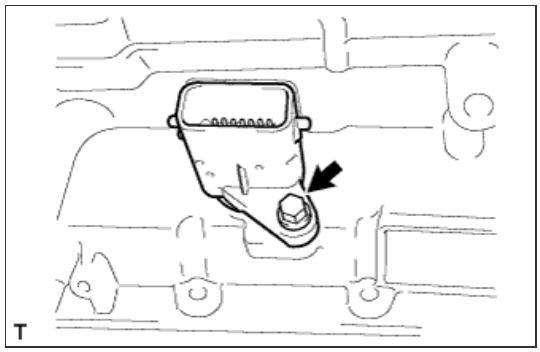
5. REMOVE TRANSMISSION WIRE

a. Disconnect the wire connector.

i. Detach the claw, press down the lever, and then disconnect the transmission wire connector.



b. Remove the bolt and pull out the transmission wire.



for Preparation [Click here]

1. INSPECT TRANSMISSION WIRE (ATF TEMPERATURE SENSOR)

a. Measure the resistance according to the value(s) in the table below.

HINT:

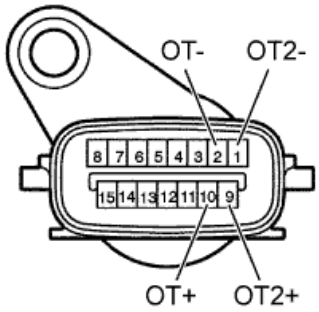
If the resistance is out of the specified range at any of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Standard Resistance:

Tester Connection	ATF Temperature	Specified Condition
2 (OT-) - 10 (OT+)	10°C (50°F)	5 to 8 kΩ
2 (OT-) - 10 (OT+)	25°C (77°F)	2.5 to 4.5 kΩ
2 (OT-) - 10 (OT+)	110°C (230°F)	0.22 to 0.28 kΩ
1 (OT2-) - 9 (OT2+)	10°C (50°F)	5 to 8 kΩ
1 (OT2-) - 9 (OT2+)	25°C (77°F)	2.5 to 4.5 kΩ
1 (OT2-) - 9 (OT2+)	110°C (230°F)	0.22 to 0.28 kΩ

If the result is not as specified, replace the transmission wire.

Component without harness connected:
(Transmission Wire)



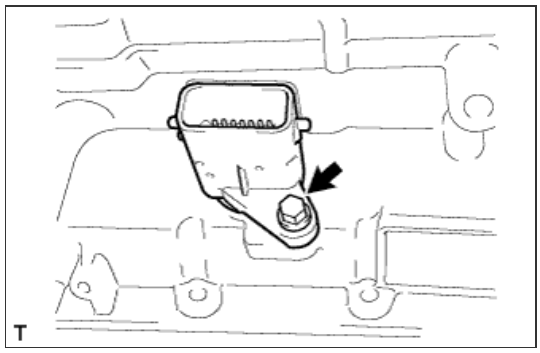
for Preparation Click here

1. INSTALL TRANSMISSION WIRE

a. Coat the O-ring of the transmission wire connector with ATF.

b. Install the transmission wire with the bolt.

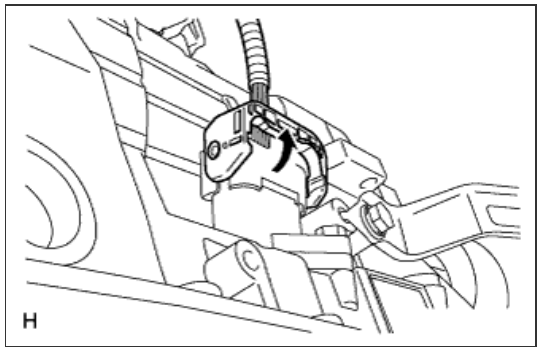
Torque:
5.4 N*m{ 55 kgf*cm , 48 in.*lbf }



c. Connect the transmission wire connector.

HINT:

Push up the lever until the claw of the transmission wire connector makes a connection sound.



2. CONNECT TRANSMISSION WIRE

a. Connect the 7 connectors to the solenoid valves.

b. Connect the 2 ATF temperature sensors with the 2 clamps and 2 bolts.

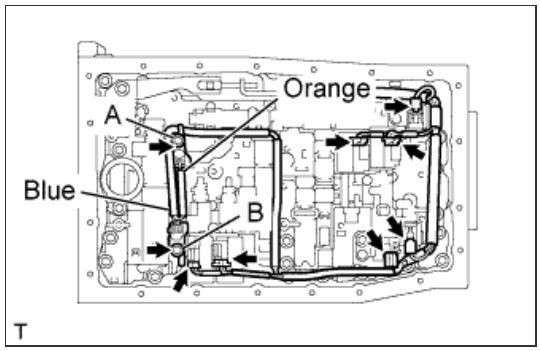
Torque:
for bolt A:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }
for bolt B:
11 N*m{ 112 kgf*cm , 8 ft.*lbf }

HINT:

Each bolt length is indicated below.

12 mm (0.472 in.) for bolt A

36 mm (1.42 in.) for bolt B

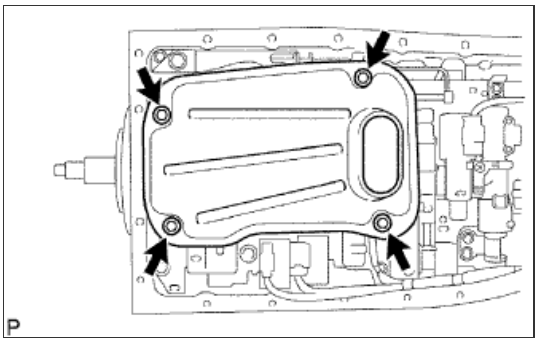


3. INSTALL VALVE BODY OIL STRAINER ASSEMBLY

a. Coat a new O-ring with ATF and install it to the oil strainer.

b. Install the oil strainer with the 4 bolts.

Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }



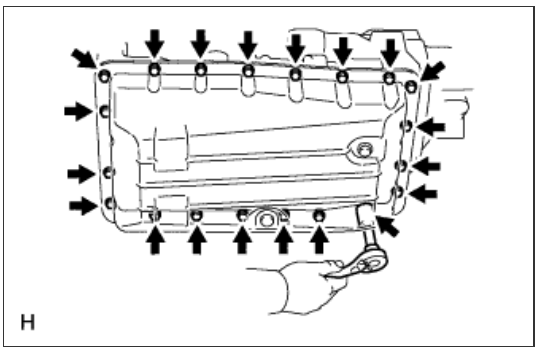
4. INSTALL AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY

NOTICE:

Remove the gasket and be careful not to spill oil on the contacting surfaces of the transmission case and oil pan.

a. Install a new gasket and the oil pan with the 20 bolts.

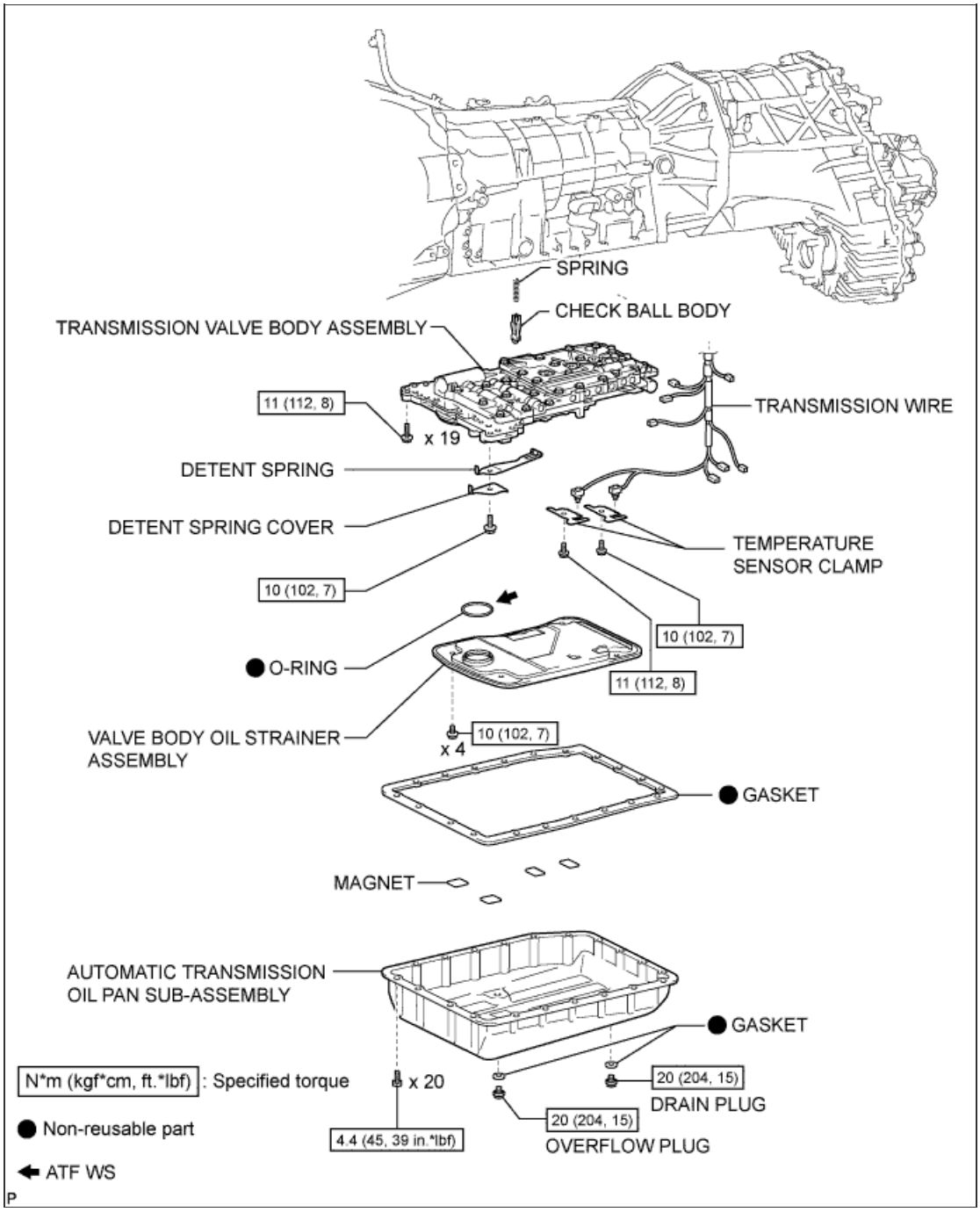
Torque:
4.4 N*m{ 45 kgf*cm , 39 in.*lbf }

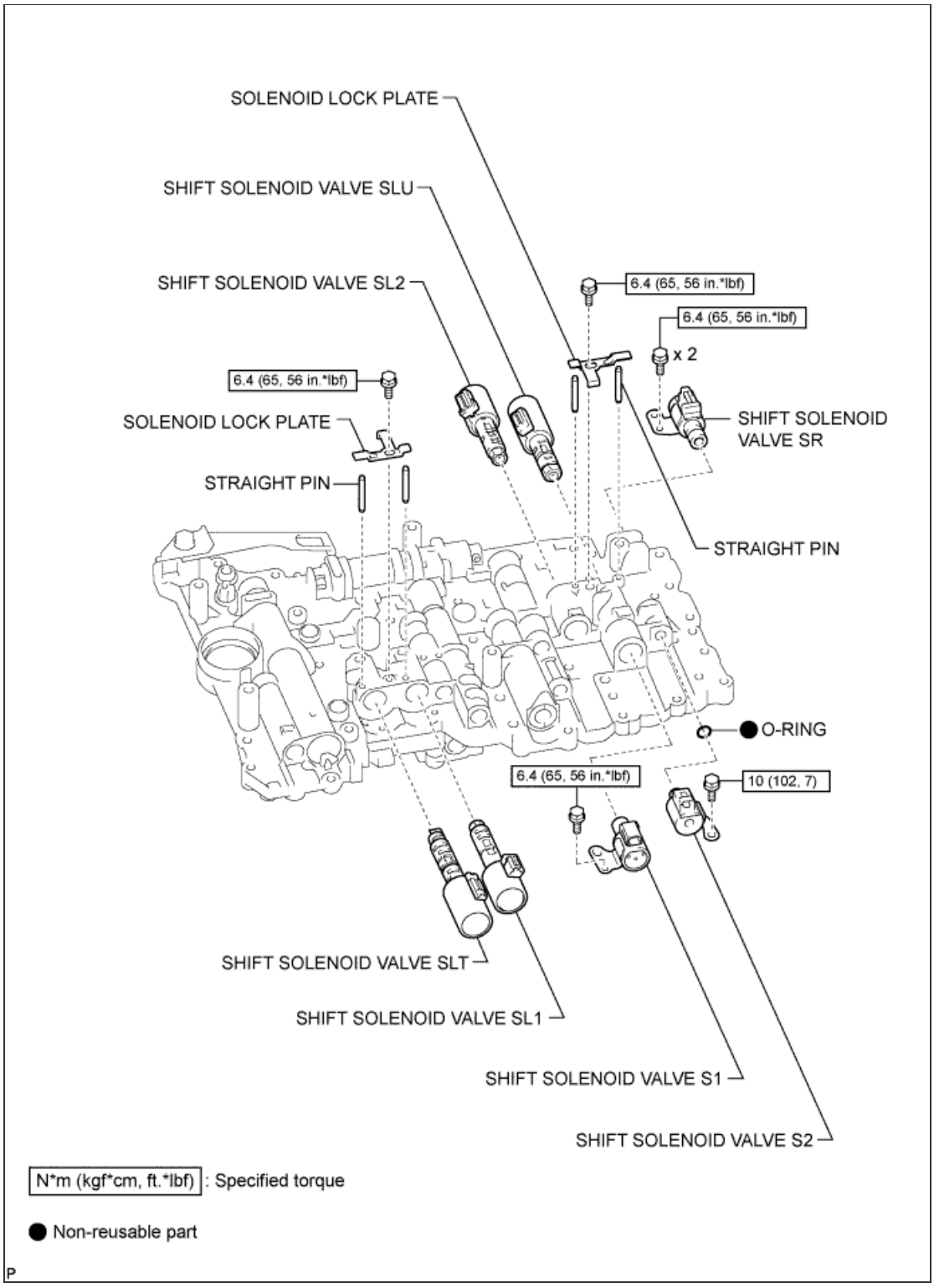


5. ADD AUTOMATIC TRANSMISSION FLUID

a. Add automatic transmission fluid (Click here).

for Preparation Click here




SOLENOID LOCK PLATE
SHIFT SOLENOID VALVE SLU
SHIFT SOLENOID VALVE SL2
6.4 (65, 56 in.*lbf)
6.4 (65, 56 in.*lbf)
x 2
6.4 (65, 56 in.*lbf)
SOLENOID LOCK PLATE
SHIFT SOLENOID VALVE SR
STRAIGHT PIN
STRAIGHT PIN
O-RING
6.4 (65, 56 in.*lbf)
10 (102, 7)
SHIFT SOLENOID VALVE SLT
SHIFT SOLENOID VALVE SL1
SHIFT SOLENOID VALVE S1
SHIFT SOLENOID VALVE S2
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
P

for Preparation Click here

1. DRAIN AUTOMATIC TRANSMISSION FLUID

a. Remove the drain plug and gasket, and drain the ATF.

b. Install a new gasket and the drain plug.

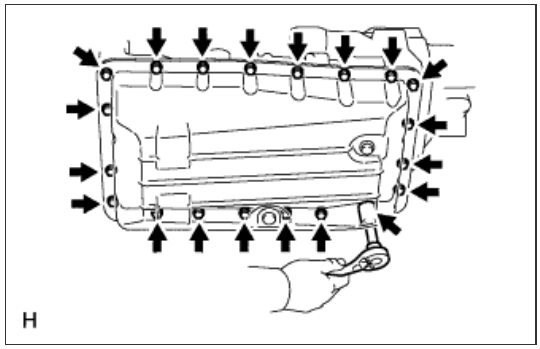
Torque:
20 N*m{ 204 kgf*cm , 15 ft.*lbf }

2. REMOVE AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY

a. Remove the 20 bolts, oil pan and gasket from the transmission.

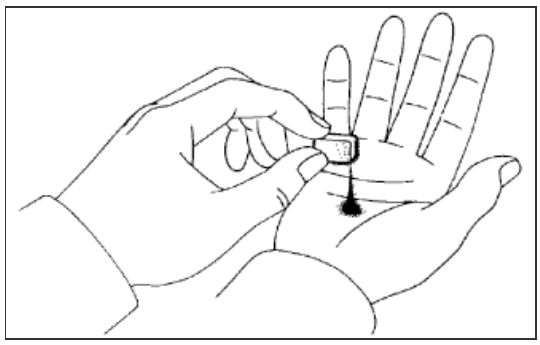
NOTICE:

Some fluid will remain in the oil pan. Remove all the pan bolts, and carefully remove the oil pan assembly.



b. Examine the particles in the pan.

i. Remove the 4 magnets and use them to collect steel particles. Carefully inspect the foreign matter and particles in the pan and on the magnets to anticipate the type of wear you will find in the transmission.
Steel (magnetic): bearing, gear and clutch plate wear
Brass (non-magnetic): bush wear



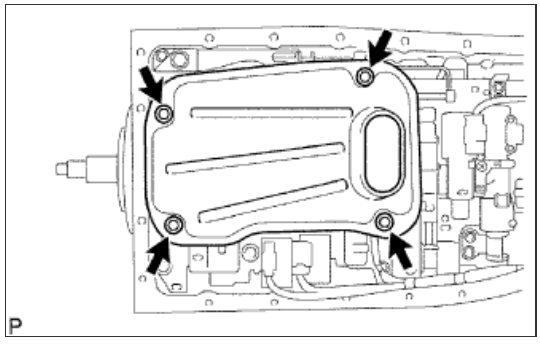
3. REMOVE VALVE BODY OIL STRAINER ASSEMBLY

a. Remove the 4 bolts and oil strainer.

NOTICE:

Be careful as some fluid may leak out of the oil strainer.

b. Remove the O-ring from the oil strainer.

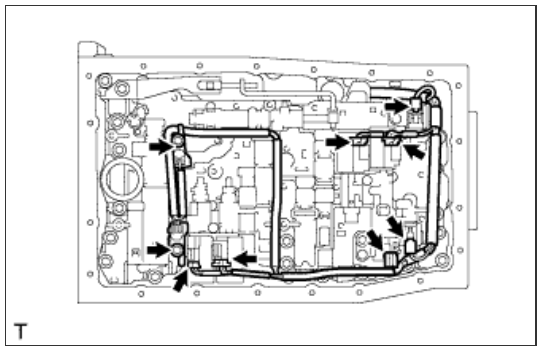


4. DISCONNECT TRANSMISSION WIRE

a. Remove the 2 bolts and 2 temperature sensor clamps.

b. Disconnect the ATF temperature sensors.

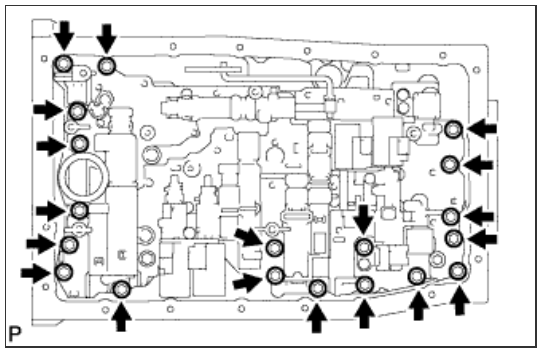
c. Disconnect the 7 connectors from the solenoid valves.



5. REMOVE TRANSMISSION VALVE BODY ASSEMBLY

a. Remove the bolt, detent spring cover and detent spring.

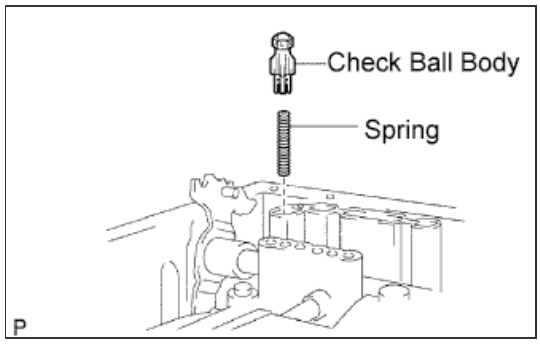
b. Remove the 19 bolts and valve body.



c. Remove the check ball body and spring.

NOTICE:

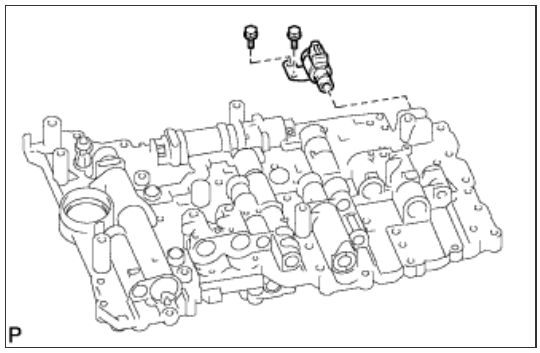
Do not drop the check ball body and spring.



for Preparation Click here

1. REMOVE SHIFT SOLENOID VALVE SR

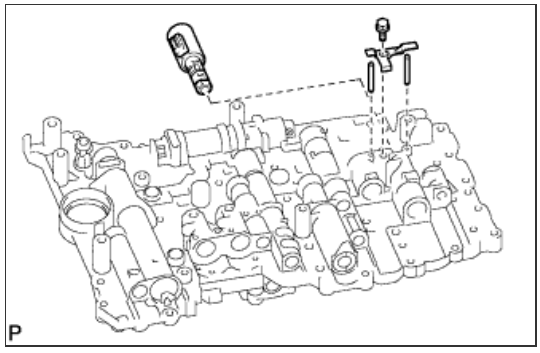
a. Remove the 2 bolts and solenoid valve.



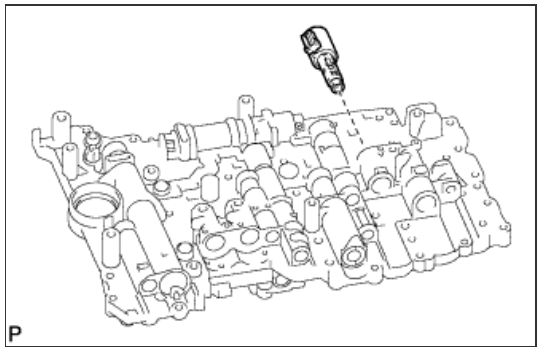
2. REMOVE SHIFT SOLENOID VALVE SLU

a. Remove the bolt, solenoid lock plate and 2 straight pins.

b. Remove the solenoid valve.



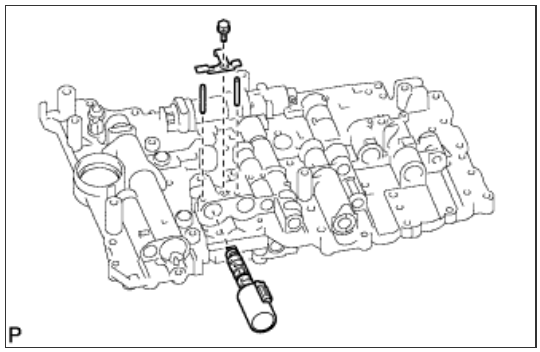
3. REMOVE SHIFT SOLENOID VALVE SL2



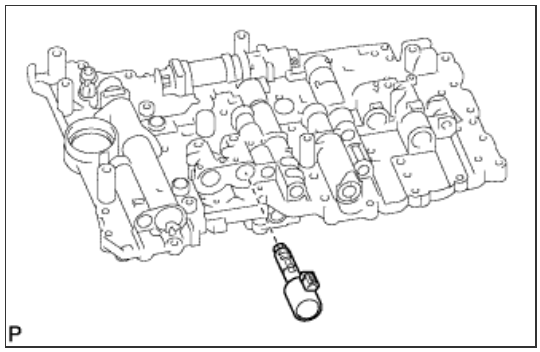
4. REMOVE SHIFT SOLENOID VALVE SLT

a. Remove the bolt, solenoid lock plate and 2 straight pins.

b. Remove the solenoid valve.

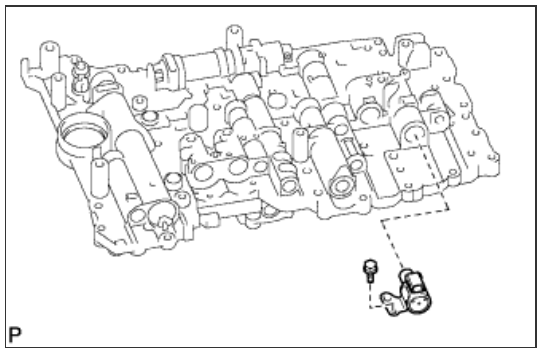


5. REMOVE SHIFT SOLENOID VALVE SL1



6. REMOVE SHIFT SOLENOID VALVE S1

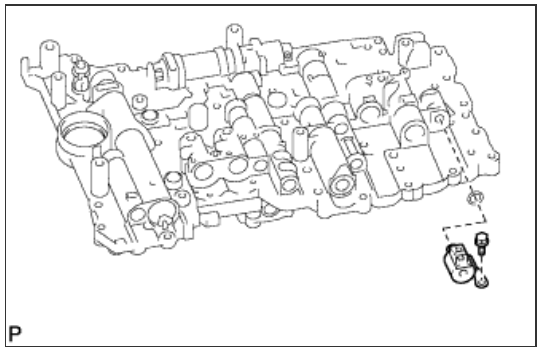
a. Remove the bolt and shift solenoid valve S1.



7. REMOVE SHIFT SOLENOID VALVE S2

a. Remove the bolt and solenoid valve.

b. Remove the O-ring from the shift solenoid valve.



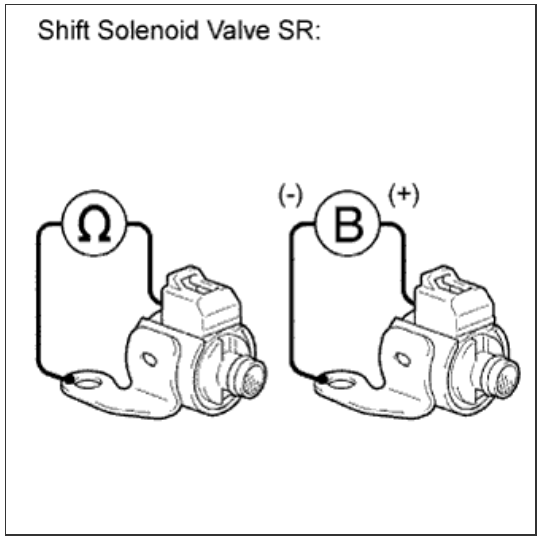
for Preparation Click here

1. INSPECT SHIFT SOLENOID VALVE SR

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Solenoid Connector (SR) - Solenoid Body (SR)	20°C (68°F)	11 to 15 Ω



b. Apply 12 V of battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve SR connector • Battery negative (-) → Shift solenoid valve SR body	Valve moves and makes an operating noise

If the result is not as specified, replace the solenoid valve.

2. INSPECT SHIFT SOLENOID VALVE SLU

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Terminal 1 of shift solenoid valve SLU - terminal 2	20°C (68°F)	5.0 to 5.6 Ω

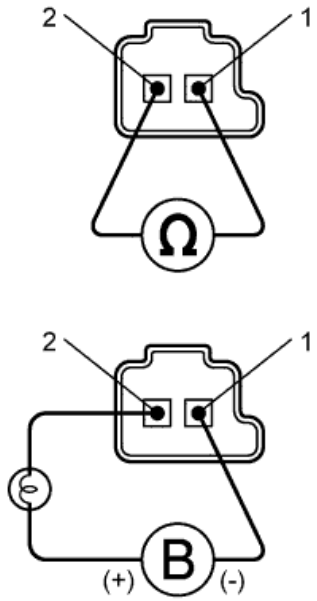
b. Apply 12 V of battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise

If the result is not as specified, replace the solenoid valve.

Component without harness connected:
(Shift Solenoid Valve SLU)



3. INSPECT SHIFT SOLENOID VALVE SL2

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Terminal 1 of shift solenoid valve SL2 - terminal 2	20°C (68°F)	5.0 to 5.6 Ω

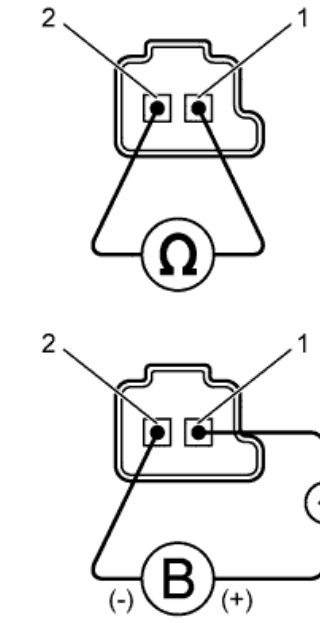
b. Apply 12 V of battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

If the result is not as specified, replace the solenoid valve.

Component without harness connected:
(Shift Solenoid Valve SL2)



4. INSPECT SHIFT SOLENOID VALVE SLT

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Terminal 1 of shift solenoid valve SLT - terminal 2	20°C (68°F)	5.0 to 5.6 Ω

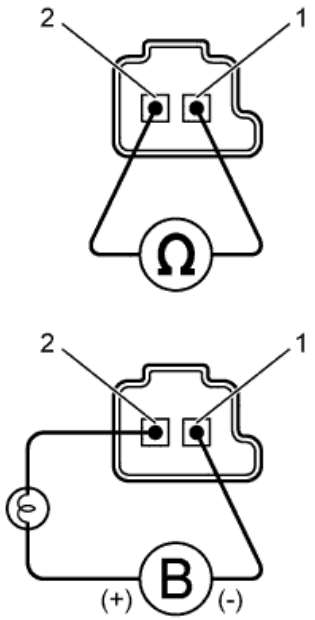
b. Apply 12 V of battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise

If the result is not as specified, replace the solenoid valve.

Component without harness connected:
(Shift Solenoid Valve SLT)



5. INSPECT SHIFT SOLENOID VALVE SL1

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Terminal 1 of shift solenoid valve SL1 - terminal 2	20°C (68°F)	5.0 to 5.6 Ω

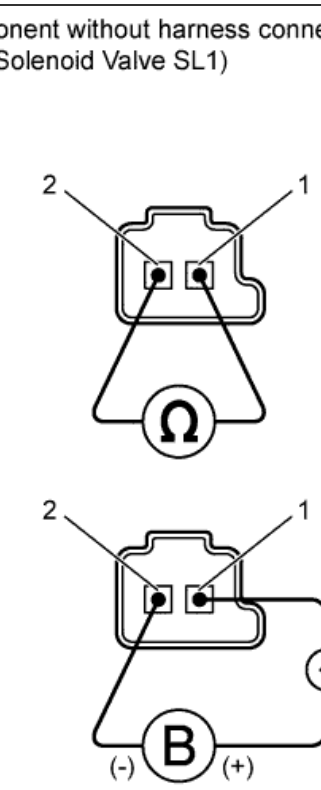
b. Apply 12 V of battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

If the result is not as specified, replace the solenoid valve.

Component without harness connected:
(Shift Solenoid Valve SL1)



6. INSPECT SHIFT SOLENOID VALVE S1

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

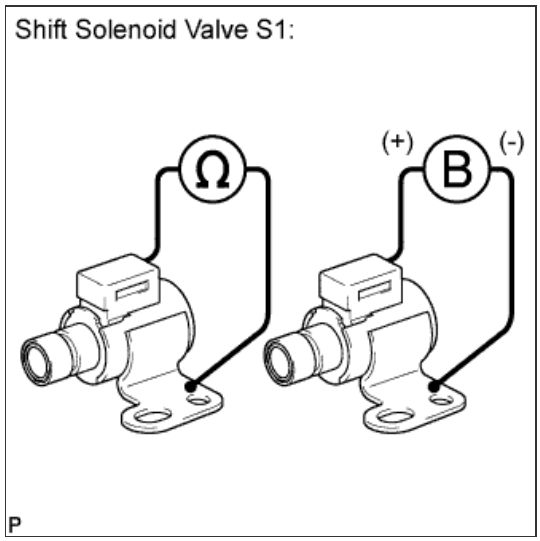
Tester Connection	Condition	Specified Condition
Solenoid Connector (S1) - Solenoid Body (S1)	20°C (68°F)	11 to 15 Ω

b. Apply 12 V of battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

If the result is not as specified, replace the solenoid valve.



7. INSPECT SHIFT SOLENOID VALVE S2

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

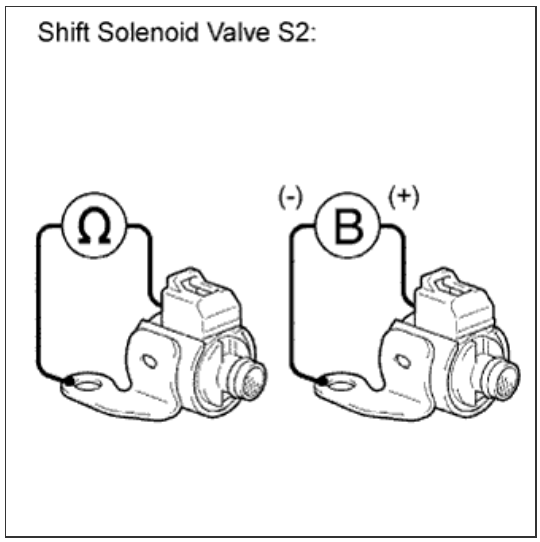
Tester Connection	Condition	Specified Condition
Solenoid Connector (S2) - Solenoid Body (S2)	20°C (68°F)	11 to 15 Ω

b. Apply 12 V of battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

If the result is not as specified, replace the solenoid valve.



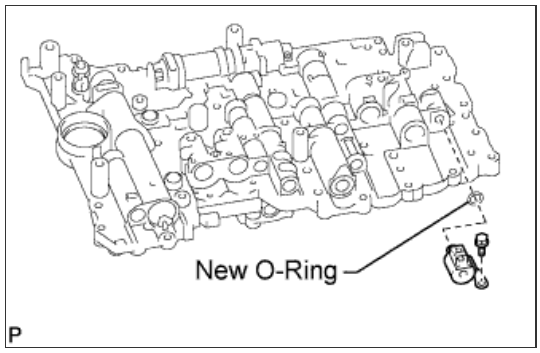
for Preparation Click here

1. INSTALL SHIFT SOLENOID VALVE S2

a. Coat a new O-ring with ATF and install it to the solenoid valve.

b. Install the solenoid valve with the bolt.

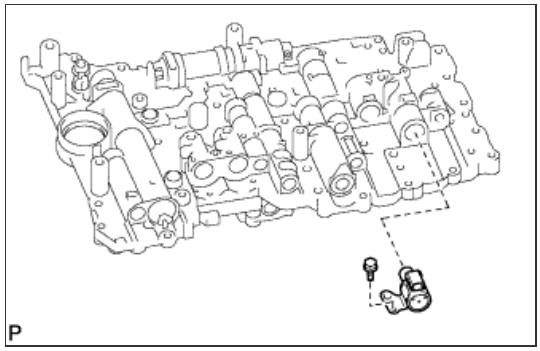
Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }



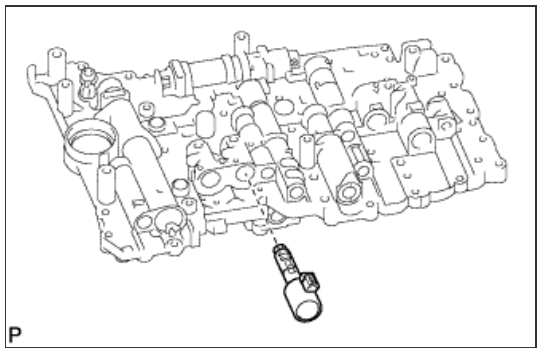
2. INSTALL SHIFT SOLENOID VALVE S1

a. Install the solenoid valve with the bolt.

Torque:
6.4 N*m{ 65 kgf*cm , 57 in.*lbf }



3. INSTALL SHIFT SOLENOID VALVE SL1

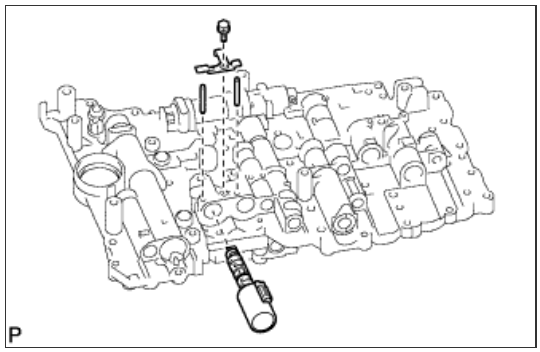


4. INSTALL SHIFT SOLENOID VALVE SLT

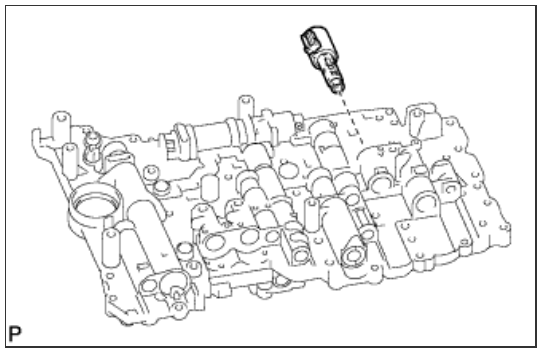
a. Install the solenoid valve.

b. Install the 2 straight pins and solenoid lock plate with the bolt.

Torque:
6.4 N*m{ 65 kgf*cm , 57 in.*lbf }



5. INSTALL SHIFT SOLENOID VALVE SL2

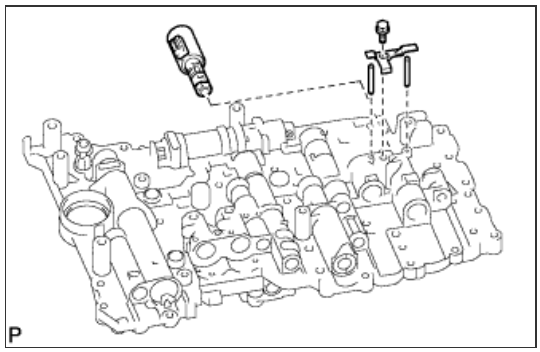


6. INSTALL SHIFT SOLENOID VALVE SLU

a. Install the solenoid valve.

b. Install 2 straight pins and solenoid lock plate with the bolt.

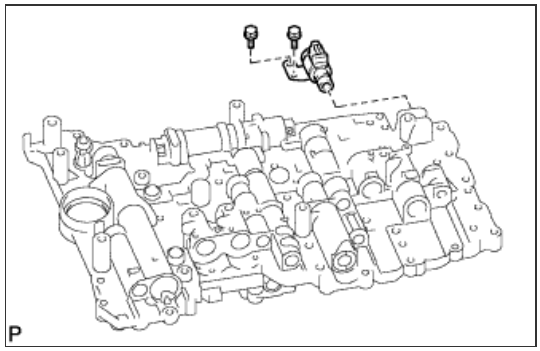
Torque:
6.4 N*m{ 65 kgf*cm , 57 in.*lbf }



7. INSTALL SHIFT SOLENOID VALVE SR

a. Install the solenoid valve with the 2 bolts.

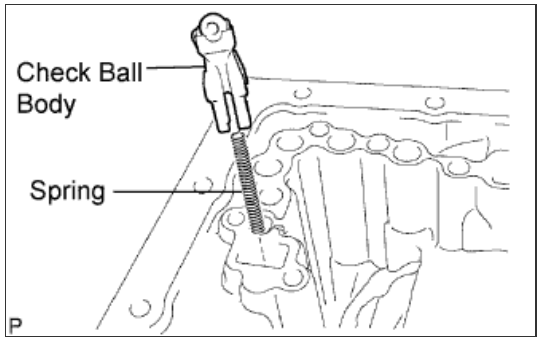
Torque:
6.4 N*m{ 65 kgf*cm , 57 in.*lbf }



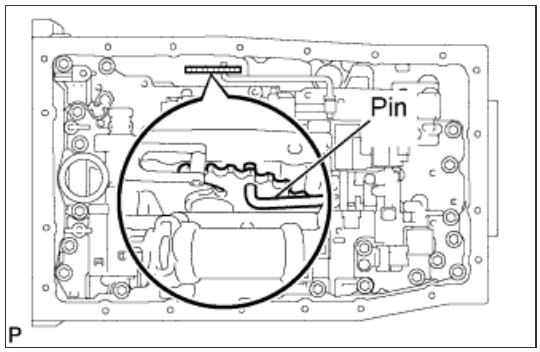
for Preparation Click here

1. INSTALL TRANSMISSION VALVE BODY ASSEMBLY

a. Install the spring and check ball body.



b. Insert the pin of the manual valve into the hole of the manual valve lever.



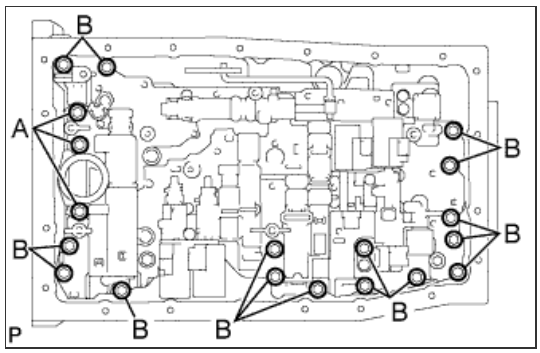
c. Install the transmission valve body with the 19 bolts.

Torque:
11 N*m{ 112 kgf*cm , 8 ft.*lbf }

HINT:

Each bolt length is indicated below.

36 mm (1.42 in.) for bolt A
25 mm (0.984 in.) for bolt B



d. Install the detent spring and detent spring cover with the bolt.

Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }

2. CONNECT TRANSMISSION WIRE

a. Connect the 7 connectors to the solenoid valves.

b. Connect the 2 ATF temperature sensors with the 2 clamps and 2 bolts.

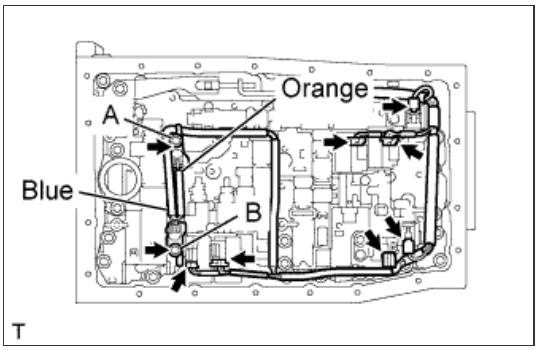
Torque:
for bolt A:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }
for bolt B:
11 N*m{ 112 kgf*cm , 8 ft.*lbf }

HINT:

Each bolt length is indicated below.

12 mm (0.472 in.) for bolt A

36 mm (1.42 in.) for bolt B

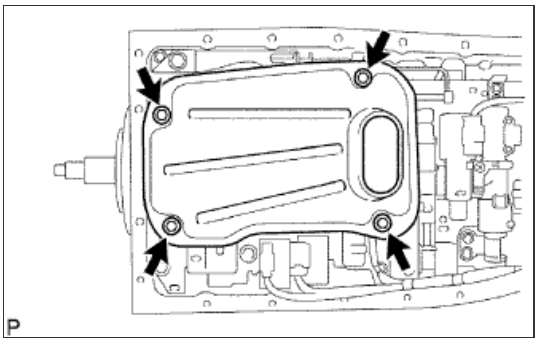


3. INSTALL VALVE BODY OIL STRAINER ASSEMBLY

a. Coat a new O-ring with ATF and install it to the oil strainer.

b. Install the oil strainer with the 4 bolts.

Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }



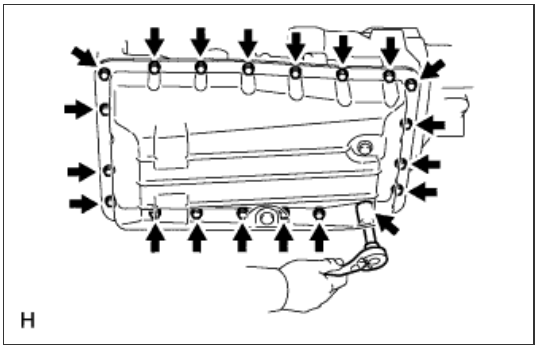
4. INSTALL AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY

NOTICE:

Remove the gasket and be careful not to spill oil on the contacting surfaces of the transmission case and oil pan.

a. Install a new gasket and the oil pan with the 20 bolts.

Torque:
4.4 N*m{ 45 kgf*cm , 39 in.*lbf }



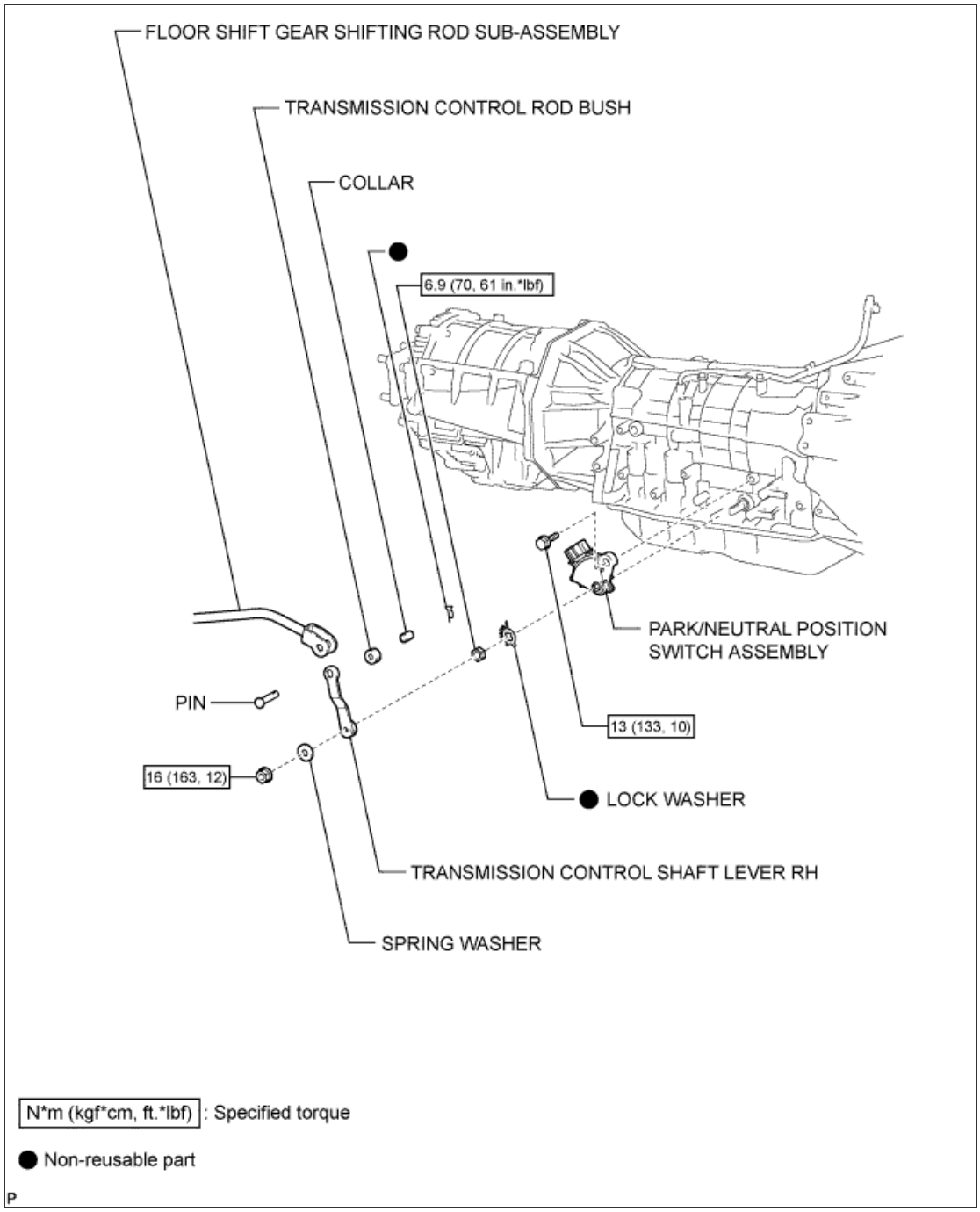
5. RESET MEMORY

(Click here)

6. ADD AUTOMATIC TRANSMISSION FLUID

a. Add automatic transmission fluid (Click here).

for Preparation Click here



for Preparation Click here

1. INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY

a. Apply the parking brake and turn the engine switch on (IG).

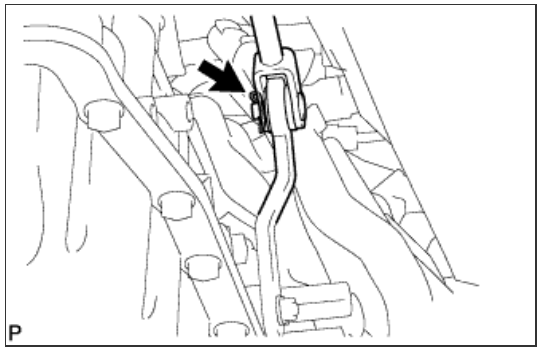
b. Depress the brake pedal and check that the engine starts when the shift lever is in N or P, but does not start in other positions.

c. Check that the back-up light illuminates and the reverse warning buzzer sounds only when the shift lever is in R.

for Preparation Click here

1. DISCONNECT FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

a. Remove the clip and pin, and disconnect the shifting rod from the transmission control shaft lever RH.

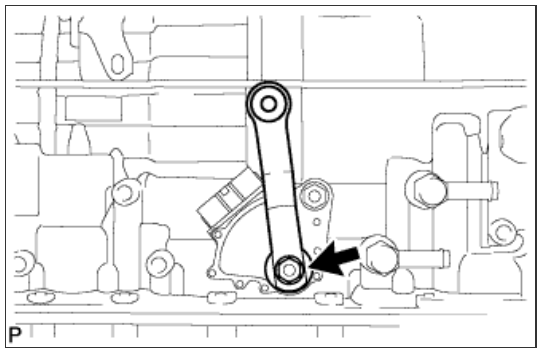


2. REMOVE PARK/NEUTRAL POSITION SWITCH ASSEMBLY

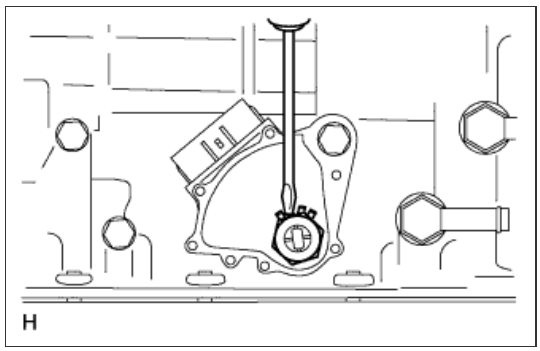
a. Disconnect the switch connector.

b. Remove the nut, spring washer and transmission control shaft lever RH.

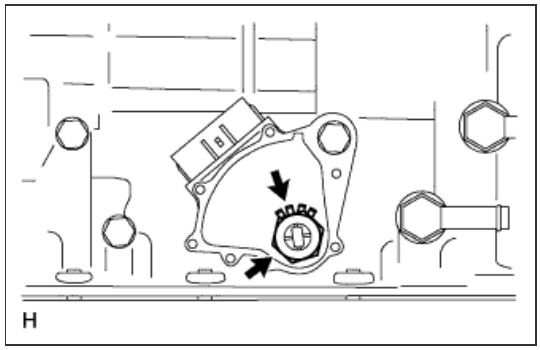
c. Remove the collar and transmission control rod bush from the transmission control shaft lever RH.



d. Using a screwdriver, bend the tabs of the lock washer.



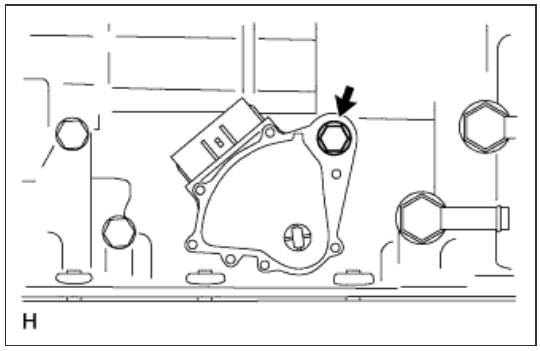
e. Remove the lock nut and lock washer.



f. Remove the bolt and switch.

HINT:

Make sure that the manual valve lever shaft has not been rotated prior to installing the park/neutral position switch as the detent spring may become detached from the manual valve lever shaft.



for Preparation Click here

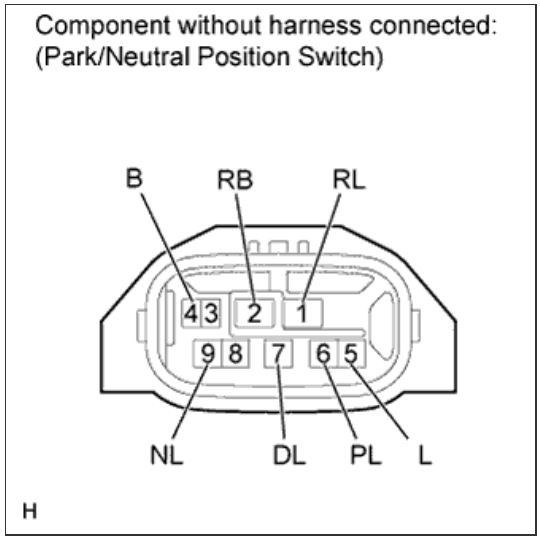
1. INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
2 (RB) - 6 (PL)	Shift lever in P	Below 1 Ω
2 (RB) - 6 (PL)	Shift lever not in P	10 kΩ or higher
2 (RB) - 1 (RL)	Shift lever in R	Below 1 Ω
2 (RB) - 1 (RL)	Shift lever not in R	10 kΩ or higher
2 (RB) - 9 (NL)	Shift lever in N	Below 1 Ω
2 (RB) - 9 (NL)	Shift lever not in N	10 kΩ or higher
2 (RB) - 7 (DL)	Shift lever in D or S	Below 1 Ω
2 (RB) - 7 (DL)	Shift lever not in D or S	10 kΩ or higher
4 (B) - 5 (L)	Shift lever in P or N	Below 1 Ω
4 (B) - 5 (L)	Shift lever not in P or N	10 kΩ or higher

If the result is not as specified, replace the switch.



for Preparation Click here

1. ADJUST PARK/NEUTRAL POSITION SWITCH ASSEMBLY

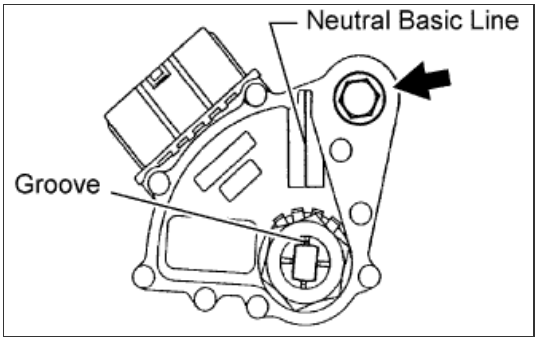
a. Loosen the bolt of the park/neutral position switch and move the shift lever to N.

b. Align the groove with the neutral basic line.

c. Hold the switch in position and tighten the bolt.

Torque:
13 N*m{ 130 kgf*cm , 10 ft.*lbf }

d. After the adjustment, perform the on-vehicle inspection (Click here).



for Preparation Click here

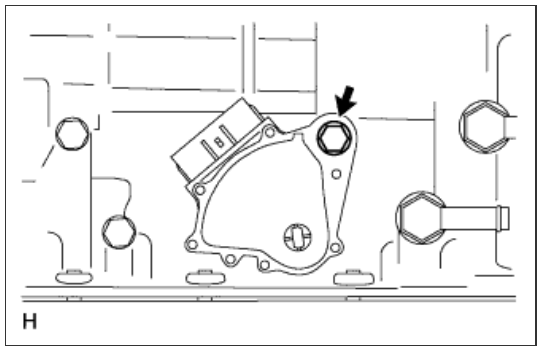
1. INSTALL PARK/NEUTRAL POSITION SWITCH ASSEMBLY

HINT:

Make sure that the manual valve lever shaft has not been rotated prior to installing the park/neutral position switch as the detent spring may become detached from the manual valve lever shaft.

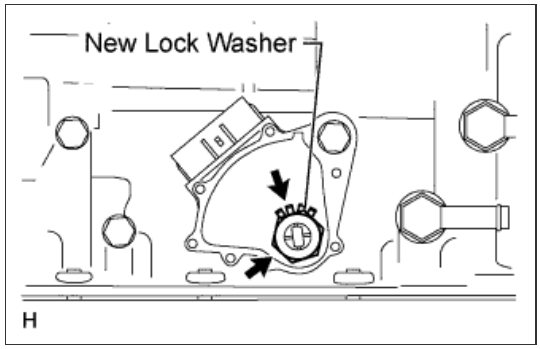
a. Install the switch to the manual valve shaft.

b. Temporarily install the bolt.

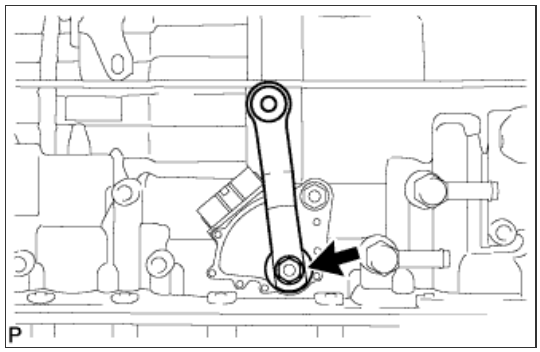


c. Install a new lock washer and the nut.

Torque:
6.9 N*m{ 70 kgf*cm , 61 in.*lbf }

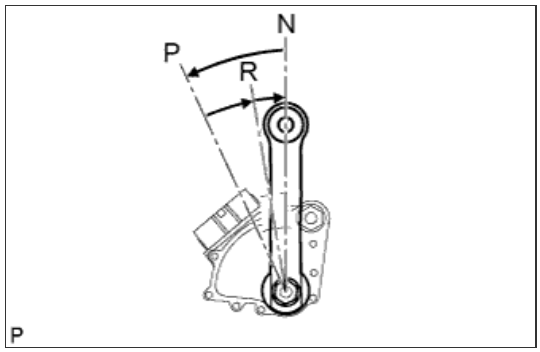


d. Temporarily install the control shaft lever RH.



e. Turn the control shaft lever RH counterclockwise until it stops, and then turn it clockwise 2 notches to set it to the N position.

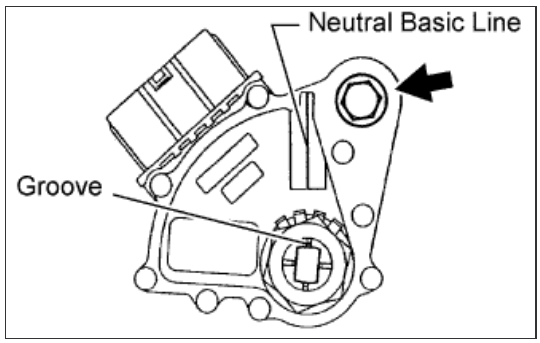
f. Remove the control shaft lever RH.



g. Align the groove with the neutral basic line.

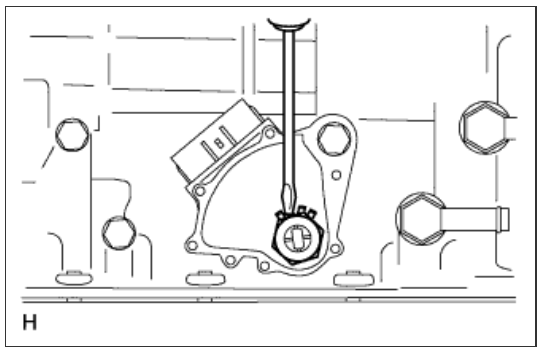
h. Hold the switch in position and tighten the bolt.

Torque:
13 N*m{ 133 kgf*cm , 10 ft.*lbf }



i. Using a screwdriver, bend the tabs of the lock washer.

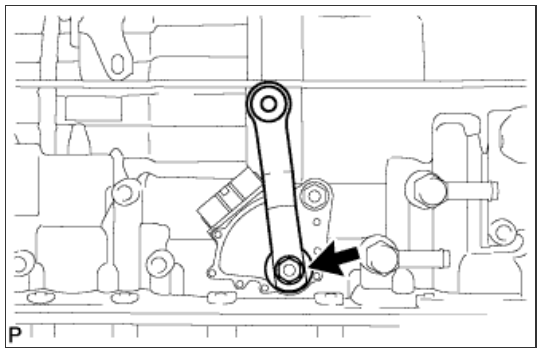
j. Install the transmission control rod bush and collar to the transmission control shaft lever RH.



k. Install the transmission control shaft lever RH with the spring washer and nut.

Torque:
16 N*m{ 163 kgf*cm , 12 ft.*lbf }

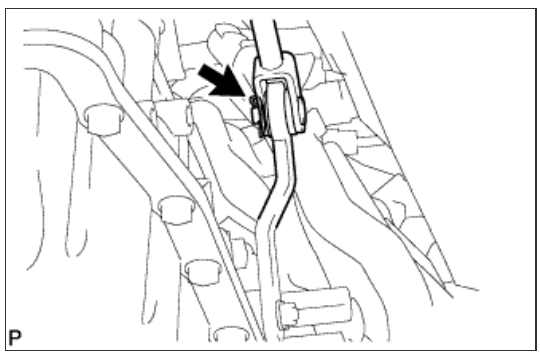
l. Connect the switch connector.



2. CONNECT FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

a. Connect the shifting rod to the transmission control shaft lever RH with the pin.

b. Install a new clip.



3. INSPECT SHIFT LEVER POSITION

a. When moving the shift lever from P to R with the engine switch on (IG) and the brake pedal depressed, make sure that it moves smoothly and correctly into position.

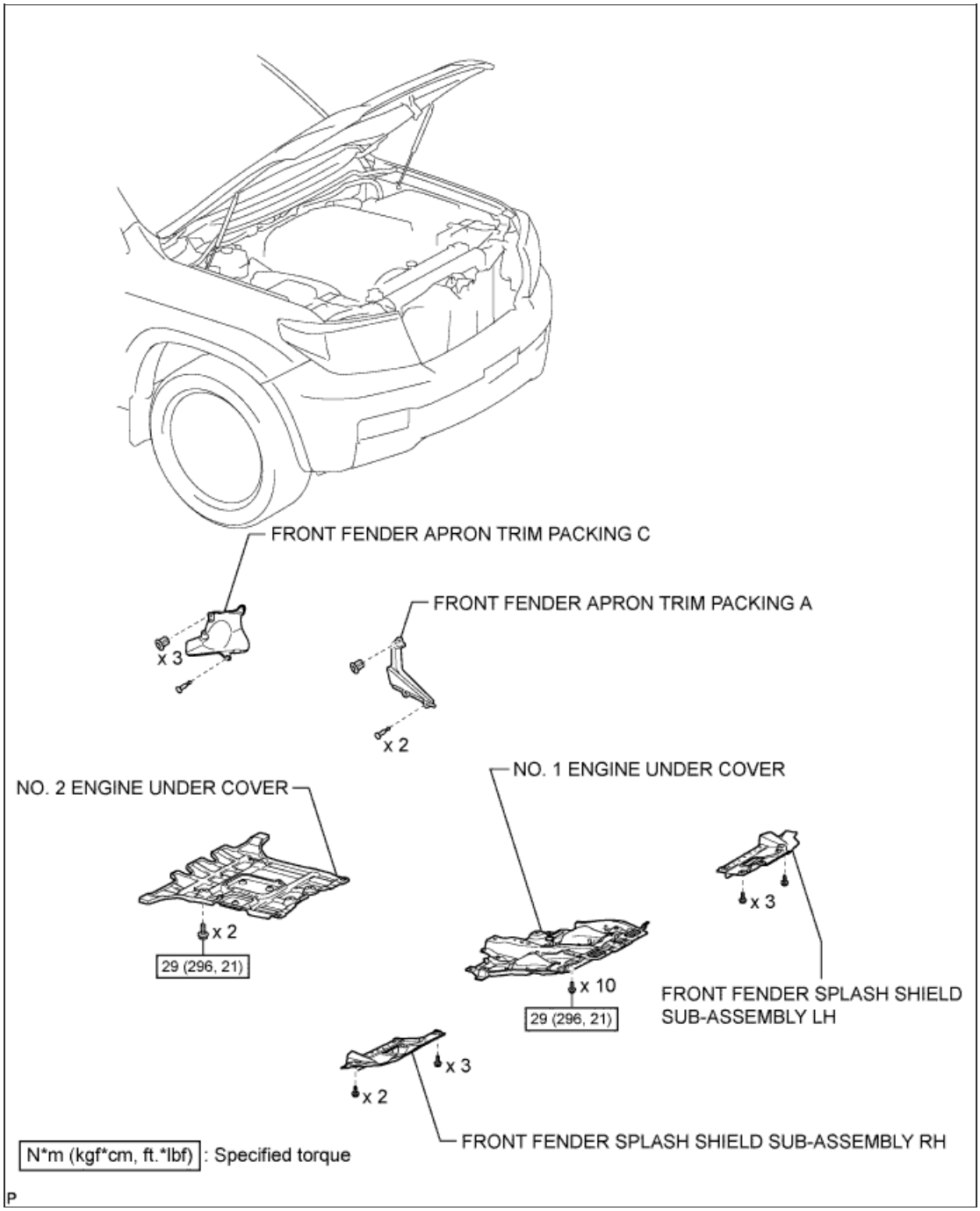
b. Check that the shift lever does not stop when moving the shift lever from R to P, and check that the shift lever does not stick when moving the shift lever from D to S.

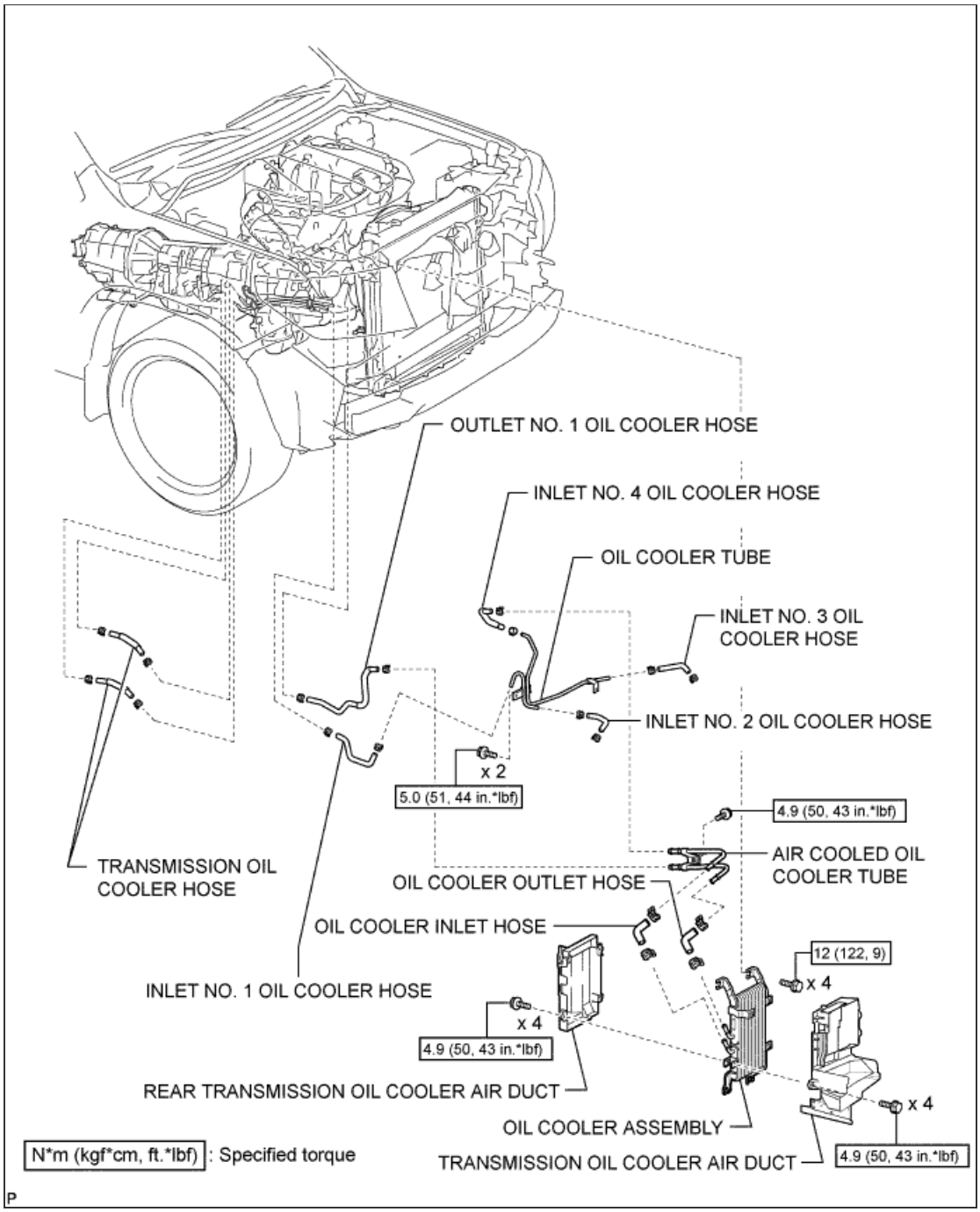
c. Start the engine and make sure that the vehicle moves forward after moving the shift lever from N to D and moves rearward after moving the shift lever to R.
If the operation cannot be performed as specified, inspect the park/neutral position switch assembly and check the shift lever assembly installation condition.

4. INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY

(Click here)

for Preparation Click here



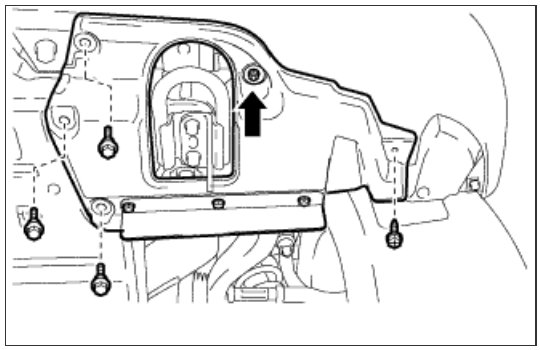

OUTLET NO. 1 OIL COOLER HOSE
INLET NO. 4 OIL COOLER HOSE
OIL COOLER TUBE
INLET NO. 3 OIL COOLER HOSE
INLET NO. 2 OIL COOLER HOSE
x 2
5.0 (51, 44 in.*lbf)
4.9 (50, 43 in.*lbf)
AIR COOLED OIL COOLER TUBE
TRANSMISSION OIL COOLER HOSE
OIL COOLER OUTLET HOSE
OIL COOLER INLET HOSE
12 (122, 9)
x 4
INLET NO. 1 OIL COOLER HOSE
x 4
4.9 (50, 43 in.*lbf)
REAR TRANSMISSION OIL COOLER AIR DUCT
x 4
OIL COOLER ASSEMBLY
TRANSMISSION OIL COOLER AIR DUCT
4.9 (50, 43 in.*lbf)
N*m (kgf*cm, ft.*lbf) : Specified torque
P

for Preparation Click here

1. REMOVE FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY LH

a. Remove the 3 bolts and screw.

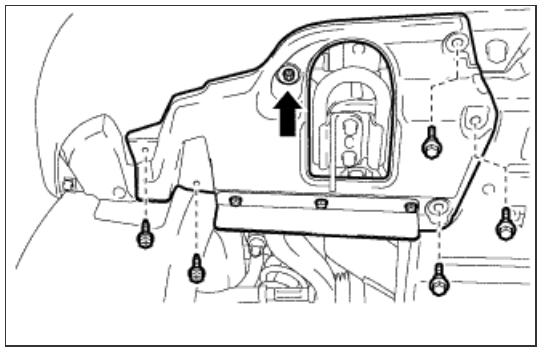
b. Turn the clip indicated by the arrow in the illustration to remove the front fender splash shield sub-assembly LH.



2. REMOVE FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY RH

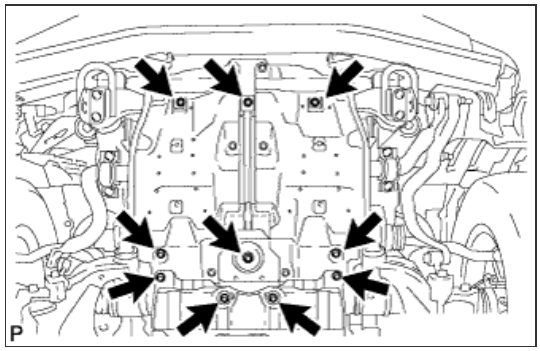
a. Remove the 3 bolts and 2 screws.

b. Turn the clip indicated by the arrow in the illustration to remove the front fender splash shield sub-assembly RH.



3. REMOVE NO. 1 ENGINE UNDER COVER

a. Remove the 10 bolts and No. 1 engine under cover.



4. REMOVE NO. 2 ENGINE UNDER COVER

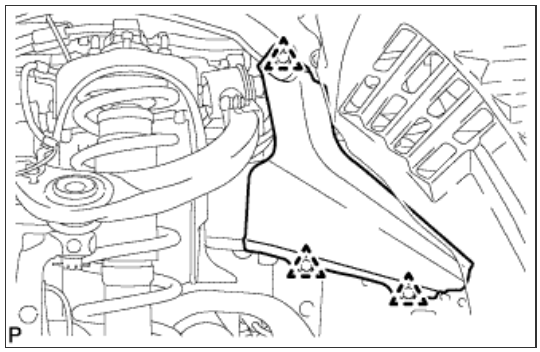
a. Remove the 2 bolts and No. 2 engine under cover.

5. REMOVE HEADLIGHT ASSEMBLY RH

for Standard: (Click here)
for HID Headlight: (Click here)

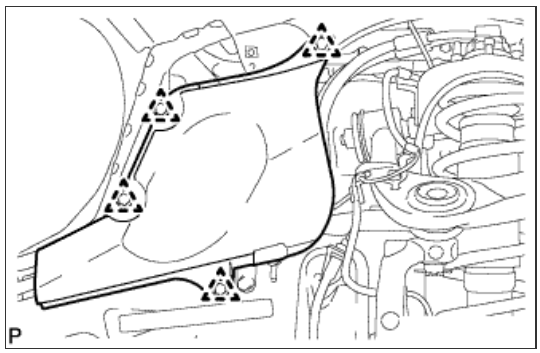
6. REMOVE FRONT FENDER APRON TRIM PACKING A

a. Remove the 3 clips and front fender apron trim packing A.



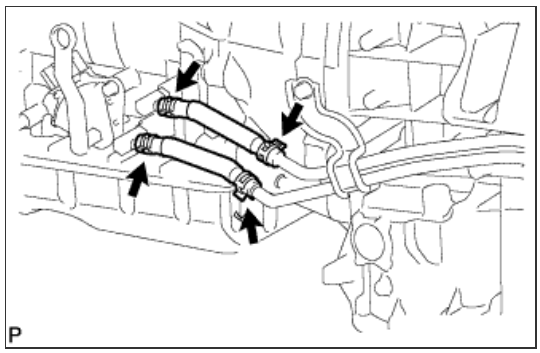
7. REMOVE FRONT FENDER APRON TRIM PACKING C

a. Remove the 4 clips and front fender apron trim packing C.



8. DISCONNECT TRANSMISSION OIL COOLER HOSE

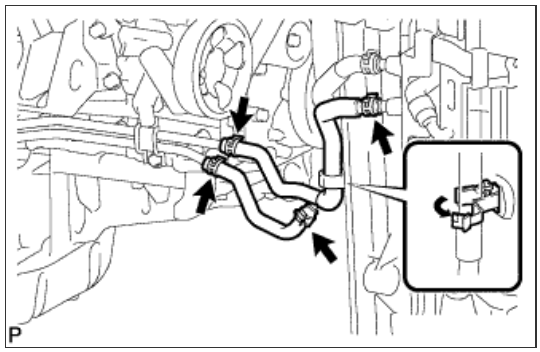
a. Disconnect the 2 transmission oil cooler hoses.



9. DISCONNECT INLET NO. 1 OIL COOLER HOSE AND OUTLET NO. 1 OIL COOLER HOSE

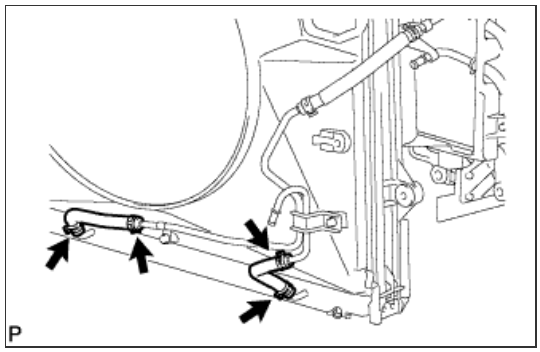
a. Detach the claw to open the flexible hose clamp.

b. Disconnect the inlet and outlet oil cooler hoses.

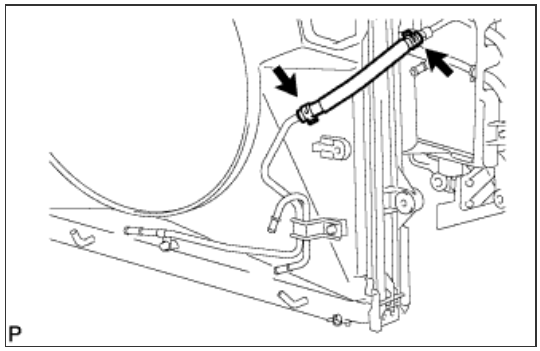


10. DISCONNECT INLET NO. 2 OIL COOLER HOSE AND INLET NO. 3 OIL COOLER HOSE

a. Disconnect the 2 inlet oil cooler hoses.

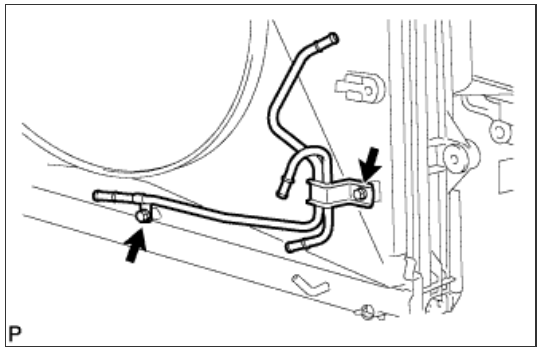


11. DISCONNECT INLET NO. 4 OIL COOLER HOSE



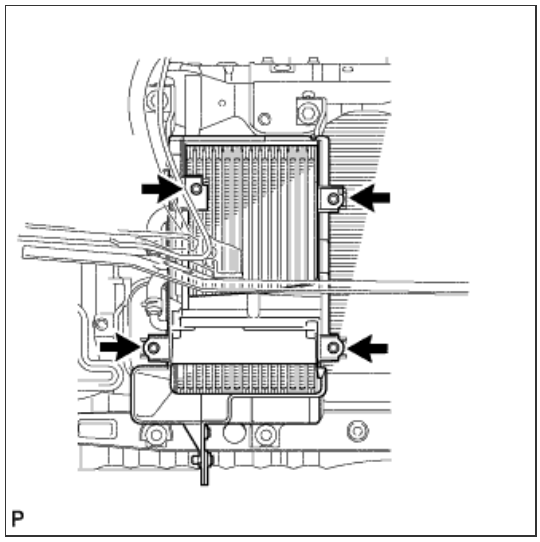
12. REMOVE OIL COOLER TUBE

a. Remove the 2 bolts and oil cooler tube.



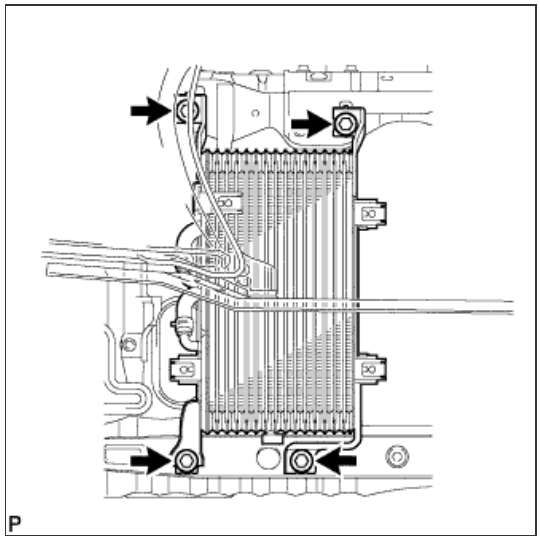
13. REMOVE TRANSMISSION OIL COOLER AIR DUCT

a. Remove the 4 bolts and transmission oil cooler air duct.

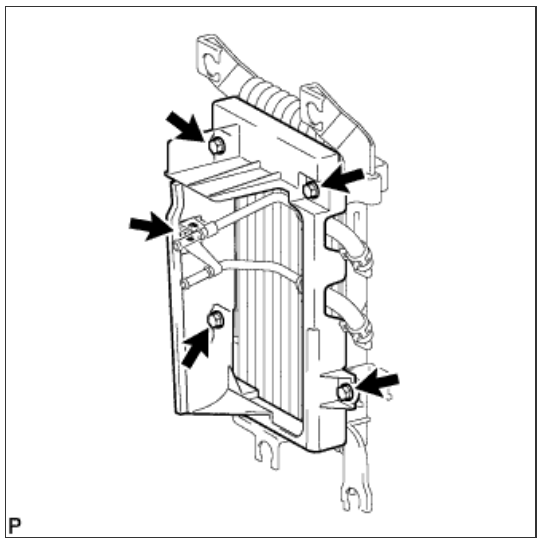


14. REMOVE OIL COOLER ASSEMBLY

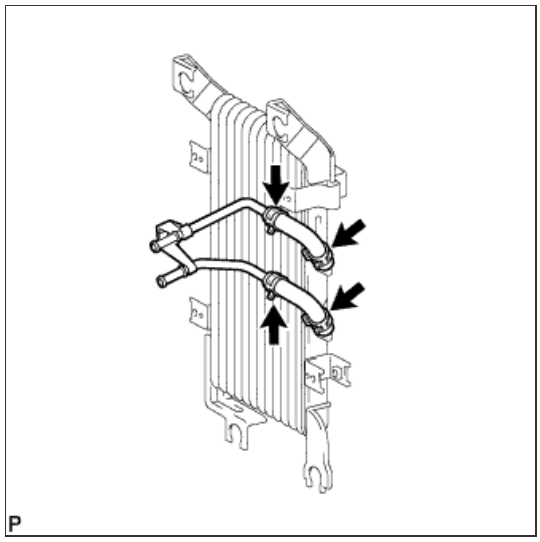
a. Remove the 4 bolts and oil cooler.



b. Remove the 5 bolts and transmission oil cooler air duct.



c. Disconnect the oil cooler inlet hose and outlet hose and remove the tube.


P

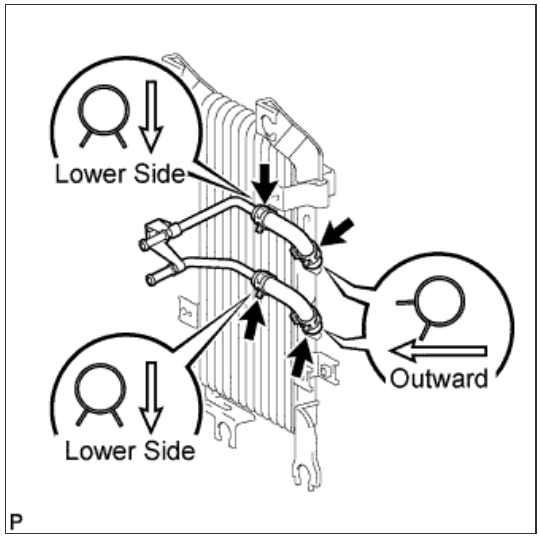
for Preparation Click here

1. INSTALL OIL COOLER ASSEMBLY

a. Connect the oil cooler inlet hose and outlet hose.

b. Install the rear transmission oil cooler air duct with the 4 bolts, and then install the air cooled oil cooler tube to the transmission oil cooler air duct with the bolt.

Torque:
4.9 N*m{ 50 kgf*cm , 43 in.*lbf }



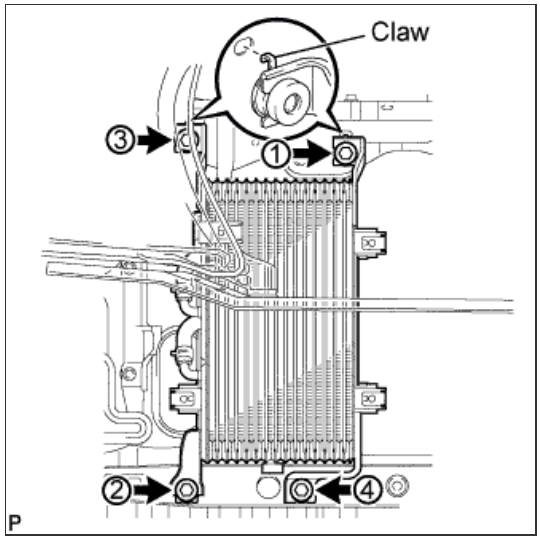
c. Temporarily put the oil cooler on the radiator support.

NOTICE:

Securely attach the 2 claws of the oil cooler into the holes of the radiator support.

d. Install the 4 bolts in the sequence shown in the illustration.

Torque:
12 N*m{ 122 kgf*cm , 9 ft.*lbf }



2. INSTALL TRANSMISSION OIL COOLER AIR DUCT

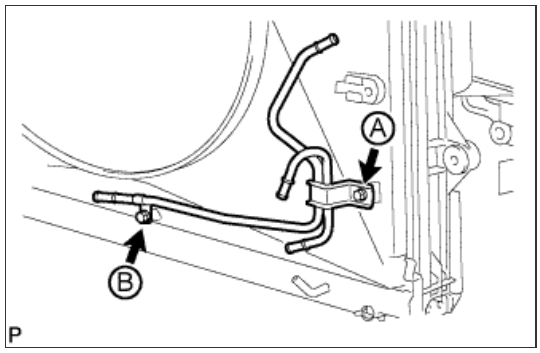
a. Install the oil cooler air duct with the 4 bolts.

Torque:
4.9 N*m{ 50 kgf*cm , 43 in.*lbf }

3. INSTALL OIL COOLER TUBE SUB-ASSEMBLY

a. Temporarily install the oil cooler tube to the fan shroud with bolt A. Install bolt B and tighten it to the specified torque. Then tighten bolt A to the specified torque.

Torque:
5.0 N*m{ 51 kgf*cm , 44 in.*lbf }

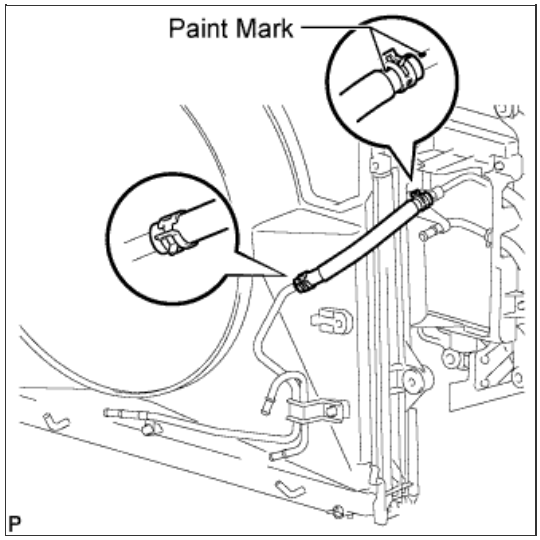


4. CONNECT INLET NO. 4 OIL COOLER HOSE

a. Connect the inlet oil cooler hose as shown in the illustration.

NOTICE:

Make sure the pinching portion of each clip is facing the direction shown in the illustration and the paint marks are aligned as shown in the illustration.

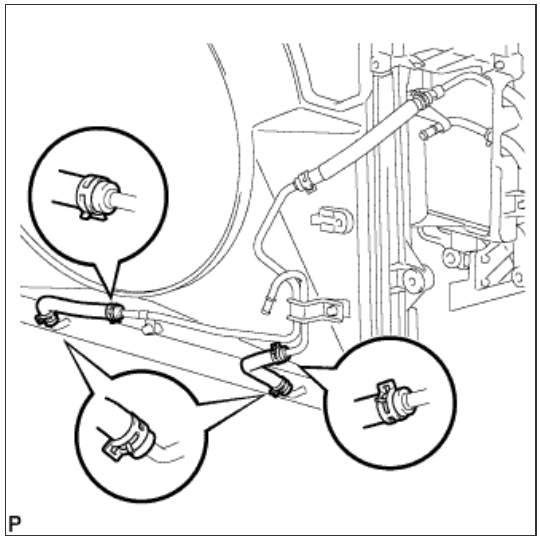


5. CONNECT INLET NO. 2 OIL COOLER HOSE AND INLET NO. 3 OIL COOLER HOSE

a. Connect the 2 transmission oil cooler hoses as shown in the illustration.

NOTICE:

Make sure the pinching portion of each clip is facing the direction shown in the illustration.



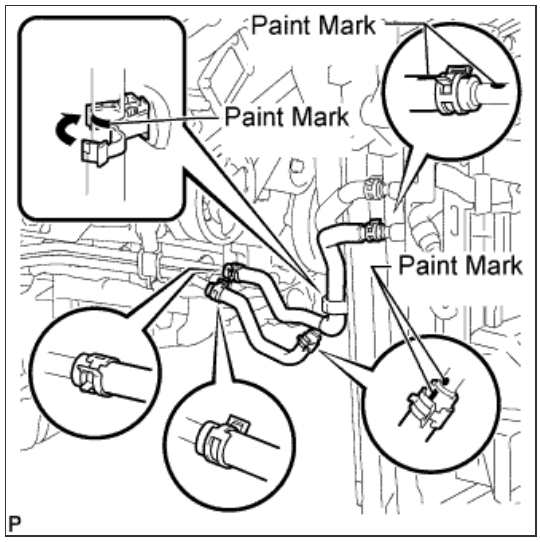
6. CONNECT INLET NO. 1 OIL COOLER HOSE AND OUTLET NO. 1 OIL COOLER HOSE

a. Connect the 2 oil cooler hoses as shown in the illustration.

NOTICE:

Make sure the pinching portion of each clip is facing the direction shown in the illustration and the paint marks are aligned as shown in the illustration.

b. Pass the hose through the flexible hose clamp and close the clamp shown in the illustration.

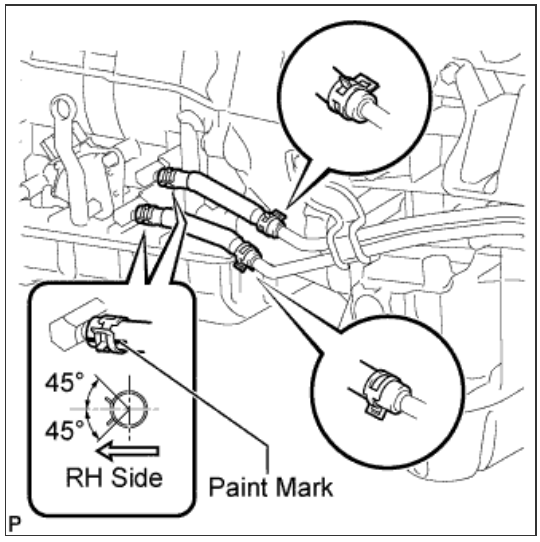


7. CONNECT TRANSMISSION OIL COOLER HOSE

a. Connect the 2 transmission oil cooler hoses as shown in the illustration.

NOTICE:

Make sure the pinching portion of each clip is facing the direction shown in the illustration.



8. ADD AUTOMATIC TRANSMISSION FLUID

a. Add automatic transmission fluid (Click here).

9. INSTALL HEADLIGHT ASSEMBLY RH

for Standard: (Click here)
for HID Headlight: (Click here)

10. INSTALL FRONT FENDER APRON TRIM PACKING C

a. Install the front fender apron trim packing C with the 4 clips.

11. INSTALL FRONT FENDER APRON TRIM PACKING A

a. Install the front fender apron trim packing A with the 3 clips.

12. INSTALL NO. 2 ENGINE UNDER COVER

a. Install the No. 2 engine under cover with the 2 bolts.

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

13. INSTALL NO. 1 ENGINE UNDER COVER

a. Install the No. 1 engine under cover with the 10 bolts.

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

14. INSTALL FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY LH

a. Push in the clip to install the front fender splash shield sub-assembly LH.

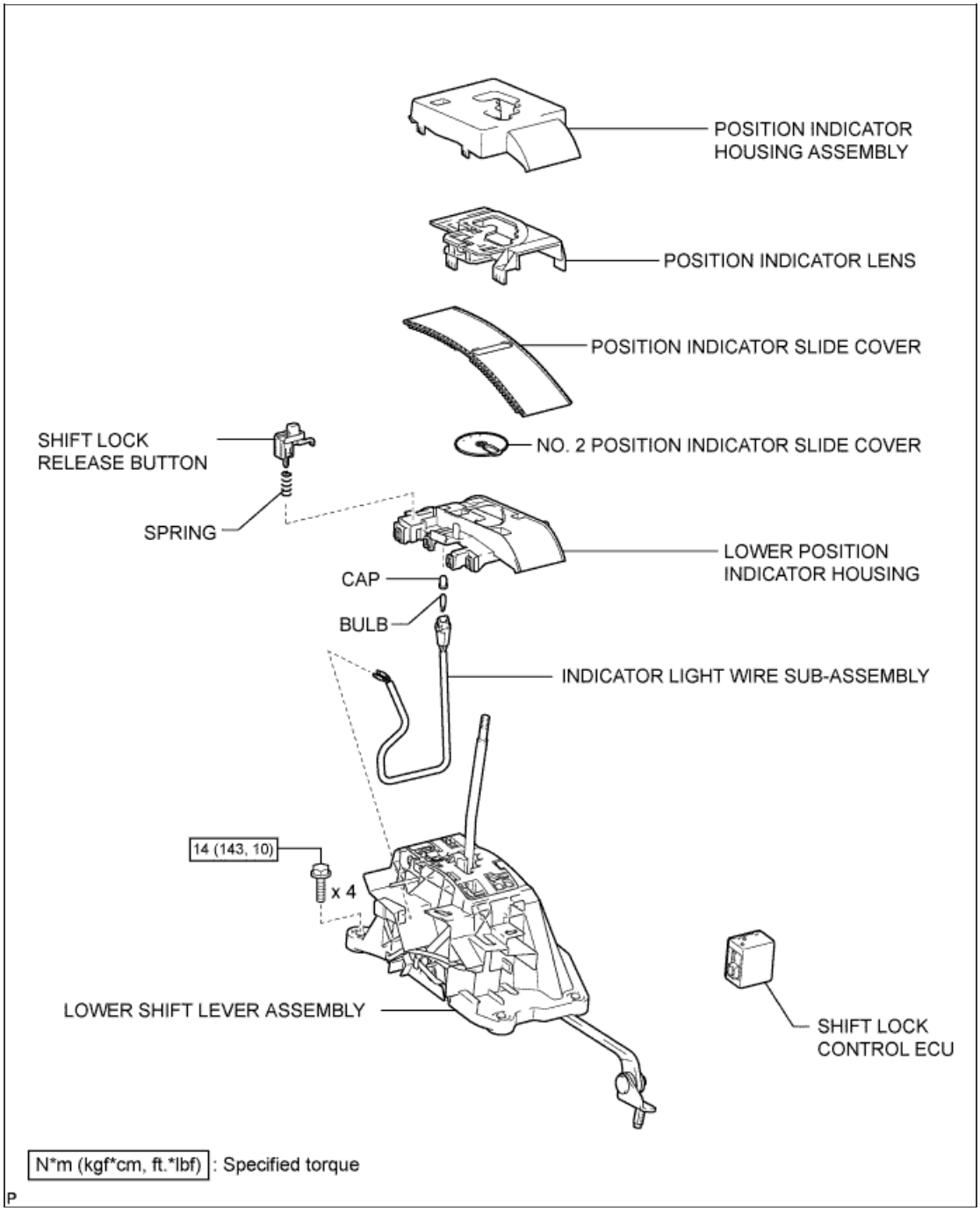
b. Install the 3 bolts and screw.

15. INSTALL FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY RH

a. Push in the clip to install the front fender splash shield sub-assembly RH.

b. Install the 3 bolts and 2 screws.

for Preparation Click here



for Preparation Click here

1. INSPECT SHIFT LEVER POSITION

a. When moving the shift lever from P to R with the engine switch on (IG) and the brake pedal depressed, make sure that it moves smoothly and correctly into position.

b. Check that the shift lever does not stop when moving the shift lever from R to P, and check that the shift lever does not stick when moving the shift lever from D to S.

c. Start the engine and make sure that the vehicle moves forward after moving the shift lever from N to D and moves rearward after moving the shift lever to R.
If the operation cannot be performed as specified, inspect the park/neutral position switch assembly and check the shift lever assembly installation condition.

2. CHECK SHIFT LOCK OPERATION

a. Move the shift lever to P.

b. Turn the engine switch off.

c. Check that the shift lever cannot be moved from P.

d. Turn the engine switch on (IG), depress the brake pedal and check that the shift lever can be moved to other positions.
If the operation cannot be done as specified, inspect the shift lever assembly and shift lock control unit.

3. CHECK SHIFT LOCK RELEASE BUTTON OPERATION

a. When operating the shift lever with the shift lock release button pressed, check that the lever can be moved to any position.
If the operation cannot be performed as specified, check the shift lever assembly.

4. CHECK SHIFT LOCK CONTROL ECU

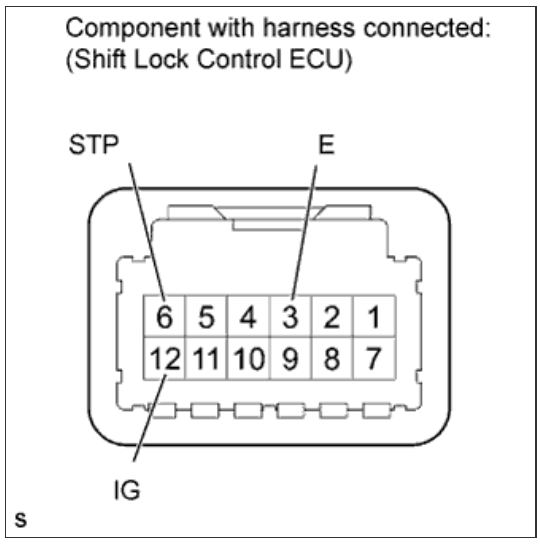
a. Measure the voltage according to the values in the table below.

HINT:

Do not disconnect the shift lock control ECU connector.

Standard Voltage:

Tester Connection	Condition	Specified Condition
12 (IG) - 3 (E)	Engine switch on (IG)	10 to 14 V
12 (IG) - 3 (E)	Engine switch off	Below 1 V
6 (STP) - 3 (E)	Brake pedal depressed	10 to 14 V
6 (STP) - 3 (E)	Brake pedal released	Below 1 V



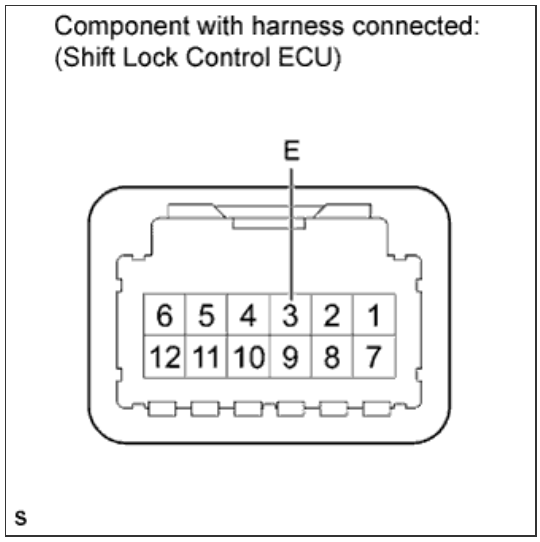
b. Measure the resistance according to the value in the table below.

HINT:

Do not disconnect the shift lock control ECU connector.

Standard Resistance:

Tester Connection	Condition	Specified Value
3 (E) - Body ground	Always	Below 1 Ω



c. Disconnect the shift lock solenoid connector from the shift lock control ECU.

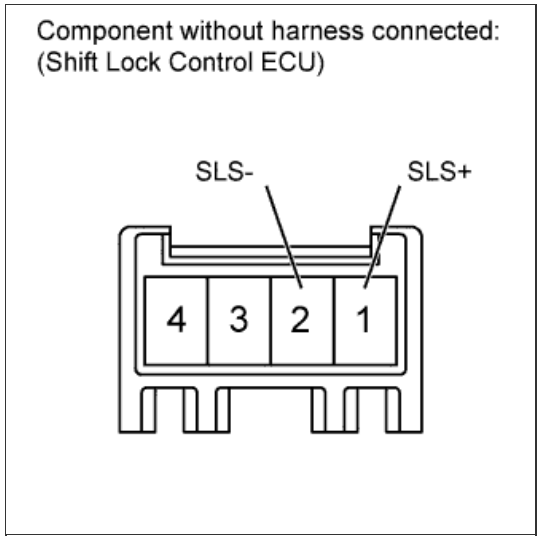
d. Measure the voltage according to the values in the table below.

HINT:

Do not disconnect the shift lock control ECU connector.

Standard Voltage:

Tester Connection	Condition	Specified Condition
1 (SLS+) - 2 (SLS-)	Engine switch off	Below 1 V
1 (SLS+) - 2 (SLS-)	Engine switch on (IG)	Below 1 V
	Engine switch on (IG) and brake pedal depressed	11 to 14 V



If the result is not as specified, replace the shift lever assembly.

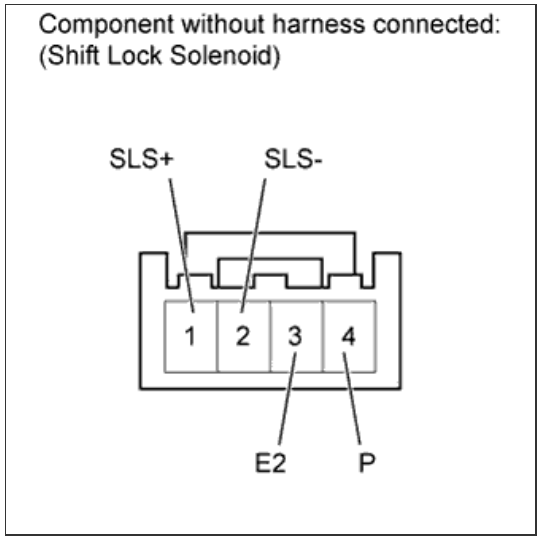
5. CHECK SHIFT LOCK SOLENOID

a. Disconnect the shift lock solenoid connector from the shift lock control ECU.

b. Measure the resistance according to the values in the table below.

Standard Voltage:

Tester Connection	Condition	Specified Condition
1 (SLS+) - 2 (SLS-)	Always	101 to 123 Ω
3 (E2) - 4 (P)	Shift lever in P	10 kΩ or higher
3 (E2) - 4 (P)	Shift lever not in P	Below 1 Ω



c. Apply 12 V of battery voltage to the shift lock solenoid and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Terminal 1 (SLS+) • Battery negative (-) → Terminal 2 (SLS-)	Solenoid moves and makes an operating noise

If the result is not as specified, replace the shift lever assembly.

for Preparation Click here

1. REMOVE FRONT CONSOLE BOX (w/ Cool Box)

(Click here)

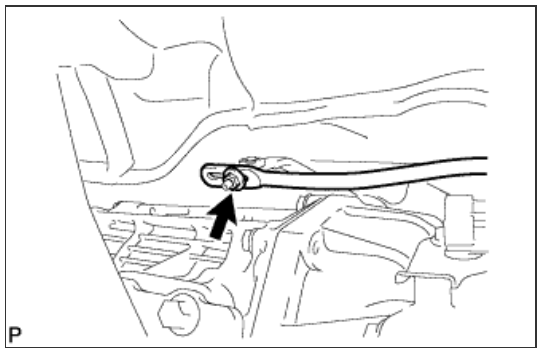
2. REMOVE FRONT CONSOLE BOX (w/o Cool Box)

(Click here)

3. DISCONNECT FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

a. Move the shift lever to N.

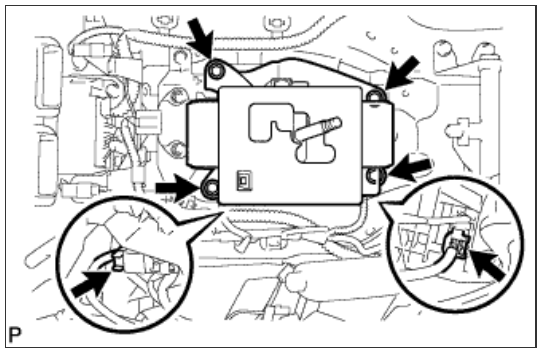
b. Remove the nut and disconnect the shifting rod from the connecting rod swivel.



4. REMOVE TRANSMISSION FLOOR SHIFT ASSEMBLY

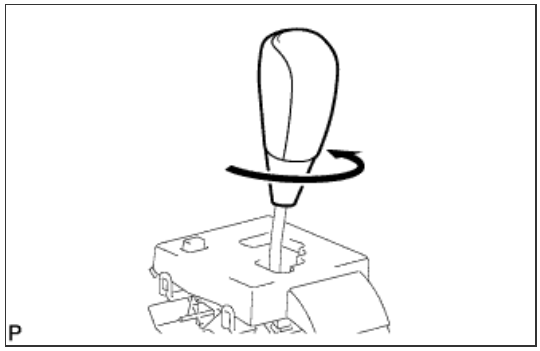
a. Disconnect the 2 connectors.

b. Remove the 4 bolts and floor shift.



for Preparation Click here

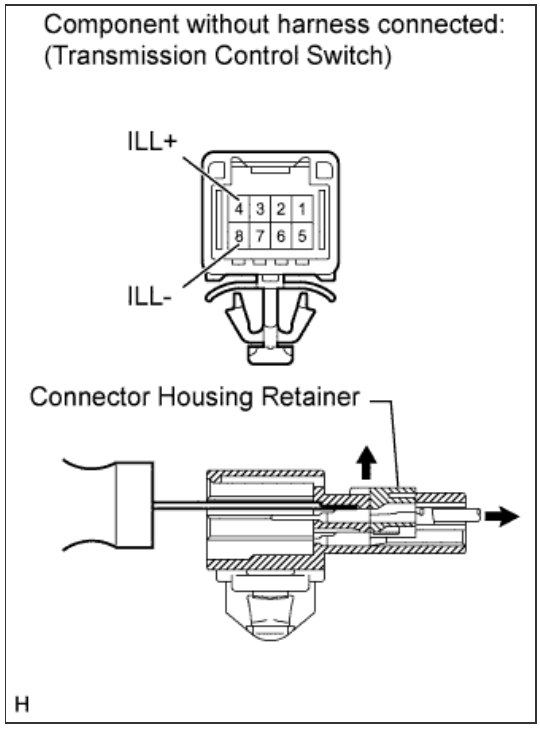
1. REMOVE SHIFT LEVER KNOB SUB-ASSEMBLY



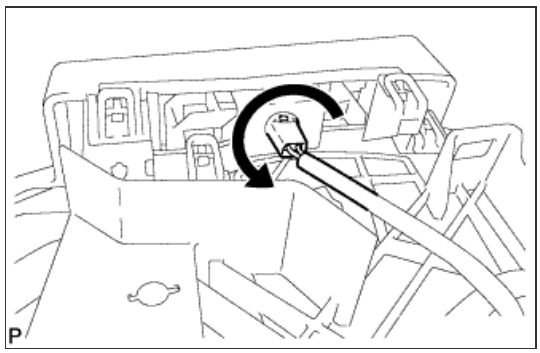
2. REMOVE INDICATOR LIGHT WIRE SUB-ASSEMBLY

a. Using a thin-bladed screwdriver, release the connector housing retainer.

b. Using a thin-bladed screwdriver, pull out the 4 (ILL+) and 8 (ILL-) terminals from the rear as shown in the illustration.

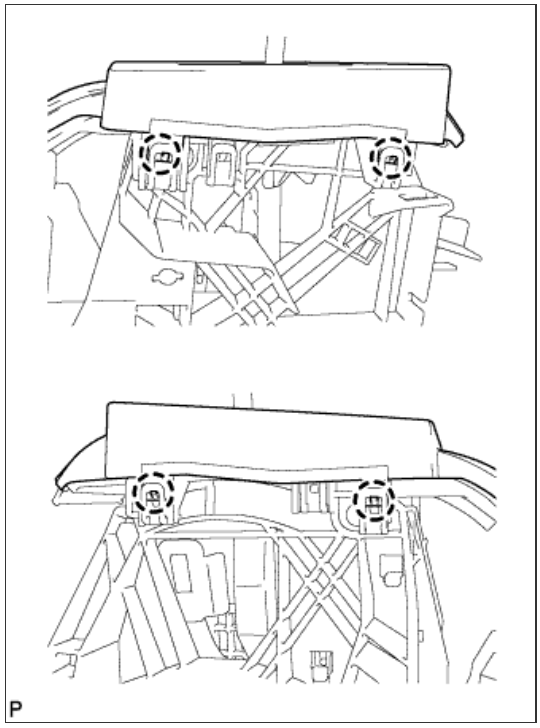


c. Rotate the indicator light wire counterclockwise to align the key part and remove the wire.



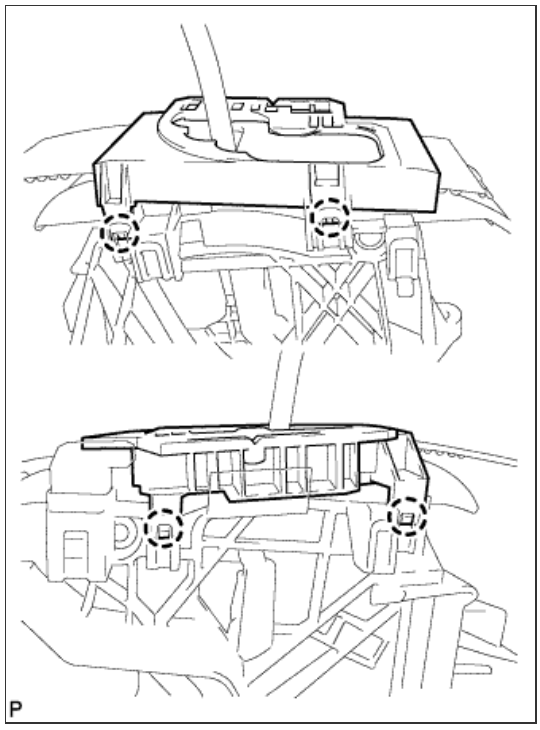
3. REMOVE POSITION INDICATOR HOUSING ASSEMBLY

a. Detach the 4 claws and remove the position indicator housing from the floor shift.



4. REMOVE POSITION INDICATOR LENS

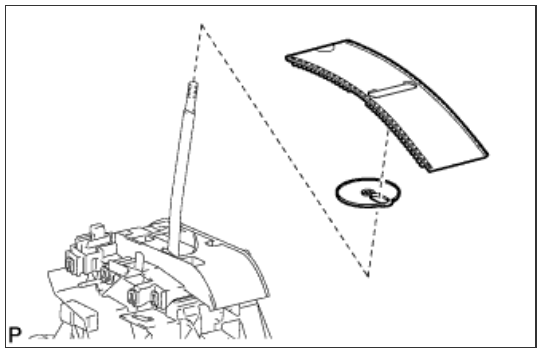
a. Detach the 4 claws and remove the position indicator lens from the floor shift.



5. REMOVE POSITION INDICATOR SLIDE COVER AND NO. 2 POSITION INDICATOR SLIDE COVER

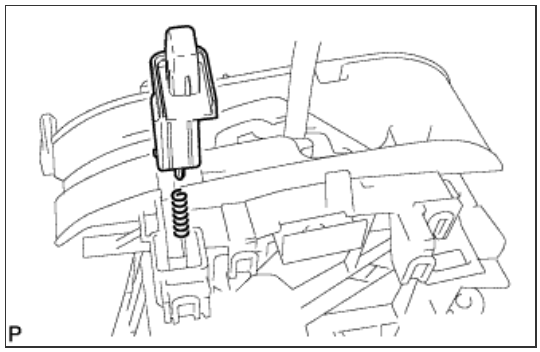
a. Remove the position indicator slide cover with No. 2 position indicator slide cover.

b. Remove the No. 2 position indicator slide cover from the position indicator slide cover.



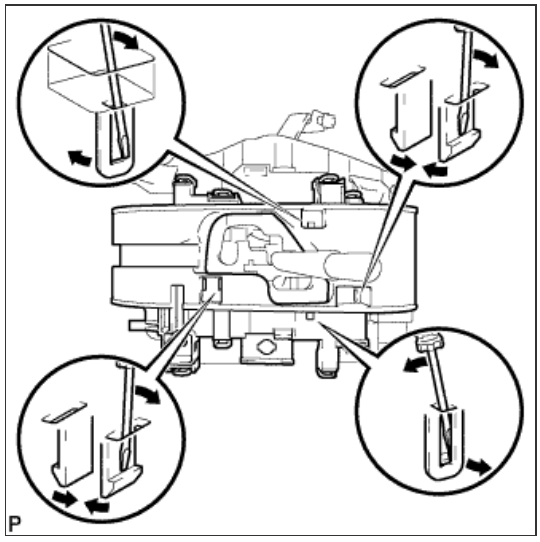
6. REMOVE SHIFT LOCK RELEASE BUTTON

a. Detach the 2 claws and remove the button and spring.



7. REMOVE LOWER POSITION INDICATOR HOUSING

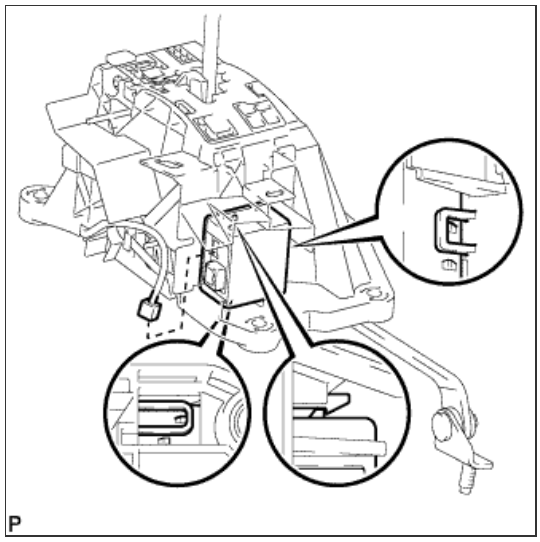
a. Using a small screwdriver, detach the 6 claws and remove the housing.



8. REMOVE SHIFT LOCK CONTROL ECU

a. Disconnect the shift lock solenoid connector.

b. Detach the 3 claws and remove the ECU.


P

for Preparation Click here

1. INSPECT TRANSMISSION CONTROL SWITCH

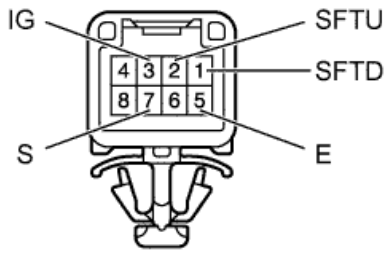
a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
3 (IG) - 7 (S)	Shift lever in S, "+" or "-"	Below 1 Ω
2 (SFTU) - 5 (E)	Shift lever held in "+" (Up-shift)	
1 (SFTD) - 5 (E)	Shift lever held in "-" (Down-shift)	
3 (IG) - 7 (S)	Shift lever not in S, "+" or "-"	10 kΩ or higher
2 (SFTU) - 5 (E)	Shift lever in S	
1 (SFTD) - 5 (E)		

If the result is not as specified, replace the transmission floor shift assembly.

Component without harness connected:
(Transmission Control Switch)



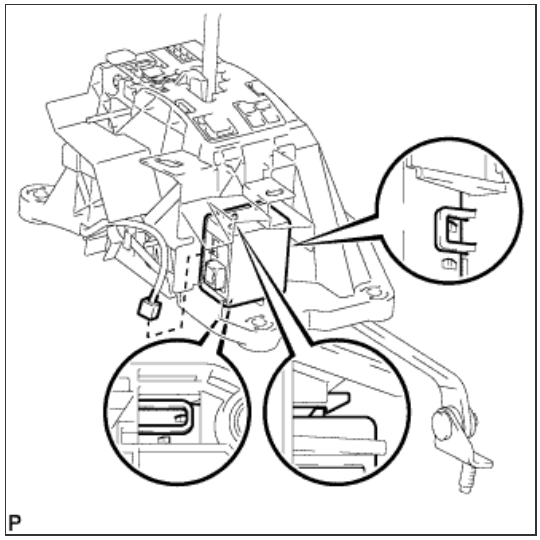
P

for Preparation Click here

1. INSTALL SHIFT LOCK CONTROL ECU

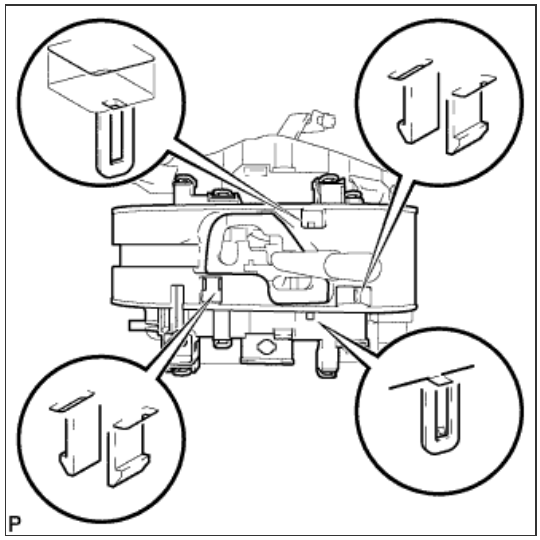
a. Attach the 3 claws to install the ECU to the floor shift.

b. Connect the shift lock solenoid connector.



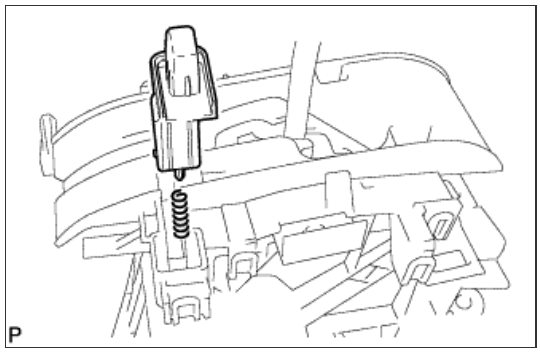
2. INSTALL LOWER POSITION INDICATOR HOUSING

a. Attach the 6 claws to install the housing.



3. INSTALL SHIFT LOCK RELEASE BUTTON

a. Attach the 2 claws to install the spring and button.



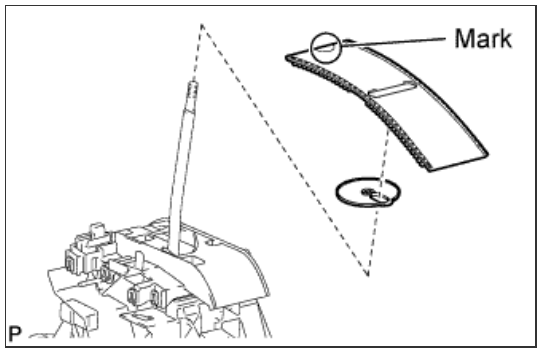
4. INSTALL POSITION INDICATOR SLIDE COVER AND NO. 2 POSITION INDICATOR SLIDE COVER

a. Install the No. 2 position indicator slide cover to the position indicator slide cover.

b. Install the position indicator slide cover together with the No. 2 position indicator slide cover.

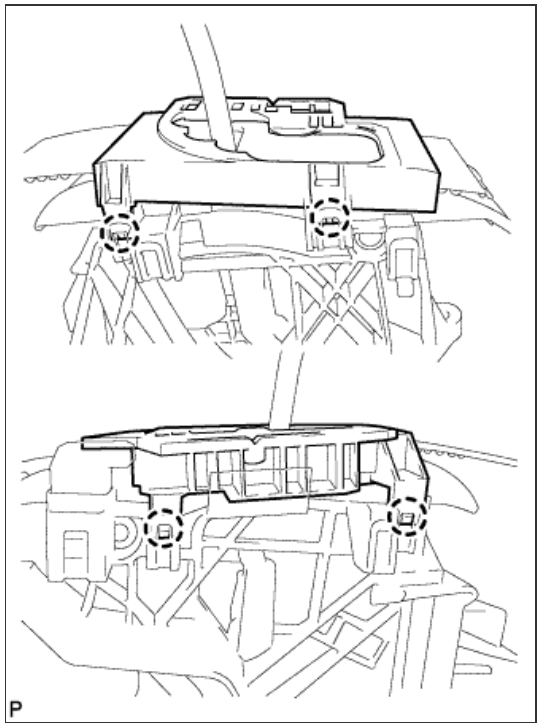
HINT:

Install the position indicator slide cover so that its mark faces the vehicle front.



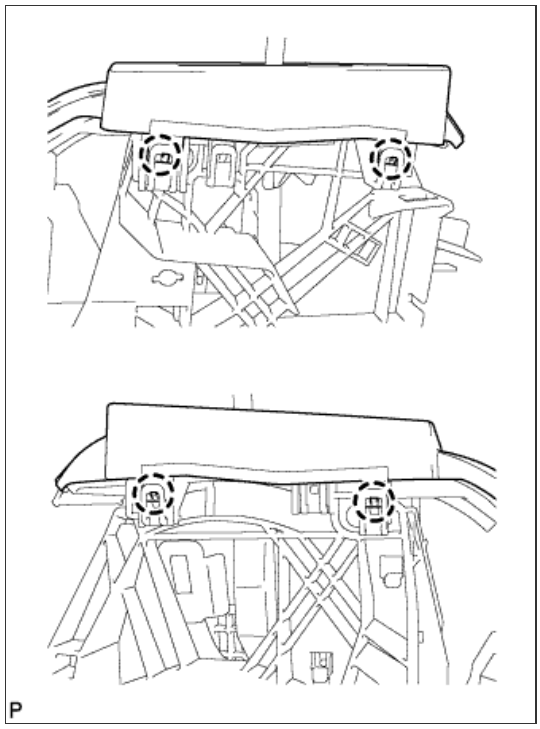
5. INSTALL POSITION INDICATOR LENS

a. Attach the 4 claws to install the position indicator lens.



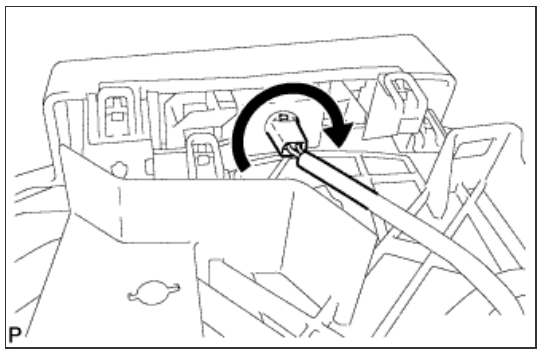
6. INSTALL POSITION INDICATOR HOUSING ASSEMBLY

a. Attach the 4 claws to install the position indicator housing.

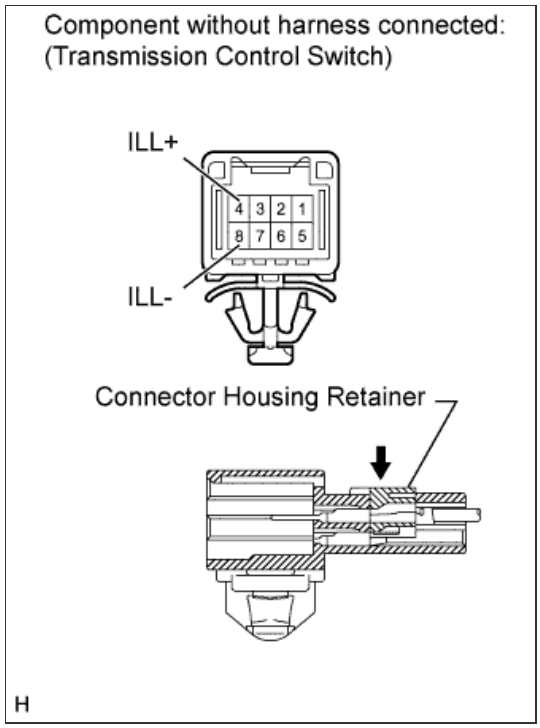


7. INSTALL INDICATOR LIGHT WIRE SUB-ASSEMBLY

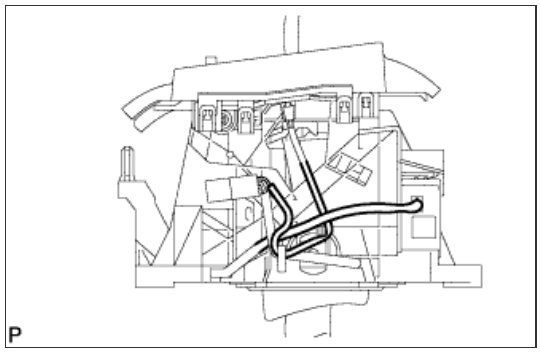
a. Align the wire with the key part of the lower position indicator housing, and install the wire. Then rotate the wire clockwise until it locks.



b. Securely connect the 2 wire terminals to terminal 4 (ILL+) and 8 (ILL-) of the transmission control switch connector. Then push the connector housing retainer to lock it.



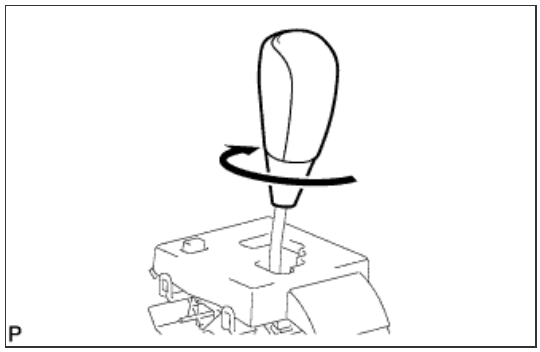
c. Check the shift lock solenoid and indicator light wire harness as shown in the illustration.



8. INSTALL SHIFT LEVER KNOB SUB-ASSEMBLY

Torque:

3 to 5 N*m{ 31 to 51 kgf*cm , 27 to 44 in.*lbf }



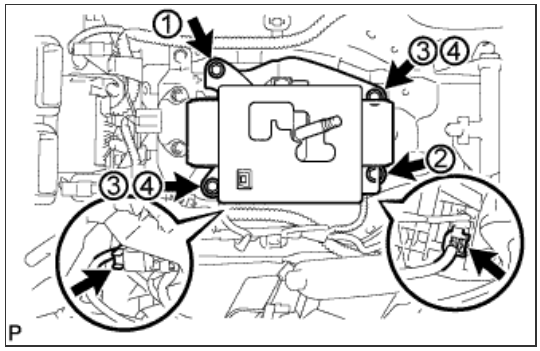
for Preparation Click here

1. INSTALL TRANSMISSION FLOOR SHIFT ASSEMBLY

a. Install the floor shift with the 4 bolts. Tighten the bolts in the order shown in the illustration.

Torque:
14 N*m{ 143 kgf*cm , 10 ft.*lbf }

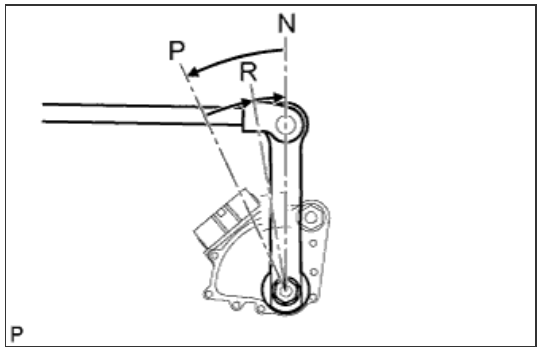
b. Connect the 2 connectors.



2. CONNECT FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

a. Turn the control shaft lever RH of the park/neutral position switch counterclockwise until it stops, and then turn it clockwise 2 notches to set it to the N position.

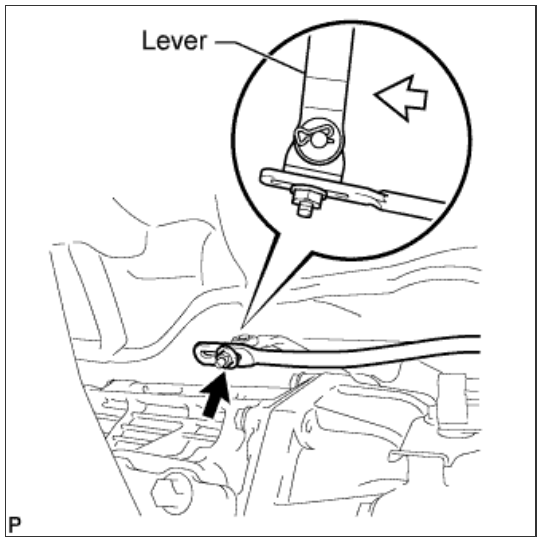
b. Move the shift lever to N.



c. Temporarily install the floor shift gear shifting rod with the nut.

d. Tighten the nut while lightly pushing the lever rearward.

Torque:
13 N*m{ 130 kgf*cm , 9 ft.*lbf }



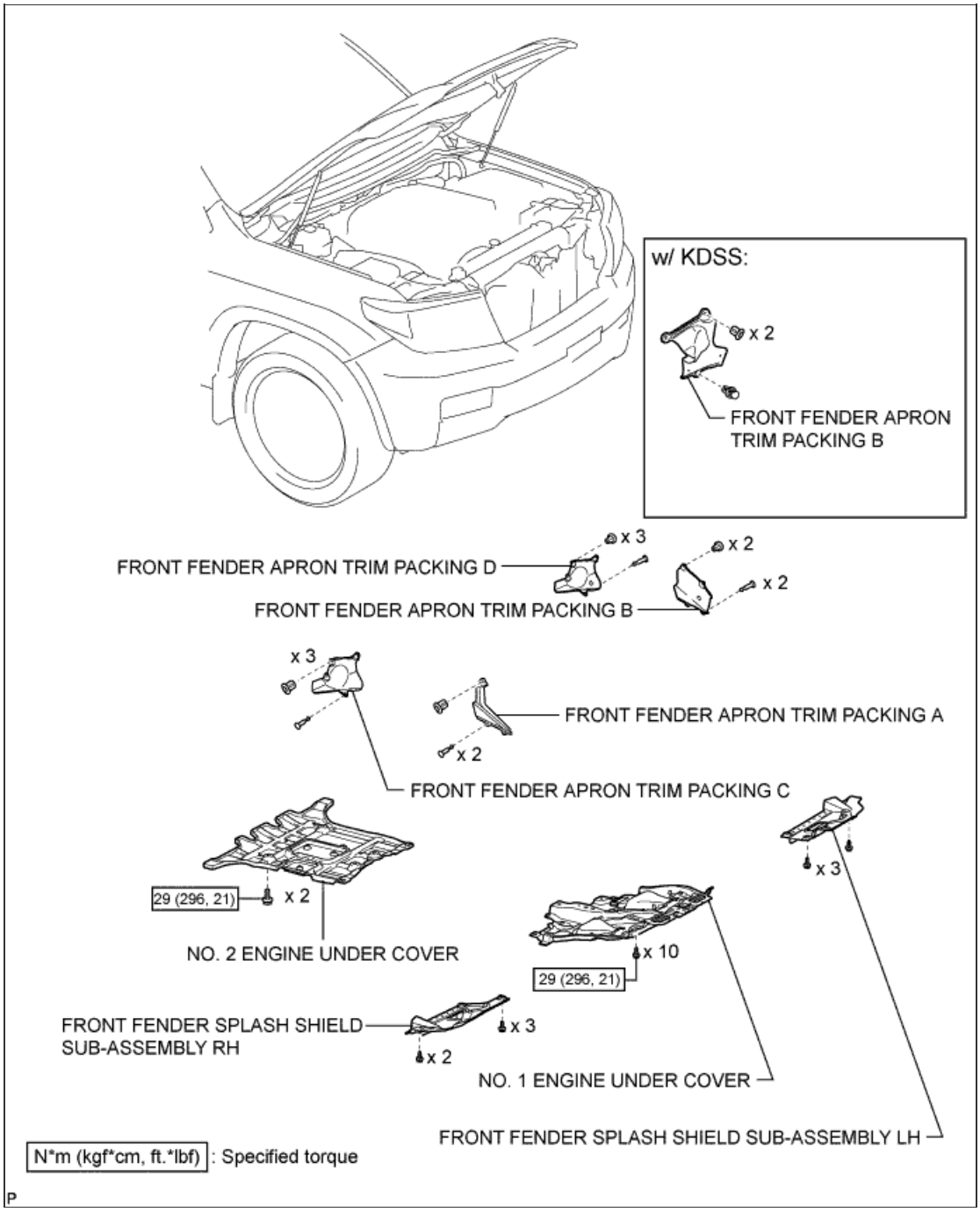
3. INSTALL FRONT CONSOLE BOX (w/o Cool Box)

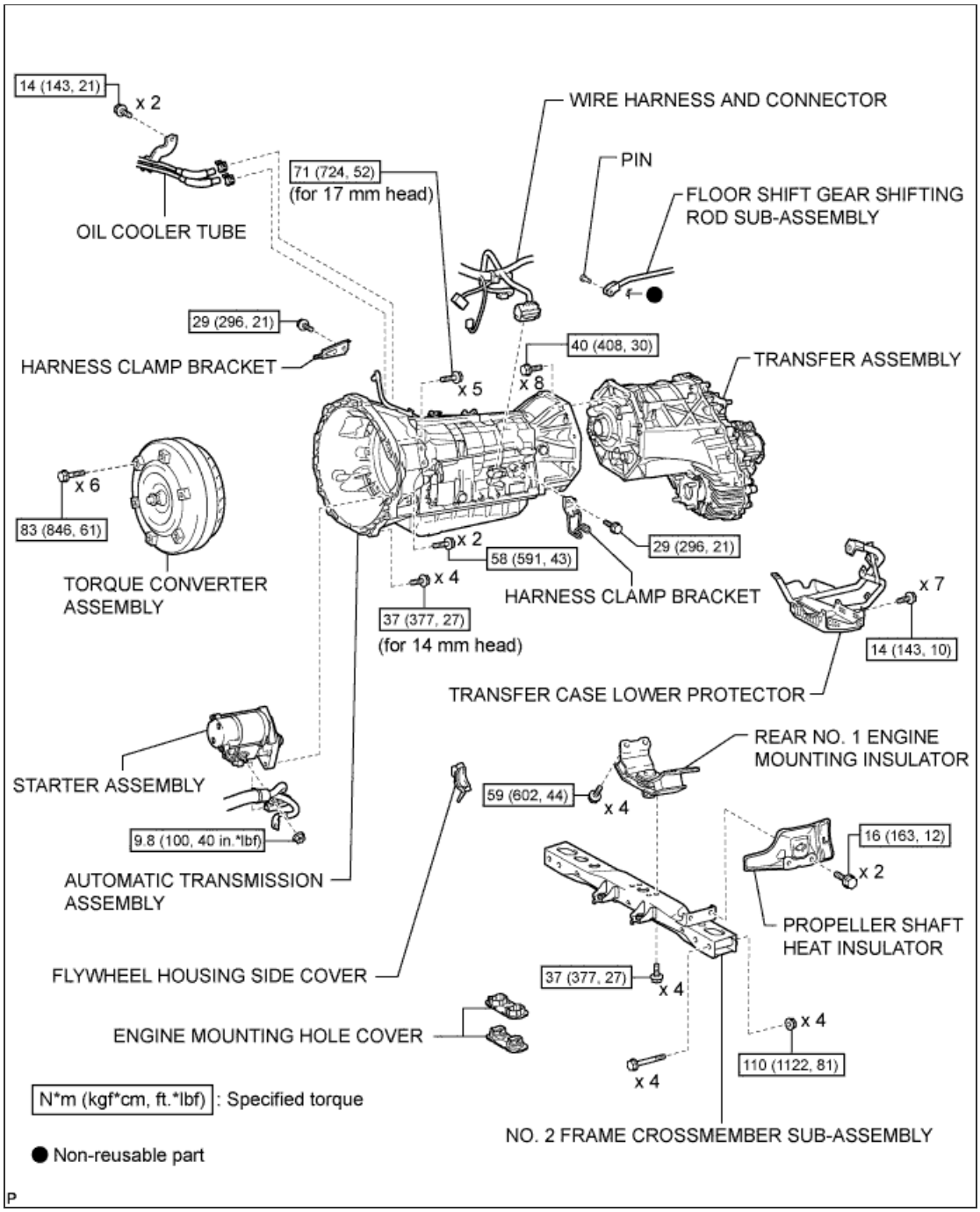
(Click here)

4. INSTALL FRONT CONSOLE BOX (w/ Cool Box)

(Click here)

for Preparation Click here




14 (143, 21)
x 2
OIL COOLER TUBE
71 (724, 52)
(for 17 mm head)
WIRE HARNESS AND CONNECTOR
PIN
FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY
29 (296, 21)
HARNESS CLAMP BRACKET
40 (408, 30)
x 5
x 8
TRANSFER ASSEMBLY
x 6
83 (846, 61)
TORQUE CONVERTER ASSEMBLY
x 2
58 (591, 43)
29 (296, 21)
x 4
37 (377, 27)
(for 14 mm head)
HARNESS CLAMP BRACKET
x 7
14 (143, 10)
TRANSFER CASE LOWER PROTECTOR
STARTER ASSEMBLY
9.8 (100, 40 in.*lbf)
AUTOMATIC TRANSMISSION ASSEMBLY
REAR NO. 1 ENGINE MOUNTING INSULATOR
59 (602, 44)
x 4
16 (163, 12)
x 2
PROPELLER SHAFT HEAT INSULATOR
FLYWHEEL HOUSING SIDE COVER
37 (377, 27)
x 4
ENGINE MOUNTING HOLE COVER
x 4
110 (1122, 81)
x 4
N*m (kgf*cm, ft.*lbf) : Specified torque
NO. 2 FRAME CROSSMEMBER SUB-ASSEMBLY
● Non-reusable part
P

for Preparation Click here

1. PRECAUTION

NOTICE:

After turning the engine switch off, waiting time may be required before disconnecting the cable from the battery terminal. Therefore, make sure to read the disconnecting the cable from the battery terminal notice before proceeding with work (Click here).

2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

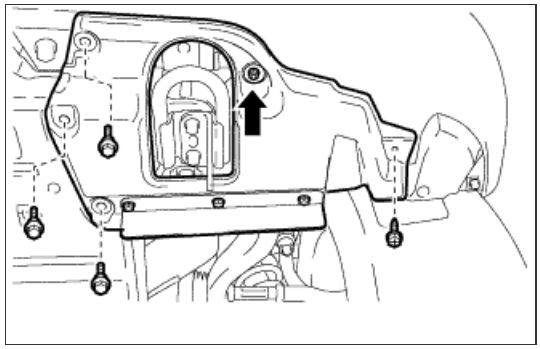
NOTICE:

When disconnecting the cable, some systems need to be initialized after the cable is reconnected (Click here).

3. REMOVE FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY LH

a. Remove the 3 bolts and screw.

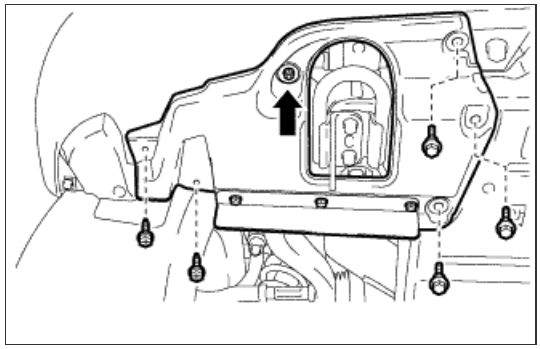
b. Turn the clip indicated by the arrow in the illustration to remove the front fender splash shield sub-assembly LH.



4. REMOVE FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY RH

a. Remove the 3 bolts and 2 screws.

b. Turn the clip indicated by the arrow in the illustration to remove the front fender splash shield sub-assembly RH.

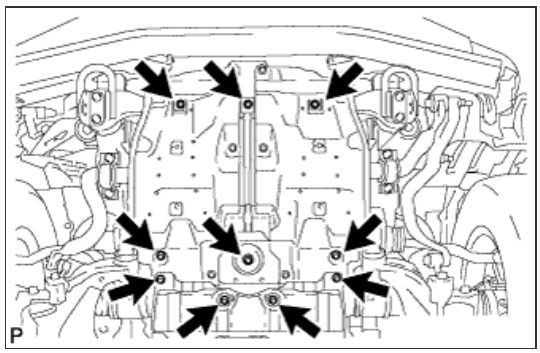


5. REMOVE NO. 2 ENGINE UNDER COVER

a. Remove the 2 bolts and No. 2 engine under cover.

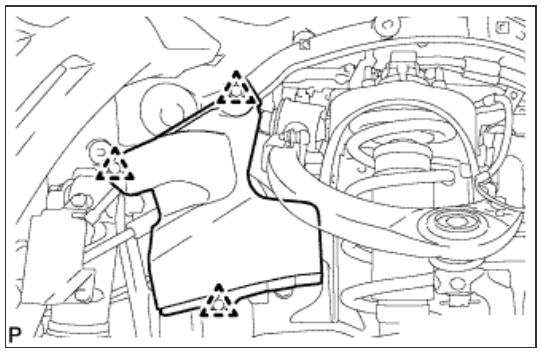
6. REMOVE NO. 1 ENGINE UNDER COVER

a. Remove the 10 bolts and No. 1 engine under cover.

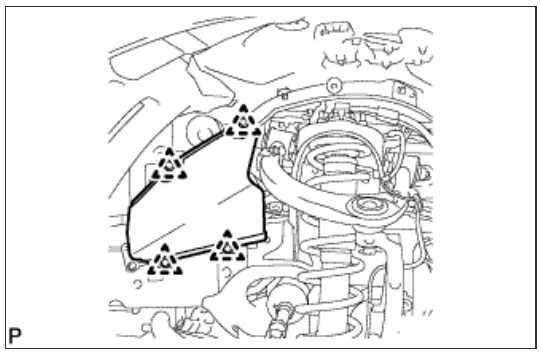


7. REMOVE FRONT FENDER APRON TRIM PACKING B

a. w/ KDSS:
Remove the 3 clips and front fender apron trim packing B.

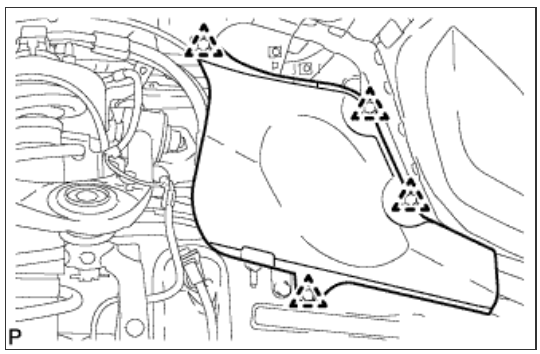


b. w/o KDSS:
Remove the 4 clips and front fender apron trim packing B.



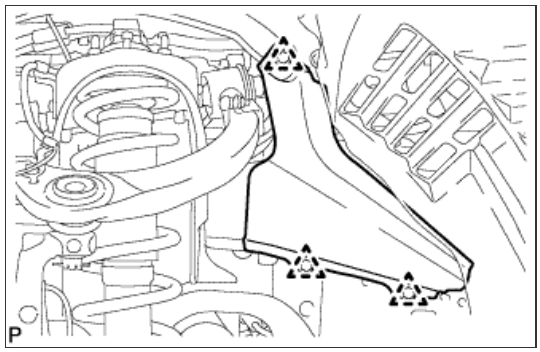
8. REMOVE FRONT FENDER APRON TRIM PACKING D

a. Remove the 4 clips and front fender apron trim packing D.



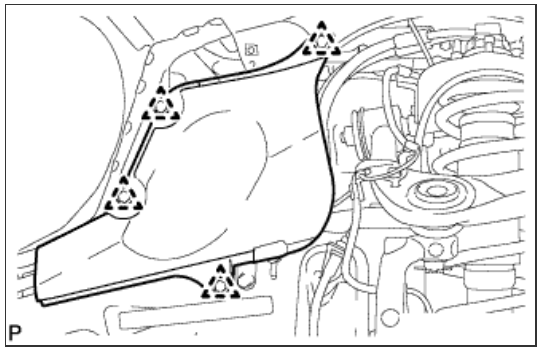
9. REMOVE FRONT FENDER APRON TRIM PACKING A

a. Remove the 3 clips and front fender apron trim packing A.



10. REMOVE FRONT FENDER APRON TRIM PACKING C

a. Remove the 4 clips and front fender apron trim packing C.



11. DRAIN AUTOMATIC TRANSMISSION FLUID

a. Remove the drain plug and gasket, and drain the ATF.

b. Install a new gasket and the drain plug.

Torque:
20 N*m{ 204 kgf*cm , 15 ft.*lbf }

12. REMOVE FRONT PROPELLER SHAFT ASSEMBLY

(Click here)

13. REMOVE PROPELLER SHAFT ASSEMBLY

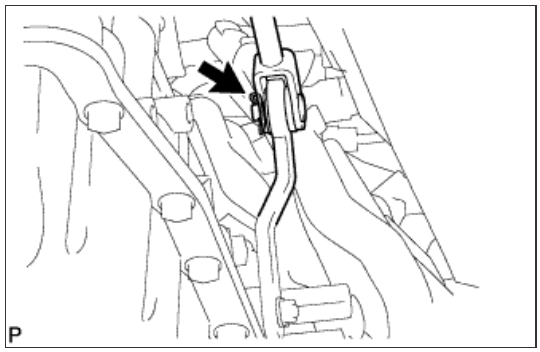
(Click here)

14. REMOVE EXHAUST PIPE

(Click here)

15. DISCONNECT FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

a. Remove the clip and pin, and disconnect the gear shifting rod from the transmission control shaft lever RH.

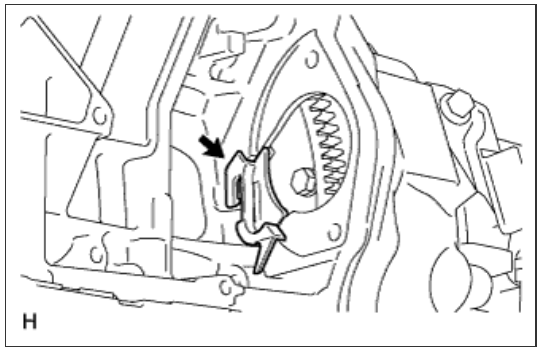


16. REMOVE STARTER ASSEMBLY

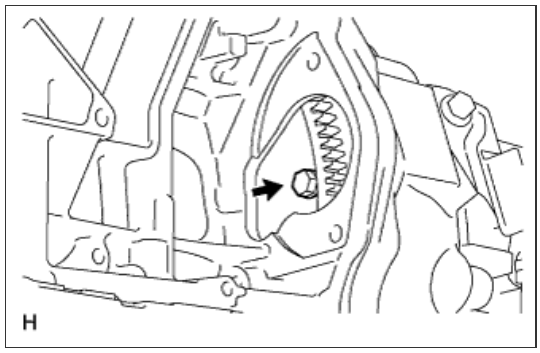
(Click here)

17. REMOVE DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT

a. Remove the flywheel housing side cover.

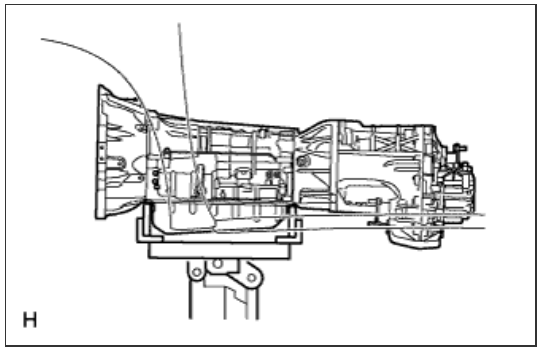


b. Turn the crankshaft to gain access to the 6 bolts and remove each bolt while holding the crankshaft pulley setting bolt with a wrench.



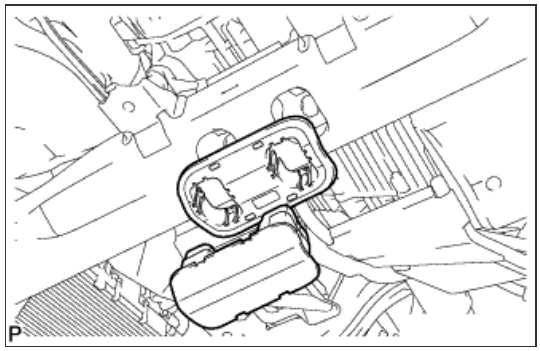
18. SUPPORT AUTOMATIC TRANSMISSION ASSEMBLY

a. Support the transmission with a transmission jack. Lift the transmission slightly from the crossmember.

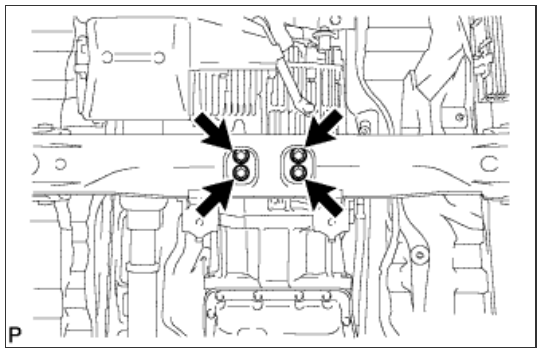


19. REMOVE NO. 2 FRAME CROSSMEMBER SUB-ASSEMBLY

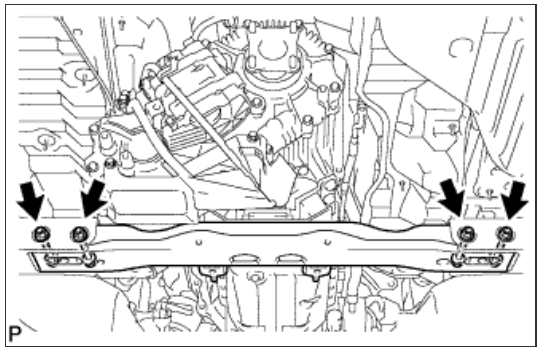
a. Remove the engine mounting hole cover.



b. Remove the 4 bolts of the rear engine mounting insulator.

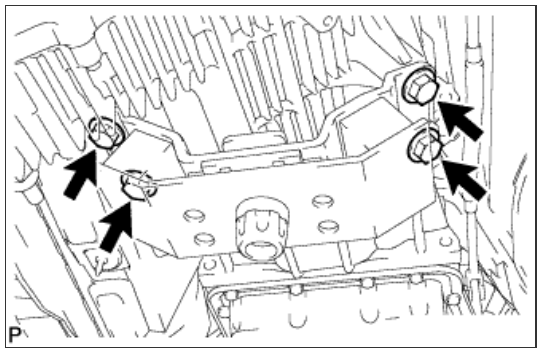


c. Remove the 4 nuts, 4 bolts and frame crossmember.



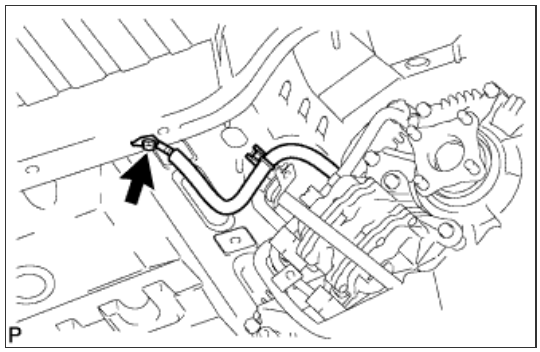
20. REMOVE REAR NO. 1 ENGINE MOUNTING INSULATOR

a. Remove the 4 bolts and rear engine mounting insulator from the transmission.



21. DISCONNECT WIRE HARNESS AND CONNECTOR

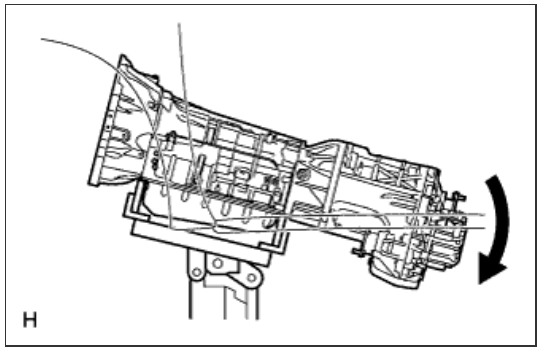
a. Remove the bolt and disconnect the ground cable.



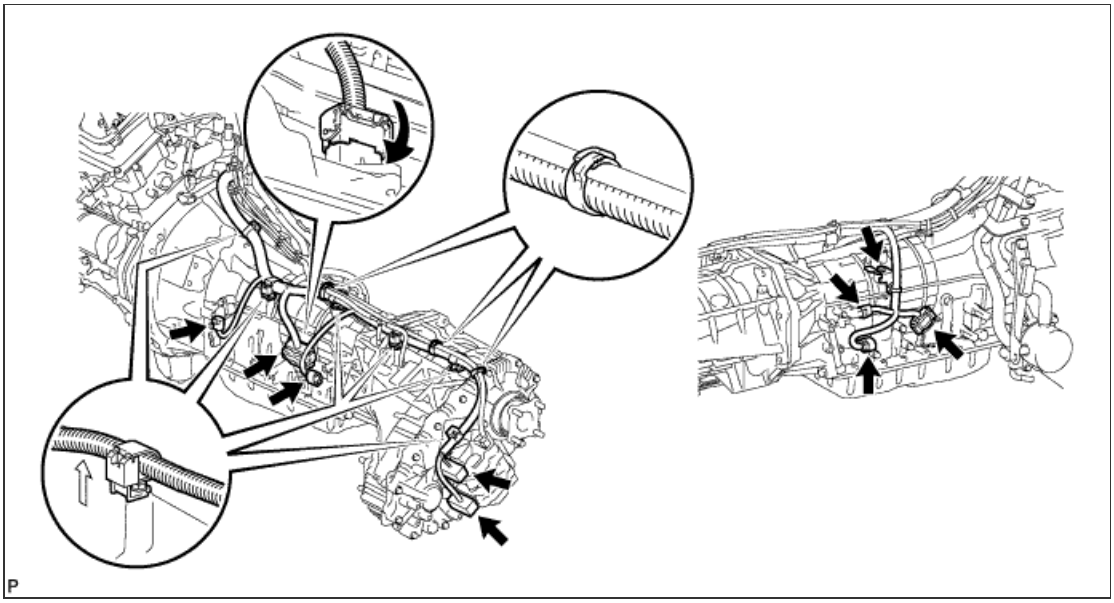
b. Tilt the transmission downward.

NOTICE:

Make sure the cooling fan does not contact the fan shroud.



c. Disconnect the park/neutral position switch connector, transmission wire connector, 2 transmission speed sensor connectors and 2 transfer control side connectors.



HINT:

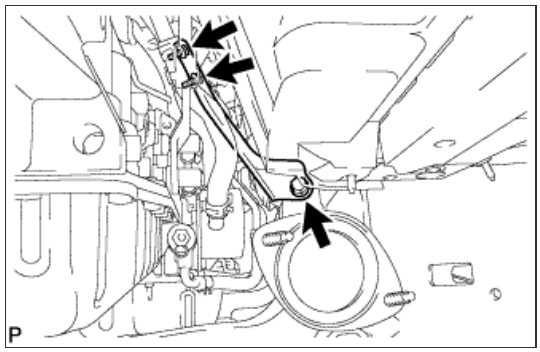
Detach the claw, press down the lever, and then disconnect the transmission wire connector.

d. Disconnect the 2 connector clamps and 6 harness clamps.

e. Remove the bolt and disconnect the wire harness.

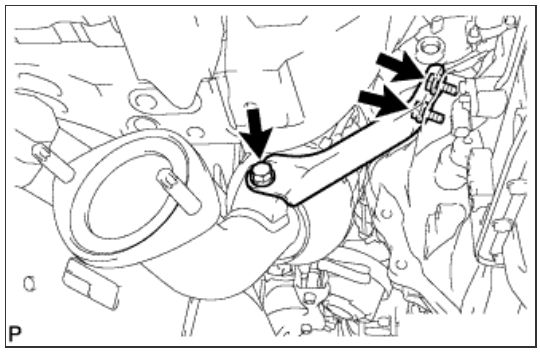
22. REMOVE MANIFOLD STAY

a. Remove the 3 bolts and stay.



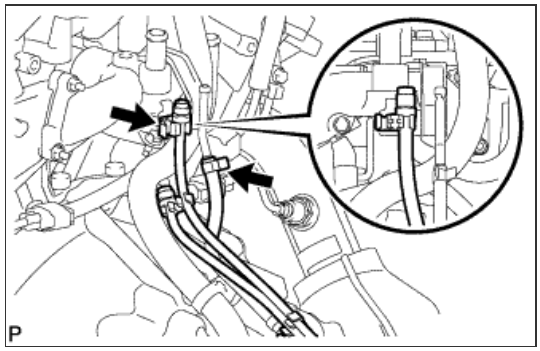
23. REMOVE NO. 2 MANIFOLD STAY

a. Remove the 3 bolts and stay.



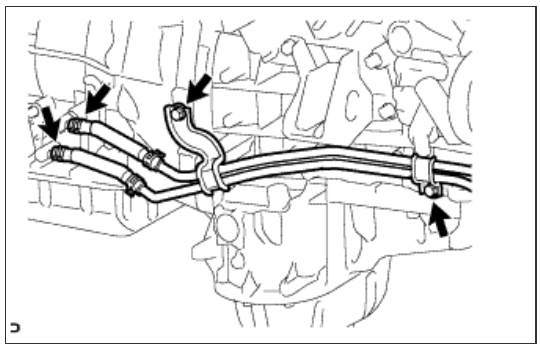
24. DISCONNECT BREATHER PLUG HOSE

a. Disconnect the breather plug hose and detach the transfer breather hose.



25. DISCONNECT OIL COOLER TUBE

a. Remove the 2 bolts and disconnect the 2 hoses from the transmission, and separate the oil cooler tube from the engine.

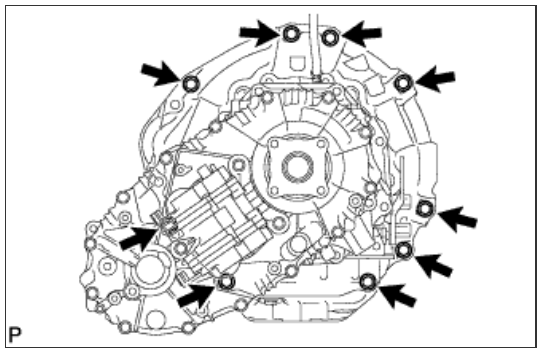


26. REMOVE AUTOMATIC TRANSMISSION ASSEMBLY

a. Remove the 9 bolts and transmission.

NOTICE:

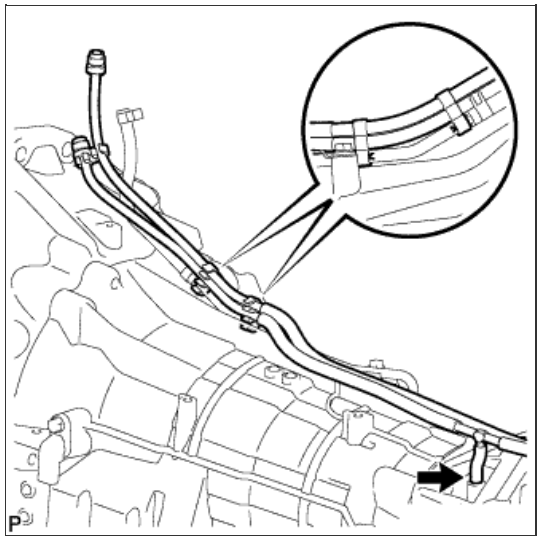
Do not use excess force when prying the transmission assembly.



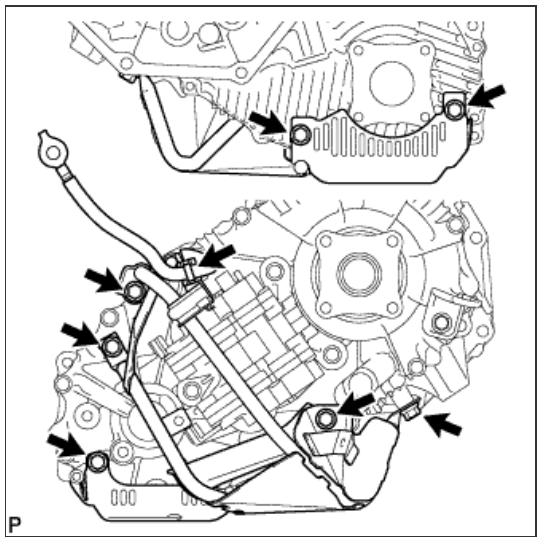
27. REMOVE TRANSFER ASSEMBLY

a. Detach the 2 breather hose clamps from the automatic transmission breather tube.

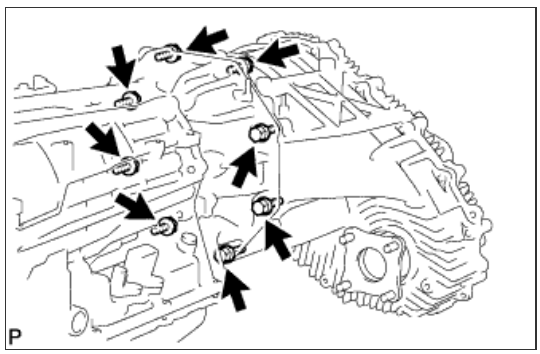
b. Disconnect the clamp of the ground cable from the transfer case lower protector.



c. Remove the 7 bolts and transfer case lower protector.



d. Remove the 8 bolts and transfer.



28. REMOVE TORQUE CONVERTER CLUTCH ASSEMBLY

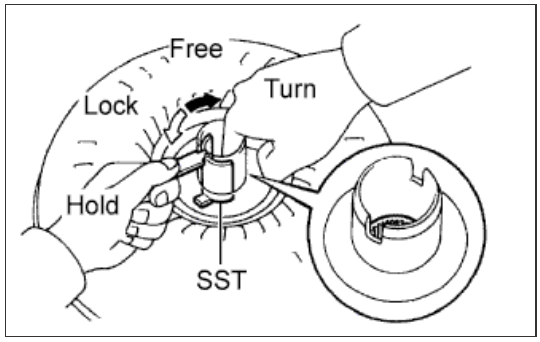
29. INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

a. Inspect the 1-way clutch.

i. Install SST to the inner race of the 1-way clutch.

SST
09350-32014 (09351-32020)

ii. Press on the serrations of the starter with a finger and rotate it. Check that it rotates smoothly when turned clockwise and locks when turned counterclockwise.
If the results are not as specified, clean the converter and recheck the 1-way clutch. If the results still are not as specified, replace the torque converter clutch assembly.



b. Determine the condition of the torque converter clutch.

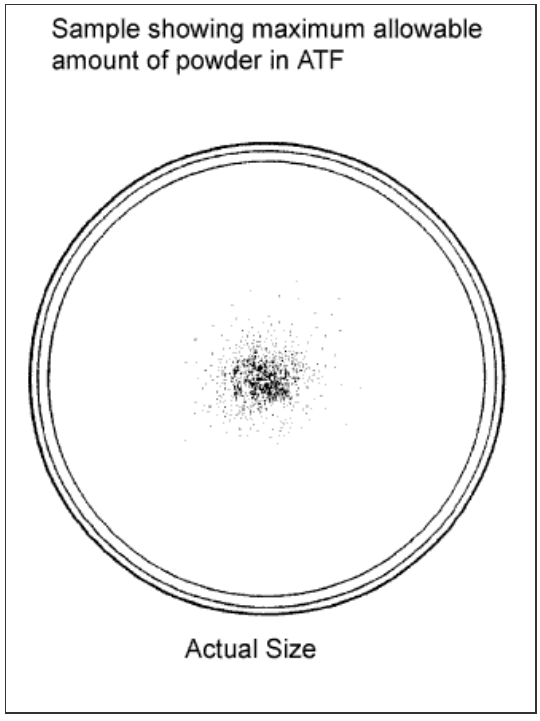
i. Check that the following conditions are met:

- During the stall test or when the shift lever is in N, metallic sounds are not emitted from the torque converter clutch.
- The 1-way clutch turns in one direction and locks in the other direction.
- The amount of powder in the ATF is not more than the sample shown in the illustration.

If the results are not as specified, replace the torque converter clutch assembly.

HINT:

The sample illustration shows approximately 0.25 liters (0.26 US qts, 0.22 Imp. qts) of ATF taken from a removed torque converter clutch.



c. Replace the ATF in the torque converter clutch.

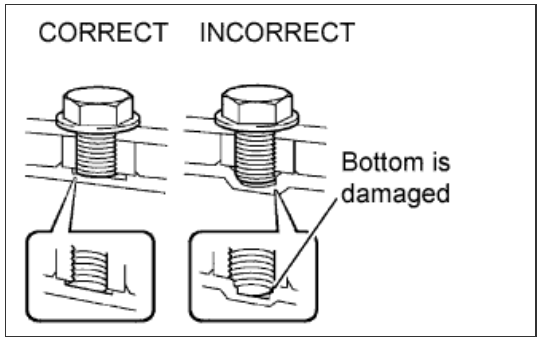
i. If the ATF is discolored and/or has a foul odor, stir the ATF in the torque converter clutch thoroughly and drain the ATF with the torque converter facing upward.

d. Prevent deformation of the torque converter clutch and damage to the oil pump gear.

i. When any marks due to interference are found on the end of the bolt for the torque converter clutch and on the bottom of the bolt hole, replace the bolt and torque converter clutch.

ii. All of the bolts should be the same length.

iii. Make sure no spring washers are missing.

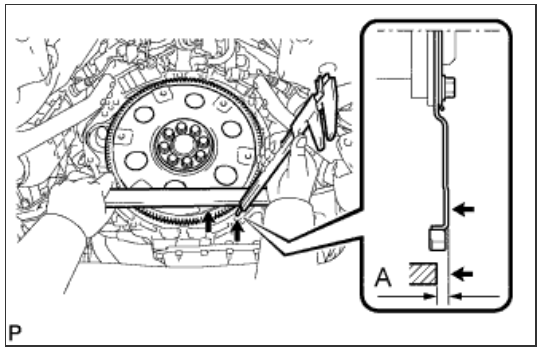


for Preparation Click here

1. INSTALL TORQUE CONVERTER CLUTCH ASSEMBLY

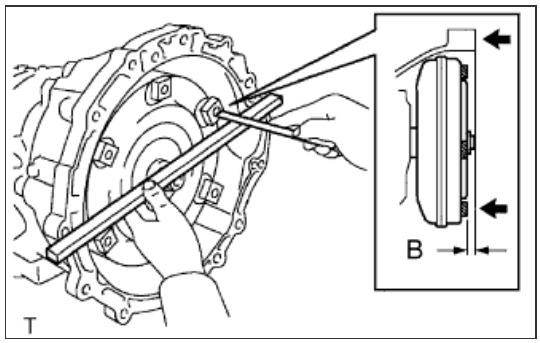
a. Using a vernier caliper and straightedge, measure dimension A between the end surface of the engine and the torque converter contact surface of the drive plate.

b. Install the torque converter clutch to the transmission housing.



c. Using a vernier caliper and straightedge, measure dimension B shown in the illustration and check that B is more than A measured in the first step.

Standard distance:
B = A + 1.00 mm (0.0394 in.) or more



2. INSTALL TRANSFER ASSEMBLY

a. Install the transfer with the 8 bolts.

Torque:
40 N*m{ 408 kgf*cm , 30 ft.*lbf }

NOTICE:

Be careful not to damage the oil seal of the transfer adapter.

b. Install the transfer case lower protector with the 7 bolts.

Torque:
14 N*m{ 143 kgf*cm , 10 ft.*lbf }

c. Connect the clamp of the ground cable to the transfer case lower protector.

d. Attach the 2 breather hose clamps to connect the transfer breather hose to the automatic transmission breather tube.

3. INSTALL HARNESS CLAMP BRACKET

a. Install the 2 harness clamp brackets with the 2 bolts.

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

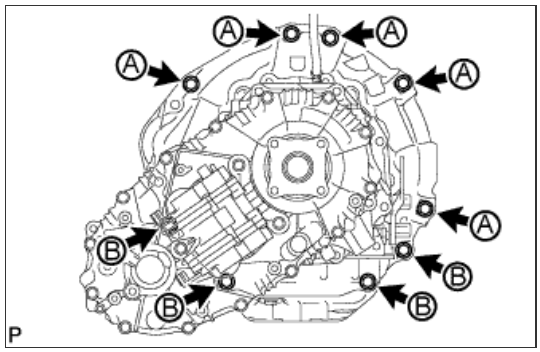
4. INSTALL AUTOMATIC TRANSMISSION ASSEMBLY

NOTICE:

Check that the 2 straight pins are attached to the engine side.

a. Install the transmission with the 9 bolts.

Torque:
for 17 mm head bolt A:
71 N*m{ 724 kgf*cm , 52 ft.*lbf }
for 14 mm head bolt B:
37 N*m{ 377 kgf*cm , 27 ft.*lbf }



5. CONNECT OIL COOLER TUBE

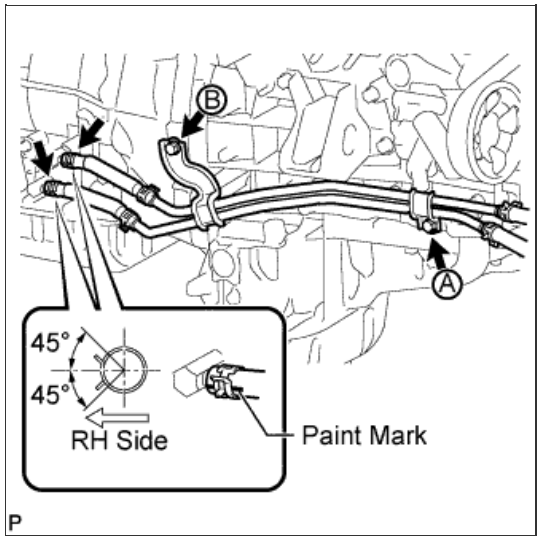
a. Temporarily install the oil cooler tube to the engine with the bolt A. Install the bolt B and tighten it to the specified torque. Then tighten the bolt A to the specified torque.

Torque:
14 N*m{ 143 kgf*cm , 21 ft.*lbf }

b. Connect the 2 transmission oil cooler hoses to the oil cooler tube union.

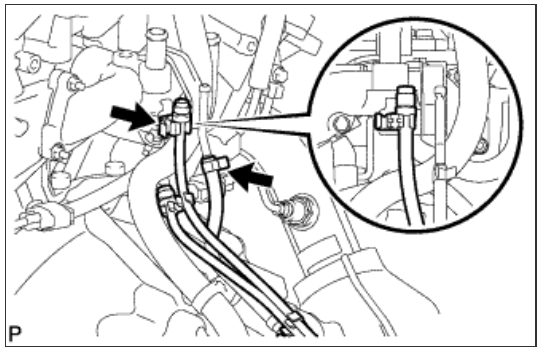
NOTICE:

- **Make sure the pinching portion of each clip is facing the direction shown in the illustration.**
- **Make sure the paint mark of each hose is facing outward.**



6. CONNECT BREATHER PLUG HOSE

a. Connect the breather plug hose and attach the transfer breather hose.



7. INSTALL NO. 2 MANIFOLD STAY

a. Install the stay with the 3 bolts.

Torque:
40 N*m{ 408 kgf*cm , 30 ft.*lbf }

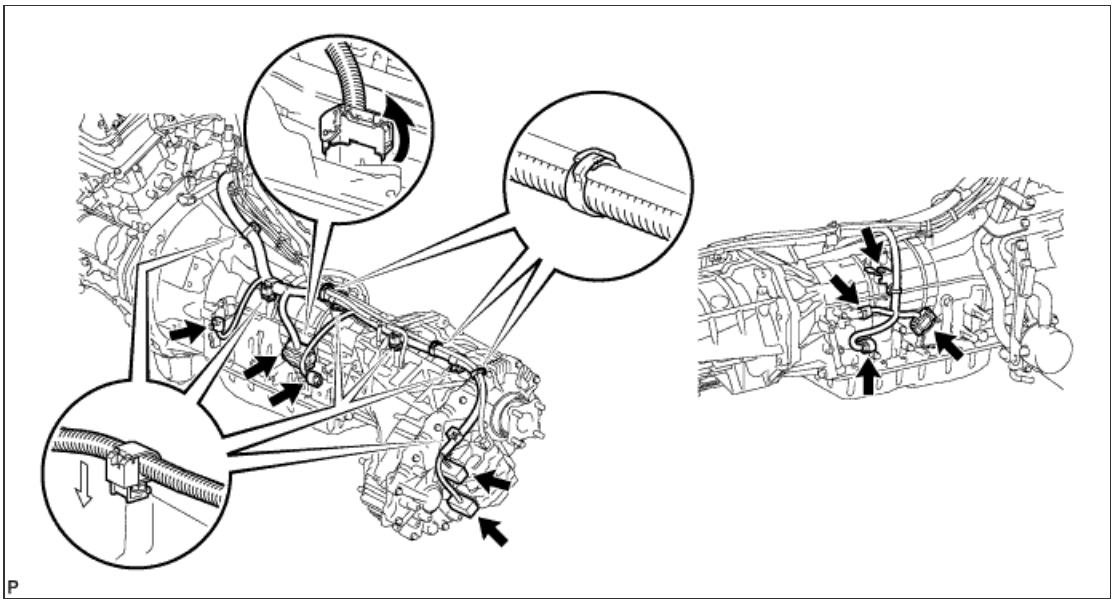
8. INSTALL MANIFOLD STAY

a. Install the stay with the 3 bolts.

Torque:
40 N*m{ 408 kgf*cm , 30 ft.*lbf }

9. CONNECT WIRE HARNESS AND CONNECTOR

a. Connect the park/neutral position switch connector, transmission wire connector, 2 speed sensor connectors and 2 transfer control side connectors.



HINT:

Push up the lever until the claw of the transmission wire connector makes a connection sound.

b. Connect the harness with the bolt.

Torque:
8.0 N*m{ 82 kgf*cm , 71 in.*lbf }

c. Connect the 2 connector clamps and 6 harness clamps.

d. Tilt up the automatic transmission.

e. Connect the ground cable with the bolt.

Torque:
8.4 N*m{ 86 kgf*cm , 74 in.*lbf }

10. INSTALL REAR NO. 1 ENGINE MOUNTING INSULATOR

a. Install the rear engine mounting insulator to the transmission with the 4 bolts.

Torque:
59 N*m{ 602 kgf*cm , 44 ft.*lbf }

11. INSTALL NO. 2 FRAME CROSSMEMBER SUB-ASSEMBLY

a. Install the frame crossmember to the rear engine mounting insulator with the 4 bolts.

Torque:
37 N*m{ 377 kgf*cm , 27 ft.*lbf }

b. Install the frame crossmember to the frame with the 4 bolts and 4 nuts.

Torque:
110 N*m{ 1122 kgf*cm , 81 ft.*lbf }

c. Install the engine mounting hole cover.

12. INSTALL DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT

a. Turn the crankshaft to gain access to the installation locations of the 6 bolts and install each bolt while holding the crankshaft pulley setting bolt with a wrench.

Torque:
48 N*m{ 489 kgf*cm , 35 ft.*lbf }

NOTICE:

First install the black colored bolt and then install the remaining 5 bolts.

b. Install the flywheel housing side cover.

13. INSTALL STARTER ASSEMBLY

(Click here)

14. CONNECT FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

a. Connect the gear shifting rod to the transmission control shaft lever RH with the pin and a new clip.

15. INSTALL EXHAUST PIPE

(Click here)

16. INSTALL PROPELLER SHAFT ASSEMBLY

(Click here)

17. INSTALL FRONT PROPELLER SHAFT ASSEMBLY

(Click here)

18. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

NOTICE:

When disconnecting the cable, some systems need to be initialized after the cable is reconnected (Click here).

19. ADD AUTOMATIC TRANSMISSION FLUID

(Click here)

20. INSPECT SHIFT LEVER POSITION

a. When moving the shift lever from P to R with the engine switch on (IG) and the brake pedal depressed, make sure that it moves smoothly and correctly into position.

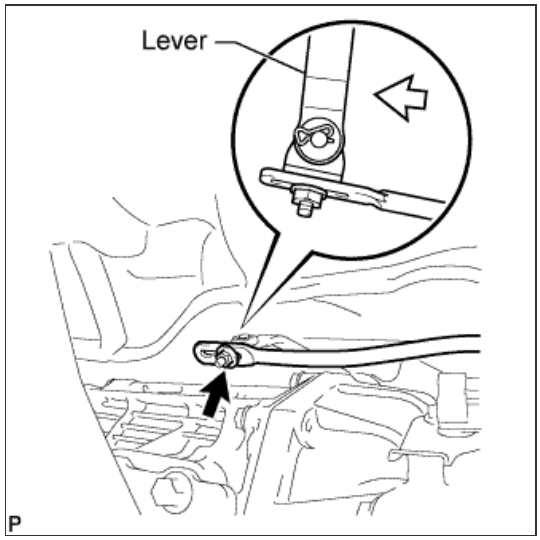
b. Check that the shift lever does not stop when moving the shift lever from R to P, and check that the shift lever does not stick when moving the shift lever from D to S.

c. Start the engine and make sure that the vehicle moves forward after moving the shift lever from N to D and moves rearward after moving the shift lever to R.
If there are no problems during the above inspections, perform the adjustment using the following procedures.

i. Move the shift lever to N

ii. Loosen the nut of the floor shift gear shifting rod. Then, with the lever of the floor shift assembly lightly pushed towards the rear of the vehicle, tighten the nut.

Torque:
13 N*m{ 130 kgf*cm , 9 ft.*lbf }



21. INSPECT FOR EXHAUST GAS LEAK

If gas is leaking, tighten the areas necessary to stop the leak. Replace damaged parts as necessary.

22. INSTALL FRONT FENDER APRON TRIM PACKING B

a. w/ KDSS:
Install the front fender apron trim packing B with the 3 clips.

b. w/o KDSS:
Install the front fender apron trim packing B with the 4 clips.

23. INSTALL FRONT FENDER APRON TRIM PACKING A

a. Install the front fender apron trim packing A with the 3 clips.

24. INSTALL FRONT FENDER APRON TRIM PACKING D

a. Install the front fender apron trim packing D with the 4 clips.

25. INSTALL FRONT FENDER APRON TRIM PACKING C

a. Install the front fender apron trim packing C with the 4 clips.

26. INSTALL NO. 1 ENGINE UNDER COVER

a. Install the No. 1 engine under cover with the 10 bolts.

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

27. INSTALL NO. 2 ENGINE UNDER COVER

a. Install the No. 2 engine under cover with the 2 bolts.

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

28. INSTALL FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY LH

a. Push in the clip to install the front fender splash shield sub-assembly LH.

b. Install the 3 bolts and screw.

29. INSTALL FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY RH

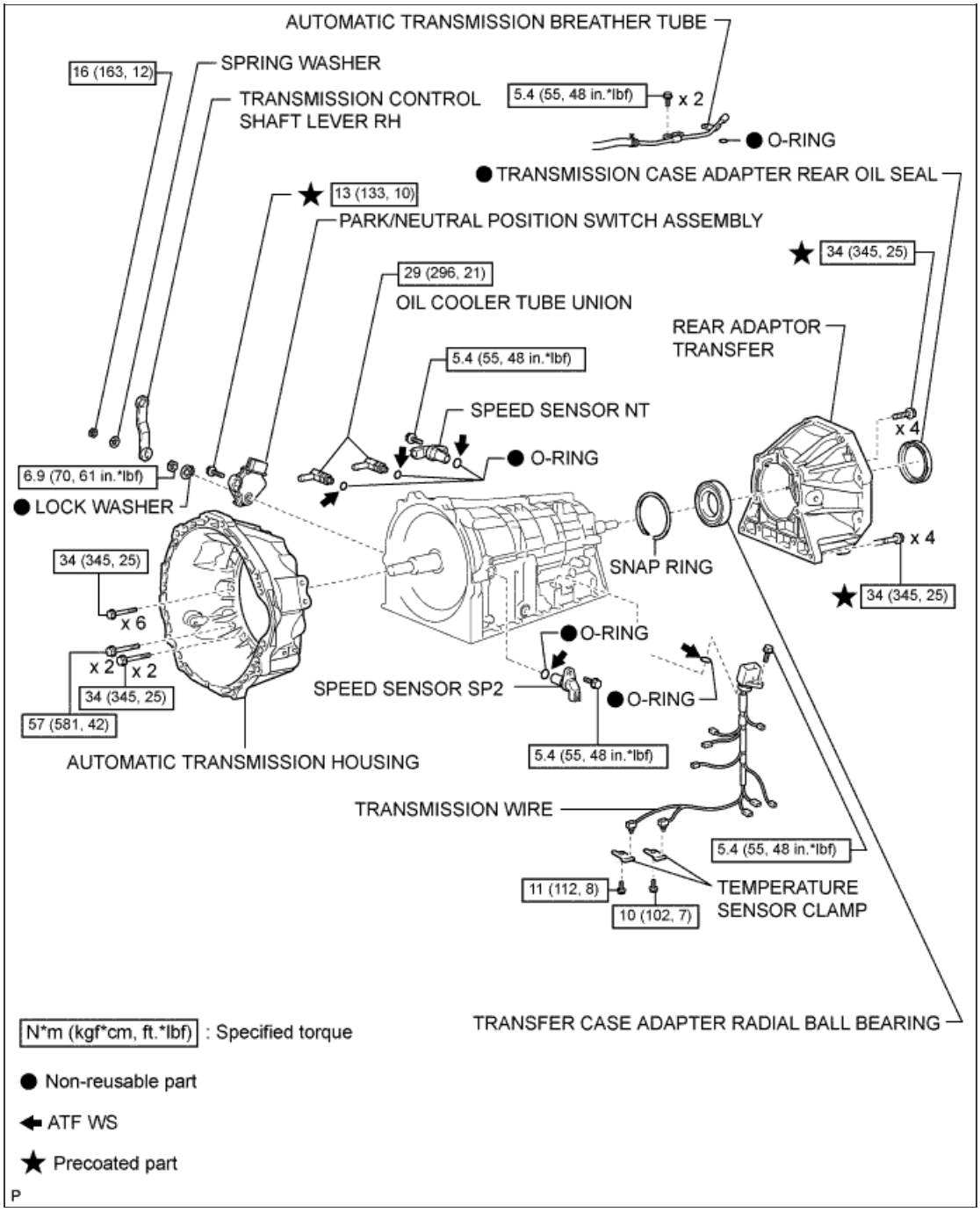
a. Push in the clip to install the front fender splash shield sub-assembly RH.

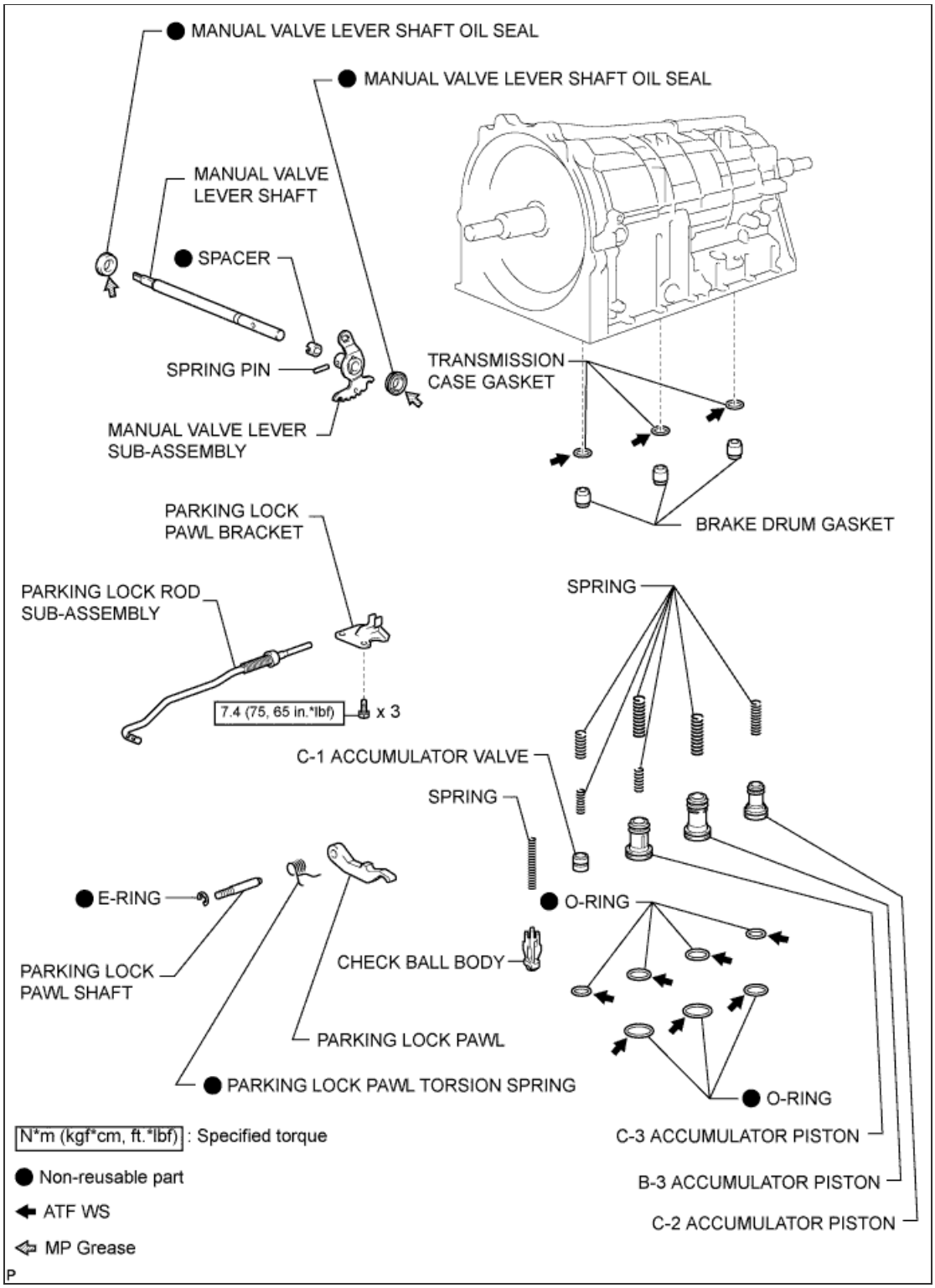
b. Install the 3 bolts and 2 screws.

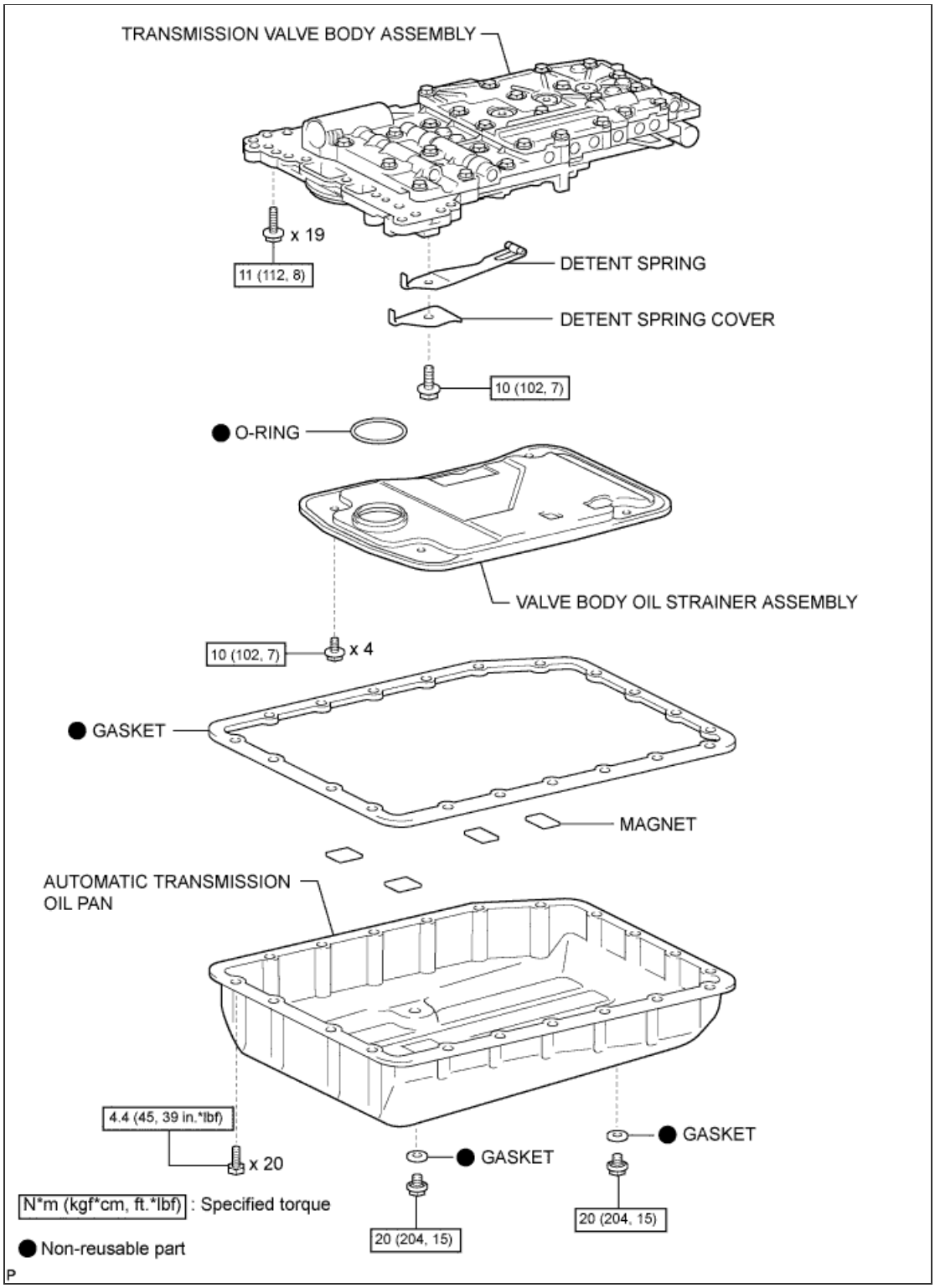
30. RESET MEMORY

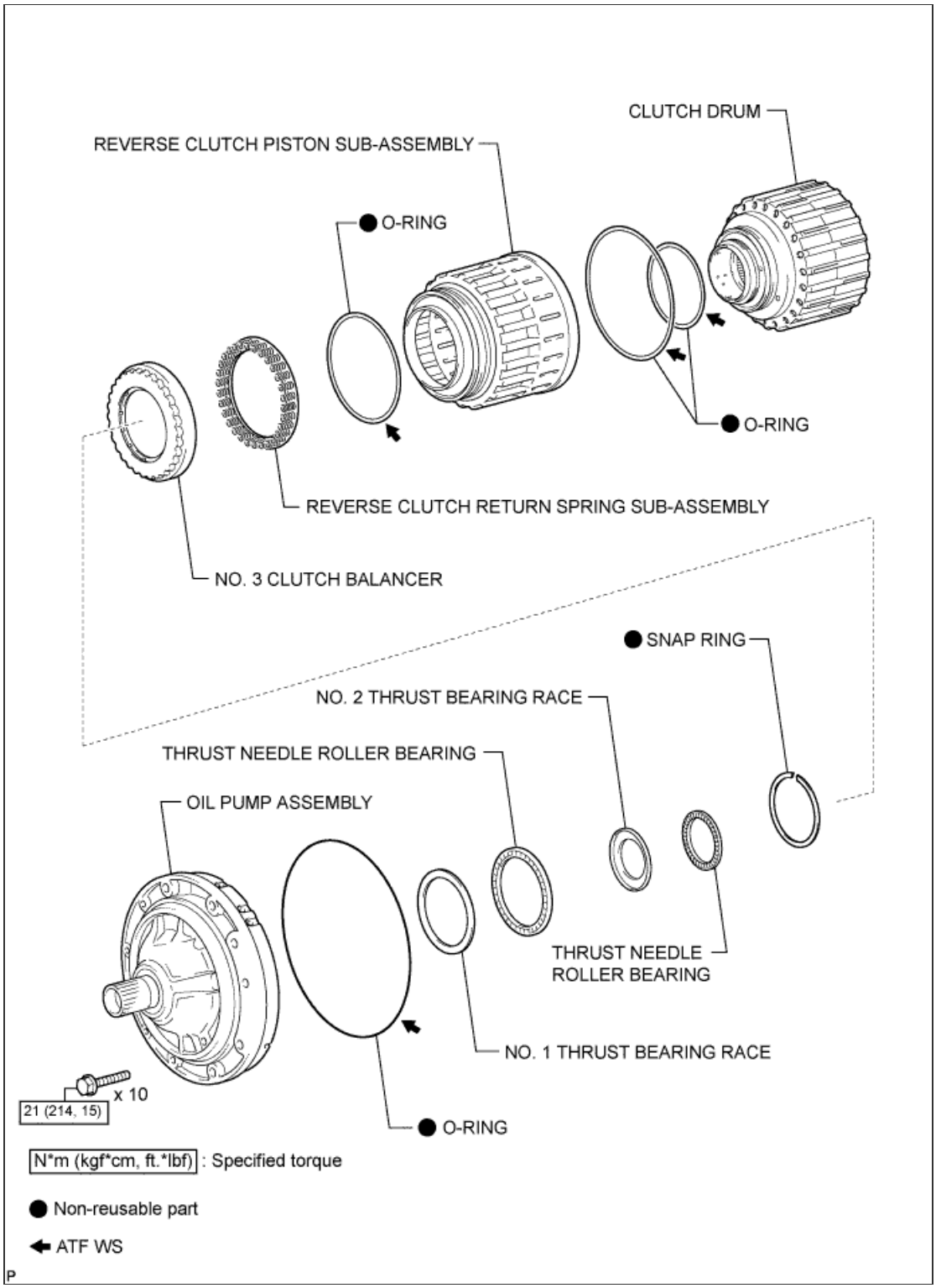
a. Perform the Reset Memory procedures (A/T initialization) (Click here).

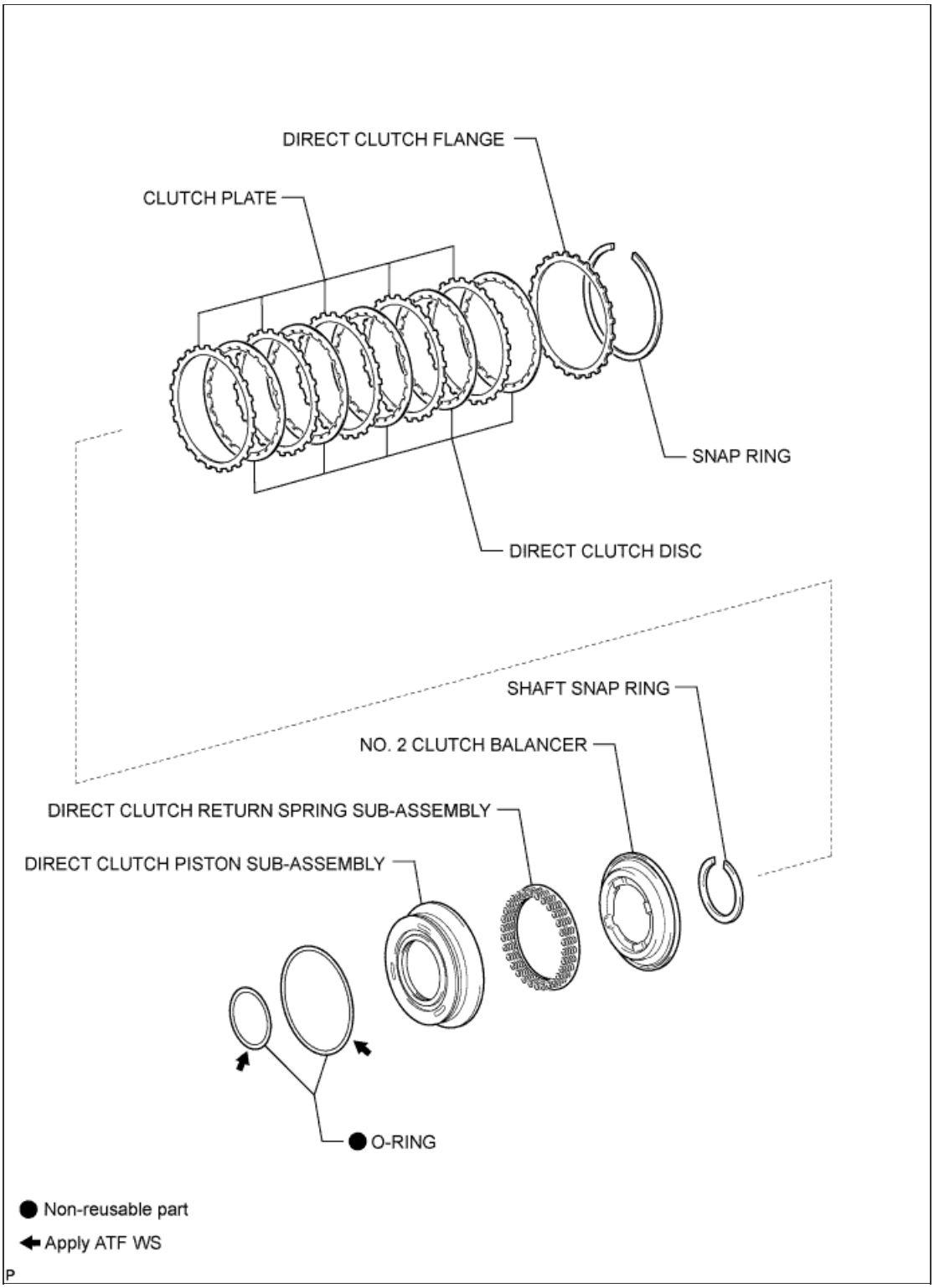
for Preparation Click here

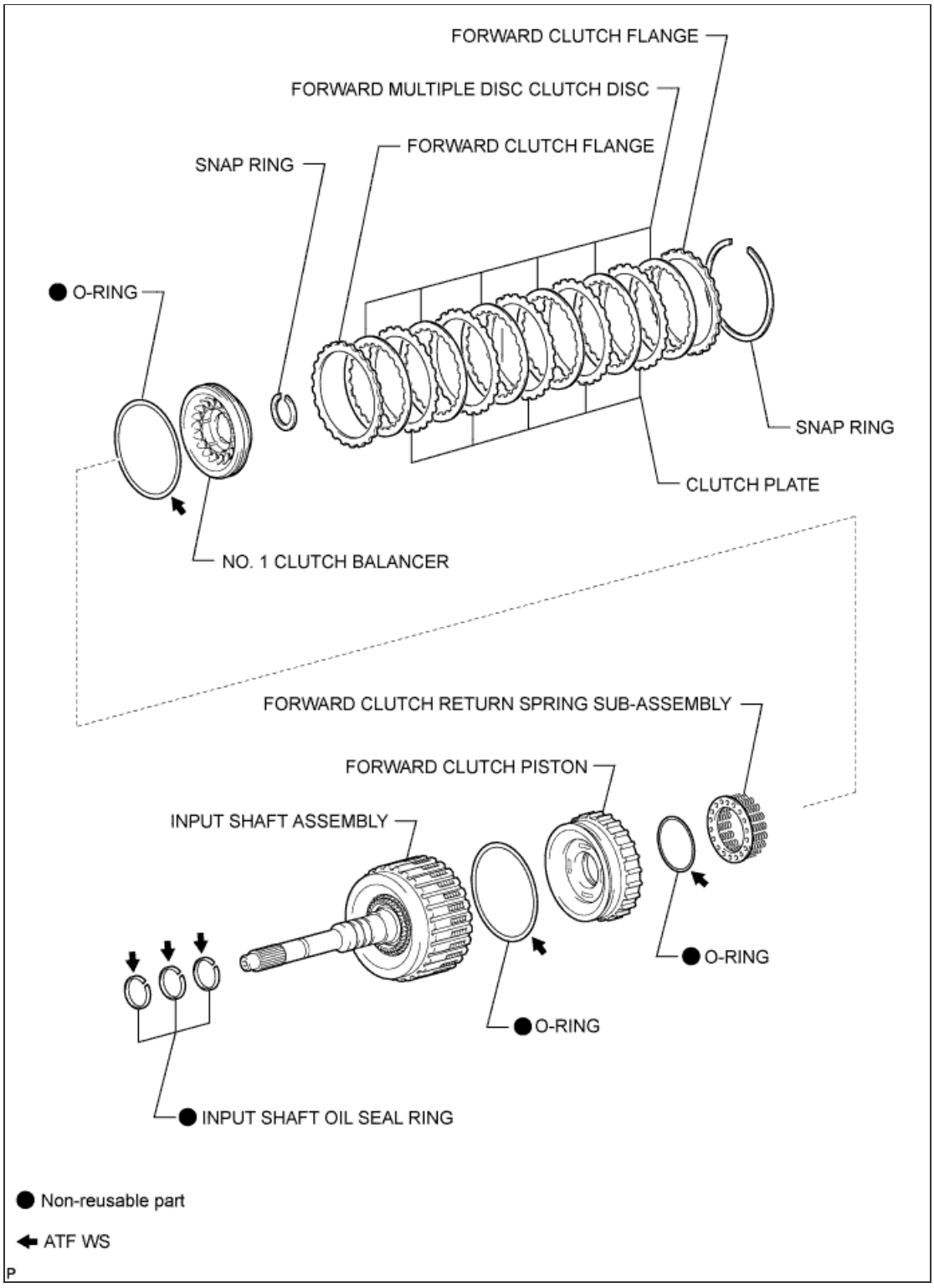


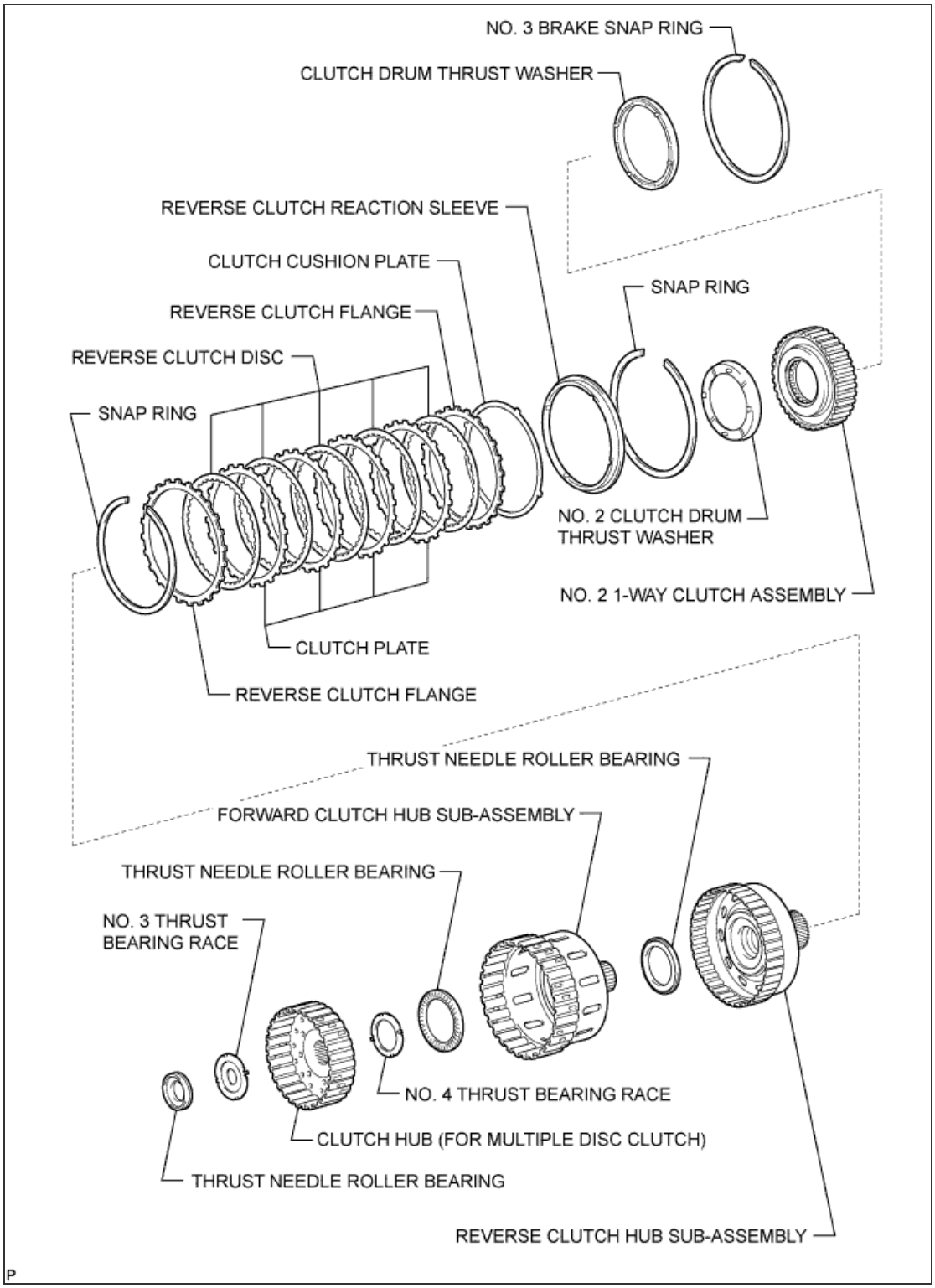

MANUAL VALVE LEVER SHAFT OIL SEAL
MANUAL VALVE LEVER SHAFT OIL SEAL
MANUAL VALVE LEVER SHAFT
SPACER
SPRING PIN
MANUAL VALVE LEVER SUB-ASSEMBLY
TRANSMISSION CASE GASKET
BRAKE DRUM GASKET
PARKING LOCK PAWL BRACKET
PARKING LOCK ROD SUB-ASSEMBLY
7.4 (75, 65 in.*lbf) x 3
SPRING
C-1 ACCUMULATOR VALVE
SPRING
E-RING
O-RING
PARKING LOCK PAWL SHAFT
CHECK BALL BODY
PARKING LOCK PAWL
PARKING LOCK PAWL TORSION SPRING
O-RING
C-3 ACCUMULATOR PISTON
B-3 ACCUMULATOR PISTON
C-2 ACCUMULATOR PISTON
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
ATF WS
MP Grease
P

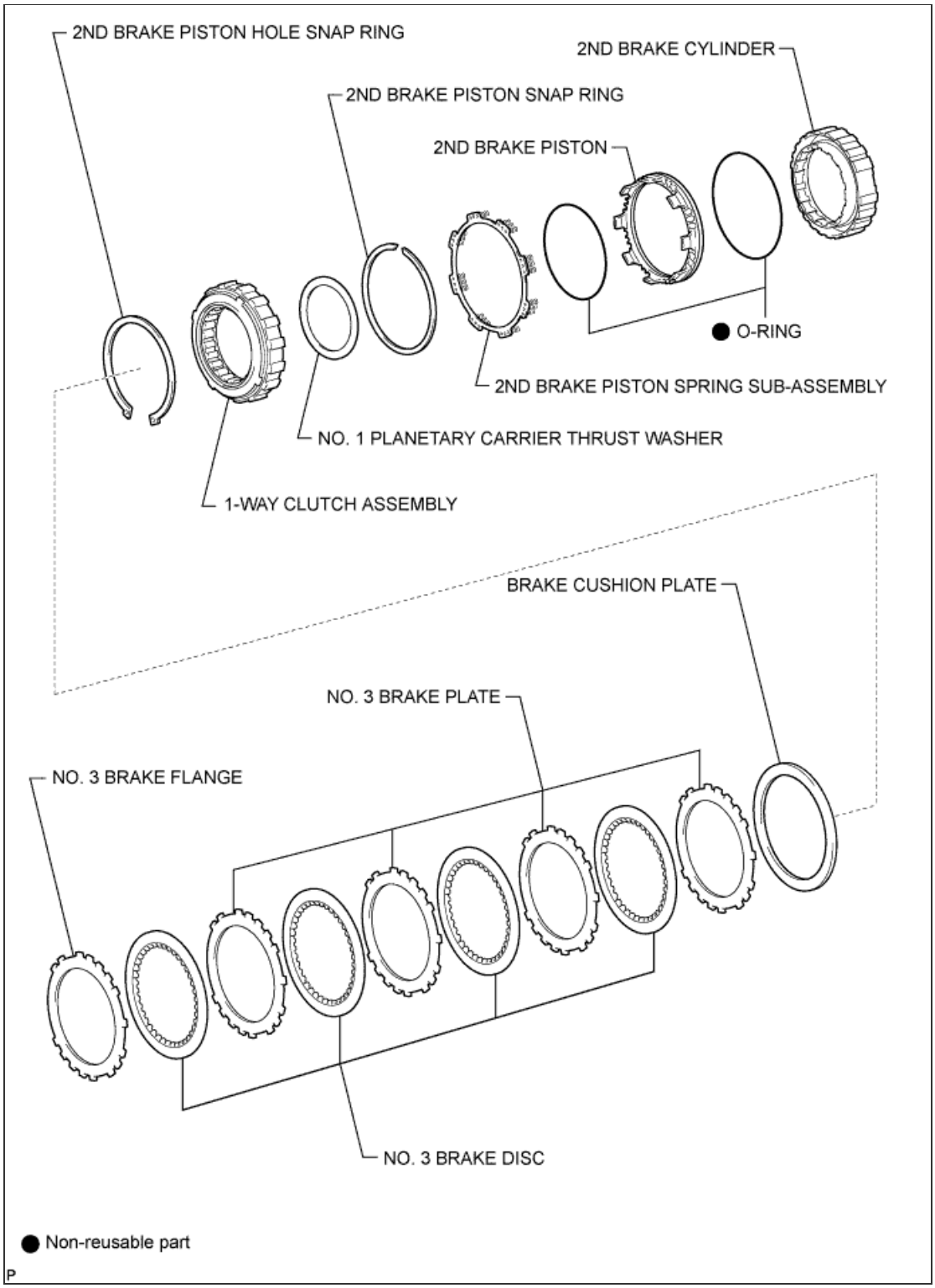

TRANSMISSION VALVE BODY ASSEMBLY
x 19
11 (112, 8)
DETENT SPRING
DETENT SPRING COVER
10 (102, 7)
O-RING
VALVE BODY OIL STRAINER ASSEMBLY
10 (102, 7)
x 4
GASKET
MAGNET
AUTOMATIC TRANSMISSION
OIL PAN
4.4 (45, 39 in.*lbf)
x 20
GASKET
GASKET
20 (204, 15)
20 (204, 15)
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
P

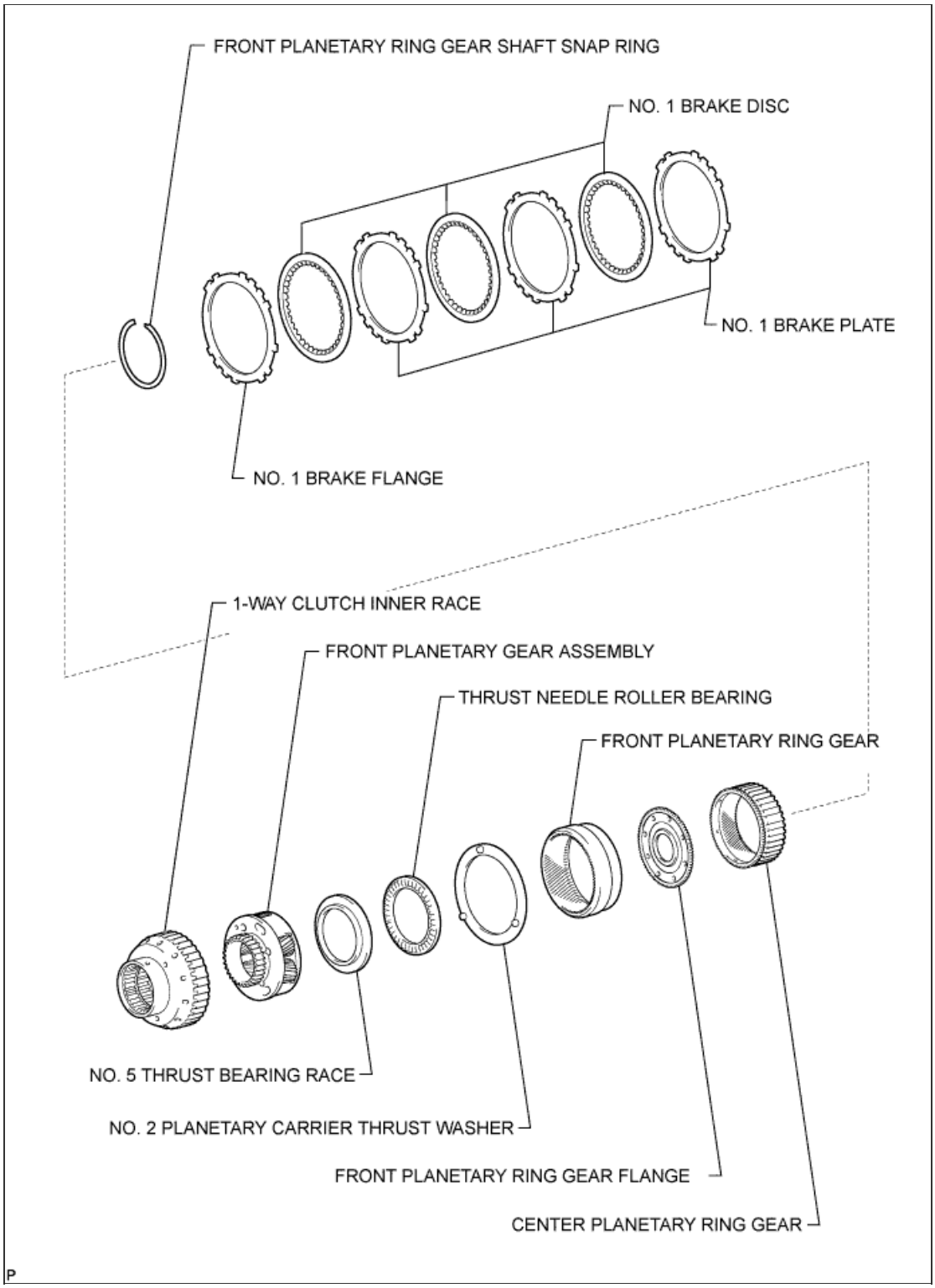

CLUTCH DRUM
REVERSE CLUTCH PISTON SUB-ASSEMBLY
O-RING
O-RING
REVERSE CLUTCH RETURN SPRING SUB-ASSEMBLY
NO. 3 CLUTCH BALANCER
SNAP RING
NO. 2 THRUST BEARING RACE
THRUST NEEDLE ROLLER BEARING
OIL PUMP ASSEMBLY
THRUST NEEDLE ROLLER BEARING
NO. 1 THRUST BEARING RACE
x 10
21 (214, 15)
O-RING
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
ATF WS
P


DIRECT CLUTCH FLANGE
CLUTCH PLATE
SNAP RING
DIRECT CLUTCH DISC
SHAFT SNAP RING
NO. 2 CLUTCH BALANCER
DIRECT CLUTCH RETURN SPRING SUB-ASSEMBLY
DIRECT CLUTCH PISTON SUB-ASSEMBLY
O-RING
Non-reusable part
Apply ATF WS
P

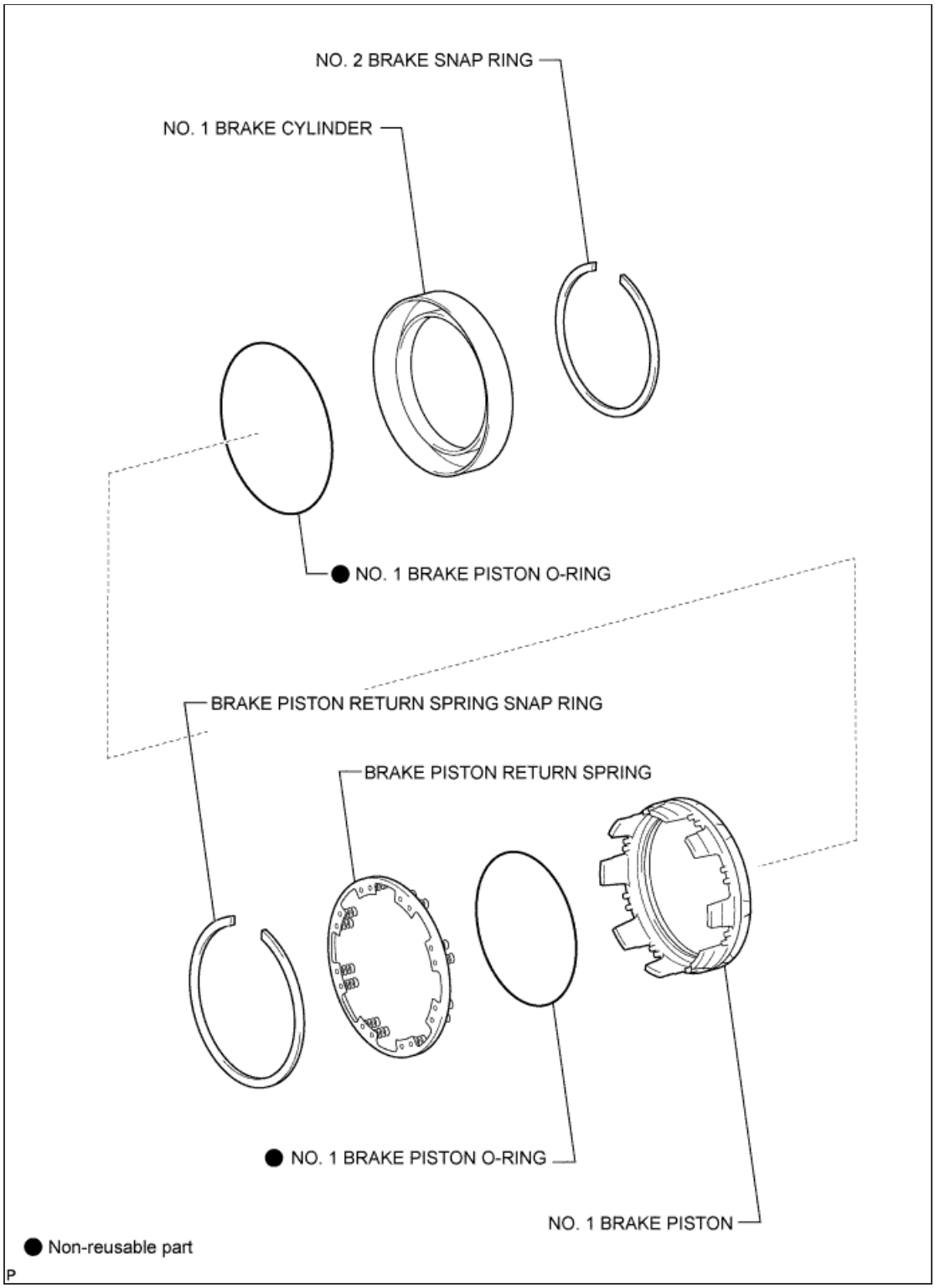

FORWARD CLUTCH FLANGE
FORWARD MULTIPLE DISC CLUTCH DISC
FORWARD CLUTCH FLANGE
SNAP RING
O-RING
SNAP RING
CLUTCH PLATE
NO. 1 CLUTCH BALANCER
FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY
FORWARD CLUTCH PISTON
INPUT SHAFT ASSEMBLY
O-RING
O-RING
INPUT SHAFT OIL SEAL RING
Non-reusable part
ATF WS
P

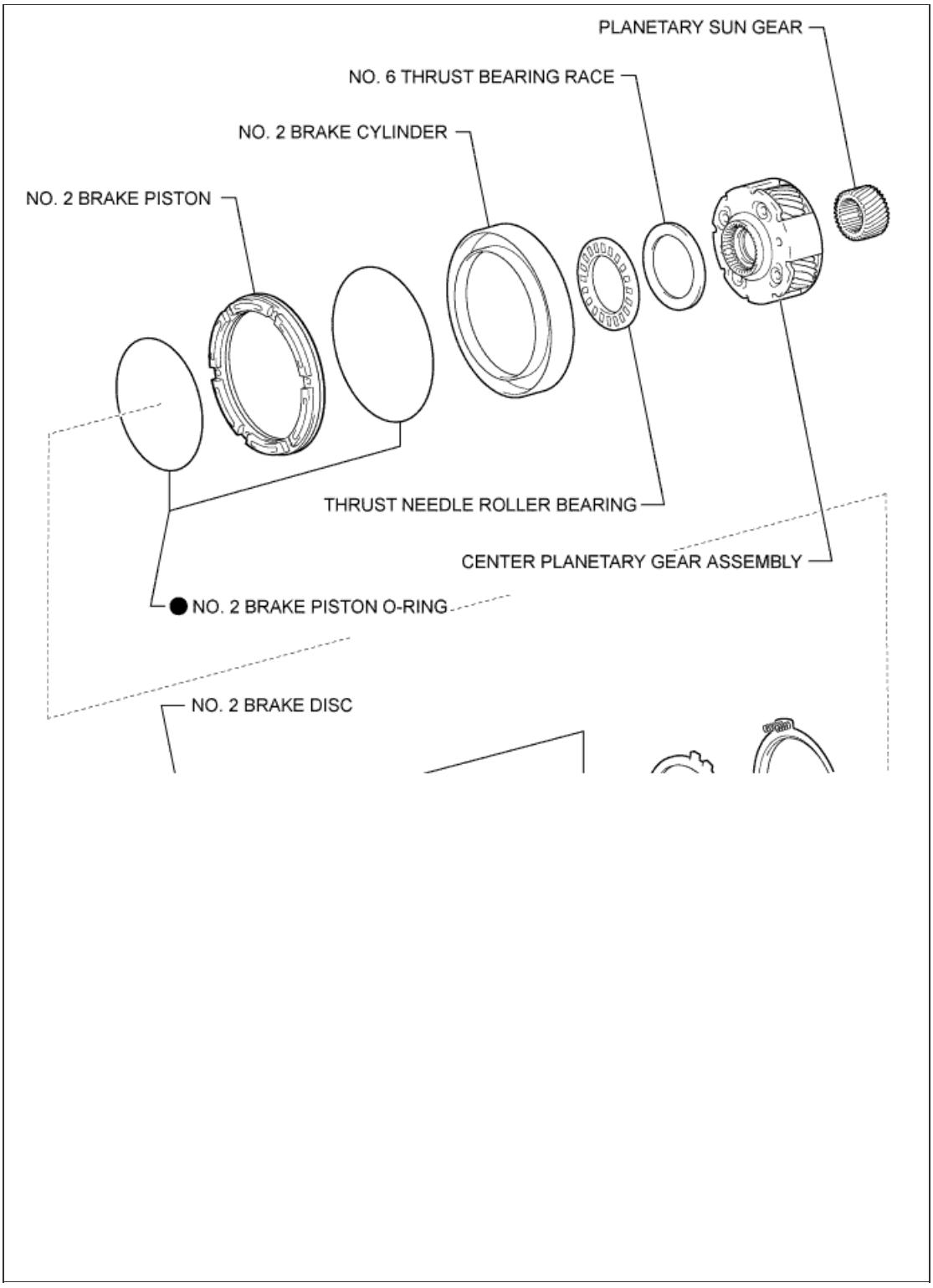

NO. 3 BRAKE SNAP RING
CLUTCH DRUM THRUST WASHER
REVERSE CLUTCH REACTION SLEEVE
CLUTCH CUSHION PLATE
SNAP RING
REVERSE CLUTCH FLANGE
REVERSE CLUTCH DISC
SNAP RING
NO. 2 CLUTCH DRUM THRUST WASHER
NO. 2 1-WAY CLUTCH ASSEMBLY
CLUTCH PLATE
REVERSE CLUTCH FLANGE
THRUST NEEDLE ROLLER BEARING
FORWARD CLUTCH HUB SUB-ASSEMBLY
THRUST NEEDLE ROLLER BEARING
NO. 3 THRUST BEARING RACE
NO. 4 THRUST BEARING RACE
CLUTCH HUB (FOR MULTIPLE DISC CLUTCH)
THRUST NEEDLE ROLLER BEARING
REVERSE CLUTCH HUB SUB-ASSEMBLY
P

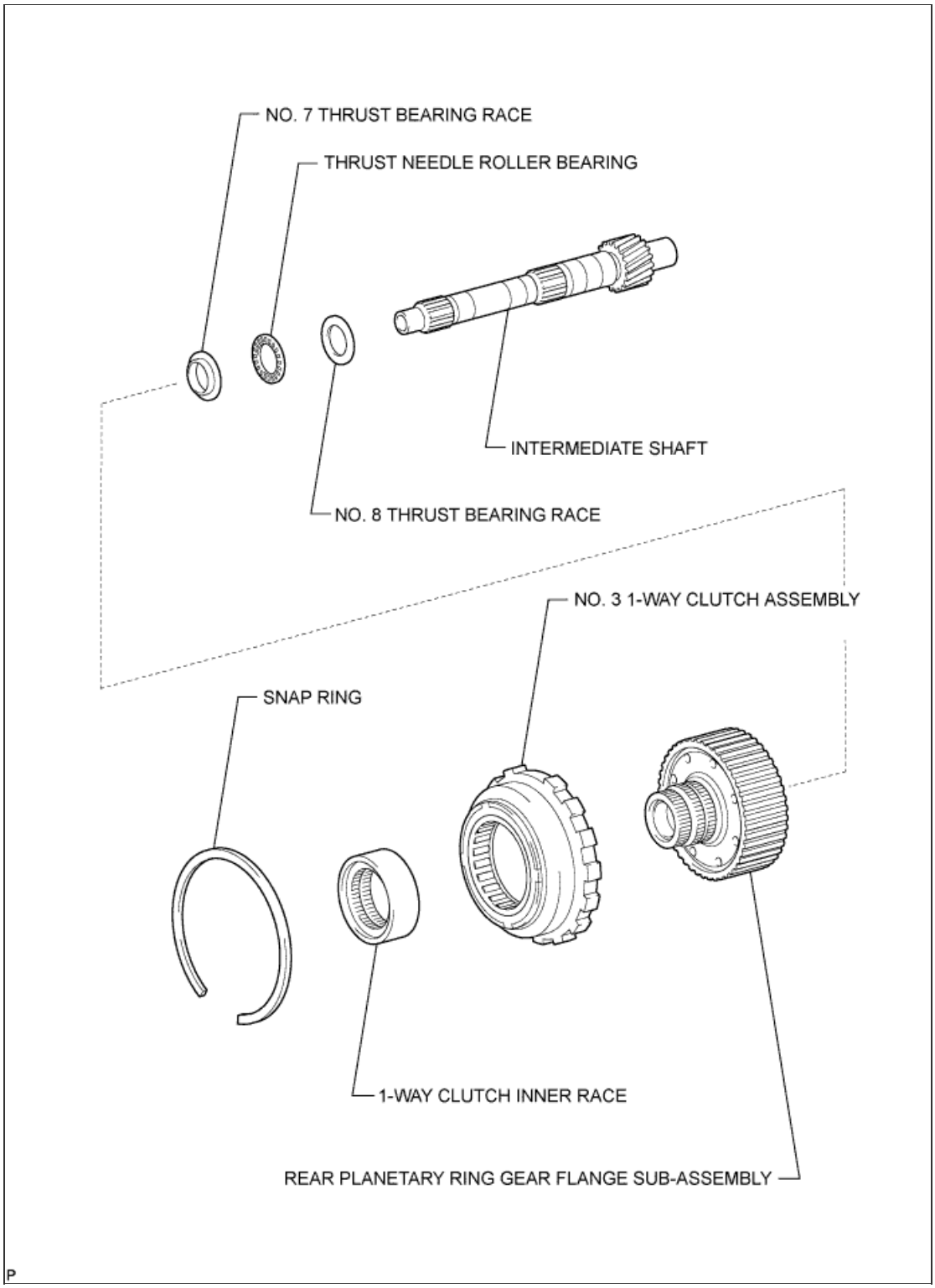

2ND BRAKE PISTON HOLE SNAP RING
2ND BRAKE CYLINDER
2ND BRAKE PISTON SNAP RING
2ND BRAKE PISTON
O-RING
2ND BRAKE PISTON SPRING SUB-ASSEMBLY
NO. 1 PLANETARY CARRIER THRUST WASHER
1-WAY CLUTCH ASSEMBLY
BRAKE CUSHION PLATE
NO. 3 BRAKE PLATE
NO. 3 BRAKE FLANGE
NO. 3 BRAKE DISC
Non-reusable part
P

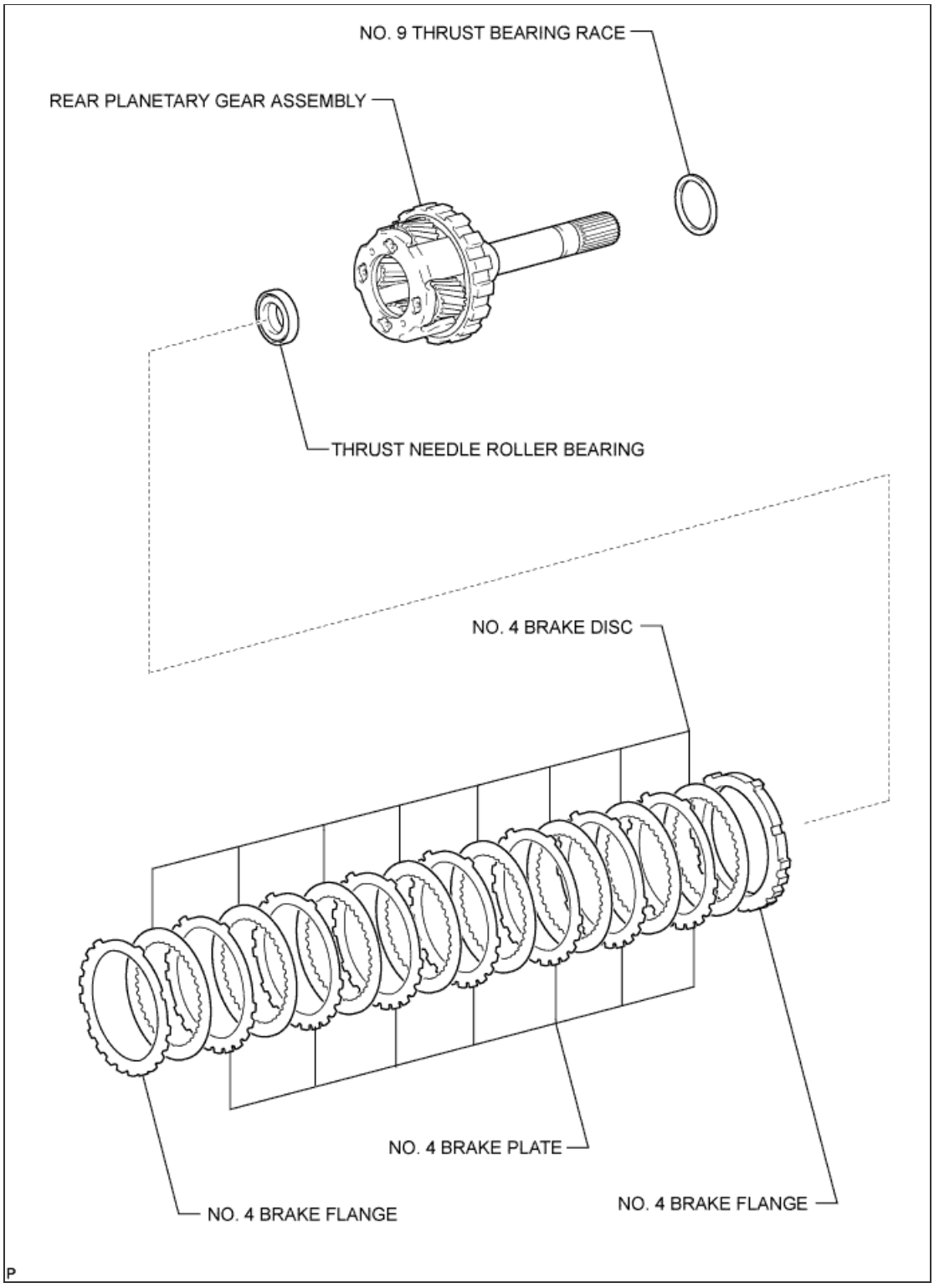

FRONT PLANETARY RING GEAR SHAFT SNAP RING
NO. 1 BRAKE DISC
NO. 1 BRAKE PLATE
NO. 1 BRAKE FLANGE
1-WAY CLUTCH INNER RACE
FRONT PLANETARY GEAR ASSEMBLY
THRUST NEEDLE ROLLER BEARING
FRONT PLANETARY RING GEAR
NO. 5 THRUST BEARING RACE
NO. 2 PLANETARY CARRIER THRUST WASHER
FRONT PLANETARY RING GEAR FLANGE
CENTER PLANETARY RING GEAR

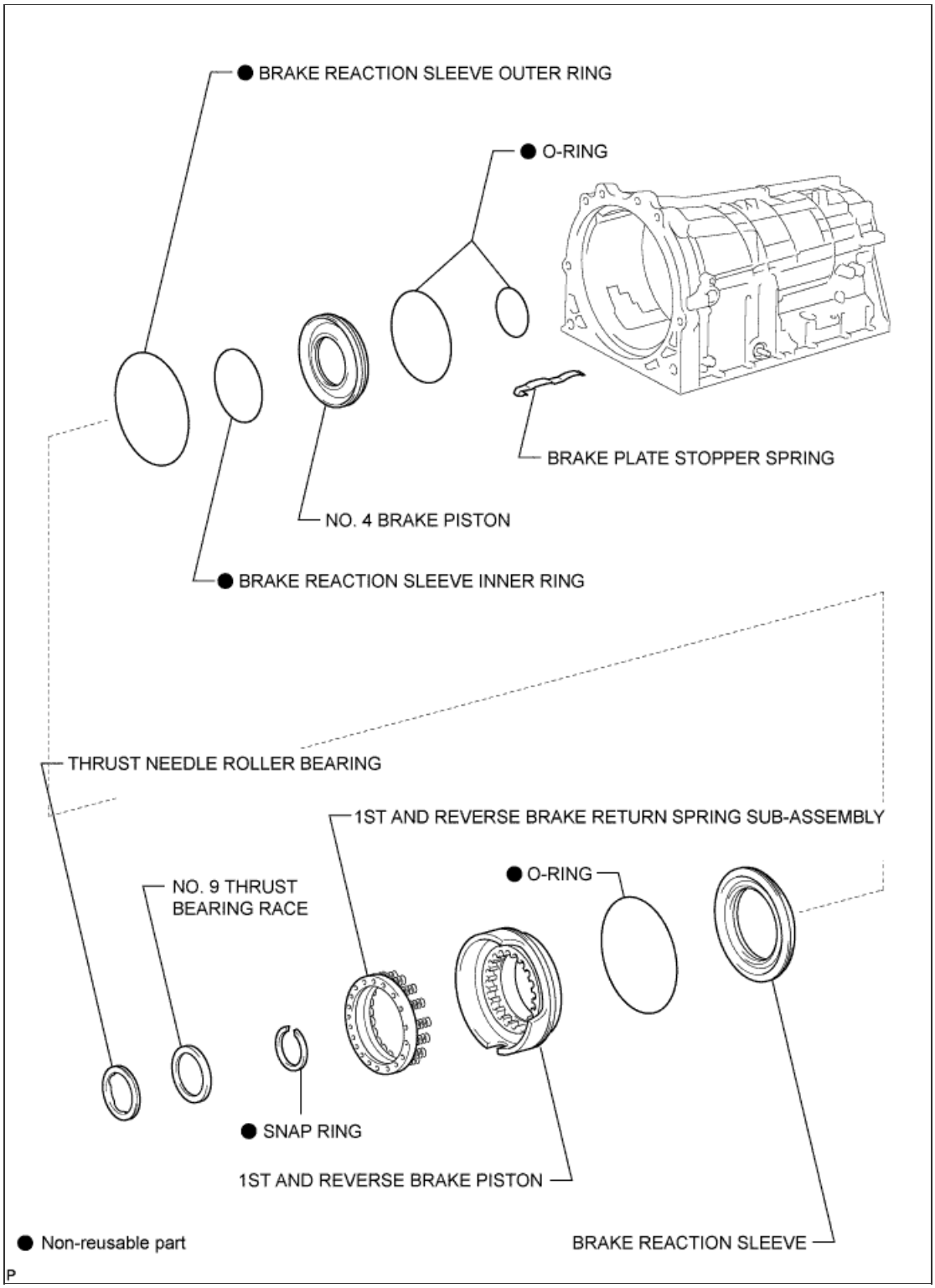
P


NO. 2 BRAKE SNAP RING
NO. 1 BRAKE CYLINDER
NO. 1 BRAKE PISTON O-RING
BRAKE PISTON RETURN SPRING SNAP RING
BRAKE PISTON RETURN SPRING
NO. 1 BRAKE PISTON O-RING
NO. 1 BRAKE PISTON
Non-reusable part
P


PLANETARY SUN GEAR
NO. 6 THRUST BEARING RACE
NO. 2 BRAKE CYLINDER
NO. 2 BRAKE PISTON
THRUST NEEDLE ROLLER BEARING
CENTER PLANETARY GEAR ASSEMBLY
NO. 2 BRAKE PISTON O-RING
NO. 2 BRAKE DISC


NO. 7 THRUST BEARING RACE
THRUST NEEDLE ROLLER BEARING
INTERMEDIATE SHAFT
NO. 8 THRUST BEARING RACE
NO. 3 1-WAY CLUTCH ASSEMBLY
SNAP RING
1-WAY CLUTCH INNER RACE
REAR PLANETARY RING GEAR FLANGE SUB-ASSEMBLY
P

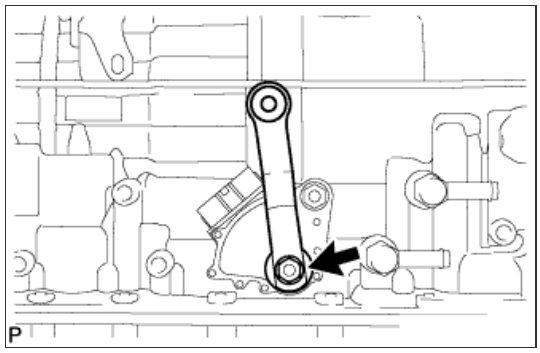

NO. 9 THRUST BEARING RACE
REAR PLANETARY GEAR ASSEMBLY
THRUST NEEDLE ROLLER BEARING
NO. 4 BRAKE DISC
NO. 4 BRAKE PLATE
NO. 4 BRAKE FLANGE
NO. 4 BRAKE FLANGE
P


● BRAKE REACTION SLEEVE OUTER RING
● O-RING
BRAKE PLATE STOPPER SPRING
NO. 4 BRAKE PISTON
● BRAKE REACTION SLEEVE INNER RING
THRUST NEEDLE ROLLER BEARING
1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY
● O-RING
NO. 9 THRUST BEARING RACE
● SNAP RING
1ST AND REVERSE BRAKE PISTON
● Non-reusable part
BRAKE REACTION SLEEVE
P

for Preparation Click here

1. REMOVE TRANSMISSION CONTROL SHAFT LEVER RH

a. Remove the nut, spring washer and control shaft lever RH.



2. REMOVE PARK/NEUTRAL POSITION SWITCH ASSEMBLY

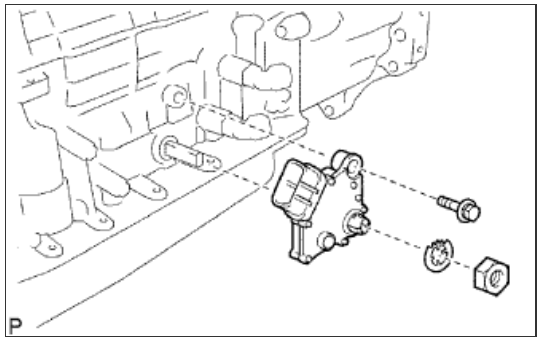
a. Using a screwdriver, bend the tabs of the lock washer.

b. Remove the nut, lock washer and bolt.

c. Remove the park/neutral position switch.

HINT:

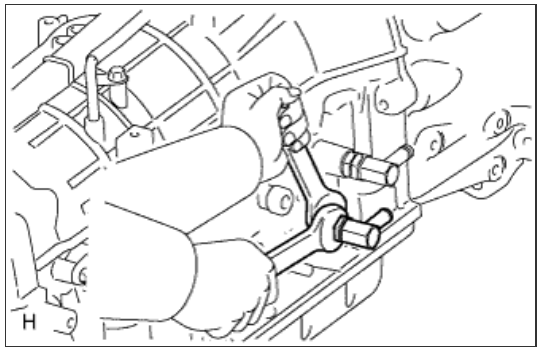
Make sure that the manual valve lever shaft has not been rotated prior to installing the park/neutral position switch as the detent spring may become detached from the manual valve lever shaft.



3. REMOVE OIL COOLER TUBE UNION

a. Remove the 2 oil cooler tube unions.

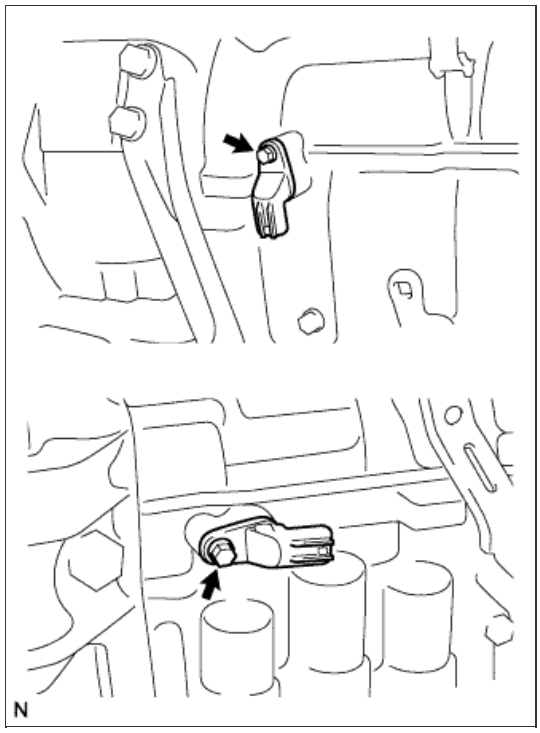
b. Remove the 2 O-rings from the oil cooler tube unions.



4. REMOVE SPEED SENSOR

a. Remove the 2 bolts and 2 speed sensors.

b. Remove the 2 O-rings from the sensors.

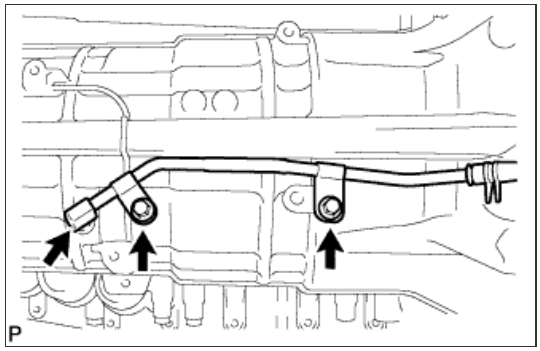


5. REMOVE AUTOMATIC TRANSMISSION BREATHER TUBE

a. Remove the 2 bolts.

b. Remove the breather tube.

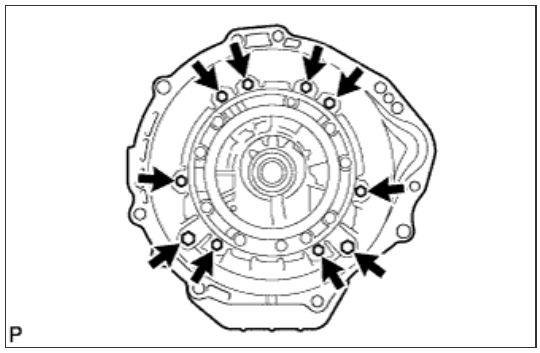
c. Remove the O-ring from the tube.



6. REMOVE AUTOMATIC TRANSMISSION HOUSING

a. Remove the 10 bolts.

b. Remove the transmission housing.



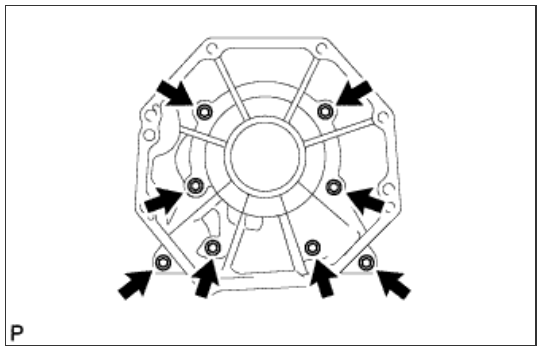
7. REMOVE REAR ADAPTOR TRANSFER

a. Remove the 8 bolts.

b. Remove the transmission case adapter.

HINT:

Use a brass bar and a hammer to remove the transmission case adapter.



8. REMOVE TRANSMISSION CASE ADAPTER REAR OIL SEAL

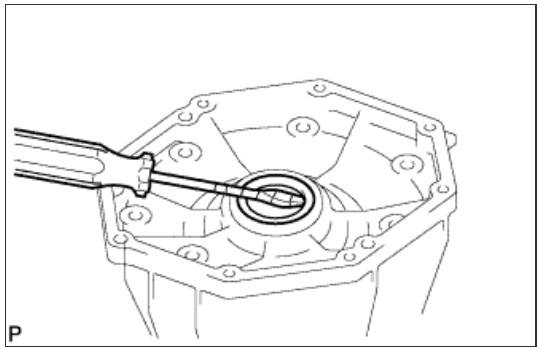
a. Using a screwdriver, pry out the oil seal.

NOTICE:

Be careful not to damage the transmission case.

HINT:

Wrap the tip of the screwdriver with tape.



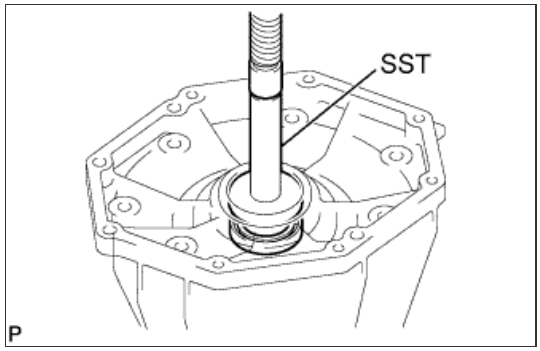
9. REMOVE TRANSFER CASE ADAPTER RADIAL BALL BEARING

a. Using a screwdriver, remove the snap ring.

b. Using SST and a press, press out the bearing.

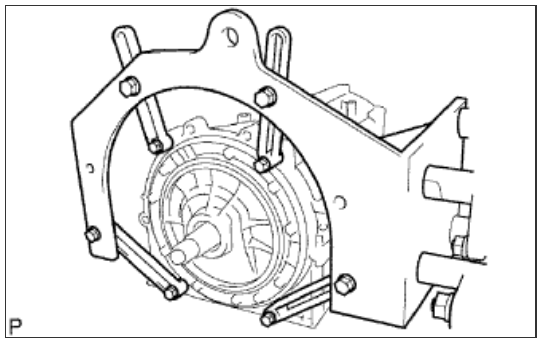
SST

09950-60010 (09951-00650)
09950-70010 (09951-07150)



10. FIX AUTOMATIC TRANSMISSION CASE SUB-ASSEMBLY

a. Install the transmission case to an overhaul attachment.



11. REMOVE AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY

NOTICE:

Do not turn the transmission over as this will contaminate the valve body with foreign matter on the bottom of the pan.

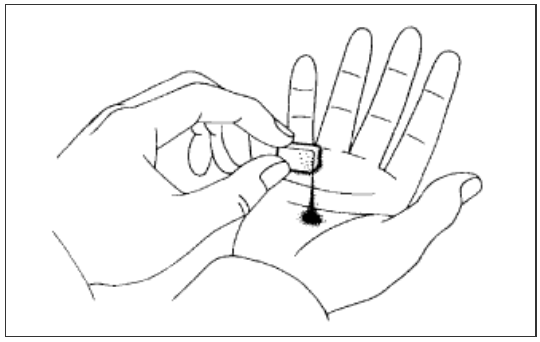
a. Remove the drain plug and 20 bolts.

12. INSPECT AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY

a. Remove the magnets, and use them to collect steel particles.

b. Carefully look at the foreign matter and particles in the pan and on the magnets to anticipate the type of wear you will find in the transmission.

- Steel (magnetic): bearing, gear and clutch plate wear
- Brass (non-magnetic): bushing wear

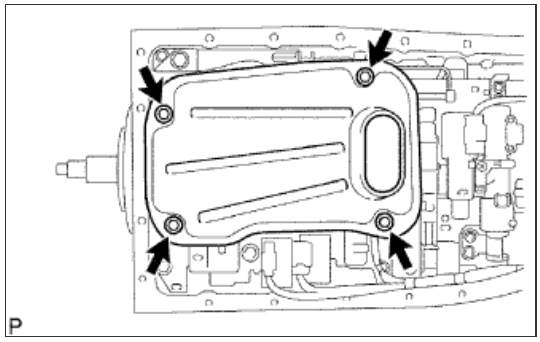


13. REMOVE VALVE BODY OIL STRAINER ASSEMBLY

a. Turn over the transmission.

b. Remove the 4 bolts and oil strainer from the valve body.

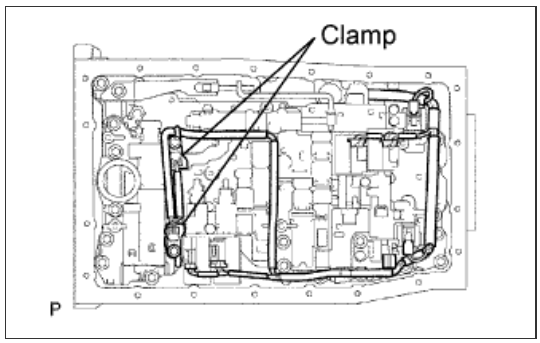
c. Remove the O-ring from the oil strainer.



14. REMOVE TRANSMISSION WIRE

a. Remove the 2 bolts and 2 clamps, and disconnect the 2 ATF temperature sensors.

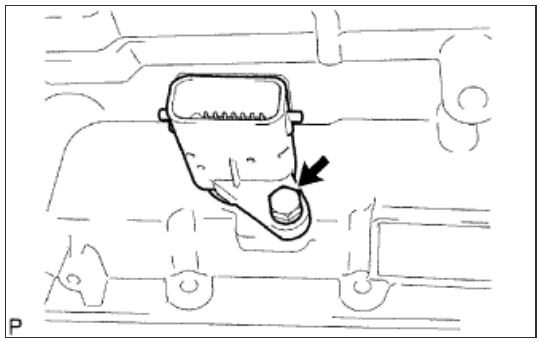
b. Disconnect the 7 connectors from the solenoid valves.



c. Remove the bolt from the case.

d. Pull the transmission wire out of the transmission case.

e. Remove the O-ring from the transmission wire.

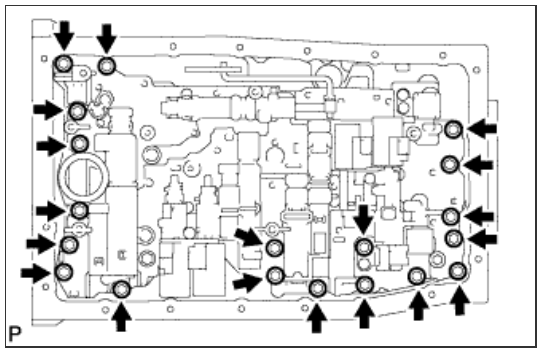


15. REMOVE TRANSMISSION VALVE BODY ASSEMBLY

a. Remove the bolt, detent spring cover and detent spring.

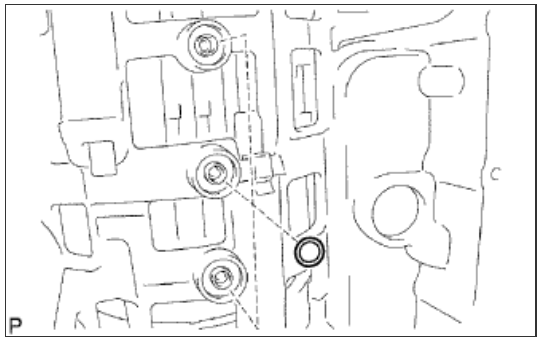
b. Remove the 19 bolts.

c. Remove the valve body.



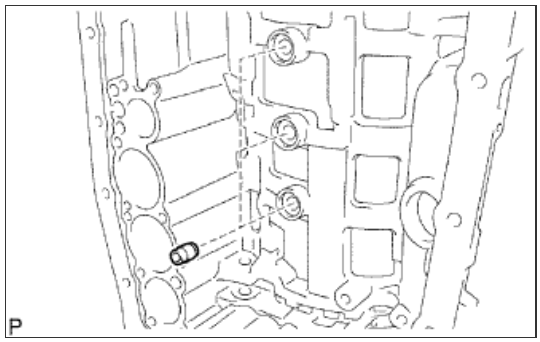
16. REMOVE TRANSMISSION CASE GASKET

a. Remove the 3 gaskets.



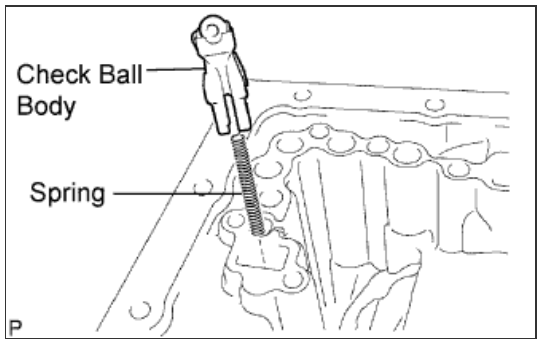
17. REMOVE BRAKE DRUM GASKET

a. Remove the 3 gaskets.



18. REMOVE CHECK BALL BODY

a. Remove the check ball body and spring.



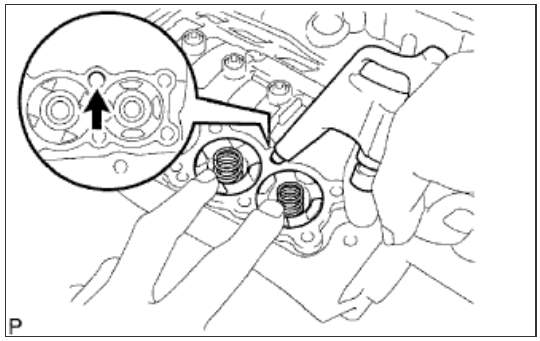
19. REMOVE C-2 ACCUMULATOR PISTON

a. Apply compressed air to the oil hole to remove the C-2 accumulator piston and spring.

b. Remove the 2 O-rings from the piston.

NOTICE:

Be careful as the C-3 and B-3 accumulator pistons may jump out.



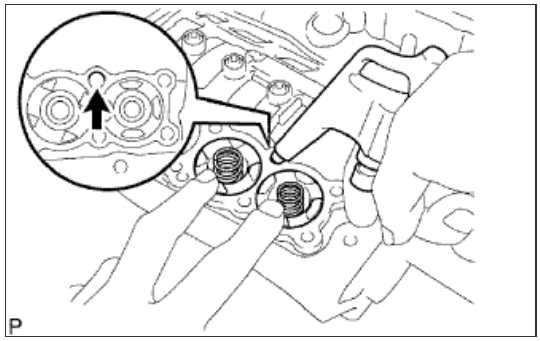
20. REMOVE B-3 ACCUMULATOR PISTON

a. Apply compressed air to the oil hole to remove the B-3 accumulator piston and spring.

b. Remove the 2 O-rings from the piston.

NOTICE:

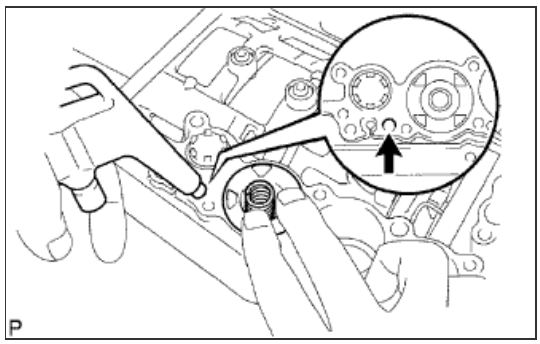
Be careful as the C-3 accumulator piston may jump out.



21. REMOVE C-3 ACCUMULATOR PISTON

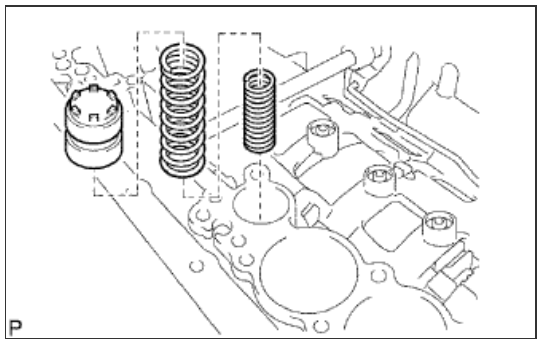
a. Apply compressed air to the oil hole to remove the C-3 accumulator piston and 2 springs.

b. Remove the 2 O-rings from the piston.



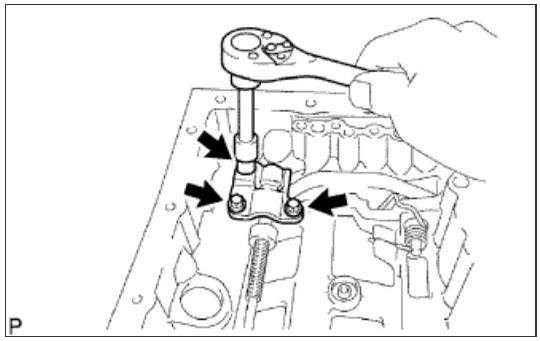
22. REMOVE C-1 ACCUMULATOR VALVE

a. Remove the C-1 accumulator valve and 2 springs.



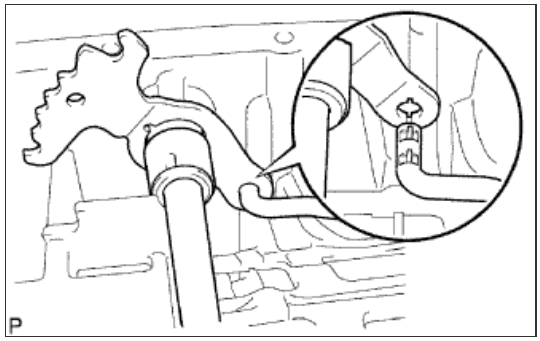
23. REMOVE PARKING LOCK PAWL BRACKET

a. Remove the 3 bolts and bracket.



24. REMOVE PARKING LOCK ROD SUB-ASSEMBLY

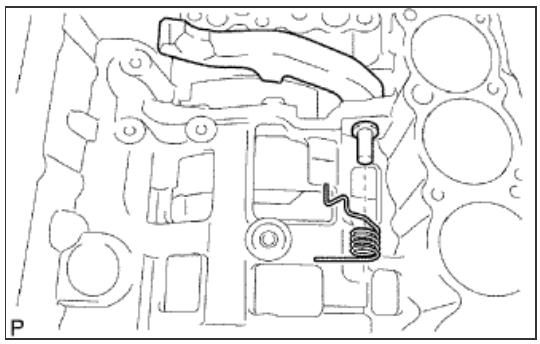
a. Disconnect the parking lock rod from the manual valve lever.



25. REMOVE PARKING LOCK PAWL SHAFT

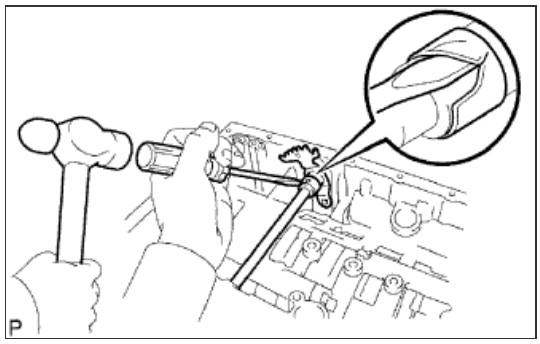
a. Pull out the parking lock pawl shaft from the front side, and then remove the lock pawl and spring.

b. Remove the E-ring from the shaft.



26. REMOVE MANUAL VALVE LEVER SUB-ASSEMBLY

a. Using a hammer and screwdriver, cut off the spacer and remove it from the shaft.

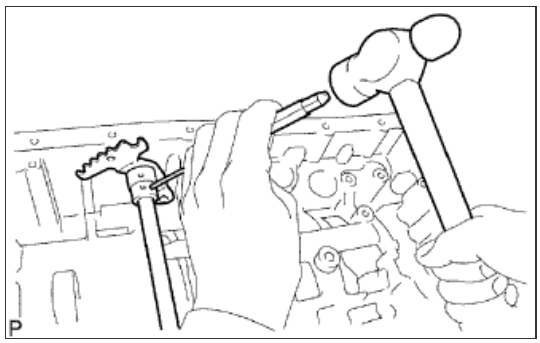


b. Using a pin punch and hammer, tap out the spring pin.

HINT:

Slowly drive out the spring pin so that it does not fall into the transmission case.

c. Pull the manual valve lever shaft out through the case, and remove the manual valve lever.



27. REMOVE MANUAL VALVE LEVER SHAFT OIL SEAL

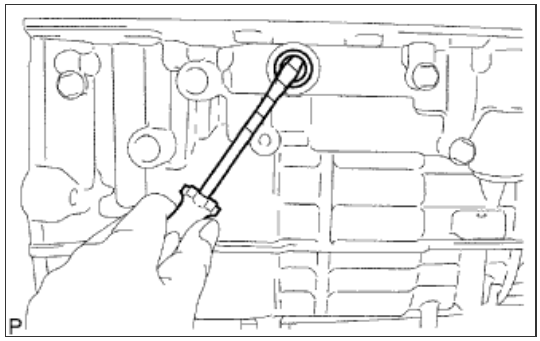
a. Using a screwdriver, pry out the 2 oil seals.

NOTICE:

Be careful not to damage the transmission case.

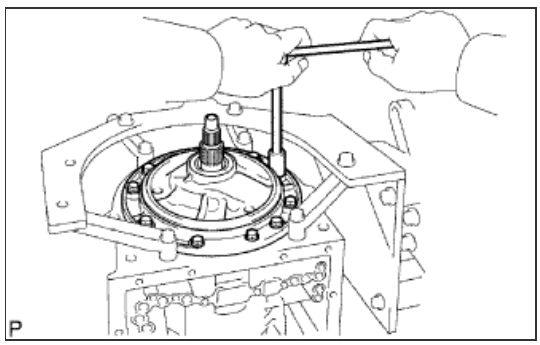
HINT:

Wrap the tip of the screwdriver with tape.



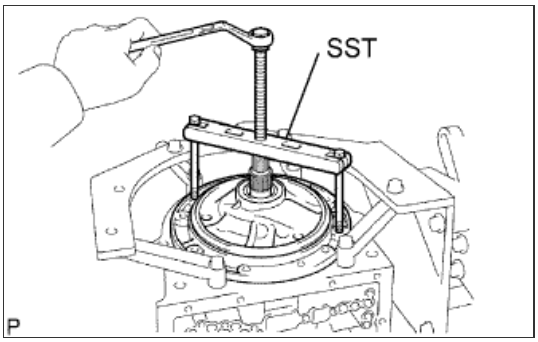
28. REMOVE OIL PUMP ASSEMBLY

a. Remove the 10 bolts.

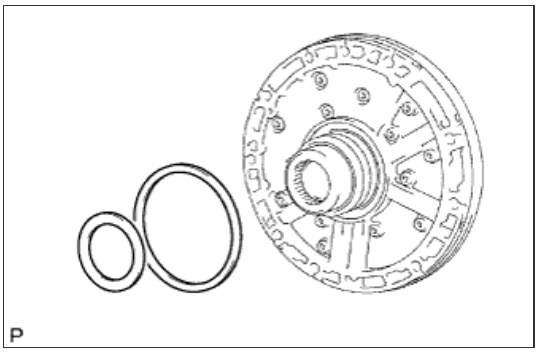


b. Using SST, remove the oil pump.

SST
09350-30020 (09350-07020)

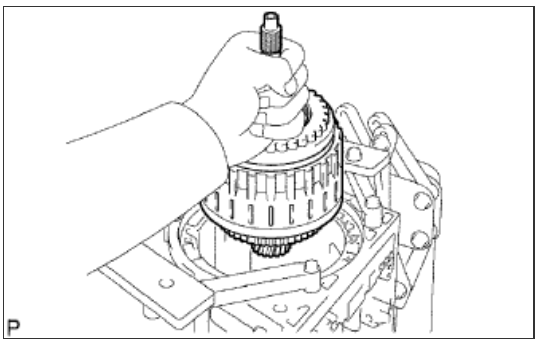


c. Remove the 2 thrust bearing races from the front oil pump.

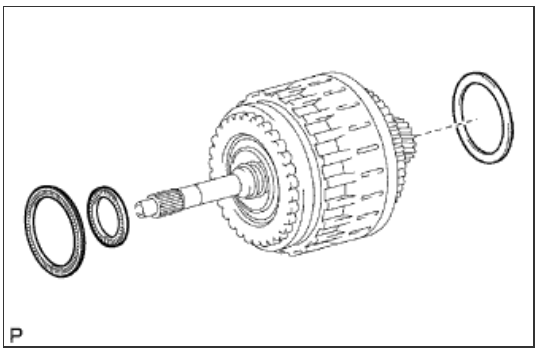


29. REMOVE CLUTCH DRUM AND INPUT SHAFT ASSEMBLY

a. Remove the clutch drum and input shaft assembly from the transmission case.



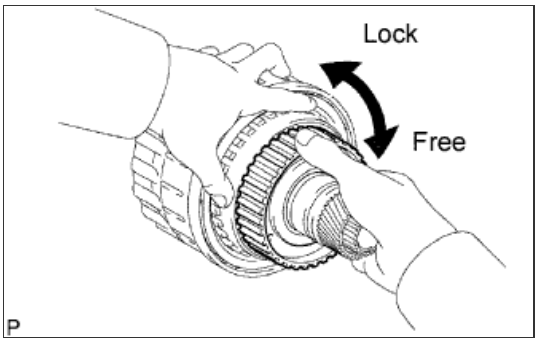
b. Remove the clutch drum thrust washer and 2 thrust needle roller bearings.



30. INSPECT NO. 2 1-WAY CLUTCH ASSEMBLY

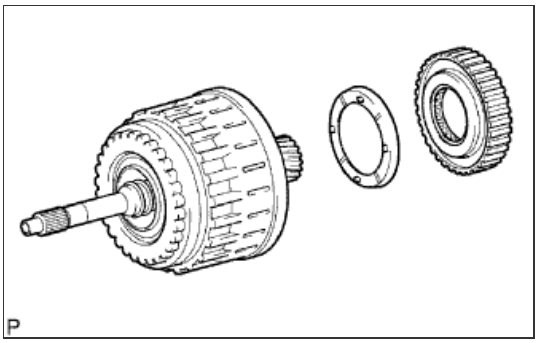
a. Hold the reverse clutch hub and turn the 1-way clutch assembly.

b. Check that the 1-way clutch turns freely clockwise and locks when turned counterclockwise.



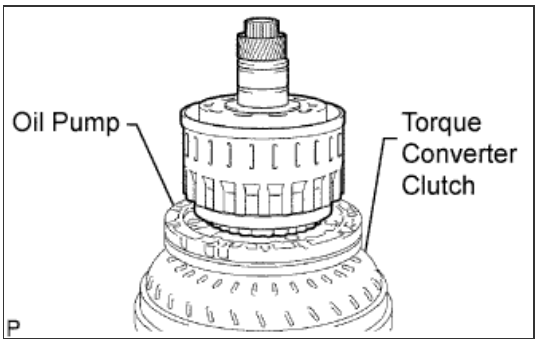
31. REMOVE NO. 2 1-WAY CLUTCH ASSEMBLY

a. Remove the 1-way clutch and No. 2 clutch drum thrust washer from the clutch drum and input shaft assembly.



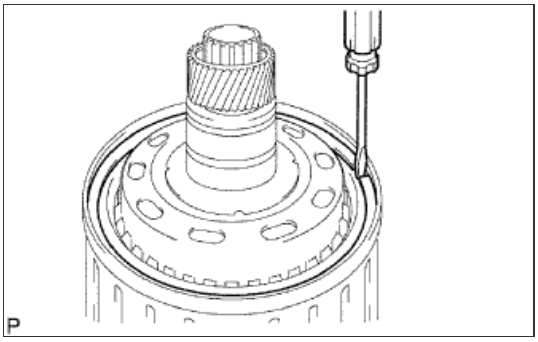
32. FIX CLUTCH DRUM AND INPUT SHAFT ASSEMBLY

a. Place the oil pump onto the torque converter, and then place the clutch drum and input shaft assembly onto the oil pump.

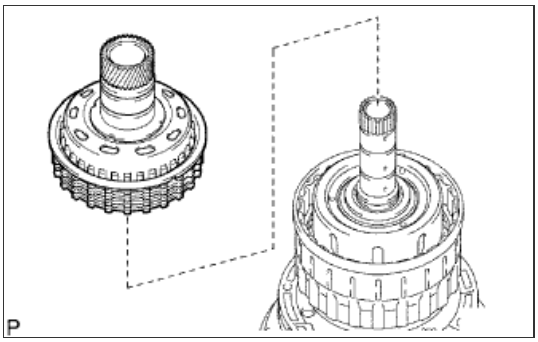


33. REMOVE REVERSE CLUTCH HUB SUB-ASSEMBLY

a. Using a screwdriver, remove the snap ring.

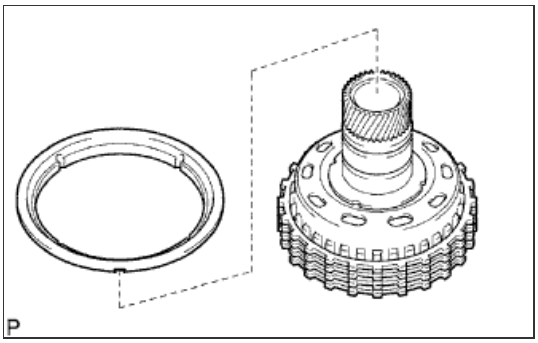


b. Remove the reverse clutch hub sub-assembly, reverse clutch reaction sleeve, clutch cushion, plate reverse clutch flange, 5 reverse clutch discs and 4 clutch plates from the clutch drum.



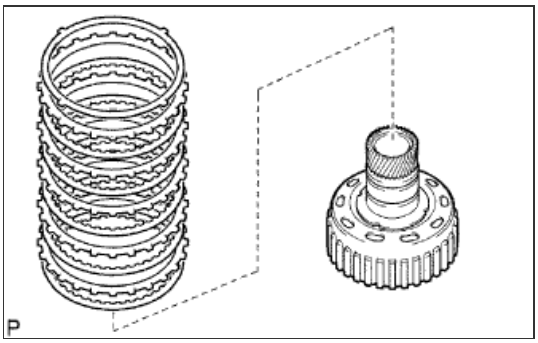
34. REMOVE REVERSE CLUTCH REACTION SLEEVE

a. Remove the reverse clutch reaction sleeve from the reverse clutch hub.



35. REMOVE REAR CLUTCH DISC

a. Remove the clutch cushion plate, reverse clutch flange, 5 discs and 4 plates from the reverse clutch hub.

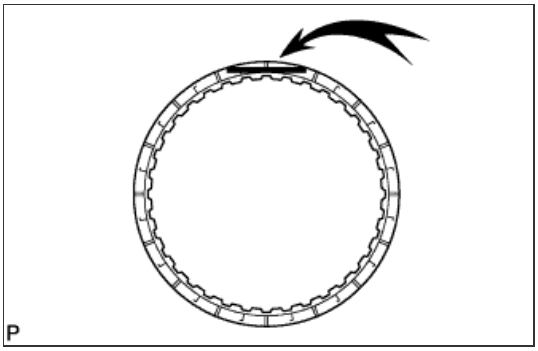


36. INSPECT REAR CLUTCH DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) the grooves or printed numbers have even a little bit of damage.

NOTICE:

Before assembling new discs, soak them in ATF for at least 15 minutes.



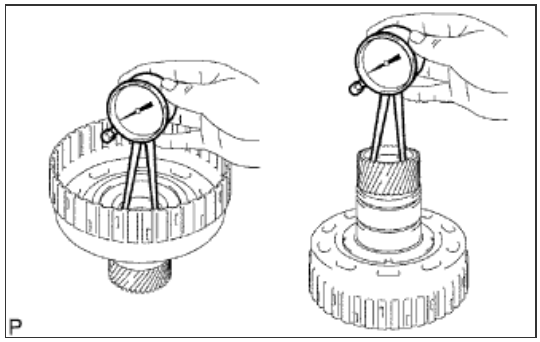
37. INSPECT REVERSE CLUTCH HUB SUB-ASSEMBLY

a. Using a dial indicator, measure the inside diameter of the reverse clutch hub bush.

Standard inside diameter:
35.812 to 35.837 mm (1.410 to 1.411 in.)

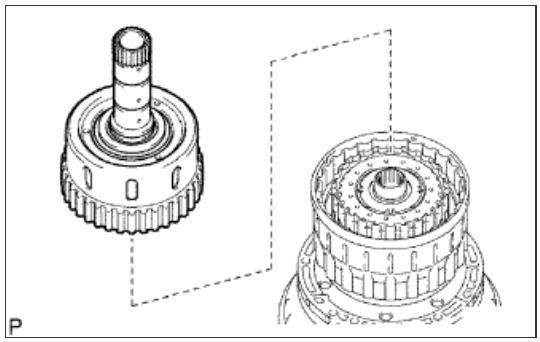
Maximum inside diameter:
35.887 mm (1.413 in.)

If the inside diameter is more than the maximum, replace the reverse clutch hub.

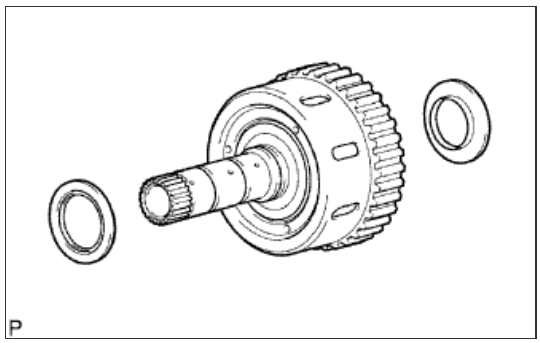


38. REMOVE FORWARD CLUTCH HUB SUB-ASSEMBLY

a. Remove the forward clutch hub from the clutch drum.



b. Remove the 2 thrust needle roller bearings from the forward clutch hub.



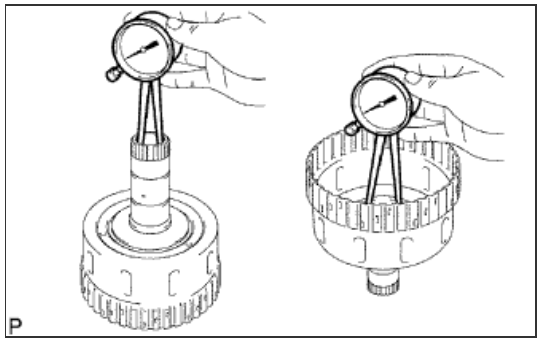
39. INSPECT FORWARD CLUTCH HUB SUB-ASSEMBLY

a. Using a dial indicator, measure the inside diameter of the forward clutch hub bush.

Standard inside diameter:
26.037 to 26.062 mm (1.025 to 1.026 in.)

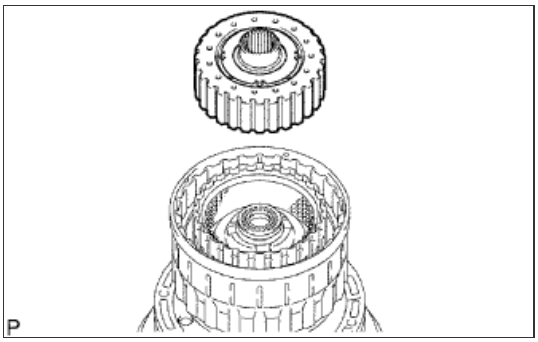
Maximum inside diameter:
26.112 mm (1.028 in.)

If the inside diameter is more than the maximum, replace the forward clutch hub.

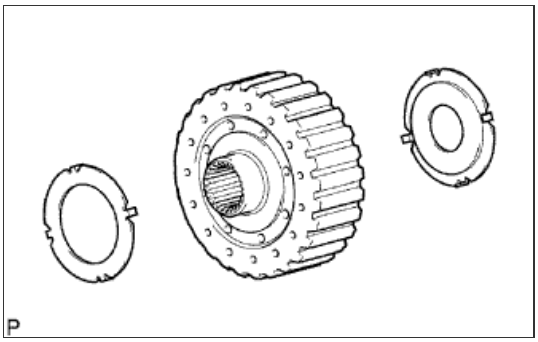


40. REMOVE MULTIPLE DISC CLUTCH HUB

a. Remove the multiple disc clutch hub from the clutch drum.

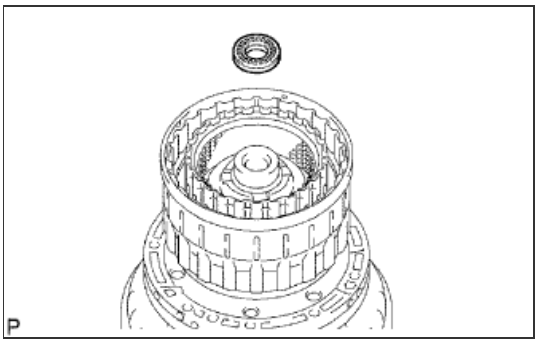


b. Remove the 2 thrust bearing races from the multiple disc clutch hub.

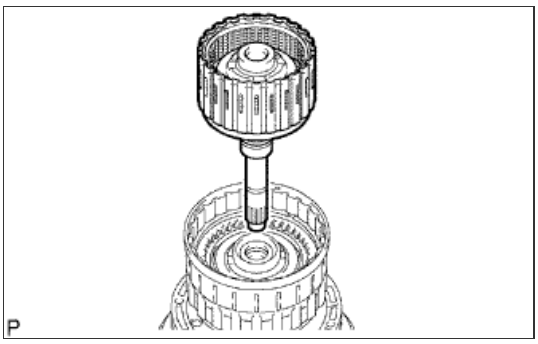


41. REMOVE INPUT SHAFT ASSEMBLY

a. Remove the thrust needle roller bearing from the clutch drum.

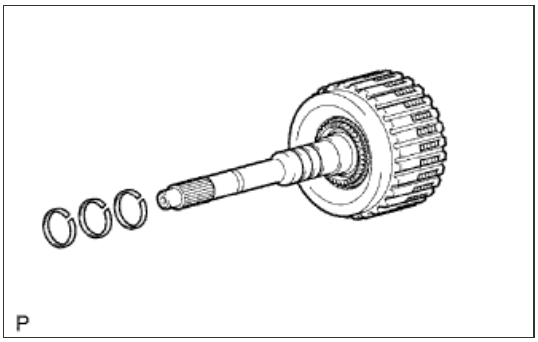


b. Remove the input shaft assembly from the clutch drum.



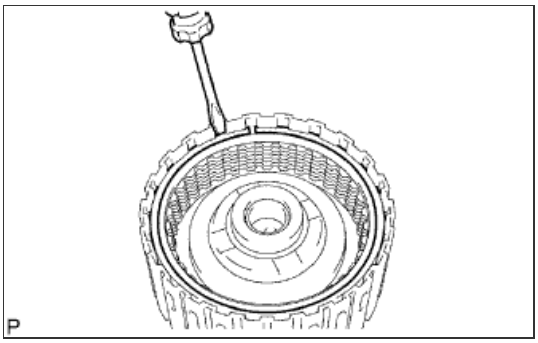
42. REMOVE INPUT SHAFT OIL SEAL RING

a. Remove the 3 oil seal rings from the input shaft.

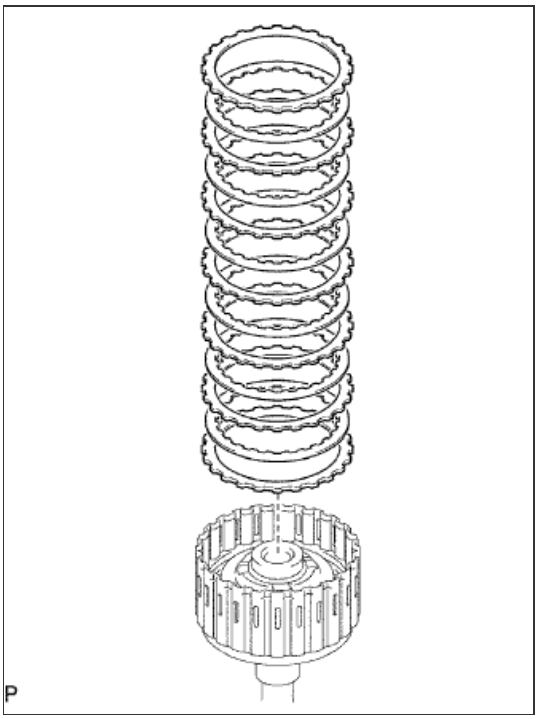


43. REMOVE FORWARD MULTIPLE DISC CLUTCH DISC

a. Using a screwdriver, remove the hole snap ring.



b. Remove the 2 flanges, 6 discs and 5 plates from the input shaft.

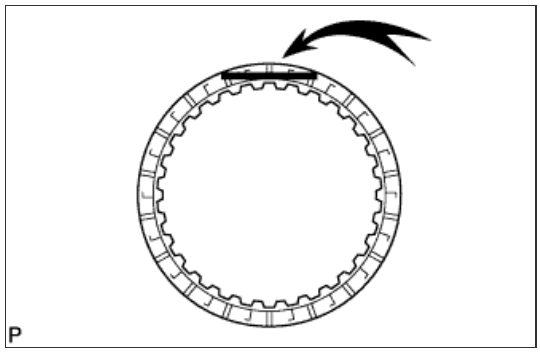


44. INSPECT FORWARD MULTIPLE DISC CLUTCH DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) the grooves or printed numbers have even a little bit of damage.

NOTICE:

Before assembling new discs, soak them in ATF for at least 15 minutes.

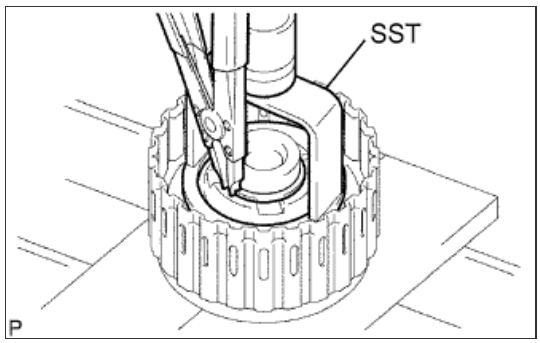


45. REMOVE NO. 1 CLUTCH BALANCER

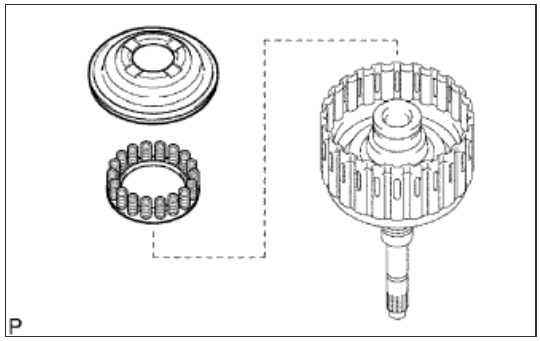
a. Place SST on the clutch balancer, and compress the return spring with a press.

SST
09350-30020 (09350-07040, 09350-07070)

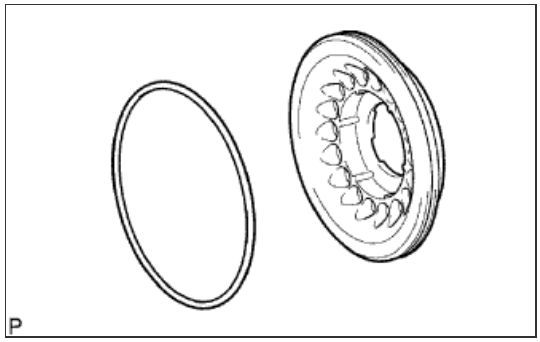
b. Using a snap ring expander, remove the snap ring.



c. Remove the clutch balancer and forward clutch return spring from the input shaft assembly.



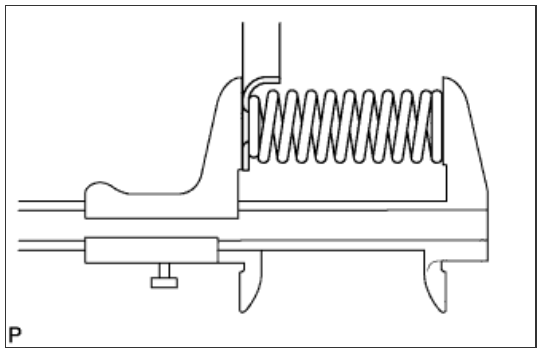
d. Remove the O-ring from the No. 1 clutch balancer.



46. INSPECT FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY

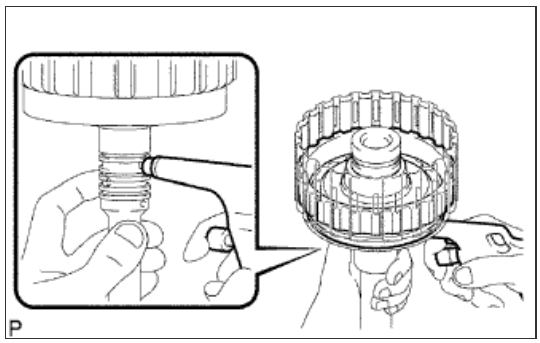
a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
26.74 mm (1.05 in.)

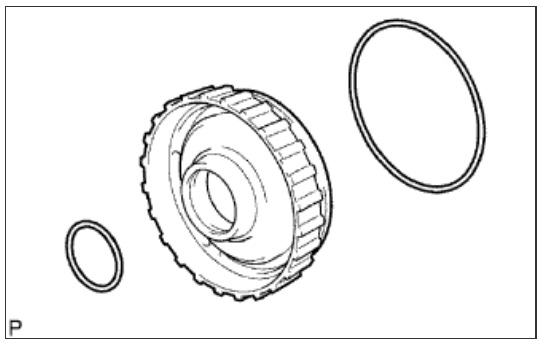


47. REMOVE FORWARD CLUTCH PISTON

a. Hold the input shaft by hand and apply compressed air (392 kPa (4.0 kgf/cm ^{2}, 57 psi)) to the input shaft to remove the forward clutch piston.

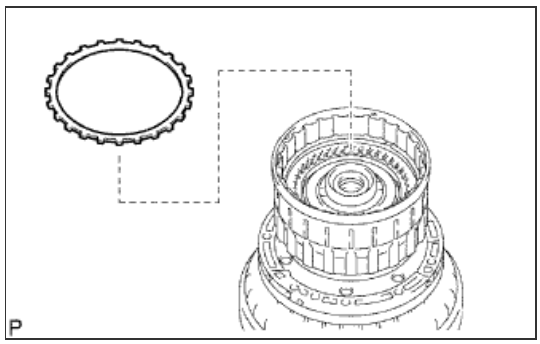


b. Remove the 2 O-rings from the forward clutch piston.



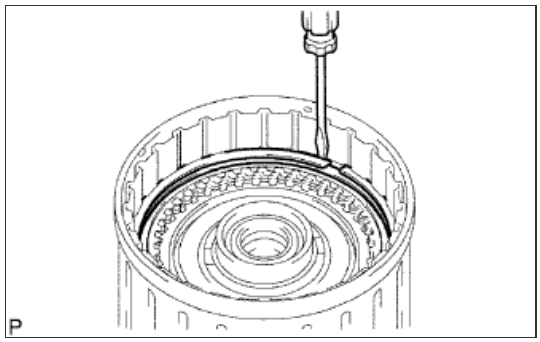
48. REMOVE REVERSE CLUTCH FLANGE

a. Remove the reverse clutch flange from the clutch drum.

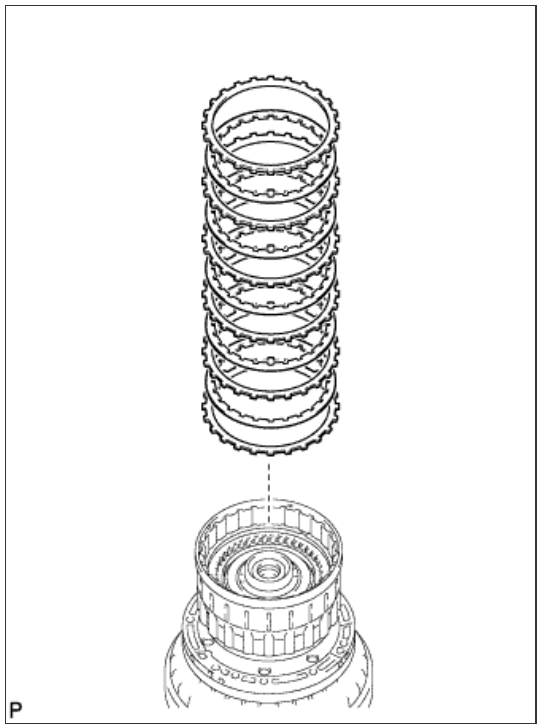


49. REMOVE DIRECT CLUTCH DISC

a. Using a screwdriver, remove the 2 hole snap rings from the clutch drum.



b. Remove the reverse clutch flange, 5 discs and 5 plates from the clutch drum.

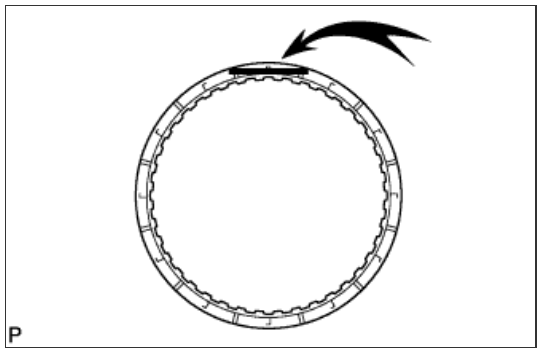


50. INSPECT DIRECT CLUTCH DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) the grooves or printed numbers have even a little bit of damage.

NOTICE:

Before assembling new discs, soak them in ATF for at least 15 minutes.



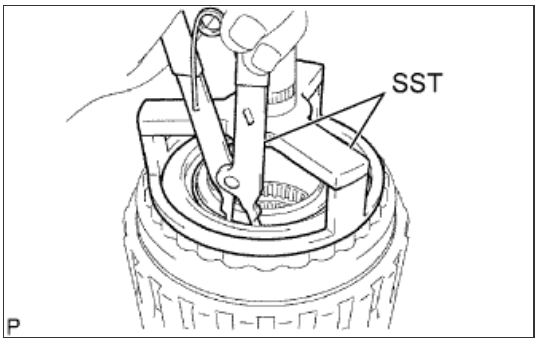
51. REMOVE NO. 3 CLUTCH BALANCER

a. Place SST on the clutch balancer, and compress the return spring with a press.

SST
09387-00070

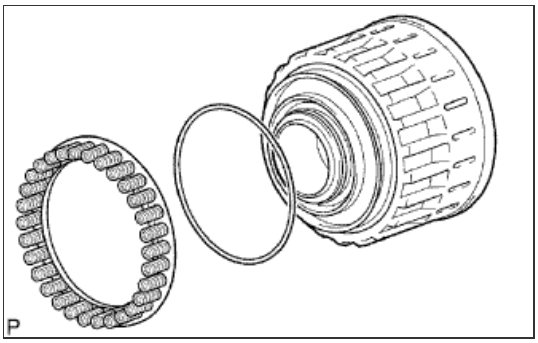
b. Using SST, remove the snap ring.

SST
09350-30020 (09350-07070)



52. REMOVE REVERSE CLUTCH RETURN SPRING SUB-ASSEMBLY

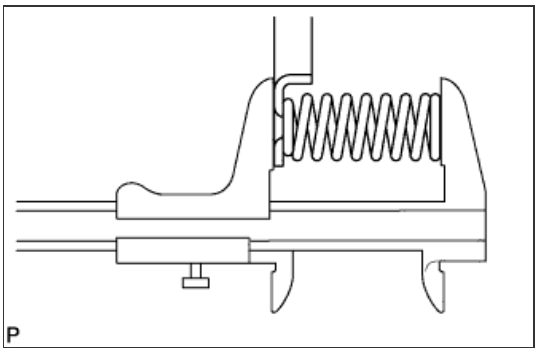
a. Remove the reverse clutch return spring and O-ring from the reverse clutch piston.



53. INSPECT REVERSE CLUTCH RETURN SPRING SUB-ASSEMBLY

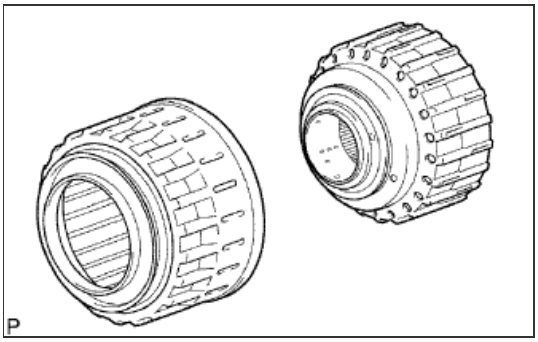
a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
21.04 mm (0.828 in.)

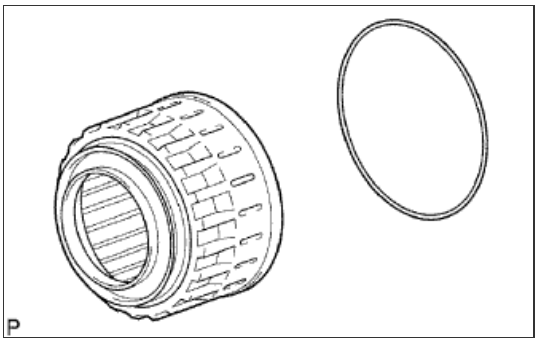


54. REMOVE REVERSE CLUTCH PISTON SUB-ASSEMBLY

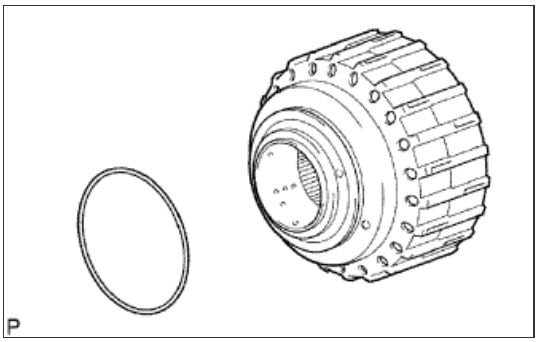
a. Remove the reverse clutch piston sub-assembly from the clutch drum.



b. Remove the O-ring from the reverse clutch piston.



c. Remove the O-ring from the clutch drum.



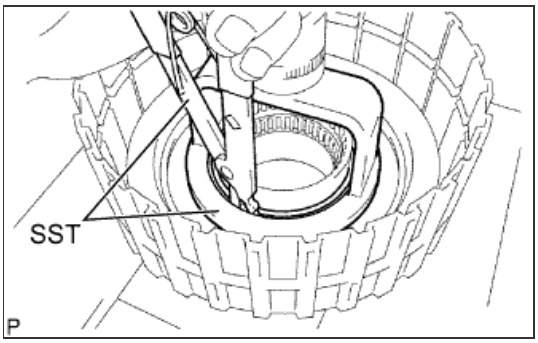
55. REMOVE DIRECT CLUTCH PISTON SUB-ASSEMBLY

a. Place SST on the direct clutch piston, and compress the return spring with a press.

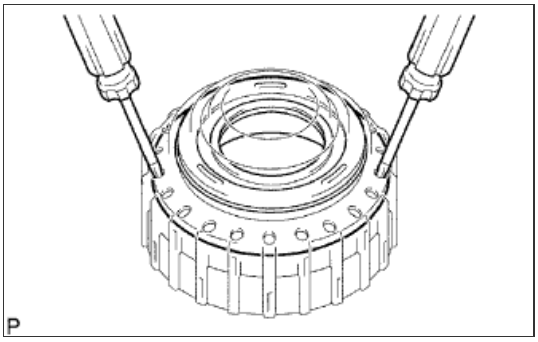
SST
09320-89010

b. Using SST, remove the snap ring.

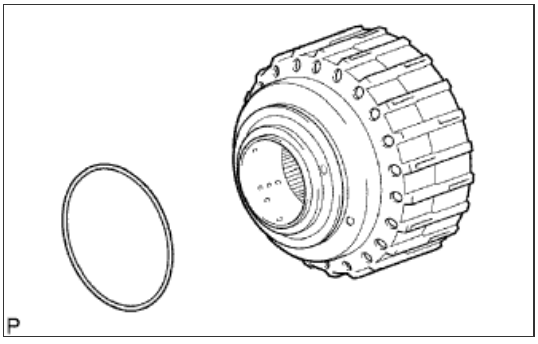
SST
09350-30020 (09350-07070)



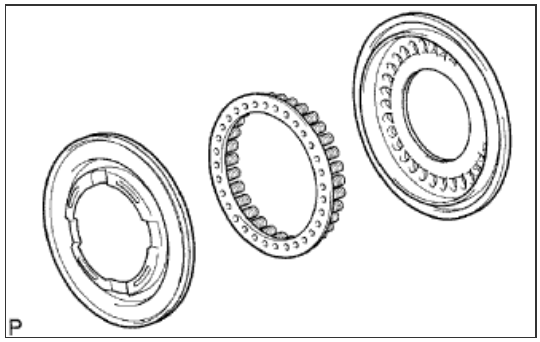
c. Using 2 screwdrivers, remove the direct clutch piston sub-assembly from the clutch drum.



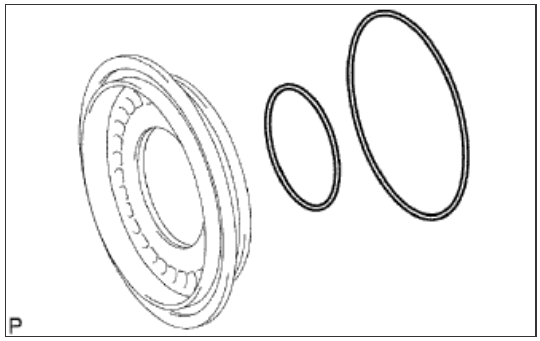
d. Remove the O-ring from the clutch drum.



e. Remove the No. 2 clutch balancer and direct clutch return spring from the direct clutch piston.



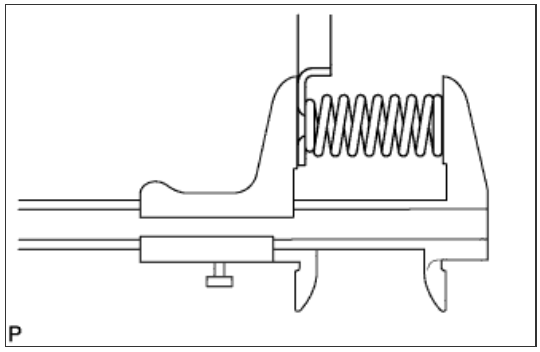
f. Remove the 2 O-rings from the direct clutch piston.



56. INSPECT DIRECT CLUTCH RETURN SPRING SUB-ASSEMBLY

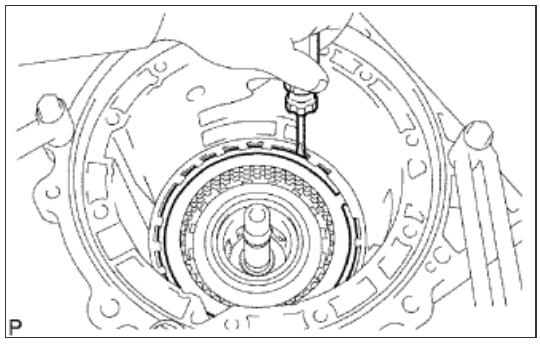
a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
19.51 mm (0.768 in.)



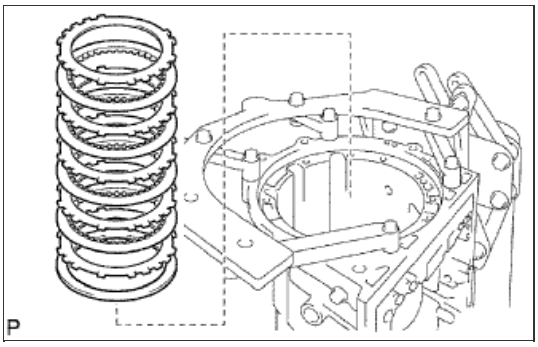
57. REMOVE NO. 3 BRAKE SNAP RING

a. Using a screwdriver, remove the No. 3 brake snap ring from the case.



58. REMOVE NO. 3 BRAKE DISC

a. Remove the flange, 4 discs, 4 plates and cushion plate from the case.

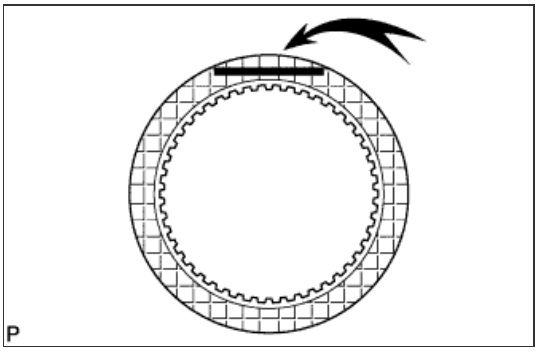


59. INSPECT NO. 3 BRAKE DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) the grooves or printed numbers have even a little bit of damage.

NOTICE:

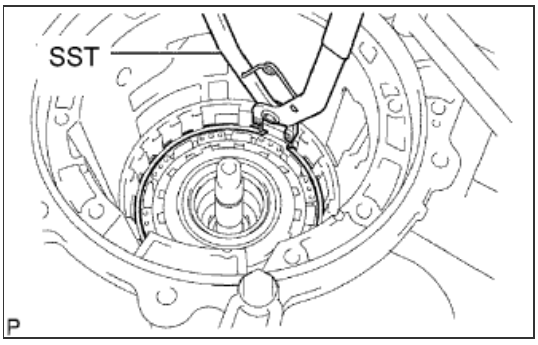
Before assembling new discs, soak them in ATF for at least 15 minutes.



60. REMOVE 2ND BRAKE PISTON HOLE SNAP RING

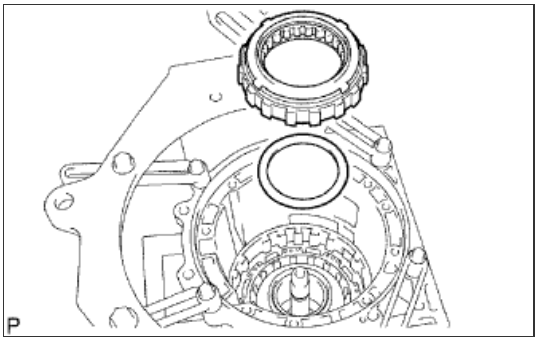
a. Using SST, remove the snap ring.

SST
09350-30020 (09350-07060)



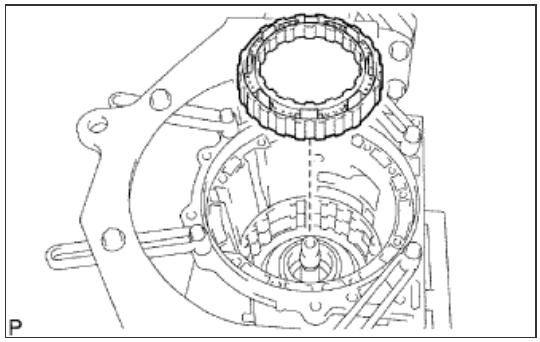
61. REMOVE 1-WAY CLUTCH ASSEMBLY

a. Remove the 1-way clutch assembly and No. 1 planetary carrier thrust washer from the case.



62. REMOVE 2ND BRAKE CYLINDER

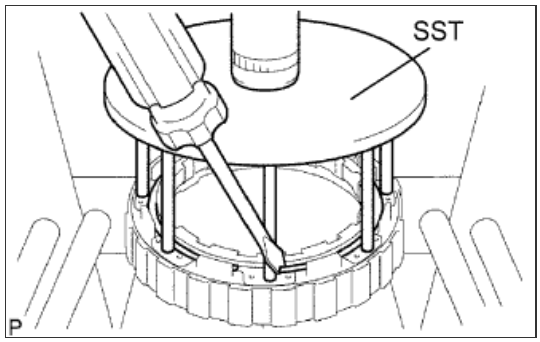
a. Remove the 2nd brake cylinder from the case.



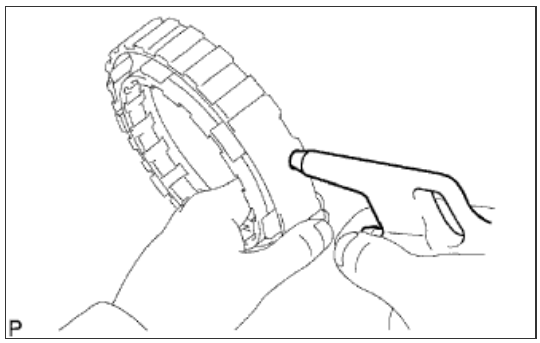
63. REMOVE 2ND BRAKE PISTON

a. Using SST and a press, compress the return spring and remove the snap ring.

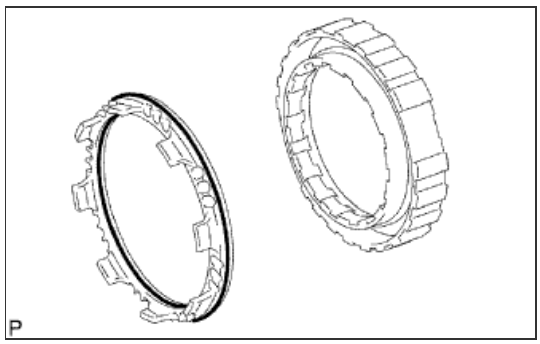
SST
09351-40010



b. Hold the 2nd brake cylinder and apply compressed air (392 kPa (4.0 kgf/cm ^{2}, 57 psi)) to the 2nd brake cylinder to remove the 2nd brake piston.



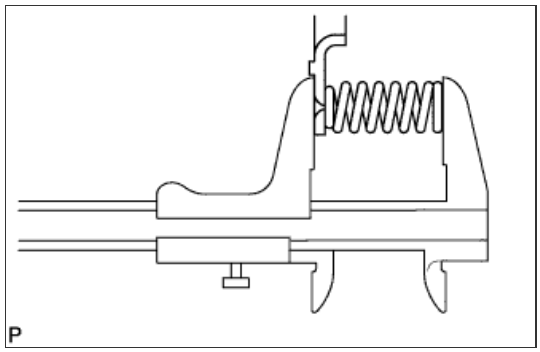
c. Remove the 2 O-rings from the 2nd brake piston.



64. INSPECT NO. 3 BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

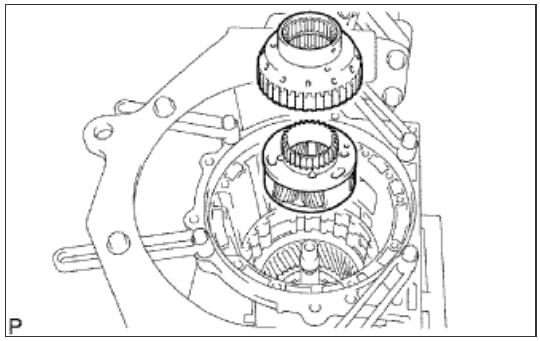
a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
15.72 mm (0.619 in.)

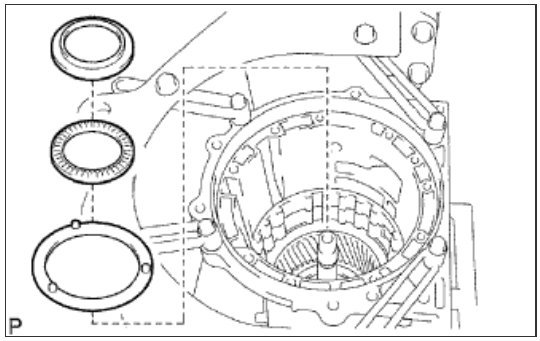


65. REMOVE FRONT PLANETARY GEAR ASSEMBLY

a. Remove the front planetary gear assembly and 1-way clutch inner race from the case.



b. Remove the No. 5 thrust bearing race, thrust needle roller bearing and No. 2 planetary carrier thrust washer from the front planetary gear assembly.



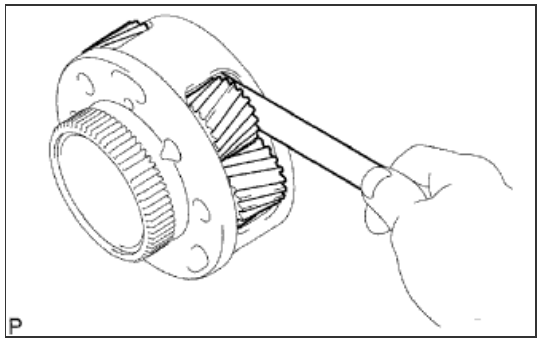
66. INSPECT FRONT PLANETARY GEAR ASSEMBLY

a. Using a feeler gauge, measure the front planetary pinion gear thrust clearance.

Standard clearance:
0.2 to 0.6 mm (0.00787 to 0.0236 in.)

Maximum clearance:
0.65 mm (0.0256 in.)

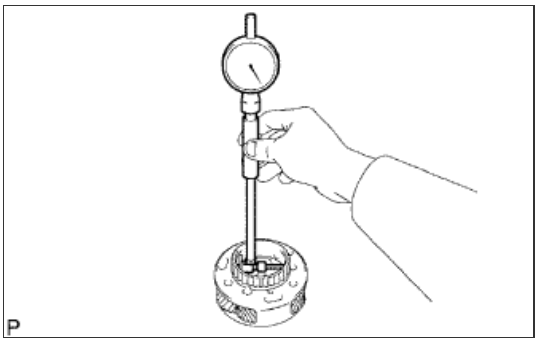
If the clearance is more than the maximum, replace the front planetary gear assembly.



b. Using a cylinder gauge, measure the inside diameter of the front planetary gear bush.

Maximum inside diameter:
57.48 mm (2.26 in.)

If the inside diameter is more than the maximum, replace the front planetary gear.

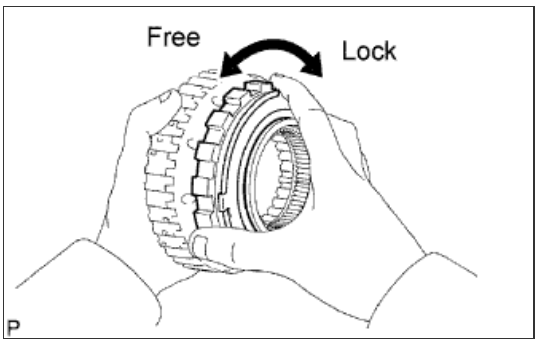


67. INSPECT 1-WAY CLUTCH ASSEMBLY

a. Install the 1-way clutch to the 1-way clutch inner race.

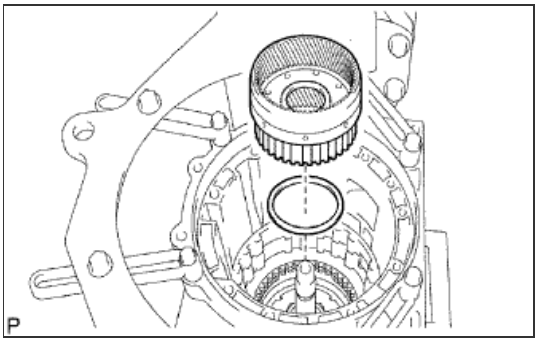
b. Hold the 1-way clutch inner race and turn the 1-way clutch assembly. Check that the 1-way clutch turns freely counterclockwise and locks when turned clockwise.

c. Remove the 1-way clutch from the 1-way clutch inner race.



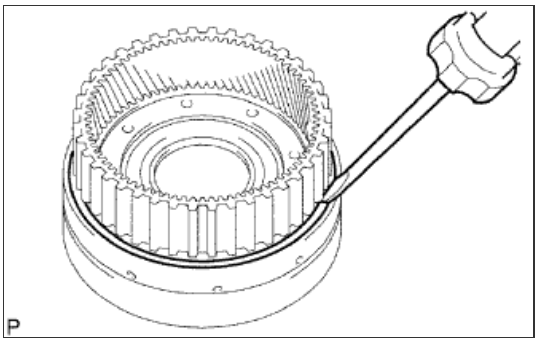
68. REMOVE FRONT PLANETARY RING GEAR

a. Remove the front planetary ring gear and thrust needle roller bearing from the transmission case.

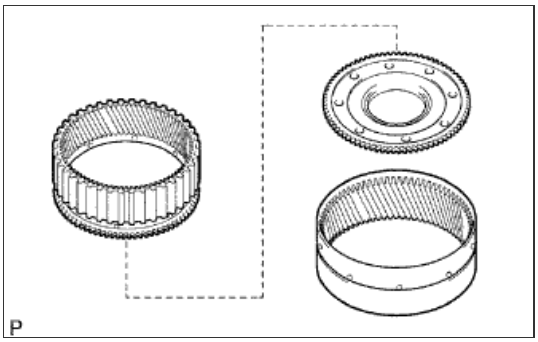


69. REMOVE CENTER PLANETARY RING GEAR

a. Using a screwdriver, remove the snap ring.

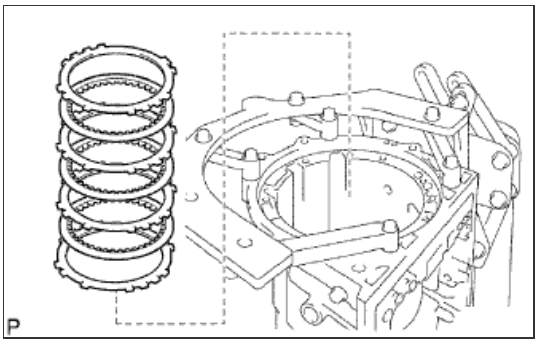


b. Remove the center planetary ring gear and front planetary ring gear flange from the front planetary ring gear.



70. REMOVE NO. 1 BRAKE DISC

a. Remove the flange, 3 discs and 3 plates from the case.

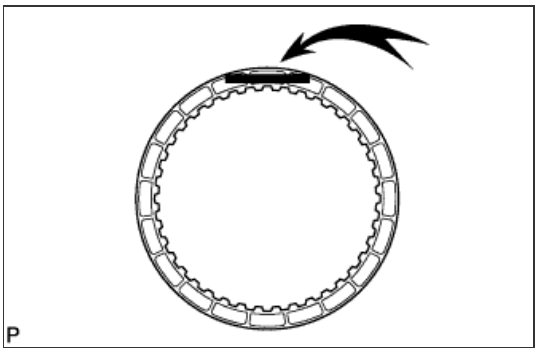


71. INSPECT NO. 1 BRAKE DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) the grooves or printed numbers have even a little bit of damage.

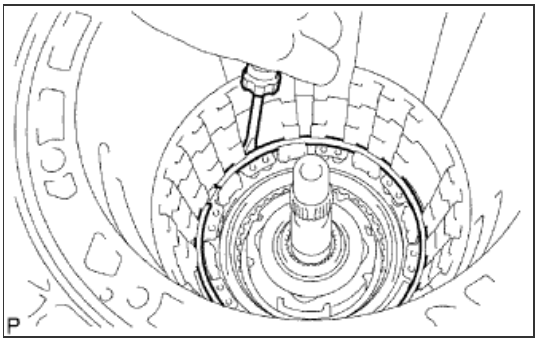
NOTICE:

Before assembling new discs, soak them in ATF for at least 15 minutes.



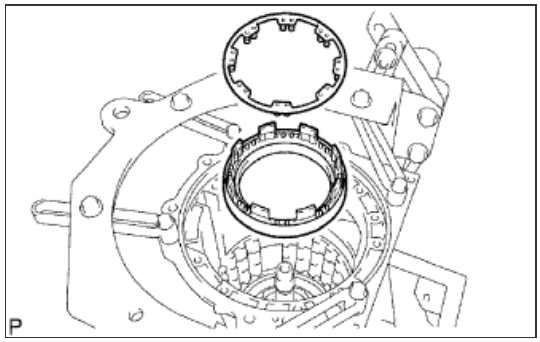
72. REMOVE BRAKE PISTON RETURN SPRING SNAP RING

a. Using a screwdriver, remove the brake piston return spring snap ring from the case.



73. REMOVE BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

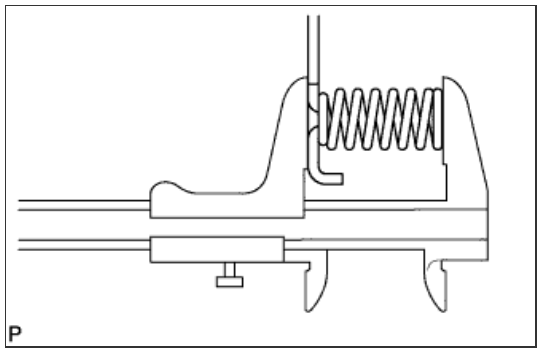
a. Remove the brake piston return spring and No. 1 brake piston with No. 1 brake cylinder from the transmission case.



74. INSPECT BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
17.05 mm (0.671 in.)



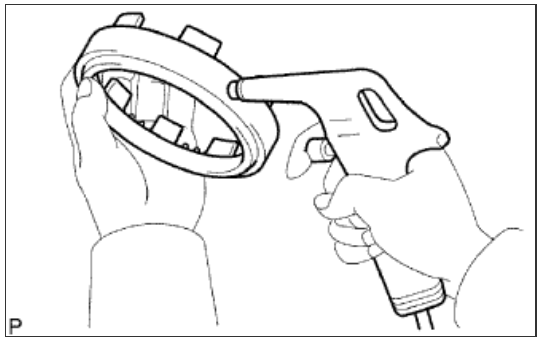
75. REMOVE NO. 1 BRAKE PISTON

a. Hold the No. 1 brake cylinder and apply compressed air (392 kPa (4.0 kgf/cm ^{2}, 57 psi)) to No. 1 brake cylinder to remove the No. 1 brake piston.

HINT:

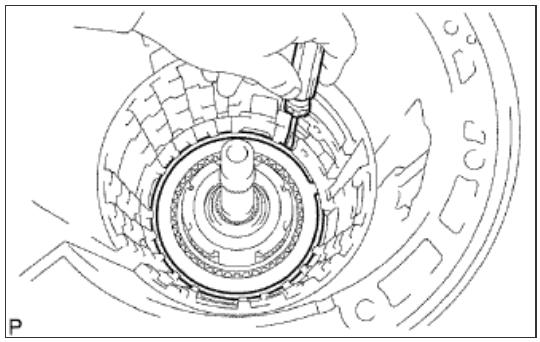
If the piston does not pop out with compressed air, lift the piston out with needle-nose pliers.

b. Remove the 2 O-rings from the No. 1 brake piston.



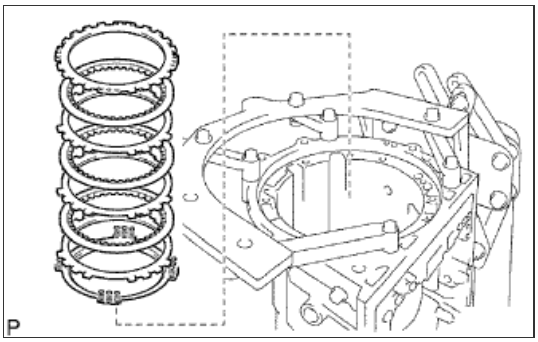
76. REMOVE NO. 2 BRAKE DISC

a. Using a screwdriver, remove the snap ring from the case.



b. Remove the flange, 3 discs, 3 plates and brake piston return spring from the

case.

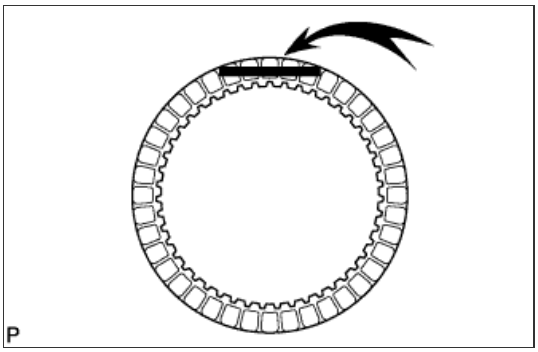


77. INSPECT NO. 2 BRAKE DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) the grooves or printed numbers have even a little bit of damage.

NOTICE:

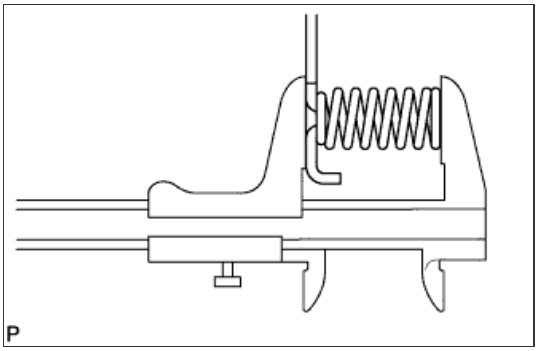
Before assembling new discs, soak them in ATF for at least 15 minutes.



78. INSPECT NO. 2 BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
17.05 mm (0.671 in.)



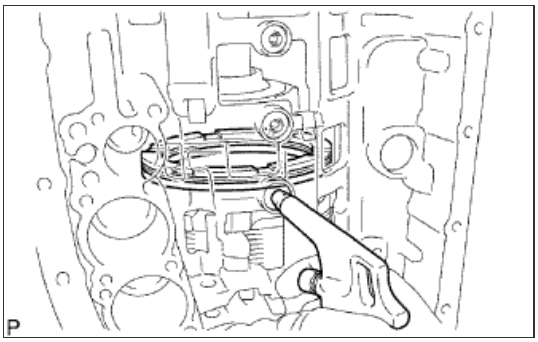
79. REMOVE NO. 2 BRAKE PISTON

a. Apply compressed air (392 kPa (4.0 kgf/cm^2, 57 psi)) to the transmission case to remove the No. 2 brake piston.

HINT:

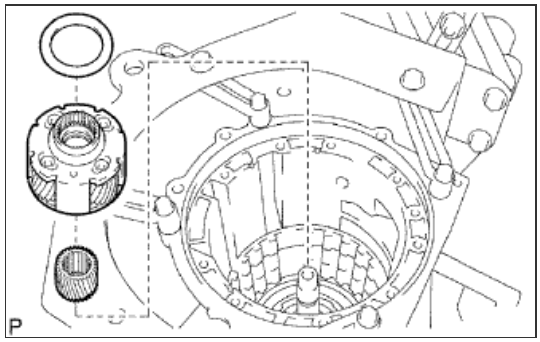
If the piston does not pop out with compressed air, lift the piston out with needle-nose pliers.

b. Remove the 2 O-rings from the No. 2 brake piston.



80. REMOVE CENTER PLANETARY GEAR ASSEMBLY

a. Remove the No. 6 thrust bearing race, center planetary gear and planetary sun gear from the case.



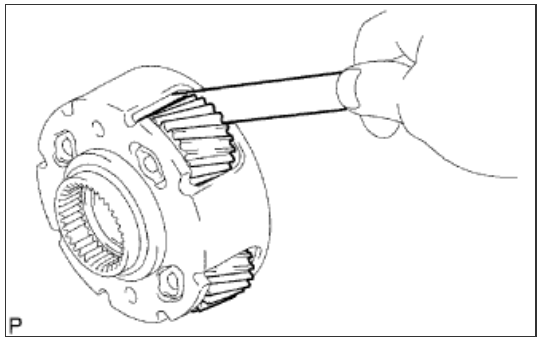
81. INSPECT CENTER PLANETARY GEAR ASSEMBLY

a. Using a feeler gauge, measure the center planetary pinion gear thrust clearance.

Standard clearance:
0.12 to 0.68 mm (0.00472 to 0.0268 in.)

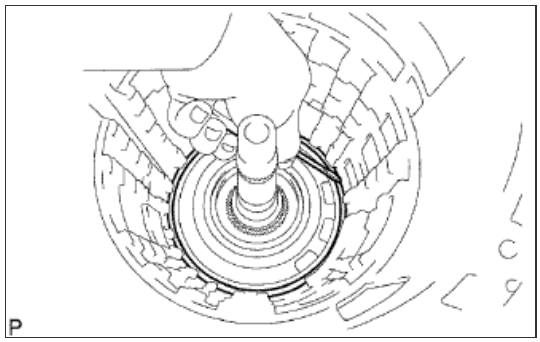
Maximum clearance:
0.73 mm (0.0287 in.)

If the clearance is more than the maximum, replace the center planetary gear assembly.

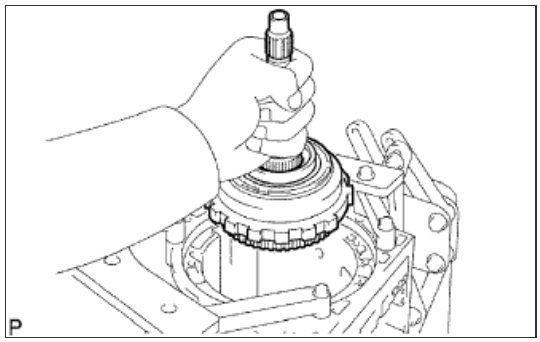


82. REMOVE INTERMEDIATE SHAFT

a. Using a screwdriver, remove the snap ring from the case.

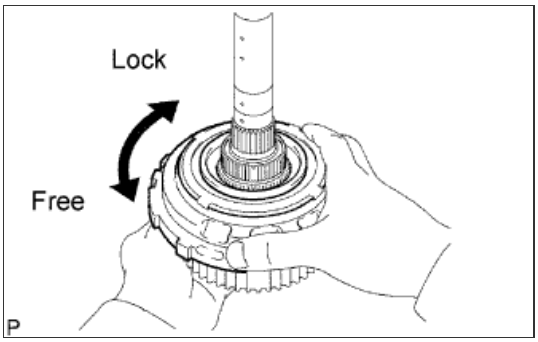


b. Remove the intermediate shaft with No. 3 1-way clutch assembly from the case.



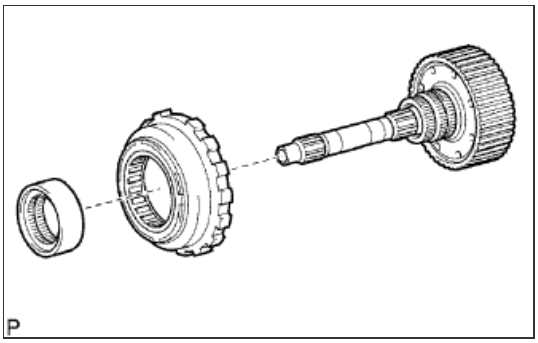
83. INSPECT NO. 3 1-WAY CLUTCH ASSEMBLY

a. Hold the rear planetary ring gear flange and turn the 1-way clutch. Check that the 1-way clutch turns freely counterclockwise and locks when turned clockwise.



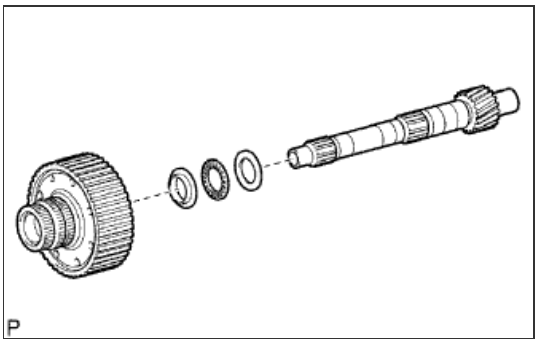
84. REMOVE NO. 3 1-WAY CLUTCH ASSEMBLY

a. Remove the No. 3 1-way clutch assembly and 1-way clutch inner race from the intermediate shaft.



85. REMOVE REAR PLANETARY RING GEAR FLANGE SUB-ASSEMBLY

a. Remove the planetary ring gear flange, No. 7 thrust bearing race, thrust needle roller bearing and No. 8 thrust bearing race from the intermediate shaft.



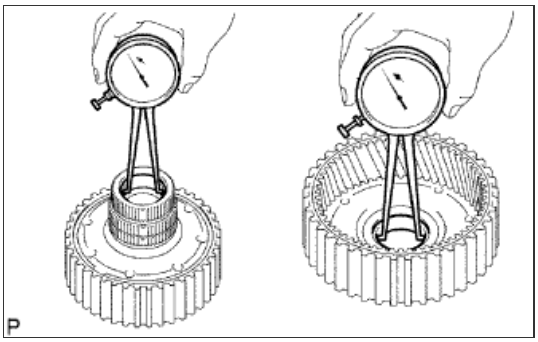
86. INSPECT REAR PLANETARY RING GEAR FLANGE SUB-ASSEMBLY

a. Using a dial indicator, measure the inside diameter of the rear planetary ring gear bush.

Standard inside diameter:
32.176 to 32.201 (1.267 to 1.268 in.)

Maximum inside diameter:
32.251 mm (1.270 in.)

If the inside diameter is more than the maximum, replace the rear planetary ring gear.



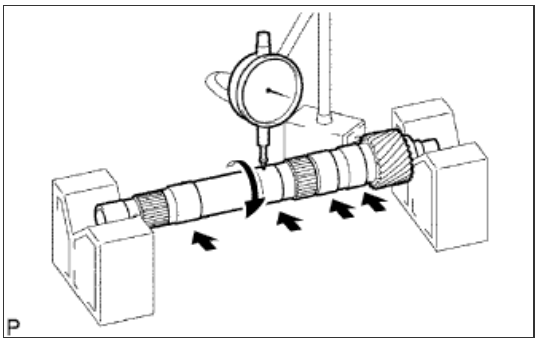
87. INSPECT INTERMEDIATE SHAFT

a. Using a dial indicator, measure the intermediate shaft runout.

Standard runout:
0.03 mm (0.00118 in.)

Maximum runout:
0.08 mm (0.00315 in.)

If the runout is more than the maximum, replace the intermediate shaft with a new one.

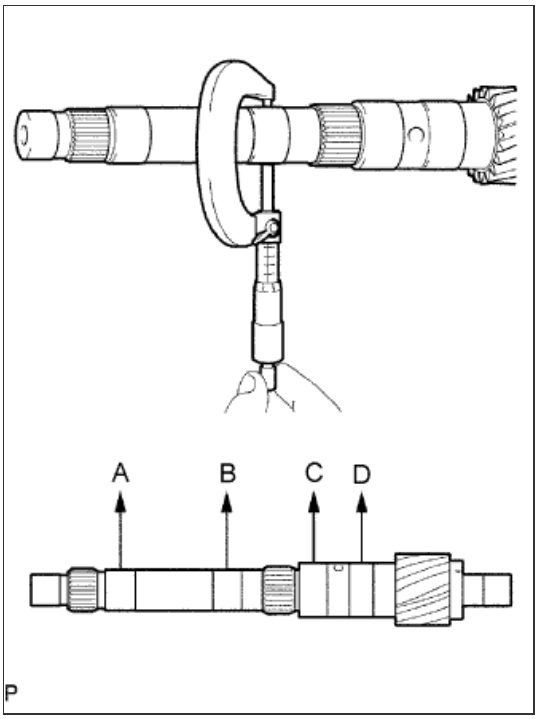


b. Using a micrometer, measure the diameter of the intermediate shaft at the positions shown in the diagram.

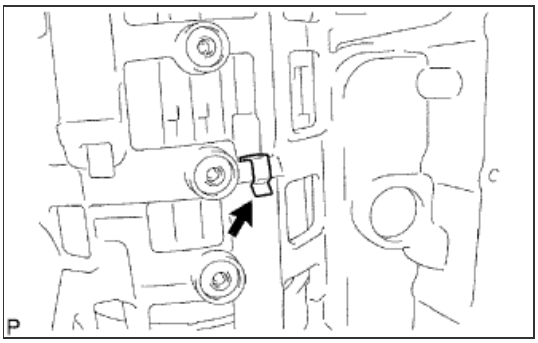
Standard diameter:
A, B:
25.962 to 25.975 mm (1.022 to 1.023 in.)
C, D:
32.062 to 32.075 mm (1.262 to 1.263 in.)

Minimum diameter:
A, B:
25.912 mm (1.02 in.)
C, D:
32.012 mm (1.26 in.)

If the diameter is less than the minimum, replace the intermediate shaft with a new one.

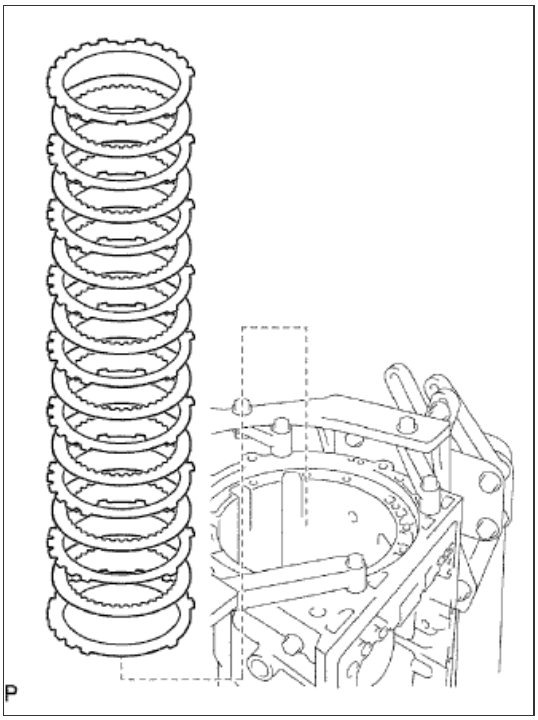


88. REMOVE BRAKE PLATE STOPPER SPRING



89. REMOVE NO. 4 BRAKE DISC

a. Remove the 7 plates, 8 discs and 2 flanges from the case.

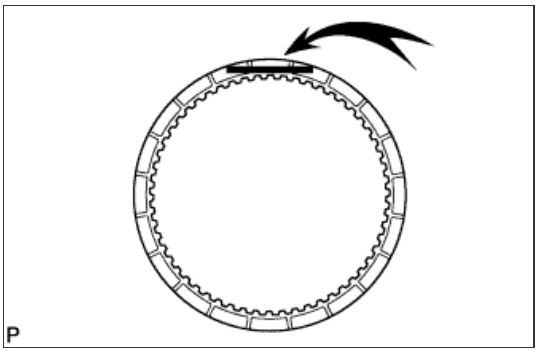


90. INSPECT NO. 4 BRAKE DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) the grooves or printed numbers have even a little bit of damage.

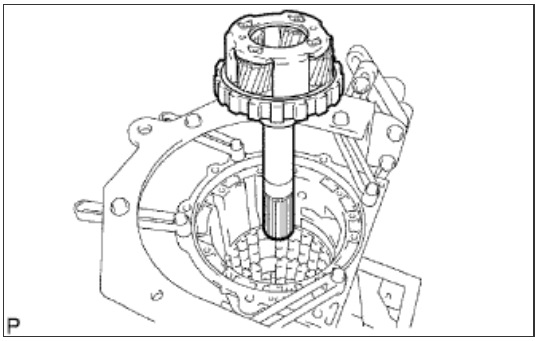
NOTICE:

Before assembling new discs, soak them in ATF for at least 15 minutes.

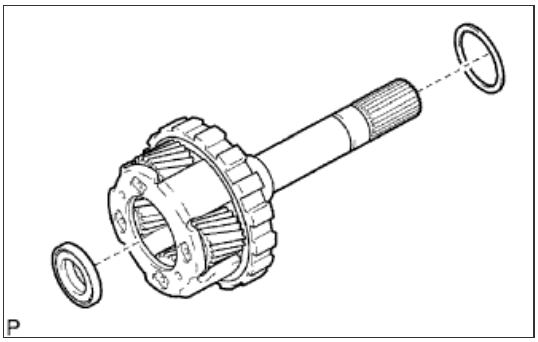


91. REMOVE REAR PLANETARY GEAR ASSEMBLY

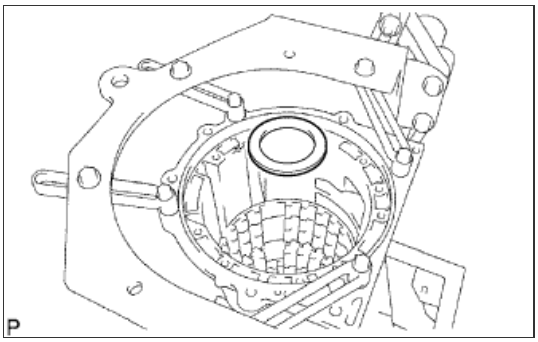
a. Remove the rear planetary gear assembly from the case.



b. Remove the 2 thrust needle roller bearings from the rear planetary gear.



c. Remove the No. 9 thrust bearing from the case.



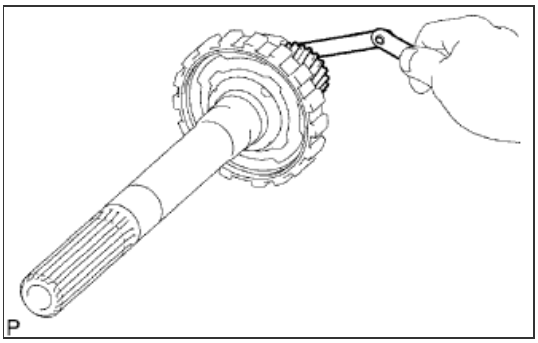
92. INSPECT REAR PLANETARY GEAR ASSEMBLY

a. Using a feeler gauge, measure the rear planetary pinion gear thrust clearance.

Standard clearance:
0.2 to 0.6 mm (0.00787 to 0.0236 in.)

Maximum clearance:
0.65 mm (0.0256 in.)

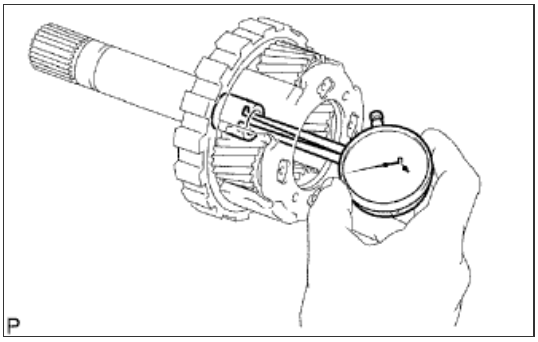
If the clearance is more than the maximum, replace the planetary gear assembly.



b. Using a dial indicator, measure the inside diameter of the rear planetary gear bush.

Maximum inside diameter:
20.075 mm (0.790 in.)

If the inside diameter is more than the maximum, replace the rear planetary gear assembly.



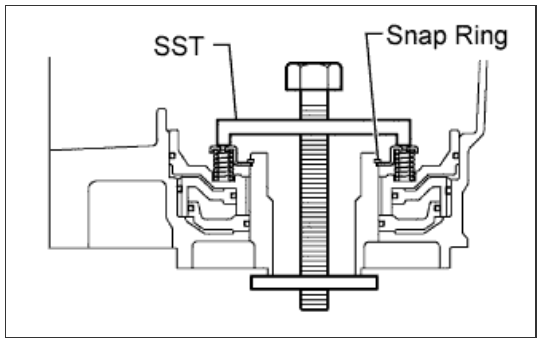
93. REMOVE 1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY

a. Place SST on the spring retainer and compress the brake return spring.

SST
09350-30020 (09350-07050)

b. Using SST, remove the snap ring and brake return spring.

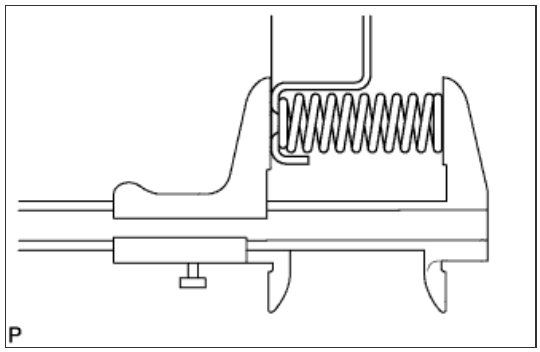
SST
09350-30020 (09350-07070)



94. INSPECT 1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY

a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
23.74 mm (0.935 in.)



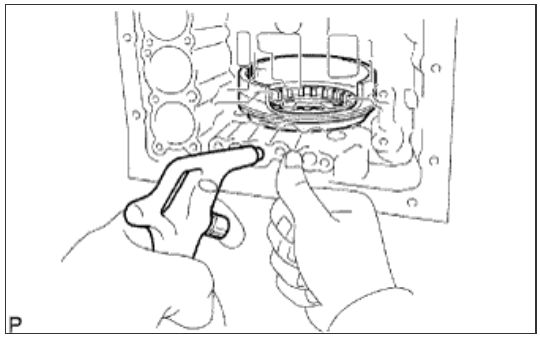
95. REMOVE 1ST AND REVERSE BRAKE PISTON

a. Apply compressed air (392 kPa (4.0 kgf/cm^2, 57 psi)) to the transmission case to remove the 1st and reverse brake piston.

HINT:

If the piston does not pop out with compressed air, lift the piston out with needle-nose pliers.

b. Remove the O-ring from the 1st and reverse brake piston.

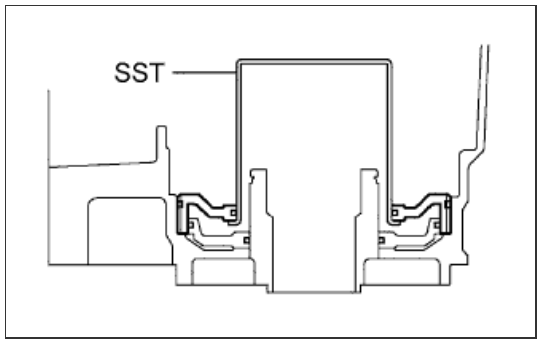


96. REMOVE BRAKE REACTION SLEEVE

a. Using SST, remove the reaction sleeve.

SST
09350-30020 (09350-07080)

b. Remove the O-ring from the reaction sleeve.



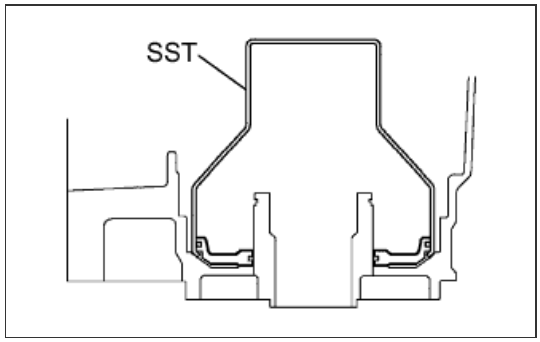
97. REMOVE NO. 4 BRAKE PISTON

a. Using SST, remove the brake piston.

SST

09350-30020 (09350-07090)

b. Remove the 2 O-rings from the brake piston.



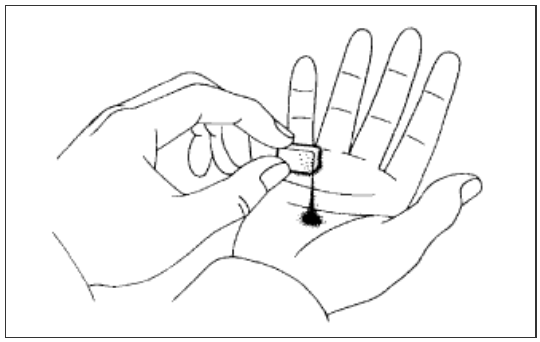
for Preparation Click here

1. INSPECT AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY

a. Remove the magnets, and use them to collect steel particles.

b. Carefully look at the foreign matter and particles in the pan and on the magnets to anticipate the type of wear you will find in the transmission.

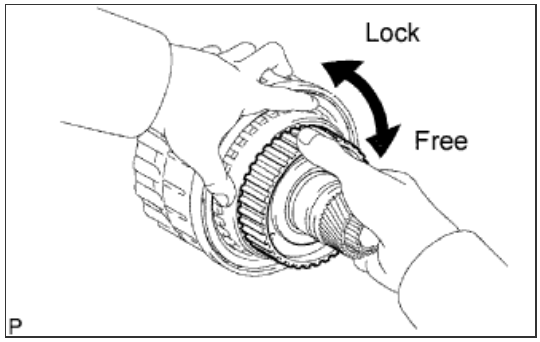
- Steel (magnetic): bearing, gear and clutch plate wear
- Brass (non-magnetic): bushing wear



2. INSPECT NO. 2 1-WAY CLUTCH ASSEMBLY

a. Hold the reverse clutch hub and turn the 1-way clutch assembly.

b. Check that the 1-way clutch turns freely clockwise and locks when turned counterclockwise.

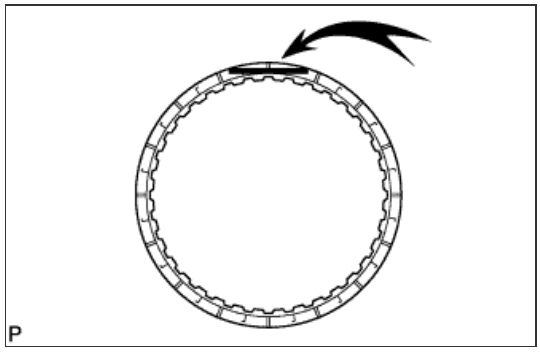


3. INSPECT REAR CLUTCH DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) the grooves or printed numbers have even a little bit of damage.

NOTICE:

Before assembling new discs, soak them in ATF for at least 15 minutes.



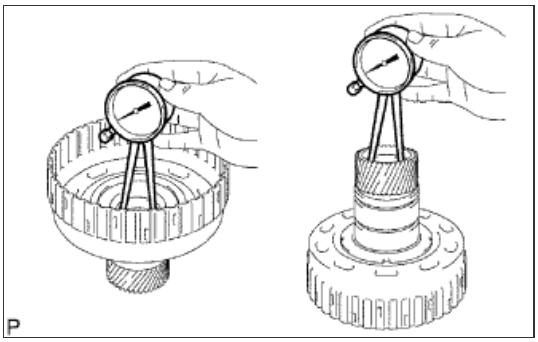
4. INSPECT REVERSE CLUTCH HUB SUB-ASSEMBLY

a. Using a dial indicator, measure the inside diameter of the reverse clutch hub bush.

Standard inside diameter:
35.812 to 35.837 mm (1.410 to 1.411 in.)

Maximum inside diameter:
35.887 mm (1.413 in.)

If the inside diameter is more than the maximum, replace the reverse clutch hub.



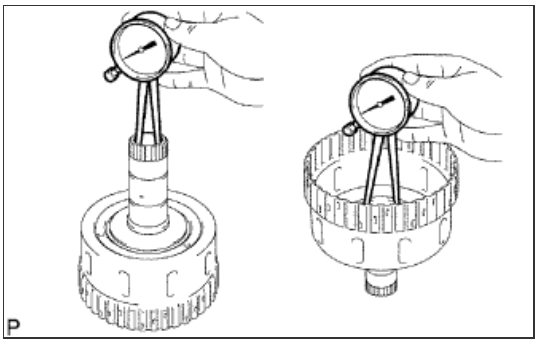
5. INSPECT FORWARD CLUTCH HUB SUB-ASSEMBLY

a. Using a dial indicator, measure the inside diameter of the forward clutch hub bush.

Standard inside diameter:
26.037 to 26.062 mm (1.025 to 1.026 in.)

Maximum inside diameter:
26.112 mm (1.028 in.)

If the inside diameter is more than the maximum, replace the forward clutch hub.

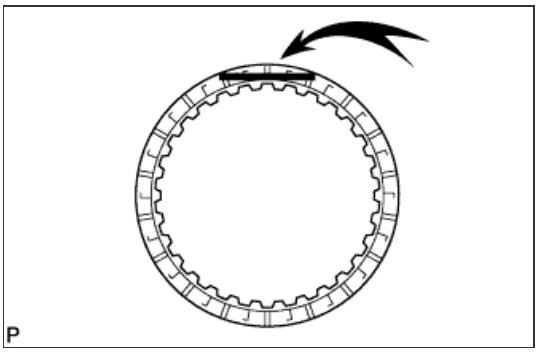


6. INSPECT FORWARD MULTIPLE DISC CLUTCH DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) the grooves or printed numbers have even a little bit of damage.

NOTICE:

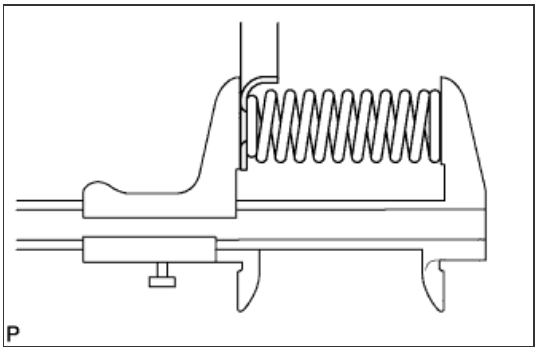
Before assembling new discs, soak them in ATF for at least 15 minutes.



7. INSPECT FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY

a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
26.74 mm (1.05 in.)

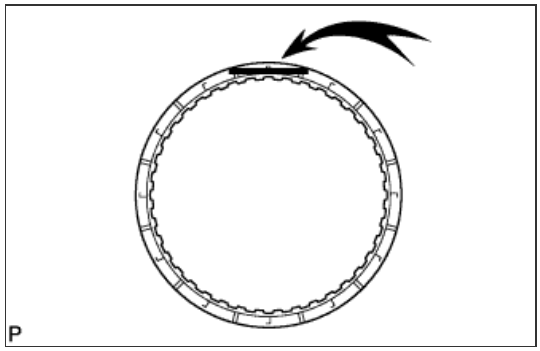


8. INSPECT DIRECT CLUTCH DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) the grooves or printed numbers have even a little bit of damage.

NOTICE:

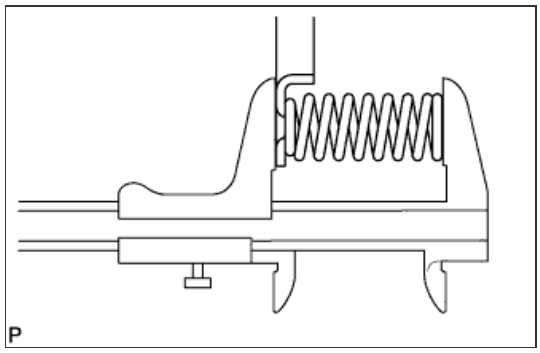
Before assembling new discs, soak them in ATF for at least 15 minutes.



9. INSPECT REVERSE CLUTCH RETURN SPRING SUB-ASSEMBLY

a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

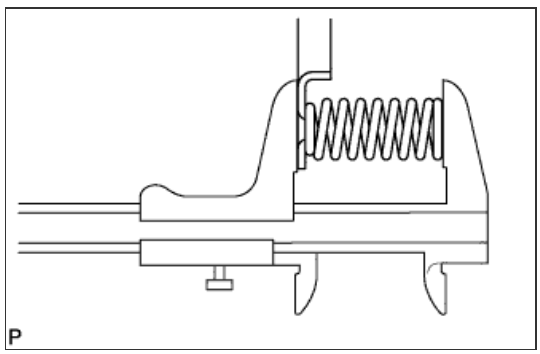
Standard free length:
21.04 mm (0.828 in.)



10. INSPECT DIRECT CLUTCH RETURN SPRING SUB-ASSEMBLY

a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
19.51 mm (0.768 in.)

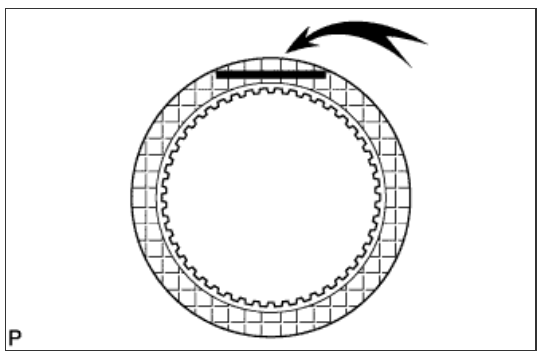


11. INSPECT NO. 3 BRAKE DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) the grooves or printed numbers have even a little bit of damage.

NOTICE:

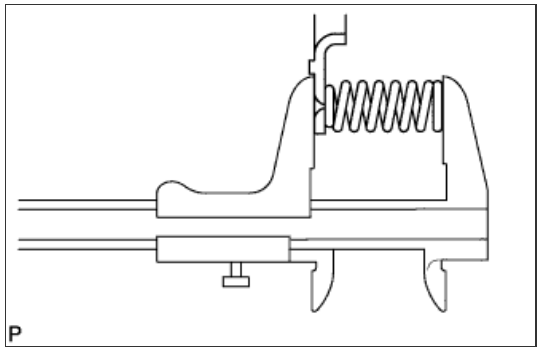
Before assembling new discs, soak them in ATF for at least 15 minutes.



12. INSPECT NO. 3 BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
15.72 mm (0.619 in.)



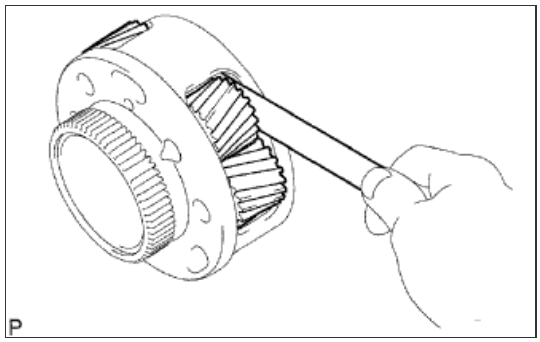
13. INSPECT FRONT PLANETARY GEAR ASSEMBLY

a. Using a feeler gauge, measure the front planetary pinion gear thrust clearance.

Standard clearance:
0.2 to 0.6 mm (0.00787 to 0.0236 in.)

Maximum clearance:
0.65 mm (0.0256 in.)

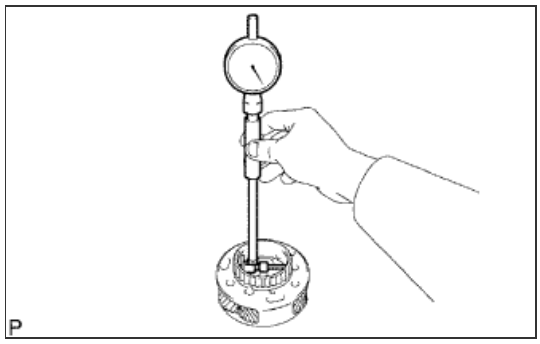
If the clearance is more than the maximum, replace the front planetary gear assembly.



b. Using a cylinder gauge, measure the inside diameter of the front planetary gear bush.

Maximum inside diameter:
57.48 mm (2.26 in.)

If the inside diameter is more than the maximum, replace the front planetary gear.

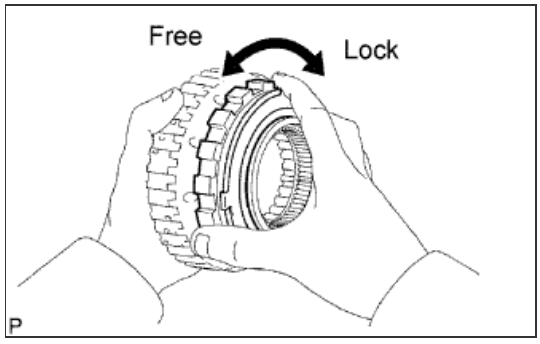


14. INSPECT 1-WAY CLUTCH ASSEMBLY

a. Install the 1-way clutch to the 1-way clutch inner race.

b. Hold the 1-way clutch inner race and turn the 1-way clutch assembly. Check that the 1-way clutch turns freely counterclockwise and locks when turned clockwise.

c. Remove the 1-way clutch from the 1-way clutch inner race.

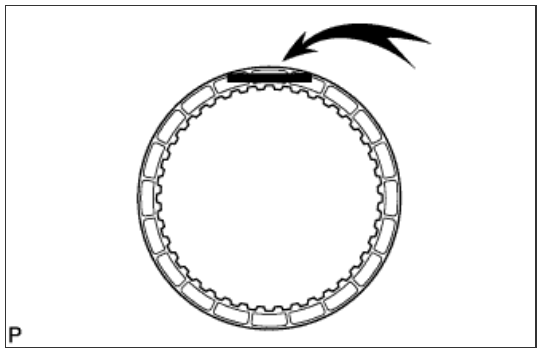


15. INSPECT NO. 1 BRAKE DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) the grooves or printed numbers have even a little bit of damage.

NOTICE:

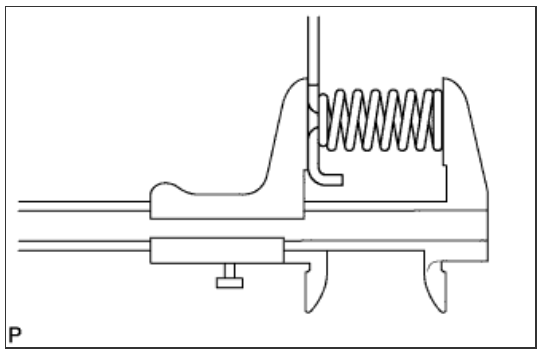
Before assembling new discs, soak them in ATF for at least 15 minutes.



16. INSPECT BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
17.05 mm (0.671 in.)

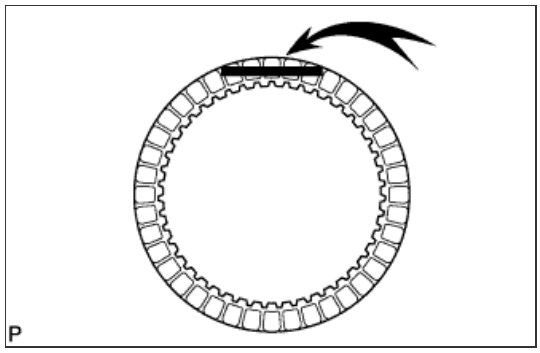


17. INSPECT NO. 2 BRAKE DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) the grooves or printed numbers have even a little bit of damage.

NOTICE:

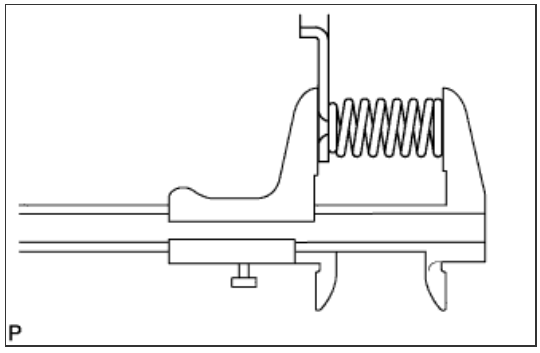
Before assembling new discs, soak them in ATF for at least 15 minutes.



18. INSPECT NO. 2 BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
17.45 mm (0.687 in.)



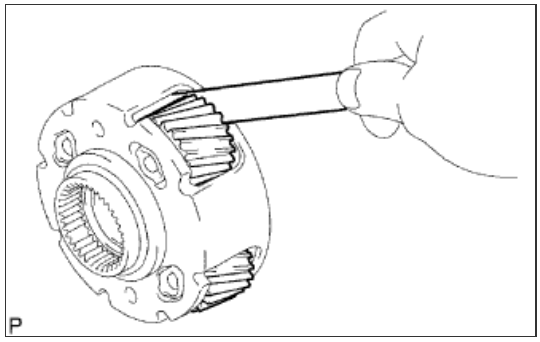
19. INSPECT CENTER PLANETARY GEAR ASSEMBLY

a. Using a feeler gauge, measure the center planetary pinion gear thrust clearance.

Standard clearance:
0.12 to 0.68 mm (0.00472 to 0.0268 in.)

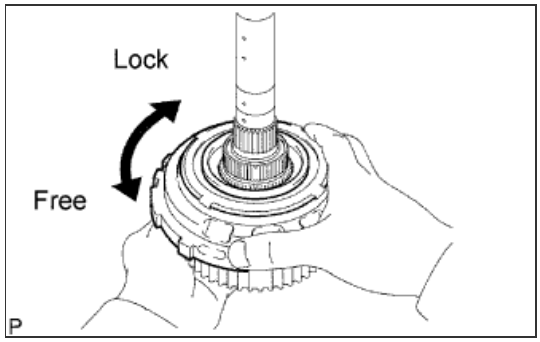
Maximum clearance:
0.73 mm (0.0287 in.)

If the clearance is more than the maximum, replace the center planetary gear assembly.



20. INSPECT NO. 3 1-WAY CLUTCH ASSEMBLY

a. Hold the rear planetary ring gear flange and turn the 1-way clutch. Check that the 1-way clutch turns freely counterclockwise and locks when turned clockwise.



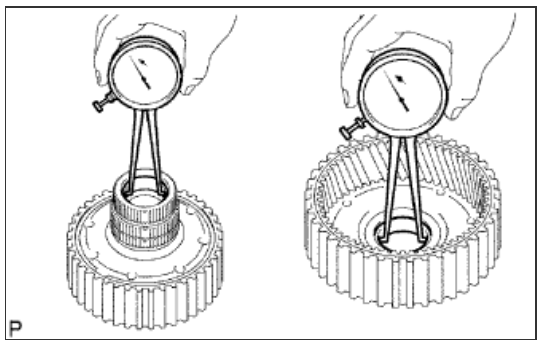
21. INSPECT REAR PLANETARY RING GEAR FLANGE SUB-ASSEMBLY

a. Using a dial indicator, measure the inside diameter of the rear planetary ring gear bush.

Standard inside diameter:
32.176 to 32.201 (1.267 to 1.268 in.)

Maximum inside diameter:
32.251 mm (1.270 in.)

If the inside diameter is more than the maximum, replace the rear planetary ring gear.



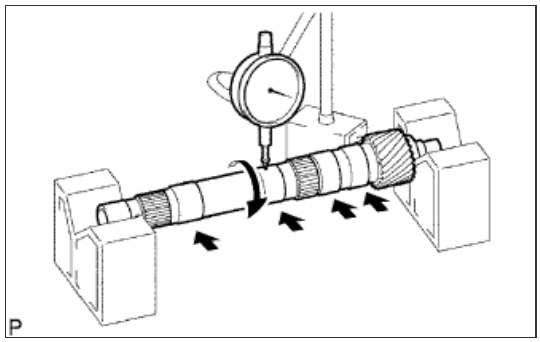
22. INSPECT INTERMEDIATE SHAFT

a. Using a dial indicator, measure the intermediate shaft runout.

Standard runout:
0.03 mm (0.00118 in.)

Maximum runout:
0.08 mm (0.00315 in.)

If the runout is more than the maximum, replace the intermediate shaft with a new one.

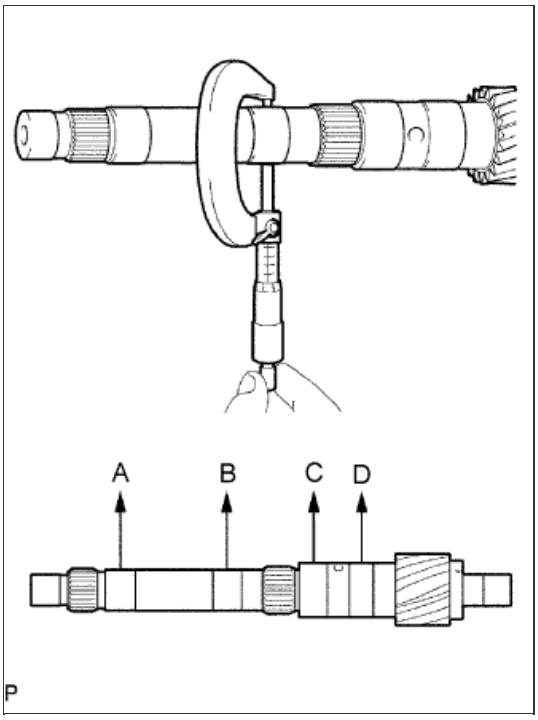


b. Using a micrometer, measure the diameter of the intermediate shaft at the positions shown in the diagram.

Standard diameter:
A, B:
25.962 to 25.975 mm (1.022 to 1.023 in.)
C, D:
32.062 to 32.075 mm (1.262 to 1.263 in.)

Minimum diameter:
A, B:
25.912 mm (1.02 in.)
C, D:
32.012 mm (1.26 in.)

If the diameter is less than the minimum, replace the intermediate shaft with a new one.

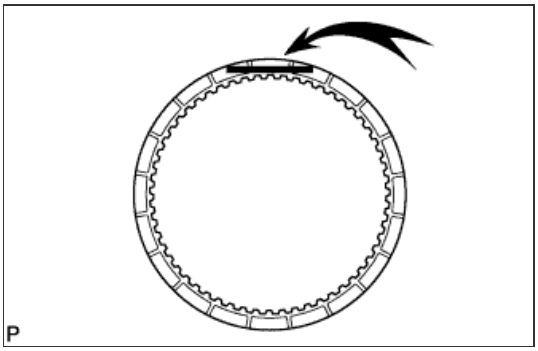


23. INSPECT NO. 4 BRAKE DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) the grooves or printed numbers have even a little bit of damage.

NOTICE:

Before assembling new discs, soak them in ATF for at least 15 minutes.



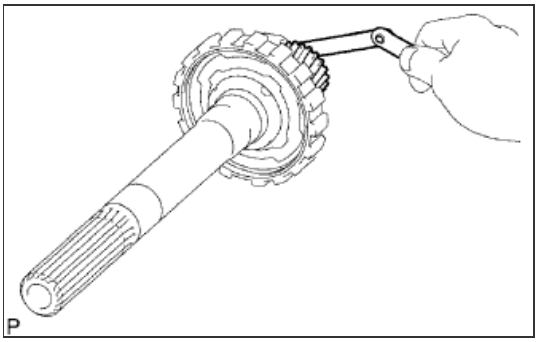
24. INSPECT REAR PLANETARY GEAR ASSEMBLY

a. Using a feeler gauge, measure the rear planetary pinion gear thrust clearance.

Standard clearance:
0.2 to 0.6 mm (0.00787 to 0.0236 in.)

Maximum clearance:
0.65 mm (0.0256 in.)

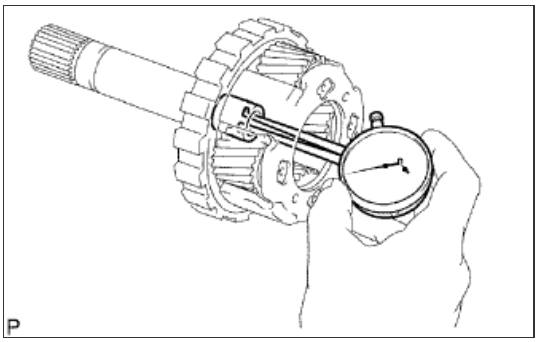
If the clearance is more than the maximum, replace the planetary gear assembly.



b. Using a dial indicator, measure the inside diameter of the rear planetary gear bush.

Maximum inside diameter:
20.075 mm (0.790 in.)

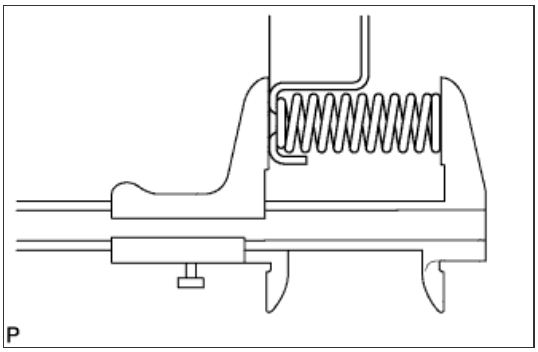
If the inside diameter is more than the maximum, replace the rear planetary gear assembly.



25. INSPECT 1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY

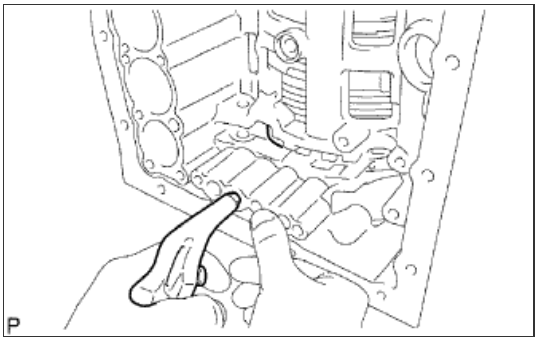
a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
23.74 mm (0.935 in.)



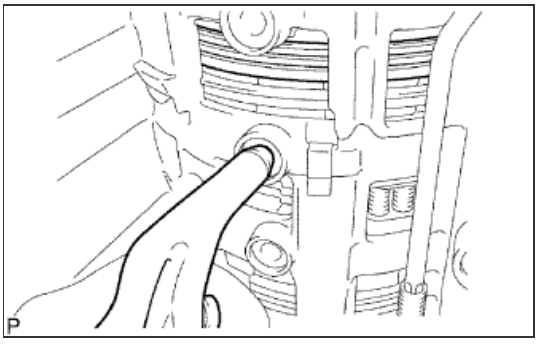
26. INSPECT PACK CLEARANCE OF 1ST AND REVERSE BRAKE

a. Make sure the 1st and reverse brake piston moves smoothly when applying and releasing compressed air into the transmission case.



27. INSPECT PISTON STROKE OF NO. 1 BRAKE PISTON

a. Make sure the No. 1 brake piston moves smoothly when applying and releasing compressed air into the transmission case.



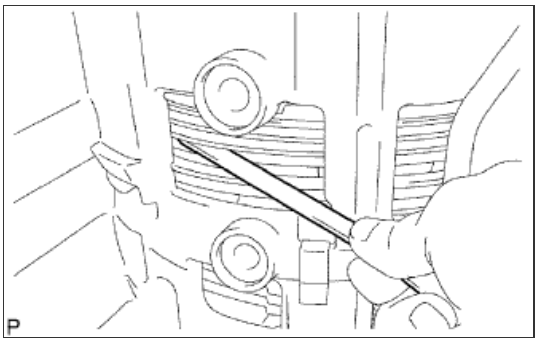
b. Using a feeler gauge, measure the B3 bearing pack clearance between the snap ring and flange.

Standard piston stroke:
0.42 to 0.72 mm (0.0165 to 0.0283 in.)

If the piston stroke is outside the specification, parts may have been assembled incorrectly. Perform the reassembly again. If the piston stroke is still outside the specification, select another flange.

HINT:

There are 4 different thicknesses for the flange.



28. INSPECT PACK CLEARANCE OF DIRECT CLUTCH

a. Using a dial indicator, measure the moving distance (distance A) of the clutch flange at both ends across a diameter while applying air to the oil hole as shown in the illustration, and calculate the average.

Standard pack clearance:
0.5 to 0.8 mm (0.0197 to 0.0315 in.)

NOTICE:

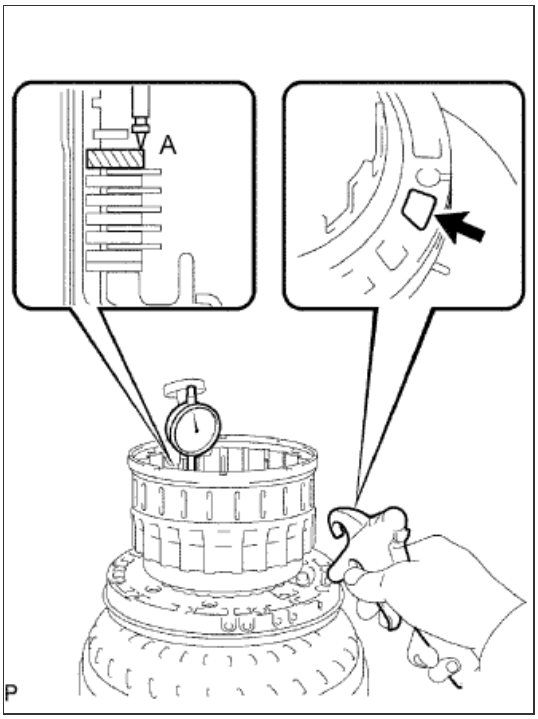
When measuring the moving distance, install a standard flange (thickness: 3.4 mm (0.134 in.)) to the position of the shaded area in the illustration.

HINT:

Flange moving distance A = 0.26 to 1.14 mm (0.0102 to 0.0449 in.)

Pack clearance = Flange moving distance A - 0.05 mm (0.00197 in.)

If the pack clearance is outside the standard, select and install a clutch flange that makes the pack clearance within the standard.



Flange Thickness:

Mark	Thickness
2	2.95 to 3.05 mm (0.116 to 0.120 in.)
3	3.05 to 3.15 mm (0.120 to 0.124 in.)
4	3.15 to 3.25 mm (0.124 to 0.128 in.)
5	3.25 to 3.35 mm (0.128 to 0.132 in.)
6	3.35 to 3.45 mm (0.132 to 0.136 in.)
7	3.45 to 3.55 mm (0.136 to 0.140 in.)
8	3.55 to 3.65 mm (0.140 to 0.144 in.)
9	3.65 to 3.75 mm (0.144 to 0.148 in.)
A	3.75 to 3.85 mm (0.148 to 0.152 in.)

29. INSPECT PACK CLEARANCE OF REVERSE CLUTCH

a. Using a dial indicator, measure the reverse clutch piston stroke (distance A) and the moving distance (distance B) of the reverse flange at both ends across a diameter while applying air (392 kPa (4.0 kgf/cm^2, 57 psi)) to the oil hole as shown in the illustration, and calculate the average.

Standard pack clearance:
0.5 to 0.8 mm (0.0197 to 0.0315 in.)

NOTICE:

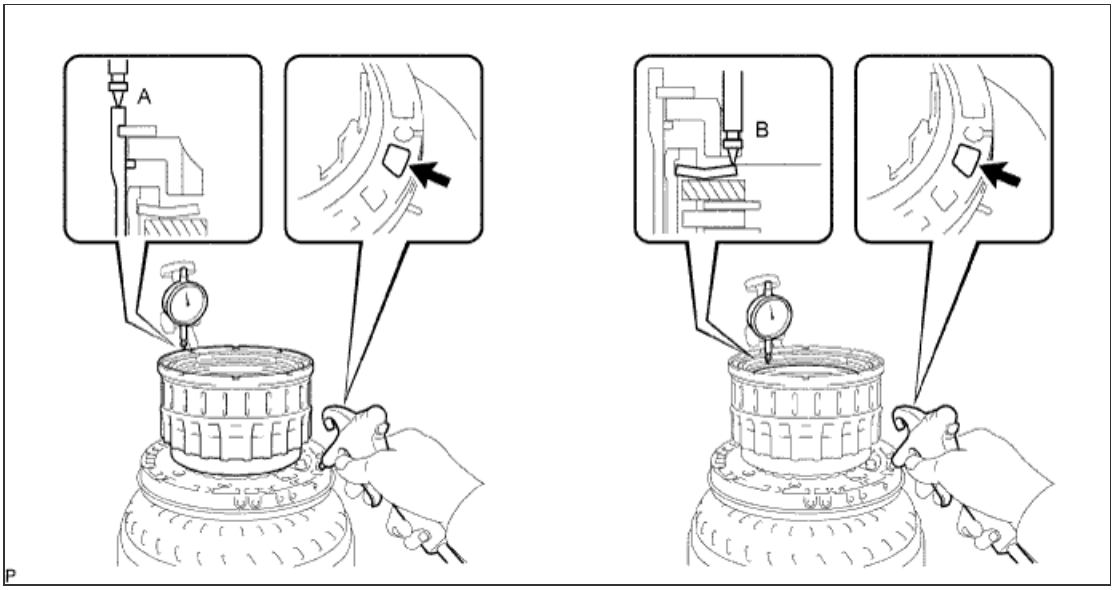
When measuring the moving distance, install a standard flange (thickness: 3.3 mm (0.130 in.)) to the position of the shaded area in the illustration.

HINT:

Piston stroke A = 1.05 to 2.15 mm (0.0413 to 0.0846 in.)

Flange moving distance B = 0.72 to 1.08 mm (0.0283 to 0.0425 in.)

Pack clearance = Piston stroke A - Flange moving distance B - 0.06 mm (0.00236 in.)



If the pack clearance is outside the standard, select and install a clutch flange that makes the pack clearance within the standard.

Flange Thickness:

Mark	Thickness
0	2.75 to 2.85 mm (0.108 to 0.112 in.)
1	2.85 to 2.95 mm (0.112 to 0.116 in.)
2	2.95 to 3.05 mm (0.116 to 0.120 in.)
3	3.05 to 3.15 mm (0.120 to 0.124 in.)
4	3.15 to 3.25 mm (0.124 to 0.128 in.)
5	3.25 to 3.35 mm (0.128 to 0.132 in.)
6	3.35 to 3.45 mm (0.132 to 0.136 in.)
7	3.45 to 3.55 mm (0.136 to 0.140 in.)
8	3.55 to 3.65 mm (0.140 to 0.144 in.)
9	3.65 to 3.75 mm (0.144 to 0.148 in.)
A	3.75 to 3.85 mm (0.148 to 0.152 in.)

30. INSPECT PACK CLEARANCE OF FORWARD CLUTCH

a. Using a dial indicator, measure the moving distance (distance A) of the clutch flange at both ends across a diameter while applying air to the oil hole as shown in the illustration, and calculate the average.

Standard pack clearance:
0.6 to 0.9 mm (0.0236 to 0.0354 in.)

NOTICE:

When measuring the moving distance, install a standard flange (thickness: 3.4 mm (0.134 in.)) to the position of the shaded area in the illustration.

HINT:

Flange moving distance A = 0.26 to 1.36 mm (0.0102 to 0.0535 in.)

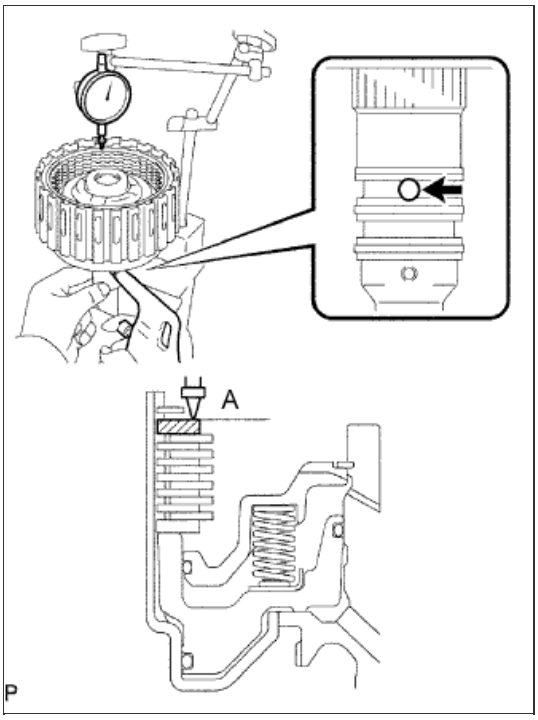
Pack clearance = Flange moving distance A - 0.01 mm (0.000394 in.)

If the pack clearance is outside the standard, select and install a clutch flange that makes the pack clearance within the standard.

Flange Thickness:

Mark	Thickness

0	2.95 to 3.05 mm (0.116 to 0.120 in.)
1	3.05 to 3.15 mm (0.120 to 0.124 in.)
2	3.15 to 3.25 mm (0.124 to 0.128 in.)
3	3.25 to 3.35 mm (0.128 to 0.132 in.)
4	3.35 to 3.45 mm (0.132 to 0.136 in.)
5	3.45 to 3.55 mm (0.136 to 0.140 in.)
6	3.55 to 3.65 mm (0.140 to 0.144 in.)
7	3.65 to 3.75 mm (0.144 to 0.148 in.)
8	3.75 to 3.85 mm (0.148 to 0.152 in.)
9	3.85 to 3.95 mm (0.148 to 0.152 in.)
A	3.95 to 4.05 mm (0.152 to 0.159 in.)



31. INSPECT INDIVIDUAL PISTON OPERATION

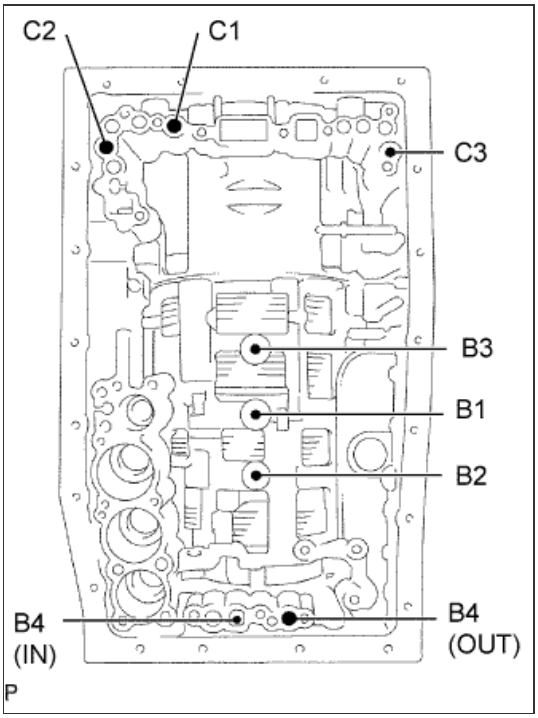
a. Check the operating sound while applying compressed air into the oil holes indicated in the illustration.

HINT:

When inspecting the O/D direct clutch, check with the accumulator piston holes indicated in the illustration.

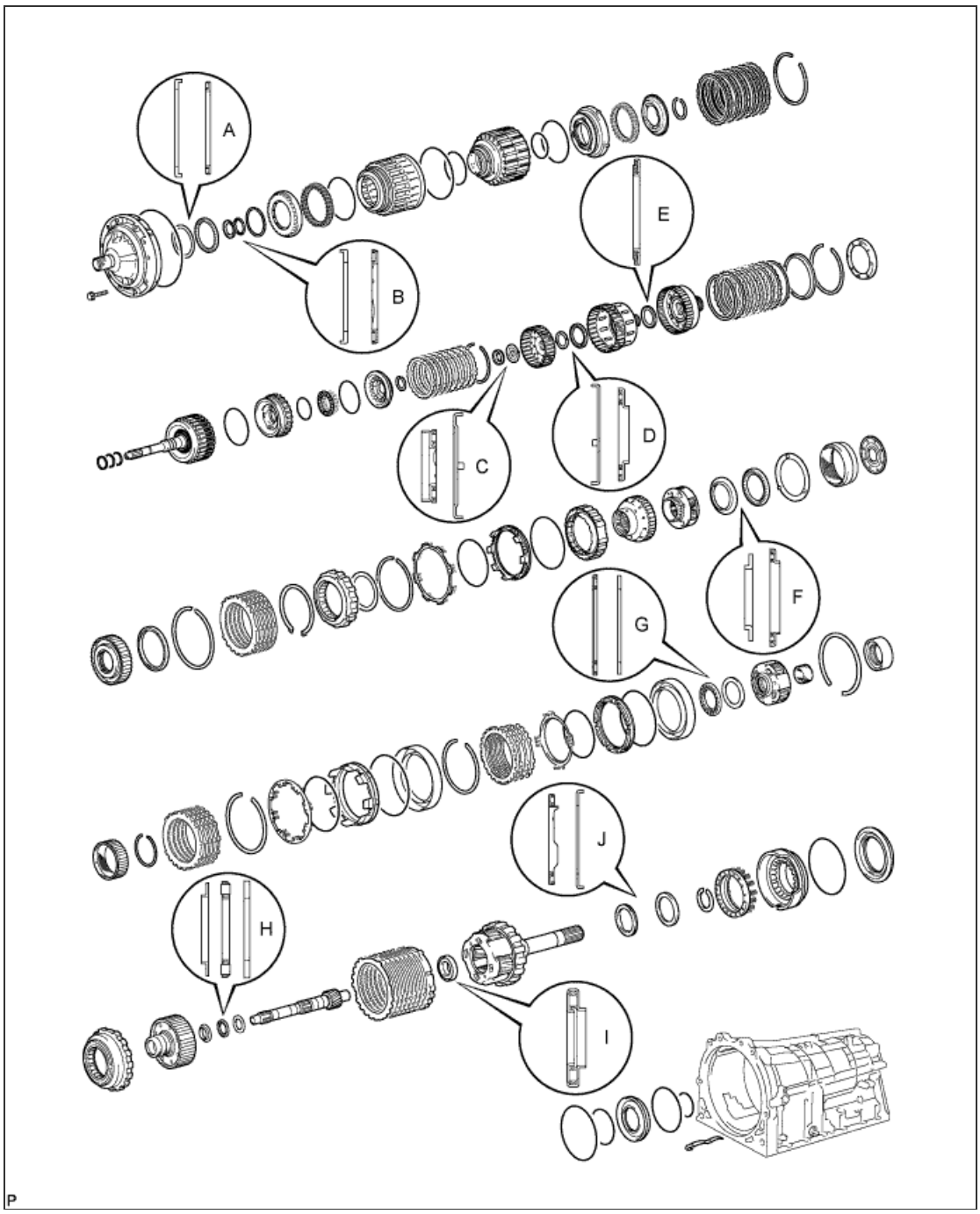
If there is no sound, disassemble and check the installation condition of the parts.

1. No. 2 clutch (C2)
2. No. 3 clutch (C3)
3. No. 1 clutch (C1)
4. No. 3 brake (B3)
5. No. 1 brake (B1)
6. No. 2 brake (B2)
7. No. 4 brake (B4)



for Preparation Click here

1. BEARING POSITION



Bearing and Race Diameter:

Mark	Front Race Diameter Inside/Outside	Thrust Bearing Diameter Inside/Outside	Rear Race Diameter Inside/Outside
A	74.3 to 74.6 mm (2.93 to 2.94 in.)/87.4 to 87.7 mm (3.44 to 3.45 in.)	72.0 to 72.3 mm (2.83 to 2.85 in.)/85.3 to 85.6 mm (3.36 to 3.37 in.)	-
B	37.0 to 37.3 mm (1.46 to 1.47 in.)/52.1 to 52.3 mm (2.05 to 2.06 in.)	34.7 to 34.9 mm (1.366 to 1.374 in.)/51.6 to 51.9 mm (2.03 to 2.04 in.)	-

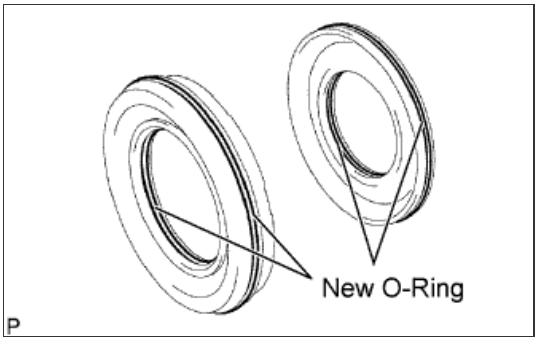
C	-	21.4 to 21.6 mm (0.841 to 0.850 in.)/40.8 to 41.0 mm (1.606 to 1.614 in.)	22.7 to 22.9 mm (0.892 to 0.902 in.)/60.0 to 60.4 mm (2.36 to 2.38 in.)
D	33.3 to 33.5 mm (1.31 to 1.32 in.)/56.3 to 56.6 mm (2.22 to 2.23 in.)	38.5 to 38.7 mm (1.515 to 1.524 in.)/56.5 to 57.0 mm (2.22 to 2.24 in.)	-
E	-	42.6 to 42.8 mm (1.68 to 1.69 in.)/60.8 to 61.1 mm (2.39 to 2.41 in.)	-
F	38.0 to 38.2 mm (1.496 to 1.504 in.)/56.5 to 57.0 mm (2.22 to 2.24 in.)	43.4 to 43.6 mm (1.71 to 1.72 in.)/58.0 to 58.4 mm (2.28 to 2.30 in.)	-
G	-	55.8 to 56.0 mm (2.197 to 2.204 in.)/76.1 to 76.4 mm (2.996 to 3.008 in.)	53.8 to 54.0 mm (2.12 to 2.13 in.)/73.7 to 74.0 mm (2.90 to 2.91 in.)
H	33.4 to 33.6 mm (1.31 to 1.32 in.)/48.7 to 49.0 mm (1.92 to 1.93 in.)	32.2 to 32.3 mm (1.268 to 1.272 in.)/49.0 to 49.2 mm (1.93 to 1.94 in.)	32.2 to 32.4 mm (1.27 to 1.28 in.)/48.7 to 49.0 mm (1.92 to 1.93 in.)
I	-	21.5 to 21.8 mm (0.846 to 0.858 in.)/40.5 to 40.8 mm (1.59 to 1.61 in.)	-
J	-	43.6 to 43.9 mm (1.72 to 1.73 in.)/60.6 to 60.9 mm (2.39 to 2.40 in.)	47.2 to 47.4 mm (1.86 to 1.87 in.)/66.9 to 67.1 mm (2.63 to 2.64 in.)

2. ASSEMBLE NO. 4 BRAKE PISTON AND BRAKE REACTION SLEEVE

a. Coat 2 new O-rings with ATF, and install them to the brake reaction sleeve.

b. Coat 2 new O-rings with ATF, and install them to the No. 4 brake piston.

c. Install the No. 4 brake piston to the reaction sleeve.

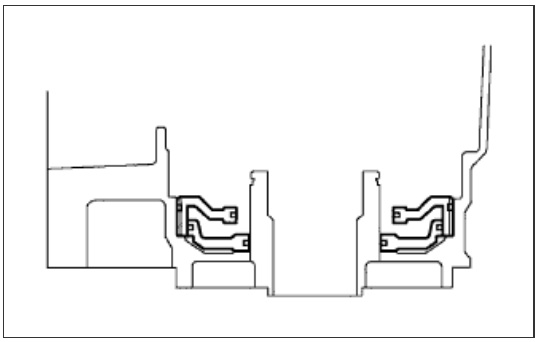


3. INSTALL NO. 4 BRAKE PISTON WITH BRAKE REACTION SLEEVE

a. Install the No. 4 brake piston with brake reaction sleeve to the transmission case

NOTICE:

- **Do not damage the O-rings.**
- **Make sure the No. 4 brake piston is underneath the brake reaction sleeve.**



4. INSTALL 1ST AND REVERSE BRAKE PISTON

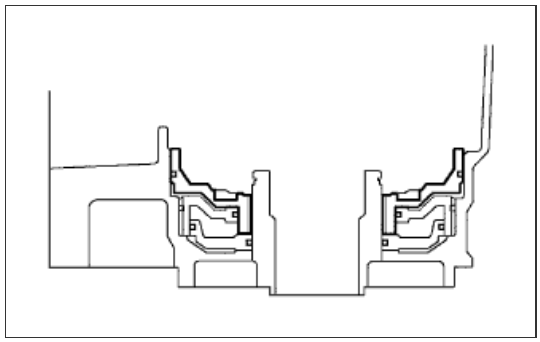
a. Coat a new O-ring with ATF.

b. Install the O-ring to the 1st and reverse brake piston.

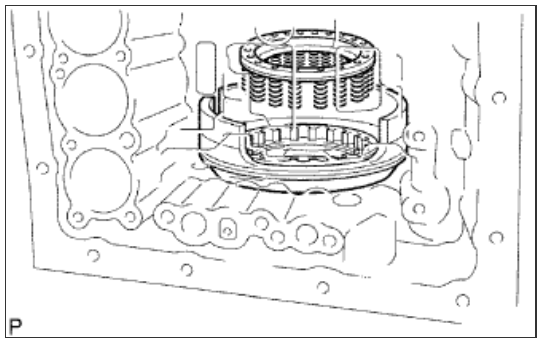
c. With the spring seat of the piston facing upwards (the front side), place the piston in the transmission case.

NOTICE:

Be careful not to damage the O-ring.



d. Place the brake return spring onto the 1st and reverse brake piston.



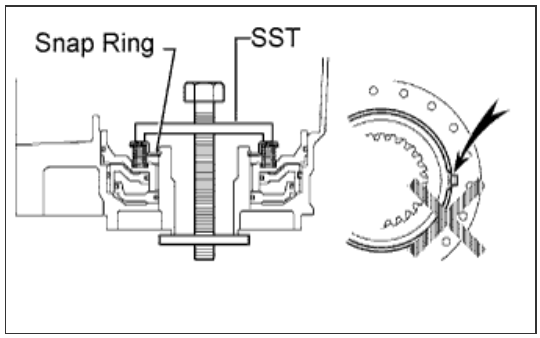
5. INSTALL 1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY

a. Place SST on a new spring retainer, and compress the return spring.

SST
09350-30020 (09350-07050)

b. Using SST, install the snap ring.

SST
09350-30020 (09350-07070)

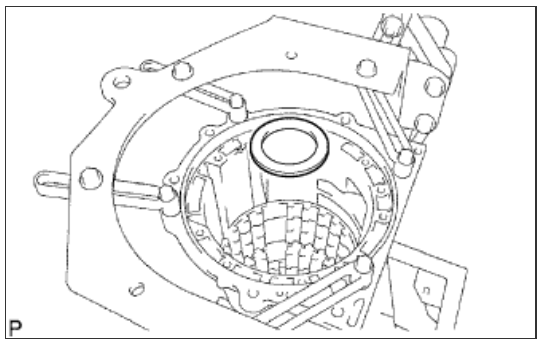


6. INSTALL REAR PLANETARY GEAR ASSEMBLY

a. Install the No. 9 thrust bearing race.

Thrust Bearing Race Diameter:

Item	Inside	Outside
No. 9 Race	47.2 to 47.4 mm (1.86 to 1.87 in.)	66.9 to 67.1 mm (2.63 to 2.64 in.)

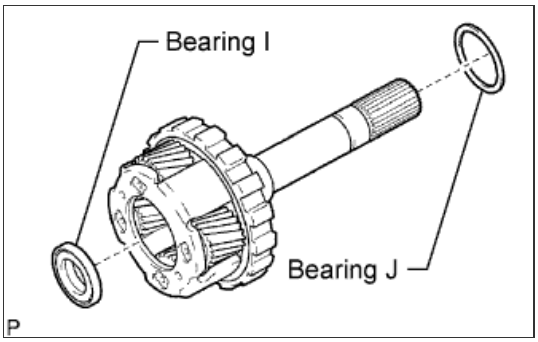


b. Coat the 2 thrust needle roller bearings with petroleum jelly, and install them to the rear planetary gear.

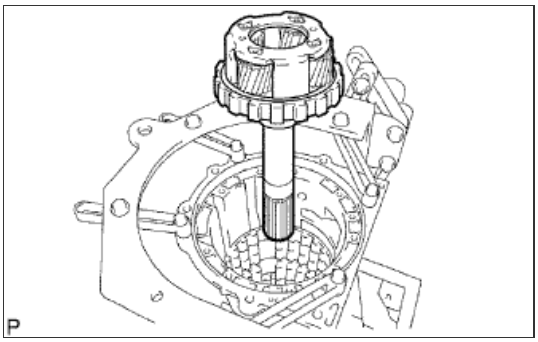
Thrust Needle Roller Bearing Diameter:

Item	Inside	Outside
Bearing J	43.6 to 43.9 mm (1.72 to 1.73 in.)	60.6 to 60.9 mm (2.39 to 2.40 in.)
	21.5 to 21.8 mm	40.5 to 40.8 mm

Bearing I	(0.846 to 0.858 in.)	(1.59 to 1.61 in.)

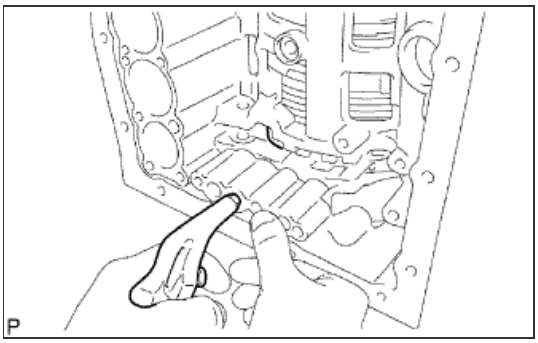


c. Install the rear planetary gear assembly.



7. INSPECT PACK CLEARANCE OF 1ST AND REVERSE BRAKE

a. Make sure the 1st and reverse brake piston moves smoothly when applying and releasing compressed air into the transmission case.



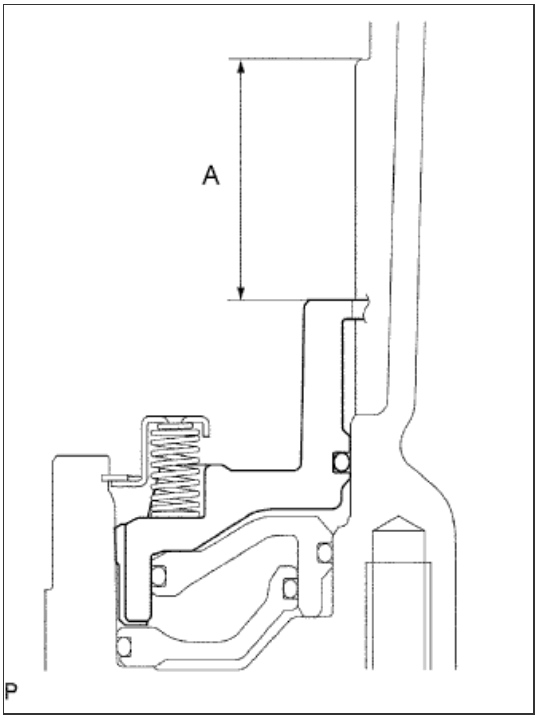
b. Using a vernier caliper, measure the level difference (length A) between the upper surface of the 1st and reverse brake piston and the hitting surface of the No. 4 brake flange at both ends across a diameter, and calculate the average.

NOTICE:

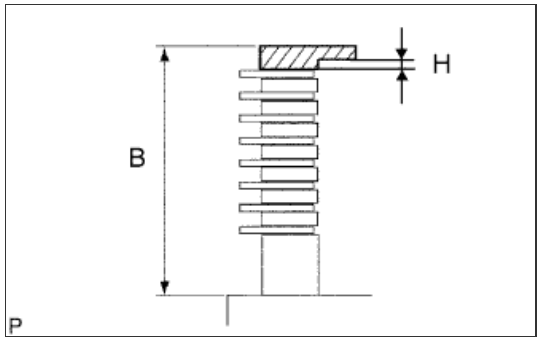
The 1st and reverse brake piston must be installed tightly to the end face of the transmission case.

HINT:

Length A = 36.35 to 37.09 mm (1.43 to 1.46 in.)



c. Using a vernier caliper, measure the thickness (length B) of the 2 brake flanges, 7 No. 4 brake plates and 8 No. 4 brake discs all together at both ends across a diameter, and calculate the average.



HINT:

Pack clearance = Length A - Length B - 0.25 mm to 1.8 mm (0.00984 to 0.0709 in.)

Length B = 36.04 to 37.14 mm (1.42 to 1.46 in.)

Standard pack clearance:
0.8 to 1.1 mm (0.0315 to 0.0433 in.)

If the pack clearance is outside the standard, select and install a brake flange that makes the pack clearance within the standard.

H Thickness:

No.	Thickness
0	0 mm (0 in.)
2	0.15 to 0.25 mm (0.00590 to 0.00984 in.)
4	0.35 to 0.45 mm (0.0138 to 0.0177 in.)
6	0.55 to 0.65 mm (0.0217 to 0.0256 in.)
8	0.75 to 0.85 mm (0.0295 to 0.0335 in.)
10	0.95 to 1.05 mm (0.0374 to 0.0413 in.)
12	1.15 to 1.25 mm (0.0453 to 0.0492 in.)
14	1.35 to 1.45 mm (0.0531 to 0.0571 in.)

8. INSTALL NO. 4 BRAKE DISC

a. Install the 2 flanges, 8 discs and 7 plates.

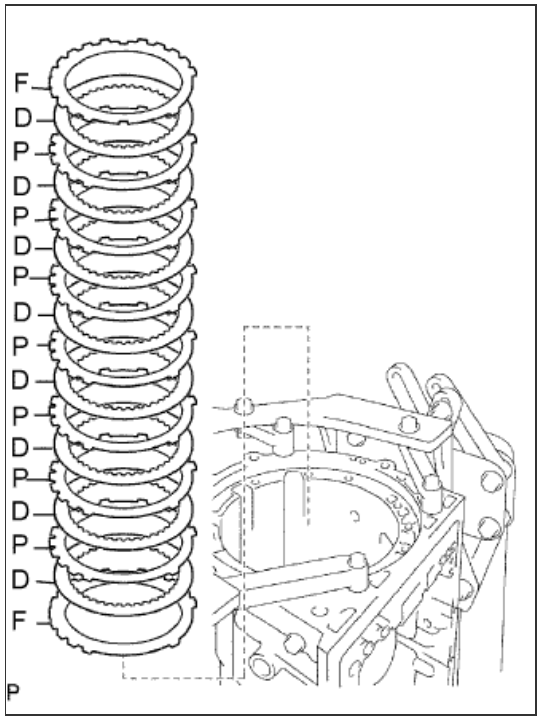
Install in order:
F - D - P - D - P - D - P - D - P - D - P - D - P - D - P - D - F

HINT:

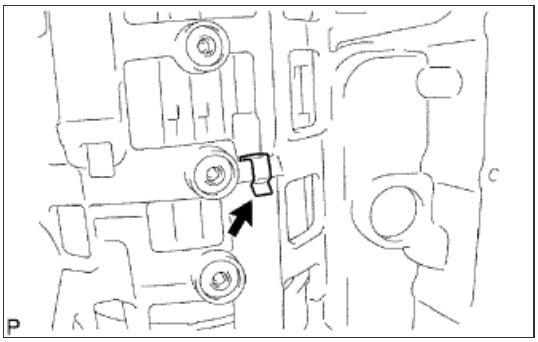
F = Flange

D = Disc

P = Plate



9. INSTALL BRAKE PLATE STOPPER SPRING

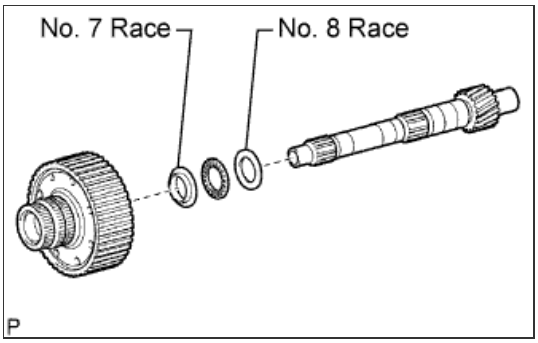


10. INSTALL REAR PLANETARY RING GEAR FLANGE SUB-ASSEMBLY

a. Install the No. 8 thrust bearing race, thrust needle roller bearing, No. 7 thrust bearing race and planetary ring gear flange to the intermediate shaft.

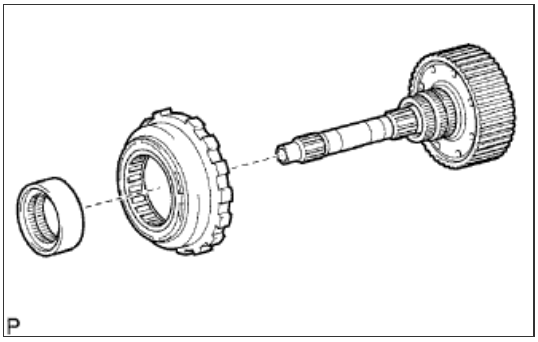
Thrust Needle Roller Bearing and Race Diameter:

Item	Inside	Outside
No. 7 Race	33.4 to 33.6 mm (1.31 to 1.32 in.)	48.7 to 49.0 mm (1.92 to 1.93 in.)
Bearing	32.2 to 32.3 mm (1.268 to 1.272 in.)	49.0 to 49.2 mm (1.93 to 1.94 in.)
No. 8 Race	32.2 to 32.4 mm (1.27 to 1.28 in.)	48.7 to 49.0 mm (1.92 to 1.93 in.)



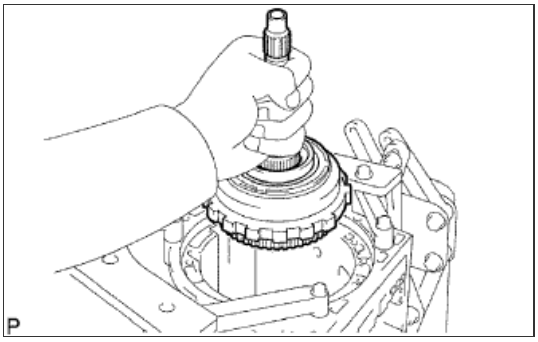
11. INSTALL NO. 3 1-WAY CLUTCH ASSEMBLY

a. Install the 1-way clutch and 1-way clutch inner race to the intermediate shaft.



12. INSTALL INTERMEDIATE SHAFT

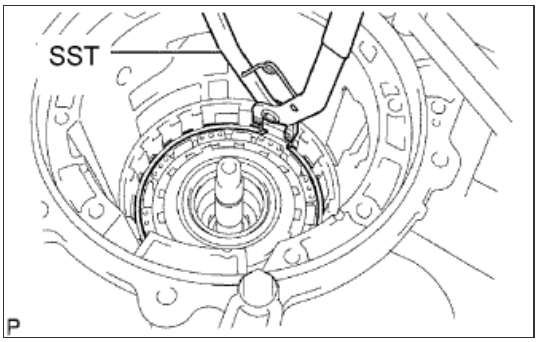
a. Install the intermediate shaft with No. 3 1-way clutch assembly to the case.



b. Using SST, install the snap ring.

SST

09350-30020 (09350-07060)



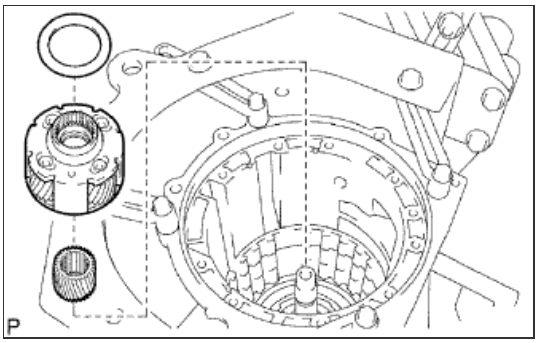
13. INSTALL CENTER PLANETARY GEAR ASSEMBLY

a. Install the planetary sun gear and center planetary gear to the case.

b. Coat the No. 6 thrust bearing race with petroleum jelly, and install it to the center planetary gear.

Thrust Bearing Race Diameter:

Item	Inside	Outside
Race	53.8 to 54.0 mm (2.12 to 2.13 in.)	73.7 to 74.0 mm (2.90 to 2.91 in.)



14. INSTALL NO. 2 BRAKE PISTON

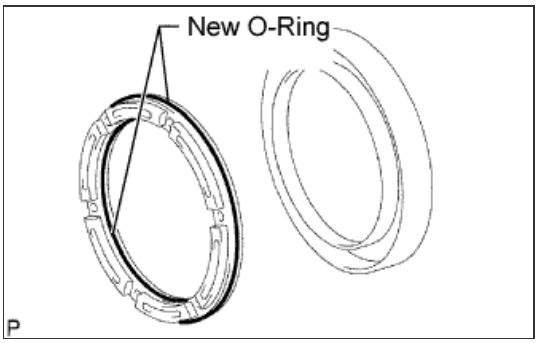
a. Coat 2 new O-rings with ATF, and install them to the brake piston.

b. Press the brake piston into the brake cylinder with both hands.

NOTICE:

Be careful not to damage the O-rings.

c. Install the No. 2 brake piston to the case.



15. INSTALL NO. 2 BRAKE DISC

a. Install the brake piston return spring.

b. Install the 3 plates, 3 discs and flange.

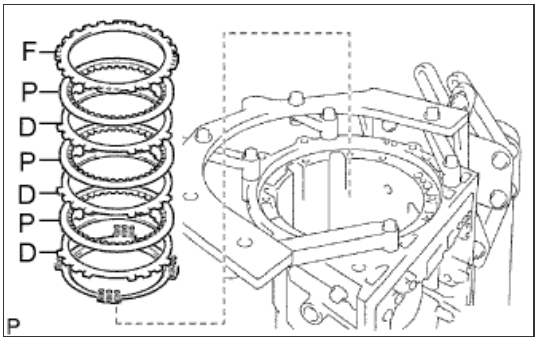
Install in order:
D - P - D - P - D - P - F

HINT:

D = Disc

P = Plate

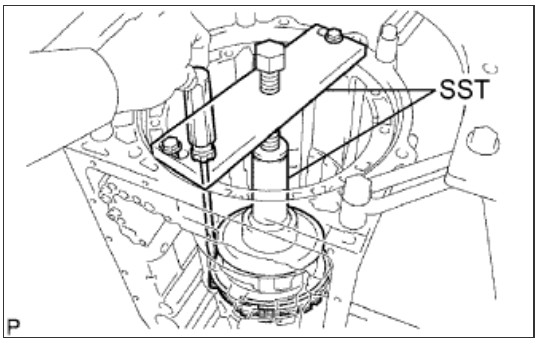
F = Flange



c. Using SST and a press, compress the return spring and install the No. 2 brake spring snap ring.

SST

09351-40010



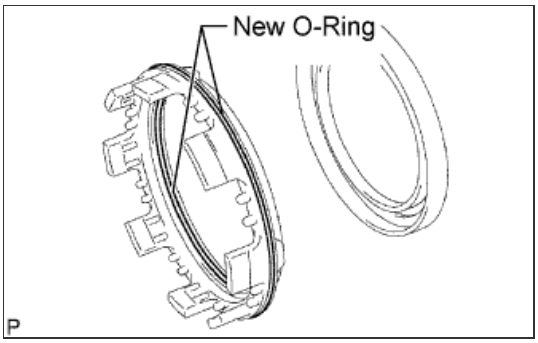
16. INSTALL NO. 1 BRAKE PISTON

a. Coat 2 new O-rings with ATF, and install them to the brake piston.

b. Press the brake piston into the brake cylinder with both hands.

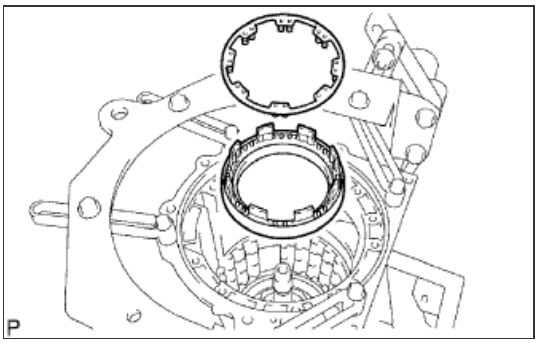
NOTICE:

Be careful not to damage the O-rings.



17. INSTALL BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

a. Install the brake piston return spring and the No. 1 brake piston with No. 1 brake cylinder to the transmission case.

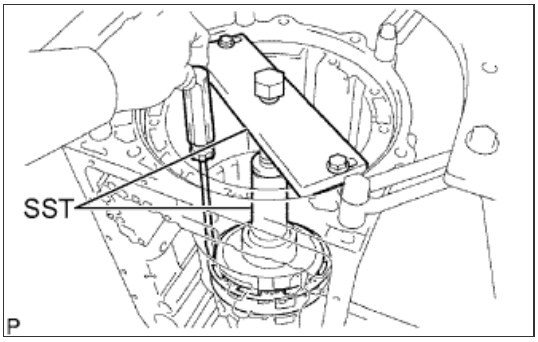


18. INSTALL BRAKE PISTON RETURN SPRING SNAP RING

a. Using SST and a press, compress the return spring and install the brake piston return spring snap ring.

SST

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19. INSTALL NO. 1 BRAKE DISC

a. Install the 3 plates, 3 discs and flange.

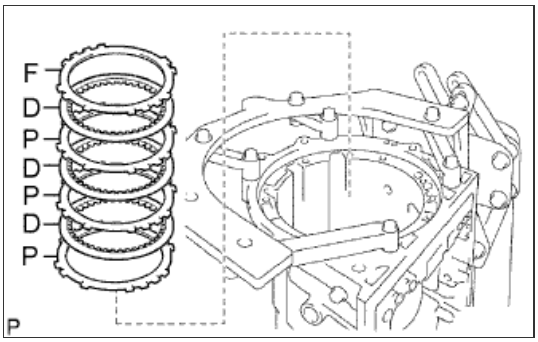
Install in order:
P - D - P - D - P - D - F

HINT:

P = Plate

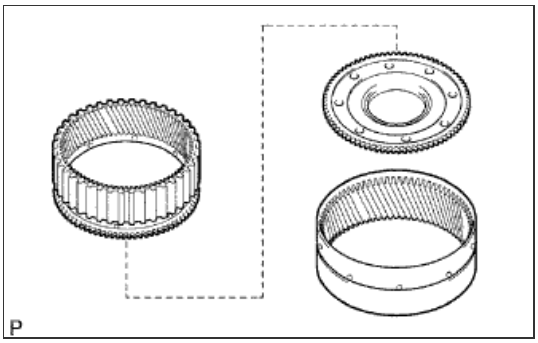
D = Disc

F = Flange

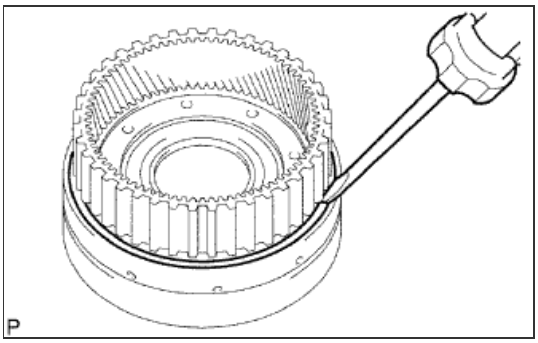


20. INSTALL CENTER PLANETARY RING GEAR

a. Install the center planetary ring gear and front planetary ring gear flange to the front planetary ring gear.



b. Using a screwdriver, install the snap ring.

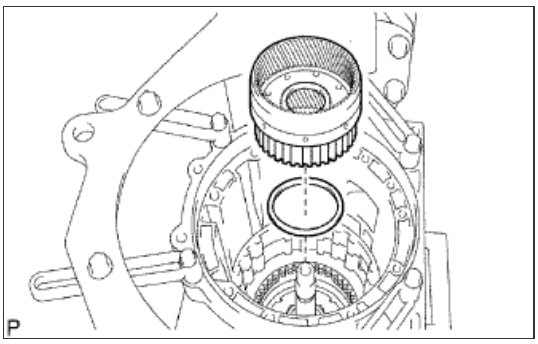


21. INSTALL FRONT PLANETARY RING GEAR

a. Install the front planetary ring gear and thrust needle roller bearing to the case.

Thrust Needle Roller Bearing Diameter:

Item	Inside	Outside
Bearing	55.8 to 56.0 mm (2.197 to 2.204 in.)	76.1 to 76.4 mm (2.996 to 3.008 in.)



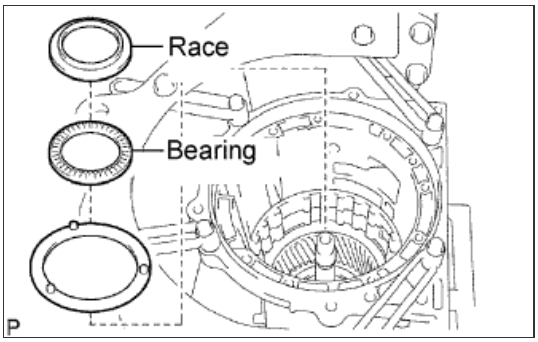
22. INSTALL FRONT PLANETARY GEAR ASSEMBLY

a. Install the thrust washer and thrust needle roller bearing.

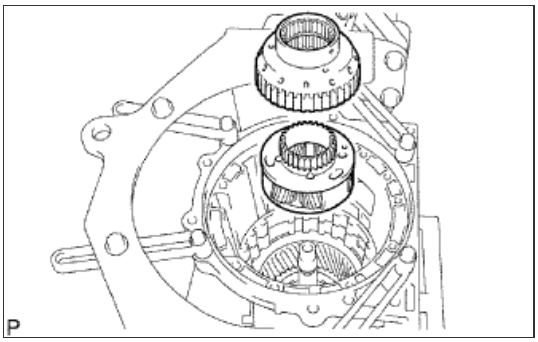
b. Coat the No. 5 thrust race with petroleum jelly, and install it to the front planetary ring gear.

Thrust Needle Roller Bearing and Race Diameter:

Item	Inside	Outside
Bearing	43.4 to 43.6 mm (1.71 to 1.72 in.)	58.0 to 58.4 mm (2.28 to 2.30 in.)
Race	38.0 to 38.2 mm (1.496 to 1.504 in.)	56.5 to 57.0 mm (2.22 to 2.24 in.)

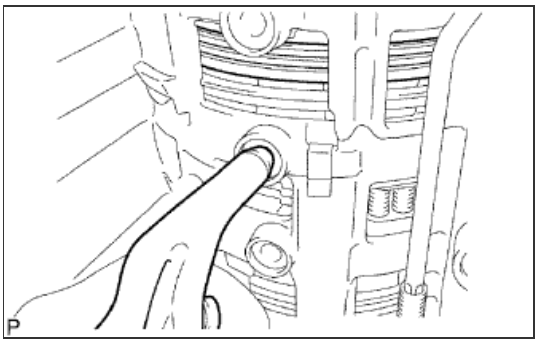


c. Install the front planetary gear assembly and 1-way clutch inner race to the case.



23. INSPECT PISTON STROKE OF NO. 1 BRAKE PISTON

a. Make sure the No. 1 brake piston moves smoothly when applying and releasing compressed air into the transmission case.



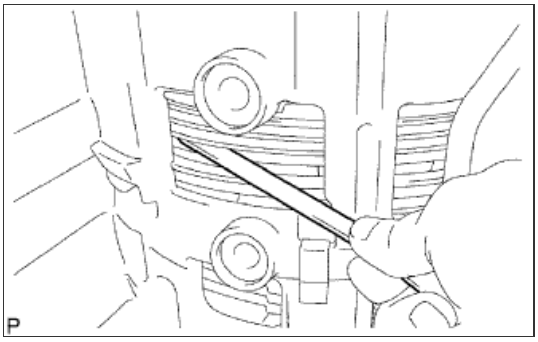
b. Using a feeler gauge, measure the B3 brake pack clearance between the snap ring and flange.

Standard piston stroke:
0.42 to 0.72 mm (0.0165 to 0.0283 in.)

If the piston stroke is outside the specification, parts may have been assembled incorrectly. Perform the reassembly again. If the piston stroke is still outside the specification, select another flange.

HINT:

There are 4 different thicknesses for the flange.



Flange Thickness:

Mark	Thickness
0	1.95 to 2.05 mm (0.0768 to 0.0807 in.)
1	2.15 to 2.25 mm (0.0846 to 0.0886 in.)
2	2.35 to 2.45 mm (0.0925 to 0.0965 in.)
3	2.55 to 2.65 mm (0.100 to 0.104 in.)

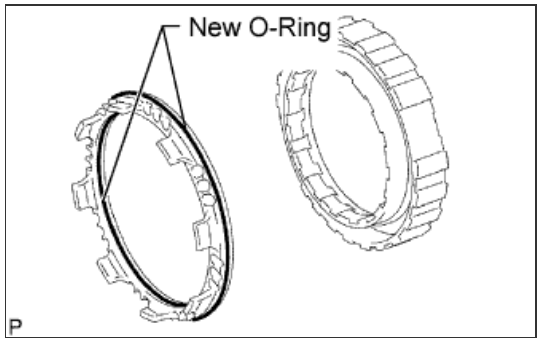
24. INSTALL 2ND BRAKE PISTON

a. Coat 2 new O-rings with ATF, and install them to the 2nd brake piston.

b. Press the 2nd brake cylinder into the 2nd brake piston with both hands.

NOTICE:

Be careful not to damage the O-rings.



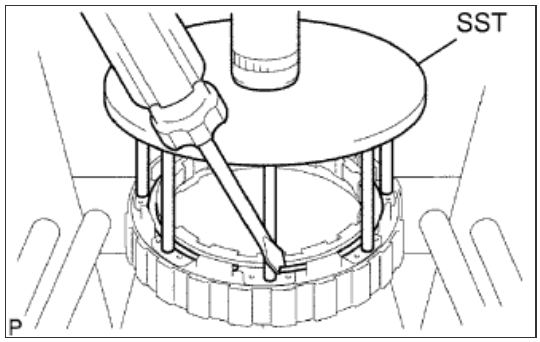
c. Using SST and a press, compress the return spring and install the snap ring.

SST

09351-40010

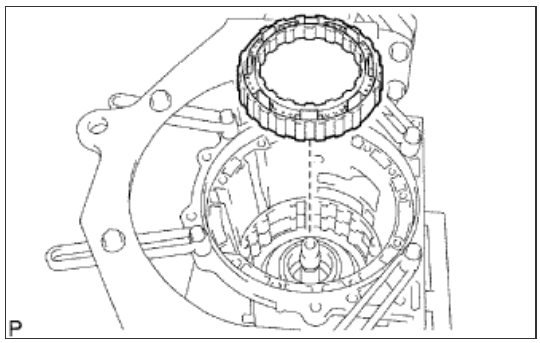
NOTICE:

Be sure the end gap of the snap ring is not aligned with the spring retainer claw.



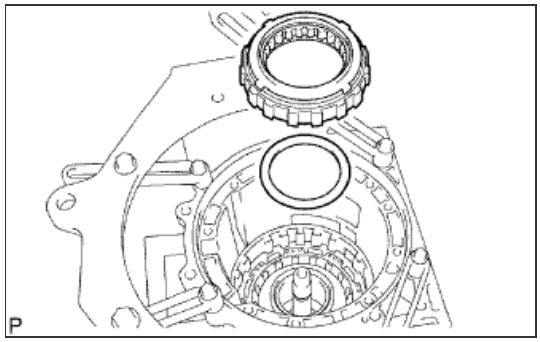
25. INSTALL 2ND BRAKE CYLINDER

a. Install the 2nd brake cylinder to the case.



26. INSTALL 1-WAY CLUTCH ASSEMBLY

a. Install the thrust washer and 1-way clutch to the case.

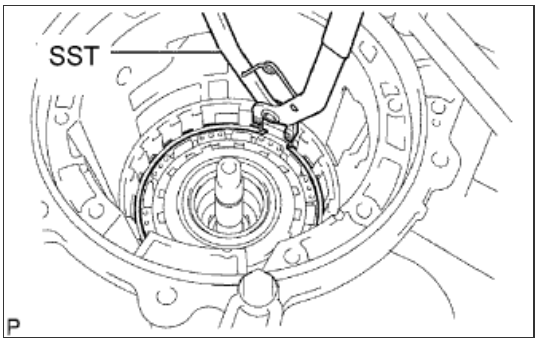


27. INSTALL 2ND BRAKE PISTON HOLE SNAP RING

a. Using SST, install the snap ring.

SST

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28. INSTALL NO. 3 BRAKE DISC

a. Install the cushion plate, 4 plates, 4 discs and flange to the case.

Install in order:
C - P - D - P - D - P - D - P - D - F

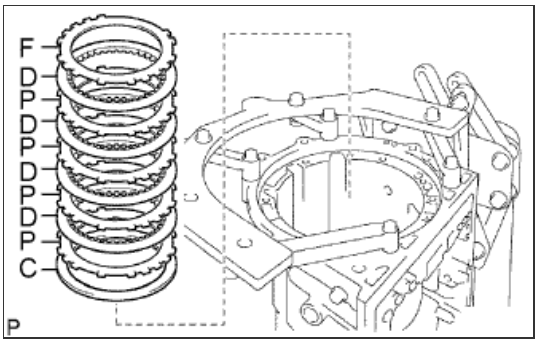
HINT:

C = Cushion plate

P = Plate

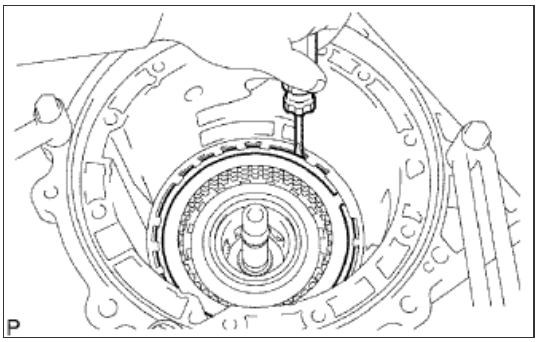
D = Disc

F = Flange



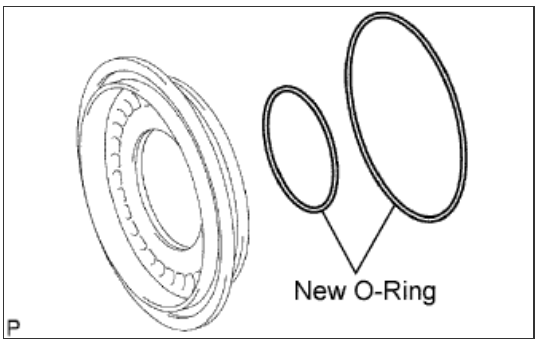
29. INSTALL NO. 3 BRAKE SNAP RING

a. Using a screwdriver, install the snap ring.

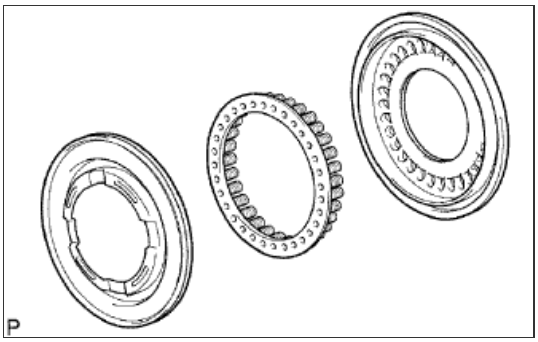


30. INSTALL DIRECT CLUTCH PISTON SUB-ASSEMBLY

a. Coat 2 new O-rings with ATF, and install them to the direct clutch piston.



b. Install the No. 2 clutch balancer and direct clutch return spring to the direct clutch piston.

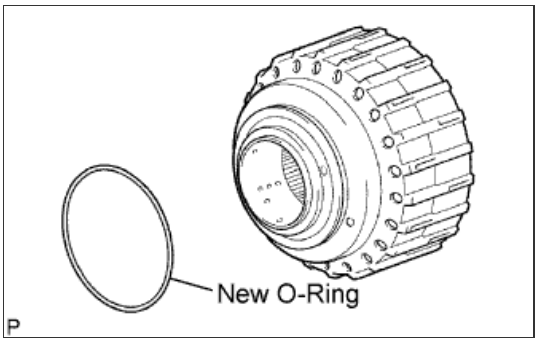


c. Coat a new O-ring with ATF, and install it to the clutch drum.

d. Press the direct clutch piston into the clutch drum with both hands.

NOTICE:

Be careful not to damage the O-rings.



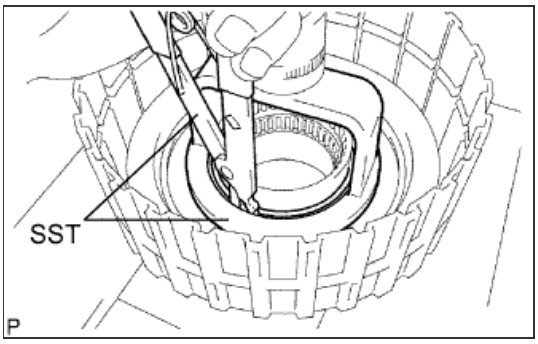
e. Place SST on the direct clutch piston, and compress the return spring with a press.

NOTICE:

Stop pressing when the spring sheet is lowered to a position 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove to prevent the spring sheet from being deformed.

SST

09320-89010
09350-30020 (09350-07070)



f. Install the snap ring with a snap ring expander.

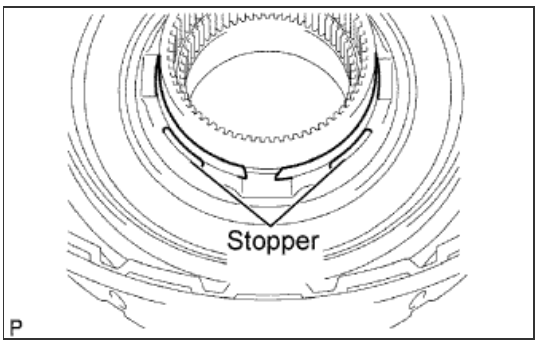
NOTICE:

Do not expand the snap ring excessively.

g. Set the end gap of the snap ring in the piston as shown in the illustration

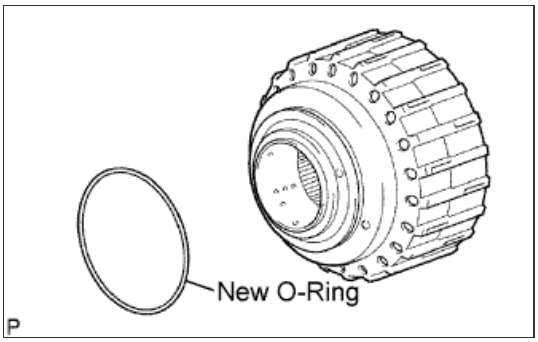
NOTICE:

Be sure the end gap of the snap ring is not aligned with the spring retainer claw.

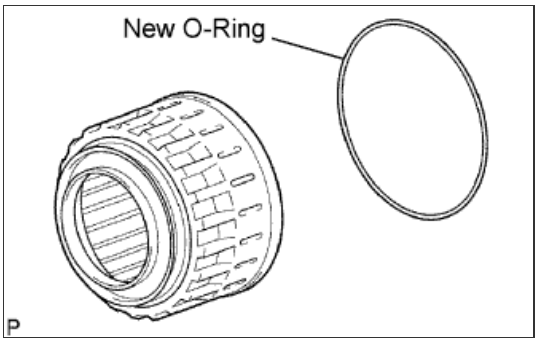


31. INSTALL REVERSE CLUTCH PISTON SUB-ASSEMBLY

a. Coat a new O-ring with ATF, and install it to the clutch drum.



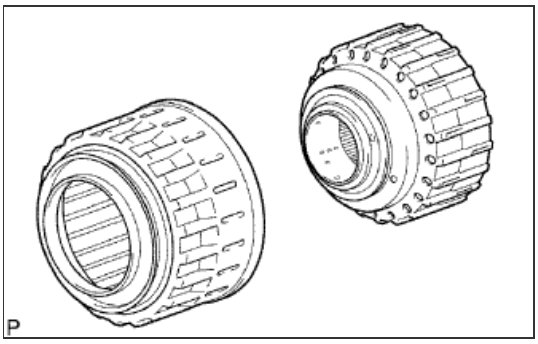
b. Coat a new O-ring with ATF, and install it to the reverse clutch piston.



c. Press the clutch drum into the reverse clutch piston with both hands.

NOTICE:

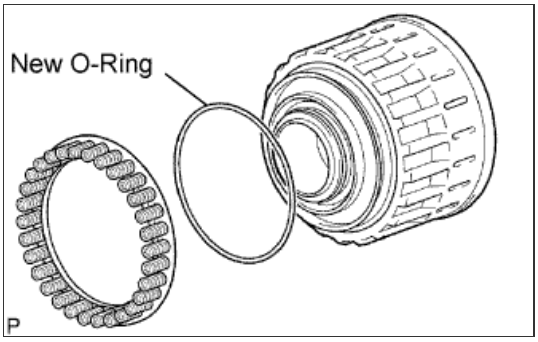
Be careful not to damage the O-ring.



32. INSTALL REVERSE CLUTCH RETURN SPRING SUB-ASSEMBLY

a. Coat a new O-ring with ATF, and install it to the reverse clutch piston.

b. Install the reverse clutch return spring to the reverse clutch piston.



33. INSTALL NO. 3 CLUTCH BALANCER

a. Place SST on the No. 3 clutch balancer, and compress the clutch balancer with a press.

NOTICE:

Stop pressing when the spring sheet is lowered to a position 1 to 2 mm (0.0393 to 0.0787 in.) from the snap ring groove to prevent the spring sheet from being deformed.

SST

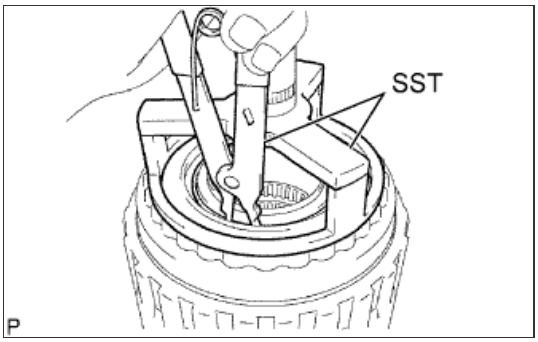
09387-00070

09350-30020 (09350-07070)

b. Install the snap ring with a snap ring expander.

NOTICE:

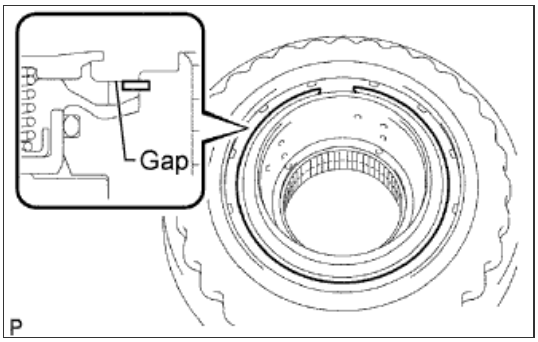
Do not expand the snap ring excessively.



c. Set the end gap of the snap ring in the piston as shown in the illustration.

NOTICE:

Be sure the end gap of the snap ring is not aligned with the spring retainer claw.



34. INSTALL DIRECT CLUTCH DISC

a. Install the 5 plates, 5 discs and reverse clutch flange to the clutch drum.

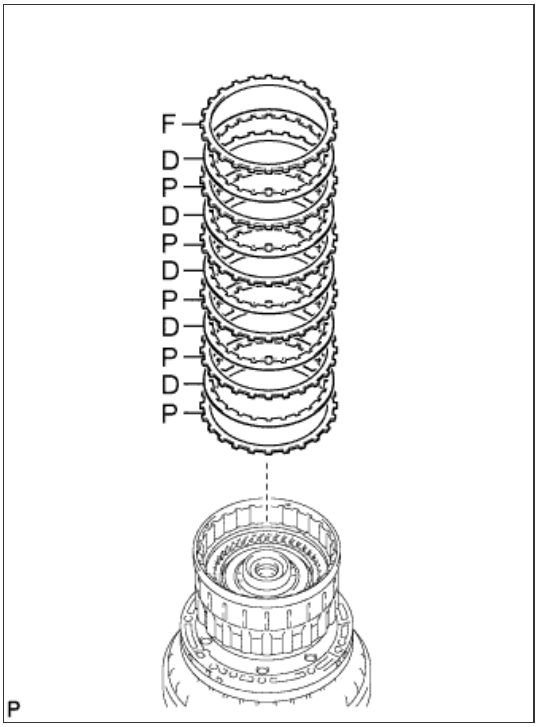
Install in order:
P - D - P - D - P - D - P - D - P - D - F

HINT:

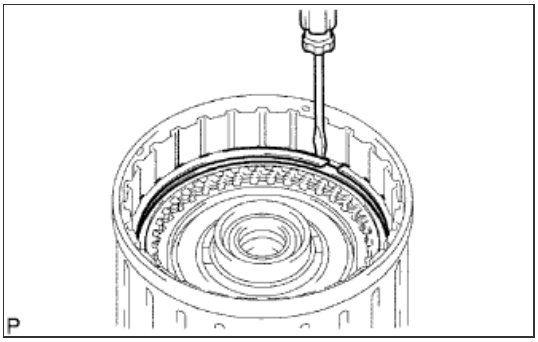
P = Plate

D = Disc

F = Flange

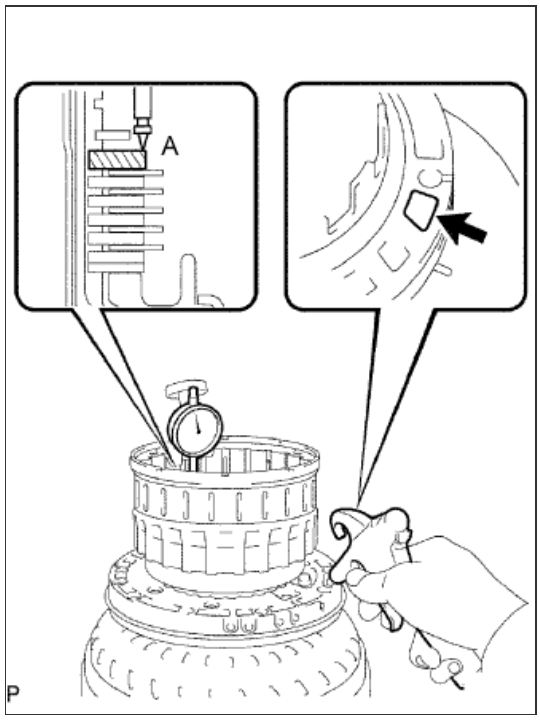


b. Using a screwdriver, install the 2 hole snap rings to the clutch drum.



35. INSPECT PACK CLEARANCE OF DIRECT CLUTCH

a. Using a dial indicator, measure the moving distance (distance A) of the clutch flange at both ends across a diameter while applying air to the oil hole as shown in the illustration, and calculate the average.



Standard pack clearance:
0.5 to 0.8 mm (0.0197 to 0.0315 in.)

NOTICE:

When measuring the moving distance, install a standard flange (thickness: 3.4 mm (0.134 in.)) to the position of the shaded area in the illustration.

HINT:

Flange moving distance A = 0.26 to 1.14 mm (0.0102 to 0.0449 in.)

Pack clearance = Flange moving distance A - 0.05 mm (0.00197 in.)

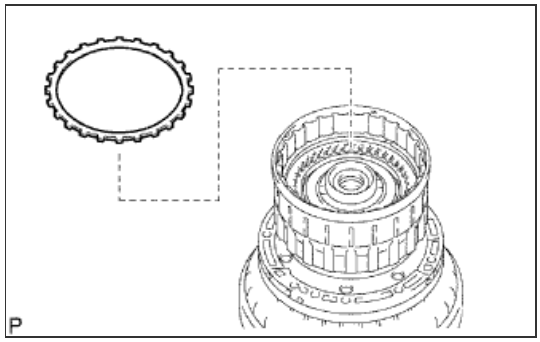
If the pack clearance is outside the standard, select and install a clutch flange that makes the pack clearance within the standard.

Flange Thickness:

Mark	Thickness
2	2.95 to 3.05 mm (0.116 to 0.120 in.)
3	3.05 to 3.15 mm (0.120 to 0.124 in.)
4	3.15 to 3.25 mm (0.124 to 0.128 in.)
5	3.25 to 3.35 mm (0.128 to 0.132 in.)
6	3.35 to 3.45 mm (0.132 to 0.136 in.)
7	3.45 to 3.55 mm (0.136 to 0.140 in.)
8	3.55 to 3.65 mm (0.140 to 0.144 in.)
9	3.65 to 3.75 mm (0.144 to 0.148 in.)
A	3.75 to 3.85 mm (0.148 to 0.152 in.)

36. INSTALL REVERSE CLUTCH FLANGE

a. Install the reverse clutch flange to the clutch drum.



37. INSTALL REVERSE CLUTCH REACTION SLEEVE

a. Install the 5 reverse clutch discs, 4 clutch plates, reverse clutch flange, clutch cushion plate and reverse clutch reaction sleeve to the reverse clutch hub.

Install in order:
D - P - D - P - D - P - D - P - D - F - C - S

HINT:

D = Disc

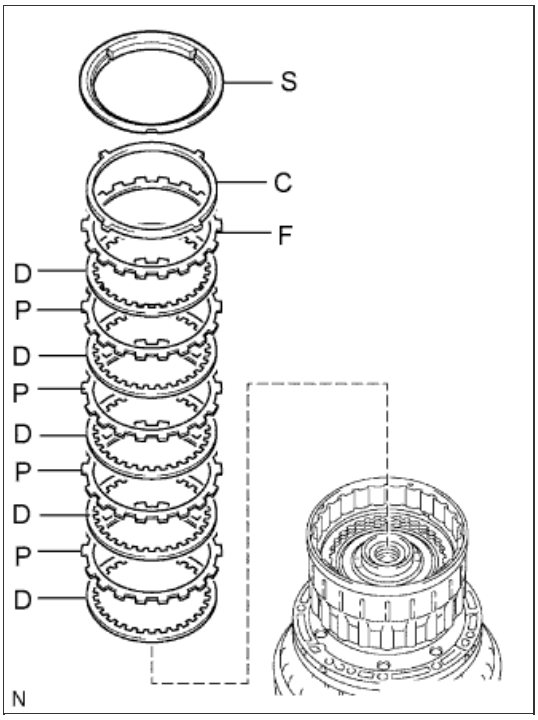
P = Plate

F = Flange

C = Cushion plate

S = Sleeve

b. Using a screwdriver, install the hole snap ring.



38. INSPECT PACK CLEARANCE OF REVERSE CLUTCH

a. Using a dial indicator, measure the reverse clutch piston stroke (distance A) and the moving distance (distance B) of the reverse flange at both ends across a diameter while applying air (392 kPa (4.0 kgf/cm^2, 57 psi)) to the oil hole as shown in the illustration, and calculate the average.

Standard pack clearance:
0.5 to 0.8 mm (0.0197 to 0.0315 in.)

NOTICE:

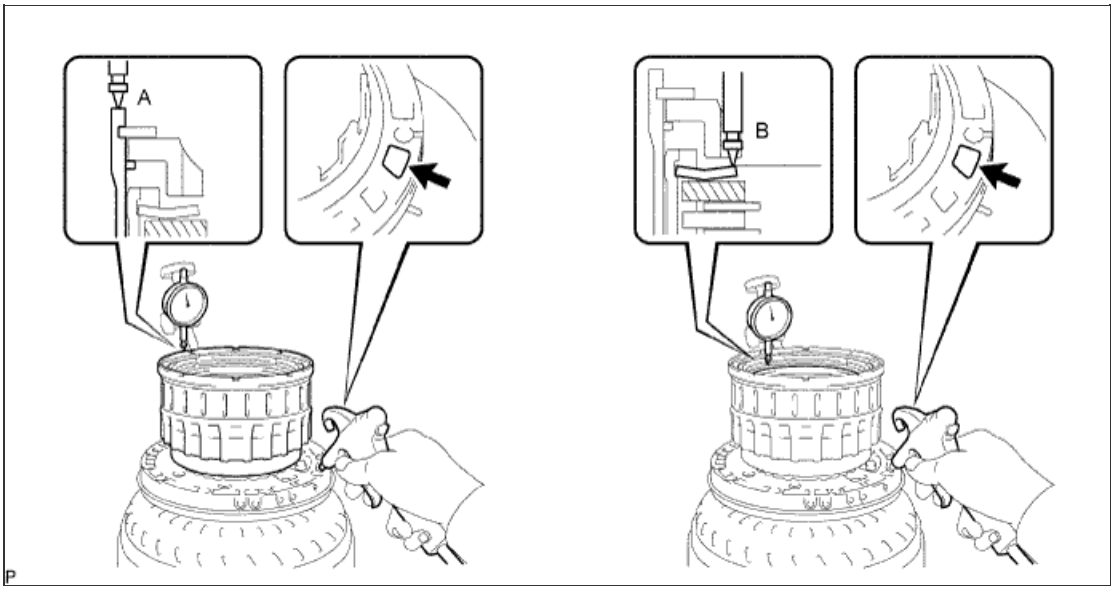
When measuring the moving distance, install a standard flange (thickness: 3.3 mm (0.130 in.)) to the position of the shaded area in the illustration.

HINT:

Piston stroke A = 1.05 to 2.15 mm (0.0413 to 0.0846 in.)

Flange moving distance B = 0.72 to 1.08 mm (0.0283 to 0.0425 in.)

Pack clearance = Piston stroke A - Flange moving distance B - 0.06 mm (0.00236 in.)



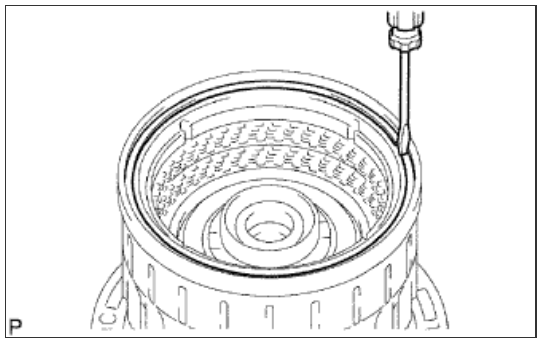
If the pack clearance is outside the standard, select and install a clutch flange that makes the pack clearance within the standard.

Flange Thickness:

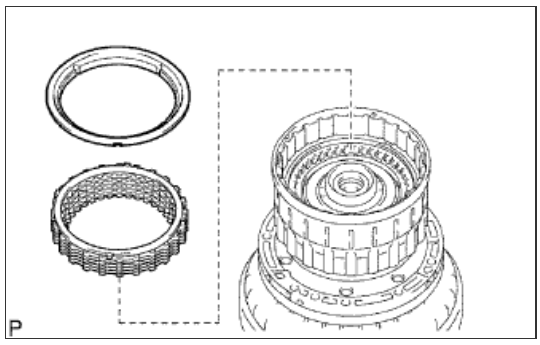
Mark	Thickness
0	2.75 to 2.85 mm (0.108 to 0.112 in.)
1	2.85 to 2.95 mm (0.112 to 0.116 in.)
2	2.95 to 3.05 mm (0.116 to 0.120 in.)
3	3.05 to 3.15 mm (0.120 to 0.124 in.)
4	3.15 to 3.25 mm (0.124 to 0.128 in.)
5	3.25 to 3.35 mm (0.128 to 0.132 in.)
6	3.35 to 3.45 mm (0.132 to 0.136 in.)
7	3.45 to 3.55 mm (0.136 to 0.140 in.)
8	3.55 to 3.65 mm (0.140 to 0.144 in.)
9	3.65 to 3.75 mm (0.144 to 0.148 in.)
A	3.75 to 3.85 mm (0.148 to 0.152 in.)

39. REMOVE REVERSE CLUTCH REACTION SLEEVE

a. Using a screwdriver, remove the snap ring from the clutch drum.

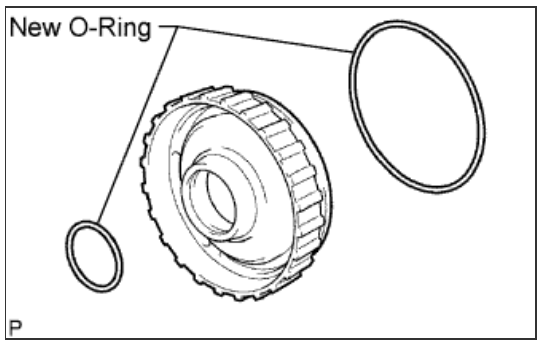


b. Remove the reverse clutch reaction sleeve, clutch cushion plate, reverse clutch flange, 5 reverse clutch discs, and 4 clutch plates from the reverse clutch hub.



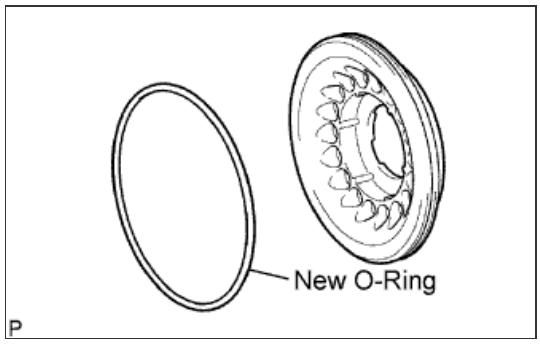
40. INSTALL FORWARD CLUTCH PISTON

a. Coat 2 new O-rings with ATF, and install them to the forward clutch piston.



41. INSTALL NO. 1 CLUTCH BALANCER

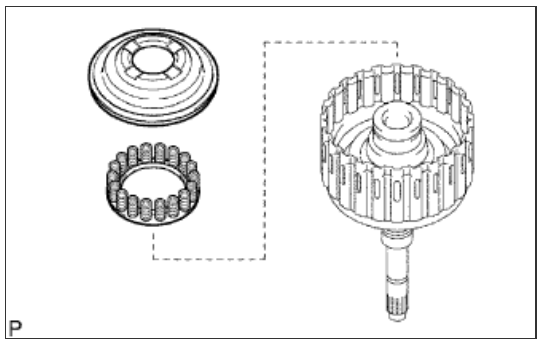
a. Coat a new O-ring with ATF and install it to the clutch balancer.



b. Install the clutch balancer and forward clutch return spring.

NOTICE:

Be careful not to damage the O-ring.

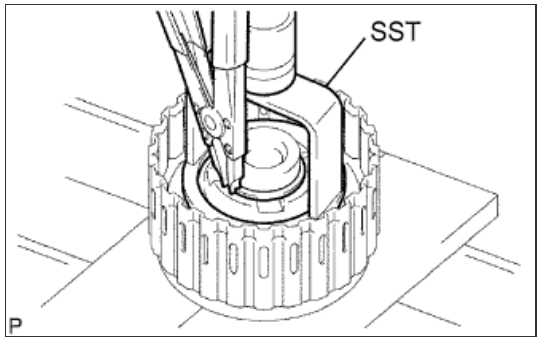


c. Place SST on the No. 1 clutch balancer, and compress the return spring with a press.

NOTICE:

Stop pressing when the spring sheet is lowered to a position 1 to 2 mm (0.0393 to 0.0787 in.) from the snap ring groove to prevent the spring sheet from being deformed.

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d. Install the snap ring with a snap ring expander.

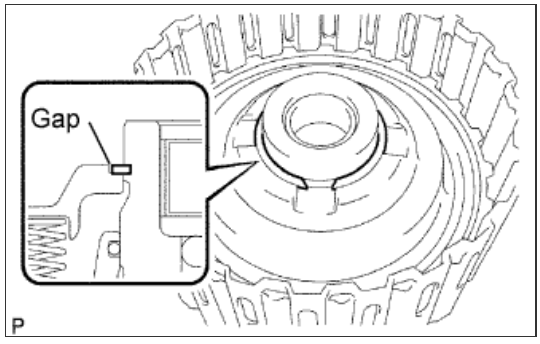
NOTICE:

Do not expand the snap ring excessively.

e. Set the end gap of the snap ring in the piston as shown in the illustration.

NOTICE:

Be sure the end gap of the snap ring is not aligned with the spring retainer claw.



42. INSTALL FORWARD MULTIPLE DISC CLUTCH DISC

a. Install the 2 flanges, 6 discs and 5 plates to the input shaft assembly.

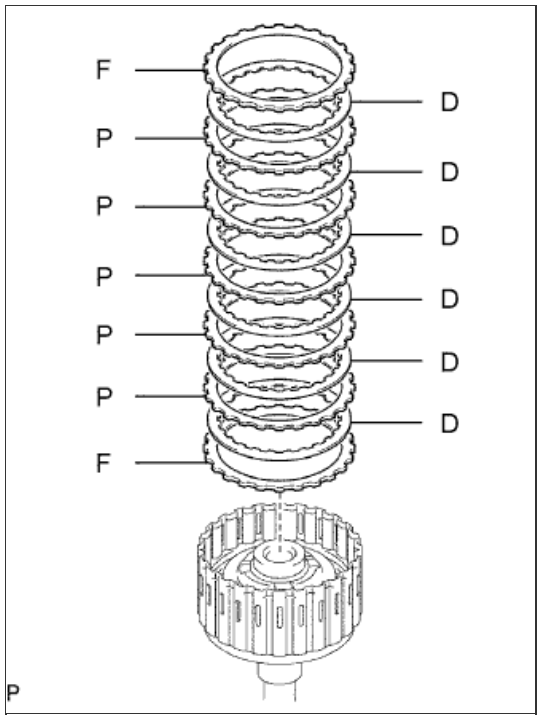
Install in order:
F- D - P - D - P - D - P - D - P - D - P - D - F

HINT:

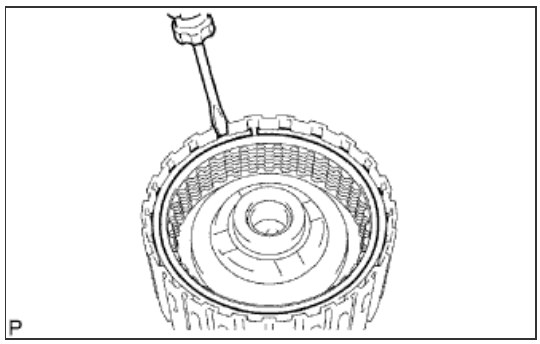
F = Flange

D = Disc

P = Plate



b. Using a screwdriver, install the hole snap ring.



43. INSTALL INPUT SHAFT OIL SEAL RING

a. Coat 3 new oil seal rings with ATF.

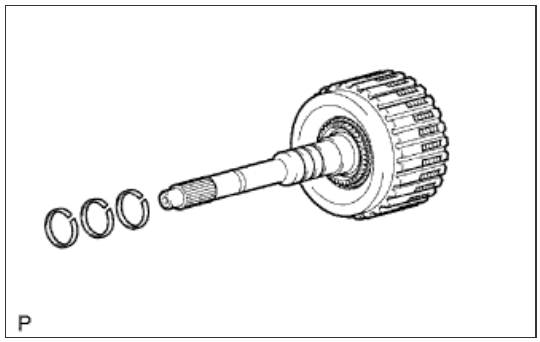
b. Squeeze the ends of the 3 oil seal rings together, and then install them to the starter shaft groove.

NOTICE:

Do not excessively widen the ring.

HINT:

After installing the oil seal rings, check that they rotate smoothly.



44. INSPECT PACK CLEARANCE OF FORWARD CLUTCH

a. Using a dial indicator, measure the moving distance (distance A) of the clutch flange at both ends across a diameter while applying air to the oil hole as shown in the illustration, and calculate the average.

Standard pack clearance:
0.6 to 0.9 mm (0.0236 to 0.0354 in.)

NOTICE:

When measuring the moving distance, install a standard flange (thickness: 3.4

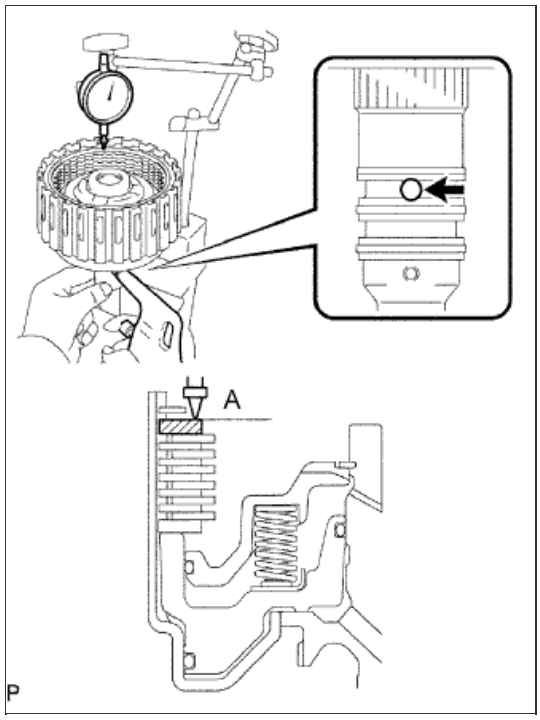
mm (0.134 in.)) to the position of the shaded area in the illustration.

HINT:

Flange moving distance A = 0.26 to 1.36 mm (0.0102 to 0.0535 in.)

Pack clearance = Flange moving distance A - 0.01 mm (0.000394 in.)

If the pack clearance is outside the standard, select and install a clutch flange that makes the pack clearance within the standard.

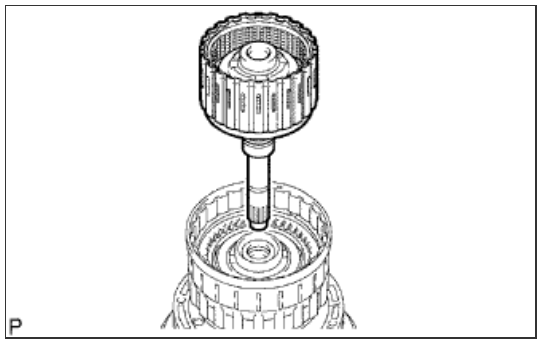


Flange Thickness:

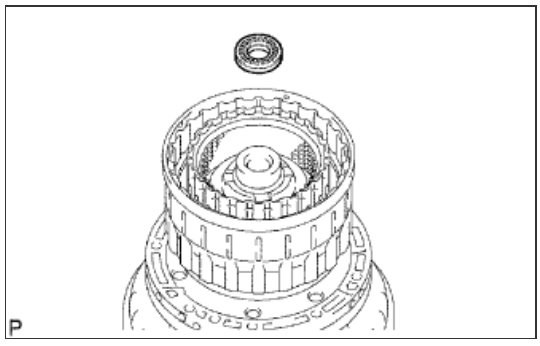
Mark	Thickness
0	2.95 to 3.05 mm (0.116 to 0.120 in.)
1	3.05 to 3.15 mm (0.120 to 0.124 in.)
2	3.15 to 3.25 mm (0.124 to 0.128 in.)
3	3.25 to 3.35 mm (0.128 to 0.132 in.)
4	3.35 to 3.45 mm (0.132 to 0.136 in.)
5	3.45 to 3.55 mm (0.136 to 0.140 in.)
6	3.55 to 3.65 mm (0.140 to 0.144 in.)
7	3.65 to 3.75 mm (0.144 to 0.148 in.)
8	3.75 to 3.85 mm (0.148 to 0.152 in.)
9	3.85 to 3.95 mm (0.148 to 0.152 in.)
A	3.95 to 4.05 mm (0.152 to 0.159 in.)

45. INSTALL INPUT SHAFT ASSEMBLY

a. Install the input shaft to the clutch drum.



b. Install the thrust needle roller bearing to the clutch drum.



Thrust Needle Roller Bearing Diameter:

Item	Inside	Outside
Bearing	21.4 to 21.6 mm (0.841 to 0.850 in.)	40.8 to 41.0 mm (1.606 to 1.614 in.)

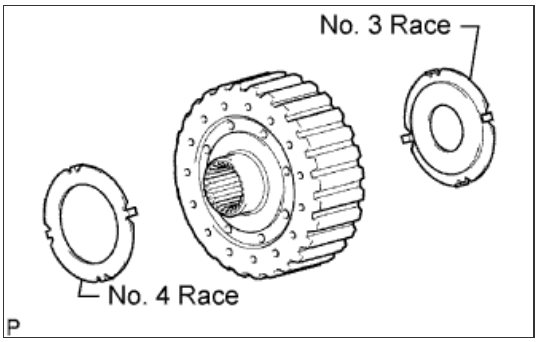
46. INSTALL MULTIPLE DISC CLUTCH HUB

a. Coat the 2 thrust bearing races with petroleum jelly, and install them onto the multiple disc clutch hub.

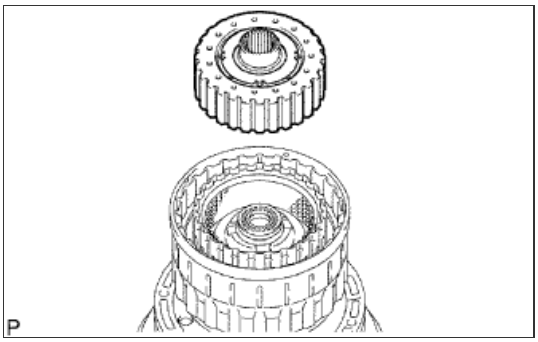
Thrust Bearing Race Diameter:

Item	Inside	Outside
No. 3 Race	22.7 to 22.9 mm	60.0 to 60.4 mm

	(0.892 to 0.902 in.)	(2.36 to 2.38 in.)
No. 4 Race	33.3 to 33.5 mm (1.31 to 1.32 in.)	56.3 to 56.6 mm (2.22 to 2.23 in.)



b. Install the multiple disc clutch hub to the clutch drum.

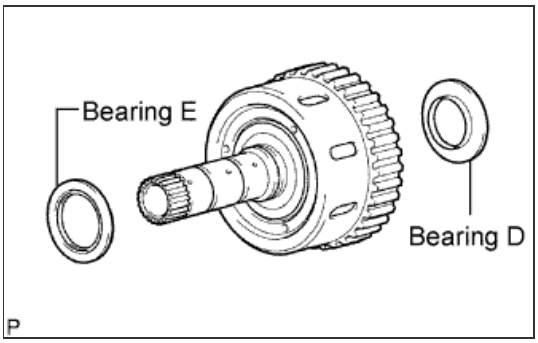


47. INSTALL FORWARD CLUTCH HUB SUB-ASSEMBLY

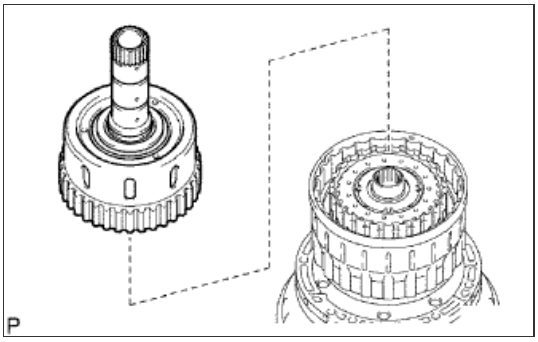
a. Coat the 2 thrust needle roller bearings with petroleum jelly, and install them to the forward clutch hub.

Thrust Needle Roller Bearing Diameter:

Item	Inside	Outside
Bearing D	38.5 to 38.7 mm (1.515 to 1.524 in.)	56.5 to 57.0 mm (2.22 to 2.24 in.)
Bearing E	42.6 to 42.8 mm (1.68 to 1.69 in.)	60.8 to 61.1 mm (2.39 to 2.41 in.)



b. Install the forward clutch hub to the clutch drum.



48. INSTALL REAR CLUTCH DISC

a. Install the 5 discs, 4 plates, reverse clutch flange and clutch cushion plate to the reverse clutch hub.

Install in order:
D - P - D - P - D - P - D - P - D - F - C

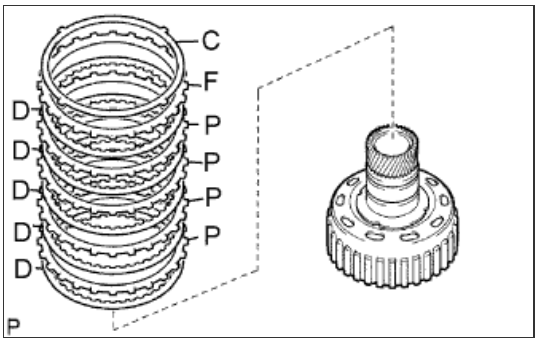
HINT:

D = Disc

P = Plate

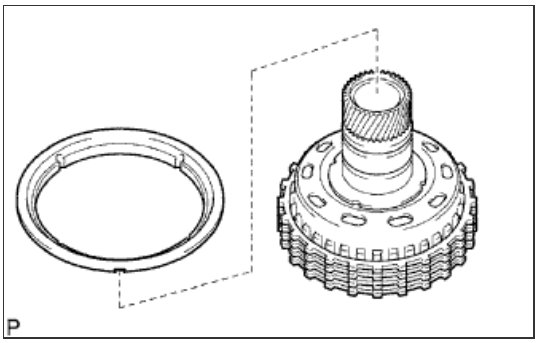
F = Flange

C = Cushion plate



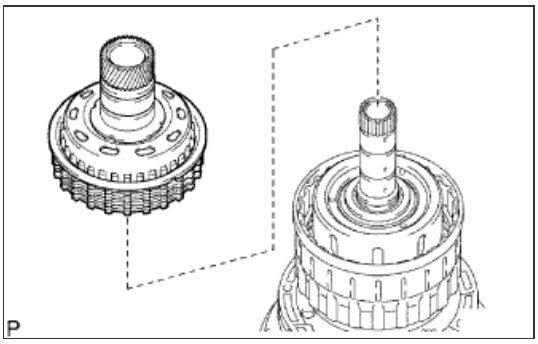
49. INSTALL REVERSE CLUTCH REACTION SLEEVE

a. Install the reverse clutch reaction sleeve to the reverse clutch hub.

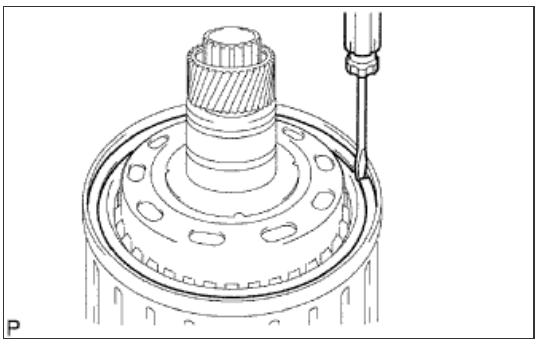


50. INSTALL REVERSE CLUTCH HUB SUB-ASSEMBLY

a. Install the reverse clutch hub to the clutch drum.



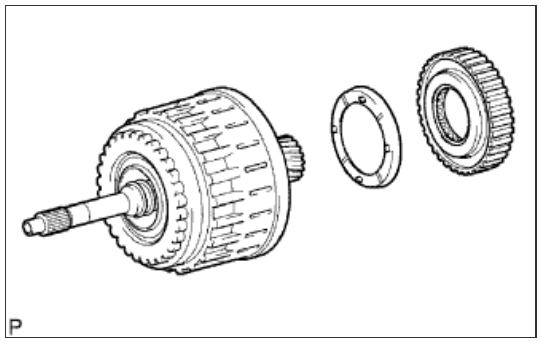
b. Using a screwdriver, install the snap ring to the clutch drum and input shaft.



51. INSTALL NO. 2 1-WAY CLUTCH ASSEMBLY

a. Coat the No. 2 clutch drum thrust washer with petroleum jelly and install it to the clutch drum.

b. Install the 1-way clutch to the clutch drum.

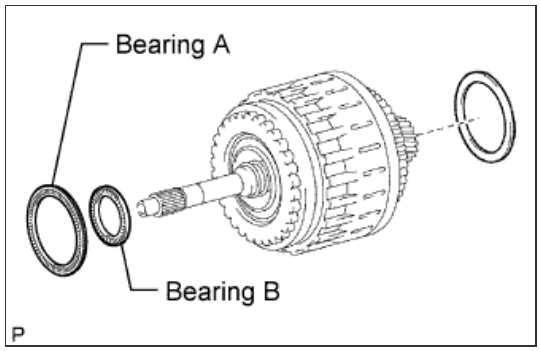


52. INSTALL CLUTCH DRUM AND INPUT SHAFT ASSEMBLY

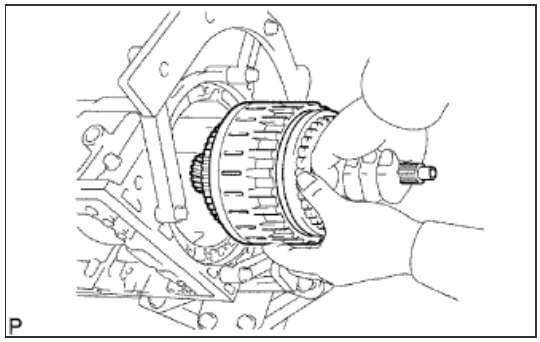
a. Coat the 2 thrust needle roller bearings and clutch drum thrust washer with petroleum jelly and install them to the clutch drum and input shaft assembly.

Thrust Needle Roller Bearing Diameter:

Item	Inside	Outside
Bearing A	72.0 to 72.3 mm (2.83 to 2.85 in.)	85.3 to 85.6 mm (3.36 to 3.37 in.)
Bearing A	34.7 to 34.9 mm (1366 to 1.374 in.)	51.6 to 51.9 mm (2.03 to 2.04 in.)



b. Install the clutch drum and input shaft assembly to the transmission case.

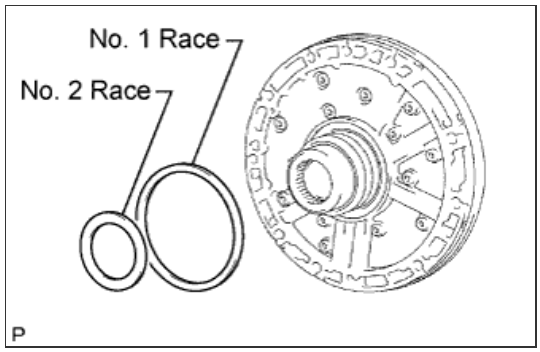


53. INSTALL OIL PUMP ASSEMBLY

a. Coat the No. 1 and No. 2 thrust bearing races with petroleum jelly, and install them to the front oil pump.

Thrust Bearing Race Diameter:

Item	Inside	Outside
No. 1 Race	74.3 to 74.6 mm (2.93 to 2.94 in.)	87.4 to 87.7 mm (3.44 to 3.45 in.)
No. 2 Race	37.0 to 37.3 mm (1.46 to 1.47 in.)	52.1 to 52.3 mm (2.05 to 2.06 in.)



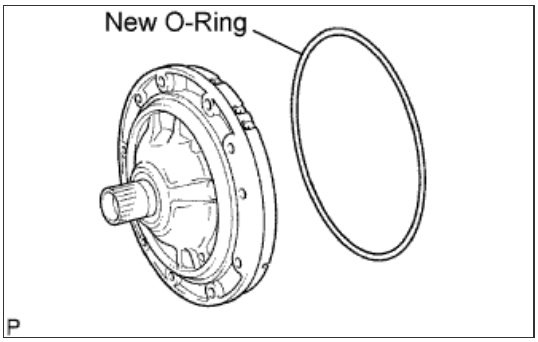
b. Coat a new O-ring with ATF, and install it to the oil pump assembly.

c. Place the oil pump through the input shaft, and align the bolt holes of the oil pump assembly with the transmission case.

d. Hold the input shaft, and lightly press the oil pump body to slide the oil seal rings into the overdrive direct clutch drum.

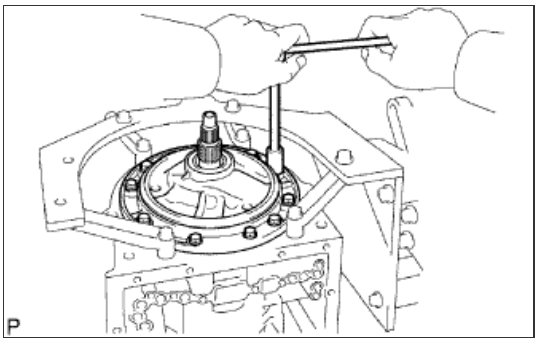
NOTICE:

Do not excessively push on the oil pump, as the oil seal ring will stick to the direct clutch drum.



e. Install the 10 bolts.

Torque:
21 N*m{ 214 kgf*cm , 15 ft.*lbf }

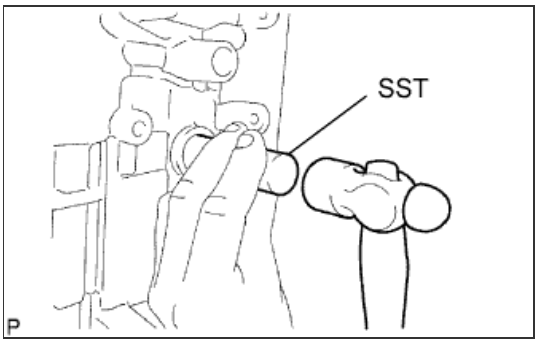


54. INSTALL MANUAL VALVE LEVER SHAFT OIL SEAL

a. Using SST and hammer, tap in 2 new oil seals.

SST
09350-30020 (09350-07110)

b. Coat the lip of the oil seals with MP grease.



55. INSPECT INDIVIDUAL PISTON OPERATION

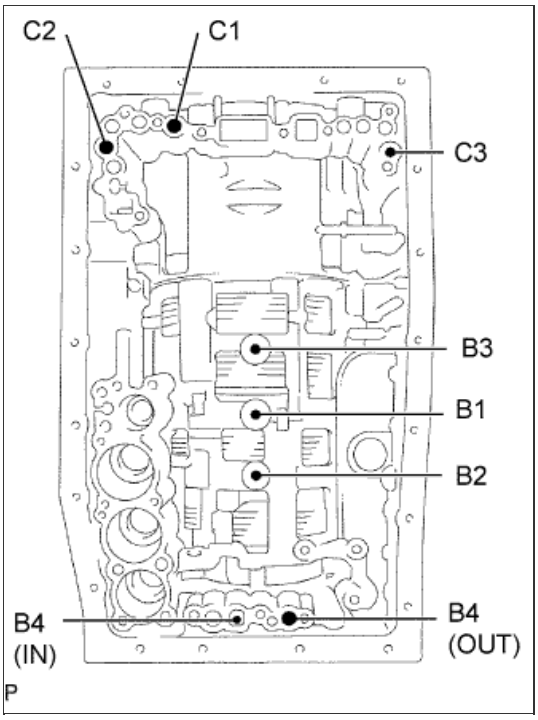
a. Check the operating sound while applying compressed air into the oil holes indicated in the illustration.

HINT:

When inspecting the O/D direct clutch, check with the accumulator piston holes indicated in the illustration.

If there is no sound, disassemble and check the installation condition of the parts.

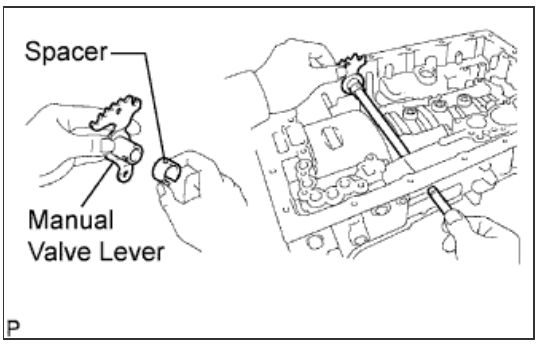
1. No. 2 clutch (C2)
2. No. 3 clutch (C3)
3. No. 1 clutch (C1)
4. No. 3 brake (B3)
5. No. 1 brake (B1)
6. No. 2 brake (B2)
7. No. 4 brake (B4)



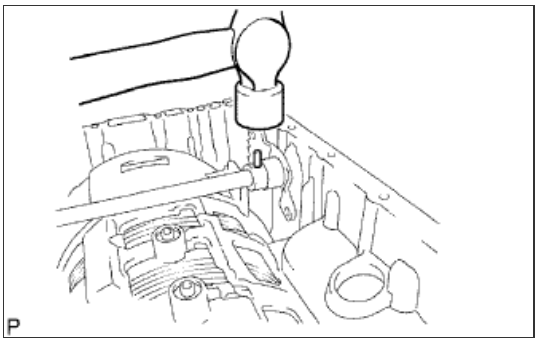
56. INSTALL MANUAL VALVE LEVER SUB-ASSEMBLY

a. Install a new spacer to the manual valve lever.

b. Push the manual valve lever shaft through the transmission case, and install the manual valve lever to the manual valve lever shaft.

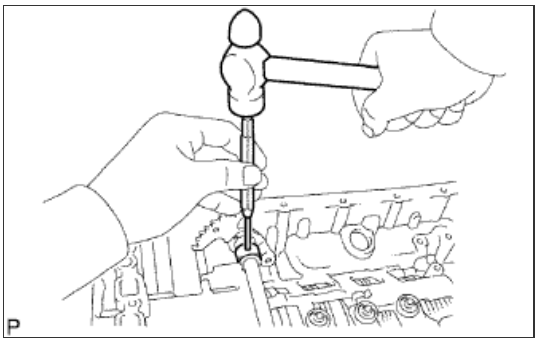


c. Using a hammer, tap in a new spring pin.



d. Align the manual valve lever indentation with the spacer hole, and stake them together with a punch.

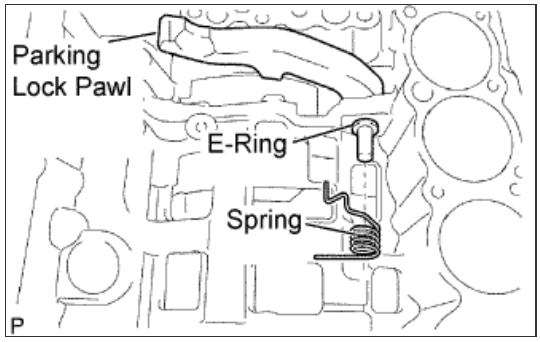
e. Check that the shaft rotates smoothly.



57. INSTALL PARKING LOCK PAWL SHAFT

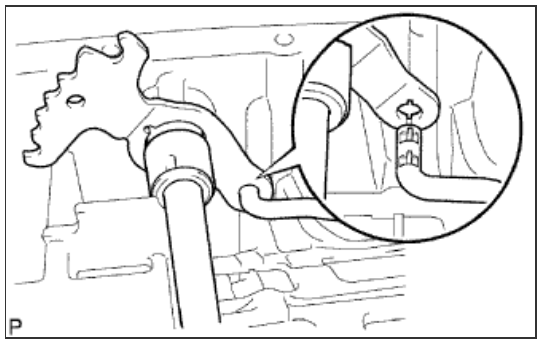
a. Install the E-ring to the shaft.

b. Install the parking lock pawl, shaft and spring.



58. INSTALL PARKING LOCK ROD SUB-ASSEMBLY

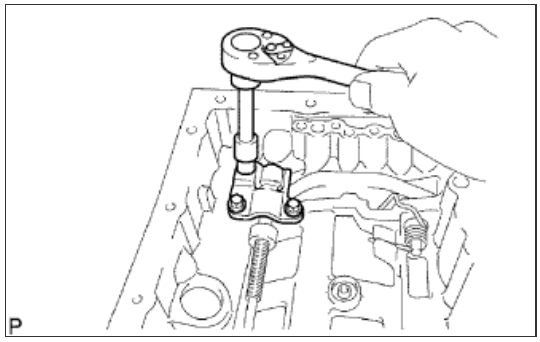
a. Connect the parking lock rod to the manual valve lever.



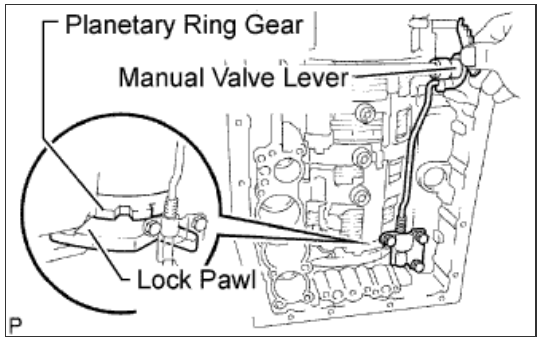
59. INSTALL PARKING LOCK PAWL BRACKET

a. Place the parking lock pawl bracket onto the transmission case and install the 3 bolts.

Torque:
7.4 N*m{ 75 kgf*cm , 65 in.*lbf }

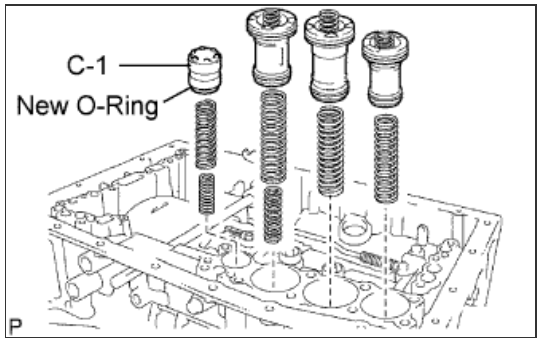


b. Move the manual valve lever to the P position, and confirm that the planetary ring gear is correctly locked up by the lock pawl.



60. INSTALL C-1 ACCUMULATOR VALVE

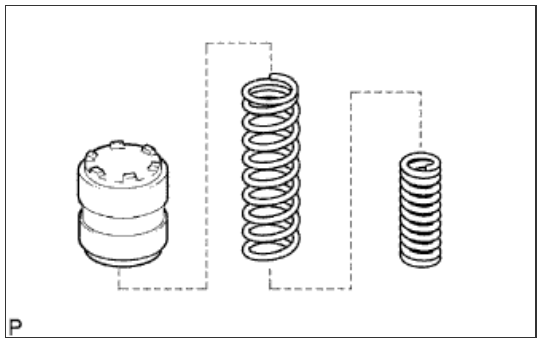
a. Coat a new O-ring with ATF, and install it to the accumulator valve.



b. Install the spring and accumulator valve to the hole.

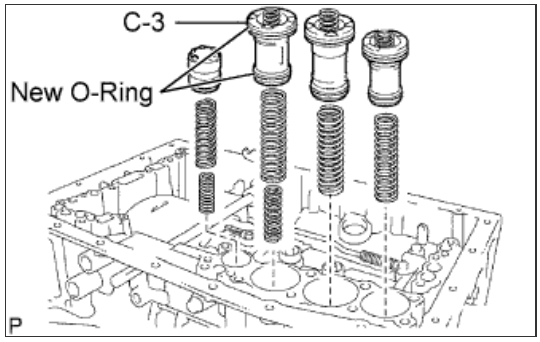
Accumulator Spring Diameter:

Spring	Free Length Outer Diameter	Color
C-1 Inner	30.40 mm (1.20 in.) 11.40 mm (0.449 in.)	Pink
C-1 Outer	48.76 mm (1.92 in.) 16.60 mm (0.654 in.)	Light green



61. INSTALL C-3 ACCUMULATOR PISTON

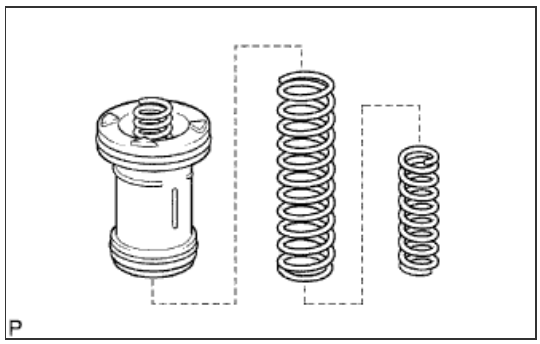
a. Coat 2 new O-rings with ATF, and install them to the piston.



b. Install the 2 springs and accumulator piston to the hole.

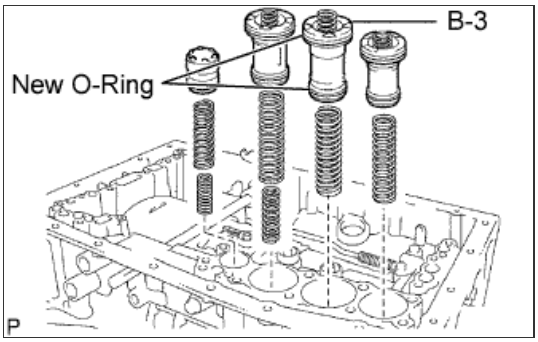
Accumulator Spring Diameter:

Spring	Free Length Outer Diameter	Color
C-3 Inner	44.0 mm (1.73 in.) 14.0 mm (0.551 in.)	Yellow
C-3 Outer	73.35 mm (2.89 in.) 19.90 mm (0.784 in.)	Red



62. INSTALL B-3 ACCUMULATOR PISTON

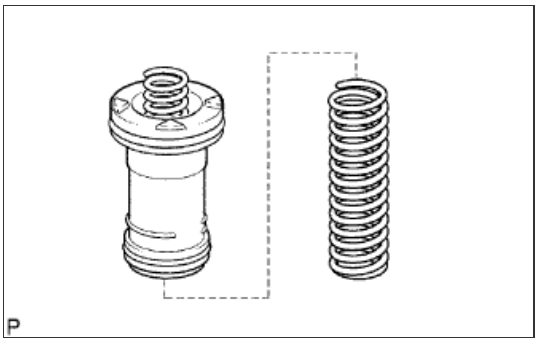
a. Coat 2 new O-rings with ATF, and install them to the piston.



b. Install the spring and accumulator piston to the hole.

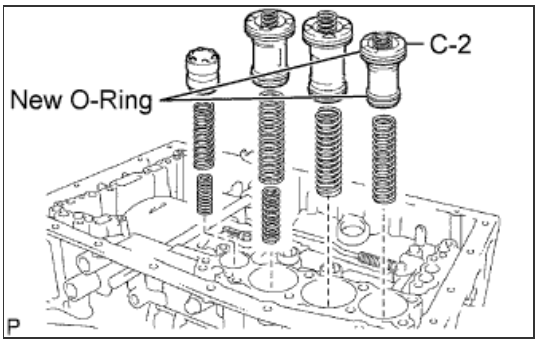
Accumulator Spring Diameter:

Spring	Free Length Outer Diameter	Color
B-3	70.5 mm (2.78 in.) 19.7 mm (0.776 in.)	Purple



63. INSTALL C-2 ACCUMULATOR PISTON

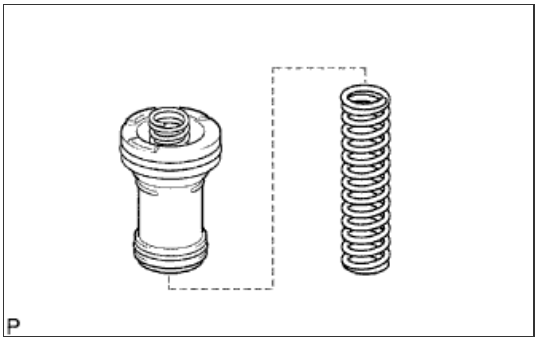
a. Coat 2 new O-rings with ATF, and install them to the piston.



b. Install the spring and accumulator piston to the hole.

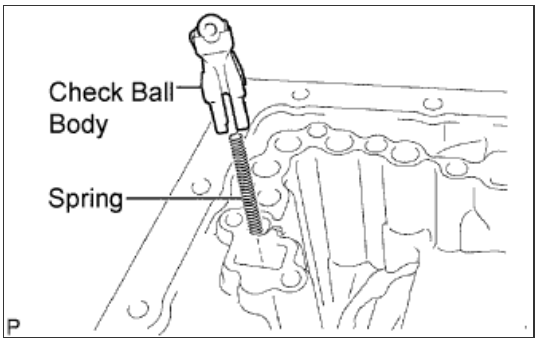
Accumulator Spring Diameter:

Spring	Free Length Outer Diameter	Color
C-2	62.0 mm (2.44 in.) 15.9 mm (0.626 in.)	White



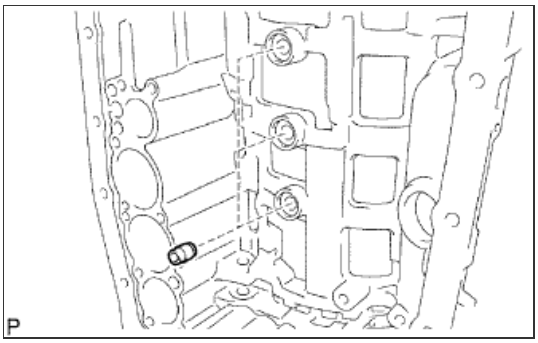
64. INSTALL CHECK BALL BODY

a. Install the spring and check ball body.



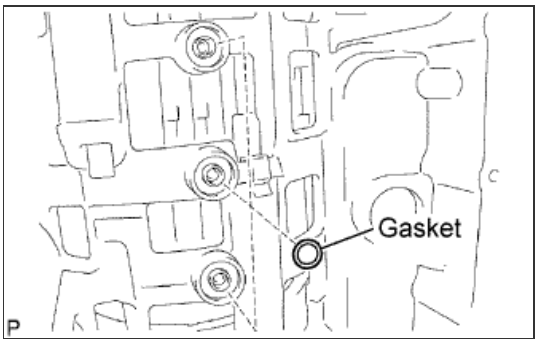
65. INSTALL BRAKE DRUM GASKET

a. Install the 3 brake drum gaskets.



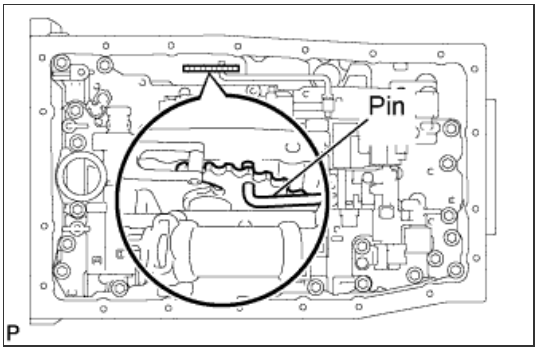
66. INSTALL TRANSMISSION CASE GASKET

a. Install the 3 transmission case gaskets.



67. INSTALL TRANSMISSION VALVE BODY ASSEMBLY

a. Insert the pin of the manual valve into the hole of the manual valve lever.



b. Install the transmission valve body assembly with the 19 bolts.

Torque:

11 N*m{ 110 kgf*cm , 8 ft.*lbf }

HINT:

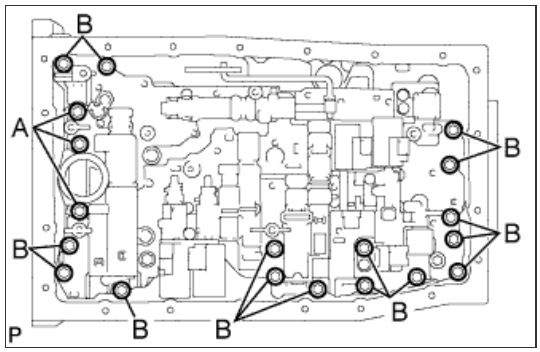
Each bolt length is indicated below.

36 mm (1.42 in.) for bolt A

25 mm (0.984 in.) for bolt B

c. Install the detent spring and detent spring cover with the bolt.

Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }



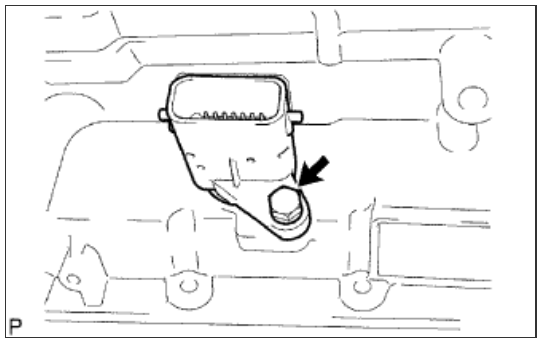
68. INSTALL TRANSMISSION WIRE

a. Install a new O-ring to the transmission wire.

b. Install the transmission wire harness.

c. Install the bolt.

Torque:
5.4 N*m{ 55 kgf*cm , 48 in.*lbf }



d. Connect the 7 solenoid connectors.

e. Install the 2 ATF temperature sensors.

f. Install the 2 clamps and 2 bolts.

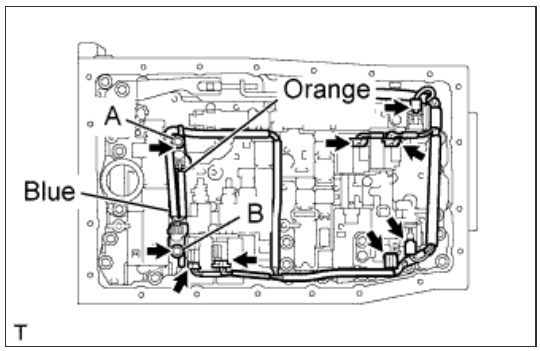
Torque:
for bolt A:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }
for bolt B:
11 N*m{ 112 kgf*cm , 8 ft.*lbf }

HINT:

Each bolt length is indicated below.

12 mm (0.472 in.) for bolt A

36 mm (1.42 in.) for bolt B



Sensor Wire Harness:

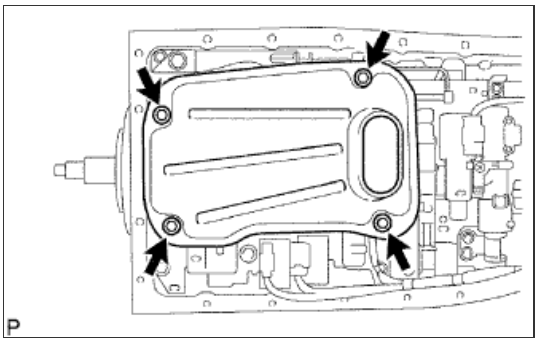
Wire Harness	Color
No. 1 temperature sensor	Orange
No. 2 temperature sensor	Blue

69. INSTALL VALVE BODY OIL STRAINER ASSEMBLY

a. Coat a new O-ring with ATF, and install it to the valve body oil strainer assembly.

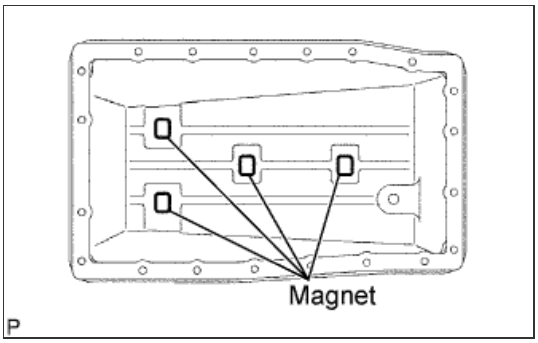
b. Install the oil strainer with the 4 bolts.

Torque:
10 N*m{ 100 kgf*cm , 7 ft.*lbf }



70. INSTALL TRANSMISSION OIL CLEANER MAGNET

a. Install the 4 magnets.



71. INSTALL AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY

a. Install a new gasket to the oil pan.

b. Install the oil pan with the 20 bolts.

Torque:
4.4 N*m{ 45 kgf*cm , 39 in.*lbf }

c. Install the drain plug.

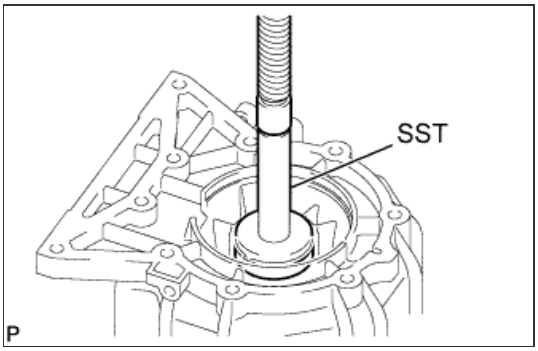
Torque:
20 N*m{ 204 kgf*cm , 15 ft.*lbf }

72. INSTALL TRANSFER CASE ADAPTER RADIAL BALL BEARING

a. Using SST and a press, press in the bearing until it stops.

SST
09950-60010 (09951-00650)
09950-70010 (09951-07150)

b. Using a screwdriver, install the snap ring.



73. INSTALL TRANSMISSION CASE ADAPTER REAR OIL SEAL

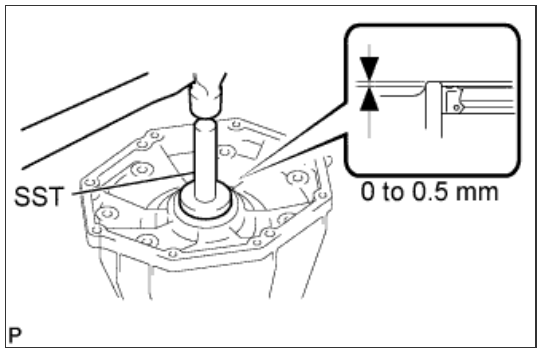
a. Coat the lip of a new oil seal with ATF.

b. Using SST and a hammer, tap in the oil seal.

SST

09950-60010 (09951-00650)
09950-70010 (09951-07150)

Standard depth:
0 to 0.5 mm (0 to 0.0197 in.)



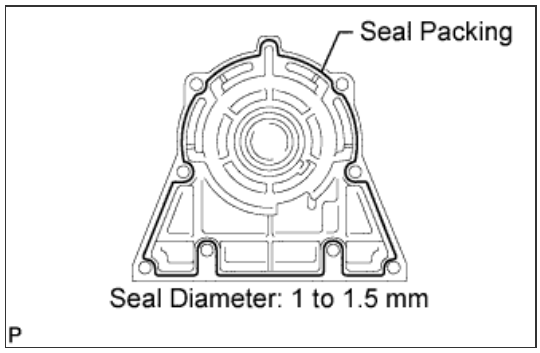
74. INSTALL TRANSFER ADAPTER REAR

a. Clean the threads of the bolts and case.

b. Apply seal packing or equivalent to the transmission case adapter and 8 bolts.

Seal packing:
Toyota Genuine Seal Packing 1281,
Three Bond 1281 or equivalent

Seal diameter:
1.0 to 1.5 mm (0.0394 to 0.0591 in.)



c. Install the transmission case adapter with the 8 bolts.

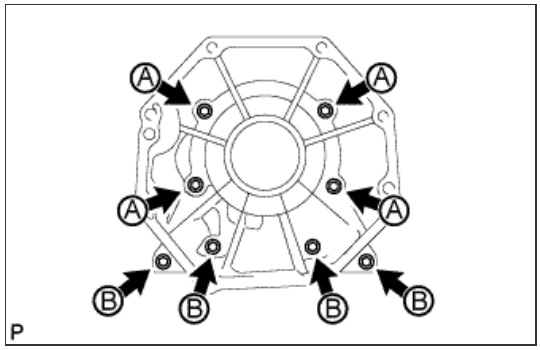
Torque:
34 N*m{ 345 kgf*cm , 25 ft.*lbf }

HINT:

Each bolt length is indicated below.

50 mm (1.97 in.) for bolt A

45 mm (1.77 in.) for bolt B

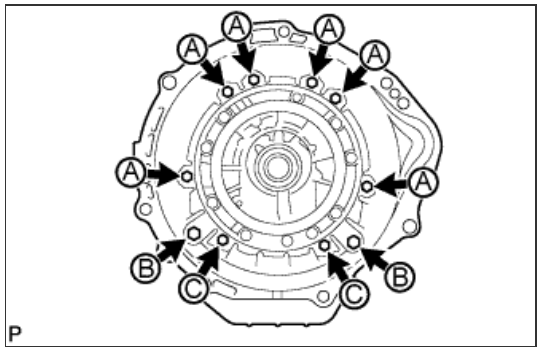


75. INSTALL AUTOMATIC TRANSMISSION HOUSING

a. Clean the threads of the bolts and case with non-residue solvent.

b. Install the transmission housing with the 10 bolts.

Torque:
for 14 mm head bolt A:
34 N*m{ 345 kgf*cm , 25 ft.*lbf }
for 17 mm head bolt B:
57 N*m{ 581 kgf*cm , 42 ft.*lbf }
for 14 mm head bolt C:
34 N*m{ 345 kgf*cm , 25 ft.*lbf }

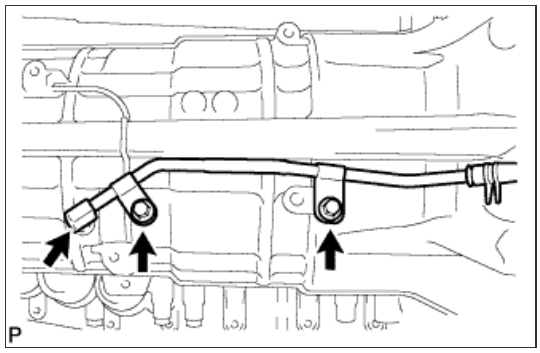


76. INSTALL AUTOMATIC TRANSMISSION BREATHER TUBE

a. Coat a new O-ring with ATF and install it to the breather tube.

b. Install the breather tube with the 2 bolts.

Torque:
5.4 N*m{ 55 kgf*cm , 48 in.*lbf }



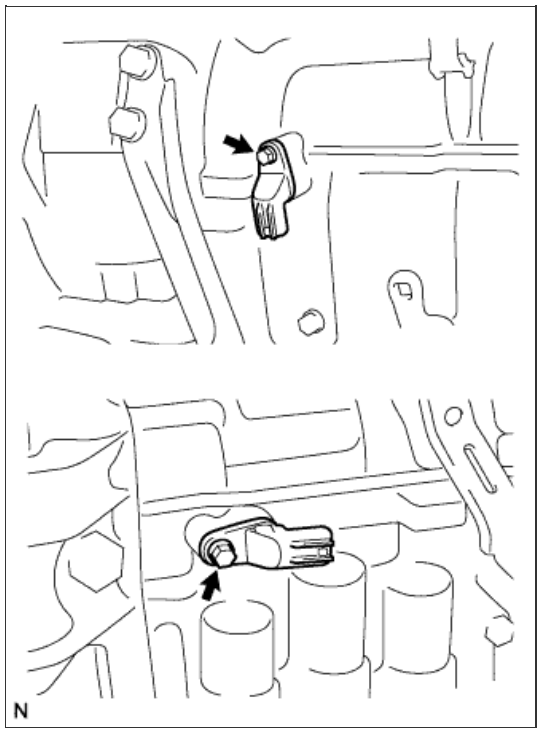
77. INSTALL SPEED SENSOR

a. Coat 2 new O-rings with ATF, and install them to the speed sensors.

b. Install the 2 speed sensors.

c. Install the 2 bolts.

Torque:
5.4 N*m{ 55 kgf*cm , 48 in.*lbf }



78. INSTALL OIL COOLER TUBE UNION

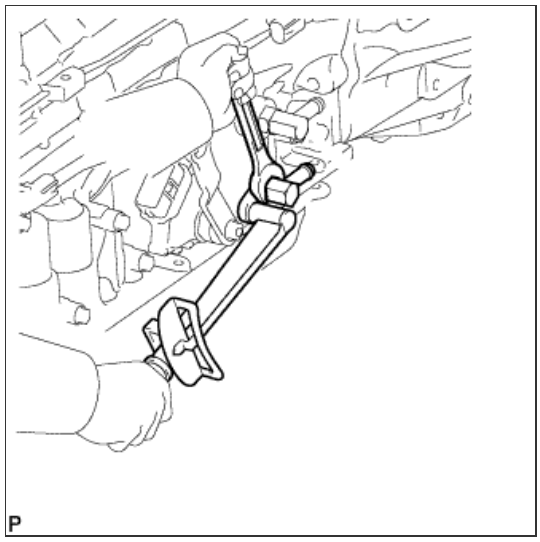
a. Coat 2 new O-rings with ATF, and install them to the 2 oil cooler tube unions.

b. Using a union nut wrench, install the 2 oil cooler tube unions.

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

NOTICE:

Use the formula to calculate special torque values for situations where a union nut wrench is combined with a torque wrench (Click here).

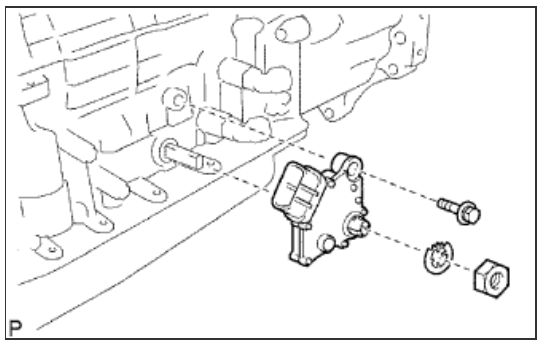


79. INSTALL PARK/NEUTRAL POSITION SWITCH ASSEMBLY

a. Install the park/neutral position switch to the manual valve lever shaft, and temporarily install the adjusting bolt.

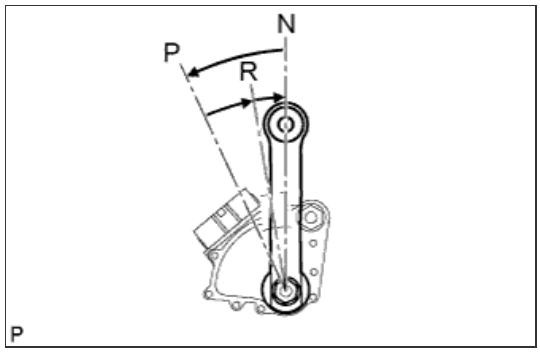
b. Install a new lock washer and the nut.

Torque:
6.9 N*m{ 70 kgf*cm , 61 in.*lbf }



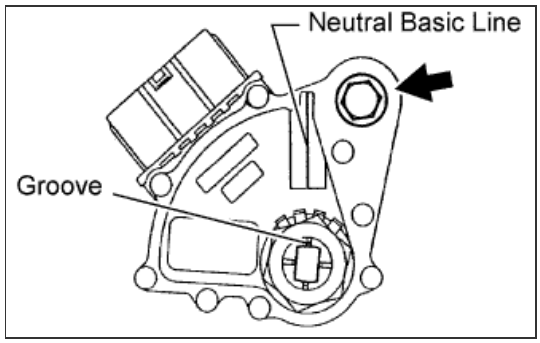
c. Push the control shaft rearward as much as possible.

d. Return the control shaft lever 2 notches to the N position.



e. Align the neutral basic line with the switch groove as shown in the illustration, and tighten the adjusting bolt.

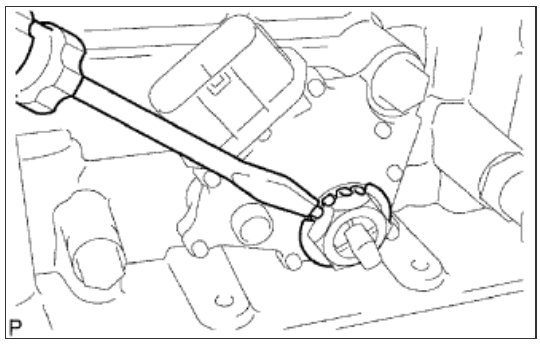
Torque:
13 N*m{ 130 kgf*cm , 9 ft.*lbf }



f. Using a screwdriver, bend the tabs of the lock washer.

HINT:

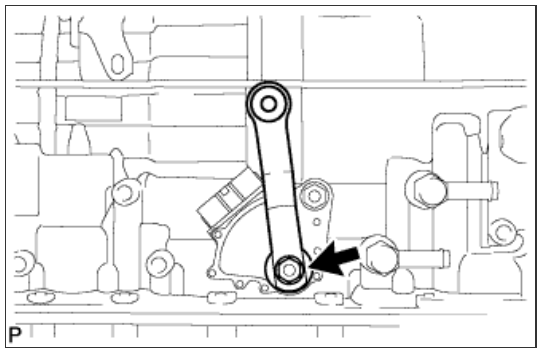
Bend at least 2 of the lock washer tabs.



80. INSTALL TRANSMISSION CONTROL SHAFT LEVER RH

a. Install the control shaft lever with the washer and nut.

Torque:
16 N*m{ 163 kgf*cm , 12 ft.*lbf }


P

for Preparation Click here

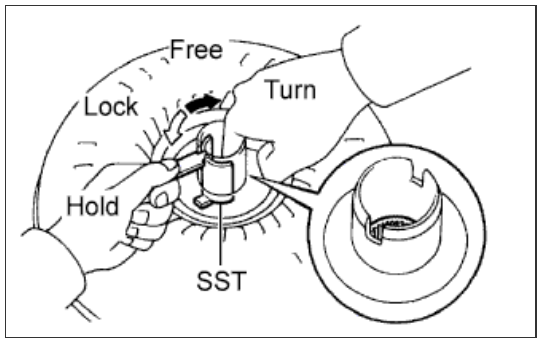
1. INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

a. Inspect the 1-way clutch.

i. Install SST to the inner race of the 1-way clutch.

SST
09350-32014 (09351-32020)

ii. Press on the serrations of the starter with a finger and rotate it.
Check that it rotates smoothly when turned clockwise and locks when turned counterclockwise.
If the results are not as specified, clean the converter and recheck the 1-way clutch. If the results still are not as specified, replace the torque converter clutch assembly.



b. Determine the condition of the torque converter clutch.

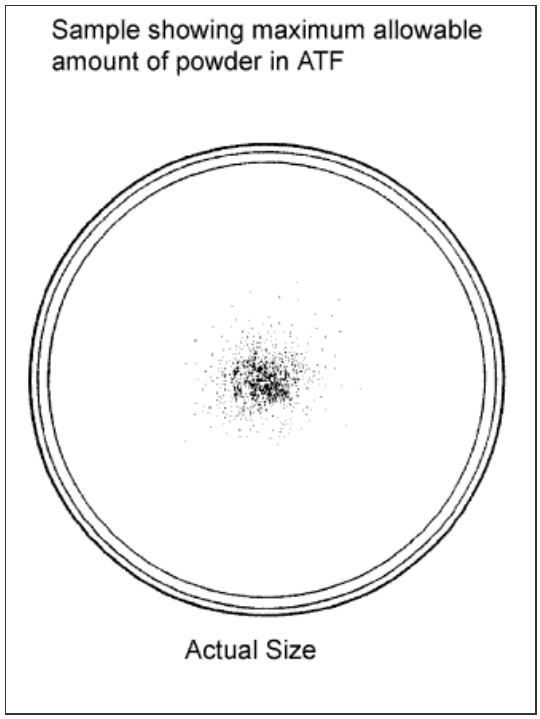
i. Check that the following conditions are met:

- During the stall test or when the shift lever is in N, metallic sounds are not emitted from the torque converter clutch.
- The 1-way clutch turns in one direction and locks in the other direction.
- The amount of powder in the ATF is not more than the sample shown in the illustration.

If the results are not as specified, replace the torque converter clutch assembly.

HINT:

The sample illustration shows approximately 0.25 liters (0.26 US qts, 0.22 Imp. qts) of ATF taken from a removed torque converter clutch.



c. Replace the ATF in the torque converter clutch.

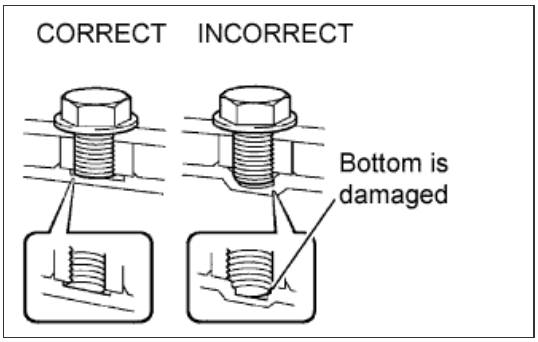
i. If the ATF is discolored and/or has a foul odor, stir the ATF in the torque converter clutch thoroughly and drain the ATF with the torque converter facing upward.

d. Prevent deformation of the torque converter clutch and damage to the oil pump gear.

i. When any marks due to interference are found on the end of the bolt for the torque converter clutch and on the bottom of the bolt hole, replace the bolt and torque converter clutch.

ii. All of the bolts should be the same length.

iii. Make sure no spring washers are missing.

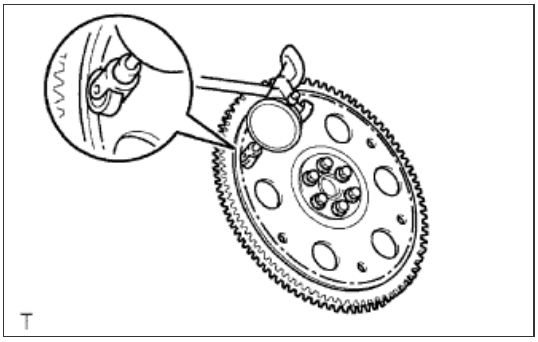


2. INSPECT RUNOUT OF DRIVE PLATE AND RING GEAR

a. Set up a dial indicator and measure the drive plate runout.

Maximum runout:
0.20 mm (0.00787 in.)

If the runout is more than the maximum or if the ring gear is damaged, replace the drive plate (Click here).



3. INSPECT RUNOUT OF TORQUE CONVERTER CLUTCH ASSEMBLY

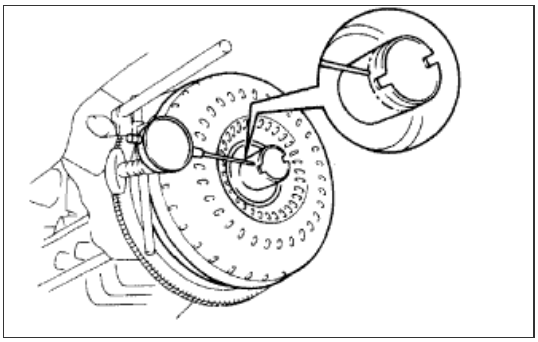
a. Temporarily mount the torque converter clutch to the drive plate. Set up a dial indicator and measure the runout.

Maximum runout:
0.30 mm (0.0118 in.)

If the runout is more than the maximum, try to correct it by changing the installation direction of the torque converter clutch. If the runout cannot be corrected, replace the torque converter clutch.

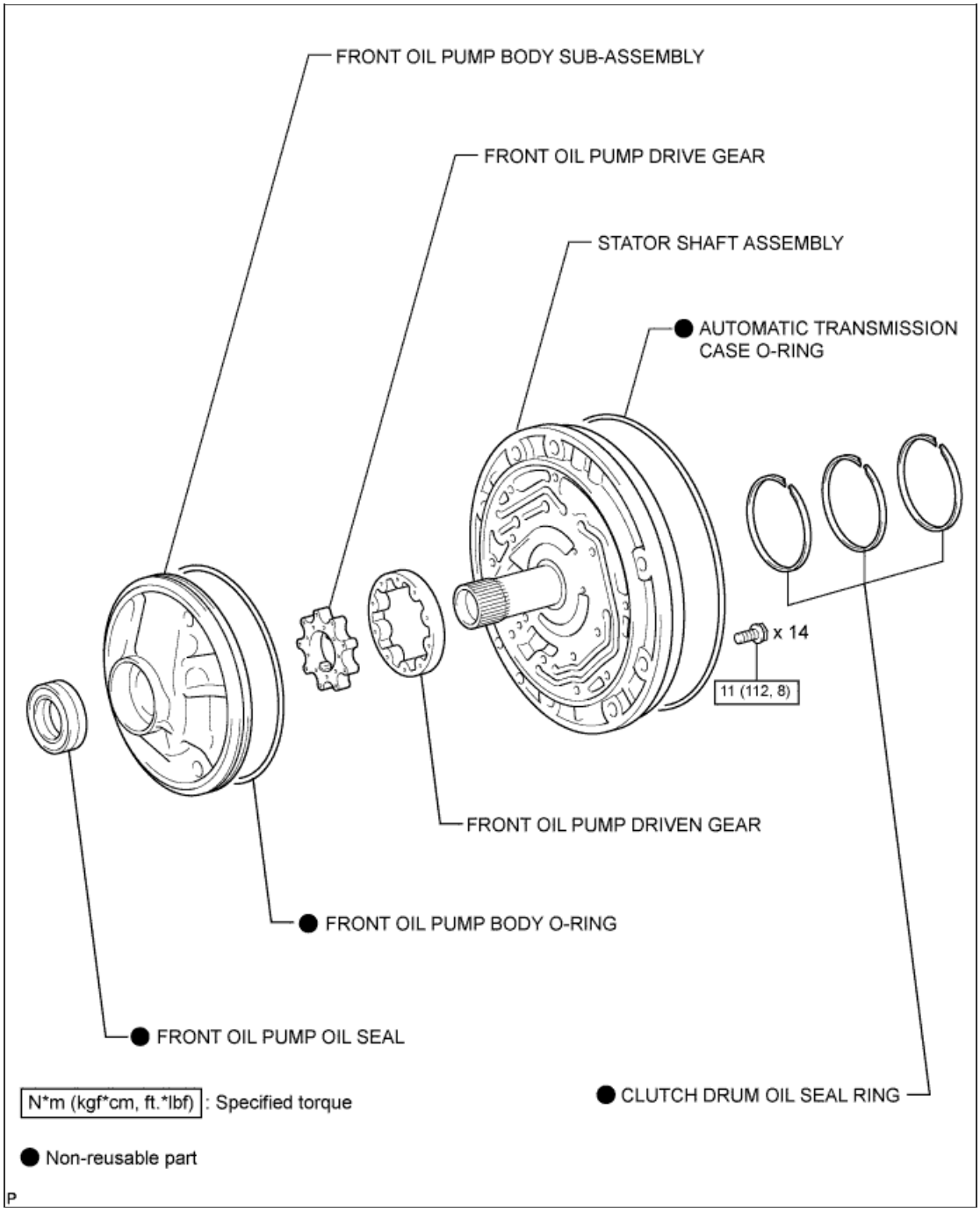
HINT:

Mark the position of the torque converter clutch so that it can be installed correctly later.



b. Remove the torque converter clutch.

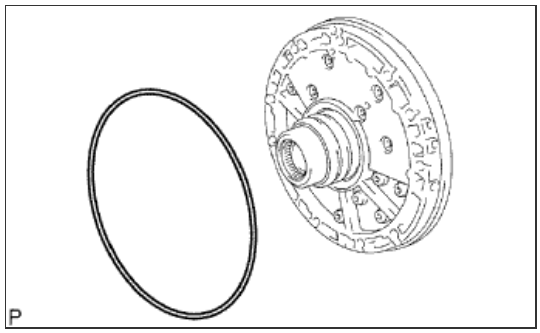
for Preparation Click here



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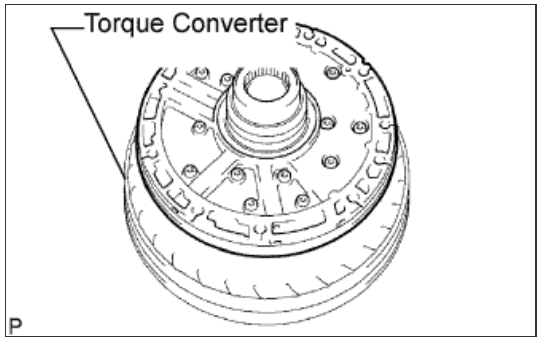
1. REMOVE AUTOMATIC TRANSMISSION CASE O-RING

a. Remove the O-ring from the oil pump assembly.



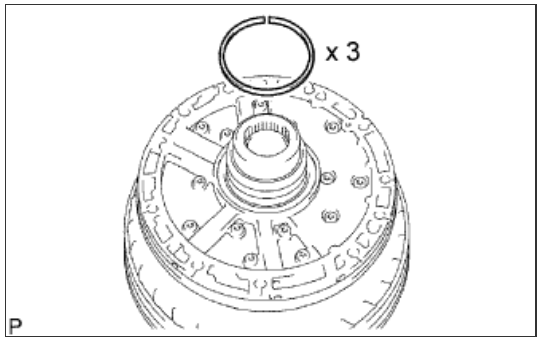
2. FIX OIL PUMP ASSEMBLY

a. Place the oil pump body on the torque converter.



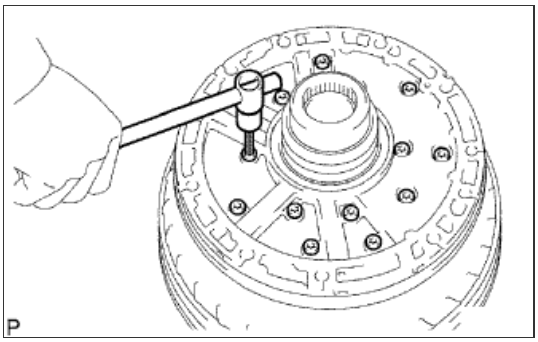
3. REMOVE CLUTCH DRUM OIL SEAL RING

a. Remove the 3 oil seal rings.



4. REMOVE STATOR SHAFT ASSEMBLY

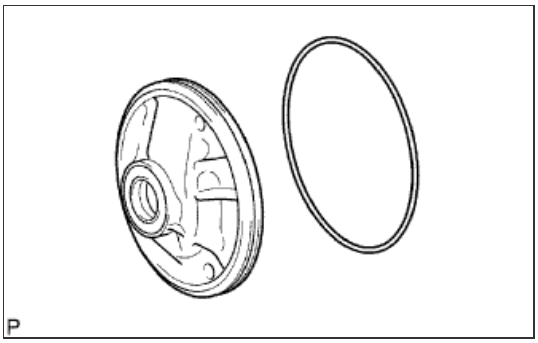
a. Remove the 14 bolts, and then remove the stator shaft from the oil pump body.



5. REMOVE FRONT OIL PUMP BODY O-RING

a. Remove the O-ring from the oil pump body.

b. Remove the oil pump body from the torque converter clutch.

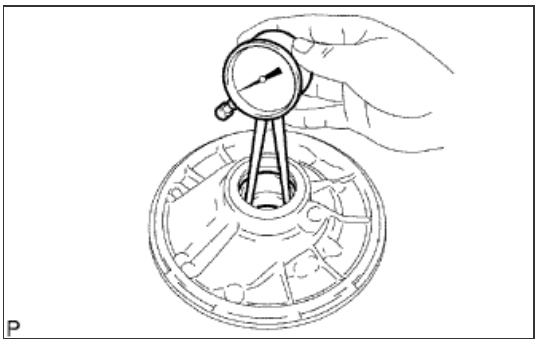


6. INSPECT FRONT OIL PUMP BODY SUB-ASSEMBLY

a. Using a dial indicator, measure the inside diameter of the oil pump body bush.

Maximum inside diameter:
38.188 mm (1.50 in.)

If the inside diameter is more than the maximum, replace the oil pump body sub-assembly.

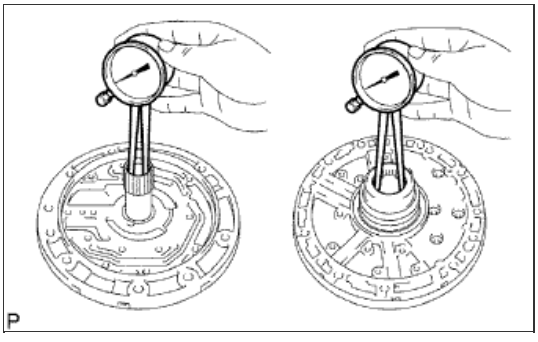


7. INSPECT STATOR SHAFT ASSEMBLY

a. Using a dial indicator, measure the inside diameter of the stator shaft bush.

Maximum inside diameter:
Front side:
21.577 mm (0.849 in.)
Rear side:
32.08 mm (1.26 in.)

If the inside diameter is grater than the maximum, replace the stator shaft assembly.



8. INSPECT CLEARANCE OF OIL PUMP ASSEMBLY

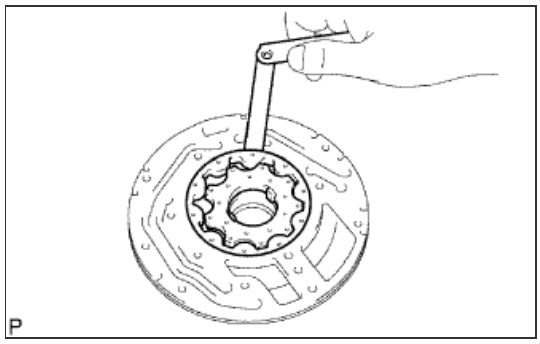
a. Push the driven gear to one side of the body.

b. Using a feeler gauge, measure the body clearance.

Standard body clearance:
0.10 to 0.17 mm (0.00394 to 0.00669 in.)

Maximum body clearance:
0.17 mm (0.00669 in.)

If the body clearance is more than the maximum, replace the drive gear, driven gear or pump body assembly.

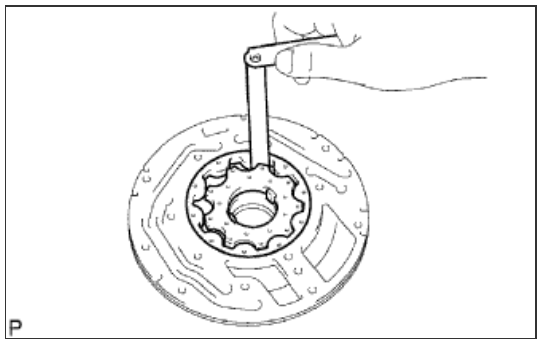


c. Using a feeler gauge, measure the tip clearance between the driven gear teeth and drive gear teeth.

Standard tip clearance:
0.070 to 0.150 mm (0.00276 to 0.00591 in.)

Maximum tip clearance:
0.150 mm (0.00591 in.)

If the tip clearance is more than the maximum, replace the drive gear, driven gear or pump body assembly.

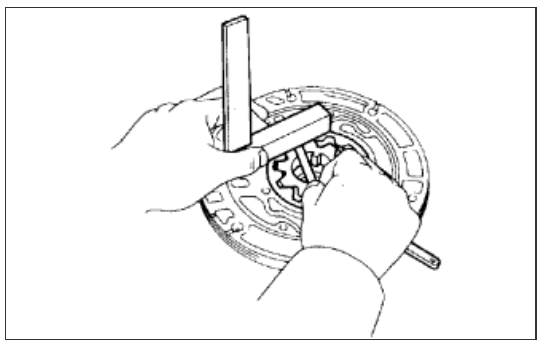


d. Using a steel straightedge and feeler gauge, measure the side clearance of both gears.

Standard side clearance:
0.02 to 0.05 mm (0.000787 to 0.00197 in.)

Maximum side clearance:
0.05 mm (0.00197 in.)

If the side clearance of both gears is more than the maximum, replace the drive gear, driven gear or pump body assembly.



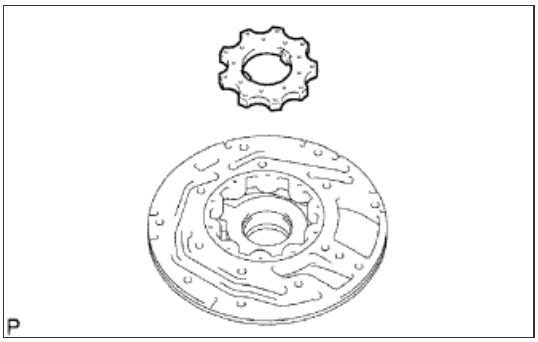
HINT:

There are 5 different thicknesses for the drive and driven gears.

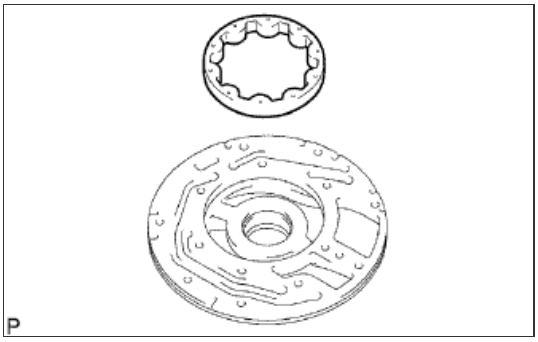
Drive and Driven Gears Thickness:

Mark	Thickness
0	10.74 to 10.749 mm (0.42283 to 0.42319 in.)
1	10.75 to 10.759 mm (0.42323 to 0.42358 in.)
2	10.76 to 10.77 mm (0.42362 to 0.42401 in.)
3	10.771 to 10.78 mm (0.42405 to 0.42441 in.)
4	10.781 to 10.79 mm (0.42445 to 0.42480 in.)

9. REMOVE FRONT OIL PUMP DRIVE GEAR



10. REMOVE FRONT OIL PUMP DRIVEN GEAR

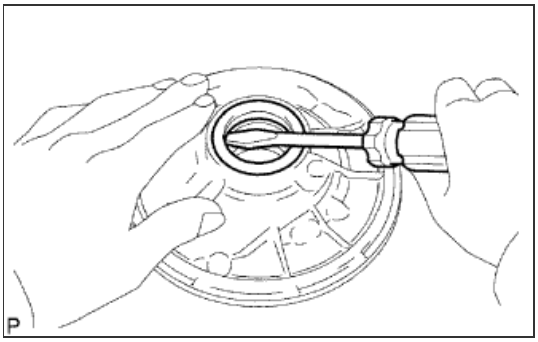


11. REMOVE FRONT OIL PUMP OIL SEAL

a. Using a screwdriver, pry out the oil seal.

NOTICE:

Be careful not to damage the bushing and oil pump body.



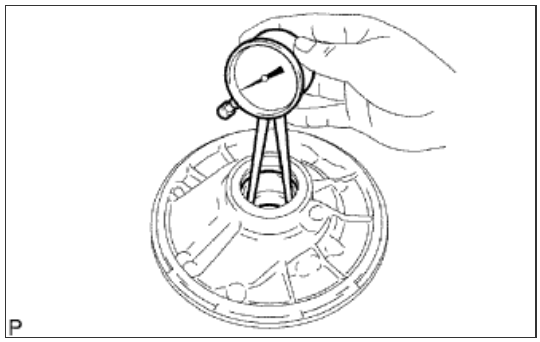
for Preparation Click here

1. INSPECT FRONT OIL PUMP BODY SUB-ASSEMBLY

a. Using a dial indicator, measure the inside diameter of the oil pump body bush.

Maximum inside diameter:
38.188 mm (1.50 in.)

If the inside diameter is more than the maximum, replace the oil pump body sub-assembly.

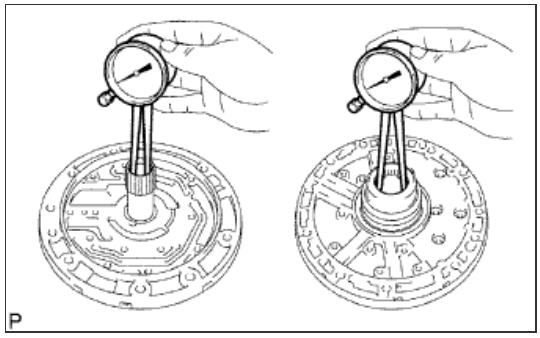


2. INSPECT STATOR SHAFT ASSEMBLY

a. Using a dial indicator, measure the inside diameter of the stator shaft bush.

Maximum inside diameter:
Front side:
21.577 mm (0.849 in.)
Rear side:
32.08 mm (1.26 in.)

If the inside diameter is grater than the maximum, replace the stator shaft assembly.



3. INSPECT CLEARANCE OF OIL PUMP ASSEMBLY

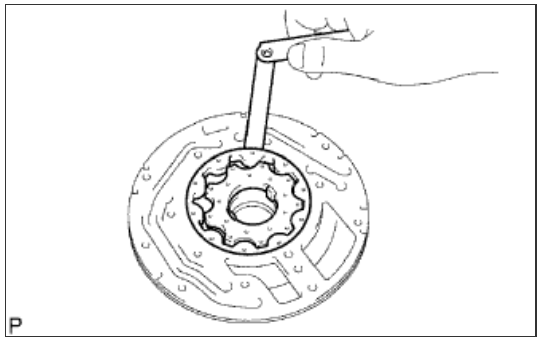
a. Push the driven gear to one side of the body.

b. Using a feeler gauge, measure the body clearance.

Standard body clearance:
0.10 to 0.17 mm (0.00394 to 0.00669 in.)

Maximum body clearance:
0.17 mm (0.00669 in.)

If the body clearance is more than the maximum, replace the drive gear, driven gear or pump body assembly.

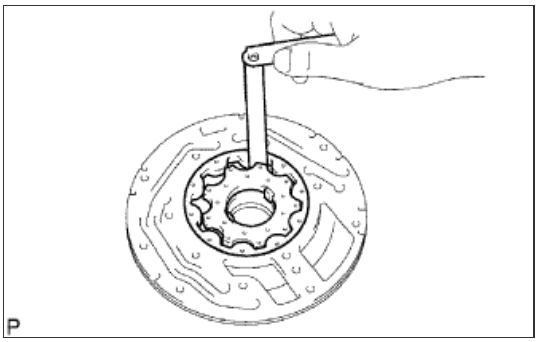


c. Using a feeler gauge, measure the tip clearance between the driven gear teeth and drive gear teeth.

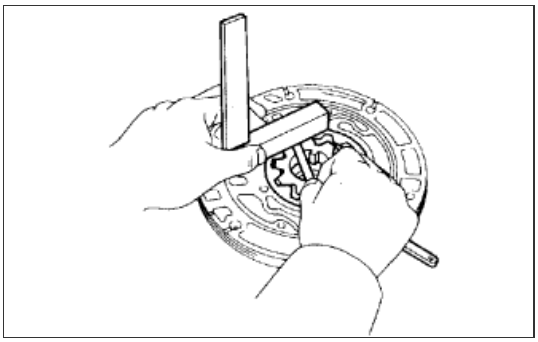
Standard tip clearance:
0.070 to 0.150 mm (0.00276 to 0.00591 in.)

Maximum tip clearance:
0.150 mm (0.00591 in.)

If the tip clearance is more than the maximum, replace the drive gear, driven gear or pump body assembly.



d. Using a steel straightedge and feeler gauge, measure the side clearance of both gears.



Standard side clearance:
0.02 to 0.05 mm (0.000787 to 0.00197 in.)

Maximum side clearance:
0.05 mm (0.00197 in.)

If the side clearance of both gears is more than the maximum, replace the drive gear, driven gear or pump body assembly.

HINT:

There are 5 different thicknesses for the drive and driven gears.

Drive and Driven Gears Thickness:

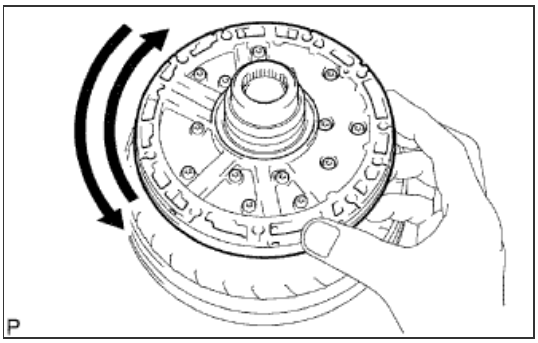
Mark	Thickness
0	10.74 to 10.749 mm (0.42283 to 0.42319 in.)
1	10.75 to 10.759 mm (0.42323 to 0.42358 in.)
2	10.76 to 10.77 mm (0.42362 to 0.42401 in.)
3	10.771 to 10.78 mm (0.42405 to 0.42441 in.)
4	10.781 to 10.79 mm (0.42445 to 0.42480 in.)

4. INSPECT FRONT OIL PUMP DRIVE GEAR ROTATION

a. Place the oil pump body on the torque converter clutch.

b. Check that the drive gear rotates smoothly.

c. Remove the oil pump assembly from the torque converter.



for Preparation Click here

1. INSTALL FRONT OIL PUMP OIL SEAL

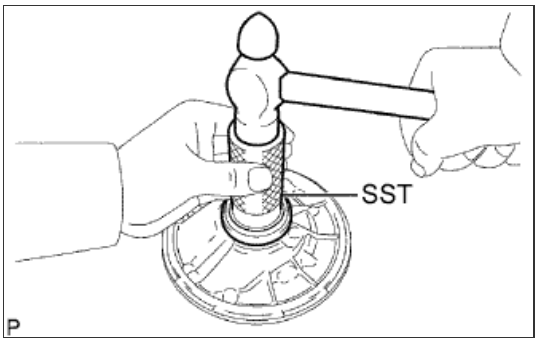
a. Using SST and a hammer, tap in a new oil seal.

SST
09350-30020 (09351-32140)

HINT:

The oil seal end should be flush with the outer edge of the pump body.

b. Coat the lip of the oil seal with MP grease.



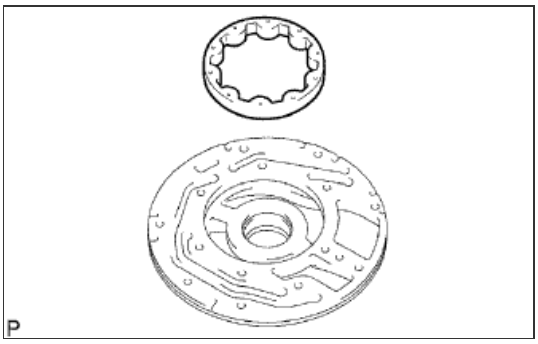
2. FIX FRONT OIL PUMP BODY SUB-ASSEMBLY

a. Place the oil pump body on the torque converter clutch.

3. INSTALL FRONT OIL PUMP DRIVEN GEAR

a. Coat the driven gear with ATF.

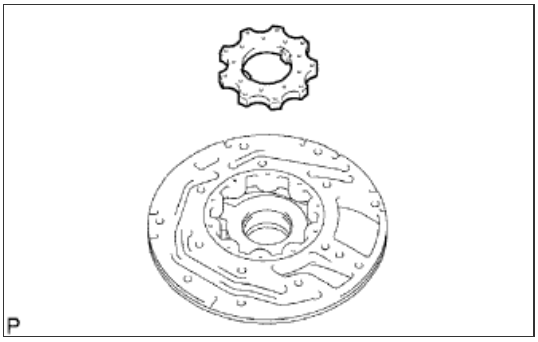
b. Install the driven gear to the oil pump body.



4. INSTALL FRONT OIL PUMP DRIVE GEAR

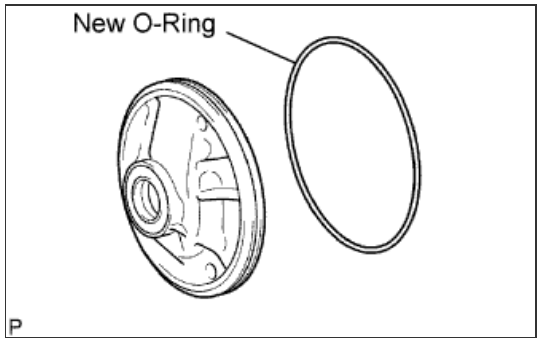
a. Coat the drive gear with ATF.

b. Install the drive gear to the oil pump body.



5. INSTALL FRONT OIL PUMP BODY O-RING

a. Coat a new O-ring with ATF and install it to the oil pump body.

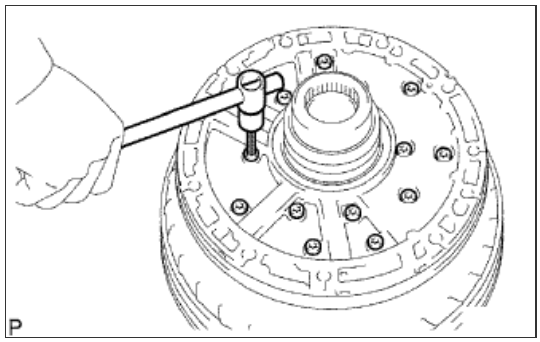


6. INSTALL STATOR SHAFT ASSEMBLY

a. Align the stator shaft with the bolt holes.

b. Install the 14 bolts.

Torque:
11 N*m{ 112 kgf*cm , 8 ft.*lbf }



7. INSTALL CLUTCH DRUM OIL SEAL RING

a. Coat 3 new oil seal rings with ATF.

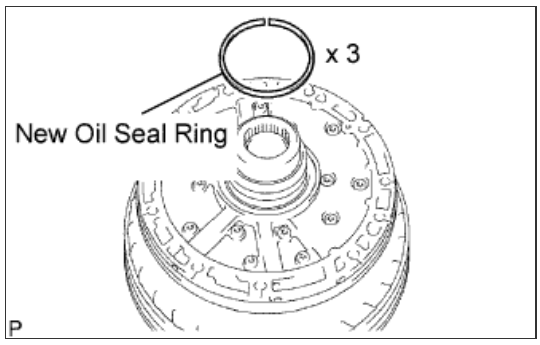
b. Squeeze the ends of the 3 oil seal rings together with an overlap distance of 8 mm (0.314 in.) or less, and then install them to the starter shaft groove.

NOTICE:

Do not excessively widen the ring.

HINT:

After installing the oil seal rings, check that they rotate smoothly.

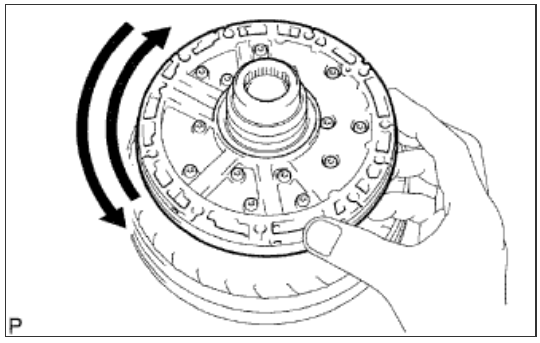


8. INSPECT OIL PUMP DRIVE GEAR ROTATION

a. Place the oil pump body on the torque converter clutch.

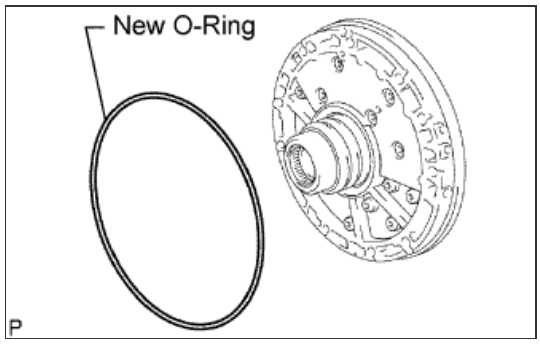
b. Check that the drive gear rotates smoothly.

c. Remove the oil pump assembly from the torque converter.



9. INSTALL AUTOMATIC TRANSMISSION CASE O-RING

a. Coat a new O-ring with ATF and install it to the oil pump assembly.



for Preparation Click here

NOTICE:

Perform the Reset Memory procedures (A/T initialization) after replacing the automatic transmission assembly, valve body assembly or any of the shift solenoid valves (Click here).

HINT:

Reset Memory cannot be completed by only reconnecting the cable to the negative (-) battery terminal.

CAUTION:

When using compressed air, always aim away from yourself to prevent Automatic Transmission Fluid (ATF) or kerosene from spraying on your face.

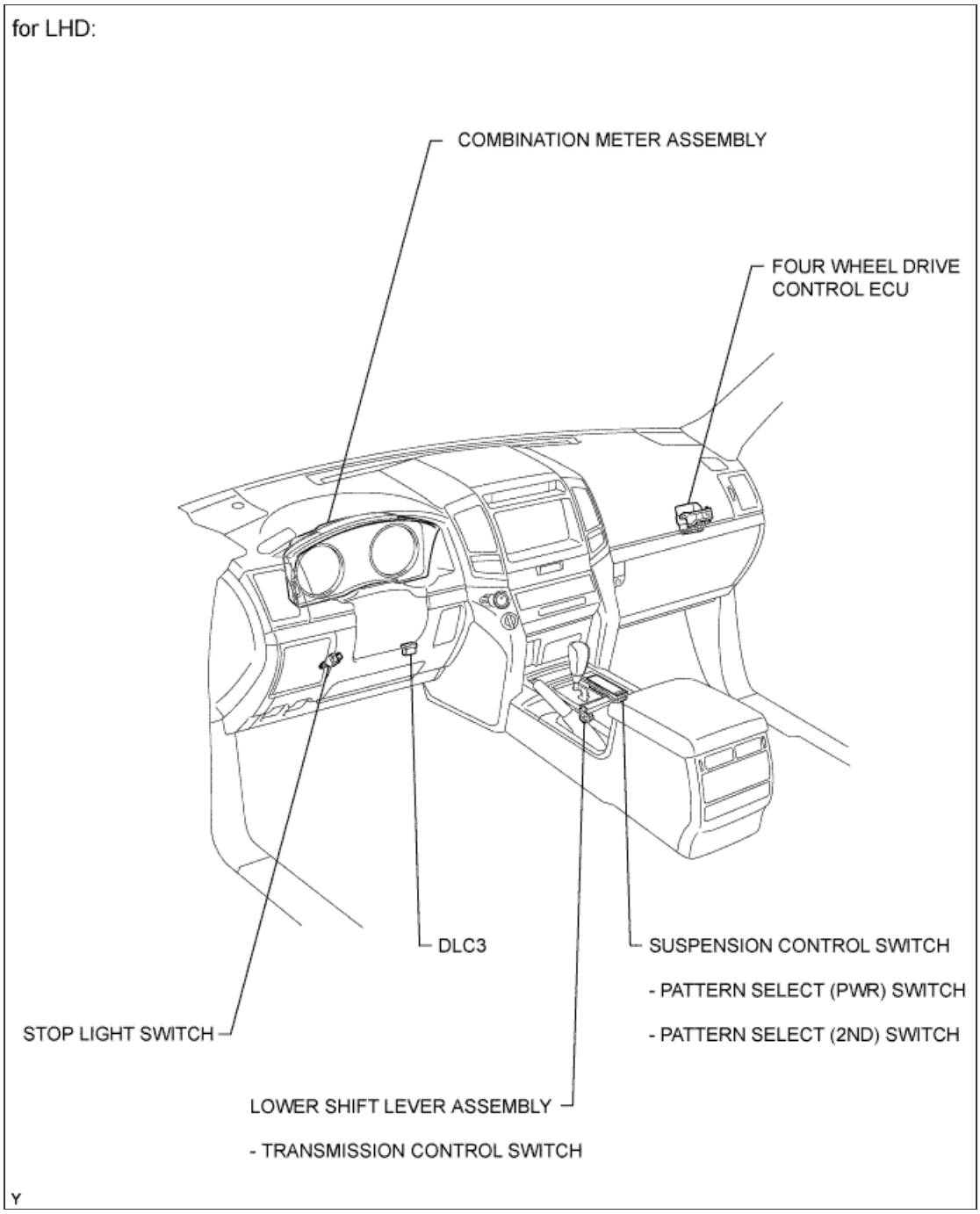
NOTICE:

- **The automatic transmission is composed of precision-made parts, necessitating careful inspection before reassembly because even a small nick could cause fluid leakage or affect performance.**
- **The procedures are organized so that you work on only one component group at a time. This will help avoid confusion with similar-looking parts of different sub-assemblies being on your workbench at the same time.**
- **The component groups are inspected and repaired from the converter housing side.**
- **Whenever possible, complete the inspection, repair and reassembly before proceeding to the next component group. If a defect is found in a certain component group during reassembly, inspect and repair this group immediately. If a component group cannot be assembled because parts are being ordered, be sure to keep all parts of the group in a separate container while proceeding with disassembly, inspection, repair and reassembly of other component groups.**
- **Use of Toyota Genuine ATF WS is recommended.**
- **All disassembled parts should be washed clean, and compressed air should be blown through any fluid passages and holes.**
- **Dry all parts with compressed air. Never use a cloth.**
- **The recommended ATF or kerosene should be used for cleaning.**
- **After cleaning, the parts should be arranged in the order they were removed for efficient inspection, repairs, and reassembly.**
- **New discs for the brakes and clutches that will be used for replacement must be soaked in ATF for at least 15 minutes before reassembly.**
- **All oil seal rings, clutch discs, clutch plates, rotating parts and sliding surfaces should be coated with ATF prior to reassembly.**
- **All old gaskets and rubber O-rings must be replaced.**
- **Do not apply adhesive cement to gaskets and similar parts.**
- **Make sure that the ends of the snap rings are not aligned with any cutouts. Also make sure that snap rings are correctly installed into the grooves.**
- **If a worn bushing is to be replaced, the sub-assembly containing the bushing must also be replaced.**
- **Check the thrust bearings and races for wear or damage. Replace them if necessary.**
- **Use petroleum jelly to keep parts in place.**
- **When working with FIPG material, perform the following:**
  Using a razor blade and gasket scraper, remove all old FIPG material from the gasket surface.
  Clean all components thoroughly to remove all foreign matter.
  Clean both sealing surfaces with a non-residue solvent.
  Apply FIPG material in a continuous line on the sealing surface.
  Reassemble parts within 10 minutes of applying FIPG material. Failing to do so will require the FIPG material to be removed and reapplied.

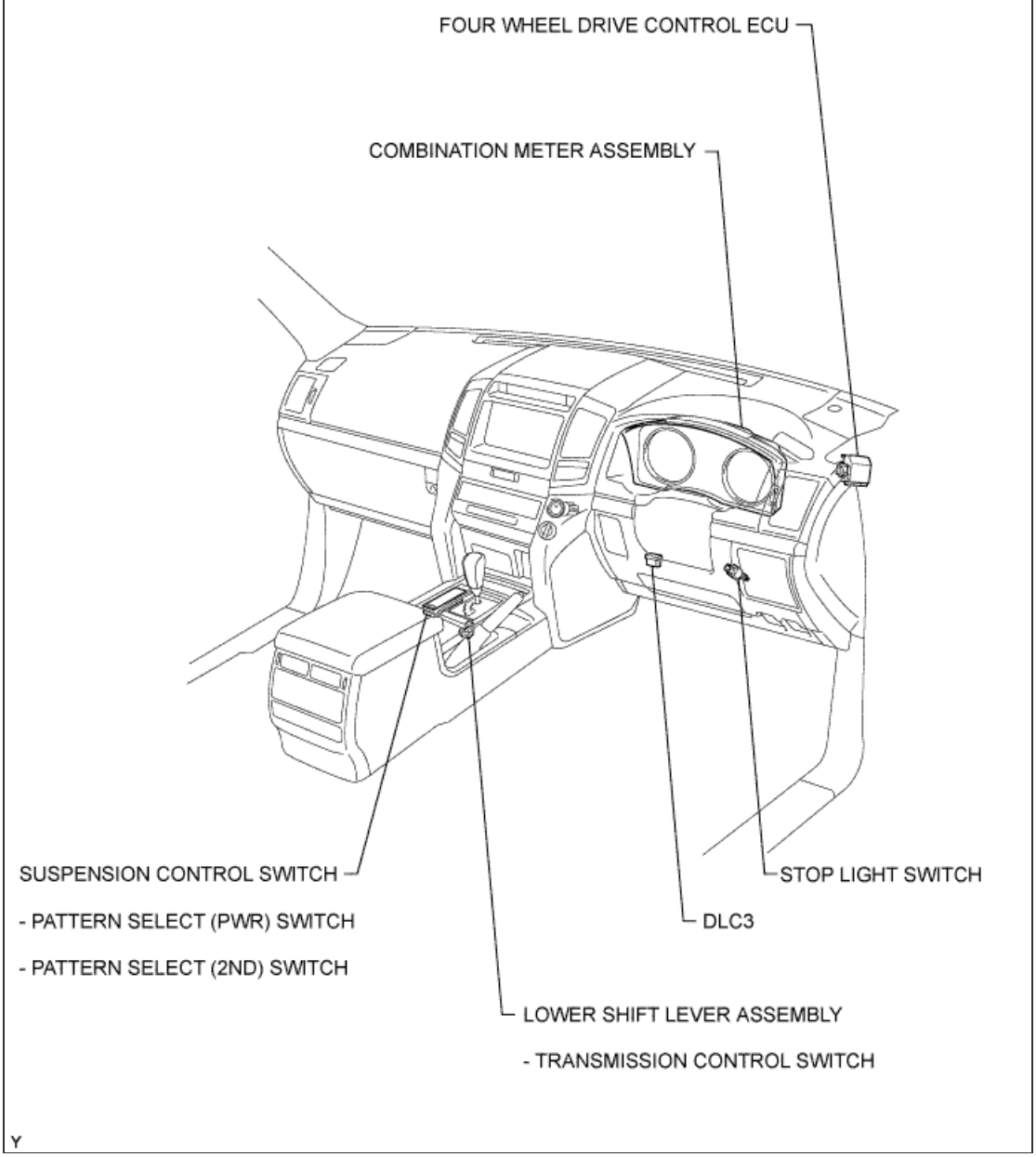
for Preparation Click here

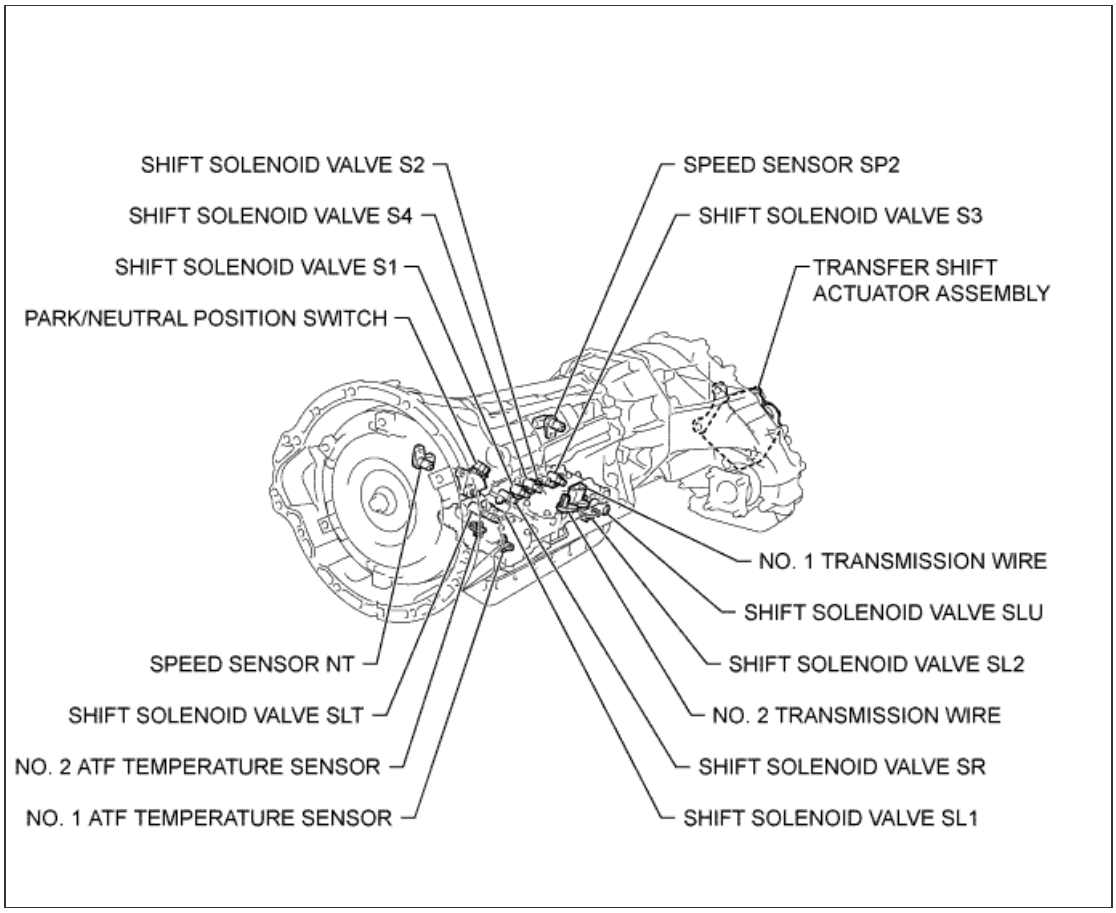
Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).

for Preparation Click here

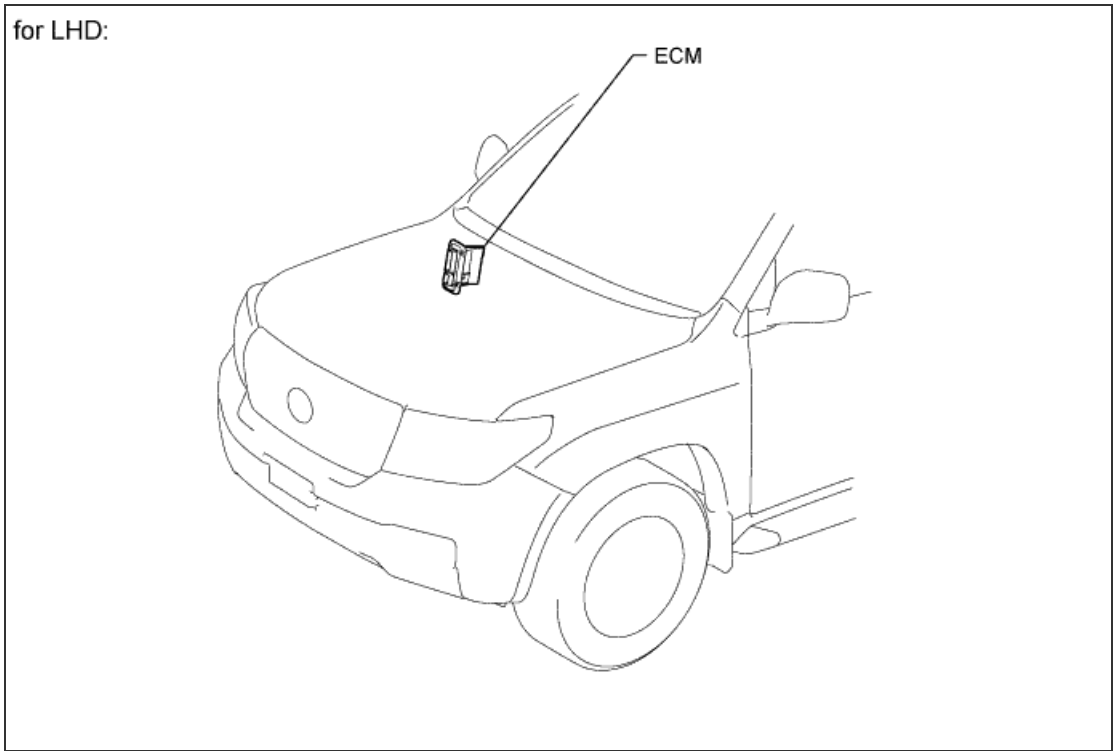


for RHD:

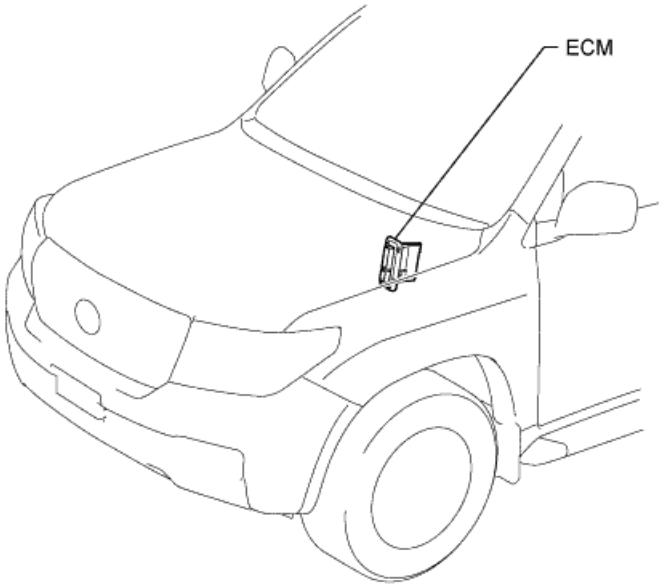

FOUR WHEEL DRIVE CONTROL ECU
COMBINATION METER ASSEMBLY
SUSPENSION CONTROL SWITCH
- PATTERN SELECT (PWR) SWITCH
- PATTERN SELECT (2ND) SWITCH
LOWER SHIFT LEVER ASSEMBLY
- TRANSMISSION CONTROL SWITCH
DLC3
STOP LIGHT SWITCH
Y


SHIFT SOLENOID VALVE S2
SHIFT SOLENOID VALVE S4
SHIFT SOLENOID VALVE S1
PARK/NEUTRAL POSITION SWITCH
SPEED SENSOR NT
SHIFT SOLENOID VALVE SLT
NO. 2 ATF TEMPERATURE SENSOR
NO. 1 ATF TEMPERATURE SENSOR
SPEED SENSOR SP2
SHIFT SOLENOID VALVE S3
TRANSFER SHIFT ACTUATOR ASSEMBLY
NO. 1 TRANSMISSION WIRE
SHIFT SOLENOID VALVE SLU
SHIFT SOLENOID VALVE SL2
NO. 2 TRANSMISSION WIRE
SHIFT SOLENOID VALVE SR
SHIFT SOLENOID VALVE SL1

for LHD:

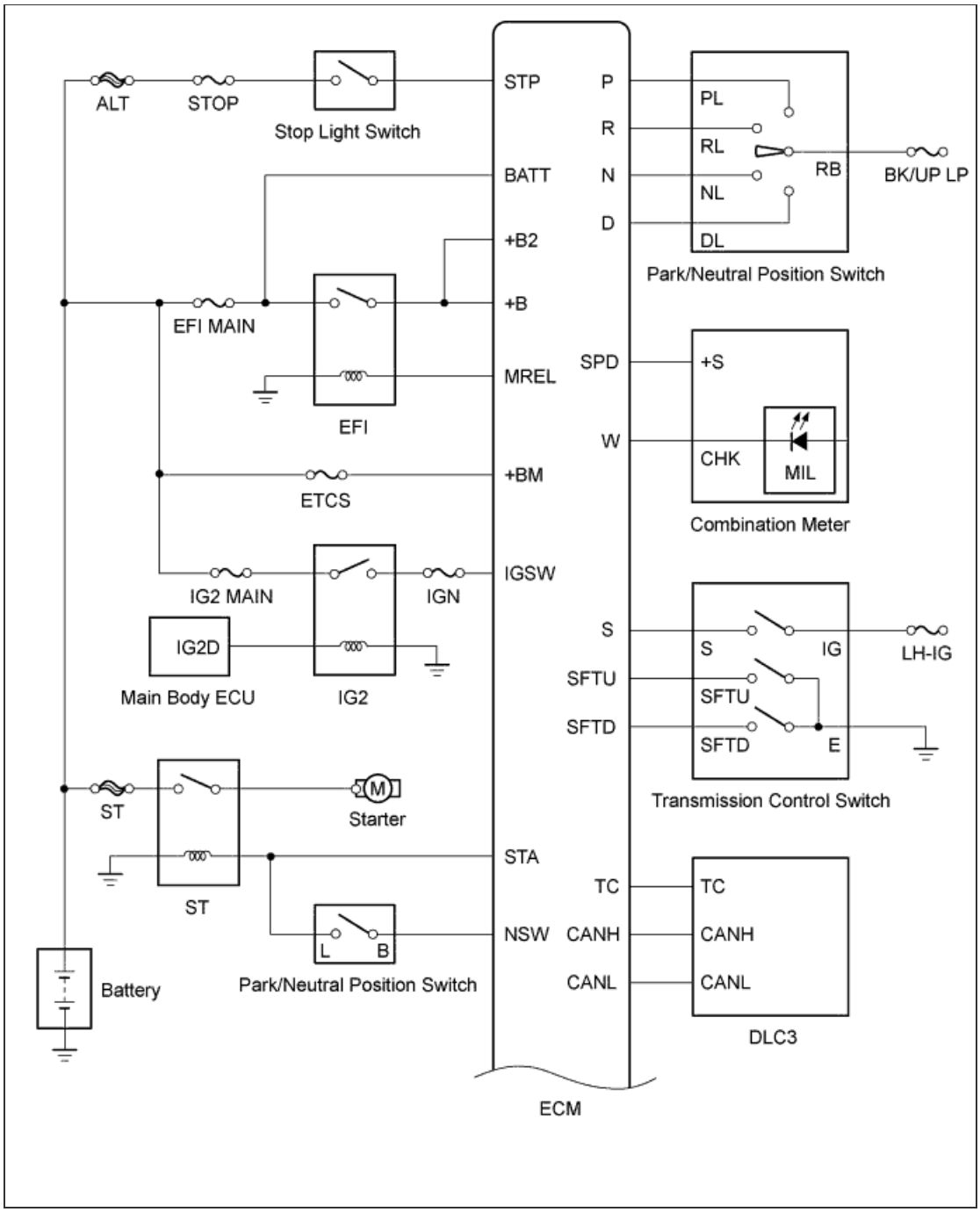

ECM

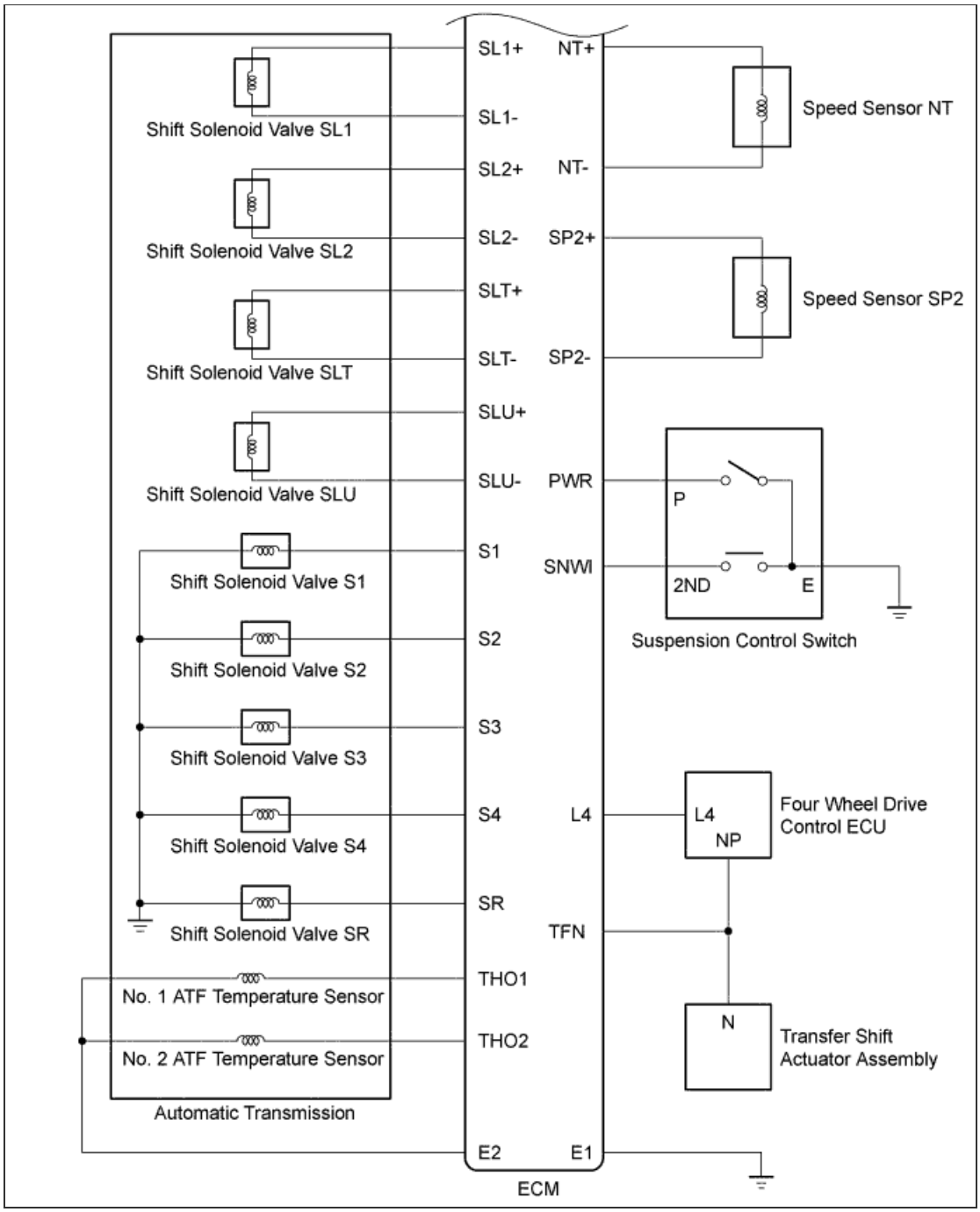
for RHD:



for Preparation Click here

The configuration of the electronic control system for the AB60F automatic transmission is as shown in the following chart.




SL1+
NT+
SL1-
SL2+
NT-
SL2-
SP2+
SLT+
SLT-
SP2-
SLU+
SLU-
PWR
S1
SNWI
S2
S3
S4
L4
SR
TFN
THO1
THO2
E2
E1
ECM
Shift Solenoid Valve SL1
Shift Solenoid Valve SL2
Shift Solenoid Valve SLT
Shift Solenoid Valve SLU
Shift Solenoid Valve S1
Shift Solenoid Valve S2
Shift Solenoid Valve S3
Shift Solenoid Valve S4
Shift Solenoid Valve SR
No. 1 ATF Temperature Sensor
No. 2 ATF Temperature Sensor
Automatic Transmission
Speed Sensor NT
Speed Sensor SP2
P
2ND
E
Suspension Control Switch
L4
NP
Four Wheel Drive
Control ECU
N
Transfer Shift
Actuator Assembly

for Preparation Click here

SYSTEM DESCRIPTION

a. The Electronic Controlled Automatic Transmission (ECT) is an automatic transmission that electronically controls shift timing using the Engine Control Module (ECM). The ECM detects electrical signals that indicate engine and driving conditions, and controls the shift point based on driver habits and road conditions. As a result, fuel efficiency and power transmission performance are improved.
Shift shock is reduced by controlling the engine and transmission simultaneously.
In addition, the ECT has the following features:

- Diagnostic function.
- Fail-safe function when a malfunction occurs.

for Preparation Click here

HINT:

- **The ECM is connected to the CAN communication system. Therefore, before starting troubleshooting, make sure to check that there is no trouble in the CAN communication system.**
- ***: Use the GTS.**

1.VEHICLE BROUGHT TO WORKSHOP

NEXT

2.CUSTOMER PROBLEM ANALYSIS

a. Refer to How to Troubleshoot ECU Controlled Systems in the Introduction section (Click here).

NEXT

3.INSPECT BATTERY VOLTAGE

Standard voltage:
11 to 14 V

If the voltage is below 11 V, recharge or replace the battery before proceeding.

NEXT

4.CONNECT GTS TO DLC3*

NEXT

5.CHECK AND CLEAR DTCS AND FREEZE FRAME DATA*

a. Refer to DTC Check/Clear (Click here).

NEXT

6.VISUAL INSPECTION

NEXT

7.SETTING CHECK MODE DIAGNOSIS*

a. Refer to Check Mode Procedure (Click here).

NEXT

8.PROBLEM SYMPTOM CONFIRMATION

a. Refer to Road Test (Click here).

Result

Result	Proceed to
Symptom does not occur	A
Symptom occurs	B

B. → GO TO STEP 10

A

9.SYMPTOM SIMULATION

a. Refer to Electronic Circuit Inspection Procedure (Click here).

NEXT

10.DTC CHECK*

a. Refer to DTC Check/Clear (Click here).

Result

Result	Proceed to
DTC is not output	A
DTC is output	B

B. → GO TO STEP 18

A

11.BASIC INSPECTION

a. Refer to Park/Neutral Position Switch (Click here).

b. Refer to Shift Lever Assembly (Click here).

NG. → GO TO STEP 21

OK

12.MECHANICAL SYSTEM TESTS

a. Refer to Mechanical System Tests (Click here).

NG. → GO TO STEP 17

OK

13.HYDRAULIC TEST

a. Refer to Hydraulic Test (Click here).

NG. → GO TO STEP 17

OK

14.MANUAL SHIFTING TEST

a. Refer to Manual Shifting Test (Click here).

NG. → GO TO STEP 16

OK

15.PROBLEM SYMPTOMS TABLE CHAPTER 1

a. Refer to Problem Symptoms Table (Click here).

NG. → GO TO STEP 19

OK

16.PROBLEM SYMPTOMS TABLE CHAPTER 2

a. Refer to Problem Symptoms Table (Click here).

NEXT

17.PART INSPECTION

NG. → GO TO STEP 21

OK

18.DTC CHART

a. Refer to Diagnostic Trouble Code Chart (Click here).

NEXT

19.CIRCUIT INSPECTION

NEXT

20.IDENTIFICATION OF PROBLEM

NEXT

21.REPAIR OR REPLACE

NEXT

22.CONFIRMATION TEST



END

for Preparation Click here

PROBLEM SYMPTOM CONFIRMATION

a. Based on the result of the customer problem analysis, try to reproduce the symptoms. If the problem is that the transmission does not shift up or down, or that the shift point is too high or too low, conduct the following road test referring to the automatic shift schedule and attempt to duplicate the problem symptoms.

ROAD TEST

a. Perform a road test.

CAUTION:

Check for safety before performing any tests.

NOTICE:

- **Be sure to inspect and adjust the engine before performing these tests.**
- **Perform the road test with the engine coolant temperature between 60 and 100°C (140 and 212°F) and the ATF temperature between 50 and 100°C (122 and 212°F).**
- **Perform these tests with the air conditioning and cruise control off.**

Inspection	Procedure
Transmission Control Switch Test	With the vehicle stationary and the shift lever in D, move the shift lever to S and return it to D. Check that the meter display changes from D to the appropriate S range and then back again.
S Position Test	With the vehicle stationary and the shift lever in S, move the shift lever to "+" and "-". Check that the meter display changes between S ranges properly.
D Position Shift Test	While driving the vehicle normally, check that the transmission shifts up and down through each gear properly.
Lock-up Function	While driving on a level surface at a constant speed in the lock-up range (80 km/h (50 mph) or more) with the shift lever in D, lightly depress the accelerator pedal and check that the engine speed does not change abruptly.
P Position Test	Stop the vehicle on an incline (approximately 5° or more). Then move the shift lever to P and release the parking brake. Check that the parking lock pawl holds the vehicle in place.
Abnormal Noise and Vibration	Check for abnormal noise and vibration while driving the vehicle forward and backward, and during shift operations.
Fluid Leakage	After performing all other road test inspections, check for fluid leakage.

for Preparation Click here

STALL SPEED TEST

HINT:

This test is to check the overall performance of the engine and transmission.

CAUTION:

- **To ensure safety, perform this test in an open and level area that provides good traction.**
- **The stall speed test should always be performed with at least 2 people. One person should observe the condition of the wheels and wheel chocks while the other is performing the test.**

NOTICE:

Do not perform the stall speed test for more than 5 seconds.

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Data List.

e. Run the vehicle until the transmission fluid temperature is between 50 and 80°C (122 and 176°F).

f. Allow the engine to idle with the air conditioning off.

g. Chock all 4 wheels.

h. Set the parking brake and keep the brake pedal depressed firmly with your left foot.

i. Move the shift lever to D.

j. Depress the accelerator pedal as much as possible with your right foot.

k. Read the engine speed (stall speed) and release the accelerator pedal immediately.

Standard value:
2350 +/-200 rpm

Evaluation

Test Result	Possible Cause
Stall speed is less than standard value	• Stator one-way clutch is not operating properly • Torque converter assembly is faulty (stall speed is less than standard value by 600 rpm or more) • Engine power may be insufficient
Stall speed is more than standard value	• Line pressure is low • C1 clutch is slipping • F3 one-way clutch is not operating properly • F4 one-way clutch is not operating properly

NOTICE:

Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).

SHIFT TIME LAG TEST

HINT:

This test is to check the condition of the direct clutch, forward clutch, 1st brake and reverse brake.

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Data List.

e. Run the vehicle until the transmission fluid temperature is between 50 and 80°C (122 and 176°F).

f. Allow the engine to idle with the air conditioning off.

g. Set the parking brake and keep the brake pedal depressed firmly.

h. Check the D position time lag.

   i. Move the shift lever to N and wait for 1 minute.

   ii. Move the shift lever to D and measure the time until the shock is felt.

   iii. Repeat the 2 procedures above 3 times, and then calculate the average time of the 3 tests.

i. Check the R position time lag.

   i. Move the shift lever to N and wait for 1 minute.

   ii. Move the shift lever to R and measure the time until the shock is felt.

   iii. Repeat the 2 procedures above 3 times, and then calculate the average time of the 3 tests.

Standard value:
D position time lag is less than 1.2 seconds
R position time lag is less than 1.5 seconds

Evaluation

Test Result	Possible Cause
D position time lag exceeds standard value	• Line pressure is low • C1 clutch is worn • F3 one-way clutch is not operating properly • F4 one-way clutch is not operating properly
R position time lag exceeds standard value	• Line pressure is low • C3 clutch is worn • B4 brake is worn • F1 one-way clutch is not operating properly

for Preparation Click here

PERFORM HYDRAULIC TEST

a. Measure the line pressure.

CAUTION:

The line pressure test should always be performed with at least 2 people. One person should observe the condition of the wheels and wheel chocks while the other is performing the test.

NOTICE:

- **Perform the test while the ATF (Automatic Transmission Fluid) temperature is between 50 and 80°C (122 and 176°F).**
- **Be careful to prevent the hose of SST from interfering with the exhaust pipe.**
- **This check must be conducted after checking and adjusting the engine.**
- **Perform the test with the A/C off.**
- **When conducting the stall test, do not continue for more than 5 seconds.**

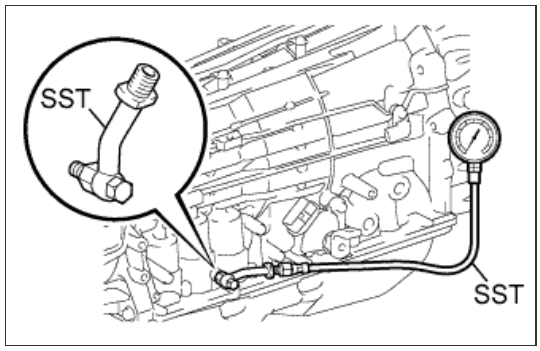
i. Warm up the ATF (Automatic Transmission Fluid).

ii. Turn the engine switch off.

iii. Lift the vehicle up.

iv. Remove the test plug from the transmission case and connect SST.

SST
09992-00095 (09992-00231, 09992-00271)



v. Lower the vehicle.

vi. Fully apply the parking brake and chock the 4 wheels.

vii. Start the engine and check the idling speed.

viii. Keep your left foot pressed firmly on the brake pedal and move the shift lever to D.

ix. Fully depress the accelerator pedal with your right foot. Quickly read the highest line pressure when the engine speed reaches the stall speed.

x. In the same manner, perform the test with the shift lever in R.

Specified Line Pressure

Condition	D Position	R Position
Stall speed	1370 to 1530 kPa (14.0 to 15.6 kgf/cm^2, 199 to 222 psi)	1540 to 1750 kPa (15.7 to 17.8 kgf/cm^2, 223 to 254 psi)

Evaluation

Problem	Possible Cause
Measured values at both positions are higher than specified pressure	• Shift solenoid valve SLT defective • Regulator valve defective
Measured values at both positions are below specified pressure	• Shift solenoid valve SLT defective • Regulator valve defective • Oil pump defective
Pressure is low in D position only	• D position circuit fluid leak • Clutch No. 1 (C1) defective
Pressure is low in R position only	• R position circuit fluid leak • Clutch No. 3 (C3) defective • Brake No. 4 (B4) defective

for Preparation Click here

MANUAL SHIFTING TEST

HINT:

- **Through this test, it can be determined whether the trouble occurs in an electrical circuit or if it is a mechanical problem in the transmission.**
- **If any abnormalities are found in the following test, the problem is in the transmission itself.**

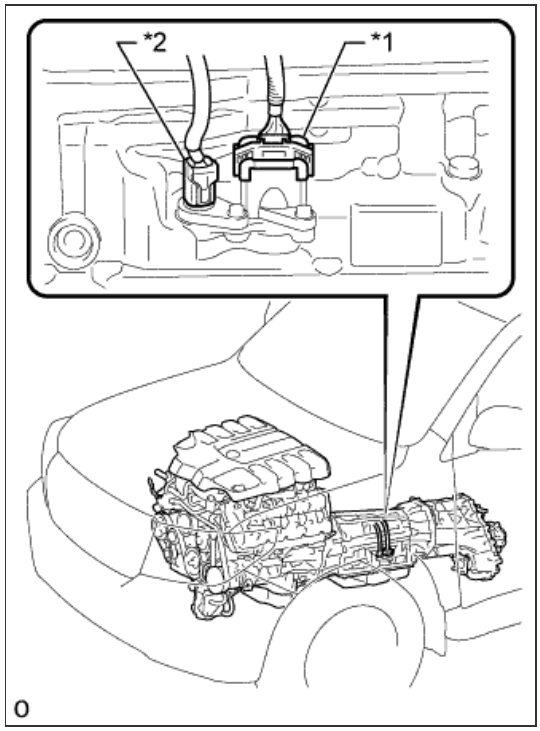
a. Disconnect the connector of the No. 1 transmission wire and/or No. 2 transmission wire.

HINT:

It is possible to deactivate the electrical shift control by disconnecting the transmission wires. The gear positions can then be changed mechanically with the shift lever.

Text in Illustration

*1	No. 1 Transmission Wire
*2	No. 2 Transmission Wire



b. Drive the vehicle with the transmission wires disconnected. Move the shift lever to each position and check whether the gear position changes as shown in the table below.

Shift Lever Position	Gear Position
P	P
R	R
D	• 4th*1 • 1st to 6th*2

HINT:

- ***1: When disconnecting only the No. 1 transmission wire or the No. 1 and No. 2 transmission wires.**
- ***2: When disconnecting only the No. 2 transmission wire.**

c. Connect the connector of the No. 1 transmission wire and/or No. 2 transmission wire.

d. Clear the DTCs (Click here).

for Preparation Click here

RESET MEMORY

NOTICE:

- **Perform Reset Memory (AT initialization) when replacing the automatic transmission assembly, valve body assembly or any of the shift solenoid valves.**
- **Reset Memory can be performed only with the GTS.**

HINT:

The ECM memorizes the control conditions of the automatic transmission assembly and engine assembly. Therefore, when the automatic transmission assembly, valve body assembly or any of the shift solenoid valves has been replaced, it is necessary to reset the memory so that the ECM can memorize the new information.

The reset procedure is as follows.

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Utility / Reset Memory.

NOTICE:

After performing Reset Memory, be sure to perform the Road Test (Click here) described earlier.

HINT:

The ECM learns through the Road Test.

for Preparation Click here

TEST MONITOR DRIVE PATTERN FOR ECT

CAUTION:

Perform this drive pattern on a level surface and strictly observe the posted speed limits and traffic laws while driving.

HINT:

Performing this drive pattern is one method to simulate the malfunction detection conditions of the ECT.

The DTCs may not be stored through ordinary, everyday driving. Also, DTCs may not be stored through this drive pattern.

a. Preparation for driving

i. Warm up the engine sufficiently (engine coolant temperature is 60°C (140°F) or higher).

ii. Drive the vehicle when the atmospheric temperature is -10°C (14°F) or higher.
Malfunctions are not detected when the atmospheric temperature is less than -10°C (14°F).

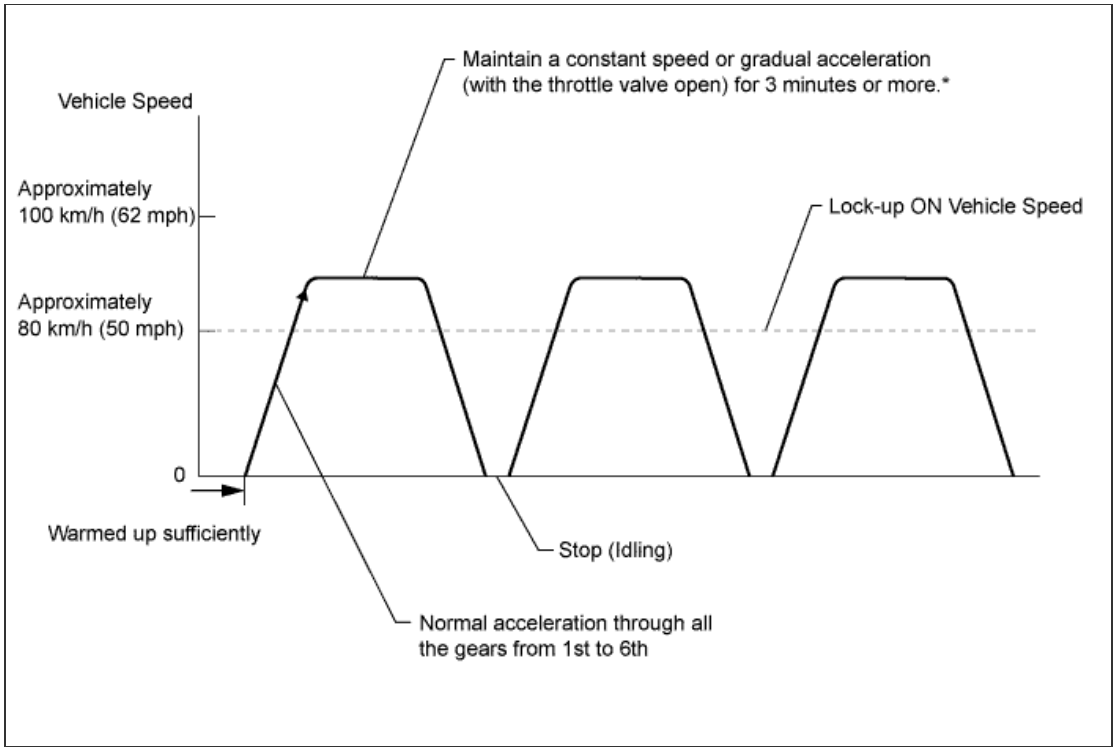
b. Drive pattern

i. Drive the vehicle through all the gears.
Stop → 1st → 2nd → 3rd → 4th → 5th → 5th (lock-up ON) → 6th → 6th (lock-up ON).

ii. Repeat the above drive pattern 3 times or more.

NOTICE:

- **When using the GTS, the monitor status can be checked in the Data List (Click here).**
- **In the event that the drive pattern must be interrupted (due to traffic conditions or other factors), the drive pattern can be resumed and, in most cases, the monitor can be completed.**



HINT:

*: Drive at such a speed in the uppermost gear so as to engage lock-up. The vehicle can be driven at a speed lower than the speed shown in the above diagram in lock-up.

NOTICE:

It is necessary to drive the vehicle for approximately 30 minutes to detect DTC P0711 (No. 1 ATF temperature sensor malfunction).

for Preparation Click here

HINT:

- **Use the table below to help determine the cause of problem symptoms. If multiple suspected areas are listed, the potential causes of the symptoms are listed in order of probability in the "Suspected Area" column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.**
- **The Matrix Chart is divided into 2 chapters. When troubleshooting, check Chapter 1 first. If instructions are given in Chapter 1 to proceed to 2, proceed as instructed.**
- **If the instruction "Proceed to Next Circuit Inspection Shown in Problem Symptoms Table" is given in the flowchart for a circuit, proceed to the next suspected area in the table.**
- **If the problem still occurs even though there are no malfunctions in any of the circuits, check the ECM and replace it if necessary.**
- ***: When the circuit is defective, a DTC may be output.**

1. Chapter 1: Electronic Circuit Matrix Chart

Symptom	Suspected Area	See page
No up-shift (1st -> 2nd)	Shift solenoid valve S1 circuit*	Click here
	ECM	Click here
No up-shift (2nd -> 3rd)	Shift solenoid valve S2 circuit*	Click here
	ECM	Click here
No up-shift (3rd -> 4th)	Shift solenoid valve S3 circuit*	Click here
	Engine coolant temperature sensor circuit*	Click here
	ECM	Click here
No up-shift (4th -> 5th)	Shift solenoid valve S4 circuit*	Click here
	Shift solenoid valve SR circuit*	Click here
	Shift solenoid valve SL1 circuit*	Click here
	Shift solenoid valve SL2 circuit*	Click here
	Engine coolant temperature sensor circuit*	Click here
	ECM	Click here
No up-shift (5th -> 6th)	Park/neutral position switch circuit*	Click here
	Shift solenoid valve S2 circuit*	Click here
	ECM	Click here
No down-shift (6th -> 5th)	Park/neutral position switch circuit*	Click here
	Shift solenoid valve S2 circuit*	Click here
	ECM	Click here
No down-shift (5th -> 4th)	Shift solenoid valve S4 circuit*	Click here
	Shift solenoid valve SR circuit*	Click here
	Shift solenoid valve SL1 circuit*	Click here
		Click

	Shift solenoid valve SL2 circuit*	here
	ECM	Click here
No down-shift (4th -> 3rd)	Shift solenoid valve S3 circuit*	Click here
	ECM	Click here
No down-shift (3rd -> 2nd)	Shift solenoid valve S2 circuit*	Click here
	ECM	Click here
No down-shift (2nd -> 1st)	Shift solenoid valve S1 circuit*	Click here
	ECM	Click here
No lock-up or no lock-up off	Shift solenoid valve SLU circuit*	Click here
	Stop light switch circuit*	Click here
	ECM	Click here
No lock-up	No. 1 ATF temperature sensor circuit*	Click here
	Shift solenoid valve SLU circuit*	Click here
	Engine coolant temperature sensor circuit*	Click here
	Stop light switch circuit*	Click here
	Speed sensor NT circuit*	Click here
	ECM	Click here
No lock-up off	Shift solenoid valve SLU circuit*	Click here
	ECM	Click here
Shift point too high or too low	Shift solenoid valve SLT circuit*	Click here
	Speed sensor NT circuit*	Click here
	Speed sensor SP2 circuit*	Click here
	Throttle position sensor circuit*	Click here
	No. 1 ATF temperature sensor circuit*	Click here
	Pattern select switch power mode circuit	Click here
	ECM	Click here
Up-shift to 4th from 3rd while engine is cold	Engine coolant temperature sensor circuit*	Click here
	ECM	Click here
Up-shift to 5th from 4th while engine is cold	Engine coolant temperature sensor circuit*	Click here
	ECM	Click here
No gear change by shifting into "+" or "-" while shift lever in S	Transmission control switch circuit	Click here
	ECM	Click here
	Shift solenoid valve SLT circuit*	Click here

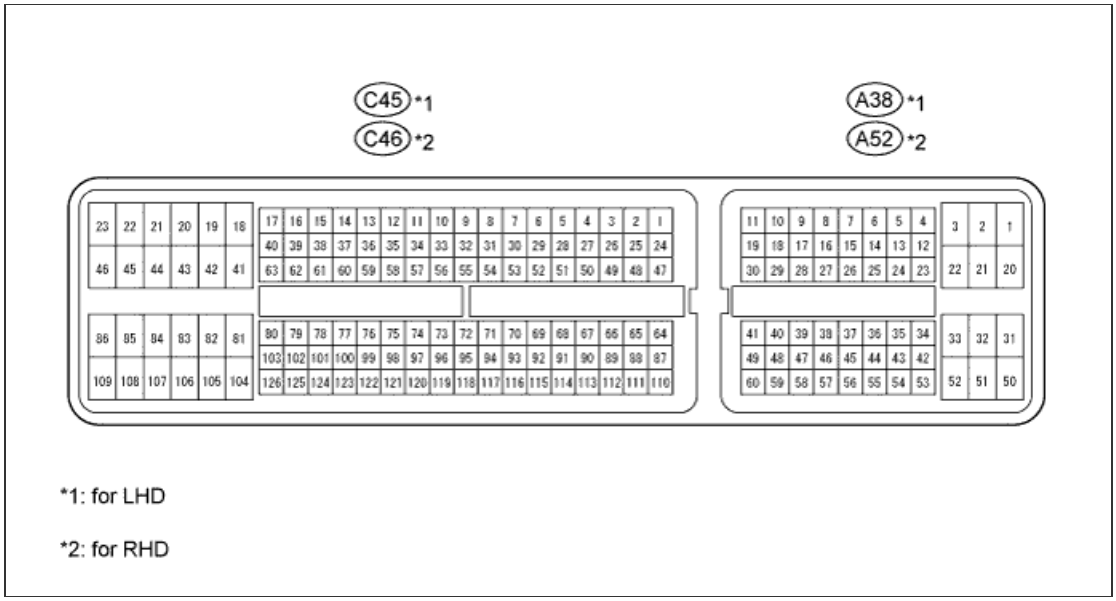
Harsh engagement (N -> D)	Speed sensor NT circuit*	Click here
	ECM	Click here
Harsh engagement (lock-up)	Speed sensor NT circuit*	Click here
	Speed sensor SP2 circuit*	Click here
	Shift solenoid valve SLU circuit*	Click here
	ECM	Click here
Harsh engagement (any driving position)	Throttle position sensor circuit*	Click here
	Shift solenoid valve SL1 circuit*	Click here
	Shift solenoid valve SL2 circuit*	Click here
	Shift solenoid valve SLU circuit*	Click here
	Shift solenoid valve SLT circuit*	Click here
	Speed sensor NT circuit*	Click here
	ECM	Click here
Poor acceleration	No. 2 ATF temperature sensor circuit*	Click here
	Shift solenoid valve SLT circuit*	Click here
	Pattern select switch 2nd start mode circuit	Click here
	ECM	Click here
No engine brake	ECM	Click here
No kick-down	ECM	Click here
Engine stalls when starting off or stopping	Shift solenoid valve SLU circuit*	Click here
	ECM	Click here
ECT 2ND does not operate	Shift solenoid valve SLT circuit*	Click here
	Pattern select switch 2nd start mode circuit	Click here
	ECM	Click here
ATF temperature warning light remains on or message is displayed in combination meter, lock-up at 3rd gear and/or shift point too high	No. 2 ATF temperature sensor circuit*	Click here
	Engine coolant temperature sensor circuit*	Click here
	ECM	Click here
Malfunction in shifting	Park/neutral position switch circuit*	Click here
	Transmission control switch circuit	Click here
	ECM	Click here
Harsh engagement (1st -> 2nd -> 3rd -> 4th -> 5th)	Shift solenoid valve SR circuit*	Click here
Slip or shudder (5th -> 6th -> and 6th -> 5th)	Shift solenoid valve SR circuit*	Click here

Symptom	Suspected Area	See page
Vehicle does not move when shift lever is in any forward position and reverse position	Transmission control cable	Click here
	Manual valve	Click here
	Parking lock pawl	Click here
	Rear planetary gear unit	Click here
	Torque converter assembly	Click here
Vehicle does not move with shift lever in R	Valve body assembly	Click here
	B4 brake	Click here
No up-shift (1st -> 2nd)	Valve body assembly	Click here
	B3 brake	Click here
	F1 one-way clutch	Click here
	F2 one-way clutch	Click here
No up-shift (2nd -> 3rd)	Valve body assembly	Click here
	C3 clutch	Click here
No up-shift (3rd -> 4th)	Valve body assembly	Click here
	C2 clutch	Click here
No up-shift (4th -> 5th)	Valve body assembly	Click here
	B1 brake	Click here
No up-shift (5th -> 6th)	Valve body assembly	Click here
	B2 brake	Click here
No down-shift (6th -> 5th)	Valve body assembly	Click here
No down-shift (5th -> 4th)	Valve body assembly	Click here
No down-shift (4th -> 3rd)	Valve body assembly	Click here
No down-shift (3rd -> 2nd)	Valve body assembly	Click here
No down-shift (2nd -> 1st)	Valve body assembly	Click here
No lock-up or no lock-up off	Valve body assembly	Click here
	Torque converter assembly	Click here
Harsh engagement (N -> D)	Valve body assembly	Click here
	C1 accumulator	Click here
	C1 clutch	Click here
	F3 one-way clutch	Click here
	F4 one-way clutch	Click here
Harsh engagement (lock-up)	Valve body assembly	Click here
	Torque converter assembly	Click here
Harsh engagement (N -> R)	Valve body assembly	Click here
	C3 accumulator	Click here
	C3 clutch	Click here
	B4 brake	Click here
	F1 one-way clutch	Click here
Harsh engagement (1st -> 2nd -> 3rd -> 4th -> 5th -> 6th)	Valve body assembly	Click here
Harsh engagement (1st -> 2nd)	Valve body assembly	Click here
	B3 accumulator	Click here
	B3 brake	Click here
	F1 one-way clutch	Click here
	F2 one-way clutch	Click here
Harsh engagement (2nd -> 3rd)	Valve body assembly	Click here
	C3 accumulator	Click here
	C3 clutch	Click here
Harsh engagement (3rd -> 4th)	Valve body assembly	Click here
	C2 accumulator	Click here
	C2 clutch	Click here
Harsh engagement (4th -> 5th)	Valve body assembly	Click here
	B1 accumulator	Click here
	B1 brake	Click here
	Valve body assembly	Click here

Harsh engagement (5th -> 6th)	B2 accumulator	Click here
	B2 brake	Click here
Harsh engagement (6th -> 5th)	Valve body assembly	Click here
	C3 accumulator	Click here
	C3 clutch	Click here
Slip or shudder (forward and reverse, after warm-up)	Transmission control cable	Click here
	Valve body assembly	Click here
	Oil strainer	Click here
	F1 one-way clutch	Click here
	C3 clutch	Click here
	Torque converter assembly	Click here
Slip or shudder (particular position, just after engine starts)	Torque converter assembly	Click here
Slip or shudder (shift lever in R)	B4 brake	Click here
	F1 one-way clutch	Click here
	C3 clutch	Click here
Slip or shudder (1st)	C1 clutch	Click here
	F3 one-way clutch	Click here
	F4 one-way clutch	Click here
Slip or shudder (2nd)	C1 clutch	Click here
	B3 brake	Click here
	F1 one-way clutch	Click here
	F2 one-way clutch	Click here
	F4 one-way clutch	Click here
Slip or shudder (3rd)	C1 clutch	Click here
	C3 clutch	Click here
	F1 one-way clutch	Click here
	F4 one-way clutch	Click here
Slip or shudder (4th)	C1 clutch	Click here
	C2 clutch	Click here
	F4 one-way clutch	Click here
Slip or shudder (5th)	C2 clutch	Click here
	C3 clutch	Click here
	B1 brake	Click here
Slip or shudder (6th)	C2 clutch	Click here
	B2 brake	Click here
No engine braking (1st to 4th, shift lever in S)	C4 clutch	Click here
No engine braking (1st: shift lever on 1)	Valve body assembly	Click here
	B4 brake	Click here
No engine braking (2nd: shift lever on 2)	Valve body assembly	Click here
	B2 brake	Click here
No engine braking (3rd: shift lever on 3)	Valve body assembly	Click here
	B1 brake	Click here
No engine braking (4th: shift lever on 4)	Valve body assembly	Click here
No kick-down	Valve body assembly	Click here
Shift point too high or too low	Valve body assembly	Click here
Poor acceleration (all positions)	Valve body assembly	Click here
	Torque converter assembly	Click here
Poor acceleration (6th)	B2 brake	Click here
	C2 clutch	Click here
	Front planetary gear unit	Click here
Engine stalls when starting off or stopping	Valve body assembly	Click here
	Torque converter assembly	Click here

for Preparation Click here

CHECK ECM



HINT:

- **Each ECM terminal standard voltage is shown in the table below.**
  In the table, first follow the information under "Condition". Look under "Terminal No. (Symbol)" for the terminals to be inspected.
  The standard voltage between the terminals is shown under "Specified Condition".
  Use the illustration above as a reference for the ECM terminals.
- ***1: for LHD**
- ***2: for RHD**
- ***3: URJ202L-GNTEKC**

Terminal No. (Symbol)	Wiring Color	Terminal Description	Condition	Specified Condition
A38-21 (L4) - C45-81 (E1)*1 A52-21 (L4) - C46-81 (E1)*2	BR-R - BR	Transfer L4 position signal	• Engine switch on (IG) • Transfer position switch on L4	Below 1.5 V
			• Engine switch on (IG) • Transfer position switch not on L4	11 to 14 V
A38-5 (TFN) - C45-81 (E1)*1 A52-5 (TFN) - C46-81 (E1)*2	G - BR	N shift position switch signal	• Engine switch on (IG) • Transfer not in neutral	Below 1.5 V
			• Engine switch on (IG) • Transfer in neutral	11 to 14 V
C45-120 (NSW) - C45-81 (E1)*1 C46-120 (NSW) - C46-81 (E1)*2	L - BR	PNP switch signal	• Engine switch on (IG) • Shift lever in P or N	Below 1 V
			• Engine switch on (IG) • Shift lever not in	11 to 14 V

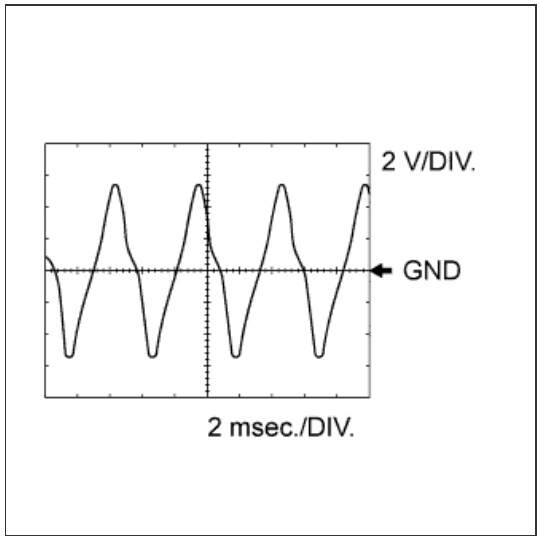
			P or N	
C45-2 (P) - C45-81 (E1)*1 C46-2 (P) - C46-81 (E1)*2	G-B - BR	P shift position switch signal	• Engine switch on (IG) • Shift lever in P	11 to 14 V
			• Engine switch on (IG) • Shift lever not in P	Below 1 V
C45-26 (R) - C45-81 (E1)*1 C46-26 (R) - C46-81 (E1)*2	L-R - BR	R shift position switch signal	• Engine switch on (IG) • Shift lever in R	11 to 14 V
			• Engine switch on (IG) • Shift lever not in R	Below 1 V
C45-25 (N) - C45-81 (E1)*1 C46-25 (N) - C46-81 (E1)*2	G-W - BR	N shift position switch signal	• Engine switch on (IG) • Shift lever in N	11 to 14 V
			• Engine switch on (IG) • Shift lever not in N	Below 1 V
C45-27 (D) - C45-81 (E1)*1 C46-27 (D) - C46-81 (E1)*2	G - BR	D shift position switch signal	• Engine switch on (IG) • Shift lever in D	11 to 14 V
			• Engine switch on (IG) • Shift lever not in D	Below 1 V
A38-25 (S) - C45-81 (E1)*1 A52-25 (S) - C46-81 (E1)*2	W - BR	S shift position switch signal	• Engine switch on (IG) • Shift lever in S	11 to 14 V
			• Engine switch on (IG) • Shift lever not in S	Below 1 V
A38-38 (SFTU) - C45-81 (E1)*1 A52-38 (SFTU) - C46-81 (E1)*2	V - BR Y - BR*3	Up-shift shift position switch signal	• Engine switch on (IG) • Shift lever in S	11 to 14 V
			• Engine switch on (IG) • Shift lever "+" position (up-shift)	Below 1 V
A38-27 (SFTD) - C45-81 (E1)*1 A52-27 (SFTD) - C46-81 (E1)*2	L - BR	Down-shift position switch signal	• Engine switch on (IG) • Shift lever in S	11 to 14 V
			• Engine switch on (IG) • Shift lever "-" position (down-shift)	Below 1 V
A38-36 (STP) - C45-81 (E1)*1 A52-36 (STP) - C46-81 (E1)*2	R - BR	Stop light switch signal	Brake pedal depressed	11 to 14 V
			Brake pedal released	Below 1.5 V
C45-7 (S1) - C45-81 (E1)*1 C46-7 (S1) - C46-81 (E1)*2	R - BR	Shift solenoid valve S1 signal	1st gear	Below 1 V
			Not in 1st gear	11 to 14 V
C45-6 (S2) - C45-81 (E1)*1		Shift solenoid valve S2	1st, 2nd or 6th gear	11 to 14 V

C46-6 (S2) - C46-81 (E1)*2	W - BR	signal	3rd, 4th or 5th gear	Below 1 V
C45-3 (S3) - C45-81 (E1)*1 C46-3 (S3) - C46-81 (E1)*2	B-R - BR	Shift solenoid valve S3 signal	1st, 2nd or 3rd gear	11 to 14 V
			4th, 5th or 6th gear	Below 1 V
C45-5 (S4) - C45-81 (E1)*1 C46-5 (S4) - C46-81 (E1)*2	G-R - BR	Shift solenoid valve S4 signal	5th or 6th gear	11 to 14 V
			1st, 2nd, 3rd or 4th gear	Below 1 V
C45-4 (SR) - C45-81 (E1)*1 C46-4 (SR) - C46-81 (E1)*2	G - BR	Shift solenoid valve SR signal	1st, 2nd, 3rd or 4th gear	11 to 14 V
			5th or 6th gear	Below 1 V
C45-14 (SL1+) - C45-15 (SL1-)*1 C46-14 (SL1+) - C46-15 (SL1-)*2	Y - L	Shift solenoid valve SL1 signal	5th or 6th gear	Pulse generation
C45-12 (SL2+) - C45-13 (SL2-)*1 C46-12 (SL2+) - C46-13 (SL2-)*2	G-R - L-W	Shift solenoid valve SL2 signal	Engine idling	Pulse generation
C45-9 (SLT+) - C45-8 (SLT-)*1 C46-9 (SLT+) - C46-8 (SLT-)*2	B - G-B	Shift solenoid valve SLT signal	Engine idling	Pulse generation
C45-10 (SLU+) - C45-11 (SLU-)*1 C46-10 (SLU+) - C46-11 (SLU-)*2	L-Y - L-R	Shift solenoid valve SLU signal	5th (lock-up) gear or 6th (lock-up) gear	Pulse generation
C45-122 (THO1) - C45-98 (E2)*1 C46-122 (THO1) - C46-98 (E2)*2	G-Y - BR	No. 1 ATF temperature sensor signal	No. 1 ATF temperature: 115°C (239°F) or higher	Below 1.5 V
C45-99 (THO2) - C45-98 (E2)*1 C46-99 (THO2) - C46-98 (E2)*2	L - BR	No. 2 ATF temperature sensor signal	No. 2 ATF temperature: 115°C (239°F) or higher	Below 1.5 V
C45-101 (SP2+) - C45-100 (SP2-)*1 C46-101 (SP2+) - C46-100 (SP2-)*2	Y - B	Speed sensor SP2 signal	Vehicle speed 20 km/h (12 mph)	Pulse generation (see waveform 1)
C45-124 (NT+) - C45-123 (NT-)*1 C46-124 (NT+) - C46-123 (NT-)*2	Y - B	Speed sensor NT signal	Engine idling (shift lever in P or N)	Pulse generation (see waveform 2)
A38-10 (CANH) - C45-81 (E1)*1 A52-10 (CANH) - C46-81 (E1)*2	P - BR	CAN communication line	Engine switch on (IG)	Pulse generation (see waveform 3)
A38-11 (CANL) - C45-81 (E1)*1 A52-11 (CANL) - C46-81 (E1)*2	B - BR	CAN communication line	Engine switch on (IG)	Pulse generation (see waveform 4)
A38-51 (PWR) - C45-81 (E1)*1 A52-51 (PWR) - C46-81 (E1)*2	L-B - BR	Pattern select (PWR) switch signal	• Engine switch on (IG) • Pattern select (PWR) switch off	11 to 14 V
			• Engine switch on (IG) • Pattern select (PWR) switch on	Below 1.5 V
A38-4 (SNWI) - C45-81 (E1)*1 A52-4 (SNWI) - C46-81 (E1)*2	P - BR P-L - BR*3	Pattern select (2ND) switch signal	• Engine switch on (IG) • Pattern select (2ND) switch off	11 to 14 V
			• Engine switch on (IG) • Pattern select (2ND) switch continuously pressed	Below 1.5 V

a. Using an oscilloscope, check waveform 1.

Reference:

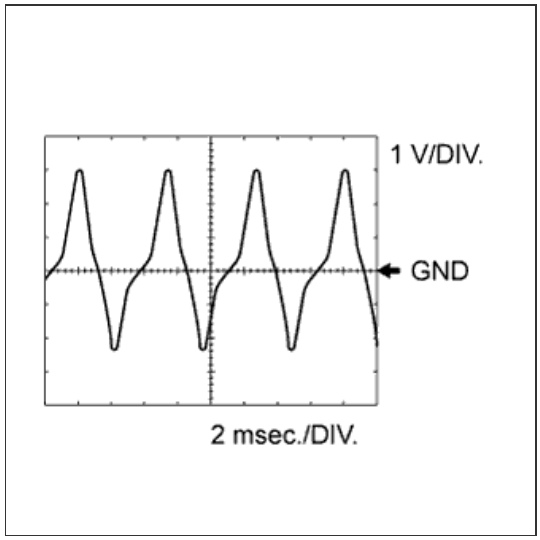
Terminal No. (Symbol)	Tool Setting	Condition
C45-101 (SP2+) - C45-100 (SP2-)*1 C46-101 (SP2+) - C46-100 (SP2-)*2	2 V/DIV., 2 msec./DIV.	Vehicle speed 20 km/h (12 mph)



b. Using an oscilloscope, check waveform 2.

Reference:

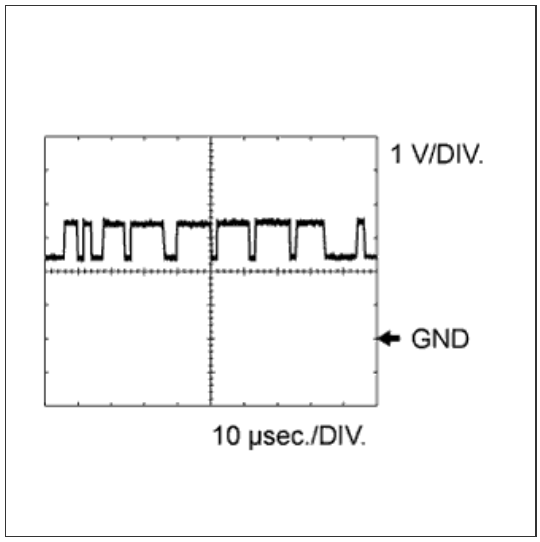
Terminal No. (Symbol)	Tool Setting	Condition
C45-124 (NT+) - C45-123 (NT-)*1 C46-124 (NT+) - C46-123 (NT-)*2	1 V/DIV., 2 msec./DIV.	Engine idling (shift lever in P or N)



c. Using an oscilloscope, check waveform 3.

Reference:

Terminal No. (Symbol)	Tool Setting	Condition
A38-10 (CANH) - C45-81 (E1)*1 A52-10 (CANH) - C46-81 (E1)*2	1 V/DIV., 10 µsec./DIV.	Engine switch on (IG)

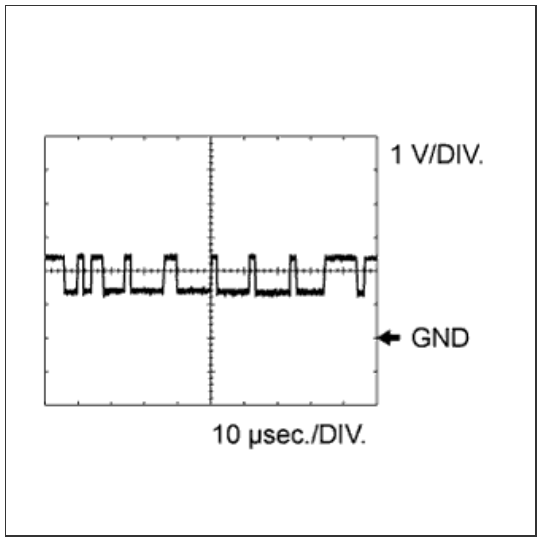


d. Using an oscilloscope, check waveform 4.

Reference:

Terminal No. (Symbol)	Tool Setting	Condition
A38-11 (CANL) - C45-81 (E1)*1	1 V/DIV., 10	Engine switch

A52-11 (CANL) - C46-81 (E1)*2	µsec./DIV.	on (IG)



for Preparation Click here

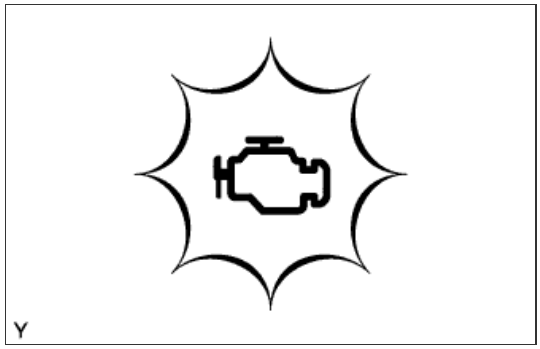
EURO-OBD

a. When troubleshooting Europe On-Board Diagnostic (Euro-OBD) vehicles, the vehicle must be connected to an OBD scan tool (complying with ISO 15765-4). Various data output from the vehicle ECM can then be read.

b. Euro-OBD regulations require that the vehicle on-board computer illuminate the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in any of the following:

- The emission control system/components
- The powertrain control components which affect vehicle emissions
- The computer

In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by ISO 15765-4 are stored in the ECM memory.
If the malfunction does not recur in 3 consecutive trips, the MIL goes off automatically but the DTCs remain stored in the ECM memory.



c. To check DTCs, connect the GTS or OBD scan tool to the Data Link Connector 3 (DLC3) of the vehicle. The scan tool displays DTCs, freeze frame data and a variety of engine data.
The DTCs and freeze frame data can be cleared with the scan tool (Click here).

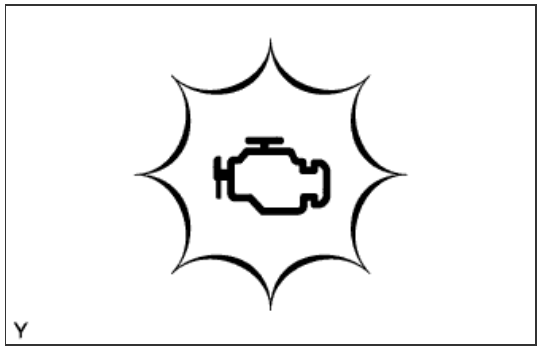
M-OBD (EXCEPT EUROPEAN SPECIFICATION)

a. When troubleshooting Multiplex On-Board Diagnostic (M-OBD) vehicles, the vehicle must be connected to the GTS. Various data output from the ECM can then be read.

b. OBD regulations require that the vehicle on-board computer illuminate the MIL on the instrument panel when the computer detects a malfunction in any of the following:

- The emission control system/components
- The powertrain control components which affect vehicle emissions
- The computer

In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by ISO 15765-4 are stored in the ECM memory.
If the malfunction does not recur in 3 consecutive trips, the MIL goes off automatically but the DTCs remain stored in the ECM memory.



NORMAL MODE AND CHECK MODE

a. The diagnosis system operates in normal mode during normal vehicle use. In normal mode, 2 trip detection logic is used to ensure accurate detection of malfunctions. Check mode is also available to technicians as an option. In check mode, 1 trip detection logic is used for simulating malfunction symptoms and increasing the system's ability to detect malfunctions, including intermittent malfunctions.

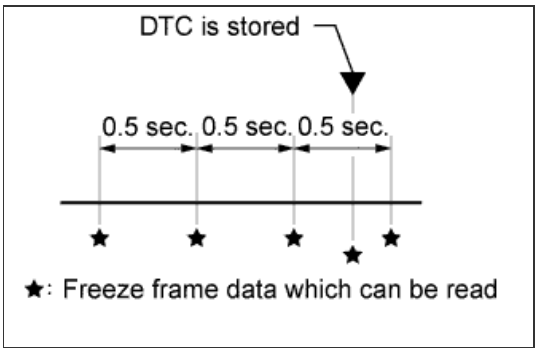
2 TRIP DETECTION LOGIC

a. When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory (1st trip). If the same malfunction is detected during the next drive cycle, the MIL is illuminated (2nd trip).

FREEZE FRAME DATA

a. Freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

b. The GTS records freeze frame data at 5 different times: 1) 3 times before the DTC is stored, 2) once when the DTC is stored, and 3) once after the DTC is stored. These data can be used to simulate the vehicle's condition from around the time when the malfunction occurred. The data may help find the cause of the malfunction, or judge if the DTC is being caused by a temporary malfunction or not.



CHECK DATA LINK CONNECTOR 3 (DLC3) (Click here)

CHECK MIL

a. Check that the MIL illuminates when turning the engine switch on (IG).
If the MIL does not illuminate, there is a problem in the MIL circuit (Click here).

b. Check that when the engine is started, the MIL turns off.

for Preparation Click here

CHECK DTC

a. DTCs which are stored in the ECM can be displayed on the GTS.
The GTS can display pending DTCs and current DTCs. Some DTCs are not stored unless a malfunction is detected in consecutive driving cycles. When a malfunction is detected in only one driving cycle, it is stored as a pending DTC.

i. Connect the GTS to the DLC3.

ii. Turn the engine switch on (IG).

iii. Turn the GTS on.

iv. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

v. Confirm the DTCs and freeze frame data, and then write them down.

vi. Confirm the details of the DTCs (Click here).

NOTICE:

When simulating a symptom with the scan tool to check for DTCs, use normal mode. For codes on the Diagnostic Trouble Code Chart subject to "2 trip detection logic", perform the following actions:

Turn the engine switch off after the symptom is simulated once. Then repeat the simulation process. When the symptom has been simulated twice, the MIL illuminates and the DTCs are recorded in the ECM.

CLEAR DTC (using the GTS)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes / Clear.

CLEAR DTC (without using the GTS)

a. Perform either of the following operations.

i. Disconnect the cable from the negative (-) battery terminal for more than 1 minute.

ii. Remove the EFI MAIN and ETCS fuses from the engine room relay block located inside the engine compartment for more than 1 minute.

for Preparation Click here

DESCRIPTION

a. Check mode has a higher sensitivity to malfunctions and can detect malfunctions that normal mode cannot detect. Check mode can also detect all the malfunctions that normal mode can detect. In check mode, DTCs are stored with 1 trip detection logic.

CHECK MODE PROCEDURE

a. Make sure that the following conditions are met:

   i. Battery positive voltage 11 V or more.

   ii. Throttle valve fully closed.

   iii. Shift lever in P or N.

   iv. A/C OFF.

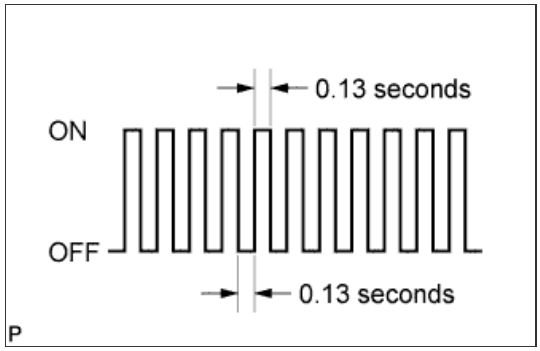
b. Connect the GTS to the DLC3.

c. Turn the engine switch on (IG).

d. Turn the GTS on.

e. Enter the following menus: Powertrain / Engine and ECT / Utility / Check Mode.

f. Check that the MIL flashes as shown in the illustration.



NOTICE:

- **All DTCs and freeze frame data will be cleared if: 1) the GTS is used to change the ECM from normal mode to check mode or vice versa; or 2) during check mode, the engine switch is turned from on (IG) to on (ACC) or off.**
- **Before changing to check mode, make a note of the DTCs and freeze frame data.**

g. Start the engine. The MIL should turn off after the engine starts.

h. Perform "Monitor Drive Pattern" for the ECT test (Click here), or reproduce the conditions of the malfunction described by the customer.

i. After reproducing the malfunction conditions, use the GTS to check the DTC and freeze frame data.

for Preparation Click here

Fail-safe

This function minimizes the loss of ECT functions when a malfunction occurs in a sensor or solenoid.

Fail-safe control list

Malfunctioning Part	Function
DTC P0717: Input Speed Sensor NT	During an input speed sensor malfunction, shift control is performed through the output speed sensor SP2 signal. During an input speed sensor malfunction, up-shift to 5th and 6th, AI-SHIFT* and flex lock-up clutch control are prohibited.
DTC P0722: Output Speed Sensor SP2	During an output speed sensor malfunction, shift control is performed using the input speed sensor NT signal. During an output speed sensor malfunction, up-shift to 5th and 6th, AI-SHIFT* and flex lock-up clutch control are prohibited.
DTC P0712, P0713: ATF Temperature Sensor	During an ATF temperature sensor malfunction, up-shift to 5th and 6th and flex lock-up clutch control are prohibited.
Shift Solenoid Valve S1, S2, S3, S4 and SR	The current to the malfunctioning solenoid valve is cut off and control is performed by operating the other normal solenoid valves. Shift control is performed depending on the failed solenoid as described in the table below.
DTC P0748, P0778: Shift Solenoid Valve SL1 and SL2	During a solenoid valve SL1 or SL2 malfunction, up-shift to 5th and 6th and flex lock-up clutch control are prohibited.
DTC P2714, P2716: Shift Solenoid Valve SLT	During a solenoid valve SLT malfunction, the current to the solenoid valve is stopped. This stops optimal line pressure control and shift shock increases. However, shifting is performed using normal clutch pressure control.
DTC P2757, P2759: Shift Solenoid Valve SLU	During a solenoid valve SLU malfunction, the current to the solenoid valve is stopped. This stops lock-up control and flex lock-up control, and fuel economy decreases.

HINT:

*: In addition to the switching of the shift pattern through the pattern select switch, Artificial Intelligence Shift (AI-SHIFT) control enables the ECM to estimate the road conditions and the driver's intention in order to automatically select the optimal shift pattern.

Shift Solenoid Valve Normal Operation Chart

Shift Lever Position	Gear*	Shift Solenoid S1	Shift Solenoid S2	Shift Solenoid S3	Shift Solenoid S4	Shift Solenoid SR	Shift Solenoid SL1	Shift Solenoid SL2
D, S6	1st	OFF	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON
	3rd	ON	OFF	ON	OFF	ON	OFF	ON
	4th	ON	OFF	OFF	OFF	ON	OFF	ON
	5th	ON	OFF	OFF	ON	OFF	ON	OFF
	6th	ON	ON	OFF	ON	OFF	ON	OFF
S5	1st	OFF	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON
	3rd	ON	OFF	ON	OFF	ON	OFF	ON
	4th	ON	OFF	OFF	OFF	ON	OFF	ON
	5th	ON	OFF	OFF	ON	OFF	ON	OFF
S4	1st	OFF	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON
	3rd	ON	OFF	ON	OFF	ON	OFF	ON
	4th	ON	OFF	OFF	OFF	ON	OFF	ON
S3	1st	OFF	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON
	3rd (E/B)	ON	OFF	ON	OFF	ON	OFF	OFF

S2	1st	OFF	ON	ON	OFF	ON	OFF	ON
	2nd (E/B)	ON	ON	ON	ON	ON	OFF	OFF
S1	1st (E/B)	OFF	ON	ON	OFF	ON	OFF	OFF

a. Fail-safe operation for electronically malfunctioning shift solenoid valve (S1, S2, S3, S4 and SR).

i. Fail-safe function

If any of the shift solenoid valve circuits has an open or short failure, the ECM turns the other shift solenoid valves ON and OFF in order to shift into the gear positions shown in the table below. Also, the ECM stops sending current to the open or short circuited solenoid.

Even if starting the engine again in fail-safe mode, the gear position remains in the same position.

HINT:

- ***: Actual gear shift (gear position) under fail-safe operation.**
- **X: OFF (the ECM stops sending current to the malfunctioning solenoid valve).**
- **Electrical malfunction: Condition is shown to the left of the "→".**
- **Fail-safe mode: Condition is shown to the right of the "→".**
- **E/B: Engine brake**

Shift Solenoid Valve S1 Electrical Malfunction (P0973, P0974)

Shift Lever Position	Gear*	Shift Solenoid S1	Shift Solenoid S2	Shift Solenoid S3	Shift Solenoid S4	Shift Solenoid SR	Shift Solenoid SL1	Shift Solenoid SL2
D, S6	1st	X	ON	ON	OFF	ON	OFF	ON
	1st → 4th	X	ON → OFF	ON → OFF	OFF	ON	OFF	ON
	3rd → 4th	X	OFF	ON → OFF	OFF	ON	OFF	ON
	4th	X	OFF	OFF	OFF	ON	OFF	ON
	5th	X	OFF	OFF	ON	OFF	ON	OFF
	N → 5th	X	ON → OFF	OFF	ON	OFF	ON	OFF
S5	1st	X	ON	ON	OFF	ON	OFF	ON
	1st → 4th	X	ON → OFF	ON → OFF	OFF	ON	OFF	ON
	3rd → 4th	X	OFF	ON → OFF	OFF	ON	OFF	ON
	4th	X	OFF	OFF	OFF	ON	OFF	ON
	5th	X	OFF	OFF	ON	OFF	ON	OFF
S4	1st	X	ON	ON	OFF	ON	OFF	ON
	1st → 4th	X	ON → OFF	ON → OFF	OFF	ON	OFF	ON
	3rd → 4th	X	OFF	ON → OFF	OFF	ON	OFF	ON
	4th	X	OFF	OFF	OFF	ON	OFF	ON
S3	1st	X	ON	ON	OFF	ON	OFF	ON
	1st → 4th	X	ON → OFF	ON → OFF	OFF	ON	OFF	ON
	3rd (E/B) → 4th	X	OFF	ON → OFF	OFF	ON	OFF	OFF → ON
S2	1st	X	ON	ON	OFF	ON	OFF	ON
	2nd (E/B) → 4th	X	ON → OFF	ON → OFF	ON → OFF	ON	OFF	OFF → ON
S1	1st (E/B)	X	ON	ON	OFF	ON	OFF	OFF

Shift Solenoid Valve S2 Electrical Malfunction (P0976, P0977)

Shift Lever Position	Gear*	Shift Solenoid S1	Shift Solenoid S2	Shift Solenoid S3	Shift Solenoid S4	Shift Solenoid SR	Shift Solenoid SL1	Shift Solenoid SL2
D, S6	3rd	OFF → ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	4th	ON	X	OFF	OFF	ON	OFF	ON
	5th	ON	X	OFF	ON	OFF	ON	OFF
	5th	ON	X	OFF	ON	OFF	ON	OFF
S5	3rd	OFF → ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON

	4th	ON	X	OFF	OFF	ON	OFF	ON
	5th	ON	X	OFF	ON	OFF	ON	OFF
S4	3rd	OFF → ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	4th	ON	X	OFF	OFF	ON	OFF	ON
S3	3rd → 3rd (E/B)	OFF → ON	X	ON	OFF	ON	OFF	ON → OFF
	3rd → 3rd (E/B)	ON	X	ON	OFF	ON	OFF	ON → OFF
	3rd (E/B)	ON	X	ON	OFF	ON	OFF	OFF
S2	3rd → 3rd (E/B)	OFF → ON	X	ON	OFF	ON	ON → OFF	ON → OFF
	3rd (E/B)	ON	X	ON	ON → OFF	ON	OFF	OFF
S1	3rd (E/B)	OFF → ON	X	ON	OFF	ON	OFF	OFF

Shift Solenoid Valve S3 Electrical Malfunction (P0979, P0980)

Shift Lever Position	Gear*	Shift Solenoid S1	Shift Solenoid S2	Shift Solenoid S3	Shift Solenoid S4	Shift Solenoid SR	Shift Solenoid SL1	Shift Solenoid SL2
D, S6	3rd → 4th	OFF	ON	X	OFF	ON	OFF	ON
	4th	ON	ON → OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	5th	ON	OFF	X	ON	OFF	ON	OFF
	6th	ON	ON	X	ON	OFF	ON	OFF
S5	3rd	OFF	ON	X	OFF	ON	OFF	ON
	4th	ON	ON → OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	5th	ON	OFF	X	ON	OFF	ON	OFF
S4	3rd	OFF	ON	X	OFF	ON	OFF	ON
	4th	ON	ON → OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
S3	3rd	OFF	ON	X	OFF	ON	OFF	ON
	4th	ON	ON → OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	OFF → ON
S2	3rd	OFF	ON	X	OFF	ON	OFF	ON
	6th → 4th	ON	ON → OFF	X	ON → OFF	ON	OFF	OFF → ON
S1	1st	OFF	ON	X	OFF	ON	OFF	OFF

Shift Solenoid Valve S4 Electrical Malfunction (P0982, P0983)

Shift Lever Position	Gear*	Shift Solenoid S1	Shift Solenoid S2	Shift Solenoid S3	Shift Solenoid S4	Shift Solenoid SR	Shift Solenoid SL1	Shift Solenoid SL2
D, S6	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON
	3rd	ON	OFF	ON	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	OFF → ON	ON → OFF	OFF → ON
	4th	ON	ON → OFF	OFF	X	OFF → ON	ON → OFF	OFF → ON
S5	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON
	3rd	ON	OFF	ON	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	OFF → ON	ON → OFF	OFF → ON

S4	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON
	3rd	ON	OFF	ON	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	ON	OFF	ON
S3	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON
	3rd (E/B)	ON	OFF	ON	X	ON	OFF	OFF
S2	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd (E/B)	ON	ON	ON	X	ON	OFF	OFF
S1	1st (E/B)	OFF	ON	ON	X	ON	OFF	OFF

Shift Solenoid Valve SR Electrical Malfunction (P0985, P0986)

Shift Lever Position	Gear*	Shift Solenoid S1	Shift Solenoid S2	Shift Solenoid S3	Shift Solenoid S4	Shift Solenoid SR	Shift Solenoid SL1	Shift Solenoid SL2
D, S6	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd	ON	OFF	ON	OFF	X	OFF	ON
	4th	ON	OFF	OFF	OFF	X	OFF	ON
	5th	ON	OFF	OFF	ON	X	ON	OFF
	6th	ON	ON	OFF	ON	X	ON	OFF
S5	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd	ON	OFF	ON	OFF	X	OFF	ON
	4th	ON	OFF	OFF	OFF	X	OFF	ON
	5th	ON	OFF	OFF	ON	X	ON	OFF
S4	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd	ON	OFF	ON	OFF	X	OFF	ON
	4th	ON	OFF	OFF	OFF	X	OFF	ON
S3	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd (E/B)	ON	OFF	ON	OFF	X	OFF	OFF
S2	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd (E/B)	ON	ON	ON	ON	X	OFF	OFF
S1	1st (E/B)	OFF	ON	ON	OFF	X	OFF	OFF

b. Fail-safe operation in the event of a mechanical system malfunction.

i. Fail-safe function
The ECM controls the gear position as shown in the table below when malfunctions occur.

DTC	Condition	Gear*1					
-	Normal	1st	2nd	3rd	4th	5th	6th
P0751	Shift solenoid valve S1: Stuck OFF malfunction	1st*2	1st*2	3rd	3rd	3rd	3rd
P0761	Shift solenoid valve S3: Stuck ON malfunction	1st	2nd	3rd	3rd	3rd	3rd
P0766 P0776	Shift solenoid valve S4, Shift solenoid valve SL2 or Valve body (brake control valve): Malfunction	1st	2nd	3rd	3rd	3rd	3rd
P0781	Valve body (1-2 shift valve): Malfunction	1st*2	1st*2	3rd	3rd	3rd	3rd
P0729	Valve body (sequence valve): Malfunction	1st	2nd	3rd	3rd	3rd	3rd

HINT:

- ***1: Actual gear shift (gear position) under fail-safe operation.**
- ***2: Under engine braking, downshifting to 1st or 2nd gear is prohibited.**

for Preparation Click here

READ DATA LIST

HINT:

Using the GTS to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the GTS, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
N Range Status	Shift lever N status/ ON or OFF	• ON: Shift lever in N • OFF: Shift lever not in N	-
Neutral Position SW Signal	PNP switch status/ ON or OFF	Shift lever is: • In P or N: ON • Not in P or N: OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
Transfer L4	Transfer status/ ON or OFF	• ON: Transfer in L4 • OFF: Transfer not in L4	-
Stop Light Switch	Stop light switch status/ ON or OFF	Brake pedal is: • Depressed: ON • Released: OFF	-
SPD (NT)	Input shaft speed/ Min.: 0 rpm Max.: 12750 rpm	Lock-up is: • ON (after warming up engine): Input turbine speed (NT) equal to engine speed • OFF (idling with shift lever in N): Input turbine speed (NT) nearly equal to engine speed	Data is displayed in increments of 50 rpm.
SPD (SP2)	Output shaft speed/ Min.: 0 km/h (0 mph) Max.: 255 km/h (158 mph)	Vehicle stopped: 0 km/h (0 mph) (output shaft speed is equal to vehicle speed)	-
Shift SW	PNP switch	Shift lever is:	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.

Status (P Range)	status/ ON or OFF	• In P: ON • Not in P: OFF	**HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
Pattern Switch (PWR/M)	Pattern switch (PWR) status/ ON or OFF	• ON: Pattern switch (PWR) is pushed • OFF: Pattern switch (PWR) is not pushed	-
Shift SW Status (R Range)	PNP switch status/ ON or OFF	Shift lever is: • In R: ON • Not in R: OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
Shift SW Status (N Range)	PNP switch status/ ON or OFF	Shift lever is: • In N: ON • Not in N: OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
Shift SW Status (N, P Range) Supported	Status of PNP switch (N or P) support/ Supp or Unsupp	-	-
Shift SW Status (N, P Range)	PNP switch status/ ON or OFF	• ON: Shift lever in P or N • OFF: Shift lever not in P or N	-
Sports Shift Up SW	Sport shift up switch status/ ON or OFF	• ON: Shift lever held in "+" (up-shift) • OFF: Shift lever not in "+" (up-shift)	-
Sports Shift Down SW	Sport shift down switch status/ ON or OFF	• ON: Shift lever held in "-" (down-shift) • OFF: Shift lever not in "-" (down-shift)	-
Sports Mode Selection SW	Sport mode select switch status/ ON or OFF	Shift lever is: • ON: In S, "+" and "-" • OFF: Not in S, "+" and "-"	-
Shift SW Status (D Range)	PNP switch status/ ON or OFF	Shift lever is: • In D, S, "+" and "-": ON • Not in D, S, "+" and "-": OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
A/T Oil Temperature 1	No. 1 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • Equal to ambient temperature while engine is cold	If the value is -40°C (-40°F) or 150°C (302°F), the No. 1 ATF temperature sensor circuit is open or shorted.
A/T Oil Temperature 2	No. 2 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • Equal to ambient temperature while engine is cold	If the value is -40°C (-40°F) or 150°C (302°F), the No. 2 ATF temperature sensor circuit is open or shorted.
Lock Up	Lock-up/ ON or OFF	Lock-up is: • Operating: ON • Not operating: OFF	-
	ECM gear	• In D: 1st, 2nd, 3rd, 4th,	

Shift Status	shift command/ 1st, 2nd, 3rd, 4th, 5th or 6th	5th or 6th • In S: 1st, 2nd, 3rd, 4th, 5th or 6th	-
SLT Solenoid Status	Shift solenoid SLT status/ ON or OFF	• Accelerator pedal is depressed: OFF • Accelerator pedal is released: ON	-
SLU Solenoid Status	Shift solenoid SLU status/ ON or OFF	Shift solenoid SLU is: • Operating: ON • Not operating: OFF	-
Snow or 2nd Start Mode	2nd Start mode status/ ON or OFF	• ON: 2nd Start mode on • OFF: 2nd Start mode off	-
AT Fluid	Flex lock-up judder judgment/ ON or OFF	• ON: Judder judgment occurs • OFF: Judder judgment does not occur	-

PERFORM ACTIVE TEST

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLU)	Operate the shift solenoid SLU	ON or OFF	[Vehicle Condition] • Engine stopped • Shift lever in P or N
Activate the Solenoid (SLT)*	Operate the shift solenoid SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands SLT solenoid to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • Vehicle stopped • Engine idling • Shift lever in P or N
Activate the Solenoid (S1)	Operate the shift solenoid S1	ON or OFF	[Vehicle Condition] • Engine stopped • Shift lever in P or N
Activate the Solenoid (S2)	Operate the shift solenoid S2	ON or OFF	[Vehicle Condition] • Engine stopped • Shift lever in P or N
Activate the Solenoid (S3)	Operate the shift solenoid S3	ON or OFF	[Vehicle Condition] • Engine stopped • Shift lever in P or N

Activate the Solenoid (S4)	Operate the shift solenoid S4	ON or OFF	[Vehicle Condition] • Engine stopped • Shift lever in P or N
Activate the Lock Up	Control shift solenoid SLU to set automatic transmission to lock-up	ON or OFF	Possible to check shift solenoid valve SLU operation. [Vehicle Condition] • Throttle valve opening angle: Less than 35% • Vehicle speed: 80 km/h (50 mph) or more
Control the Shift Position	Operate shift solenoid valves and set each shift position by yourself	• Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of the shift solenoid valves. [Vehicle Condition] 50 km/h (30 mph) or less
Activate the Solenoid (SR)	Operate the shift solenoid SR	ON or OFF	[Vehicle Condition] • Engine stopped • Shift lever in P or N
Activate the Solenoid (SL1)	Operate the shift solenoid SL1	ON or OFF	[Vehicle Condition] • Engine stopped • Shift lever in P or N
Activate the Solenoid (SL2)	Operate the shift solenoid SL2	ON or OFF	[Vehicle Condition] • Engine stopped • Shift lever in P or N

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Please note that the pressure values in the Active Test and Hydraulic Test are different.

for Preparation Click here

HINT:

- **If a DTC is displayed during the DTC check, check the parts listed in the table below and proceed to the "See page" given.**
- ***1: "Comes on" means the Malfunction Indicator Lamp (MIL) illuminates.**
- ***2: "DTC stored" means the ECM memorizes the trouble code if the ECM detects the DTC detection condition.**
- **These DTCs may be output when the clutches, brakes, gear components, etc. inside the automatic transmission are damaged.**
- ***3: w/ OBD**
- ***4: w/o OBD**
- ***5: The ATF temperature warning light blinks or a message is displayed in the combination meter.**

Automatic Transmission System

DTC Code	Detection Item	MIL*1	Memory*2	See page
P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	Comes on	DTC stored	Click here
P0711	Transmission Fluid Temperature Sensor "A" Performance	Comes on	DTC stored	Click here
P0712	Transmission Fluid Temperature Sensor "A" Circuit Low Input	Comes on	DTC stored	Click here
P0713	Transmission Fluid Temperature Sensor "A" Circuit High Input	Comes on	DTC stored	Click here
P0717	Turbine Speed Sensor Circuit No Signal	Comes on	DTC stored	Click here
P0722	Output Speed Sensor Circuit No Signal	Comes on	DTC stored	Click here
P0729	Gear 6 Incorrect Ratio	Comes on*3 -*4	DTC stored	Click here
P0748	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	Comes on	DTC stored	Click here
P0751	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)	Comes on*3 -*4	DTC stored	Click here
P0756	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)	Comes on	DTC stored	Click here
P0761	Shift Solenoid "C" Performance (Shift Solenoid Valve S3)	Comes on*3 -*4	DTC stored	Click here
P0766	Shift Solenoid "D" Performance (Shift Solenoid Valve S4)	Comes on*3 -*4	DTC stored	Click here
P0776	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)	Comes on	DTC stored	Click here
P0778	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	Comes on	DTC stored	Click here
P0781	1-2 Shift (1-2 Shift Valve)	Comes on*3 -*4	DTC stored	Click here
P0894	Transmission Component Slipping	Comes on	DTC stored	Click here
P0973	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)	Comes on	DTC stored	Click here
P0974	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)	Comes on	DTC stored	Click here
P0976	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)	Comes on	DTC stored	Click here
P0977	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)	Comes on	DTC stored	Click here
P0979	Shift Solenoid "C" Control Circuit Low (Shift Solenoid Valve S3)	Comes on	DTC stored	Click here

P0980	Shift Solenoid "C" Control Circuit High (Shift Solenoid Valve S3)	Comes on	DTC stored	Click here
P0982	Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)	Comes on	DTC stored	Click here
P0983	Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)	Comes on	DTC stored	Click here
P0985	Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)	Comes on	DTC stored	Click here
P0986	Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)	Comes on	DTC stored	Click here
P2714	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)	Comes on*3 -*4	DTC stored	Click here
P2716	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	Comes on	DTC stored	Click here
P2742	Transmission Fluid Temperature Sensor "B" Circuit Low Input	-*5	DTC stored	Click here
P2743	Transmission Fluid Temperature Sensor "B" Circuit High Input	-*5	DTC stored	Click here
P2757	Torque Converter Clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU)	Comes on	DTC stored	Click here
P2759	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)	Comes on	DTC stored	Click here
P2772	Four Wheel Drive (4WD) Low Switch Circuit Range / Performance	Comes on	DTC stored	Click here

DTC P0705 Transmission Range Sensor Circuit Malfunction (PRNDL Input)

for Preparation Click here

DESCRIPTION

The Park/Neutral Position (PNP) switch detects the shift lever position and sends signals to the ECM.

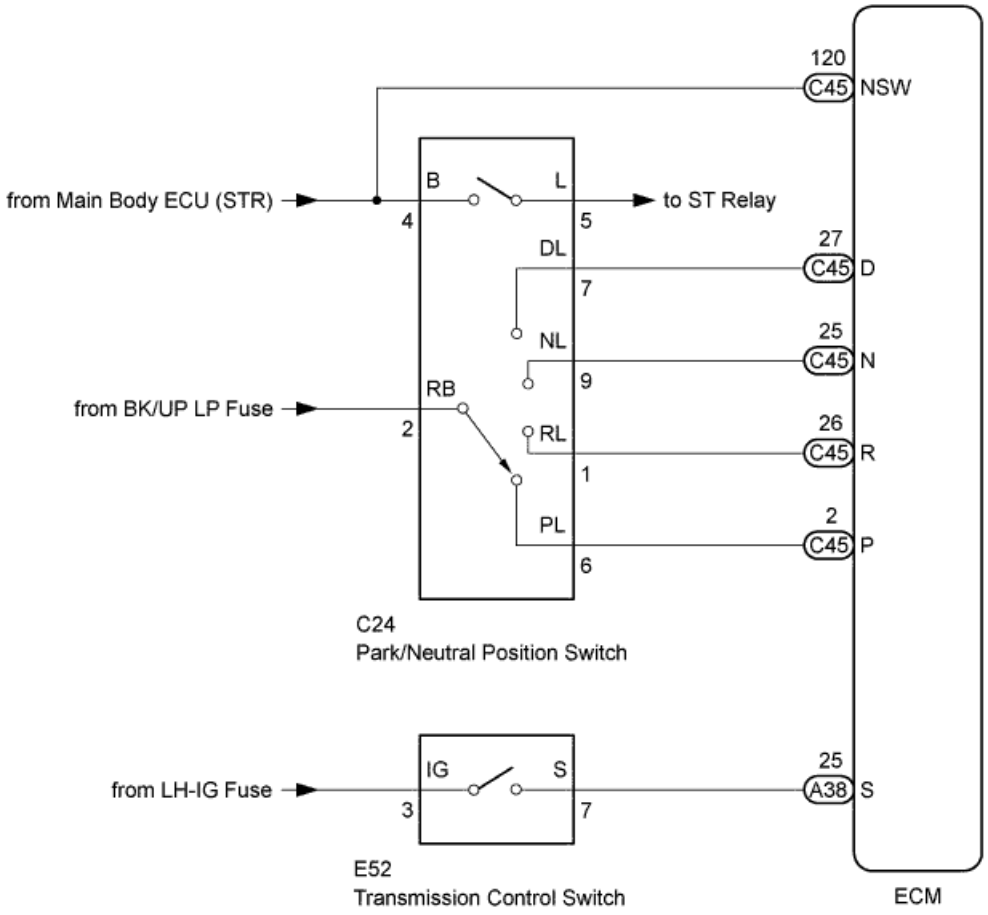
DTC Code	DTC Detection Condition	Trouble Area
P0705	When one of the following conditions is met: (A) Any 2 or more of the following signals are ON simultaneously (2 trip detection logic). • P input signal • N input signal • R input signal • D input signal (B) Any 2 or more of the following signals are ON simultaneously (2 trip detection logic). • NSW input signal • R input signal • D input signal (C) Any of the following signals are ON for 2.0 sec. or more when the shift lever is in S (2 trip detection logic). • NSW input signal • P input signal • N input signal • R input signal (D) All the signals are OFF simultaneously for the P, R, N and D positions (2 trip detection logic).	• Park/neutral position switch • Transmission control switch (Lower shift lever assembly) • Open or short in park/neutral position switch circuit • ECM

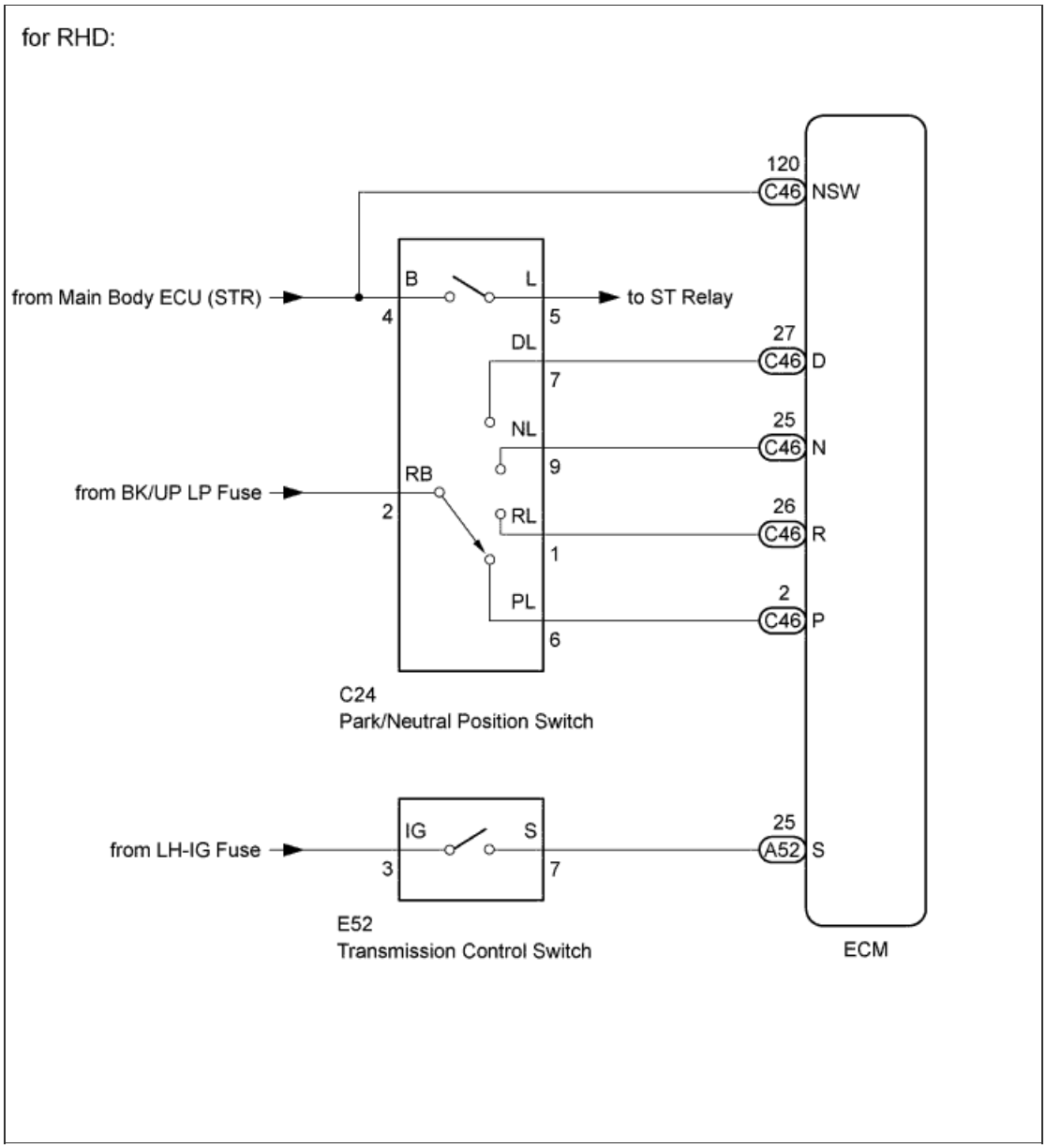
MONITOR DESCRIPTION

This DTC indicates a problem with the park/neutral position switch and the wire harness in the park/neutral position switch circuit.
The park/neutral position switch detects the shift lever position and sends a signal to the ECM.
For security, the park/neutral position switch detects the shift lever position so that the engine can be started only when the shift lever is in P or N.
The park/neutral position switch sends a signal to the ECM according to the shift lever position (P, R, N, D or S).
The ECM determines that there is a problem with the switch or related parts if it receives more than 1 position signal simultaneously. The ECM will illuminate the MIL and store the DTC.

WIRING DIAGRAM

for LHD:


120
C45
NSW
from Main Body ECU (STR)
B
L
to ST Relay
4
5
DL
27
C45
D
7
NL
25
C45
N
9
from BK/UP LP Fuse
RB
2
RL
26
C45
R
1
PL
2
C45
P
6
C24
Park/Neutral Position Switch
from LH-IG Fuse
IG
S
25
A38
S
3
7
E52
Transmission Control Switch
ECM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the GTS to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the GTS, read the Data List.

Engine and ECT

Tester	Measurement	Normal Condition	Diagnostic Note

Display	Item/Range		
Neutral Position SW Signal	PNP switch status/ ON or OFF	Shift lever: • In P or N: ON • Not in P or N: OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Shift SW Status (R Range)	PNP switch status/ ON or OFF	Shift lever: • In R: ON • Not in R: OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Shift SW Status (P Range)	PNP switch status/ ON or OFF	Shift lever: • In P: ON • Not in P: OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Shift SW Status (N Range)	PNP switch status/ ON or OFF	Shift lever: • In N: ON • Not in N: OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Shift SW Status (D Range)	PNP switch status/ ON or OFF	Shift lever: • In D: ON • Not in D: OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Sports Shift Up SW	Sport shift up switch status/ ON or OFF	• ON: Shift lever held in "+" (up-shift) • OFF: Shift lever not in "+" (up-shift)	-
Sports Shift Down SW	Sport shift down switch status/ ON or OFF	• ON: Shift lever held in "-" (down-shift) • OFF: Shift lever not in "-" (down-shift)	-

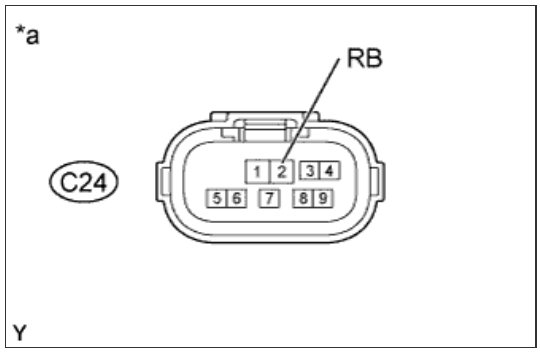
1.CHECK HARNESS AND CONNECTOR (BK/UP LP FUSE - PARK/NEUTRAL POSITION SWITCH)

a. Disconnect the park/neutral position switch connector.

b. Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
C24-2 (RB) - Body ground	Engine switch on (IG)	11 to 14 V
C24-2 (RB) - Body ground	Engine switch off	Below 1 V



Text in Illustration

*a	Front view of wire harness connector (to Park/Neutral Position Switch)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

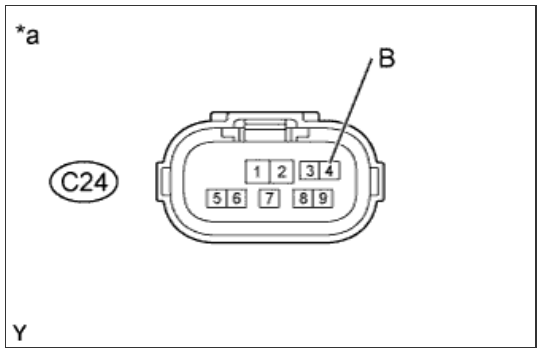
OK

2.CHECK HARNESS AND CONNECTOR (NSW TERMINAL VOLTAGE)

a. Disconnect the park/neutral position switch connector.

a. Disconnect the park/neutral position switch connector.

b. Measure the voltage according to the value(s) in the table below.



Standard voltage:

Tester Connection	Condition	Specified Condition
C24-4 (B) - Body ground	Engine switch on (IG)	11 to 14 V
C24-4 (B) - Body ground	Engine switch off	Below 1 V

Text in Illustration

*a	Front view of wire harness connector (to Park/Neutral Position Switch)

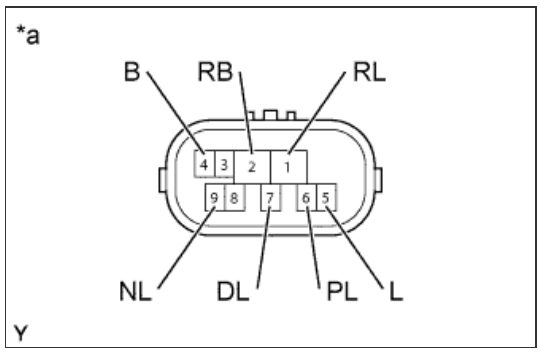
NG → Go to step 7

OK

3.INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY

a. Disconnect the park/neutral position switch connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
• 2 (RB) - 6 (PL) • 4 (B) - 5 (L)	Shift lever in P	Below 1 Ω
2 (RB) - 1 (RL)	Shift lever in R	Below 1 Ω
• 2 (RB) - 9 (NL) • 4 (B) - 5 (L)	Shift lever in N	Below 1 Ω
2 (RB) - 7 (DL)	• Shift lever in D • Shift lever in S, "+" or "-"	Below 1 Ω
• 2 (RB) - 6 (PL) • 4 (B) - 5 (L)	Shift lever not in P	10 kΩ or higher
2 (RB) - 1 (RL)	Shift lever not in R	10 kΩ or higher
• 2 (RB) - 9 (NL) • 4 (B) - 5 (L)	Shift lever not in N	10 kΩ or higher
2 (RB) - 7 (DL)	• Shift lever not in D • Shift lever not in S, "+"	10 kΩ or higher

	or "-"	

Text in Illustration

*a	Component without harness connected (Park/Neutral Position Switch)

NG → REPLACE PARK/NEUTRAL POSITION SWITCH ASSEMBLY (Click here)

OK

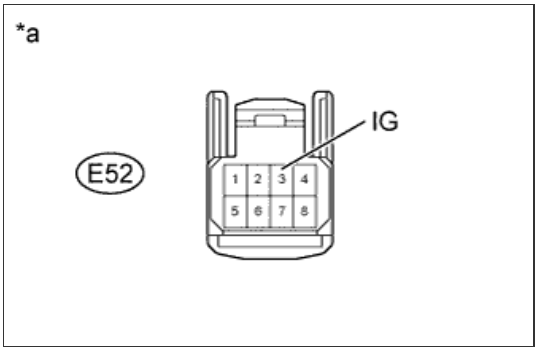
4.CHECK HARNESS AND CONNECTOR (LH ECU-IG FUSE - TRANSMISSION CONTROL SWITCH)

a. Disconnect the transmission control switch connector.

b. Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
E52-3 (IG) - Body ground	Engine switch on (IG)	11 to 14 V
E52-3 (IG) - Body ground	Engine switch off	Below 1 V



Text in Illustration

*a	Front view of wire harness connector (to Transmission Control Switch)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

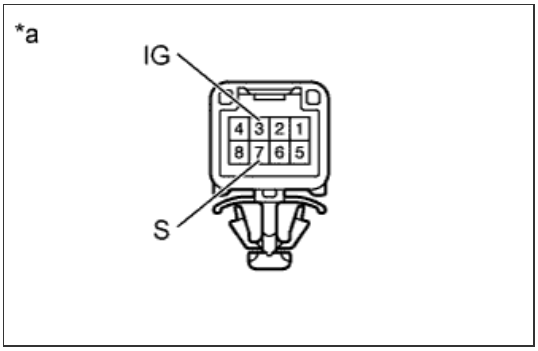
5.INSPECT TRANSMISSION CONTROL SWITCH

a. Disconnect the transmission control switch connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
3 (IG) - 7 (S)	Shift lever in S, "+" or "-"	Below 1 Ω
3 (IG) - 7 (S)	Shift lever not in S, "+" or "-"	10 kΩ or higher



Text in Illustration

*a	Component without harness connected (Transmission Control Switch)

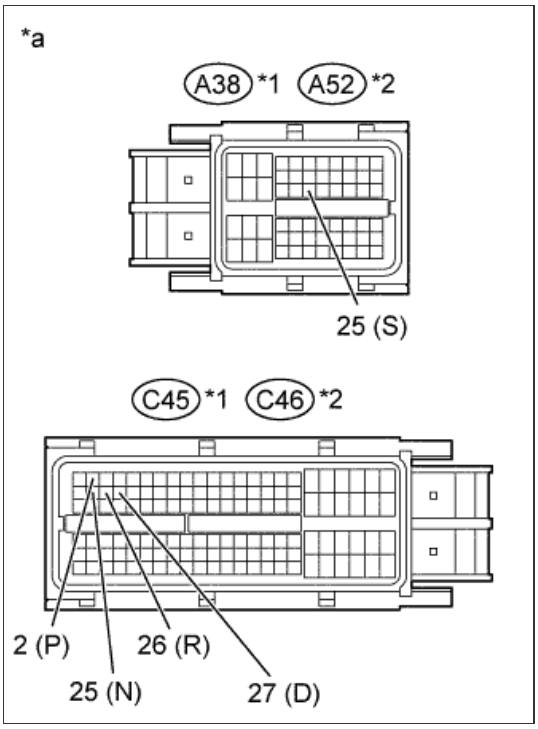
NG → REPLACE TRANSMISSION CONTROL SWITCH (LOWER SHIFT LEVER ASSEMBLY) (Click here)

OK

6.CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH, TRANSMISSION CONTROL SWITCH - ECM)

a. Disconnect the ECM connector.

b. Measure the voltage according to the value(s) in the table below.



Standard Voltage:

for LHD

Tester Connection	Condition	Specified Condition
C45-2 (P) - Body ground	• Engine switch on (IG) • Shift lever in P	11 to 14 V
C45-26 (R) - Body ground	• Engine switch on (IG) • Shift lever in R	11 to 14 V*
C45-25 (N) - Body ground	• Engine switch on (IG) • Shift lever in N	11 to 14 V
C45-27 (D) - Body ground	• Engine switch on (IG) • Shift lever in D	11 to 14 V
A38-25 (S) - Body ground	• Engine switch on (IG) • Shift lever in S, "+" or "-"	11 to 14 V
C45-2 (P) - Body ground	• Engine switch on (IG) • Shift lever not in P	Below 1 V
C45-26 (R) - Body ground	• Engine switch on (IG) • Shift lever not in R	Below 1 V
C45-25 (N) - Body ground	• Engine switch on (IG) • Shift lever not in N	Below 1 V
C45-27 (D) - Body ground	• Engine switch on (IG) • Shift lever not in D	Below 1 V
A38-25 (S) - Body ground	• Engine switch on (IG) • Shift lever not in S, "+" or "-"	Below 1 V

for RHD

Tester Connection	Condition	Specified Condition

C46-2 (P) - Body ground	• Engine switch on (IG) • Shift lever in P	11 to 14 V
C46-26 (R) - Body ground	• Engine switch on (IG) • Shift lever in R	11 to 14 V*
C46-25 (N) - Body ground	• Engine switch on (IG) • Shift lever in N	11 to 14 V
C46-27 (D) - Body ground	• Engine switch on (IG) • Shift lever in D	11 to 14 V
A52-25 (S) - Body ground	• Engine switch on (IG) • Shift lever in S, "+" or "-"	11 to 14 V
C46-2 (P) - Body ground	• Engine switch on (IG) • Shift lever not in P	Below 1 V
C46-26 (R) - Body ground	• Engine switch on (IG) • Shift lever not in R	Below 1 V
C46-25 (N) - Body ground	• Engine switch on (IG) • Shift lever not in N	Below 1 V
C46-27 (D) - Body ground	• Engine switch on (IG) • Shift lever not in D	Below 1 V
A52-25 (S) - Body ground	• Engine switch on (IG) • Shift lever not in S, "+" or "-"	Below 1 V

HINT:

*: The voltage will drop slightly due to the turning on of the back up light.

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK →

REPLACE ECM (Click here)

7.CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH - ECM)

a. Disconnect the C24 park/neutral position switch connector.

b. Disconnect the C45 ECM connector (for LHD).

c. Disconnect the C46 ECM connector (for RHD).

d. Measure the voltage according to the value(s) in the table below.

Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C24-4 (B) - C45-120 (NSW)	Always	Below 1 Ω
C24-4 (B) or C45-120 (NSW) -	Always	10 kΩ or

Body ground		higher

for RHD

Tester Connection	Condition	Specified Condition
C24-4 (B) - C46-120 (NSW)	Always	Below 1 Ω
C24-4 (B) or C46-120 (NSW) - Body ground	Always	10 kΩ or higher

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0973 Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)

DTC P0974 Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)

for Preparation Click here

DESCRIPTION

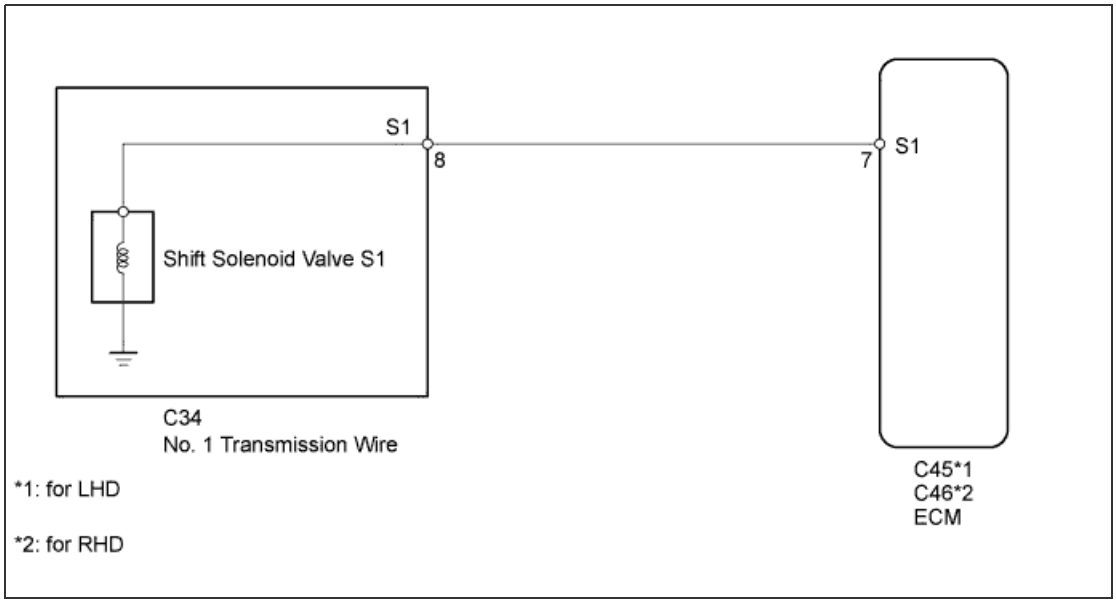
Shifting from 1st to 6th is performed in combination with ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0973	The ECM detects a short in the solenoid valve S1 circuit 2 times when the solenoid valve S1 is operated (1 trip detection logic).	• Short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM
P0974	The ECM detects an open in the solenoid valve S1 circuit 2 times when the solenoid valve S1 is not operated (1 trip detection logic).	• Open in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S1 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S1 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S1 circuit.
When the shift solenoid valve S1 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S1 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

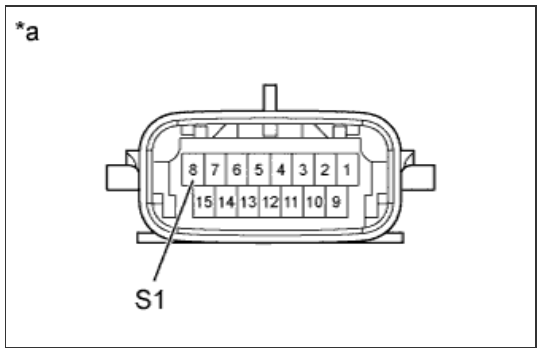
The shift solenoid valve S1 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S1	OFF	ON	ON	ON	ON	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S1)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
8 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

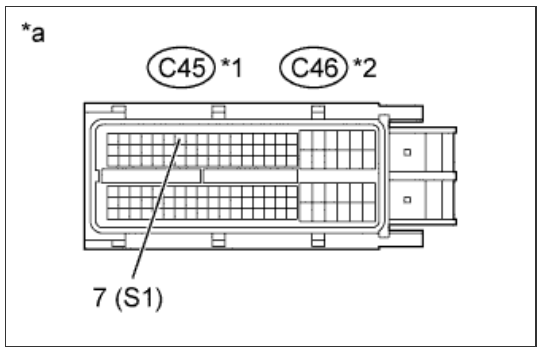
NG → Go to step 3

OK ↓

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-7 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-7 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ↓

REPLACE ECM (Click here)

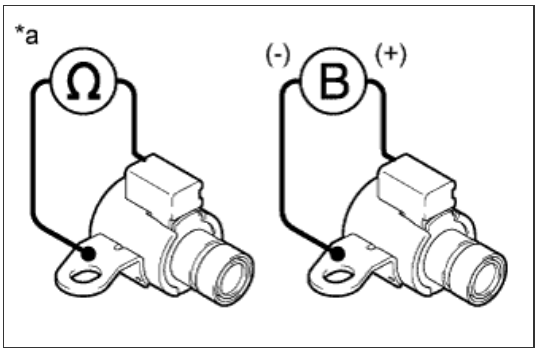
3.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S1)

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0711 Transmission Fluid Temperature Sensor "A" Performance

for Preparation Click here

DESCRIPTION

The ATF temperature sensor converts the fluid temperature into a resistance value for use by the ECM.
The ECM applies a voltage to the temperature sensor through terminal THO1 of the ECM.
The sensor resistance changes with the ATF temperature. As the temperature becomes higher, the sensor resistance decreases.
One terminal of the sensor is grounded so that the sensor resistance decreases and the voltage goes down as the temperature becomes higher.
The ECM calculates the fluid temperature based on the voltage signal.

DTC Code	DTC Detection Condition	Trouble Area
P0711	Either condition is met (2-trip detection logic): (a) Certain monitor enabling conditions are met and the ATF temperature is below 20°C (68°F). (b) Certain monitor enabling conditions are met and the ATF temperature is 110°C (230°F) or higher.	Transmission wire (No. 1 ATF temperature sensor)

MONITOR DESCRIPTION

This DTC indicates that there is a problem with output from the Automatic Transmission Fluid (ATF) temperature sensor and that the sensor itself is defective. The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature and detects an open or short in the ATF temperature sensor circuit or a fault in the ATF temperature sensor.
After running the vehicle for a certain period, the ATF temperature should increase. If the ATF temperature is below 20°C (68°F) after running the vehicle for a certain period, the ECM interprets this as a fault, turns on the MIL and stores the DTC.
When the ATF temperature is 110°C (230°F) or more and the engine coolant temperature takes 10 seconds or more to reach 60°C (140°F) after a cold start, the ECM also determines this as a fault, turns on the MIL and stores the DTC.

INSPECTION PROCEDURE

DATA LIST

HINT:

Using the GTS to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.
b. Turn the engine switch off.
c. Connect the GTS to the DLC3.
d. Turn the engine switch on (IG).
e. Turn the GTS on.
f. Enter the following menus: Powertrain / Engine and ECT / Data List.
g. According to the display on the GTS, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 1	No. 1 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • Equal to ambient temperature when engine cold	If the value is -40°C (-40°F) or 150°C (302°F), the No. 1 ATF temperature sensor circuit is open or shorted.

HINT:

When DTC P0712 is output and the GTS output is 150°C (302°F) or more, there is a short circuit.

When DTC P0713 is output and the GTS output is -40°C (-40°F), there is an open circuit.

Check the temperature displayed on the GTS in order to check if a malfunction exists.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or more	Short circuit

If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately stored (in 0.5 seconds). When P0713 is stored, P0711 cannot be stored.
It is not necessary to inspect the circuit when P0711 is stored.

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0711)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
Only P0711 is output	A
P0711 and other DTCs are output	B

HINT:

If any other codes besides P0711 are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART (Click here)**

A

2.CHECK TRANSMISSION FLUID LEVEL

a. Check the transmission fluid level (Click here).

OK:
Automatic transmission fluid level is correct.

NG → **ADD FLUID (Click here)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE (Click here)

DTC P0973 Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)

DTC P0974 Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)

for Preparation Click here

DESCRIPTION

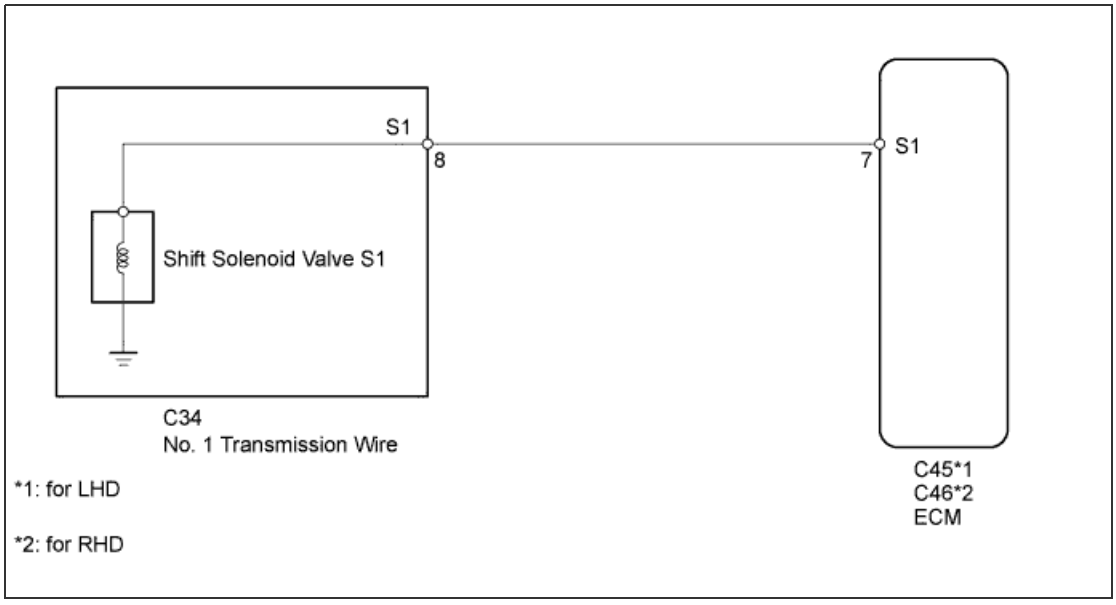
Shifting from 1st to 6th is performed in combination with ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0973	The ECM detects a short in the solenoid valve S1 circuit 2 times when the solenoid valve S1 is operated (1 trip detection logic).	• Short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM
P0974	The ECM detects an open in the solenoid valve S1 circuit 2 times when the solenoid valve S1 is not operated (1 trip detection logic).	• Open in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S1 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S1 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S1 circuit.
When the shift solenoid valve S1 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S1 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

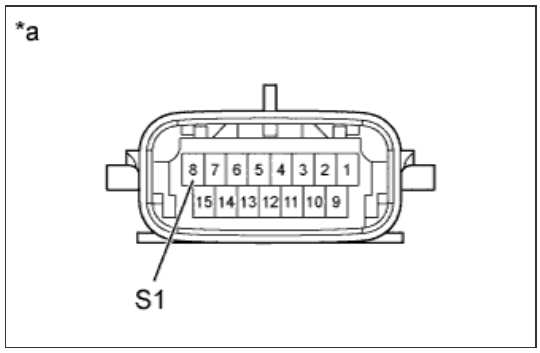
The shift solenoid valve S1 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S1	OFF	ON	ON	ON	ON	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S1)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
8 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

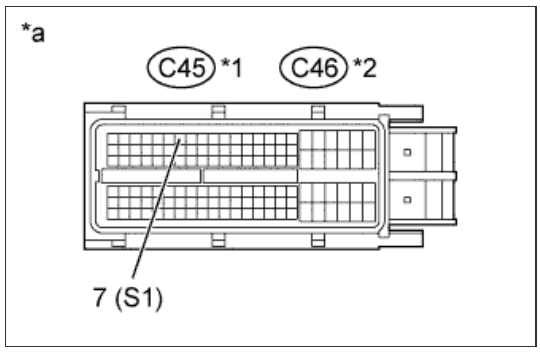
NG → Go to step 3

OK ↓

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-7 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-7 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ↓

REPLACE ECM (Click here)

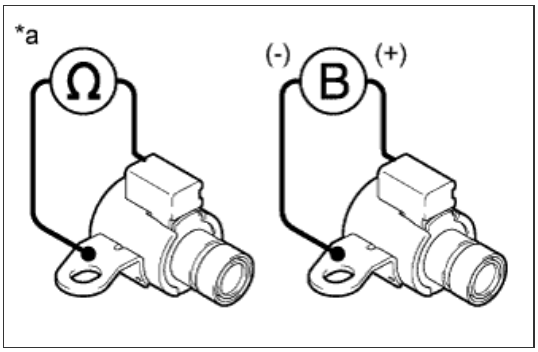
3.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S1)

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0712 Transmission Fluid Temperature Sensor "A" Circuit Low Input

DTC P0713 Transmission Fluid Temperature Sensor "A" Circuit High Input

for Preparation Click here

DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.
The ECM applies voltage to the temperature sensor through the ECM terminal THO1.
The sensor resistance changes with the transmission fluid temperature. As the temperature becomes higher, the sensor resistance decreases.
One terminal of the sensor is grounded so that the sensor resistance decreases and the voltage goes down as the temperature becomes higher.
The ECM calculates the fluid temperature based on the voltage signal.

DTC Code	DTC Detection Condition	Trouble Area
P0712	The No. 1 ATF temperature sensor resistance is below 79 Ω for 0.5 seconds or more (1 trip detection logic).	• Short in No. 1 ATF temperature sensor circuit • No. 1 transmission wire (No. 1 ATF temperature sensor) • ECM
P0713	ATF temperature sensor resistance is higher than 156 kΩ for 0.5 sec. or more and either condition is met (1 trip detection logic). (A) 15 min. or more have elapsed after the engine start when the engine coolant temperature or intake air temperature is -29.375°C (-20.875°F) or less. (B) 10 sec. or more have elapsed after the engine start when the engine coolant temperature and intake air temperature are higher than -29.375°C (-20.875°F).	• Open in No. 1 ATF temperature sensor circuit • No. 1 transmission wire (No. 1 ATF temperature sensor) • ECM

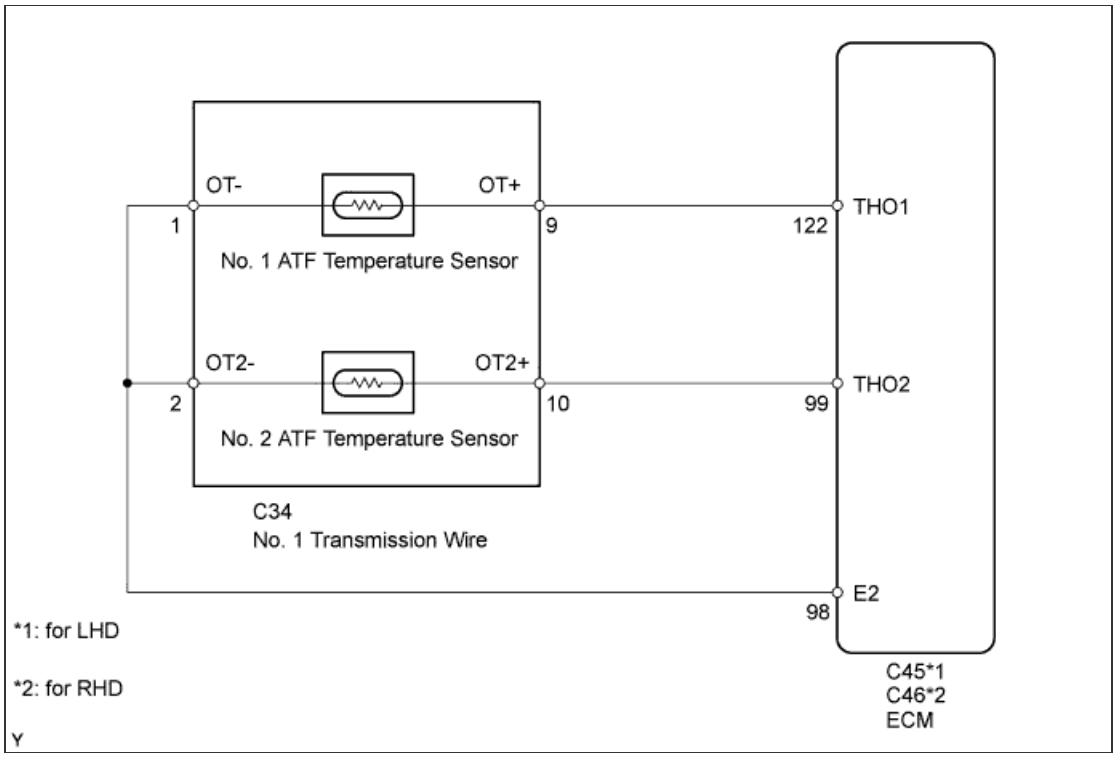
MONITOR DESCRIPTION

These DTCs indicate an open or short in the Automatic Transmission Fluid (ATF) temperature sensor circuit. The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is below 79 Ω*1 or higher than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM will turn on the MIL and store the DTC.

HINT:

- **The ATF temperature can be checked on the GTS display.**
- ***1: 150°C (302°F) or higher is indicated regardless of the actual ATF temperature.**
- ***2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.**

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the GTS to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the GTS, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 1	No. 1 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 1 ATF temperature sensor circuit is open or shorted.

HINT:

When DTC P0712 is stored and the GTS output is 150°C (302°F) or higher, there is a short circuit.

When DTC P0713 is stored and the GTS output is -40°C (-40°F), there is an open circuit.

Check the temperature displayed on the GTS in order to check if a malfunction exists.

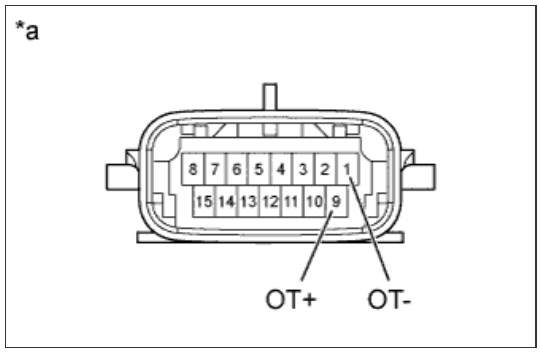
Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or higher	Short circuit

If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately stored (in 0.5 seconds). When P0713 is stored, P0711 cannot be stored. It is not necessary to inspect the circuit when P0711 is stored.

1.INSPECT NO. 1 TRANSMISSION WIRE (NO. 1 ATF TEMPERATURE SENSOR)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
1 (OT-) - 9 (OT+)	Always	79 Ω to 156 kΩ
1 (OT-) - Body ground	Always	10 kΩ or higher
9 (OT+) - Body ground	Always	10 kΩ or higher

HINT:

If the resistance is out of the specified range at any of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Resistance (Reference):

ATF Temperature	Specified Condition
10°C (50°F)	5 to 8 kΩ
25°C (77°F)	2.5 to 4.5 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

Text in Illustration

*a	Component without harness connected (No. 1 transmission wire)

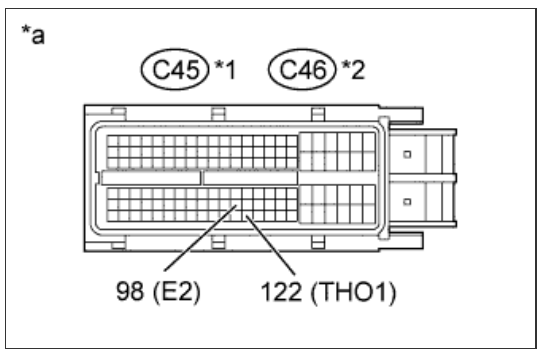
NG → REPAIR OR REPLACE NO. 1 ATF TEMPERATURE SENSOR (NO. 1 TRANSMISSION WIRE) (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-122 (THO1) - C45-98 (E2)	Always	79 Ω to 156 kΩ

C45-122 (THO1) - Body ground	Always	10 kΩ or higher
C45-98 (E2) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-122 (THO1) - C46-98 (E2)	Always	79 Ω to 156 kΩ
C46-122 (THO1) - Body ground	Always	10 kΩ or higher
C46-98 (E2) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK → REPLACE ECM (Click here)

DTC P0976 Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)

DTC P0977 Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)

for Preparation Click here

DESCRIPTION

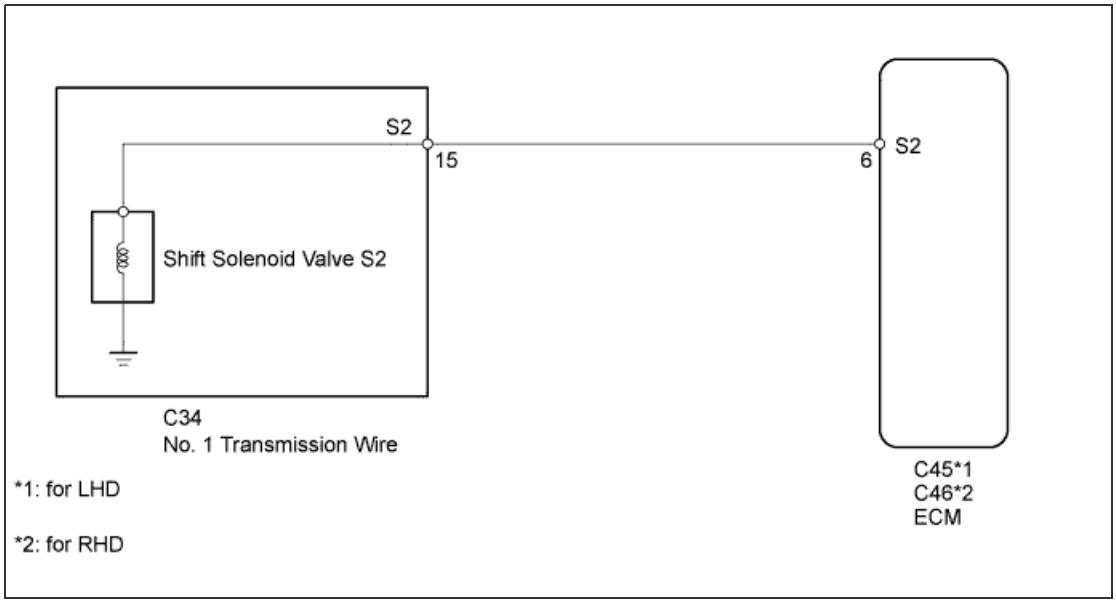
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0976	The ECM detects a short in the solenoid valve S2 circuit 2 times when the solenoid valve S2 is operated (1 trip detection logic).	• Short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM
P0977	The ECM detects an open in the solenoid valve S2 circuit 2 times when the solenoid valve S2 is not operated (1 trip detection logic).	• Open in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S2 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S2 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S2 circuit.
When the shift solenoid valve S2 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S2 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

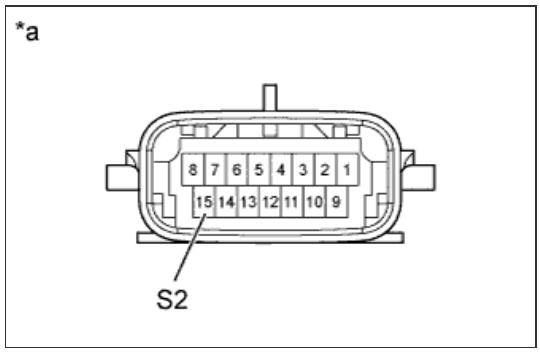
The shift solenoid valve S2 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S2	ON	ON	OFF	OFF	OFF	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S2)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
15 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

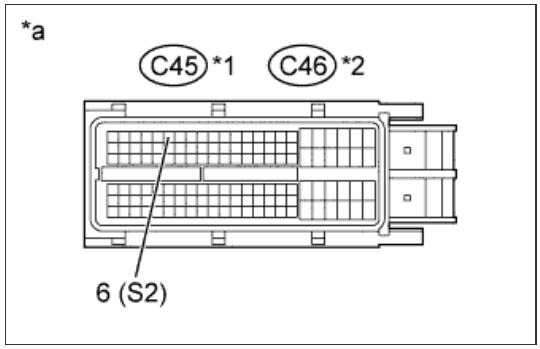
NG → Go to step 3

OK ↓

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-6 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-6 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ↓

REPLACE ECM (Click here)

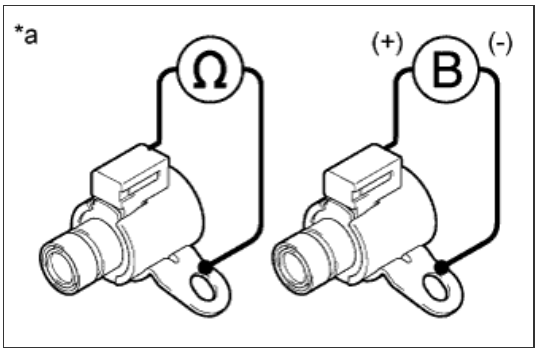
3.INSPECT SHIFT SOLENOID VALVE S2

a. Remove shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S2)

NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0712 Transmission Fluid Temperature Sensor "A" Circuit Low Input

DTC P0713 Transmission Fluid Temperature Sensor "A" Circuit High Input

for Preparation Click here

DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.
The ECM applies voltage to the temperature sensor through the ECM terminal THO1.
The sensor resistance changes with the transmission fluid temperature. As the temperature becomes higher, the sensor resistance decreases.
One terminal of the sensor is grounded so that the sensor resistance decreases and the voltage goes down as the temperature becomes higher.
The ECM calculates the fluid temperature based on the voltage signal.

DTC Code	DTC Detection Condition	Trouble Area
P0712	The No. 1 ATF temperature sensor resistance is below 79 Ω for 0.5 seconds or more (1 trip detection logic).	• Short in No. 1 ATF temperature sensor circuit • No. 1 transmission wire (No. 1 ATF temperature sensor) • ECM
P0713	ATF temperature sensor resistance is higher than 156 kΩ for 0.5 sec. or more and either condition is met (1 trip detection logic). (A) 15 min. or more have elapsed after the engine start when the engine coolant temperature or intake air temperature is -29.375°C (-20.875°F) or less. (B) 10 sec. or more have elapsed after the engine start when the engine coolant temperature and intake air temperature are higher than -29.375°C (-20.875°F).	• Open in No. 1 ATF temperature sensor circuit • No. 1 transmission wire (No. 1 ATF temperature sensor) • ECM

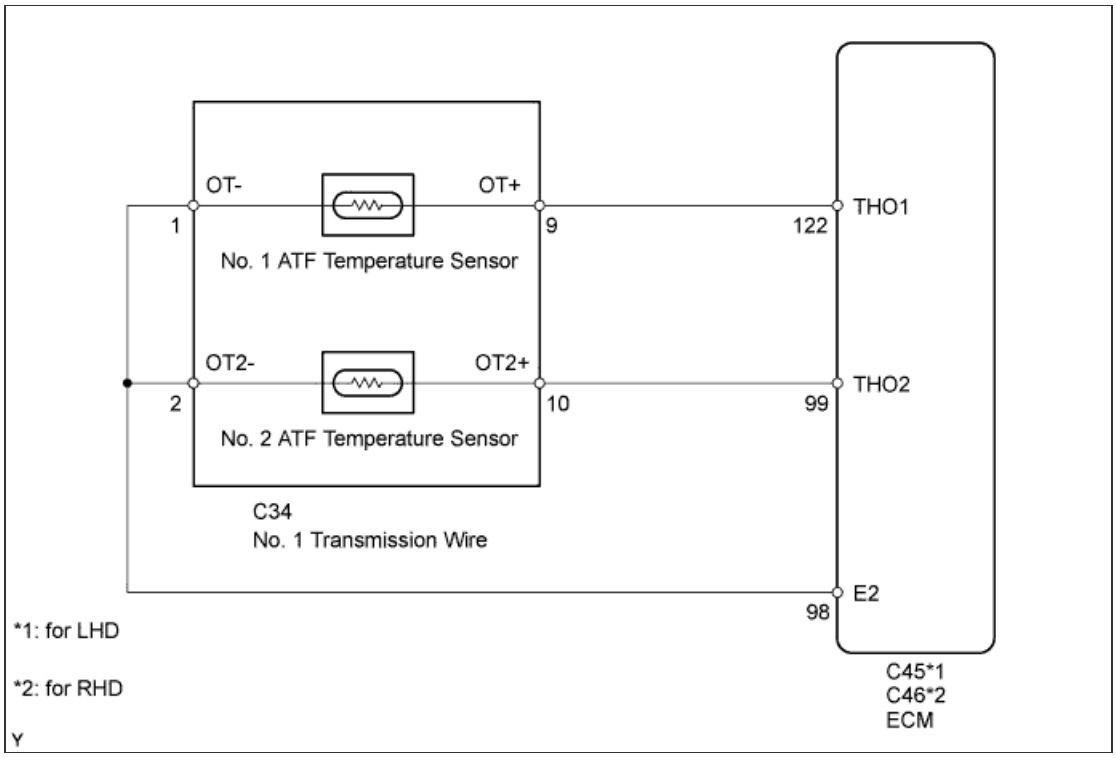
MONITOR DESCRIPTION

These DTCs indicate an open or short in the Automatic Transmission Fluid (ATF) temperature sensor circuit. The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is below 79 Ω*1 or higher than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM will turn on the MIL and store the DTC.

HINT:

- **The ATF temperature can be checked on the GTS display.**
- ***1: 150°C (302°F) or higher is indicated regardless of the actual ATF temperature.**
- ***2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.**

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the GTS to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the GTS, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 1	No. 1 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 1 ATF temperature sensor circuit is open or shorted.

HINT:

When DTC P0712 is stored and the GTS output is 150°C (302°F) or higher, there is a short circuit.

When DTC P0713 is stored and the GTS output is -40°C (-40°F), there is an open circuit.

Check the temperature displayed on the GTS in order to check if a malfunction exists.

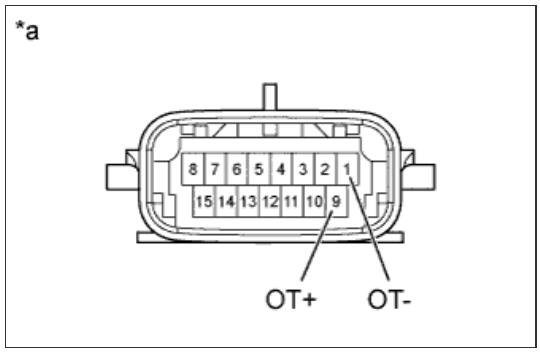
Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or higher	Short circuit

If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately stored (in 0.5 seconds). When P0713 is stored, P0711 cannot be stored. It is not necessary to inspect the circuit when P0711 is stored.

1.INSPECT NO. 1 TRANSMISSION WIRE (NO. 1 ATF TEMPERATURE SENSOR)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
1 (OT-) - 9 (OT+)	Always	79 Ω to 156 kΩ
1 (OT-) - Body ground	Always	10 kΩ or higher
9 (OT+) - Body ground	Always	10 kΩ or higher

HINT:

If the resistance is out of the specified range at any of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Resistance (Reference):

ATF Temperature	Specified Condition
10°C (50°F)	5 to 8 kΩ
25°C (77°F)	2.5 to 4.5 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

Text in Illustration

*a	Component without harness connected (No. 1 transmission wire)

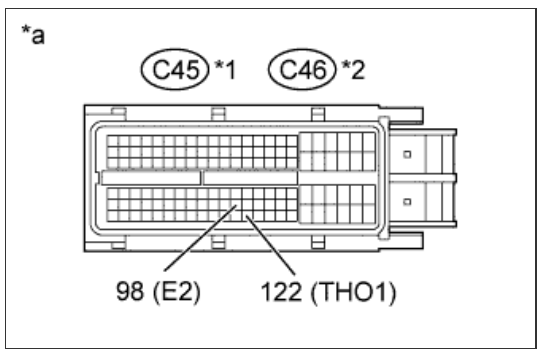
NG → REPAIR OR REPLACE NO. 1 ATF TEMPERATURE SENSOR (NO. 1 TRANSMISSION WIRE) (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-122 (THO1) - C45-98 (E2)	Always	79 Ω to 156 kΩ

C45-122 (THO1) - Body ground	Always	10 kΩ or higher
C45-98 (E2) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-122 (THO1) - C46-98 (E2)	Always	79 Ω to 156 kΩ
C46-122 (THO1) - Body ground	Always	10 kΩ or higher
C46-98 (E2) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK → REPLACE ECM (Click here)

DTC P0976 Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)

DTC P0977 Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)

for Preparation Click here

DESCRIPTION

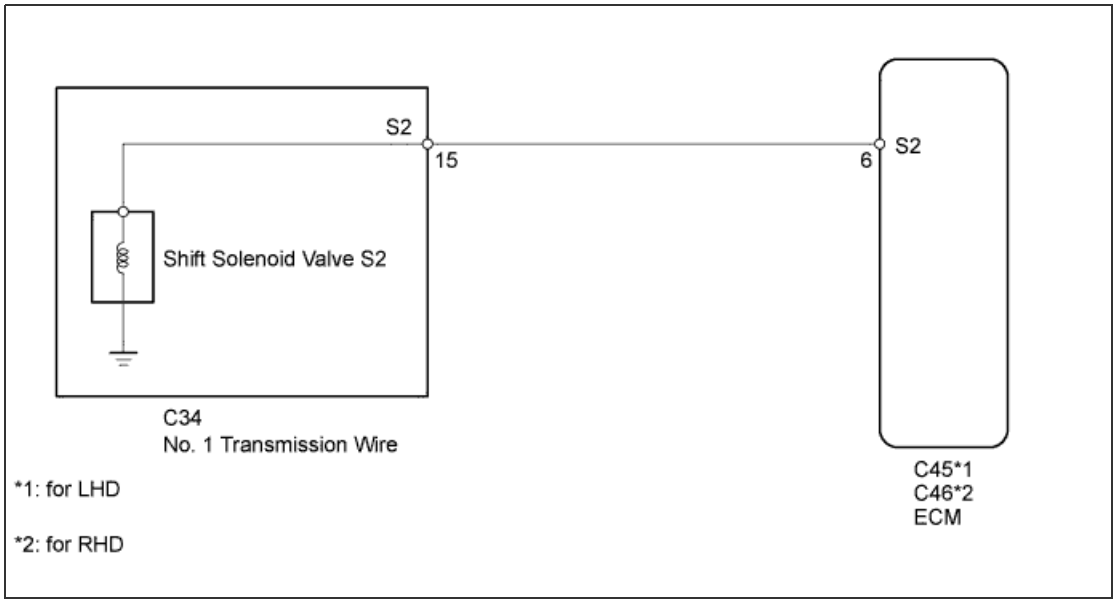
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0976	The ECM detects a short in the solenoid valve S2 circuit 2 times when the solenoid valve S2 is operated (1 trip detection logic).	• Short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM
P0977	The ECM detects an open in the solenoid valve S2 circuit 2 times when the solenoid valve S2 is not operated (1 trip detection logic).	• Open in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S2 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S2 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S2 circuit.
When the shift solenoid valve S2 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S2 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

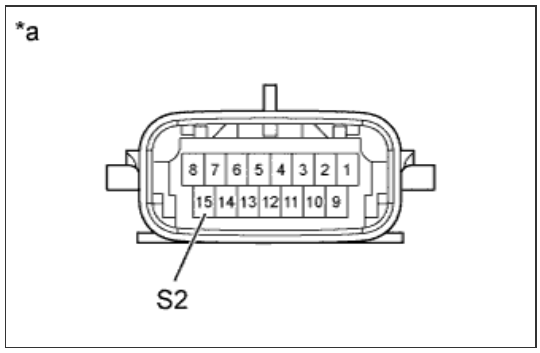
The shift solenoid valve S2 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S2	ON	ON	OFF	OFF	OFF	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S2)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
15 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

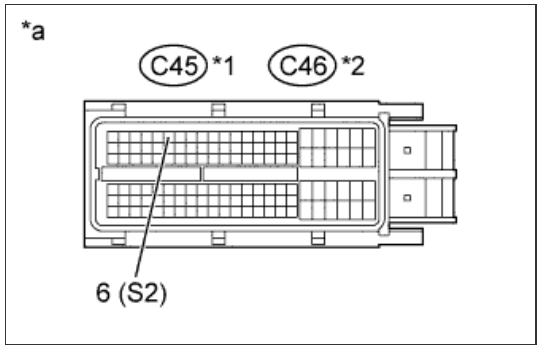
NG → Go to step 3

OK ↓

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-6 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-6 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ↓

REPLACE ECM (Click here)

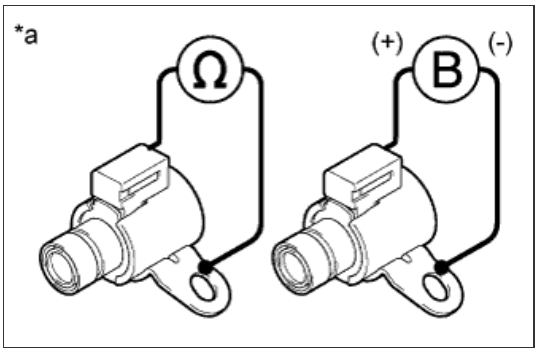
3.INSPECT SHIFT SOLENOID VALVE S2

a. Remove shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S2)

NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0717 Turbine Speed Sensor Circuit No Signal

for Preparation Click here

DESCRIPTION

This sensor detects the rotation speed of the turbine which shows the input revolution of the transmission. By comparing the input turbine speed signal NT with the counter gear speed sensor signal SP2, the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure according to various conditions. As a result, the gears shift smoothly.

DTC Code	DTC Detection Condition	Trouble Area
P0717	All the conditions below are detected for 5 sec. or more (1 trip detection logic). (a) Gear change is not performed. (b) The gear position is 4th, 5th or 6th. (c) The T/M input shaft rpm is 300 rpm or less. (d) The T/M output shaft rpm is 1000 rpm or more. (e) The park/neutral position switch: • The NSW input signal is OFF. • The R input signal is OFF. (f) The shift solenoid valves and park/neutral position switch are operating normally.	• Open or short in speed sensor NT circuit • Speed sensor NT • ECM • Automatic transmission (clutch, brake, gear, etc.)

Reference: Inspect using an oscilloscope.
Check the waveform of the ECM connector.

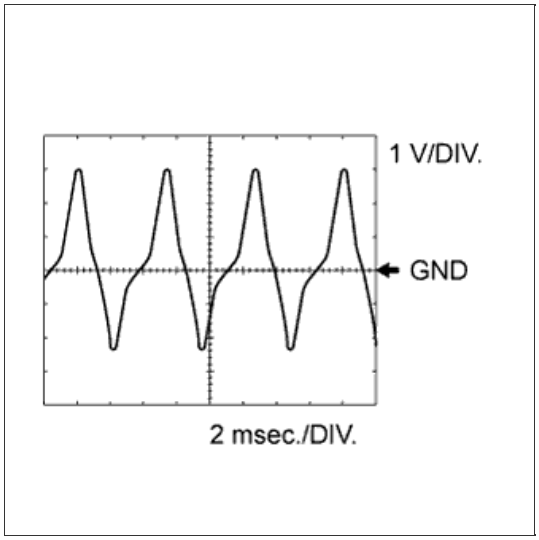
Standard:

for LHD

Terminal No. (Symbol)	Tool Setting	Condition	Specified Condition
C45-124 (NT+) - C45-123 (NT-)	1 V/DIV., 2 msec./DIV.	Engine idling (shift lever in P or N)	Refer to illustration

for RHD

Terminal No. (Symbol)	Tool Setting	Condition	Specified Condition
C46-124 (NT+) - C46-123 (NT-)	1 V/DIV., 2 msec./DIV.	Engine idling (shift lever in P or N)	Refer to illustration



MONITOR DESCRIPTION

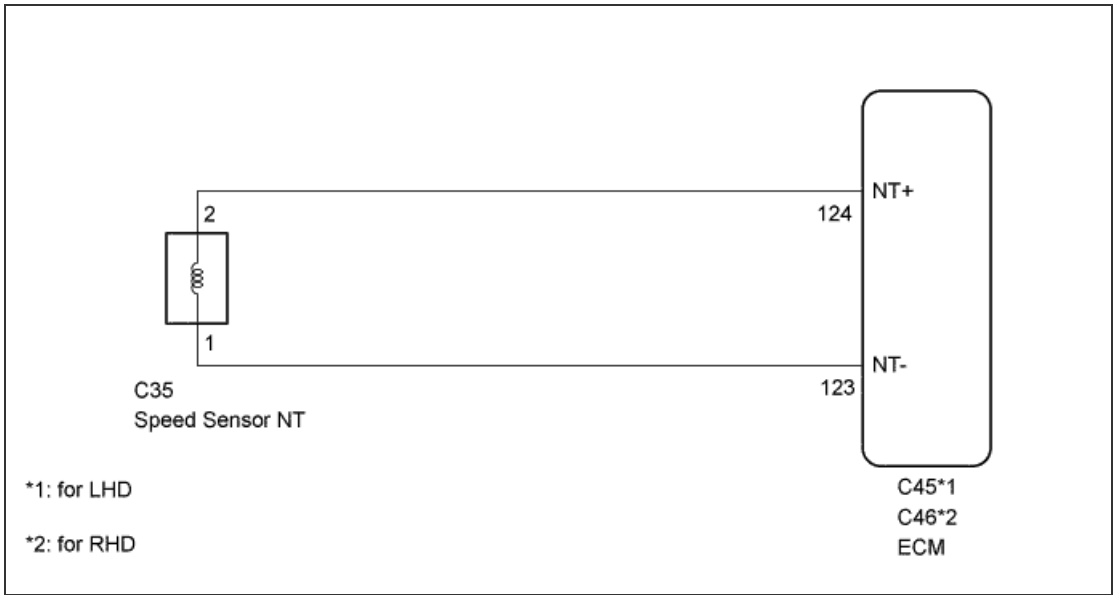
This DTC indicates that a pulse is not output from the speed sensor NT (turbine (input) speed sensor) or is output only a little. The NT terminal of the ECM detects the pulse signal from the speed sensor NT (input RPM). The ECM outputs a gear shift signal comparing the input speed sensor NT with the output speed sensor SP2.
While the vehicle is operating in 4th, 5th or 6th gear with the shift lever in D, if the input shaft speed is less than 300 rpm*1 although the output shaft speed is 1000 rpm or more*2, the ECM detects the trouble, illuminates the MIL and stores the DTC.

HINT:

- ***1: Pulse is not output or is irregularly output.**

- ***2: The vehicle speed is approximately 50 km/h (31 mph) or more.**

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the GTS to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the GTS, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
SPD (NT)	Input shaft speed/ Min.: 0 rpm Max.: 12750 rpm	Lock-up: • ON (after warming up engine): Input turbine speed (NT) equal to engine speed • OFF (idling with shift lever in N): Input turbine speed (NT) nearly equal to engine speed	The data is displayed in increments of 50 rpm.

HINT:

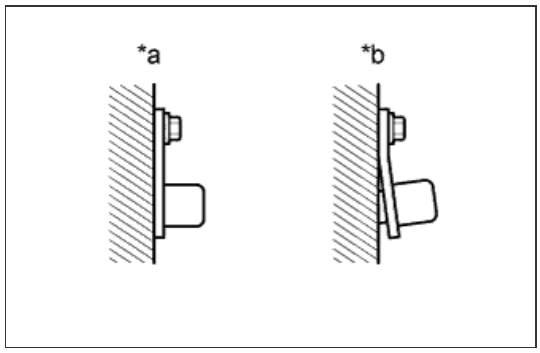
- **SPD (NT) is always 0 while driving:**
  Open or short in the sensor or circuit.
- **SPD (NT) is always more than 0 and less than 300 rpm while driving the vehicle at 50 km/h (31 mph) or more:**
  Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

1.INSPECT SPEED SENSOR NT INSTALLATION

a. Check the speed sensor NT installation.

OK:

The installation bolt is tightened properly and there is no clearance between the sensor and transmission case.



Text in Illustration

*a	CORRECT
*b	INCORRECT

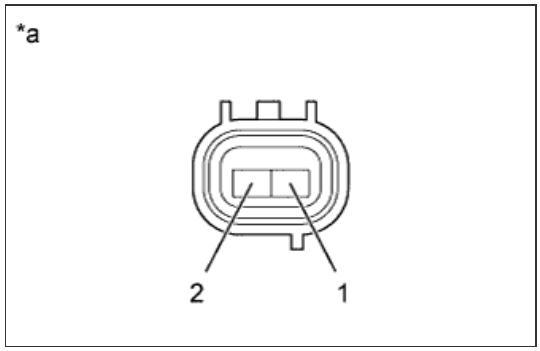
NG → SECURELY INSTALL OR REPLACE SPEED SENSOR NT (Click here)

OK ↓

2.INSPECT SPEED SENSOR NT

a. Disconnect the speed sensor connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	560 to 680 Ω

Text in Illustration

*a	Component without harness connected (Speed Sensor NT)

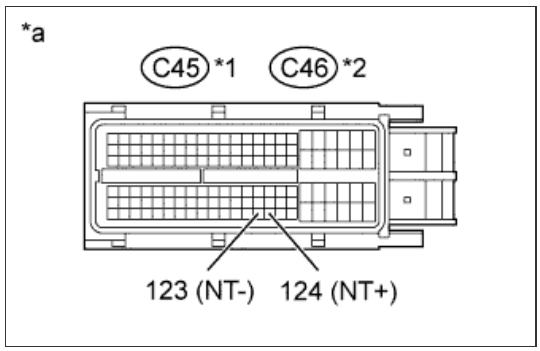
NG → REPLACE SPEED SENSOR NT (Click here)

OK ↓

3.CHECK HARNESS AND CONNECTOR (SPEED SENSOR NT - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-124 (NT+) - C45-123 (NT-)	20°C (68°F)	560 to 680 Ω
C45-124 (NT+) - Body	Always	10 kΩ or higher

ground		
C45-123 (NT-) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-124 (NT+) - C46-123 (NT-)	20°C (68°F)	560 to 680 Ω
C46-124 (NT+) - Body ground	Always	10 kΩ or higher
C46-123 (NT-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0979 Shift Solenoid "C" Control Circuit Low (Shift Solenoid Valve S3)

DTC P0980 Shift Solenoid "C" Control Circuit High (Shift Solenoid Valve S3)

for Preparation Click here

DESCRIPTION

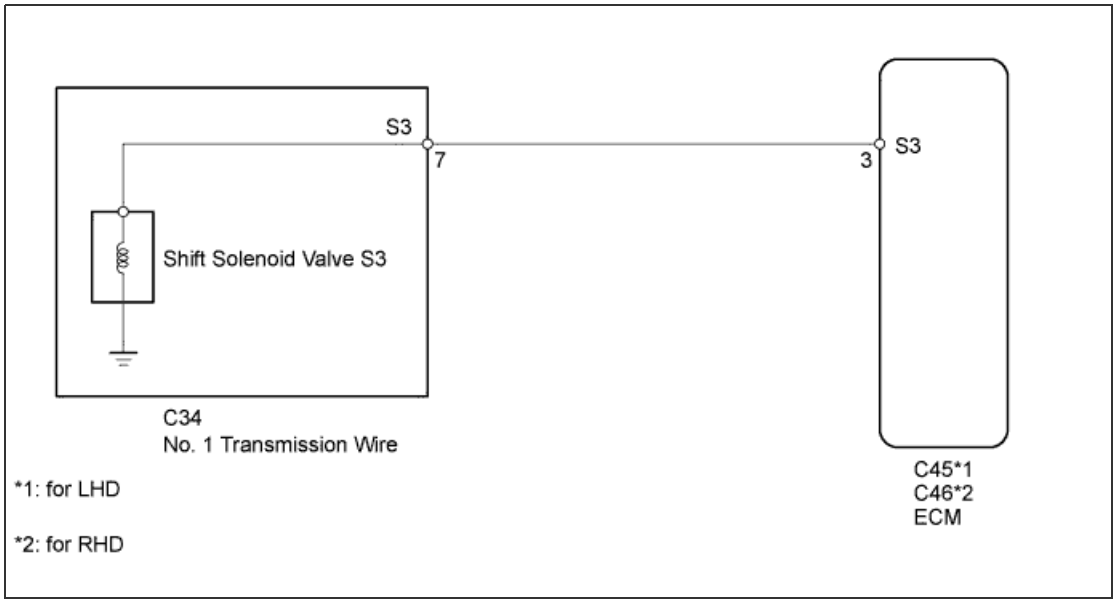
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0979	The ECM detects a short in the solenoid valve S3 circuit 2 times when the solenoid valve S3 is operated (1 trip detection logic).	• Short in shift solenoid valve S3 circuit • Shift solenoid valve S3 • ECM
P0980	The ECM detects an open in the solenoid valve S3 circuit 2 times when the solenoid valve S3 is not operated (1 trip detection logic).	• Open in shift solenoid valve S3 circuit • Shift solenoid valve S3 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S3 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S3 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S3 circuit.
When the shift solenoid valve S3 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S3 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

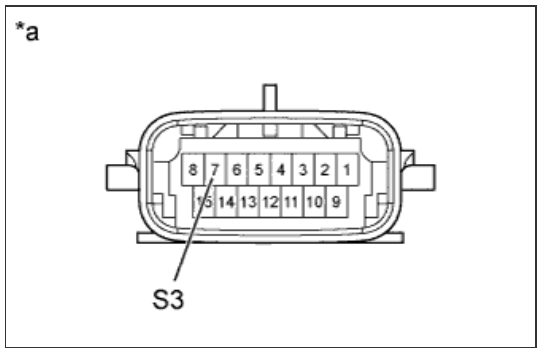
The shift solenoid valve S3 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S3	ON	ON	ON	OFF	OFF	OFF

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S3)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
7 (S3) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

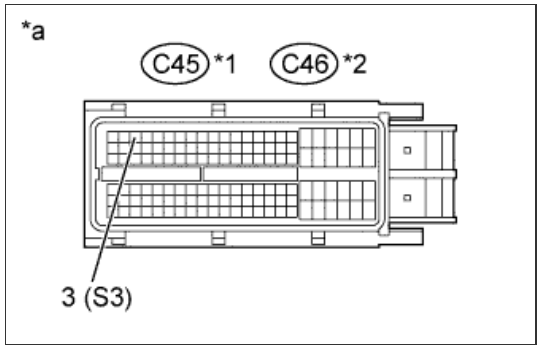
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-3 (S3) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-3 (S3) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

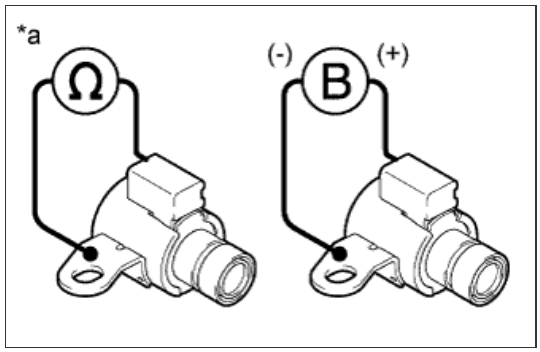
3.INSPECT SHIFT SOLENOID VALVE S3

a. Remove the shift solenoid valve S3.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S3 connector • Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S3)

NG → REPLACE SHIFT SOLENOID VALVE S3 (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0722 Output Speed Sensor Circuit No Signal

for Preparation Click here

DESCRIPTION

The speed sensor SP2 detects the rotation speed of the transmission output shaft and sends signals to the ECM. The ECM determines the vehicle speed based on these signals. An AC voltage is generated in the speed sensor SP2 coil as the parking gear mounted on the rear planetary gear assembly rotates, and this voltage is sent to the ECM. The parking gear on the rear planetary gear is used as the timing rotor for this sensor.
The gear shift point and lock-up timing are controlled by the ECM based on the signals from this vehicle speed sensor and the throttle position sensor signal.

DTC Code	DTC Detection Condition	Trouble Area
P0722	All conditions are met 5 seconds or more continuously (2 trip detection logic). (a) No signal from the speed sensor SP2 is input to the ECM while 4 pulses of the No. 1 vehicle speed sensor signal are sent. (b) The vehicle speed is 9 km/h (6 mph) or more for at least 5 sec. (c) The park/neutral position switch is off.	• Open or short in speed sensor SP2 circuit • Speed sensor SP2 • ECM • Automatic transmission (clutch, brake, gear, etc.)

Reference: Inspect using an oscilloscope.
Check the waveform of the ECM connector.

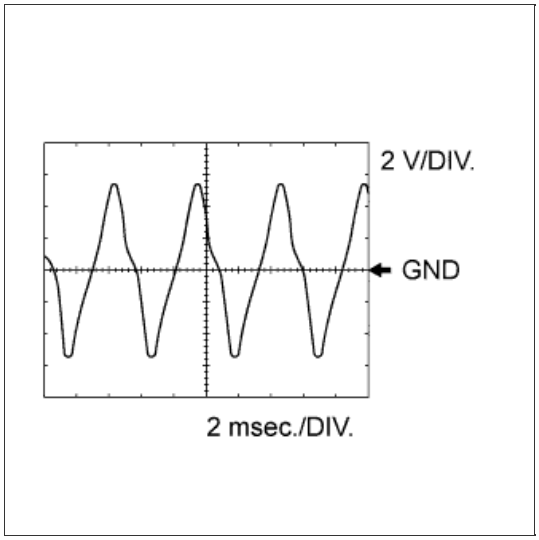
Standard:

for LHD

Terminal No. (Symbol)	Tool Setting	Condition	Specified Condition
C45-101 (SP2+) - C45-100 (SP2-)	2 V/DIV., 2 msec./DIV	Vehicle speed 20 km/h (12 mph)	Refer to illustration

for RHD

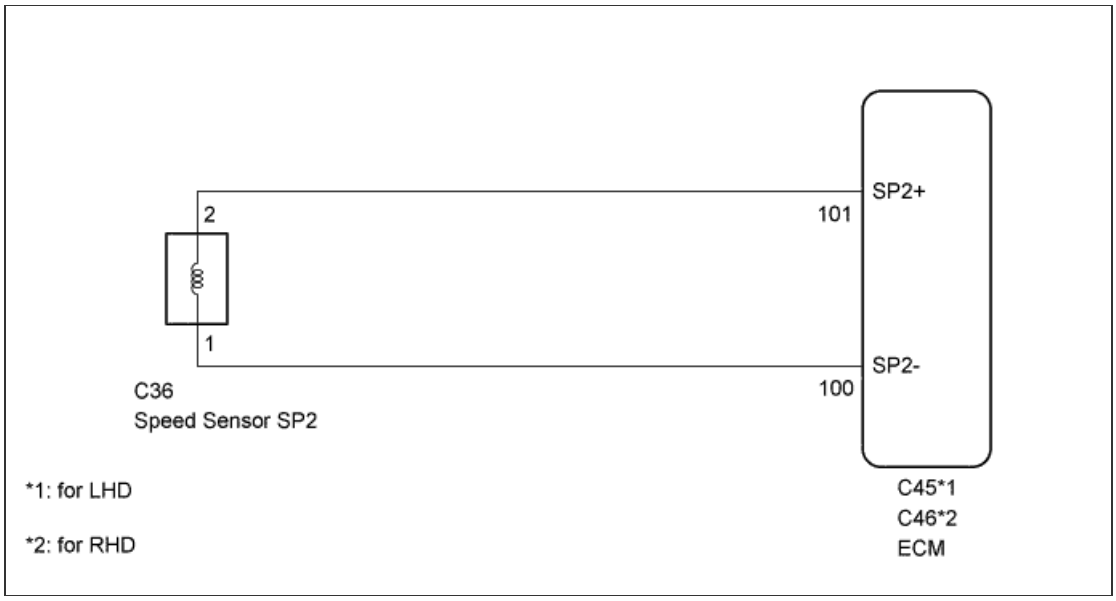
Terminal No. (Symbol)	Tool Setting	Condition	Specified Condition
C46-101 (SP2+) - C46-100 (SP2-)	2 V/DIV., 2 msec./DIV	Vehicle speed 20 km/h (12 mph)	Refer to illustration



MONITOR DESCRIPTION

The output speed sensor SP2 monitors the output shaft speed. The ECM controls the gear shift point and the lock up timing based on the signals from the output speed sensor SP2 and throttle position sensor.
If the ECM detects no signal from the output speed sensor SP2 even while the vehicle is moving, it will conclude that there is a malfunction of the output speed sensor SP2. The ECM will illuminate the MIL and store a DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the GTS to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the GTS, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
SPD (SP2)	Output shaft speed/ Min.: 0 km/h (0 mph) Max.: 255 km/h (158 mph)	Vehicle stopped: 0 km/h (0 mph) (output shaft speed equal to vehicle speed)	-

HINT:

- **SPD (SP2) is always 0 while driving:**
  Open or short in the sensor or circuit.
- **The SPD (SP2) value displayed on the GTS is much lower than the actual vehicle speed:**
  Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

1.INSPECT SPEED SENSOR SP2 INSTALLATION

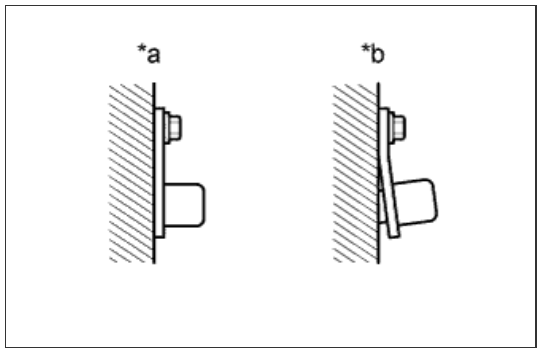
a. Check the speed sensor SP2 installation.

OK:

The installation bolt is tightened properly and there is no clearance between the sensor and transmission case.

Text in Illustration

*a	CORRECT
*b	INCORRECT



NG → SECURELY INSTALL OR REPLACE SPEED SENSOR SP2 (Click here)

OK →

2.INSPECT SPEED SENSOR SP2

a. Disconnect the speed sensor connector.

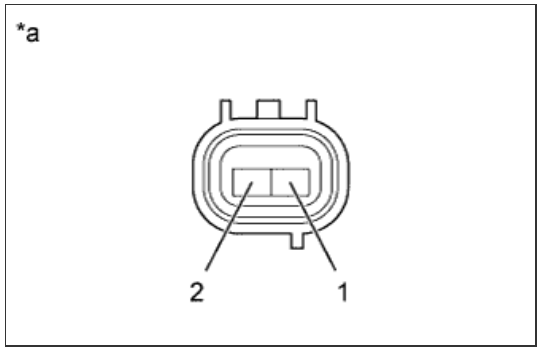
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	560 to 680 Ω

Text in Illustration

*a	Component without harness connected (Speed Sensor SP2)



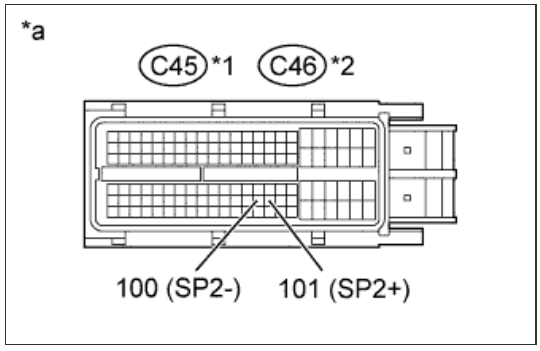
NG → REPLACE SPEED SENSOR SP2 (Click here)

OK →

3.CHECK HARNESS AND CONNECTOR (SPEED SENSOR SP2 - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-101 (SP2+) - C45-100 (SP2-)	20°C (68°F)	560 to 680 Ω
C45-101 (SP2+) - Body ground	Always	10 kΩ or higher
C45-100 (SP2-) - Body	Always	10 kΩ or higher

ground		

for RHD

Tester Connection	Condition	Specified Condition
C46-101 (SP2+) - C46-100 (SP2-)	20°C (68°F)	560 to 680 Ω
C46-101 (SP2+) - Body ground	Always	10 kΩ or higher
C46-100 (SP2-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0979 Shift Solenoid "C" Control Circuit Low (Shift Solenoid Valve S3)

DTC P0980 Shift Solenoid "C" Control Circuit High (Shift Solenoid Valve S3)

for Preparation Click here

DESCRIPTION

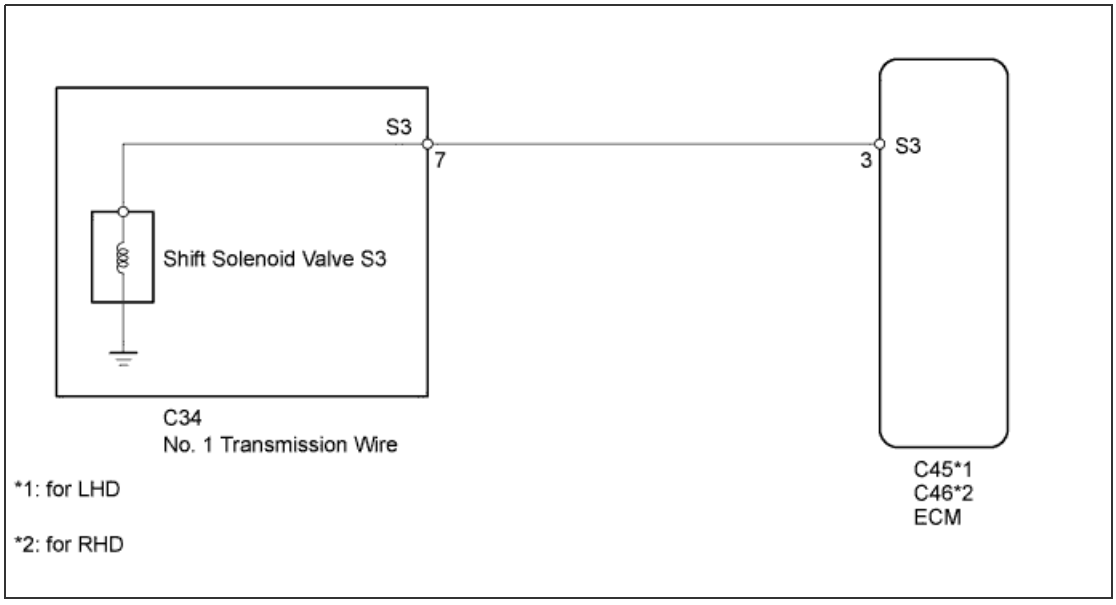
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0979	The ECM detects a short in the solenoid valve S3 circuit 2 times when the solenoid valve S3 is operated (1 trip detection logic).	• Short in shift solenoid valve S3 circuit • Shift solenoid valve S3 • ECM
P0980	The ECM detects an open in the solenoid valve S3 circuit 2 times when the solenoid valve S3 is not operated (1 trip detection logic).	• Open in shift solenoid valve S3 circuit • Shift solenoid valve S3 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S3 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S3 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S3 circuit.
When the shift solenoid valve S3 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S3 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

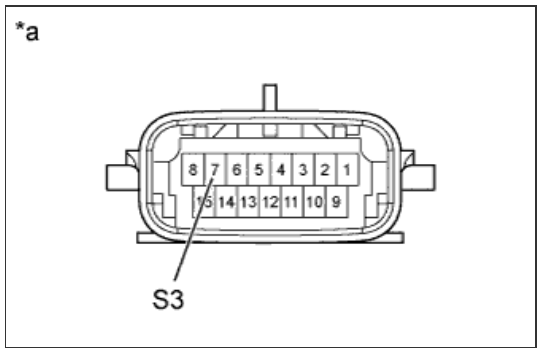
The shift solenoid valve S3 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S3	ON	ON	ON	OFF	OFF	OFF

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S3)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
7 (S3) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

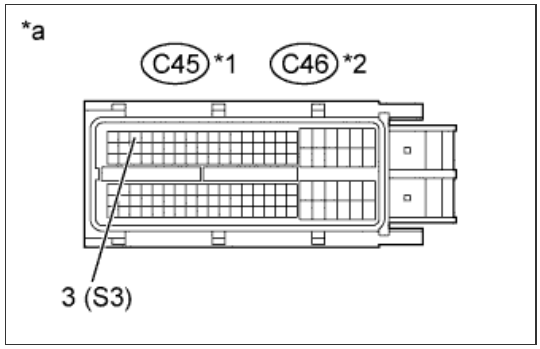
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-3 (S3) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-3 (S3) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

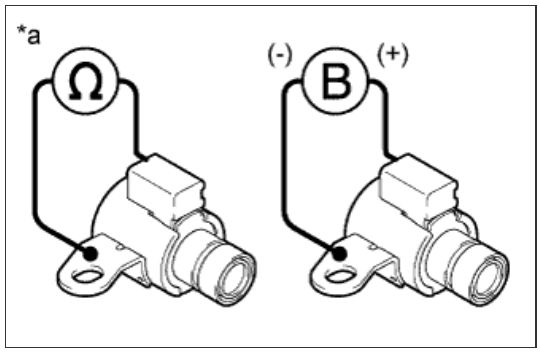
3.INSPECT SHIFT SOLENOID VALVE S3

a. Remove the shift solenoid valve S3.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S3 connector • Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S3)

NG → REPLACE SHIFT SOLENOID VALVE S3 (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0729 Gear 6 Incorrect Ratio

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output speed sensor SP2 and input speed sensor NT to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake, gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0729	6th gearshift malfunction: The ECM determines there is a malfunction when both of the following conditions are met (2 trip detection logic*1, 1 trip detection logic*2). (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is also shifted to 5th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 4th.	• Valve body is blocked up or stuck (sequence valve) • Shift solenoid valve SLT remains open or closed • Automatic transmission (clutch, brake, gear, etc.)

*1: w/ OBD
*2: w/o OBD

HINT:

- **Gear positions in the event of a solenoid valve mechanical problem:**

ECM command gearshift	1st	2nd	3rd	4th	5th	6th
Actual gear position under malfunction	1st	2nd	3rd	4th	5th	4th

- **Gear position during fail-safe operation:**
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
Actual gear position under fail-safe mode	1st	2nd	3rd	3rd	3rd	3rd

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves ON/OFF and switching oil pressure to the valves in the valve body.
The DTC indicates that the sequence valve is locked in the direction the spring stretches and that shifting to 6th gear is impossible.

INSPECTION PROCEDURE

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0729)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
Only P0729 is output	A
P0729 and other DTCs are output	B

HINT:

If any other codes besides P0729 are output, perform troubleshooting for those DTCs first.

B

GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING GTS (RUNNING TEST)

CAUTION:

This test should always be performed with at least 2 people.

NOTICE:

- **Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).**
- **Perform the test with the A/C turned off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Connect the GTS to the DLC3.

b. Clear the DTC (Click here).

c. Warm up the engine.

d. Enter the following menus: Powertrain / Engine and ECT / Active Test.

e. According to the display on the GTS, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the GTS.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position by yourself	• Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of shift solenoid valves. [Vehicle Condition] 50 km/h (30 mph) or less

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (30 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shift must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shift must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the GTS.**
- **Gear positions in the event of a solenoid valve mechanical problem:**

Tester command gearshift	1st	2nd	3rd	4th	5th	6th
Actual gear position under malfunction	1st	2nd	3rd	4th	5th	4th

OK:

Gear position changes in accordance with the GTS command.

NG

REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

3.PERFORM ACTIVE TEST USING GTS (SHIFT SOLENOID VALVE SLT)

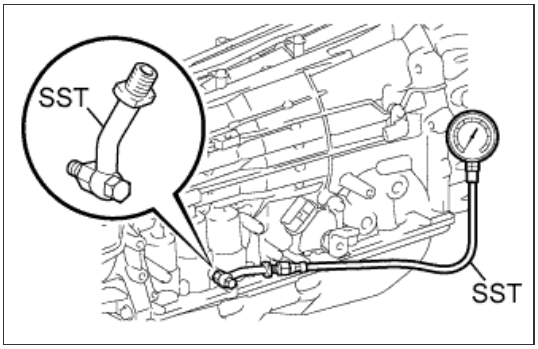
NOTICE:

- **Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).**
- **Be careful to prevent the hose of SST from interfering with the exhaust pipe.**
- **Perform the test with the A/C off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case and connect SST.



SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the GTS to the DLC3.

c. Start the engine and warm it up.

d. Measure the line pressure with SST.

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

h. Measure the line pressure.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate the shift solenoid SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands SLT solenoid to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • Vehicle stopped • Engine idling

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Please note that the pressure values in the Active Test and Hydraulic Test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (**Click here**)

OK

4.CLEAR DTC AND PERFORM RUNNING TEST

a. Clear the DTC (Click here).

b. Check for DTCs again after conducting the Monitor Drive Pattern (Click here).

OK:

No DTC code output.

NG → REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (**Click here**)

OK

```
END
```

DTC P0982 Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)

DTC P0983 Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)

for Preparation Click here

DESCRIPTION

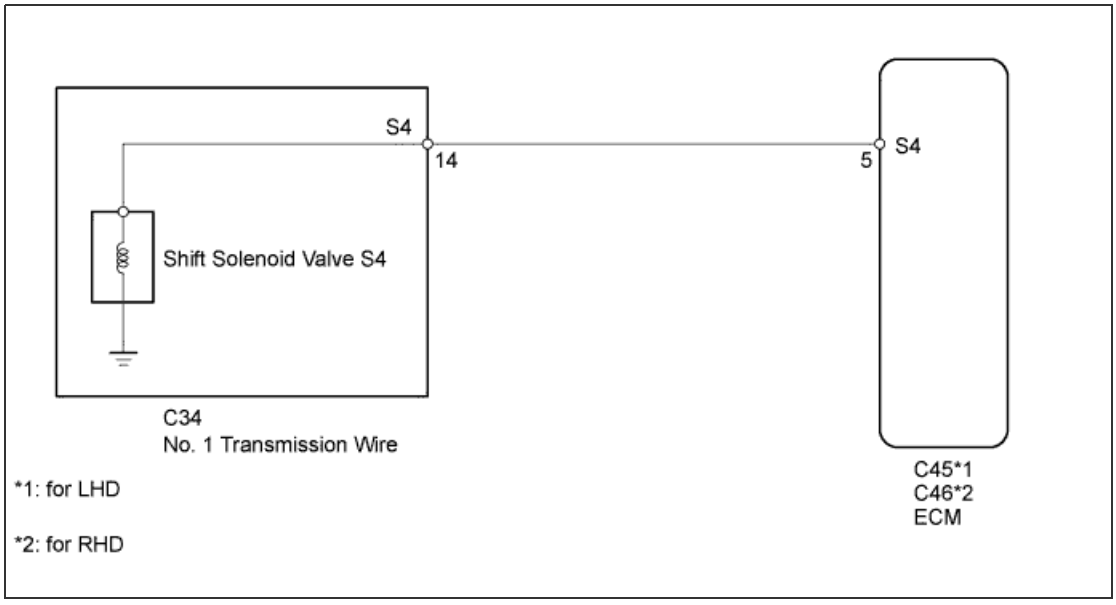
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0982	The ECM detects a short in the solenoid valve S4 circuit 2 times when the solenoid valve S4 is operated (1 trip detection logic).	• Short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM
P0983	The ECM detects an open in the solenoid valve S4 circuit 2 times when the solenoid valve S4 is not operated (1 trip detection logic).	• Open in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S4 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S4 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S4 circuit.
When the shift solenoid valve S4 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S4 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

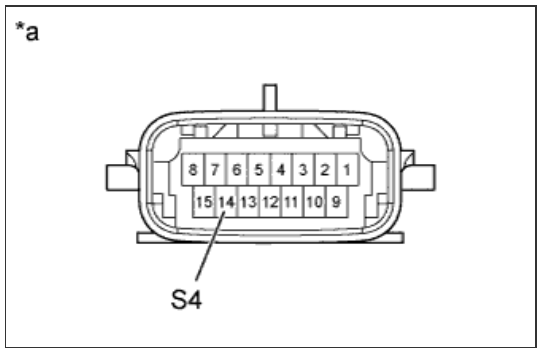
The shift solenoid valve S4 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S4	OFF	OFF	OFF	OFF	ON	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S4)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
14 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

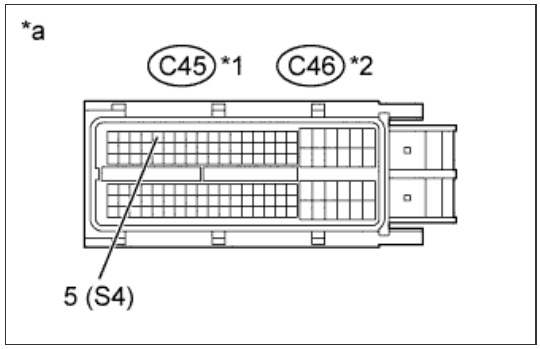
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-5 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-5 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

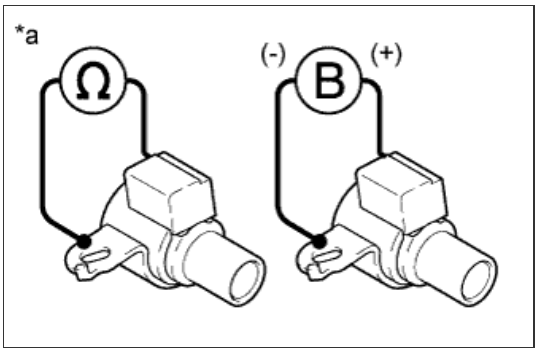
3.INSPECT SHIFT SOLENOID VALVE S4

a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S4)

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0748 Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)

for Preparation Click here

DESCRIPTION

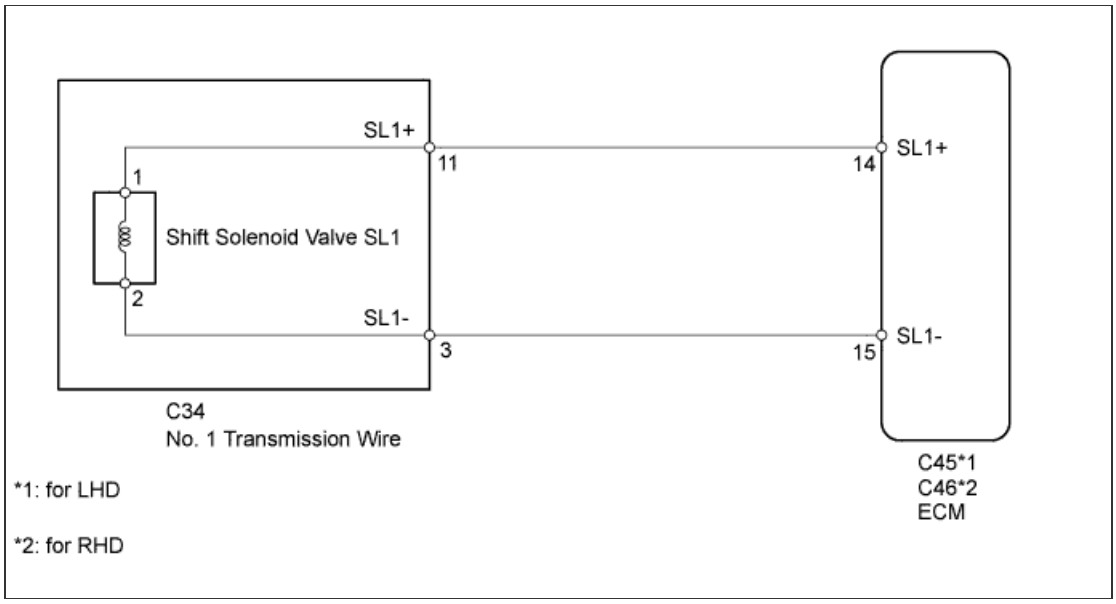
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0748	The ECM checks for an open or short in the shift solenoid valve SL1 circuit while driving and shifting between 4th and 5th gear (1 trip detection logic). The output signal duty equals 100%. **HINT:** The SL1 output signal duty is less than 100% under normal conditions.	• Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL1 circuit. The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. Also, the ECM performs the fail-safe function and turns the other normal shift solenoid valves ON/OFF. In case of an open or short circuit, the ECM stops sending current to the open or short circuited solenoid.
While driving and shifting between 4th and 5th gears, if the ECM detects an open or short in the shift solenoid valve SL1 circuit, the ECM determines that there is a malfunction (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

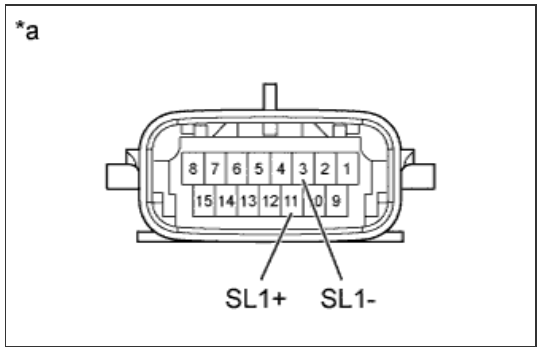
The shift solenoid valve SL1 turns ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve SL1	OFF	OFF	OFF	OFF	ON	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SL1)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
11 (SL1+) - 3 (SL1-)	20°C (68°F)	5.0 to 5.6 Ω
11 (SL1+) - Body ground	Always	10 kΩ or higher
3 (SL1-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

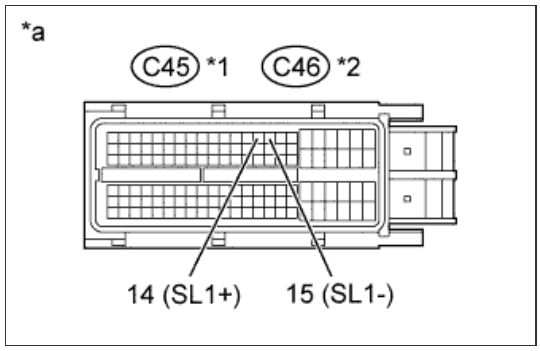
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-14 (SL1+) - C45-15 (SL1-)	20°C (68°F)	5.0 to 5.6 Ω
C45-14 (SL1+) - Body ground	Always	10 kΩ or higher
C45-15 (SL1-) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-14 (SL1+) - C46-15 (SL1-)	20°C (68°F)	5.0 to 5.6 Ω
C46-14 (SL1+) - Body ground	Always	10 kΩ or higher
C46-15 (SL1-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SL1

a. Remove the shift solenoid valve SL1.

b. Measure the resistance according to the value(s) in the table below.

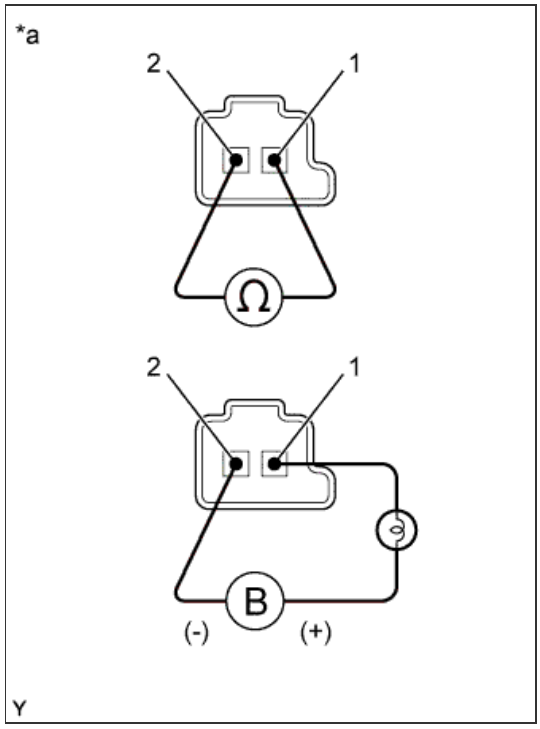
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SL1)

NG → REPLACE SHIFT SOLENOID VALVE SL1 (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0982 Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)

DTC P0983 Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)

for Preparation Click here

DESCRIPTION

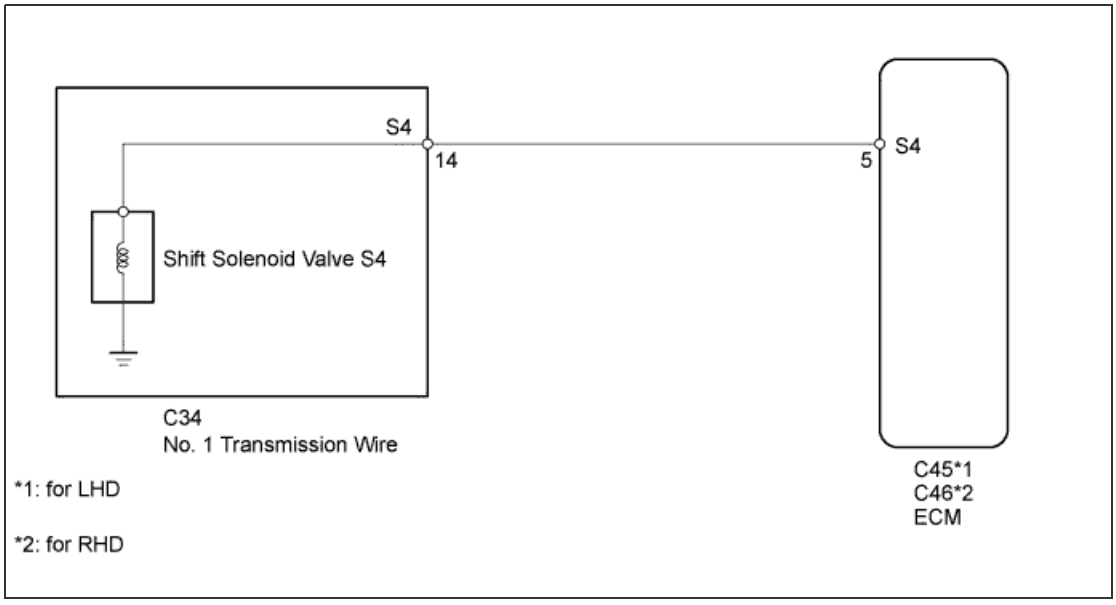
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0982	The ECM detects a short in the solenoid valve S4 circuit 2 times when the solenoid valve S4 is operated (1 trip detection logic).	• Short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM
P0983	The ECM detects an open in the solenoid valve S4 circuit 2 times when the solenoid valve S4 is not operated (1 trip detection logic).	• Open in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S4 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S4 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S4 circuit.
When the shift solenoid valve S4 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S4 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

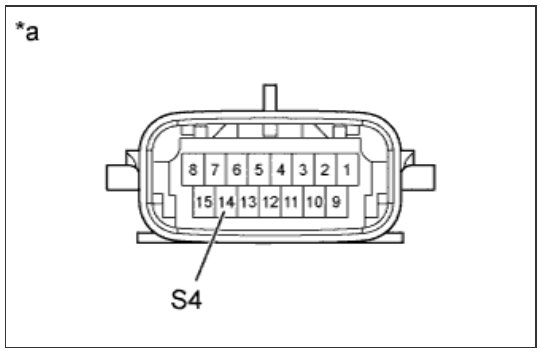
The shift solenoid valve S4 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S4	OFF	OFF	OFF	OFF	ON	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S4)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
14 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

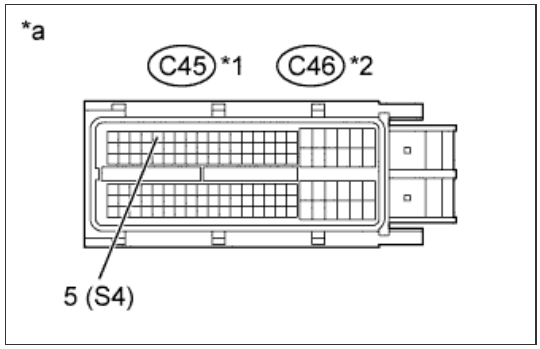
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-5 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-5 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

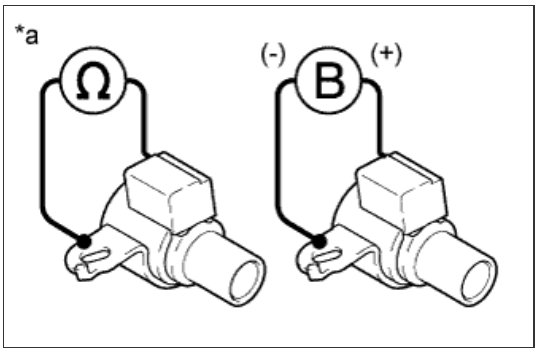
3.INSPECT SHIFT SOLENOID VALVE S4

a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S4)

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0751 Shift Solenoid "A" Performance (Shift Solenoid Valve S1)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake, gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0751	S1 stuck ON malfunction*1: The ECM determines there is a malfunction when the following conditions are both met. (2 trip detection logic*3, 1 trip detection logic*4) (a) When the ECM directs the transmission to switch to 1st gear, the actual gear is shifted to 2nd. (b) When the ECM directs the transmission to switch to 5th gear, the actual gear is also shifted to 5th.	• Shift solenoid valve S1 remains closed • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)
P0751	S1 stuck OFF malfunction*2: The ECM determines there is a malfunction when conditions (a) and (b) are met. (2 trip detection logic*3, 1 trip detection logic*4) (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is also shifted to 5th. (b) When the ECM directs the transmission to switch to 6th gear, the engine overruns (clutch slips).	• Shift solenoid valve S1 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked • No. 2 brake malfunction (Driving is difficult.) • Automatic transmission (clutch, brake, gear, etc.)

*3: w/ OBD
*4: w/o OBD

HINT:

- **Gear positions in the event of a solenoid valve mechanical problem:**

ECM command gearshift	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under S1 stuck ON malfunction	2nd	2nd	3rd	4th	5th	6th
*2: Actual gear position under S1 stuck OFF malfunction	1st	1st	3rd	4th	5th	N*

N*: Neutral

- **Gear position during fail-safe operation:**
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under fail-safe mode when S1 stuck ON malfunction	2nd	2nd	3rd	4th	5th	6th
*2: Actual gear position under fail-safe mode when S1 stuck OFF malfunction	1st*	1st*	3rd	3rd	3rd	3rd

***: Under engine braking, downshifting to 1st or 2nd gear is prohibited.**

MONITOR DESCRIPTION

This DTC indicates a stuck ON malfunction or stuck OFF malfunction of shift solenoid valve S1.
The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the GTS.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valves and set each shift position by yourself	• Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of the shift solenoid valves. [Vehicle Condition] 50 km/h (30 mph) or less

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (30 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shift must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shift must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the GTS.**
- **Shift solenoid valve S1 turns ON/OFF normally when the shift lever is in D.**

ECM command gearshift	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S1	OFF	ON	ON	ON	ON	ON

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0751)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
Only P0751 is output	A
P0751 and other DTCs are output	B

HINT:

If any other codes besides P0751 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING GTS (SHIFT SOLENOID VALVE SLT)

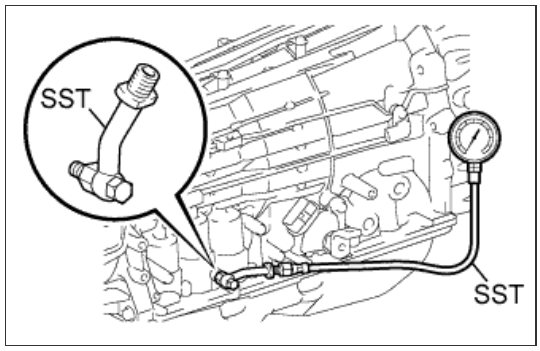
NOTICE:

- **Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).**
- **Be careful to prevent the hose of SST from interfering with the exhaust pipe.**
- **Perform the test with the A/C off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case and connect SST.



SST
09992-00095 (09992-00231, 09992-00271)

b. Connect the GTS to the DLC3.

c. Start the engine and warm it up.

d. Measure the line pressure with SST.

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

h. Measure the line pressure.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate the shift solenoid SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands SLT solenoid to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • Vehicle stopped • Engine idling

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Please note that the pressure values in the Active Test and Hydraulic Test are different.

OK:
The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

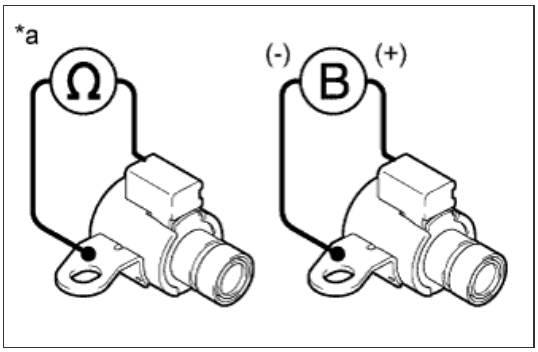
3.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S1)

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

4.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P0985 Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)

DTC P0986 Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)

for Preparation Click here

DESCRIPTION

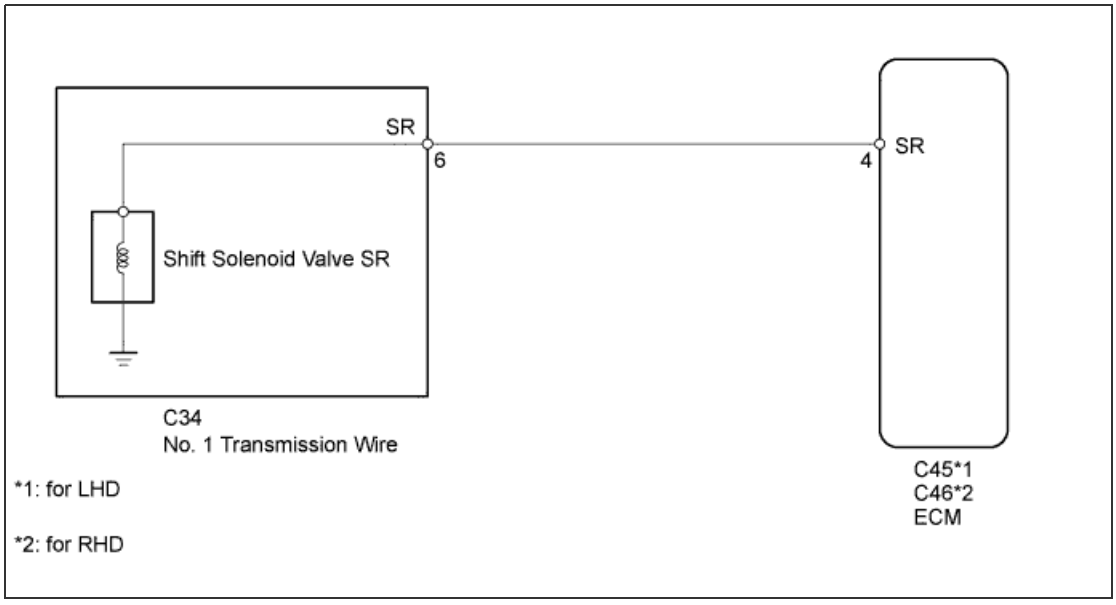
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0985	The ECM detects a short in the solenoid valve SR circuit 2 times when the solenoid valve SR is operated (1 trip detection logic).	• Short in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM
P0986	The ECM detects an open in the solenoid valve SR circuit 2 times when the solenoid valve SR is not operated (1 trip detection logic).	• Open in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve SR circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve SR is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve SR circuit.
When the shift solenoid valve SR is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve SR circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

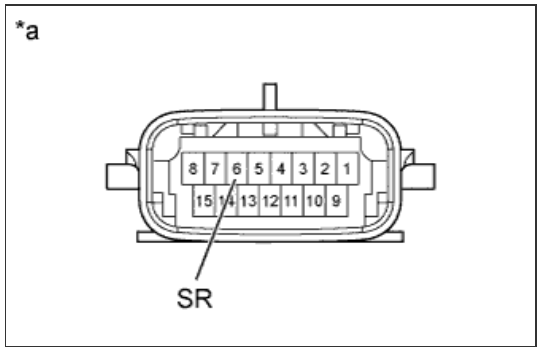
The shift solenoid valve SR is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve SR	ON	ON	ON	ON	OFF	OFF

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SR)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
6 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

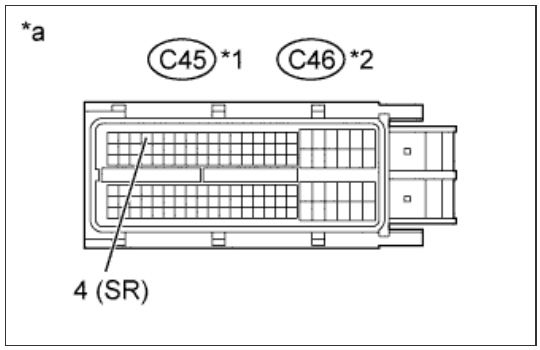
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-4 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-4 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

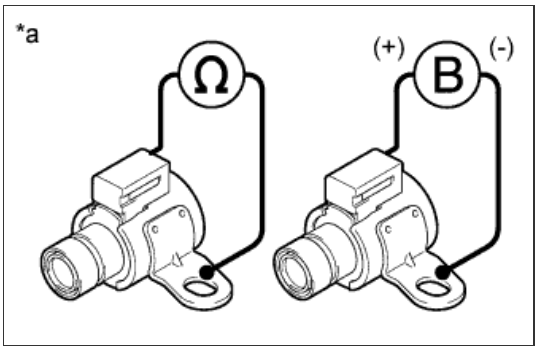
OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SR

a. Remove the shift solenoid valve SR.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve SR connector terminal - Shift solenoid valve SR body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve SR connector • Battery negative (-) → Shift solenoid valve SR body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SR)

NG → REPLACE SHIFT SOLENOID VALVE SR (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0756 Shift Solenoid "B" Performance (Shift Solenoid Valve S2)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body and automatic transmission (clutch, brake, gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0756	S2 stuck ON malfunction*1: Shifting to 3rd and 5th gears is impossible. The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic): (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is shifted to 6th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 6th.	• Shift solenoid valve S2 remains closed • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)
P0756	S2 stuck OFF malfunction*2: The vehicle starts in 3rd gear and shifting to 6th gear is impossible. The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic): (a) When the ECM directs the transmission to switch to 1st gear, the actual gear is shifted to 3rd. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 5th.	• Shift solenoid valve S2 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)

HINT:

Gear positions in the event of a solenoid valve mechanical problem:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under S2 stuck ON malfunction	1st	2nd	2nd	4th	6th	6th
*2: Actual gear position under S2 stuck OFF malfunction	3rd	3rd	3rd	4th	5th	5th

MONITOR DESCRIPTION

This DTC indicates a "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve S2.
The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the GTS.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valves and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of the shift solenoid valves. [Vehicle Condition] 50 km/h (30 mph) or less

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (30 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the GTS.**
- **The shift solenoid valve S2 turns ON/OFF normally when the shift lever is in D.**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S2	ON	ON	OFF	OFF	OFF	ON

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0756)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
Only P0756 is output	A
P0756 and other DTCs are output	B

HINT:

If any other codes besides P0756 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.INSPECT SHIFT SOLENOID VALVE S2

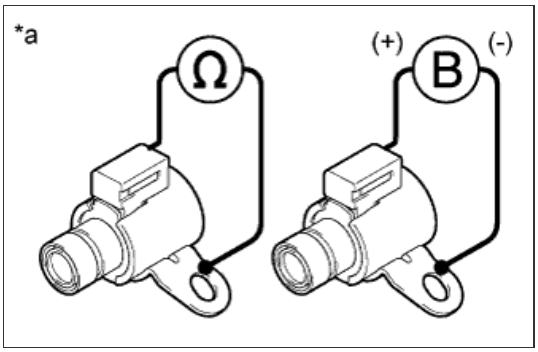
a. Remove shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector		

terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S2)

NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK

3.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P0985 Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)

DTC P0986 Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)

for Preparation Click here

DESCRIPTION

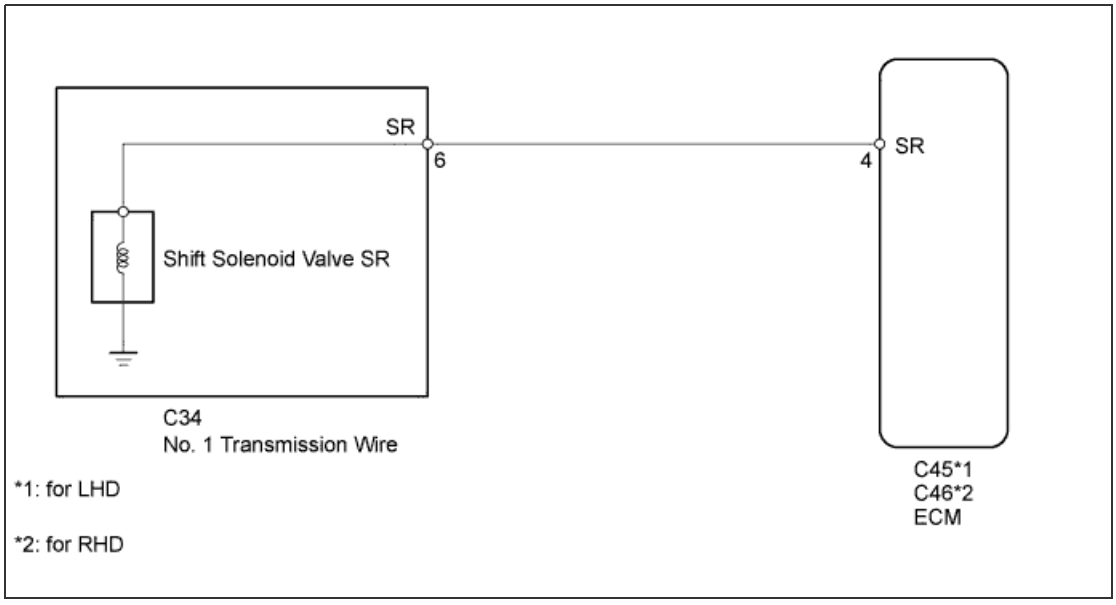
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0985	The ECM detects a short in the solenoid valve SR circuit 2 times when the solenoid valve SR is operated (1 trip detection logic).	• Short in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM
P0986	The ECM detects an open in the solenoid valve SR circuit 2 times when the solenoid valve SR is not operated (1 trip detection logic).	• Open in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve SR circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve SR is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve SR circuit.
When the shift solenoid valve SR is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve SR circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

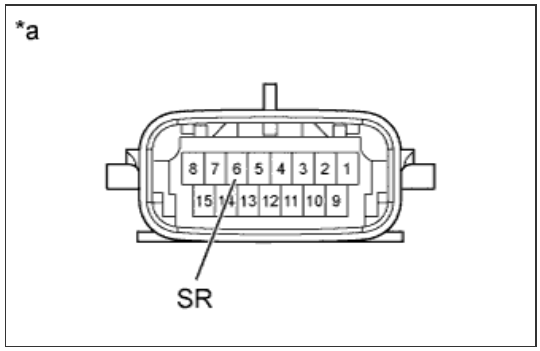
The shift solenoid valve SR is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve SR	ON	ON	ON	ON	OFF	OFF

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SR)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
6 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

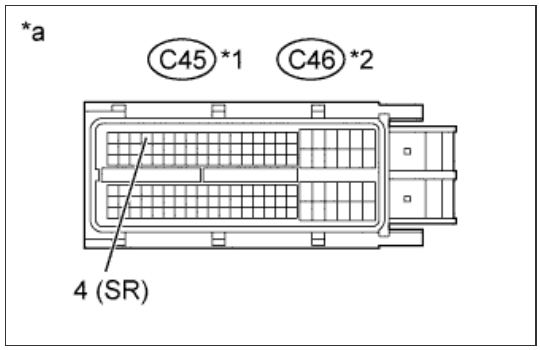
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-4 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-4 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

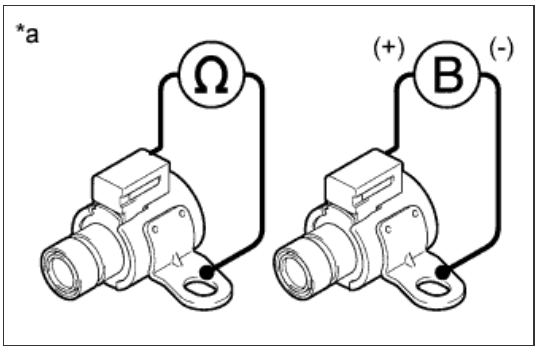
OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SR

a. Remove the shift solenoid valve SR.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve SR connector terminal - Shift solenoid valve SR body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve SR connector • Battery negative (-) → Shift solenoid valve SR body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SR)

NG → REPLACE SHIFT SOLENOID VALVE SR (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0761 Shift Solenoid "C" Performance (Shift Solenoid Valve S3)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake, gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0761	S3 stuck ON malfunction*1: When the ECM directs the gearshift to switch to 5th or 6th gear, the engine overruns (clutch slips). The ECM determines there is a malfunction when either of the following conditions is met (2 trip detection logic*3, 1 trip detection logic*4). (a) When the ECM directs the transmission to switch to 4th gear, the actual gear is shifted to 3rd. (b) When the ECM directs the transmission to switch to 5th gear, the engine overruns (clutch slips).	• Shift solenoid valve S3 remains closed • Shift solenoid valve SLT remains closed • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)
P0761	S3 stuck OFF malfunction*2: Shifting to 1st, 2nd, and 3rd gears is impossible. The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic*3, 1 trip detection logic*4). (a) When the ECM directs the transmission to switch to 2nd gear, the actual gear is shifted to 4th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 6th.	• Shift solenoid valve S3 remains open • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)

*3: w/ OBD
*4: w/o OBD

HINT:

- **Gear positions in the event of a solenoid valve mechanical problem:**

ECM command gearshift	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under S3 stuck ON malfunction	1st	2nd	3rd	3rd	N*	N*
*2: Actual gear position under S3 stuck OFF malfunction	3rd	4th	4th	4th	5th	6th

N*: Neutral

- **Gear position during fail-safe operation:**
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under fail-safe mode when S3 stuck ON malfunction	1st	2nd	3rd	3rd	3rd	3rd
*2: Actual gear position under fail-safe mode when S3 stuck OFF malfunction	3rd	4th	4th	4th	5th	6th

MONITOR DESCRIPTION

This DTC indicates a stuck ON malfunction or stuck OFF malfunction of shift solenoid valve S3.

The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the GTS.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valves and set each shift position by yourself	• Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of the shift solenoid valves. [Vehicle Condition] 50 km/h (30 mph) or less

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (30 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shift must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shift must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the GTS.**
- **Shift solenoid valve SL2 turns ON/OFF normally when the shift lever is in D.**

ECM command gearshift	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S3	ON	ON	ON	OFF	OFF	OFF

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0761)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
Only P0761 is output	A
P0761 and other DTCs are output	B

HINT:

If any other codes besides P0761 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING GTS (SHIFT SOLENOID VALVE SLT)

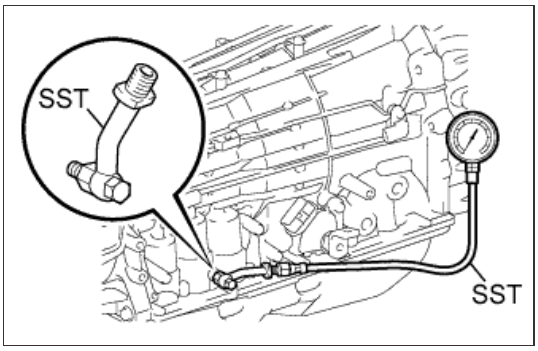
NOTICE:

- **Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).**
- **Be careful to prevent the hose of SST from interfering with the exhaust pipe.**
- **Perform the test with the A/C off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case and connect SST.



SST
09992-00095 (09992-00231, 09992-00271)

b. Connect the GTS to the DLC3.

c. Start the engine and warm it up.

d. Measure the line pressure with SST.

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

h. Measure the line pressure.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate the shift solenoid SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands SLT solenoid to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • Vehicle stopped • Engine idling

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Please note that the pressure values in the Active Test and Hydraulic Test are different.

OK:
The line pressure changes as specified when performing the Active Test.

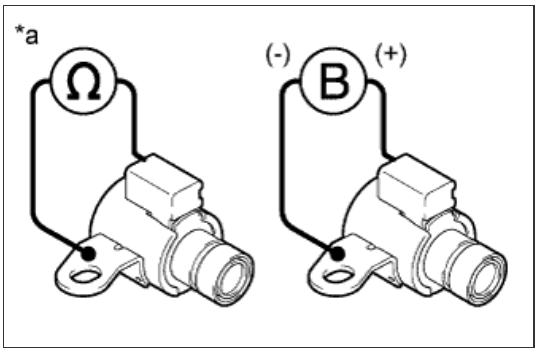
NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

3.INSPECT SHIFT SOLENOID VALVE S3

a. Remove the shift solenoid valve S3.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S3 connector • Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S3)

NG → REPLACE SHIFT SOLENOID VALVE S3 (Click here)

OK

4.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on each valve.

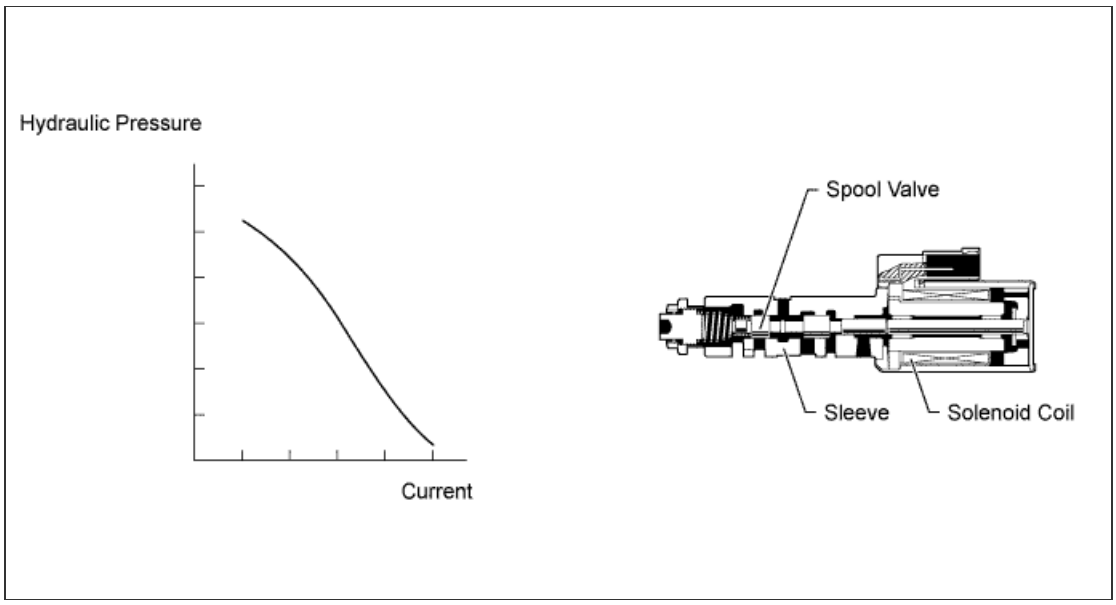
NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

for Preparation Click here

DESCRIPTION



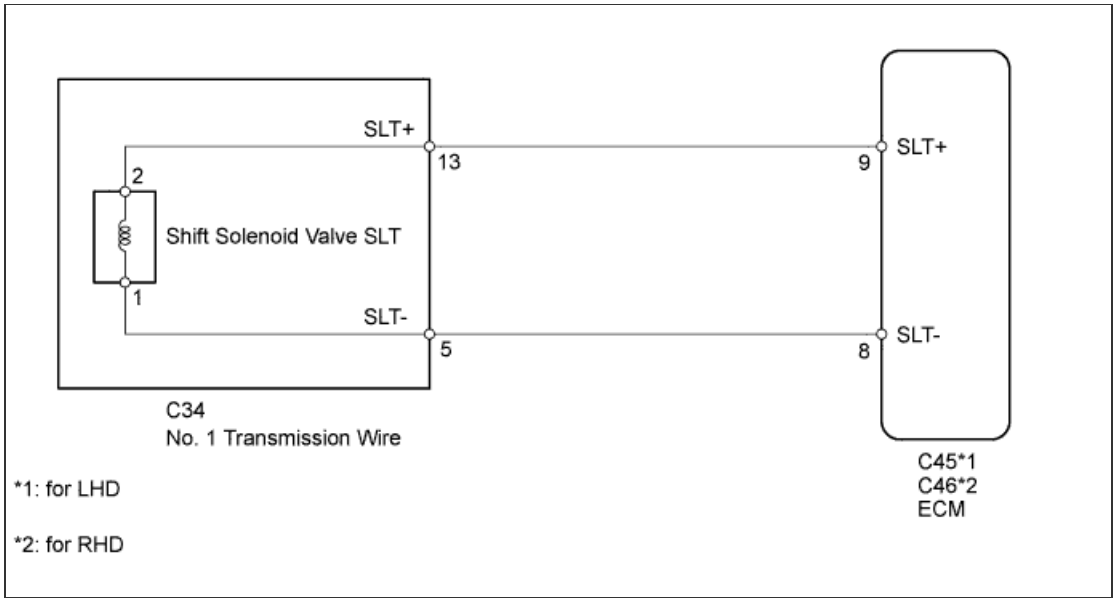
Shift solenoid valve SLT controls the transmission line pressure for smooth transmission operation based on signals from the throttle position sensor and vehicle speed sensor. The ECM adjusts the current to shift solenoid valve SLT to control the hydraulic line pressure coming from the primary regulator valve.
Appropriate line pressure assures smooth shifting with varying engine outputs.

DTC Code	DTC Detection Condition	Trouble Area
P2716	Open or short is detected in shift solenoid valve SLT circuit for 1 second or more while driving (1 trip detection logic)	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM

MONITOR DESCRIPTION

When an open or short in the shift solenoid valve SLT circuit is detected, the ECM interprets this as a fault. The ECM will turn on the MIL and store the DTC.

WIRING DIAGRAM

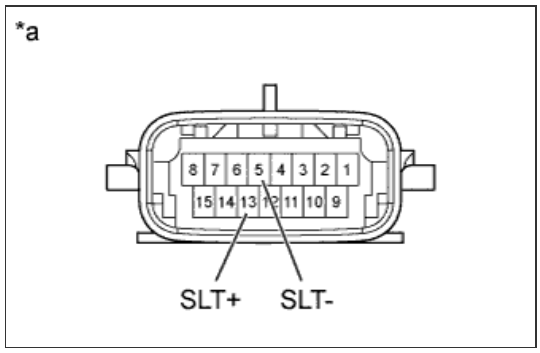


INSPECTION PROCEDURE

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SLT)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
13 (SLT+) - 5 (SLT-)	20°C (68°F)	5.0 to 5.6 Ω
13 (SLT+) - Body ground	Always	10 kΩ or higher
5 (SLT-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

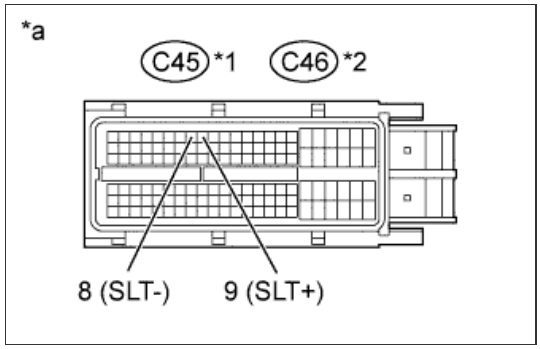
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-9 (SLT+) - C45-8 (SLT-)	20°C (68°F)	5.0 to 5.6 Ω
C45-9 (SLT+) - Body ground	Always	10 kΩ or higher
C45-8 (SLT-) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-9 (SLT+) - C46-8 (SLT-)	20°C (68°F)	5.0 to 5.6 Ω
C46-9 (SLT+) - Body ground	Always	10 kΩ or higher
C46-8 (SLT-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
	Front view of wire harness connector

*a	(to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SLT

a. Remove shift solenoid valve SLT.

b. Measure the resistance according to the value(s) in the table below.

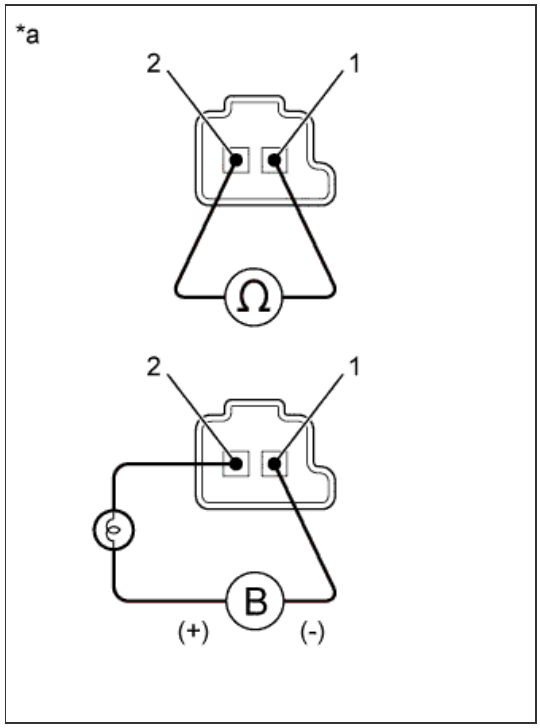
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SLT)

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0766 Shift Solenoid "D" Performance (Shift Solenoid Valve S4)

DTC P0776 Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake, gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0766	S4 stuck OFF malfunction or brake control valve malfunction*1: Shifting to 5th and 6th gears is impossible. The ECM determines there is a malfunction when the following conditions are both met. (2 trip detection logic*2, 1 trip detection logic*3) (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is shifted to 4th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 4th.	• Shift solenoid valve S4 remains closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked (Brake control valve) • Automatic transmission (clutch, brake, gear, etc.)
P0776	SL2 stuck ON malfunction or brake control valve malfunction*1: Shifting to 5th and 6th gears is impossible. The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic): (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is shifted to 4th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 4th.	• Shift solenoid valve SL2 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked (Brake control valve) • Automatic transmission (clutch, brake, gear, etc.)

*2: w/ OBD
*3: w/o OBD

HINT:

- **Gear positions in the event of a solenoid valve mechanical problem:**

ECM command gearshift	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under malfunction	1st	2nd	3rd	4th	4th	4th

- **Gear position during fail-safe operation:**
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under fail-safe mode	1st	2nd	3rd	3rd	3rd	3rd

MONITOR DESCRIPTION

This DTC indicates a stuck OFF malfunction of shift solenoid valve S4, stuck ON malfunction of shift solenoid valve SL2, or brake control valve malfunction. The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive

functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the GTS.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valves and set each shift position by yourself	• Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of the shift solenoid valves. [Vehicle Condition] 50 km/h (30 mph) or less

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (30 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shift must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shift must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the GTS.**
- **Shift solenoid valve SL2 turns ON/OFF normally when the shift lever is in D.**

ECM command gearshift	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S4	OFF	OFF	OFF	OFF	ON	ON
Shift solenoid valve SL2	ON	ON	ON	ON	OFF	OFF

1.CHECK DTC OUTPUT (IN ADDITION TO DTCS P0766 AND P0776)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
Only P0766 and P0776 are output	A
P0766, P0776 and other DTCs are output	B

HINT:

If any other codes besides P0766 and P0776 are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART (Click here)**

A

2.PERFORM ACTIVE TEST USING GTS (SHIFT SOLENOID VALVE SLT)

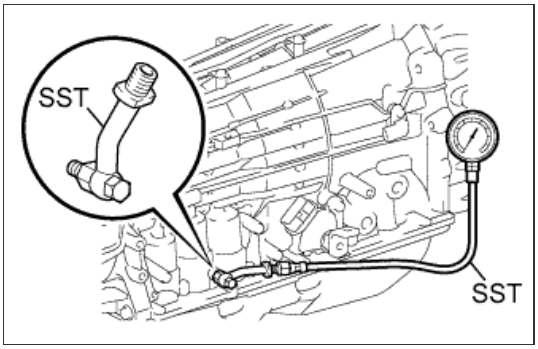
NOTICE:

- **Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).**
- **Be careful to prevent the hose of SST from interfering with the exhaust pipe.**
- **Perform the test with the A/C off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case and connect SST.



SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the GTS to the DLC3.

c. Start the engine and warm it up.

d. Measure the line pressure with SST.

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

h. Measure the line pressure.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate the shift solenoid SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands SLT solenoid to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • Vehicle stopped • Engine idling

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Please note that the pressure values in the Active Test and Hydraulic Test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

3.INSPECT SHIFT SOLENOID VALVE S4

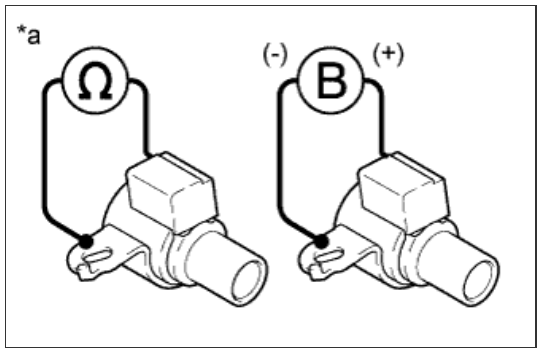
a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector		

terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S4)

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK

4.INSPECT SHIFT SOLENOID VALVE SL2

a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

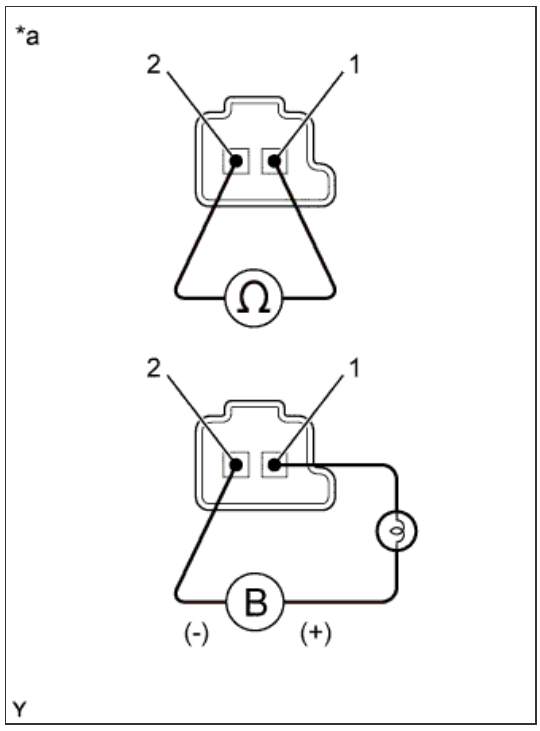
c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SL2)



NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK

5.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on each valve.

→ REPAIR OR REPLACE TRANSMISSION VALVE BODY

NG

ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P2742 Transmission Fluid Temperature Sensor "B" Circuit Low Input

DTC P2743 Transmission Fluid Temperature Sensor "B" Circuit High Input

for Preparation Click here

DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor is on the transmission, just in front of the oil cooler inlet pipeline.
If the ECM detects an abnormally high ATF temperature near this sensor, it illuminates the warning light.

HINT:

- **The temperature of ATF easily rises when towing, climbing hills, in traffic, etc.**
- **If the ATF temperature sensor becomes short-circuited, the signal that indicates that the ATF temperature is 150°C (302°F) or higher is input into the ECM.**

Vehicle conditions when the sensor is normal and when the sensor is short-circuited are indicated in the table below.

No. 2 ATF Temperature Sensor State	Detection Condition	Symptom	Recovery Condition
Sensor is normal	ATF temperature more than 150°C (302°F)	ATF temperature warning light remains ON	ATF temperature less than 135°C (275°F)*1
	ATF temperature more than 130°C (266°F)	Shift point too high	ATF temperature less than 110°C (230°F)
	When the conditions (a) and (b) are satisfied. (a) ATF temperature more than 130°C (266°F) (b) Engine coolant temperature more than 95°C (203°F)	Lock-up at 3rd gear*2	ATF temperature less than 110°C (230°F)*1 and engine coolant temperature more than 95°C (203°F)
Sensor is short-circuited	Any conditions	• ATF temperature warning light blinks or message is displayed in combination meter • Shift point too high	Symptoms still occur
	Engine coolant temperature more than 95°C (203°F)	Lock-up at 3rd gear*2	Symptoms still occur

HINT:

*1: When the ATF is normal, the ATF temperature decreases to less than 135°C (275°F) within 5 minutes with the shift lever in P or N in an idling state.

*2: When ATF temperature is normal, transmission lock-up occurs in 5th or 6th gear with the shift lever in D or S with the S6 range selected, in 5th gear with the shift lever in S with the S5 range selected, and 4th gear with the shift lever in S with the S4 range selected.

DTC Code	DTC Detection Condition	Trouble Area
P2742	No. 2 ATF temperature sensor resistance is less than 25 Ω (0.046 V) for 0.5 seconds or more (1 trip detection logic).	• Short in No. 2 ATF temperature sensor circuit • No. 2 ATF temperature sensor (No. 1 transmission wire) • ECM
P2743	ATF temperature sensor resistance is higher than 156 kΩ (4.915 V) for 0.5 sec. or more and either condition is met (1 trip detection logic): (A) 15 min. or more have elapsed after the engine start when the engine coolant temperature or intake air temperature is -29.375°C (-20.875°F) or less. (B) 10 sec. or more have elapsed after the engine start when the engine coolant temperature and intake air temperature are higher than -29.375°C (-20.875°F).	• Open in No. 2 ATF temperature sensor circuit • No. 2 ATF temperature sensor (No. 1 transmission wire) • ECM

MONITOR DESCRIPTION

The ATF temperature sensor converts the ATF temperature into an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is less than 25 Ω*1 or more than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM stores a DTC, and the ATF temperature warning light blinks or a message is displayed in the combination meter.

HINT:

- ***1: 150°C (302°F) or more is indicated regardless of the actual ATF temperature.**
- ***2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.**
- **The ATF temperature can be checked on the GTS display.**

WIRING DIAGRAM

Refer to DTC P0712 (Click here).

INSPECTION PROCEDURE

DATA LIST

HINT:

Using the GTS to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the GTS, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 2	No. 2 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • Equal to ambient temperature while engine is cold	If the value is -40°C (-40°F) or 150°C (302°F), the No. 2 ATF temperature sensor circuit is open or shorted.

HINT:

- **When DTC P2742 is output and the GTS output is 150°C (302°F) or more, there is a short circuit.**
- **When DTC P2743 is output and the GTS output is -40°C (-40°F), there is an open circuit.**
  Measure the resistance between terminal THO2 and the body ground.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or more	Short circuit

1.INSPECT NO. 1 TRANSMISSION WIRE (NO. 2 ATF TEMPERATURE SENSOR)

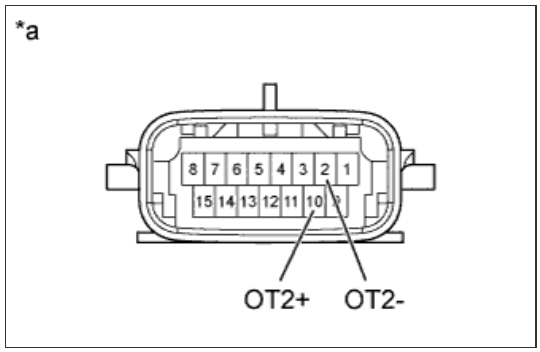
a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
2 (OT2-) - 10 (OT2+)	Always	25 Ω to 156 kΩ
2 (OT2-) - Body	Always	10 kΩ or higher

ground		
10 (OT2+) - Body ground	Always	10 kΩ or higher



HINT:

If the resistance is out of the specified range at any of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Standard Resistance:

ATF temperature	Specified Condition
10°C (50°F)	5 to 8 kΩ
25°C (77°F)	2.5 to 4.5 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

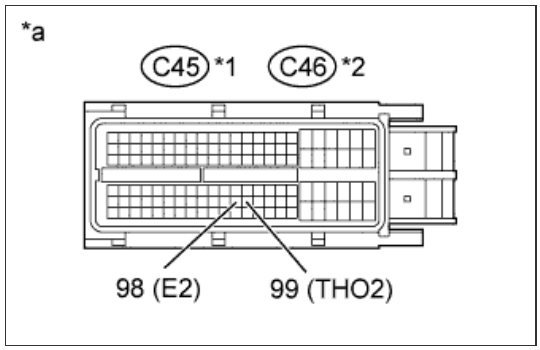
NG → REPAIR OR REPLACE NO. 2 ATF TEMPERATURE SENSOR (NO. 1 TRANSMISSION WIRE) (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-99 (THO2) - C45-98 (E2)	Always	25 Ω to 156 kΩ
C45-99 (THO2) - Body ground	Always	10 kΩ or higher
C45-98 (E2) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-99 (THO2) - C46-98 (E2)	Always	25 Ω to 156 kΩ
C46-99 (THO2) - Body ground	Always	10 kΩ or higher
C46-98 (E2) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0766 Shift Solenoid "D" Performance (Shift Solenoid Valve S4)

DTC P0776 Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake, gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0766	S4 stuck OFF malfunction or brake control valve malfunction*1: Shifting to 5th and 6th gears is impossible. The ECM determines there is a malfunction when the following conditions are both met. (2 trip detection logic*2, 1 trip detection logic*3) (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is shifted to 4th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 4th.	• Shift solenoid valve S4 remains closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked (Brake control valve) • Automatic transmission (clutch, brake, gear, etc.)
P0776	SL2 stuck ON malfunction or brake control valve malfunction*1: Shifting to 5th and 6th gears is impossible. The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic): (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is shifted to 4th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 4th.	• Shift solenoid valve SL2 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked (Brake control valve) • Automatic transmission (clutch, brake, gear, etc.)

*2: w/ OBD
*3: w/o OBD

HINT:

- **Gear positions in the event of a solenoid valve mechanical problem:**

ECM command gearshift	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under malfunction	1st	2nd	3rd	4th	4th	4th

- **Gear position during fail-safe operation:**
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under fail-safe mode	1st	2nd	3rd	3rd	3rd	3rd

MONITOR DESCRIPTION

This DTC indicates a stuck OFF malfunction of shift solenoid valve S4, stuck ON malfunction of shift solenoid valve SL2, or brake control valve malfunction. The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive

functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the GTS.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valves and set each shift position by yourself	• Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of the shift solenoid valves. [Vehicle Condition] 50 km/h (30 mph) or less

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (30 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shift must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shift must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the GTS.**
- **Shift solenoid valve SL2 turns ON/OFF normally when the shift lever is in D.**

ECM command gearshift	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S4	OFF	OFF	OFF	OFF	ON	ON
Shift solenoid valve SL2	ON	ON	ON	ON	OFF	OFF

1.CHECK DTC OUTPUT (IN ADDITION TO DTCS P0766 AND P0776)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
Only P0766 and P0776 are output	A
P0766, P0776 and other DTCs are output	B

HINT:

If any other codes besides P0766 and P0776 are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART (Click here)**

A

2.PERFORM ACTIVE TEST USING GTS (SHIFT SOLENOID VALVE SLT)

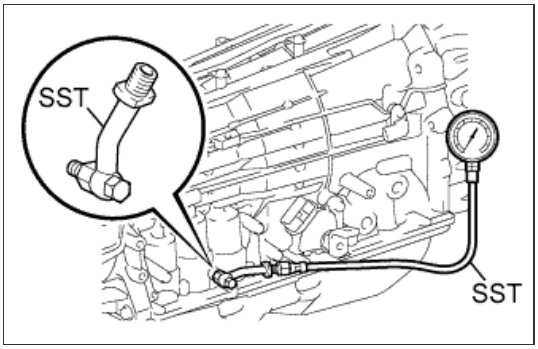
NOTICE:

- **Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).**
- **Be careful to prevent the hose of SST from interfering with the exhaust pipe.**
- **Perform the test with the A/C off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case and connect SST.



SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the GTS to the DLC3.

c. Start the engine and warm it up.

d. Measure the line pressure with SST.

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

h. Measure the line pressure.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate the shift solenoid SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands SLT solenoid to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • Vehicle stopped • Engine idling

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Please note that the pressure values in the Active Test and Hydraulic Test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

3.INSPECT SHIFT SOLENOID VALVE S4

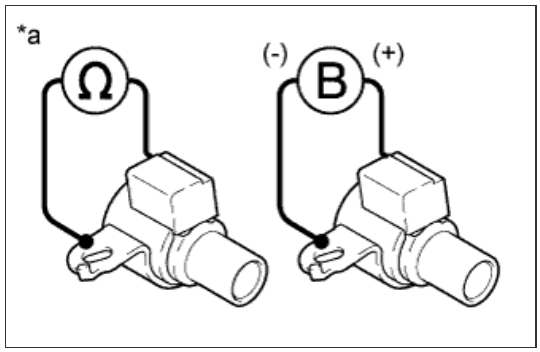
a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector		

terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S4)

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK

4.INSPECT SHIFT SOLENOID VALVE SL2

a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

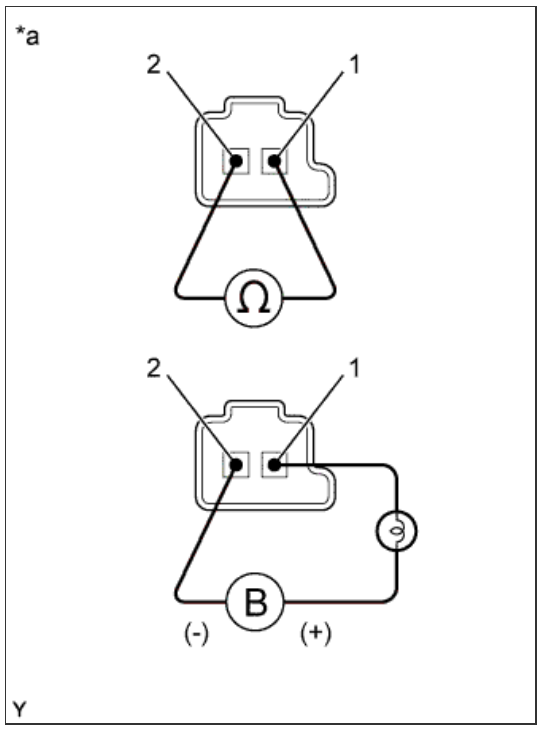
c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SL2)



NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK

5.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on each valve.

→ REPAIR OR REPLACE TRANSMISSION VALVE BODY

NG

ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P2742 Transmission Fluid Temperature Sensor "B" Circuit Low Input

DTC P2743 Transmission Fluid Temperature Sensor "B" Circuit High Input

for Preparation Click here

DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor is on the transmission, just in front of the oil cooler inlet pipeline.
If the ECM detects an abnormally high ATF temperature near this sensor, it illuminates the warning light.

HINT:

- **The temperature of ATF easily rises when towing, climbing hills, in traffic, etc.**
- **If the ATF temperature sensor becomes short-circuited, the signal that indicates that the ATF temperature is 150°C (302°F) or higher is input into the ECM.**

Vehicle conditions when the sensor is normal and when the sensor is short-circuited are indicated in the table below.

No. 2 ATF Temperature Sensor State	Detection Condition	Symptom	Recovery Condition
Sensor is normal	ATF temperature more than 150°C (302°F)	ATF temperature warning light remains ON	ATF temperature less than 135°C (275°F)*1
	ATF temperature more than 130°C (266°F)	Shift point too high	ATF temperature less than 110°C (230°F)
	When the conditions (a) and (b) are satisfied. (a) ATF temperature more than 130°C (266°F) (b) Engine coolant temperature more than 95°C (203°F)	Lock-up at 3rd gear*2	ATF temperature less than 110°C (230°F)*1 and engine coolant temperature more than 95°C (203°F)
Sensor is short-circuited	Any conditions	• ATF temperature warning light blinks or message is displayed in combination meter • Shift point too high	Symptoms still occur
	Engine coolant temperature more than 95°C (203°F)	Lock-up at 3rd gear*2	Symptoms still occur

HINT:

*1: When the ATF is normal, the ATF temperature decreases to less than 135°C (275°F) within 5 minutes with the shift lever in P or N in an idling state.

*2: When ATF temperature is normal, transmission lock-up occurs in 5th or 6th gear with the shift lever in D or S with the S6 range selected, in 5th gear with the shift lever in S with the S5 range selected, and 4th gear with the shift lever in S with the S4 range selected.

DTC Code	DTC Detection Condition	Trouble Area
P2742	No. 2 ATF temperature sensor resistance is less than 25 Ω (0.046 V) for 0.5 seconds or more (1 trip detection logic).	• Short in No. 2 ATF temperature sensor circuit • No. 2 ATF temperature sensor (No. 1 transmission wire) • ECM
P2743	ATF temperature sensor resistance is higher than 156 kΩ (4.915 V) for 0.5 sec. or more and either condition is met (1 trip detection logic): (A) 15 min. or more have elapsed after the engine start when the engine coolant temperature or intake air temperature is -29.375°C (-20.875°F) or less. (B) 10 sec. or more have elapsed after the engine start when the engine coolant temperature and intake air temperature are higher than -29.375°C (-20.875°F).	• Open in No. 2 ATF temperature sensor circuit • No. 2 ATF temperature sensor (No. 1 transmission wire) • ECM

MONITOR DESCRIPTION

The ATF temperature sensor converts the ATF temperature into an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is less than 25 Ω*1 or more than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM stores a DTC, and the ATF temperature warning light blinks or a message is displayed in the combination meter.

HINT:

- ***1: 150°C (302°F) or more is indicated regardless of the actual ATF temperature.**
- ***2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.**
- **The ATF temperature can be checked on the GTS display.**

WIRING DIAGRAM

Refer to DTC P0712 (Click here).

INSPECTION PROCEDURE

DATA LIST

HINT:

Using the GTS to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the GTS, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 2	No. 2 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • Equal to ambient temperature while engine is cold	If the value is -40°C (-40°F) or 150°C (302°F), the No. 2 ATF temperature sensor circuit is open or shorted.

HINT:

- **When DTC P2742 is output and the GTS output is 150°C (302°F) or more, there is a short circuit.**
- **When DTC P2743 is output and the GTS output is -40°C (-40°F), there is an open circuit.**
  Measure the resistance between terminal THO2 and the body ground.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or more	Short circuit

1.INSPECT NO. 1 TRANSMISSION WIRE (NO. 2 ATF TEMPERATURE SENSOR)

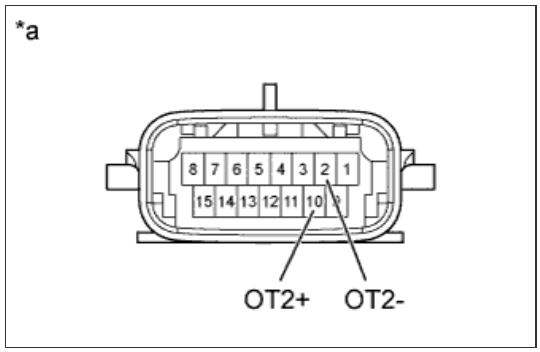
a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
2 (OT2-) - 10 (OT2+)	Always	25 Ω to 156 kΩ
2 (OT2-) - Body	Always	10 kΩ or higher

ground		
10 (OT2+) - Body ground	Always	10 kΩ or higher



HINT:

If the resistance is out of the specified range at any of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Standard Resistance:

ATF temperature	Specified Condition
10°C (50°F)	5 to 8 kΩ
25°C (77°F)	2.5 to 4.5 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

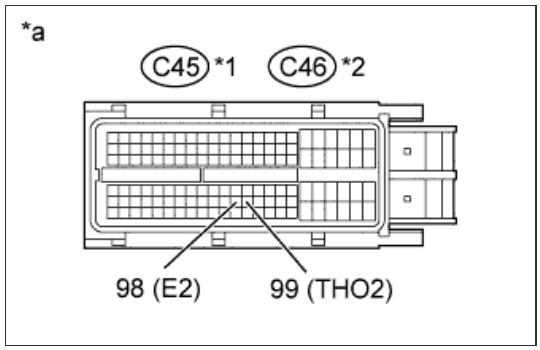
NG → REPAIR OR REPLACE NO. 2 ATF TEMPERATURE SENSOR (NO. 1 TRANSMISSION WIRE) (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-99 (THO2) - C45-98 (E2)	Always	25 Ω to 156 kΩ
C45-99 (THO2) - Body ground	Always	10 kΩ or higher
C45-98 (E2) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-99 (THO2) - C46-98 (E2)	Always	25 Ω to 156 kΩ
C46-99 (THO2) - Body ground	Always	10 kΩ or higher
C46-98 (E2) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0778 Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)

for Preparation Click here

DESCRIPTION

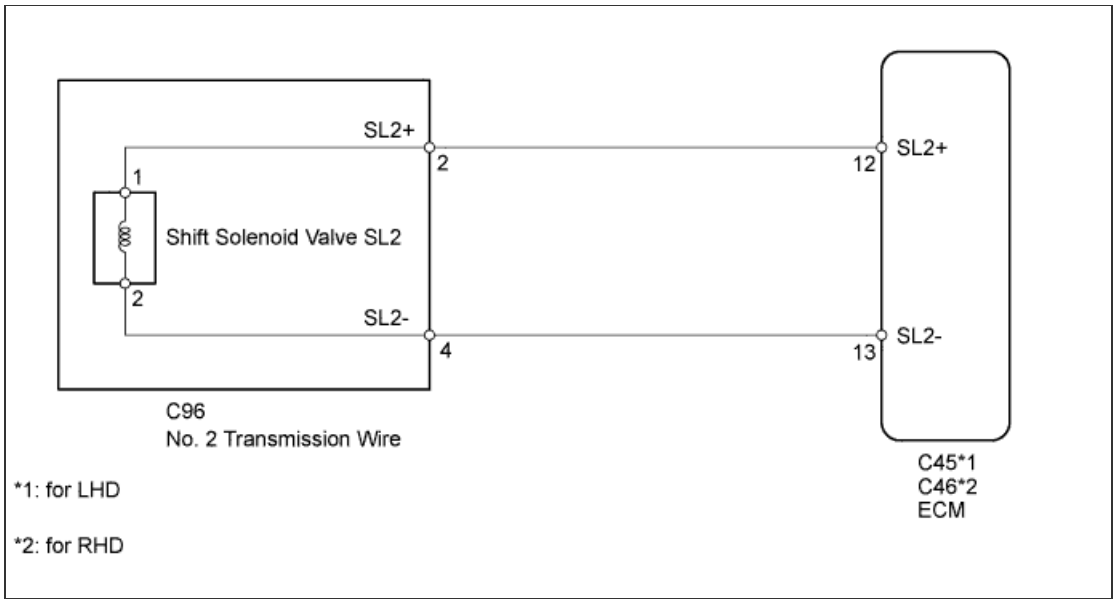
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0778	The ECM checks for an open or short in the shift solenoid valve SL2 circuit while driving and shifting gears (1 trip detection logic). The output signal duty ratio equals 100% (the SL2 output signal duty ratio is less than 100% under normal conditions).	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL2 circuit. The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. Also, the ECM performs the fail-safe function and turns the other normally functioning shift solenoid valves ON/OFF. In case of an open or short circuit, the ECM stops sending current to the open or short circuited solenoid.
While driving and shifting gears, if the ECM detects an open or short in the shift solenoid valve SL2 circuit, the ECM determines there is a malfunction (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve SL2 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve SL2	ON	ON	ON	ON	OFF	OFF

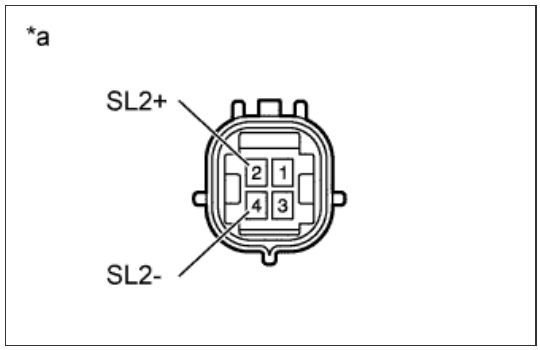
1.INSPECT NO. 2 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SL2)

a. Disconnect the No. 2 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
2 (SL2+) - 4 (SL2-)	20°C (68°F)	5.0 to 5.6 Ω
2 (SL2+) - Body ground	Always	10 kΩ or higher
4 (SL2-) - Body ground	Always	10 kΩ or higher



Text in Illustration

*a	Component without harness connected (No. 2 Transmission Wire)

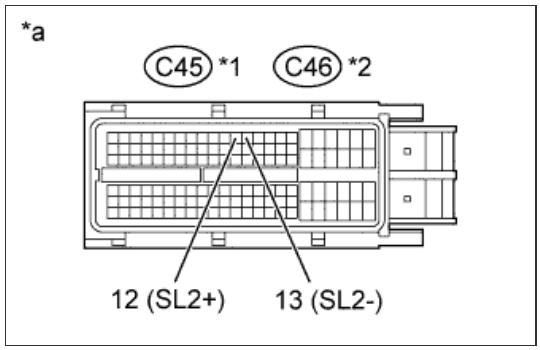
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 2 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-12 (SL2+) - C45-13 (SL2-)	20°C (68°F)	5.0 to 5.6 Ω
C45-12 (SL2+) - Body ground	Always	10 kΩ or higher
C45-13 (SL2-) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-12 (SL2+) - C46-13 (SL2-)	20°C (68°F)	5.0 to 5.6 Ω
C46-12 (SL2+) - Body ground	Always	10 kΩ or higher
C46-13 (SL2-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SL2

a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

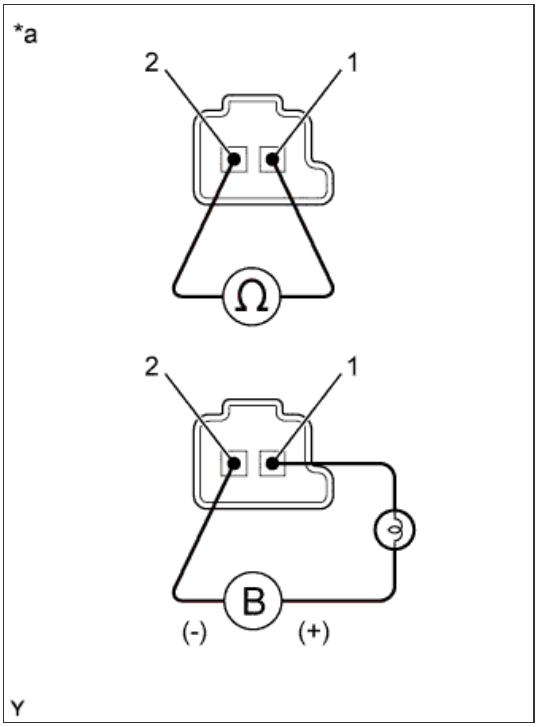
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SL2)

NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

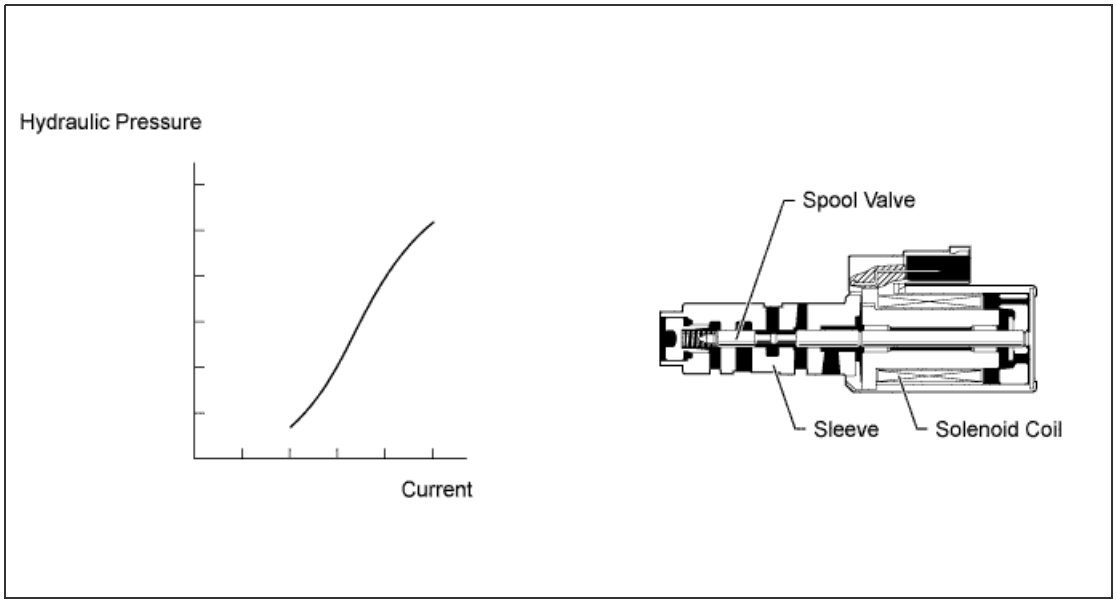
OK → REPAIR OR REPLACE NO. 2 TRANSMISSION WIRE (Click here)

DTC P2757 Torque Converter Clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU)

for Preparation Click here

DESCRIPTION

The ECM uses the signals from the throttle position sensor, air-flow meter, turbine (input) speed sensor, output speed sensor and crankshaft position sensor to monitor the engagement condition of the lock-up clutch.



Then the ECM compares the engagement condition of the lock-up clutch with the lock-up schedule in the ECM memory to detect mechanical problems of the shift solenoid valve SLU, valve body and torque converter assembly.

DTC Code	DTC Detection Condition	Trouble Area
P2757	Lock-up does not occur when driving in the lock-up range (normal driving at 80 km/h (50 mph)), or lock-up remains ON in the lock-up OFF range (2 trip detection logic).	• Shift solenoid valve SLU remains open or closed • Valve body is blocked • Shift solenoid valve SLU • Torque converter assembly • Automatic transmission (clutch, brake, gear, etc.) • Line pressure is too low

MONITOR DESCRIPTION

Torque converter assembly lock-up is controlled by the ECM based on the turbine (input) speed sensor NT, output speed sensor SP2, engine speed, engine load, engine temperature, vehicle speed, transmission temperature and gear selection. The ECM determines the lock-up status of the torque converter assembly by comparing the engine speed (NE) to the input turbine speed (NT). The ECM calculates the actual transmission gear by comparing input turbine speed (NT) to the output shaft speed (SP2). When conditions are appropriate, the ECM requests lock-up by applying control voltage to the shift solenoid SLU. When the SLU is turned ON, it applies pressure to the lock-up relay valve and locks the torque converter assembly. If the ECM detects no lock-up after lock-up has been requested or if it detects lock-up when it is not requested, the ECM interprets this as a fault in the shift solenoid valve SLU or lock-up system performance.
The ECM will illuminate the MIL and store the DTC.
Example:
When one of the following conditions is met, the system determines that there is a malfunction.

- There is a difference in speed between the input side (engine speed) and output side (input turbine speed) of the torque converter assembly when the ECM commands lock-up ON.
  Engine speed is at least 70 rpm more than input turbine speed.
- There is no difference in rotation between the input side (engine speed) and output side (input turbine speed) of the torque converter assembly when the ECM commands lock-up OFF.
  The difference between engine speed and input turbine speed is less than 35 rpm.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive

functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

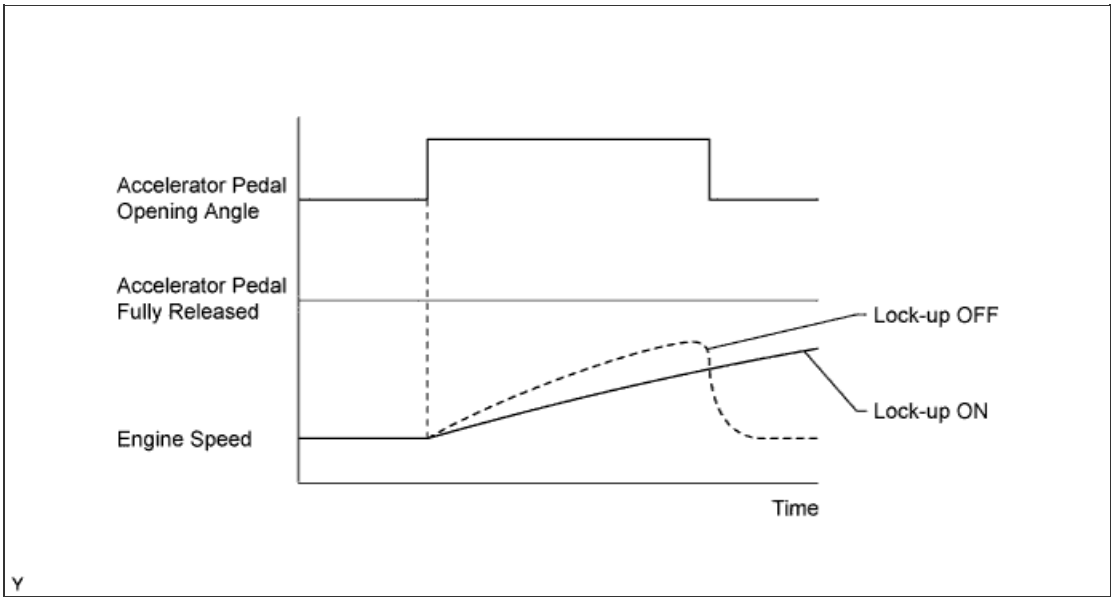
Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Lock Up	Control shift solenoid SLU to set automatic transmission to lock-up	ON or OFF	Possible to check shift solenoid valve SLU operation. [Vehicle Condition] • Throttle valve opening angle: Less than 35% • Vehicle speed: 80 km/h (50 mph) or more

HINT:

- **This test can be conducted when the vehicle speed is 80 km/h (50 mph) or more.**
- **Perform this test while driving in 5th or 6th gear.**

h. Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.



HINT:

- **When changing the accelerator pedal opening angle while driving, if the engine speed does not change rapidly, lock-up is on.**
- **Slowly release the accelerator pedal in order to decelerate, but do not fully release the pedal. (Fully releasing the pedal will close the throttle valve and lock-up may be turned off automatically.)**

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P2757)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
Only P2757 is output	A
P2757 and other DTCs are output	B

HINT:

If any other codes besides P2757 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.INSPECT SHIFT SOLENOID VALVE SLU

a. Remove shift solenoid valve SLU.

b. Measure the resistance according to the value(s) in the table below.

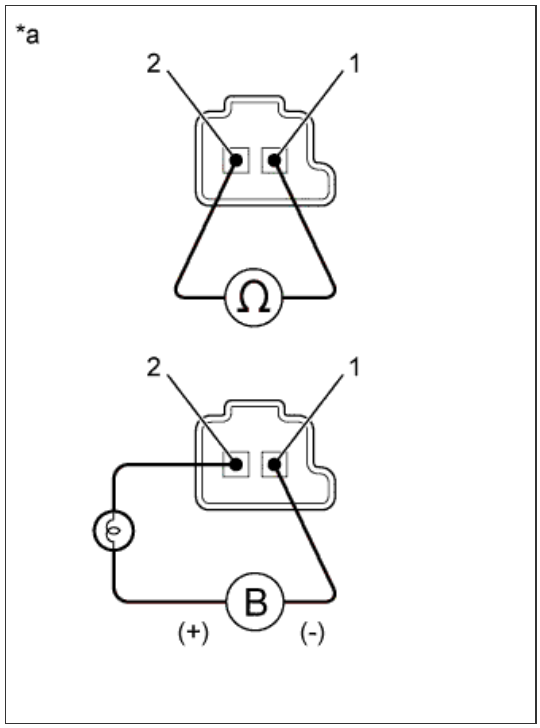
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SLU)

NG → REPLACE SHIFT SOLENOID VALVE SLU (Click here)

OK

3.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on each valve.

NG → REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

4.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:

The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P0781 1-2 Shift (1-2 Shift Valve)

for Preparation Click here

DESCRIPTION

The 1-2 shift valve performs shifting to 1st gear and other gears. When shifting to 2nd and 4th gears is impossible, or when the ECM directs the gearshift to switch to 5th and 6th gear and the engine overruns (clutch slips), this DTC is output.

DTC Code	DTC Detection Condition	Trouble Area
P0781	When conditions (a) and (b), or (a) and (c) are met. (2 trip detection logic*1, 1 trip detection logic*2) (a) When the ECM directs the transmission to switch to 2nd gear, the actual gear is shifted to 1st. (b) When the ECM directs the transmission to switch to 4th gear, the actual gear is shifted to 3rd. (c) When the ECM directs the transmission to switch to 5th gear, the engine overruns (clutch slips).	• Valve body is blocked up or stuck (1-2 shift valve) • Shift solenoid valve SLT remains open or closed • Automatic transmission (clutch, brake, gear, etc.)

*1: w/ OBD
*2: w/o OBD

HINT:

- Gear positions in the event of a solenoid valve mechanical problem:

ECM command gearshift	1st	2nd	3rd	4th	5th	6th
Actual gear position under malfunction	1st	1st	3rd	3rd	N*	N*

N*: Neutral

- Gear position during fail-safe operation:
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
Actual gear position under fail-safe mode	1st*	1st*	3rd	3rd	3rd	3rd

1st*: Under engine braking, downshifting to 1st or 2nd gear is prohibited.

MONITOR DESCRIPTION

This DTC indicates that the 1-2 shift valve in the valve body is locked in the position in which the spring is compressed.
The ECM commands gear shifts by turning the shift solenoid valves ON/OFF and switching oil pressure to the valves in the valve body.
The ECM calculates the actual transmission gear by comparing the signals from the input speed sensor (NT) and the output speed sensor (SP2). The ECM can detect many mechanical problems in the shift solenoids, valve body, transmission clutches, brakes, and gears. If the ECM detects that the actual gear position and commanded gear position are different, it will illuminate the MIL and store the DTC.

INSPECTION PROCEDURE

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0781)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
Only P0781 is output	A
P0781 and other DTCs are output	B

HINT:

If any other codes besides P0781 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING GTS (RUNNING TEST)

CAUTION:

This test should always be performed with at least 2 people.

NOTICE:

- **Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).**
- **Perform the test with the A/C turned off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Test early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Test.

a. Connect the GTS to the DLC3.

b. Clear the DTC (Click here).

c. Warm up the engine.

d. Enter the following menus: Powertrain / Engine and ECT / Active Test.

e. According to the display on the GTS, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the GTS.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valves and set each shift position by yourself	• Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of the shift solenoid valves. [Vehicle Condition] 50 km/h (30 mph) or less

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (30 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shift must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shift must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the GTS.**
- **Gear positions in the event of a solenoid valve mechanical problem:**

Tester command gearshift	1st	2nd	3rd	4th	5th	6th
Actual gear position under malfunction	1st	1st	3rd	3rd	N*	N*

N*: Neutral

OK:

Gear position changes in accordance with the GTS command.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

3.PERFORM ACTIVE TEST USING GTS (SHIFT SOLENOID VALVE SLT)

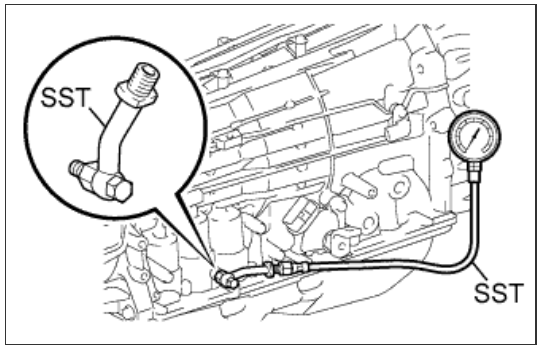
NOTICE:

- **Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).**
- **Be careful to prevent the hose of SST from interfering with the exhaust pipe.**
- **Perform the test with the A/C off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case and connect SST.



SST
09992-00095 (09992-00231, 09992-00271)

b. Connect the GTS to the DLC3.

c. Start the engine and warm it up.

d. Measure the line pressure with SST.

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

h. Measure the line pressure.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate the shift solenoid SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands SLT solenoid to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • Vehicle stopped • Engine idling

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Please note that the pressure values in the Active Test and Hydraulic Test are different.

OK:
The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (**Click here**)

OK

4.CLEAR DTC AND PERFORM RUNNING TEST

a. Clear the DTC (Click here).

b. Check for DTCs again after conducting the Monitor Drive Pattern (Click here).

OK:
No DTC code output.

NG

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

OK

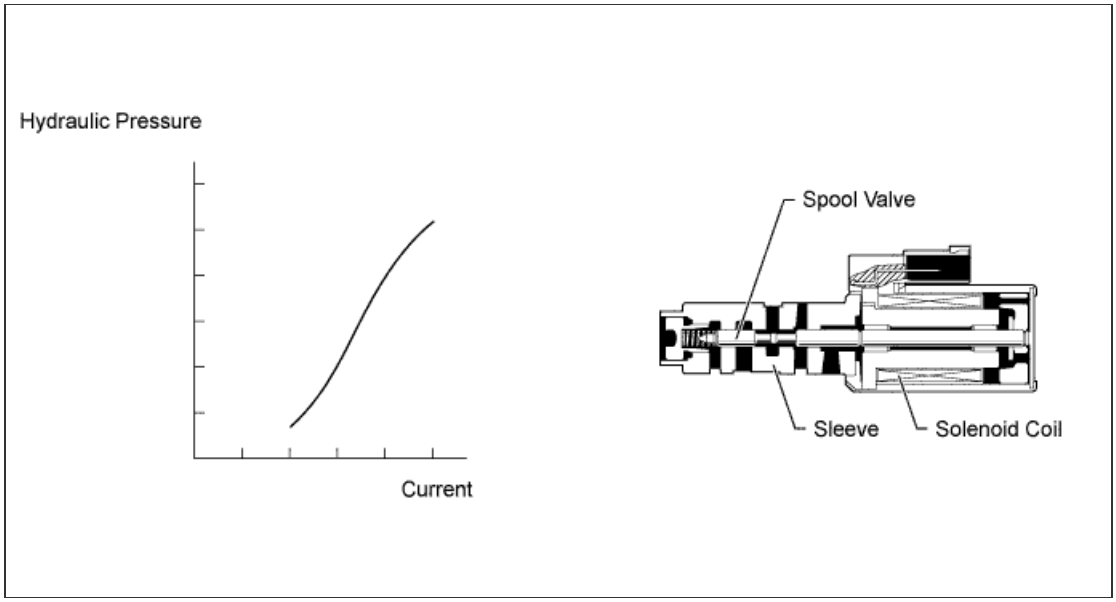
END

DTC P2759 Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)

for Preparation Click here

DESCRIPTION

The amount of current flow to the solenoid is controlled by the ECM. During the lock-up operation, if the current increases, the lock-up hydraulic pressure increases.

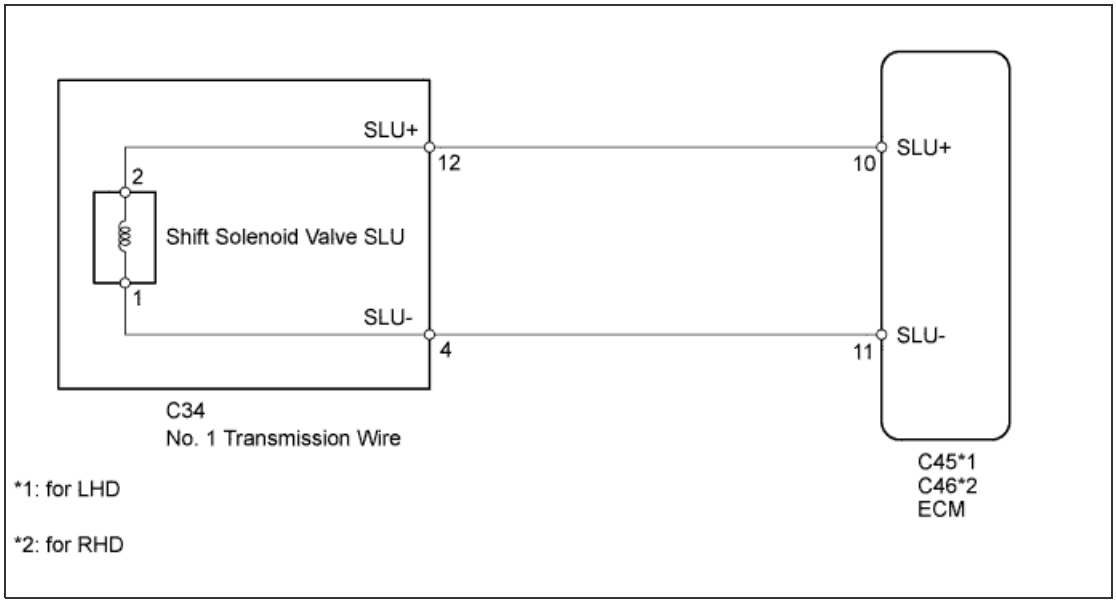


DTC Code	DTC Detection Condition	Trouble Area
P2759	An open or short is detected in the shift solenoid valve SLU circuit for 1 sec. or more while driving (1 trip detection logic).	• Open or short in shift solenoid valve SLU circuit • Shift solenoid valve SLU • ECM

MONITOR DESCRIPTION

When an open or short in the shift solenoid valve SLU circuit is detected, the ECM determines that there is a malfunction. The ECM will illuminate the MIL and store this DTC.

WIRING DIAGRAM

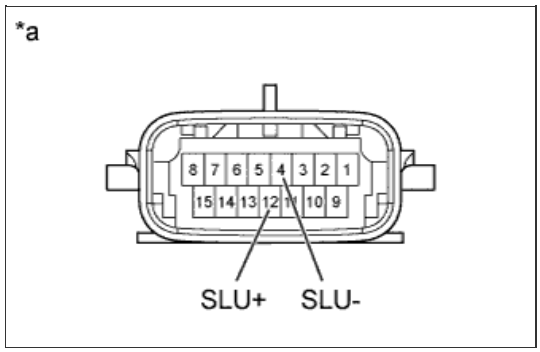


INSPECTION PROCEDURE

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SLU)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
12 (SLU+) - 4 (SLU-)	20°C (68°F)	5.0 to 5.6 Ω
12 (SLU+) - Body ground	Always	10 kΩ or higher
4 (SLU-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

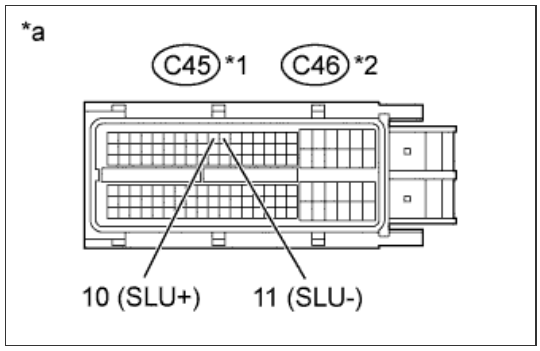
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-10 (SLU+) - C45-11 (SLU-)	20°C (68°F)	5.0 to 5.6 Ω
C45-10 (SLU+) - Body ground	Always	10 kΩ or higher
C45-11 (SLU-) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-10 (SLU+) - C46-11 (SLU-)	20°C (68°F)	5.0 to 5.6 Ω
C46-10 (SLU+) - Body ground	Always	10 kΩ or higher
C46-11 (SLU-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector

	(to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK →

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SLU

a. Remove shift solenoid valve SLU.

b. Measure the resistance according to the value(s) in the table below.

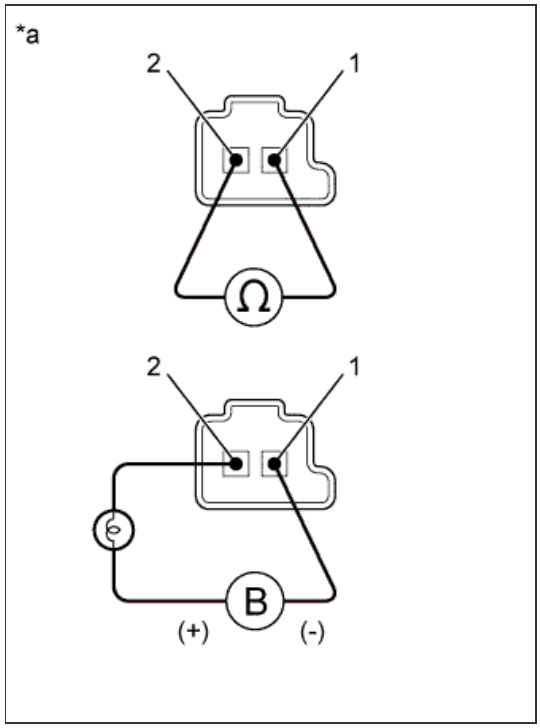
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SLU)

NG → REPLACE SHIFT SOLENOID VALVE SLU (Click here)

OK →

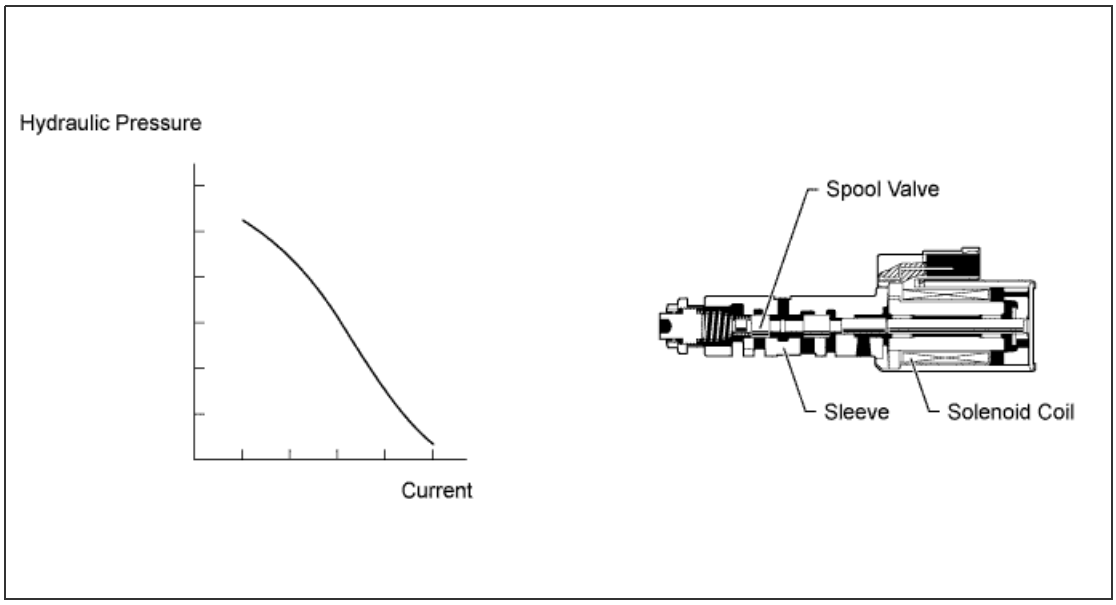
REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0894 Transmission Component Slipping

DTC P2714 Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)

for Preparation Click here

DESCRIPTION



Shift solenoid valve SLT controls the transmission line pressure for smooth transmission operation based on signals from the throttle position sensor and vehicle speed sensor. The ECM adjusts the current to shift solenoid valve SLT to control the hydraulic line pressure coming from the primary regulator valve.
Appropriate line pressure assures smooth shifting with varying engine outputs.

DTC Code	DTC Detection Condition	Trouble Area
P0894	The ECM detects a malfunction in shift solenoid valve SLT, S1, S2, S3, S4 or SL2, or the 1-2 shift valve, or an incorrect gear 6 ratio according to the difference in speed of the turbine and output shaft, and also by the oil pressure (2 trip detection logic).	• Shift solenoid valve SLT remains open or closed • Shift solenoid valve S1, S2, S3, S4 or SL2 remains open or closed • Gear 6 incorrect ratio (sequence valve) or 1-2 shift valve is stuck • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)
P2714	The ECM detects a malfunction in shift solenoid valve SLT (ON side) according to the difference in speed of the turbine and output shaft, and also by the oil pressure (2 trip detection logic*1, 1 trip detection logic*2).	• Shift solenoid valve SLT remains open or closed • Shift solenoid valve S1, S2, S3, S4 or SL2 remains open or closed • Gear 6 incorrect ratio (sequence valve) or 1-2 shift valve is stuck • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)

*1: w/ OBD
*2: w/o OBD

MONITOR DESCRIPTION

The ECM calculates the amount of heat absorbed by the friction material based on the difference in speed (clutch slippage) between the turbine and output shaft. The ECM illuminates the MIL and stores this DTC when the amount of heat absorption exceeds the specified value.
There are two causes of speed difference.

- When the shift solenoid valve SLT remains ON, oil pressure decreases, which causes the clutch engagement force to decrease.
- When a shift solenoid valve remains ON or OFF, the gear position commanded by the ECM and the actual gear position are not the same.

NOTICE:

If you continue driving under these conditions, the clutch will burn out and the vehicle will no longer be drivable.

INSPECTION PROCEDURE

1.CHECK DTC OUTPUT (IN ADDITION TO DTCS P0894 AND P2714)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
• Only P0894 is output • Only P0894 and P2714 are output	A
P0894, P2714 and other DTCs are output	B

HINT:

If any other codes besides P0894 and P2714 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING GTS (SHIFT SOLENOID VALVE SLT)

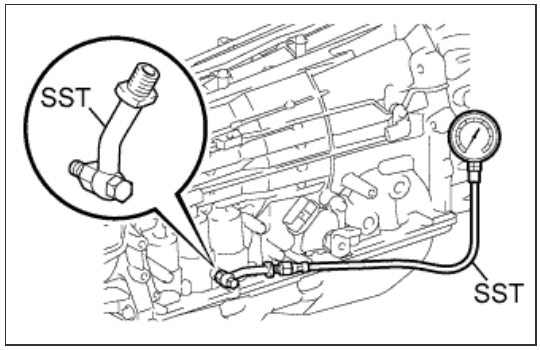
NOTICE:

- **Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).**
- **Be careful to prevent the hose of SST from interfering with the exhaust pipe.**
- **Perform the test with the A/C off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case and connect SST.



SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the GTS to the DLC3.

c. Start the engine and warm it up.

d. Measure the line pressure with SST.

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

h. Measure the line pressure.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate the shift solenoid SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands SLT solenoid to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • Vehicle stopped • Engine idling

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Please note that the pressure values in the Active Test and Hydraulic Test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → Go to step 17

OK

3.PERFORM ACTIVE TEST USING GTS (RUNNING TEST)

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Connect the GTS to the DLC3.

b. Clear the DTC (Click here).

c. Enter the following menus: Powertrain / Engine and ECT / Active Test.

d. According to the display on the GTS, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the GTS.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valves and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of the shift solenoid valves. [Vehicle Condition] 50 km/h (30 mph) or less

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (30 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the GTS.**

e. Compare the ECM gear shift command and the actual gear position.

Result

ECM Gear Shift Command			1st	2nd	3rd	4th	5th	6th	Proceed to
Actual gear position under malfunction	Shift solenoid S1	Stuck ON*1	2nd	2nd	3rd	4th	5th	6th	A
		Stuck OFF	1st	1st	3rd	4th	5th	N*2	
	Shift solenoid S2	Stuck ON	1st	2nd	2nd	4th	6th	6th	B
		Stuck OFF	3rd	3rd	3rd	4th	5th	5th	
	Shift solenoid S3	Stuck ON	1st	2nd	3rd	3rd	N*2	N*2	C
		Stuck OFF	3rd	4th	4th	4th	5th	6th	
	Shift solenoid S4	Stuck ON*3	1st	2nd	3rd	4th	5th	6th	D
		Stuck OFF	1st	2nd	3rd	4th	4th	4th	

Actual gear position when normal	1st	2nd	3rd	4th	5th	6th	E

HINT:

- ***1: When shift solenoid S1 is stuck ON, the vehicle cannot drive in reverse.**
- ***2: Neutral**
- ***3: When shift solenoid S4 is stuck ON, gear shifting is normal.**

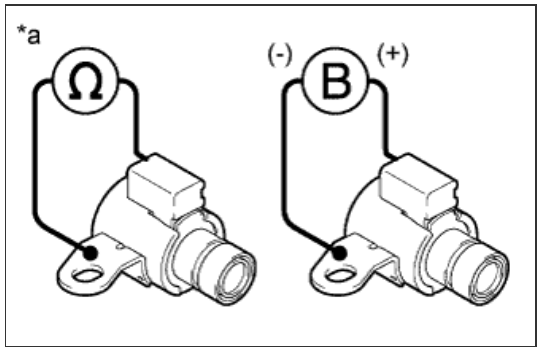
B	Go to step 7
C	Go to step 10
D	Go to step 13
E	Go to step 20

A

4.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S1)

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

5.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

6.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:

The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

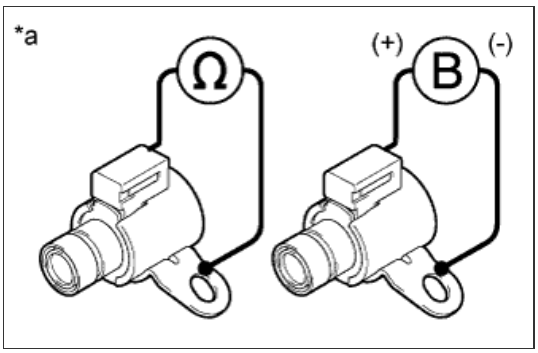
OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

7.INSPECT SHIFT SOLENOID VALVE S2

a. Remove shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S2)

NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK

8.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

9.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:
The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

OK ↓

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

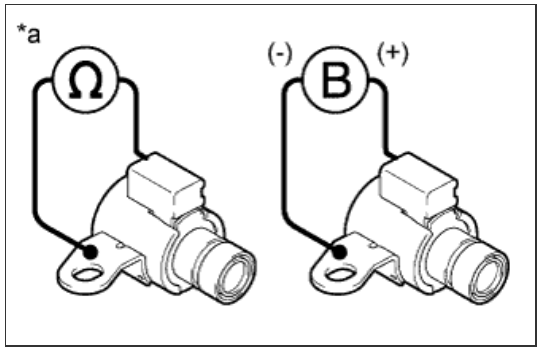
10.INSPECT SHIFT SOLENOID VALVE S3

a. Remove the shift solenoid valve S3.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S3 connector • Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S3)

NG → REPLACE SHIFT SOLENOID VALVE S3 (Click here)

OK ↓

11.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:
There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK ↓

12.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:
The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

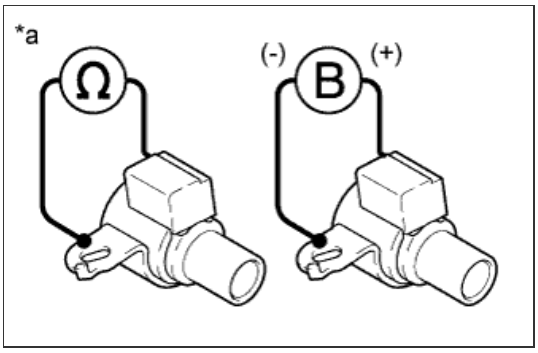
OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

13.INSPECT SHIFT SOLENOID VALVE S4

a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S4)

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK

14.INSPECT SHIFT SOLENOID VALVE SL2

a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

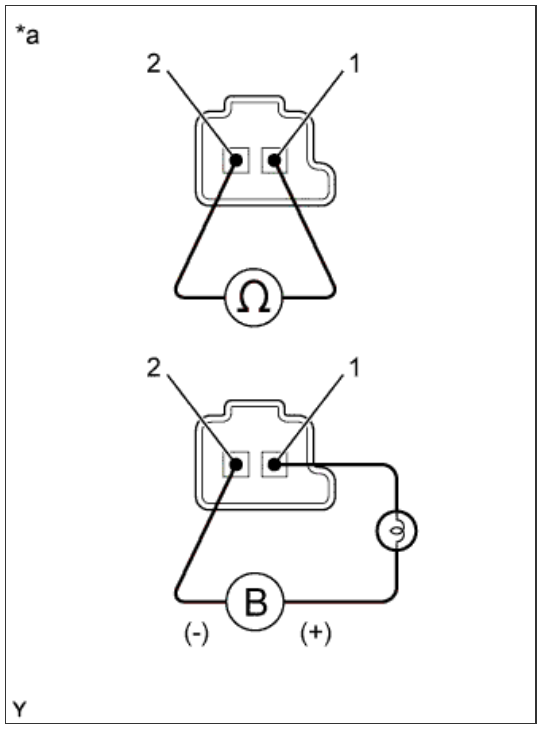
OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W	

bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SL2)



NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK

15.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:
There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

16.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:
The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

17.INSPECT SHIFT SOLENOID VALVE SLT

a. Remove shift solenoid valve SLT.

b. Measure the resistance according to the value(s) in the table below.

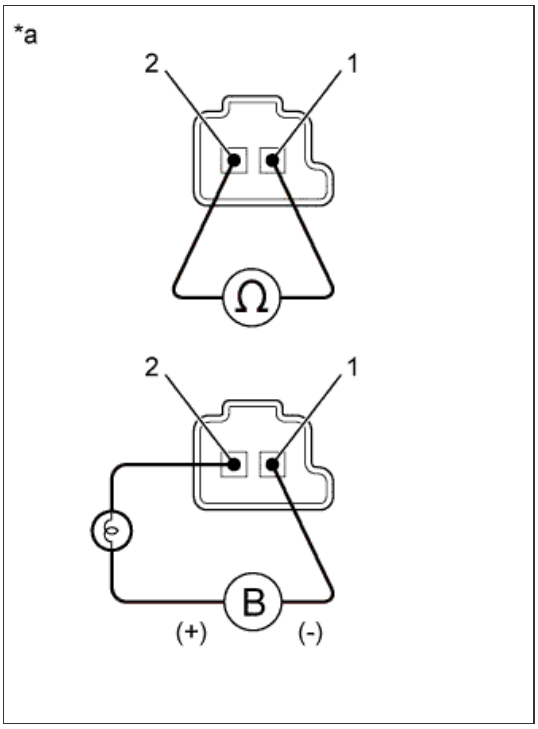
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SLT)

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

18.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

19.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:

The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

20.INSPECT SHIFT SOLENOID VALVE SLT

a. Remove shift solenoid valve SLT.

b. Measure the resistance according to the value(s) in the table below.

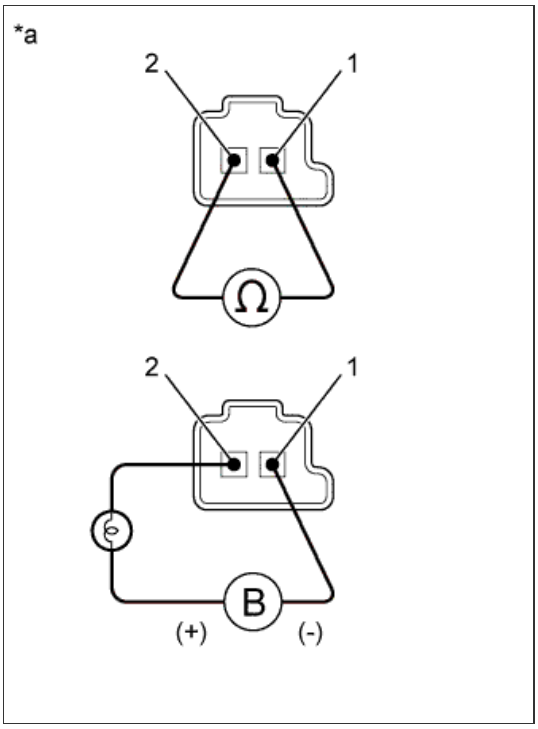
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SLT)

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

21.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

22.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:

The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P2772 Four Wheel Drive (4WD) Low Switch Circuit Range / Performance

for Preparation Click here

DESCRIPTION

The ECM detects the signal from the transfer L4 position switch.
This DTC indicates that the transfer L4 position switch remains on.

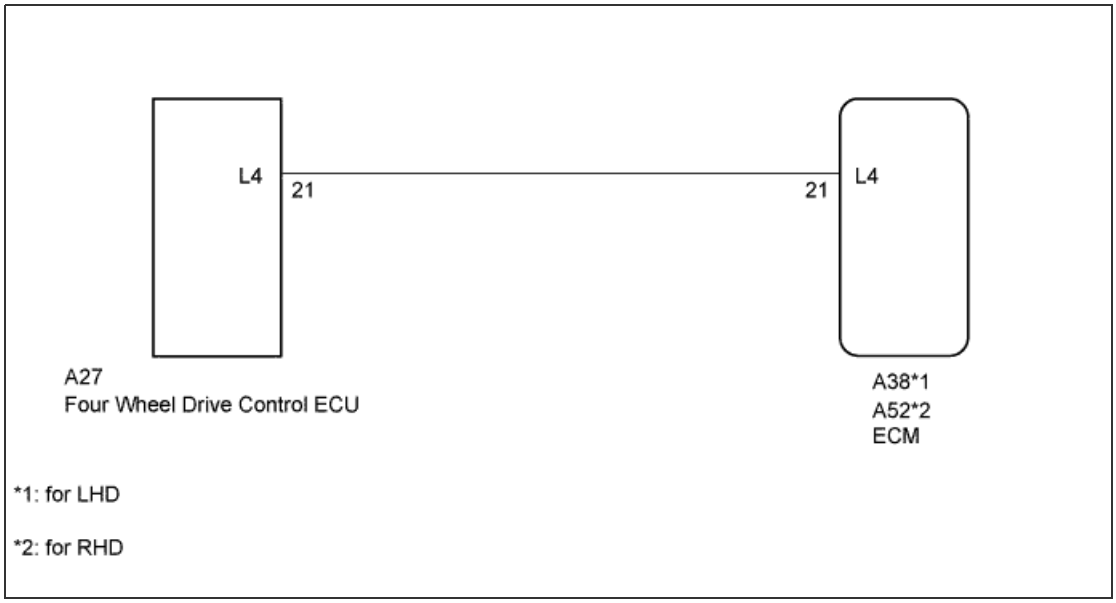
DTC Code	DTC Detection Condition	Trouble Area
P2772	The transfer L4 position switch remains on while the vehicle is running under the following conditions for 1.8 sec. or more (1 trip detection logic). (a) The output shaft speed is between 1000 and 3000 rpm. (b) The transfer position switch is in H4.	• Short in transfer L4 position switch circuit • Four wheel drive control ECU • ECM

MONITOR DESCRIPTION

The ECM monitors the transfer-case L4 position switch to determine when the transfer-case L4 gears are engaged. If the L4 switch indicates that the transfer-case L4 gears remain engaged under the following conditions, the ECM will conclude that there is a malfunction of the L4 position switch, illuminate the MIL and store the DTC:

- The transfer-case shifter is in the "H4" position.
- The transfer-case output shaft rpm is between 1000 and 3000 rpm.
- The specified time period has elapsed.

WIRING DIAGRAM



INSPECTION PROCEDURE

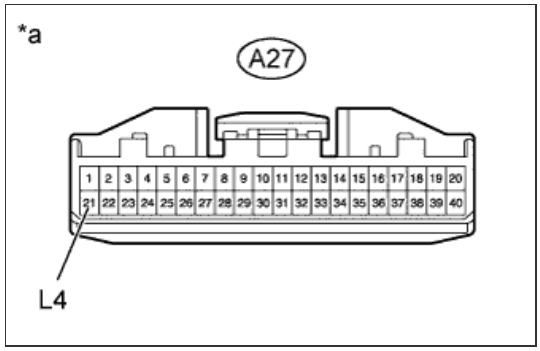
1.CHECK HARNESS AND CONNECTOR (FOUR WHEEL DRIVE CONTROL ECU - BODY GROUND)

a. Disconnect the four wheel drive control ECU connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
A27-21 (L4) - Body ground	Always	10 kΩ or higher



Text in Illustration

*a	Front view of wire harness connector

	(to Four Wheel Drive Control ECU)

NG → Go to step 2

OK

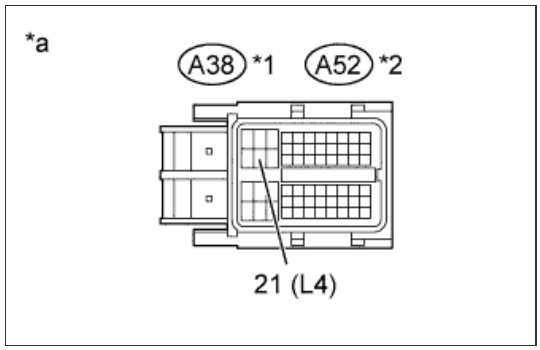
GO TO TRANSFER SYSTEM INSPECTION (Click here)

2.CHECK HARNESS AND CONNECTOR (FOUR WHEEL DRIVE CONTROL ECU - ECM)

a. Disconnect the ECM connector.

b. Disconnect the A27 four wheel drive control ECU connector.

c. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
A38-21 (L4) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
A52-21 (L4) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

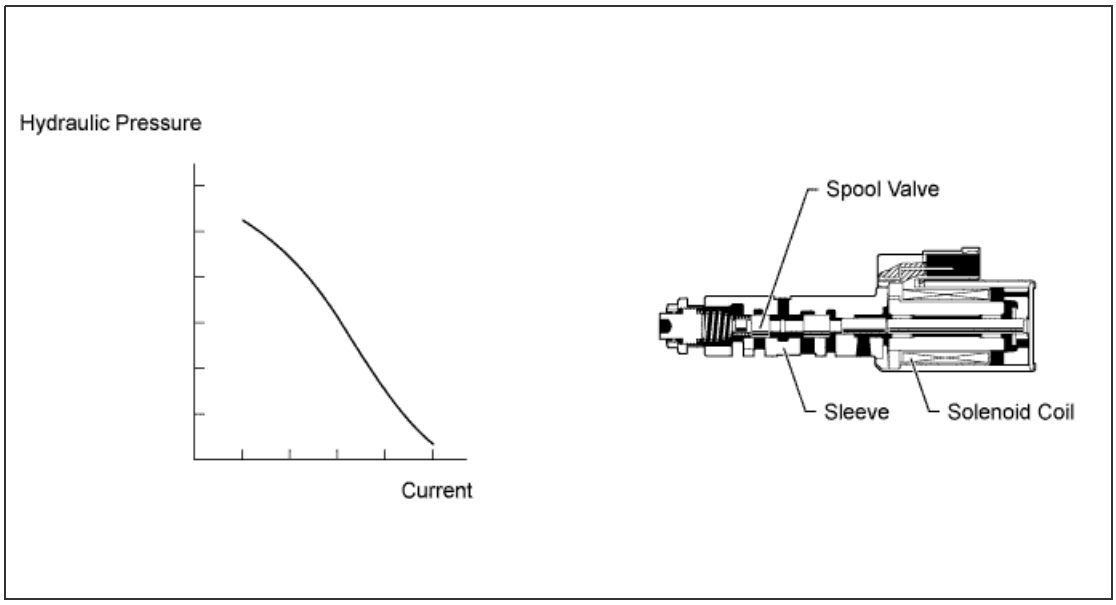
REPLACE ECM (Click here)

DTC P0894 Transmission Component Slipping

DTC P2714 Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)

for Preparation Click here

DESCRIPTION



Shift solenoid valve SLT controls the transmission line pressure for smooth transmission operation based on signals from the throttle position sensor and vehicle speed sensor. The ECM adjusts the current to shift solenoid valve SLT to control the hydraulic line pressure coming from the primary regulator valve.
Appropriate line pressure assures smooth shifting with varying engine outputs.

DTC Code	DTC Detection Condition	Trouble Area
P0894	The ECM detects a malfunction in shift solenoid valve SLT, S1, S2, S3, S4 or SL2, or the 1-2 shift valve, or an incorrect gear 6 ratio according to the difference in speed of the turbine and output shaft, and also by the oil pressure (2 trip detection logic).	• Shift solenoid valve SLT remains open or closed • Shift solenoid valve S1, S2, S3, S4 or SL2 remains open or closed • Gear 6 incorrect ratio (sequence valve) or 1-2 shift valve is stuck • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)
P2714	The ECM detects a malfunction in shift solenoid valve SLT (ON side) according to the difference in speed of the turbine and output shaft, and also by the oil pressure (2 trip detection logic*1, 1 trip detection logic*2).	• Shift solenoid valve SLT remains open or closed • Shift solenoid valve S1, S2, S3, S4 or SL2 remains open or closed • Gear 6 incorrect ratio (sequence valve) or 1-2 shift valve is stuck • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)

*1: w/ OBD
*2: w/o OBD

MONITOR DESCRIPTION

The ECM calculates the amount of heat absorbed by the friction material based on the difference in speed (clutch slippage) between the turbine and output shaft. The ECM illuminates the MIL and stores this DTC when the amount of heat absorption exceeds the specified value.
There are two causes of speed difference.

- When the shift solenoid valve SLT remains ON, oil pressure decreases, which causes the clutch engagement force to decrease.
- When a shift solenoid valve remains ON or OFF, the gear position commanded by the ECM and the actual gear position are not the same.

NOTICE:

If you continue driving under these conditions, the clutch will burn out and the vehicle will no longer be drivable.

INSPECTION PROCEDURE

1.CHECK DTC OUTPUT (IN ADDITION TO DTCS P0894 AND P2714)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
• Only P0894 is output • Only P0894 and P2714 are output	A
P0894, P2714 and other DTCs are output	B

HINT:

If any other codes besides P0894 and P2714 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING GTS (SHIFT SOLENOID VALVE SLT)

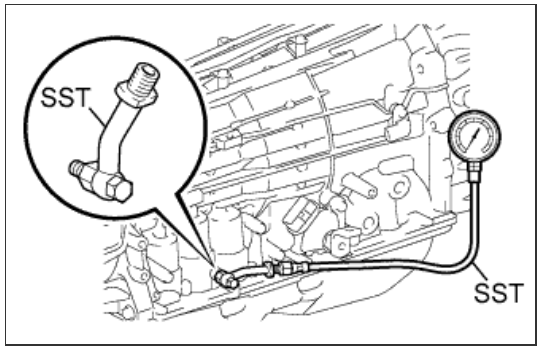
NOTICE:

- **Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).**
- **Be careful to prevent the hose of SST from interfering with the exhaust pipe.**
- **Perform the test with the A/C off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case and connect SST.



SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the GTS to the DLC3.

c. Start the engine and warm it up.

d. Measure the line pressure with SST.

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

h. Measure the line pressure.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate the shift solenoid SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands SLT solenoid to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • Vehicle stopped • Engine idling

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Please note that the pressure values in the Active Test and Hydraulic Test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → Go to step 17

OK

3.PERFORM ACTIVE TEST USING GTS (RUNNING TEST)

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Connect the GTS to the DLC3.

b. Clear the DTC (Click here).

c. Enter the following menus: Powertrain / Engine and ECT / Active Test.

d. According to the display on the GTS, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the GTS.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valves and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of the shift solenoid valves. [Vehicle Condition] 50 km/h (30 mph) or less

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (30 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the GTS.**

e. Compare the ECM gear shift command and the actual gear position.

Result

ECM Gear Shift Command			1st	2nd	3rd	4th	5th	6th	Proceed to
Actual gear position under malfunction	Shift solenoid S1	Stuck ON*1	2nd	2nd	3rd	4th	5th	6th	A
		Stuck OFF	1st	1st	3rd	4th	5th	N*2	
	Shift solenoid S2	Stuck ON	1st	2nd	2nd	4th	6th	6th	B
		Stuck OFF	3rd	3rd	3rd	4th	5th	5th	
	Shift solenoid S3	Stuck ON	1st	2nd	3rd	3rd	N*2	N*2	C
		Stuck OFF	3rd	4th	4th	4th	5th	6th	
	Shift solenoid S4	Stuck ON*3	1st	2nd	3rd	4th	5th	6th	D
		Stuck OFF	1st	2nd	3rd	4th	4th	4th	

Actual gear position when normal	1st	2nd	3rd	4th	5th	6th	E

HINT:

- ***1: When shift solenoid S1 is stuck ON, the vehicle cannot drive in reverse.**
- ***2: Neutral**
- ***3: When shift solenoid S4 is stuck ON, gear shifting is normal.**

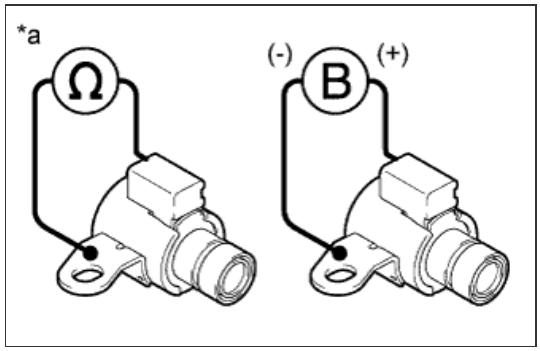
B	Go to step 7
C	Go to step 10
D	Go to step 13
E	Go to step 20

A

4.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S1)

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

5.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

6.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:

The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

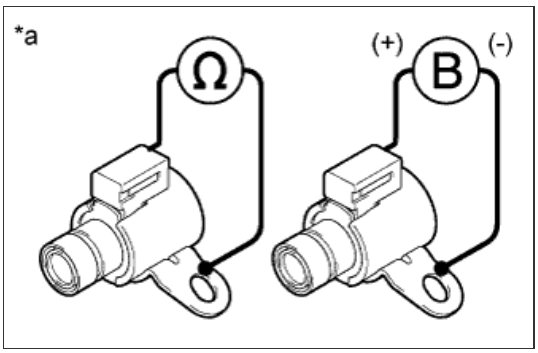
OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

7.INSPECT SHIFT SOLENOID VALVE S2

a. Remove shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S2)

NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK

8.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

9.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:
The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

OK ↓

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

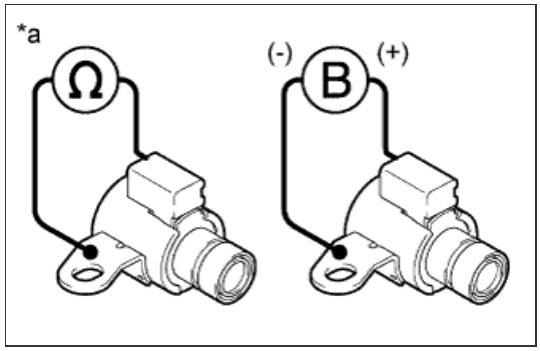
10.INSPECT SHIFT SOLENOID VALVE S3

a. Remove the shift solenoid valve S3.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S3 connector • Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S3)

NG → REPLACE SHIFT SOLENOID VALVE S3 (Click here)

OK ↓

11.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:
There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK ↓

12.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:
The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

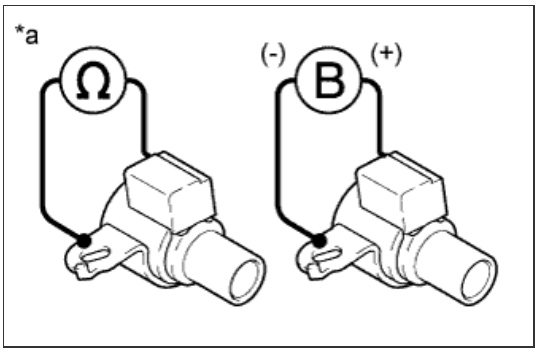
OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

13.INSPECT SHIFT SOLENOID VALVE S4

a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S4)

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK

14.INSPECT SHIFT SOLENOID VALVE SL2

a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

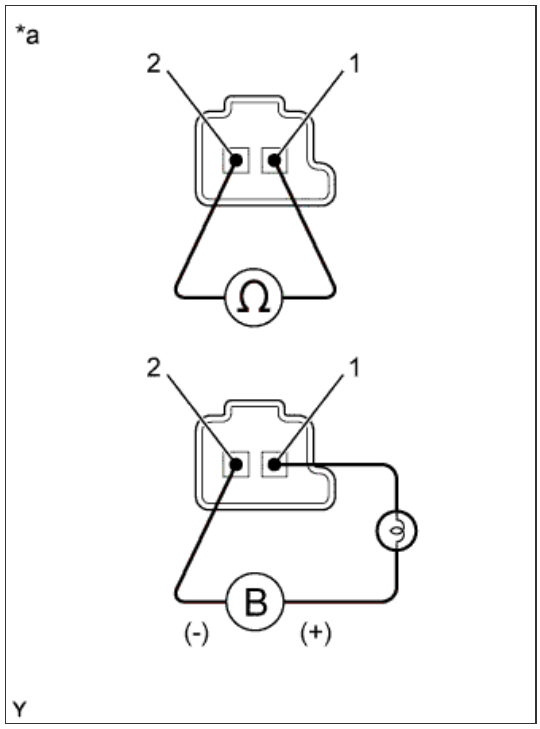
OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W	

bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SL2)



NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK

15.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:
There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

16.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:
The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

17.INSPECT SHIFT SOLENOID VALVE SLT

a. Remove shift solenoid valve SLT.

b. Measure the resistance according to the value(s) in the table below.

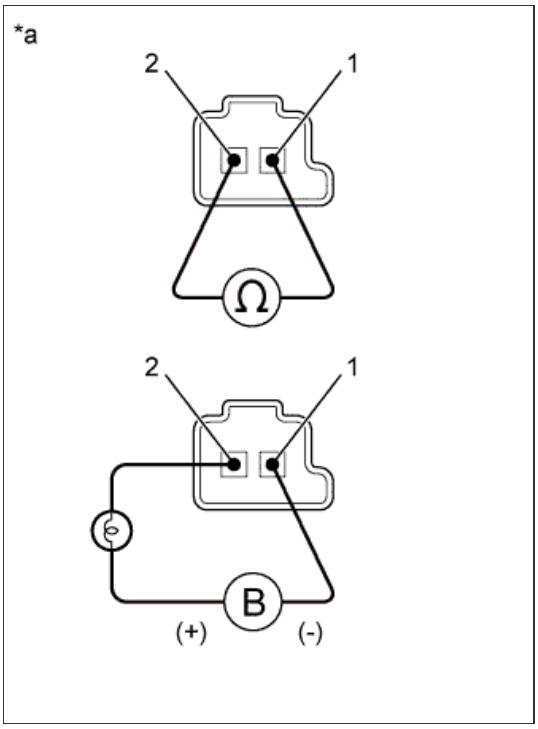
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SLT)

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

18.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

19.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:

The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

20.INSPECT SHIFT SOLENOID VALVE SLT

a. Remove shift solenoid valve SLT.

b. Measure the resistance according to the value(s) in the table below.

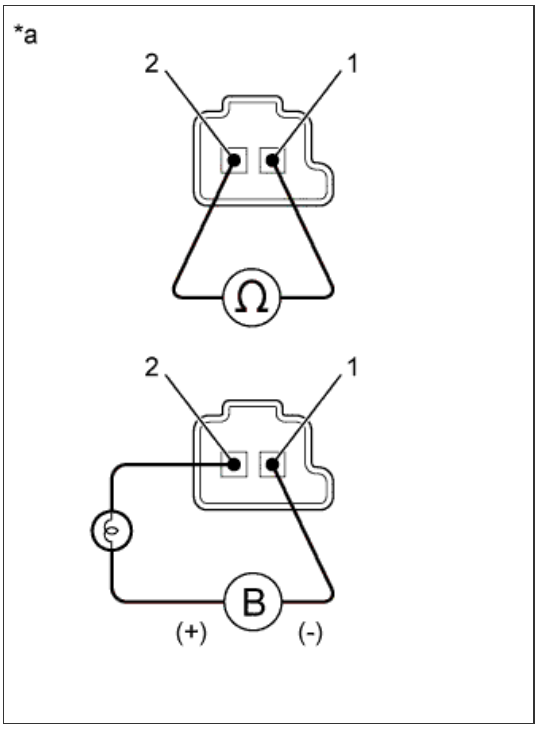
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SLT)

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

21.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

22.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:

The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

OK

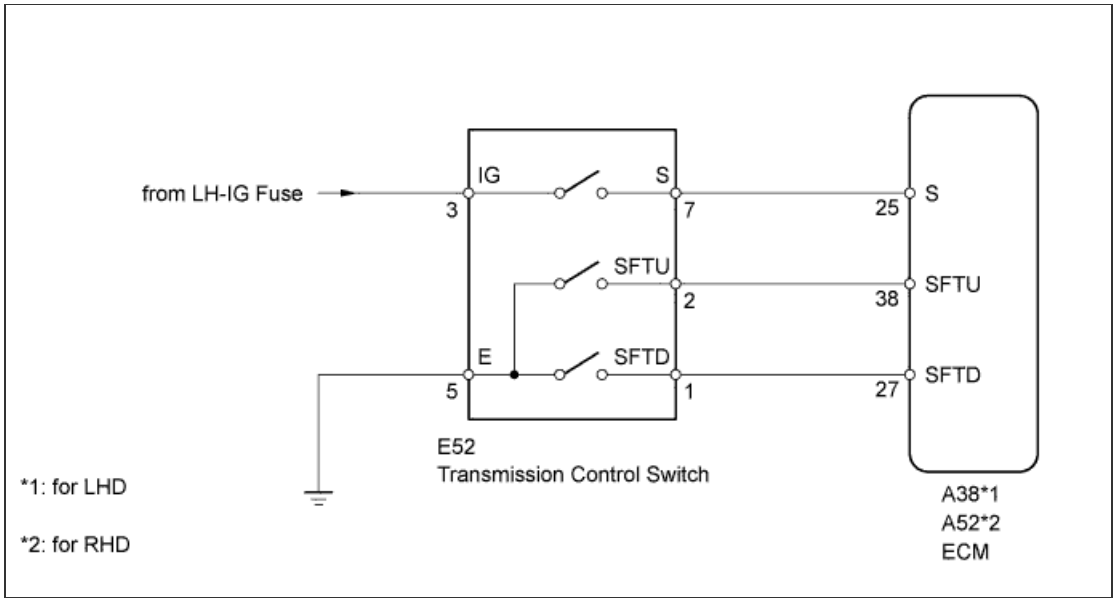
REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

for Preparation Click here

DESCRIPTION

After moving the shift lever to S using the transmission control switch, it is possible to switch the shift range between "1" (1st range) and "6" (6th range). Shifting to "+" once raises the shift range by one, and shifting to "-" lowers the shift range by one.

WIRING DIAGRAM

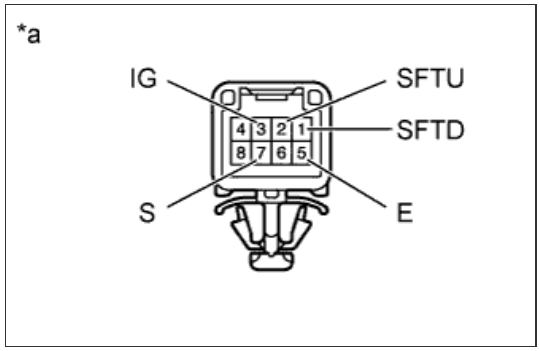


INSPECTION PROCEDURE

1.INSPECT TRANSMISSION CONTROL SWITCH

a. Disconnect the transmission control switch connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
3 (IG) - 7 (S)	Shift lever in S, "+" or "-"	Below 1 Ω
2 (SFTU) - 5 (E)	Shift lever held in "+" (Up-shift)	Below 1 Ω
1 (SFTD) - 5 (E)	Shift lever held in "-" (Down-shift)	Below 1 Ω
3 (IG) - 7 (S)	Shift lever not in S, "+" or "-"	10 kΩ or higher
2 (SFTU) - 5 (E)	Shift lever in S	10 kΩ or higher
1 (SFTD) - 5 (E)	Shift lever in S	10 kΩ or higher

Text in Illustration

*a	Component without harness connected (Transmission Control Switch)

NG → REPLACE TRANSMISSION CONTROL SWITCH (LOWER SHIFT LEVER ASSEMBLY) (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL SWITCH - BATTERY, BODY GROUND)

a. Disconnect the transmission control switch connector.

b. Measure the voltage according to the value(s) in the table below.

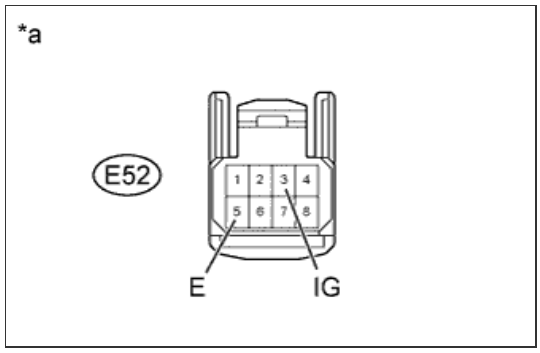
Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
E52-3 (IG) - Body ground	Engine switch on (IG)	11 to 14 V
E52-3 (IG) - Body ground	Engine switch off	Below 1 V

c. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
E52-5 (E) - Body ground	Always	Below 1 Ω



Text in Illustration

*a	Front view of wire harness connector (to Transmission Control Switch)

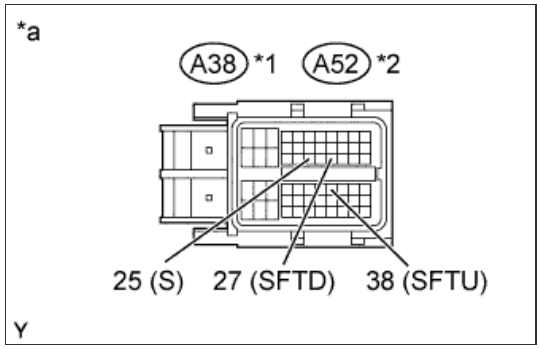
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3.CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL SWITCH - ECM)

a. Disconnect the ECM connector.

b. Measure the voltage according to the value(s) in the table below.



Standard Voltage:

for LHD

Tester Connection	Condition	Specified Condition
A38-25 (S) - Body ground	• Engine switch on (IG) • Shift lever in S, "+" or "-"	11 to 14 V
A38-25 (S) - Body ground	• Engine switch on (IG) • Shift lever not in S, "+" or "-"	Below 1 V

for RHD

Tester Connection	Condition	Specified Condition

A52-25 (S) - Body ground	• Engine switch on (IG) • Shift lever in S, "+" or "-"	11 to 14 V
A52-25 (S) - Body ground	• Engine switch on (IG) • Shift lever not in S, "+" or "-"	Below 1 V

c. Turn the engine switch off.

d. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
A38-38 (SFTU) - Body ground	Shift lever held in "+" (Up-shift)	Below 1 Ω
A38-27 (SFTD) - Body ground	Shift lever held in "-" (Down-shift)	Below 1 Ω
A38-38 (SFTU) - Body ground	Shift lever in S	10 kΩ or higher
A38-27 (SFTD) - Body ground	Shift lever in S	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
A52-38 (SFTU) - Body ground	Shift lever held in "+" (Up-shift)	Below 1 Ω
A52-27 (SFTD) - Body ground	Shift lever held in "-" (Down-shift)	Below 1 Ω
A52-38 (SFTU) - Body ground	Shift lever in S	10 kΩ or higher
A52-27 (SFTD) - Body ground	Shift lever in S	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

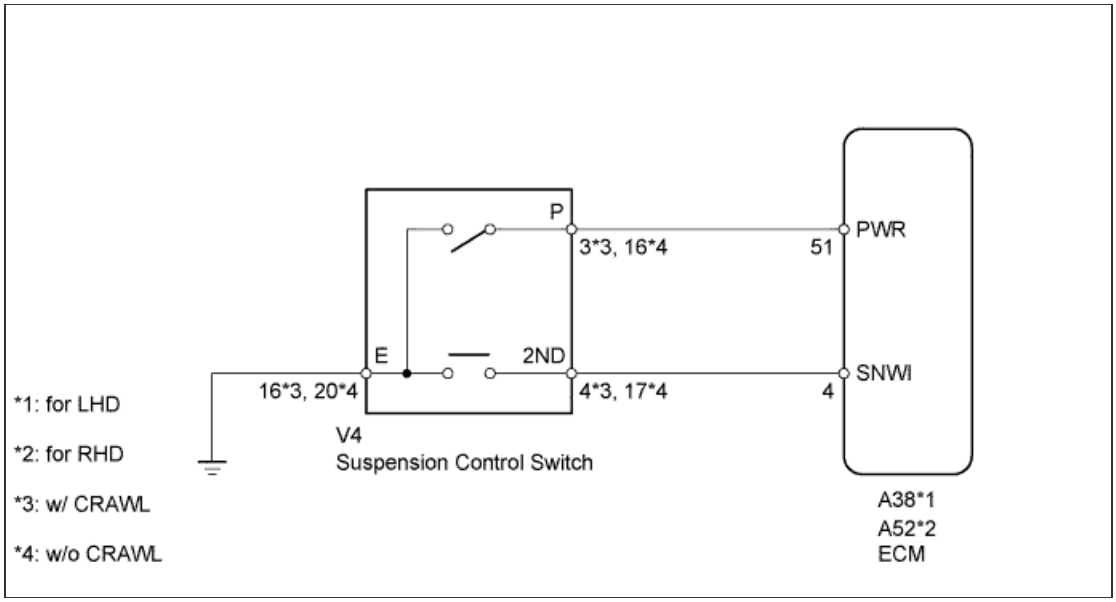
PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (Click here)

for Preparation Click here

DESCRIPTION

The ECM memory contains the programs for the normal and power shift patterns and lock-up pattern.
By following the programs corresponding to the signals from the pattern select switch, the park/neutral position switch and other various sensors, the ECM switches the solenoid valves on and off, and controls the transmission gear change and the lock-up clutch operation.

WIRING DIAGRAM



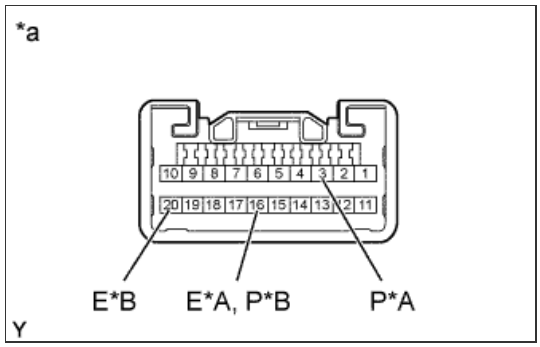
INSPECTION PROCEDURE

When the pattern select (PWR) switch is pushed, switch contact is made and power mode is selected. To cancel power mode, push the pattern select (PWR) switch once again.

1.INSPECT PATTERN SELECT (PWR) SWITCH

a. Remove the suspension control switch (Click here).

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

w/ CRAWL

Tester Connection	Switch Condition	Specified Condition
3 (P) - 16 (E)	Pattern select (PWR) switch on	Below 1 Ω
3 (P) - 16 (E)	Pattern select (PWR) switch off	10 kΩ or higher

w/o CRAWL

Tester Connection	Switch Condition	Specified Condition
16 (P) - 20 (E)	Pattern select (PWR) switch on	Below 1 Ω

16 (P) - 20 (E)	Pattern select (PWR) switch off	10 kΩ or higher

Text in Illustration

A	w/ CRAWL
B	w/o CRAWL
*a	Component without harness connected (Suspension Control Switch)

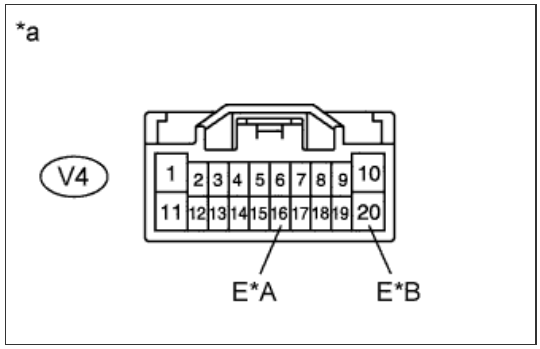
NG → REPLACE PATTERN SELECT (PWR) SWITCH (SUSPENSION CONTROL SWITCH) (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (PATTERN SELECT (PWR) SWITCH - BODY GROUND)

a. Disconnect the suspension control switch connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

w/ CRAWL

Tester Connection	Condition	Specified Condition
V4-16 (E) - Body ground	Always	Below 1 Ω

w/o CRAWL

Tester Connection	Condition	Specified Condition
V4-20 (E) - Body ground	Always	Below 1 Ω

Text in Illustration

A	w/ CRAWL
B	w/o CRAWL
*a	Front view of wire harness connector (to Suspension Control Switch)

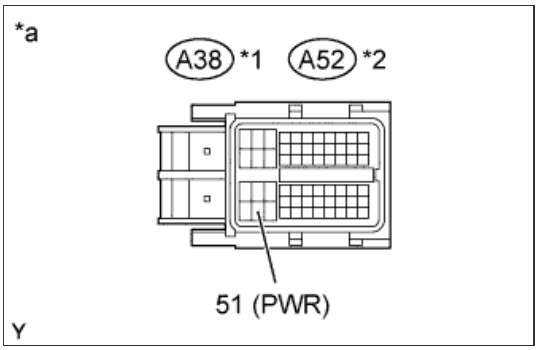
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3.CHECK HARNESS AND CONNECTOR (PATTERN SELECT (PWR) SWITCH - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Switch Condition	Specified Condition
A38-51 (PWR) - Body ground	Pattern select (PWR) switch on	Below 1 Ω
A38-51 (PWR) - Body ground	Pattern select (PWR) switch off	10 kΩ or higher

for RHD

Tester Connection	Switch Condition	Specified Condition
A52-51 (PWR) - Body ground	Pattern select (PWR) switch on	Below 1 Ω
A52-51 (PWR) - Body ground	Pattern select (PWR) switch off	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK → PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (Click here)

for Preparation Click here

DESCRIPTION

When 2nd mode is selected with the pattern select (2ND) switch, the ECM controls the solenoid valves and the transmission starts from 2nd gear. The 2nd mode is the system that operates the throttle motor to control engine output to reduce skidding of the driving wheels, and guarantee takeoff acceleration, driving straightness and turning stability.
When the shift lever is in D, the transmission automatically shifts up through 3rd to 6th as usual.

WIRING DIAGRAM

Refer to Pattern Select Switch Power Mode Circuit (Click here).

INSPECTION PROCEDURE

When the pattern select (2ND) switch is pushed, switch contact is made and 2nd mode is selected. To cancel 2nd mode, push the pattern select (2ND) switch once again.

HINT:

2nd mode is automatically canceled when the engine switch is turned off.

1.DRIVING TEST

HINT:

The driving test should be performed on a paved road (nonskid road).

a. Start the engine.

b. Turn the 2ND switch off (normal drive mode).

c. Confirm vehicle response by driving from a parked position to fully depressing the accelerator pedal.

d. Turn the 2ND switch on and perform the same check as above.
When driving the vehicle with the 2ND switch on and off, check that there is a difference in acceleration.

OK:
There is a difference in acceleration.

NG → Go to step 2

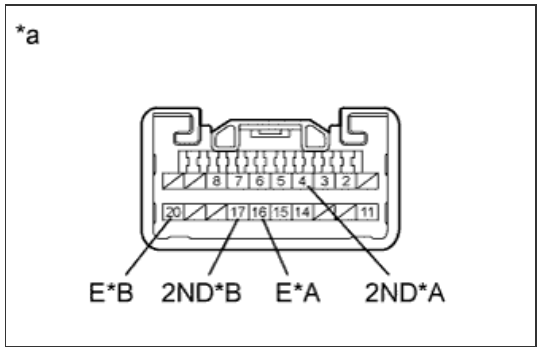
OK →

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (Click here)

2.INSPECT PATTERN SELECT (2ND) SWITCH

a. Remove the suspension control switch (Click here).

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

w/ CRAWL

Tester Connection	Switch Condition	Specified Condition
4 (2ND) - 16 (E)	Pattern select (2nd) switch continuously pressed	Below 1 Ω

4 (2ND) - 16 (E)	Pattern select (2nd) switch released	10 kΩ or higher

w/o CRAWL

Tester Connection	Switch Condition	Specified Condition
17 (2ND) - 20 (E)	Pattern select (2nd) switch continuously pressed	Below 1 Ω
17 (2ND) - 20 (E)	Pattern select (2nd) switch released	10 kΩ or higher

Text in Illustration

A	w/ CRAWL
B	w/o CRAWL
*a	Component without harness connected (Suspension Control Switch)

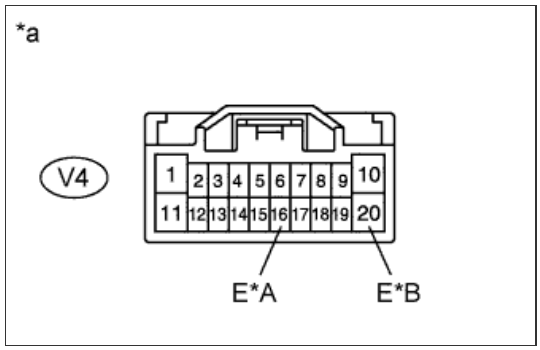
NG → REPLACE PATTERN SELECT (2ND) SWITCH (SUSPENSION CONTROL SWITCH) (Click here)

OK →

3.CHECK HARNESS AND CONNECTOR (PATTERN SELECT (2ND) SWITCH - BODY GROUND)

a. Disconnect the suspension control switch connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

w/ CRAWL

Tester Connection	Condition	Specified Condition
V4-16 (E) - Body ground	Always	Below 1 Ω

w/o CRAWL

Tester Connection	Condition	Specified Condition
V4-20 (E) - Body ground	Always	Below 1 Ω

Text in Illustration

A	w/ CRAWL
B	w/o CRAWL
*a	Front view of wire harness connector (to Suspension Control Switch)

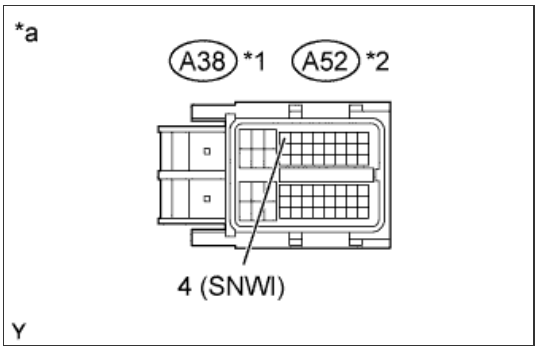
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK →

4.CHECK HARNESS AND CONNECTOR (PATTERN SELECT (2ND) SWITCH - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Switch Condition	Specified Condition
A38-4 (SNWI) - Body ground	Pattern select (2ND) switch continuously pressed	Below 1 Ω
A38-4 (SNWI) - Body ground	Pattern select (2ND) switch released	10 kΩ or higher

for RHD

Tester Connection	Switch Condition	Specified Condition
A52-4 (SNWI) - Body ground	Pattern select (2ND) switch continuously pressed	Below 1 Ω
A52-4 (SNWI) - Body ground	Pattern select (2ND) switch released	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (Click here)

for Preparation Click here

DESCRIPTION

The four wheel drive control ECU judges whether the transfer is in the L4 position based on the information from the limit switch inside the transfer shift actuator assembly which is detected by the ECM. The four wheel drive control ECU then inputs a signal to the combination meter assembly via CAN communication and turns on the 4LO indicator.

WIRING DIAGRAM

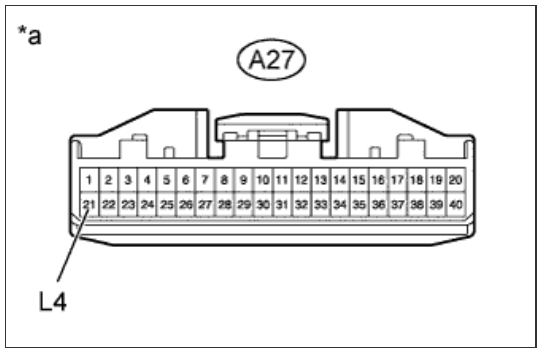
Refer to DTC P2772 (Click here).

INSPECTION PROCEDURE

1.CHECK HARNESS AND CONNECTOR (FOUR WHEEL DRIVE CONTROL ECU - BODY GROUND)

a. Disconnect the four wheel drive control ECU connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
A27-21 (L4) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to Four Wheel Drive Control ECU)

NG → Go to step 2

OK

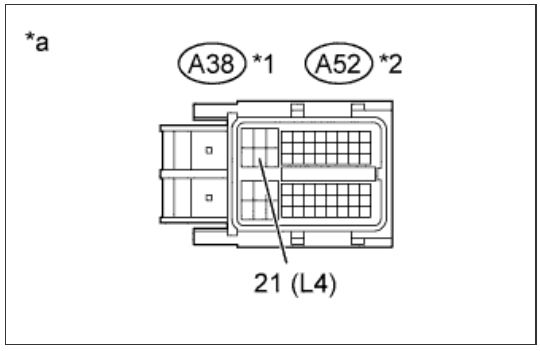
GO TO TRANSFER SYSTEM INSPECTION (Click here)

2.CHECK HARNESS AND CONNECTOR (FOUR WHEEL DRIVE CONTROL ECU - ECM)

a. Disconnect the ECM connector.

b. Disconnect the A27 four wheel drive control ECU connector.

c. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
A38-21 (L4) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
A52-21 (L4) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

for Preparation Click here

NOTICE:

- **Perform the Reset Memory procedures (A/T initialization) after replacing the automatic transmission assembly, valve body assembly or any of the shift solenoid valves (Click here).**

  HINT:

  Reset Memory cannot be completed by only reconnecting the cable to the negative (-) battery terminal.

- **If either of the following conditions is met, perform ATF Thermal Degradation Estimate Reset (Click here).**
  - **The ATF has been replaced.**

    HINT:

    If 50000 or more is displayed for the Data List item "ATF Thermal Degradation Estimate", thermal degradation of the ATF is suspected. Perform ATF Thermal Degradation Estimate Reset after replacing the ATF.

  - **Approximately 50% or more of the ATF has been replaced during a repair of the transmission or a similar operation.**

CAUTION:

When using compressed air, always aim away from yourself to prevent Automatic Transmission Fluid (ATF) or kerosene from spraying on your face.

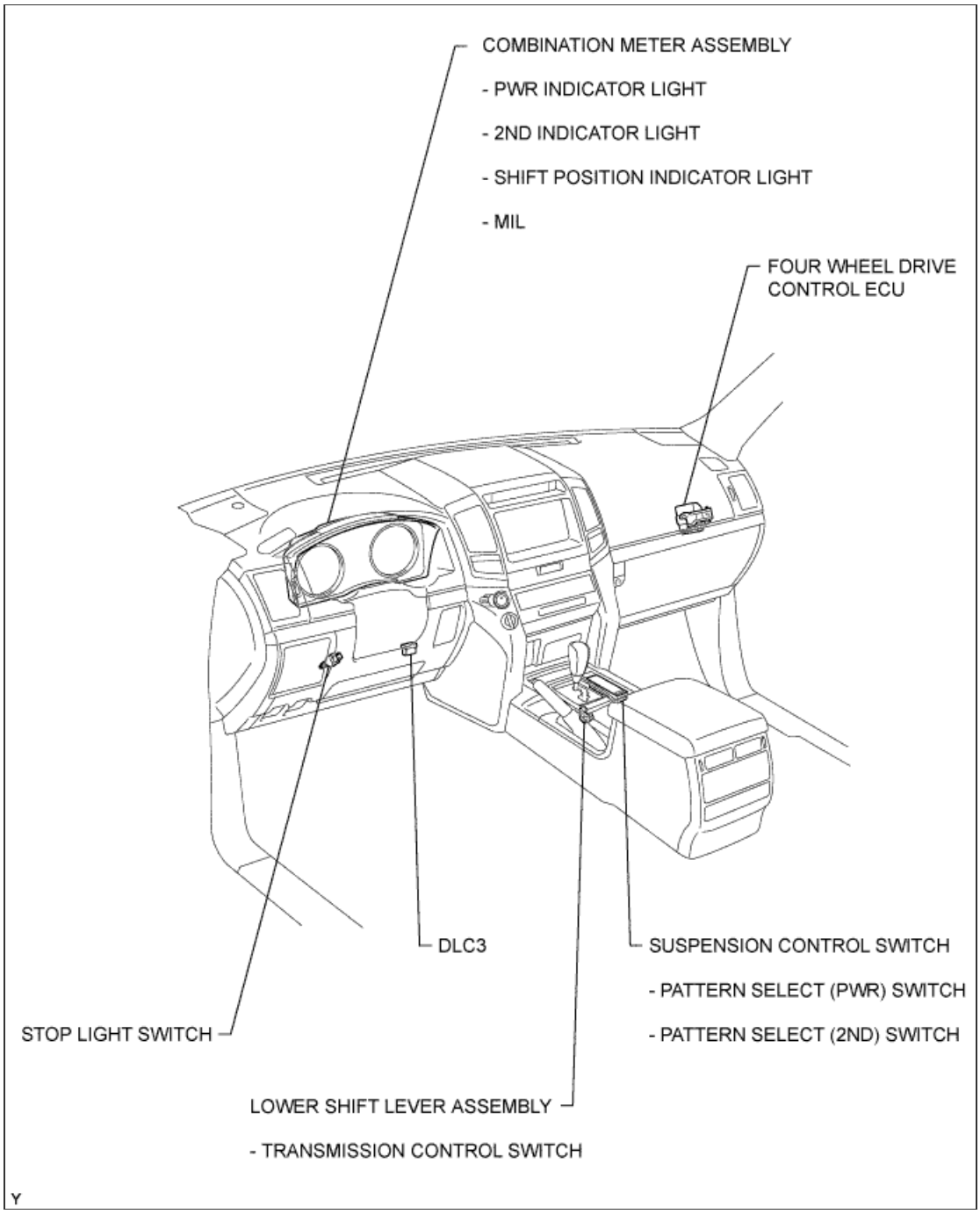
NOTICE:

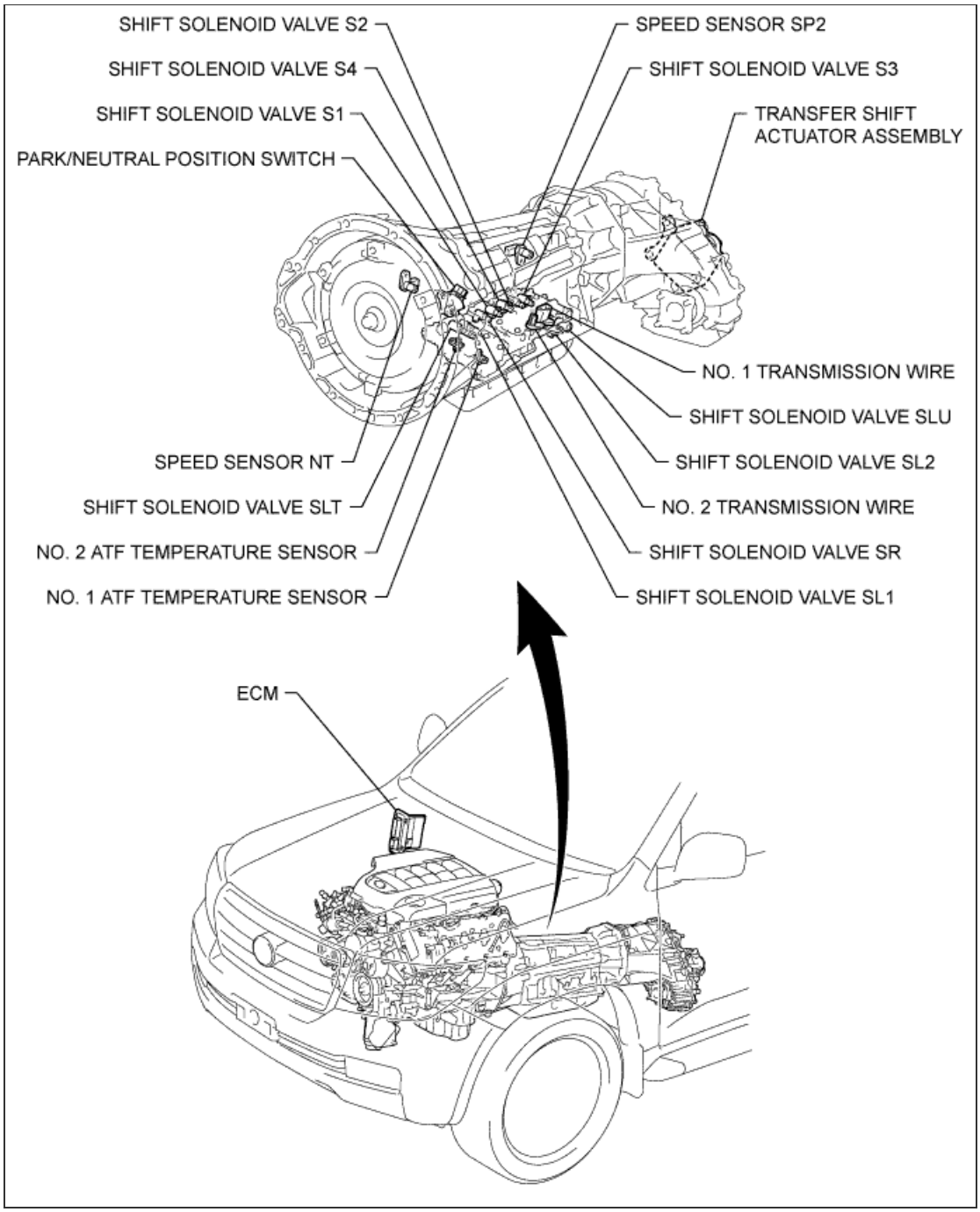
- **The automatic transmission is composed of precision-made parts, necessitating careful inspection before reassembly because even a small nick could cause fluid leakage or affect performance.**
- **The procedures are organized so that you work on only one component group at a time. This will help avoid confusion with similar-looking parts of different sub-assemblies being on your workbench at the same time.**
- **The component groups are inspected and repaired from the converter housing side.**
- **Whenever possible, complete the inspection, repair and reassembly before proceeding to the next component group. If a defect is found in a certain component group during reassembly, inspect and repair this group immediately. If a component group cannot be assembled because parts are being ordered, be sure to keep all parts of the group in a separate container while proceeding with disassembly, inspection, repair and reassembly of other component groups.**
- **Use of Toyota Genuine ATF WS is recommended.**
- **All disassembled parts should be washed clean, and compressed air should be blown through any fluid passages and holes.**
- **Dry all parts with compressed air. Never use a cloth.**
- **The recommended ATF or kerosene should be used for cleaning.**
- **After cleaning, the parts should be arranged in the order they were removed for efficient inspection, repairs, and reassembly.**
- **New discs for the brakes and clutches that will be used for replacement must be soaked in ATF for at least 15 minutes before reassembly.**
- **All oil seal rings, clutch discs, clutch plates, rotating parts and sliding surfaces should be coated with ATF prior to reassembly.**
- **All old gaskets and rubber O-rings must be replaced.**
- **Do not apply adhesive cement to gaskets and similar parts.**
- **Make sure that the ends of the snap rings are not aligned with any cutouts. Also make sure that snap rings are correctly installed into the grooves.**
- **If a worn bushing is to be replaced, the sub-assembly containing the bushing must also be replaced.**
- **Check the thrust bearings and races for wear or damage. Replace them if necessary.**
- **Use petroleum jelly to keep parts in place.**
- **When working with FIPG material, perform the following:**
  Using a razor blade and gasket scraper, remove all old FIPG material from the gasket surface.
  Clean all components thoroughly to remove all foreign matter.
  Clean both sealing surfaces with a non-residue solvent.
  Apply FIPG material in a continuous line on the sealing surface.
  Reassemble parts within 10 minutes of applying FIPG material. Failing to do so will require the FIPG material to be removed and reapplied.

for Preparation Click here

Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).

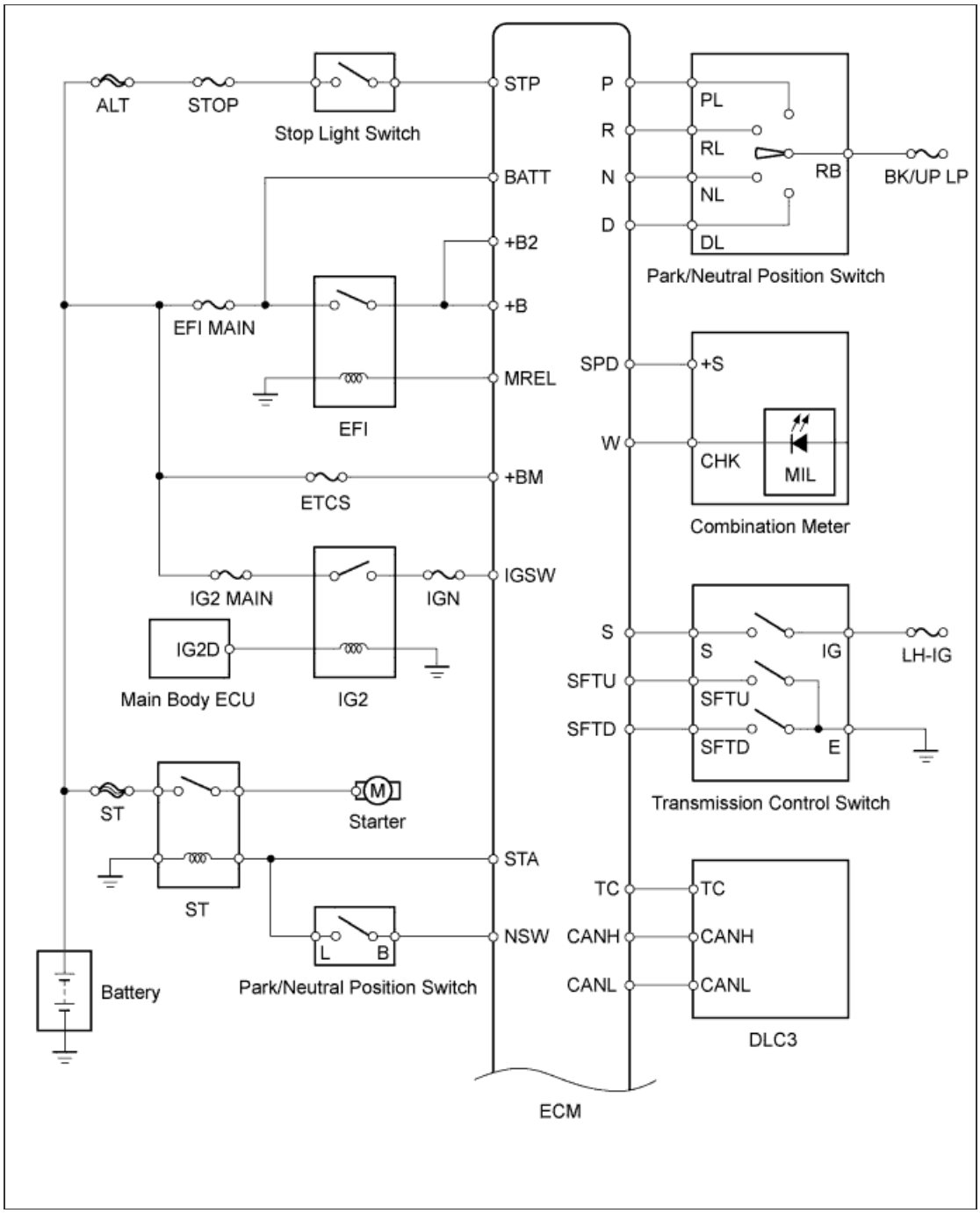
for Preparation Click here

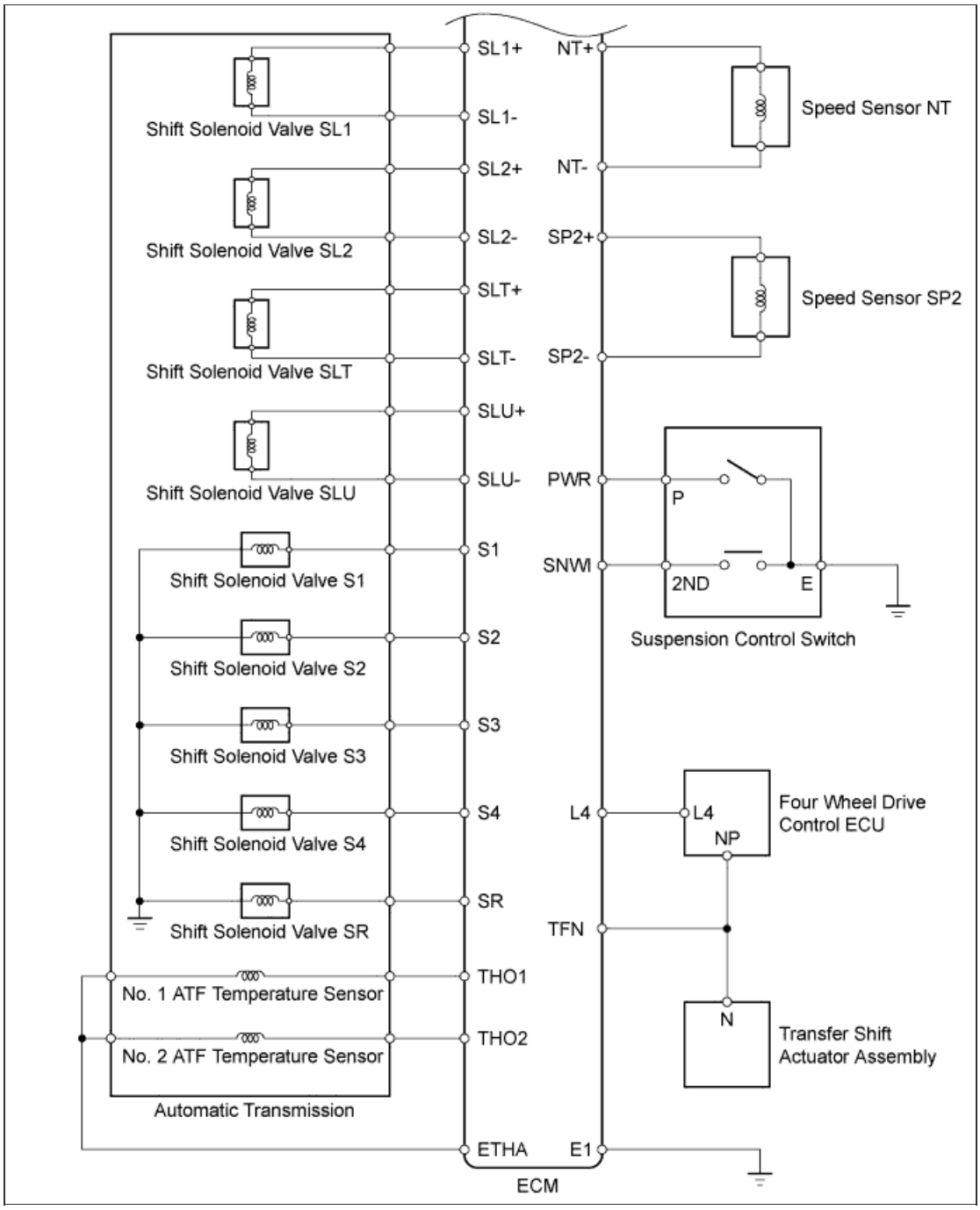



SHIFT SOLENOID VALVE S2
SHIFT SOLENOID VALVE S4
SHIFT SOLENOID VALVE S1
PARK/NEUTRAL POSITION SWITCH
SPEED SENSOR NT
SHIFT SOLENOID VALVE SLT
NO. 2 ATF TEMPERATURE SENSOR
NO. 1 ATF TEMPERATURE SENSOR
SPEED SENSOR SP2
SHIFT SOLENOID VALVE S3
TRANSFER SHIFT ACTUATOR ASSEMBLY
NO. 1 TRANSMISSION WIRE
SHIFT SOLENOID VALVE SLU
SHIFT SOLENOID VALVE SL2
NO. 2 TRANSMISSION WIRE
SHIFT SOLENOID VALVE SR
SHIFT SOLENOID VALVE SL1
ECM

for Preparation Click here

The configuration of the electronic control system for the AB60F automatic transmission is as shown in the following chart.




SL1+
SL1-
SL2+
SL2-
SLT+
SLT-
SLU+
SLU-
S1
S2
S3
S4
SR
THO1
THO2
ETHA
NT+
NT-
SP2+
SP2-
PWR
SNWI
L4
TFN
E1
Shift Solenoid Valve SL1
Shift Solenoid Valve SL2
Shift Solenoid Valve SLT
Shift Solenoid Valve SLU
Shift Solenoid Valve S1
Shift Solenoid Valve S2
Shift Solenoid Valve S3
Shift Solenoid Valve S4
Shift Solenoid Valve SR
No. 1 ATF Temperature Sensor
No. 2 ATF Temperature Sensor
Automatic Transmission
ECM
Speed Sensor NT
Speed Sensor SP2
P
2ND
E
Suspension Control Switch
L4
NP
Four Wheel Drive
Control ECU
N
Transfer Shift
Actuator Assembly

for Preparation Click here

SYSTEM DESCRIPTION

a. The Electronic Controlled Automatic Transmission (ECT) is an automatic transmission that electronically controls shift timing using the Engine Control Module (ECM). The ECM detects electrical signals that indicate engine and driving conditions, and controls the shift point based on driver habits and road conditions. As a result, fuel efficiency and power transmission performance are improved.
Shift shock is reduced by controlling the engine and transmission simultaneously.
In addition, the ECT has the following features:

- Diagnostic function.
- Fail-safe function when a malfunction occurs.

for Preparation Click here

HINT:

- **The ECM is connected to the CAN communication system. Therefore, before starting troubleshooting, make sure to check that there is no trouble in the CAN communication system.**
- ***: Use the intelligent tester.**

1.VEHICLE BROUGHT TO WORKSHOP

NEXT

2.CUSTOMER PROBLEM ANALYSIS

a. Refer to How to Troubleshoot ECU Controlled Systems in the Introduction section (Click here).

NEXT

3.INSPECT BATTERY VOLTAGE

Standard voltage:
11 to 14 V

If the voltage is below 11 V, recharge or replace the battery before proceeding.

NEXT

4.CONNECT INTELLIGENT TESTER TO DLC3*

NEXT

5.CHECK AND CLEAR DTCS AND FREEZE FRAME DATA*

a. Refer to DTC Check/Clear (Click here).

NEXT

6.VISUAL INSPECTION

NEXT

7.SETTING CHECK MODE DIAGNOSIS*

a. Refer to Check Mode Procedure (Click here).

NEXT

8.PROBLEM SYMPTOM CONFIRMATION

a. Refer to Road Test (Click here).

Result

Result	Proceed to
Symptom does not occur	A
Symptom occurs	B

B. → GO TO STEP 10

A

9.SYMPTOM SIMULATION

a. Refer to Electronic Circuit Inspection Procedure (Click here).

NEXT

10.DTC CHECK*

a. Refer to DTC Check/Clear (Click here).

Result

Result	Proceed to
DTC is not output	A
DTC is output	B

B. → GO TO STEP 18

A

11.BASIC INSPECTION

a. Refer to Park/Neutral Position Switch (Click here).

b. Refer to Shift Lever Assembly (Click here).

NG. → GO TO STEP 21

OK

12.MECHANICAL SYSTEM TESTS

a. Refer to Mechanical System Tests (Click here).

NG. → GO TO STEP 17

OK

13.HYDRAULIC TEST

a. Refer to Hydraulic Test (Click here).

NG. → GO TO STEP 17

OK

14.MANUAL SHIFTING TEST

a. Refer to Manual Shifting Test (Click here).

NG. → GO TO STEP 16

OK

15.PROBLEM SYMPTOMS TABLE CHAPTER 1

a. Refer to Problem Symptoms Table (Click here).

NG. → GO TO STEP 19

OK

16.PROBLEM SYMPTOMS TABLE CHAPTER 2

a. Refer to Problem Symptoms Table (Click here).

NEXT

17.PART INSPECTION

NG. → GO TO STEP 21

OK

18.DTC CHART

a. Refer to Diagnostic Trouble Code Chart (Click here).

NEXT

19.CIRCUIT INSPECTION

NEXT

20.IDENTIFICATION OF PROBLEM

NEXT

21.REPAIR OR REPLACE

NEXT

22.CONFIRMATION TEST



END

for Preparation Click here

PROBLEM SYMPTOM CONFIRMATION

a. Based on the result of the customer problem analysis, try to reproduce the symptoms. If the problem is that the transmission does not shift up or down, or that the shift point is too high or too low, conduct the following road test referring to the automatic shift schedule and attempt to duplicate the problem symptoms.

ROAD TEST

a. Perform a road test.

CAUTION:

Check for safety before performing any tests.

NOTICE:

- **Be sure to inspect and adjust the engine before performing these tests.**
- **Perform the road test with the engine coolant temperature between 60 and 100°C (140 and 212°F) and the ATF temperature between 50 and 100°C (122 and 212°F).**
- **Perform these tests with the air conditioning and cruise control off.**

Inspection	Procedure
Transmission Control Switch Test	With the vehicle stationary and the shift lever in D, move the shift lever to S and return it to D. Check that the meter display changes from D to the appropriate S range and then back again.
S Position Test	With the vehicle stationary and the shift lever in S, move the shift lever to "+" and "-". Check that the meter display changes between S ranges properly.
D Position Shift Test	While driving the vehicle normally, check that the transmission shifts up and down through each gear properly.
Lock-up Function	While driving on a level surface at a constant speed in the lock-up range (80 km/h (50 mph) or more) with the shift lever in D, lightly depress the accelerator pedal and check that the engine speed does not change abruptly.
P Position Test	Stop the vehicle on an incline (approximately 5° or more). Then move the shift lever to P and release the parking brake. Check that the parking lock pawl holds the vehicle in place.
Abnormal Noise and Vibration	Check for abnormal noise and vibration while driving the vehicle forward and backward, and during shift operations.
Fluid Leakage	After performing all other road test inspections, check for fluid leakage.

for Preparation Click here

STALL SPEED TEST

HINT:

This test is to check the overall performance of the engine and transmission.

CAUTION:

- **To ensure safety, perform this test in an open and level area that provides good traction.**
- **The stall speed test should always be performed with at least 2 people. One person should observe the condition of the wheels and wheel chocks while the other is performing the test.**

NOTICE:

Do not perform the stall speed test for more than 5 seconds.

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / Data List.

e. Run the vehicle until the transmission fluid temperature is between 50 and 80°C (122 and 176°F).

f. Allow the engine to idle with the air conditioning off.

g. Chock all 4 wheels.

h. Set the parking brake and keep the brake pedal depressed firmly with your left foot.

i. Move the shift lever to D.

j. Depress the accelerator pedal as much as possible with your right foot.

k. Read the engine speed (stall speed) and release the accelerator pedal immediately.

Standard value:
2350 +/-200 rpm

Evaluation

Test Result	Possible Cause
Stall speed is less than standard value	• Stator one-way clutch is not operating properly • Torque converter is faulty (stall speed is less than standard value by 600 rpm or more) • Engine power may be insufficient
Stall speed is more than standard value	• Line pressure is low • C1 clutch is slipping • F3 one-way clutch is not operating properly • F4 one-way clutch is not operating properly

NOTICE:

Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).

SHIFT TIME LAG TEST

HINT:

This test is to check the condition of the direct clutch, forward clutch, 1st brake and reverse brake.

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / Data List.

e. Run the vehicle until the transmission fluid temperature is between 50 and 80°C (122 and 176°F).

f. Allow the engine to idle with the air conditioning off.

g. Set the parking brake and keep the brake pedal depressed firmly.

h. Check the D position time lag.

   i. Move the shift lever to N and wait for 1 minute.

   ii. Move the shift lever to D and measure the time until the shock is felt.

   iii. Repeat the 2 procedures above 3 times, and then calculate the average time of the 3 tests.

i. Check the R position time lag.

   i. Move the shift lever to N and wait for 1 minute.

   ii. Move the shift lever to R and measure the time until the shock is felt.

   iii. Repeat the 2 procedures above 3 times, and then calculate the average time of the 3 tests.

Standard value:
D position time lag is less than 1.2 seconds
R position time lag is less than 1.5 seconds

Evaluation

Test Result	Possible Cause
D position time lag exceeds standard value	• Line pressure is low • C1 clutch is worn • F3 one-way clutch is not operating properly • F4 one-way clutch is not operating properly
R position time lag exceeds standard value	• Line pressure is low • C3 clutch is worn • B4 brake is worn • F1 one-way clutch is not operating properly

for Preparation Click here

PERFORM HYDRAULIC TEST

a. Measure the line pressure.

CAUTION:

The line pressure test should always be performed with at least 2 people. One person should observe the condition of the wheels and wheel chocks while the other is performing the test.

NOTICE:

- **Perform the test while the ATF (Automatic Transmission Fluid) temperature is between 50 and 80°C (122 and 176°F).**
- **Be careful to prevent the hose of SST from interfering with the exhaust pipe.**
- **This check must be conducted after checking and adjusting the engine.**
- **Perform the test with the A/C off.**
- **When conducting stall test, do not continue for more than 5 seconds.**

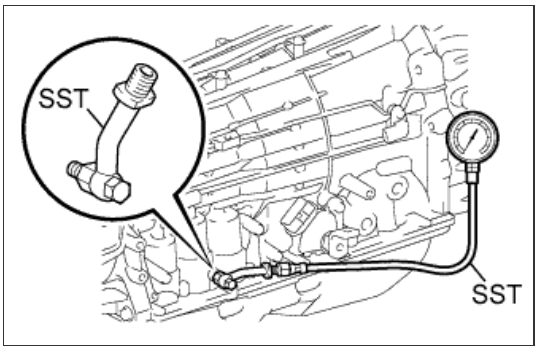
i. Warm up the ATF (Automatic Transmission Fluid).

ii. Turn the engine switch off.

iii. Lift the vehicle up.

iv. Remove the test plug from the transmission case and connect SST.

SST
09992-00095 (09992-00231, 09992-00271)



v. Lower the vehicle.

vi. Fully apply the parking brake and chock the 4 wheels.

vii. Start the engine and check the idling speed.

viii. Keep your left foot pressed firmly on the brake pedal and move the shift lever to D.

ix. Measure the line pressure when the engine is idling.

x. Fully depress the accelerator pedal with your right foot. Quickly read the highest line pressure when the engine speed reaches the stall speed.

xi. In the same manner, perform the test with the shift lever in R.

Specified Line Pressure

Condition	D Position	R Position
Stall speed	1370 to 1530 kPa (14.0 to 15.6 kgf/cm^2, 199 to 222 psi)	1540 to 1750 kPa (15.7 to 17.8 kgf/cm^2, 223 to 254 psi)

Evaluation

Problem	Possible Cause
Measured values at both positions are higher than specified pressure	• Shift solenoid valve SLT defective • Regulator valve defective
Measured values at both positions are below specified pressure	• Shift solenoid valve SLT defective • Regulator valve defective • Oil pump defective
Pressure is low in D position only	• D position circuit fluid leak • Clutch No. 1 (C1) defective
	• R position circuit fluid leak

Pressure is low in R position only	• Clutch No. 3 (C3) defective • Brake No. 4 (B4) defective

for Preparation Click here

MANUAL SHIFTING TEST

HINT:

- **Through this test, it can be determined whether the trouble occurs in an electrical circuit or if it is a mechanical problem in the transmission.**
- **If any abnormalities are found in the following test, the problem is in the transmission itself.**

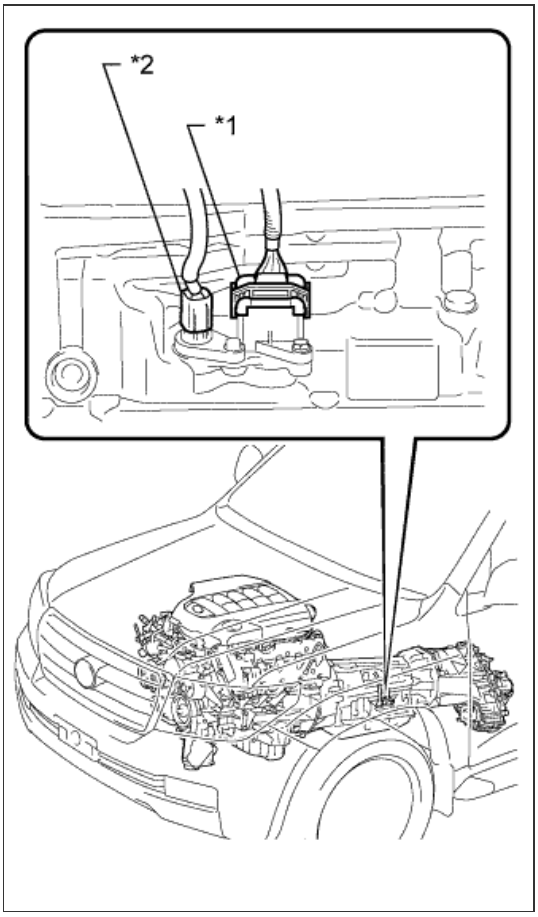
a. Disconnect the connector of the No. 1 transmission wire and/or No. 2 transmission wire.

HINT:

It is possible to deactivate the electrical shift control by disconnecting the transmission wires. The gear positions can then be changed mechanically with the shift lever.

Text in Illustration

*1	No. 1 Transmission Wire
*2	No. 2 Transmission Wire



b. Drive the vehicle with the transmission wires disconnected. Move the shift lever to each position and check whether the gear position changes as shown in the table below.

Shift Lever Position	Gear Position
P	P
R	R
D	• 4th*1 • 1st to 6th*2

HINT:

- ***1: When disconnecting only the No. 1 transmission wire or the No. 1 and No. 2 transmission wires.**
- ***2: When disconnecting only the No. 2 transmission wire.**

c. Connect the connector of the No. 1 transmission wire and/or No. 2 transmission wire.

d. Clear the DTCs (Click here).

for Preparation Click here

RESET MEMORY

NOTICE:

- **Perform Reset Memory (AT initialization) when replacing the automatic transmission assembly, valve body assembly or any of the shift solenoid valves.**
- **Reset Memory can be performed only with the GTS.**

HINT:

The ECM memorizes the control conditions of the automatic transmission assembly and engine assembly. Therefore, when the automatic transmission assembly, valve body assembly or any of the shift solenoid valves has been replaced, it is necessary to reset the memory so that the ECM can memorize the new information.

The reset procedure is as follows.

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Utility / Reset Memory.

NOTICE:

After performing Reset Memory, be sure to perform the Road Test (Click here) described earlier.

HINT:

The ECM learns through the Road Test.

ATF THERMAL DEGRADATION ESTIMATE RESET

NOTICE:

If either of the following conditions is met, perform ATF Thermal Degradation Estimate Reset.

- The ATF has been replaced.

  HINT:

  If 50000 or more is displayed for the Data List item "ATF Thermal Degradation Estimate", thermal degradation of the ATF is suspected. Perform ATF Thermal Degradation Estimate Reset after replacing the ATF.

- Approximately 50% or more of the ATF has been replaced during a repair of the transmission or a similar operation.

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

NOTICE:

Do not start the engine.

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Utility / ATF Thermal Degradation Estimate Reset.

for Preparation Click here

TEST MONITOR DRIVE PATTERN FOR ECT

CAUTION:

Perform this drive pattern on a level surface and strictly observe the posted speed limits and traffic laws while driving.

HINT:

Performing this drive pattern is one method to simulate the malfunction detection conditions of the ECT.

The DTCs may not be stored through ordinary, everyday driving. Also, DTCs may not be stored through this drive pattern.

a. Preparation for driving

i. Warm up the engine sufficiently (engine coolant temperature is 60°C (140°F) or higher).

ii. Drive the vehicle when the atmospheric temperature is -10°C (14°F) or higher.
Malfunctions are not detected when the atmospheric temperature is less than -10°C (14°F).

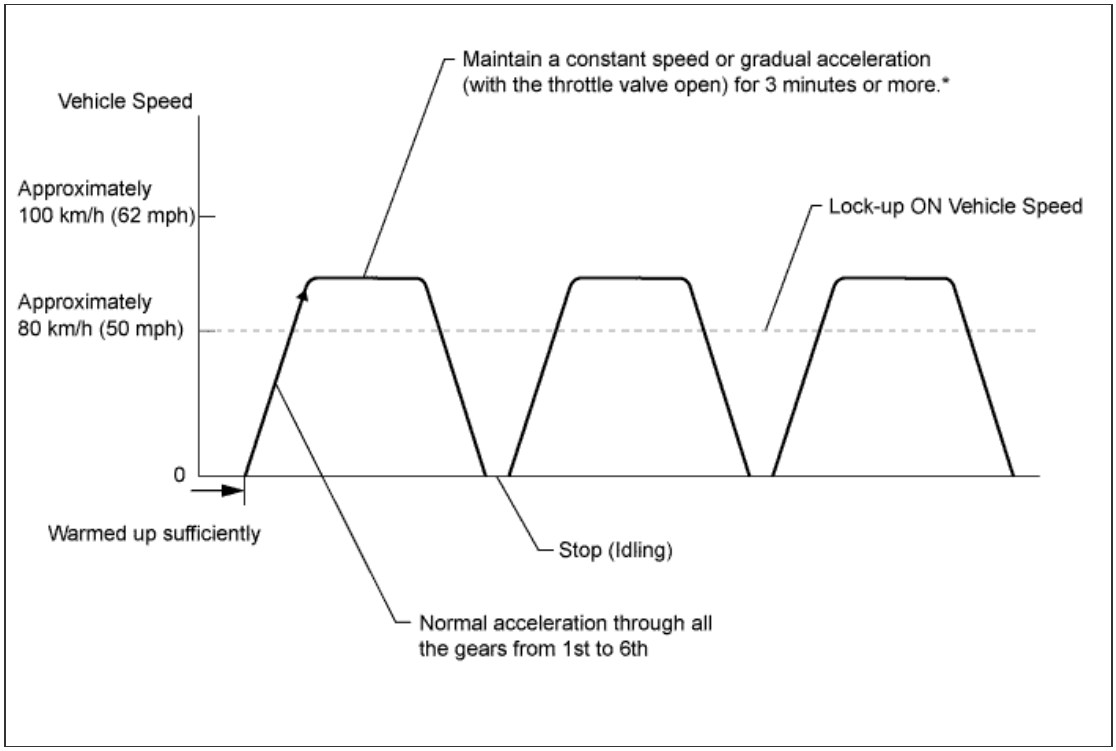
b. Drive pattern

i. Drive the vehicle through all the gears.
Stop → 1st → 2nd → 3rd → 4th → 5th → 5th (lock-up ON) → 6th → 6th (lock-up ON).

ii. Repeat the above drive pattern 3 times or more.

NOTICE:

- **When using the intelligent tester, the monitor status can be checked in the Data List (Click here).**
- **In the event that the drive pattern must be interrupted (due to traffic conditions or other factors), the drive pattern can be resumed and, in most cases, the monitor can be completed.**



HINT:

*: Drive at such a speed in the uppermost gear so as to engage lock-up. The vehicle can be driven at a speed lower than the speed shown in the above diagram in lock-up.

for Preparation Click here

HINT:

- **Use the table below to help determine the cause of problem symptoms. If multiple suspected areas are listed, the potential causes of the symptoms are listed in order of probability in the "Suspected Area" column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.**
- **The Matrix Chart is divided into 2 chapters. When troubleshooting, check Chapter 1 first. If instructions are given in Chapter 1 to proceed to 2, proceed as instructed.**
- **If the instruction "Proceed to Next Circuit Inspection Shown in Problem Symptoms Table" is given in the flowchart for a circuit, proceed to the next suspected area in the table.**
- **If the problem still occurs even though there are no malfunctions in any of the circuits, check the ECM and replace it if necessary.**
- ***: When the circuit is defective, a DTC may be output.**

1. Chapter 1: Electronic Circuit Matrix Chart

Symptom	Suspected Area	See page
No up-shift (1st -> 2nd)	Shift solenoid valve S1 circuit*	Click here
	ECM	Click here
No up-shift (2nd -> 3rd)	Shift solenoid valve S2 circuit*	Click here
	ECM	Click here
No up-shift (3rd -> 4th)	Shift solenoid valve S3 circuit*	Click here
	Engine coolant temperature sensor circuit*	Click here
	ECM	Click here
No up-shift (4th -> 5th)	Shift solenoid valve S4 circuit*	Click here
	Shift solenoid valve SR circuit*	Click here
	Shift solenoid valve SL1 circuit*	Click here
	Shift solenoid valve SL2 circuit*	Click here
	Engine coolant temperature sensor circuit*	Click here
	ECM	Click here
No up-shift (5th -> 6th)	Park/Neutral position switch circuit*	Click here
	Shift solenoid valve S2 circuit*	Click here
	ECM	Click here
No down-shift (6th -> 5th)	Park/Neutral position switch circuit*	Click here
	Shift solenoid valve S2 circuit*	Click here
	ECM	Click here
No down-shift (5th -> 4th)	Shift solenoid valve S4 circuit*	Click here
	Shift solenoid valve SR circuit*	Click here
	Shift solenoid valve SL1 circuit*	Click here
	Shift solenoid valve SL2 circuit*	Click here
	ECM	Click here
No down-shift (4th -> 3rd)	Shift solenoid valve S3 circuit*	Click here
	ECM	Click here
No down-shift (3rd -> 2nd)	Shift solenoid valve S2 circuit*	Click here
	ECM	Click here
No down-shift (2nd -> 1st)	Shift solenoid valve S1 circuit*	Click here
	ECM	Click here
No lock-up or no lock-up off	Shift solenoid valve SLU circuit*	Click here
	Stop light switch circuit*	Click here
	ECM	Click here
No lock-up	No. 1 ATF temperature sensor circuit*	Click here
	Shift solenoid valve SLU circuit*	Click here
	Engine coolant temperature sensor circuit*	Click here
	Stop light switch circuit*	Click here
	Speed sensor NT circuit*	Click here
	ECM	Click here
	Shift solenoid valve SLU circuit*	Click here

No lock-up off	ECM	Click here
Shift point too high or too low	Shift solenoid valve SLT circuit*	Click here
	Speed sensor NT circuit*	Click here
	Speed sensor SP2 circuit*	Click here
	Throttle position sensor circuit*	Click here
	No. 1 ATF temperature sensor circuit*	Click here
	Pattern select switch power mode circuit	Click here
	ECM	Click here
Up-shift to 4th from 3rd while engine is cold	Engine coolant temperature sensor circuit*	Click here
	ECM	Click here
Up-shift to 5th from 4th while engine is cold	Engine coolant temperature sensor circuit*	Click here
	ECM	Click here
No gear change by shifting into "+" or "-" while shift lever in S	Transmission control switch circuit	Click here
	ECM	Click here
Harsh engagement (N -> D)	Shift solenoid valve SLT circuit*	Click here
	Speed sensor NT circuit*	Click here
	ECM	Click here
Harsh engagement (lock-up)	Speed sensor NT circuit*	Click here
	Speed sensor SP2 circuit*	Click here
	Shift solenoid valve SLU circuit*	Click here
	ECM	Click here
Harsh engagement (any driving position)	Throttle position sensor circuit*	Click here
	Shift solenoid valve SL1 circuit*	Click here
	Shift solenoid valve SL2 circuit*	Click here
	Shift solenoid valve SLU circuit*	Click here
	Shift solenoid valve SLT circuit*	Click here
	Speed sensor NT circuit*	Click here
	ECM	Click here
Poor acceleration	No. 2 ATF temperature sensor circuit*	Click here
	Shift solenoid valve SLT circuit*	Click here
	Pattern select switch 2nd start mode circuit	Click here
	ECM	Click here
No engine brake	ECM	Click here
No kick-down	ECM	Click here
Engine stalls when starting off or stopping	Shift solenoid valve SLU circuit*	Click here
	ECM	Click here
ECT 2ND does not operate	Shift solenoid valve SLT circuit*	Click here
	Pattern select switch 2nd start mode circuit	Click here
	ECM	Click here
"A/T OIL TEMP" warning light remains on, lock-up at 3rd gear and/or shift point too high	No. 2 ATF temperature sensor circuit*	Click here
	Engine coolant temperature sensor circuit*	Click here
	ECM	Click here
Malfunction in shifting	Park/Neutral position switch circuit*	Click here
	Transmission control switch circuit	Click here
	ECM	Click here
Harsh engagement (1st -> 2nd -> 3rd -> 4th -> 5th)	Shift solenoid valve SR circuit*	Click here
Slip or shudder (5th -> 6th -> and 6th -> 5th)	Shift solenoid valve SR circuit*	Click here

2. Chapter 2: On-Vehicle Repair and Off-Vehicle Repair

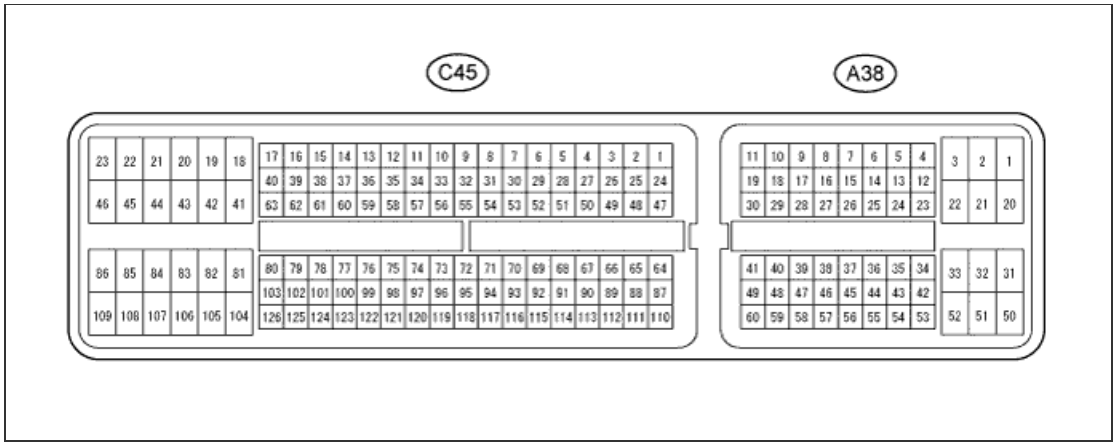
Symptom	Suspected Area	See page
Vehicle does not move when shift lever is in any forward position and reverse position	Transmission control cable	Click here
	Manual valve	Click here
	Parking lock pawl	Click here
	Rear planetary gear unit	Click here
	Torque converter	Click here
Vehicle does not move with shift lever in R	Valve body assembly	Click here

	B4 brake	Click here
No up-shift (1st -> 2nd)	Valve body assembly	Click here
	B3 brake	Click here
	F1 one-way clutch	Click here
	F2 one-way clutch	Click here
No up-shift (2nd -> 3rd)	Valve body assembly	Click here
	C3 clutch	Click here
No up-shift (3rd -> 4th)	Valve body assembly	Click here
	C2 clutch	Click here
No up-shift (4th -> 5th)	Valve body assembly	Click here
	B1 brake	Click here
No up-shift (5th -> 6th)	Valve body assembly	Click here
	B2 brake	Click here
No down-shift (6th -> 5th)	Valve body assembly	Click here
No down-shift (5th -> 4th)	Valve body assembly	Click here
No down-shift (4th -> 3rd)	Valve body assembly	Click here
No down-shift (3rd -> 2nd)	Valve body assembly	Click here
No down-shift (2nd -> 1st)	Valve body assembly	Click here
No lock-up or no lock-up off	Valve body assembly	Click here
	Torque converter	Click here
Harsh engagement (N -> D)	Valve body assembly	Click here
	C1 accumulator	Click here
	C1 clutch	Click here
	F3 one-way clutch	Click here
	F4 one-way clutch	Click here
Harsh engagement (lock-up)	Valve body assembly	Click here
	Torque converter	Click here
Harsh engagement (N -> R)	Valve body assembly	Click here
	C3 accumulator	Click here
	C3 clutch	Click here
	B4 brake	Click here
	F1 one-way clutch	Click here
Harsh engagement (1st -> 2nd -> 3rd -> 4th -> 5th -> 6th)	Valve body assembly	Click here
Harsh engagement (1st -> 2nd)	Valve body assembly	Click here
	B3 accumulator	Click here
	B3 brake	Click here
	F1 one-way clutch	Click here
	F2 one-way clutch	Click here
Harsh engagement (2nd -> 3rd)	Valve body assembly	Click here
	C3 accumulator	Click here
	C3 clutch	Click here
Harsh engagement (3rd -> 4th)	Valve body assembly	Click here
	C2 accumulator	Click here
	C2 clutch	Click here
Harsh engagement (4th -> 5th)	Valve body assembly	Click here
	B1 accumulator	Click here
	B1 brake	Click here
Harsh engagement (5th -> 6th)	Valve body assembly	Click here
	B2 accumulator	Click here
	B2 brake	Click here
Harsh engagement (6th -> 5th)	Valve body assembly	Click here
	C3 accumulator	Click here
	C3 clutch	Click here
Slip or shudder (forward and reverse, after warm-up)	Transmission control cable	Click here
	Valve body assembly	Click here
	Oil strainer	Click here
	F1 one-way clutch	Click here

	C3 clutch	Click here
	Torque converter	Click here
Slip or shudder (particular position, just after engine starts)	Torque converter	Click here
Slip or shudder (shift lever in R)	B4 brake	Click here
	F1 one-way clutch	Click here
	C3 clutch	Click here
Slip or shudder (1st)	C1 clutch	Click here
	F3 one-way clutch	Click here
	F4 one-way clutch	Click here
Slip or shudder (2nd)	C1 clutch	Click here
	B3 brake	Click here
	F1 one-way clutch	Click here
	F2 one-way clutch	Click here
	F4 one-way clutch	Click here
Slip or shudder (3rd)	C1 clutch	Click here
	C3 clutch	Click here
	F1 one-way clutch	Click here
	F4 one-way clutch	Click here
Slip or shudder (4th)	C1 clutch	Click here
	C2 clutch	Click here
	F4 one-way clutch	Click here
Slip or shudder (5th)	C2 clutch	Click here
	C3 clutch	Click here
	B1 brake	Click here
Slip or shudder (6th)	C2 clutch	Click here
	B2 brake	Click here
No engine braking (1st to 4th, shift lever in S)	C4 clutch	Click here
No engine braking (1st: shift lever on 1)	Valve body assembly	Click here
	B4 brake	Click here
No engine braking (2nd: shift lever on 2)	Valve body assembly	Click here
	B2 brake	Click here
No engine braking (3rd: shift lever on 3)	Valve body assembly	Click here
	B1 brake	Click here
No engine braking (4th: shift lever on 4)	Valve body assembly	Click here
No kick-down	Valve body assembly	Click here
Shift point too high or too low	Valve body assembly	Click here
Poor acceleration (all positions)	Valve body assembly	Click here
	Torque converter	Click here
Poor acceleration (6th)	B2 brake	Click here
	C2 clutch	Click here
	Front planetary gear unit	Click here
Engine stalls when starting off or stopping	Valve body assembly	Click here
	Torque converter	Click here

for Preparation Click here

CHECK ECM



HINT:

Each ECM terminal's standard voltage is shown in the table below.

In the table, first follow the information under "Condition". Look under "Terminal No. (Symbol)" for the terminals to be inspected. The standard voltage between the terminals is shown under "Specified Condition".

Use the illustration above as a reference for the ECM terminals.

Terminal No. (Symbol)	Wiring Color	Terminal Description	Condition	Specified Condition
A38-21 (L4) - C45-81 (E1)	BR-R - W-B	4L position signal	• Engine switch on (IG) • Transfer in 4L	Below 1.5 V
			• Engine switch on (IG) • Transfer not in 4L	11 to 14 V
A38-5 (TFN) - C45-81 (E1)	G - W-B	N shift position switch signal	• Engine switch on (IG) • Transfer in neutral	Below 1.5 V
			• Engine switch on (IG) • Transfer not in neutral	11 to 14 V
C45-120 (NSW) - C45-81 (E1)	L - W-B	PNP switch signal	• Engine switch on (IG) • Shift lever in P or N	Below 1 V
			• Engine switch on (IG) • Shift lever not in P or N	11 to 14 V
C45-2 (P) - C45-81 (E1)	G-B - W-B	P shift position switch signal	• Engine switch on (IG) • Shift lever in P	11 to 14 V
			• Engine switch on (IG) • Shift lever not in P	Below 1 V

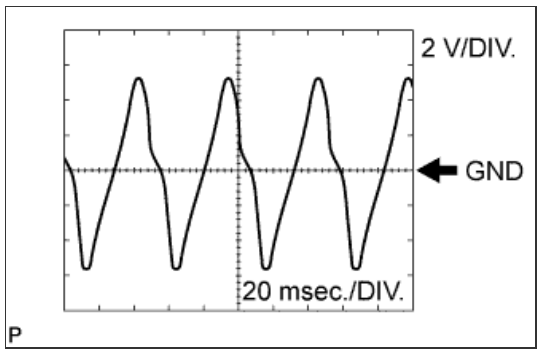
C45-26 (R) - C45-81 (E1)	L-R - W-B	R shift position switch signal	• Engine switch on (IG) • Shift lever in R	11 to 14 V
			• Engine switch on (IG) • Shift lever not in R	Below 1 V
C45-25 (N) - C45-81 (E1)	G-W - W-B	N shift position switch signal	• Engine switch on (IG) • Shift lever in N	11 to 14 V
			• Engine switch on (IG) • Shift lever not in N	Below 1 V
C45-27 (D) - C45-81 (E1)	G - W-B	D shift position switch signal	• Engine switch on (IG) • Shift lever in D	11 to 14 V
			• Engine switch on (IG) • Shift lever not in D	Below 1 V
A38-25 (S) - C45-81 (E1)	W - W-B	S shift position switch signal	• Engine switch on (IG) • Shift lever in S	11 to 14 V
			• Engine switch on (IG) • Shift lever not in S	Below 1 V
A38-38 (SFTU) - C45-81 (E1)	V - W-B	Up-shift shift position switch signal	• Engine switch on (IG) • Shift lever in S	11 to 14 V
			• Engine switch on (IG) • Shift lever in "+" position (up-shift)	Below 1 V
A38-27 (SFTD) - C45-81 (E1)	L - W-B	Down-shift position switch signal	• Engine switch on (IG) • Shift lever in S	11 to 14 V
			• Engine switch on (IG) • Shift lever in "-" position (down-shift)	Below 1 V
C45-7 (S1) - C45-81 (E1)	R - W-B	S1 solenoid signal	1st gear	Below 1 V
			Not on 1st gear	11 to 14 V
C45-6 (S2) - C45-81 (E1)	W - W-B	S2 solenoid signal	1st, 2nd or 6th gear	11 to 14 V
			3rd, 4th or 5th gear	Below 1 V
C45-3 (S3) - C45-81 (E1)	B-R - W-B	S3 solenoid signal	1st, 2nd or 3rd gear	11 to 14 V
			4th, 5th or 6th gear	Below 1 V
C45-5 (S4) - C45-81 (E1)	G-R - W-B	S4 solenoid signal	5th or 6th gear	11 to 14 V
			1st, 2nd, 3rd or 4th gear	Below 1 V
C45-4 (SR) - C45-81 (E1)	G - W-B	SR solenoid signal	1st, 2nd, 3rd or 4th gear	11 to 14 V
			5th or 6th gear	Below 1 V
C45-14 (SL1+) - C45-15 (SL1-)	Y - L	SL1 solenoid signal	5th or 6th gear	Pulse generation
C45-12 (SL2+) - C45-13 (SL2-)	G-R - L-W	SL2 solenoid signal	Engine is idling	Pulse generation

C45-9 (SLT+) - C45-8 (SLT-)	B - G-B	SLT solenoid signal	Engine is idling	Pulse generation
C45-10 (SLU+) - C45-11 (SLU-)	L-Y - L-R	SLU solenoid signal	5th gear (lock-up) or 6th gear (lock-up)	Pulse generation
C45-122 (THO1) - C45-98 (ETHA)	G-Y - BR	No. 1 ATF temperature sensor signal	No. 1 ATF temperature: 115°C (239°F) or higher	Below 1.5 V
C45-99 (THO2) - C45-98 (ETHA)	L - BR	No. 2 ATF temperature sensor signal	No. 2 ATF temperature: 115°C (239°F) or higher	Below 1.5 V
C45-101 (SP2+) - C45-100 (SP2-)	Y - B	Speed sensor SP2 signal	Vehicle speed 20 km/h (12 mph)	Pulse generation (see waveform 1)
C45-124 (NT+) - C45-123 (NT-)	Y - B	Speed sensor NT signal	Engine is idling (shift lever in P or N)	Pulse generation (see waveform 2)
A38-10 (CANH) - C45-81 (E1)	P - W-B	CAN communication line	Engine switch on (IG)	Pulse generation (see waveform 3)
A38-11 (CANL) - C45-81 (E1)	B - W-B	CAN communication line	Engine switch on (IG)	Pulse generation (see waveform 4)
A38-51 (PWR) - C45-81 (E1)	L-B - W-B	Pattern select (PWR) switch signal	• Engine switch on (IG) • Pattern select (PWR) switch off	11 to 14 V
			• Engine switch on (IG) • Pattern select (PWR) switch on	Below 1.5 V
A38-4 (SNWI) - C45-81 (E1)	P - W-B	Pattern select (2nd) switch signal	• Engine switch on (IG) • Pattern select (2nd) switch off	11 to 14 V
			• Engine switch on (IG) • Pattern select (2nd) switch continuously pressed	Below 1.5 V

a. Using an oscilloscope, check waveform 1.

Reference

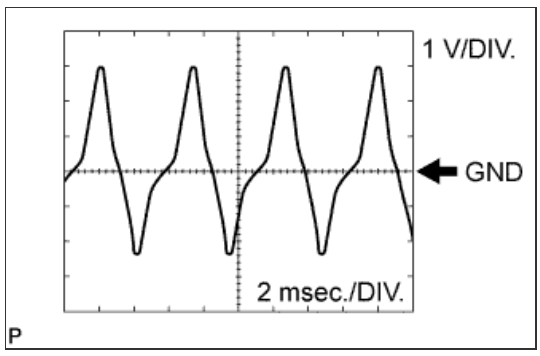
Terminal No. (Symbol)	Tool Setting	Condition
C45-101 (SP2+) - C45-100 (SP2-)	2 V/DIV., 20 msec./DIV.	Vehicle speed 20 km/h (12 mph)



b. Using an oscilloscope, check waveform 2.

Reference

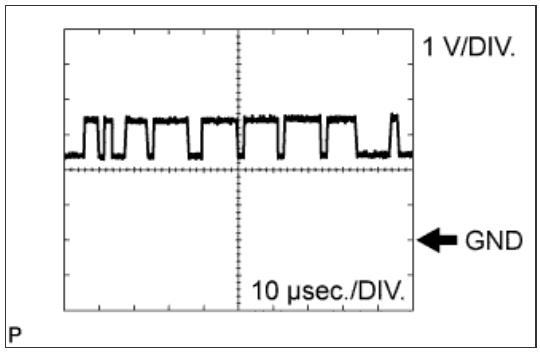
Terminal No. (Symbol)	Tool Setting	Condition
C45-124 (NT+) - C45-123 (NT-)	1 V/DIV., 2 msec./DIV.	Engine is idling (Shift lever in P or N)



c. Using an oscilloscope, check waveform 3.

Reference

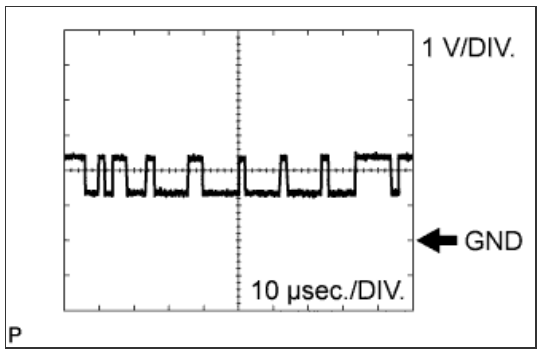
Terminal No. (Symbol)	Tool Setting	Condition
A38-10 (CANH) - C45-81 (E1)	1 V/DIV., 10 µsec./DIV.	Engine switch on (IG)



d. Using an oscilloscope, check waveform 4.

Reference

Terminal No. (Symbol)	Tool Setting	Condition
A38-11 (CANL) - C45-81 (E1)	1 V/DIV., 10 µsec./DIV.	Engine switch on (IG)



for Preparation Click here

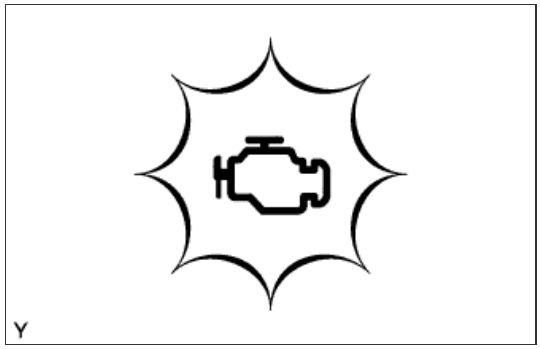
EURO-OBD

a. When troubleshooting Europe On-Board Diagnostic (Euro-OBD) vehicles, the vehicle must be connected to an OBD scan tool (complying with ISO 15765-4). Various data output from the vehicle ECM can then be read.

b. Euro-OBD regulations require that the vehicle on-board computer illuminate the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in any of the following:

- The emission control system/components
- The powertrain control components which affect vehicle emissions
- The computer

In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by ISO 15765-4 are stored in the ECM memory.
If the malfunction does not recur in 3 consecutive trips, the MIL goes off automatically but the DTCs remain stored in the ECM memory.



c. To check DTCs, connect the intelligent tester or OBD scan tool to the Data Link Connector 3 (DLC3) of the vehicle. The scan tool displays DTCs, freeze frame data and a variety of engine data.
The DTCs and freeze frame data can be cleared with the scan tool (Click here).

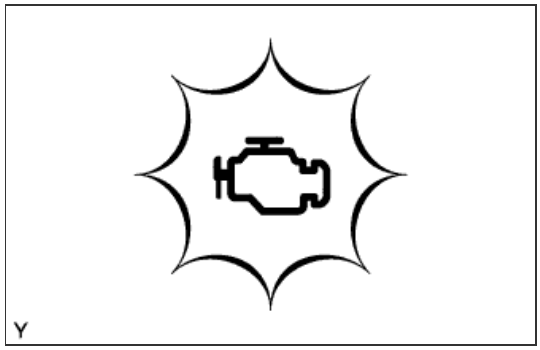
M-OBD (EXCEPT EUROPEAN SPECIFICATION)

a. When troubleshooting Multiplex On-Board Diagnostic (M-OBD) vehicles, the vehicle must be connected to the intelligent tester. Various data output from the ECM can then be read.

b. OBD regulations require that the vehicle on-board computer illuminate the MIL on the instrument panel when the computer detects a malfunction in any of the following:

- The emission control system/components
- The powertrain control components which affect vehicle emissions
- The computer

In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by ISO 15765-4 are stored in the ECM memory.
If the malfunction does not recur in 3 consecutive trips, the MIL goes off automatically but the DTCs remain stored in the ECM memory.



NORMAL MODE AND CHECK MODE

a. The diagnosis system operates in normal mode during normal vehicle use. In normal mode, 2 trip detection logic is used to ensure accurate detection of malfunctions. Check mode is also available to technicians as an option. In check mode, 1 trip detection logic is used for simulating malfunction symptoms and increasing the system's ability to detect malfunctions, to including intermittent malfunctions.

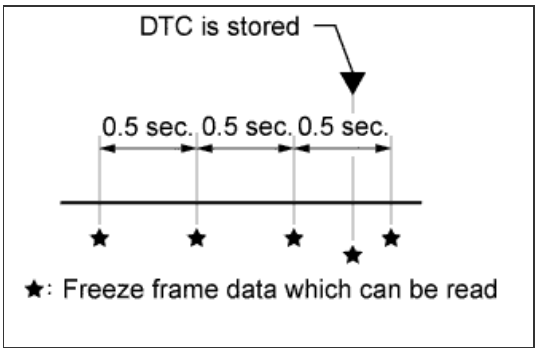
2 TRIP DETECTION LOGIC

a. When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory (1st trip). If the same malfunction is detected during the next drive cycle, the MIL is illuminated (2nd trip).

FREEZE FRAME DATA

a. Freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

b. The intelligent tester records freeze frame data at 5 different times: 1) 3 times before the DTC is stored, 2) once when the DTC is stored, and 3) once after the DTC is stored. These data can be used to simulate the vehicle's condition from around the time when the malfunction occurred. The data may help find the cause of the malfunction, or judge if the DTC is being caused by a temporary malfunction or not.



CHECK DATA LINK CONNECTOR 3 (DLC3) (Click here)

CHECK MIL

a. Check that the MIL illuminates when turning the engine switch on (IG).
If the MIL does not illuminate, there is a problem in the MIL circuit (Click here).

b. Check that when the engine is started, the MIL should turn off.

for Preparation Click here

CHECK DTC

a. DTCs which are stored in the ECM can be displayed on the intelligent tester.
The intelligent tester can display pending DTCs and current DTCs. Some DTCs are not stored unless a malfunction is detected in consecutive driving cycles. When a malfunction is detected in only one driving cycle, it is stored as a pending DTC.

i. Connect the intelligent tester to the DLC3.

ii. Turn the engine switch on (IG).

iii. Turn the intelligent tester on.

iv. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

v. Confirm the DTCs and freeze frame data, and then write them down.

vi. Confirm the details of the DTCs (Click here).

NOTICE:

When simulating a symptom with the scan tool to check for DTCs, use normal mode. For codes on the Diagnostic Trouble Code Chart subject to "2 trip detection logic", perform the following actions:

Turn the engine switch off after the symptom is simulated once. Then repeat the simulation process. When the symptom has been simulated twice, the MIL illuminates and the DTCs are recorded in the ECM.

CLEAR DTC (using the intelligent tester)

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / DTC / Clear.

CLEAR DTC (without using the intelligent tester)

a. Perform either of the following operations.

i. Disconnect the cable from the negative (-) battery terminal for more than 1 minute.

ii. Remove the EFI MAIN and ETCS fuses from the engine room relay block located inside the engine compartment for more than 1 minute.

for Preparation Click here

DESCRIPTION

a. Check mode has a higher sensitivity to malfunctions and can detect malfunctions that normal mode cannot detect. Check mode can also detect all the malfunctions that normal mode can detect. In check mode, DTCs are stored with 1 trip detection logic.

CHECK MODE PROCEDURE

a. Make sure that the following conditions are met:

   i. Battery positive voltage 11 V or more.

   ii. Throttle valve fully closed.

   iii. Shift lever in P or N.

   iv. A/C OFF.

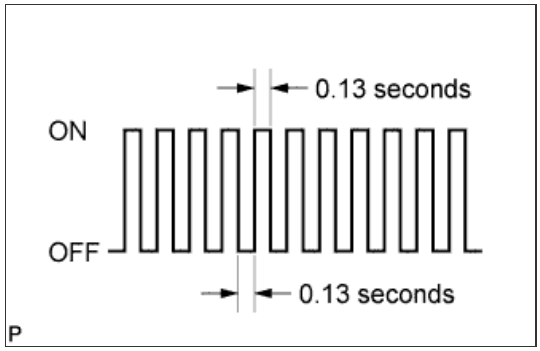
b. Connect the intelligent tester to the DLC3.

c. Turn the engine switch on (IG).

d. Turn the intelligent tester on.

e. Enter the following menus: Powertrain / Engine and ECT / Utility / Check Mode.

f. Check that the MIL flashes as shown in the illustration.



NOTICE:

- **All DTCs and freeze frame data will be cleared if: 1) the intelligent tester is used to change the ECM from normal mode to check mode or vice versa; or 2) during check mode, the engine switch is turned from on (IG) to on (ACC) or off.**
- **Before changing to check mode, make a note of the DTCs and freeze frame data.**

g. Start the engine. The MIL should turn off after the engine starts.

h. Perform "Monitor Drive Pattern" for the ECT test (Click here), or reproduce the conditions of the malfunction described by the customer.

i. After reproducing the malfunction conditions, use the intelligent tester to check the DTC and freeze frame data.

for Preparation Click here

Fail-safe

This function minimizes the loss of ECT functions when a malfunction occurs in a sensor or solenoid.

Fail-safe control list

Malfunctioning Part	Function
DTC P0717: Input Speed Sensor NT	During an input speed sensor malfunction, shift control is performed through the output speed sensor SP2 signal. During an input speed sensor malfunction, up-shift to 5th and 6th, AI-SHIFT* and flex lock-up clutch control are prohibited.
DTC P0722: Output Speed Sensor SP2	During an output speed sensor malfunction, shift control is performed using the input speed sensor NT signal. During an output speed sensor malfunction, up-shift to 5th and 6th, AI-SHIFT* and flex lock-up clutch control are prohibited.
DTC P0712, P0713: ATF Temperature Sensor	During an ATF temperature sensor malfunction, up-shift to 5th and 6th and flex lock-up clutch control are prohibited.
Shift Solenoid Valve S1, S2, S3, S4 and SR	The current to the malfunctioning solenoid valve is cut off and control is performed by operating the other normal solenoid valves. Shift control is performed depending on the failed solenoid as described in the table below.
DTC P0748, P0778: Shift Solenoid Valve SL1 and SL2	During a solenoid valve SL1 or SL2 malfunction, up-shift to 5th and 6th and flex lock-up clutch control are prohibited.
DTC P2714, P2716: Shift Solenoid Valve SLT	During a solenoid valve SLT malfunction, the current to the solenoid valve is stopped. This stops optimal line pressure control and shift shock increases. However, shifting is performed using normal clutch pressure control.
DTC P2759: Shift Solenoid Valve SLU	During a solenoid valve SLU malfunction, the current to the solenoid valve is stopped. This stops lock-up control and flex lock-up control, and fuel economy decreases.

HINT:

*: In addition to the switching of the shift pattern through the pattern select switch, Artificial Intelligence Shift (AI-SHIFT) control enables the ECM to estimate the road conditions and the driver's intention in order to automatically select the optimal shift pattern.

Shift Solenoid Valve Normal Operation Chart

Shift Lever Position	Gear*	Shift Solenoid S1	Shift Solenoid S2	Shift Solenoid S3	Shift Solenoid S4	Shift Solenoid SR	Shift Solenoid SL1	Shift Solenoid SL2
D, S6	1st	OFF	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON
	3rd	ON	OFF	ON	OFF	ON	OFF	ON
	4th	ON	OFF	OFF	OFF	ON	OFF	ON
	5th	ON	OFF	OFF	ON	OFF	ON	OFF
	6th	ON	ON	OFF	ON	OFF	ON	OFF
S5	1st	OFF	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON
	3rd	ON	OFF	ON	OFF	ON	OFF	ON
	4th	ON	OFF	OFF	OFF	ON	OFF	ON
	5th	ON	OFF	OFF	ON	OFF	ON	OFF
S4	1st	OFF	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON
	3rd	ON	OFF	ON	OFF	ON	OFF	ON
	4th	ON	OFF	OFF	OFF	ON	OFF	ON
S3	1st	OFF	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON
	3rd (E/B)	ON	OFF	ON	OFF	ON	OFF	OFF

S2	1st	OFF	ON	ON	OFF	ON	OFF	ON
	2nd (E/B)	ON	ON	ON	ON	ON	OFF	OFF
S1	1st (E/B)	OFF	ON	ON	OFF	ON	OFF	OFF

a. Fail-safe operation for electronically malfunctioning shift solenoid valve (S1, S2, S3, S4 and SR).

i. Fail-safe function

If any of the shift solenoid valve circuits has an open or short failure, the ECM turns the other shift solenoid valves ON and OFF in order to shift into the gear positions shown in the table below. Also, the ECM stops sending current to the open or short circuited solenoid.

Even if starting the engine again in fail-safe mode, the gear position remains in the same position.

HINT:

- ***: Actual gear shift (gear position) under fail-safe operation.**
- **X: OFF (the ECM stops sending current to the malfunctioning solenoid valve).**
- **Electrical malfunction: Condition is shown to the left of the "→".**
- **Fail-safe mode: Condition is shown to the right of the "→".**
- **E/B: Engine brake**

Shift Solenoid Valve S1 Electrical Malfunction (P0973, P0974)

Shift Lever Position	Gear*	Shift Solenoid S1	Shift Solenoid S2	Shift Solenoid S3	Shift Solenoid S4	Shift Solenoid SR	Shift Solenoid SL1	Shift Solenoid SL2
D, S6	1st	X	ON	ON	OFF	ON	OFF	ON
	1st → 4th	X	ON → OFF	ON → OFF	OFF	ON	OFF	ON
	3rd → 4th	X	OFF	ON → OFF	OFF	ON	OFF	ON
	4th	X	OFF	OFF	OFF	ON	OFF	ON
	5th	X	OFF	OFF	ON	OFF	ON	OFF
	N → 5th	X	ON → OFF	OFF	ON	OFF	ON	OFF
S5	1st	X	ON	ON	OFF	ON	OFF	ON
	1st → 4th	X	ON → OFF	ON → OFF	OFF	ON	OFF	ON
	3rd → 4th	X	OFF	ON → OFF	OFF	ON	OFF	ON
	4th	X	OFF	OFF	OFF	ON	OFF	ON
	5th	X	OFF	OFF	ON	OFF	ON	OFF
S4	1st	X	ON	ON	OFF	ON	OFF	ON
	1st → 4th	X	ON → OFF	ON → OFF	OFF	ON	OFF	ON
	3rd → 4th	X	OFF	ON → OFF	OFF	ON	OFF	ON
	4th	X	OFF	OFF	OFF	ON	OFF	ON
S3	1st	X	ON	ON	OFF	ON	OFF	ON
	1st → 4th	X	ON → OFF	ON → OFF	OFF	ON	OFF	ON
	3rd (E/B) → 4th	X	OFF	ON → OFF	OFF	ON	OFF	OFF → ON
S2	1st	X	ON	ON	OFF	ON	OFF	ON
	2nd (E/B) → 4th	X	ON → OFF	ON → OFF	ON → OFF	ON	OFF	OFF → ON
S1	1st (E/B)	X	ON	ON	OFF	ON	OFF	OFF

Shift Solenoid Valve S2 Electrical Malfunction (P0976, P0977)

Shift Lever Position	Gear*	Shift Solenoid S1	Shift Solenoid S2	Shift Solenoid S3	Shift Solenoid S4	Shift Solenoid SR	Shift Solenoid SL1	Shift Solenoid SL2
D, S6	3rd	OFF → ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	4th	ON	X	OFF	OFF	ON	OFF	ON
	5th	ON	X	OFF	ON	OFF	ON	OFF
	5th	ON	X	OFF	ON	OFF	ON	OFF
S5	3rd	OFF → ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON

	4th	ON	X	OFF	OFF	ON	OFF	ON
	5th	ON	X	OFF	ON	OFF	ON	OFF
S4	3rd	OFF → ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	4th	ON	X	OFF	OFF	ON	OFF	ON
S3	3rd → 3rd (E/B)	OFF → ON	X	ON	OFF	ON	OFF	ON → OFF
	3rd → 3rd (E/B)	ON	X	ON	OFF	ON	OFF	ON → OFF
	3rd (E/B)	ON	X	ON	OFF	ON	OFF	OFF
S2	3rd → 3rd (E/B)	OFF → ON	X	ON	OFF	ON	ON → OFF	ON → OFF
	3rd (E/B)	ON	X	ON	ON → OFF	ON	OFF	OFF
S1	3rd (E/B)	OFF → ON	X	ON	OFF	ON	OFF	OFF

Shift Solenoid Valve S3 Electrical Malfunction (P0979, P0980)

Shift Lever Position	Gear*	Shift Solenoid S1	Shift Solenoid S2	Shift Solenoid S3	Shift Solenoid S4	Shift Solenoid SR	Shift Solenoid SL1	Shift Solenoid SL2
D, S6	3rd → 4th	OFF	ON	X	OFF	ON	OFF	ON
	4th	ON	ON → OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	5th	ON	OFF	X	ON	OFF	ON	OFF
	6th	ON	ON	X	ON	OFF	ON	OFF
S5	3rd	OFF	ON	X	OFF	ON	OFF	ON
	4th	ON	ON → OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	5th	ON	OFF	X	ON	OFF	ON	OFF
S4	3rd	OFF	ON	X	OFF	ON	OFF	ON
	4th	ON	ON → OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
S3	3rd	OFF	ON	X	OFF	ON	OFF	ON
	4th	ON	ON → OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	OFF → ON
S2	3rd	OFF	ON	X	OFF	ON	OFF	ON
	6th → 4th	ON	ON → OFF	X	ON → OFF	ON	OFF	OFF → ON
S1	1st	OFF	ON	X	OFF	ON	OFF	OFF

Shift Solenoid Valve S4 Electrical Malfunction (P0982, P0983)

Shift Lever Position	Gear*	Shift Solenoid S1	Shift Solenoid S2	Shift Solenoid S3	Shift Solenoid S4	Shift Solenoid SR	Shift Solenoid SL1	Shift Solenoid SL2
D, S6	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON
	3rd	ON	OFF	ON	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	OFF → ON	ON → OFF	OFF → ON
	4th	ON	ON → OFF	OFF	X	OFF → ON	ON → OFF	OFF → ON
S5	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON
	3rd	ON	OFF	ON	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	OFF → ON	ON → OFF	OFF → ON

S4	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON
	3rd	ON	OFF	ON	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	ON	OFF	ON
S3	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON
	3rd (E/B)	ON	OFF	ON	X	ON	OFF	OFF
S2	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd (E/B)	ON	ON	ON	X	ON	OFF	OFF
S1	1st (E/B)	OFF	ON	ON	X	ON	OFF	OFF

Shift Solenoid Valve SR Electrical Malfunction (P0985, P0986)

Shift Lever Position	Gear*	Shift Solenoid S1	Shift Solenoid S2	Shift Solenoid S3	Shift Solenoid S4	Shift Solenoid SR	Shift Solenoid SL1	Shift Solenoid SL2
D, S6	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd	ON	OFF	ON	OFF	X	OFF	ON
	4th	ON	OFF	OFF	OFF	X	OFF	ON
	5th	ON	OFF	OFF	ON	X	ON	OFF
	6th	ON	ON	OFF	ON	X	ON	OFF
S5	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd	ON	OFF	ON	OFF	X	OFF	ON
	4th	ON	OFF	OFF	OFF	X	OFF	ON
	5th	ON	OFF	OFF	ON	X	ON	OFF
S4	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd	ON	OFF	ON	OFF	X	OFF	ON
	4th	ON	OFF	OFF	OFF	X	OFF	ON
S3	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd (E/B)	ON	OFF	ON	OFF	X	OFF	OFF
S2	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd (E/B)	ON	ON	ON	ON	X	OFF	OFF
S1	1st (E/B)	OFF	ON	ON	OFF	X	OFF	OFF

b. Fail-safe operation in the event of a mechanical system malfunction.

i. Fail-safe function
The ECM controls the gear position as shown in the table below when malfunctions occur.

DTC	Condition	Gear*1					
-	Normal	1st	2nd	3rd	4th	5th	6th
P0751	Shift solenoid valve S1: Stuck OFF malfunction	1st*2	1st*2	3rd	3rd	3rd	3rd
P0761	Shift solenoid valve S3: Stuck ON malfunction	1st	2nd	3rd	3rd	3rd	3rd
P0766 P0776	Shift solenoid valve S4, Shift solenoid valve SL2 or Valve body (brake control valve): Malfunction	1st	2nd	3rd	3rd	3rd	3rd
P0781	Valve body (1-2 shift valve): Malfunction	1st*2	1st*2	3rd	3rd	3rd	3rd
P0729	Valve body (sequence valve): Malfunction	1st	2nd	3rd	3rd	3rd	3rd

HINT:

- ***1: Actual gear shift (gear position) under fail-safe operation.**
- ***2: Under engine braking, downshifting to 1st or 2nd gear is prohibited.**

for Preparation Click here

READ DATA LIST

HINT:

Using the GTS to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the GTS, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
Neutral Position SW Signal	PNP switch status/ ON or OFF	Shift lever is: • In P or N: ON • Not in P or N: OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
Transfer L4	Transfer status/ ON or OFF	ON: Transfer in L4 OFF: Transfer not in L4	-
Stop Light Switch	Stop light switch status/ ON or OFF	Brake pedal is: • Depressed: ON • Released: OFF	-
SPD (NT)	Input shaft speed/ Min.: 0 rpm Max.: 12750 rpm	Lock-up is: • ON (after warming up engine): Input turbine speed (NT) equal to engine speed • OFF (idling with shift lever in N): Input turbine speed (NT) nearly equal to engine speed	Data is displayed in increments of 50 rpm.
SPD (SP2)	Output shaft speed/ Min.: 0 km/h (0 mph) Max.: 255 km/h (158 mph)	Vehicle stopped: 0 km/h (0 mph) (output shaft speed is equal to vehicle speed)	-
Shift SW Status (P	PNP switch status/	Shift lever is: • In P: ON	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:**

Range)	ON or OFF	• Not in P: OFF	When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
Pattern Switch (PWR/M)	Pattern switch (PWR) status/ ON or OFF	• ON: Pattern switch (PWR) is pushed • OFF: Pattern switch (PWR) is not pushed	-
Shift SW Status (R Range)	PNP switch status/ ON or OFF	Shift lever is: • In R: ON • Not in R: OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
Shift SW Status (N Range)	PNP switch status/ ON or OFF	Shift lever is: • In N: ON • Not in N: OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
Shift SW Status (N, P Range) Supported	Status of PNP switch (N or P) support/ Supp or Unsupp	-	-
Shift SW Status (N, P Range)	PNP switch status/ ON or OFF	ON: Shift lever in P or N OFF: Shift lever not in P or N	-
Sports Shift Up SW	Sport shift up switch status/ ON or OFF	• ON: Shift lever held in "+" (up-shift) • OFF: Shift lever not in "+" (up-shift)	-
Sports Shift Down SW	Sport shift down switch status/ ON or OFF	• ON: Shift lever held in "-" (down-shift) • OFF: Shift lever not in "-" (down-shift)	-
Sports Mode Selection SW	Sport mode select switch status/ ON or OFF	Shift lever is: • ON: In S, "+" and "-" • OFF: Not in S, "+" and "-"	-
Shift SW Status (D Range)	PNP switch status/ ON or OFF	Shift lever is: • In D, S, "+" and "-": ON • Not in D, S, "+" and "-": OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
A/T Oil Temperature 1	No. 1 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • Equal to ambient temperature while engine is cold	If the value is -40°C (-40°F) or 150°C (302°F), the No. 1 ATF temperature sensor circuit is open or shorted.
A/T Oil Temperature 2	No. 2 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • Equal to ambient temperature while engine is cold	If the value is -40°C (-40°F) or 150°C (302°F), the No. 2 ATF temperature sensor circuit is open or shorted.
	Estimated		

ATF Thermal Degradation Estimate	value of ATF thermal degradation/ Min.: 0 Max.: 65535	-	If 50000 or more is displayed for the Data List item "ATF Thermal Degradation Estimate", thermal degradation of the ATF is suspected. Perform ATF Thermal Degradation Estimate Reset after replacing the ATF.
Lock Up	Lock-up/ ON or OFF	Lock-up is: • Operating: ON • Not operating: OFF	-
Shift Status	ECM gear shift command/ 1st, 2nd, 3rd, 4th, 5th or 6th	• In D: 1st, 2nd, 3rd, 4th, 5th or 6th • In S: 1st, 2nd, 3rd, 4th, 5th or 6th	-
SLT Solenoid Status	Shift solenoid SLT status/ ON or OFF	• Accelerator pedal is depressed: OFF • Accelerator pedal is released: ON	-
SLU Solenoid Status	Shift solenoid SLU status/ ON or OFF	Shift solenoid SLU is: • Operating: ON • Not operating: OFF	-
Snow or 2nd Start Mode	Pattern switch (2nd) status/ ON or OFF	Pattern switch (2nd): Pushed: ON ↓ Pattern switch (2nd): Pushed: OFF	-
Torque Converter Temperature Raise History	Torque converter temperature raise history status/ ON or OFF	OFF	This item always displays OFF.

PERFORM ACTIVE TEST

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLU)	Operate the shift solenoid SLU	ON or OFF	[Vehicle Condition] • Engine stopped • Shift lever in P or N
Activate the Solenoid (SLT)*	Operate the shift solenoid SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands SLT solenoid to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • Vehicle stopped • Engine idling • Shift lever in P or N
Activate			[Vehicle Condition]

the Solenoid (S1)	Operate the shift solenoid S1	ON or OFF	• Engine stopped • Shift lever in P or N
Activate the Solenoid (S2)	Operate the shift solenoid S2	ON or OFF	[Vehicle Condition] • Engine stopped • Shift lever in P or N
Activate the Solenoid (S3)	Operate the shift solenoid S3	ON or OFF	[Vehicle Condition] • Engine stopped • Shift lever in P or N
Activate the Solenoid (S4)	Operate the shift solenoid S4	ON or OFF	[Vehicle Condition] • Engine stopped • Shift lever in P or N
Activate the Lock Up	Control shift solenoid SLU to set automatic transmission to lock-up	ON or OFF	Possible to check shift solenoid valve SLU operation. [Vehicle Condition] • Throttle valve opening angle: Less than 35% • Vehicle speed: 80 km/h (50 mph) or more
Control the Shift Position	Operate shift solenoid valves and set each shift position by yourself	• Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of the shift solenoid valves. [Vehicle Condition] 50 km/h (30 mph) or less
Activate the Solenoid (SR)	Operate the shift solenoid SR	ON or OFF	[Vehicle Condition] • Engine stopped • Shift lever in P or N
Activate the Solenoid (SL1)	Operate the shift solenoid SL1	ON or OFF	[Vehicle Condition] • Engine stopped • Shift lever in P or N
Activate the Solenoid (SL2)	Operate the shift solenoid SL2	ON or OFF	[Vehicle Condition] • Engine stopped • Shift lever in P or N

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Please note that the pressure values in the Active Test and Hydraulic Test are different.

for Preparation Click here

HINT:

- **If a DTC is displayed during the DTC check, check the parts listed in the table below and proceed to the "See page" given.**
- ***1: "Comes on" means the Malfunction Indicator Lamp (MIL) illuminates.**
- ***2: "DTC stored" means the ECM memorizes the trouble code if the ECM detects the DTC detection condition.**
- ***3: The ATF temperature warning light blinks or a message is displayed in the combination meter.**
- **These DTCs may be output when the clutch, brake, gear components, etc., inside the automatic transmission are damaged.**

Automatic Transmission System

DTC Code	Detection Item	MIL*1	Memory*2	See page
P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	Comes on	DTC stored	Click here
P0712	Transmission Fluid Temperature Sensor "A" Circuit Low Input	Comes on	DTC stored	Click here
P0713	Transmission Fluid Temperature Sensor "A" Circuit High Input	Comes on	DTC stored	Click here
P0717	Turbine Speed Sensor Circuit No Signal	Comes on	DTC stored	Click here
P0722	Output Speed Sensor Circuit No Signal	Comes on	DTC stored	Click here
P0729	Gear 6 Incorrect Ratio	-	DTC stored	Click here
P0748	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	Comes on	DTC stored	Click here
P0751	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)	-	DTC stored	Click here
P0761	Shift Solenoid "C" Performance (Shift Solenoid Valve S3)	-	DTC stored	Click here
P0766	Shift Solenoid "D" Performance (Shift Solenoid Valve S4)	-	DTC stored	Click here
P0776	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)	Comes on	DTC stored	Click here
P0778	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	Comes on	DTC stored	Click here
P0781	1-2 Shift (1-2 Shift Valve)	-	DTC stored	Click here
P0973	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)	Comes on	DTC stored	Click here
P0974	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)	Comes on	DTC stored	Click here
P0976	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)	Comes on	DTC stored	Click here
P0977	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)	Comes on	DTC stored	Click here
P0979	Shift Solenoid "C" Control Circuit Low (Shift Solenoid Valve S3)	Comes on	DTC stored	Click here
P0980	Shift Solenoid "C" Control Circuit High (Shift Solenoid Valve S3)	Comes on	DTC stored	Click here
P0982	Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)	Comes on	DTC stored	Click here
P0983	Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)	Comes on	DTC stored	Click here
P0985	Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)	Comes on	DTC stored	Click here
P0986	Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)	Comes on	DTC stored	Click here
P2714	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)	-	DTC stored	Click here

P2716	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	Comes on	DTC stored	Click here
P2742	Transmission Fluid Temperature Sensor "B" Circuit Low Input	-*3	DTC stored	Click here
P2743	Transmission Fluid Temperature Sensor "B" Circuit High Input	-*3	DTC stored	Click here
P2759	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)	Comes on	DTC stored	Click here

DTC P0705 Transmission Range Sensor Circuit Malfunction (PRNDL Input)

for Preparation Click here

DESCRIPTION

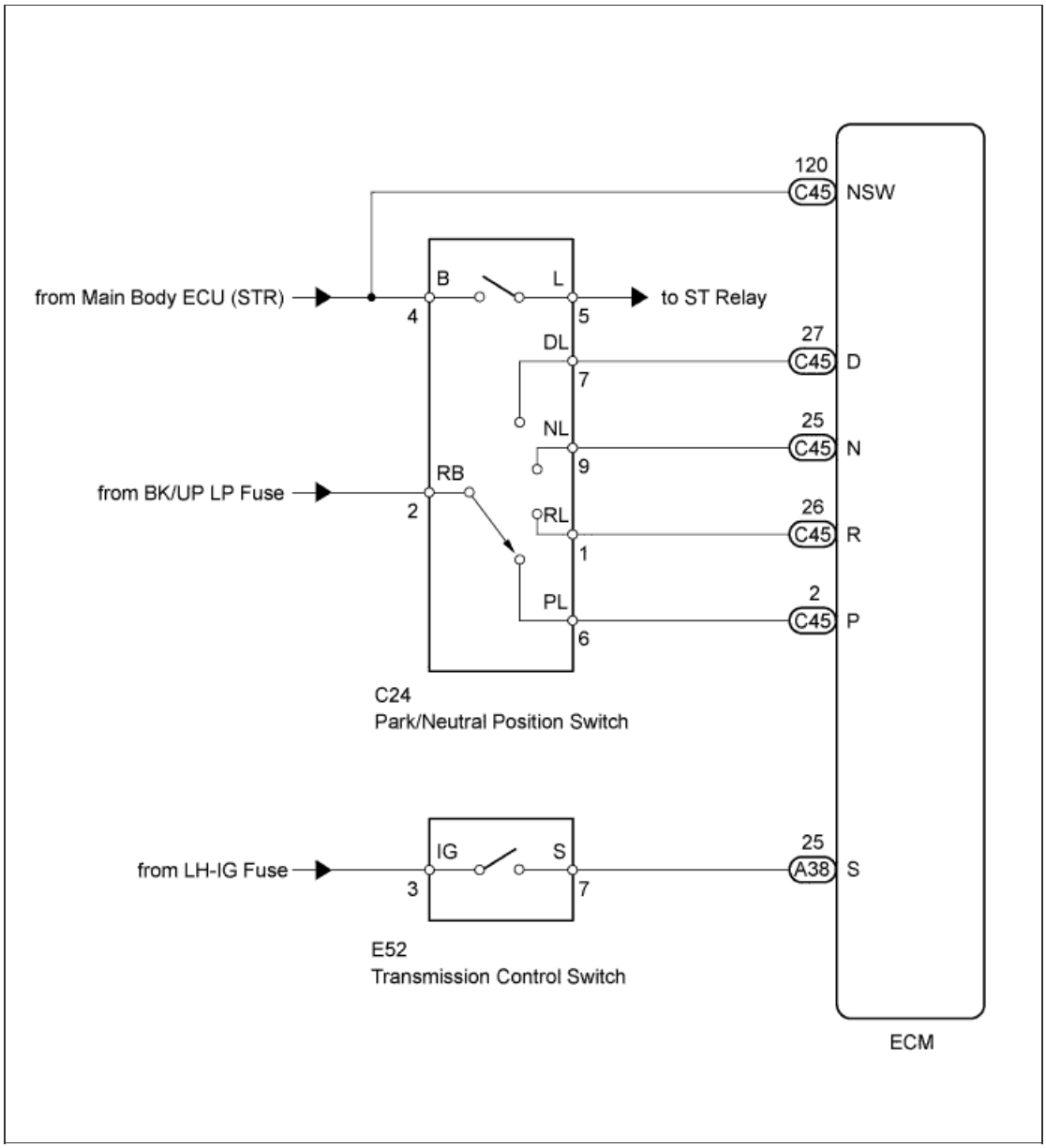
The Park/Neutral Position (PNP) switch detects the shift lever position and sends signals to the ECM.

DTC Code	DTC Detection Condition	Trouble Area
P0705	One of the following conditions is met: (A) Any 2 or more of the following signals are ON simultaneously (2 trip detection logic): • P input signal • N input signal • R input signal • D input signal (B) Any 2 or more of the following signals are ON simultaneously (2 trip detection logic): • NSW input signal • R input signal • D input signal (C) Any of following signals are ON for 2.0 seconds or more in S position (2 trip detection logic): • NSW input signal • P input signal • N input signal • R input signal (D) P, R, N and D switches are OFF simultaneously (2 trip detection logic).	• Open or short in park/neutral position switch circuit • Park/neutral position switch • Transmission control switch (lower shift lever assembly) • ECM

MONITOR DESCRIPTION

This DTC indicates a problem with the park/neutral position switch or the wire harness in the park/neutral position switch circuit.
The park/neutral position switch detects the shift lever position and sends a signal to the ECM.
For security, the park/neutral position switch detects the shift lever position so that the engine can be started only when the shift lever is in P or N.
The park/neutral position switch sends a signal to the ECM according to the shift lever position (P, R, N, D or S).
The ECM determines that there is a problem with the switch or related parts if it receives more than 1 position signal simultaneously. The ECM will illuminate the MIL and store the DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the intelligent tester, read the Data List.

Engine and ECT

Tester	Measurement	Normal Condition	Diagnostic Note

Display	Item/Range		
Neutral Position SW Signal	PNP switch status/ ON or OFF	Shift lever is: • In P or N: ON • Not in P or N: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Shift SW Status (P Range)	PNP switch status/ ON or OFF	Shift lever is: • In P: ON • Not in P: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Shift SW Status (R Range)	PNP switch status/ ON or OFF	Shift lever is: • In R: ON • Not in R: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Shift SW Status (N Range)	PNP switch status/ ON or OFF	Shift lever is: • In N: ON • Not in N: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Sports Shift Up SW	Sport shift up switch status/ ON or OFF	• ON: Continuously shift to "+" (up-shift) • OFF: Release "+" (up-shift)	-
Sports Shift Down SW	Sport shift down switch status/ ON or OFF	• ON: Continuously shift to "-" (down-shift) • OFF: Release "-" (down-shift)	-
Sports Mode Selection SW	Sport mode select switch status/ ON or OFF	Shift lever position is: • ON: In S, "+" and "-" • OFF: Not in S, "+" and "-"	-
Shift SW Status (D Range)	PNP switch status/ ON or OFF	Shift lever is: • In D, S, "+" and "-": ON • Not in D, S, "+" and "-": OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.

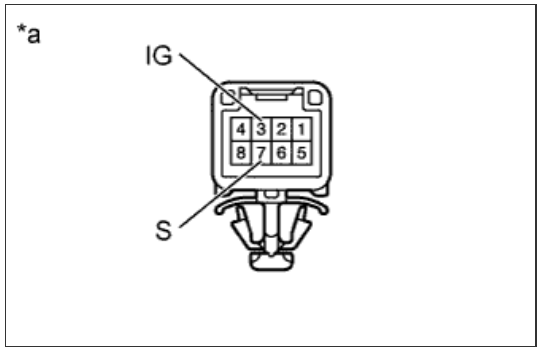
1.INSPECT TRANSMISSION CONTROL SWITCH

a. Disconnect the transmission control switch connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
3 (IG) - 7 (S)	Shift lever in S, "+" or "-"	Below 1 Ω
3 (IG) - 7 (S)	Shift lever not in S, "+" or "-"	10 kΩ or higher



Text in Illustration

*a	Component without harness connected (Transmission Control Switch)

NG → REPLACE TRANSMISSION CONTROL SWITCH (LOWER SHIFT LEVER ASSEMBLY) (Click here)

OK

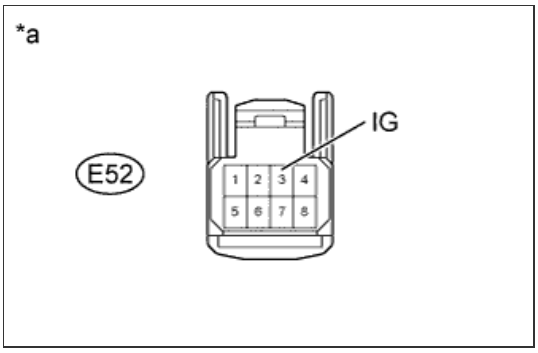
2.CHECK TRANSMISSION CONTROL SWITCH (POWER SOURCE)

a. Disconnect the transmission control switch connector.

b. Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
E52-3 (IG) - Body ground	Engine switch on (IG)	11 to 14 V
E52-3 (IG) - Body ground	Engine switch off	Below 1 V



Text in Illustration

*a	Front view of wire harness connector (to Transmission Control Switch)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR (TRANSMISSION CONTROL SWITCH - BATTERY)

OK

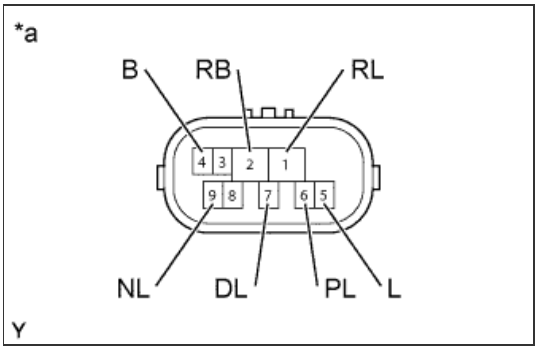
3.INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY

a. Disconnect the park/neutral position switch connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
• 2 (RB) - 6 (PL) • 4 (B) - 5 (L)	Shift lever in P	Below 1 Ω
2 (RB) - 1 (RL)	Shift lever in R	Below 1 Ω
• 2 (RB) - 9 (NL) • 4 (B) - 5 (L)	Shift lever in N	Below 1 Ω
2 (RB) - 7 (DL)	Shift lever in D, S, "+" or "-"	Below 1 Ω
• 2 (RB) - 6 (PL) • 4 (B) - 5 (L)	Shift lever not in P	10 kΩ or higher
2 (RB) - 1 (RL)	Shift lever not in R	10 kΩ or higher
• 2 (RB) - 9 (NL) • 4 (B) - 5 (L)	Shift lever not in N	10 kΩ or higher
2 (RB) - 7 (DL)	Shift lever not in D, S, "+" or "-"	10 kΩ or higher



Text in Illustration

	Component without harness connected

*a	(Park/Neutral Position Switch)

NG → REPLACE PARK/NEUTRAL POSITION SWITCH ASSEMBLY (Click here)

OK

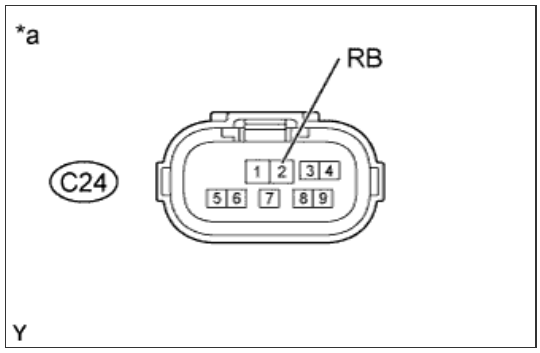
4.CHECK PARK/NEUTRAL POSITION SWITCH ASSEMBLY (POWER SOURCE)

a. Disconnect the park/neutral position switch connector.

b. Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
C24-2 (RB) - Body ground	Engine switch on (IG)	11 to 14 V
C24-2 (RB) - Body ground	Engine switch off	Below 1 V



Text in Illustration

*a	Front view of wire harness connector (to Park/Neutral Position Switch)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR (PARK/NEUTRAL POSITION SWITCH - BATTERY)

OK

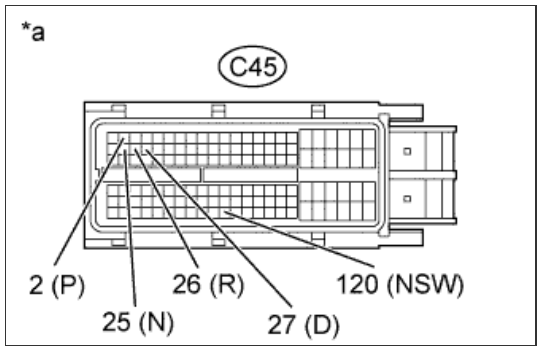
5.CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH - ECM)

a. Disconnect the ECM connector.

b. Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Condition	Specified Condition
C45-2 (P) - Body ground	• Engine switch on (IG) • Shift lever in P	11 to 14 V
C45-26 (R) - Body ground	• Engine switch on (IG) • Shift lever in R	11 to 14 V*
C45-25 (N) - Body ground	• Engine switch on (IG) • Shift lever in N	11 to 14 V
C45-27 (D) - Body ground	• Engine switch on (IG) • Shift	11 to 14 V



	lever in D	
C45-120 (NSW) - Body ground	• Engine switch on (IG) • Shift lever not in P or N	11 to 14 V
C45-2 (P) - Body ground	• Engine switch on (IG) • Shift lever not in P	Below 1 V
C45-26 (R) - Body ground	• Engine switch on (IG) • Shift lever not in R	Below 1 V
C45-25 (N) - Body ground	• Engine switch on (IG) • Shift lever not in N	Below 1 V
C45-27 (D) - Body ground	• Engine switch on (IG) • Shift lever not in D	Below 1 V
C45-120 (NSW) - Body ground	• Engine switch on (IG) • Shift lever in P or N	Below 1 V

Text in Illustration

*a	Front view of wire harness connector (to ECM)

HINT:

*: The voltage will drop slightly due to turning on the back up light.

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

6.CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL SWITCH - ECM)

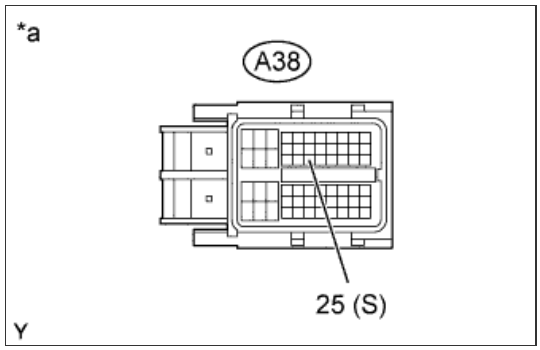
a. Disconnect the ECM connector.

b. Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Condition	Specified Condition
	• Engine switch	

A38-25 (S) - Body ground	on (IG) • Shift lever in S, "+" and "-"	11 to 14 V
A38-25 (S) - Body ground	• Engine switch on (IG) • Shift lever not in S, "+" and "-"	Below 1 V



Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK → REPLACE ECM (Click here)

DTC P0973 Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)

DTC P0974 Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)

for Preparation Click here

DESCRIPTION

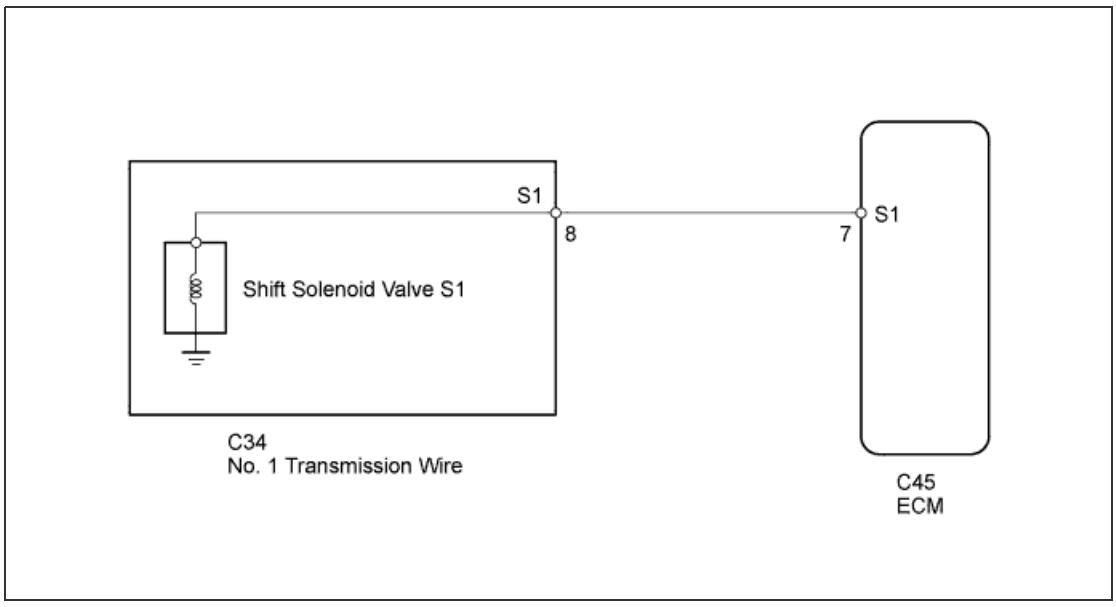
Shifting from 1st to 6th is performed in combination with ON and OFF operation of shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending the current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0973	ECM detects a short in the solenoid valve S1 circuit 2 times when solenoid valve S1 is operated (1 trip detection logic).	• Short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM
P0974	ECM detects an open in the solenoid valve S1 circuit 2 times when solenoid valve S1 is not operated (1 trip detection logic).	• Open in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S1 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When shift solenoid valve S1 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S1 circuit.
When shift solenoid valve S1 is OFF, if its resistance is 100 kΩ or more, the ECM determines there is an open in the shift solenoid valve S1 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Shift solenoid valve S1 is turned ON/OFF normally when the shift lever is in D.

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S1	OFF	ON	ON	ON	ON	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S1)

a. Disconnect the No. 1 transmission wire connector.

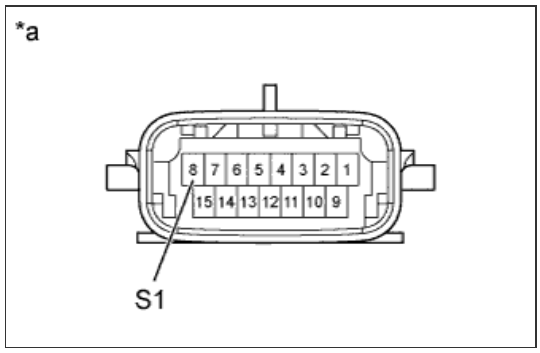
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
8 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)



NG → Go to step 3

OK ↓

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

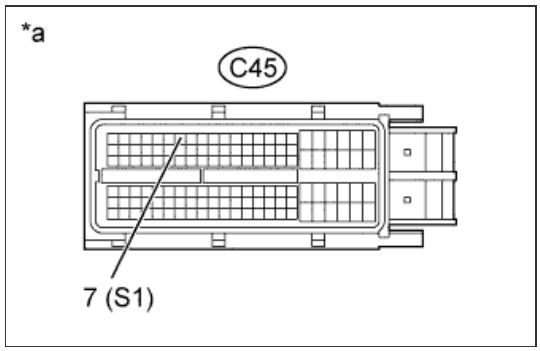
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-7 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ↓

REPLACE ECM (Click here)

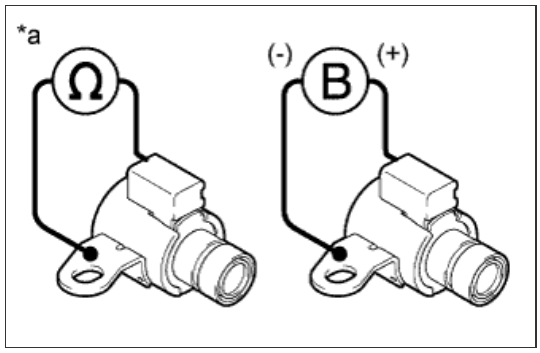
3.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve	

	S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S1)

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0712 Transmission Fluid Temperature Sensor "A" Circuit Low Input

DTC P0713 Transmission Fluid Temperature Sensor "A" Circuit High Input

for Preparation Click here

DESCRIPTION

The ATF (Automatic Transmission Fluid) temperature sensor converts the ATF temperature into a resistance value which is input into the ECM.
The ECM applies a voltage to the temperature sensor through ECM terminal THO1.
The sensor resistance changes with the ATF temperature.
One terminal of the sensor is grounded so that the sensor resistance and voltage decrease as the temperature becomes higher.
The ECM calculates the ATF temperature based on the voltage signal.

DTC Code	DTC Detection Condition	Trouble Area
P0712	No. 1 ATF temperature sensor resistance is less than 79 Ω for 0.5 sec. or more (1 trip detection logic).	• Short in No. 1 ATF temperature sensor circuit • No. 1 ATF temperature sensor (No. 1 transmission wire) • ECM
P0713	When 15 min. or more have elapsed after engine is started, No. 1 ATF temperature sensor resistance is more than 156 kΩ for 0.5 sec. or more (1 trip detection logic).	• Open in No. 1 ATF temperature sensor circuit • No. 1 ATF temperature sensor (No. 1 transmission wire) • ECM

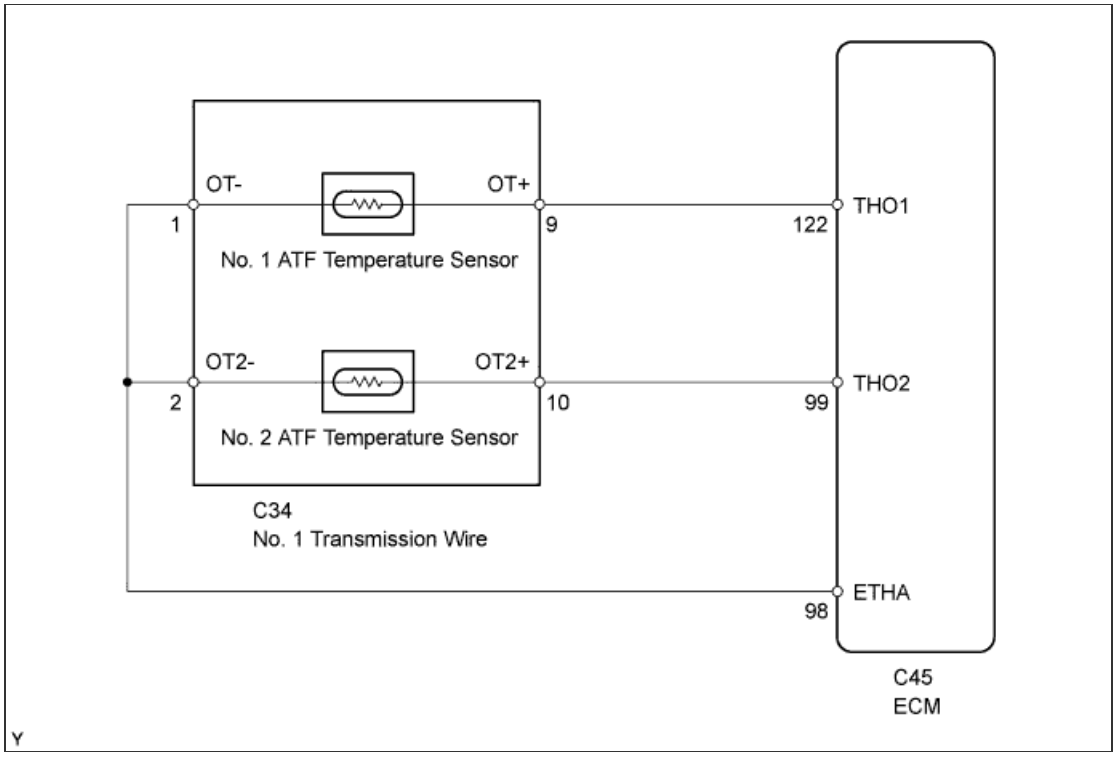
MONITOR DESCRIPTION

The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature and detects an open or short in the ATF temperature sensor circuit. If the resistance value of the ATF temperature sensor is less than 79 Ω*1 or more than 156 kΩ*2, the ECM interprets this as a fault in the ATF temperature sensor or wiring. The ECM will illuminate the MIL and store the DTC.

HINT:

- ***1: 150°C (302°F) or more is indicated regardless of the actual ATF temperature.**
- ***2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.**
- **The ATF temperature can be checked on the intelligent tester display.**

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the intelligent tester, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 1	No. 1 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • Equal to ambient temperature while engine is cold	If the value is -40°C (-40°F) or 150°C (302°F), the No. 1 ATF temperature sensor circuit is open or shorted.

HINT:

When DTC P0712 is output and the intelligent tester output is 150°C (302°F) or more, there is a short circuit.

When DTC P0713 is output and the intelligent tester output is -40°C (-40°F), there is an open circuit.

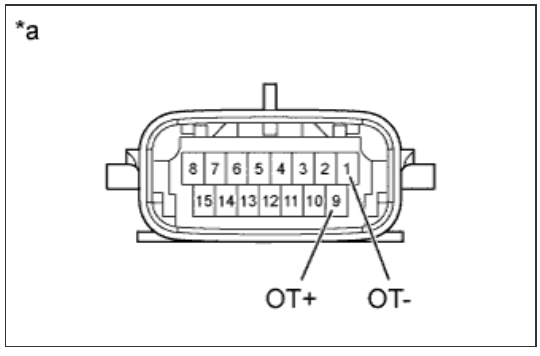
Measure the resistance between terminal THO1 and the body ground.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or more	Short circuit

1.INSPECT NO. 1 TRANSMISSION WIRE (NO. 1 ATF TEMPERATURE SENSOR)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
1 (OT-) - 9 (OT+)	Always	79 Ω to 156 kΩ
1 (OT-) - Body ground	Always	10 kΩ or higher
9 (OT+) - Body ground	Always	10 kΩ or higher

HINT:

If the resistance is out of the specified range at one of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Standard Resistance:

ATF Temperature	Specified Condition

10°C (50°F)	5 to 8 kΩ
25°C (77°F)	2.5 to 4.5 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

NG → REPAIR OR REPLACE NO. 1 ATF TEMPERATURE SENSOR (NO. 1 TRANSMISSION WIRE) (Click here)

OK

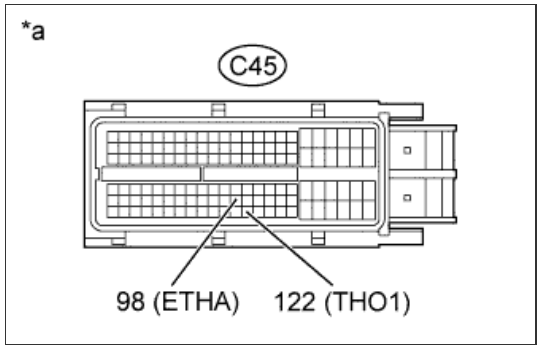
2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-122 (THO1) - C45-98 (ETHA)	Always	79 Ω to 156 kΩ
C45-122 (THO1) - Body ground	Always	10 kΩ or higher
C45-98 (ETHA) - Body ground	Always	10 kΩ or higher



Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0976 Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)

DTC P0977 Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)

for Preparation Click here

DESCRIPTION

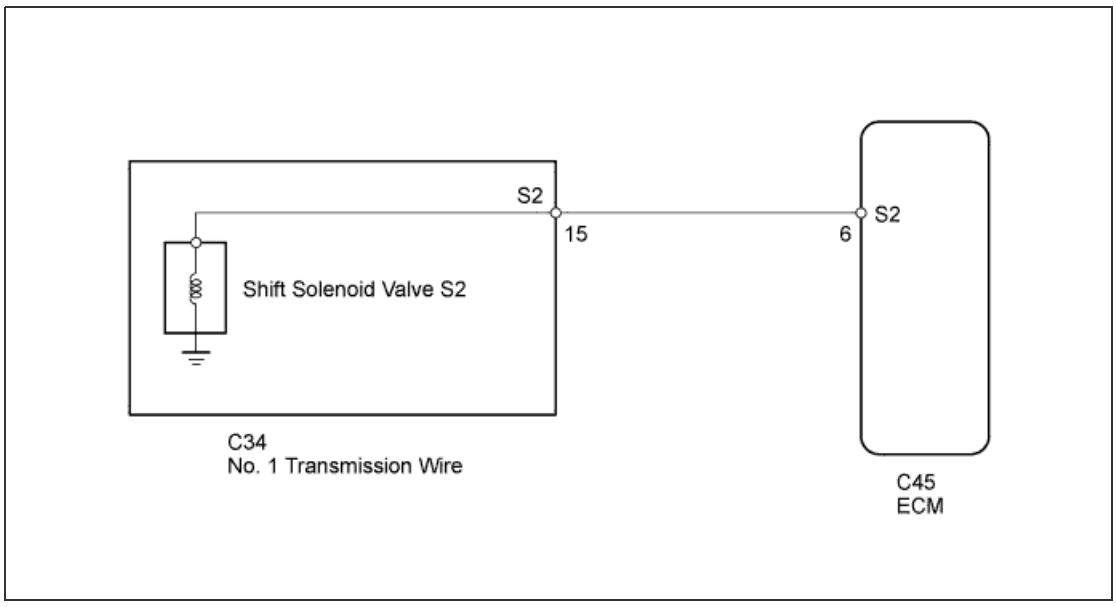
Shifting from 1st to 6th is performed in combination with ON and OFF operation of shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending the current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0976	ECM detects a short in the solenoid valve S2 circuit 2 times when solenoid valve S2 is operated (1 trip detection logic).	• Short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM
P0977	ECM detects an open in the solenoid valve S2 circuit 2 times when solenoid valve S2 is not operated (1 trip detection logic).	• Open in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S2 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When shift solenoid valve S2 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S2 circuit.
When shift solenoid valve S2 is OFF, if its resistance is 100 kΩ or more, the ECM determines there is an open in the shift solenoid valve S2 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Shift solenoid valve S2 is turned ON/OFF normally when the shift lever is in D.

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S2	ON	ON	OFF	OFF	OFF	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S2)

a. Disconnect the No. 1 transmission wire connector.

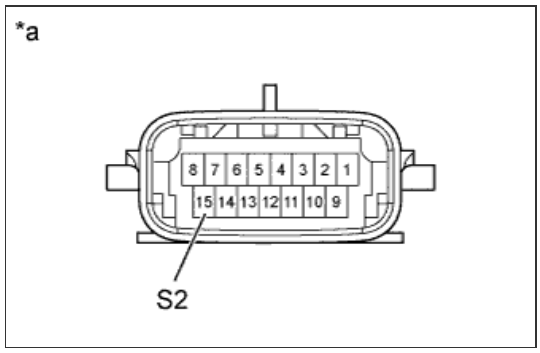
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
15 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)



NG → Go to step 3

OK ↓

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

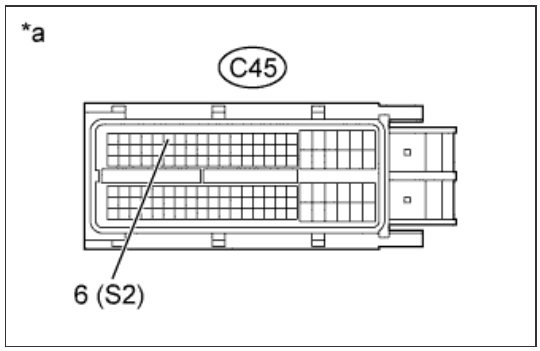
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-6 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ↓

REPLACE ECM (Click here)

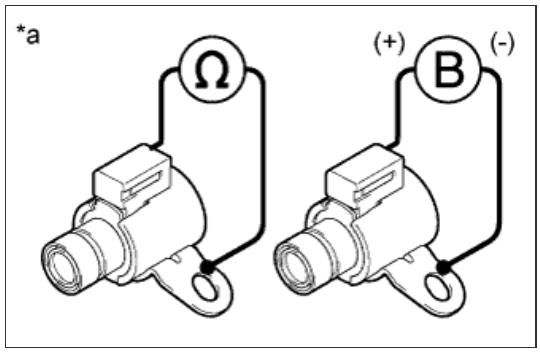
3.INSPECT SHIFT SOLENOID VALVE S2

a. Remove the shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve	

	S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S2)

NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0712 Transmission Fluid Temperature Sensor "A" Circuit Low Input

DTC P0713 Transmission Fluid Temperature Sensor "A" Circuit High Input

for Preparation Click here

DESCRIPTION

The ATF (Automatic Transmission Fluid) temperature sensor converts the ATF temperature into a resistance value which is input into the ECM.
The ECM applies a voltage to the temperature sensor through ECM terminal THO1.
The sensor resistance changes with the ATF temperature.
One terminal of the sensor is grounded so that the sensor resistance and voltage decrease as the temperature becomes higher.
The ECM calculates the ATF temperature based on the voltage signal.

DTC Code	DTC Detection Condition	Trouble Area
P0712	No. 1 ATF temperature sensor resistance is less than 79 Ω for 0.5 sec. or more (1 trip detection logic).	• Short in No. 1 ATF temperature sensor circuit • No. 1 ATF temperature sensor (No. 1 transmission wire) • ECM
P0713	When 15 min. or more have elapsed after engine is started, No. 1 ATF temperature sensor resistance is more than 156 kΩ for 0.5 sec. or more (1 trip detection logic).	• Open in No. 1 ATF temperature sensor circuit • No. 1 ATF temperature sensor (No. 1 transmission wire) • ECM

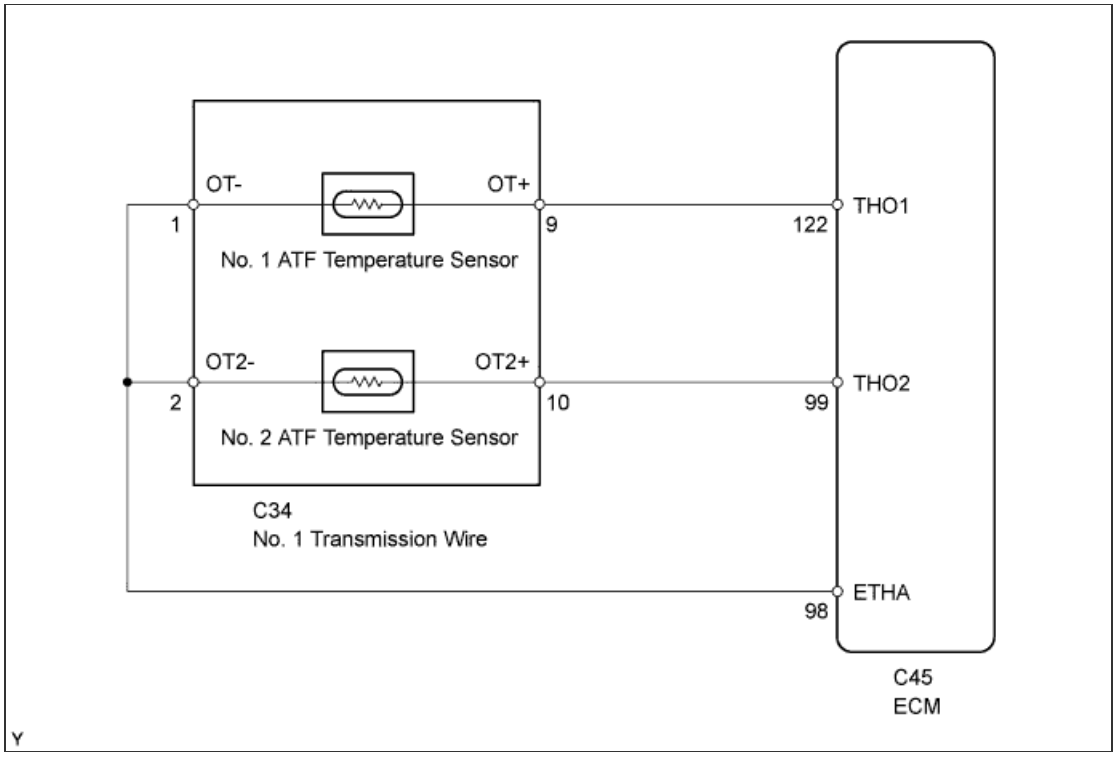
MONITOR DESCRIPTION

The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature and detects an open or short in the ATF temperature sensor circuit. If the resistance value of the ATF temperature sensor is less than 79 Ω*1 or more than 156 kΩ*2, the ECM interprets this as a fault in the ATF temperature sensor or wiring. The ECM will illuminate the MIL and store the DTC.

HINT:

- ***1: 150°C (302°F) or more is indicated regardless of the actual ATF temperature.**
- ***2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.**
- **The ATF temperature can be checked on the intelligent tester display.**

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the intelligent tester, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 1	No. 1 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • Equal to ambient temperature while engine is cold	If the value is -40°C (-40°F) or 150°C (302°F), the No. 1 ATF temperature sensor circuit is open or shorted.

HINT:

When DTC P0712 is output and the intelligent tester output is 150°C (302°F) or more, there is a short circuit.

When DTC P0713 is output and the intelligent tester output is -40°C (-40°F), there is an open circuit.

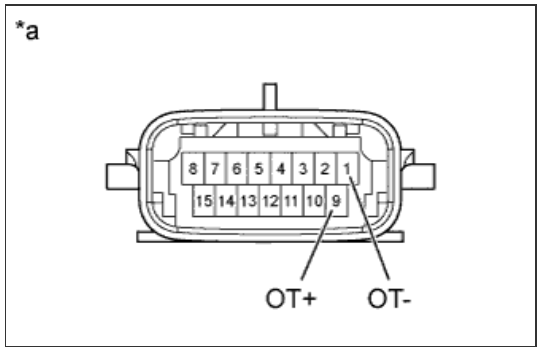
Measure the resistance between terminal THO1 and the body ground.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or more	Short circuit

1.INSPECT NO. 1 TRANSMISSION WIRE (NO. 1 ATF TEMPERATURE SENSOR)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
1 (OT-) - 9 (OT+)	Always	79 Ω to 156 kΩ
1 (OT-) - Body ground	Always	10 kΩ or higher
9 (OT+) - Body ground	Always	10 kΩ or higher

HINT:

If the resistance is out of the specified range at one of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Standard Resistance:

ATF Temperature	Specified Condition

10°C (50°F)	5 to 8 kΩ
25°C (77°F)	2.5 to 4.5 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

NG → REPAIR OR REPLACE NO. 1 ATF TEMPERATURE SENSOR (NO. 1 TRANSMISSION WIRE) (Click here)

OK

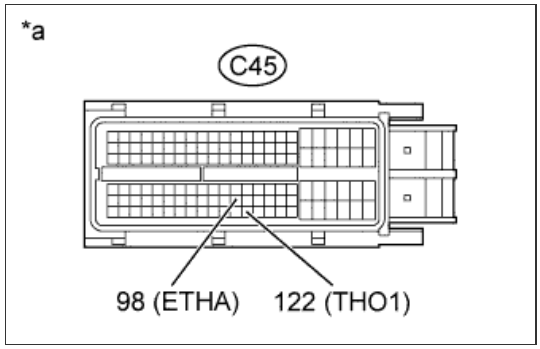
2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-122 (THO1) - C45-98 (ETHA)	Always	79 Ω to 156 kΩ
C45-122 (THO1) - Body ground	Always	10 kΩ or higher
C45-98 (ETHA) - Body ground	Always	10 kΩ or higher



Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0976 Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)

DTC P0977 Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)

for Preparation Click here

DESCRIPTION

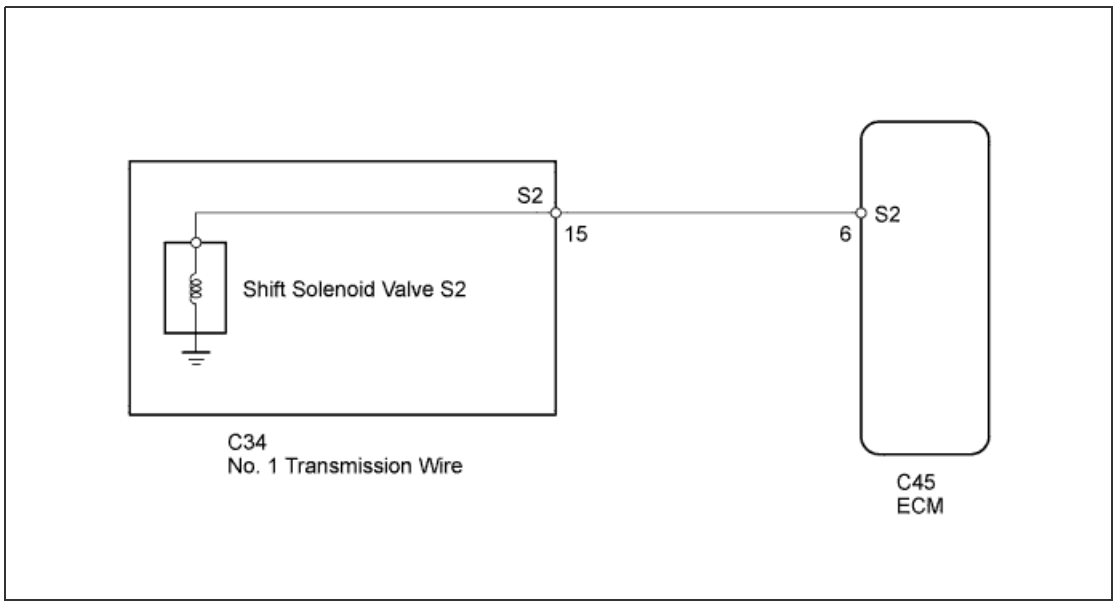
Shifting from 1st to 6th is performed in combination with ON and OFF operation of shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending the current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0976	ECM detects a short in the solenoid valve S2 circuit 2 times when solenoid valve S2 is operated (1 trip detection logic).	• Short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM
P0977	ECM detects an open in the solenoid valve S2 circuit 2 times when solenoid valve S2 is not operated (1 trip detection logic).	• Open in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S2 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When shift solenoid valve S2 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S2 circuit.
When shift solenoid valve S2 is OFF, if its resistance is 100 kΩ or more, the ECM determines there is an open in the shift solenoid valve S2 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Shift solenoid valve S2 is turned ON/OFF normally when the shift lever is in D.

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S2	ON	ON	OFF	OFF	OFF	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S2)

a. Disconnect the No. 1 transmission wire connector.

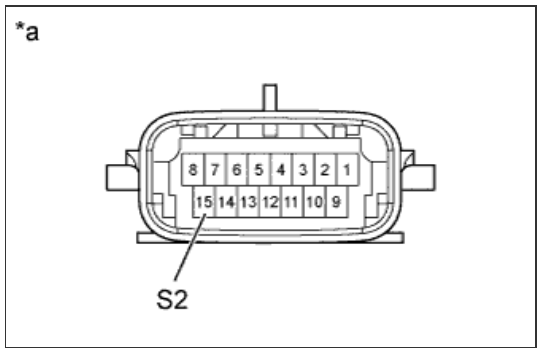
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
15 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)



NG → Go to step 3

OK ↓

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

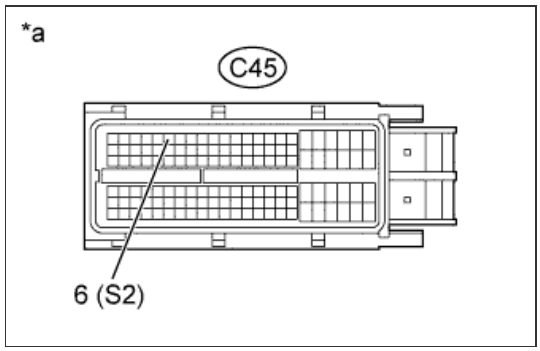
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-6 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ↓

REPLACE ECM (Click here)

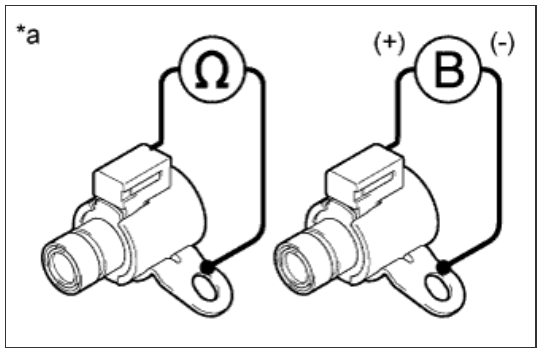
3.INSPECT SHIFT SOLENOID VALVE S2

a. Remove the shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve	

	S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S2)

NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

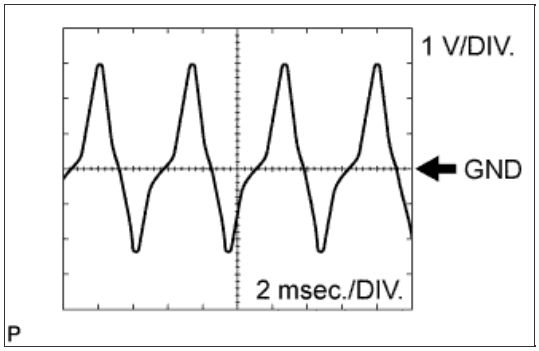
for Preparation Click here

DESCRIPTION

This sensor detects the rotation speed of the turbine which indicates the input speed of the transmission. By comparing the input turbine speed signal NT with the counter gear speed sensor signal SP2, the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure according to various conditions, and as a result, the gears shift smoothly.

DTC Code	DTC Detection Condition	Trouble Area
P0717	All conditions are met for 5 seconds or more (1 trip detection logic): (a) Gear shift is not being performed. (b) Transmission is in 4th, 5th or 6th gear. (c) Transmission input shaft speed is 300 rpm or less. (d) Transmission output shaft speed is 1000 rpm or more. (e) Park/neutral position switch NSW and R input signals are OFF. (f) Shift solenoid valves and park/neutral position switch are normal.	• Open or short in speed sensor NT circuit • Speed sensor NT • ECM • Automatic transmission (clutch, brake, gear, etc.)

Reference: Inspect using an oscilloscope.
Check the waveform of the ECM connector.



Standard:

Terminal No. (Symbol)	Tool Setting	Condition	Specified Condition
C45-124 (NT+) - C45-123 (NT-)	1 V/DIV., 2 msec./DIV.	Engine is idling (Shift lever in P or N)	Refer to illustration

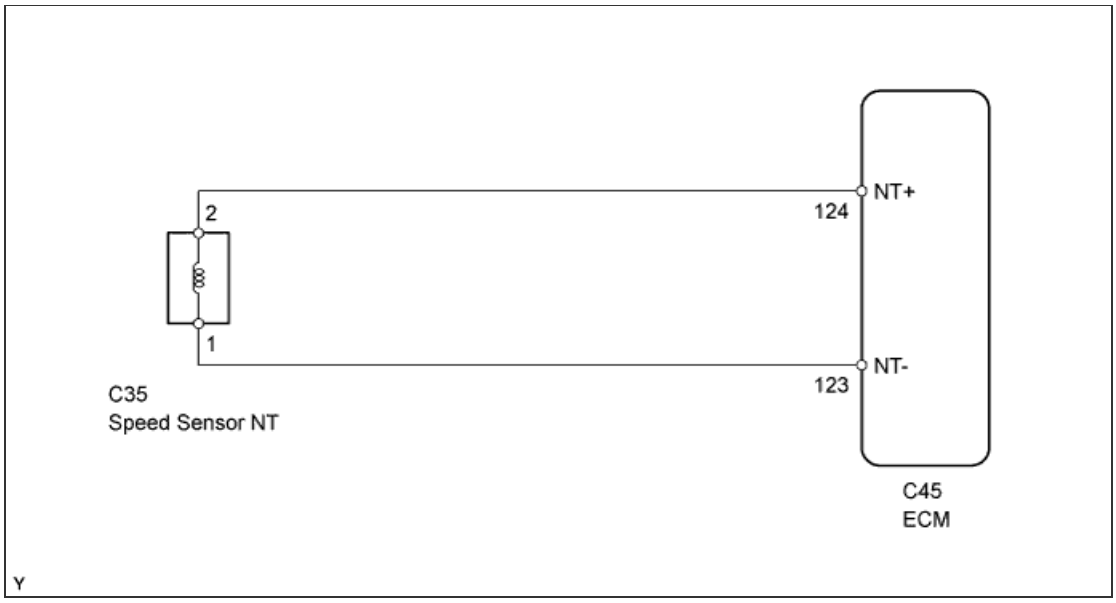
MONITOR DESCRIPTION

This DTC indicates that a pulse is not output from the speed sensor NT (turbine (input) speed sensor) or is output only a little. The NT terminal of the ECM detects the pulse signal from the speed sensor NT (input turbine speed). The ECM outputs a gear shift signal by comparing the input speed sensor NT signal with the output speed sensor SP2 signal.
While the vehicle is operating in the 4th, 5th or 6th gear position with the shift lever in D, if the input shaft revolution is less than 300 rpm*1 although the output shaft speed is more than 1000 rpm or more*2, the ECM detects the trouble, illuminates the MIL and stores the DTC.

HINT:

- ***1: Pulse is not output or is irregularly output.**
- ***2: The vehicle speed is approximately 50 km/h (30 mph) or more.**

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the intelligent tester, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
SPD (NT)	Input shaft speed/ Min.: 0 rpm Max.: 12750 rpm	Lock-up is: • ON (after warming up engine): Input turbine speed (NT) equal to engine speed • OFF (idling with shift lever in N): Input turbine speed (NT) nearly equal to engine speed	Data is displayed in increments of 50 rpm.

HINT:

- **SPD (NT) is always 0 while driving:**
  Open or short in the sensor or circuit.
- **SPD (NT) is always more than 0 and less than 300 rpm while driving the vehicle at 50 km/h (30 mph) or more:**
  Sensor trouble, improper installation or intermittent connection trouble of the circuit.

1.INSPECT SPEED SENSOR NT INSTALLATION

a. Check the speed sensor NT installation.

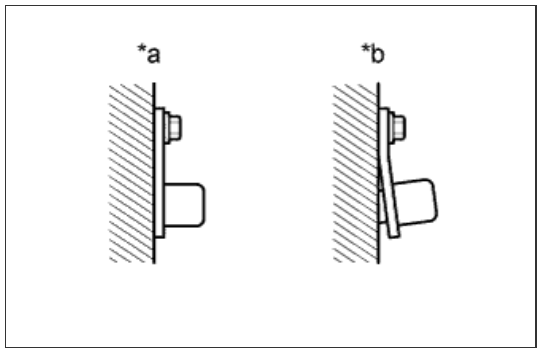
OK:

The installation bolt is tightened properly and there is no clearance

between the sensor and transmission case.

Text in Illustration

*a	CORRECT
*b	INCORRECT



NG → SECURELY INSTALL OR REPLACE SPEED SENSOR NT

OK

2.INSPECT SPEED SENSOR NT

a. Disconnect the speed sensor connector.

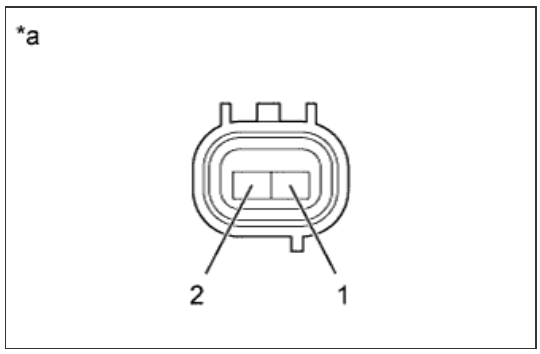
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	560 to 680 Ω

Text in Illustration

*a	Component without harness connected (Speed Sensor NT)



NG → REPLACE SPEED SENSOR NT (Click here)

OK

3.CHECK HARNESS AND CONNECTOR (SPEED SENSOR NT - ECM)

a. Disconnect the ECM connector.

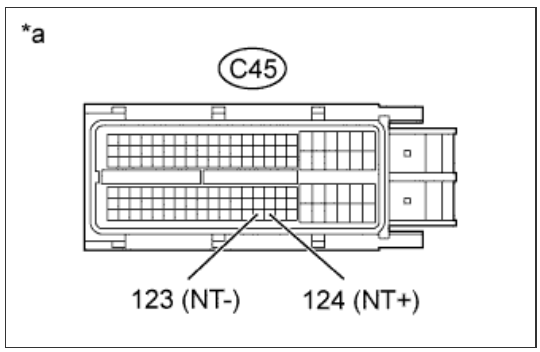
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-124 (NT+) - C45-123 (NT-)	20°C (68°F)	560 to 680 Ω
C45-124 (NT+) - Body ground	Always	10 kΩ or higher
C45-123 (NT-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0979 Shift Solenoid "C" Control Circuit Low (Shift Solenoid Valve S3)

DTC P0980 Shift Solenoid "C" Control Circuit High (Shift Solenoid Valve S3)

for Preparation Click here

DESCRIPTION

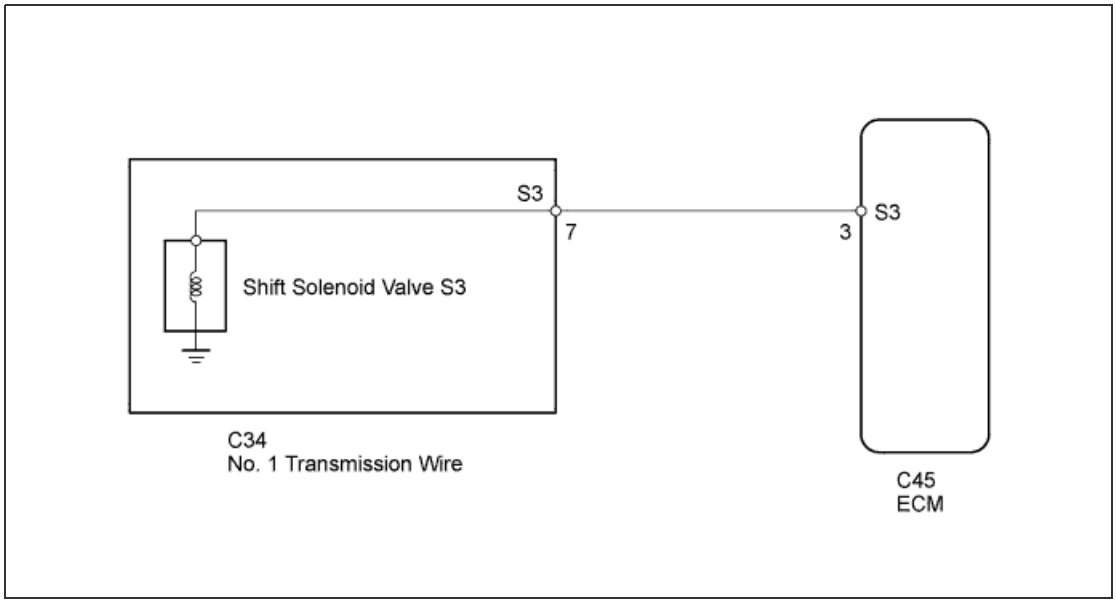
Shifting from 1st to 6th is performed in combination with ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending the current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0979	ECM detects short in solenoid valve S3 circuit 2 times when solenoid valve S3 is operated (1 trip detection logic).	• Short in shift solenoid valve S3 circuit • Shift solenoid valve S3 • ECM
P0980	ECM detects open in solenoid valve S3 circuit 2 times when solenoid valve S3 is not operated (1 trip detection logic).	• Open in shift solenoid valve S3 circuit • Shift solenoid valve S3 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S3 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S3 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S3 circuit.
When the shift solenoid valve S3 is OFF, if its resistance is 100 kΩ or more, the ECM determines there is an open in the shift solenoid valve S3 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Shift solenoid valve S3 is turned ON/OFF normally when the shift lever is in D.

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S3	ON	ON	ON	OFF	OFF	OFF

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S3)

a. Disconnect the No. 1 transmission wire connector.

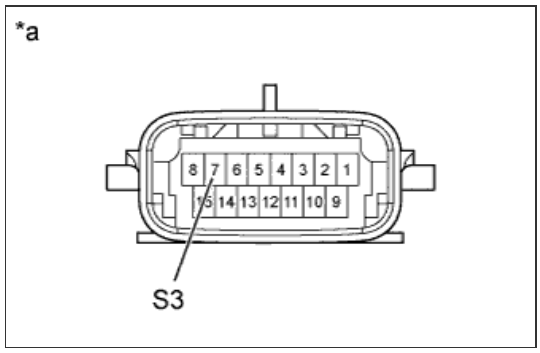
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
7 (S3) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)



NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

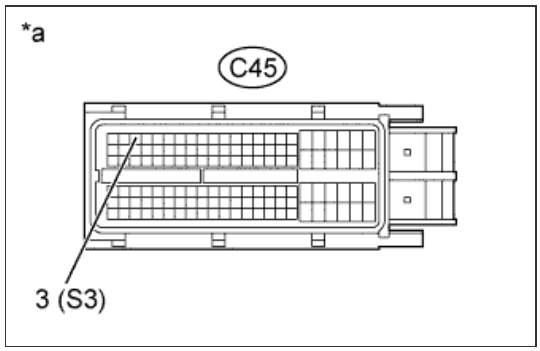
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-3 (S3) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

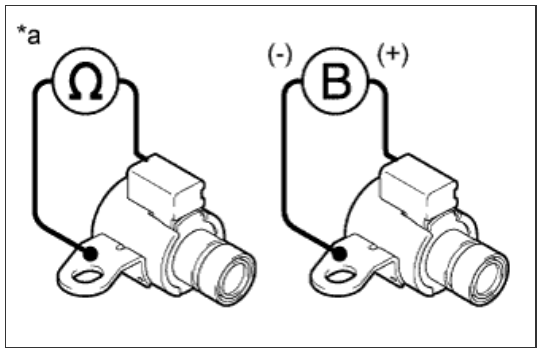
3.INSPECT SHIFT SOLENOID VALVE S3

a. Remove the shift solenoid valve S3.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve	

	S3 connector • Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S3)

NG → REPLACE SHIFT SOLENOID VALVE S3 (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0722 Output Speed Sensor Circuit No Signal

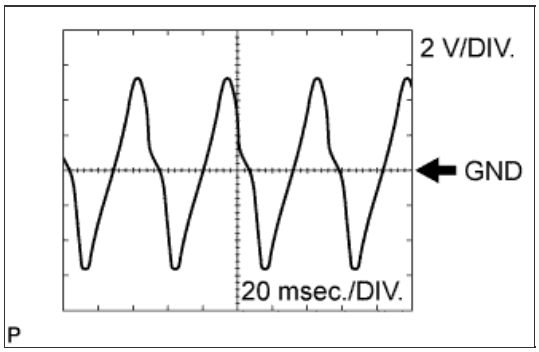
for Preparation Click here

DESCRIPTION

The speed sensor SP2 detects the rotation speed of the transmission output shaft and sends signals to the ECM. The ECM determines the vehicle speed based on these signals. An AC voltage is generated in the speed sensor SP2 coil as the parking gear mounted on the rear planetary gear assembly rotates, and this voltage is sent to the ECM. The parking gear on the rear planetary gear is used as the timing rotor for this sensor.
The gear shift point and lock-up timing are controlled by the ECM based on the signals from this vehicle speed sensor and the throttle position sensor signal.

DTC Code	DTC Detection Condition	Trouble Area
P0722	All conditions are met 5 seconds or more continuously (2 trip detection logic): (a) No signal from speed sensor SP2 is input to the ECM while 4 pulses of the No. 1 vehicle speed sensor signal are sent. (b) Vehicle speed is 9 km/h (5.59 mph) or more. (c) Park/neutral position switch is OFF.	• Open or short in speed sensor SP2 circuit • Speed sensor SP2 • ECM • Automatic transmission (clutch, brake, gear, etc.)

Reference: Inspect using an oscilloscope.
Check the waveform of the ECM connector.



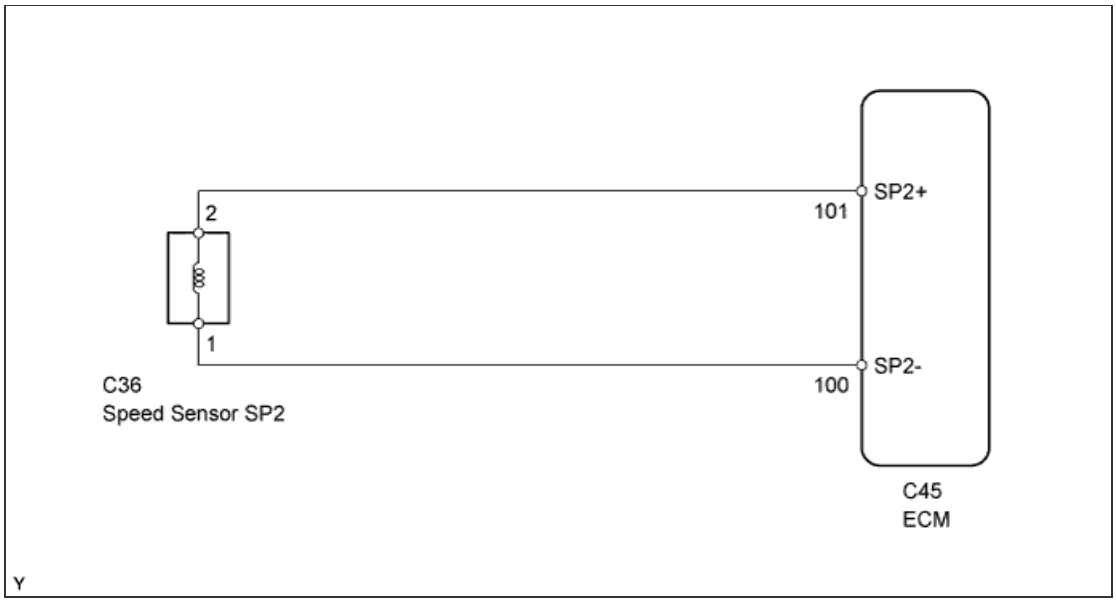
Standard:

Terminal No. (Symbol)	Tool Setting	Condition	Specified Condition
C45-101 (SP2+) - C45-100 (SP2-)	2 V/DIV., 20 msec./DIV.	Vehicle speed 20 km/h (12 mph)	Refer to illustration

MONITOR DESCRIPTION

The output speed sensor SP2 monitors the output shaft speed. The ECM controls the gear shift point and lock up timing based on the signals from the output speed sensor SP2 and throttle position sensor.
If the ECM detects no signal from the output speed sensor SP2 even while the vehicle is moving, it will conclude that there is a malfunction of the output speed sensor SP2. The ECM will illuminate the MIL and store the DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the intelligent tester, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
SPD (SP2)	Output shaft speed/ Min.: 0 km/h (0 mph) Max.: 255 km/h (158 mph)	Vehicle stopped: 0 km/h (0 mph) (output shaft speed is equal to vehicle speed)	-

HINT:

- **SPD (SP2) is always 0 while driving:**
  Open or short in the sensor or circuit.
- **The SPD (SP2) value displayed on the intelligent tester is much lower than the actual vehicle speed:**
  Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

1.INSPECT SPEED SENSOR SP2 INSTALLATION

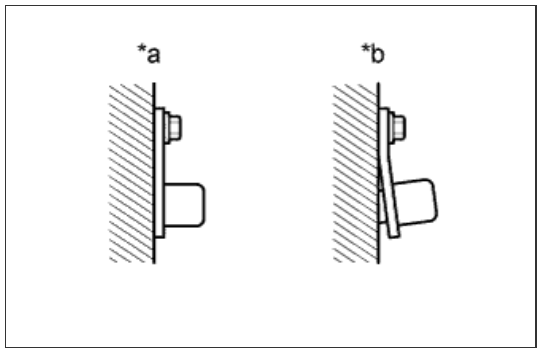
a. Check the speed sensor SP2 installation.

OK:

The installation bolt is tightened properly and there is no clearance between the sensor and transmission case.

Text in Illustration

*a	CORRECT
*b	INCORRECT



NG → SECURELY INSTALL OR REPLACE SPEED SENSOR SP2

OK →

2.INSPECT SPEED SENSOR SP2

a. Disconnect the speed sensor connector.

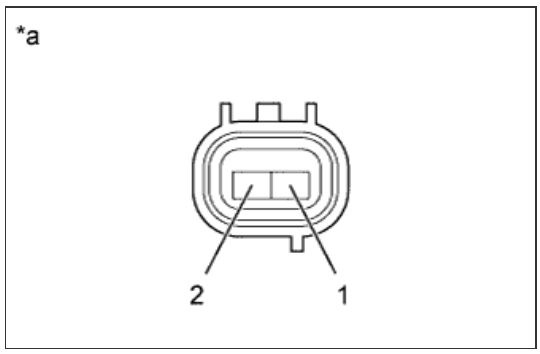
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	560 to 680 Ω

Text in Illustration

*a	Component without harness connected (Speed Sensor SP2)



NG → REPLACE SPEED SENSOR SP2 (Click here)

OK →

3.CHECK HARNESS AND CONNECTOR (SPEED SENSOR SP2 - ECM)

a. Disconnect the ECM connector.

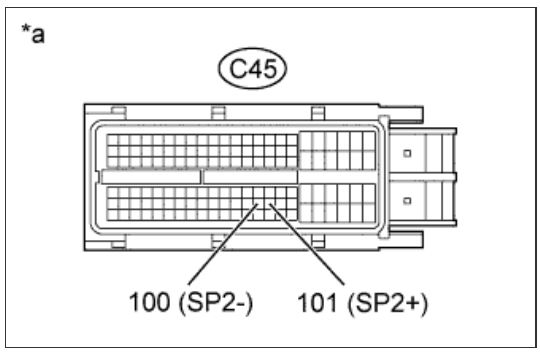
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-101 (SP2+) - C45-100 (SP2-)	20°C (68°F)	560 to 680 Ω
C45-101 (SP2+) - Body ground	Always	10 kΩ or higher
C45-100 (SP2-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK →

REPLACE ECM (Click here)

DTC P0979 Shift Solenoid "C" Control Circuit Low (Shift Solenoid Valve S3)

DTC P0980 Shift Solenoid "C" Control Circuit High (Shift Solenoid Valve S3)

for Preparation Click here

DESCRIPTION

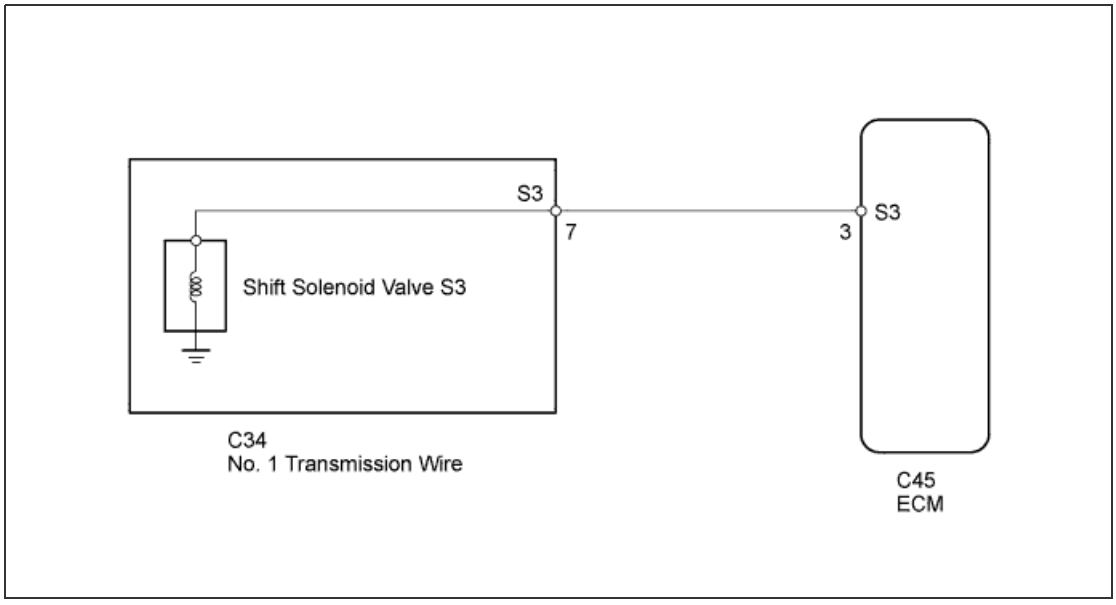
Shifting from 1st to 6th is performed in combination with ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending the current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0979	ECM detects short in solenoid valve S3 circuit 2 times when solenoid valve S3 is operated (1 trip detection logic).	• Short in shift solenoid valve S3 circuit • Shift solenoid valve S3 • ECM
P0980	ECM detects open in solenoid valve S3 circuit 2 times when solenoid valve S3 is not operated (1 trip detection logic).	• Open in shift solenoid valve S3 circuit • Shift solenoid valve S3 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S3 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S3 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S3 circuit.
When the shift solenoid valve S3 is OFF, if its resistance is 100 kΩ or more, the ECM determines there is an open in the shift solenoid valve S3 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Shift solenoid valve S3 is turned ON/OFF normally when the shift lever is in D.

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S3	ON	ON	ON	OFF	OFF	OFF

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S3)

a. Disconnect the No. 1 transmission wire connector.

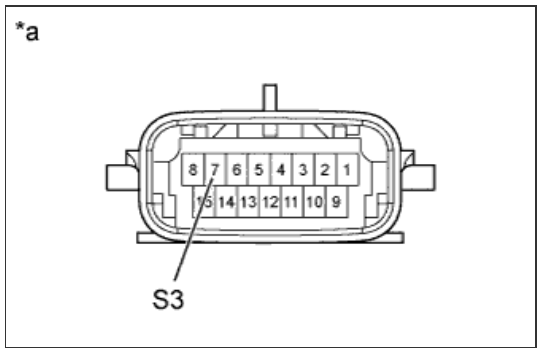
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
7 (S3) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)



NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

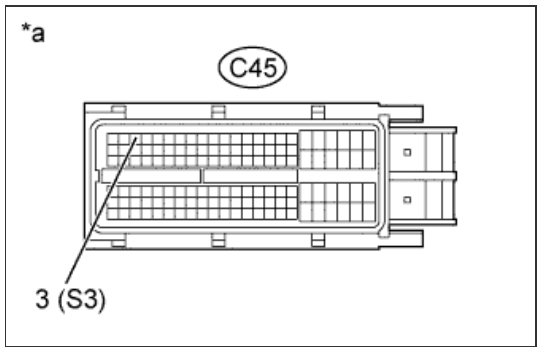
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-3 (S3) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

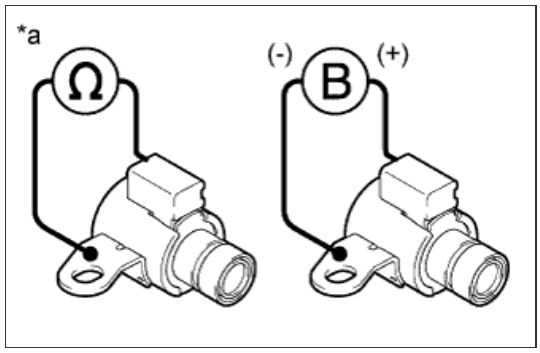
3.INSPECT SHIFT SOLENOID VALVE S3

a. Remove the shift solenoid valve S3.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve	

	S3 connector • Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S3)

NG → REPLACE SHIFT SOLENOID VALVE S3 (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0729 Gear 6 Incorrect Ratio

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output speed sensor SP2 and input speed sensor NT to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0729	6th gearshift malfunction: The ECM determines there is a malfunction when both of the following conditions are met (1 trip detection logic). (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is also shifted to 5th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 4th.	• Valve body is blocked up or stuck (sequence valve) • Shift solenoid valve SLT remains open or closed • Automatic transmission (clutch, brake, gear, etc.)

HINT:

- **Gear positions in the event of a solenoid valve mechanical problem:**

ECM command gearshift	1st	2nd	3rd	4th	5th	6th
Actual gear position under malfunction	1st	2nd	3rd	4th	5th	4th

- **Gear position during fail-safe operation:**
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
Actual gear position under fail-safe mode	1st	2nd	3rd	3rd	3rd	3rd

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves ON/OFF and switching oil pressure to the valves in the valve body.
The DTC indicates that the sequence valve is locked in the direction the spring stretches and that shifting to 6th gear is impossible.

INSPECTION PROCEDURE

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0729)

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the intelligent tester.

Result

Result	Proceed to
Only P0729 is output	A
P0729 and other DTCs are output	B

HINT:

If any other codes besides P0729 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (RUNNING TEST)

CAUTION:

This test should always be performed with at least 2 people.

NOTICE:

- **Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).**
- **Perform the test with the A/C turned off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Connect the intelligent tester to the DLC3.

b. Clear the DTC (Click here).

c. Warm up the engine.

d. Enter the following menus: Powertrain / Engine and ECT / Active Test.

e. According to the display on the intelligent tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position by yourself	• Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of shift solenoid valves. [Vehicle Condition] 50 km/h (30 mph) or less

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (30 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shift must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shift must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the intelligent tester.**
- **Gear positions in the event of a solenoid valve mechanical problem:**

Tester command gearshift	1st	2nd	3rd	4th	5th	6th
Actual gear position under malfunction	1st	2nd	3rd	4th	5th	4th

OK:

Gear position changes in accordance with the tester command.

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)**

OK

3.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

NOTICE:

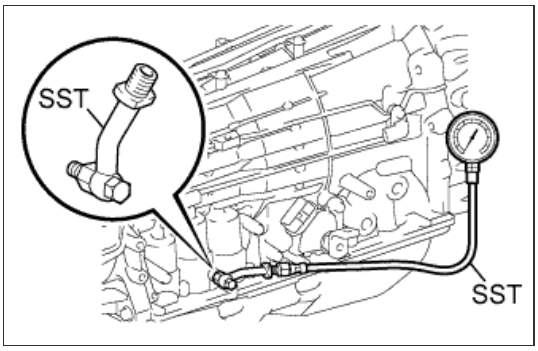
- **Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).**

- **Be careful to prevent the hose of SST from interfering with the exhaust pipe.**
- **Perform the test with the A/C off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case and connect SST.



SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the intelligent tester, perform the Active Test.

h. Measure the line pressure.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate the shift solenoid SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands SLT solenoid to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • Vehicle stopped • Engine idling

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Please note that the pressure values in the Active Test and Hydraulic Test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (**Click here**)

OK

4.CLEAR DTC AND PERFORM RUNNING TEST

a. Clear the DTC (Click here).

b. Check the DTC again after conducting the Monitor Drive Pattern (Click here).

OK:

No DTC code output.

NG → REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (**Click here**)

OK

END

DTC P0982 Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)

DTC P0983 Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)

for Preparation Click here

DESCRIPTION

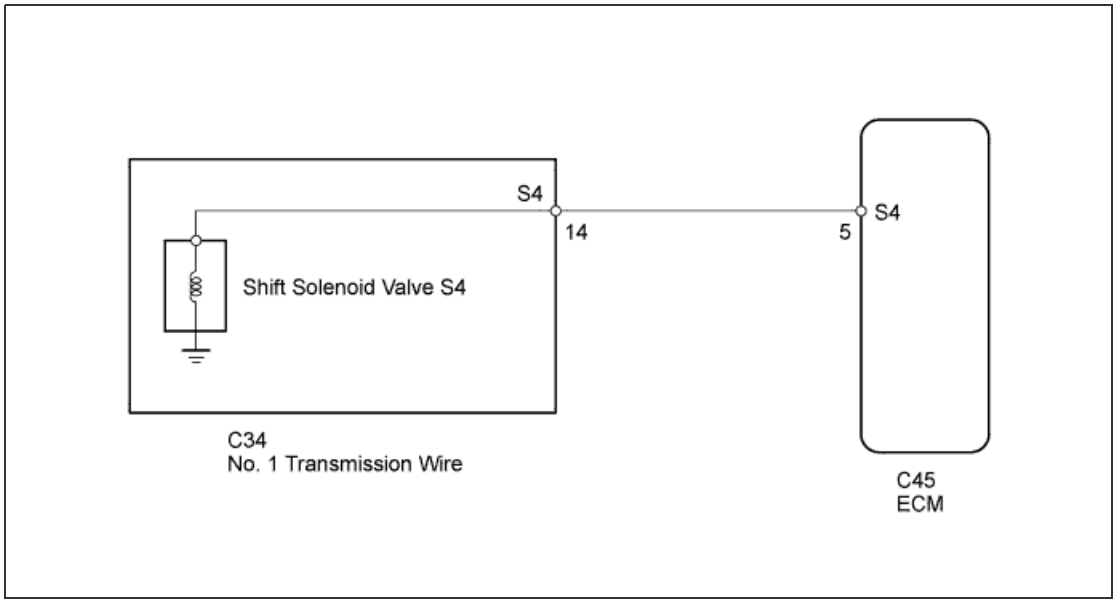
Shifting from 1st to 6th is performed in combination with ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending the current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0982	ECM detects short in solenoid valve S4 circuit 2 times when solenoid valve S4 is operated (1 trip detection logic).	• Short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM
P0983	ECM detects open in solenoid valve S4 circuit 2 times when solenoid valve S4 is not operated (1 trip detection logic).	• Open in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S4 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S4 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S4 circuit.
When the shift solenoid valve S4 is OFF, if its resistance is 100 kΩ or more, the ECM determines there is an open in the shift solenoid valve S4 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Shift solenoid valve S4 is turned ON/OFF normally when the shift lever is in D.

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S4	OFF	OFF	OFF	OFF	ON	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S4)

a. Disconnect the No. 1 transmission wire connector.

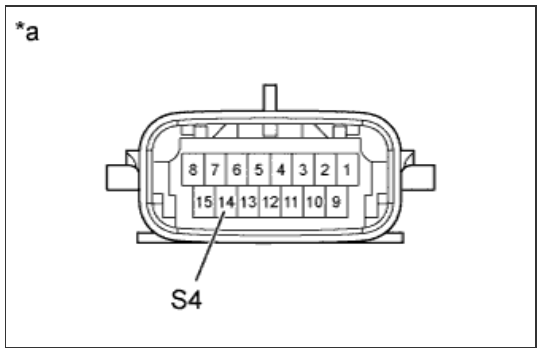
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
14 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)



NG → Go to step 3

OK ↓

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

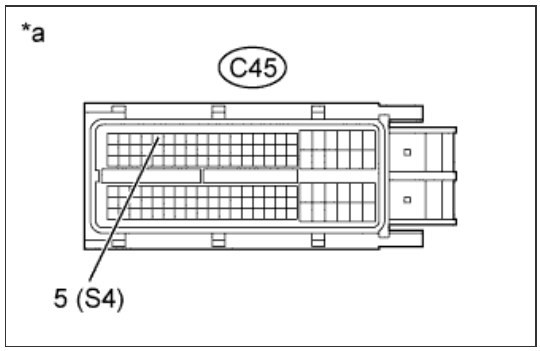
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-5 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ↓

REPLACE ECM (Click here)

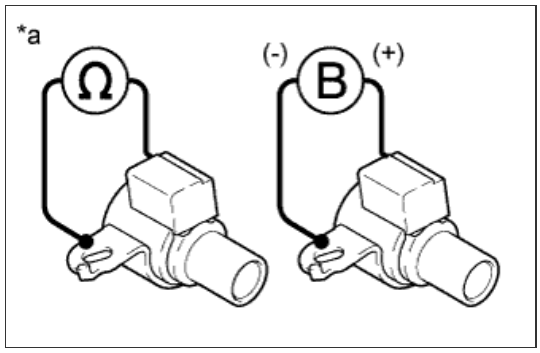
3.INSPECT SHIFT SOLENOID VALVE S4

a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve	

	S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S4)

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0748 Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)

for Preparation Click here

DESCRIPTION

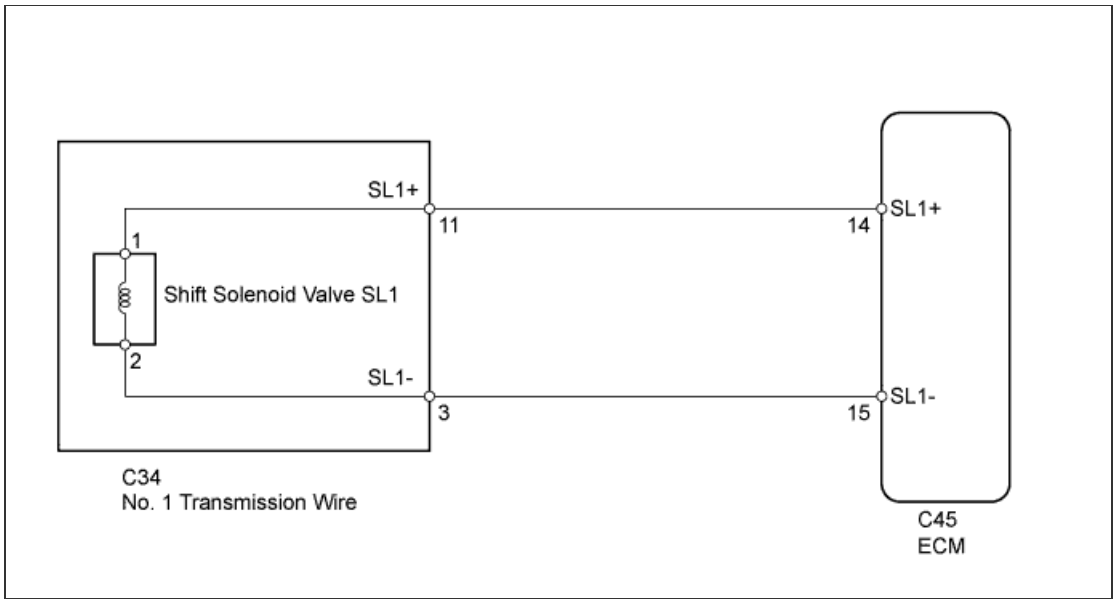
Shifting from 1st to 5th is performed in combination with the ON and OFF operation of shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0748	The ECM checks for an open or short in the shift solenoid valve SL1 circuit while driving and shifting between 4th and 5th gear (1 trip detection logic). Output signal duty equals 100%. **HINT:** SL1 output signal duty is less than 100% under normal conditions.	• Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL1 circuit. The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. Also, the ECM performs the fail-safe function and turns the other normal shift solenoid valves ON/OFF. In the case of an open or short circuit, the ECM stops sending the current to the open or short circuited solenoid.
While driving and shifting between 4th and 5th gears, if the ECM detects an open or short in the shift solenoid valve SL1 circuit, the ECM determines that there is a malfunction (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Shift solenoid valve SL1 turns ON/OFF normally when the shift lever is in D.

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve SL1	OFF	OFF	OFF	OFF	ON	ON

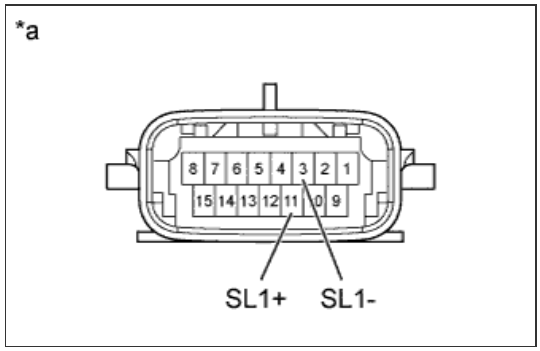
1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SL1)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
11 (SL1+) - 3 (SL1-)	20°C (68°F)	5.0 to 5.6 Ω
11 (SL1+) - Body ground	Always	10 kΩ or higher
3 (SL1-) - Body ground	Always	10 kΩ or higher



Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

NG → Go to step 3

OK

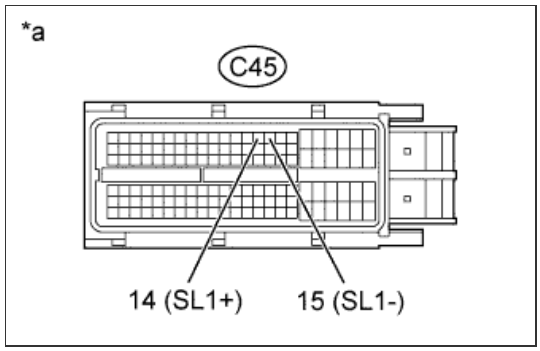
2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-14 (SL1+) - C45-15 (SL1-)	20°C (68°F)	5.0 to 5.6 Ω
C45-14 (SL1+) - Body ground	Always	10 kΩ or higher
C45-15 (SL1-) - Body ground	Always	10 kΩ or higher



Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SL1

a. Remove the shift solenoid valve SL1.

b. Measure the resistance according to the value(s) in the table below.

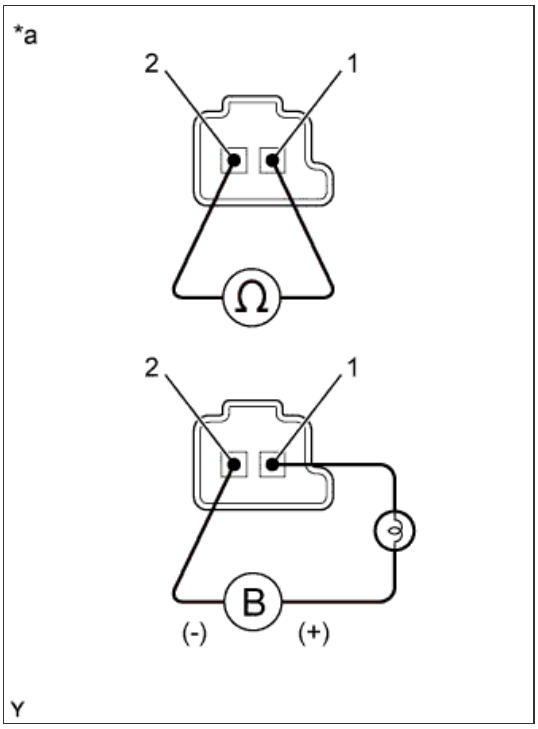
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SL1)

NG → REPLACE SHIFT SOLENOID VALVE SL1 (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0982 Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)

DTC P0983 Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)

for Preparation Click here

DESCRIPTION

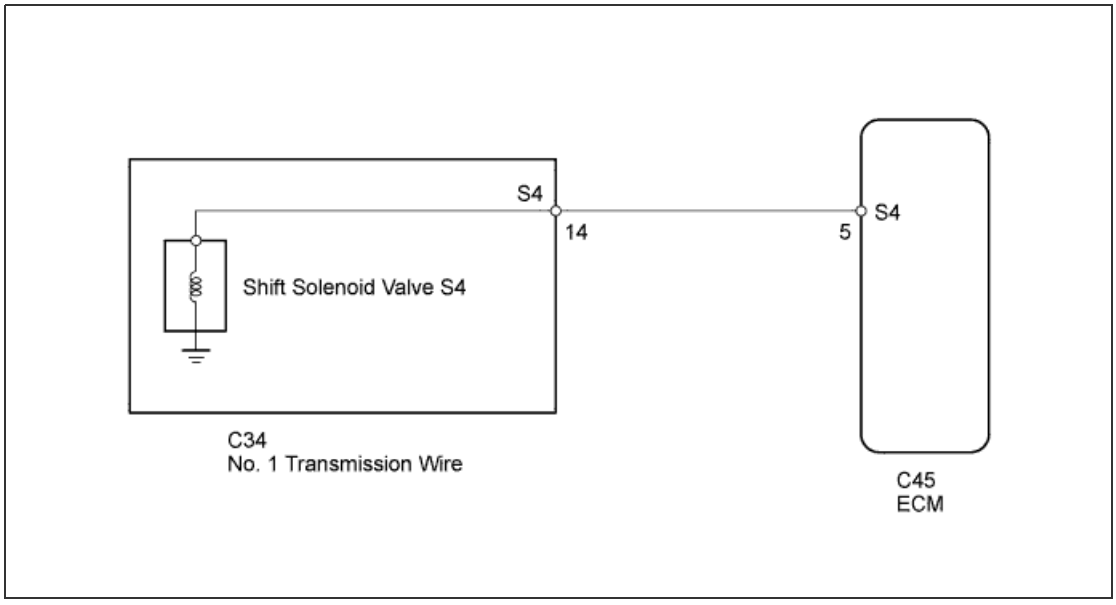
Shifting from 1st to 6th is performed in combination with ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending the current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0982	ECM detects short in solenoid valve S4 circuit 2 times when solenoid valve S4 is operated (1 trip detection logic).	• Short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM
P0983	ECM detects open in solenoid valve S4 circuit 2 times when solenoid valve S4 is not operated (1 trip detection logic).	• Open in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S4 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S4 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S4 circuit.
When the shift solenoid valve S4 is OFF, if its resistance is 100 kΩ or more, the ECM determines there is an open in the shift solenoid valve S4 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Shift solenoid valve S4 is turned ON/OFF normally when the shift lever is in D.

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S4	OFF	OFF	OFF	OFF	ON	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S4)

a. Disconnect the No. 1 transmission wire connector.

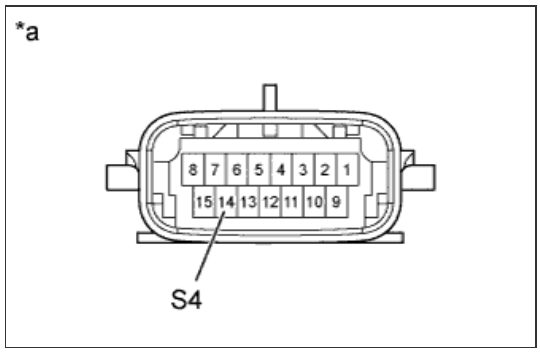
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
14 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)



NG → Go to step 3

OK ↓

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

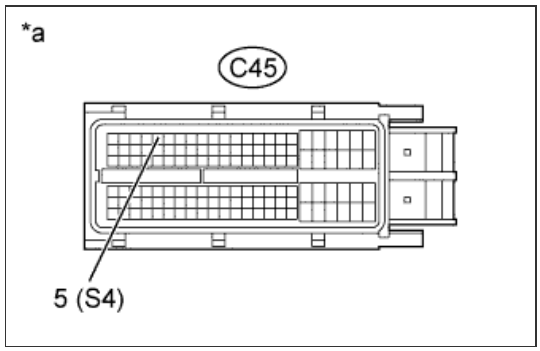
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-5 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ↓

REPLACE ECM (Click here)

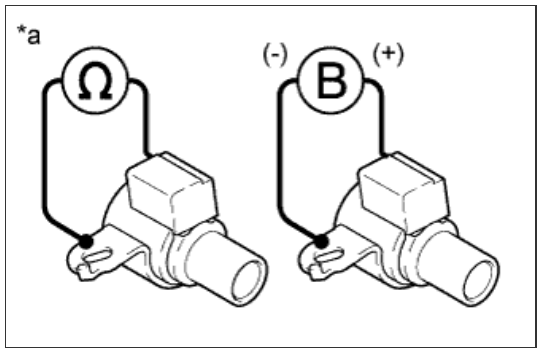
3.INSPECT SHIFT SOLENOID VALVE S4

a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve	

	S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S4)

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0751 Shift Solenoid "A" Performance (Shift Solenoid Valve S1)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake, gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0751	S1 stuck ON malfunction*1: The ECM determines there is a malfunction when the following conditions are both met. (1 trip detection logic) (a) When the ECM directs the transmission to switch to 1st gear, the actual gear is shifted to 2nd. (b) When the ECM directs the transmission to switch to 5th gear, the actual gear is also shifted to 5th.	• Shift solenoid valve S1 remains closed • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)
P0751	S1 stuck OFF malfunction*2: The ECM determines there is a malfunction when conditions (a) and (b) are met. (1 trip detection logic) (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is also shifted to 5th. (b) When the ECM directs the transmission to switch to 6th gear, the engine overruns (clutch slips).	• Shift solenoid valve S1 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked • No. 2 brake malfunction (Driving is difficult.) • Automatic transmission (clutch, brake, gear, etc.)

HINT:

- **Gear positions in the event of a solenoid valve mechanical problem:**

ECM command gearshift	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under S1 stuck ON malfunction	2nd	2nd	3rd	4th	5th	6th
*2: Actual gear position under S1 stuck OFF malfunction	1st	1st	3rd	4th	5th	N*

N*: Neutral

- **Gear position during fail-safe operation:**
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under fail-safe mode when S1 stuck ON malfunction	2nd	2nd	3rd	4th	5th	6th
*2: Actual gear position under fail-safe mode when S1 stuck OFF malfunction	1st*3	1st*3	3rd	3rd	3rd	3rd

***3: Under engine braking, downshifting to 1st or 2nd gear is prohibited.**

MONITOR DESCRIPTION

This DTC indicates stuck ON malfunction or stuck OFF malfunction of shift solenoid valve S1.
The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the intelligent tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valves and set each shift position by yourself	• Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of the shift solenoid valves. [Vehicle Condition] 50 km/h (30 mph) or less

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (30 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shift must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shift must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the intelligent tester.**
- **Shift solenoid valve S1 turns ON/OFF normally when the shift lever is in D.**

ECM command gearshift	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S1	OFF	ON	ON	ON	ON	ON

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0751)

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the intelligent tester.

Result

Result	Proceed to
Only P0751 is output	A
P0751 and other DTCs are output	B

HINT:

If any other codes besides P0751 are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART (Click here)**

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

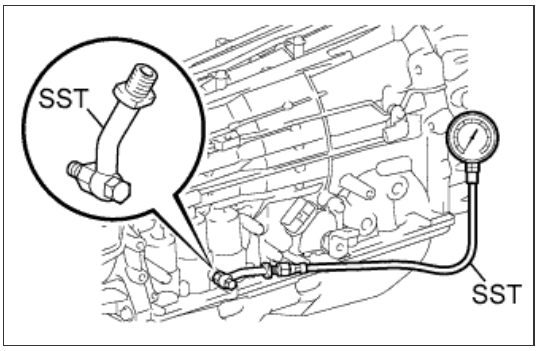
NOTICE:

- **Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).**
- **Be careful to prevent the hose of SST from interfering with the exhaust pipe.**
- **Perform the test with the A/C off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case and connect SST.



SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the intelligent tester, perform the Active Test.

h. Measure the line pressure.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate the shift solenoid SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands SLT solenoid to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • Vehicle stopped • Engine idling

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Please note that the pressure values in the Active Test and Hydraulic Test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

3.INSPECT SHIFT SOLENOID VALVE S1

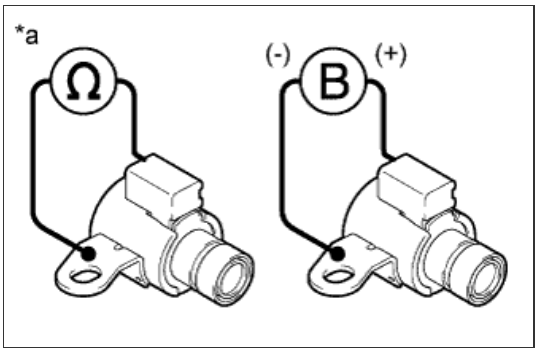
a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified

		Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S1)

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

4.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly.

OK:

There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P0985 Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)

DTC P0986 Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)

for Preparation Click here

DESCRIPTION

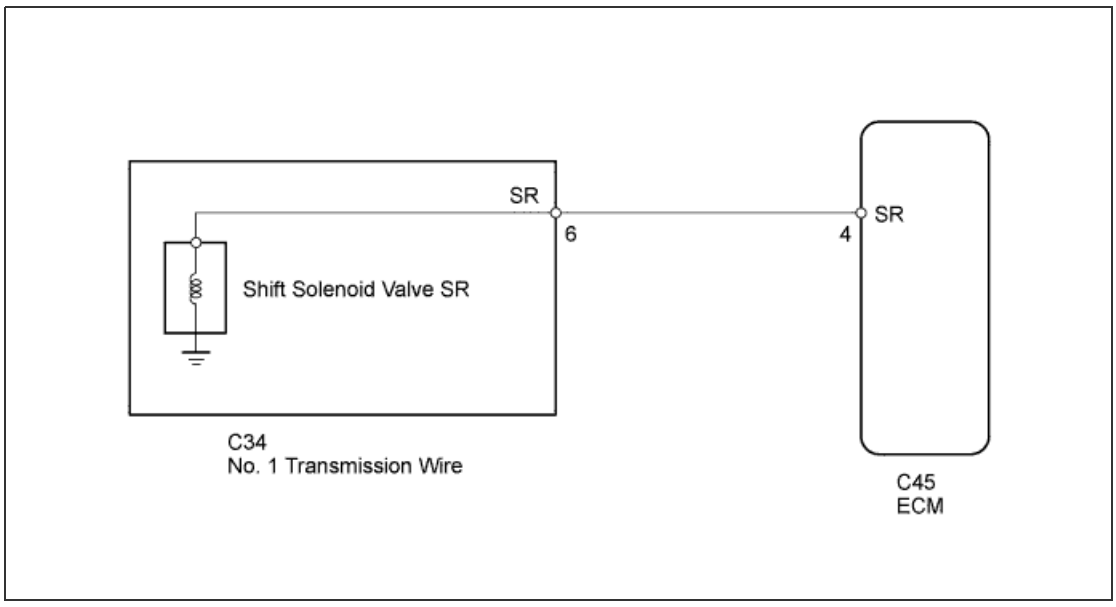
Shifting from 1st to 6th is performed in combination with ON and OFF operation of shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending the current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0985	ECM detects a short in the solenoid valve SR circuit 2 times when solenoid valve SR is operated (1 trip detection logic).	• Short in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM
P0986	ECM detects an open in the solenoid valve SR circuit 2 times when solenoid valve SR is not operated (1 trip detection logic).	• Open in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve SR circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When shift solenoid valve SR is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve SR circuit.
When shift solenoid valve SR is OFF, if its resistance is 100 kΩ or more, the ECM determines there is an open in the shift solenoid valve SR circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Shift solenoid valve SR is turned ON/OFF normally when the shift lever is in D.

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve SR	ON	ON	ON	ON	OFF	OFF

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SR)

a. Disconnect the No. 1 transmission wire connector.

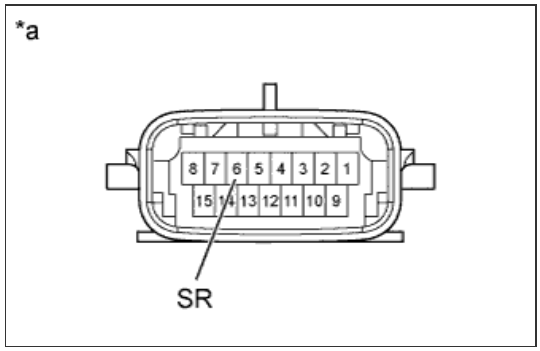
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
6 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)



NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

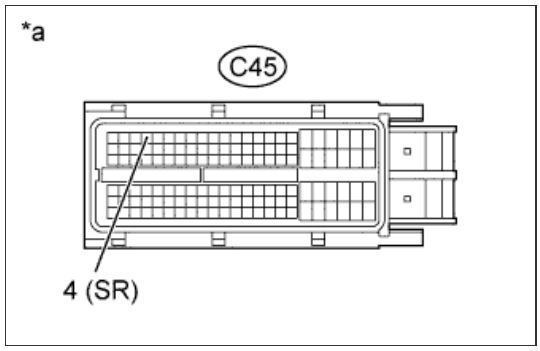
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-4 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

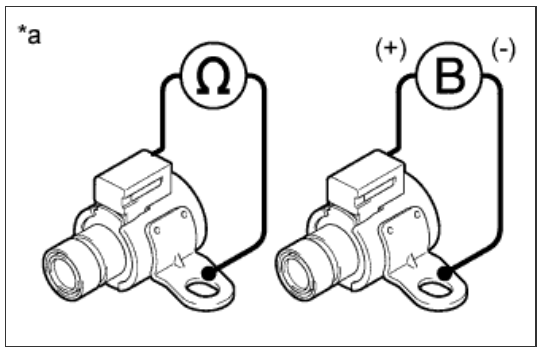
3.INSPECT SHIFT SOLENOID VALVE SR

a. Remove the shift solenoid valve SR.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve SR connector terminal - Shift solenoid valve SR body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive	

	(+) → Shift solenoid valve SR connector • Battery negative (-) → Shift solenoid valve SR body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SR)

NG → REPLACE SHIFT SOLENOID VALVE SR (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0761 Shift Solenoid "C" Performance (Shift Solenoid Valve S3)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake, gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0761	S3 stuck ON malfunction*1: When the ECM directs the gearshift to switch to 5th or 6th gear, the engine overruns (clutch slips). The ECM determines there is a malfunction when either of the following conditions is met (1 trip detection logic). (a) When the ECM directs the transmission to switch to 4th gear, the actual gear is shifted to 3rd. (b) When the ECM directs the transmission to switch to 5th gear, the engine overruns (clutch slips).	• Shift solenoid valve S3 remains closed • Shift solenoid valve SLT remains closed • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)
P0761	S3 stuck OFF malfunction*2: Shifting to 1st, 2nd, and 3rd gears is impossible. The ECM determines there is a malfunction when the following conditions are both met (1 trip detection logic). (a) When the ECM directs the transmission to switch to 2nd gear, the actual gear is shifted to 4th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 6th.	• Shift solenoid valve S3 remains open • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)

HINT:

- **Gear positions in the event of a solenoid valve mechanical problem:**

ECM command gearshift	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under S3 stuck ON malfunction	1st	2nd	3rd	3rd	N*	N*
*2: Actual gear position under S3 stuck OFF malfunction	3rd	4th	4th	4th	5th	6th

N*: Neutral

- **Gear position during fail-safe operation:**
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under fail-safe mode when S3 stuck ON malfunction	1st	2nd	3rd	3rd	3rd	3rd
*2: Actual gear position under fail-safe mode when S3 stuck OFF malfunction	3rd	4th	4th	4th	5th	6th

MONITOR DESCRIPTION

This DTC indicates stuck ON malfunction or stuck OFF malfunction of shift solenoid valve S3.
The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When the gear position commanded by the ECM and the actual gear position are not same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the intelligent tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valves and set each shift position by yourself	• Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of the shift solenoid valves. [Vehicle Condition] 50 km/h (30 mph) or less

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (30 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shift must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shift must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the intelligent tester.**
- **Shift solenoid valve SL2 turns ON/OFF normally when the shift lever is in D.**

ECM command gearshift	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S3	ON	ON	ON	OFF	OFF	OFF

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0761)

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the intelligent tester.

Result

Result	Proceed to
Only P0761 is output	A
P0761 and other DTCs are output	B

HINT:

If any other codes besides P0761 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

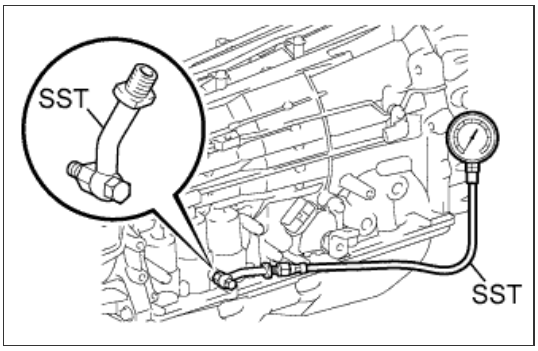
NOTICE:

- **Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).**
- **Be careful to prevent the hose of SST from interfering with the exhaust pipe.**
- **Perform the test with the A/C off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case and connect SST.



SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the intelligent tester, perform the Active Test.

h. Measure the line pressure.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate the shift solenoid SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands SLT solenoid to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • Vehicle stopped • Engine idling

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Please note that the pressure values in the Active Test and Hydraulic Test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

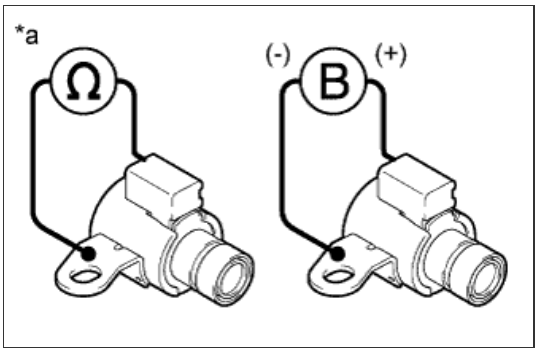
3.INSPECT SHIFT SOLENOID VALVE S3

a. Remove the shift solenoid valve S3.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S3 connector • Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S3)

NG → REPLACE SHIFT SOLENOID VALVE S3 (Click here)

OK

4.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly.

OK:

There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P0985 Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)

DTC P0986 Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)

for Preparation Click here

DESCRIPTION

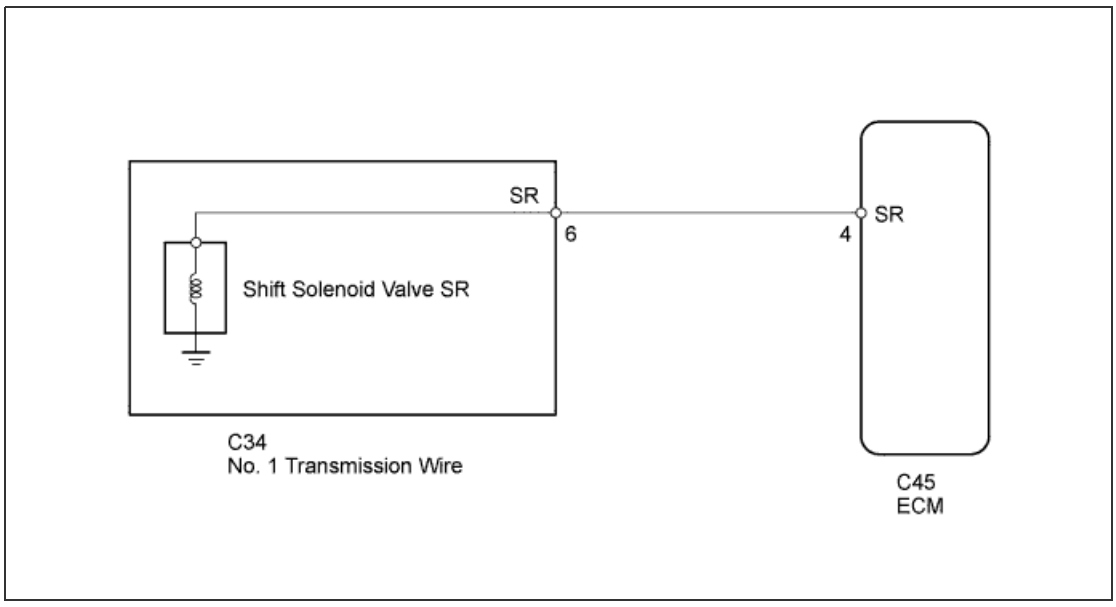
Shifting from 1st to 6th is performed in combination with ON and OFF operation of shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending the current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0985	ECM detects a short in the solenoid valve SR circuit 2 times when solenoid valve SR is operated (1 trip detection logic).	• Short in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM
P0986	ECM detects an open in the solenoid valve SR circuit 2 times when solenoid valve SR is not operated (1 trip detection logic).	• Open in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve SR circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When shift solenoid valve SR is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve SR circuit.
When shift solenoid valve SR is OFF, if its resistance is 100 kΩ or more, the ECM determines there is an open in the shift solenoid valve SR circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Shift solenoid valve SR is turned ON/OFF normally when the shift lever is in D.

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve SR	ON	ON	ON	ON	OFF	OFF

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SR)

a. Disconnect the No. 1 transmission wire connector.

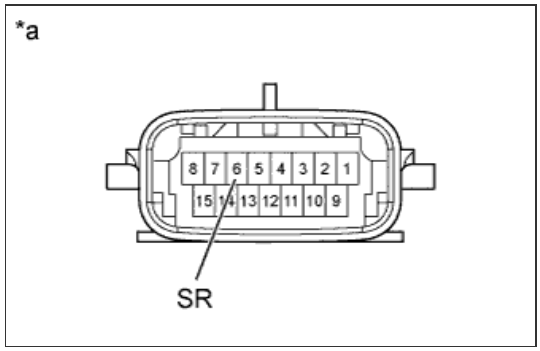
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
6 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)



NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

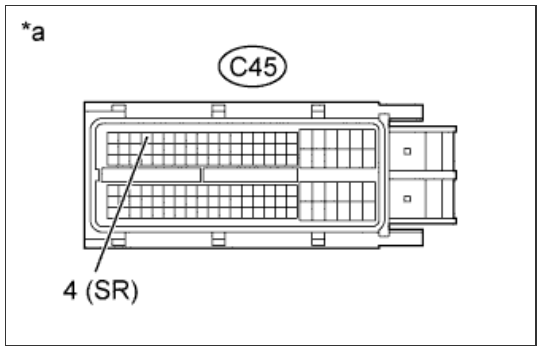
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-4 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

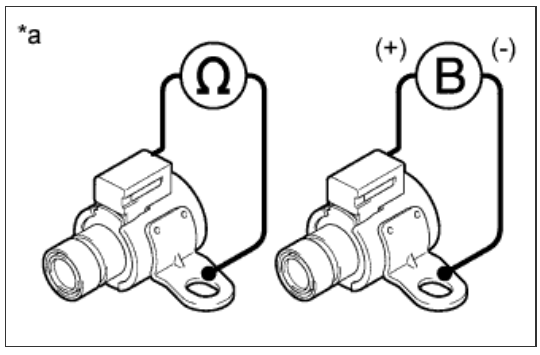
3.INSPECT SHIFT SOLENOID VALVE SR

a. Remove the shift solenoid valve SR.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve SR connector terminal - Shift solenoid valve SR body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive	

	(+) → Shift solenoid valve SR connector • Battery negative (-) → Shift solenoid valve SR body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SR)

NG → REPLACE SHIFT SOLENOID VALVE SR (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0766 Shift Solenoid "D" Performance (Shift Solenoid Valve S4)

DTC P0776 Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake, gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0766	S4 stuck OFF malfunction or brake control valve malfunction*: Shifting to 5th and 6th gears is impossible. The ECM determines there is a malfunction when the following conditions are both met. (1 trip detection logic) (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is shifted to 4th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 4th.	• Shift solenoid valve S4 remains closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked (Brake control valve) • Automatic transmission (clutch, brake, gear, etc.)
P0776	SL2 stuck ON malfunction or brake control valve malfunction*: Shifting to 5th and 6th gears is impossible. The ECM determines there is a malfunction when the following conditions are both met (2-trip detection logic): (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is shifted to 4th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 4th.	• Shift solenoid valve SL2 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked (Brake control valve) • Automatic transmission (clutch, brake, gear, etc.)

HINT:

- **Gear positions in the event of a solenoid valve mechanical problem:**

ECM command gearshift	1st	2nd	3rd	4th	5th	6th
*: Actual gear position under malfunction	1st	2nd	3rd	4th	4th	4th

- **Gear position during fail-safe operation:**
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
*: Actual gear position under fail-safe mode	1st	2nd	3rd	3rd	3rd	3rd

MONITOR DESCRIPTION

This DTC indicates stuck OFF malfunction of shift solenoid valve S4, stuck ON malfunction of shift solenoid valve SL2, or brake control valve malfunction. The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When the gear position commanded by the ECM and the actual gear position are not same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the intelligent tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valves and set each shift position by yourself	• Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of the shift solenoid valves. [Vehicle Condition] 50 km/h (30 mph) or less

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (30 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shift must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shift must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the intelligent tester.**
- **Shift solenoid valve SL2 turns ON/OFF normally when the shift lever is in D.**

ECM command gearshift	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S4	OFF	OFF	OFF	OFF	ON	ON
Shift solenoid valve SL2	ON	ON	ON	ON	OFF	OFF

1.CHECK DTC OUTPUT (IN ADDITION TO DTCS P0766 AND P0776)

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the intelligent tester.

Result

Result	Proceed to
Only P0766 and P0776 are output	A
P0766, P0776 and other DTCs are output	B

HINT:

If any other codes besides P0766 and P0776 are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART (Click here)**

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

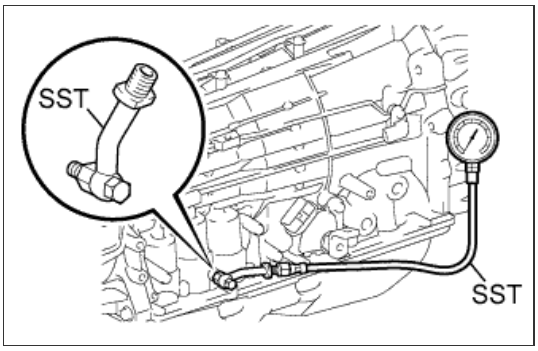
NOTICE:

- **Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).**
- **Be careful to prevent the hose of SST from interfering with the exhaust pipe.**
- **Perform the test with the A/C off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case and connect SST.



SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the intelligent tester, perform the Active Test.

h. Measure the line pressure.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate the shift solenoid SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands SLT solenoid to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • Vehicle stopped • Engine idling

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Please note that the pressure values in the Active Test and Hydraulic Test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

3.INSPECT SHIFT SOLENOID VALVE S4

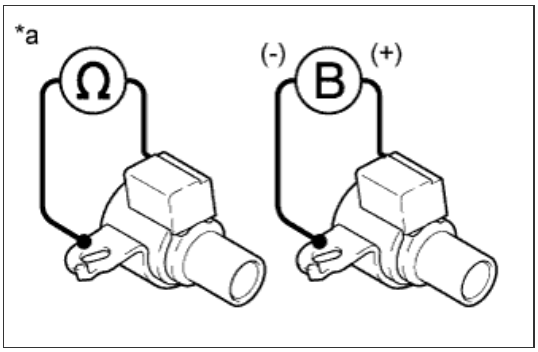
a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.



OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S4)

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK

4.INSPECT SHIFT SOLENOID VALVE SL2

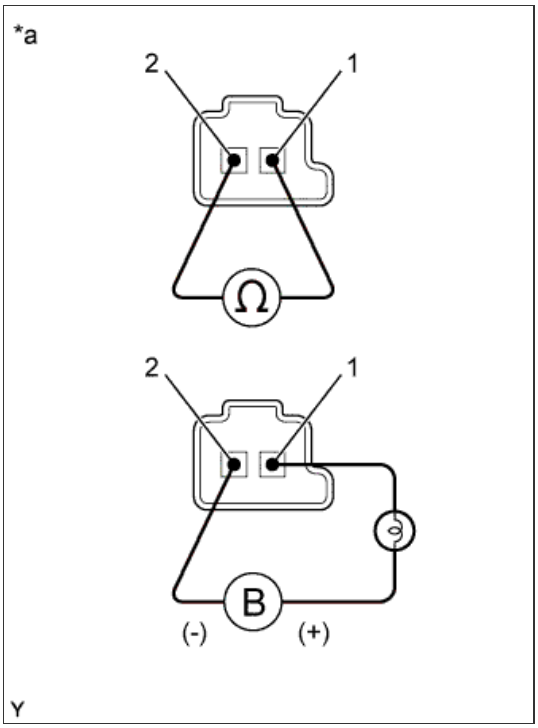
a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.



OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SL2)

NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK

5.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly.

OK:

There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

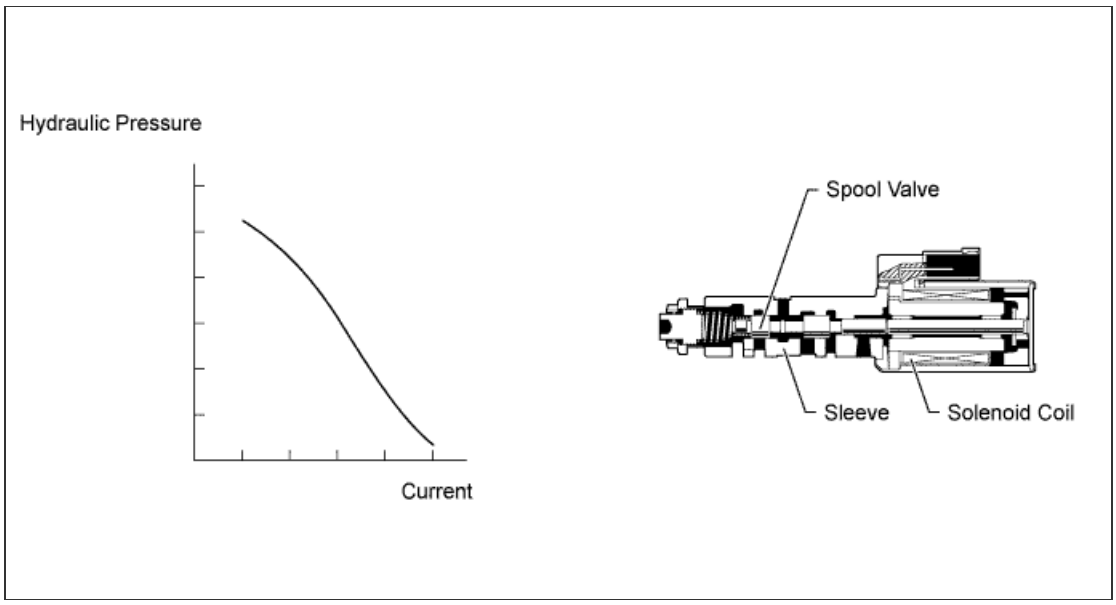
OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P2714 Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)

for Preparation Click here

DESCRIPTION



Shift solenoid valve SLT controls the transmission line pressure for smooth transmission operation based on signals from the throttle position sensor and vehicle speed sensor. The ECM adjusts the current to shift solenoid valve SLT to control the hydraulic line pressure coming from the primary regulator valve. Appropriate line pressure assures smooth shifting with varying engine outputs.

DTC Code	DTC Detection Condition	Trouble Area
P2714	The ECM detects a malfunction in shift solenoid valve SLT (ON side) according to the difference in speed of the turbine and output shaft, and also by the oil pressure (1 trip detection logic).	• Shift solenoid valve SLT remains open or closed • Shift solenoid valve S1, S2, S3, S4 or SL2 remains open or closed • Gear 6 incorrect ratio (sequence valve) or 1-2 shift valve is stuck • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)

MONITOR DESCRIPTION

The ECM calculates the amount of heat absorbed by the friction material based on the difference in speed (clutch slippage) between the turbine and output shaft. The ECM illuminates the MIL and stores this DTC when the amount of heat absorption exceeds the specified value.
There are two reasons that the speed may be different.

- When shift solenoid valve SLT remains ON, oil pressure decreases, which causes the clutch engagement force to decrease.
- When the shift solenoid valve remains ON or OFF, the gear position commanded by the ECM and the actual gear position are not the same.

NOTICE:

If the vehicle continues to be driven under these conditions, the clutch will burn out and the vehicle will no longer be drivable.

INSPECTION PROCEDURE

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P2714)

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the intelligent tester.

Result

Result	Proceed to

Only P2714 is output	A
P2714 and other DTCs are output	B

HINT:

If any other codes besides P2714 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

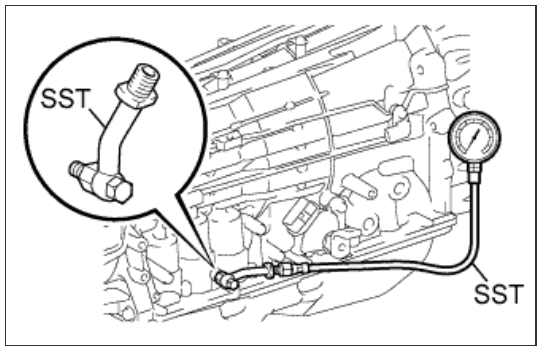
NOTICE:

- **Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).**
- **Be careful to prevent the hose of SST from interfering with the exhaust pipe.**
- **Perform the test with the A/C off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case and connect SST.



SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the intelligent tester, perform the Active Test.

h. Measure the line pressure.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate the shift solenoid SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands SLT solenoid to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • Vehicle stopped • Engine idling

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Please note that the pressure values in the Active Test and Hydraulic Test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → Go to step 7

OK

3.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (RUNNING TEST)

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Connect the intelligent tester to the DLC3.

b. Clear the DTC (Click here).

c. Enter the following menus: Powertrain / Engine and ECT / Active Test.

d. According to the display on the intelligent tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valves and set each shift position by yourself	• Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of the shift solenoid valves. [Vehicle Condition] 50 km/h (30 mph) or less

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (30 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shift must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shift must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the intelligent tester.**

e. Compare the ECM gear shift command and actual gear position.

Result

ECM gear shift command			1st	2nd	3rd	4th	5th	6th	Proceed to
Actual gear position under malfunction	Shift solenoid S1	Stuck ON*1	2nd	2nd	3rd	4th	5th	6th	A
		Stuck OFF	1st	1st	3rd	4th	5th	N*2	
	Shift solenoid S2	Stuck ON	1st	2nd	2nd	4th	6th	6th	B
		Stuck OFF	3rd	3rd	3rd	4th	5th	5th	
	Shift solenoid S3	Stuck ON	1st	2nd	3rd	3rd	N*2	N*2	C
		Stuck OFF	3rd	4th	4th	4th	5th	6th	
	Shift solenoid S4	Stuck ON*3	1st	2nd	3rd	4th	5th	6th	D
		Stuck OFF	1st	2nd	3rd	4th	4th	4th	
Actual gear position when normal			1st	2nd	3rd	4th	5th	6th	E

HINT:

- ***1: When shift solenoid S1 is stuck ON, the vehicle cannot drive in reverse.**
- ***2: Neutral**
- ***3: When shift solenoid S4 is stuck ON, gear shifting is normal.**

B	Go to step 10
C	Go to step 13
D	Go to step 16

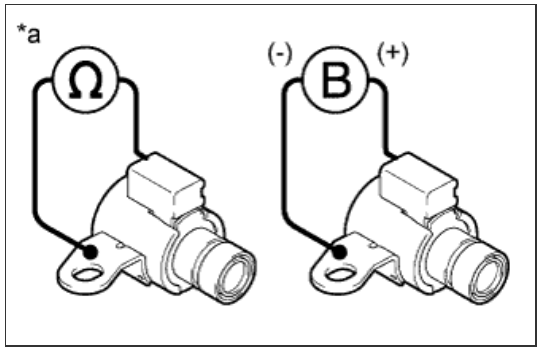
E → Go to step 20

A

4.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S1)

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

5.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly.

OK:
There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

6.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:
The torque converter operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

7.INSPECT SHIFT SOLENOID VALVE SLT

a. Remove shift solenoid valve SLT.

b. Measure the resistance according to the value(s) in the table below.

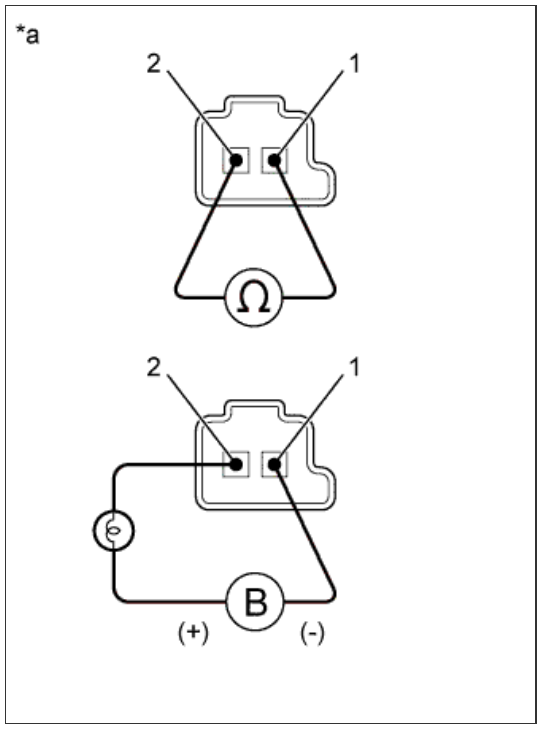
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SLT)

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

8.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly.

OK:

There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

9.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:

The torque converter operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

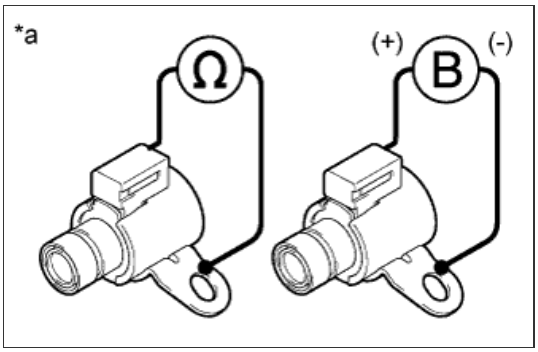
OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

10.INSPECT SHIFT SOLENOID VALVE S2

a. Remove the shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S2)

NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK

11.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly.

OK:
There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

12.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:
The torque converter operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

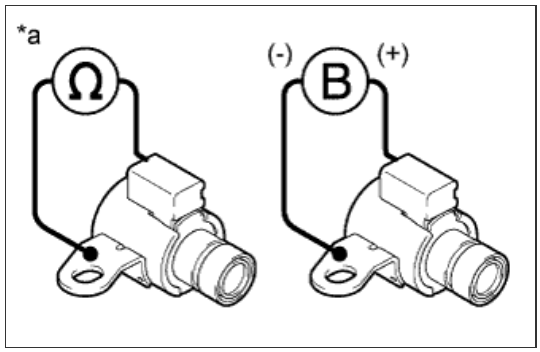
13.INSPECT SHIFT SOLENOID VALVE S3

a. Remove the shift solenoid valve S3.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S3 connector • Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S3)

NG → REPLACE SHIFT SOLENOID VALVE S3 (Click here)

OK ↓

14.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly.

OK:
There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK ↓

15.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:
The torque converter operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

OK ↓

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

16.INSPECT SHIFT SOLENOID VALVE S4

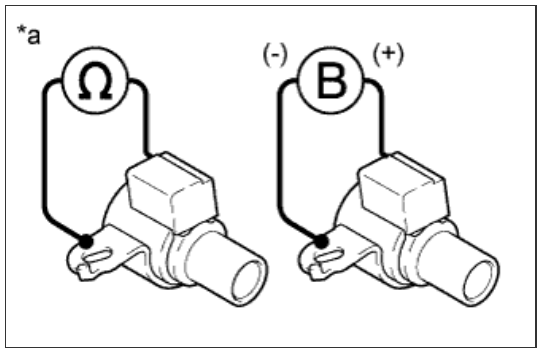
a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

		Specified

Tester Connection	Condition	Condition
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S4)

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK

17.INSPECT SHIFT SOLENOID VALVE SL2

a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

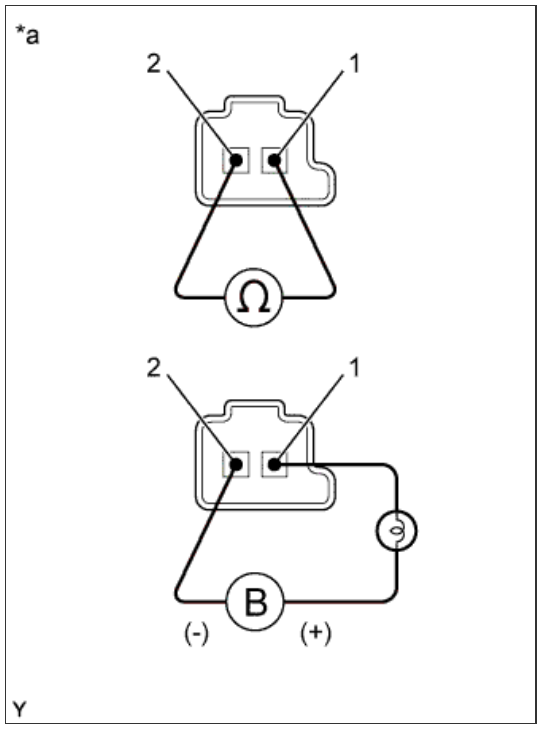
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SL2)

NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK

18.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly.

OK:

There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

19.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:

The torque converter operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

20.INSPECT SHIFT SOLENOID VALVE SLT

a. Remove the shift solenoid valve SLT.

b. Measure the resistance according to the value(s) in the table below.

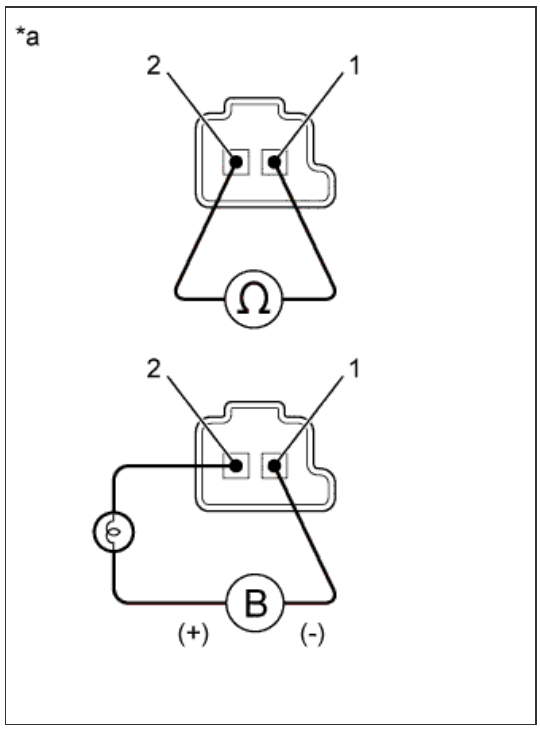
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SLT)

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

21.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly.

OK:

There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

22.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:
The torque converter operates normally.

NG → **REPLACE TORQUE CONVERTER ASSEMBLY (Click here)**

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P0766 Shift Solenoid "D" Performance (Shift Solenoid Valve S4)

DTC P0776 Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake, gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0766	S4 stuck OFF malfunction or brake control valve malfunction*: Shifting to 5th and 6th gears is impossible. The ECM determines there is a malfunction when the following conditions are both met. (1 trip detection logic) (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is shifted to 4th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 4th.	• Shift solenoid valve S4 remains closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked (Brake control valve) • Automatic transmission (clutch, brake, gear, etc.)
P0776	SL2 stuck ON malfunction or brake control valve malfunction*: Shifting to 5th and 6th gears is impossible. The ECM determines there is a malfunction when the following conditions are both met (2-trip detection logic): (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is shifted to 4th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 4th.	• Shift solenoid valve SL2 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked (Brake control valve) • Automatic transmission (clutch, brake, gear, etc.)

HINT:

- **Gear positions in the event of a solenoid valve mechanical problem:**

ECM command gearshift	1st	2nd	3rd	4th	5th	6th
*: Actual gear position under malfunction	1st	2nd	3rd	4th	4th	4th

- **Gear position during fail-safe operation:**
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
*: Actual gear position under fail-safe mode	1st	2nd	3rd	3rd	3rd	3rd

MONITOR DESCRIPTION

This DTC indicates stuck OFF malfunction of shift solenoid valve S4, stuck ON malfunction of shift solenoid valve SL2, or brake control valve malfunction. The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When the gear position commanded by the ECM and the actual gear position are not same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the intelligent tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valves and set each shift position by yourself	• Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of the shift solenoid valves. [Vehicle Condition] 50 km/h (30 mph) or less

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (30 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shift must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shift must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the intelligent tester.**
- **Shift solenoid valve SL2 turns ON/OFF normally when the shift lever is in D.**

ECM command gearshift	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S4	OFF	OFF	OFF	OFF	ON	ON
Shift solenoid valve SL2	ON	ON	ON	ON	OFF	OFF

1.CHECK DTC OUTPUT (IN ADDITION TO DTCS P0766 AND P0776)

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the intelligent tester.

Result

Result	Proceed to
Only P0766 and P0776 are output	A
P0766, P0776 and other DTCs are output	B

HINT:

If any other codes besides P0766 and P0776 are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART (Click here)**

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

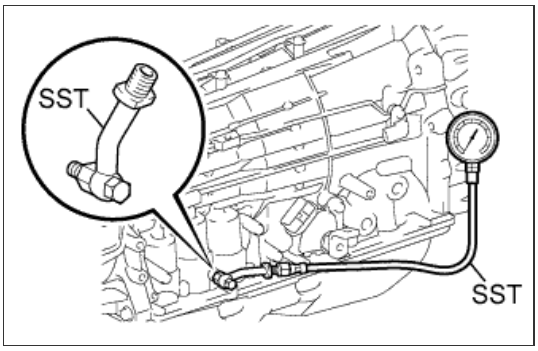
NOTICE:

- **Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).**
- **Be careful to prevent the hose of SST from interfering with the exhaust pipe.**
- **Perform the test with the A/C off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case and connect SST.



SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the intelligent tester, perform the Active Test.

h. Measure the line pressure.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate the shift solenoid SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands SLT solenoid to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • Vehicle stopped • Engine idling

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Please note that the pressure values in the Active Test and Hydraulic Test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

3.INSPECT SHIFT SOLENOID VALVE S4

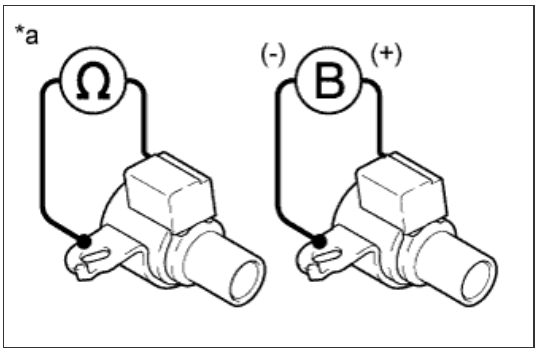
a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.



OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S4)

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK

4.INSPECT SHIFT SOLENOID VALVE SL2

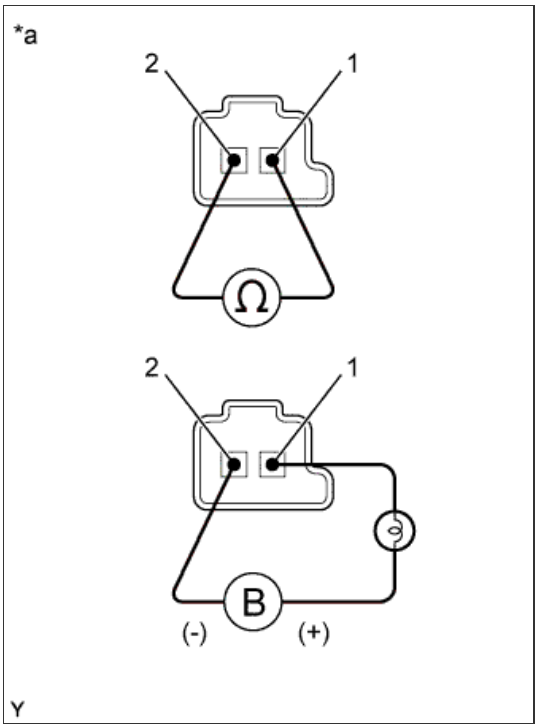
a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.



OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SL2)

NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK

5.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly.

OK:

There are no foreign objects on each valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P2716 Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)

for Preparation Click here

DESCRIPTION

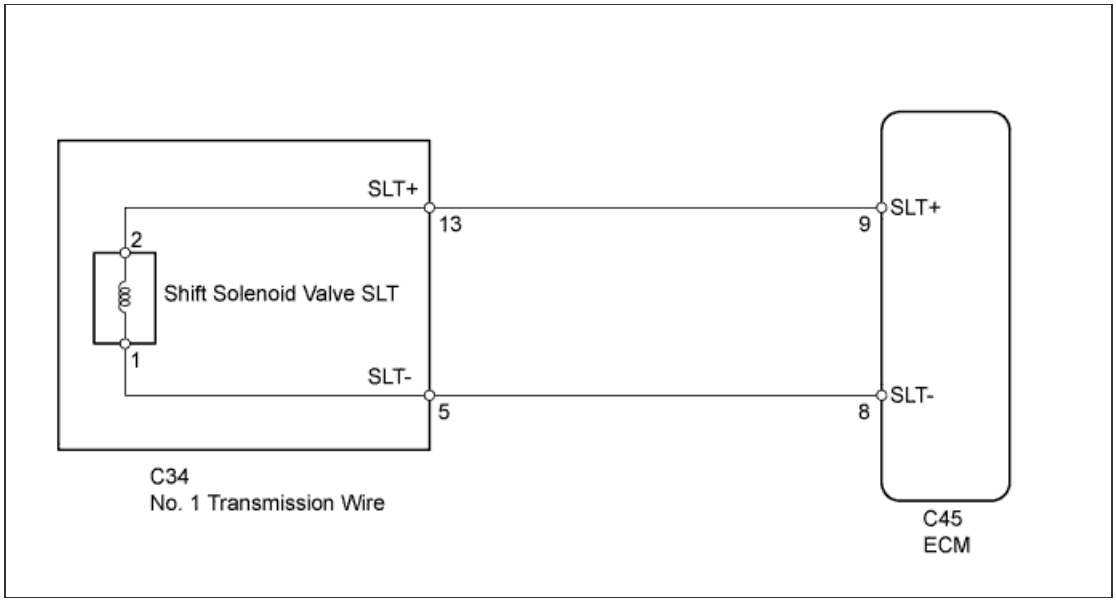
Refer to DTC P2714 (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P2716	Open or short is detected in the shift solenoid valve SLT circuit for 1 second or more while driving (1 trip detection logic).	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM

MONITOR DESCRIPTION

When an open or short in the shift solenoid valve SLT circuit is detected, the ECM interprets this as a fault. The ECM will turn on the MIL and store the DTC.

WIRING DIAGRAM

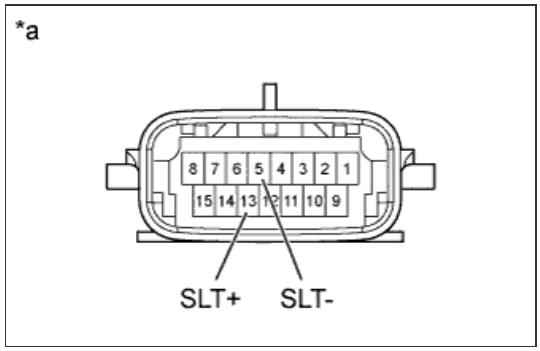


INSPECTION PROCEDURE

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SLT)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
13 (SLT+) - 5 (SLT-)	20°C (68°F)	5.0 to 5.6 Ω
13 (SLT+) - Body ground	Always	10 kΩ or higher
5 (SLT-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

NG → Go to step 3

OK

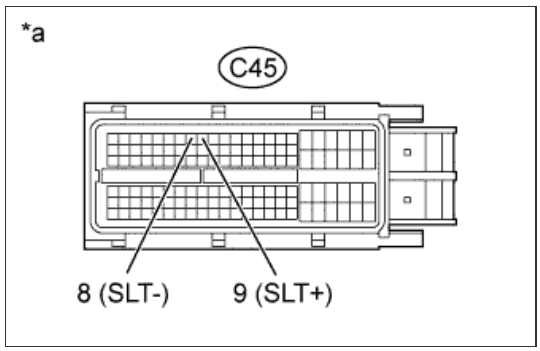
2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-9 (SLT+) - C45-8 (SLT-)	20°C (68°F)	5.0 to 5.6 Ω
C45-9 (SLT+) - Body ground	Always	10 kΩ or higher
C45-8 (SLT-) - Body ground	Always	10 kΩ or higher



Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SLT

a. Remove shift solenoid valve SLT.

b. Measure the resistance according to the value(s) in the table below.

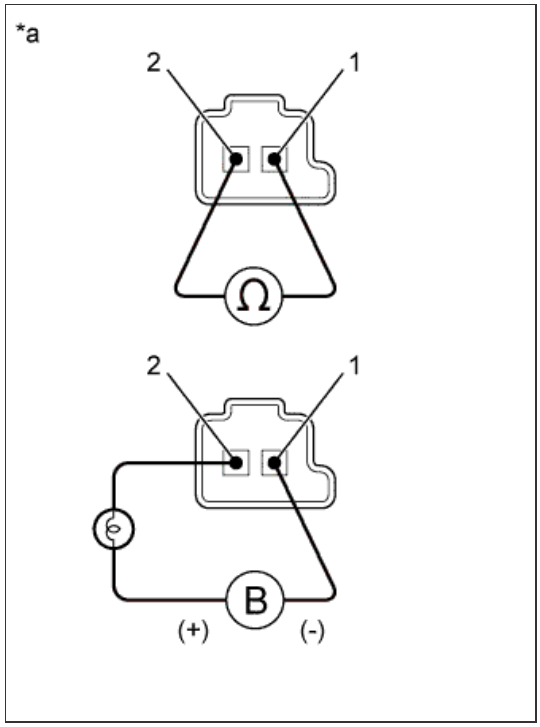
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SLT)

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0778 Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)

for Preparation Click here

DESCRIPTION

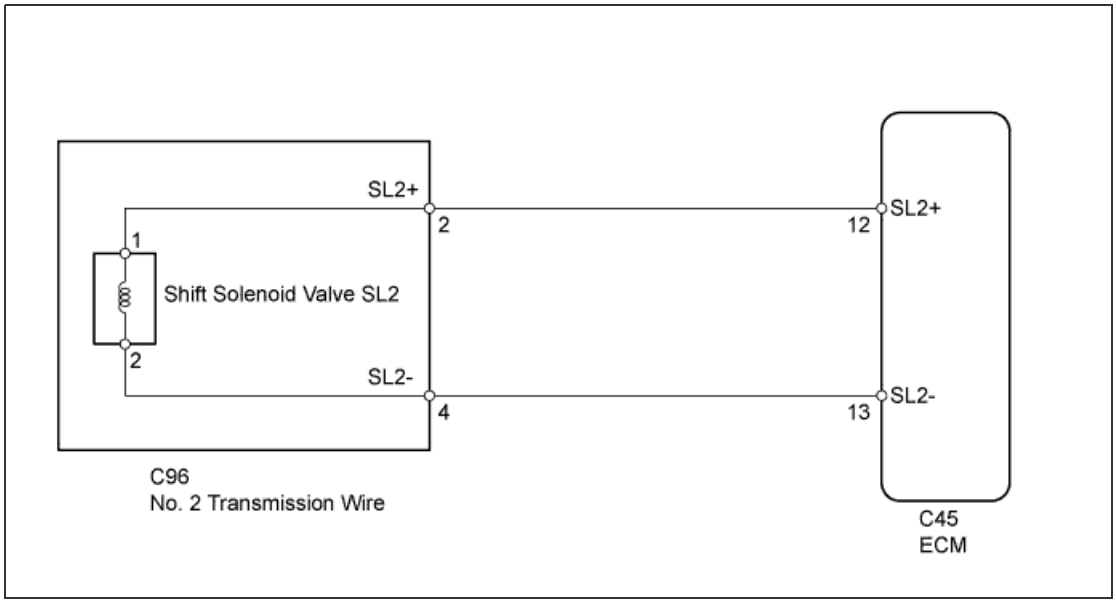
Shifting from 1st to 5th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0778	The ECM checks for an open or short in the shift solenoid valve SL2 circuit while driving and shifting gears (1 trip detection logic). Output signal duty ratio equals to 100%. **HINT:** SL2 output signal duty ratio is less than 100% under normal condition.	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL2 circuit. The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. Also, the ECM performs the fail-safe function and turns the other shift solenoid valves that are in good condition ON/OFF. In the case of an open or short circuit, the ECM stops sending the current to the open or short circuited solenoid.
While driving and shifting gears, if the ECM detects an open or short in the shift solenoid valve SL2 circuit, the ECM determines there is a malfunction (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

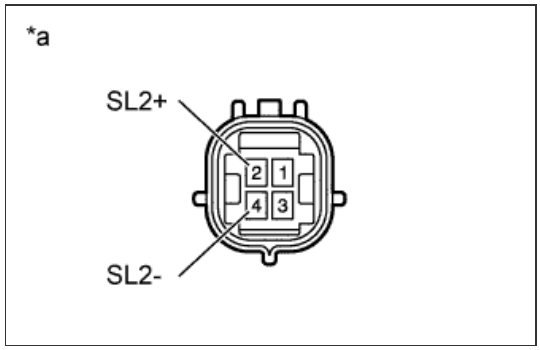
Shift solenoid valve SL2 is turned ON/OFF normally when the shift lever is in D.

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve SL2	ON	ON	ON	ON	OFF	OFF

1.INSPECT NO. 2 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SL2)

a. Disconnect the No. 2 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
2 (SL2+) - 4 (SL2-)	20°C (68°F)	5.0 to 5.6 Ω
2 (SL2+) - Body ground	Always	10 kΩ or higher
4 (SL2-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Component without harness connected (No. 2 Transmission Wire)

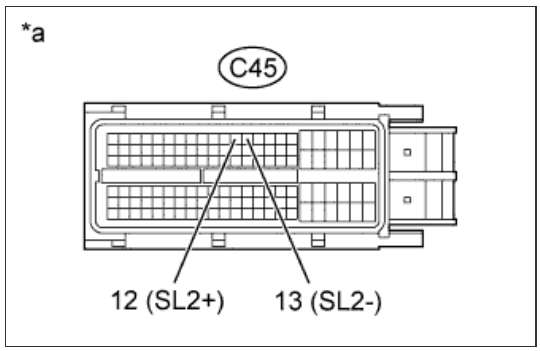
NG → Go to step 3

OK ↓

2.CHECK HARNESS AND CONNECTOR (NO. 2 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-12 (SL2+) - C45-13 (SL2-)	20°C (68°F)	5.0 to 5.6 Ω
C45-12 (SL2+) - Body ground	Always	10 kΩ or higher
C45-13 (SL2-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ↓

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SL2

a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

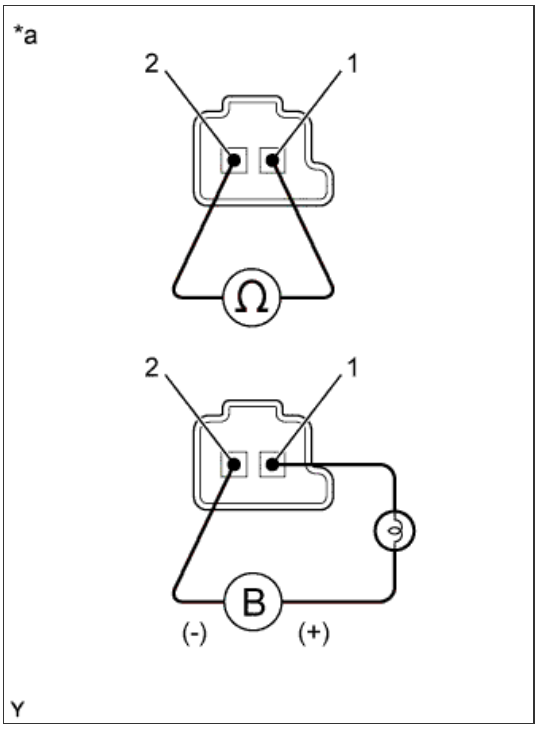
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SL2)

NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK → REPAIR OR REPLACE NO. 2 TRANSMISSION WIRE (Click here)

DTC P2742 Transmission Fluid Temperature Sensor "B" Circuit Low Input

DTC P2743 Transmission Fluid Temperature Sensor "B" Circuit High Input

for Preparation Click here

DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor is on the transmission, just in front of the oil cooler inlet pipeline.
If the ECM detects an abnormally high ATF temperature near this sensor, it illuminates the warning light.

HINT:

- **The temperature of ATF easily rises when towing, climbing hills, in traffic, etc.**
- **If the ATF temperature sensor becomes short-circuited, the signal that indicates that the ATF temperature is 150°C (302°F) or higher is input into the ECM.**

Vehicle conditions when the sensor is normal and when the sensor is short-circuited are indicated in the table below.

No. 2 ATF Temperature Sensor State	Detection Condition	Symptom	Recovery Condition
Sensor is normal	ATF temperature more than 150°C (302°F)	ATF temperature warning light remains on	ATF temperature less than 135°C (275°F)*1
	ATF temperature more than 130°C (266°F)	Shift point too high	ATF temperature less than 110°C (230°F)
	When the conditions (a) and (b) are satisfied. (a) ATF temperature more than 130°C (266°F) (b) Engine coolant temperature more than 95°C (203°F)	Lock-up at 3rd gear*2	ATF temperature less than 110°C (230°F)*1 and engine coolant temperature more than 95°C (203°F)
Sensor is short-circuited	Any conditions	• ATF temperature warning light blinks or message is displayed in combination meter • Shift point too high	Symptoms still occur
	Engine coolant temperature more than 95°C (203°F)	Lock-up at 3rd gear*2	Symptoms still occur

HINT:

*1: When ATF temperature is in the normal range, it decreases to less than 135°C (275°F) within 5 minutes with the shift lever in P or N in an idling state.

*2: When ATF temperature is normal, transmission lock-up occurs in 5th or 6th gear with the shift lever in D or S with the S6 range selected, in 5th gear with the shift lever in S with the S5 range selected, and 4th gear with the shift lever in S with the S4 range selected.

DTC Code	DTC Detection Condition	Trouble Area
P2742	No. 2 ATF temperature sensor resistance is less than 25 Ω (0.046 V) for 0.5 seconds or more (1 trip detection logic).	• Short in No. 2 ATF temperature sensor circuit • No. 2 ATF temperature sensor (No. 1 transmission wire) • ECM
P2743	When 15 minutes or more have elapsed after engine is started, No. 2 ATF temperature sensor resistance is more than 156 kΩ (4.915 V) for 0.5 seconds or more (1 trip detection logic).	• Open in No. 2 ATF temperature sensor circuit • No. 2 ATF temperature sensor (No. 1 transmission wire) • ECM

MONITOR DESCRIPTION

The ATF temperature sensor converts the ATF temperature into an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is less than 25 Ω*1 or more than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM stores a DTC, and the ATF temperature warning light blinks or a message is displayed in the combination meter.

HINT:

- ***1: 150°C (302°F) or more is indicated regardless of the actual ATF temperature.**
- ***2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.**
- **The ATF temperature can be checked on the intelligent tester display.**

WIRING DIAGRAM

Refer to DTC P0712 (Click here).

INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the intelligent tester, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 2	No. 2 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • Equal to ambient temperature while engine is cold	If the value is -40°C (-40°F) or 150°C (302°F), the No. 2 ATF temperature sensor circuit is open or shorted.

HINT:

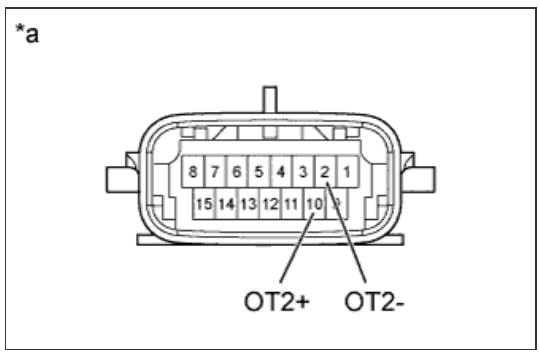
- **When DTC P2742 is output and the intelligent tester output is 150°C (302°F) or more, there is a short circuit.**
- **When DTC P2743 is output and the intelligent tester output is -40°C (-40°F), there is an open circuit. Measure the resistance between terminal THO2 and the body ground.**

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or more	Short circuit

1.INSPECT NO. 1 TRANSMISSION WIRE (NO. 2 ATF TEMPERATURE SENSOR)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
2 (OT2-) - 10 (OT2+)	Always	25 Ω to 156 kΩ
2 (OT2-) - Body ground	Always	10 kΩ or higher
10 (OT2+) - Body ground	Always	10 kΩ or higher

HINT:

If the resistance is out of the specified range at any of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Standard Resistance:

ATF temperature	Specified Condition
10°C (50°F)	5 to 8 kΩ
25°C (77°F)	2.5 to 4.5 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

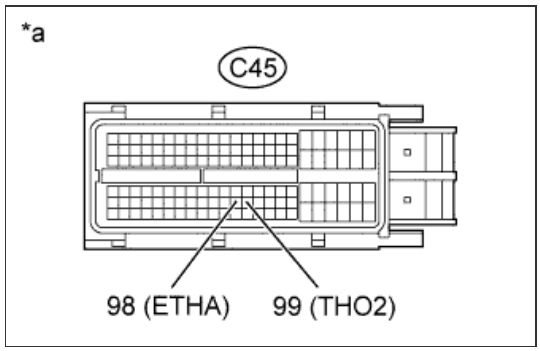
NG → REPAIR OR REPLACE NO. 2 ATF TEMPERATURE SENSOR (NO. 1 TRANSMISSION WIRE) (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-99 (THO2) - C45-98 (ETHA)	Always	25 Ω to 156 kΩ
C45-99 (THO2) - Body ground	Always	10 kΩ or higher
C45-98 (ETHA) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0781 1-2 Shift (1-2 Shift Valve)

for Preparation Click here

DESCRIPTION

The 1-2 shift valve performs shifting to 1st gear and other gears. When shifting to 2nd and 4th gears is impossible, or when the ECM directs the gearshift to switch to 5th and 6th gear and the engine overruns (clutch slips), this DTC is output.

DTC Code	DTC Detection Condition	Trouble Area
P0781	When conditions (a) and (b), or (a) and (c) are met. (1 trip detection logic) (a) When the ECM directs the transmission to switch to 2nd gear, the actual gear is shifted to 1st. (b) When the ECM directs the transmission to switch to 4th gear, the actual gear is shifted to 3rd. (c) When the ECM directs the transmission to switch to 5th gear, the engine overruns (clutch slips).	• Valve body is blocked up or stuck (1-2 shift valve) • Shift solenoid valve SLT remains open or closed • Automatic transmission (clutch, brake, gear, etc.)

HINT:

- Gear positions in the event of a solenoid valve mechanical problem:

ECM command gearshift	1st	2nd	3rd	4th	5th	6th
Actual gear position under malfunction	1st	1st	3rd	3rd	N*	N*

N*: Neutral

- Gear position during fail-safe operation:
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
Actual gear position under fail-safe mode	1st*	1st*	3rd	3rd	3rd	3rd

1st*: Under engine braking, downshifting to 1st or 2nd gear is prohibited.

MONITOR DESCRIPTION

This DTC indicates that the 1-2 shift valve in the valve body is locked in the position in which the spring is compressed.
The ECM commands gear shifts by turning the shift solenoid valves ON/OFF and switching oil pressure to the valves in the valve body.
The ECM calculates the actual transmission gear by comparing the signals from the input speed sensor (NT) and the output speed sensor (SP2). The ECM can detect many mechanical problems in the shift solenoids, valve body, transmission clutches, brakes, and gears. If the ECM detects that the actual gear position and commanded gear position are different, it will illuminate the MIL and store the DTC.

INSPECTION PROCEDURE

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0781)

a. Connect the intelligent tester to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the intelligent tester.

Result

Result	Proceed to
Only P0781 is output	A
P0781 and other DTCs are output	B

HINT:

If any other codes besides P0781 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (RUNNING TEST)

CAUTION:

This test should always be performed with at least 2 people.

NOTICE:

- **Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).**
- **Perform the test with the A/C turned off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Test early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Test.

a. Connect the intelligent tester to the DLC3.

b. Clear the DTC (Click here).

c. Warm up the engine.

d. Enter the following menus: Powertrain / Engine and ECT / Active Test.

e. According to the display on the intelligent tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valves and set each shift position by yourself	• Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of the shift solenoid valves. [Vehicle Condition] 50 km/h (30 mph) or less

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (30 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shift must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shift must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the intelligent tester.**
- **Gear positions in the event of a solenoid valve mechanical problem:**

Tester command gearshift	1st	2nd	3rd	4th	5th	6th
Actual gear position under malfunction	1st	1st	3rd	3rd	N*	N*

N*: Neutral

OK:

Gear position changes in accordance with the intelligent tester command.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

3.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

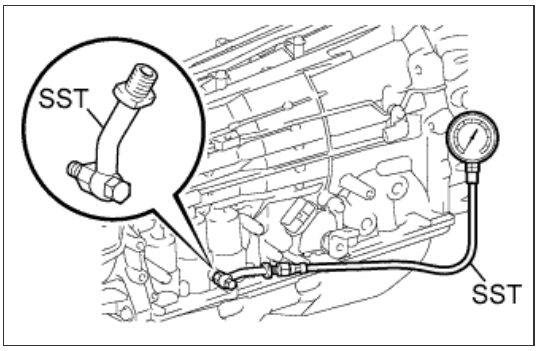
NOTICE:

- **Perform the test while the ATF temperature is between 50 and 80°C (122 and 176°F).**
- **Be careful to prevent the hose of SST from interfering with the exhaust pipe.**
- **Perform the test with the A/C off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case and connect SST.



SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the intelligent tester, perform the Active Test.

h. Measure the line pressure.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate the shift solenoid SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands SLT solenoid to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • Vehicle stopped • Engine idling

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Please note that the pressure values in the Active Test and Hydraulic Test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (**Click here**)

OK

4.CLEAR DTC AND PERFORM RUNNING TEST

a. Clear the DTC (Click here).

b. Check the DTC again after conducting the Monitor Drive Pattern (Click here).

OK:

No DTC code output.

NG → REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (**Click here**)


OK
END

DTC P2742 Transmission Fluid Temperature Sensor "B" Circuit Low Input

DTC P2743 Transmission Fluid Temperature Sensor "B" Circuit High Input

for Preparation Click here

DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor is on the transmission, just in front of the oil cooler inlet pipeline.
If the ECM detects an abnormally high ATF temperature near this sensor, it illuminates the warning light.

HINT:

- **The temperature of ATF easily rises when towing, climbing hills, in traffic, etc.**
- **If the ATF temperature sensor becomes short-circuited, the signal that indicates that the ATF temperature is 150°C (302°F) or higher is input into the ECM.**

Vehicle conditions when the sensor is normal and when the sensor is short-circuited are indicated in the table below.

No. 2 ATF Temperature Sensor State	Detection Condition	Symptom	Recovery Condition
Sensor is normal	ATF temperature more than 150°C (302°F)	ATF temperature warning light remains on	ATF temperature less than 135°C (275°F)*1
	ATF temperature more than 130°C (266°F)	Shift point too high	ATF temperature less than 110°C (230°F)
	When the conditions (a) and (b) are satisfied. (a) ATF temperature more than 130°C (266°F) (b) Engine coolant temperature more than 95°C (203°F)	Lock-up at 3rd gear*2	ATF temperature less than 110°C (230°F)*1 and engine coolant temperature more than 95°C (203°F)
Sensor is short-circuited	Any conditions	• ATF temperature warning light blinks or message is displayed in combination meter • Shift point too high	Symptoms still occur
	Engine coolant temperature more than 95°C (203°F)	Lock-up at 3rd gear*2	Symptoms still occur

HINT:

*1: When ATF temperature is in the normal range, it decreases to less than 135°C (275°F) within 5 minutes with the shift lever in P or N in an idling state.

*2: When ATF temperature is normal, transmission lock-up occurs in 5th or 6th gear with the shift lever in D or S with the S6 range selected, in 5th gear with the shift lever in S with the S5 range selected, and 4th gear with the shift lever in S with the S4 range selected.

DTC Code	DTC Detection Condition	Trouble Area
P2742	No. 2 ATF temperature sensor resistance is less than 25 Ω (0.046 V) for 0.5 seconds or more (1 trip detection logic).	• Short in No. 2 ATF temperature sensor circuit • No. 2 ATF temperature sensor (No. 1 transmission wire) • ECM
P2743	When 15 minutes or more have elapsed after engine is started, No. 2 ATF temperature sensor resistance is more than 156 kΩ (4.915 V) for 0.5 seconds or more (1 trip detection logic).	• Open in No. 2 ATF temperature sensor circuit • No. 2 ATF temperature sensor (No. 1 transmission wire) • ECM

MONITOR DESCRIPTION

The ATF temperature sensor converts the ATF temperature into an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is less than 25 Ω*1 or more than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM stores a DTC, and the ATF temperature warning light blinks or a message is displayed in the combination meter.

HINT:

- ***1: 150°C (302°F) or more is indicated regardless of the actual ATF temperature.**
- ***2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.**
- **The ATF temperature can be checked on the intelligent tester display.**

WIRING DIAGRAM

Refer to DTC P0712 (Click here).

INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the intelligent tester, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 2	No. 2 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • Equal to ambient temperature while engine is cold	If the value is -40°C (-40°F) or 150°C (302°F), the No. 2 ATF temperature sensor circuit is open or shorted.

HINT:

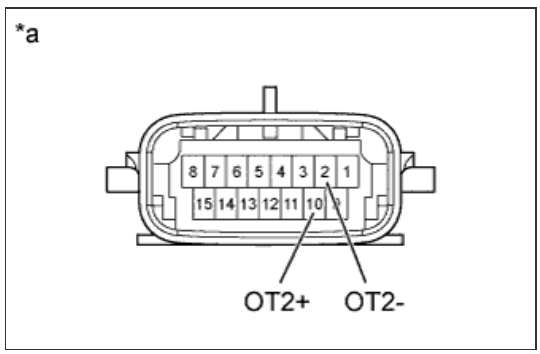
- **When DTC P2742 is output and the intelligent tester output is 150°C (302°F) or more, there is a short circuit.**
- **When DTC P2743 is output and the intelligent tester output is -40°C (-40°F), there is an open circuit. Measure the resistance between terminal THO2 and the body ground.**

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or more	Short circuit

1.INSPECT NO. 1 TRANSMISSION WIRE (NO. 2 ATF TEMPERATURE SENSOR)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
2 (OT2-) - 10 (OT2+)	Always	25 Ω to 156 kΩ
2 (OT2-) - Body ground	Always	10 kΩ or higher
10 (OT2+) - Body ground	Always	10 kΩ or higher

HINT:

If the resistance is out of the specified range at any of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Standard Resistance:

ATF temperature	Specified Condition
10°C (50°F)	5 to 8 kΩ
25°C (77°F)	2.5 to 4.5 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

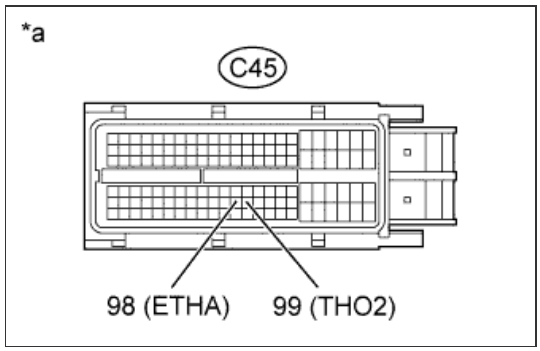
NG → REPAIR OR REPLACE NO. 2 ATF TEMPERATURE SENSOR (NO. 1 TRANSMISSION WIRE) (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-99 (THO2) - C45-98 (ETHA)	Always	25 Ω to 156 kΩ
C45-99 (THO2) - Body ground	Always	10 kΩ or higher
C45-98 (ETHA) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0973 Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)

DTC P0974 Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)

for Preparation Click here

DESCRIPTION

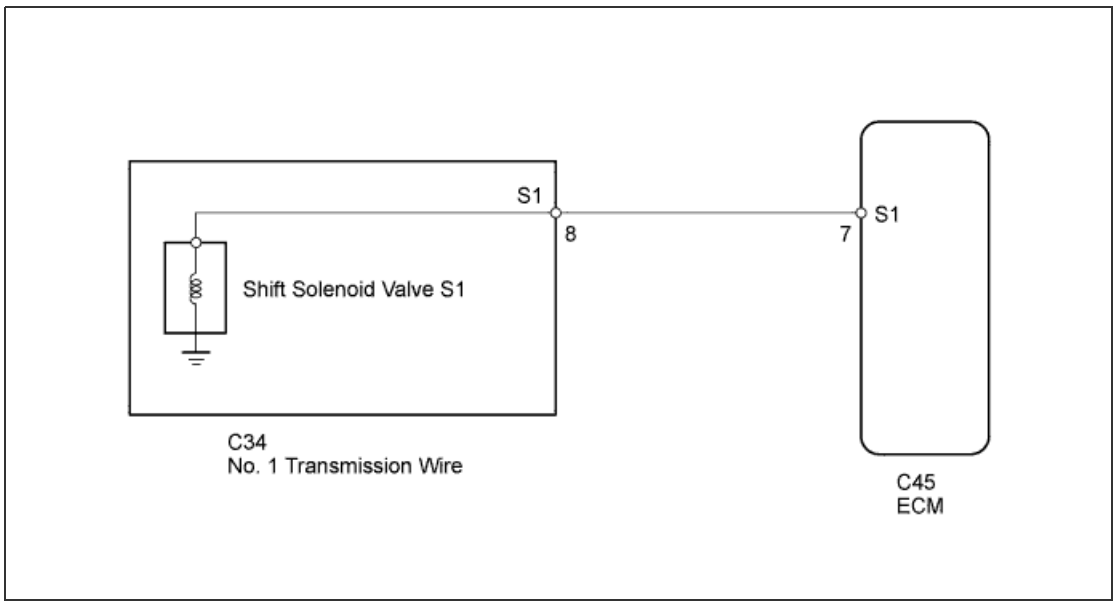
Shifting from 1st to 6th is performed in combination with ON and OFF operation of shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending the current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0973	ECM detects a short in the solenoid valve S1 circuit 2 times when solenoid valve S1 is operated (1 trip detection logic).	• Short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM
P0974	ECM detects an open in the solenoid valve S1 circuit 2 times when solenoid valve S1 is not operated (1 trip detection logic).	• Open in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S1 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When shift solenoid valve S1 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S1 circuit.
When shift solenoid valve S1 is OFF, if its resistance is 100 kΩ or more, the ECM determines there is an open in the shift solenoid valve S1 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Shift solenoid valve S1 is turned ON/OFF normally when the shift lever is in D.

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S1	OFF	ON	ON	ON	ON	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S1)

a. Disconnect the No. 1 transmission wire connector.

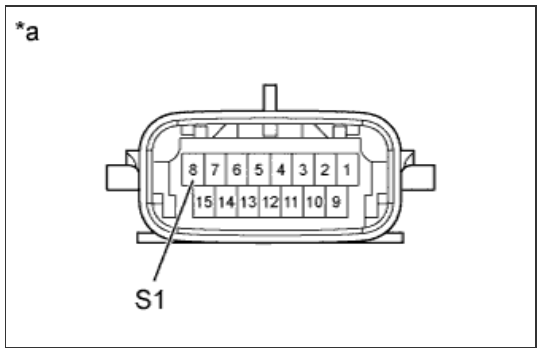
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
8 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)



NG → Go to step 3

OK ↓

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

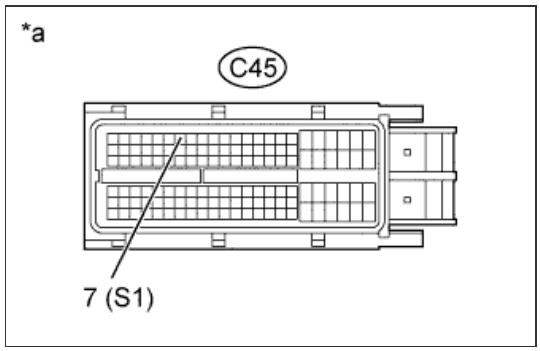
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-7 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ↓

REPLACE ECM (Click here)

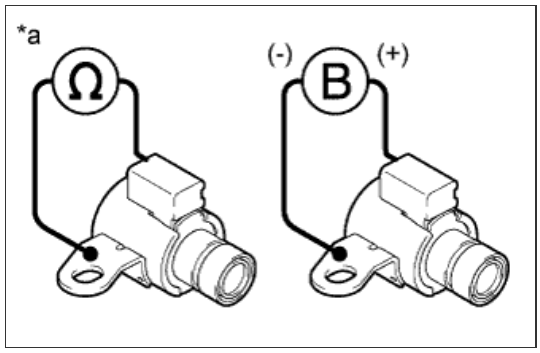
3.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve	

	S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S1)

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

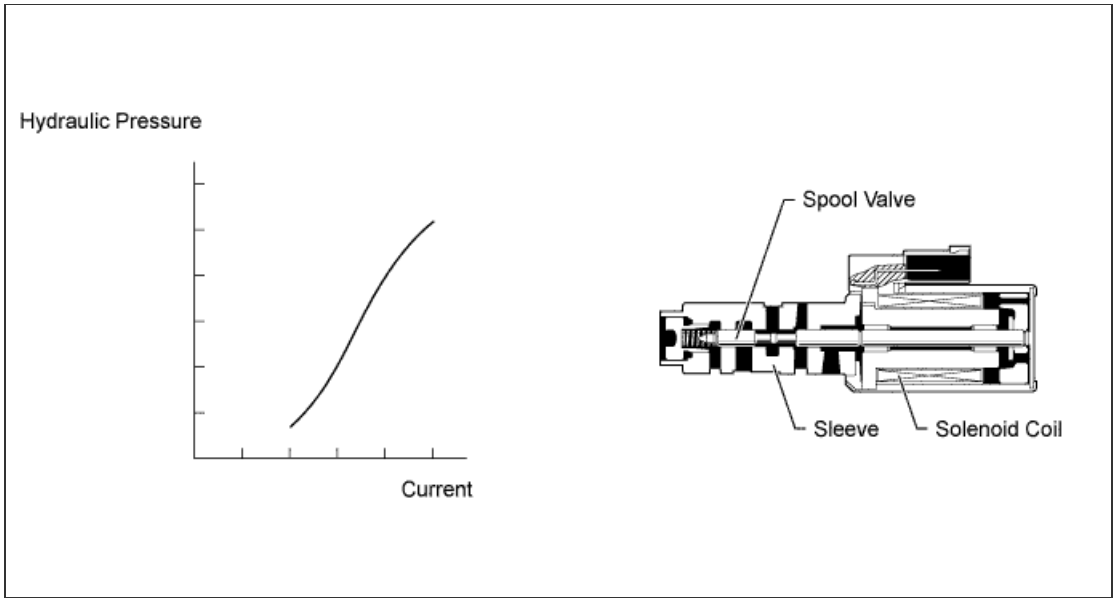
OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P2759 Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)

for Preparation Click here

DESCRIPTION

The amount of current flow to the solenoid is controlled by the ECM. During the lock-up operation, if the current increases, the lock-up hydraulic pressure increases.

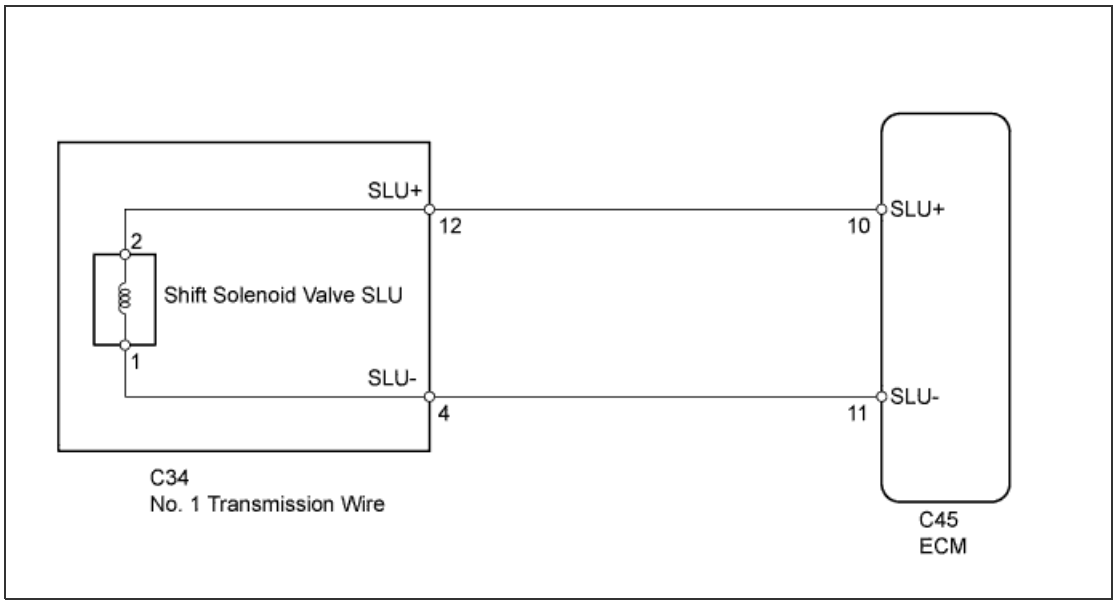


DTC Code	DTC Detection Condition	Trouble Area
P2759	Open or short is detected in the shift solenoid valve SLU circuit for 1 second or more while driving (1 trip detection logic).	• Open or short in shift solenoid valve SLU circuit • Shift solenoid valve SLU • ECM

MONITOR DESCRIPTION

When an open or short in a shift solenoid valve SLU circuit is detected, the ECM determines that there is a malfunction. The ECM will illuminate the MIL and store the DTC.

WIRING DIAGRAM

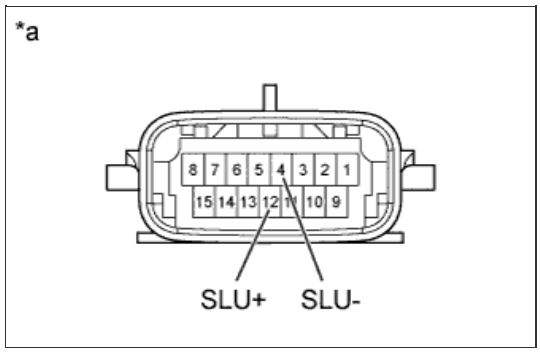


INSPECTION PROCEDURE

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SLU)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
12 (SLU+) - 4 (SLU-)	20°C (68°F)	5.0 to 5.6 Ω
12 (SLU+) - Body ground	Always	10 kΩ or higher
4 (SLU-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

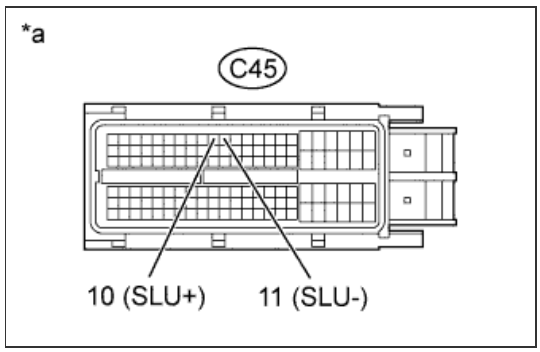
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
C45-10 (SLU+) - C45-11 (SLU-)	20°C (68°F)	5.0 to 5.6 Ω
C45-10 (SLU+) - Body ground	Always	10 kΩ or higher
C45-11 (SLU-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SLU

a. Remove the shift solenoid valve SLU.

b. Measure the resistance according to the value(s) in the table below.

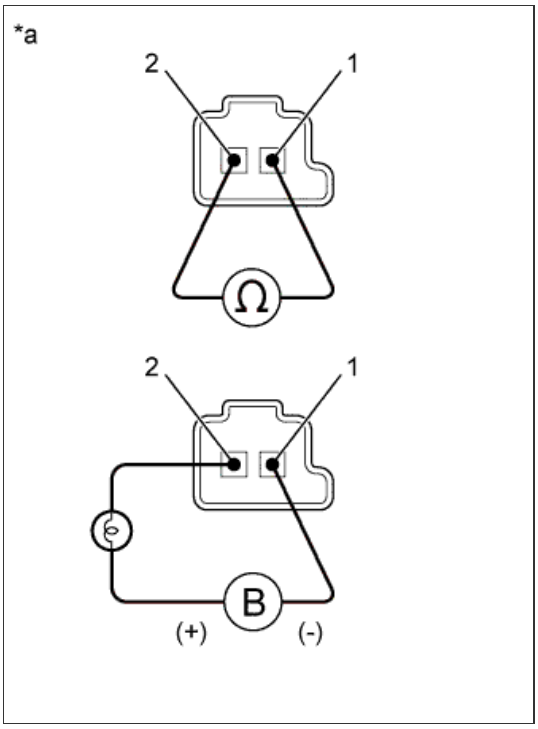
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SLU)

NG → REPLACE SHIFT SOLENOID VALVE SLU (Click here)

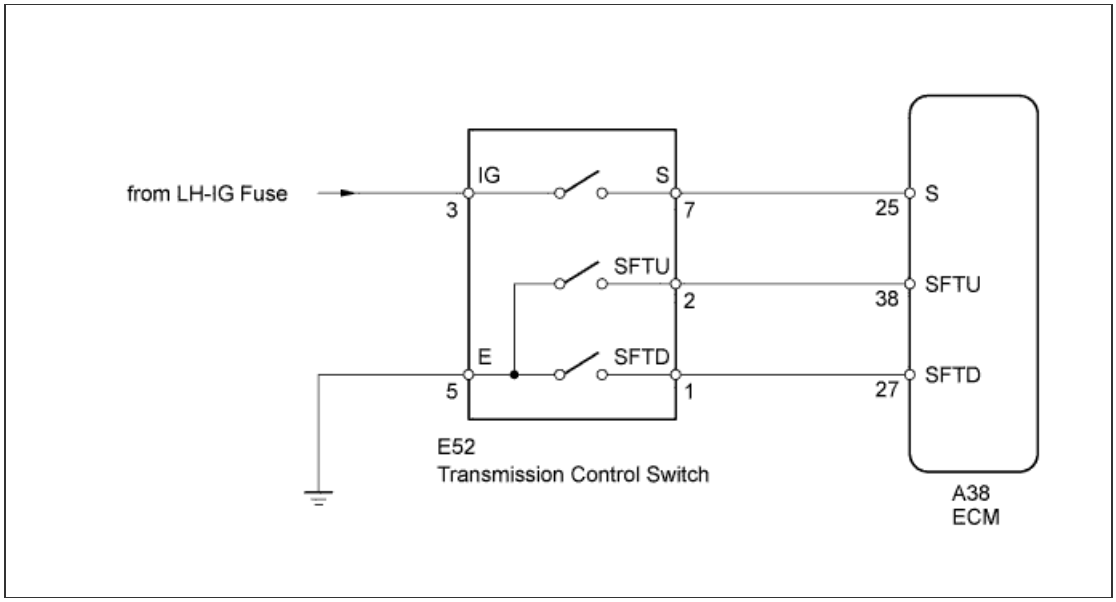
OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

for Preparation Click here

DESCRIPTION

When moving the shift lever to S using the transmission control switch, it is possible to switch the shift range among "1" (1st range) and "6" (6th range). Shifting to "+" once raises the shift range by one, and shifting to "-" lowers the shift range by one.

WIRING DIAGRAM

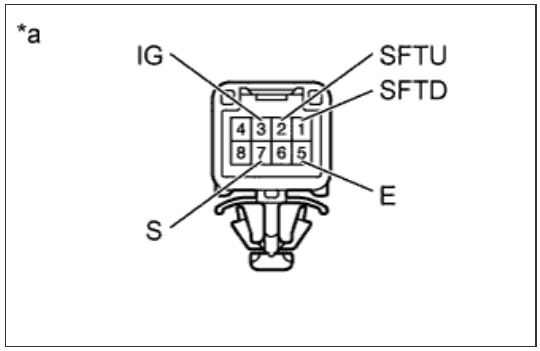


INSPECTION PROCEDURE

1.INSPECT TRANSMISSION CONTROL SWITCH

a. Disconnect the transmission control switch connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
3 (IG) - 7 (S)	Shift lever in S, "+" and "-"	Below 1 Ω
2 (SFTU) - 5 (E)	Shift lever continuously in "+" (Up-shift)	Below 1 Ω
1 (SFTD) - 5 (E)	Shift lever continuously in "-" (Down-shift)	Below 1 Ω
3 (IG) - 7 (S)	Shift lever not in S, "+" and "-"	10 kΩ or higher
2 (SFTU) - 5 (E)	Shift lever in S	10 kΩ or higher
1 (SFTD) - 5 (E)	Shift lever in S	10 kΩ or higher

Text in Illustration

*a	Component without harness connected (Transmission Control Switch)

NG → REPLACE TRANSMISSION CONTROL SWITCH (LOWER SHIFT LEVER ASSEMBLY) (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL SWITCH - BATTERY, BODY GROUND)

a. Disconnect the transmission control switch connector.

b. Measure the voltage according to the value(s) in the table below.

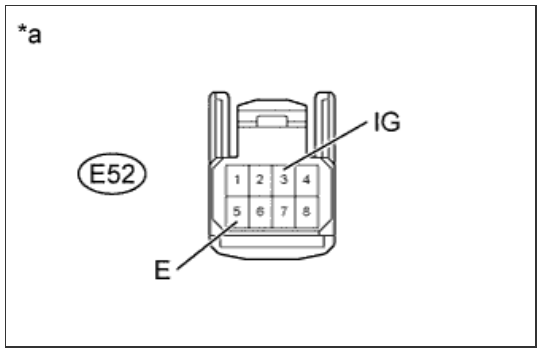
Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
E52-3 (IG) - Body ground	Engine switch on (IG)	11 to 14 V
E52-3 (IG) - Body ground	Engine switch off	Below 1 V

c. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
E52-5 (E) - Body ground	Always	Below 1 Ω



Text in Illustration

*a	Front view of wire harness connector (to Transmission Control Switch)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3.CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL SWITCH - ECM)

a. Disconnect the ECM connector.

b. Measure the voltage according to the value(s) in the table below.

Standard Voltage:

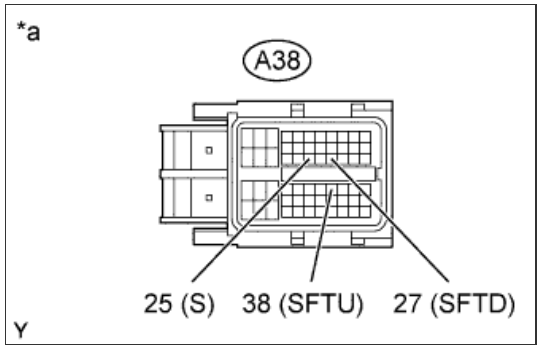
Tester Connection	Condition	Specified Condition
A38-25 (S) - Body ground	• Engine switch on (IG) • Shift lever in S, "+" and "-"	11 to 14 V
A38-25 (S) - Body ground	• Engine switch on (IG) • Shift lever not in S, "+" and "-"	Below 1 V

c. Turn the engine switch off.

d. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition



A38-38 (SFTU) - Body ground	Shift lever continuously in "+" (Up-shift)	Below 1 Ω
A38-27 (SFTD) - Body ground	Shift lever continuously in "-" (Down-shift)	Below 1 Ω
A38-38 (SFTU) - Body ground	Shift lever in S	10 kΩ or higher
A38-27 (SFTD) - Body ground	Shift lever in S	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

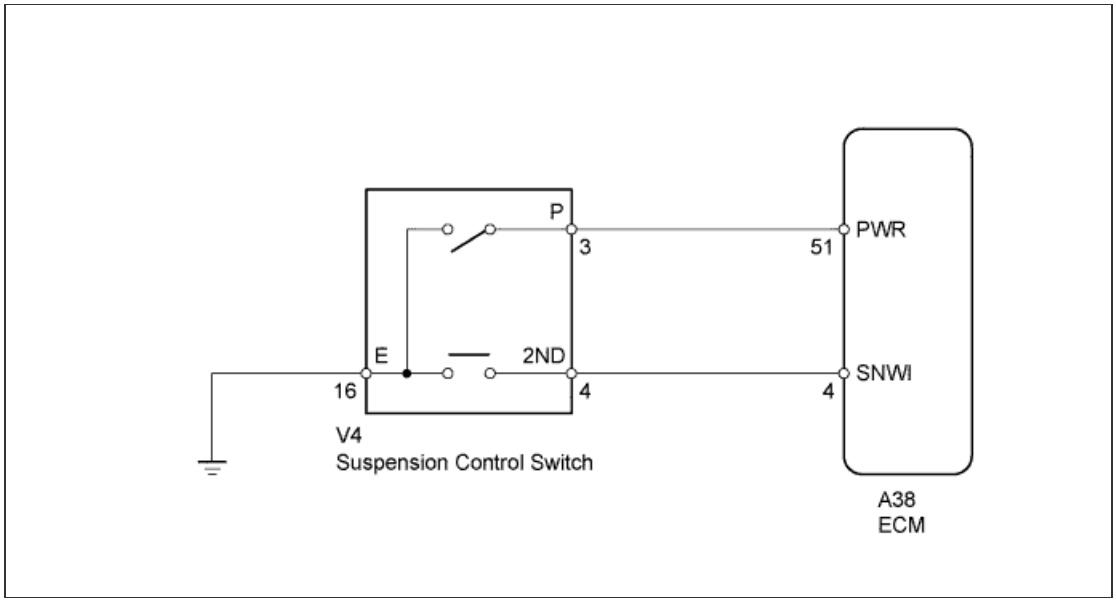
PROCEED TO NEXT SUSPECTED AREA SHOWN IN PROBLEM SYMPTOMS TABLE (Click here)

for Preparation Click here

DESCRIPTION

The ECM memory contains the programs for the normal and power shift patterns and lock-up pattern.
By following the programs corresponding to the signals from the pattern select switch, the park/neutral position switch and other various sensors, the ECM switches the shift solenoid valves on and off, and controls the transmission gear change and the lock-up clutch operation.

WIRING DIAGRAM



INSPECTION PROCEDURE

When the pattern select (PWR) switch is pushed, switch contact is made and power mode is selected. To cancel power mode, push the pattern select (2nd) switch once again.

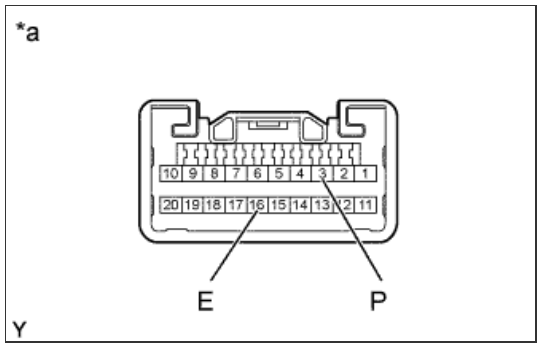
1.INSPECT PATTERN SELECT (PWR) SWITCH

a. Remove the suspension control switch (Click here).

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
3 (P) - 16 (E)	Pattern select (PWR) switch on	Below 1 Ω
3 (P) - 16 (E)	Pattern select (PWR) switch off	10 kΩ or higher



Text in Illustration

*a	Component without harness connected (Suspension Control Switch)

NG → REPLACE PATTERN SELECT (PWR) SWITCH (SUSPENSION CONTROL SWITCH) (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (PATTERN SELECT (PWR) SWITCH - BODY GROUND)

a. Disconnect the suspension control switch connector.

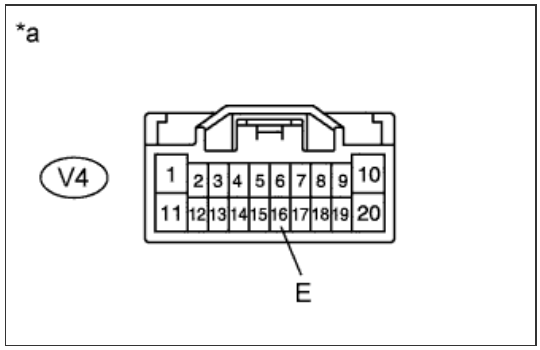
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
V4-16 (E) - Body ground	Always	Below 1 Ω

Text in Illustration

*a	Front view of wire harness connector (to Suspension Control Switch)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3.CHECK HARNESS AND CONNECTOR (PATTERN SELECT (PWR) SWITCH - ECM)

a. Disconnect the ECM connector.

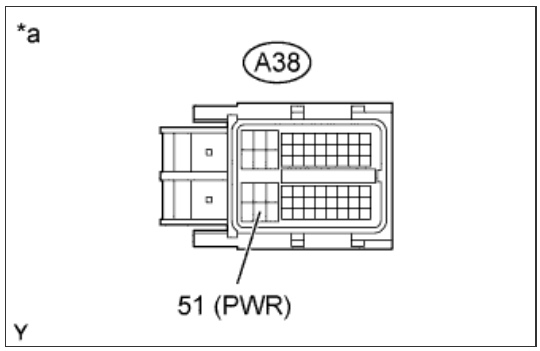
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
A38-51 (PWR) - Body ground	Pattern select (PWR) switch on	Below 1 Ω
A38-51 (PWR) - Body ground	Pattern select (PWR) switch off	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

PROCEED TO NEXT SUSPECTED AREA SHOWN IN PROBLEM SYMPTOMS TABLE (Click here)

for Preparation Click here

DESCRIPTION

When 2nd mode is selected with the pattern select (2nd) switch, the ECM controls the shift solenoid valves and the transmission starts from 2nd gear. The 2nd mode is the system that operates the throttle motor to control engine output to reduce skidding of the driving wheels, and guarantee takeoff acceleration, driving straightness and turning stability.
When the shift lever is in D, the transmission automatically shifts up through 3rd to 6th as usual.

WIRING DIAGRAM

Refer to Pattern Select Switch Power Mode Circuit (Click here).

INSPECTION PROCEDURE

When the pattern select (2nd) switch is pushed, switch contact is made and 2nd mode is selected. To cancel 2nd mode, push the pattern select (2nd) switch once again.

HINT:

2nd mode is automatically canceled when the engine switch is turned off.

1.DRIVING TEST

HINT:

The driving test should be performed on a paved road (nonskid road).

a. Start the engine.

b. Turn the 2nd switch off (normal drive mode).

c. Confirm vehicle response by driving from a parked position to fully depressing the accelerator pedal.

d. Turn the 2nd switch on and perform the same check as above.
When driving the vehicle with the 2nd switch on and off, check that there is a difference in acceleration.

OK:
There is a difference in acceleration.

NG → Go to step 2

OK →

PROCEED TO NEXT SUSPECTED AREA SHOWN IN PROBLEM SYMPTOMS TABLE (Click here)

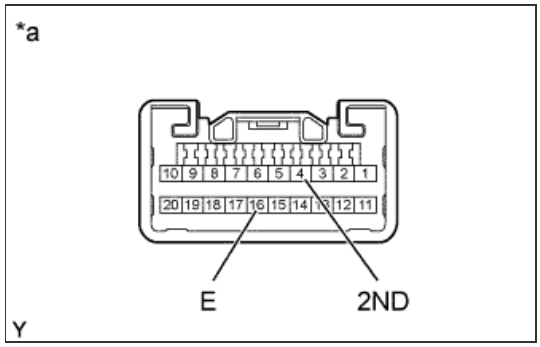
2.INSPECT PATTERN SELECT (2ND) SWITCH

a. Remove the suspension control switch (Click here).

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
4 (2ND) - 16 (E)	Pattern select (2nd) switch continuously pressed	Below 1 Ω
4 (2ND) - 16 (E)	Pattern select (2nd) switch released	10 kΩ or higher



Text in Illustration

*a	Component without harness connected (Suspension Control Switch)

NG → REPLACE PATTERN SELECT (2ND) SWITCH (SUSPENSION CONTROL SWITCH) (Click here)

OK

3.CHECK HARNESS AND CONNECTOR (PATTERN SELECT (2ND) SWITCH - BODY GROUND)

a. Disconnect the suspension control switch connector.

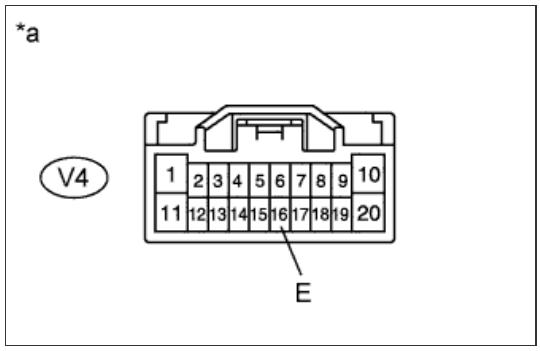
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
V4-16 (E) - Body ground	Always	Below 1 Ω

Text in Illustration

*a	Front view of wire harness connector (to Suspension Control Switch)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4.CHECK HARNESS AND CONNECTOR (PATTERN SELECT (2ND) SWITCH - ECM)

a. Disconnect the ECM connector.

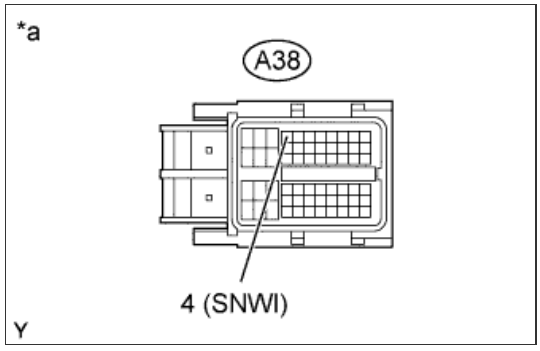
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
A38-4 (SNWI) - Body ground	Pattern select (2nd) switch continuously pressed	Below 1 Ω
A38-4 (SNWI) - Body ground	Pattern select (2nd) switch released	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

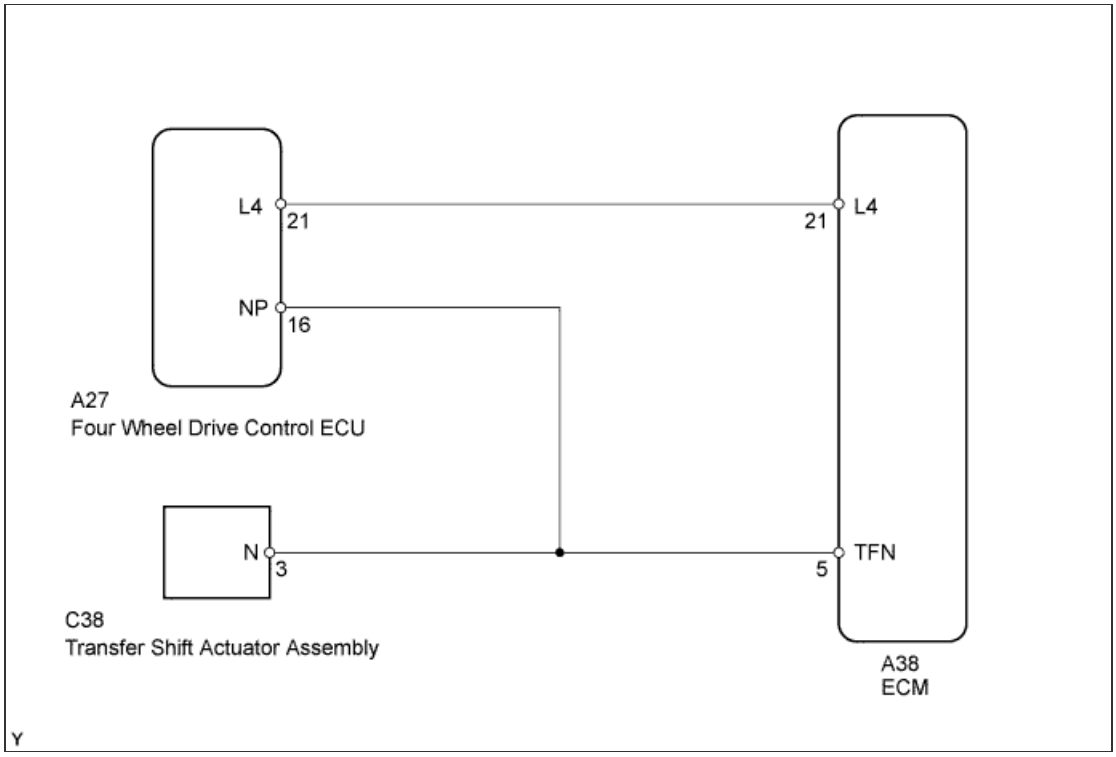
PROCEED TO NEXT SUSPECTED AREA SHOWN IN PROBLEM SYMPTOMS TABLE (Click here)

for Preparation Click here

DESCRIPTION

The four wheel drive control ECU judges whether the transfer is in L4 based on the information from the limit switch inside the transfer shift actuator assembly which is detected by the ECM. The four wheel drive control ECU inputs a signal to the combination meter assembly via CAN communication and turns on the 4LO indicator when the transfer is in L4.

WIRING DIAGRAM



INSPECTION PROCEDURE

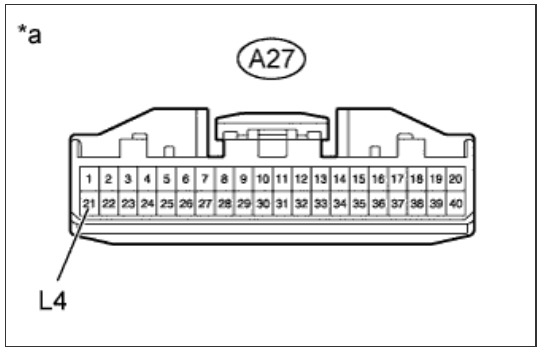
1.CHECK HARNESS AND CONNECTOR (FOUR WHEEL DRIVE CONTROL ECU - BODY GROUND)

a. Disconnect the four wheel drive control ECU connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
A27-21 (L4) - Body ground	Always	10 kΩ or higher



Text in Illustration

*a	Front view of wire harness connector (to Four Wheel Drive control ECU)

NG → Go to step 2

OK

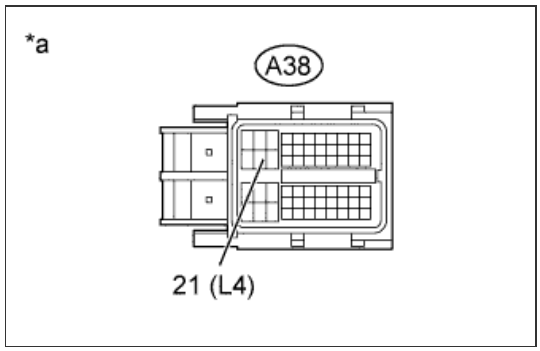
GO TO TRANSFER SYSTEM (INSPECTION) (Click here)

2.CHECK HARNESS AND CONNECTOR (FOUR WHEEL DRIVE CONTROL ECU - ECM)

a. Disconnect the A38 ECM connector.

b. Disconnect the four wheel drive control ECU connector.

c. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
A38-21 (L4) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK → REPLACE ECM (Click here)

for Preparation Click here

1.IGNITION SWITCH EXPRESSION

HINT:

The type of ignition switch used on this model differs according to the specifications of the vehicle. The expressions listed in the table below are used in this section.

Expression	Ignition Switch (position)	Engine Switch (condition)
Ignition Switch off	Off	Off
Ignition Switch ON	ON	On (IG)
Ignition Switch ACC	ACC	On (ACC)
Engine Start	START	Start

2.PRECAUTION

NOTICE:

Perform the Reset Memory procedures (A/T initialization) after replacing the automatic transmission assembly, valve body assembly or any of the shift solenoid valves (Click here).

HINT:

Reset Memory cannot be completed by only reconnecting the cable to the negative (-) battery terminal.

CAUTION:

When using compressed air, always aim away from yourself to prevent Automatic Transmission Fluid (ATF) or kerosene from spraying on your face.

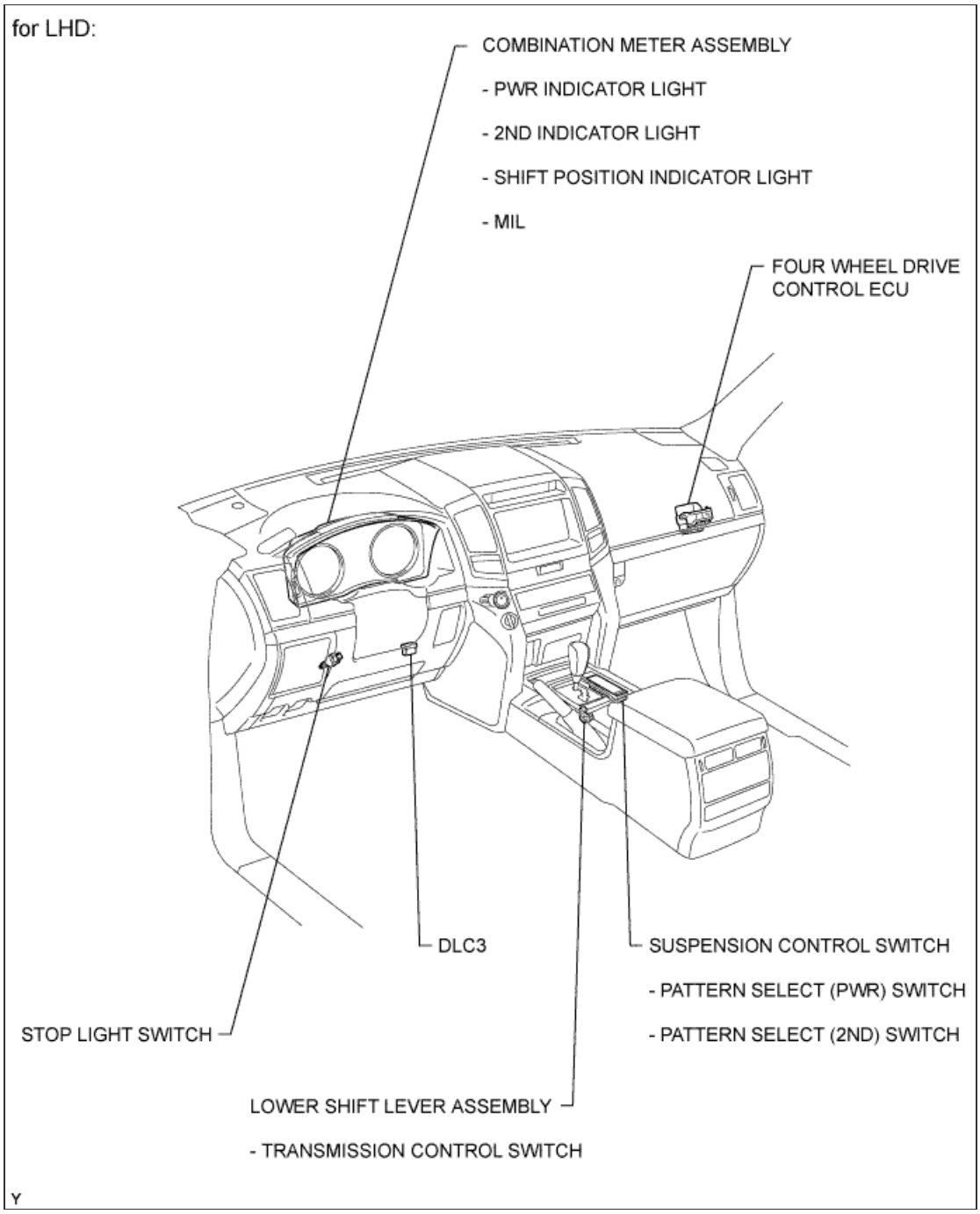
NOTICE:

- **The automatic transmission is composed of precision-made parts, necessitating careful inspection before reassembly because even a small nick could cause fluid leakage or affect performance.**
- **The procedures are organized so that you work on only one component group at a time. This will help avoid confusion with similar-looking parts of different sub-assemblies being on your workbench at the same time.**
- **The component groups are inspected and repaired from the converter housing side.**
- **Whenever possible, complete the inspection, repair and reassembly before proceeding to the next component group. If a defect is found in a certain component group during reassembly, inspect and repair this group immediately. If a component group cannot be assembled because parts are being ordered, be sure to keep all parts of the group in a separate container while proceeding with disassembly, inspection, repair and reassembly of other component groups.**
- **Use of Toyota Genuine ATF WS is recommended.**
- **All disassembled parts should be washed clean, and compressed air should be blown through any fluid passages and holes.**
- **Dry all parts with compressed air. Never use cloth.**
- **The recommended ATF or kerosene should be used for cleaning.**
- **After cleaning, the parts should be arranged in the order they were removed for efficient inspection, repairs, and reassembly.**
- **New discs for the brakes and clutches that will be used for replacement must be soaked in ATF for at least 15 minutes before reassembly.**
- **All oil seal rings, clutch discs, clutch plates, rotating parts, and sliding surfaces should be coated with ATF prior to reassembly.**
- **All old gaskets and rubber O-rings must be replaced.**
- **Do not apply adhesive cement to gaskets and similar parts.**
- **Make sure that the ends of the snap rings are not aligned with any cutouts. Also make sure that snap rings are correctly installed into the grooves.**
- **If a worn bushing is to be replaced, the sub-assembly containing the bushing must also be replaced.**
- **Check the thrust bearings and races for wear or damage. Replace them if necessary.**
- **Use petroleum jelly to keep parts in place.**
- **When working with FIPG material, perform the following:**
  Using a razor blade and gasket scraper, remove all old FIPG material from the gasket surface.
  Clean all components thoroughly to remove all foreign matter.
  Clean both sealing surfaces with non-residue solvent.
  Apply FIPG material in a continuous line approximately 1 mm (0.0394 in.) in diameter on the sealing surface.
  Reassemble parts within 10 minutes of applying FIPG material. Failing to do so will require the FIPG material to be removed and reapplied.

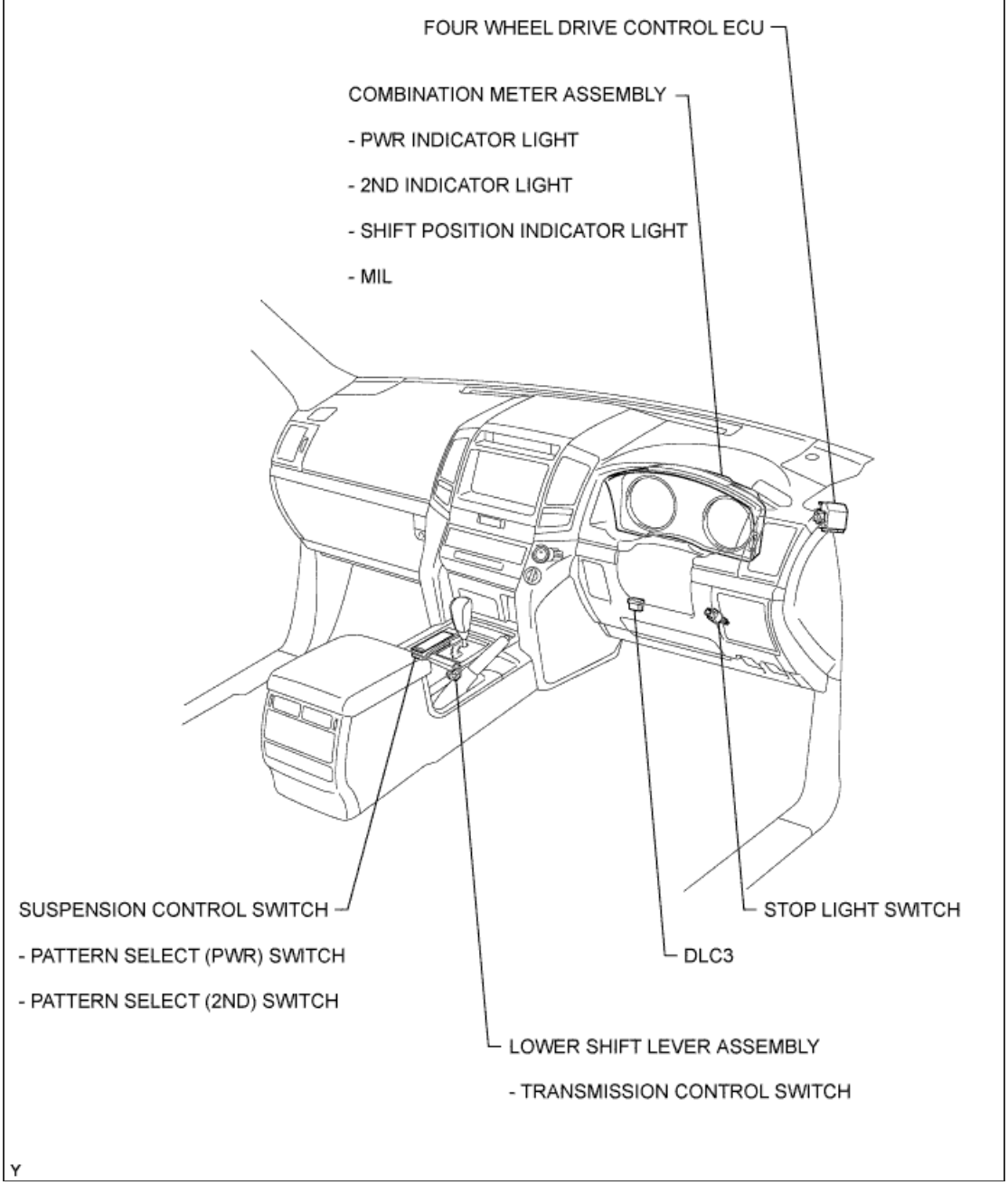
for Preparation Click here

Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).

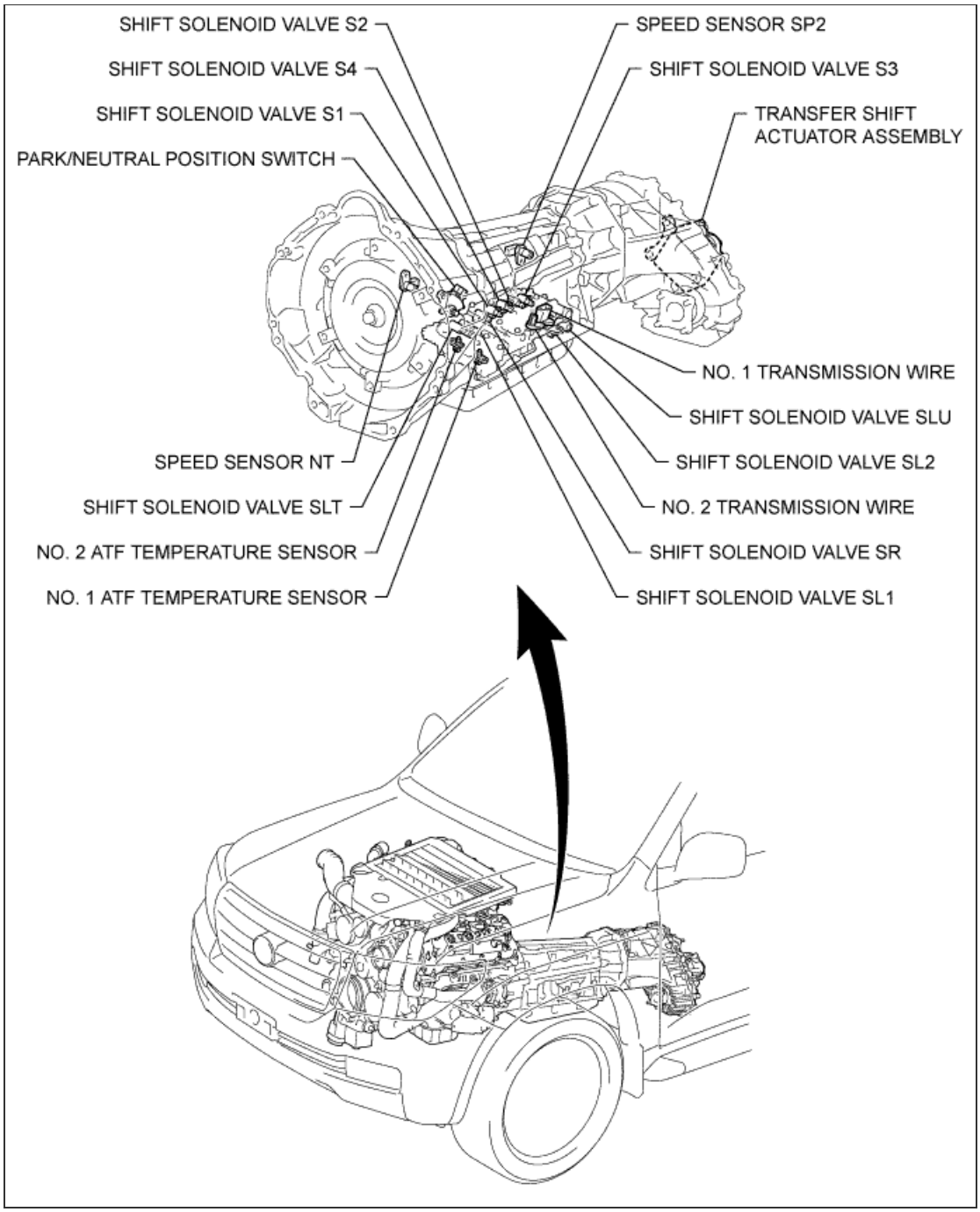
for Preparation Click here



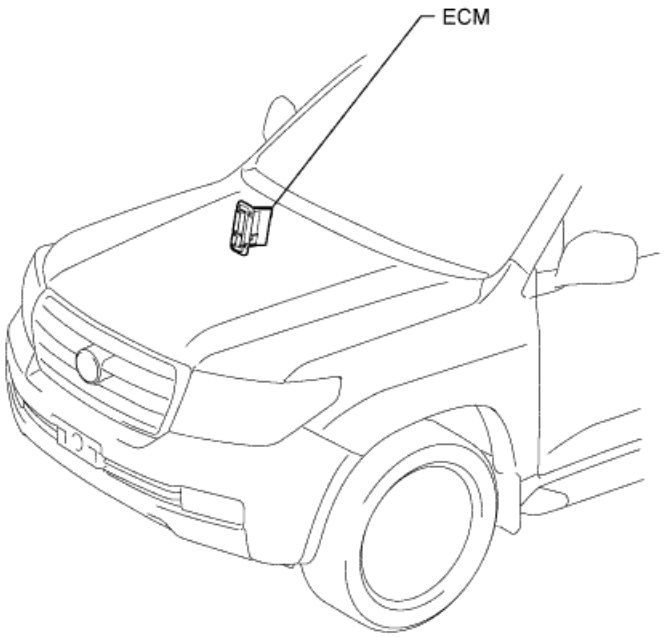
for RHD:


FOUR WHEEL DRIVE CONTROL ECU
COMBINATION METER ASSEMBLY
- PWR INDICATOR LIGHT
- 2ND INDICATOR LIGHT
- SHIFT POSITION INDICATOR LIGHT
- MIL
SUSPENSION CONTROL SWITCH
- PATTERN SELECT (PWR) SWITCH
- PATTERN SELECT (2ND) SWITCH
STOP LIGHT SWITCH
DLC3
LOWER SHIFT LEVER ASSEMBLY
- TRANSMISSION CONTROL SWITCH

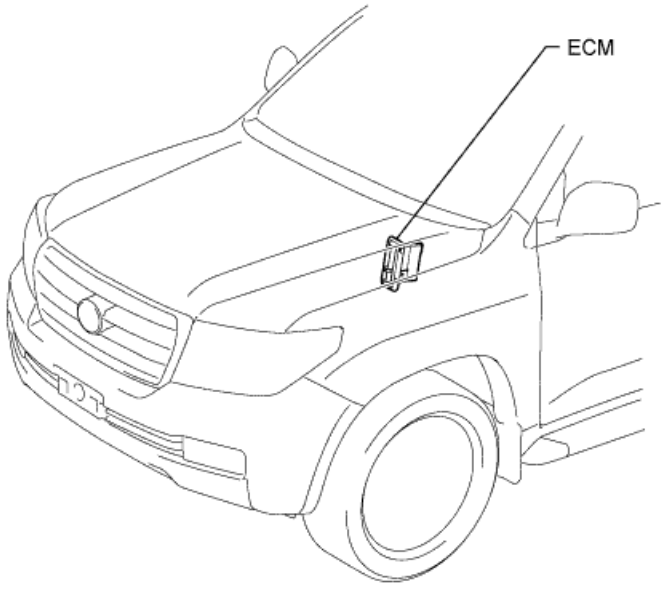
Y


SHIFT SOLENOID VALVE S2
SHIFT SOLENOID VALVE S4
SHIFT SOLENOID VALVE S1
PARK/NEUTRAL POSITION SWITCH
SPEED SENSOR NT
SHIFT SOLENOID VALVE SLT
NO. 2 ATF TEMPERATURE SENSOR
NO. 1 ATF TEMPERATURE SENSOR
SPEED SENSOR SP2
SHIFT SOLENOID VALVE S3
TRANSFER SHIFT ACTUATOR ASSEMBLY
NO. 1 TRANSMISSION WIRE
SHIFT SOLENOID VALVE SLU
SHIFT SOLENOID VALVE SL2
NO. 2 TRANSMISSION WIRE
SHIFT SOLENOID VALVE SR
SHIFT SOLENOID VALVE SL1

for LHD:

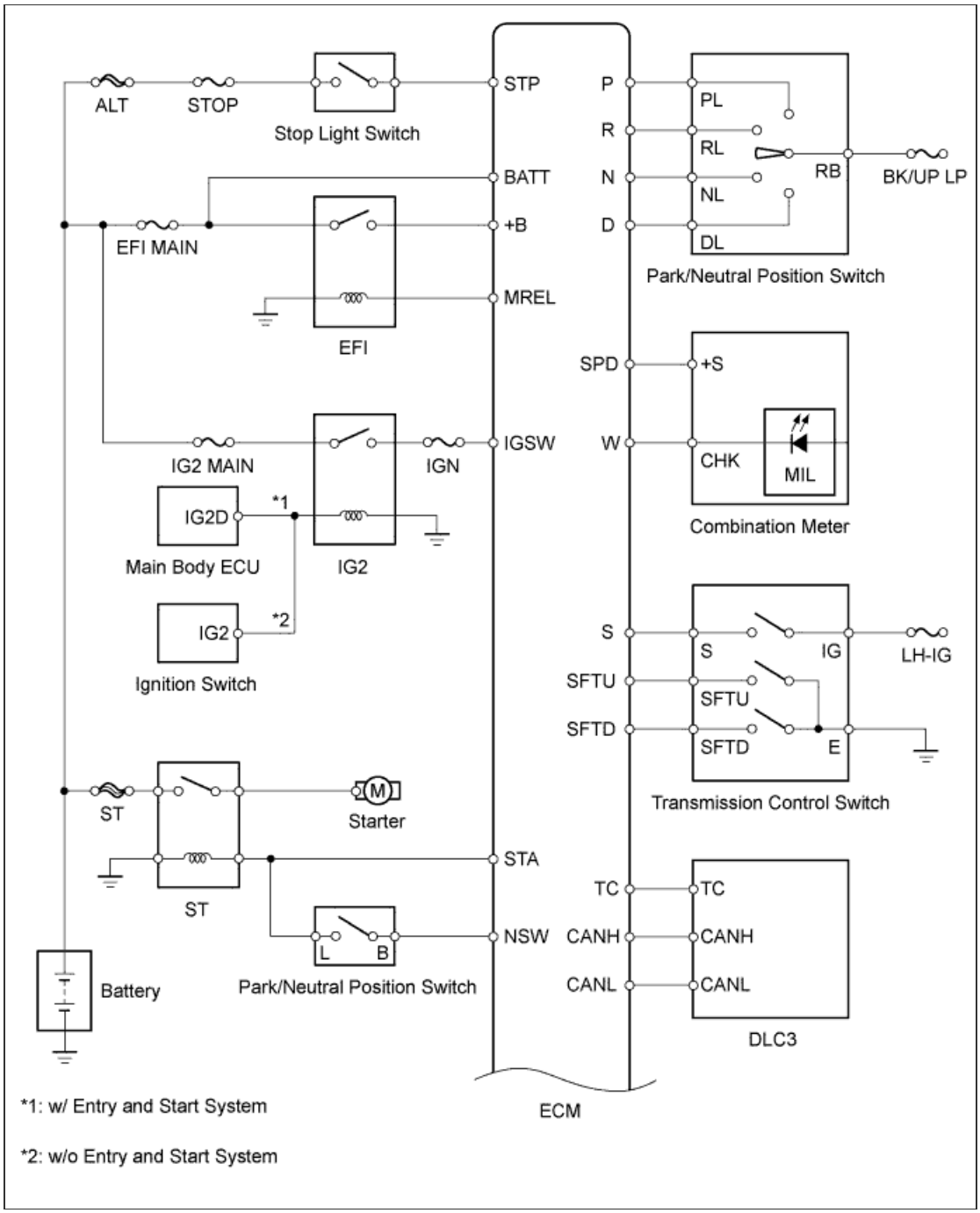


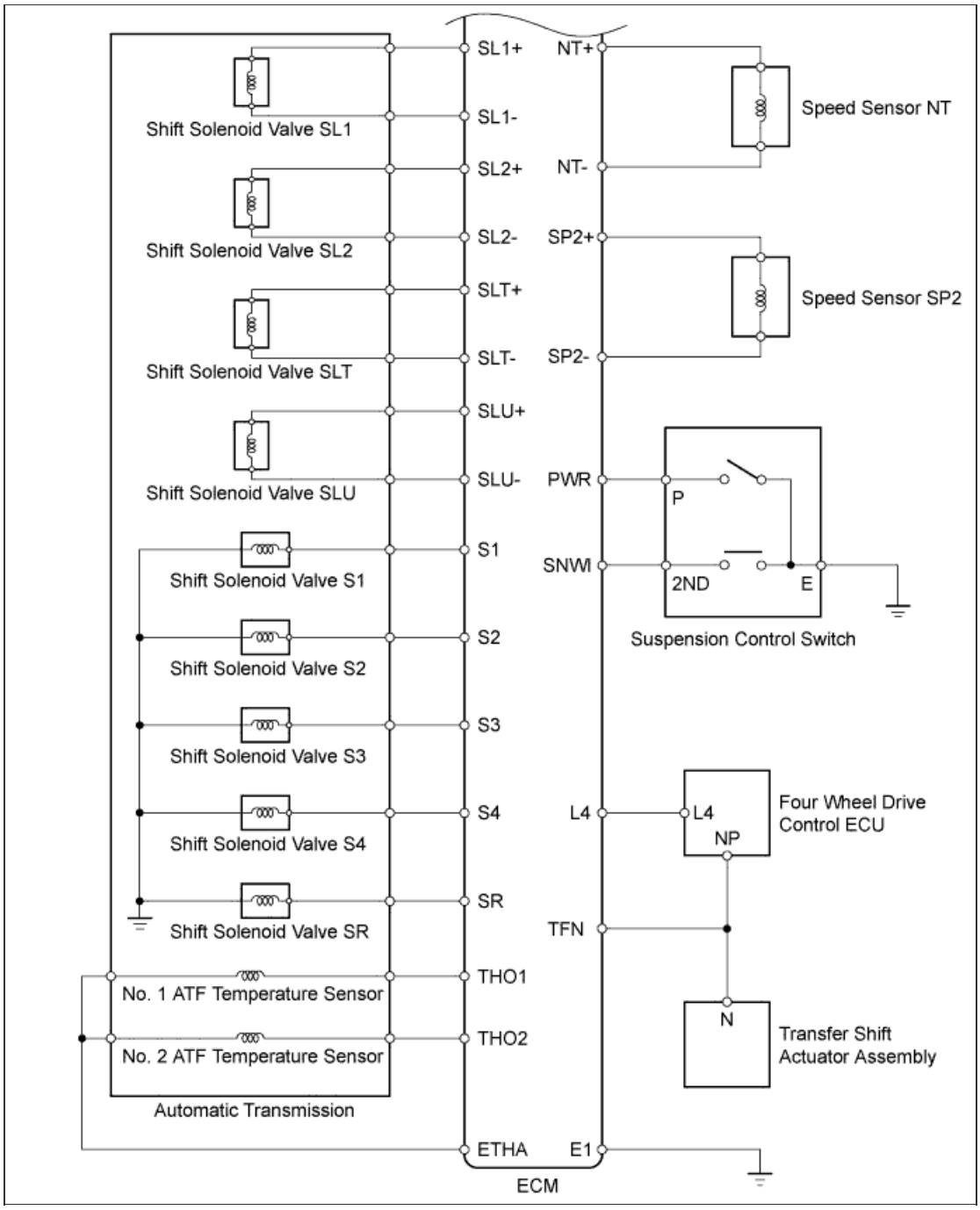
for RHD:



for Preparation Click here

The configuration of the electronic control system in the AB60F automatic transmission is as shown in the following chart.




SL1+
SL1-
SL2+
SL2-
SLT+
SLT-
SLU+
SLU-
S1
S2
S3
S4
SR
THO1
THO2
ETHA
NT+
NT-
SP2+
SP2-
PWR
SNWI
L4
TFN
E1
Shift Solenoid Valve SL1
Shift Solenoid Valve SL2
Shift Solenoid Valve SLT
Shift Solenoid Valve SLU
Shift Solenoid Valve S1
Shift Solenoid Valve S2
Shift Solenoid Valve S3
Shift Solenoid Valve S4
Shift Solenoid Valve SR
No. 1 ATF Temperature Sensor
No. 2 ATF Temperature Sensor
Automatic Transmission
ECM
Speed Sensor NT
Speed Sensor SP2
P
2ND
E
Suspension Control Switch
L4
NP
Four Wheel Drive
Control ECU
N
Transfer Shift
Actuator Assembly

for Preparation Click here

SYSTEM DESCRIPTION

a. The Electronic Controlled Automatic Transmission (ECT) is an automatic transmission that electronically controls shift timing using the Engine Control Module (ECM). The ECM detects electrical signals that indicate engine and driving conditions, and controls the shift point based on driver habits and road conditions. As a result, fuel efficiency and power transmission performance are improved.
Shift shock is reduced by controlling the engine and transmission simultaneously.
In addition, the ECT has the following features:

- Diagnostic function.
- Fail-safe function when a malfunction occurs.

for Preparation Click here

HINT:

- **The ECM is connected to the CAN communication system. Therefore, before starting troubleshooting, make sure to check that there is no trouble in the CAN communication system.**
- ***: Use the intelligent tester.**

1.VEHICLE BROUGHT TO WORKSHOP

NEXT

2.CUSTOMER PROBLEM ANALYSIS

NEXT

3.INSPECT BATTERY VOLTAGE

Standard Voltage:
11 to 14 V

If the voltage is below 11 V, recharge or replace the battery before proceeding.

NEXT

4.CONNECT INTELLIGENT TESTER TO DLC3*

NEXT

5.CHECK AND CLEAR DTCS AND FREEZE FRAME DATA*

a. Refer to the DTC Check / Clear (Click here).

NEXT

6.VISUAL INSPECTION

NEXT

7.SETTING CHECK MODE DIAGNOSIS*

a. Refer to the Check Mode Procedure (Click here).

NEXT

8.PROBLEM SYMPTOM CONFIRMATION

a. Refer to the Road Test (Click here).

Result

Result	Proceed to
Symptom does not occur	A
Symptom occurs	B

B. → GO TO STEP 10

A

9.SYMPTOM SIMULATION

a. Refer to the Electronic Circuit Inspection Procedure (Click here).

NEXT

10.DTC CHECK*

a. Refer to the DTC Check / Clear (Click here).

Result

Result	Proceed to
DTC is not output	A
DTC is output	B

B. → GO TO STEP 18

A

11.BASIC INSPECTION

a. Refer to the Park/Neutral Position Switch (Click here).

b. Refer to the Shift Lever Assembly (Click here).

NG. → GO TO STEP 21

OK

12.MECHANICAL SYSTEM TESTS

a. Refer to the Mechanical System Tests (Click here).

NG. → GO TO STEP 17

OK

13.HYDRAULIC TEST

a. Refer to the Hydraulic Test (Click here).

NG. → GO TO STEP 17

OK

14.MANUAL SHIFTING TEST

a. Refer to the Manual Shifting Test (Click here).

NG. → GO TO STEP 16

OK

15.PROBLEM SYMPTOMS TABLE CHAPTER 1

a. Refer to the Problem Symptoms Table (Click here).

NG. → GO TO STEP 19

OK

16.PROBLEM SYMPTOMS TABLE CHAPTER 2

a. Refer to the Problem Symptoms Table (Click here).

NEXT

17.PART INSPECTION

NG. → GO TO STEP 21

OK

18.DTC CHART

a. Refer to the Diagnostic Trouble Code Chart (Click here).

NEXT

19.CIRCUIT INSPECTION

NEXT

20.IDENTIFICATION OF PROBLEM

NEXT

21.REPAIR OR REPLACE

NEXT

22.CONFIRMATION TEST

NEXT

END

for Preparation Click here

PROBLEM SYMPTOM CONFIRMATION

a. Based on the result of the customer problem analysis, try to reproduce the symptoms. If the problem is that the transmission does not shift up or down, or that the shift point is too high or too low, conduct the following road test referring to the automatic shift schedule and attempt to duplicate the problem symptoms.

ROAD TEST

a. Perform a road test.

CAUTION:

Check for safety before performing any tests.

NOTICE:

- **Be sure to inspect and adjust the engine before performing these tests.**
- **Perform the road test with the engine coolant temperature between 60 and 100°C (140 and 212°F) and the ATF temperature between 50 and 100°C (122 and 212°F).**
- **Perform these tests with the air conditioning and cruise control off.**

Inspection	Procedure
Transmission Control Switch Test	With the vehicle stationary and the shift lever in D, move the shift lever to S and return it to D. Check that the meter display changes from D to the appropriate S range and then back again.
S Position Test	With the vehicle stationary and the shift lever in S, move the shift lever to "+" and "-". Check that the meter display changes between S ranges properly.
D Position Shift Test	While driving the vehicle normally, check that the transmission shifts up and down through each gear properly.
Lock-up Function	While driving on a level surface at a constant speed in the lock-up range (90 km/h (56 mph) or more) with the shift lever in D, lightly depress the accelerator pedal and check that the engine speed does not change abruptly.
P Position Test	Stop the vehicle on an incline (approximately 5° or more). Then move the shift lever to P and release the parking brake. Check that the parking lock pawl holds the vehicle in place.
Abnormal Noise and Vibration	Check for abnormal noise and vibration while driving the vehicle forward and backward, and during shift operations.
Fluid Leakage	After performing all other road test inspections, check for fluid leakage.

for Preparation Click here

STALL SPEED TEST

HINT:

This test is to check the overall performance of the engine and transmission.

CAUTION:

- **To ensure safety, perform this test in an open and level area that provides good traction.**
- **The stall speed test should always be performed with at least 2 people. One person should observe the condition of the wheels and wheel chocks while the other is performing the test.**

NOTICE:

Do not perform the stall speed test for more than 5 seconds.

a. Connect the intelligent tester to the DLC3.

b. Run the vehicle until the transmission fluid temperature has reached 50 to 80°C (122 to 176°F).

c. Allow the engine to idle with the A/C off.

d. Chock all 4 wheels.

e. Set the parking brake and keep the brake pedal depressed firmly with your left foot.

f. Move the shift lever to D.

g. Depress the accelerator pedal as much as possible with your right foot.

h. Read the engine speed (stall speed) and release the accelerator pedal immediately.

Standard value:
2750 +/-200 rpm

Evaluation

Test Result	Possible Cause
Stall speed is lower than standard value	• Stator one-way clutch is not operating properly • Torque converter is faulty (stall speed is less than standard value by 600 rpm or more) • Engine power may be insufficient
Stall speed is higher than standard value	• Line pressure is low • C1 clutch slipping • F3 one-way clutch is not operating properly • F4 one-way clutch is not operating properly

NOTICE:

Perform the test at the normal operating ATF temperature of 50 to 80°C (122 to 176°F).

SHIFT TIME LAG TEST

HINT:

This test is to check the condition of the direct clutch, forward clutch, 1st brake and reverse brake.

a. Connect the intelligent tester to the DLC3.

b. Run the vehicle until the transmission fluid temperature has reached 50 to 80°C (122 to 176°F).

c. Allow the engine to idle with the A/C off.

d. Set the parking brake and keep the brake pedal depressed firmly.

e. Check the D position time lag.

i. Move the shift lever to N and wait for 1 minute.

ii. Move the shift lever to D and measure the time until the shock is felt.

iii. Repeat the 2 procedures above 3 times, and calculate the average time of the 3 tests.

f. Check the R position time lag.

i. Move the shift lever to N and wait for 1 minute.

ii. Move the shift lever to R and measure the time until the shock is felt.

iii. Repeat the 2 procedures above 3 times, and calculate the average time of the 3 tests.

Standard value:
D position time lag is less than 1.2 seconds
R position time lag is less than 1.5 seconds

Evaluation

Test Result	Possible Cause
D position time lag exceeds standard value	• Line pressure is low • C1 clutch is worn • F3 one-way clutch is not operating properly • F4 one-way clutch is not operating properly
R position time lag exceeds standard value	• Line pressure is low • C3 clutch is worn • B4 brake is worn • F1 one-way clutch is not operating properly

for Preparation Click here

PERFORM HYDRAULIC TEST

a. Measure the line pressure.

CAUTION:

The line pressure test should always be carried out in pairs. One technician should observe the conditions of the wheels and wheel chocks outside the vehicle while the other is performing the test.

NOTICE:

- **Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **This check must be conducted after checking and adjusting the engine.**
- **Perform the test with the A/C turned off.**
- **When conducting the stall test, do not continue for more than 5 seconds.**

i. Warm up the ATF (Automatic Transmission Fluid).

ii. Turn the ignition switch off.

iii. Lift the vehicle up.

iv. Remove the test plug on the transmission case center right side and connect SST.

SST
09992-00095 (09992-00231, 09992-00271)

v. Lower the vehicle.

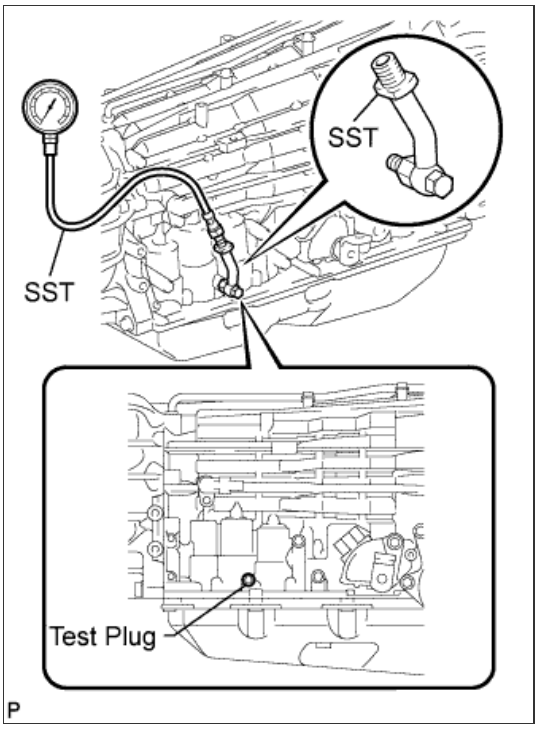
vi. Fully apply the parking brake and chock the 4 wheels.

vii. Start the engine and check the idling speed.

viii. Keep your left foot pressed firmly on the brake pedal and move the shift lever to D.

ix. Fully depress the accelerator pedal with your right foot. Quickly read the highest line pressure when the engine speed reaches the stall speed.

x. In the same manner, perform the test with the shift lever in R.



Specified Line Pressure

Condition	D Position kPa (kgf/cm^2, psi)	R Position kPa (kgf/cm^2, psi)
Stall speed	1230 to 1390 kPa (12.5 to 14.2 kgf/cm^2, 178 to 202 psi)	1470 to 1690 kPa (15.0 to 17.2 kgf/cm^2, 213 to 245 psi)

Evaluation

Problem	Possible Cause
Measured values at D and R positions are higher than specified pressure	• Shift solenoid valve SLT defective • Regulator valve defective

Measured values at D and R positions are lower than specified pressure	• Shift solenoid valve SLT defective • Regulator valve defective • Oil pump defective
Pressure is low in D position only	• D position circuit fluid leak • Clutch No. 1 (C1) defective
Pressure is low in R position only	• R position circuit fluid leak • Clutch No. 3 (C3) defective • Brake No. 4 (B4) defective

for Preparation Click here

MANUAL SHIFTING TEST

HINT:

- **Through this test, it can be determined whether the trouble occurs in an electrical circuit or if it is a mechanical problem in the transmission.**
- **If any abnormalities are found in the following test, the problem is in the transmission itself.**

a. Disconnect the connector of the No. 1 transmission wire and/or No. 2 transmission wire.

HINT:

It is possible to deactivate the electrical shift control by disconnecting the transmission wires. The gear positions can then be changed mechanically with the shift lever.

b. Drive the vehicle with the transmission wires disconnected. Move the shift lever to each position to check whether the gear position changes as shown in the table below.

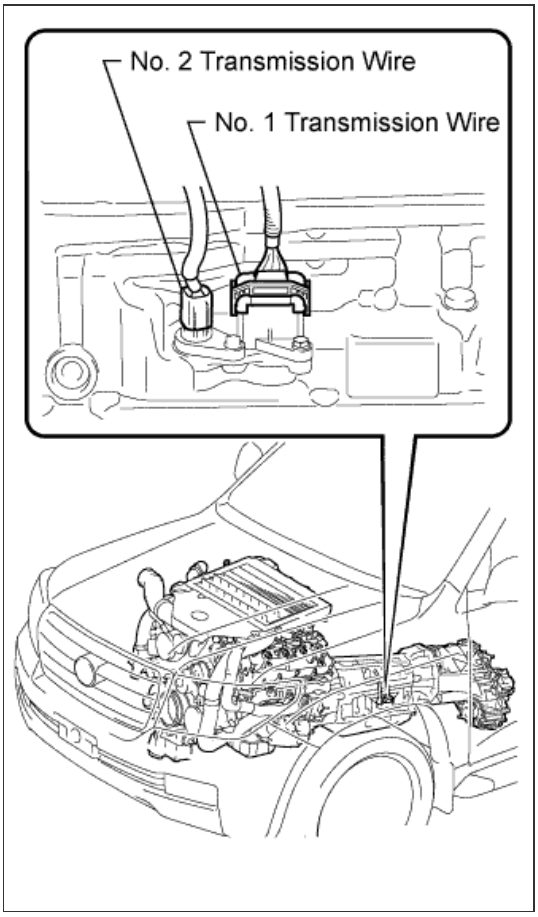
Shift Lever Position	Gear Position
P	P
R	R
D	• 4th*1 • 1st to 6th*2

HINT:

- ***1: When disconnecting only the No. 1 transmission wire or the No. 1 and No. 2 transmission wires.**
- ***2: When disconnecting only the No. 2 transmission wire.**

c. Connect the connector of the No. 1 transmission wire and/or No. 2 transmission wire.

d. Clear the DTC (Click here).



for Preparation Click here

RESET MEMORY

NOTICE:

- **Perform the Reset Memory (AT initialization) when replacing the automatic transmission assembly, valve body assembly or any of the shift solenoid valves.**
- **The Reset Memory can be performed only with the intelligent tester.**

HINT:

The ECM memorizes the control conditions of the automatic transmission assembly and engine assembly. Therefore, when the automatic transmission assembly, valve body assembly or any of the shift solenoid valves has been replaced, it is necessary to reset the memory so that the ECM can memorize the new information.

a. Connect the intelligent tester to the DLC3.

b. Turn the ignition switch to ON.

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / ECT / Utility / Reset Memory.

NOTICE:

After performing the Reset Memory, be sure to perform the Road Test (Click here) described earlier.

HINT:

The ECM learns through the Road Test.

for Preparation Click here

AUTOMATIC TRANSMISSION MONITOR DRIVE PATTERN

CAUTION:

Perform this drive pattern on a level surface and strictly observe the posted speed limits and traffic laws while driving.

HINT:

Performing this drive pattern is one method to simulate the automatic transmission malfunction detection conditions.

The DTCs may not be stored through ordinary, everyday driving. Also, DTCs may not be stored through this drive pattern.

a. Preparation for driving

i. Warm up the engine sufficiently (engine coolant temperature is 60°C (140°F) or higher).

ii. Drive the vehicle when the atmospheric temperature is -10°C (14°F) or higher.
Malfunctions are not detected when the atmospheric temperature is below -10°C (14°F).

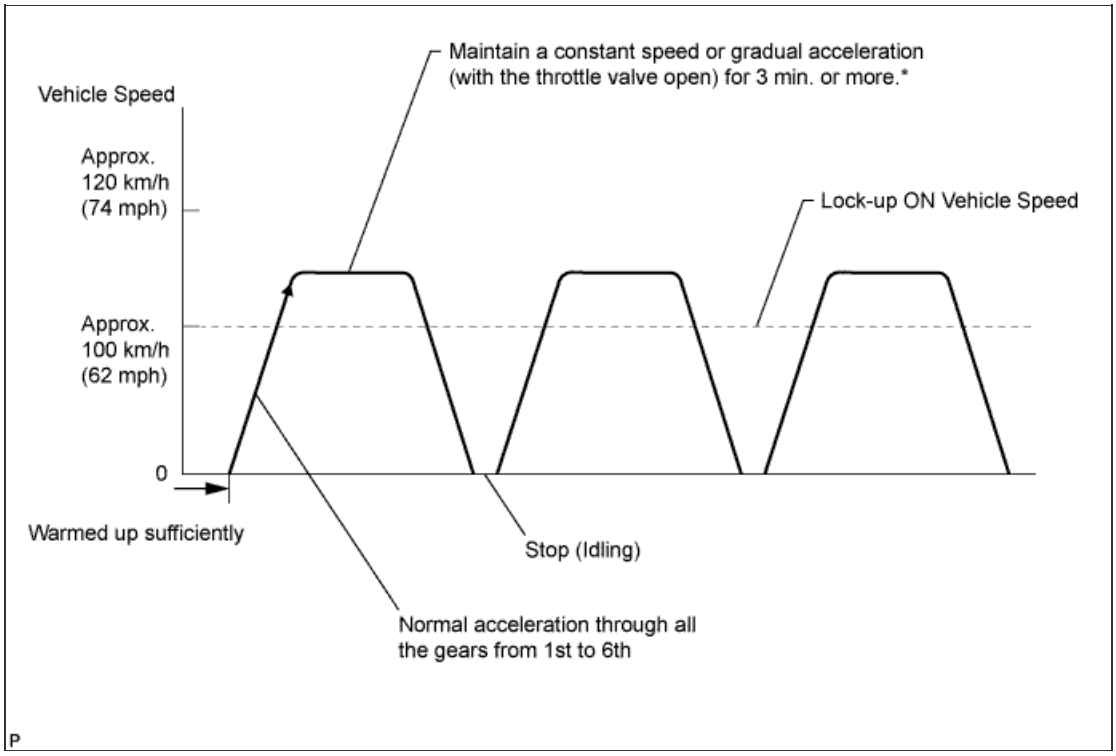
b. Drive pattern

i. Drive the vehicle through all the gears.
Stop → 1st → 2nd → 3rd → 4th → 5th → 5th (lock-up ON) → 6th → 6th (lock-up ON).

ii. Repeat the above drive pattern 3 times or more.

NOTICE:

- **When using the intelligent tester, the monitor status can be checked in the Data List (Click here).**
- **In the event that the drive pattern must be interrupted (due to traffic conditions or other factors), the drive pattern can be resumed and, in most cases, the monitor can be completed.**



HINT:

*: Drive at such a speed in the uppermost gear to engage lock-up. The vehicle can be driven at a speed lower than the speed shown in the above diagram under the lock-up condition.

NOTICE:

It is necessary to drive the vehicle for approximately 30 minutes to store DTC P0711 (No. 1 ATF temperature sensor malfunction).

for Preparation Click here

HINT:

- **Use the table below to help determine the cause of problem symptoms. If multiple suspected areas are listed, the potential causes of the symptoms are listed in order of probability in the "Suspected Area" column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.**
- **The Matrix Chart is divided into 2 chapters. When troubleshooting, check Chapter 1 first. If instructions are given in Chapter 1 to proceed to 2, proceed as instructed.**
- **If the instruction "Proceed to next circuit inspection shown in problem symptoms table" is given in the flowchart for each circuit, proceed to the next suspected area in the table.**
- **If the problem still occurs even though there are no malfunctions in any of the circuits, check the ECM and replace it if necessary.**
- ***: When the circuit is defective, a DTC may be stored.**

1. Chapter 1: Electronic Circuit Matrix Chart

Symptom	Suspected Area	See page
No up-shift (1st -> 2nd)	Shift solenoid valve S1 circuit*	Click here
	ECM	Click here
No up-shift (2nd -> 3rd)	Shift solenoid valve S2 circuit*	Click here
	ECM	Click here
No up-shift (3rd -> 4th)	Shift solenoid valve S3 circuit*	Click here
	ECM	Click here
No up-shift (4th -> 5th)	Shift solenoid valve S4 circuit*	Click here
	Shift solenoid valve SR circuit*	Click here
	Shift solenoid valve SL1 circuit*	Click here
	Shift solenoid valve SL2 circuit*	Click here
	ECM	Click here
No up-shift (5th -> 6th)	Park/neutral position switch circuit*	Click here
	Shift solenoid valve S2 circuit*	Click here
	ECM	Click here
No down-shift (6th -> 5th)	Park/neutral position switch circuit*	Click here
	Shift solenoid valve S2 circuit*	Click here
	ECM	Click here
No down-shift (5th -> 4th)	Shift solenoid valve S4 circuit*	Click here
	Shift solenoid valve SR circuit*	Click here
	Shift solenoid valve SL1 circuit*	Click here
	Shift solenoid valve SL2 circuit*	Click here
	ECM	Click here
No down-shift (4th -> 3rd)	Shift solenoid valve S3 circuit*	Click here
	ECM	Click here
No down-shift (3rd -> 2nd)	Shift solenoid valve S2 circuit*	Click here
	ECM	Click here
No down-shift (2nd -> 1st)	Shift solenoid valve S1 circuit*	Click here
	ECM	Click here
No lock-up or no lock-up off	Shift solenoid valve SLU circuit*	Click here
	Stop light switch circuit*	Click here
	ECM	Click here
No lock-up	No. 1 ATF temperature sensor circuit*	Click here
	Shift solenoid valve SLU circuit*	Click here
	Engine coolant temperature sensor circuit*	Click here
	Stop light switch circuit*	Click here
	Speed sensor NT circuit*	Click here
	ECM	Click here
No lock-up off	Shift solenoid valve SLU circuit*	Click here
	ECM	Click here
	Shift solenoid valve SLT circuit*	Click here

Shift point too high or too low	Speed sensor NT circuit*	Click here
	Speed sensor SP2 circuit*	Click here
	Throttle position sensor circuit*	Click here
	Pattern select (PWR) switch circuit	Click here
	No. 1 ATF temperature sensor circuit*	Click here
	ECM	Click here
Up-shift to 4th from 3rd while engine is cold	Engine coolant temperature sensor circuit*	Click here
	ECM	Click here
Up-shift to 5th from 4th while engine is cold	Engine coolant temperature sensor circuit*	Click here
	ECM	Click here
No gear change by shifting into "+" or "-" while shift lever in S	Transmission control switch circuit	Click here
	ECM	Click here
Harsh engagement (N -> D)	Shift solenoid valve SLT circuit*	Click here
	Speed sensor NT circuit*	Click here
	ECM	Click here
Harsh engagement (lock-up)	Speed sensor NT circuit*	Click here
	Speed sensor SP2 circuit*	Click here
	Shift solenoid valve SLU circuit*	Click here
	ECM	Click here
Harsh engagement (any gear position)	Throttle position sensor circuit*	Click here
	Shift solenoid valve SL1 circuit*	Click here
	Shift solenoid valve SL2 circuit*	Click here
	Shift solenoid valve SLU circuit*	Click here
	Shift solenoid valve SLT circuit*	Click here
	Speed sensor NT circuit*	Click here
	ECM	Click here
Poor acceleration	No. 2 ATF temperature sensor circuit*	Click here
	Shift solenoid valve SLT circuit*	Click here
	Pattern select (2ND) switch circuit	Click here
	ECM	Click here
No engine brake	ECM	Click here
No kick-down	ECM	Click here
Engine stalls when starting off or stopping	Shift solenoid valve SLU circuit*	Click here
	ECM	Click here
ECT 2ND does not operate	Shift solenoid valve SLT circuit*	Click here
	Pattern select (2ND) switch circuit	Click here
	ECM	Click here
ATF temperature warning light remains on, lock-up at 3rd gear and/or shift point too high	No. 2 ATF temperature sensor circuit*	Click here
	Engine coolant temperature sensor circuit*	Click here
	ECM	Click here
Malfunction in shifting	Park/neutral position switch circuit*	Click here
	Transmission control switch circuit	Click here
	ECM	Click here
Harsh engagement (1st -> 2nd -> 3rd -> 4th -> 5th)	Shift solenoid valve SR circuit*	Click here
Slip or shudder (5th -> 6th -> and 6th -> 5th)	Shift solenoid valve SR circuit*	Click here

2. Chapter 2: On-vehicle Repair and Off-vehicle Repair

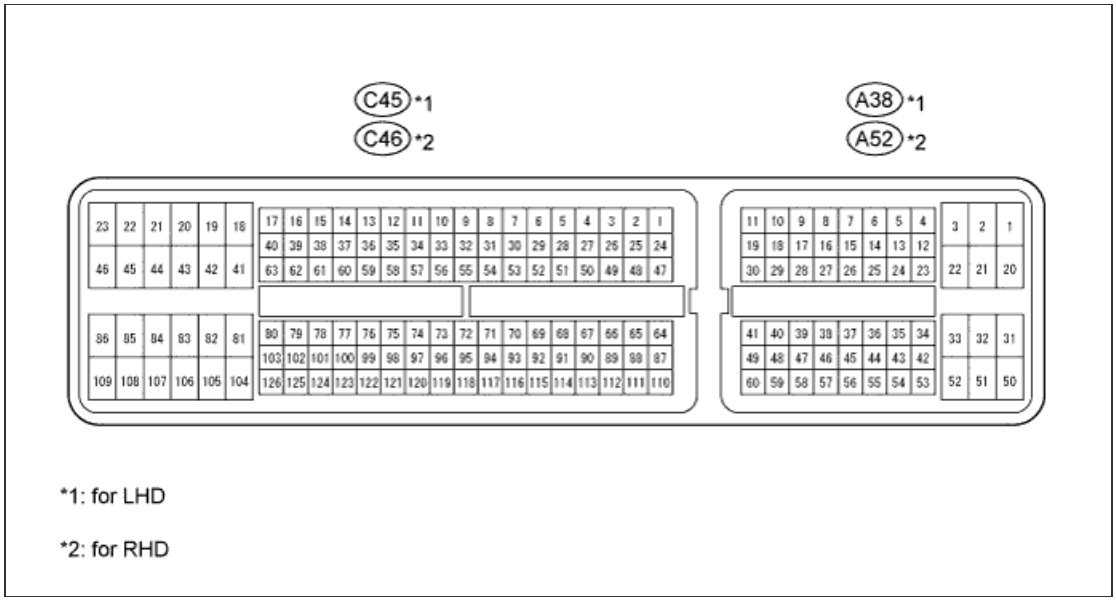
Symptom	Suspected Area	See page
Vehicle does not move when shift lever is in any forward position and reverse position	Floor shift gear shifting rod sub-assembly	Click here
	Manual valve	Click here
	Parking lock pawl	Click here
	Rear planetary gear unit	Click here
	Torque converter clutch	Click here
Vehicle does not move with shift lever in R	Valve body assembly	Click here
	B4 brake	Click here
	Valve body assembly	Click here

No up-shift (1st -> 2nd)	B3 brake	Click here
	F1 one-way clutch	Click here
	F2 one-way clutch	Click here
No up-shift (2nd -> 3rd)	Valve body assembly	Click here
	C3 clutch	Click here
No up-shift (3rd -> 4th)	Valve body assembly	Click here
	C2 clutch	Click here
No up-shift (4th -> 5th)	Valve body assembly	Click here
	B1 brake	Click here
No up-shift (5th -> 6th)	Valve body assembly	Click here
	B2 brake	Click here
No down-shift (6th -> 5th)	Valve body assembly	Click here
No down-shift (5th -> 4th)	Valve body assembly	Click here
No down-shift (4th -> 3rd)	Valve body assembly	Click here
No down-shift (3rd -> 2nd)	Valve body assembly	Click here
No down-shift (2nd -> 1st)	Valve body assembly	Click here
No lock-up or no lock-up off	Valve body assembly	Click here
	Torque converter clutch	Click here
Harsh engagement (N -> D)	Valve body assembly	Click here
	C1 accumulator	Click here
	C1 clutch	Click here
	F3 one-way clutch	Click here
	F4 one-way clutch	Click here
Harsh engagement (lock-up)	Valve body assembly	Click here
	Torque converter clutch	Click here
Harsh engagement (N -> R)	Valve body assembly	Click here
	C3 accumulator	Click here
	C3 clutch	Click here
	B4 brake	Click here
	F1 one-way clutch	Click here
Harsh engagement (1st -> 2nd -> 3rd -> 4th -> 5th -> 6th)	Valve body assembly	Click here
Harsh engagement (1st -> 2nd)	Valve body assembly	Click here
	B3 accumulator	Click here
	B3 brake	Click here
	F1 one-way clutch	Click here
	F2 one-way clutch	Click here
Harsh engagement (2nd -> 3rd)	Valve body assembly	Click here
	C3 accumulator	Click here
	C3 clutch	Click here
Harsh engagement (3rd -> 4th)	Valve body assembly	Click here
	C2 accumulator	Click here
	C2 clutch	Click here
Harsh engagement (4th -> 5th)	Valve body assembly	Click here
	B1 accumulator	Click here
	B1 brake	Click here
Harsh engagement (5th -> 6th)	Valve body assembly	Click here
	B2 accumulator	Click here
	B2 brake	Click here
Harsh engagement (6th -> 5th)	Valve body assembly	Click here
	C3 accumulator	Click here
	C3 clutch	Click here
Slip or shudder (forward and reverse, after warm-up)	Floor shift gear shifting rod sub-assembly	Click here
	Valve body assembly	Click here
	Oil strainer	Click here
	F1 one-way clutch	Click here
	C3 clutch	Click here
	Torque converter clutch	Click here

Slip or shudder (particular position, just after engine starts)	Torque converter clutch	Click here
Slip or shudder (shift lever in R)	B4 brake	Click here
	F1 one-way clutch	Click here
	C3 clutch	Click here
Slip or shudder (1st)	C1 clutch	Click here
	F3 one-way clutch	Click here
	F4 one-way clutch	Click here
Slip or shudder (2nd)	C1 clutch	Click here
	B3 brake	Click here
	F1 one-way clutch	Click here
	F2 one-way clutch	Click here
	F4 one-way clutch	Click here
Slip or shudder (3rd)	C1 clutch	Click here
	C3 clutch	Click here
	F1 one-way clutch	Click here
	F4 one-way clutch	Click here
Slip or shudder (4th)	C1 clutch	Click here
	C2 clutch	Click here
	F4 one-way clutch	Click here
Slip or shudder (5th)	C2 clutch	Click here
	C3 clutch	Click here
	B1 brake	Click here
Slip or shudder (6th)	C2 clutch	Click here
	B2 brake	Click here
No engine braking (1st to 4th, shift lever in S)	C4 clutch	Click here
No engine braking (1st: shift lever in 1)	Valve body assembly	Click here
	B4 brake	Click here
No engine braking (2nd: shift lever in 2)	Valve body assembly	Click here
	B2 brake	Click here
No engine braking (3rd: shift lever in 3)	Valve body assembly	Click here
	B1 brake	Click here
No engine braking (4th: shift lever in 4)	Valve body assembly	Click here
No kick-down	Valve body assembly	Click here
Shift point too high or too low	Valve body assembly	Click here
Poor acceleration (all positions)	Valve body assembly	Click here
	Torque converter clutch	Click here
Poor acceleration (6th)	B2 brake	Click here
	C2 clutch	Click here
	Front planetary gear unit	Click here
Engine stalls when starting off or stopping	Valve body assembly	Click here
	Torque converter clutch	Click here

for Preparation Click here

CHECK ECM



HINT:

- **Each ECM terminal standard voltage is shown in the table below.**
  In the table, first follow the information under "Condition". Look under "Terminal No. (Symbol)" for the terminals to be inspected.
  The standard voltage between the terminals is shown under "Specified Condition".
  Use the illustration above as a reference for the ECM terminals.
- ***1: for LHD**
- ***2: for RHD**

Terminal No. (Symbol)	Wiring Color	Terminal Description	Condition	Specified Condition
A38-21 (L4) - C45-81 (E1)*1 A52-21 (L4) - C46-81 (E1)*2	BR-R - BR	Transfer L4 position signal	• Ignition switch ON • Transfer position switch on L4	Below 1.5 V
			• Ignition switch ON • Transfer position switch not on L4	11 to 14 V
A38-39 (TFN) - C45-81 (E1)*1 A52-39 (TFN) - C46-81 (E1)*2	G - BR	Transfer neutral position signal	• Ignition switch ON • Transfer position in neutral	Below 1.5 V
			• Ignition switch ON • Transfer position not in neutral	11 to 14 V
A38-43 (NSW) - C45-81 (E1)*1 A52-43 (NSW) - C46-81 (E1)*2	L - BR	PNP switch signal	• Ignition switch ON • Shift lever in P or N	Below 1 V
			• Ignition switch ON	

			• Shift lever not in P or N	11 to 14 V
C45-31 (P) - C45-81 (E1)*1 C46-31 (P) - C46-81 (E1)*2	G-B - BR	P shift position switch signal	• Ignition switch ON • Shift lever in P	11 to 14 V
			• Ignition switch ON • Shift lever not in P	Below 1 V
C45-30 (R) - C45-81 (E1)*1 C46-30 (R) - C46-81 (E1)*2	L-R - BR	R shift position switch signal	• Ignition switch ON • Shift lever in R	11 to 14 V
			• Ignition switch ON • Shift lever not in R	Below 1 V
C45-29 (N) - C45-81 (E1)*1 C46-29 (N) - C46-81 (E1)*2	G-W - BR	N shift position switch signal	• Ignition switch ON • Shift lever in N	11 to 14 V
			• Ignition switch ON • Shift lever not in N	Below 1 V
C45-28 (D) - C45-81 (E1)*1 C46-28 (D) - C46-81 (E1)*2	G - BR	D shift position switch signal	• Ignition switch ON • Shift lever in D	11 to 14 V
			• Ignition switch ON • Shift lever not in D	Below 1 V
A38-25 (S) - C45-81 (E1)*1 A52-25 (S) - C46-81 (E1)*2	W - BR	S shift position switch signal	• Ignition switch ON • Shift lever in S	11 to 14 V
			• Ignition switch ON • Shift lever not in S	Below 1 V
A38-60 (SFTU) - C45-81 (E1)*1 A52-60 (SFTU) - C46-81 (E1)*2	V - BR	Up-shift shift position switch signal	• Ignition switch ON • Shift lever in S	11 to 14 V
			• Ignition switch ON • Shift lever "+" position (up-shift)	Below 1 V
A38-59 (SFTD) - C45-81 (E1)*1 A52-59 (SFTD) - C46-81 (E1)*2	L - BR	Down-shift position switch signal	• Ignition switch ON • Shift lever in S	11 to 14 V
			• Ignition switch ON • Shift lever "-" position (down-shift)	Below 1 V
A38-36 (STP) - C45-81 (E1)*1 A52-36 (STP) - C46-81 (E1)*2	R - BR	Stop light switch signal	Brake pedal depressed	11 to 14 V
			Brake pedal released	Below 1.5 V
C45-9 (S1) - C45-81 (E1)*1 C46-9 (S1) - C46-81 (E1)*2	R - BR	Shift solenoid valve S1 signal	1st gear	Below 1 V
			Not in 1st gear	11 to 14 V

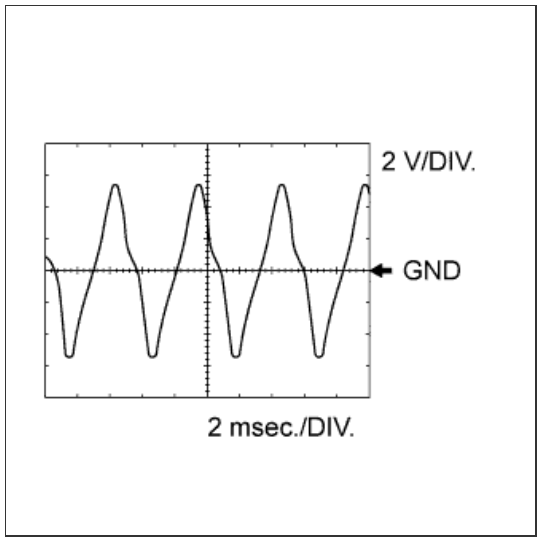
C45-8 (S2) - C45-81 (E1)*1 C46-8 (S2) - C46-81 (E1)*2	W - BR	Shift solenoid valve S2 signal	1st, 2nd or 6th gear	11 to 14 V
			3rd, 4th or 5th gear	Below 1 V
C45-7 (S3) - C45-81 (E1)*1 C46-7 (S3) - C46-81 (E1)*2	B-R - BR	Shift solenoid valve S3 signal	1st, 2nd or 3rd gear	11 to 14 V
			4th, 5th or 6th gear	Below 1 V
C45-6 (S4) - C45-81 (E1)*1 C46-6 (S4) - C46-81 (E1)*2	G-R - BR	Shift solenoid valve S4 signal	5th or 6th gear	11 to 14 V
			1st, 2nd, 3rd or 4th gear	Below 1 V
C45-5 (SR) - C45-81 (E1)*1 C46-5 (SR) - C46-81 (E1)*2	G - BR	Shift solenoid valve SR signal	1st, 2nd, 3rd or 4th gear	11 to 14 V
			5th or 6th gear	Below 1 V
C45-13 (SL1+) - C45-12 (SL1-)*1 C46-13 (SL1+) - C46-12 (SL1-)*2	Y - L	Shift solenoid valve SL1 signal	5th or 6th gear	Pulse generation
C45-17 (SL2+) - C45-16 (SL2-)*1 C46-17 (SL2+) - C46-16 (SL2-)*2	G-R - L-W	Shift solenoid valve SL2 signal	Engine idling	Pulse generation
C45-11 (SLT+) - C45-10 (SLT-)*1 C46-11 (SLT+) - C46-10 (SLT-)*2	B - G-B	Shift solenoid valve SLT signal	Engine idling	Pulse generation
C45-15 (SLU+) - C45-14 (SLU-)*1 C46-15 (SLU+) - C46-14 (SLU-)*2	L-Y - L-R	Shift solenoid valve SLU signal	5th (lock-up) gear or 6th (lock-up) gear	Pulse generation
C45-123 (THO1) - C45-122 (ETHA)*1 C46-123 (THO1) - C46-122 (ETHA)*2	G-Y - BR	No. 1 ATF temperature sensor signal	No. 1 ATF temperature: 115°C (239°F) or higher	Below 1.5 V
C45-121 (THO2) - C45-122 (ETHA)*1 C46-121 (THO2) - C46-122 (ETHA)*2	L - BR	No. 2 ATF temperature sensor signal	No. 2 ATF temperature: 115°C (239°F) or higher	Below 1.5 V
C45-68 (SP2+) - C45-67 (SP2-)*1 C46-68 (SP2+) - C46-67 (SP2-)*2	Y - B	Speed sensor SP2 signal	Vehicle speed 20 km/h (12 mph)	Pulse generation (see waveform 1)
C45-4 (NT+) - C45-3 (NT-)*1 C46-4 (NT+) - C46-3 (NT-)*2	Y - B	Speed sensor NT signal	Engine idling (shift lever in P or N)	Pulse generation (see waveform 2)
A38-41 (CANH) - C45-81 (E1)*1 A52-41 (CANH) - C46-81 (E1)*2	P - BR	CAN communication line	Ignition switch ON	Pulse generation (see waveform 3)
A38-49 (CANL) - C45-81 (E1)*1 A52-49 (CANL) - C46-81 (E1)*2	B - BR	CAN communication line	Ignition switch ON	Pulse generation (see waveform 4)
A38-47 (PWR) - C45-81 (E1)*1 A52-47 (PWR) - C46-81 (E1)*2	L-B - BR	Pattern select (PWR) switch signal	• Ignition switch ON • Pattern select (PWR) switch off	11 to 14 V
			• Ignition switch ON • Pattern select (PWR) switch on	Below 1.5 V
A38-17 (SNWI) - C45-81 (E1)*1 A52-17 (SNWI) - C46-81 (E1)*2	P - BR	Pattern select (2ND) switch signal	• Ignition switch ON • Pattern select (2ND) switch off	11 to 14 V
			• Ignition switch ON • Pattern select (2ND) switch continuously pressed	Below 1.5 V

A38-8 (SPD) - C45-81 (E1)*1 A52-8 (SPD) - C46-81 (E1)*2	V - BR	Speed signal	Vehicle speed 20 km/h (12 mph)	Pulse generation (see waveform 5)

a. Using an oscilloscope, check waveform 1.

Reference:

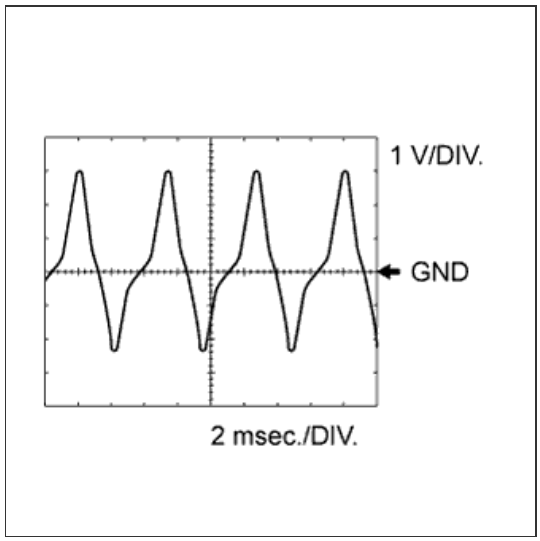
Terminal No. (Symbol)	Tool Setting	Condition
C45-68 (SP2+) - C45-67 (SP2-)*1 C46-68 (SP2+) - C46-67 (SP2-)*2	2 V/DIV., 2 msec./DIV.	Vehicle speed 20 km/h (12 mph)



b. Using an oscilloscope, check waveform 2.

Reference:

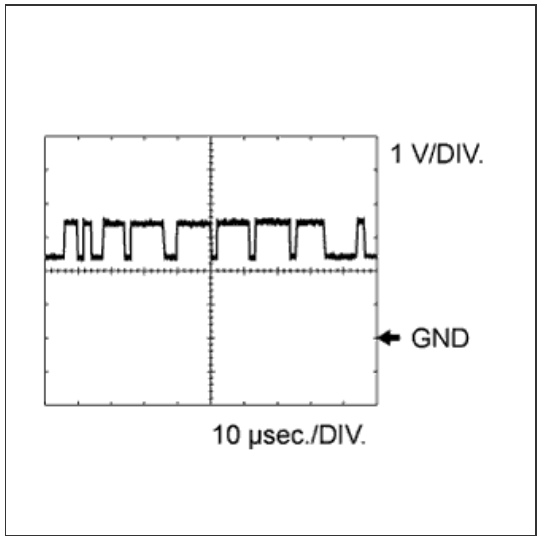
Terminal No. (Symbol)	Tool Setting	Condition
C45-4 (NT+) - C45-3 (NT-)*1 C46-4 (NT+) - C46-3 (NT-)*2	1 V/DIV., 2 msec./DIV.	Engine idling (shift lever in P or N)



c. Using an oscilloscope, check waveform 3.

Reference:

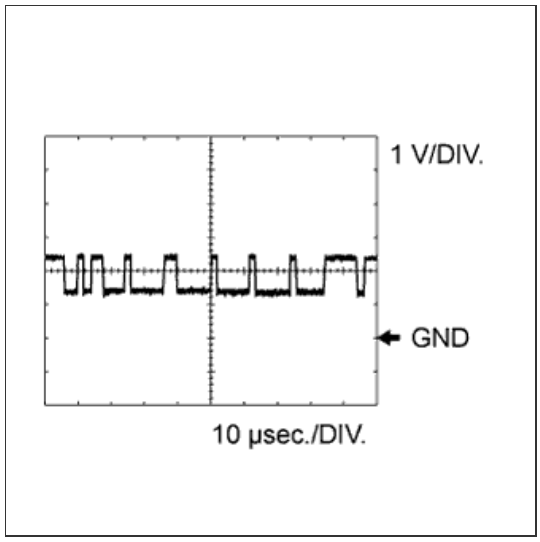
Terminal No. (Symbol)	Tool Setting	Condition
A38-41 (CANH) - C45-81 (E1)*1 A52-41 (CANH) - C46-81 (E1)*2	1 V/DIV., 10 µsec./DIV.	Ignition switch ON



d. Using an oscilloscope, check waveform 4.

Reference:

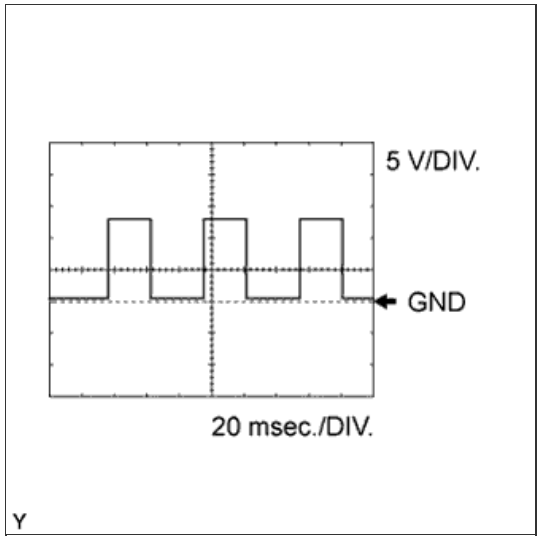
Terminal No. (Symbol)	Tool Setting	Condition
A38-49 (CANL) - C45-81 (E1)*1 A52-49 (CANL) - C46-81 (E1)*2	1 V/DIV., 10 µsec./DIV.	Ignition switch ON



e. Using an oscilloscope, check waveform 5.

Reference:

Terminal No. (Symbol)	Tool Setting	Condition
A38-8 (SPD) - C45-81 (E1)*1 A52-8 (SPD) - C46-81 (E1)*2	5 V/DIV., 20 msec./DIV.	Vehicle speed 20 km/h (12 mph)

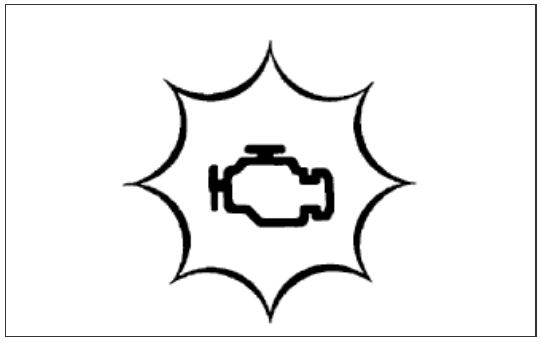


for Preparation Click here

DESCRIPTION

a. When troubleshooting On-Board Diagnostic (OBD II) vehicles, the vehicle must be connected to the OBD II scan tool (complying with SAE J1987). Various data output from the vehicle ECM can then be read.

b. OBD II regulations require that the vehicle on-board computer illuminate the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in:



i. The emission control system/components

ii. The powertrain control components (which affect vehicle emissions)

iii. The computer
In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are stored in the ECM memory.
When the malfunction does not reoccur, the MIL stays illuminated until the ignition switch is turned off, and the MIL turns off when the engine is started. However, the DTCs remain stored in the ECM memory.

c. To check DTCs, connect the intelligent tester to the Data Link Connector 3 (DLC3) of the vehicle. The tester displays output DTCs, the freeze frame data and a variety of the engine data.
The DTCs and freeze frame data can be cleared with the tester (Click here).

NORMAL MODE AND CHECK MODE

a. The diagnosis system operates in "normal mode" during normal vehicle use. In normal mode, "2 trip detection logic" is used to ensure accurate detection of malfunctions. "Check mode" is also available to technicians as an option. In check mode, "1 trip detection logic" is used for simulating malfunction symptoms and increasing the system ability to detect malfunctions, including intermittent malfunctions.

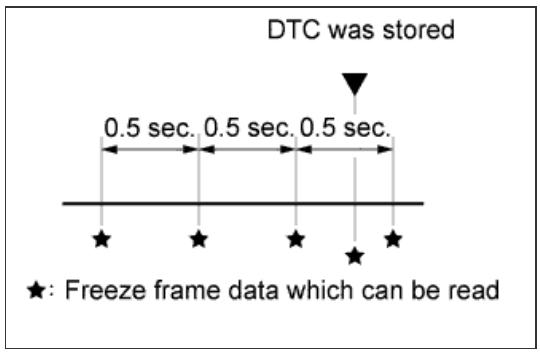
2 TRIP DETECTION LOGIC

a. When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory (1st trip). If the same malfunction is detected during the next drive cycle, the MIL is illuminated (2nd trip).

FREEZE FRAME DATA

a. Freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

b. The ECM records freeze frame data at 5 different times: 1) 3 times before the DTC is stored, 2) once when the DTC is stored, and 3) once after the DTC is stored. These data can be used to simulate the vehicle condition around the time when the malfunction occurred. The data may help find the cause of the malfunction, or judge if the DTC is being caused by a temporary malfunction or not.



CHECK DATA LINK CONNECTOR 3 (DLC3) (Click here)

CHECK MIL

a. Check that the MIL illuminates when turning the ignition switch to ON.
If the MIL does not illuminate, there is a problem in the MIL circuit (Click here).

b. When the engine is started, the MIL should turn off.

for Preparation Click here

CHECK DTC

a. DTCs which are stored in the ECM can be output to the intelligent tester.
The tester can display pending DTCs and current DTCs. Some DTCs are not stored unless a malfunction is detected in consecutive driving cycles. When a malfunction is detected in only one driving cycle, it is stored as a pending DTC.

i. Connect the intelligent tester to the DLC3.

ii. Turn the ignition switch to ON.

iii. Turn the intelligent tester on.

iv. Enter the following menus: Powertrain / ECT / Trouble Codes.

v. Confirm the DTCs and freeze frame data, and then write them down.

vi. Confirm the details of the DTCs (Click here).

NOTICE:

When simulating a symptom with the scan tool to check for DTCs, use normal mode. For codes on the Diagnostic Trouble Code Chart subject to "2 trip detection logic", perform the following actions:

Turn the ignition switch off after the symptom is simulated once. Then repeat the simulation process. When the symptom has been simulated twice, the MIL illuminates and the DTCs are stored in the ECM.

CLEAR DTC (using intelligent tester)

a. Connect the intelligent tester to the DLC3.

b. Turn the ignition switch to ON.

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / ECT / DTC / Clear.

CLEAR DTC (without using intelligent tester)

a. Perform either of the following operations.

i. Disconnect the cable from the negative (-) battery terminal for more than 1 minute.

ii. Remove the EFI MAIN fuse from the engine room relay block located inside the engine compartment for more than 1 minute.

for Preparation Click here

DESCRIPTION

a. Check mode has a higher sensitivity to malfunctions and can detect malfunctions that normal mode cannot detect. Check mode can also detect all the malfunctions that normal mode can detect. In check mode, DTCs are stored with 1 trip detection logic.

CHECK MODE PROCEDURE

a. Make sure that the following conditions are met:

   i. Battery positive voltage 11 V or higher.

   ii. Throttle valve fully closed.

   iii. Shift lever in P or N.

   iv. A/C turned off.

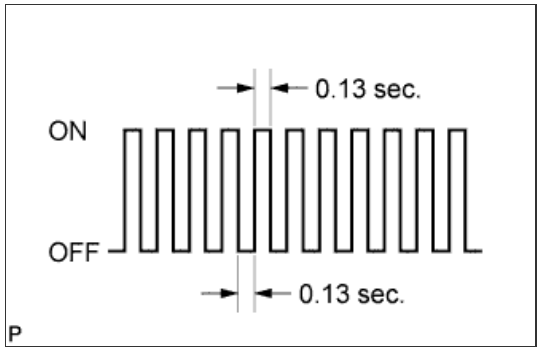
b. Connect the intelligent tester to the DLC3.

c. Turn the ignition switch to ON.

d. Turn the intelligent tester on.

e. Enter the following menus: Powertrain / ECT / Utility / Check Mode.

f. Check that the MIL flashes as shown in the illustration.



NOTICE:

- **All DTCs and freeze frame data will be cleared if: 1) the intelligent tester is used to change the ECM from normal mode to check mode or vice versa; or 2) during check mode, the ignition switch is turned from ON to ACC or off.**
- **Before changing to check mode, make notes of the DTCs and freeze frame data.**

g. Start the engine. The MIL should turn off after the engine starts.

h. Perform the Monitor Drive Pattern for the ECT test (Click here).
(Or, simulate the conditions of the malfunction described by the customer).

i. After simulating the malfunction conditions, use the tester to check the DTC and freeze frame data.

for Preparation Click here

Fail-safe

This function minimizes the loss of the ECT functions when a malfunction occurs in each sensor or solenoid.

Fail-safe Control List

Malfunctioning Part	Function
DTC P0717: Input Speed Sensor NT	During an input speed sensor malfunction, shift control is performed through the output speed sensor SP2 signal. During an input speed sensor malfunction, up-shift to 5th and 6th, AI-SHIFT* and flex lock-up clutch control are prohibited.
DTC P0722: Output Speed Sensor SP2	During an output speed sensor malfunction, shift control is performed through the input speed sensor NT signal. During an output speed sensor malfunction, up-shift to 5th and 6th, AI-SHIFT* and flex lock-up clutch control are prohibited.
DTC P0712, P0713: ATF Temperature Sensor	During an ATF temperature sensor malfunction, up-shift to 5th and 6th and flex lock-up clutch control are prohibited.
Shift Solenoid Valve S1, S2, S3, S4 and SR	The current to the malfunctioning solenoid valve is cut off and control is performed by operating the other solenoid valves. Shift control is performed depending on the malfunctioning solenoid as described in the table below.
DTC P0748, P0778: Shift Solenoid Valve SL1 and SL2	During a solenoid valve SL1 or SL2 malfunction, up-shift to 5th and 6th and flex lock-up clutch control are prohibited.
DTC P2714, P2716: Shift Solenoid Valve SLT	During a solenoid valve SLT malfunction, the current to the solenoid valve is stopped. This stops line pressure optimal control, and shift shock increases. However, shifting is performed through normal clutch pressure control.
DTC P2757, P2759: Shift Solenoid Valve SLU	During a solenoid valve SLU malfunction, the current to the solenoid valve is stopped. This stops lock-up control and flex lock-up control, and fuel economy decreases.

HINT:

*: In addition to the switching of the shift pattern through the pattern select switch, Artificial Intelligence Shift (AI-SHIFT) control enables the ECM to estimate the road conditions and the driver intention in order to automatically select the optimal shift pattern.

Shift Solenoid Valve Normal Operation Chart

Shift Lever Position	Gear*	Shift Solenoid valve S1	Shift Solenoid valve S2	Shift Solenoid valve S3	Shift Solenoid valve S4	Shift Solenoid valve SR	Shift Solenoid valve SL1	Shift Solenoid valve SL2
D, S6	1st	OFF	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON
	3rd	ON	OFF	ON	OFF	ON	OFF	ON
	4th	ON	OFF	OFF	OFF	ON	OFF	ON
	5th	ON	OFF	OFF	ON	OFF	ON	OFF
	6th	ON	ON	OFF	ON	OFF	ON	OFF
S5	1st	OFF	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON
	3rd	ON	OFF	ON	OFF	ON	OFF	ON
	4th	ON	OFF	OFF	OFF	ON	OFF	ON
	5th	ON	OFF	OFF	ON	OFF	ON	OFF
S4	1st	OFF	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON
	3rd	ON	OFF	ON	OFF	ON	OFF	ON
	4th	ON	OFF	OFF	OFF	ON	OFF	ON
S3	1st	OFF	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON
	3rd (E/B)	ON	OFF	ON	OFF	ON	OFF	OFF

S2	1st	OFF	ON	ON	OFF	ON	OFF	ON
	2nd (E/B)	ON	ON	ON	ON	ON	OFF	OFF
S1	1st (E/B)	OFF	ON	ON	OFF	ON	OFF	OFF

a. Fail-safe operation for electronically malfunctioning shift solenoid valve (S1, S2, S3, S4 and SR).

i. Fail-safe function

If any of the shift solenoid valve circuits has an open or short failure, the ECM turns the other shift solenoids "ON" and "OFF" in order to shift into the gear positions shown in the table below. Also, the ECM stops sending current to the open or short circuited solenoid.

Even if starting the engine again in the fail-safe mode, the gear position remains in the same position.

HINT:

- ***: Actual gear shift (gear position) under fail-safe operation.**
- **X: OFF (the ECM stops sending current to the malfunctioning solenoid valve).**
- **Electrical malfunction: Condition is shown to the left of the "→".**
- **Fail-safe mode: Condition is shown to the right of the "→".**
- **E/B: Engine brake**

Shift Solenoid Valve S1 Electrical Malfunction (P0973, P0974)

Shift Lever Position	Gear*	Shift Solenoid valve S1	Shift Solenoid valve S2	Shift Solenoid valve S3	Shift Solenoid valve S4	Shift Solenoid valve SR	Shift Solenoid valve SL1	Shift Solenoid valve SL2
D, S6	1st	X	ON	ON	OFF	ON	OFF	ON
	1st → 4th	X	ON → OFF	ON → OFF	OFF	ON	OFF	ON
	3rd → 4th	X	OFF	ON → OFF	OFF	ON	OFF	ON
	4th	X	OFF	OFF	OFF	ON	OFF	ON
	5th	X	OFF	OFF	ON	OFF	ON	OFF
	N → 5th	X	ON → OFF	OFF	ON	OFF	ON	OFF
S5	1st	X	ON	ON	OFF	ON	OFF	ON
	1st → 4th	X	ON → OFF	ON → OFF	OFF	ON	OFF	ON
	3rd → 4th	X	OFF	ON → OFF	OFF	ON	OFF	ON
	4th	X	OFF	OFF	OFF	ON	OFF	ON
	5th	X	OFF	OFF	ON	OFF	ON	OFF
S4	1st	X	ON	ON	OFF	ON	OFF	ON
	1st → 4th	X	ON → OFF	ON → OFF	OFF	ON	OFF	ON
	3rd → 4th	X	OFF	ON → OFF	OFF	ON	OFF	ON
	4th	X	OFF	OFF	OFF	ON	OFF	ON
S3	1st	X	ON	ON	OFF	ON	OFF	ON
	1st → 4th	X	ON → OFF	ON → OFF	OFF	ON	OFF	ON
	3rd (E/B) → 4th	X	OFF	ON → OFF	OFF	ON	OFF	OFF → ON
S2	1st	X	ON	ON	OFF	ON	OFF	ON
	2nd (E/B) → 4th	X	ON → OFF	ON → OFF	ON → OFF	ON	OFF	OFF → ON
S1	1st (E/B)	X	ON	ON	OFF	ON	OFF	OFF

Shift Solenoid Valve S2 Electrical Malfunction (P0976, P0977)

Shift Lever Position	Gear*	Shift Solenoid valve S1	Shift Solenoid valve S2	Shift Solenoid valve S3	Shift Solenoid valve S4	Shift Solenoid valve SR	Shift Solenoid valve SL1	Shift Solenoid valve SL2
	3rd	OFF → ON	X	ON	OFF	ON	OFF	ON

D, S6	3rd	ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	4th	ON	X	OFF	OFF	ON	OFF	ON
	5th	ON	X	OFF	ON	OFF	ON	OFF
	5th	ON	X	OFF	ON	OFF	ON	OFF
S5	3rd	OFF → ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	4th	ON	X	OFF	OFF	ON	OFF	ON
	5th	ON	X	OFF	ON	OFF	ON	OFF
S4	3rd	OFF → ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	4th	ON	X	OFF	OFF	ON	OFF	ON
S3	3rd → 3rd (E/B)	OFF → ON	X	ON	OFF	ON	OFF	ON → OFF
	3rd → 3rd (E/B)	ON	X	ON	OFF	ON	OFF	ON → OFF
	3rd (E/B)	ON	X	ON	OFF	ON	OFF	OFF
S2	3rd → 3rd (E/B)	OFF → ON	X	ON	OFF	ON	ON → OFF	ON → OFF
	3rd (E/B)	ON	X	ON	ON → OFF	ON	OFF	OFF
S1	3rd (E/B)	OFF → ON	X	ON	OFF	ON	OFF	OFF

Shift Solenoid Valve S3 Electrical Malfunction (P0979, P0980)

Shift Lever Position	Gear*	Shift Solenoid valve S1	Shift Solenoid valve S2	Shift Solenoid valve S3	Shift Solenoid valve S4	Shift Solenoid valve SR	Shift Solenoid valve SL1	Shift Solenoid valve SL2
D, S6	3rd → 4th	OFF	ON	X	OFF	ON	OFF	ON
	4th	ON	ON → OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	5th	ON	OFF	X	ON	OFF	ON	OFF
	6th	ON	ON	X	ON	OFF	ON	OFF
S5	3rd	OFF	ON	X	OFF	ON	OFF	ON
	4th	ON	ON → OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	5th	ON	OFF	X	ON	OFF	ON	OFF
S4	3rd	OFF	ON	X	OFF	ON	OFF	ON
	4th	ON	ON → OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
S3	3rd	OFF	ON	X	OFF	ON	OFF	ON
	4th	ON	ON → OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	OFF → ON
S2	3rd	OFF	ON	X	OFF	ON	OFF	ON
	6th → 4th	ON	ON → OFF	X	ON → OFF	ON	OFF	OFF → ON
S1	1st	OFF	ON	X	OFF	ON	OFF	OFF

Shift Solenoid Valve S4 Electrical Malfunction (P0982, P0983)

Shift Lever Position	Gear*	Shift Solenoid valve S1	Shift Solenoid valve S2	Shift Solenoid valve S3	Shift Solenoid valve S4	Shift Solenoid valve SR	Shift Solenoid valve SL1	Shift Solenoid valve SL2
D, S6	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON
	3rd	ON	OFF	ON	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	OFF → ON	ON → OFF	OFF → ON
	4th	ON	ON → OFF	OFF	X	OFF → ON	ON → OFF	OFF → ON
S5	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON
	3rd	ON	OFF	ON	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	OFF → ON	ON → OFF	OFF → ON
S4	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON
	3rd	ON	OFF	ON	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	ON	OFF	ON
S3	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON
	3rd (E/B)	ON	OFF	ON	X	ON	OFF	OFF
S2	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd (E/B)	ON	ON	ON	X	ON	OFF	OFF
S1	1st (E/B)	OFF	ON	ON	X	ON	OFF	OFF

Shift Solenoid Valve SR Electrical Malfunction (P0985, P0986)

Shift Lever Position	Gear*	Shift Solenoid valve S1	Shift Solenoid valve S2	Shift Solenoid valve S3	Shift Solenoid valve S4	Shift Solenoid valve SR	Shift Solenoid valve SL1	Shift Solenoid valve SL2
D, S6	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd	ON	OFF	ON	OFF	X	OFF	ON
	4th	ON	OFF	OFF	OFF	X	OFF	ON
	5th	ON	OFF	OFF	ON	X	ON	OFF
	6th	ON	ON	OFF	ON	X	ON	OFF
S5	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd	ON	OFF	ON	OFF	X	OFF	ON
	4th	ON	OFF	OFF	OFF	X	OFF	ON
	5th	ON	OFF	OFF	ON	X	ON	OFF
S4	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd	ON	OFF	ON	OFF	X	OFF	ON
	4th	ON	OFF	OFF	OFF	X	OFF	ON
S3	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd (E/B)	ON	OFF	ON	OFF	X	OFF	OFF
S2	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd (E/B)	ON	ON	ON	ON	X	OFF	OFF
S1	1st (E/B)	OFF	ON	ON	OFF	X	OFF	OFF

b. Fail-safe operation in the event of a mechanical system malfunction.

i. Fail-safe function

The ECM controls the gear position as shown in the table below when malfunctions occur.

DTC Code	Condition	Gear*1					
-	Normal	1st	2nd	3rd	4th	5th	6th
P0751	Shift solenoid valve S1: Stuck OFF malfunction	1st*2	1st*2	3rd	3rd	3rd	3rd
P0761	Shift solenoid valve S3: Stuck ON malfunction	1st	2nd	3rd	3rd	3rd	3rd
P0766 P0776	Shift solenoid valve S4, shift solenoid valve SL2 or valve body (brake control valve): Malfunction	1st	2nd	3rd	3rd	3rd	3rd
P0781	Valve body (1-2 shift valve): Malfunction	1st*2	1st*2	3rd	3rd	3rd	3rd
P0729	Valve body (sequence valve): Malfunction	1st	2nd	3rd	3rd	3rd	3rd

HINT:

- ***1: Actual gear shift (gear position) under fail-safe operation.**
- ***2: Under engine braking, downshifting to 1st or 2nd gear is prohibited.**

for Preparation Click here

READ DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the ignition switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the ignition switch to ON.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Data List.

g. According to the display on the tester, read the Data List.

ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
Vehicle Speed	Vehicle speed/ Min.: 0 km/h (0 mph) Max.: 255 km/h (158 mph)	Actual vehicle speed	-
Engine Speed	Engine speed/ Min.: 0 rpm Max.: 16383.75 rpm	Idling: 550 to 650 rpm	-
Calculate Load	Calculated load/ Min.: 0% Max.: 100%	• Idling: 15.4 to 20.4% • Running without load (2500 rpm): 20.1 to 25.9% • Driving with the accelerator fully open at 3000 rpm: 80.3 to 99.6% • Driving with the accelerator fully open at 4000 rpm: 96.4 to 98%	-
Coolant Temp	Engine coolant temperature/ Min.: -40°C (-40°F) Max.: 140°C (284°F)	After warming up engine: 75 to 90°C (167 to 194°F)	If the value is -40°C (-40°F), the sensor circuit is open. If the value is 140°C (284°F), the sensor circuit is shorted.
Engine Run Time	Engine run time/ Min.: 0 seconds Max.: 65535 seconds	Time after the ignition switch turned ON	-
Battery Voltage	Battery voltage/ Min.: 0 V	Engine idling: 11 to 14 V	-

	Max.: 65.535 V		
Neutral Position SW Signal	PNP switch status/ ON or OFF	Shift lever: • In P or N: ON • Not in P or N: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
Stop Light Switch	Stop light switch status/ ON or OFF	• ON: Brake pedal depressed • OFF: Brake pedal released	-
Check Mode	Check mode/ ON or OFF	ON: Check mode on	-
# Codes (Include History)	# of Codes/ Min.: 0 Max.: 255	-	The number of stored DTCs.
MIL	MIL status/ ON or OFF	ON: MIL on	-
MIL ON Run Distance	MIL on run distance/ Min.: 0 km (0 mile) Max.: 65535 km (40723 mile)	Distance after DTC stored	-
Running Time from MIL ON	Running time from MIL on/ Min.: 0 minutes Max.: 65535 minutes	Equivalent to running time after MIL turns on	-
Time after DTC Cleared	Time after DTCs cleared/ Min.: 0 minutes Max.: 65535 minutes	Equivalent to time after DTCs cleared	-
Distance from DTC Cleared	Distance driven after DTCs cleared/ Min.: 0 km (0 mile) Max.: 65535 km (40723 mile)	Equivalent to distance driven after DTCs cleared	-
Warmup Cycle Cleared DTC	Warm-up cycles after DTCs cleared/ Min.: 0, Max.: 255	-	Number of warm-up cycles after DTCs are cleared.
Number of Emission DTC	Emissions-related DTCs/ Min.: 0, Max.: 127	-	-
Model Code	Model code/	-	-
Engine Type	Engine type	-	-
Cylinder Number	Cylinder number/	-	-
Destination	Destination/	-	-
Model Year	Model year/	-	-
Engine Speed from EFI	Engine speed/ Min.: 0 rpm Max.:	Idling: 550 to 650 rpm	The engine speed received from the ECM.

	16383.75 rpm		
Intake-Air Temp from EFI	Intake air temperature/ Min.: -40°C (-40°F) Max.: 215°C (419°F)	Equivalent to temperature at intake manifold	The intake air temperature received from the ECM.
Coolant Temp from EFI	Engine coolant temperature/ Min.: -40°C (-40°F) Max.: 215°C (419°F)	After warming up engine: 75 to 90°C (167 to 194°F)	The coolant temperature received from the ECM.
Accel Position from EFI	Accelerator sensor positioning/ Min.: 0% Max.: 100%	Idling: 0 to 10%	The accelerator position received from the ECM.
Injection Volume from EFI	Injection volume/ Min.: 0 mm3/st Max.: 639.98 mm3/st	Idling: 3.0 to 10 mm3/st	The injector volume received from the ECM.
SPD (NT)	Input shaft speed/ Min.: 0 rpm Max.: 12750 rpm	Lock-up: • ON (after warming up engine): Input turbine speed (NT) equal to engine speed • OFF (idling with shift lever in N): Input turbine speed (NT) nearly equal to engine speed	The data is displayed in increments of 50 rpm.
SPD (SP2)	Output shaft speed/ Min.: 0 km/h (0 mph) Max.: 255 km/h (158 mph)	Vehicle stopped: 0 km/h (0 mph) (output shaft speed equal to vehicle speed)	-
Shift SW Status (P Range)	PNP switch status/ ON or OFF	Shift lever: • In P: ON • Not in P: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
Pattern Switch (PWR/M)	Pattern switch (PWR) status/ ON or OFF	Pattern switch (PWR): • Pushed: ON • Not pushed: OFF	-
Shift SW Status (R Range)	PNP switch status/ ON or OFF	Shift lever: • In R: ON • Not in R: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
Shift SW Status (N Range)	PNP switch status/ ON or OFF	Shift lever: • In N: ON • Not in N: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
Sports Shift	Sport shift up switch status/	• ON: Shift lever held in "+" (up-shift)	-

Up SW	ON or OFF	• OFF: Shift lever not in "+" (up-shift)	
Sports Shift Down SW	Sport shift down switch status/ ON or OFF	• ON: Shift lever held in "-" (down-shift) • OFF: Shift lever not in "-" (down-shift)	-
Shift SW Status (D Range)	PNP switch status/ ON or OFF	Shift lever: • In D: ON • Not in D: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
A/T Oil Temperature 1	No. 1 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 1 ATF temperature sensor circuit is open or shorted.
A/T Oil Temperature 2	No. 2 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 2 ATF temperature sensor circuit is open or shorted.
Lock Up	Lock-up/ ON or OFF	Lock-up: • Operating: ON • Not operating: OFF	-
Lock Up Solenoid Status	Lock-up solenoid status/ ON or OFF	Lock-up solenoid: • Operating: ON • Not operating: OFF	-
Shift Status	ECM gear shift command/ 1st, 2nd, 3rd, 4th, 5th or 6th	Shift lever: • In D: 1st, 2nd, 3rd, 4th, 5th or 6th • In S: 1st, 2nd, 3rd, 4th, 5th or 6th	-
SLT Solenoid Status	Shift solenoid valve SLT status/ ON or OFF	• Accelerator pedal depressed: OFF • Accelerator pedal released: ON	-
SLU Solenoid Status	Shift solenoid valve SLU status/ ON or OFF	Shift solenoid valve SLU: • Operating: ON • Not operating: OFF	-
Snow or 2nd Start Mode	2nd Start mode status/ ON or OFF	• ON: 2nd Start mode on • OFF: 2nd Start mode off	-

PERFORM ACTIVE TEST

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the ignition switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the ignition switch to ON.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Connect the TC and TE1	Turn on and off TC and TE1 connection	ON or OFF	• ON: TC and TE1 are connected. • OFF: TC and TE1 are disconnected.
Activate the Solenoid (SLU)	Operate shift solenoid valve SLU	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT solenoid to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.
Activate the Solenoid (S1)	Operate shift solenoid valve S1	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.
Activate the Solenoid (S2)	Operate shift solenoid valve S2	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.
Activate the Solenoid (S3)	Operate shift solenoid valve S3	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.
Activate the Solenoid (S4)	Operate shift solenoid valve S4	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.
Activate the Lock Up	Control shift solenoid valve SLU to set automatic transmission to lock-up condition	ON or OFF	It is possible to check the shift solenoid valve SLU operation. [Vehicle Condition] • The throttle valve opening angle is less than 35%. • The vehicle speed is 80 km/h (50 mph) or more.
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.
Activate the Solenoid	Operate shift solenoid valve SR	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift

(SR)			lever is in P or N.
Activate the Solenoid (SL1)	Operate shift solenoid valve SL1	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.
Activate the Solenoid (SL2)	Operate shift solenoid valve SL2	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

for Preparation Click here

HINT:

- **If a DTC is output during the DTC check, check the parts listed in the table below and proceed to the "See page" given.**
- ***1: "Comes on" means the Malfunction Indicator Lamp (MIL) illuminates.**
- ***2: "DTC stored" means the ECM stores the trouble code if the ECM detects the DTC detection condition.**
- ***3: w/ OBD**
- ***4: w/o OBD**
- ***5: The ATF temperature warning light blinks or a message is displayed in the combination meter.**
- **These DTCs may be output when the clutch, brake, gear components, etc., inside the automatic transmission are damaged.**

Automatic Transmission System

DTC Code	Detection Item	MIL*1	Memory*2	See page
P0500	Vehicle Speed Sensor "A"	Comes on	DTC stored	Click here
P0560	System Voltage	Comes on	DTC stored	Click here
P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	Comes on	DTC stored	Click here
P0711	Transmission Fluid Temperature Sensor "A" Performance	Comes on	DTC stored	Click here
P0712	Transmission Fluid Temperature Sensor "A" Circuit Low Input	Comes on	DTC stored	Click here
P0713	Transmission Fluid Temperature Sensor "A" Circuit High Input	Comes on	DTC stored	Click here
P0717	Turbine Speed Sensor Circuit No Signal	Comes on	DTC stored	Click here
P0722	Output Speed Sensor Circuit No Signal	Comes on	DTC stored	Click here
P0724	Brake Switch "B" Circuit High	Comes on	DTC stored	Click here
P0729	Gear 6 Incorrect Ratio	Comes on*3 -*4	DTC stored	Click here
P0748	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	Comes on	DTC stored	Click here
P0751	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)	Comes on*3 -*4	DTC stored	Click here
P0756	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)	Comes on	DTC stored	Click here
P0761	Shift Solenoid "C" Performance (Shift Solenoid Valve S3)	Comes on	DTC stored	Click here
P0766	Shift Solenoid "D" Performance (Shift Solenoid Valve S4)	Comes on*3 -*4	DTC stored	Click here
P0776	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)	Comes on	DTC stored	Click here
P0778	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	Comes on	DTC stored	Click here
P0781	1-2 Shift (1-2 Shift Valve)	Comes on*3 -*4	DTC stored	Click here
P0894	Transmission Component Slipping	Comes on	DTC stored	Click here
P0973	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)	Comes on	DTC stored	Click here
P0974	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)	Comes on	DTC stored	Click here
P0976	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)	Comes on	DTC	Click here

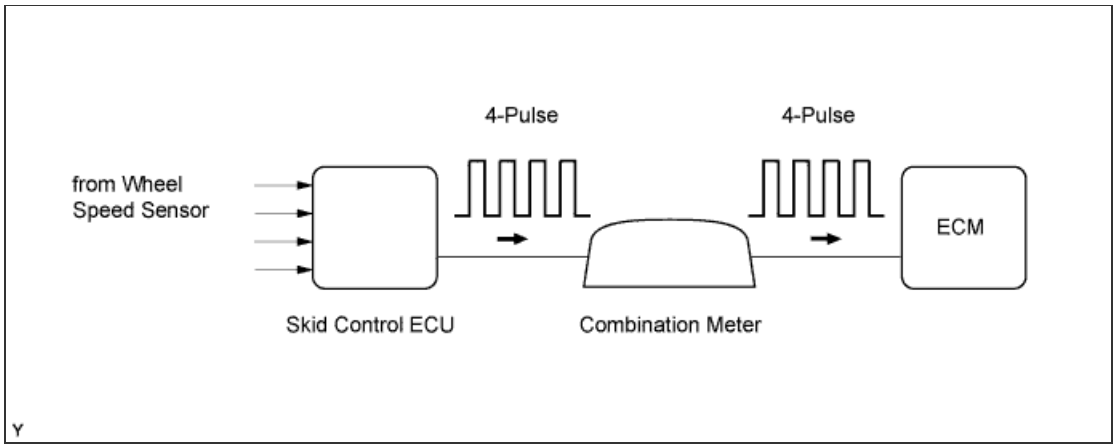
			stored	
P0977	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)	Comes on	DTC stored	Click here
P0979	Shift Solenoid "C" Control Circuit Low (Shift Solenoid Valve S3)	Comes on	DTC stored	Click here
P0980	Shift Solenoid "C" Control Circuit High (Shift Solenoid Valve S3)	Comes on	DTC stored	Click here
P0982	Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)	Comes on	DTC stored	Click here
P0983	Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)	Comes on	DTC stored	Click here
P0985	Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)	Comes on	DTC stored	Click here
P0986	Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)	Comes on	DTC stored	Click here
P2714	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)	Comes on*3 -*4	DTC stored	Click here
P2716	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	Comes on*3 -*4	DTC stored	Click here
P2742	Transmission Fluid Temperature Sensor "B" Circuit Low Input	-*5	DTC stored	Click here
P2743	Transmission Fluid Temperature Sensor "B" Circuit High Input	-*5	DTC stored	Click here
P2757	Torque Converter Clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU)	Comes on	DTC stored	Click here
P2759	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)	Comes on*3 -*4	DTC stored	Click here
P2772	Four Wheel Drive (4WD) Low Switch Circuit Range / Performance	Comes on	DTC stored	Click here
U0100	Lost Communication with ECM / PCM "A"	Comes on	DTC stored	Click here

DTC P0500 Vehicle Speed Sensor "A"

for Preparation Click here

DESCRIPTION

The speed sensor detects the wheel speed and sends the appropriate signals to the skid control ECU. The skid control ECU converts these wheel speed signals into a 4-pulse signal and outputs it to the ECM via the combination meter. The ECM determines the vehicle speed based on the frequency of these pulse signals.

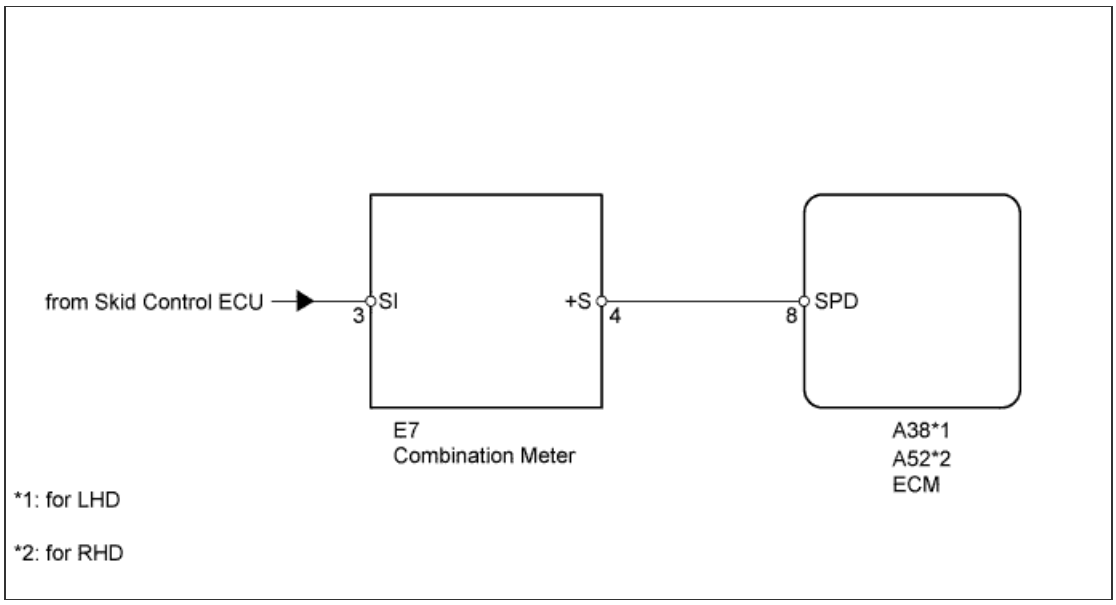


DTC Code	DTC Detection Condition	Trouble Area
P0500	While the vehicle is being driven, no vehicle speed sensor signal is transmitted to the ECM (2 trip detection logic).	• Open or short in speed signal circuit • Wheel speed sensor • Combination meter • ECM • Skid control ECU

MONITOR DESCRIPTION

The ECM assumes that the vehicle is being driven when the indicated vehicle speed is more than 9 km/h (5.6 mph). If there is no speed signal from the combination meter despite these conditions being met, the ECM interprets this as a malfunction in the speed signal circuit. The ECM then illuminates the MIL and stores the DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Read freeze frame data using the intelligent tester. Freeze frame data records the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio

was lean or rich, and other data from the time the malfunction occurred.

1.CHECK OPERATION OF SPEEDOMETER

a. Drive the vehicle and check whether the operation of the speedometer in the combination meter is normal.

HINT:

- **The vehicle speed sensor is operating normally if the speedometer reading is normal.**
- **If the speedometer does not operate, check it by following the procedure described in Speedometer Malfunction (Click here).**

NG → **GO TO METER / GAUGE SYSTEM PROBLEM SYMPTOMS TABLE (Click here)**

OK

2.READ VALUE USING INTELLIGENT TESTER (VEHICLE SPD)

a. Connect the intelligent tester to the DLC3.

b. Turn the ignition switch to ON.

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / ECT / Data List.

e. Drive the vehicle.

f. According to the display on the tester, read the Data List.

ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
Vehicle Speed	Vehicle speed/ Min.: 0 km/h (0 mph) Max.: 255 km/h (158 mph)	Actual vehicle speed	The speed is indicated on the speedometer.

OK:

Vehicle speeds displayed on intelligent tester and speedometer display are equal.

NG → **Go to step 3**

OK

CHECK FOR INTERMITTENT PROBLEMS (Click here)

3.CHECK COMBINATION METER ASSEMBLY (+S VOLTAGE)

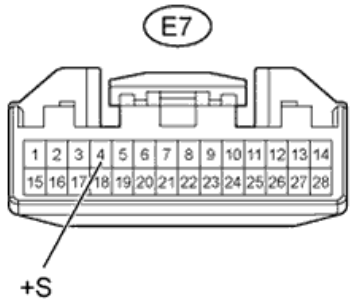
a. Disconnect the combination meter connector.

b. Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
E7-4 (+S) - Body ground	Ignition switch ON	4.5 to 5.5 V

Front view of wire harness connector:
(to Combination Meter)



NG → **Go to step 5**

OK

4.CHECK COMBINATION METER ASSEMBLY (SPD SIGNAL WAVEFORM)

a. Move the shift lever to N.

b. Jack up the vehicle.

c. Measure the voltage according to the value(s) in the table below.

Standard Voltage:

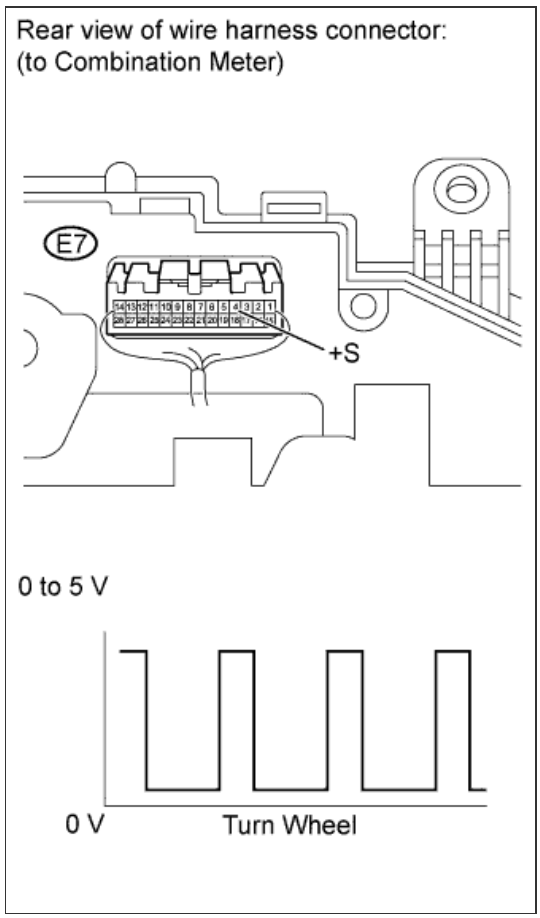
Tester Connection	Condition	Specified Condition
E7-4 (+S) - Body ground	• Ignition switch ON • Wheel is turned slowly	Voltage generated intermittently

HINT:

The output voltage should fluctuate up and down, similarly to the diagram, when the wheel is turned slowly.

Result

Result	Proceed to
OK	A
NG (w/ Multi-information Display)	B
NG (w/o Multi-information Display)	C



B → REPLACE COMBINATION METER ASSEMBLY (Click here)

C → REPLACE COMBINATION METER ASSEMBLY (Click here)

A

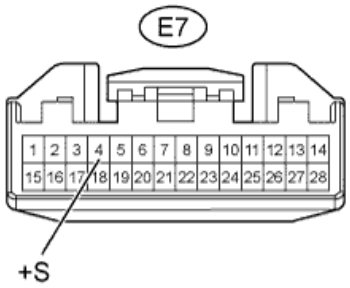
5.CHECK HARNESS AND CONNECTOR (COMBINATION METER - ECM)

a. Disconnect the combination meter connector.

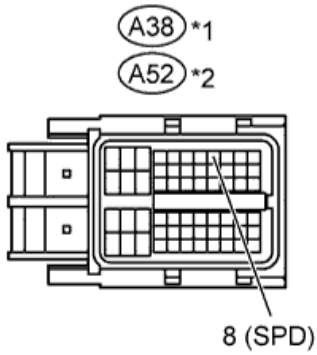
b. Disconnect the ECM connector.

c. Measure the resistance according to the value(s) in the table below.

Front view of wire harness connector:
(to Combination Meter)



Front view of wire harness connector:
(to ECM)



*1: for LHD

*2: for RHD

Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
E7-4 (+S) - A38-8 (SPD)	Always	Below 1 Ω
E7-4 (+S) or A38-8 (SPD) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
E7-4 (+S) - A52-8 (SPD)	Always	Below 1 Ω
E7-4 (+S) or A52-8 (SPD) - Body ground	Always	10 kΩ or higher

NG → REPAIR HARNESS OR CONNECTOR

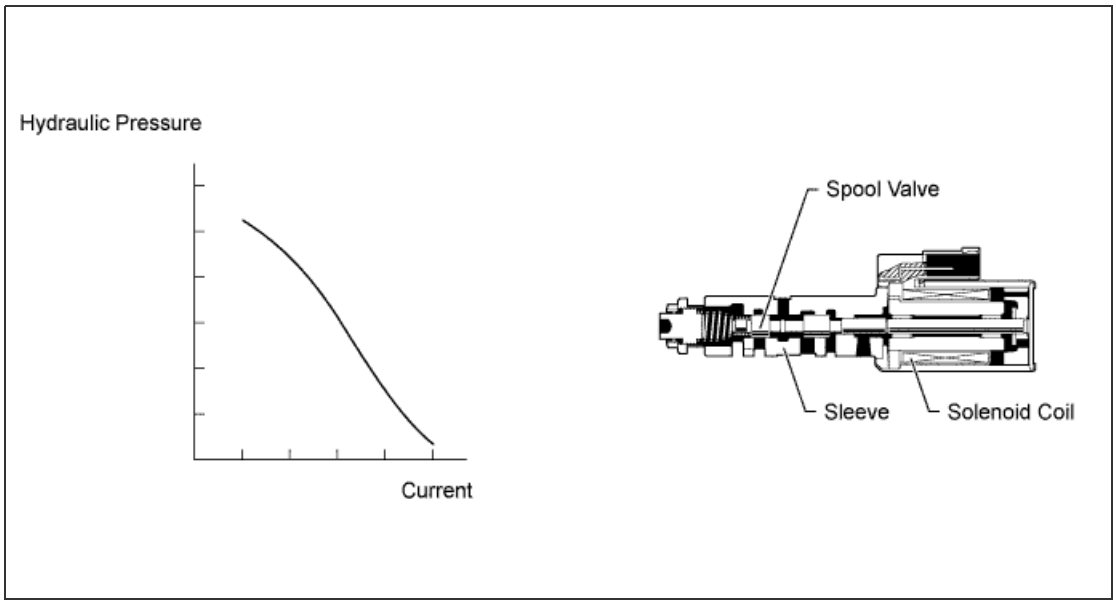
OK → REPLACE ECM (Click here)

DTC P0894 Transmission Component Slipping

DTC P2714 Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)

for Preparation Click here

DESCRIPTION



The shift solenoid valve SLT controls the transmission line pressure for smooth transmission operation based on signals from the throttle position sensor and the vehicle speed sensor. The ECM adjusts the current of the SLT solenoid valve to control the hydraulic line pressure coming from the primary regulator valve. Appropriate line pressure assures smooth shifting with varying engine outputs.

DTC Code	DTC Detection Condition	Trouble Area
P0894	The ECM detects a malfunction of the SLT, S1, S2, S3, S4, SL2, gear 6 incorrect ratio (sequence valve) or 1-2 shift solenoid valves according to the revolution difference of the turbine and output shaft, and also by the oil pressure (2 trip detection logic).	• Shift solenoid valve SLT remains open or closed • Shift solenoid valve S1, S2, S3, S4 or SL2 remains open or closed • Gear 6 incorrect ratio (sequence valve) or 1-2 shift valve is stuck • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)
P2714	The ECM detects a malfunction of the SLT shift solenoid valve (ON side) according to the revolution difference of the turbine and output shaft, and also by the oil pressure (2 trip detection logic*1, 1 trip detection logic*2).	• Shift solenoid valve SLT remains open or closed • Shift solenoid valve S1, S2, S3, S4 or SL2 remains open or closed • Gear 6 incorrect ratio (sequence valve) or 1-2 shift valve is stuck • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)

HINT:

- ***1: w/ OBD**
- ***2: w/o OBD**

MONITOR DESCRIPTION

The ECM calculates the amount of heat absorbed by the friction material based on the difference in revolution (clutch slippage) between the turbine and output shaft. The ECM illuminates the MIL and stores this DTC when the amount of heat absorption exceeds the specified value.
There are two reasons that make the revolution different.

- When the shift solenoid valve SLT remains on, oil pressure goes down and clutch engagement force decreases.
- When the shift solenoid valve remains on or off, the gear position commanded by the ECM and the actual gear position are not the same.

NOTICE:

If you continue driving under these conditions, the clutch will burn out and the vehicle will no longer be drivable.

INSPECTION PROCEDURE

1.CHECK DTC OUTPUT (IN ADDITION TO DTCS P0894 AND P2714)

a. Connect the intelligent tester to the DLC3.

b. Turn the ignition switch to ON.

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / ECT / Trouble Codes.

e. Read the DTCs using the tester.

Result

Result	Proceed to
P0894 and/or P2714 is output	A
P0894, P2714 and other DTCs are output	B

HINT:

If any other codes besides P0894 and P2714 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

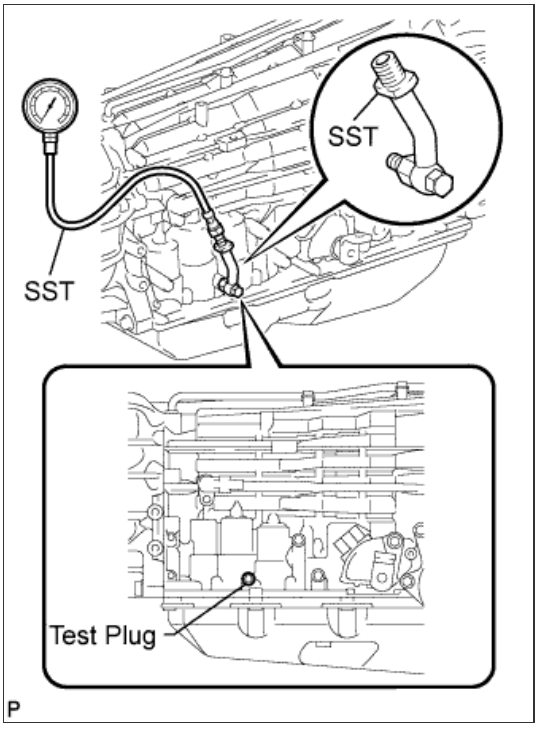
HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST

09992-00095 (09992-00231, 09992-00271)



b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

h. Measure the line pressure.

ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → Go to step 17

OK

3.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (RUNNING TEST)

CAUTION:

This test should always be performed with at least 2 people.

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Perform the test with the A/C turned off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Connect the intelligent tester to the DLC3.

b. Clear the DTC (Click here).

c. Warm up the engine.

d. Enter the following menus: Powertrain / ECT / Active Test.

e. According to the display on the tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the tester.**

f. Compare the ECM gear shift command and the actual gear position.

OK:

Gear position changes in accordance with the tester command.

Result

System Condition			ECM Gear Shift Command						Proceed to
			1st	2nd	3rd	4th	5th	6th	
Malfunction	Shift solenoid valve S1	Stuck ON*1	2nd	2nd	3rd	4th	5th	6th	A
		Stuck OFF	1st	1st	3rd	4th	5th	N*2	
	Shift solenoid valve S2	Stuck ON	1st	2nd	2nd	4th	6th	6th	B
		Stuck OFF	3rd	3rd	3rd	4th	5th	5th	
	Shift solenoid valve S3	Stuck ON	1st	2nd	3rd	3rd	N*2	N*2	C
		Stuck OFF	3rd	4th	4th	4th	5th	6th	
	Shift solenoid valve S4	Stuck ON*3	1st	2nd	3rd	4th	5th	6th	D
		Stuck OFF	1st	2nd	3rd	4th	4th	4th	
Normal			1st	2nd	3rd	4th	5th	6th	E

HINT:

- ***1: When shift solenoid valve S1 is stuck ON, the vehicle cannot drive in reverse.**
- ***2: Neutral**
- ***3: When shift solenoid valve S4 is stuck ON, gear shifting is normal.**

B	Go to step 7
C	Go to step 10
D	Go to step 13
E	Go to step 17

A

4.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

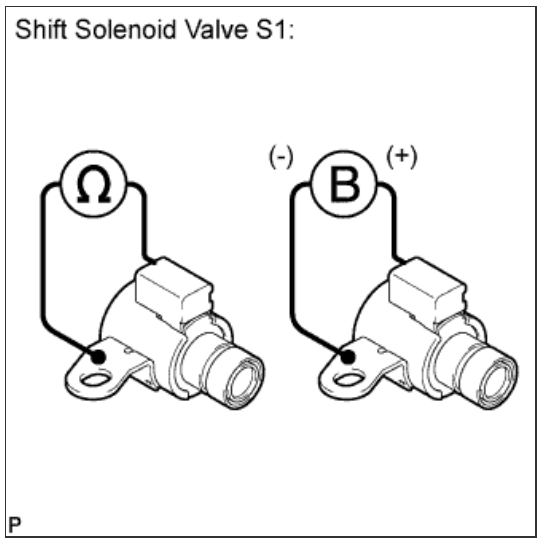
Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector	Valve moves and makes an

Shift Solenoid Valve S1:



P

• Battery negative (-) → Shift solenoid valve S1 body	operating noise

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

5.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:
There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

6.INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

a. Check the torque converter clutch assembly (Click here).

OK:
The torque converter clutch operates normally.

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

7.INSPECT SHIFT SOLENOID VALVE S2

a. Remove the shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

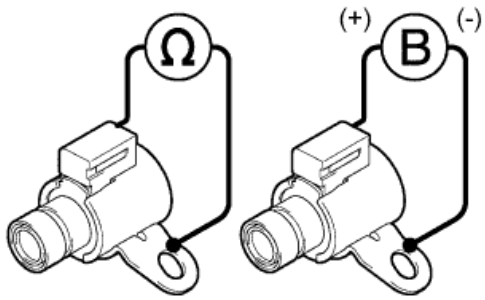
Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

Shift Solenoid Valve S2:



P

NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK

8.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

9.INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

a. Check the torque converter clutch assembly (Click here).

OK:

The torque converter clutch operates normally.

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

10.INSPECT SHIFT SOLENOID VALVE S3

a. Remove the shift solenoid valve S3.

b. Measure the resistance according to the value(s) in the table below.

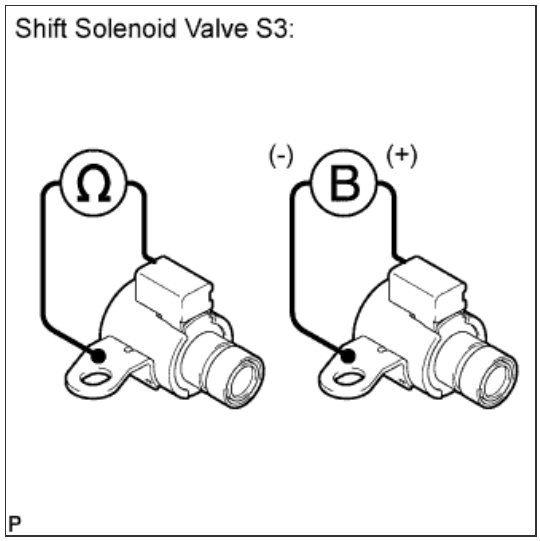
Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S3 connector • Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise



NG → REPLACE SHIFT SOLENOID VALVE S3 (Click here)

OK

11.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:
There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

12.INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

a. Check the torque converter clutch assembly (Click here).

OK:
The torque converter clutch operates normally.

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

13.INSPECT SHIFT SOLENOID VALVE S4

a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

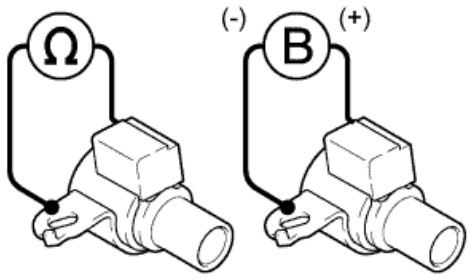
Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Shift Solenoid Valve S4:



P

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK

14.INSPECT SHIFT SOLENOID VALVE SL2

a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

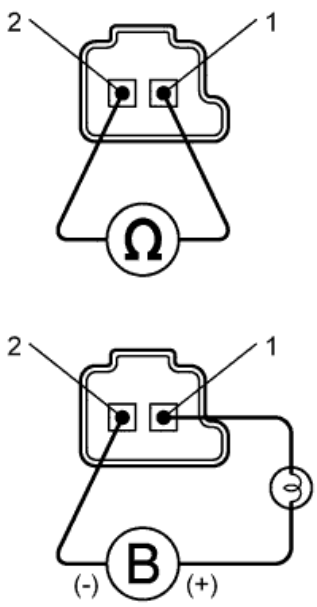
Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Component without harness connected:
(Shift Solenoid Valve SL2)



NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK

15.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:
There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

16.INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

a. Check the torque converter clutch assembly (Click here).

OK:
The torque converter clutch operates normally.

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

17.INSPECT SHIFT SOLENOID VALVE SLT

a. Remove the shift solenoid valve SLT.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

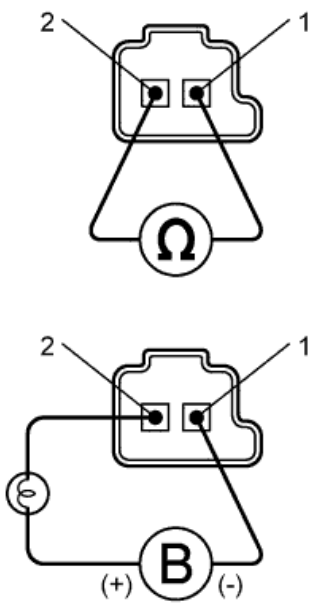
Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise

Component without harness connected:
(Shift Solenoid Valve SLT)



NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

18.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:
There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

19.INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

a. Check the torque converter clutch assembly (Click here).

OK:
The torque converter clutch operates normally.

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P0560 System Voltage

for Preparation Click here

DESCRIPTION

The battery supplies electricity to the ECM even when the ignition switch is off. This power allows the ECM to store data such as DTC history, freeze frame data and fuel trim values. If the battery voltage falls below a minimum level, the ECM memory is cleared and the ECM determines that there is a malfunction in the power supply circuit. When the engine is next started, the ECM illuminates the MIL and stores the DTC.

DTC Code	DTC Detection Condition	Trouble Area
P0560	The voltage at terminal BATT drops excessively for 3 seconds and part of the stored values in the ECU are initialized (1 trip detection logic).	• Open in back up power source circuit (to BATT terminal) • Battery • Battery terminals • EFI MAIN fuse • ECM

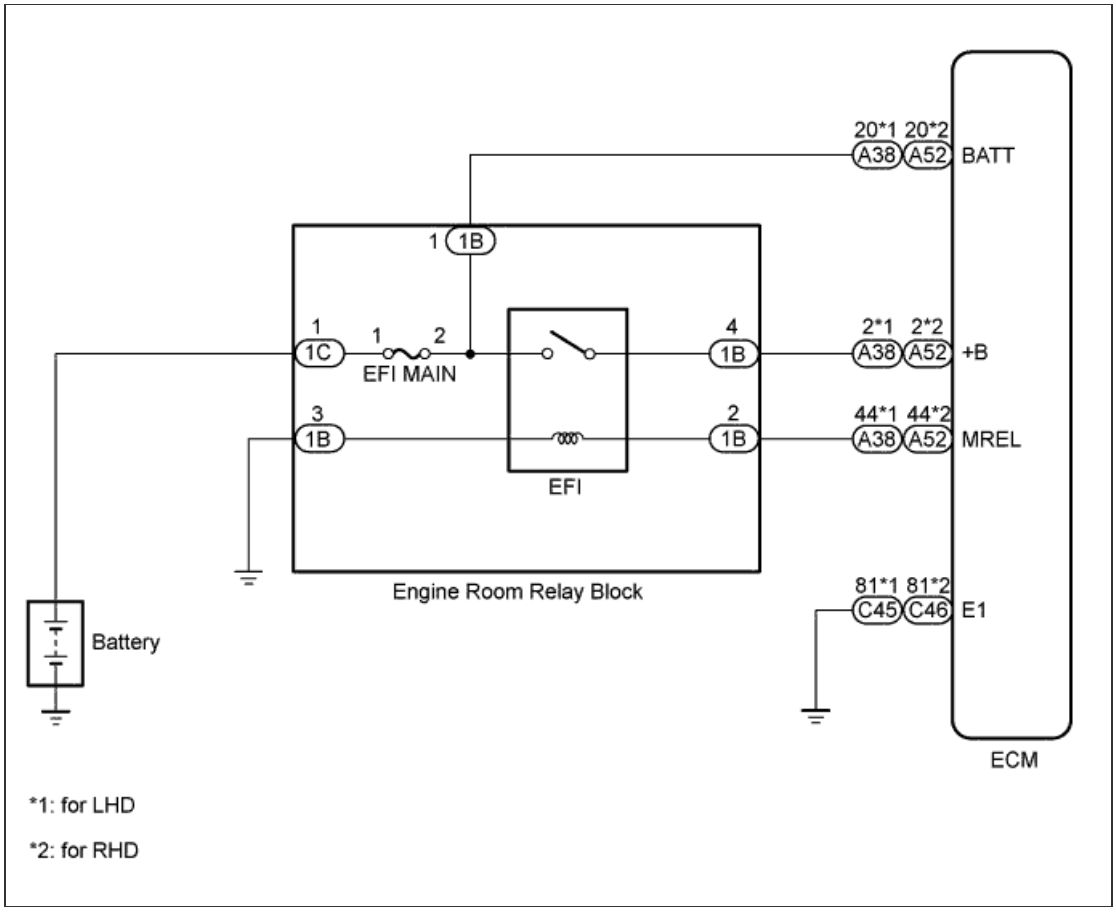
Related Data List

DTC No.	Data List
P0560	Battery Voltage

HINT:

If DTC P0560 is stored, the ECM does not store other DTCs or the data stored in the ECM is partly erased.

WIRING DIAGRAM



INSPECTION PROCEDURE

NOTICE:

After replacing the ECM, the new ECM needs registration (Click here) and initialization (Click here).

HINT:

- **Read freeze frame data using the intelligent tester. Freeze frame data records the engine condition when malfunctions are detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, and other data from the time the malfunction occurred.**
- **When the ignition switch is ON, even though +B voltage is present, when the voltage at terminal BATT (power supply for maintaining memorized values in the ECM) drops excessively, a DTC is stored.**

1.INSPECT FUSE (EFI MAIN)

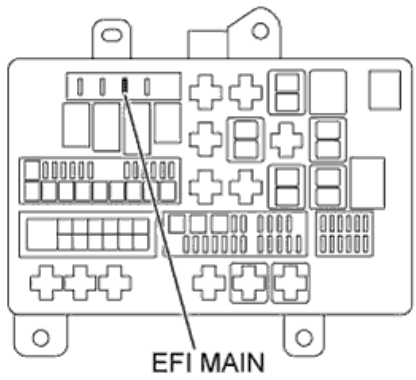
a. Remove the EFI MAIN fuse from the engine room relay block.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
EFI MAIN Fuse	Always	Below 1 Ω

Engine Room Relay Block:



NG → Go to step 7

OK

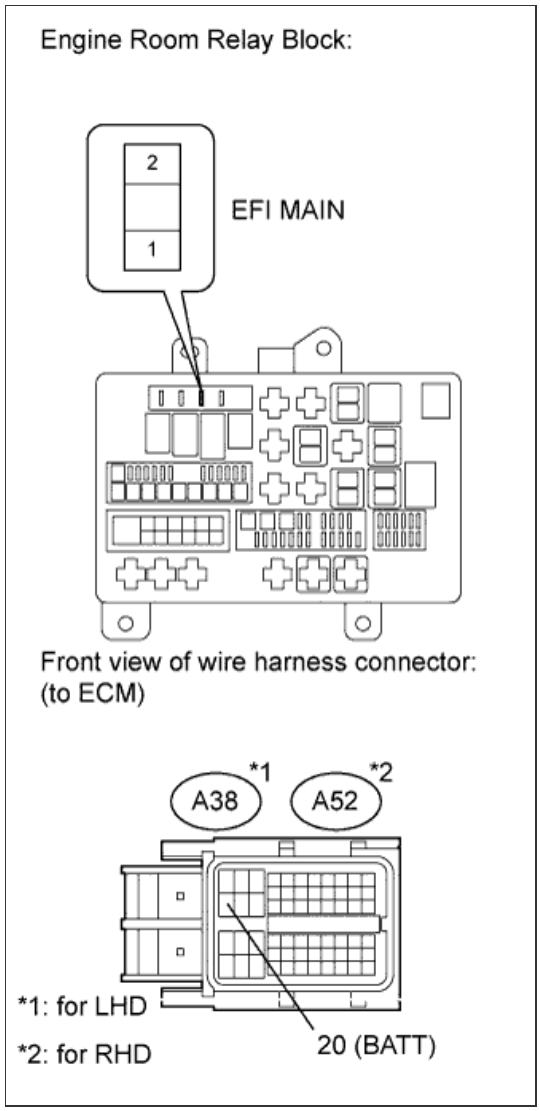
2.CHECK HARNESS AND CONNECTOR (ENGINE ROOM RELAY BLOCK - ECM, BATTERY)

a. Check the harness and the connector between the EFI MAIN fuse and ECM.

i. Remove the EFI MAIN fuse from the engine room relay block.

ii. Disconnect the ECM connector.

iii. Measure the resistance according to the value(s) in the table below.



Standard Resistance (Check for Open):

for LHD

Tester Connection	Condition	Specified Condition
EFI MAIN fuse (2) - A38-20 (BATT)	Always	Below 1 Ω

for RHD

Tester Connection	Condition	Specified Condition
EFI MAIN fuse (2) - A52-20 (BATT)	Always	Below 1 Ω

Standard Resistance (Check for Short):

for LHD

Tester Connection	Condition	Specified Condition
EFI MAIN fuse (2) or A38-20 (BATT) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
EFI MAIN fuse (2) or A52-20 (BATT) - Body ground	Always	10 kΩ or higher

b. Check the harness and the connector between the EFI MAIN fuse and battery.

i. Remove the EFI MAIN fuse from the engine room relay block.

ii. Disconnect the cable from the positive (+) battery terminal.

iii. Measure the resistance according to the value(s) in the table below.

Standard Resistance (Check for Open):

Tester Connection	Condition	Specified Condition
Battery positive terminal - EFI MAIN fuse (1)	Always	Below 1 Ω

Standard Resistance (Check for Short):

Tester Connection	Condition	Specified Condition
Battery positive terminal or EFI MAIN fuse (1) - Body ground	Always	10 kΩ or higher

NG → Go to step 8

OK

3.INSPECT BATTERY

a. Check that the battery is not depleted.

OK:
Battery is not depleted.

NG → Go to step 9

OK

4.CHECK BATTERY TERMINAL

a. Check that the battery terminals are not loose or corroded.

OK:
Battery terminals are not loose or corroded.

NG → Go to step 10

OK

5.CHECK WHETHER DTC OUTPUT RECURS

a. Connect the intelligent tester to the DLC3.

b. Turn the ignition switch to ON and turn the tester on.

c. Clear the DTCs (Click here).

d. Turn the ignition switch off.

e. Turn the ignition switch to ON for 3 seconds.

f. Enter the following menus: Powertrain / ECT / DTC.

g. Read the DTCs.

Result

Result	Proceed to
P0560 is output	A
No DTC is output	B

B → END

A

6.REPLACE ECM

a. Replace the ECM (Click here).

NEXT → Go to step 11

7.CHECK FOR SHORTS IN ALL HARNESSES AND CONNECTORS CONNECTED TO FUSE AND REPLACE FUSE

NEXT → Go to step 11

8.REPAIR OR REPLACE HARNESS OR CONNECTOR

NEXT → Go to step 11

9.REPLACE BATTERY

NEXT → Go to step 11

10.REPAIR OR REPLACE BATTERY TERMINAL

NEXT

11.CONFIRM WHETHER MALFUNCTION HAS BEEN SUCCESSFULLY REPAIRED

a. Connect the intelligent tester to the DLC3.

b. Clear the DTCs (Click here).

c. Turn the ignition switch off.

d. Turn the ignition switch to ON for 3 seconds.

e. Enter the following menus: Powertrain / ECT / DTC.

f. Confirm that the DTC is not output again.

NEXT

END

DTC P0973 Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)

DTC P0974 Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)

for Preparation Click here

DESCRIPTION

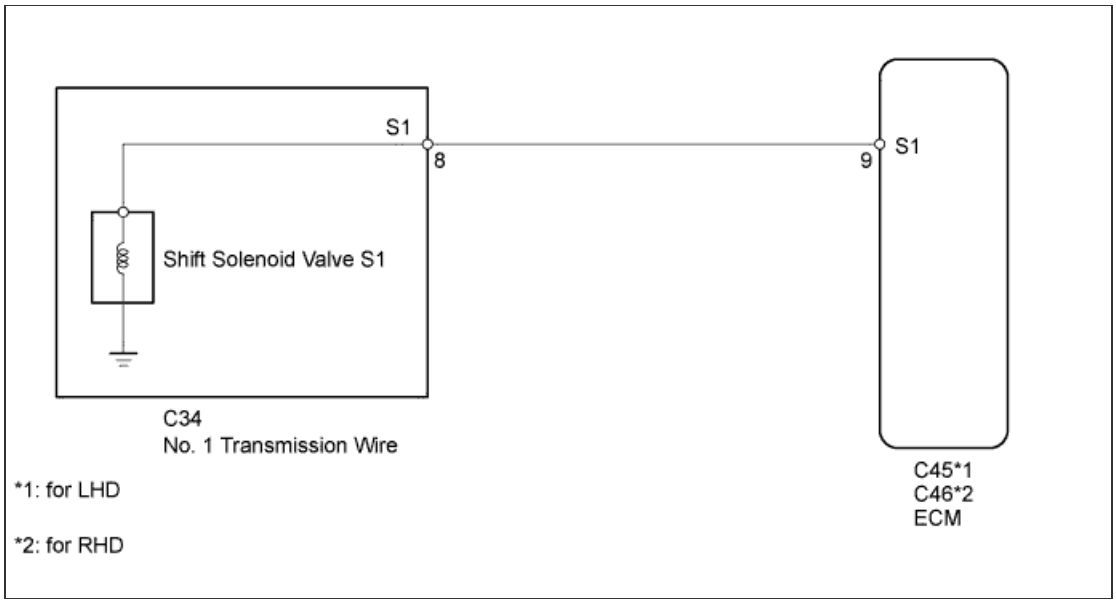
Shifting from 1st to 6th is performed in combination with ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0973	The ECM detects a short in the solenoid valve S1 circuit 2 times when the solenoid valve S1 is operated (1 trip detection logic).	• Short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM
P0974	The ECM detects an open in the solenoid valve S1 circuit 2 times when the solenoid valve S1 is not operated (1 trip detection logic).	• Open in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S1 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S1 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S1 circuit.
When the shift solenoid valve S1 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S1 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve S1 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S1	OFF	ON	ON	ON	ON	ON

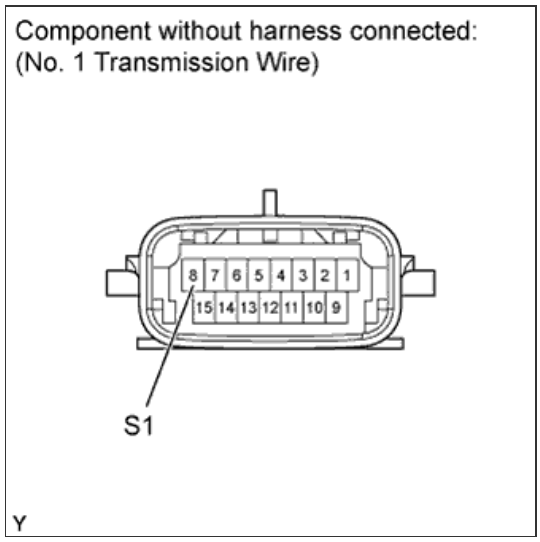
1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S1)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
8 (S1) - Body ground	20°C (68°F)	11 to 15 Ω



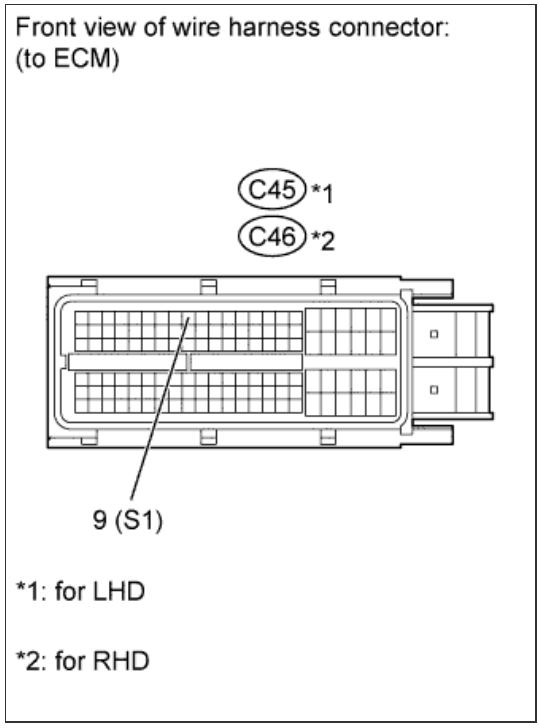
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-9 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-9 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

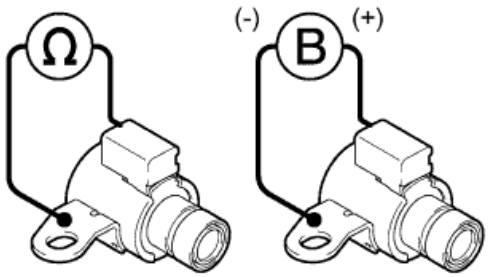
Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

Shift Solenoid Valve S1:



P

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0705 Transmission Range Sensor Circuit Malfunction (PRNDL Input)

for Preparation Click here

DESCRIPTION

The Park/Neutral Position (PNP) switch detects the shift lever position and sends signals to the ECM.

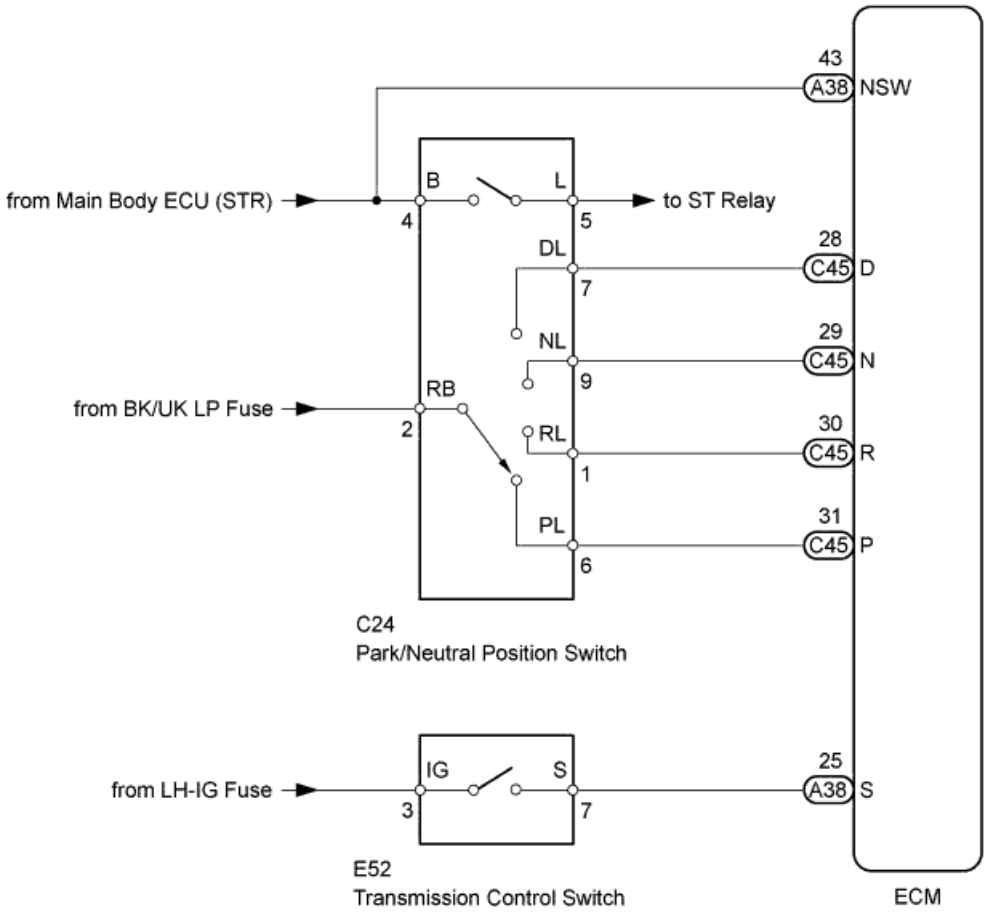
DTC Code	DTC Detection Condition	Trouble Area
P0705	When one of the following conditions is met: (A) Any 2 or more of the following signals are ON simultaneously (2 trip detection logic). • P input signal • N input signal • R input signal • D input signal (B) Any 2 or more of the following signals are ON simultaneously (2 trip detection logic). • NSW input signal • R input signal • D input signal (C) Any of the following signals are ON for 2.0 sec. or more when the shift lever is in S (2 trip detection logic). • NSW input signal • P input signal • N input signal • R input signal (D) All the signals are OFF simultaneously for the P, R, N and D positions (2 trip detection logic).	• Park/neutral position switch • Transmission control switch (Lower shift lever assembly) • Open or short in park/neutral position switch circuit • ECM

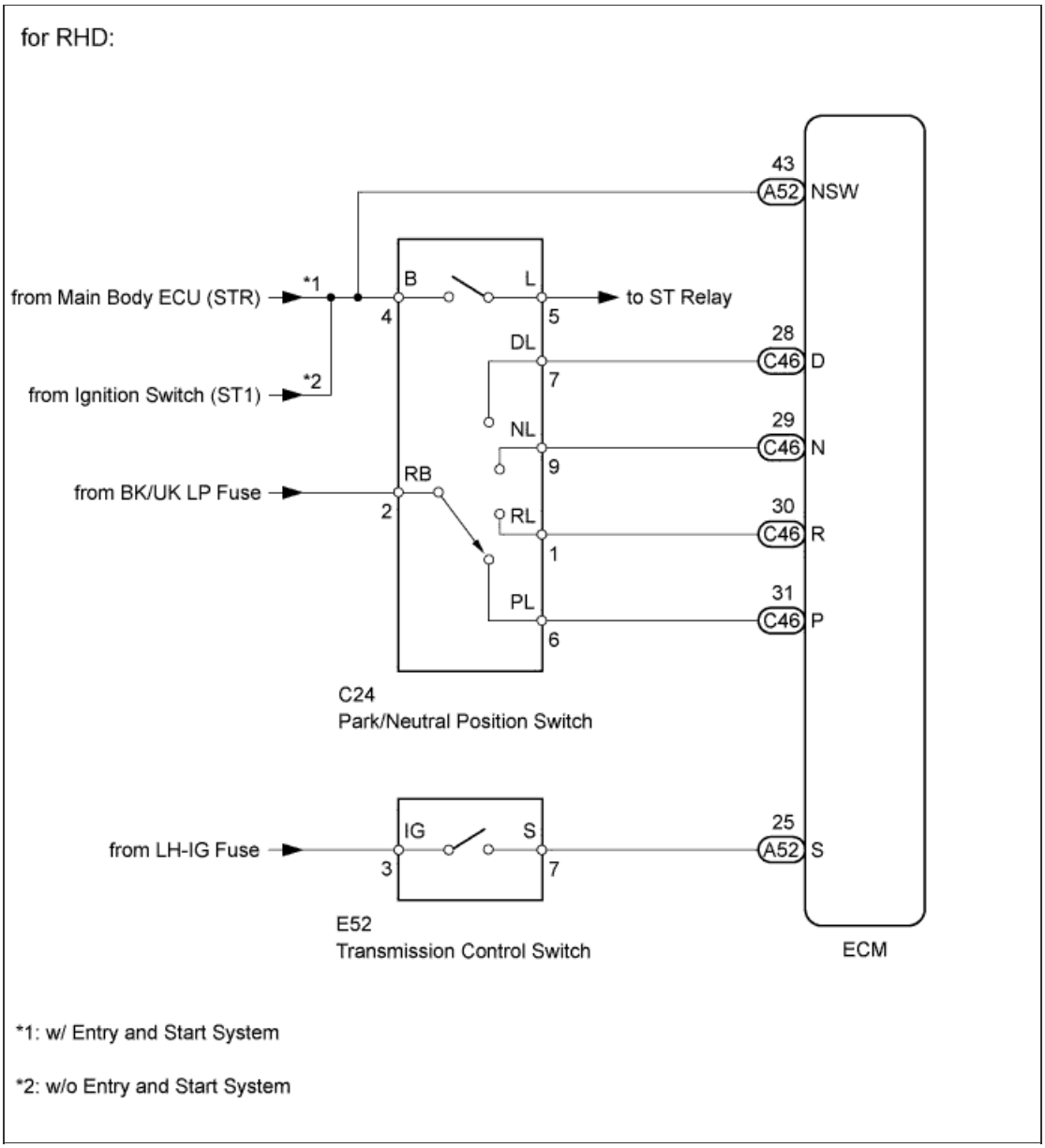
MONITOR DESCRIPTION

This DTC indicates a problem with the park/neutral position switch and the wire harness in the park/neutral position switch circuit.
The park/neutral position switch detects the shift lever position and sends a signal to the ECM.
For security, the park/neutral position switch detects the shift lever position so that the engine can be started only when the shift lever is in P or N.
The park/neutral position switch sends a signal to the ECM according to the shift lever position (P, R, N, D or S).
The ECM determines that there is a problem with the switch or related parts if it receives more than 1 position signal simultaneously. The ECM will illuminate the MIL and store the DTC.

WIRING DIAGRAM

for LHD:


43
A38
NSW
from Main Body ECU (STR)
B
L
to ST Relay
4
5
DL
28
C45
D
7
NL
29
C45
N
9
from BK/UK LP Fuse
RB
2
RL
30
C45
R
1
PL
31
C45
P
6
C24
Park/Neutral Position Switch
from LH-IG Fuse
IG
S
25
A38
S
3
7
E52
Transmission Control Switch
ECM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the ignition switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the ignition switch to ON.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Data List.

g. According to the display on the tester, read the Data List.

ECT

Tester	Measurement	Normal Condition	Diagnostic Note

Display	Item/Range		
Neutral Position SW Signal	PNP switch status/ ON or OFF	Shift lever: • In P or N: ON • Not in P or N: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Shift SW Status (R Range)	PNP switch status/ ON or OFF	Shift lever: • In R: ON • Not in R: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Shift SW Status (P Range)	PNP switch status/ ON or OFF	Shift lever: • In P: ON • Not in P: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Shift SW Status (N Range)	PNP switch status/ ON or OFF	Shift lever: • In N: ON • Not in N: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Shift SW Status (D Range)	PNP switch status/ ON or OFF	Shift lever: • In D: ON • Not in D: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Sports Shift Up SW	Sport shift up switch status/ ON or OFF	• ON: Shift lever held in "+" (up-shift) • OFF: Shift lever not in "+" (up-shift)	-
Sports Shift Down SW	Sport shift down switch status/ ON or OFF	• ON: Shift lever held in "-" (down-shift) • OFF: Shift lever not in "-" (down-shift)	-

1.INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY

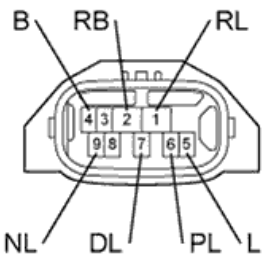
a. Disconnect the park/neutral position switch connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
• 2 (RB) - 6 (PL) • 4 (B) - 5 (L)	Shift lever in P	Below 1 Ω
2 (RB) - 1 (RL)	Shift lever in R	Below 1 Ω
• 2 (RB) - 9 (NL) • 4 (B) - 5 (L)	Shift lever in N	Below 1 Ω
2 (RB) - 7 (DL)	• Shift lever in D • Shift lever in S, "+" or "-"	Below 1 Ω
• 2 (RB)		

Component without harness connected:
(Park/Neutral Position Switch)



• 6 (PL) • 4 (B) - 5 (L)	Shift lever not in P	10 kΩ or higher
2 (RB) - 1 (RL)	Shift lever not in R	10 kΩ or higher
• 2 (RB) - 9 (NL) • 4 (B) - 5 (L)	Shift lever not in N	10 kΩ or higher
2 (RB) - 7 (DL)	• Shift lever not in D • Shift lever not in S, "+" or "-"	10 kΩ or higher

NG → REPLACE PARK/NEUTRAL POSITION SWITCH ASSEMBLY (Click here)

OK

2.INSPECT TRANSMISSION CONTROL SWITCH

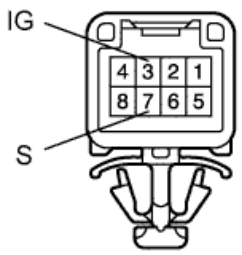
a. Disconnect the transmission control switch connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
3 (IG) - 7 (S)	Shift lever in S, "+" or "-"	Below 1 Ω
3 (IG) - 7 (S)	Shift lever not in S, "+" or "-"	10 kΩ or higher

Component without harness connected:
(Transmission Control Switch)



P

NG → REPLACE TRANSMISSION CONTROL SWITCH (LOWER SHIFT LEVER ASSEMBLY) (Click here)

OK

3.CHECK PARK/NEUTRAL POSITION SWITCH ASSEMBLY (POWER SOURCE)

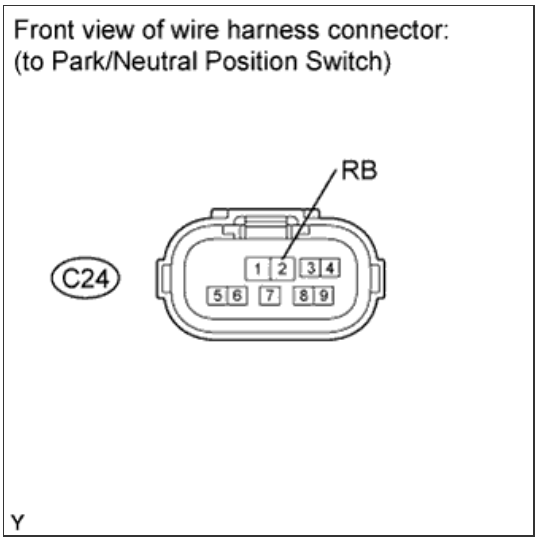
a. Disconnect the park/neutral position switch connector.

b. Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
C24-2 (RB) - Body ground	Ignition switch ON	11 to 14 V

C24-2 (RB) - Body ground	Ignition switch off	Below 1 V



NG → REPAIR OR REPLACE HARNESS OR CONNECTOR (PARK/NEUTRAL POSITION SWITCH - BK/UK LP FUSE)

OK

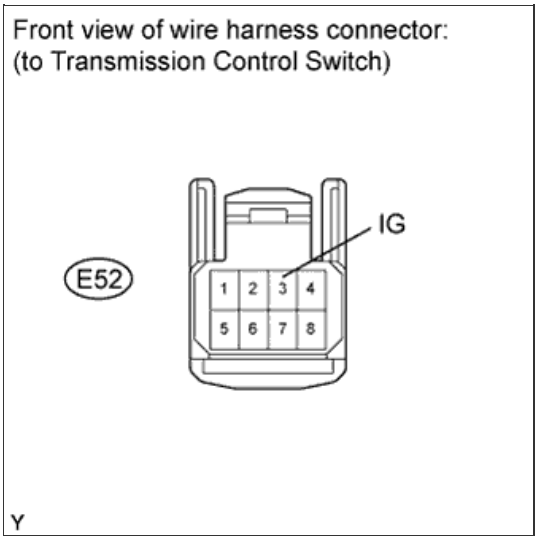
4.CHECK TRANSMISSION CONTROL SWITCH (POWER SOURCE)

a. Disconnect the transmission control switch connector.

b. Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
E52-3 (IG) - Body ground	Ignition switch ON	11 to 14 V
E52-3 (IG) - Body ground	Ignition switch off	Below 1 V



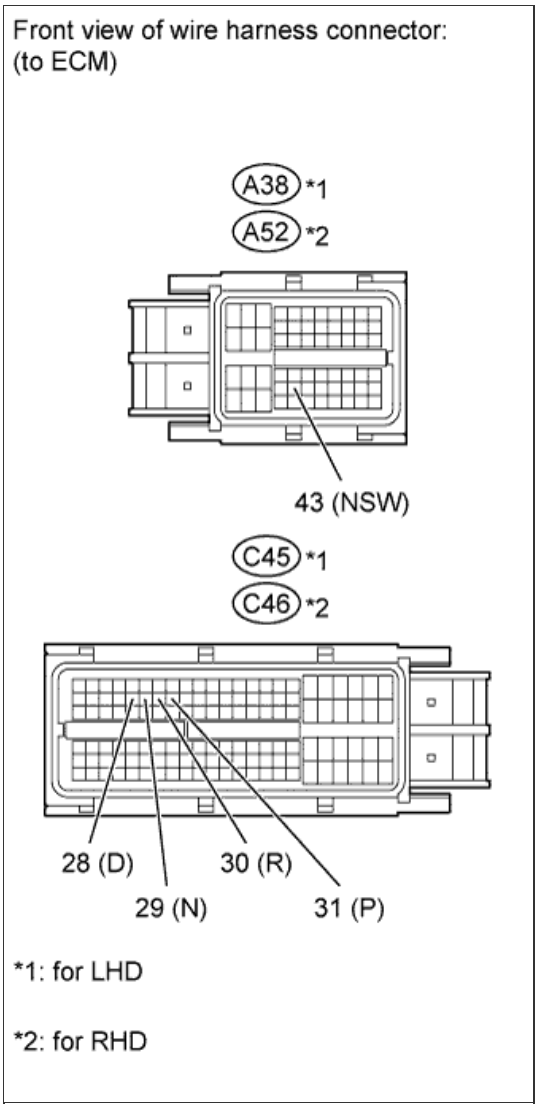
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR (TRANSMISSION CONTROL SWITCH - LH-IG FUSE)

OK

5.CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH - ECM)

a. Disconnect the ECM connector.

b. Measure the voltage according to the value(s) in the table below.



Standard Voltage:

for LHD

Tester Connection	Condition	Specified Condition
• C45-31 (P) - Body ground • A38-43 (NSW) - Body ground	• Ignition switch ON • Shift lever in P	11 to 14 V
C45-30 (R) - Body ground	• Ignition switch ON • Shift lever in R	11 to 14 V*
• C45-29 (N) - Body ground • A38-43 (NSW) - Body ground	• Ignition switch ON • Shift lever in N	11 to 14 V
C45-28 (D) - Body ground	• Ignition switch ON • Shift lever in D	11 to 14 V
• C45-31 (P) - Body ground • A38-43	• Ignition switch ON • Shift	Below 1 V

(NSW) - Body ground	lever not in P	
C45-30 (R) - Body ground	• Ignition switch ON • Shift lever not in R	Below 1 V
• C45-29 (N) - Body ground • A38-43 (NSW) - Body ground	• Ignition switch ON • Shift lever not in N	Below 1 V
C45-28 (D) - Body ground	• Ignition switch ON • Shift lever not in D	Below 1 V

for RHD

Tester Connection	Condition	Specified Condition
• C46-31 (P) - Body ground • A52-43 (NSW) - Body ground	• Ignition switch ON • Shift lever in P	11 to 14 V
C46-30 (R) - Body ground	• Ignition switch ON • Shift lever in R	11 to 14 V*
• C46-29 (N) - Body ground • A52-43 (NSW) - Body ground	• Ignition switch ON • Shift lever in N	11 to 14 V
C46-28 (D) - Body ground	• Ignition switch ON • Shift lever in D	11 to 14 V
• C46-31 (P) - Body ground • A52-43 (NSW) - Body ground	• Ignition switch ON • Shift lever not in P	Below 1 V
C46-30 (R) - Body ground	• Ignition switch ON • Shift lever not in R	Below 1 V
• C46-29 (N) - Body ground • A52-43 (NSW) - Body ground	• Ignition switch ON • Shift lever not in N	Below 1 V

C46-28 (D) - Body ground	• Ignition switch ON • Shift lever not in D	Below 1 V

HINT:

*: The voltage will drop slightly due to the turning on of the back up light.

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

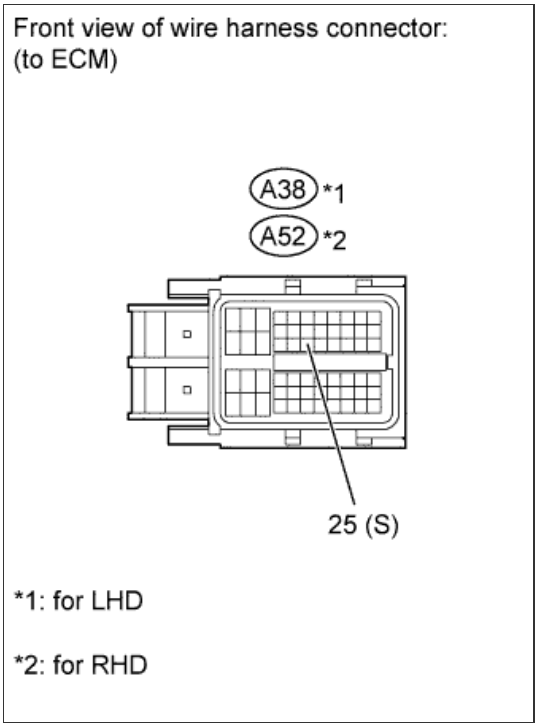
OK

6.CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL SWITCH - ECM)

a. Disconnect the ECM connector.

b. Turn the ignition switch to ON.

c. Measure the voltage according to the value(s) in the table below.



Standard Voltage:

for LHD

Tester Connection	Condition	Specified Condition
A38-25 (S) - Body ground	Shift lever in S, "+" or "-"	11 to 14 V
A38-25 (S) - Body ground	Shift lever not in S, "+" or "-"	Below 1 V

for RHD

Tester Connection	Condition	Specified Condition
A52-25 (S) - Body ground	Shift lever in S, "+" or "-"	11 to 14 V
A52-25 (S) - Body ground	Shift lever not in S, "+" or "-"	Below 1 V

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0973 Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)

DTC P0974 Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)

for Preparation Click here

DESCRIPTION

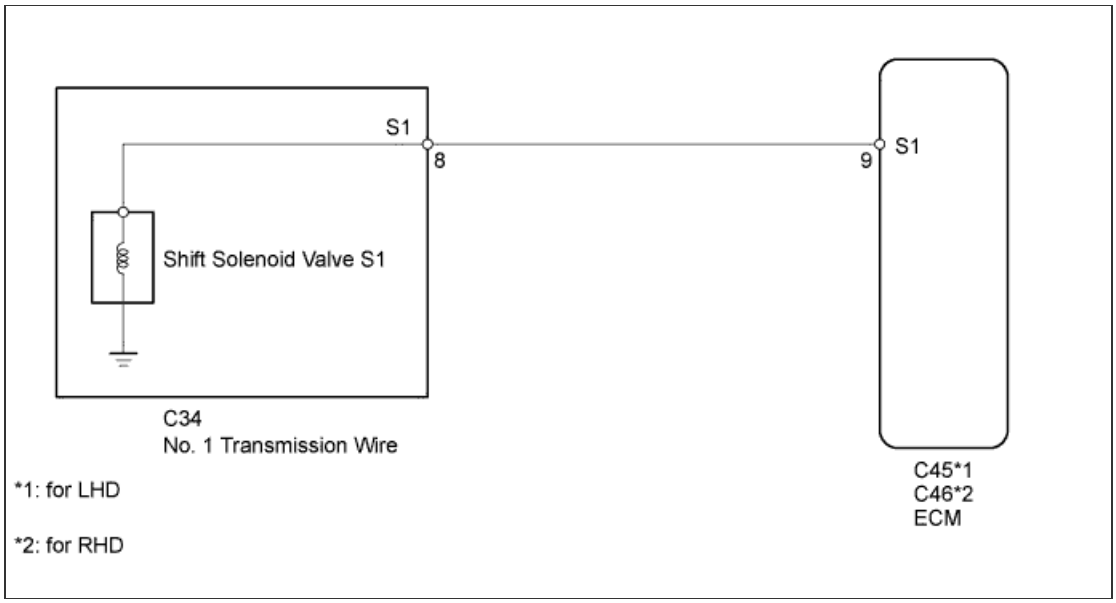
Shifting from 1st to 6th is performed in combination with ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0973	The ECM detects a short in the solenoid valve S1 circuit 2 times when the solenoid valve S1 is operated (1 trip detection logic).	• Short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM
P0974	The ECM detects an open in the solenoid valve S1 circuit 2 times when the solenoid valve S1 is not operated (1 trip detection logic).	• Open in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S1 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S1 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S1 circuit.
When the shift solenoid valve S1 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S1 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve S1 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S1	OFF	ON	ON	ON	ON	ON

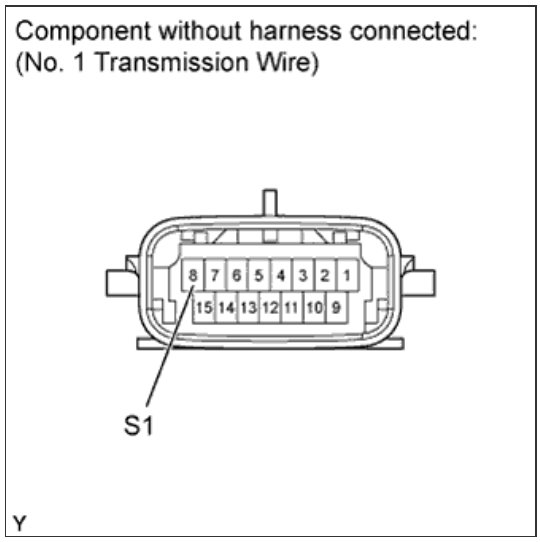
1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S1)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
8 (S1) - Body ground	20°C (68°F)	11 to 15 Ω



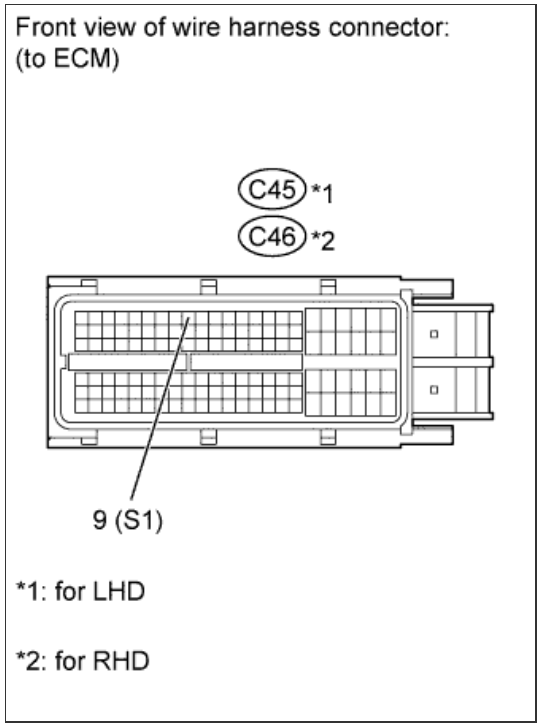
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-9 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-9 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

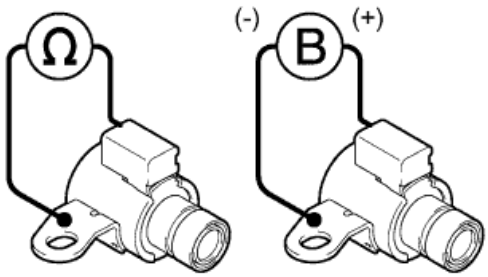
Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

Shift Solenoid Valve S1:



P

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0711 Transmission Fluid Temperature Sensor "A" Performance

for Preparation Click here

DESCRIPTION

Refer to DTC P0712 (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0711	Either condition is met (2-trip detection logic): (a) Certain monitor enabling conditions are met and the ATF temperature is below 20°C (68°F). (b) Certain monitor enabling conditions are met and the ATF temperature is 110°C (230°F) or higher.	No. 1 transmission wire (No. 1 ATF temperature sensor)

MONITOR DESCRIPTION

This DTC indicates that there is a problem with the signal from the Automatic Transmission Fluid (ATF) temperature sensor and that the sensor itself is defective. The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature and detects an open or short in the ATF temperature circuit or a fault in the ATF temperature sensor.
After running the vehicle for a certain period, the ATF temperature should increase. If the ATF temperature is below 20°C (68°F) after running the vehicle for a certain period, the ECM interprets this as a fault, and turns on the MIL.

WIRING DIAGRAM

Refer to DTC P0712 (Click here).

INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the ignition switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the ignition switch to ON.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Data List.

g. According to the display on the tester, read the Data List.

ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 1	No. 1 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 1 ATF temperature sensor circuit is open or shorted.

HINT:

When DTC P0712 is stored and the intelligent tester output is 150°C (302°F) or higher, there is a short circuit.

When DTC P0713 is stored and the intelligent tester output is -40°C (-40°F), there is an open circuit.

Check the temperature displayed on the tester in order to check if a malfunction exists.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or higher	Short circuit

If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately stored (in 0.5 seconds). When P0713 is stored, P0711 cannot be stored. It is not necessary to inspect the circuit when P0711 is stored.

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0711)

a. Connect the intelligent tester to the DLC3.

b. Turn the ignition switch to ON.

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / ECT / Trouble Codes.

e. Read the DTCs using the tester.

Result

Result	Proceed to
Only P0711 is output	A
P0711 and other DTCs are output	B

HINT:

If any other codes besides P0711 are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART (Click here)**

A

2.CHECK TRANSMISSION FLUID LEVEL

a. Check the transmission fluid level (Click here).

OK:

Automatic transmission fluid level is correct.

NG → **ADD FLUID (Click here)**

OK

REPAIR OR REPLACE NO. 1 ATF TEMPERATURE SENSOR (NO. 1 TRANSMISSION WIRE) (Click here)

DTC P0976 Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)

DTC P0977 Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)

for Preparation Click here

DESCRIPTION

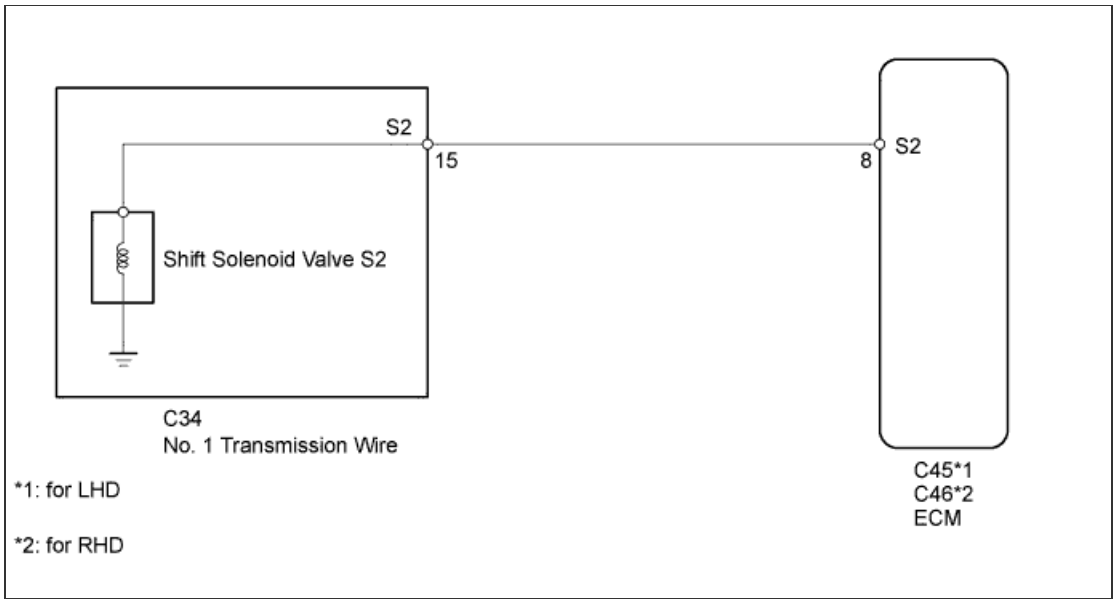
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0976	The ECM detects a short in the solenoid valve S2 circuit 2 times when the solenoid valve S2 is operated (1 trip detection logic).	• Short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM
P0977	The ECM detects an open in the solenoid valve S2 circuit 2 times when the solenoid valve S2 is not operated (1 trip detection logic).	• Open in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S2 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S2 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S2 circuit.
When the shift solenoid valve S2 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S2 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve S2 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S2	ON	ON	OFF	OFF	OFF	ON

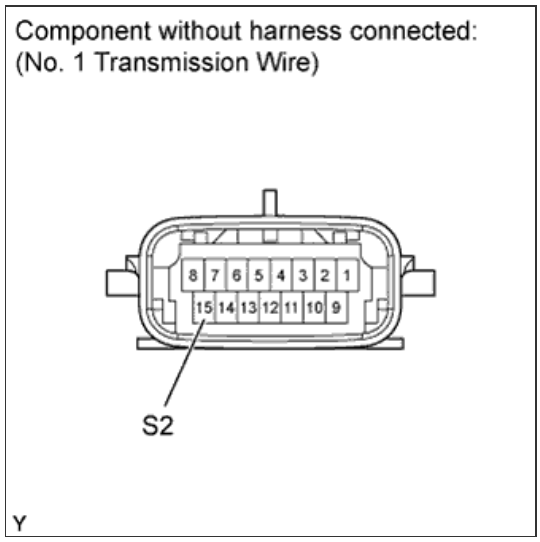
1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S2)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
15 (S2) - Body ground	20°C (68°F)	11 to 15 Ω



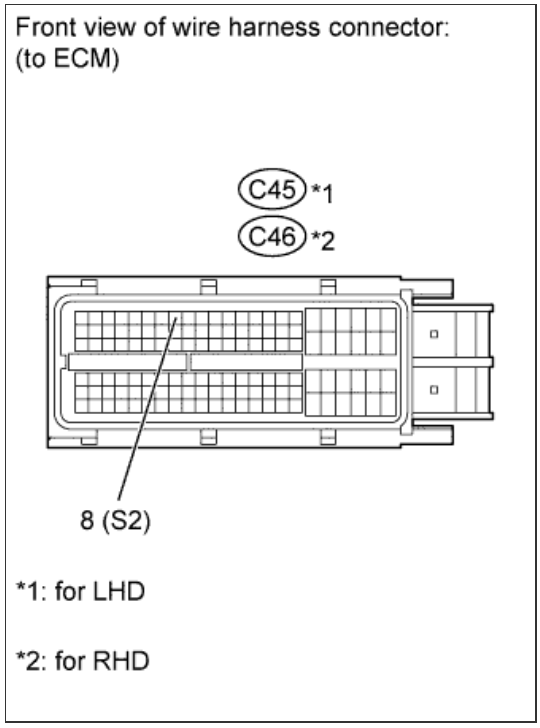
NG → Go to step 3

OK →

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-8 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-8 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE S2

a. Remove the shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

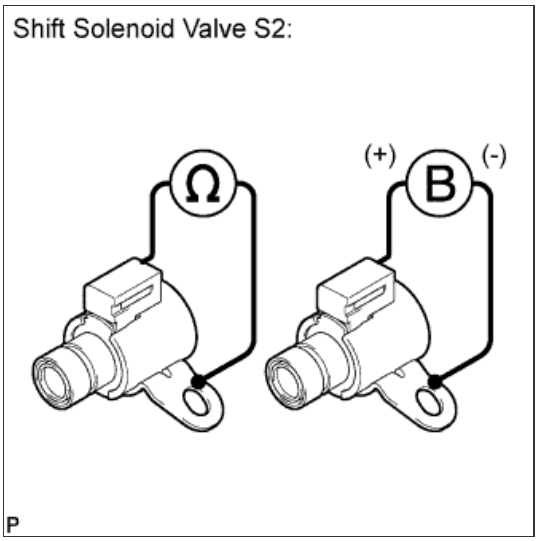
Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

Shift Solenoid Valve S2:



NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0712 Transmission Fluid Temperature Sensor "A" Circuit Low Input

DTC P0713 Transmission Fluid Temperature Sensor "A" Circuit High Input

for Preparation Click here

DESCRIPTION

The ATF temperature sensor converts the fluid temperature into a resistance value for use by the ECM.
The ECM applies a voltage to the temperature sensor through terminal THO1 of the ECM.
The sensor resistance changes with the ATF temperature. As the temperature becomes higher, the sensor resistance decreases.
One terminal of the sensor is grounded so that the sensor resistance decreases and the voltage goes down as the temperature becomes higher.
The ECM calculates the fluid temperature based on the voltage signal.

DTC Code	DTC Detection Condition	Trouble Area
P0712	The No. 1 ATF temperature sensor resistance is below 79 Ω for 0.5 seconds or more (1 trip detection logic).	• Short in No. 1 ATF temperature sensor circuit • No. 1 transmission wire (No. 1 ATF temperature sensor) • ECM
P0713	The No. 1 ATF temperature sensor resistance is higher than 156 kΩ for 0.5 seconds or more, and one of the following conditions is met (1 trip detection logic). Condition A: 15 minutes or more have elapsed. Condition B: If the conditions needed to detect DTC P0711 have been met, P0713 can be detected immediately following engine start.	• Open in No. 1 ATF temperature sensor circuit • No. 1 transmission wire (No. 1 ATF temperature sensor) • ECM

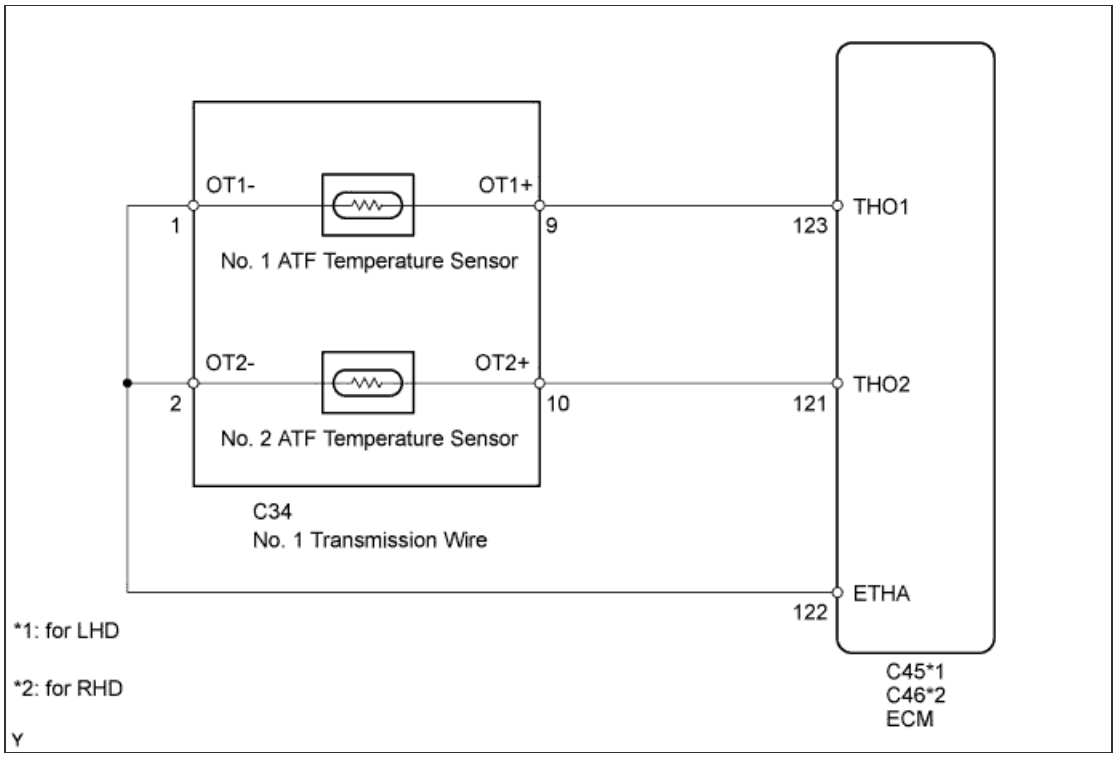
MONITOR DESCRIPTION

These DTCs indicate an open or short in the Automatic Transmission Fluid (ATF) temperature sensor circuit. The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is below 79 Ω*1 or higher than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM will turn on the MIL and store the DTC.

HINT:

- **The ATF temperature can be checked on the intelligent tester display.**
- ***1: 150°C (302°F) or higher is indicated regardless of the actual ATF temperature.**
- ***2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.**

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the ignition switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the ignition switch to ON.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Data List.

g. According to the display on the tester, read the Data List.

ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 1	No. 1 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 1 ATF temperature sensor circuit is open or shorted.

HINT:

When DTC P0712 is stored and the intelligent tester output is 150°C (302°F) or higher, there is a short circuit.

When DTC P0713 is stored and the intelligent tester output is -40°C (-40°F), there is an open circuit.

Check the temperature displayed on the tester in order to check if a malfunction exists.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or higher	Short circuit

If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately stored (in 0.5 seconds). When P0713 is stored, P0711 cannot be stored. It is not necessary to inspect the circuit when P0711 is stored.

1.INSPECT NO. 1 TRANSMISSION WIRE (NO. 1 ATF TEMPERATURE SENSOR)

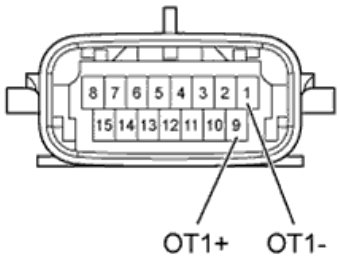
a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 (OT1-) - 9 (OT1+)	Always	79 Ω to 156 kΩ
1 (OT1-) - Body ground	Always	10 kΩ or higher
9 (OT1+) - Body ground	Always	10 kΩ or higher

Component without harness connected:
(No. 1 Transmission Wire)



Y

HINT:

If the resistance is out of the specified range of one of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Resistance (Reference):

ATF Temperature	Specified Condition
10°C (50°F)	5 to 8 kΩ
25°C (77°F)	2.5 to 4.5 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

NG → REPAIR OR REPLACE NO. 1 ATF TEMPERATURE SENSOR (NO. 1 TRANSMISSION WIRE) (Click here)

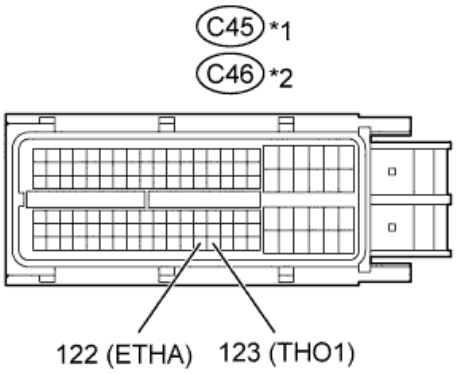
OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.

Front view of wire harness connector:
(to ECM)



*1: for LHD

*2: for RHD

Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-123 (THO1) - C45-122 (ETHA)	Always	79 Ω to 156 kΩ
C45-123 (THO1) - Body ground	Always	10 kΩ or higher
C45-122 (ETHA) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-123 (THO1) - C46-122 (ETHA)	Always	79 Ω to 156 kΩ
C46-123 (THO1) - Body ground	Always	10 kΩ or higher
C46-122 (ETHA) - Body ground	Always	10 kΩ or higher

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0976 Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)

DTC P0977 Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)

for Preparation Click here

DESCRIPTION

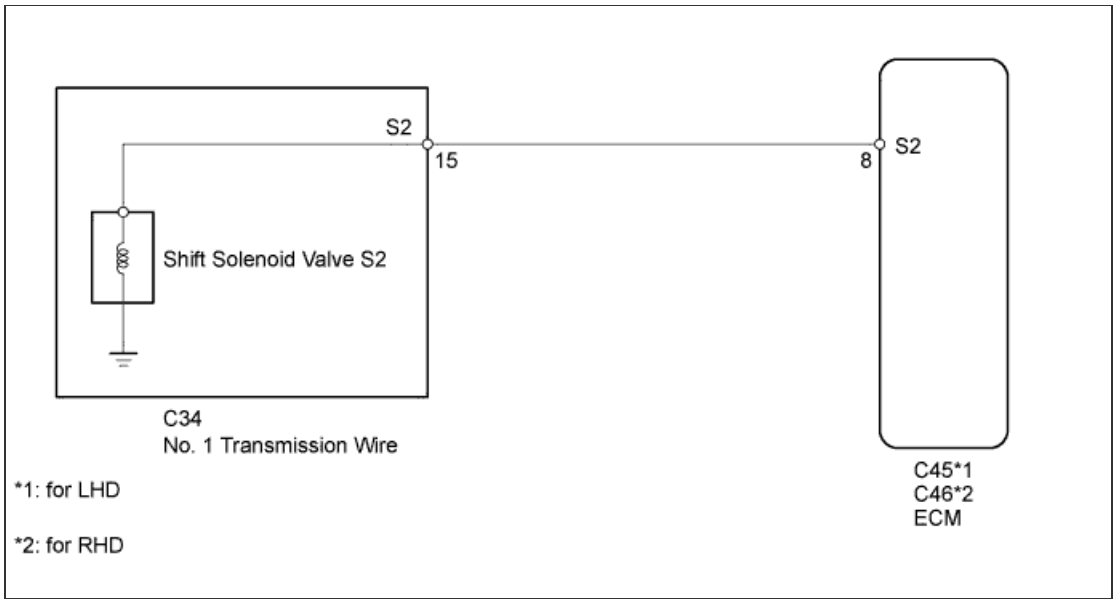
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0976	The ECM detects a short in the solenoid valve S2 circuit 2 times when the solenoid valve S2 is operated (1 trip detection logic).	• Short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM
P0977	The ECM detects an open in the solenoid valve S2 circuit 2 times when the solenoid valve S2 is not operated (1 trip detection logic).	• Open in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S2 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S2 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S2 circuit.
When the shift solenoid valve S2 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S2 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve S2 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S2	ON	ON	OFF	OFF	OFF	ON

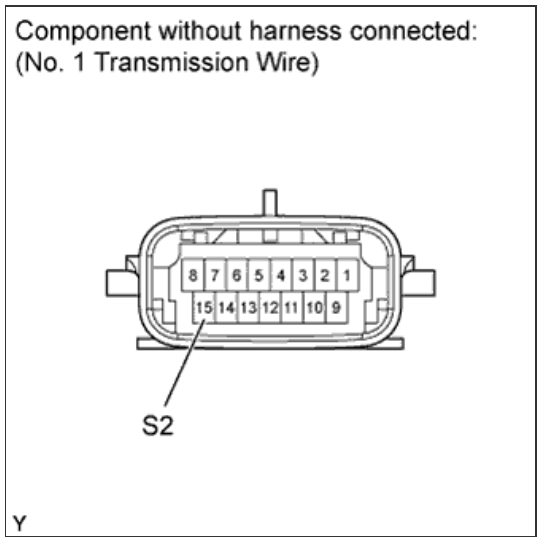
1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S2)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
15 (S2) - Body ground	20°C (68°F)	11 to 15 Ω



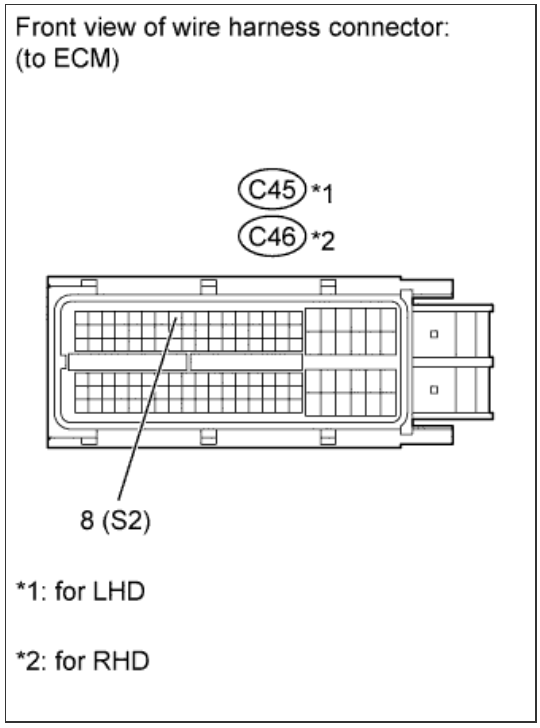
NG → Go to step 3

OK →

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-8 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-8 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE S2

a. Remove the shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

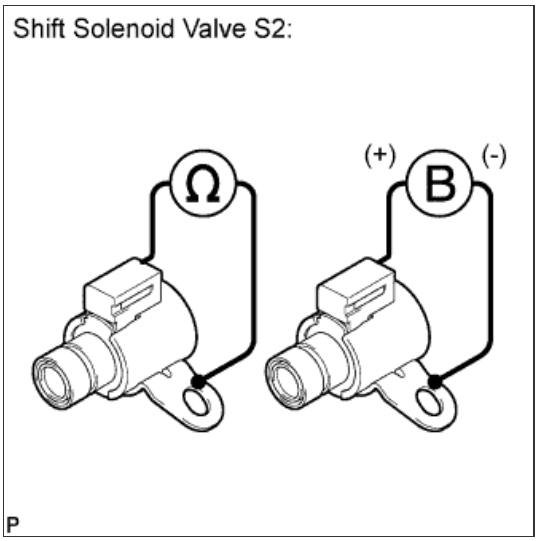
Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

Shift Solenoid Valve S2:



NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0712 Transmission Fluid Temperature Sensor "A" Circuit Low Input

DTC P0713 Transmission Fluid Temperature Sensor "A" Circuit High Input

for Preparation Click here

DESCRIPTION

The ATF temperature sensor converts the fluid temperature into a resistance value for use by the ECM.
The ECM applies a voltage to the temperature sensor through terminal THO1 of the ECM.
The sensor resistance changes with the ATF temperature. As the temperature becomes higher, the sensor resistance decreases.
One terminal of the sensor is grounded so that the sensor resistance decreases and the voltage goes down as the temperature becomes higher.
The ECM calculates the fluid temperature based on the voltage signal.

DTC Code	DTC Detection Condition	Trouble Area
P0712	The No. 1 ATF temperature sensor resistance is below 79 Ω for 0.5 seconds or more (1 trip detection logic).	• Short in No. 1 ATF temperature sensor circuit • No. 1 transmission wire (No. 1 ATF temperature sensor) • ECM
P0713	The No. 1 ATF temperature sensor resistance is higher than 156 kΩ for 0.5 seconds or more, and one of the following conditions is met (1 trip detection logic). Condition A: 15 minutes or more have elapsed. Condition B: If the conditions needed to detect DTC P0711 have been met, P0713 can be detected immediately following engine start.	• Open in No. 1 ATF temperature sensor circuit • No. 1 transmission wire (No. 1 ATF temperature sensor) • ECM

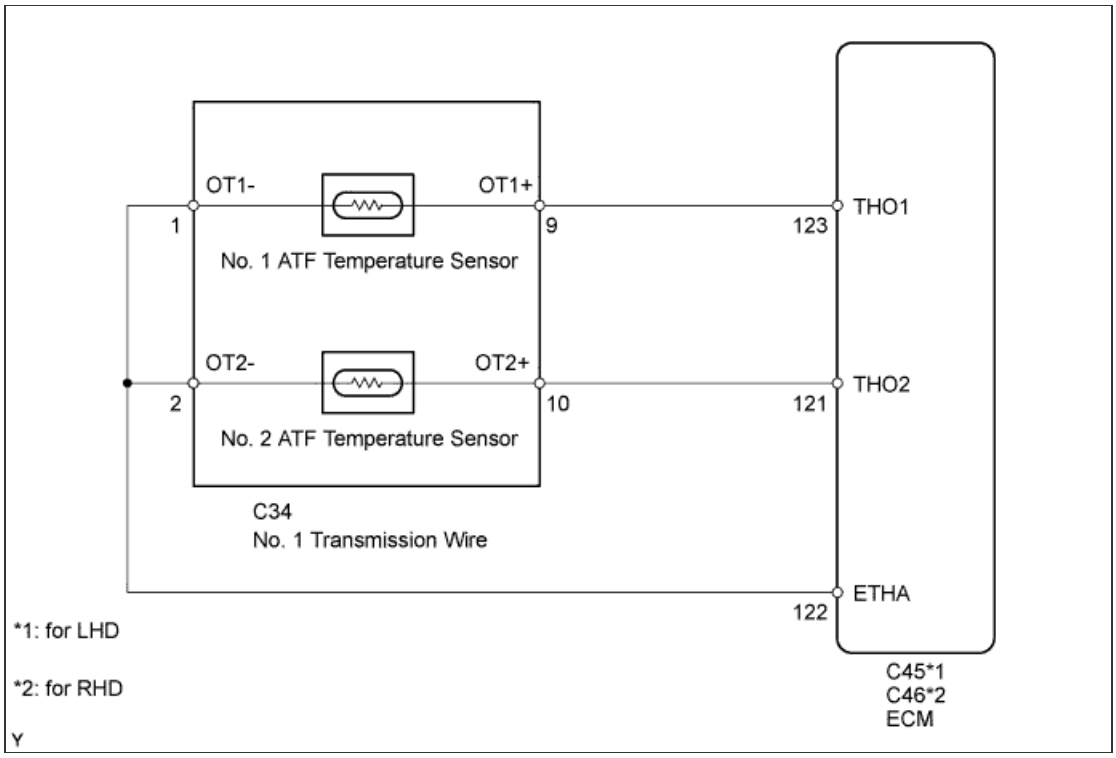
MONITOR DESCRIPTION

These DTCs indicate an open or short in the Automatic Transmission Fluid (ATF) temperature sensor circuit. The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is below 79 Ω*1 or higher than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM will turn on the MIL and store the DTC.

HINT:

- **The ATF temperature can be checked on the intelligent tester display.**
- ***1: 150°C (302°F) or higher is indicated regardless of the actual ATF temperature.**
- ***2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.**

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the ignition switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the ignition switch to ON.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Data List.

g. According to the display on the tester, read the Data List.

ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 1	No. 1 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 1 ATF temperature sensor circuit is open or shorted.

HINT:

When DTC P0712 is stored and the intelligent tester output is 150°C (302°F) or higher, there is a short circuit.

When DTC P0713 is stored and the intelligent tester output is -40°C (-40°F), there is an open circuit.

Check the temperature displayed on the tester in order to check if a malfunction exists.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or higher	Short circuit

If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately stored (in 0.5 seconds). When P0713 is stored, P0711 cannot be stored. It is not necessary to inspect the circuit when P0711 is stored.

1.INSPECT NO. 1 TRANSMISSION WIRE (NO. 1 ATF TEMPERATURE SENSOR)

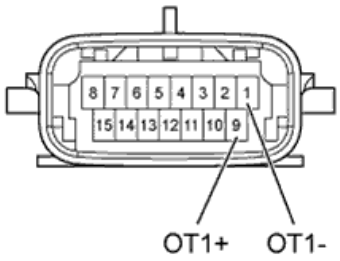
a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 (OT1-) - 9 (OT1+)	Always	79 Ω to 156 kΩ
1 (OT1-) - Body ground	Always	10 kΩ or higher
9 (OT1+) - Body ground	Always	10 kΩ or higher

Component without harness connected:
(No. 1 Transmission Wire)



Y

HINT:

If the resistance is out of the specified range of one of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Resistance (Reference):

ATF Temperature	Specified Condition
10°C (50°F)	5 to 8 kΩ
25°C (77°F)	2.5 to 4.5 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

NG → REPAIR OR REPLACE NO. 1 ATF TEMPERATURE SENSOR (NO. 1 TRANSMISSION WIRE) (Click here)

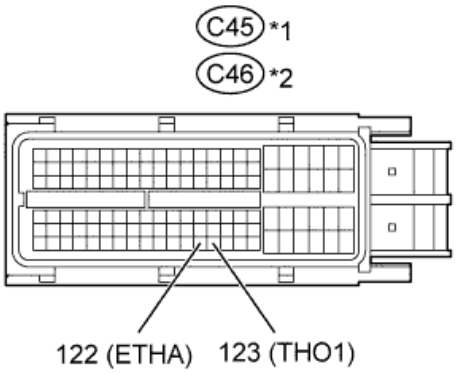
OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.

Front view of wire harness connector:
(to ECM)



*1: for LHD

*2: for RHD

Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-123 (THO1) - C45-122 (ETHA)	Always	79 Ω to 156 kΩ
C45-123 (THO1) - Body ground	Always	10 kΩ or higher
C45-122 (ETHA) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-123 (THO1) - C46-122 (ETHA)	Always	79 Ω to 156 kΩ
C46-123 (THO1) - Body ground	Always	10 kΩ or higher
C46-122 (ETHA) - Body ground	Always	10 kΩ or higher

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0979 Shift Solenoid "C" Control Circuit Low (Shift Solenoid Valve S3)

DTC P0980 Shift Solenoid "C" Control Circuit High (Shift Solenoid Valve S3)

for Preparation Click here

DESCRIPTION

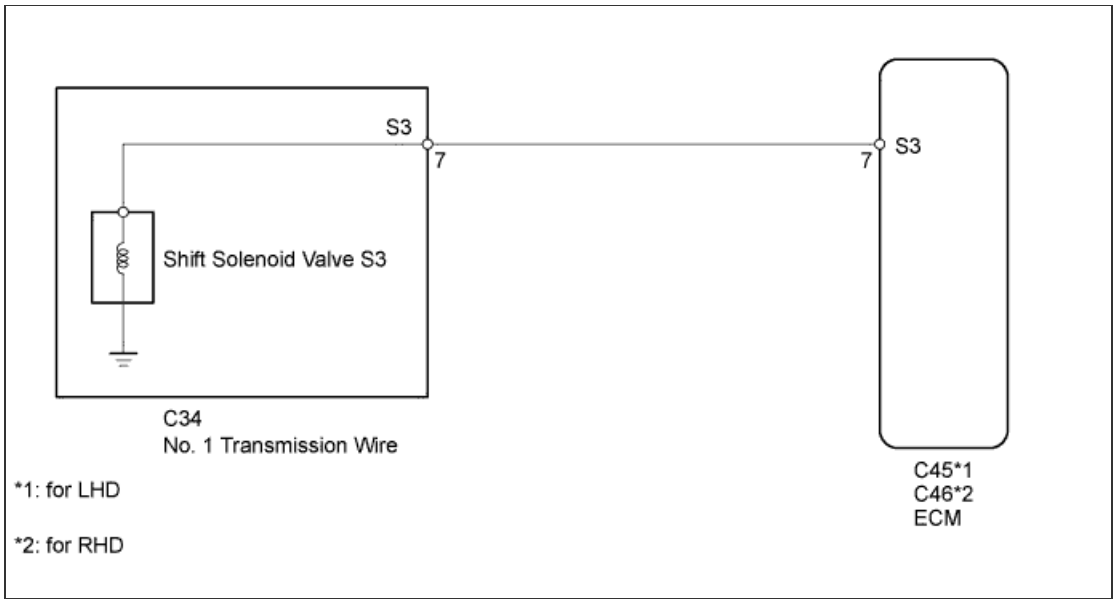
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0979	The ECM detects a short in the solenoid valve S3 circuit 2 times when the solenoid valve S3 is operated (1 trip detection logic).	• Short in shift solenoid valve S3 circuit • Shift solenoid valve S3 • ECM
P0980	The ECM detects an open in the solenoid valve S3 circuit 2 times when the solenoid valve S3 is not operated (1 trip detection logic).	• Open in shift solenoid valve S3 circuit • Shift solenoid valve S3 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S3 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S3 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S3 circuit.
When the shift solenoid valve S3 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S3 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve S3 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S3	ON	ON	ON	OFF	OFF	OFF

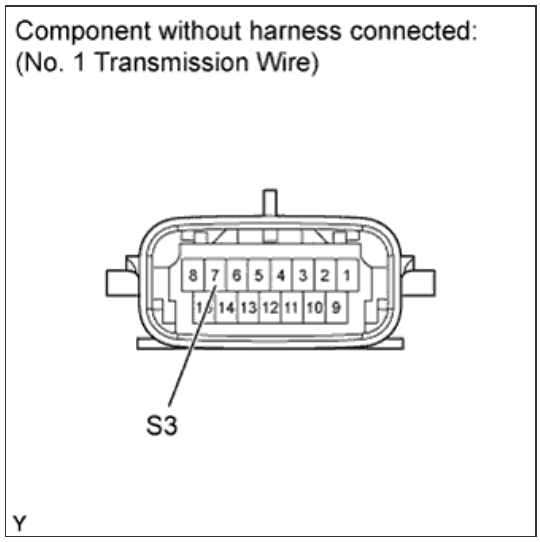
1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S3)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
7 (S3) - Body ground	20°C (68°F)	11 to 15 Ω



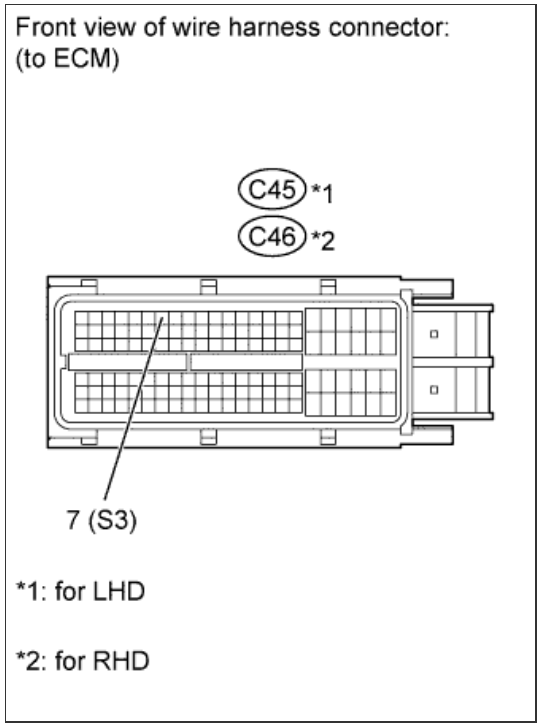
NG → Go to step 3

OK →

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-7 (S3) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-7 (S3) - Body ground	20°C (68°F)	11 to 15 Ω

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE S3

a. Remove the shift solenoid valve S3.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

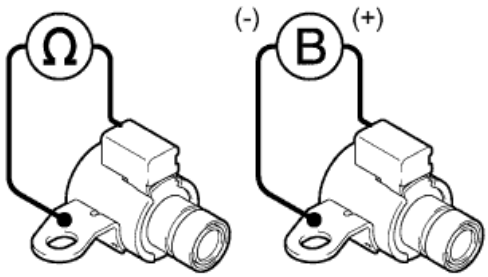
Tester Connection	Condition	Specified Condition
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S3 connector • Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise

Shift Solenoid Valve S3:



P

NG → REPLACE SHIFT SOLENOID VALVE S3 (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0717 Turbine Speed Sensor Circuit No Signal

for Preparation Click here

DESCRIPTION

This sensor detects the rotation speed of the turbine which shows the input revolution of the transmission. By comparing the input turbine speed signal NT with the counter gear speed sensor signal SP2, the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure according to various conditions. As a result, the gears shift smoothly.

DTC Code	DTC Detection Condition	Trouble Area
P0717	All the conditions below are detected for 5 sec. or more (1 trip detection logic*1, 2 trip detection logic*2). (a) Gear change is not performed. (b) The gear position is 4th, 5th or 6th. (c) The T/M input shaft rpm is 300 rpm or less. (d) The T/M output shaft rpm is 1000 rpm or more. (e) The park/neutral position switch: • The NSW input signal is OFF. • The R input signal is OFF. (f) The shift solenoid valves and park/neutral position switch are operating normally.	• Open or short in speed sensor NT circuit • Speed sensor NT • ECM • Automatic transmission (clutch, brake or gear, etc.)

HINT:

- ***1: w/ OBD**
- ***2: w/o OBD**

Reference: Inspect using an oscilloscope.
Check the waveform of the ECM connector.

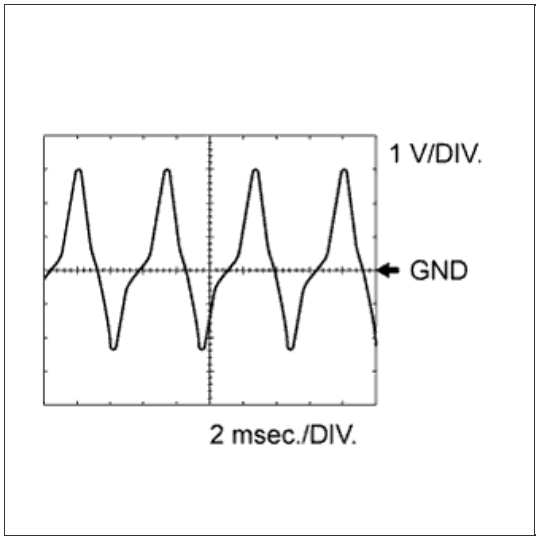
Standard:

for LHD

Terminal No. (Symbol)	Tool Setting	Condition	Specified Condition
C45-4 (NT+) - C45-3 (NT-)	1 V/DIV., 2 msec./DIV.	Engine idling (shift lever in P or N)	Refer to illustration

for RHD

Terminal No. (Symbol)	Tool Setting	Condition	Specified Condition
C46-4 (NT+) - C46-3 (NT-)	1 V/DIV., 2 msec./DIV.	Engine idling (shift lever in P or N)	Refer to illustration



MONITOR DESCRIPTION

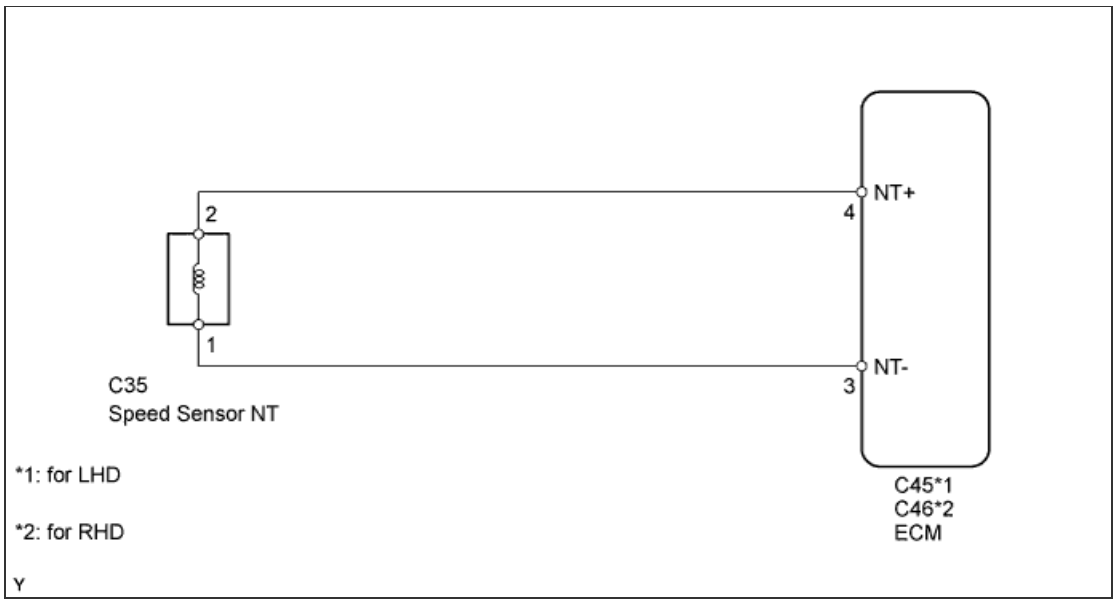
This DTC indicates that a pulse is not output from the speed sensor NT (turbine (input) speed sensor) or is output only a little. The NT terminal of the

ECM detects the pulse signal from the speed sensor NT (input RPM). The ECM outputs a gear shift signal comparing the input speed sensor NT with the output speed sensor SP2.
While the vehicle is operating in the 4th, 5th or 6th gear position with the shift lever in D, if the input shaft revolution is less than 300 rpm*1 although the output shaft revolution is 1000 rpm or more*2, the ECM detects the trouble, illuminates the MIL and stores the DTC.

HINT:

- ***1: Pulse is not output or is irregularly output.**
- ***2: The vehicle speed is approximately 50 km/h (31 mph) or more.**

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the ignition switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the ignition switch to ON.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Data List.

g. According to the display on the tester, read the Data List.

ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
SPD (NT)	Input shaft speed/ Min.: 0 rpm Max.: 12750 rpm	Lock-up: • ON (after warming up engine): Input turbine speed (NT) equal to engine speed • OFF (idling with shift lever in N): Input turbine speed (NT) nearly equal to engine speed	The data is displayed in increments of 50 rpm.

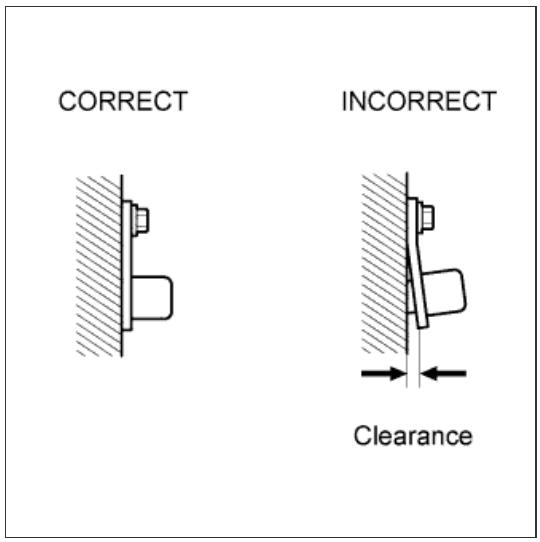
HINT:

- **SPD (NT) is always 0 while driving:**
  Open or short in the sensor or circuit.
- **SPD (NT) is always more than 0 and less than 300 rpm while driving the vehicle at 50 km/h (31 mph) or more:**
  Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

1.INSPECT SPEED SENSOR NT INSTALLATION

a. Check the speed sensor NT installation.

OK:
The installation bolt is tightened properly and there is no clearance between the sensor and transmission case.



NG → SECURELY INSTALL OR REPLACE SPEED SENSOR NT (Click here)

OK

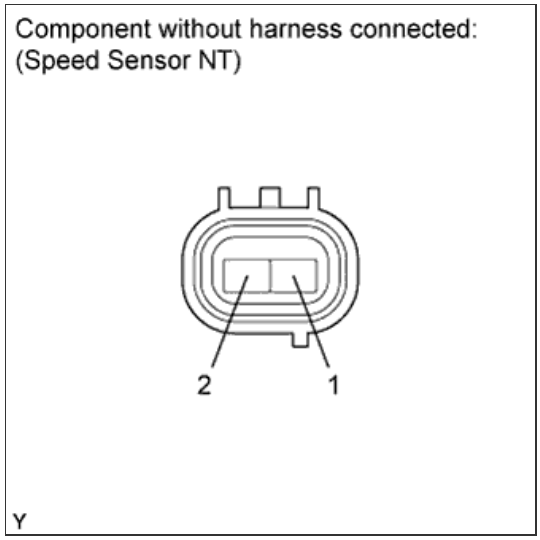
2.INSPECT SPEED SENSOR NT

a. Disconnect the speed sensor connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	560 to 680 Ω



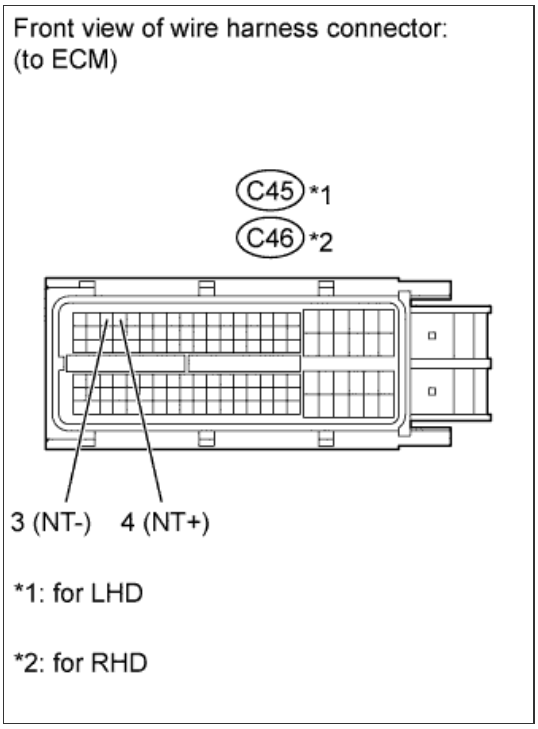
NG → REPLACE SPEED SENSOR NT (Click here)

OK

3.CHECK HARNESS AND CONNECTOR (SPEED SENSOR NT - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-4 (NT+) - C45-3 (NT-)	20°C (68°F)	560 to 680 Ω
C45-4 (NT+) - Body ground	Always	10 kΩ or higher
C45-3 (NT-) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-4 (NT+) - C46-3 (NT-)	20°C (68°F)	560 to 680 Ω
C46-4 (NT+) - Body ground	Always	10 kΩ or higher
C46-3 (NT-) - Body ground	Always	10 kΩ or higher

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0979 Shift Solenoid "C" Control Circuit Low (Shift Solenoid Valve S3)

DTC P0980 Shift Solenoid "C" Control Circuit High (Shift Solenoid Valve S3)

for Preparation Click here

DESCRIPTION

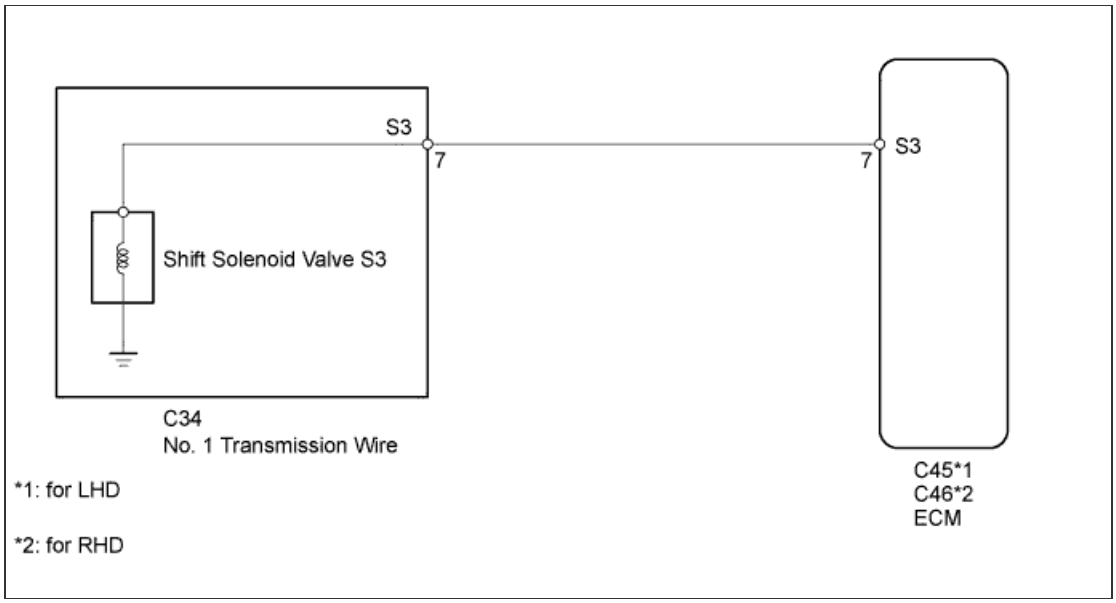
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0979	The ECM detects a short in the solenoid valve S3 circuit 2 times when the solenoid valve S3 is operated (1 trip detection logic).	• Short in shift solenoid valve S3 circuit • Shift solenoid valve S3 • ECM
P0980	The ECM detects an open in the solenoid valve S3 circuit 2 times when the solenoid valve S3 is not operated (1 trip detection logic).	• Open in shift solenoid valve S3 circuit • Shift solenoid valve S3 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S3 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S3 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S3 circuit.
When the shift solenoid valve S3 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S3 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve S3 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S3	ON	ON	ON	OFF	OFF	OFF

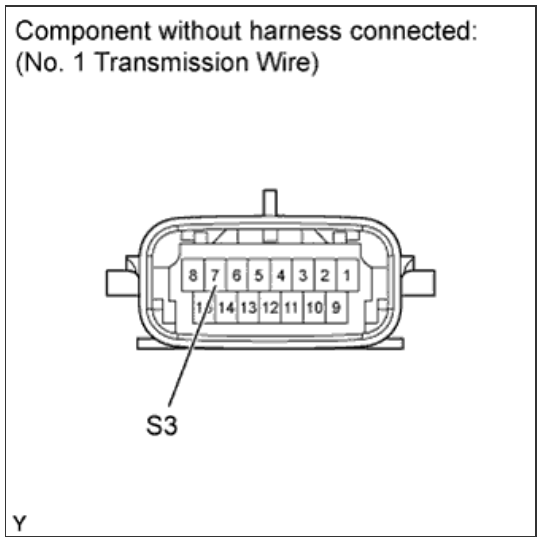
1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S3)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
7 (S3) - Body ground	20°C (68°F)	11 to 15 Ω



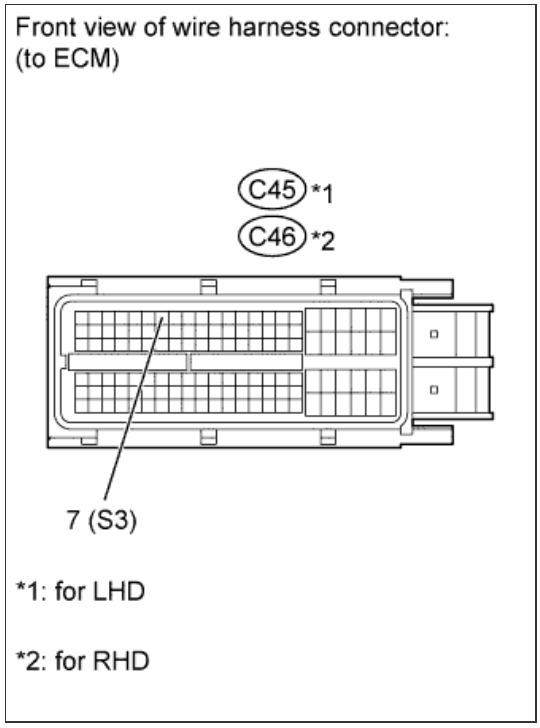
NG → Go to step 3

OK →

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-7 (S3) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-7 (S3) - Body ground	20°C (68°F)	11 to 15 Ω

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE S3

a. Remove the shift solenoid valve S3.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

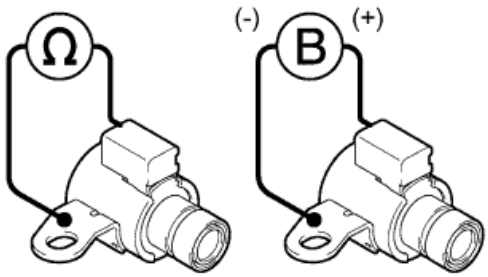
Tester Connection	Condition	Specified Condition
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S3 connector • Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise

Shift Solenoid Valve S3:



P

NG → REPLACE SHIFT SOLENOID VALVE S3 (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

for Preparation Click here

DESCRIPTION

The speed sensor SP2 detects the rotation speed of the transmission output shaft and sends signals to the ECM. The ECM determines the vehicle speed based on these signals. An AC voltage is generated in the speed sensor SP2 coil as the parking gear mounted on the rear planetary gear assembly rotates, and this voltage is sent to the ECM. The parking gear on the rear planetary gear is used as the timing rotor for this sensor.
The gear shift point and lock-up timing are controlled by the ECM based on the signals from this vehicle speed sensor and the throttle position sensor signal.

DTC Code	DTC Detection Condition	Trouble Area
P0722	All the conditions below are detected 500 times or more continuously (2 trip detection logic). (a) No signal from the speed sensor SP2 is input to the ECM while 4 pulses of the No. 1 vehicle speed sensor signal are sent. (b) The vehicle speed is 9 km/h (6 mph) or more for at least 5 sec. (c) The park/neutral position switch is off. (d) The transfer position is not in neutral.	• Open or short in speed sensor SP2 circuit • Speed sensor SP2 • ECM • Automatic transmission (clutch, brake or gear, etc.)

Reference: Inspect using an oscilloscope.
Check the waveform of the ECM connector.

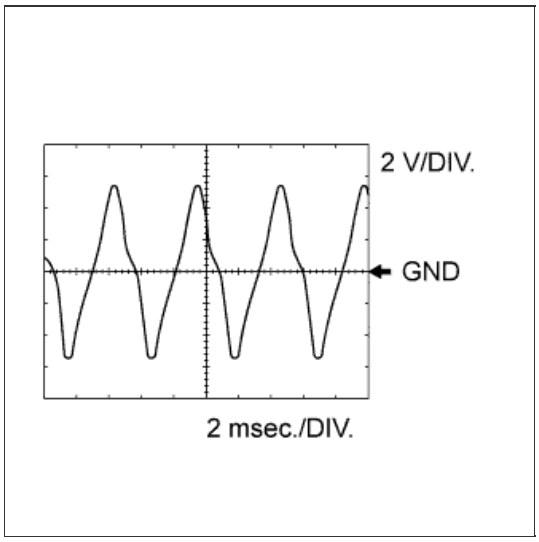
Standard:

for LHD

Terminal No. (Symbol)	Tool Setting	Condition	Specified Condition
C45-68 (SP2+) - C45-67 (SP2-)	2 V/DIV., 2 msec./DIV	Vehicle speed 20 km/h (12 mph)	Refer to illustration

for RHD

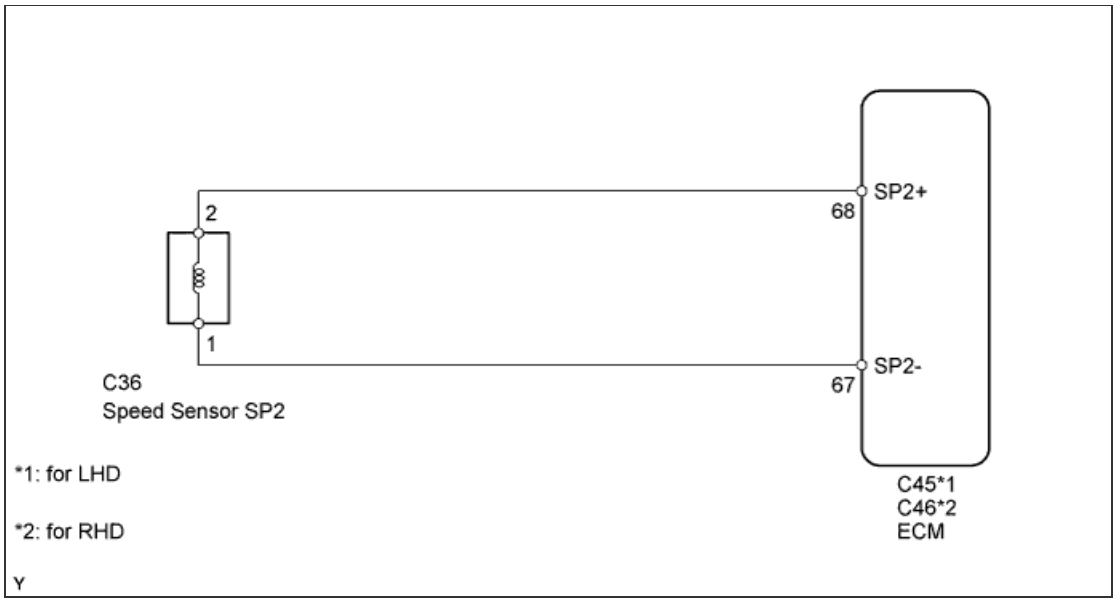
Terminal No. (Symbol)	Tool Setting	Condition	Specified Condition
C46-68 (SP2+) - C46-67 (SP2-)	2 V/DIV., 2 msec./DIV	Vehicle speed 20 km/h (12 mph)	Refer to illustration



MONITOR DESCRIPTION

The output speed sensor SP2 monitors the output shaft speed. The ECM controls the gear shift point and the lock up timing based on the signals from the output speed sensor SP2 and throttle position sensor.
If the ECM detects no signal from the output speed sensor SP2 even while the vehicle is moving, it will conclude that there is a malfunction of the output speed sensor SP2. The ECM will illuminate the MIL and store a DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the ignition switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the ignition switch to ON.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Data List.

g. According to the display on the tester, read the Data List.

ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
SPD (SP2)	Output shaft speed/ Min.: 0 km/h (0 mph) Max.: 255 km/h (158 mph)	Vehicle stopped: 0 km/h (0 mph) (output shaft speed equal to vehicle speed)	-

HINT:

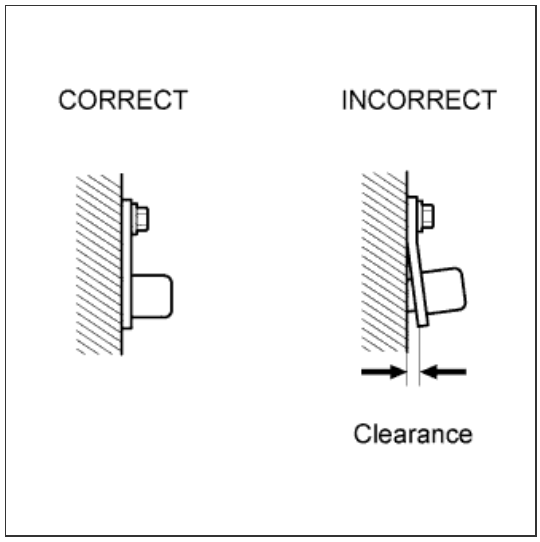
- **SPD (SP2) is always 0 while driving:**
  Open or short in the sensor or circuit.
- **The SPD (SP2) value displayed on the tester is much lower than the actual vehicle speed:**
  Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

1.INSPECT SPEED SENSOR SP2 INSTALLATION

a. Check the speed sensor SP2 installation.

OK:

The installation bolt is tightened properly and there is no clearance between the sensor and transmission case.



NG → SECURELY INSTALL OR REPLACE SPEED SENSOR SP2 (Click here)

OK

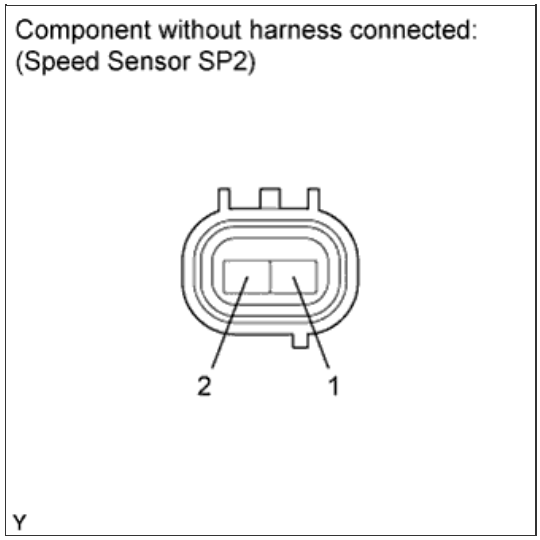
2.INSPECT SPEED SENSOR SP2

a. Disconnect the speed sensor connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	560 to 680 Ω



NG → REPLACE SPEED SENSOR SP2 (Click here)

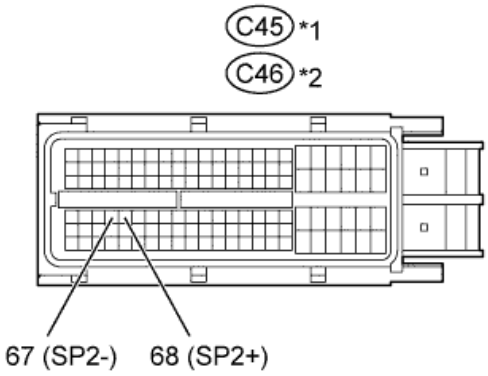
OK

3.CHECK HARNESS AND CONNECTOR (SPEED SENSOR SP2 - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.

Front view of wire harness connector:
(to ECM)



*1: for LHD

*2: for RHD

Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-68 (SP2+) - C45-67 (SP2-)	20°C (68°F)	560 to 680 Ω
C45-68 (SP2+) - Body ground	Always	10 kΩ or higher
C45-67 (SP2-) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-68 (SP2+) - C46-67 (SP2-)	20°C (68°F)	560 to 680 Ω
C46-68 (SP2+) - Body ground	Always	10 kΩ or higher
C46-67 (SP2-) - Body ground	Always	10 kΩ or higher

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0982 Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)

DTC P0983 Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)

for Preparation Click here

DESCRIPTION

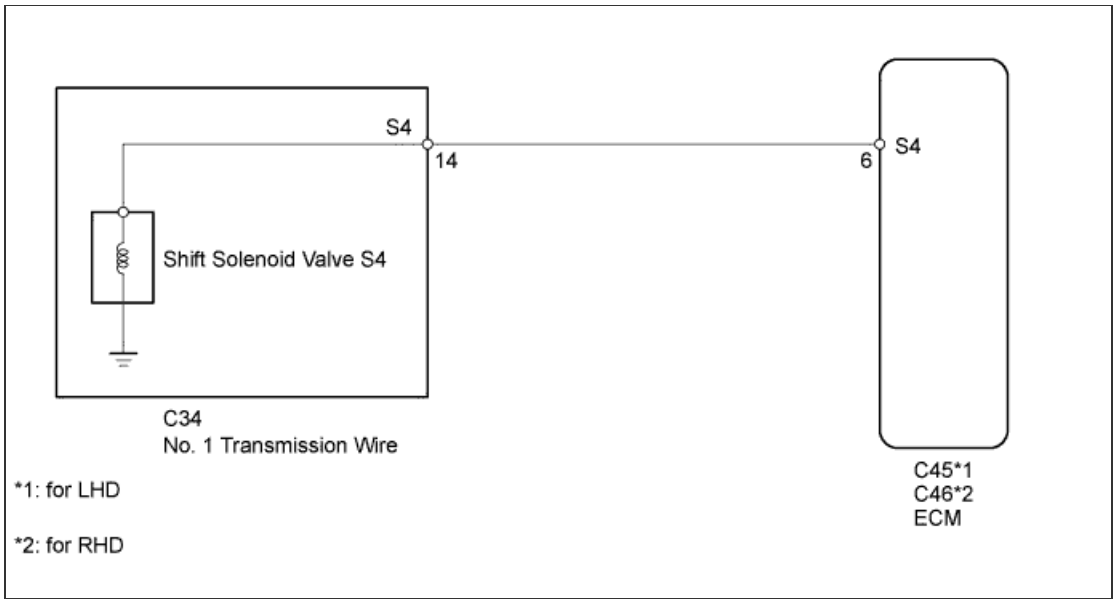
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0982	The ECM detects a short in the solenoid valve S4 circuit 2 times when the solenoid valve S4 is operated (1 trip detection logic).	• Short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM
P0983	The ECM detects an open in the solenoid valve S4 circuit 2 times when the solenoid valve S4 is not operated (1 trip detection logic).	• Open in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S4 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S4 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S4 circuit.
When the shift solenoid valve S4 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S4 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve S4 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S4	OFF	OFF	OFF	OFF	ON	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S4)

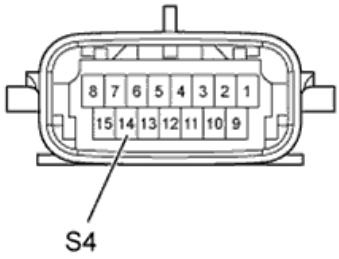
a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
14 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

Component without harness connected:
(No. 1 Transmission Wire)



Y

NG → Go to step 3

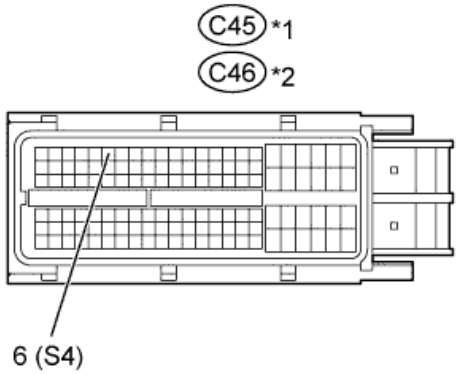
OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.

Front view of wire harness connector:
(to ECM)



*1: for LHD

*2: for RHD

Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-6 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-6 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE S4

a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

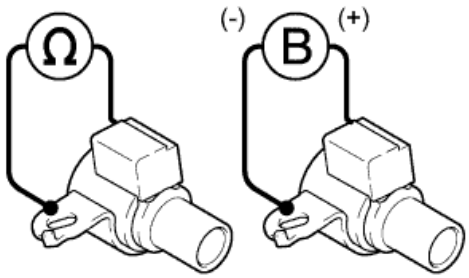
Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Shift Solenoid Valve S4:



P

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0724 Brake Switch "B" Circuit High

for Preparation Click here

DESCRIPTION

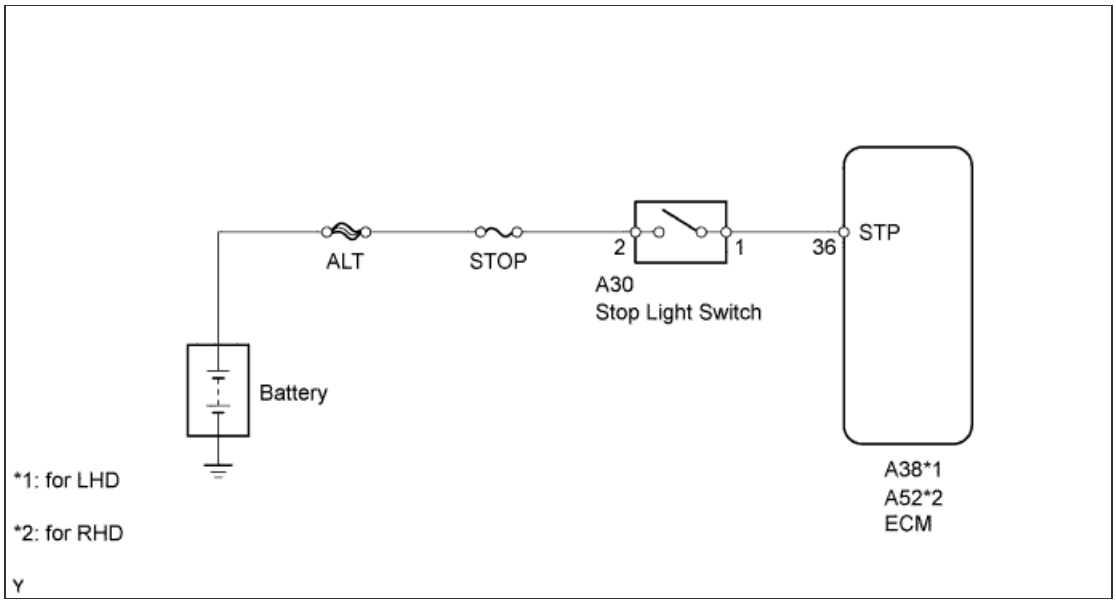
The purpose of this circuit is to prevent the engine from stalling while driving in the lock-up condition when the brakes are suddenly applied.
When the brake pedal is depressed, this switch sends a signal to the ECM. Then the ECM cancels the operation of the lock-up clutch while braking is in progress.

DTC Code	DTC Detection Condition	Trouble Area
P0724	The stop light switch remains on even when the vehicle is driven in a STOP (less than 3 km/h (2 mph)) and GO (30 km/h (19 mph) or more) pattern 5 times (2 trip detection logic).	• Short in stop light switch signal circuit • Stop light switch • ECM

MONITOR DESCRIPTION

This DTC indicates that the stop light switch remains on. When the stop light switch remains on during "stop and go" driving, the ECM interprets this as a fault in the stop light switch, the MIL comes on and the ECM stores the DTC. The vehicle must stop (less than 3 km/h (2 mph)) and go (30 km/h (19 mph) or more) five times for 2 driving cycles in order to detect a malfunction.

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the ignition switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the ignition switch to ON.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Data List.

g. According to the display on the tester, read the Data List.

ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
Stop Light Switch	Stop light switch status/ ON or OFF	Brake pedal: • Depressed: ON • Released: OFF	-

1.INSPECT STOP LIGHT SWITCH

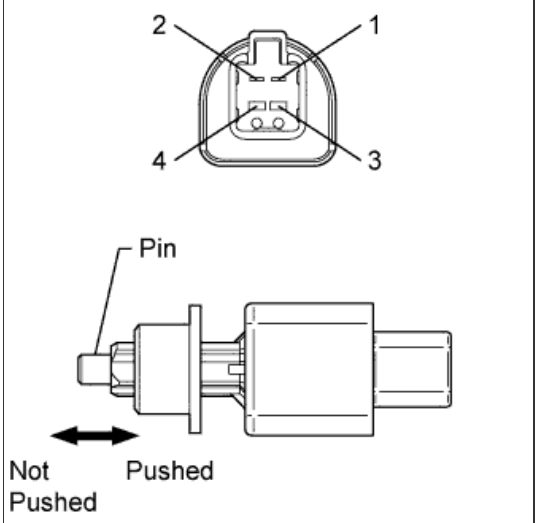
a. Remove the stop light switch (Click here).

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
1 - 2	Pin not pushed	Below 1 Ω
3 - 4	Pin pushed	Below 1 Ω
1 - 2	Pin pushed	10 kΩ or higher
3 - 4	Pin not pushed	10 kΩ or higher

Component without harness connected:
(Stop Light Switch)



NG → REPLACE STOP LIGHT SWITCH (Click here)

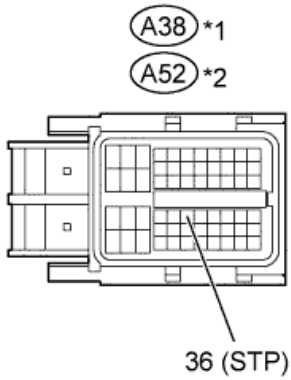
OK

2.CHECK HARNESS AND CONNECTOR (BATTERY - ECM)

a. Disconnect the ECM connector.

b. Measure the voltage according to the value(s) in the table below.

Front view of wire harness connector:
(to ECM)



*1: for LHD

*2: for RHD

Standard Voltage:

for LHD

Tester Connection	Condition	Specified Condition
A38-36 (STP) - Body ground	Brake pedal depressed	11 to 14 V
A38-36 (STP) - Body ground	Brake pedal released	Below 1 V

for RHD

Tester Connection	Condition	Specified Condition
A52-36 (STP) - Body ground	Brake pedal depressed	11 to 14 V
A52-36 (STP) - Body ground	Brake pedal released	Below 1 V

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0982 Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)

DTC P0983 Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)

for Preparation Click here

DESCRIPTION

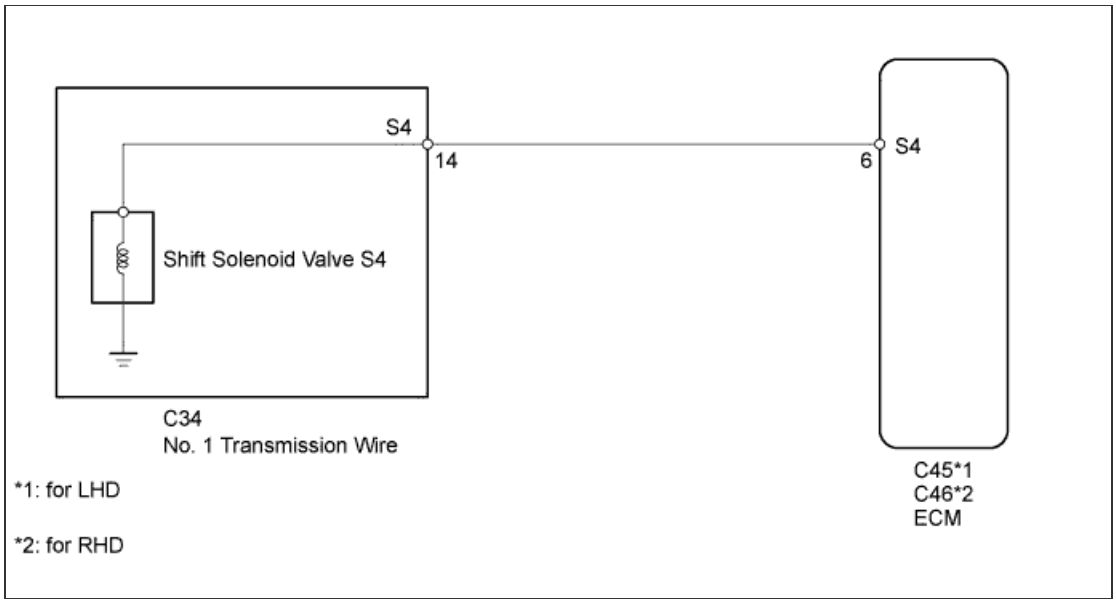
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0982	The ECM detects a short in the solenoid valve S4 circuit 2 times when the solenoid valve S4 is operated (1 trip detection logic).	• Short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM
P0983	The ECM detects an open in the solenoid valve S4 circuit 2 times when the solenoid valve S4 is not operated (1 trip detection logic).	• Open in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S4 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S4 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S4 circuit.
When the shift solenoid valve S4 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S4 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve S4 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S4	OFF	OFF	OFF	OFF	ON	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S4)

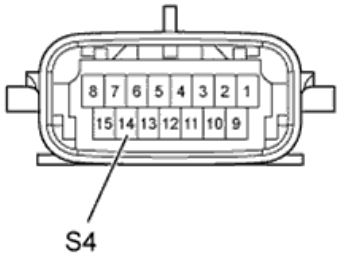
a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
14 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

Component without harness connected:
(No. 1 Transmission Wire)



Y

NG → Go to step 3

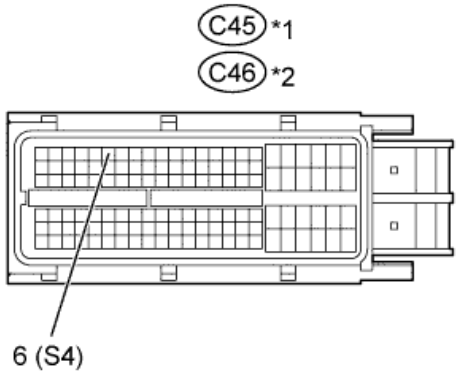
OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.

Front view of wire harness connector:
(to ECM)



*1: for LHD

*2: for RHD

Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-6 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-6 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE S4

a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

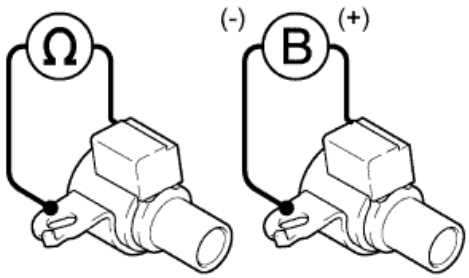
Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Shift Solenoid Valve S4:



P

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0729 Gear 6 Incorrect Ratio

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output speed sensor SP2 and input speed sensor NT to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0729	A 6th gear shift malfunction: The ECM determines there is a malfunction when both of the following conditions are met (2 trip detection logic*1, 1 trip detection logic*2). (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is also shifted to 5th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 4th.	• Valve body is blocked up or stuck (sequence valve) • Shift solenoid valve SLT remains open or closed • Automatic transmission (clutch, brake or gear, etc.)

HINT:

- ***1: w/ OBD**
- ***2: w/o OBD**
- **Gear positions in the event of a solenoid valve mechanical problem:**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Actual gear position under malfunction	1st	2nd	3rd	4th	5th	4th

- **Gear position during fail-safe operation:**
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
Actual gear position under fail-safe mode	1st	2nd	3rd	3rd	3rd	3rd

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF" and switching oil pressure to the valves in the valve body.
The DTC indicates that the sequence valve is locked in the direction the spring stretches and that shifting to the 6th gear is impossible.

INSPECTION PROCEDURE

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0729)

a. Connect the intelligent tester to the DLC3.

b. Turn the ignition switch to ON.

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / ECT / Trouble Codes.

e. Read the DTCs using the tester.

Result

Result	Proceed to
Only P0729 is output	A
P0729 and other DTCs are output	B

HINT:

If any other codes besides P0729 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (RUNNING TEST)

CAUTION:

This test should always be performed with at least 2 people.

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Perform the test with the A/C turned off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Connect the intelligent tester to the DLC3.

b. Clear the DTC (Click here).

c. Warm up the engine.

d. Enter the following menus: Powertrain / ECT / Active Test.

e. According to the display on the tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the tester.**
- **Gear positions in the event of a solenoid valve mechanical problem:**

Tester gear shift command	1st	2nd	3rd	4th	5th	6th
Actual gear position under malfunction	1st	2nd	3rd	4th	5th	4th

OK:

Gear position changes in accordance with the tester command.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

3.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

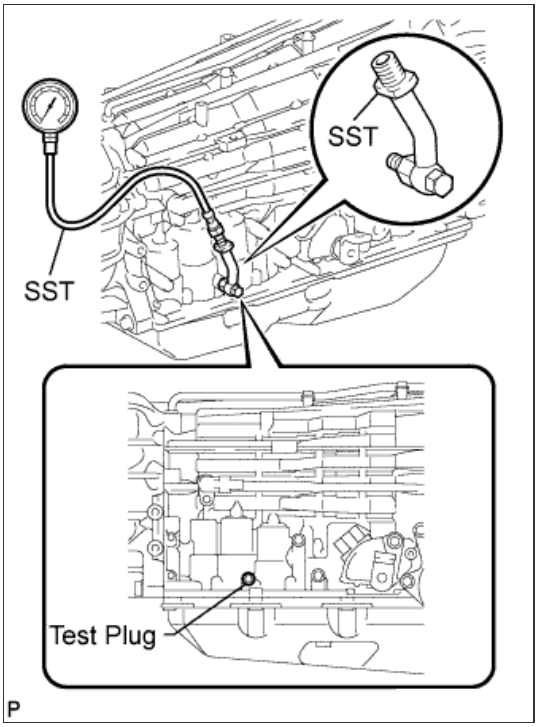
HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST

09992-00095 (09992-00231, 09992-00271)



b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

h. Measure the line pressure.

ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (**Click here**)

OK

4.CLEAR DTC AND PERFORM RUNNING TEST

a. Clear the DTC (Click here).

b. Check for DTC again after conducting the Monitor Drive Pattern (Click here).

OK:

No DTC output

NG → REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

OK

END

DTC P0985 Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)

DTC P0986 Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)

for Preparation Click here

DESCRIPTION

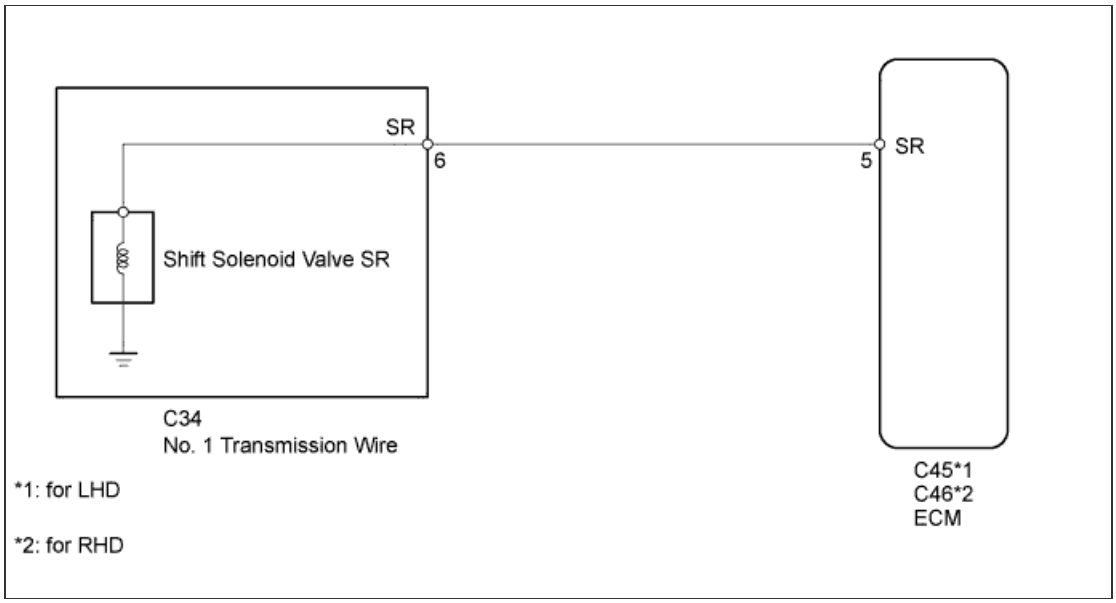
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0985	The ECM detects a short in the solenoid valve SR circuit 2 times when the solenoid valve SR is operated (1 trip detection logic).	• Short in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM
P0986	The ECM detects an open in the solenoid valve SR circuit 2 times when the solenoid valve SR is not operated (1 trip detection logic).	• Open in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve SR circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve SR is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve SR circuit.
When the shift solenoid valve SR is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve SR circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve SR is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve SR	ON	ON	ON	ON	OFF	OFF

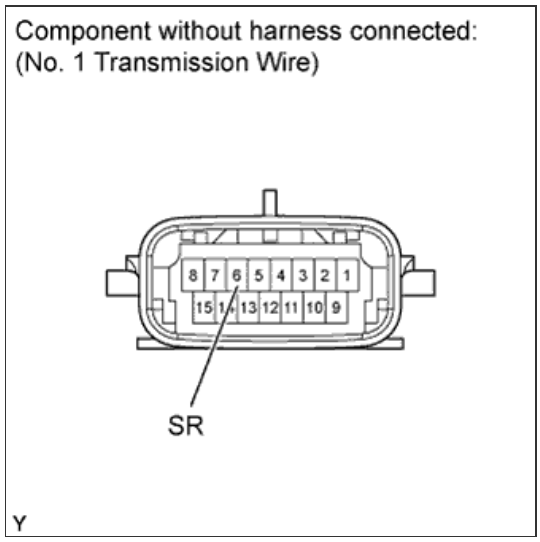
1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SR)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
6 (SR) - Body ground	20°C (68°F)	11 to 15 Ω



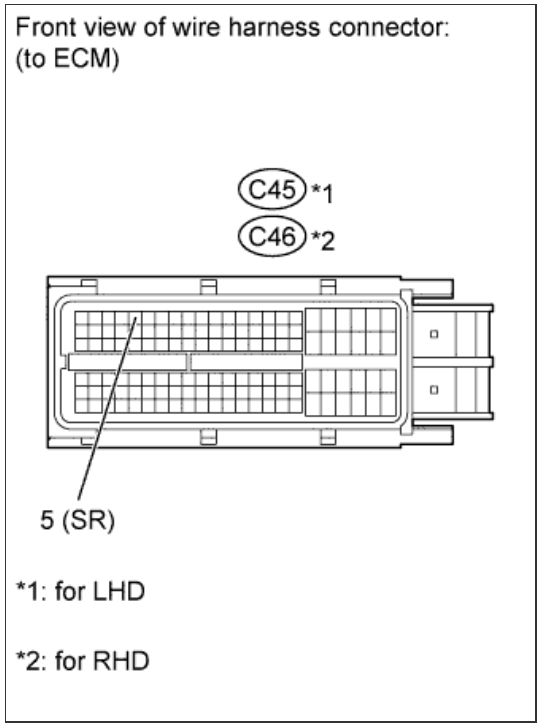
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-5 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-5 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SR

a. Remove the shift solenoid valve SR.

b. Measure the resistance according to the value(s) in the table below.

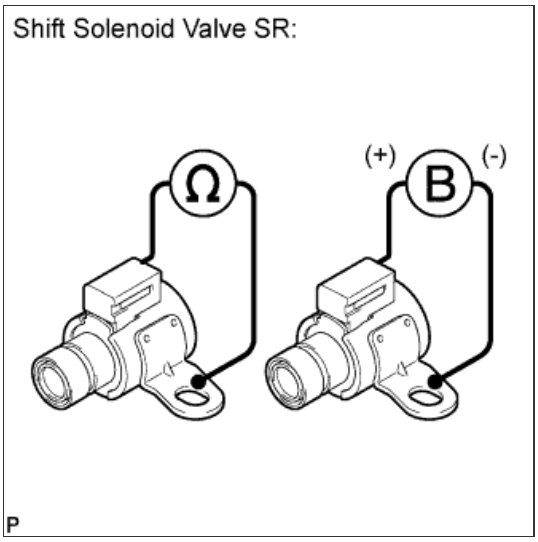
Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve SR connector terminal - Shift solenoid valve SR body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve SR connector • Battery negative (-) → Shift solenoid valve SR body	Valve moves and makes an operating noise



NG → REPLACE SHIFT SOLENOID VALVE SR (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0748 Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)

for Preparation Click here

DESCRIPTION

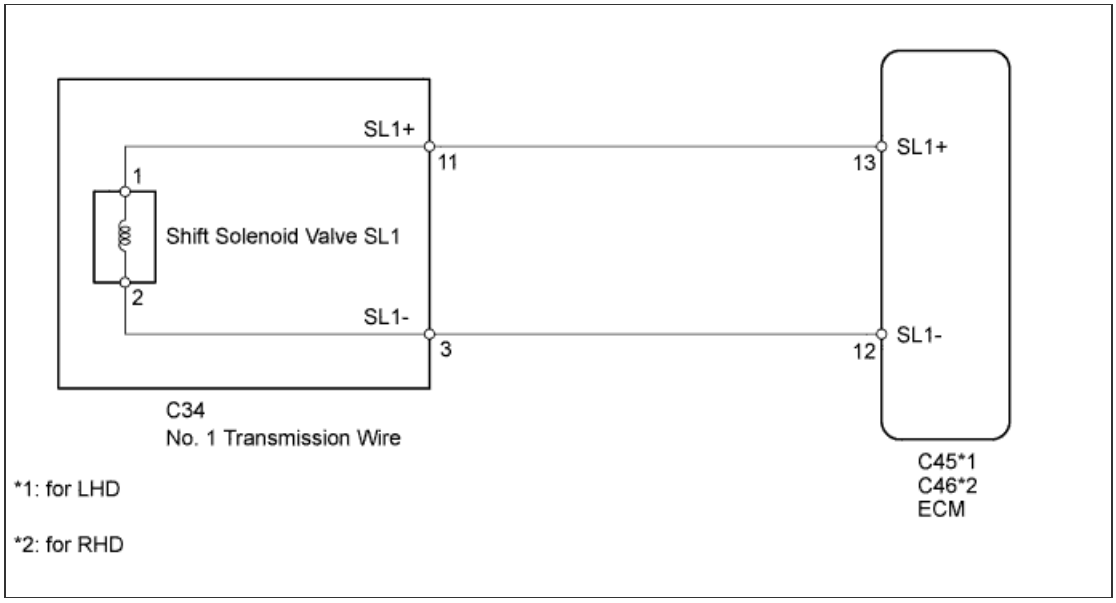
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0748	The ECM checks for an open or short in the shift solenoid valve SL1 circuit while driving and shifting between 4th and 5th gear (1 trip detection logic). The output signal duty equals 100%. **HINT:** The SL1 output signal duty is less than 100% under normal conditions.	• Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL1 circuit. The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. Also, the ECM performs the fail-safe function and turns the other normal shift solenoid valves ON/OFF. In case of an open or short circuit, the ECM stops sending current to the open or short circuited solenoid.
While driving and shifting between 4th and 5th gears, if the ECM detects an open or short in the shift solenoid valve SL1 circuit, the ECM determines that there is a malfunction (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve SL1 turns ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve SL1	OFF	OFF	OFF	OFF	ON	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SL1)

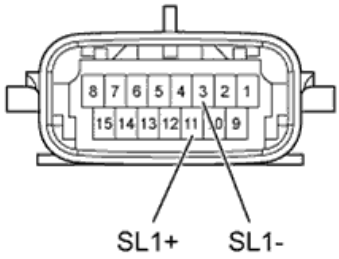
a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
11 (SL1+) - 3 (SL1-)	20°C (68°F)	5.0 to 5.6 Ω
11 (SL1+) - Body ground	Always	10 kΩ or higher
3 (SL1-) - Body ground	Always	10 kΩ or higher

Component without harness connected:
(No. 1 Transmission Wire)



Y

NG → Go to step 3

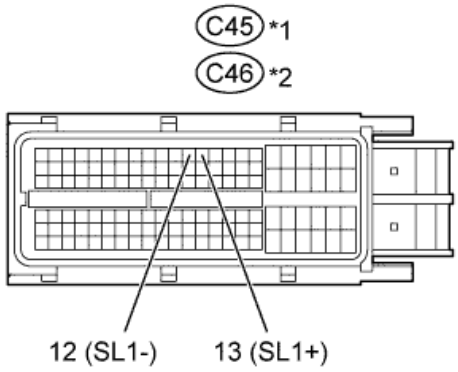
OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.

Front view of wire harness connector:
(to ECM)



*1: for LHD

*2: for RHD

Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-13 (SL1+) - C45-12 (SL1-)	20°C (68°F)	5.0 to 5.6 Ω
C45-13 (SL1+) - Body ground	Always	10 kΩ or higher
C45-12 (SL1-) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-13 (SL1+) - C46-12 (SL1-)	20°C (68°F)	5.0 to 5.6 Ω

C46-13 (SL1+) - Body ground	Always	10 kΩ or higher
C46-12 (SL1-) - Body ground	Always	10 kΩ or higher

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SL1

a. Remove the shift solenoid valve SL1.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

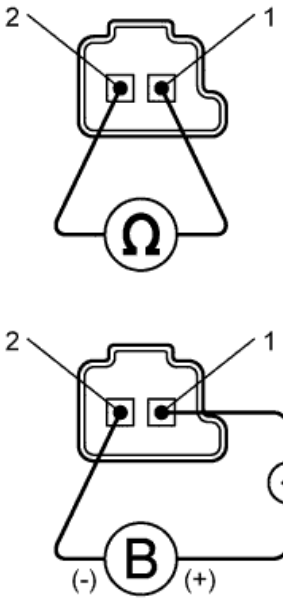
Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Component without harness connected:
(Shift Solenoid Valve SL1)



NG → REPLACE SHIFT SOLENOID VALVE SL1 (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0985 Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)

DTC P0986 Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)

for Preparation Click here

DESCRIPTION

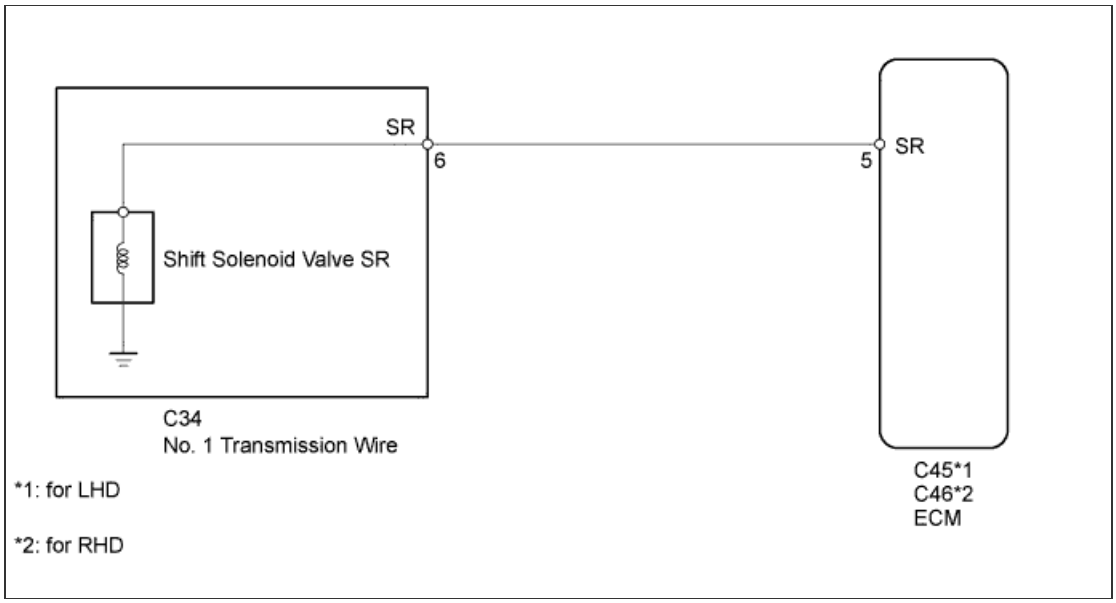
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0985	The ECM detects a short in the solenoid valve SR circuit 2 times when the solenoid valve SR is operated (1 trip detection logic).	• Short in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM
P0986	The ECM detects an open in the solenoid valve SR circuit 2 times when the solenoid valve SR is not operated (1 trip detection logic).	• Open in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve SR circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve SR is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve SR circuit.
When the shift solenoid valve SR is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve SR circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve SR is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve SR	ON	ON	ON	ON	OFF	OFF

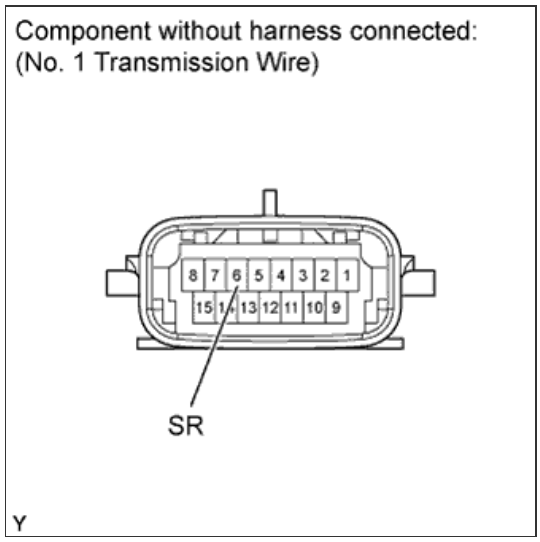
1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SR)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
6 (SR) - Body ground	20°C (68°F)	11 to 15 Ω



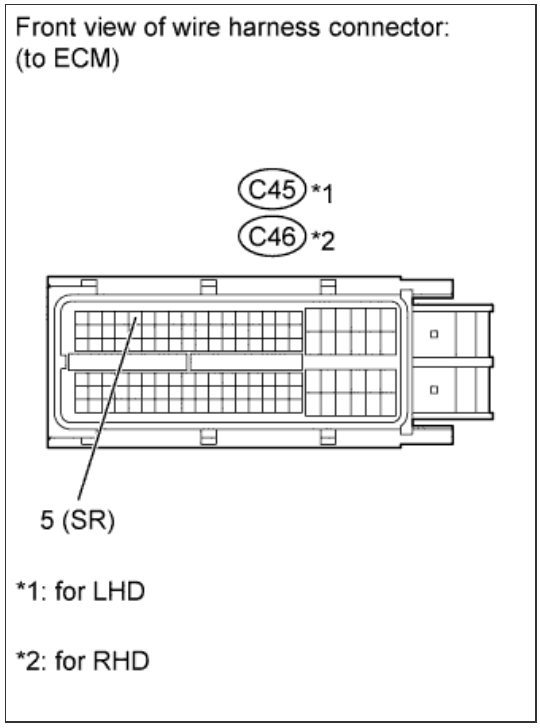
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-5 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-5 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SR

a. Remove the shift solenoid valve SR.

b. Measure the resistance according to the value(s) in the table below.

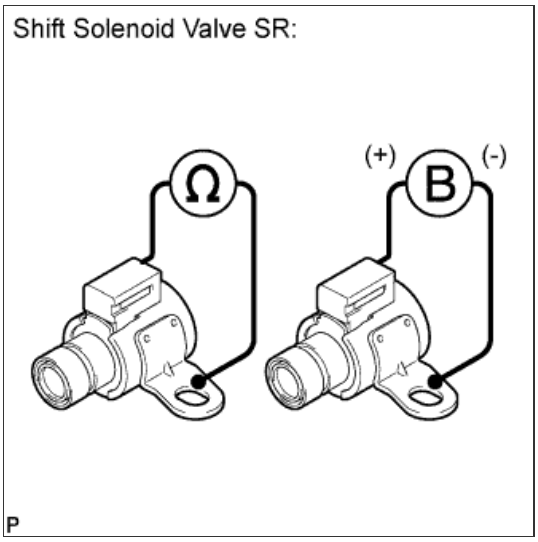
Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve SR connector terminal - Shift solenoid valve SR body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve SR connector • Battery negative (-) → Shift solenoid valve SR body	Valve moves and makes an operating noise



NG → REPLACE SHIFT SOLENOID VALVE SR (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0751 Shift Solenoid "A" Performance (Shift Solenoid Valve S1)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems with the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0751	A shift solenoid valve S1 stuck ON malfunction*1: The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic*3, 1 trip detection logic*4). (a) When the ECM directs the transmission to switch to 1st gear, the actual gear is shifted to 2nd. (b) When the ECM directs the transmission to switch to 5th gear, the actual gear is also shifted to 5th.	• Shift solenoid valve S1 remains open • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)
P0751	A shift solenoid valve S1 stuck OFF malfunction*2: The ECM determines there is a malfunction when conditions (a) and (b), or (a) and (c) are met (2 trip detection logic*3, 1 trip detection logic*4). (a) When the ECM directs the transmission to switch to 2nd gear, the actual gear is shifted to 1st. (b) When the ECM directs the transmission to switch to 5th gear, the actual gear is also shifted to 5th. (c) When the ECM directs the transmission to switch to 6th gear, the engine overruns (clutch slips).	• Shift solenoid valve S1 remains closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked • No. 2 brake malfunction (Driving is difficult.) • Automatic transmission (clutch, brake or gear, etc.)

HINT:

- **Gear positions in the event of a solenoid valve mechanical problem:**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under S1 stuck ON malfunction	2nd	2nd	3rd	4th	5th	6th
*2: Actual gear position under S1 stuck OFF malfunction	1st	1st	3rd	4th	5th	N*

N*: Neutral

- **Gear position during fail-safe operation:**
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under fail-safe mode when S1 stuck ON malfunction	2nd	2nd	3rd	4th	5th	6th
*2: Actual gear position under fail-safe mode when S1 stuck OFF malfunction	1st*	1st*	3rd	3rd	3rd	3rd

1st*: Under engine braking, downshifting to 1st or 2nd gear is prohibited.

- ***3: w/ OBD**

- ***4: w/o OBD**

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve S1.
The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the ignition switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the ignition switch to ON.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the tester.**
- **The shift solenoid valve S1 turns ON/OFF normally when the shift lever is in D.**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S1	OFF	ON	ON	ON	ON	ON

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0751)

a. Connect the intelligent tester to the DLC3.

b. Turn the ignition switch to ON.

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / ECT / Trouble Codes.

e. Read the DTCs using the tester.

Result

Result	Proceed to
Only P0751 is output	A

P0751 and other DTCs are output	B

HINT:

If any other codes besides P0751 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST
09992-00095 (09992-00231, 09992-00271)

b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

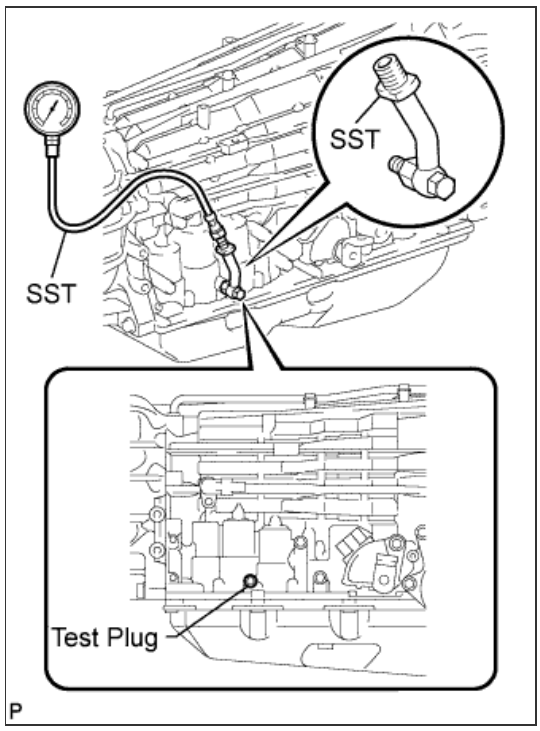
d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

h. Measure the line pressure.



ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

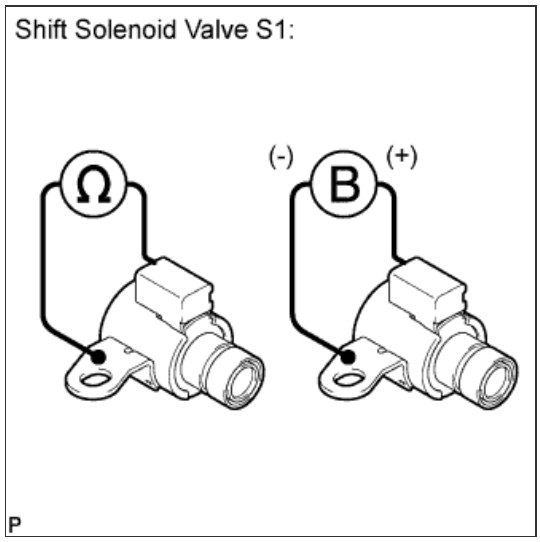
3.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

4.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P2716 Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)

for Preparation Click here

DESCRIPTION

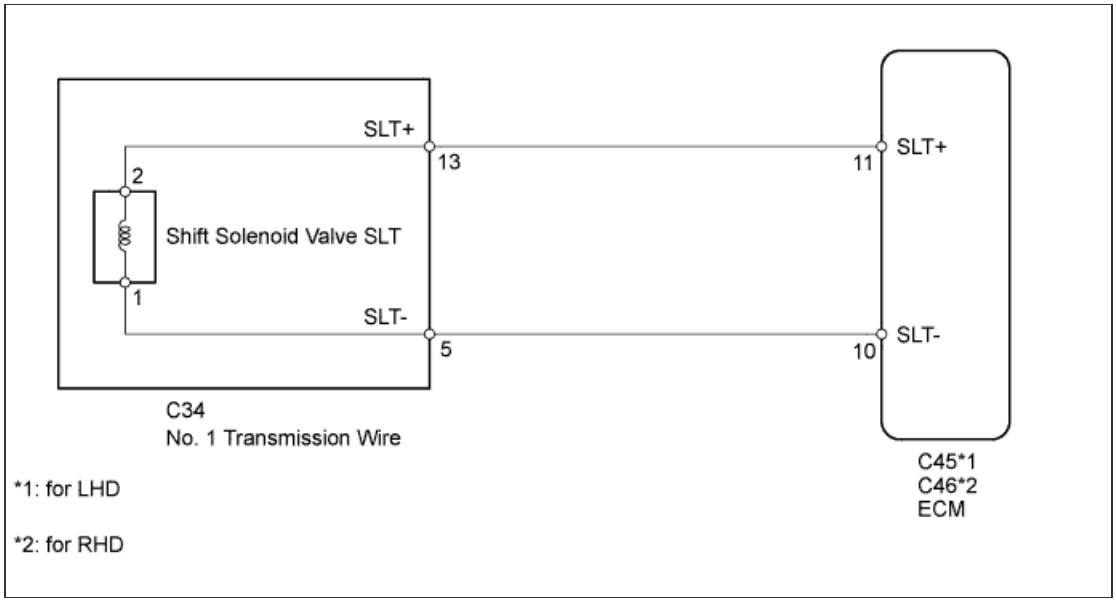
Refer to DTC P0894 (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P2716	Conditions (a) or (b) below are detected for 1 sec. or more (1 trip detection logic). (a) SLT - terminal: 0 V (b) SLT - terminal: 12 V	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM

MONITOR DESCRIPTION

When an open or short in the shift solenoid valve SLT circuit is detected, the ECM interprets this as a fault. The ECM will turn on the MIL and store the DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SLT)

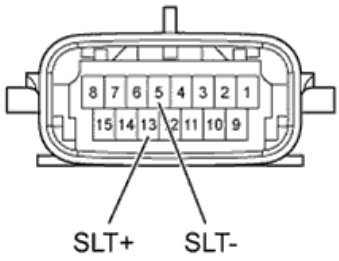
a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
13 (SLT+) - 5 (SLT-)	20°C (68°F)	5.0 to 5.6 Ω
13 (SLT+) - Body ground	Always	10 kΩ or higher
5 (SLT-) - Body ground	Always	10 kΩ or higher

Component without harness connected:
(No. 1 Transmission Wire)



Y

NG → Go to step 3

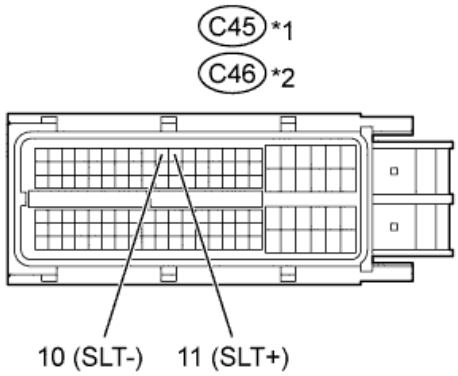
OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.

Front view of wire harness connector:
(to ECM)



*1: for LHD

*2: for RHD

Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-11 (SLT+) - C45-10 (SLT-)	20°C (68°F)	5.0 to 5.6 Ω
C45-11 (SLT+) - Body ground	Always	10 kΩ or higher
C45-10 (SLT-) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-11 (SLT+) - C46-10 (SLT-)	20°C (68°F)	5.0 to 5.6 Ω
C46-11 (SLT+) - Body ground	Always	10 kΩ or higher
C46-10 (SLT-) - Body ground	Always	10 kΩ or higher

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SLT

a. Remove the shift solenoid valve SLT.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition

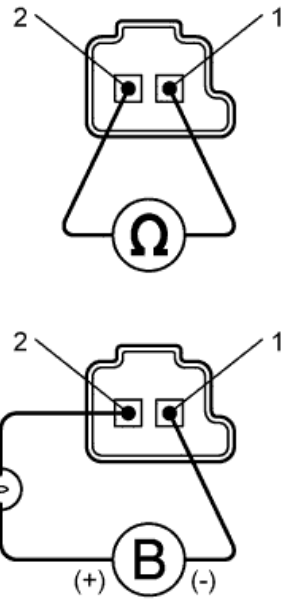
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise

Component without harness connected:
(Shift Solenoid Valve SLT)



NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0756 Shift Solenoid "B" Performance (Shift Solenoid Valve S2)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems with the shift solenoid valves, valve body or automatic transmission (clutch, brake, gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0756	A shift solenoid valve S2 stuck ON malfunction*1: Shifting to 3rd and 5th gears is impossible. The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic). (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is shifted to 6th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 6th.	• Shift solenoid valve S2 remains open • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.) • ECM
P0756	A shift solenoid valve S2 stuck OFF malfunction*2: The vehicle starts in 3rd gear and shifting to 6th gear is impossible. The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic). (a) When the ECM directs the transmission to switch to 1st gear, the actual gear is shifted to 3rd. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 5th.	• Shift solenoid valve S2 remains closed • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.) • ECM

HINT:

Gear positions in the event of a solenoid valve mechanical problem:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under S2 stuck ON malfunction	1st	2nd	2nd	4th	6th	6th
*2: Actual gear position under S2 stuck OFF malfunction	3rd	3rd	3rd	4th	5th	5th

MONITOR DESCRIPTION

This DTC indicates a stuck ON malfunction or stuck OFF malfunction of the shift solenoid valve S2.
The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the ignition switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the ignition switch to ON.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the tester.**
- **The shift solenoid valve S2 turns ON/OFF normally when the shift lever is in D.**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S2	ON	ON	OFF	OFF	OFF	ON

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0756)

a. Connect the intelligent tester to the DLC3.

b. Turn the ignition switch to ON.

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / ECT / Trouble Codes.

e. Read the DTCs using the tester.

Result

Result	Proceed to
Only P0756 is output	A
P0756 and other DTCs are output	B

HINT:

If any other codes besides P0756 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

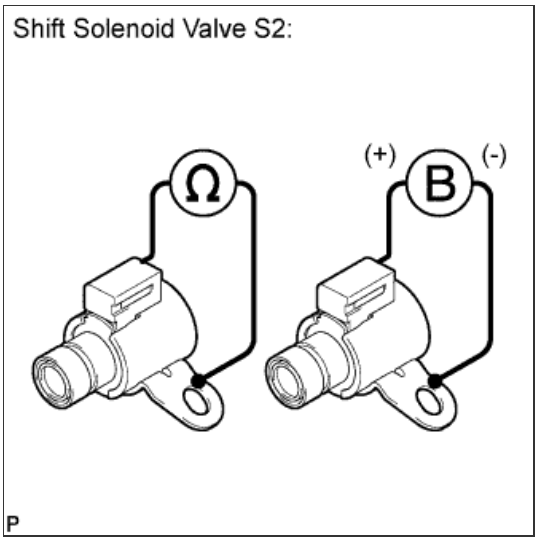
2.INSPECT SHIFT SOLENOID VALVE S2

a. Remove the shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK

3.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P2742 Transmission Fluid Temperature Sensor "B" Circuit Low Input

DTC P2743 Transmission Fluid Temperature Sensor "B" Circuit High Input

for Preparation Click here

DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor is on the transmission, just in front of the oil cooler inlet pipeline.
If the ECM detects an abnormally high ATF temperature near this sensor, it illuminates the warning light.

HINT:

- **The temperature of ATF easily rises when towing, climbing hills, in traffic, etc.**
- **If the ATF temperature sensor becomes short-circuited, the signal that indicates that the ATF temperature is 150°C (302°F) or higher is input into the ECM.**

Vehicle conditions when the sensor is normal and when the sensor is short-circuited are indicated in the table below.

No. 2 ATF Temperature Sensor State	Detection Condition	Symptom	Recovery Condition
Sensor is normal	ATF temperature higher than 150°C (302°F)	ATF temperature warning light remains on	ATF temperature below 135°C (275°F)*1
	ATF temperature higher than 130°C (266°F)	Shift point too high	ATF temperature below 110°C (230°F)
	When conditions (a) and (b) are satisfied. (a) ATF temperature higher than 130°C (266°F) (b) Engine coolant temperature higher than 95°C (203°F)	Lock-up at 3rd gear*2	ATF temperature below 110°C (230°F)*1 and engine coolant temperature higher than 95°C (203°F)
Sensor is short-circuited	Any conditions	• ATF temperature warning light blinks or message is displayed in combination meter • Shift point too high	Symptoms still occur
	Engine coolant temperature higher than 95°C (203°F)	Lock-up at 3rd gear*2	Symptoms still occur

HINT:

*1: When the ATF temperature is in the normal range, it decreases to below 135°C (275°F) within 5 minutes with the shift lever in P or N in an idling state.

*2: When the ATF temperature is normal, transmission lock-up occurs in 5th or 6th gear with the shift lever in D or the S6 range, in 5th gear with the shift lever in the S5 range, and 4th gear with the shift lever in the S4 range.

DTC Code	DTC Detection Condition	Trouble Area
P2742	The No. 2 ATF temperature sensor resistance is below 25 Ω (0.046 V) for 0.5 sec. or more (1 trip detection logic).	• Short in No. 2 ATF temperature sensor circuit • No. 1 transmission wire (No. 2 ATF temperature sensor) • ECM
P2743	When 15 min. or more have elapsed after the engine is started, the No. 2 ATF temperature sensor resistance is higher than 156 kΩ (4.915 V) for 0.5 sec. or more (1 trip detection logic).	• Open in No. 2 ATF temperature sensor circuit • No. 1 transmission wire (No. 2 ATF temperature sensor) • ECM

MONITOR DESCRIPTION

The ATF temperature sensor converts the ATF temperature into an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is below 25 Ω*1 or higher than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM stores a DTC, and the ATF temperature warning light blinks or a message is displayed in the combination meter.

HINT:

- ***1: 150°C (302°F) or higher is indicated regardless of the actual ATF temperature.**
- ***2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.**
- **The ATF temperature can be checked on the intelligent tester display.**

WIRING DIAGRAM

Refer to DTC P0712 (Click here).

INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the ignition switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the ignition switch to ON.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Data List.

g. According to the display on the tester, read the Data List.

ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 2	No. 2 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 2 ATF temperature sensor circuit is open or shorted.

HINT:

- **When DTC P2742 is stored and the intelligent tester output is 150°C (302°F) or higher, there is a short circuit.**
- **When DTC P2743 is stored and the intelligent tester output is -40°C (-40°F), there is an open circuit.**
  Check the temperature displayed on the tester in order to check if a malfunction exists.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or higher	Short circuit

1.INSPECT NO. 1 TRANSMISSION WIRE (NO. 2 ATF TEMPERATURE SENSOR)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
2 (OT2-) - 10 (OT2+)	Always	25 Ω to 156 kΩ
2 (OT2-) - Body ground	Always	10 kΩ or higher
10 (OT2+) - Body ground	Always	10 kΩ or higher

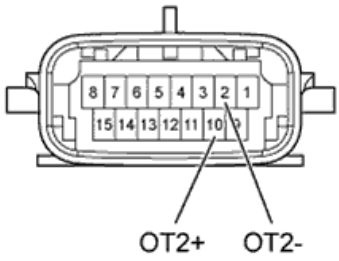
HINT:

If the resistance is out of the specified range of one of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Resistance (Reference):

ATF Temperature	Specified Condition
10°C (50°F)	5 to 8 kΩ
25°C (77°F)	2.5 to 4.5 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

Component without harness connected:
(No. 1 Transmission Wire)



Y

NG → REPAIR OR REPLACE NO. 2 ATF TEMPERATURE SENSOR (NO. 1 TRANSMISSION WIRE) (Click here)

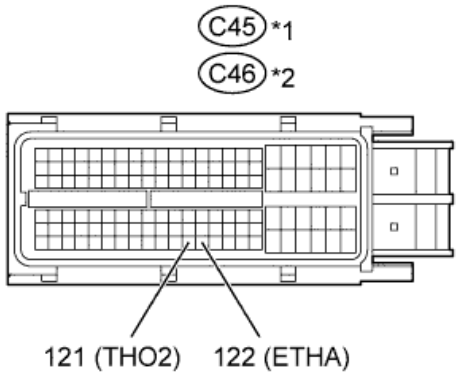
OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.

Front view of wire harness connector:
(to ECM)



*1: for LHD

*2: for RHD

Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-121 (THO2) - C45-122 (ETHA)	Always	25 Ω to 156 kΩ
C45-121 (THO2) - Body ground	Always	10 kΩ or higher
C45-122 (ETHA) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-121 (THO2) - C46-122		

(ETHA)	Always	25 Ω to 156 kΩ
C46-121 (THO2) - Body ground	Always	10 kΩ or higher
C46-122 (ETHA) - Body ground	Always	10 kΩ or higher

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0761 Shift Solenoid "C" Performance (Shift Solenoid Valve S3)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems with the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0761	A shift solenoid valve S3 stuck ON malfunction*1: When the ECM directs the transmission to switch to 5th or 6th gear, the engine overruns (clutch slips). The ECM determines there is a malfunction when either of the following conditions is met (2 trip detection logic). (a) When the ECM directs the transmission to switch to 4th gear, the actual gear is shifted to 3rd. (b) When the ECM directs the transmission to switch to 5th gear, the engine overruns (clutch slips).	• Shift solenoid valve S3 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)
P0761	A shift solenoid valve S3 stuck OFF malfunction*2: Shifting to 1st, 2nd, and 3rd gears is impossible. The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic). (a) When the ECM directs the transmission to switch to 2nd gear, the actual gear is shifted to 4th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 6th.	• Shift solenoid valve S3 remains closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

HINT:

- **Gear positions in the event of a solenoid valve mechanical problem:**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under S3 stuck ON malfunction	1st	2nd	3rd	3rd	N*	N*
*2: Actual gear position under S3 stuck OFF malfunction	3rd	4th	4th	4th	5th	6th

N*: Neutral

- **Gear position during fail-safe operation:**
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under fail-safe mode when S3 stuck ON malfunction	1st	2nd	3rd	3rd	3rd	3rd
*2: Actual gear position under fail-safe mode when S3 stuck OFF malfunction	3rd	4th	4th	4th	5th	6th

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve S3.
The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When the gear position commanded by the ECM and the actual gear position are not same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the ignition switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the ignition switch to ON.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the tester.**
- **The shift solenoid valve SL2 turns ON/OFF normally when the shift lever is in D.**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S3	ON	ON	ON	OFF	OFF	OFF

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0761)

a. Connect the intelligent tester to the DLC3.

b. Turn the ignition switch to ON.

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / ECT / Trouble Codes.

e. Read the DTCs using the tester.

Result

Result	Proceed to
Only P0761 is output	A
P0761 and other DTCs are output	B

HINT:

If any other codes besides P0761 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST
09992-00095 (09992-00231, 09992-00271)

b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

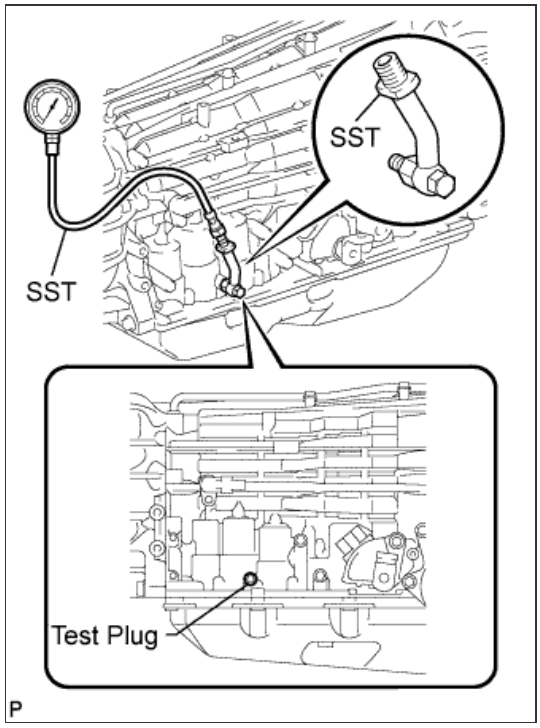
d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

h. Measure the line pressure.



ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

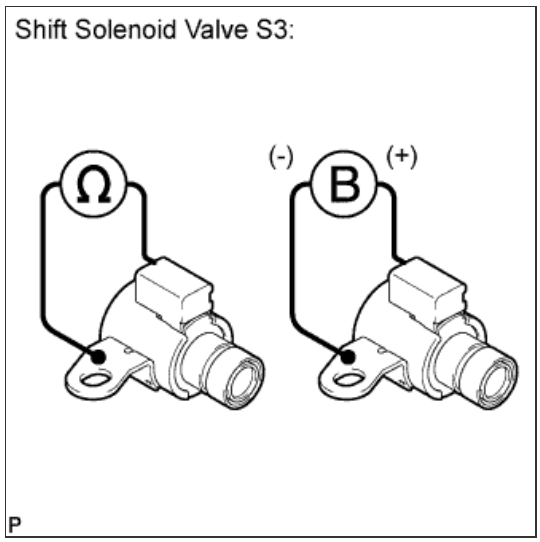
3.INSPECT SHIFT SOLENOID VALVE S3

a. Remove the shift solenoid valve S3.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S3 connector • Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise

NG → REPLACE SHIFT SOLENOID VALVE S3 (Click here)

OK

4.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P2742 Transmission Fluid Temperature Sensor "B" Circuit Low Input

DTC P2743 Transmission Fluid Temperature Sensor "B" Circuit High Input

for Preparation Click here

DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor is on the transmission, just in front of the oil cooler inlet pipeline.
If the ECM detects an abnormally high ATF temperature near this sensor, it illuminates the warning light.

HINT:

- **The temperature of ATF easily rises when towing, climbing hills, in traffic, etc.**
- **If the ATF temperature sensor becomes short-circuited, the signal that indicates that the ATF temperature is 150°C (302°F) or higher is input into the ECM.**

Vehicle conditions when the sensor is normal and when the sensor is short-circuited are indicated in the table below.

No. 2 ATF Temperature Sensor State	Detection Condition	Symptom	Recovery Condition
Sensor is normal	ATF temperature higher than 150°C (302°F)	ATF temperature warning light remains on	ATF temperature below 135°C (275°F)*1
	ATF temperature higher than 130°C (266°F)	Shift point too high	ATF temperature below 110°C (230°F)
	When conditions (a) and (b) are satisfied. (a) ATF temperature higher than 130°C (266°F) (b) Engine coolant temperature higher than 95°C (203°F)	Lock-up at 3rd gear*2	ATF temperature below 110°C (230°F)*1 and engine coolant temperature higher than 95°C (203°F)
Sensor is short-circuited	Any conditions	• ATF temperature warning light blinks or message is displayed in combination meter • Shift point too high	Symptoms still occur
	Engine coolant temperature higher than 95°C (203°F)	Lock-up at 3rd gear*2	Symptoms still occur

HINT:

*1: When the ATF temperature is in the normal range, it decreases to below 135°C (275°F) within 5 minutes with the shift lever in P or N in an idling state.

*2: When the ATF temperature is normal, transmission lock-up occurs in 5th or 6th gear with the shift lever in D or the S6 range, in 5th gear with the shift lever in the S5 range, and 4th gear with the shift lever in the S4 range.

DTC Code	DTC Detection Condition	Trouble Area
P2742	The No. 2 ATF temperature sensor resistance is below 25 Ω (0.046 V) for 0.5 sec. or more (1 trip detection logic).	• Short in No. 2 ATF temperature sensor circuit • No. 1 transmission wire (No. 2 ATF temperature sensor) • ECM
P2743	When 15 min. or more have elapsed after the engine is started, the No. 2 ATF temperature sensor resistance is higher than 156 kΩ (4.915 V) for 0.5 sec. or more (1 trip detection logic).	• Open in No. 2 ATF temperature sensor circuit • No. 1 transmission wire (No. 2 ATF temperature sensor) • ECM

MONITOR DESCRIPTION

The ATF temperature sensor converts the ATF temperature into an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is below 25 Ω*1 or higher than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM stores a DTC, and the ATF temperature warning light blinks or a message is displayed in the combination meter.

HINT:

- ***1: 150°C (302°F) or higher is indicated regardless of the actual ATF temperature.**
- ***2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.**
- **The ATF temperature can be checked on the intelligent tester display.**

WIRING DIAGRAM

Refer to DTC P0712 (Click here).

INSPECTION PROCEDURE

DATA LIST

HINT:

Using the intelligent tester to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the ignition switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the ignition switch to ON.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Data List.

g. According to the display on the tester, read the Data List.

ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 2	No. 2 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 2 ATF temperature sensor circuit is open or shorted.

HINT:

- **When DTC P2742 is stored and the intelligent tester output is 150°C (302°F) or higher, there is a short circuit.**
- **When DTC P2743 is stored and the intelligent tester output is -40°C (-40°F), there is an open circuit.**
  Check the temperature displayed on the tester in order to check if a malfunction exists.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or higher	Short circuit

1.INSPECT NO. 1 TRANSMISSION WIRE (NO. 2 ATF TEMPERATURE SENSOR)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
2 (OT2-) - 10 (OT2+)	Always	25 Ω to 156 kΩ
2 (OT2-) - Body ground	Always	10 kΩ or higher
10 (OT2+) - Body ground	Always	10 kΩ or higher

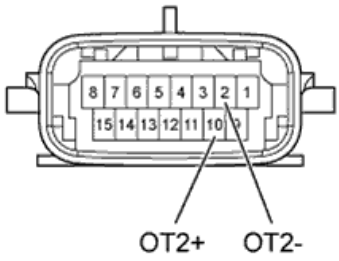
HINT:

If the resistance is out of the specified range of one of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Resistance (Reference):

ATF Temperature	Specified Condition
10°C (50°F)	5 to 8 kΩ
25°C (77°F)	2.5 to 4.5 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

Component without harness connected:
(No. 1 Transmission Wire)



Y

NG → REPAIR OR REPLACE NO. 2 ATF TEMPERATURE SENSOR (NO. 1 TRANSMISSION WIRE) (Click here)

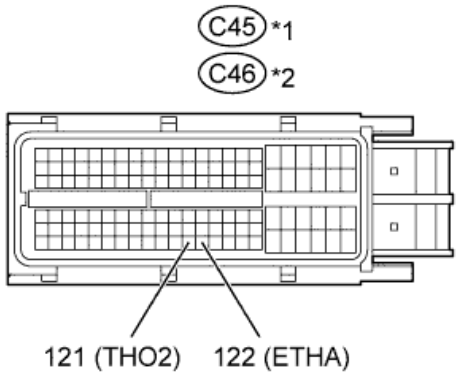
OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.

Front view of wire harness connector:
(to ECM)



*1: for LHD

*2: for RHD

Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-121 (THO2) - C45-122 (ETHA)	Always	25 Ω to 156 kΩ
C45-121 (THO2) - Body ground	Always	10 kΩ or higher
C45-122 (ETHA) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-121 (THO2) - C46-122		

(ETHA)	Always	25 Ω to 156 kΩ
C46-121 (THO2) - Body ground	Always	10 kΩ or higher
C46-122 (ETHA) - Body ground	Always	10 kΩ or higher

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0766 Shift Solenoid "D" Performance (Shift Solenoid Valve S4)

DTC P0776 Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems with the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0766	A shift solenoid valve S4 stuck OFF malfunction or brake control valve malfunction*1: Shifting to 5th and 6th gears is impossible. The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic*2, 1 trip detection logic*3). (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is shifted to 4th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 4th.	• Shift solenoid valve S4 remains closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked (brake control valve) • Automatic transmission (clutch, brake or gear, etc.)
P0776	A shift solenoid valve SL2 stuck ON malfunction or brake control valve malfunction*1: Shifting to 5th and 6th gears is impossible. The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic). (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is shifted to 4th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 4th.	• Shift solenoid valve SL2 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked (brake control valve) • Automatic transmission (clutch, brake or gear, etc.)

HINT:

- **Gear positions in the event of a solenoid valve mechanical problem:**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under malfunction	1st	2nd	3rd	4th	4th	4th

- **Gear position during fail-safe operation:**
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under fail-safe mode	1st	2nd	3rd	3rd	3rd	3rd

- ***2: w/ OBD**
- ***3: w/o OBD**

MONITOR DESCRIPTION

This DTC indicates "stuck OFF malfunction" of the shift solenoid valve S4, "stuck ON malfunction" of the shift solenoid valve SL2, or brake control valve malfunction. The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When the gear position commanded by the ECM and the actual gear position are not same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the ignition switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the ignition switch to ON.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the tester.**
- **The shift solenoid valve SL2 turns ON/OFF normally when the shift lever is in D.**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S4	OFF	OFF	OFF	OFF	ON	ON
Shift solenoid valve SL2	ON	ON	ON	ON	OFF	OFF

1.CHECK DTC OUTPUT (IN ADDITION TO DTCS P0766 AND P0776)

a. Connect the intelligent tester to the DLC3.

b. Turn the ignition switch to ON.

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / ECT / Trouble Codes.

e. Read the DTCs using the tester.

Result

Result	Proceed to
P0766 and/or P0776 is output	A
P0766, P0776 and other DTCs are output	B

HINT:

If any other codes besides P0766 and P0776 are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART (Click here)**

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

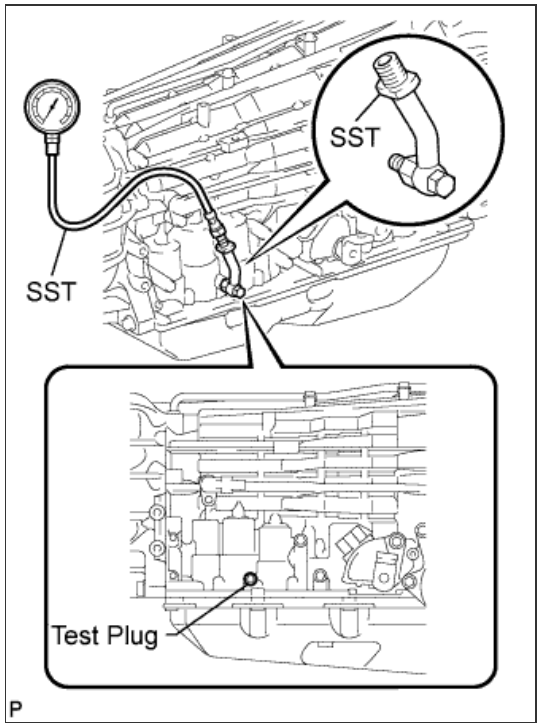
d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

h. Measure the line pressure.



ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

3.INSPECT SHIFT SOLENOID VALVE S4

a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

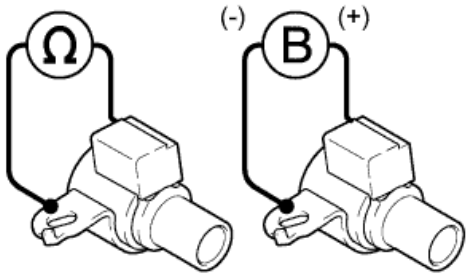
Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Shift Solenoid Valve S4:



P

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK

4.INSPECT SHIFT SOLENOID VALVE SL2

a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

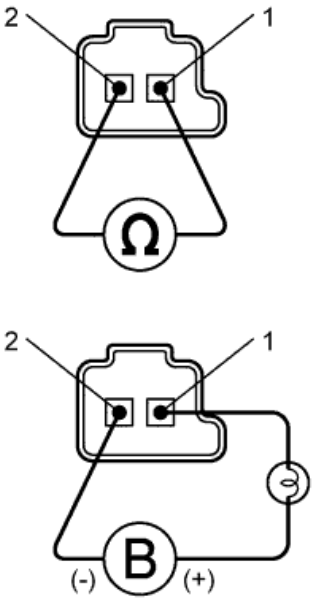
Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Component without harness connected:
(Shift Solenoid Valve SL2)



NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK

5.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (**Click here**)

OK

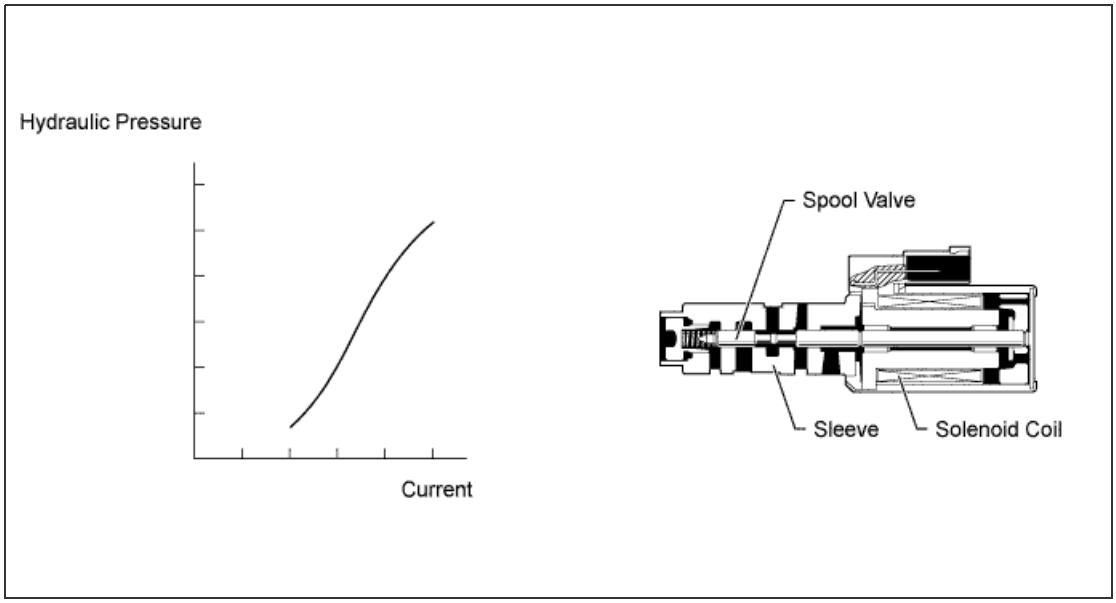
REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (**Click here**)

DTC P2757 Torque Converter Clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU)

for Preparation Click here

DESCRIPTION

The ECM uses the signals from the throttle position sensor, air-flow meter, turbine (input) speed sensor, output speed sensor and crankshaft position sensor to monitor the engagement condition of the lock-up clutch.



Then the ECM compares the engagement condition of the lock-up clutch with the lock-up schedule in the ECM memory to detect mechanical problems with the shift solenoid valve SLU, valve body and torque converter clutch.

DTC Code	DTC Detection Condition	Trouble Area
P2757	Lock-up does not occur when driving in the lock-up range (normal driving at 100 km/h (62 mph)), or lock-up remains ON in the lock-up OFF range (2 trip detection logic).	• Shift solenoid valve SLU remains open or closed • Valve body is blocked • Shift solenoid valve SLU • Torque converter clutch • Automatic transmission (clutch, brake, gear, etc.) • Line pressure is too low • ECM

MONITOR DESCRIPTION

Torque converter lock-up is controlled by the ECM based on the turbine (input) speed sensor NT, output speed sensor SP2, engine speed, engine load, engine temperature, vehicle speed, transmission temperature, and gear selection. The ECM determines the lock-up status of the torque converter by comparing the engine speed (NE) to the input turbine rpm (NT). The ECM calculates the actual transmission gear by comparing input turbine rpm (NT) to output shaft rpm (SP2). When conditions are appropriate, the ECM requests lock-up by applying control voltage to the shift solenoid SLU. When the SLU is turned ON, it applies pressure to the lock-up relay valve and locks the torque converter clutch.
If the ECM detects no lock-up after lock-up has been requested or if it detects lock-up when it is not requested, the ECM interprets this as a fault in the shift solenoid valve SLU or lock-up system performance.
The ECM will illuminate the MIL and store the DTC.
Example:
When one of the following conditions is met, the system determines that there is a malfunction.

- There is a difference in rotation between the input side (engine speed) and output side (input turbine speed) of the torque converter when the ECM commands lock-up ON.
  Engine speed is at least 70 rpm more than input turbine speed.
- There is no difference in rotation between the input side (engine speed) and output side (input turbine speed) of the torque converter when the ECM commands lock-up OFF.
  The difference between engine speed and input turbine speed is less than 35 rpm.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the ignition switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the ignition switch to ON.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

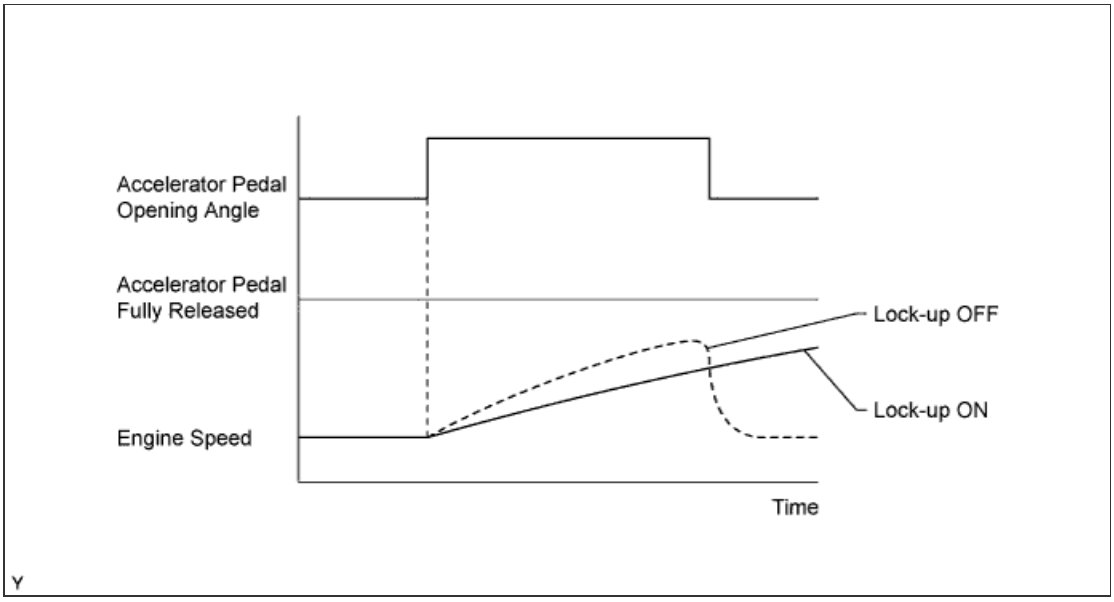
ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Lock Up	Control shift solenoid valve SLU to set automatic transmission to lock-up condition	ON or OFF	It is possible to check the shift solenoid valve SLU operation. [Vehicle Condition] • The throttle valve opening angle is less than 35%. • The vehicle speed is 80 km/h (50 mph) or more.

HINT:

- **This test can be conducted when the vehicle speed is 80 km/h (50 mph) or more.**
- **Perform this test while driving in the 5th or 6th gear.**

h. Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.



HINT:

- **When changing the accelerator pedal opening angle while driving, if the engine speed does not change, lock-up is on.**
- **Slowly release the accelerator pedal in order to decelerate, but do not fully release the pedal (fully releasing the pedal will close the throttle valve and lock-up may be turned off automatically).**

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P2757)

a. Connect the intelligent tester to the DLC3.

b. Turn the ignition switch to ON.

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / ECT / Trouble Codes.

e. Read the DTCs using the tester.

Result

Result	Proceed to
Only P2757 is output	A
P2757 and other DTCs are output	B

HINT:

If any other codes besides P2757 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.INSPECT SHIFT SOLENOID VALVE SLU

a. Remove the shift solenoid valve SLU.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

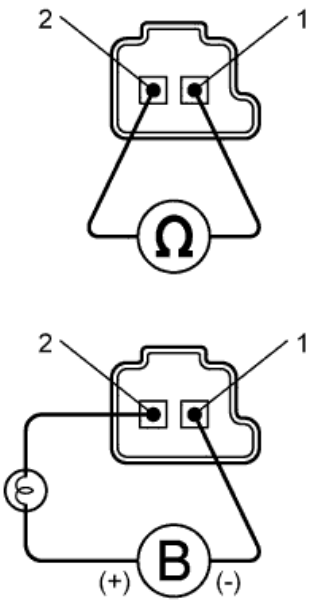
Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise

Component without harness connected:
(Shift Solenoid Valve SLU)



NG → REPLACE SHIFT SOLENOID VALVE SLU (Click here)

OK

3.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:
There are no foreign objects on any valve.

NG → REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

4.INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

a. Check the torque converter clutch assembly (Click here).

OK:

The torque converter clutch operates normally.

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY (**Click here**)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (**Click here**)

DTC P0766 Shift Solenoid "D" Performance (Shift Solenoid Valve S4)

DTC P0776 Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems with the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0766	A shift solenoid valve S4 stuck OFF malfunction or brake control valve malfunction*1: Shifting to 5th and 6th gears is impossible. The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic*2, 1 trip detection logic*3). (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is shifted to 4th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 4th.	• Shift solenoid valve S4 remains closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked (brake control valve) • Automatic transmission (clutch, brake or gear, etc.)
P0776	A shift solenoid valve SL2 stuck ON malfunction or brake control valve malfunction*1: Shifting to 5th and 6th gears is impossible. The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic). (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is shifted to 4th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 4th.	• Shift solenoid valve SL2 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked (brake control valve) • Automatic transmission (clutch, brake or gear, etc.)

HINT:

- **Gear positions in the event of a solenoid valve mechanical problem:**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under malfunction	1st	2nd	3rd	4th	4th	4th

- **Gear position during fail-safe operation:**
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under fail-safe mode	1st	2nd	3rd	3rd	3rd	3rd

- ***2: w/ OBD**
- ***3: w/o OBD**

MONITOR DESCRIPTION

This DTC indicates "stuck OFF malfunction" of the shift solenoid valve S4, "stuck ON malfunction" of the shift solenoid valve SL2, or brake control valve malfunction. The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When the gear position commanded by the ECM and the actual gear position are not same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the ignition switch off.

c. Connect the intelligent tester to the DLC3.

d. Turn the ignition switch to ON.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the tester.**
- **The shift solenoid valve SL2 turns ON/OFF normally when the shift lever is in D.**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S4	OFF	OFF	OFF	OFF	ON	ON
Shift solenoid valve SL2	ON	ON	ON	ON	OFF	OFF

1.CHECK DTC OUTPUT (IN ADDITION TO DTCS P0766 AND P0776)

a. Connect the intelligent tester to the DLC3.

b. Turn the ignition switch to ON.

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / ECT / Trouble Codes.

e. Read the DTCs using the tester.

Result

Result	Proceed to
P0766 and/or P0776 is output	A
P0766, P0776 and other DTCs are output	B

HINT:

If any other codes besides P0766 and P0776 are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART (Click here)**

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

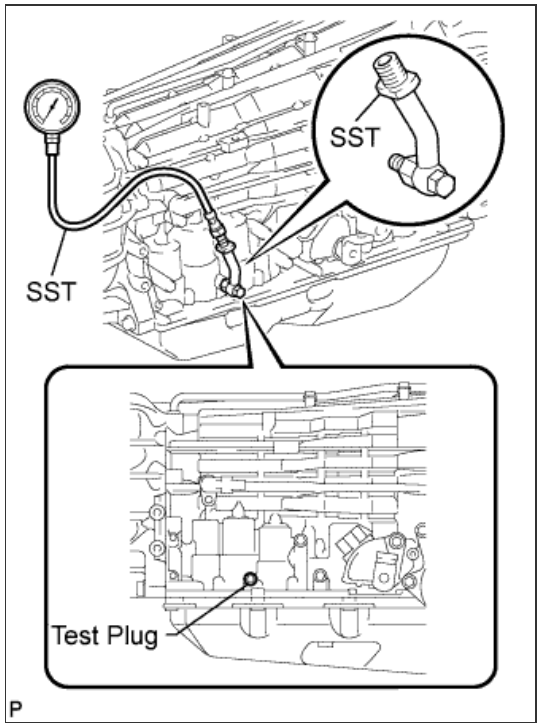
d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

h. Measure the line pressure.



ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

3.INSPECT SHIFT SOLENOID VALVE S4

a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

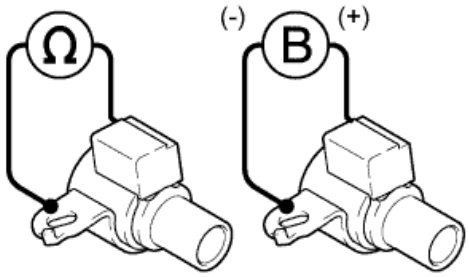
Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Shift Solenoid Valve S4:



P

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK

4.INSPECT SHIFT SOLENOID VALVE SL2

a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

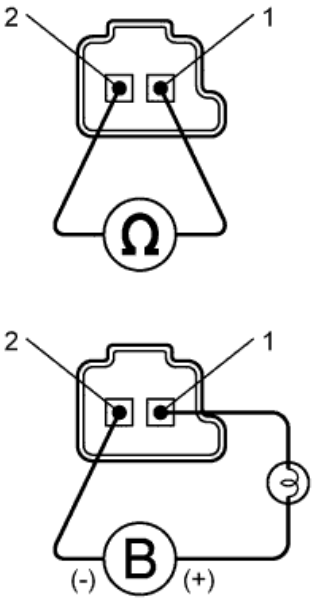
Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Component without harness connected:
(Shift Solenoid Valve SL2)



NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK

5.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (**Click here**)

OK

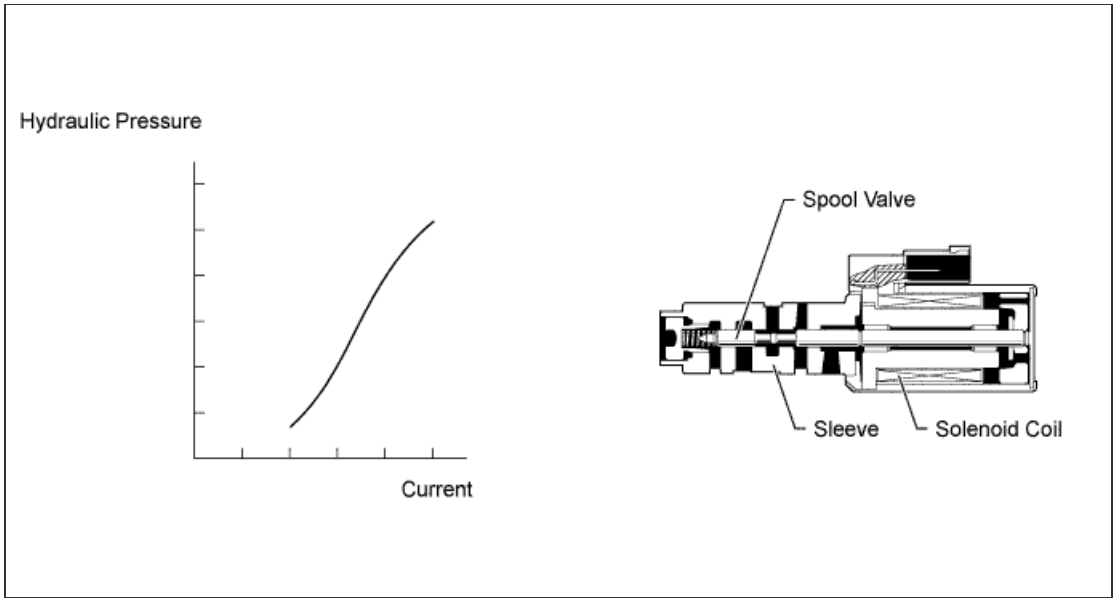
REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (**Click here**)

DTC P2759 Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)

for Preparation Click here

DESCRIPTION

The amount of current flow to the solenoid is controlled by the duty ratio* of the ECM output signal. During the lock-up operation, if the duty ratio increases, the lock-up hydraulic pressure increases.

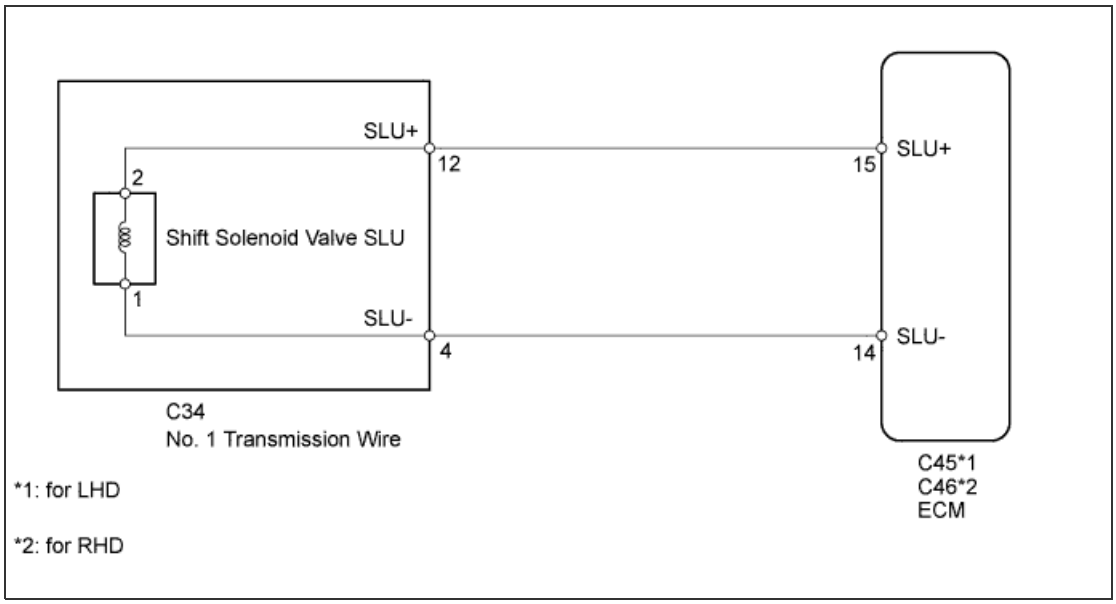


DTC Code	DTC Detection Condition	Trouble Area
P2759	An open or short is detected in the shift solenoid valve SLU circuit for 1 sec. or more while driving (1 trip detection logic).	• Open or short in shift solenoid valve SLU circuit • Shift solenoid valve SLU • ECM

MONITOR DESCRIPTION

When an open or short in the shift solenoid valve SLU circuit is detected, the ECM determines that there is a malfunction. The ECM will illuminate the MIL and store this DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SLU)

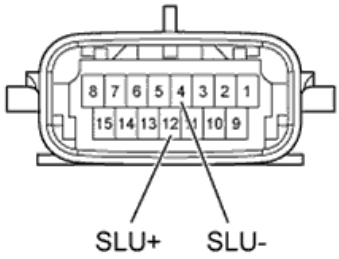
a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
12 (SLU+) - 4 (SLU-)	20°C (68°F)	5.0 to 5.6 Ω
12 (SLU+) - Body ground	Always	10 kΩ or higher
4 (SLU-) - Body ground	Always	10 kΩ or higher

Component without harness connected:
(No. 1 Transmission Wire)



Y

NG → Go to step 3

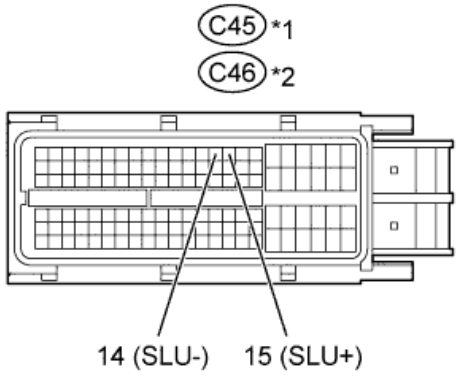
OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.

Front view of wire harness connector:
(to ECM)



*1: for LHD

*2: for RHD

Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-15 (SLU+) - C45-14 (SLU-)	20°C (68°F)	5.0 to 5.6 Ω
C45-15 (SLU+) - Body ground	Always	10 kΩ or higher
C45-14 (SLU-) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition

C46-15 (SLU+) - C46-14 (SLU-)	20°C (68°F)	5.0 to 5.6 Ω
C46-15 (SLU+) - Body ground	Always	10 kΩ or higher
C46-14 (SLU-) - Body ground	Always	10 kΩ or higher

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SLU

a. Remove the shift solenoid valve SLU.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

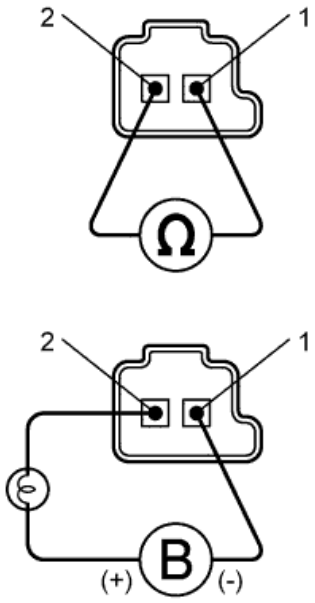
Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise

Component without harness connected:
(Shift Solenoid Valve SLU)



NG → REPLACE SHIFT SOLENOID VALVE SLU (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0778 Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)

for Preparation Click here

DESCRIPTION

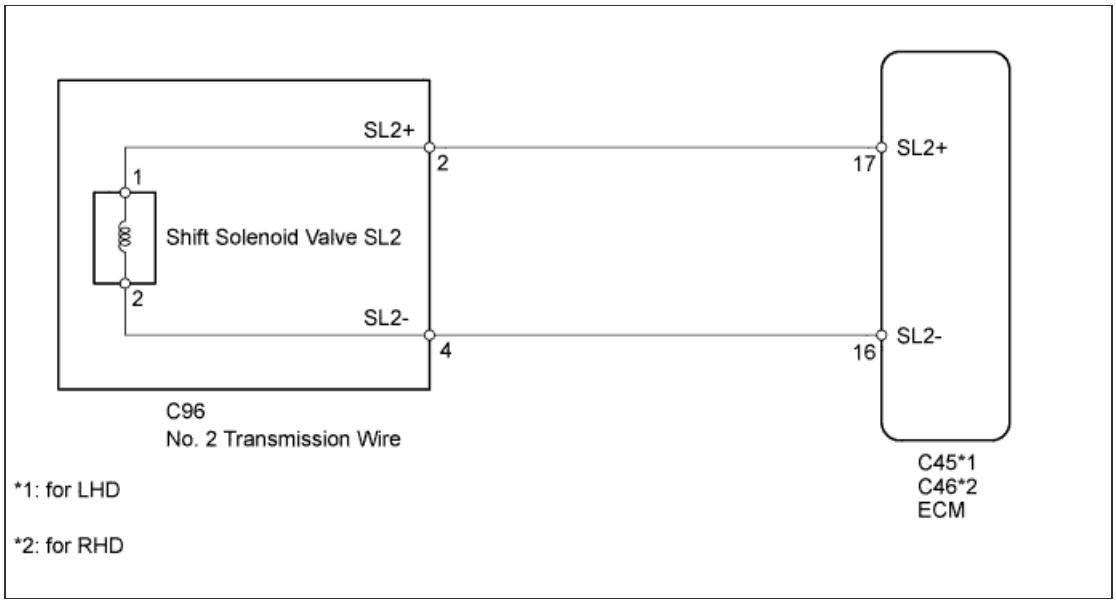
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0778	The ECM checks for an open or short in the shift solenoid valve SL2 circuit while driving and shifting gears (1 trip detection logic). The output signal duty ratio equals 100% (the SL2 output signal duty ratio is less than 100% under normal conditions).	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL2 circuit. The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. Also, the ECM performs the fail-safe function and turns the other normally functioning shift solenoid valves ON/OFF. In case of an open or short circuit, the ECM stops sending current to the open or short circuited solenoid.
While driving and shifting gears, if the ECM detects an open or short in the shift solenoid valve SL2 circuit, the ECM determines there is a malfunction (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve SL2 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve SL2	ON	ON	ON	ON	OFF	OFF

1.INSPECT NO. 2 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SL2)

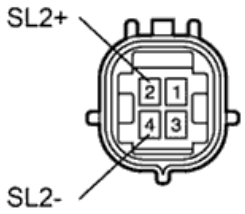
a. Disconnect the No. 2 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
2 (SL2+) - 4 (SL2-)	20°C (68°F)	5.0 to 5.6 Ω
2 (SL2+) - Body ground	Always	10 kΩ or higher
4 (SL2-) - Body ground	Always	10 kΩ or higher

Component without harness connected:
(No. 2 Transmission Wire)



NG → Go to step 3

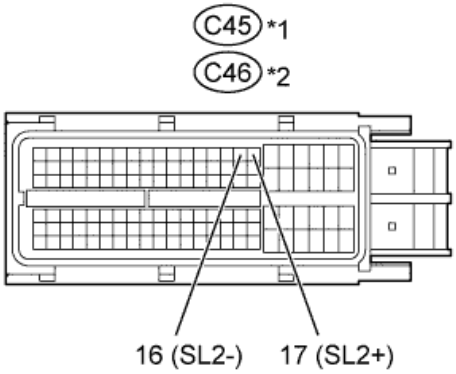
OK

2.CHECK HARNESS AND CONNECTOR (NO. 2 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.

Front view of wire harness connector:
(to ECM)



*1: for LHD

*2: for RHD

Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-17 (SL2+) - C45-16 (SL2-)	20°C (68°F)	5.0 to 5.6 Ω
C45-17 (SL2+) - Body ground	Always	10 kΩ or higher
C45-16 (SL2-) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-17 (SL2+) - C46-16 (SL2-)	20°C (68°F)	5.0 to 5.6 Ω
C46-17 (SL2+) - Body ground	Always	10 kΩ or higher

C46-16 (SL2-) - Body ground	Always	10 kΩ or higher

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK →

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SL2

a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

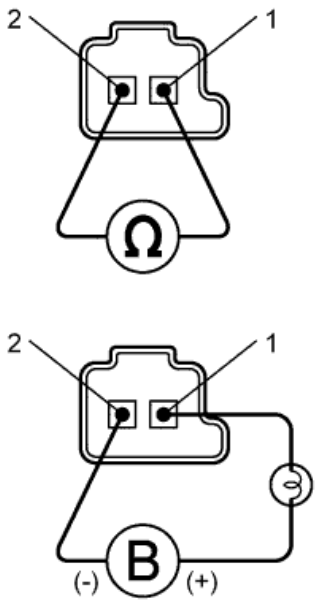
Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Component without harness connected:
(Shift Solenoid Valve SL2)



NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK →

REPAIR OR REPLACE NO. 2 TRANSMISSION WIRE (Click here)

DTC P2772 Four Wheel Drive (4WD) Low Switch Circuit Range / Performance

for Preparation Click here

DESCRIPTION

The ECM detects the signal from the transfer L4 position switch.
This DTC indicates that the transfer L4 position switch remains on.

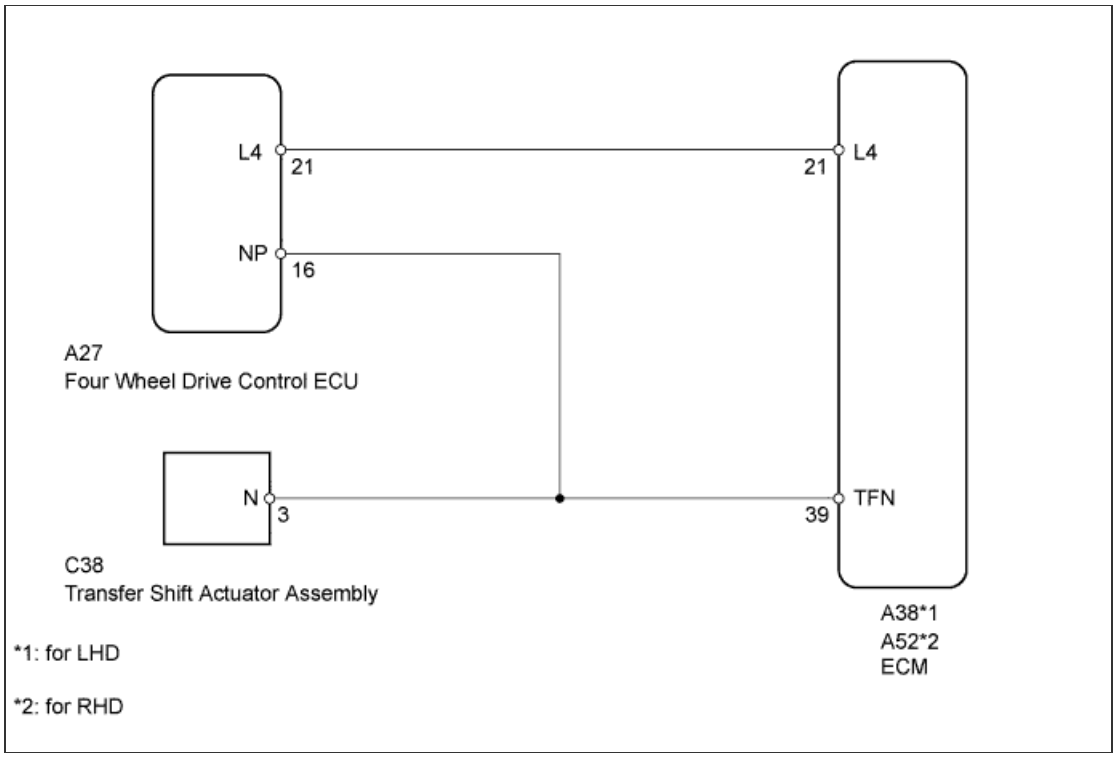
DTC Code	DTC Detection Condition	Trouble Area
P2772	The transfer L4 position switch remains on while the vehicle is running under the following conditions for 1.8 sec. or more (1 trip detection logic). (a) The output shaft speed is between 1000 and 3000 rpm. (b) The transfer position switch is in H4.	• Short in transfer L4 position switch circuit • Four wheel drive control ECU • ECM

MONITOR DESCRIPTION

The ECM monitors the transfer-case L4 position switch to determine when the transfer-case L4 gears are engaged. If the transfer-case L4 gears remain engaged under the following conditions, the ECM will conclude that there is a malfunction of the L4 position switch, illuminate the MIL and store the DTC:

- L4 switch indicated that the L4 transfer-case gears are engaged.
- The transfer-case shifter is in the "H4" position.
- The transfer-case output shaft rpm is between 1000 and 3000 rpm.
- The specified time period has elapsed.

WIRING DIAGRAM



INSPECTION PROCEDURE

1.CHECK HARNESS AND CONNECTOR (FOUR WHEEL DRIVE CONTROL ECU - BODY GROUND)

a. Disconnect the four wheel drive control ECU connector.

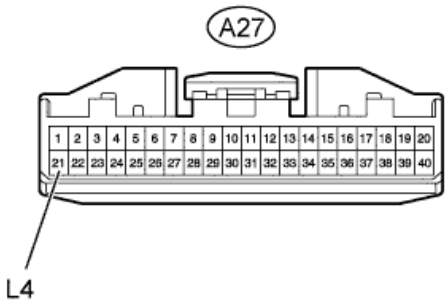
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified

		Condition
A27-21 (L4) - Body ground	Always	10 kΩ or higher

Front view of wire harness connector:
(to Four Wheel Drive Control ECU)



NG → Go to step 2

OK

GO TO TRANSFER SYSTEM INSPECTION (Click here)

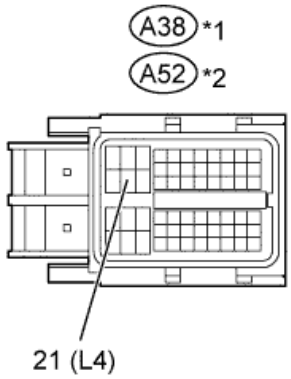
2.CHECK HARNESS AND CONNECTOR (FOUR WHEEL DRIVE CONTROL ECU - ECM)

a. Disconnect the ECM connector.

b. Disconnect the A27 four wheel drive control ECU connector.

c. Measure the resistance according to the value(s) in the table below.

Front view of wire harness connector:
(to ECM)



*1: for LHD

*2: for RHD

Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
A38-21 (L4) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
A52-21 (L4) - Body ground	Always	10 kΩ or higher

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0781 1-2 Shift (1-2 Shift Valve)

for Preparation Click here

DESCRIPTION

The 1-2 shift valve performs shifting to 1st gear and other gears. When shifting to 2nd and 4th gears is impossible, or when the ECM directs the transmission to switch to 5th and 6th gear and the engine overruns (clutch slips), this DTC is stored.

DTC Code	DTC Detection Condition	Trouble Area
P0781	When conditions (a) and (b), or (a) and (c) are met (2 trip detection logic*1, 1 trip detection logic*2). (a) When the ECM directs the transmission to switch to 2nd gear, the actual gear is shifted to 1st. (b) When the ECM directs the transmission to switch to 4th gear, the actual gear is shifted to 3rd. (c) When the ECM directs the transmission to switch to 5th gear, the engine overruns (clutch slips).	• Valve body is blocked up or stuck (1-2 shift valve) • Shift solenoid valve SLT remains open or closed • Automatic transmission (clutch, brake or gear, etc.)

HINT:

- *1: w/ OBD
- *2: w/o OBD
- Gear positions in the event of a solenoid valve mechanical problem:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Actual gear position under malfunction	1st	1st	3rd	3rd	N*	N*

N*: Neutral

- Gear position during fail-safe operation:
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
Actual gear position under fail-safe mode	1st*	1st*	3rd	3rd	3rd	3rd

1st*: Under engine braking, downshifting to 1st or 2nd gear is prohibited.

MONITOR DESCRIPTION

This DTC indicates that the 1-2 shift valve in the valve body is locked in the direction the spring compresses.
The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF" and switching oil pressure to the valves in the valve body.
The ECM calculates the "actual" transmission gear by comparing the signals from the input speed sensor (NT) and the output speed sensor (SP2). The ECM can detect many mechanical problems with the shift solenoids, valve body, transmission clutches, brakes, and gears. If the ECM detects that the actual gear position and the commanded gear position are different, it will illuminate the MIL and store the DTC.

INSPECTION PROCEDURE

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0781)

a. Connect the intelligent tester to the DLC3.

b. Turn the ignition switch to ON.

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / ECT / Trouble Codes.

e. Read the DTCs using the tester.

Result

Result	Proceed to

Only P0781 is output	A
P0781 and other DTCs are output	B

HINT:

If any other codes besides P0781 are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART (Click here)**

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (RUNNING TEST)

CAUTION:

This test should always be performed with at least 2 people.

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Perform the test with the A/C turned off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Connect the intelligent tester to the DLC3.

b. Clear the DTC (Click here).

c. Warm up the engine.

d. Enter the following menus: Powertrain / ECT / Active Test.

e. According to the display on the tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the tester.**
- **Gear positions in the event of a solenoid valve mechanical problem:**

Tester gear shift command	1st	2nd	3rd	4th	5th	6th
Actual gear position under malfunction	1st	1st	3rd	3rd	N*	N*

N*: Neutral

OK:

Gear position changes in accordance with the tester command.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

3.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

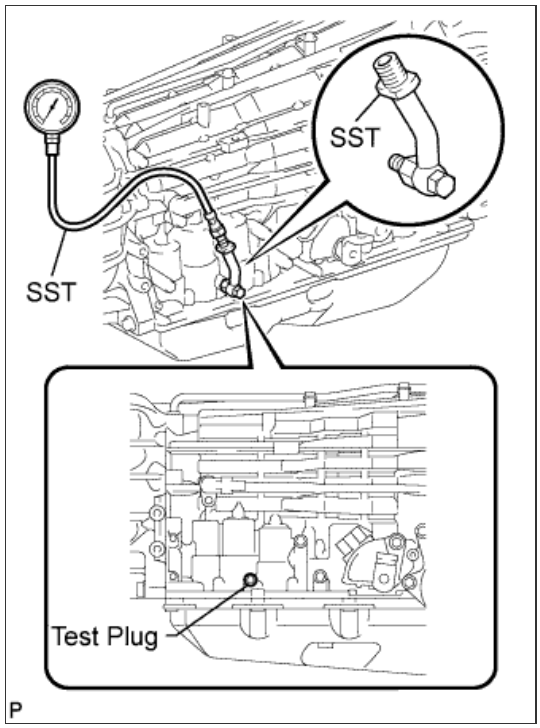
d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

h. Measure the line pressure.



ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

4.CLEAR DTC AND PERFORM RUNNING TEST

a. Clear the DTC (Click here).

b. Check the DTC again after conducting the Monitor Drive Pattern (Click here).

OK:
No DTC output

NG → REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (**Click here**)

OK

END

DTC U0100 Lost Communication with ECM / PCM "A"

for Preparation Click here

DESCRIPTION

The engine control unit and the transmission control unit are located inside the ECM. The engine control unit intercommunicates with the transmission control unit with the Controller Area Network (CAN). If there is a problem in this intercommunication, the ECM stores a DTC.

DTC Code	DTC Detection Condition	Trouble Area
U0100	No communication with the ECM continues (1 trip detection logic).	ECM

INSPECTION PROCEDURE

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0100)

a. Connect the intelligent tester to the DLC3.

b. Turn the ignition switch to ON.

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / ECT / DTC.

e. Read the DTCs using the tester.

Result

Result	Proceed to
Only U0100 is output	A
U0100 and other DTCs are output	B

HINT:

If any other codes besides U0100 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.REPLACE ECM

a. Replace the ECM (Click here).

NEXT

3.CHECK IF DTC RECURS

a. Clear the DTC (Click here).

b. Start the engine.

c. Read the DTCs using the tester.

Result

Result	Proceed to
No DTC output	A
Other DTCs output	B

B → GO TO DTC CHART (Click here)

A

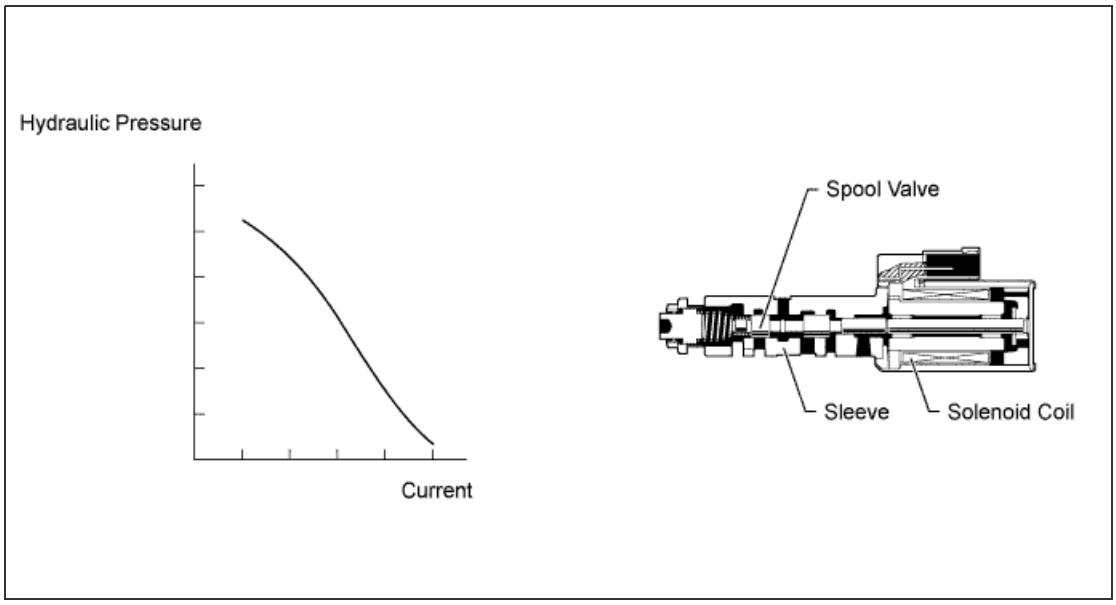
END

DTC P0894 Transmission Component Slipping

DTC P2714 Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)

for Preparation Click here

DESCRIPTION



The shift solenoid valve SLT controls the transmission line pressure for smooth transmission operation based on signals from the throttle position sensor and the vehicle speed sensor. The ECM adjusts the current of the SLT solenoid valve to control the hydraulic line pressure coming from the primary regulator valve. Appropriate line pressure assures smooth shifting with varying engine outputs.

DTC Code	DTC Detection Condition	Trouble Area
P0894	The ECM detects a malfunction of the SLT, S1, S2, S3, S4, SL2, gear 6 incorrect ratio (sequence valve) or 1-2 shift solenoid valves according to the revolution difference of the turbine and output shaft, and also by the oil pressure (2 trip detection logic).	• Shift solenoid valve SLT remains open or closed • Shift solenoid valve S1, S2, S3, S4 or SL2 remains open or closed • Gear 6 incorrect ratio (sequence valve) or 1-2 shift valve is stuck • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)
P2714	The ECM detects a malfunction of the SLT shift solenoid valve (ON side) according to the revolution difference of the turbine and output shaft, and also by the oil pressure (2 trip detection logic*1, 1 trip detection logic*2).	• Shift solenoid valve SLT remains open or closed • Shift solenoid valve S1, S2, S3, S4 or SL2 remains open or closed • Gear 6 incorrect ratio (sequence valve) or 1-2 shift valve is stuck • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)

HINT:

- ***1: w/ OBD**
- ***2: w/o OBD**

MONITOR DESCRIPTION

The ECM calculates the amount of heat absorbed by the friction material based on the difference in revolution (clutch slippage) between the turbine and output shaft. The ECM illuminates the MIL and stores this DTC when the amount of heat absorption exceeds the specified value.
There are two reasons that make the revolution different.

- When the shift solenoid valve SLT remains on, oil pressure goes down and clutch engagement force decreases.
- When the shift solenoid valve remains on or off, the gear position commanded by the ECM and the actual gear position are not the same.

NOTICE:

If you continue driving under these conditions, the clutch will burn out and the vehicle will no longer be drivable.

INSPECTION PROCEDURE

1.CHECK DTC OUTPUT (IN ADDITION TO DTCS P0894 AND P2714)

a. Connect the intelligent tester to the DLC3.

b. Turn the ignition switch to ON.

c. Turn the intelligent tester on.

d. Enter the following menus: Powertrain / ECT / Trouble Codes.

e. Read the DTCs using the tester.

Result

Result	Proceed to
P0894 and/or P2714 is output	A
P0894, P2714 and other DTCs are output	B

HINT:

If any other codes besides P0894 and P2714 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

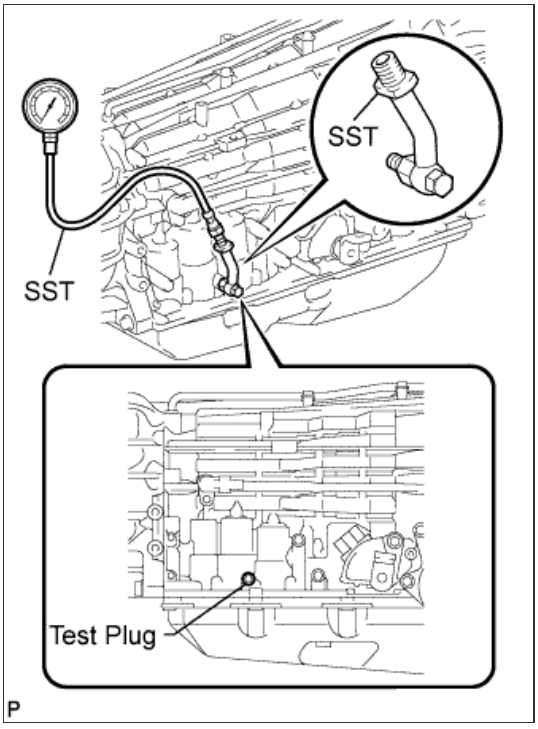
HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST

09992-00095 (09992-00231, 09992-00271)



b. Connect the intelligent tester to the DLC3.

c. Start the engine and warm it up.

d. Measure the line pressure with SST.

e. Turn the intelligent tester on.

f. Enter the following menus: Powertrain / ECT / Active Test.

g. According to the display on the tester, perform the Active Test.

h. Measure the line pressure.

ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → Go to step 17

OK

3.PERFORM ACTIVE TEST USING INTELLIGENT TESTER (RUNNING TEST)

CAUTION:

This test should always be performed with at least 2 people.

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Perform the test with the A/C turned off.**

HINT:

Using the intelligent tester to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Connect the intelligent tester to the DLC3.

b. Clear the DTC (Click here).

c. Warm up the engine.

d. Enter the following menus: Powertrain / ECT / Active Test.

e. According to the display on the tester, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the intelligent tester.

ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the tester.**

f. Compare the ECM gear shift command and the actual gear position.

OK:

Gear position changes in accordance with the tester command.

Result

System Condition			ECM Gear Shift Command						Proceed to
			1st	2nd	3rd	4th	5th	6th	
Malfunction	Shift solenoid valve S1	Stuck ON*1	2nd	2nd	3rd	4th	5th	6th	A
		Stuck OFF	1st	1st	3rd	4th	5th	N*2	
	Shift solenoid valve S2	Stuck ON	1st	2nd	2nd	4th	6th	6th	B
		Stuck OFF	3rd	3rd	3rd	4th	5th	5th	
	Shift solenoid valve S3	Stuck ON	1st	2nd	3rd	3rd	N*2	N*2	C
		Stuck OFF	3rd	4th	4th	4th	5th	6th	
	Shift solenoid valve S4	Stuck ON*3	1st	2nd	3rd	4th	5th	6th	D
		Stuck OFF	1st	2nd	3rd	4th	4th	4th	
Normal			1st	2nd	3rd	4th	5th	6th	E

HINT:

- ***1: When shift solenoid valve S1 is stuck ON, the vehicle cannot drive in reverse.**
- ***2: Neutral**
- ***3: When shift solenoid valve S4 is stuck ON, gear shifting is normal.**

B	Go to step 7
C	Go to step 10
D	Go to step 13
E	Go to step 17

A

4.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

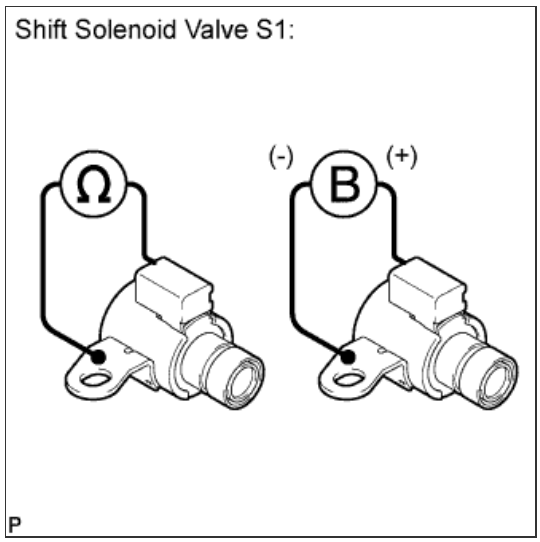
Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector	Valve moves and makes an

Shift Solenoid Valve S1:



P

• Battery negative (-) → Shift solenoid valve S1 body	operating noise

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

5.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:
There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

6.INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

a. Check the torque converter clutch assembly (Click here).

OK:
The torque converter clutch operates normally.

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

7.INSPECT SHIFT SOLENOID VALVE S2

a. Remove the shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

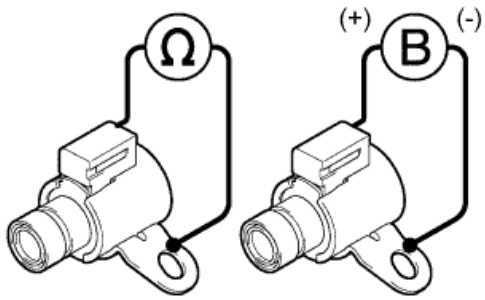
Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

Shift Solenoid Valve S2:



P

NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK

8.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

9.INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

a. Check the torque converter clutch assembly (Click here).

OK:

The torque converter clutch operates normally.

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

10.INSPECT SHIFT SOLENOID VALVE S3

a. Remove the shift solenoid valve S3.

b. Measure the resistance according to the value(s) in the table below.

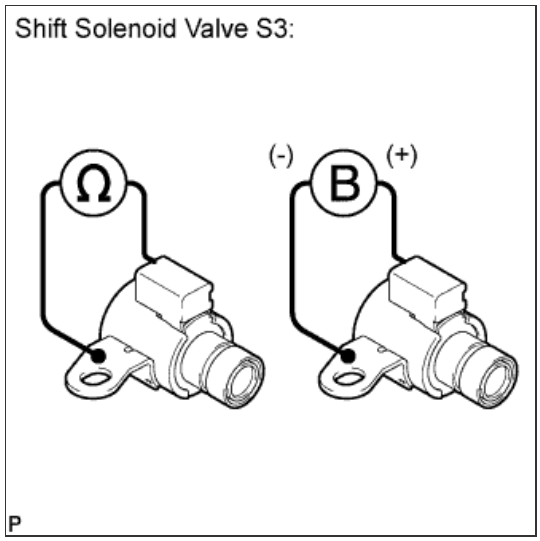
Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S3 connector • Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise



NG → REPLACE SHIFT SOLENOID VALVE S3 (Click here)

OK

11.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:
There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

12.INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

a. Check the torque converter clutch assembly (Click here).

OK:
The torque converter clutch operates normally.

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

13.INSPECT SHIFT SOLENOID VALVE S4

a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

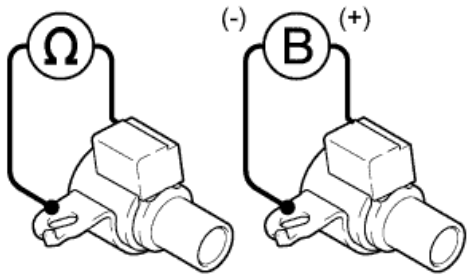
Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Shift Solenoid Valve S4:



P

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK

14.INSPECT SHIFT SOLENOID VALVE SL2

a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

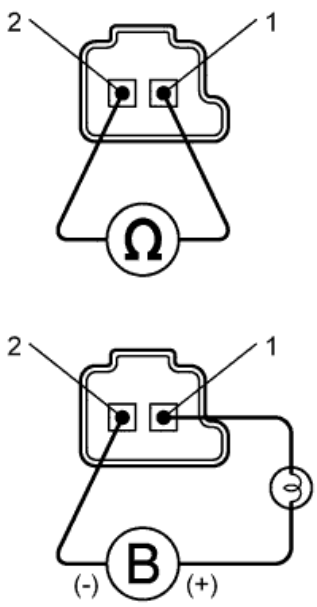
Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Component without harness connected:
(Shift Solenoid Valve SL2)



NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK

15.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:
There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

16.INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

a. Check the torque converter clutch assembly (Click here).

OK:
The torque converter clutch operates normally.

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

17.INSPECT SHIFT SOLENOID VALVE SLT

a. Remove the shift solenoid valve SLT.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

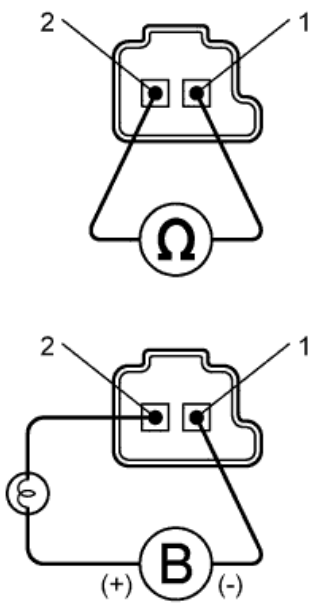
Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise

Component without harness connected:
(Shift Solenoid Valve SLT)



NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

18.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:
There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

19.INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

a. Check the torque converter clutch assembly (Click here).

OK:
The torque converter clutch operates normally.

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY (Click here)

OK

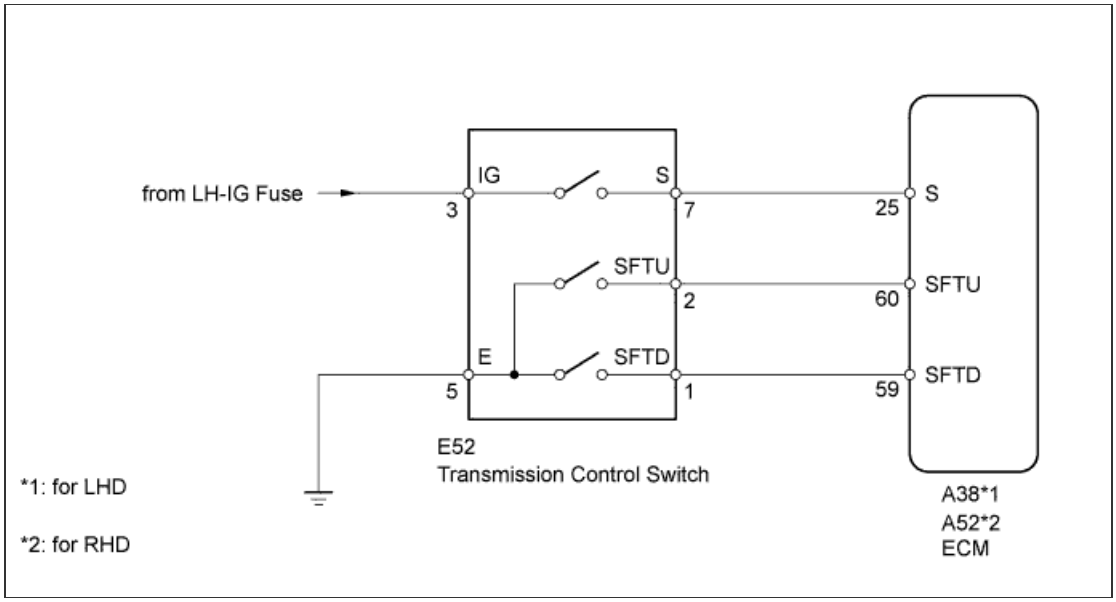
REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

for Preparation Click here

DESCRIPTION

When moving the shift lever to S using the transmission control switch, it is possible to switch the shift range between "1" (1st range) and "6" (6th range). Shifting to "+" once raises the shift range by one, and shifting to "-" lowers the shift range by one.

WIRING DIAGRAM



INSPECTION PROCEDURE

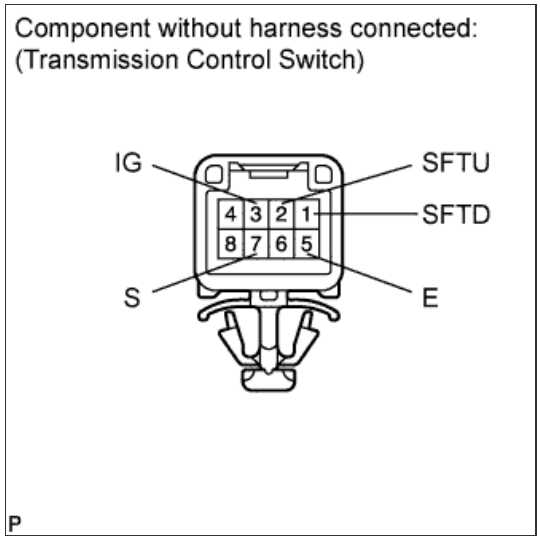
1.INSPECT TRANSMISSION CONTROL SWITCH

a. Disconnect the transmission control switch connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
3 (IG) - 7 (S)	Shift lever in S, "+" or "-"	Below 1 Ω
2 (SFTU) - 5 (E)	Shift lever held in "+" (Up-shift)	Below 1 Ω
1 (SFTD) - 5 (E)	Shift lever held in "-" (Down-shift)	Below 1 Ω
3 (IG) - 7 (S)	Shift lever not in S, "+" or "-"	10 kΩ or higher
2 (SFTU) - 5 (E)	Shift lever in S	10 kΩ or higher
1 (SFTD) - 5 (E)	Shift lever in S	10 kΩ or higher



NG → REPLACE TRANSMISSION CONTROL SWITCH (LOWER SHIFT LEVER ASSEMBLY) (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL SWITCH - BATTERY, BODY GROUND)

a. Disconnect the transmission control switch connector.

b. Measure the voltage according to the value(s) in the table below.

Standard Voltage:

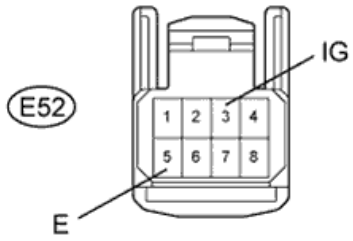
Tester Connection	Switch Condition	Specified Condition
E52-3 (IG) - Body ground	Ignition switch ON	11 to 14 V
E52-3 (IG) - Body ground	Ignition switch off	Below 1 V

c. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
E52-5 (E) - Body ground	Always	Below 1 Ω

Front view of wire harness connector:
(to Transmission Control Switch)



Y

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

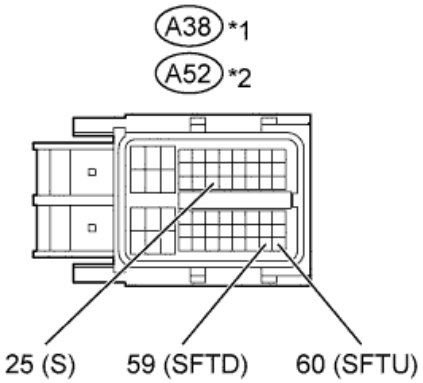
OK

3.CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL SWITCH - ECM)

a. Disconnect the ECM connector.

b. Measure the voltage according to the value(s) in the table below.

Front view of wire harness connector:
(to ECM)



*1: for LHD

*2: for RHD

Standard Voltage:

for LHD

Tester Connection	Condition	Specified Condition
A38-25 (S) - Body ground	• Ignition switch ON • Shift lever in S, "+" or "-"	11 to 14 V
A38-25 (S) - Body ground	• Ignition switch ON • Shift lever not	Below 1 V

	in S, "+" or "-"	

for RHD

Tester Connection	Condition	Specified Condition
A52-25 (S) - Body ground	• Ignition switch ON • Shift lever in S, "+" or "-"	11 to 14 V
A52-25 (S) - Body ground	• Ignition switch ON • Shift lever not in S, "+" or "-"	Below 1 V

c. Turn the ignition switch off.

d. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
A38-60 (SFTU) - Body ground	Shift lever held in "+" (Up-shift)	Below 1 Ω
A38-59 (SFTD) - Body ground	Shift lever held in "-" (Down-shift)	Below 1 Ω
A38-60 (SFTU) - Body ground	Shift lever in S	10 kΩ or higher
A38-59 (SFTD) - Body ground	Shift lever in S	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
A52-60 (SFTU) - Body ground	Shift lever held in "+" (Up-shift)	Below 1 Ω
A52-59 (SFTD) - Body ground	Shift lever held in "-" (Down-shift)	Below 1 Ω
A52-60 (SFTU) - Body ground	Shift lever in S	10 kΩ or higher
A52-59 (SFTD) - Body ground	Shift lever in S	10 kΩ or higher

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

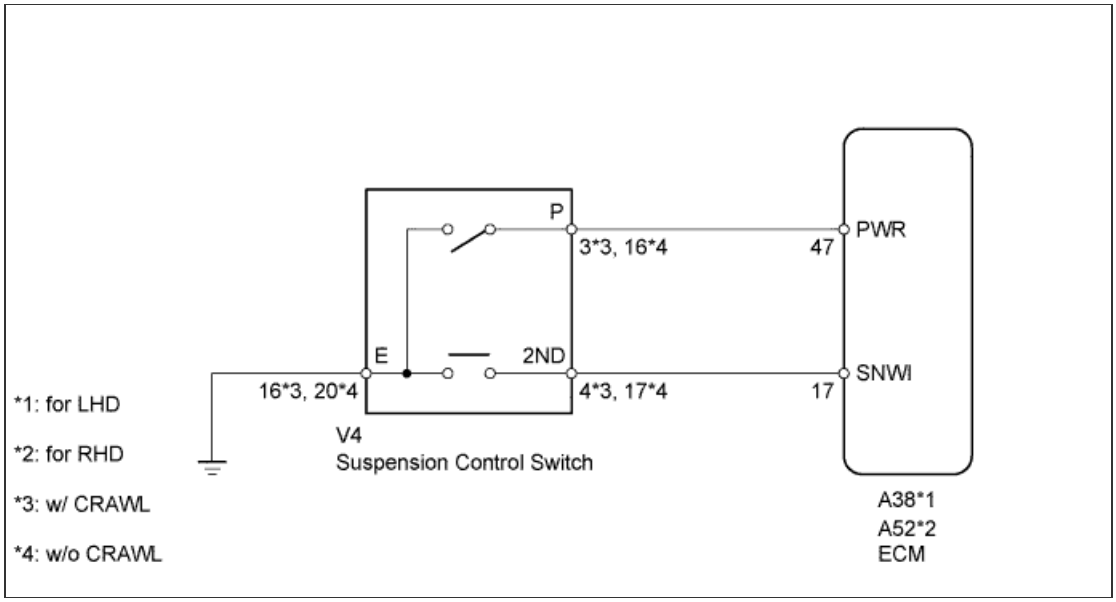
PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (Click here)

for Preparation Click here

DESCRIPTION

The ECM memory contains the programs for the normal and power shift patterns and lock-up pattern.
By following the programs corresponding to the signals from the pattern select switch, the park/neutral position switch and other various sensors, the ECM switches the solenoid valves on and off, and controls the transmission gear change and the lock-up clutch operation.

WIRING DIAGRAM



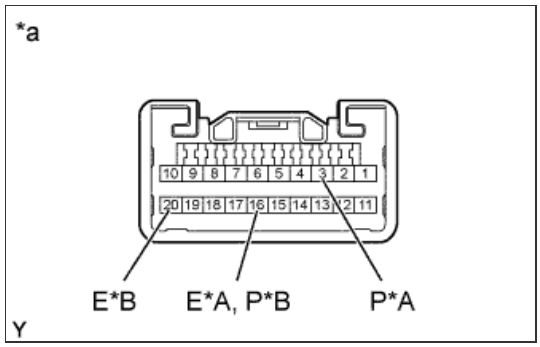
INSPECTION PROCEDURE

When the pattern select (PWR) switch is pushed, switch contact is made and power mode is selected. To cancel power mode, push the pattern select (PWR) switch once again.

1.INSPECT PATTERN SELECT (PWR) SWITCH

a. Remove the suspension control switch (Click here).

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

w/ CRAWL

Tester Connection	Switch Condition	Specified Condition
3 (P) - 16 (E)	Pattern select (PWR) switch on	Below 1 Ω
3 (P) - 16 (E)	Pattern select (PWR) switch off	10 kΩ or higher

w/o CRAWL

Tester Connection	Switch Condition	Specified Condition
16 (P) - 20 (E)	Pattern select (PWR) switch on	Below 1 Ω

16 (P) - 20 (E)	Pattern select (PWR) switch off	10 kΩ or higher

Text in Illustration

A	w/ CRAWL
B	w/o CRAWL
*a	Component without harness connected (Suspension Control Switch)

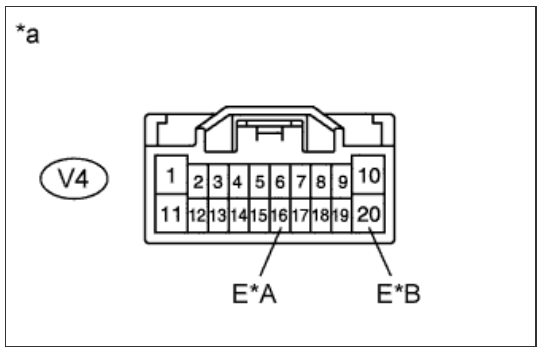
NG → REPLACE PATTERN SELECT (PWR) SWITCH (SUSPENSION CONTROL SWITCH) (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (PATTERN SELECT (PWR) SWITCH - BODY GROUND)

a. Disconnect the suspension control switch connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

w/ CRAWL

Tester Connection	Condition	Specified Condition
V4-16 (E) - Body ground	Always	Below 1 Ω

w/o CRAWL

Tester Connection	Condition	Specified Condition
V4-20 (E) - Body ground	Always	Below 1 Ω

Text in Illustration

A	w/ CRAWL
B	w/o CRAWL
*a	Front view of wire harness connector (to Suspension Control Switch)

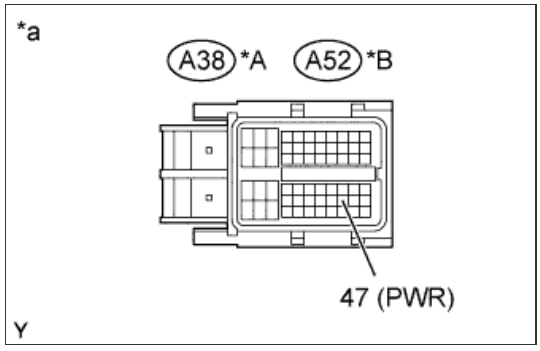
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3.CHECK HARNESS AND CONNECTOR (PATTERN SELECT (PWR) SWITCH - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Switch Condition	Specified Condition
A38-47 (PWR) - Body ground	Pattern select (PWR) switch on	Below 1 Ω
A38-47 (PWR) - Body ground	Pattern select (PWR) switch off	10 kΩ or higher

for RHD

Tester Connection	Switch Condition	Specified Condition
A52-47 (PWR) - Body ground	Pattern select (PWR) switch on	Below 1 Ω
A52-47 (PWR) - Body ground	Pattern select (PWR) switch off	10 kΩ or higher

Text in Illustration

A	for LHD
B	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (Click here)

for Preparation Click here

DESCRIPTION

When 2nd mode is selected with the pattern select (2ND) switch, the ECM controls the solenoid valves and the transmission starts from 2nd gear. The 2nd mode is the system that operates the throttle motor to control engine output to reduce skidding of the driving wheels, and guarantee takeoff acceleration, driving straightness and turning stability.
When the shift lever is in D, the transmission automatically shifts up through 3rd to 6th as usual.

WIRING DIAGRAM

Refer to Pattern Select Switch Power Mode Circuit (Click here).

INSPECTION PROCEDURE

When the pattern select (2ND) switch is pushed, switch contact is made and 2nd mode is selected. To cancel 2nd mode, push the pattern select (2ND) switch once again.

HINT:

2nd mode is automatically canceled when the ignition switch is turned off.

1.DRIVING TEST

HINT:

The driving test should be performed on a paved road (nonskid road).

a. Start the engine.

b. Turn the 2ND switch off (normal drive mode).

c. Confirm vehicle response by driving from a parked position to fully depressing the accelerator pedal.

d. Turn the 2ND switch on and perform the same check as above.
When driving the vehicle with the 2ND switch on and off, check that there is a difference in acceleration.

OK:
There is a difference in acceleration.

NG → Go to step 2

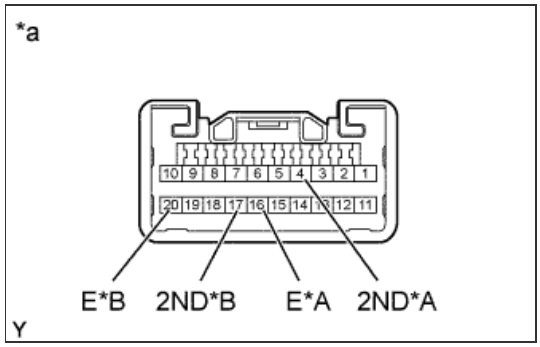
OK →

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (Click here)

2.INSPECT PATTERN SELECT (2ND) SWITCH

a. Remove the suspension control switch (Click here).

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

w/ CRAWL

Tester Connection	Switch Condition	Specified Condition
4 (2ND) - 16 (E)	Pattern select (2nd) switch continuously pressed	Below 1 Ω

4 (2ND) - 16 (E)	Pattern select (2nd) switch released	10 kΩ or higher

w/o CRAWL

Tester Connection	Switch Condition	Specified Condition
17 (2ND) - 20 (E)	Pattern select (2nd) switch continuously pressed	Below 1 Ω
17 (2ND) - 20 (E)	Pattern select (2nd) switch released	10 kΩ or higher

Text in Illustration

A	w/ CRAWL
B	w/o CRAWL
*a	Component without harness connected (Suspension Control Switch)

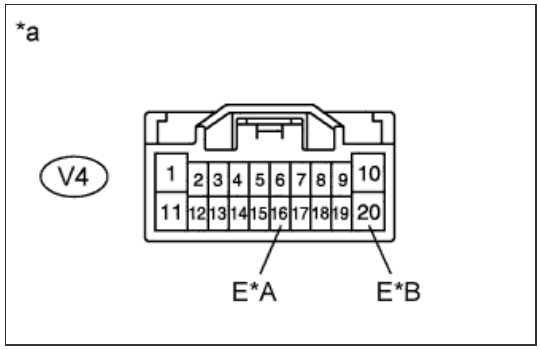
NG → REPLACE PATTERN SELECT (2ND) SWITCH (SUSPENSION CONTROL SWITCH) (Click here)

OK

3.CHECK HARNESS AND CONNECTOR (PATTERN SELECT (2ND) SWITCH - BODY GROUND)

a. Disconnect the suspension control switch connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

w/ CRAWL

Tester Connection	Condition	Specified Condition
V4-16 (E) - Body ground	Always	Below 1 Ω

w/o CRAWL

Tester Connection	Condition	Specified Condition
V4-20 (E) - Body ground	Always	Below 1 Ω

Text in Illustration

A	w/ CRAWL
B	w/o CRAWL
*a	Front view of wire harness connector (to Suspension Control Switch)

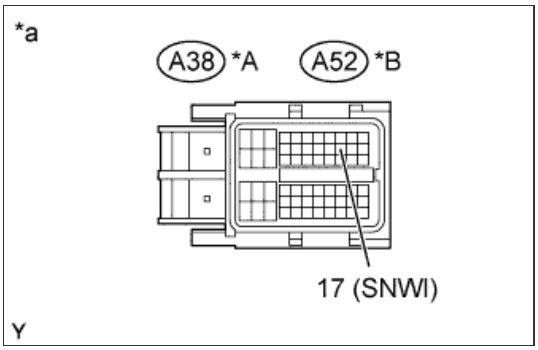
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4.CHECK HARNESS AND CONNECTOR (PATTERN SELECT (2ND) SWITCH - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Switch Condition	Specified Condition
A38-17 (SNWI) - Body ground	Pattern select (2ND) switch continuously pressed	Below 1 Ω
A38-17 (SNWI) - Body ground	Pattern select (2ND) switch released	10 kΩ or higher

for RHD

Tester Connection	Switch Condition	Specified Condition
A52-17 (SNWI) - Body ground	Pattern select (2ND) switch continuously pressed	Below 1 Ω
A52-17 (SNWI) - Body ground	Pattern select (2ND) switch released	10 kΩ or higher

Text in Illustration

A	for LHD
B	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (Click here)

for Preparation Click here

DESCRIPTION

The four wheel drive control ECU judges whether the transfer is in the L4 position based on the information from the limit switch inside the transfer shift actuator assembly which is detected by the ECM. The four wheel drive control ECU then inputs a signal to the combination meter assembly via CAN communication and turns on the 4LO indicator.

WIRING DIAGRAM

Refer to DTC P2772 (Click here).

INSPECTION PROCEDURE

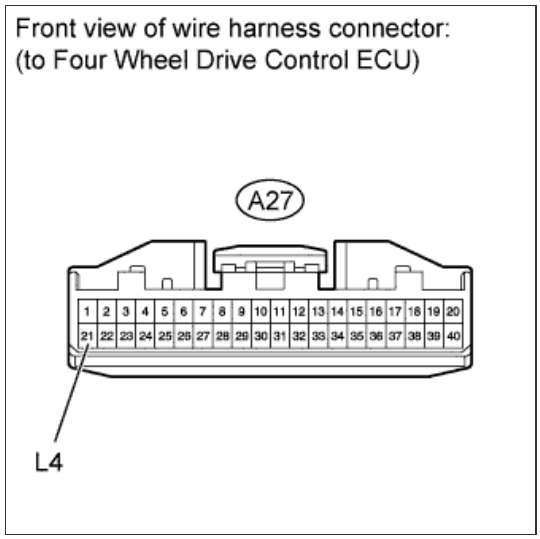
1.CHECK HARNESS AND CONNECTOR (FOUR WHEEL DRIVE CONTROL ECU - BODY GROUND)

a. Disconnect the four wheel drive control ECU connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
A27-21 (L4) - Body ground	Always	10 kΩ or higher



NG → Go to step 2

OK

GO TO TRANSFER SYSTEM INSPECTION (Click here)

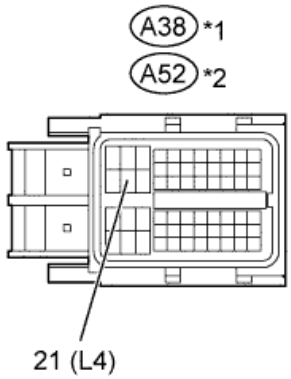
2.CHECK HARNESS AND CONNECTOR (FOUR WHEEL DRIVE CONTROL ECU - ECM)

a. Disconnect the ECM connector.

b. Disconnect the four wheel drive control ECU connector.

c. Measure the resistance according to the value(s) in the table below.

Front view of wire harness connector:
(to ECM)



*1: for LHD

*2: for RHD

Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
A38-21 (L4) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
A52-21 (L4) - Body ground	Always	10 kΩ or higher

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK → REPLACE ECM (Click here)

for Preparation Click here

1.PRECAUTION

NOTICE:

Perform the Reset Memory procedures (A/T initialization) after replacing the automatic transmission assembly, valve body assembly or any of the shift solenoid valves (Click here).

HINT:

Reset Memory cannot be completed by only reconnecting the cable to the negative (-) battery terminal.

CAUTION:

When using compressed air, always aim away from yourself to prevent Automatic Transmission Fluid (ATF) or kerosene from spraying on your face.

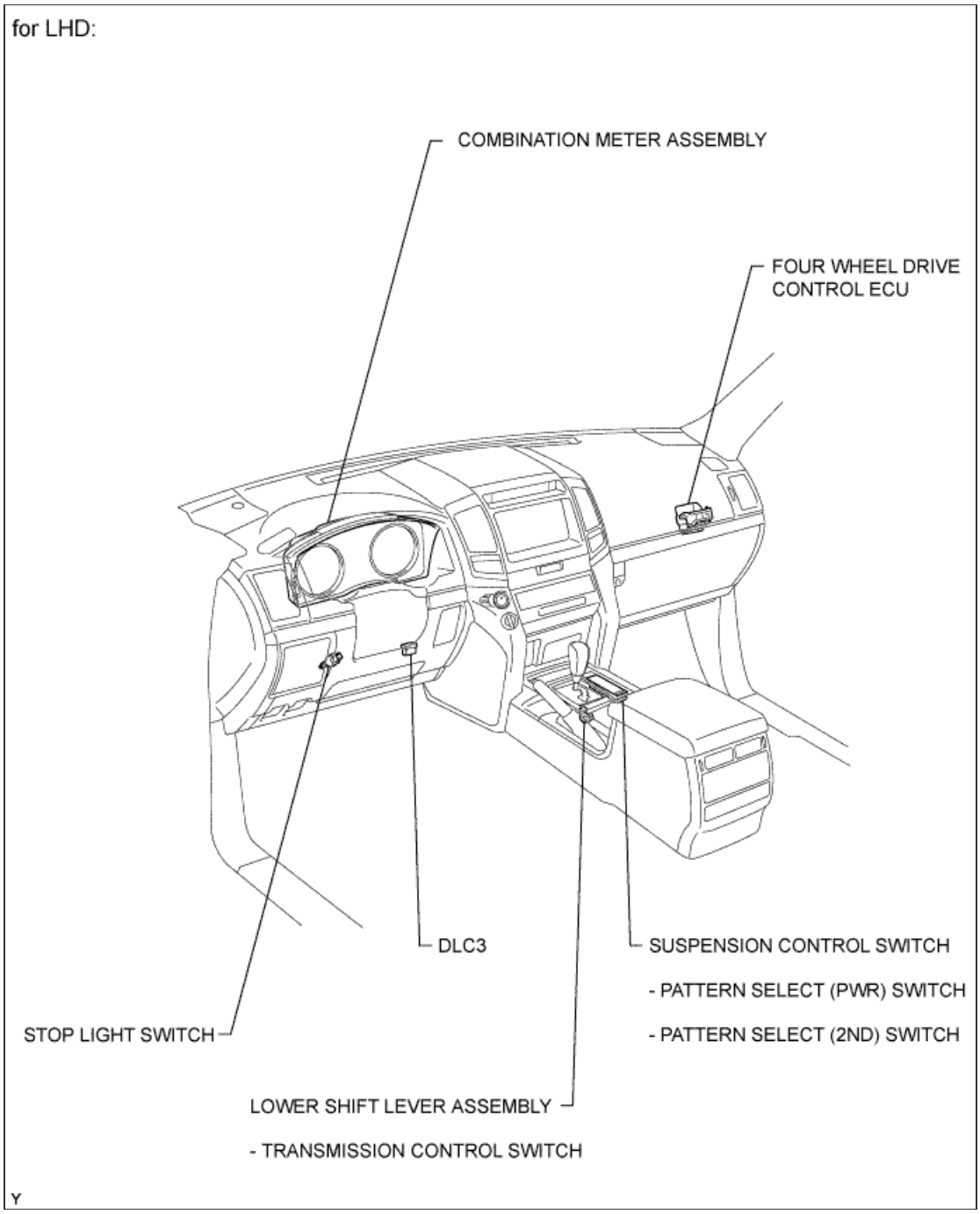
NOTICE:

- **The automatic transmission is composed of precision-made parts, necessitating careful inspection before reassembly because even a small nick could cause fluid leakage or affect performance.**
- **The procedures are organized so that you work on only one component group at a time. This will help avoid confusion with similar-looking parts of different sub-assemblies being on your workbench at the same time.**
- **The component groups are inspected and repaired from the converter housing side.**
- **Whenever possible, complete the inspection, repair and reassembly before proceeding to the next component group. If a defect is found in a certain component group during reassembly, inspect and repair this group immediately. If a component group cannot be assembled because parts are being ordered, be sure to keep all parts of the group in a separate container while proceeding with disassembly, inspection, repair and reassembly of other component groups.**
- **Use of Toyota Genuine ATF WS is recommended.**
- **All disassembled parts should be washed clean, and compressed air should be blown through any fluid passages and holes.**
- **Dry all parts with compressed air. Never use cloth.**
- **The recommended ATF or kerosene should be used for cleaning.**
- **After cleaning, the parts should be arranged in the order they were removed for efficient inspection, repairs, and reassembly.**
- **New discs for the brakes and clutches that will be used for replacement must be soaked in ATF for at least 15 minutes before reassembly.**
- **All oil seal rings, clutch discs, clutch plates, rotating parts, and sliding surfaces should be coated with ATF prior to reassembly.**
- **All old gaskets and rubber O-rings must be replaced.**
- **Do not apply adhesive cement to gaskets and similar parts.**
- **Make sure that the ends of the snap rings are not aligned with any cutouts. Also make sure that snap rings are correctly installed into the grooves.**
- **If a worn bushing is to be replaced, the sub-assembly containing the bushing must also be replaced.**
- **Check the thrust bearings and races for wear or damage. Replace them if necessary.**
- **Use petroleum jelly to keep parts in place.**
- **When working with FIPG material, perform the following:**
  Using a razor blade and gasket scraper, remove all old FIPG material from the gasket surface.
  Clean all components thoroughly to remove all foreign matter.
  Clean both sealing surfaces with non-residue solvent.
  Apply FIPG material in a continuous line approximately 1 mm (0.0394 in.) in diameter on the sealing surface.
  Reassemble parts within 10 minutes of applying FIPG material. Failing to do so will require the FIPG material to be removed and reapplied.

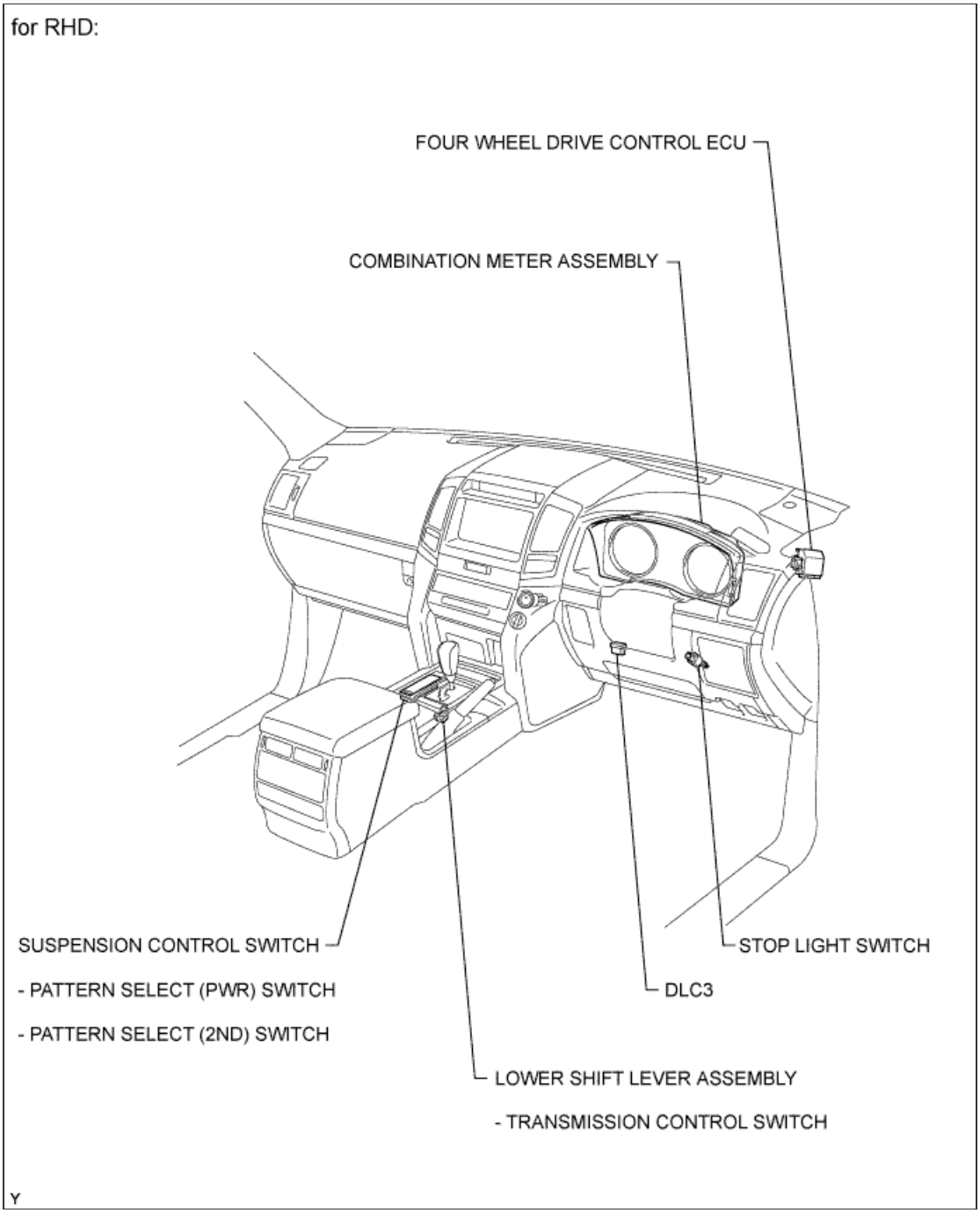
for Preparation Click here

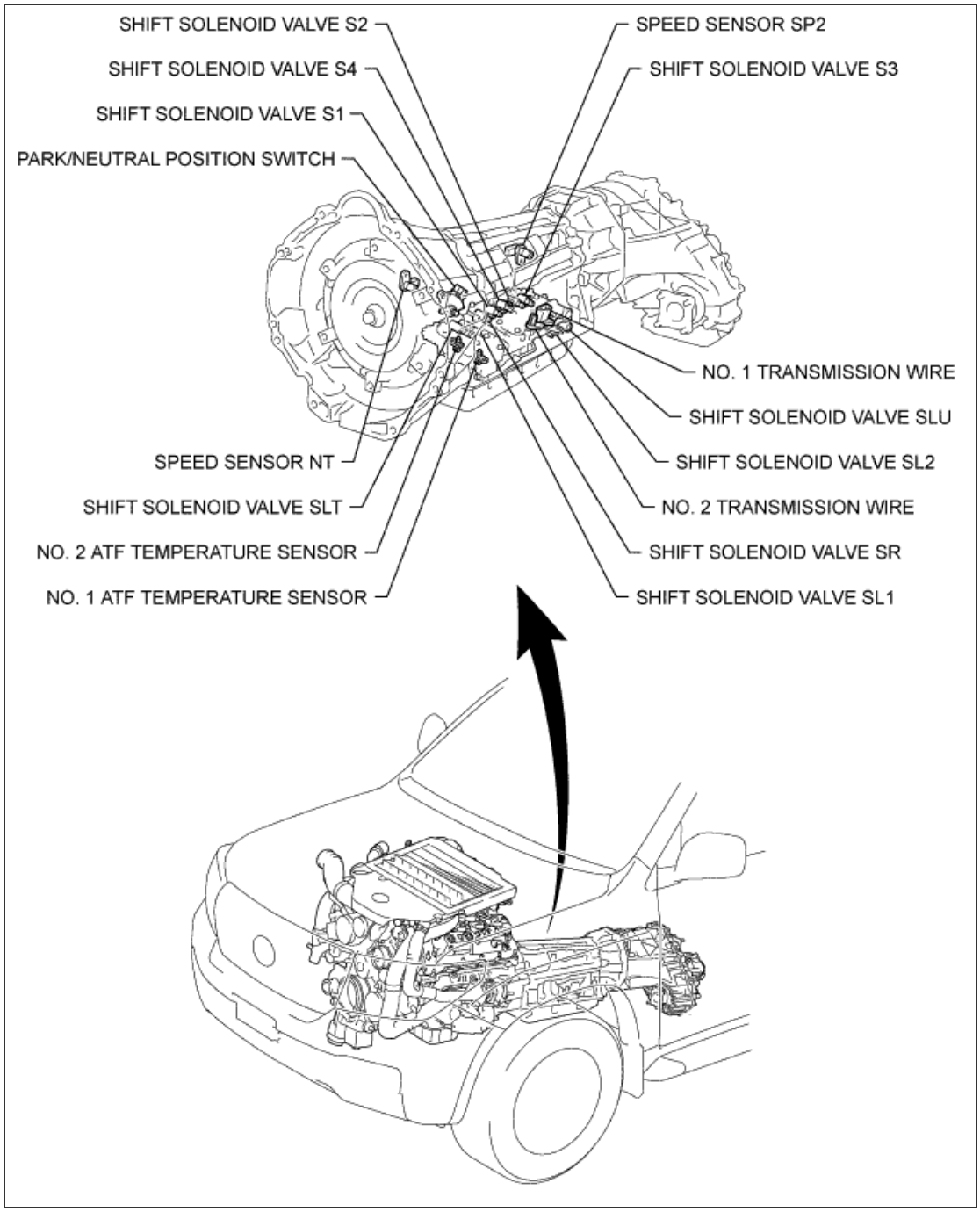
Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).

for Preparation Click here

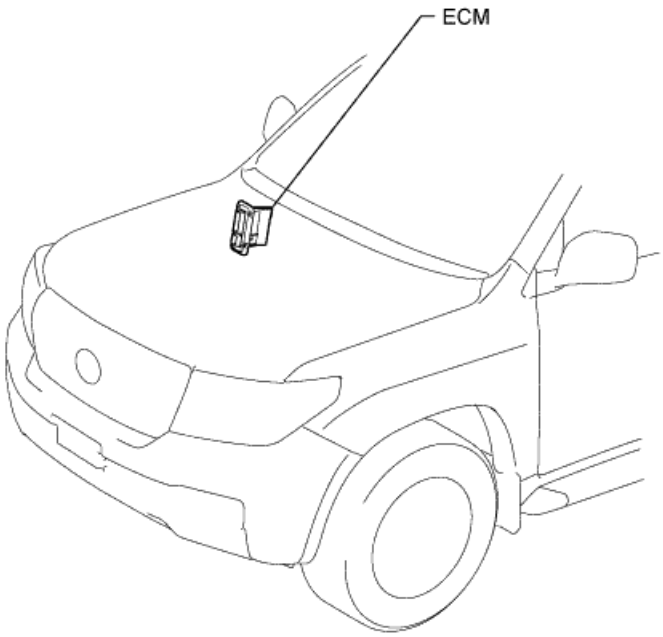


for RHD:

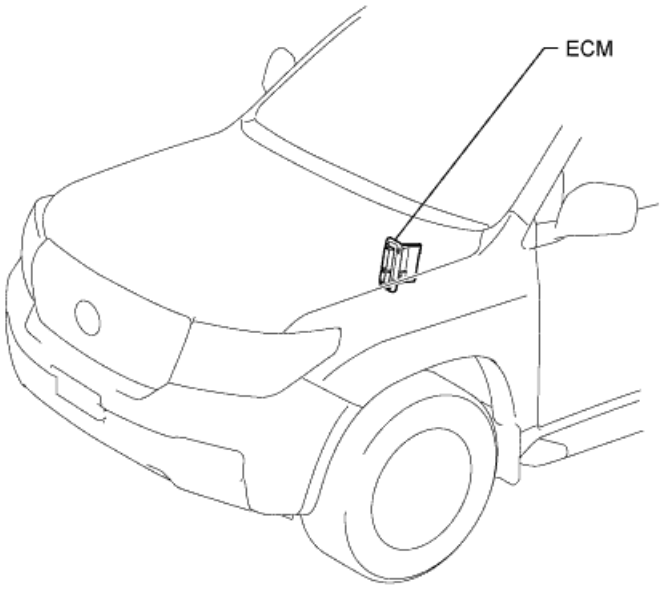

FOUR WHEEL DRIVE CONTROL ECU
COMBINATION METER ASSEMBLY
SUSPENSION CONTROL SWITCH
- PATTERN SELECT (PWR) SWITCH
- PATTERN SELECT (2ND) SWITCH
LOWER SHIFT LEVER ASSEMBLY
- TRANSMISSION CONTROL SWITCH
DLC3
STOP LIGHT SWITCH
Y


SHIFT SOLENOID VALVE S2
SHIFT SOLENOID VALVE S4
SHIFT SOLENOID VALVE S1
PARK/NEUTRAL POSITION SWITCH
SPEED SENSOR NT
SHIFT SOLENOID VALVE SLT
NO. 2 ATF TEMPERATURE SENSOR
NO. 1 ATF TEMPERATURE SENSOR
SPEED SENSOR SP2
SHIFT SOLENOID VALVE S3
NO. 1 TRANSMISSION WIRE
SHIFT SOLENOID VALVE SLU
SHIFT SOLENOID VALVE SL2
NO. 2 TRANSMISSION WIRE
SHIFT SOLENOID VALVE SR
SHIFT SOLENOID VALVE SL1

for LHD:

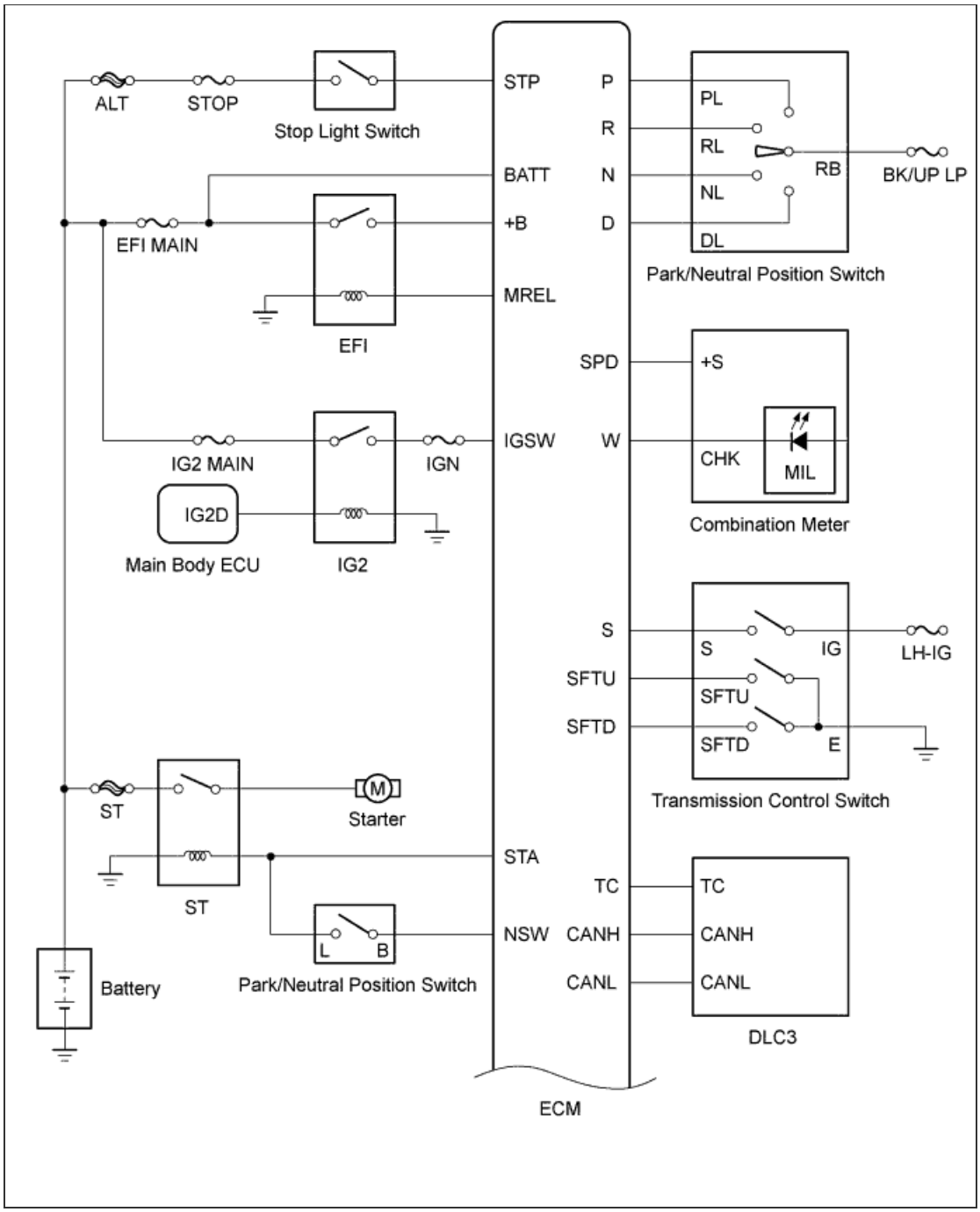


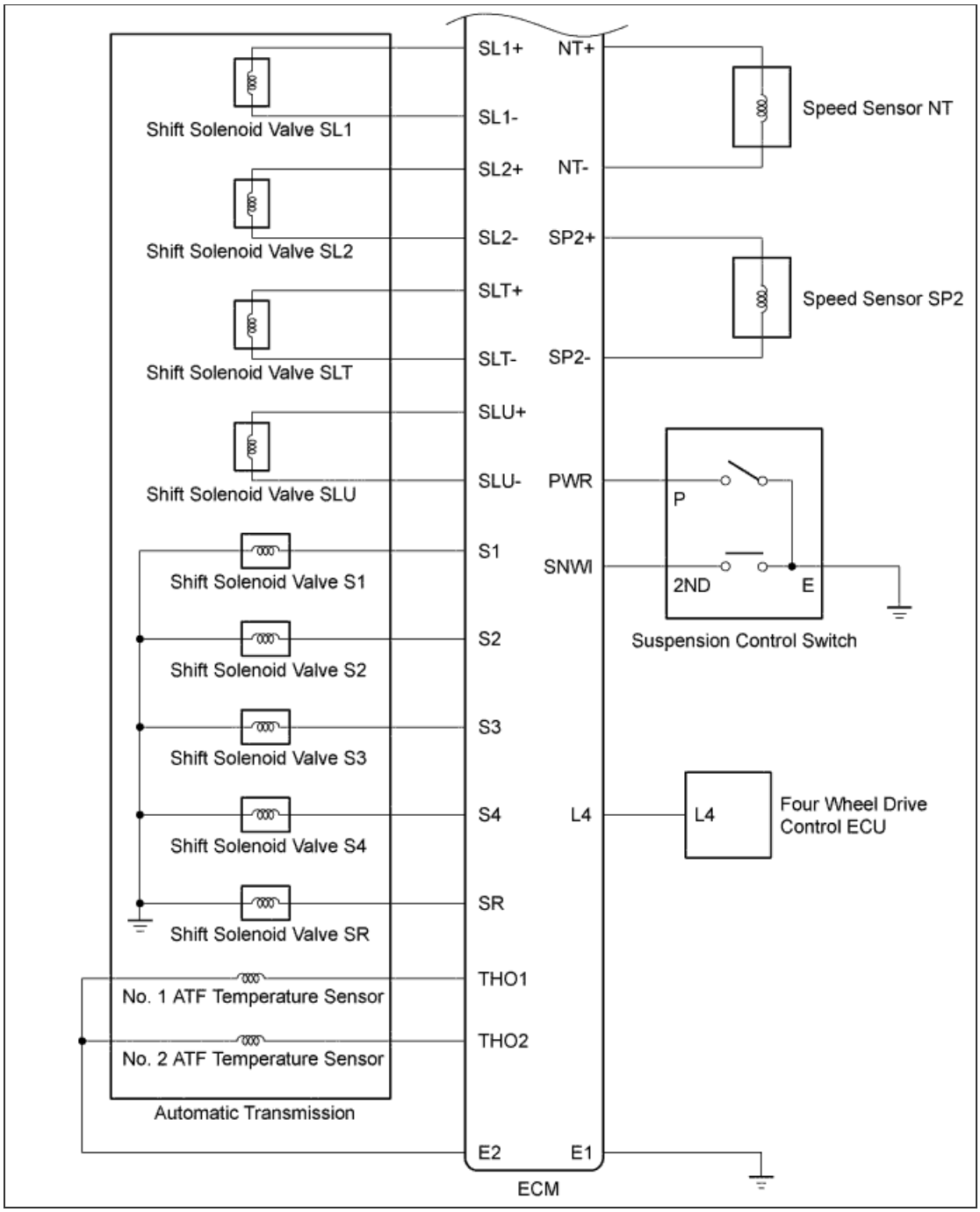
for RHD:



for Preparation Click here

The configuration of the electronic control system in the AB60F automatic transmission is as shown in the following chart.




SL1+
NT+
SL1-
SL2+
NT-
SL2-
SP2+
SLT+
SLT-
SP2-
SLU+
SLU-
PWR
S1
SNWI
S2
S3
S4
L4
SR
THO1
THO2
E2
E1
Shift Solenoid Valve SL1
Shift Solenoid Valve SL2
Shift Solenoid Valve SLT
Shift Solenoid Valve SLU
Shift Solenoid Valve S1
Shift Solenoid Valve S2
Shift Solenoid Valve S3
Shift Solenoid Valve S4
Shift Solenoid Valve SR
No. 1 ATF Temperature Sensor
No. 2 ATF Temperature Sensor
Automatic Transmission
ECM
Speed Sensor NT
Speed Sensor SP2
P
2ND
E
Suspension Control Switch
L4
Four Wheel Drive
Control ECU

for Preparation Click here

SYSTEM DESCRIPTION

a. The Electronic Controlled Automatic Transmission (ECT) is an automatic transmission that electronically controls shift timing using the Engine Control Module (ECM). The ECM detects electrical signals that indicate engine and driving conditions, and controls the shift point based on driver habits and road conditions. As a result, fuel efficiency and power transmission performance are improved.
Shift shock is reduced by controlling the engine and transmission simultaneously.
In addition, the ECT has the following features:

- Diagnostic function.
- Fail-safe function when a malfunction occurs.

for Preparation Click here

HINT:

- **The ECM is connected to the CAN communication system. Therefore, before starting troubleshooting, make sure to check that there is no trouble in the CAN communication system.**
- ***: Use the GTS.**

1.VEHICLE BROUGHT TO WORKSHOP

NEXT

2.CUSTOMER PROBLEM ANALYSIS

NEXT

3.INSPECT BATTERY VOLTAGE

Standard Voltage:
11 to 14 V

If the voltage is below 11 V, recharge or replace the battery before proceeding.

NEXT

4.CONNECT GTS TO DLC3*

NEXT

5.CHECK AND CLEAR DTCS AND FREEZE FRAME DATA*

a. Refer to the DTC Check / Clear (Click here).

NEXT

6.VISUAL INSPECTION

NEXT

7.SETTING CHECK MODE DIAGNOSIS*

a. Refer to the Check Mode Procedure (Click here).

NEXT

8.PROBLEM SYMPTOM CONFIRMATION

a. Refer to the Road Test (Click here).

Result

Result	Proceed to
Symptom does not occur	A
Symptom occurs	B

B. → GO TO STEP 10

A

9.SYMPTOM SIMULATION

a. Refer to the Electronic Circuit Inspection Procedure (Click here).

NEXT

10.DTC CHECK*

a. Refer to the DTC Check / Clear (Click here).

Result

Result	Proceed to
DTC is not output	A
DTC is output	B

B. → GO TO STEP 18

A

11.BASIC INSPECTION

a. Refer to the Park/Neutral Position Switch (Click here).

b. Refer to the Shift Lever Assembly (Click here).

NG. → GO TO STEP 21

OK

12.MECHANICAL SYSTEM TESTS

a. Refer to the Mechanical System Tests (Click here).

NG. → GO TO STEP 17

OK

13.HYDRAULIC TEST

a. Refer to the Hydraulic Test (Click here).

NG. → GO TO STEP 17

OK

14.MANUAL SHIFTING TEST

a. Refer to the Manual Shifting Test (Click here).

NG. → GO TO STEP 16

OK

15.PROBLEM SYMPTOMS TABLE CHAPTER 1

a. Refer to the Problem Symptoms Table (Click here).

NG. → GO TO STEP 19

OK

16.PROBLEM SYMPTOMS TABLE CHAPTER 2

a. Refer to the Problem Symptoms Table (Click here).

NEXT

17.PART INSPECTION

NG. → GO TO STEP 21

OK

18.DTC CHART

a. Refer to the Diagnostic Trouble Code Chart (Click here).

NEXT

19.CIRCUIT INSPECTION

NEXT

20.IDENTIFICATION OF PROBLEM

NEXT

21.REPAIR OR REPLACE

NEXT

22.CONFIRMATION TEST

NEXT

END

for Preparation Click here

PROBLEM SYMPTOM CONFIRMATION

a. Based on the result of the customer problem analysis, try to reproduce the symptoms. If the problem is that the transmission does not shift up or down, or that the shift point is too high or too low, conduct the following road test referring to the automatic shift schedule and attempt to duplicate the problem symptoms.

ROAD TEST

a. Perform a road test.

CAUTION:

Check for safety before performing any tests.

NOTICE:

- **Be sure to inspect and adjust the engine before performing these tests.**
- **Perform the road test with the engine coolant temperature between 60 and 100°C (140 and 212°F) and the ATF temperature between 50 and 100°C (122 and 212°F).**
- **Perform these tests with the air conditioning and cruise control off.**

Inspection	Procedure
Transmission Control Switch Test	With the vehicle stationary and the shift lever in D, move the shift lever to S and return it to D. Check that the meter display changes from D to the appropriate S range and then back again.
S Position Test	With the vehicle stationary and the shift lever in S, move the shift lever to "+" and "-". Check that the meter display changes between S ranges properly.
D Position Shift Test	While driving the vehicle normally, check that the transmission shifts up and down through each gear properly.
Lock-up Function	While driving on a level surface at a constant speed in the lock-up range (90 km/h (56 mph) or more) with the shift lever in D, lightly depress the accelerator pedal and check that the engine speed does not change abruptly.
P Position Test	Stop the vehicle on an incline (approximately 5° or more). Then move the shift lever to P and release the parking brake. Check that the parking lock pawl holds the vehicle in place.
Abnormal Noise and Vibration	Check for abnormal noise and vibration while driving the vehicle forward and backward, and during shift operations.
Fluid Leakage	After performing all other road test inspections, check for fluid leakage.

for Preparation Click here

STALL SPEED TEST

HINT:

This test is to check the overall performance of the engine and transmission.

CAUTION:

- **To ensure safety, perform this test in an open and level area that provides good traction.**
- **The stall speed test should always be performed with at least 2 people. One person should observe the condition of the wheels and wheel chocks while the other is performing the test.**

NOTICE:

Do not perform the stall speed test for more than 5 seconds.

a. Connect the GTS to the DLC3.

b. Run the vehicle until the transmission fluid temperature has reached 50 to 80°C (122 to 176°F).

c. Allow the engine to idle with the A/C off.

d. Chock all 4 wheels.

e. Set the parking brake and keep the brake pedal depressed firmly with your left foot.

f. Move the shift lever to D.

g. Depress the accelerator pedal as much as possible with your right foot.

h. Read the engine speed (stall speed) and release the accelerator pedal immediately.

Standard value:
2750 +/-200 rpm

Evaluation

Test Result	Possible Cause
Stall speed is lower than standard value	• Stator one-way clutch is not operating properly • Torque converter assembly is faulty (stall speed is less than standard value by 600 rpm or more) • Engine power may be insufficient
Stall speed is higher than standard value	• Line pressure is low • C1 clutch slipping • F3 one-way clutch is not operating properly • F4 one-way clutch is not operating properly

NOTICE:

Perform the test at the normal operating ATF temperature of 50 to 80°C (122 to 176°F).

SHIFT TIME LAG TEST

HINT:

This test is to check the condition of the direct clutch, forward clutch, 1st brake and reverse brake.

a. Connect the GTS to the DLC3.

b. Run the vehicle until the transmission fluid temperature has reached 50 to 80°C (122 to 176°F).

c. Allow the engine to idle with the A/C off.

d. Set the parking brake and keep the brake pedal depressed firmly.

e. Check the D position time lag.

i. Move the shift lever to N and wait for 1 minute.

ii. Move the shift lever to D and measure the time until the shock is felt.

iii. Repeat the 2 procedures above 3 times, and calculate the average time of the 3 tests.

f. Check the R position time lag.

i. Move the shift lever to N and wait for 1 minute.

ii. Move the shift lever to R and measure the time until the shock is felt.

iii. Repeat the 2 procedures above 3 times, and calculate the average time of the 3 tests.

Standard value:
D position time lag is less than 1.2 seconds
R position time lag is less than 1.5 seconds

Evaluation

Test Result	Possible Cause
D position time lag exceeds standard value	• Line pressure is low • C1 clutch is worn • F3 one-way clutch is not operating properly • F4 one-way clutch is not operating properly
R position time lag exceeds standard value	• Line pressure is low • C3 clutch is worn • B4 brake is worn • F1 one-way clutch is not operating properly

for Preparation Click here

PERFORM HYDRAULIC TEST

a. Measure the line pressure.

CAUTION:

The line pressure test should always be carried out in pairs. One technician should observe the conditions of the wheels and wheel chocks outside the vehicle while the other is performing the test.

NOTICE:

- **Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **This check must be conducted after checking and adjusting the engine.**
- **Perform the test with the A/C turned off.**
- **When conducting the stall test, do not continue for more than 5 seconds.**

i. Warm up the ATF (Automatic Transmission Fluid).

ii. Turn the engine switch off.

iii. Lift the vehicle up.

iv. Remove the test plug on the transmission case center right side and connect SST.

SST
09992-00095 (09992-00231, 09992-00271)

v. Lower the vehicle.

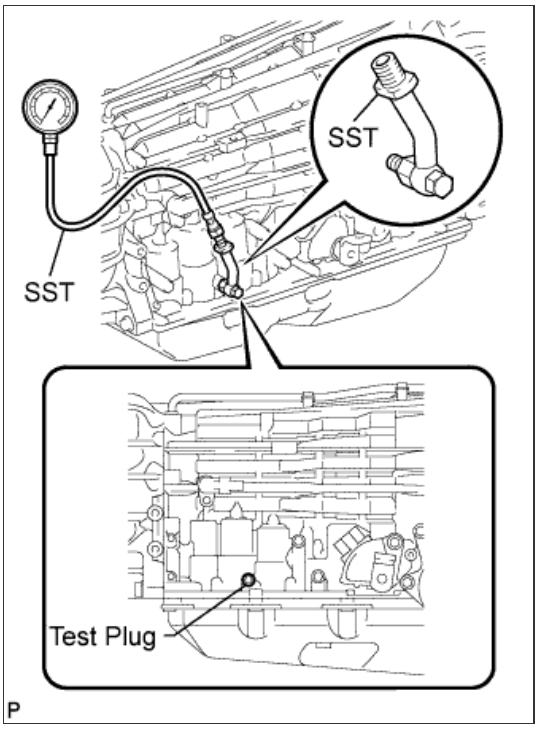
vi. Fully apply the parking brake and chock the 4 wheels.

vii. Start the engine and check the idling speed.

viii. Keep your left foot pressed firmly on the brake pedal and move the shift lever to D.

ix. Fully depress the accelerator pedal with your right foot. Quickly read the highest line pressure when the engine speed reaches the stall speed.

x. In the same manner, perform the test with the shift lever in R.



Specified Line Pressure

Condition	D Position	R Position
Stall speed	1230 to 1390 kPa (12.5 to 14.2 kgf/cm^2, 178 to 202 psi)	1470 to 1690 kPa (15.0 to 17.2 kgf/cm^2, 213 to 245 psi)

Evaluation

Problem	Possible Cause
Measured values at D and R positions are higher than specified pressure	• Shift solenoid valve SLT defective • Regulator valve defective

Measured values at D and R positions are lower than specified pressure	• Shift solenoid valve SLT defective • Regulator valve defective • Oil pump defective
Pressure is low in D position only	• D position circuit fluid leak • Clutch No. 1 (C1) defective
Pressure is low in R position only	• R position circuit fluid leak • Clutch No. 3 (C3) defective • Brake No. 4 (B4) defective

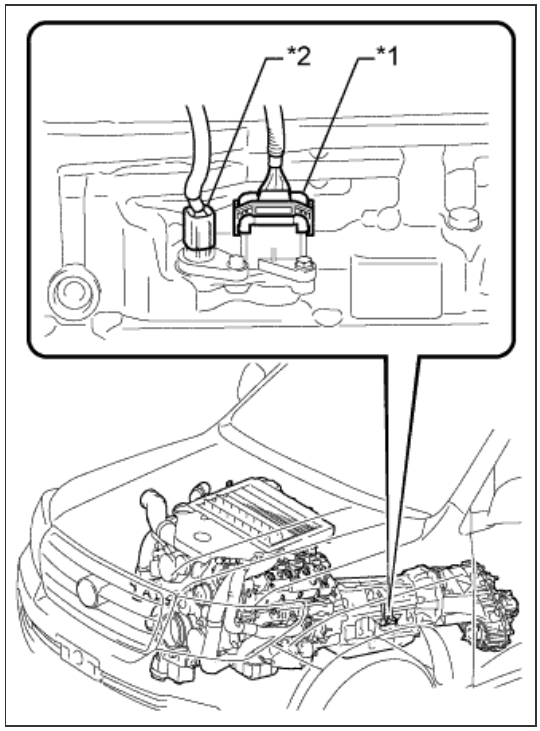
for Preparation Click here

MANUAL SHIFTING TEST

HINT:

- **Through this test, it can be determined whether the trouble occurs in an electrical circuit or if it is a mechanical problem in the transmission.**
- **If any abnormalities are found in the following test, the problem is in the transmission itself.**

a. Disconnect the connector of the No. 1 transmission wire and/or No. 2 transmission wire.



Text in Illustration

*1	No. 1 Transmission Wire
*2	No. 2 Transmission Wire

HINT:

It is possible to deactivate the electrical shift control by disconnecting the transmission wires. The gear positions can then be changed mechanically with the shift lever.

b. Drive the vehicle with the transmission wires disconnected. Move the shift lever to each position to check whether the gear position changes as shown in the table below.

Shift Lever Position	Gear Position
P	P
R	R
D	• 4th*1 • 1st to 6th*2

HINT:

- ***1: When disconnecting only the No. 1 transmission wire or the No. 1 and No. 2 transmission wires.**
- ***2: When disconnecting only the No. 2 transmission wire.**

c. Connect the connector of the No. 1 transmission wire and/or No. 2 transmission wire.

d. Clear the DTC (Click here).

for Preparation Click here

RESET MEMORY

NOTICE:

- **Perform the Reset Memory (AT initialization) when replacing the automatic transmission assembly, valve body assembly or any of the shift solenoid valves.**
- **The Reset Memory can be performed only with the GTS.**

HINT:

The ECM memorizes the control conditions of the automatic transmission assembly and engine assembly. Therefore, when the automatic transmission assembly, valve body assembly or any of the shift solenoid valves has been replaced, it is necessary to reset the memory so that the ECM can memorize the new information.

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Utility / Reset Memory.

NOTICE:

After performing the Reset Memory, be sure to perform the Road Test (Click here) described earlier.

HINT:

The ECM learns through the Road Test.

for Preparation Click here

AUTOMATIC TRANSMISSION MONITOR DRIVE PATTERN

CAUTION:

Perform this drive pattern on a level surface and strictly observe the posted speed limits and traffic laws while driving.

HINT:

Performing this drive pattern is one method to simulate the automatic transmission malfunction detection conditions.

The DTCs may not be stored through ordinary, everyday driving. Also, DTCs may not be stored through this drive pattern.

a. Preparation for driving

i. Warm up the engine sufficiently (engine coolant temperature is 60°C (140°F) or higher).

ii. Drive the vehicle when the atmospheric temperature is -10°C (14°F) or higher.
Malfunctions are not detected when the atmospheric temperature is below -10°C (14°F).

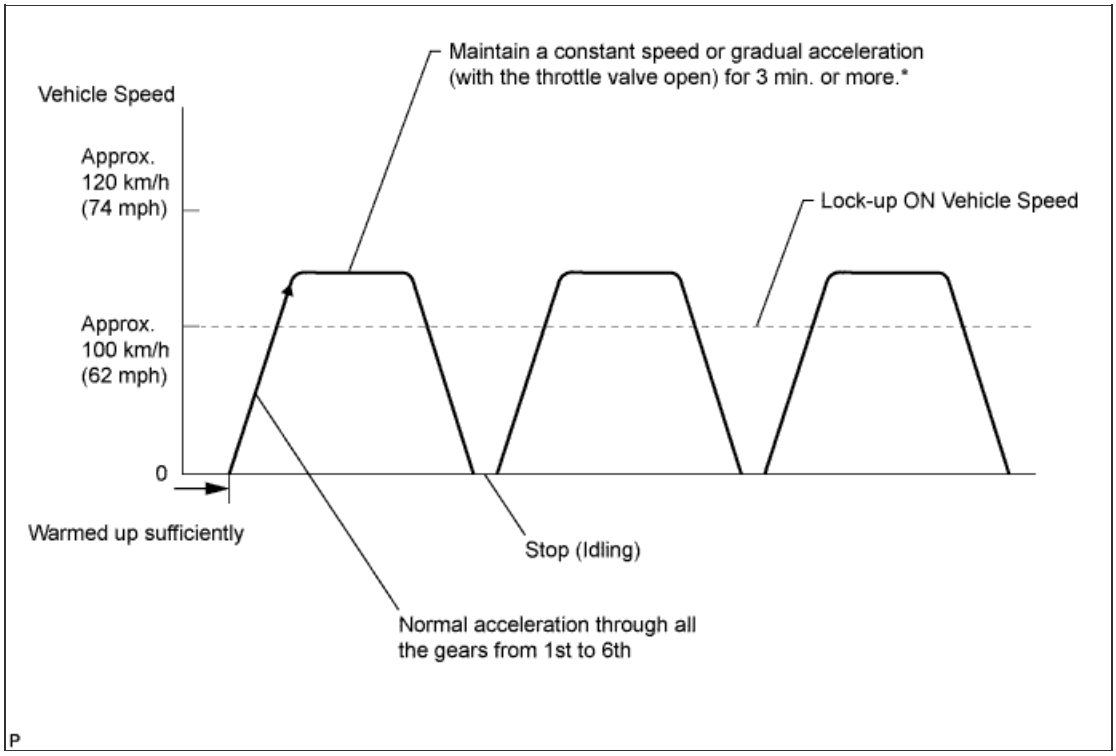
b. Drive pattern

i. Drive the vehicle through all the gears.
Stop → 1st → 2nd → 3rd → 4th → 5th → 5th (lock-up ON) → 6th → 6th (lock-up ON).

ii. Repeat the above drive pattern 3 times or more.

NOTICE:

- **When using the GTS, the monitor status can be checked in the Data List (Click here).**
- **In the event that the drive pattern must be interrupted (due to traffic conditions or other factors), the drive pattern can be resumed and, in most cases, the monitor can be completed.**



HINT:

*: Drive at such a speed in the uppermost gear to engage lock-up. The vehicle can be driven at a speed lower than the speed shown in the above diagram under the lock-up condition.

NOTICE:

It is necessary to drive the vehicle for approximately 30 minutes to store DTC P0711 (No. 1 ATF temperature sensor malfunction).

for Preparation Click here

HINT:

- **Use the table below to help determine the cause of problem symptoms. If multiple suspected areas are listed, the potential causes of the symptoms are listed in order of probability in the "Suspected Area" column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.**
- **The Matrix Chart is divided into 2 chapters. When troubleshooting, check Chapter 1 first. If instructions are given in Chapter 1 to proceed to 2, proceed as instructed.**
- **If the instruction "Proceed to next circuit inspection shown in problem symptoms table" is given in the flowchart for each circuit, proceed to the next suspected area in the table.**
- **If the problem still occurs even though there are no malfunctions in any of the circuits, check the ECM and replace it if necessary.**
- ***: When the circuit is defective, a DTC may be stored.**

1. Chapter 1: Electronic Circuit Matrix Chart

Symptom	Suspected Area	See page
No up-shift (1st -> 2nd)	Shift solenoid valve S1 circuit*	Click here
	ECM	Click here
No up-shift (2nd -> 3rd)	Shift solenoid valve S2 circuit*	Click here
	ECM	Click here
No up-shift (3rd -> 4th)	Shift solenoid valve S3 circuit*	Click here
	ECM	Click here
No up-shift (4th -> 5th)	Shift solenoid valve S4 circuit*	Click here
	Shift solenoid valve SR circuit*	Click here
	Shift solenoid valve SL1 circuit*	Click here
	Shift solenoid valve SL2 circuit*	Click here
	ECM	Click here
No up-shift (5th -> 6th)	Park/neutral position switch circuit*	Click here
	Shift solenoid valve S2 circuit*	Click here
	ECM	Click here
No down-shift (6th -> 5th)	Park/neutral position switch circuit*	Click here
	Shift solenoid valve S2 circuit*	Click here
	ECM	Click here
No down-shift (5th -> 4th)	Shift solenoid valve S4 circuit*	Click here
	Shift solenoid valve SR circuit*	Click here
	Shift solenoid valve SL1 circuit*	Click here
	Shift solenoid valve SL2 circuit*	Click here
	ECM	Click here
No down-shift (4th -> 3rd)	Shift solenoid valve S3 circuit*	Click here
	ECM	Click here
No down-shift (3rd -> 2nd)	Shift solenoid valve S2 circuit*	Click here
	ECM	Click here
No down-shift (2nd -> 1st)	Shift solenoid valve S1 circuit*	Click here
	ECM	Click here
No lock-up or no lock-up off	Shift solenoid valve SLU circuit*	Click here
	Stop light switch circuit*	Click here
	ECM	Click here
No lock-up	No. 1 ATF temperature sensor circuit*	Click here
	Shift solenoid valve SLU circuit*	Click here
	Engine coolant temperature sensor circuit*	Click here
	Stop light switch circuit*	Click here
	Speed sensor NT circuit*	Click here
	ECM	Click here
No lock-up off	Shift solenoid valve SLU circuit*	Click here
	ECM	Click here
	Shift solenoid valve SLT circuit*	Click here

Shift point too high or too low	Speed sensor NT circuit*	Click here
	Speed sensor SP2 circuit*	Click here
	Throttle position sensor circuit*	Click here
	Pattern select (PWR) switch circuit	Click here
	No. 1 ATF temperature sensor circuit*	Click here
	ECM	Click here
Up-shift to 4th from 3rd while engine is cold	Engine coolant temperature sensor circuit*	Click here
	ECM	Click here
Up-shift to 5th from 4th while engine is cold	Engine coolant temperature sensor circuit*	Click here
	ECM	Click here
No gear change by shifting into "+" or "-" while shift lever in S	Transmission control switch circuit	Click here
	ECM	Click here
Harsh engagement (N -> D)	Shift solenoid valve SLT circuit*	Click here
	Speed sensor NT circuit*	Click here
	ECM	Click here
Harsh engagement (lock-up)	Speed sensor NT circuit*	Click here
	Speed sensor SP2 circuit*	Click here
	Shift solenoid valve SLU circuit*	Click here
	ECM	Click here
Harsh engagement (any gear position)	Throttle position sensor circuit*	Click here
	Shift solenoid valve SL1 circuit*	Click here
	Shift solenoid valve SL2 circuit*	Click here
	Shift solenoid valve SLU circuit*	Click here
	Shift solenoid valve SLT circuit*	Click here
	Speed sensor NT circuit*	Click here
	ECM	Click here
Poor acceleration	No. 2 ATF temperature sensor circuit*	Click here
	Shift solenoid valve SLT circuit*	Click here
	Pattern select (2ND) switch circuit	Click here
	ECM	Click here
No engine brake	ECM	Click here
No kick-down	ECM	Click here
Engine stalls when starting off or stopping	Shift solenoid valve SLU circuit*	Click here
	ECM	Click here
ECT 2ND does not operate	Shift solenoid valve SLT circuit*	Click here
	Pattern select (2ND) switch circuit	Click here
	ECM	Click here
ATF temperature warning light remains on, lock-up at 3rd gear and/or shift point too high	No. 2 ATF temperature sensor circuit*	Click here
	Engine coolant temperature sensor circuit*	Click here
	ECM	Click here
Malfunction in shifting	Park/neutral position switch circuit*	Click here
	Transmission control switch circuit	Click here
	ECM	Click here
Harsh engagement (1st -> 2nd -> 3rd -> 4th -> 5th)	Shift solenoid valve SR circuit*	Click here
Slip or shudder (5th -> 6th -> and 6th -> 5th)	Shift solenoid valve SR circuit*	Click here

2. Chapter 2: On-vehicle Repair and Off-vehicle Repair

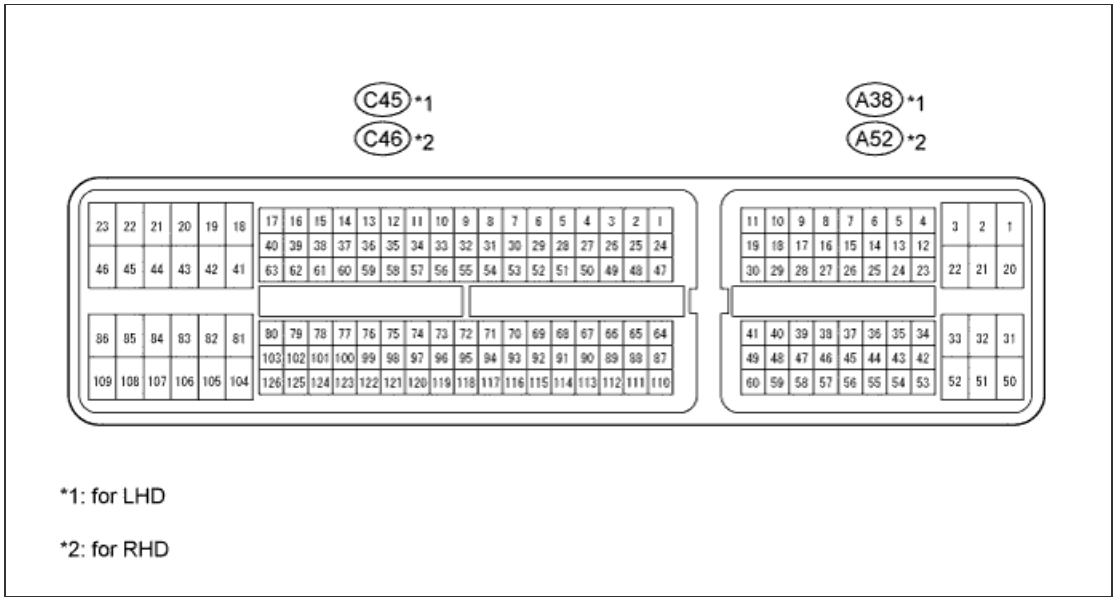
Symptom	Suspected Area	See page
Vehicle does not move when shift lever is in any forward position and reverse position	Floor shift gear shifting rod sub-assembly	Click here
	Manual valve	Click here
	Parking lock pawl	Click here
	Rear planetary gear unit	Click here
	Torque converter assembly	Click here
Vehicle does not move with shift lever in R	Valve body assembly	Click here
	B4 brake	Click here
	Valve body assembly	Click here

No up-shift (1st -> 2nd)	B3 brake	Click here
	F1 one-way clutch	Click here
	F2 one-way clutch	Click here
No up-shift (2nd -> 3rd)	Valve body assembly	Click here
	C3 clutch	Click here
No up-shift (3rd -> 4th)	Valve body assembly	Click here
	C2 clutch	Click here
No up-shift (4th -> 5th)	Valve body assembly	Click here
	B1 brake	Click here
No up-shift (5th -> 6th)	Valve body assembly	Click here
	B2 brake	Click here
No down-shift (6th -> 5th)	Valve body assembly	Click here
No down-shift (5th -> 4th)	Valve body assembly	Click here
No down-shift (4th -> 3rd)	Valve body assembly	Click here
No down-shift (3rd -> 2nd)	Valve body assembly	Click here
No down-shift (2nd -> 1st)	Valve body assembly	Click here
No lock-up or no lock-up off	Valve body assembly	Click here
	Torque converter assembly	Click here
Harsh engagement (N -> D)	Valve body assembly	Click here
	C1 accumulator	Click here
	C1 clutch	Click here
	F3 one-way clutch	Click here
	F4 one-way clutch	Click here
Harsh engagement (lock-up)	Valve body assembly	Click here
	Torque converter assembly	Click here
Harsh engagement (N -> R)	Valve body assembly	Click here
	C3 accumulator	Click here
	C3 clutch	Click here
	B4 brake	Click here
	F1 one-way clutch	Click here
Harsh engagement (1st -> 2nd -> 3rd -> 4th -> 5th -> 6th)	Valve body assembly	Click here
Harsh engagement (1st -> 2nd)	Valve body assembly	Click here
	B3 accumulator	Click here
	B3 brake	Click here
	F1 one-way clutch	Click here
	F2 one-way clutch	Click here
Harsh engagement (2nd -> 3rd)	Valve body assembly	Click here
	C3 accumulator	Click here
	C3 clutch	Click here
Harsh engagement (3rd -> 4th)	Valve body assembly	Click here
	C2 accumulator	Click here
	C2 clutch	Click here
Harsh engagement (4th -> 5th)	Valve body assembly	Click here
	B1 accumulator	Click here
	B1 brake	Click here
Harsh engagement (5th -> 6th)	Valve body assembly	Click here
	B2 accumulator	Click here
	B2 brake	Click here
Harsh engagement (6th -> 5th)	Valve body assembly	Click here
	C3 accumulator	Click here
	C3 clutch	Click here
Slip or shudder (forward and reverse, after warm-up)	Floor shift gear shifting rod sub-assembly	Click here
	Valve body assembly	Click here
	Oil strainer	Click here
	F1 one-way clutch	Click here
	C3 clutch	Click here
	Torque converter assembly	Click here

Slip or shudder (particular position, just after engine starts)	Torque converter assembly	Click here
Slip or shudder (shift lever in R)	B4 brake	Click here
	F1 one-way clutch	Click here
	C3 clutch	Click here
Slip or shudder (1st)	C1 clutch	Click here
	F3 one-way clutch	Click here
	F4 one-way clutch	Click here
Slip or shudder (2nd)	C1 clutch	Click here
	B3 brake	Click here
	F1 one-way clutch	Click here
	F2 one-way clutch	Click here
	F4 one-way clutch	Click here
Slip or shudder (3rd)	C1 clutch	Click here
	C3 clutch	Click here
	F1 one-way clutch	Click here
	F4 one-way clutch	Click here
Slip or shudder (4th)	C1 clutch	Click here
	C2 clutch	Click here
	F4 one-way clutch	Click here
Slip or shudder (5th)	C2 clutch	Click here
	C3 clutch	Click here
	B1 brake	Click here
Slip or shudder (6th)	C2 clutch	Click here
	B2 brake	Click here
No engine braking (1st to 4th, shift lever in S)	C4 clutch	Click here
No engine braking (1st: shift lever in 1)	Valve body assembly	Click here
	B4 brake	Click here
No engine braking (2nd: shift lever in 2)	Valve body assembly	Click here
	B2 brake	Click here
No engine braking (3rd: shift lever in 3)	Valve body assembly	Click here
	B1 brake	Click here
No engine braking (4th: shift lever in 4)	Valve body assembly	Click here
No kick-down	Valve body assembly	Click here
Shift point too high or too low	Valve body assembly	Click here
Poor acceleration (all positions)	Valve body assembly	Click here
	Torque converter assembly	Click here
Poor acceleration (6th)	B2 brake	Click here
	C2 clutch	Click here
	Front planetary gear unit	Click here
Engine stalls when starting off or stopping	Valve body assembly	Click here
	Torque converter assembly	Click here

for Preparation Click here

CHECK ECM



HINT:

- **Each ECM terminal standard voltage is shown in the table below.**
  In the table, first follow the information under "Condition". Look under "Terminal No. (Symbol)" for the terminals to be inspected.
  The standard voltage between the terminals is shown under "Specified Condition".
  Use the illustration above as a reference for the ECM terminals.
- ***1: for LHD**
- ***2: for RHD**

Terminal No. (Symbol)	Wiring Color	Terminal Description	Condition	Specified Condition
A38-19 (L4) - C45-81 (E1)*1 A52-19 (L4) - C46-81 (E1)*2	BR-R - BR	Transfer L4 position signal	• Engine switch on (IG) • Transfer position switch on L4	Below 1.5 V
			• Engine switch on (IG) • Transfer position switch not on L4	11 to 14 V
C45-49 (NSW) - C45-81 (E1)*1 C46-49 (NSW) - C46-81 (E1)*2	L - BR	PNP switch signal	• Engine switch on (IG) • Shift lever in P or N	Below 1 V
			• Engine switch on (IG) • Shift lever not in P or N	11 to 14 V
C45-31 (P) - C45-81 (E1)*1 C46-31 (P) - C46-81 (E1)*2	G-B - BR	P shift position switch signal	• Engine switch on (IG) • Shift lever in P	11 to 14 V
			• Engine switch on (IG) • Shift lever not in P	Below 1 V

C45-30 (R) - C45-81 (E1)*1 C46-30 (R) - C46-81 (E1)*2	L-R - BR	R shift position switch signal	• Engine switch on (IG) • Shift lever in R	11 to 14 V
			• Engine switch on (IG) • Shift lever not in R	Below 1 V
C45-29 (N) - C45-81 (E1)*1 C46-29 (N) - C46-81 (E1)*2	G-W - BR	N shift position switch signal	• Engine switch on (IG) • Shift lever in N	11 to 14 V
			• Engine switch on (IG) • Shift lever not in N	Below 1 V
C45-28 (D) - C45-81 (E1)*1 C46-28 (D) - C46-81 (E1)*2	G - BR	D shift position switch signal	• Engine switch on (IG) • Shift lever in D	11 to 14 V
			• Engine switch on (IG) • Shift lever not in D	Below 1 V
A38-25 (S) - C45-81 (E1)*1 A52-25 (S) - C46-81 (E1)*2	W - BR	S shift position switch signal	• Engine switch on (IG) • Shift lever in S	11 to 14 V
			• Engine switch on (IG) • Shift lever not in S	Below 1 V
A38-38 (SFTU) - C45-81 (E1)*1 A52-38 (SFTU) - C46-81 (E1)*2	V - BR	Up-shift shift position switch signal	• Engine switch on (IG) • Shift lever in S	11 to 14 V
			• Engine switch on (IG) • Shift lever "+" position (up-shift)	Below 1 V
A38-37 (SFTD) - C45-81 (E1)*1 A52-37 (SFTD) - C46-81 (E1)*2	L - BR	Down-shift position switch signal	• Engine switch on (IG) • Shift lever in S	11 to 14 V
			• Engine switch on (IG) • Shift lever "-" position (down-shift)	Below 1 V
A38-13 (STP) - C45-81 (E1)*1 A52-13 (STP) - C46-81 (E1)*2	R - BR	Stop light switch signal	Brake pedal depressed	11 to 14 V
			Brake pedal released	Below 1.5 V
C45-9 (S1) - C45-81 (E1)*1 C46-9 (S1) - C46-81 (E1)*2	R - BR	Shift solenoid valve S1 signal	1st gear	Below 1 V
			Not in 1st gear	11 to 14 V
C45-8 (S2) - C45-81 (E1)*1 C46-8 (S2) - C46-81 (E1)*2	W - BR	Shift solenoid valve S2 signal	1st, 2nd or 6th gear	11 to 14 V
			3rd, 4th or 5th gear	Below 1 V
C45-7 (S3) - C45-81 (E1)*1 C46-7 (S3) - C46-81 (E1)*2	B-R - BR	Shift solenoid valve S3 signal	1st, 2nd or 3rd gear	11 to 14 V
			4th, 5th or 6th gear	Below 1 V
C45-6 (S4) - C45-81 (E1)*1 C46-6 (S4) - C46-81 (E1)*2	G-R - BR	Shift solenoid valve S4 signal	5th or 6th gear	11 to 14 V
			1st, 2nd, 3rd or 4th gear	Below 1 V
C45-5 (SR) - C45-81 (E1)*1 C46-5 (SR) - C46-81 (E1)*2	G - BR	Shift solenoid valve SR signal	1st, 2nd, 3rd or 4th gear	11 to 14 V
			5th or 6th gear	Below 1 V
C45-13 (SL1+) - C45-12				

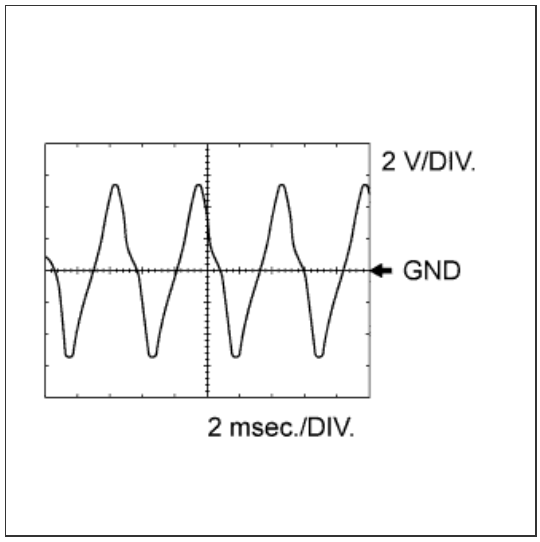
(SL1-)*1 C46-13 (SL1+) - C46-12 (SL1-)*2	Y - L	Shift solenoid valve SL1 signal	5th or 6th gear	Pulse generation
C45-17 (SL2+) - C45-16 (SL2-)*1 C46-17 (SL2+) - C46-16 (SL2-)*2	G-R - L-W	Shift solenoid valve SL2 signal	Engine idling	Pulse generation
C45-11 (SLT+) - C45-10 (SLT-)*1 C46-11 (SLT+) - C46-10 (SLT-)*2	B - G-B	Shift solenoid valve SLT signal	Engine idling	Pulse generation
C45-15 (SLU+) - C45-14 (SLU-)*1 C46-15 (SLU+) - C46-14 (SLU-)*2	L-Y - L-R	Shift solenoid valve SLU signal	5th (lock-up) gear or 6th (lock-up) gear	Pulse generation
C45-114 (THO1) - C45-92 (E2)*1 C46-114 (THO1) - C46-92 (E2)*2	G-Y - BR	No. 1 ATF temperature sensor signal	No. 1 ATF temperature: 115°C (239°F) or higher	Below 1.5 V
C45-113 (THO2) - C45-92 (E2)*1 C46-113 (THO2) - C46-92 (E2)*2	L - BR	No. 2 ATF temperature sensor signal	No. 2 ATF temperature: 115°C (239°F) or higher	Below 1.5 V
C45-101 (SP2+) - C45-100 (SP2-)*1 C46-101 (SP2+) - C46-100 (SP2-)*2	Y - B	Speed sensor SP2 signal	Vehicle speed 20 km/h (12 mph)	Pulse generation (see waveform 1)
C45-76 (NT+) - C45-75 (NT-)*1 C46-76 (NT+) - C46-75 (NT-)*2	Y - B	Speed sensor NT signal	Engine idling (shift lever in P or N)	Pulse generation (see waveform 2)
A38-41 (CANH) - C45-81 (E1)*1 A52-41 (CANH) - C46-81 (E1)*2	P - BR	CAN communication line	Engine switch on (IG)	Pulse generation (see waveform 3)
A38-49 (CANL) - C45-81 (E1)*1 A52-49 (CANL) - C46-81 (E1)*2	B - BR	CAN communication line	Engine switch on (IG)	Pulse generation (see waveform 4)
A38-21 (PWR) - C45-81 (E1)*1 A52-21 (PWR) - C46-81 (E1)*2	L-B - BR	Pattern select (PWR) switch signal	• Engine switch on (IG) • Pattern select (PWR) switch off	11 to 14 V
			• Engine switch on (IG) • Pattern select (PWR) switch on	Below 1.5 V
A38-17 (SNWI) - C45-81 (E1)*1 A52-17 (SNWI) - C46-81 (E1)*2	P - BR	Pattern select (2ND) switch signal	• Engine switch on (IG) • Pattern select (2ND) switch off	11 to 14 V
			• Engine switch on (IG) • Pattern select (2ND) switch continuously pressed	Below 1.5 V

a. Using an oscilloscope, check waveform 1.

Reference:

Terminal No. (Symbol)	Tool Setting	Condition
C45-101 (SP2+) - C45-100 (SP2-)*1	2 V/DIV., 2	Vehicle speed 20

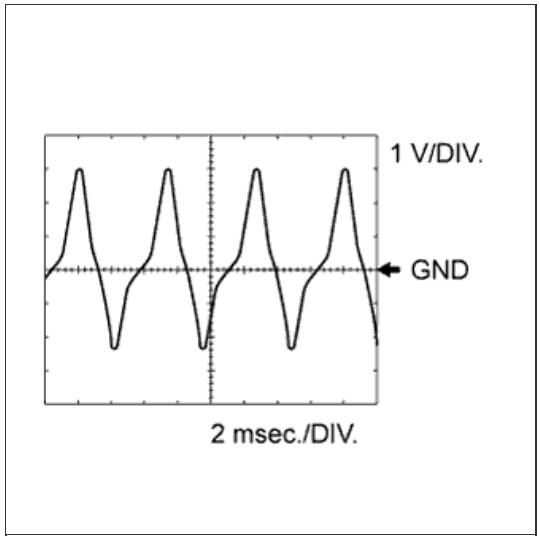
C46-101 (SP2+) - C46-100 (SP2-)*2	msec./DIV.	km/h (12 mph)



b. Using an oscilloscope, check waveform 2.

Reference:

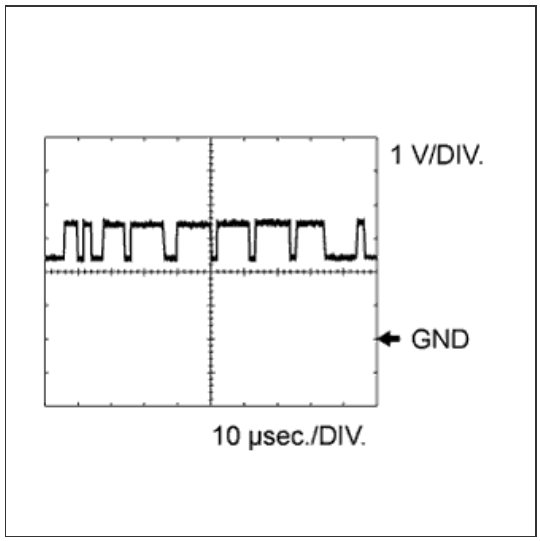
Terminal No. (Symbol)	Tool Setting	Condition
C45-76 (NT+) - C45-75 (NT-)*1 C46-76 (NT+) - C46-75 (NT-)*2	1 V/DIV., 2 msec./DIV.	Engine idling (shift lever in P or N)



c. Using an oscilloscope, check waveform 3.

Reference:

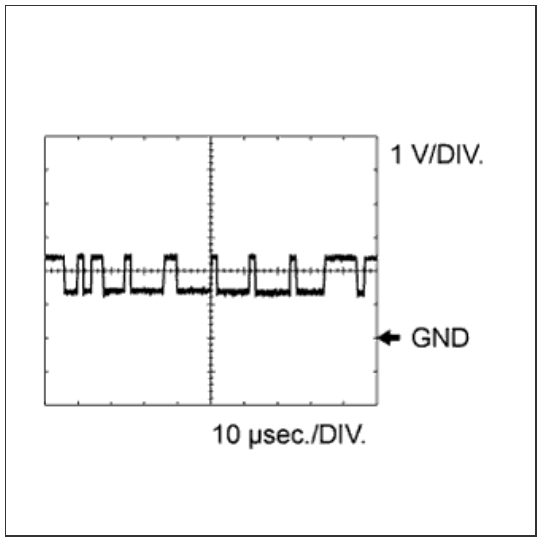
Terminal No. (Symbol)	Tool Setting	Condition
A38-41 (CANH) - C45-81 (E1)*1 A52-41 (CANH) - C46-81 (E1)*2	1 V/DIV., 10 µsec./DIV.	Engine switch on (IG)



d. Using an oscilloscope, check waveform 4.

Reference:

Terminal No. (Symbol)	Tool Setting	Condition
A38-49 (CANL) - C45-81 (E1)*1 A52-49 (CANL) - C46-81 (E1)*2	1 V/DIV., 10 µsec./DIV.	Engine switch on (IG)

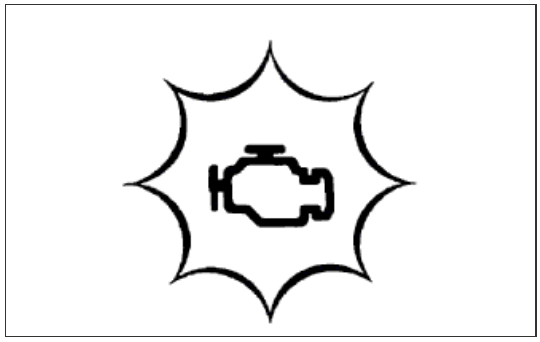

1 V/DIV.
GND
10 µsec./DIV.

for Preparation Click here

DESCRIPTION

a. When troubleshooting On-Board Diagnostic (OBD II) vehicles, the vehicle must be connected to the OBD II scan tool (complying with SAE J1987). Various data output from the vehicle ECM can then be read.

b. OBD II regulations require that the vehicle on-board computer illuminate the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in:



i. The emission control system/components

ii. The powertrain control components (which affect vehicle emissions)

iii. The computer
In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are stored in the ECM memory.
When the malfunction does not reoccur, the MIL stays illuminated until the engine switch is turned off, and the MIL turns off when the engine is started. However, the DTCs remain stored in the ECM memory.

c. To check DTCs, connect the GTS to the Data Link Connector 3 (DLC3) of the vehicle. The GTS displays output DTCs, the freeze frame data and a variety of the engine data.
The DTCs and freeze frame data can be cleared with the GTS (Click here).

NORMAL MODE AND CHECK MODE

a. The diagnosis system operates in "normal mode" during normal vehicle use. In normal mode, "2 trip detection logic" is used to ensure accurate detection of malfunctions. "Check mode" is also available to technicians as an option. In check mode, "1 trip detection logic" is used for simulating malfunction symptoms and increasing the system ability to detect malfunctions, including intermittent malfunctions.

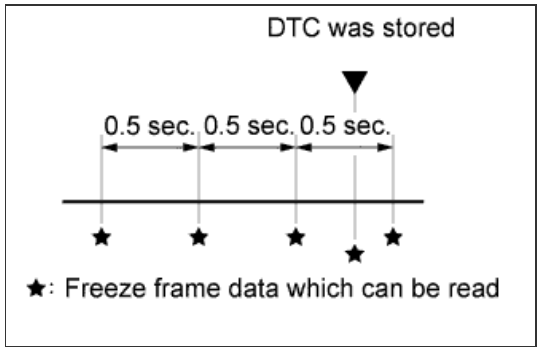
2 TRIP DETECTION LOGIC

a. When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory (1st trip). If the same malfunction is detected during the next drive cycle, the MIL is illuminated (2nd trip).

FREEZE FRAME DATA

a. Freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was moving or stationary, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

b. The ECM records freeze frame data at 5 different times: 1) 3 times before the DTC is stored, 2) once when the DTC is stored, and 3) once after the DTC is stored. These data can be used to simulate the vehicle condition around the time when the malfunction occurred. The data may help find the cause of the malfunction, or judge if the DTC is being caused by a temporary malfunction or not.



CHECK DATA LINK CONNECTOR 3 (DLC3) (Click here)

CHECK MIL

a. Check that the MIL illuminates when turning the engine switch on (IG).
   If the MIL does not illuminate, there is a problem in the MIL circuit (Click here).

b. When the engine is started, the MIL should turn off.

for Preparation Click here

CHECK DTC

a. DTCs which are stored in the ECM can be output to the GTS.
The GTS can display pending DTCs and current DTCs. Some DTCs are not stored unless a malfunction is detected in consecutive driving cycles. When a malfunction is detected in only one driving cycle, it is stored as a pending DTC.

i. Connect the GTS to the DLC3.

ii. Turn the engine switch on (IG).

iii. Turn the GTS on.

iv. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

v. Confirm the DTCs and freeze frame data, and then write them down.

vi. Confirm the details of the DTCs (Click here).

NOTICE:

When simulating a symptom with the scan tool to check for DTCs, use normal mode. For codes on the Diagnostic Trouble Code Chart subject to "2 trip detection logic", perform the following actions:

Turn the engine switch off after the symptom is simulated once. Then repeat the simulation process. When the symptom has been simulated twice, the MIL illuminates and the DTCs are stored in the ECM.

CLEAR DTC (using GTS)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes / Clear.

CLEAR DTC (without using GTS)

a. Perform either of the following operations.

i. Disconnect the cable from the negative (-) battery terminal for more than 1 minute.

ii. Remove the EFI MAIN fuse from the engine room relay block located inside the engine compartment for more than 1 minute.

for Preparation Click here

DESCRIPTION

a. Check mode has a higher sensitivity to malfunctions and can detect malfunctions that normal mode cannot detect. Check mode can also detect all the malfunctions that normal mode can detect. In check mode, DTCs are stored with 1 trip detection logic.

CHECK MODE PROCEDURE

a. Make sure that the following conditions are met:

   i. Battery positive voltage 11 V or higher.

   ii. Throttle valve fully closed.

   iii. Shift lever in P or N.

   iv. A/C turned off.

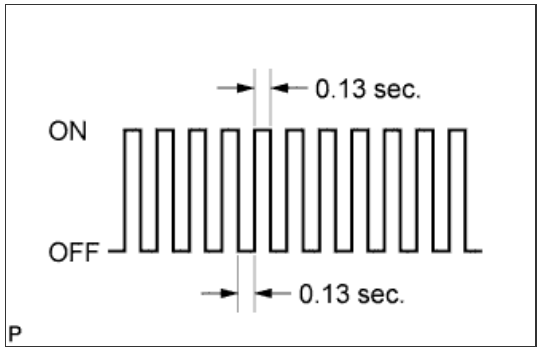
b. Connect the GTS to the DLC3.

c. Turn the engine switch on (IG).

d. Turn the GTS on.

e. Enter the following menus: Powertrain / Engine and ECT / Utility / Check Mode.

f. Check that the MIL flashes as shown in the illustration.



NOTICE:

- **All DTCs and freeze frame data will be cleared if: 1) the GTS is used to change the ECM from normal mode to check mode or vice versa; or 2) during check mode, the engine switch is turned from on (IG) to on (ACC) or off.**
- **Before changing to check mode, make notes of the DTCs and freeze frame data.**

g. Start the engine. The MIL should turn off after the engine starts.

h. Perform the Monitor Drive Pattern for the ECT test (Click here).
(Or, simulate the conditions of the malfunction described by the customer).

i. After simulating the malfunction conditions, use the GTS to check the DTC and freeze frame data.

for Preparation Click here

Fail-safe

This function minimizes the loss of the ECT functions when a malfunction occurs in each sensor or solenoid.

Fail-safe Control List

Malfunctioning Part	Function
DTC P0717: Input Speed Sensor NT	During an input speed sensor malfunction, shift control is performed through the output speed sensor SP2 signal. During an input speed sensor malfunction, up-shift to 5th and 6th, AI-SHIFT* and flex lock-up clutch control are prohibited.
DTC P0722: Output Speed Sensor SP2	During an output speed sensor malfunction, shift control is performed through the input speed sensor NT signal. During an output speed sensor malfunction, up-shift to 5th and 6th, AI-SHIFT* and flex lock-up clutch control are prohibited.
DTC P0712, P0713: ATF Temperature Sensor	During an ATF temperature sensor malfunction, up-shift to 5th and 6th and flex lock-up clutch control are prohibited.
Shift Solenoid Valve S1, S2, S3, S4 and SR	The current to the malfunctioning solenoid valve is cut off and control is performed by operating the other solenoid valves. Shift control is performed depending on the malfunctioning solenoid as described in the table below.
DTC P0748, P0778: Shift Solenoid Valve SL1 and SL2	During a solenoid valve SL1 or SL2 malfunction, up-shift to 5th and 6th and flex lock-up clutch control are prohibited.
DTC P2714, P2716: Shift Solenoid Valve SLT	During a solenoid valve SLT malfunction, the current to the solenoid valve is stopped. This stops line pressure optimal control, and shift shock increases. However, shifting is performed through normal clutch pressure control.
DTC P2757, P2759: Shift Solenoid Valve SLU	During a solenoid valve SLU malfunction, the current to the solenoid valve is stopped. This stops lock-up control and flex lock-up control, and fuel economy decreases.

HINT:

*: In addition to the switching of the shift pattern through the pattern select switch, Artificial Intelligence Shift (AI-SHIFT) control enables the ECM to estimate the road conditions and the driver intention in order to automatically select the optimal shift pattern.

Shift Solenoid Valve Normal Operation Chart

Shift Lever Position	Gear*	Shift Solenoid valve S1	Shift Solenoid valve S2	Shift Solenoid valve S3	Shift Solenoid valve S4	Shift Solenoid valve SR	Shift Solenoid valve SL1	Shift Solenoid valve SL2
D, S6	1st	OFF	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON
	3rd	ON	OFF	ON	OFF	ON	OFF	ON
	4th	ON	OFF	OFF	OFF	ON	OFF	ON
	5th	ON	OFF	OFF	ON	OFF	ON	OFF
	6th	ON	ON	OFF	ON	OFF	ON	OFF
S5	1st	OFF	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON
	3rd	ON	OFF	ON	OFF	ON	OFF	ON
	4th	ON	OFF	OFF	OFF	ON	OFF	ON
	5th	ON	OFF	OFF	ON	OFF	ON	OFF
S4	1st	OFF	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON
	3rd	ON	OFF	ON	OFF	ON	OFF	ON
	4th	ON	OFF	OFF	OFF	ON	OFF	ON
S3	1st	OFF	ON	ON	OFF	ON	OFF	ON
	2nd	ON	ON	ON	OFF	ON	OFF	ON
	3rd (E/B)	ON	OFF	ON	OFF	ON	OFF	OFF

S2	1st	OFF	ON	ON	OFF	ON	OFF	ON
	2nd (E/B)	ON	ON	ON	ON	ON	OFF	OFF
S1	1st (E/B)	OFF	ON	ON	OFF	ON	OFF	OFF

a. Fail-safe operation for electronically malfunctioning shift solenoid valve (S1, S2, S3, S4 and SR).

i. Fail-safe function

If any of the shift solenoid valve circuits has an open or short failure, the ECM turns the other shift solenoids "ON" and "OFF" in order to shift into the gear positions shown in the table below. Also, the ECM stops sending current to the open or short circuited solenoid.

Even if starting the engine again in the fail-safe mode, the gear position remains in the same position.

HINT:

- ***: Actual gear shift (gear position) under fail-safe operation.**
- **X: OFF (the ECM stops sending current to the malfunctioning solenoid valve).**
- **Electrical malfunction: Condition is shown to the left of the "→".**
- **Fail-safe mode: Condition is shown to the right of the "→".**
- **E/B: Engine brake**

Shift Solenoid Valve S1 Electrical Malfunction (P0973, P0974)

Shift Lever Position	Gear*	Shift Solenoid valve S1	Shift Solenoid valve S2	Shift Solenoid valve S3	Shift Solenoid valve S4	Shift Solenoid valve SR	Shift Solenoid valve SL1	Shift Solenoid valve SL2
D, S6	1st	X	ON	ON	OFF	ON	OFF	ON
	1st → 4th	X	ON → OFF	ON → OFF	OFF	ON	OFF	ON
	3rd → 4th	X	OFF	ON → OFF	OFF	ON	OFF	ON
	4th	X	OFF	OFF	OFF	ON	OFF	ON
	5th	X	OFF	OFF	ON	OFF	ON	OFF
	N → 5th	X	ON → OFF	OFF	ON	OFF	ON	OFF
S5	1st	X	ON	ON	OFF	ON	OFF	ON
	1st → 4th	X	ON → OFF	ON → OFF	OFF	ON	OFF	ON
	3rd → 4th	X	OFF	ON → OFF	OFF	ON	OFF	ON
	4th	X	OFF	OFF	OFF	ON	OFF	ON
	5th	X	OFF	OFF	ON	OFF	ON	OFF
S4	1st	X	ON	ON	OFF	ON	OFF	ON
	1st → 4th	X	ON → OFF	ON → OFF	OFF	ON	OFF	ON
	3rd → 4th	X	OFF	ON → OFF	OFF	ON	OFF	ON
	4th	X	OFF	OFF	OFF	ON	OFF	ON
S3	1st	X	ON	ON	OFF	ON	OFF	ON
	1st → 4th	X	ON → OFF	ON → OFF	OFF	ON	OFF	ON
	3rd (E/B) → 4th	X	OFF	ON → OFF	OFF	ON	OFF	OFF → ON
S2	1st	X	ON	ON	OFF	ON	OFF	ON
	2nd (E/B) → 4th	X	ON → OFF	ON → OFF	ON → OFF	ON	OFF	OFF → ON
S1	1st (E/B)	X	ON	ON	OFF	ON	OFF	OFF

Shift Solenoid Valve S2 Electrical Malfunction (P0976, P0977)

Shift Lever Position	Gear*	Shift Solenoid valve S1	Shift Solenoid valve S2	Shift Solenoid valve S3	Shift Solenoid valve S4	Shift Solenoid valve SR	Shift Solenoid valve SL1	Shift Solenoid valve SL2
	3rd	OFF → ON	X	ON	OFF	ON	OFF	ON

D, S6	3rd	ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	4th	ON	X	OFF	OFF	ON	OFF	ON
	5th	ON	X	OFF	ON	OFF	ON	OFF
	5th	ON	X	OFF	ON	OFF	ON	OFF
S5	3rd	OFF → ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	4th	ON	X	OFF	OFF	ON	OFF	ON
	5th	ON	X	OFF	ON	OFF	ON	OFF
S4	3rd	OFF → ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	3rd	ON	X	ON	OFF	ON	OFF	ON
	4th	ON	X	OFF	OFF	ON	OFF	ON
S3	3rd → 3rd (E/B)	OFF → ON	X	ON	OFF	ON	OFF	ON → OFF
	3rd → 3rd (E/B)	ON	X	ON	OFF	ON	OFF	ON → OFF
	3rd (E/B)	ON	X	ON	OFF	ON	OFF	OFF
S2	3rd → 3rd (E/B)	OFF → ON	X	ON	OFF	ON	ON → OFF	ON → OFF
	3rd (E/B)	ON	X	ON	ON → OFF	ON	OFF	OFF
S1	3rd (E/B)	OFF → ON	X	ON	OFF	ON	OFF	OFF

Shift Solenoid Valve S3 Electrical Malfunction (P0979, P0980)

Shift Lever Position	Gear*	Shift Solenoid valve S1	Shift Solenoid valve S2	Shift Solenoid valve S3	Shift Solenoid valve S4	Shift Solenoid valve SR	Shift Solenoid valve SL1	Shift Solenoid valve SL2
D, S6	3rd → 4th	OFF	ON	X	OFF	ON	OFF	ON
	4th	ON	ON → OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	5th	ON	OFF	X	ON	OFF	ON	OFF
	6th	ON	ON	X	ON	OFF	ON	OFF
S5	3rd	OFF	ON	X	OFF	ON	OFF	ON
	4th	ON	ON → OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	5th	ON	OFF	X	ON	OFF	ON	OFF
S4	3rd	OFF	ON	X	OFF	ON	OFF	ON
	4th	ON	ON → OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	ON
S3	3rd	OFF	ON	X	OFF	ON	OFF	ON
	4th	ON	ON → OFF	X	OFF	ON	OFF	ON
	4th	ON	OFF	X	OFF	ON	OFF	OFF → ON
S2	3rd	OFF	ON	X	OFF	ON	OFF	ON
	6th → 4th	ON	ON → OFF	X	ON → OFF	ON	OFF	OFF → ON
S1	1st	OFF	ON	X	OFF	ON	OFF	OFF

Shift Solenoid Valve S4 Electrical Malfunction (P0982, P0983)

Shift Lever Position	Gear*	Shift Solenoid valve S1	Shift Solenoid valve S2	Shift Solenoid valve S3	Shift Solenoid valve S4	Shift Solenoid valve SR	Shift Solenoid valve SL1	Shift Solenoid valve SL2
D, S6	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON
	3rd	ON	OFF	ON	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	OFF → ON	ON → OFF	OFF → ON
	4th	ON	ON → OFF	OFF	X	OFF → ON	ON → OFF	OFF → ON
S5	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON
	3rd	ON	OFF	ON	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	OFF → ON	ON → OFF	OFF → ON
S4	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON
	3rd	ON	OFF	ON	X	ON	OFF	ON
	4th	ON	OFF	OFF	X	ON	OFF	ON
S3	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd	ON	ON	ON	X	ON	OFF	ON
	3rd (E/B)	ON	OFF	ON	X	ON	OFF	OFF
S2	1st	OFF	ON	ON	X	ON	OFF	ON
	2nd (E/B)	ON	ON	ON	X	ON	OFF	OFF
S1	1st (E/B)	OFF	ON	ON	X	ON	OFF	OFF

Shift Solenoid Valve SR Electrical Malfunction (P0985, P0986)

Shift Lever Position	Gear*	Shift Solenoid valve S1	Shift Solenoid valve S2	Shift Solenoid valve S3	Shift Solenoid valve S4	Shift Solenoid valve SR	Shift Solenoid valve SL1	Shift Solenoid valve SL2
D, S6	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd	ON	OFF	ON	OFF	X	OFF	ON
	4th	ON	OFF	OFF	OFF	X	OFF	ON
	5th	ON	OFF	OFF	ON	X	ON	OFF
	6th	ON	ON	OFF	ON	X	ON	OFF
S5	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd	ON	OFF	ON	OFF	X	OFF	ON
	4th	ON	OFF	OFF	OFF	X	OFF	ON
	5th	ON	OFF	OFF	ON	X	ON	OFF
S4	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd	ON	OFF	ON	OFF	X	OFF	ON
	4th	ON	OFF	OFF	OFF	X	OFF	ON
S3	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd	ON	ON	ON	OFF	X	OFF	ON
	3rd (E/B)	ON	OFF	ON	OFF	X	OFF	OFF
S2	1st	OFF	ON	ON	OFF	X	OFF	ON
	2nd (E/B)	ON	ON	ON	ON	X	OFF	OFF
S1	1st (E/B)	OFF	ON	ON	OFF	X	OFF	OFF

b. Fail-safe operation in the event of a mechanical system malfunction.

i. Fail-safe function

The ECM controls the gear position as shown in the table below when malfunctions occur.

DTC Code	Condition	Gear*1					
-	Normal	1st	2nd	3rd	4th	5th	6th
P0751	Shift solenoid valve S1: Stuck OFF malfunction	1st*2	1st*2	3rd	3rd	3rd	3rd
P0761	Shift solenoid valve S3: Stuck ON malfunction	1st	2nd	3rd	3rd	3rd	3rd
P0766 P0776	Shift solenoid valve S4, shift solenoid valve SL2 or valve body (brake control valve): Malfunction	1st	2nd	3rd	3rd	3rd	3rd
P0781	Valve body (1-2 shift valve): Malfunction	1st*2	1st*2	3rd	3rd	3rd	3rd
P0729	Valve body (sequence valve): Malfunction	1st	2nd	3rd	3rd	3rd	3rd

HINT:

- ***1: Actual gear shift (gear position) under fail-safe operation.**
- ***2: Under engine braking, downshifting to 1st or 2nd gear is prohibited.**

for Preparation Click here

READ DATA LIST

HINT:

Using the GTS to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the GTS, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
N Range Status	Shift lever N status/ ON or OFF	• ON: Shift lever in N • OFF: Shift lever not in N	-
Neutral Position SW Signal	PNP switch status/ ON or OFF	Shift lever: • In P or N: ON • Not in P or N: OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
Transfer L4	Transfer status/ ON or OFF	• ON: Transfer position is in L4 • OFF: Transfer position is not L4	-
Stop Light Switch	Stop light switch status/ ON or OFF	Brake pedal: • Depressed: ON • Released: OFF	-
SPD (NT)	Input shaft speed/ Min.: 0 rpm Max.: 12750 rpm	Lock-up: • ON (after warming up engine): Input turbine speed (NT) equal to engine speed • OFF (idling with shift lever in N): Input turbine speed (NT) nearly equal to engine speed	The data is displayed in increments of 50 rpm.
SPD (SP2)	Output shaft speed/ Min.: 0 km/h (0 mph) Max.: 255 km/h (158 mph)	Vehicle stopped: 0 km/h (0 mph) (output shaft speed equal to vehicle speed)	-
Shift SW	PNP switch	Shift lever:	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.

Status (P Range)	status/ ON or OFF	• In P: ON • Not in P: OFF	**HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
Pattern Switch (PWR/M)	Pattern switch (PWR) status/ ON or OFF	Pattern switch (PWR): • Pushed: ON • Not pushed: OFF	-
Shift SW Status (R Range)	PNP switch status/ ON or OFF	Shift lever: • In R: ON • Not in R: OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
Shift SW Status (N Range)	PNP switch status/ ON or OFF	Shift lever: • In N: ON • Not in N: OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
Shift SW Status (N, P Range) Supported	Status of PNP switch (N or P) supported/ Supp or Unsupp	-	-
Shift SW Status (N, P Range)	PNP switch status/ ON or OFF	• ON: Shift lever in P or N • OFF: Shift lever not in P or N	-
Sports Shift Up SW	Sport shift up switch status/ ON or OFF	• ON: Shift lever held in "+" (up-shift) • OFF: Shift lever not in "+" (up-shift)	-
Sports Shift Down SW	Sport shift down switch status/ ON or OFF	• ON: Shift lever held in "-" (down-shift) • OFF: Shift lever not in "-" (down-shift)	-
Sports Mode Selection SW	Sport mode select switch status/ ON or OFF	Shift lever: • ON: In S, "+" or "-" • OFF: Not in S, "+" or "-"	-
Shift SW Status (D Range)	PNP switch status/ ON or OFF	Shift lever: • In D: ON • Not in D: OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect. **HINT:** When failure still occurs even after adjusting these parts, refer to DTC P0705 (Click here).
A/T Oil Temperature 1	No. 1 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 1 ATF temperature sensor circuit is open or shorted.
A/T Oil Temperature 2	No. 2 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 2 ATF temperature sensor circuit is open or shorted.
Lock Up	Lock-up/ ON or OFF	Lock-up: • Operating: ON • Not operating: OFF	-
	ECM gear shift command/	Shift lever: • In D: 1st, 2nd, 3rd, 4th,	

Shift Status	1st, 2nd, 3rd, 4th, 5th or 6th	5th or 6th • In S: 1st, 2nd, 3rd, 4th, 5th or 6th	-
SLU Solenoid Status	Shift solenoid valve SLU status/ ON or OFF	Shift solenoid valve SLU: • Operating: ON • Not operating: OFF	-
SLT Solenoid Status	Shift solenoid valve SLT status/ ON or OFF	• Accelerator pedal depressed: OFF • Accelerator pedal released: ON	-
Snow or 2nd Start Mode	2nd Start mode status/ ON or OFF	• ON: 2nd Start mode on • OFF: 2nd Start mode off	-

PERFORM ACTIVE TEST

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Connect the TC and TE1	Turn on and off TC and TE1 connection	ON or OFF	• ON: TC and TE1 are connected. • OFF: TC and TE1 are disconnected.
Activate the Solenoid (SLU)	Operate shift solenoid valve SLU	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT solenoid to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.
Activate the Solenoid (S1)	Operate shift solenoid valve S1	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.
Activate the Solenoid (S2)	Operate shift solenoid valve S2	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.

Activate the Solenoid (S3)	Operate shift solenoid valve S3	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.
Activate the Solenoid (S4)	Operate shift solenoid valve S4	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.
Activate the Lock Up	Control shift solenoid valve SLU to set automatic transmission to lock-up condition	ON or OFF	It is possible to check the shift solenoid valve SLU operation. [Vehicle Condition] • The throttle valve opening angle is less than 35%. • The vehicle speed is 80 km/h (50 mph) or more.
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.
Activate the Solenoid (SR)	Operate shift solenoid valve SR	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.
Activate the Solenoid (SL1)	Operate shift solenoid valve SL1	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.
Activate the Solenoid (SL2)	Operate shift solenoid valve SL2	ON or OFF	[Vehicle Condition] • The engine is stopped. • The shift lever is in P or N.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

for Preparation Click here

HINT:

- **If a DTC is output during the DTC check, check the parts listed in the table below and proceed to the "See page" given.**
- ***1: "Comes on" means the Malfunction Indicator Lamp (MIL) illuminates.**
- ***2: "DTC stored" means the ECM stores the trouble code if the ECM detects the DTC detection condition.**
- ***3: The ATF temperature warning light blinks or a message is displayed in the combination meter.**
- **These DTCs may be output when the clutch, brake, gear components, etc., inside the automatic transmission are damaged.**

Automatic Transmission System

DTC Code	Detection Item	MIL*1	Memory*2	See page
P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	Comes on	DTC stored	Click here
P0711	Transmission Fluid Temperature Sensor "A" Performance	Comes on	DTC stored	Click here
P0712	Transmission Fluid Temperature Sensor "A" Circuit Low Input	Comes on	DTC stored	Click here
P0713	Transmission Fluid Temperature Sensor "A" Circuit High Input	Comes on	DTC stored	Click here
P0717	Turbine Speed Sensor Circuit No Signal	Comes on	DTC stored	Click here
P0722	Output Speed Sensor Circuit No Signal	Comes on	DTC stored	Click here
P0729	Gear 6 Incorrect Ratio	Comes on	DTC stored	Click here
P0748	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	Comes on	DTC stored	Click here
P0751	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)	Comes on	DTC stored	Click here
P0756	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)	Comes on	DTC stored	Click here
P0761	Shift Solenoid "C" Performance (Shift Solenoid Valve S3)	Comes on	DTC stored	Click here
P0766	Shift Solenoid "D" Performance (Shift Solenoid Valve S4)	Comes on	DTC stored	Click here
P0776	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)	Comes on	DTC stored	Click here
P0778	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	Comes on	DTC stored	Click here
P0781	1-2 Shift (1-2 Shift Valve)	Comes on	DTC stored	Click here
P0894	Transmission Component Slipping	Comes on	DTC stored	Click here
P0973	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)	Comes on	DTC stored	Click here
P0974	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)	Comes on	DTC stored	Click here
P0976	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)	Comes on	DTC stored	Click here
P0977	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)	Comes on	DTC stored	Click here
P0979	Shift Solenoid "C" Control Circuit Low (Shift Solenoid Valve S3)	Comes on	DTC stored	Click here
P0980	Shift Solenoid "C" Control Circuit High (Shift Solenoid Valve S3)	Comes on	DTC stored	Click here
P0982	Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)	Comes on	DTC stored	Click here
P0983	Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)	Comes on	DTC stored	Click here

P0985	Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)	Comes on	DTC stored	Click here
P0986	Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)	Comes on	DTC stored	Click here
P2714	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)	Comes on	DTC stored	Click here
P2716	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	Comes on	DTC stored	Click here
P2742	Transmission Fluid Temperature Sensor "B" Circuit Low Input	-*3	DTC stored	Click here
P2743	Transmission Fluid Temperature Sensor "B" Circuit High Input	-*3	DTC stored	Click here
P2757	Torque Converter Clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU)	Comes on	DTC stored	Click here
P2759	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)	Comes on	DTC stored	Click here
P2772	Four Wheel Drive (4WD) Low Switch Circuit Range / Performance	Comes on	DTC stored	Click here

DTC P0705 Transmission Range Sensor Circuit Malfunction (PRNDL Input)

for Preparation Click here

DESCRIPTION

The Park/Neutral Position (PNP) switch detects the shift lever position and sends signals to the ECM.

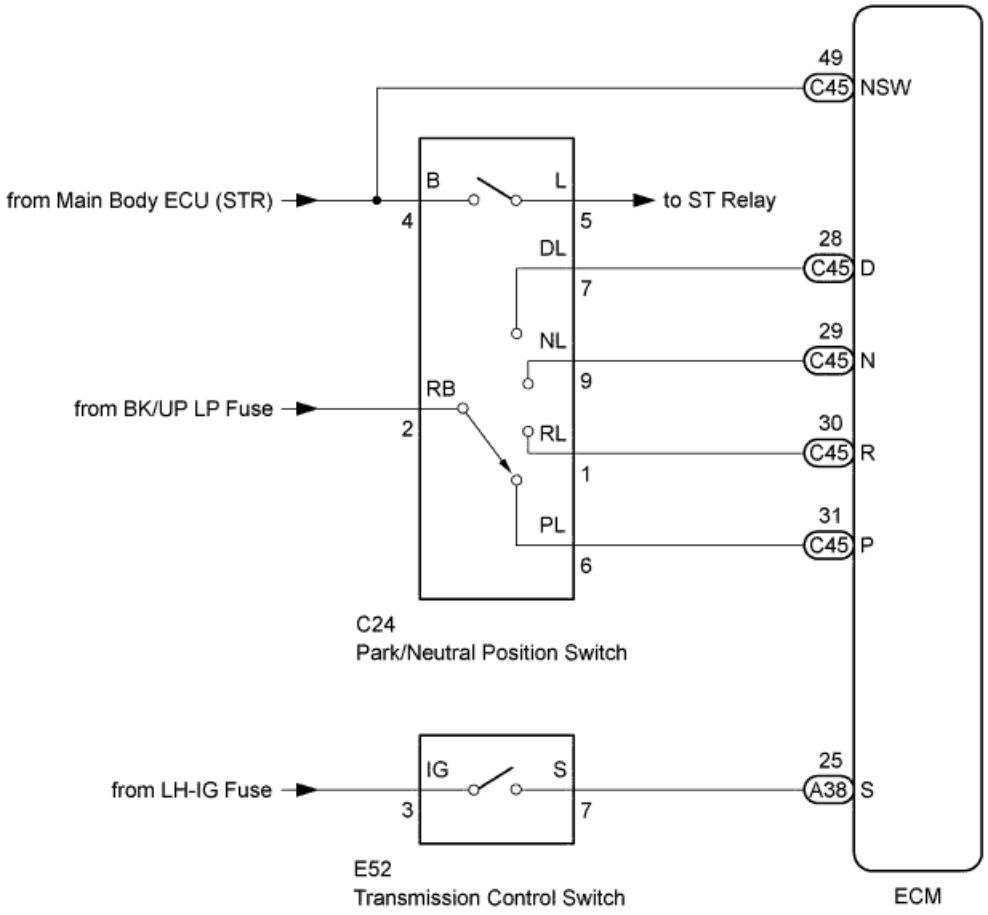
DTC Code	DTC Detection Condition	Trouble Area
P0705	When one of the following conditions is met: (A) Any 2 or more of the following signals are ON simultaneously (2 trip detection logic). • P input signal • N input signal • R input signal • D input signal (B) Any 2 or more of the following signals are ON simultaneously (2 trip detection logic). • NSW input signal • R input signal • D input signal (C) Any of the following signals are ON for 2.0 sec. or more when the shift lever is in S (2 trip detection logic). • NSW input signal • P input signal • N input signal • R input signal (D) All the signals are OFF simultaneously for the P, R, N and D positions (2 trip detection logic).	• Park/neutral position switch • Transmission control switch (Lower shift lever assembly) • Open or short in park/neutral position switch circuit • ECM

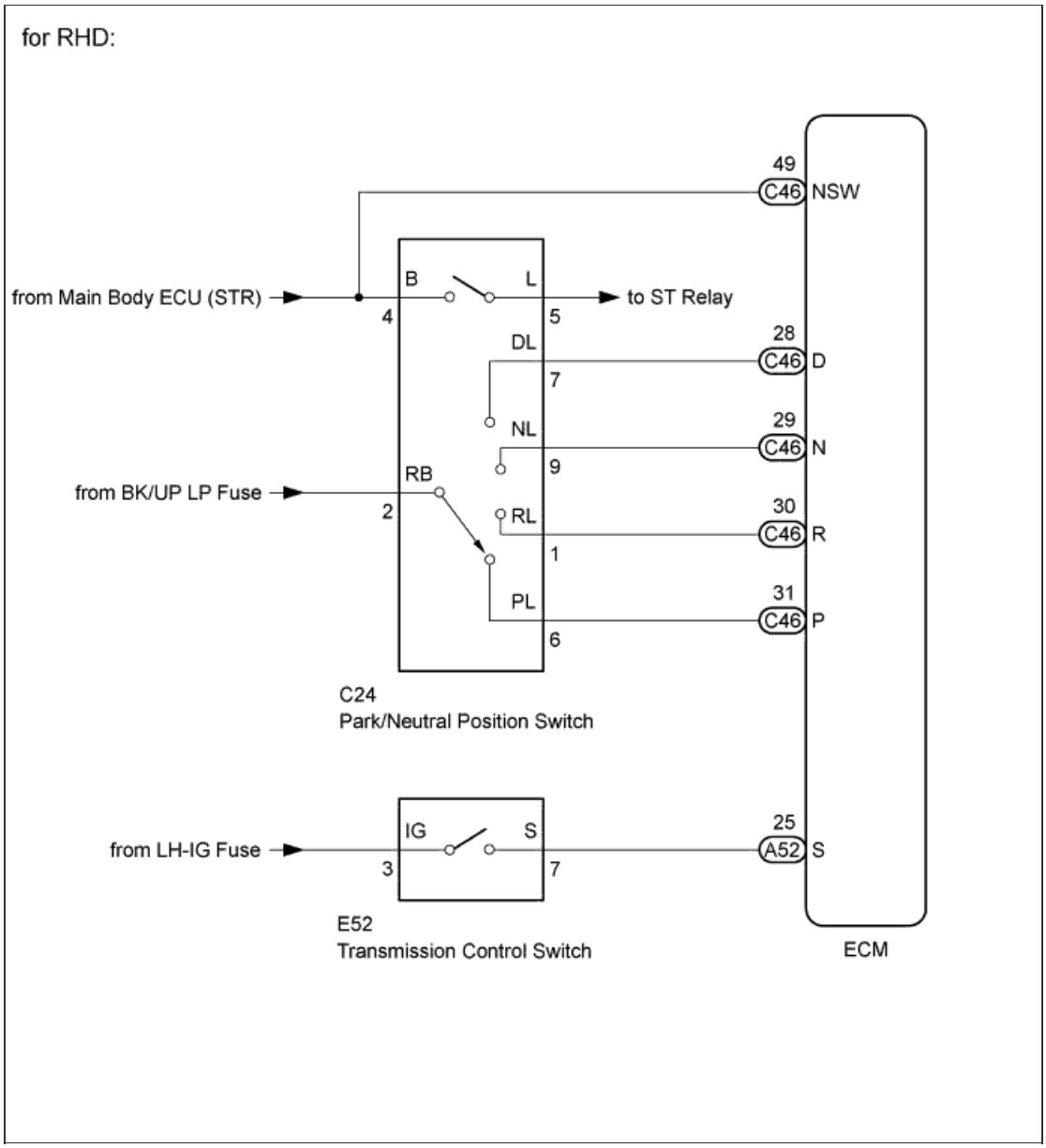
MONITOR DESCRIPTION

This DTC indicates a problem with the park/neutral position switch and the wire harness in the park/neutral position switch circuit.
The park/neutral position switch detects the shift lever position and sends a signal to the ECM.
For security, the park/neutral position switch detects the shift lever position so that the engine can be started only when the shift lever is in P or N.
The park/neutral position switch sends a signal to the ECM according to the shift lever position (P, R, N, D or S).
The ECM determines that there is a problem with the switch or related parts if it receives more than 1 position signal simultaneously. The ECM will illuminate the MIL and store the DTC.

WIRING DIAGRAM

for LHD:


49
C45
NSW
from Main Body ECU (STR)
B
L
to ST Relay
4
5
DL
28
C45
D
7
NL
29
C45
N
9
from BK/UP LP Fuse
RB
2
RL
30
C45
R
1
PL
31
C45
P
6
C24
Park/Neutral Position Switch
from LH-IG Fuse
IG
S
25
A38
S
3
7
E52
Transmission Control Switch
ECM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the GTS to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the GTS, read the Data List.

Engine and ECT

Tester	Measurement	Normal Condition	Diagnostic Note

Display	Item/Range		
Neutral Position SW Signal	PNP switch status/ ON or OFF	Shift lever: • In P or N: ON • Not in P or N: OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Shift SW Status (R Range)	PNP switch status/ ON or OFF	Shift lever: • In R: ON • Not in R: OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Shift SW Status (P Range)	PNP switch status/ ON or OFF	Shift lever: • In P: ON • Not in P: OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Shift SW Status (N Range)	PNP switch status/ ON or OFF	Shift lever: • In N: ON • Not in N: OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Shift SW Status (D Range)	PNP switch status/ ON or OFF	Shift lever: • In D: ON • Not in D: OFF	When the shift lever position displayed on the GTS differs from the actual position, the adjustment of the PNP switch or shift cable may be incorrect.
Sports Shift Up SW	Sport shift up switch status/ ON or OFF	• ON: Shift lever held in "+" (up-shift) • OFF: Shift lever not in "+" (up-shift)	-
Sports Shift Down SW	Sport shift down switch status/ ON or OFF	• ON: Shift lever held in "-" (down-shift) • OFF: Shift lever not in "-" (down-shift)	-

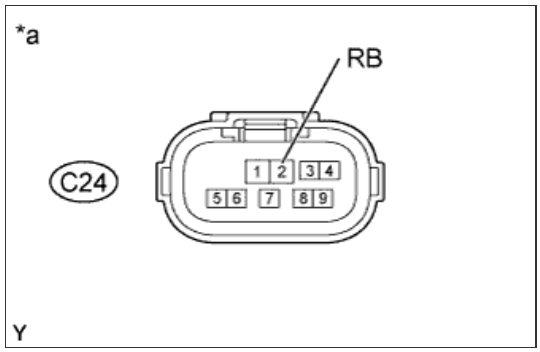
1.CHECK HARNESS AND CONNECTOR (BK/UP LP FUSE - PARK/NEUTRAL POSITION SWITCH)

a. Disconnect the park/neutral position switch connector.

b. Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
C24-2 (RB) - Body ground	Engine switch on (IG)	11 to 14 V
C24-2 (RB) - Body ground	Engine switch off	Below 1 V



Text in Illustration

*a	Front view of wire harness connector (to Park/Neutral Position Switch)

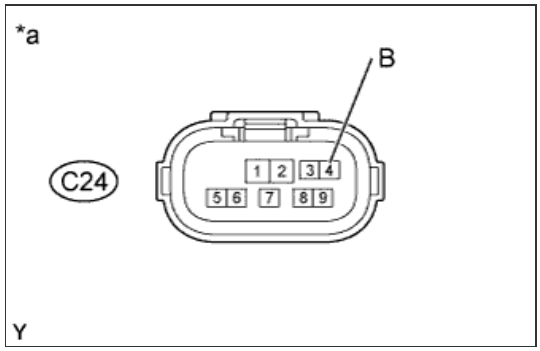
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

2.CHECK HARNESS AND CONNECTOR (NSW TERMINAL VOLTAGE)

a. Disconnect the park/neutral position switch connector.

b. Measure the voltage according to the value(s) in the table below.



Standard voltage:

Tester Connection	Condition	Specified Condition
C24-4 (B) - Body ground	Engine switch on (IG)	11 to 14 V
C24-4 (B) - Body ground	Engine switch off	Below 1 V

Text in Illustration

*a	Front view of wire harness connector (to Park/Neutral Position Switch)

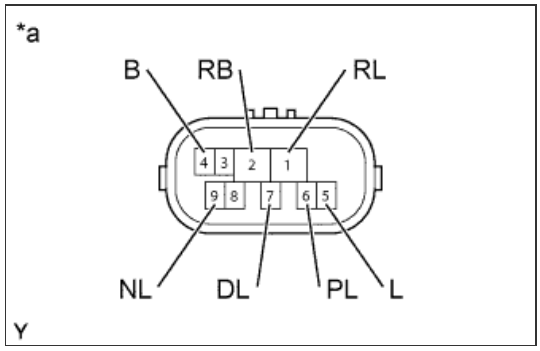
NG → Go to step 7

OK

3.INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY

a. Disconnect the park/neutral position switch connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
• 2 (RB) - 6 (PL) • 4 (B) - 5 (L)	Shift lever in P	Below 1 Ω
2 (RB) - 1 (RL)	Shift lever in R	Below 1 Ω
• 2 (RB) - 9 (NL) • 4 (B) - 5 (L)	Shift lever in N	Below 1 Ω
2 (RB) - 7 (DL)	• Shift lever in D • Shift lever in S, "+" or "-"	Below 1 Ω
• 2 (RB) - 6 (PL) • 4 (B) - 5 (L)	Shift lever not in P	10 kΩ or higher
2 (RB) - 1 (RL)	Shift lever not in R	10 kΩ or higher
• 2 (RB) - 9 (NL) • 4 (B) - 5 (L)	Shift lever not in N	10 kΩ or higher
2 (RB) - 7 (DL)	• Shift lever not in D • Shift lever not in	10 kΩ or higher

	S, "+" or "-"	

Text in Illustration

*a	Component without harness connected (Park/Neutral Position Switch)

NG → REPLACE PARK/NEUTRAL POSITION SWITCH ASSEMBLY (Click here)

OK

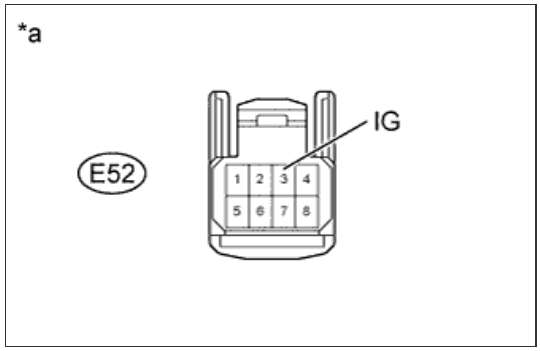
4.CHECK HARNESS AND CONNECTOR (LH ECU-IG FUSE - TRANSMISSION CONTROL SWITCH)

a. Disconnect the transmission control switch connector.

b. Measure the voltage according to the value(s) in the table below.

Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
E52-3 (IG) - Body ground	Engine switch on (IG)	11 to 14 V
E52-3 (IG) - Body ground	Engine switch off	Below 1 V



Text in Illustration

*a	Front view of wire harness connector (to Transmission Control Switch)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

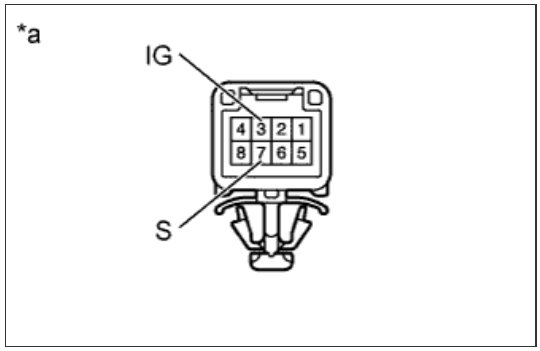
5.INSPECT TRANSMISSION CONTROL SWITCH

a. Disconnect the transmission control switch connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
3 (IG) - 7 (S)	Shift lever in S, "+" or "-"	Below 1 Ω
3 (IG) - 7 (S)	Shift lever not in S, "+" or "-"	10 kΩ or higher



Text in Illustration

*a	Component without harness connected (Transmission Control Switch)

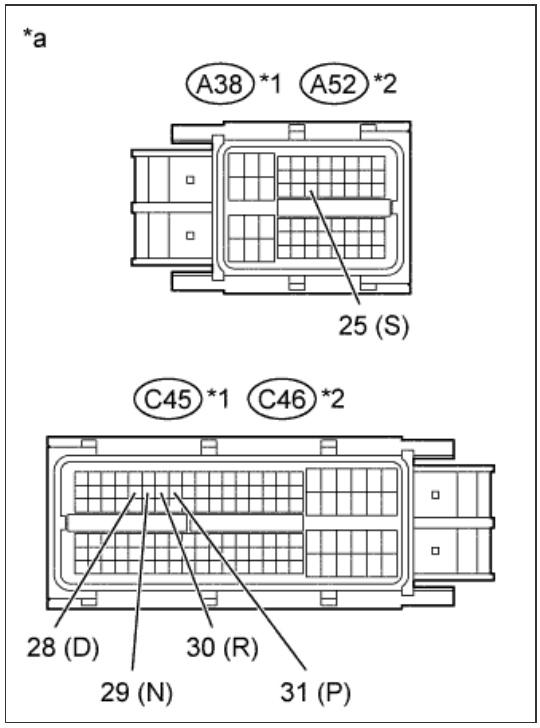
NG → REPLACE TRANSMISSION CONTROL SWITCH (LOWER SHIFT LEVER ASSEMBLY) (Click here)

OK

6.CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH, TRANSMISSION CONTROL SWITCH - ECM)

a. Disconnect the ECM connector.

b. Measure the voltage according to the value(s) in the table below.



Standard Voltage:

for LHD

Tester Connection	Condition	Specified Condition
C45-31 (P) - Body ground	• Engine switch on (IG) • Shift lever in P	11 to 14 V
C45-30 (R) - Body ground	• Engine switch on (IG) • Shift lever in R	11 to 14 V*
C45-29 (N) - Body ground	• Engine switch on (IG) • Shift lever in N	11 to 14 V
C45-28 (D) - Body ground	• Engine switch on (IG) • Shift lever in D	11 to 14 V
A38-25 (S) - Body ground	• Engine switch on (IG) • Shift lever in S, "+" or "-"	11 to 14 V
C45-31 (P) - Body ground	• Engine switch on (IG) • Shift lever not in P	Below 1 V
C45-30 (R) - Body ground	• Engine switch on (IG) • Shift lever not in R	Below 1 V
C45-29 (N) - Body ground	• Engine switch on (IG) • Shift lever not in N	Below 1 V
C45-28 (D) - Body ground	• Engine switch on (IG) • Shift lever not in D	Below 1 V
A38-25 (S) - Body ground	• Engine switch on (IG) • Shift lever not in S, "+" or "-"	Below 1 V

for RHD

Tester Connection	Condition	Specified Condition

C46-31 (P) - Body ground	• Engine switch on (IG) • Shift lever in P	11 to 14 V
C46-30 (R) - Body ground	• Engine switch on (IG) • Shift lever in R	11 to 14 V*
C46-29 (N) - Body ground	• Engine switch on (IG) • Shift lever in N	11 to 14 V
C46-28 (D) - Body ground	• Engine switch on (IG) • Shift lever in D	11 to 14 V
A52-25 (S) - Body ground	• Engine switch on (IG) • Shift lever in S, "+" or "-"	11 to 14 V
C46-31 (P) - Body ground	• Engine switch on (IG) • Shift lever not in P	Below 1 V
C46-30 (R) - Body ground	• Engine switch on (IG) • Shift lever not in R	Below 1 V
C46-29 (N) - Body ground	• Engine switch on (IG) • Shift lever not in N	Below 1 V
C46-28 (D) - Body ground	• Engine switch on (IG) • Shift lever not in D	Below 1 V
A52-25 (S) - Body ground	• Engine switch on (IG) • Shift lever not in S, "+" or "-"	Below 1 V

HINT:

*: The voltage will drop slightly due to the turning on of the back up light.

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK →

REPLACE ECM (Click here)

7.CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH - ECM)

a. Disconnect the C24 park/neutral position switch connector.

b. Disconnect the A38 ECM connector (for LHD).

c. Disconnect the A52 ECM connector (for RHD).

d. Measure the voltage according to the value(s) in the table below.

Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C24-4 (B) - C45-49 (NSW)	Always	Below 1 Ω
C24-4 (B) or C45-49 (NSW) -	Always	10 kΩ or

Body ground		higher

for RHD

Tester Connection	Condition	Specified Condition
C24-4 (B) - C46-49 (NSW)	Always	Below 1 Ω
C24-4 (B) or C46-49 (NSW) - Body ground	Always	10 kΩ or higher

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0973 Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)

DTC P0974 Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)

for Preparation Click here

DESCRIPTION

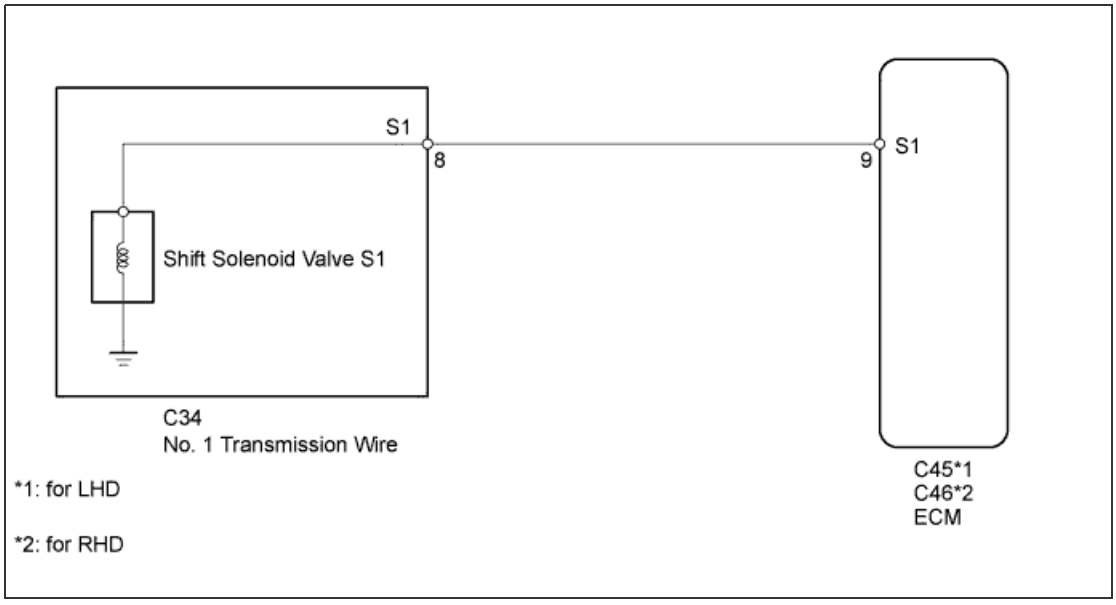
Shifting from 1st to 6th is performed in combination with ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0973	The ECM detects a short in the solenoid valve S1 circuit 2 times when the solenoid valve S1 is operated (1 trip detection logic).	• Short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM
P0974	The ECM detects an open in the solenoid valve S1 circuit 2 times when the solenoid valve S1 is not operated (1 trip detection logic).	• Open in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S1 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S1 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S1 circuit.
When the shift solenoid valve S1 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S1 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

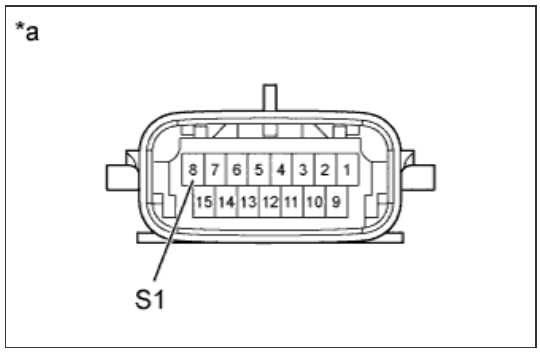
The shift solenoid valve S1 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S1	OFF	ON	ON	ON	ON	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S1)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
8 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

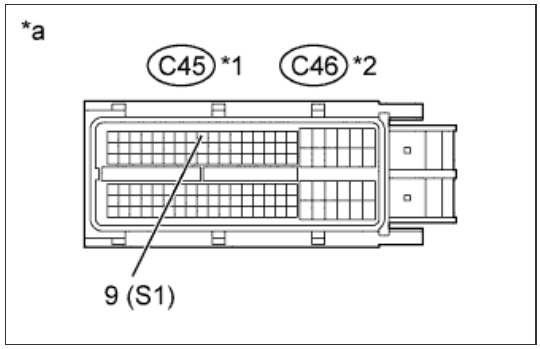
NG → Go to step 3

OK ↓

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-9 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-9 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ↓

REPLACE ECM (Click here)

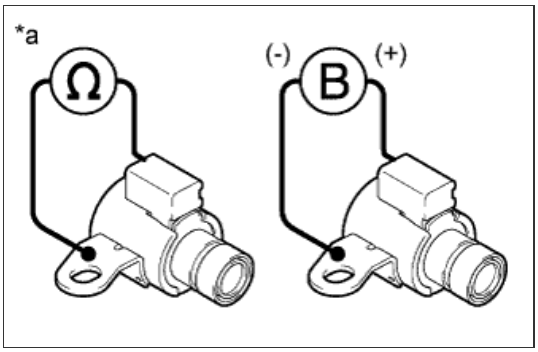
3.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S1)

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0711 Transmission Fluid Temperature Sensor "A" Performance

for Preparation Click here

DESCRIPTION

The ATF temperature sensor converts the fluid temperature into a resistance value for use by the ECM.
The ECM applies a voltage to the temperature sensor through terminal THO1 of the ECM.
The sensor resistance changes with the ATF temperature. As the temperature becomes higher, the sensor resistance decreases.
One terminal of the sensor is grounded so that the sensor resistance decreases and the voltage goes down as the temperature becomes higher.
The ECM calculates the fluid temperature based on the voltage signal.

DTC Code	DTC Detection Condition	Trouble Area
P0711	Either condition is met (2-trip detection logic): (a) Certain monitor enabling conditions are met and the ATF temperature is below 20°C (68°F). (b) Certain monitor enabling conditions are met and the ATF temperature is 110°C (230°F) or higher.	No. 1 transmission wire (No. 1 ATF temperature sensor)

MONITOR DESCRIPTION

This DTC indicates that there is a problem with the signal from the Automatic Transmission Fluid (ATF) temperature sensor and that the sensor itself is defective. The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature and detects an open or short in the ATF temperature circuit or a fault in the ATF temperature sensor.
After running the vehicle for a certain period, the ATF temperature should increase. If the ATF temperature is below 20°C (68°F) after running the vehicle for a certain period, the ECM interprets this as a fault, and turns on the MIL.

INSPECTION PROCEDURE

DATA LIST

HINT:

Using the GTS to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the GTS, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 1	No. 1 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 1 ATF temperature sensor circuit is open or shorted.

HINT:

When DTC P0712 is stored and the GTS output is 150°C (302°F) or higher, there is a short circuit.

When DTC P0713 is stored and the GTS output is -40°C (-40°F), there is an open circuit.

Check the temperature displayed on the GTS in order to check if a malfunction exists.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or higher	Short circuit

If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately stored (in 0.5 seconds). When P0713 is stored, P0711 cannot be stored. It is not necessary to inspect the circuit when P0711 is stored.

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0711)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
Only P0711 is output	A
P0711 and other DTCs are output	B

HINT:

If any other codes besides P0711 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.CHECK TRANSMISSION FLUID LEVEL

a. Check the transmission fluid level (Click here).

OK:

Automatic transmission fluid level is correct.

NG → ADD FLUID (Click here)

OK

REPAIR OR REPLACE NO. 1 ATF TEMPERATURE SENSOR (NO. 1 TRANSMISSION WIRE) (Click here)

DTC P0973 Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)

DTC P0974 Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)

for Preparation Click here

DESCRIPTION

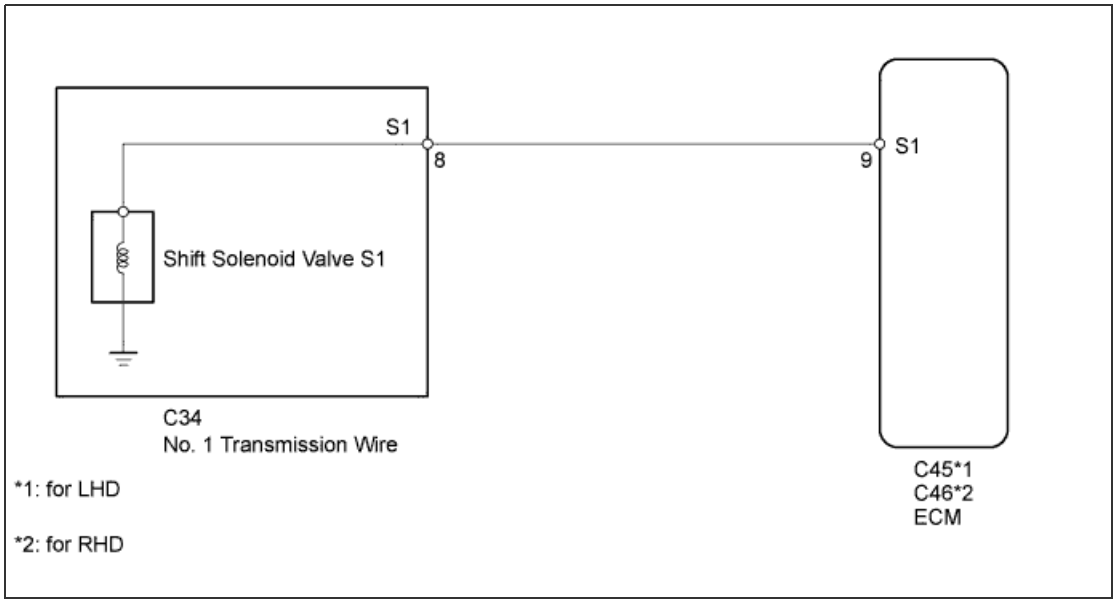
Shifting from 1st to 6th is performed in combination with ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0973	The ECM detects a short in the solenoid valve S1 circuit 2 times when the solenoid valve S1 is operated (1 trip detection logic).	• Short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM
P0974	The ECM detects an open in the solenoid valve S1 circuit 2 times when the solenoid valve S1 is not operated (1 trip detection logic).	• Open in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S1 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S1 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S1 circuit.
When the shift solenoid valve S1 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S1 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

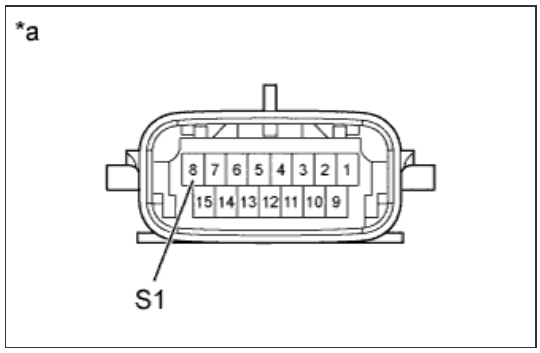
The shift solenoid valve S1 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S1	OFF	ON	ON	ON	ON	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S1)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
8 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

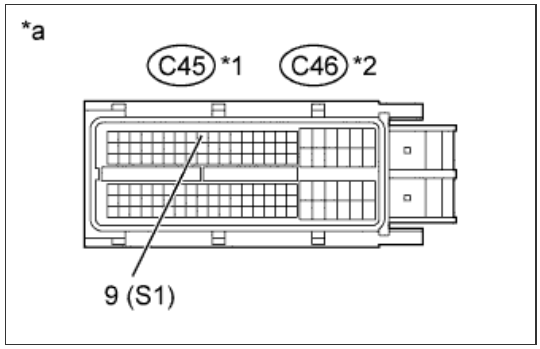
NG → Go to step 3

OK ↓

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-9 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-9 (S1) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ↓

REPLACE ECM (Click here)

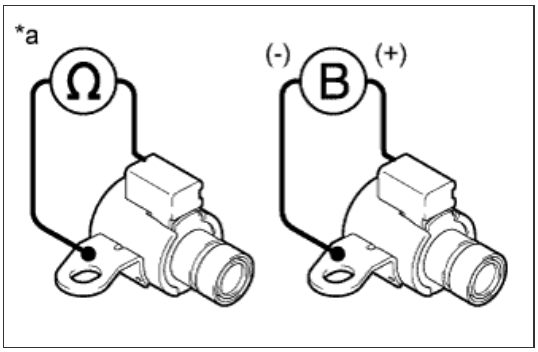
3.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S1)

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0712 Transmission Fluid Temperature Sensor "A" Circuit Low Input

DTC P0713 Transmission Fluid Temperature Sensor "A" Circuit High Input

for Preparation Click here

DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.
The ECM applies voltage to the temperature sensor through the ECM terminal THO1.
The sensor resistance changes with the transmission fluid temperature. As the temperature becomes higher, the sensor resistance decreases.
One terminal of the sensor is grounded so that the sensor resistance decreases and the voltage goes down as the temperature becomes higher.
The ECM calculates the fluid temperature based on the voltage signal.

DTC Code	DTC Detection Condition	Trouble Area
P0712	The No. 1 ATF temperature sensor resistance is below 79 Ω for 0.5 seconds or more (1 trip detection logic).	• Short in No. 1 ATF temperature sensor circuit • No. 1 transmission wire (No. 1 ATF temperature sensor) • ECM
P0713	ATF temperature sensor resistance is higher than 156 kΩ for 0.5 sec. or more and either condition is met (1 trip detection logic): (A) 15 min. or more have elapsed after the engine start when the engine coolant temperature or intake air temperature is -29.375°C (-20.875°F) or less. (B) 10 sec. or more have elapsed after the engine start when the engine coolant temperature and intake air temperature are higher than -29.375°C (-20.875°F).	• Open in No. 1 ATF temperature sensor circuit • No. 1 transmission wire (No. 1 ATF temperature sensor) • ECM

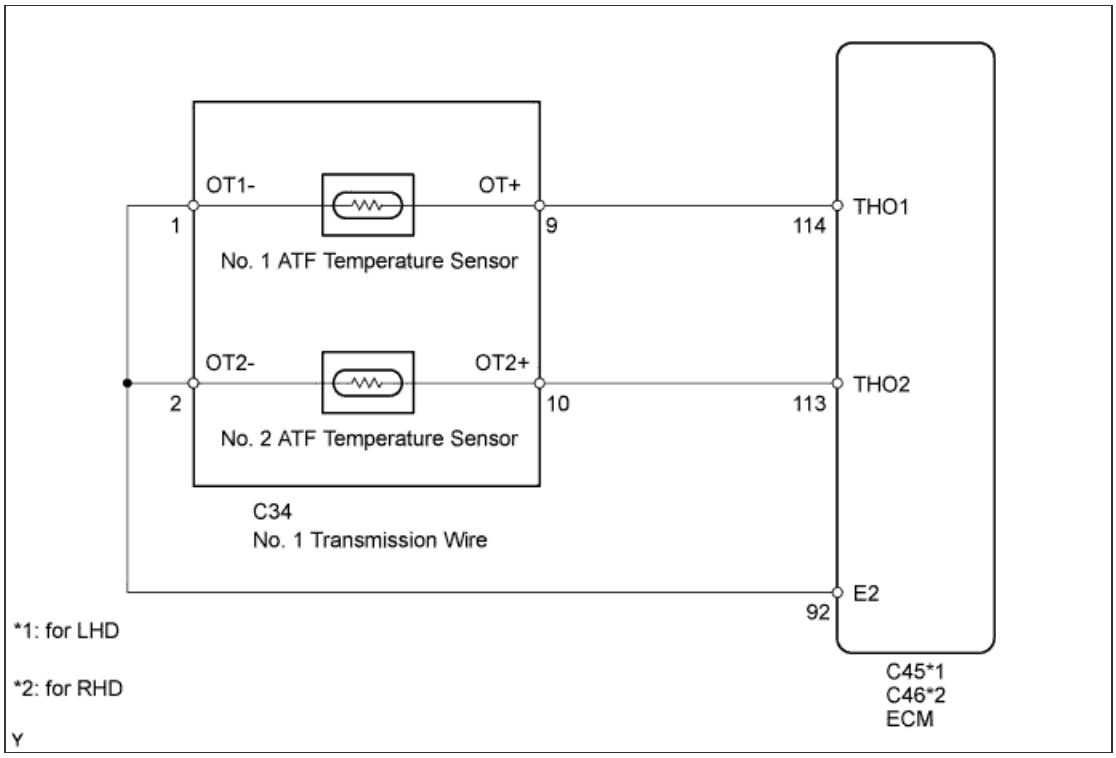
MONITOR DESCRIPTION

These DTCs indicate an open or short in the Automatic Transmission Fluid (ATF) temperature sensor circuit. The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is below 79 Ω*1 or higher than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM will turn on the MIL and store the DTC.

HINT:

- **The ATF temperature can be checked on the GTS display.**
- ***1: 150°C (302°F) or higher is indicated regardless of the actual ATF temperature.**
- ***2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.**

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the GTS to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the GTS, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 1	No. 1 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 1 ATF temperature sensor circuit is open or shorted.

HINT:

When DTC P0712 is stored and the GTS output is 150°C (302°F) or higher, there is a short circuit.

When DTC P0713 is stored and the GTS output is -40°C (-40°F), there is an open circuit.

Check the temperature displayed on the GTS in order to check if a malfunction exists.

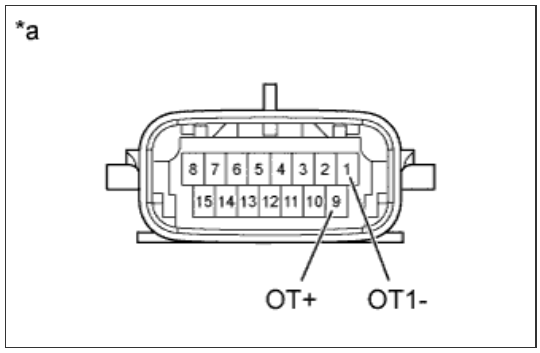
Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or higher	Short circuit

If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately stored (in 0.5 seconds). When P0713 is stored, P0711 cannot be stored. It is not necessary to inspect the circuit when P0711 is stored.

1.INSPECT NO. 1 TRANSMISSION WIRE (NO. 1 ATF TEMPERATURE SENSOR)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
1 (OT1-) - 9 (OT+)	Always	79 Ω to 156 kΩ
1 (OT1-) - Body ground	Always	10 kΩ or higher
9 (OT+) - Body ground	Always	10 kΩ or higher

HINT:

If the resistance is out of the specified range at any of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Resistance (Reference):

ATF Temperature	Specified Condition
10°C (50°F)	5 to 8 kΩ
25°C (77°F)	2.5 to 4.5 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

Text in Illustration

*a	Component without harness connected (No. 1 transmission wire)

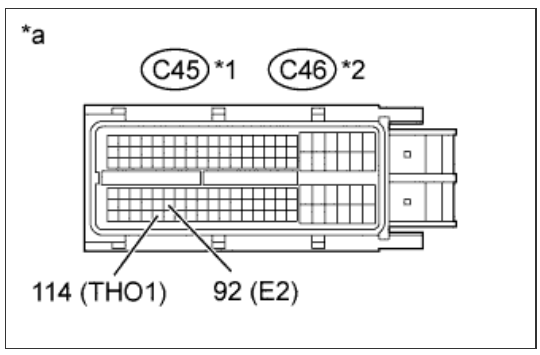
NG → **REPAIR OR REPLACE NO. 1 ATF TEMPERATURE SENSOR (NO. 1 TRANSMISSION WIRE) (Click here)**

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-114 (THO1) - C45-92 (E2)	Always	79 Ω to 156 kΩ

C45-114 (THO1) - Body ground	Always	10 kΩ or higher
C45-92 (E2) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-114 (THO1) - C46-92 (E2)	Always	79 Ω to 156 kΩ
C46-114 (THO1) - Body ground	Always	10 kΩ or higher
C46-92 (E2) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK → REPLACE ECM (Click here)

DTC P0976 Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)

DTC P0977 Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)

for Preparation Click here

DESCRIPTION

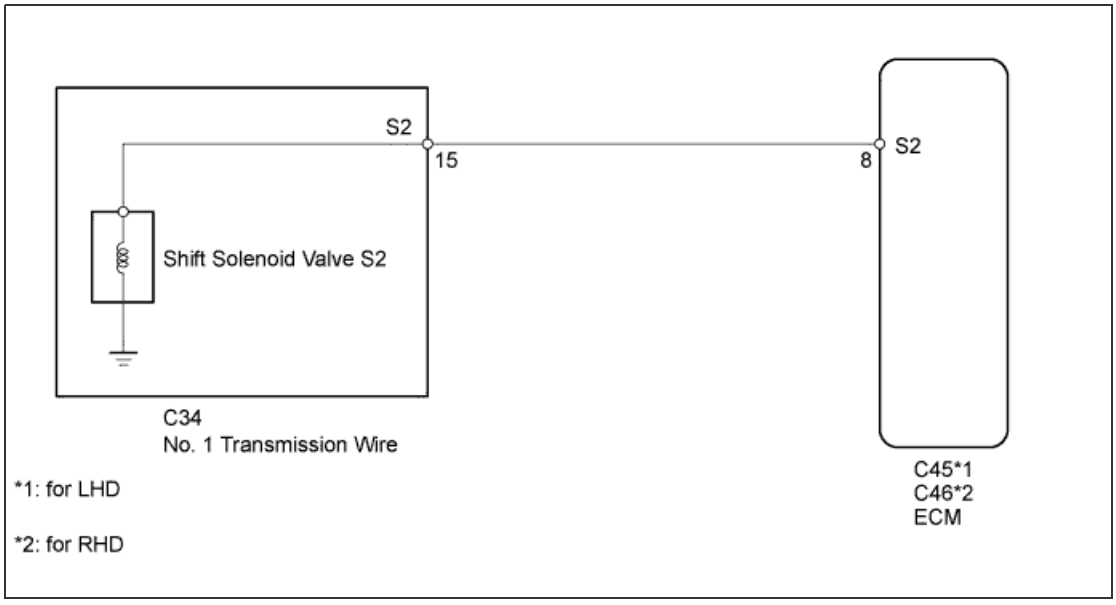
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0976	The ECM detects a short in the solenoid valve S2 circuit 2 times when the solenoid valve S2 is operated (1 trip detection logic).	• Short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM
P0977	The ECM detects an open in the solenoid valve S2 circuit 2 times when the solenoid valve S2 is not operated (1 trip detection logic).	• Open in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S2 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S2 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S2 circuit.
When the shift solenoid valve S2 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S2 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

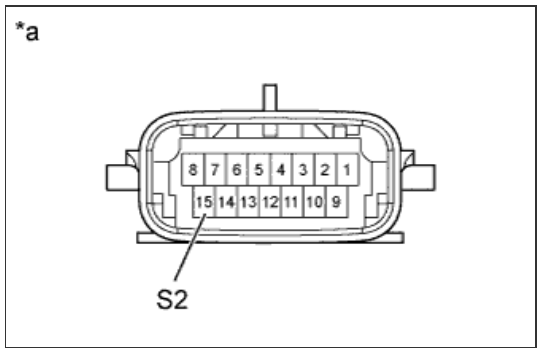
The shift solenoid valve S2 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S2	ON	ON	OFF	OFF	OFF	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S2)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
15 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

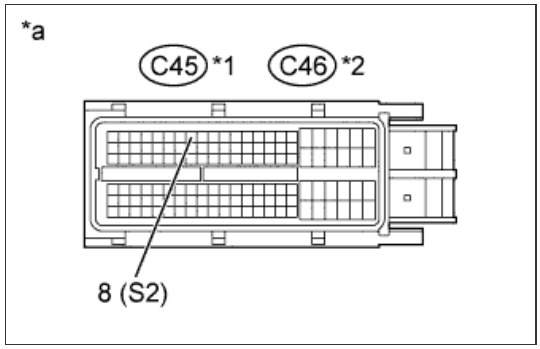
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-8 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-8 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

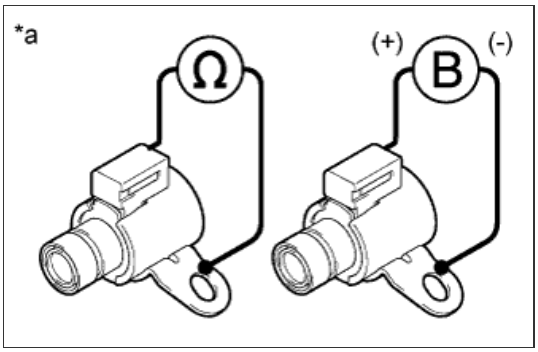
3.INSPECT SHIFT SOLENOID VALVE S2

a. Remove the shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S2)

NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0712 Transmission Fluid Temperature Sensor "A" Circuit Low Input

DTC P0713 Transmission Fluid Temperature Sensor "A" Circuit High Input

for Preparation Click here

DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.
The ECM applies voltage to the temperature sensor through the ECM terminal THO1.
The sensor resistance changes with the transmission fluid temperature. As the temperature becomes higher, the sensor resistance decreases.
One terminal of the sensor is grounded so that the sensor resistance decreases and the voltage goes down as the temperature becomes higher.
The ECM calculates the fluid temperature based on the voltage signal.

DTC Code	DTC Detection Condition	Trouble Area
P0712	The No. 1 ATF temperature sensor resistance is below 79 Ω for 0.5 seconds or more (1 trip detection logic).	• Short in No. 1 ATF temperature sensor circuit • No. 1 transmission wire (No. 1 ATF temperature sensor) • ECM
P0713	ATF temperature sensor resistance is higher than 156 kΩ for 0.5 sec. or more and either condition is met (1 trip detection logic): (A) 15 min. or more have elapsed after the engine start when the engine coolant temperature or intake air temperature is -29.375°C (-20.875°F) or less. (B) 10 sec. or more have elapsed after the engine start when the engine coolant temperature and intake air temperature are higher than -29.375°C (-20.875°F).	• Open in No. 1 ATF temperature sensor circuit • No. 1 transmission wire (No. 1 ATF temperature sensor) • ECM

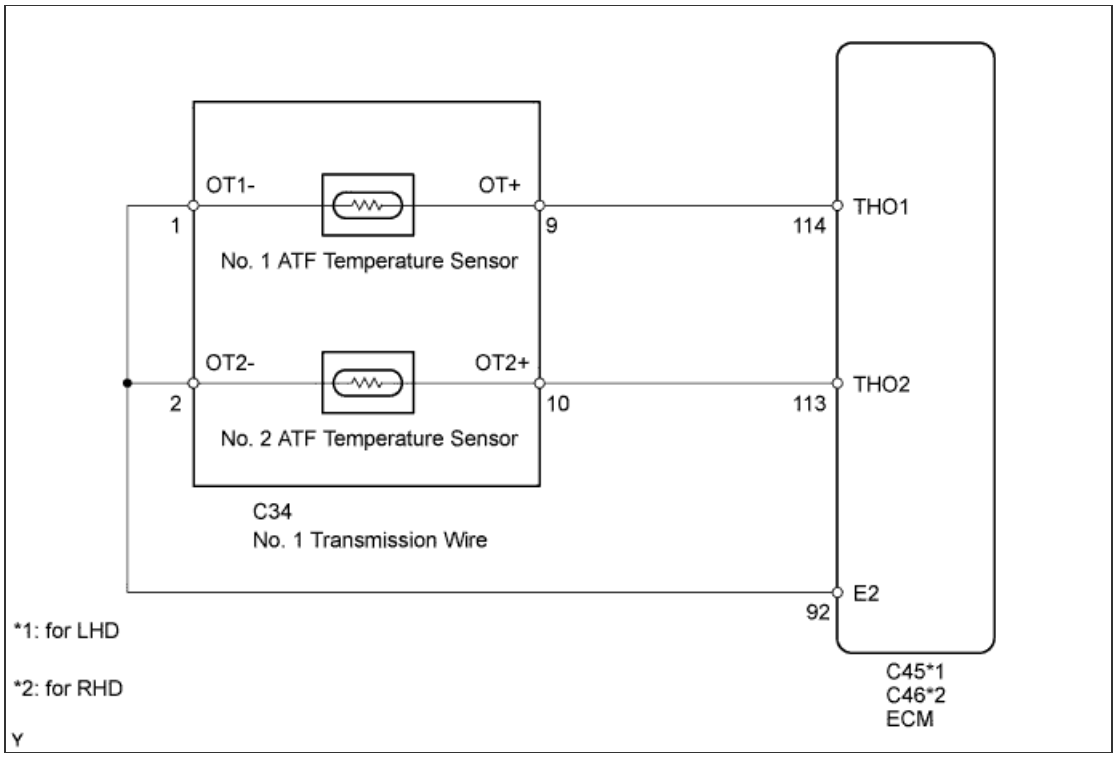
MONITOR DESCRIPTION

These DTCs indicate an open or short in the Automatic Transmission Fluid (ATF) temperature sensor circuit. The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is below 79 Ω*1 or higher than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM will turn on the MIL and store the DTC.

HINT:

- **The ATF temperature can be checked on the GTS display.**
- ***1: 150°C (302°F) or higher is indicated regardless of the actual ATF temperature.**
- ***2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.**

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the GTS to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the GTS, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 1	No. 1 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 1 ATF temperature sensor circuit is open or shorted.

HINT:

When DTC P0712 is stored and the GTS output is 150°C (302°F) or higher, there is a short circuit.

When DTC P0713 is stored and the GTS output is -40°C (-40°F), there is an open circuit.

Check the temperature displayed on the GTS in order to check if a malfunction exists.

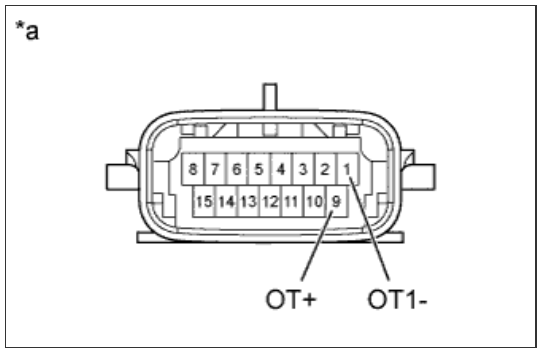
Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or higher	Short circuit

If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately stored (in 0.5 seconds). When P0713 is stored, P0711 cannot be stored. It is not necessary to inspect the circuit when P0711 is stored.

1.INSPECT NO. 1 TRANSMISSION WIRE (NO. 1 ATF TEMPERATURE SENSOR)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
1 (OT1-) - 9 (OT+)	Always	79 Ω to 156 kΩ
1 (OT1-) - Body ground	Always	10 kΩ or higher
9 (OT+) - Body ground	Always	10 kΩ or higher

HINT:

If the resistance is out of the specified range at any of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Resistance (Reference):

ATF Temperature	Specified Condition
10°C (50°F)	5 to 8 kΩ
25°C (77°F)	2.5 to 4.5 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

Text in Illustration

*a	Component without harness connected (No. 1 transmission wire)

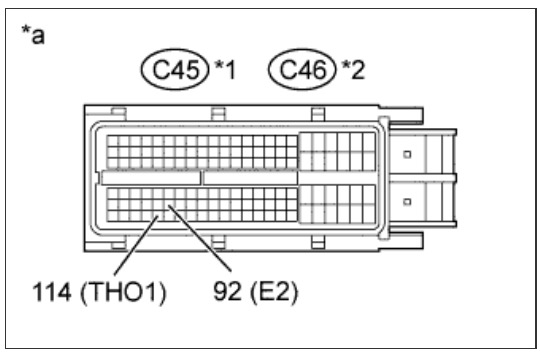
NG → **REPAIR OR REPLACE NO. 1 ATF TEMPERATURE SENSOR (NO. 1 TRANSMISSION WIRE) (Click here)**

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-114 (THO1) - C45-92 (E2)	Always	79 Ω to 156 kΩ

C45-114 (THO1) - Body ground	Always	10 kΩ or higher
C45-92 (E2) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-114 (THO1) - C46-92 (E2)	Always	79 Ω to 156 kΩ
C46-114 (THO1) - Body ground	Always	10 kΩ or higher
C46-92 (E2) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK → REPLACE ECM (Click here)

DTC P0976 Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)

DTC P0977 Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)

for Preparation Click here

DESCRIPTION

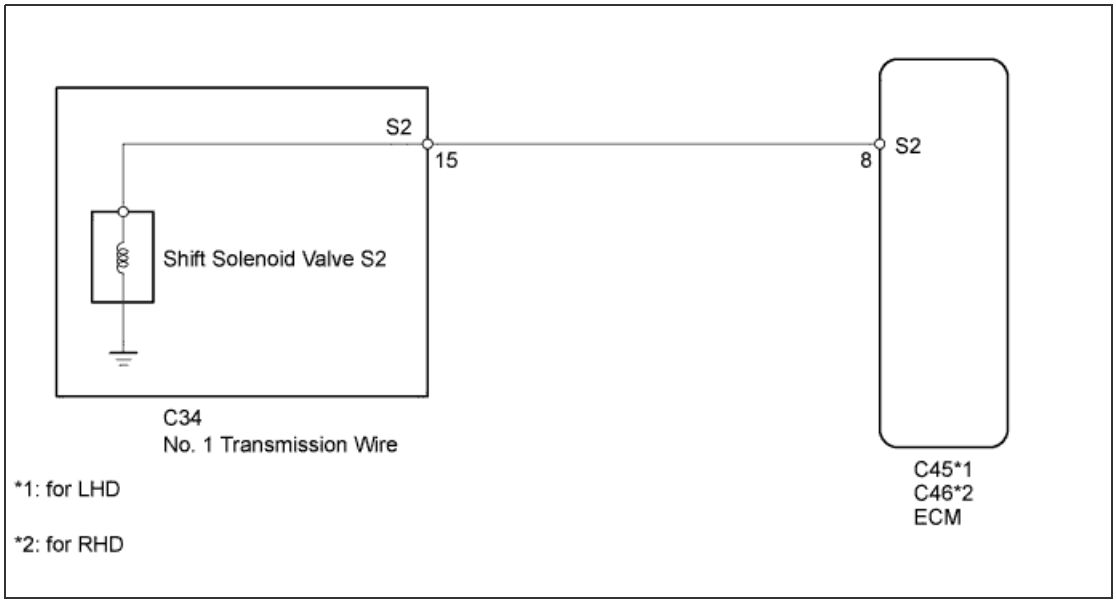
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0976	The ECM detects a short in the solenoid valve S2 circuit 2 times when the solenoid valve S2 is operated (1 trip detection logic).	• Short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM
P0977	The ECM detects an open in the solenoid valve S2 circuit 2 times when the solenoid valve S2 is not operated (1 trip detection logic).	• Open in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S2 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S2 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S2 circuit.
When the shift solenoid valve S2 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S2 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

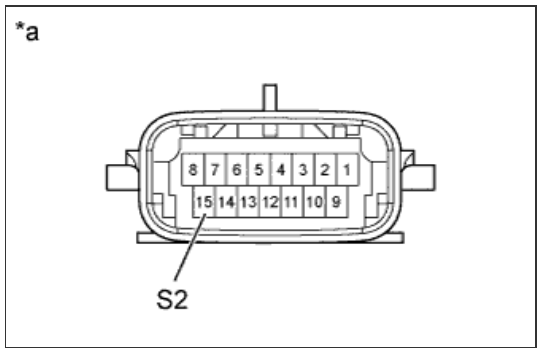
The shift solenoid valve S2 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S2	ON	ON	OFF	OFF	OFF	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S2)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
15 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

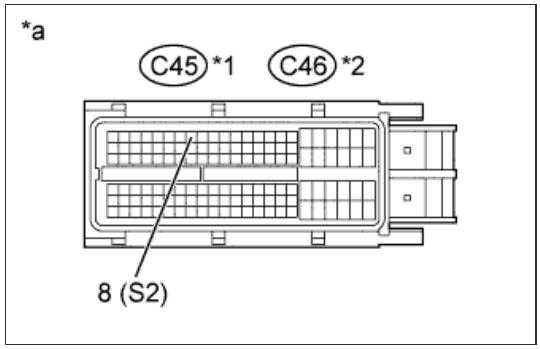
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-8 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-8 (S2) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

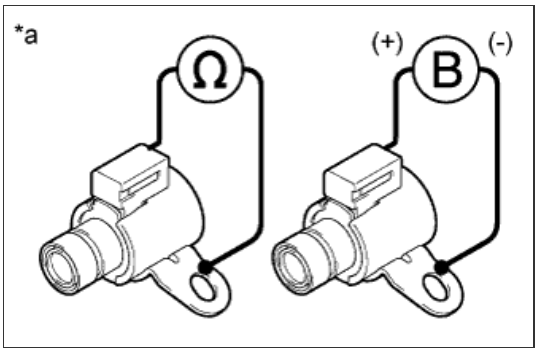
3.INSPECT SHIFT SOLENOID VALVE S2

a. Remove the shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S2)

NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0717 Turbine Speed Sensor Circuit No Signal

for Preparation Click here

DESCRIPTION

This sensor detects the rotation speed of the turbine which shows the input revolution of the transmission. By comparing the input turbine speed signal NT with the counter gear speed sensor signal SP2, the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure according to various conditions. As a result, the gears shift smoothly.

DTC Code	DTC Detection Condition	Trouble Area
P0717	All the conditions below are detected for 5 sec. or more (1 trip detection logic). (a) Gear change is not performed. (b) The gear position is 4th, 5th or 6th. (c) The T/M input shaft rpm is 300 rpm or less. (d) The T/M output shaft rpm is 1000 rpm or more. (e) The park/neutral position switch: • The NSW input signal is OFF. • The R input signal is OFF. (f) The shift solenoid valves and park/neutral position switch are operating normally.	• Open or short in speed sensor NT circuit • Speed sensor NT • ECM • Automatic transmission (clutch, brake or gear, etc.)

Reference: Inspect using an oscilloscope.
Check the waveform of the ECM connector.

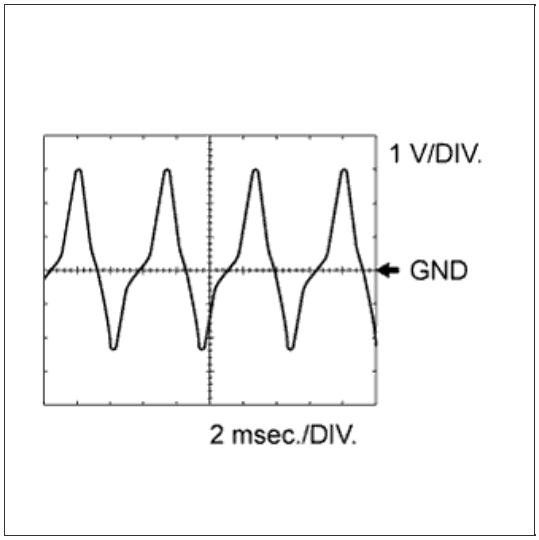
Standard:

for LHD

Terminal No. (Symbol)	Tool Setting	Condition	Specified Condition
C45-76 (NT+) - C45-75 (NT-)	1 V/DIV., 2 msec./DIV.	Engine idling (shift lever in P or N)	Refer to illustration

for RHD

Terminal No. (Symbol)	Tool Setting	Condition	Specified Condition
C46-76 (NT+) - C46-75 (NT-)	1 V/DIV., 2 msec./DIV.	Engine idling (shift lever in P or N)	Refer to illustration



MONITOR DESCRIPTION

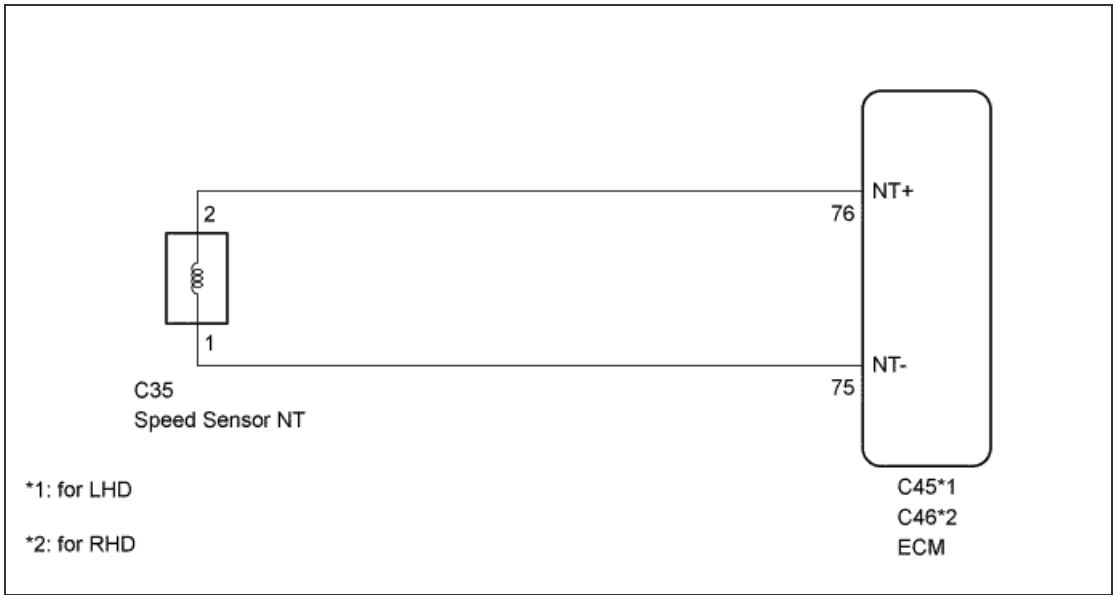
This DTC indicates that a pulse is not output from the speed sensor NT (turbine (input) speed sensor) or is output only a little. The NT terminal of the ECM detects the pulse signal from the speed sensor NT (input RPM). The ECM outputs a gear shift signal comparing the input speed sensor NT with the output speed sensor SP2.
While the vehicle is operating in the 4th, 5th or 6th gear position with the shift lever in D, if the input shaft revolution is less than 300 rpm*1 although the output shaft revolution is 1000 rpm or more*2, the ECM detects the trouble, illuminates the MIL and stores the DTC.

HINT:

- ***1: Pulse is not output or is irregularly output.**

- ***2: The vehicle speed is approximately 50 km/h (31 mph) or more.**

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the GTS to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the GTS, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
SPD (NT)	Input shaft speed/ Min.: 0 rpm Max.: 12750 rpm	Lock-up: • ON (after warming up engine): Input turbine speed (NT) equal to engine speed • OFF (idling with shift lever in N): Input turbine speed (NT) nearly equal to engine speed	The data is displayed in increments of 50 rpm.

HINT:

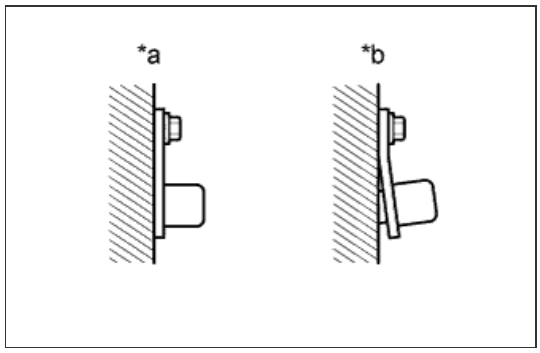
- **SPD (NT) is always 0 while driving:**
  Open or short in the sensor or circuit.
- **SPD (NT) is always more than 0 and less than 300 rpm while driving the vehicle at 50 km/h (31 mph) or more:**
  Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

1.INSPECT SPEED SENSOR NT INSTALLATION

a. Check the speed sensor NT installation.

OK:

The installation bolt is tightened properly and there is no clearance between the sensor and transmission case.



Text in Illustration

*a	CORRECT
*b	INCORRECT

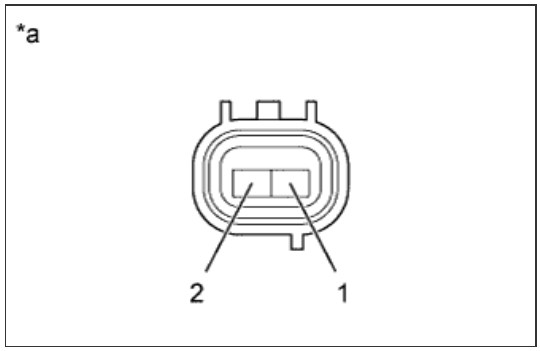
NG → SECURELY INSTALL OR REPLACE SPEED SENSOR NT (Click here)

OK ↓

2.INSPECT SPEED SENSOR NT

a. Disconnect the speed sensor connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	560 to 680 Ω

Text in Illustration

*a	Component without harness connected (Speed Sensor NT)

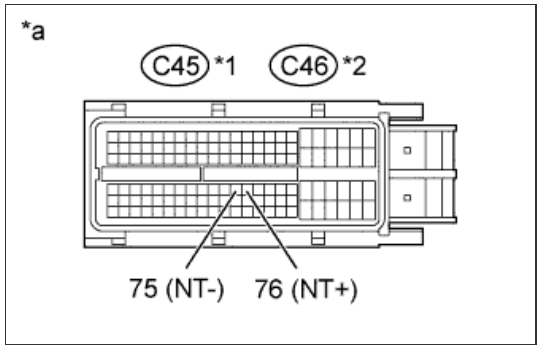
NG → REPLACE SPEED SENSOR NT (Click here)

OK ↓

3.CHECK HARNESS AND CONNECTOR (SPEED SENSOR NT - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-76 (NT+) - C45-75 (NT-)	20°C (68°F)	560 to 680 Ω
C45-76 (NT+) - Body	Always	10 kΩ or higher

ground		
C45-75 (NT-) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-76 (NT+) - C46-75 (NT-)	20°C (68°F)	560 to 680 Ω
C46-76 (NT+) - Body ground	Always	10 kΩ or higher
C46-75 (NT-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0979 Shift Solenoid "C" Control Circuit Low (Shift Solenoid Valve S3)

DTC P0980 Shift Solenoid "C" Control Circuit High (Shift Solenoid Valve S3)

for Preparation Click here

DESCRIPTION

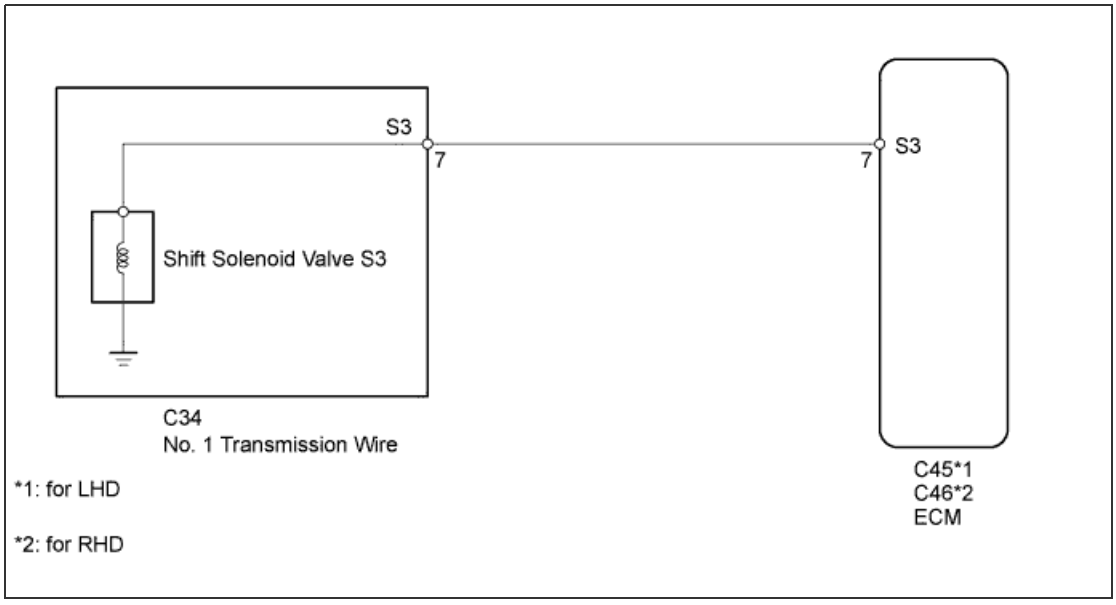
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0979	The ECM detects a short in the solenoid valve S3 circuit 2 times when the solenoid valve S3 is operated (1 trip detection logic).	• Short in shift solenoid valve S3 circuit • Shift solenoid valve S3 • ECM
P0980	The ECM detects an open in the solenoid valve S3 circuit 2 times when the solenoid valve S3 is not operated (1 trip detection logic).	• Open in shift solenoid valve S3 circuit • Shift solenoid valve S3 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S3 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S3 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S3 circuit.
When the shift solenoid valve S3 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S3 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

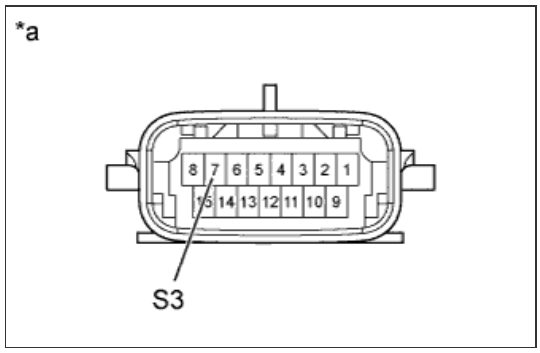
The shift solenoid valve S3 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S3	ON	ON	ON	OFF	OFF	OFF

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S3)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
7 (S3) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

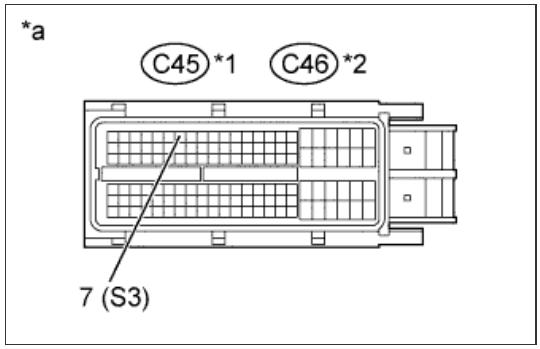
NG → Go to step 3

OK ↓

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-7 (S3) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-7 (S3) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ↓

REPLACE ECM (Click here)

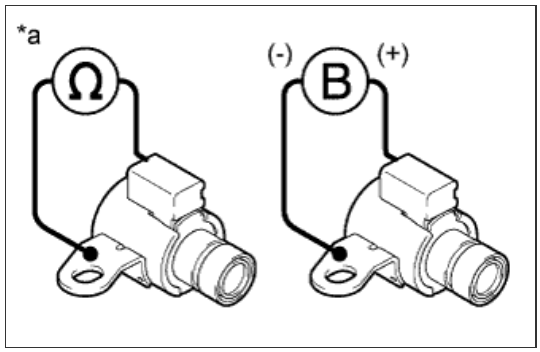
3.INSPECT SHIFT SOLENOID VALVE S3

a. Remove the shift solenoid valve S3.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S3 connector • Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S3)

NG → REPLACE SHIFT SOLENOID VALVE S3 (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0722 Output Speed Sensor Circuit No Signal

for Preparation Click here

DESCRIPTION

The speed sensor SP2 detects the rotation speed of the transmission output shaft and sends signals to the ECM. The ECM determines the vehicle speed based on these signals. An AC voltage is generated in the speed sensor SP2 coil as the parking gear mounted on the rear planetary gear assembly rotates, and this voltage is sent to the ECM. The parking gear on the rear planetary gear is used as the timing rotor for this sensor.
The gear shift point and lock-up timing are controlled by the ECM based on the signals from this vehicle speed sensor and the throttle position sensor signal.

DTC Code	DTC Detection Condition	Trouble Area
P0722	All the conditions below are detected 500 times or more continuously (2 trip detection logic). (a) No signal from the speed sensor SP2 is input to the ECM while 4 pulses of the No. 1 vehicle speed sensor signal are sent. (b) The vehicle speed is 9 km/h (6 mph) or more for at least 5 sec. (c) The park/neutral position switch is off.	• Open or short in speed sensor SP2 circuit • Speed sensor SP2 • ECM • Automatic transmission (clutch, brake or gear, etc.)

Reference: Inspect using an oscilloscope.
Check the waveform of the ECM connector.

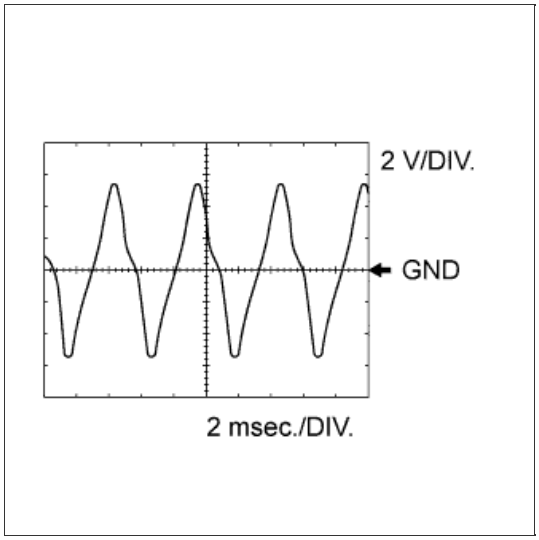
Standard:

for LHD

Terminal No. (Symbol)	Tool Setting	Condition	Specified Condition
C45-101 (SP2+) - C45-100 (SP2-)	2 V/DIV., 2 msec./DIV	Vehicle speed 20 km/h (12 mph)	Refer to illustration

for RHD

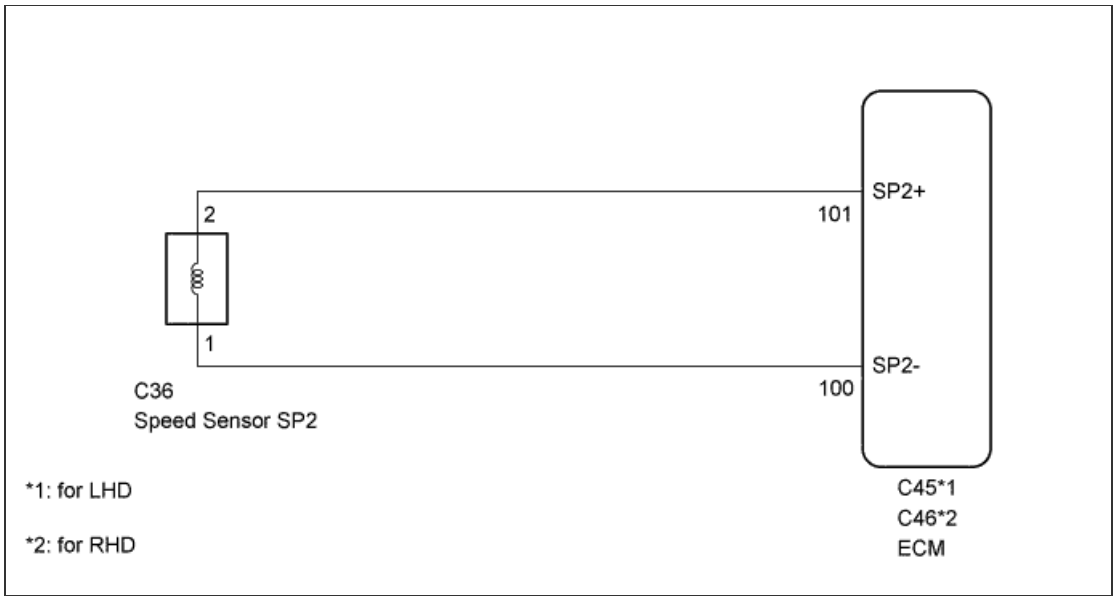
Terminal No. (Symbol)	Tool Setting	Condition	Specified Condition
C46-101 (SP2+) - C46-100 (SP2-)	2 V/DIV., 2 msec./DIV	Vehicle speed 20 km/h (12 mph)	Refer to illustration



MONITOR DESCRIPTION

The output speed sensor SP2 monitors the output shaft speed. The ECM controls the gear shift point and the lock up timing based on the signals from the output speed sensor SP2 and throttle position sensor.
If the ECM detects no signal from the output speed sensor SP2 even while the vehicle is moving, it will conclude that there is a malfunction of the output speed sensor SP2. The ECM will illuminate the MIL and store a DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

DATA LIST

HINT:

Using the GTS to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the GTS, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
SPD (SP2)	Output shaft speed/ Min.: 0 km/h (0 mph) Max.: 255 km/h (158 mph)	Vehicle stopped: 0 km/h (0 mph) (output shaft speed equal to vehicle speed)	-

HINT:

- **SPD (SP2) is always 0 while driving:**
  Open or short in the sensor or circuit.
- **The SPD (SP2) value displayed on the GTS is much lower than the actual vehicle speed:**
  Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

1.INSPECT SPEED SENSOR SP2 INSTALLATION

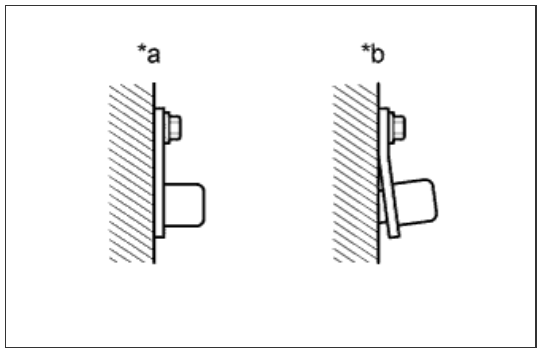
a. Check the speed sensor SP2 installation.

OK:

The installation bolt is tightened properly and there is no clearance between the sensor and transmission case.

Text in Illustration

*a	CORRECT
*b	INCORRECT



NG → SECURELY INSTALL OR REPLACE SPEED SENSOR SP2 (Click here)

OK →

2.INSPECT SPEED SENSOR SP2

a. Disconnect the speed sensor connector.

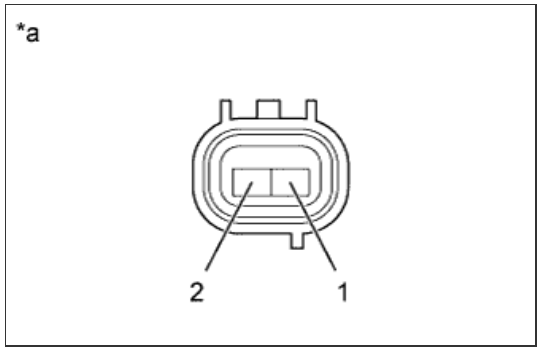
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	560 to 680 Ω

Text in Illustration

*a	Component without harness connected (Speed Sensor SP2)



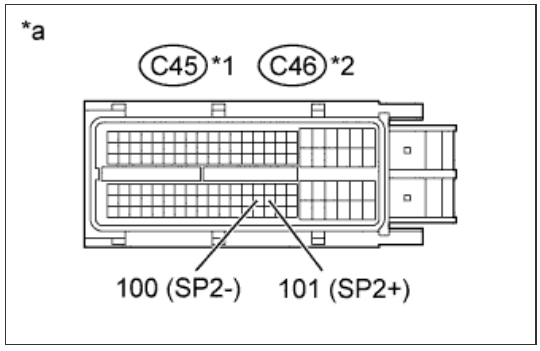
NG → REPLACE SPEED SENSOR SP2 (Click here)

OK →

3.CHECK HARNESS AND CONNECTOR (SPEED SENSOR SP2 - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-101 (SP2+) - C45-100 (SP2-)	20°C (68°F)	560 to 680 Ω
C45-101 (SP2+) - Body ground	Always	10 kΩ or higher
C45-100 (SP2-) - Body	Always	10 kΩ or higher

ground		

for RHD

Tester Connection	Condition	Specified Condition
C46-101 (SP2+) - C46-100 (SP2-)	20°C (68°F)	560 to 680 Ω
C46-101 (SP2+) - Body ground	Always	10 kΩ or higher
C46-100 (SP2-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0979 Shift Solenoid "C" Control Circuit Low (Shift Solenoid Valve S3)

DTC P0980 Shift Solenoid "C" Control Circuit High (Shift Solenoid Valve S3)

for Preparation Click here

DESCRIPTION

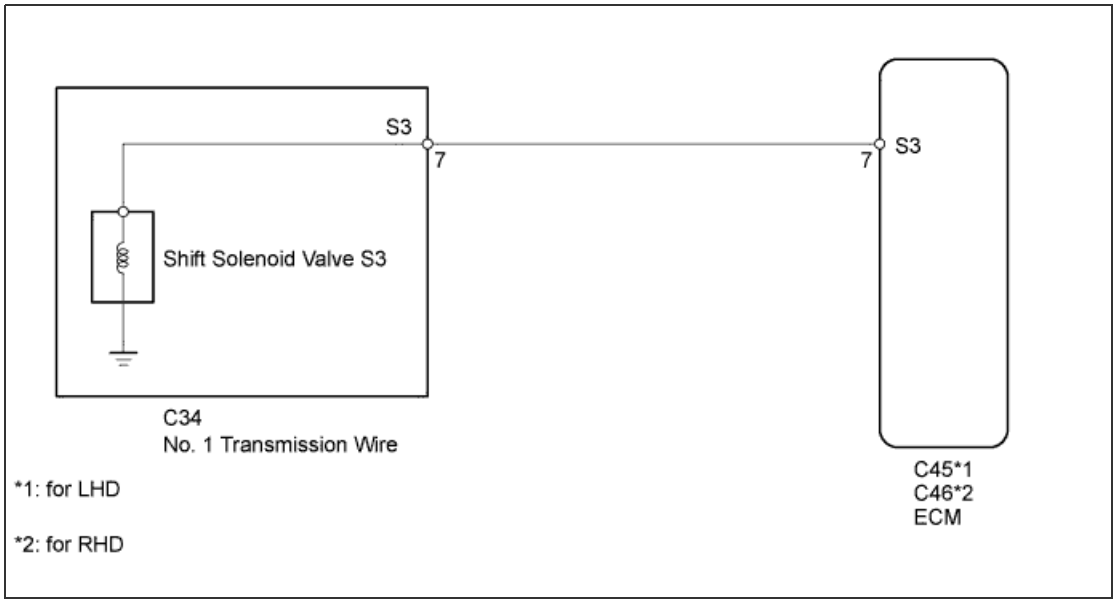
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0979	The ECM detects a short in the solenoid valve S3 circuit 2 times when the solenoid valve S3 is operated (1 trip detection logic).	• Short in shift solenoid valve S3 circuit • Shift solenoid valve S3 • ECM
P0980	The ECM detects an open in the solenoid valve S3 circuit 2 times when the solenoid valve S3 is not operated (1 trip detection logic).	• Open in shift solenoid valve S3 circuit • Shift solenoid valve S3 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S3 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S3 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S3 circuit.
When the shift solenoid valve S3 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S3 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

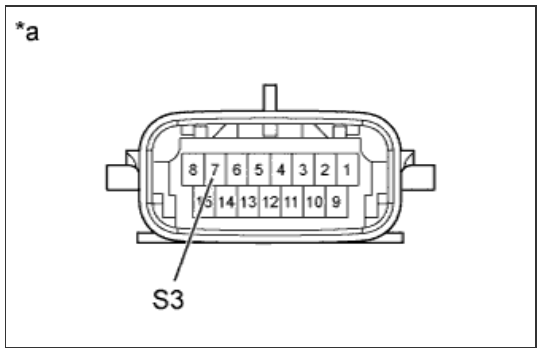
The shift solenoid valve S3 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S3	ON	ON	ON	OFF	OFF	OFF

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S3)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
7 (S3) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

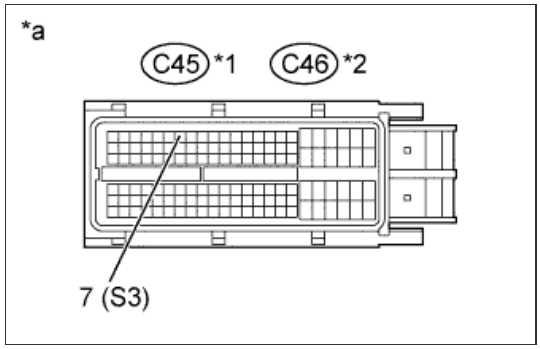
NG → Go to step 3

OK ↓

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-7 (S3) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-7 (S3) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ↓

REPLACE ECM (Click here)

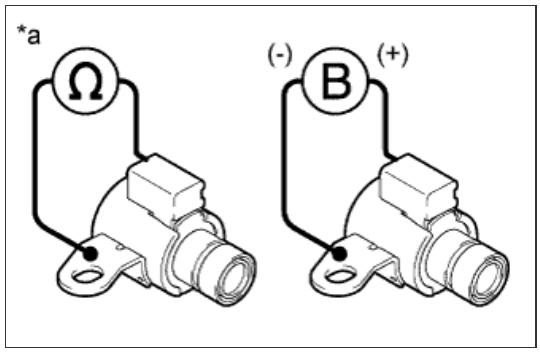
3.INSPECT SHIFT SOLENOID VALVE S3

a. Remove the shift solenoid valve S3.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S3 connector • Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S3)

NG → REPLACE SHIFT SOLENOID VALVE S3 (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0729 Gear 6 Incorrect Ratio

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output speed sensor SP2 and input speed sensor NT to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0729	A 6th gear shift malfunction: The ECM determines there is a malfunction when both of the following conditions are met (2 trip detection logic). (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is also shifted to 5th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 4th.	• Valve body is blocked up or stuck (sequence valve) • Shift solenoid valve SLT remains open or closed • Automatic transmission (clutch, brake or gear, etc.)

HINT:

- **Gear positions in the event of a solenoid valve mechanical problem:**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Actual gear position under malfunction	1st	2nd	3rd	4th	5th	4th

- **Gear position during fail-safe operation:**
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
Actual gear position under fail-safe mode	1st	2nd	3rd	3rd	3rd	3rd

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF" and switching oil pressure to the valves in the valve body. The DTC indicates that the sequence valve is locked in the direction the spring stretches and that shifting to the 6th gear is impossible.

INSPECTION PROCEDURE

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0729)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
Only P0729 is output	A
P0729 and other DTCs are output	B

HINT:

If any other codes besides P0729 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING GTS (RUNNING TEST)

CAUTION:

This test should always be performed with at least 2 people.

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Perform the test with the A/C turned off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Connect the GTS to the DLC3.

b. Clear the DTC (Click here).

c. Warm up the engine.

d. Enter the following menus: Powertrain / Engine and ECT / Active Test.

e. According to the display on the GTS, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the GTS.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the GTS.**
- **Gear positions in the event of a solenoid valve mechanical problem:**

Tester gear shift command	1st	2nd	3rd	4th	5th	6th
Actual gear position under malfunction	1st	2nd	3rd	4th	5th	4th

OK:

Gear position changes in accordance with the GTS command.

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)**

OK

3.PERFORM ACTIVE TEST USING GTS (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

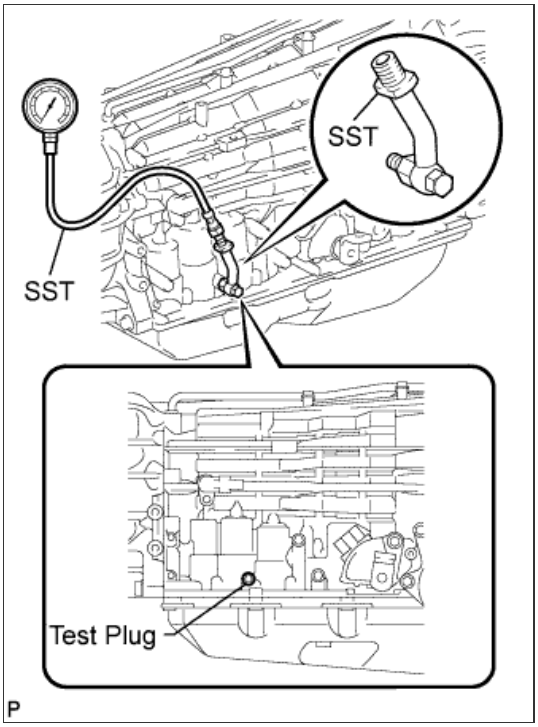
HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST

09992-00095 (09992-00231, 09992-00271)



b. Connect the GTS to the DLC3.

c. Start the engine and warm it up.

d. Measure the line pressure with SST.

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

h. Measure the line pressure.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (**Click here**)

OK

4.CLEAR DTC AND PERFORM RUNNING TEST

a. Clear the DTC (Click here).

b. Check for DTC again after conducting the Monitor Drive Pattern (Click here).

OK:

No DTC output

NG → REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (**Click here**)


OK
END

DTC P0982 Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)

DTC P0983 Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)

for Preparation Click here

DESCRIPTION

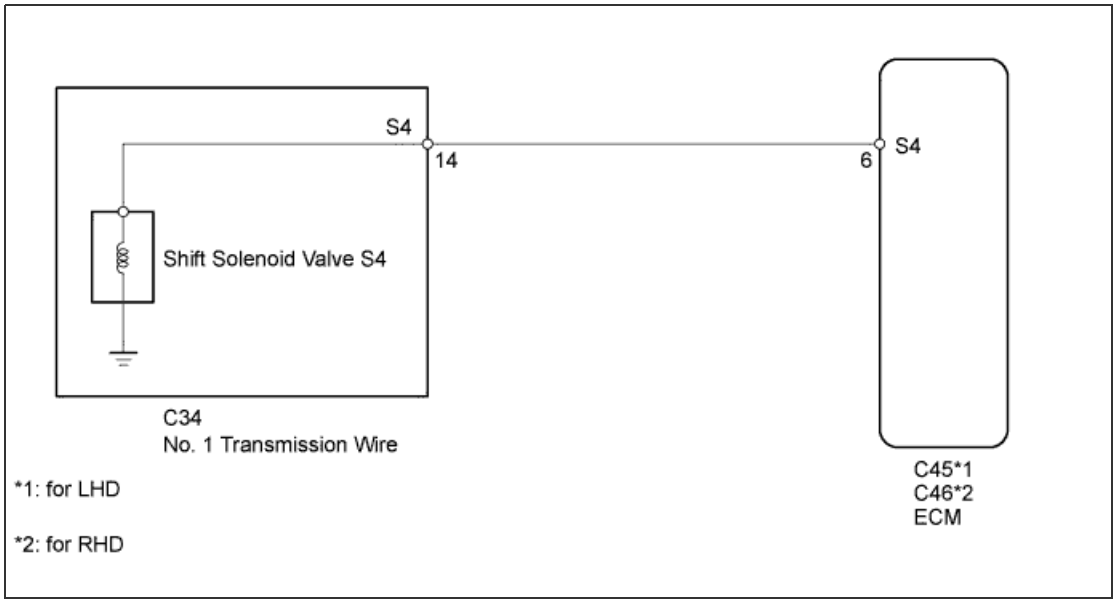
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0982	The ECM detects a short in the solenoid valve S4 circuit 2 times when the solenoid valve S4 is operated (1 trip detection logic).	• Short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM
P0983	The ECM detects an open in the solenoid valve S4 circuit 2 times when the solenoid valve S4 is not operated (1 trip detection logic).	• Open in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S4 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S4 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S4 circuit.
When the shift solenoid valve S4 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S4 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

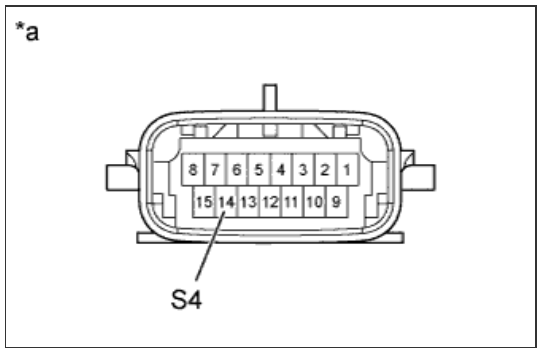
The shift solenoid valve S4 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S4	OFF	OFF	OFF	OFF	ON	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S4)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
14 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

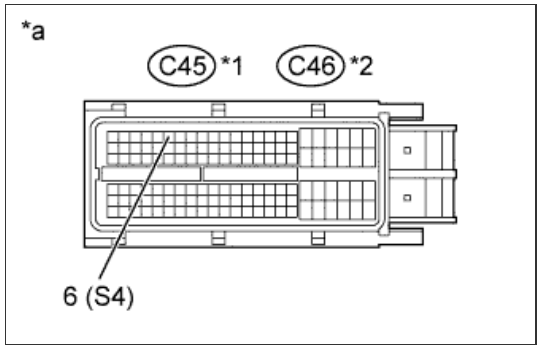
NG → Go to step 3

OK ↓

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-6 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-6 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ↓

REPLACE ECM (Click here)

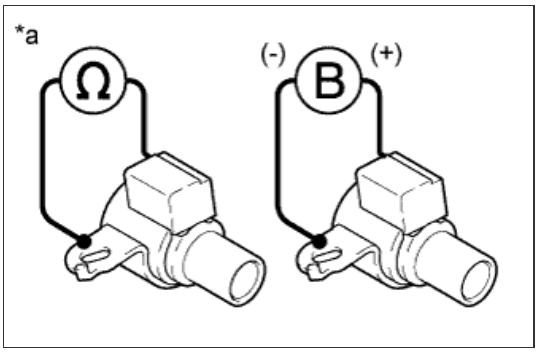
3.INSPECT SHIFT SOLENOID VALVE S4

a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S4)

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0748 Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)

for Preparation Click here

DESCRIPTION

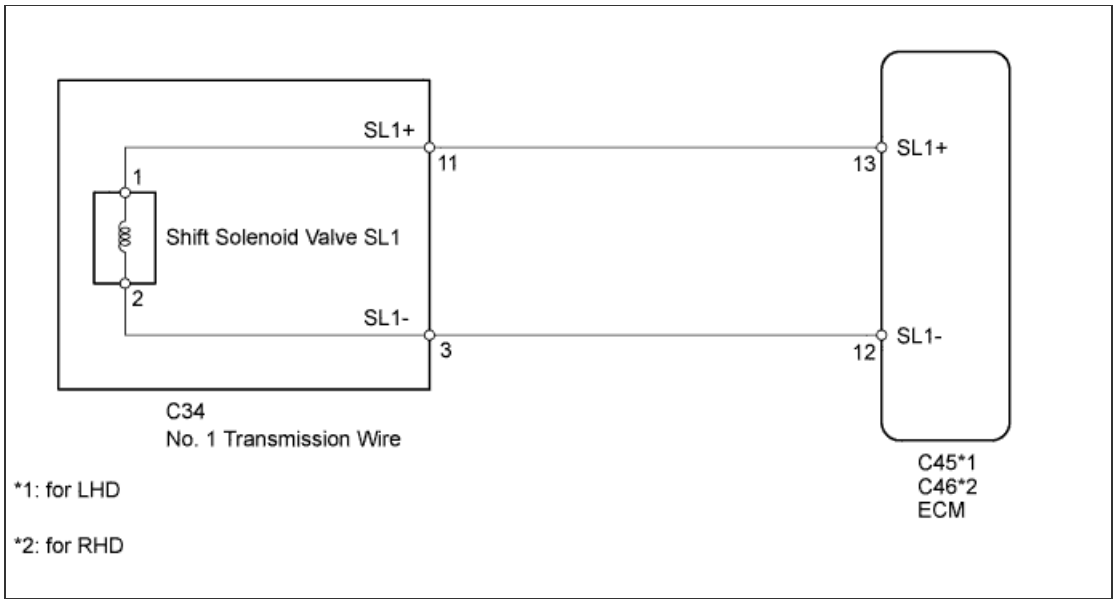
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0748	The ECM checks for an open or short in the shift solenoid valve SL1 circuit while driving and shifting between 4th and 5th gear (1 trip detection logic). The output signal duty equals 100%. **HINT:** The SL1 output signal duty is less than 100% under normal conditions.	• Open or short in shift solenoid valve SL1 circuit • Shift solenoid valve SL1 • ECM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL1 circuit. The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. Also, the ECM performs the fail-safe function and turns the other normal shift solenoid valves ON/OFF. In case of an open or short circuit, the ECM stops sending current to the open or short circuited solenoid.
While driving and shifting between 4th and 5th gears, if the ECM detects an open or short in the shift solenoid valve SL1 circuit, the ECM determines that there is a malfunction (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

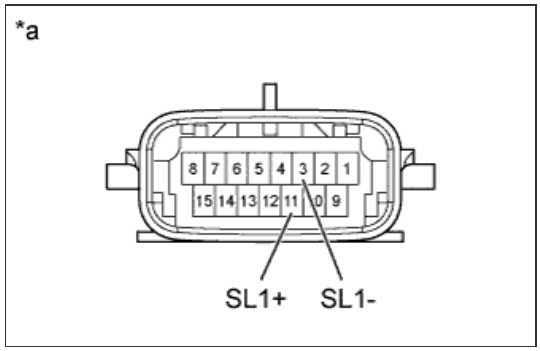
The shift solenoid valve SL1 turns ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve SL1	OFF	OFF	OFF	OFF	ON	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SL1)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
11 (SL1+) - 3 (SL1-)	20°C (68°F)	5.0 to 5.6 Ω
11 (SL1+) - Body ground	Always	10 kΩ or higher
3 (SL1-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

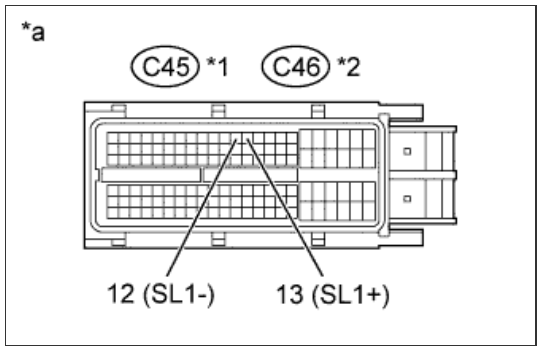
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-13 (SL1+) - C45-12 (SL1-)	20°C (68°F)	5.0 to 5.6 Ω
C45-13 (SL1+) - Body ground	Always	10 kΩ or higher
C45-12 (SL1-) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-13 (SL1+) - C46-12 (SL1-)	20°C (68°F)	5.0 to 5.6 Ω
C46-13 (SL1+) - Body ground	Always	10 kΩ or higher
C46-12 (SL1-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SL1

a. Remove the shift solenoid valve SL1.

b. Measure the resistance according to the value(s) in the table below.

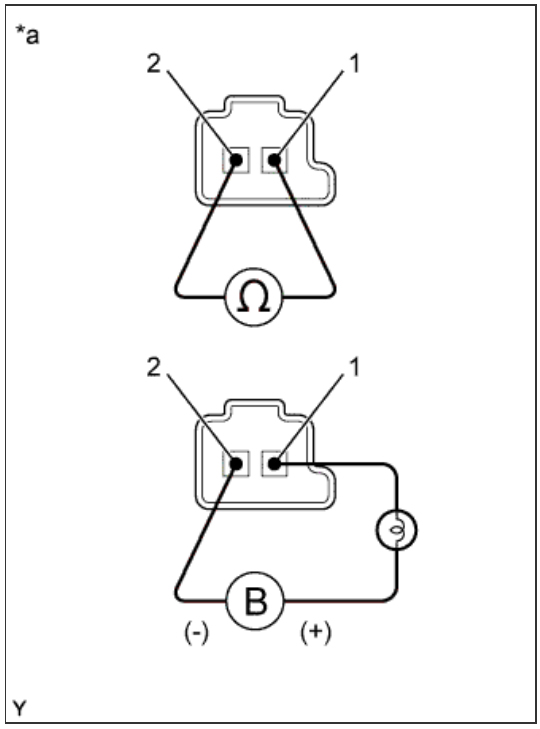
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SL1)

NG → REPLACE SHIFT SOLENOID VALVE SL1 (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0982 Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)

DTC P0983 Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)

for Preparation Click here

DESCRIPTION

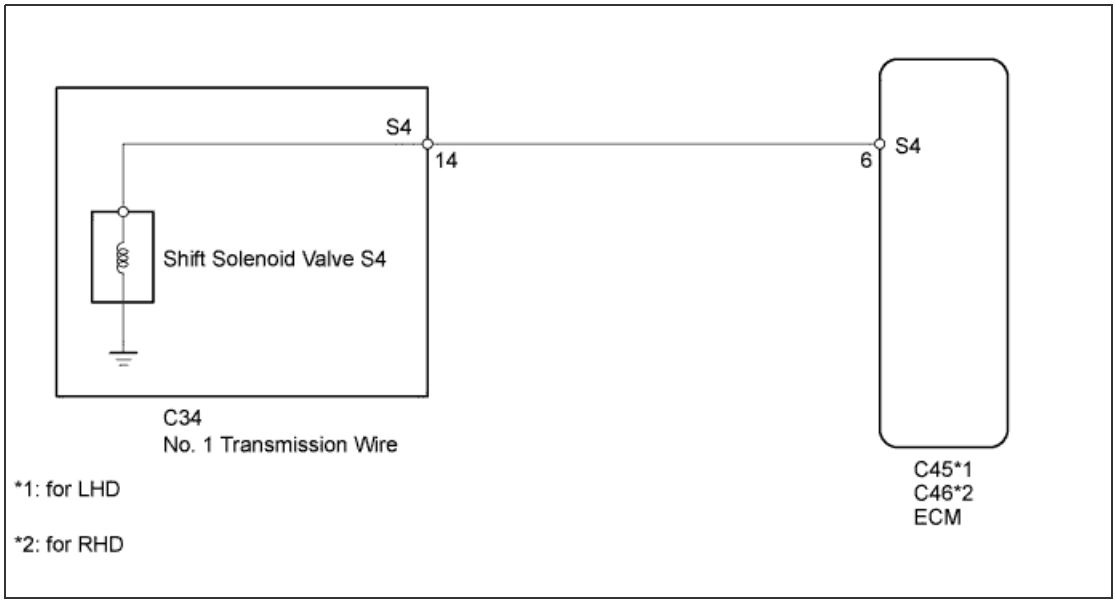
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0982	The ECM detects a short in the solenoid valve S4 circuit 2 times when the solenoid valve S4 is operated (1 trip detection logic).	• Short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM
P0983	The ECM detects an open in the solenoid valve S4 circuit 2 times when the solenoid valve S4 is not operated (1 trip detection logic).	• Open in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S4 circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S4 is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve S4 circuit.
When the shift solenoid valve S4 is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve S4 circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

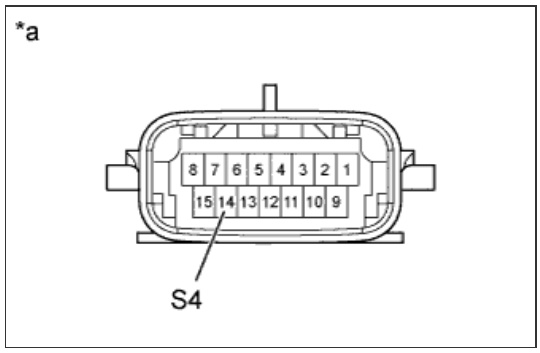
The shift solenoid valve S4 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S4	OFF	OFF	OFF	OFF	ON	ON

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE S4)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
14 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

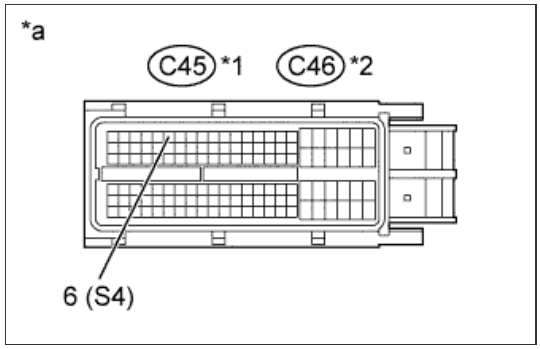
NG → Go to step 3

OK ↓

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-6 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-6 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK ↓

REPLACE ECM (Click here)

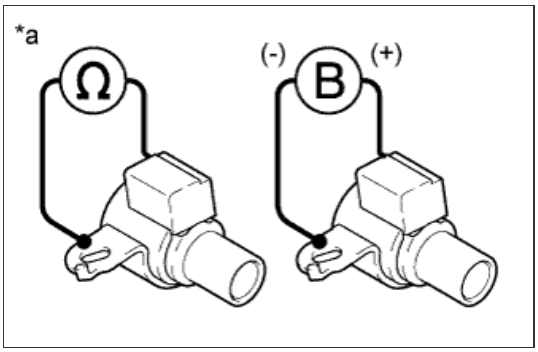
3.INSPECT SHIFT SOLENOID VALVE S4

a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S4)

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0751 Shift Solenoid "A" Performance (Shift Solenoid Valve S1)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems with the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0751	A shift solenoid valve S1 stuck ON malfunction*1: The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic). (a) When the ECM directs the transmission to switch to 1st gear, the actual gear is shifted to 2nd. (b) When the ECM directs the transmission to switch to 5th gear, the actual gear is also shifted to 5th.	• Shift solenoid valve S1 remains open • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)
P0751	A shift solenoid valve S1 stuck OFF malfunction*2: The ECM determines there is a malfunction when conditions (a) and (b), or (a) and (c) are met (2 trip detection logic). (a) When the ECM directs the transmission to switch to 2nd gear, the actual gear is shifted to 1st. (b) When the ECM directs the transmission to switch to 5th gear, the actual gear is also shifted to 5th. (c) When the ECM directs the transmission to switch to 6th gear, the engine overruns (clutch slips).	• Shift solenoid valve S1 remains closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked • No. 2 brake malfunction (Driving is difficult.) • Automatic transmission (clutch, brake or gear, etc.)

HINT:

- **Gear positions in the event of a solenoid valve mechanical problem:**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under S1 stuck ON malfunction	2nd	2nd	3rd	4th	5th	6th
*2: Actual gear position under S1 stuck OFF malfunction	1st	1st	3rd	4th	5th	N*

N*: Neutral

- **Gear position during fail-safe operation:**
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under fail-safe mode when S1 stuck ON malfunction	2nd	2nd	3rd	4th	5th	6th
*2: Actual gear position under fail-safe mode when S1 stuck OFF malfunction	1st*	1st*	3rd	3rd	3rd	3rd

1st*: Under engine braking, downshifting to 1st or 2nd gear is prohibited.

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve S1.
The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the GTS.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the GTS.**
- **The shift solenoid valve S1 turns ON/OFF normally when the shift lever is in D.**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S1	OFF	ON	ON	ON	ON	ON

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0751)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
Only P0751 is output	A
P0751 and other DTCs are output	B

HINT:

If any other codes besides P0751 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING GTS (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST
09992-00095 (09992-00231, 09992-00271)

b. Connect the GTS to the DLC3.

c. Start the engine and warm it up.

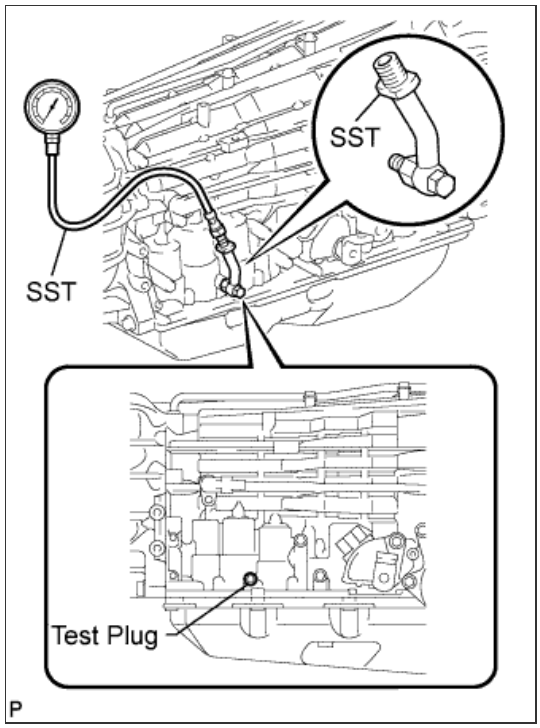
d. Measure the line pressure with SST.

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

h. Measure the line pressure.



Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:
The line pressure changes as specified when performing the Active Test.

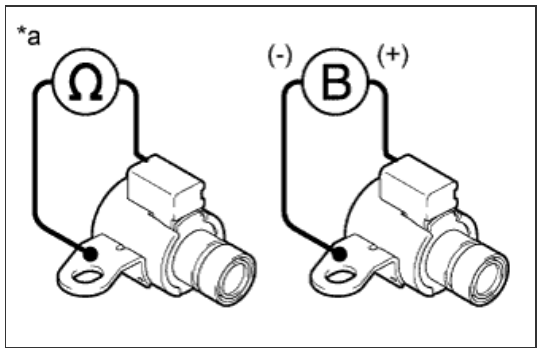
NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

3.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S1)

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

4.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P0985 Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)

DTC P0986 Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)

for Preparation Click here

DESCRIPTION

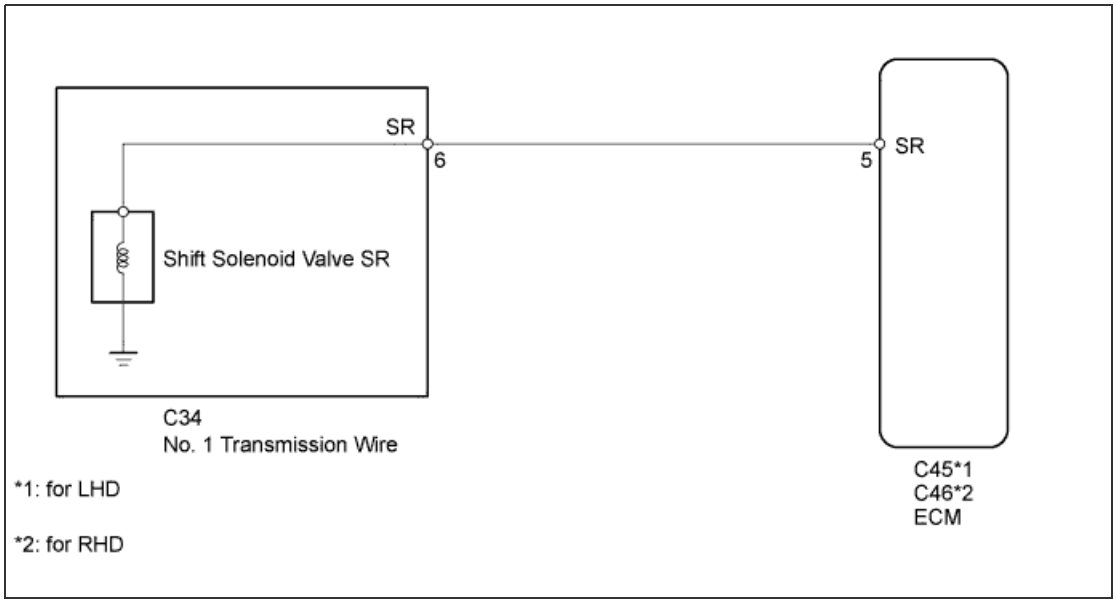
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0985	The ECM detects a short in the solenoid valve SR circuit 2 times when the solenoid valve SR is operated (1 trip detection logic).	• Short in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM
P0986	The ECM detects an open in the solenoid valve SR circuit 2 times when the solenoid valve SR is not operated (1 trip detection logic).	• Open in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve SR circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve SR is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve SR circuit.
When the shift solenoid valve SR is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve SR circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

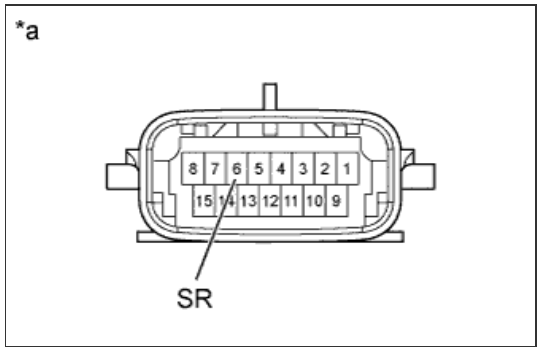
The shift solenoid valve SR is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve SR	ON	ON	ON	ON	OFF	OFF

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SR)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
6 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

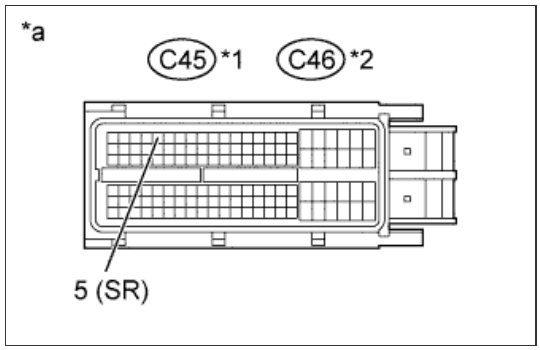
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-5 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-5 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

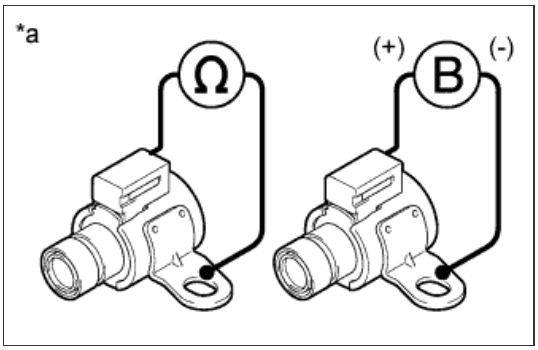
OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SR

a. Remove the shift solenoid valve SR.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve SR connector terminal - Shift solenoid valve SR body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve SR connector • Battery negative (-) → Shift solenoid valve SR body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SR)

NG → REPLACE SHIFT SOLENOID VALVE SR (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0756 Shift Solenoid "B" Performance (Shift Solenoid Valve S2)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems with the shift solenoid valves, valve body or automatic transmission (clutch, brake, gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0756	A shift solenoid valve S2 stuck ON malfunction*1: Shifting to 3rd and 5th gears is impossible. The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic). (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is shifted to 6th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 6th.	• Shift solenoid valve S2 remains open • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.) • ECM
P0756	A shift solenoid valve S2 stuck OFF malfunction*2: The vehicle starts in 3rd gear and shifting to 6th gear is impossible. The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic). (a) When the ECM directs the transmission to switch to 1st gear, the actual gear is shifted to 3rd. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 5th.	• Shift solenoid valve S2 remains closed • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.) • ECM

HINT:

Gear positions in the event of a solenoid valve mechanical problem:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under S2 stuck ON malfunction	1st	2nd	2nd	4th	6th	6th
*2: Actual gear position under S2 stuck OFF malfunction	3rd	3rd	3rd	4th	5th	5th

MONITOR DESCRIPTION

This DTC indicates a stuck ON malfunction or stuck OFF malfunction of the shift solenoid valve S2.
The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the GTS.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the GTS.**
- **The shift solenoid valve S2 turns ON/OFF normally when the shift lever is in D.**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S2	ON	ON	OFF	OFF	OFF	ON

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0756)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
Only P0756 is output	A
P0756 and other DTCs are output	B

HINT:

If any other codes besides P0756 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.INSPECT SHIFT SOLENOID VALVE S2

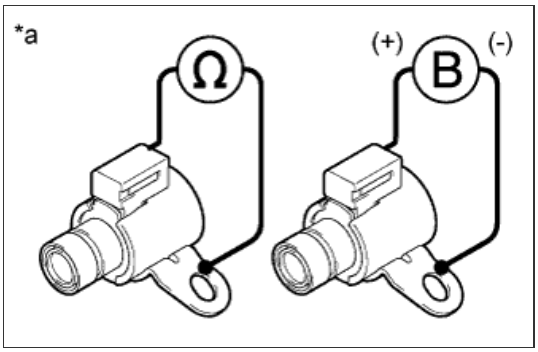
a. Remove the shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.



OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S2)

NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK

3.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P0985 Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)

DTC P0986 Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)

for Preparation Click here

DESCRIPTION

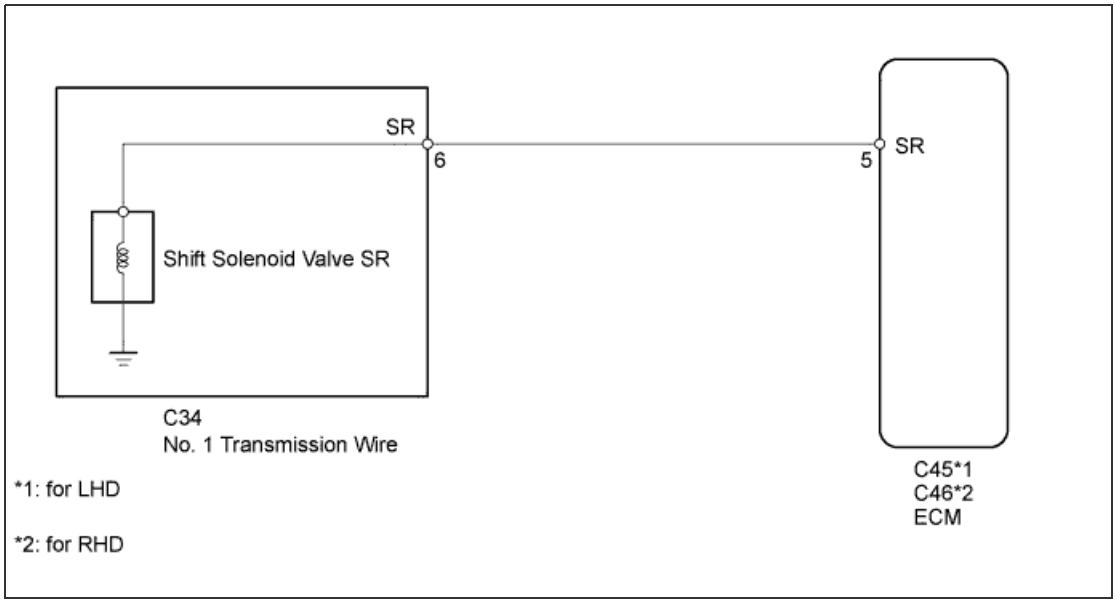
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely. Also, the ECM stops sending current to the open or short circuited solenoid (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0985	The ECM detects a short in the solenoid valve SR circuit 2 times when the solenoid valve SR is operated (1 trip detection logic).	• Short in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM
P0986	The ECM detects an open in the solenoid valve SR circuit 2 times when the solenoid valve SR is not operated (1 trip detection logic).	• Open in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve SR circuit. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve SR is ON, if its resistance is 8 Ω or less, the ECM determines there is a short in the shift solenoid valve SR circuit.
When the shift solenoid valve SR is OFF, if its resistance is 100 kΩ or higher, the ECM determines there is an open in the shift solenoid valve SR circuit (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

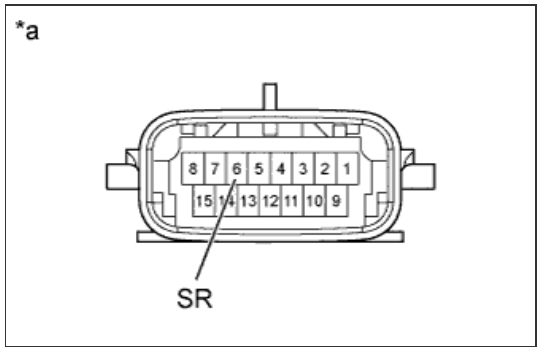
The shift solenoid valve SR is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve SR	ON	ON	ON	ON	OFF	OFF

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SR)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
6 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

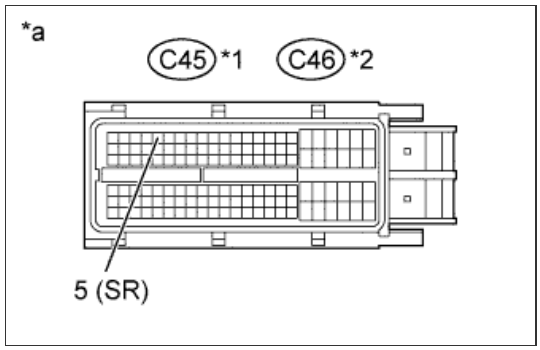
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-5 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

for RHD

Tester Connection	Condition	Specified Condition
C46-5 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

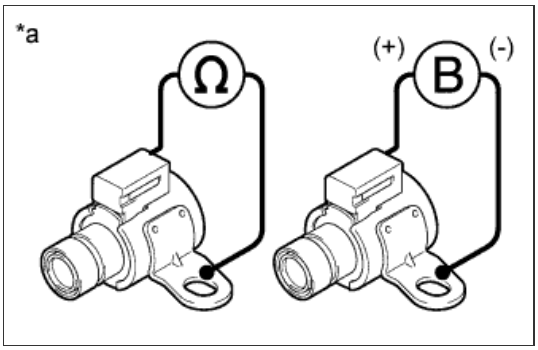
OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SR

a. Remove the shift solenoid valve SR.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve SR connector terminal - Shift solenoid valve SR body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve SR connector • Battery negative (-) → Shift solenoid valve SR body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SR)

NG → REPLACE SHIFT SOLENOID VALVE SR (Click here)

OK → REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0761 Shift Solenoid "C" Performance (Shift Solenoid Valve S3)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems with the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0761	A shift solenoid valve S3 stuck ON malfunction*1: When the ECM directs the transmission to switch to 5th or 6th gear, the engine overruns (clutch slips). The ECM determines there is a malfunction when either of the following conditions is met (2 trip detection logic). (a) When the ECM directs the transmission to switch to 4th gear, the actual gear is shifted to 3rd. (b) When the ECM directs the transmission to switch to 5th gear, the engine overruns (clutch slips).	• Shift solenoid valve S3 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)
P0761	A shift solenoid valve S3 stuck OFF malfunction*2: Shifting to 1st, 2nd, and 3rd gears is impossible. The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic). (a) When the ECM directs the transmission to switch to 2nd gear, the actual gear is shifted to 4th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 6th.	• Shift solenoid valve S3 remains closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

HINT:

- **Gear positions in the event of a solenoid valve mechanical problem:**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under S3 stuck ON malfunction	1st	2nd	3rd	3rd	N*	N*
*2: Actual gear position under S3 stuck OFF malfunction	3rd	4th	4th	4th	5th	6th

N*: Neutral

- **Gear position during fail-safe operation:**
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under fail-safe mode when S3 stuck ON malfunction	1st	2nd	3rd	3rd	3rd	3rd
*2: Actual gear position under fail-safe mode when S3 stuck OFF malfunction	3rd	4th	4th	4th	5th	6th

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve S3.
The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain /Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the GTS.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the GTS.**
- **The shift solenoid valve SL2 turns ON/OFF normally when the shift lever is in D.**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S3	ON	ON	ON	OFF	OFF	OFF

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0761)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
Only P0761 is output	A
P0761 and other DTCs are output	B

HINT:

If any other codes besides P0761 are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART (Click here)**

A

2.PERFORM ACTIVE TEST USING GTS (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the GTS to the DLC3.

c. Start the engine and warm it up.

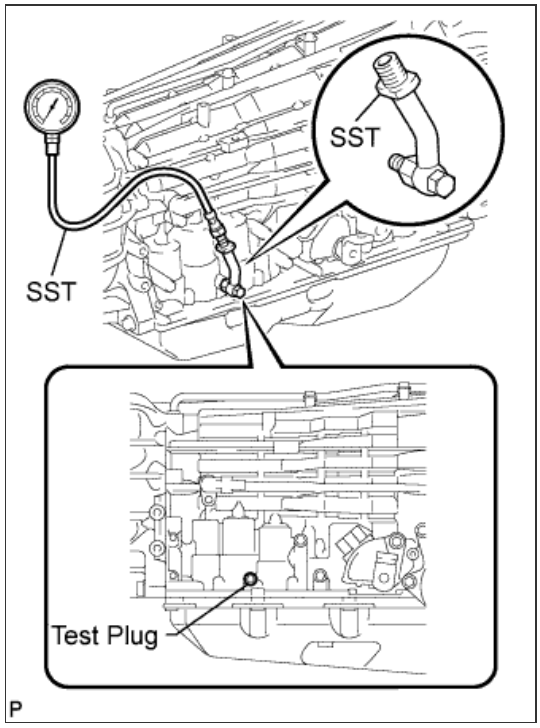
d. Measure the line pressure with SST.

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

h. Measure the line pressure.



Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

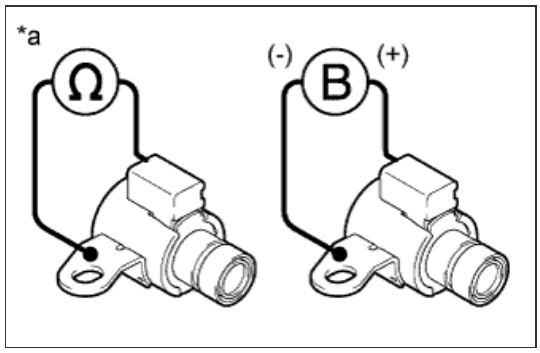
NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

3.INSPECT SHIFT SOLENOID VALVE S3

a. Remove the shift solenoid valve S3.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S3 connector • Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S3)

NG → REPLACE SHIFT SOLENOID VALVE S3 (Click here)

OK

4.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P2716 Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)

for Preparation Click here

DESCRIPTION

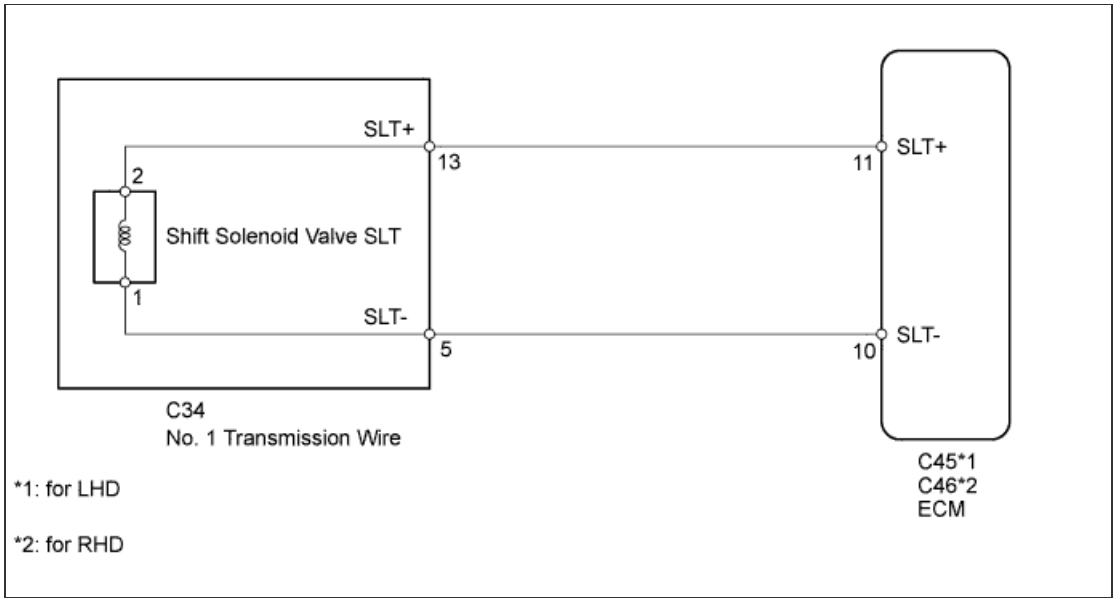
Refer to DTC P0894 (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P2716	Conditions (a) or (b) below are detected for 1 sec. or more (1 trip detection logic). (a) SLT - terminal: 0 V (b) SLT - terminal: 12 V	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM

MONITOR DESCRIPTION

When an open or short in the shift solenoid valve SLT circuit is detected, the ECM interprets this as a fault. The ECM will turn on the MIL and store the DTC.

WIRING DIAGRAM



INSPECTION PROCEDURE

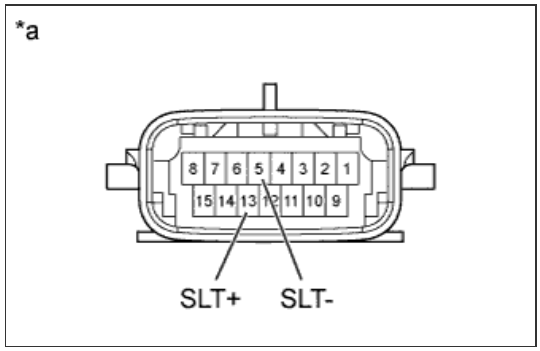
1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SLT)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
13 (SLT+) - 5 (SLT-)	20°C (68°F)	5.0 to 5.6 Ω
13 (SLT+) - Body ground	Always	10 kΩ or higher
5 (SLT-) - Body ground	Always	10 kΩ or higher



Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

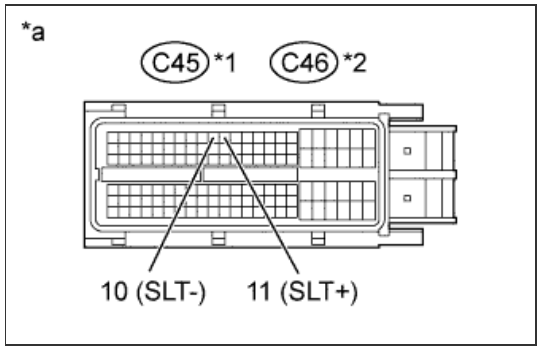
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-11 (SLT+) - C45-10 (SLT-)	20°C (68°F)	5.0 to 5.6 Ω
C45-11 (SLT+) - Body ground	Always	10 kΩ or higher
C45-10 (SLT-) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-11 (SLT+) - C46-10 (SLT-)	20°C (68°F)	5.0 to 5.6 Ω
C46-11 (SLT+) - Body ground	Always	10 kΩ or higher
C46-10 (SLT-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SLT

a. Remove the shift solenoid valve SLT.

b. Measure the resistance according to the value(s) in the table below.

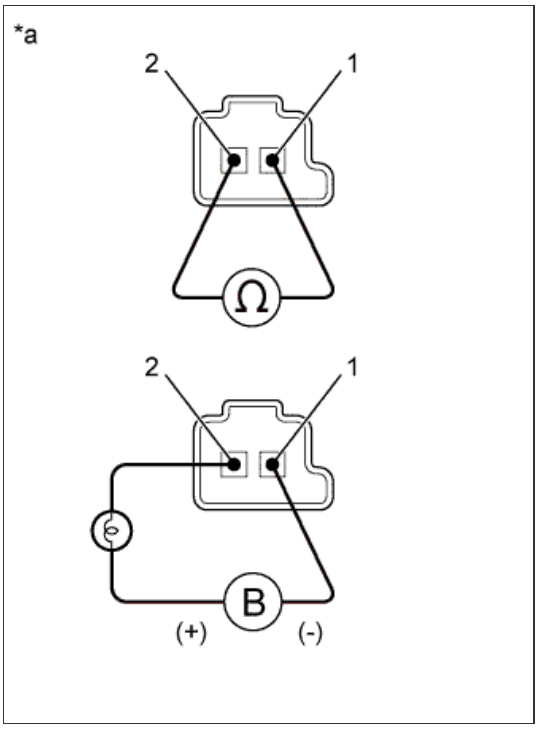
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SLT)

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0766 Shift Solenoid "D" Performance (Shift Solenoid Valve S4)

DTC P0776 Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems with the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0766	A shift solenoid valve S4 stuck OFF malfunction or brake control valve malfunction*1: Shifting to 5th and 6th gears is impossible. The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic). (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is shifted to 4th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 4th.	• Shift solenoid valve S4 remains closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked (brake control valve) • Automatic transmission (clutch, brake or gear, etc.)
P0776	A shift solenoid valve SL2 stuck ON malfunction or brake control valve malfunction*1: Shifting to 5th and 6th gears is impossible. The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic). (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is shifted to 4th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 4th.	• Shift solenoid valve SL2 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked (brake control valve) • Automatic transmission (clutch, brake or gear, etc.)

HINT:

- **Gear positions in the event of a solenoid valve mechanical problem:**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under malfunction	1st	2nd	3rd	4th	4th	4th

- **Gear position during fail-safe operation:**
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under fail-safe mode	1st	2nd	3rd	3rd	3rd	3rd

MONITOR DESCRIPTION

This DTC indicates "stuck OFF malfunction" of the shift solenoid valve S4, "stuck ON malfunction" of the shift solenoid valve SL2, or brake control valve malfunction. The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the GTS.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the GTS.**
- **The shift solenoid valve SL2 turns ON/OFF normally when the shift lever is in D.**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S4	OFF	OFF	OFF	OFF	ON	ON
Shift solenoid valve SL2	ON	ON	ON	ON	OFF	OFF

1.CHECK DTC OUTPUT (IN ADDITION TO DTCS P0766 AND P0776)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
P0766 and/or P0776 is output	A
P0766, P0776 and other DTCs are output	B

HINT:

If any other codes besides P0766 and P0776 are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART (Click here)**

A

2.PERFORM ACTIVE TEST USING GTS (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the GTS to the DLC3.

c. Start the engine and warm it up.

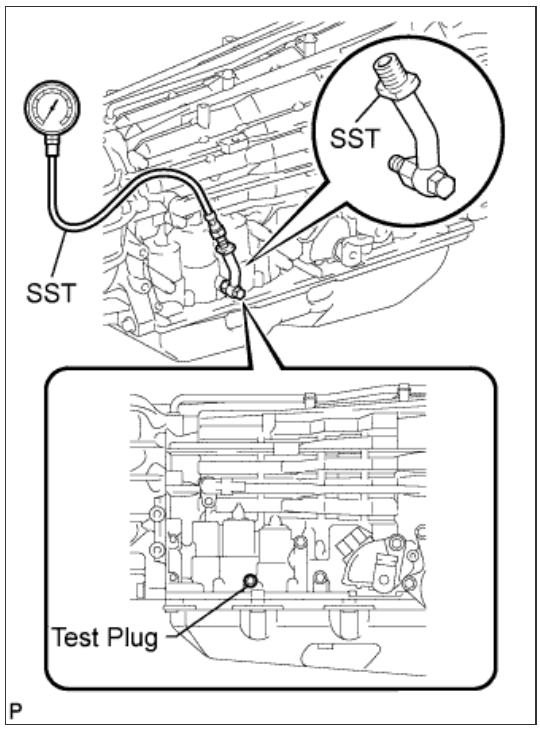
d. Measure the line pressure with SST.

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

h. Measure the line pressure.



Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

3.INSPECT SHIFT SOLENOID VALVE S4

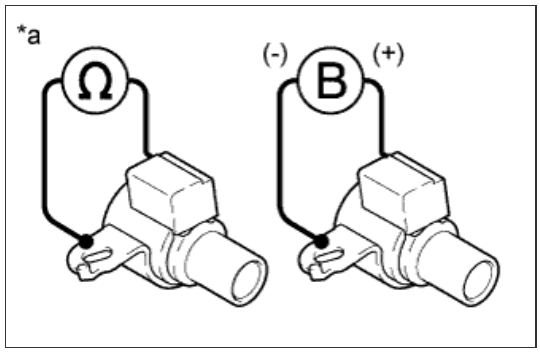
a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition

Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S4)

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK

4.INSPECT SHIFT SOLENOID VALVE SL2

a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

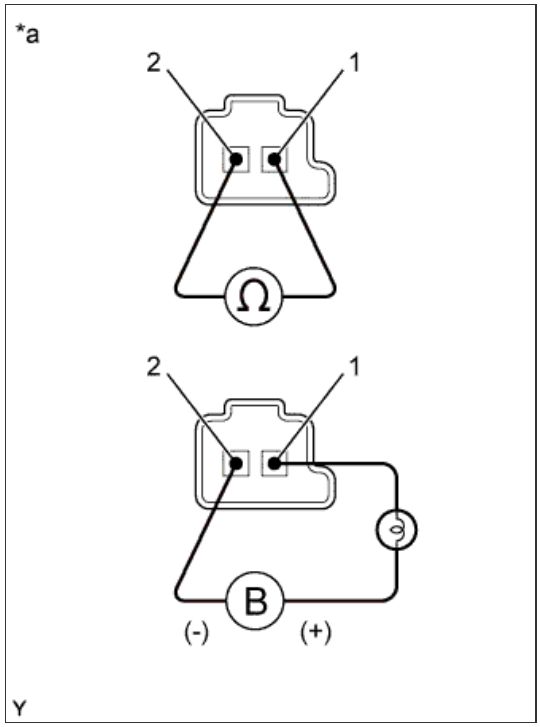
c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SL2)



NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK

5.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG

REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P2742 Transmission Fluid Temperature Sensor "B" Circuit Low Input

DTC P2743 Transmission Fluid Temperature Sensor "B" Circuit High Input

for Preparation Click here

DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor is on the transmission, just in front of the oil cooler inlet pipeline.
If the ECM detects an abnormally high ATF temperature near this sensor, it illuminates the warning light.

HINT:

- **The temperature of ATF easily rises when towing, climbing hills, in traffic, etc.**
- **If the ATF temperature sensor becomes short-circuited, the signal that indicates that the ATF temperature is 150°C (302°F) or higher is input into the ECM.**

Vehicle conditions when the sensor is normal and when the sensor is short-circuited are indicated in the table below.

No. 2 ATF Temperature Sensor State	Detection Condition	Symptom	Recovery Condition
Sensor is normal	ATF temperature higher than 150°C (302°F)	ATF temperature warning light remains on	ATF temperature below 135°C (275°F)*1
	ATF temperature higher than 130°C (266°F)	Shift point too high	ATF temperature below 110°C (230°F)
	When conditions (a) and (b) are satisfied. (a) ATF temperature higher than 130°C (266°F) (b) Engine coolant temperature higher than 95°C (203°F)	Lock-up at 3rd gear*2	ATF temperature below 110°C (230°F)*1 and engine coolant temperature higher than 95°C (203°F)
Sensor is short-circuited	Any conditions	• ATF temperature warning light blinks or message is displayed in combination meter • Shift point too high	Symptoms still occur
	Engine coolant temperature higher than 95°C (203°F)	Lock-up at 3rd gear*2	Symptoms still occur

HINT:

*1: When the ATF temperature is in the normal range, it decreases to below 135°C (275°F) within 5 minutes with the shift lever in P or N in an idling state.

*2: When the ATF temperature is normal, transmission lock-up occurs in 5th or 6th gear with the shift lever in D or the S6 range, in 5th gear with the shift lever in the S5 range, and 4th gear with the shift lever in the S4 range.

DTC Code	DTC Detection Condition	Trouble Area
P2742	The No. 2 ATF temperature sensor resistance is below 25 Ω (0.046 V) for 0.5 sec. or more (1 trip detection logic).	• Short in No. 2 ATF temperature sensor circuit • No. 1 transmission wire (No. 2 ATF temperature sensor) • ECM
P2743	ATF temperature sensor resistance is higher than 156 kΩ (4.915 V) for 0.5 sec. or more and either condition is met (1 trip detection logic): (A) 15 min. or more have elapsed after the engine start when the engine coolant temperature or intake air temperature is - 29.375°C (-20.875°F) or less. (B) 10 sec. or more have elapsed after the engine start when the engine coolant temperature and intake air temperature are higher than -29.375°C (-20.875°F).	• Open in No. 2 ATF temperature sensor circuit • No. 1 transmission wire (No. 2 ATF temperature sensor) • ECM

MONITOR DESCRIPTION

The ATF temperature sensor converts the ATF temperature into an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is below 25 Ω*1 or higher than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM stores a DTC, and the ATF temperature warning light blinks or a message is displayed in the combination meter.

HINT:

- ***1: 150°C (302°F) or higher is indicated regardless of the actual ATF temperature.**
- ***2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.**
- **The ATF temperature can be checked on the GTS display.**

WIRING DIAGRAM

Refer to DTC P0712 (Click here).

INSPECTION PROCEDURE

DATA LIST

HINT:

Using the GTS to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the GTS, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 2	No. 2 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 2 ATF temperature sensor circuit is open or shorted.

HINT:

- **When DTC P2742 is stored and the GTS output is 150°C (302°F) or higher, there is a short circuit.**
- **When DTC P2743 is stored and the GTS output is -40°C (-40°F), there is an open circuit.**
  Check the temperature displayed on the GTS in order to check if a malfunction exists.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or higher	Short circuit

1.INSPECT NO. 1 TRANSMISSION WIRE (NO. 2 ATF TEMPERATURE SENSOR)

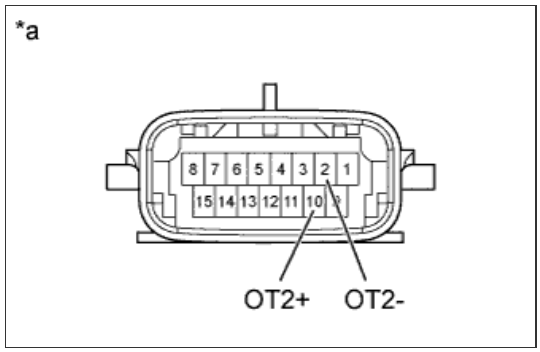
a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
2 (OT2-) - 10 (OT2+)	Always	25 Ω to 156 kΩ
2 (OT2-) - Body	Always	10 kΩ or higher

ground		
10 (OT2+) - Body ground	Always	10 kΩ or higher



HINT:

If the resistance is out of the specified range at any of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Resistance (Reference):

ATF Temperature	Specified Condition
10°C (50°F)	5 to 8 kΩ
25°C (77°F)	2.5 to 4.5 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

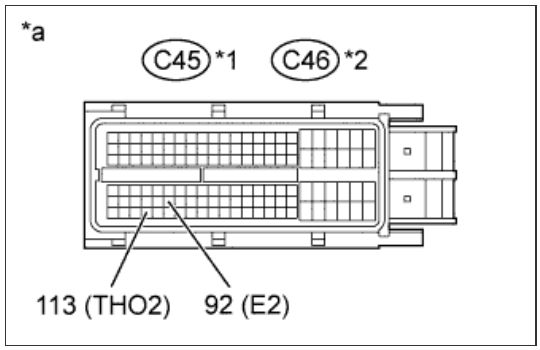
NG → REPAIR OR REPLACE NO. 2 ATF TEMPERATURE SENSOR (NO. 1 TRANSMISSION WIRE) (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-113 (THO2) - C45-92 (E2)	Always	25 Ω to 156 kΩ
C45-113 (THO2) - Body ground	Always	10 kΩ or higher
C45-92 (E2) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-113 (THO2) - C46-92 (E2)	Always	25 Ω to 156 kΩ
C46-113 (THO2) - Body ground	Always	10 kΩ or higher
C46-92 (E2) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0766 Shift Solenoid "D" Performance (Shift Solenoid Valve S4)

DTC P0776 Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)

for Preparation Click here

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th, 5th or 6th gear). Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems with the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC Code	DTC Detection Condition	Trouble Area
P0766	A shift solenoid valve S4 stuck OFF malfunction or brake control valve malfunction*1: Shifting to 5th and 6th gears is impossible. The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic). (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is shifted to 4th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 4th.	• Shift solenoid valve S4 remains closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked (brake control valve) • Automatic transmission (clutch, brake or gear, etc.)
P0776	A shift solenoid valve SL2 stuck ON malfunction or brake control valve malfunction*1: Shifting to 5th and 6th gears is impossible. The ECM determines there is a malfunction when the following conditions are both met (2 trip detection logic). (a) When the ECM directs the transmission to switch to 5th gear, the actual gear is shifted to 4th. (b) When the ECM directs the transmission to switch to 6th gear, the actual gear is shifted to 4th.	• Shift solenoid valve SL2 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked (brake control valve) • Automatic transmission (clutch, brake or gear, etc.)

HINT:

- **Gear positions in the event of a solenoid valve mechanical problem:**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under malfunction	1st	2nd	3rd	4th	4th	4th

- **Gear position during fail-safe operation:**
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
*1: Actual gear position under fail-safe mode	1st	2nd	3rd	3rd	3rd	3rd

MONITOR DESCRIPTION

This DTC indicates "stuck OFF malfunction" of the shift solenoid valve S4, "stuck ON malfunction" of the shift solenoid valve SL2, or brake control valve malfunction. The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the GTS.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the GTS.**
- **The shift solenoid valve SL2 turns ON/OFF normally when the shift lever is in D.**

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve S4	OFF	OFF	OFF	OFF	ON	ON
Shift solenoid valve SL2	ON	ON	ON	ON	OFF	OFF

1.CHECK DTC OUTPUT (IN ADDITION TO DTCS P0766 AND P0776)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
P0766 and/or P0776 is output	A
P0766, P0776 and other DTCs are output	B

HINT:

If any other codes besides P0766 and P0776 are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART (Click here)**

A

2.PERFORM ACTIVE TEST USING GTS (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the GTS to the DLC3.

c. Start the engine and warm it up.

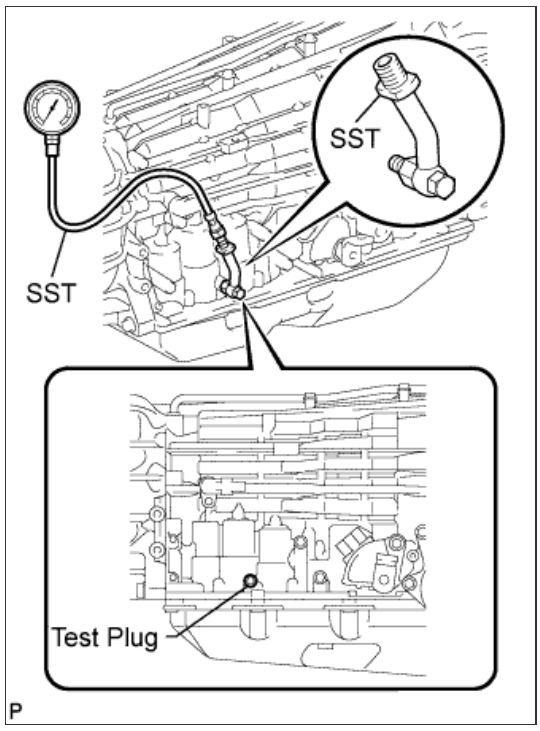
d. Measure the line pressure with SST.

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

h. Measure the line pressure.



Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

3.INSPECT SHIFT SOLENOID VALVE S4

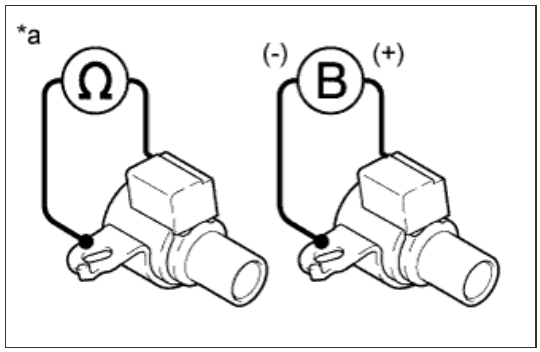
a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition

Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S4)

NG → REPLACE SHIFT SOLENOID VALVE S4 (Click here)

OK

4.INSPECT SHIFT SOLENOID VALVE SL2

a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

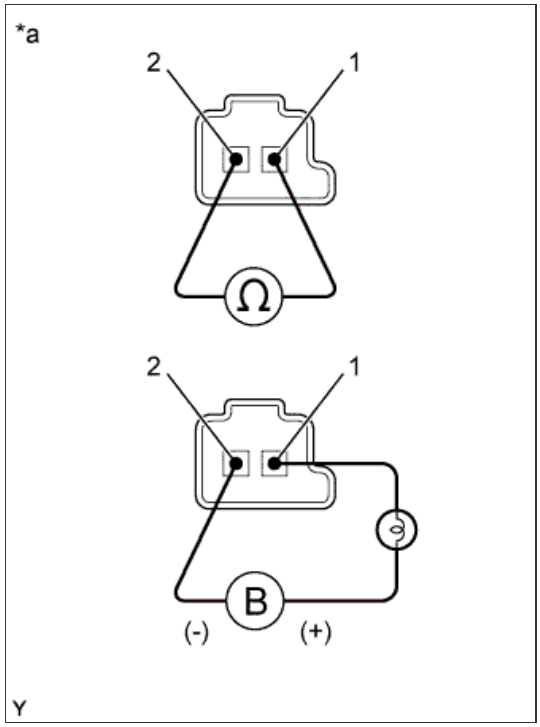
c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SL2)



NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK

5.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG

REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P2742 Transmission Fluid Temperature Sensor "B" Circuit Low Input

DTC P2743 Transmission Fluid Temperature Sensor "B" Circuit High Input

for Preparation Click here

DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor is on the transmission, just in front of the oil cooler inlet pipeline.
If the ECM detects an abnormally high ATF temperature near this sensor, it illuminates the warning light.

HINT:

- **The temperature of ATF easily rises when towing, climbing hills, in traffic, etc.**
- **If the ATF temperature sensor becomes short-circuited, the signal that indicates that the ATF temperature is 150°C (302°F) or higher is input into the ECM.**

Vehicle conditions when the sensor is normal and when the sensor is short-circuited are indicated in the table below.

No. 2 ATF Temperature Sensor State	Detection Condition	Symptom	Recovery Condition
Sensor is normal	ATF temperature higher than 150°C (302°F)	ATF temperature warning light remains on	ATF temperature below 135°C (275°F)*1
	ATF temperature higher than 130°C (266°F)	Shift point too high	ATF temperature below 110°C (230°F)
	When conditions (a) and (b) are satisfied. (a) ATF temperature higher than 130°C (266°F) (b) Engine coolant temperature higher than 95°C (203°F)	Lock-up at 3rd gear*2	ATF temperature below 110°C (230°F)*1 and engine coolant temperature higher than 95°C (203°F)
Sensor is short-circuited	Any conditions	• ATF temperature warning light blinks or message is displayed in combination meter • Shift point too high	Symptoms still occur
	Engine coolant temperature higher than 95°C (203°F)	Lock-up at 3rd gear*2	Symptoms still occur

HINT:

*1: When the ATF temperature is in the normal range, it decreases to below 135°C (275°F) within 5 minutes with the shift lever in P or N in an idling state.

*2: When the ATF temperature is normal, transmission lock-up occurs in 5th or 6th gear with the shift lever in D or the S6 range, in 5th gear with the shift lever in the S5 range, and 4th gear with the shift lever in the S4 range.

DTC Code	DTC Detection Condition	Trouble Area
P2742	The No. 2 ATF temperature sensor resistance is below 25 Ω (0.046 V) for 0.5 sec. or more (1 trip detection logic).	• Short in No. 2 ATF temperature sensor circuit • No. 1 transmission wire (No. 2 ATF temperature sensor) • ECM
P2743	ATF temperature sensor resistance is higher than 156 kΩ (4.915 V) for 0.5 sec. or more and either condition is met (1 trip detection logic): (A) 15 min. or more have elapsed after the engine start when the engine coolant temperature or intake air temperature is - 29.375°C (-20.875°F) or less. (B) 10 sec. or more have elapsed after the engine start when the engine coolant temperature and intake air temperature are higher than -29.375°C (-20.875°F).	• Open in No. 2 ATF temperature sensor circuit • No. 1 transmission wire (No. 2 ATF temperature sensor) • ECM

MONITOR DESCRIPTION

The ATF temperature sensor converts the ATF temperature into an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is below 25 Ω*1 or higher than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM stores a DTC, and the ATF temperature warning light blinks or a message is displayed in the combination meter.

HINT:

- ***1: 150°C (302°F) or higher is indicated regardless of the actual ATF temperature.**
- ***2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.**
- **The ATF temperature can be checked on the GTS display.**

WIRING DIAGRAM

Refer to DTC P0712 (Click here).

INSPECTION PROCEDURE

DATA LIST

HINT:

Using the GTS to read the Data List allows the values or states of switches, sensors, actuators and other items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

NOTICE:

In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Data List.

g. According to the display on the GTS, read the Data List.

Engine and ECT

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 2	No. 2 ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 150°C (302°F)	• After stall test: Approximately 80°C (176°F) • With engine cold: Equal to ambient temperature	If the value is -40°C (-40°F) or 150°C (302°F), the No. 2 ATF temperature sensor circuit is open or shorted.

HINT:

- **When DTC P2742 is stored and the GTS output is 150°C (302°F) or higher, there is a short circuit.**
- **When DTC P2743 is stored and the GTS output is -40°C (-40°F), there is an open circuit.**
  Check the temperature displayed on the GTS in order to check if a malfunction exists.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or higher	Short circuit

1.INSPECT NO. 1 TRANSMISSION WIRE (NO. 2 ATF TEMPERATURE SENSOR)

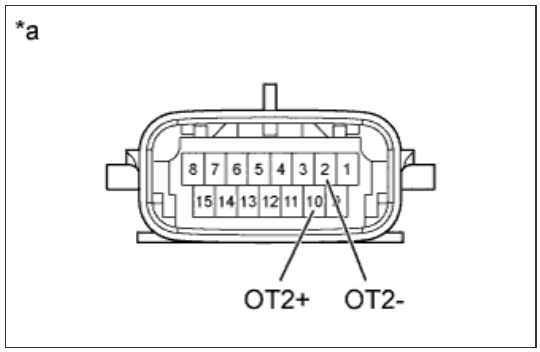
a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
2 (OT2-) - 10 (OT2+)	Always	25 Ω to 156 kΩ
2 (OT2-) - Body	Always	10 kΩ or higher

ground		
10 (OT2+) - Body ground	Always	10 kΩ or higher



HINT:

If the resistance is out of the specified range at any of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Resistance (Reference):

ATF Temperature	Specified Condition
10°C (50°F)	5 to 8 kΩ
25°C (77°F)	2.5 to 4.5 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

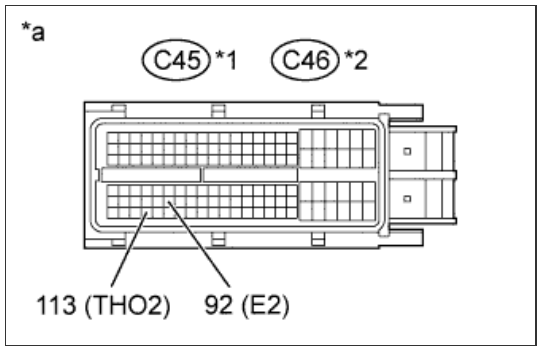
NG → REPAIR OR REPLACE NO. 2 ATF TEMPERATURE SENSOR (NO. 1 TRANSMISSION WIRE) (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-113 (THO2) - C45-92 (E2)	Always	25 Ω to 156 kΩ
C45-113 (THO2) - Body ground	Always	10 kΩ or higher
C45-92 (E2) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-113 (THO2) - C46-92 (E2)	Always	25 Ω to 156 kΩ
C46-113 (THO2) - Body ground	Always	10 kΩ or higher
C46-92 (E2) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

DTC P0778 Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)

for Preparation Click here

DESCRIPTION

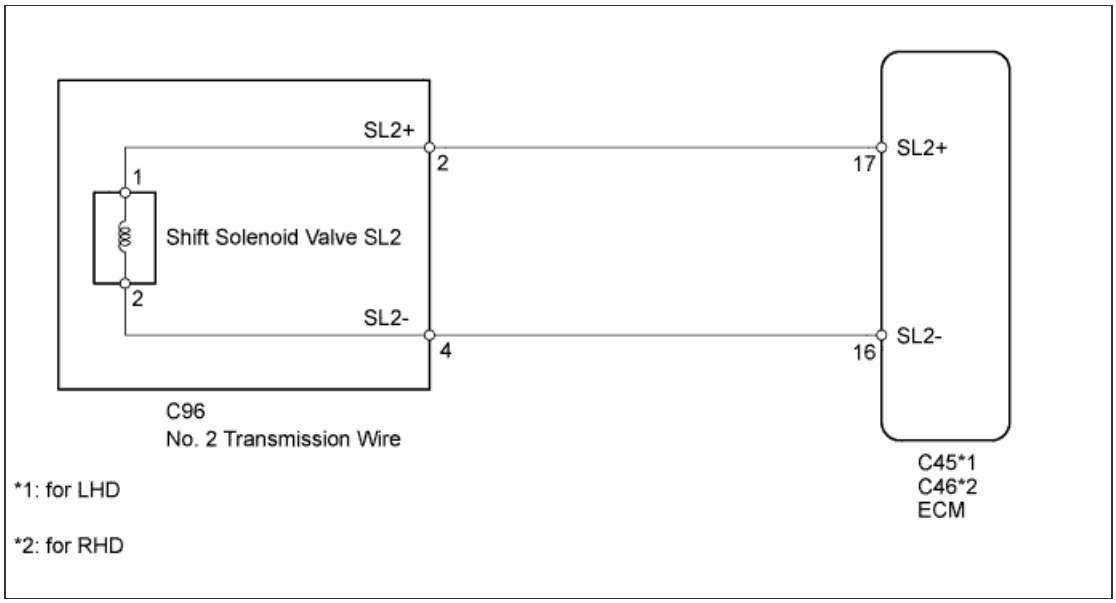
Shifting from 1st to 6th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, S1, S2, S3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely (Click here).

DTC Code	DTC Detection Condition	Trouble Area
P0778	The ECM checks for an open or short in the shift solenoid valve SL2 circuit while driving and shifting gears (1 trip detection logic). The output signal duty ratio equals 100% (the SL2 output signal duty ratio is less than 100% under normal conditions).	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL2 circuit. The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. Also, the ECM performs the fail-safe function and turns the other normally functioning shift solenoid valves ON/OFF. In case of an open or short circuit, the ECM stops sending current to the open or short circuited solenoid.
While driving and shifting gears, if the ECM detects an open or short in the shift solenoid valve SL2 circuit, the ECM determines there is a malfunction (Click here).

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

The shift solenoid valve SL2 is turned ON/OFF normally when the shift lever is in D:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve SL2	ON	ON	ON	ON	OFF	OFF

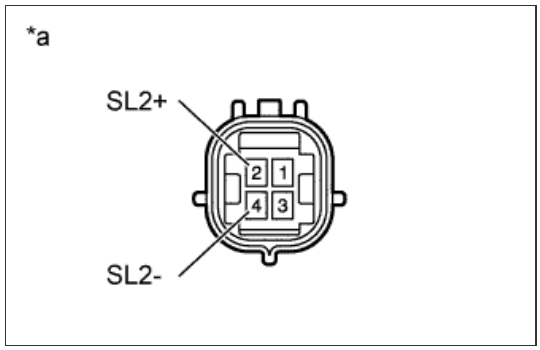
1.INSPECT NO. 2 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SL2)

a. Disconnect the No. 2 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
2 (SL2+) - 4 (SL2-)	20°C (68°F)	5.0 to 5.6 Ω
2 (SL2+) - Body ground	Always	10 kΩ or higher
4 (SL2-) - Body ground	Always	10 kΩ or higher



Text in Illustration

*a	Component without harness connected (No. 2 Transmission Wire)

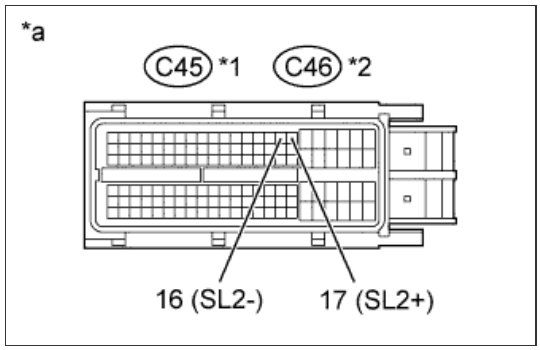
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 2 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-17 (SL2+) - C45-16 (SL2-)	20°C (68°F)	5.0 to 5.6 Ω
C45-17 (SL2+) - Body ground	Always	10 kΩ or higher
C45-16 (SL2-) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-17 (SL2+) - C46-16 (SL2-)	20°C (68°F)	5.0 to 5.6 Ω
C46-17 (SL2+) - Body ground	Always	10 kΩ or higher
C46-16 (SL2-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SL2

a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

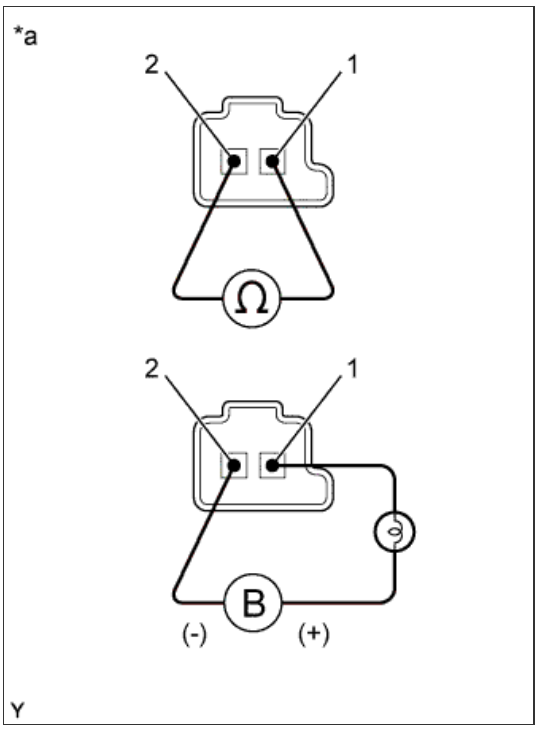
c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SL2)



NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK

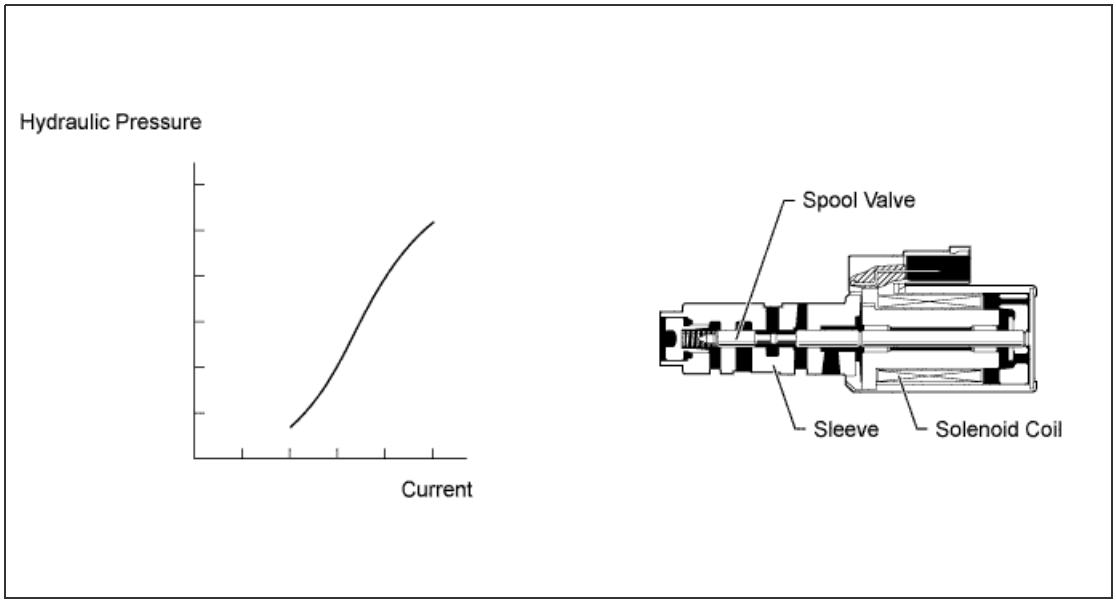
REPAIR OR REPLACE NO. 2 TRANSMISSION WIRE (Click here)

DTC P2757 Torque Converter Clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU)

for Preparation Click here

DESCRIPTION

The ECM uses the signals from the throttle position sensor, air-flow meter, turbine (input) speed sensor, output speed sensor and crankshaft position sensor to monitor the engagement condition of the lock-up clutch.



Then the ECM compares the engagement condition of the lock-up clutch with the lock-up schedule in the ECM memory to detect mechanical problems with the shift solenoid valve SLU, valve body and torque converter assembly.

DTC Code	DTC Detection Condition	Trouble Area
P2757	Lock-up does not occur when driving in the lock-up range (normal driving at 100 km/h (62 mph)), or lock-up remains ON in the lock-up OFF range (2 trip detection logic).	• Shift solenoid valve SLU remains open or closed • Valve body is blocked • Shift solenoid valve SLU • Torque converter assembly • Automatic transmission (clutch, brake, gear, etc.) • Line pressure is too low • ECM

MONITOR DESCRIPTION

Torque converter assembly lock-up is controlled by the ECM based on the turbine (input) speed sensor NT, output speed sensor SP2, engine speed, engine load, engine temperature, vehicle speed, transmission temperature, and gear selection. The ECM determines the lock-up status of the torque converter assembly by comparing the engine speed (NE) to the input turbine rpm (NT). The ECM calculates the actual transmission gear by comparing input turbine rpm (NT) to output shaft rpm (SP2). When conditions are appropriate, the ECM requests lock-up by applying control voltage to the shift solenoid SLU. When the SLU is turned ON, it applies pressure to the lock-up relay valve and locks the torque converter assembly.
If the ECM detects no lock-up after lock-up has been requested or if it detects lock-up when it is not requested, the ECM interprets this as a fault in the shift solenoid valve SLU or lock-up system performance.
The ECM will illuminate the MIL and store the DTC.
Example:
When one of the following conditions is met, the system determines that there is a malfunction.

- There is a difference in rotation between the input side (engine speed) and output side (input turbine speed) of the torque converter assembly when the ECM commands lock-up ON.
  Engine speed is at least 70 rpm more than input turbine speed.
- There is no difference in rotation between the input side (engine speed) and output side (input turbine speed) of the torque converter assembly when the ECM commands lock-up OFF.
  The difference between engine speed and input turbine speed is less than 35 rpm.

INSPECTION PROCEDURE

ACTIVE TEST

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Warm up the engine.

b. Turn the engine switch off.

c. Connect the GTS to the DLC3.

d. Turn the engine switch on (IG).

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

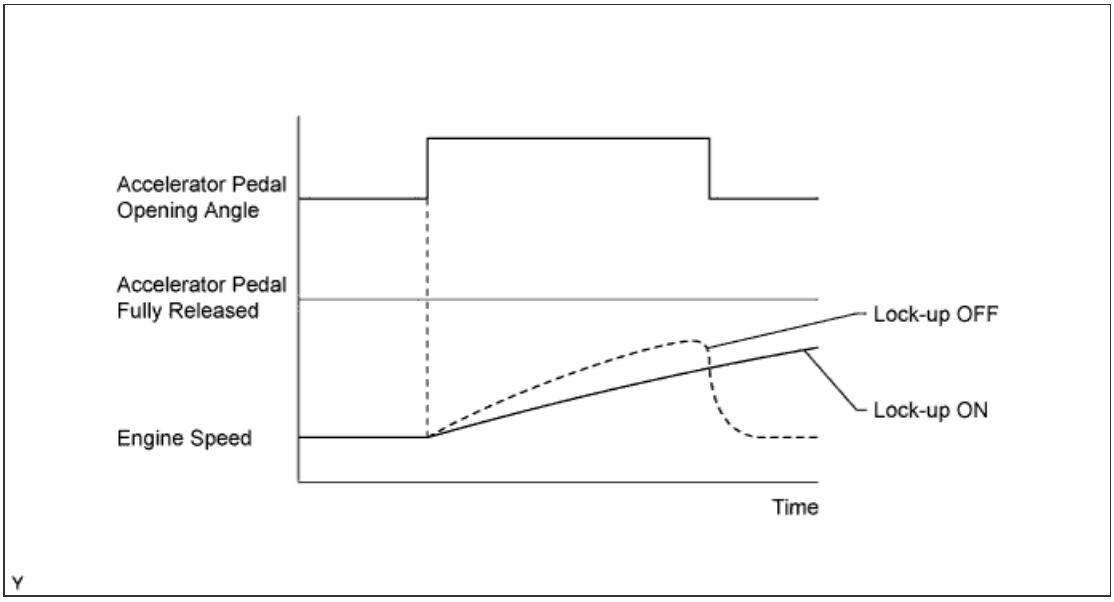
Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Lock Up	Control shift solenoid valve SLU to set automatic transmission to lock-up condition	ON or OFF	It is possible to check the shift solenoid valve SLU operation. [Vehicle Condition] • The throttle valve opening angle is less than 35%. • The vehicle speed is 80 km/h (50 mph) or more.

HINT:

- **This test can be conducted when the vehicle speed is 80 km/h (50 mph) or more.**
- **Perform this test while driving in the 5th or 6th gear.**

h. Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.



HINT:

- **When changing the accelerator pedal opening angle while driving, if the engine speed does not change, lock-up is on.**
- **Slowly release the accelerator pedal in order to decelerate, but do not fully release the pedal (fully releasing the pedal will close the throttle valve and lock-up may be turned off automatically).**

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P2757)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
Only P2757 is output	A
P2757 and other DTCs are output	B

HINT:

If any other codes besides P2757 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.INSPECT SHIFT SOLENOID VALVE SLU

a. Remove the shift solenoid valve SLU.

b. Measure the resistance according to the value(s) in the table below.

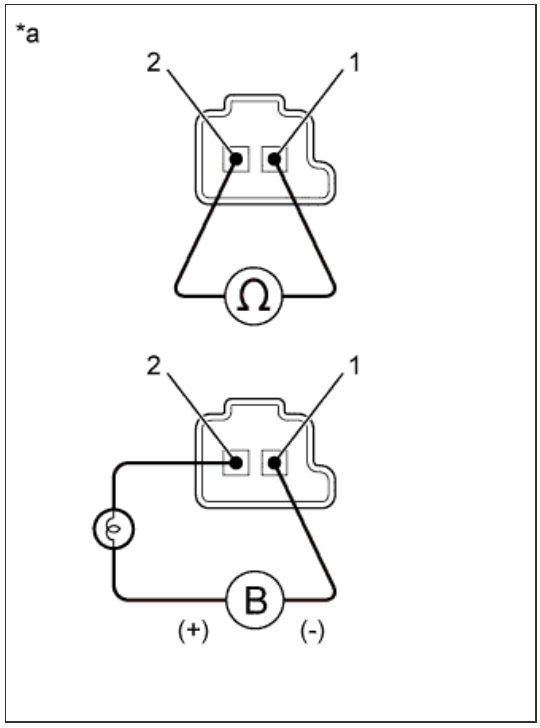
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SLU)

NG → REPLACE SHIFT SOLENOID VALVE SLU (Click here)

OK

3.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

4.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:

The torque converter assembly operates normally.

NG

REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P0781 1-2 Shift (1-2 Shift Valve)

for Preparation Click here

DESCRIPTION

The 1-2 shift valve performs shifting to 1st gear and other gears. When shifting to 2nd and 4th gears is impossible, or when the ECM directs the transmission to switch to 5th and 6th gear and the engine overruns (clutch slips), this DTC is stored.

DTC Code	DTC Detection Condition	Trouble Area
P0781	When conditions (a) and (b), or (a) and (c) are met (2 trip detection logic). (a) When the ECM directs the transmission to switch to 2nd gear, the actual gear is shifted to 1st. (b) When the ECM directs the transmission to switch to 4th gear, the actual gear is shifted to 3rd. (c) When the ECM directs the transmission to switch to 5th gear, the engine overruns (clutch slips).	• Valve body is blocked up or stuck (1-2 shift valve) • Shift solenoid valve SLT remains open or closed • Automatic transmission (clutch, brake or gear, etc.)

HINT:

- Gear positions in the event of a solenoid valve mechanical problem:

ECM gear shift command	1st	2nd	3rd	4th	5th	6th
Actual gear position under malfunction	1st	1st	3rd	3rd	N*	N*

N*: Neutral

- Gear position during fail-safe operation:
  If any malfunction is detected, the ECM changes into the fail-safe mode to shift into the gear positions as shown in the table below.

Gear position under normal conditions	1st	2nd	3rd	4th	5th	6th
Actual gear position under fail-safe mode	1st*	1st*	3rd	3rd	3rd	3rd

1st*: Under engine braking, downshifting to 1st or 2nd gear is prohibited.

MONITOR DESCRIPTION

This DTC indicates that the 1-2 shift valve in the valve body is locked in the direction the spring compresses.
The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF" and switching oil pressure to the valves in the valve body.
The ECM calculates the "actual" transmission gear by comparing the signals from the input speed sensor (NT) and the output speed sensor (SP2). The ECM can detect many mechanical problems with the shift solenoids, valve body, transmission clutches, brakes, and gears. If the ECM detects that the actual gear position and the commanded gear position are different, it will illuminate the MIL and store the DTC.

INSPECTION PROCEDURE

1.CHECK DTC OUTPUT (IN ADDITION TO DTC P0781)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
Only P0781 is output	A
P0781 and other DTCs are output	B

HINT:

If any other codes besides P0781 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING GTS (RUNNING TEST)

CAUTION:

This test should always be performed with at least 2 people.

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Perform the test with the A/C turned off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Connect the GTS to the DLC3.

b. Clear the DTC (Click here).

c. Warm up the engine.

d. Enter the following menus: Powertrain / Engine and ECT / Active Test.

e. According to the display on the GTS, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the GTS.

Comparing the shift position commanded by the Active Test with the actual shift position enables you to confirm the problem (Click here).

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the GTS.**
- **Gear positions in the event of a solenoid valve mechanical problem:**

Tester gear shift command	1st	2nd	3rd	4th	5th	6th
Actual gear position under malfunction	1st	1st	3rd	3rd	N*	N*

N*: Neutral

OK:

Gear position changes in accordance with the GTS command.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

3.PERFORM ACTIVE TEST USING GTS (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the GTS to the DLC3.

c. Start the engine and warm it up.

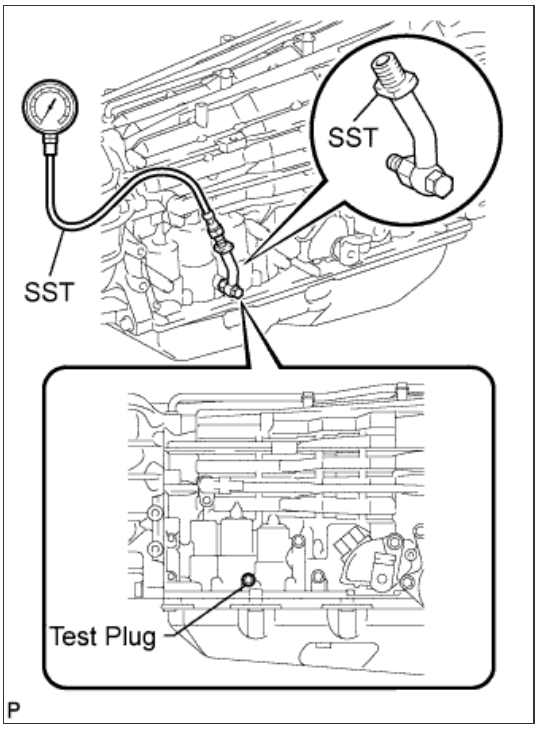
d. Measure the line pressure with SST.

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

h. Measure the line pressure.



Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the Solenoid (SLT)*	Operate shift solenoid valve SLT and raise line pressure	ON or OFF **HINT:** • **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	[Vehicle Condition] • The vehicle is stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

4.CLEAR DTC AND PERFORM RUNNING TEST

a. Clear the DTC (Click here).

b. Check for DTC again after conducting the Monitor Drive Pattern (Click here).

OK:
No DTC output

NG → **REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)**

OK

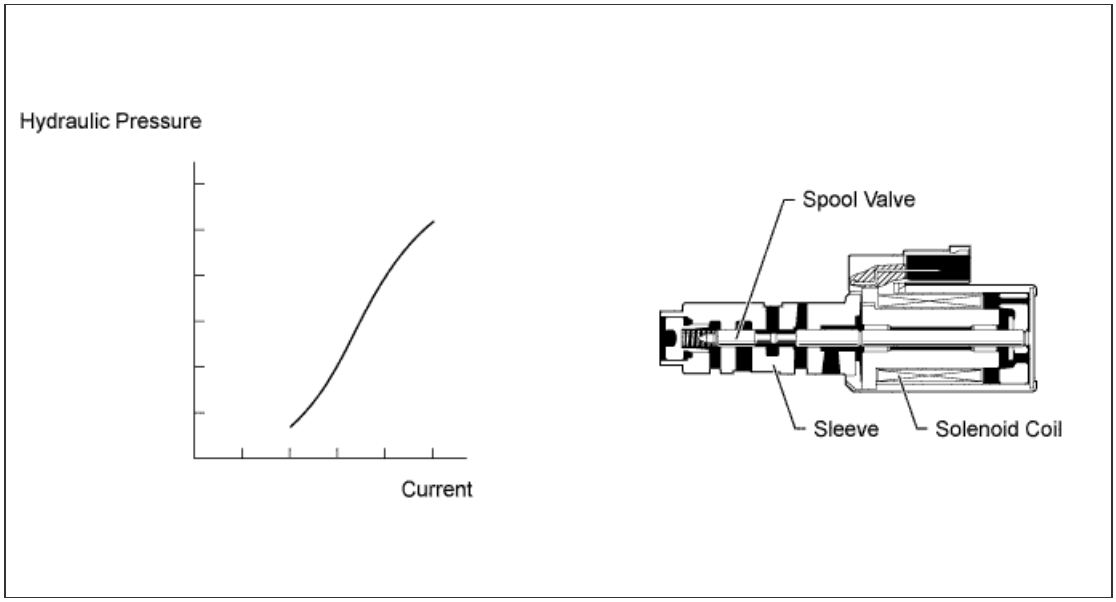
END

DTC P2759 Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)

for Preparation Click here

DESCRIPTION

The amount of current flow to the solenoid is controlled by the ECM. During the lock-up operation, if the current increases, the lock-up hydraulic pressure increases.

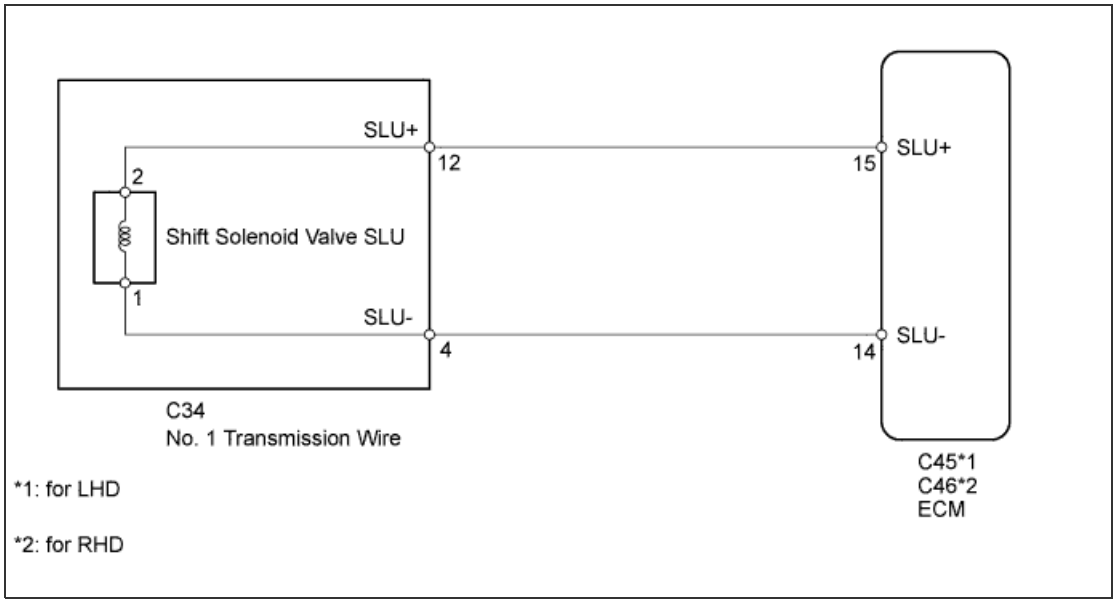


DTC Code	DTC Detection Condition	Trouble Area
P2759	An open or short is detected in the shift solenoid valve SLU circuit for 1 sec. or more while driving (1 trip detection logic).	• Open or short in shift solenoid valve SLU circuit • Shift solenoid valve SLU • ECM

MONITOR DESCRIPTION

When an open or short in the shift solenoid valve SLU circuit is detected, the ECM determines that there is a malfunction. The ECM will illuminate the MIL and store this DTC.

WIRING DIAGRAM

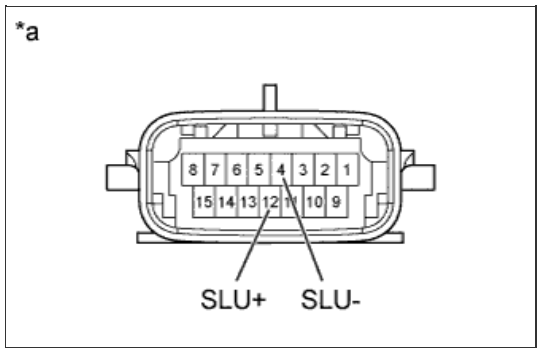


INSPECTION PROCEDURE

1.INSPECT NO. 1 TRANSMISSION WIRE (SHIFT SOLENOID VALVE SLU)

a. Disconnect the No. 1 transmission wire connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
12 (SLU+) - 4 (SLU-)	20°C (68°F)	5.0 to 5.6 Ω
12 (SLU+) - Body ground	Always	10 kΩ or higher
4 (SLU-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Component without harness connected (No. 1 Transmission Wire)

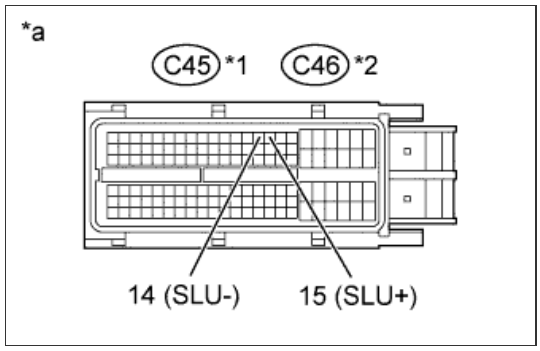
NG → Go to step 3

OK

2.CHECK HARNESS AND CONNECTOR (NO. 1 TRANSMISSION WIRE - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
C45-15 (SLU+) - C45-14 (SLU-)	20°C (68°F)	5.0 to 5.6 Ω
C45-15 (SLU+) - Body ground	Always	10 kΩ or higher
C45-14 (SLU-) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
C46-15 (SLU+) - C46-14 (SLU-)	20°C (68°F)	5.0 to 5.6 Ω
C46-15 (SLU+) - Body ground	Always	10 kΩ or higher
C46-14 (SLU-) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector

	(to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK →

REPLACE ECM (Click here)

3.INSPECT SHIFT SOLENOID VALVE SLU

a. Remove the shift solenoid valve SLU.

b. Measure the resistance according to the value(s) in the table below.

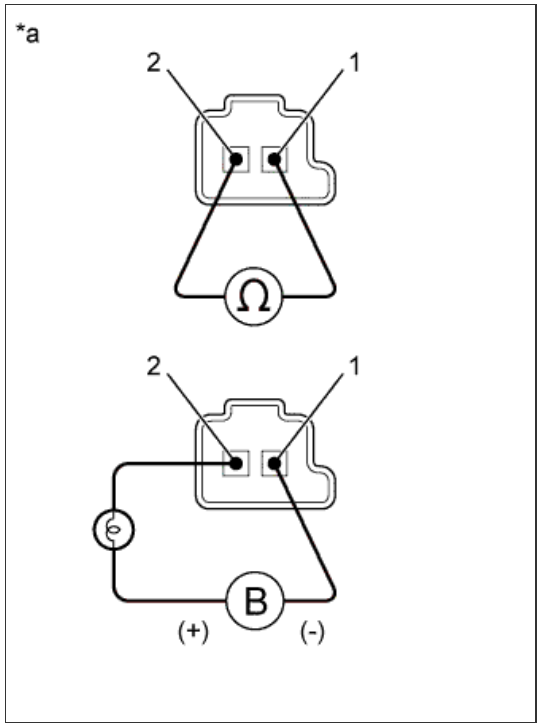
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SLU)

NG → REPLACE SHIFT SOLENOID VALVE SLU (Click here)

OK →

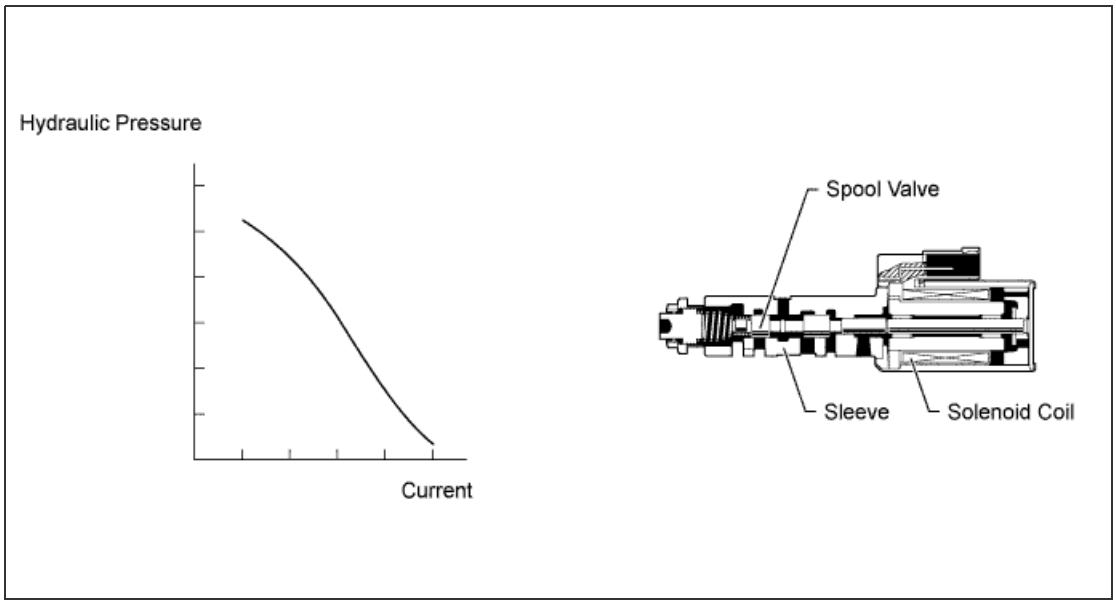
REPAIR OR REPLACE NO. 1 TRANSMISSION WIRE (Click here)

DTC P0894 Transmission Component Slipping

DTC P2714 Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)

for Preparation Click here

DESCRIPTION



The shift solenoid valve SLT controls the transmission line pressure for smooth transmission operation based on signals from the throttle position sensor and the vehicle speed sensor. The ECM adjusts the current of the SLT solenoid valve to control the hydraulic line pressure coming from the primary regulator valve. Appropriate line pressure assures smooth shifting with varying engine outputs.

DTC Code	DTC Detection Condition	Trouble Area
P0894	The ECM detects a malfunction of the SLT, S1, S2, S3, S4, SL2, gear 6 incorrect ratio (sequence valve) or 1-2 shift solenoid valves according to the revolution difference of the turbine and output shaft, and also by the oil pressure (2 trip detection logic).	• Shift solenoid valve SLT remains open or closed • Shift solenoid valve S1, S2, S3, S4 or SL2 remains open or closed • Gear 6 incorrect ratio (sequence valve) or 1-2 shift valve is stuck • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)
P2714	The ECM detects a malfunction of the SLT shift solenoid valve (ON side) according to the revolution difference of the turbine and output shaft, and also by the oil pressure (2 trip detection logic).	• Shift solenoid valve SLT remains open or closed • Shift solenoid valve S1, S2, S3, S4 or SL2 remains open or closed • Gear 6 incorrect ratio (sequence valve) or 1-2 shift valve is stuck • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)

MONITOR DESCRIPTION

The ECM calculates the amount of heat absorbed by the friction material based on the difference in revolution (clutch slippage) between the turbine and output shaft. The ECM illuminates the MIL and stores this DTC when the amount of heat absorption exceeds the specified value.
There are two reasons that make the revolution different.

- When the shift solenoid valve SLT remains on, oil pressure goes down and clutch engagement force decreases.
- When the shift solenoid valve remains on or off, the gear position commanded by the ECM and the actual gear position are not the same.

NOTICE:

If you continue driving under these conditions, the clutch will burn out and the vehicle will no longer be drivable.

INSPECTION PROCEDURE

1.CHECK DTC OUTPUT (IN ADDITION TO DTCS P0894 AND P2714)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
P0894 and/or P2714 is output	A
P0894, P2714 and other DTCs are output	B

HINT:

If any other codes besides P0894 and P2714 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING GTS (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the GTS to the DLC3.

c. Start the engine and warm it up.

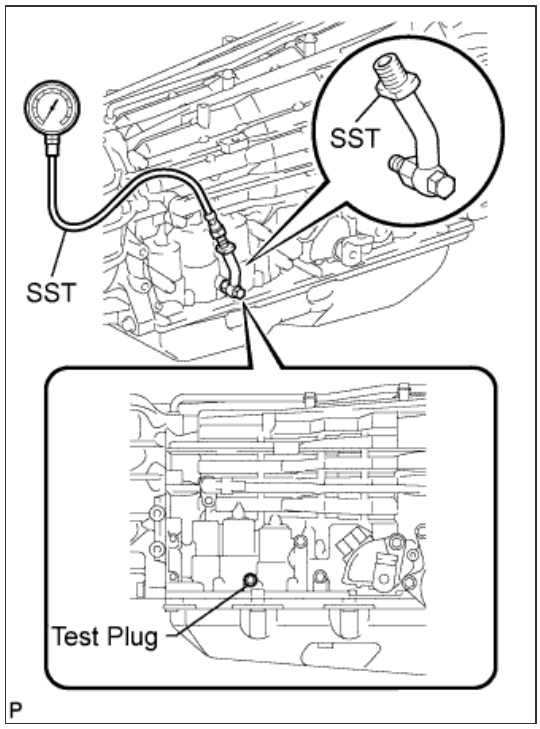
d. Measure the line pressure with SST.

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

h. Measure the line pressure.



Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the	Operate shift solenoid	ON or OFF **HINT:**	[Vehicle Condition] • The vehicle is

Solenoid (SLT)*	valve SLT and raise line pressure	• **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → **Go to step 17**

OK

3.PERFORM ACTIVE TEST USING GTS (RUNNING TEST)

CAUTION:

This test should always be performed with at least 2 people.

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Perform the test with the A/C turned off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Connect the GTS to the DLC3.

b. Clear the DTC (Click here).

c. Warm up the engine.

d. Enter the following menus: Powertrain / Engine and ECT / Active Test.

e. According to the display on the GTS, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the GTS.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the GTS.**

f. Compare the ECM gear shift command and the actual gear position.

OK:

Gear position changes in accordance with the GTS command.

Result

System Condition	ECM Gear Shift Command						Proceed to

			1st	2nd	3rd	4th	5th	6th	
Malfunction	Shift solenoid valve S1	Stuck ON*1	2nd	2nd	3rd	4th	5th	6th	A
		Stuck OFF	1st	1st	3rd	4th	5th	N*2	
	Shift solenoid valve S2	Stuck ON	1st	2nd	2nd	4th	6th	6th	B
		Stuck OFF	3rd	3rd	3rd	4th	5th	5th	
	Shift solenoid valve S3	Stuck ON	1st	2nd	3rd	3rd	N*2	N*2	C
		Stuck OFF	3rd	4th	4th	4th	5th	6th	
	Shift solenoid valve S4	Stuck ON*3	1st	2nd	3rd	4th	5th	6th	D
		Stuck OFF	1st	2nd	3rd	4th	4th	4th	
Normal			1st	2nd	3rd	4th	5th	6th	E

HINT:

- ***1: When shift solenoid valve S1 is stuck ON, the vehicle cannot drive in reverse.**
- ***2: Neutral**
- ***3: When shift solenoid valve S4 is stuck ON, gear shifting is normal.**

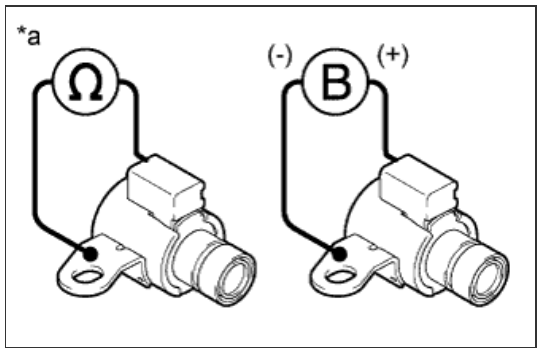
B	Go to step 7
C	Go to step 10
D	Go to step 13
E	Go to step 17

A

4.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected

	(Shift Solenoid Valve S1)

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

5.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

6.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:

The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

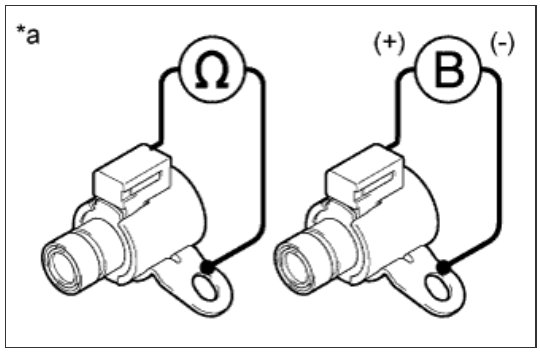
OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

7.INSPECT SHIFT SOLENOID VALVE S2

a. Remove the shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S2)

NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK

8.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

9.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:

The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

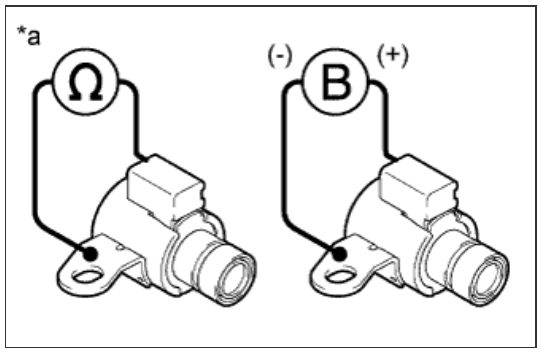
10.INSPECT SHIFT SOLENOID VALVE S3

a. Remove the shift solenoid valve S3.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S3 connector • Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S3)

NG → REPLACE SHIFT SOLENOID VALVE S3 (Click here)

OK

11.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:
There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (**Click here**)

OK

12.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:
The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (**Click here**)

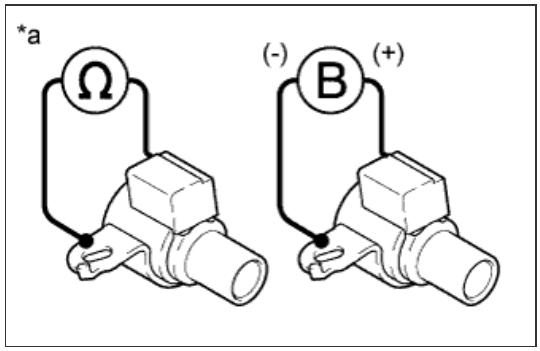
OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (**Click here**)

13.INSPECT SHIFT SOLENOID VALVE S4

a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S4)

NG → REPLACE SHIFT SOLENOID VALVE S4 (**Click here**)

OK

14.INSPECT SHIFT SOLENOID VALVE SL2

a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

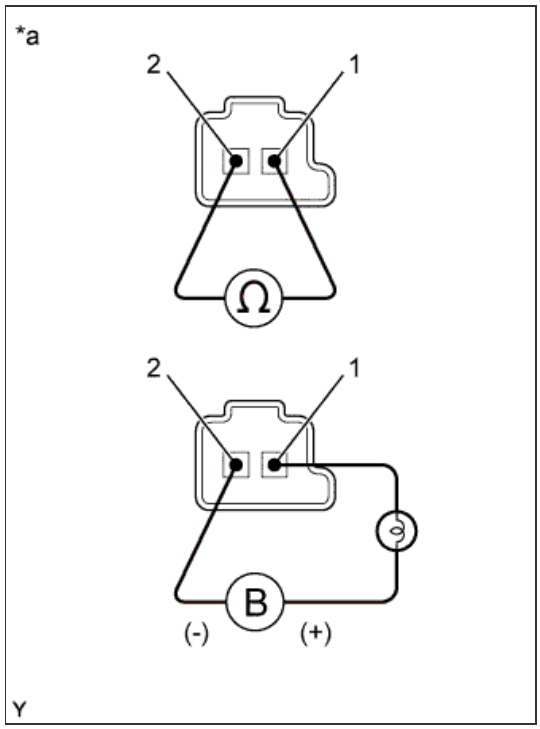
c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SL2)



NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK

15.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:
There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

16.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:
The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

17.INSPECT SHIFT SOLENOID VALVE SLT

a. Remove the shift solenoid valve SLT.

b. Measure the resistance according to the value(s) in the table below.

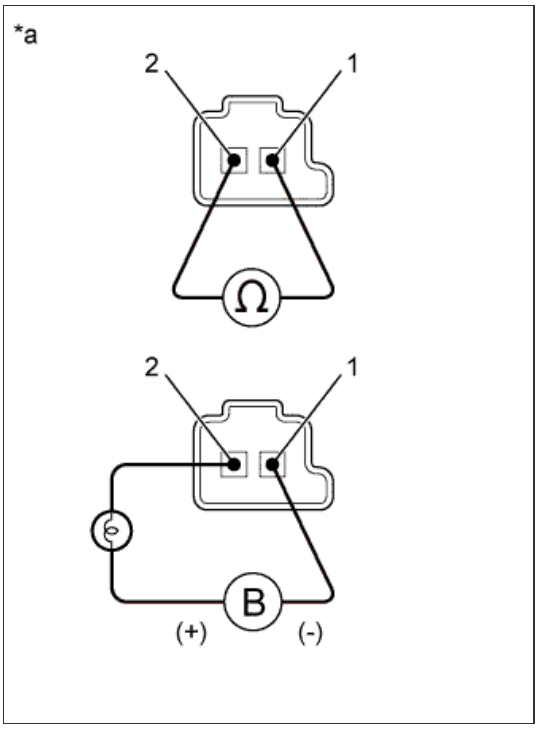
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SLT)

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

18.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

19.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:

The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

DTC P2772 Four Wheel Drive (4WD) Low Switch Circuit Range / Performance

for Preparation Click here

DESCRIPTION

The ECM detects the signal from the transfer L4 position switch.
This DTC indicates that the transfer L4 position switch remains on.

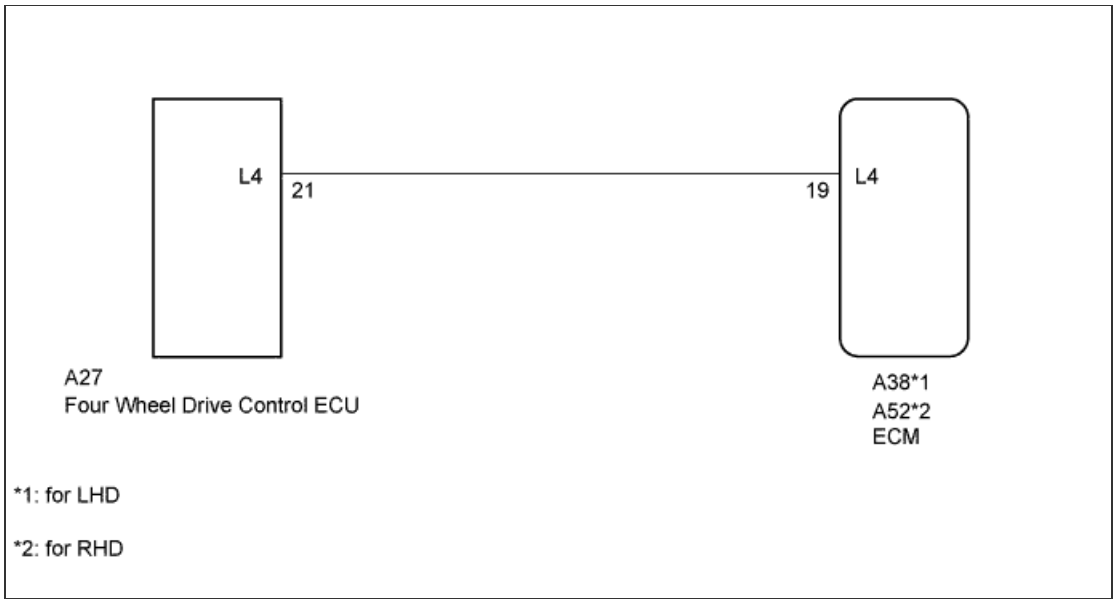
DTC Code	DTC Detection Condition	Trouble Area
P2772	The transfer L4 position switch remains on while the vehicle is running under the following conditions for 1.8 sec. or more (1 trip detection logic). (a) The output shaft speed is between 1000 and 3000 rpm. (b) The transfer position switch is in H4.	• Short in transfer L4 position switch circuit • Four wheel drive control ECU • ECM

MONITOR DESCRIPTION

The ECM monitors the transfer-case L4 position switch to determine when the transfer-case L4 gears are engaged. If the transfer-case L4 gears remain engaged under the following conditions, the ECM will conclude that there is a malfunction of the L4 position switch, illuminate the MIL and store the DTC:

- L4 switch indicated that the L4 transfer-case gears are engaged.
- The transfer-case shifter is in the "H4" position.
- The transfer-case output shaft rpm is between 1000 and 3000 rpm.
- The specified time period has elapsed.

WIRING DIAGRAM



INSPECTION PROCEDURE

1.CHECK HARNESS AND CONNECTOR (FOUR WHEEL DRIVE CONTROL ECU - BODY GROUND)

a. Disconnect the four wheel drive control ECU connector.

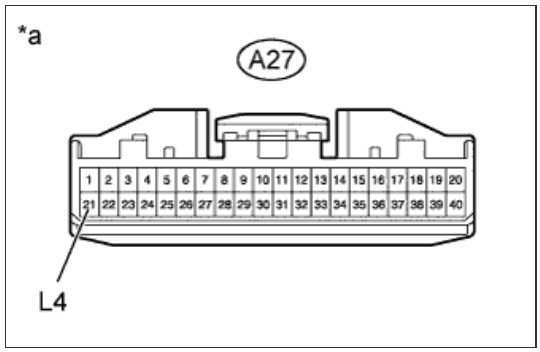
b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
A27-21 (L4) - Body ground	Always	10 kΩ or higher

Text in Illustration

*a	Front view of wire harness connector (to Four Wheel Drive control ECU)



NG → Go to step 2

OK

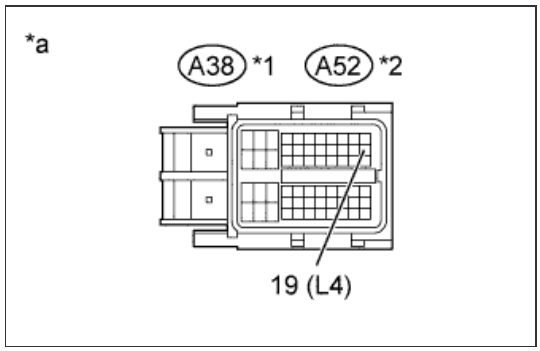
GO TO TRANSFER SYSTEM INSPECTION (Click here)

2.CHECK HARNESS AND CONNECTOR (FOUR WHEEL DRIVE CONTROL ECU - ECM)

a. Disconnect the ECM connector.

b. Disconnect the A27 four wheel drive control ECU connector.

c. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
A38-19 (L4) - Body ground	Always	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
A52-19 (L4) - Body ground	Always	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

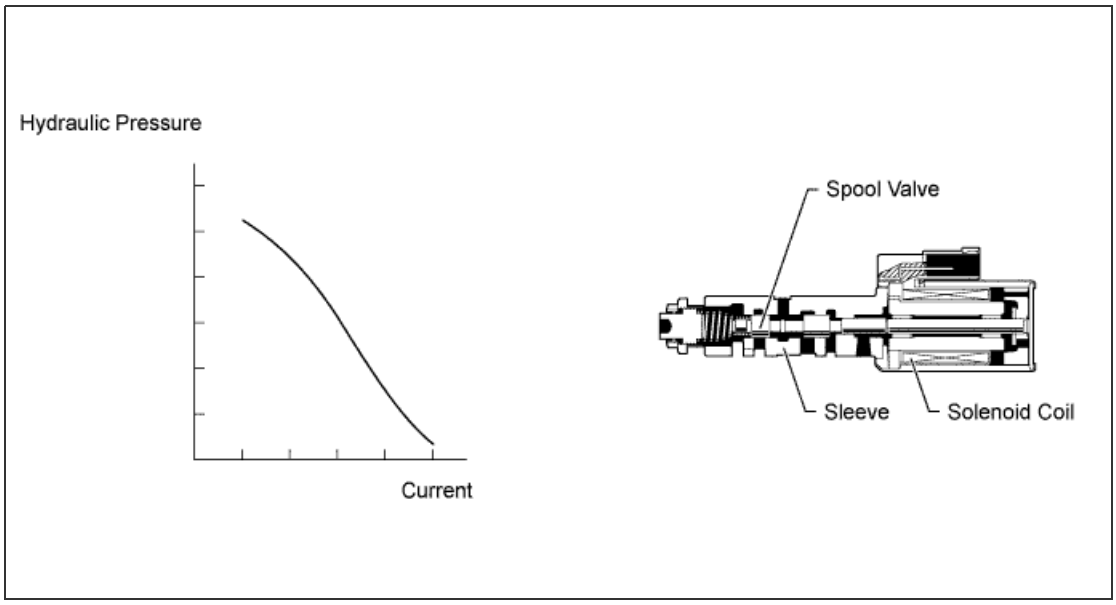
REPLACE ECM (Click here)

DTC P0894 Transmission Component Slipping

DTC P2714 Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)

for Preparation Click here

DESCRIPTION



The shift solenoid valve SLT controls the transmission line pressure for smooth transmission operation based on signals from the throttle position sensor and the vehicle speed sensor. The ECM adjusts the current of the SLT solenoid valve to control the hydraulic line pressure coming from the primary regulator valve. Appropriate line pressure assures smooth shifting with varying engine outputs.

DTC Code	DTC Detection Condition	Trouble Area
P0894	The ECM detects a malfunction of the SLT, S1, S2, S3, S4, SL2, gear 6 incorrect ratio (sequence valve) or 1-2 shift solenoid valves according to the revolution difference of the turbine and output shaft, and also by the oil pressure (2 trip detection logic).	• Shift solenoid valve SLT remains open or closed • Shift solenoid valve S1, S2, S3, S4 or SL2 remains open or closed • Gear 6 incorrect ratio (sequence valve) or 1-2 shift valve is stuck • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)
P2714	The ECM detects a malfunction of the SLT shift solenoid valve (ON side) according to the revolution difference of the turbine and output shaft, and also by the oil pressure (2 trip detection logic).	• Shift solenoid valve SLT remains open or closed • Shift solenoid valve S1, S2, S3, S4 or SL2 remains open or closed • Gear 6 incorrect ratio (sequence valve) or 1-2 shift valve is stuck • Valve body is blocked • Automatic transmission (clutch, brake, gear, etc.)

MONITOR DESCRIPTION

The ECM calculates the amount of heat absorbed by the friction material based on the difference in revolution (clutch slippage) between the turbine and output shaft. The ECM illuminates the MIL and stores this DTC when the amount of heat absorption exceeds the specified value.
There are two reasons that make the revolution different.

- When the shift solenoid valve SLT remains on, oil pressure goes down and clutch engagement force decreases.
- When the shift solenoid valve remains on or off, the gear position commanded by the ECM and the actual gear position are not the same.

NOTICE:

If you continue driving under these conditions, the clutch will burn out and the vehicle will no longer be drivable.

INSPECTION PROCEDURE

1.CHECK DTC OUTPUT (IN ADDITION TO DTCS P0894 AND P2714)

a. Connect the GTS to the DLC3.

b. Turn the engine switch on (IG).

c. Turn the GTS on.

d. Enter the following menus: Powertrain / Engine and ECT / Trouble Codes.

e. Read the DTCs using the GTS.

Result

Result	Proceed to
P0894 and/or P2714 is output	A
P0894, P2714 and other DTCs are output	B

HINT:

If any other codes besides P0894 and P2714 are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART (Click here)

A

2.PERFORM ACTIVE TEST USING GTS (SHIFT SOLENOID VALVE SLT)

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C turned off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Remove the test plug on the transmission case center right side and connect SST.

SST

09992-00095 (09992-00231, 09992-00271)

b. Connect the GTS to the DLC3.

c. Start the engine and warm it up.

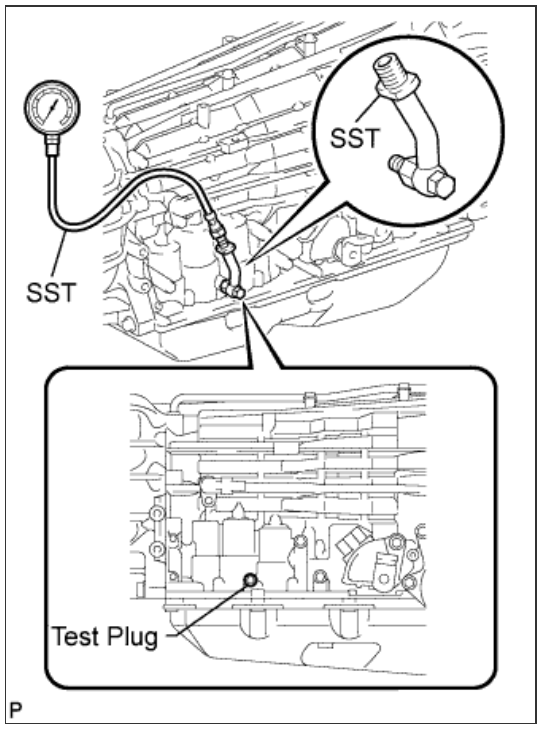
d. Measure the line pressure with SST.

e. Turn the GTS on.

f. Enter the following menus: Powertrain / Engine and ECT / Active Test.

g. According to the display on the GTS, perform the Active Test.

h. Measure the line pressure.



Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Activate the	Operate shift solenoid	ON or OFF **HINT:**	[Vehicle Condition] • The vehicle is

Solenoid (SLT)*	valve SLT and raise line pressure	• **OFF: Line pressure up (when Active Test "Activate the Solenoid (SLT)" is performed, ECM commands shift solenoid valve SLT to turn OFF)** • **ON: No action (normal operation)**	stopped. • The engine is idling.

HINT:

*: Activate the Solenoid (SLT) in the Active Test is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the Hydraulic Test (Click here) as well. Note that the pressure values in the Active Test and hydraulic test are different.

OK:

The line pressure changes as specified when performing the Active Test.

NG → **Go to step 17**

OK

3.PERFORM ACTIVE TEST USING GTS (RUNNING TEST)

CAUTION:

This test should always be performed with at least 2 people.

NOTICE:

- **Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).**
- **Perform the test with the A/C turned off.**

HINT:

Using the GTS to perform Active Tests allows relays, VSVs, actuators and other items to be operated without removing any parts. This non-intrusive functional inspection can be very useful because intermittent operation may be discovered before parts or wiring is disturbed. Performing Active Tests early in troubleshooting is one way to save diagnostic time. Data List information can be displayed while performing Active Tests.

a. Connect the GTS to the DLC3.

b. Clear the DTC (Click here).

c. Warm up the engine.

d. Enter the following menus: Powertrain / Engine and ECT / Active Test.

e. According to the display on the GTS, perform the Active Test.

HINT:

While driving, the shift position can be forcibly changed with the GTS.

Engine and ECT

Tester Display	Test Part	Control Range	Diagnostic Note
Control the Shift Position	Operate shift solenoid valve and set each shift position	• Press "→" button: Shift up • Press "←" button: Shift down	It is possible to check the operation of the shift solenoid valves. [Vehicle Condition] The vehicle speed is 50 km/h (31 mph) or less.

HINT:

- **This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.**
- **The 4th to 5th and 5th to 6th up-shifts must be performed with the accelerator pedal released.**
- **The 6th to 5th and 5th to 4th down-shifts must be performed with the accelerator pedal released.**
- **Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.**
- **The shift position commanded by the ECM is shown in the Data List display on the GTS.**

f. Compare the ECM gear shift command and the actual gear position.

OK:

Gear position changes in accordance with the GTS command.

Result

System Condition	ECM Gear Shift Command						Proceed to

			1st	2nd	3rd	4th	5th	6th	
Malfunction	Shift solenoid valve S1	Stuck ON*1	2nd	2nd	3rd	4th	5th	6th	A
		Stuck OFF	1st	1st	3rd	4th	5th	N*2	
	Shift solenoid valve S2	Stuck ON	1st	2nd	2nd	4th	6th	6th	B
		Stuck OFF	3rd	3rd	3rd	4th	5th	5th	
	Shift solenoid valve S3	Stuck ON	1st	2nd	3rd	3rd	N*2	N*2	C
		Stuck OFF	3rd	4th	4th	4th	5th	6th	
	Shift solenoid valve S4	Stuck ON*3	1st	2nd	3rd	4th	5th	6th	D
		Stuck OFF	1st	2nd	3rd	4th	4th	4th	
Normal			1st	2nd	3rd	4th	5th	6th	E

HINT:

- ***1: When shift solenoid valve S1 is stuck ON, the vehicle cannot drive in reverse.**
- ***2: Neutral**
- ***3: When shift solenoid valve S4 is stuck ON, gear shifting is normal.**

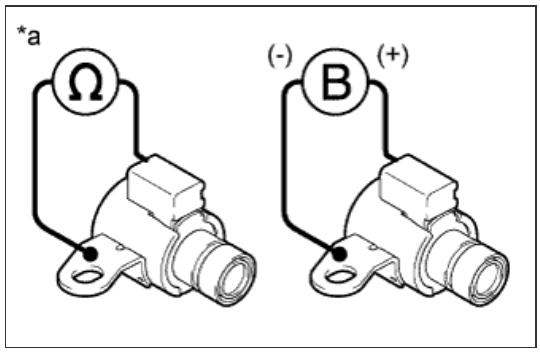
B	Go to step 7
C	Go to step 10
D	Go to step 13
E	Go to step 17

A

4.INSPECT SHIFT SOLENOID VALVE S1

a. Remove the shift solenoid valve S1.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected

	(Shift Solenoid Valve S1)

NG → REPLACE SHIFT SOLENOID VALVE S1 (Click here)

OK

5.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

6.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:

The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

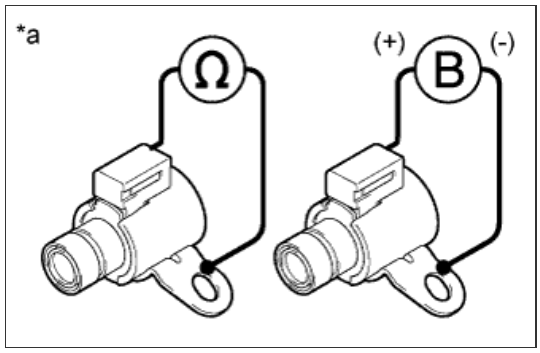
OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

7.INSPECT SHIFT SOLENOID VALVE S2

a. Remove the shift solenoid valve S2.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S2)

NG → REPLACE SHIFT SOLENOID VALVE S2 (Click here)

OK

8.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

9.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:

The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

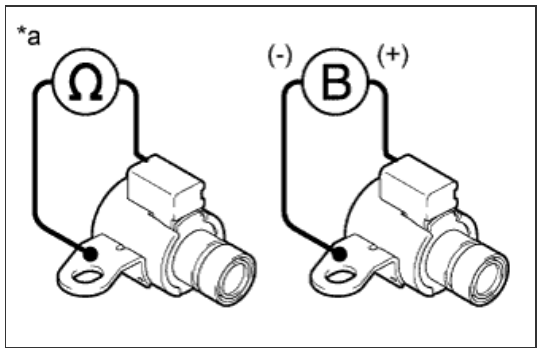
10.INSPECT SHIFT SOLENOID VALVE S3

a. Remove the shift solenoid valve S3.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω



c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S3 connector • Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S3)

NG → REPLACE SHIFT SOLENOID VALVE S3 (Click here)

OK

11.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:
There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (**Click here**)

OK

12.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:
The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (**Click here**)

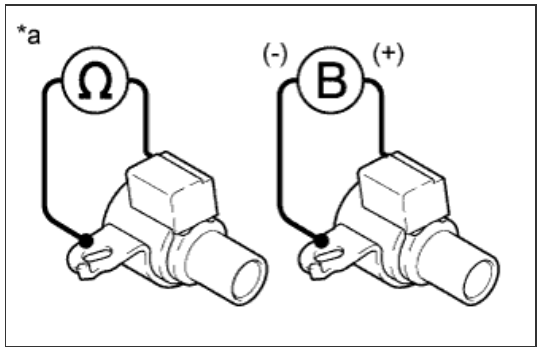
OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (**Click here**)

13.INSPECT SHIFT SOLENOID VALVE S4

a. Remove the shift solenoid valve S4.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve S4)

NG → REPLACE SHIFT SOLENOID VALVE S4 (**Click here**)

OK

14.INSPECT SHIFT SOLENOID VALVE SL2

a. Remove the shift solenoid valve SL2.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

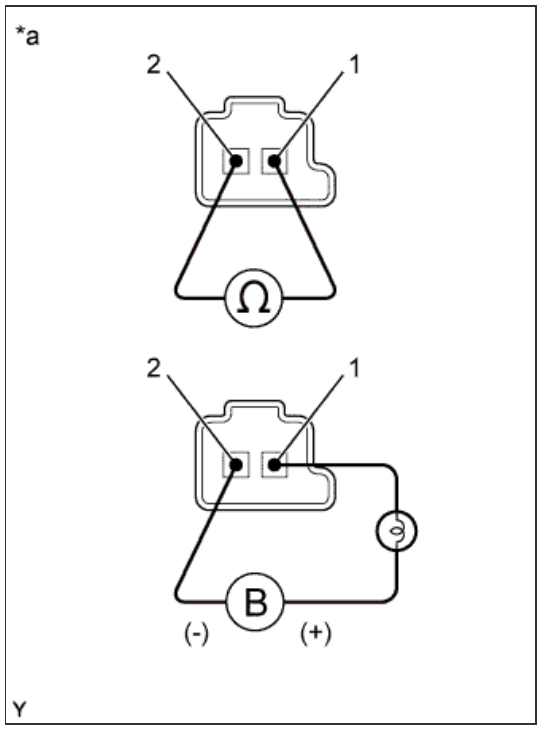
c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SL2)



NG → REPLACE SHIFT SOLENOID VALVE SL2 (Click here)

OK

15.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:
There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

16.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:
The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

17.INSPECT SHIFT SOLENOID VALVE SLT

a. Remove the shift solenoid valve SLT.

b. Measure the resistance according to the value(s) in the table below.

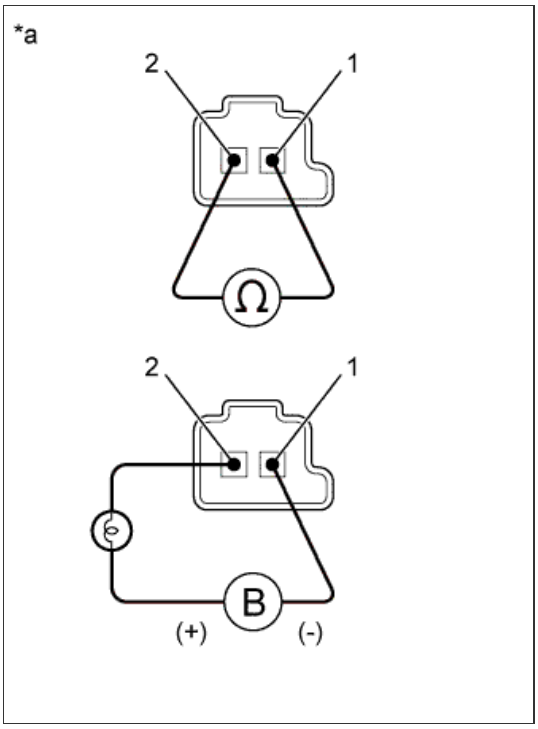
Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

c. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise



Text in Illustration

*a	Component without harness connected (Shift Solenoid Valve SLT)

NG → REPLACE SHIFT SOLENOID VALVE SLT (Click here)

OK

18.INSPECT TRANSMISSION VALVE BODY ASSEMBLY

a. Check the transmission valve body assembly (Click here).

OK:

There are no foreign objects on any valve.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (Click here)

OK

19.INSPECT TORQUE CONVERTER ASSEMBLY

a. Check the torque converter assembly (Click here).

OK:

The torque converter assembly operates normally.

NG → REPLACE TORQUE CONVERTER ASSEMBLY (Click here)

OK

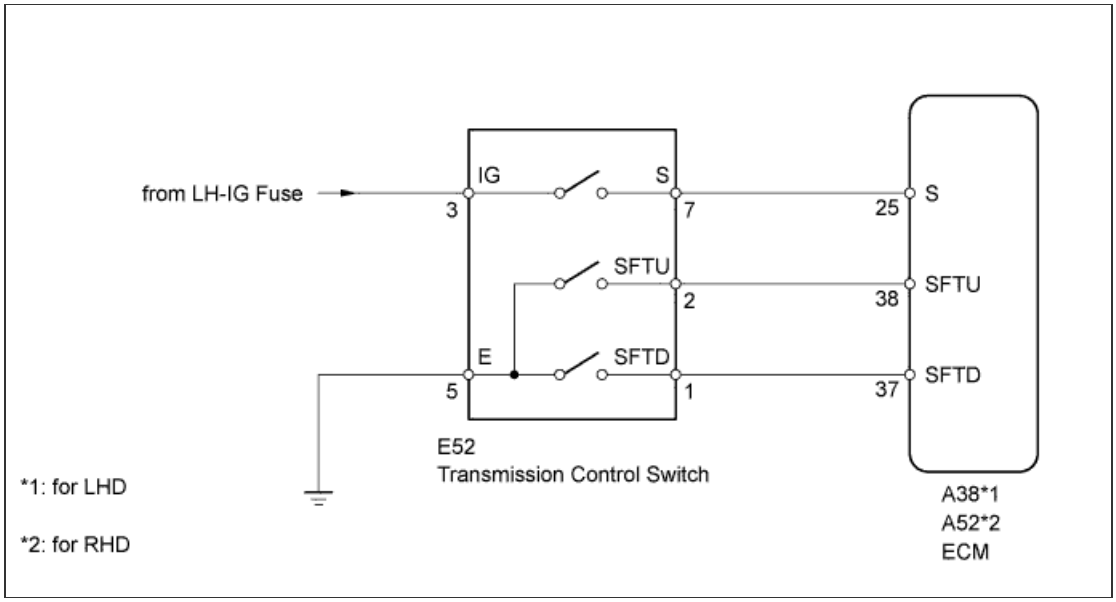
REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (Click here)

for Preparation Click here

DESCRIPTION

When moving the shift lever to S using the transmission control switch, it is possible to switch the shift range between "1" (1st range) and "6" (6th range). Shifting to "+" once raises the shift range by one, and shifting to "-" lowers the shift range by one.

WIRING DIAGRAM

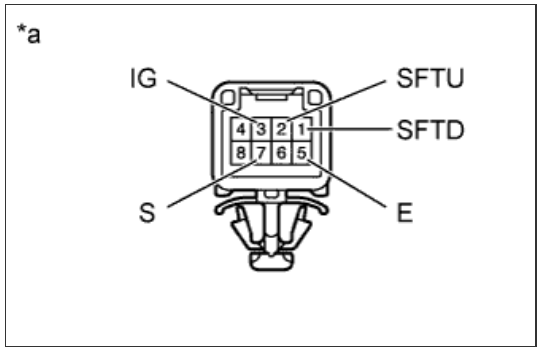


INSPECTION PROCEDURE

1.INSPECT TRANSMISSION CONTROL SWITCH

a. Disconnect the transmission control switch connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
3 (IG) - 7 (S)	Shift lever in S, "+" or "-"	Below 1 Ω
2 (SFTU) - 5 (E)	Shift lever held in "+" (Up-shift)	Below 1 Ω
1 (SFTD) - 5 (E)	Shift lever held in "-" (Down-shift)	Below 1 Ω
3 (IG) - 7 (S)	Shift lever not in S, "+" or "-"	10 kΩ or higher
2 (SFTU) - 5 (E)	Shift lever in S	10 kΩ or higher
1 (SFTD) - 5 (E)	Shift lever in S	10 kΩ or higher

Text in Illustration

*a	Component without harness connected (Transmission Control Switch)

NG → REPLACE TRANSMISSION CONTROL SWITCH (LOWER SHIFT LEVER ASSEMBLY) (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL SWITCH - BATTERY, BODY GROUND)

a. Disconnect the transmission control switch connector.

b. Measure the voltage according to the value(s) in the table below.

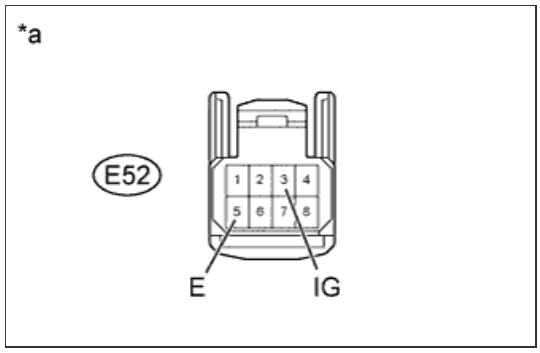
Standard Voltage:

Tester Connection	Switch Condition	Specified Condition
E52-3 (IG) - Body ground	Engine switch on (IG)	11 to 14 V
E52-3 (IG) - Body ground	Engine switch off	Below 1 V

c. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
E52-5 (E) - Body ground	Always	Below 1 Ω



Text in Illustration

*a	Front view of wire harness connector (to Transmission Control Switch)

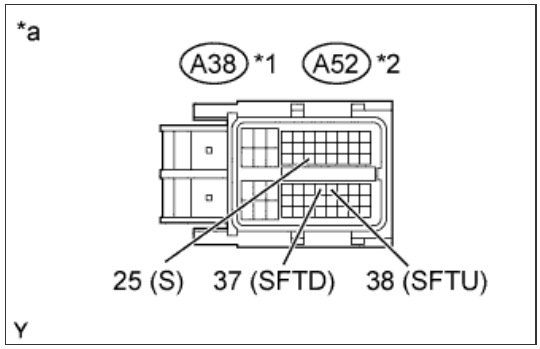
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3.CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL SWITCH - ECM)

a. Disconnect the ECM connector.

b. Measure the voltage according to the value(s) in the table below.



Standard Voltage:

for LHD

Tester Connection	Condition	Specified Condition
A38-25 (S) - Body ground	• Engine switch on (IG) • Shift lever in S, "+" or "-"	11 to 14 V
A38-25 (S) - Body ground	• Engine switch on (IG) • Shift lever not in S, "+" or "-"	Below 1 V

for RHD

Tester Connection	Condition	Specified Condition

A52-25 (S) - Body ground	• Engine switch on (IG) • Shift lever in S, "+" or "-"	11 to 14 V
A52-25 (S) - Body ground	• Engine switch on (IG) • Shift lever not in S, "+" or "-"	Below 1 V

c. Turn the engine switch off.

d. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

for LHD

Tester Connection	Condition	Specified Condition
A38-38 (SFTU) - Body ground	Shift lever held in "+" (Up-shift)	Below 1 Ω
A38-37 (SFTD) - Body ground	Shift lever held in "-" (Down-shift)	Below 1 Ω
A38-38 (SFTU) - Body ground	Shift lever in S	10 kΩ or higher
A38-37 (SFTD) - Body ground	Shift lever in S	10 kΩ or higher

for RHD

Tester Connection	Condition	Specified Condition
A52-38 (SFTU) - Body ground	Shift lever held in "+" (Up-shift)	Below 1 Ω
A52-37 (SFTD) - Body ground	Shift lever held in "-" (Down-shift)	Below 1 Ω
A52-38 (SFTU) - Body ground	Shift lever in S	10 kΩ or higher
A52-37 (SFTD) - Body ground	Shift lever in S	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

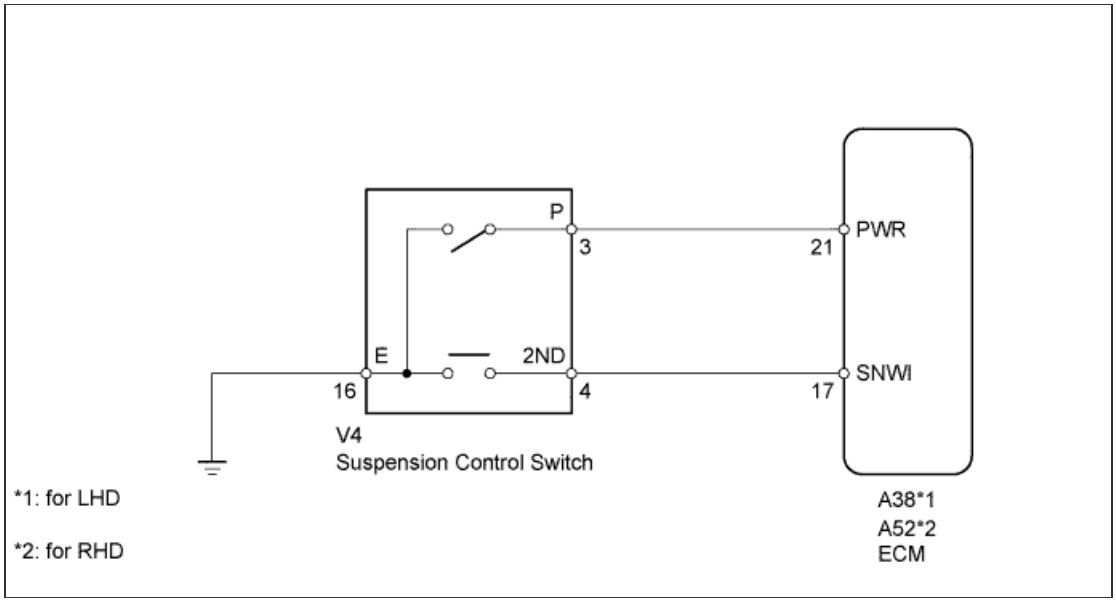
PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (Click here)

for Preparation Click here

DESCRIPTION

The ECM memory contains the programs for the normal and power shift patterns and lock-up pattern.
By following the programs corresponding to the signals from the pattern select switch, the park/neutral position switch and other various sensors, the ECM switches the solenoid valves on and off, and controls the transmission gear change and the lock-up clutch operation.

WIRING DIAGRAM



INSPECTION PROCEDURE

When the pattern select (PWR) switch is pushed, switch contact is made and power mode is selected. To cancel power mode, push the pattern select (PWR) switch once again.

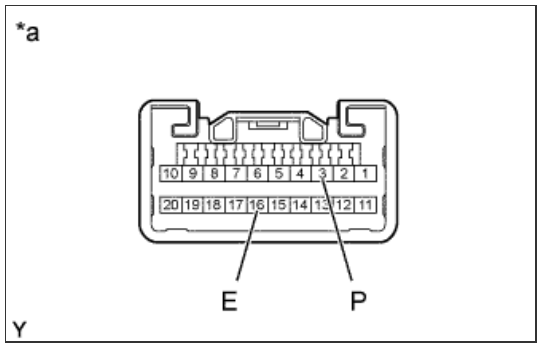
1.INSPECT PATTERN SELECT (PWR) SWITCH

a. Remove the suspension control switch (Click here).

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
3 (P) - 16 (E)	Pattern select (PWR) switch on	Below 1 Ω
3 (P) - 16 (E)	Pattern select (PWR) switch off	10 kΩ or higher



Text in Illustration

*a	Component without harness connected (Suspension Control Switch)

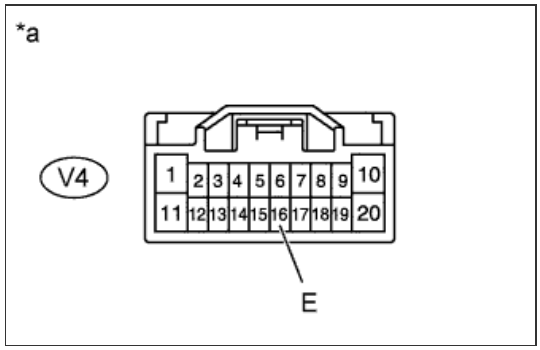
NG → REPLACE PATTERN SELECT (PWR) SWITCH (SUSPENSION CONTROL SWITCH) (Click here)

OK

2.CHECK HARNESS AND CONNECTOR (PATTERN SELECT (PWR) SWITCH - BODY GROUND)

a. Disconnect the suspension control switch connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
V4-16 (E) - Body ground	Always	Below 1 Ω

Text in Illustration

*a	Front view of wire harness connector (to Suspension Control Switch)

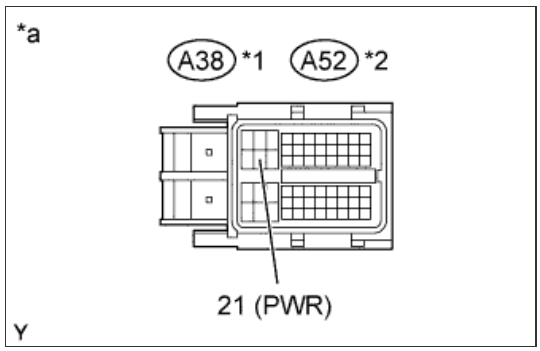
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

3.CHECK HARNESS AND CONNECTOR (PATTERN SELECT (PWR) SWITCH - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Switch Condition	Specified Condition
A38-21 (PWR) - Body ground	Pattern select (PWR) switch on	Below 1 Ω
A38-21 (PWR) - Body ground	Pattern select (PWR) switch off	10 kΩ or higher

for RHD

Tester Connection	Switch Condition	Specified Condition
A52-21 (PWR) - Body ground	Pattern select (PWR) switch on	Below 1 Ω
A52-21 (PWR) - Body ground	Pattern select (PWR) switch off	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (Click here)

for Preparation Click here

DESCRIPTION

When 2nd mode is selected with the pattern select (2ND) switch, the ECM controls the solenoid valves and the transmission starts from 2nd gear. The 2nd mode is the system that operates the throttle motor to control engine output to reduce skidding of the driving wheels, and guarantee takeoff acceleration, driving straightness and turning stability.
When the shift lever is in D, the transmission automatically shifts up through 3rd to 6th as usual.

WIRING DIAGRAM

Refer to Pattern Select Switch Power Mode Circuit (Click here).

INSPECTION PROCEDURE

When the pattern select (2ND) switch is pushed, switch contact is made and 2nd mode is selected. To cancel 2nd mode, push the pattern select (2ND) switch once again.

HINT:

2nd mode is automatically canceled when the engine switch is turned off.

1.DRIVING TEST

HINT:

The driving test should be performed on a paved road (nonskid road).

a. Start the engine.

b. Turn the 2ND switch off (normal drive mode).

c. Confirm vehicle response by driving from a parked position to fully depressing the accelerator pedal.

d. Turn the 2ND switch on and perform the same check as above.
When driving the vehicle with the 2ND switch on and off, check that there is a difference in acceleration.

OK:
There is a difference in acceleration.

NG → Go to step 2

OK →

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (Click here)

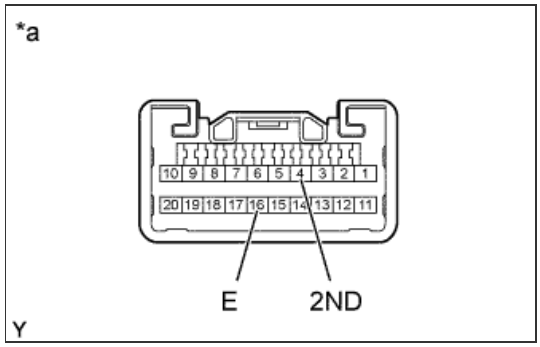
2.INSPECT PATTERN SELECT (2ND) SWITCH

a. Remove the suspension control switch (Click here).

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
4 (2ND) - 16 (E)	Pattern select (2ND) switch continuously pressed	Below 1 Ω
4 (2ND) - 16 (E)	Pattern select (2ND) switch released	10 kΩ or higher



Text in Illustration

*a	Component without harness connected (Suspension Control Switch)

NG → REPLACE PATTERN SELECT (2ND) SWITCH (SUSPENSION CONTROL SWITCH) (Click here)

OK

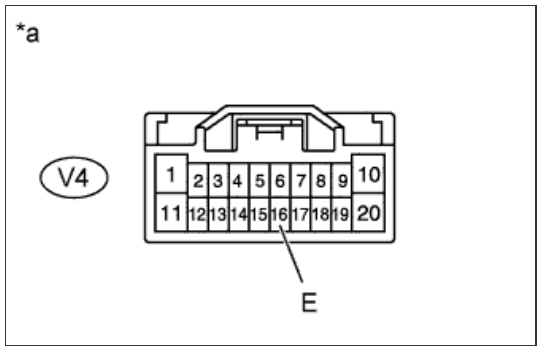
3.CHECK HARNESS AND CONNECTOR (PATTERN SELECT (2ND) SWITCH - BODY GROUND)

a. Disconnect the suspension control switch connector.

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
V4-16 (E) - Body ground	Always	Below 1 Ω



Text in Illustration

*a	Front view of wire harness connector (to Suspension Control Switch)

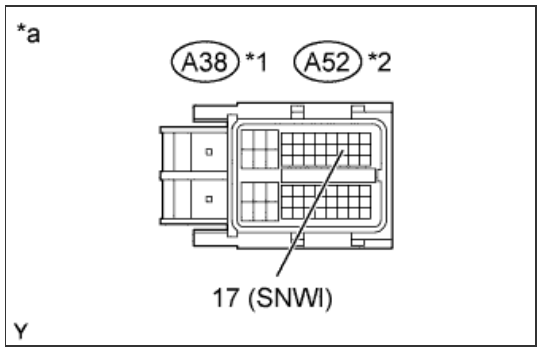
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

4.CHECK HARNESS AND CONNECTOR (PATTERN SELECT (2ND) SWITCH - ECM)

a. Disconnect the ECM connector.

b. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

for LHD

Tester Connection	Switch Condition	Specified Condition
A38-17 (SNWI) - Body ground	Pattern select (2ND) switch continuously pressed	Below 1 Ω
A38-17 (SNWI) - Body ground	Pattern select (2ND) switch released	10 kΩ or higher

for RHD

Tester Connection	Switch Condition	Specified Condition
A52-17 (SNWI) - Body ground	Pattern select (2ND) switch continuously pressed	Below 1 Ω
A52-17 (SNWI) - Body ground	Pattern select (2ND) switch released	10 kΩ or higher

Text in Illustration

*1	for LHD
*2	for RHD
*a	Front view of wire harness connector (to ECM)

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE (Click here)

for Preparation Click here

NOTICE:

- **This transmission requires Toyota Genuine ATF WS.**
- **After servicing the transmission, you must follow the ATF adjustment procedure.**
- **Maintain the vehicle in a horizontal position while adjusting the fluid level.**

1. PRELIMINARY PROCEDURES (w/ ATF Warmer)

a. Using compressed air or equivalent, blow dust off the thermostat cap to clean it.

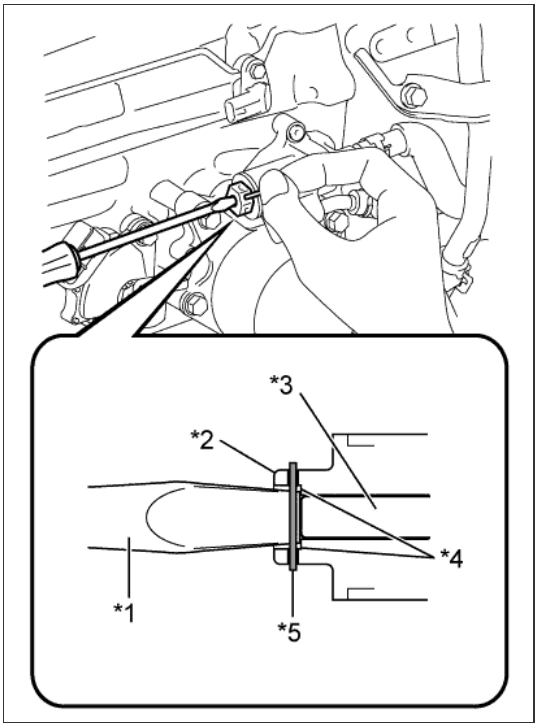
b. Using a screwdriver, push in the shaft of the thermostat.

Text in Illustration

*1	Screwdriver
*2	Cap
*3	Shaft
*4	Step
*5	Pin

HINT:

- **Pushed amount: 5.5 to 7.0 mm (0.217 to 0.276 in.)**
- **Push in the shaft until the screwdriver contacts the step inside the cap.**



c. With the shaft of the thermostat pressed, insert a pin into a hole on the side of the thermostat cap. Insert the pin until it passes through the hole on the other side of the thermostat cap to fix the shaft in place.

HINT:

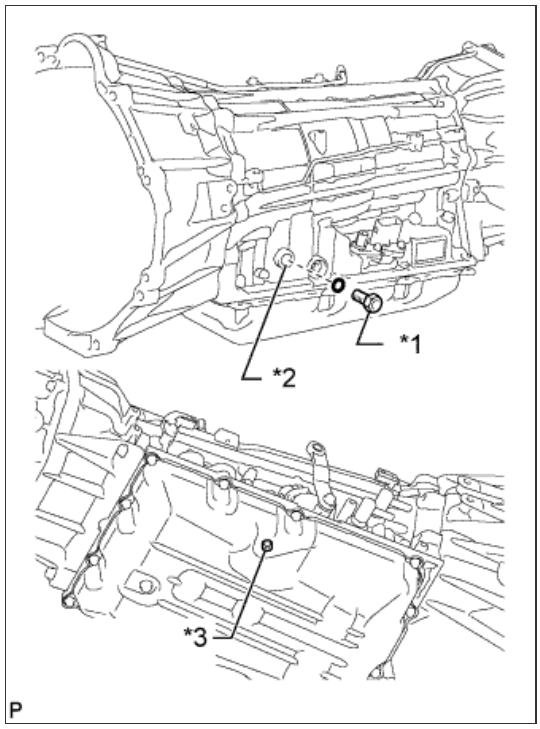
Pin diameter: 1.0 to 1.8 mm (0.0394 to 0.0709 in.)

2. BEFORE FILLING TRANSMISSION

- This transmission requires Toyota Genuine ATF WS transmission fluid.
- After servicing the transmission, you must refill the transmission with the correct amount of fluid.
- Keep the vehicle level while adjusting the fluid level.
- Proceed to the "Transmission Pan Fill" procedures if you replaced the entire transmission, transmission pan, drain plug, valve body and/or torque converter.
- Proceed to the "Transmission Fill" procedures after removing the refill plug if you replaced the transmission hose and/or output shaft oil seal.

Text in Illustration

*1	Refill Plug
*2	Refill Hole
*3	Overflow Plug

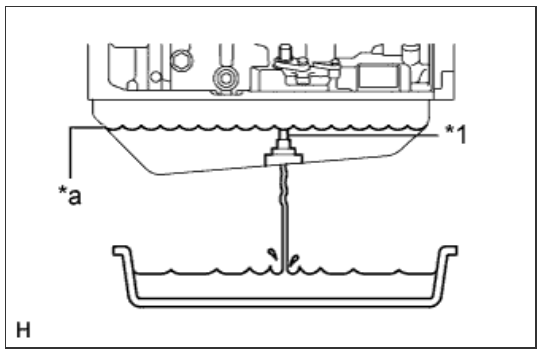


3. TRANSMISSION PAN FILL

a. Remove the refill plug and overflow plug.

b. Fill the transmission through the refill hole until fluid begins to trickle out of the overflow tube.

c. Reinstall the overflow plug.



Text in Illustration

*1	Overflow Tube
*a	Specified Fluid Level

4. TRANSMISSION FILL

a. Fill the transmission with the amount of fluid listed in the table below.

Standard Capacity:

Repair	Fill Amount
Transmission pan and drain plug removal	2.1 liters (2.2 US qts, 1.9 Imp. qts)
Transmission valve body removal	4.7 liters (5.0 US qts, 4.1 Imp. qts)
Torque converter removal	6.1 liters (6.4 US qts, 5.4 Imp. qts)

b. Reinstall the refill plug to prevent the fluid from splashing.

HINT:

If you cannot add the listed amount of fluid, do the following:

i. Install the refill plug.

ii. Allow the engine to idle with the air conditioning OFF.

iii. Move the shift lever through the entire gear range to circulate fluid.

iv. Wait for 30 seconds with the engine idling.

v. Stop the engine.

vi. Remove the refill plug and add fluid.

vii. Reinstall the refill plug.

5. ADJUST FLUID TEMPERATURE

NOTICE:

The fluid temperature can be confirmed by checking the indicator light in the meter or by using the GTS. When using the GTS, it is necessary to change to temperature detection mode in order to idle the vehicle appropriately.

a. When using the GTS:

i. Turn the ignition switch off.

ii. Connect the GTS to the DLC3.

iii. Turn the ignition switch to ON.

iv. Enter the following menus: Powertrain / Engine and ECT / Active Test / Connect the TC and TE1.

v. Enter the following menus: Powertrain / Engine and ECT / Data List / A/T Oil Temperature 1.

vi. for 1VD-FTV:
Check the ATF temperature.

NOTICE:

- **The ATF temperature must be between 41 to 46°C (106 to 115°F).**
- **If the ATF temperature is not between 41 to 46°C (106 to 115°F), turn the ignition switch off and wait until the fluid temperature drops between 41 to 46°C (106 to 115°F).**

vii. for 1UR-FE, 3UR-FE:
Check the ATF temperature.

NOTICE:

- **The ATF temperature must be between 43 to 48°C (109 to 118°F).**
- **If the ATF temperature is not between 43 to 48°C (109 to 118°F), turn the ignition switch off and wait until the fluid temperature drops between 43 to 48°C (109 to 118°F).**

viii. for 1VD-FTV:
According to the display on the GTS, perform the Active Test "Connect the TC and TE1".

ix. for 1UR-FE, 3UR-FE:
According to the display on the GTS, perform the Active Test "Connect the TC and TE1".

HINT:

Indicator lights of the combination meter blink to output DTCs when TC and TE1 are connected.

x. Start the engine.

NOTICE:

Check that electrical systems such as the air conditioning system, audio system and lighting system are off.

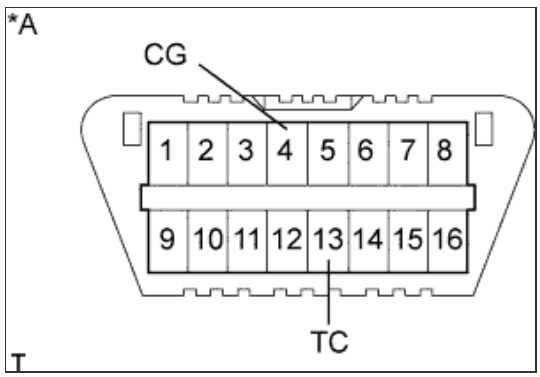
b. When not using the GTS:

i. Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3.

SST
09843-18040

Text in Illustration

*A	Front View of DLC3



ii. Start the engine.

NOTICE:

Check that electrical systems such as the air conditioning system, audio system and lighting system are off.

HINT:

Indicator lights of the meter blink to output DTCs when terminals TC and CG are connected.

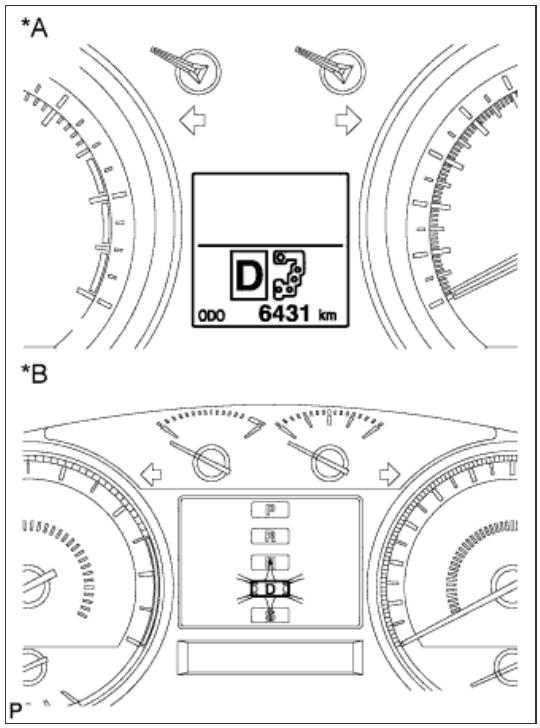
c. Slowly move the shift lever from P to S, then change the gears from 1st to 6th. Then return the shift lever to P.

HINT:

Slowly move the shift lever to circulate the fluid through each part of the transmission.

d. Move the shift lever to D, and quickly move back and forth between N and D (once within 1.5 seconds) for at least 6 seconds. This will activate the fluid temperature detection mode.

Standard condition:
Indicator light (D) remains illuminated for 2 seconds and then turns off.



Text in Illustration

*A	w/ Multi-information Display
*B	w/o Multi-information Display

e. When using the GTS:

i. Return the shift lever to P and press OFF on the Active Test display.

f. When not using the GTS:

i. Return the shift lever to P and disconnect terminals 13 (TC) and 4 (CG).

g. for 1VD-FTV:
Allow the engine to idle until the fluid temperature reaches 41 to 46°C (106 to 115°F).

h. for 1UR-FE, 3UR-FE:
Allow the engine to idle until the fluid temperature reaches 43 to 48°C (109 to 118°F).

i. for 1VD-FTV:
The indicator (D) will come on again when the fluid temperature reaches 41°C (106°F) and will blink when it exceeds 46°C (115°F).

Indicator Indication of ATF Temperature :

Below Proper Temperature	Proper Temperature	Higher than Proper Temperature
Data List [A/T Oil Temperature 1] 41°C (106°F) or less	Data List [A/T Oil Temperature 1] 41 to 46°C (106 to 115°F)	Data List [A/T Oil Temperature 1] 46°C (115°F) or higher
Indicator light (D) Turns off	Indicator light (D) Turns on	Indicator light (D) Blinking

NOTICE:

Perform the fluid level inspection while the indicator light is on.

j. for 1UR-FE, 3UR-FE:
The indicator (D) will come on again when the fluid temperature reaches 43°C (109°F) and will blink when it exceeds 48°C (118°F).

Indicator Indication of ATF Temperature :

Below Proper Temperature	Proper Temperature	Higher than Proper Temperature
Data List [A/T Oil Temperature 1] 43°C (109°F) or less	Data List [A/T Oil Temperature 1] 43 to 48°C (109 to 118°F)	Data List [A/T Oil Temperature 1] 48°C (118°F) or higher
Indicator light (D) Turns off	Indicator light (D) Turns on	Indicator light (D) Blinking

NOTICE:

Perform the fluid level inspection while the indicator light is on.

6. FLUID LEVEL CHECK

NOTICE:

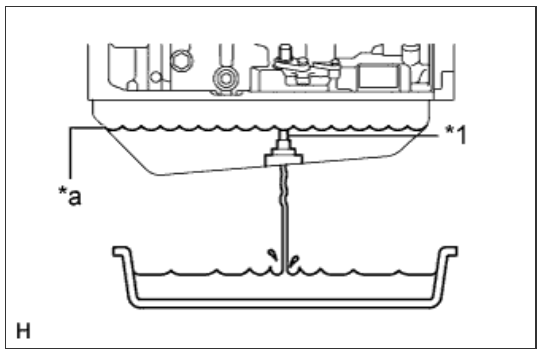
- **for 1VD-FTV:**
  The fluid temperature must be between 41 and 46°C (106 and 115°F) to accurately check the fluid level.
- **for 1UR-FE, 3UR-FE:**
  The fluid temperature must be between 43 and 48°C (109 and 118°F) to accurately check the fluid level.

a. Remove the overflow plug with the engine idling.

b. Check that fluid comes out of the overflow tube.
If fluid does not come out, proceed to the "Transmission Refill" procedures.
If fluid comes out, wait until the overflow slows to a trickle and proceed to the "Complete" procedures.

Text in Illustration

*1	Overflow Tube
*a	Specified Fluid Level



7. TRANSMISSION REFILL

a. Remove the overflow plug.

b. Remove the refill plug and gasket.

c. Add ATF into the refill hole until ATF flows from the overflow tube.

d. Wait until the overflow slows to a trickle and proceed to the "Complete" procedures.

8. COMPLETE

a. Install a new gasket and the overflow plug.

Torque:
20 N*m{ 204 kgf*cm , 15 ft.*lbf }

b. Stop the engine.

c. Install a new gasket and the refill plug.

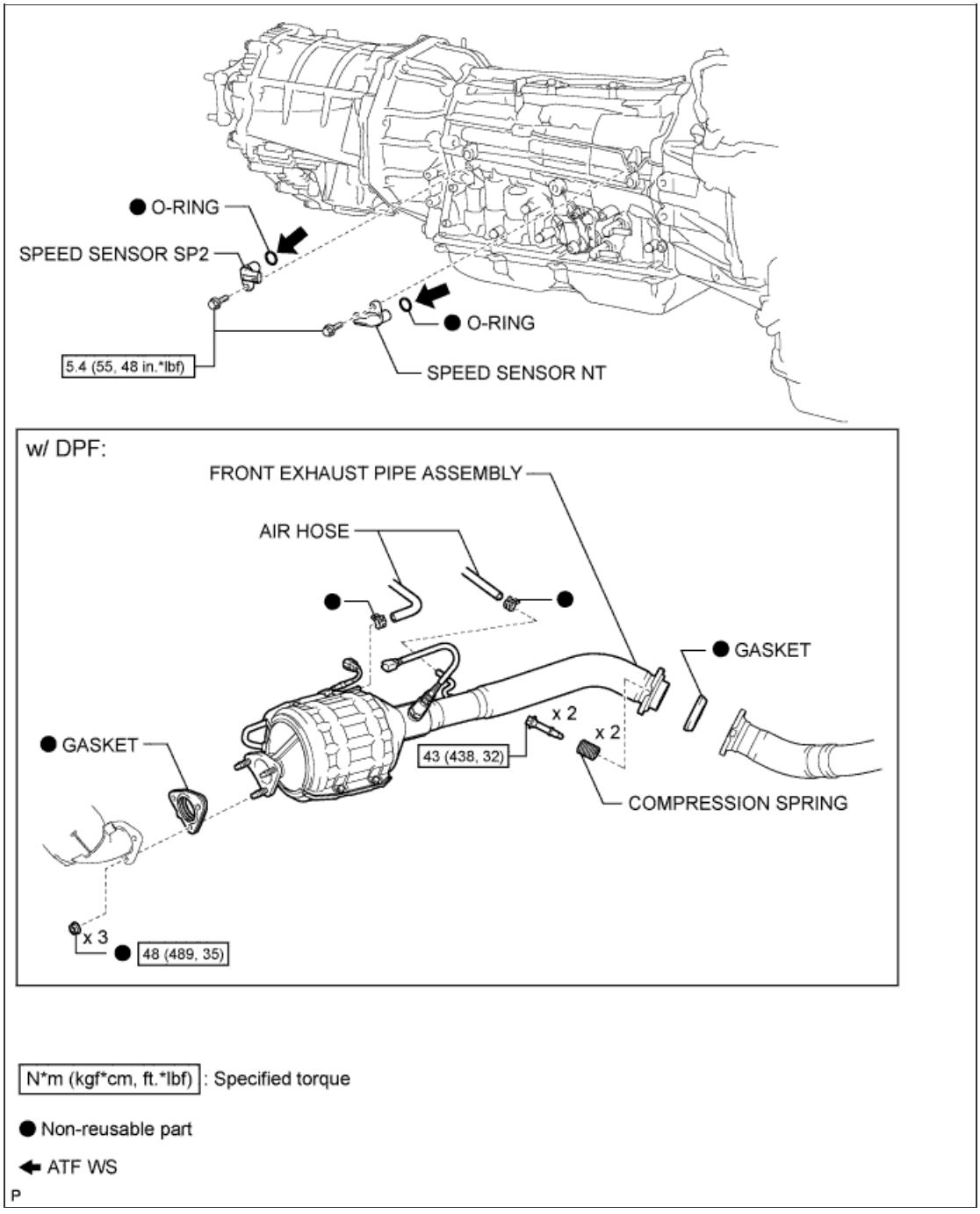
Torque:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }

9. ATF THERMAL DEGRADATION ESTIMATE RESET (for 3UR-FE)

HINT:

Approximately 50% or more of the ATF has been replaced during a repair of the transmission or a similar operation (Click here)

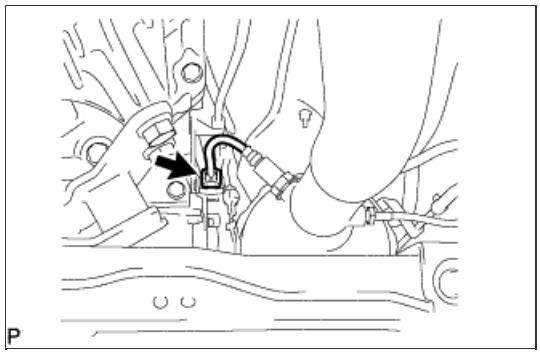
for Preparation Click here



for Preparation Click here

1. REMOVE FRONT EXHAUST PIPE ASSEMBLY (w/ DPF)

a. Disconnect the air fuel ratio sensor connector.



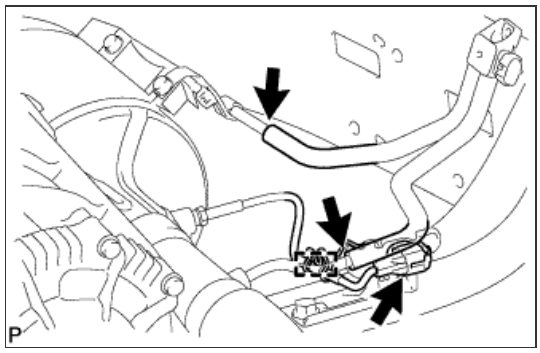
b. Disconnect the 2 air hoses.

c. Disconnect the exhaust gas temperature sensor connector and detach the clamp.

d. Remove the 2 bolts and 2 compression springs and disconnect the front exhaust pipe assembly from the center exhaust pipe assembly.

e. Remove the 3 nuts and front exhaust pipe.

f. Remove the 2 gaskets from the front exhaust pipe assembly.

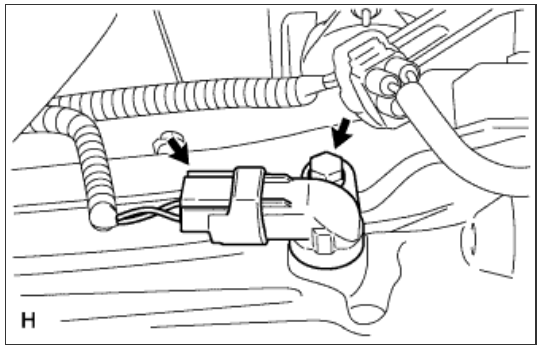


2. REMOVE SPEED SENSOR NT

a. Disconnect the sensor connector.

b. Remove the bolt and sensor.

c. Remove the O-ring from the sensor.

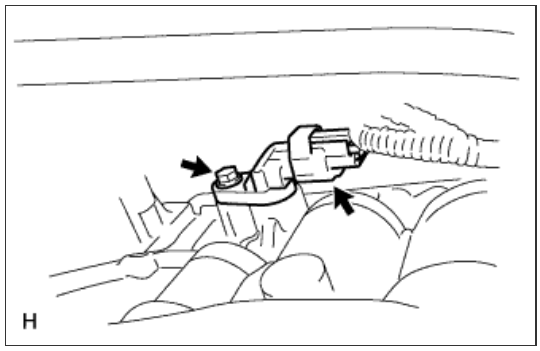


3. REMOVE SPEED SENSOR SP2

a. Disconnect the sensor connector.

b. Remove the bolt and sensor.

c. Remove the O-ring from the sensor.


H

for Preparation Click here

1. INSPECT SPEED SENSOR NT

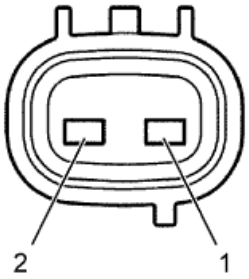
a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	560 to 680 Ω

If the result is not as specified, replace the sensor.

Component without harness connected:
(Speed Sensor NT)



2. INSPECT SPEED SENSOR SP2

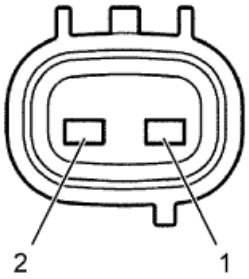
a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	560 to 680 Ω

If the result is not as specified, replace the sensor.

Component without harness connected:
(Speed Sensor SP2)



for Preparation Click here

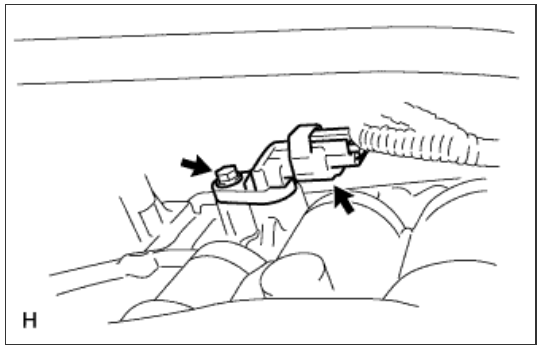
1. INSTALL SPEED SENSOR SP2

a. Coat a new O-ring with ATF and install it to the sensor.

b. Install the sensor with the bolt.

Torque:
5.4 N*m{ 55 kgf*cm , 48 in.*lbf }

c. Connect the sensor connector.



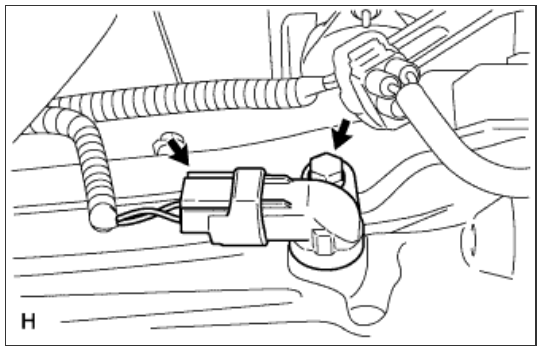
2. INSTALL SPEED SENSOR NT

a. Coat a new O-ring with ATF and install it to the sensor.

b. Install the sensor with the bolt.

Torque:
5.4 N*m{ 55 kgf*cm , 48 in.*lbf }

c. Connect the sensor connector.



3. INSTALL FRONT EXHAUST PIPE ASSEMBLY (w/ DPF)

a. Install a new gasket and the front exhaust pipe to the monolithic converter RH with 3 new nuts.

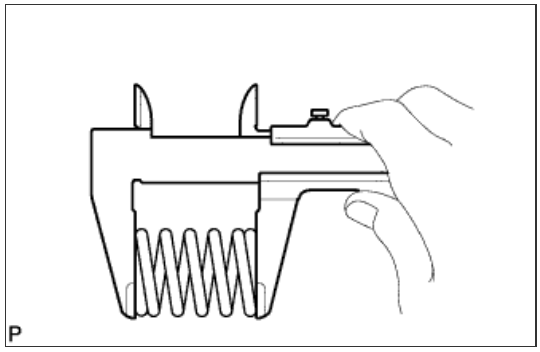
Torque:
48 N*m{ 489 kgf*cm , 35 ft.*lbf }

b. Check the free length.

i. Using a vernier caliper, measure the free length of the compression spring.

Free length:
43 mm (1.69 in.)

If the free length is less than the minimum, replace the compression spring.



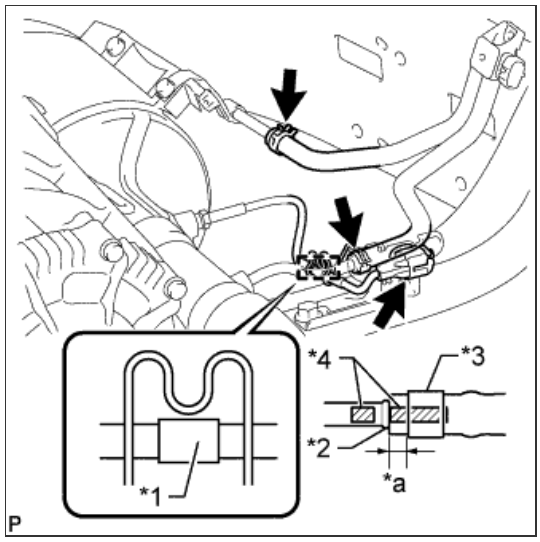
c. Install a new gasket and connect the front exhaust pipe assembly with the 2 bolts and 2 compression springs.

Torque:
43 N*m{ 438 kgf*cm , 32 ft.*lbf }

d. Attach the clamp and connect the exhaust gas temperature sensor connector.

Text in Illustration

*1	Tape
*2	Stopper
*3	Clip
*4	Paint Mark
*a	2 to 7 mm (0.0787 to 0.276 in.)



HINT:

Make sure that the tape is in the position shown in the illustration.

e. Install 2 new clips to the 2 air hoses.

f. Connect the 2 air hoses to the front exhaust pipe.

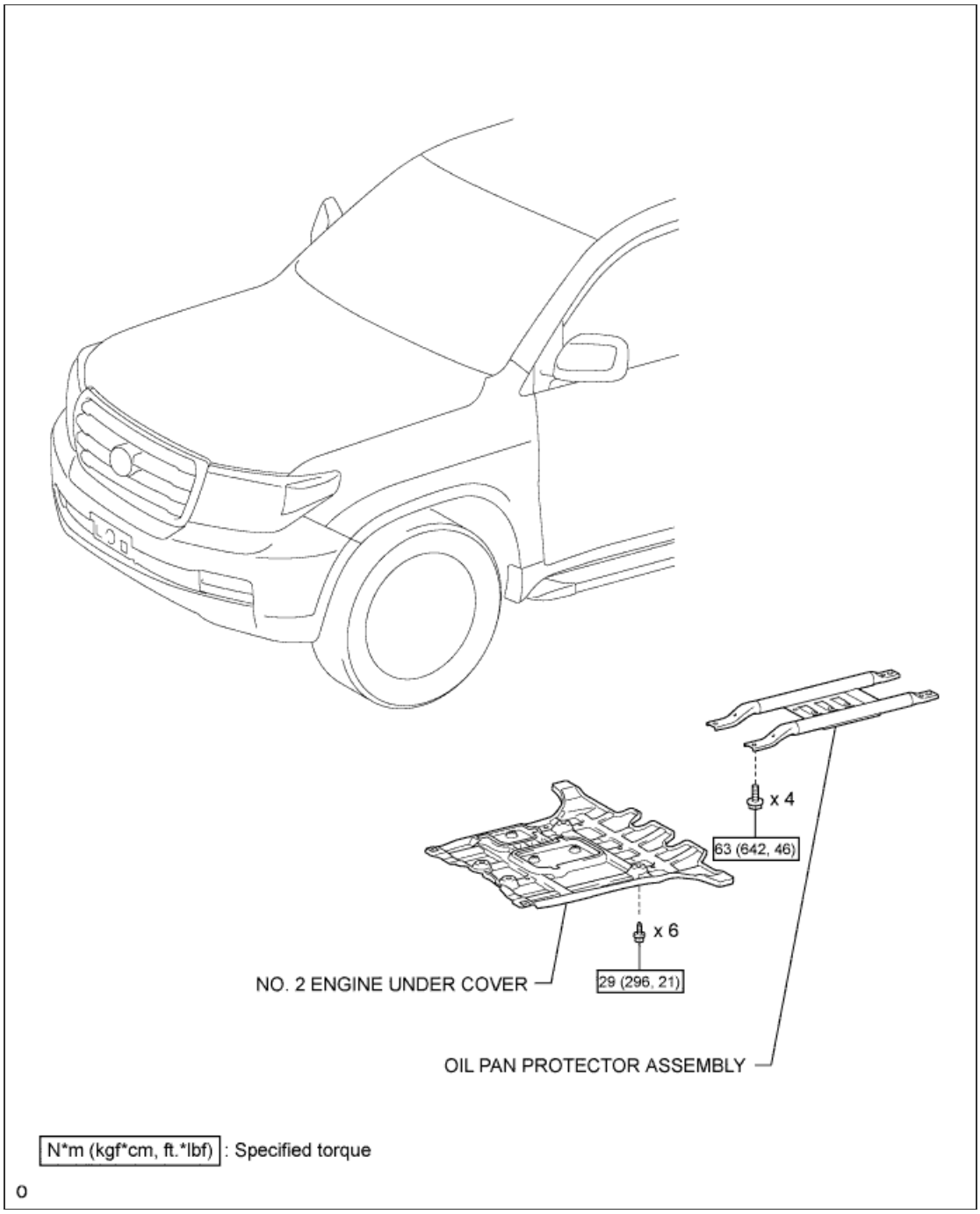
NOTICE:

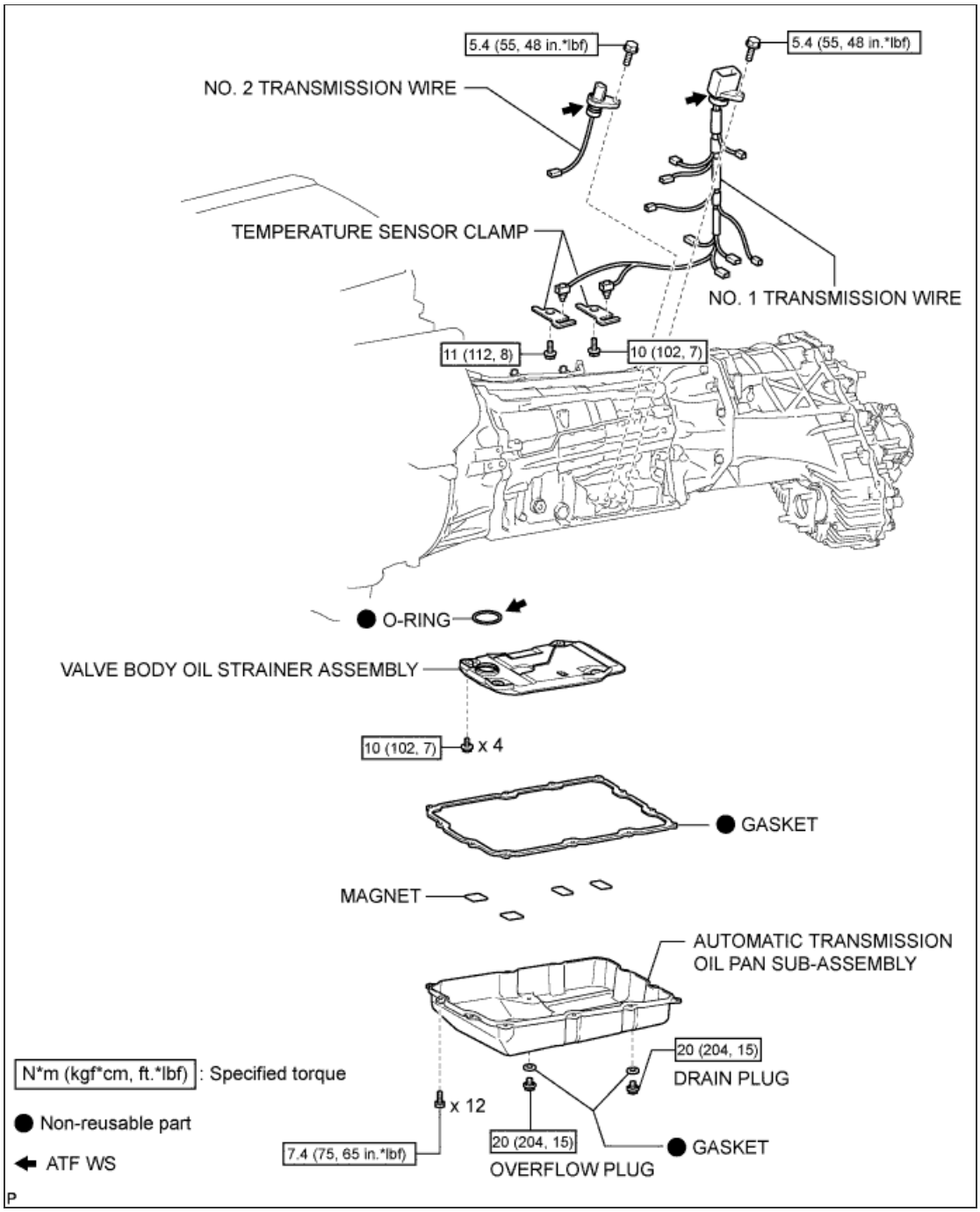
- **Align the paint marks of the front exhaust pipe and air hose and push on the air hose until it contacts the stopper.**
- **Make sure the clip is 4 to 10 mm (0.157 to 0.394 in.) from the end of the air hose when installing the clip.**
- **Make sure that there is no slack in the air hose, and that it is not twisted or bent.**
- **Take care not to damage the inner or outer surface of the air hose when installing it. If the air hose is damaged, replace it with a new one.**

g. Connect the air fuel ratio sensor connector.

4. INSPECT FOR EXHAUST GAS LEAK

for Preparation Click here

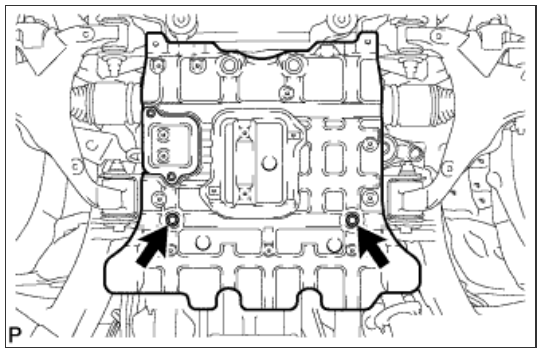



5.4 (55, 48 in.*lbf)
5.4 (55, 48 in.*lbf)
NO. 2 TRANSMISSION WIRE
TEMPERATURE SENSOR CLAMP
NO. 1 TRANSMISSION WIRE
11 (112, 8)
10 (102, 7)
O-RING
VALVE BODY OIL STRAINER ASSEMBLY
10 (102, 7)
x 4
GASKET
MAGNET
AUTOMATIC TRANSMISSION
OIL PAN SUB-ASSEMBLY
20 (204, 15)
DRAIN PLUG
x 12
7.4 (75, 65 in.*lbf)
20 (204, 15)
GASKET
OVERFLOW PLUG
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
ATF WS
P

for Preparation Click here

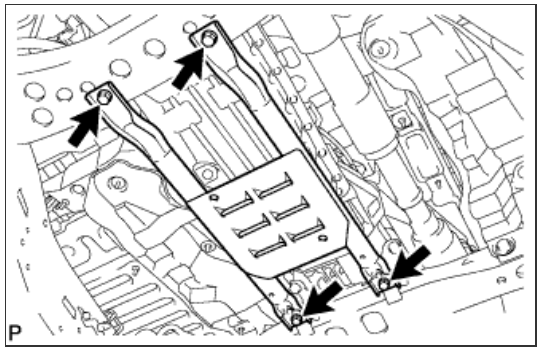
1. REMOVE NO. 2 ENGINE UNDER COVER

a. Remove the 2 bolts and No. 2 engine under cover.



2. REMOVE OIL PAN PROTECTOR ASSEMBLY

a. Remove the 4 bolts and oil pan protector.



3. DRAIN AUTOMATIC TRANSMISSION FLUID

a. Remove the drain plug and gasket, and drain the ATF.

b. Install a new gasket and the drain plug.

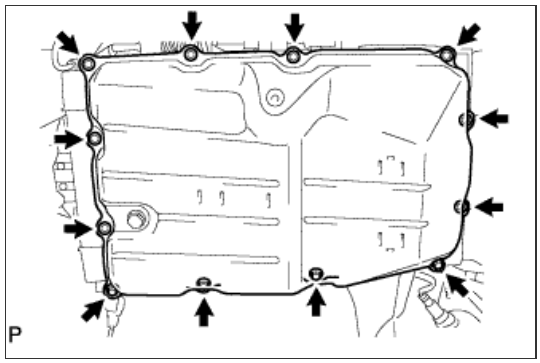
Torque:
20 N*m{ 204 kgf*cm , 15 ft.*lbf }

4. REMOVE AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY

a. Remove the 12 bolts, oil pan and gasket from the transmission.

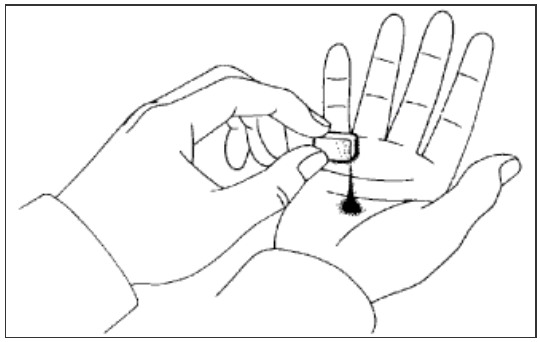
NOTICE:

Some fluid will remain in the oil pan. Remove all the bolts, and carefully remove the oil pan assembly.



b. Examine the particles in the pan.

i. Remove the 4 magnets and use them to collect steel particles. Carefully inspect the foreign matter and particles in the pan and on the magnets to anticipate the type of wear you will find in the transmission.
Steel (magnetic): bearing, gear and clutch plate wear
Brass (non-magnetic): bush wear



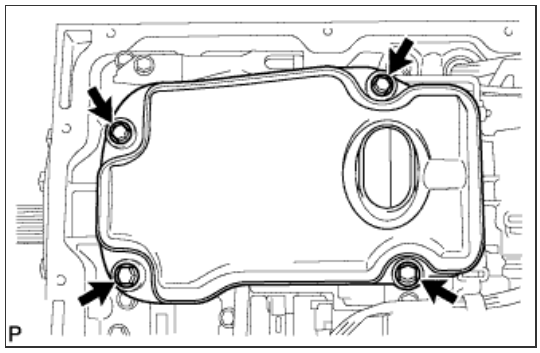
5. REMOVE VALVE BODY OIL STRAINER ASSEMBLY

a. Remove the 4 bolts and oil strainer.

NOTICE:

Be careful as some fluid may leak out of the oil strainer.

b. Remove the O-ring from the oil strainer.

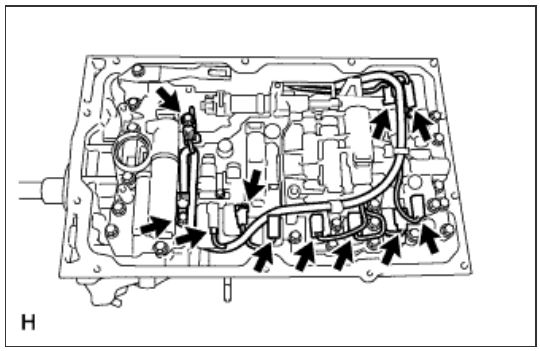


6. DISCONNECT TRANSMISSION WIRE

a. Remove the 2 bolts and 2 temperature sensor clamps.

b. Disconnect the 2 ATF temperature sensors.

c. Disconnect the 9 connectors from the solenoid valves.

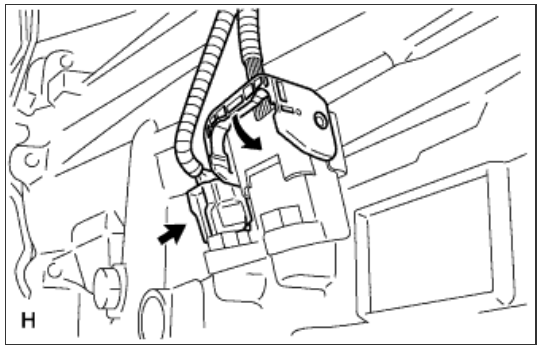


7. REMOVE TRANSMISSION WIRE

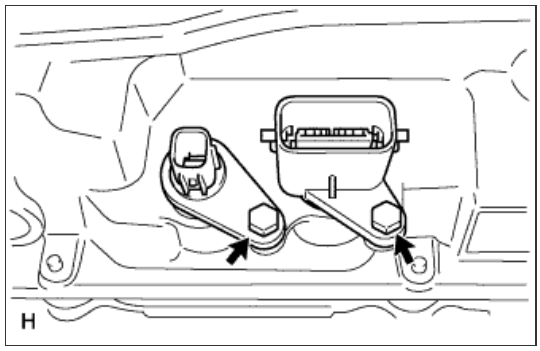
a. Disconnect the 2 wire connectors.

HINT:

Detach the claw, press down the lever, and then disconnect the transmission wire connector.



b. Remove the 2 bolts and pull out the 2 transmission wires.


H

for Preparation Click here

1. INSPECT TRANSMISSION WIRE (ATF TEMPERATURE SENSOR)

a. Measure the resistance according to the value(s) in the table below.

HINT:

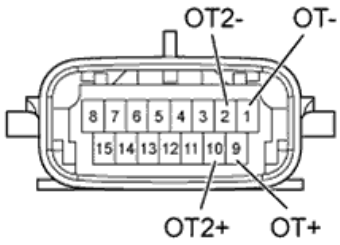
If the resistance is out of the specified range at any of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

Standard Resistance:

Tester Connection	ATF Temperature	Specified Condition
1 (OT-) - 9 (OT+)	10°C (50°F)	5 to 8 kΩ
1 (OT-) - 9 (OT+)	25°C (77°F)	2.5 to 4.5 kΩ
1 (OT-) - 9 (OT+)	110°C (230°F)	0.22 to 0.28 kΩ
2 (OT2-) - 10 (OT2+)	10°C (50°F)	5 to 8 kΩ
2 (OT2-) - 10 (OT2+)	25°C (77°F)	2.5 to 4.5 kΩ
2 (OT2-) - 10 (OT2+)	110°C (230°F)	0.22 to 0.28 kΩ

If the result is not as specified, replace the transmission wire.

Component without harness connected:
(No. 1 Transmission Wire)



Y

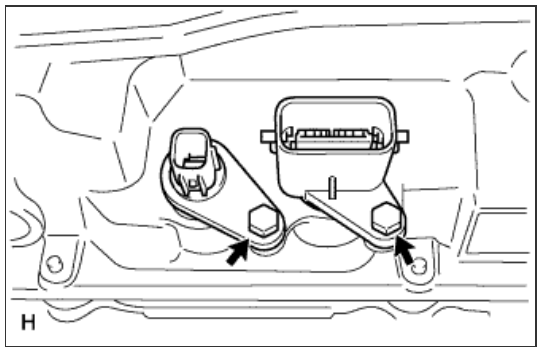
for Preparation Click here

1. INSTALL TRANSMISSION WIRE

a. Coat the O-ring of the transmission wire connector with ATF.

b. Install the 2 transmission wires with the 2 bolts.

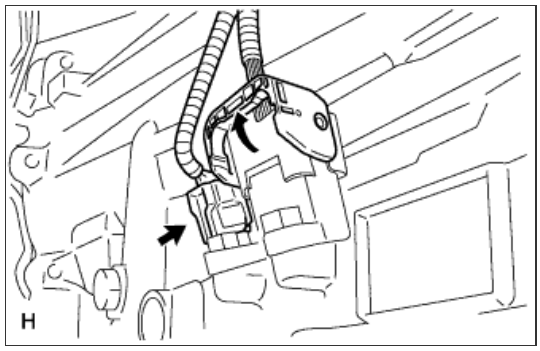
Torque:
5.4 N*m{ 55 kgf*cm , 48 in.*lbf }



c. Connect the 2 transmission wire connectors.

HINT:

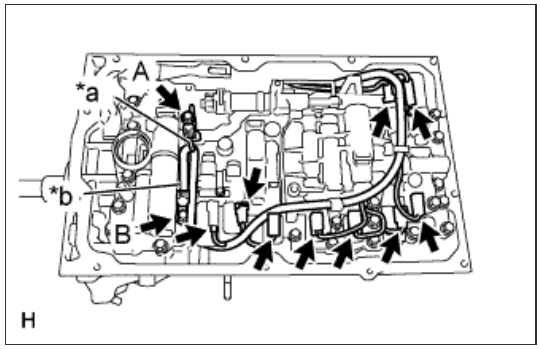
Push up the lever until the claw of the transmission wire connector makes a connection sound.



2. CONNECT TRANSMISSION WIRE

Text in Illustration

*a	Orange
*b	Blue



a. Connect the 9 connectors to the solenoid valves.

b. Connect the 2 ATF temperature sensors with the 2 clamps and 2 bolts.

Torque:
for bolt A:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }
for bolt B:
11 N*m{ 112 kgf*cm , 8 ft.*lbf }

HINT:

Each bolt length is indicated below.

12 mm (0.472 in.) for bolt A

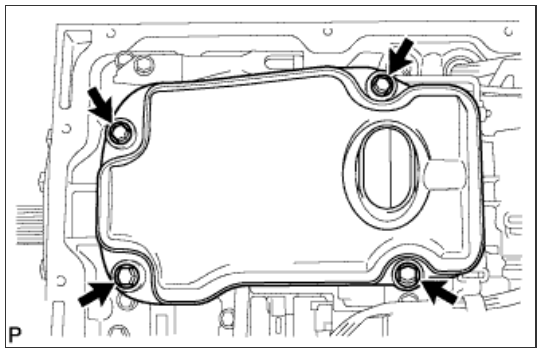
36 mm (1.41 in.) for bolt B

3. INSTALL VALVE BODY OIL STRAINER ASSEMBLY

a. Coat a new O-ring with ATF and install it to the oil strainer.

b. Install the oil strainer with the 4 bolts.

Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }

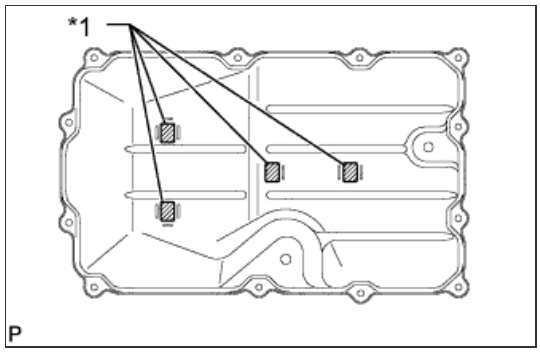


4. INSTALL AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY

Text in Illustration

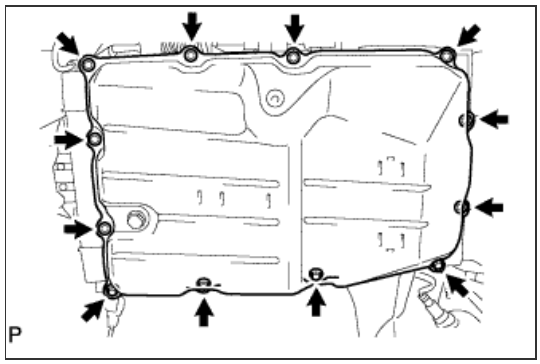
*1	Magnet

a. Install the 4 transmission oil cleaner magnets to the oil pan.



b. Install a new gasket and the oil pan with the 12 bolts.

Torque:
7.4 N*m{ 75 kgf*cm , 65 in.*lbf }

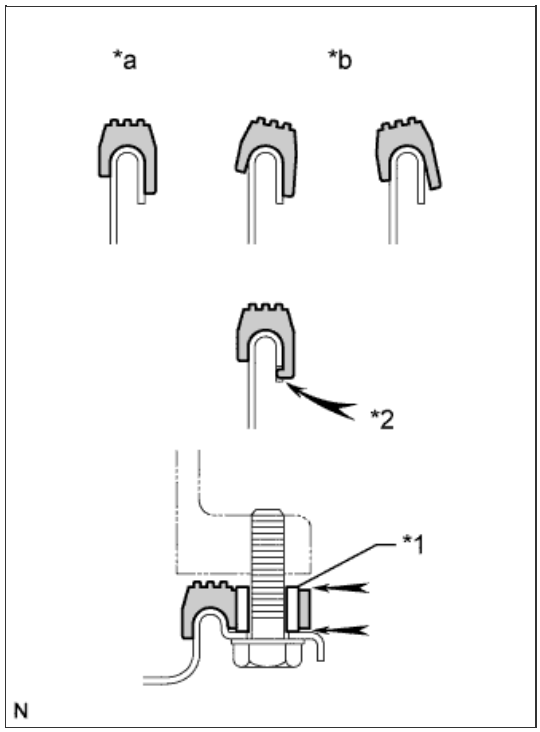


NOTICE:

- **Make sure that there is no oil or foreign matter on the gasket seal surface and oil pan contact surface.**
- **Install the gasket so that there is no slack in the gasket, and make sure the entire circumference of the seal surface is level.**
- **Make sure that the 9 gasket drop prevention protrusions are set on the oil pan.**
- **When tightening the bolts of the oil pan, make sure that the gasket is not pinched between the gasket tightening area sleeve and the transmission seal surface.**

Text in Illustration

*1	Sleeve
*2	Protrusion
*a	Correct
*b	Incorrect



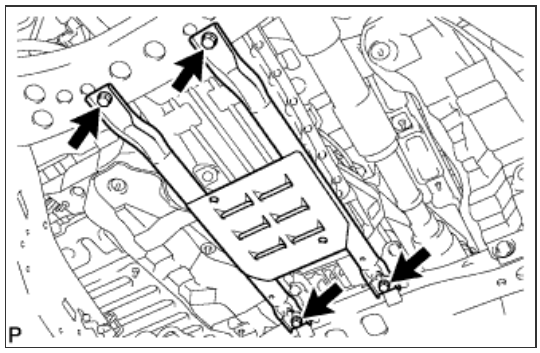
5. ADD AUTOMATIC TRANSMISSION FLUID

(Click here)

6. INSTALL OIL PAN PROTECTOR ASSEMBLY

a. Install the oil pan protector with the 4 bolts.

Torque:
63 N*m{ 642 kgf*cm , 46 ft.*lbf }

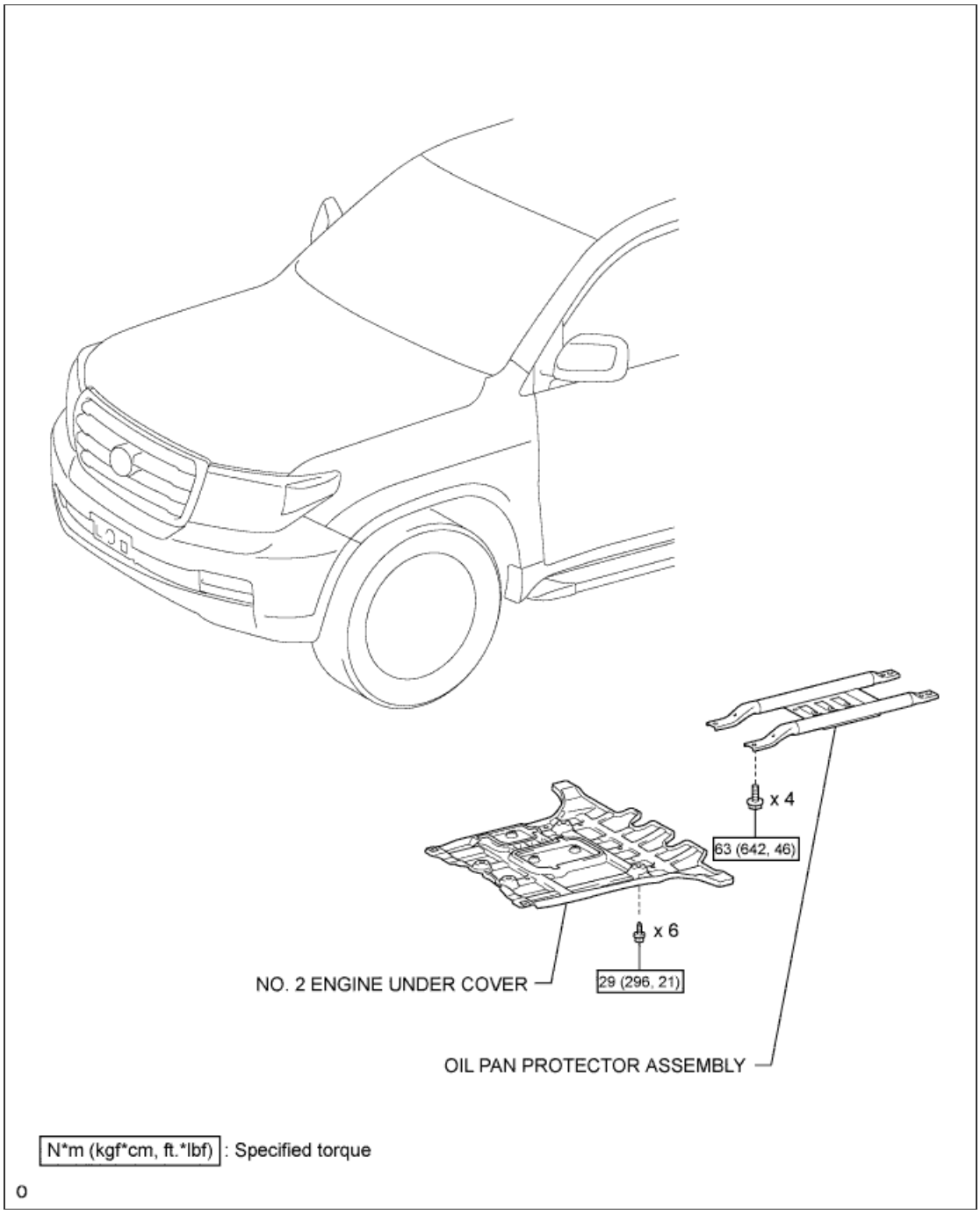


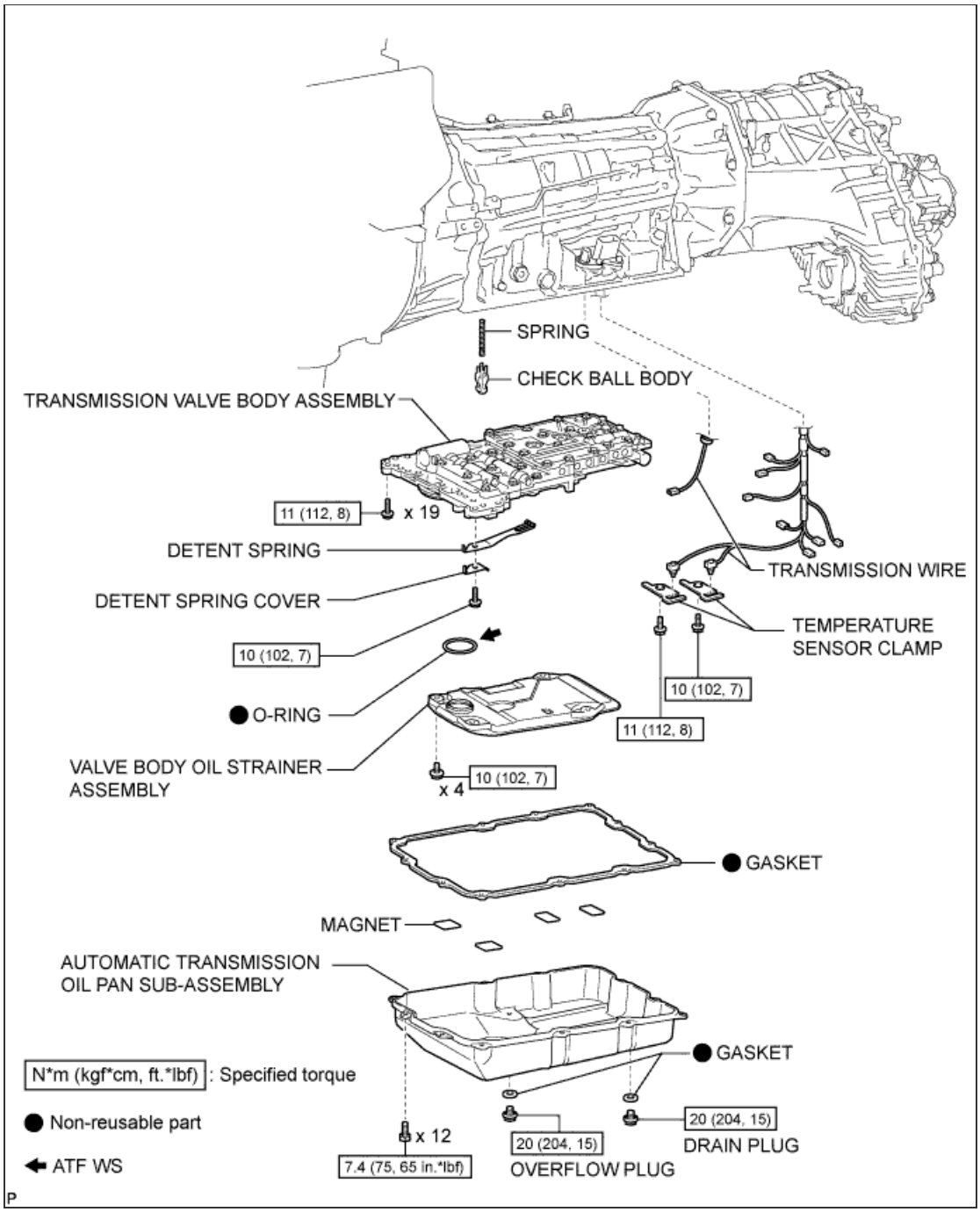
7. INSTALL NO. 2 ENGINE UNDER COVER

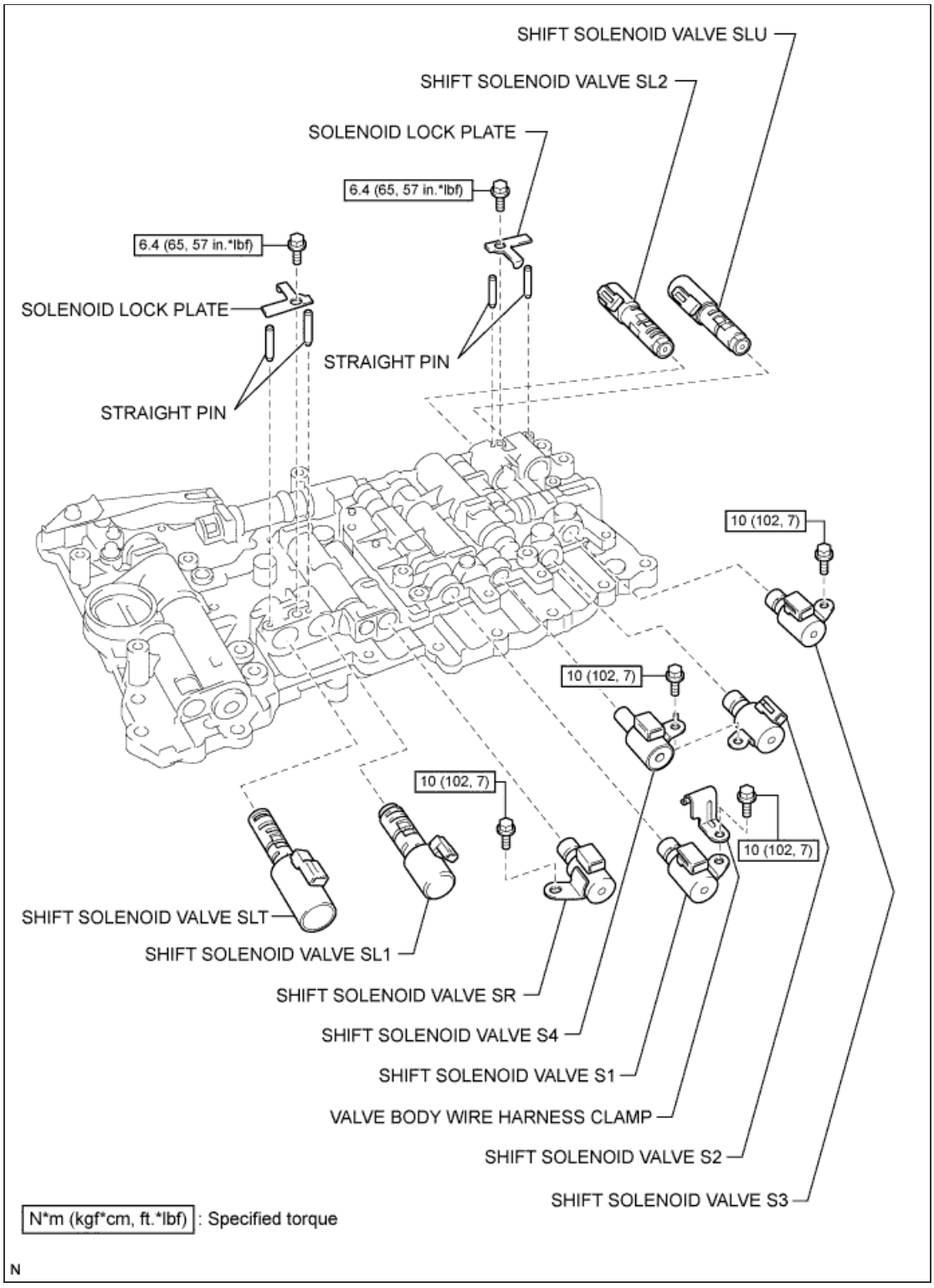
a. Install the No. 2 engine under cover with the 2 bolts.

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

for Preparation Click here



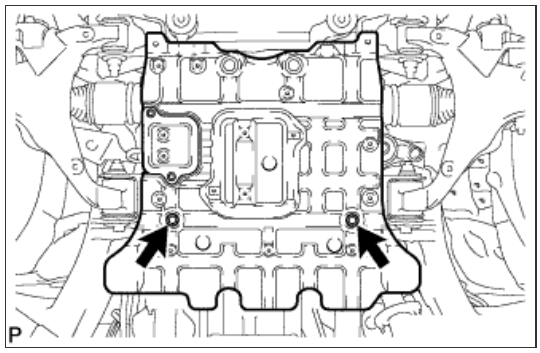

SPRING
CHECK BALL BODY
TRANSMISSION VALVE BODY ASSEMBLY
11 (112, 8)
x 19
DETENT SPRING
DETENT SPRING COVER
10 (102, 7)
O-RING
VALVE BODY OIL STRAINER ASSEMBLY
TRANSMISSION WIRE
TEMPERATURE SENSOR CLAMP
10 (102, 7)
11 (112, 8)
10 (102, 7)
x 4
GASKET
MAGNET
AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY
GASKET
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
ATF WS
x 12
7.4 (75, 65 in.*lbf)
20 (204, 15)
OVERFLOW PLUG
20 (204, 15)
DRAIN PLUG
P


SHIFT SOLENOID VALVE SLU
SHIFT SOLENOID VALVE SL2
SOLENOID LOCK PLATE
6.4 (65, 57 in.*lbf)
6.4 (65, 57 in.*lbf)
SOLENOID LOCK PLATE
STRAIGHT PIN
STRAIGHT PIN
10 (102, 7)
10 (102, 7)
10 (102, 7)
10 (102, 7)
SHIFT SOLENOID VALVE SLT
SHIFT SOLENOID VALVE SL1
SHIFT SOLENOID VALVE SR
SHIFT SOLENOID VALVE S4
SHIFT SOLENOID VALVE S1
VALVE BODY WIRE HARNESS CLAMP
SHIFT SOLENOID VALVE S2
SHIFT SOLENOID VALVE S3
N*m (kgf*cm, ft.*lbf) : Specified torque
N

for Preparation Click here

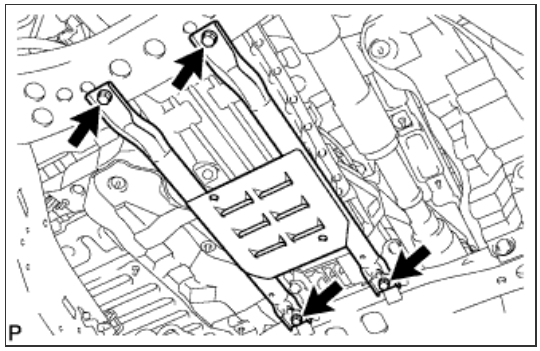
1. REMOVE NO. 2 ENGINE UNDER COVER

a. Remove the 2 bolts and No. 2 engine under cover.



2. REMOVE OIL PAN PROTECTOR ASSEMBLY

a. Remove the 4 bolts and oil pan protector.



3. DRAIN AUTOMATIC TRANSMISSION FLUID

a. Remove the drain plug and gasket, and drain the ATF.

b. Install a new gasket and the drain plug.

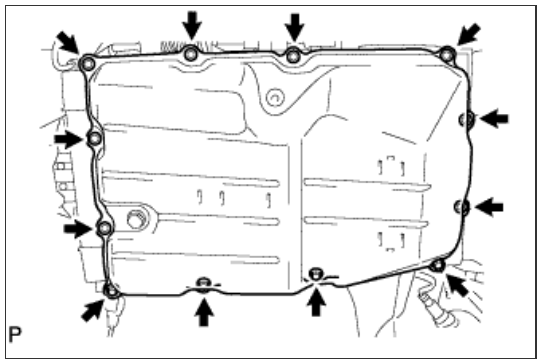
Torque:
20 N*m{ 204 kgf*cm , 15 ft.*lbf }

4. REMOVE AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY

a. Remove the 12 bolts, oil pan and gasket from the transmission.

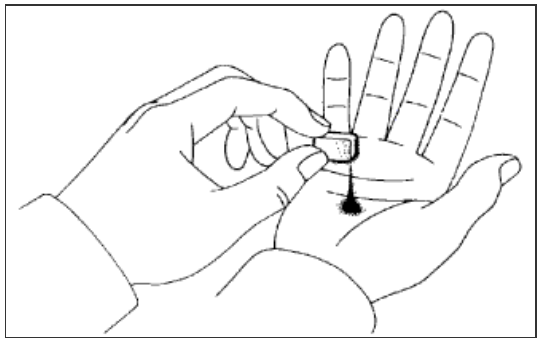
NOTICE:

Some fluid will remain in the oil pan. Remove all the bolts, and carefully remove the oil pan assembly.



b. Examine the particles in the pan.

i. Remove the 4 magnets and use them to collect steel particles. Carefully inspect the foreign matter and particles in the pan and on the magnets to anticipate the type of wear you will find in the transmission.
Steel (magnetic): bearing, gear and clutch plate wear
Brass (non-magnetic): bush wear



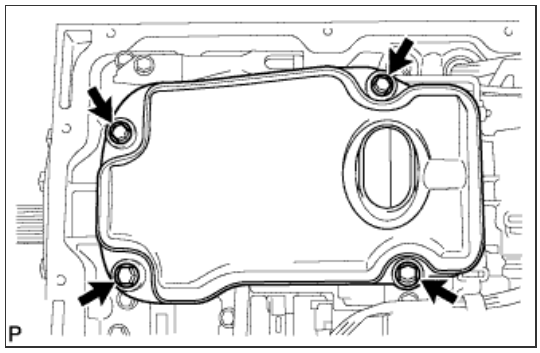
5. REMOVE VALVE BODY OIL STRAINER ASSEMBLY

a. Remove the 4 bolts and oil strainer.

NOTICE:

Be careful as some fluid may leak out of the oil strainer.

b. Remove the O-ring from the oil strainer.

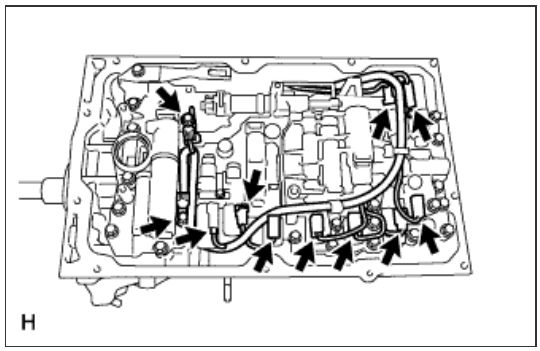


6. DISCONNECT TRANSMISSION WIRE

a. Remove the 2 bolts and 2 temperature sensor clamps.

b. Disconnect the 2 ATF temperature sensors.

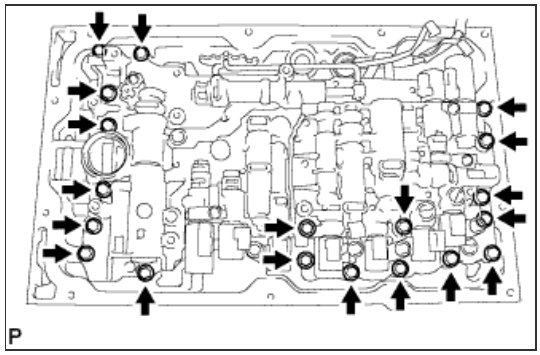
c. Disconnect the 9 connectors from the solenoid valves.



7. REMOVE TRANSMISSION VALVE BODY ASSEMBLY

a. Remove the bolt, detent spring cover and detent spring.

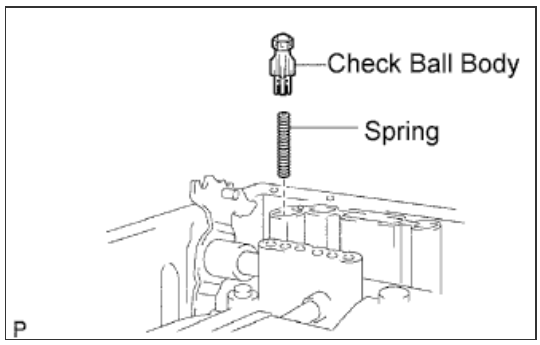
b. Remove the 19 bolts and valve body.



c. Remove the check ball body and spring.

NOTICE:

Do not drop the check ball body and spring.

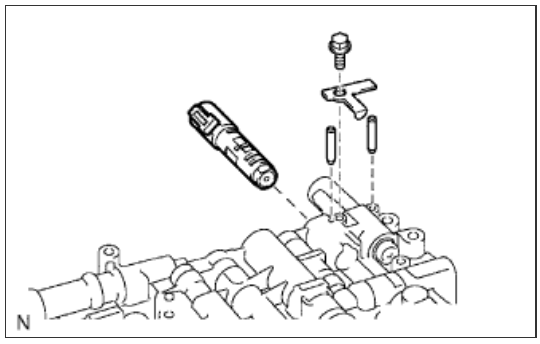


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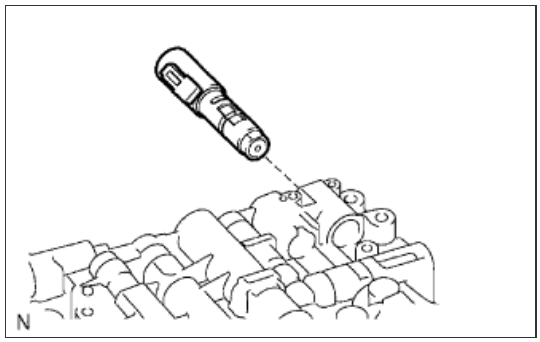
1. REMOVE SHIFT SOLENOID VALVE SL2

a. Remove the bolt, lock plate and 2 straight pins.

b. Remove the shift solenoid valve.



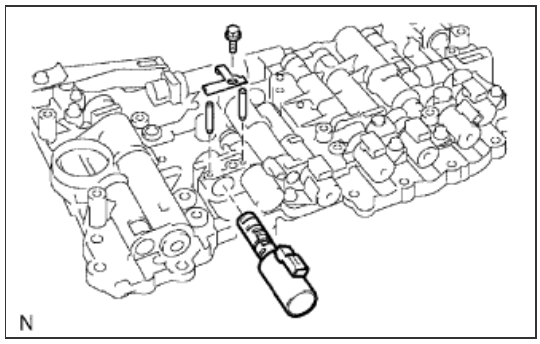
2. REMOVE SHIFT SOLENOID VALVE SLU



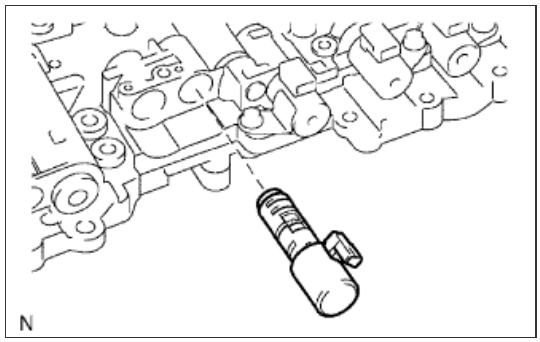
3. REMOVE SHIFT SOLENOID VALVE SLT

a. Remove the bolt, lock plate and 2 straight pins.

b. Remove the shift solenoid valve.

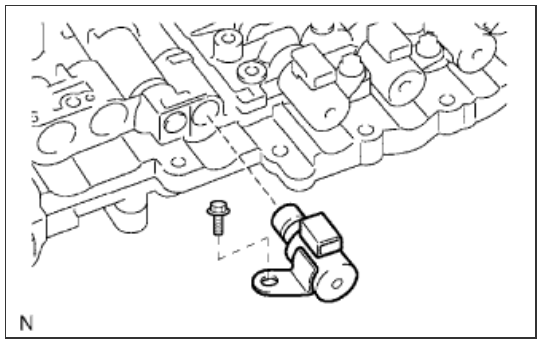


4. REMOVE SHIFT SOLENOID VALVE SL1



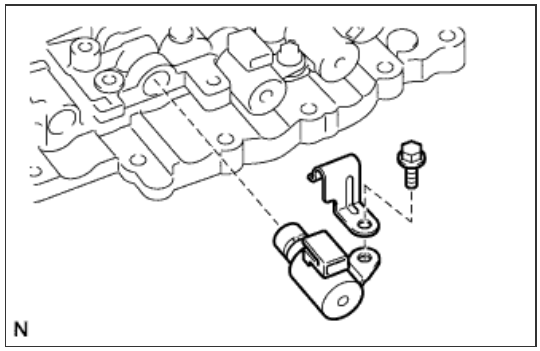
5. REMOVE SHIFT SOLENOID VALVE SR

a. Remove the bolt and shift solenoid valve.



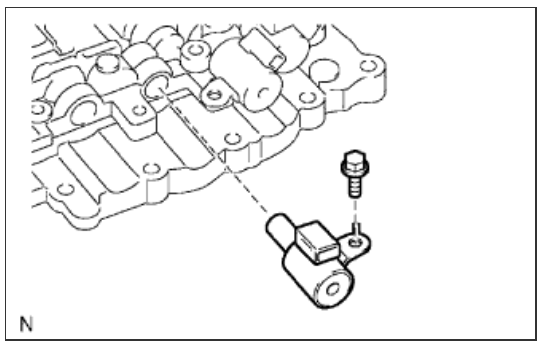
6. REMOVE SHIFT SOLENOID VALVE S1

a. Remove the bolt, valve body wire harness clamp and shift solenoid valve.

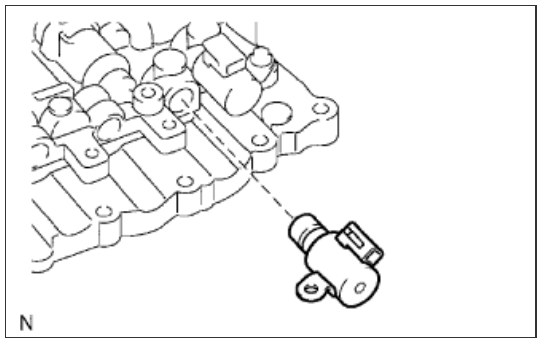


7. REMOVE SHIFT SOLENOID VALVE S4

a. Remove the bolt and shift solenoid valve.

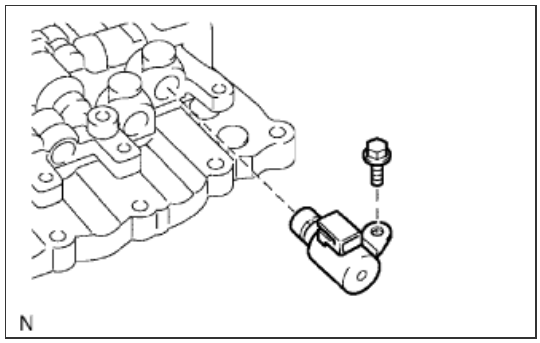


8. REMOVE SHIFT SOLENOID VALVE S2



9. REMOVE SHIFT SOLENOID VALVE S3

a. Remove the bolt and shift solenoid valve.



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1. INSPECT SHIFT SOLENOID VALVE SL1

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

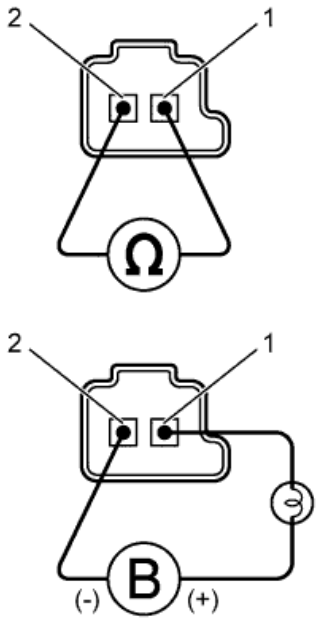
b. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Shift solenoid valve Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

If the result is not as specified, replace the solenoid valve.

Component without harness connected:
(Shift Solenoid Valve SL1)



2. INSPECT SHIFT SOLENOID VALVE S1

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

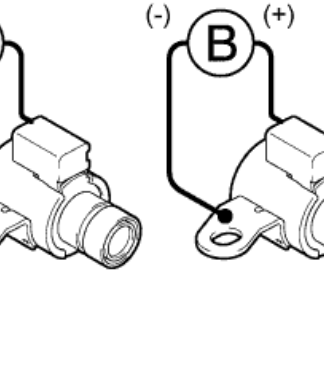
Tester Connection	Condition	Specified Condition
Shift solenoid valve S1 connector terminal - Shift solenoid valve S1 body	20°C (68°F)	11 to 15 Ω

b. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S1 connector • Battery negative (-) → Shift solenoid valve S1 body	Valve moves and makes an operating noise

Shift Solenoid Valve S1:



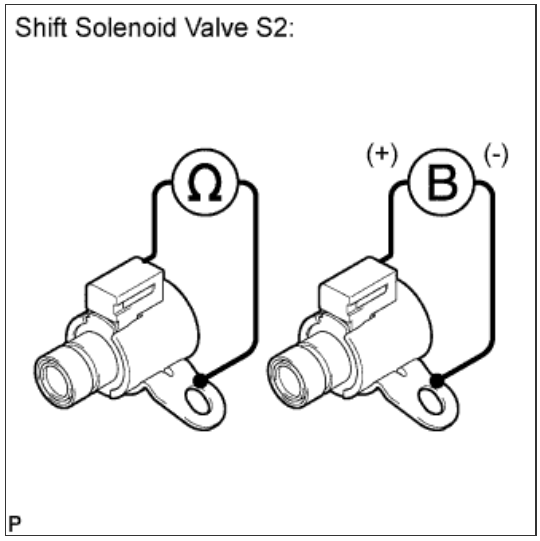
If the result is not as specified, replace the solenoid valve.

3. INSPECT SHIFT SOLENOID VALVE S2

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S2 connector terminal - Shift solenoid valve S2 body	20°C (68°F)	11 to 15 Ω



b. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S2 connector • Battery negative (-) → Shift solenoid valve S2 body	Valve moves and makes an operating noise

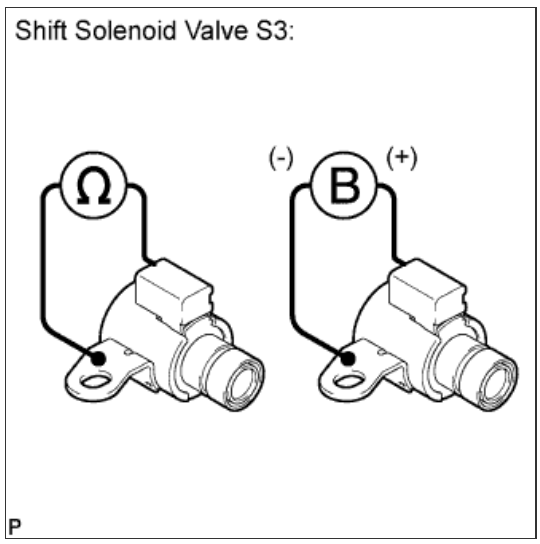
If the result is not as specified, replace the solenoid valve.

4. INSPECT SHIFT SOLENOID VALVE S3

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S3 connector terminal - Shift solenoid valve S3 body	20°C (68°F)	11 to 15 Ω



b. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S3 connector • Battery negative (-) → Shift solenoid valve S3 body	Valve moves and makes an operating noise

If the result is not as specified, replace the solenoid valve.

5. INSPECT SHIFT SOLENOID VALVE S4

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
Shift solenoid valve S4 connector terminal - Shift solenoid valve S4 body	20°C (68°F)	11 to 15 Ω

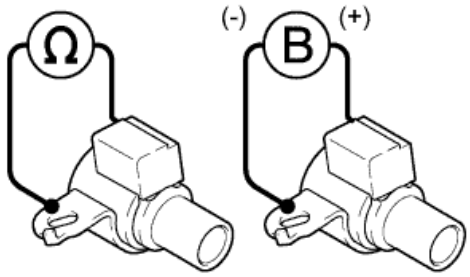
b. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve S4 connector • Battery negative (-) → Shift solenoid valve S4 body	Valve moves and makes an operating noise

If the result is not as specified, replace the solenoid valve.

Shift Solenoid Valve S4:



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6. INSPECT SHIFT SOLENOID VALVE SL2

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

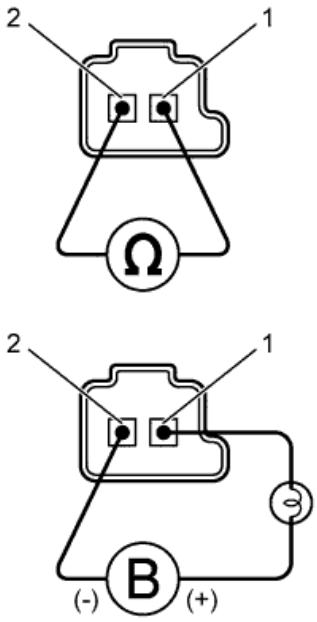
b. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Shift solenoid valve Terminal 1 • Battery negative (-) → Terminal 2	Valve moves and makes an operating noise

If the result is not as specified, replace the solenoid valve.

Component without harness connected:
(Shift Solenoid Valve SL2)



7. INSPECT SHIFT SOLENOID VALVE SR

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

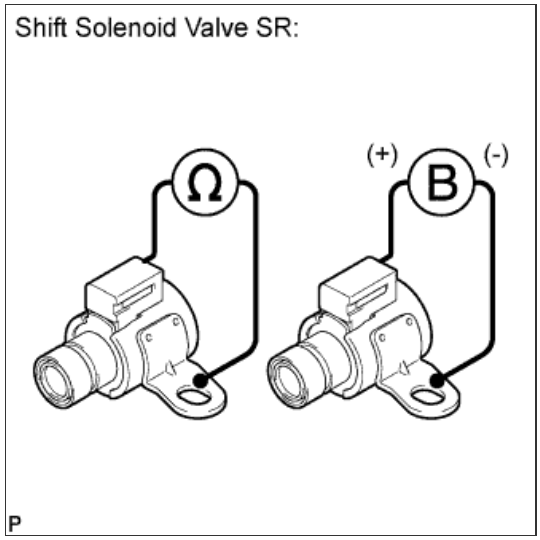
Tester Connection	Condition	Specified Condition
Shift solenoid valve SR connector terminal - Shift solenoid valve SR body	20°C (68°F)	11 to 15 Ω

b. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Shift solenoid valve SR connector • Battery negative (-) → Shift solenoid valve SR body	Valve moves and makes an operating noise

If the result is not as specified, replace the solenoid valve.



8. INSPECT SHIFT SOLENOID VALVE SLT

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

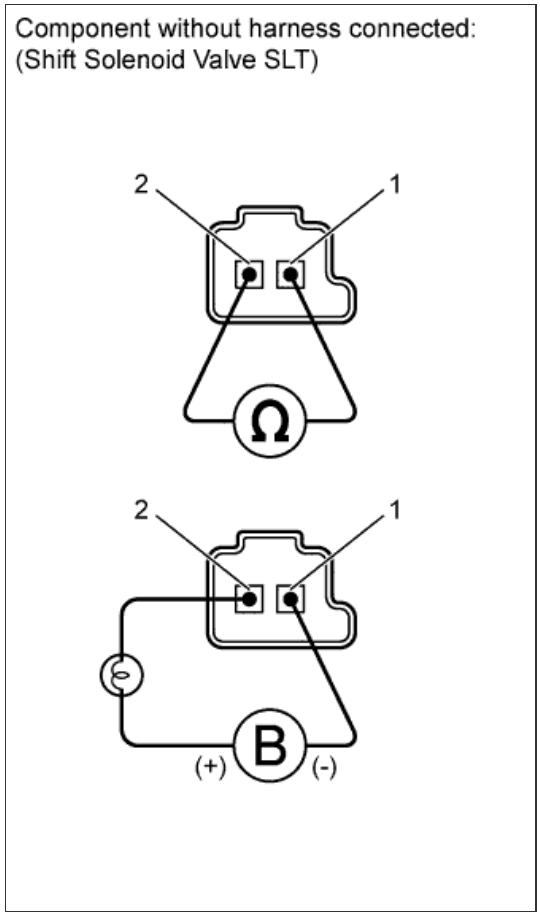
Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

b. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Shift solenoid valve Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise

If the result is not as specified, replace the solenoid valve.



9. INSPECT SHIFT SOLENOID VALVE SLU

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	5.0 to 5.6 Ω

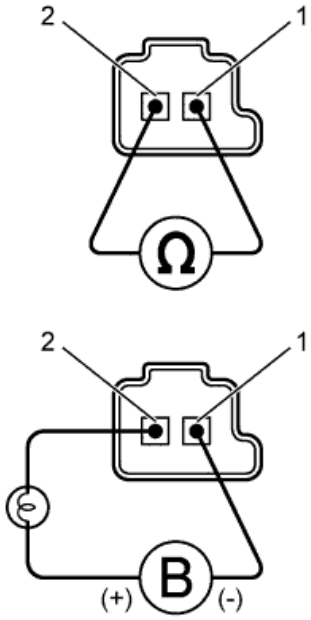
b. Apply 12 V battery voltage to the shift solenoid valve and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) with a 21 W bulb → Shift solenoid valve Terminal 2 • Battery negative (-) → Terminal 1	Valve moves and makes an operating noise

If the result is not as specified, replace the solenoid valve.

Component without harness connected:
(Shift Solenoid Valve SLU)

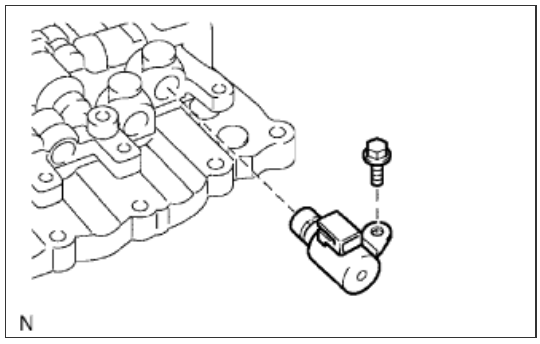


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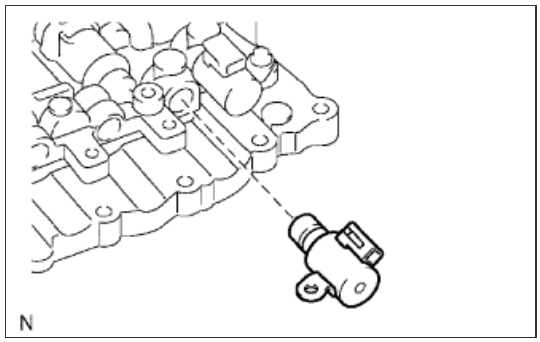
1. INSTALL SHIFT SOLENOID VALVE S3

a. Install the shift solenoid valve with the bolt.

Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }



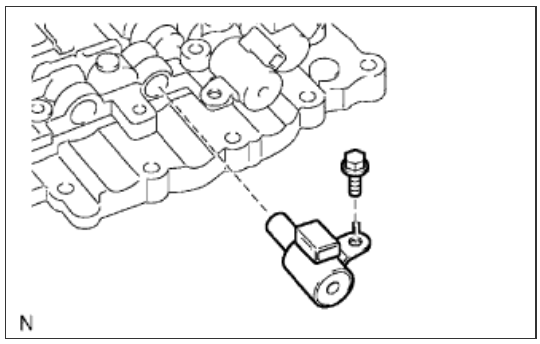
2. INSTALL SHIFT SOLENOID VALVE S2



3. INSTALL SHIFT SOLENOID VALVE S4

a. Install the shift solenoid valve with the bolt.

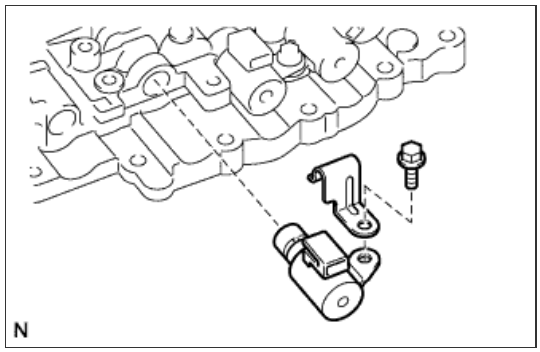
Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }



4. INSTALL SHIFT SOLENOID VALVE S1

a. Install the shift solenoid valve and valve body wire harness clamp with the bolt.

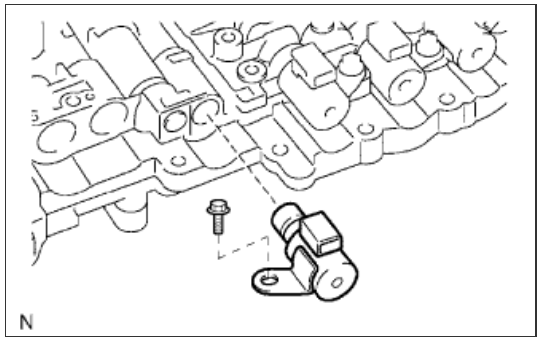
Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }



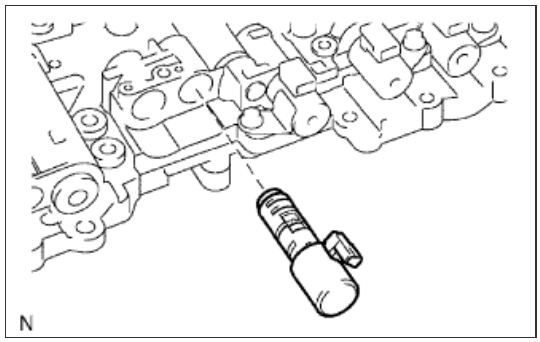
5. INSTALL SHIFT SOLENOID VALVE SR

a. Install the shift solenoid valve with the bolt.

Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }



6. INSTALL SHIFT SOLENOID VALVE SL1

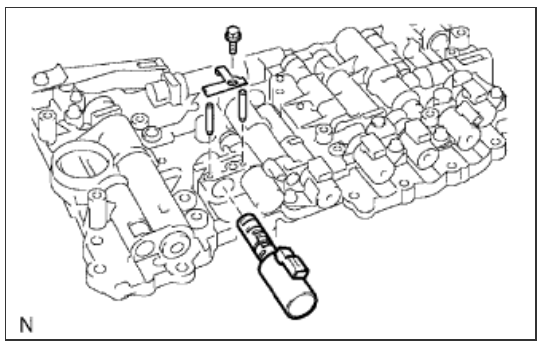


7. INSTALL SHIFT SOLENOID VALVE SLT

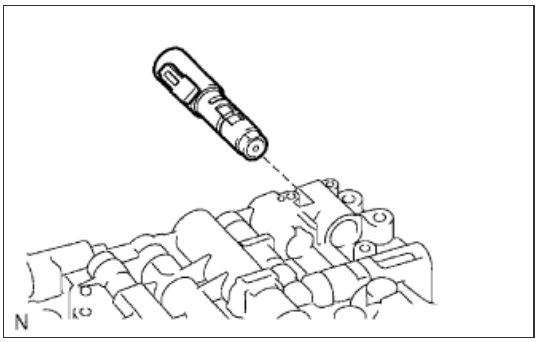
a. Install the shift solenoid valve.

b. Install the 2 straight pins and lock plate with the bolt.

Torque:
6.4 N*m{ 65 kgf*cm , 57 in.*lbf }



8. INSTALL SHIFT SOLENOID VALVE SLU

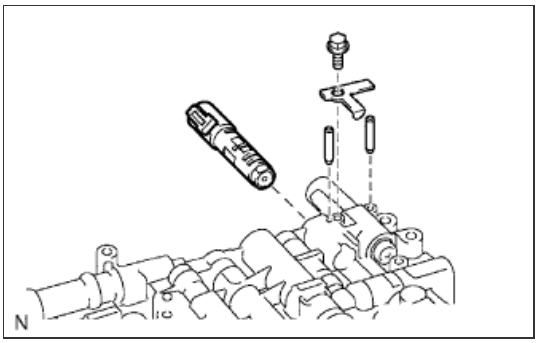


9. INSTALL SHIFT SOLENOID VALVE SL2

a. Install the shift solenoid valve.

b. Install the 2 straight pins and lock plate with the bolt.

Torque:
6.4 N*m{ 65 kgf*cm , 57 in.*lbf }

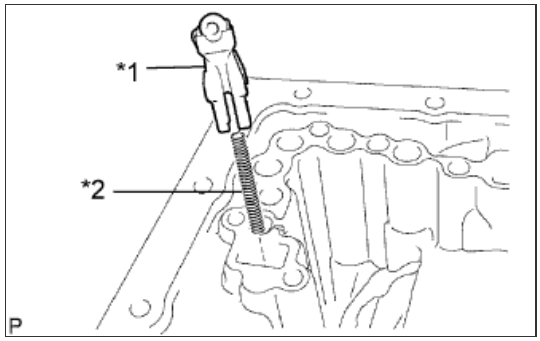


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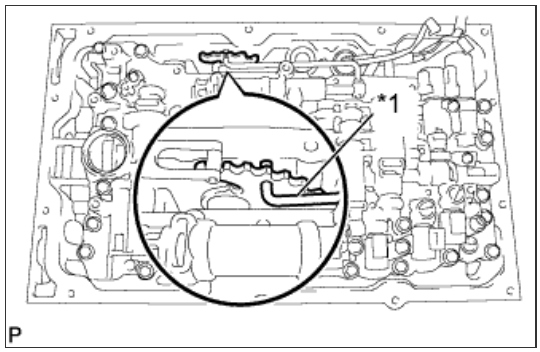
1. INSTALL TRANSMISSION VALVE BODY ASSEMBLY

Text in Illustration

*1	Check Ball Body
*2	Spring



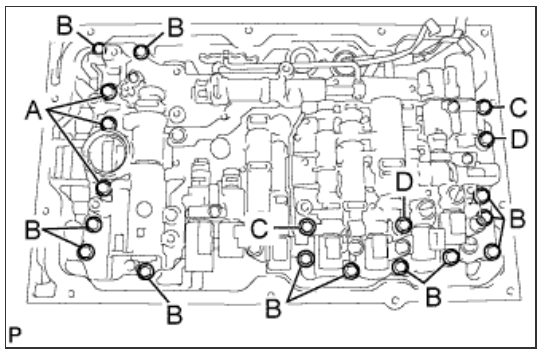
a. Install the spring and check ball body.



b. Insert the pin of the manual valve into the hole of the manual valve lever.

Text in Illustration

*1	Pin



c. Install the 19 bolts.

Torque:
11 N*m{ 112 kgf*cm , 8 ft.*lbf }

HINT:

Each bolt length is indicated below.

36 mm (1.42 in.) for bolt A

25 mm (0.984 in.) for bolt B

45 mm (1.77 in.) for bolt C

50 mm (1.97 in.) for bolt D

d. Install the detent spring and detent spring cover with the bolt.

Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }

2. CONNECT TRANSMISSION WIRE

Text in Illustration

*a	Orange
*b	Blue

a. Connect the 9 connectors to the solenoid valves.

b. Connect the 2 ATF temperature sensors with the 2 clamps and 2 bolts.

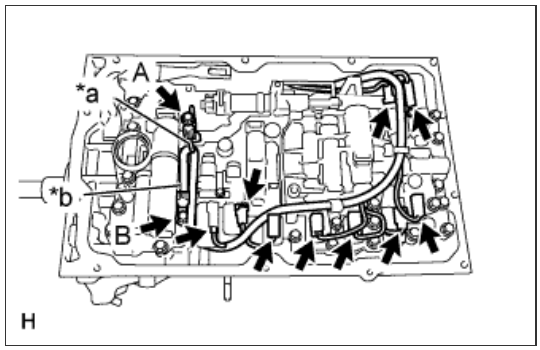
Torque:
for bolt A:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }
for bolt B:
11 N*m{ 112 kgf*cm , 8 ft.*lbf }

HINT:

Each bolt length is indicated below.

12 mm (0.472 in.) for bolt A

36 mm (1.41 in.) for bolt B

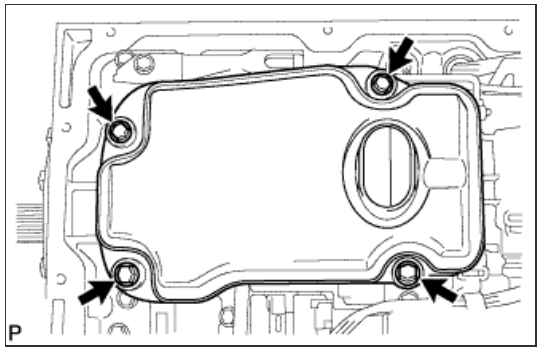


3. INSTALL VALVE BODY OIL STRAINER ASSEMBLY

a. Coat a new O-ring with ATF and install it to the oil strainer.

b. Install the oil strainer with the 4 bolts.

Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }

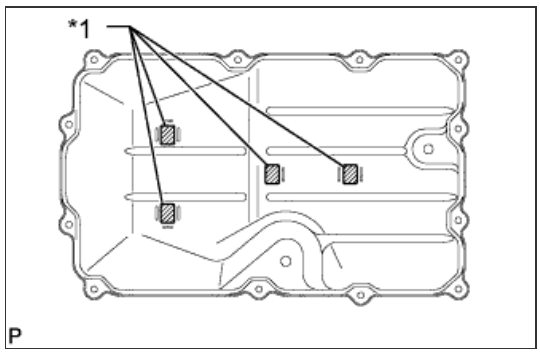


4. INSTALL AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY

Text in Illustration

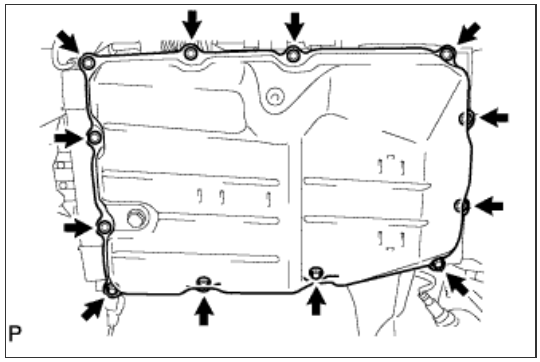
*1	Magnet

a. Install the 4 transmission oil cleaner magnets to the oil pan.



b. Install a new gasket and the oil pan with the 12 bolts.

Torque:
7.4 N*m{ 75 kgf*cm , 65 in.*lbf }



NOTICE:

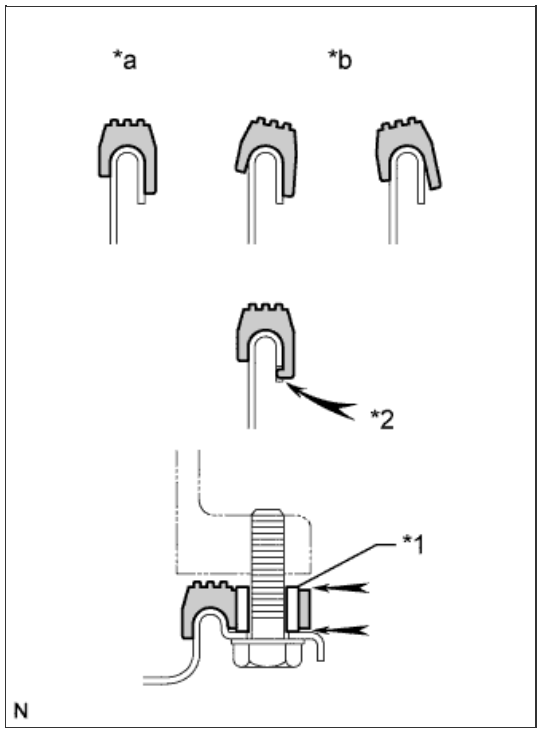
- **Make sure that there is no oil or foreign matter on the gasket seal surface and oil pan contact surface.**
- **Install the gasket so that there is no slack in the gasket, and make sure the entire circumference of the seal surface is level.**
- **Make sure that the 9 gasket drop prevention protrusions**

are set on the oil pan.

- When tightening the bolts of the oil pan, make sure that the gasket is not pinched between the gasket tightening area sleeve and the transmission seal surface.

Text in Illustration

*1	Sleeve
*2	Protrusion
*a	Correct
*b	Incorrect



5. RESET MEMORY

for 1UR-FE: (Click here)
for 3UR-FE: (Click here)
for 1VD-FTV: (Click here)

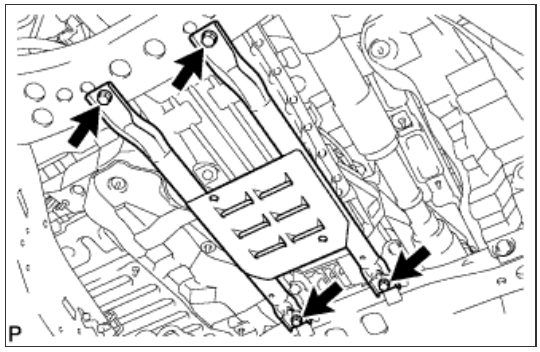
6. ADD AUTOMATIC TRANSMISSION FLUID

(Click here)

7. INSTALL OIL PAN PROTECTOR ASSEMBLY

a. Install the oil pan protector with the 4 bolts.

Torque:
63 N*m{ 642 kgf*cm , 46 ft.*lbf }

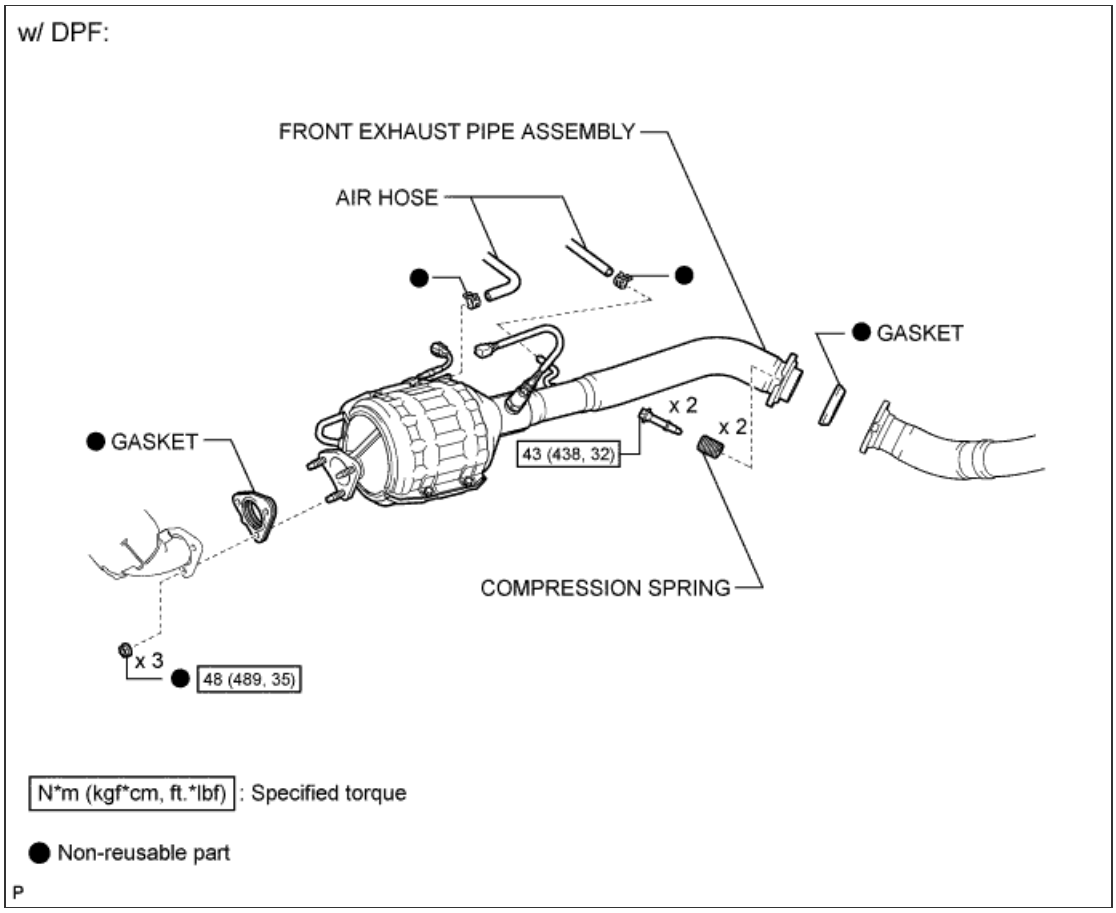


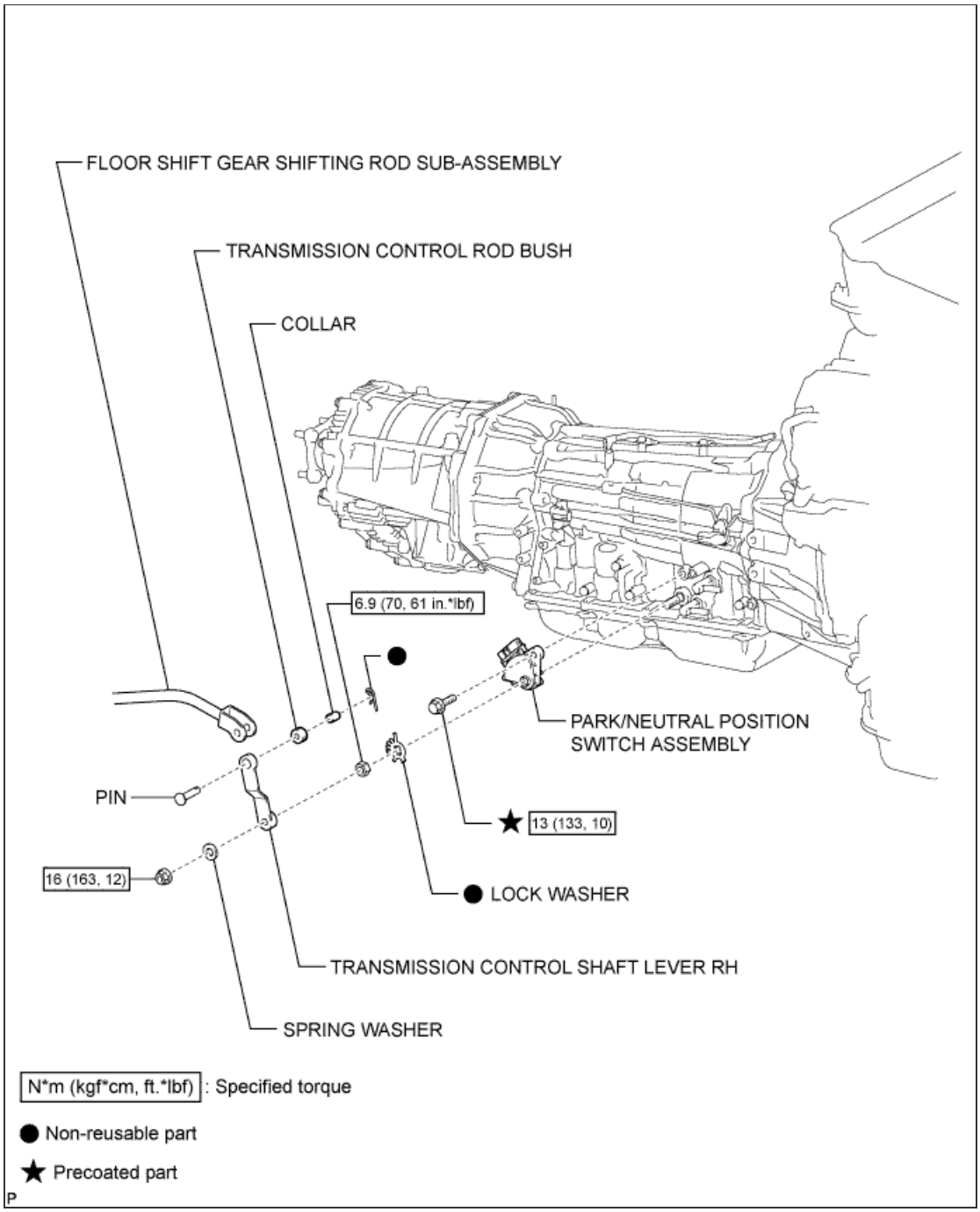
8. INSTALL NO. 2 ENGINE UNDER COVER

a. Install the No. 2 engine under cover with the 2 bolts.

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

for Preparation [Click here]




FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY
TRANSMISSION CONTROL ROD BUSH
COLLAR
6.9 (70, 61 in.*lbf)
PARK/NEUTRAL POSITION SWITCH ASSEMBLY
PIN
13 (133, 10)
16 (163, 12)
LOCK WASHER
TRANSMISSION CONTROL SHAFT LEVER RH
SPRING WASHER
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
Precoated part
P

for Preparation Click here

1. INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY

a. Apply the parking brake and turn the ignition switch to ON.

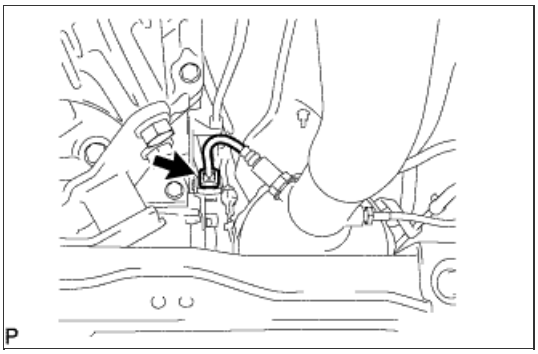
b. Depress the brake pedal and check that the engine starts when the shift lever is in N or P, but does not start in other positions.

c. Check that the back-up light illuminates and the reverse warning buzzer sounds only when the shift lever in R.

for Preparation Click here

1. REMOVE FRONT EXHAUST PIPE ASSEMBLY (w/ DPF)

a. Disconnect the air fuel ratio sensor connector.



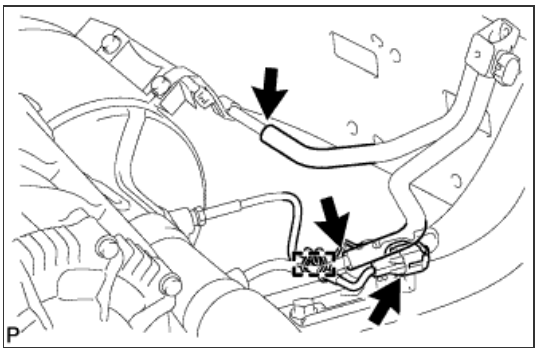
b. Disconnect the 2 air hoses.

c. Disconnect the exhaust gas temperature sensor connector and detach the clamp.

d. Remove the 2 bolts and 2 compression springs and disconnect the front exhaust pipe assembly from the center exhaust pipe assembly.

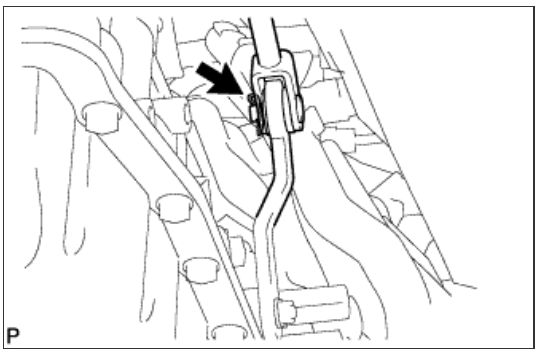
e. Remove the 3 nuts and front exhaust pipe.

f. Remove the 2 gaskets from the front exhaust pipe assembly.



2. DISCONNECT FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

a. Remove the clip and pin, and disconnect the shifting rod from the transmission control shaft lever RH.

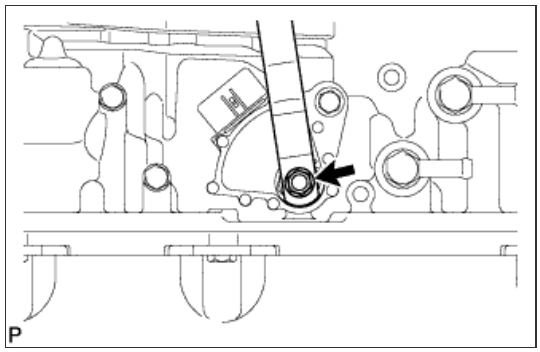


3. REMOVE PARK/NEUTRAL POSITION SWITCH ASSEMBLY

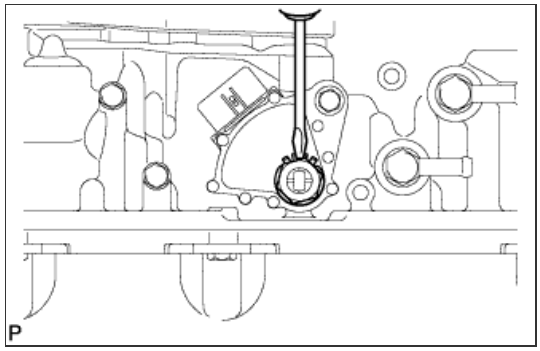
a. Disconnect the switch connector.

b. Remove the nut, spring washer and transmission control shaft lever RH.

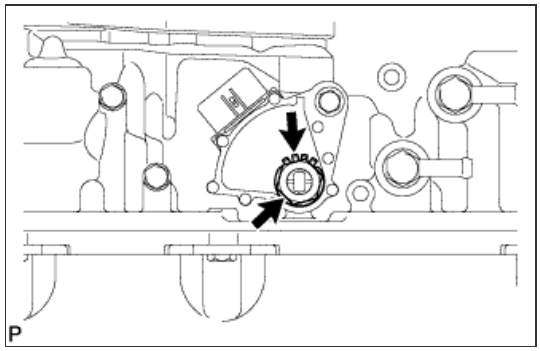
c. Remove the collar and transmission control rod bush from the transmission control shaft lever RH.



d. Using a screwdriver, bend the tabs of the lock washer.



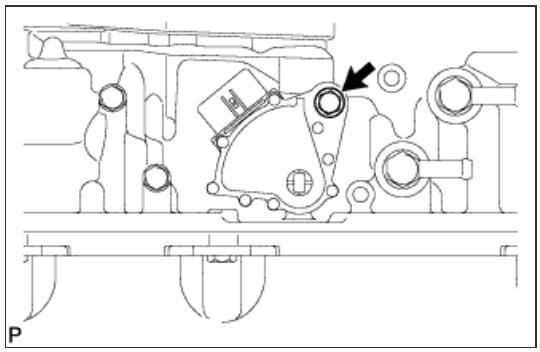
e. Remove the lock nut and lock washer.



f. Remove the bolt and switch.

HINT:

Make sure that the manual valve lever shaft has not been rotated prior to installing the park/neutral position switch as the detent spring may become detached from the manual valve lever shaft.



for Preparation Click here

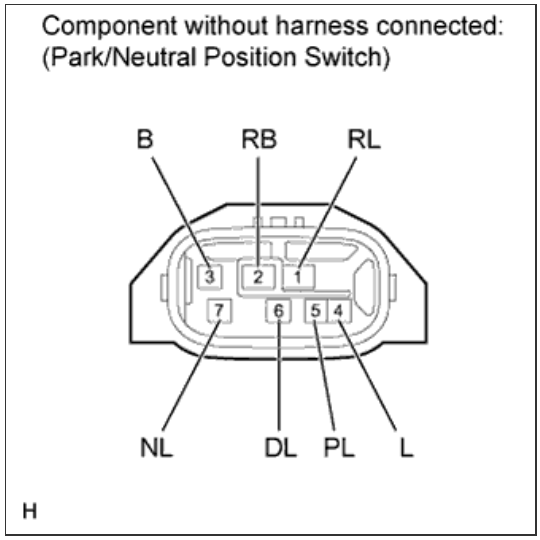
1. INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
2 (RB) - 5 (PL)	Shift lever in P	Below 1 Ω
2 (RB) - 5 (PL)	Shift lever not in P	10 kΩ or higher
2 (RB) - 1 (RL)	Shift lever in R	Below 1 Ω
2 (RB) - 1 (RL)	Shift lever not in R	10 kΩ or higher
2 (RB) - 7 (NL)	Shift lever in N	Below 1 Ω
2 (RB) - 7 (NL)	Shift lever not in N	10 kΩ or higher
2 (RB) - 6 (DL)	Shift lever in D or S	Below 1 Ω
2 (RB) - 6 (DL)	Shift lever not in D or S	10 kΩ or higher
3 (B) - 4 (L)	Shift lever in P or N	Below 1 Ω
3 (B) - 4 (L)	Shift lever not in P or N	10 kΩ or higher

If the result is not as specified, replace the switch assembly.



for Preparation Click here

1. ADJUST PARK/NEUTRAL POSITION SWITCH ASSEMBLY

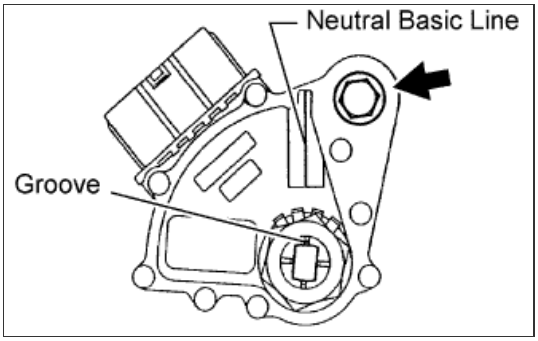
a. Loosen the bolt of the park/neutral position switch and move the shift lever to N.

b. Align the groove with the neutral basic line.

c. Hold the switch in the position described above and tighten the bolt.

Torque:
13 N*m{ 133 kgf*cm , 10 ft.*lbf }

d. After the adjustment, perform the on-vehicle inspection (Click here).



for Preparation Click here

1. INSTALL PARK/NEUTRAL POSITION SWITCH ASSEMBLY

HINT:

Make sure that the manual valve lever shaft has not been rotated prior to installing the park/neutral position switch as the detent spring may become detached from the manual valve lever shaft.

a. Clean the bolt and the bolt hole.

b. Apply adhesive to 2 or 3 threads on the end of the bolt.

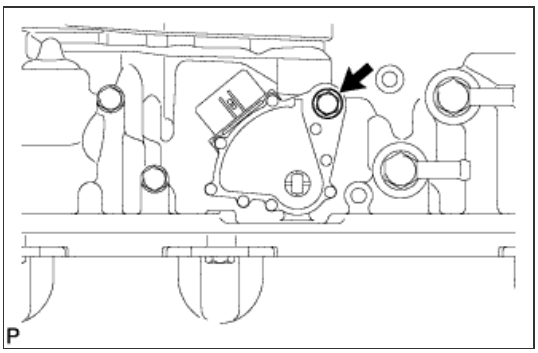
Adhesive:
Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

c. Install the switch to the manual valve shaft.

d. Temporarily install the park/neutral position switch assembly with the bolt.

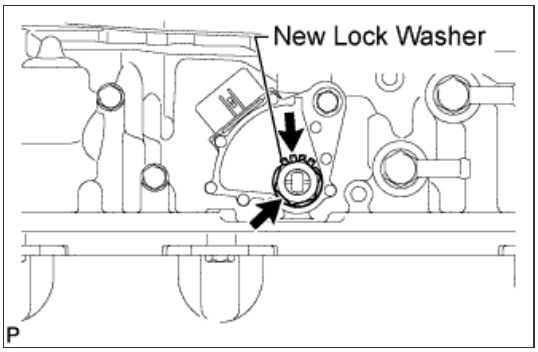
HINT:

Tighten the bolt to the specified torque when adjusting the park/neutral position switch assembly.

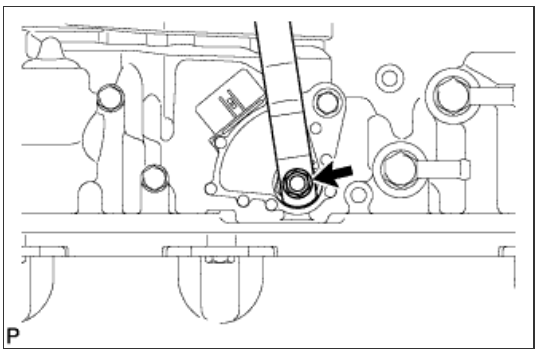


e. Install a new lock washer and the nut.

Torque:
6.9 N*m{ 70 kgf*cm , 61 in.*lbf }

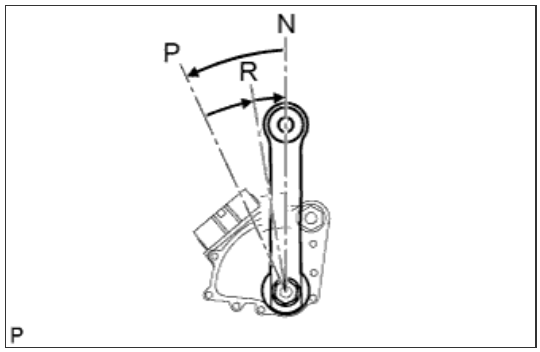


f. Temporarily install the control shaft lever RH.



g. Turn the control shaft lever RH counterclockwise until it stops, and then turn it clockwise 2 notches to set it to the N position.

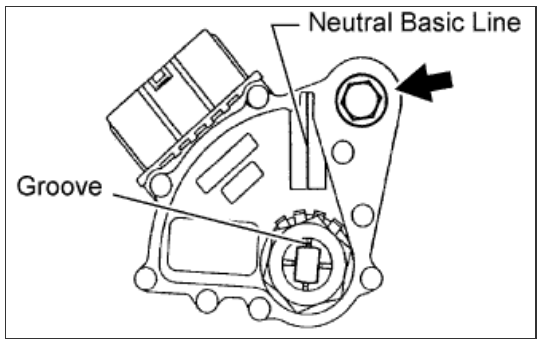
h. Remove the control shaft lever RH.



i. Align the groove with the neutral basic line.

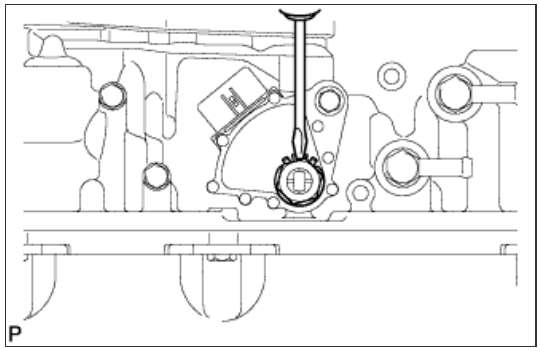
j. Hold the switch in the position described above and tighten the bolt.

Torque:
13 N*m{ 133 kgf*cm , 10 ft.*lbf }



k. Using a screwdriver, bend the tabs of the lock washer.

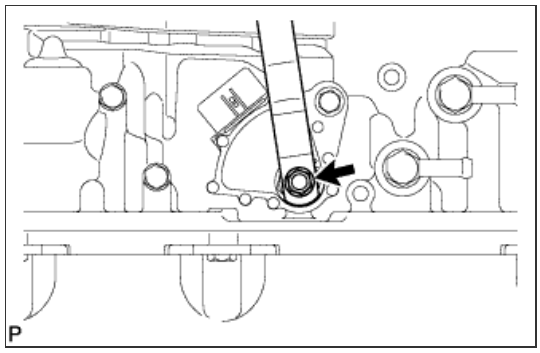
l. Install the transmission control rod bush and collar to the transmission control shaft lever RH.



m. Install the transmission control shaft lever RH with the spring washer and nut.

Torque:
16 N*m{ 163 kgf*cm , 12 ft.*lbf }

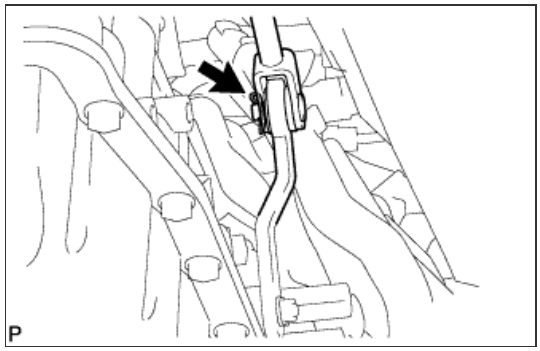
n. Connect the switch connector.



2. CONNECT FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

a. Connect the shifting rod to the transmission control shaft lever RH with the pin.

b. Install a new clip.



3. INSPECT SHIFT LEVER POSITION

a. When moving the shift lever from P to R with the ignition switch ON and the brake pedal depressed, make sure that it moves smoothly and correctly into position.

b. Check that the shift lever does not stop when moving the shift lever from R to P, and check that the shift lever does not stick when moving the shift lever from D to S.

c. Start the engine and make sure that the vehicle moves forward after moving the shift lever from N to D and moves rearward after moving the shift lever to R.
If the operation cannot be performed as specified, inspect the park/neutral position switch assembly and check the shift lever assembly installation condition.

4. INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY

(Click here)

5. INSTALL FRONT EXHAUST PIPE ASSEMBLY (w/ DPF)

a. Install a new gasket and the front exhaust pipe to the monolithic converter RH with 3 new nuts.

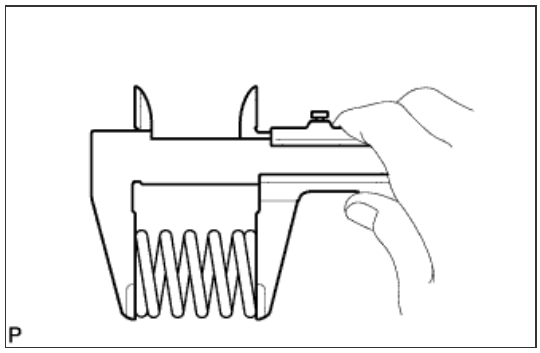
Torque:
48 N*m{ 489 kgf*cm , 35 ft.*lbf }

b. Check the free length.

i. Using a vernier caliper, measure the free length of the compression spring.

Free length:
43 mm (1.69 in.)

If the free length is less than the minimum, replace the compression spring.



c. Install a new gasket and connect the front exhaust pipe assembly with the 2 bolts and 2 compression springs.

Torque:
43 N*m{ 438 kgf*cm , 32 ft.*lbf }

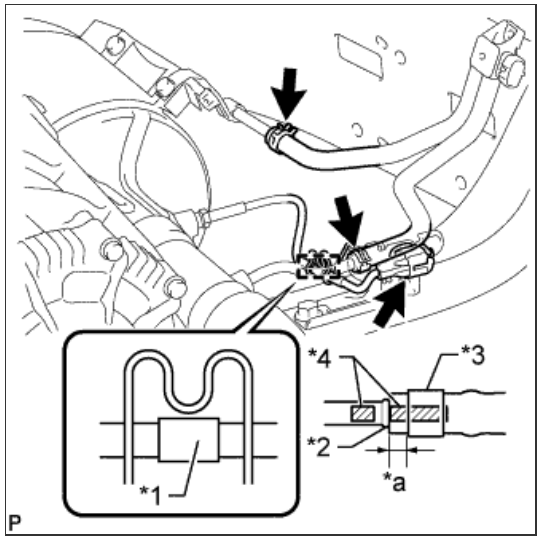
d. Attach the clamp and connect the exhaust gas temperature sensor connector.

Text in Illustration

*1	Tape
*2	Stopper
*3	Clip
*4	Paint Mark
*a	2 to 7 mm (0.0787 to 0.276 in.)

HINT:

Make sure that the tape is in the position shown in the illustration.



e. Install 2 new clips to the 2 air hoses.

f. Connect the 2 air hoses to the front exhaust pipe.

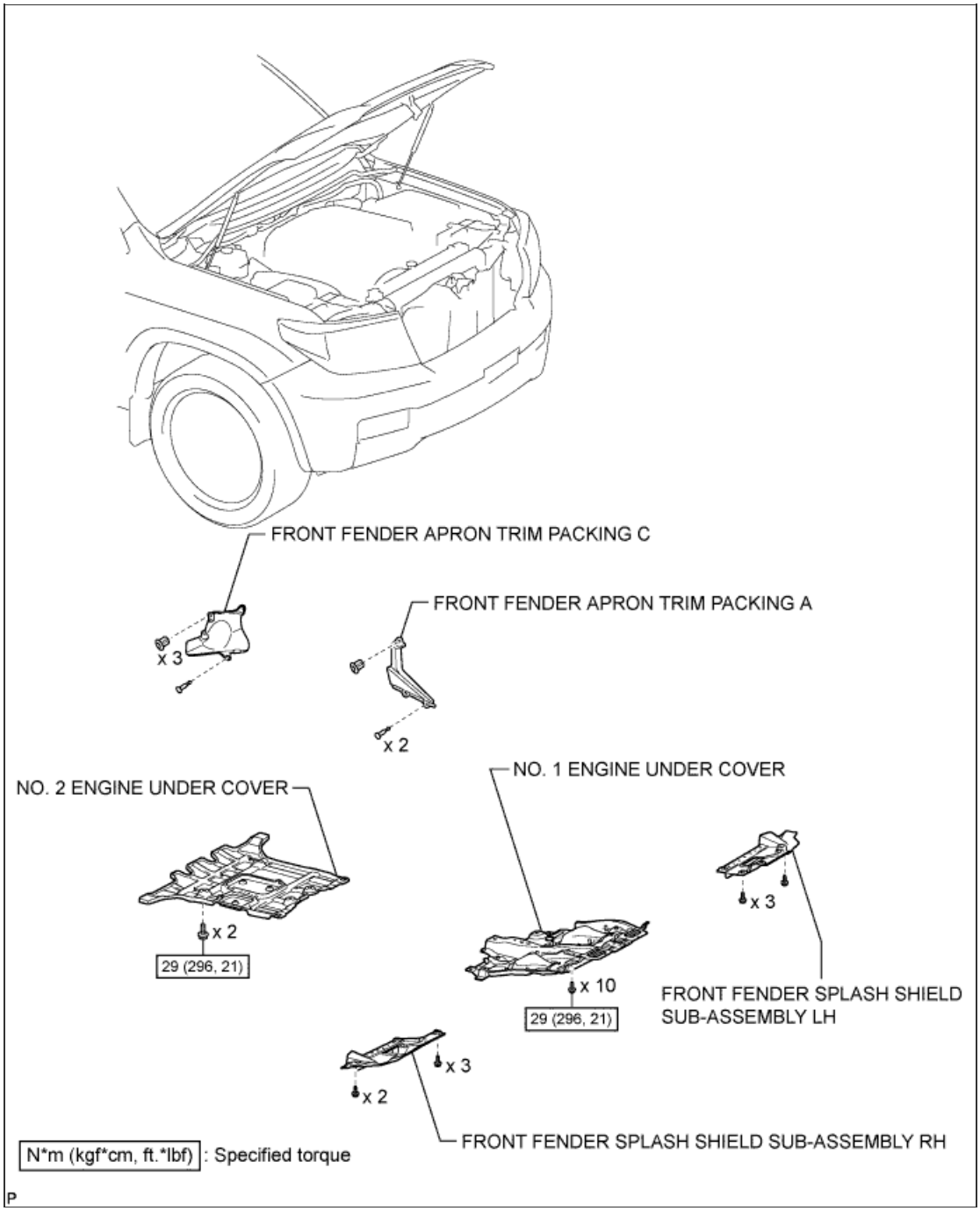
NOTICE:

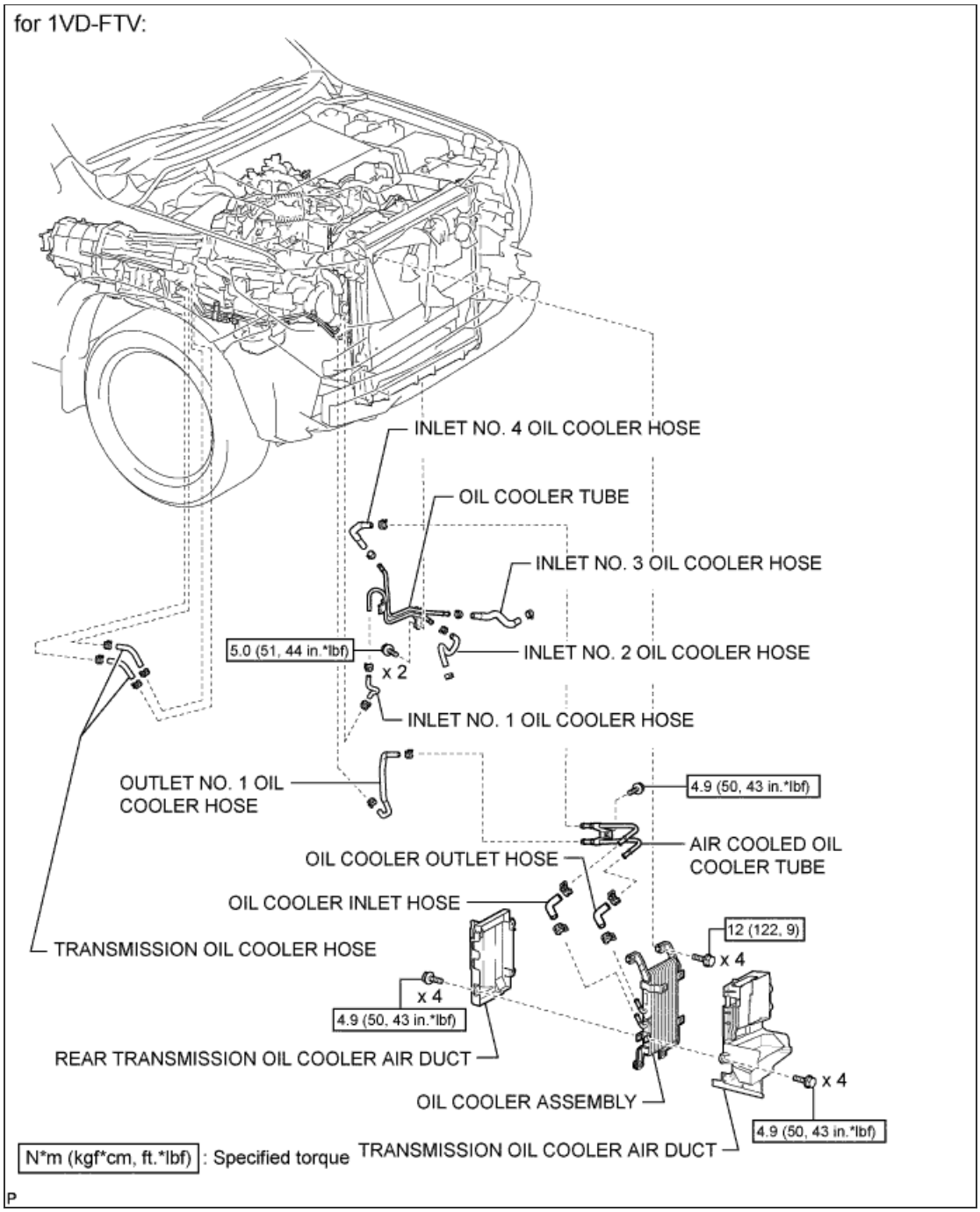
- **Align the paint marks of the front exhaust pipe and air hose and push on the air hose until it contacts the stopper.**
- **Make sure the clip is 4 to 10 mm (0.157 to 0.394 in.) from the end of the air hose when installing the clip.**
- **Make sure that there is no slack in the air hose, and that it is not twisted or bent.**
- **Take care not to damage the inner or outer surface of the air hose when installing it. If the air hose is damaged, replace it with a new one.**

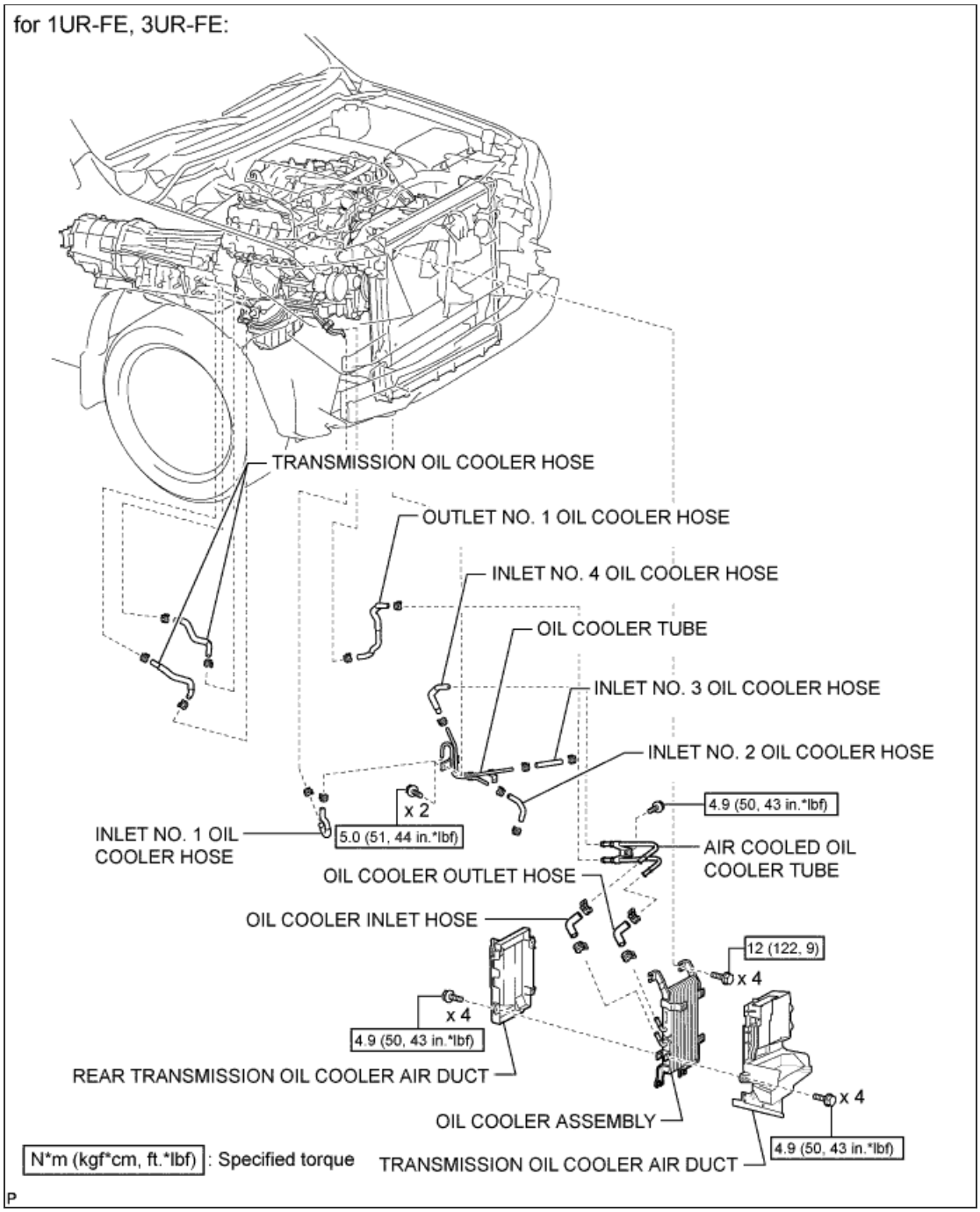
g. Connect the air fuel ratio sensor connector.

6. INSPECT FOR EXHAUST GAS LEAK

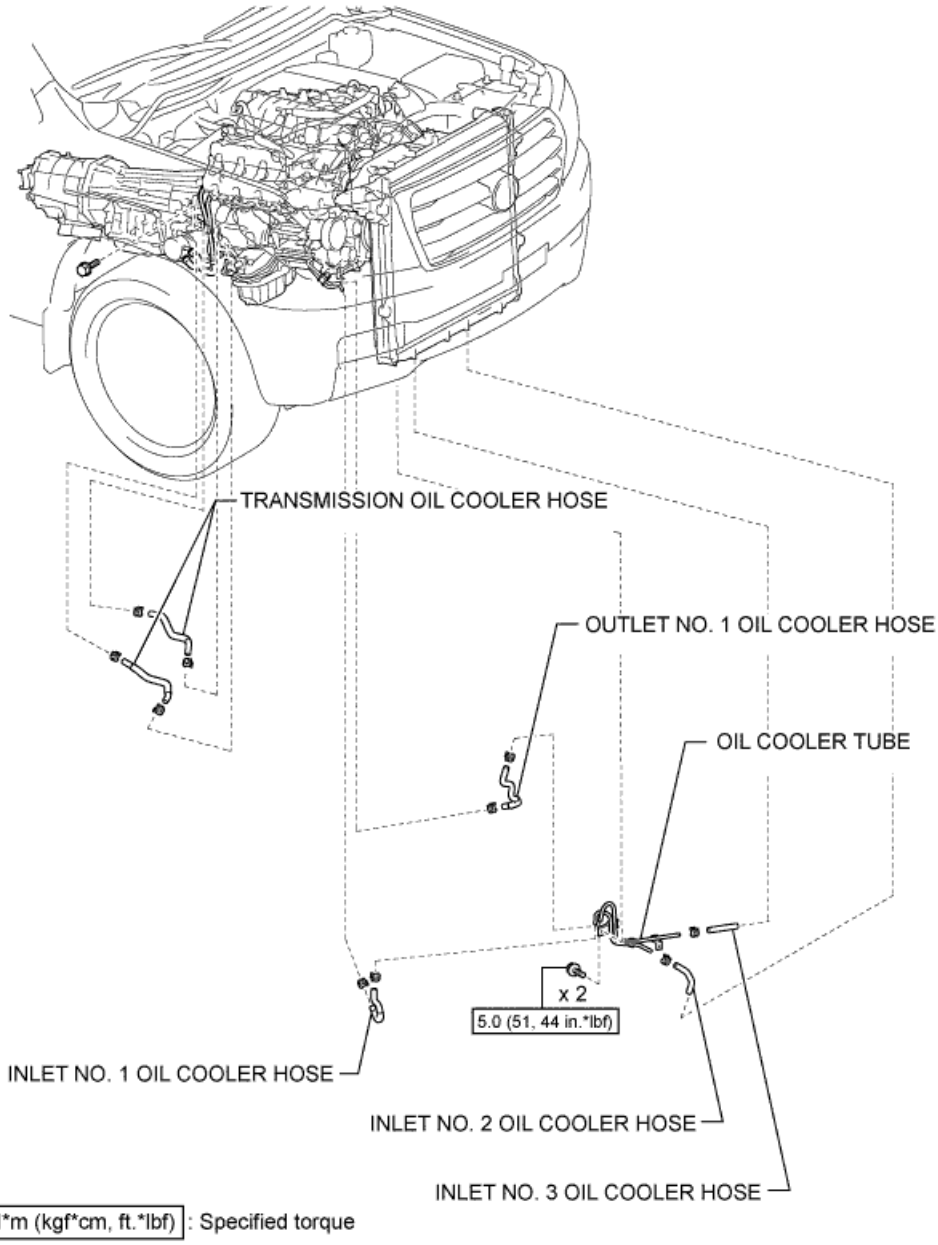
for Preparation Click here




for 1VD-FTV:
INLET NO. 4 OIL COOLER HOSE
OIL COOLER TUBE
INLET NO. 3 OIL COOLER HOSE
5.0 (51, 44 in.*lbf)
x 2
INLET NO. 2 OIL COOLER HOSE
INLET NO. 1 OIL COOLER HOSE
OUTLET NO. 1 OIL COOLER HOSE
4.9 (50, 43 in.*lbf)
AIR COOLED OIL COOLER TUBE
OIL COOLER OUTLET HOSE
OIL COOLER INLET HOSE
TRANSMISSION OIL COOLER HOSE
12 (122, 9)
x 4
x 4
4.9 (50, 43 in.*lbf)
REAR TRANSMISSION OIL COOLER AIR DUCT
OIL COOLER ASSEMBLY
x 4
4.9 (50, 43 in.*lbf)
N*m (kgf*cm, ft.*lbf) : Specified torque
TRANSMISSION OIL COOLER AIR DUCT
P


for 1UR-FE, 3UR-FE:
TRANSMISSION OIL COOLER HOSE
OUTLET NO. 1 OIL COOLER HOSE
INLET NO. 4 OIL COOLER HOSE
OIL COOLER TUBE
INLET NO. 3 OIL COOLER HOSE
INLET NO. 2 OIL COOLER HOSE
x 2
5.0 (51, 44 in.*lbf)
INLET NO. 1 OIL COOLER HOSE
4.9 (50, 43 in.*lbf)
AIR COOLED OIL COOLER TUBE
OIL COOLER OUTLET HOSE
OIL COOLER INLET HOSE
12 (122, 9)
x 4
x 4
4.9 (50, 43 in.*lbf)
REAR TRANSMISSION OIL COOLER AIR DUCT
x 4
OIL COOLER ASSEMBLY
4.9 (50, 43 in.*lbf)
TRANSMISSION OIL COOLER AIR DUCT
N*m (kgf*cm, ft.*lbf) : Specified torque
P

w/o Air Cooled Transmission Oil Cooler:



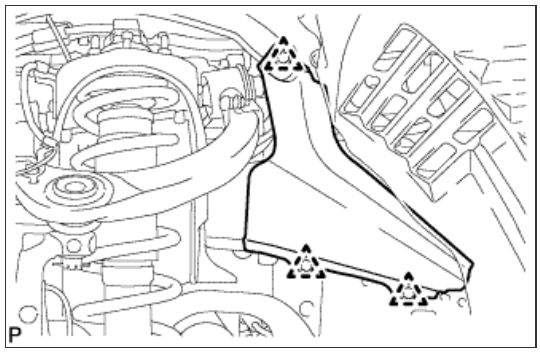
N*m (kgf*cm, ft.*lbf) : Specified torque

P

for Preparation Click here

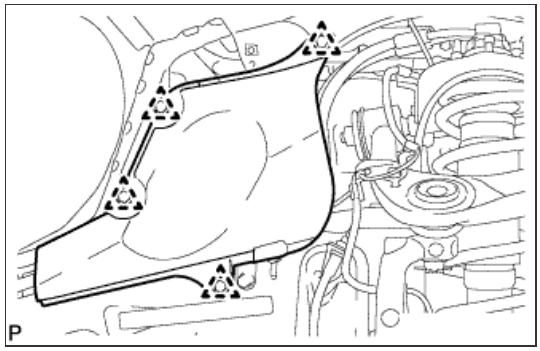
1. REMOVE FRONT FENDER APRON TRIM PACKING A

a. Remove the 3 clips and front fender apron trim packing A.



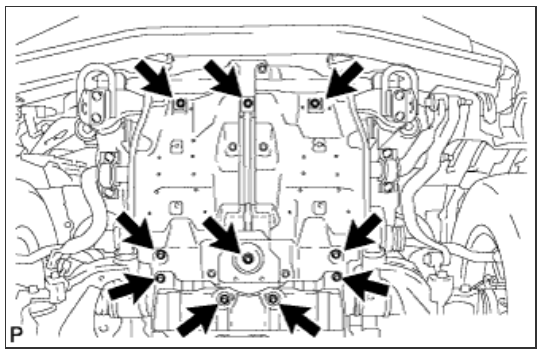
2. REMOVE FRONT FENDER APRON TRIM PACKING C

a. Remove the 4 clips and front fender apron trim packing C.



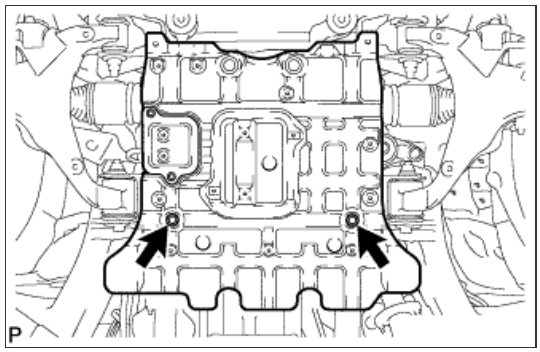
3. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

a. Remove the 10 bolts and No. 1 engine under cover.



4. REMOVE NO. 2 ENGINE UNDER COVER

a. Remove the 2 bolts and No. 2 engine under cover.



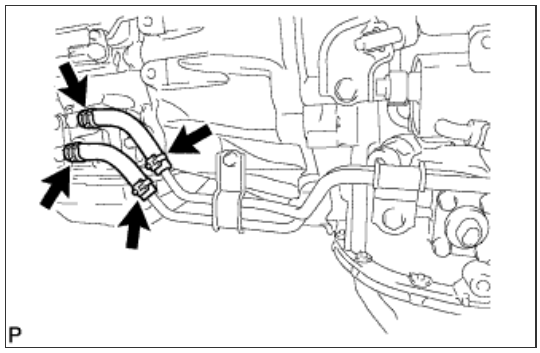
5. REMOVE FRONT BUMPER COVER (w/ Air Cooled Transmission Oil Cooler)

a. for Standard:
(Click here)

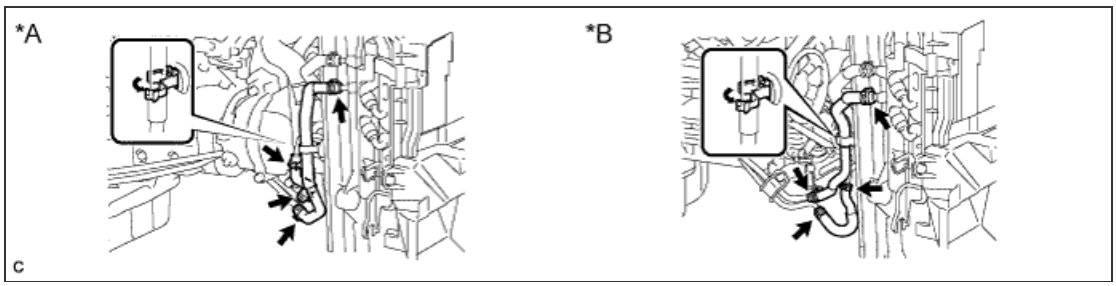
b. w/ Winch:
(Click here)

6. DISCONNECT TRANSMISSION OIL COOLER HOSE

a. Disconnect the 2 transmission oil cooler hoses.



7. DISCONNECT INLET NO. 1 OIL COOLER HOSE AND OUTLET NO. 1 OIL COOLER HOSE



Text in Illustration

*A	for 1VD-FTV	*B	for 1UR-FE, 3UR-FE

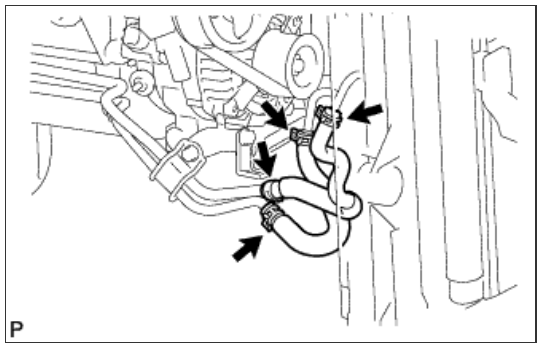
a. Detach the claw to open the flexible hose clamp.

b. Disconnect the inlet and outlet oil cooler hoses.

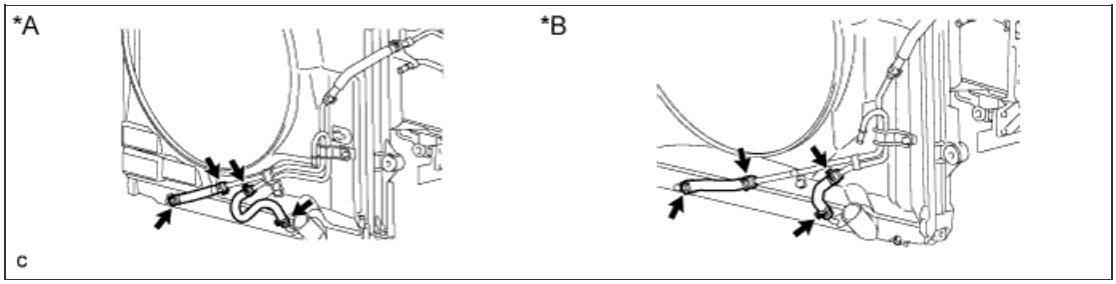
8. DISCONNECT INLET NO. 1 OIL COOLER HOSE AND OUTLET NO. 1 OIL COOLER HOSE (w/o Air Cooled Transmission Oil Cooler)

a. Disconnect the inlet and outlet oil cooler hoses.

a. Disconnect the inlet and outlet oil cooler hoses.



9. DISCONNECT INLET NO. 2 OIL COOLER HOSE AND INLET NO. 3 OIL COOLER HOSE



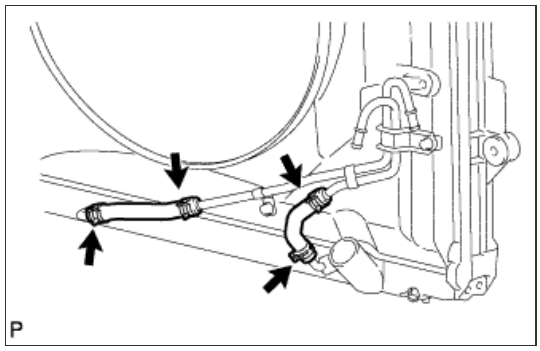
Text in Illustration

*A	for 1VD-FTV	*B	for 1UR-FE, 3UR-FE

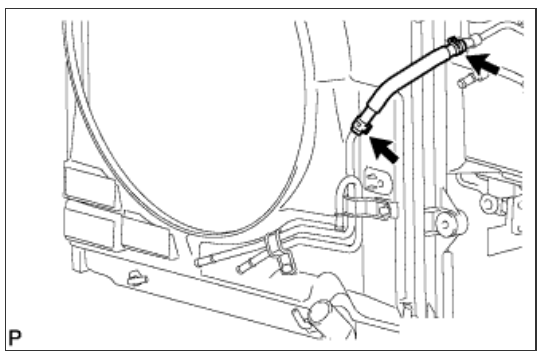
a. Disconnect the 2 inlet oil cooler hoses.

10. DISCONNECT INLET NO. 2 OIL COOLER HOSE AND INLET NO. 3 OIL COOLER HOSE (w/o Air Cooled Transmission Oil Cooler)

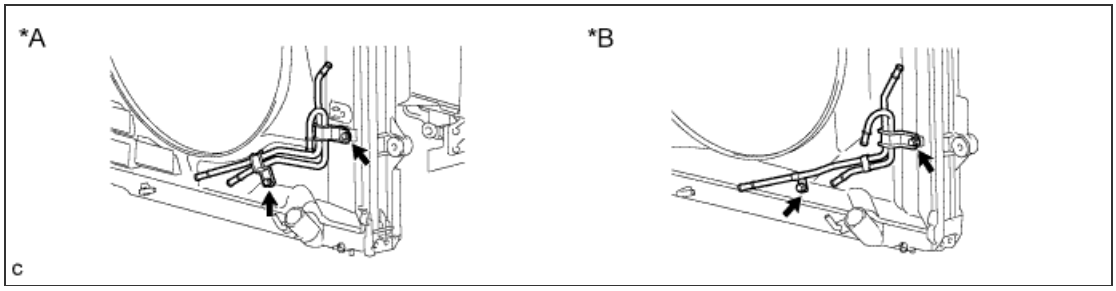
a. Disconnect the 2 inlet oil cooler hoses.



11. DISCONNECT INLET NO. 4 OIL COOLER HOSE



12. REMOVE OIL COOLER TUBE



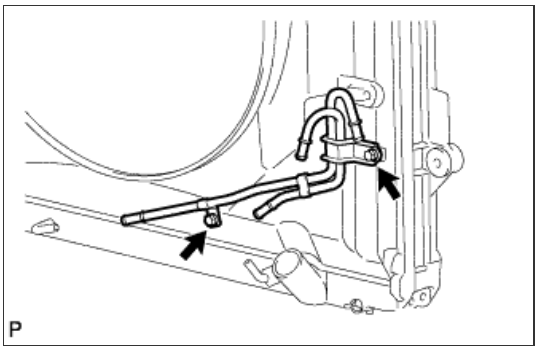
Text in Illustration

*A	for 1VD-FTV	*B	for 1UR-FE, 3UR-FE

a. Remove the 2 bolts and oil cooler tube.

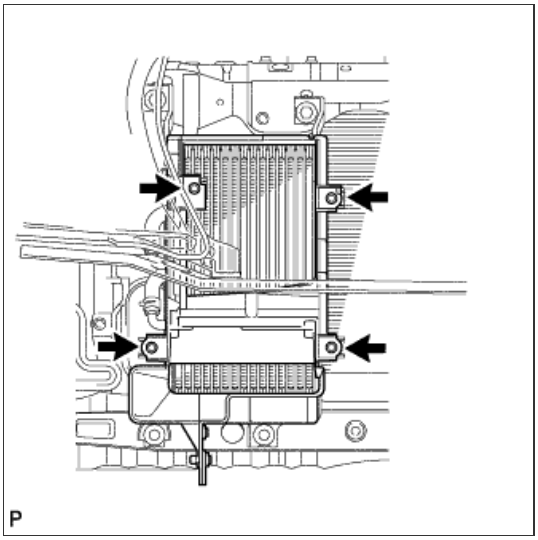
13. REMOVE OIL COOLER TUBE (w/o Air Cooled Transmission Oil Cooler)

a. Remove the 2 bolts and oil cooler tube.



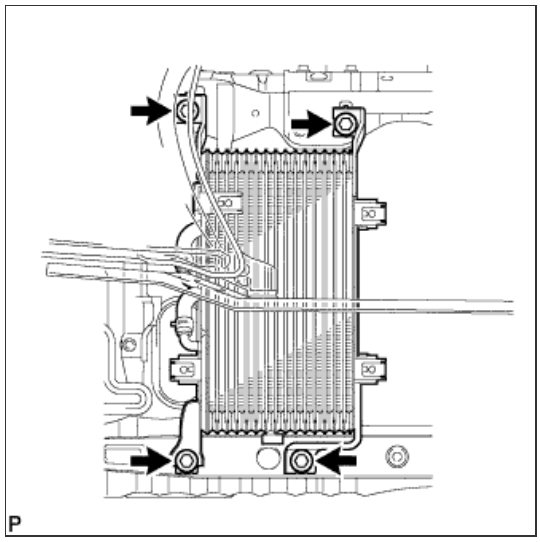
14. REMOVE TRANSMISSION OIL COOLER AIR DUCT

a. Remove the 4 bolts and transmission oil cooler air duct.

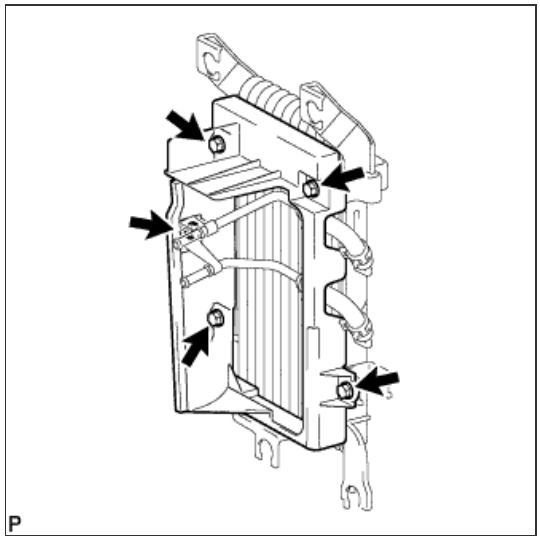


15. REMOVE OIL COOLER ASSEMBLY

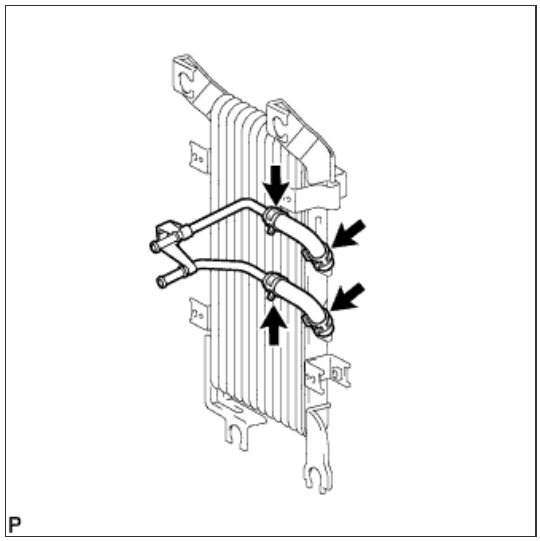
a. Remove the 4 bolts and oil cooler.



b. Remove the 5 bolts and rear transmission oil cooler air duct.



c. Disconnect the oil cooler inlet hose and outlet hose and remove the tube.



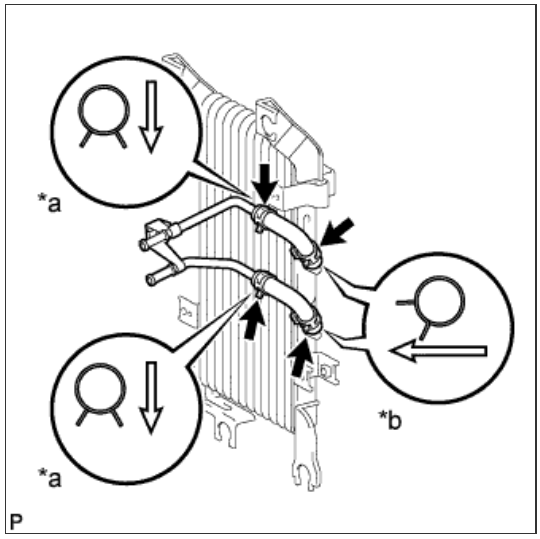
for Preparation Click here

1. INSTALL OIL COOLER ASSEMBLY

a. Connect the oil cooler inlet hose and outlet hose.

Text in Illustration

*a	Lower Side
*b	Outward



b. Install the rear transmission oil cooler air duct with the 4 bolts, and then install the air cooled oil cooler tube to the transmission oil cooler air duct with the bolt.

Torque:
4.9 N*m{ 50 kgf*cm , 43 in.*lbf }

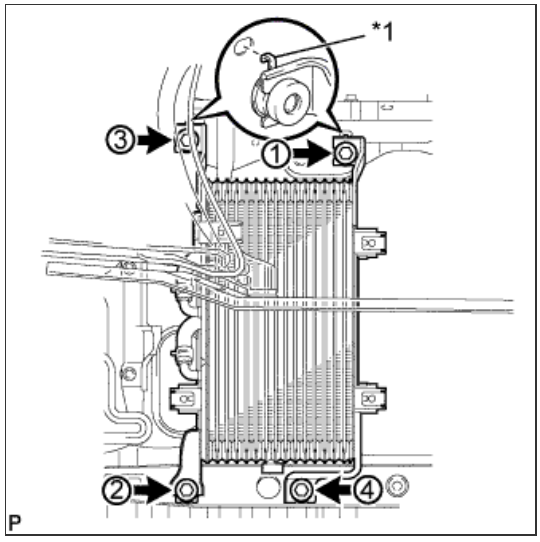
c. Temporarily put the oil cooler on the radiator support.

NOTICE:

Securely attach the 2 claws of the oil cooler into the holes of the radiator support.

Text in Illustration

*1	Claw



d. Install the 4 bolts in the sequence shown in the illustration.

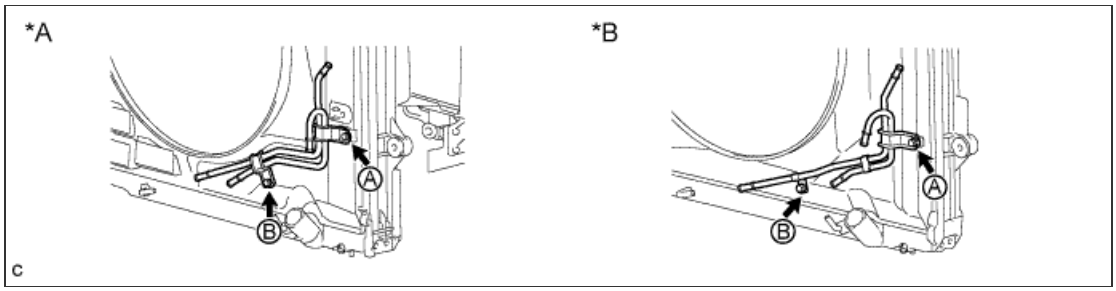
Torque:
12 N*m{ 122 kgf*cm , 9 ft.*lbf }

2. INSTALL TRANSMISSION OIL COOLER AIR DUCT

a. Install the oil cooler air duct with the 4 bolts.

Torque:
4.9 N*m{ 50 kgf*cm , 43 in.*lbf }

3. INSTALL OIL COOLER TUBE



Text in Illustration

*A	for 1VD-FTV	*B	for 1UR-FE, 3UR-FE

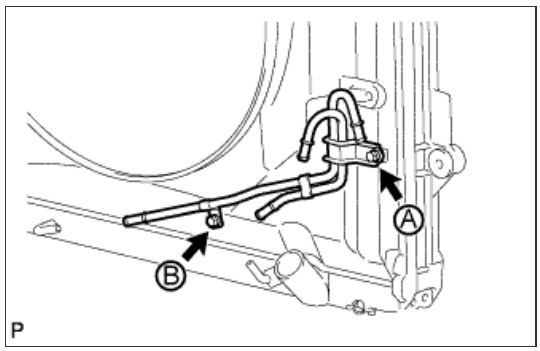
a. Temporarily install the oil cooler tube to the fan shroud with bolt A. Install bolt B and tighten it to the specified torque. Then tighten bolt A to the specified torque.

Torque:
5.0 N*m{ 51 kgf*cm , 44 in.*lbf }

4. INSTALL OIL COOLER TUBE (w/o Air Cooled Transmission Oil Cooler)

a. Temporarily install the oil cooler tube to the fan shroud with bolt A. Install bolt B and tighten it to the specified torque. Then tighten bolt A to the specified torque.

Torque:
5.0 N*m{ 51 kgf*cm , 44 in.*lbf }



5. CONNECT INLET NO. 4 OIL COOLER HOSE

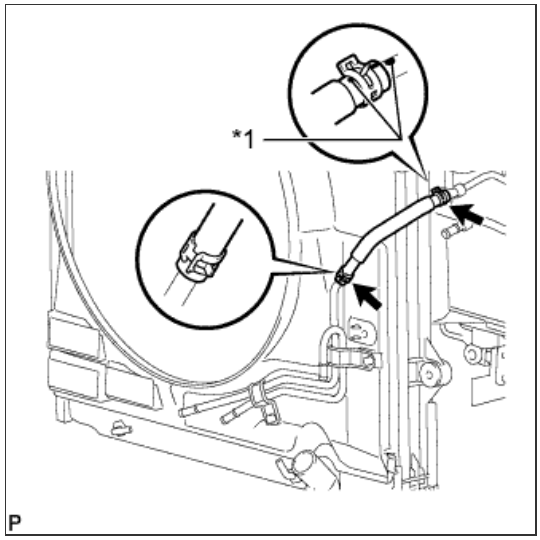
a. Connect the inlet oil cooler hose as shown in the illustration.

NOTICE:

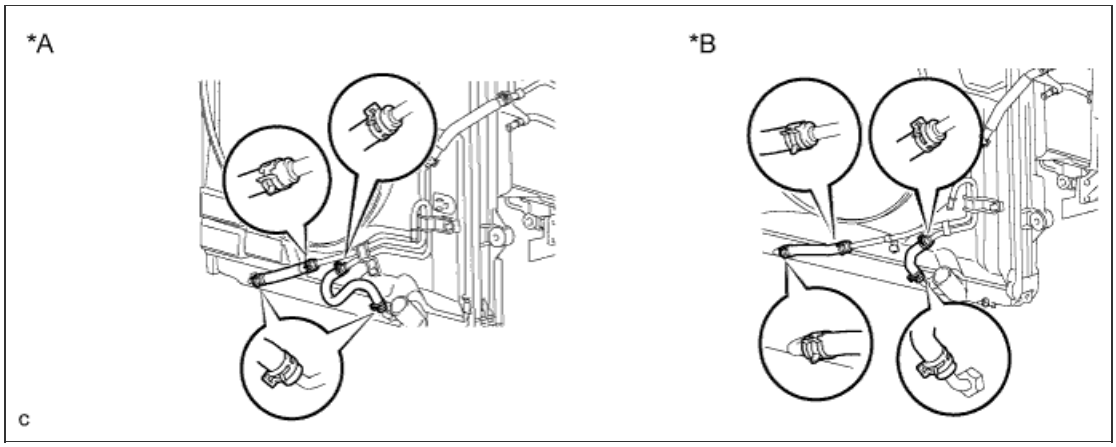
Make sure the pinching portion of each clip is facing the direction shown in the illustration and the paint marks are aligned as shown in the illustration.

Text in Illustration

*1	Paint Mark



6. CONNECT INLET NO. 2 OIL COOLER HOSE AND INLET NO. 3 OIL COOLER HOSE



Text in Illustration

*A	for 1VD-FTV	*B	for 1UR-FE, 3UR-FE

a. Connect the 2 inlet oil cooler hoses as shown in the illustration.

NOTICE:

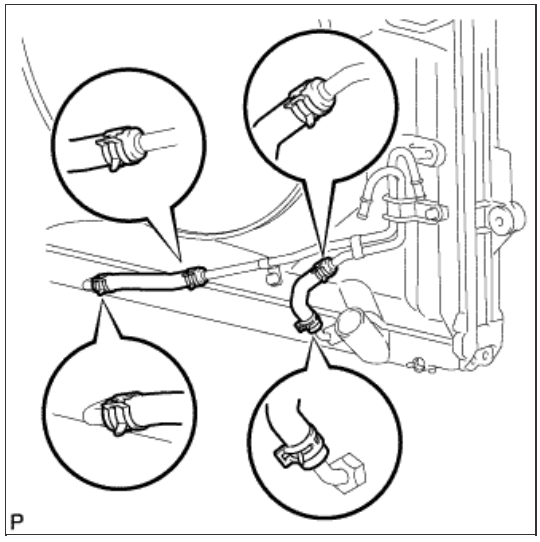
Make sure the pinching portion of each clip is facing the direction shown in the illustration.

7. CONNECT INLET NO. 2 OIL COOLER HOSE AND INLET NO. 3 OIL COOLER HOSE (w/o Air Cooled Transmission Oil Cooler)

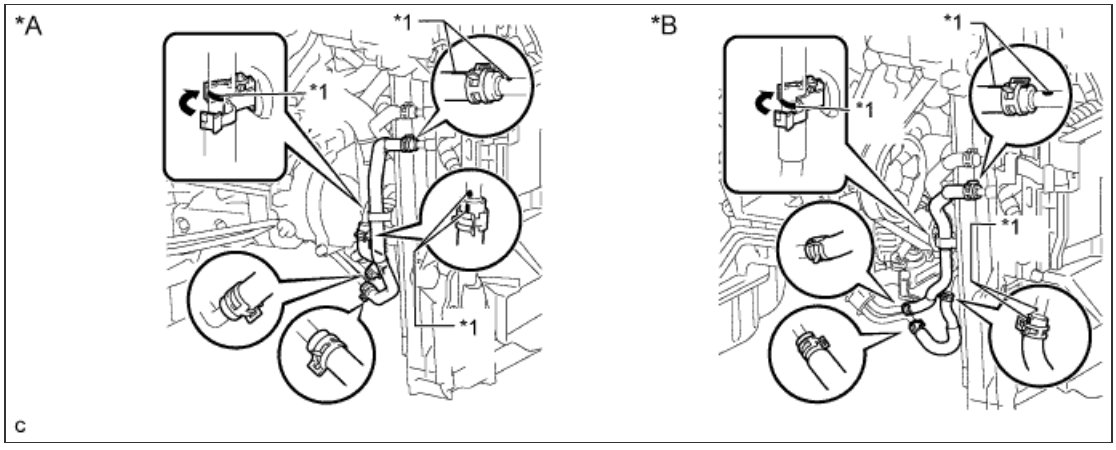
a. Connect the 2 inlet oil cooler hoses as shown in the illustration.

NOTICE:

Make sure the pinching portion of each clip is facing the direction shown in the illustration.



8. CONNECT INLET NO. 1 OIL COOLER HOSE AND OUTLET NO. 1 OIL COOLER HOSE



Text in Illustration

*A	for 1VD-FTV	*B	for 1UR-FE, 3UR-FE
*1	Paint Mark	-	-

a. Connect the 2 oil cooler hoses as shown in the illustration.

NOTICE:

Make sure the pinching portion of each clip is facing the direction shown in the illustration and the paint marks are aligned as shown in the illustration.

b. Attach the hose to the flexible hose clamp and close the clamp as shown in the illustration.

9. CONNECT INLET NO. 1 OIL COOLER HOSE AND OUTLET NO. 1 OIL COOLER HOSE (w/o Air Cooled Transmission Oil Cooler)

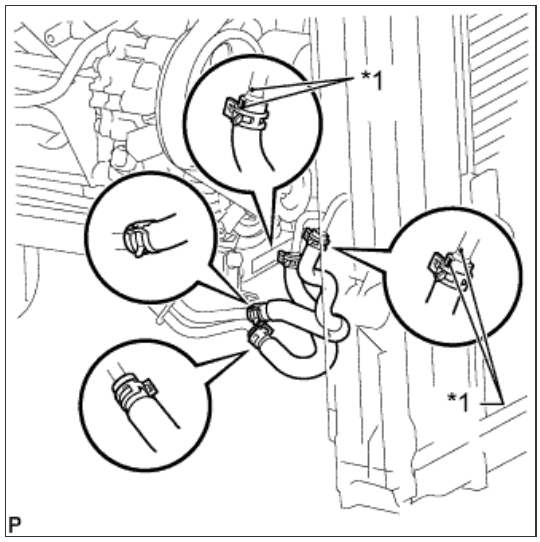
a. Connect the 2 oil cooler hoses as shown in the illustration.

Text in Illustration

*1	Paint Mark

NOTICE:

Make sure the pinching portion of each clip is facing the direction shown in the illustration and the paint marks are aligned as shown in the illustration.



10. CONNECT TRANSMISSION OIL COOLER HOSE

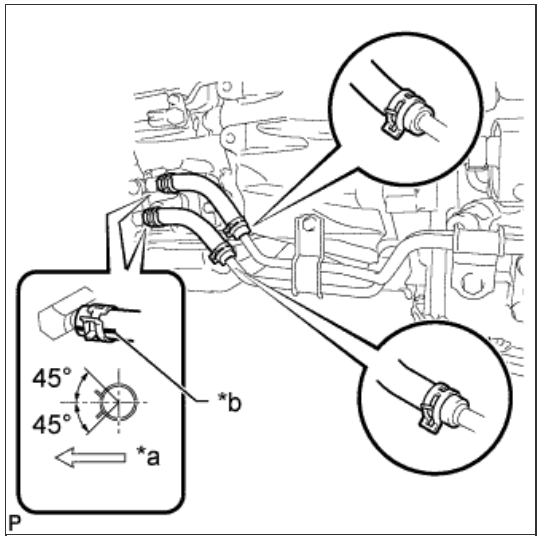
a. Connect the 2 transmission oil cooler hoses as shown in the illustration.

Text in Illustration

*a	RH Side
*b	Paint Mark

NOTICE:

- **Make sure the pinching portion of each clip is facing the direction shown in the illustration.**
- **Make sure the paint mark of each hose is facing outward.**



11. ADD AUTOMATIC TRANSMISSION FLUID

a. Add automatic transmission fluid (Click here).

12. INSTALL FRONT BUMPER COVER (w/ Air Cooled Transmission Oil Cooler)

a. for Standard:
(Click here)

b. w/ Winch:
(Click here)

13. INSTALL NO. 2 ENGINE UNDER COVER

a. Install the No. 2 engine under cover with the 2 bolts.

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

14. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

a. Install the No. 1 engine under cover sub-assembly with the 10 bolts.

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

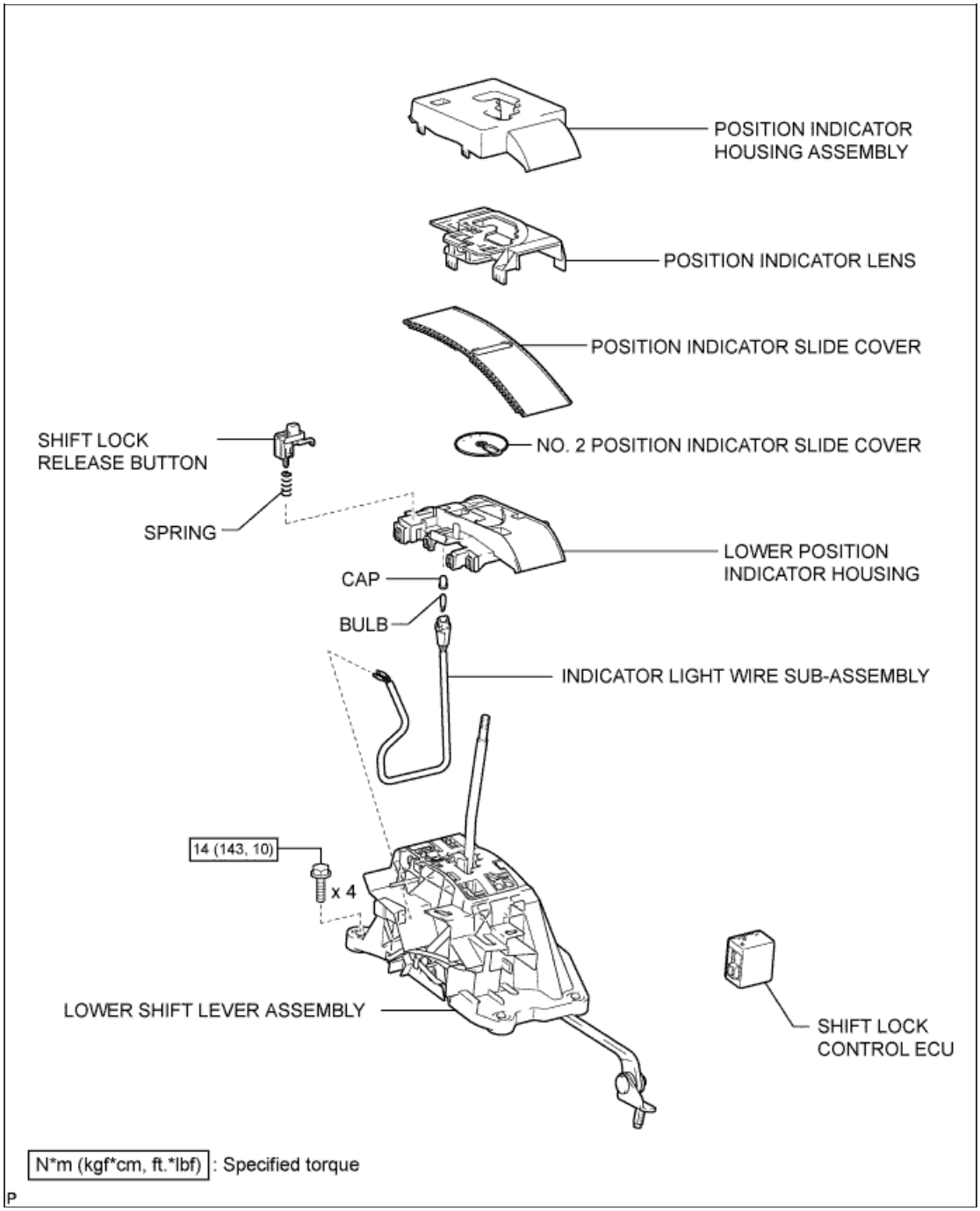
15. INSTALL FRONT FENDER APRON TRIM PACKING C

a. Install the front fender apron trim packing C with the 4 clips.

16. INSTALL FRONT FENDER APRON TRIM PACKING A

a. Install the front fender apron trim packing A with the 3 clips.

for Preparation Click here



for Preparation Click here

1. INSPECT SHIFT LEVER POSITION

a. When moving the shift lever from P to R with the ignition switch ON and the brake pedal depressed, make sure that it moves smoothly and correctly into position.

b. Check that the shift lever does not stop when moving the shift lever from R to P, and check that the shift lever does not stick when moving the shift lever from D to S.

c. Start the engine and make sure that the vehicle moves forward after moving the shift lever from N to D and moves rearward after moving the shift lever to R.
If the operation cannot be performed as specified, inspect the park/neutral position switch assembly and check the shift lever assembly installation condition.

2. CHECK SHIFT LOCK OPERATION

a. Move the shift lever to P.

b. Turn the ignition switch off.

c. Check that the shift lever cannot be moved from P.

d. Turn the ignition switch to ON, depress the brake pedal and check that the shift lever can be moved to other positions.
If the operation cannot be done as specified, inspect the shift lever assembly and shift lock control unit.

3. CHECK SHIFT LOCK RELEASE BUTTON OPERATION

a. When operating the shift lever with the shift lock release button pressed, check that the lever can be moved to any position.
If the operation cannot be performed as specified, check the shift lever assembly.

4. CHECK SHIFT LOCK CONTROL ECU

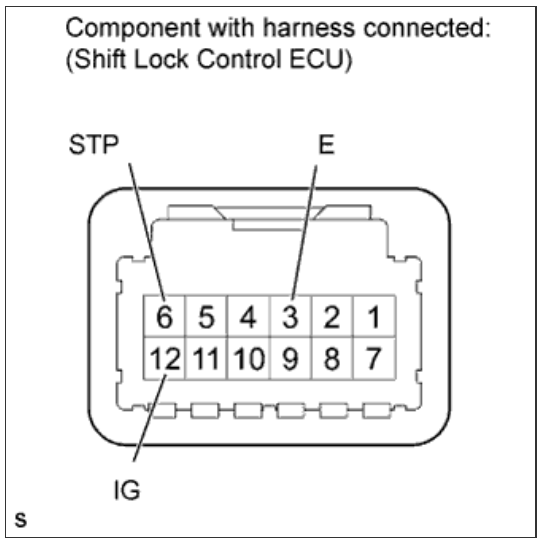
a. Measure the voltage according to the values in the table below.

HINT:

Do not disconnect the shift lock control ECU connector.

Standard Voltage:

Tester Connection	Condition	Specified Condition
12 (IG) - 3 (E)	Ignition switch ON	11 to 14 V
12 (IG) - 3 (E)	Ignition switch off	Below 1 V
6 (STP) - 3 (E)	Depress brake pedal	11 to 14 V
6 (STP) - 3 (E)	Release brake pedal	Below 1 V



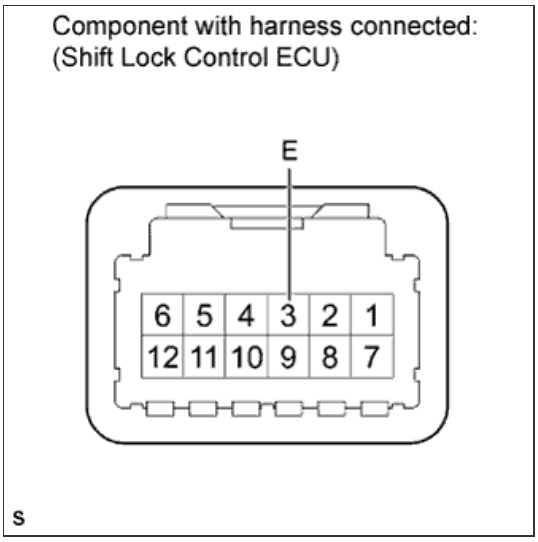
b. Measure the resistance according to the value in the table below.

HINT:

Do not disconnect the shift lock control ECU connector.

Standard Resistance:

Tester Connection	Condition	Specified Value
3 (E) - Body ground	Always	Below 1 Ω



c. Disconnect the shift lock solenoid connector from the shift lock control ECU.

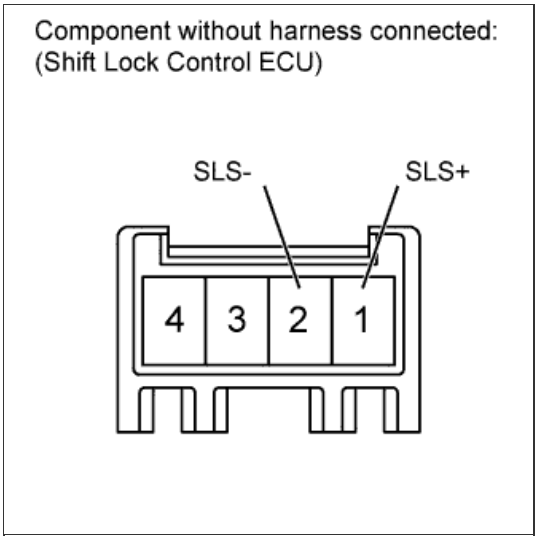
d. Measure the voltage according to the values in the table below.

HINT:

Do not disconnect the shift lock control ECU connector.

Standard Voltage:

Tester Connection	Condition	Specified Condition
1 (SLS+) - 2 (SLS-)	Ignition switch off	Below 1 V
1 (SLS+) - 2 (SLS-)	Ignition switch ON	Below 1 V
	Ignition switch ON and brake pedal depressed	11 to 14 V



If the result is not as specified, replace the shift lever assembly.

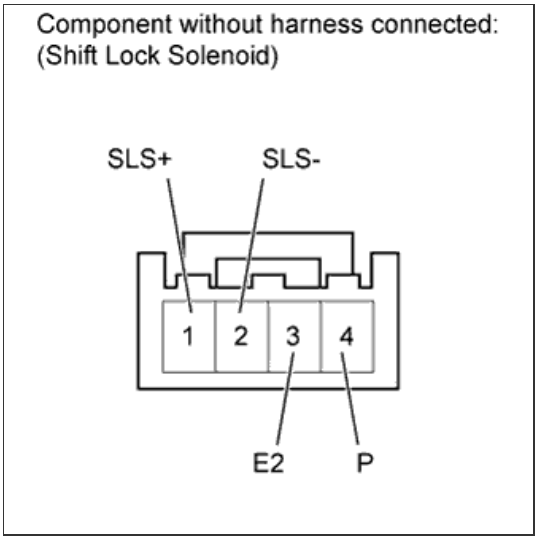
5. CHECK SHIFT LOCK SOLENOID

a. Disconnect the shift lock solenoid connector from the shift lock control ECU.

b. Measure the resistance according to the values in the table below.

Standard Voltage:

Tester Connection	Condition	Specified Condition
1 (SLS+) - 2 (SLS-)	Always	101 to 123 Ω
3 (E2) - 4 (P)	Shift lever in P	10 kΩ or higher
3 (E2) - 4 (P)	Shift lever not in P	Below 1 Ω



c. Apply 12 V battery voltage to the shift lock solenoid and check that the valve moves and makes an operating noise.

OK:

Measurement Condition	Specified Condition
• Battery positive (+) → Terminal 1 (SLS+) • Battery negative (-) → Terminal 2 (SLS-)	Solenoid moves and makes an operating noise

If the result is not as specified, replace the shift lever assembly.

for Preparation Click here

1. REMOVE FRONT CONSOLE BOX (w/ Cool Box)

(Click here)

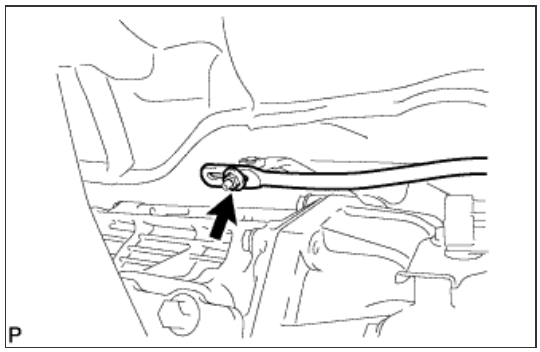
2. REMOVE FRONT CONSOLE BOX (w/o Cool Box)

(Click here)

3. DISCONNECT FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

a. Move the shift lever to N.

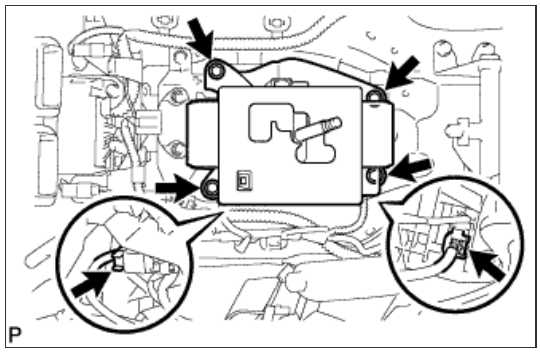
b. Remove the nut and disconnect the shifting rod from the connecting rod swivel.



4. REMOVE TRANSMISSION FLOOR SHIFT ASSEMBLY

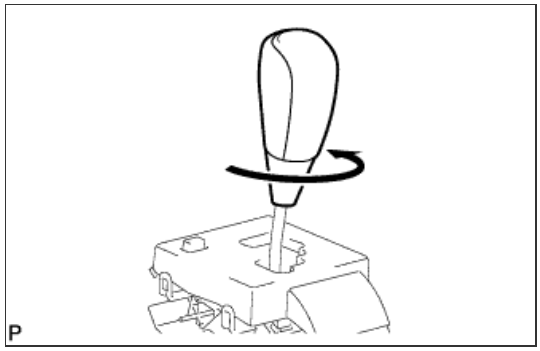
a. Disconnect the 2 connectors.

b. Remove the 4 bolts and floor shift.



for Preparation Click here

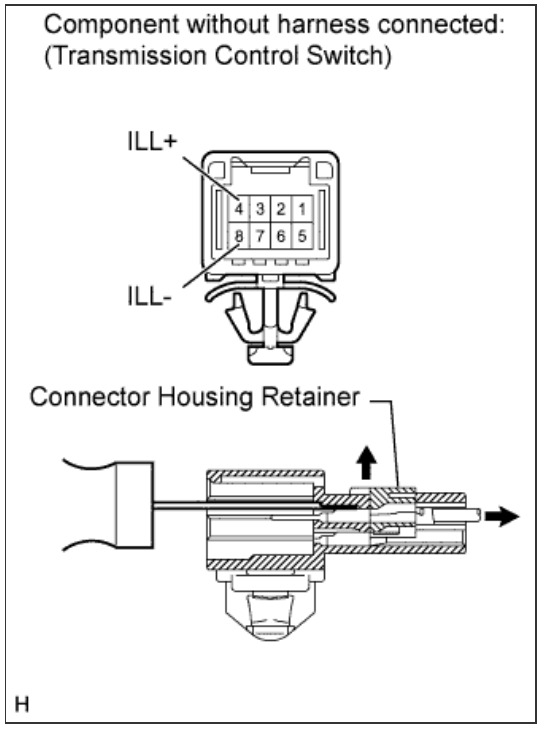
1. REMOVE SHIFT LEVER KNOB SUB-ASSEMBLY



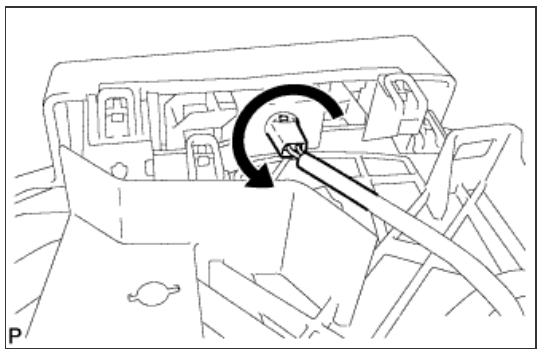
2. REMOVE INDICATOR LIGHT WIRE SUB-ASSEMBLY

a. Using a thin-bladed screwdriver, release the connector housing retainer.

b. Using a thin-bladed screwdriver, pull out the 4 (ILL+) and 8 (ILL-) terminals from the rear as shown in the illustration.

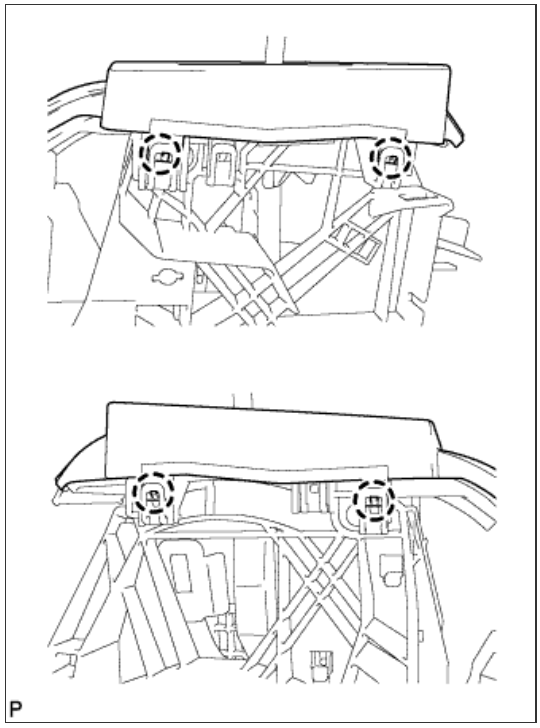


c. Rotate the indicator light wire counterclockwise to align the key part and remove the wire.



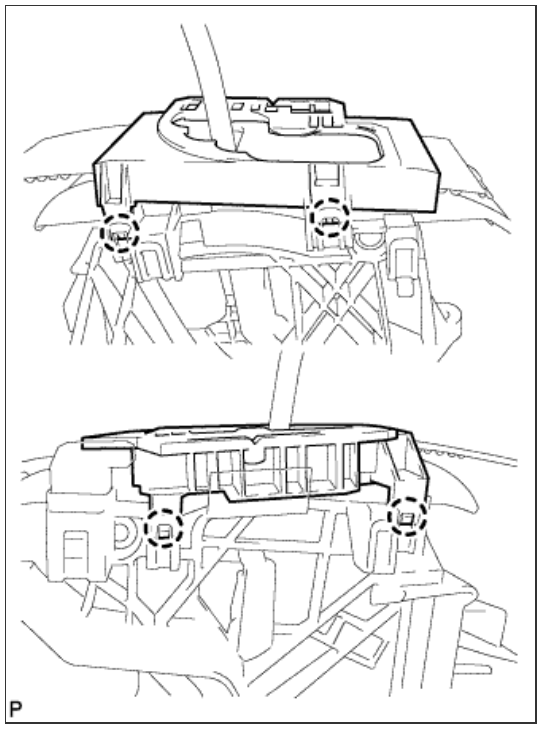
3. REMOVE POSITION INDICATOR HOUSING ASSEMBLY

a. Detach the 4 claws and remove the position indicator housing from the floor shift.



4. REMOVE POSITION INDICATOR LENS

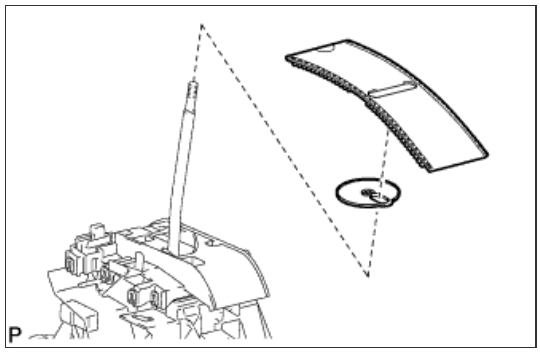
a. Detach the 4 claws and remove the position indicator lens from the floor shift.



5. REMOVE POSITION INDICATOR SLIDE COVER AND NO. 2 POSITION INDICATOR SLIDE COVER

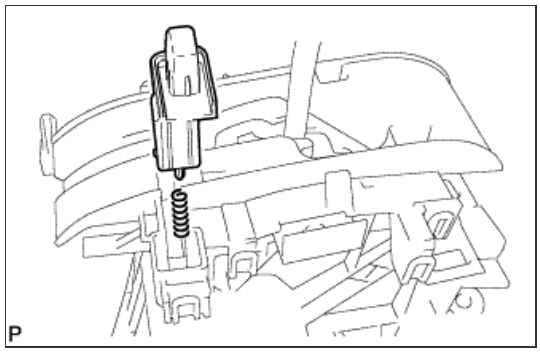
a. Remove the position indicator slide cover with No. 2 position indicator slide cover.

b. Remove the No. 2 position indicator slide cover from the position indicator slide cover.



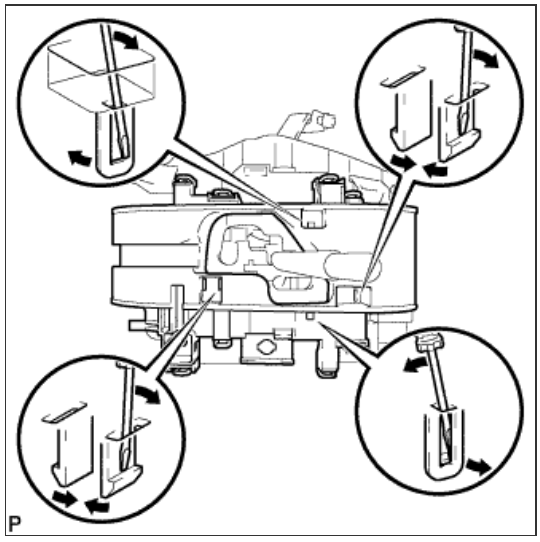
6. REMOVE SHIFT LOCK RELEASE BUTTON

a. Detach the 2 claws and remove the button and spring.



7. REMOVE LOWER POSITION INDICATOR HOUSING

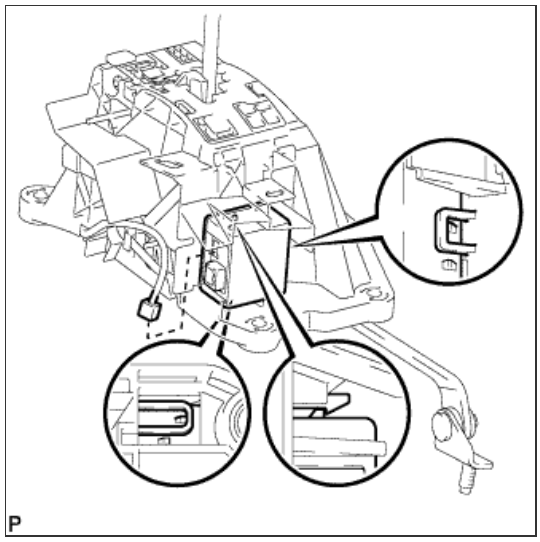
a. Using a small screwdriver, detach the 6 claws and remove the housing.



8. REMOVE SHIFT LOCK CONTROL ECU

a. Disconnect the shift lock solenoid connector.

b. Detach the 3 claws and remove the ECU.


P

for Preparation Click here

1. INSPECT TRANSMISSION CONTROL SWITCH

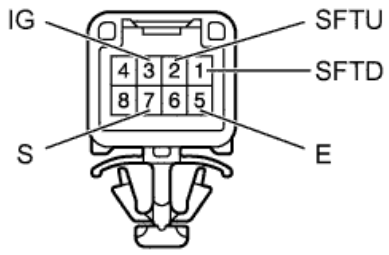
a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
3 (IG) - 7 (S)	Shift lever in S, "+" or "-"	Below 1 Ω
2 (SFTU) - 5 (E)	Shift lever held in "+" (Up-shift)	
1 (SFTD) - 5 (E)	Shift lever held in "-" (Down-shift)	
3 (IG) - 7 (S)	Shift lever not in S, "+" or "-"	10 kΩ or higher
2 (SFTU) - 5 (E)	Shift lever in S	
1 (SFTD) - 5 (E)		

If the result is not as specified, replace the transmission floor shift assembly.

Component without harness connected:
(Transmission Control Switch)



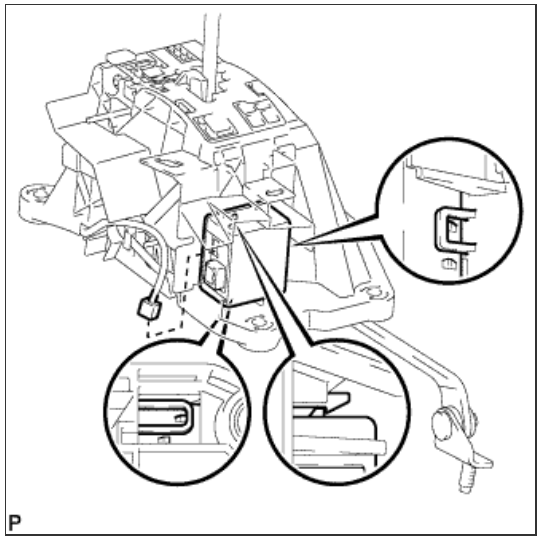
P

for Preparation Click here

1. INSTALL SHIFT LOCK CONTROL ECU

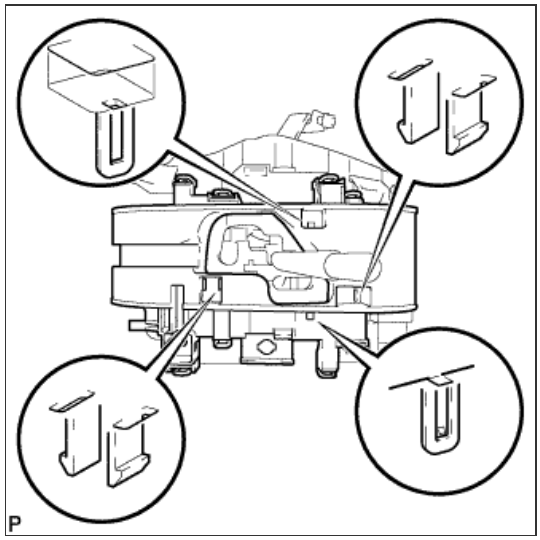
a. Attach the 3 claws to install the ECU to the floor shift.

b. Connect the shift lock solenoid connector.



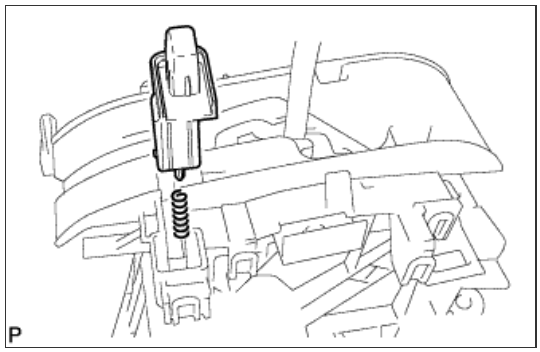
2. INSTALL LOWER POSITION INDICATOR HOUSING

a. Attach the 6 claws to install the housing.



3. INSTALL SHIFT LOCK RELEASE BUTTON

a. Attach the 2 claws to install the spring and button.



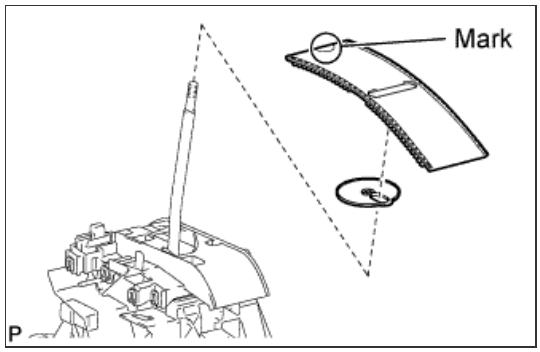
4. INSTALL POSITION INDICATOR SLIDE COVER AND NO. 2 POSITION INDICATOR SLIDE COVER

a. Install the No. 2 position indicator slide cover to the position indicator slide cover.

b. Install the position indicator slide cover together with the No. 2 position indicator slide cover.

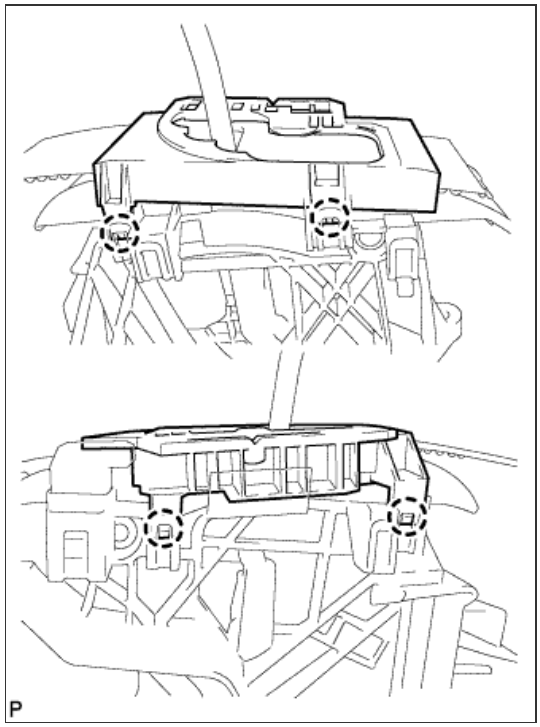
HINT:

Install the position indicator slide cover so that its mark faces the vehicle front.



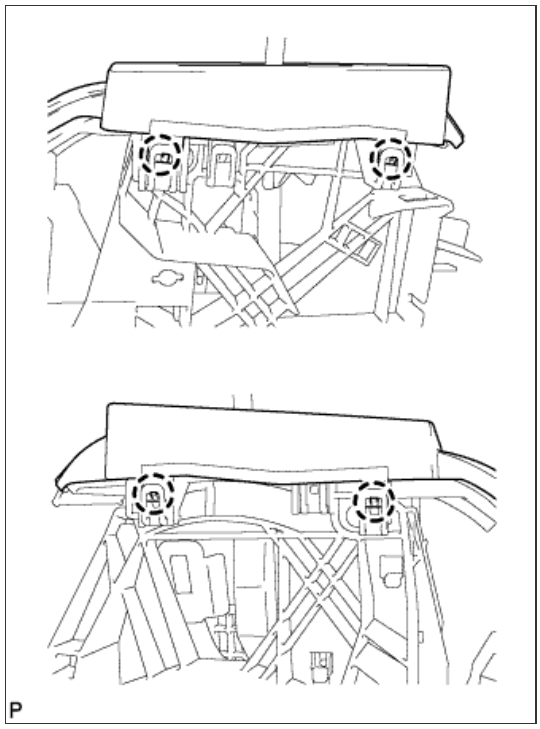
5. INSTALL POSITION INDICATOR LENS

a. Attach the 4 claws to install the position indicator lens.



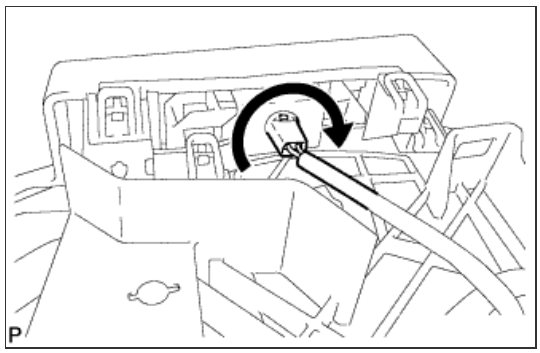
6. INSTALL POSITION INDICATOR HOUSING ASSEMBLY

a. Attach the 4 claws to install the position indicator housing.

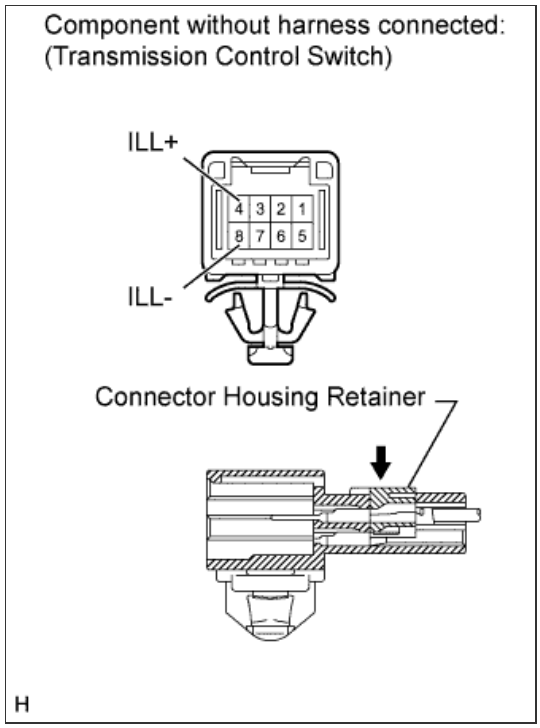


7. INSTALL INDICATOR LIGHT WIRE SUB-ASSEMBLY

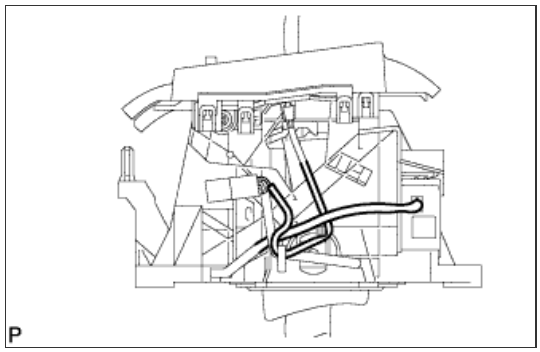
a. Align the wire with the key part of the lower position indicator housing, and install the wire. Then rotate the wire clockwise until it locks.



b. Securely connect the 2 wire terminals to terminal 4 (ILL+) and 8 (ILL-) of the transmission control switch connector. Then push the connector housing retainer to lock it.



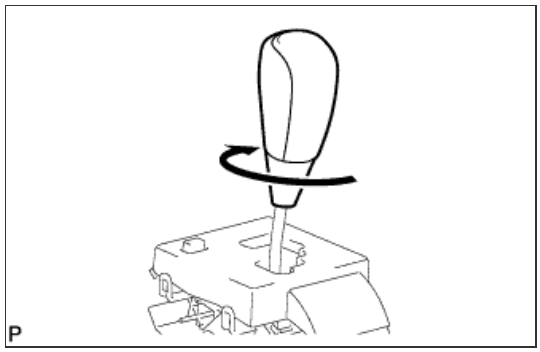
c. Check the shift lock solenoid and indicator light wire harness as shown in the illustration.



8. INSTALL SHIFT LEVER KNOB SUB-ASSEMBLY

Torque:

3 to 5 N*m{ 31 to 51 kgf*cm , 27 to 44 in.*lbf }



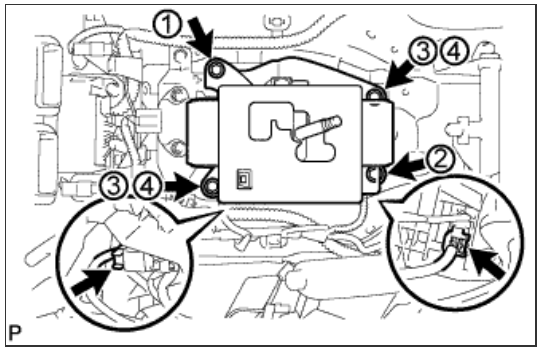
for Preparation [Click here]

1. INSTALL TRANSMISSION FLOOR SHIFT ASSEMBLY

a. Install the floor shift with the 4 bolts. Tighten the bolts in the order shown in the illustration.

Torque:
14 N*m{ 143 kgf*cm , 10 ft.*lbf }

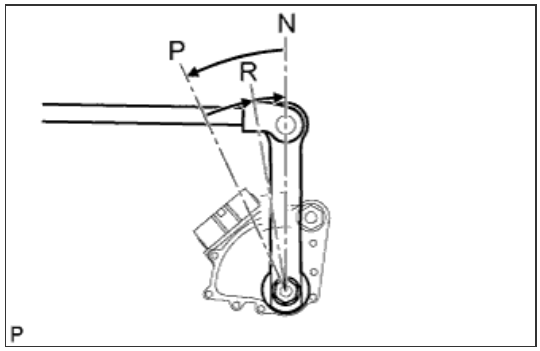
b. Connect the 2 connectors.



2. CONNECT FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

a. Turn the control shaft lever RH of the park/neutral position switch counterclockwise until it stops, and then turn it clockwise 2 notches to set it to the N position.

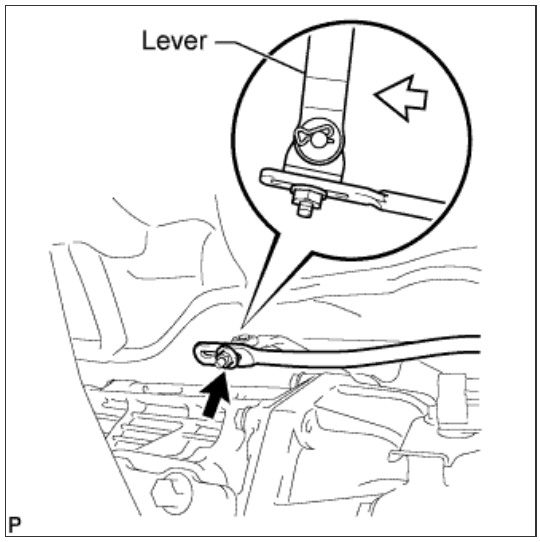
b. Move the shift lever to N.



c. Temporarily install the floor shift gear shifting rod with the nut.

d. Tighten the nut while lightly pushing the lever rearward.

Torque:
13 N*m{ 130 kgf*cm , 9 ft.*lbf }



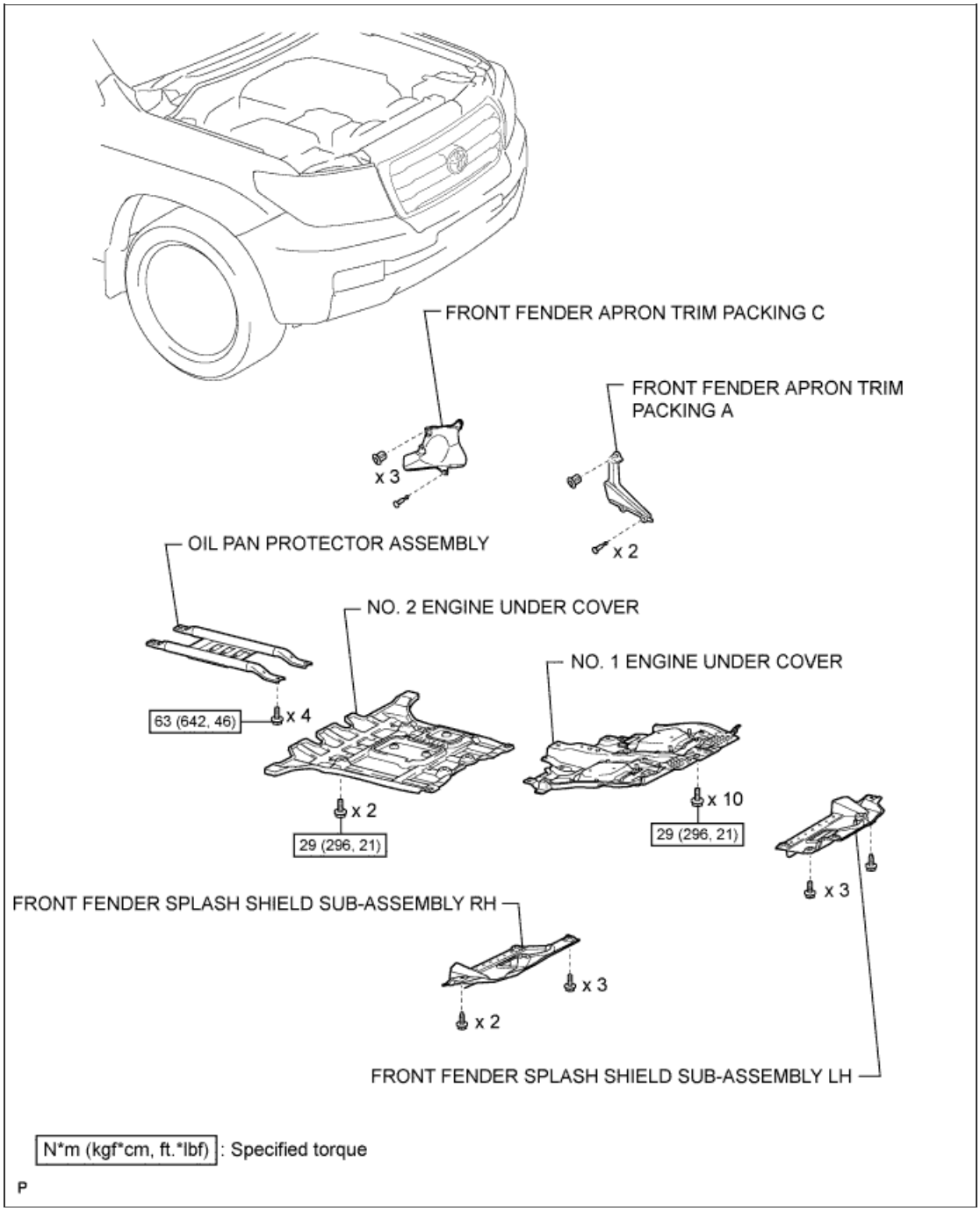
3. INSTALL FRONT CONSOLE BOX (w/o Cool Box)

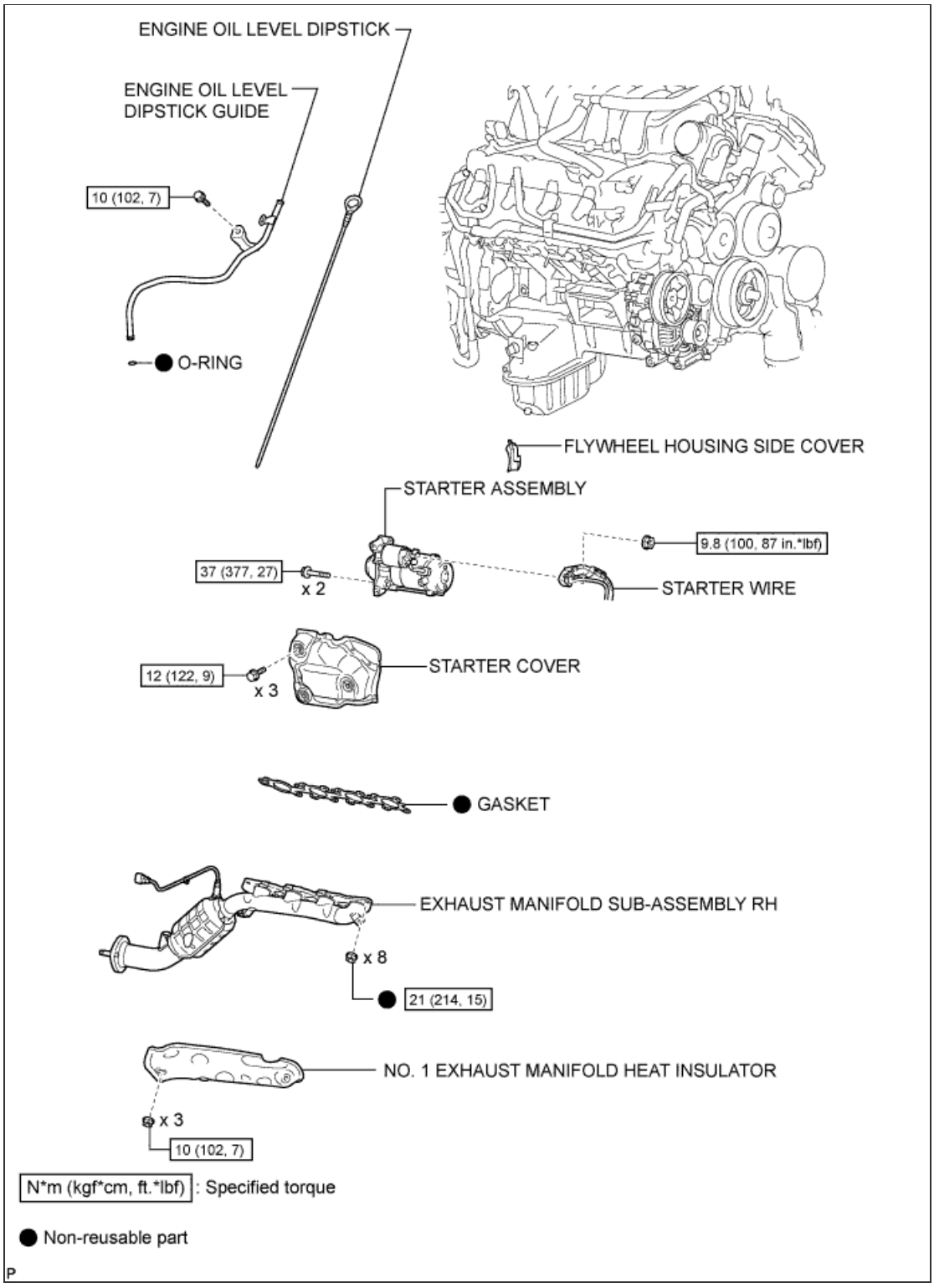
([Click here])

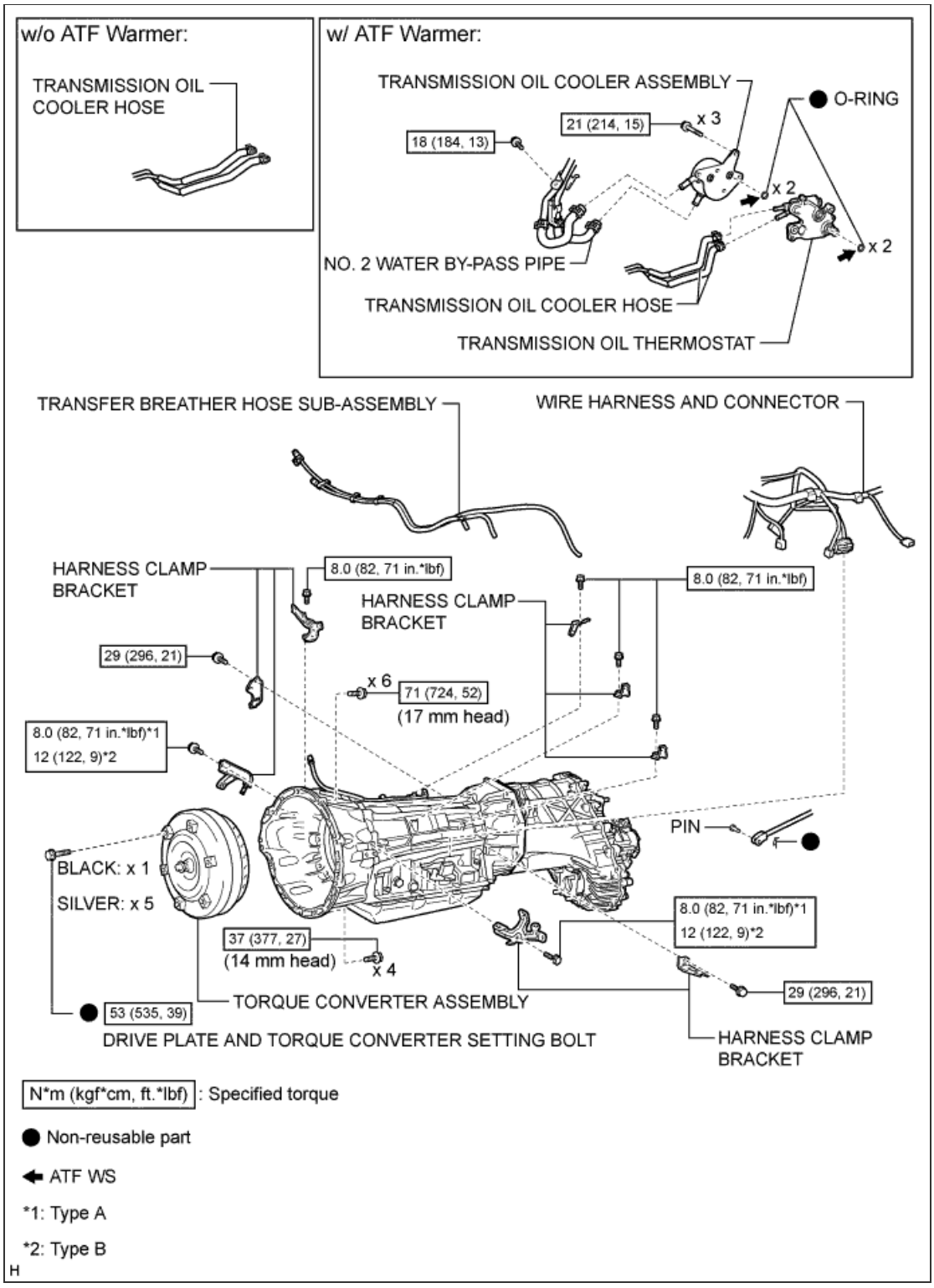
4. REMOVE FRONT CONSOLE BOX (w/ Cool Box)

([Click here])

for Preparation Click here




ENGINE OIL LEVEL DIPSTICK
ENGINE OIL LEVEL DIPSTICK GUIDE
10 (102, 7)
O-RING
FLYWHEEL HOUSING SIDE COVER
STARTER ASSEMBLY
9.8 (100, 87 in.*lbf)
37 (377, 27)
x 2
STARTER WIRE
12 (122, 9)
x 3
STARTER COVER
GASKET
EXHAUST MANIFOLD SUB-ASSEMBLY RH
x 8
21 (214, 15)
NO. 1 EXHAUST MANIFOLD HEAT INSULATOR
x 3
10 (102, 7)
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
P



N*m (kgf*cm, ft.*lbf) : Specified torque

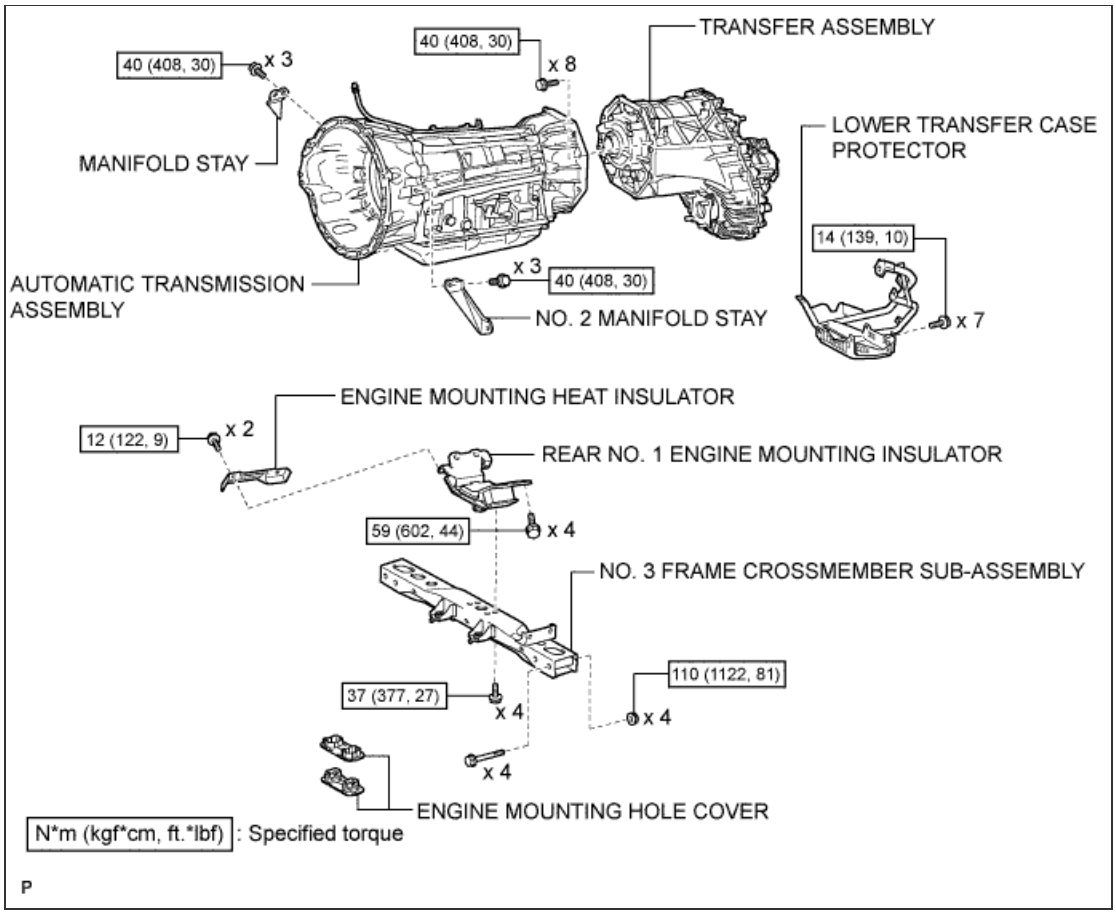
● Non-reusable part

⬅ ATF WS

*1: Type A

*2: Type B

H


40 (408, 30)
x 3
MANIFOLD STAY
40 (408, 30)
x 8
TRANSFER ASSEMBLY
LOWER TRANSFER CASE PROTECTOR
14 (139, 10)
x 7
AUTOMATIC TRANSMISSION ASSEMBLY
x 3
40 (408, 30)
NO. 2 MANIFOLD STAY
ENGINE MOUNTING HEAT INSULATOR
12 (122, 9)
x 2
REAR NO. 1 ENGINE MOUNTING INSULATOR
59 (602, 44)
x 4
NO. 3 FRAME CROSSMEMBER SUB-ASSEMBLY
110 (1122, 81)
37 (377, 27)
x 4
x 4
x 4
ENGINE MOUNTING HOLE COVER
N*m (kgf*cm, ft.*lbf) : Specified torque
P

for Preparation Click here

1. PRECAUTION

NOTICE:

After turning the engine switch off, waiting time may be required before disconnecting the cable from the battery terminal. Therefore, make sure to read the disconnecting the cable from the battery terminal notice before proceeding with work (Click here).

2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

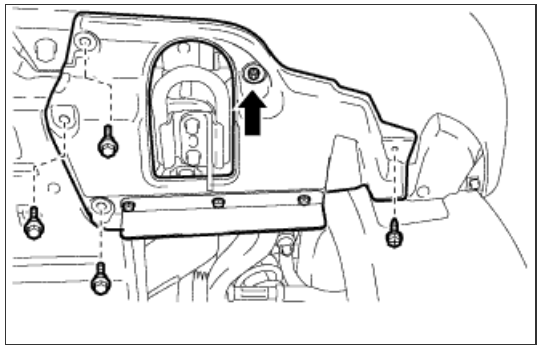
NOTICE:

When disconnecting the cable, some systems need to be initialized after the cable is reconnected (Click here).

3. REMOVE FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY LH

a. Remove the 3 bolts and screw.

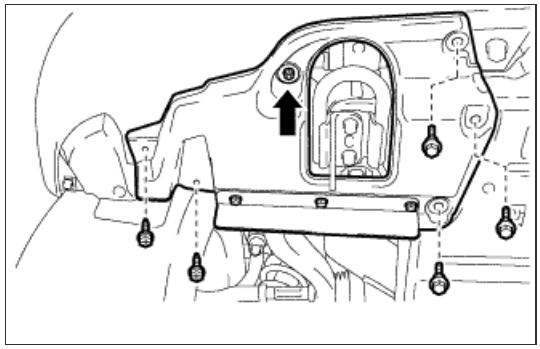
b. Turn the clip indicated by the arrow in the illustration to remove the front fender splash shield sub-assembly LH.



4. REMOVE FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY RH

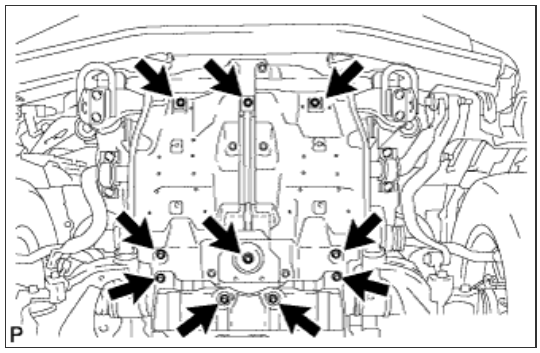
a. Remove the 3 bolts and 2 screws.

b. Turn the clip indicated by the arrow in the illustration to remove the front fender splash shield sub-assembly RH.



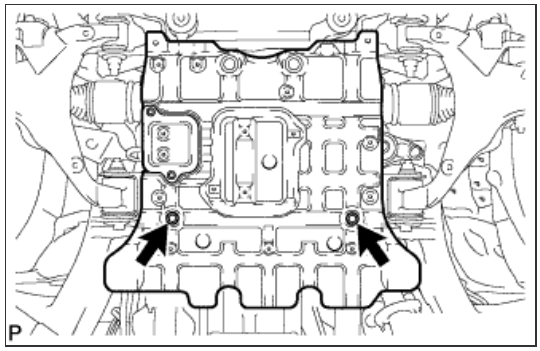
5. REMOVE NO. 1 ENGINE UNDER COVER

a. Remove the 10 bolts and No. 1 engine under cover sub-assembly.



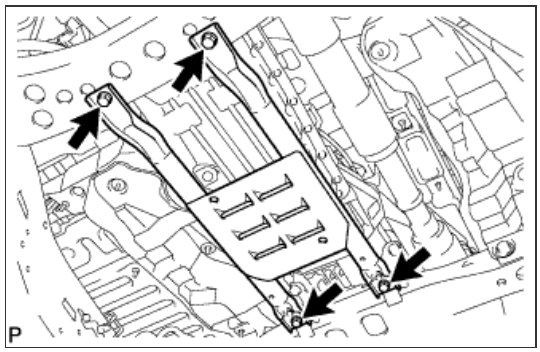
6. REMOVE NO. 2 ENGINE UNDER COVER

a. Remove the 2 bolts and No. 2 engine under cover.



7. REMOVE OIL PAN PROTECTOR ASSEMBLY

a. Remove the 4 bolts and oil pan protector assembly.



8. DRAIN AUTOMATIC TRANSMISSION FLUID

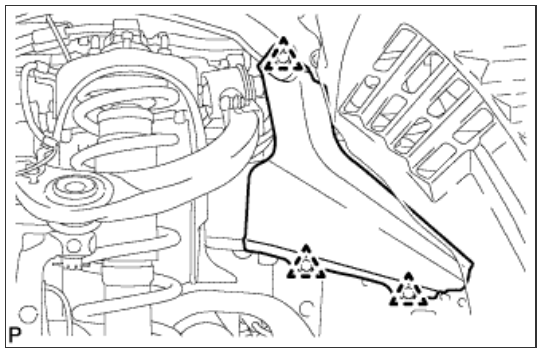
a. Remove the drain plug and gasket, and drain the ATF.

b. Install a new gasket and the drain plug.

Torque:
20 N*m{ 204 kgf*cm , 15 ft.*lbf }

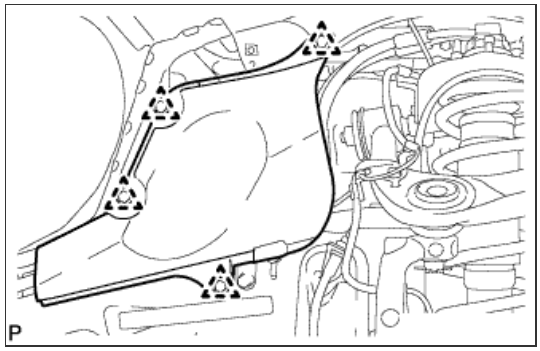
9. REMOVE FRONT FENDER APRON TRIM PACKING A

a. Remove the 3 clips and front fender apron trim packing A.



10. REMOVE FRONT FENDER APRON TRIM PACKING C

a. Remove the 4 clips and front fender apron trim packing C.



11. DRAIN ENGINE COOLANT

CAUTION:

Do not remove the radiator cap while the engine and radiator are still hot. Pressurized, hot engine coolant and steam may be released and cause serious burns.

a. Loosen the radiator drain cock plug.

HINT:

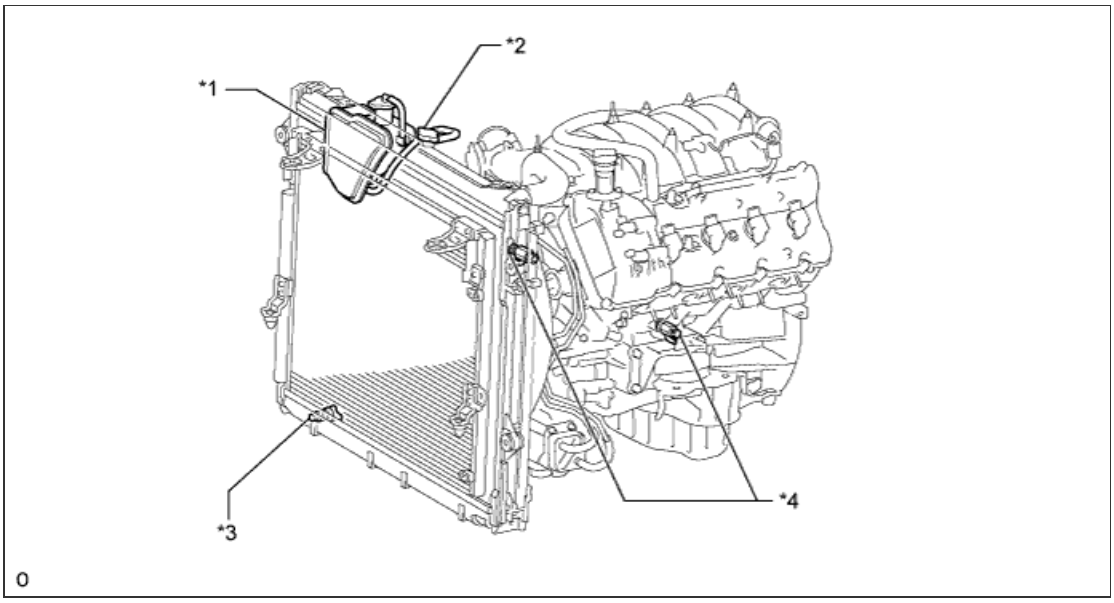
Collect the coolant in a container and dispose of it according to the regulations in your area.

b. Remove the radiator cap. Then drain the coolant from the radiator.

c. Loosen the 2 cylinder block drain cock plugs. Then drain the coolant from the engine.

d. Tighten the 2 cylinder block drain cock plugs.

Torque:
13 N*m{ 133 kgf*cm , 10 ft.*lbf }



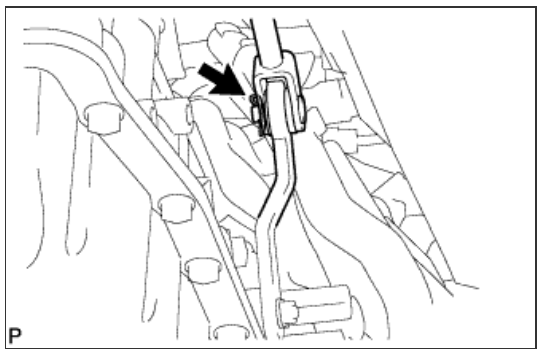
Text in Illustration

*1	Radiator Reservoir	*2	Radiator Cap
*3	Radiator Drain Cock Plug	*4	Cylinder Block Drain Cock Plug

e. Tighten the radiator drain cock plug by hand.

12. DISCONNECT FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

a. Remove the clip and pin and disconnect the gear shifting rod from the transmission control shaft lever RH.



13. REMOVE FRONT PROPELLER SHAFT ASSEMBLY

(Click here)

14. REMOVE PROPELLER SHAFT ASSEMBLY

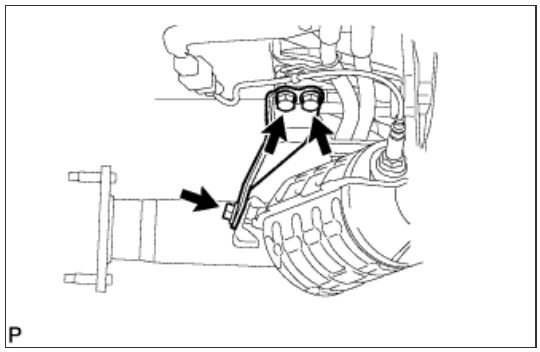
(Click here)

15. REMOVE EXHAUST PIPE

(Click here)

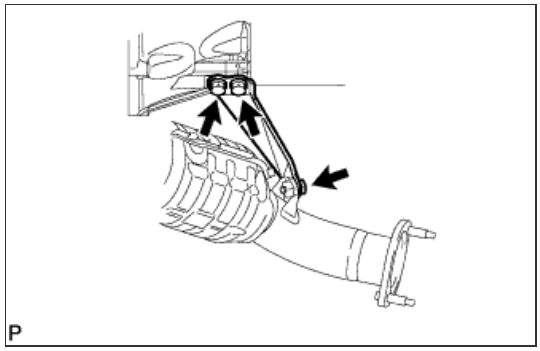
16. REMOVE MANIFOLD STAY

a. Remove the 3 bolts and manifold stay.



17. REMOVE NO. 2 MANIFOLD STAY

a. Remove the 3 bolts and No. 2 manifold stay.



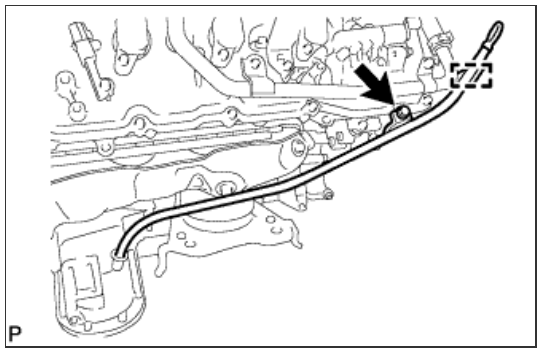
18. REMOVE ENGINE OIL LEVEL DIPSTICK GUIDE

a. Remove the engine oil level dipstick.

b. Detach the engine wire clamp.

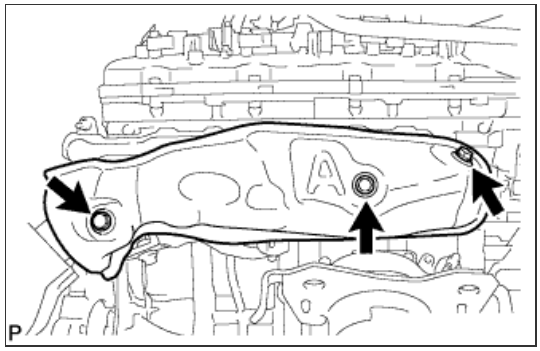
c. Remove the bolt and engine oil level dipstick guide.

d. Remove the O-ring from the engine oil level dipstick guide.



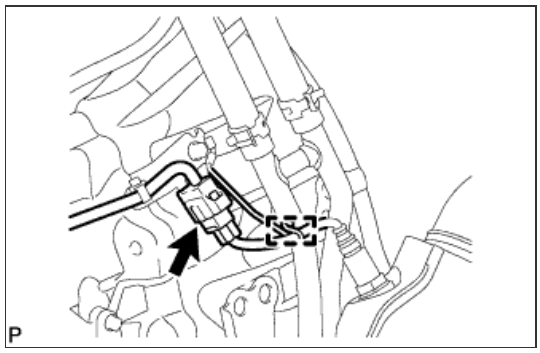
19. REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

a. Remove the 3 bolts and heat insulator.



20. REMOVE EXHAUST MANIFOLD SUB-ASSEMBLY RH

a. Disconnect the air fuel ratio sensor connector and detach the wire harness clamp.

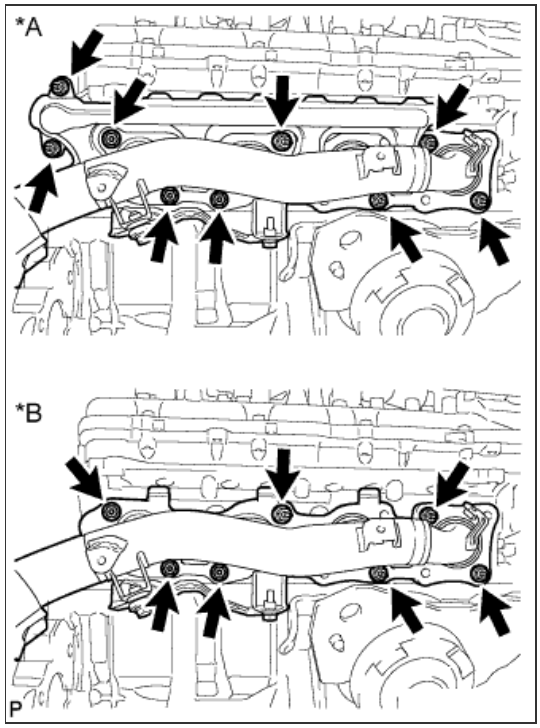


b. w/ Secondary Air Injection System:
Remove the 9 nuts, exhaust manifold and 2 gaskets.

Text in Illustration

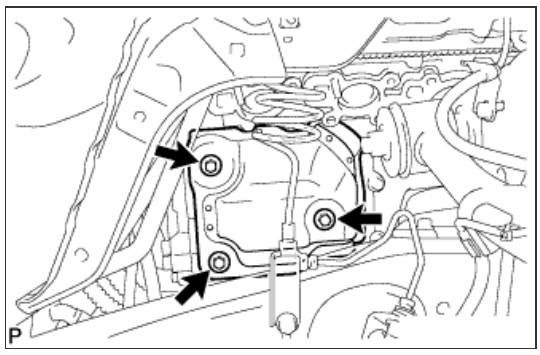
*A	w/ Secondary Air Injection System
*B	w/o Secondary Air Injection System

c. w/o Secondary Air Injection System:
Remove the 7 nuts, exhaust manifold and 2 gaskets.



21. REMOVE STARTER COVER

a. Remove the 3 bolts and starter cover.



22. REMOVE STARTER ASSEMBLY

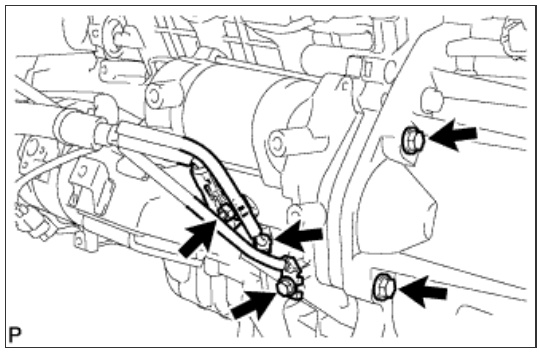
a. Remove the bolt and disconnect the ground wire.

b. Disconnect the starter connector.

c. Disconnect the terminal cap.

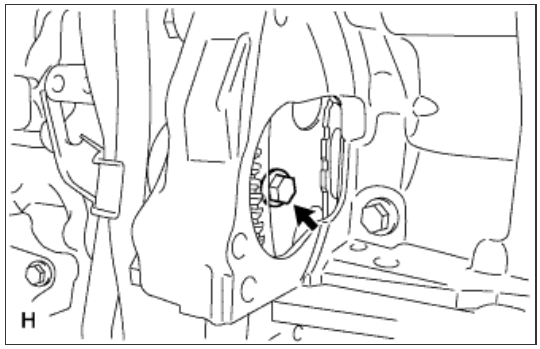
d. Remove the nut and disconnect the starter wire.

e. Remove the 2 bolts and starter.



23. REMOVE DRIVE PLATE AND TORQUE CONVERTER SETTING BOLT

a. Turn the crankshaft to gain access to the 6 bolts and remove the bolts while holding the crankshaft pulley setting bolt with a wrench.

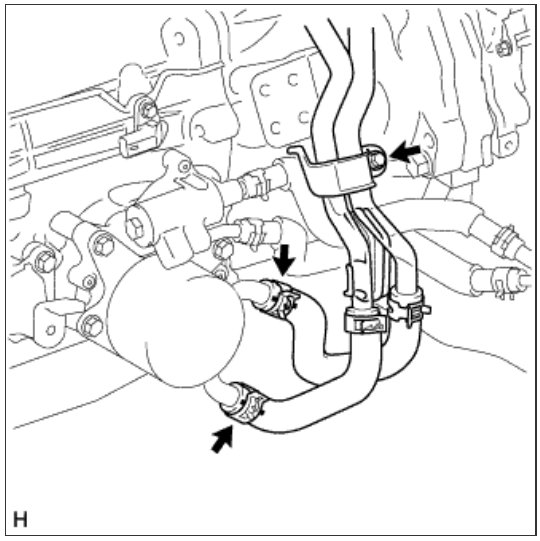


24. DISCONNECT NO.2 WATER BY-PASS PIPE (w/ ATF Warmer)

a. Remove the bolt and disconnect the 2 water by-pass hoses from the transmission oil cooler. Then disconnect the No. 2 water by-pass pipe from the automatic transmission assembly.

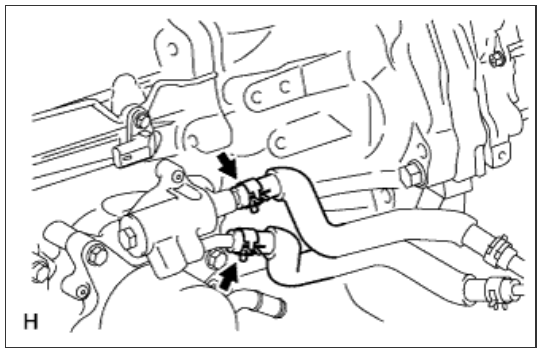
NOTICE:

Use a container to catch any coolant which flows out of the water by-pass hoses.



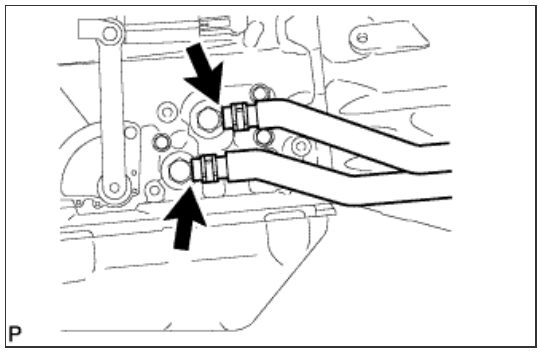
25. DISCONNECT TRANSMISSION OIL COOLER HOSE (w/ ATF Warmer)

a. Disconnect the 2 transmission oil cooler hoses from the transmission oil thermostat.



26. DISCONNECT TRANSMISSION OIL COOLER HOSE (w/o ATF Warmer)

a. Disconnect the 2 transmission oil cooler hoses from the oil cooler tube unions.

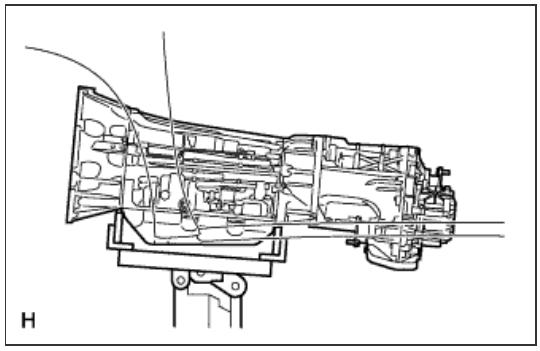


27. SUPPORT AUTOMATIC TRANSMISSION ASSEMBLY

a. Support the transmission with a transmission jack. Lift the transmission slightly from the crossmember.

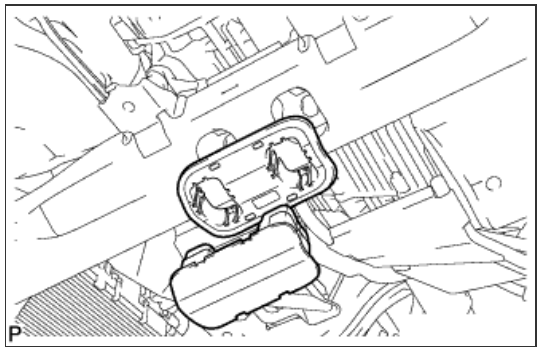
NOTICE:

Support the oil pan bolts to prevent damage to the oil pan gasket.

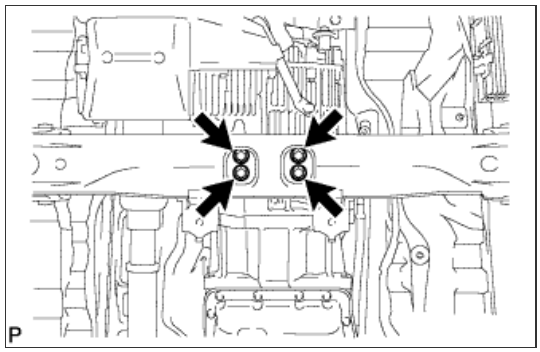


28. REMOVE NO. 3 FRAME CROSSMEMBER SUB-ASSEMBLY

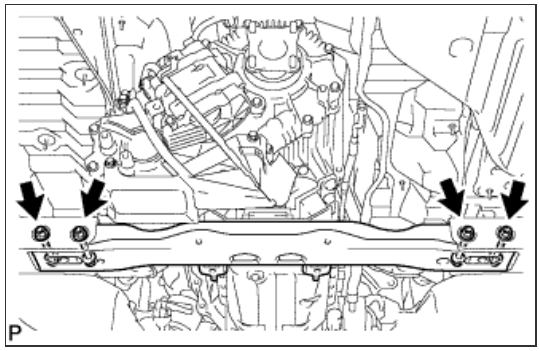
a. Remove the engine mounting hole cover.



b. Remove the 4 bolts of the rear engine mounting insulator.



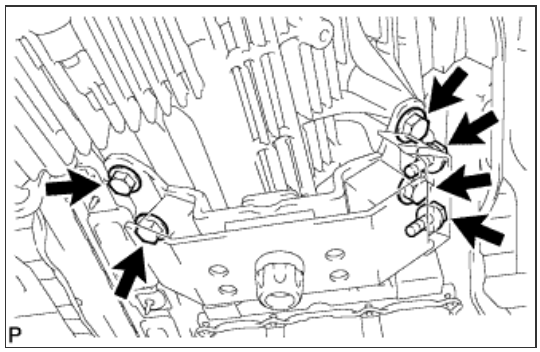
c. Remove the 4 nuts, 4 bolts and No. 3 frame crossmember.



29. REMOVE REAR NO. 1 ENGINE MOUNTING INSULATOR

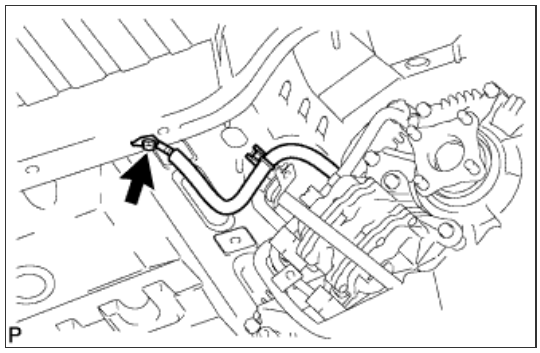
a. Remove the 2 bolts and engine mounting heat insulator.

b. Remove the 4 bolts and rear engine No. 1 mounting insulator from the transmission.



30. DISCONNECT WIRE HARNESS AND CONNECTOR

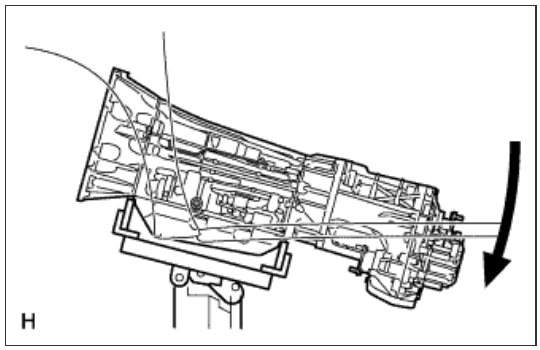
a. Remove the bolt and disconnect the ground cable.



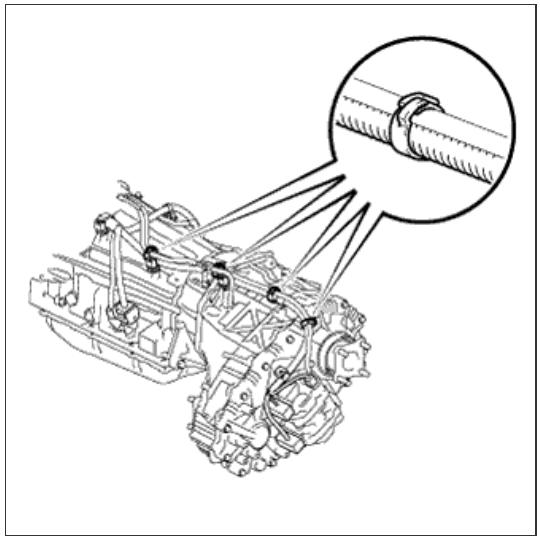
b. Tilt the transmission downward.

NOTICE:

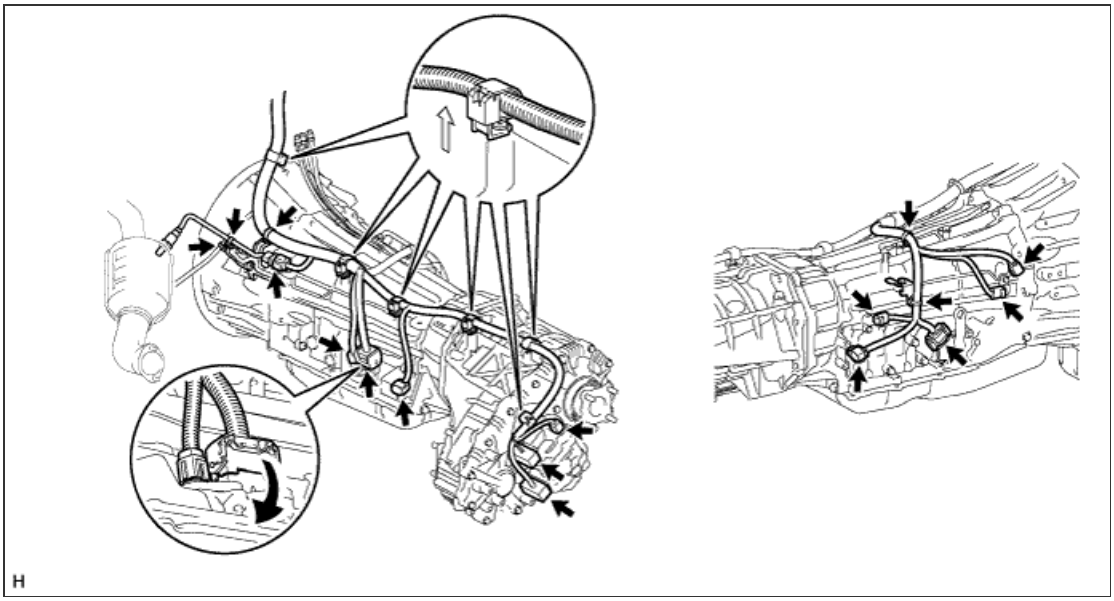
- **Support the oil pan bolts to prevent damage to the oil pan gasket.**
- **Make sure the cooling fan does not contact the fan shroud.**



c. Remove the 4 wire harness clamps.



d. Disconnect the park/neutral position switch connector, 2 transmission wire connectors, 2 speed sensor connectors and 3 transfer control connectors.



HINT:

Detach the claw, press down the lever, and then disconnect the transmission wire connector.

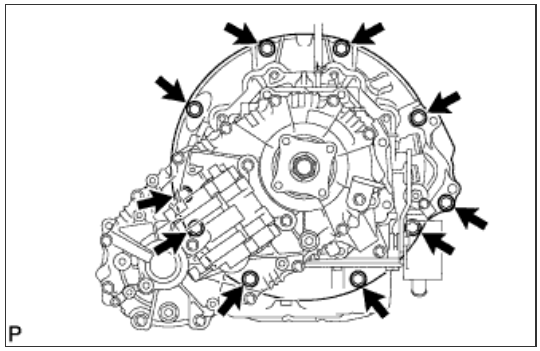
e. Detach the 4 connector clamps and 11 harness clamps.

31. REMOVE AUTOMATIC TRANSMISSION ASSEMBLY

a. Remove the 10 bolts and transmission.

NOTICE:

Do not use excess force to pry off the transmission assembly.



32. REMOVE TRANSMISSION OIL COOLER ASSEMBLY (w/ ATF Warmer)

a. Remove the 3 bolts and transmission oil cooler assembly with transmission oil thermostat.

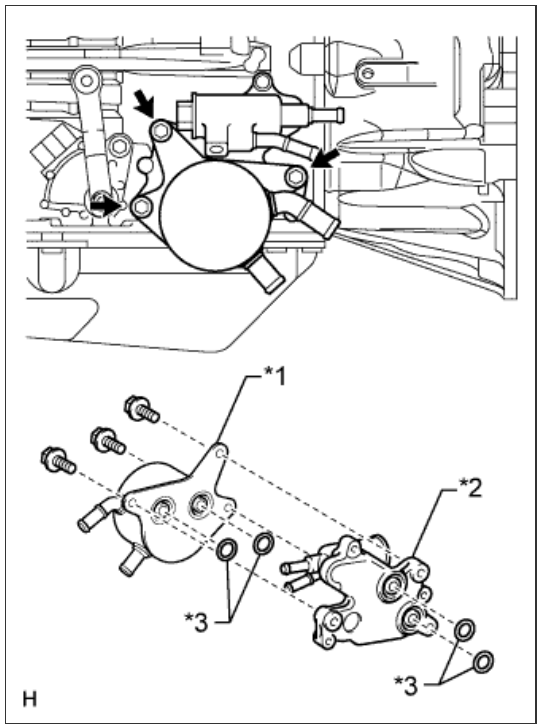
Text in Illustration

*1	Transmission Oil Cooler Assembly
*2	Transmission Oil Thermostat
*3	O-ring

b. Disconnect the transmission oil cooler assembly from the transmission oil thermostat.

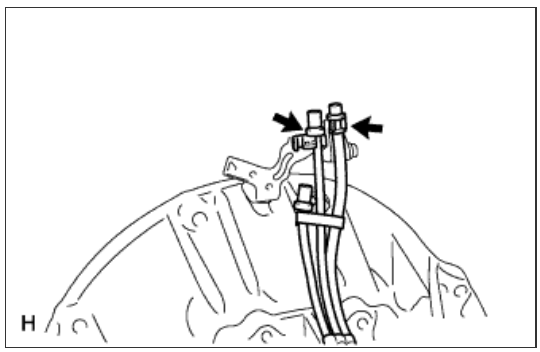
c. Remove the 2 O-rings from the transmission oil cooler assembly.

d. Remove the 2 O-rings from the transmission oil thermostat.

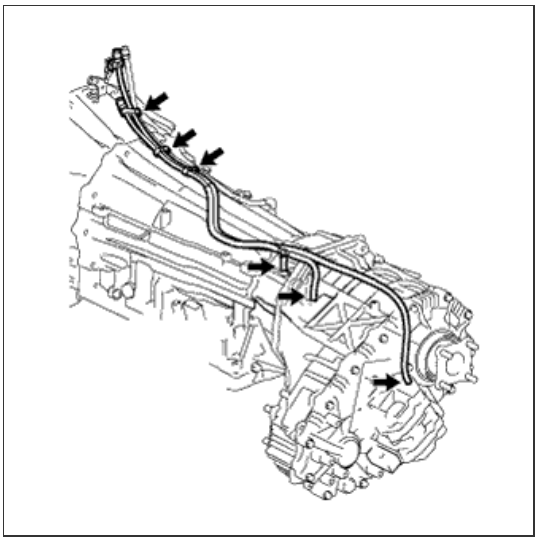


33. DISCONNECT TRANSFER BREATHER HOSE SUB-ASSEMBLY

a. Disconnect the 2 breather plug hoses from the harness clamp bracket.



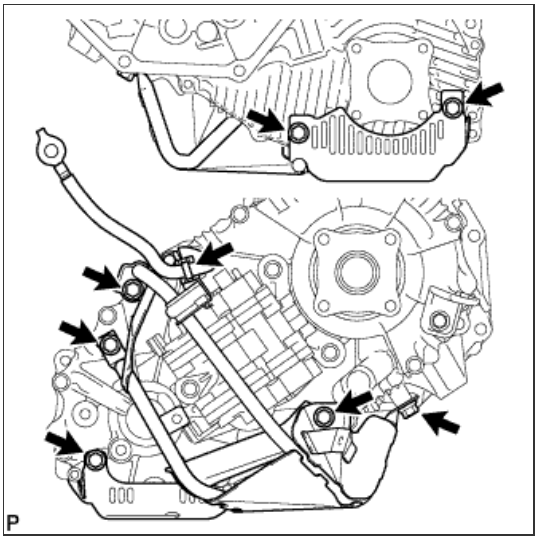
b. Detach the 3 breather hose clamps from the automatic transmission breather tube.



34. REMOVE LOWER TRANSFER CASE PROTECTOR

a. Detach the clamp of the ground cable from the lower transfer case protector.

b. Remove the 7 bolts and lower transfer case protector.



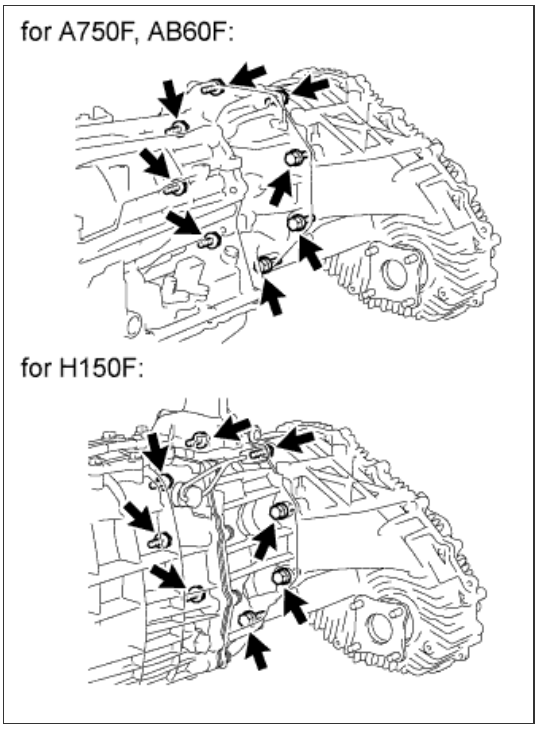
35. REMOVE TRANSFER ASSEMBLY

a. Remove the 8 transfer adaptor rear mounting bolts.

b. Pull the transfer straight up and remove it from the transmission.

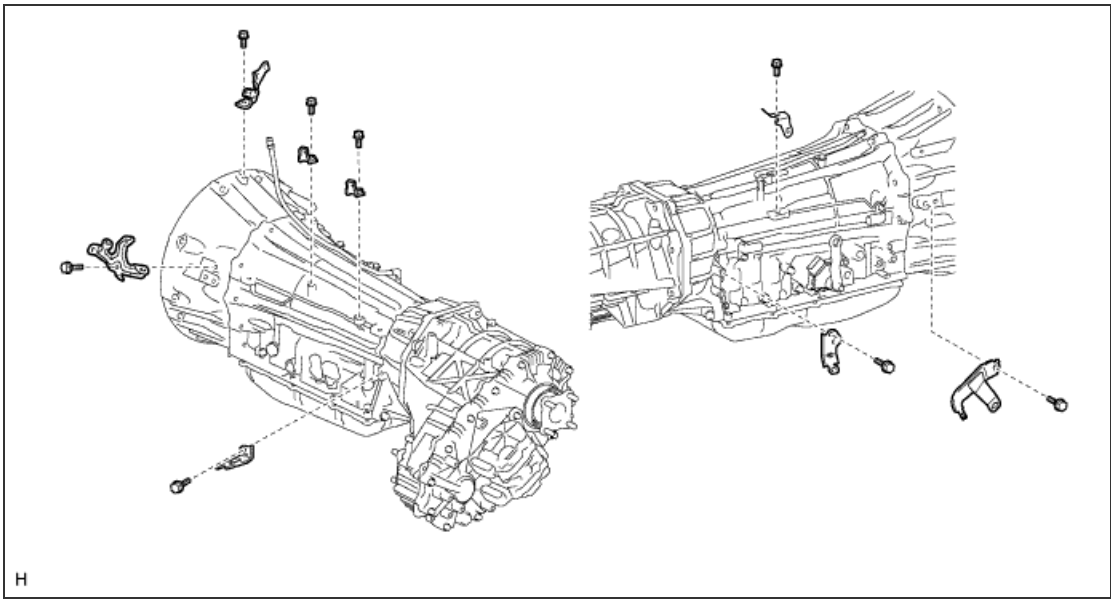
NOTICE:

Take care not to damage the adaptor oil seal with the transfer input shaft spline.



36. REMOVE HARNESS CLAMP BRACKET

a. Remove the 8 bolts and 8 harness clamp brackets.



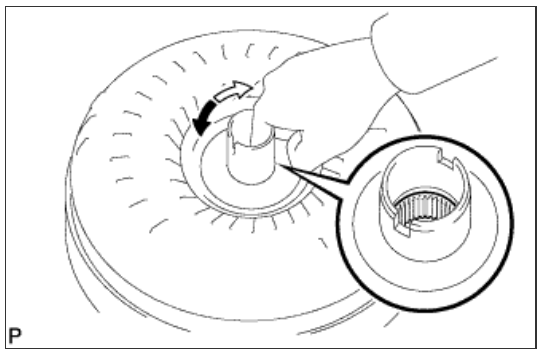
37. REMOVE TORQUE CONVERTER ASSEMBLY

for Preparation Click here

1. INSPECT TORQUE CONVERTER ASSEMBLY

a. Inspect the 1-way clutch.

i. Press on the serrations of the stator with a finger and rotate the stator. Check that it rotates smoothly when turned clockwise and locks when turned counterclockwise.
If necessary, clean the converter and recheck the 1-way clutch.
Replace the converter if the 1-way clutch still fails the inspection.



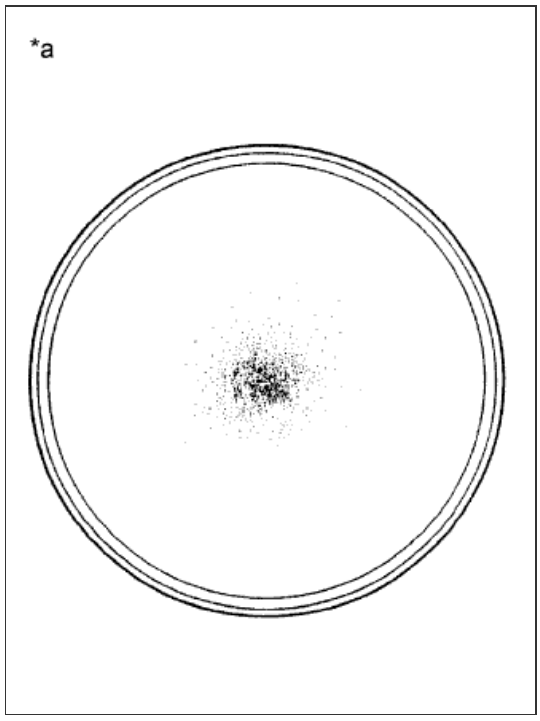
Text in Illustration

⇨	Free
➡	Lock

b. Determine the condition of the torque converter.

Text in Illustration

*a	Sample showing maximum allowable amount of powder in ATF



i. If the inspection result of the torque converter satisfies the following conditions, replace the torque converter.

Malfunction

- A metallic sound is emitted from the torque converter during the stall test or when the shift lever is moved to N.
- The 1-way clutch is free or locks in both directions.
- The amount of powder in the ATF is more than the sample shown in the illustration (see the sample).

HINT:

The sample shows approximately 0.025 liters (0.026 US qts, 0.022 Imp. qts) of ATF that was taken out from a removed torque converter.

c. Replace the ATF in the torque converter.

i. If the ATF is discolored and/or has a foul odor, stir the ATF in the torque converter thoroughly and drain the ATF with the torque converter facing upward.

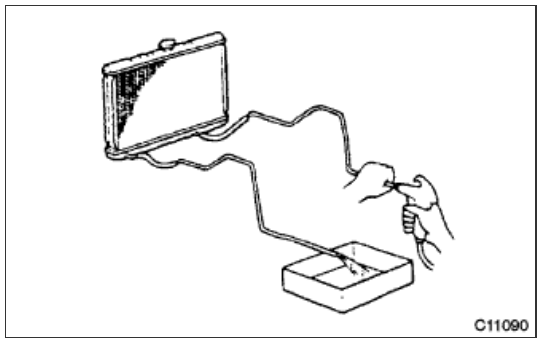
d. Clean and check the oil cooler and oil pipe line.

i. If the torque converter is inspected or the ATF is replaced, clean the oil cooler and oil pipe line.

HINT:

- **Apply compressed air at 196 kPa (2.0 kgf/cm ^{2}, 28 psi) into the inlet hose.**
- **If a large amount of powder is found in the ATF, add new ATF using a bucket pump and clean the oil cooler and oil pipe again.**

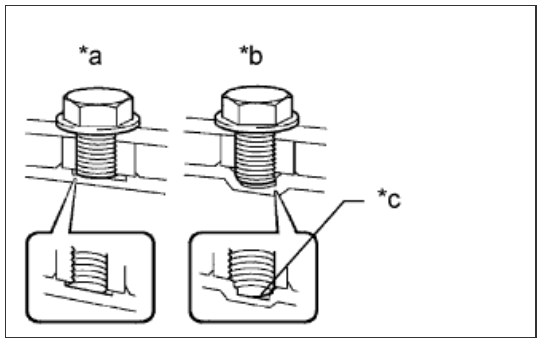
ii. If the ATF is cloudy, inspect the oil cooler.



e. Prevent deformation of the torque converter and damage to the oil pump gear.

Text in Illustration

*a	Correct
*b	Incorrect
*c	Bottom is damaged



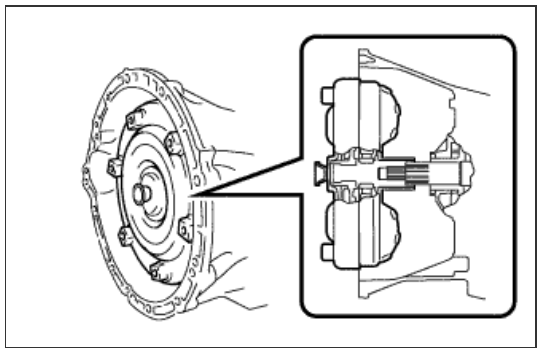
i. When there is any damage to the end of a bolt for the torque converter and to the bottom of the bolt hole, replace the bolt and the torque converter.

ii. All of the bolts should be the same length.

iii. Bolts with washers must be used.

2. INSTALL TORQUE CONVERTER ASSEMBLY

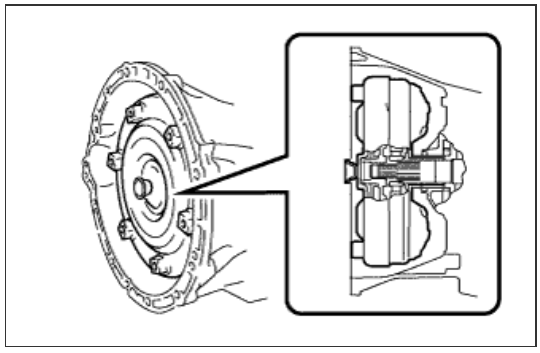
a. Engage the splines of the input shaft and turbine runner.



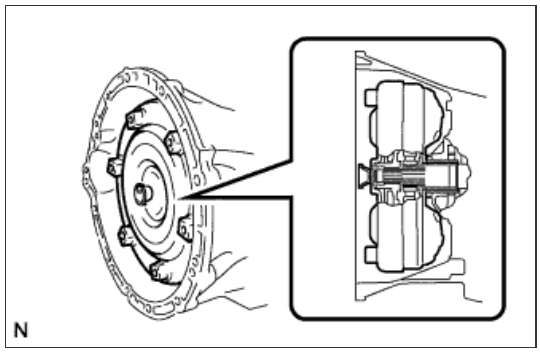
b. Engage the splines of the stator shaft and stator while turning the torque converter assembly.

HINT:

If the stator shaft splines are difficult to engage with the stator splines, move the torque converter back approximately 10 mm and engage the splines while rotating the torque converter.



c. Turn the torque converter assembly to engage the key of the oil pump drive gear and the slot on the torque converter assembly.



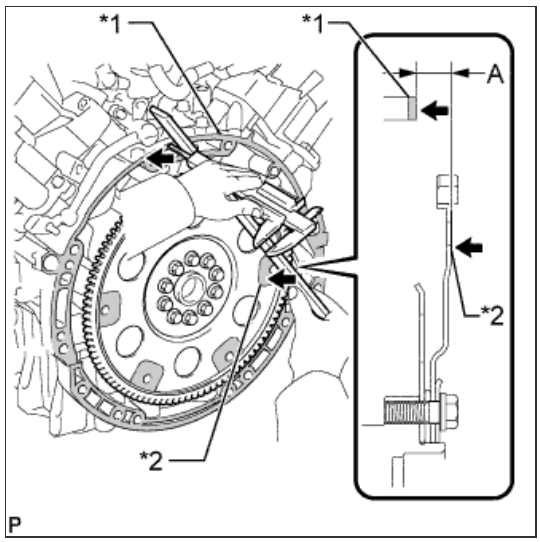
d. Using a vernier caliper and straightedge, measure dimension A between the surface of the engine that contacts the transmission and the surface of the drive plate that contacts the torque converter.

Text in Illustration

*1	Engine Surface
*2	Drive Plate Surface

NOTICE:

Make sure to deduct the thickness of the straightedge.

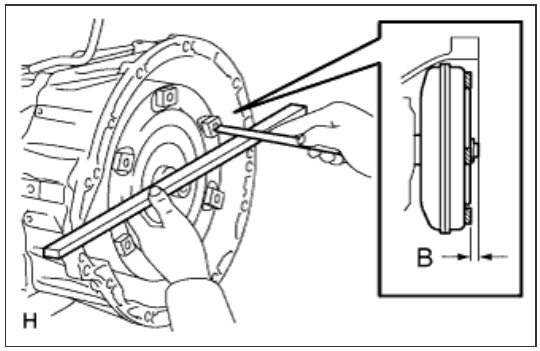


e. Using a vernier caliper and a straightedge, measure dimension B shown in the illustration and check that B is more than A measured in the first step.

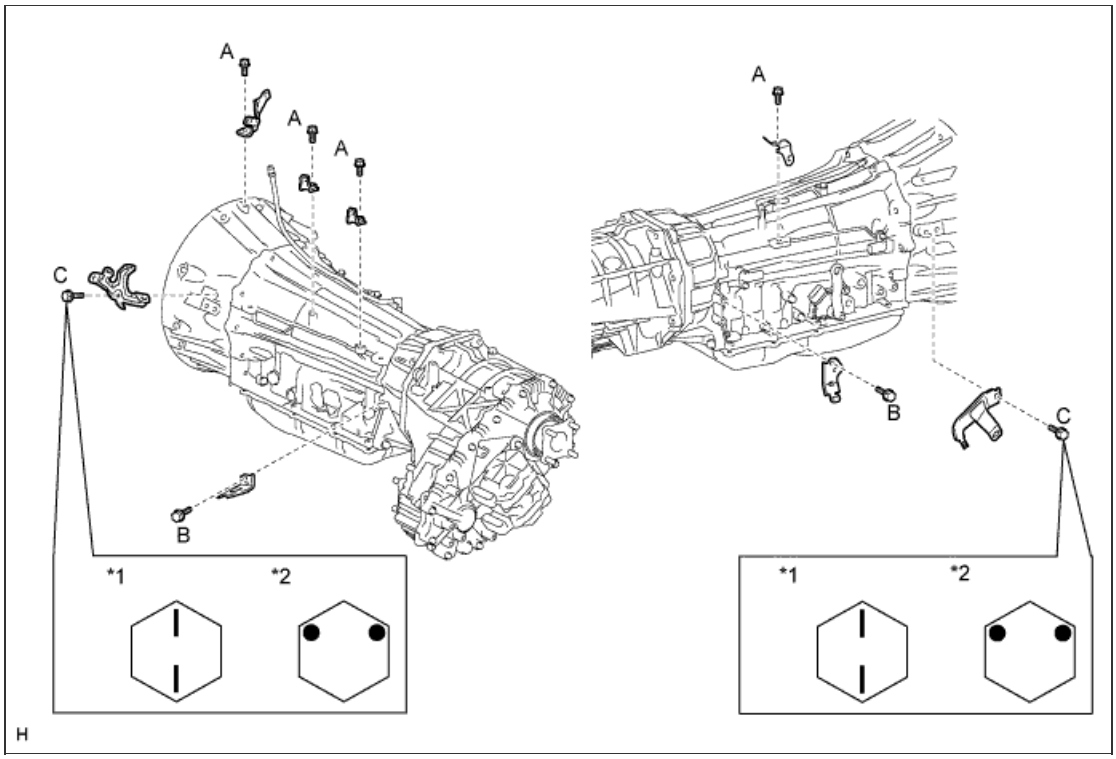
Standard distance:
B = A + 1.00 mm (0.0394 in.) or more

NOTICE:

- **Make sure to deduct the thickness of the straightedge.**
- **If the transaxle is installed to the engine with the torque converter not sufficiently inserted, the torque converter may be damaged.**



3. INSTALL WIRE HARNESS CLAMP BRACKET



a. Install the 8 bolts and 8 harness clamp brackets.

Torque:
Bolt A:
8.0 N*m{ 82 kgf*cm , 71 in.*lbf }
Bolt B:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }
Bolt C, Type A:
8.0 N*m{ 82 kgf*cm , 71 in.*lbf }
Bolt C, Type B:
12 N*m{ 122 kgf*cm , 9 ft.*lbf }

Text in Illustration

*1	Type A
*2	Type B

NOTICE:

The different marks on the heads of the bolts are shown in the illustration. Check whether the bolt being used is type A or type B, and then tighten the bolt using the appropriate torque.

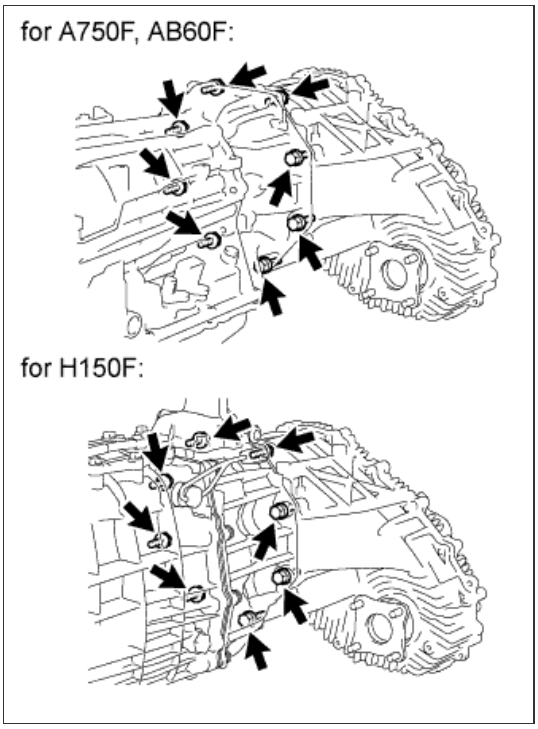
4. INSTALL TRANSFER ASSEMBLY

a. Install the transfer with the 8 bolts.

Torque:
40 N*m{ 408 kgf*cm , 30 ft.*lbf }

NOTICE:

Take care not to damage the adaptor oil seal with the transfer input shaft spline.



5. INSTALL LOWER TRANSFER CASE PROTECTOR

a. Install the lower transfer case protector with the 7 bolts.

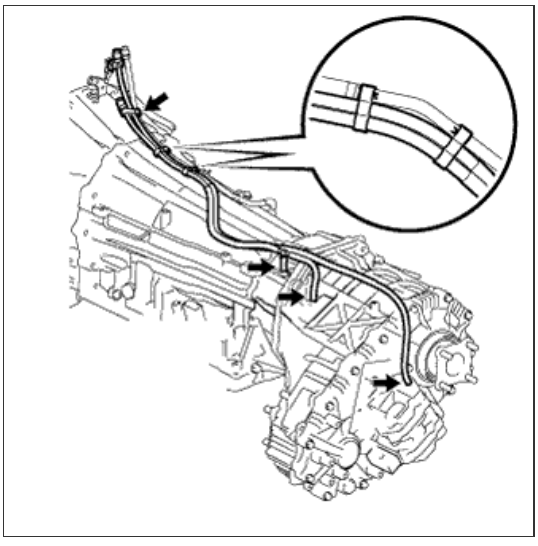
Torque:
14 N*m{ 139 kgf*cm , 10 ft.*lbf }

b. Attach the clamp of the ground cable to the lower transfer case protector.

6. INSTALL TRANSFER BREATHER HOSE SUB-ASSEMBLY

a. Attach the 3 breather hose clamps to connect the transfer breather hose to the automatic transmission breather tube.

b. Connect the 2 breather plug hoses to the harness clamp bracket.



7. INSTALL TRANSMISSION OIL COOLER ASSEMBLY (w/ ATF Warmer)

a. Coat 2 new O-rings with ATF and install them to the transmission oil cooler assembly.

Text in Illustration

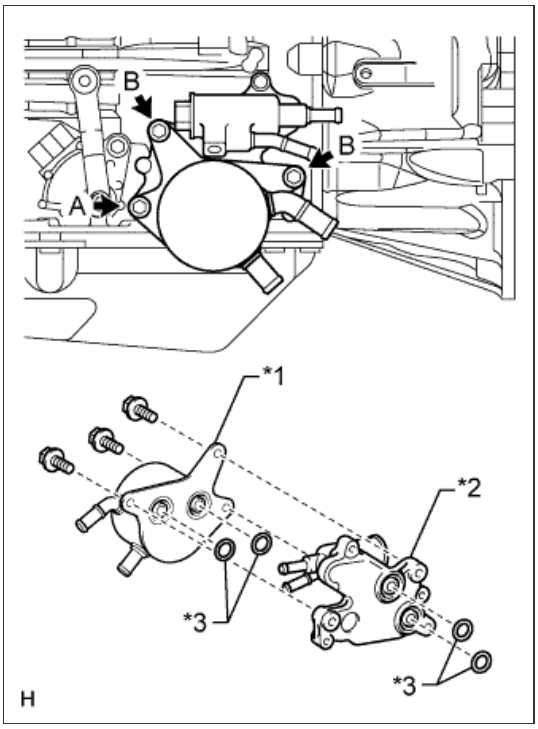
*1	Transmission Oil Cooler Assembly

*2	Transmission Oil Thermostat
*3	O-ring

b. Coat 2 new O-rings with ATF and install them to the transmission oil thermostat.

c. Temporarily install bolt labeled A. Install the bolts labeled B and tighten them to the specified torque. Then tighten bolt labeled A to the specified torque.

Torque:
21 N*m{ 214 kgf*cm , 15 ft.*lbf }



8. INSTALL AUTOMATIC TRANSMISSION ASSEMBLY

a. Apply clutch spline grease to the surface of the crankshaft that contacts the torque converter centerpiece.

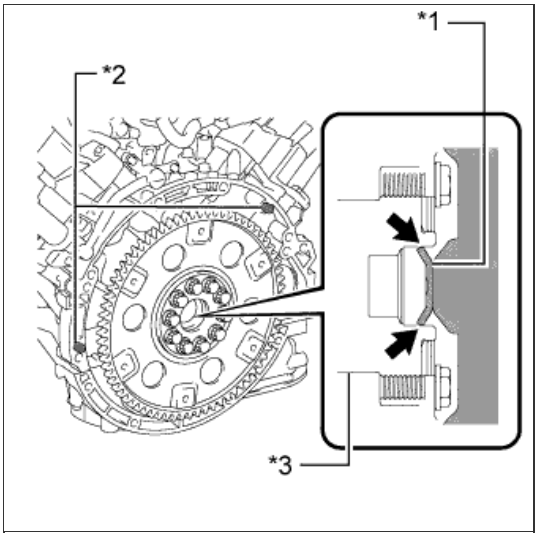
Clutch spline grease:
Toyota Genuine Clutch Spline Grease or equivalent

Maximum grease amount:
Approximately 1 g (0.0353 oz.)

b. Confirm that the 2 knock pins are on the surface of the engine block that contacts the transaxle.

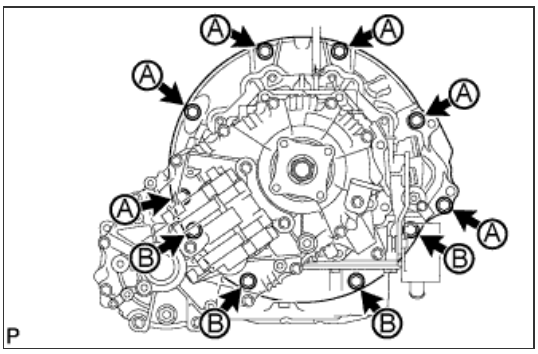
Text in Illustration

*1	Torque Converter Centerpiece
*2	Knock Pin
*3	Crankshaft



c. Keeping the engine and automatic transaxle assembly horizontal, align the knock pins with the holes on the automatic transaxle assembly and install the 10 bolts shown in the illustration.

Torque:
for 17 mm head bolt A:
71 N*m{ 724 kgf*cm , 52 ft.*lbf }
for 14 mm head bolt B:
37 N*m{ 377 kgf*cm , 27 ft.*lbf }



9. CONNECT TRANSMISSION OIL COOLER HOSE (w/ ATF Warmer)

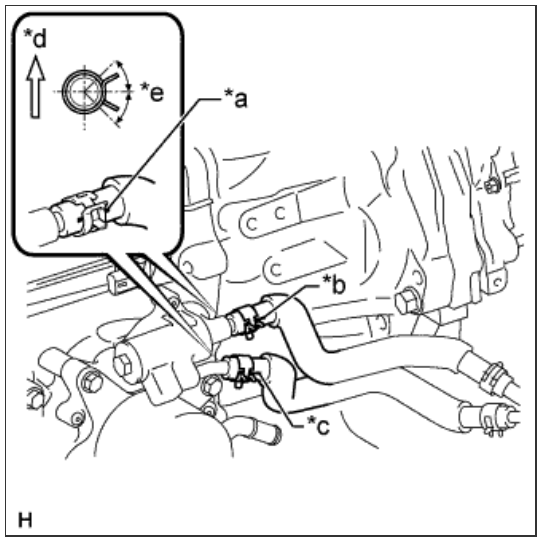
a. Connect the 2 transmission oil cooler hoses to the transmission oil thermostat as shown in the illustration.

Text in Illustration

*a	Paint Mark
*b	White Paint
*c	Yellow Paint
*d	Upper
*e	-45 to 45°

CAUTION:

- **Make sure the pinching portion of each clip is facing the direction shown in the illustration.**
- **Make sure the paint mark of each hose is facing outward.**



10. CONNECT NO.2 WATER BY-PASS PIPE (w/ ATF Warmer)

a. Connect the 2 water by-pass hoses with the 2 clips and install the No. 2 water by-pass pipe with the bolt as shown in the illustration.

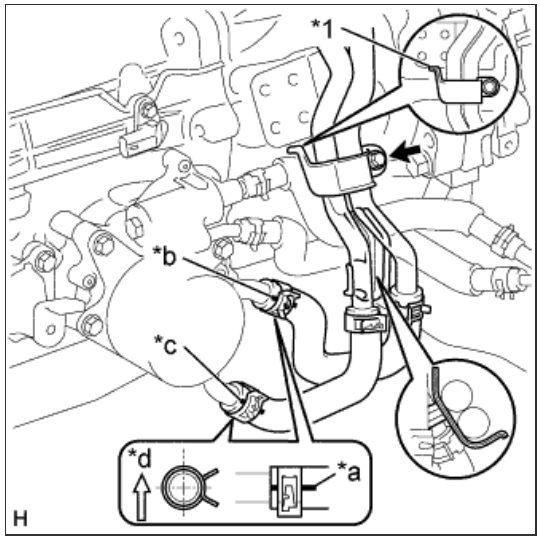
Text in Illustration

*1	Claw
*a	Paint Mark
*b	Green Paint Mark
*c	White Paint Mark
*d	Upper

Torque:
18 N*m{ 184 kgf*cm , 13 ft.*lbf }

NOTICE:

- **Make sure the pinching portion of each clip is facing the direction shown in the illustration.**
- **Make sure the paint mark of each hose is facing outward.**



11. CONNECT TRANSMISSION OIL COOLER HOSE (w/o ATF Warmer)

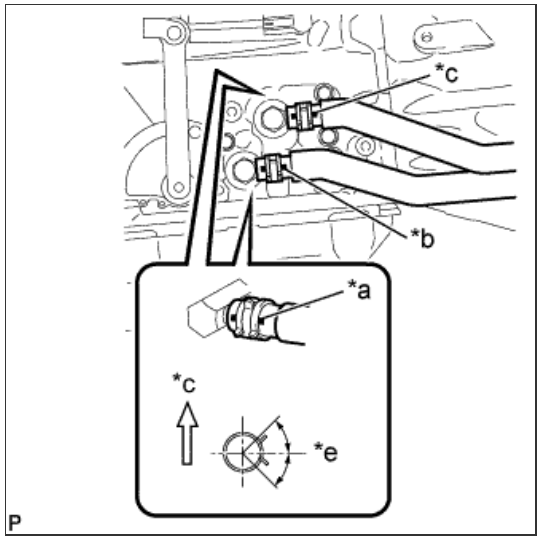
a. Connect the 2 transmission oil cooler hoses to the oil cooler tube unions.

Text in Illustration

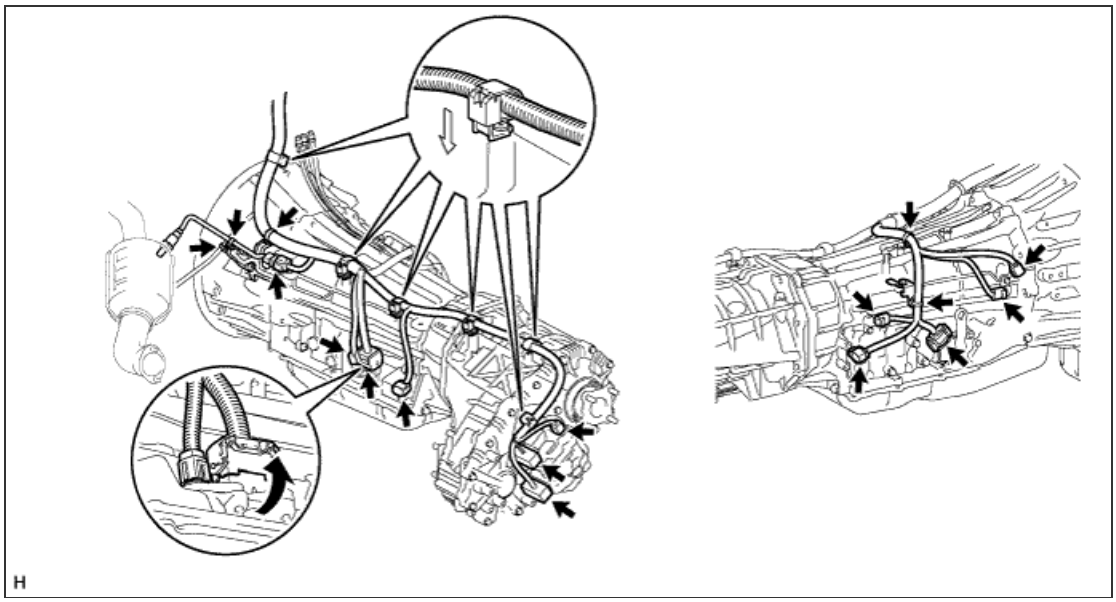
*a	Paint Mark
*b	Yellow Paint
*c	White Paint
*d	Upper
*e	-45 to 45°

NOTICE:

- **Make sure the pinching portion of each clip is facing the direction shown in the illustration.**
- **Make sure the paint mark of each hose is facing outward.**



12. CONNECT WIRE HARNESS AND CONNECTOR



a. Connect the park/neutral position switch connector, 2 transmission wire connectors, 2 speed sensor connectors and 3 transfer control connectors.

HINT:

Push up the lever until the claw of the transmission wire connector makes a connection sound.

b. Attach the 4 connector clamps and 11 harness clamps.

c. Install the 4 wire harness clamps.

d. Tilt up the automatic transmission.

e. Connect the ground cable with the bolt.

Torque:
8.4 N*m{ 86 kgf*cm , 74 in.*lbf }

13. INSTALL REAR NO. 1 ENGINE MOUNTING INSULATOR

a. Install the rear No. 1 engine mounting insulator to the transmission with the 4 bolts.

Torque:
59 N*m{ 602 kgf*cm , 44 ft.*lbf }

b. Install the engine mounting heat insulator with the 2 bolts.

Torque:
12 N*m{ 122 kgf*cm , 9 ft.*lbf }

14. INSTALL NO. 3 FRAME CROSSMEMBER SUB-ASSEMBLY

a. Install the frame crossmember to the rear engine mounting insulator with the 4 bolts.

Torque:
37 N*m{ 377 kgf*cm , 27 ft.*lbf }

b. Install the frame crossmember to the frame with the 4 bolts and 4 nuts.

Torque:
110 N*m{ 1122 kgf*cm , 81 ft.*lbf }

c. Install the engine mounting hole cover.

15. INSTALL DRIVE PLATE AND TORQUE CONVERTER SETTING BOLT

a. Turn the crankshaft to gain access to the installation locations of the 6 bolts and install the bolts while holding the crankshaft pulley set bolt with a wrench.

Torque:
53 N*m{ 535 kgf*cm , 39 ft.*lbf }

NOTICE:

First install the black-colored bolt, and then the remaining 5 silver colored bolts.

16. INSTALL STARTER ASSEMBLY

a. Install the flywheel housing side cover.

b. Install the starter with the 2 bolts.

Torque:
37 N*m{ 377 kgf*cm , 27 ft.*lbf }

c. Install the starter wire with the nut.

Torque:
9.8 N*m{ 100 kgf*cm , 87 in.*lbf }

d. Connect the starter connector.

17. INSTALL STARTER COVER

a. Install the starter cover with the 3 bolts.

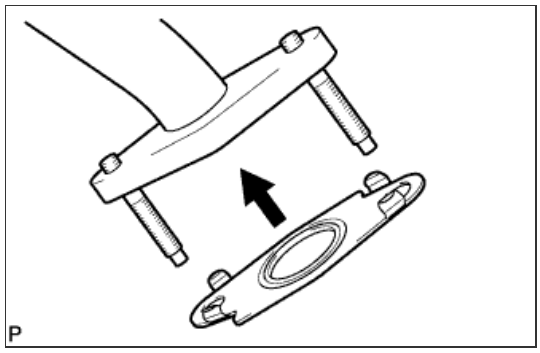
Torque:
12 N*m{ 117 kgf*cm , 8 ft.*lbf }

18. INSTALL EXHAUST MANIFOLD SUB-ASSEMBLY RH

a. w/ Secondary Air Injection System:
Install a new gasket to the No. 3 air tube.

HINT:

Install the gasket with the claws of the gasket facing the tube.



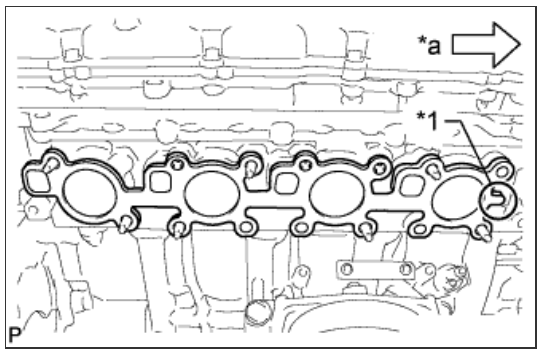
b. Install a new gasket to the cylinder head.

Text in Illustration

*1	Tab
*a	Front

HINT:

Install the gasket with the gasket tab facing toward the front of the engine.



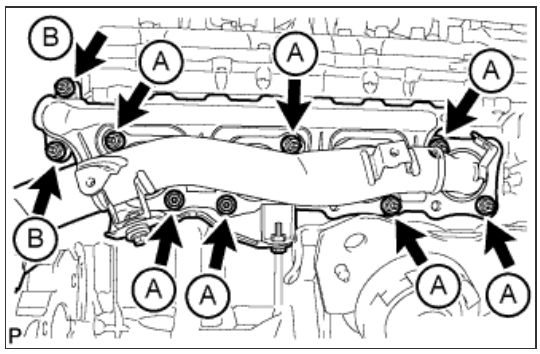
c. w/ Secondary Air Injection System:

i. Install the exhaust manifold to the cylinder head with the 7 new nuts labeled A.

Torque:
21 N*m{ 214 kgf*cm , 15 ft.*lbf }

ii. Install the exhaust manifold to the No. 3 air tube with the 2 nuts labeled B.

Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }



d. w/o Secondary Air Injection System:
Install the exhaust manifold with 7 new nuts.

Torque:
21 N*m{ 214 kgf*cm , 15 ft.*lbf }

e. Connect the air fuel ratio sensor connector and attach the wire harness clamp.

19. INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

a. Install the heat insulator with 3 new bolts.

Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }

20. INSTALL ENGINE OIL LEVEL DIPSTICK GUIDE

a. Apply engine oil to a new O-ring, and then install the O-ring to the engine oil level dipstick guide.

b. Install the engine oil level dipstick guide with the bolt.

Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }

c. Attach the engine wire clamp.

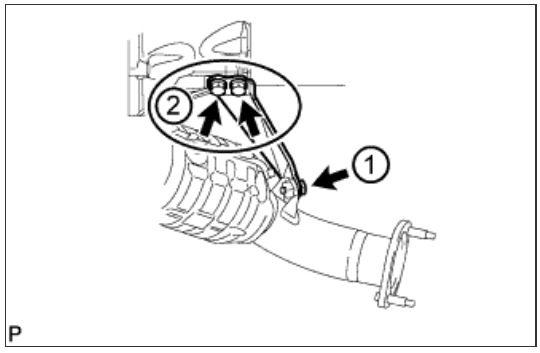
d. Install the engine oil level dipstick.

21. INSTALL NO. 2 MANIFOLD STAY

a. Temporarily install the manifold stay with the 3 bolts.

b. Tighten the 3 bolts in the sequence shown in the illustration.

Torque:
40 N*m{ 408 kgf*cm , 30 ft.*lbf }

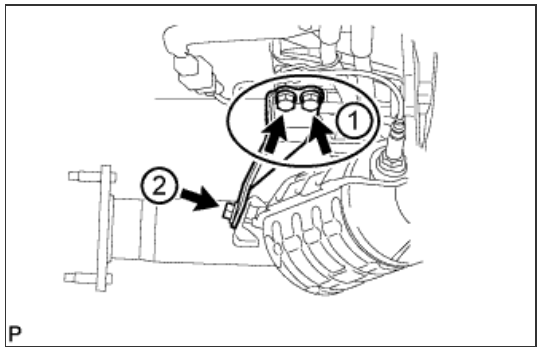


22. INSTALL MANIFOLD STAY

a. Temporarily install the manifold stay with the 3 bolts.

b. Tighten the 3 bolts in the sequence shown in the illustration.

Torque:
40 N*m{ 408 kgf*cm , 30 ft.*lbf }



23. INSTALL EXHAUST PIPE

(Click here)

24. INSTALL PROPELLER SHAFT ASSEMBLY

(Click here)

25. INSTALL FRONT PROPELLER SHAFT ASSEMBLY

(Click here)

26. CONNECT FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

a. Connect the gear shifting rod to the transmission control shaft lever RH with the pin and a new clip.

27. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

NOTICE:

When disconnecting the cable, some systems need to be initialized after the cable is reconnected (Click here).

28. ADD AUTOMATIC TRANSMISSION FLUID

(Click here)

29. ADD ENGINE COOLANT

a. Add engine coolant.

Standard Capacity:

Item	Specified Condition
with rear heater	16.2 liters (17.1 US qts, 14.3 Imp. qts)
without rear heater	13.4 liters (14.2 US qts, 11.8 Imp. qts)

NOTICE:

Do not substitute plain water for engine coolant.

HINT:

TOYOTA vehicles are filled with TOYOTA SLLC at the factory. In order to avoid damage to the engine cooling system and other technical problems, only use TOYOTA SLLC or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, non-borate coolant with long-life hybrid organic acid technology (coolant with long-life hybrid organic acid technology consists of a combination of low phosphates and organic acids).

b. Slowly pour coolant into the radiator reservoir until it reaches the F line.

c. Install the reservoir cap.

d. Press the No. 1 and No. 2 radiator hoses several times by hand, and then check the coolant level. If the coolant level is low, add coolant.

e. Install the radiator cap.

f. Start the engine and warm it up until the thermostat opens.

HINT:

The thermostat opening timing can be confirmed by pressing the radiator inlet hose by hand, and checking when the engine coolant starts to flow inside the hose.

g. Maintain the engine speed at 2000 to 2500 rpm.

NOTICE:

- **Make sure that the radiator reservoir still has some coolant in it.**
- **Pay attention to the needle of the water temperature meter. Make sure that the needle does not show an abnormally high temperature.**
- **If there is not enough coolant, the engine may burn out or overheat.**
- **Immediately after starting the engine, if the radiator reservoir does not have any coolant, perform the following: 1) stop the engine, 2) wait until the coolant has cooled down, and 3) add coolant until the coolant is filled to the F line.**
- **Run the engine at 2000 rpm until the coolant level has stabilized.**

h. Press the No. 1 and No. 2 radiator hoses several times by hand to bleed air.

CAUTION:

- **Wear protective gloves.**
- **Be careful as the radiator hoses are hot.**
- **Keep your hands away from the fan.**

i. Stop the engine, and wait until the engine coolant cools down to ambient temperature.

CAUTION:

Do not remove the radiator cap while the engine and radiator are still hot. Pressurized, hot engine coolant and steam may be released and cause serious burns.

j. Check that the coolant level is between the F and L lines.
If the coolant level is below the L line, repeat all of the procedures above.
If the coolant level is above the F line, drain coolant so that the coolant level is between the F and L lines.

30. INSPECT FOR ENGINE COOLANT LEAK

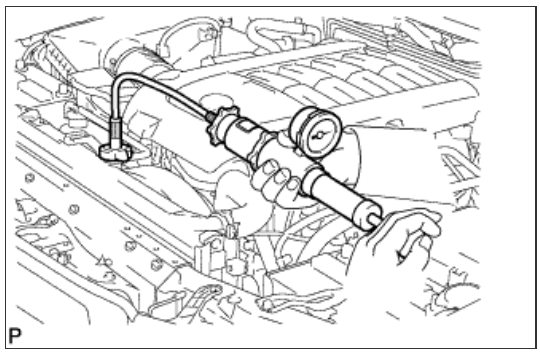
CAUTION:

Do not remove the radiator cap while the engine and radiator are still hot. Pressurized, hot engine coolant and steam may be released and cause serious burns.

a. Fill the radiator with coolant and attach a radiator cap tester.

b. Warm up the engine.

c. Using the radiator cap tester, increase the pressure inside the radiator to 123 kPa (1.3 kgf/cm^2, 18 psi), and check that the pressure does not drop.
If the pressure drops, check the hoses, radiator and water pump for leaks. If no external leaks are found, check the heater core, cylinder block and head.



31. INSPECT SHIFT LEVER POSITION

a. When moving the shift lever from P to R with the engine switch on (IG) and the brake pedal depressed, make sure that it moves smoothly and correctly into position.

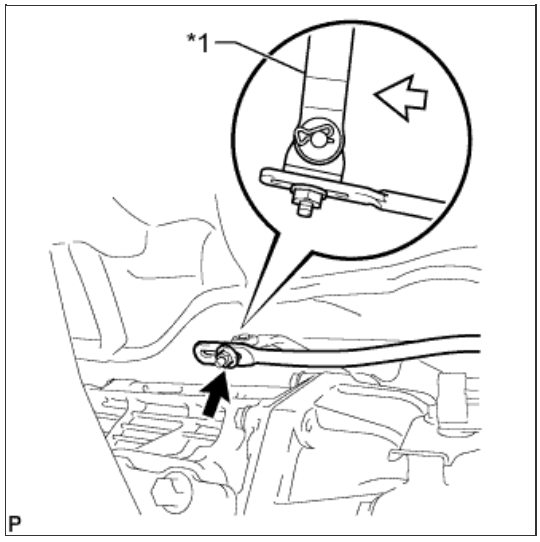
b. Check that the shift lever does not stop when moving the shift lever from R to P, and check that the shift lever does not stick when moving the shift lever from D to S.

c. Start the engine and make sure that the vehicle moves forward after moving the shift lever from N to D, and moves rearward after moving the shift lever to R.
If there are problems during the above inspections, perform the adjustment using the following procedures.

i. Move the shift lever to N

ii. Loosen the nut of the floor shift gear shifting rod. Then, with the lever of the floor shift assembly lightly pushed towards the rear of the vehicle, tighten the nut.

Torque:
13 N*m{ 133 kgf*cm , 10 ft.*lbf }



Text in Illustration

*1	Lever

32. INSPECT FOR EXHAUST GAS LEAK

33. INSTALL FRONT FENDER APRON TRIM PACKING C

a. Install the front fender apron trim packing C with the 4 clips.

34. INSTALL FRONT FENDER APRON TRIM PACKING A

a. Install the front fender apron trim packing A with the 3 clips.

35. INSTALL OIL PAN PROTECTOR ASSEMBLY

a. Install the oil pan protector with the 4 bolts.

Torque:
63 N*m{ 642 kgf*cm , 46 ft.*lbf }

36. INSTALL NO. 2 ENGINE UNDER COVER

a. Install the No. 2 engine under cover with the 2 bolts.

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

37. INSTALL NO. 1 ENGINE UNDER COVER

a. Install the No. 1 engine under cover sub-assembly with the 10 bolts.

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

38. INSTALL FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY LH

a. Push in the clip to install the front fender splash shield sub-assembly LH.

b. Install the 3 bolts and screw.

39. INSTALL FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY RH

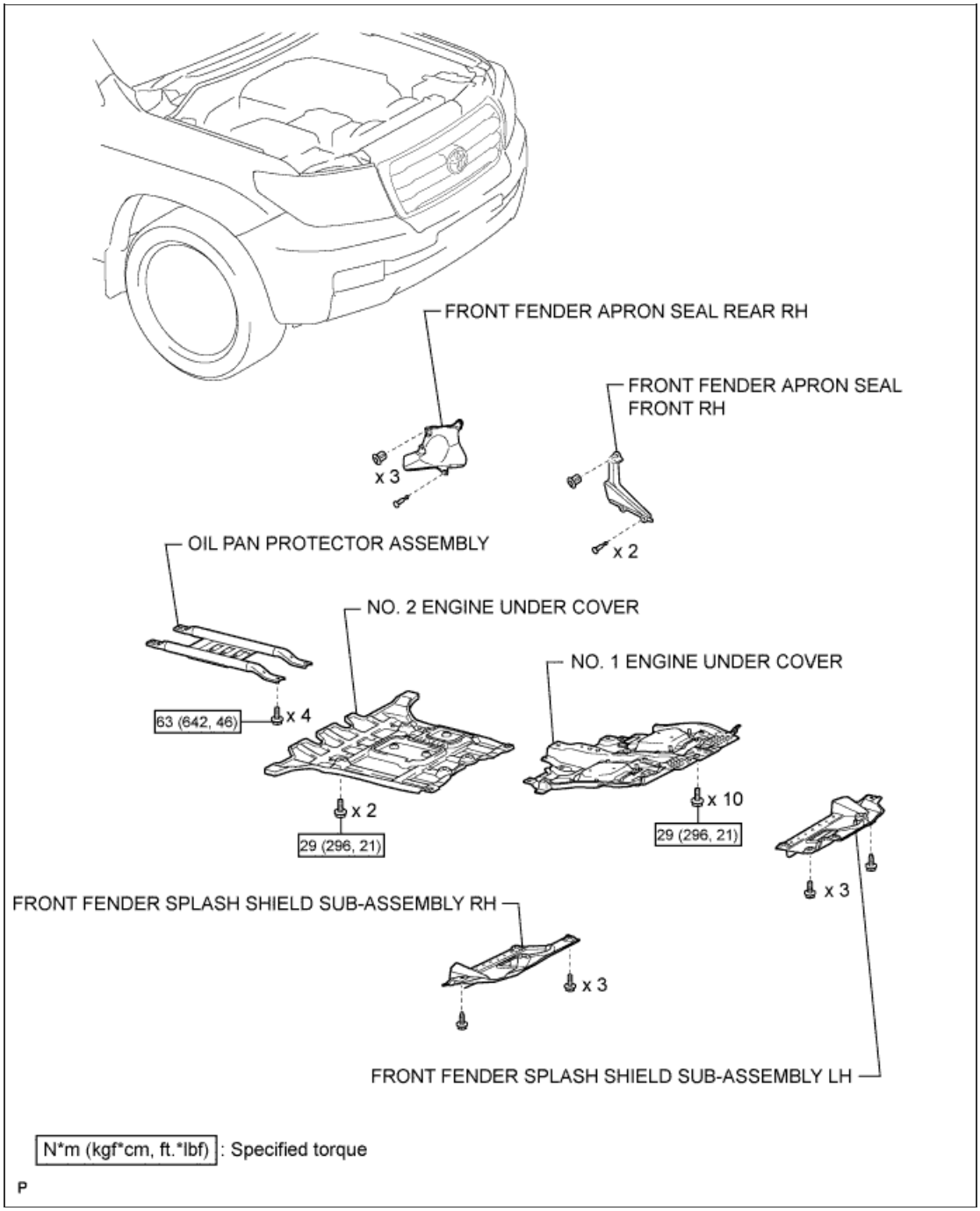
a. Push in the clip to install the front fender splash shield sub-assembly RH.

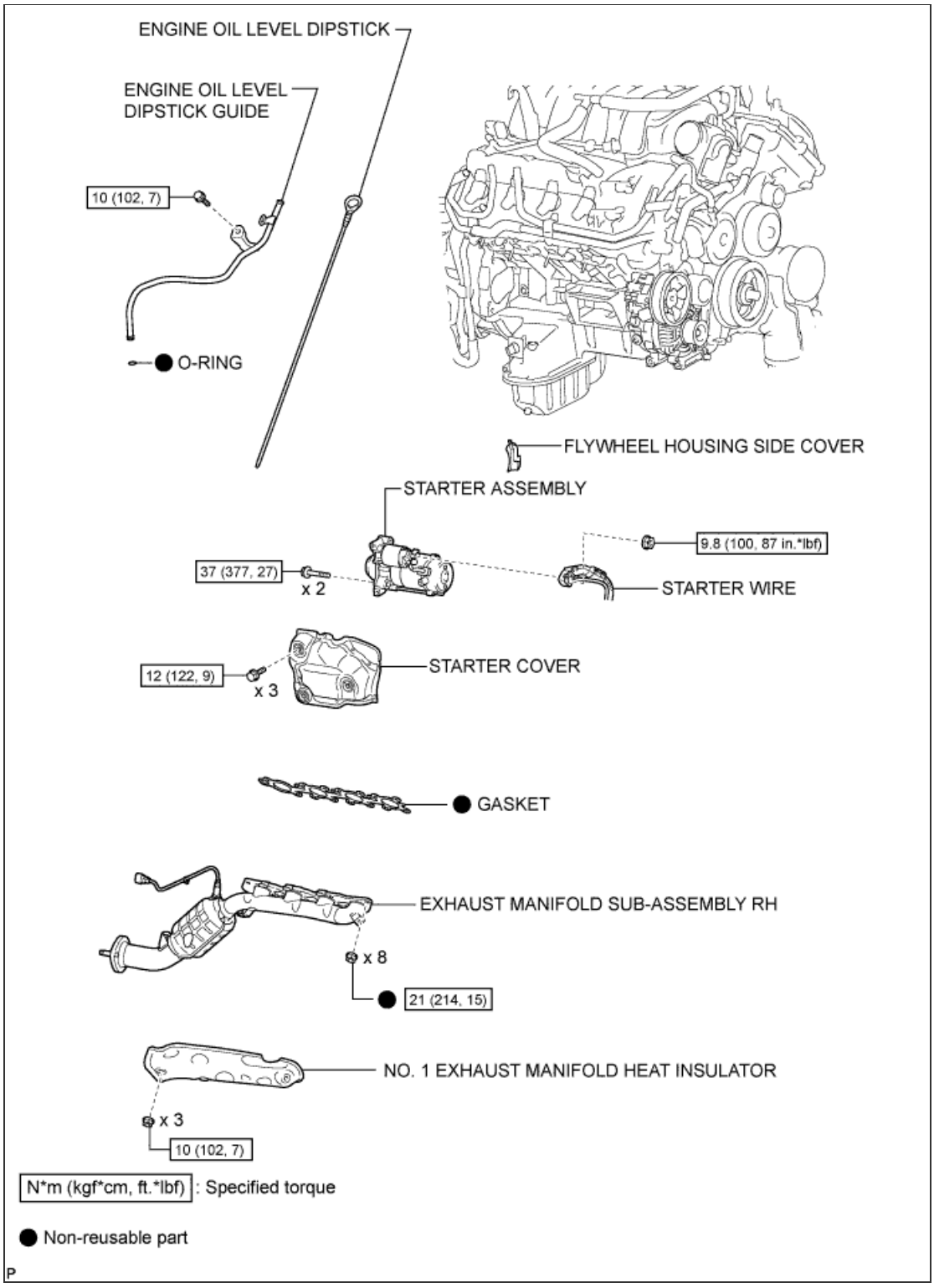
b. Install the 3 bolts and 2 screws.

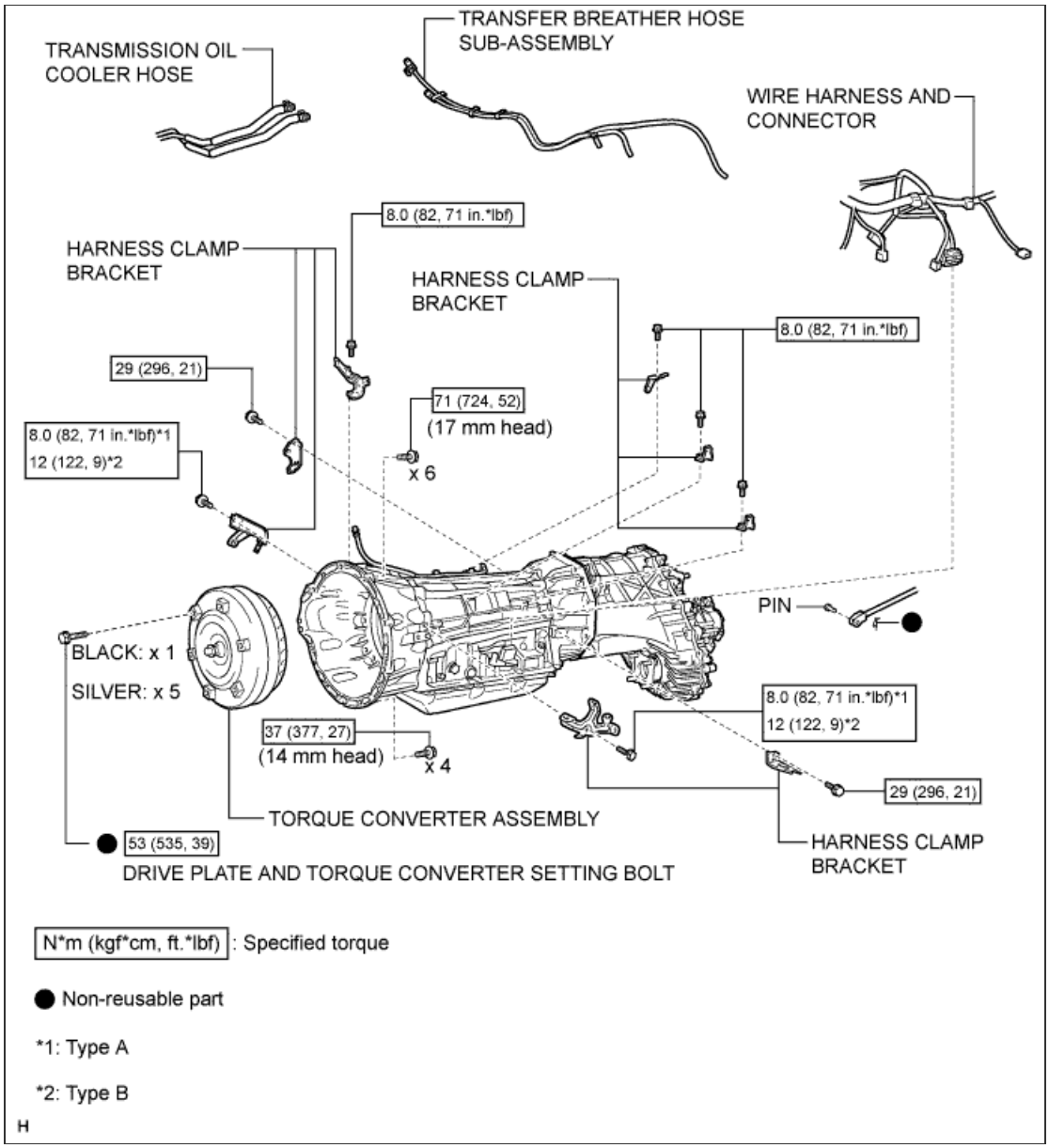
40. RESET MEMORY

a. Perform the Reset Memory procedures (A/T initialization) (Click here).

for Preparation Click here




ENGINE OIL LEVEL DIPSTICK
ENGINE OIL LEVEL DIPSTICK GUIDE
10 (102, 7)
O-RING
FLYWHEEL HOUSING SIDE COVER
STARTER ASSEMBLY
9.8 (100, 87 in.*lbf)
37 (377, 27)
x 2
STARTER WIRE
12 (122, 9)
x 3
STARTER COVER
GASKET
EXHAUST MANIFOLD SUB-ASSEMBLY RH
x 8
21 (214, 15)
NO. 1 EXHAUST MANIFOLD HEAT INSULATOR
x 3
10 (102, 7)
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
P



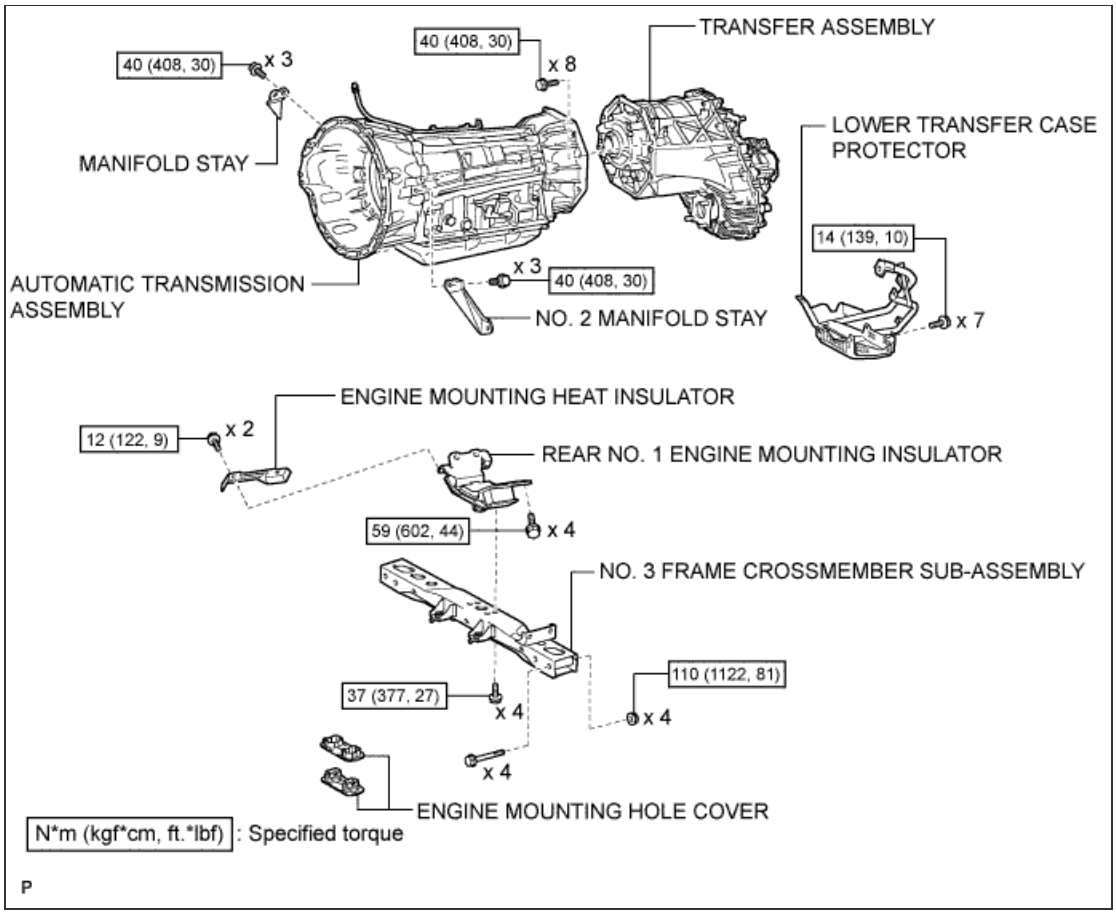
N*m (kgf*cm, ft.*lbf) : Specified torque

● Non-reusable part

*1: Type A

*2: Type B

H


40 (408, 30)
x 3
MANIFOLD STAY
40 (408, 30)
x 8
TRANSFER ASSEMBLY
LOWER TRANSFER CASE PROTECTOR
14 (139, 10)
x 7
AUTOMATIC TRANSMISSION ASSEMBLY
x 3
40 (408, 30)
NO. 2 MANIFOLD STAY
ENGINE MOUNTING HEAT INSULATOR
12 (122, 9)
x 2
REAR NO. 1 ENGINE MOUNTING INSULATOR
59 (602, 44)
x 4
NO. 3 FRAME CROSSMEMBER SUB-ASSEMBLY
110 (1122, 81)
37 (377, 27)
x 4
x 4
x 4
ENGINE MOUNTING HOLE COVER
N*m (kgf*cm, ft.*lbf) : Specified torque
P

for Preparation Click here

1. PRECAUTION

NOTICE:

After turning the engine switch off, waiting time may be required before disconnecting the cable from the battery terminal. Therefore, make sure to read the disconnecting the cable from the battery terminal notice before proceeding with work (Click here).

2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

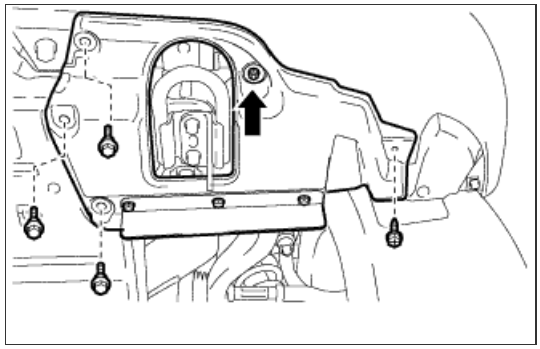
NOTICE:

When disconnecting the cable, some systems need to be initialized after the cable is reconnected (Click here).

3. REMOVE FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY LH

a. Remove the 3 bolts and screw.

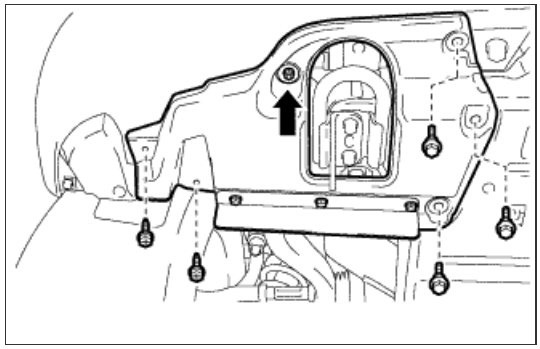
b. Turn the clip indicated by the arrow in the illustration to remove the front fender splash shield sub-assembly LH.



4. REMOVE FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY RH

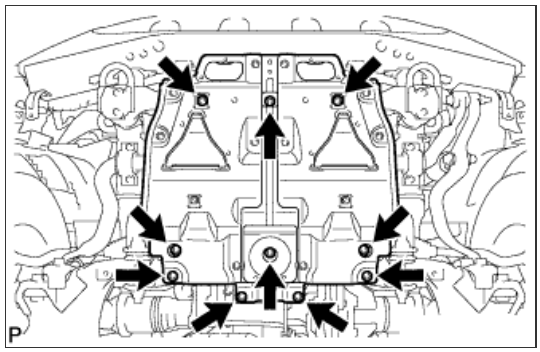
a. Remove the 3 bolts and 2 screws.

b. Turn the clip indicated by the arrow in the illustration to remove the front fender splash shield sub-assembly RH.



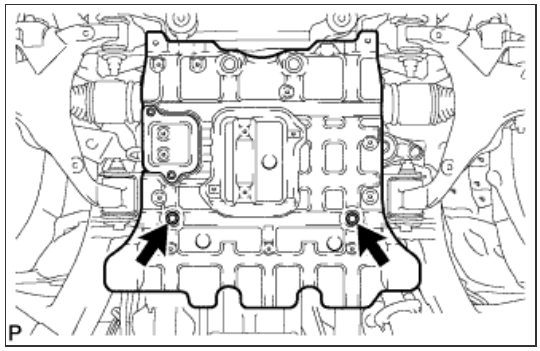
5. REMOVE NO. 1 ENGINE UNDER COVER

a. Remove the 10 bolts and No. 1 engine under cover.



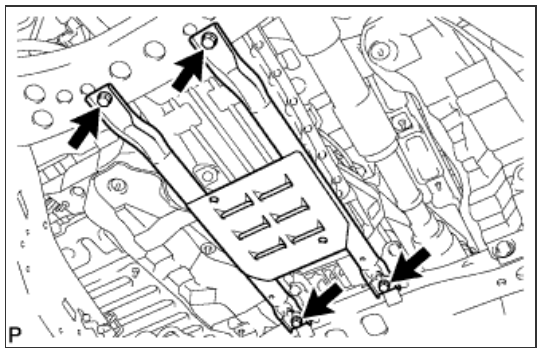
6. REMOVE NO. 2 ENGINE UNDER COVER

a. Remove the 2 bolts and No. 2 engine under cover.



7. REMOVE OIL PAN PROTECTOR ASSEMBLY

a. Remove the 4 bolts and oil pan protector assembly.



8. DRAIN AUTOMATIC TRANSMISSION FLUID

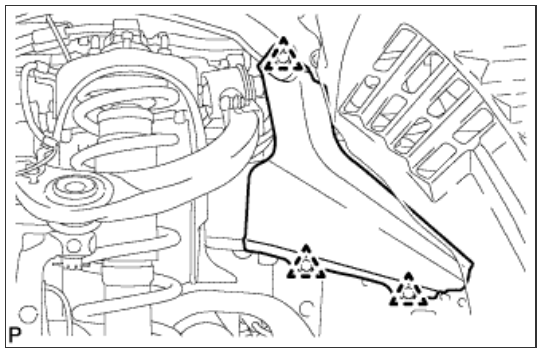
a. Remove the drain plug and gasket, and drain the ATF.

b. Install a new gasket and the drain plug.

Torque:
20 N*m{ 204 kgf*cm , 15 ft.*lbf }

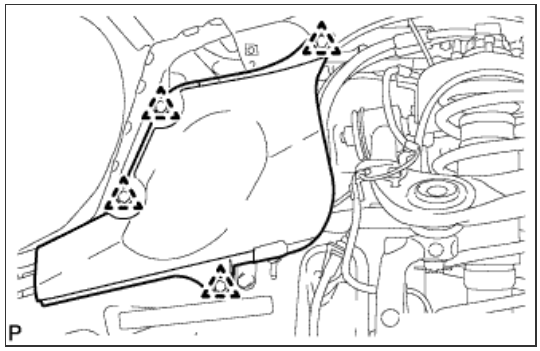
9. REMOVE FRONT FENDER APRON SEAL FRONT RH

a. Using a clip remover, remove the 3 clips and fender apron seal.



10. REMOVE FRONT FENDER APRON SEAL REAR RH

a. Using a clip remover, remove the 4 clips and fender apron seal.



11. DRAIN ENGINE COOLANT

CAUTION:

Do not remove the radiator cap while the engine and radiator are still hot. Pressurized, hot engine coolant and steam may be released and cause serious burns.

a. Loosen the radiator drain cock plug.

HINT:

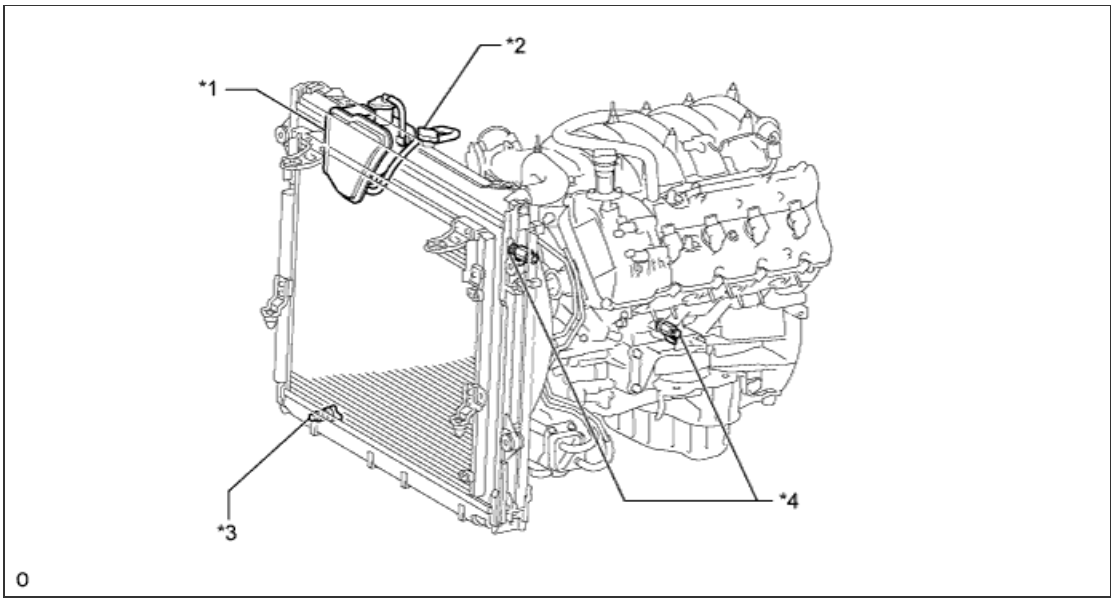
Collect the coolant in a container and dispose of it according to the regulations in your area.

b. Remove the radiator cap. Then drain the coolant from the radiator.

c. Loosen the 2 cylinder block drain cock plugs. Then drain the coolant from the engine.

d. Tighten the 2 cylinder block drain cock plugs.

Torque:
13 N*m{ 133 kgf*cm , 10 ft.*lbf }



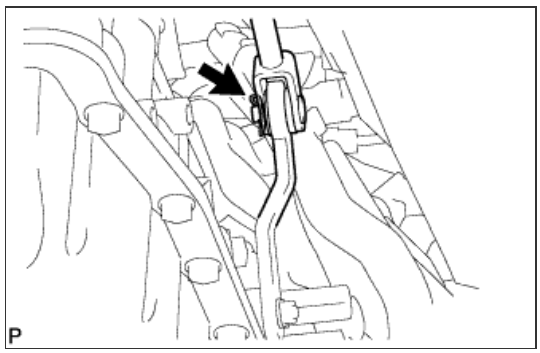
Text in Illustration

*1	Radiator Reservoir	*2	Radiator Cap
*3	Radiator Drain Cock Plug	*4	Cylinder Block Drain Cock Plug

e. Tighten the radiator drain cock plug by hand.

12. DISCONNECT FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

a. Remove the clip and pin and disconnect the gear shifting rod from the transmission control shaft lever RH.



13. REMOVE FRONT PROPELLER SHAFT ASSEMBLY

(Click here)

14. REMOVE PROPELLER SHAFT ASSEMBLY

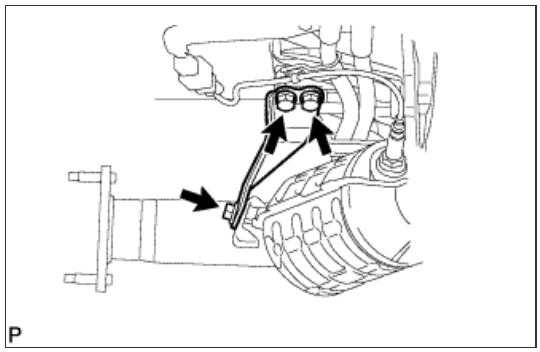
(Click here)

15. REMOVE EXHAUST PIPE

(Click here)

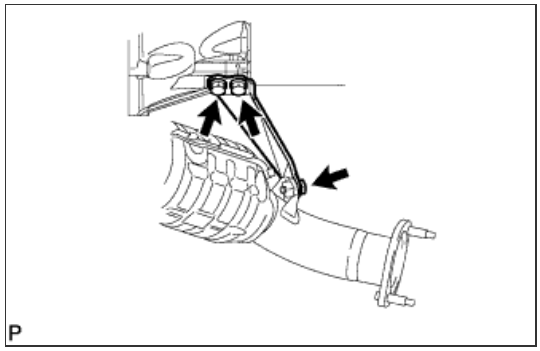
16. REMOVE NO. 1 MANIFOLD STAY

a. Remove the 3 bolts and No. 1 manifold stay.



17. REMOVE NO. 2 MANIFOLD STAY

a. Remove the 3 bolts and No. 2 manifold stay.



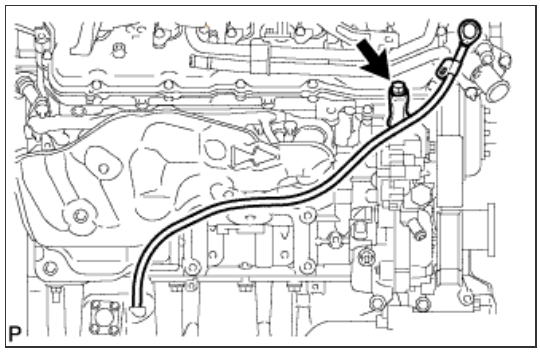
18. REMOVE ENGINE OIL LEVEL DIPSTICK GUIDE

a. Disconnect the wire harness clamp.

b. Remove the dipstick.

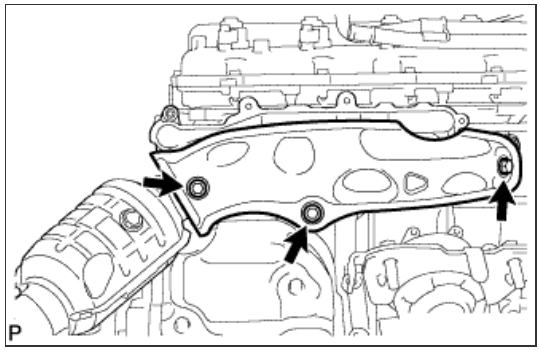
c. Remove the bolt and dipstick guide.

d. Remove the O-ring from the dipstick guide.



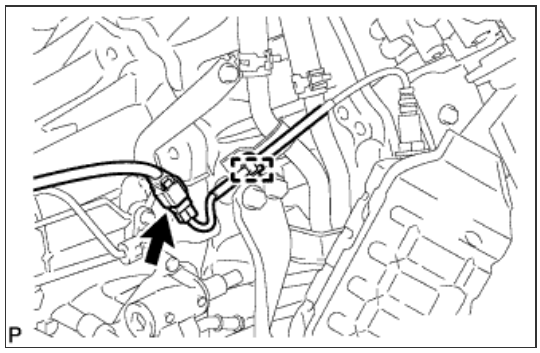
19. REMOVE NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

a. Remove the 3 bolts and heat insulator.

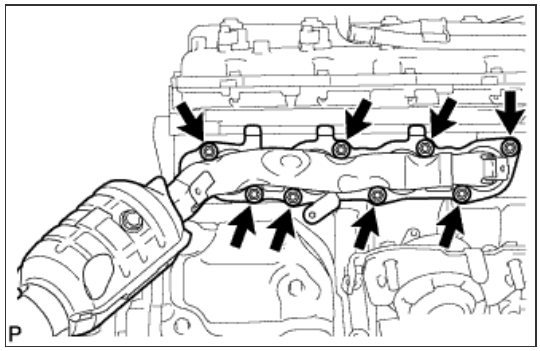


20. REMOVE EXHAUST MANIFOLD SUB-ASSEMBLY RH

a. Disconnect the connector and detach the wire harness clamp.

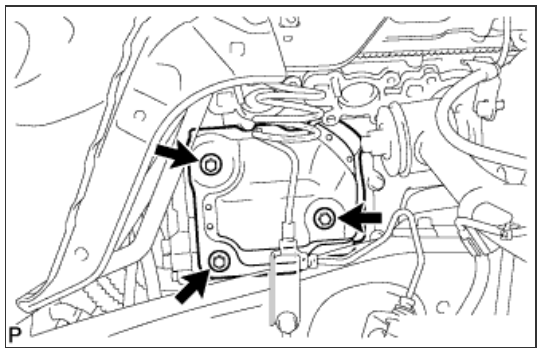


b. Remove the 8 nuts, exhaust manifold sub-assembly RH and gasket.



21. REMOVE STARTER COVER

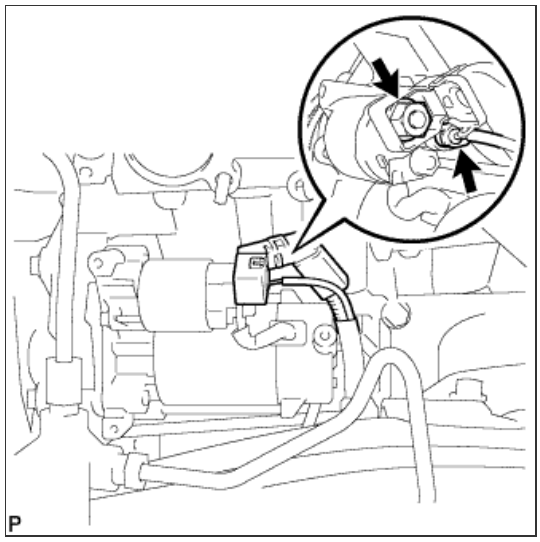
a. Remove the 3 bolts and starter cover.



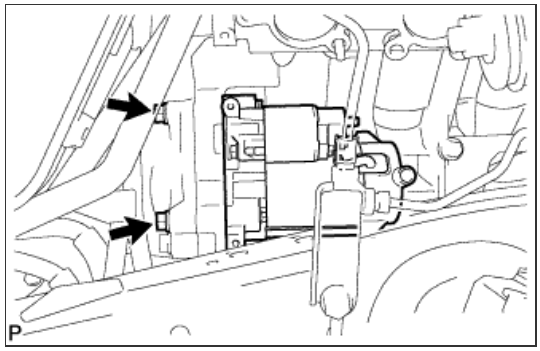
22. REMOVE STARTER ASSEMBLY

a. Disconnect the starter connector.

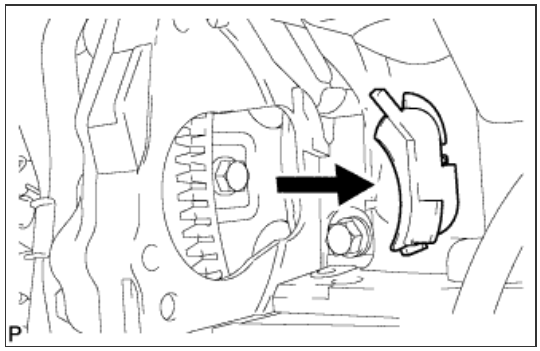
b. Remove the nut and disconnect the starter wire.



c. Remove the 2 bolts and starter.

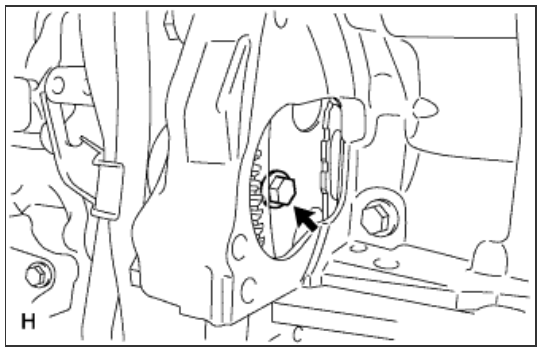


d. Remove the flywheel housing side cover.



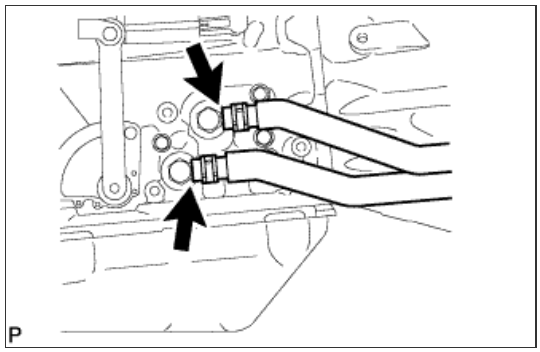
23. REMOVE DRIVE PLATE AND TORQUE CONVERTER SETTING BOLT

a. Turn the crankshaft to gain access to the 6 bolts and remove the bolts while holding the crankshaft pulley setting bolt with a wrench.



24. DISCONNECT TRANSMISSION OIL COOLER HOSE

a. Disconnect the 2 transmission oil cooler hoses from the oil cooler tube union.

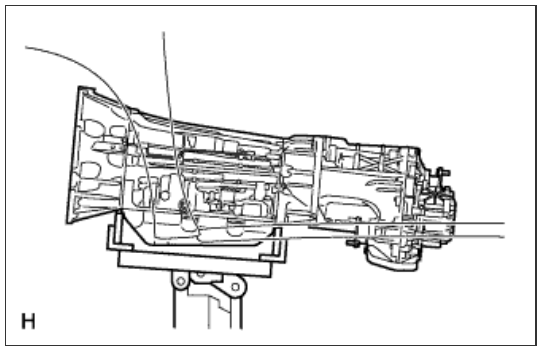


25. SUPPORT AUTOMATIC TRANSMISSION ASSEMBLY

a. Support the transmission with a transmission jack. Lift the transmission slightly from the crossmember.

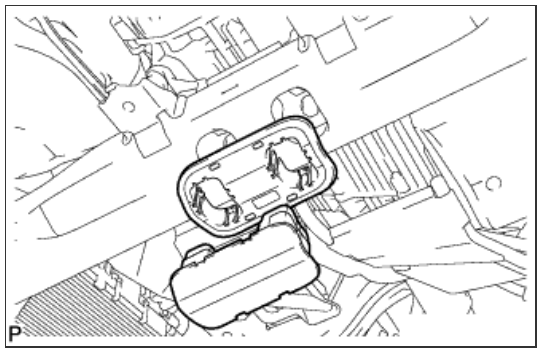
NOTICE:

Support the oil pan bolts to prevent damage to the oil pan gasket.

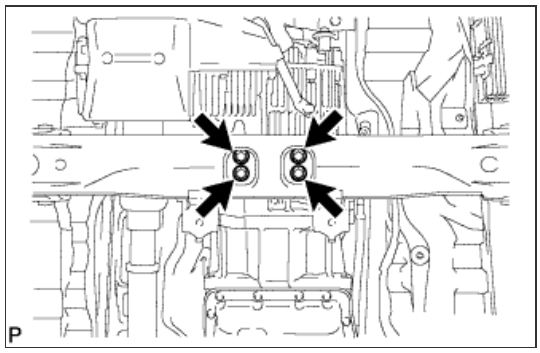


26. REMOVE NO. 3 FRAME CROSSMEMBER SUB-ASSEMBLY

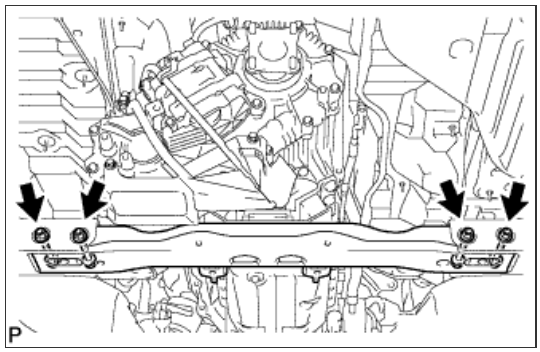
a. Remove the engine mounting hole cover.



b. Remove the 4 bolts of the rear engine mounting insulator.



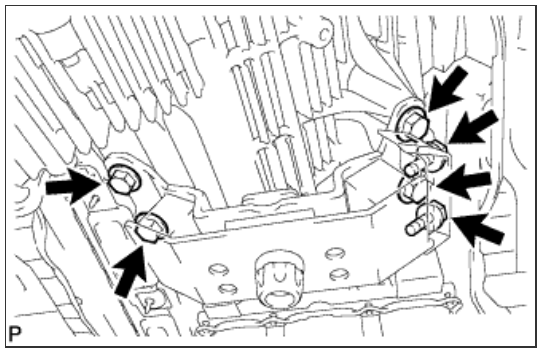
c. Remove the 4 nuts, 4 bolts and No. 3 frame crossmember.



27. REMOVE REAR NO. 1 ENGINE MOUNTING INSULATOR

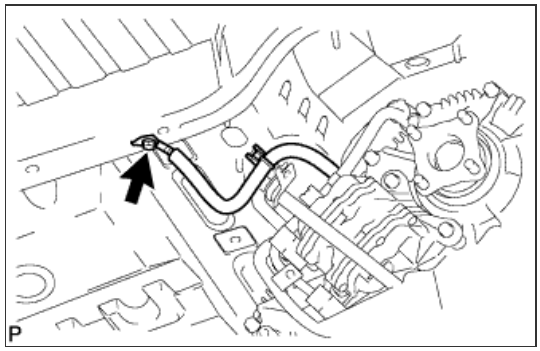
a. Remove the 2 bolts and engine mounting heat insulator.

b. Remove the 4 bolts and rear engine No. 1 mounting insulator from the transmission.



28. DISCONNECT WIRE HARNESS AND CONNECTOR

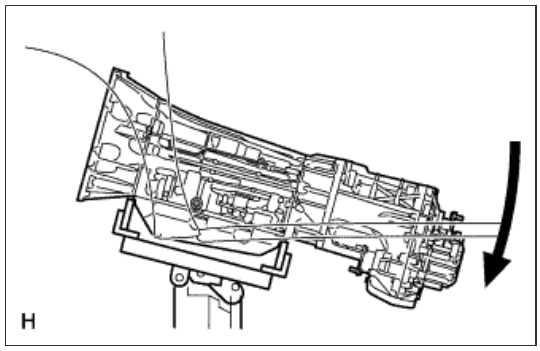
a. Remove the bolt and disconnect the ground cable.



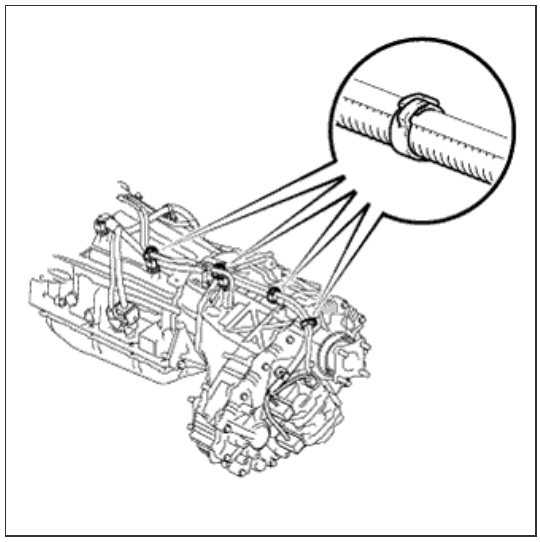
b. Tilt the transmission downward.

NOTICE:

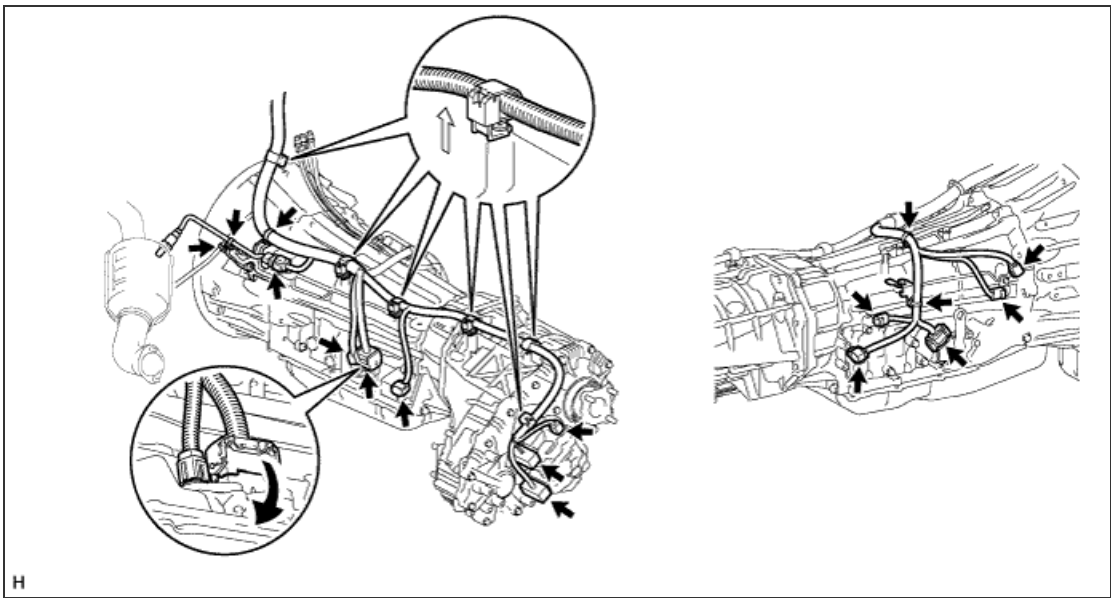
- **Support the oil pan bolts to prevent damage to the oil pan gasket.**
- **Make sure the cooling fan does not contact the fan shroud.**



c. Remove the 4 wire harness clamps.



d. Disconnect the park/neutral position switch connector, 2 transmission wire connectors, 2 speed sensor connectors and 3 transfer control connectors.



HINT:

Detach the claw, press down the lever, and then disconnect the transmission wire connector.

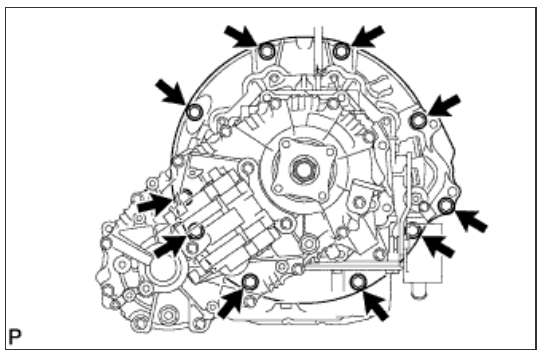
e. Detach the 4 connector clamps and 11 harness clamps.

29. REMOVE AUTOMATIC TRANSMISSION ASSEMBLY

a. Remove the 10 bolts and transmission.

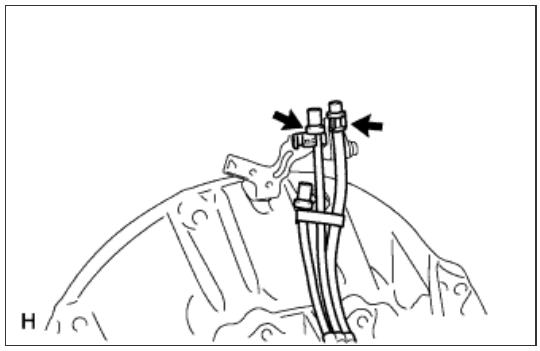
NOTICE:

Do not use excess force to pry off the transmission assembly.

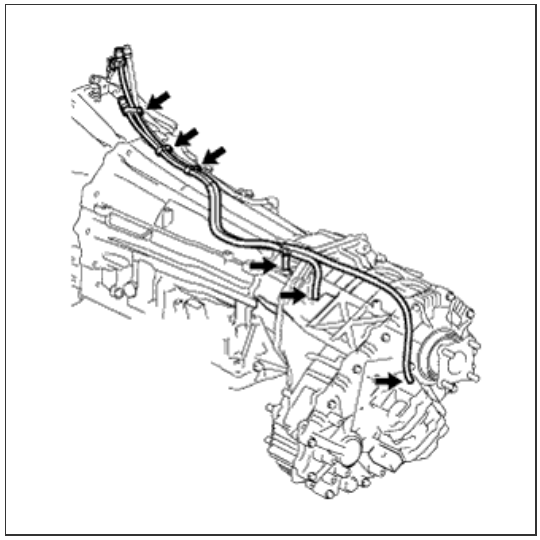


30. DISCONNECT TRANSFER BREATHER HOSE SUB-ASSEMBLY

a. Disconnect the 2 breather plug hoses from the harness clamp bracket.



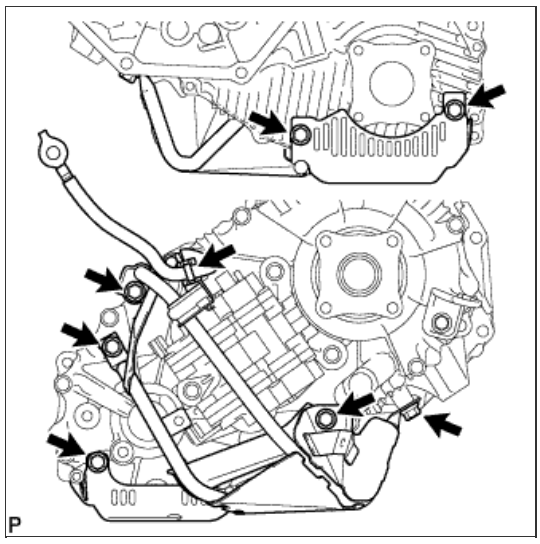
b. Detach the 3 breather hose clamps from the automatic transmission breather tube.



31. REMOVE LOWER TRANSFER CASE PROTECTOR

a. Detach the clamp of the ground cable from the lower transfer case protector.

b. Remove the 7 bolts and lower transfer case protector.



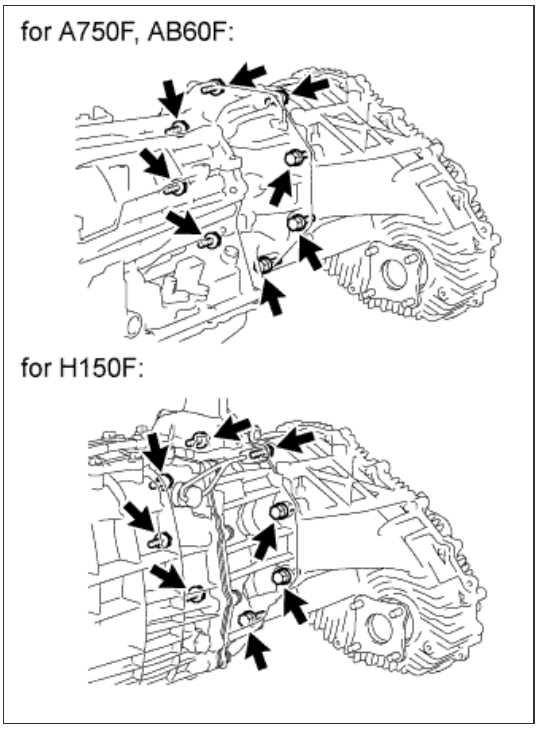
32. REMOVE TRANSFER ASSEMBLY

a. Remove the 8 transfer adaptor rear mounting bolts.

b. Pull the transfer straight up and remove it from the transmission.

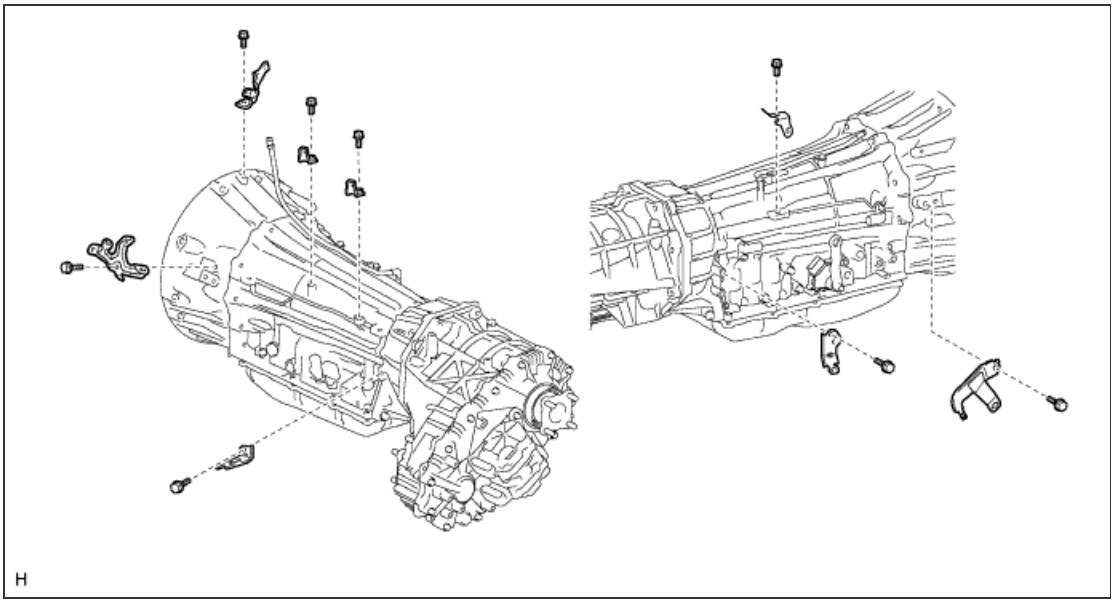
NOTICE:

Take care not to damage the adaptor oil seal with the transfer input shaft spline.



33. REMOVE HARNESS CLAMP BRACKET

a. Remove the 8 bolts and 8 harness clamp brackets.



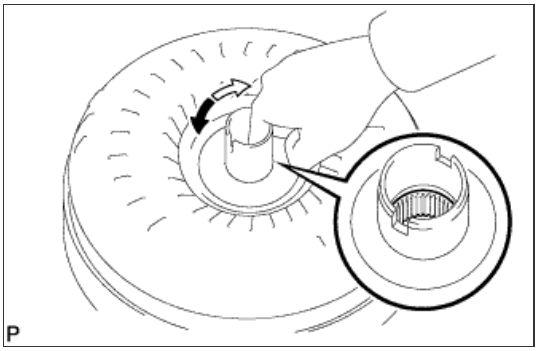
34. REMOVE TORQUE CONVERTER ASSEMBLY

for Preparation Click here

1. INSPECT TORQUE CONVERTER ASSEMBLY

a. Inspect the 1-way clutch.

i. Press on the serrations of the stator with a finger and rotate the stator. Check that it rotates smoothly when turned clockwise and locks when turned counterclockwise.
If necessary, clean the converter and recheck the 1-way clutch.
Replace the converter if the 1-way clutch still fails the inspection.



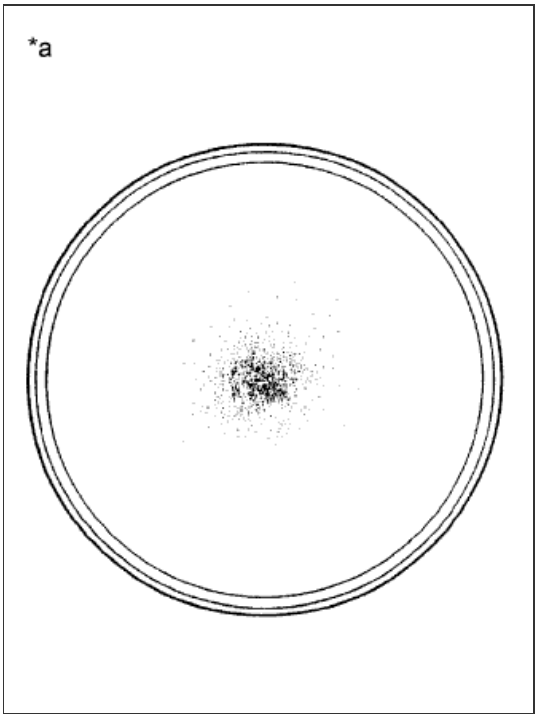
Text in Illustration

⇨	Free
➡	Lock

b. Determine the condition of the torque converter.

Text in Illustration

*a	Sample showing maximum allowable amount of powder in ATF



i. If the inspection result of the torque converter satisfies the following conditions, replace the torque converter.

Malfunction

- A metallic sound is emitted from the torque converter during the stall test or when the shift lever is moved to N.
- The 1-way clutch is free or locks in both directions.
- The amount of powder in the ATF is more than the sample shown in the illustration (see the sample).

HINT:

The sample shows approximately 0.025 liters (0.026 US qts, 0.022 Imp. qts) of ATF that was taken out from a removed torque converter.

c. Replace the ATF in the torque converter.

i. If the ATF is discolored and/or has a foul odor, stir the ATF in the torque converter thoroughly and drain the ATF with the torque converter facing upward.

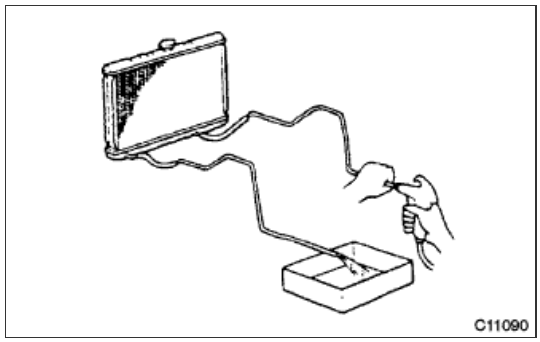
d. Clean and check the oil cooler and oil pipe line.

i. If the torque converter is inspected or the ATF is replaced, clean the oil cooler and oil pipe line.

HINT:

- **Apply compressed air at 196 kPa (2.0 kgf/cm ^{2}, 28 psi) into the inlet hose.**
- **If a large amount of powder is found in the ATF, add new ATF using a bucket pump and clean the oil cooler and oil pipe again.**

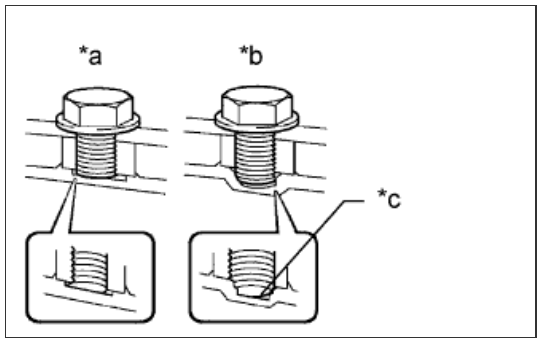
ii. If the ATF is cloudy, inspect the oil cooler.



e. Prevent deformation of the torque converter and damage to the oil pump gear.

Text in Illustration

*a	Correct
*b	Incorrect
*c	Bottom is damaged



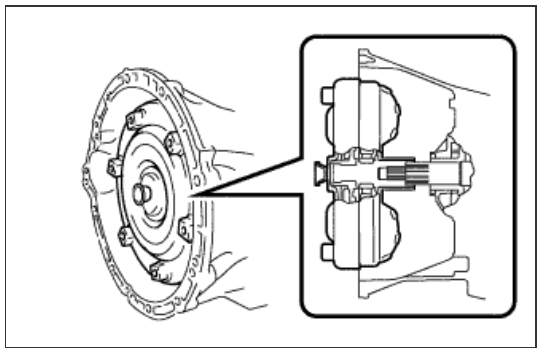
i. When there is any damage to the end of a bolt for the torque converter and to the bottom of the bolt hole, replace the bolt and the torque converter.

ii. All of the bolts should be the same length.

iii. Bolts with washers must be used.

2. INSTALL TORQUE CONVERTER ASSEMBLY

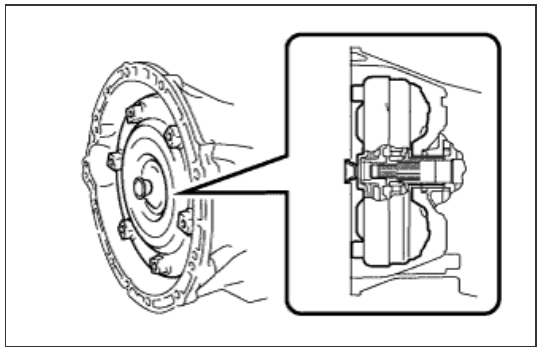
a. Engage the splines of the input shaft and turbine runner.



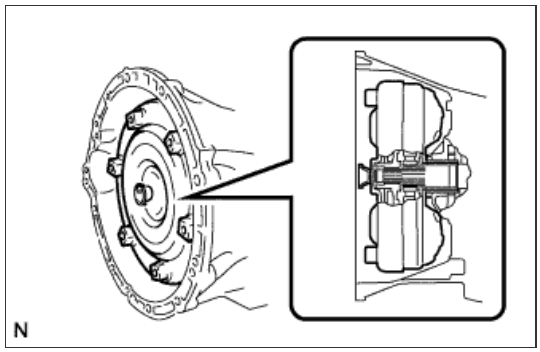
b. Engage the splines of the stator shaft and stator while turning the torque converter assembly.

HINT:

If the stator shaft splines are difficult to engage with the stator splines, move the torque converter back approximately 10 mm and engage the splines while rotating the torque converter.



c. Turn the torque converter assembly to engage the key of the oil pump drive gear and the slot on the torque converter assembly.



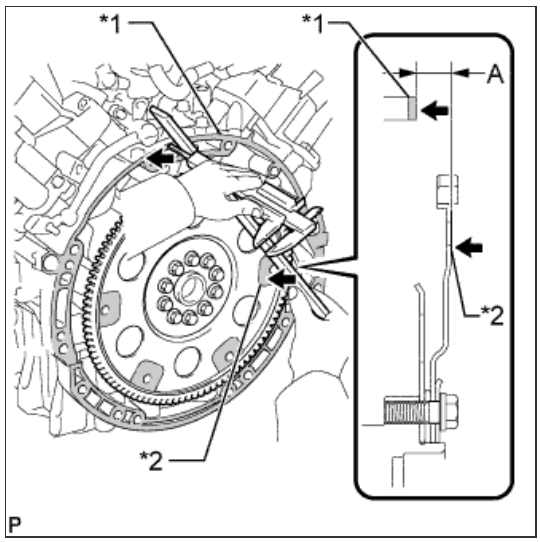
d. Using a vernier caliper and straightedge, measure dimension A between the surface of the engine that contacts the transmission and the surface of the drive plate that contacts the torque converter.

Text in Illustration

*1	Engine Surface
*2	Drive Plate Surface

NOTICE:

Make sure to deduct the thickness of the straightedge.

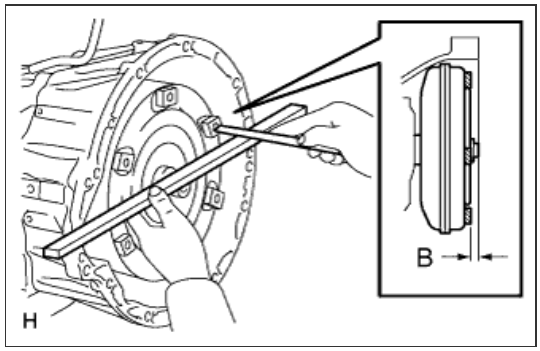


e. Using a vernier caliper and a straightedge, measure dimension B shown in the illustration and check that B is more than A measured in the first step.

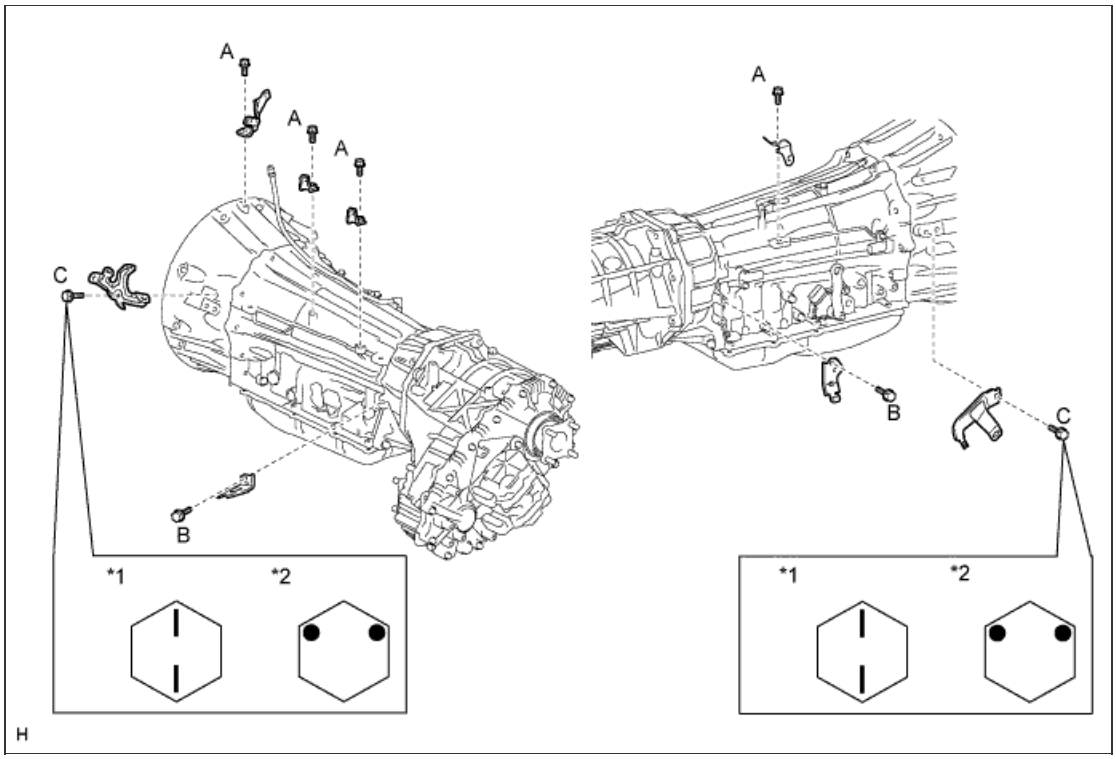
Standard distance:
B = A + 1.00 mm (0.0394 in.) or more

NOTICE:

- **Make sure to deduct the thickness of the straightedge.**
- **If the transaxle is installed to the engine with the torque converter not sufficiently inserted, the torque converter may be damaged.**



3. INSTALL WIRE HARNESS CLAMP BRACKET



a. Install the 8 bolts and 8 harness clamp brackets.

Torque:
Bolt A:
8.0 N*m{ 82 kgf*cm , 71 in.*lbf }
Bolt B:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }
Bolt C, Type A:
8.0 N*m{ 82 kgf*cm , 71 in.*lbf }
Bolt C, Type B:
12 N*m{ 122 kgf*cm , 9 ft.*lbf }

Text in Illustration

*1	Type A
*2	Type B

NOTICE:

The different marks on the heads of the bolts are shown in the illustration. Check whether the bolt being used is type A or type B, and then tighten the bolt using the appropriate torque.

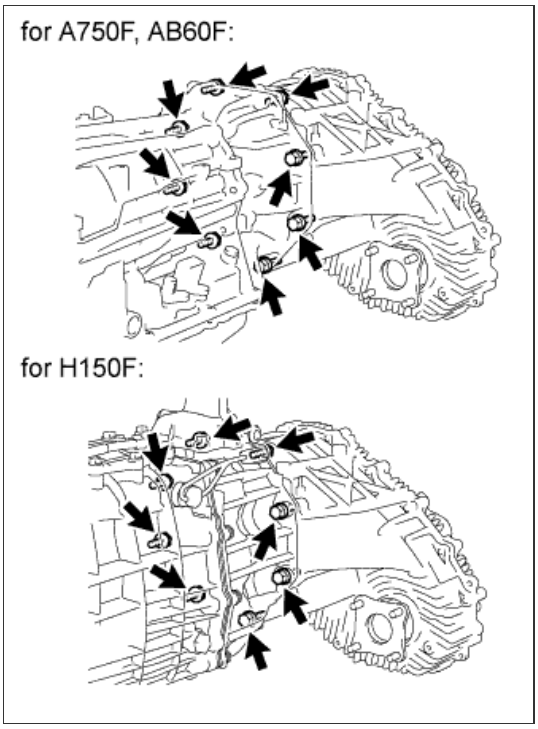
4. INSTALL TRANSFER ASSEMBLY

a. Install the transfer with the 8 bolts.

Torque:
40 N*m{ 408 kgf*cm , 30 ft.*lbf }

NOTICE:

Take care not to damage the adaptor oil seal with the transfer input shaft spline.



5. INSTALL LOWER TRANSFER CASE PROTECTOR

a. Install the lower transfer case protector with the 7 bolts.

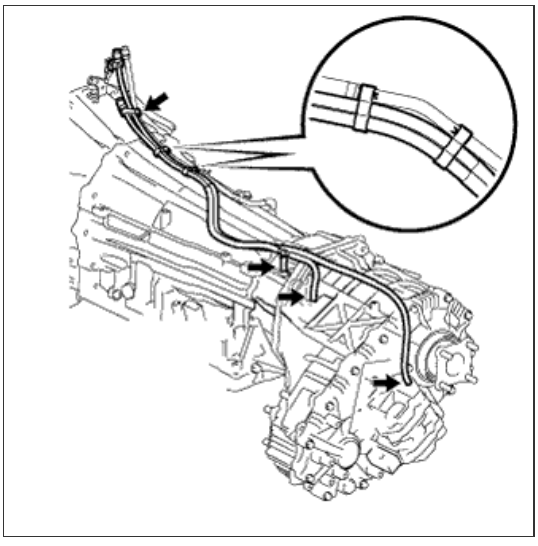
Torque:
14 N*m{ 139 kgf*cm , 10 ft.*lbf }

b. Attach the clamp of the ground cable to the lower transfer case protector.

6. INSTALL TRANSFER BREATHER HOSE SUB-ASSEMBLY

a. Attach the 3 breather hose clamps to connect the transfer breather hose to the automatic transmission breather tube.

b. Connect the 2 breather plug hoses to the harness clamp bracket.



7. INSTALL AUTOMATIC TRANSMISSION ASSEMBLY

a. Apply clutch spline grease to the surface of the crankshaft that contacts the torque converter centerpiece.

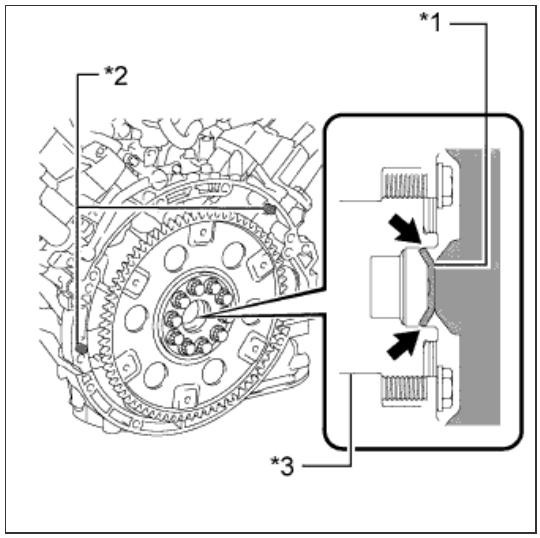
Clutch spline grease:
Toyota Genuine Clutch Spline Grease or equivalent

Maximum grease amount:
Approximately 1 g (0.0353 oz.)

b. Confirm that the 2 knock pins are on the surface of the engine block that contacts the transaxle.

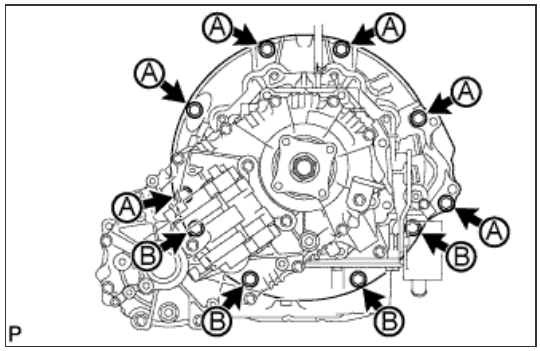
Text in Illustration

*1	Torque Converter Centerpiece
*2	Knock Pin
*3	Crankshaft



c. Keeping the engine and automatic transaxle assembly horizontal, align the knock pins with the holes on the automatic transaxle assembly and install the 10 bolts shown in the illustration.

Torque:
for 17 mm head bolt A:
71 N*m{ 724 kgf*cm , 52 ft.*lbf }
for 14 mm head bolt B:
37 N*m{ 377 kgf*cm , 27 ft.*lbf }



8. CONNECT TRANSMISSION OIL COOLER HOSE

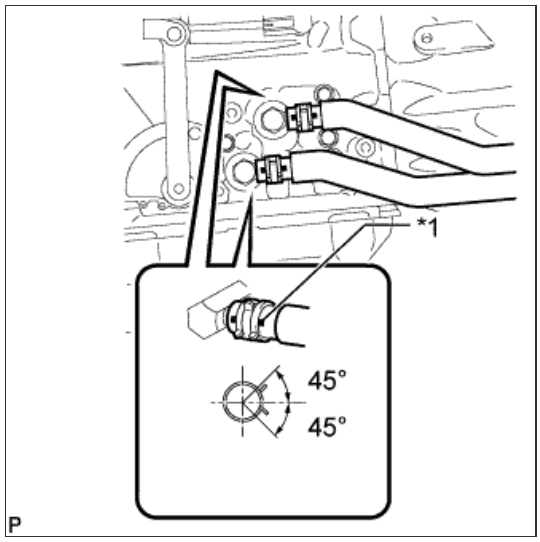
a. Connect the 2 transmission oil cooler hoses to the oil cooler tube union.

NOTICE:

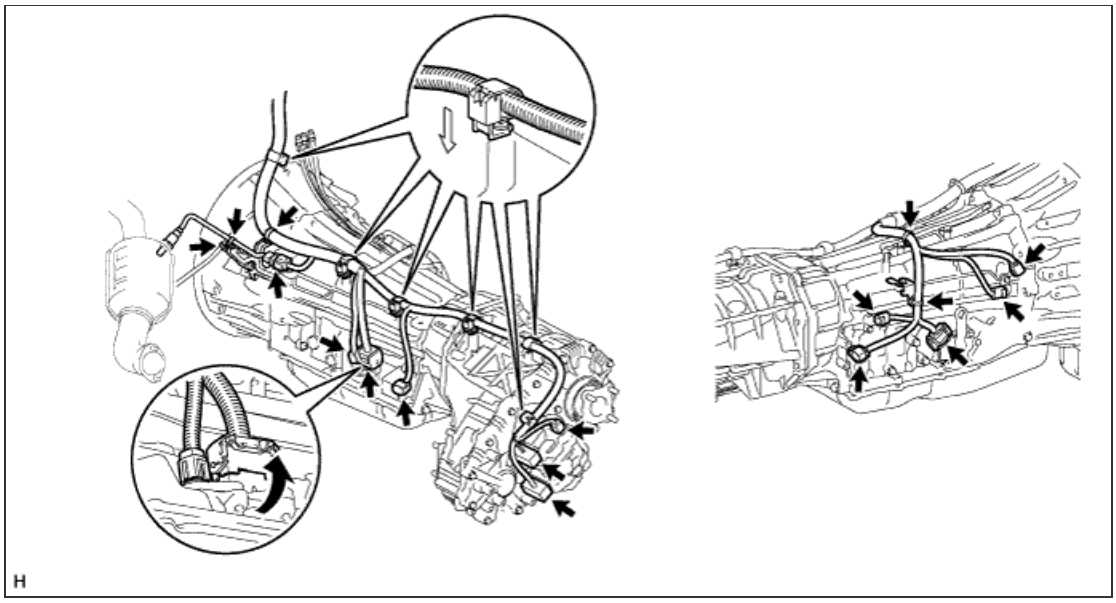
- **Make sure the pinching portion of each clip is facing the direction shown in the illustration.**
- **Make sure the paint mark of each hose is facing outward.**

Text in Illustration

*1	Paint Mark



9. CONNECT WIRE HARNESS AND CONNECTOR



a. Connect the park/neutral position switch connector, 2 transmission wire connectors, 2 speed sensor connectors and 3 transfer control connectors.

HINT:

Push up the lever until the claw of the transmission wire connector makes a connection sound.

b. Attach the 4 connector clamps and 11 harness clamps.

c. Install the 4 wire harness clamps.

d. Tilt up the automatic transmission.

e. Connect the ground cable with the bolt.

Torque:
8.4 N*m{ 86 kgf*cm , 74 in.*lbf }

10. INSTALL REAR NO. 1 ENGINE MOUNTING INSULATOR

a. Install the rear No. 1 engine mounting insulator to the transmission with the 4 bolts.

Torque:
59 N*m{ 602 kgf*cm , 44 ft.*lbf }

b. Install the engine mounting heat insulator with the 2 bolts.

Torque:
12 N*m{ 122 kgf*cm , 9 ft.*lbf }

11. INSTALL NO. 3 FRAME CROSSMEMBER SUB-ASSEMBLY

a. Install the frame crossmember to the rear engine mounting insulator with the 4 bolts.

Torque:
37 N*m{ 377 kgf*cm , 27 ft.*lbf }

b. Install the frame crossmember to the frame with the 4 bolts and 4 nuts.

Torque:
110 N*m{ 1122 kgf*cm , 81 ft.*lbf }

c. Install the engine mounting hole cover.

12. INSTALL DRIVE PLATE AND TORQUE CONVERTER SETTING BOLT

a. Turn the crankshaft to gain access to the installation locations of the 6 bolts and install the bolts while holding the crankshaft pulley set bolt with a wrench.

Torque:
53 N*m{ 535 kgf*cm , 39 ft.*lbf }

NOTICE:

First install the black-colored bolt, and then the remaining 5 silver colored bolts.

13. INSTALL STARTER ASSEMBLY

a. Install the flywheel housing side cover.

b. Install the starter with the 2 bolts.

Torque:
37 N*m{ 377 kgf*cm , 27 ft.*lbf }

c. Install the starter wire with the nut.

Torque:
9.8 N*m{ 100 kgf*cm , 87 in.*lbf }

d. Connect the starter connector.

14. INSTALL STARTER COVER

a. Install the starter cover with the 3 bolts.

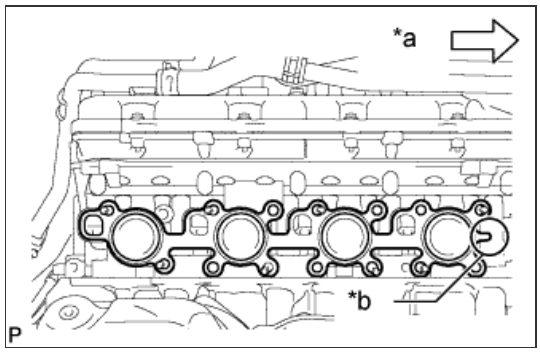
Torque:
12 N*m{ 122 kgf*cm , 9 ft.*lbf }

15. INSTALL EXHAUST MANIFOLD SUB-ASSEMBLY RH

a. Install a new gasket to the cylinder head.

Text in Illustration

*a	Front
*b	Tab



HINT:

Install the exhaust manifold gasket with the gasket tab facing toward the front of the engine.

b. Temporarily install the exhaust manifold sub-assembly RH with the 8 new nuts.

c. Uniformly tighten the 8 nuts.

Torque:
21 N*m{ 214 kgf*cm , 15 ft.*lbf }

d. Attach the wire harness clamp to the bracket and connect the connector.

16. INSTALL NO. 1 EXHAUST MANIFOLD HEAT INSULATOR

a. Install the heat insulator with the 3 bolts.

Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }

17. INSTALL ENGINE OIL LEVEL DIPSTICK GUIDE

a. Apply a light coat of engine oil to a new O-ring.

b. Install the O-ring to the guide.

c. Install the dipstick guide with the bolt.

Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }

d. Install the dipstick.

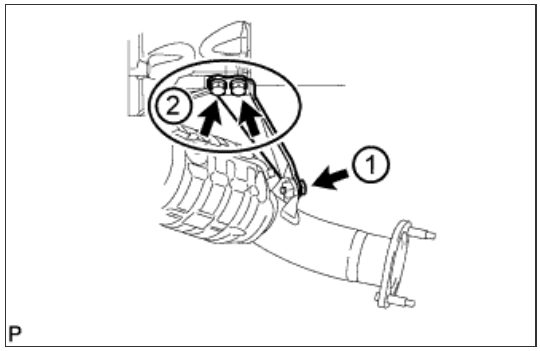
e. Connect the wire harness clamp.

18. INSTALL NO. 2 MANIFOLD STAY

a. Temporarily install the No. 2 manifold stay with the 3 bolts.

b. Tighten the 3 bolts in the order shown in the illustration.

Torque:
40 N*m{ 408 kgf*cm , 30 ft.*lbf }

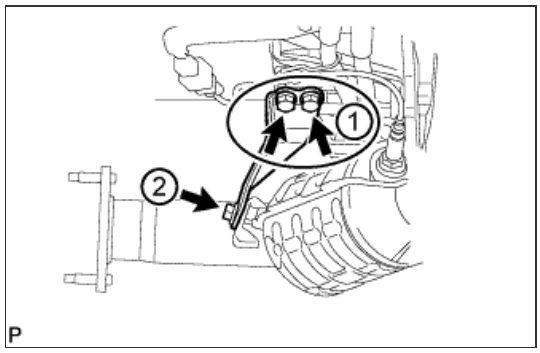


19. INSTALL NO. 1 MANIFOLD STAY

a. Temporarily install the No. 1 manifold stay with the 3 bolts.

b. Tighten the 3 bolts in the order shown in the illustration.

Torque:
40 N*m{ 408 kgf*cm , 30 ft.*lbf }



20. INSTALL EXHAUST PIPE

(Click here)

21. INSTALL PROPELLER SHAFT ASSEMBLY

(Click here)

22. INSTALL FRONT PROPELLER SHAFT ASSEMBLY

(Click here)

23. CONNECT FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

a. Connect the gear shifting rod to the transmission control shaft lever RH with the pin and a new clip.

24. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

NOTICE:

When disconnecting the cable, some systems need to be initialized after the cable is reconnected (Click here).

25. ADD AUTOMATIC TRANSMISSION FLUID

(Click here)

26. ADD ENGINE COOLANT

a. Add engine coolant.

Standard Capacity:

Item	Specified Condition
with rear heater	16.2 liters (17.1 US qts, 14.3 Imp. qts)
without rear heater	13.4 liters (14.2 US qts, 11.8 Imp. qts)

NOTICE:

Do not substitute plain water for engine coolant.

HINT:

TOYOTA vehicles are filled with TOYOTA SLLC at the factory. In order to avoid damage to the engine cooling system and other technical problems, only use TOYOTA SLLC or similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, non-borate coolant with long-life hybrid organic acid technology (coolant with long-life hybrid organic acid technology consists of a combination of low phosphates and organic acids).

b. Slowly pour coolant into the radiator reservoir until it reaches the F line.

c. Install the reservoir cap.

d. Press the No. 1 and No. 2 radiator hoses several times by hand, and then check the coolant level. If the coolant level is low, add coolant.

e. Install the radiator cap.

f. Start the engine and warm it up until the thermostat opens.

HINT:

The thermostat opening timing can be confirmed by pressing the radiator inlet hose by hand, and checking when the engine coolant starts to flow inside the hose.

g. Maintain the engine speed at 2000 to 2500 rpm.

NOTICE:

- **Make sure that the radiator reservoir still has some coolant in it.**
- **Pay attention to the needle of the water temperature meter. Make sure that the needle does not show an abnormally high temperature.**
- **If there is not enough coolant, the engine may burn out or overheat.**
- **Immediately after starting the engine, if the radiator reservoir does not have any coolant, perform the following: 1) stop the engine, 2) wait until the coolant has cooled down, and 3) add coolant until the coolant is filled to the F line.**
- **Run the engine at 2000 rpm until the coolant level has stabilized.**

h. Press the No. 1 and No. 2 radiator hoses several times by hand to bleed air.

CAUTION:

- **Wear protective gloves.**
- **Be careful as the radiator hoses are hot.**
- **Keep your hands away from the fan.**

i. Stop the engine, and wait until the engine coolant cools down to ambient temperature.

CAUTION:

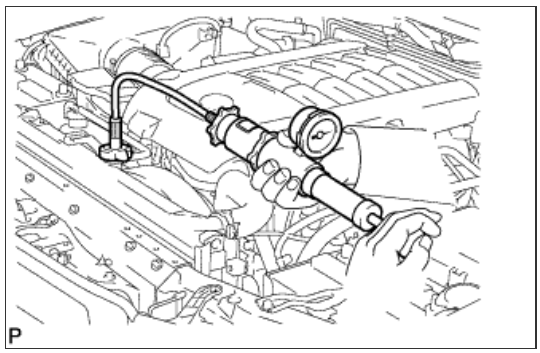
Do not remove the radiator cap while the engine and radiator are still hot. Pressurized, hot engine coolant and steam may be released and cause serious burns.

j. Check that the coolant level is between the F and L lines.
If the coolant level is below the L line, repeat all of the procedures above.
If the coolant level is above the F line, drain coolant so that the coolant level is between the F and L lines.

27. INSPECT FOR ENGINE COOLANT LEAK

CAUTION:

Do not remove the radiator cap while the engine and radiator are still hot. Pressurized, hot engine coolant and steam may be released and cause serious burns.



a. Fill the radiator with coolant and attach a radiator cap tester.

b. Warm up the engine.

c. Using the radiator cap tester, increase the pressure inside the radiator to 123 kPa (1.3 kgf/cm^2, 18 psi), and check that the pressure does not drop.
If the pressure drops, check the hoses, radiator and water pump for leaks. If no external leaks are found, check the heater core, cylinder block and head.

28. INSPECT SHIFT LEVER POSITION

a. When moving the shift lever from P to R with the engine switch on (IG) and the brake pedal depressed, make sure that it moves smoothly and correctly into position.

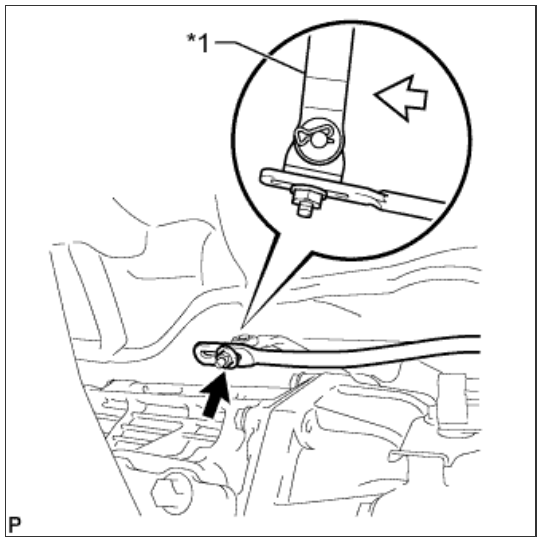
b. Check that the shift lever does not stop when moving the shift lever from R to P, and check that the shift lever does not stick when moving the shift lever from D to S.

c. Start the engine and make sure that the vehicle moves forward after moving the shift lever from N to D, and moves rearward after moving the shift lever to R.
If there are problems during the above inspections, perform the adjustment using the following procedures.

i. Move the shift lever to N

ii. Loosen the nut of the floor shift gear shifting rod. Then, with the lever of the floor shift assembly lightly pushed towards the rear of the vehicle, tighten the nut.

Torque:
13 N*m{ 133 kgf*cm , 10 ft.*lbf }



Text in Illustration

*1	Lever

29. INSPECT FOR EXHAUST GAS LEAK

30. INSTALL FRONT FENDER APRON SEAL REAR RH

a. Install the fender apron seal with the 4 clips.

31. INSTALL FRONT FENDER APRON SEAL FRONT RH

a. Install the fender apron seal with the 3 clips.

32. INSTALL OIL PAN PROTECTOR ASSEMBLY

a. Install the oil pan protector with the 4 bolts.

Torque:
63 N*m{ 642 kgf*cm , 46 ft.*lbf }

33. INSTALL NO. 2 ENGINE UNDER COVER

a. Install the No. 2 engine under cover with the 2 bolts.

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

34. INSTALL NO. 1 ENGINE UNDER COVER

a. Install the No. 1 engine under cover with the 10 bolts.

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

35. INSTALL FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY LH

a. Push in the clip to install the front fender splash shield sub-assembly LH.

b. Install the 3 bolts and screw.

36. INSTALL FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY RH

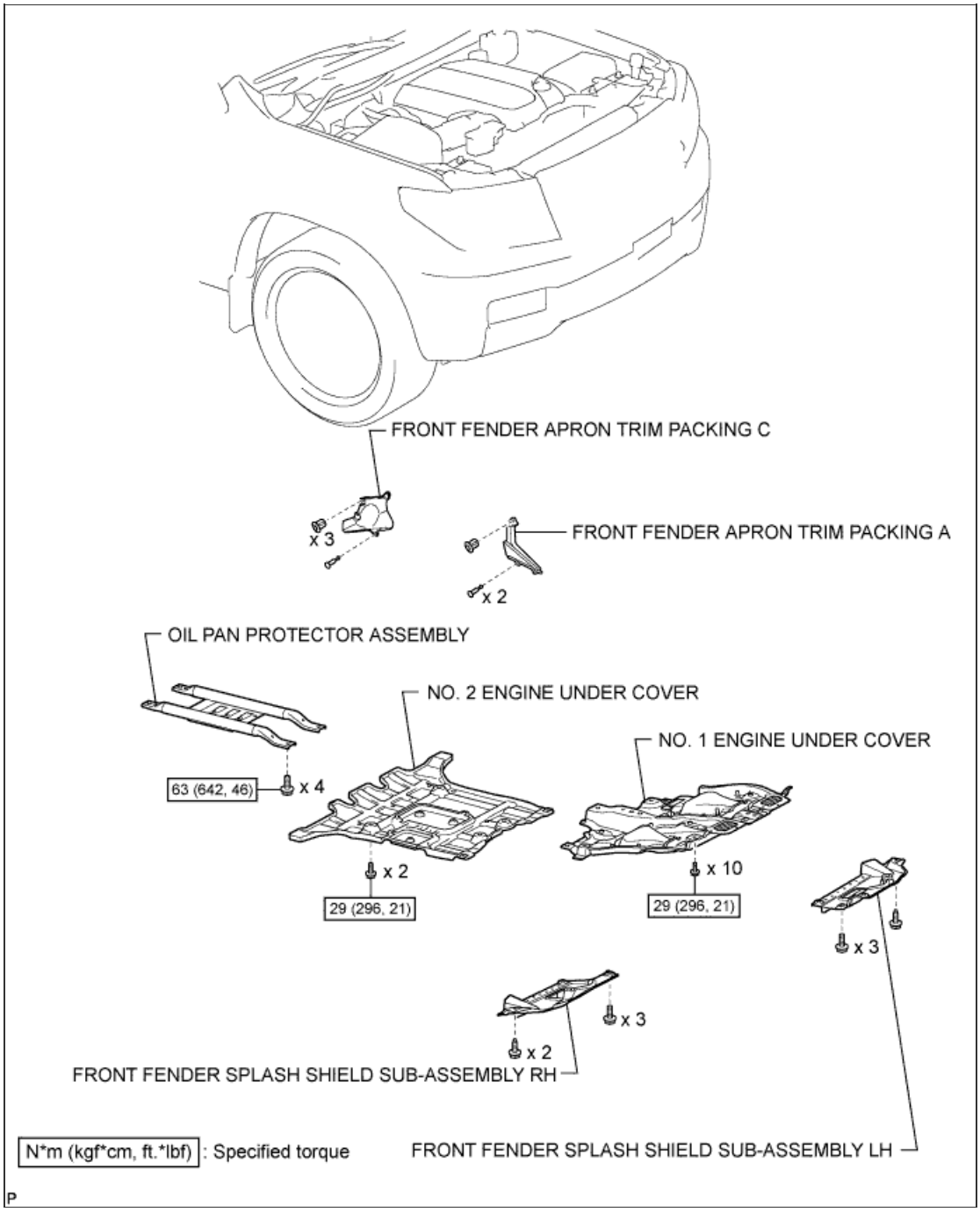
a. Push in the clip to install the front fender splash shield sub-assembly RH.

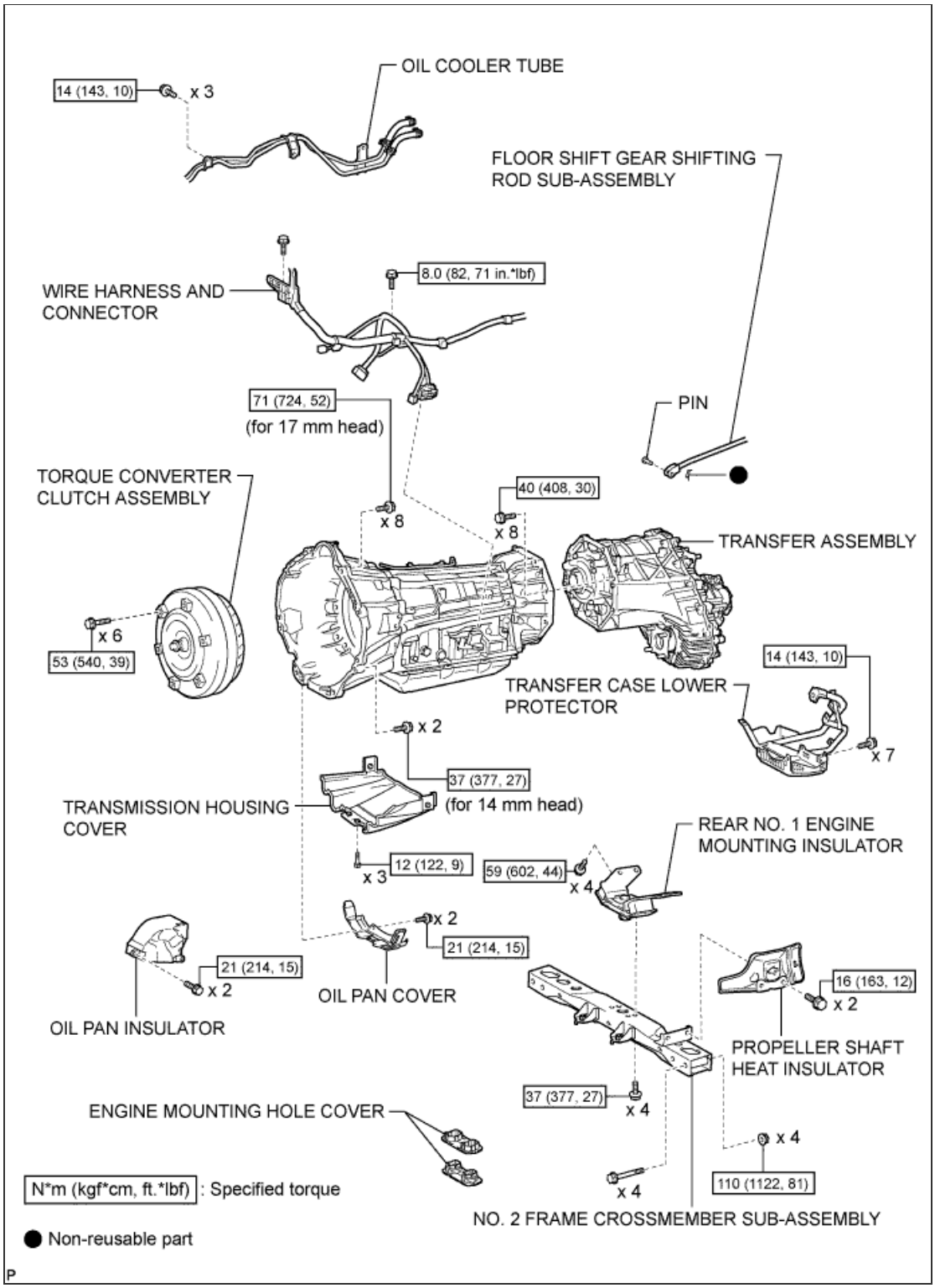
b. Install the 3 bolts and 2 screws.

37. RESET MEMORY

a. Perform the Reset Memory procedures (A/T initialization) (Click here).

for Preparation Click here




OIL COOLER TUBE
14 (143, 10)
x 3
FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY
WIRE HARNESS AND CONNECTOR
8.0 (82, 71 in.*lbf)
71 (724, 52)
(for 17 mm head)
PIN
TORQUE CONVERTER CLUTCH ASSEMBLY
40 (408, 30)
x 8
x 8
TRANSFER ASSEMBLY
x 6
53 (540, 39)
14 (143, 10)
TRANSFER CASE LOWER PROTECTOR
x 7
x 2
37 (377, 27)
(for 14 mm head)
TRANSMISSION HOUSING COVER
REAR NO. 1 ENGINE MOUNTING INSULATOR
12 (122, 9)
x 3
59 (602, 44)
x 4
x 2
21 (214, 15)
21 (214, 15)
x 2
OIL PAN COVER
OIL PAN INSULATOR
16 (163, 12)
x 2
PROPELLER SHAFT HEAT INSULATOR
37 (377, 27)
x 4
ENGINE MOUNTING HOLE COVER
x 4
x 4
110 (1122, 81)
N*m (kgf*cm, ft.*lbf) : Specified torque
NO. 2 FRAME CROSSMEMBER SUB-ASSEMBLY
Non-reusable part
P

for Preparation Click here

1. PRECAUTION

NOTICE:

After turning the ignition switch off, waiting time may be required before disconnecting the cable from the battery terminal. Therefore, make sure to read the disconnecting the cable from the battery terminal notice before proceeding with work (Click here)

2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

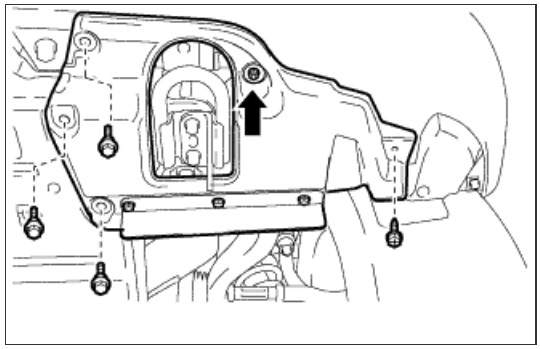
NOTICE:

When disconnecting the cable some systems need to be initialized after the cable is reconnected (Click here).

3. REMOVE FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY LH

a. Remove the 3 bolts and screw.

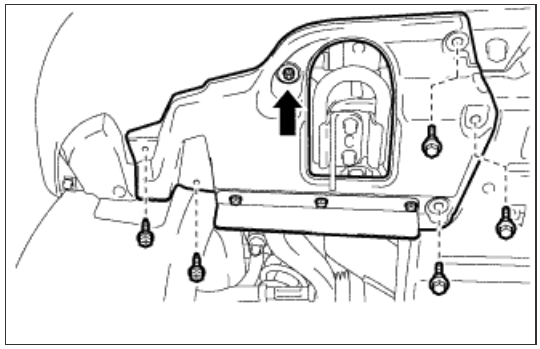
b. Turn the clip indicated by the arrow in the illustration to remove the front fender splash shield sub-assembly LH.



4. REMOVE FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY RH

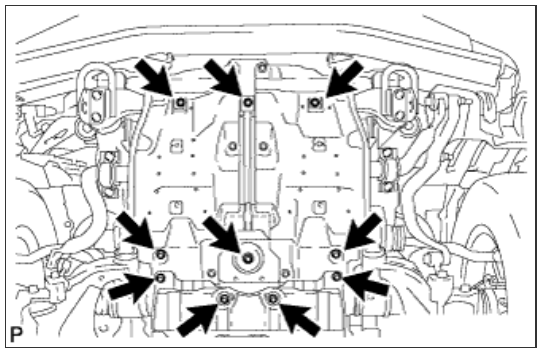
a. Remove the 3 bolts and 2 screws.

b. Turn the clip indicated by the arrow in the illustration to remove the front fender splash shield sub-assembly RH.



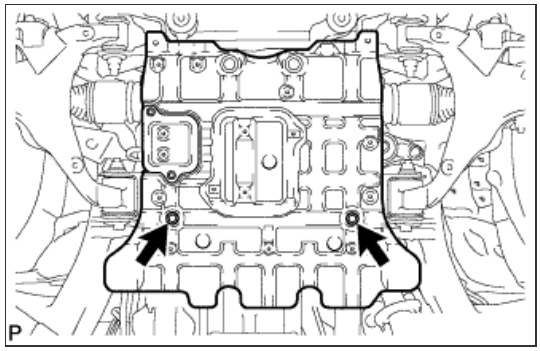
5. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

a. Remove the 10 bolts and No. 1 engine under cover.



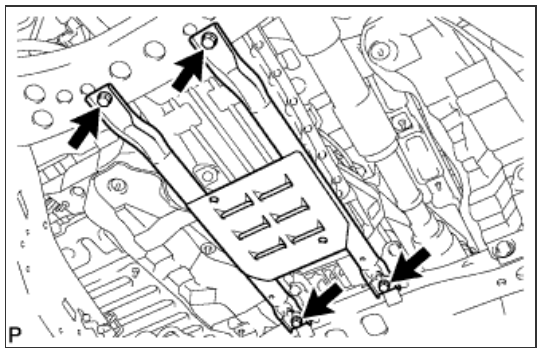
6. REMOVE NO. 2 ENGINE UNDER COVER

a. Remove the 2 bolts and No. 2 engine under cover.



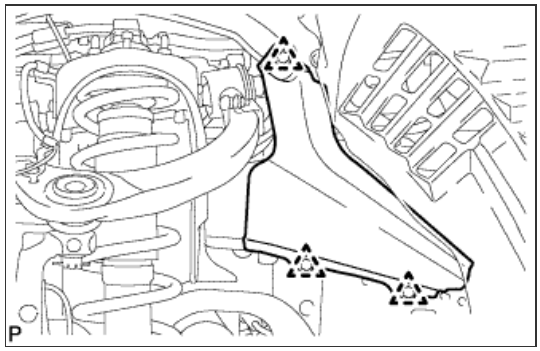
7. REMOVE OIL PAN PROTECTOR ASSEMBLY

a. Remove the 4 bolts and oil pan protector.



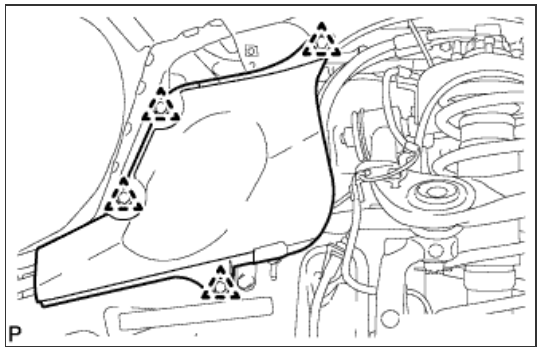
8. REMOVE FRONT FENDER APRON TRIM PACKING A

a. Remove the 3 clips and front fender apron seal front RH.



9. REMOVE FRONT FENDER APRON TRIM PACKING C

a. Remove the 4 clips and front fender apron seal rear RH.



10. DRAIN AUTOMATIC TRANSMISSION FLUID

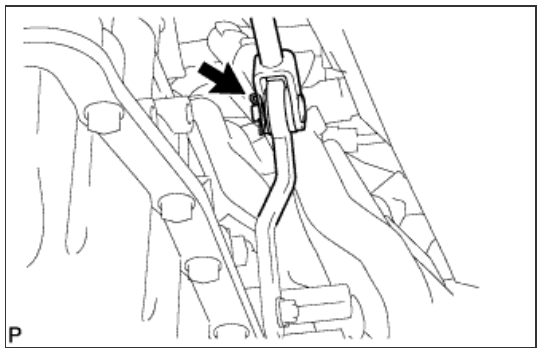
a. Remove the drain plug and gasket, and drain the ATF.

b. Install a new gasket and the drain plug.

Torque:
20 N*m{ 204 kgf*cm , 15 ft.*lbf }

11. DISCONNECT FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

a. Remove the clip and pin, and disconnect the gear shifting rod from the transmission control shaft lever RH.



12. REMOVE FRONT PROPELLER SHAFT ASSEMBLY

(Click here)

13. REMOVE PROPELLER SHAFT ASSEMBLY

(Click here)

14. REMOVE EXHAUST PIPE (w/ DPF)

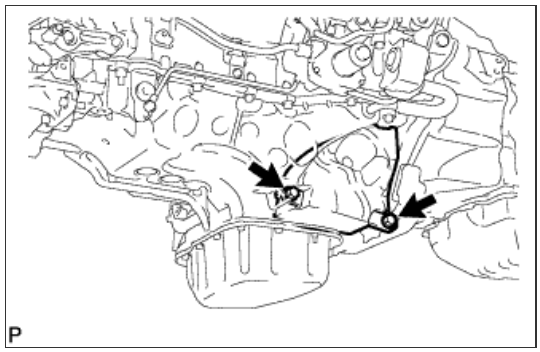
(Click here)

15. REMOVE EXHAUST PIPE (w/o DPF)

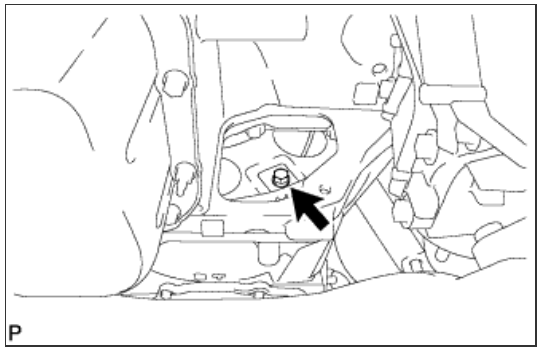
(Click here)

16. REMOVE DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT

a. Remove the 2 bolts and oil pan insulator.



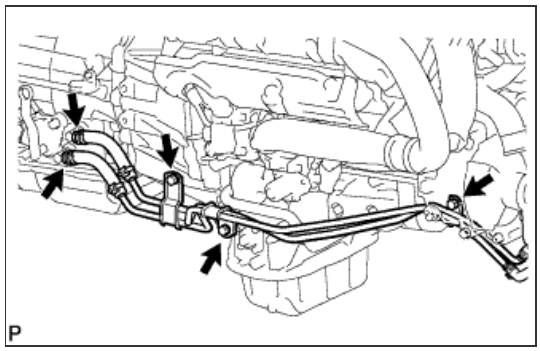
b. Turn the crankshaft to gain access to the 6 bolts and remove the bolts while holding the crankshaft pulley setting bolt with a wrench.



17. DISCONNECT OIL COOLER TUBE

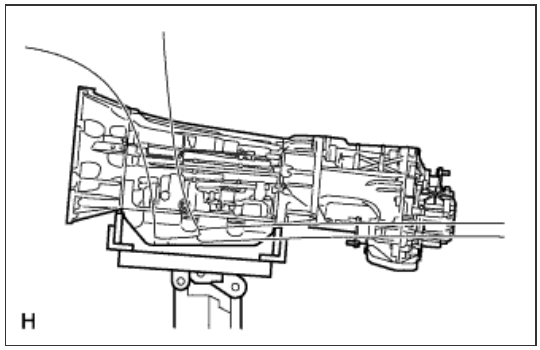
a. Disconnect the 2 transmission oil cooler hoses from the oil cooler tube union.

b. Remove the 3 bolts and separate the oil cooler tube from the engine.



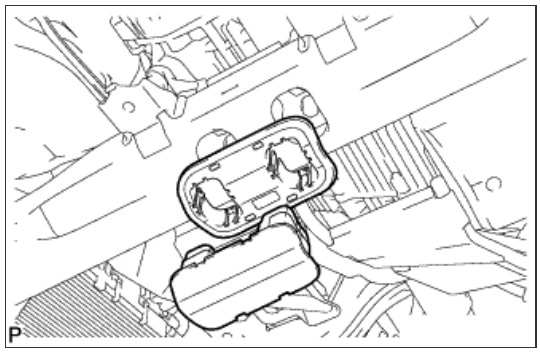
18. SUPPORT AUTOMATIC TRANSMISSION ASSEMBLY

a. Support the transmission with a transmission jack. Lift the transmission slightly from the crossmember.

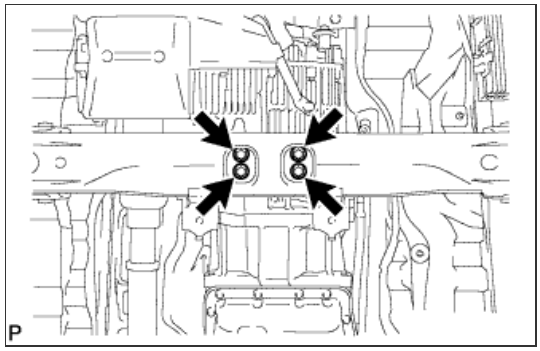


19. REMOVE NO. 2 FRAME CROSSMEMBER SUB-ASSEMBLY

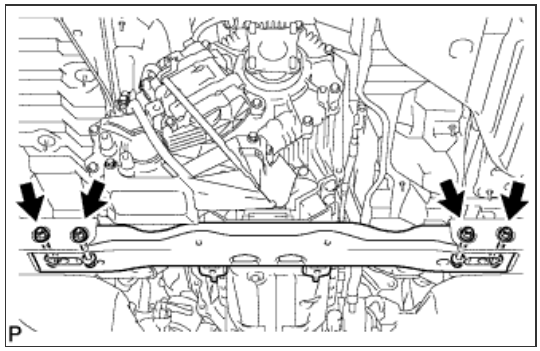
a. Remove the engine mounting hole cover.



b. Remove the 4 bolts of the rear engine mounting insulator.

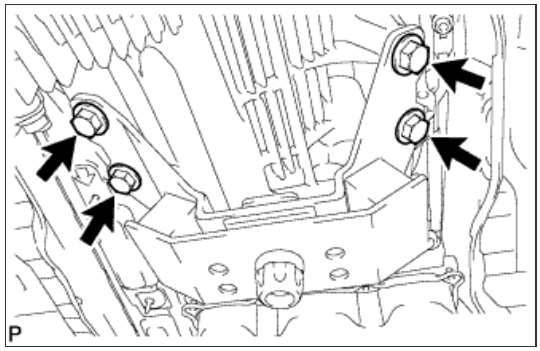


c. Remove the 4 nuts, 4 bolts and frame crossmember.



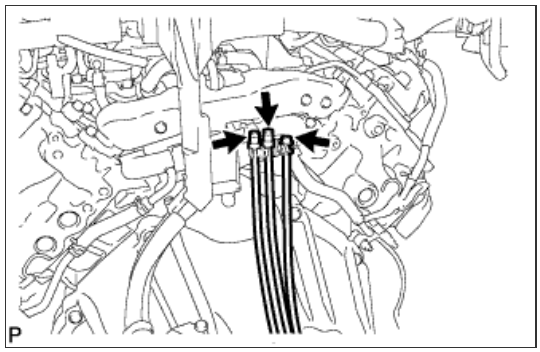
20. REMOVE REAR NO. 1 ENGINE MOUNTING INSULATOR

a. Remove the 4 bolts and rear engine mounting insulator from the transmission.



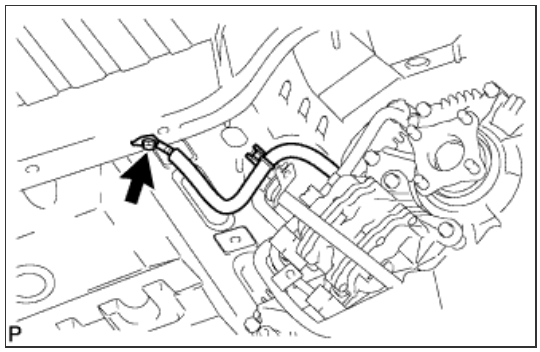
21. DISCONNECT BREATHER PLUG HOSE

a. Disconnect the 3 breather plug hoses from the wire harness.



22. DISCONNECT WIRE HARNESS AND CONNECTOR

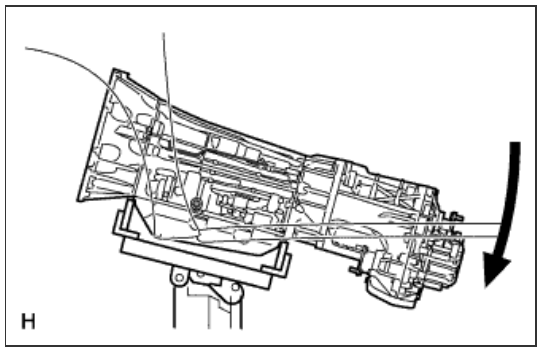
a. Remove the bolt and disconnect the ground cable.



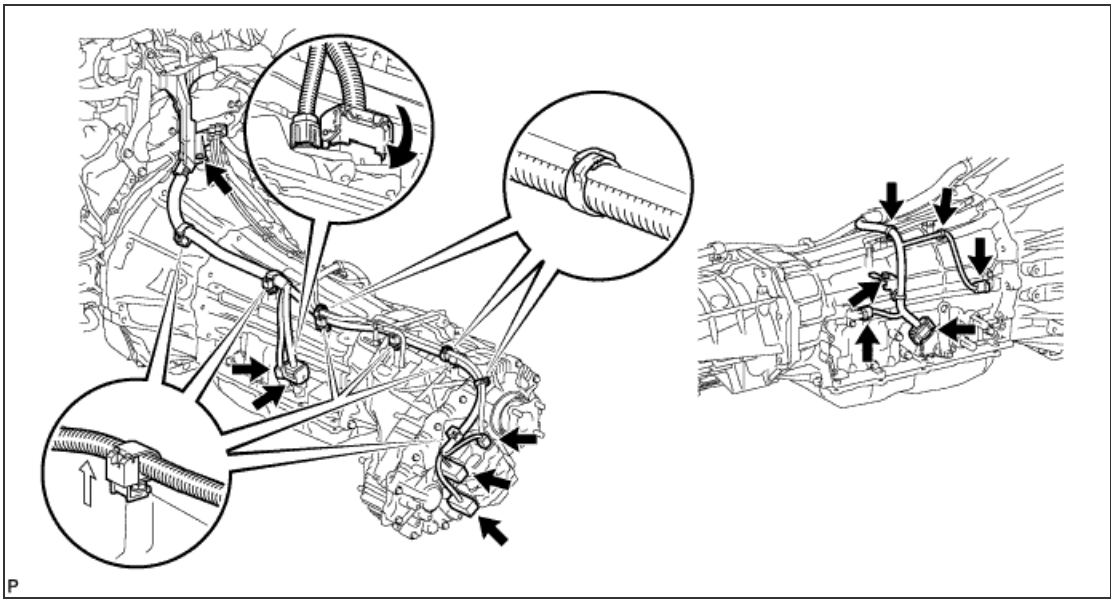
b. Tilt the transmission downward.

NOTICE:

Make sure the cooling fan does not contact the fan shroud.



c. Disconnect the park/neutral position switch connector, 2 transmission wire connectors, 2 speed sensor connectors and 2 or 3 transfer control side connectors.



HINT:

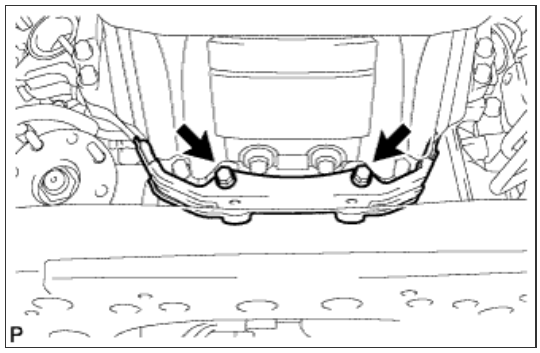
Detach the claw, press down the lever, and then disconnect the transmission wire connector.

d. Disconnect the 8 harness clamps.

e. Remove the 2 bolts and disconnect the wire harness.

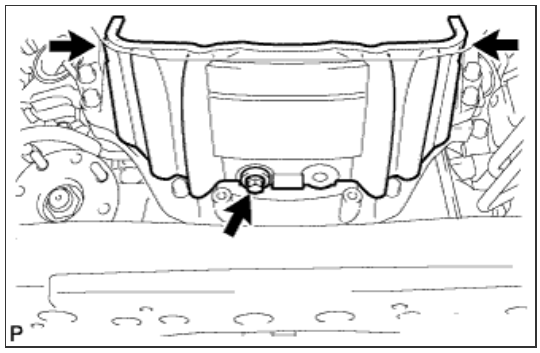
23. REMOVE OIL PAN COVER

a. Remove the 2 bolts and oil pan cover.



24. REMOVE TRANSMISSION HOUSING COVER

a. Remove the 3 bolts and transmission housing cover.

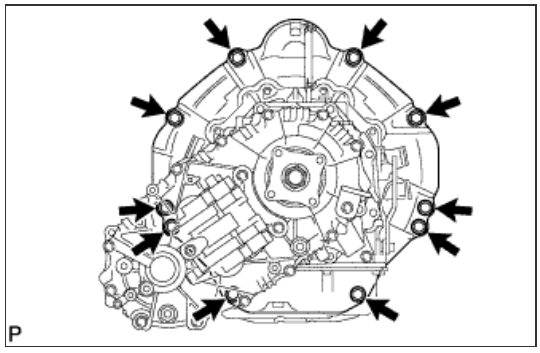


25. REMOVE AUTOMATIC TRANSMISSION ASSEMBLY

a. Remove the 10 bolts and transmission.

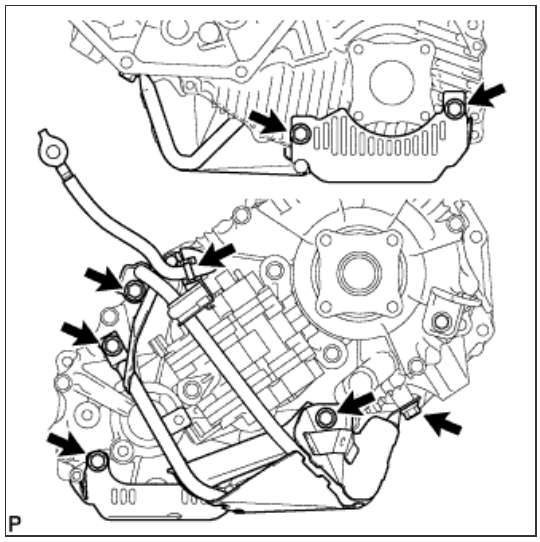
NOTICE:

Do not use excess force to pry off the transmission assembly.

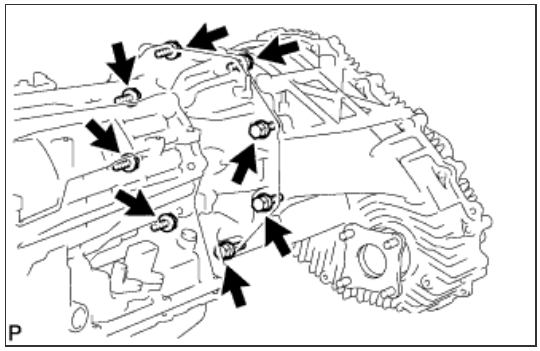


26. REMOVE TRANSFER ASSEMBLY

a. Remove the 7 bolts and transfer case lower protector.



b. Remove the 8 bolts and transfer.



27. REMOVE TORQUE CONVERTER CLUTCH ASSEMBLY

28. INSPECT TORQUE CONVERTER ASSEMBLY

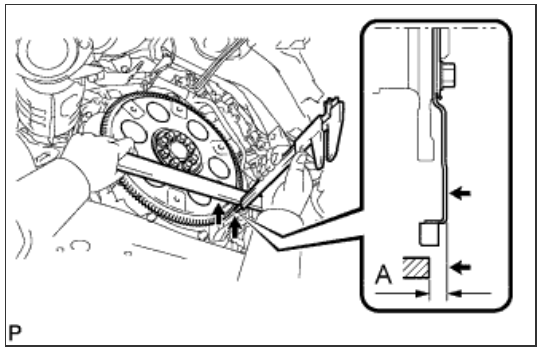
(Click here)

for Preparation Click here

1. INSTALL TORQUE CONVERTER CLUTCH ASSEMBLY

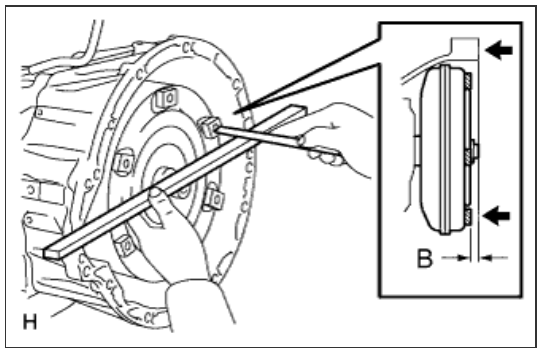
a. Using a vernier caliper and straightedge, measure dimension A between the end of the engine and the torque converter contact surface of the drive plate.

b. Install the torque converter to the transmission housing.



c. Using a vernier caliper and straightedge, measure dimension B shown in the illustration and check that B is more than A measured in the first step.

Standard distance:
B = A + 1.00 mm (0.0394 in.) or more



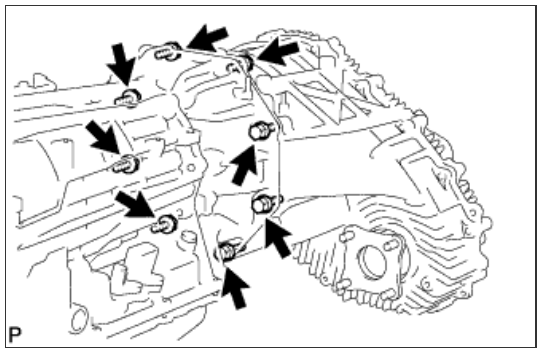
2. INSTALL TRANSFER ASSEMBLY

a. Install the transfer with the 8 bolts.

Torque:
40 N*m{ 408 kgf*cm , 30 ft.*lbf }

NOTICE:

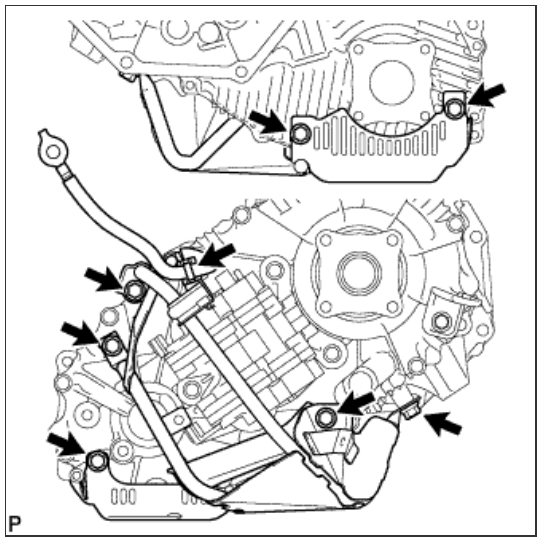
Be careful not to damage the oil seal of the transfer adapter.



b. Install the transfer case lower protector with the 7 bolts.

Torque:
14 N*m{ 143 kgf*cm , 10 ft.*lbf }

c. Connect the clamp of the ground cable to the transfer case lower protector.



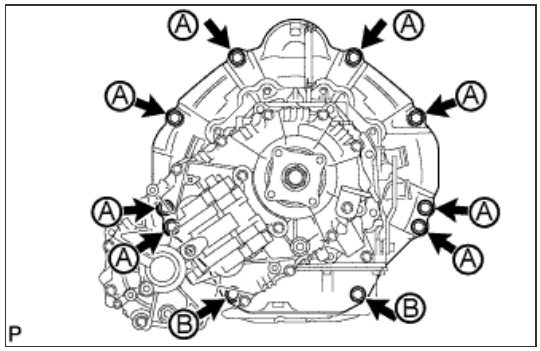
3. INSTALL AUTOMATIC TRANSMISSION ASSEMBLY

NOTICE:

Check that the 2 straight pins are attached to the engine side.

a. Install the transmission with the 10 bolts.

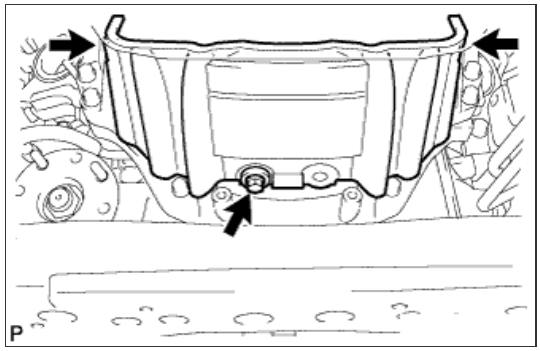
Torque:
for 17 mm head bolt A:
71 N*m{ 724 kgf*cm , 52 ft.*lbf }
for 14 mm head bolt B:
37 N*m{ 377 kgf*cm , 27 ft.*lbf }



4. INSTALL TRANSMISSION HOUSING COVER

a. Install the transmission housing cover with the 3 bolts.

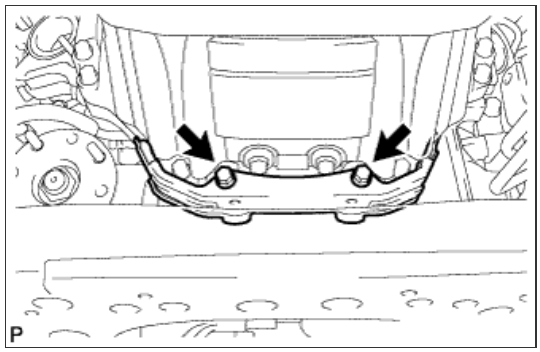
Torque:
12 N*m{ 122 kgf*cm , 9 ft.*lbf }



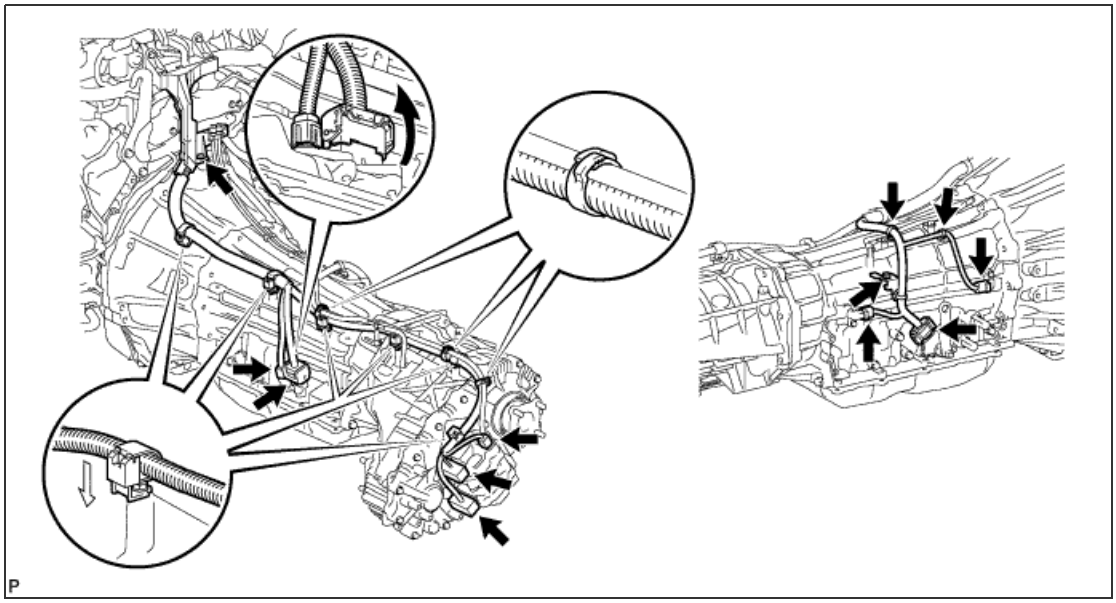
5. INSTALL OIL PAN COVER

a. Install the oil pan cover with the 2 bolts.

Torque:
21 N*m{ 214 kgf*cm , 15 ft.*lbf }



6. CONNECT WIRE HARNESS AND CONNECTOR



a. Connect the park/neutral position switch connector, 2 transmission wire connectors, 2 speed sensor connectors and 2 or 3 transfer control side connectors.

HINT:

Push up the lever until the claw of the transmission wire connector makes a connection sound.

b. Connect the 8 harness clamps.

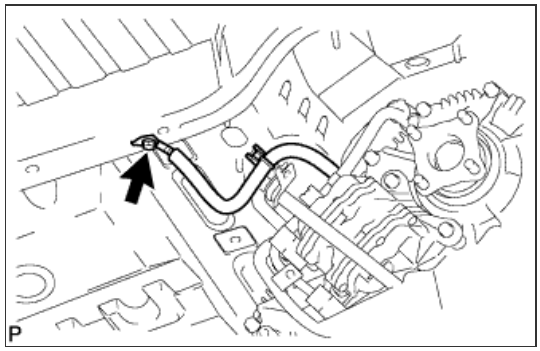
c. Connect the wire harness with the 2 bolts.

Torque:
8.0 N*m{ 82 kgf*cm , 71 in.*lbf }

d. Tilt up the automatic transmission.

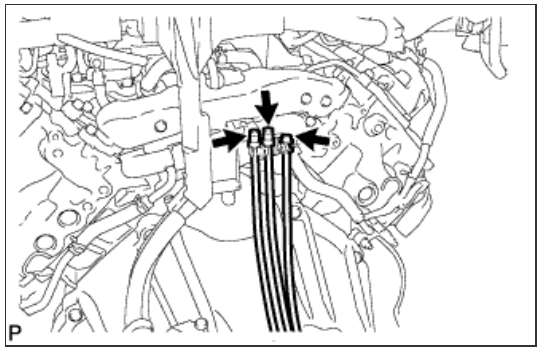
e. Connect the ground cable with the bolt.

Torque:
8.4 N*m{ 86 kgf*cm , 74 in.*lbf }



7. CONNECT BREATHER PLUG HOSE

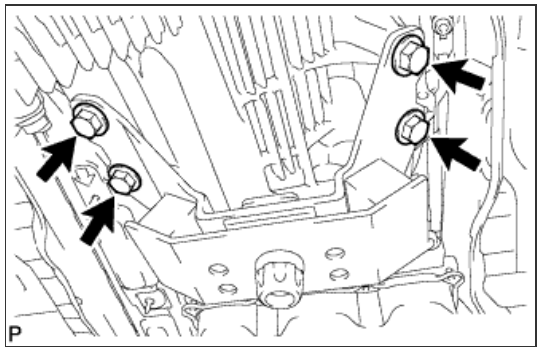
a. Connect the 3 breather plug hoses to the wire harness.



8. INSTALL REAR NO. 1 ENGINE MOUNTING INSULATOR

a. Install the rear engine mounting insulator to the transmission with the 4 bolts.

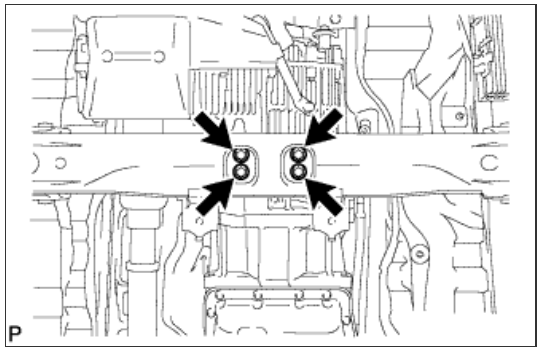
Torque:
59 N*m{ 602 kgf*cm , 44 ft.*lbf }



9. INSTALL NO. 2 FRAME CROSSMEMBER SUB-ASSEMBLY

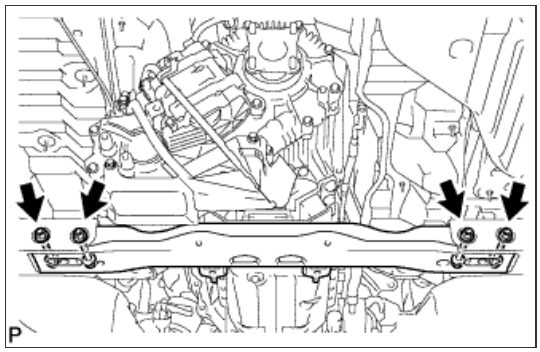
a. Install the frame crossmember to the rear engine mounting insulator with the 4 bolts.

Torque:
37 N*m{ 377 kgf*cm , 27 ft.*lbf }

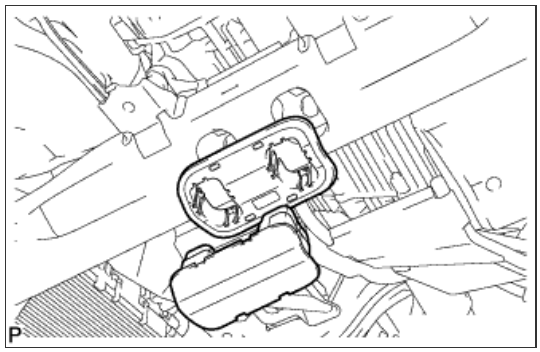


b. Install the frame crossmember to the frame with the 4 bolts and 4 nuts.

Torque:
110 N*m{ 1122 kgf*cm , 81 ft.*lbf }



c. Install the engine mounting hole cover.



10. CONNECT OIL COOLER TUBE

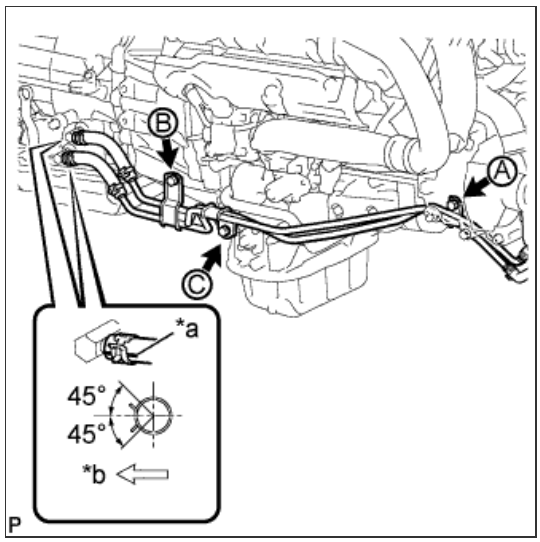
a. Connect the 2 transmission oil cooler hoses as shown in the illustration.

Text in Illustration

*a	Paint Mark
*b	RH Side

NOTICE:

- **Make sure the pinching portion of each clip is facing the direction shown in the illustration.**
- **Make sure the paint mark of each hose is facing outward.**



b. Temporarily install the oil cooler tube to the engine with the bolts A and B. Install the bolt C and tighten it to the specified torque. Then tighten the bolts A and B to the specified torque.

Torque:
14 N*m{ 143 kgf*cm , 10 ft.*lbf }

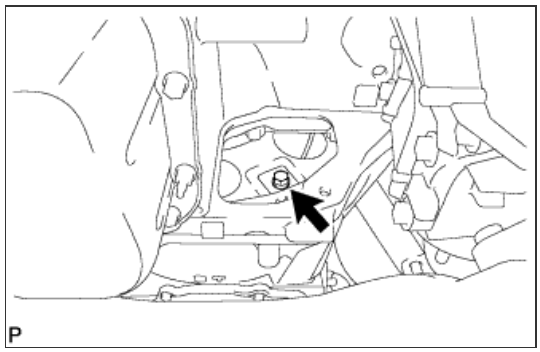
11. INSTALL DRIVE PLATE AND TORQUE CONVERTER CLUTCH SETTING BOLT

a. Turn the crankshaft to gain access to the installation locations of the 6 bolts and install the bolts while holding the crankshaft pulley set bolt with a wrench.

Torque:
53 N*m{ 540 kgf*cm , 39 ft.*lbf }

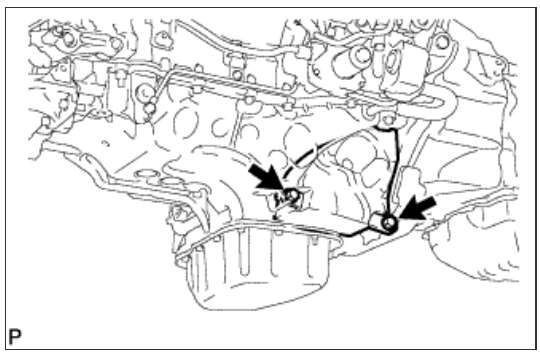
NOTICE:

First install the black colored bolt and then install the remaining 5 bolts.



b. Install the oil pan insulator with the 2 bolts.

Torque:
21 N*m{ 214 kgf*cm , 15 ft.*lbf }



12. INSTALL EXHAUST PIPE (w/ DPF)

(Click here)

13. INSTALL EXHAUST PIPE (w/o DPF)

(Click here)

14. INSTALL PROPELLER SHAFT ASSEMBLY

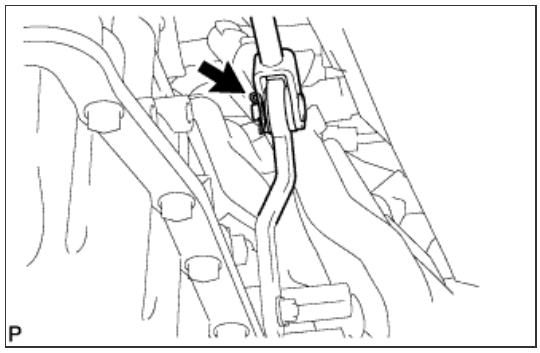
(Click here)

15. INSTALL FRONT PROPELLER SHAFT ASSEMBLY

(Click here)

16. CONNECT FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

a. Connect the gear shifting rod to the transmission control shaft lever RH with the pin and a new clip.



17. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

NOTICE:

When disconnecting the cable, some systems need to be initialized after the cable is reconnected (Click here).

18. ADD AUTOMATIC TRANSMISSION FLUID

(Click here)

19. INSPECT SHIFT LEVER POSITION

a. When moving the shift lever from P to R with the ignition switch ON and the brake pedal depressed, make sure that it moves smoothly and correctly into position.

b. Check that the shift lever does not stop when moving the shift lever from R to P, and check that the shift lever does not stick when moving the shift lever from D to S.

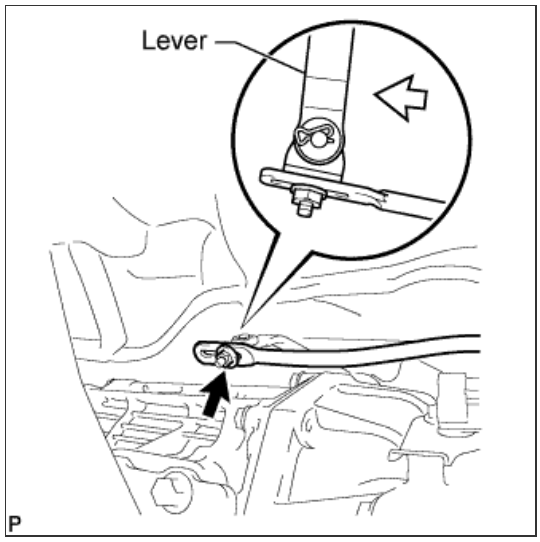
c. Start the engine and make sure that the vehicle moves forward after moving the shift lever from N to D and moves rearward after moving the shift lever to R.
If there are problems during the above inspections, perform the adjustment using the following procedures.

i. Move the shift lever to N

ii. Loosen the nut of the floor shift gear shifting rod. Then, with the lever of the floor shift assembly lightly pushed towards the rear of the vehicle, tighten the nut.

Torque:

13 N*m{ 130 kgf*cm , 9 ft.*lbf }

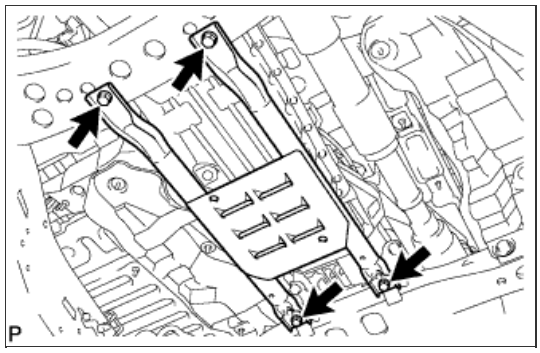


20. INSPECT FOR EXHAUST GAS LEAK

21. INSTALL OIL PAN PROTECTOR ASSEMBLY

a. Install the oil pan protector with the 4 bolts.

Torque:
63 N*m{ 642 kgf*cm , 46 ft.*lbf }



22. INSTALL FRONT FENDER APRON TRIM PACKING C

a. Install the front fender apron seal rear RH with the 4 clips.

23. INSTALL FRONT FENDER APRON TRIM PACKING A

a. Install the front fender apron seal front RH with the 3 clips.

24. INSTALL NO. 2 ENGINE UNDER COVER

a. Install the No. 2 engine under cover with the 2 bolts.

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

25. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

a. Install the No. 1 engine under cover with the 10 bolts.

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

26. INSTALL FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY LH

a. Push in the clip to install the front fender splash shield sub-assembly LH.

b. Install the 3 bolts and screw.

27. INSTALL FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY RH

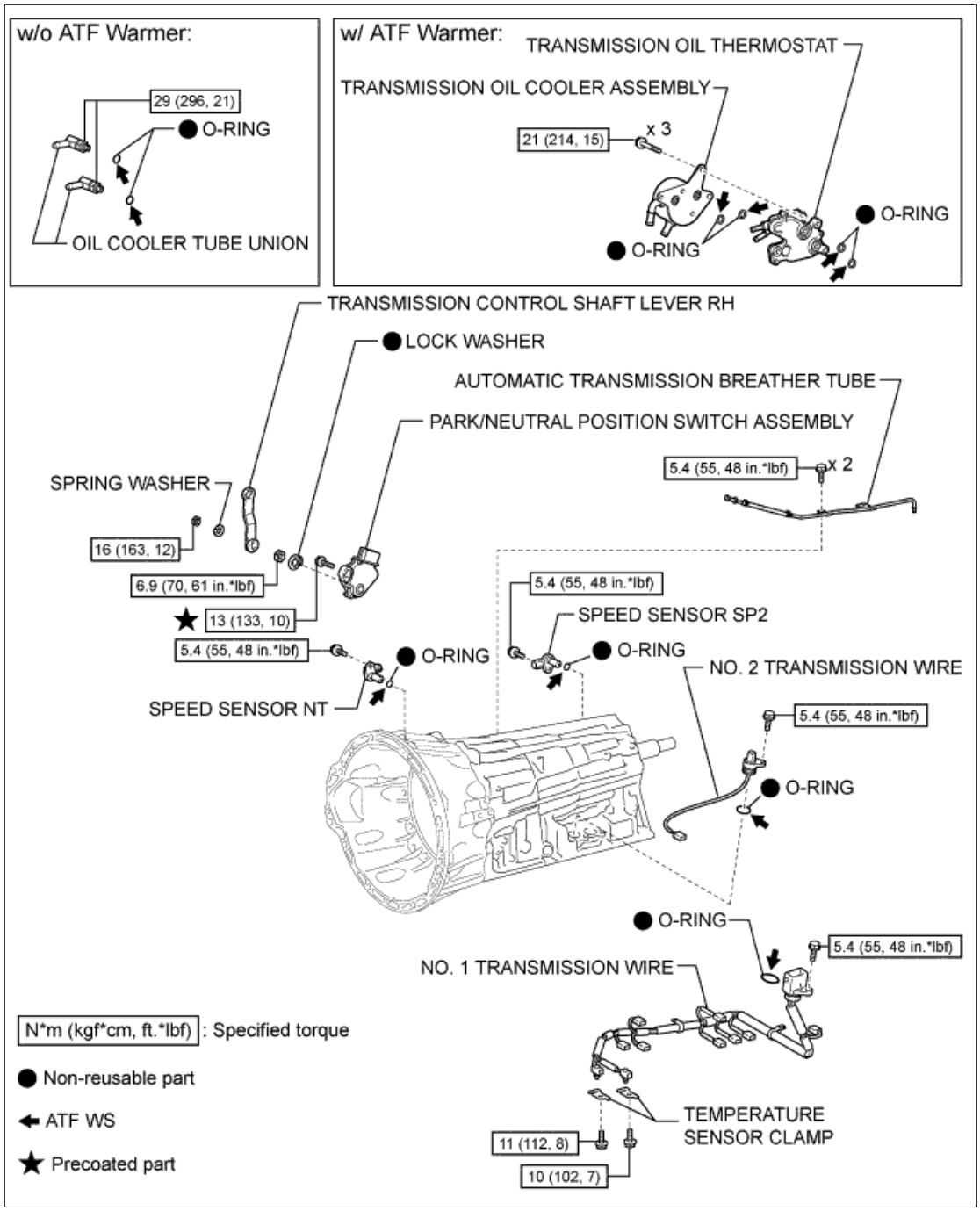
a. Push in the clip to install the front fender splash shield sub-assembly RH.

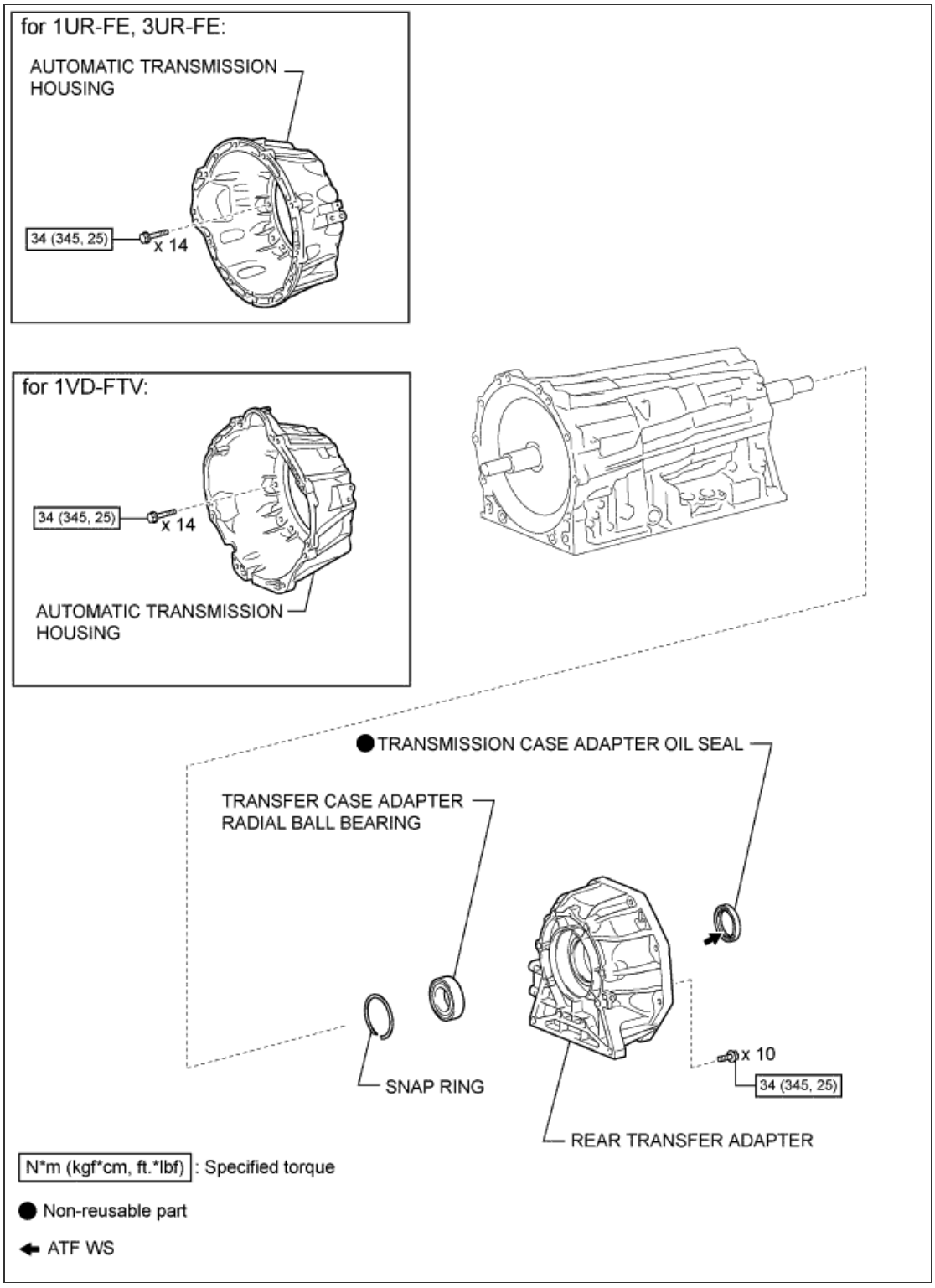
b. Install the 3 bolts and 2 screws.

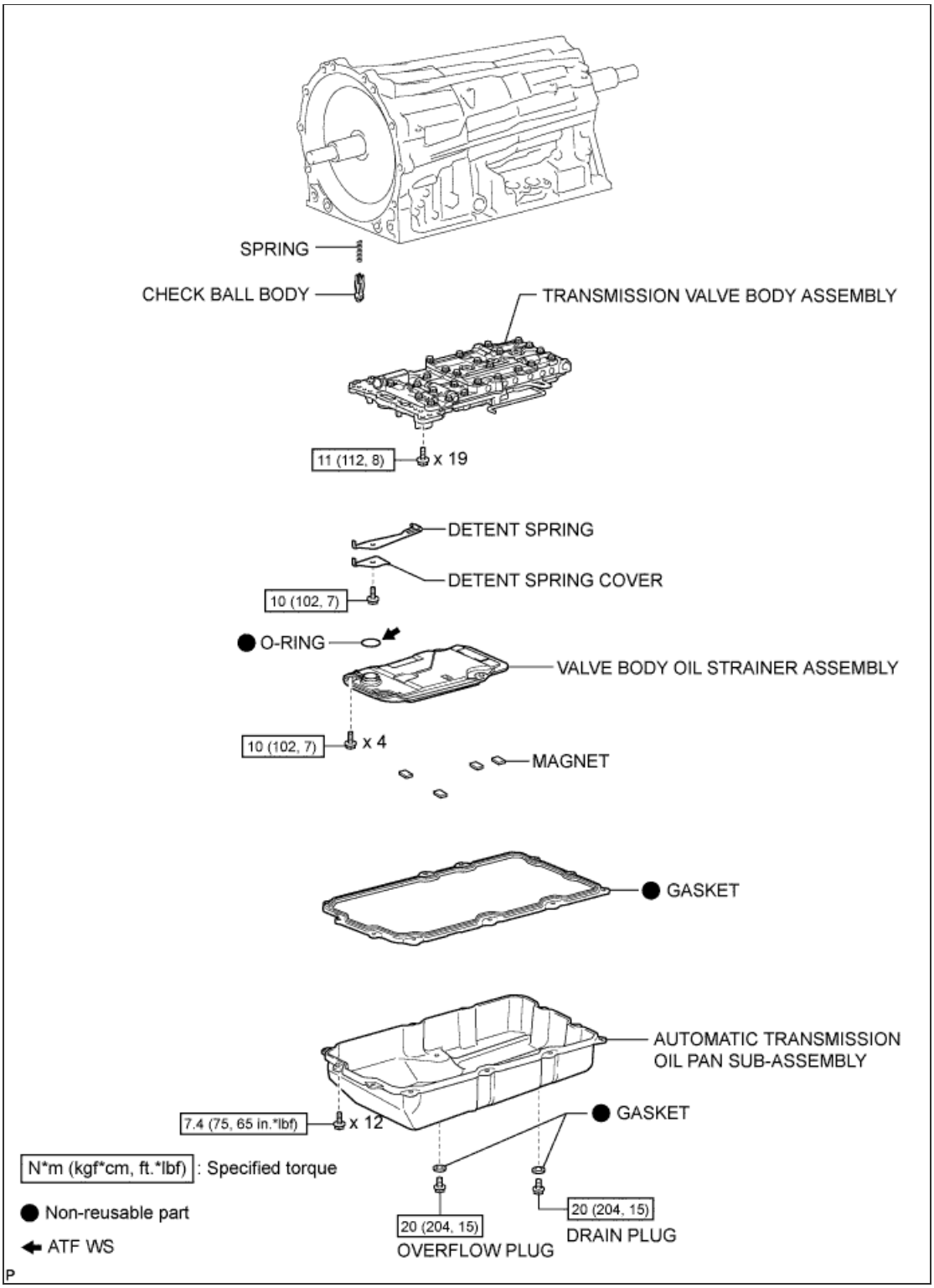
28. RESET MEMORY

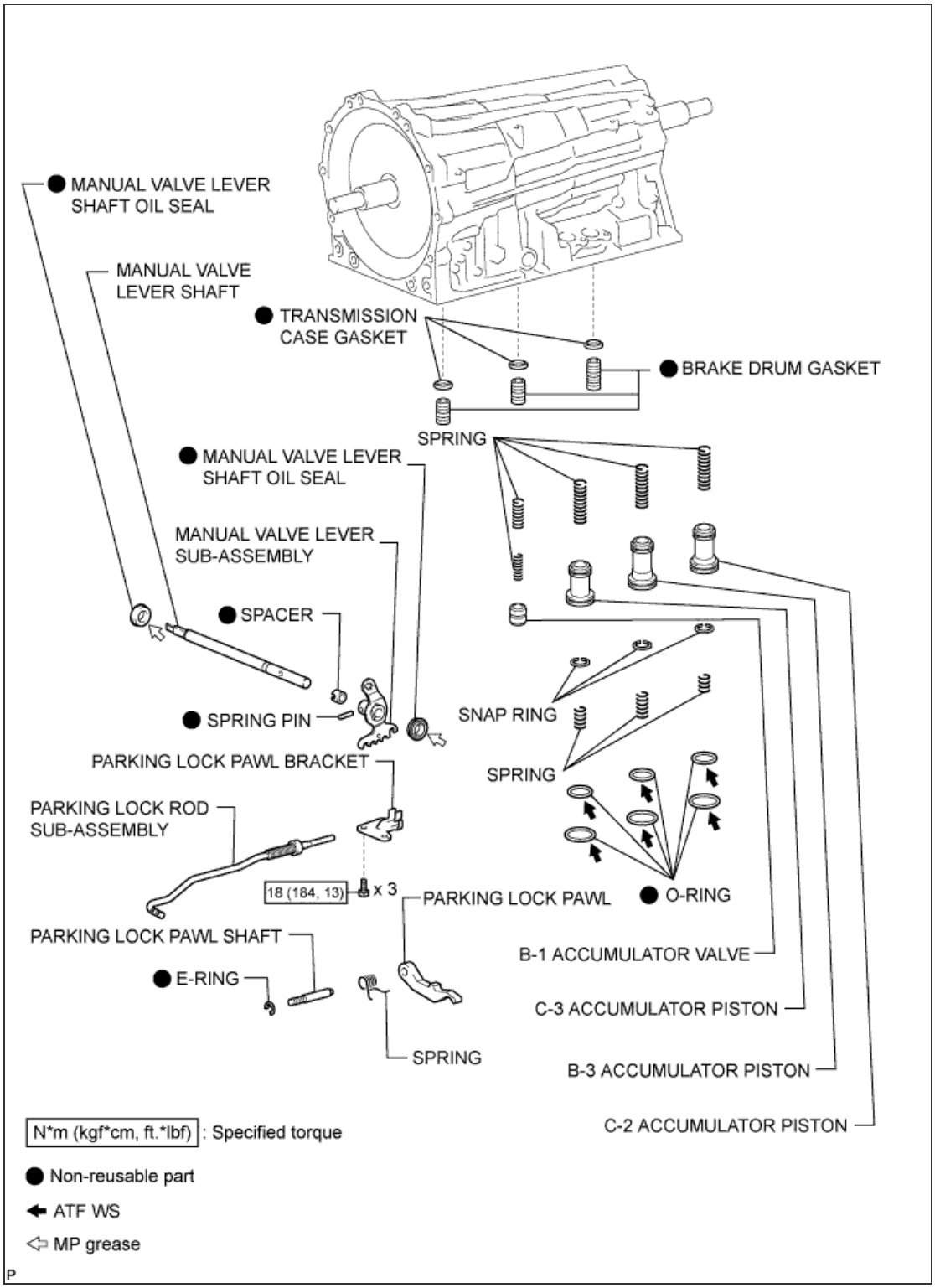
for w/ DPF (Click here)
for w/o DPF (Click here)

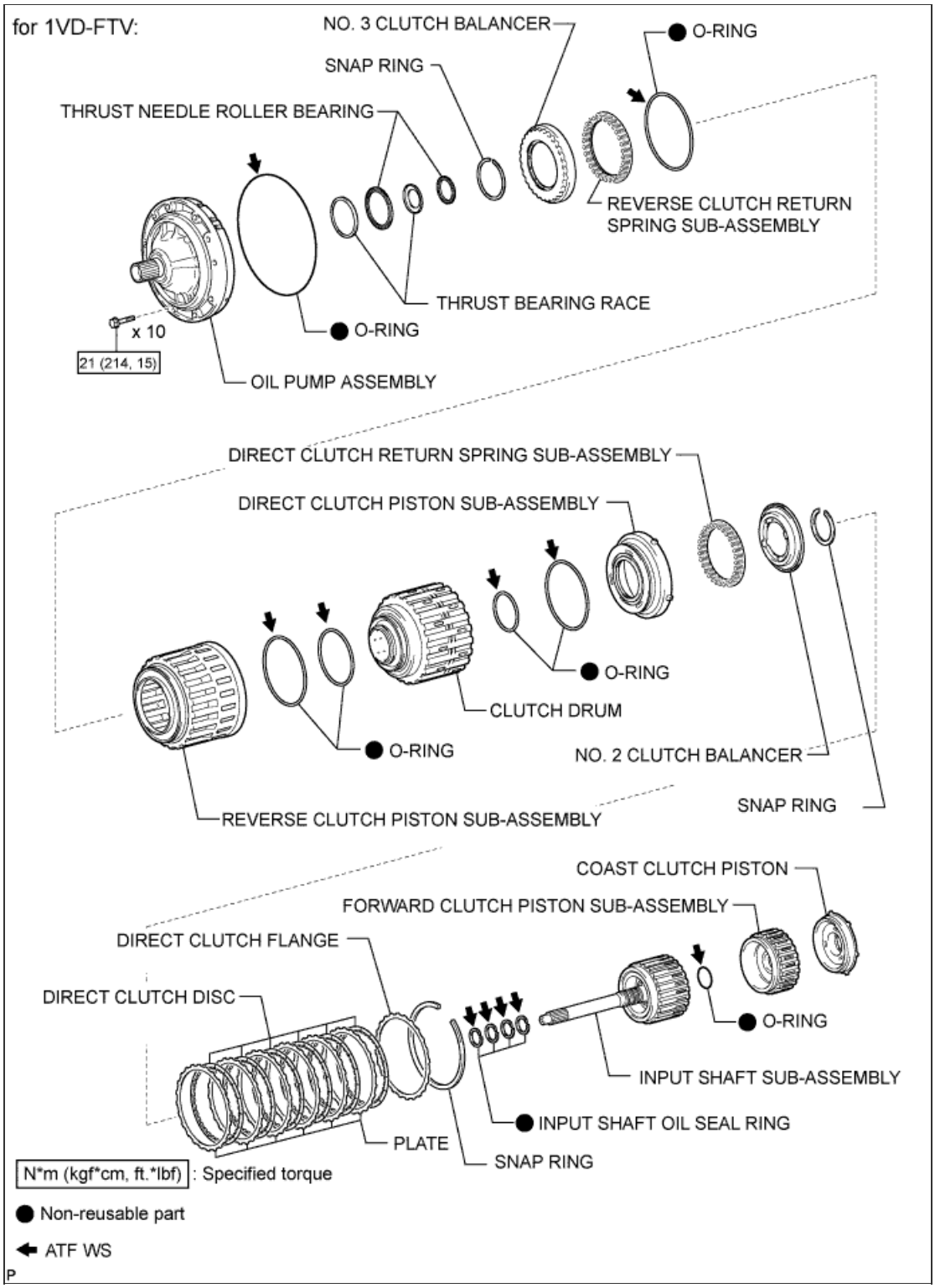
for Preparation Click here

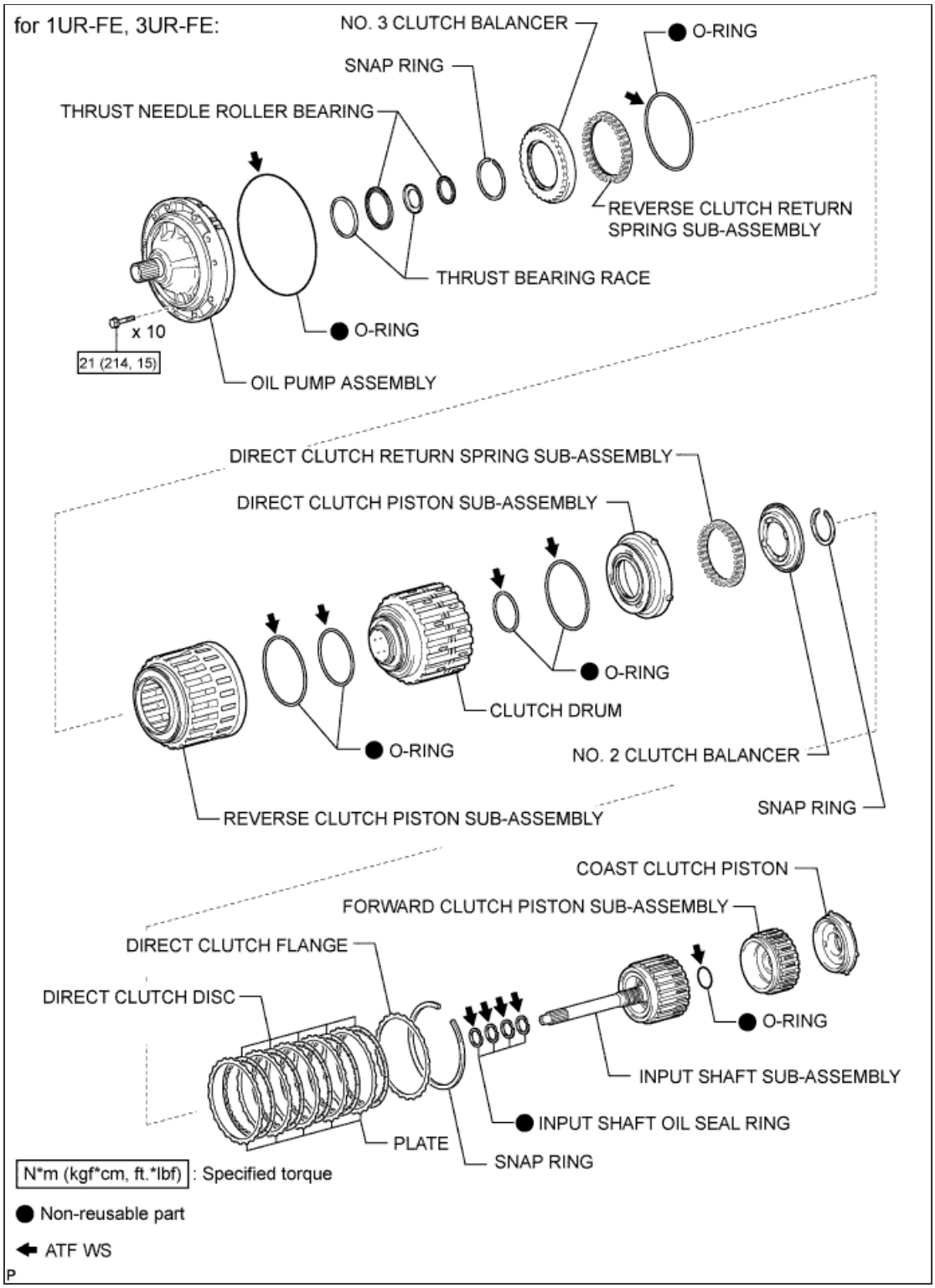


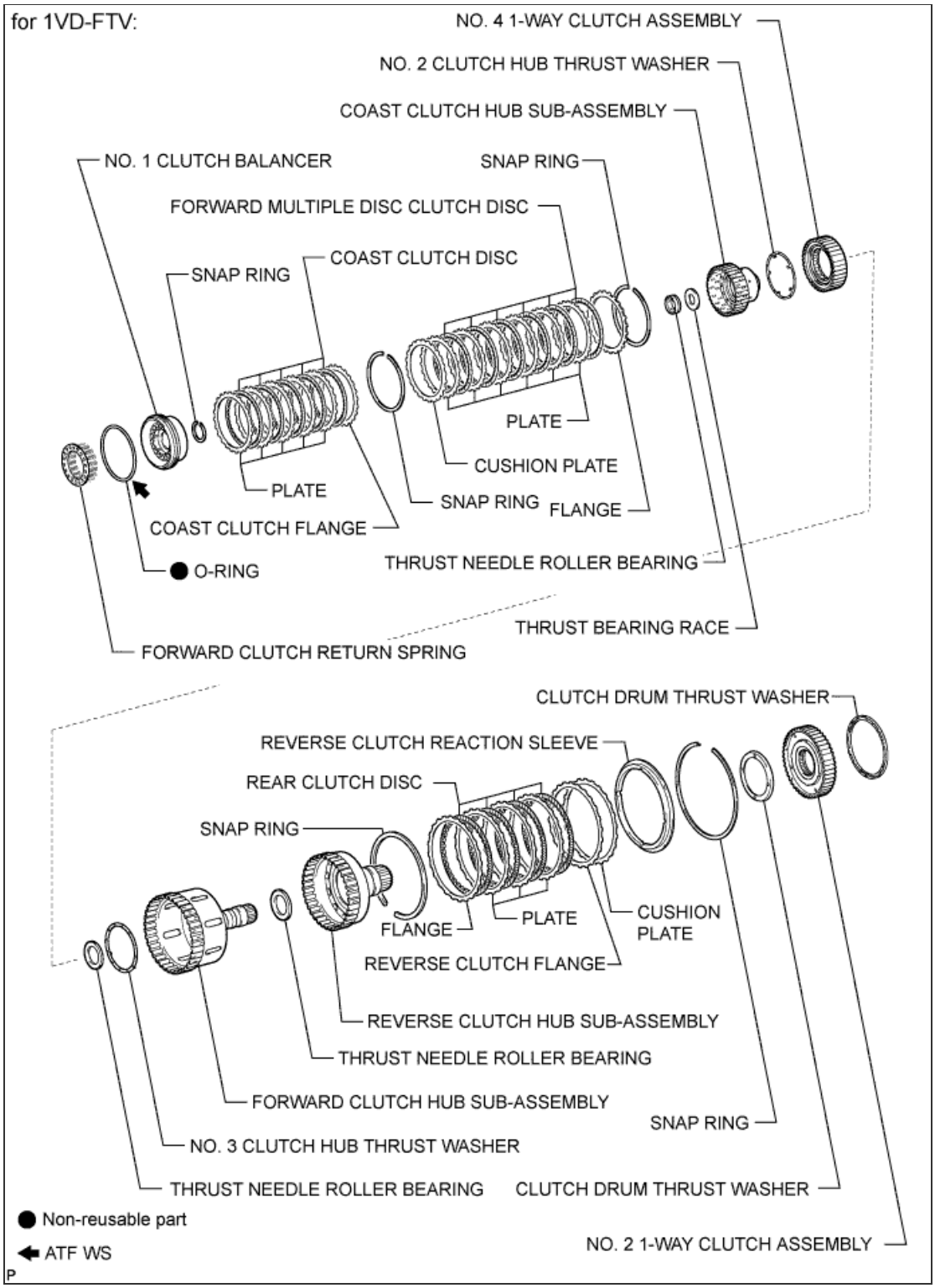

for 1UR-FE, 3UR-FE:
AUTOMATIC TRANSMISSION HOUSING
34 (345, 25)
x 14
for 1VD-FTV:
34 (345, 25)
x 14
AUTOMATIC TRANSMISSION HOUSING
TRANSMISSION CASE ADAPTER OIL SEAL
TRANSFER CASE ADAPTER RADIAL BALL BEARING
SNAP RING
x 10
34 (345, 25)
REAR TRANSFER ADAPTER
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
ATF WS

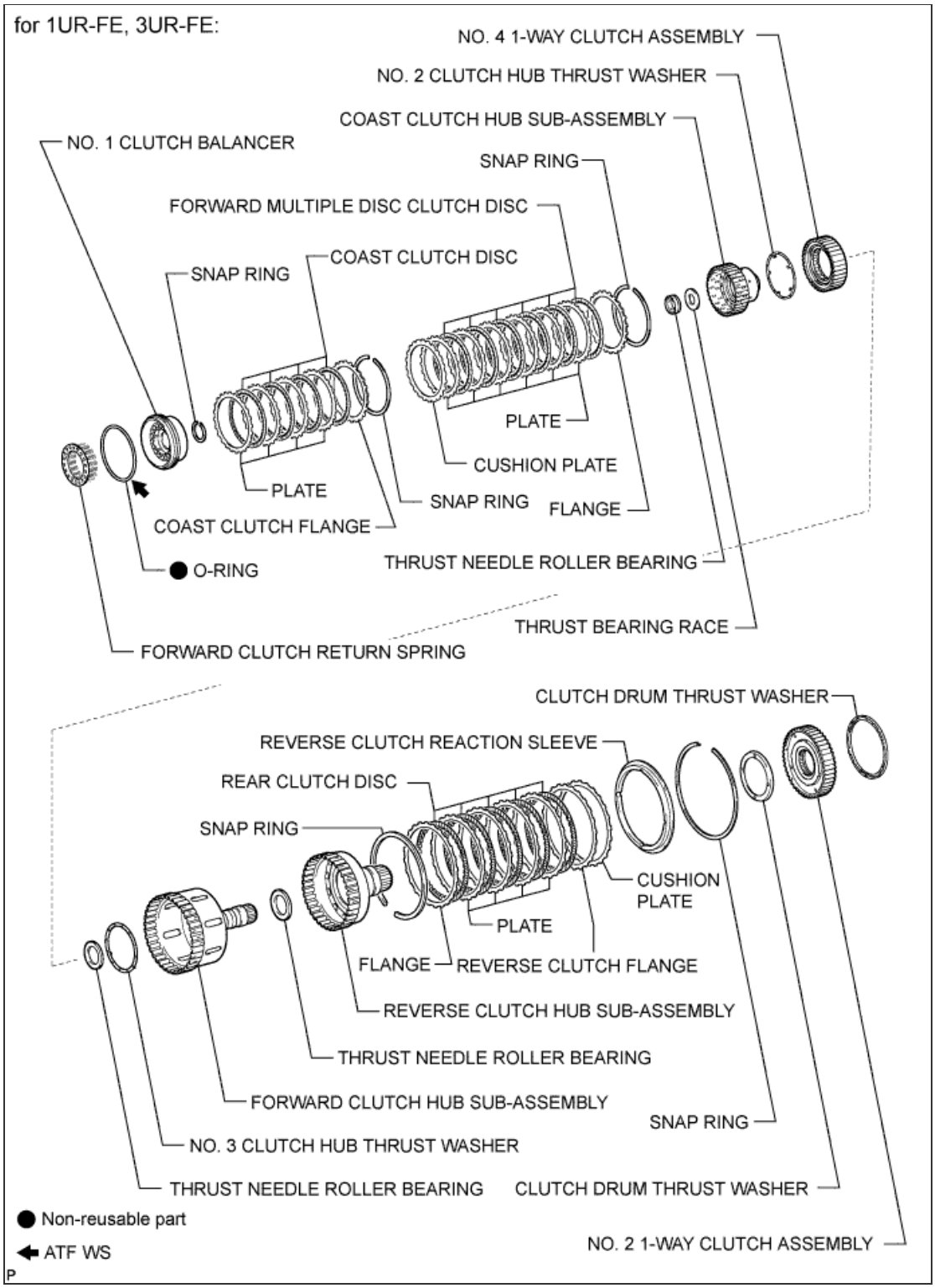

SPRING
CHECK BALL BODY
TRANSMISSION VALVE BODY ASSEMBLY
11 (112, 8)
x 19
DETENT SPRING
DETENT SPRING COVER
10 (102, 7)
O-RING
VALVE BODY OIL STRAINER ASSEMBLY
10 (102, 7)
x 4
MAGNET
GASKET
AUTOMATIC TRANSMISSION
OIL PAN SUB-ASSEMBLY
7.4 (75, 65 in.*lbf)
x 12
GASKET
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
ATF WS
20 (204, 15)
OVERFLOW PLUG
20 (204, 15)
DRAIN PLUG
P

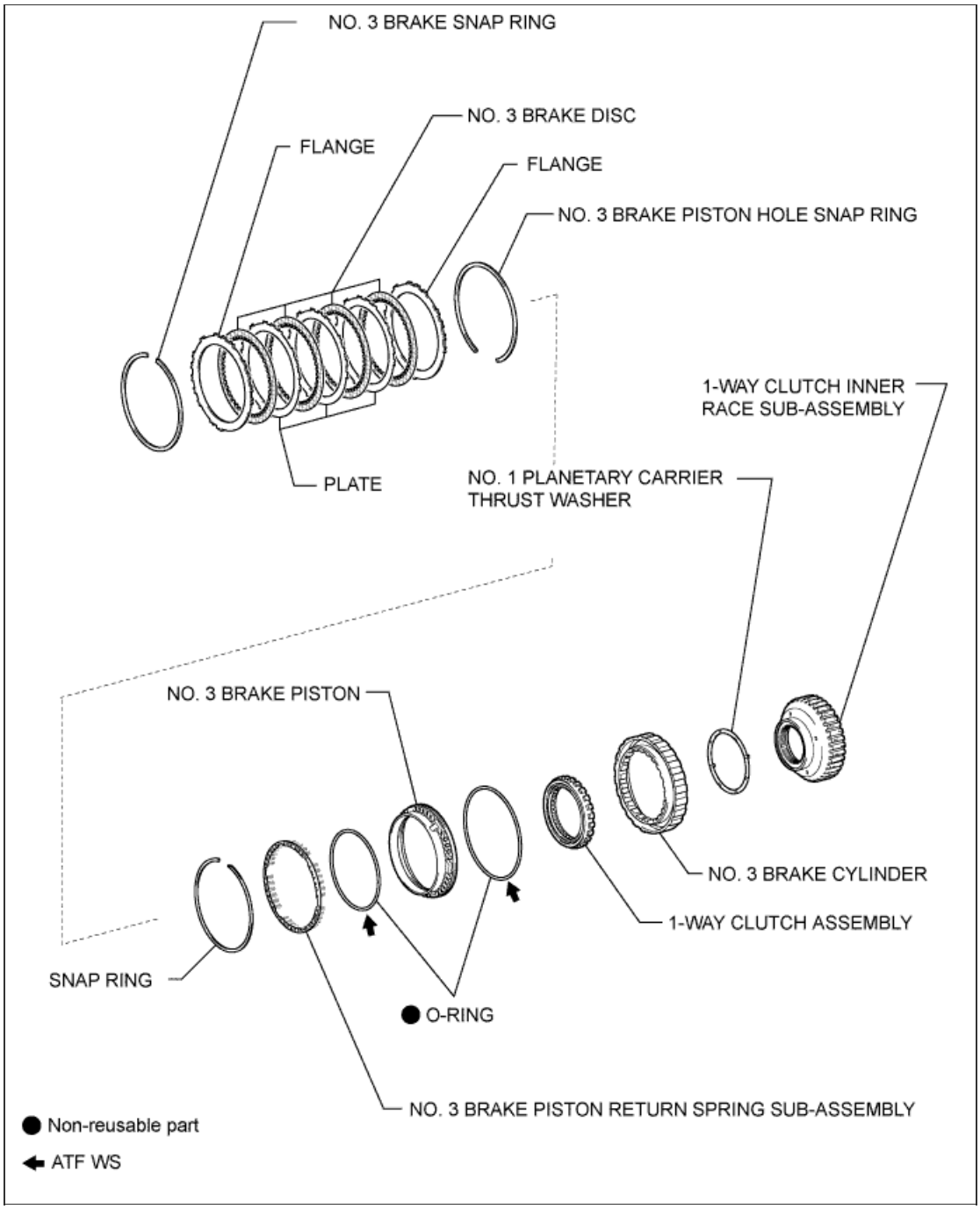

MANUAL VALVE LEVER SHAFT OIL SEAL
MANUAL VALVE LEVER SHAFT
TRANSMISSION CASE GASKET
BRAKE DRUM GASKET
SPRING
MANUAL VALVE LEVER SHAFT OIL SEAL
MANUAL VALVE LEVER SUB-ASSEMBLY
SPACER
SPRING PIN
SNAP RING
SPRING
PARKING LOCK PAWL BRACKET
PARKING LOCK ROD SUB-ASSEMBLY
18 (184, 13) x 3
PARKING LOCK PAWL
O-RING
PARKING LOCK PAWL SHAFT
E-RING
B-1 ACCUMULATOR VALVE
C-3 ACCUMULATOR PISTON
SPRING
B-3 ACCUMULATOR PISTON
C-2 ACCUMULATOR PISTON
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
ATF WS
MP grease
P

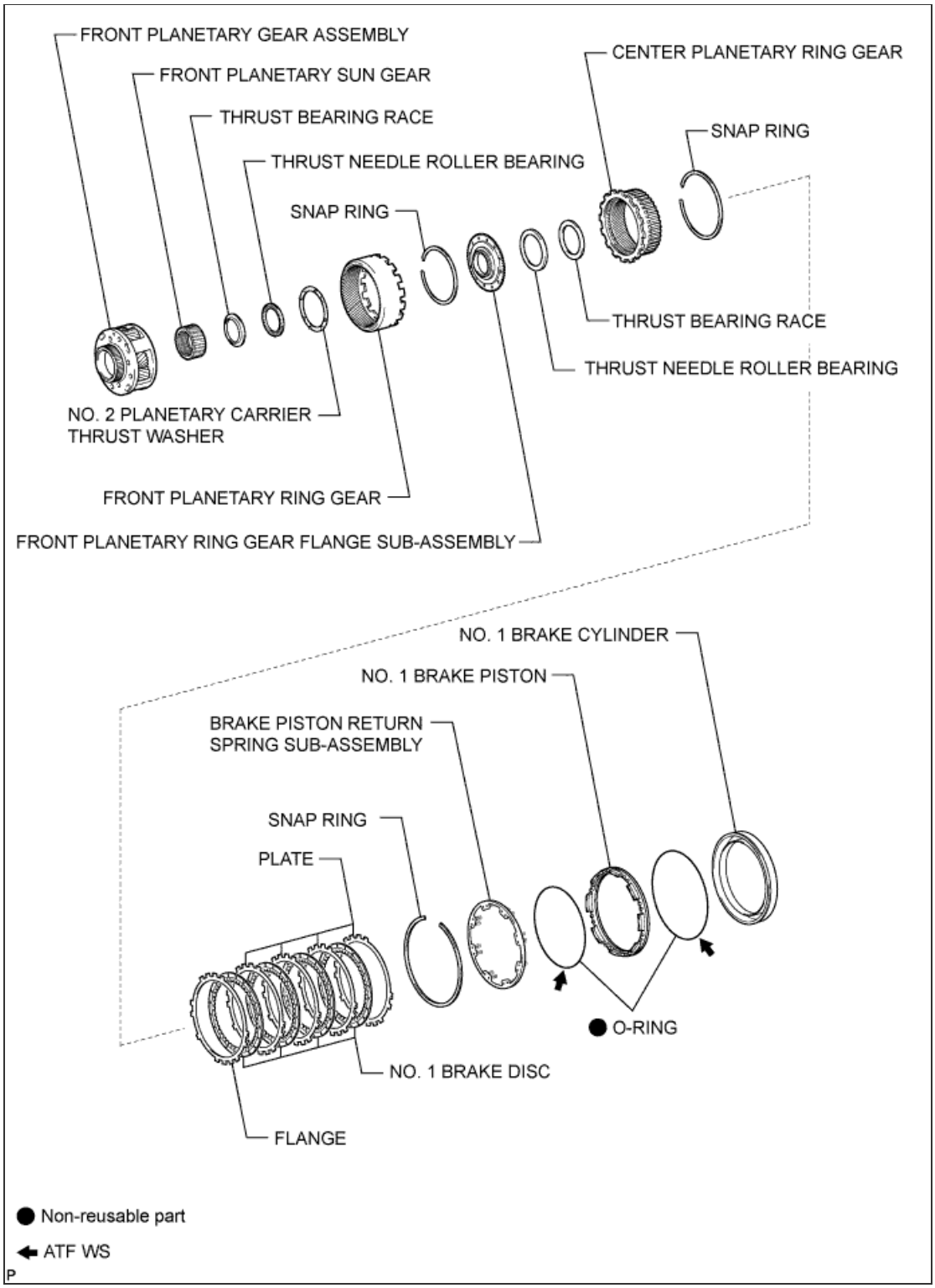

for 1VD-FTV:
NO. 3 CLUTCH BALANCER
O-RING
SNAP RING
THRUST NEEDLE ROLLER BEARING
REVERSE CLUTCH RETURN SPRING SUB-ASSEMBLY
THRUST BEARING RACE
O-RING
x 10
21 (214, 15)
OIL PUMP ASSEMBLY
DIRECT CLUTCH RETURN SPRING SUB-ASSEMBLY
DIRECT CLUTCH PISTON SUB-ASSEMBLY
O-RING
CLUTCH DRUM
O-RING
NO. 2 CLUTCH BALANCER
SNAP RING
REVERSE CLUTCH PISTON SUB-ASSEMBLY
COAST CLUTCH PISTON
FORWARD CLUTCH PISTON SUB-ASSEMBLY
DIRECT CLUTCH FLANGE
DIRECT CLUTCH DISC
O-RING
INPUT SHAFT SUB-ASSEMBLY
INPUT SHAFT OIL SEAL RING
PLATE
SNAP RING
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
ATF WS
P

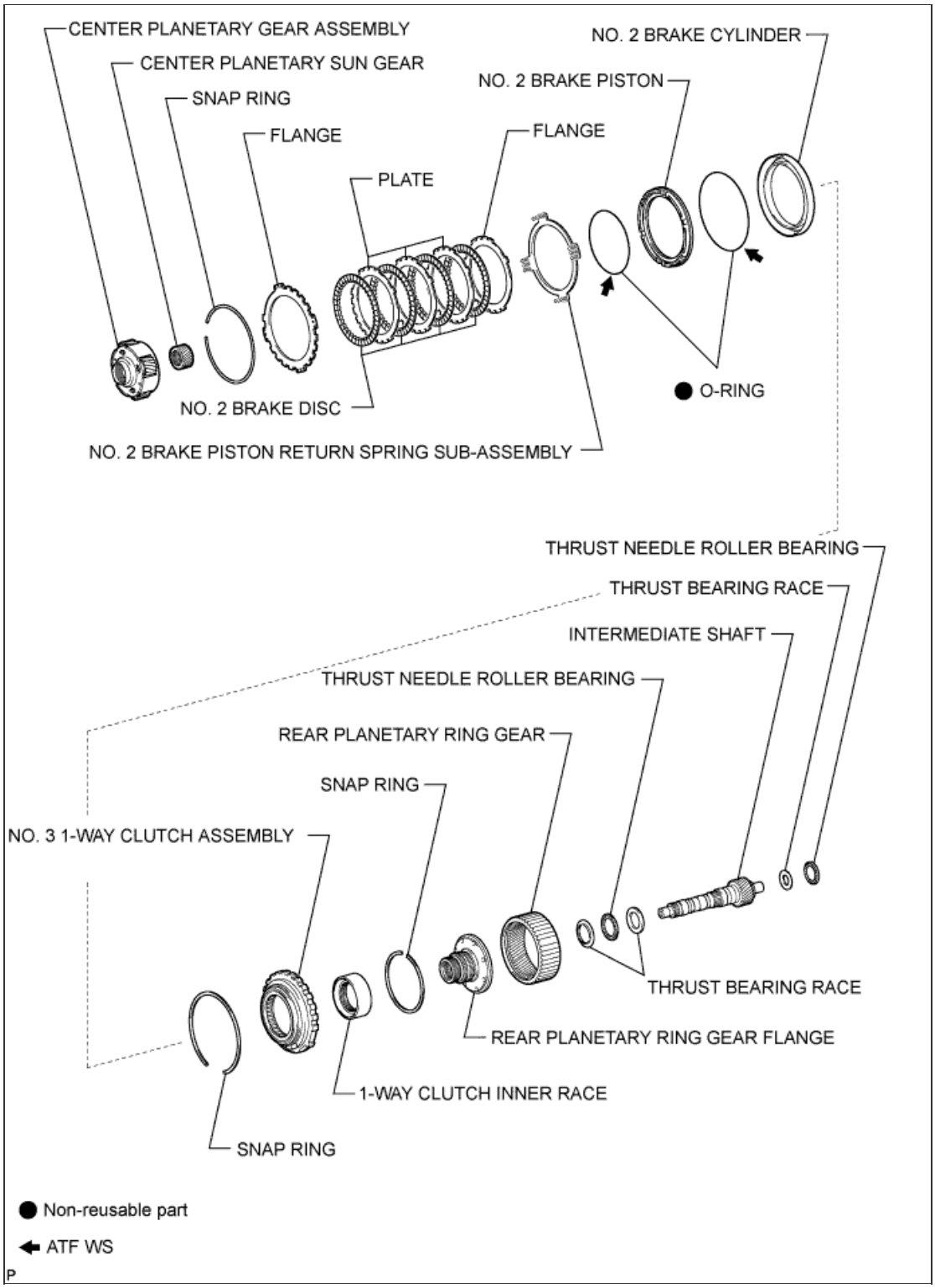

for 1UR-FE, 3UR-FE:
NO. 3 CLUTCH BALANCER
O-RING
SNAP RING
THRUST NEEDLE ROLLER BEARING
REVERSE CLUTCH RETURN SPRING SUB-ASSEMBLY
THRUST BEARING RACE
O-RING
x 10
21 (214, 15)
OIL PUMP ASSEMBLY
DIRECT CLUTCH RETURN SPRING SUB-ASSEMBLY
DIRECT CLUTCH PISTON SUB-ASSEMBLY
O-RING
CLUTCH DRUM
O-RING
NO. 2 CLUTCH BALANCER
SNAP RING
REVERSE CLUTCH PISTON SUB-ASSEMBLY
COAST CLUTCH PISTON
FORWARD CLUTCH PISTON SUB-ASSEMBLY
DIRECT CLUTCH FLANGE
DIRECT CLUTCH DISC
O-RING
INPUT SHAFT SUB-ASSEMBLY
INPUT SHAFT OIL SEAL RING
PLATE
SNAP RING
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
ATF WS
P

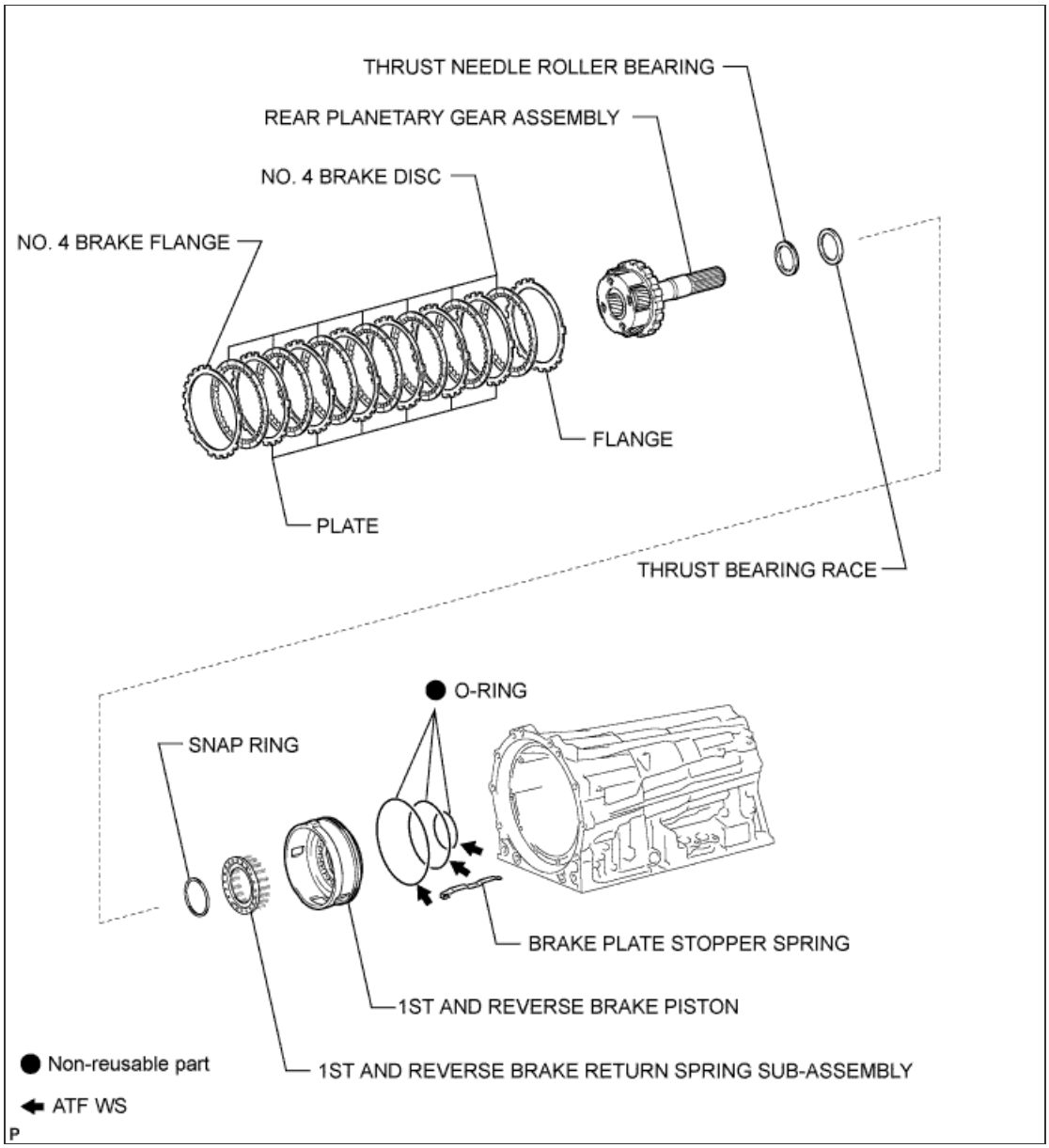

for 1VD-FTV:
NO. 4 1-WAY CLUTCH ASSEMBLY
NO. 2 CLUTCH HUB THRUST WASHER
COAST CLUTCH HUB SUB-ASSEMBLY
NO. 1 CLUTCH BALANCER
SNAP RING
FORWARD MULTIPLE DISC CLUTCH DISC
SNAP RING
COAST CLUTCH DISC
PLATE
CUSHION PLATE
PLATE
SNAP RING
FLANGE
COAST CLUTCH FLANGE
O-RING
THRUST NEEDLE ROLLER BEARING
THRUST BEARING RACE
FORWARD CLUTCH RETURN SPRING
CLUTCH DRUM THRUST WASHER
REVERSE CLUTCH REACTION SLEEVE
REAR CLUTCH DISC
SNAP RING
FLANGE
PLATE
CUSHION PLATE
REVERSE CLUTCH FLANGE
REVERSE CLUTCH HUB SUB-ASSEMBLY
THRUST NEEDLE ROLLER BEARING
FORWARD CLUTCH HUB SUB-ASSEMBLY
SNAP RING
NO. 3 CLUTCH HUB THRUST WASHER
THRUST NEEDLE ROLLER BEARING
CLUTCH DRUM THRUST WASHER
Non-reusable part
ATF WS
NO. 2 1-WAY CLUTCH ASSEMBLY
P


for 1UR-FE, 3UR-FE:
NO. 4 1-WAY CLUTCH ASSEMBLY
NO. 2 CLUTCH HUB THRUST WASHER
COAST CLUTCH HUB SUB-ASSEMBLY
NO. 1 CLUTCH BALANCER
SNAP RING
FORWARD MULTIPLE DISC CLUTCH DISC
COAST CLUTCH DISC
SNAP RING
PLATE
CUSHION PLATE
PLATE
SNAP RING
FLANGE
COAST CLUTCH FLANGE
O-RING
THRUST NEEDLE ROLLER BEARING
THRUST BEARING RACE
FORWARD CLUTCH RETURN SPRING
CLUTCH DRUM THRUST WASHER
REVERSE CLUTCH REACTION SLEEVE
REAR CLUTCH DISC
SNAP RING
CUSHION PLATE
PLATE
FLANGE
REVERSE CLUTCH FLANGE
REVERSE CLUTCH HUB SUB-ASSEMBLY
THRUST NEEDLE ROLLER BEARING
FORWARD CLUTCH HUB SUB-ASSEMBLY
SNAP RING
NO. 3 CLUTCH HUB THRUST WASHER
THRUST NEEDLE ROLLER BEARING
CLUTCH DRUM THRUST WASHER
Non-reusable part
ATF WS
NO. 2 1-WAY CLUTCH ASSEMBLY
P


NO. 3 BRAKE SNAP RING
NO. 3 BRAKE DISC
FLANGE
FLANGE
NO. 3 BRAKE PISTON HOLE SNAP RING
1-WAY CLUTCH INNER RACE SUB-ASSEMBLY
PLATE
NO. 1 PLANETARY CARRIER THRUST WASHER
NO. 3 BRAKE PISTON
NO. 3 BRAKE CYLINDER
1-WAY CLUTCH ASSEMBLY
SNAP RING
O-RING
NO. 3 BRAKE PISTON RETURN SPRING SUB-ASSEMBLY
Non-reusable part
ATF WS


FRONT PLANETARY GEAR ASSEMBLY
FRONT PLANETARY SUN GEAR
THRUST BEARING RACE
THRUST NEEDLE ROLLER BEARING
SNAP RING
CENTER PLANETARY RING GEAR
SNAP RING
THRUST BEARING RACE
THRUST NEEDLE ROLLER BEARING
NO. 2 PLANETARY CARRIER THRUST WASHER
FRONT PLANETARY RING GEAR
FRONT PLANETARY RING GEAR FLANGE SUB-ASSEMBLY
NO. 1 BRAKE CYLINDER
NO. 1 BRAKE PISTON
BRAKE PISTON RETURN SPRING SUB-ASSEMBLY
SNAP RING
PLATE
O-RING
NO. 1 BRAKE DISC
FLANGE
Non-reusable part
ATF WS
P

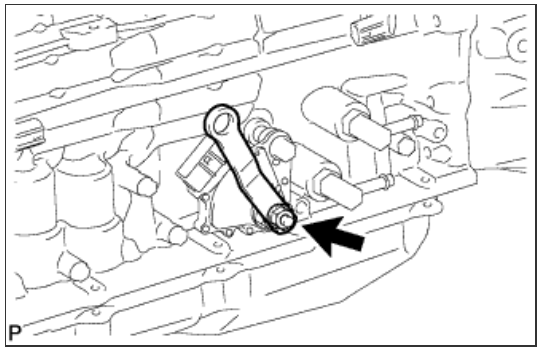

CENTER PLANETARY GEAR ASSEMBLY
CENTER PLANETARY SUN GEAR
SNAP RING
FLANGE
PLATE
FLANGE
NO. 2 BRAKE PISTON
NO. 2 BRAKE CYLINDER
O-RING
NO. 2 BRAKE DISC
NO. 2 BRAKE PISTON RETURN SPRING SUB-ASSEMBLY
THRUST NEEDLE ROLLER BEARING
THRUST BEARING RACE
INTERMEDIATE SHAFT
THRUST NEEDLE ROLLER BEARING
REAR PLANETARY RING GEAR
SNAP RING
NO. 3 1-WAY CLUTCH ASSEMBLY
THRUST BEARING RACE
REAR PLANETARY RING GEAR FLANGE
1-WAY CLUTCH INNER RACE
SNAP RING
Non-reusable part
ATF WS
P


THRUST NEEDLE ROLLER BEARING
REAR PLANETARY GEAR ASSEMBLY
NO. 4 BRAKE DISC
NO. 4 BRAKE FLANGE
FLANGE
PLATE
THRUST BEARING RACE
O-RING
SNAP RING
BRAKE PLATE STOPPER SPRING
1ST AND REVERSE BRAKE PISTON
1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY
Non-reusable part
ATF WS
P

for Preparation Click here

1. REMOVE TRANSMISSION CONTROL SHAFT LEVER RH

a. Remove the nut, spring washer and control shaft lever.



2. REMOVE PARK/NEUTRAL POSITION SWITCH ASSEMBLY

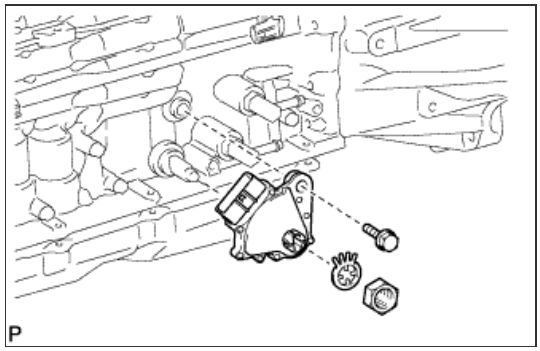
a. Using a screwdriver, bend the tabs of the lock washer.

b. Remove the nut, lock washer and bolt.

c. Remove the park/neutral position switch.

HINT:

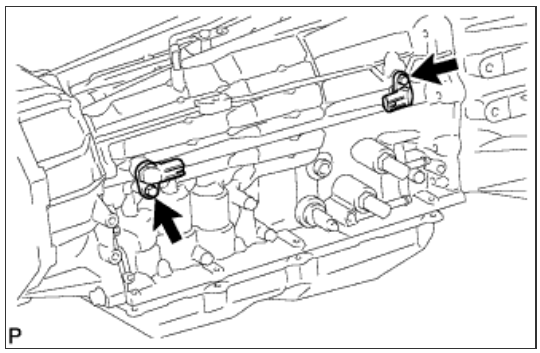
Make sure that the manual valve lever shaft has not been rotated prior to installing the park/neutral position switch as the detent spring may become detached from the manual valve lever shaft.



3. REMOVE SPEED SENSOR

a. Remove the 2 bolts and 2 speed sensors.

b. Remove the 2 O-rings from the sensors.



4. REMOVE TRANSMISSION OIL COOLER ASSEMBLY (w/ ATF Warmer)

a. Remove the 3 bolts and transmission oil cooler assembly with transmission oil thermostat.

Text in Illustration

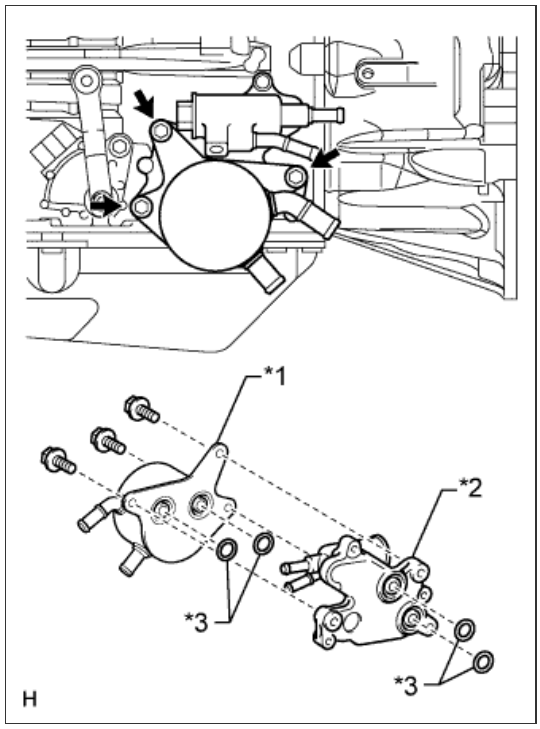
*1	Transmission Oil Cooler Assembly
*2	Transmission Oil Thermostat

*3	O-ring

b. Disconnect the transmission oil cooler assembly from the transmission oil thermostat.

c. Remove the 2 O-rings from the transmission oil cooler assembly.

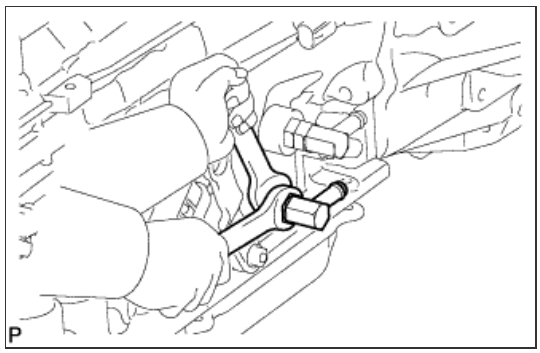
d. Remove the 2 O-rings from the transmission oil thermostat.



5. REMOVE OIL COOLER TUBE UNION (w/o ATF Warmer)

a. Remove the 2 oil cooler tube unions.

b. Remove the 2 O-rings from the oil cooler tube unions.

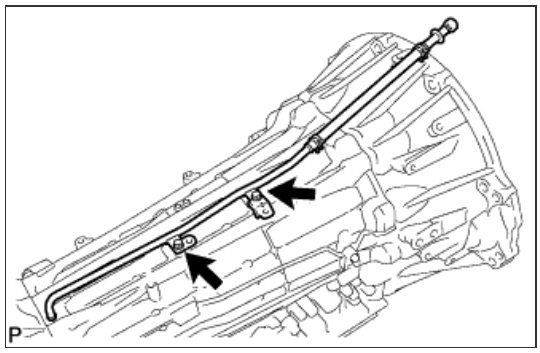


6. REMOVE AUTOMATIC TRANSMISSION BREATHER TUBE

a. Remove the 2 bolts.

b. Remove the breather tube.

c. Remove the O-ring from the tube.



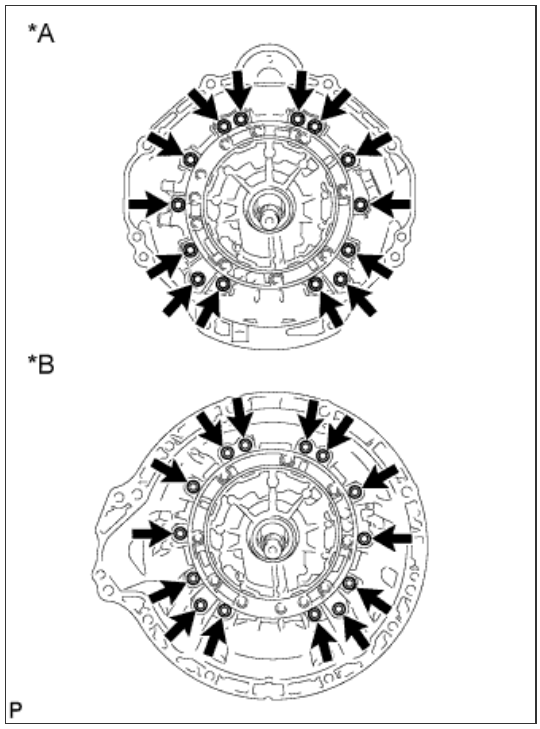
7. REMOVE AUTOMATIC TRANSMISSION HOUSING

a. Remove the 14 bolts.

Text in Illustration

*A	for 1VD-FTV
*B	for 1UR-FE, 3UR-FE

b. Remove the transmission housing.



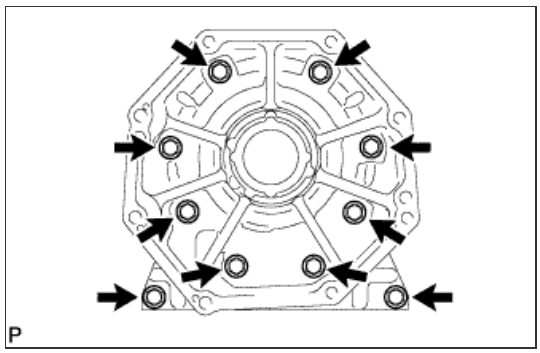
8. REMOVE REAR TRANSFER ADAPTER

a. Remove the 10 bolts.

b. Remove the rear transfer adapter.

HINT:

Tap on the circumference of the extension housing with a plastic-faced hammer to remove the rear transfer adapter.



9. REMOVE TRANSMISSION CASE ADAPTER OIL SEAL

a. Using a screwdriver, pry out the oil seal.

Text in Illustration

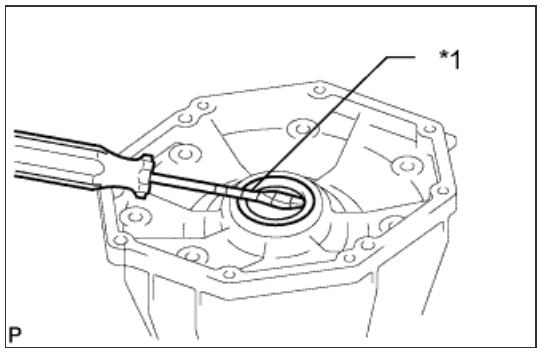
*1	Protective Tape

NOTICE:

Be careful not to damage the rear transfer adapter.

HINT:

Wrap the tip of the screwdriver with tape.



10. REMOVE TRANSFER CASE ADAPTER RADIAL BALL BEARING

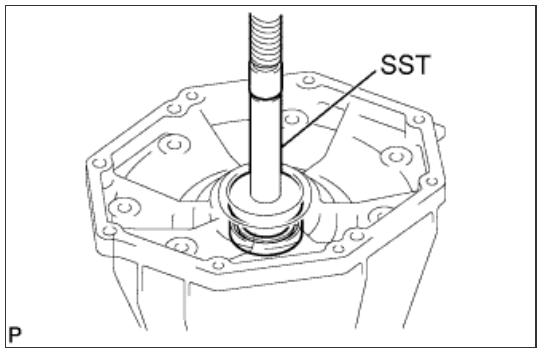
a. Using a screwdriver, remove the snap ring.

b. Using SST and a press, press out the bearing.

SST

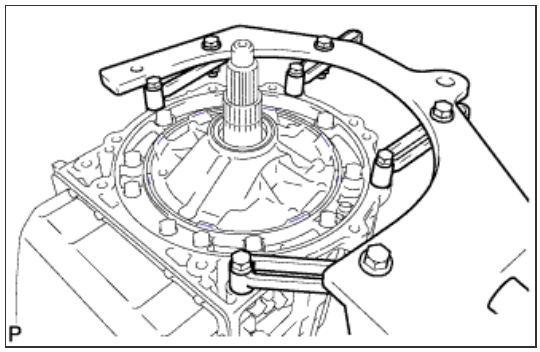
09950-60010 (09951-00650)

09950-70010 (09951-07150)



11. SECURE AUTOMATIC TRANSMISSION CASE SUB-ASSEMBLY

a. Install the transmission case to an overhaul attachment.



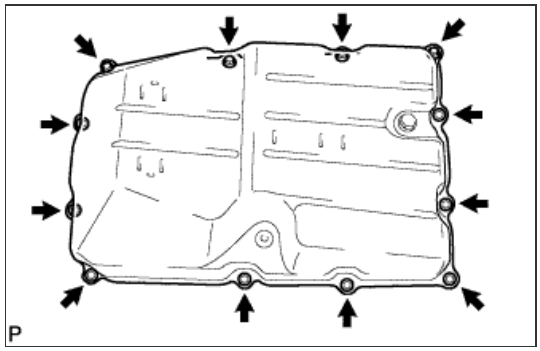
12. REMOVE AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY

NOTICE:

Do not turn the transmission over as this will contaminate the valve body with foreign matter from the bottom of the pan.

a. Remove the drain plug, 12 bolts, oil pan and gasket.

b. Remove the 4 magnets.

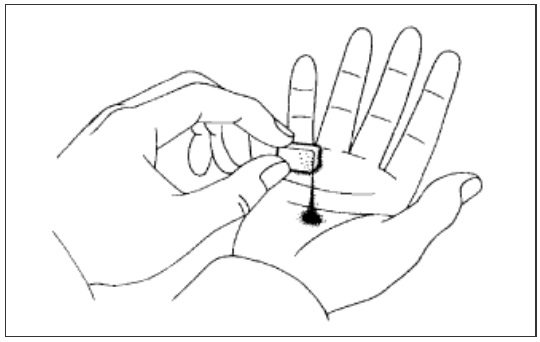


13. INSPECT AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY

a. Remove the magnets, and use them to collect steel particles.

b. Carefully look at the foreign matter and particles in the pan and on the magnets to anticipate the type of wear you will find in the transmission.

- Steel (magnetic): bearing, gear and clutch plate wear
- Brass (non-magnetic): bush wear

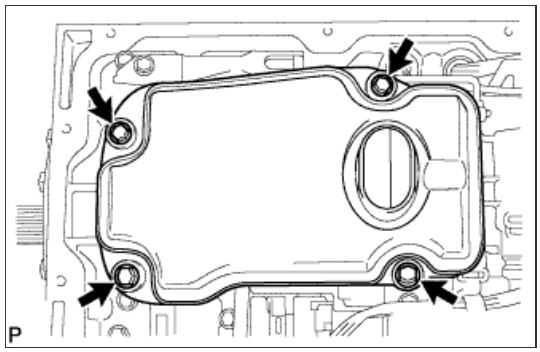


14. REMOVE VALVE BODY OIL STRAINER ASSEMBLY

a. Turn over the transmission.

b. Remove the 4 bolts and oil strainer from the valve body oil strainer assembly.

c. Remove the O-ring from the valve body oil strainer assembly.

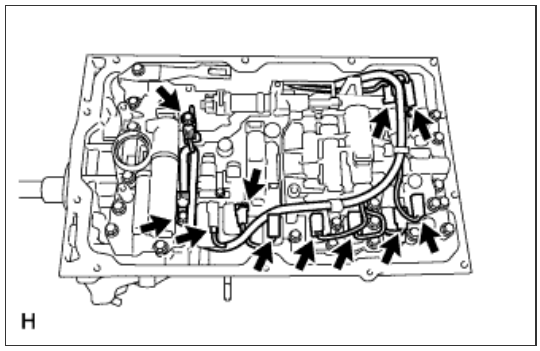


15. REMOVE NO. 1 TRANSMISSION WIRE AND NO. 2 TRANSMISSION WIRE

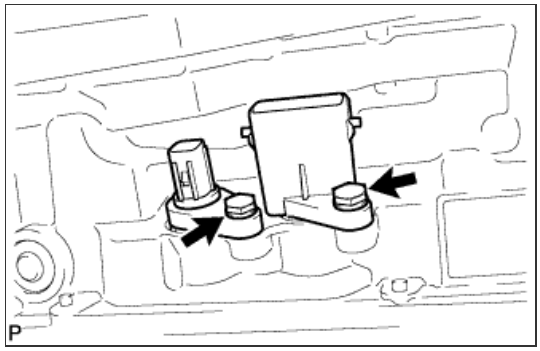
a. Remove the 2 bolts and 2 temperature sensor clamps.

b. Disconnect the 2 ATF temperature sensors.

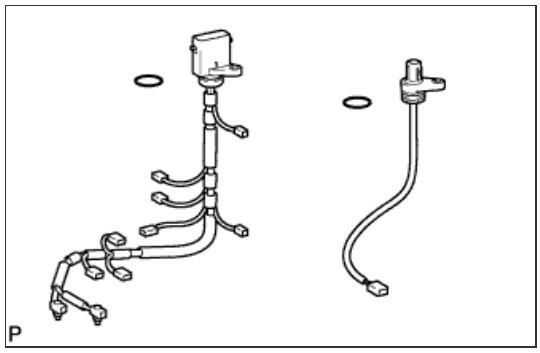
c. Disconnect the 9 connectors from the solenoid valves.



d. Remove the 2 bolts and pull the No. 1 and No. 2 transmission wires out of the transmission case.



e. Remove the 2 O-rings from the transmission wires.

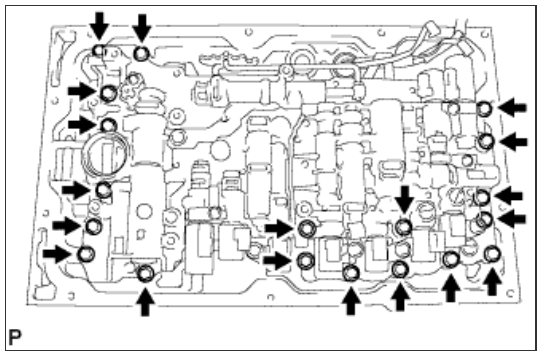


16. REMOVE TRANSMISSION VALVE BODY ASSEMBLY

a. Remove the bolt, detent spring cover and detent spring.

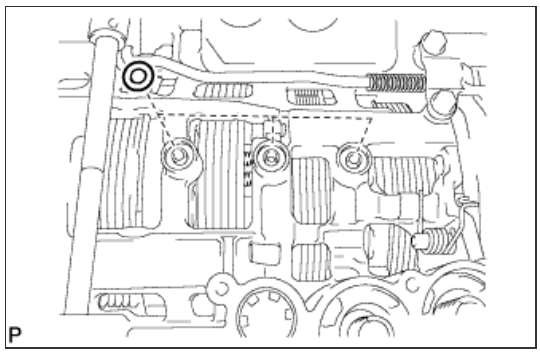
b. Remove the 19 bolts.

c. Remove the valve body assembly.



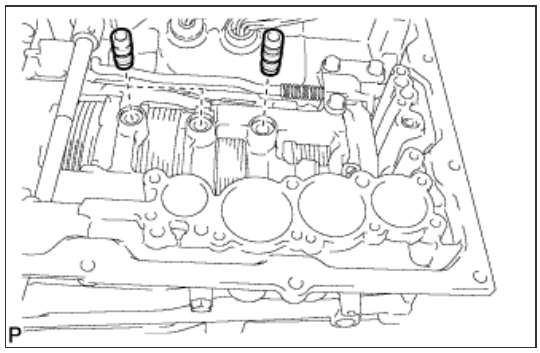
17. REMOVE TRANSMISSION CASE GASKET

a. Remove the 3 gaskets.



18. REMOVE BRAKE DRUM GASKET

a. Remove the 3 gaskets.

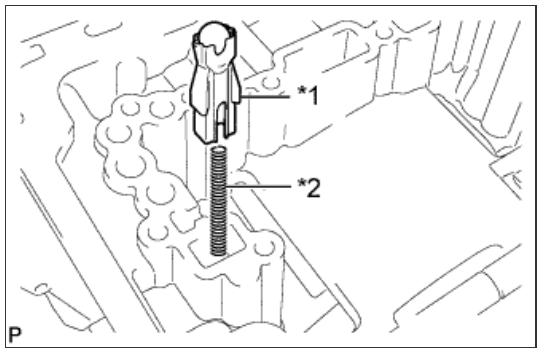


19. REMOVE CHECK BALL BODY

Text in Illustration

*1	Check Ball Body
*2	Spring

a. Remove the check ball body and spring.



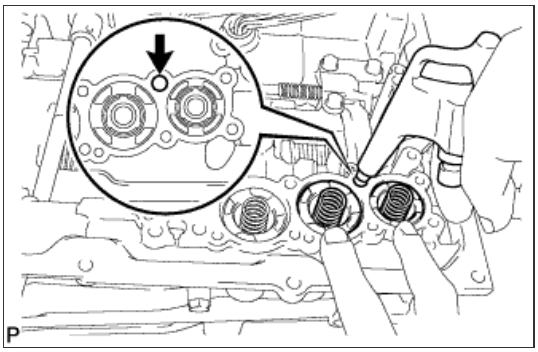
20. REMOVE C-2 ACCUMULATOR PISTON

a. While applying compressed air to the oil hole, remove the C-2 accumulator piston and spring.

NOTICE:

Be careful as the B-3 accumulator pistons may jump out.

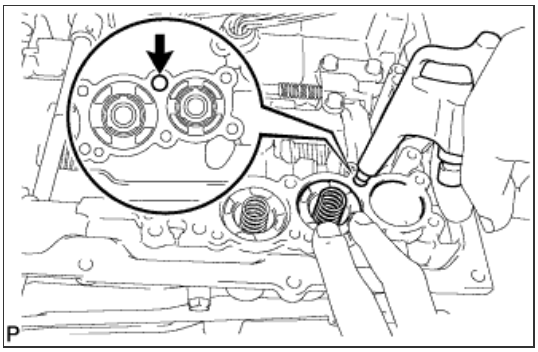
b. Remove the 2 O-rings from the piston.



21. REMOVE B-3 ACCUMULATOR PISTON

a. While applying compressed air to the oil hole, remove the B-3 accumulator piston and spring.

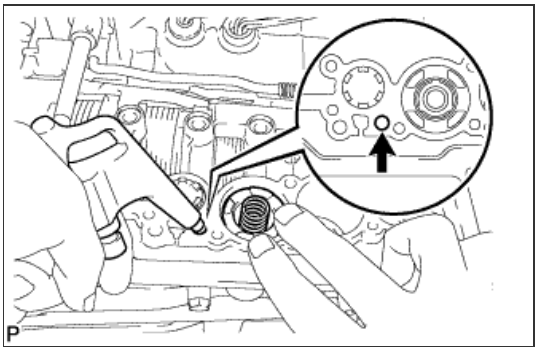
b. Remove the 2 O-rings from the piston.



22. REMOVE C-3 ACCUMULATOR PISTON

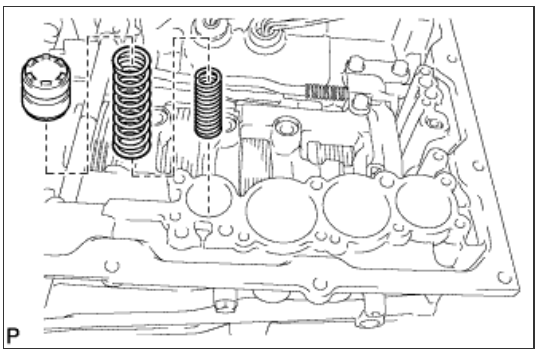
a. While applying compressed air to the oil hole, remove the C-3 accumulator piston and spring.

b. Remove the 2 O-rings from the piston.



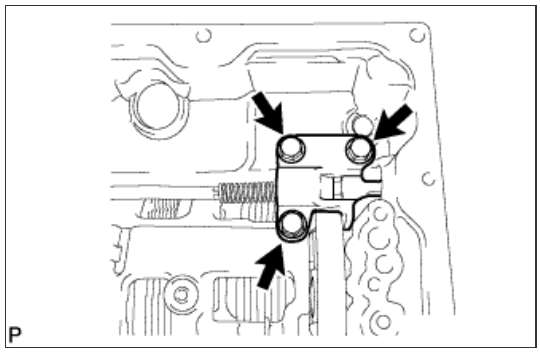
23. REMOVE B-1 ACCUMULATOR VALVE

a. Remove the B-1 accumulator valve and 2 springs.



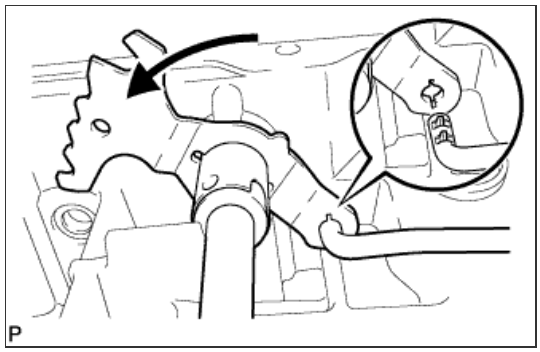
24. REMOVE PARKING LOCK PAWL BRACKET

a. Remove the 3 bolts and bracket.



25. REMOVE PARKING LOCK ROD SUB-ASSEMBLY

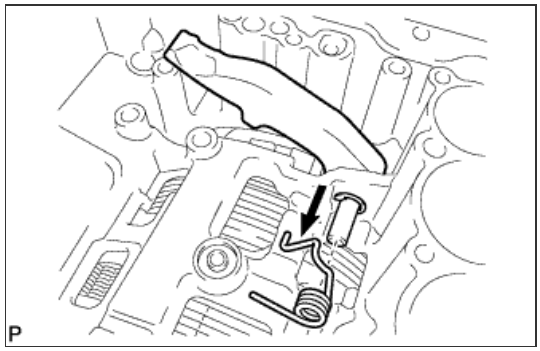
a. Disconnect the parking lock rod from the manual valve lever sub-assembly.



26. REMOVE PARKING LOCK PAWL

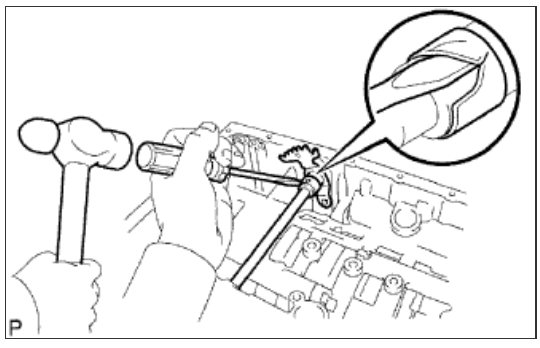
a. Pull out the parking lock pawl shaft from the front side, and then remove the lock pawl and spring.

b. Remove the E-ring from the shaft.



27. REMOVE MANUAL VALVE LEVER SUB-ASSEMBLY

a. Using a screwdriver and hammer, cut off the spacer and remove it from the shaft.

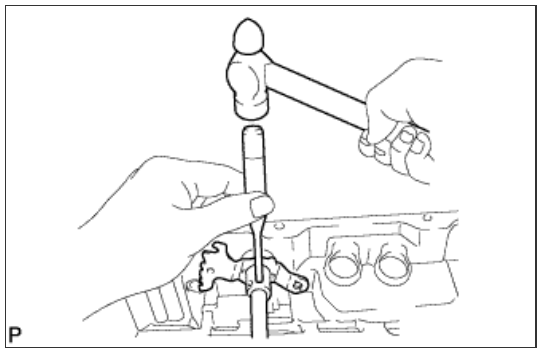


b. Using a pin punch and hammer, tap out the spring pin.

HINT:

Slowly tap out the spring pin so that it does not fall into the transmission case.

c. Pull the manual valve lever shaft out through the transmission case and remove the manual valve lever sub-assembly.



28. REMOVE MANUAL VALVE LEVER SHAFT OIL SEAL

a. Using a screwdriver, pry out the 2 oil seals.

Text in Illustration

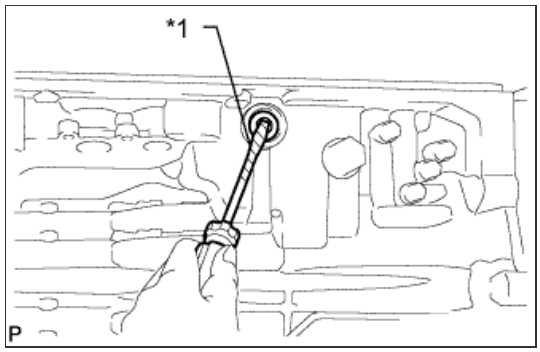
*1	Protective Tape

NOTICE:

Be careful not to damage the transmission case.

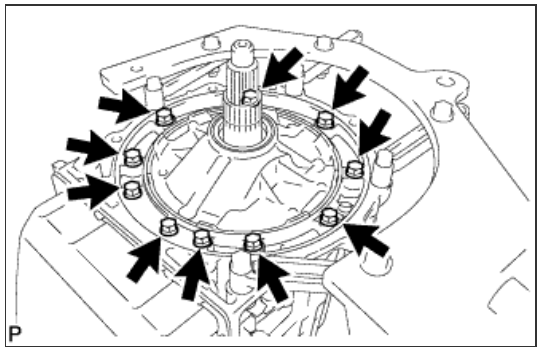
HINT:

Wrap the tip of the screwdriver with protective tape before use.



29. REMOVE OIL PUMP ASSEMBLY

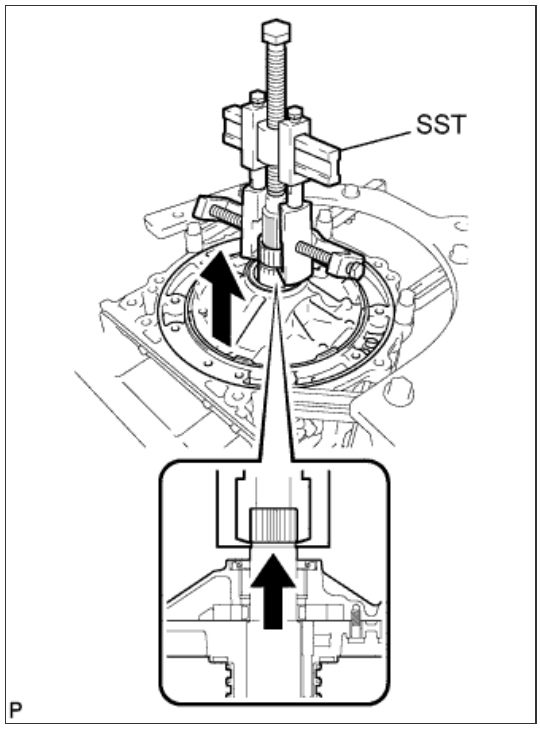
a. Remove the 10 bolts.



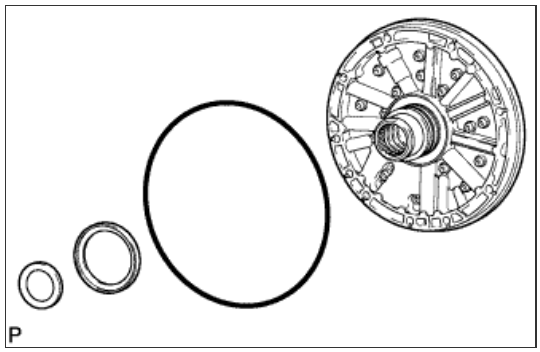
b. Using SST, pull out the oil pump.

SST

09950-40011 (09951-04010, 09953-04020, 09958-04011, 09952-04010, 09954-04010, 09955-04031, 09955-04031)

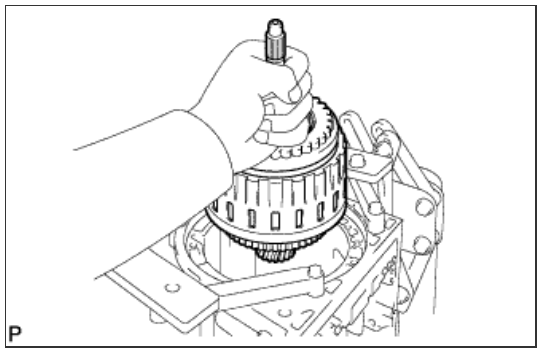


c. Remove the O-ring and 2 thrust bearing races from the oil pump.

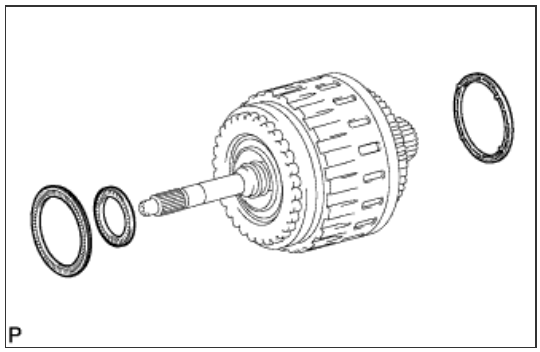


30. REMOVE CLUTCH DRUM AND INPUT SHAFT ASSEMBLY

a. Remove the clutch drum and input shaft assembly from the transmission case.

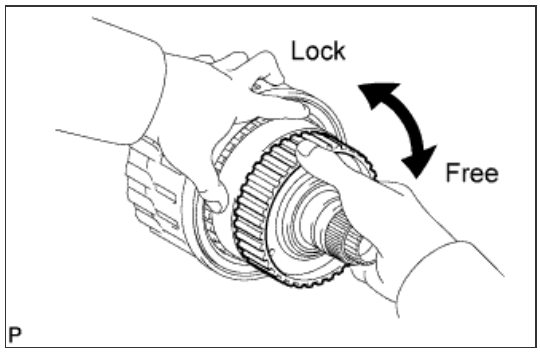


b. Remove the clutch drum thrust washer and 2 thrust needle roller bearings.



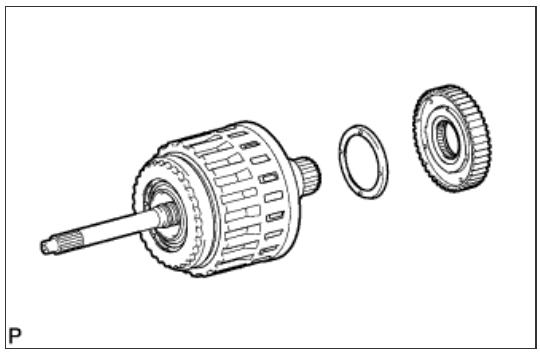
31. INSPECT NO. 2 1-WAY CLUTCH ASSEMBLY

a. Hold the reverse clutch hub and turn the 1-way clutch assembly. Check that the 1-way clutch turns freely clockwise and locks when turned counterclockwise.



32. REMOVE NO. 2 1-WAY CLUTCH ASSEMBLY

a. Remove the No. 2 1-way clutch and clutch drum thrust washer from the clutch drum and input shaft assembly.

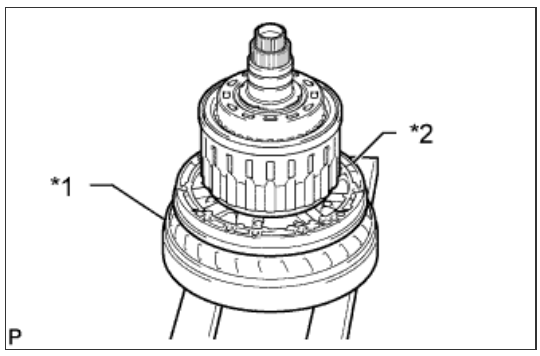


33. SECURE CLUTCH DRUM AND INPUT SHAFT ASSEMBLY

a. Place the oil pump onto the torque converter, and then place the clutch drum and input shaft assembly onto the oil pump.

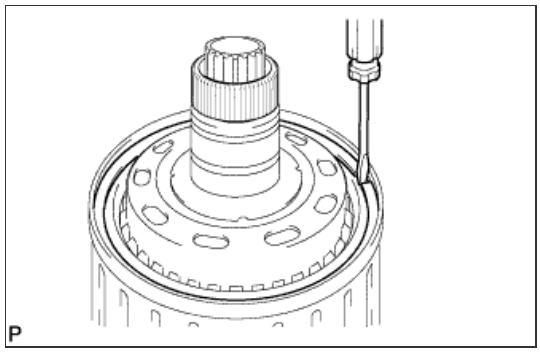
Text in Illustration

*1	Torque Converter
*2	Oil Pump

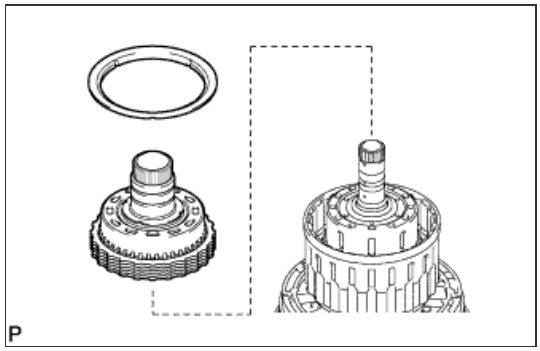


34. REMOVE REVERSE CLUTCH HUB SUB-ASSEMBLY

a. Using a screwdriver, remove the snap ring.



b. Remove the reverse clutch reaction sleeve and reverse clutch hub sub-assembly together with the rear clutch disc set from the clutch drum.

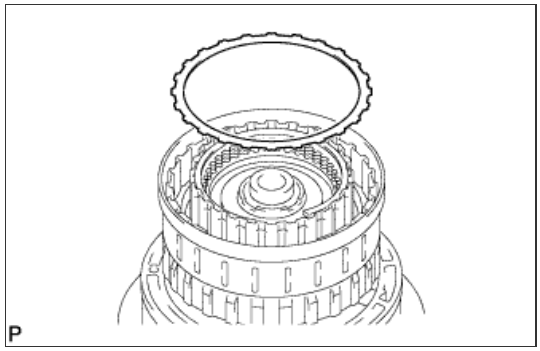


35. REMOVE REAR CLUTCH DISC SET

a. for 1VD-FTV:
Remove the cushion plate, reverse clutch flange, 4 discs and 3 plates from the reverse clutch hub.

b. for 1UR-FE, 3UR-FE
Remove the cushion plate, reverse clutch flange, 5 discs and 4 plates from the reverse clutch hub.

c. Remove the flange from the clutch drum.



d. Using a screwdriver, remove the snap ring.

Text in Illustration

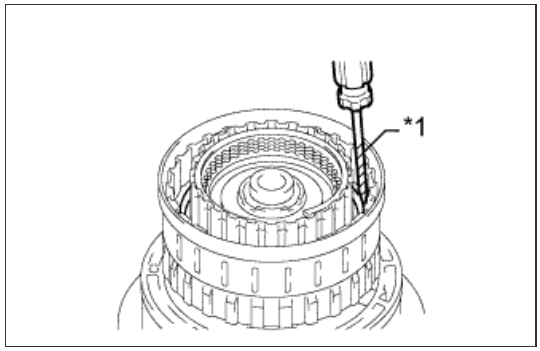
*1	Protective Tape

NOTICE:

Be careful not to damage the clutch drum.

HINT:

Wrap the tip of the screwdriver with tape.

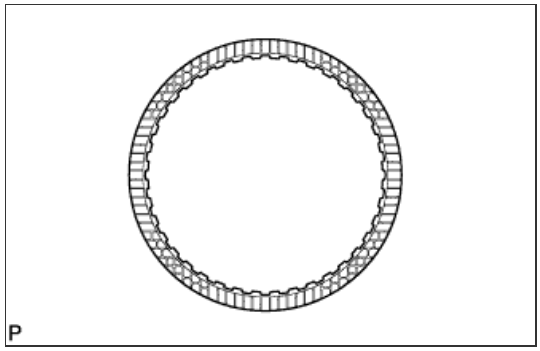


36. INSPECT REAR CLUTCH DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) grooves have even a little bit of damage.

NOTICE:

Before assembling new discs, soak them in ATF for at least 2 hours.

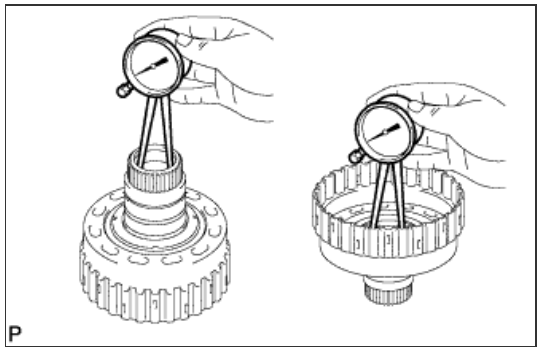


37. INSPECT REVERSE CLUTCH HUB SUB-ASSEMBLY

a. Using a dial indicator, measure the inside diameter of the reverse clutch hub bush.

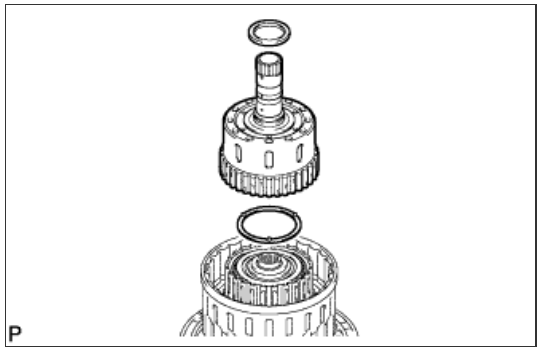
Standard inside diameter:
41.912 to 41.937 mm (1.410 to 1.411 in.)

If the inside diameter is more than the standard, replace the reverse clutch hub.



38. REMOVE FORWARD CLUTCH HUB SUB-ASSEMBLY

a. Remove the thrust needle roller bearing, forward clutch hub and No. 3 clutch hub thrust washer from the clutch drum.

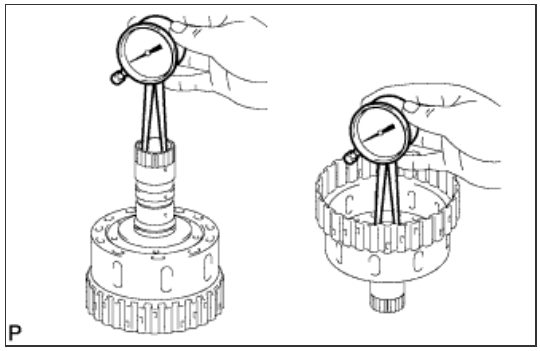


39. INSPECT FORWARD CLUTCH HUB SUB-ASSEMBLY

a. Using a dial indicator, measure the inside diameter of the forward clutch hub bush.

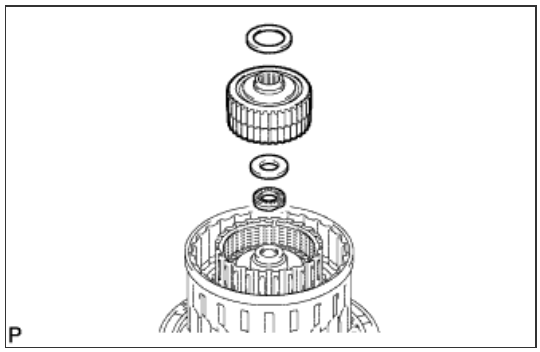
Standard inside diameter:
30.200 to 30.225 mm (1.189 to 1.190 in.)

If the inside diameter is more than the standard, replace the forward clutch hub.



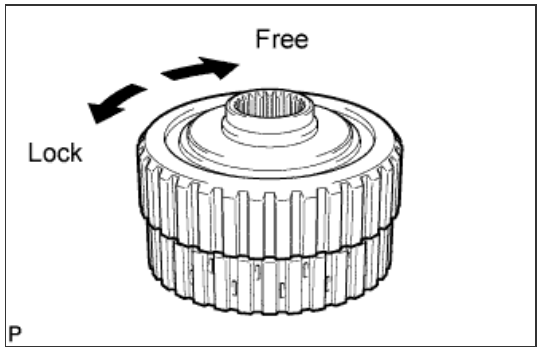
40. REMOVE COAST CLUTCH HUB SUB-ASSEMBLY WITH NO. 4 1-WAY CLUTCH ASSEMBLY

a. Remove the 2 thrust needle roller bearings, the coast clutch hub with the No. 4 1-way clutch assembly, and the thrust bearing race from the clutch drum.



41. INSPECT NO. 4 1-WAY CLUTCH ASSEMBLY

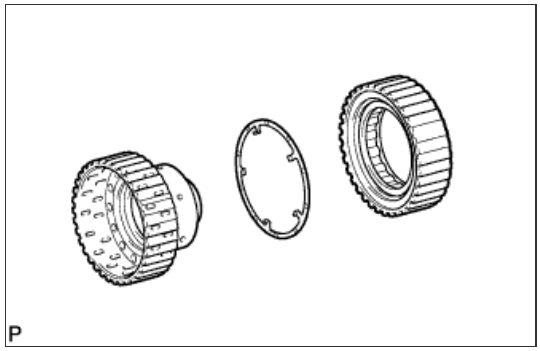
a. Hold the coast clutch hub and turn the 1-way clutch assembly. Check that the 1-way clutch turns freely clockwise and locks when turned counterclockwise.



42. REMOVE NO. 4 1-WAY CLUTCH ASSEMBLY

a. Separate the No. 4 1-way clutch assembly from the coast clutch hub.

b. Remove the No. 2 clutch hub thrust washer from the coast clutch hub.



43. REMOVE FORWARD MULTIPLE DISC CLUTCH DISC SET

a. Using a screwdriver, remove the snap ring.

Text in Illustration

*1	Protective Tape

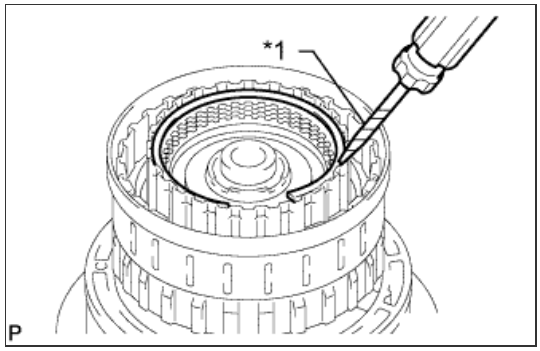
NOTICE:

Be careful not to damage the forward clutch piston.

HINT:

Wrap the tip of the screwdriver with tape.

b. Remove the flange, 6 discs, 6 plates and cushion plate from the input shaft.

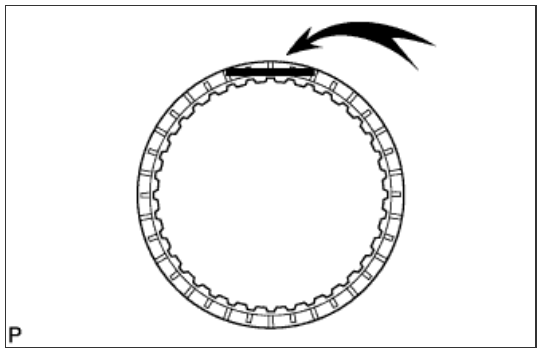


44. INSPECT FORWARD MULTIPLE DISC CLUTCH DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) grooves or printed numbers have even a little bit of damage.

NOTICE:

Before assembling new discs, soak them in ATF for at least 2 hours.



45. REMOVE COAST CLUTCH DISC SET

a. Using a screwdriver, remove the snap ring.

Text in Illustration

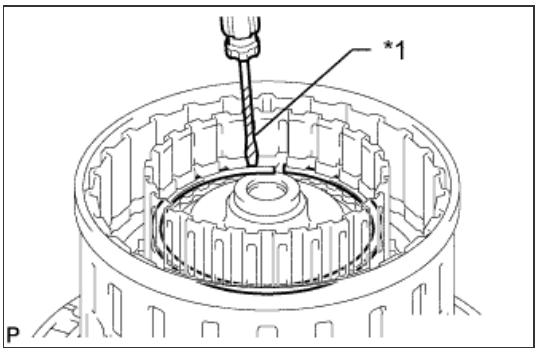
*1	Protective Tape

NOTICE:

Be careful not to damage the forward clutch piston.

HINT:

Wrap the tip of the screwdriver with tape.



b. for 1VD-FTV:
Remove the coast clutch flange, 5 discs and 5 plates from the input shaft.

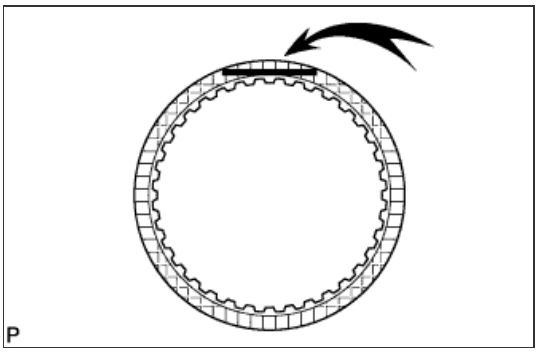
c. for 1UR-FE, 3UR-FE
Remove the coast clutch flange, 4 discs and 4 plates from the input shaft.

46. INSPECT COAST CLUTCH DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) grooves or printed numbers have even a little bit of damage.

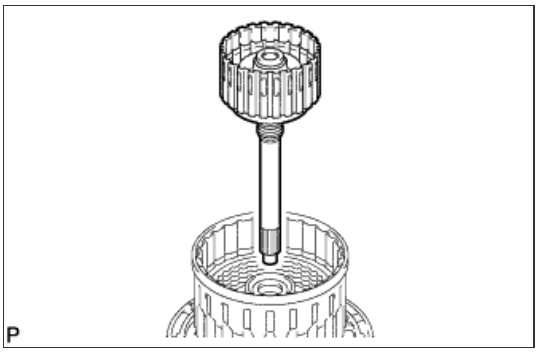
NOTICE:

Before assembling new discs, soak them in ATF for at least 2 hours.



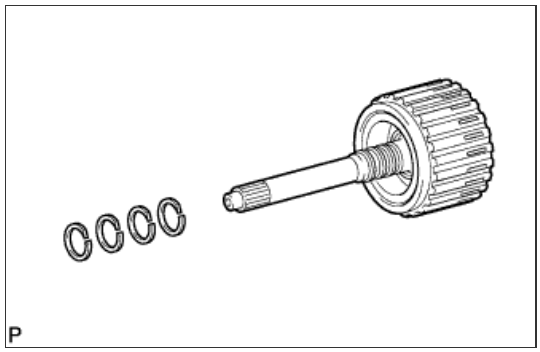
47. REMOVE INPUT SHAFT SUB-ASSEMBLY

a. Remove the input shaft from the clutch drum.



48. REMOVE INPUT SHAFT OIL SEAL RING

a. Remove the 4 oil seal rings from the input shaft.



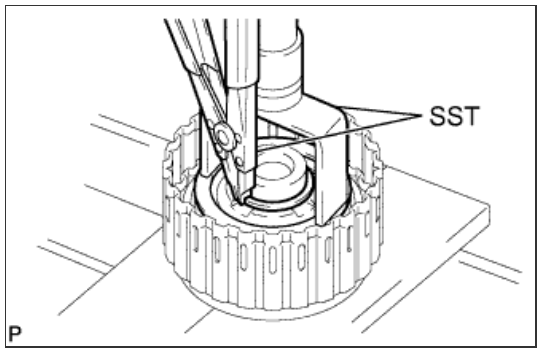
49. REMOVE COAST CLUTCH PISTON

a. Place SST on the No. 1 clutch balancer and compress the forward clutch return spring with a press.

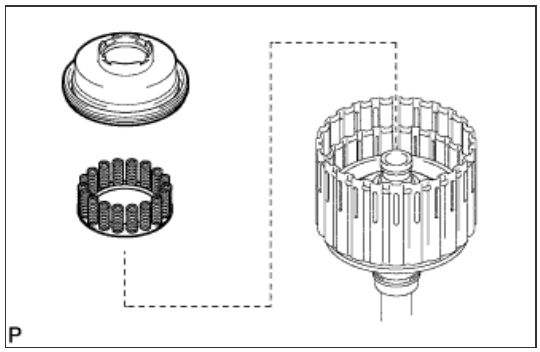
SST
09350-30020 (09350-07040)

b. Using SST, remove the snap ring.

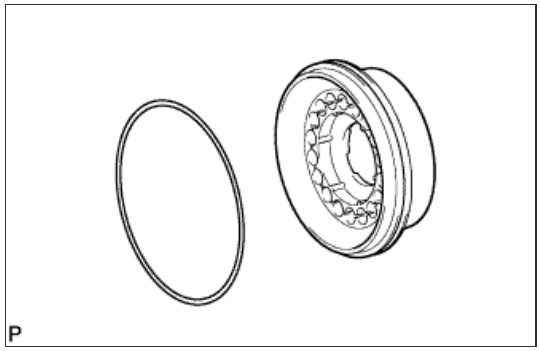
SST
09350-30020 (09350-07070)



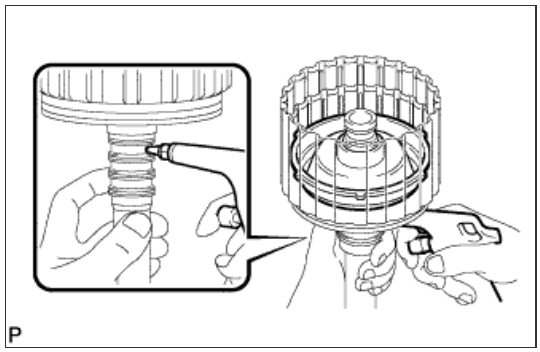
c. Remove the No. 1 clutch balancer and forward clutch return spring from the input shaft.



d. Remove the O-ring from the No. 1 clutch balancer.



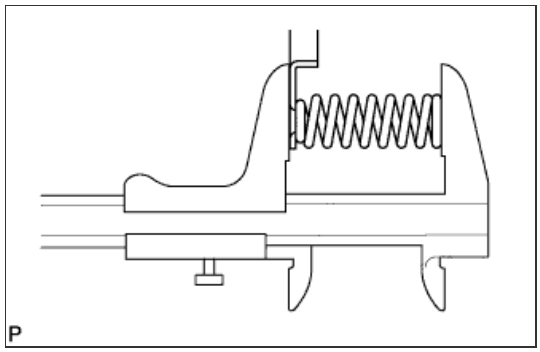
e. Hold the input shaft by hand and apply compressed air to the input shaft to remove the coast clutch piston.



50. INSPECT FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY

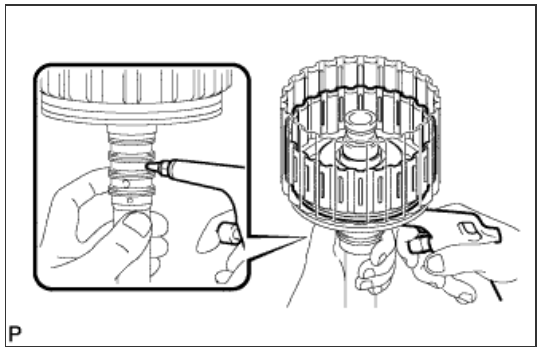
a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
29.65 mm (1.17 in.)

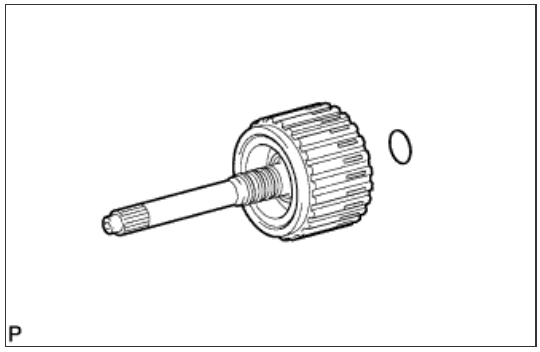


51. REMOVE FORWARD CLUTCH PISTON SUB-ASSEMBLY

a. Hold the input shaft by hand and apply compressed air to the input shaft to remove the forward clutch piston.



b. Remove the O-ring from the input shaft.



52. REMOVE NO. 3 CLUTCH BALANCER

a. Place SST on the No. 3 clutch balancer and compress the reverse clutch return spring with a press.

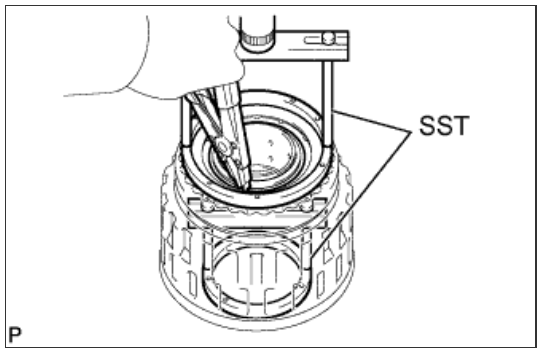
SST

09380-60010 (09381-06020, 09381-06030, 09381-06040, 09381-06050, 09381-06080)

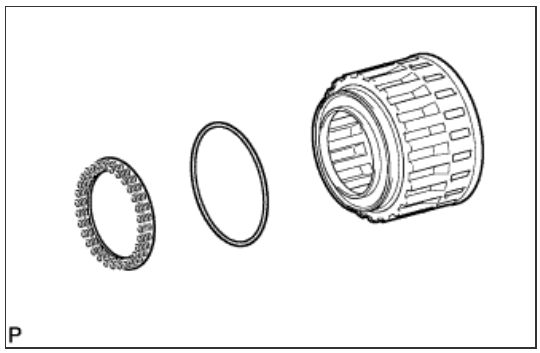
b. Using SST, remove the snap ring.

SST
09350-30020 (09350-07070)

c. Remove the No. 3 clutch balancer.



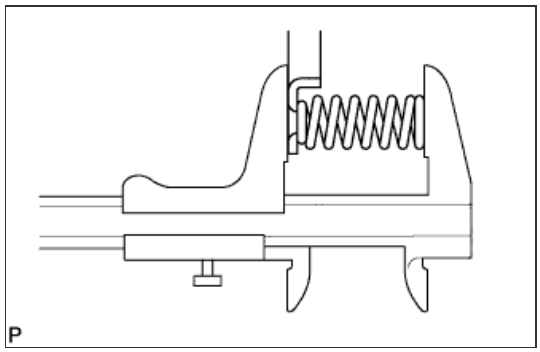
d. Remove the reverse clutch return spring and O-ring from the reverse clutch piston.



53. INSPECT REVERSE CLUTCH RETURN SPRING SUB-ASSEMBLY

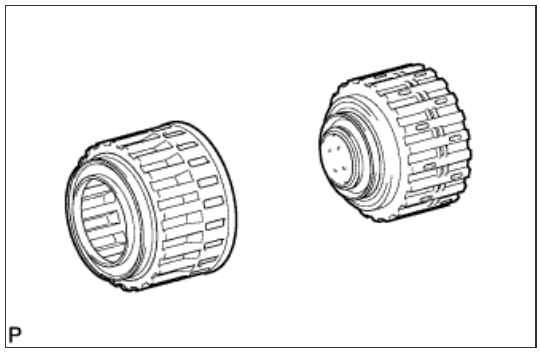
a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
21.24 mm (0.836 in.)

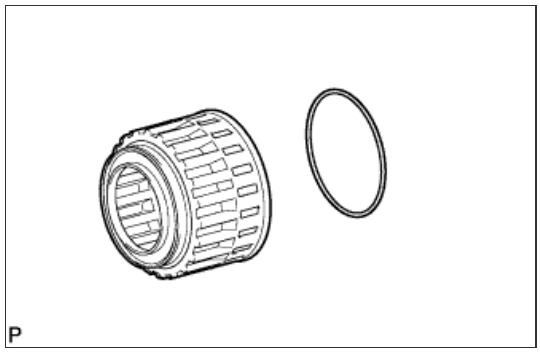


54. REMOVE REVERSE CLUTCH PISTON SUB-ASSEMBLY

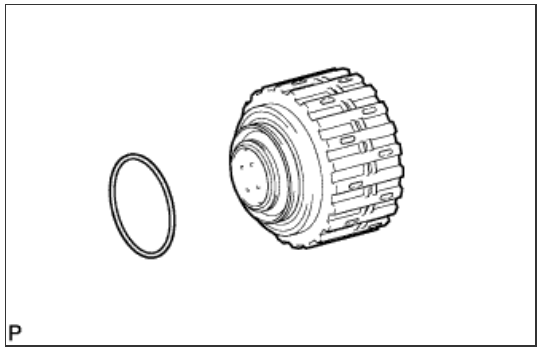
a. Remove the reverse clutch piston from the clutch drum.



b. Remove the O-ring from the reverse clutch piston.



c. Remove the O-ring from the clutch drum.



55. REMOVE DIRECT CLUTCH DISC SET

a. Using a screwdriver, remove the snap rings from the clutch drum.

Text in Illustration

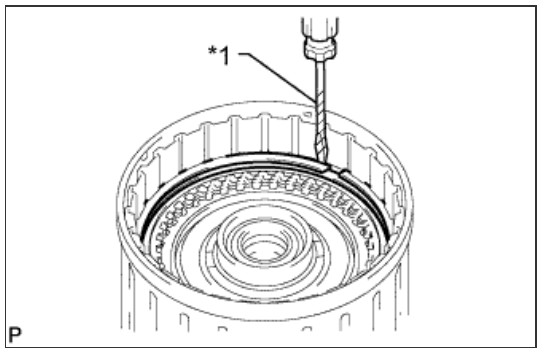
*1	Protective Tape

NOTICE:

Be careful not to damage the clutch drum.

HINT:

Wrap the tip of the screwdriver with tape.



b. for 1VD-FTV:
Remove the direct clutch flange, 6 discs and 6 plates from the clutch drum.

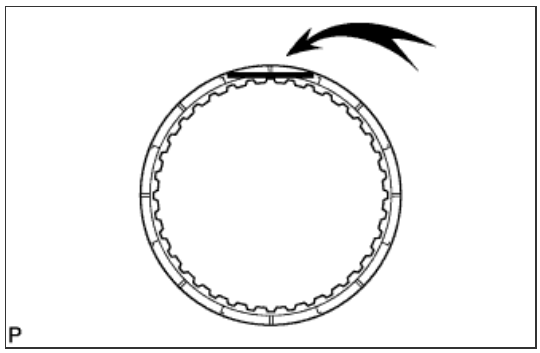
c. for 1UR-FE, 3UR-FE
Remove the direct clutch flange, 5 discs and 5 plates from the clutch drum.

56. INSPECT DIRECT CLUTCH DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) grooves or printed numbers have even a little bit of damage.

NOTICE:

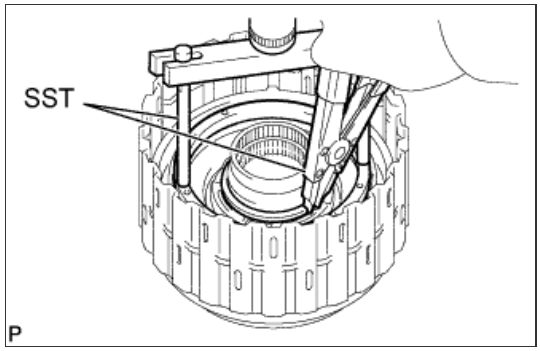
Before assembling new discs, soak them in ATF for at least 2 hours.



57. REMOVE DIRECT CLUTCH PISTON SUB-ASSEMBLY

a. Place SST on the direct clutch piston and compress the direct clutch return spring with a press.

SST
09380-60010 (09381-06030, 09381-06040, 09381-06080)



b. Using SST, remove the snap ring.

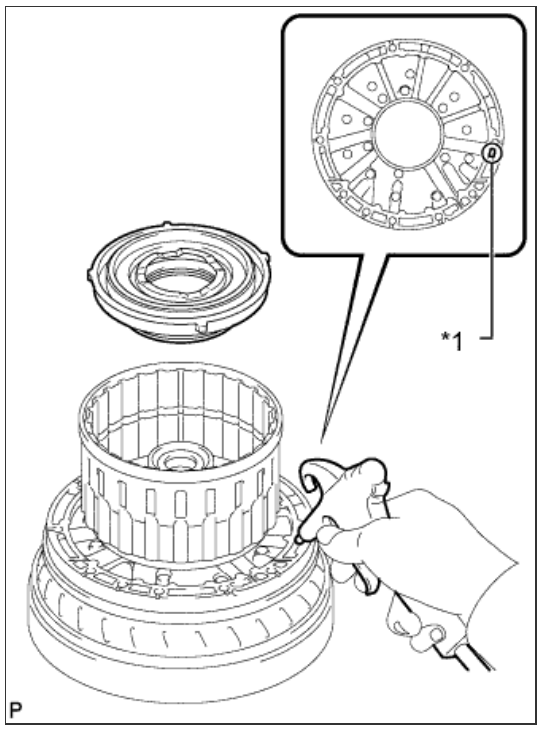
SST
09350-30020 (09350-07070)

c. Place the oil pump onto the torque converter, and then place the clutch drum onto the oil pump.

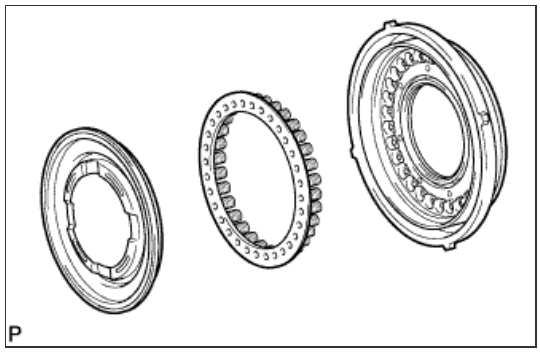
d. Hold the direct clutch piston by hand and apply compressed air to the oil hole of the oil pump as shown in the illustration to remove the direct clutch piston together with the No. 2 clutch balancer and direct clutch return spring sub-assembly.

Text in Illustration

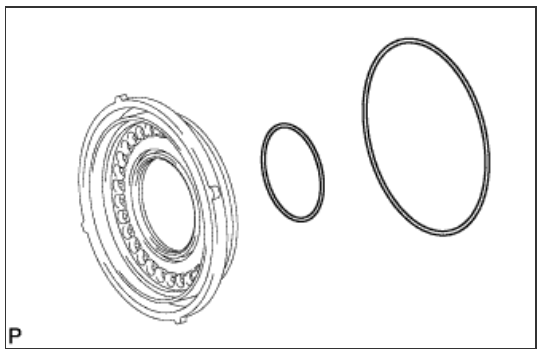
*1	Oil Hole



e. Remove the No. 2 clutch balancer and direct clutch return spring sub-assembly from the direct clutch piston.



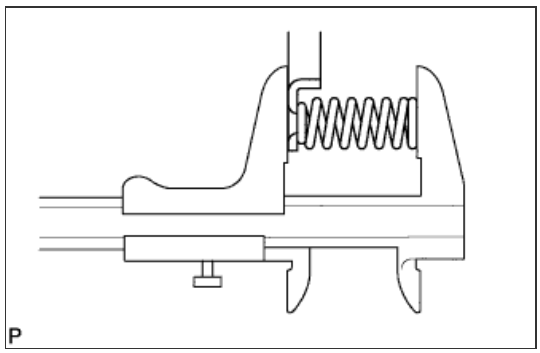
f. Remove the 2 O-rings from the direct clutch piston.



58. INSPECT DIRECT CLUTCH RETURN SPRING SUB-ASSEMBLY

a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
19.46 mm (0.766 in.)



59. REMOVE NO. 3 BRAKE SNAP RING

a. Using a screwdriver, remove the No. 3 brake snap ring from the transmission case.

Text in Illustration

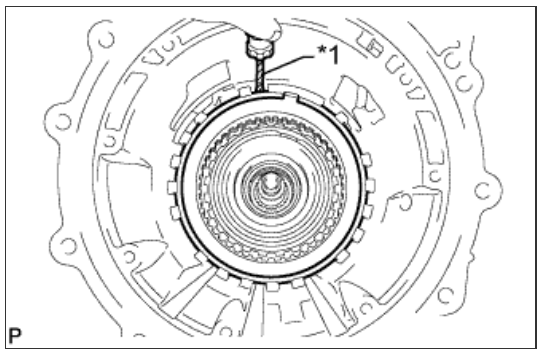
*1	Protective Tape

NOTICE:

Be careful not to damage the transmission case.

HINT:

Wrap the tip of the screwdriver with tape.



60. REMOVE NO. 3 BRAKE DISC SET

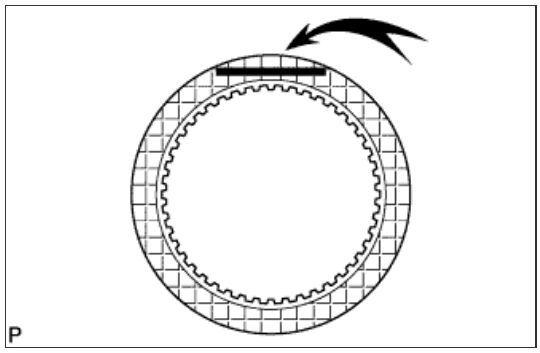
a. Remove the 2 flanges, 4 discs and 3 plates from the transmission case.

61. INSPECT NO. 3 BRAKE DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) grooves or printed numbers have even a little bit of damage.

NOTICE:

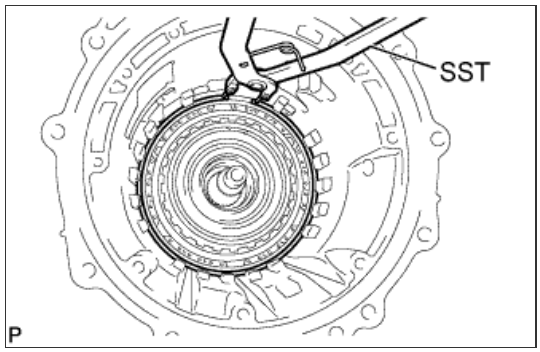
Before assembling new discs, soak them in ATF for at least 2 hours.



62. REMOVE NO. 3 BRAKE PISTON HOLE SNAP RING

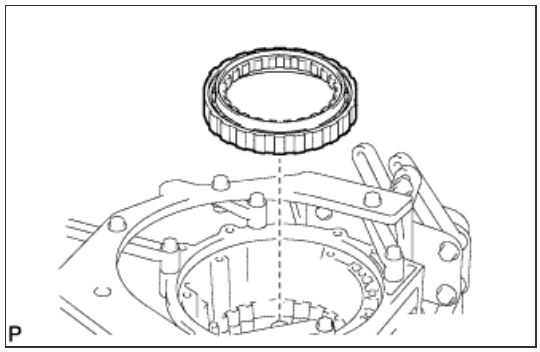
a. Using SST, remove the snap ring.

SST
09350-30020 (09350-07060)



63. REMOVE NO. 3 BRAKE CYLINDER WITH NO. 3 BRAKE PISTON AND NO. 3 BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

a. Remove the No. 3 brake cylinder with the No. 3 brake piston and No. 3 brake piston return spring from the transmission case.

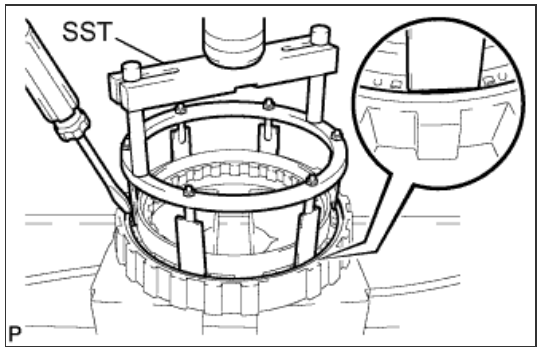


64. REMOVE NO. 3 BRAKE PISTON

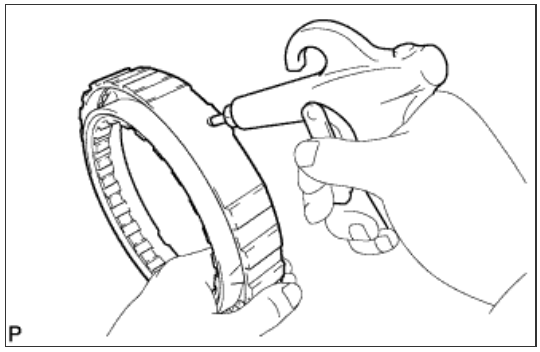
a. Using SST and a press, compress the No. 3 brake piston return spring and remove the snap ring and No. 3 brake piston return spring with a screwdriver.

SST

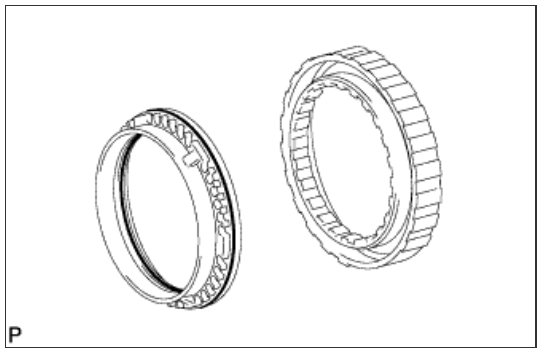
09380-60010 (09381-06020, 09381-06040, 09381-06060, 09381-06100, 09381-06110)



b. Hold the No. 3 brake piston and apply compressed air (392 kPa, 4.0 kgf/cm ^{2}, 57 psi) to the No. 3 brake cylinder to remove the No. 3 brake piston.



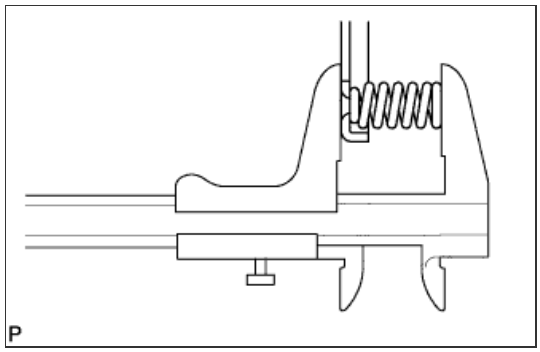
c. Remove the 2 O-rings from the No. 3 brake piston.



65. INSPECT NO. 3 BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

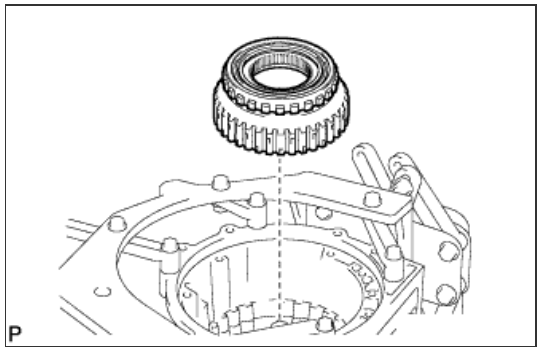
a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
15.72 mm (0.619 in.)



66. REMOVE 1-WAY CLUTCH ASSEMBLY WITH 1-WAY CLUTCH INNER RACE SUB-ASSEMBLY

a. Remove the 1-way clutch assembly with 1-way clutch inner race from the transmission case.

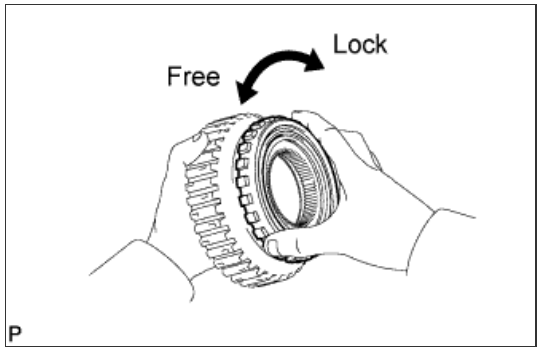


67. INSPECT 1-WAY CLUTCH ASSEMBLY

a. Install the 1-way clutch to the 1-way clutch inner race.

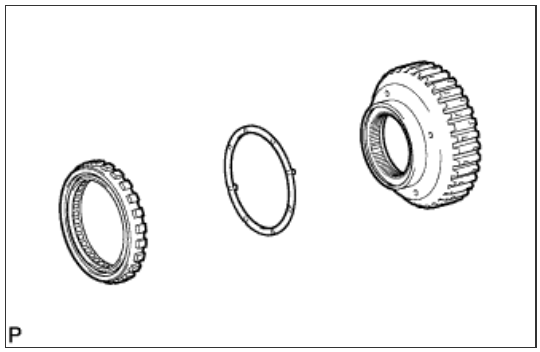
b. Hold the 1-way clutch inner race and turn the 1-way clutch. Check that the 1-way clutch turns freely counterclockwise and locks when turned clockwise.

c. Remove the 1-way clutch from the 1-way clutch inner race.



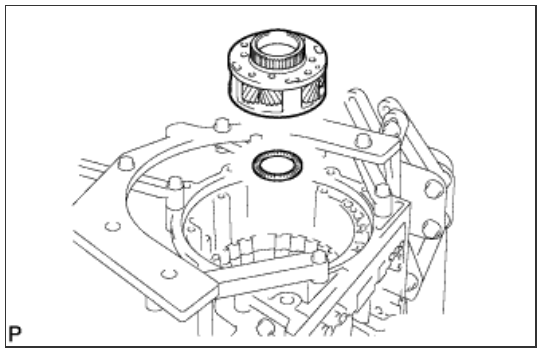
68. REMOVE 1-WAY CLUTCH INNER RACE SUB-ASSEMBLY

a. Separate the 1-way clutch inner race from the 1-way clutch assembly and remove the No. 1 planetary carrier thrust washer.

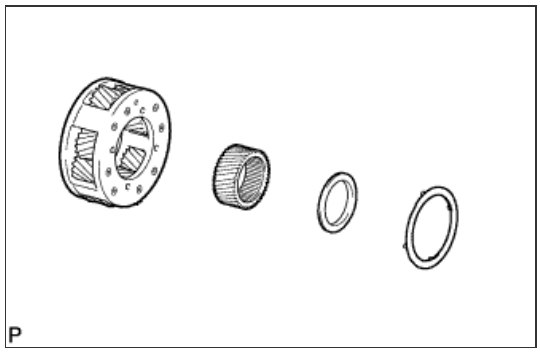


69. REMOVE FRONT PLANETARY GEAR ASSEMBLY

a. Remove the front planetary gear assembly and thrust needle roller bearing from the transmission case.



b. Remove the No. 2 planetary carrier thrust washer, thrust bearing race and front planetary sun gear from the front planetary gear assembly.

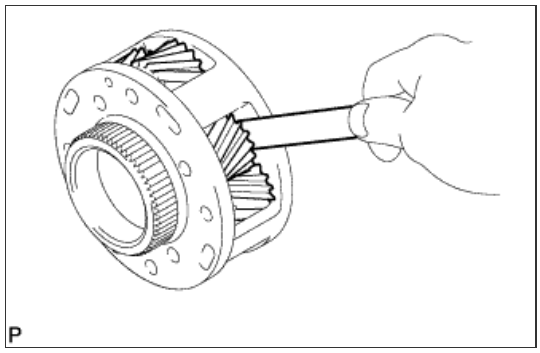


70. INSPECT FRONT PLANETARY GEAR ASSEMBLY

a. Using a feeler gauge, measure the front planetary pinion gear thrust clearance.

Standard clearance:
0.2 to 0.6 mm (0.00787 to 0.0236 in.)

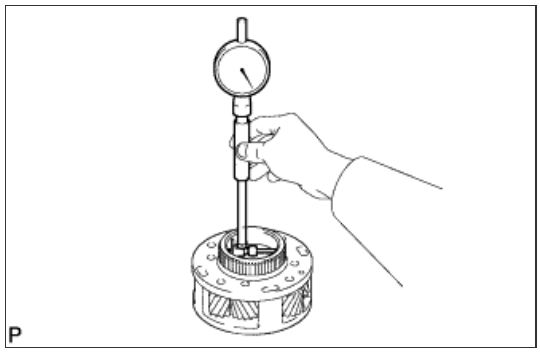
If the clearance is more than the standard, replace the front planetary gear assembly.



b. Using a cylinder gauge, measure the inside diameter of the front planetary gear bush.

Standard inside diameter:
61.005 to 61.030 mm (2.402 to 2.403 in.)

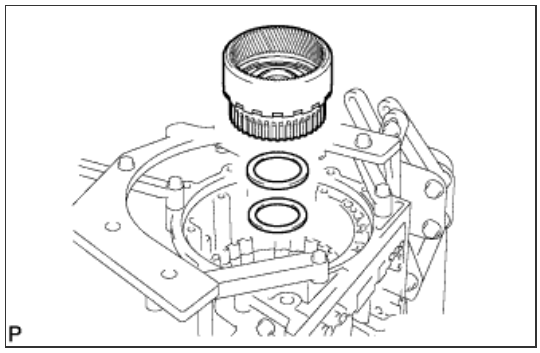
If the inside diameter is more than the standard, replace the front planetary gear.



71. REMOVE FRONT PLANETARY RING GEAR WITH FRONT PLANETARY RING GEAR FLANGE SUB-ASSEMBLY AND CENTER PLANETARY RING GEAR

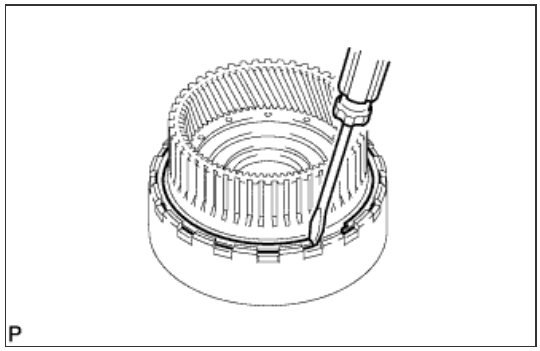
a. Remove the front planetary ring gear together with the front planetary ring gear flange and center planetary ring gear from the transmission case.

b. Remove the thrust needle roller bearing and thrust bearing race.

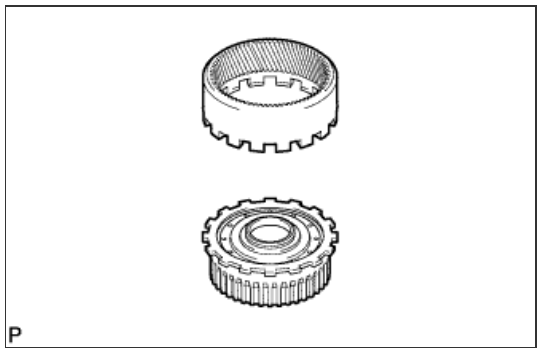


72. REMOVE FRONT PLANETARY RING GEAR

a. Using a screwdriver, remove the snap ring.

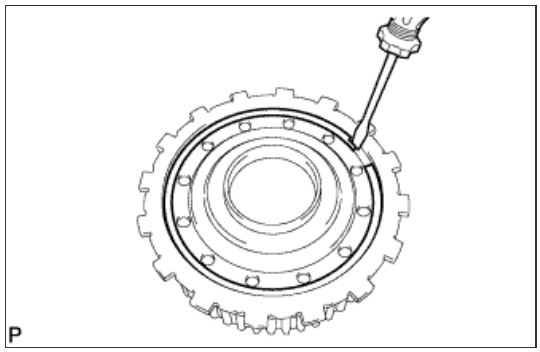


b. Remove the front planetary ring gear from the center planetary ring gear.

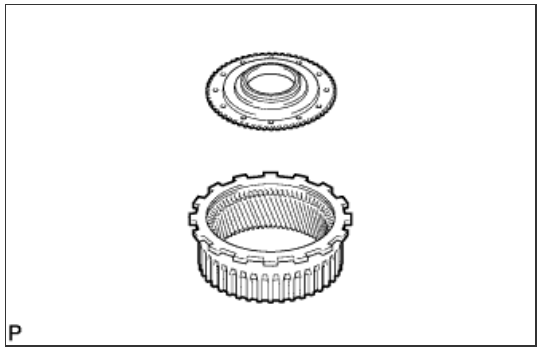


73. REMOVE CENTER PLANETARY RING GEAR

a. Using a screwdriver, remove the snap ring.



b. Remove the center planetary ring gear from the front planetary ring gear flange.



74. REMOVE NO. 1 BRAKE DISC SET

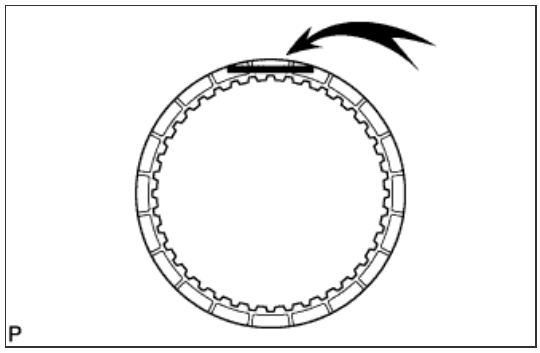
a. Remove the flange, 4 discs and 4 plates from the transmission case.

75. INSPECT NO. 1 BRAKE DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) grooves or printed numbers have even a little bit of damage.

NOTICE:

Before assembling new discs, soak them in ATF for at least 2 hours.



76. REMOVE NO. 1 BRAKE CYLINDER WITH NO. 1 BRAKE PISTON

a. Place SST on the brake piston return spring and compress the brake piston return spring.

SST

09380-60010 (09381-06010, 09381-06020, 09381-06050, 09381-06060, 09381-06090, 09381-06100, 09381-06110, 09381-06120)

b. Using a screwdriver, remove the snap ring from the transmission case.

Text in Illustration

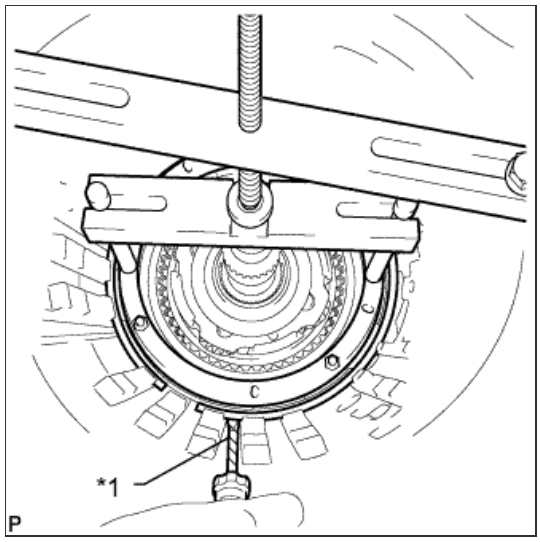
*1	Protective Tape

NOTICE:

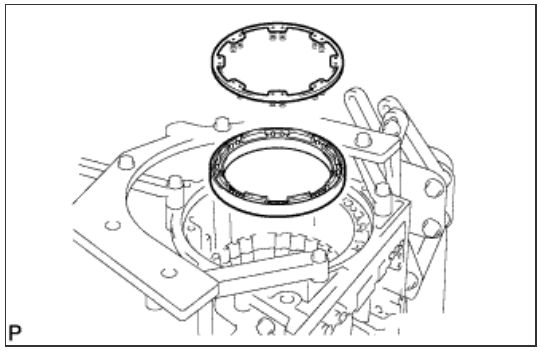
Be careful not to damage the transmission case.

HINT:

Wrap the tip of the screwdriver with tape.



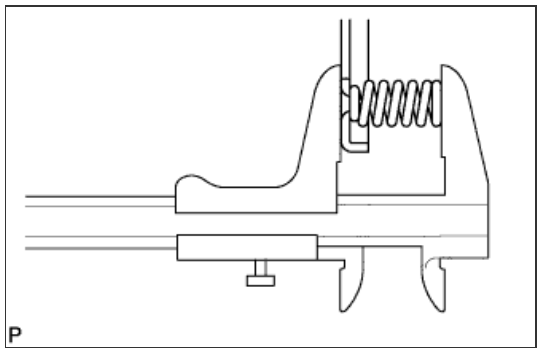
c. Remove the brake piston return spring and No. 1 brake piston with No. 1 brake cylinder from the transmission case.



77. INSPECT BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
17.05 mm (0.671 in.)

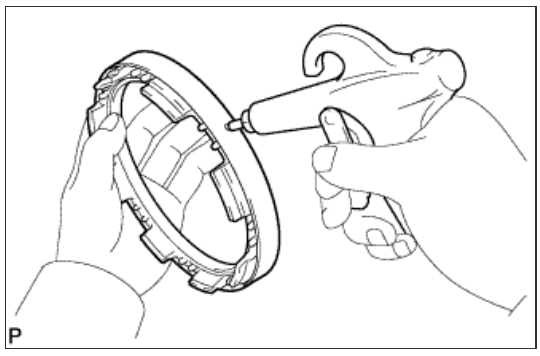


78. REMOVE NO. 1 BRAKE PISTON

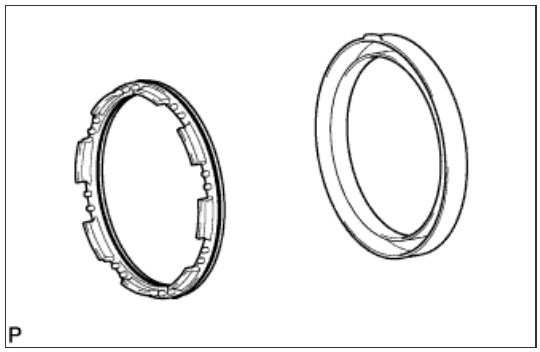
a. Hold the No. 1 brake piston and apply compressed air to the No. 1 brake cylinder to remove the No. 1 brake piston.

HINT:

If the piston does not pop out with compressed air, lift the piston out with needle-nose pliers.

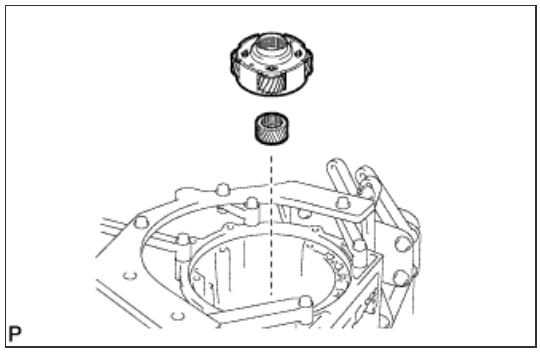


b. Remove the 2 O-rings from the No. 1 brake piston.



79. REMOVE CENTER PLANETARY GEAR ASSEMBLY

a. Remove the center planetary gear assembly and center planetary sun gear from the transmission case.

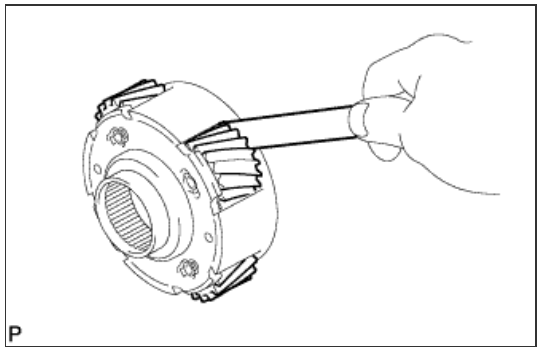


80. INSPECT CENTER PLANETARY GEAR ASSEMBLY

a. Using a feeler gauge, measure the center planetary pinion gear thrust clearance.

Standard clearance:
0.20 to 0.60 mm (0.00787 to 0.0236 in.)

If the clearance is more than the standard, replace the center planetary gear assembly.



81. REMOVE NO. 2 BRAKE DISC SET

a. Place SST on the flange and compress the No. 2 brake piston return spring.

SST
09380-60010 (09381-06010, 09381-06020, 09381-06050, 09381-06070, 09381-06090, 09381-06120)

b. Using a screwdriver, remove the snap ring from the transmission case.

Text in Illustration

*1	Protective Tape

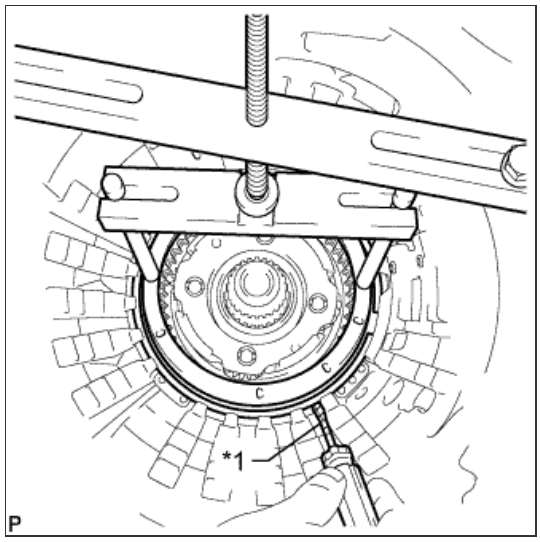
NOTICE:

Be careful not to damage the transmission case.

HINT:

Wrap the tip of the screwdriver with tape.

c. Remove the No. 2 brake flange, flange, 4 discs, 3 plates and No. 2 brake piston return spring from the transmission case.

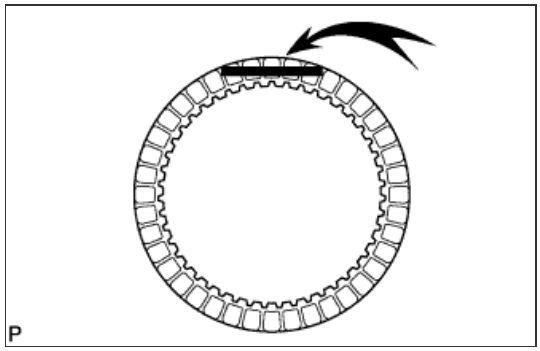


82. INSPECT NO. 2 BRAKE DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) grooves or printed numbers have even a little bit of damage.

NOTICE:

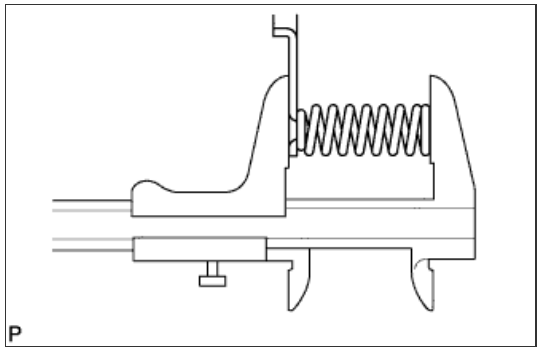
Before assembling new discs, soak them in ATF for at least 2 hours.



83. INSPECT NO. 2 BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

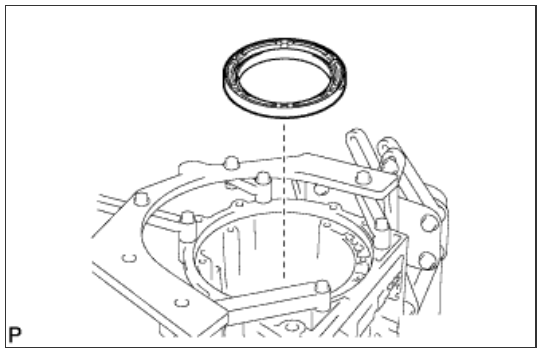
a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
22.66 mm (0.892 in.)



84. REMOVE NO. 2 BRAKE CYLINDER WITH NO. 2 BRAKE PISTON

a. Remove the No. 2 brake cylinder together with the No. 2 brake piston from the transmission case.

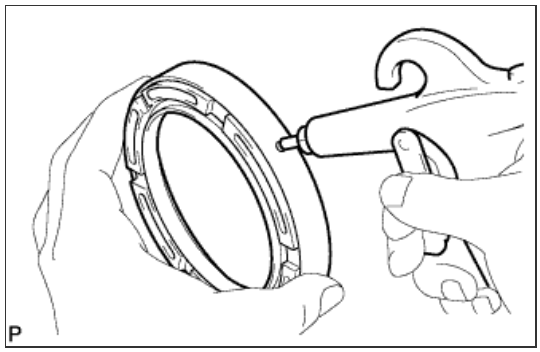


85. REMOVE NO. 2 BRAKE PISTON

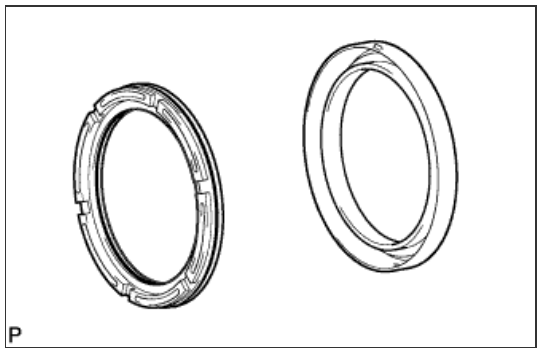
a. Hold the No. 2 brake piston and apply compressed air to the No. 2 brake cylinder to remove the No. 2 brake piston.

HINT:

If the piston does not pop out with compressed air, lift the piston out with needle-nose pliers.



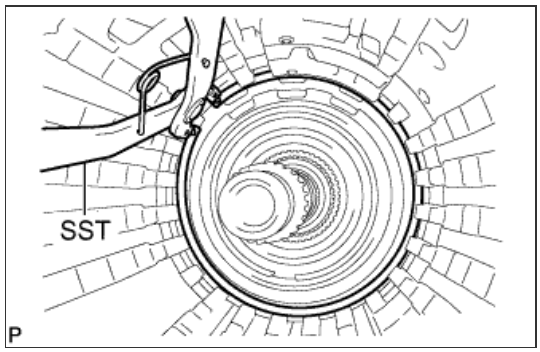
b. Remove the 2 O-rings from the No. 2 brake piston.



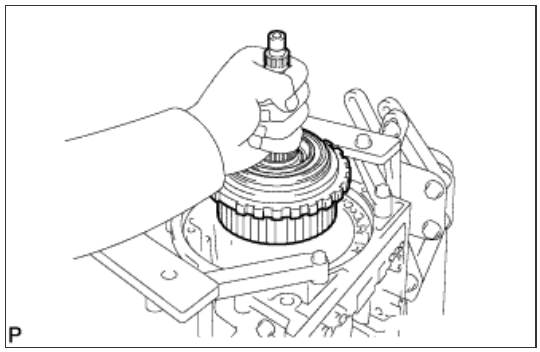
86. REMOVE INTERMEDIATE SHAFT WITH NO. 3 1-WAY CLUTCH ASSEMBLY, REAR PLANETARY RING GEAR FLANGE AND REAR PLANETARY RING GEAR

a. Using SST, remove the snap ring from the transmission case.

SST
09350-30020 (09350-07060)

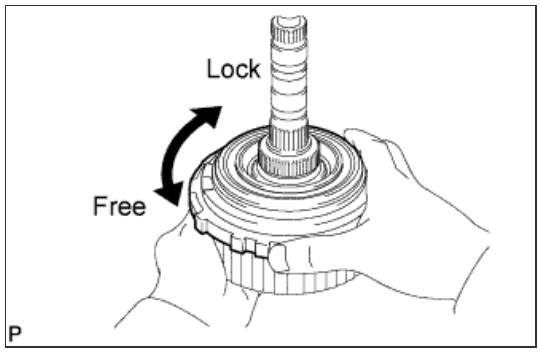


b. Remove the intermediate shaft with No. 3 1-way clutch assembly, rear planetary ring gear flange and rear planetary ring gear from the transmission case.



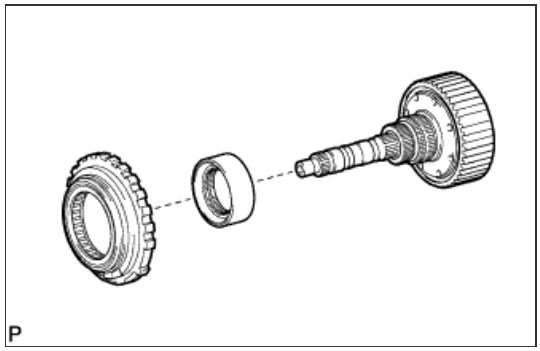
87. INSPECT NO. 3 1-WAY CLUTCH ASSEMBLY

a. Hold the rear planetary ring gear flange and turn the 1-way clutch. Check that the 1-way clutch turns freely counterclockwise and locks when turned clockwise.



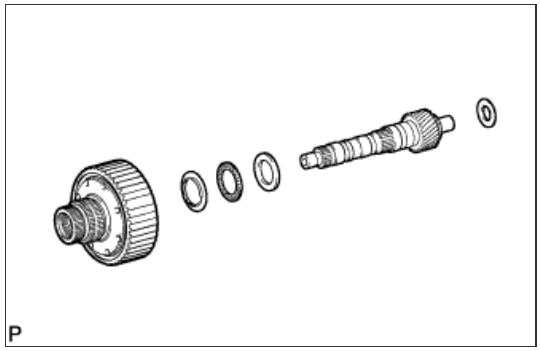
88. REMOVE 1-WAY CLUTCH INNER RACE

a. Remove the No. 3 1-way clutch assembly and 1-way clutch inner race from the intermediate shaft.



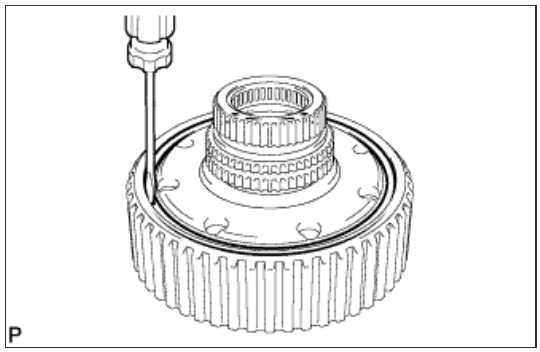
89. REMOVE REAR PLANETARY RING GEAR

a. Remove the rear planetary ring gear with rear planetary ring gear flange, 3 thrust bearing races and thrust needle roller bearing from the intermediate shaft.



b. Using a screwdriver, remove the snap ring.

c. Remove the rear planetary ring gear flange from the rear planetary ring gear.

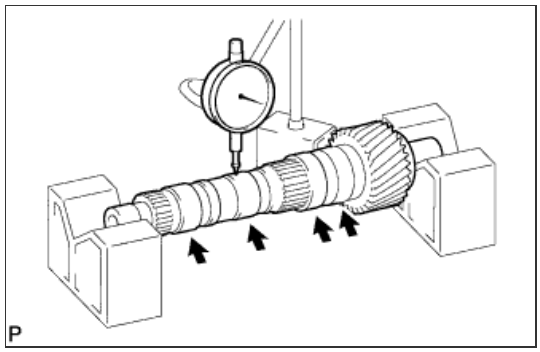


90. INSPECT INTERMEDIATE SHAFT

a. Using a dial indicator, check the intermediate shaft runout.

Standard runout:
0.03 mm (0.00118 in.)

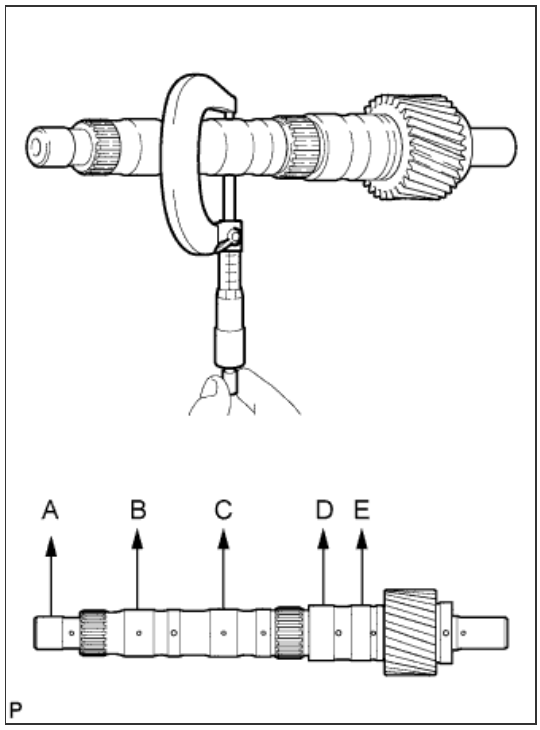
If the runout is more than the standard, replace the intermediate shaft with a new one.



b. Using a micrometer, check the diameter of the intermediate shaft at the positions shown in the diagram.

Standard diameter:
A:
19.963 to 19.976 mm (0.7859 to 0.7865 in.)
B, C:
30.150 to 30.163 mm (1.187 to 1.188 in.)
D, E:
36.404 to 36.420 mm (1.433 to 1.434 in.)

If the diameter is less than the standard, replace the intermediate shaft with a new one.



91. REMOVE NO. 4 BRAKE DISC SET

a. Remove the No. 4 brake flange, flange, 7 No. 4 brake discs and 6 plates from the transmission case.

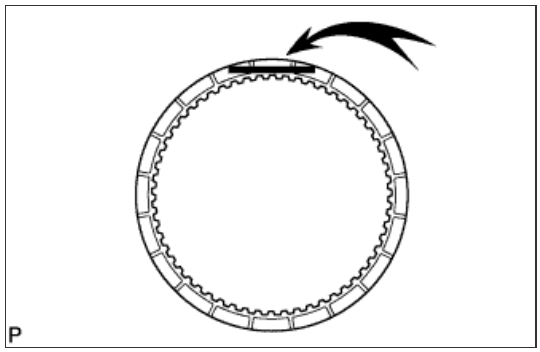
92. INSPECT NO. 4 BRAKE DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3)

grooves or printed numbers have even a little bit of damage.

NOTICE:

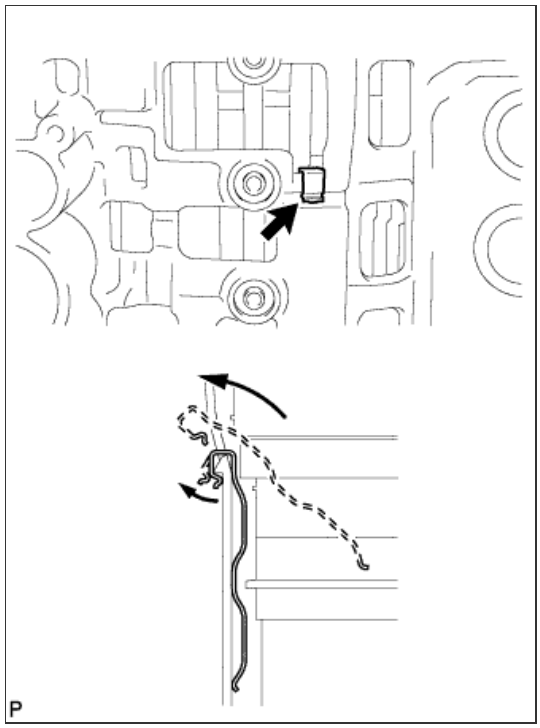
Before assembling new discs, soak them in ATF for at least 2 hours.



93. REMOVE BRAKE PLATE STOPPER SPRING

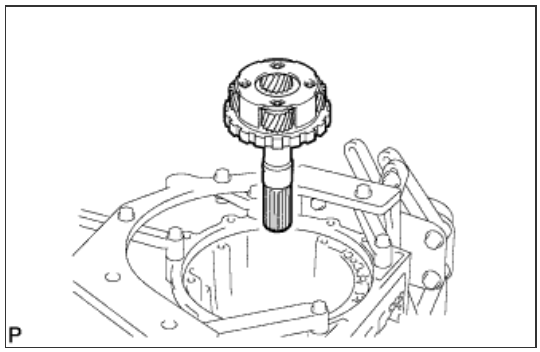
NOTICE:

When removing the brake plate stopper spring, do not apply excessive force and do not deform it.

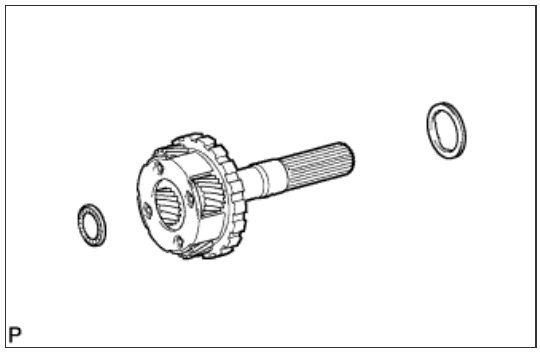


94. REMOVE REAR PLANETARY GEAR ASSEMBLY

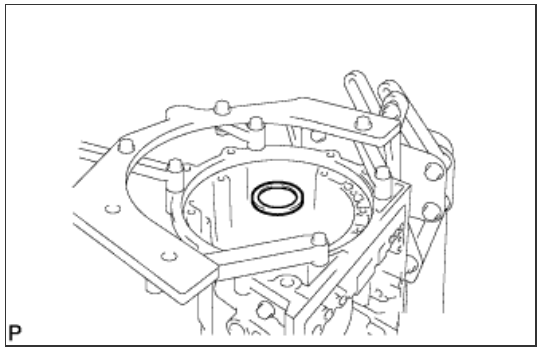
a. Remove the rear planetary gear assembly from the transmission case.



b. Remove the 2 thrust needle roller bearings from the rear planetary gear assembly.



c. Remove the thrust bearing race from the transmission case.

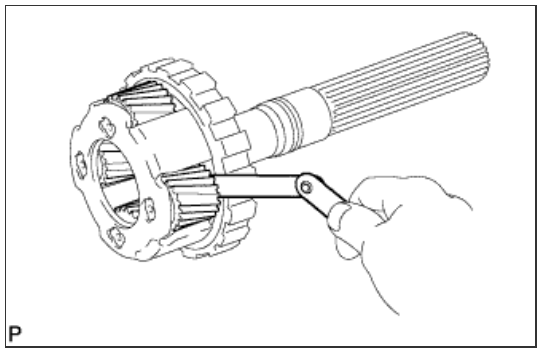


95. INSPECT REAR PLANETARY GEAR ASSEMBLY

a. Using a feeler gauge, measure the rear planetary pinion gear thrust clearance.

Standard clearance:
0.2 to 0.6 mm (0.00787 to 0.0236 in.)

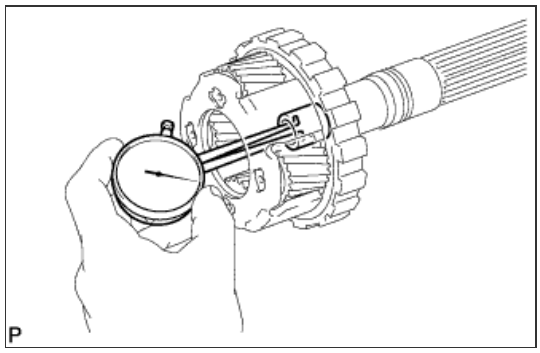
If the clearance is more than the standard, replace the planetary gear assembly.



b. Using a dial indicator, measure the inside diameter of the rear planetary gear bush.

Standard inside diameter:
20.0 to 20.025 mm (0.787 to 0.788 in.)

If the inside diameter is more than the standard, replace the rear planetary gear assembly.



96. REMOVE 1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY

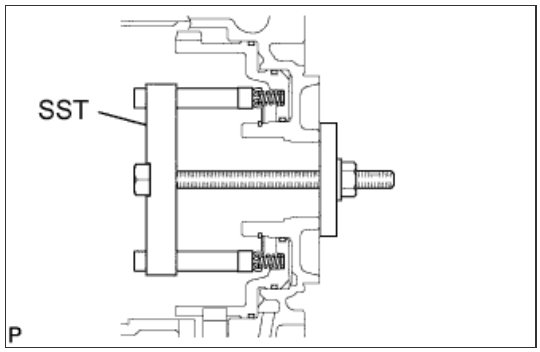
a. Place SST on the 1st and reverse brake return spring and compress the 1st and reverse brake return spring.

SST
09380-60010 (09381-06030, 09381-06040, 09381-06080, 09381-06120, 09381-06130, 09381-05040, 09381-05050)

b. Using SST, remove the snap ring and 1st and reverse brake return spring.

SST

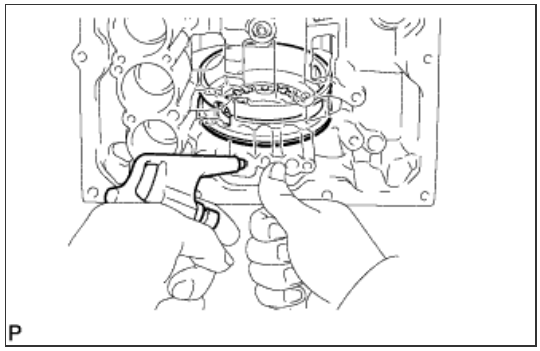
09350-30020 (09350-07070)



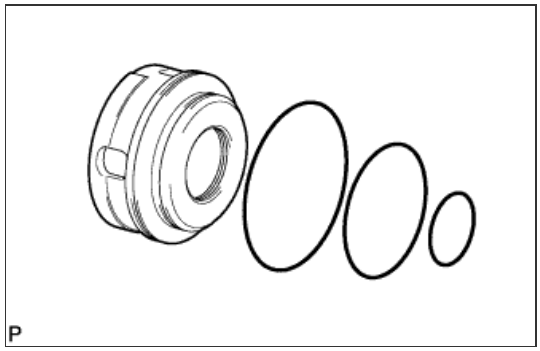
c. Hold the 1st and reverse brake piston and apply compressed air (392 kPa, 4.0 kgf/cm^2, 57 psi) to the transmission case to remove the 1st and reverse brake piston.

HINT:

If the piston does not pop out with compressed air, lift the piston out with needle-nose pliers.



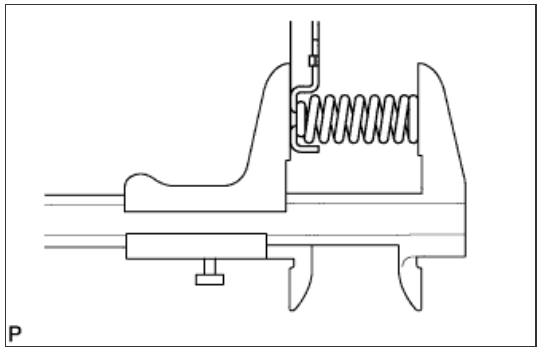
d. Remove the 3 O-rings from the 1st and reverse brake piston.



97. INSPECT 1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY

a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
23.54 to 23.94 mm (0.927 to 0.943 in.)



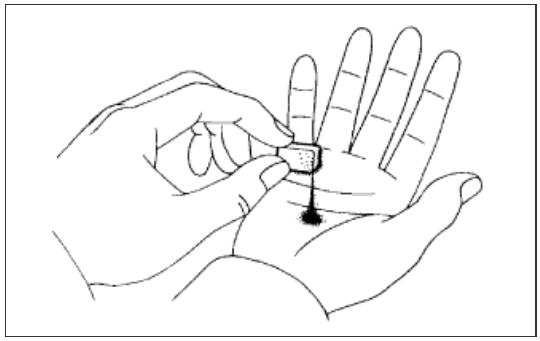
for Preparation Click here

1. INSPECT AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY

a. Remove the magnets, and use them to collect steel particles.

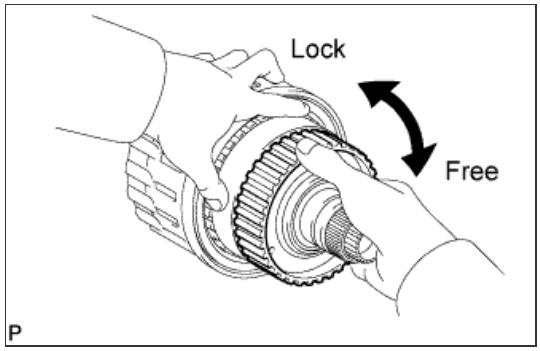
b. Carefully look at the foreign matter and particles in the pan and on the magnets to anticipate the type of wear you will find in the transmission.

- Steel (magnetic): bearing, gear and clutch plate wear
- Brass (non-magnetic): bush wear



2. INSPECT NO. 2 1-WAY CLUTCH ASSEMBLY

a. Hold the reverse clutch hub and turn the 1-way clutch assembly. Check that the 1-way clutch turns freely clockwise and locks when turned counterclockwise.

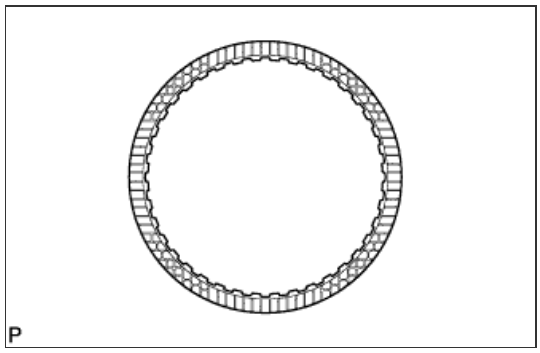


3. INSPECT REAR CLUTCH DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) grooves have even a little bit of damage.

NOTICE:

Before assembling new discs, soak them in ATF for at least 2 hours.

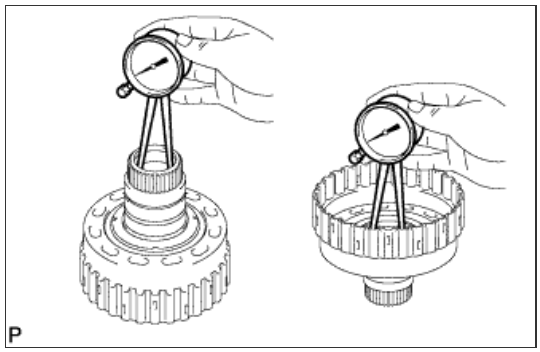


4. INSPECT REVERSE CLUTCH HUB SUB-ASSEMBLY

a. Using a dial indicator, measure the inside diameter of the reverse clutch hub bush.

Standard inside diameter:
41.912 to 41.937 mm (1.410 to 1.411 in.)

If the inside diameter is more than the standard, replace the reverse clutch hub.

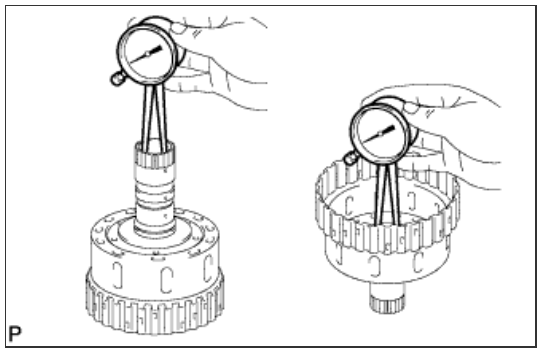


5. INSPECT FORWARD CLUTCH HUB SUB-ASSEMBLY

a. Using a dial indicator, measure the inside diameter of the forward clutch hub bush.

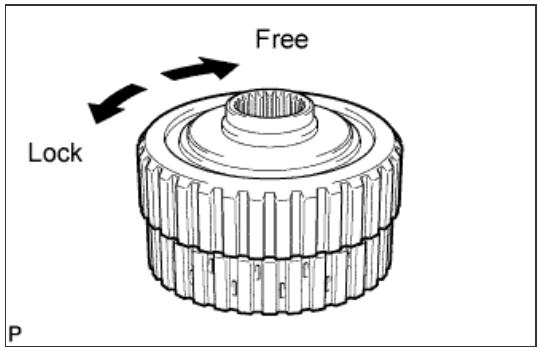
Standard inside diameter:
30.200 to 30.225 mm (1.189 to 1.190 in.)

If the inside diameter is more than the standard, replace the forward clutch hub.



6. INSPECT NO. 4 1-WAY CLUTCH ASSEMBLY

a. Hold the coast clutch hub and turn the 1-way clutch assembly. Check that the 1-way clutch turns freely clockwise and locks when turned counterclockwise.

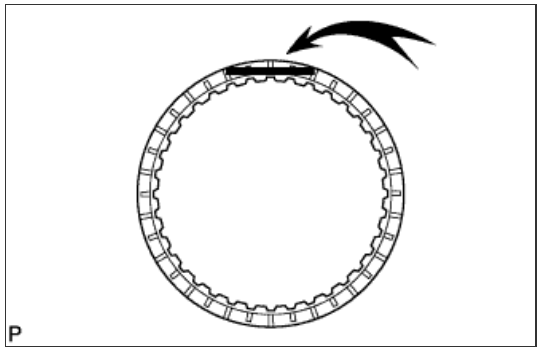


7. INSPECT FORWARD MULTIPLE DISC CLUTCH DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) grooves or printed numbers have even a little bit of damage.

NOTICE:

Before assembling new discs, soak them in ATF for at least 2 hours.

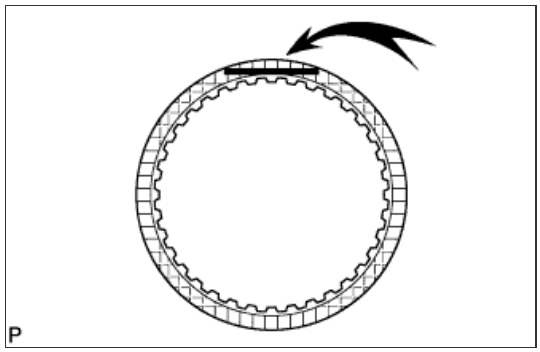


8. INSPECT COAST CLUTCH DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) grooves or printed numbers have even a little bit of damage.

NOTICE:

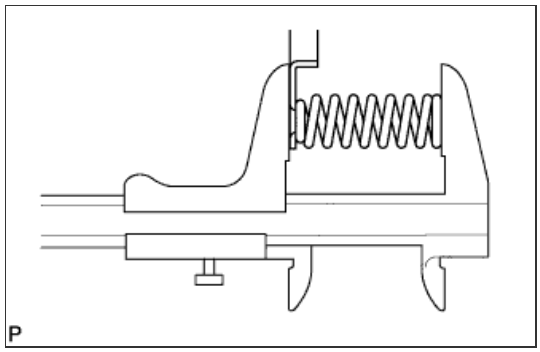
Before assembling new discs, soak them in ATF for at least 2 hours.



9. INSPECT FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY

a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
29.65 mm (1.17 in.)

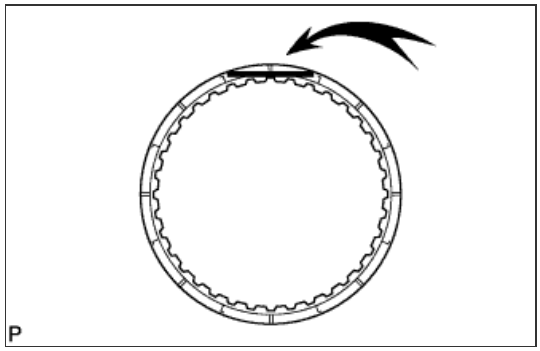


10. INSPECT DIRECT CLUTCH DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) grooves or printed numbers have even a little bit of damage.

NOTICE:

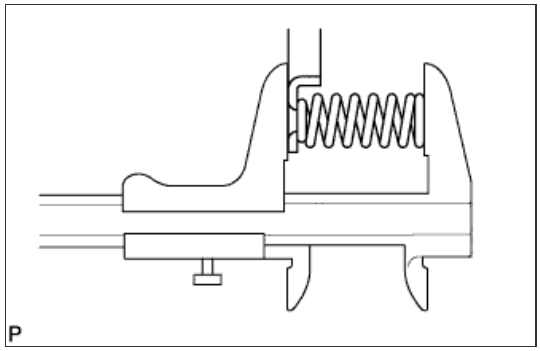
Before assembling new discs, soak them in ATF for at least 2 hours.



11. INSPECT REVERSE CLUTCH RETURN SPRING SUB-ASSEMBLY

a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

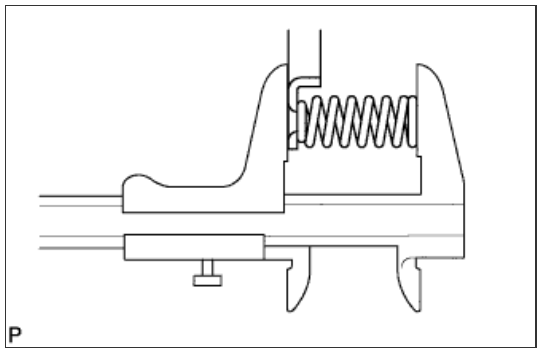
Standard free length:
21.24 mm (0.836 in.)



12. INSPECT DIRECT CLUTCH RETURN SPRING SUB-ASSEMBLY

a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
19.46 mm (0.766 in.)

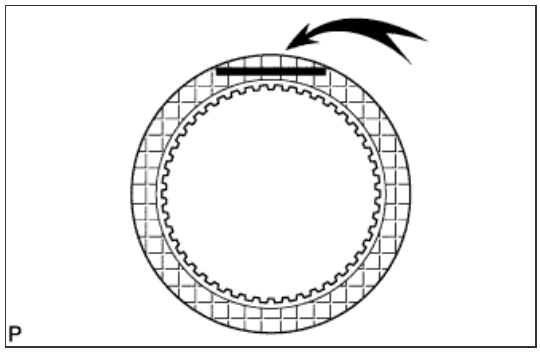


13. INSPECT NO. 3 BRAKE DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) grooves or printed numbers have even a little bit of damage.

NOTICE:

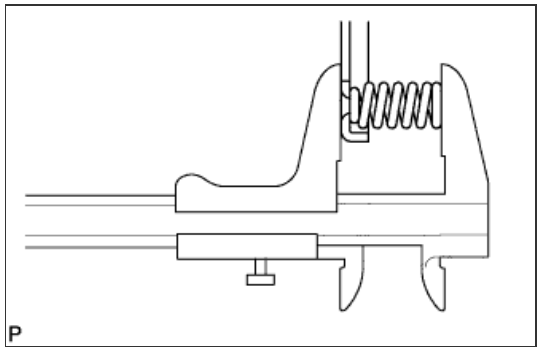
Before assembling new discs, soak them in ATF for at least 2 hours.



14. INSPECT NO. 3 BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
15.72 mm (0.619 in.)

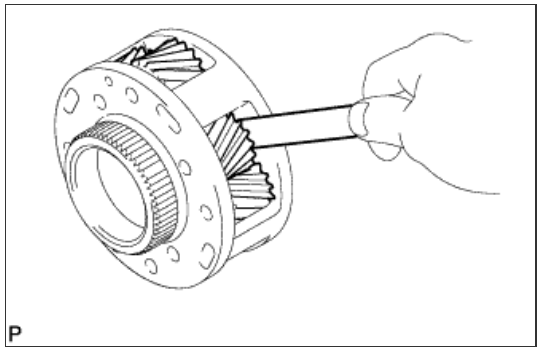


15. INSPECT FRONT PLANETARY GEAR ASSEMBLY

a. Using a feeler gauge, measure the front planetary pinion gear thrust clearance.

Standard clearance:
0.2 to 0.6 mm (0.00787 to 0.0236 in.)

If the clearance is more than the standard, replace the front planetary gear assembly.

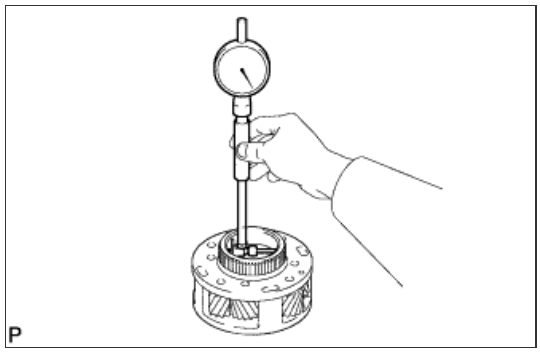


b. Using a cylinder gauge, measure the inside diameter of the front planetary gear bush.

Standard inside diameter:

61.005 to 61.030 mm (2.402 to 2.403 in.)

If the inside diameter is more than the standard, replace the front planetary gear.

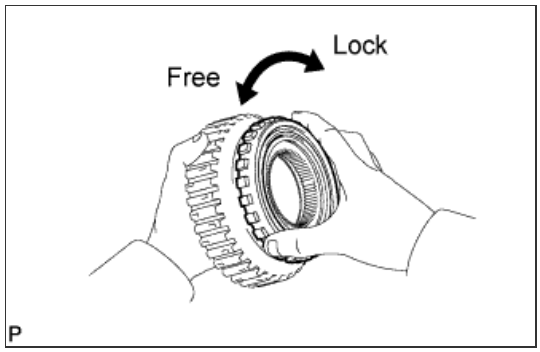


16. INSPECT 1-WAY CLUTCH ASSEMBLY

a. Install the 1-way clutch to the 1-way clutch inner race.

b. Hold the 1-way clutch inner race and turn the 1-way clutch. Check that the 1-way clutch turns freely counterclockwise and locks when turned clockwise.

c. Remove the 1-way clutch from the 1-way clutch inner race.

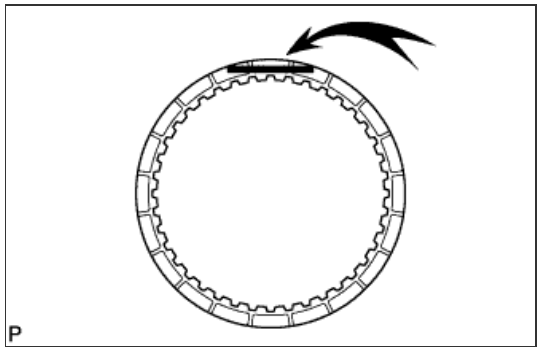


17. INSPECT NO. 1 BRAKE DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) grooves or printed numbers have even a little bit of damage.

NOTICE:

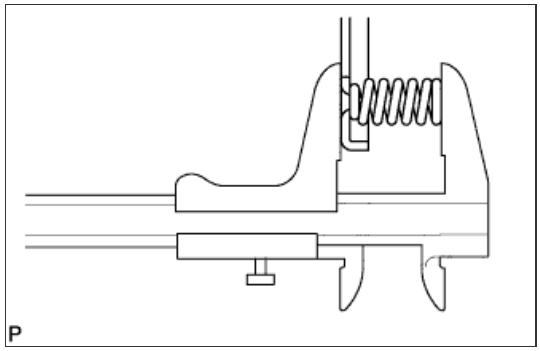
Before assembling new discs, soak them in ATF for at least 2 hours.



18. INSPECT BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
17.05 mm (0.671 in.)

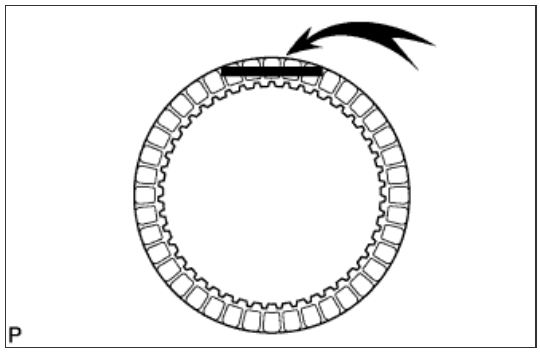


19. INSPECT NO. 2 BRAKE DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) grooves or printed numbers have even a little bit of damage.

NOTICE:

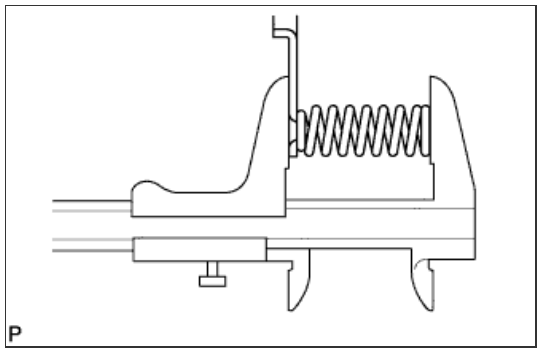
Before assembling new discs, soak them in ATF for at least 2 hours.



20. INSPECT NO. 2 BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
22.66 mm (0.892 in.)

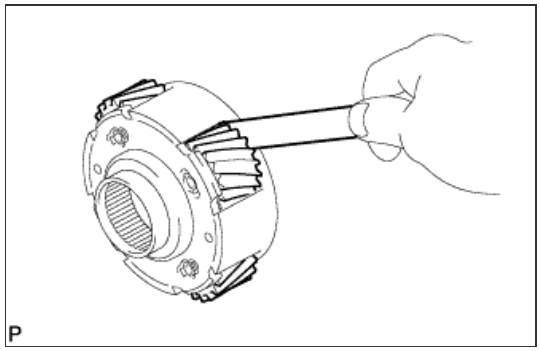


21. INSPECT CENTER PLANETARY GEAR ASSEMBLY

a. Using a feeler gauge, measure the center planetary pinion gear thrust clearance.

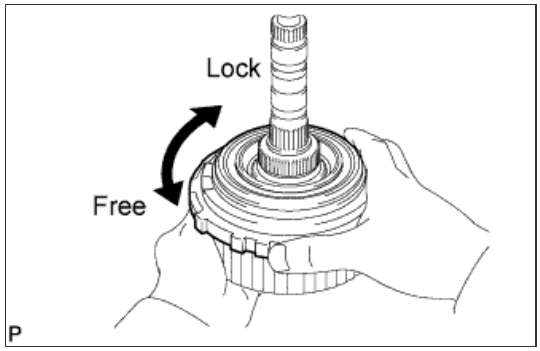
Standard clearance:
0.20 to 0.60 mm (0.00787 to 0.0236 in.)

If the clearance is more than the standard, replace the center planetary gear assembly.



22. INSPECT NO. 3 1-WAY CLUTCH ASSEMBLY

a. Hold the rear planetary ring gear flange and turn the 1-way clutch. Check that the 1-way clutch turns freely counterclockwise and locks when turned clockwise.

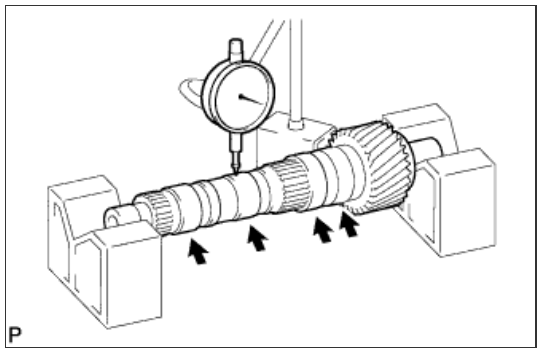


23. INSPECT INTERMEDIATE SHAFT

a. Using a dial indicator, check the intermediate shaft runout.

Standard runout:
0.03 mm (0.00118 in.)

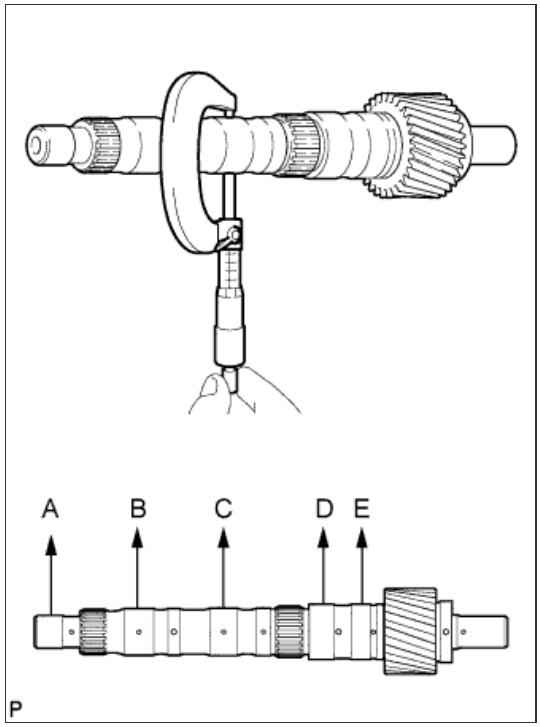
If the runout is more than the standard, replace the intermediate shaft with a new one.



b. Using a micrometer, check the diameter of the intermediate shaft at the positions shown in the diagram.

Standard diameter:
A:
19.963 to 19.976 mm (0.7859 to 0.7865 in.)
B, C:
30.150 to 30.163 mm (1.187 to 1.188 in.)
D, E:
36.404 to 36.420 mm (1.433 to 1.434 in.)

If the diameter is less than the standard, replace the intermediate shaft with a new one.

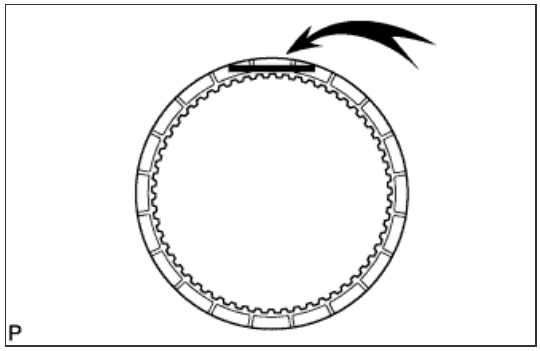


24. INSPECT NO. 4 BRAKE DISC

a. Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) grooves or printed numbers have even a little bit of damage.

NOTICE:

Before assembling new discs, soak them in ATF for at least 2 hours.

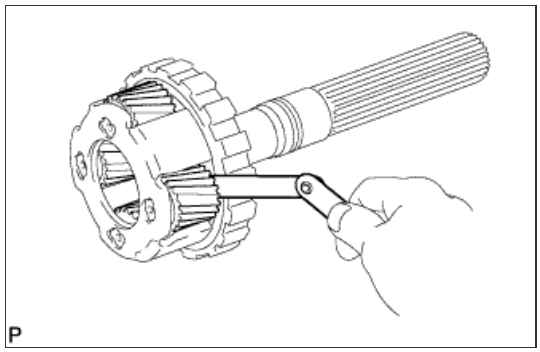


25. INSPECT REAR PLANETARY GEAR ASSEMBLY

a. Using a feeler gauge, measure the rear planetary pinion gear thrust clearance.

Standard clearance:
0.2 to 0.6 mm (0.00787 to 0.0236 in.)

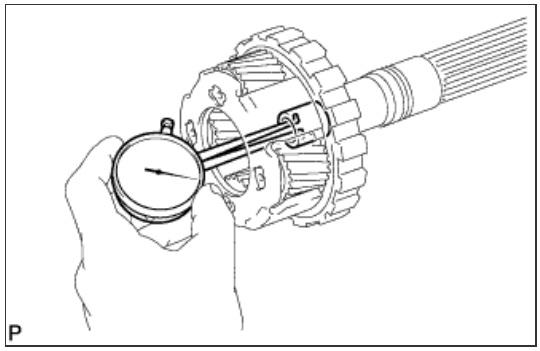
If the clearance is more than the standard, replace the planetary gear assembly.



b. Using a dial indicator, measure the inside diameter of the rear planetary gear bush.

Standard inside diameter:
20.0 to 20.025 mm (0.787 to 0.788 in.)

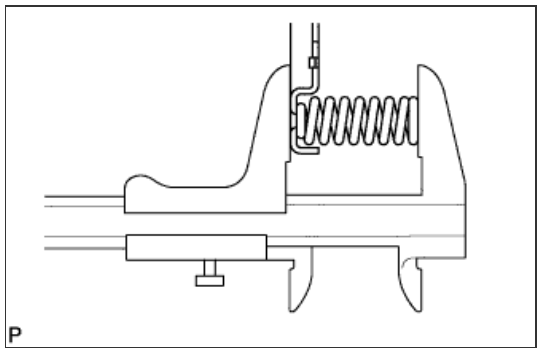
If the inside diameter is more than the standard, replace the rear planetary gear assembly.



26. INSPECT 1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY

a. Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:
23.54 to 23.94 mm (0.927 to 0.943 in.)



27. INSPECT INDIVIDUAL PISTON OPERATION

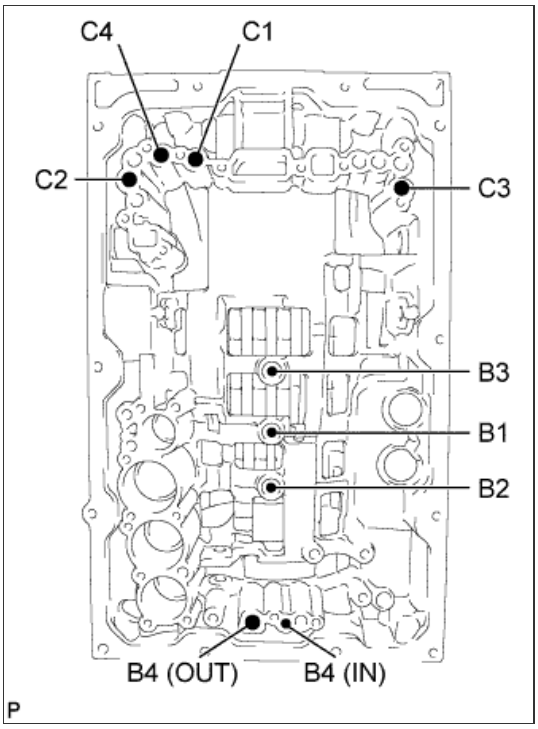
a. Check the operating sound while applying compressed air into the oil holes indicated in the illustration.

HINT:

When inspecting the direct clutch, check with the accumulator piston holes indicated in the illustration.

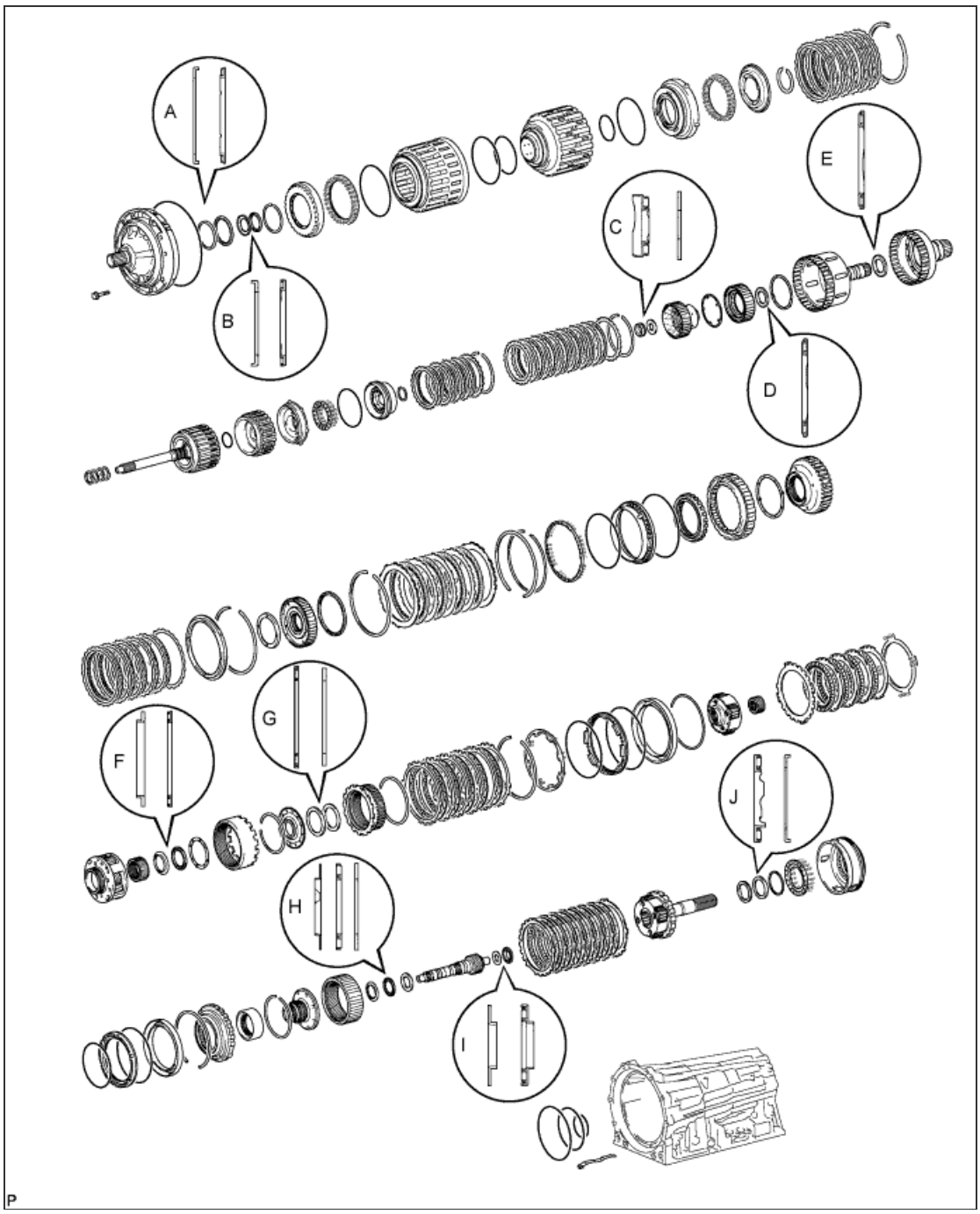
If there is no sound, disassemble and check the installation condition of the parts.

1. No. 2 clutch (C2)
2. No. 3 clutch (C3)
3. No. 4 clutch (C4)
4. No. 1 clutch (C1)
5. No. 3 brake (B3)
6. No. 1 brake (B1)
7. No. 2 brake (B2)
8. No. 4 brake (B4)


C4
C1
C2
C3
B3
B1
B2
B4 (OUT)
B4 (IN)
P

for Preparation Click here

1. BEARING POSITION



Bearing and Race Diameter:

Mark	Front Race Diameter Inside / Outside	Thrust Bearing Diameter Inside / Outside	Rear Race Diameter Inside / Outside
A	74.26 to 74.56 mm (2.92 to 2.94 in.) / 87.39 to 87.74 mm (3.44 to 3.45 in.)	71.96 to 72.26 mm (2.83 to 2.84 in.) / 85.25 to 85.6 mm (3.36 to 3.37 in.)	-
B	38.0 to 38.3 mm (1.50 to 1.51 in.) / 53.9 to 54.1 mm (2.12 to 2.13 in.)	36.45 to 36.7 mm (1.44 to 1.45 in.) / 52.96 to 53.26 mm (2.09 to 2.10 in.)	-

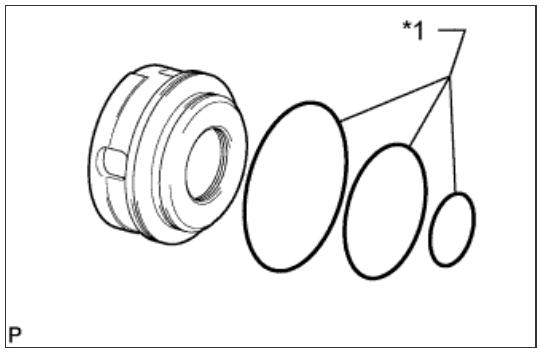
C	-	21.05 to 21.3 mm (0.829 to 0.839 in.) / 39.63 to 39.88 mm (1.56 to 1.57 in.)	22.8 to 23.1 mm (0.898 to 0.909 in.) / 44.5 to 44.75 mm (1.75 to 1.76 in.)
D	-	39.45 to 39.7 mm (1.55 to 1.56 in.) / 60.5 to 60.75 mm (2.38 to 2.39 in.)	-
E	-	46.45 to 46.7 mm (1.83 to 1.84 in.) / 64.3 to 64.55 mm (2.53 to 2.54 in.)	-
F	55.0 to 55.2 mm (2.165 to 2.173 in.) / 68.8 to 69.3 mm (2.71 to 2.73 in.)	54.55 to 54.8 mm (2.15 to 2.16 in.) / 70.0 to 70.5 mm (2.76 to 2.78 in.)	-
G	-	65.35 to 65.6 mm (2.57 to 2.58 in.) / 85.6 to 85.95 mm (3.37 to 3.38 in.)	62.85 to 63.1 mm (2.47 to 2.48 in.) / 82.3 to 82.6 mm (3.24 to 3.25 in.)
H	39.67 to 39.87 mm (1.56 to 1.57 in.) / 56.5 to 57.0 mm (2.22 to 2.24 in.)	36.45 to 36.61 mm (1.437 to 1.441 in.) / 56.62 to 56.92 mm (2.23 to 2.24 in.)	36.45 to 36.7 mm (1.435 to 1.445 in.) / 56.5 to 57.0 mm (2.22 to 2.24 in.)
I	21.05 to 21.3 mm (0.829 to 0.839 in.) / 39.5 to 39.8 mm (1.56 to 1.57 in.)	23.2 to 23.4 mm (0.913 to 0.921 in.) / 43.9 to 44.15 mm (1.73 to 1.74 in.)	-
J	-	43.6 to 43.85 mm (1.72 to 1.73 in.) / 62.3 to 62.8 mm (2.45 to 2.47 in.)	47.15 to 47.4 mm (1.86 to 1.87 in.) / 66.9 to 67.1 mm (2.63 to 2.64 in.)

2. INSTALL 1ST AND REVERSE BRAKE PISTON

a. Coat 3 new O-rings with ATF and install them to the 1st and reverse brake piston.

Text in Illustration

*1	New O-Ring



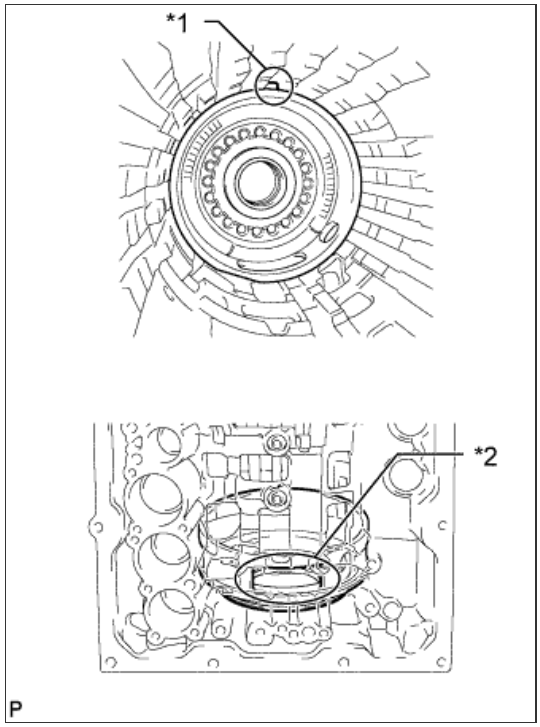
b. Install the 1st and reverse brake piston to the transmission case.

NOTICE:

- **Be careful not to damage the O-ring.**
- **Make sure that the parking hole of the brake piston is on the bottom by engaging the brake piston protrusion and the transmission case spline grooves.**

Text in Illustration

*1	Protrusion
*2	Parking Hole



3. INSTALL 1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY

a. Place the 1st and reverse brake return spring onto the 1st and reverse brake piston.

b. Place SST on the 1st and reverse brake return spring and compress the 1st and reverse brake return spring.

SST

09380-60010 (09381-06030, 09381-06040, 09381-06080, 09381-06120, 09381-06130, 09381-05040, 09381-05050)

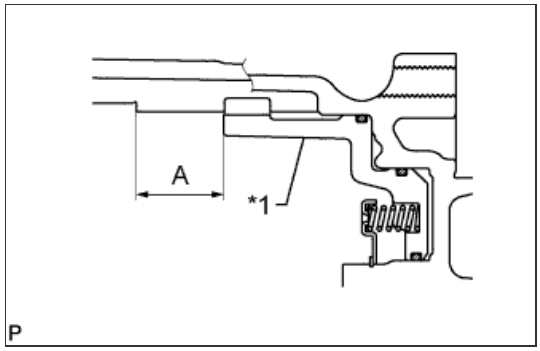
c. Using SST, install the snap ring.

SST

09350-30020 (09350-07070)

4. SELECT NO. 4 BRAKE FLANGE

a. Measure distance A (from the tip of the 1st and reverse brake piston to the step in the transmission case) in the illustration.*1



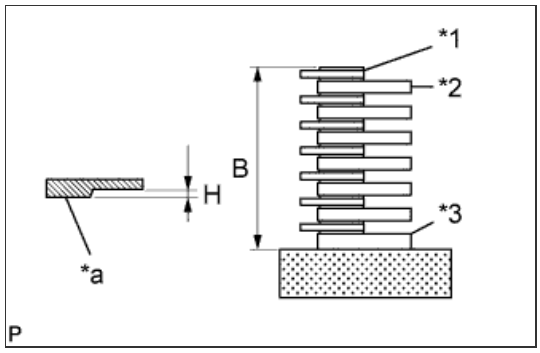
Text in Illustration

*1	Brake Piston

HINT:

Standard distance A: 27.82 to 28.42 mm (1.09 to 1.12 in.)

b. Assemble the flange, No. 4 brake flange, 7 No. 4 brake discs and 6 plates, and measure distance B in the illustration.*2



Text in Illustration

*1	Disc
*2	Plate
*3	Flange
*a	Selected No. 4 brake flange

HINT:

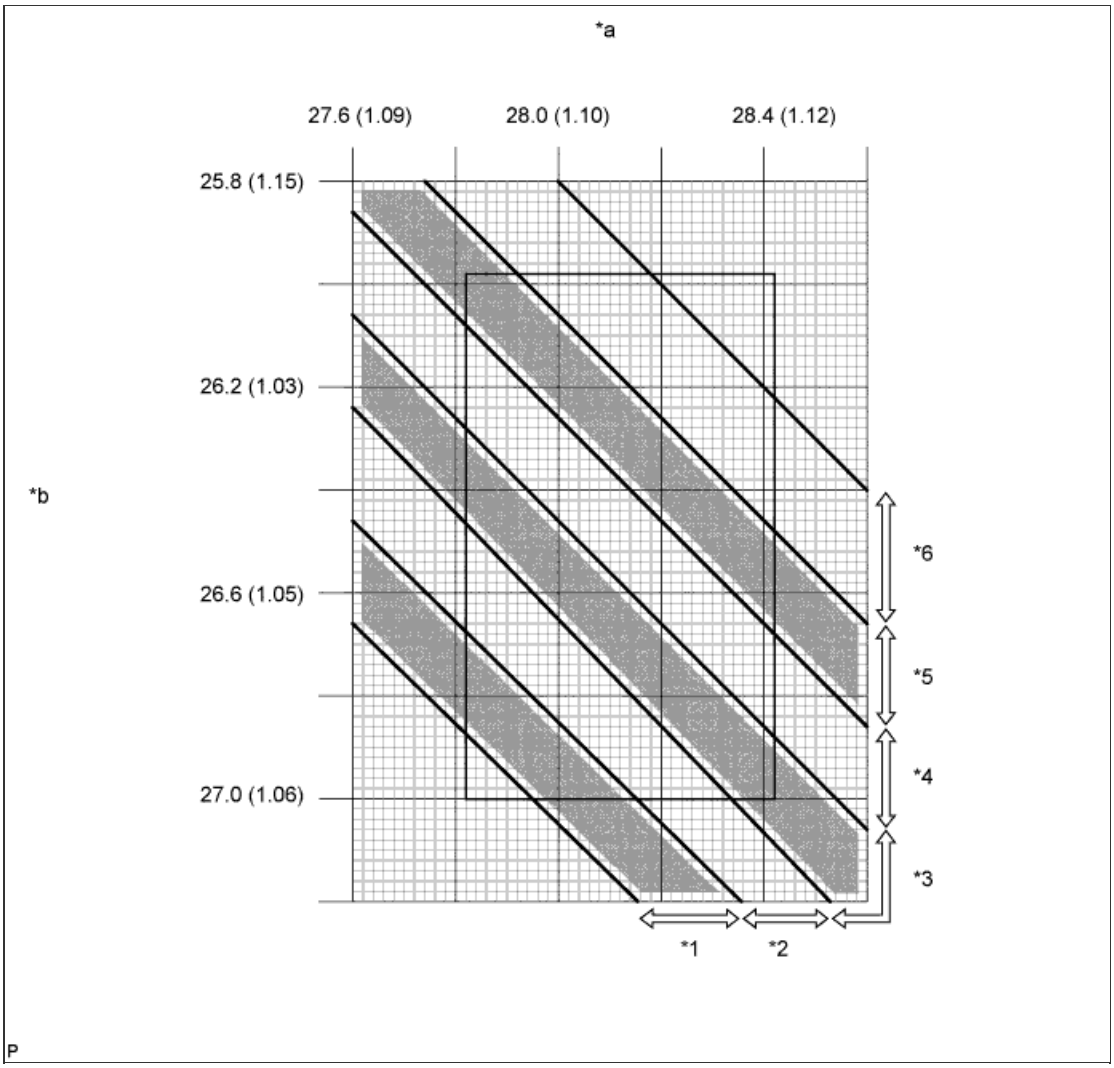
Standard distance B: 25.98 to 27.01 mm (1.02 to 1.06 in.)

c. Apply the A and B measurements taken in *1 and *2 to the graph below. Use A for the X axis and B for the Y axis, and then choose the No. 4 brake flange indicated by the graph point.

d. Measure length H of the selected No. 4 brake flange as shown in the illustration.

HINT:

Make sure that when the B measurement and the H dimension of the selected No. 4 brake flange are subtracted from the A measurement, the value is 0.961 to 1.261 mm (0.0378 to 0.0495 in.).



Text in Illustration

*1	Mark 0	*2	Mark 2
*3	Mark 4	*4	Mark 6
*5	Mark 8	*6	Mark 10
*a	Distance A mm (in.)	*b	Distance B mm (in.)

Selected No. 4 Brake Flange Length H:

Mark	Length H
0	0 mm (0 in.)
2	0.15 to 0.25 mm (0.00590 to 0.00984 in.)
4	0.35 to 0.45 mm (0.0138 to 0.0177 in.)
6	0.55 to 0.65 mm (0.0217 to 0.0256 in.)
8	0.75 to 0.85 mm (0.0295 to 0.0335 in.)
10	0.95 to 1.05 mm (0.0374 to 0.0413 in.)

5. INSTALL REAR PLANETARY GEAR ASSEMBLY

a. Install the thrust bearing race.

Text in Illustration

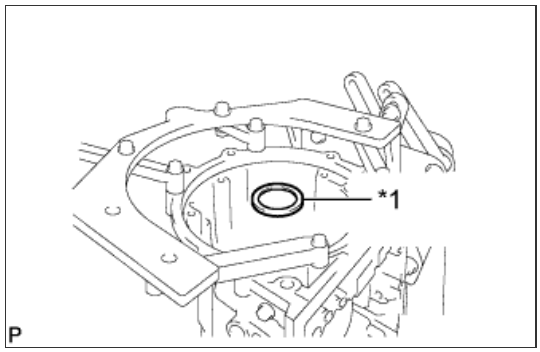
*1	Race J

HINT:

Use a small amount of MP grease to make the thrust bearing race stay securely in place.

Bearing Race Diameter:

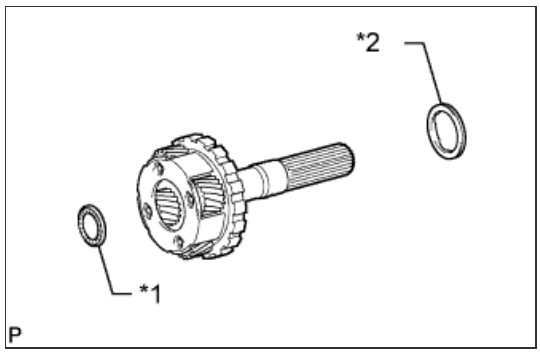
Item	Inside	Outside
Race J	47.15 to 47.4 mm (1.86 to 1.87 in.)	66.9 to 67.1 mm (2.63 to 2.64 in.)



b. Install the 2 thrust needle roller bearings to the rear planetary gear assembly.

Bearing Diameter:

Item	Inside	Outside
Bearing I	23.2 to 23.4 mm (0.913 to 0.921 in.)	43.9 to 44.15 mm (1.73 to 1.74 in.)
Bearing J	43.6 to 43.85 mm (1.72 to 1.73 in.)	62.3 to 62.8 mm (2.45 to 2.47 in.)



Text in Illustration

*1	Bearing I
*2	Bearing J

HINT:

Use a small amount of MP grease to make the thrust needle roller bearings stay securely in place.

c. Install the rear planetary gear assembly.

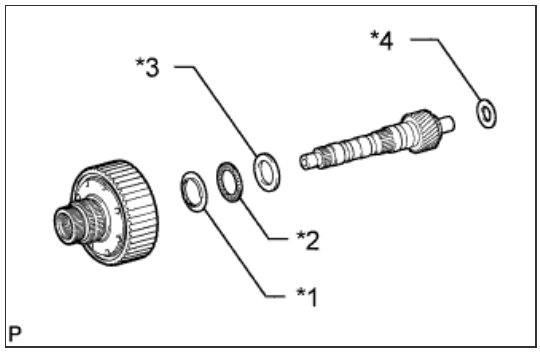
6. INSTALL BRAKE PLATE STOPPER SPRING

7. INSTALL REAR PLANETARY RING GEAR

a. Install the rear planetary ring gear flange to the rear planetary ring gear.

b. Using a screwdriver, install the snap ring.

c. Install the 3 thrust bearing races, thrust needle roller bearing and rear planetary ring gear together with the rear planetary ring gear flange to the intermediate shaft.



Text in Illustration

*1	Front Race H
*2	Bearing H
*3	Rear Race H
*4	Race I

HINT:

Use a small amount of MP grease to make the thrust needle roller bearings and races stay securely in place.

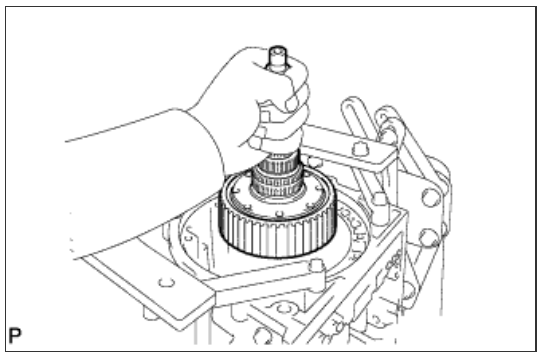
Bearing and Race Diameter:

Item	Inside	Outside
Front race H	39.67 to 39.87 mm (1.56 to 1.57 in.)	56.5 to 57.0 mm (2.22 to 2.24 in.)
Bearing H	36.45 to 36.61 mm (1.437 to 1.441 in.)	56.62 to 56.92 mm (2.23 to 2.24 in.)
Rear race H	36.45 to 36.7 mm (1.435 to 1.445 in.)	56.5 to 57.0 mm (2.22 to 2.24 in.)
	21.05 to 21.3 mm (0.829	39.5 to 39.8 mm (1.56 to

Race I	to 0.839 in.)	1.57 in.)

8. INSTALL INTERMEDIATE SHAFT WITH REAR PLANETARY RING GEAR FLANGE AND REAR PLANETARY RING GEAR

a. Install the intermediate shaft together with the rear planetary ring gear flange and rear planetary ring gear to the transmission case.



9. INSTALL NO. 4 BRAKE DISC

a. Install the flange, 7 discs, 6 plates and selected No. 4 brake flange.

Install in order:
F - D - P - D - P - D - P - D - P - D - P - D - P - D - S/F

HINT:

F = Flange

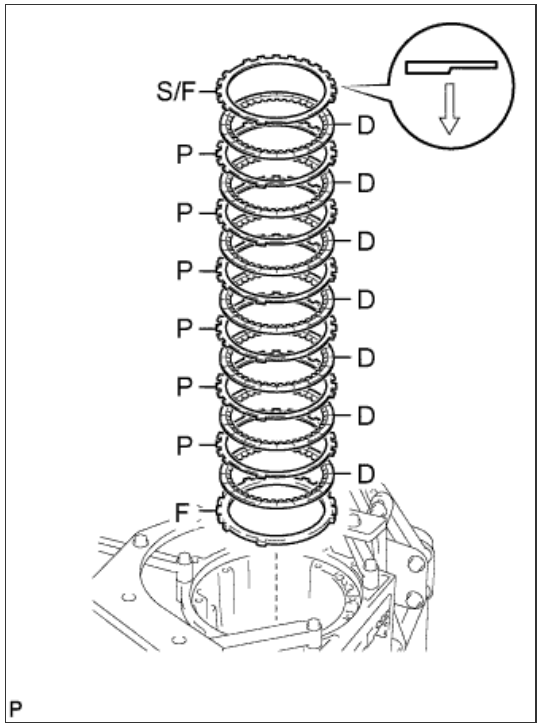
D = Disc

P = Plate

S/F = Selected No. 4 brake flange

NOTICE:

Before assembling new discs, soak them in ATF for at least 2 hours.



10. INSTALL 1-WAY CLUTCH INNER RACE

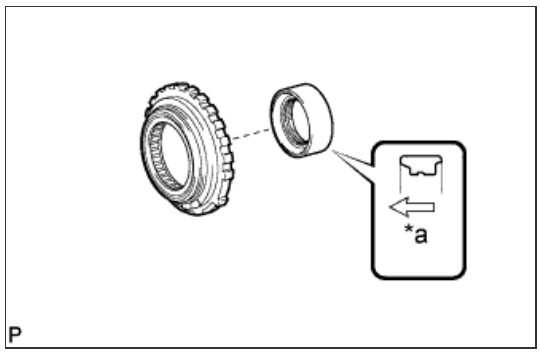
Text in Illustration

*a	Front

a. Install the No. 3 1-way clutch inner race to the No. 3 1-way clutch assembly.

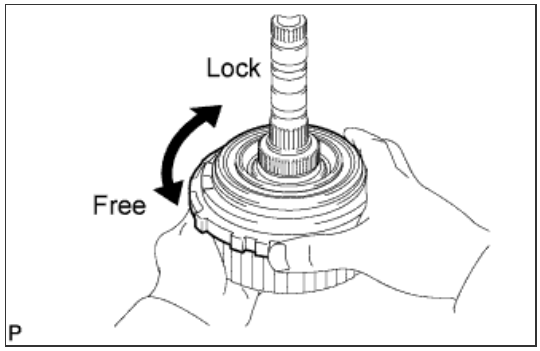
NOTICE:

Be sure to install the 1-way clutch inner race so that it is facing in the proper direction.



11. INSPECT NO. 3 1-WAY CLUTCH ASSEMBLY

a. Hold the rear planetary ring gear flange and turn the 1-way clutch. Check that the 1-way clutch turns freely counterclockwise and locks when turned clockwise.

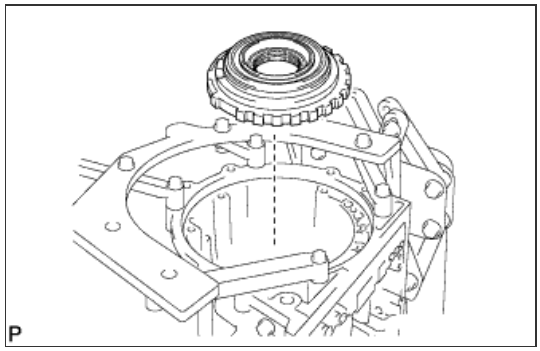


12. INSTALL NO. 3 1-WAY CLUTCH ASSEMBLY

a. Install the No. 3 1-way clutch assembly to the transmission case.

b. Using SST, install the snap ring.

SST
09350-30020 (09350-07060)



13. INSTALL NO. 2 BRAKE PISTON

a. Coat 2 new O-rings with ATF and install them to the No. 2 brake piston.

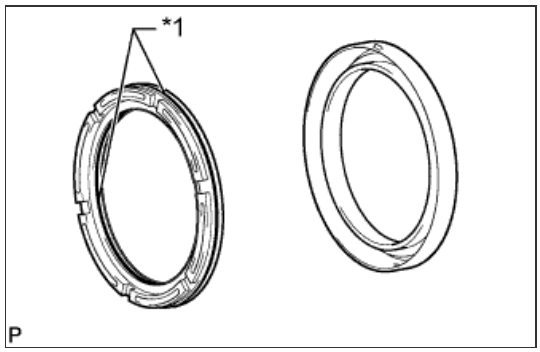
Text in Illustration

*1	New O-ring

b. Press the No. 2 brake piston into the No. 2 brake cylinder with both hands.

NOTICE:

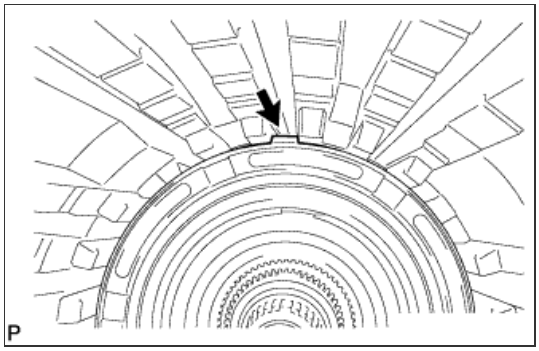
Be careful not to damage the O-rings.



14. INSTALL NO. 2 BRAKE CYLINDER WITH NO. 2 BRAKE PISTON

a. Install the No. 2 brake cylinder with No. 2 brake piston to the transmission case.

NOTICE:



- When installing the No. 2 brake cylinder with No. 2 brake piston to the transmission case, align the cylinder claw with the groove in the top of the case.
- Make sure the No. 2 brake cylinder with No. 2 brake piston is securely inserted into the transmission case.

15. SELECT NO. 2 BRAKE FLANGE

a. Install the No. 2 brake piston return spring and flange to the No. 2 brake piston.

b. Place SST on the No. 2 brake flange and compress the No. 2 brake piston return spring.

SST

09380-60010 (09381-06010, 09381-06020, 09381-06050, 09381-06070, 09381-06090, 09381-06120)

c. Using a screwdriver, install the snap ring to the transmission case.

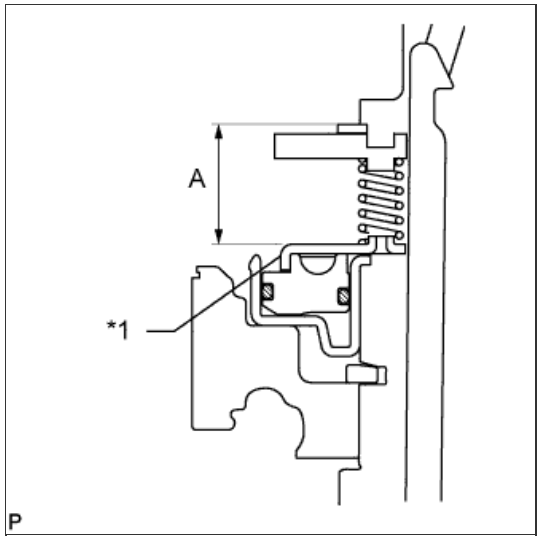
d. Measure distance A (from the top surface of the snap ring to the top surface of the No. 2 brake piston return spring) in the illustration.*1

Text in Illustration

*1	No. 2 Brake Piston Return Spring

HINT:

Standard distance A: 21.00 to 21.76 mm (0.834 to 0.857 in.)



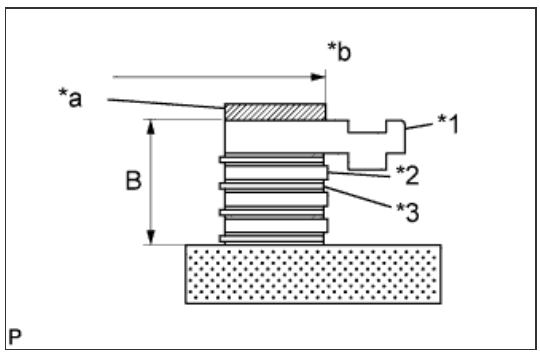
e. Assemble the 4 discs, 3 plates and flange as shown in the illustration. Then, with a fixture of 165.2 mm (6.50 in.) or less placed on the flange, measure distance B.*2

Text in Illustration

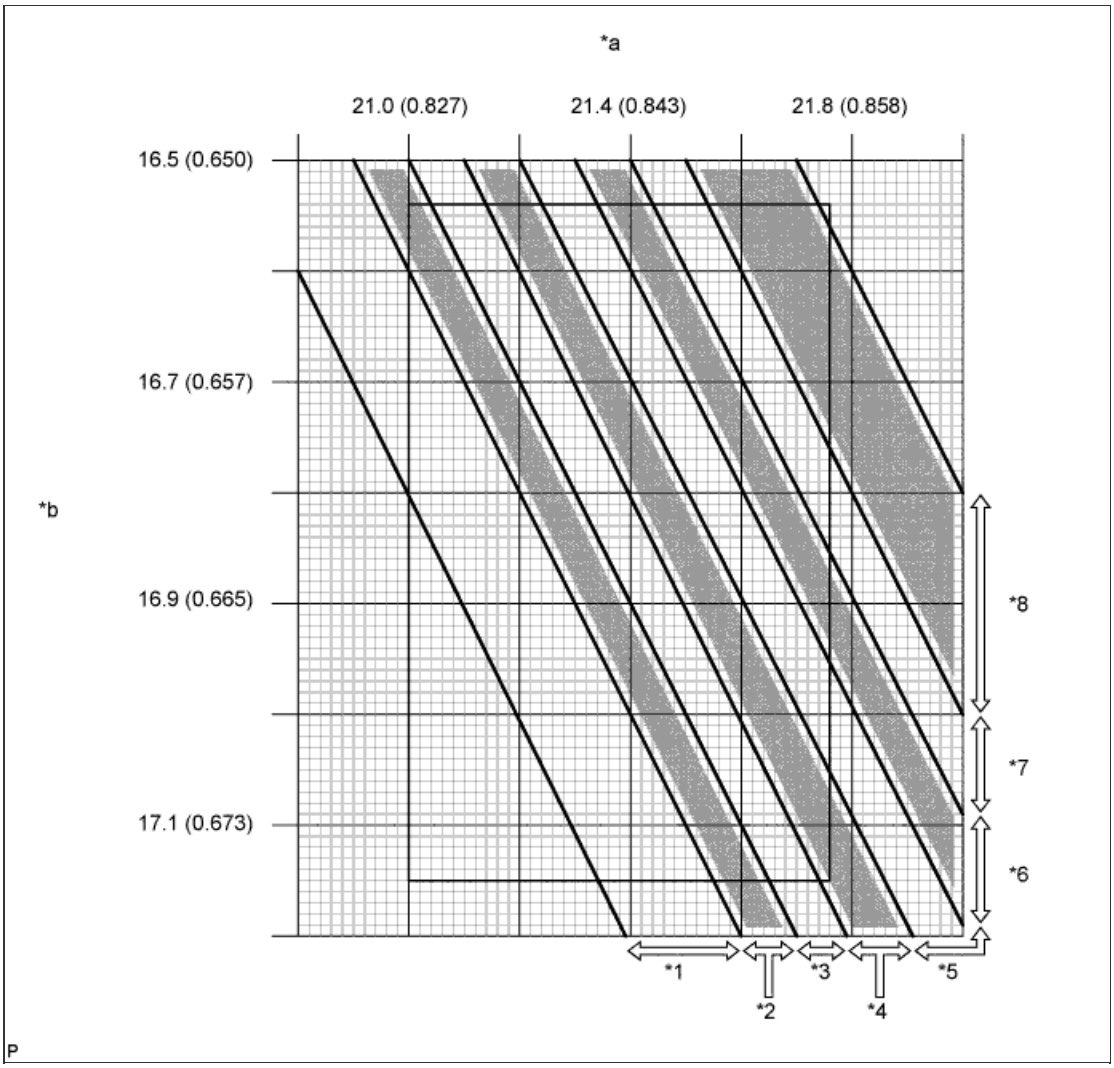
*1	Flange
*2	Plate
*3	Disc
*a	Fixture
*b	165.2 mm or less

HINT:

Standard distance B: 16.54 to 17.15 mm (0.651 to 0.675 in.)



f. Apply the A and B measurements taken in *1 and *2 to the graph below. Use A for the X axis and B for the Y axis, and then choose the No. 2 brake flange indicated by the graph point.



Text in Illustration

*1	Mark 0	*2	Mark 1
*3	Mark 2	*4	Mark 3
*5	Mark 4	*6	Mark 5
*7	Mark 6	*8	Mark 7
*a	Distance A mm (in.)	*b	Distance B mm (in.)

HINT:

Make sure that when the B measurement and selected No. 2 brake flange thickness are subtracted from the A measurement, the value is 2.20 to 2.50 mm (0.0866 to 0.0984 in.).

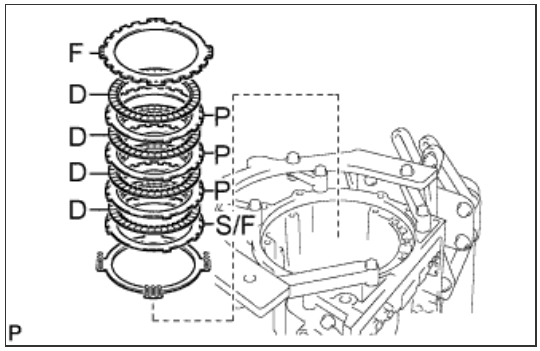
Flange Thickness:

Mark	Thickness
0	1.95 to 2.05 mm (0.0768 to 0.0807 in.)
1	2.05 to 2.15 mm (0.0807 to 0.0846 in.)
2	2.15 to 2.25 mm (0.0846 to 0.0886 in.)
3	2.25 to 2.35 mm (0.0886 to 0.0925 in.)
4	2.35 to 2.45 mm (0.0925 to 0.0965 in.)
5	2.45 to 2.55 mm (0.0965 to 0.100 in.)
6	2.55 to 2.65 mm (0.100 to 0.104 in.)
7	2.65 to 2.75 mm (0.104 to 0.108 in.)

g. Remove the snap ring, flange and No. 2 brake piston return spring from the transmission case.

16. INSTALL NO. 2 BRAKE DISC SET

a. Install the No. 2 brake piston return spring, selected No. 2 brake flange, 4 No. 2 brake discs, 3 plates and flange.



Install in order:
S/F - D - P - D - P - D - P - D - F

HINT:

S/F = Selected flange

D = No. 2 brake disc

P = Plate

F = Flange

NOTICE:

Before assembling new discs, soak them in ATF for at least 2 hours.

b. Place SST on the flange and compress the No. 2 brake piston return spring.

SST
09380-60010 (09381-06010, 09381-06020, 09381-06050, 09381-06070, 09381-06090, 09381-06120)

c. Using a screwdriver, install the snap ring to the transmission case.

NOTICE:

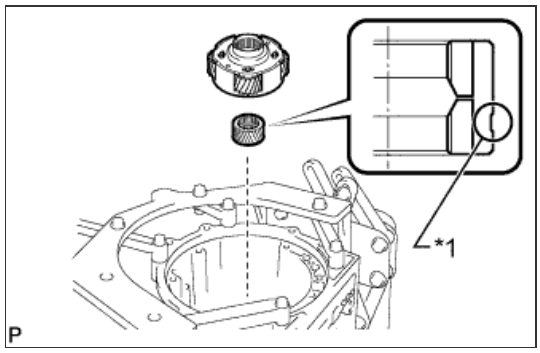
Be careful not to damage the transmission case.

HINT:

Wrap the tip of the screwdriver with protective tape before use.

17. INSTALL CENTER PLANETARY GEAR ASSEMBLY

a. Install the center planetary sun gear and center planetary gear assembly to the transmission case.



Text in Illustration

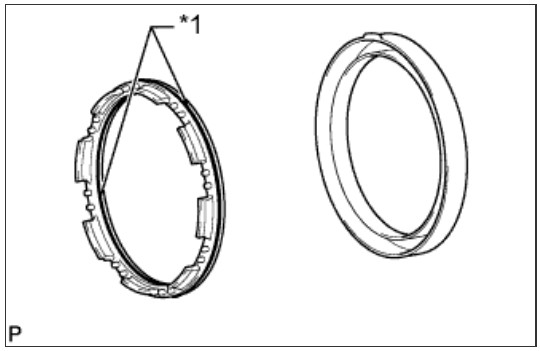
*1	Return Spring Retainer

NOTICE:

Make sure to install the center planetary sun gear with the groove facing the transmission case.

18. INSTALL NO. 1 BRAKE PISTON

a. Coat 2 new O-rings with ATF and install them to the No. 1 brake piston.



Text in Illustration

*1	New O-Ring

b. Press the No. 1 brake piston into the No. 1 brake cylinder with both hands.

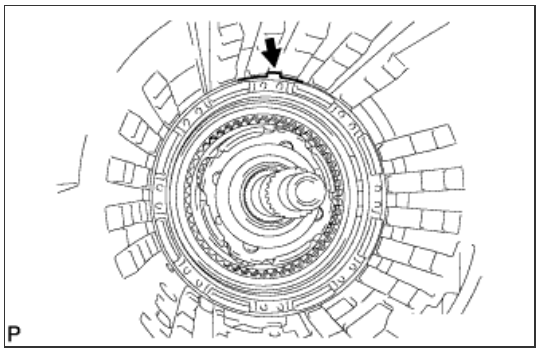
NOTICE:

Be careful not to damage the O-rings.

19. INSTALL NO. 1 BRAKE CYLINDER WITH NO. 1 BRAKE PISTON

a. Install the No. 1 brake cylinder with No. 1 brake piston and brake piston return spring to the transmission case.

NOTICE:



- **When installing the No. 1 brake cylinder with No. 1 brake piston to the transmission case, align the cylinder claw with the groove in the top of the case**
- **Make sure the No. 1 brake cylinder with No. 1 brake piston is securely inserted into the transmission case.**

b. Place SST on the brake piston return spring and compress the brake piston return spring.

SST

09380-60010 (09381-06010, 09381-06020, 09381-06050, 09381-06060, 09381-06090, 09381-06100, 09381-06110, 09381-06120)

c. Using a screwdriver, install the snap ring to the transmission case.

NOTICE:

Be careful not to damage the transmission case.

HINT:

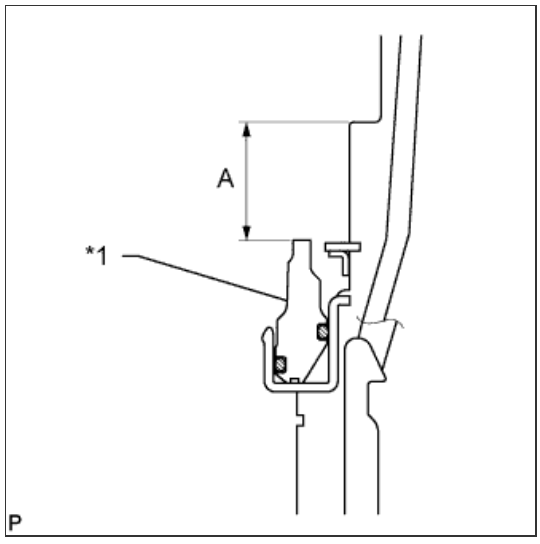
Wrap the tip of the screwdriver with protective tape before use.

20. SELECT NO. 1 BRAKE FLANGE

a. Measure distance A (from the step in the transmission case to the tip of the No. 1 brake piston) in the illustration.*1

HINT:

Standard distance A: 19.74 to 20.22 mm (0.777 to 0.796 in.)



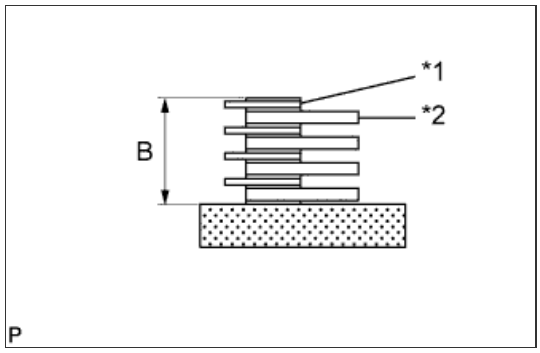
b. Assemble the 4 plates and 4 discs and measure distance B in the illustration.*2

HINT:

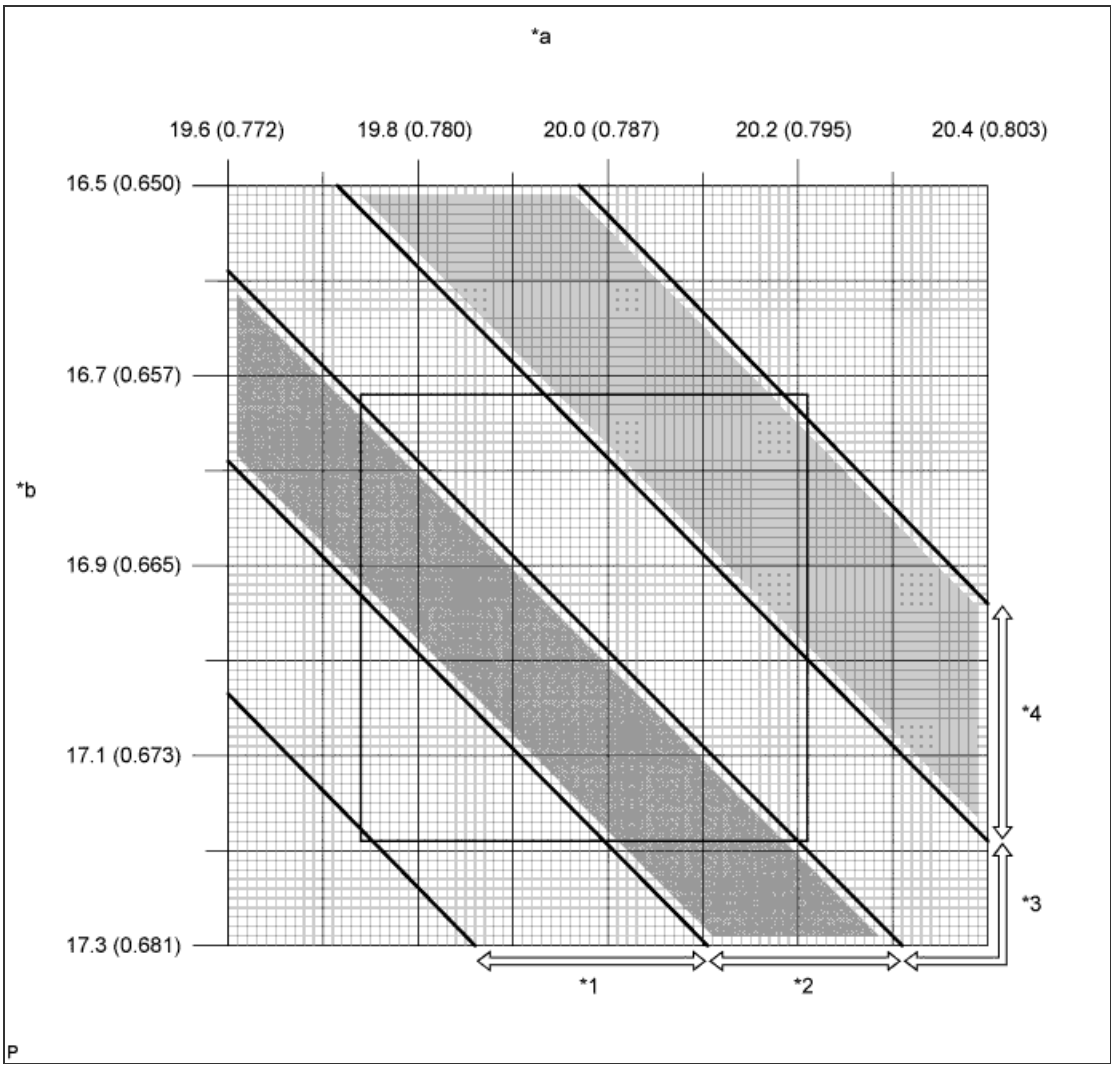
Standard distance B: 16.72 to 17.19 mm (0.658 to 0.677 in.)

Text in Illustration

*1	Disc
*2	Plate



c. Apply the A and B measurements taken in *1 and *2 to the graph below. Use A for the X axis and B for the Y axis, and then choose the No. 1 brake flange indicated by the graph point.



Text in Illustration

*1	Mark 0	*2	Mark 1
*3	Mark 2	*4	Mark 3
*a	Distance A mm (in.)	*b	Distance B mm (in.)

HINT:

Make sure that when the B measurement and selected flange thickness are subtracted from the A measurement, the value is 0.56 to 0.86 mm (0.0220 to 0.0339 in.).

Flange Thickness:

Mark	Thickness
0	1.95 to 2.05 mm (0.0768 to 0.0807 in.)
1	2.15 to 2.25 mm (0.0846 to 0.0886 in.)

2	2.35 to 2.45 mm (0.0925 to 0.0965 in.)
3	2.55 to 2.65 mm (0.100 to 0.104 in.)

21. INSTALL CENTER PLANETARY RING GEAR

a. Install the front planetary ring gear flange to the center planetary ring gear.

b. Using a screwdriver, install the snap ring.

22. INSTALL FRONT PLANETARY RING GEAR

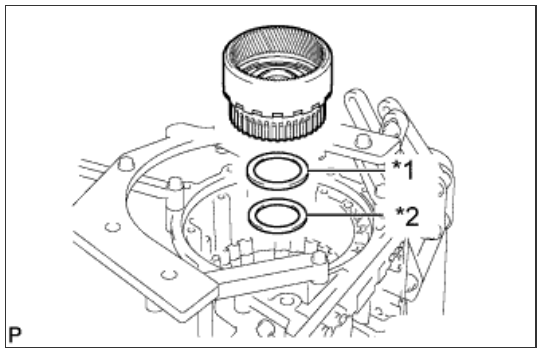
a. Install the front planetary ring gear to the center planetary ring gear.

23. INSTALL FRONT PLANETARY RING GEAR WITH FRONT PLANETARY RING GEAR FLANGE SUB-ASSEMBLY AND CENTER PLANETARY RING GEAR

a. Install the thrust bearing race and thrust needle roller bearing.

Text in Illustration

*1	Bearing
*2	Race



HINT:

Use a small amount of MP grease to make the thrust needle roller bearing and thrust bearing race stay securely in place.

Bearing and Race Diameter:

Item	Inside	Outside
Race	62.85 to 63.1 mm (2.47 to 2.48 in.)	82.3 to 82.6 mm (3.24 to 3.25 in.)
Bearing	65.35 to 65.6 mm (2.57 to 2.58 in.)	85.6 to 85.95 mm (3.37 to 3.38 in.)

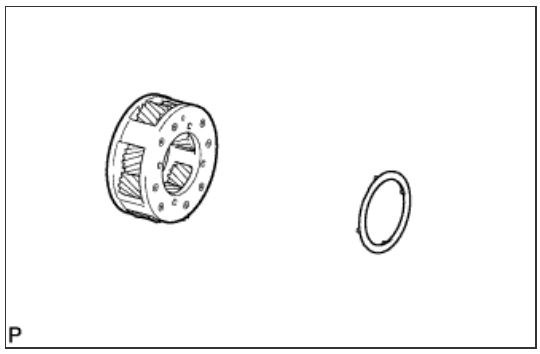
b. Install the front planetary ring gear with the front planetary ring gear flange and center planetary ring gear to the transmission case.

24. INSTALL FRONT PLANETARY GEAR ASSEMBLY

a. Install the No. 2 planetary carrier thrust washer to the front planetary gear assembly.

HINT:

Use a small amount of MP grease to make the No. 2 planetary carrier thrust washer stay securely in place.



b. Install the thrust needle roller bearing, thrust bearing race, front planetary sun gear and front planetary gear assembly.

HINT:

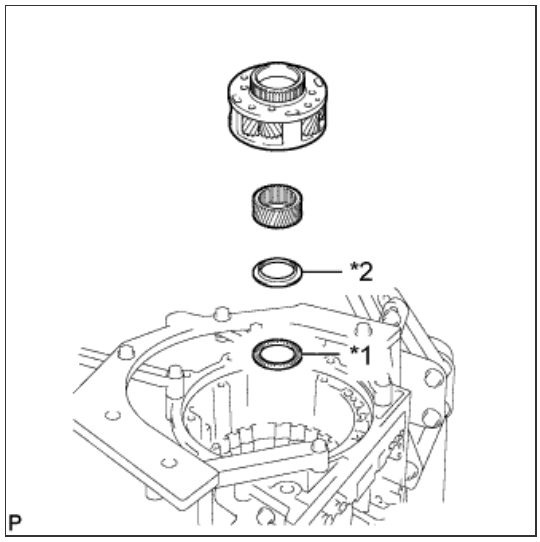
Use a small amount of MP grease to make the thrust needle roller bearing and thrust bearing race stay securely in place.

Text in Illustration

*1	Bearing
*2	Race

Bearing Diameter:

Item	Inside	Outside
Bearing	54.55 to 54.8 mm (2.15 to 2.16 in.)	70.0 to 70.5 mm (2.76 to 2.78 in.)
Race	55.0 to 55.2 mm (2.165 to 2.173 in.)	68.8 to 69.3 mm (2.71 to 2.73 in.)



25. INSTALL 1-WAY CLUTCH INNER RACE SUB-ASSEMBLY

a. Install the No. 1 planetary carrier thrust washer to the 1-way clutch inner race, and then install them to the 1-way clutch assembly.

HINT:

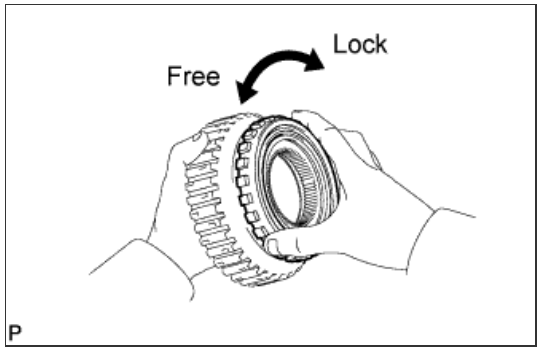
Use a small amount of MP grease to make the No. 1 planetary carrier thrust washer stay securely in place.

26. INSPECT 1-WAY CLUTCH ASSEMBLY

a. Install the 1-way clutch to the 1-way clutch inner race.

b. Hold the 1-way clutch inner race and turn the 1-way clutch. Check that the 1-way clutch turns freely counterclockwise and locks when turned clockwise.

c. Remove the 1-way clutch from the 1-way clutch inner race.



27. INSTALL 1-WAY CLUTCH ASSEMBLY WITH 1-WAY CLUTCH INNER RACE SUB-ASSEMBLY

a. Install the 1-way clutch assembly with the 1-way clutch inner race to the transmission case.

28. INSTALL NO. 1 BRAKE DISC SET

a. Install the 4 plates, 4 discs and No. 1 brake flange.

Install in order:
P - D - P - D - P - D - P - D - F

HINT:

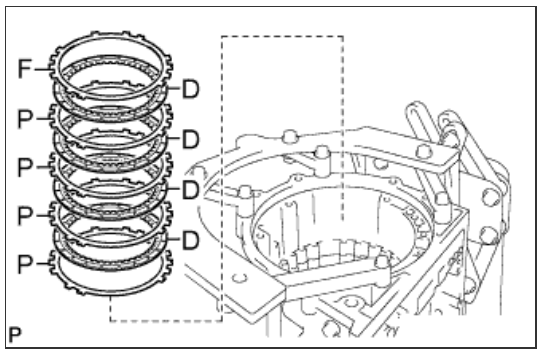
P = Plate

D = Disc

F = No. 1 brake flange

NOTICE:

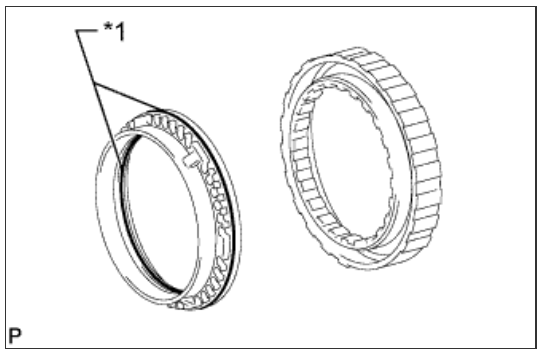
Before assembling new discs, soak them in ATF for at least 2 hours.



29. INSTALL NO. 3 BRAKE PISTON

Text in Illustration

*1	New O-Ring



a. Coat 2 new O-rings with ATF and install them to the No. 3 brake piston.

b. Press the No. 3 brake piston into the No. 3 brake cylinder with both hands.

NOTICE:

Be careful not to damage the O-rings.

c. Using SST and a press, compress the No. 3 brake piston return spring and install the snap ring with a screwdriver.

SST

09380-60010 (09381-06020, 09381-06040, 09381-06060, 09381-06100, 09381-06110)

NOTICE:

Be sure the end gap of the snap ring is not aligned with the No. 3 brake piston return spring claw.

30. INSTALL NO. 3 BRAKE CYLINDER WITH NO. 3 BRAKE PISTON AND NO. 3 BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

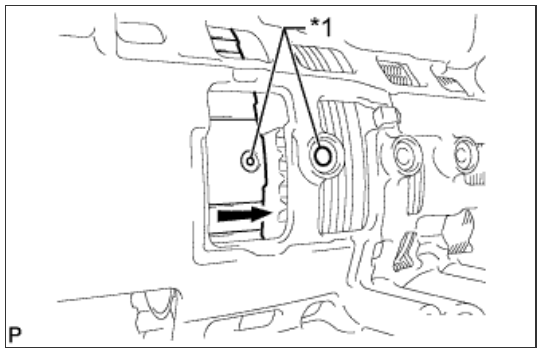
a. Install the No. 3 brake cylinder together with the No. 3 brake piston and No. 3 brake piston return spring to the transmission case.

NOTICE:

- **Align the oil holes of the No. 3 brake cylinder and transmission case as shown in the illustration.**
- **Make sure the No. 3 brake piston and cylinder are securely inserted into the transmission case.**

Text in Illustration

*1	Oil Hole



31. INSTALL NO. 3 BRAKE PISTON HOLE SNAP RING

a. Using SST, install the snap ring.

SST

09350-30020 (09350-07060)

32. INSTALL NO. 3 BRAKE DISC SET

a. Install the "O" mark flange, 4 discs, 3 plates and "A" mark flange to the transmission case.

Install in order:
OF - D - P - D - P - D - P - D - AF

HINT:

OF = "O" mark flange

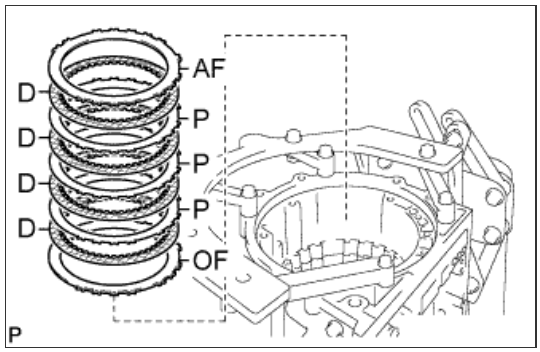
P = Plate

D = Disc

AF = "A" mark flange

NOTICE:

Before assembling new discs, soak them in ATF for at least 2 hours.



33. INSTALL NO. 3 BRAKE SNAP RING

a. Using a screwdriver, install the snap ring.

NOTICE:

Be careful not to damage the transmission case.

HINT:

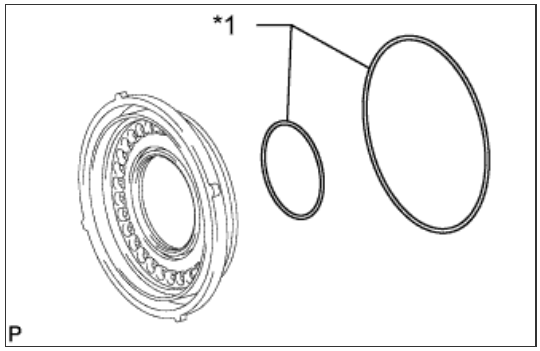
Wrap the tip of the screwdriver with protective tape before use.

34. INSTALL DIRECT CLUTCH PISTON SUB-ASSEMBLY

a. Coat 2 new O-rings with ATF and install them to the direct clutch piston.

Text in Illustration

*1	New O-ring

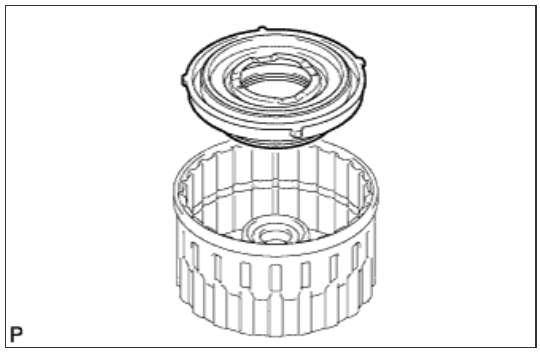


b. Install the direct clutch return spring and No. 2 clutch balancer to the direct clutch piston.

c. Press the direct clutch piston together with the direct clutch return spring and No. 2 clutch balancer into the clutch drum with both hands.

NOTICE:

Be careful not to damage the O-ring.



d. Place SST on the direct clutch balancer and compress the direct clutch return spring with a press.

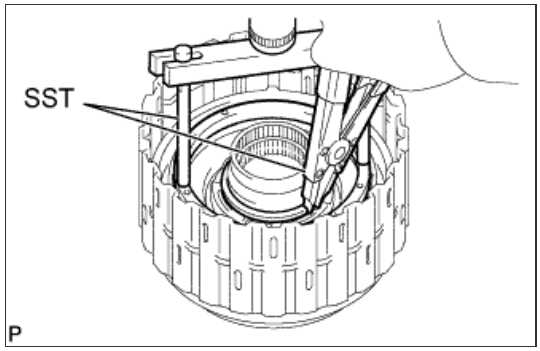
SST

09380-60010 (09381-06030, 09381-06040, 09381-06080)

NOTICE:

Stop pressing when the spring sheet is lowered to a position 1 to 2 mm (0.0394 to 0.0787 in.) from the snap ring groove to prevent the spring sheet from being deformed.

e. Using SST, install the snap ring.



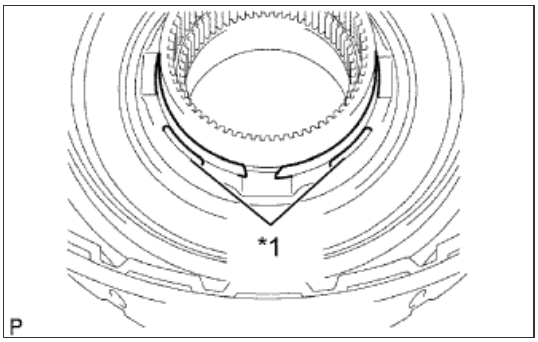
SST

09350-30020 (09350-07070)

NOTICE:

Do not expand the snap ring excessively.

f. Set the end gap of the snap ring in the balancer as shown in the illustration.



Text in Illustration

*1	Stopper

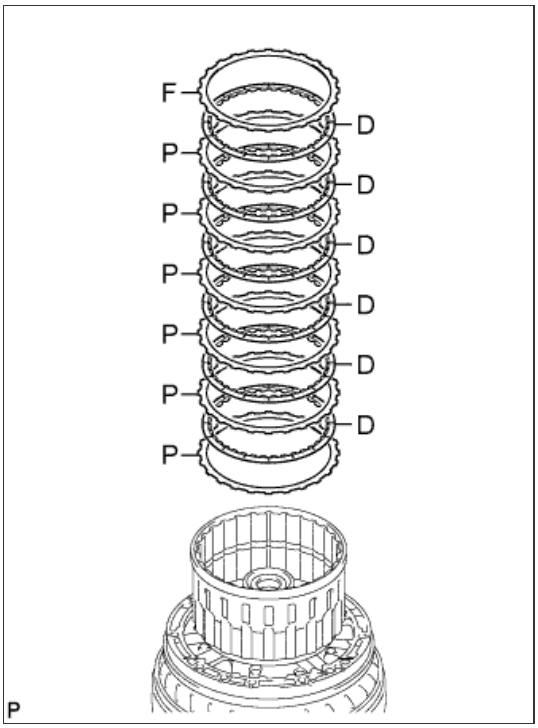
NOTICE:

Be sure the end gap of the snap ring is not aligned with the spring retainer claw.

35. INSTALL DIRECT CLUTCH DISC SET

a. Place the oil pump assembly onto the torque converter, and then place the clutch drum onto the oil pump assembly.

b. for 1VD-FTV:
Install the 6 plates, 6 discs and direct clutch flange to the clutch drum.



Install in order:
P - D - P - D - P - D - P - D - P - D - P - D - F

HINT:

P = Plate

D = Disc

F = Direct clutch flange

NOTICE:

Before assembling new discs, soak them in ATF for at least 2 hours.

c. for 1UR-FE, 3UR-FE:
Install the 5 plates, 5 discs and direct clutch flange to the clutch drum.

Install in order:
P - D - P - D - P - D - P - D - P - D - F

HINT:

P = Plate

D = Disc

F = Direct clutch flange

NOTICE:

Before assembling new discs, soak them in ATF for at least 2 hours.

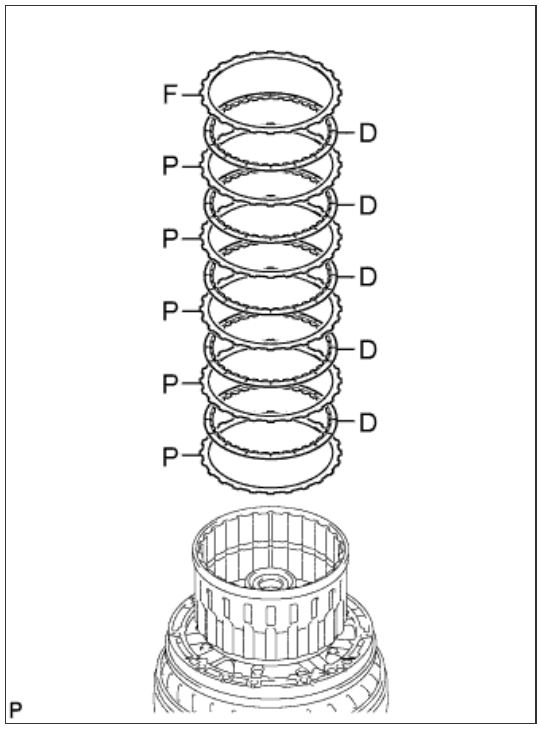
d. Using a screwdriver, install the snap ring to the clutch drum.

NOTICE:

Be careful not to damage the clutch drum.

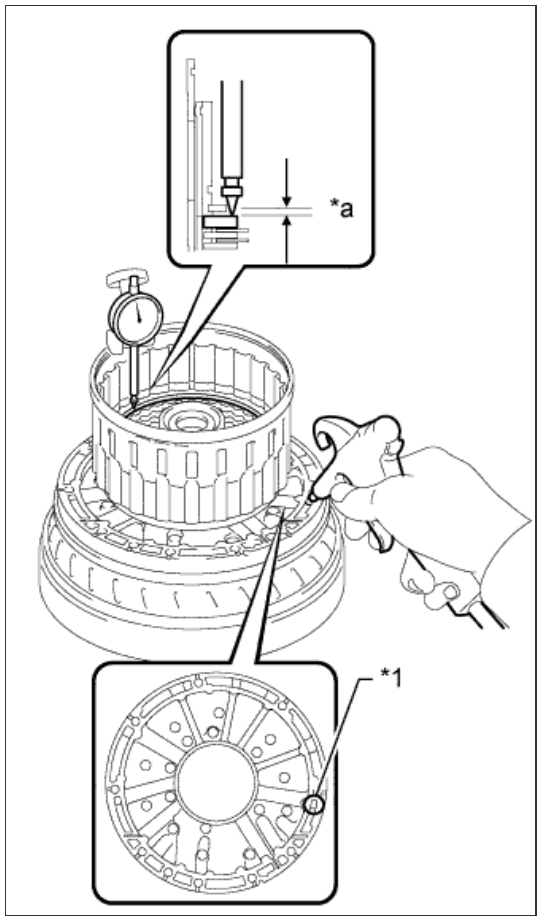
HINT:

Wrap the tip of the screwdriver with protective tape before use.



e. Using a dial indicator, measure the moving distance (A) of the direct clutch flange at both ends across the diameter while blowing compressed air (392 kPa, 2.0 kgf/cm^2, 57 psi) into the oil hole as shown in the illustration. Then choose from the 9 flange thicknesses in the table so that the measured value is within the standard range.

Standard moving distance (A):
0.58 to 0.88 mm (0.0228 to 0.0346 in.)



Text in Illustration

*1	Oil Hole
*a	Distance (A)

Flange Thickness (for 1VD-FTV):

Mark	Thickness
0	3.45 to 3.55 mm (0.136 to 0.140 in.)
1	3.55 to 3.65 mm (0.140 to 0.144 in.)
2	3.65 to 3.75 mm (0.144 to 0.148 in.)
3	3.75 to 3.85 mm (0.148 to 0.152 in.)
4	3.85 to 3.95 mm (0.152 to 0.156 in.)
5	3.95 to 4.05 mm (0.156 to 0.159 in.)
6	4.05 to 4.15 mm (0.159 to 0.163 in.)
7	4.15 to 4.25 mm (0.163 to 0.167 in.)
8	4.25 to 4.35 mm (0.167 to 0.171 in.)
A	4.35 to 4.45 mm (0.171 to 0.175 in.)

Flange Thickness (for 1UR-FE, 3UR-FE):

Mark	Thickness
0	3.45 to 3.55 mm (0.136 to 0.140 in.)
1	3.55 to 3.65 mm (0.140 to 0.144 in.)
2	3.65 to 3.75 mm (0.144 to 0.148 in.)
3	3.75 to 3.85 mm (0.148 to 0.152 in.)
4	3.85 to 3.95 mm (0.152 to 0.156 in.)
5	3.95 to 4.05 mm (0.156 to 0.159 in.)
6	4.05 to 4.15 mm (0.159 to 0.163 in.)
7	4.15 to 4.25 mm (0.163 to 0.167 in.)
8	4.25 to 4.35 mm (0.167 to 0.171 in.)

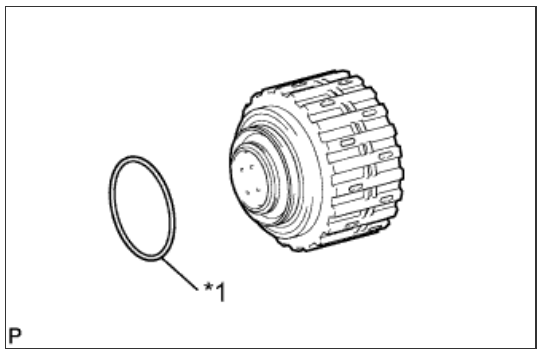
f. Temporarily remove the snap ring, install the selected flange and reinstall the snap ring.

36. INSTALL REVERSE CLUTCH PISTON SUB-ASSEMBLY

Text in Illustration

*1	New O-Ring

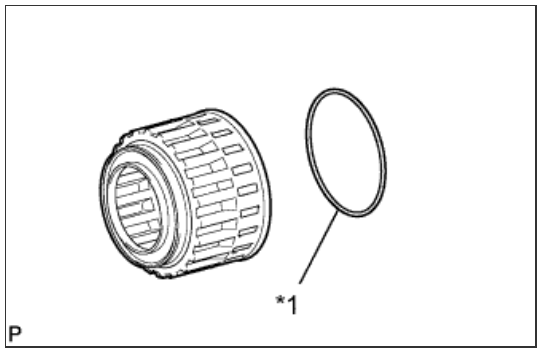
a. Coat a new O-ring with ATF and install it to the clutch drum.



b. Coat a new O-ring with ATF and install it to the reverse clutch piston.

Text in Illustration

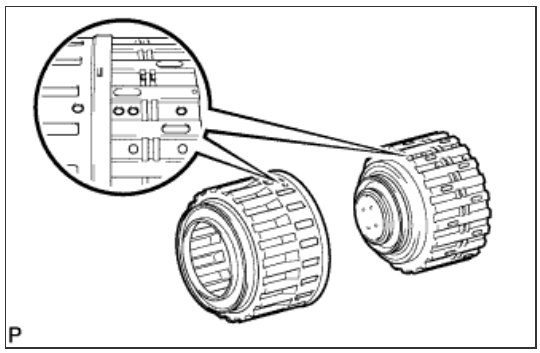
*1	New O-Ring



c. Insert the clutch drum into the reverse clutch piston with both hands.

NOTICE:

- **Be careful not to damage the O-ring.**
- **Make sure to align the holes of the reverse clutch piston with those of the clutch drum as shown in the illustration.**
- **Make sure to align the protrusions of the reverse clutch piston with the cutout of the clutch drum.**



37. INSTALL NO. 3 CLUTCH BALANCER

Text in Illustration

*1	New O-ring

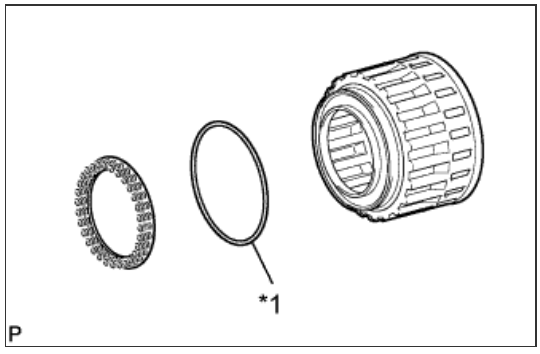
a. Coat a new O-ring with ATF and install it to the reverse clutch piston.

b. Install the reverse clutch return spring and No. 3 balancer to the reverse clutch piston.

c. Place SST on the clutch balancer and compress the clutch balancer with a press.

SST

09380-60010 (09381-06020, 09381-06030, 09381-06040, 09381-06050, 09381-06070, 09381-06080)



NOTICE:

Stop pressing when the spring sheet is lowered to a position 1 to 2 mm (0.0394 to 0.0787 in.) from the snap ring groove to prevent the spring sheet from being deformed.

d. Using SST, install the snap ring.

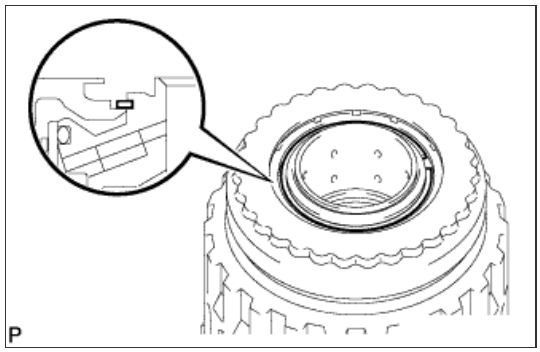
SST

09350-30020 (09350-07070)

NOTICE:

Do not expand the snap ring excessively.

e. Set the end gap of the snap ring in the piston as shown in the illustration.



NOTICE:

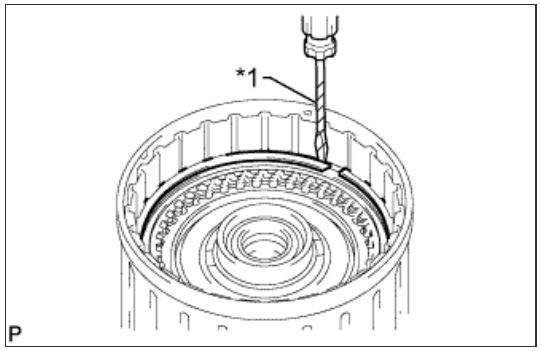
Be sure the end gap of the snap ring is not aligned with the spring retainer claw.

38. SELECT REVERSE CLUTCH FLANGE

a. Using a screwdriver, install the snap ring to the clutch drum.

Text in Illustration

*1	Protective Tape



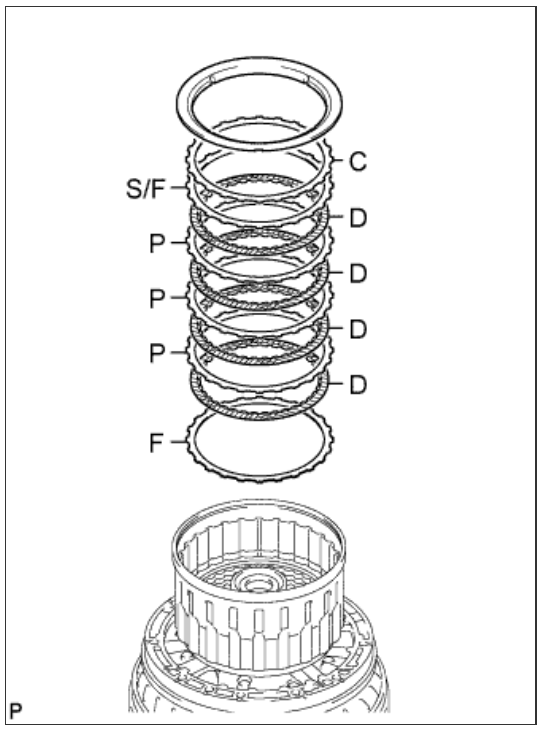
NOTICE:

- **Be careful not to damage the clutch drum.**
- **Make sure to install the direct clutch and reverse clutch snap rings so that their openings face opposite directions.**

HINT:

Wrap the tip of the screwdriver with protective tape before use.

b. for 1VD-FTV:
Install the flange, 4 discs, 3 plates, selected reverse clutch flange, cushion plate and reverse clutch reaction sleeve to the clutch drum.



Install in order:
F - D - P - D - P - D - P - D - S/F - C

HINT:

F = Flange

D = Disc

P = Plate

S/F = Selected reverse clutch flange

C = Cushion plate

c. for 1UR-FE, 3UR-FE:

Install the flange, 5 discs, 4 plates, selected reverse clutch flange, cushion plate and reverse clutch reaction sleeve to the clutch drum.

Install in order:
F - D - P - D - P - D - P - D - P -D - S/F - C

HINT:

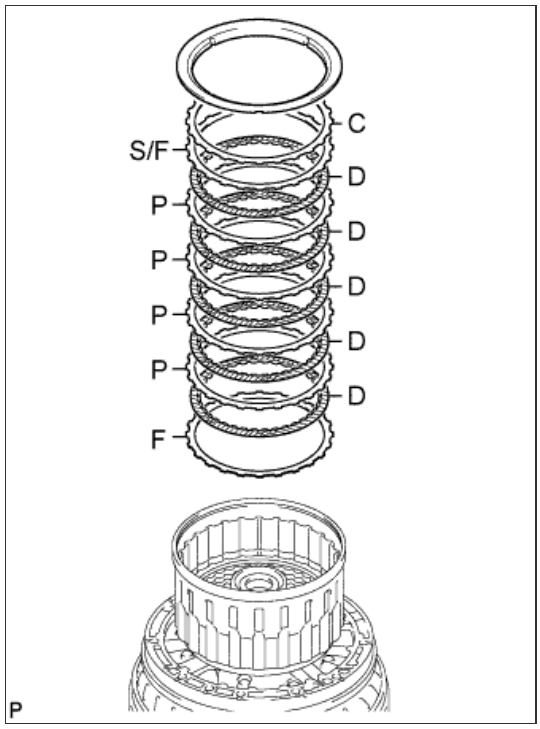
F = Flange

D = Disc

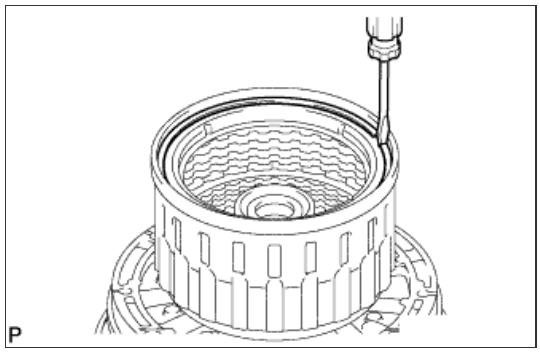
P = Plate

S/F = Selected reverse clutch flange

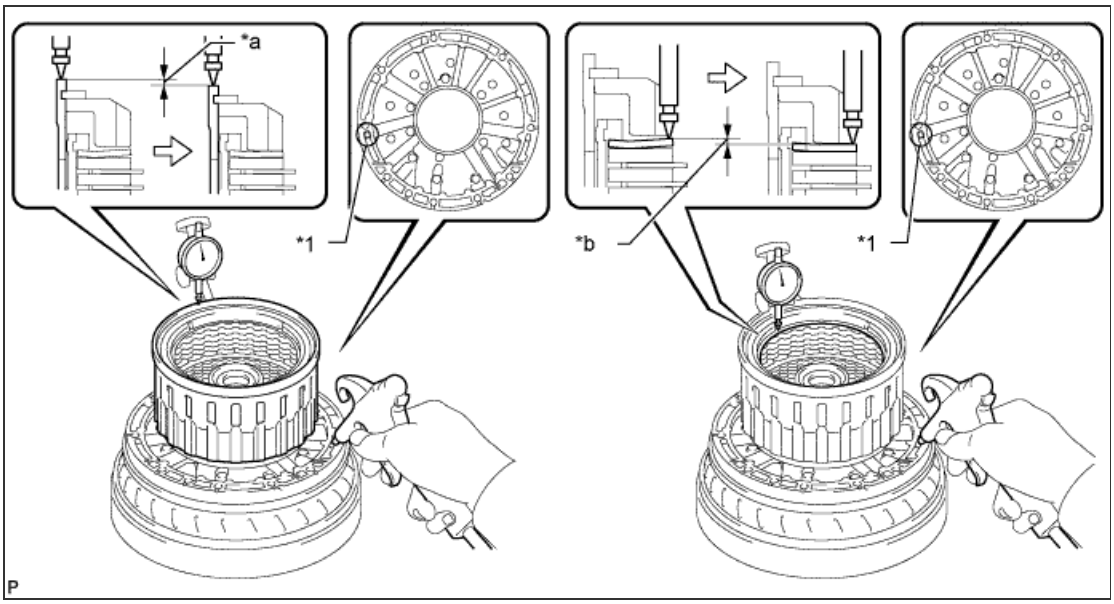
C = Cushion plate



d. Using a screwdriver, install the snap ring.



e. Using a dial indicator, measure the moving distance (A minus B) of the top surface of the reverse clutch piston (A) and cushion plate (B) at both ends across the diameter while blowing compressed air (392 kPa, 2.0 kgf/cm^2, 57 psi) into the oil hole as shown in the illustration. Then choose from the 12 flange thicknesses in the table so that the measured value is within the standard range.



Standard moving distance (A minus B):
for 1VD-FTV:
0.46 to 0.76 mm (0.0181 to 0.0299 in.)

for 1UR-FE, 3UR-FE:
0.59 to 0.89 mm (0.0232 to 0.0350 in.)

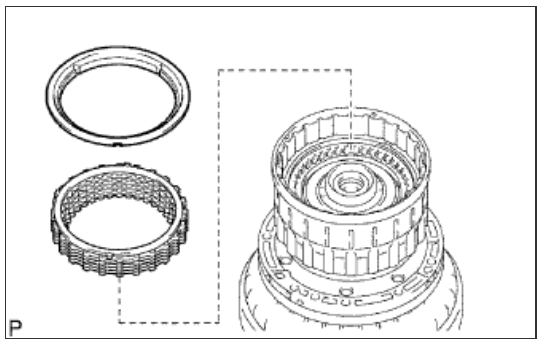
Text in Illustration

*1	Oil Hole	-	-
*a	Distance (A)	*b	Distance (B)

Flange Thickness:

Mark	Thickness
0	2.35 to 2.45 mm (0.0925 to 0.0965 in.)
1	2.45 to 2.55 mm (0.0965 to 0.100 in.)
2	2.55 to 2.65 mm (0.100 to 0.104 in.)
3	2.65 to 2.75 mm (0.104 to 0.108 in.)
4	2.75 to 2.85 mm (0.108 to 0.112 in.)
5	2.85 to 2.95 mm (0.112 to 0.116 in.)
6	2.95 to 3.05 mm (0.116 to 0.120 in.)
7	3.05 to 3.15 mm (0.120 to 0.124 in.)
8	3.15 to 3.25 mm (0.124 to 0.128 in.)
A	3.25 to 3.35 mm (0.128 to 0.132 in.)
B	3.35 to 3.45 mm (0.132 to 0.136 in.)
C	3.45 to 3.55 mm (0.136 to 0.140 in.)

f. Remove the snap ring, reverse clutch reaction sleeve and rear clutch disc set from the clutch drum.

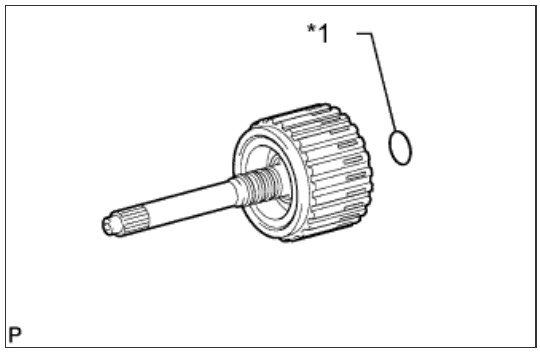


39. INSTALL FORWARD CLUTCH PISTON SUB-ASSEMBLY

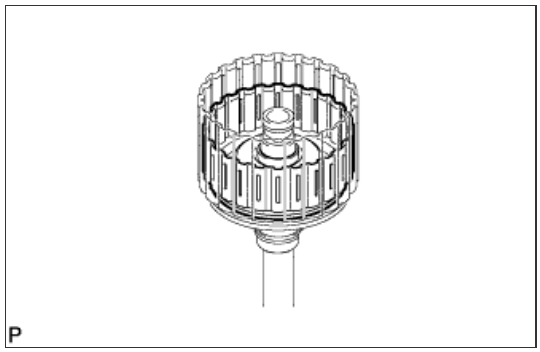
Text in Illustration

*1	New O-Ring

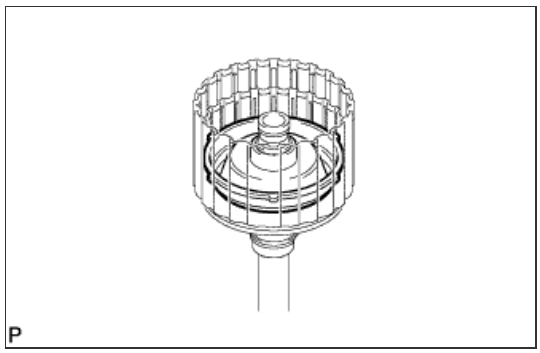
a. Coat a new O-ring with ATF and install it to the input shaft.



b. Install the forward clutch piston to the input shaft.



40. INSTALL COAST CLUTCH PISTON



a. Install the coast clutch piston to the input shaft.

b. Coat a new O-ring with ATF and install it to the No. 1 clutch balancer.

Text in Illustration

*1	New O-Ring

c. Install the forward clutch return spring and No. 1 clutch balancer to the input shaft.

NOTICE:

Be careful not to damage the O-rings.

d. Place SST on the No. 1 clutch balancer and compress the forward clutch return spring with a press.

SST

09350-30020 (09350-07040)

NOTICE:

Stop pressing when the spring sheet is lowered to a position 1 to 2 mm (0.0394 to 0.0787 in.) from the snap ring groove to prevent the spring sheet from being deformed.

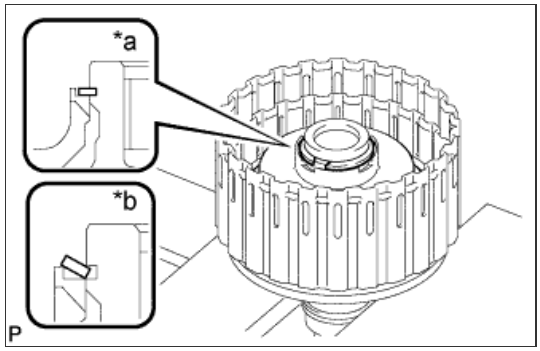
e. Using SST, install the snap ring.

SST

09350-30020 (09350-07070)

NOTICE:

Do not expand the snap ring excessively.



f. Set the end gap of the snap ring in the balancer as shown in the illustration.

NOTICE:

Be sure the end gap of the snap ring is not aligned with the spring retainer claw.

Text in Illustration

*a	Correct
*b	Incorrect

41. INSTALL COAST CLUTCH DISC SET

a. for 1VD-FTV:
Install the 5 plates, 5 discs and coast clutch flange.

Install in order:
P - D - P - D - P - D - P - D - P - D - F

HINT:

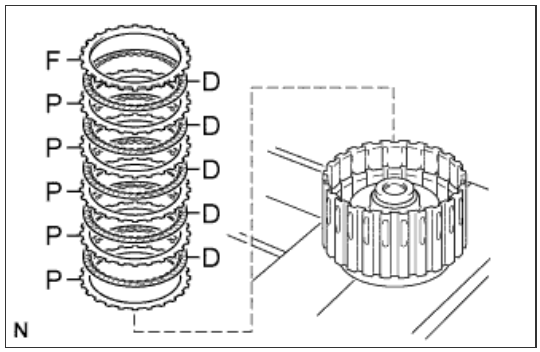
P = Plate

D = Disc

F = Flange

NOTICE:

Before assembling new discs, soak them in ATF for at least 2 hours.



b. for 1UR-FE, 3UR-FE:
Install the 4 plates, 4 discs and coast clutch flange.

Install in order:
P - D - P - D - P - D - P - D - F

HINT:

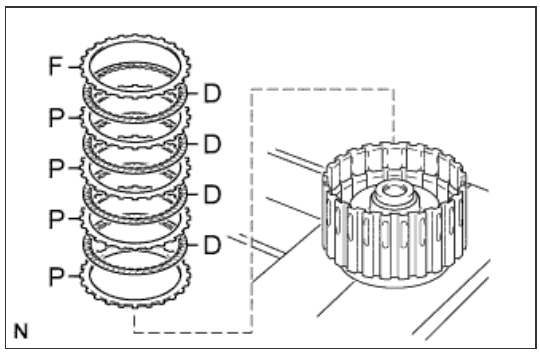
P = Plate

D = Disc

F = Flange

NOTICE:

Before assembling new discs, soak them in ATF for at least 2 hours.



c. Temporarily install the snap ring.

Text in Illustration

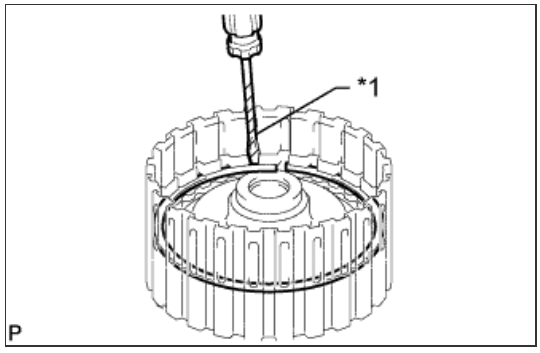
*1	Protective Tape

NOTICE:

Be careful not to damage the forward clutch piston.

HINT:

Wrap the tip of the screwdriver with protective tape before use.



d. Using a dial indicator, measure the moving distance (A) of the coast clutch flange at both ends across the diameter while blowing compressed air (196 kPa, 2.0 kgf/cm^2, 28 psi) into the oil hole as shown in the illustration. Then choose from the 11 flange thicknesses in the table so that the measured value is within the standard range.

Standard moving distance (A):
for 1VD-FTV:
0.51 to 0.81 mm (0.0201 to 0.0319 in.)
for UR Engine Series:
0.41 to 0.71 mm (0.0161 to 0.0280 in.)

Text in Illustration

*1	Oil Hole
*a	Distance (A)

Flange Thickness:

Mark	Thickness
0	2.95 to 3.05 mm (0.116 to 0.120 in.)
1	3.05 to 3.15 mm (0.120 to 0.124 in.)
2	3.15 to 3.25 mm (0.124 to 0.128 in.)
3	3.25 to 3.35 mm (0.128 to 0.132 in.)
4	3.35 to 3.45 mm (0.132 to 0.136 in.)

5	3.45 to 3.55 mm (0.136 to 0.140 in.)
6	3.55 to 3.65 mm (0.140 to 0.144 in.)
7	3.65 to 3.75 mm (0.144 to 0.148 in.)
8	3.75 to 3.85 mm (0.148 to 0.152 in.)
A	3.85 to 3.95 mm (0.152 to 0.156 in.)
B	3.95 to 4.05 mm (0.156 to 0.159 in.)

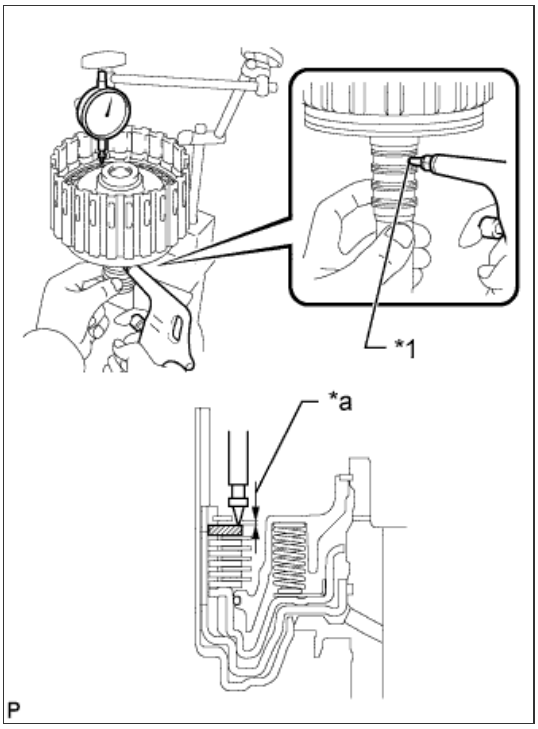
e. Temporarily remove the snap ring, install the selected coast clutch flange and reinstall the snap ring.

NOTICE:

Be careful not to damage the forward clutch piston.

HINT:

Wrap the tip of the screwdriver with protective tape before use.



42. INSTALL FORWARD MULTIPLE DISC CLUTCH DISC SET

a. Install the cushion plate, 6 plates, 6 discs and flange to the input shaft.

Install in order:
C - P - D - P - D - P - D - P - D - P - D - P - D - F

HINT:

C = Cushion plate

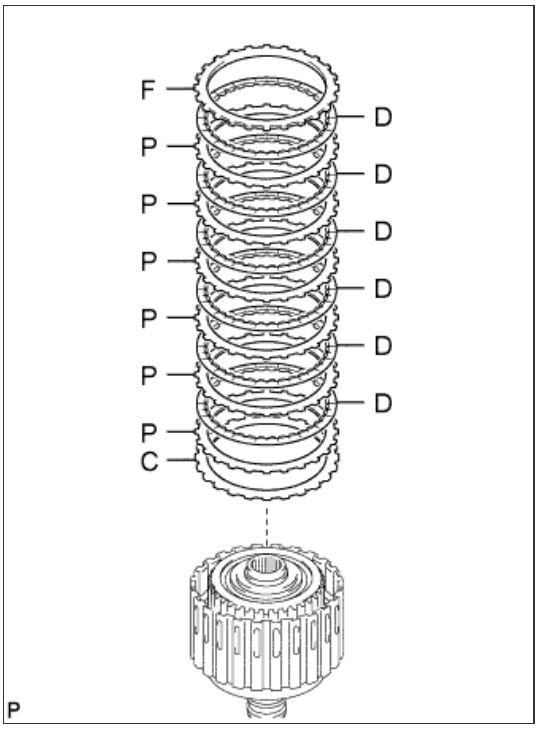
P = Plate

D = Disc

F = Flange

NOTICE:

Before assembling new discs, soak them in ATF for at least 2 hours.



b. Temporarily install the snap ring.

Text in Illustration

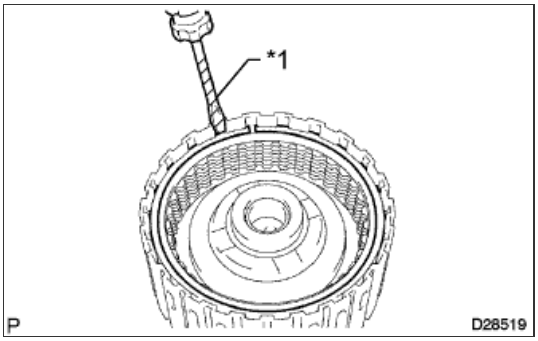
*1	Protective Tape

NOTICE:

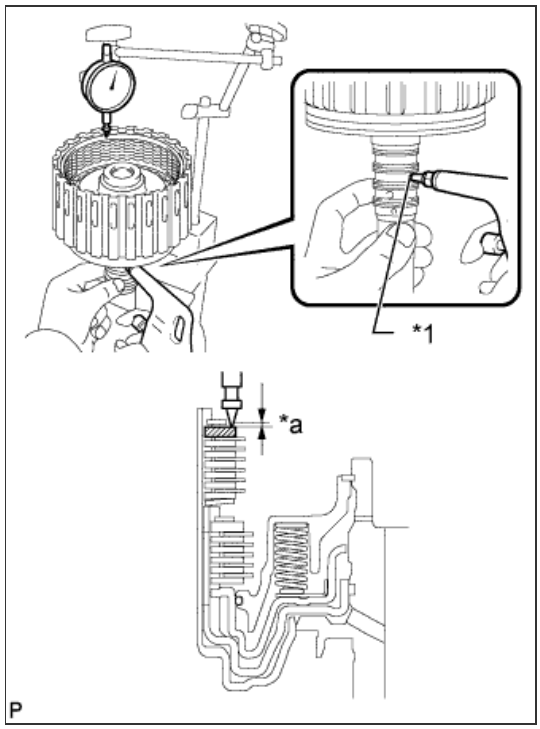
Be careful not to damage the forward clutch piston.

HINT:

Wrap the tip of the screwdriver with protective tape before use.



c. Using a dial indicator, measure the moving distance (A) of the clutch flange at both ends across the diameter while blowing compressed air (196 kPa, 2.0 kgf/cm^2, 28 psi) into the oil hole as shown in the illustration. Then choose from the 12 flange thicknesses in the table so that the measured value is within the standard range.



Standard moving distance (A):
0.85 to 1.15 mm (0.0335 to 0.0453 in.)

Text in Illustration

*1	Oil Hole
*a	Distance (A)

Flange Thickness:

Mark	Thickness
0	2.95 to 3.05 mm (0.116 to 0.120 in.)
1	3.05 to 3.15 mm (0.120 to 0.124 in.)
2	3.15 to 3.25 mm (0.124 to 0.128 in.)
3	3.25 to 3.35 mm (0.128 to 0.132 in.)
4	3.35 to 3.45 mm (0.132 to 0.136 in.)
5	3.45 to 3.55 mm (0.136 to 0.140 in.)
6	3.55 to 3.65 mm (0.140 to 0.144 in.)
7	3.65 to 3.75 mm (0.144 to 0.148 in.)
8	3.75 to 3.85 mm (0.148 to 0.152 in.)
A	3.85 to 3.95 mm (0.152 to 0.156 in.)
B	3.95 to 4.05 mm (0.156 to 0.159 in.)
C	4.05 to 4.15 mm (0.159 to 0.163 in.)

d. Temporarily remove the snap ring, install the selected flange and reinstall the snap ring.

NOTICE:

Be careful not to damage the forward clutch piston.

HINT:

Wrap the tip of the screwdriver with protective tape before use.

43. INSTALL NO. 4 1-WAY CLUTCH ASSEMBLY

a. Install the No. 2 clutch hub thrust washer to the coast clutch hub.

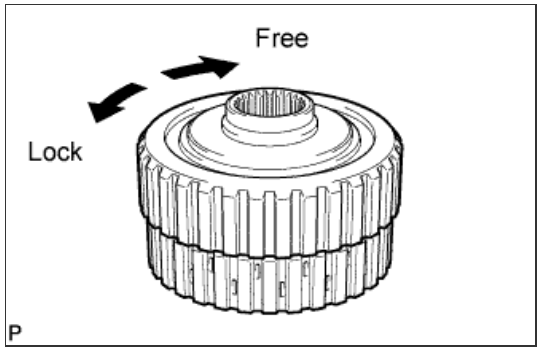
HINT:

Use a small amount of MP grease to make the No. 2 clutch hub thrust washer stay securely in place.

b. Install the No. 4 1-way clutch assembly to the coast clutch hub.

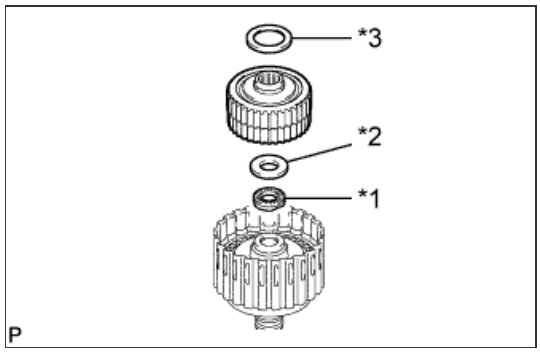
44. INSPECT NO. 4 1-WAY CLUTCH ASSEMBLY

a. Hold the coast clutch hub and turn the 1-way clutch assembly. Check that the 1-way clutch turns freely clockwise and locks when turned counterclockwise.



45. INSTALL COAST CLUTCH HUB SUB-ASSEMBLY WITH NO. 4 1-WAY CLUTCH ASSEMBLY

a. Install the 2 thrust needle roller bearings, thrust bearing race and coast clutch hub with the No. 4 1-way clutch assembly to the input shaft.



Text in Illustration

*1	Bearing C
*2	Race
*3	Bearing D

HINT:

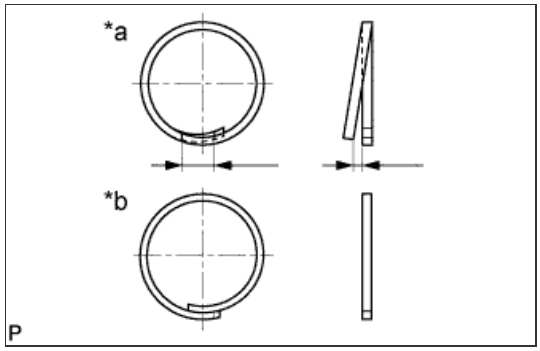
Use a small amount of MP grease to make the thrust needle roller bearings and thrust bearing race stay securely in place.

Bearing and Race Diameter:

Item	Inside	Outside
Bearing C	21.05 to 21.3 mm (0.829 to 0.839 in.)	39.63 to 39.88 mm (1.56 to 1.57 in.)
Race	22.8 to 23.1 mm (0.898 to 0.909 in.)	44.5 to 44.75 mm (1.75 to 1.76 in.)
Bearing D	39.45 to 39.7 mm (1.55 to 1.56 in.)	60.5 to 60.75 mm (2.38 to 2.39 in.)

46. INSTALL INPUT SHAFT OIL SEAL RING

a. Overlap the seal ring edges in the axial direction.



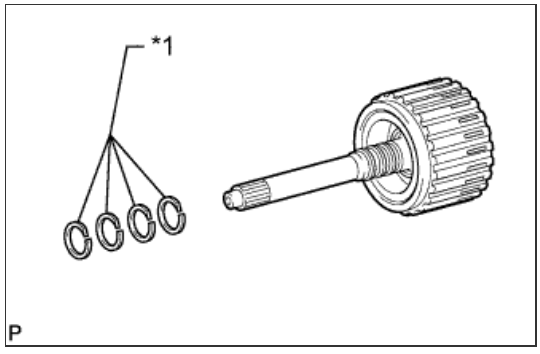
Text in Illustration

*a	Correct
*b	Incorrect

NOTICE:

- **Overlapping the seal ring edges in the axial direction prevents damage to the seal ring.**
- **Do not overlap the seal ring edges in the radial direction, as this may damage the seal ring.**

b. Coat 4 new oil seal rings with ATF.



Text in Illustration

*1	New O-Ring

c. Squeeze the ends of the 4 oil seal rings together, and then install them to the input shaft groove.

NOTICE:

Do not excessively widen the rings.

HINT:

After installing the oil seal rings, check that they rotate smoothly.

47. INSTALL INPUT SHAFT ASSEMBLY

a. Install the input shaft to the clutch drum.

48. INSTALL FORWARD CLUTCH HUB SUB-ASSEMBLY

a. Install the No. 3 clutch hub thrust washer, forward clutch hub and thrust needle roller bearing to the clutch drum.

NOTICE:

Before installing the forward clutch hub, apply ATF to the sliding surfaces of the forward clutch hub bush. After the installation, check that the forward clutch hub rotates smoothly.

HINT:

Use a small amount of MP grease to make the thrust needle roller bearing and No. 3 clutch hub thrust washer stay securely in place.

Bearing Diameter:

Item	Inside	Outside
Bearing	46.45 to 46.7 mm (1.83 to 1.84 in.)	64.3 to 64.55 mm (2.53 to 2.54 in.)

49. INSTALL REVERSE CLUTCH HUB SUB-ASSEMBLY

a. Install the reverse clutch hub to the clutch drum.

NOTICE:

Before installing of the reverse clutch hub, apply ATF to the sliding surfaces of the reverse clutch hub bush. After the installation, check that the reverse clutch rotates smoothly.

50. INSTALL REAR CLUTCH DISC SET

a. Using a screwdriver, install the snap ring.

NOTICE:

Be careful not to damage the clutch drum.

HINT:

Wrap the tip of the screwdriver with protective tape before use.

b. for 1VD-FTV:
Install the flange, 4 discs, 3 plates, selected reverse clutch flange and reverse clutch reaction sleeve to the clutch drum.

Install in order:
F - D - P - D - P - D - P - D - S/F - C

HINT:

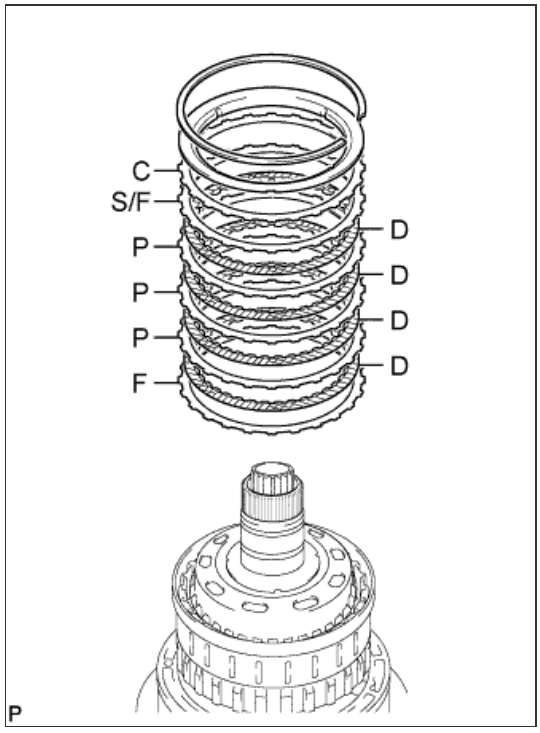
F = Flange

D = Disc

P = Plate

S/F = Selected reverse clutch flange

C = Cushion plate



c. for 1UR-FE, 3UR-FE:
Install the flange, 5 discs, 4 plates, selected reverse clutch flange and reverse clutch reaction sleeve to the clutch drum.

Install in order:
F - D - P - D - P - D - P - D - P - D - S/F - C

HINT:

F = Flange

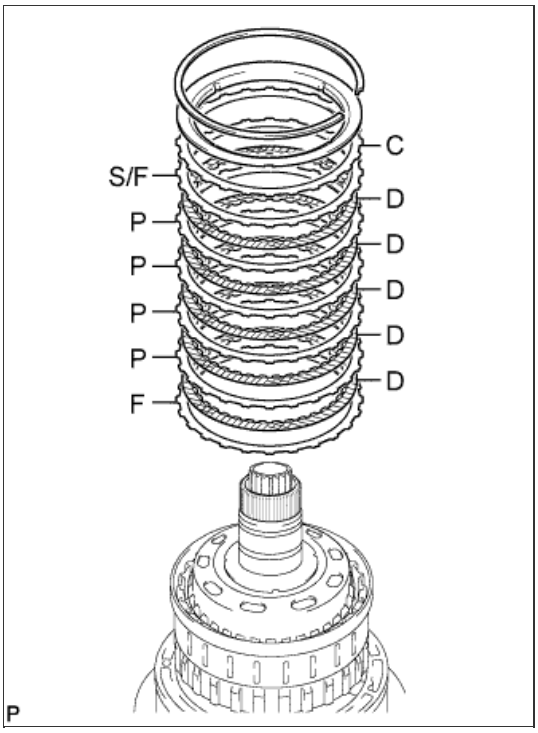
D = Disc

P = Plate

S/F = Selected reverse clutch flange

C = Cushion plate

d. Using a screwdriver, install the snap ring to the clutch drum.



51. INSTALL NO. 2 1-WAY CLUTCH ASSEMBLY

a. Install the clutch drum thrust washer to the clutch drum.

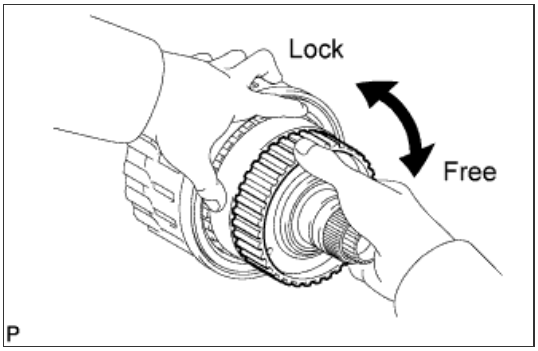
HINT:

Use a small amount of MP grease to make the clutch drum thrust washer stay securely in place.

b. Install the 1-way clutch to the clutch drum.

52. INSPECT NO. 2 1-WAY CLUTCH ASSEMBLY

a. Hold the reverse clutch hub and turn the 1-way clutch assembly. Check that the 1-way clutch turns freely clockwise and locks when turned counterclockwise.



53. INSTALL CLUTCH DRUM AND INPUT SHAFT ASSEMBLY

Text in Illustration

*1	Bearing A
*2	Bearing B

a. Install the 2 thrust needle roller bearings.

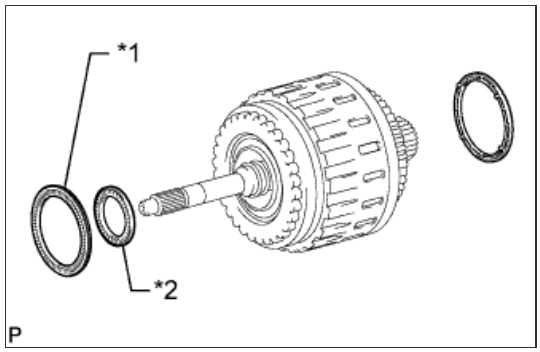
HINT:

Use a small amount of MP grease to make the thrust needle roller bearings stay securely in place.

Bearing Diameter:

Item	Inside	Outside

Bearing A	71.96 to 72.26 mm (2.83 to 2.84 in.)	85.25 to 85.6 mm (3.36 to 3.37 in.)
Bearing B	36.45 to 36.7 mm (1.44 to 1.45 in.)	52.96 to 53.26 mm (2.09 to 2.10 in.)



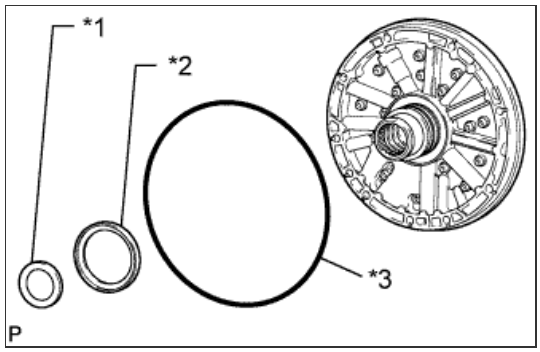
b. Coat the clutch drum thrust washer with petroleum jelly and install it to the clutch drum and input shaft assembly.

c. Install the clutch drum and input shaft assembly to the transmission case.

54. INSTALL OIL PUMP ASSEMBLY

Text in Illustration

*1	Race A
*2	Race B
*3	New O-Ring



a. Coat a new O-ring with ATF and install it to the oil pump assembly.

b. Install the 2 thrust bearing races to the front oil pump assembly.

Thrust Bearing Race Diameter:

Item	Inside	Outside
Race A	74.26 to 74.56 mm (2.92 to 2.94 in.)	87.39 to 87.74 mm (3.44 to 3.45 in.)
Race B	38.0 to 38.3 mm (1.50 to 1.51 in.)	53.9 to 54.1 mm (2.12 to 2.13 in.)

c. Pass the input shaft through the center hole of the oil pump assembly, and align the bolt holes of the oil pump assembly with the transmission case.

d. Hold the input shaft and lightly press the oil pump body to slide the oil seal rings into the overdrive direct clutch drum.

e. Apply seal packing to the flanges of the bolts.

Seal packing:
Toyota Genuine Seal Packing 1281, Three Bond 1281 or equivalent

NOTICE:

Do not allow seal packing to contact the bolt threads.

f. Install the 10 bolts.

Torque:
21 N*m{ 214 kgf*cm , 15 ft.*lbf }

NOTICE:

During installation, do not allow oil to contact the bolts or the surface of the oil pump body.

55. INSPECT INDIVIDUAL PISTON OPERATION

a. Check the operating sound while applying compressed air into the oil holes indicated in the illustration.

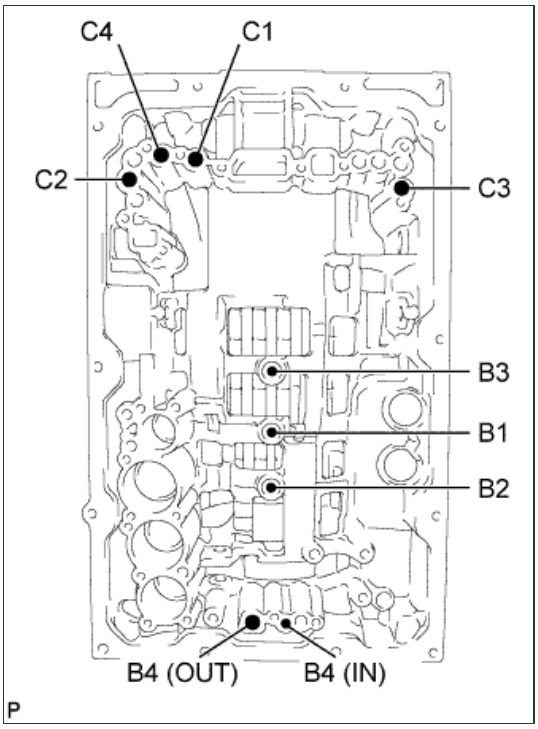
HINT:

When inspecting the direct clutch, check with the accumulator piston holes indicated in the illustration.

If there is no sound, disassemble and check the installation condition of the parts.

1. No. 2 clutch (C2)
2. No. 3 clutch (C3)

3. No. 4 clutch (C4)
4. No. 1 clutch (C1)
5. No. 3 brake (B3)
6. No. 1 brake (B1)
7. No. 2 brake (B2)
8. No. 4 brake (B4)

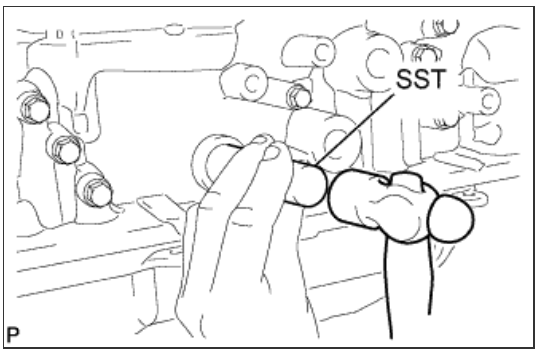


56. INSTALL MANUAL VALVE LEVER SHAFT OIL SEAL

a. Using SST, tap in 2 new oil seals.

SST
09350-30020 (09350-07110)

b. Coat the lips of the oil seals with MP grease.



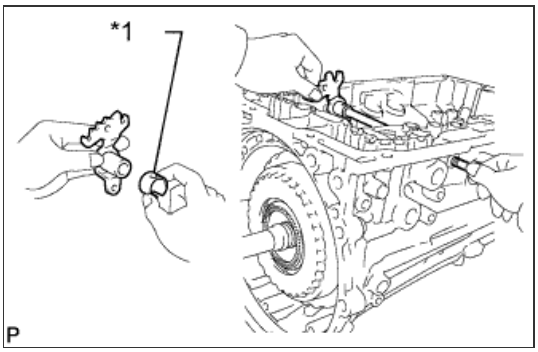
57. INSTALL MANUAL VALVE LEVER SUB-ASSEMBLY

Text in Illustration

*1	New Spacer

a. Install a new spacer to the manual valve lever sub-assembly.

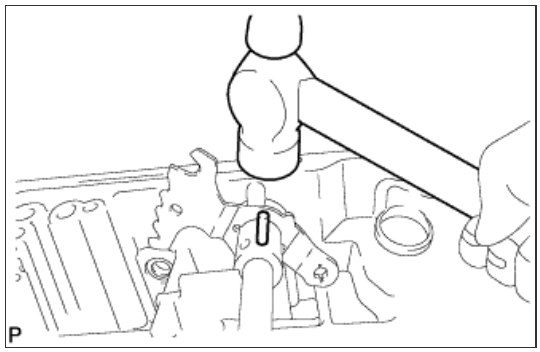
b. Push the manual valve lever shaft through the transmission case and install the manual valve lever sub-assembly to the manual valve lever shaft.



c. Using a hammer, tap in a new spring pin.

d. Align the manual valve lever indentation with the spacer hole and stake them together with a punch.

e. Check that the shaft rotates smoothly.



58. INSTALL PARKING LOCK PAWL

a. Install a new E-ring to the shaft.

b. Install the parking lock pawl, shaft and spring.

59. INSTALL PARKING LOCK ROD SUB-ASSEMBLY

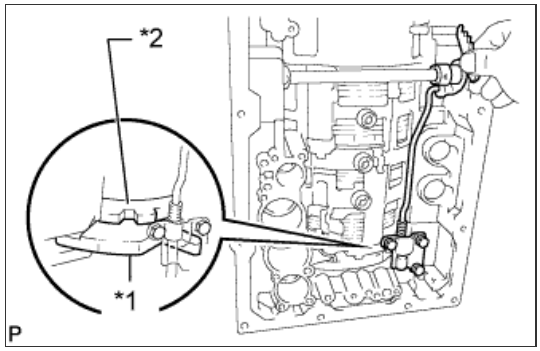
a. Connect the parking lock rod to the manual valve lever sub-assembly.

60. INSTALL PARKING LOCK PAWL BRACKET

a. Place the parking lock pawl bracket onto the transmission case and install the 3 bolts.

Torque:
18 N*m{ 184 kgf*cm , 13 ft.*lbf }

b. Move the manual valve lever sub-assembly to the P position and confirm that the planetary ring gear is correctly locked by the lock pawl.

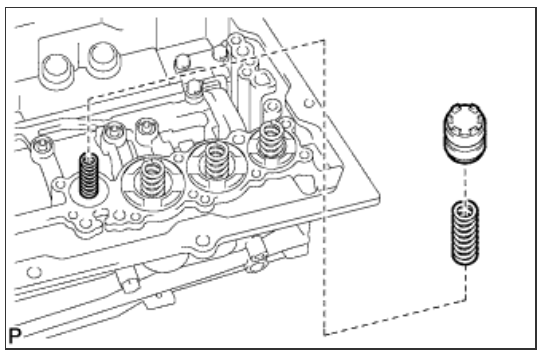


Text in Illustration

*1	Lock Pawl
*2	Rear Planetary Gear

61. INSTALL B-1 ACCUMULATOR VALVE

a. Install the 2 springs and accumulator valve to the hole.



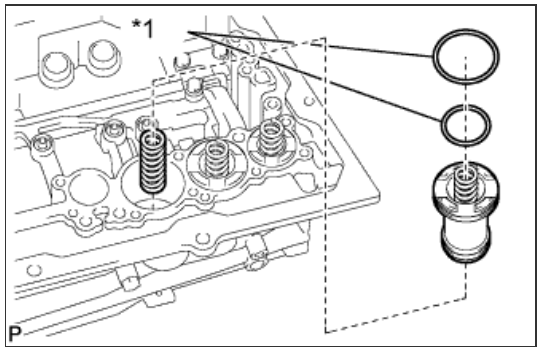
Spring Diameter:

Spring	Free Length Outer Diameter	Color
B-1 Inner	44.98 mm (1.77 in.) 11.30 mm (0.445 in.)	Natural
B-1 Outer	46.36 mm (1.83 in.) 17.10 mm (0.673 in.)	Natural

62. INSTALL C-3 ACCUMULATOR PISTON

Text in Illustration

*1	New O-Ring



a. Coat 2 new O-rings with ATF and install them to the piston.

b. Install the spring and accumulator piston to the hole.

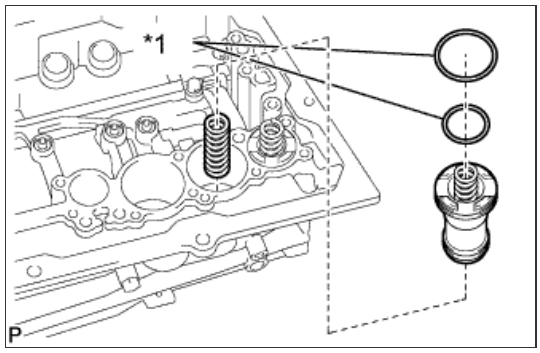
Spring Diameter:

Spring	Free Length Outer Diameter	Color
C-3	76.65 mm (3.02 in.) 20.1 mm (0.791 in.)	for 1VD-FTV: White
		for 1UR-FE, 3UR-FE: Natural

63. INSTALL B-3 ACCUMULATOR PISTON

Text in Illustration

*1	New O-Ring



a. Coat 2 new O-rings with ATF and install them to the piston.

b. Install the spring and accumulator piston to the hole.

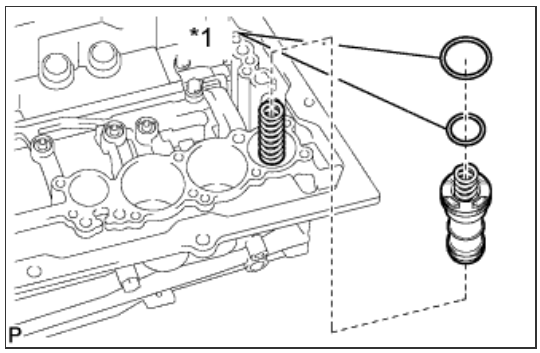
Spring Diameter:

Spring	Free Length Outer Diameter	Color
B-3	64.50 mm (2.54 in.) 19.5 mm (0.768 in.)	Orange

64. INSTALL C-2 ACCUMULATOR PISTON

Text in Illustration

*1	New O-Ring



a. Coat 2 new O-rings with ATF and install them to the piston.

b. Install the spring and accumulator piston to the hole.

Spring Diameter:

Spring	Free Length Outer Diameter	Color
C-2	68.0 mm (2.68 in.) 16.1 mm (0.634 in.)	for 1VD-FTV: Blue
		for 1UR-FE, 3UR-FE: Light green

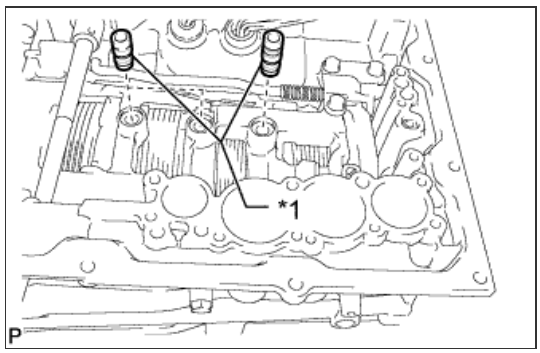
65. INSTALL CHECK BALL BODY

a. Install the spring and check ball body.

66. INSTALL BRAKE DRUM GASKET

Text in Illustration

*1	New O-Ring

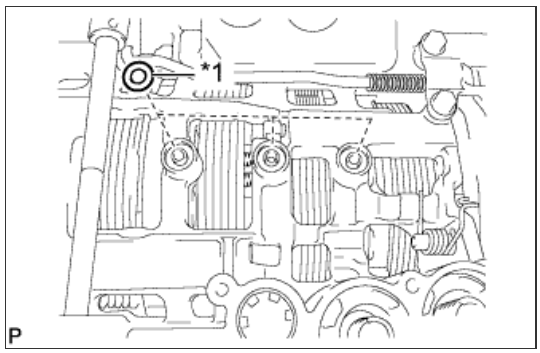


a. Install 3 new brake drum gaskets.

67. INSTALL TRANSMISSION CASE GASKET

Text in Illustration

*1	New O-Ring

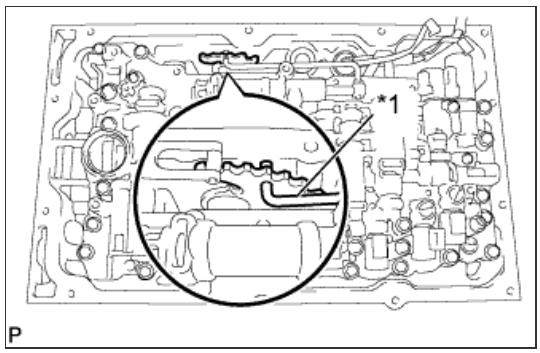


a. Install 3 new transmission case gaskets.

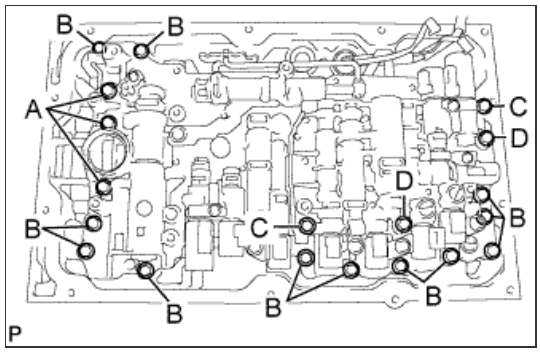
68. INSTALL TRANSMISSION VALVE BODY ASSEMBLY

Text in Illustration

*1	Pin



a. Align the hole of the manual valve with the pin of the lever.



b. Install the 19 bolts.

Torque:
11 N*m{ 112 kgf*cm , 8 ft.*lbf }

HINT:

Each bolt length is indicated below.

36 mm (1.42 in.) for bolt A

25 mm (0.984 in.) for bolt B

45 mm (1.77 in.) for bolt C

50 mm (1.97 in.) for bolt D

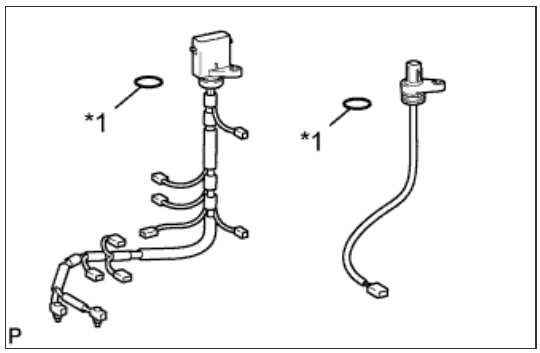
c. Install the detent spring and detent spring cover with the bolt.

Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }

69. INSTALL NO. 1 TRANSMISSION WIRE AND NO. 2 TRANSMISSION WIRE

Text in Illustration

*1	New O-Ring

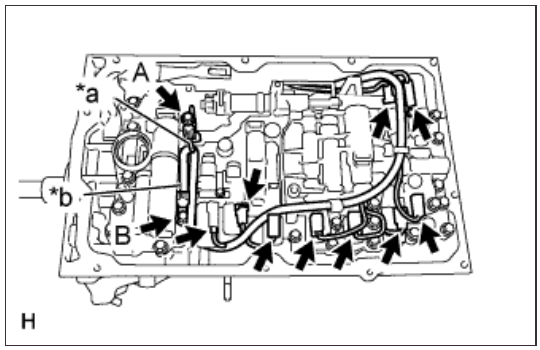


a. Install 2 new O-rings to the transmission wires.

b. Install the transmission wire harnesses.

c. Install the No. 1 transmission wire and No. 2 transmission wire with the 2 bolts.

Torque:
5.4 N*m{ 55 kgf*cm , 48 in.*lbf }



d. Connect the 9 connectors to the solenoid valves.

Text in Illustration

*a	Orange
*b	Blue

e. Connect the 2 ATF temperature sensors with the 2 clamps and 2 bolts.

Torque:
for bolt A:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }
for bolt B:
11 N*m{ 112 kgf*cm , 8 ft.*lbf }

HINT:

Each bolt length is indicated below.

12 mm (0.472 in.) for bolt A

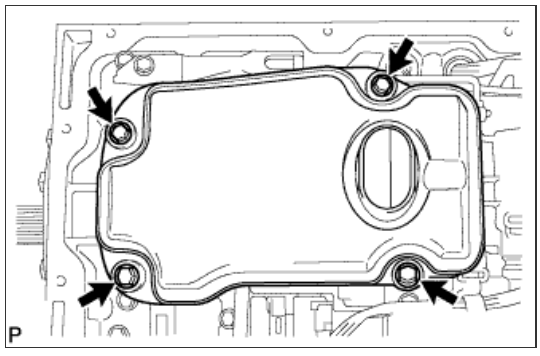
36 mm (1.42 in.) for bolt B

70. INSTALL VALVE BODY OIL STRAINER ASSEMBLY

a. Coat a new O-ring with ATF and install it to the valve body oil strainer assembly.

b. Install the valve body oil strainer assembly with the 4 bolts.

Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }



71. INSTALL AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY

Text in Illustration

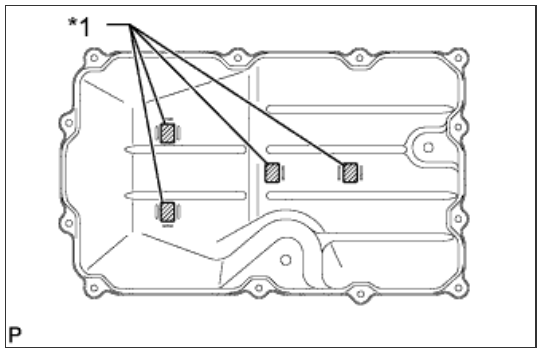
*1	Magnet

a. Install the 4 magnets.

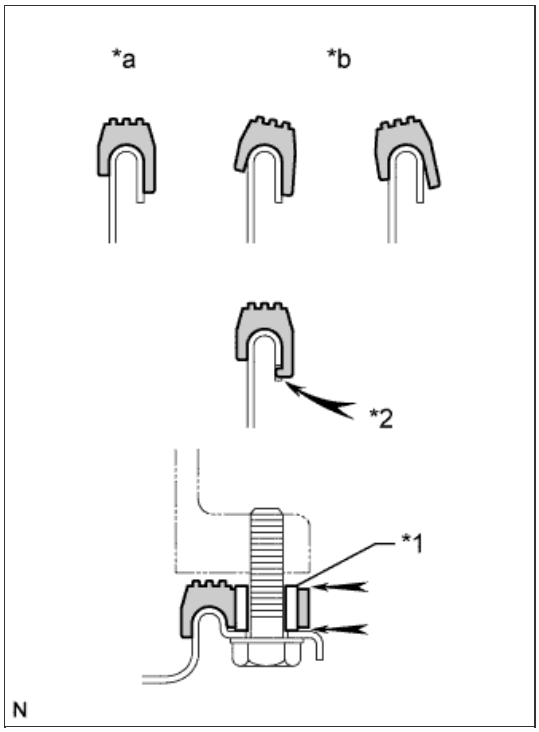
b. Install a new gasket to the oil pan.

c. Install the oil pan with the 12 bolts.

Torque:
7.4 N*m{ 75 kgf*cm , 65 in.*lbf }



NOTICE:



- **Make sure that there is no oil or foreign matter on the gasket seal surface and oil pan contact surface.**
- **Install the gasket so that there is no slack in the gasket, and make sure the entire circumference of the seal surface is level.**
- **Make sure that the 9 gasket drop prevention protrusions are attached to the oil pan.**
- **When tightening the bolts of the oil pan, make sure that the gasket is not pinched between the gasket tightening area sleeve and the transmission seal surface.**

Text in Illustration

*1	Sleeve
*2	Protrusion
*a	Correct
*b	Incorrect

d. Install the drain plug.

Torque:
20 N*m{ 204 kgf*cm , 15 ft.*lbf }

72. INSTALL TRANSFER CASE ADAPTER RADIAL BALL BEARING

a. Using SST and a press, press in the bearing until it stops.

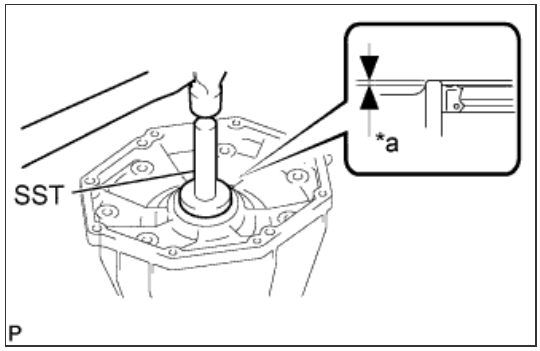
SST
09950-60010 (09951-00650)
09950-70010 (09951-07150)

b. Using a screwdriver, install the snap ring.

73. INSTALL TRANSMISSION CASE ADAPTER OIL SEAL

Text in Illustration

*a	0 to 1 mm



a. Coat the lip of a new oil seal with ATF.

b. Using SST and a hammer, tap in the oil seal.

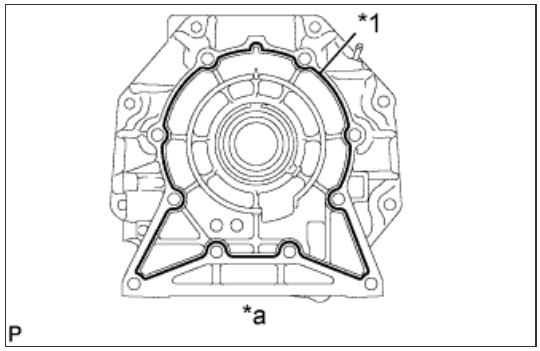
Standard depth:
0 to 1 mm (0 to 0.0394 in.)

SST
09950-60010 (09951-00650)
09950-70010 (09951-07150)

74. INSTALL REAR TRANSFER ADAPTER

Text in Illustration

*1	Seal Packing
*a	Seal Diameter: 1 to 1.5 mm



a. Clean the threads of the bolts and case with non-residue solvent.

b. Apply seal packing to the rear transfer adapter.

Seal packing:
Toyota Genuine Seal Packing 1281,
Three Bond 1281 or equivalent

Seal diameter:
1.0 to 1.5 mm (0.0394 to 0.0591 in.)

c. Install the rear transfer adapter with the 10 bolts.

Torque:
34 N*m{ 345 kgf*cm , 25 ft.*lbf }

75. INSTALL AUTOMATIC TRANSMISSION HOUSING

a. Clean the threads of the bolts and case with non-residue solvent.

b. Install the transmission housing with the 14 bolts.

Torque:
34 N*m{ 345 kgf*cm , 25 ft.*lbf }

76. INSTALL AUTOMATIC TRANSMISSION BREATHER TUBE

a. Coat a new O-ring with ATF and install it to the breather tube.

b. Install the breather tube with the 2 bolts.

Torque:
5.4 N*m{ 55 kgf*cm , 48 in.*lbf }

77. REMOVE TRANSMISSION OIL COOLER ASSEMBLY (w/ ATF Warmer)

a. Coat 2 new O-rings with ATF and install them to the transmission oil cooler assembly.

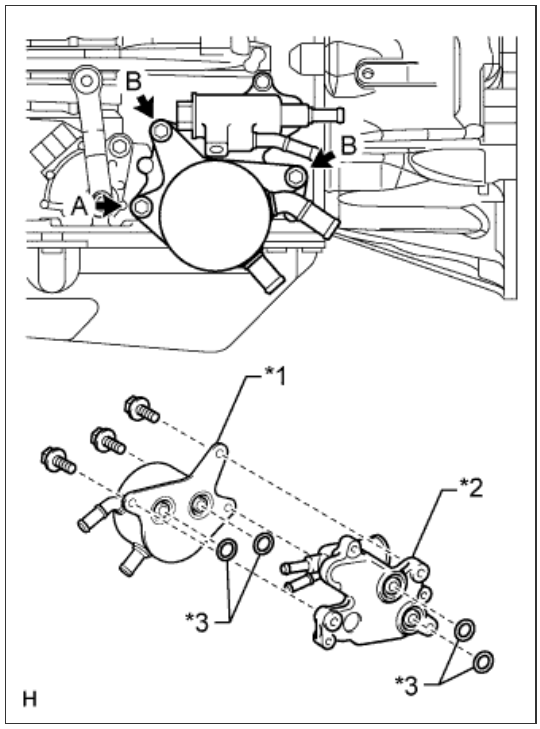
Text in Illustration

*1	Transmission Oil Cooler Assembly
*2	Transmission Oil Thermostat
*3	O-ring

b. Coat 2 new O-rings with ATF and install them to the transmission oil thermostat.

c. Temporarily install bolt labeled A. Install the bolts labeled B and tighten them to the specified torque. Then tighten bolt labeled A to the specified torque.

Torque:
21 N*m{ 214 kgf*cm , 15 ft.*lbf }



78. INSTALL OIL COOLER TUBE UNION (w/o ATF Warmer)

a. Coat 2 new O-rings with ATF and install them to the 2 oil cooler tube unions.

b. Using a union nut wrench, install the 2 oil cooler tube unions.

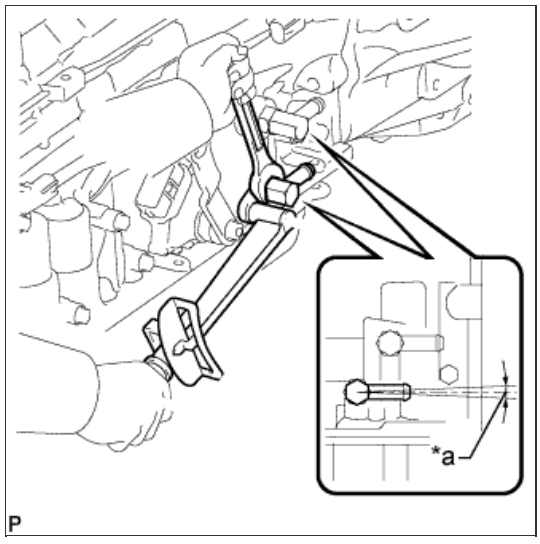
Text in Illustration

*a	-2 to 2°

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

NOTICE:

Use the formula to calculate special torque values for situations where a union nut wrench is combined with a torque wrench (Click here).



79. INSTALL SPEED SENSOR

a. Coat 2 new O-rings with ATF and install them to the speed sensors.

b. Install the 2 speed sensors.

c. Install the 2 bolts.

Torque:
5.4 N*m{ 55 kgf*cm , 48 in.*lbf }

80. INSTALL PARK/NEUTRAL POSITION SWITCH ASSEMBLY

HINT:

Make sure that the manual valve lever shaft has not been rotated prior to installing the park/neutral position switch as the detent spring may become detached from the manual valve lever shaft.

a. Clean the bolt and the bolt hole.

b. Apply adhesive to 2 or 3 threads on the end of the bolt.

Adhesive:
Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

c. Temporarily install the park/neutral position switch assembly to the automatic transmission case subassembly with the bolt.

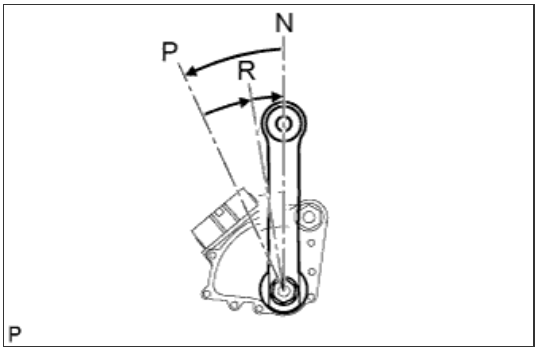
d. Install a new lock washer and the nut to the park/ neutral position switch assembly.

Torque:
6.9 N*m{ 70 kgf*cm , 61 in.*lbf }

e. Temporarily install the transmission control shaft lever RH.

f. Using the transmission control shaft lever RH, turn the manual lever shaft all the way back and then forward 2 notches to select the N position.

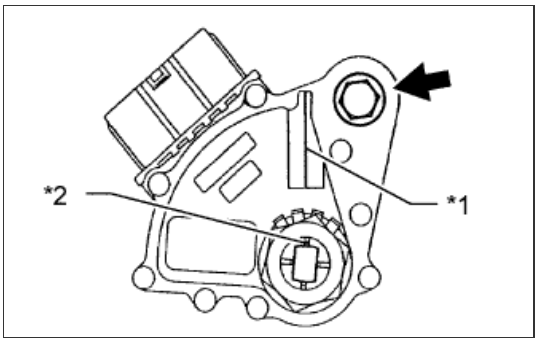
g. Remove the control shaft lever RH.



h. Align the groove with the neutral basic line.

Text in Illustration

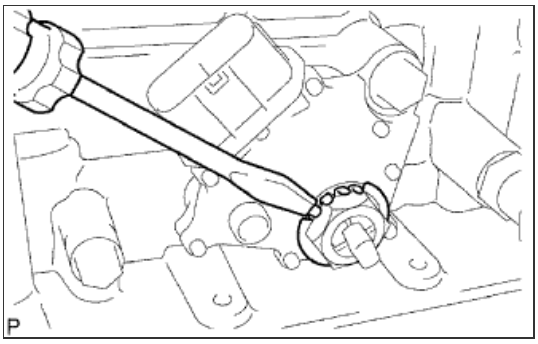
*1	Neutral Basic Line
*2	Groove



i. Hold the switch in position and tighten the bolt.

Torque:
13 N*m{ 133 kgf*cm , 10 ft.*lbf }

j. Using a screwdriver, bend the tabs of the lock washer.



81. INSTALL TRANSMISSION CONTROL SHAFT LEVER RH

a. Install the transmission control shaft lever RH with the washer and nut.

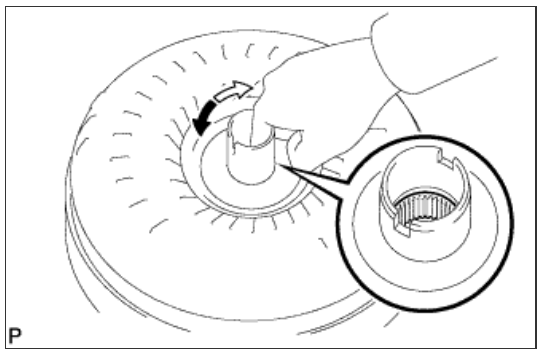
Torque:
16 N*m{ 163 kgf*cm , 12 ft.*lbf }

for Preparation Click here

1. INSPECT TORQUE CONVERTER ASSEMBLY

a. Inspect the 1-way clutch.

i. Press on the serrations of the stator with a finger and rotate the stator. Check that it rotates smoothly when turned clockwise and locks when turned counterclockwise.
If necessary, clean the converter and recheck the 1-way clutch.
Replace the converter if the 1-way clutch still fails the inspection.



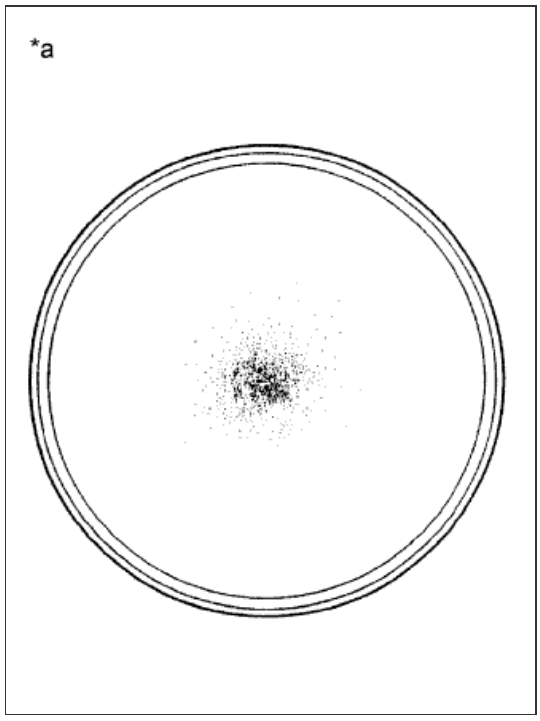
Text in Illustration

⇨	Free
➡	Lock

b. Determine the condition of the torque converter.

Text in Illustration

*a	Sample showing maximum allowable amount of powder in ATF



i. If the inspection result of the torque converter satisfies the following conditions, replace the torque converter.

Malfunction

- A metallic sound is emitted from the torque converter during the stall test or when the shift lever is moved to N.
- The 1-way clutch is free or locks in both directions.
- The amount of powder in the ATF is more than the sample shown in the illustration (see the sample).

HINT:

The sample shows approximately 0.025 liters (0.026 US qts, 0.022 Imp. qts) of ATF that was taken out from a removed torque converter.

c. Replace the ATF in the torque converter.

i. If the ATF is discolored and/or has a foul odor, stir the ATF in the torque converter thoroughly and drain the ATF with the torque converter facing upward.

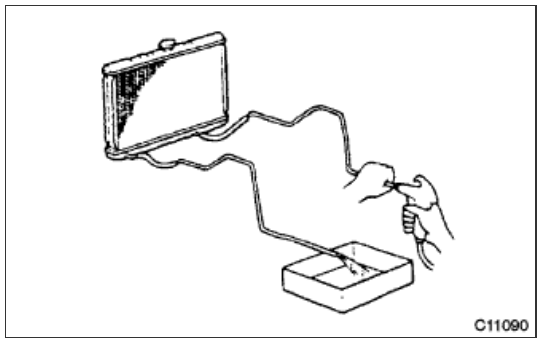
d. Clean and check the oil cooler and oil pipe line.

i. If the torque converter is inspected or the ATF is replaced, clean the oil cooler and oil pipe line.

HINT:

- **Apply compressed air at 196 kPa (2.0 kgf/cm ^{2}, 28 psi) into the inlet hose.**
- **If a large amount of powder is found in the ATF, add new ATF using a bucket pump and clean the oil cooler and oil pipe again.**

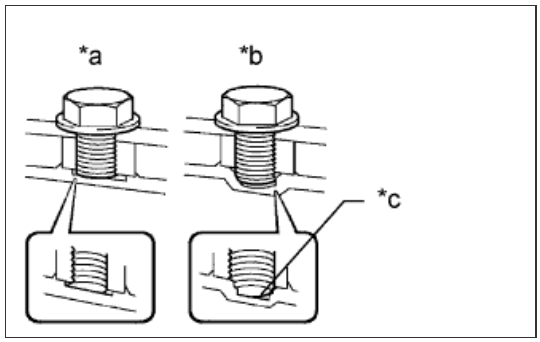
ii. If the ATF is cloudy, inspect the oil cooler.



e. Prevent deformation of the torque converter and damage to the oil pump gear.

Text in Illustration

*a	Correct
*b	Incorrect
*c	Bottom is damaged



i. When there is any damage to the end of a bolt for the torque converter and to the bottom of the bolt hole, replace the bolt and the torque converter.

ii. All of the bolts should be the same length.

iii. Bolts with washers must be used.

2. INSPECT DRIVE PLATE

a. Check the drive plate for damage.

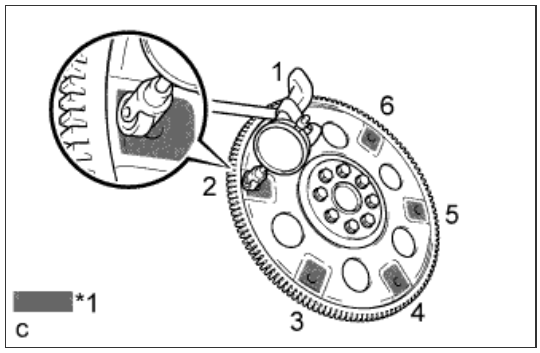
b. Set up a dial indicator and measure the runout of the 6 portions around the torque converter contact surfaces.

Text in Illustration

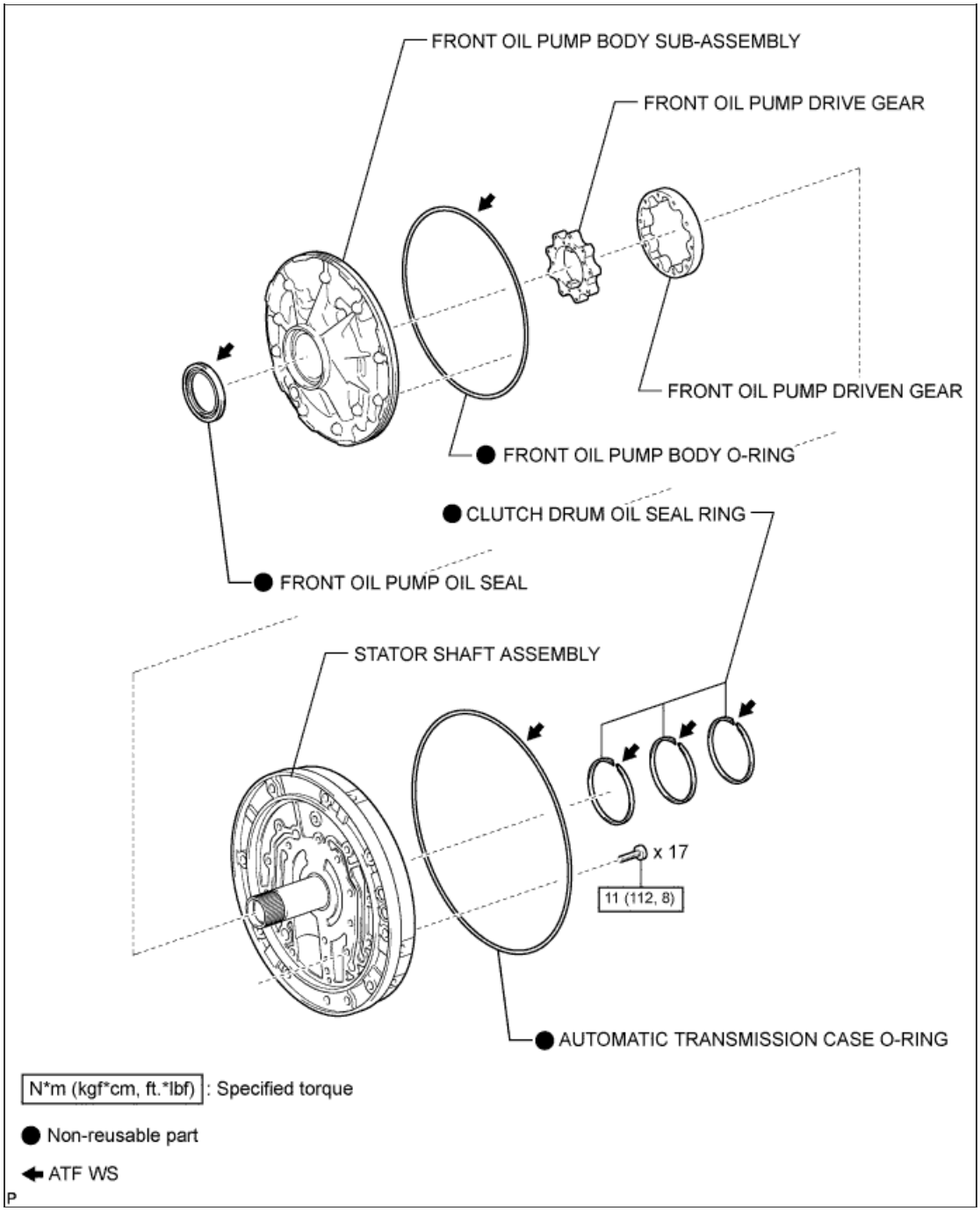
*1	Measurement point

Maximum runout:
0.30 mm (0.0118 in.)

If the runout is not within the specification or the drive plate is damaged, replace the drive plate.
for 1UR-FE (Click here)
for 3UR-FE (Click here)
for 1VD-FTV (Click here)



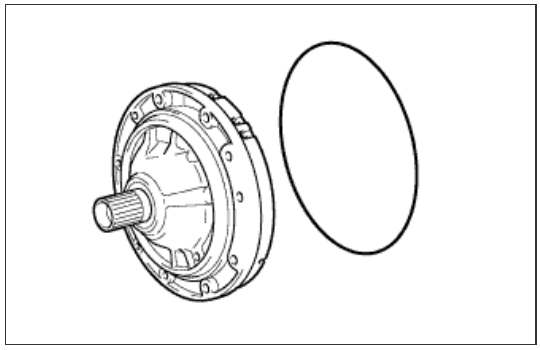
for Preparation Click here



for Preparation Click here

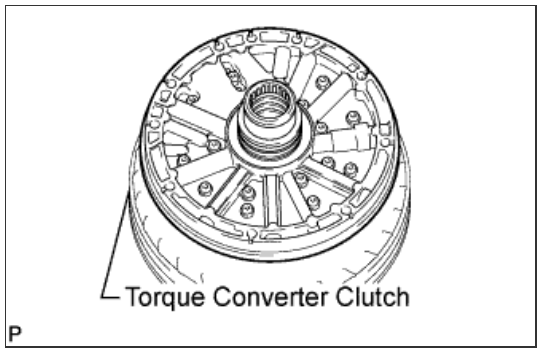
1. REMOVE AUTOMATIC TRANSMISSION CASE O-RING

a. Remove the O-ring from the oil pump.



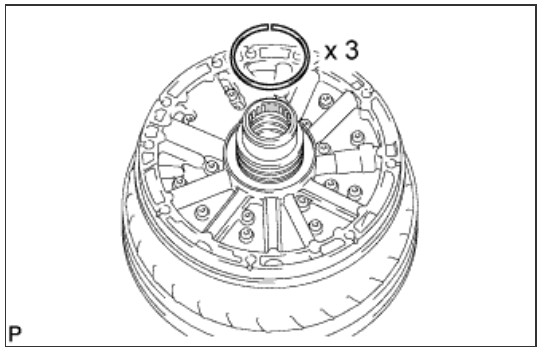
2. FIX OIL PUMP ASSEMBLY

a. Place the oil pump body on the torque converter.



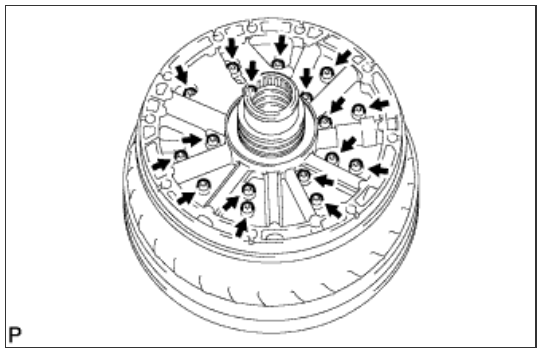
3. REMOVE CLUTCH DRUM OIL SEAL RING

a. Remove the 3 oil seal rings.



4. REMOVE STATOR SHAFT ASSEMBLY

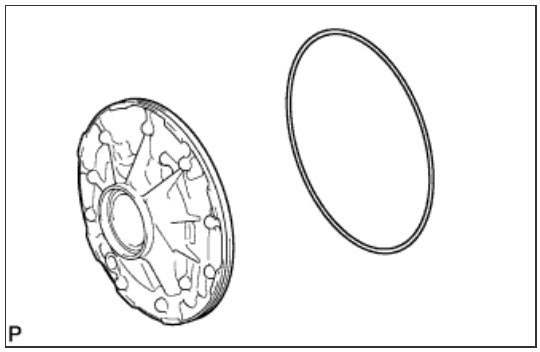
a. Remove the 17 bolts, and then remove the stator shaft from the oil pump body.



5. REMOVE FRONT OIL PUMP BODY O-RING

a. Remove the O-ring from the oil pump body.

b. Remove the oil pump body from the torque converter clutch.

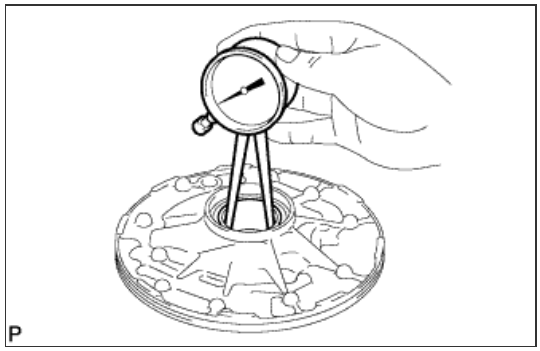


6. INSPECT FRONT OIL PUMP BODY SUB-ASSEMBLY

a. Using a dial indicator, measure the inside diameter of the oil pump body bush.

Standard inside diameter:
45.064 to 45.078 mm (1.774 to 1.775 in.)

If the inside diameter is more than the standard, replace the oil pump body sub-assembly.

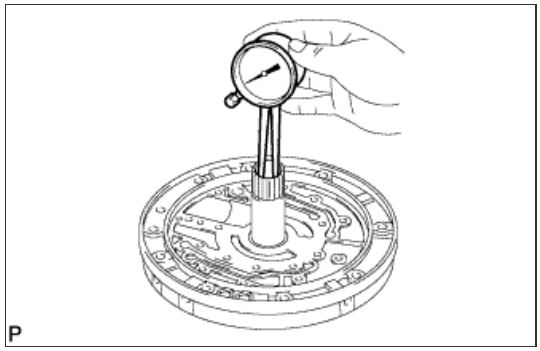


7. INSPECT STATOR SHAFT ASSEMBLY

a. Using a dial indicator, measure the inside diameter of the stator shaft bush.

Standard inside diameter:
25.900 to 25.921 mm (1.020 to 1.021 in.)

If the inside diameter is more than the standard, replace the stator shaft assembly.



8. INSPECT CLEARANCE OF OIL PUMP ASSEMBLY

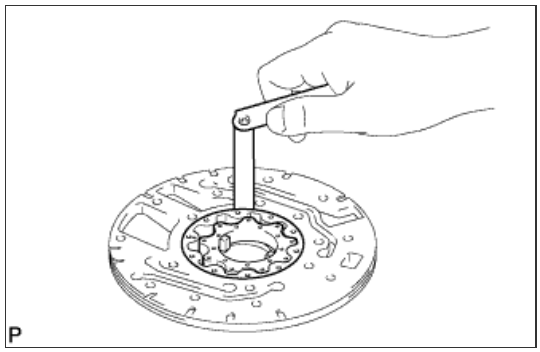
a. Push the driven gear to one side of the body.

b. Using a feeler gauge, measure the body clearance.

Standard body clearance:
0.10 to 0.17 mm (0.00394 to 0.00669 in.)

Maximum body clearance:
0.17 mm (0.00669 in.)

If the body clearance is more than the maximum, replace the drive gear, driven gear or pump body assembly.

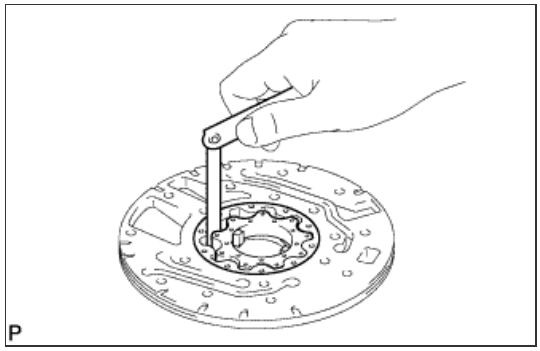


c. Using a feeler gauge, measure the tip clearance between the driven gear teeth and drive gear teeth.

Standard tip clearance:
0.070 to 0.150 mm (0.00276 to 0.00591 in.)

Maximum tip clearance:
0.150 mm (0.00591 in.)

If the tip clearance is more than the maximum, replace the drive gear, driven gear or pump body assembly.



d. Using a steel straightedge and feeler gauge, measure the side clearance of both gears.

Standard side clearance:
0.03 to 0.05 mm (0.00118 to 0.00197 in.)

Maximum side clearance:
0.05 mm (0.00197 in.)

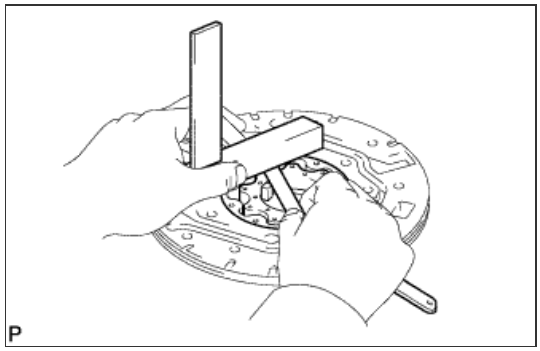
If the side clearance of both gears is more than the maximum, replace the drive gear, driven gear or pump body assembly.

HINT:

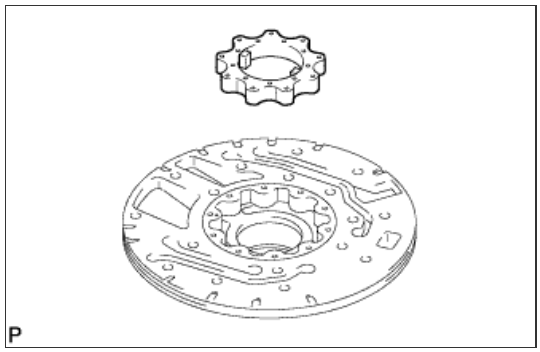
There are 7 different thicknesses for the drive and driven gears.

Standard Drive and Driven Gears Thickness:

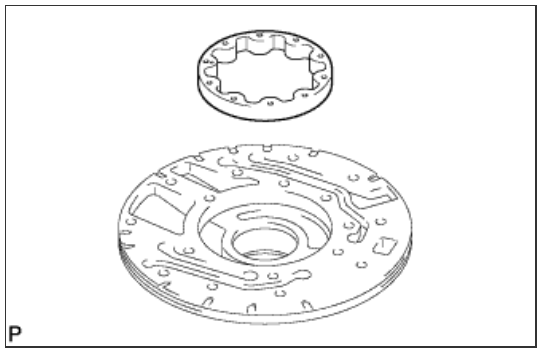
Mark	Thickness
0	11.636 to 11.642 mm (0.4581 to 0.4583 in.)
1	11.643 to 11.649 mm (0.4584 to 0.4586 in.)
2	11.650 to 11.656 mm (0.4587 to 0.4589 in.)
3	11.657 to 11.663 mm (0.4589 to 0.4592 in.)
4	11.664 to 11.670 mm (0.4592 to 0.4594 in.)
5	11.671 to 11.677 mm (0.4595 to 0.4597 in.)
6	11.678 to 11.684 mm (0.4598 to 0.4600 in.)



9. REMOVE FRONT OIL PUMP DRIVE GEAR



10. REMOVE FRONT OIL PUMP DRIVEN GEAR



11. REMOVE FRONT OIL PUMP OIL SEAL

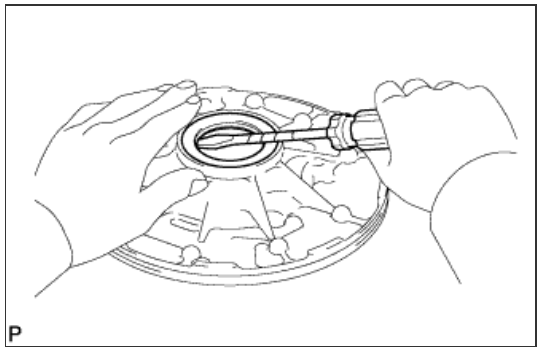
a. Using a screwdriver, pry out the oil seal.

NOTICE:

Be careful not to damage the oil pump body.

HINT:

Wrap the tip of the screwdriver with tape.



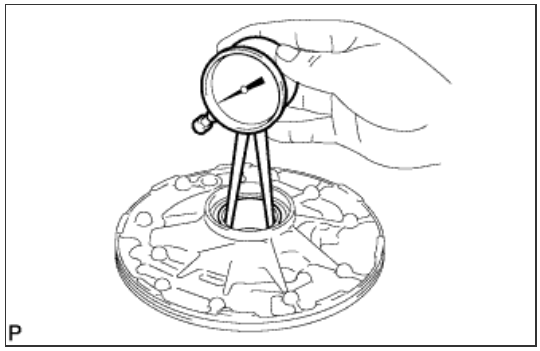
for Preparation Click here

1. INSPECT FRONT OIL PUMP BODY SUB-ASSEMBLY

a. Using a dial indicator, measure the inside diameter of the oil pump body bush.

Standard inside diameter:
45.064 to 45.078 mm (1.774 to 1.775 in.)

If the inside diameter is more than the standard, replace the oil pump body sub-assembly.

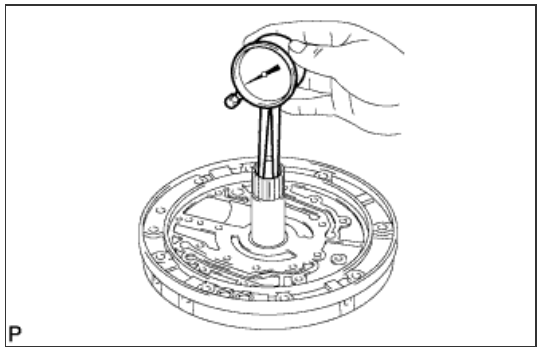


2. INSPECT STATOR SHAFT ASSEMBLY

a. Using a dial indicator, measure the inside diameter of the stator shaft bush.

Standard inside diameter:
25.900 to 25.921 mm (1.020 to 1.021 in.)

If the inside diameter is more than the standard, replace the stator shaft assembly.



3. INSPECT CLEARANCE OF OIL PUMP ASSEMBLY

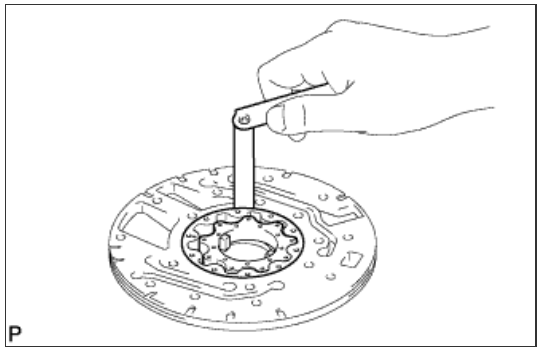
a. Push the driven gear to one side of the body.

b. Using a feeler gauge, measure the body clearance.

Standard body clearance:
0.10 to 0.17 mm (0.00394 to 0.00669 in.)

Maximum body clearance:
0.17 mm (0.00669 in.)

If the body clearance is more than the maximum, replace the drive gear, driven gear or pump body assembly.

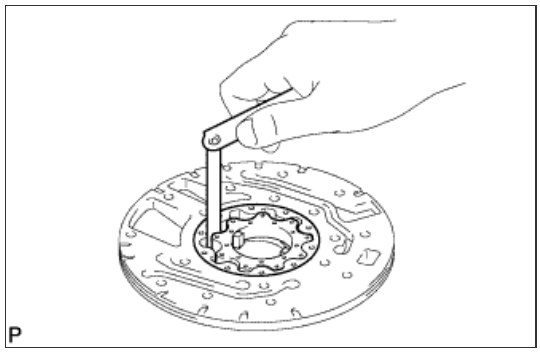


c. Using a feeler gauge, measure the tip clearance between the driven gear teeth and drive gear teeth.

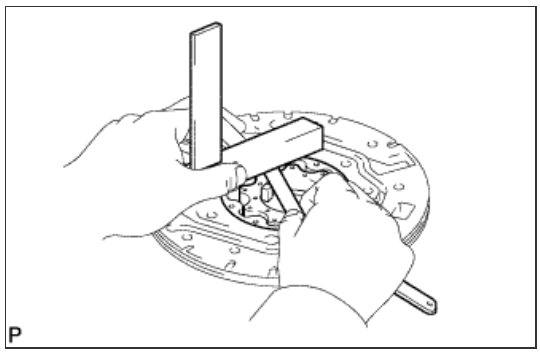
Standard tip clearance:
0.070 to 0.150 mm (0.00276 to 0.00591 in.)

Maximum tip clearance:
0.150 mm (0.00591 in.)

If the tip clearance is more than the maximum, replace the drive gear, driven gear or pump body assembly.



d. Using a steel straightedge and feeler gauge, measure the side clearance of both gears.



Standard side clearance:
0.03 to 0.05 mm (0.00118 to 0.00197 in.)

Maximum side clearance:
0.05 mm (0.00197 in.)

If the side clearance of both gears is more than the maximum, replace the drive gear, driven gear or pump body assembly.

HINT:

There are 7 different thicknesses for the drive and driven gears.

Standard Drive and Driven Gears Thickness:

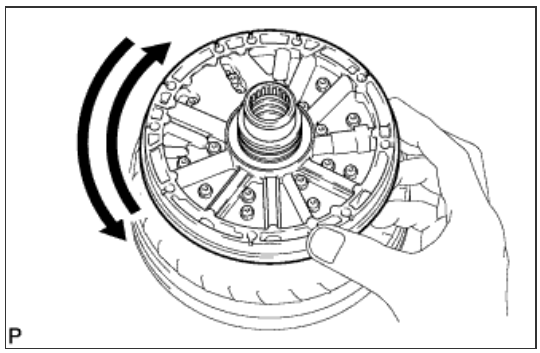
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4	11.664 to 11.670 mm (0.4592 to 0.4594 in.)
5	11.671 to 11.677 mm (0.4595 to 0.4597 in.)
6	11.678 to 11.684 mm (0.4598 to 0.4600 in.)

4. INSPECT FRONT OIL PUMP DRIVE GEAR ROTATION

a. Place the oil pump body on the torque converter clutch.

b. Check that the drive gear rotates smoothly.

c. Remove the oil pump assembly from the torque converter.



for Preparation Click here

1. INSTALL FRONT OIL PUMP OIL SEAL

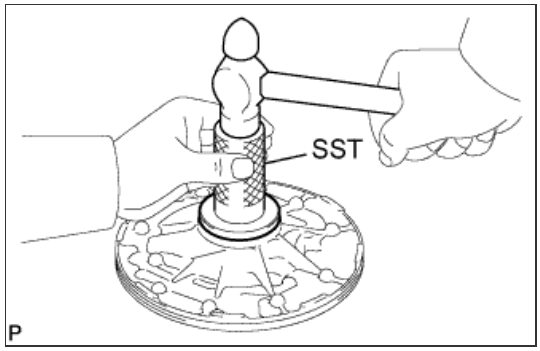
a. Using SST and a hammer, tap in a new oil seal.

SST
09950-60010 (09951-00650)
09950-70010 (09951-07100)

HINT:

The oil seal end should be flush with the outer edge of the pump body.

b. Coat the lip of the oil seal with MP grease.



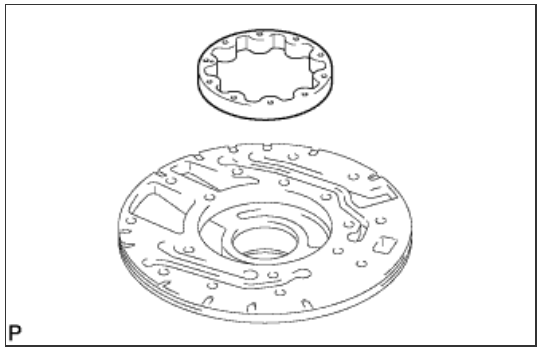
2. FIX FRONT OIL PUMP BODY SUB-ASSEMBLY

a. Place the oil pump body on the torque converter clutch.

3. INSTALL FRONT OIL PUMP DRIVEN GEAR

a. Coat the driven gear with ATF.

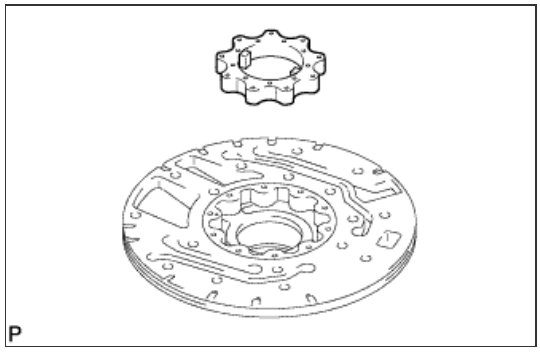
b. Install the driven gear to the oil pump body.



4. INSTALL FRONT OIL PUMP DRIVE GEAR

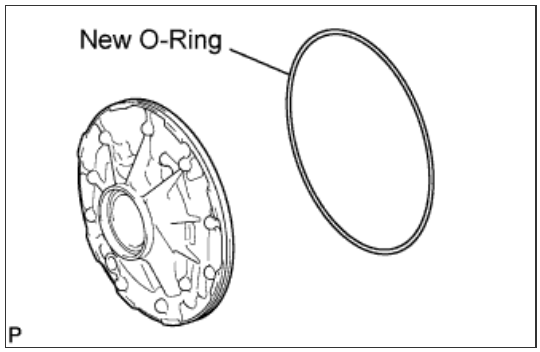
a. Coat the drive gear with ATF.

b. Install the drive gear to the oil pump body.



5. INSTALL FRONT OIL PUMP BODY O-RING

a. Coat a new O-ring with ATF and install it to the oil pump body.

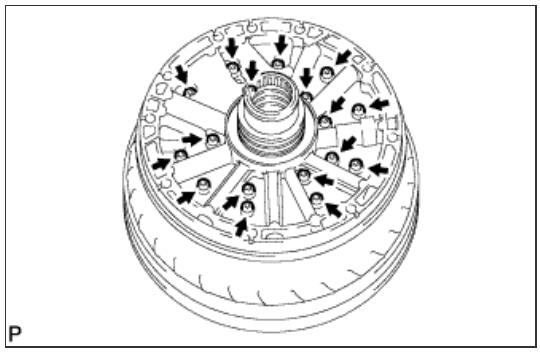


6. INSTALL STATOR SHAFT ASSEMBLY

a. Align the stator shaft with the bolt holes.

b. Install the 17 bolts.

Torque:
11 N*m{ 112 kgf*cm , 8 ft.*lbf }



7. INSTALL CLUTCH DRUM OIL SEAL RING

a. Coat 3 new oil seal rings with ATF.

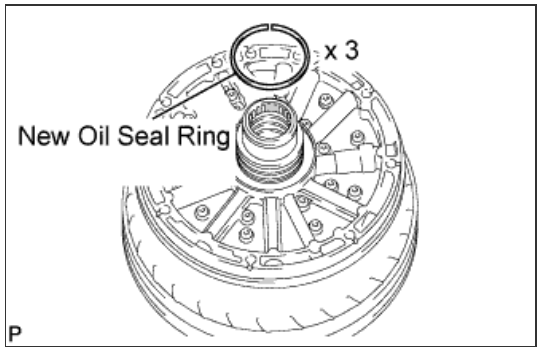
b. Squeeze the ends of the 3 oil seal rings together so that the overlap distance is 8 mm (0.314 in.) or less, and then install them to the starter shaft groove.

NOTICE:

Do not excessively widen the rings.

HINT:

After installing the oil seal rings, check that they rotate smoothly.

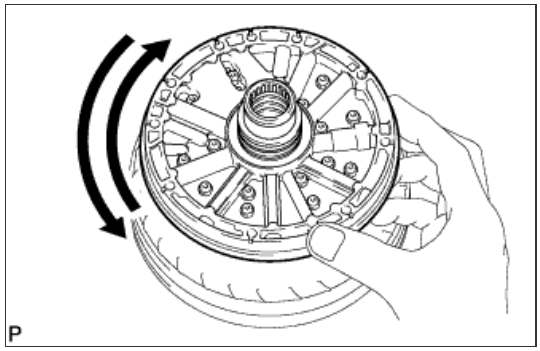


8. INSPECT OIL PUMP DRIVE GEAR ROTATION

a. Place the oil pump body on the torque converter clutch.

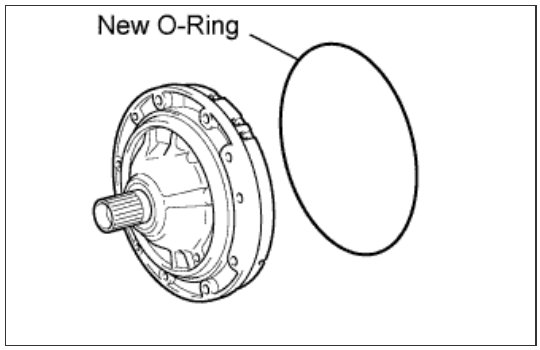
b. Check that the drive gear rotates smoothly.

c. Remove the oil pump assembly from the torque converter.



9. INSTALL AUTOMATIC TRANSMISSION CASE O-RING

a. Coat a new O-ring with ATF and install it to the oil pump.



for Preparation Click here

HINT:

Use the table below to help determine the cause of problem symptoms. If multiple suspected areas are listed, the potential causes of the symptoms are listed in order of probability in the "Suspected Area" column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.

Clutch System

Symptom	Suspected Area	See page
Clutch grabs/chatters	Engine mounting (Loose)	-
	Clutch disc (Excessive runout) (for 1GR-FE)	Click here
	Clutch disc (Excessive runout) (for 1VD-FTV)	Click here
	Clutch disc (Oily) (for 1GR-FE)	Click here
	Clutch disc (Oily) (for 1VD-FTV)	Click here
	Clutch disc (Worn out) (for 1GR-FE)	Click here
	Clutch disc (Worn out) (for 1VD-FTV)	Click here
	Clutch disc (Glazed) (for 1GR-FE)	Click here
	Clutch disc (Glazed) (for 1VD-FTV)	Click here
	Diaphragm spring (Tip out of alignment) (for 1GR-FE)	Click here
	Diaphragm spring (Tip out of alignment) (for 1VD-FTV)	Click here
Clutch pedal spongy	Clutch line (Air in line)	-
	Release cylinder rubber (Damaged)	Click here
Clutch noisy	Release bearing (Worn, dirty or damaged) (for 1GR-FE)	Click here
	Release bearing (Worn, dirty or damaged) (for 1VD-FTV)	Click here
Clutch slips	Clutch pedal (Free play out of adjustment) for LHD	Click here
	Clutch pedal (Free play out of adjustment) for RHD	Click here
	Clutch disc (Oily) (for 1GR-FE)	Click here
	Clutch disc (Oily) (for 1VD-FTV)	Click here
	Clutch disc (Worn out) (for 1GR-FE)	Click here
	Clutch disc (Worn out) (for 1VD-FTV)	Click here
	Diaphragm spring (Damaged) (for 1GR-FE)	Click here
	Diaphragm spring (Damaged) (for 1VD-FTV)	Click here
	Flywheel (Distorted) (for 1GR-FE)	Click here
	Flywheel (Distorted) (for 1VD-FTV)	Click here
Clutch does not disengage	Clutch pedal (Free play out of adjustment) for LHD	Click here
	Clutch pedal (Free play out of adjustment) for RHD	Click here
	Clutch line (Air in line)	-
	Release cylinder cup (Damaged)	Click here
	Clutch disc (Out of line) (for 1GR-FE)	Click here
	Clutch disc (Out of line) (for 1VD-FTV)	Click here
	Clutch disc (Runout excessive) (for 1GR-FE)	Click here
	Clutch disc (Runout excessive) (for 1VD-FTV)	Click here
	Clutch disc (Lining broken) (for 1GR-FE)	Click here
	Clutch disc (Lining broken) (for 1VD-FTV)	Click here
	Clutch disc (Dirty or burned) (for 1GR-FE)	Click here
	Clutch disc (Dirty or burned) (for 1VD-FTV)	Click here
	Clutch disc (Oily) (for 1GR-FE)	Click here
	Clutch disc (Oily) (for 1VD-FTV)	Click here
	Clutch disc (Lack of spline grease) (for 1GR-FE)	Click here
	Clutch disc (Lack of spline grease) (for 1VD-FTV)	Click here

for Preparation Click here

NOTICE:

Wash off clutch fluid immediately if it comes in contact with any painted surface.

HINT:

If any work is performed on the clutch system or if air in the clutch lines is suspected, bleed air from the clutch hydraulic system.

1. FILL RESERVOIR WITH BRAKE FLUID

a. Fill the reservoir with brake fluid.

Brake Fluid:
SAE J1703 or FMVSS No. 116 DOT 3

2. BLEED CLUTCH LINE

a. Remove the release cylinder bleeder plug cap.

b. Connect a vinyl tube to the bleeder plug.

c. Depress the clutch pedal several times, and then loosen the bleeder plug while the pedal is depressed.

d. When fluid no longer comes out, tighten the bleeder plug, and then release the clutch pedal.

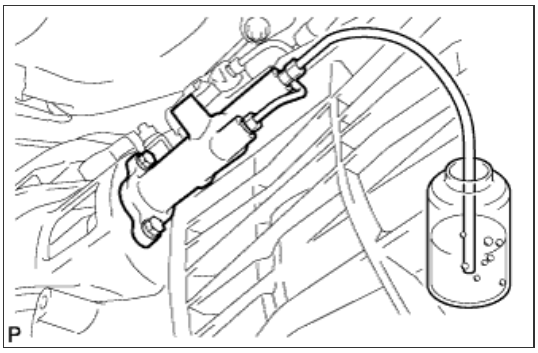
e. Repeat the previous 2 steps until all the air in the fluid is completely bled.

f. Tighten the bleeder plug.

Torque:
11 N*m{ 110 kgf*cm , 8 ft.*lbf }

g. Install the bleeder plug cap.

h. Check that all the air has been bled from the clutch line.



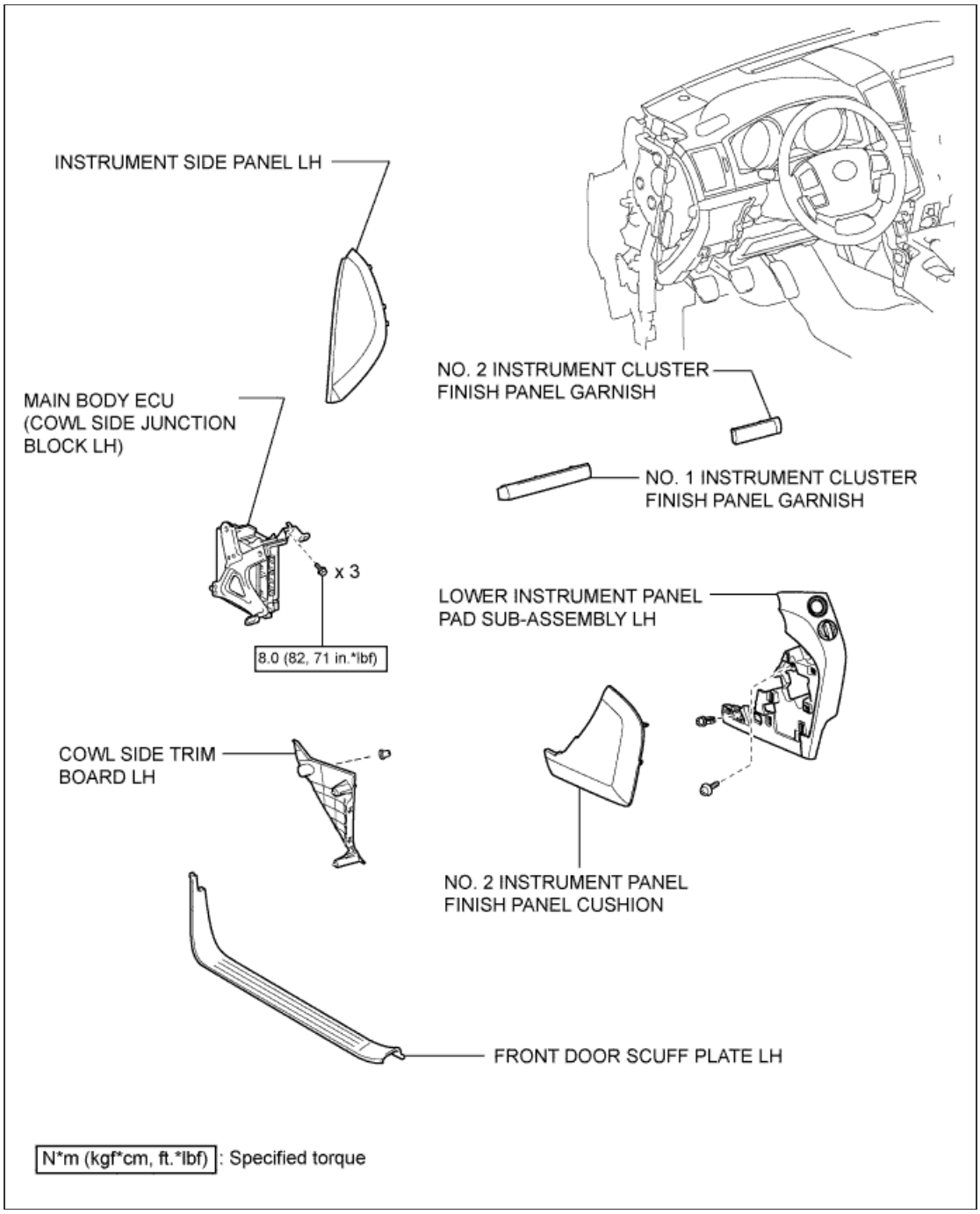
3. CHECK FLUID LEVEL IN RESERVOIR

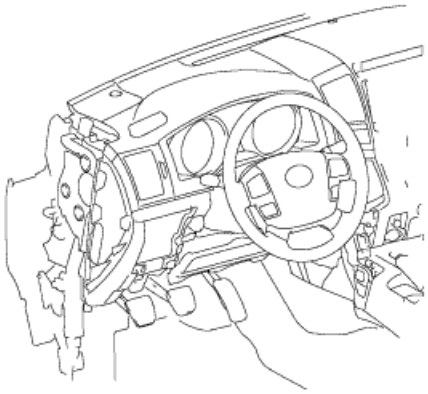
a. Check the fluid level.
If the brake fluid level is low, check for leaks and inspect the disc brake pad. If necessary, refill the reservoir with brake fluid after repair or replacement.

Brake fluid:
SAE J1703 or FMVSS No. 116 DOT 3

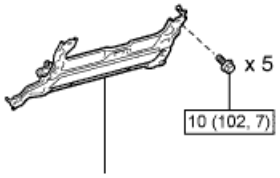
4. INSPECT FOR CLUTCH FLUID LEAK

for Preparation Click here



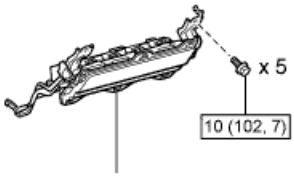


w/o Driver Side Knee Airbag:



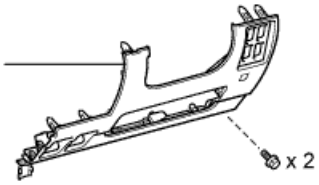
LOWER INSTRUMENT PANEL SUB-ASSEMBLY

w/ Driver Side Knee Airbag:



DRIVER SIDE KNEE AIRBAG ASSEMBLY

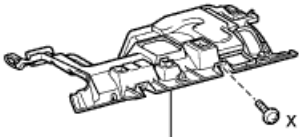
LOWER NO. 1 INSTRUMENT PANEL FINISH PANEL





NO. 1 SWITCH HOLE BASE

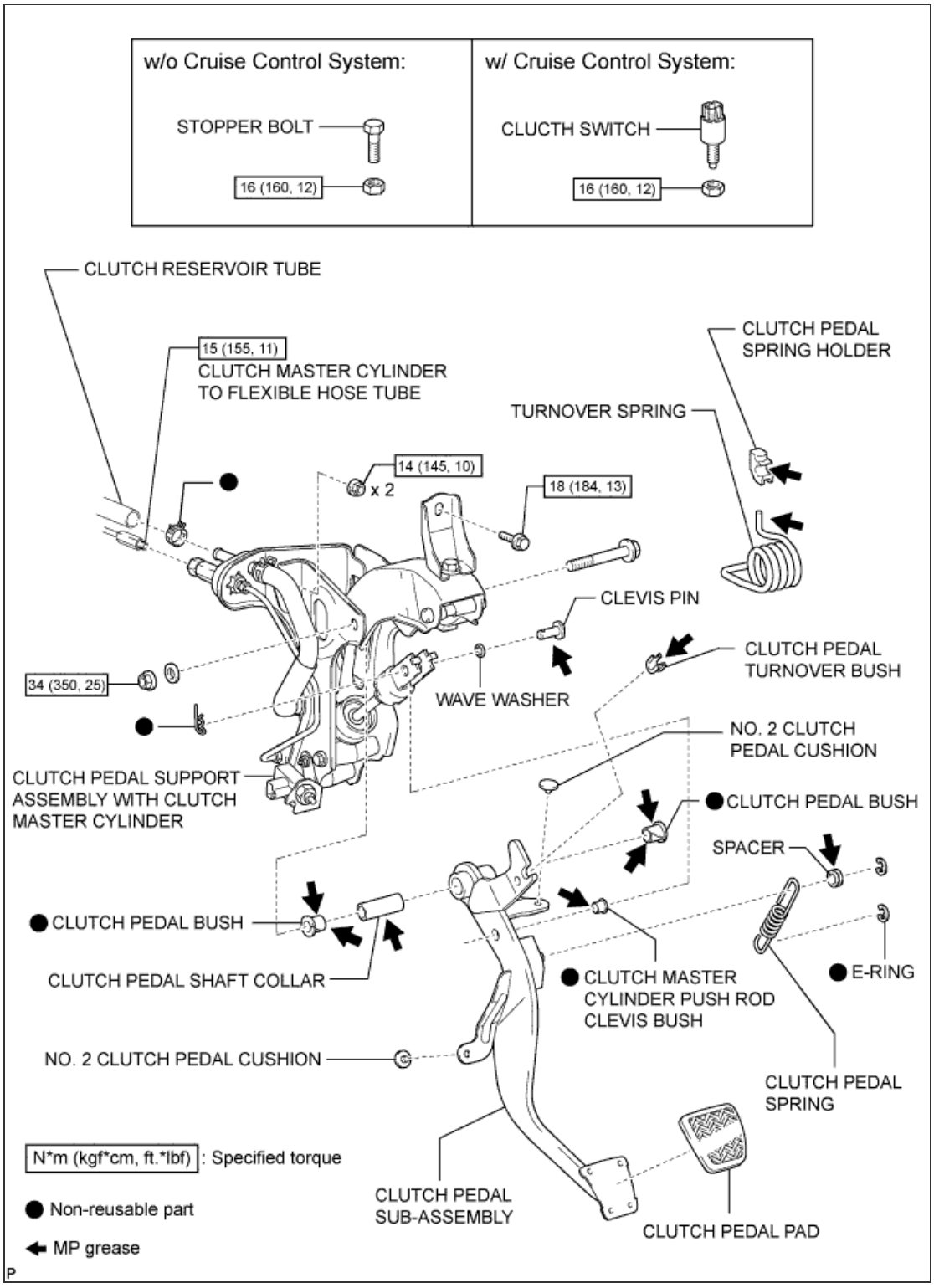
w/ Floor Under Cover:



NO. 1 INSTRUMENT PANEL UNDER COVER SUB-ASSEMBLY

N*m (kgf*cm, ft.*lbf) : Specified torque

T


w/o Cruise Control System:
STOPPER BOLT
16 (160, 12)
w/ Cruise Control System:
CLUCTH SWITCH
16 (160, 12)
CLUTCH RESERVOIR TUBE
15 (155, 11)
CLUTCH MASTER CYLINDER TO FLEXIBLE HOSE TUBE
CLUTCH PEDAL SPRING HOLDER
TURNOVER SPRING
14 (145, 10)
x 2
18 (184, 13)
CLEVIS PIN
34 (350, 25)
WAVE WASHER
CLUTCH PEDAL TURNOVER BUSH
NO. 2 CLUTCH PEDAL CUSHION
CLUTCH PEDAL SUPPORT ASSEMBLY WITH CLUTCH MASTER CYLINDER
CLUTCH PEDAL BUSH
SPACER
CLUTCH PEDAL BUSH
CLUTCH PEDAL SHAFT COLLAR
CLUTCH MASTER CYLINDER PUSH ROD CLEVIS BUSH
E-RING
NO. 2 CLUTCH PEDAL CUSHION
CLUTCH PEDAL SPRING
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
MP grease
CLUTCH PEDAL SUB-ASSEMBLY
CLUTCH PEDAL PAD
P

for Preparation Click here

1. DRAIN CLUTCH FLUID

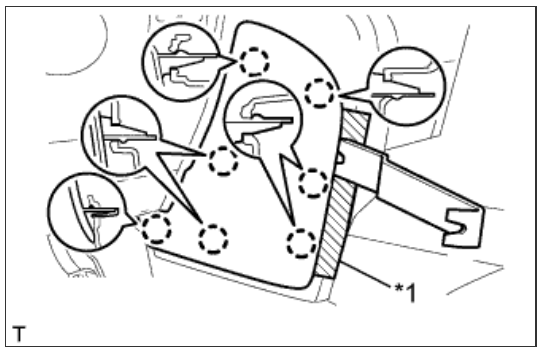
2. REMOVE NO. 2 INSTRUMENT PANEL FINISH PANEL CUSHION

a. Put protective tape around the No. 2 instrument panel finish panel cushion.

Text in Illustration

*1	Protective Tape

b. Using a moulding remover, detach the 7 claws and remove the No. 2 instrument panel finish panel cushion.

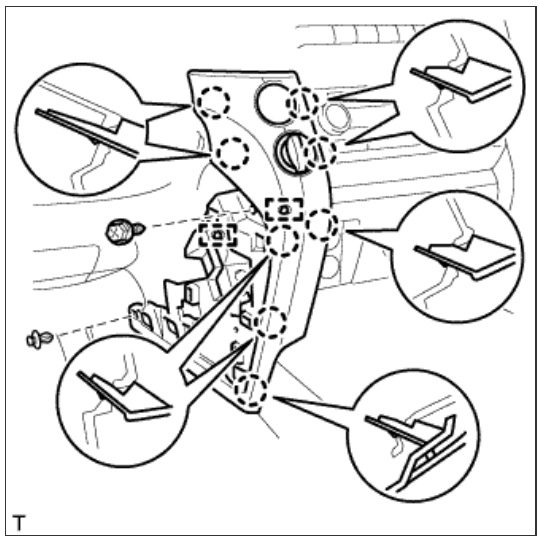


3. REMOVE LOWER INSTRUMENT PANEL PAD SUB-ASSEMBLY LH

a. Remove the clip and screw.

b. Detach the 8 claws.

c. Disconnect the connectors, detach the 2 clamps and remove the lower instrument panel pad sub-assembly.



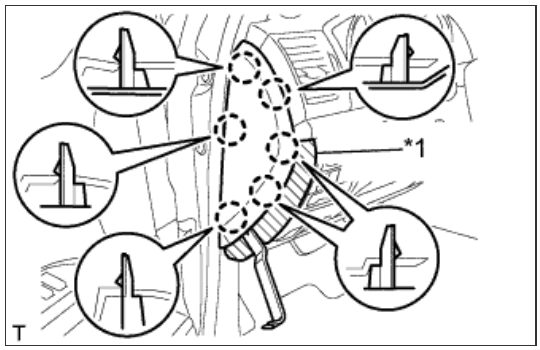
4. REMOVE INSTRUMENT SIDE PANEL LH

a. Place protective tape as shown in the illustration.

Text in Illustration

*1	Protective Tape

b. Using a moulding remover, detach the 6 claws and remove the instrument side panel.



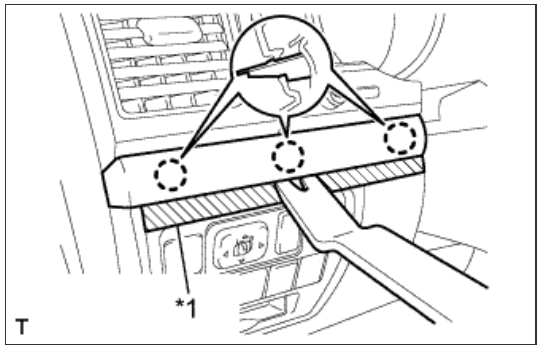
5. REMOVE NO. 1 INSTRUMENT CLUSTER FINISH PANEL GARNISH

a. Place protective tape as shown in the illustration.

Text in Illustration

*1	Protective Tape

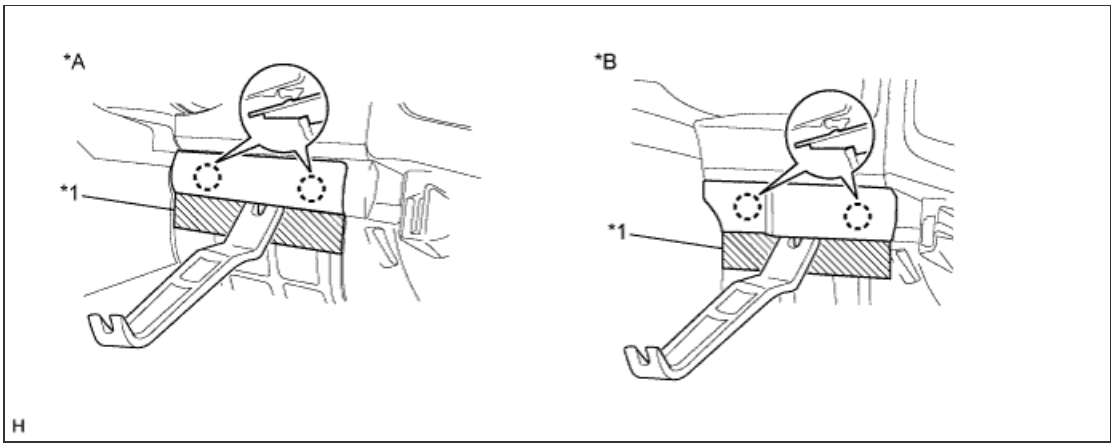
b. Using a moulding remover, detach the 3 claws and remove the No. 1 instrument cluster finish panel garnish.



6. REMOVE NO. 2 INSTRUMENT CLUSTER FINISH PANEL GARNISH

a. Place protective tape as shown in the illustration.

b. Using a moulding remover, detach the 2 claws and remove the No. 2 instrument cluster finish panel garnish.

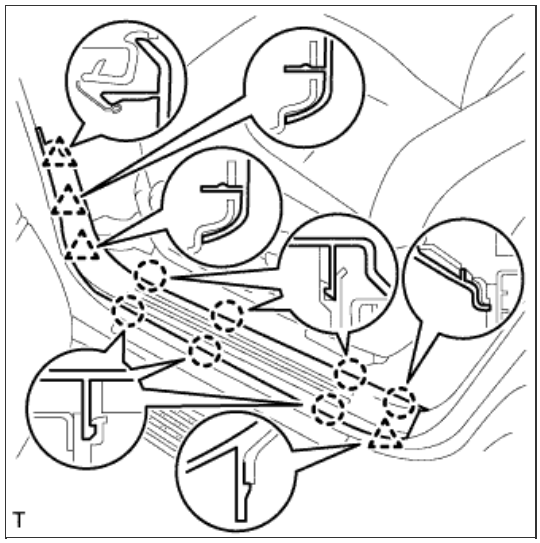


Text in Illustration

*A	w/ Entry and Start System	*B	w/o Entry and Start System
*1	Protective Tape	-	-

7. REMOVE FRONT DOOR SCUFF PLATE LH

a. Detach the 7 claws and 4 clips, and remove the scuff plate.

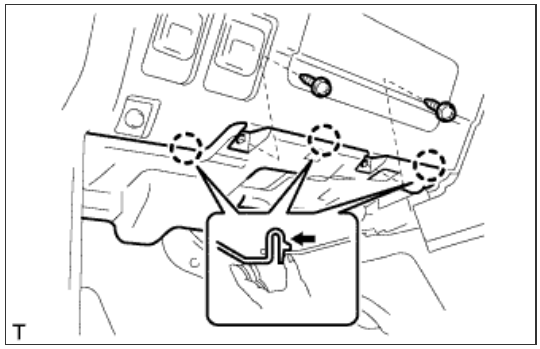


8. REMOVE NO. 1 INSTRUMENT PANEL UNDER COVER SUB-ASSEMBLY (w/ Floor Under Cover)

a. Remove the 2 screws.

b. Detach the 3 claws.

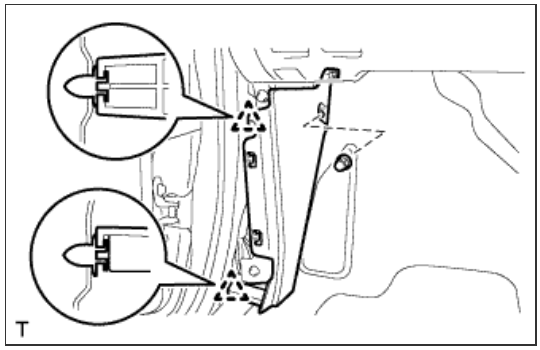
c. Disconnect the connectors and remove the No. 1 instrument panel under cover.



9. REMOVE COWL SIDE TRIM BOARD LH

a. Remove the cap nut.

b. Detach the 2 clips and remove the cowl side trim board.



10. REMOVE LOWER NO. 1 INSTRUMENT PANEL FINISH PANEL

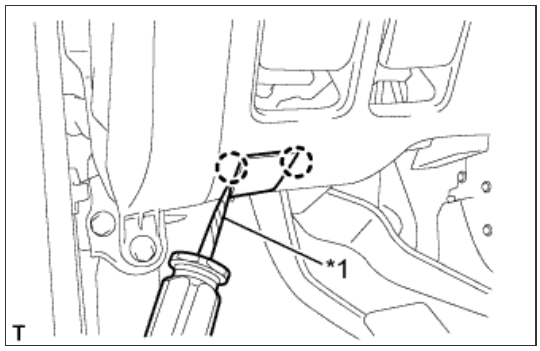
a. Using a screwdriver, detach the 2 claws and open the hole cover.

HINT:

Tape the screwdriver tip before use.

Text in Illustration

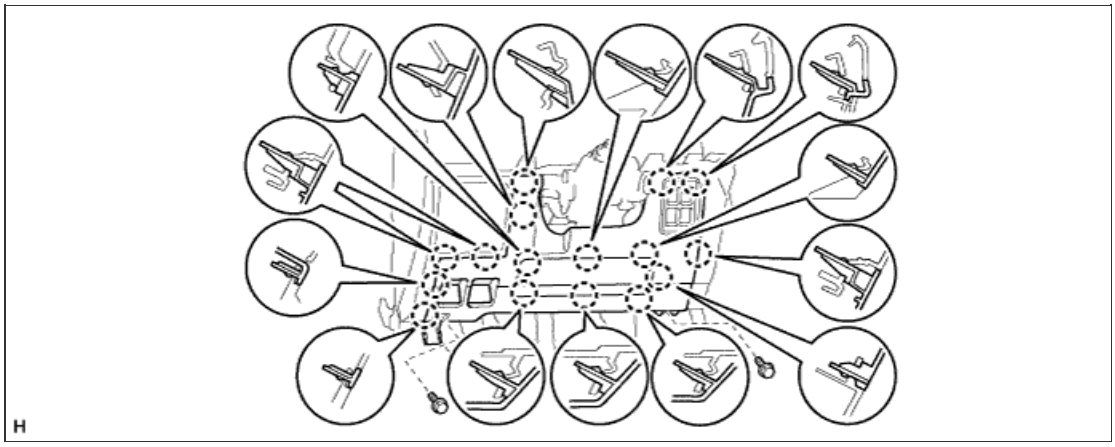
*1	Protective Tape



b. w/ Driver Side Knee Airbag:

i. Remove the 2 bolts.

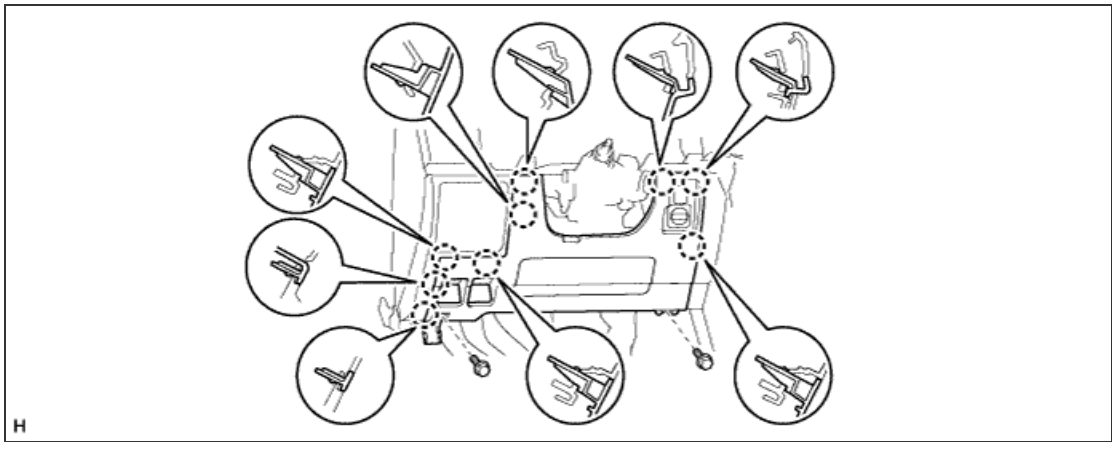
ii. Detach the 16 claws.



c. w/o Driver Side Knee Airbag:

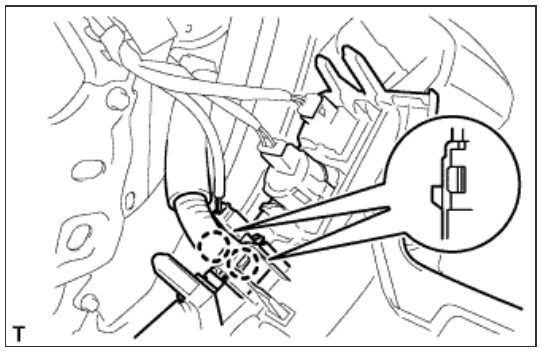
i. Remove the 2 bolts.

ii. Detach the 9 claws.



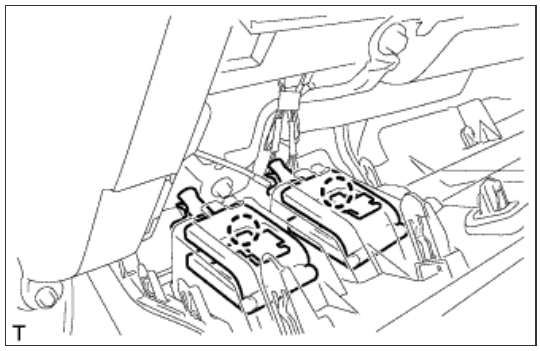
d. for Automatic Air Conditioning System:

i. Detach the 2 claws and remove the room temperature sensor.



e. Detach the 2 claws and disconnect the 2 control cables.

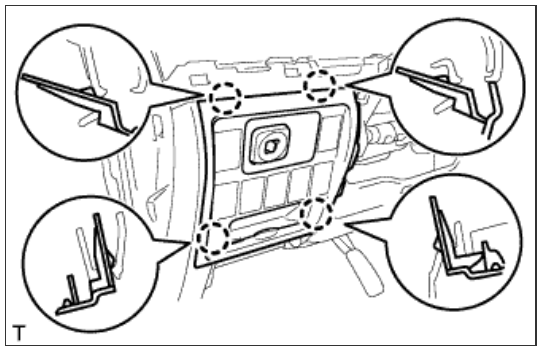
f. Disconnect the connectors and remove the lower No. 1 instrument panel finish panel.



11. REMOVE NO. 1 SWITCH HOLE BASE

a. Detach the 4 claws.

b. Disconnect the connectors and remove the No. 1 switch hole cover.



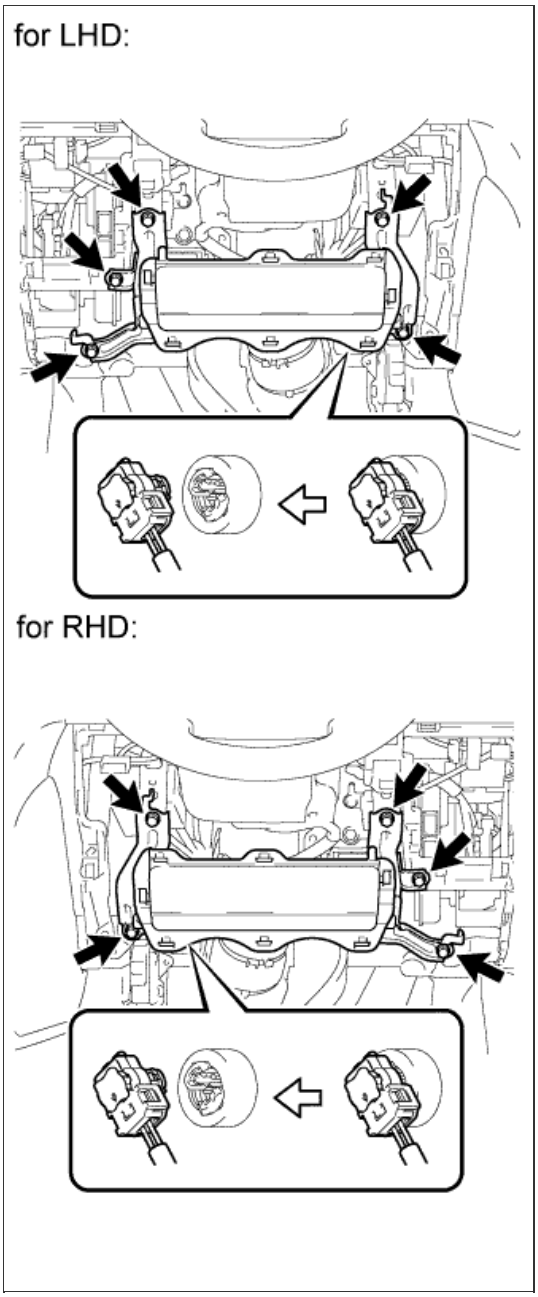
12. REMOVE DRIVER SIDE KNEE AIRBAG ASSEMBLY (w/ Driver Side Knee Airbag)

a. Remove the 5 bolts and driver side knee airbag.

b. Disconnect the connector.

NOTICE:

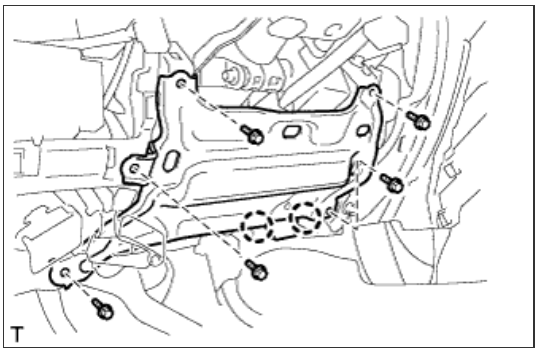
When handling the airbag connector, take care not to damage the airbag wire harness.



13. REMOVE LOWER INSTRUMENT PANEL SUB-ASSEMBLY (w/o Driver Side Knee Airbag)

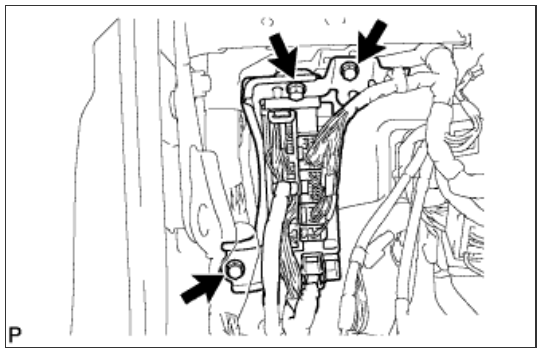
a. Detach the 2 claws and disconnect the DLC3.

b. Remove the 5 bolts and lower instrument panel.

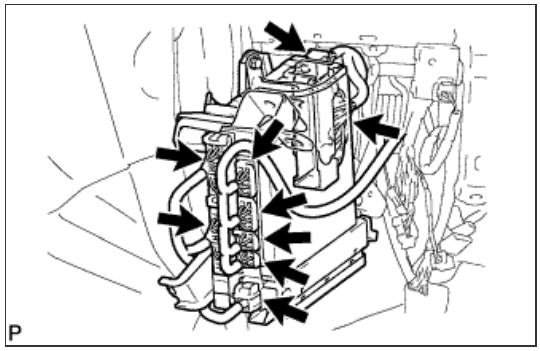


14. REMOVE MAIN BODY ECU (COWL SIDE JUNCTION BLOCK LH)

a. Remove the 3 bolts.



b. Disconnect the 9 ECU connectors and remove the ECU.



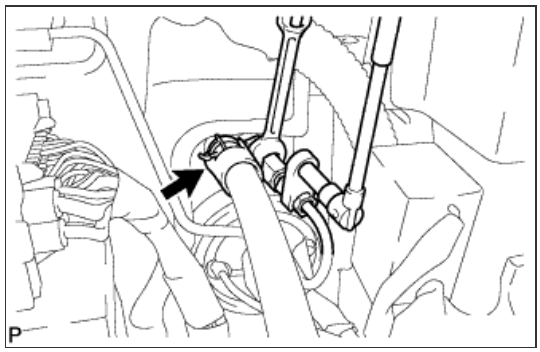
15. DISCONNECT CLUTCH MASTER CYLINDER TO FLEXIBLE HOSE TUBE AND CLUTCH RESERVOIR TUBE

a. Using a union nut wrench, disconnect the flexible hose tube.

HINT:

Use a container to catch the fluid.

b. Disconnect the clutch reservoir tube.

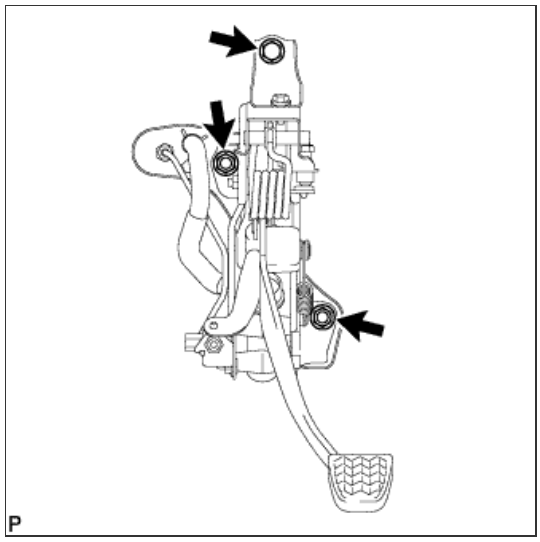


16. REMOVE CLUTCH PEDAL SUPPORT ASSEMBLY WITH CLUTCH MASTER CYLINDER

a. Disconnect the clutch start switch connector.

b. w/ Cruise Control System:
Disconnect the clutch switch connector.

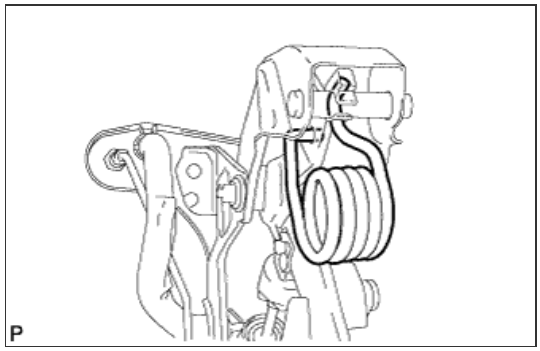
c. Remove the 2 nuts, bolt and clutch pedal support with clutch master cylinder.



17. REMOVE TURNOVER SPRING

a. Move the pedal to the full stroke position.

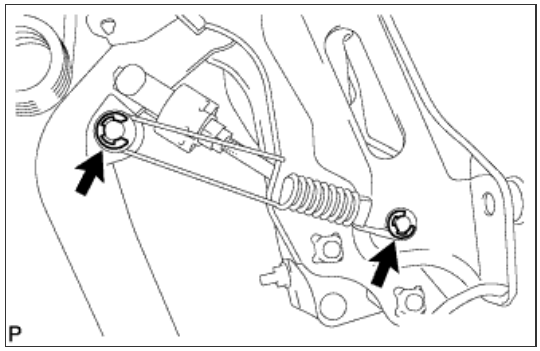
b. Remove the turnover spring.



18. REMOVE CLUTCH PEDAL SPRING

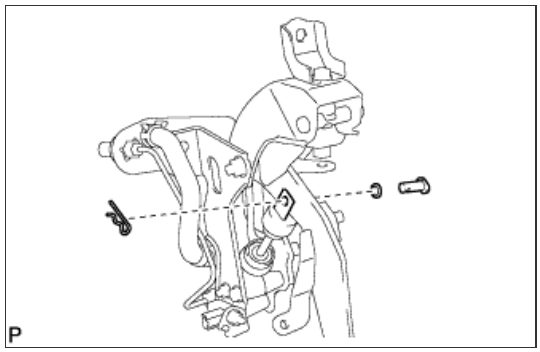
a. Remove the 2 E-rings and the spring with spacer.

b. Remove the spacer from the spring.



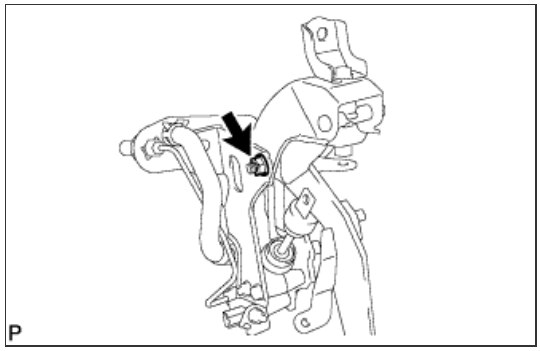
19. REMOVE CLUTCH PEDAL SUB-ASSEMBLY

a. Remove the clip, wave washer and clevis pin.



b. Remove the nut, washer and bolt.

c. Remove the clutch pedal from the clutch pedal support.

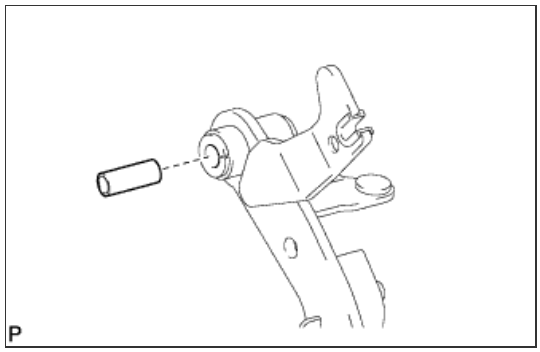


20. REMOVE CLUTCH PEDAL PAD

a. Remove the clutch pedal pad from the clutch pedal.

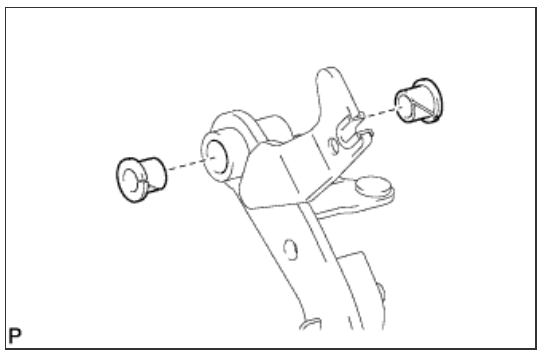
21. REMOVE CLUTCH PEDAL SHAFT COLLAR

a. Remove the clutch pedal shaft collar from the clutch pedal.



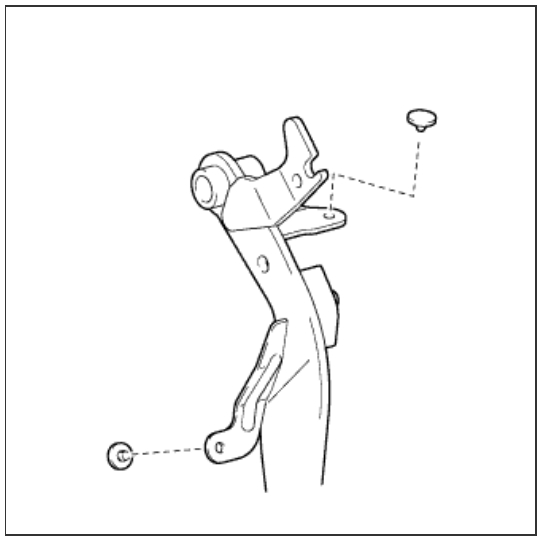
22. REMOVE CLUTCH PEDAL BUSH

a. Remove the 2 bushes from the clutch pedal.



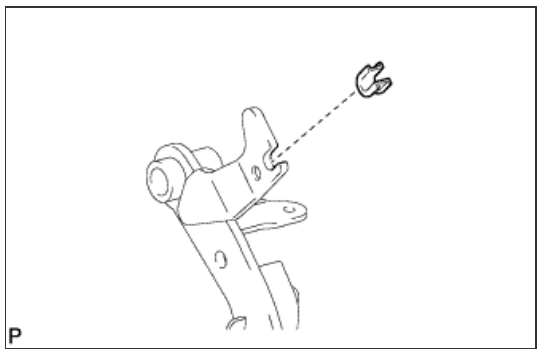
23. REMOVE NO. 2 CLUTCH PEDAL CUSHION

a. Remove the 2 clutch pedal cushions from the clutch pedal.



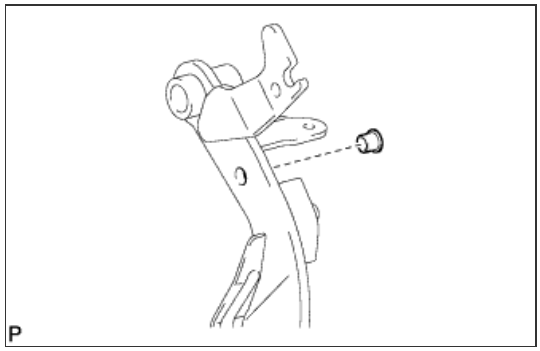
24. REMOVE CLUTCH PEDAL TURNOVER BUSH

a. Remove the clutch pedal turnover bush from the clutch pedal.



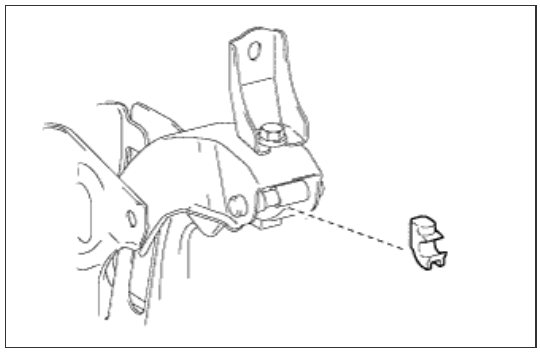
25. REMOVE CLUTCH MASTER CYLINDER PUSH ROD CLEVIS BUSH

a. Remove the push rod clevis bush from the clutch pedal.



26. REMOVE CLUTCH PEDAL SPRING HOLDER

a. Remove the clutch pedal spring holder from the clutch pedal support.



for Preparation Click here

1. INSPECT AND ADJUST CLUTCH PEDAL SUB-ASSEMBLY

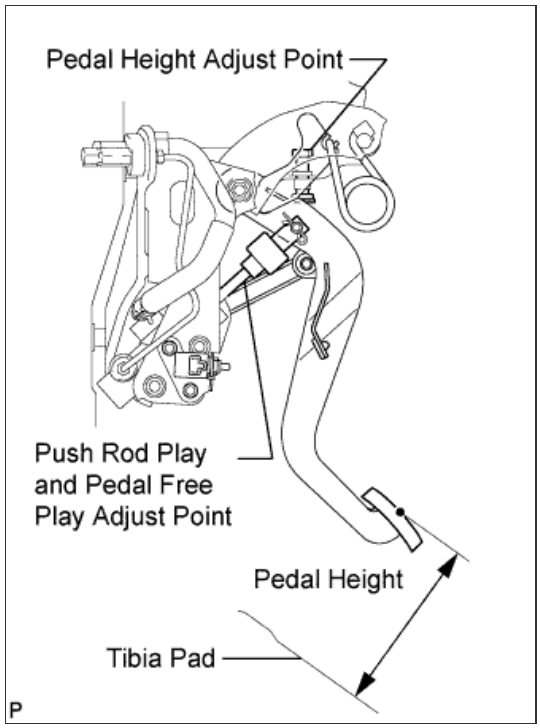
a. Check that the clutch pedal height is correct.

Standard Clutch Pedal Height from Tibia Pad:
162.7 to 172.7 mm (6.41 to 6.79 in.)

b. Adjust the clutch pedal height.

i. Loosen the lock nut and turn the stopper bolt or clutch switch until the height is correct. Tighten the lock nut.

Torque:
16 N*m{ 160 kgf*cm , 12 ft.*lbf }



c. Check that the clutch pedal free play and push rod play are correct.

HINT:

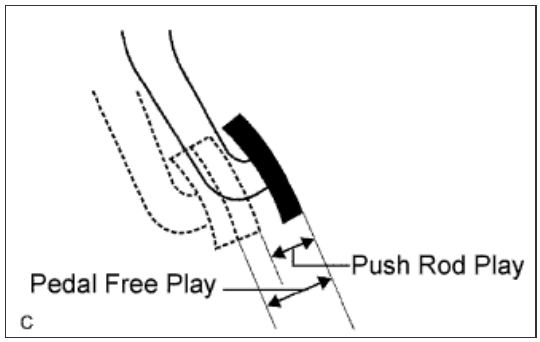
Pay close attention to the change in resistance to distinguish between pedal free play and push rod play while performing the inspection.

i. Depress the clutch pedal until the clutch resistance begins to be felt.

Standard Pedal Free Play:
5.0 to 15.0 mm (0.197 to 0.591 in.)

ii. Gently depress the clutch pedal until the resistance begins to increase a little.

Standard Push Rod Play at Pedal Top:
1.0 to 5.0 mm (0.0394 to 0.197 in.)



d. Adjust the clutch pedal free play and push rod play.

HINT:

The push rod play can be adjusted by changing the length of the push rod. Pedal free play changes together with push rod play.

i. Loosen the lock nut and turn the clutch push rod until the clutch pedal free play and push rod play are correct.

NOTICE:

If pedal free play and push rod play are not within the standard range even after adjustment, inspect the related parts.

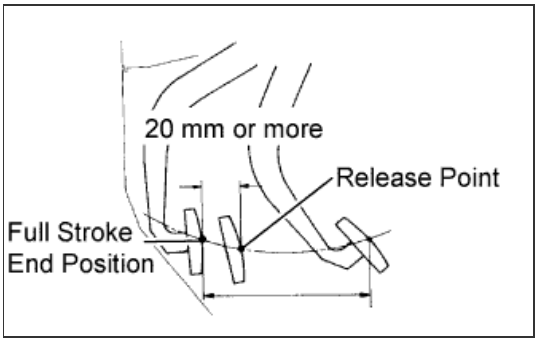
ii. Tighten the lock nut.

Torque:
12 N*m{ 120 kgf*cm , 9 ft.*lbf }

iii. After adjusting the clutch pedal free play and push rod play, check the clutch pedal height.

Standard Clutch Pedal Height from Tibia Pad:
162.7 to 172.7 mm (6.41 to 6.79 in.)

e. Check the clutch release point.



i. Pull the parking brake lever and chock the wheels.

ii. Start the engine and allow it to idle.

iii. Without depressing the clutch pedal, slowly move the shift lever to R until the gears engage.

iv. Gradually depress the clutch pedal and measure the stroke distance from the point that the gear noise stops (release point) up to the full stroke end position.

Standard Distance from Pedal Stroke End Position to Release Point:
20 mm (0.787 in.) or more

If the distance is not as specified, perform the following operations:

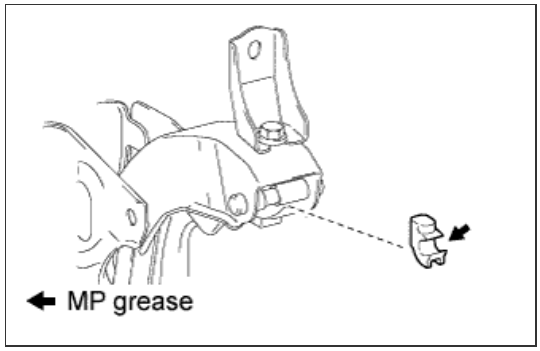
- Check the clutch pedal height.
- Check the push rod play and pedal free play.
- Bleed the clutch line.
- Check the clutch cover and disc.

for Preparation Click here

1. INSTALL CLUTCH PEDAL SPRING HOLDER

a. Apply MP grease to the contact surface of the clutch pedal spring holder.

b. Install the clutch pedal spring holder to the clutch pedal support.



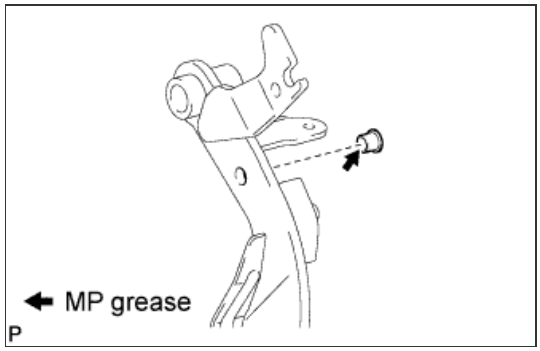
2. INSTALL CLUTCH MASTER CYLINDER PUSH ROD CLEVIS BUSH

a. Apply MP grease to the inside of a new clevis bush.

b. Install the clevis bush to the clutch pedal.

HINT:

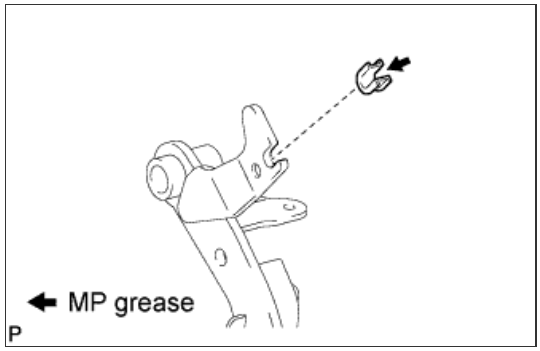
Install the clevis bush from the right side of the vehicle.



3. INSTALL CLUTCH PEDAL TURNOVER BUSH

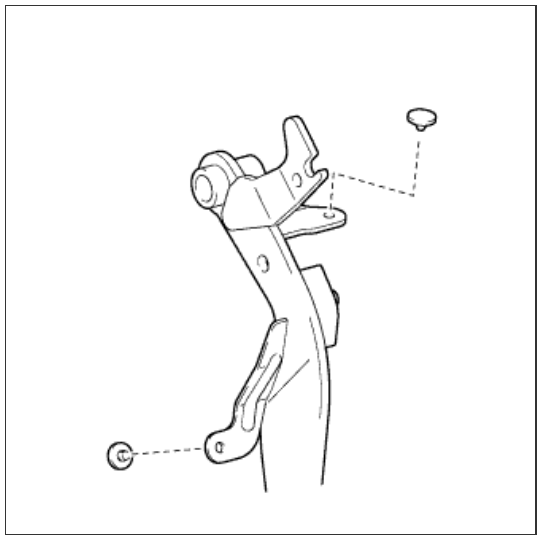
a. Apply MP grease to the inside of the clutch pedal turnover bush.

b. Install the clutch pedal turnover bush to the clutch pedal.



4. INSTALL NO. 2 CLUTCH PEDAL CUSHION

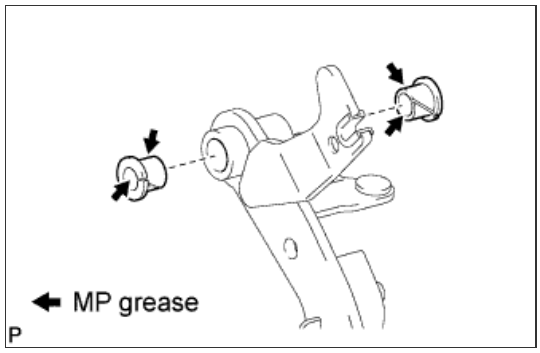
a. Install the 2 clutch pedal cushions to the clutch pedal.



5. INSTALL CLUTCH PEDAL BUSH

a. Apply MP grease to the inside and outside of 2 new bushes.

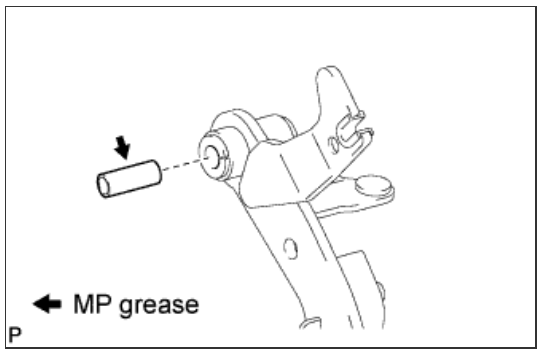
b. Install the 2 bushes to the clutch pedal.



6. INSTALL CLUTCH PEDAL SHAFT COLLAR

a. Apply MP grease to the clutch pedal shaft collar.

b. Install the clutch pedal shaft collar to the clutch pedal.



7. INSTALL CLUTCH PEDAL PAD

a. Install the clutch pedal pad to the clutch pedal.

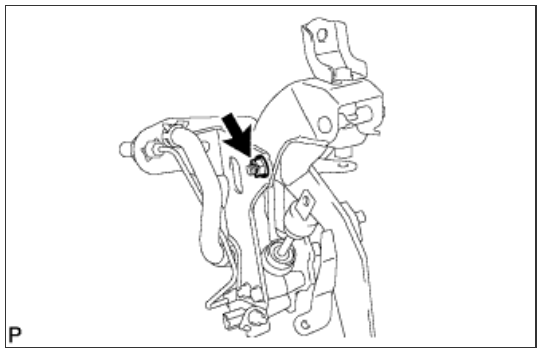
8. INSTALL CLUTCH PEDAL SUB-ASSEMBLY

a. Install the clutch pedal to the clutch pedal support with the nut, washer and bolt.

Torque:
34 N*m{ 350 kgf*cm , 25 ft.*lbf }

HINT:

Install the bolt from the right side of the vehicle.

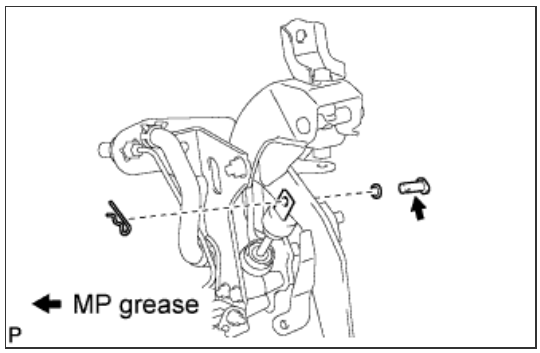


b. Apply MP grease to the contact surface of the clevis pin and clevis bush.

c. Install the wave washer to the clevis pin.

d. Connect the clevis of the master cylinder to the clutch pedal with the clevis pin.

e. Install a new clip to the clevis pin.

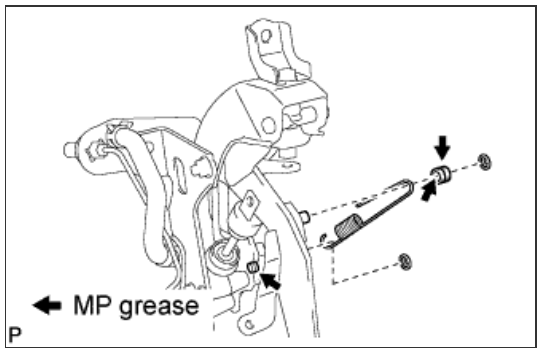


9. INSTALL CLUTCH PEDAL SPRING

a. Apply MP grease to the inside and outside of the spacer and pin of the clutch pedal support.

b. Install the spacer to the spring.

c. Install the spring to the clutch pedal support with 2 new E-rings.

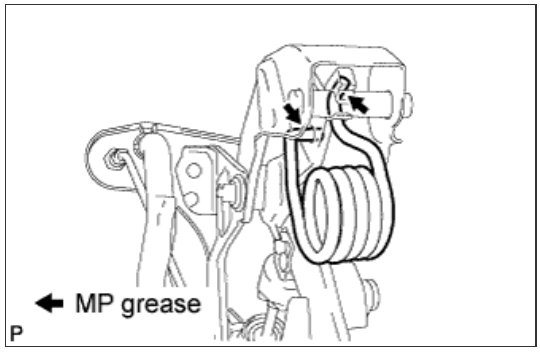


10. INSTALL TURNOVER SPRING

a. Apply MP grease to the contact surfaces of the spring holder, clutch pedal and spring.

b. Move the pedal to the full stroke position.

c. Install the spring to the clutch pedal and spring holder.



11. INSTALL CLUTCH PEDAL SUPPORT ASSEMBLY WITH CLUTCH MASTER CYLINDER

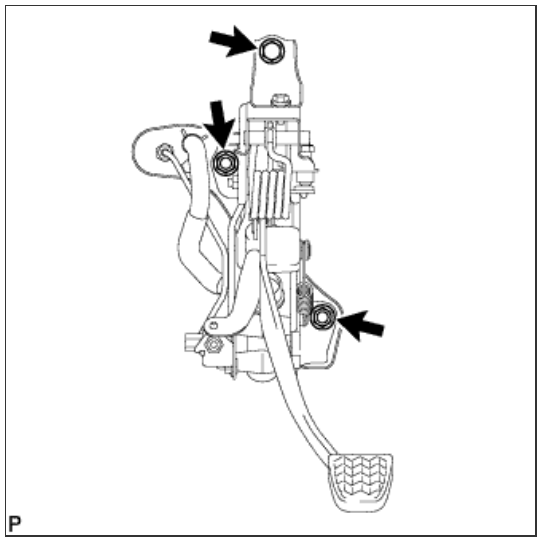
a. Install the clutch pedal support with clutch master cylinder with the bolt and 2 nuts.

Torque:

for bolt:
18 N*m{ 184 kgf*cm , 13 ft.*lbf }
for nut:
14 N*m{ 145 kgf*cm , 10 ft.*lbf }

b. Connect the clutch start switch connector.

c. w/ Cruise Control System:
Connect the clutch switch connector.



12. CONNECT CLUTCH MASTER CYLINDER TO FLEXIBLE HOSE TUBE AND CLUTCH RESERVOIR TUBE

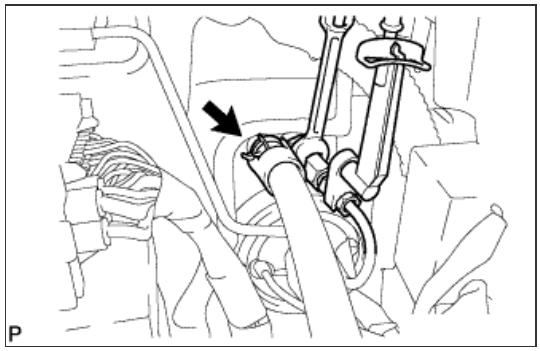
a. Using a union nut wrench, connect the flexible hose tube.

Torque:
15 N*m{ 155 kgf*cm , 11 ft.*lbf }

NOTICE:

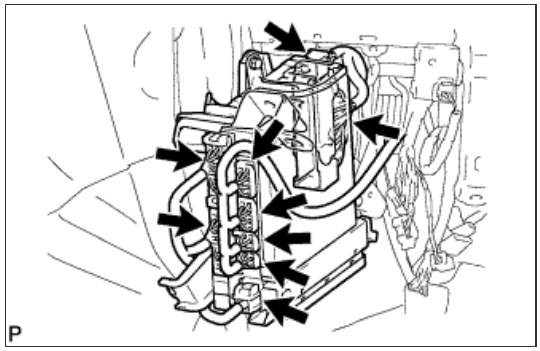
Use the formula to calculate special torque values for situations where a union nut wrench is combined with a torque wrench (Click here).

b. Connect the clutch reservoir tube with a new clip.



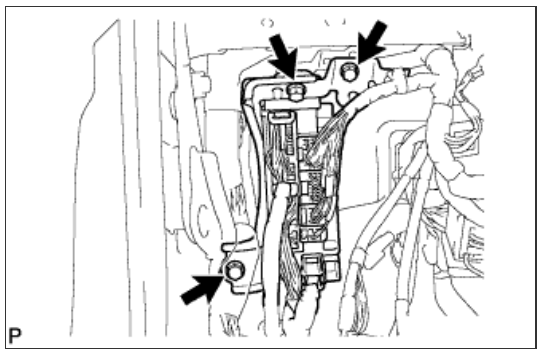
13. INSTALL MAIN BODY ECU (COWL SIDE JUNCTION BLOCK LH)

a. Connect the 9 ECU connectors.



b. Install the ECU with the 3 bolts.

Torque:
8.0 N*m{ 82 kgf*cm , 71 in.*lbf }

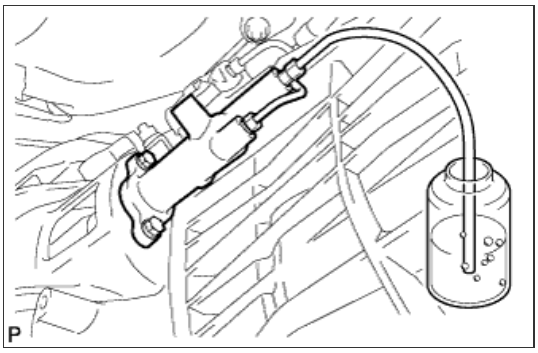


14. FILL RESERVOIR WITH BRAKE FLUID

a. Fill the reservoir with brake fluid.

Brake Fluid:
SAE J1703 or FMVSS No. 116 DOT 3

15. BLEED CLUTCH LINE



a. Remove the release cylinder bleeder plug cap.

b. Connect a vinyl tube to the bleeder plug.

c. Depress the clutch pedal several times, and then loosen the bleeder plug while the pedal is depressed.

d. When fluid no longer comes out, tighten the bleeder plug, and then release the clutch pedal.

e. Repeat the previous 2 steps until all the air in the fluid is completely bled.

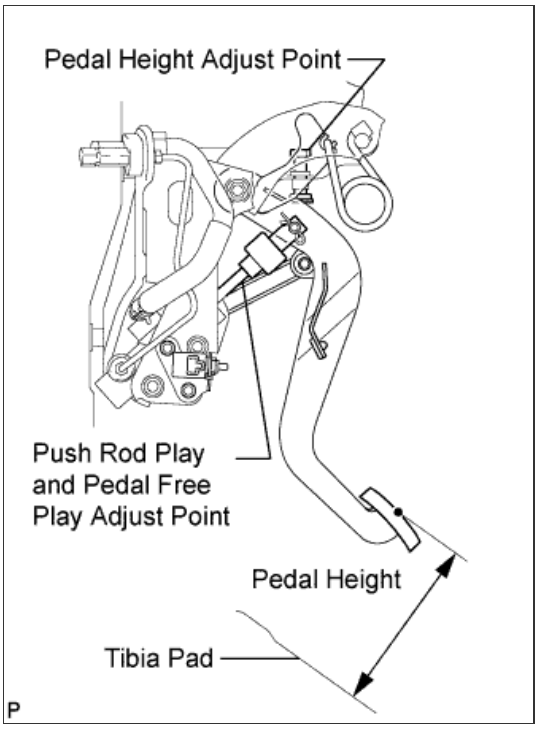
f. Tighten the bleeder plug.

Torque:
11 N*m{ 110 kgf*cm , 8 ft.*lbf }

g. Install the bleeder plug cap.

h. Check that all the air has been bled from the clutch line.

16. INSPECT AND ADJUST CLUTCH PEDAL SUB-ASSEMBLY



a. Check that the clutch pedal height is correct.

Standard Clutch Pedal Height from Tibia Pad:
162.7 to 172.7 mm (6.41 to 6.79 in.)

b. Adjust the clutch pedal height.

i. Loosen the lock nut and turn the stopper bolt or clutch switch until the height is correct. Tighten the lock nut.

Torque:
16 N*m{ 160 kgf*cm , 12 ft.*lbf }

c. Check that the clutch pedal free play and push rod play are correct.

HINT:

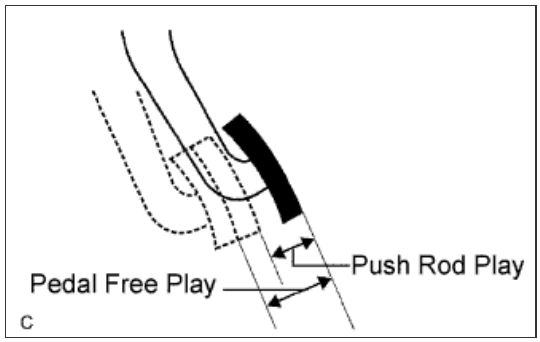
Pay close attention to the change in resistance to distinguish between pedal free play and push rod play while performing the inspection.

i. Depress the clutch pedal until the clutch resistance begins to be felt.

Standard Pedal Free Play:
5.0 to 15.0 mm (0.197 to 0.591 in.)

ii. Gently depress the clutch pedal until the resistance begins to increase a little.

Standard Push Rod Play at Pedal Top:
1.0 to 5.0 mm (0.0394 to 0.197 in.)



d. Adjust the clutch pedal free play and push rod play.

HINT:

The push rod play can be adjusted by changing the length of the push rod. Pedal free play changes together with push rod play.

i. Loosen the lock nut and turn the clutch push rod until the clutch pedal free play and push rod play are correct.

NOTICE:

If pedal free play and push rod play are not within the standard range even after adjustment, inspect the related parts.

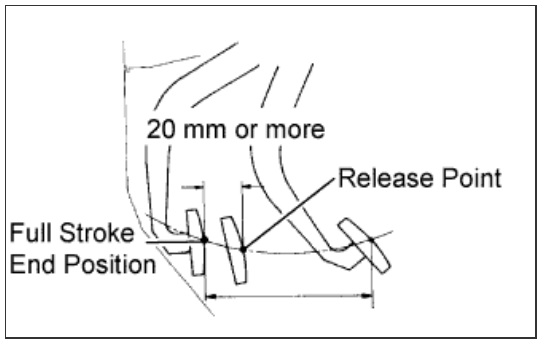
ii. Tighten the lock nut.

Torque:
12 N*m{ 120 kgf*cm , 9 ft.*lbf }

iii. After adjusting the clutch pedal free play and push rod play, check the clutch pedal height.

Standard Clutch Pedal Height from Tibia Pad:
162.7 to 172.7 mm (6.41 to 6.79 in.)

e. Check the clutch release point.



i. Pull the parking brake lever and chock the wheels.

ii. Start the engine and allow it to idle.

iii. Without depressing the clutch pedal, slowly move the shift lever to R until the gears engage.

iv. Gradually depress the clutch pedal and measure the stroke distance from the point that the gear noise stops (release point) up to the full stroke end position.

Standard Distance from Pedal Stroke End Position to Release Point:
20 mm (0.787 in.) or more

If the distance is not as specified, perform the following operations:

- Check the clutch pedal height.
- Check the push rod play and pedal free play.
- Bleed the clutch line.
- Check the clutch cover and disc.

17. CHECK FLUID LEVEL IN RESERVOIR

a. Check the fluid level.
If the brake fluid level is low, check for leaks and inspect the disc brake pad. If necessary, refill the reservoir with brake fluid after repair or replacement.

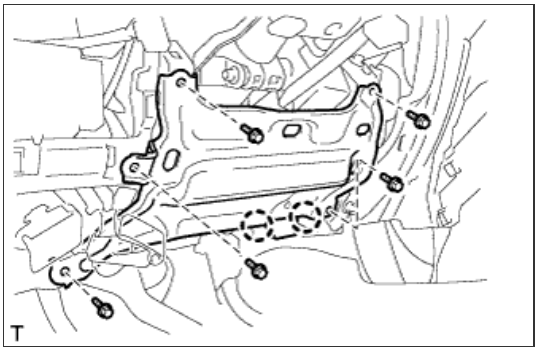
Brake fluid:
SAE J1703 or FMVSS No. 116 DOT 3

18. INSPECT FOR CLUTCH FLUID LEAK

19. INSTALL LOWER INSTRUMENT PANEL SUB-ASSEMBLY (w/o Driver Side Knee Airbag)

a. Attach the 2 claws and connect the DLC3.

b. Install the lower instrument panel with the 5 bolts.



20. INSTALL DRIVER SIDE KNEE AIRBAG ASSEMBLY (w/ Driver Side Knee Airbag)

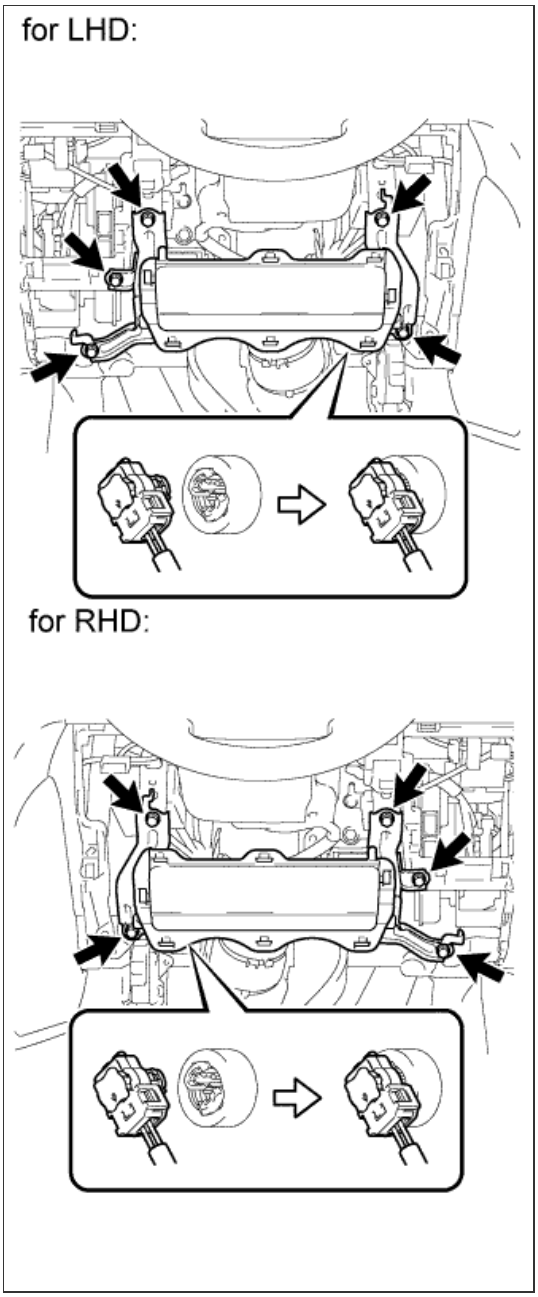
a. Connect the connector.

NOTICE:

When handling the airbag connector, take care not to damage the airbag wire harness.

b. Install the driver side knee airbag with the 5 bolts.

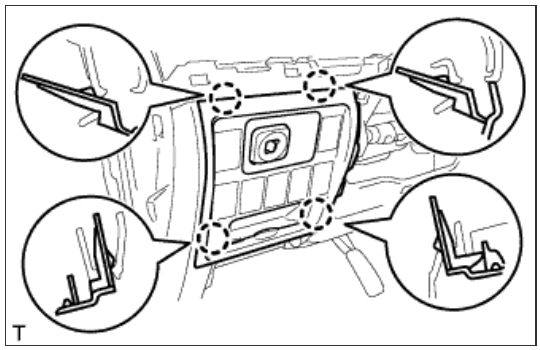
Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }



21. INSTALL NO. 1 SWITCH HOLE BASE

a. Connect the connectors.

b. Attach the 4 claws to install the No. 1 switch hole base.

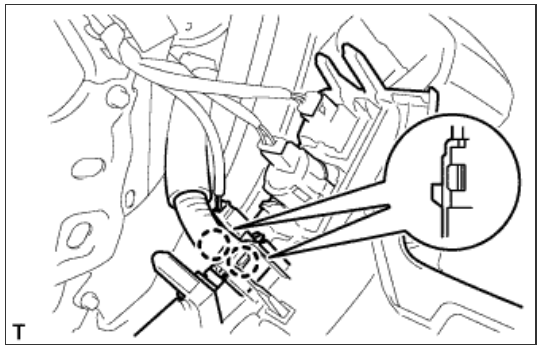


22. INSTALL LOWER NO. 1 INSTRUMENT PANEL FINISH PANEL

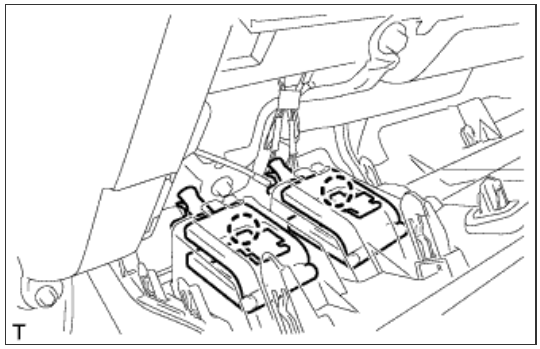
a. Connect the connectors.

b. for Automatic Air Conditioning System:

i. Attach the 2 claws to install the room temperature sensor.



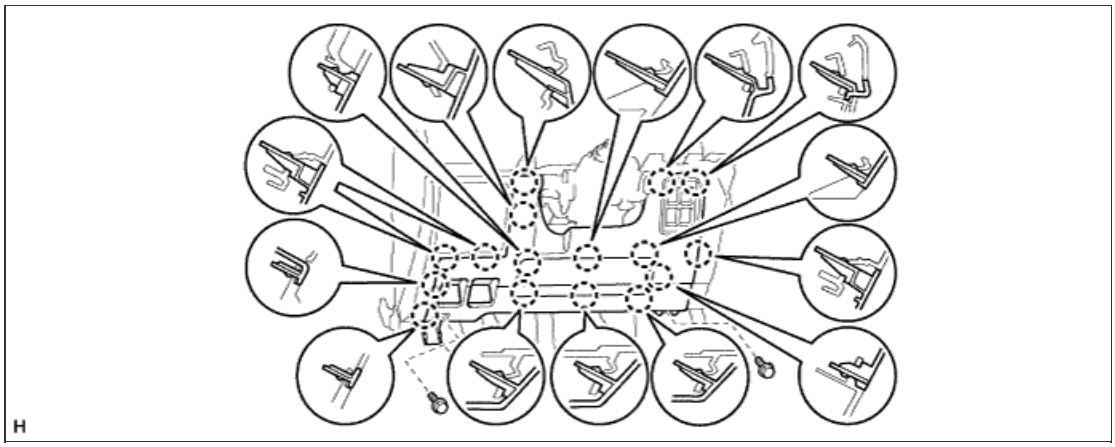
c. Attach the 2 claws to connect the 2 control cables.



d. w/ Driver Side Knee Airbag:

i. Attach the 16 claws to install the lower No. 1 instrument panel finish panel.

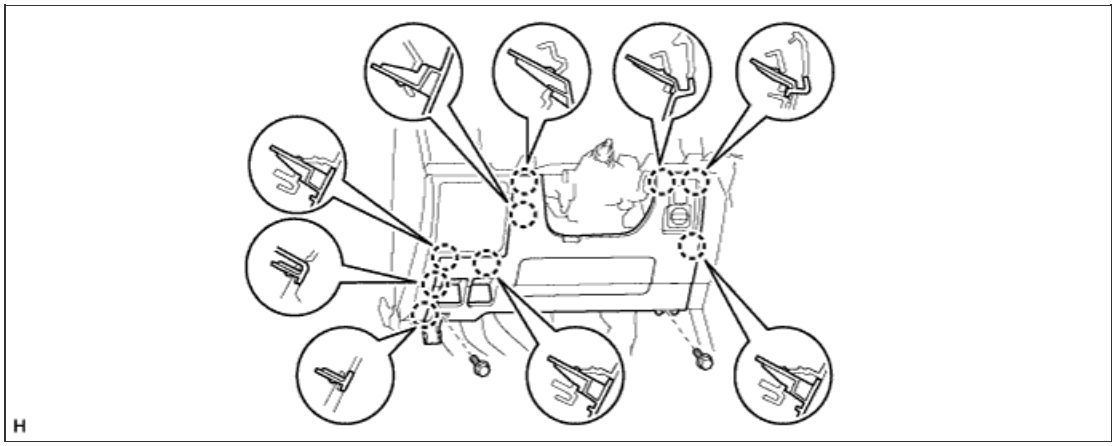
ii. Install the 2 bolts.



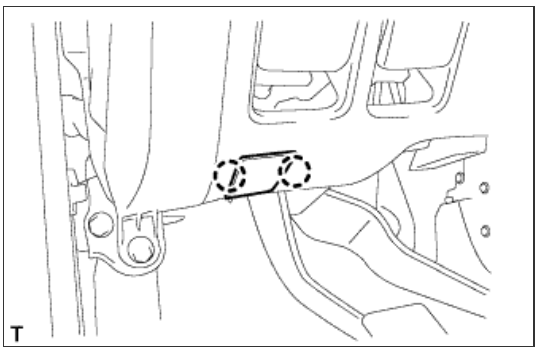
e. w/o Driver Side Knee Airbag:

i. Attach the 9 claws to install the lower No. 1 instrument panel finish panel.

ii. Install the 2 bolts.



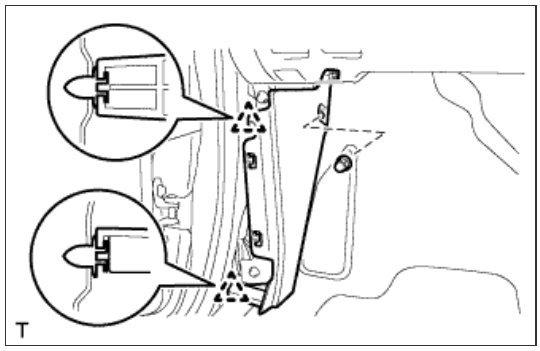
f. Attach the 2 claws to close the hole cover.



23. INSTALL COWL SIDE TRIM BOARD LH

a. Attach the 2 clips to install the cowl side trim board.

b. Install the cap nut.

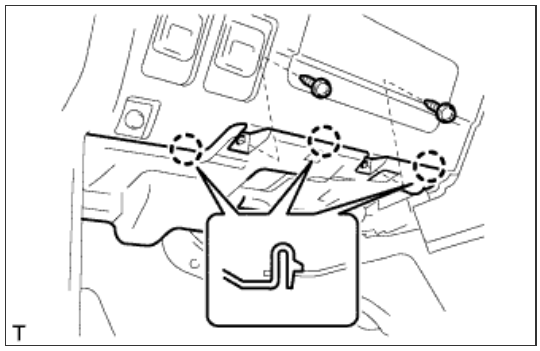


24. INSTALL NO. 1 INSTRUMENT PANEL UNDER COVER SUB-ASSEMBLY (w/ Floor Under Cover)

a. Connect the connectors.

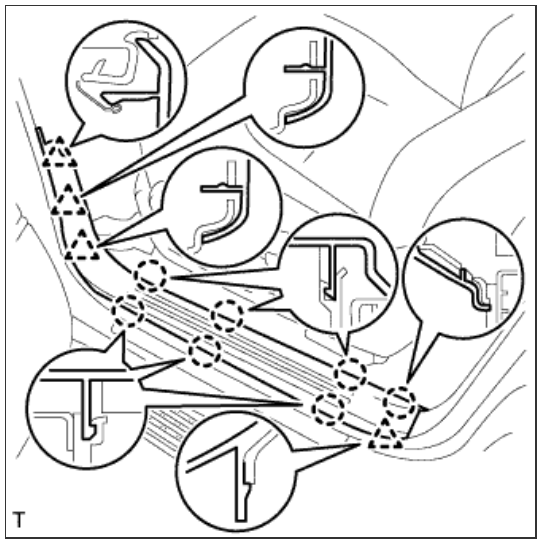
b. Attach the 3 claws to install the No. 1 instrument panel under cover.

c. Install the 2 screws.



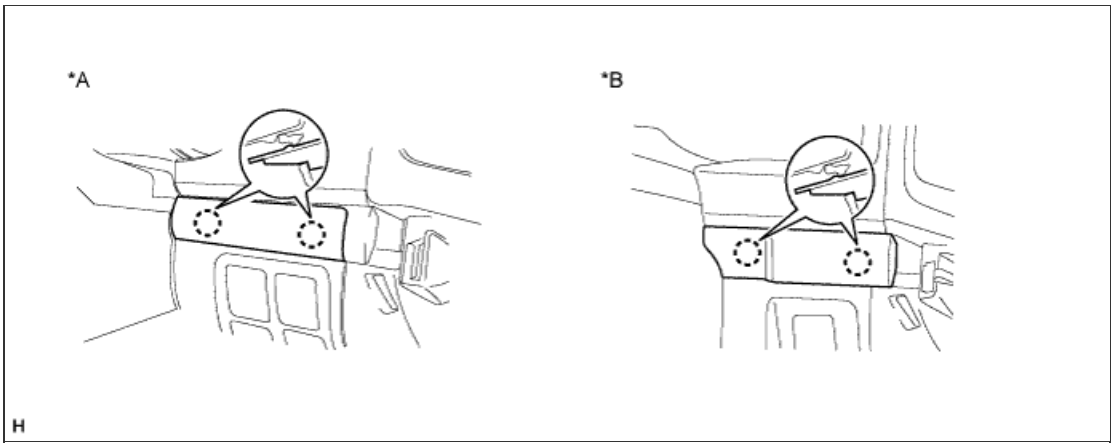
25. INSTALL FRONT DOOR SCUFF PLATE LH

a. Attach the 7 claws and 4 clips to install the scuff plate.



26. INSTALL NO. 2 INSTRUMENT CLUSTER FINISH PANEL GARNISH

a. Attach the 2 claws to install the No. 2 instrument cluster finish panel garnish.

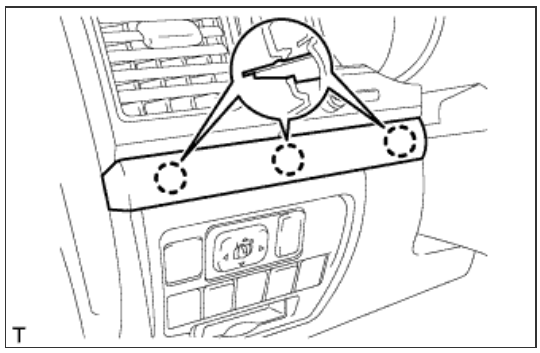


Text in Illustration

*A	w/ Entry and Start System	*B	w/o Entry and Start System

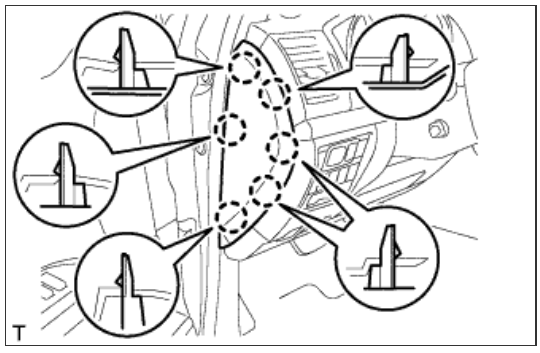
27. INSTALL NO. 1 INSTRUMENT CLUSTER FINISH PANEL GARNISH

a. Attach the 3 claws to install the No. 1 instrument cluster finish panel garnish.



28. INSTALL INSTRUMENT SIDE PANEL LH

a. Attach the 6 claws to install the instrument side panel.

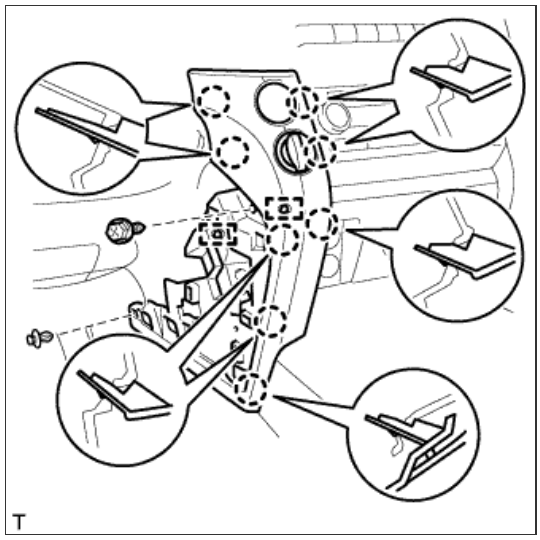


29. INSTALL LOWER INSTRUMENT PANEL PAD SUB-ASSEMBLY LH

a. Connect the connectors and attach the 2 clamps.

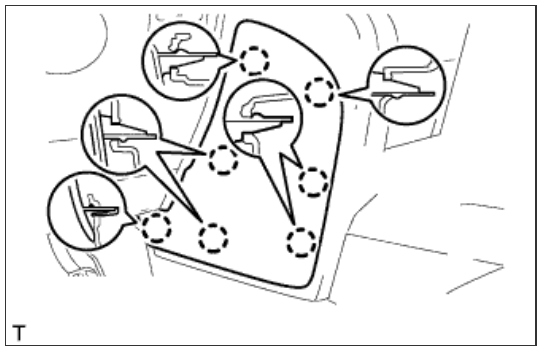
b. Attach the 8 claws to install the lower instrument panel pad sub-assembly.

c. Install the clip and screw.

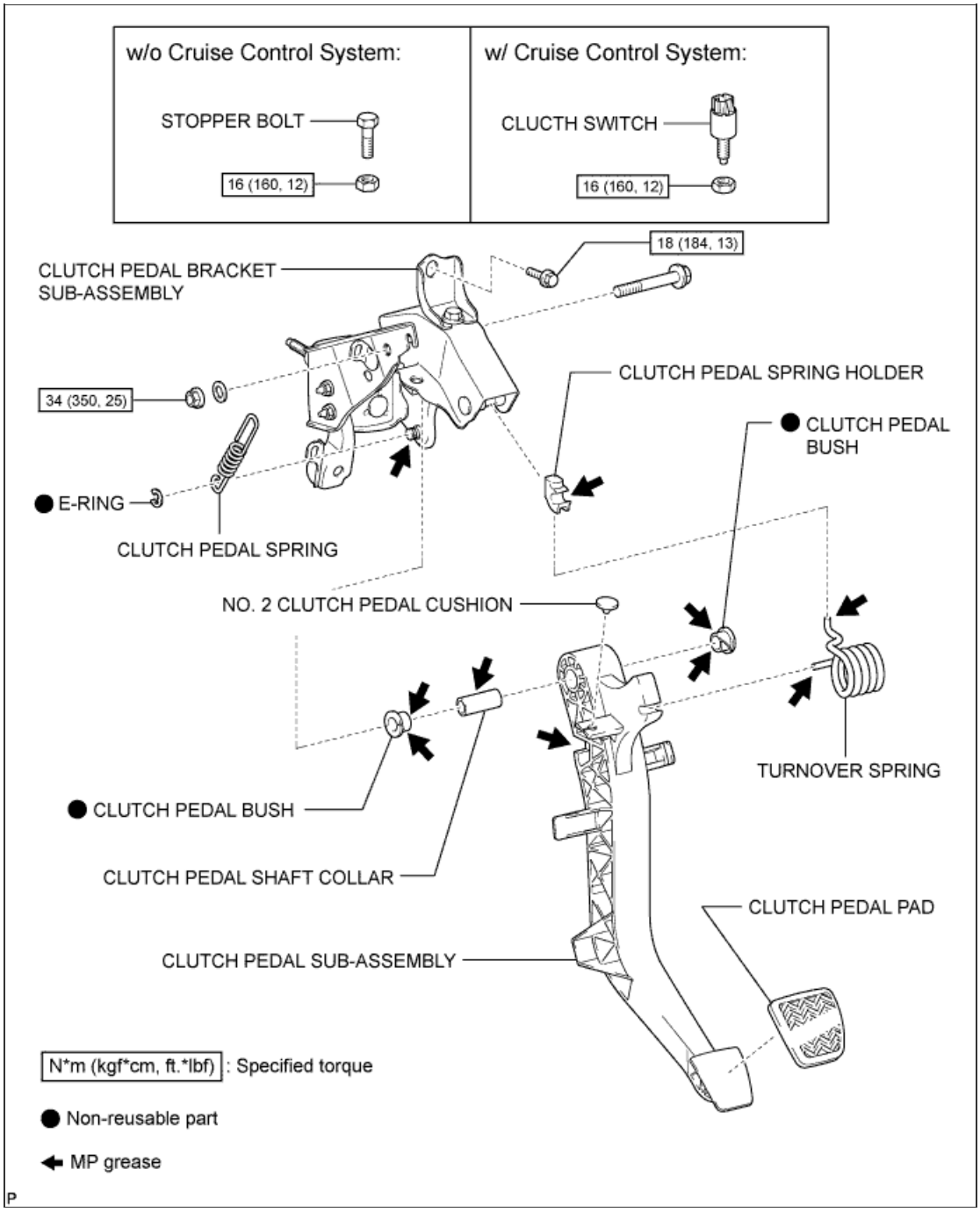


30. INSTALL NO. 2 INSTRUMENT PANEL FINISH PANEL CUSHION

a. Attach the 7 claws to install the No. 2 instrument panel finish panel cushion.



for Preparation Click here



for Preparation Click here

1. REMOVE CLUTCH MASTER CYLINDER ASSEMBLY

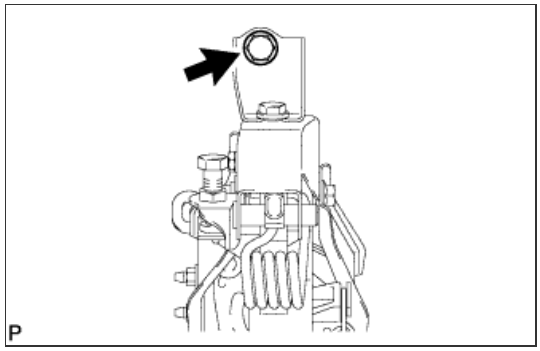
a. Remove the clutch master cylinder assembly (Click here).

2. REMOVE CLUTCH PEDAL BRACKET SUB-ASSEMBLY

a. Disconnect the clutch start switch connector.

b. w/ Cruise Control System:
Disconnect the clutch switch connector.

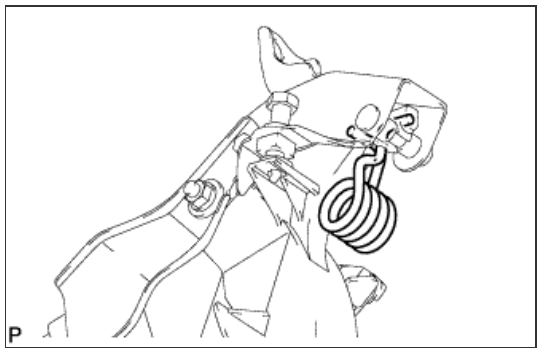
c. Remove the bolt and clutch pedal bracket.



3. REMOVE TURNOVER SPRING

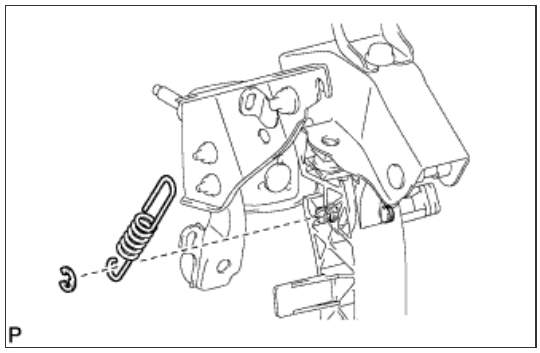
a. Move the pedal to the full stroke position.

b. Remove the turnover spring.



4. REMOVE CLUTCH PEDAL SPRING

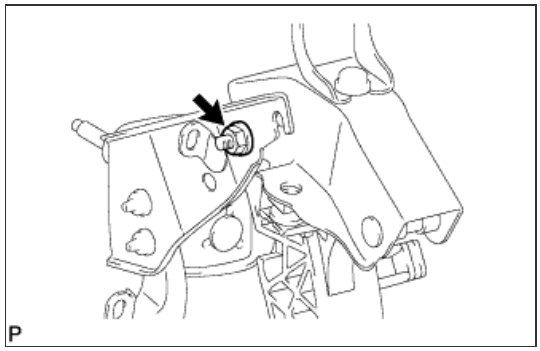
a. Remove the E-ring and spring.



5. REMOVE CLUTCH PEDAL SUB-ASSEMBLY

a. Remove the nut, washer and bolt.

b. Remove the clutch pedal from the clutch pedal bracket.

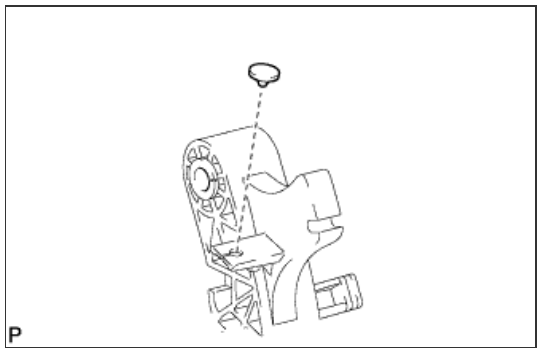


6. REMOVE CLUTCH PEDAL PAD

a. Remove the clutch pedal pad from the clutch pedal.

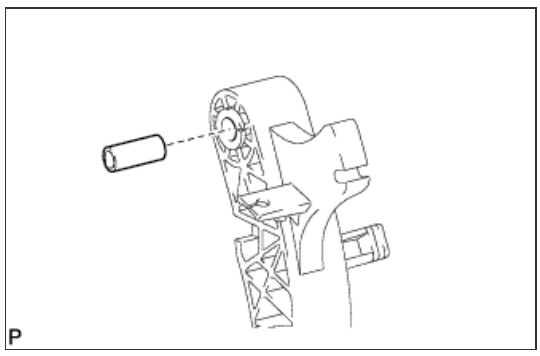
7. REMOVE NO. 2 CLUTCH PEDAL CUSHION

a. Remove the clutch pedal cushion from the clutch pedal.



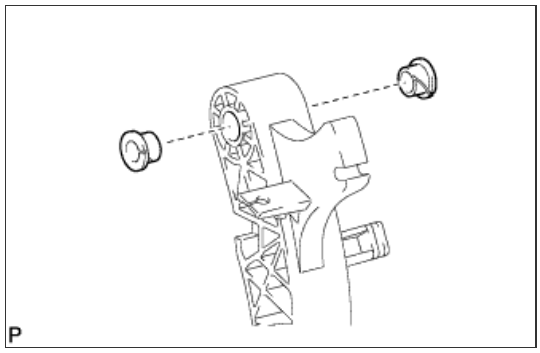
8. REMOVE CLUTCH PEDAL SHAFT COLLAR

a. Remove the clutch pedal shaft collar from the clutch pedal.



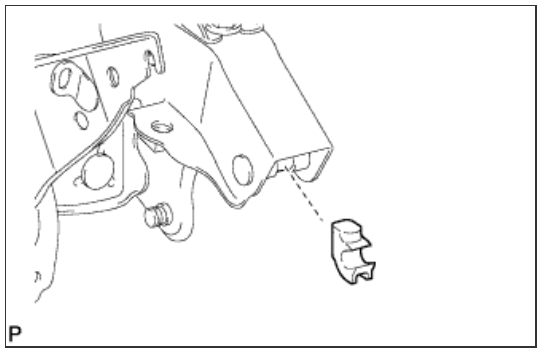
9. REMOVE CLUTCH PEDAL BUSH

a. Remove the 2 bushes from the clutch pedal.



10. REMOVE CLUTCH PEDAL SPRING HOLDER

a. Remove the clutch pedal spring holder from the clutch pedal bracket.



for Preparation Click here

1. INSPECT AND ADJUST CLUTCH PEDAL SUB-ASSEMBLY

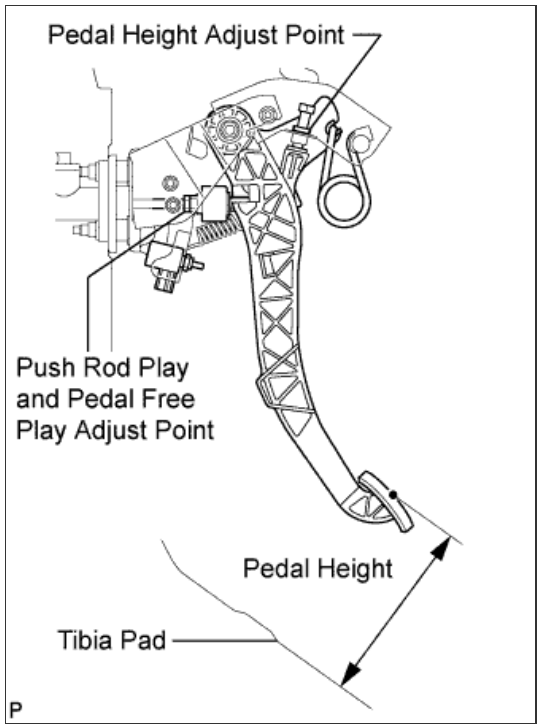
a. Check that the clutch pedal height is correct.

Standard Clutch Pedal Height from Tibia Pad:
164.8 to 174.8 mm (6.49 to 6.88 in.)

b. Adjust the clutch pedal height.

i. Loosen the lock nut and turn the stopper bolt or clutch switch until the height is correct. Tighten the lock nut.

Torque:
16 N*m{ 160 kgf*cm , 12 ft.*lbf }



c. Check that the clutch pedal free play and push rod play are correct.

HINT:

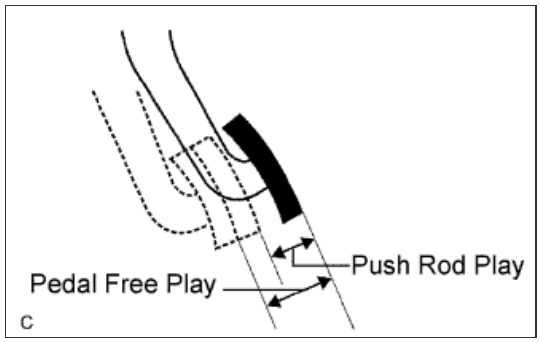
Pay close attention to the change in resistance to distinguish between pedal free play and push rod play while performing the inspection.

i. Depress the clutch pedal until the clutch resistance begins to be felt.

Standard Clutch Pedal Free Play:
5.0 to 15.0 mm (0.197 to 0.591 in.)

ii. Gently depress the clutch pedal until the resistance begins to increase a little.

Standard Push Rod Play at Pedal Top:
1.0 to 5.0 mm (0.0394 to 0.197 in.)



d. Adjust the clutch pedal free play and push rod play.

HINT:

The push rod play can be adjusted by changing the length of the push rod. Pedal free play changes together with push rod play.

i. Loosen the lock nut and turn the push rod until the clutch pedal free play and push rod play are correct.

NOTICE:

If pedal free play and push rod play are not within the standard range even after adjustment, inspect the related parts.

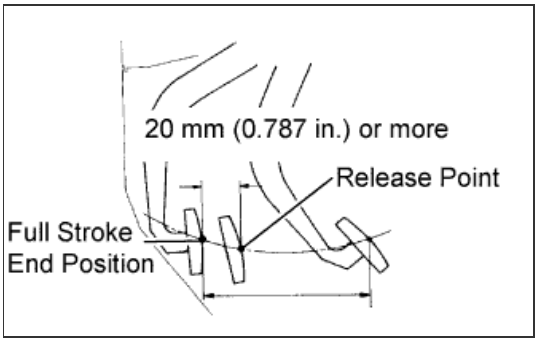
ii. Tighten the lock nut.

Torque:
12 N*m{ 120 kgf*cm , 9 ft.*lbf }

iii. After adjusting the clutch pedal free play and push rod play, check the clutch pedal height.

Standard Clutch Pedal Height from Tibia Pad:
164.8 to 174.8 mm (6.49 to 6.88 in.)

e. Check the clutch release point.



i. Pull the parking brake lever and chock the wheels.

ii. Start the engine and allow it to idle.

iii. Without depressing the clutch pedal, slowly move the shift lever to R until the gears engage.

iv. Gradually depress the clutch pedal and measure the stroke distance from the point that the gear noise stops (release point) up to the full stroke end position.

Standard Distance from Pedal Stroke End Position to Release Point:
20 mm (0.787 in.) or more

If the distance is not as specified, perform the following operations:

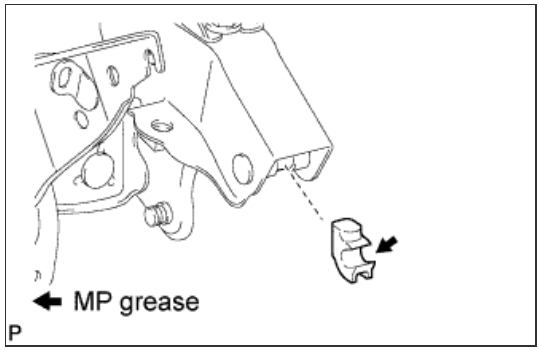
- Check the clutch pedal height.
- Check the push rod play and pedal free play.
- Bleed the clutch line.
- Check the clutch cover and disc.

for Preparation Click here

1. INSTALL CLUTCH PEDAL SPRING HOLDER

a. Apply MP grease to the contact surface of the spring holder.

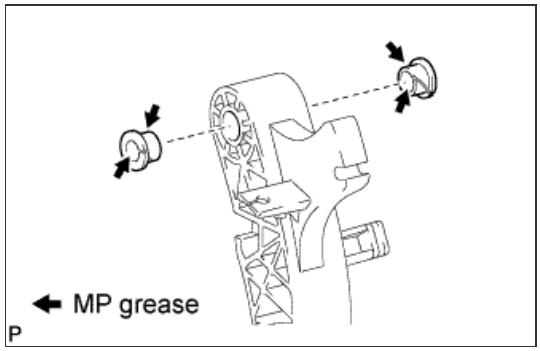
b. Install the clutch pedal spring holder to the clutch pedal bracket.



2. INSTALL CLUTCH PEDAL BUSH

a. Apply MP grease to the inside and outside of 2 new bushes.

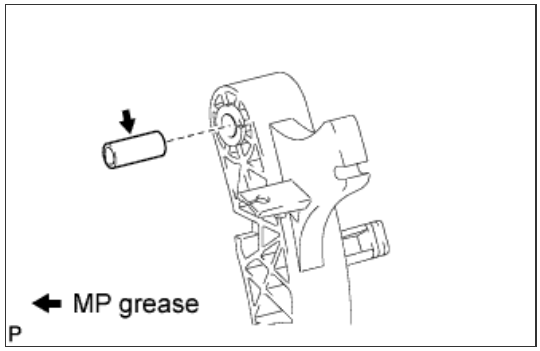
b. Install the 2 bushes to the clutch pedal.



3. INSTALL CLUTCH PEDAL SHAFT COLLAR

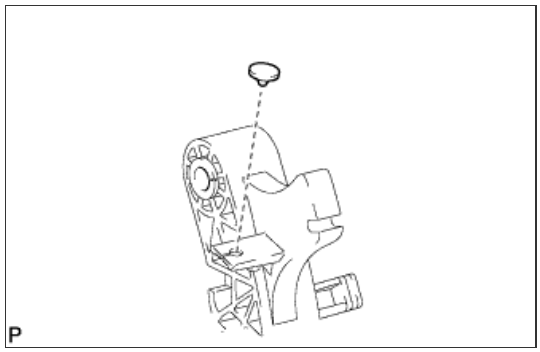
a. Apply MP grease to the clutch pedal shaft collar.

b. Install the clutch pedal shaft collar to the clutch pedal.



4. INSTALL NO. 2 CLUTCH PEDAL CUSHION

a. Install the clutch pedal cushion to the clutch pedal.



5. INSTALL CLUTCH PEDAL PAD

a. Install the clutch pedal pad to the clutch pedal.

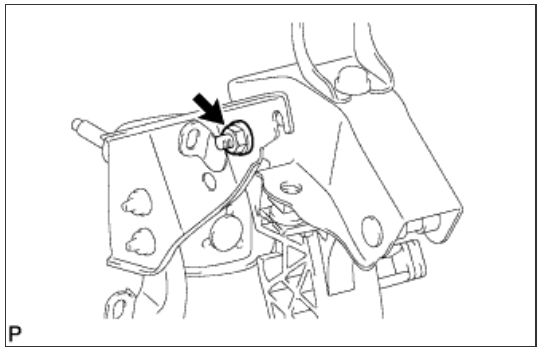
6. INSTALL CLUTCH PEDAL SUB-ASSEMBLY

a. Install the clutch pedal to the clutch pedal bracket with the nut, washer and bolt.

Torque:
34 N*m{ 350 kgf*cm , 25 ft.*lbf }

HINT:

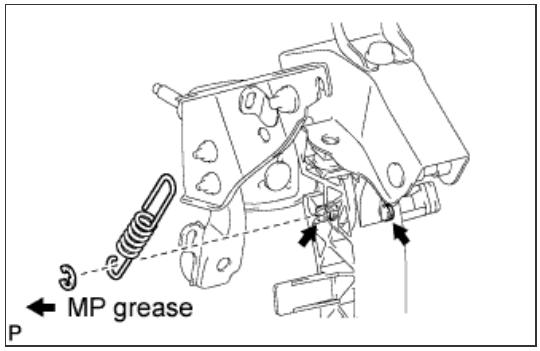
Install the bolt from the right side of the vehicle.



7. INSTALL CLUTCH PEDAL SPRING

a. Apply MP grease to the pins of the clutch pedal bracket and clutch pedal.

b. Connect the spring to the clutch pedal, and connect the spring to the clutch pedal bracket with a new E-ring.

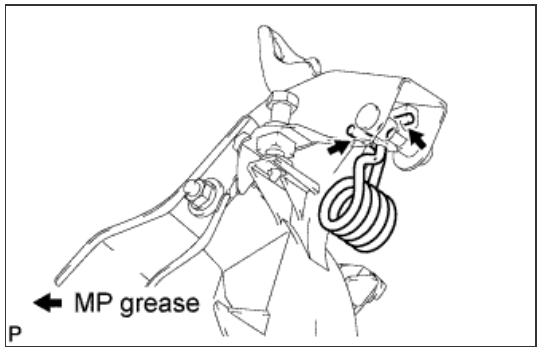


8. INSTALL TURNOVER SPRING

a. Apply MP grease to the contact surfaces of the spring holder, clutch pedal and spring.

b. Move the pedal to the full stroke position.

c. Install the spring to the clutch pedal and spring holder.



9. INSTALL CLUTCH PEDAL BRACKET SUB-ASSEMBLY

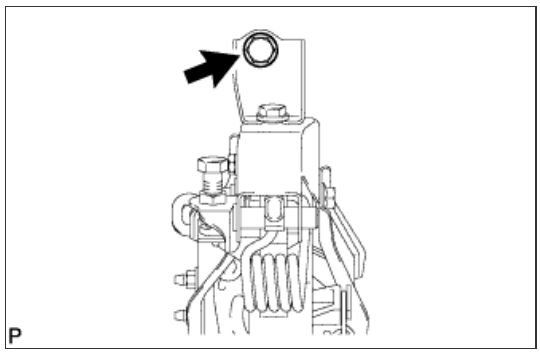
a. Install the clutch pedal bracket to the vehicle, and then temporarily install the bolt.

HINT:

The bolt will be tightened to a torque specification in the "Install Clutch Master Cylinder Assembly" procedure.

b. Connect the clutch start switch connector.

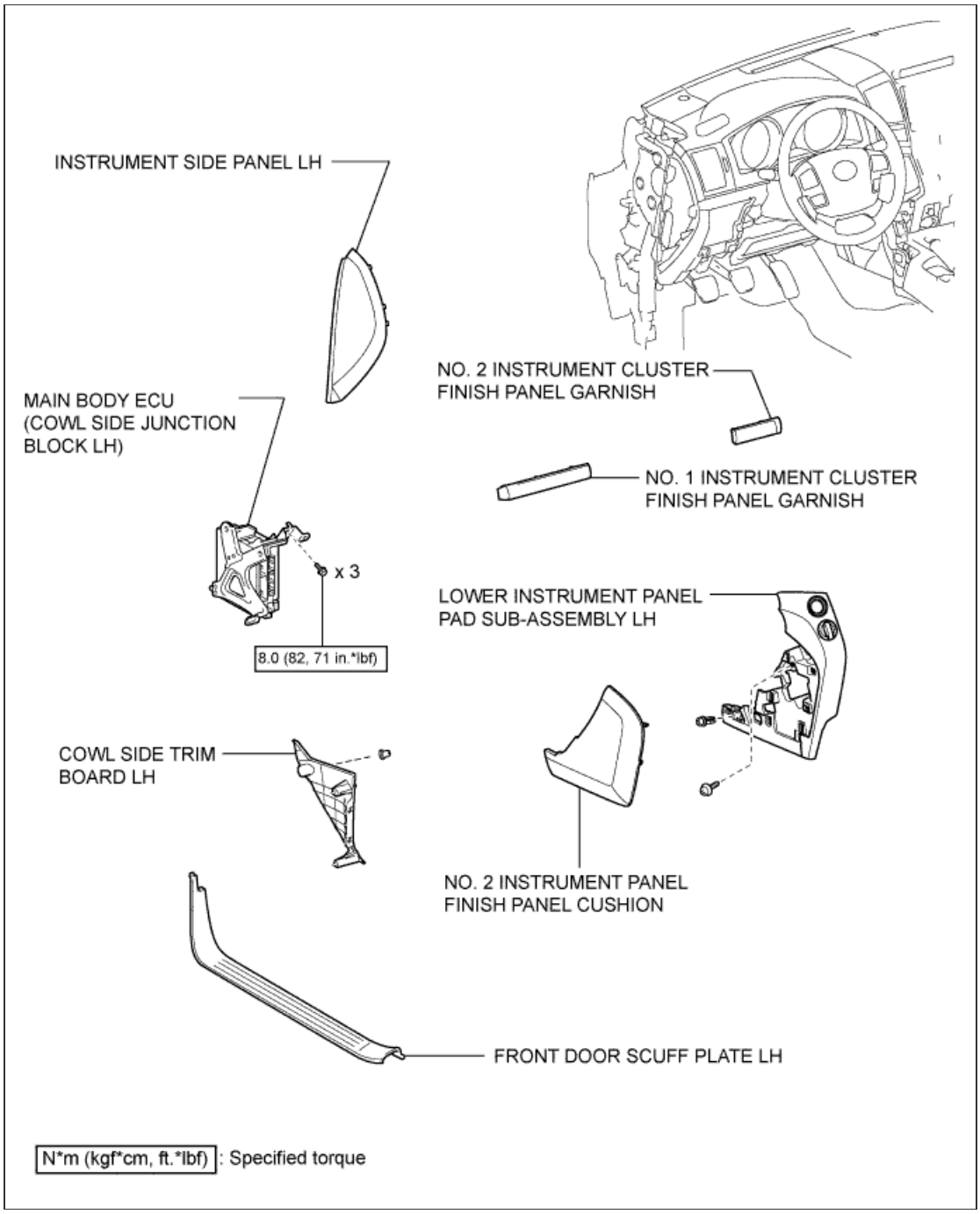
c. w/ Cruise Control System:
Connect the clutch switch connector.

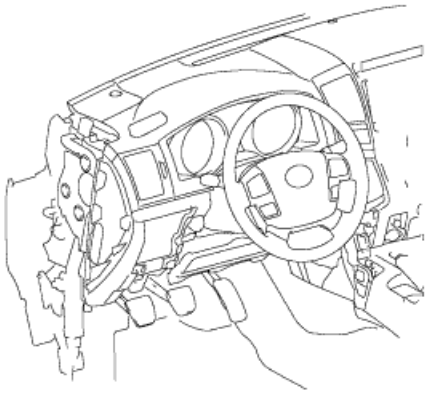


10. INSTALL CLUTCH MASTER CYLINDER ASSEMBLY

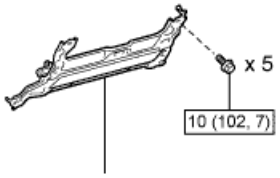
a. Install the clutch master cylinder assembly (Click here).

for Preparation Click here



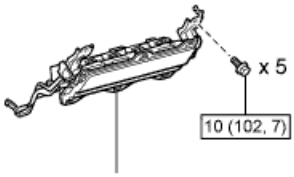


w/o Driver Side Knee Airbag:



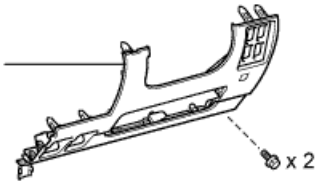
LOWER INSTRUMENT PANEL SUB-ASSEMBLY

w/ Driver Side Knee Airbag:



DRIVER SIDE KNEE AIRBAG ASSEMBLY

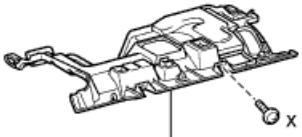
LOWER NO. 1 INSTRUMENT PANEL FINISH PANEL





NO. 1 SWITCH HOLE BASE

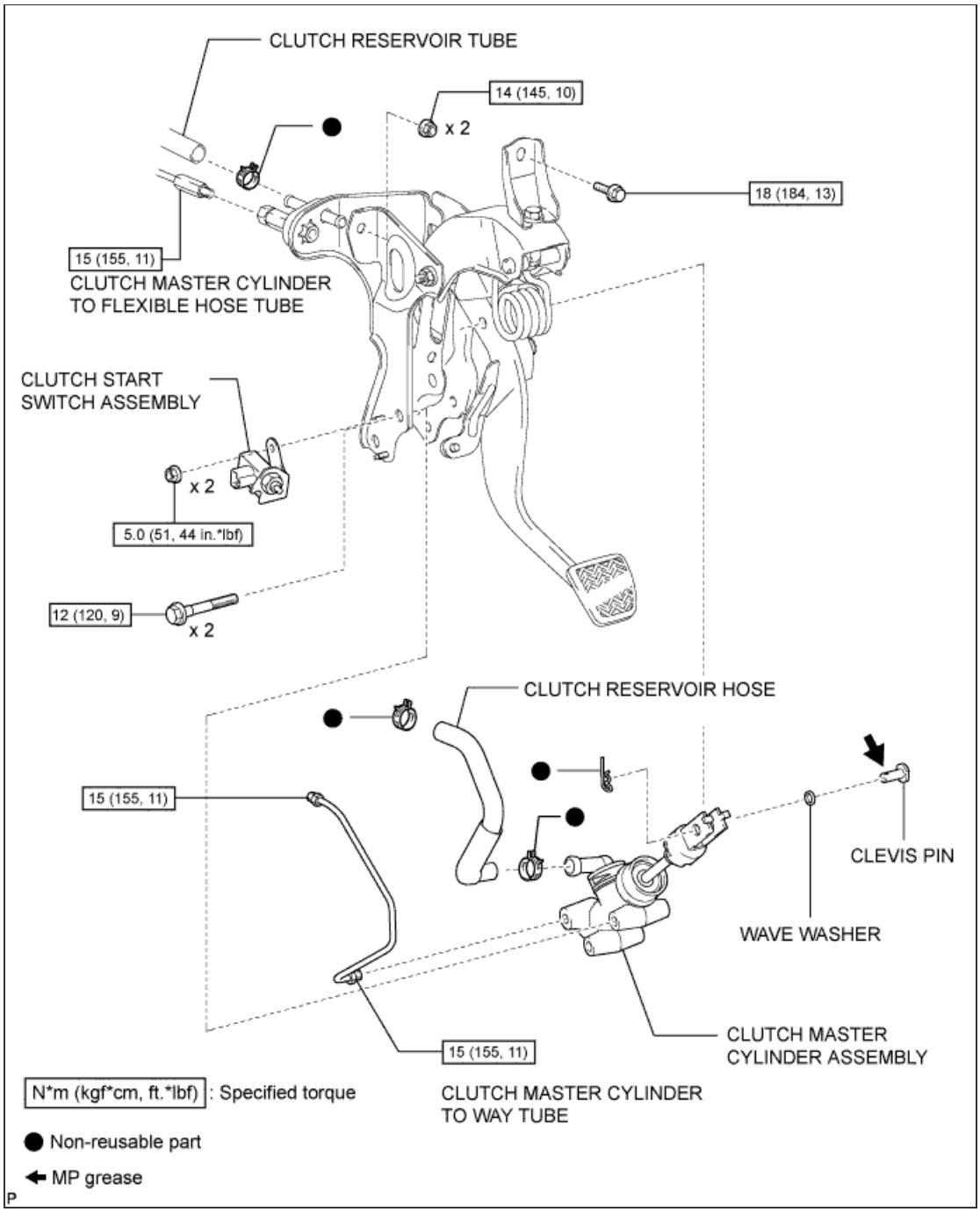
w/ Floor Under Cover:

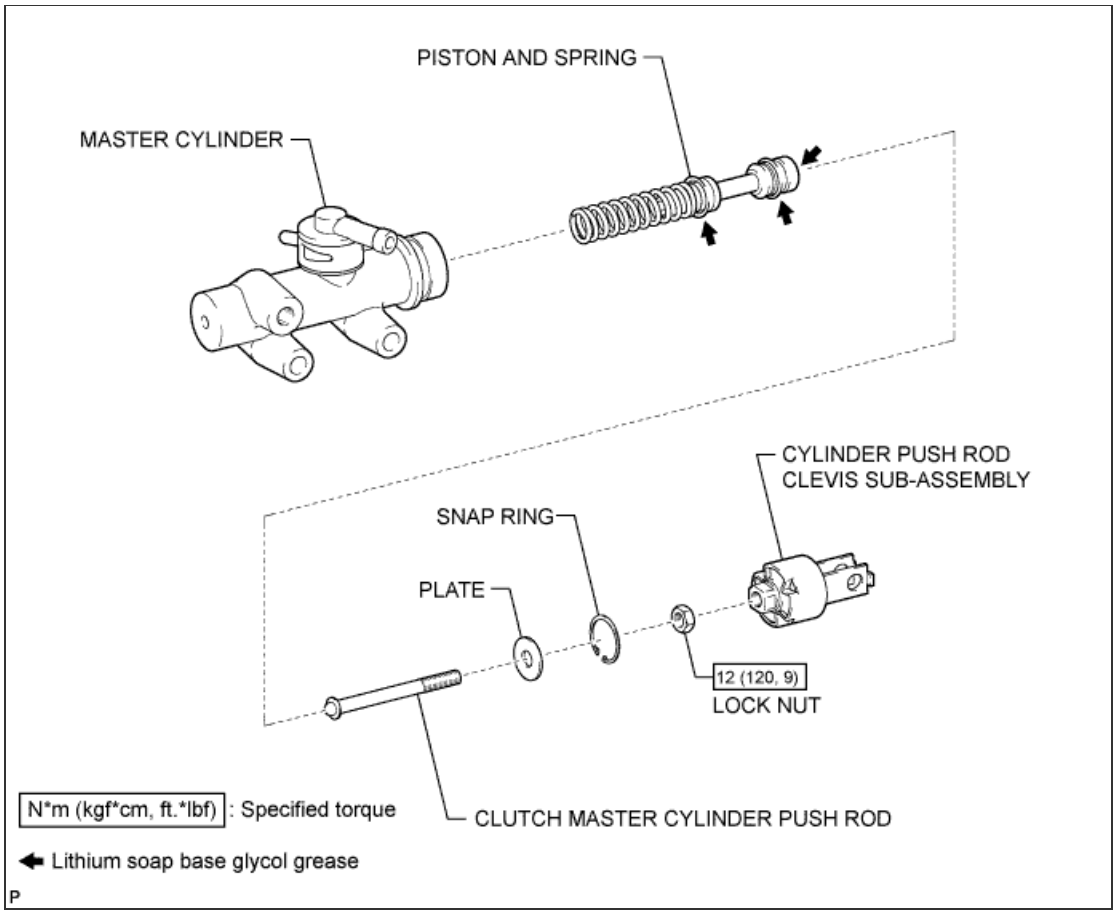


NO. 1 INSTRUMENT PANEL UNDER COVER SUB-ASSEMBLY

N*m (kgf*cm, ft.*lbf) : Specified torque

T


CLUTCH RESERVOIR TUBE
14 (145, 10)
x 2
18 (184, 13)
15 (155, 11)
CLUTCH MASTER CYLINDER
TO FLEXIBLE HOSE TUBE
CLUTCH START
SWITCH ASSEMBLY
x 2
5.0 (51, 44 in.*lbf)
12 (120, 9)
x 2
CLUTCH RESERVOIR HOSE
15 (155, 11)
CLEVIS PIN
WAVE WASHER
CLUTCH MASTER
CYLINDER ASSEMBLY
15 (155, 11)
CLUTCH MASTER CYLINDER
TO WAY TUBE
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
MP grease
P


PISTON AND SPRING
MASTER CYLINDER
CYLINDER PUSH ROD
CLEVIS SUB-ASSEMBLY
SNAP RING
PLATE
12 (120, 9)
LOCK NUT
CLUTCH MASTER CYLINDER PUSH ROD
N*m (kgf*cm, ft.*lbf) : Specified torque
Lithium soap base glycol grease
P

for Preparation Click here

1. DRAIN CLUTCH FLUID

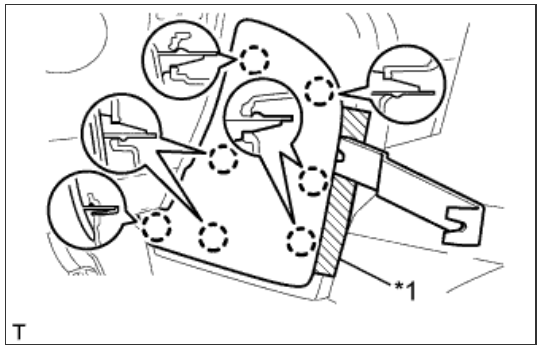
2. REMOVE NO. 2 INSTRUMENT PANEL FINISH PANEL CUSHION

a. Put protective tape around the No. 2 instrument panel finish panel cushion.

Text in Illustration

*1	Protective Tape

b. Using a moulding remover, detach the 7 claws and remove the No. 2 instrument panel finish panel cushion.

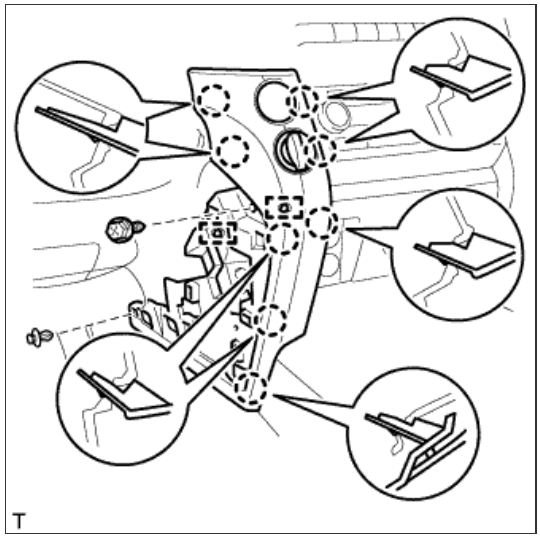


3. REMOVE LOWER INSTRUMENT PANEL PAD SUB-ASSEMBLY LH

a. Remove the clip and screw.

b. Detach the 8 claws.

c. Disconnect the connectors, detach the 2 clamps and remove the lower instrument panel pad sub-assembly.



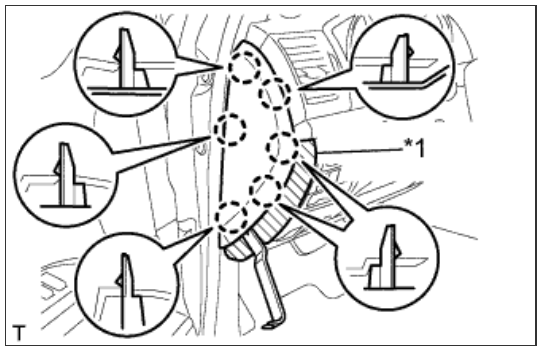
4. REMOVE INSTRUMENT SIDE PANEL LH

a. Place protective tape as shown in the illustration.

Text in Illustration

*1	Protective Tape

b. Using a moulding remover, detach the 6 claws and remove the instrument side panel.



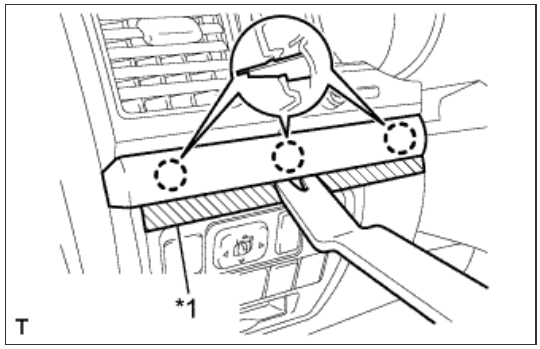
5. REMOVE NO. 1 INSTRUMENT CLUSTER FINISH PANEL GARNISH

a. Place protective tape as shown in the illustration.

Text in Illustration

*1	Protective Tape

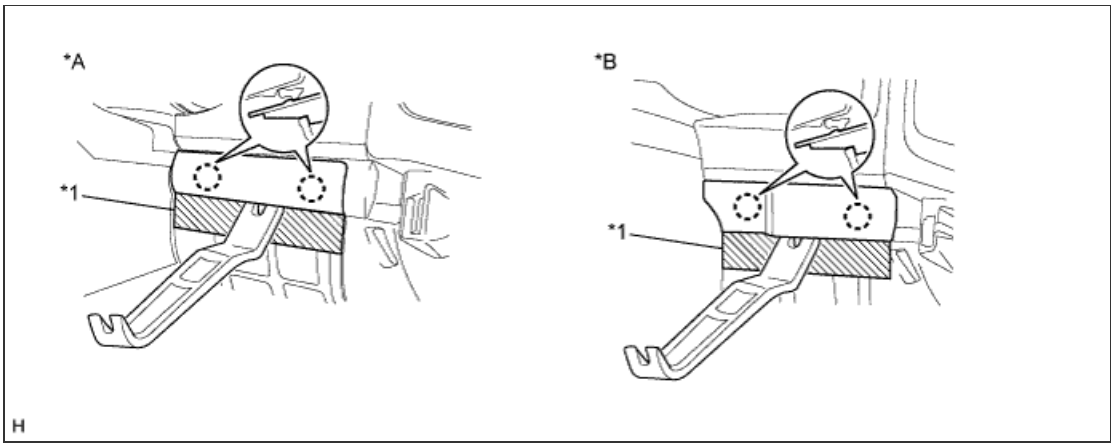
b. Using a moulding remover, detach the 3 claws and remove the No. 1 instrument cluster finish panel garnish.



6. REMOVE NO. 2 INSTRUMENT CLUSTER FINISH PANEL GARNISH

a. Place protective tape as shown in the illustration.

b. Using a moulding remover, detach the 2 claws and remove the No. 2 instrument cluster finish panel garnish.

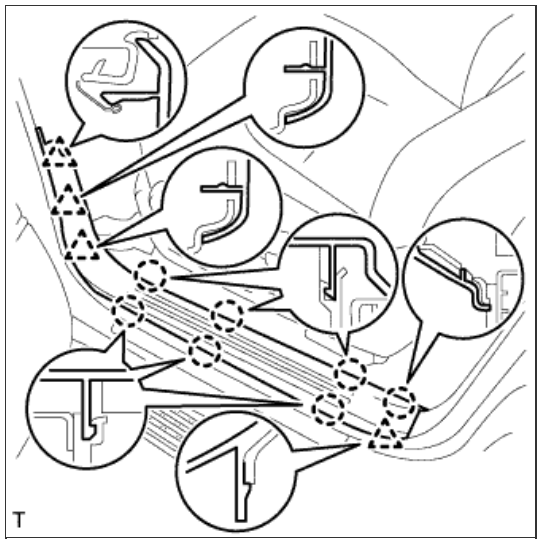


Text in Illustration

*A	w/ Entry and Start System	*B	w/o Entry and Start System
*1	Protective Tape	-	-

7. REMOVE FRONT DOOR SCUFF PLATE LH

a. Detach the 7 claws and 4 clips, and remove the scuff plate.

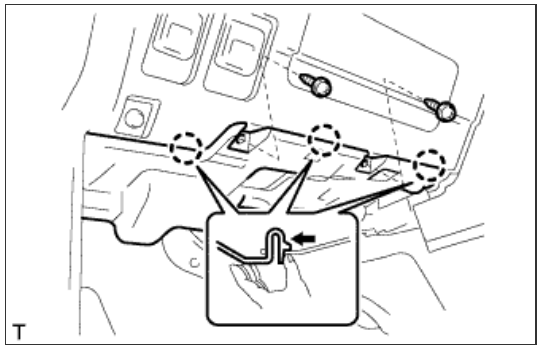


8. REMOVE NO. 1 INSTRUMENT PANEL UNDER COVER SUB-ASSEMBLY (w/ Floor Under Cover)

a. Remove the 2 screws.

b. Detach the 3 claws.

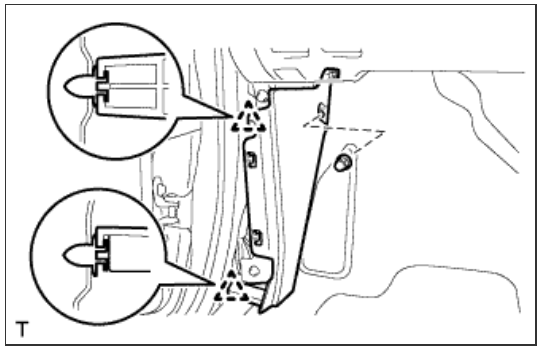
c. Disconnect the connectors and remove the No. 1 instrument panel under cover.



9. REMOVE COWL SIDE TRIM BOARD LH

a. Remove the cap nut.

b. Detach the 2 clips and remove the cowl side trim board.



10. REMOVE LOWER NO. 1 INSTRUMENT PANEL FINISH PANEL

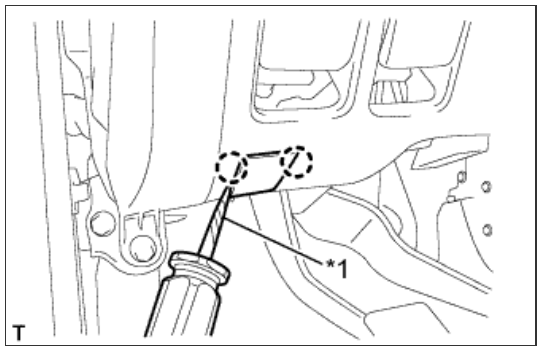
a. Using a screwdriver, detach the 2 claws and open the hole cover.

HINT:

Tape the screwdriver tip before use.

Text in Illustration

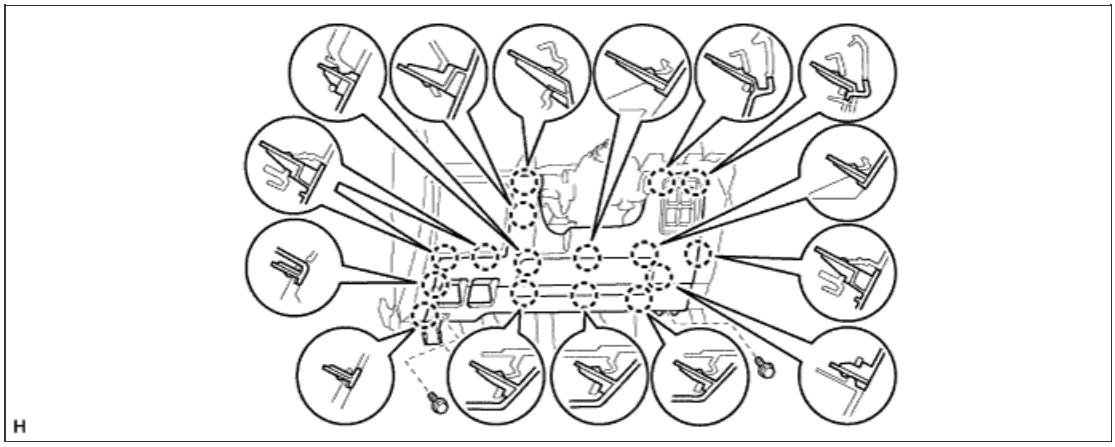
*1	Protective Tape



b. w/ Driver Side Knee Airbag:

i. Remove the 2 bolts.

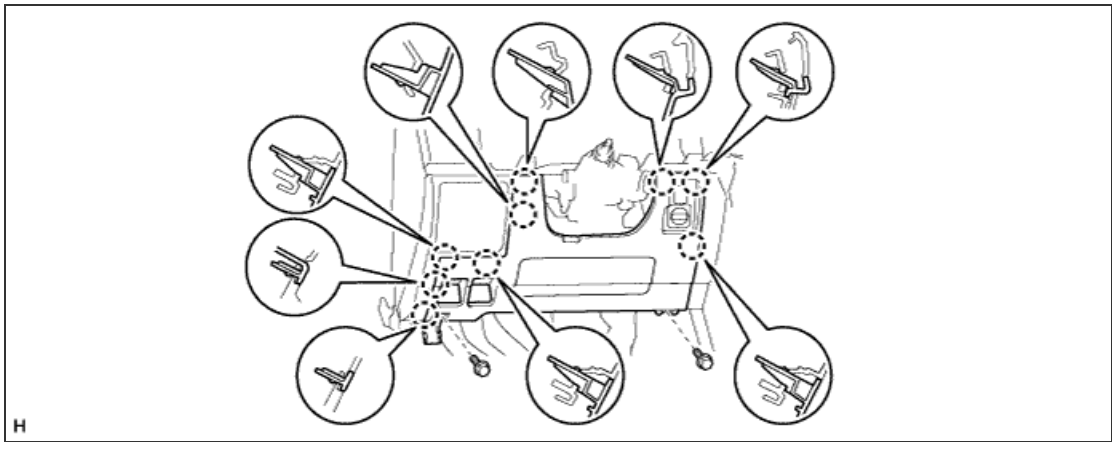
ii. Detach the 16 claws.



c. w/o Driver Side Knee Airbag:

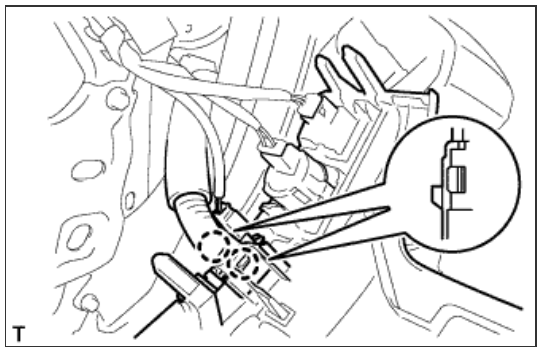
i. Remove the 2 bolts.

ii. Detach the 9 claws.



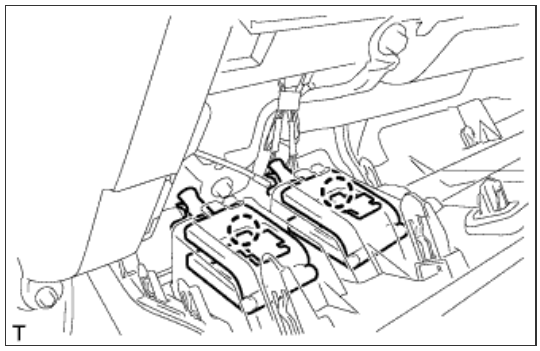
d. for Automatic Air Conditioning System:

i. Detach the 2 claws and remove the room temperature sensor.



e. Detach the 2 claws and disconnect the 2 control cables.

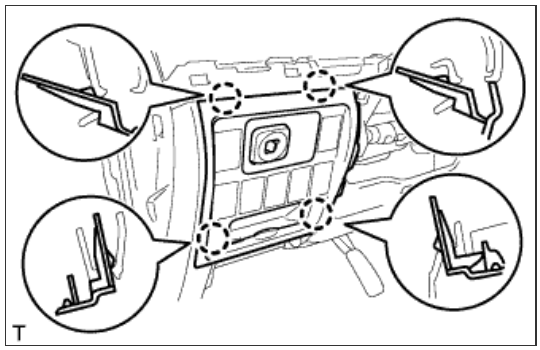
f. Disconnect the connectors and remove the lower No. 1 instrument panel finish panel.



11. REMOVE NO. 1 SWITCH HOLE BASE

a. Detach the 4 claws.

b. Disconnect the connectors and remove the No. 1 switch hole cover.



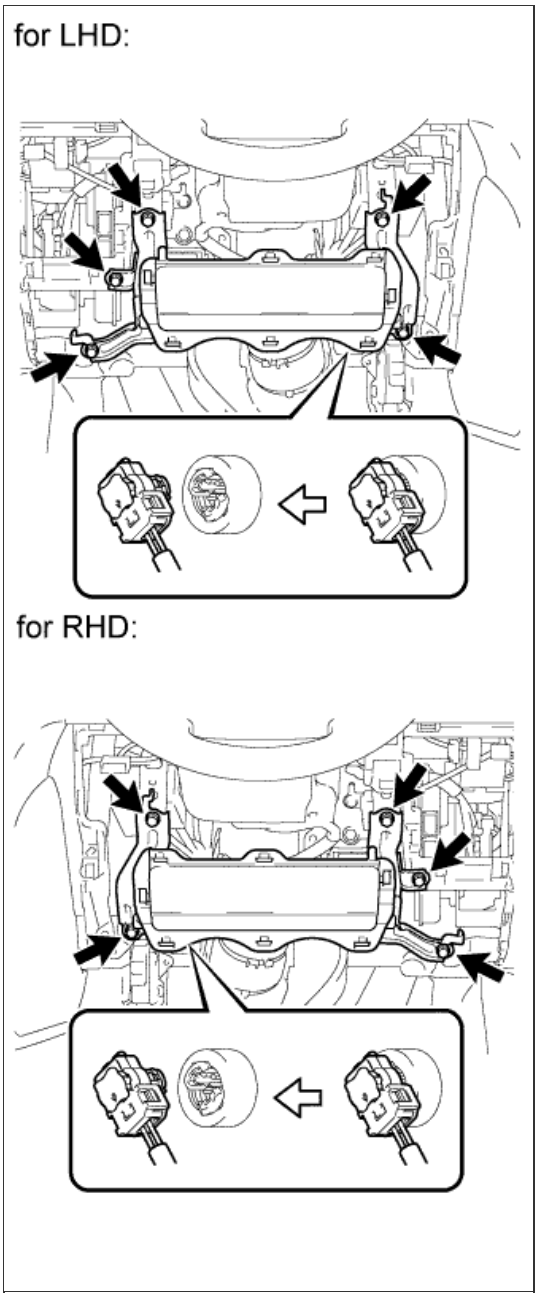
12. REMOVE DRIVER SIDE KNEE AIRBAG ASSEMBLY (w/ Driver Side Knee Airbag)

a. Remove the 5 bolts and driver side knee airbag.

b. Disconnect the connector.

NOTICE:

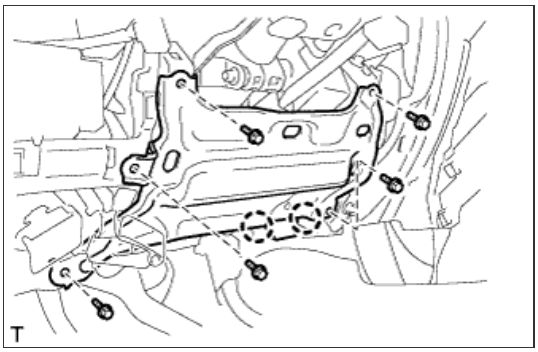
When handling the airbag connector, take care not to damage the airbag wire harness.



13. REMOVE LOWER INSTRUMENT PANEL SUB-ASSEMBLY (w/o Driver Side Knee Airbag)

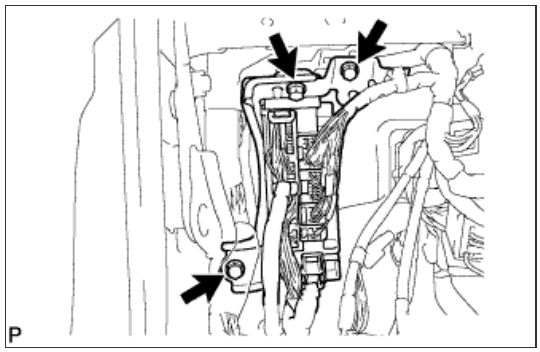
a. Detach the 2 claws and disconnect the DLC3.

b. Remove the 5 bolts and lower instrument panel.

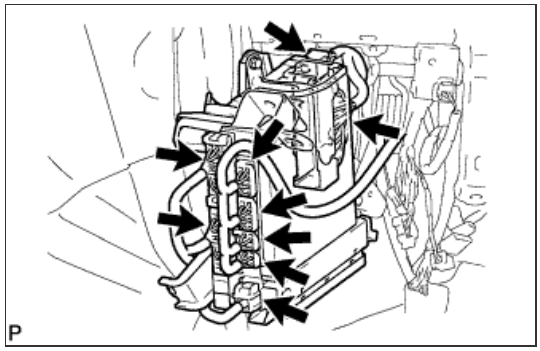


14. REMOVE MAIN BODY ECU (COWL SIDE JUNCTION BLOCK LH)

a. Remove the 3 bolts.



b. Disconnect the 9 ECU connectors and remove the ECU.



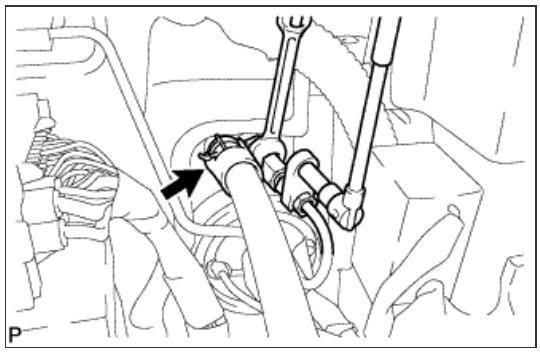
15. DISCONNECT CLUTCH MASTER CYLINDER TO FLEXIBLE HOSE TUBE AND CLUTCH RESERVOIR TUBE

a. Using a union nut wrench, disconnect the flexible hose tube.

HINT:

Use a container to catch the fluid.

b. Disconnect the clutch reservoir tube.

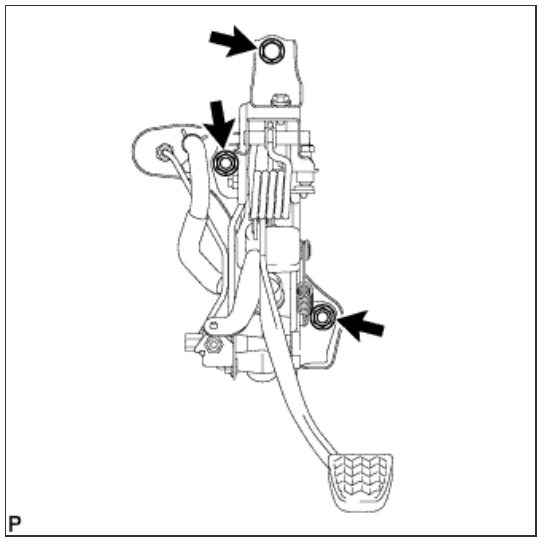


16. REMOVE CLUTCH PEDAL SUPPORT ASSEMBLY WITH CLUTCH MASTER CYLINDER

a. Disconnect the clutch start switch connector.

b. w/ Cruise Control System:
Disconnect the clutch switch connector.

c. Remove the 2 nuts, bolt and clutch pedal support with clutch master cylinder.

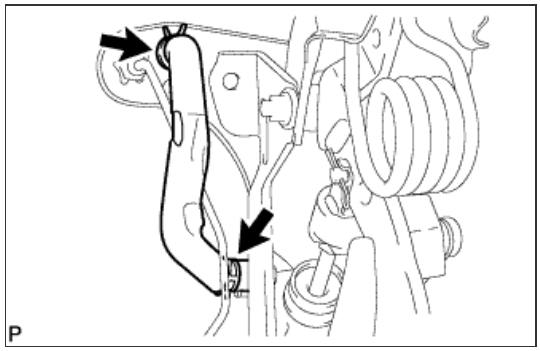


17. REMOVE CLUTCH RESERVOIR HOSE

a. Using pliers, grip the claws of the clip, slide the 2 clips and remove the clutch reservoir hose.

HINT:

Use a container to catch the fluid.

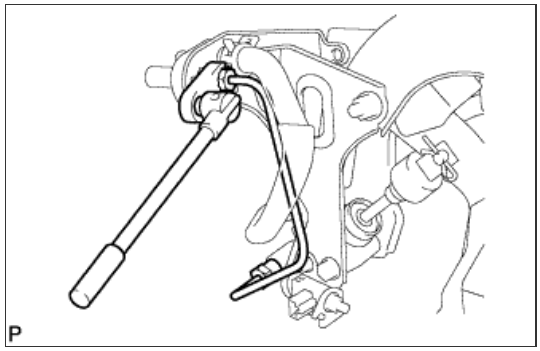


18. REMOVE CLUTCH MASTER CYLINDER TO WAY TUBE

a. Using a union nut wrench, remove the tube.

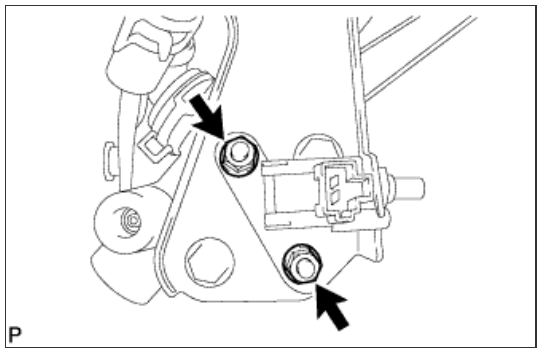
HINT:

Use a container to catch the fluid.



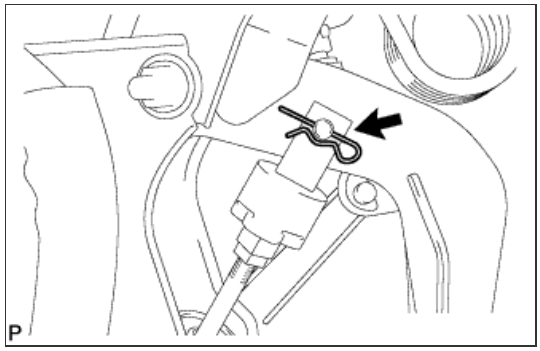
19. REMOVE CLUTCH START SWITCH ASSEMBLY

a. Remove the 2 nuts and clutch start switch.

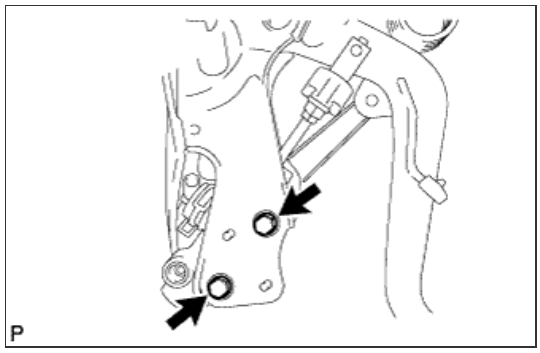


20. REMOVE CLUTCH MASTER CYLINDER ASSEMBLY

a. Remove the clip, wave washer and clevis pin.



b. Remove the 2 bolts and clutch master cylinder.



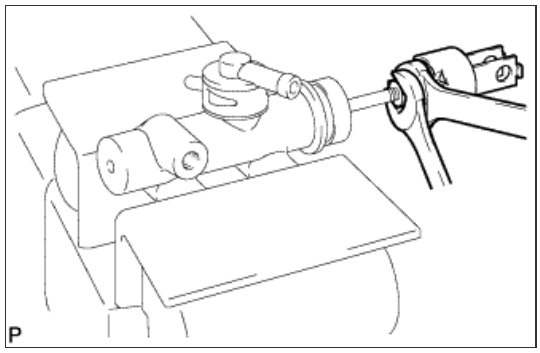
for Preparation Click here

1. REMOVE CYLINDER PUSH ROD CLEVIS SUB-ASSEMBLY

a. Secure the master cylinder in a vise.

b. Loosen the lock nut, and then remove the cylinder push rod clevis sub-assembly.

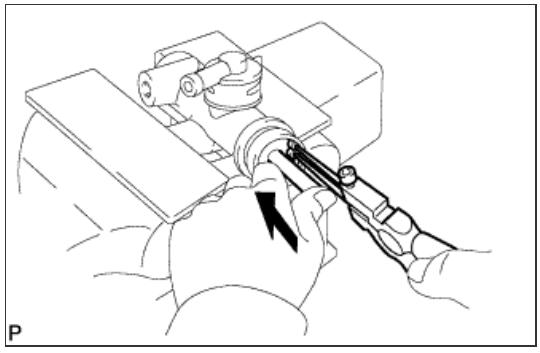
c. Remove the lock nut from the clutch master cylinder push rod.



2. REMOVE CLUTCH MASTER CYLINDER PUSH ROD

a. Using snap ring pliers, remove the snap ring and plate while pushing in the clutch master cylinder push rod.

b. Remove the clutch master cylinder push rod.



3. REMOVE PISTON AND SPRING

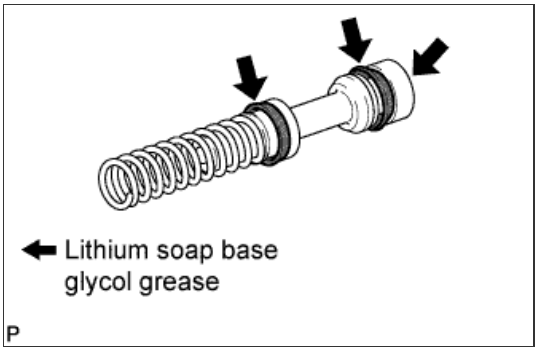
a. Remove the piston and spring from the master cylinder.

for Preparation Click here

1. INSTALL PISTON AND SPRING

a. Apply lithium soap base glycol grease to the circumference of the cups and the contact surfaces of the piston and clutch master cylinder push rod.

b. Install the piston and spring to the master cylinder.



2. INSTALL CLUTCH MASTER CYLINDER PUSH ROD

a. Secure the master cylinder in a vise.

b. Install the clutch master cylinder push rod and plate to the master cylinder.

c. Using snap ring pliers, install the snap ring while pushing in the clutch master cylinder push rod.

3. INSTALL CYLINDER PUSH ROD CLEVIS SUB-ASSEMBLY

a. Install the lock nut and cylinder push rod clevis sub-assembly to the clutch master cylinder push rod, and then partially tighten the lock nut.

HINT:

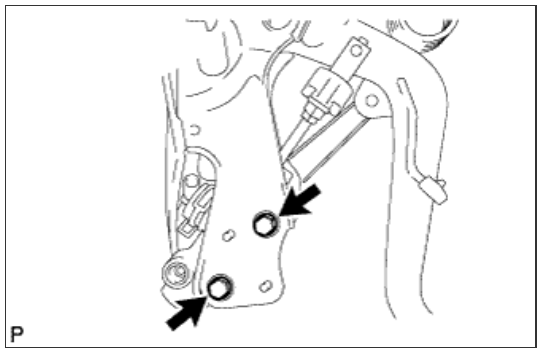
The lock nut will be tightened to a torque specification in the "Inspect and Adjust Clutch Pedal Sub-assembly" procedure (Click here).

for Preparation Click here

1. INSTALL CLUTCH MASTER CYLINDER ASSEMBLY

a. Install the clutch master cylinder with the 2 bolts.

Torque:
12 N*m{ 120 kgf*cm , 9 ft.*lbf }

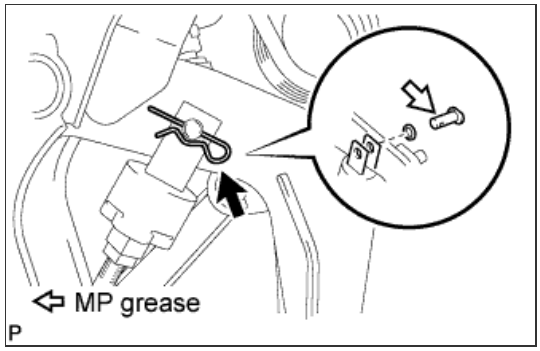


b. Apply MP grease to the contact surface of the clevis pin and clevis bush.

c. Install the wave washer to the clevis pin.

d. Connect the clevis of the master cylinder to the clutch pedal with the clevis pin.

e. Install a new clip to the clevis pin.

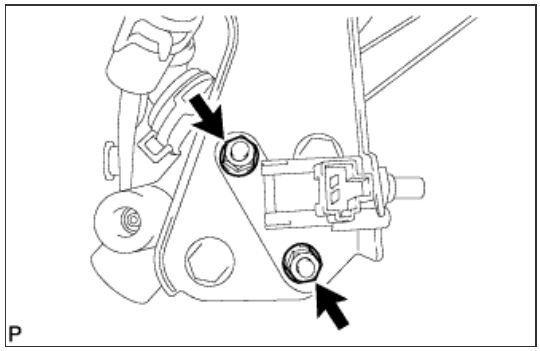


2. INSTALL CLUTCH START SWITCH ASSEMBLY

a. Install the clutch start switch to the clutch pedal bracket, and then temporarily install the 2 nuts.

HINT:

The 2 nuts will be tightened to a torque specification in the "Adjust Clutch Start Switch Assembly" procedure.



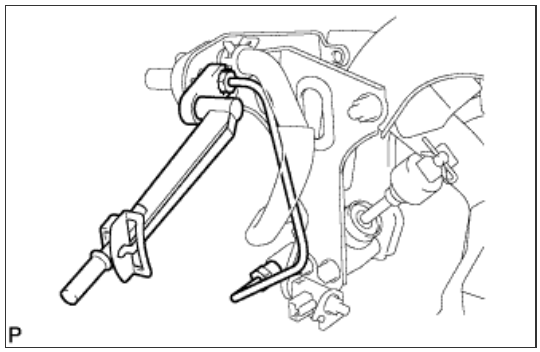
3. INSTALL CLUTCH MASTER CYLINDER TO WAY TUBE

a. Using a union nut wrench, install the tube to the clutch master cylinder and clutch pedal support way.

Torque:
15 N*m{ 155 kgf*cm , 11 ft.*lbf }

NOTICE:

Use the formula to calculate special torque values for situations where a union nut wrench is combined with a torque wrench (Click here).

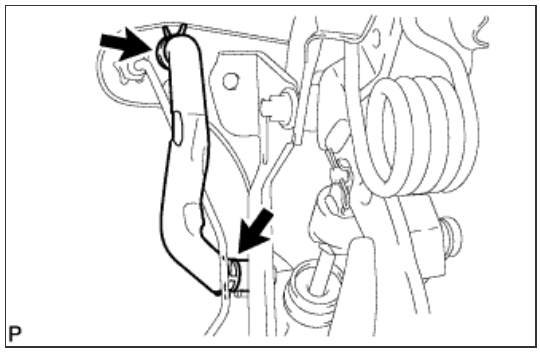


4. INSTALL CLUTCH RESERVOIR HOSE

a. Install the clutch reservoir hose to the clutch master cylinder and clutch pedal support way with 2 new clips.

NOTICE:

Connect the clutch reservoir hose so that it will not be twisted.



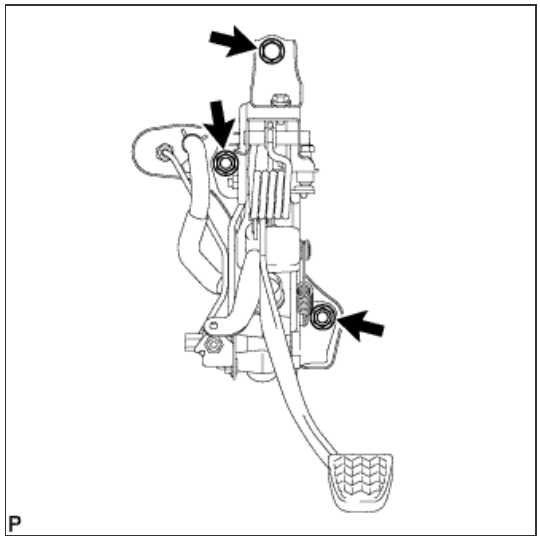
5. INSTALL CLUTCH PEDAL SUPPORT ASSEMBLY WITH CLUTCH MASTER CYLINDER

a. Install the clutch pedal support with clutch master cylinder with the bolt and 2 nuts.

Torque:
for bolt:
18 N*m{ 184 kgf*cm , 13 ft.*lbf }
for nut:
14 N*m{ 145 kgf*cm , 10 ft.*lbf }

b. Connect the clutch start switch connector.

c. w/ Cruise Control System:
Connect the clutch switch connector.



6. CONNECT CLUTCH MASTER CYLINDER TO FLEXIBLE HOSE TUBE AND CLUTCH RESERVOIR TUBE

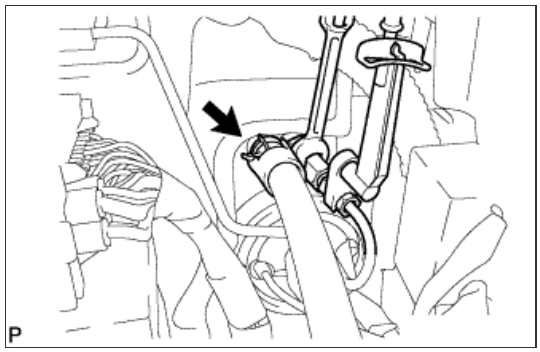
a. Using a union nut wrench, connect the flexible hose tube.

Torque:
15 N*m{ 155 kgf*cm , 11 ft.*lbf }

NOTICE:

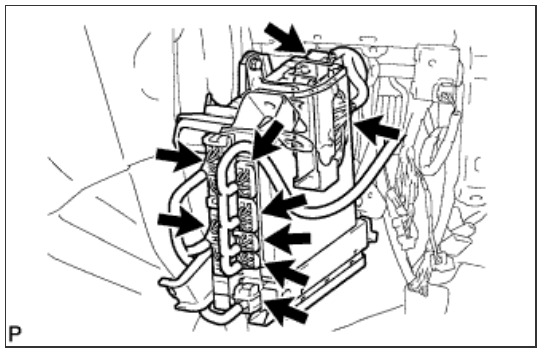
Use the formula to calculate special torque values for situations where a union nut wrench is combined with a torque wrench (Click here).

b. Connect the clutch reservoir tube with a new clip.



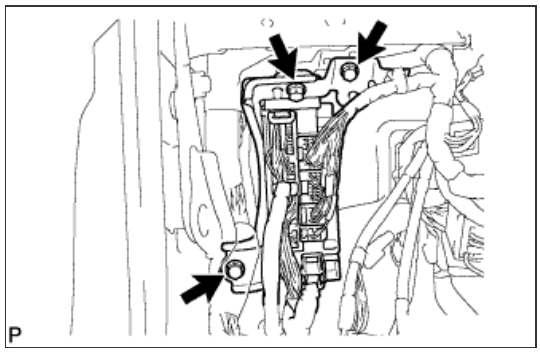
7. INSTALL MAIN BODY ECU (COWL SIDE JUNCTION BLOCK LH)

a. Connect the 9 ECU connectors.



b. Install the ECU with the 3 bolts.

Torque:
8.0 N*m{ 82 kgf*cm , 71 in.*lbf }



8. FILL RESERVOIR WITH BRAKE FLUID

a. Fill the reservoir with brake fluid.

Brake Fluid:
SAE J1703 or FMVSS No. 116 DOT 3

9. BLEED CLUTCH LINE

a. Remove the release cylinder bleeder plug cap.

b. Connect a vinyl tube to the bleeder plug.

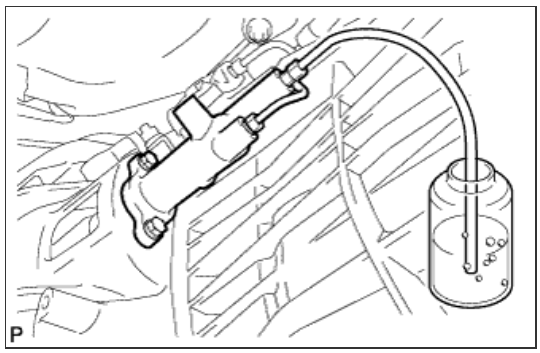
c. Depress the clutch pedal several times, and then loosen the bleeder plug while the pedal is depressed.

d. When fluid no longer comes out, tighten the bleeder plug, and then release the clutch pedal.

e. Repeat the previous 2 steps until all the air in the fluid is completely bled.

f. Tighten the bleeder plug.

Torque:



11 N*m{ 110 kgf*cm , 8 ft.*lbf }

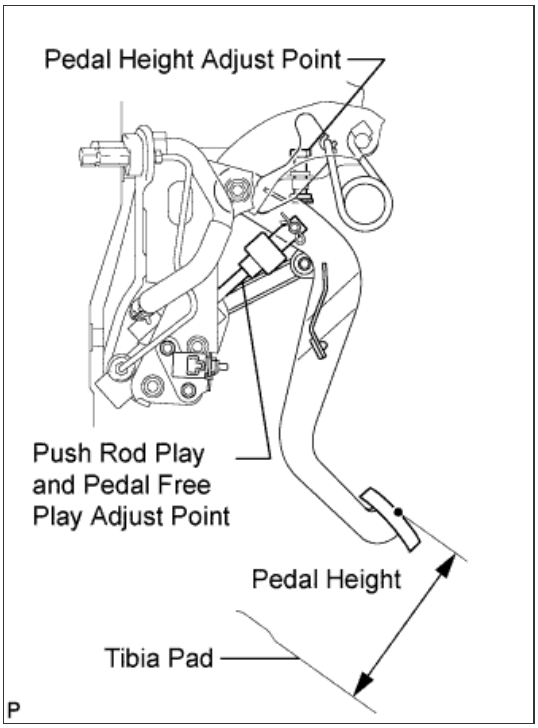
g. Install the bleeder plug cap.

h. Check that all the air has been bled from the clutch line.

10. INSPECT AND ADJUST CLUTCH PEDAL SUB-ASSEMBLY

a. Check that the clutch pedal height is correct.

Standard Clutch Pedal Height from Tibia Pad:
162.7 to 172.7 mm (6.41 to 6.79 in.)



b. Adjust the clutch pedal height.

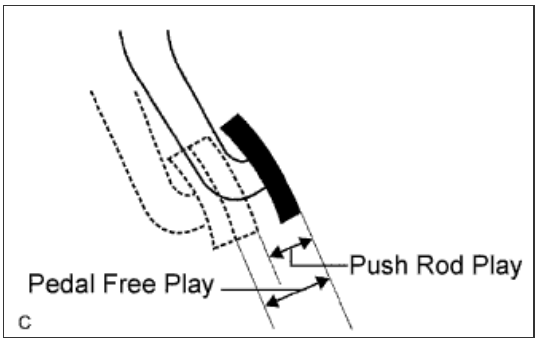
i. Loosen the lock nut and turn the stopper bolt or clutch switch until the height is correct. Tighten the lock nut.

Torque:
16 N*m{ 160 kgf*cm , 12 ft.*lbf }

c. Check that the clutch pedal free play and push rod play are correct.

HINT:

Pay close attention to the change in resistance to distinguish between pedal free play and push rod play while performing the inspection.



i. Depress the clutch pedal until the clutch resistance begins to be felt.

Standard Pedal Free Play:
5.0 to 15.0 mm (0.197 to 0.591 in.)

ii. Gently depress the clutch pedal until the resistance begins to increase a little.

Standard Push Rod Play at Pedal Top:
1.0 to 5.0 mm (0.0394 to 0.197 in.)

d. Adjust the clutch pedal free play and push rod play.

HINT:

The push rod play can be adjusted by changing the length of the push rod. Pedal free play changes together with push rod play.

i. Loosen the lock nut and turn the clutch push rod until the clutch pedal free play and push rod play are correct.

NOTICE:

If pedal free play and push rod play are not within the standard range even after adjustment, inspect the related parts.

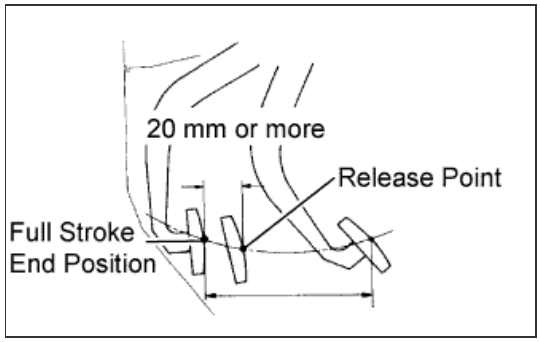
ii. Tighten the lock nut.

Torque:
12 N*m{ 120 kgf*cm , 9 ft.*lbf }

iii. After adjusting the clutch pedal free play and push rod play, check the clutch pedal height.

Standard Clutch Pedal Height from Tibia Pad:
162.7 to 172.7 mm (6.41 to 6.79 in.)

e. Check the clutch release point.



i. Pull the parking brake lever and chock the wheels.

ii. Start the engine and allow it to idle.

iii. Without depressing the clutch pedal, slowly move the shift lever to R until the gears engage.

iv. Gradually depress the clutch pedal and measure the stroke distance from the point that the gear noise stops (release point) up to the full stroke end position.

Standard Distance from Pedal Stroke End Position to Release Point:
20 mm (0.787 in.) or more

If the distance is not as specified, perform the following operations:

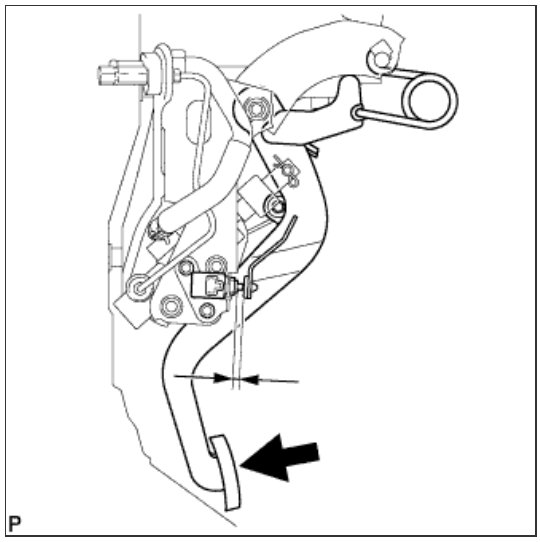
- Check the clutch pedal height.
- Check the push rod play and pedal free play.
- Bleed the clutch line.
- Check the clutch cover and disc.

11. ADJUST CLUTCH START SWITCH ASSEMBLY

a. While depressing the clutch pedal, tighten the 2 nuts so that the clearance between the clutch pedal and clutch start switch is within the specification.

Standard clearance between clutch pedal and clutch start switch:
4.1 to 6.1 mm (0.162 to 0.240 in.)

Torque:
5.0 N*m{ 51 kgf*cm , 44 in.*lbf }



12. CHECK FLUID LEVEL IN RESERVOIR

a. Check the fluid level.
If the brake fluid level is low, check for leaks and inspect the disc brake pad. If necessary, refill the reservoir with brake fluid after repair or replacement.

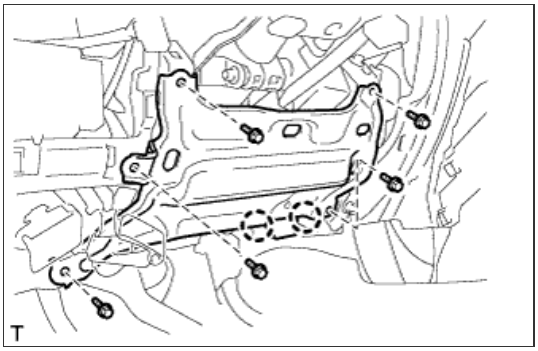
Brake fluid:
SAE J1703 or FMVSS No. 116 DOT 3

13. INSPECT FOR CLUTCH FLUID LEAK

14. INSTALL LOWER INSTRUMENT PANEL SUB-ASSEMBLY (w/o Driver Side Knee Airbag)

a. Attach the 2 claws and connect the DLC3.

b. Install the lower instrument panel with the 5 bolts.



15. INSTALL DRIVER SIDE KNEE AIRBAG ASSEMBLY (w/ Driver Side Knee Airbag)

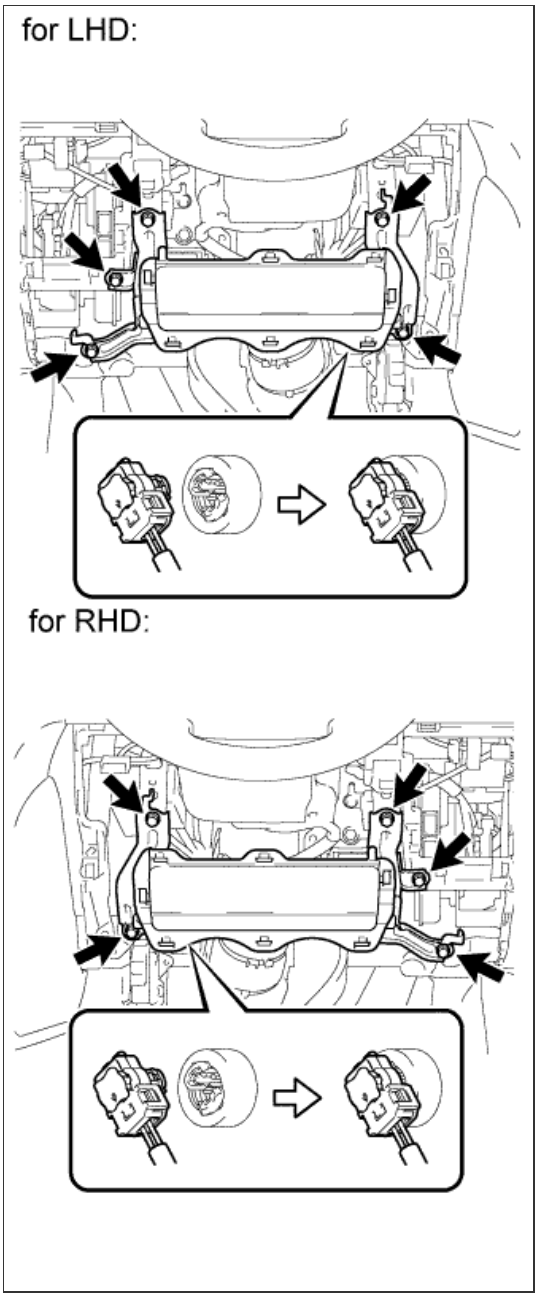
a. Connect the connector.

NOTICE:

When handling the airbag connector, take care not to damage the airbag wire harness.

b. Install the driver side knee airbag with the 5 bolts.

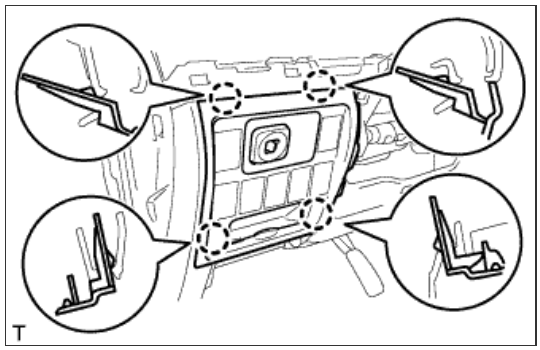
Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }



16. INSTALL NO. 1 SWITCH HOLE BASE

a. Connect the connectors.

b. Attach the 4 claws to install the No. 1 switch hole base.

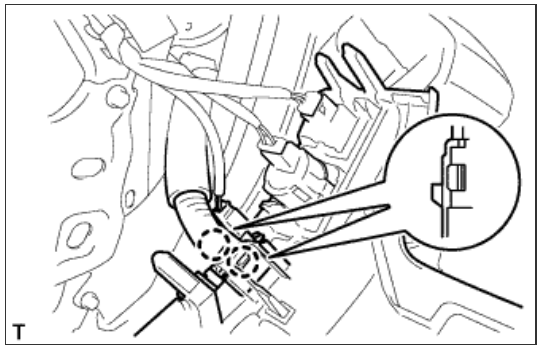


17. INSTALL LOWER NO. 1 INSTRUMENT PANEL FINISH PANEL

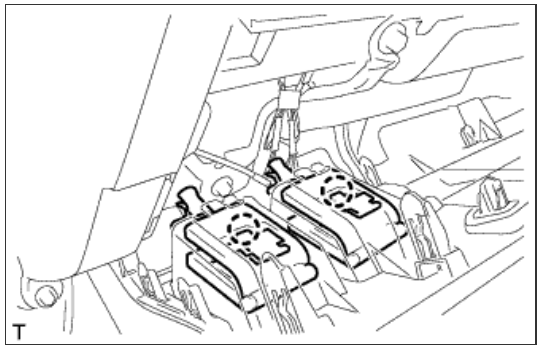
a. Connect the connectors.

b. for Automatic Air Conditioning System:

i. Attach the 2 claws to install the room temperature sensor.



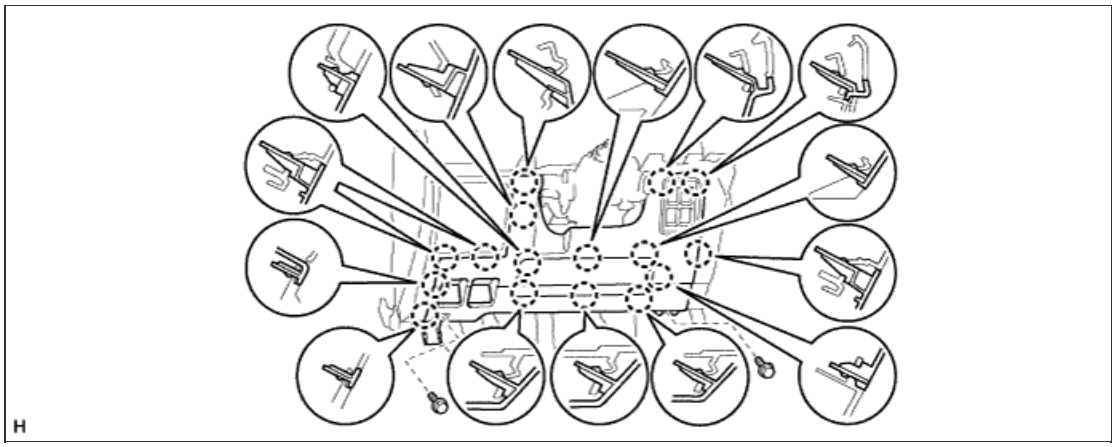
c. Attach the 2 claws to connect the 2 control cables.



d. w/ Driver Side Knee Airbag:

i. Attach the 16 claws to install the lower No. 1 instrument panel finish panel.

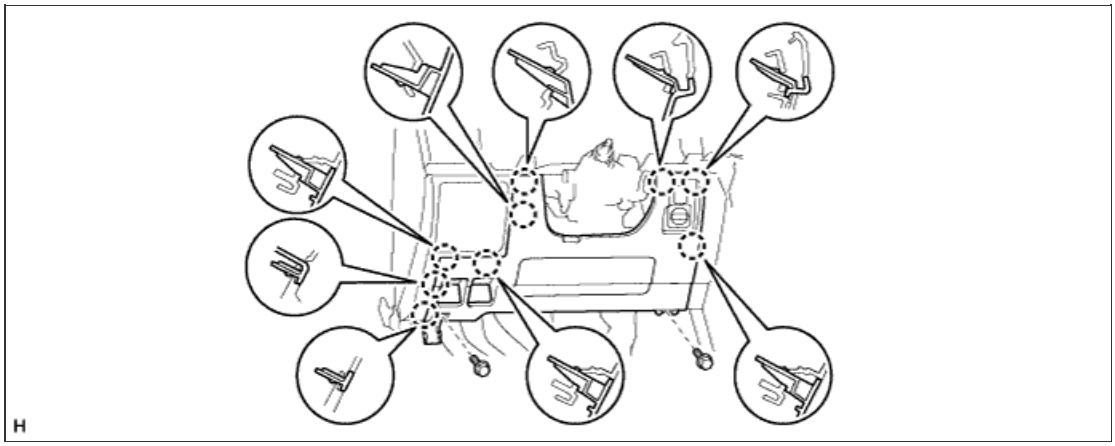
ii. Install the 2 bolts.



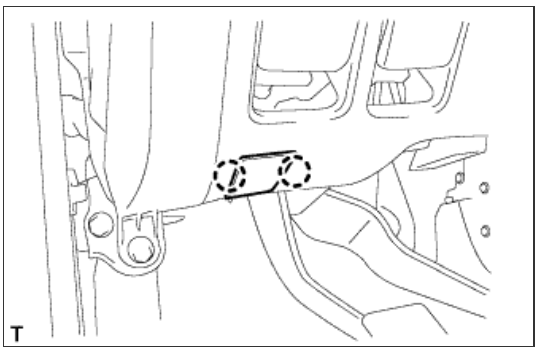
e. w/o Driver Side Knee Airbag:

i. Attach the 9 claws to install the lower No. 1 instrument panel finish panel.

ii. Install the 2 bolts.



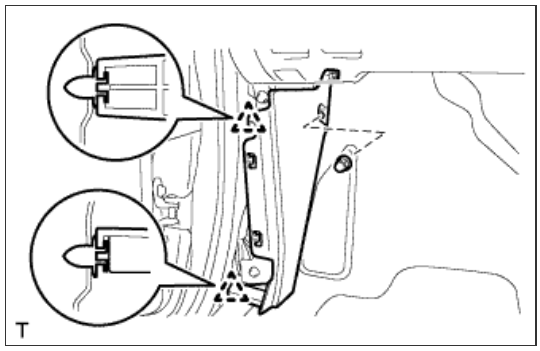
f. Attach the 2 claws to close the hole cover.



18. INSTALL COWL SIDE TRIM BOARD LH

a. Attach the 2 clips to install the cowl side trim board.

b. Install the cap nut.

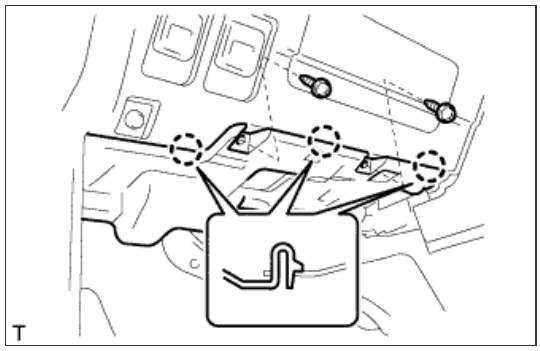


19. INSTALL NO. 1 INSTRUMENT PANEL UNDER COVER SUB-ASSEMBLY (w/ Floor Under Cover)

a. Connect the connectors.

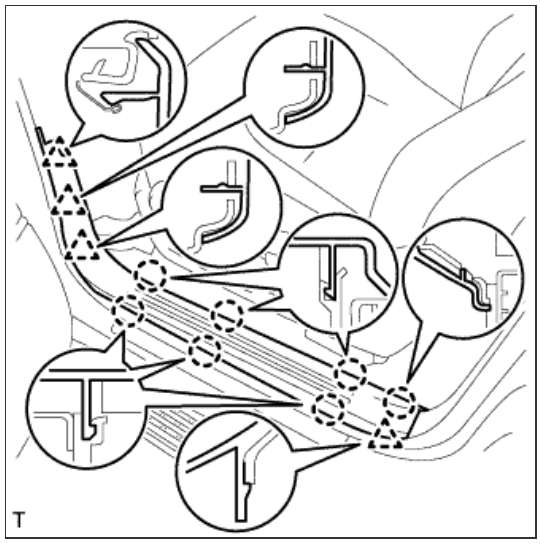
b. Attach the 3 claws to install the No. 1 instrument panel under cover.

c. Install the 2 screws.



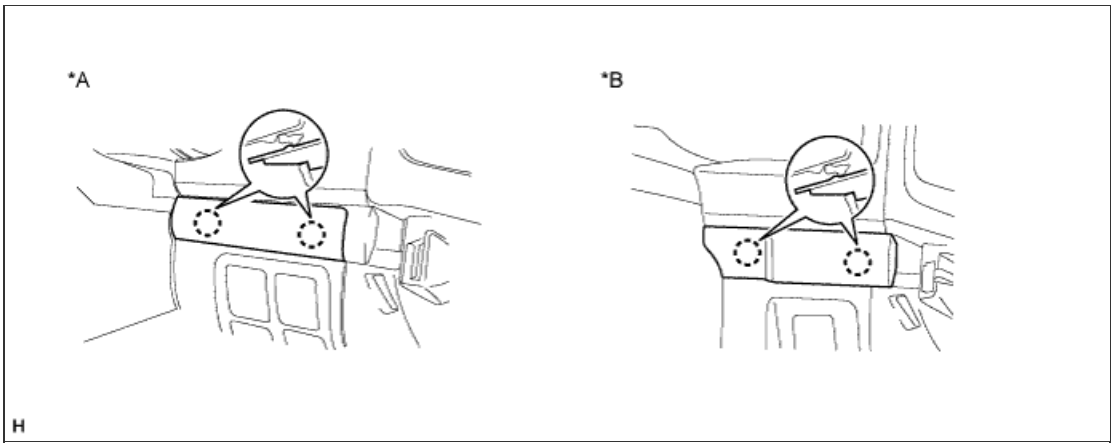
20. INSTALL FRONT DOOR SCUFF PLATE LH

a. Attach the 7 claws and 4 clips to install the scuff plate.



21. INSTALL NO. 2 INSTRUMENT CLUSTER FINISH PANEL GARNISH

a. Attach the 2 claws to install the No. 2 instrument cluster finish panel garnish.

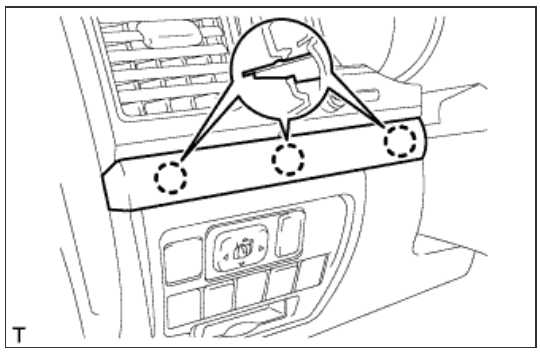


Text in Illustration

*A	w/ Entry and Start System	*B	w/o Entry and Start System

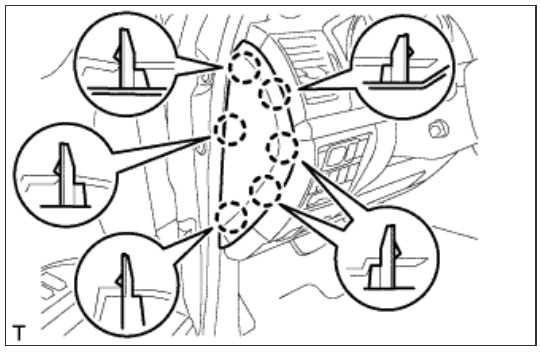
22. INSTALL NO. 1 INSTRUMENT CLUSTER FINISH PANEL GARNISH

a. Attach the 3 claws to install the No. 1 instrument cluster finish panel garnish.



23. INSTALL INSTRUMENT SIDE PANEL LH

a. Attach the 6 claws to install the instrument side panel.

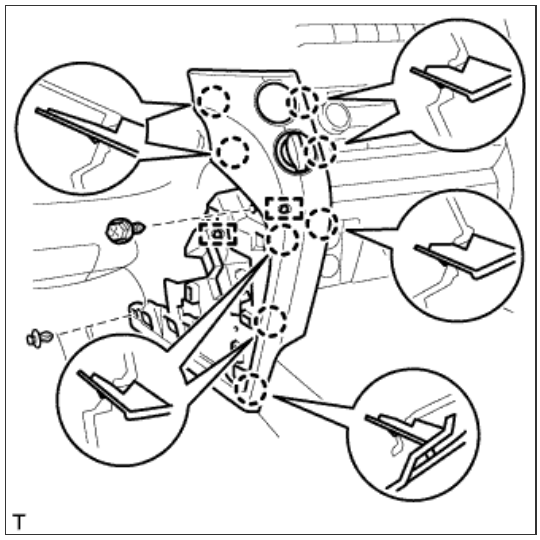


24. INSTALL LOWER INSTRUMENT PANEL PAD SUB-ASSEMBLY LH

a. Connect the connectors and attach the 2 clamps.

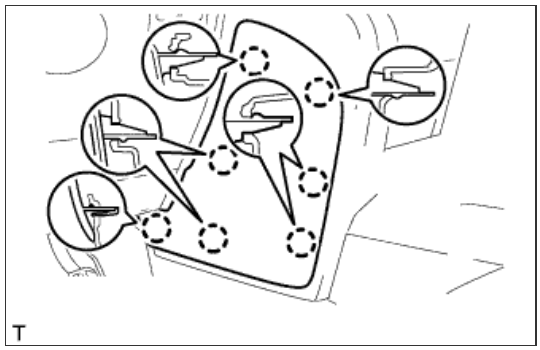
b. Attach the 8 claws to install the lower instrument panel pad sub-assembly.

c. Install the clip and screw.

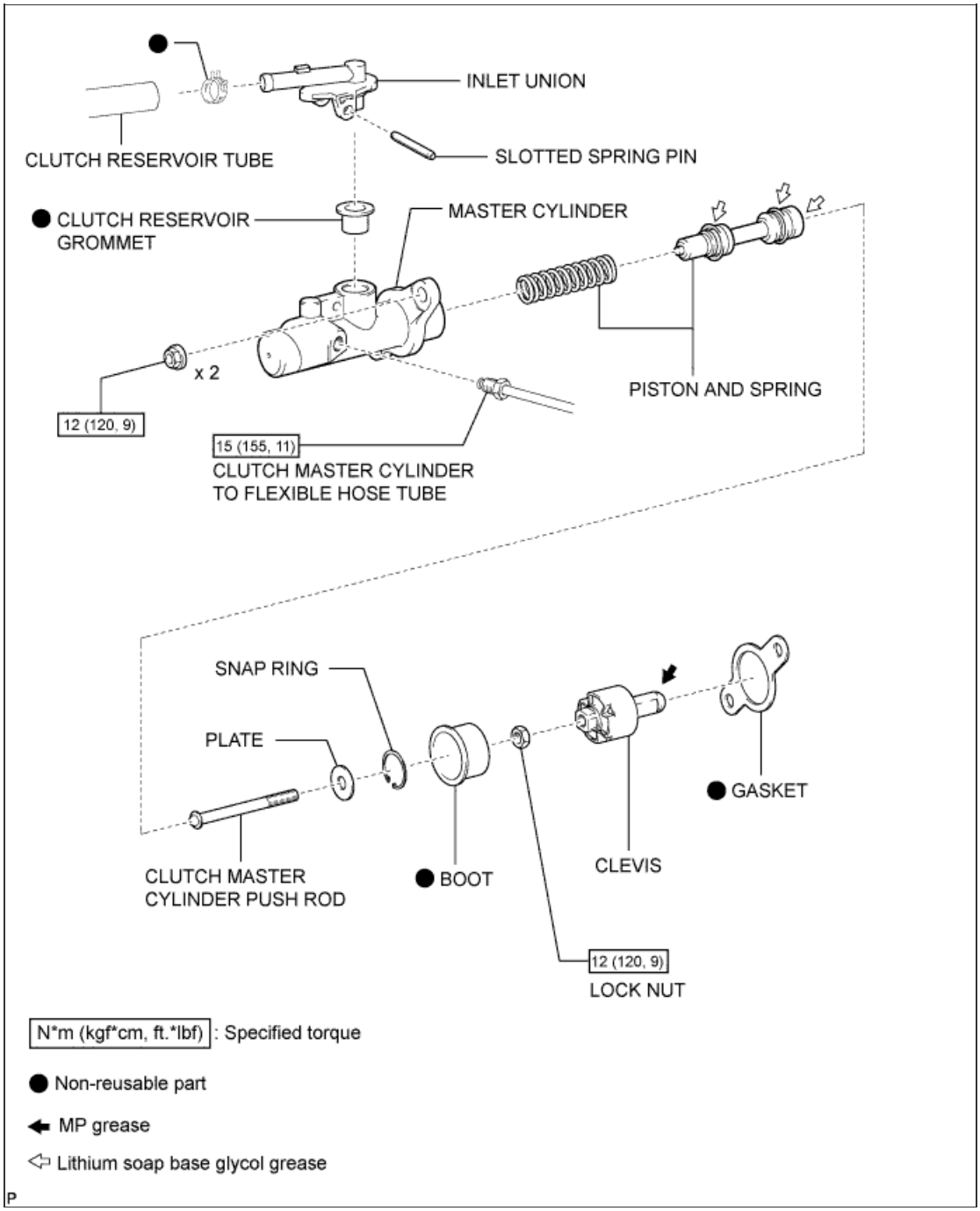


25. INSTALL NO. 2 INSTRUMENT PANEL FINISH PANEL CUSHION

a. Attach the 7 claws to install the No. 2 instrument panel finish panel cushion.



for Preparation Click here



for Preparation Click here

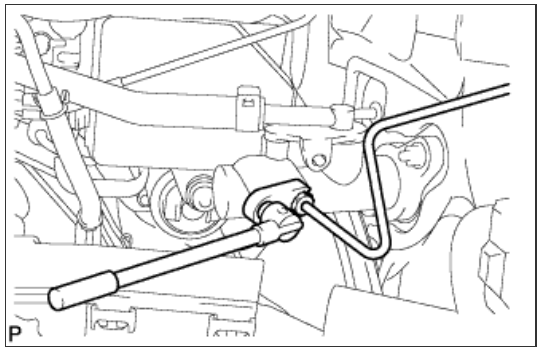
1. DRAIN CLUTCH FLUID

2. DISCONNECT CLUTCH MASTER CYLINDER TO FLEXIBLE HOSE TUBE

a. Using a union nut wrench, disconnect the tube.

HINT:

Use a container to catch the fluid.

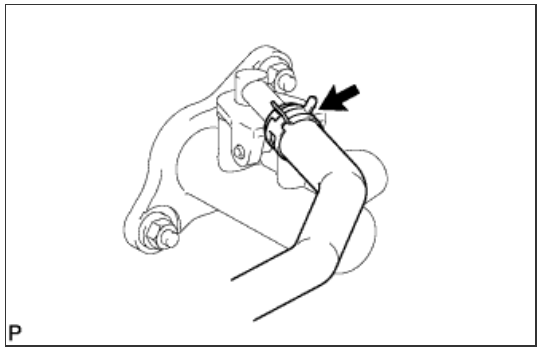


3. DISCONNECT CLUTCH RESERVOIR TUBE

a. Using pliers, grip the claws of the clip, slide the clip and disconnect the clutch reservoir tube.

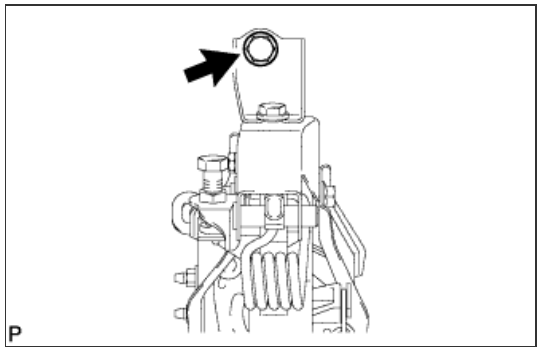
HINT:

Use a container to catch the fluid.



4. REMOVE CLUTCH MASTER CYLINDER ASSEMBLY

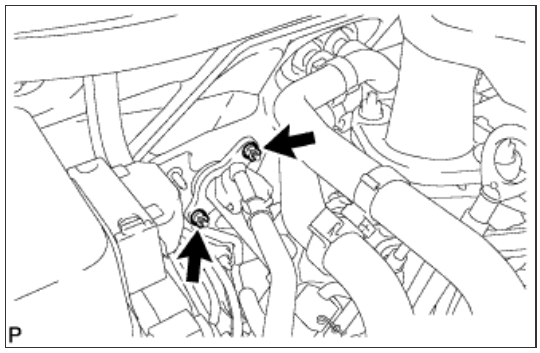
a. Loosen the clutch pedal bracket bolt.



b. Remove the 2 nuts.

c. Disconnect the clutch pedal from the clevis, and remove the master cylinder.

d. Remove the gasket.


P

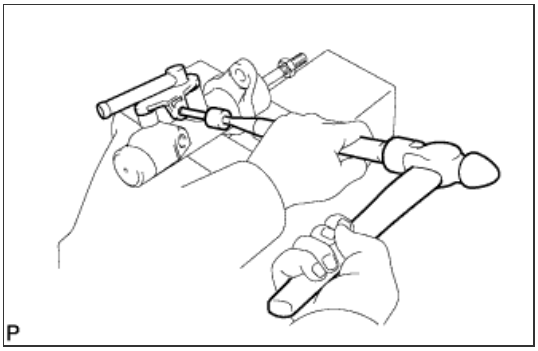
for Preparation Click here

1. REMOVE CLUTCH RESERVOIR GROMMET

a. Fix the master cylinder in a vise.

b. Using a pin punch and hammer, tap out the slotted spring pin.

c. Remove the inlet union and grommet.



2. REMOVE CLUTCH MASTER CYLINDER PUSH ROD

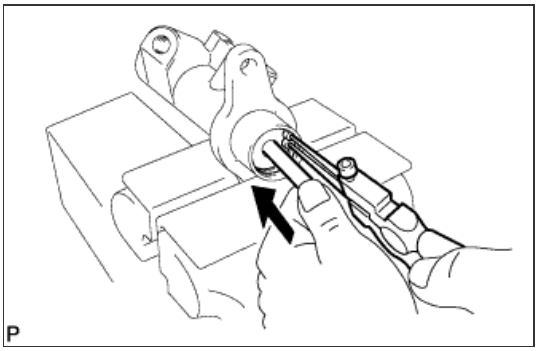
a. Loosen the lock nut, and then remove the clevis.

b. Remove the lock nut from the push rod.

c. Remove the boot.

d. Using snap ring pliers, remove the snap ring and plate.

e. Remove the push rod.



3. REMOVE PISTON AND SPRING

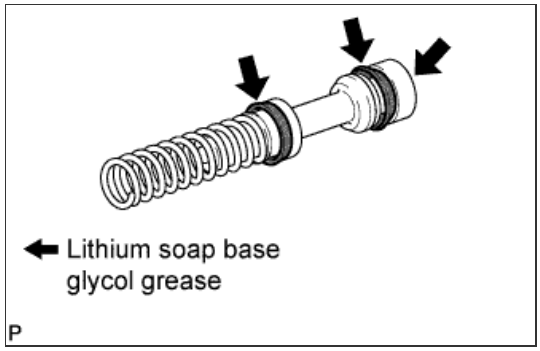
a. Remove the piston and spring from the master cylinder.

for Preparation Click here

1. INSTALL PISTON AND SPRING

a. Apply lithium soap base glycol grease to the circumference of the cups and the contact surfaces of the piston and push rod.

b. Install the spring and piston to the master cylinder.



2. INSTALL CLUTCH MASTER CYLINDER PUSH ROD

a. Fix the master cylinder in a vise.

b. Install the push rod and plate to the master cylinder.

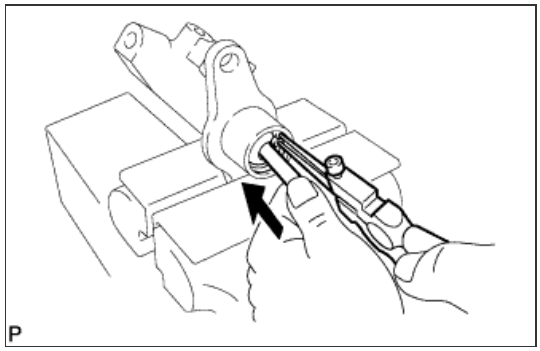
c. Using snap ring pliers, install the snap ring.

d. Install a new boot.

e. Install the clevis to the push rod, and then temporarily install the nut.

HINT:

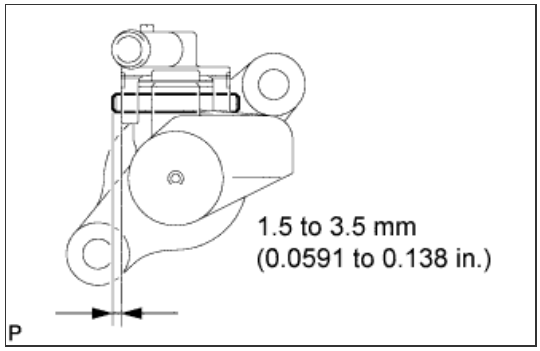
The lock nut will be tightened to a torque specification in the "Inspect and Adjust Clutch Pedal Sub-assembly" procedure.



3. INSTALL CLUTCH RESERVOIR GROMMET

a. Install a new grommet and the inlet union.

b. Using a pin punch and hammer, tap in the slotted spring pin as shown in the illustration.



for Preparation Click here

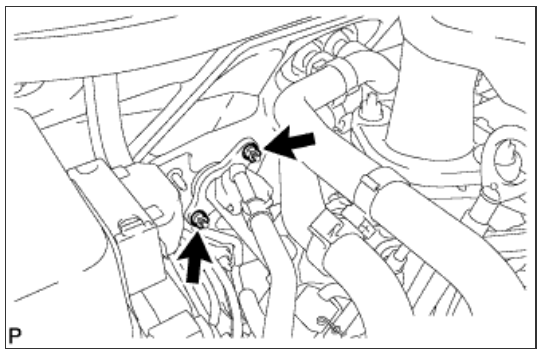
1. INSTALL CLUTCH MASTER CYLINDER ASSEMBLY

a. Install a new gasket to the master cylinder.

b. Apply MP grease to the contact surface of the clevis and clutch pedal.

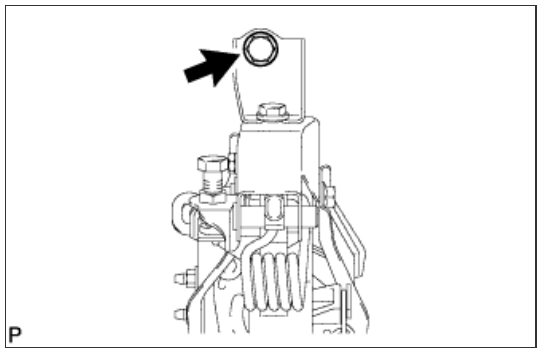
c. Connect the clutch pedal to the clevis, and then install the master cylinder with the 2 nuts.

Torque:
12 N*m{ 120 kgf*cm , 9 ft.*lbf }



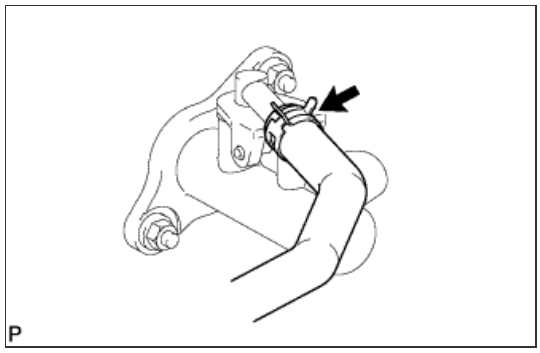
d. Tighten the clutch pedal support bolt.

Torque:
18 N*m{ 184 kgf*cm , 13 ft.*lbf }



2. CONNECT CLUTCH RESERVOIR TUBE

a. Connect the clutch reservoir tube with a new clip.



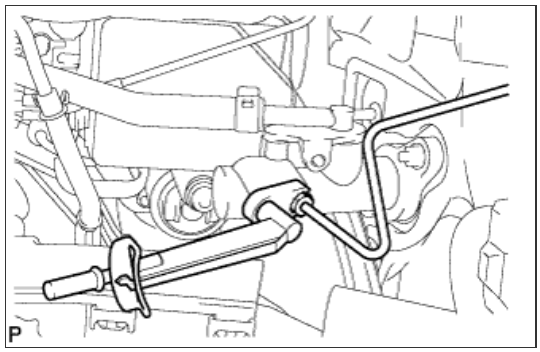
3. CONNECT CLUTCH MASTER CYLINDER TO FLEXIBLE HOSE TUBE

a. Using a union nut wrench, connect the tube.

Torque:
15 N*m{ 155 kgf*cm , 11 ft.*lbf }

NOTICE:

Use the formula to calculate special torque values for situations where a union nut wrench is combined with a torque wrench (Click here).

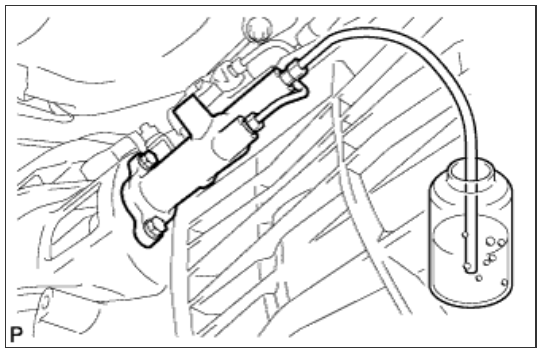


4. FILL RESERVOIR WITH BRAKE FLUID

a. Fill the reservoir with brake fluid.

Brake Fluid:
SAE J1703 or FMVSS No. 116 DOT 3

5. BLEED CLUTCH LINE



a. Remove the release cylinder bleeder plug cap.

b. Connect a vinyl tube to the bleeder plug.

c. Depress the clutch pedal several times, and then loosen the bleeder plug while the pedal is depressed.

d. When fluid no longer comes out, tighten the bleeder plug, and then release the clutch pedal.

e. Repeat the previous 2 steps until all the air in the fluid is completely bled.

f. Tighten the bleeder plug.

Torque:
11 N*m{ 110 kgf*cm , 8 ft.*lbf }

g. Install the bleeder plug cap.

h. Check that all the air has been bled from the clutch line.

6. CHECK FLUID LEVEL IN RESERVOIR

a. Check the fluid level.
If the brake fluid level is low, check for leaks and inspect the disc brake pad. If necessary, refill the reservoir with brake fluid after repair or replacement.

Brake fluid:
SAE J1703 or FMVSS No. 116 DOT 3

7. INSPECT FOR CLUTCH FLUID LEAK

8. INSPECT AND ADJUST CLUTCH PEDAL SUB-ASSEMBLY

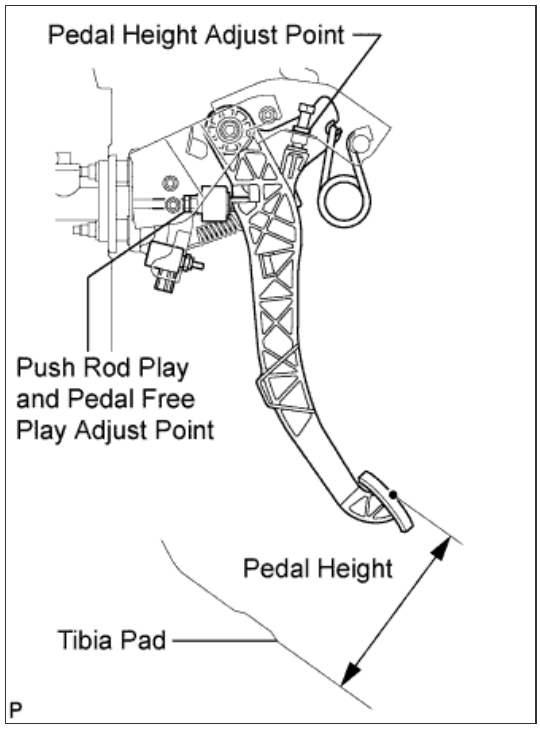
a. Check that the clutch pedal height is correct.

Standard Clutch Pedal Height from Tibia Pad:
164.8 to 174.8 mm (6.49 to 6.88 in.)

b. Adjust the clutch pedal height.

i. Loosen the lock nut and turn the stopper bolt or clutch switch until the height is correct. Tighten the lock nut.

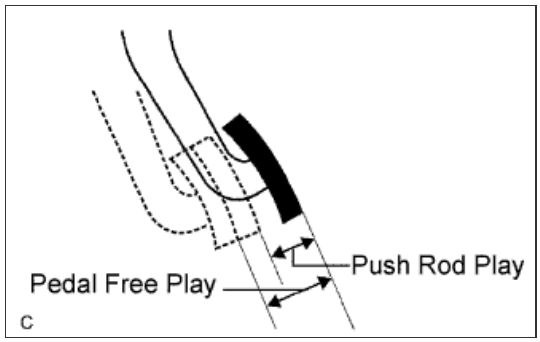
Torque:
16 N*m{ 160 kgf*cm , 12 ft.*lbf }



c. Check that the clutch pedal free play and push rod play are correct.

HINT:

Pay close attention to the change in resistance to distinguish between pedal free play and push rod play while performing the inspection.



i. Depress the clutch pedal until the clutch resistance begins to be felt.

Standard Clutch Pedal Free Play:
5.0 to 15.0 mm (0.197 to 0.591 in.)

ii. Gently depress the clutch pedal until the resistance begins to increase a little.

Standard Push Rod Play at Pedal Top:
1.0 to 5.0 mm (0.0394 to 0.197 in.)

d. Adjust the clutch pedal free play and push rod play.

HINT:

The push rod play can be adjusted by changing the length of the push rod. Pedal free play changes together with push rod play.

i. Loosen the lock nut and turn the push rod until the clutch pedal free play and push rod play are correct.

NOTICE:

If pedal free play and push rod play are not within the standard range even after adjustment, inspect the related parts.

ii. Tighten the lock nut.

Torque:
12 N*m{ 120 kgf*cm , 9 ft.*lbf }

iii. After adjusting the clutch pedal free play and push rod play, check the clutch pedal height.

Standard Clutch Pedal Height from Tibia Pad:
164.8 to 174.8 mm (6.49 to 6.88 in.)

e. Check the clutch release point.

i. Pull the parking brake lever and chock the wheels.

ii. Start the engine and allow it to idle.

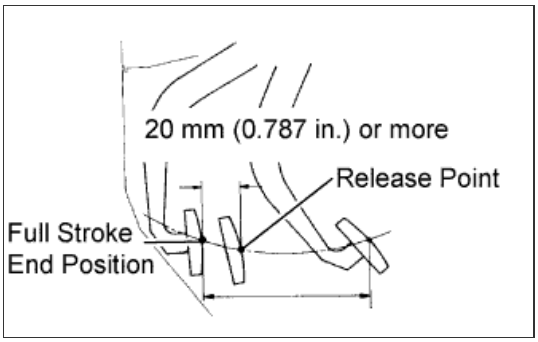
iii. Without depressing the clutch pedal, slowly move the shift lever to R until the gears engage.

iv. Gradually depress the clutch pedal and measure the stroke distance from the point that the gear noise stops (release point) up to the full stroke end position.

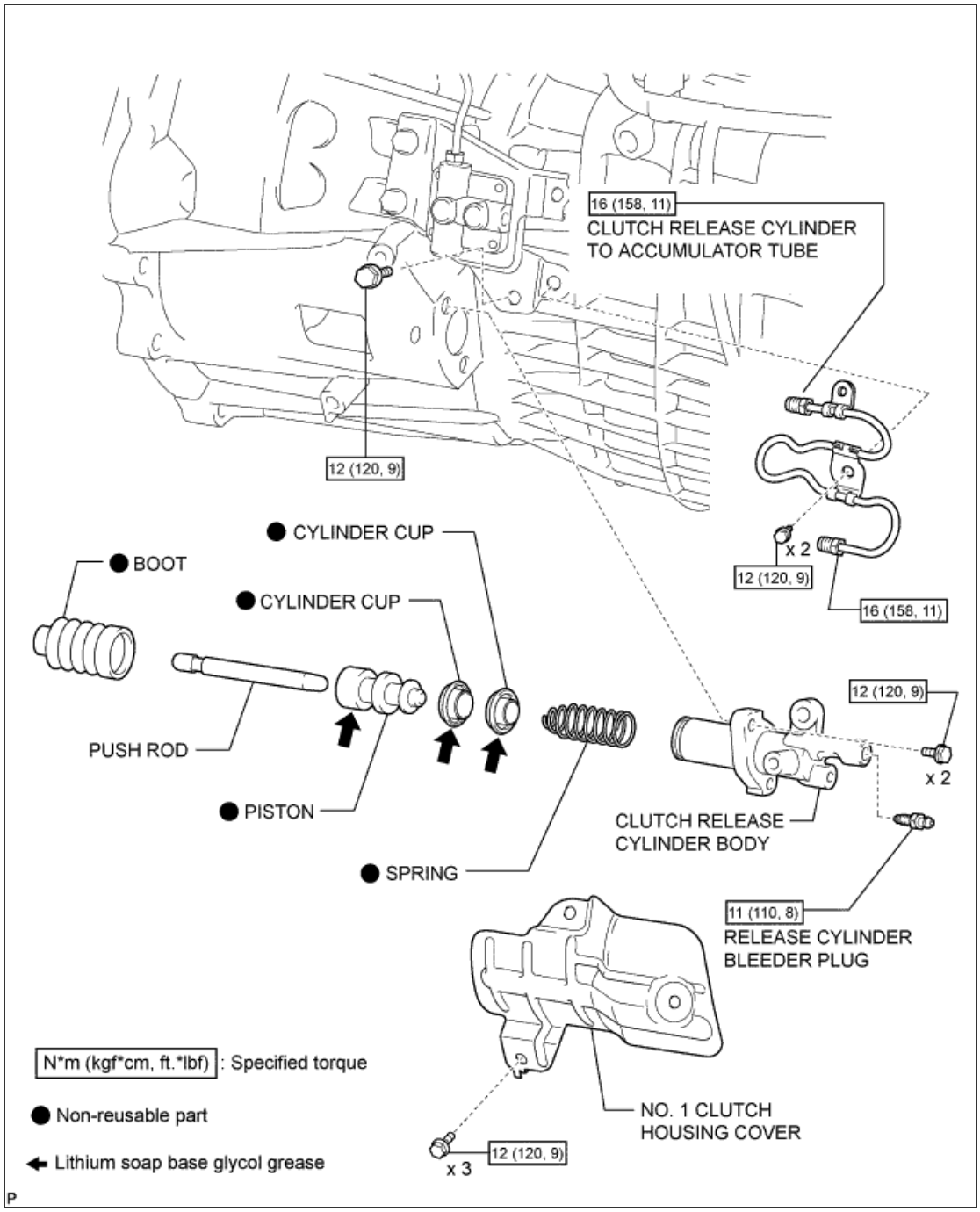
Standard Distance from Pedal Stroke End Position to Release Point:
20 mm (0.787 in.) or more

If the distance is not as specified, perform the following operations:

- Check the clutch pedal height.
- Check the push rod play and pedal free play.
- Bleed the clutch line.
- Check the clutch cover and disc.



for Preparation Click here

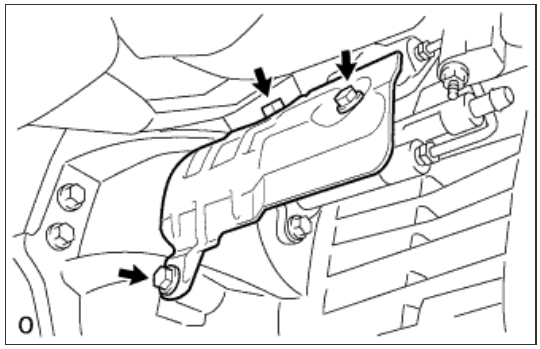


for Preparation Click here

1. DRAIN CLUTCH FLUID

2. REMOVE NO. 1 CLUTCH HOUSING COVER

a. Remove the 3 bolts and housing cover.



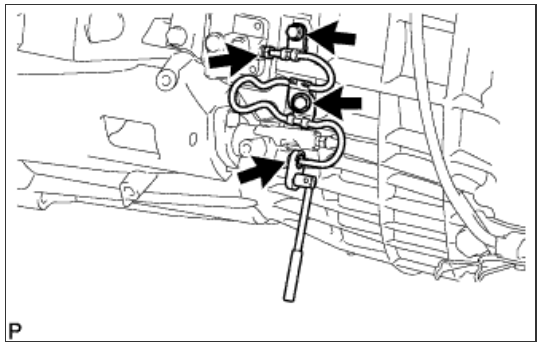
3. REMOVE CLUTCH RELEASE CYLINDER TO ACCUMULATOR TUBE

a. Using a union nut wrench, disconnect the tube.

HINT:

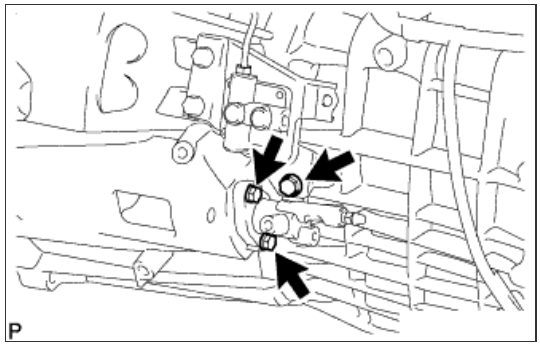
Use a container to catch the fluid.

b. Remove the 2 bolts and tube.



4. REMOVE CLUTCH RELEASE CYLINDER ASSEMBLY

a. Remove the 3 bolts and pull out the clutch release cylinder.



for Preparation Click here

1. REMOVE CLUTCH RELEASE CYLINDER KIT

a. Remove the boot from the cylinder body.

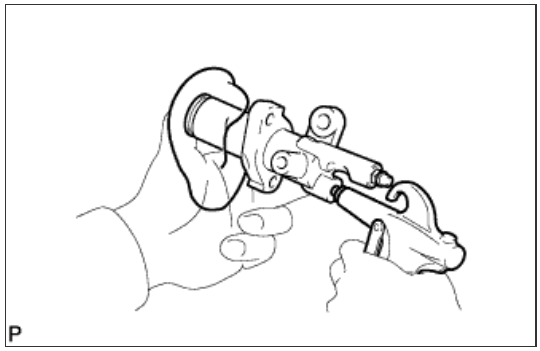
b. Remove the push rod from the cylinder body.

c. Using compressed air, remove the piston together with the spring from the cylinder body.

NOTICE:

Do not damage the inside of the cylinder body.

d. Remove the 2 cylinder cups from the piston.



2. REMOVE RELEASE CYLINDER BLEEDER PLUG

a. Remove the bleeder plug from the cylinder body.

for Preparation Click here

1. INSTALL RELEASE CYLINDER BLEEDER PLUG

a. Install the bleeder plug to the cylinder body.

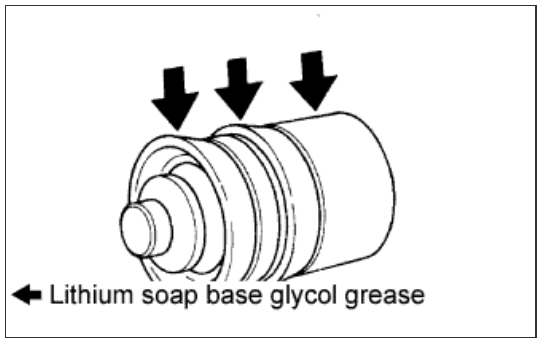
Torque:
11 N*m{ 110 kgf*cm , 8 ft.*lbf }

2. INSTALL CLUTCH RELEASE CYLINDER KIT

a. Install 2 new cylinder cups onto a new piston.

b. Install a new spring into the cylinder body.

c. Apply lithium soap base glycol grease to the portions indicated by the arrows in the illustration.



d. Install the piston into the cylinder body.

NOTICE:

Do not damage the inside of the cylinder body.

e. Install the push rod into the cylinder body.

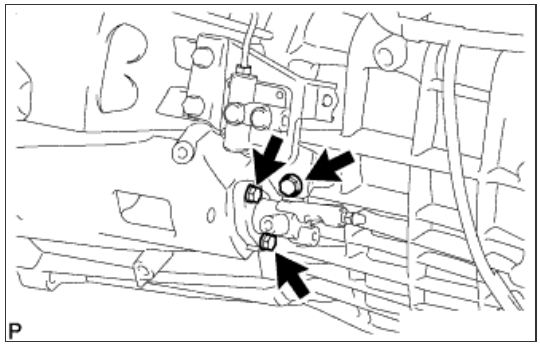
f. Install a new boot onto the cylinder body.

for Preparation Click here

1. INSTALL CLUTCH RELEASE CYLINDER ASSEMBLY

a. Install the clutch release cylinder with the 3 bolts.

Torque:
12 N*m{ 120 kgf*cm , 9 ft.*lbf }



2. INSTALL CLUTCH RELEASE CYLINDER TO ACCUMULATOR TUBE

a. Using a union nut wrench, connect the tube to the clutch accumulator and release cylinder.

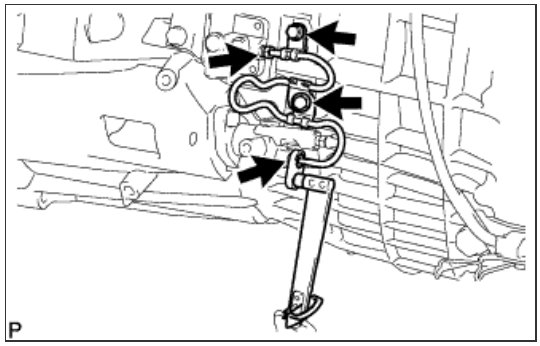
Torque:
16 N*m{ 158 kgf*cm , 11 ft.*lbf }

NOTICE:

Use the formula to calculate special torque values for situations where a union nut wrench is combined with a torque wrench (Click here).

b. Install the tube with the 2 bolts.

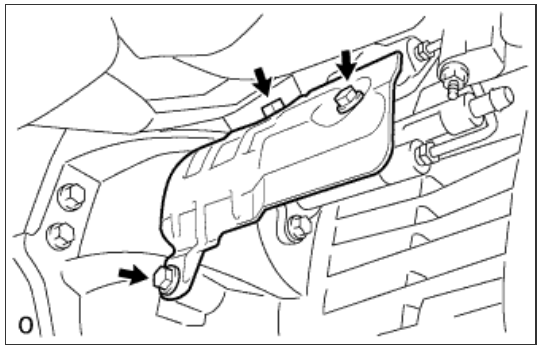
Torque:
12 N*m{ 120 kgf*cm , 9 ft.*lbf }



3. INSTALL NO. 1 CLUTCH HOUSING COVER

a. Install the housing cover with the 3 bolts.

Torque:
12 N*m{ 120 kgf*cm , 9 ft.*lbf }

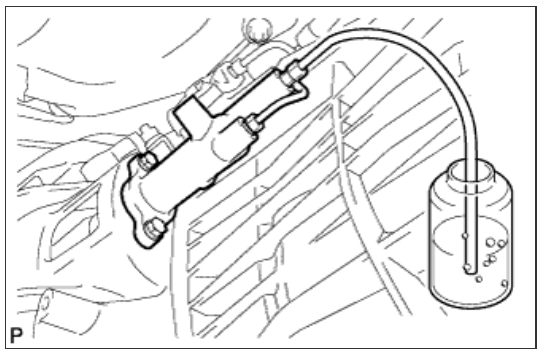


4. FILL RESERVOIR WITH BRAKE FLUID

a. Check the fluid level.
If the brake fluid level is low, check for leaks and inspect the disc brake pad. If necessary, refill the reservoir with brake fluid after repair or replacement.

Brake fluid:
SAE J1703 or FMVSS No. 116 DOT 3

5. BLEED CLUTCH LINE



a. Remove the release cylinder bleeder plug cap.

b. Connect a vinyl tube to the bleeder plug.

c. Depress the clutch pedal several times, and then loosen the bleeder plug while the pedal is depressed.

d. When fluid no longer comes out, tighten the bleeder plug, and then release the clutch pedal.

e. Repeat the previous 2 steps until all the air in the fluid is completely bled.

f. Tighten the bleeder plug.

Torque:
11 N*m{ 110 kgf*cm , 8 ft.*lbf }

g. Install the bleeder plug cap.

h. Check that all the air has been bled from the clutch line.

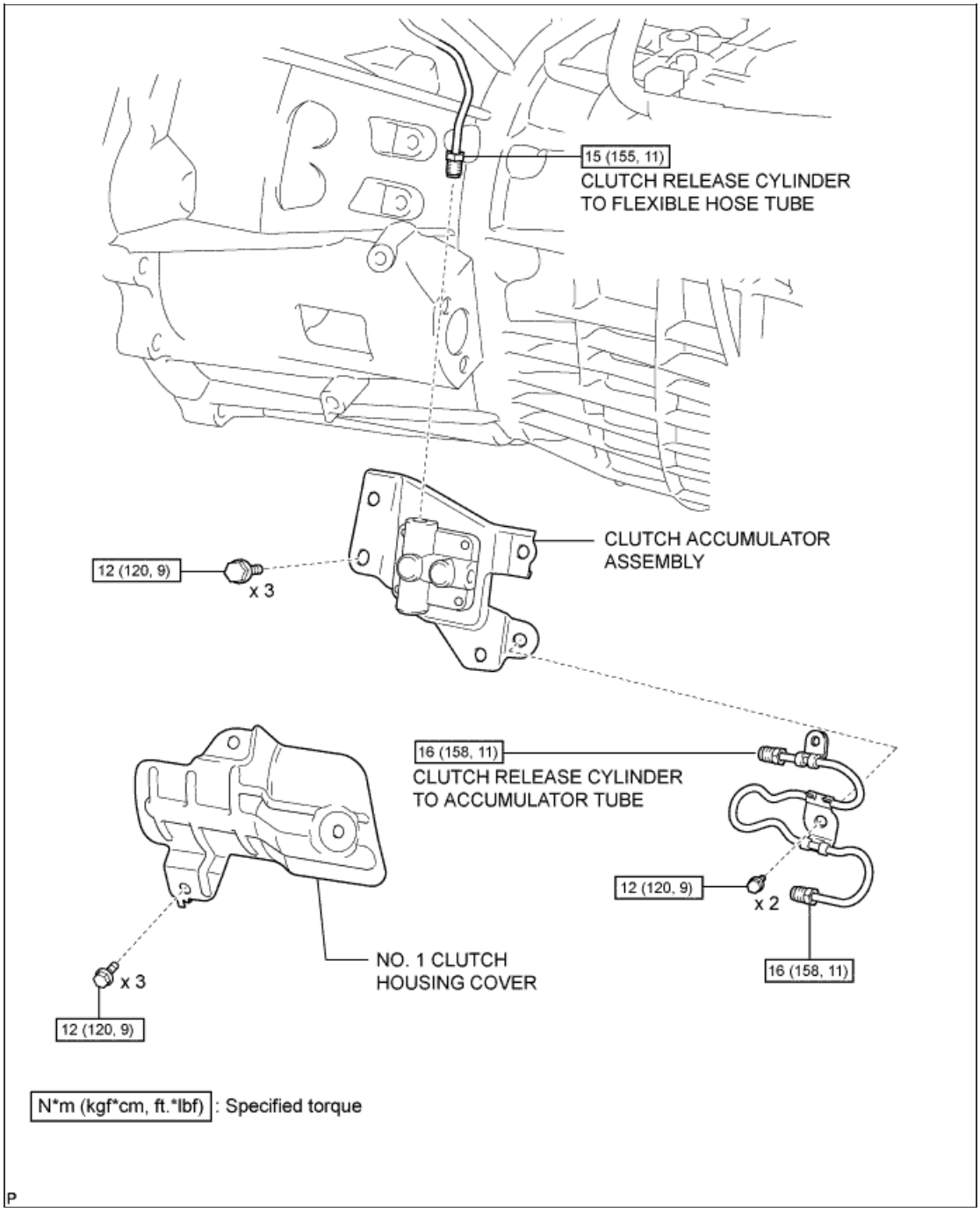
6. CHECK FLUID LEVEL IN RESERVOIR

a. Check the fluid level.
If the brake fluid level is low, check for leaks and inspect the disc brake pad. If necessary, refill the reservoir with brake fluid after repair or replacement.

Brake fluid:
SAE J1703 or FMVSS No. 116 DOT 3

7. INSPECT FOR CLUTCH FLUID LEAK

for Preparation Click here

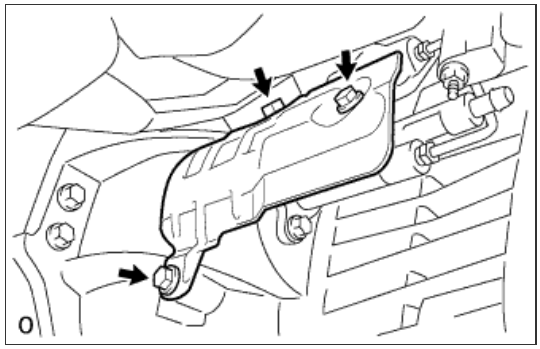


for Preparation Click here

1. DRAIN CLUTCH FLUID

2. REMOVE NO. 1 CLUTCH HOUSING COVER

a. Remove the 3 bolts and housing cover.



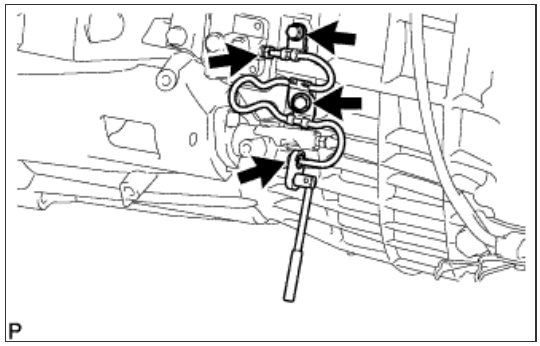
3. REMOVE CLUTCH RELEASE CYLINDER TO ACCUMULATOR TUBE

a. Using a union nut wrench, disconnect the tube.

HINT:

Use a container to catch the fluid.

b. Remove the 2 bolts and tube.

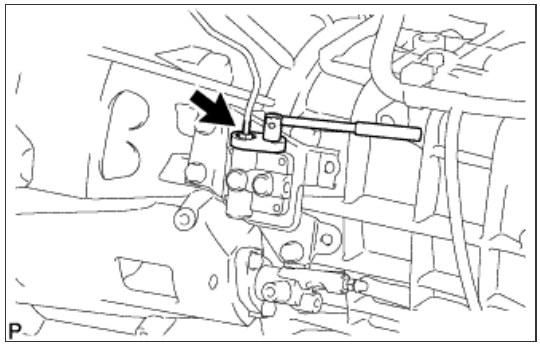


4. REMOVE CLUTCH ACCUMULATOR ASSEMBLY

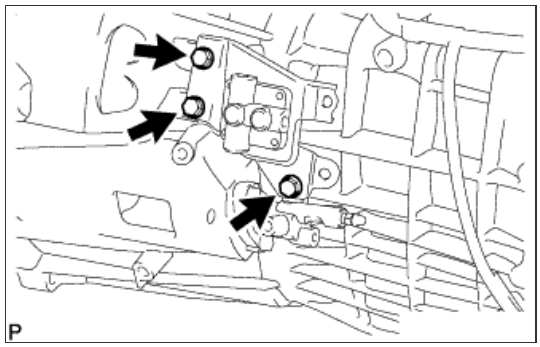
a. Using a union nut wrench, disconnect the flexible hose tube.

HINT:

Use a container to catch the fluid.



b. Remove the 3 bolts and clutch accumulator.

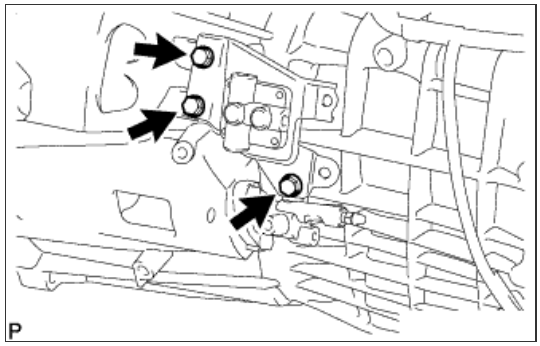

P

for Preparation Click here

1. INSTALL CLUTCH ACCUMULATOR ASSEMBLY

a. Install the clutch accumulator with the 3 bolts.

Torque:
12 N*m{ 120 kgf*cm , 9 ft.*lbf }

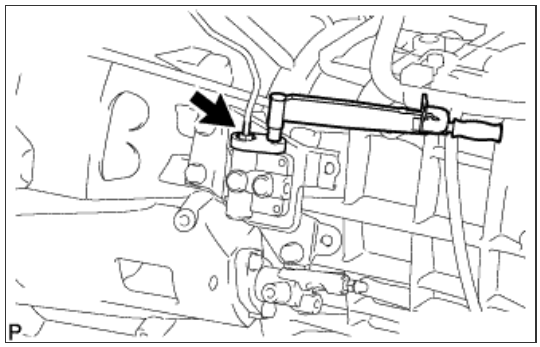


b. Using a union nut wrench, connect the flexible hose tube.

Torque:
15 N*m{ 155 kgf*cm , 11 ft.*lbf }

NOTICE:

Use the formula to calculate special torque values for situations where a union nut wrench is combined with a torque wrench (Click here).



2. INSTALL CLUTCH RELEASE CYLINDER TO ACCUMULATOR TUBE

a. Using a union nut wrench, connect the tube to the clutch accumulator and release cylinder.

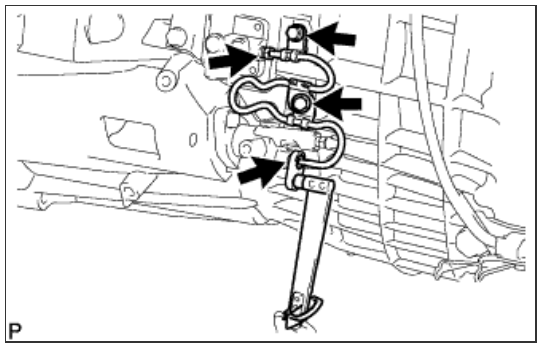
Torque:
16 N*m{ 158 kgf*cm , 11 ft.*lbf }

NOTICE:

Use the formula to calculate special torque values for situations where a union nut wrench is combined with a torque wrench (Click here).

b. Install the tube with the 2 bolts.

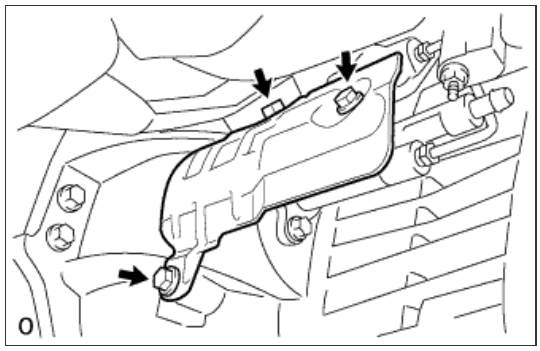
Torque:
12 N*m{ 120 kgf*cm , 9 ft.*lbf }



3. INSTALL NO. 1 CLUTCH HOUSING COVER

a. Install the housing cover with the 3 bolts.

Torque:
12 N*m{ 120 kgf*cm , 9 ft.*lbf }

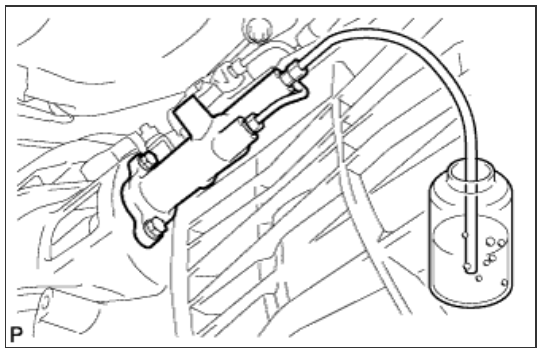


4. FILL RESERVOIR WITH BRAKE FLUID

a. Fill the reservoir with brake fluid.

Brake Fluid:
SAE J1703 or FMVSS No. 116 DOT 3

5. BLEED CLUTCH LINE



a. Remove the release cylinder bleeder plug cap.

b. Connect a vinyl tube to the bleeder plug.

c. Depress the clutch pedal several times, and then loosen the bleeder plug while the pedal is depressed.

d. When fluid no longer comes out, tighten the bleeder plug, and then release the clutch pedal.

e. Repeat the previous 2 steps until all the air in the fluid is completely bled.

f. Tighten the bleeder plug.

Torque:
11 N*m{ 110 kgf*cm , 8 ft.*lbf }

g. Install the bleeder plug cap.

h. Check that all the air has been bled from the clutch line.

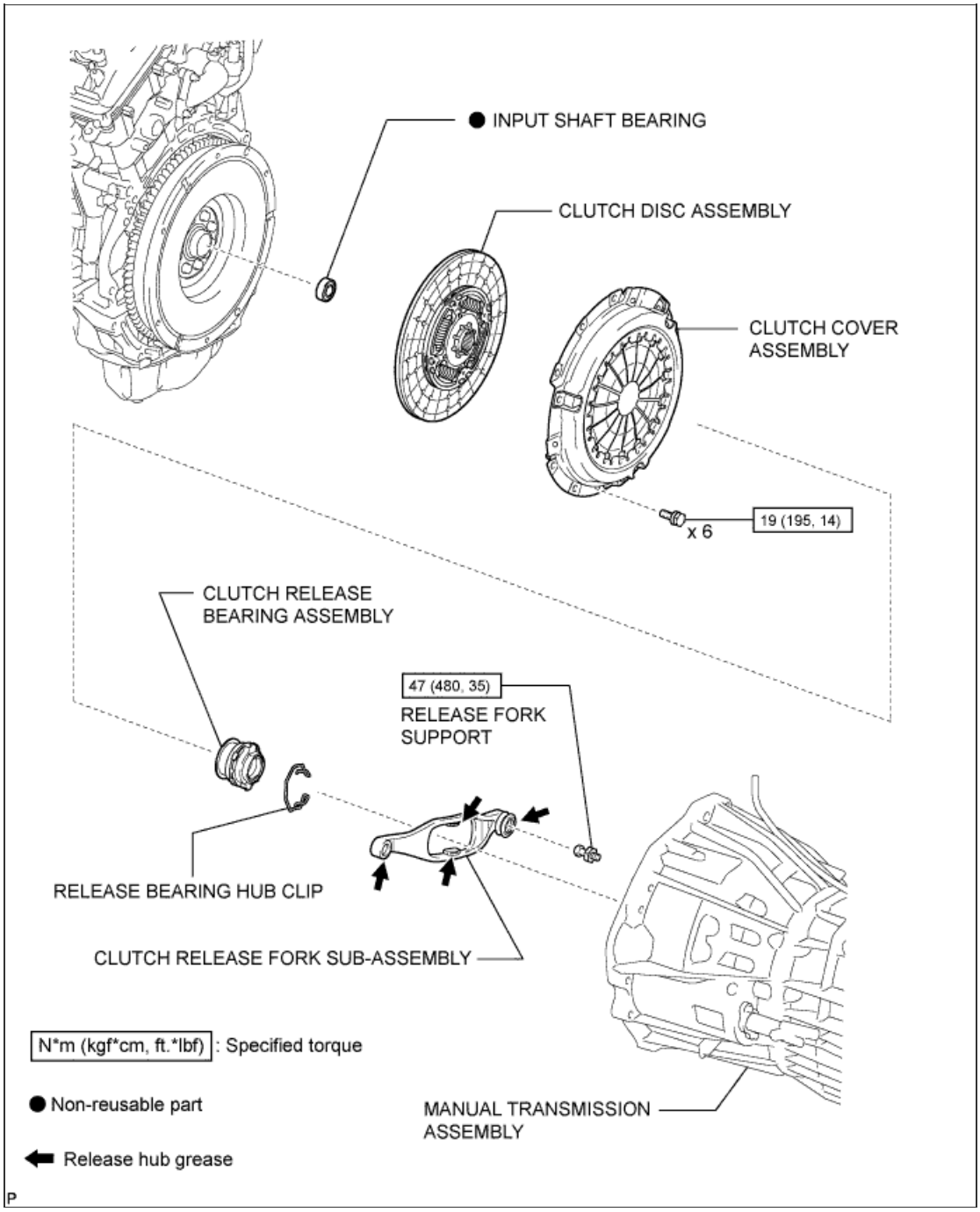
6. CHECK FLUID LEVEL IN RESERVOIR

a. Check the fluid level.
If the brake fluid level is low, check for leaks and inspect the disc brake pad. If necessary, refill the reservoir with brake fluid after repair or replacement.

Brake fluid:
SAE J1703 or FMVSS No. 116 DOT 3

7. INSPECT FOR CLUTCH FLUID LEAK

for Preparation [Click here]



for Preparation Click here

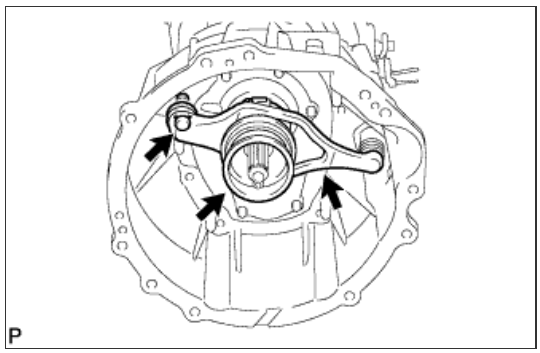
1. REMOVE MANUAL TRANSMISSION ASSEMBLY

a. Remove the manual transmission (Click here).

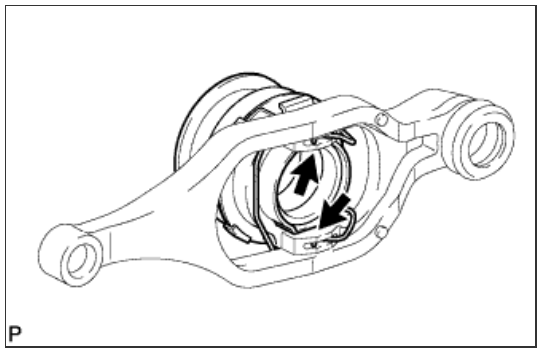
2. REMOVE CLUTCH RELEASE FORK SUB-ASSEMBLY

a. Remove the clutch release fork with the clutch release bearing from the transmission unit.

b. Remove the release fork support from the transmission unit.



c. Remove the clip and release bearing from the clutch release fork.



3. REMOVE CLUTCH COVER ASSEMBLY

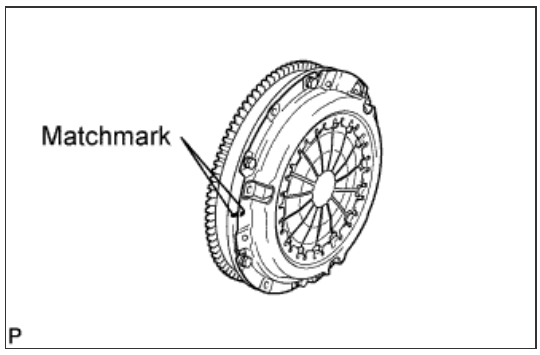
a. Put matchmarks on the clutch cover and flywheel.

b. Loosen each set bolt one turn at a time until spring tension is released.

c. Remove the 6 set bolts, and pull off the clutch cover.

NOTICE:

Do not drop the clutch disc.



4. REMOVE CLUTCH DISC ASSEMBLY

NOTICE:

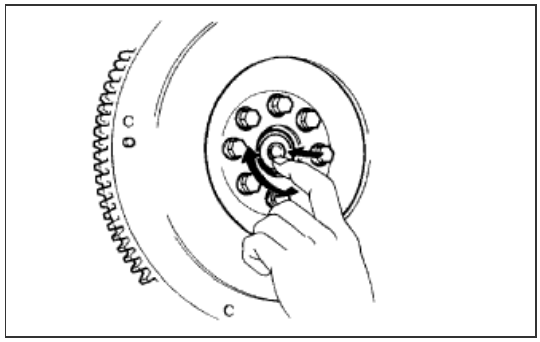
Keep the lining part of the clutch disc, pressure plate and surface of the flywheel away from oil and foreign matter.

5. INSPECT INPUT SHAFT BEARING

a. Turn the bearing by hand while applying force in the direction of the rotation.
If the bearing is stuck or difficult to turn, replace the input shaft bearing.

HINT:

The bearing is permanently lubricated and requires no cleaning or lubrication.



for Preparation Click here

1. INSPECT CLUTCH DISC ASSEMBLY

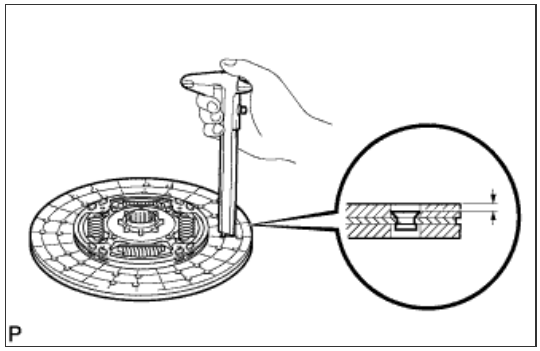
NOTICE:

When replacing the clutch disc assembly, make sure to perform an inspection of the flywheel sub-assembly and clutch cover assembly.

a. Using a vernier caliper, measure the rivet depth.

Minimum Rivet Depth:
0.3 mm (0.0118 in.)

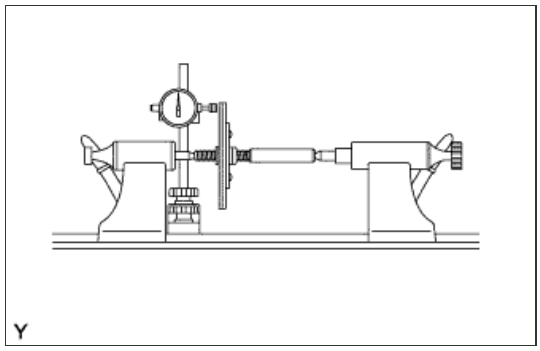
If the depth is less than the minimum, replace the clutch disc assembly.



b. Using a dial indicator with a roller instrument, check the clutch disc runout.

Maximum Runout:
0.9 mm (0.0354 in.)

If the runout is more than the maximum, replace the clutch disc assembly.



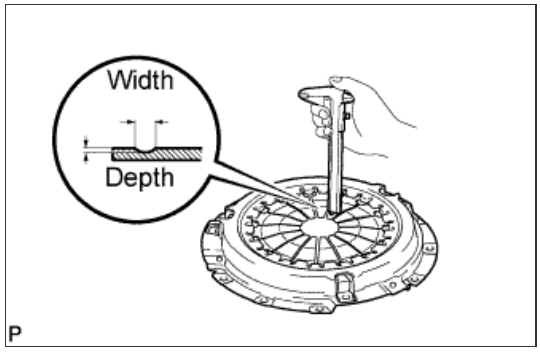
2. INSPECT CLUTCH COVER ASSEMBLY

a. Using a vernier caliper, inspect the depth and width of wear of the diaphragm spring.

Maximum Wear:

Depth	Width
0.6 mm (0.0236 in.)	5.0 mm (0.197 in.)

If the wear is more than the maximum, replace the clutch cover assembly.



b. Perform a visual inspection of the clutch cover assembly.

i. Inspect for hair cracks or scratches extending from the center outwards, or discoloration.

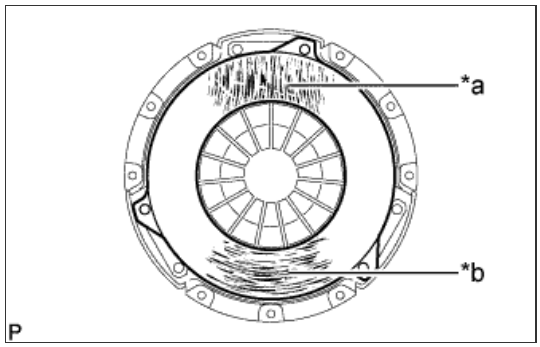
ii. Inspect for hair cracks in a circular pattern, discoloration or excessive wear.

Text in Illustration

*1	Hair cracks, scratches or discoloration

*2	Hair cracks, discoloration or excessive wear

If there is any damage, replace the clutch cover assembly.

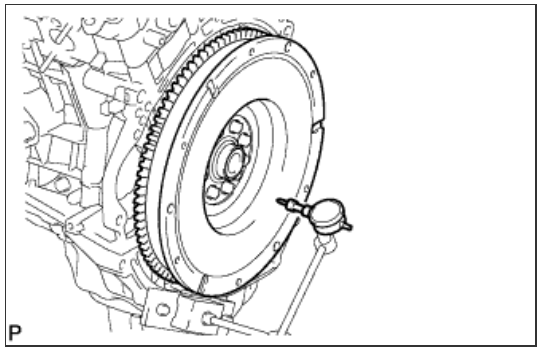


3. INSPECT FLYWHEEL SUB-ASSEMBLY

a. Using a dial indicator, inspect the flywheel runout.

Maximum Runout:
0.1 mm (0.00393 in.)

If the runout is more than the maximum, replace the flywheel sub-assembly.



b. Perform a visual inspection of the flywheel sub-assembly.

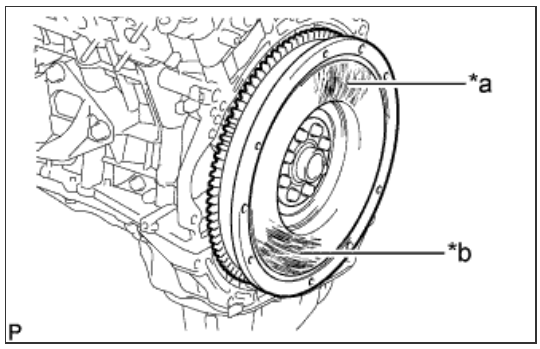
i. Inspect for hair cracks or scratches extending from the center outwards, or discoloration.

ii. Inspect for hair cracks in a circular pattern, discoloration or excessive wear.

Text in Illustration

*1	Hair cracks, scratches or discoloration
*2	Hair cracks, discoloration or excessive wear

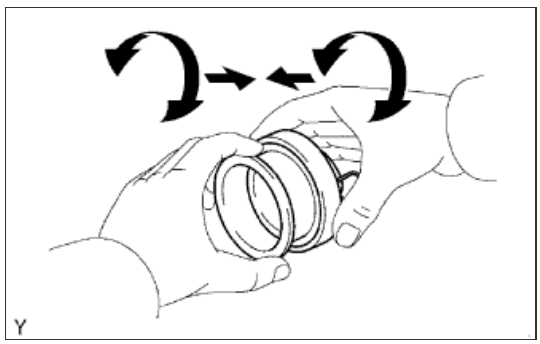
If there is any damage, replace the flywheel sub-assembly.



4. INSPECT CLUTCH RELEASE BEARING ASSEMBLY

a. Check that the clutch release bearing moves smoothly without abnormal resistance by turning the sliding parts of the clutch release bearing (contact surfaces with the clutch cover) while applying force in the axial direction.

b. Inspect the clutch release bearing for damage or wear.
Replace the release bearing assembly as necessary.

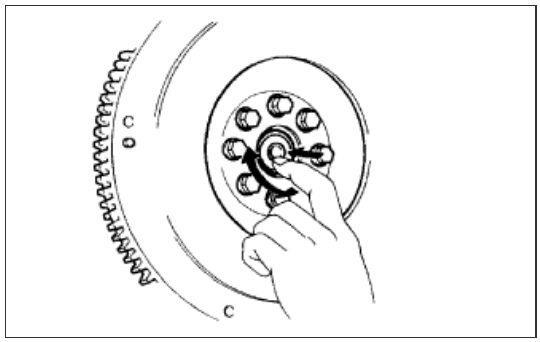


5. INSPECT INPUT SHAFT BEARING

a. Turn the bearing by hand while applying force in the direction of the rotation.
If the bearing is stuck or difficult to turn, replace the input shaft bearing.

HINT:

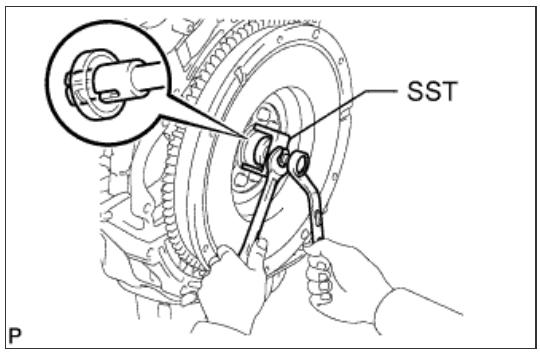
The bearing is permanently lubricated and requires no cleaning or lubrication.



6. REPLACE INPUT SHAFT BEARING

a. Using SST, remove the bearing.

SST
09303-35011

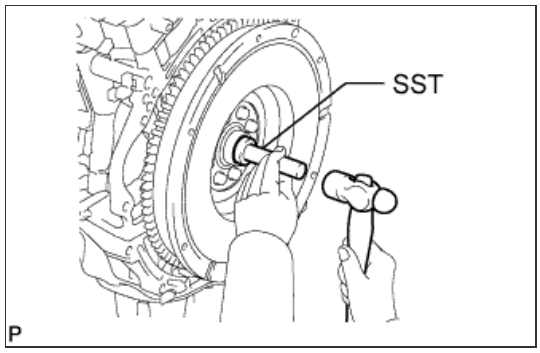


b. Using SST and a hammer, install a new bearing.

SST
09304-12012

HINT:

After installing the input shaft bearing to the engine side, make sure that it rotates smoothly.



for Preparation Click here

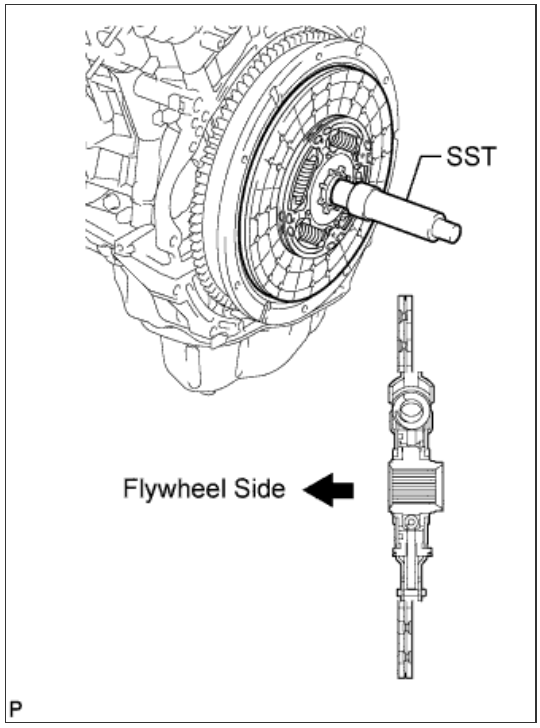
1. INSTALL CLUTCH DISC ASSEMBLY

a. Insert SST into the clutch disc, then insert the clutch disc into the flywheel.

SST
09301-00110

NOTICE:

Take care not to insert the clutch disc in the wrong direction.



2. INSTALL CLUTCH COVER ASSEMBLY

a. Align the matchmark on the clutch cover with the one on the flywheel.

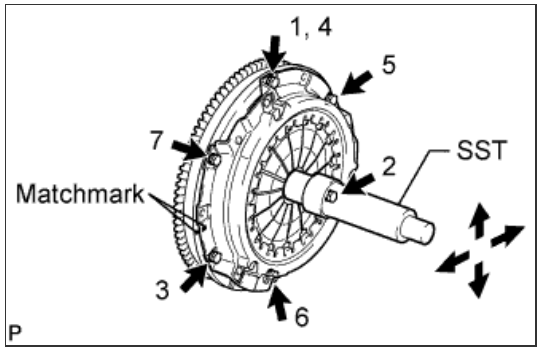
b. In the order shown in the illustration, temporarily install the 6 bolts starting from the bolt located near the knock pin on the top.

c. Check that the disc is in the center by lightly moving SST up and down, and left and right.

SST
09301-00110

d. Evenly tighten the bolts by following the order shown in the illustration.

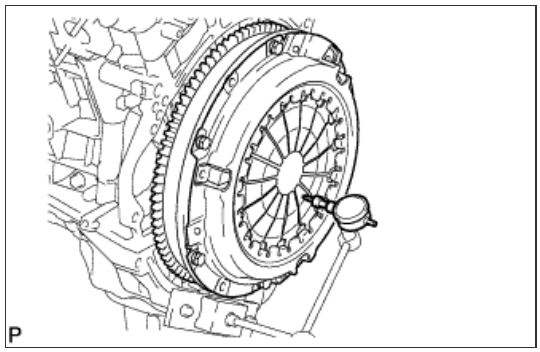
Torque:
19 N*m{ 195 kgf*cm , 14 ft.*lbf }



3. INSPECT AND ADJUST CLUTCH COVER ASSEMBLY

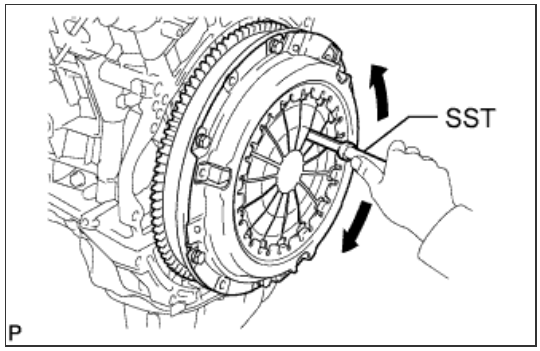
a. Using a dial indicator with a roller instrument, check the diaphragm spring tip alignment.

Maximum Misalignment:
1.3 mm (0.0512 in.)



b. If the alignment is not as specified, adjust the diaphragm spring tip alignment using SST.

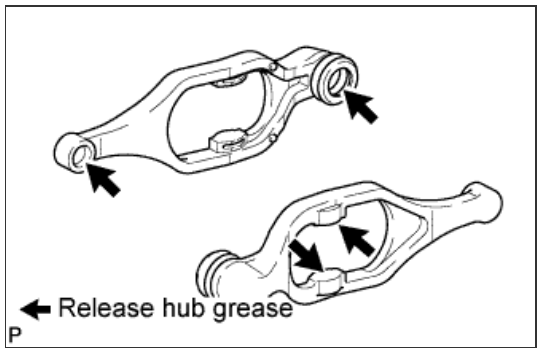
SST
09333-00013



4. INSTALL CLUTCH RELEASE FORK SUB-ASSEMBLY

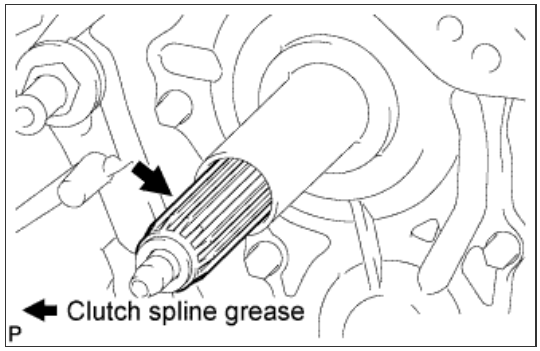
a. Apply release hub grease to the release fork, release bearing, push rod contact point and pivot points shown in the illustration.

Grease:
Toyota Genuine Release Hub Grease or equivalent

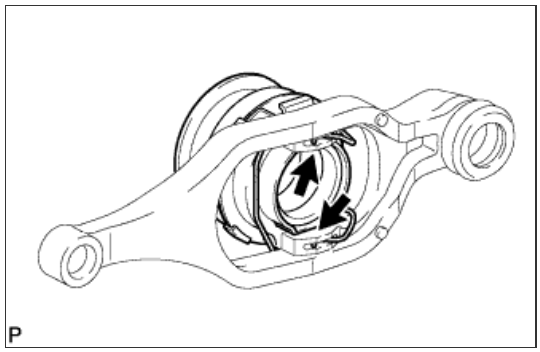


b. Apply clutch spline grease to the input shaft spline.

Grease:
Toyota Genuine Clutch Spline Grease or equivalent

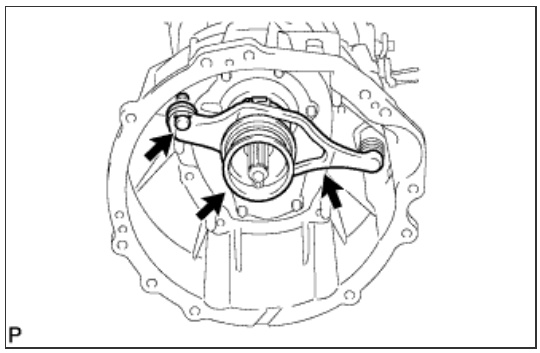


c. Install the release bearing to the clutch release fork with the clip.



d. Install the release fork support to the transmission unit.

Torque:
47 N*m{ 480 kgf*cm , 35 ft.*lbf }



e. Install the clutch release fork with the clutch release bearing to the transmission unit.

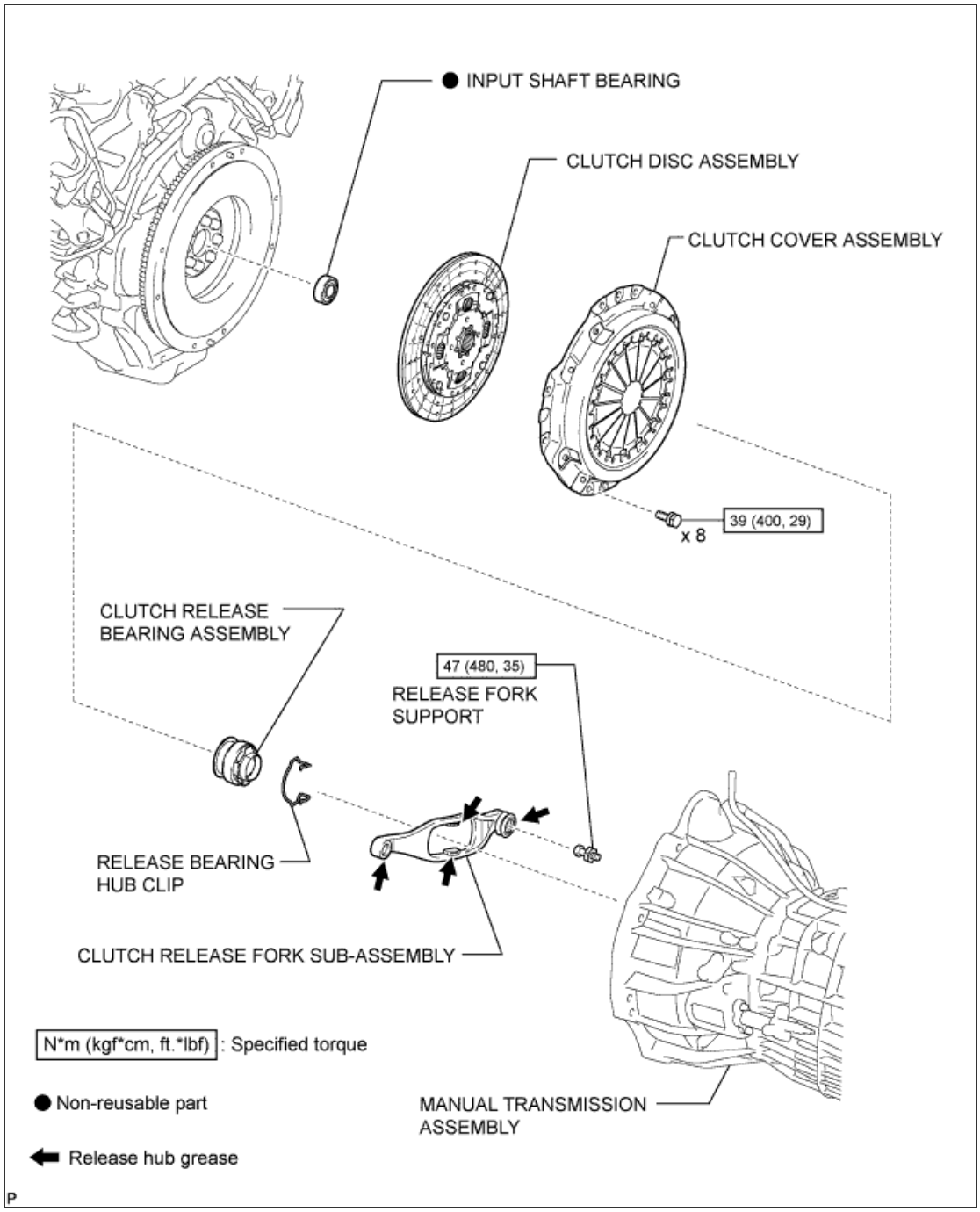
HINT:

After installation, move the fork back and forth to check that the release bearing slides smoothly.

5. INSTALL MANUAL TRANSMISSION ASSEMBLY

a. Install the manual transmission (Click here).

for Preparation Click here



for Preparation Click here

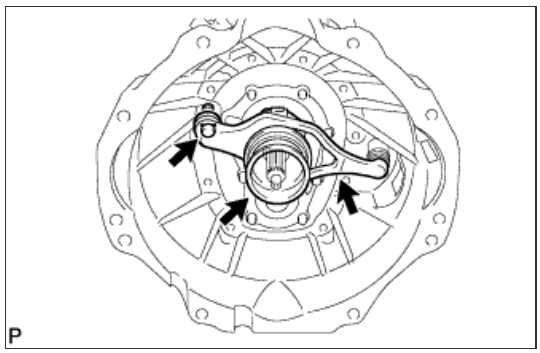
1. REMOVE MANUAL TRANSMISSION ASSEMBLY

a. Remove the manual transmission (Click here).

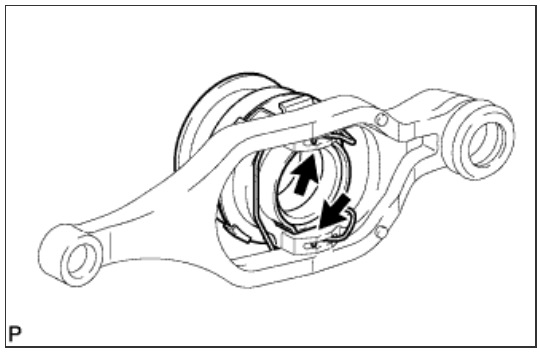
2. REMOVE CLUTCH RELEASE FORK SUB-ASSEMBLY

a. Remove the clutch release fork with the clutch release bearing from the transmission unit.

b. Remove the release fork support from the transmission unit.



c. Remove the clip and release bearing from the clutch release fork.



3. REMOVE CLUTCH COVER ASSEMBLY

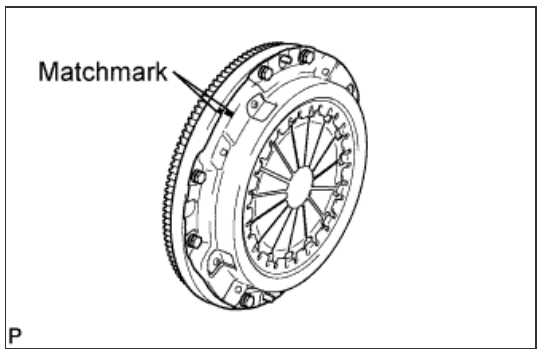
a. Put matchmarks on the clutch cover and flywheel.

b. Loosen each set bolt one turn at a time until spring tension is released.

c. Remove the 8 set bolts, and pull off the clutch cover.

NOTICE:

Do not drop the clutch disc.



4. REMOVE CLUTCH DISC ASSEMBLY

NOTICE:

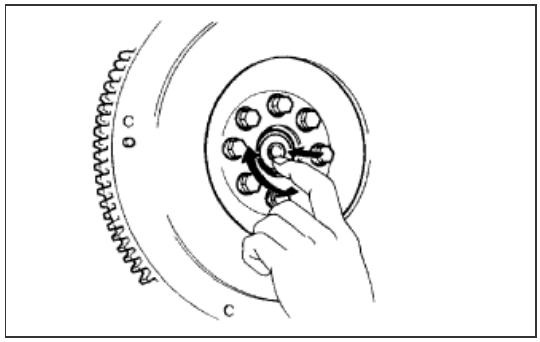
Keep the lining part of the clutch disc, pressure plate and surface of the flywheel away from oil and foreign matter.

5. INSPECT INPUT SHAFT BEARING

a. Turn the bearing by hand while applying force in the direction of the rotation.
If the bearing is stuck or difficult to turn, replace the input shaft bearing.

HINT:

The bearing is permanently lubricated and requires no cleaning or lubrication.



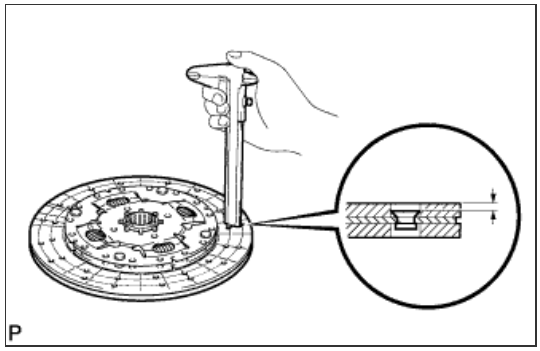
for Preparation Click here

1. INSPECT CLUTCH DISC ASSEMBLY

a. Using a vernier caliper, measure the rivet depth.

Minimum Rivet Depth:
0.3 mm (0.0118 in.)

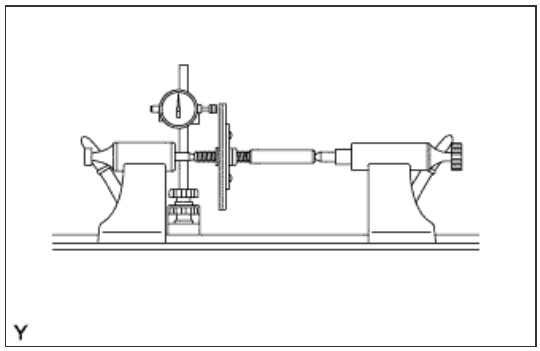
If the depth is less than the minimum, replace the clutch disc assembly.



b. Using a dial indicator, check the clutch disc runout.

Maximum Runout:
1.0 mm (0.0394 in.)

If the runout is more than the maximum, replace the clutch disc assembly.



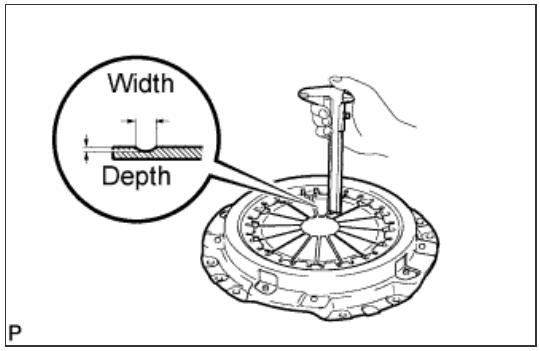
2. INSPECT CLUTCH COVER ASSEMBLY

a. Using a vernier caliper, inspect the depth and width of wear of the diaphragm spring.

Maximum Wear:

Depth	Width
0.6 mm (0.0236 in.)	5.0 mm (0.197 in.)

If the wear is more than the maximum, replace the clutch cover assembly.

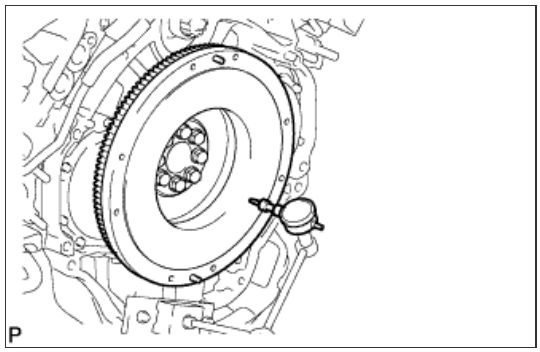


3. INSPECT FLYWHEEL SUB-ASSEMBLY

a. Using a dial indicator, inspect the flywheel runout.

Maximum Runout:
0.1 mm (0.00393 in.)

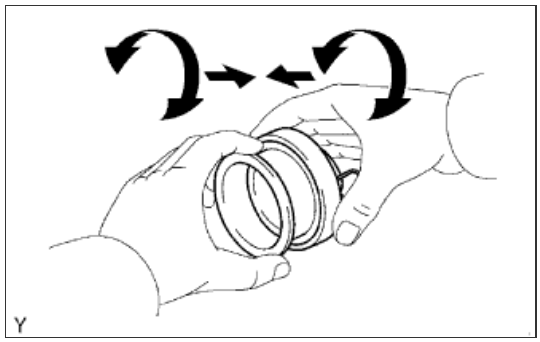
If the runout is more than the maximum, replace the flywheel sub-assembly.



4. INSPECT CLUTCH RELEASE BEARING ASSEMBLY

a. Check that the clutch release bearing moves smoothly without abnormal resistance by turning the sliding parts of the clutch release bearing (contact surfaces with the clutch cover) while applying force in the axial direction.

b. Inspect the clutch release bearing for damage or wear.
Replace the release bearing assembly as necessary.

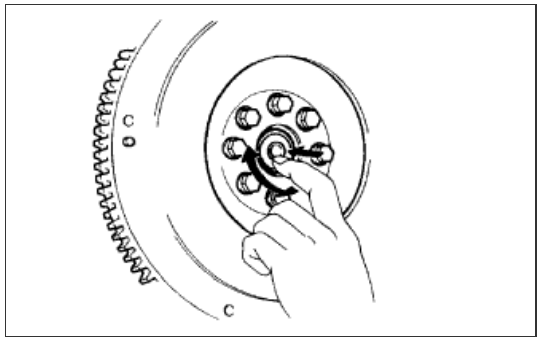


5. INSPECT INPUT SHAFT BEARING

a. Turn the bearing by hand while applying force in the direction of the rotation.
If the bearing is stuck or difficult to turn, replace the input shaft bearing.

HINT:

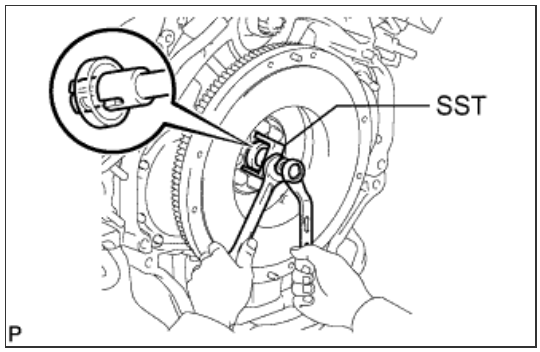
The bearing is permanently lubricated and requires no cleaning or lubrication.



6. REPLACE INPUT SHAFT BEARING

a. Using SST, remove the bearing.

SST
09303-35011

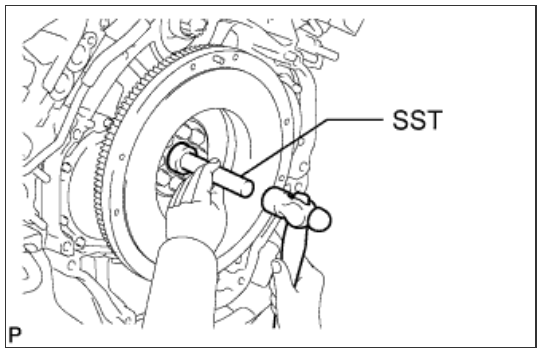


b. Using SST and a hammer, install a new bearing.

SST
09304-12012

HINT:

After installing the input shaft bearing to the engine side, make sure that it rotates smoothly.



for Preparation Click here

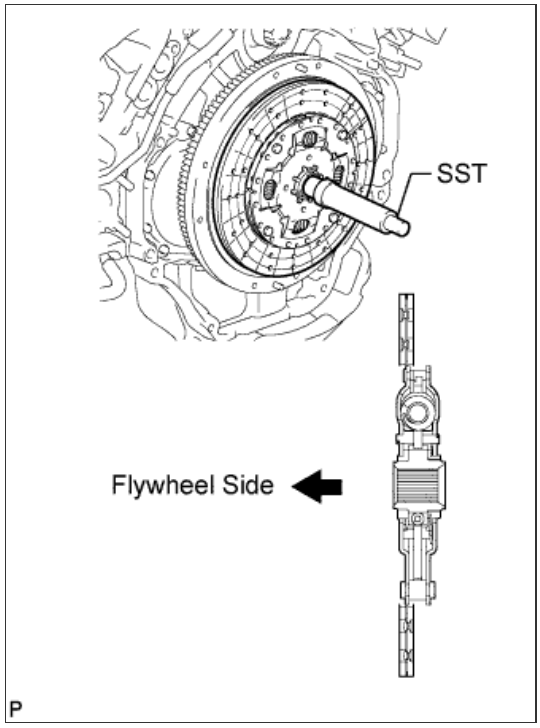
1. INSTALL CLUTCH DISC ASSEMBLY

a. Insert SST into the clutch disc, then insert the clutch disc into the flywheel.

SST
09301-00120

NOTICE:

Take care not to insert the clutch disc in the wrong direction.



2. INSTALL CLUTCH COVER ASSEMBLY

a. Align the matchmark on the clutch cover with the one on the flywheel.

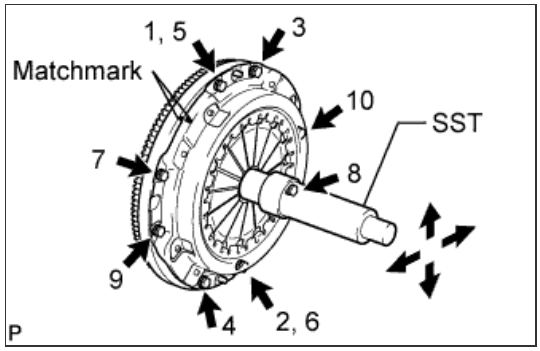
b. In the order shown in the illustration, temporarily install the 8 bolts starting from the bolt located near the knock pin on the top.

c. Check that the disc is in the center by lightly moving SST up and down, and left and right.

SST
09301-00120

d. Evenly tighten the bolts by following the order shown in the illustration.

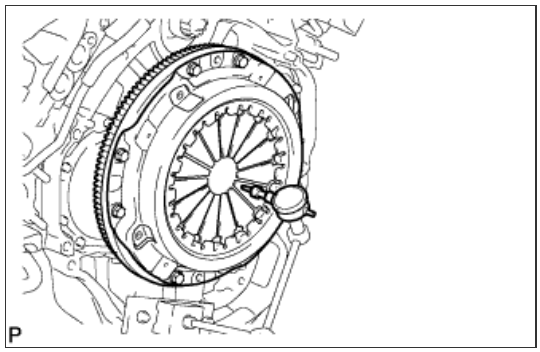
Torque:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }



3. INSPECT AND ADJUST CLUTCH COVER ASSEMBLY

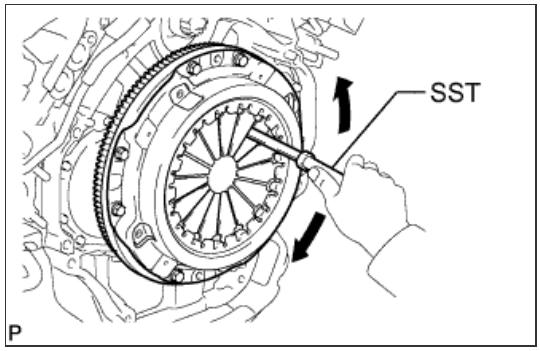
a. Using a dial indicator with a roller instrument, check the diaphragm spring tip alignment.

Maximum Misalignment:
1.3 mm (0.0512 in.)



b. If the alignment is not as specified, adjust the diaphragm spring tip alignment using SST.

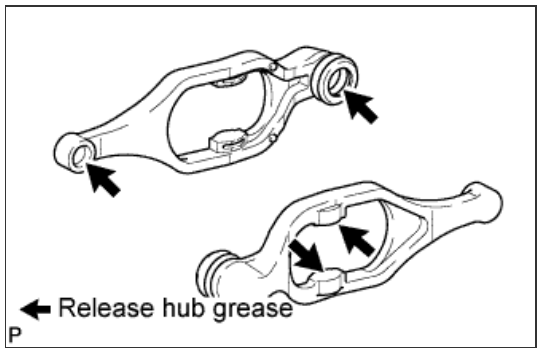
SST
09333-00013



4. INSTALL CLUTCH RELEASE FORK SUB-ASSEMBLY

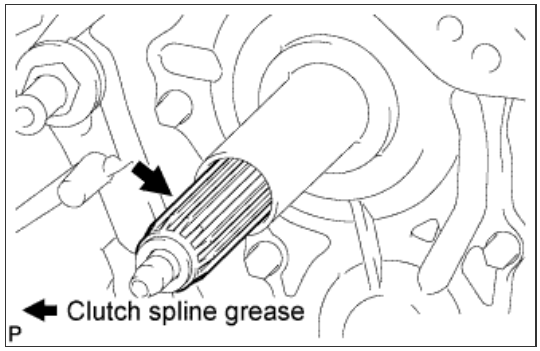
a. Apply release hub grease to the release fork, release bearing, push rod contact point and pivot points shown in the illustration.

Grease:
Toyota Genuine Release Hub Grease or equivalent

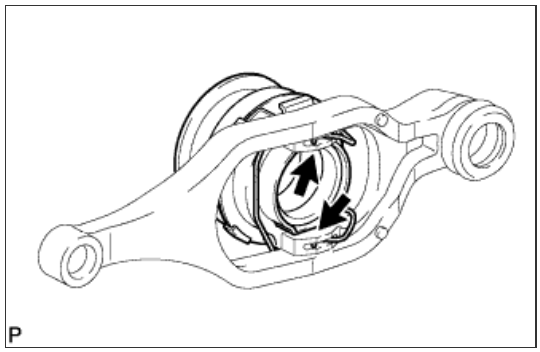


b. Apply clutch spline grease to the input shaft spline.

Grease:
Toyota Genuine Clutch Spline Grease or equivalent

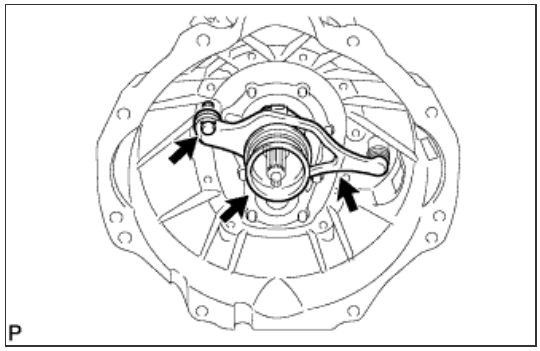


c. Install the release bearing to the clutch release fork with the clip.



d. Install the release fork support to the transmission unit.

Torque:
47 N*m{ 480 kgf*cm , 35 ft.*lbf }



e. Install the clutch release fork with the clutch release bearing to the transmission unit.

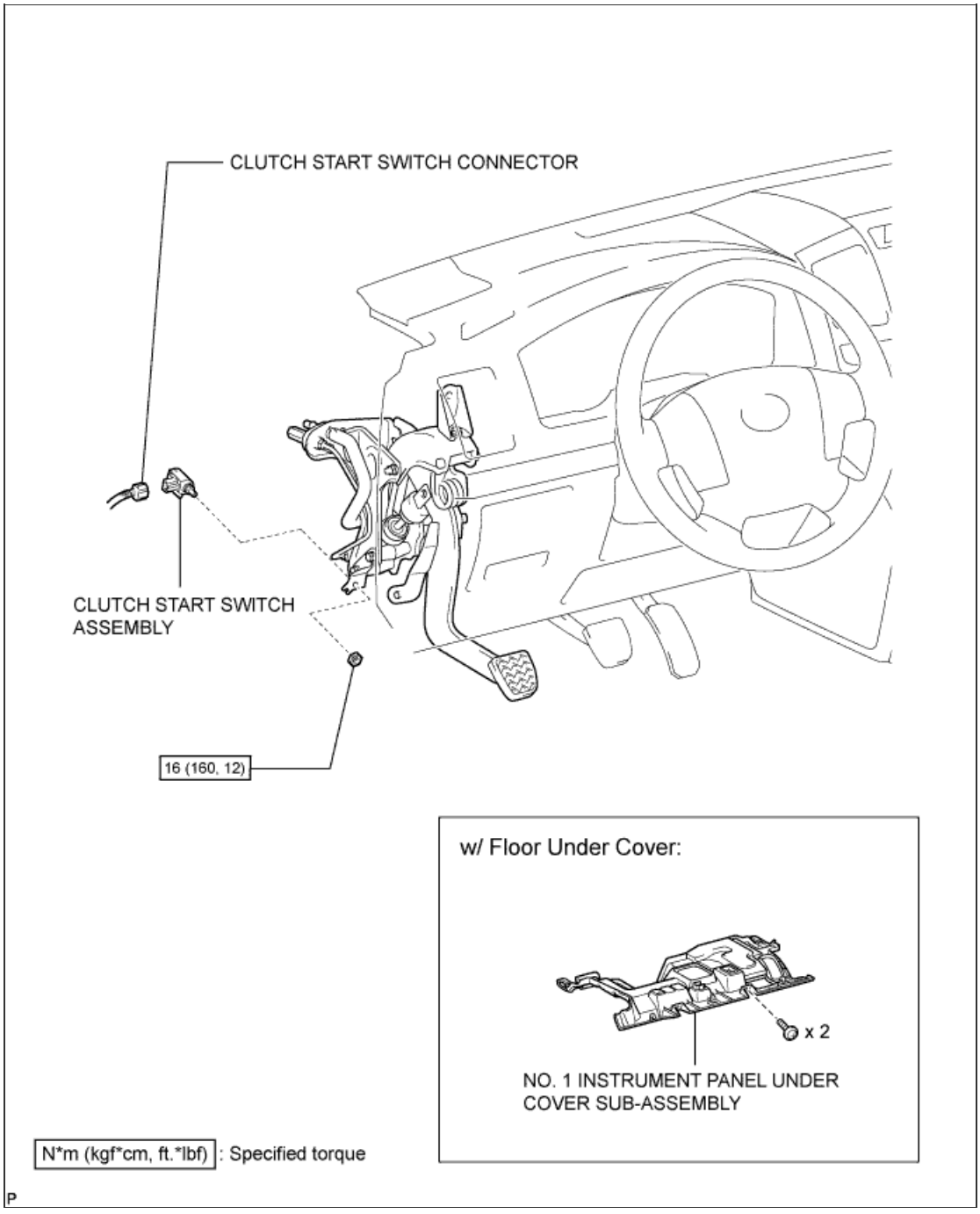
HINT:

After installation, move the fork back and forth to check that the release bearing slides smoothly.

5. INSTALL MANUAL TRANSMISSION ASSEMBLY

a. Install the manual transmission (Click here).

for Preparation Click here



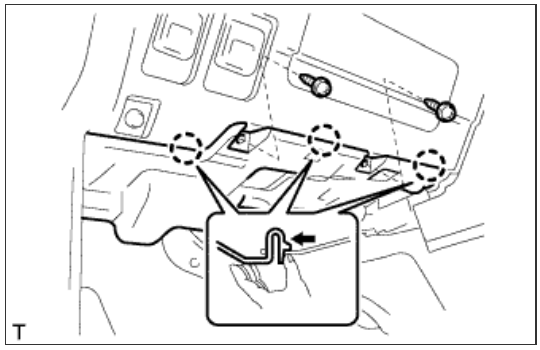
for Preparation Click here

1. REMOVE NO. 1 INSTRUMENT PANEL UNDER COVER SUB-ASSEMBLY (w/ Floor Under Cover)

a. Remove the 2 screws.

b. Detach the 3 claws.

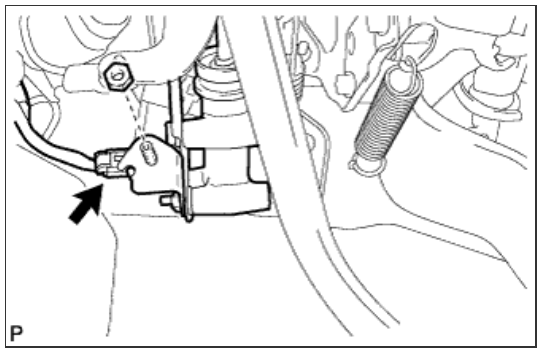
c. Disconnect the connectors and remove the No. 1 instrument panel under cover.



2. REMOVE CLUTCH START SWITCH ASSEMBLY

a. Disconnect the connector.

b. Remove the nut and clutch start switch.



for Preparation Click here

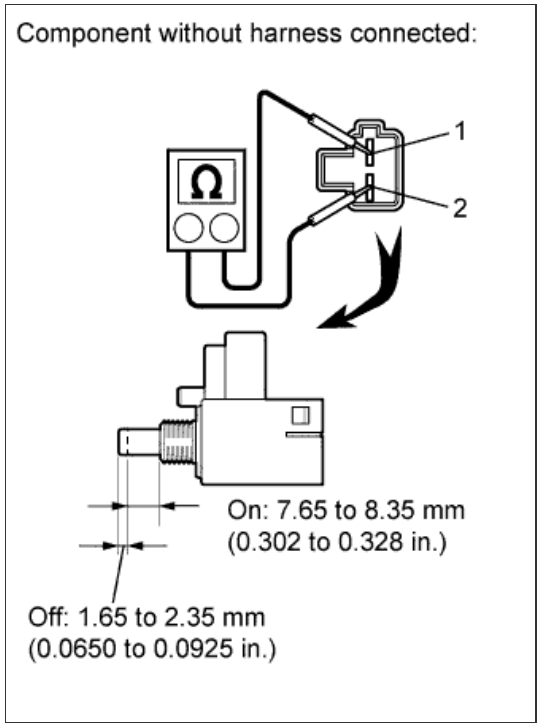
1. INSPECT CLUTCH START SWITCH ASSEMBLY

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
1 - 2	On (Pushed)	Below 1 Ω
1 - 2	Off (Not pushed)	10 kΩ or higher

If the result is not as specified, replace the clutch start switch.



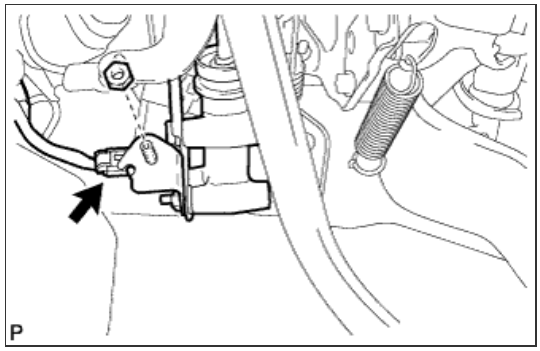
for Preparation Click here

1. INSTALL CLUTCH START SWITCH ASSEMBLY

a. Install the clutch start switch with the nut.

Torque:
16 N*m{ 160 kgf*cm , 12 ft.*lbf }

b. Connect the connector.

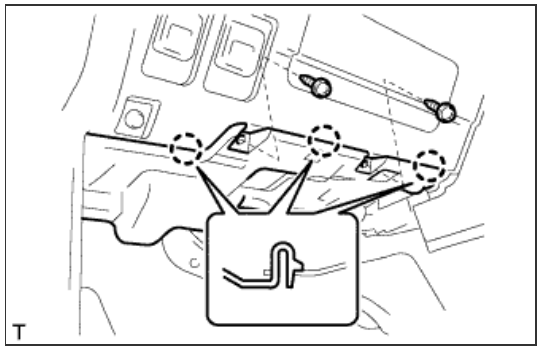


2. INSTALL NO. 1 INSTRUMENT PANEL UNDER COVER SUB-ASSEMBLY (w/ Floor Under Cover)

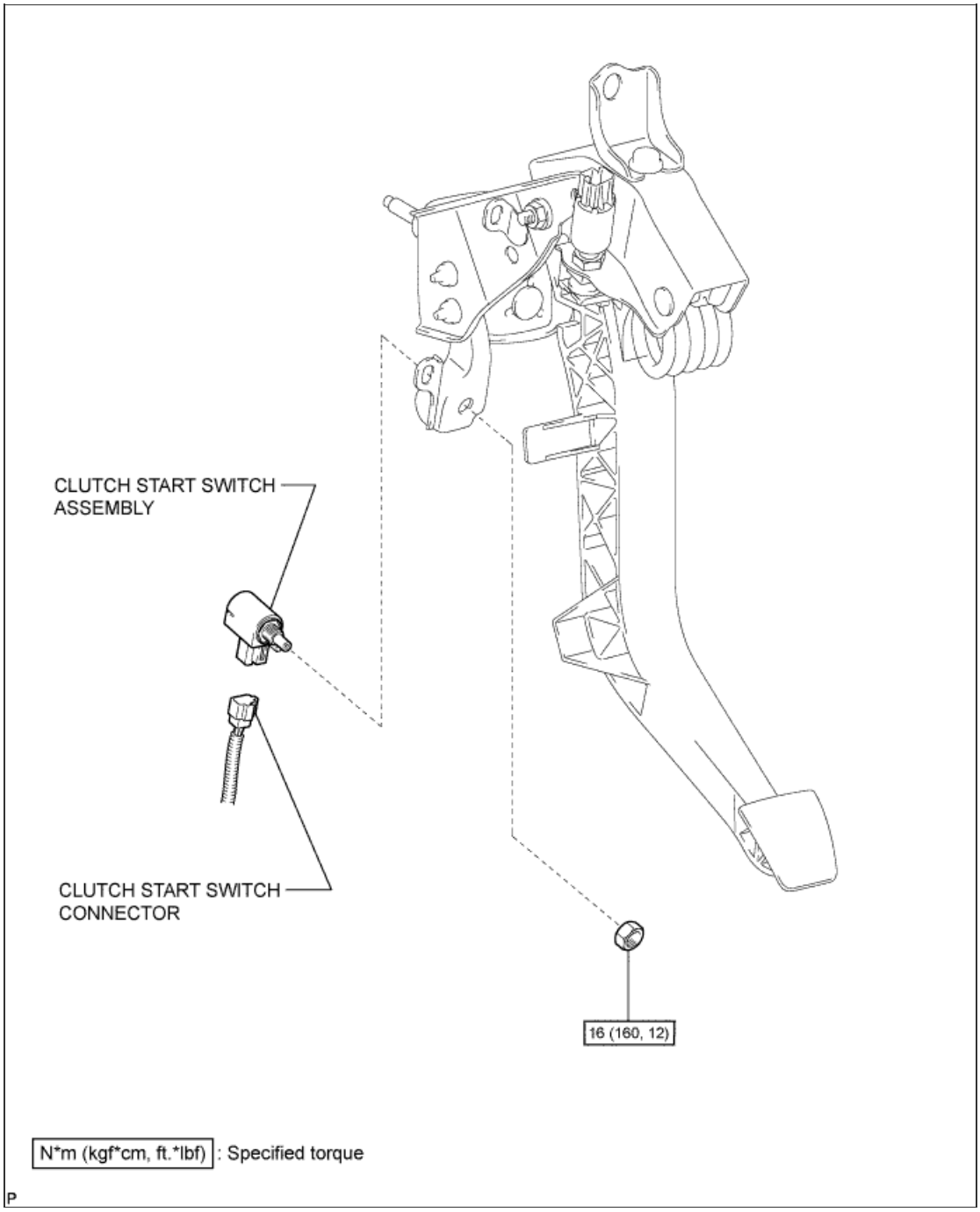
a. Connect the connectors.

b. Attach the 3 claws to install the No. 1 instrument panel under cover.

c. Install the 2 screws.



for Preparation Click here

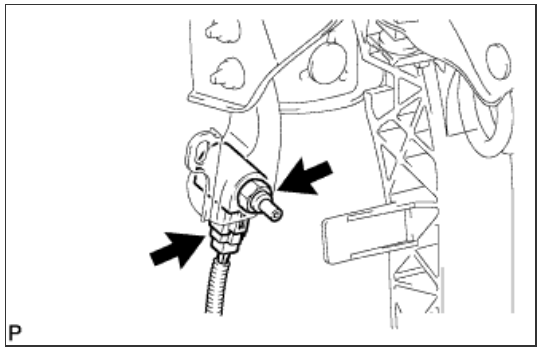


for Preparation Click here

1. REMOVE CLUTCH START SWITCH ASSEMBLY

a. Disconnect the connector.

b. Remove the nut and clutch start switch.



for Preparation Click here

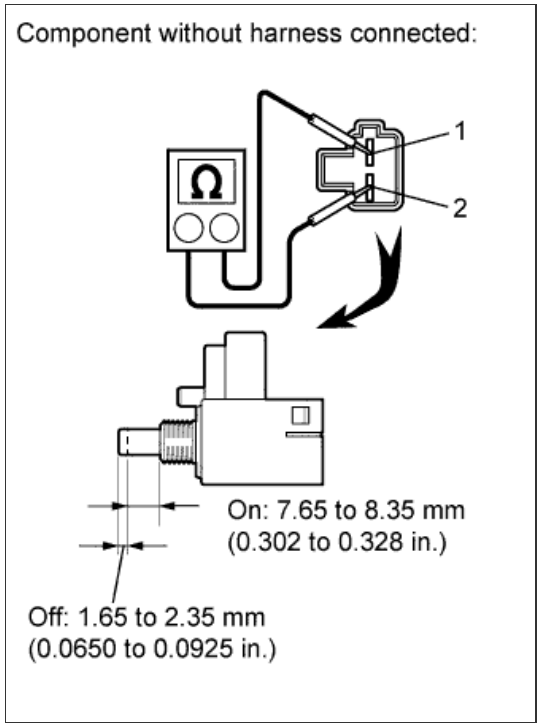
1. INSPECT CLUTCH START SWITCH ASSEMBLY

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
1 - 2	On (Pushed)	Below 1 Ω
1 - 2	Off (Not pushed)	10 kΩ or higher

If the result is not as specified, replace the clutch start switch.



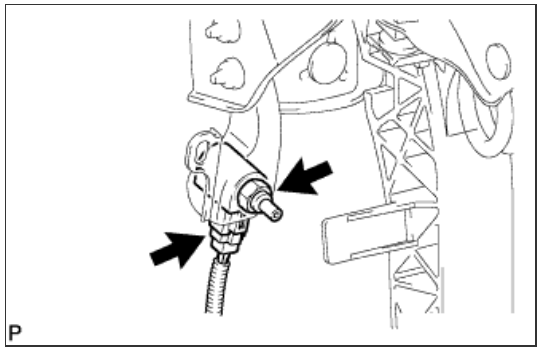
for Preparation Click here

1. INSTALL CLUTCH START SWITCH ASSEMBLY

a. Install the clutch start switch with the nut.

Torque:
16 N*m{ 160 kgf*cm , 12 ft.*lbf }

b. Connect the connector.



for Preparation Click here

HINT:

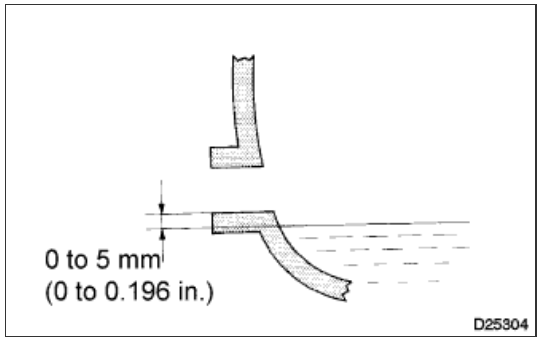
- **Use the table below to help determine the cause of the problem symptom. the potential causes of the symptoms are listed in order of probability in the 'Suspected Area' column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.**
- **Inspect the fuses and relays related to this system before inspecting the suspected areas below.**

Manual Transmission System

Symptom	Suspected Area	See page
Abnormal noise	Oil level (Low)	Click here
	Oil (Wrong)	Click here
	Gears (Worn or damaged)	-
	Bearings (Worn or damaged)	-
Oil leakage	Oil level (High)	Click here
	Gasket (Damaged)	-
	Oil seal (Worn or damaged)	-
	O-Ring (Worn or damaged)	-
Hard shifting or will not shift	Synchronizer ring (Worn or damaged)	-
	Shift key spring (Damaged)	-
Jumps out of gear	Locking ball spring (Damaged)	-
	Shift fork (Worn)	-
	Gears (Worn or damaged)	-
	Bearings (Worn or damaged)	-

for Preparation Click here

1. INSPECT TRANSMISSION OIL



a. Park the vehicle in a level place.

b. Remove the transmission filler plug and gasket.

c. Check that the oil level is within 5 mm (0.196 in.) of the lowest point of the transmission filler plug opening.
If the result is not as specified, add transmission oil.

Oil Grade:
GL-4

Viscosity:
SAE 75W-90

Standard Capacity:
3.0 liters (3.17 US qts, 2.64 Imp. qts)

NOTICE:

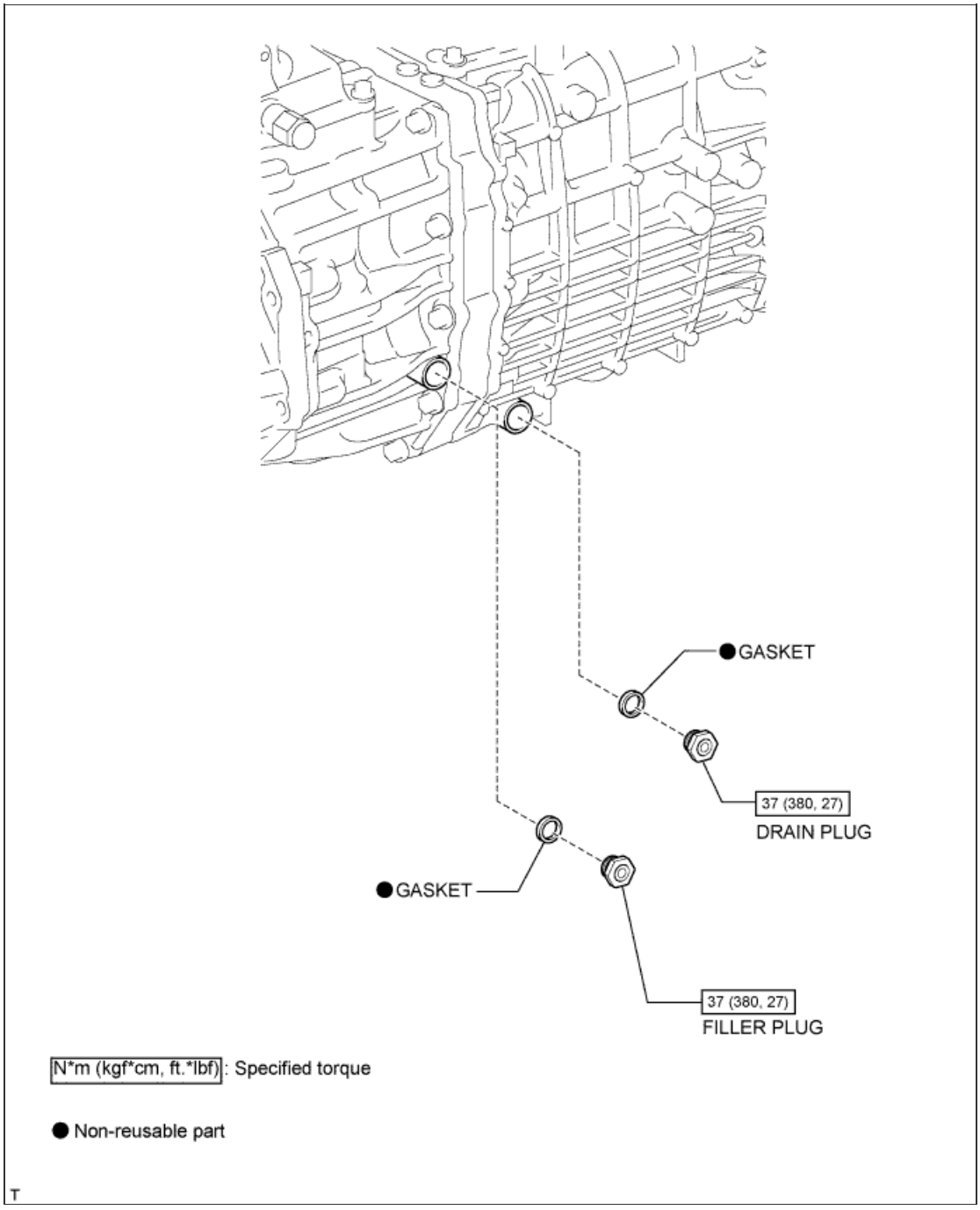
- **Problems may occur when the oil level is too high or low.**
- **After replacing the oil, drive the vehicle and check the oil level again.**

d. Inspect for oil leaks when the oil level is low.

e. Install a new gasket and the transmission filler plug.

Torque:
37 N*m{ 380 kgf*cm , 27 ft.*lbf }

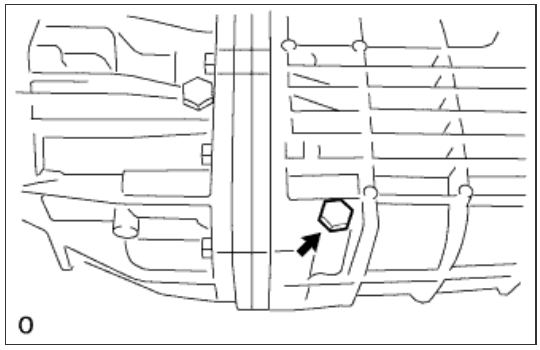
for Preparation Click here



for Preparation Click here

1. DRAIN MANUAL TRANSMISSION OIL

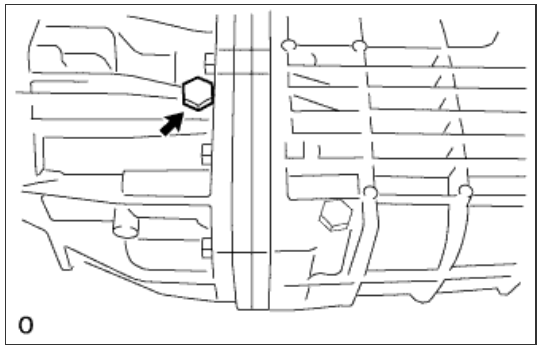
a. Remove the drain plug and gasket and then drain the manual transmission oil.



b. Remove the filler plug and gasket.

c. Install a new gasket and the drain plug.

Torque:
37 N*m{ 380 kgf*cm , 27 ft.*lbf }



2. ADD MANUAL TRANSMISSION OIL

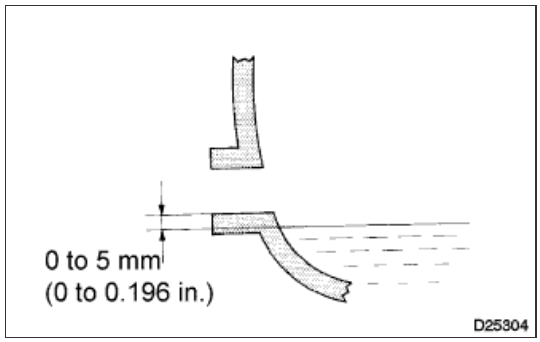
3. INSPECT TRANSMISSION OIL

a. Park the vehicle in a level place.

b. Check that the oil level is within 5 mm (0.196 in.) of the lowest point of the transmission filler plug opening.

NOTICE:

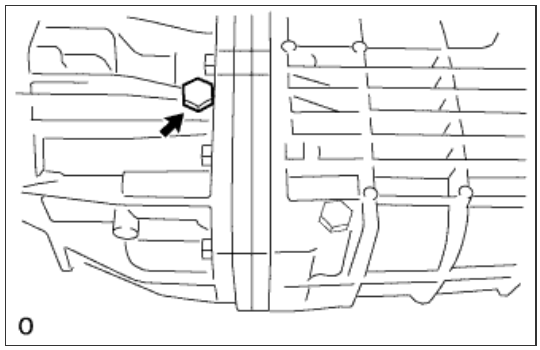
- **Problems may occur when the oil level is too high or low.**
- **After replacing the oil, drive the vehicle and check the oil level again.**



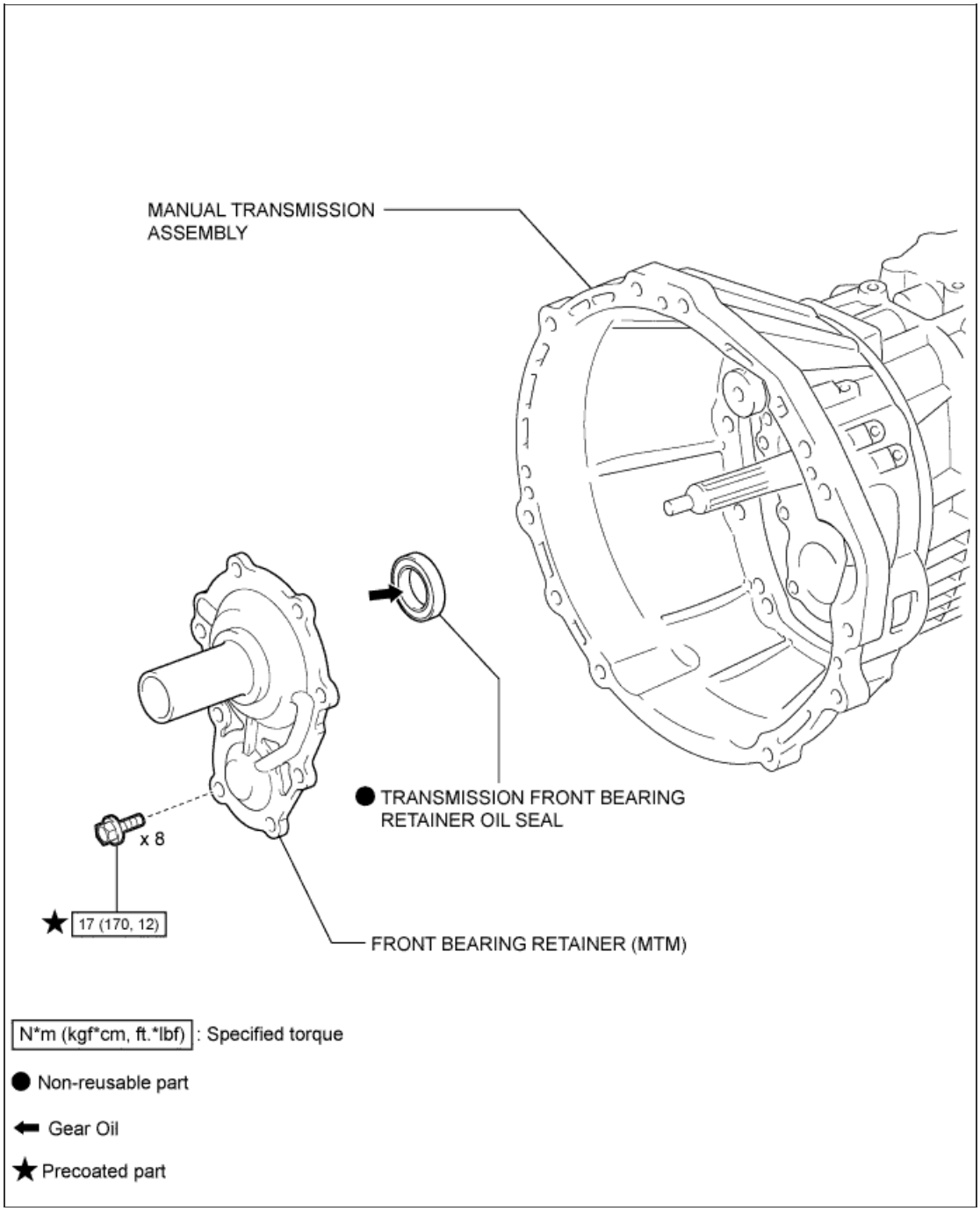
c. Inspect for oil leaks when the oil level is low.

d. Install a new gasket and the filler plug.

Torque:
37 N*m{ 380 kgf*cm , 27 ft.*lbf }


o

for Preparation Click here



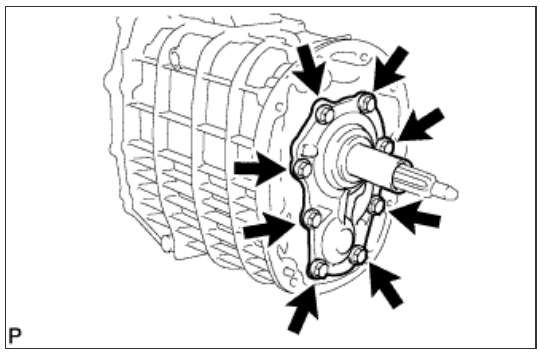
for Preparation Click here

1. REMOVE MANUAL TRANSMISSION ASSEMBLY

a. Remove the manual transmission (Click here).

2. REMOVE FRONT BEARING RETAINER (MTM)

a. Remove the 8 bolts and front bearing retainer.



3. REMOVE TRANSMISSION FRONT BEARING RETAINER OIL SEAL

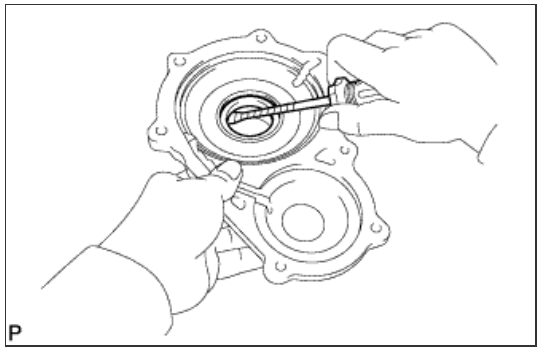
a. Using a screwdriver, pry out the oil seal.

NOTICE:

Be careful not to damage the oil seal and front bearing retainer contact surfaces.

HINT:

Tape the screwdriver tip before use.



4. INSTALL TRANSMISSION FRONT BEARING RETAINER OIL SEAL

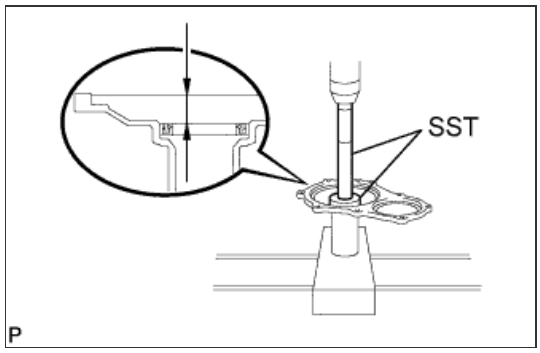
a. Using SST and a press, drive in a new oil seal.

SST

09950-60010 (09951-00460)
09950-70010 (09951-07150)

Standard Drive in Depth:
15.4 to 16.2 mm (0.607 to 0.637 in.)

b. Apply gear oil to the lip of the oil seal.



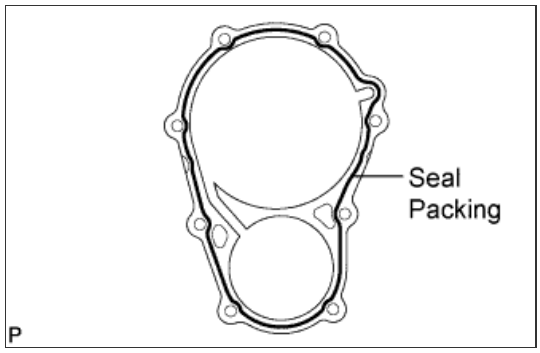
5. INSTALL FRONT BEARING RETAINER (MTM)

a. Apply seal packing to the front bearing retainer, as shown in the illustration.

Seal Packing:
Toyota Genuine Seal Packing 1281, Three Bond 1281 or equivalent

NOTICE:

Parts must be assembled within 10 minutes of application. Otherwise, the packing (FIPG) material must be removed and reapplied.

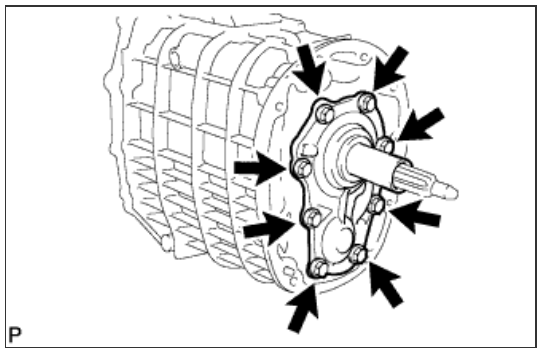


b. Apply adhesive to 2 or 3 threads of the bolts.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

c. Install the front bearing retainer with the 8 bolts.

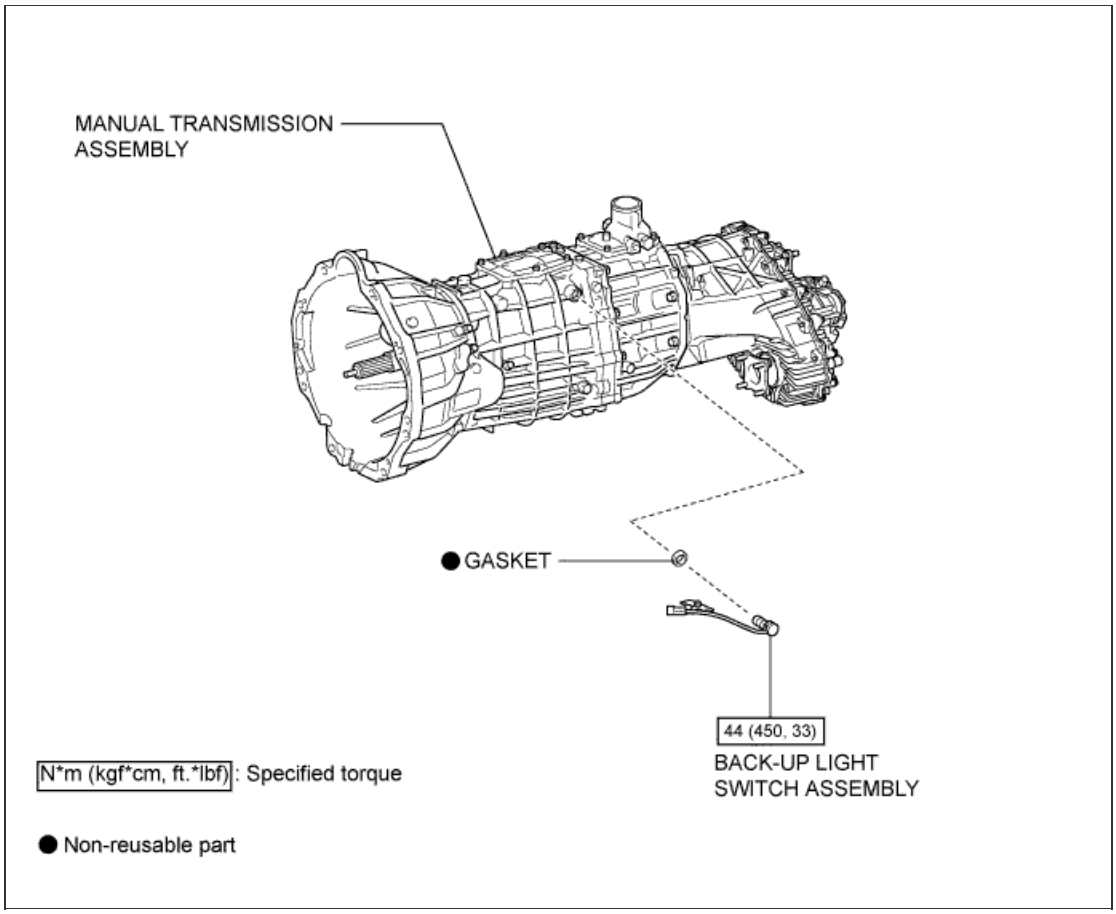
Torque:
17 N*m{ 170 kgf*cm , 12 ft.*lbf }



6. INSTALL MANUAL TRANSMISSION ASSEMBLY

a. Install the manual transmission (Click here).

for Preparation Click here



for Preparation Click here

1. REMOVE MANUAL TRANSMISSION ASSEMBLY

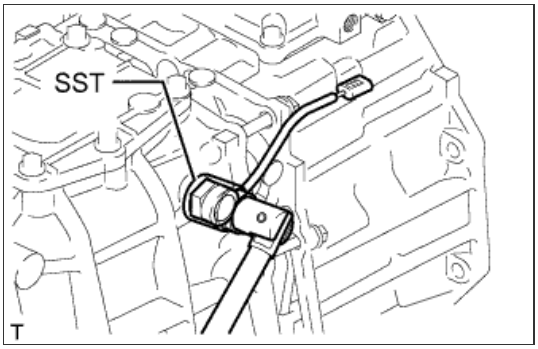
a. Remove the manual transmission (Click here).

2. REMOVE BACK-UP LIGHT SWITCH ASSEMBLY

a. Disconnect the wire harness clamp.

b. Using SST, remove the back-up light switch and gasket.

SST
09817-16011



for Preparation Click here

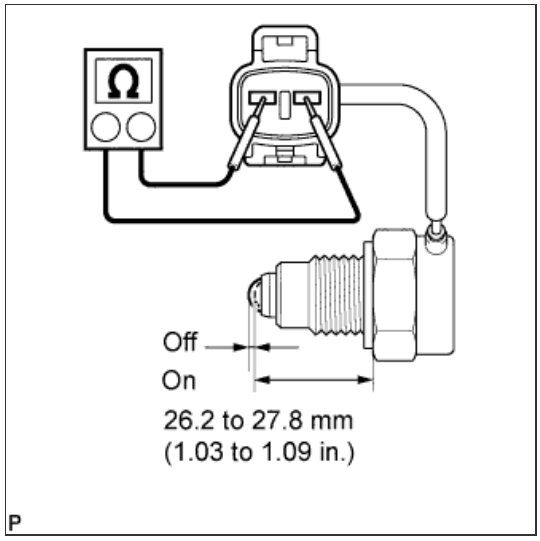
1. INSPECT BACK-UP LIGHT SWITCH ASSEMBLY

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
1 - 2	On (pushed)	Below 1 Ω
1 - 2	Off (released)	10 kΩ or higher

If the result is not as specified, replace the back-up light switch assembly.



for Preparation Click here

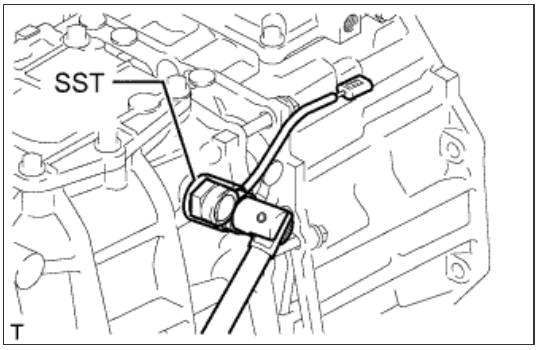
1. INSTALL BACK-UP LIGHT SWITCH ASSEMBLY

a. Using SST, install a new gasket and the back-up light switch to the manual transmission.

SST
09817-16011

Torque:
44 N*m{ 450 kgf*cm , 33 ft.*lbf }

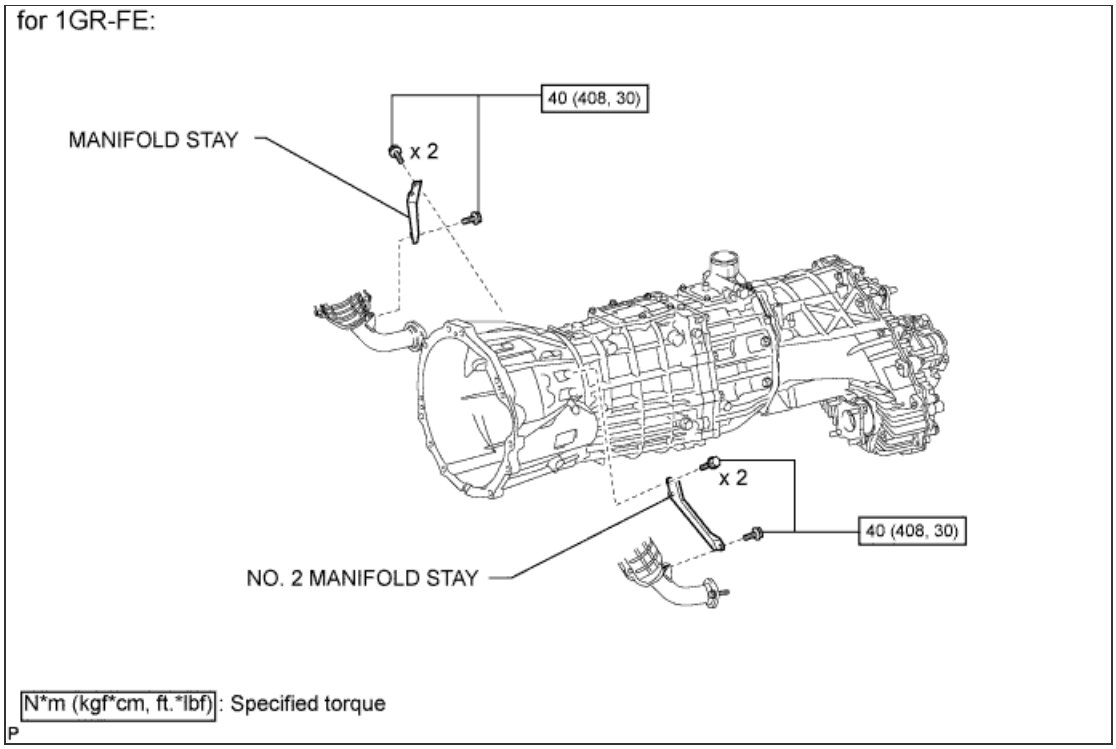
b. Connect the wire harness clamp.

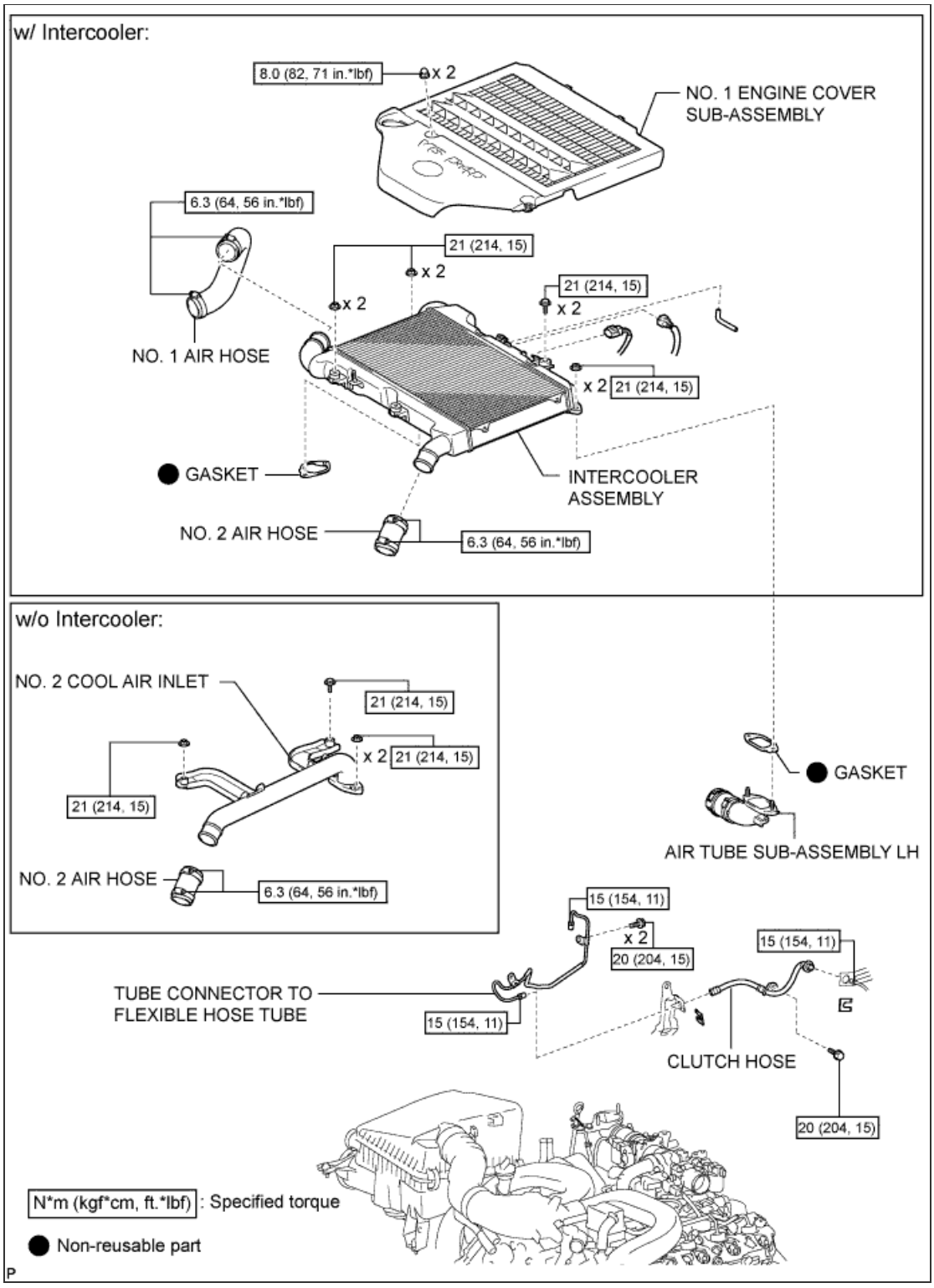


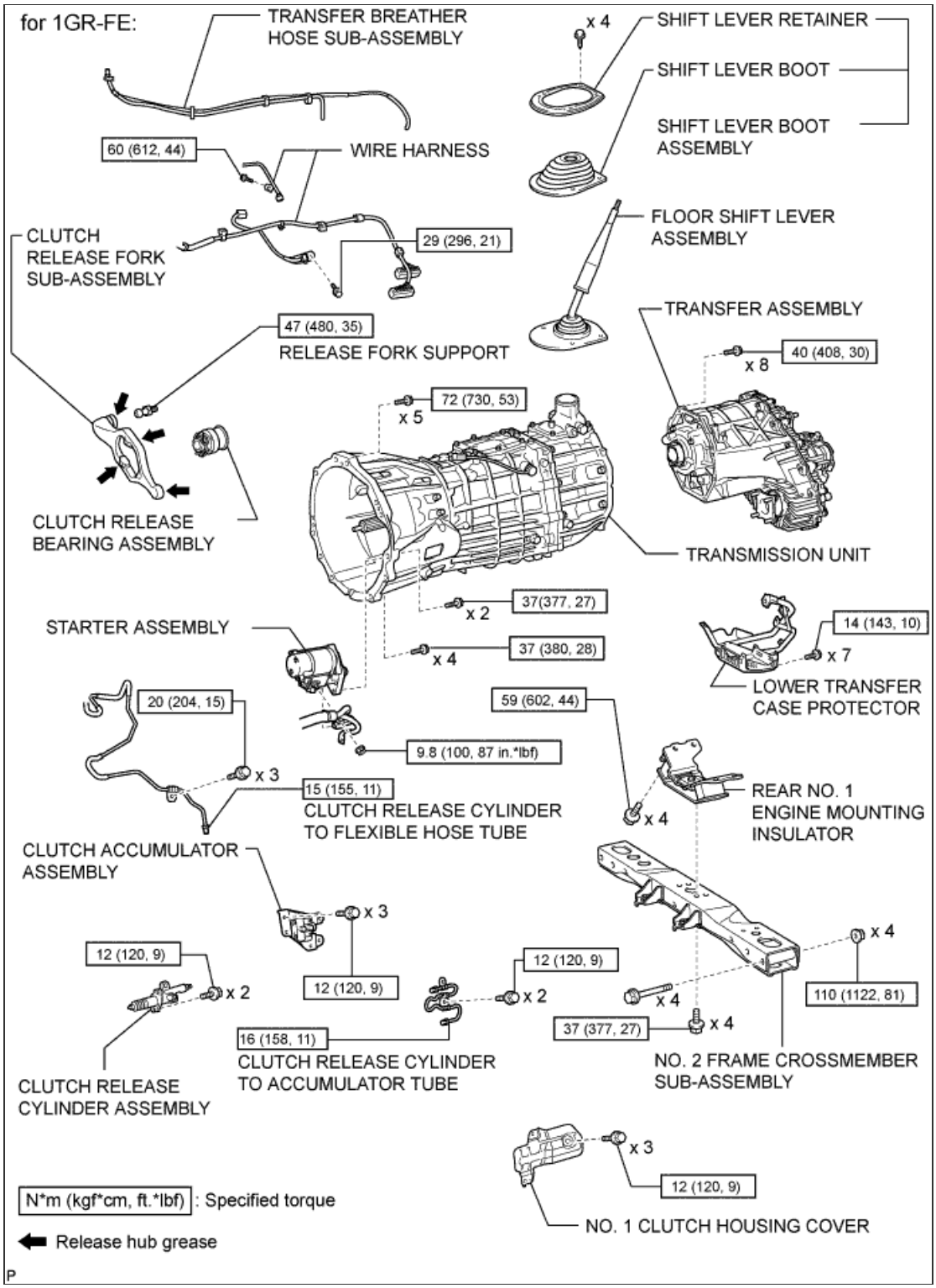
2. INSTALL MANUAL TRANSMISSION ASSEMBLY

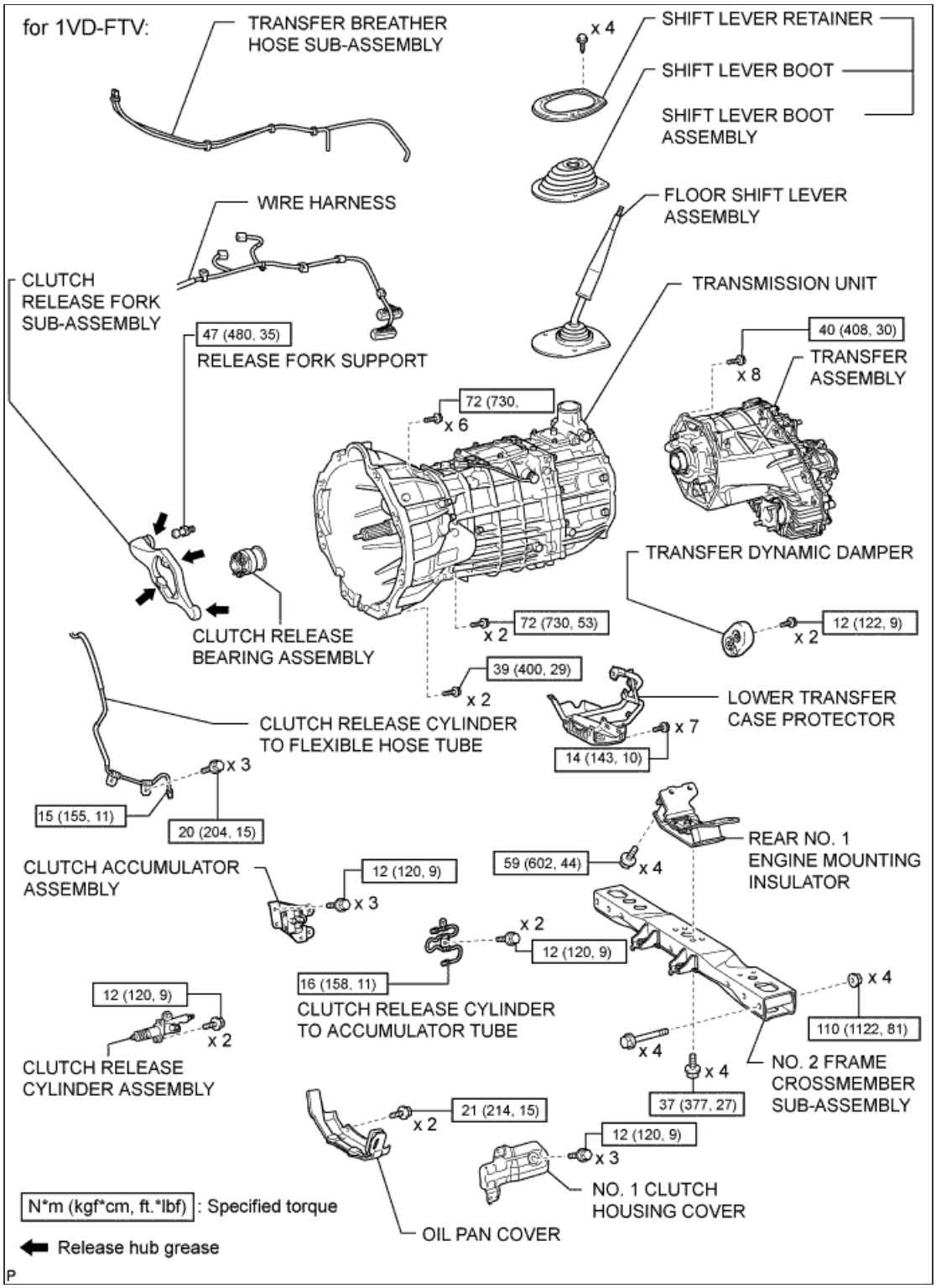
a. Install the manual transmission (Click here).

for Preparation Click here




w/ Intercooler:
8.0 (82, 71 in.*lbf)
x 2
NO. 1 ENGINE COVER SUB-ASSEMBLY
6.3 (64, 56 in.*lbf)
21 (214, 15)
x 2
21 (214, 15)
x 2
x 2
NO. 1 AIR HOSE
x 2
21 (214, 15)
GASKET
INTERCOOLER ASSEMBLY
NO. 2 AIR HOSE
6.3 (64, 56 in.*lbf)
w/o Intercooler:
NO. 2 COOL AIR INLET
21 (214, 15)
x 2
21 (214, 15)
21 (214, 15)
NO. 2 AIR HOSE
6.3 (64, 56 in.*lbf)
GASKET
AIR TUBE SUB-ASSEMBLY LH
15 (154, 11)
x 2
20 (204, 15)
15 (154, 11)
TUBE CONNECTOR TO FLEXIBLE HOSE TUBE
15 (154, 11)
CLUTCH HOSE
20 (204, 15)
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
P


for 1GR-FE:
TRANSFER BREATHER HOSE SUB-ASSEMBLY
x 4
SHIFT LEVER RETAINER
SHIFT LEVER BOOT
SHIFT LEVER BOOT ASSEMBLY
60 (612, 44)
WIRE HARNESS
FLOOR SHIFT LEVER ASSEMBLY
CLUTCH RELEASE FORK SUB-ASSEMBLY
29 (296, 21)
TRANSFER ASSEMBLY
47 (480, 35)
RELEASE FORK SUPPORT
40 (408, 30)
x 8
72 (730, 53)
x 5
CLUTCH RELEASE BEARING ASSEMBLY
TRANSMISSION UNIT
37(377, 27)
x 2
STARTER ASSEMBLY
14 (143, 10)
x 7
37 (380, 28)
x 4
LOWER TRANSFER CASE PROTECTOR
20 (204, 15)
59 (602, 44)
9.8 (100, 87 in.*lbf)
x 3
15 (155, 11)
CLUTCH RELEASE CYLINDER TO FLEXIBLE HOSE TUBE
REAR NO. 1 ENGINE MOUNTING INSULATOR
x 4
CLUTCH ACCUMULATOR ASSEMBLY
x 3
x 4
12 (120, 9)
12 (120, 9)
x 2
12 (120, 9)
x 2
x 4
110 (1122, 81)
37 (377, 27)
x 4
16 (158, 11)
CLUTCH RELEASE CYLINDER TO ACCUMULATOR TUBE
NO. 2 FRAME CROSSMEMBER SUB-ASSEMBLY
CLUTCH RELEASE CYLINDER ASSEMBLY
x 3
12 (120, 9)
NO. 1 CLUTCH HOUSING COVER
N*m (kgf*cm, ft.*lbf) : Specified torque
Release hub grease
P


for 1VD-FTV:
TRANSFER BREATHER HOSE SUB-ASSEMBLY
x 4
SHIFT LEVER RETAINER
SHIFT LEVER BOOT
SHIFT LEVER BOOT ASSEMBLY
FLOOR SHIFT LEVER ASSEMBLY
WIRE HARNESS
CLUTCH RELEASE FORK SUB-ASSEMBLY
47 (480, 35)
RELEASE FORK SUPPORT
TRANSMISSION UNIT
40 (408, 30)
x 8
TRANSFER ASSEMBLY
72 (730,
x 6
CLUTCH RELEASE BEARING ASSEMBLY
72 (730, 53)
x 2
TRANSFER DYNAMIC DAMPER
12 (122, 9)
x 2
39 (400, 29)
x 2
LOWER TRANSFER CASE PROTECTOR
x 7
14 (143, 10)
CLUTCH RELEASE CYLINDER TO FLEXIBLE HOSE TUBE
x 3
15 (155, 11)
20 (204, 15)
REAR NO. 1 ENGINE MOUNTING INSULATOR
59 (602, 44)
x 4
CLUTCH ACCUMULATOR ASSEMBLY
12 (120, 9)
x 3
x 2
12 (120, 9)
16 (158, 11)
CLUTCH RELEASE CYLINDER TO ACCUMULATOR TUBE
x 4
110 (1122, 81)
12 (120, 9)
x 2
CLUTCH RELEASE CYLINDER ASSEMBLY
x 4
x 4
37 (377, 27)
NO. 2 FRAME CROSSMEMBER SUB-ASSEMBLY
21 (214, 15)
x 2
12 (120, 9)
x 3
NO. 1 CLUTCH HOUSING COVER
OIL PAN COVER
N*m (kgf*cm, ft.*lbf) : Specified torque
Release hub grease
P

for Preparation Click here

1. PRECAUTION

NOTICE:

After turning the ignition switch off, waiting time may be required before disconnecting the cable from the battery terminal. Therefore, make sure to read the disconnecting the cable from the battery terminal notice before proceeding with work (Click here)

2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

NOTICE:

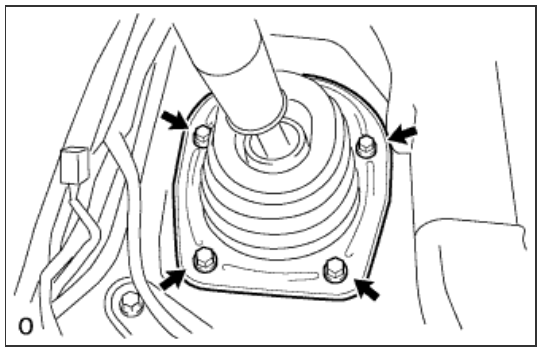
When disconnecting the cable, some systems need to be initialized after the cable is reconnected (Click here).

3. REMOVE UPPER CONSOLE PANEL SUB-ASSEMBLY

w/o Console Box Lid (Click here)
w/ Cool Box (Click here)
w/o Cool Box (Click here)

4. REMOVE SHIFT LEVER BOOT ASSEMBLY

a. Remove the 4 screws, shift lever retainer and shift lever boot.

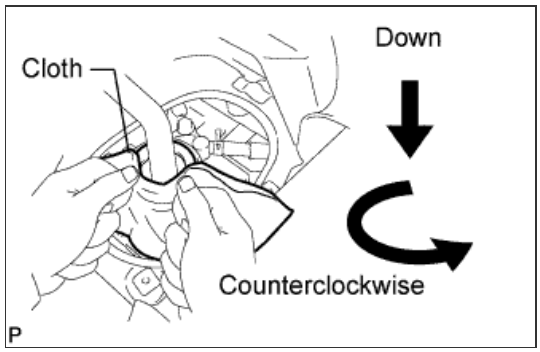


5. REMOVE FLOOR SHIFT LEVER ASSEMBLY

a. Cover the shift lever cap with a cloth.

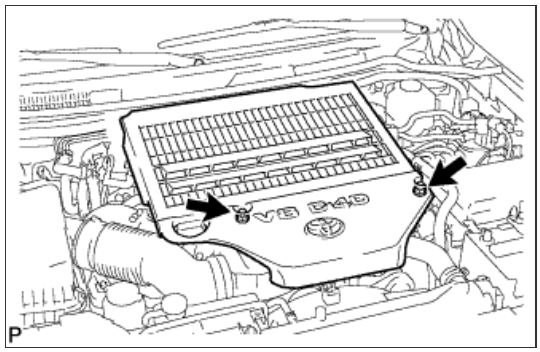
b. Press down on the shift lever cap and rotate it counterclockwise to remove it.

c. Pull out the shift lever.



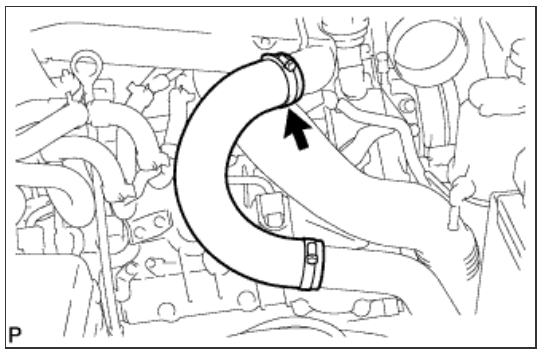
6. REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY (w/ Intercooler)

a. Remove the 2 nuts and No. 1 engine cover.

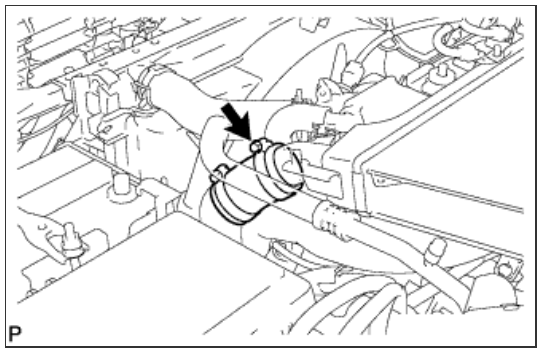


7. REMOVE INTERCOOLER ASSEMBLY (w/ Intercooler)

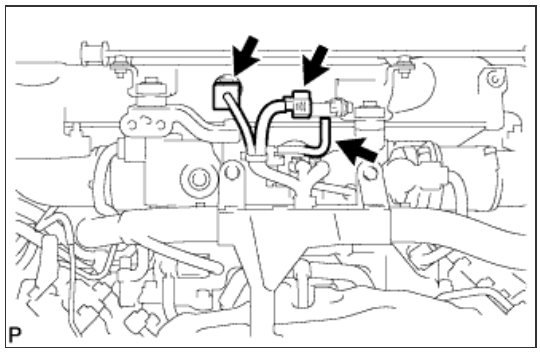
a. Loosen the No. 1 air hose clamp.



b. Loosen the No. 2 air hose clamp.



c. Disconnect the turbo pressure sensor connector, intake air temperature sensor connector and vacuum hose.



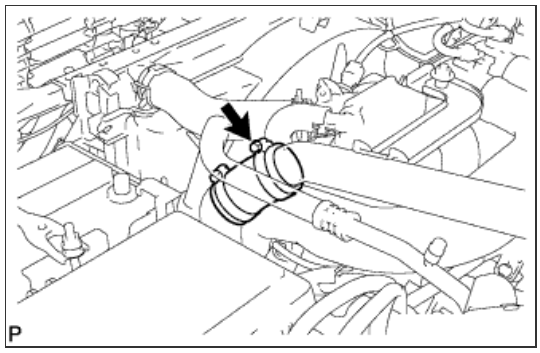
d. Remove the 6 nuts, 2 bolts and intercooler.

e. Remove the 2 gaskets from the air tube LH and RH.



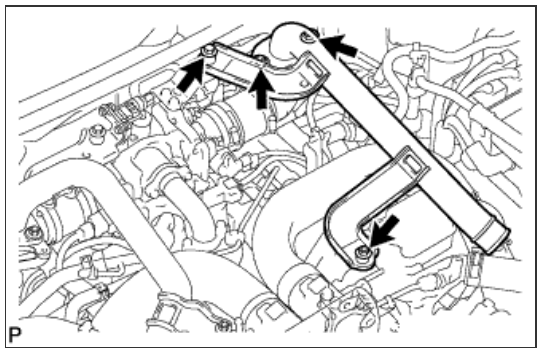
8. REMOVE NO. 2 COOL AIR INLET (w/o Intercooler)

a. Loosen the No. 2 air hose clamp.



b. Remove the 3 nuts, bolt and No. 2 cool air inlet.

c. Remove the gasket from the air tube LH.



9. DRAIN CLUTCH FLUID

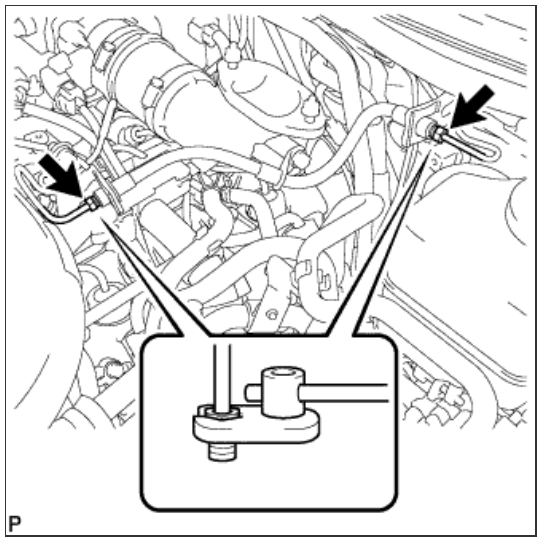
10. REMOVE CLUTCH HOSE (for 1VD-FTV)

a. Disconnect the 2 flexible hose tubes from the clutch hose with a 10 mm union nut wrench while holding the flexible hose with a wrench.

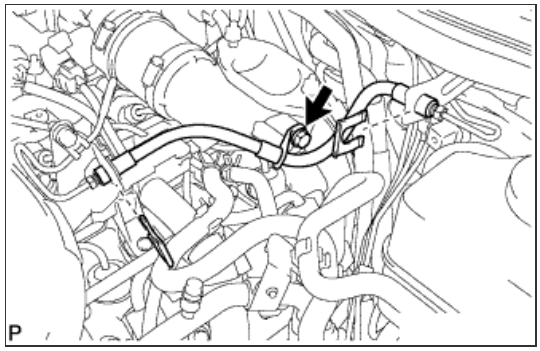
NOTICE:

- **Do not bend or damage the flexible hose tubes.**
- **Do not allow any foreign matter such as dirt and dust to enter the flexible hose tubes from the connecting point.**

b. Remove the 2 clips.



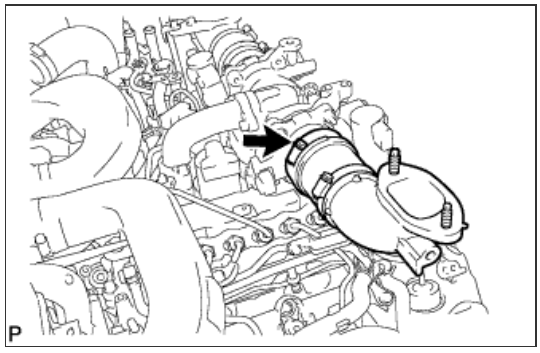
c. Remove the bolt and clutch hose.



11. REMOVE AIR TUBE SUB-ASSEMBLY LH (for 1VD-FTV)

a. Loosen the hose clamp.

b. Remove the air tube from the throttle body.

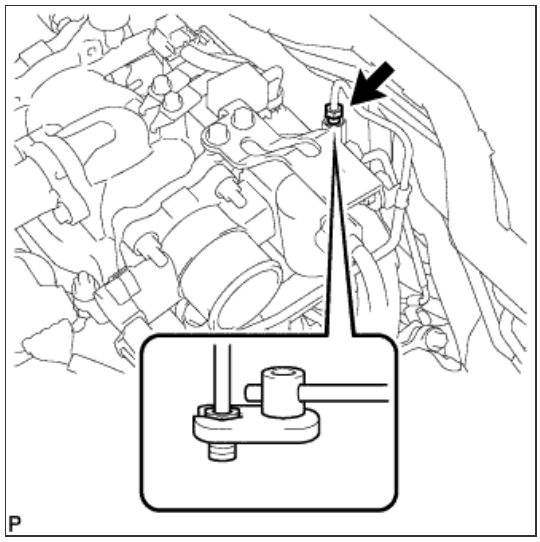


12. REMOVE TUBE CONNECTOR TO FLEXIBLE HOSE TUBE (for 1VD-FTV)

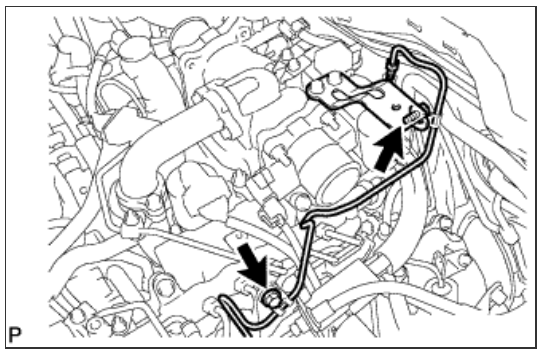
a. Using a 10 mm union nut wrench, disconnect the tube connector to flexible hose tube from the clutch tube to release cylinder 2 way.

NOTICE:

- **Do not bend or damage the flexible hose tube.**
- **Do not allow any foreign matter such as dirt and dust to enter the flexible hose tube from the connecting point.**

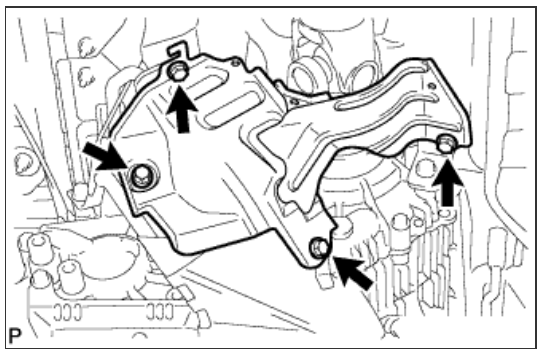


b. Remove the 2 bolts and tube connector to flexible hose tube.



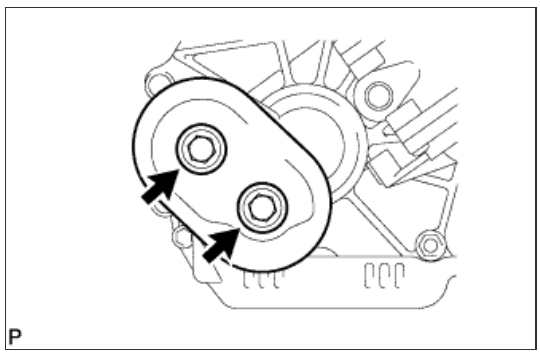
13. REMOVE TRANSFER HEAT INSULATOR

a. Remove the 4 bolts and insulator.



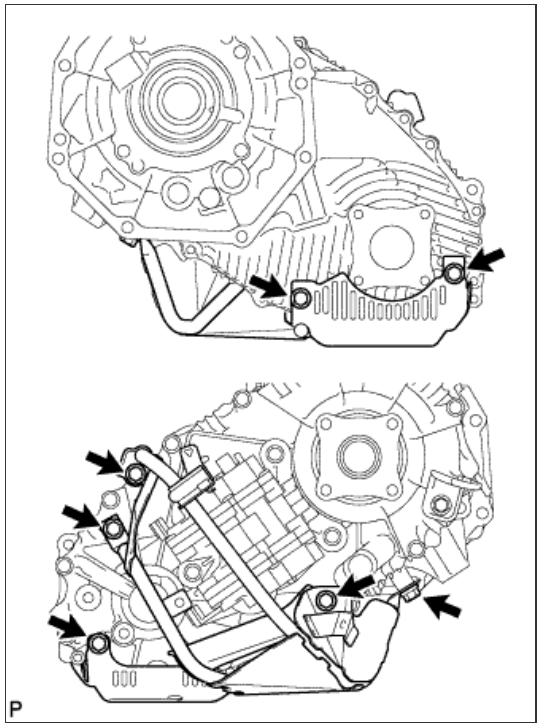
14. REMOVE TRANSFER DYNAMIC DAMPER (for 1VD-FTV)

a. Remove the 2 bolts and transfer dynamic damper.



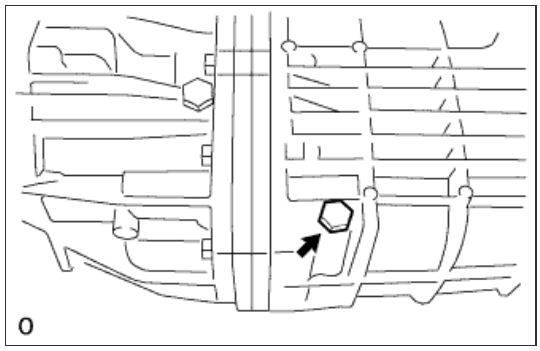
15. REMOVE LOWER TRANSFER CASE PROTECTOR

a. Remove the 7 bolts and lower transfer case protector.



16. DRAIN MANUAL TRANSMISSION OIL

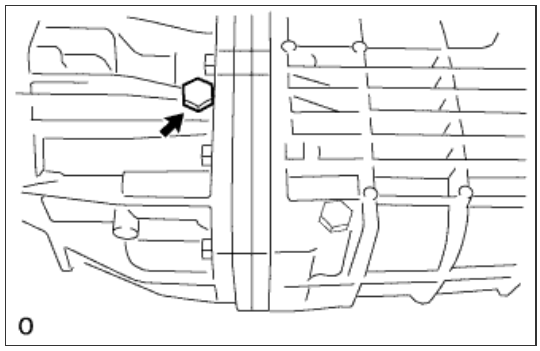
a. Remove the drain plug and gasket and then drain the manual transmission oil.



b. Remove the filler plug and gasket.

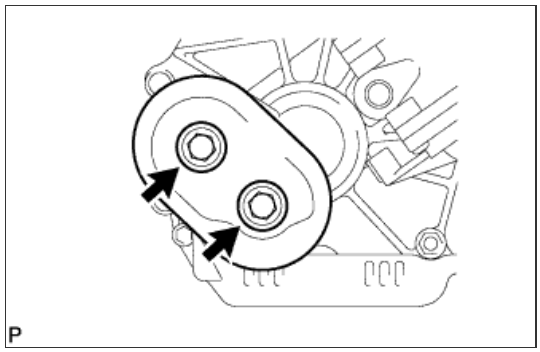
c. Install a new gasket and the drain plug.

Torque:
37 N*m{ 380 kgf*cm , 27 ft.*lbf }

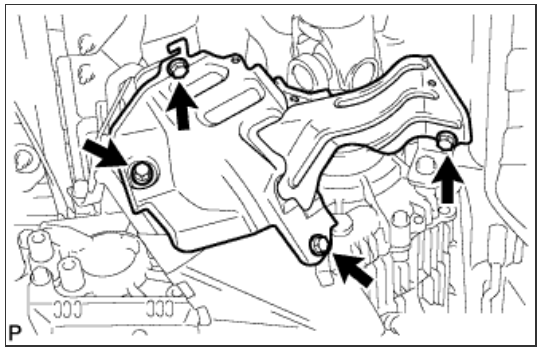


17. DRAIN TRANSFER OIL

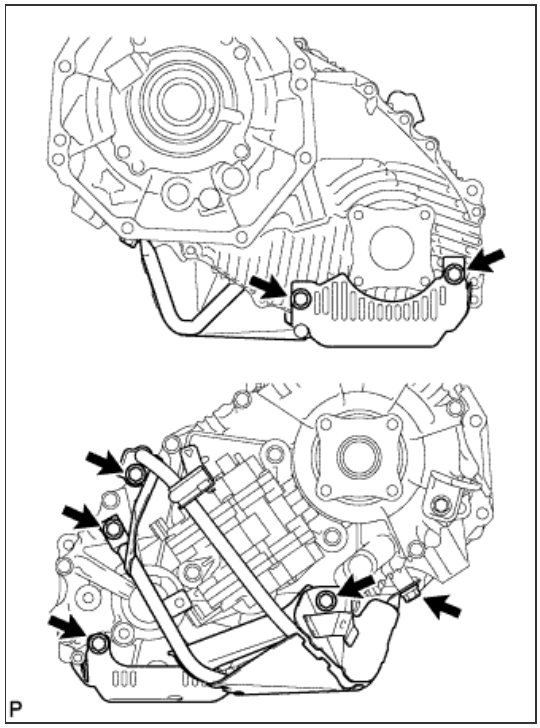
a. except 1GR-FE:
Remove the 2 bolts and transfer dynamic damper.



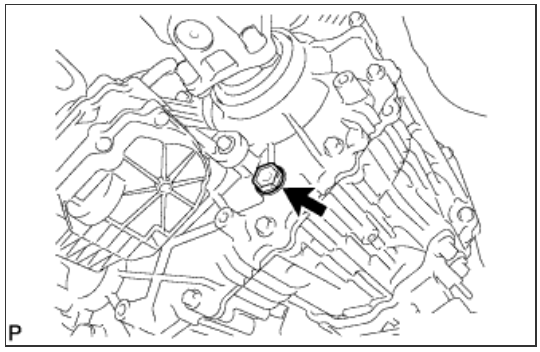
b. Remove the 4 bolts and transfer heat insulator.



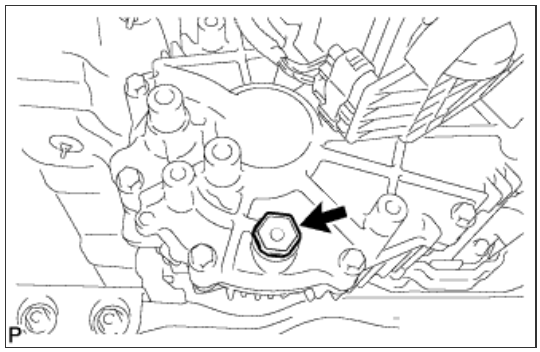
c. Remove the 7 bolts and lower transfer case protector.



d. Remove the filler plug and gasket.



e. Remove the drain plug and gasket, and drain the transfer oil.



18. REMOVE PROPELLER SHAFT ASSEMBLY

(Click here)

19. REMOVE FRONT PROPELLER SHAFT ASSEMBLY

(Click here)

20. REMOVE EXHAUST PIPE (for 1GR-FE)

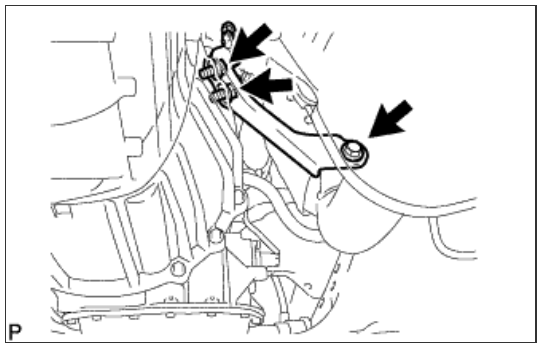
(Click here)

21. REMOVE EXHAUST PIPE (for 1VD-FTV)

w/o DPF: (Click here)
w/ DPF: (Click here)

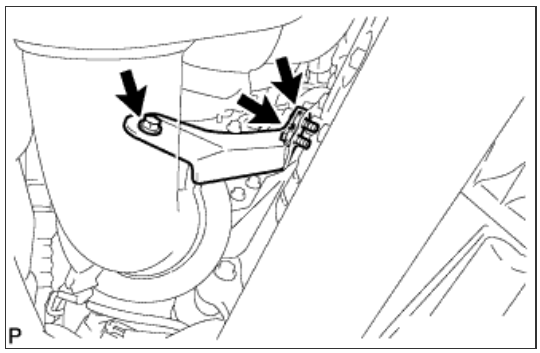
22. REMOVE MANIFOLD STAY (for 1GR-FE)

a. Remove the 3 bolts and manifold stay.



23. REMOVE NO. 2 MANIFOLD STAY (for 1GR-FE)

a. Remove the 3 bolts and No. 2 manifold stay.



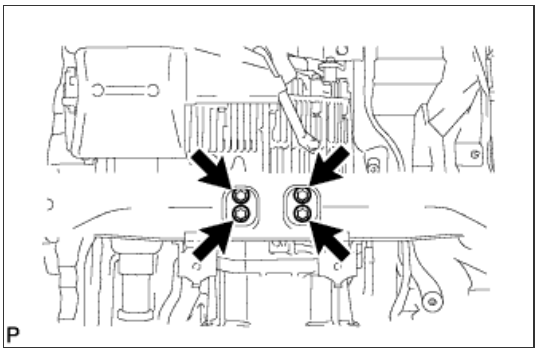
24. REMOVE STARTER ASSEMBLY (for 1GR-FE)

(Click here)

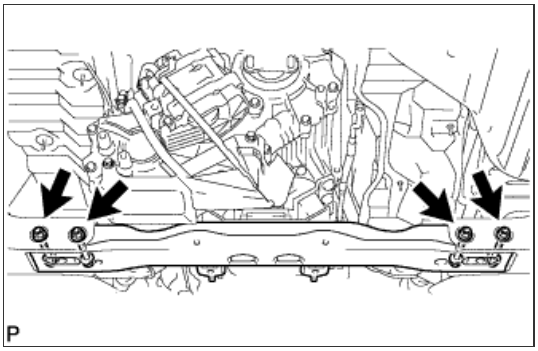
25. REMOVE NO. 2 FRAME CROSSMEMBER SUB-ASSEMBLY

a. Support the transmission with a transmission jack. Lift the transmission slightly from the crossmember.

b. Remove the 4 bolts of the rear engine mounting insulator.

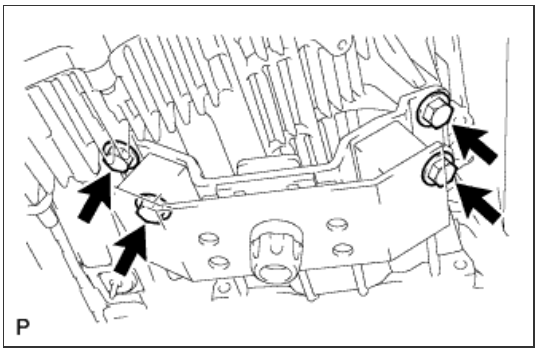


c. Remove the 4 bolts, 4 nuts, 4 washers and frame crossmember.



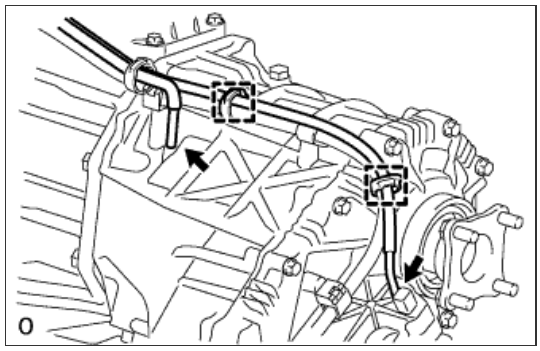
26. REMOVE REAR NO. 1 ENGINE MOUNTING INSULATOR

a. Remove the 4 bolts and engine mounting insulator.

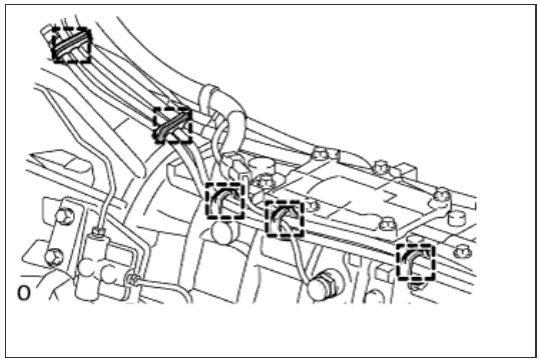


27. REMOVE TRANSFER BREATHER HOSE SUB-ASSEMBLY (for 1GR-FE)

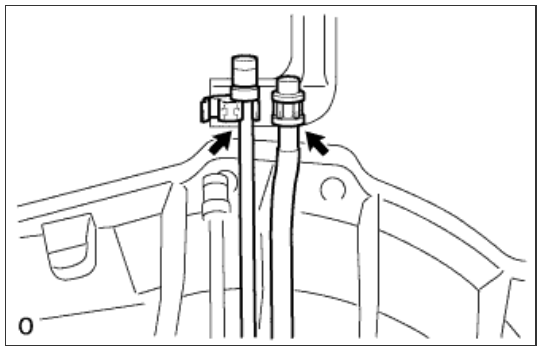
a. Disconnect the breather hose from the transfer and actuator, and disconnect the 2 clamps.



b. Disconnect the 5 clamps.

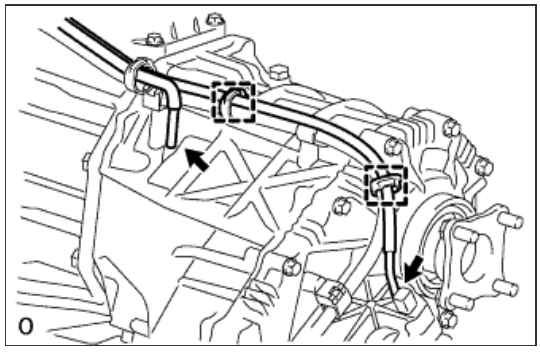


c. Disconnect the 2 breather hoses from the bracket.

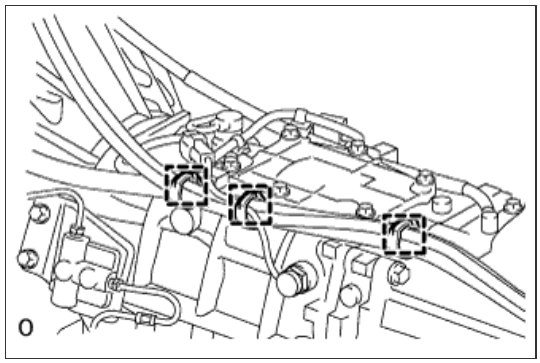


28. REMOVE TRANSFER BREATHER HOSE SUB-ASSEMBLY (for 1VD-FTV)

a. Disconnect the breather hose from the transfer and actuator, and disconnect the 2 clamps.

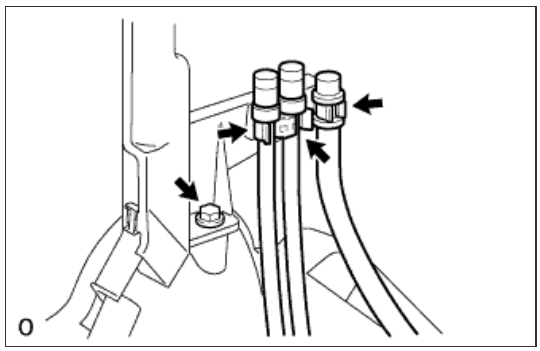


b. Disconnect the 3 clamps.



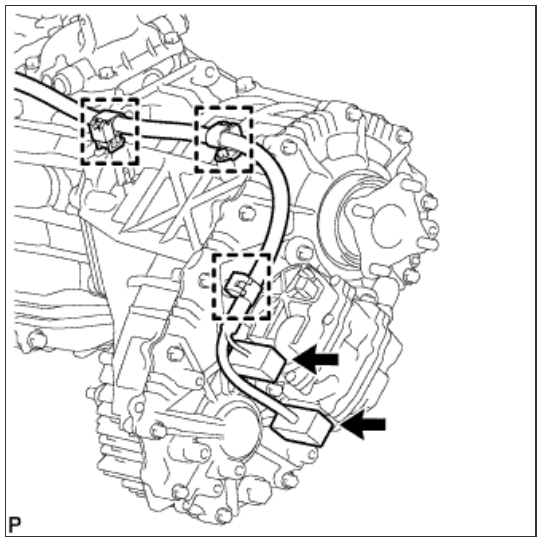
c. Disconnect the 3 breather hoses from the bracket.

d. Remove the bolt and disconnect the bracket from the transmission.



29. DISCONNECT WIRE HARNESS (for 1GR-FE)

a. Disconnect the 2 connectors and 3 clamps.

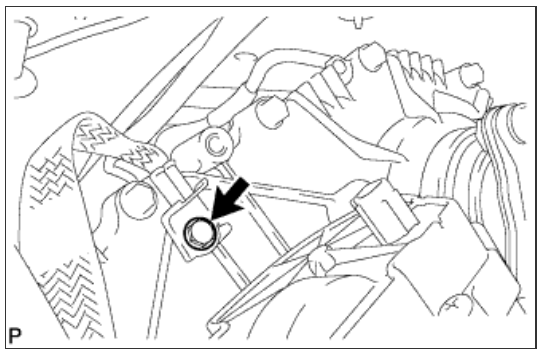


b. Remove the bolt and disconnect the ground cable.

c. Tilt the transmission downward.

NOTICE:

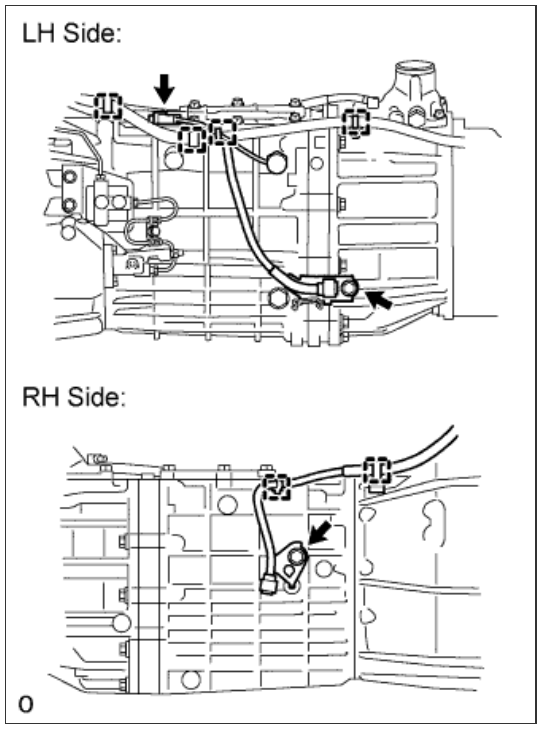
Make sure the cooling fan does not contact the fan shroud.



d. Remove the 2 bolts.

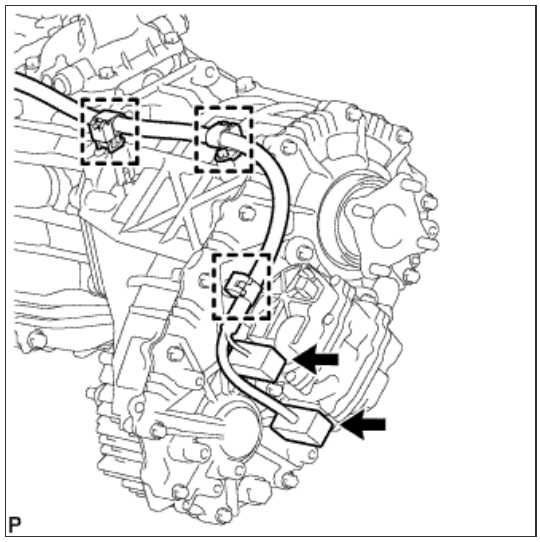
e. Disconnect the back-up light switch connector.

f. Disconnect the 6 clamps.



30. DISCONNECT WIRE HARNESS (for 1VD-FTV)

a. Disconnect the 2 connectors and 3 clamps.

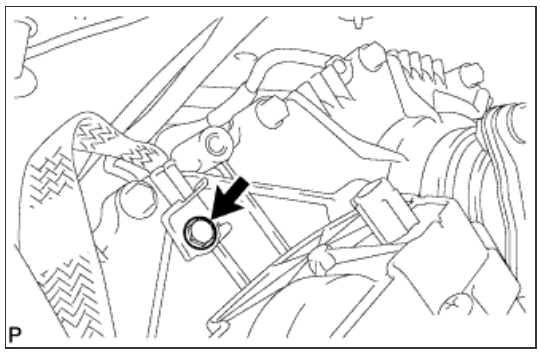


b. Remove the bolt and disconnect the ground cable.

c. Tilt the transmission downward.

NOTICE:

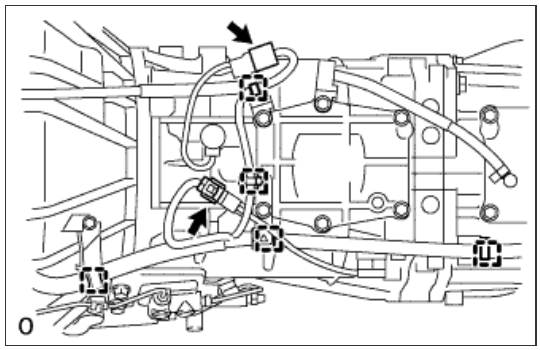
Make sure the cooling fan does not contact the fan shroud.



d. Disconnect the shift position switch connector.

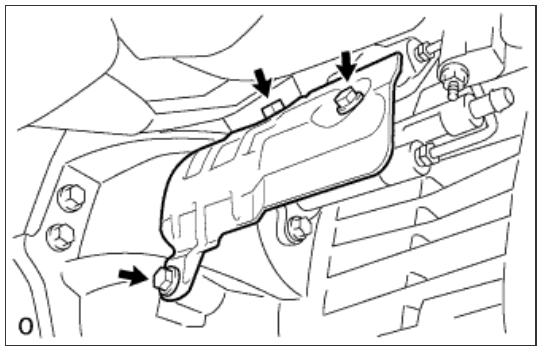
e. Disconnect the back-up light switch connector.

f. Disconnect the 5 clamps.



31. REMOVE NO. 1 CLUTCH HOUSING COVER

a. Remove the 3 bolts and clutch housing cover.



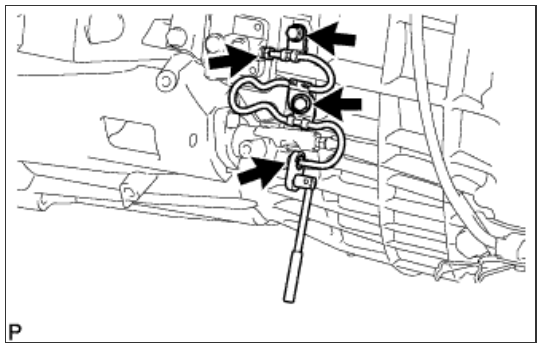
32. REMOVE CLUTCH RELEASE CYLINDER TO ACCUMULATOR TUBE

a. Using a union nut wrench, disconnect the tube.

HINT:

Use a container to catch the fluid.

b. Remove the 2 bolts and tube.

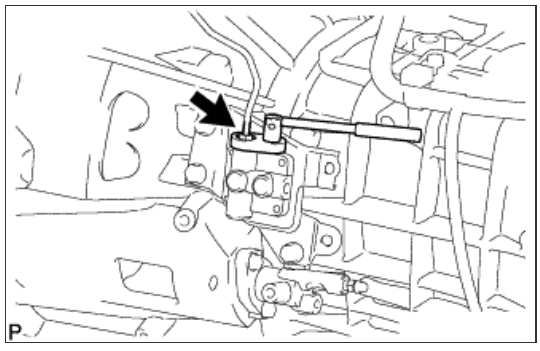


33. REMOVE CLUTCH ACCUMULATOR ASSEMBLY

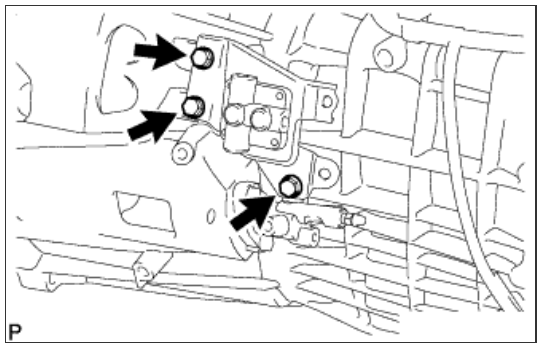
a. Using a union nut wrench, disconnect the flexible hose tube.

HINT:

Use a container to catch the fluid.

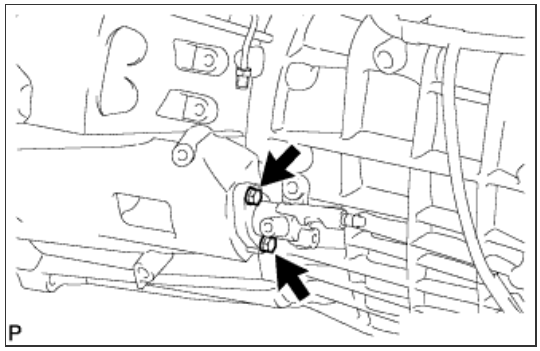


b. Remove the 3 bolts and clutch accumulator.



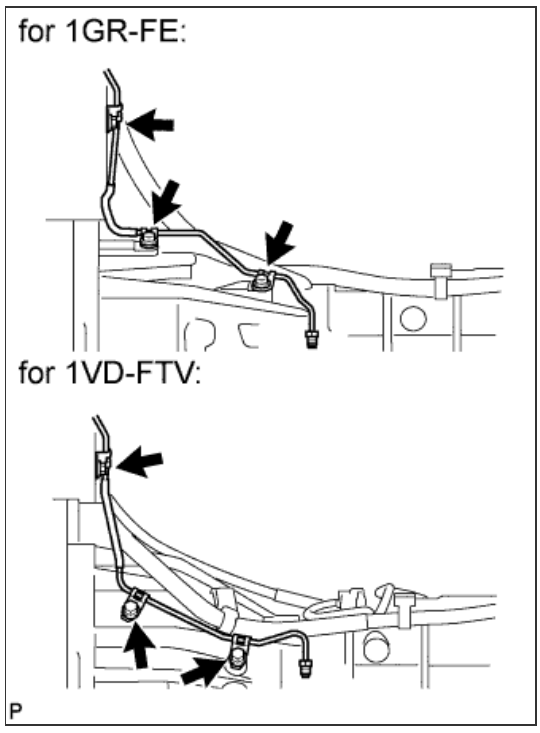
34. REMOVE CLUTCH RELEASE CYLINDER ASSEMBLY

a. Remove the 2 bolts and pull out the clutch release cylinder.



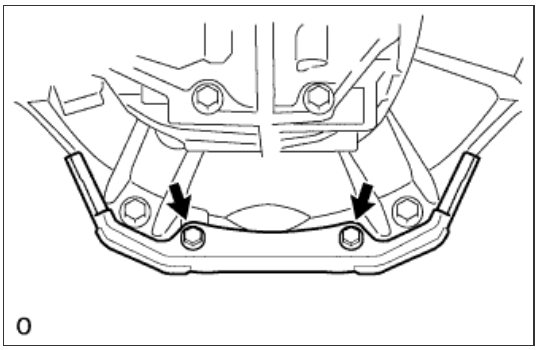
35. REMOVE CLUTCH RELEASE CYLINDER TO FLEXIBLE HOSE TUBE

a. Remove the 3 bolts and flexible hose tube.



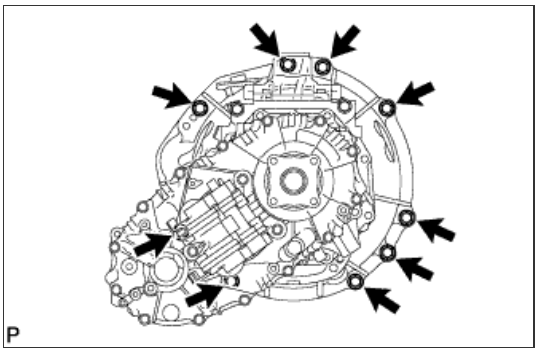
36. REMOVE OIL PAN COVER (for 1VD-FTV)

a. Remove the 2 bolts and oil pan cover.



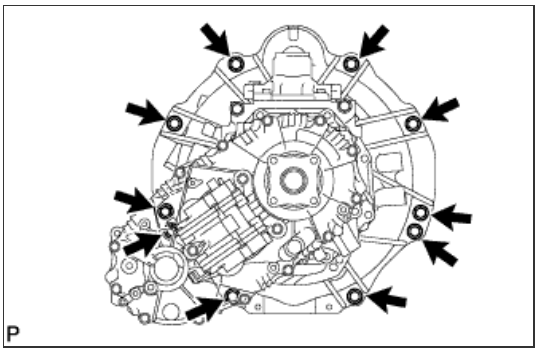
37. REMOVE MANUAL TRANSMISSION WITH TRANSFER (for 1GR-FE)

a. Remove the 9 bolts and manual transmission with transfer.



38. REMOVE MANUAL TRANSMISSION WITH TRANSFER (for 1VD-FTV)

a. Remove the 10 bolts and manual transmission with transfer.



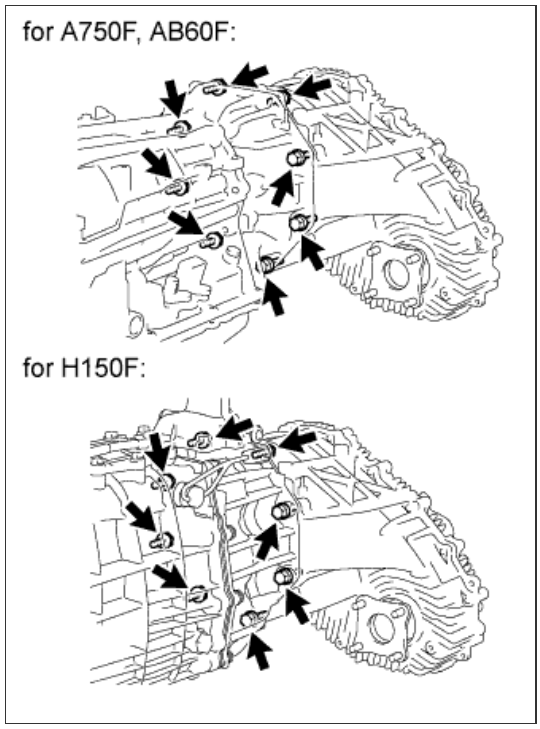
39. REMOVE TRANSFER ASSEMBLY

a. Remove the 8 transfer adaptor rear mounting bolts.

b. Pull the transfer straight up and remove it from the transmission.

NOTICE:

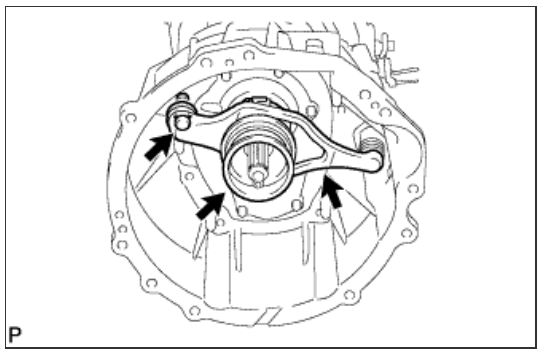
Take care not to damage the adaptor oil seal with the transfer input shaft spline.



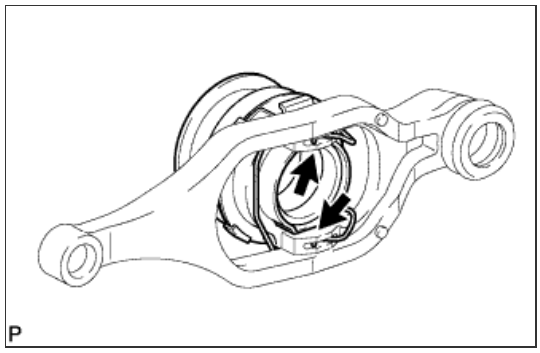
40. REMOVE CLUTCH RELEASE FORK SUB-ASSEMBLY

a. Remove the clutch release fork with the clutch release bearing from the transmission unit.

b. Remove the release fork support from the transmission unit.



c. Remove the clip and release bearing from the clutch release fork.

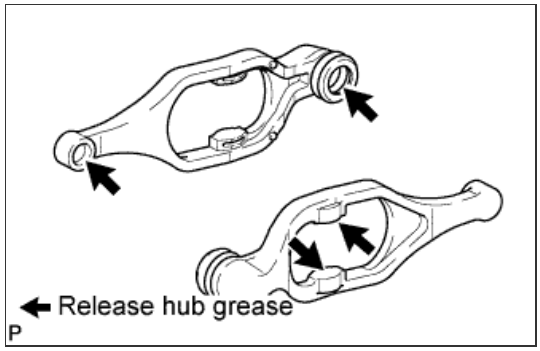


for Preparation Click here

1. INSTALL CLUTCH RELEASE FORK SUB-ASSEMBLY

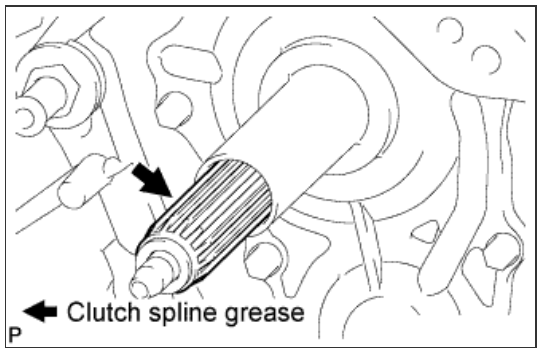
a. Apply release hub grease to the release fork, release bearing, push rod contact point and pivot points shown in the illustration.

Grease:
Toyota Genuine Release Hub Grease or equivalent

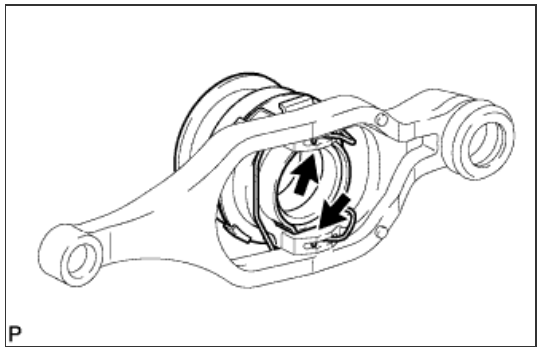


b. Apply clutch spline grease to the input shaft spline.

Grease:
Toyota Genuine Clutch Spline Grease or equivalent



c. Install the release bearing to the clutch release fork with the clip.



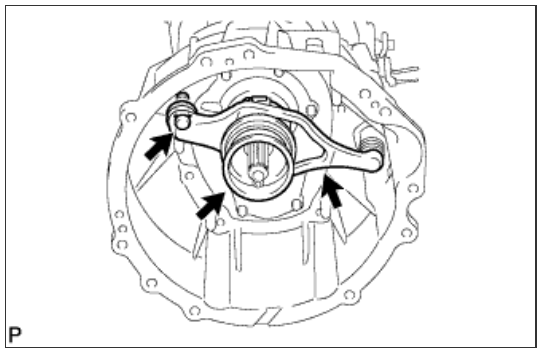
d. Install the release fork support to the transmission unit.

Torque:
47 N*m{ 480 kgf*cm , 35 ft.*lbf }

e. Install the clutch release fork with the clutch release bearing to the transmission unit.

HINT:

After installation, move the fork back and forth to check that the release bearing slides smoothly.



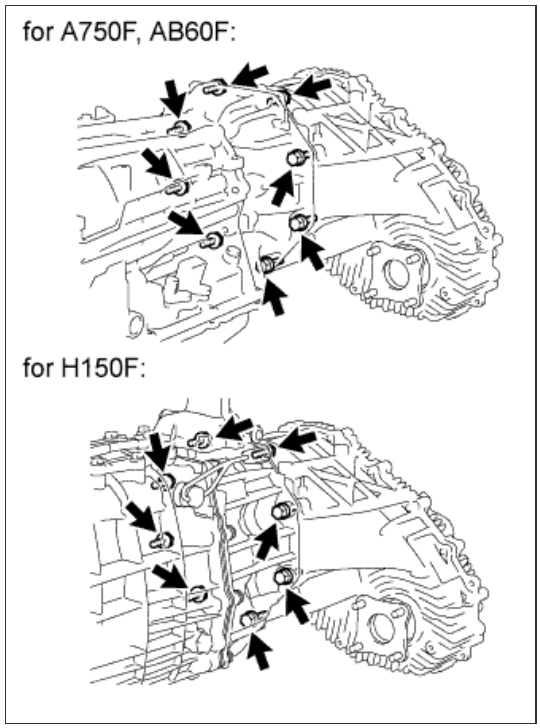
2. INSTALL TRANSFER ASSEMBLY

a. Install the transfer with the 8 bolts.

Torque:
40 N*m{ 408 kgf*cm , 30 ft.*lbf }

NOTICE:

Take care not to damage the adaptor oil seal with the transfer input shaft spline.



3. INSTALL MANUAL TRANSMISSION WITH TRANSFER (for 1GR-FE)

NOTICE:

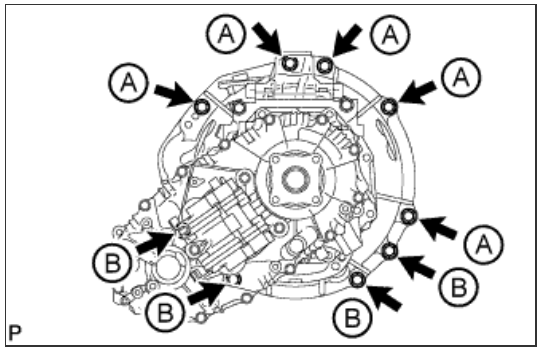
Check that the 2 straight pins are attached to the engine side.

a. Install the manual transmission with transfer with the 9 bolts.

Torque:
for bolt A:
72 N*m{ 730 kgf*cm , 53 ft.*lbf }
for bolt B:
37 N*m{ 380 kgf*cm , 28 ft.*lbf }

Bolt Length:

Item	Length
Bolt A	50 mm (1.97 in.)
Bolt B	45 mm (1.77 in.)



4. INSTALL MANUAL TRANSMISSION WITH TRANSFER (for 1VD-FTV)

NOTICE:

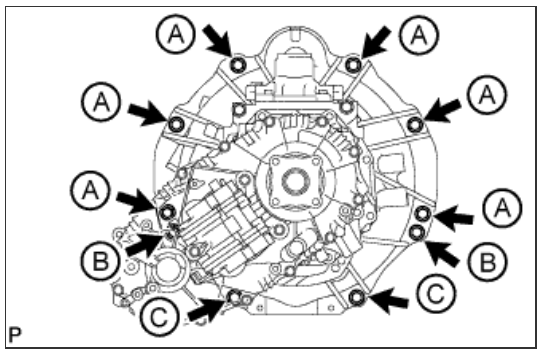
Check that the 2 straight pins are attached to the engine side.

a. Install the manual transmission with transfer with the 10 bolts.

Torque:
for bolt A and B:
72 N*m{ 730 kgf*cm , 53 ft.*lbf }
for bolt C:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }

Bolt Length:

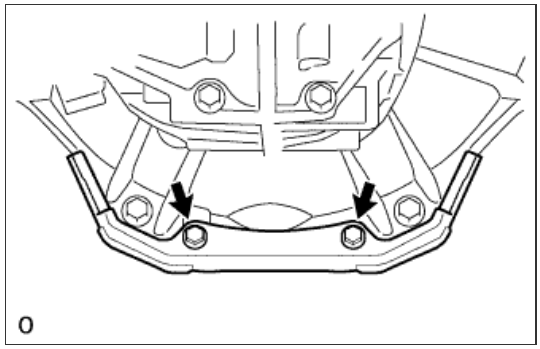
Item	Length
Bolt A	45 mm (1.77 in.)
Bolt B	50 mm (1.97 in.)
Bolt C	70 mm (2.76 in.)



5. INSTALL OIL PAN COVER (for 1VD-FTV)

a. Install the oil pan cover with the 2 bolts.

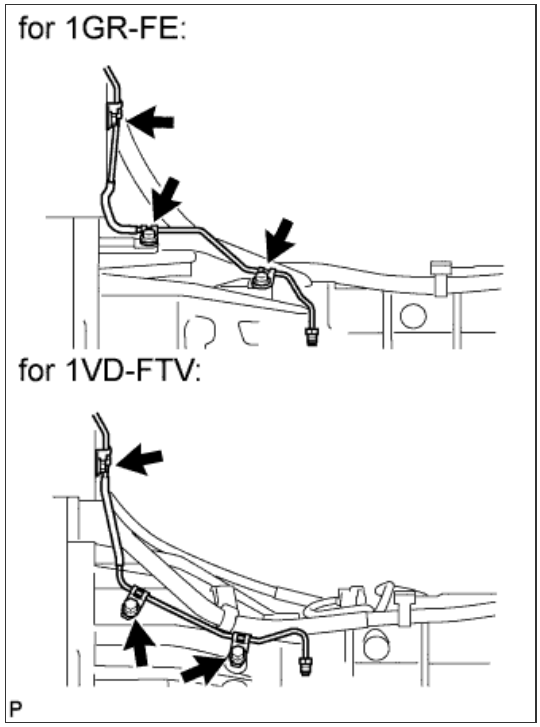
Torque:
21 N*m{ 214 kgf*cm , 15 ft.*lbf }



6. INSTALL CLUTCH RELEASE CYLINDER TO FLEXIBLE HOSE TUBE

a. Install the flexible hose tube with the 3 bolts.

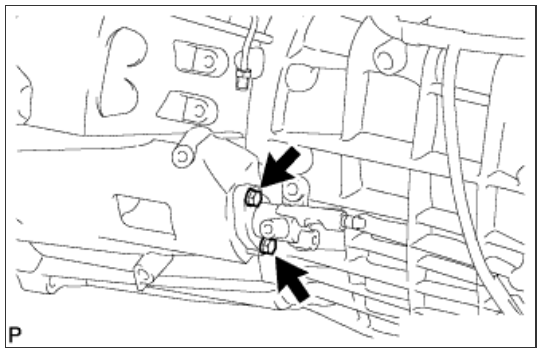
Torque:
20 N*m{ 204 kgf*cm , 15 ft.*lbf }



7. INSTALL CLUTCH RELEASE CYLINDER ASSEMBLY

a. Install the clutch release cylinder with the 2 bolts.

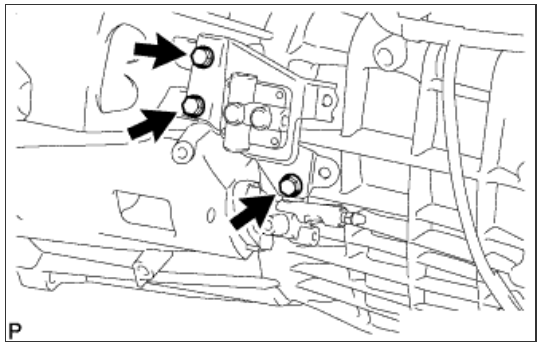
Torque:
12 N*m{ 120 kgf*cm , 9 ft.*lbf }



8. INSTALL CLUTCH ACCUMULATOR ASSEMBLY

a. Install the clutch accumulator with the 3 bolts.

Torque:
12 N*m{ 120 kgf*cm , 9 ft.*lbf }

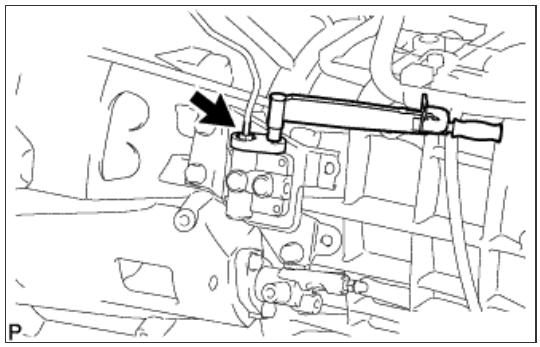


b. Using a union nut wrench, connect the flexible hose tube.

Torque:
15 N*m{ 155 kgf*cm , 11 ft.*lbf }

NOTICE:

Use the formula to calculate special torque values for situations where a union nut wrench is combined with a torque wrench (Click here).



9. INSTALL CLUTCH RELEASE CYLINDER TO ACCUMULATOR TUBE

a. Using a union nut wrench, connect the tube to the clutch accumulator and release cylinder.

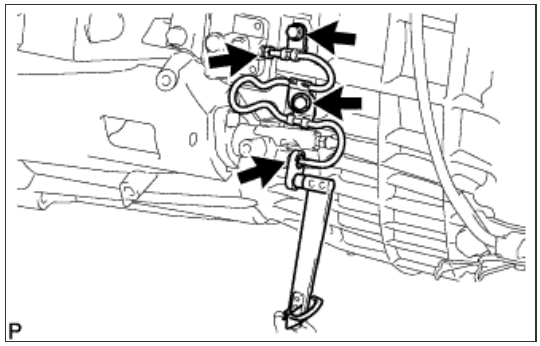
Torque:
16 N*m{ 158 kgf*cm , 11 ft.*lbf }

NOTICE:

Use the formula to calculate special torque values for situations where a union nut wrench is combined with a torque wrench (Click here).

b. Install the tube with the 2 bolts.

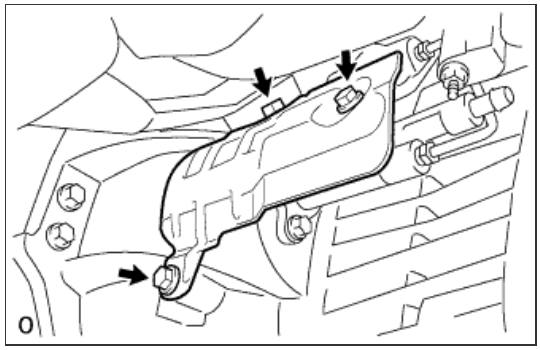
Torque:
12 N*m{ 120 kgf*cm , 9 ft.*lbf }



10. INSTALL NO. 1 CLUTCH HOUSING COVER

a. Install the housing cover with the 3 bolts.

Torque:
12 N*m{ 120 kgf*cm , 9 ft.*lbf }



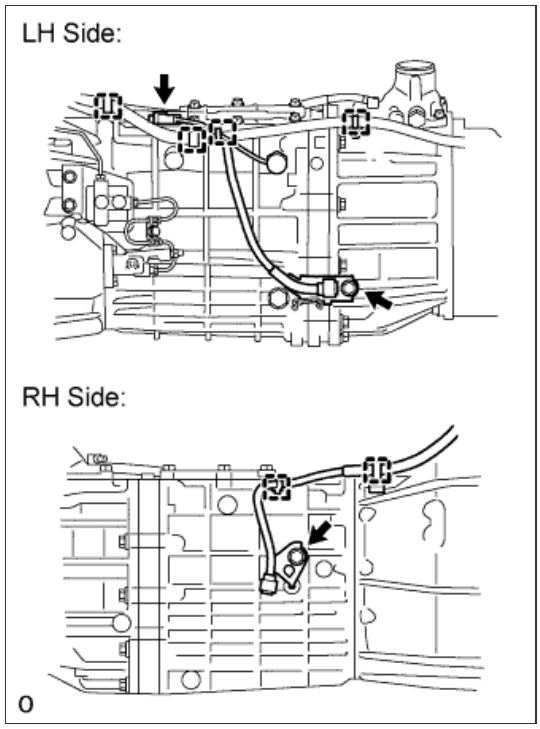
11. CONNECT WIRE HARNESS (for 1GR-FE)

a. Connect the 6 clamps.

b. Connect the back-up light switch connector.

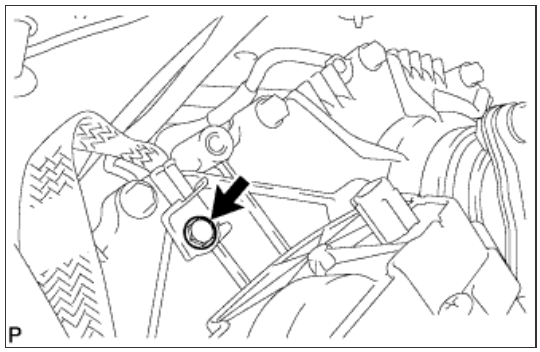
c. Install the 2 bolts.

Torque:
for LH side:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }
for RH side:
60 N*m{ 612 kgf*cm , 44 ft.*lbf }

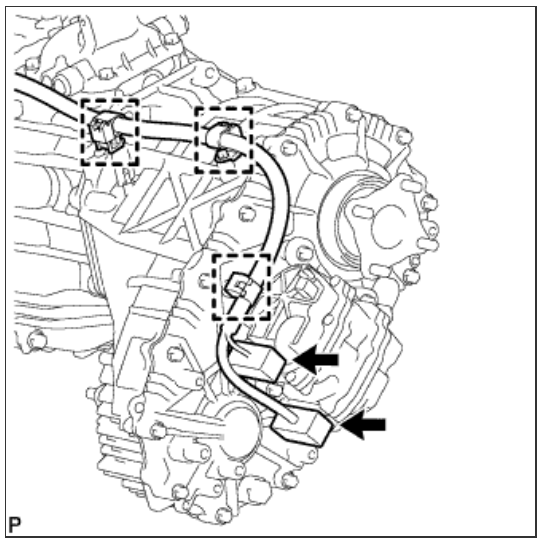


d. Connect the ground cable with the bolt.

Torque:
8.0 N*m{ 82 kgf*cm , 71 in.*lbf }



e. Connect the 2 connectors and 3 clamps.

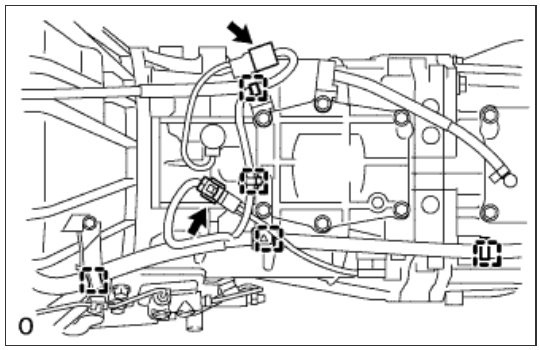


12. CONNECT WIRE HARNESS (for 1VD-FTV)

a. Connect the 5 clamps.

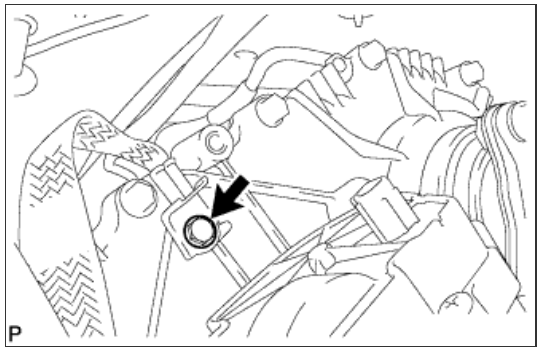
b. Connect the back-up light switch connector.

c. Connect the shift position switch connector.

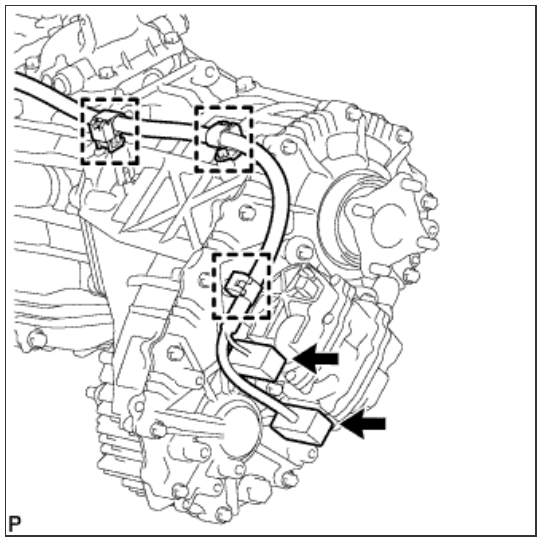


d. Connect the ground cable with the bolt.

Torque:
8.0 N*m{ 82 kgf*cm , 71 in.*lbf }

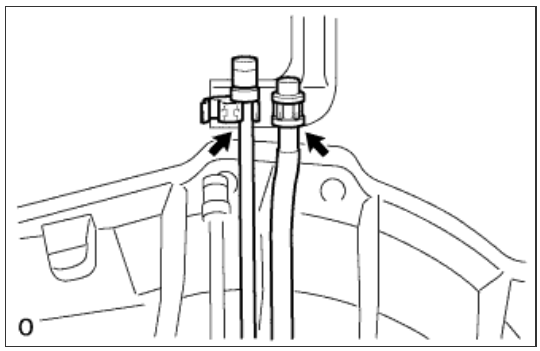


e. Connect the 2 connectors and 3 clamps.

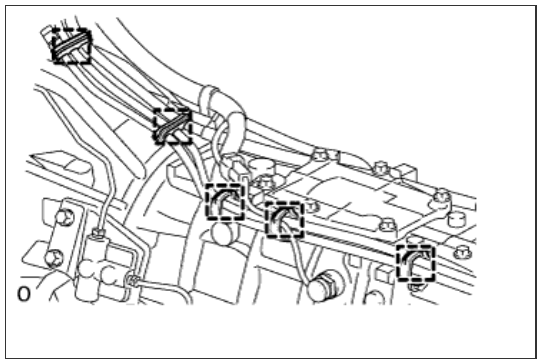


13. INSTALL TRANSFER BREATHER HOSE SUB-ASSEMBLY (for 1GR-FE)

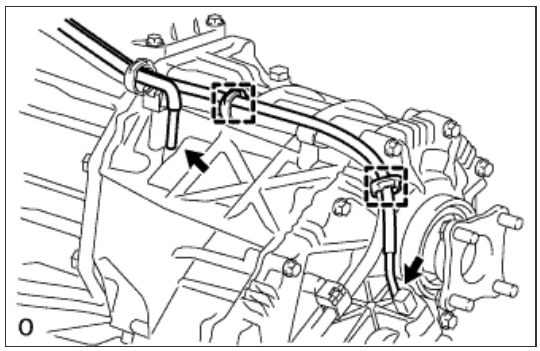
a. Connect the 2 breather hoses to the bracket.



b. Connect the 5 clamps.



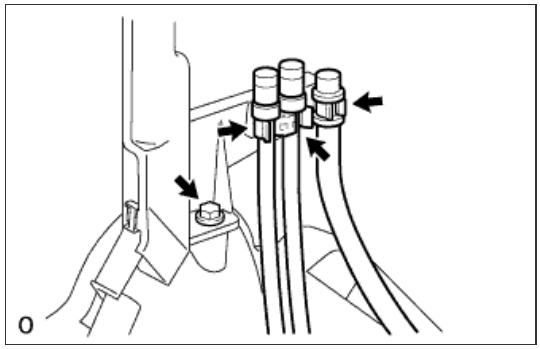
c. Connect the breather hose to the transfer and actuator, and attach the 2 clamps.



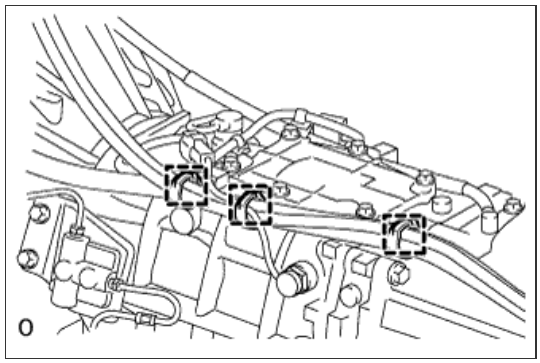
14. INSTALL TRANSFER BREATHER HOSE SUB-ASSEMBLY (for 1VD-FTV)

a. Install the bracket with the bolt.

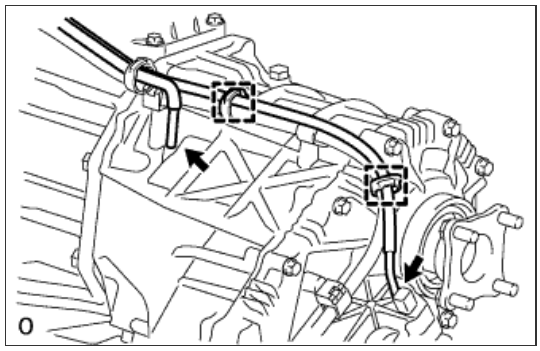
b. Connect the 3 breather hoses to the bracket.



c. Connect the 3 clamps.



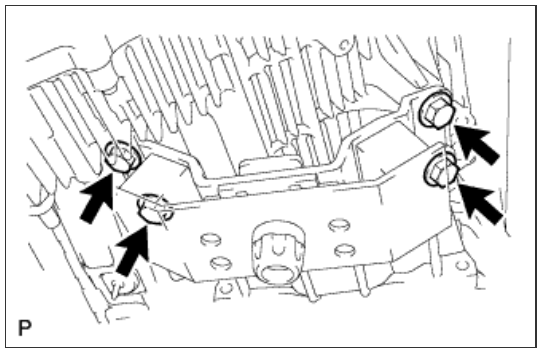
d. Connect the breather hose to the transfer and actuator, and attach the 2 clamps.



15. INSTALL REAR NO. 1 ENGINE MOUNTING INSULATOR

a. Install the engine mounting insulator to the transmission with the 4 bolts.

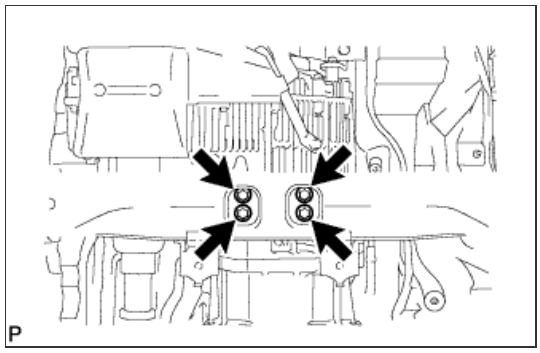
Torque:
59 N*m{ 602 kgf*cm , 44 ft.*lbf }



16. INSTALL NO. 2 FRAME CROSSMEMBER SUB-ASSEMBLY

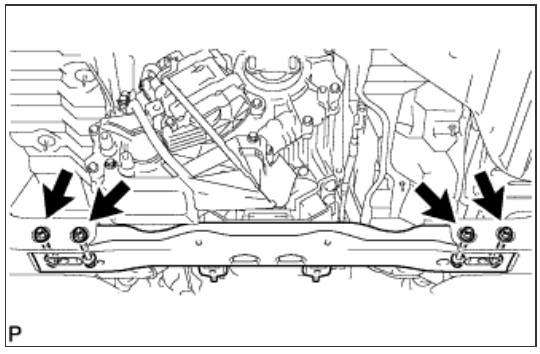
a. Install the frame crossmember to the rear engine mounting insulator with the 4 bolts.

Torque:
37 N*m{ 377 kgf*cm , 27 ft.*lbf }



b. Install the frame crossmember to the vehicle body with the 4 bolts, 4 washers and 4 nuts.

Torque:
110 N*m{ 1,122 kgf*cm , 81 ft.*lbf }



17. INSTALL STARTER ASSEMBLY (for 1GR-FE)

(Click here)

18. INSTALL NO. 2 MANIFOLD STAY (for 1GR-FE)

a. Install the No. 2 manifold stay with the 3 bolts.

Torque:
40 N*m{ 408 kgf*cm , 30 ft.*lbf }

19. INSTALL MANIFOLD STAY (for 1GR-FE)

a. Install the manifold stay with the 3 bolts.

Torque:
40 N*m{ 408 kgf*cm , 30 ft.*lbf }

20. INSTALL EXHAUST PIPE (for 1GR-FE)

(Click here)

21. INSTALL EXHAUST PIPE (for 1VD-FTV)

w/o DPF: (Click here)
w/ DPF: (Click here)

22. INSTALL FRONT PROPELLER SHAFT ASSEMBLY

(Click here)

23. INSTALL PROPELLER SHAFT ASSEMBLY

(Click here)

24. ADD MANUAL TRANSMISSION OIL

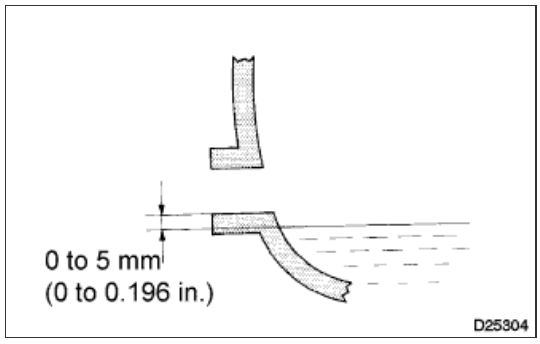
25. INSPECT TRANSMISSION OIL

a. Park the vehicle in a level place.

b. Check that the oil level is within 5 mm (0.196 in.) of the lowest point of the transmission filler plug opening.

NOTICE:

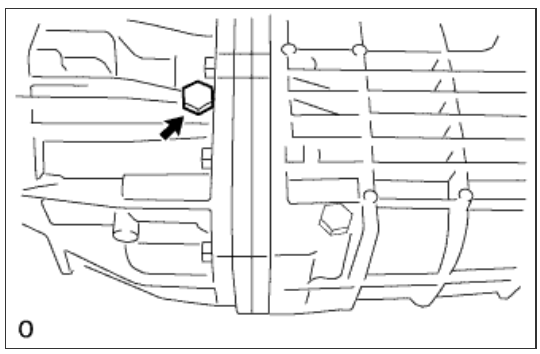
- **Problems may occur when the oil level is too high or low.**
- **After replacing the oil, drive the vehicle and check the oil level again.**



c. Inspect for oil leaks when the oil level is low.

d. Install a new gasket and the filler plug.

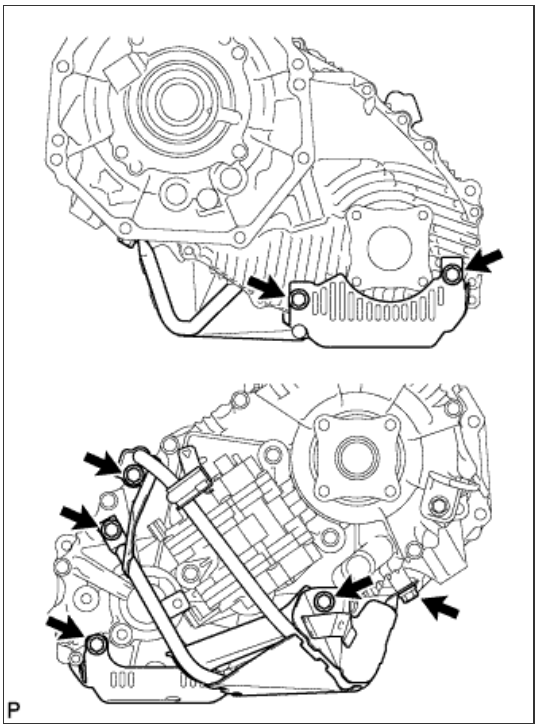
Torque:
37 N*m{ 380 kgf*cm , 27 ft.*lbf }



26. INSTALL LOWER TRANSFER CASE PROTECTOR

a. Install the lower transfer case protector with the 7 bolts.

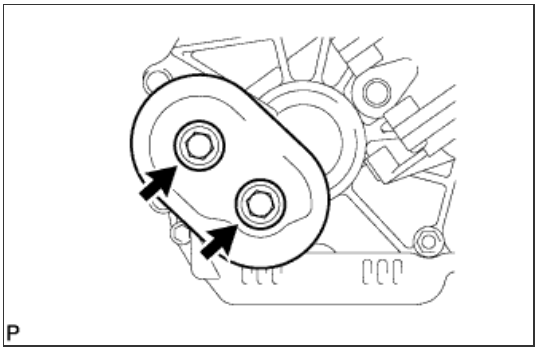
Torque:
14 N*m{ 139 kgf*cm , 10 ft.*lbf }



27. INSTALL TRANSFER DYNAMIC DAMPER (for 1VD-FTV)

a. Install the transfer dynamic damper with the 2 bolts.

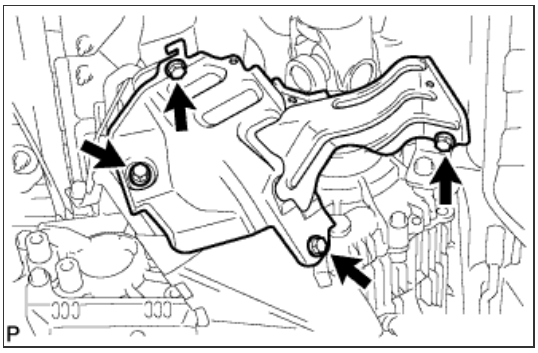
Torque:
12 N*m{ 122 kgf*cm , 9 ft.*lbf }



28. INSTALL TRANSFER HEAT INSULATOR

a. Install the insulator with the 4 bolts.

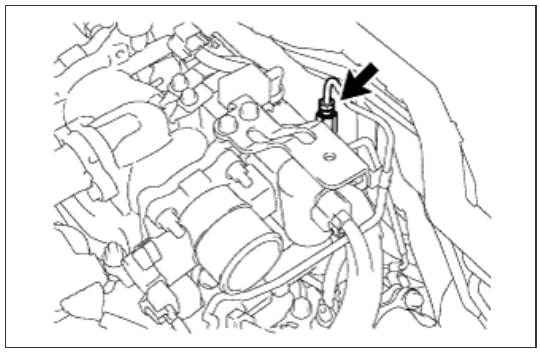
Torque:
30 N*m{ 306 kgf*cm , 22 ft.*lbf }



29. INSTALL TUBE CONNECTOR TO FLEXIBLE HOSE TUBE (for 1VD-FTV)

a. Temporarily install the flare nut of the tube connector to flexible hose tube to the

clutch tube to release cylinder 2 way by hand.



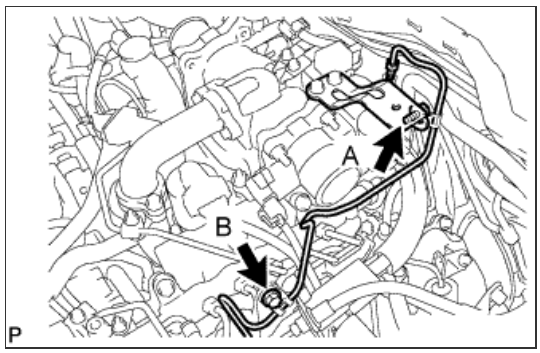
b. Temporarily install the tube connector to flexible hose tube with the 2 bolts.

c. Tighten the bolt labeled A.

Torque:
20 N*m{ 204 kgf*cm , 15 ft.*lbf }

NOTICE:

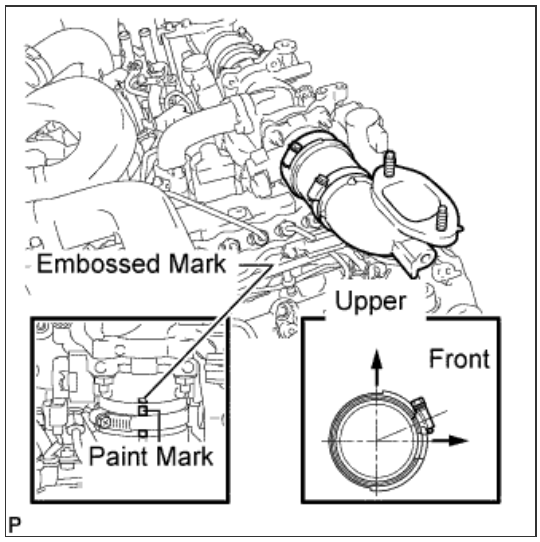
Tighten the bolt labeled B after installing the clutch hose.



30. INSTALL AIR TUBE SUB-ASSEMBLY LH (for 1VD-FTV)

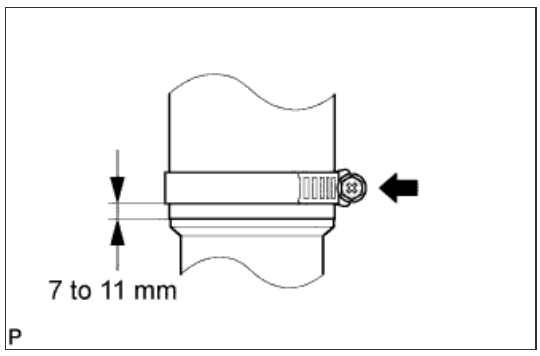
a. Install the air tube to the throttle body.

b. Align the embossed mark of the throttle body with the paint mark of the No. 4 air hose.



c. Tighten the hose clamp so that it is 7 to 11 mm (0.276 to 0.433 in.) from the end of the hose as shown in the illustration.

Torque:
6.3 N*m{ 64 kgf*cm , 56 in.*lbf }



31. INSTALL CLUTCH HOSE (for 1VD-FTV)

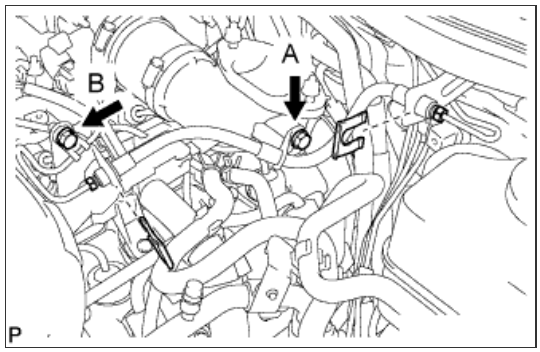
a. Connect the clutch hose to the air tube with the bolt labeled A.

b. Temporarily install the clutch hose to the clutch master cylinder tube to flexible hose tube and tube connector to flexible hose tube, and fix it in place with the 2 clips.

Torque:
20 N*m{ 204 kgf*cm , 15 ft.*lbf }

c. Tighten the bolt labeled B.

Torque:
20 N*m{ 204 kgf*cm , 15 ft.*lbf }



d. Tighten the flexible hose tube.

NOTICE:

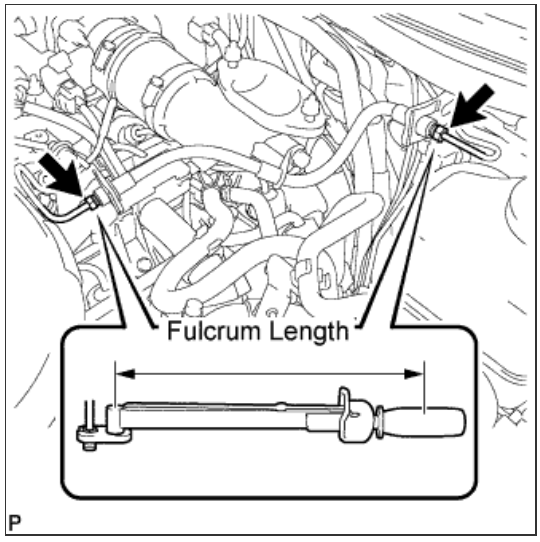
- **Do not bend or damage the flexible hose tube.**
- **Do not allow any foreign matter such as dirt and dust to enter the flexible hose tube from the connecting points.**

HINT:

- **Use a torque wrench with a fulcrum length of 30 cm (11.8 in.). If using a torque wrench with a length that is not 30 cm (11.8 in.), calculate the torque specification for the torque wrench and SST based on the "without SST" torque specification (Click here).**
- **Make sure union nut wrench and the wrench are connected in a straight line.**

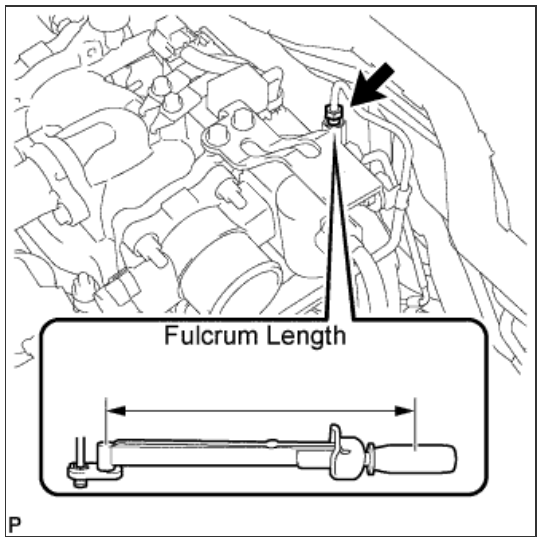
i. Using a 10 mm union nut wrench, tighten the 2 flare nuts of the flexible hose tube.

Torque:
without union nut wrench:
15 N*m{ 154 kgf*cm , 11 ft.*lbf }
with union nut wrench:
14 N*m{ 141 kgf*cm , 10 ft.*lbf }



ii. Using a 10 mm union nut wrench, tighten the flare nut of the flexible hose tube.

Torque:
without union nut wrench:
15 N*m{ 154 kgf*cm , 11 ft.*lbf }
with union nut wrench:
14 N*m{ 141 kgf*cm , 10 ft.*lbf }



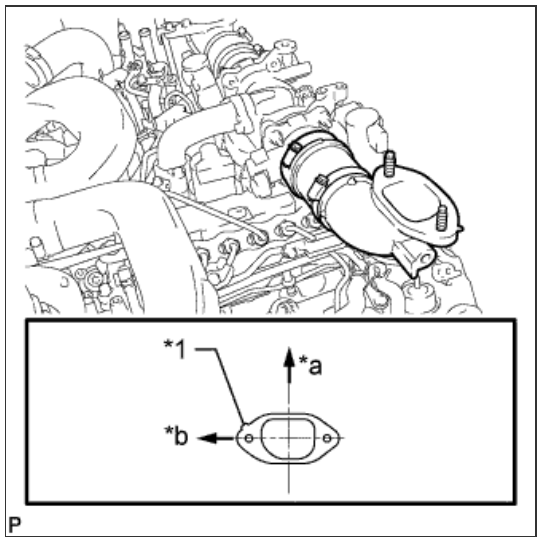
a. Install a new gasket to the air tube LH.

Text in Illustration

*1	Protrusion
*a	Front
*b	LH Side

HINT:

Install the gasket with the protrusion facing as shown in the illustration.



b. Install the No. 2 cool air inlet with the 3 nuts and bolt.

Torque:
21 N*m{ 214 kgf*cm , 15 ft.*lbf }

c. Connect the No. 2 air hose to the No. 2 cool air inlet.

Text in Illustration

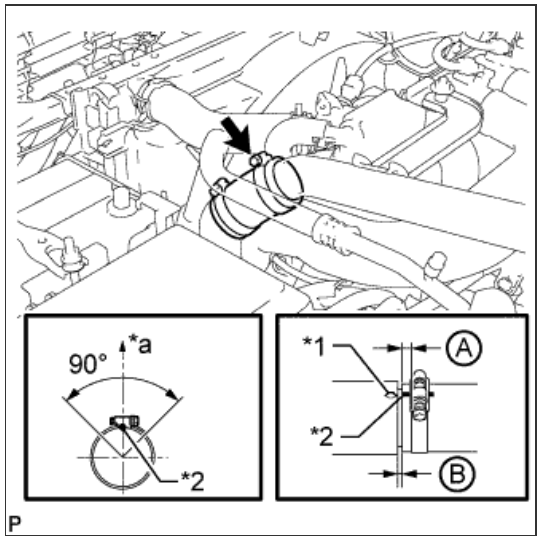
*1	Protrusion
*2	Paint Mark
*a	Top

d. Tighten the No. 2 air hose clamp.

Torque:
6.3 N*m{ 64 kgf*cm , 56 in.*lbf }

HINT:

- **Align the paint mark of the air hose with the protrusion and push on the air hose so that distance B is 0 to 3 mm (0 to 0.118 in.).**
- **Position the clamp so that distance A is 2 to 6 mm (0.0787 to 0.236 in.).**
- **Make sure the direction of the hose clamp is as shown in the illustration.**



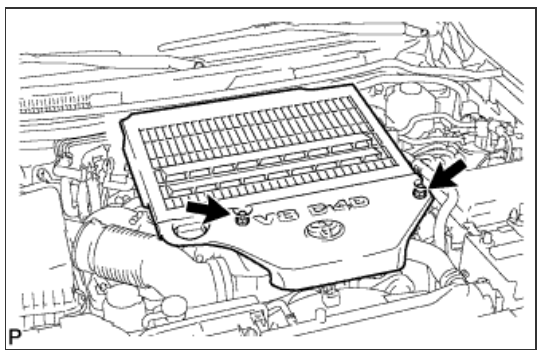
33. INSTALL INTERCOOLER ASSEMBLY (w/ Intercooler)

a. (Click here)

34. INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY

a. Install the engine cover with the 2 nuts.

Torque:
8.0 N*m{ 82 kgf*cm , 71 in.*lbf }



35. INSTALL FLOOR SHIFT LEVER ASSEMBLY

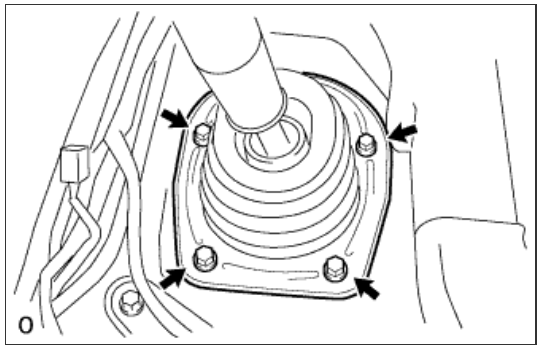
a. Apply MP grease to the tip of the shift lever.

b. Cover the shift lever cap with a cloth.

c. Press down on the shift lever cap and rotate it clockwise to install it.

36. INSTALL SHIFT LEVER BOOT ASSEMBLY

a. Install the shift lever retainer and shift lever boot with the 4 screws.



37. INSTALL UPPER CONSOLE PANEL SUB-ASSEMBLY

w/o Console Box Lid (Click here)
w/ Cool Box (Click here)
w/o Cool Box Click here)

38. FILL RESERVOIR WITH BRAKE FLUID

a. Fill the reservoir with brake fluid.

Brake Fluid:
SAE J1703 or FMVSS No. 116 DOT 3

39. BLEED CLUTCH LINE

a. Remove the release cylinder bleeder plug cap.

b. Connect a vinyl tube to the bleeder plug.

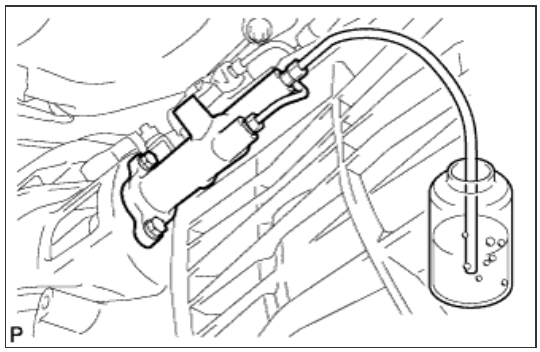
c. Depress the clutch pedal several times, and then loosen the bleeder plug while the pedal is depressed.

d. When fluid no longer comes out, tighten the bleeder plug, and then release the clutch pedal.

e. Repeat the previous 2 steps until all the air in the fluid is completely bled.

f. Tighten the bleeder plug.

Torque:
11 N*m{ 110 kgf*cm , 8 ft.*lbf }



g. Install the bleeder plug cap.

h. Check that all the air has been bled from the clutch line.

40. CHECK FLUID LEVEL IN RESERVOIR

a. Check the fluid level.
If the brake fluid level is low, check for leaks and inspect the disc brake pad. If necessary, refill the reservoir with brake fluid after repair or replacement.

Brake fluid:

SAE J1703 or FMVSS No. 116 DOT 3

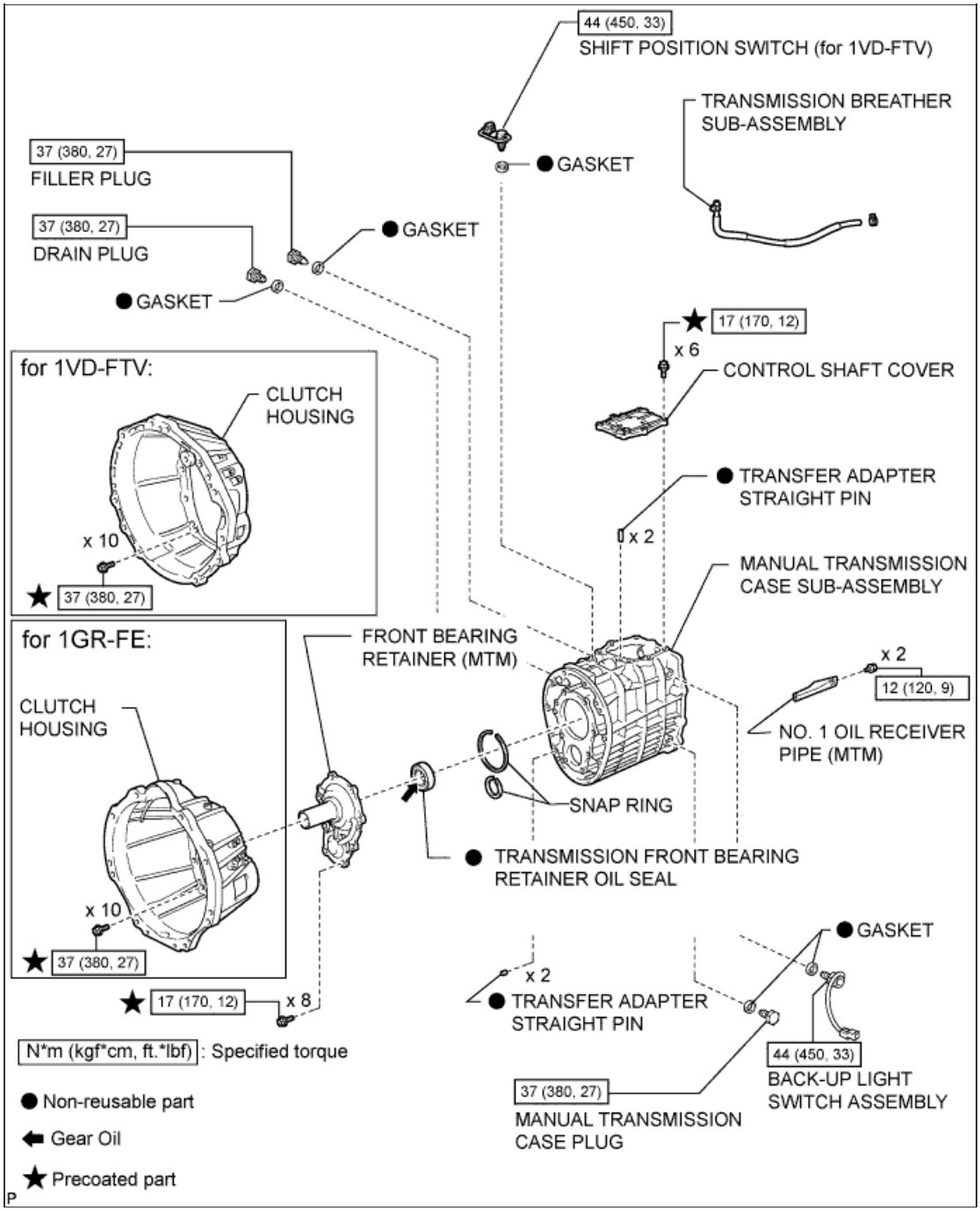
41. INSPECT FOR CLUTCH FLUID LEAK

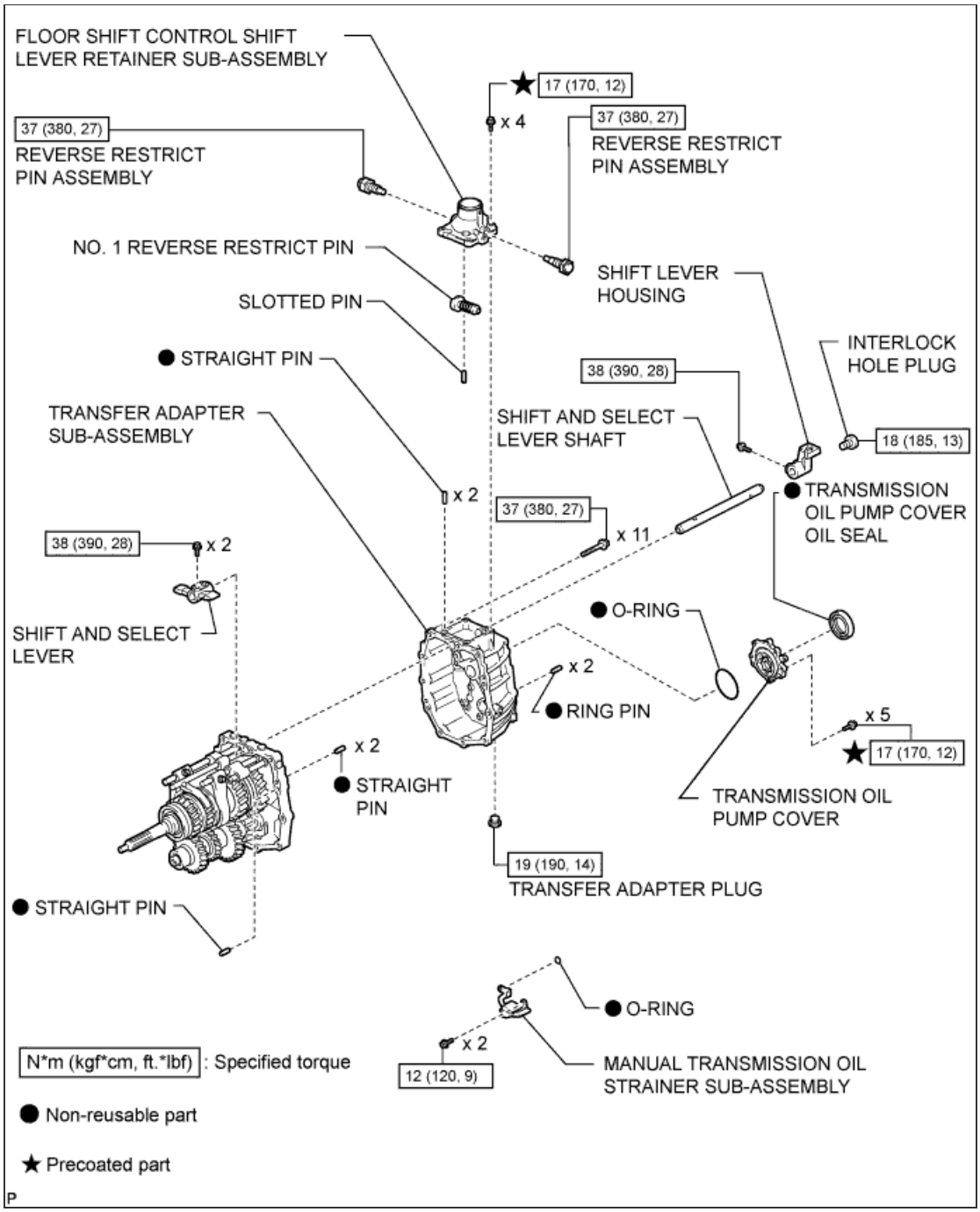
42. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

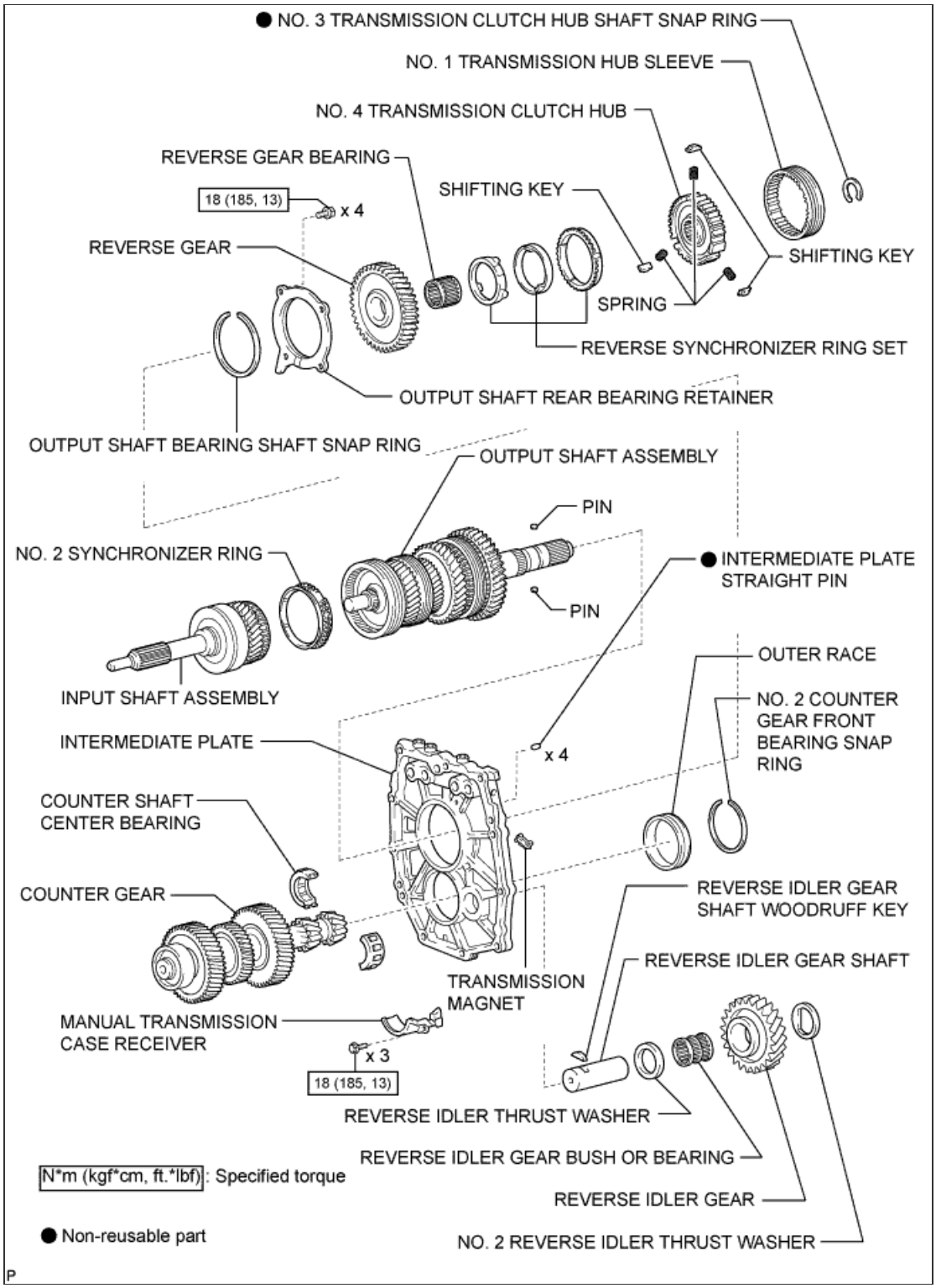
NOTICE:

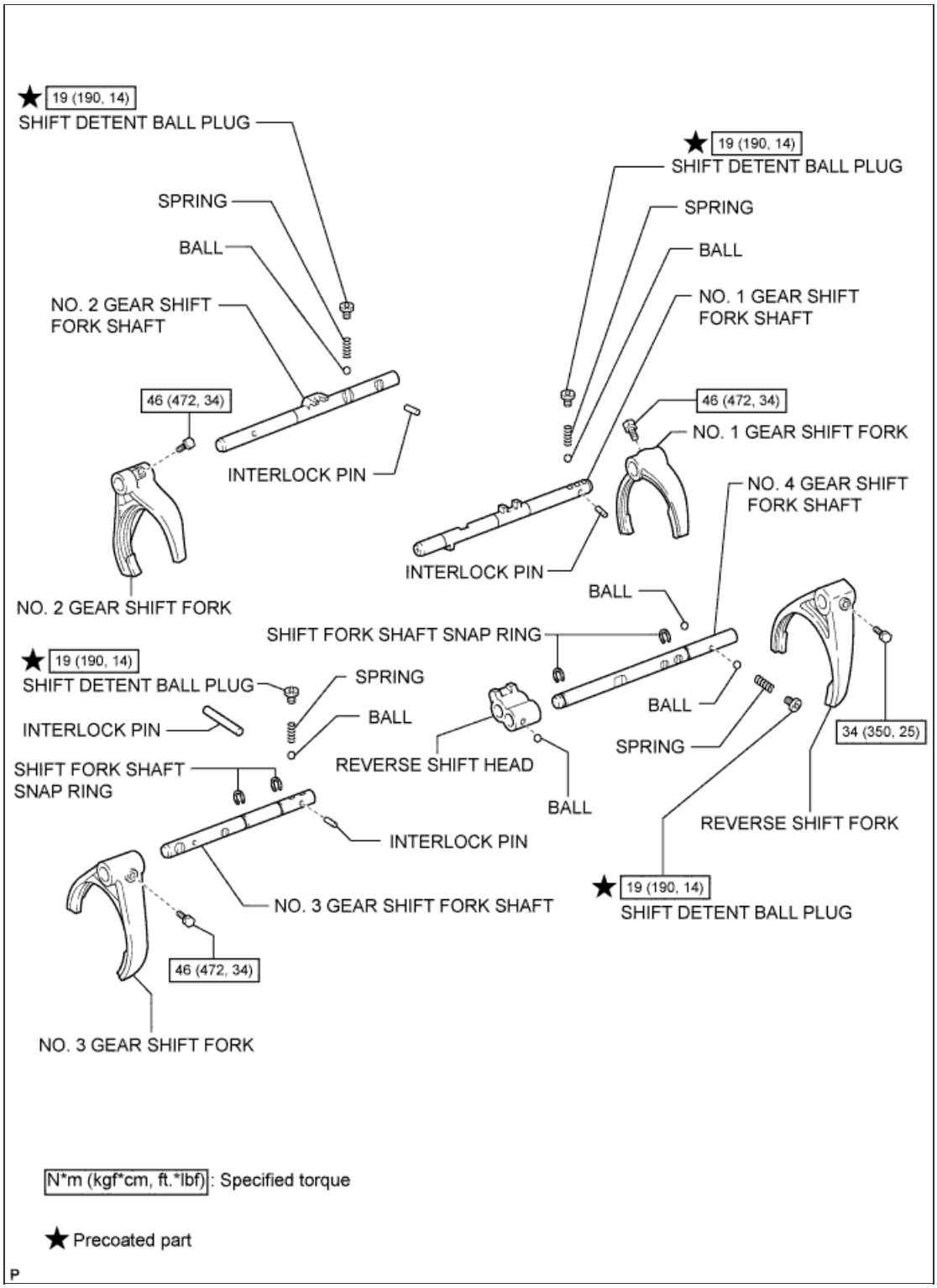
When disconnecting the cable, some systems need to be initialized after the cable is reconnected (Click here).

for Preparation Click here




FLOOR SHIFT CONTROL SHIFT LEVER RETAINER SUB-ASSEMBLY
17 (170, 12)
x 4
37 (380, 27)
REVERSE RESTRICT PIN ASSEMBLY
37 (380, 27)
REVERSE RESTRICT PIN ASSEMBLY
NO. 1 REVERSE RESTRICT PIN
SHIFT LEVER HOUSING
SLOTTED PIN
INTERLOCK HOLE PLUG
STRAIGHT PIN
38 (390, 28)
TRANSFER ADAPTER SUB-ASSEMBLY
SHIFT AND SELECT LEVER SHAFT
18 (185, 13)
x 2
TRANSMISSION OIL PUMP COVER OIL SEAL
37 (380, 27)
x 11
38 (390, 28)
x 2
O-RING
SHIFT AND SELECT LEVER
x 2
RING PIN
x 5
17 (170, 12)
x 2
STRAIGHT PIN
TRANSMISSION OIL PUMP COVER
19 (190, 14)
TRANSFER ADAPTER PLUG
STRAIGHT PIN
O-RING
x 2
12 (120, 9)
MANUAL TRANSMISSION OIL STRAINER SUB-ASSEMBLY
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
Precoated part
P

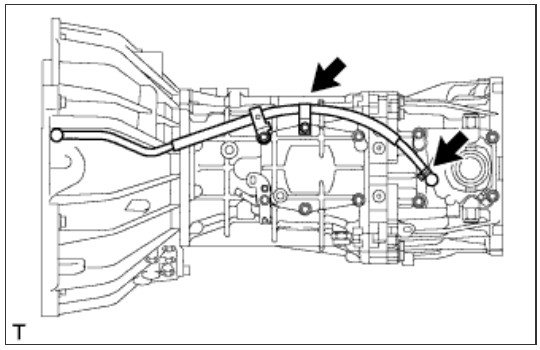

● NO. 3 TRANSMISSION CLUTCH HUB SHAFT SNAP RING
NO. 1 TRANSMISSION HUB SLEEVE
NO. 4 TRANSMISSION CLUTCH HUB
REVERSE GEAR BEARING
18 (185, 13)
x 4
SHIFTING KEY
REVERSE GEAR
SHIFTING KEY
SPRING
REVERSE SYNCHRONIZER RING SET
OUTPUT SHAFT REAR BEARING RETAINER
OUTPUT SHAFT BEARING SHAFT SNAP RING
OUTPUT SHAFT ASSEMBLY
PIN
NO. 2 SYNCHRONIZER RING
● INTERMEDIATE PLATE STRAIGHT PIN
PIN
OUTER RACE
INPUT SHAFT ASSEMBLY
NO. 2 COUNTER GEAR FRONT BEARING SNAP RING
INTERMEDIATE PLATE
x 4
COUNTER SHAFT CENTER BEARING
COUNTER GEAR
REVERSE IDLER GEAR SHAFT WOODRUFF KEY
REVERSE IDLER GEAR SHAFT
TRANSMISSION MAGNET
MANUAL TRANSMISSION CASE RECEIVER
x 3
18 (185, 13)
REVERSE IDLER THRUST WASHER
REVERSE IDLER GEAR BUSH OR BEARING
N*m (kgf*cm, ft.*lbf): Specified torque
REVERSE IDLER GEAR
● Non-reusable part
NO. 2 REVERSE IDLER THRUST WASHER
P


★ 19 (190, 14)
SHIFT DETENT BALL PLUG
SPRING
BALL
NO. 2 GEAR SHIFT FORK SHAFT
46 (472, 34)
INTERLOCK PIN
NO. 2 GEAR SHIFT FORK
★ 19 (190, 14)
SHIFT DETENT BALL PLUG
SPRING
BALL
NO. 1 GEAR SHIFT FORK SHAFT
46 (472, 34)
NO. 1 GEAR SHIFT FORK
NO. 4 GEAR SHIFT FORK SHAFT
INTERLOCK PIN
BALL
SHIFT FORK SHAFT SNAP RING
★ 19 (190, 14)
SHIFT DETENT BALL PLUG
SPRING
BALL
INTERLOCK PIN
SHIFT FORK SHAFT SNAP RING
REVERSE SHIFT HEAD
BALL
BALL
SPRING
34 (350, 25)
REVERSE SHIFT FORK
INTERLOCK PIN
NO. 3 GEAR SHIFT FORK SHAFT
★ 19 (190, 14)
SHIFT DETENT BALL PLUG
46 (472, 34)
NO. 3 GEAR SHIFT FORK
N*m (kgf*cm, ft.*lbf): Specified torque
★ Precoated part
P

for Preparation Click here

1. REMOVE TRANSMISSION BREATHER SUB-ASSEMBLY (for 1GR-FE)

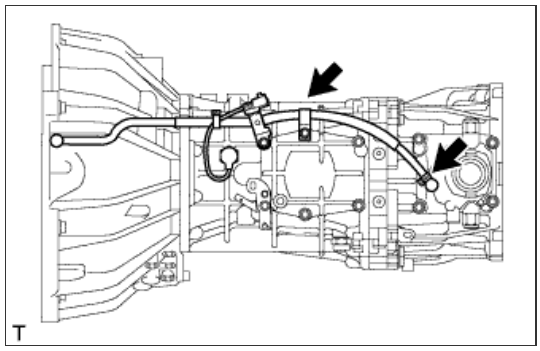
a. Loosen the hose clamp, and remove the breather hose.



2. REMOVE TRANSMISSION BREATHER SUB-ASSEMBLY (for 1VD-FTV)

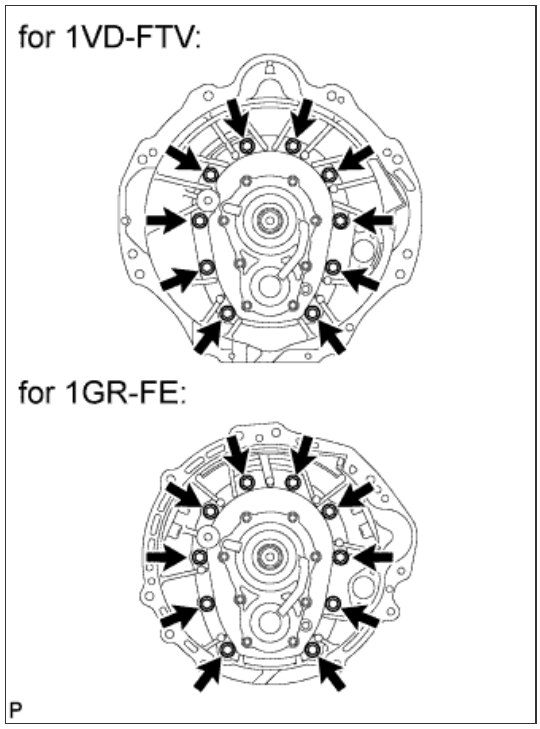
a. Remove the wire harness clamp.

b. Loosen the hose clamp, and remove the breather hose.



3. REMOVE CLUTCH HOUSING

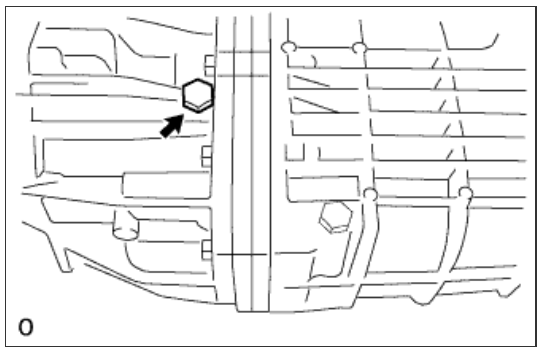
a. Remove the 10 bolts and clutch housing.



4. REMOVE FILLER PLUG

a. Remove the filler plug.

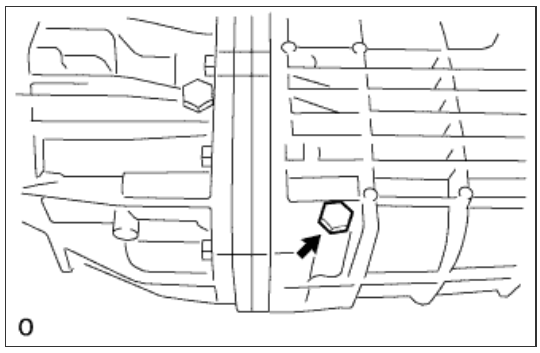
b. Remove the gasket from the filler plug.



5. REMOVE DRAIN PLUG

a. Remove the drain plug.

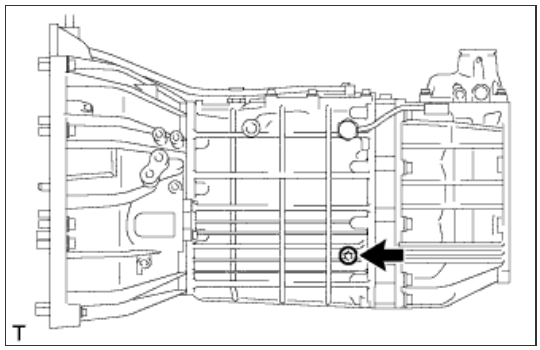
b. Remove the gasket from the drain plug.



6. REMOVE MANUAL TRANSMISSION CASE PLUG

a. Using a T55 "TORX" socket wrench, remove the transmission case plug.

b. Remove the gasket from the transmission case plug.

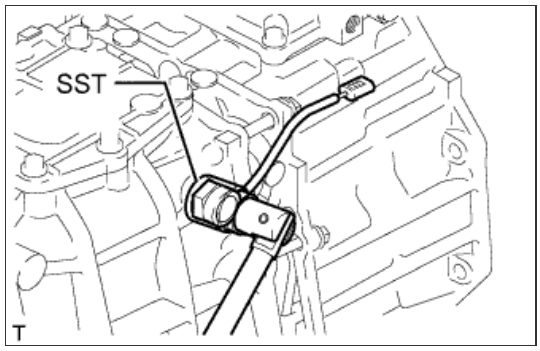


7. REMOVE BACK-UP LIGHT SWITCH ASSEMBLY

a. Disconnect the wire harness clamp.

b. Using SST, remove the back-up light switch and gasket.

SST
09817-16011

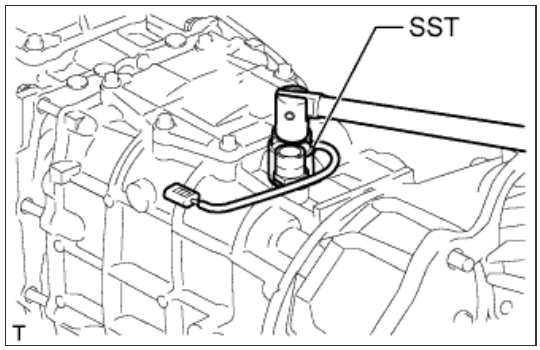


8. REMOVE SHIFT POSITION SWITCH (for 1VD-FTV)

a. Disconnect the wire harness clamp.

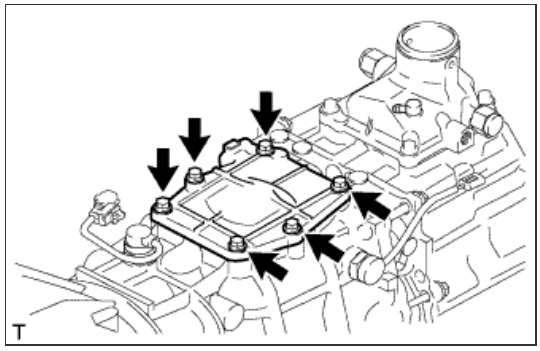
b. Using SST, remove the shift position switch and gasket.

SST
09817-16011



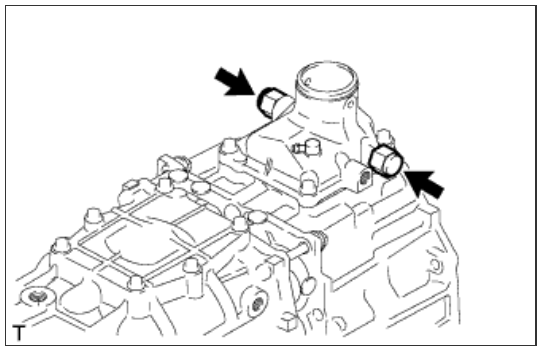
9. REMOVE CONTROL SHAFT COVER

a. Remove the 6 bolts and control shaft cover.



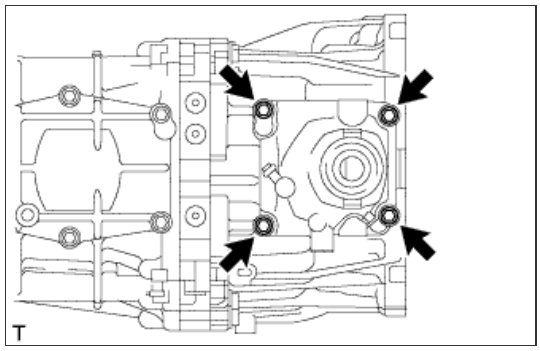
10. REMOVE REVERSE RESTRICT PIN ASSEMBLY

a. Remove the 2 restrict pins.

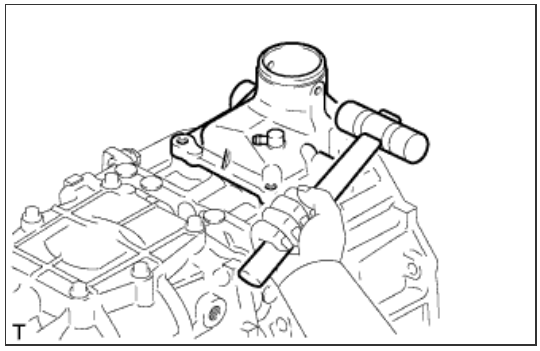


11. REMOVE FLOOR SHIFT CONTROL SHIFT LEVER RETAINER SUB-ASSEMBLY

a. Remove the 4 bolts.

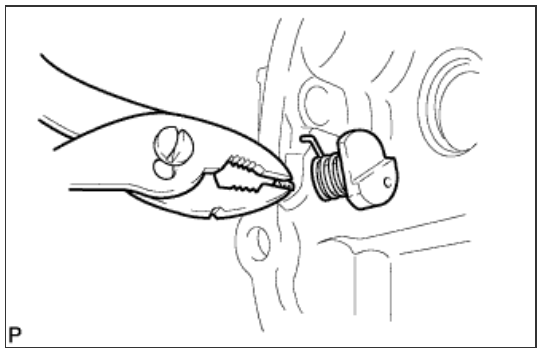


b. Using a plastic-faced hammer, remove the floor shift control shift lever retainer.

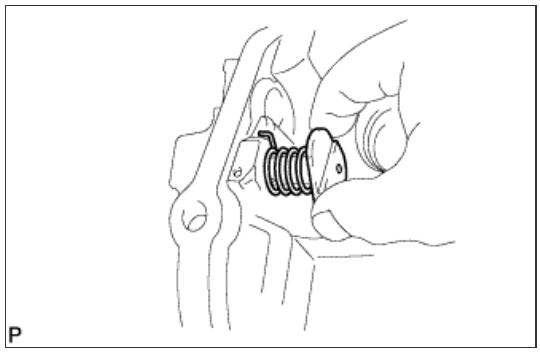


12. REMOVE NO. 1 REVERSE RESTRICT PIN

a. Remove the slotted pin.

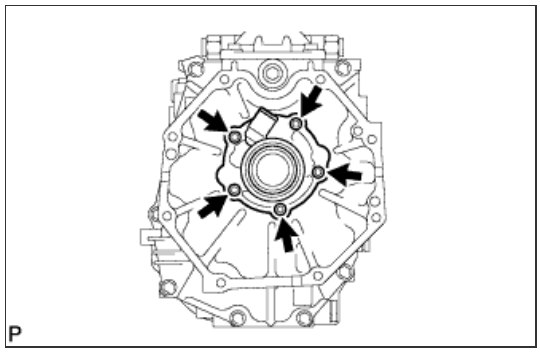


b. Remove the No. 1 reverse restrict pin and spring.



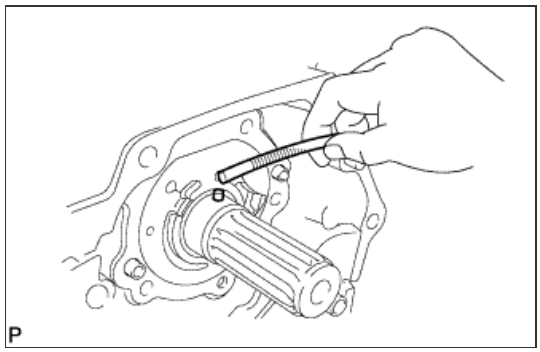
13. REMOVE TRANSMISSION OIL PUMP COVER

a. Remove the 5 bolts and oil pump cover.



b. Using a magnet hand, remove the 2 pins.

c. Remove the oil pump cover O-ring from the oil pump cover.



14. REMOVE TRANSMISSION OIL PUMP COVER OIL SEAL

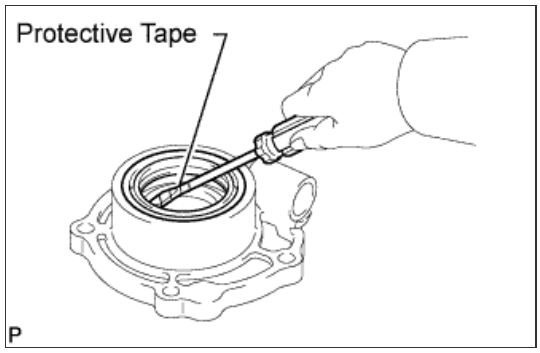
a. Using a screwdriver, pry out the oil pump cover oil seal.

NOTICE:

Be careful not to damage the oil seal and oil pump cover contact surfaces.

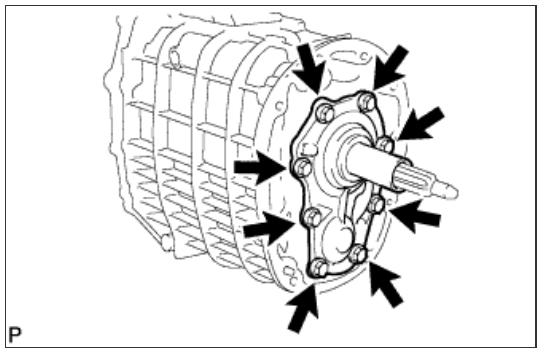
HINT:

Tape the screwdriver tip before use.



15. REMOVE FRONT BEARING RETAINER (MTM)

a. Remove the 8 bolts and front bearing retainer.



16. REMOVE TRANSMISSION FRONT BEARING RETAINER OIL SEAL

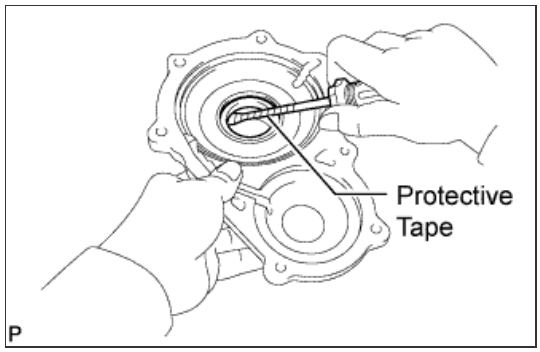
a. Using a screwdriver, pry out the oil seal.

NOTICE:

Be careful not to damage the oil seal and front bearing retainer contact surfaces.

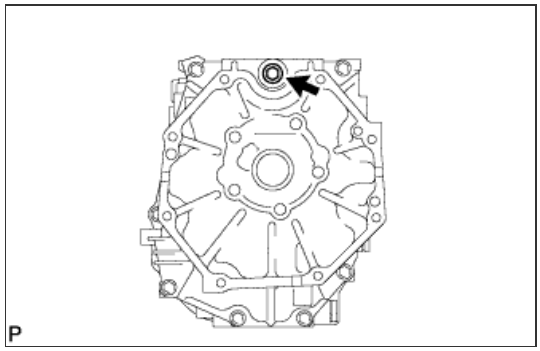
HINT:

Tape the screwdriver tip before use.

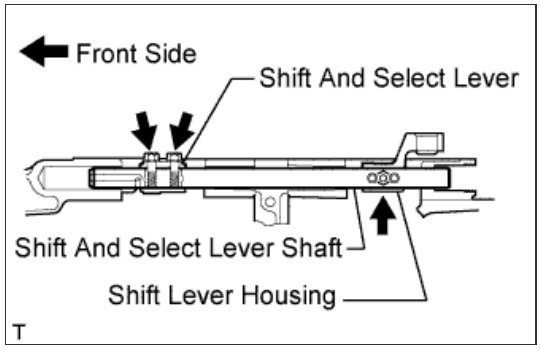


17. REMOVE SHIFT AND SELECT LEVER SHAFT

a. Using a 14 mm hexagon wrench, remove the interlock hole plug.

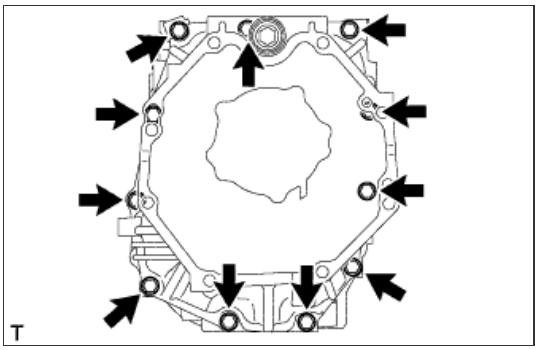


b. Remove the 3 bolts, shift and select lever shaft, shift and select lever and shift lever housing.



18. REMOVE TRANSFER ADAPTER SUB-ASSEMBLY

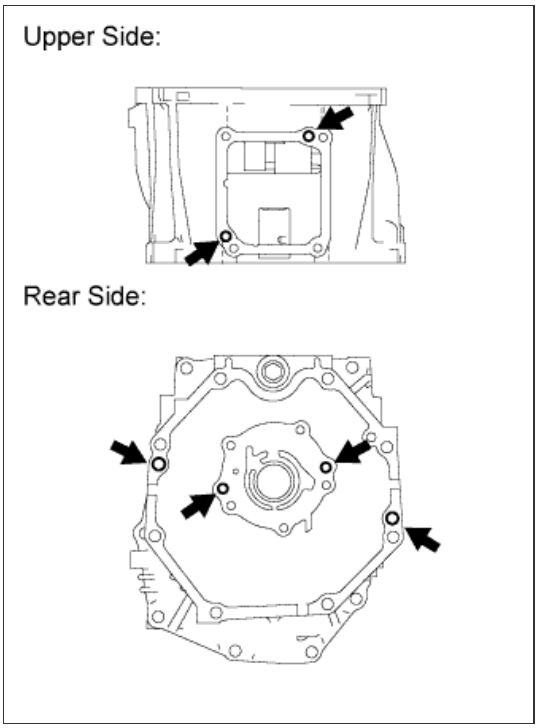
a. Remove the 11 bolts and transfer adapter.



19. REMOVE TRANSFER ADAPTER STRAIGHT PIN AND RING PIN

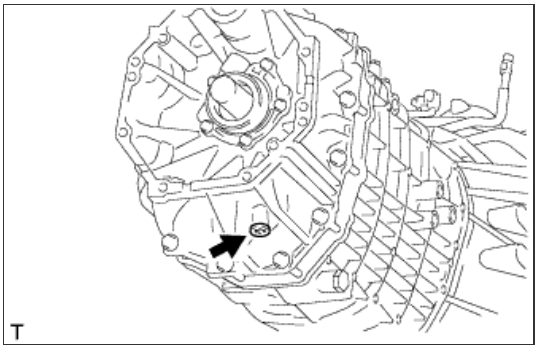
a. Remove the 4 straight pins from the transfer adapter.

b. Remove the 2 ring pins from the transfer adapter.



20. REMOVE TRANSFER ADAPTER PLUG

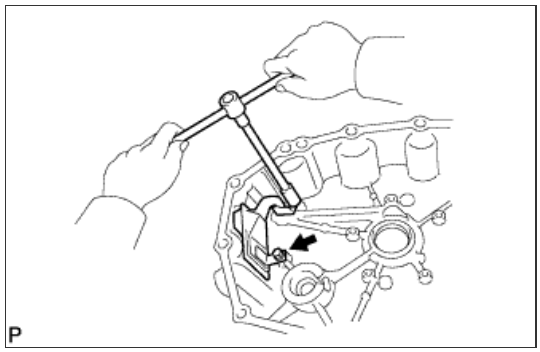
a. Using a T40 "TORX" socket wrench, remove the transfer adapter plug.



21. REMOVE MANUAL TRANSMISSION OIL STRAINER SUB-ASSEMBLY

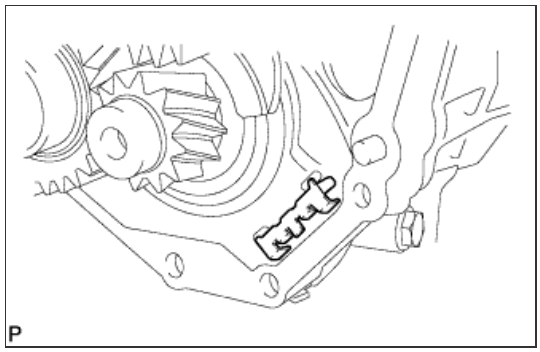
a. Remove the 2 bolts and oil strainer.

b. Remove the O-ring from the oil strainer.



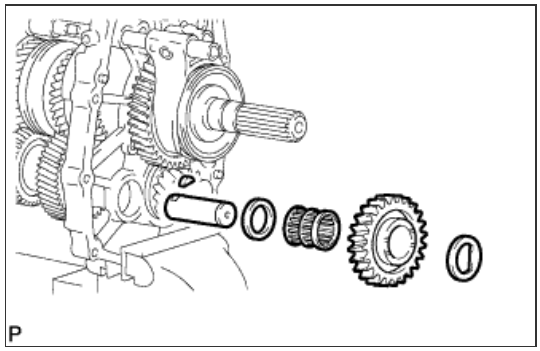
22. REMOVE TRANSMISSION MAGNET

a. Remove the transmission magnet.



23. REMOVE NO. 2 REVERSE IDLER THRUST WASHER

a. Remove the thrust washer.



24. REMOVE REVERSE IDLER GEAR

a. Remove the reverse idler gear.

25. REMOVE REVERSE IDLER GEAR BUSH OR BEARING

a. Remove the bearing.

26. REMOVE REVERSE IDLER THRUST WASHER

a. Remove the thrust washer.

27. REMOVE REVERSE IDLER GEAR SHAFT

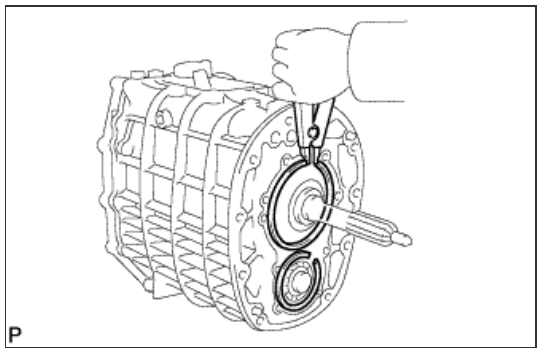
a. Remove the reverse idler gear shaft.

28. REMOVE REVERSE IDLER GEAR SHAFT WOODRUFF KEY

a. Remove the woodruff key from the reverse idler gear shaft.

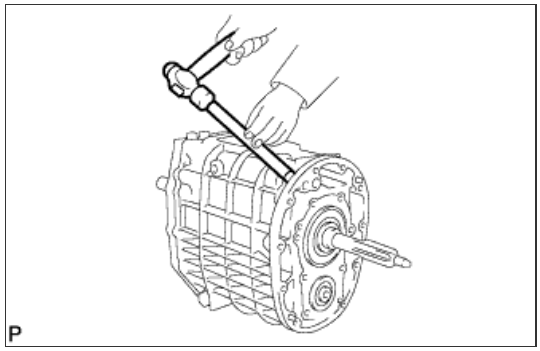
29. REMOVE MANUAL TRANSMISSION CASE SUB-ASSEMBLY

a. Using a snap ring expander, remove the 2 snap rings from the input shaft and counter gear.



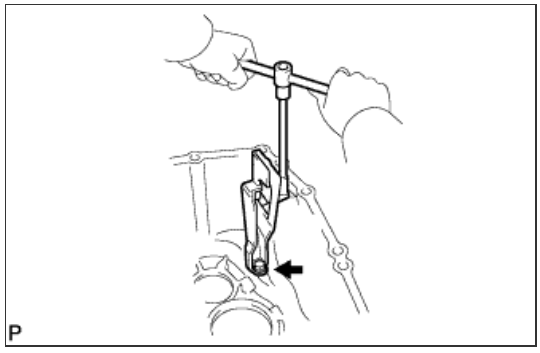
b. Using a brass bar and hammer, carefully tap the transmission case.

c. Remove the transmission case from the intermediate plate.



30. REMOVE NO. 1 OIL RECEIVER PIPE (MTM)

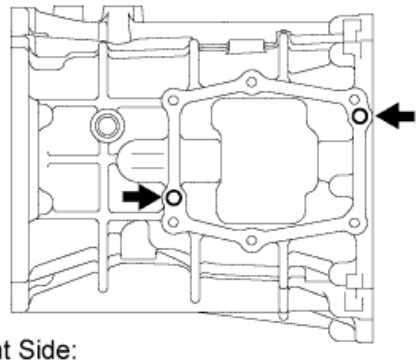
a. Remove the 2 bolts and oil receiver pipe from the transmission case.



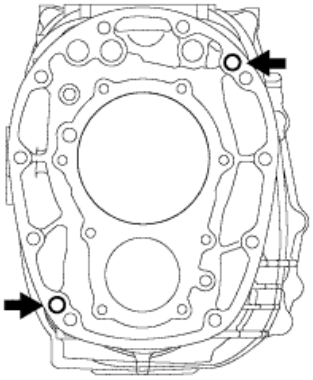
31. REMOVE TRANSFER ADAPTER STRAIGHT PIN

a. Remove the 4 straight pins from the transmission case.

Upper Side:



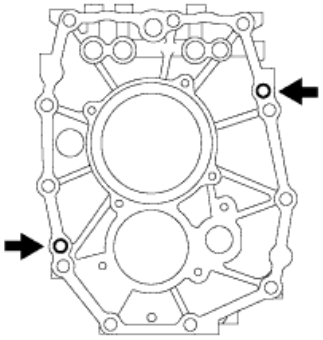
Front Side:



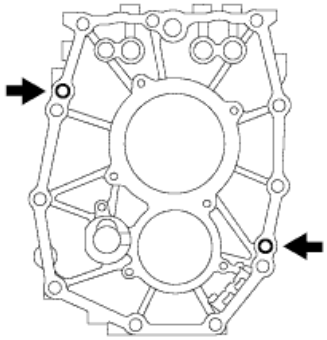
32. REMOVE INTERMEDIATE PLATE STRAIGHT PIN

a. Remove the 4 straight pins from the intermediate plate.

Front Side:

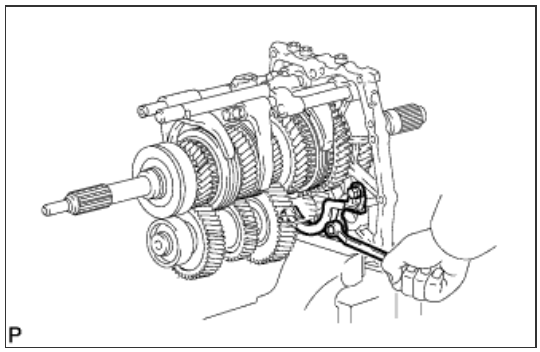


Rear Side:



33. REMOVE MANUAL TRANSMISSION CASE RECEIVER

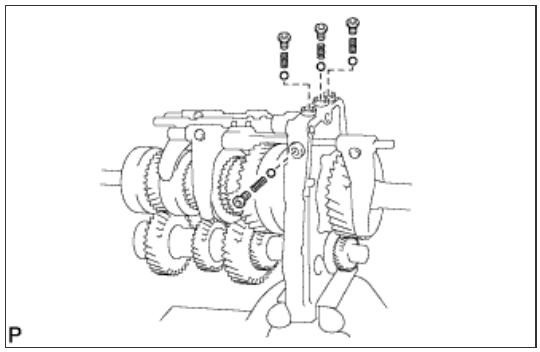
a. Remove the 3 bolts and oil receiver from the intermediate plate.



34. REMOVE SHIFT DETENT BALL PLUG

a. Using a T40 "TORX" socket wrench, remove the 4 ball plugs.

b. Using a magnet hand, remove the 4 springs and 4 balls.

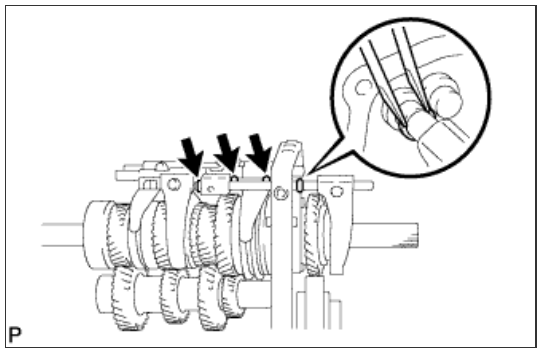


35. REMOVE SHIFT FORK SHAFT SNAP RING

a. Using 2 screwdrivers and a hammer, tap out the 4 snap rings.

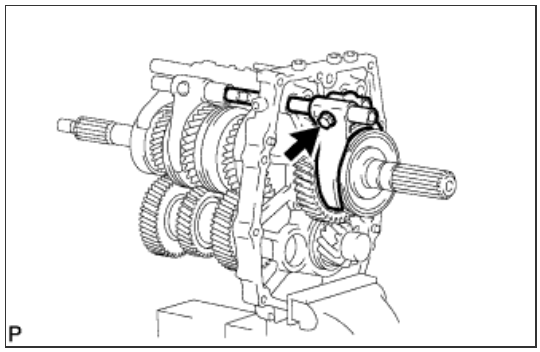
HINT:

Use a piece of cloth to prevent the snap ring from flying off.

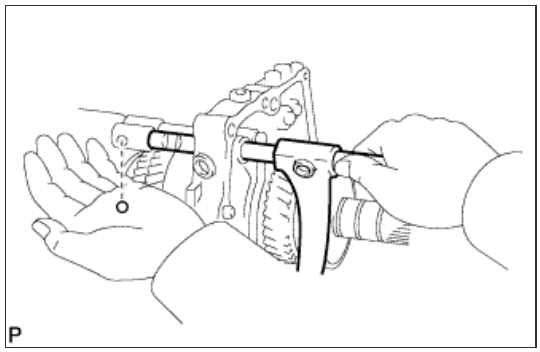


36. REMOVE NO. 4 GEAR SHIFT FORK SHAFT

a. Remove the No. 4 gear shift fork set bolt.



b. Remove the No. 4 gear shift fork shaft and 2 balls.

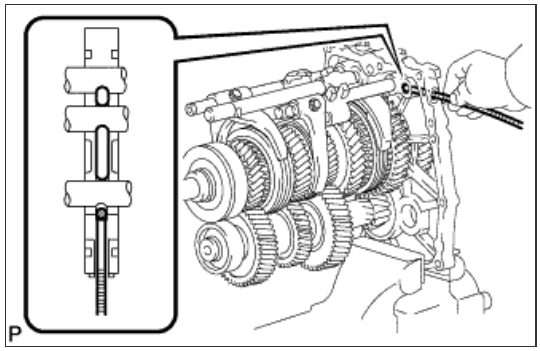


37. REMOVE REVERSE SHIFT FORK

a. Remove the reverse shift fork.

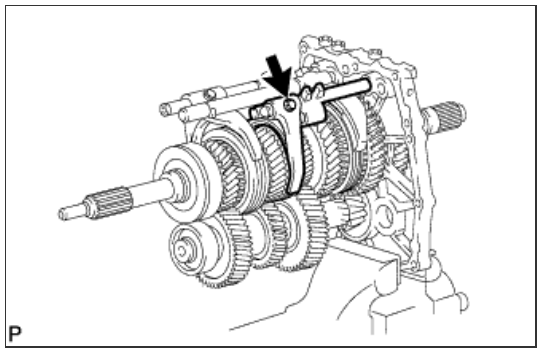
38. REMOVE NO. 3 GEAR SHIFT FORK SHAFT

a. Using a magnet hand, remove the ball.

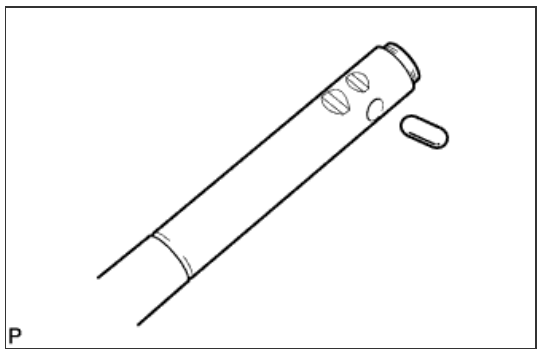


b. Remove the No. 3 gear shift fork set bolt.

c. Remove the No. 3 shift gear fork shaft and reverse shift head.



d. Using a magnet hand, remove the interlock pin from the No. 3 gear shift fork shaft.

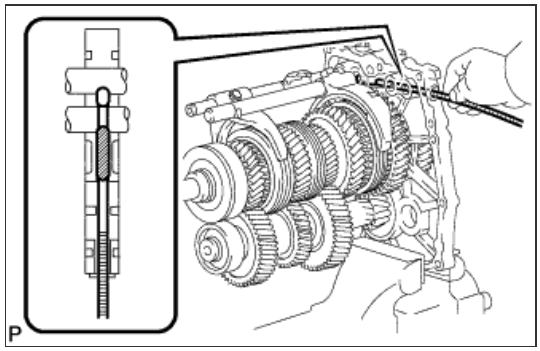


39. REMOVE NO. 3 GEAR SHIFT FORK

a. Remove the No. 3 gear shift fork.

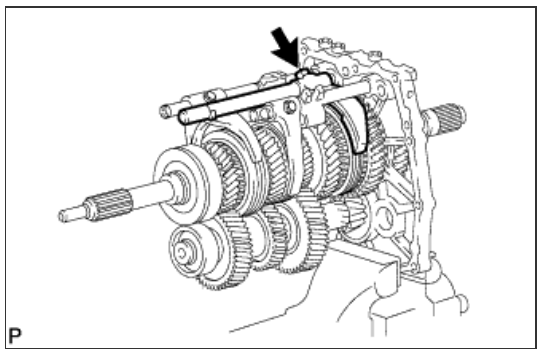
40. REMOVE NO. 1 GEAR SHIFT FORK SHAFT

a. Using a magnet hand, remove the interlock pin.

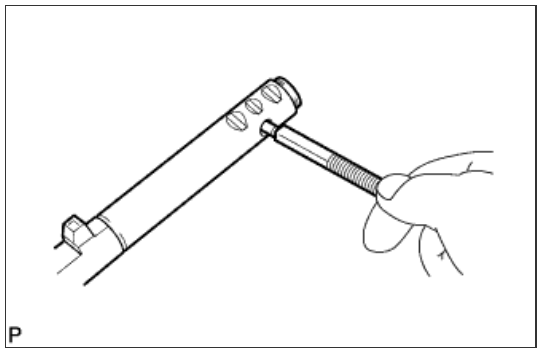


b. Remove the No. 1 gear shift fork set bolt.

c. Remove the No. 1 gear shift fork shaft.



d. Using a magnet hand, remove the interlock pin from the No. 1 gear shift fork shaft.

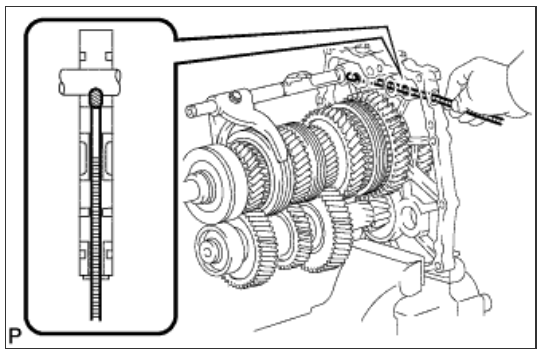


41. REMOVE NO. 1 GEAR SHIFT FORK

a. Remove the No. 1 gear shift fork.

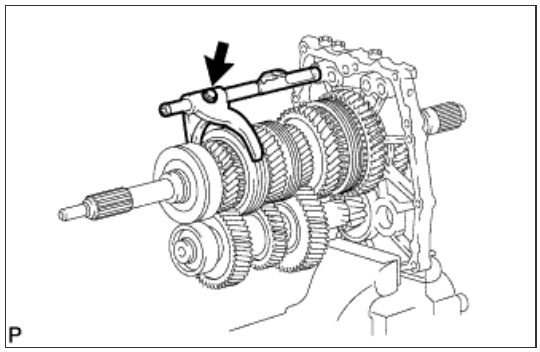
42. REMOVE NO. 2 GEAR SHIFT FORK SHAFT

a. Using a magnet hand, remove the interlock pin.



b. Remove the No. 2 gear shift fork set bolt.

c. Remove the No. 2 gear shift fork shaft.



43. REMOVE NO. 2 GEAR SHIFT FORK

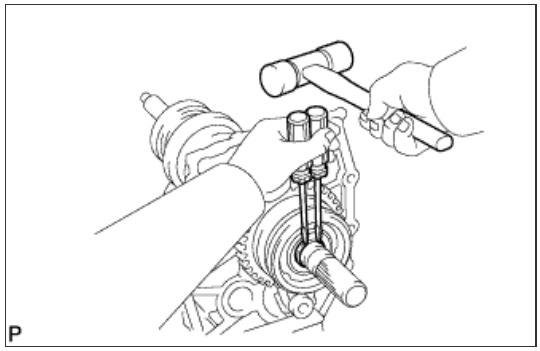
a. Remove the No. 2 gear shift fork.

44. REMOVE NO. 3 TRANSMISSION CLUTCH HUB SHAFT SNAP RING

a. Using 2 screwdrivers and a hammer, tap out the snap ring.

HINT:

Use a piece of cloth to prevent the snap ring from flying off.

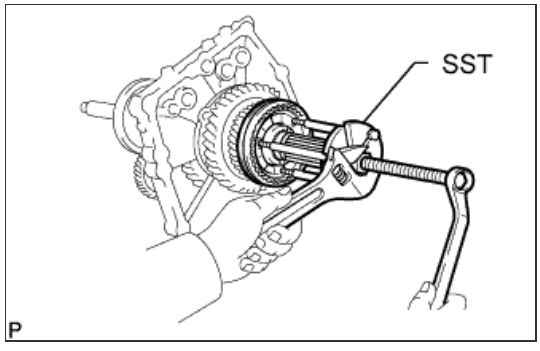


45. REMOVE NO. 4 TRANSMISSION CLUTCH HUB

a. Using SST, remove the No. 4 transmission clutch hub.

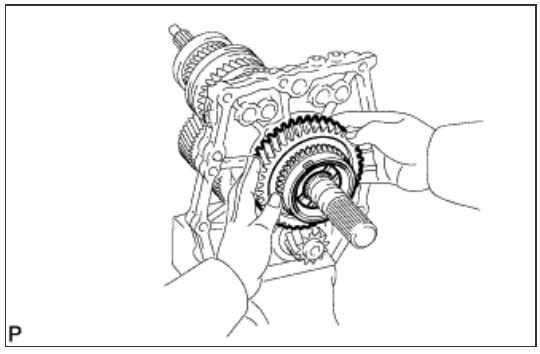
SST

09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03080)



46. REMOVE REVERSE GEAR

a. Remove the reverse synchronizer ring set and reverse gear.



47. REMOVE REVERSE SYNCHRONIZER RING SET

a. Remove the reverse synchronizer ring set from the reverse gear.

48. REMOVE REVERSE GEAR BEARING

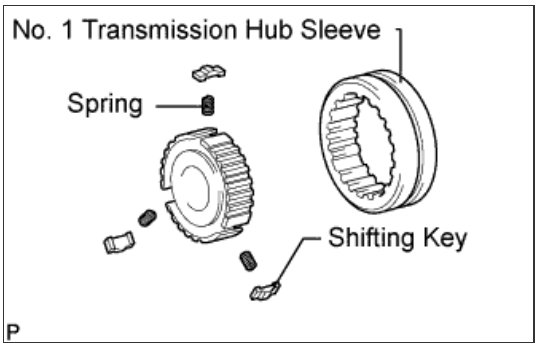
a. Remove the reverse gear bearing.

49. REMOVE NO. 1 TRANSMISSION HUB SLEEVE

a. Remove the No. 1 transmission hub sleeve, 3 shifting keys, and 3 springs from the No. 4 transmission clutch hub.

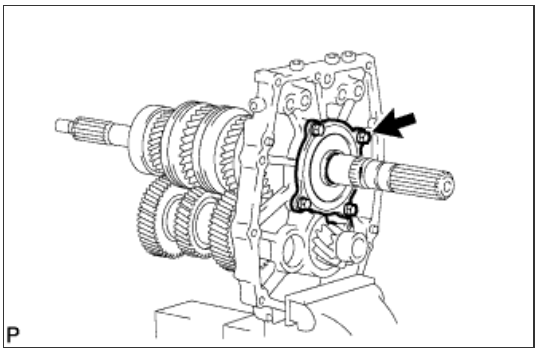
HINT:

Use a piece of cloth to prevent the spring from flying off.



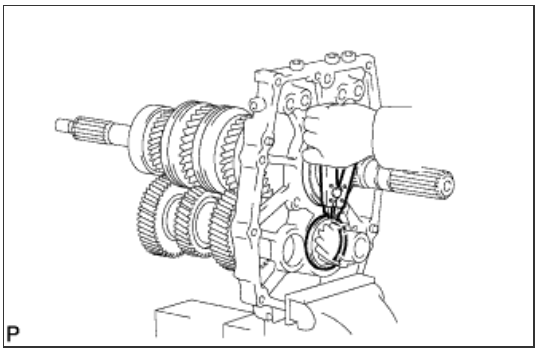
50. REMOVE OUTPUT SHAFT REAR BEARING(MTM) RETAINER

a. Remove the 4 bolts and rear bearing retainer.



51. REMOVE COUNTER GEAR

a. Using a snap ring expander, remove the snap ring.



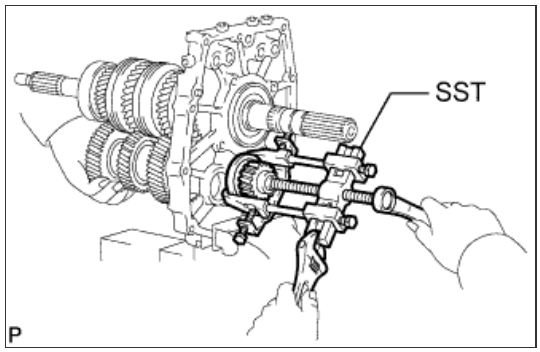
b. Using SST, remove the outer race.

SST

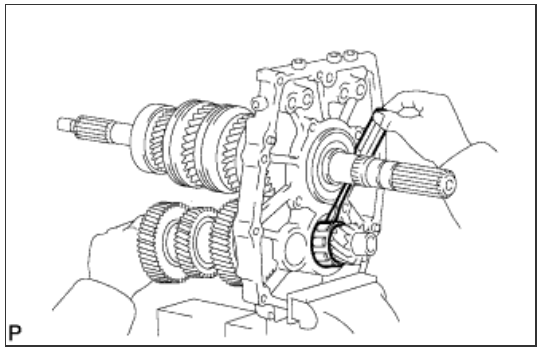
09950-40011 (09951-04020, 09952-04010, 09953-04030, 09954-04020, 09955-04011, 09957-04010, 09958-04011)

NOTICE:

Do not drop the counter gear. Hold the front side of the counter gear when removing the bearing outer race.



c. Using a screwdriver, remove the center bearing and counter gear.

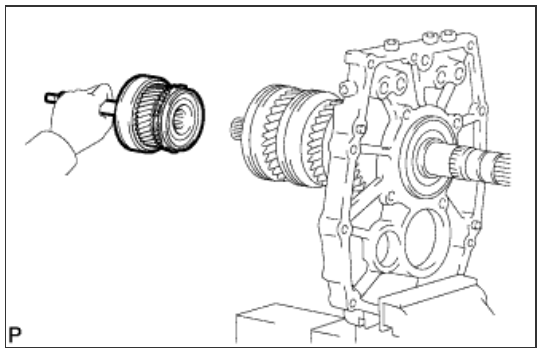


52. REMOVE INPUT SHAFT ASSEMBLY

a. Remove the input shaft from the output shaft.

NOTICE:

Do not drop the input shaft bearing.

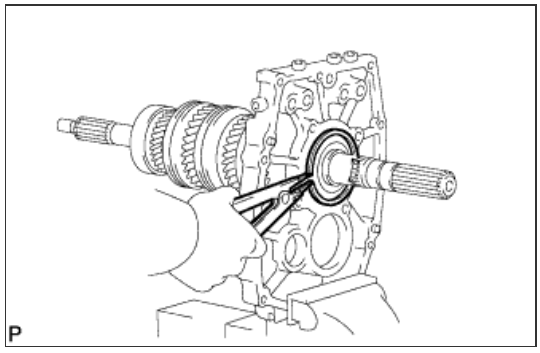


53. REMOVE NO. 2 SYNCHRONIZER RING

a. Remove the No. 2 synchronizer ring from the input shaft.

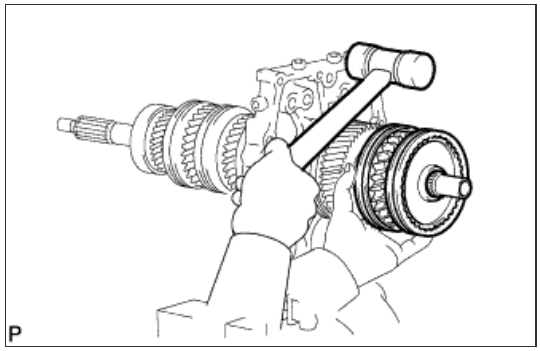
54. REMOVE OUTPUT SHAFT BEARING SHAFT SNAP RING

a. Using a snap ring expander, remove the snap ring.



55. REMOVE OUTPUT SHAFT ASSEMBLY

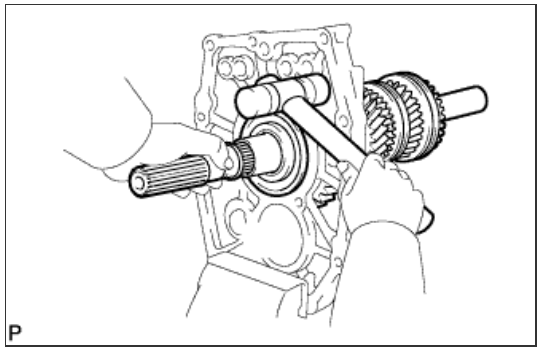
a. Remove the output shaft from the intermediate plate by pulling on the output shaft and tapping on the intermediate plate with a plastic-faced hammer.



for Preparation Click here

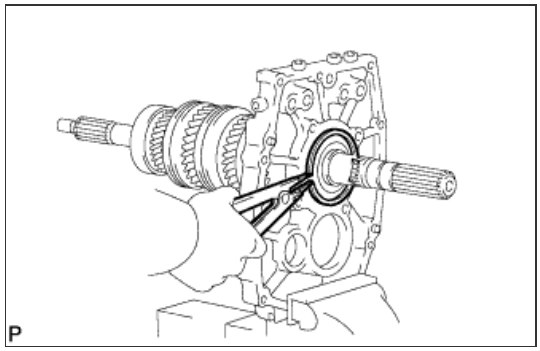
1. INSTALL OUTPUT SHAFT ASSEMBLY

a. Install the output shaft by lightly tapping on the back side of the intermediate plate with a plastic-faced hammer.



2. INSTALL OUTPUT SHAFT BEARING SHAFT SNAP RING

a. Using a snap ring expander, install the snap ring to the output shaft bearing.



3. INSTALL NO. 2 SYNCHRONIZER RING

a. Install the No. 2 synchronizer ring to the input shaft.

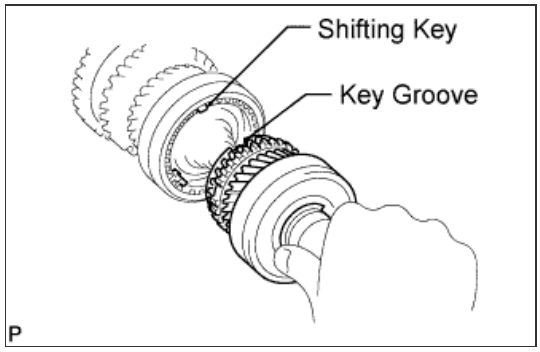
4. INSTALL INPUT SHAFT ASSEMBLY

a. Install the input shaft to the output shaft.

HINT:

Align the shifting key of the synchronizer ring with the groove of the clutch hub.

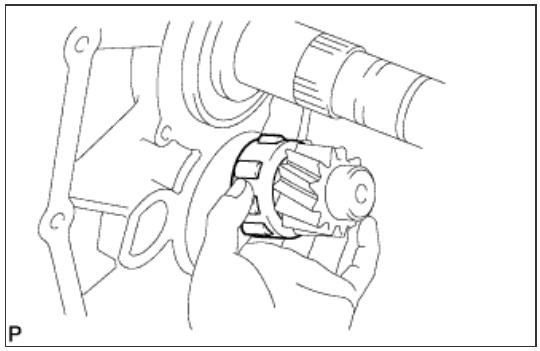
b. Install the clutch hub and confirm that the gear and synchronizer ring move smoothly.



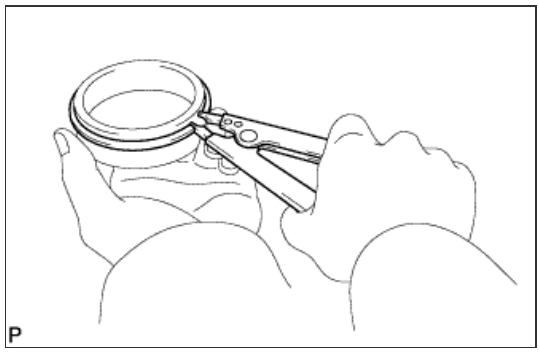
5. INSTALL COUNTER GEAR

a. Install the counter gear to the intermediate plate.

b. Install the center bearing to the counter gear.



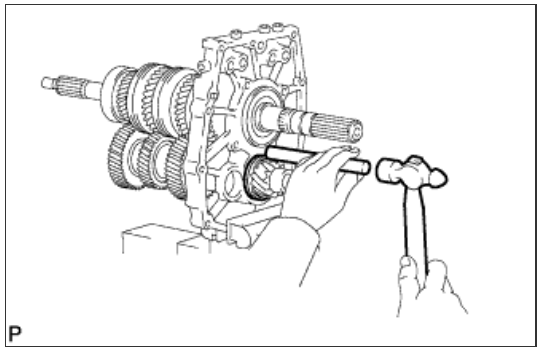
c. Using a snap ring expander, install the snap ring to the outer race.



d. Using a brass bar and hammer, lightly tap the bearing outer race uniformly to install it.

NOTICE:

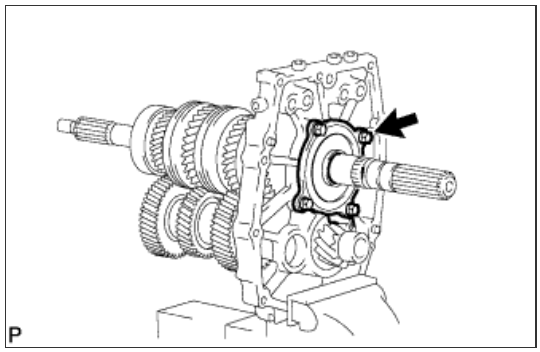
Do not drop the counter gear. Hold the front side of the counter gear.



6. INSTALL OUTPUT SHAFT REAR BEARING(MTM) RETAINER

a. Install the output shaft rear bearing retainer to the intermediate plate with the 4 bolts.

Torque:
18 N*m{ 185 kgf*cm , 13 ft.*lbf }



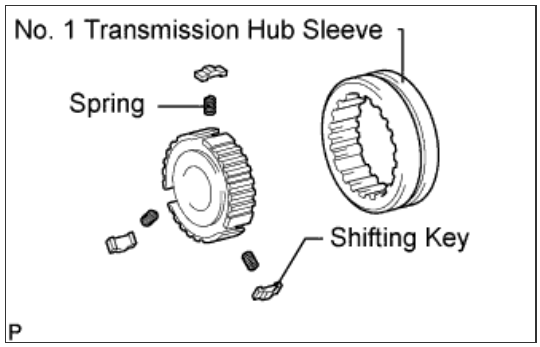
7. INSTALL NO. 1 TRANSMISSION HUB SLEEVE

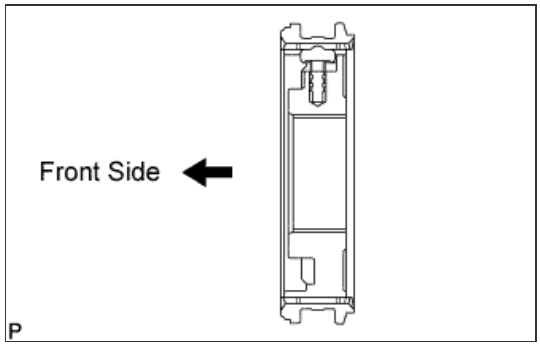
a. Apply a light coat of gear oil to the sleeve and hub.

b. Install the No. 1 transmission hub sleeve, 3 shifting keys and 3 springs to the No. 4 transmission clutch hub.

NOTICE:

Do not mistake the installation direction of the No. 1 transmission hub sleeve, No. 4 transmission clutch hub, and shifting keys.





8. INSTALL REVERSE GEAR BEARING

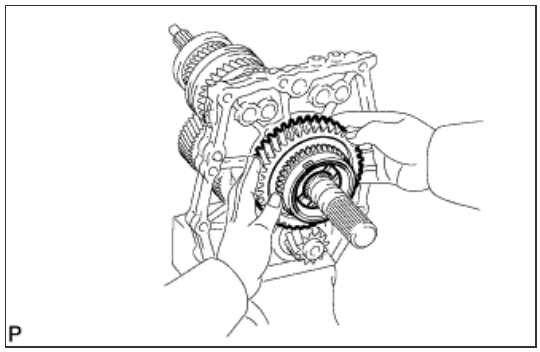
a. Coat the reverse gear bearing with gear oil, and install it to the reverse gear.

9. INSTALL REVERSE SYNCHRONIZER RING SET

a. Coat the reverse synchronizer ring set with gear oil, and install it to the reverse gear.

10. INSTALL REVERSE GEAR

a. Coat the reverse gear with gear oil, and install it to the output shaft.



11. INSTALL NO. 4 TRANSMISSION CLUTCH HUB

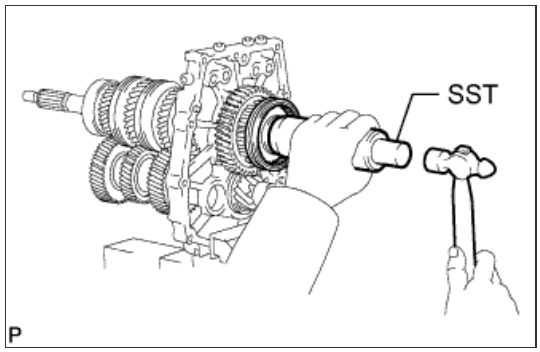
a. Using SST and a hammer, install the No. 4 transmission clutch hub.

SST
09316-60011 (09316-00011)

HINT:

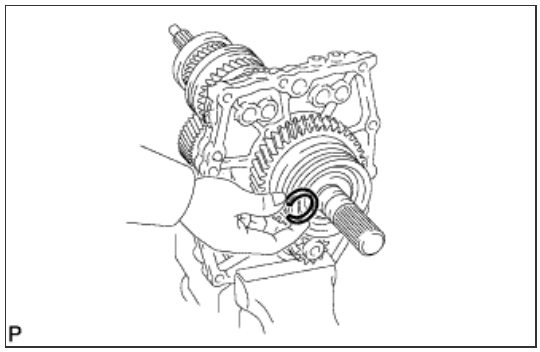
Align the shifting key of the synchronizer ring with the groove of the clutch hub.

b. Install the clutch hub and confirm that the gear and synchronizer ring move smoothly.



12. INSTALL NO. 3 TRANSMISSION CLUTCH HUB SHAFT SNAP RING

a. Select a new snap ring that will allow minimum clearance.

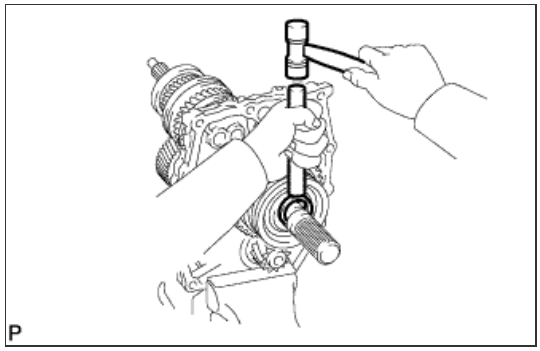


Standard Clearance:
0.1 mm (0.00393 in.) or less

Snap Ring Thickness:

Part No.	Thickness	Mark
90520-34018	2.40 to 2.45 mm (0.0945 to 0.0965 in.)	A
90520-34019	2.45 to 2.50 mm (0.0965 to 0.0984 in.)	B
90520-34020	2.50 to 2.55 mm (0.0984 to 0.100 in.)	C
90520-34021	2.55 to 2.60 mm (0.100 to 0.102 in.)	D
90520-34022	2.60 to 2.65 mm (0.102 to 0.104 in.)	E
90520-34023	2.65 to 2.70 mm (0.104 to 0.106 in.)	F

b. Using a brass bar and hammer, install the snap ring to the output shaft.

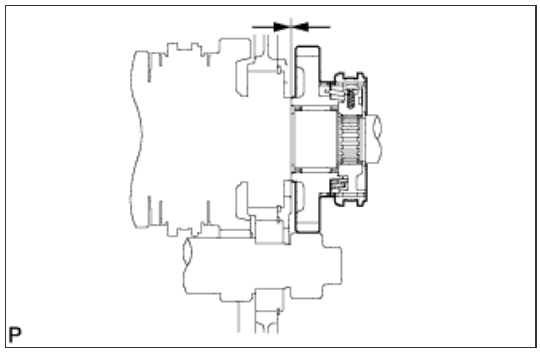


13. INSPECT REVERSE GEAR THRUST CLEARANCE

a. Using a feeler gauge, measure the reverse gear thrust clearance.

Standard Clearance:
0.15 to 0.52 mm (0.00591 to 0.0204 in.)

If the clearance is outside the specification, replace the defective gear or shaft.



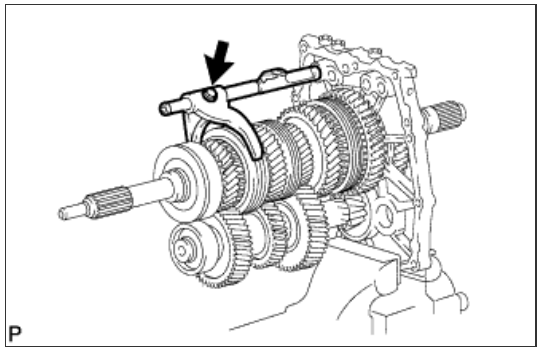
14. INSTALL NO. 2 GEAR SHIFT FORK

a. Install the No. 2 gear shift fork.

15. INSTALL NO. 2 GEAR SHIFT FORK SHAFT

a. Install the No. 2 gear shift fork shaft to the No. 2 gear shift fork and intermediate plate with the bolt.

Torque:
46 N*m{ 472 kgf*cm , 34 ft.*lbf }

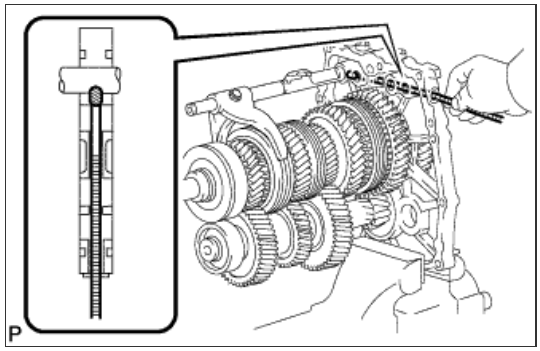


16. INSTALL NO. 1 GEAR SHIFT FORK

a. Install the No. 1 gear shift fork.

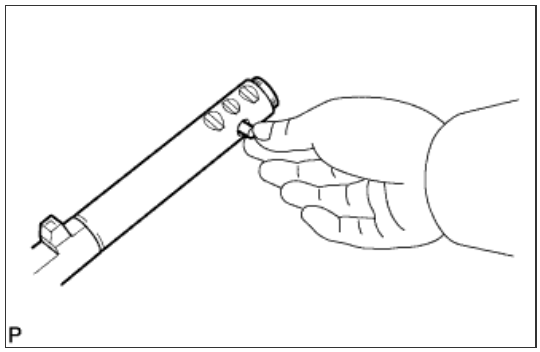
17. INSTALL NO. 1 GEAR SHIFT FORK SHAFT

a. Using a magnet hand, install the interlock pin to the intermediate plate.



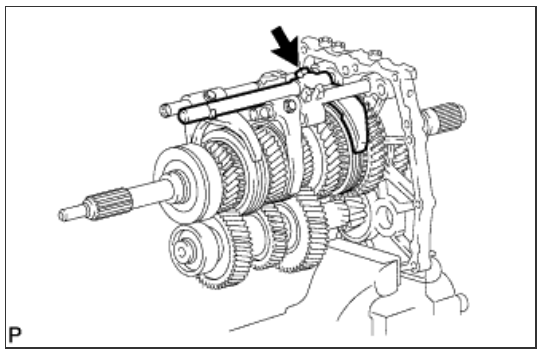
b. Apply MP grease to the interlock pin.

c. Install the interlock pin to the No. 1 gear shift fork shaft.



d. Install the No. 1 gear shift fork shaft to the No. 2 gear shift fork and intermediate plate with the bolt.

Torque:
46 N*m{ 472 kgf*cm , 34 ft.*lbf }

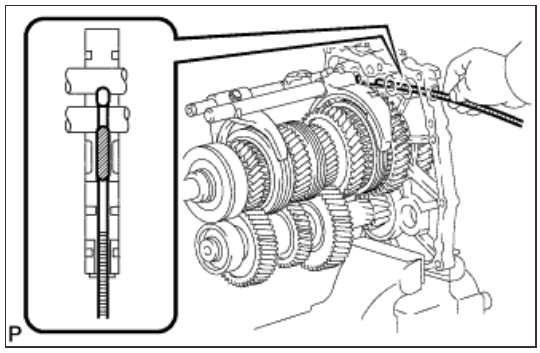


18. INSTALL NO. 3 GEAR SHIFT FORK

a. Install the No. 3 gear shift fork.

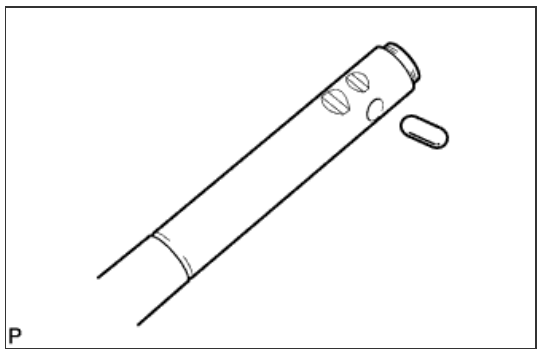
19. INSTALL NO. 3 GEAR SHIFT FORK SHAFT

a. Using a magnet hand, install the interlock pin to the intermediate plate.



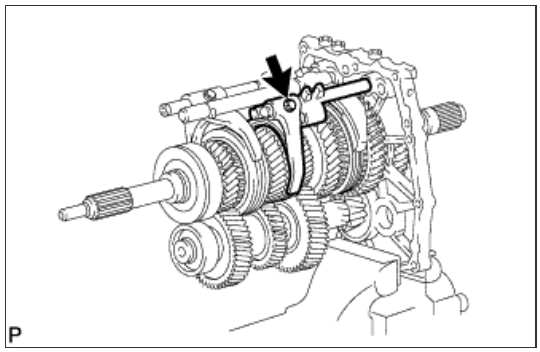
b. Apply MP grease to the interlock pin.

c. Install the interlock pin to the No. 3 gear shift fork shaft.



d. Install the No. 3 gear shift fork shaft to the No. 3 gear shift fork and intermediate plate with the bolt.

Torque:
46 N*m{ 472 kgf*cm , 34 ft.*lbf }

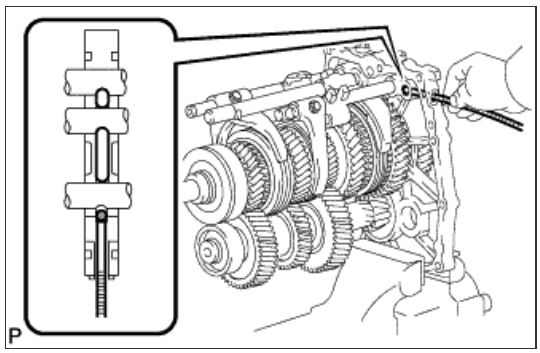


20. INSTALL REVERSE SHIFT FORK

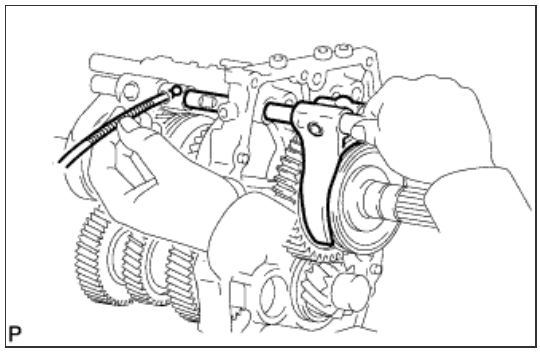
a. Install the reverse shift fork.

21. INSTALL NO. 4 GEAR SHIFT FORK SHAFT

a. Using a magnet hand, install the ball to the intermediate plate.

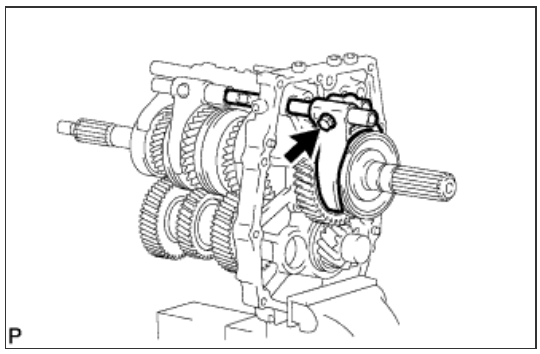


b. Using a magnet hand, install the ball to the reverse shift head.



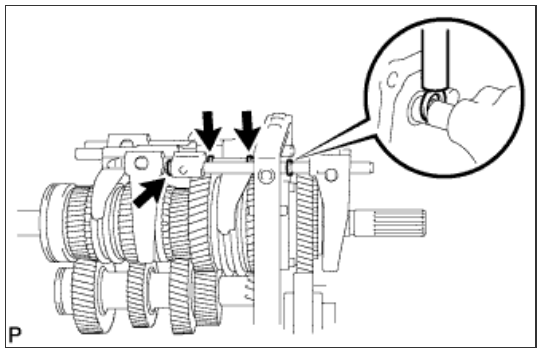
c. Install the No. 4 gear shift fork shaft to the reverse gear shift fork and intermediate plate with the bolt.

Torque:
34 N*m{ 350 kgf*cm , 25 ft.*lbf }



22. INSTALL SHIFT FORK SHAFT SNAP RING

a. Using a brass bar and hammer, install the 4 snap rings.



23. INSTALL SHIFT DETENT BALL PLUG

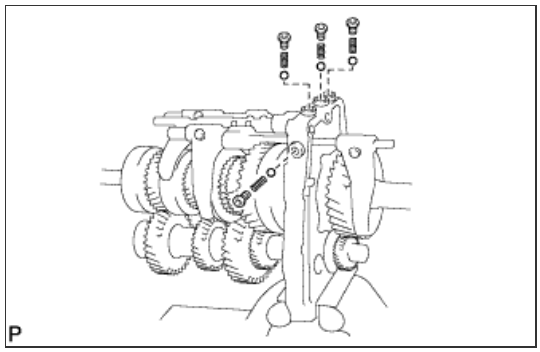
a. Install the 4 balls and 4 springs to the intermediate plate.

b. Apply adhesive to 2 or 3 threads of the 4 detent ball plugs.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

c. Using a T40 "TORX" socket wrench, install the 4 detent ball plugs.

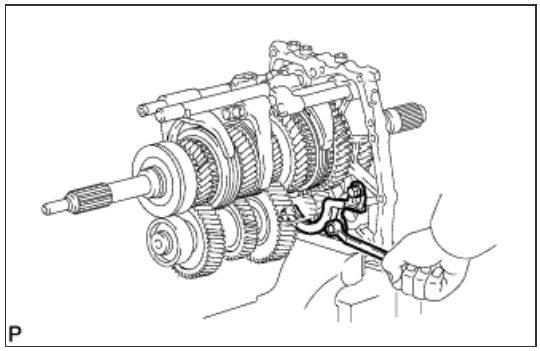
Torque:
19 N*m{ 190 kgf*cm , 14 ft.*lbf }



24. INSTALL MANUAL TRANSMISSION CASE RECEIVER

a. Install the transmission case receiver to the intermediate plate with the 3 bolts.

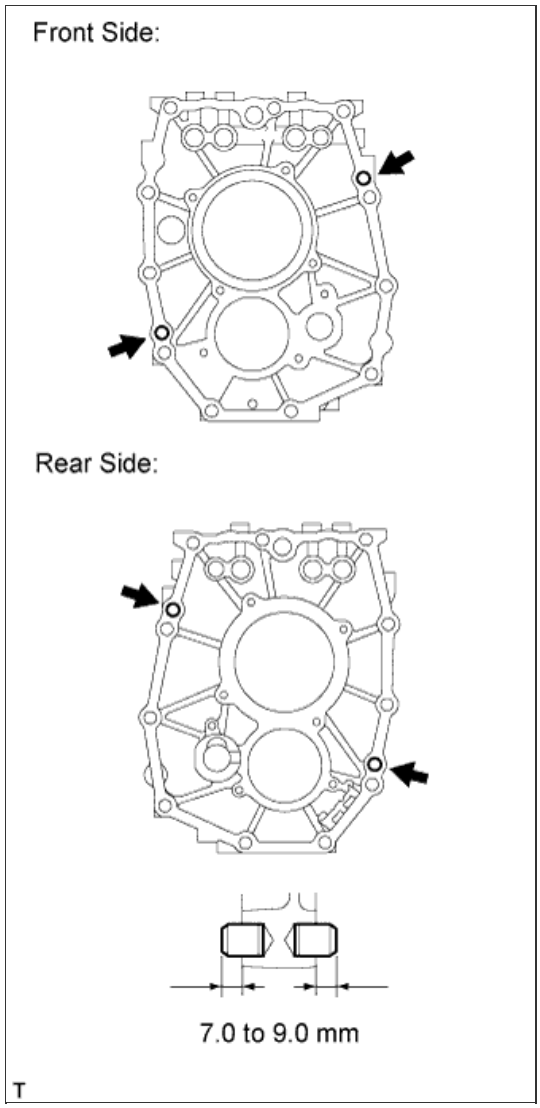
Torque:
18 N*m{ 185 kgf*cm , 13 ft.*lbf }



25. INSTALL INTERMEDIATE PLATE STRAIGHT PIN

a. Using a plastic-faced hammer, tap 4 new straight pins into the intermediate plate.

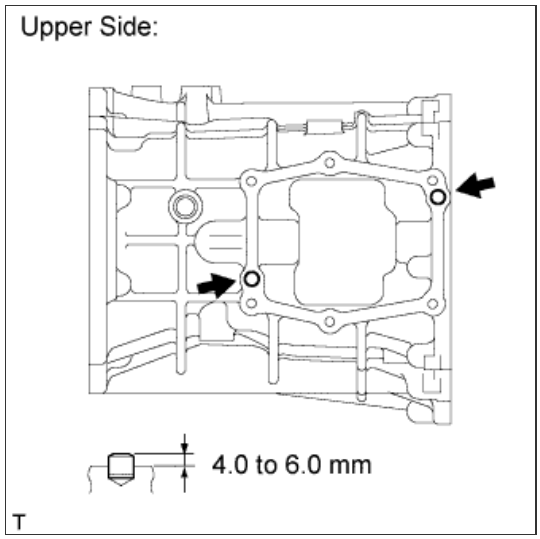
Standard Protrusion Height:
7.0 to 9.0 mm (0.276 to 0.354 in.)



26. INSTALL TRANSFER ADAPTER STRAIGHT PIN

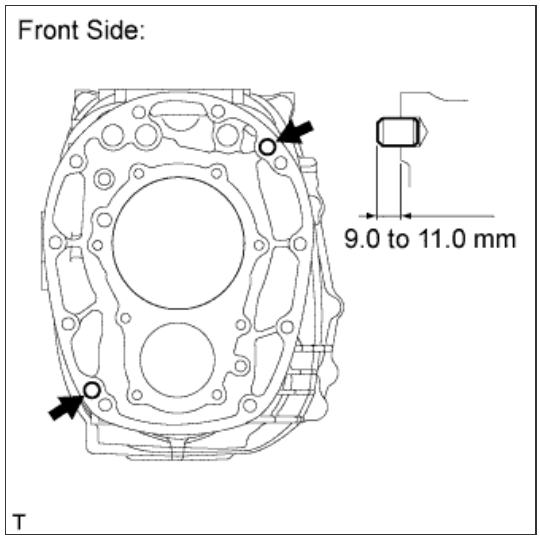
a. Using a plastic-faced hammer, tap 2 new straight pins into the transmission case.

Standard Protrusion Height:
4.0 to 6.0 mm (0.158 to 0.236 in.)



b. Using a plastic-faced hammer, tap 2 new straight pins into the transmission case.

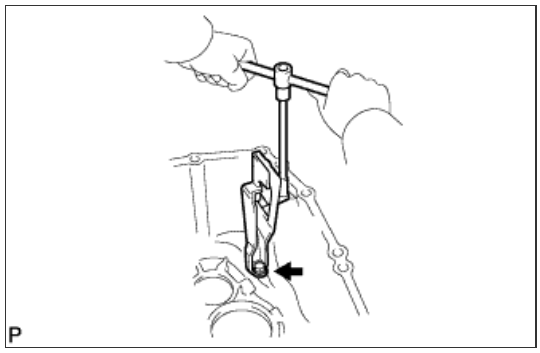
Standard Protrusion Height:
9.0 to 11.0 mm (0.355 to 0.433 in.)



27. INSTALL NO. 1 OIL RECEIVER PIPE (MTM)

a. Install the oil receiver pipe to the transmission case with the 2 bolts.

Torque:
12 N*m{ 120 kgf*cm , 9 ft.*lbf }



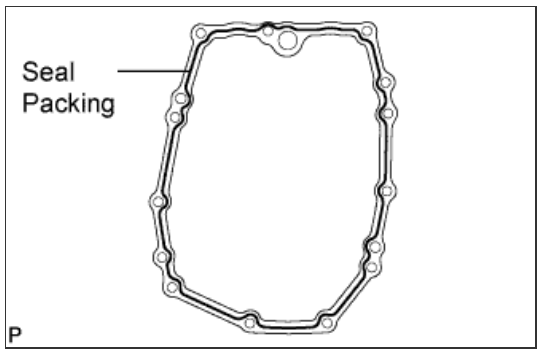
28. INSTALL MANUAL TRANSMISSION CASE SUB-ASSEMBLY

a. Apply seal packing to the transmission case, as shown in the illustration.

Seal Packing:
Toyota Genuine Seal Packing 1281, Three Bond 1281 or equivalent

NOTICE:

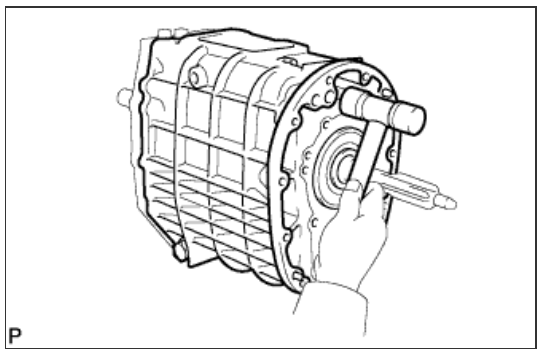
Parts must be assembled within 10 minutes of application. Otherwise, the packing (FIPG) material must be removed and reapplied.



b. Install the transmission case by lightly tapping it into place with a plastic-faced hammer.

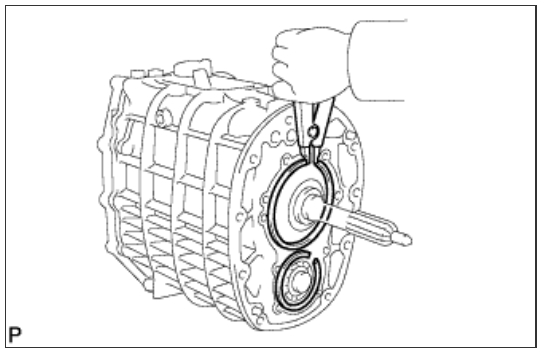
NOTICE:

Make sure that the oil receiver installed on the transmission side is above the oil application area of the intermediate plate side oil receiver.



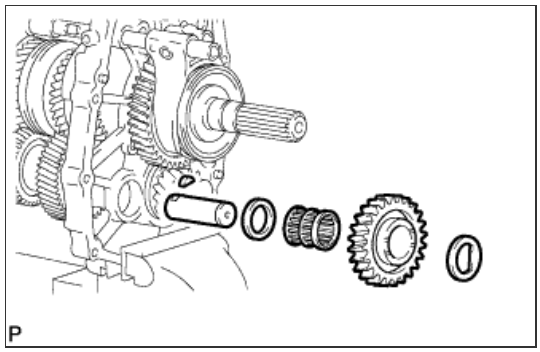
c. Using a snap ring expander, install the 2 snap rings to the counter gear and

input shaft.



29. INSTALL REVERSE IDLER GEAR SHAFT WOODRUFF KEY

a. Install the woodruff key to the reverse idler gear shaft.



30. INSTALL REVERSE IDLER GEAR SHAFT

a. Install the reverse idler gear shaft to the intermediate plate.

31. INSTALL REVERSE IDLER THRUST WASHER

a. Install the thrust washer to the reverse idler gear shaft.

NOTICE:

- **Align the protrusion of the washer with the groove of the intermediate plate during installation.**
- **Install the washer so that the dimpled surface of the washer contacts the reverse idler gear thrust surface.**

32. INSTALL REVERSE IDLER GEAR BUSH OR BEARING

a. Install the bearing to the reverse idler gear shaft.

33. INSTALL REVERSE IDLER GEAR

a. Install the reverse idler gear to the reverse idler gear shaft.

34. INSTALL NO. 2 REVERSE IDLER THRUST WASHER

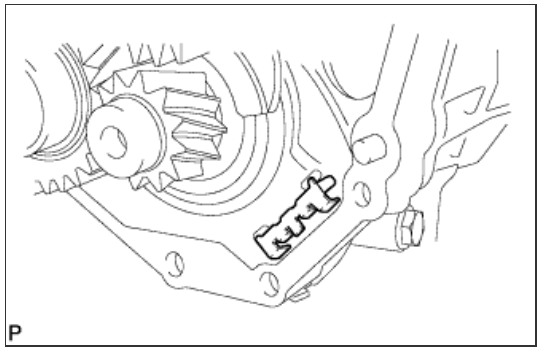
a. Install the thrust washer to the reverse idler gear shaft.

NOTICE:

Install the washer so that the dimpled surface of the washer contacts the reverse idler gear thrust surface.

35. INSTALL TRANSMISSION MAGNET

a. Install the transmission magnet to the intermediate plate.



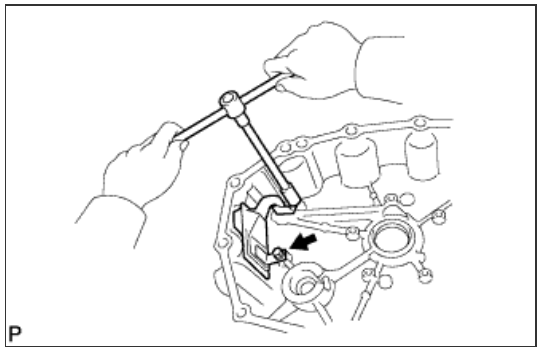
36. INSTALL MANUAL TRANSMISSION OIL STRAINER SUB-ASSEMBLY

a. Install a new O-ring to the oil strainer.

b. Apply a light coat of gear oil to the O-ring.

c. Install the oil strainer to the transfer adapter with the 2 bolts.

Torque:
12 N*m{ 120 kgf*cm , 9 ft.*lbf }

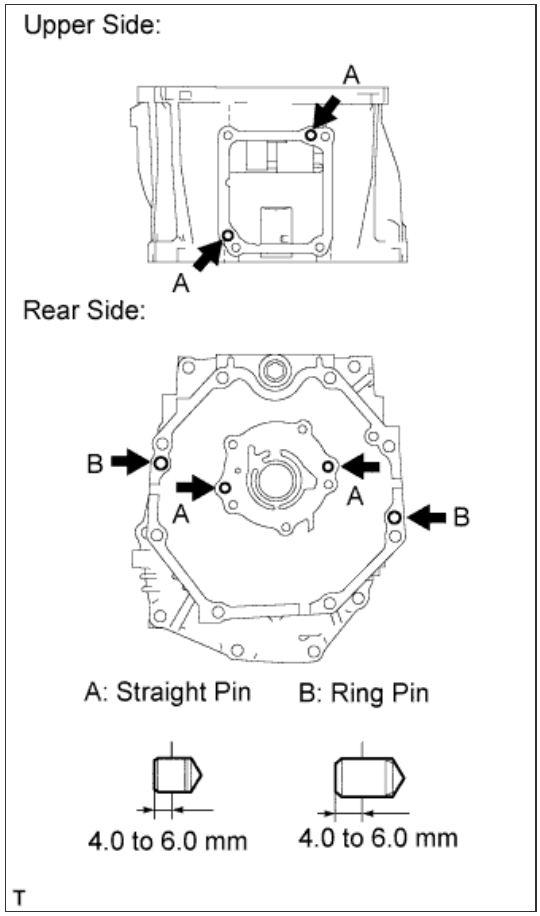


37. INSTALL TRANSFER ADAPTER STRAIGHT PIN AND RING PIN

a. Using a plastic-faced hammer, tap in 4 new straight pins and 2 new ring pins to the transfer adapter.

Standard Protrusion Height A (Straight Pin):
4.0 to 6.0 mm (0.157 to 0.236 in.)

Standard Protrusion Height B (Ring Pin):
4.0 to 6.0 mm (0.157 to 0.236 in.)



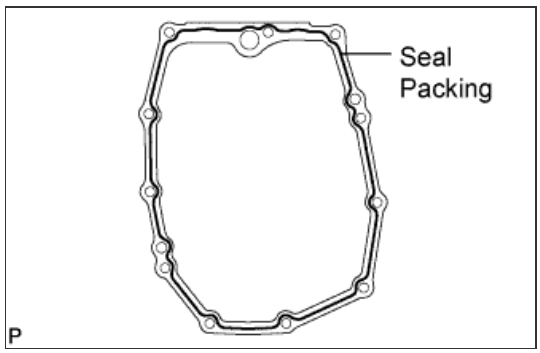
38. INSTALL TRANSFER ADAPTER SUB-ASSEMBLY

a. Apply seal packing to the transfer adapter, as shown in the illustration.

Seal Packing:
Toyota Genuine Seal Packing 1281, Three Bond 1281 or equivalent

NOTICE:

Parts must be assembled within 10 minutes of application. Otherwise, the packing (FIPG) material must be removed and reapplied.

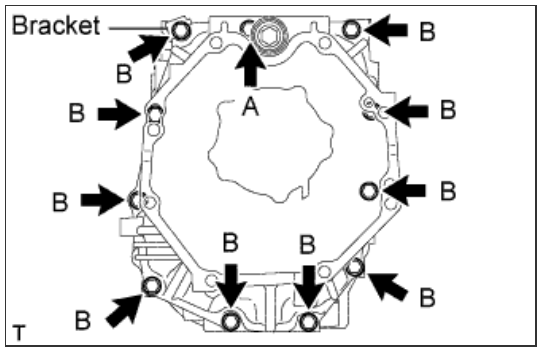


b. Install the transfer adapter and bracket to the transmission case with the 11 bolts.

Torque:
37 N*m{ 380 kgf*cm , 27 ft.*lbf }

Bolt Length:

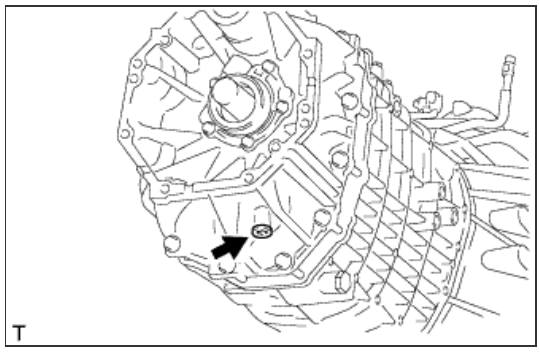
Item	Length
Bolt A	110 mm (4.33 in.)
Bolt B	70 mm (2.75 in.)



39. INSTALL TRANSFER ADAPTER PLUG

a. Using a T40 "TORX" socket wrench, install the transfer adapter plug to the transfer adapter.

Torque:
19 N*m{ 190 kgf*cm , 14 ft.*lbf }



40. INSTALL SHIFT AND SELECT LEVER SHAFT

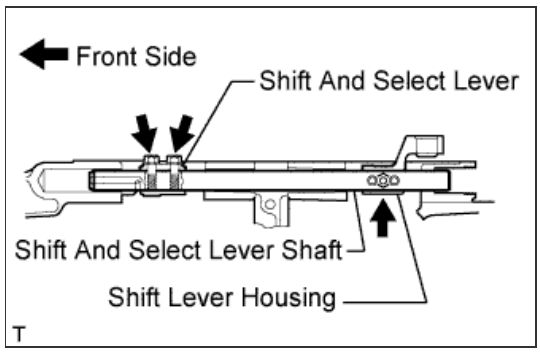
a. Install the shift and select lever, shift lever housing, and shift and select lever shaft to the transmission as shown in the illustration.

b. Install the 2 bolts to the shift and select lever.

Torque:
38 N*m{ 390 kgf*cm , 28 ft.*lbf }

c. Install the bolt to the shift lever housing.

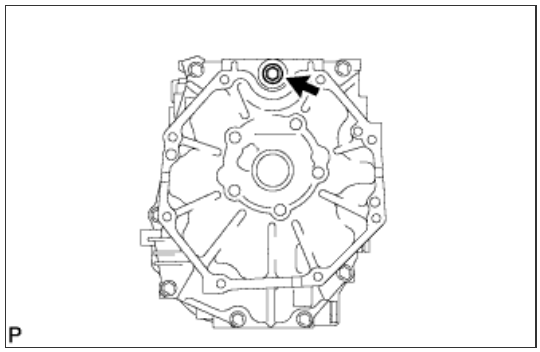
Torque:
38 N*m{ 390 kgf*cm , 28 ft.*lbf }



d. Using a 14 mm hexagon wrench, install the interlock hole plug to the transfer adapter.

Torque:

18 N*m{ 185 kgf*cm , 13 ft.*lbf }



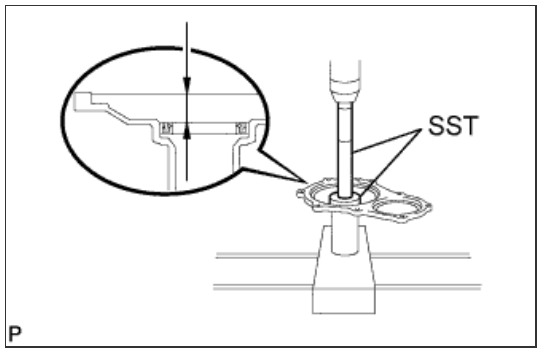
41. INSTALL TRANSMISSION FRONT BEARING RETAINER OIL SEAL

a. Using SST and a press, drive in a new oil seal.

SST
09950-60010 (09951-00460)
09950-70010 (09951-07150)

Standard Drive in Depth:
15.4 to 16.2 mm (0.607 to 0.637 in.)

b. Apply gear oil to the lip of the oil seal.



42. INSTALL FRONT BEARING RETAINER (MTM)

a. Apply seal packing to the front bearing retainer, as shown in the illustration.

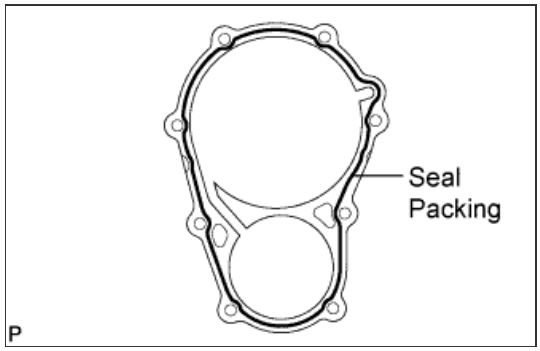
Seal Packing:
Toyota Genuine Seal Packing 1281, Three Bond 1281 or equivalent

NOTICE:

Parts must be assembled within 10 minutes of application. Otherwise, the packing (FIPG) material must be removed and reapplied.

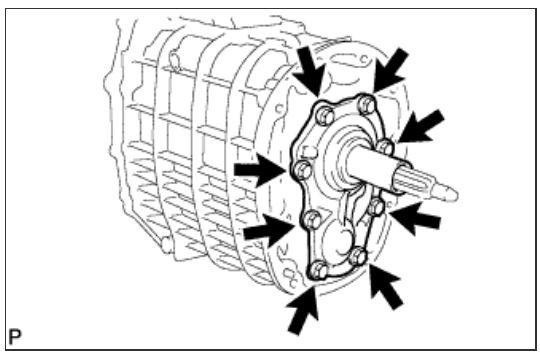
b. Apply adhesive to 2 or 3 threads of the bolts.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent



c. Install the front bearing retainer to the transmission case with the 8 bolts.

Torque:
17 N*m{ 170 kgf*cm , 12 ft.*lbf }

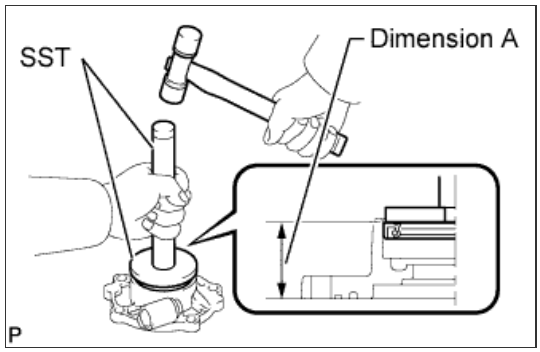


43. INSTALL TRANSMISSION OIL PUMP COVER OIL SEAL

a. Using SST and a hammer, tap a new oil seal into the oil pump cover in accordance with the dimension specified in the illustration.

SST

09950-70010 (09951-07150)
09950-60010 (09951-00640)



44. INSTALL TRANSMISSION OIL PUMP COVER

a. Apply MP grease to the straight pins.

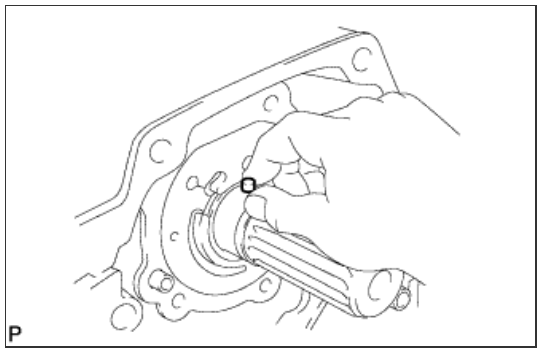
b. Install the 2 straight pins.

c. Install a new O-ring to the oil pump cover.

d. Align the oil pump drive rotor groove with the straight pin, and install the oil pump cover to the transfer adapter.

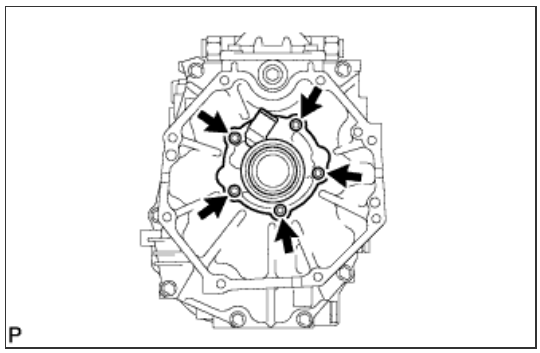
e. Apply adhesive to 2 or 3 threads of the bolts.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent



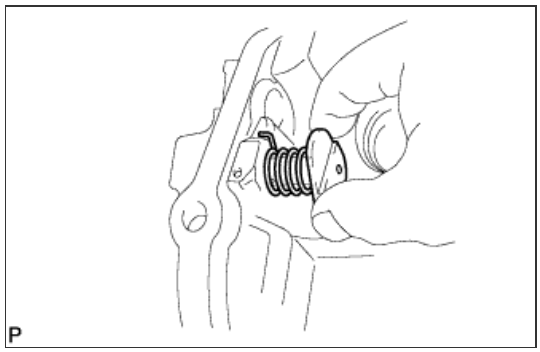
f. Install the oil pump cover to the transfer adapter with the 5 bolts.

Torque:
17 N*m{ 170 kgf*cm , 12 ft.*lbf }

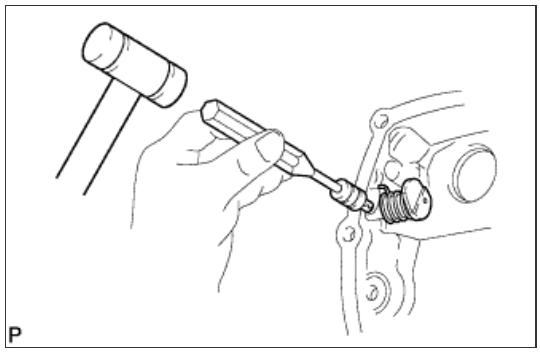


45. INSTALL NO. 1 REVERSE RESTRICT PIN

a. Install the No. 1 reverse restrict pin and spring to the shift lever retainer.



b. Using a 5 mm pin punch and hammer, tap a new slotted pin into the shift lever retainer.



46. INSTALL FLOOR SHIFT CONTROL SHIFT LEVER RETAINER SUB-ASSEMBLY

a. Apply seal packing to the shift lever retainer, as shown in the illustration.

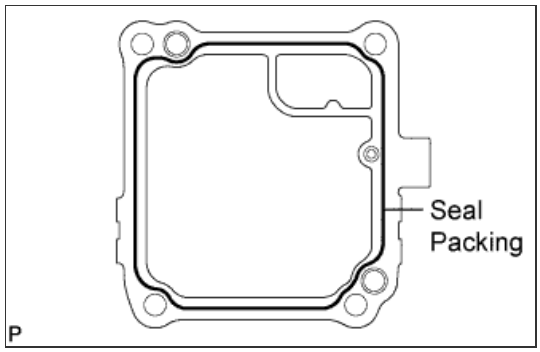
Seal Packing:
Toyota Genuine Seal Packing 1281, Three Bond 1281 or equivalent

NOTICE:

Parts must be assembled within 10 minutes of application. Otherwise, the packing (FIPG) material must be removed and reapplied.

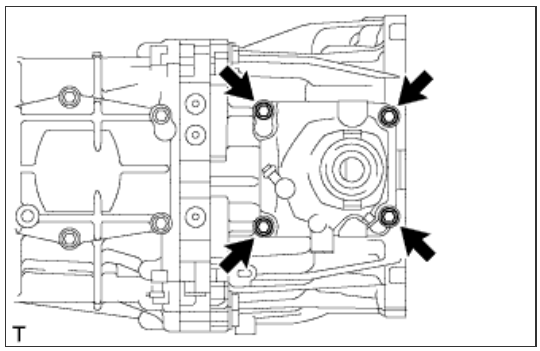
b. Apply adhesive to 2 or 3 threads of the bolts.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent



c. Install the shift lever retainer to the transfer adapter with the 4 bolts.

Torque:
17 N*m{ 170 kgf*cm , 12 ft.*lbf }



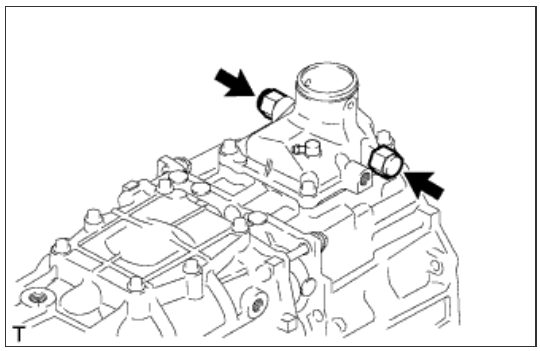
47. INSTALL REVERSE RESTRICT PIN ASSEMBLY

a. Apply adhesive to 2 or 3 threads of the reverse restrict pins.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

b. Install the 2 reverse restrict pins to the shift lever retainer.

Torque:
37 N*m{ 380 kgf*cm , 27 ft.*lbf }



48. INSTALL CONTROL SHAFT COVER

a. Apply seal packing to the control shaft cover, as shown in the illustration.

Seal Packing:

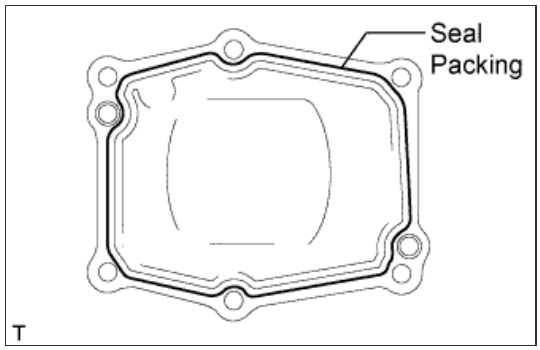
Toyota Genuine Seal Packing 1281, Three Bond 1281 or equivalent

NOTICE:

Parts must be assembled within 10 minutes of application. Otherwise, the packing (FIPG) material must be removed and reapplied.

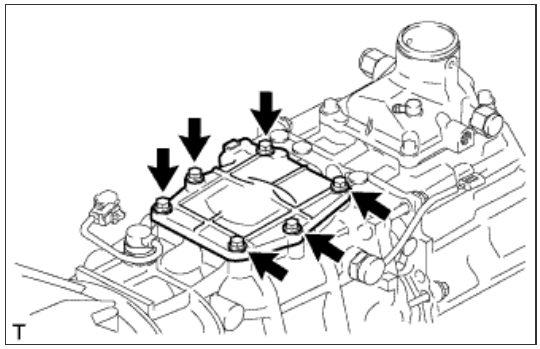
b. Apply adhesive to 2 or 3 threads of the bolts.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent



c. Install the control shaft cover to the manual transmission with the 6 bolts.

Torque:
17 N*m{ 170 kgf*cm , 12 ft.*lbf }



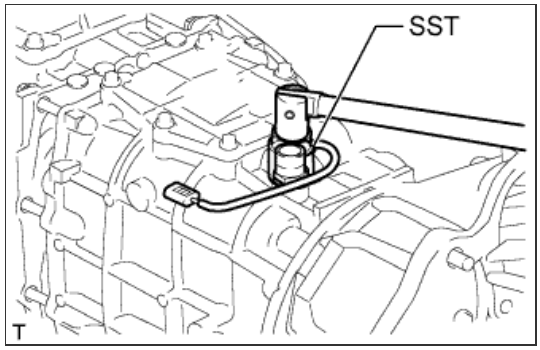
49. INSTALL SHIFT POSITION SWITCH (for 1VD-FTV)

a. Using SST, install a new gasket and the shift position switch to the transmission.

SST
09817-16011

Torque:
44 N*m{ 450 kgf*cm , 33 ft.*lbf }

b. Connect the wire harness clamp.



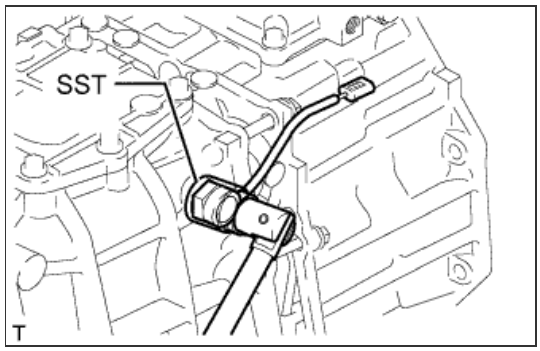
50. INSTALL BACK-UP LIGHT SWITCH ASSEMBLY

a. Using SST, install a new gasket and the back-up light switch to the transmission.

SST
09817-16011

Torque:
44 N*m{ 450 kgf*cm , 33 ft.*lbf }

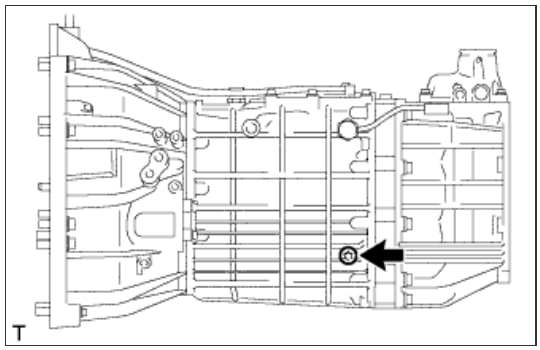
b. Connect the wire harness clamp.



51. INSTALL MANUAL TRANSMISSION CASE PLUG

a. Using a T55 "TORX" socket wrench, install a new gasket and the manual transmission case plug to the transmission.

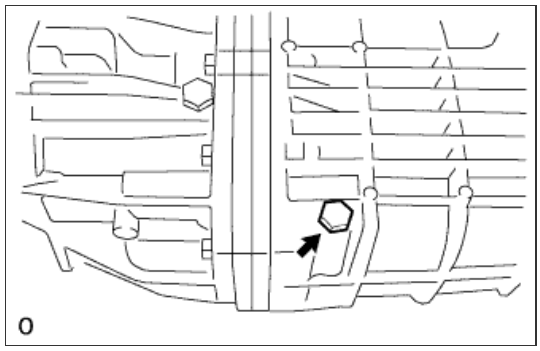
Torque:
37 N*m{ 380 kgf*cm , 27 ft.*lbf }



52. INSTALL DRAIN PLUG

a. Install a new gasket and the drain plug to the manual transmission.

Torque:
37 N*m{ 380 kgf*cm , 27 ft.*lbf }



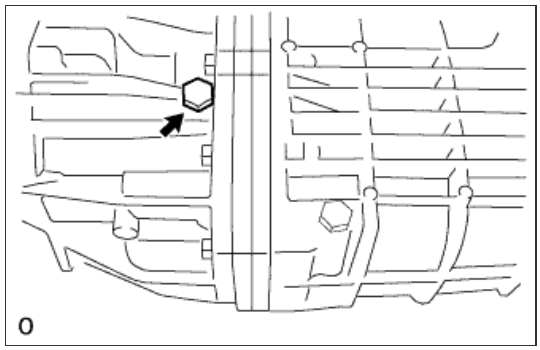
53. TEMPORARILY INSTALL FILLER PLUG

a. Temporarily install a new gasket and the filler plug to the manual transmission.

Torque:
37 N*m{ 380 kgf*cm , 27 ft.*lbf }

HINT:

The filler plug will be tightened to a torque specification in the "Inspect Transmission Oil" procedure.



54. INSTALL CLUTCH HOUSING

a. Apply adhesive to 2 or 3 threads of the bolts labeled A only.

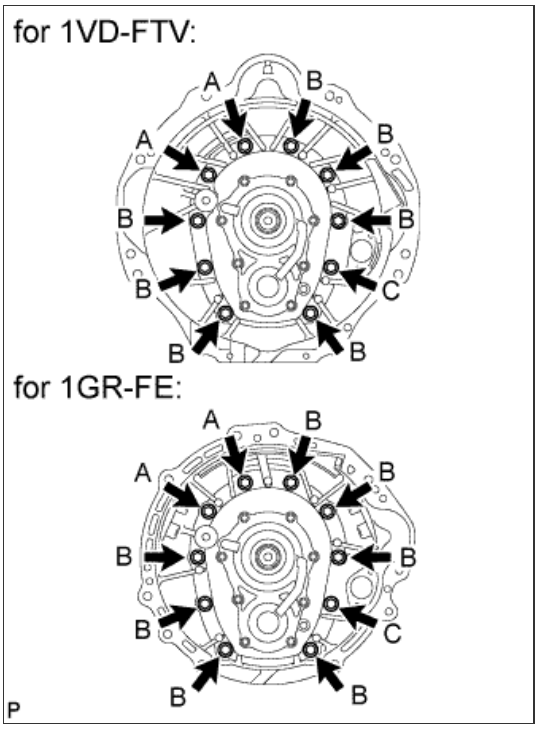
Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

b. Install the clutch housing with the 10 bolts.

Torque:
37 N*m{ 380 kgf*cm , 27 ft.*lbf }

Bolt Length:

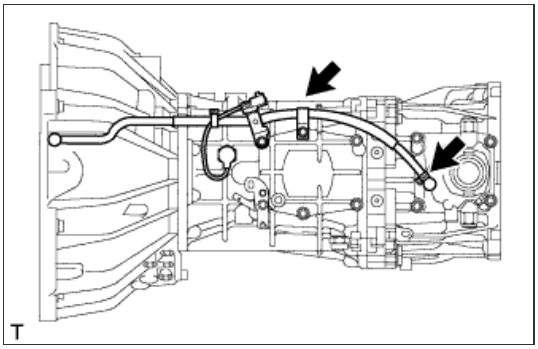
Item	Length
Bolt A	45 mm (1.77 in.)
Bolt B	45 mm (1.77 in.)
Bolt C	35 mm (1.38 in.)



55. INSTALL TRANSMISSION BREATHER SUB-ASSEMBLY (for 1VD-FTV)

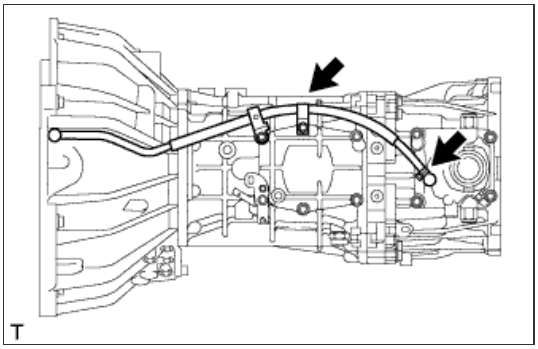
a. Connect the breather hose with the clamp.

b. Install the wire harness clamp.

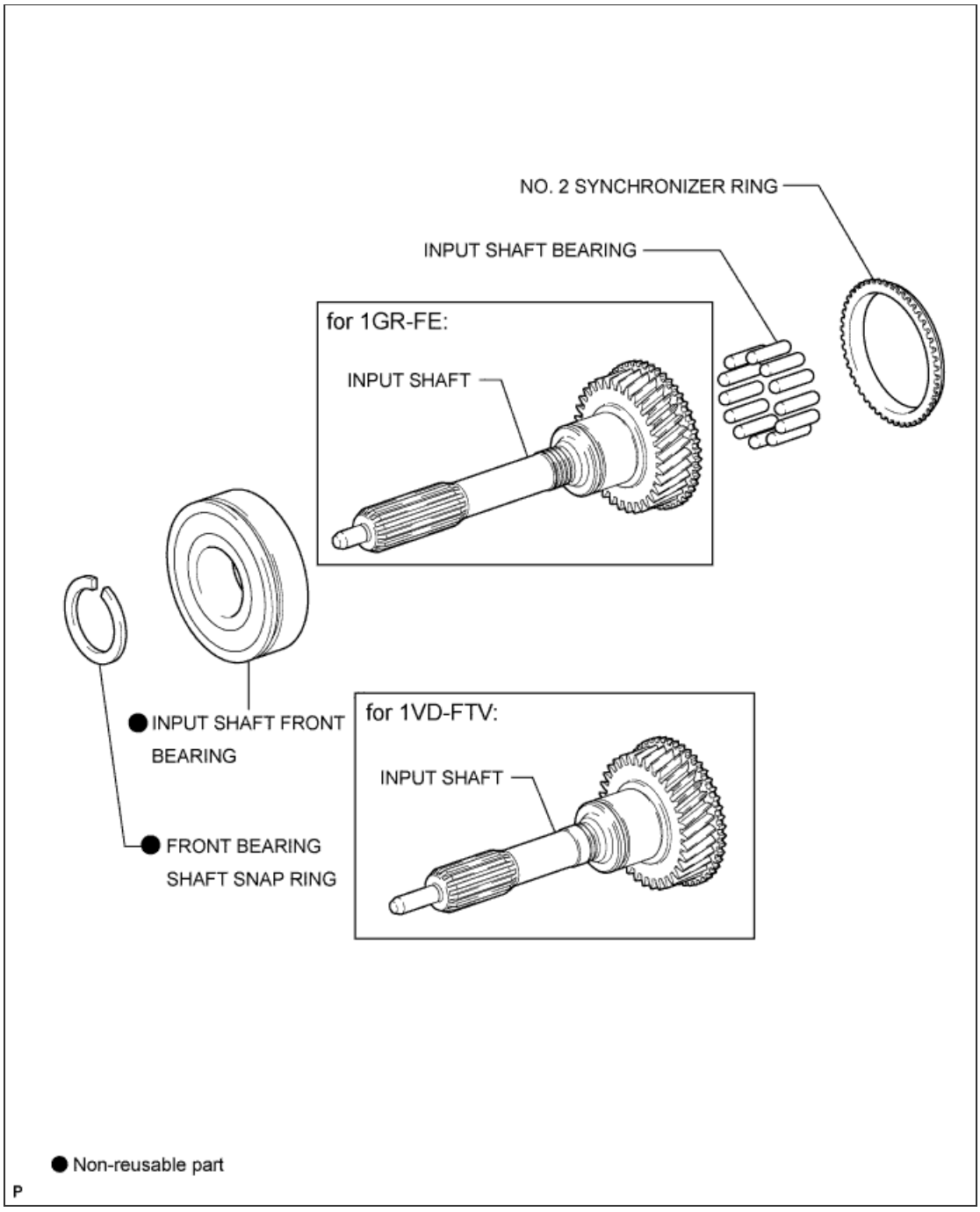


56. INSTALL TRANSMISSION BREATHER SUB-ASSEMBLY (for 1GR-FE)

a. Connect the breather hose with the clamp.



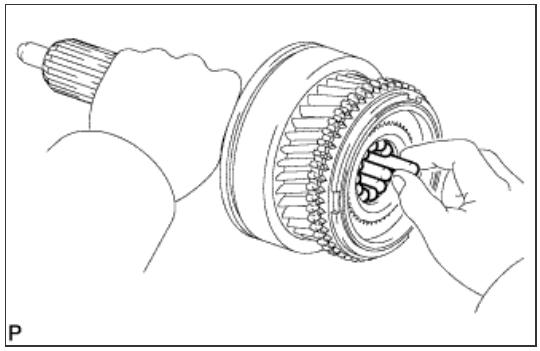
for Preparation Click here



for Preparation Click here

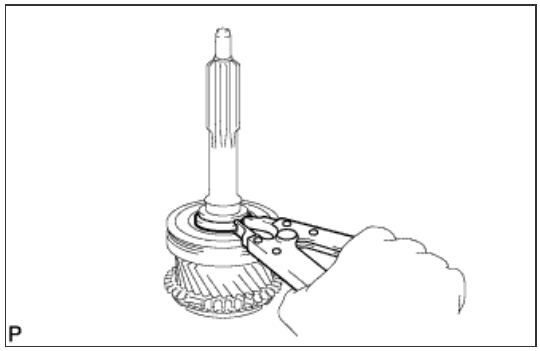
1. REMOVE INPUT SHAFT BEARING

a. Remove the 12 roller bearings.



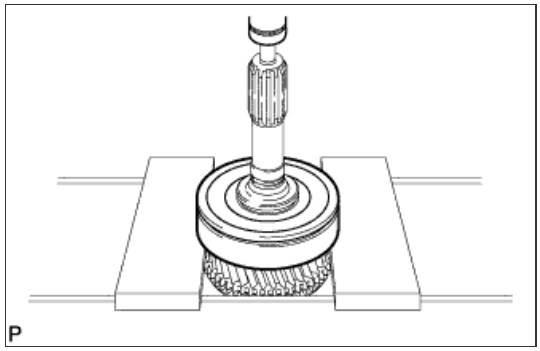
2. REMOVE FRONT BEARING SHAFT SNAP RING

a. Using a snap ring expander, remove the snap ring.



3. REMOVE INPUT SHAFT FRONT BEARING

a. Using a press, remove the bearing.

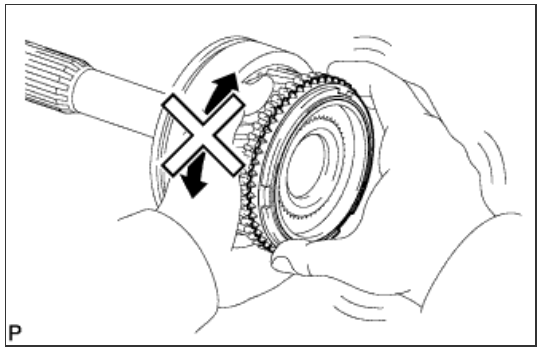


for Preparation Click here

1. INSPECT NO. 2 SYNCHRONIZER RING

a. Check for wear or damage.

b. Coat the gear cone with gear oil. Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the gear cone. Check that the ring locks.

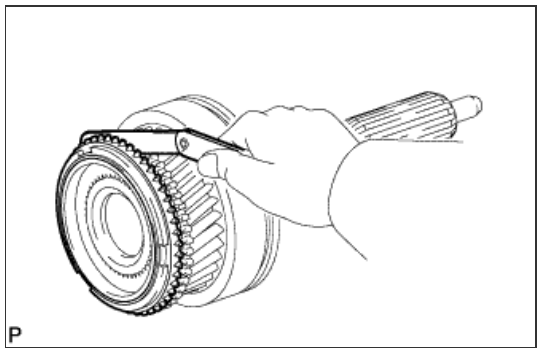


c. Using a feeler gauge, measure the clearance between the synchronizer ring back and gear spline end.

Standard Clearance:
0.08 to 0.16 mm (0.0315 to 0.0629 in.)

Minimum Clearance:
0.08 mm (0.0315 in.)

If the clearance is less than the minimum, replace the synchronizer ring.



for Preparation Click here

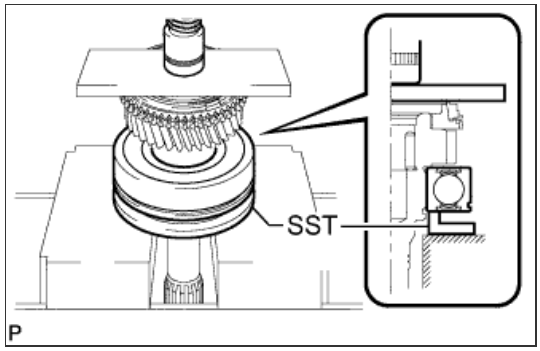
1. INSTALL INPUT SHAFT FRONT BEARING

a. Using SST and a press, install the input shaft front bearing to the input shaft.

SST
09316-20011

HINT:

Make sure that the groove of the bearing faces the correct direction as shown in the illustration.



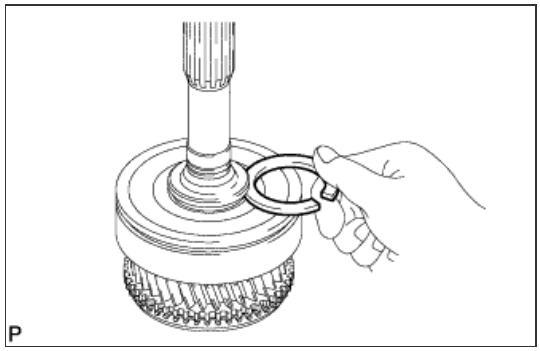
2. INSTALL FRONT BEARING SHAFT SNAP RING

a. Select a new snap ring that will allow minimum clearance.

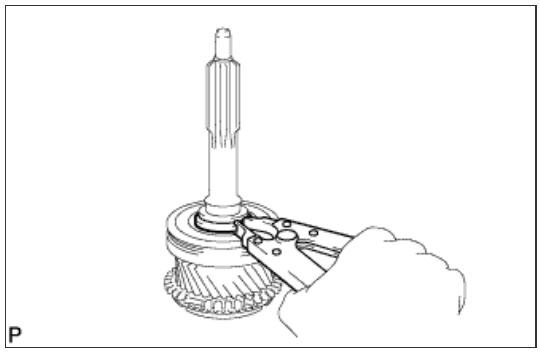
Standard Clearance:
0.1 mm (0.00393 in.) or less

Snap Ring Thickness:

Part No.	Thickness	Mark
90520-45003	2.50 to 2.55 mm (0.0984 to 0.100 in.)	A
90520-45004	2.55 to 2.60 mm (0.100 to 0.102 in.)	B
90520-45005	2.60 to 2.65 mm (0.102 to 0.104 in.)	C
90520-45006	2.65 to 2.70 mm (0.104 to 0.106 in.)	D
90520-45007	2.70 to 2.75 mm (0.106 to 0.108 in.)	E
90520-45008	2.75 to 2.80 mm (0.108 to 0.110 in.)	F



b. Using a snap ring expander, install the snap ring to the input shaft.

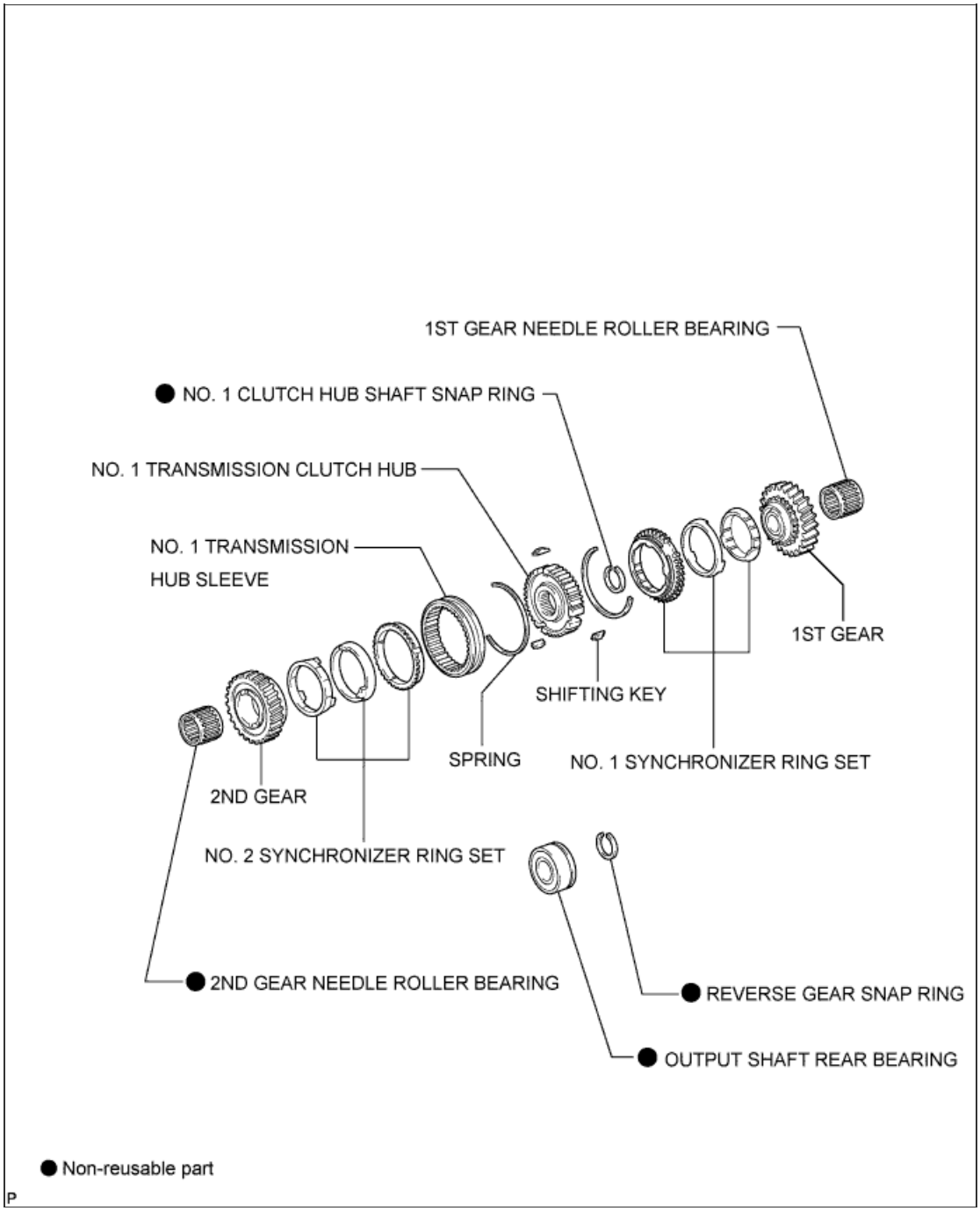


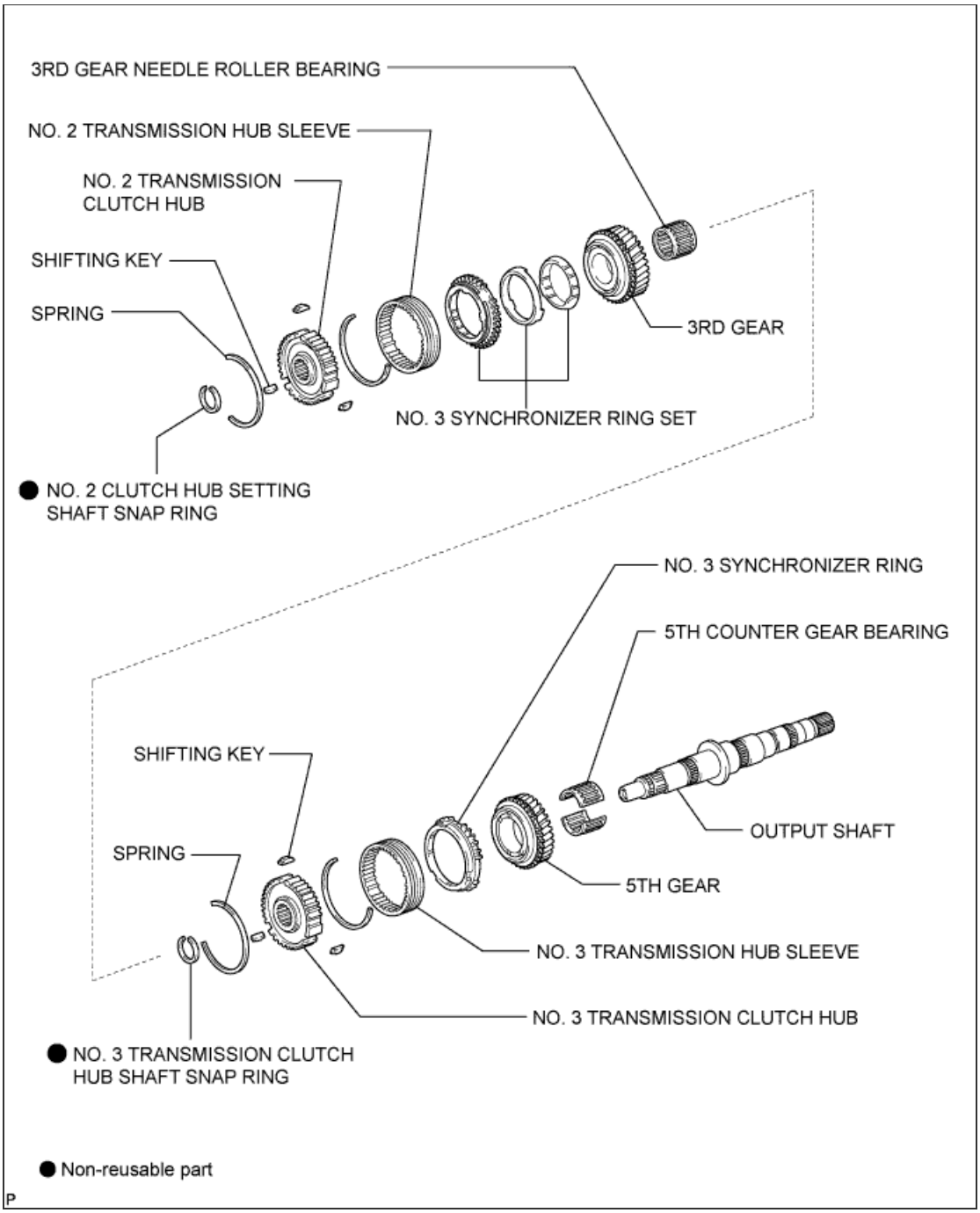
3. INSTALL INPUT SHAFT BEARING

a. Apply MP grease to the 12 roller bearings.

b. Install the 12 roller bearings into the input shaft.

for Preparation [Click here]




3RD GEAR NEEDLE ROLLER BEARING
NO. 2 TRANSMISSION HUB SLEEVE
NO. 2 TRANSMISSION CLUTCH HUB
SHIFTING KEY
SPRING
3RD GEAR
NO. 3 SYNCHRONIZER RING SET
● NO. 2 CLUTCH HUB SETTING SHAFT SNAP RING
NO. 3 SYNCHRONIZER RING
5TH COUNTER GEAR BEARING
SHIFTING KEY
SPRING
OUTPUT SHAFT
5TH GEAR
NO. 3 TRANSMISSION HUB SLEEVE
NO. 3 TRANSMISSION CLUTCH HUB
● NO. 3 TRANSMISSION CLUTCH HUB SHAFT SNAP RING
● Non-reusable part
P

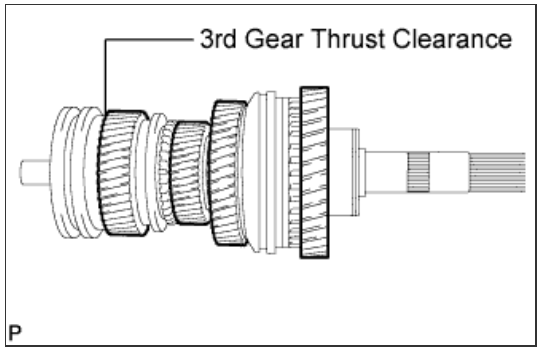
for Preparation Click here

1. INSPECT 3RD GEAR THRUST CLEARANCE

a. Using a feeler gauge, measure the 3rd gear thrust clearance.

Standard Clearance:
0.10 to 0.45 mm (0.00394 to 0.0177 in.)

If the clearance is outside the specification, replace the defective gear, spacer or shaft.

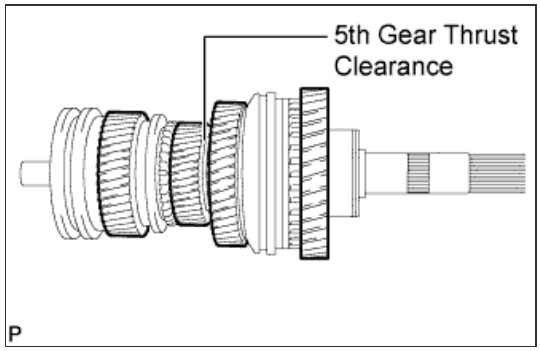


2. INSPECT 5TH GEAR THRUST CLEARANCE

a. Using a feeler gauge, measure the 5th gear thrust clearance.

Standard Clearance:
0.10 to 0.35 mm (0.00394 to 0.0137 in.)

If the clearance is outside the specification, replace the defective gear, spacer or shaft.

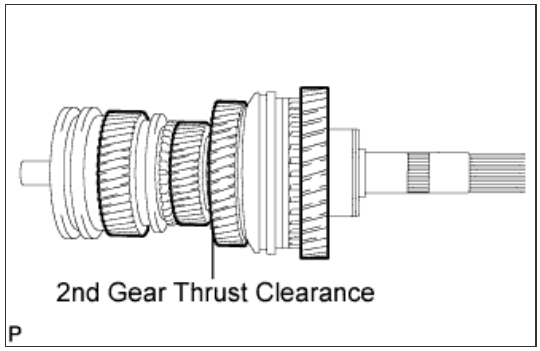


3. INSPECT 2ND GEAR THRUST CLEARANCE

a. Using a feeler gauge, measure the 2nd gear thrust clearance.

Standard Clearance:
0.10 to 0.35 mm (0.00394 to 0.0137 in.)

If the clearance is outside the specification, replace the defective gear, spacer or shaft.

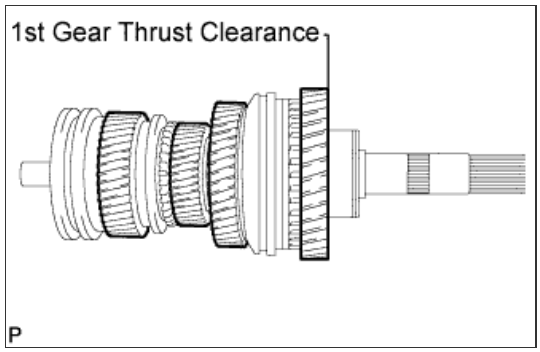


4. INSPECT 1ST GEAR THRUST CLEARANCE

a. Using a feeler gauge, measure the 1st gear thrust clearance.

Standard Clearance:
0.10 to 0.45 mm (0.00394 to 0.0177 in.)

If the clearance is outside the specification, replace the defective gear, spacer or shaft.

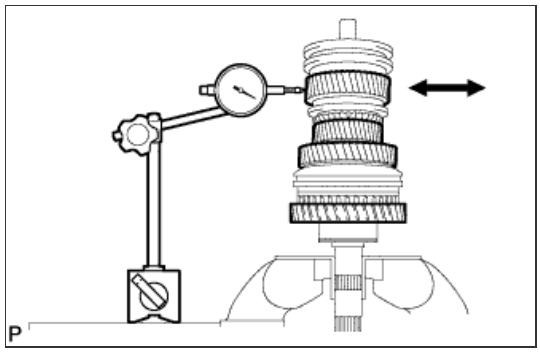


5. INSPECT 3RD GEAR RADIAL CLEARANCE

a. Using a dial indicator, measure the 3rd gear radial clearance.

Standard Clearance:
0.020 to 0.073 mm (0.000788 to 0.00287 in.)

If the clearance is outside the specification, replace the defective gear, needle roller bearing or shaft.

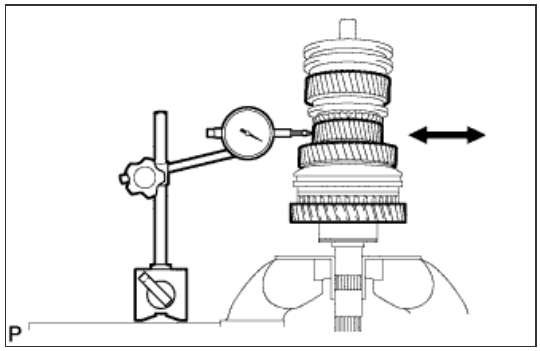


6. INSPECT 5TH GEAR RADIAL CLEARANCE

a. Using a dial indicator, measure the 5th gear radial clearance.

Standard Clearance:
0.015 to 0.068 mm (0.000591 to 0.00267 in.)

If the clearance is outside the specification, replace the defective gear, needle roller bearing or shaft.

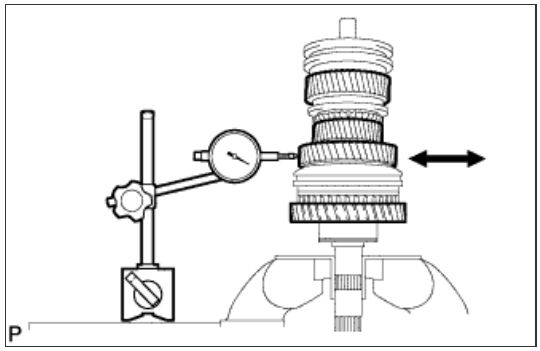


7. INSPECT 2ND GEAR RADIAL CLEARANCE

a. Using a dial indicator, measure the 2nd gear radial clearance.

Standard Clearance:
0.015 to 0.068 mm (0.000591 to 0.00267 in.)

If the clearance is outside the specification, replace the defective gear, needle roller bearing or shaft.

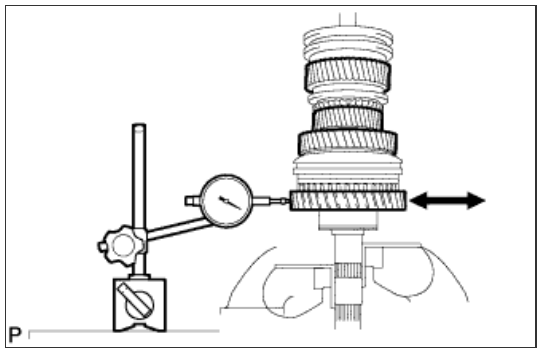


8. INSPECT 1ST GEAR RADIAL CLEARANCE

a. Using a dial indicator, measure the 1st gear radial clearance.

Standard Clearance:
0.020 to 0.073 mm (0.000788 to 0.00287 in.)

If the clearance is outside the specification, replace the defective gear, needle roller bearing or shaft.

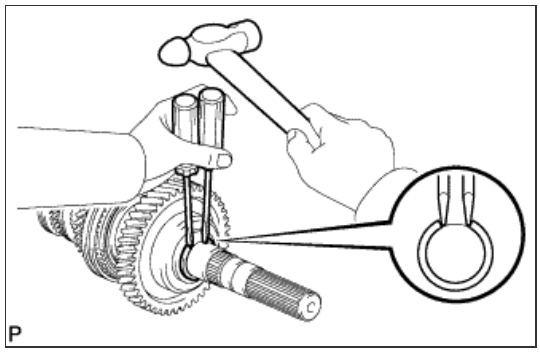


9. REMOVE REVERSE GEAR SNAP RING

a. Using 2 screwdrivers and a hammer, tap out the snap ring.

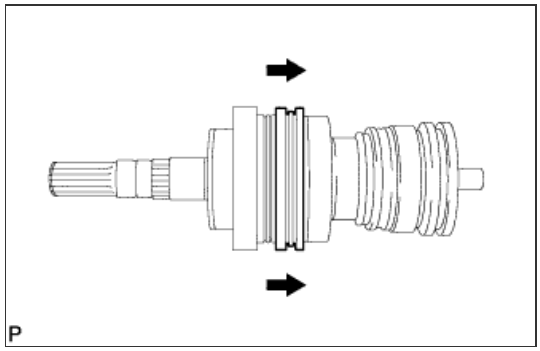
HINT:

Use a piece of cloth to prevent the snap ring from flying off.



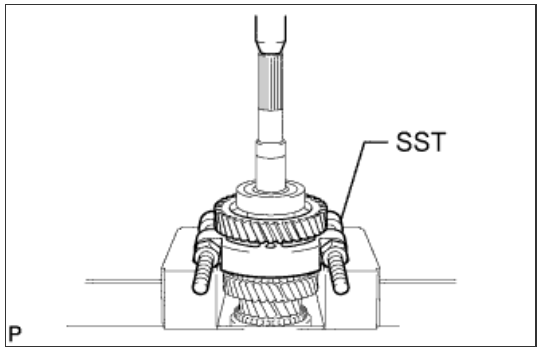
10. REMOVE 1ST GEAR

a. Shift the No. 1 transmission hub sleeve to the 2nd gear.



b. Using SST and a press, remove the bearing, 1st gear and synchronizer ring.

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09555-55010



11. REMOVE 1ST GEAR NEEDLE ROLLER BEARING

a. Remove the 1st gear needle roller bearing from the output shaft.

12. REMOVE NO. 1 SYNCHRONIZER RING SET

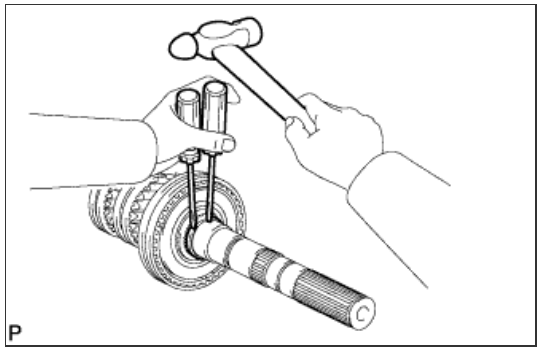
a. Remove the No. 1 synchronizer ring from the 1st gear.

13. REMOVE NO. 1 CLUTCH HUB SHAFT SNAP RING

a. Using 2 screwdrivers and a hammer, tap out the snap ring.

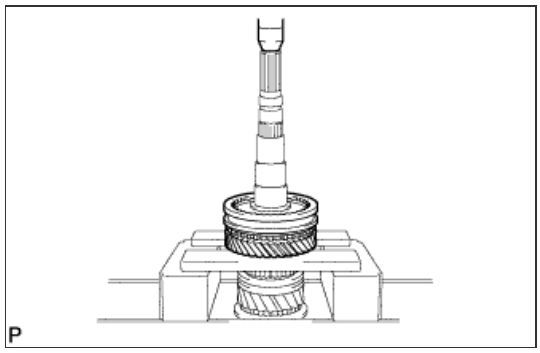
HINT:

Use a piece of cloth to prevent the snap ring from flying off.



14. REMOVE 2ND GEAR

a. Using a press, remove the 2nd gear and synchronizer ring.



15. REMOVE 2ND GEAR NEEDLE ROLLER BEARING

a. Remove the 2nd gear needle roller bearing from the output shaft.

16. REMOVE NO. 2 SYNCHRONIZER RING SET

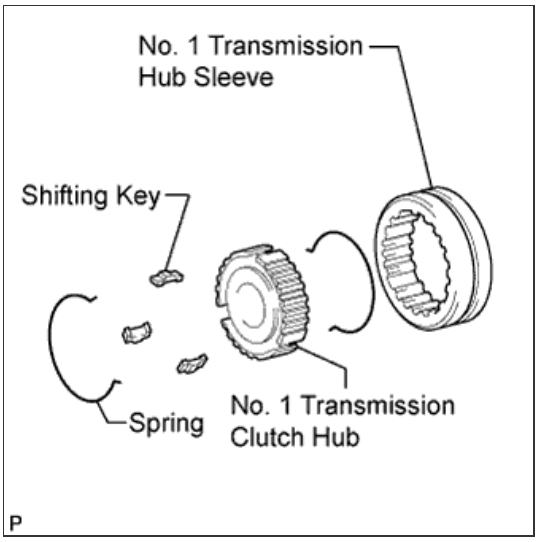
a. Remove the No. 2 synchronizer ring set from the 2nd gear.

17. REMOVE NO. 1 TRANSMISSION HUB SLEEVE

a. Remove the No. 1 transmission hub sleeve, 3 shifting keys and 2 springs from the No. 1 transmission clutch hub.

HINT:

Use a piece of cloth to prevent the spring from flying off.

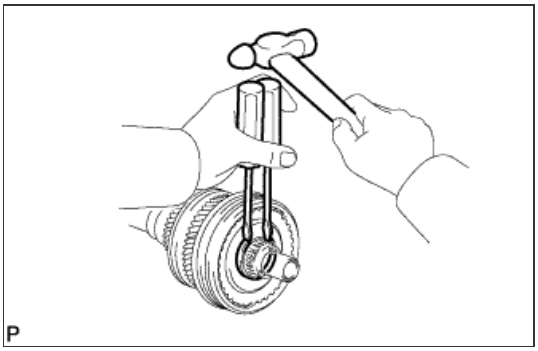


18. REMOVE NO. 2 CLUTCH HUB SETTING SHAFT SNAP RING

a. Using 2 screwdrivers and a hammer, tap out the snap ring.

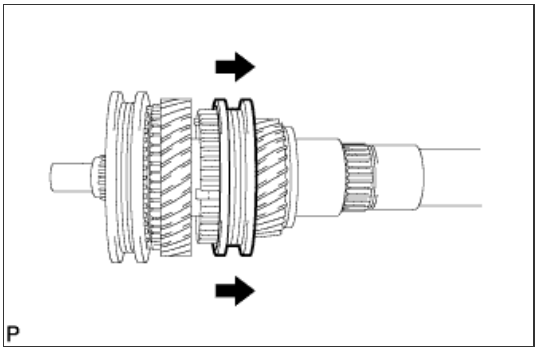
HINT:

Use a piece of cloth to prevent the snap ring from flying off.



19. REMOVE 3RD GEAR

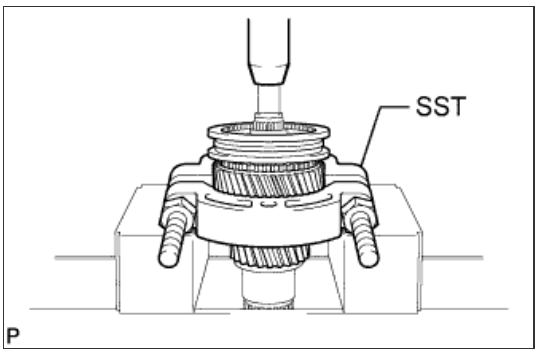
a. Shift the No. 3 transmission hub sleeve to the 5th gear.



b. Using SST and a press, remove the 3rd gear and synchronizer ring.

SST

09555-55010



20. REMOVE 3RD GEAR NEEDLE ROLLER BEARING

a. Remove the 3rd gear needle roller bearing from the output shaft.

21. REMOVE NO. 3 SYNCHRONIZER RING SET

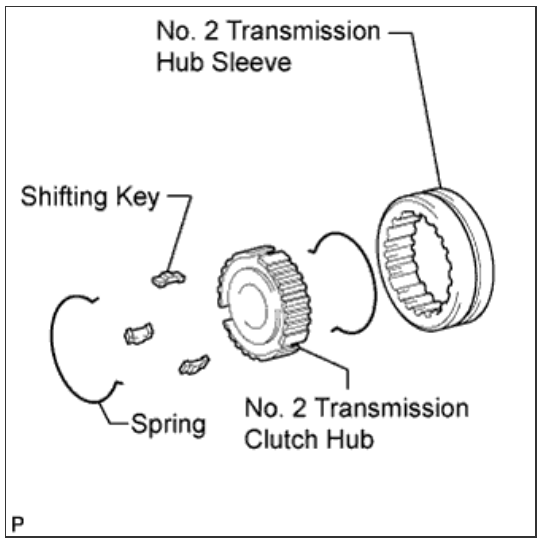
a. Remove the No. 3 synchronizer ring set from the 3rd gear.

22. REMOVE NO. 2 TRANSMISSION HUB SLEEVE

a. Remove the No. 2 transmission hub sleeve, 3 shifting keys and 2 springs from the No. 2 transmission clutch hub.

HINT:

Use a piece of cloth to prevent the spring from flying off.

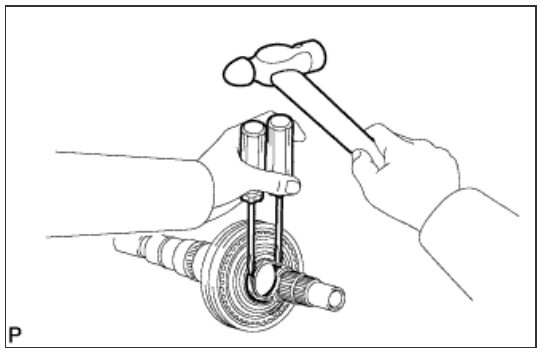


23. REMOVE NO. 3 TRANSMISSION CLUTCH HUB SHAFT SNAP RING

a. Using 2 screwdrivers and a hammer, tap out the snap ring.

HINT:

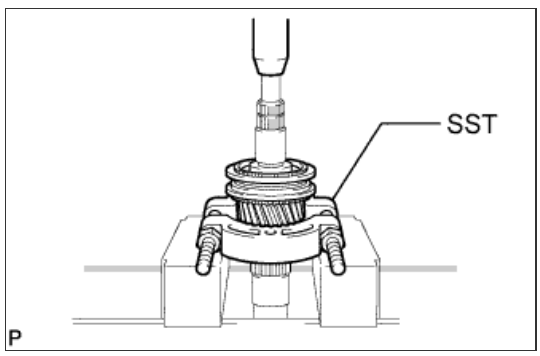
Use a piece of cloth to prevent the snap ring from flying off.



24. REMOVE 5TH GEAR

a. Using SST and a press, remove the 5th gear and synchronizer ring.

SST
09555-55010



25. REMOVE 5TH COUNTER GEAR BEARING

a. Remove the 5th counter gear bearing from the output shaft.

26. REMOVE NO. 3 SYNCHRONIZER RING SET

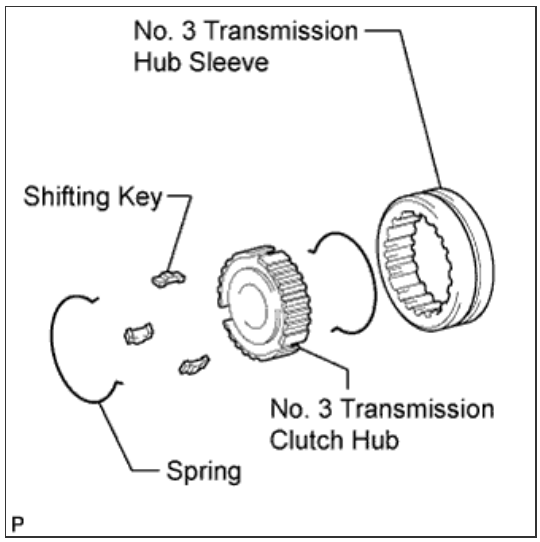
a. Remove the No. 3 synchronizer ring from the 5th gear.

27. REMOVE NO. 3 TRANSMISSION HUB SLEEVE

a. Remove the No. 3 transmission hub sleeve, 3 shifting keys and 2 springs from the No. 3 transmission clutch hub.

HINT:

Use a piece of cloth to prevent the spring from flying off.



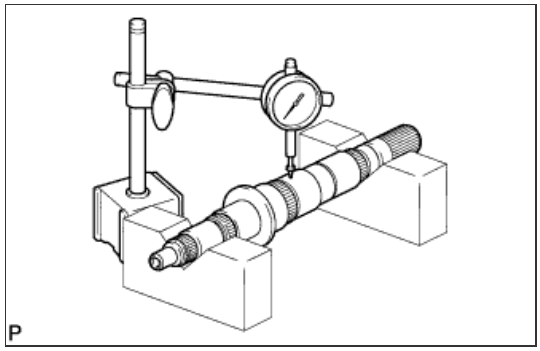
for Preparation Click here

1. INSPECT OUTPUT SHAFT

a. Using a dial indicator and 2 V-blocks, measure the shaft runout.

Maximum Runout:
0.03 mm (0.00118 in.)

If the runout is more than the maximum, replace the output shaft.



b. Using a micrometer, measure the journal diameter.

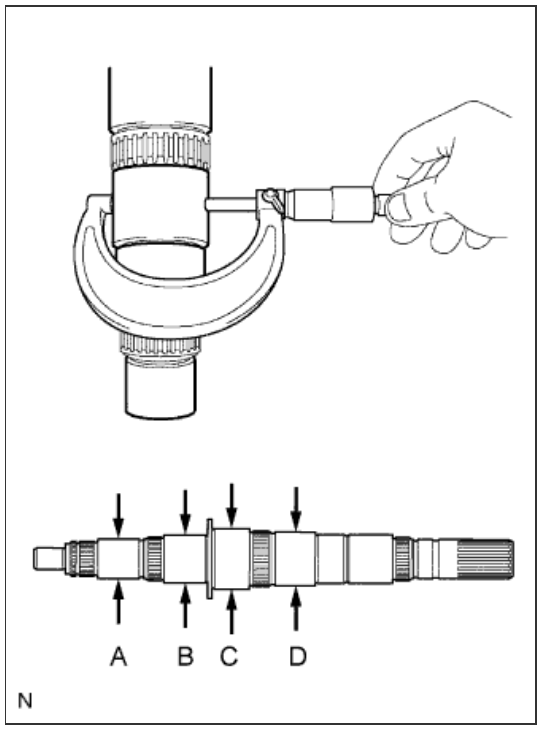
Standard Diameter:

Part	Specified Condition
A	37.979 to 37.995 mm (1.4952 to 1.4959 in.)
B	45.984 to 46.000 mm (1.8104 to 1.8110 in.)
C	57.984 to 58.000 mm (2.2828 to 2.2835 in.)
D	49.979 to 49.995 mm (1.9677 to 1.9683 in.)

Minimum Diameter:

Part	Specified Condition
A	37.979 mm (1.4952 in.)
B	45.984 mm (1.8104 in.)
C	57.984 mm (2.2828 in.)
D	49.979 mm (1.9677 in.)

If the diameter is less than the minimum, replace the output shaft.



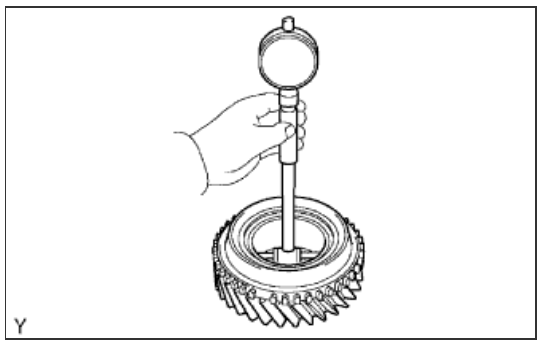
2. INSPECT 3RD GEAR

a. Using a cylinder gauge, measure the inside diameter of the 3rd gear.

Standard Inside Diameter:
44.015 to 44.040 mm (1.733 to 1.734 in.)

Maximum Inside Diameter:
44.040 mm (1.734 in.)

If the inside diameter is more than the maximum, replace the 3rd gear.



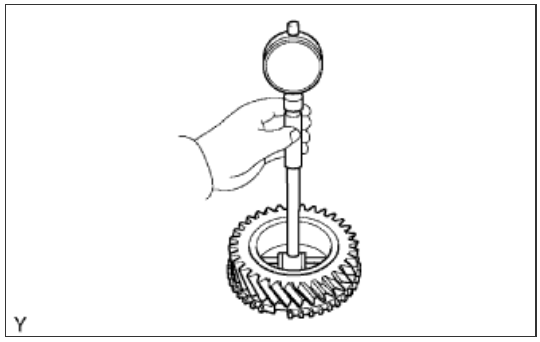
3. INSPECT 5TH GEAR

a. Using a cylinder gauge, measure the inside diameter of the 5th gear.

Standard Inside Diameter:
53.015 to 53.040 mm (2.087 to 2.088 in.)

Maximum Inside Diameter:
53.040 mm (2.088 in.)

If the inside diameter is more than the maximum, replace the 5th gear.



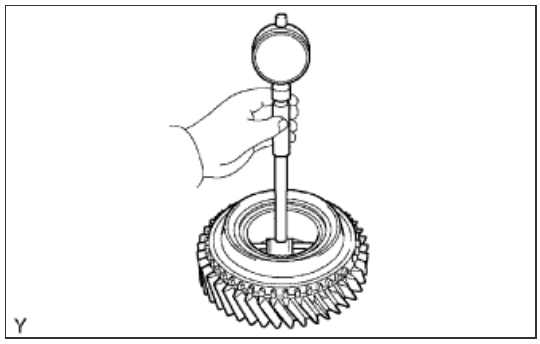
4. INSPECT 2ND GEAR

a. Using a cylinder gauge, measure the inside diameter of the 2nd gear.

Standard Inside Diameter:
65.015 to 65.040 mm (2.560 to 2.561 in.)

Maximum Inside Diameter:
65.040 mm (2.561 in.)

If the inside diameter is more than the maximum, replace the 2nd gear.



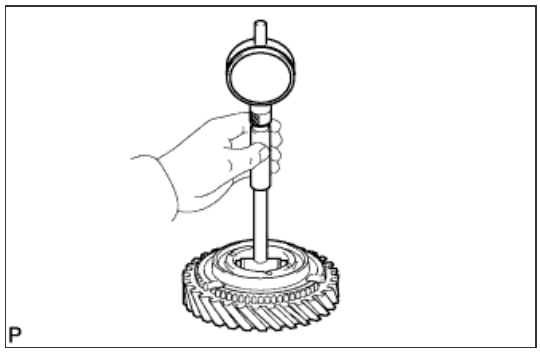
5. INSPECT 1ST GEAR

a. Using a cylinder gauge, measure the inside diameter of the 1st gear.

Standard Inside Diameter:
57.015 to 57.040 mm (2.2447 to 2.2457 in.)

Maximum Inside Diameter:
57.040 mm (2.2457 in.)

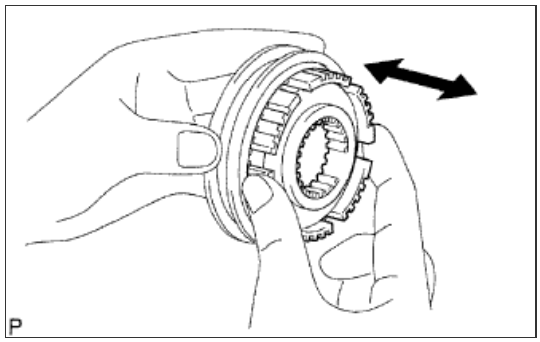
If the inside diameter is more than the maximum, replace the 1st gear.



6. INSPECT NO. 2 TRANSMISSION HUB SLEEVE

a. Check the sliding condition between the No. 2 transmission clutch hub and No. 2 transmission hub sleeve.

b. Check that the spline gear teeth of the No. 2 transmission hub sleeve are not worn.

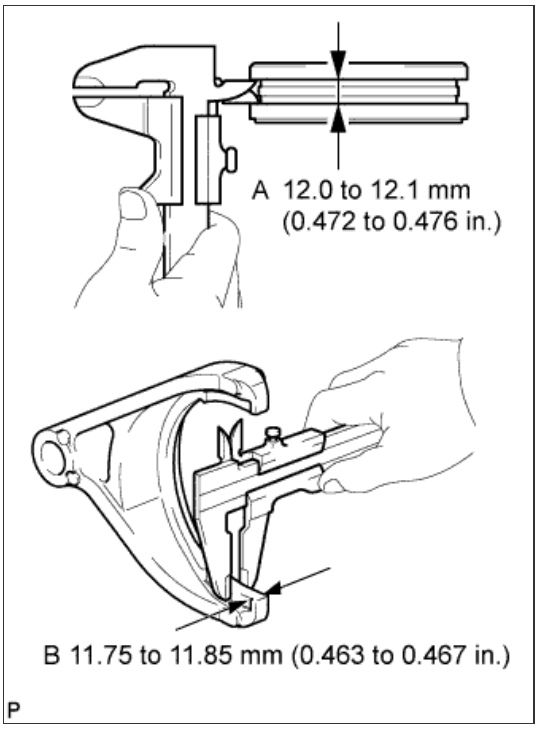


c. Using a vernier caliper, measure the width of the No. 2 transmission hub sleeve groove (A) and the thickness of the claw part on the gear shift forks (B), and calculate the clearance.

Standard Clearance (A - B):
0.15 to 0.35 mm (0.00591 to 0.0137 in.)

Maximum Clearance:
0.35 mm (0.0137 in.)

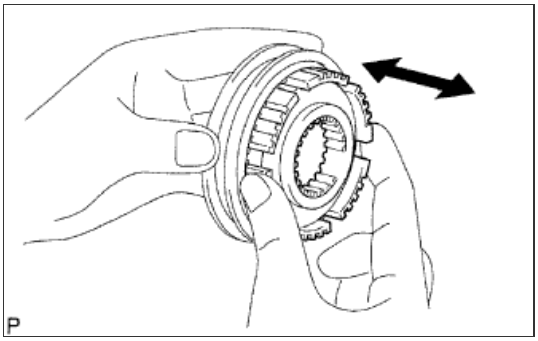
If the clearance is is more than the maximum, replace the No. 2 transmission hub sleeve and gear shift fork.



7. INSPECT NO. 3 TRANSMISSION HUB SLEEVE

a. Check the sliding condition between the No. 3 transmission clutch hub and No. 3 transmission hub sleeve.

b. Check that the spline gear teeth of the No. 3 transmission hub sleeve are not worn.

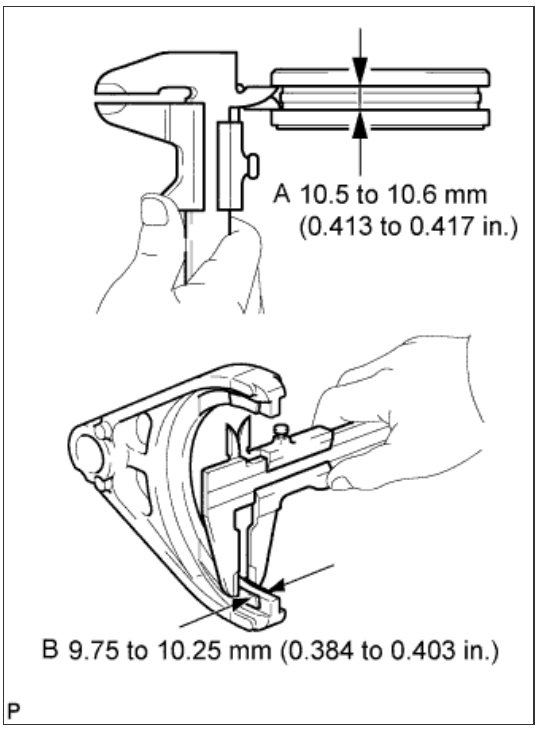


c. Using a vernier caliper, measure the width of the No. 3 transmission hub sleeve groove (A) and the thickness of the claw part on the gear shift forks (B), and calculate the clearance.

Standard Clearance (A - B):
0.25 to 0.85 mm (0.00984 to 0.0335 in.)

Maximum Clearance:
0.85 mm (0.0335 in.)

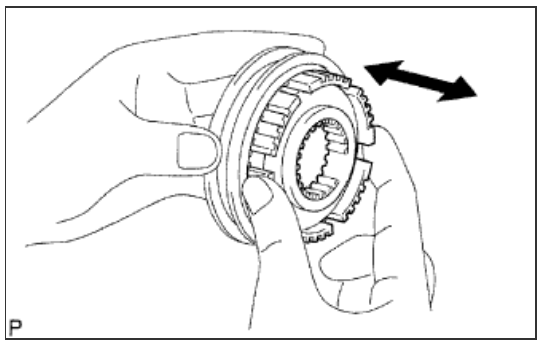
If the clearance is more than the maximum, replace the No. 3 transmission hub sleeve and gear shift fork.



8. INSPECT NO. 1 TRANSMISSION HUB SLEEVE

a. Check the sliding condition between the No. 1 transmission clutch hub and No. 1 transmission hub sleeve.

b. Check that the spline gear teeth of the No. 1 transmission hub sleeve are not worn.

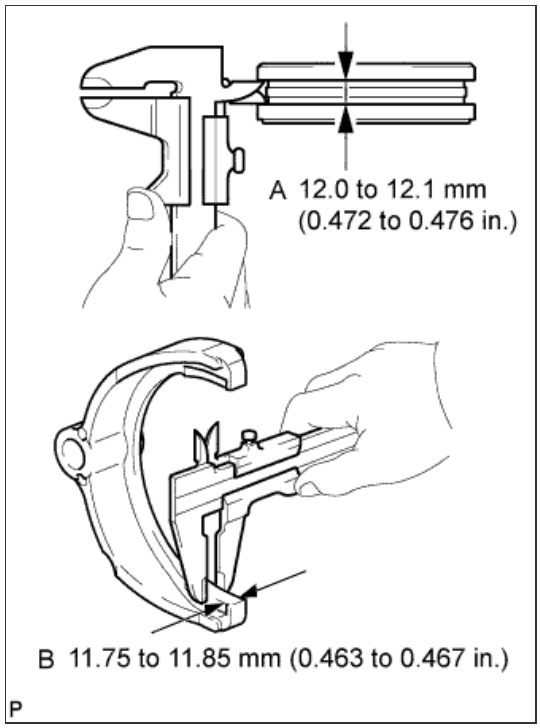


c. Using a vernier caliper, measure the width of the No. 1 transmission hub sleeve groove (A) and the thickness of the claw part on the gear shift forks (B), and calculate the clearance.

Standard Clearance (A - B):
0.15 to 0.35 mm (0.00591 to 0.0137 in.)

Maximum Clearance:
0.35 mm (0.0137 in.)

If the clearance is more than the maximum, replace the No. 1 transmission hub sleeve and gear shift fork.



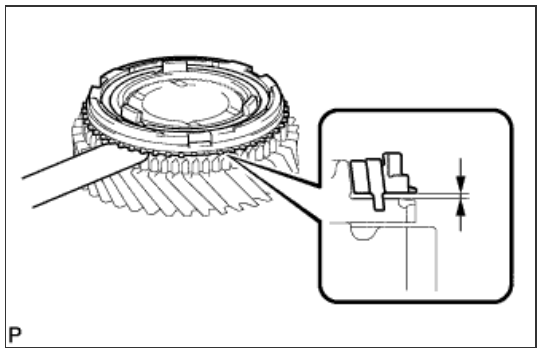
9. INSPECT NO. 3 SYNCHRONIZER RING SET (FOR 3RD GEAR)

a. Using a feeler gauge, measure the clearance between the synchronizer ring and the 6th gear.

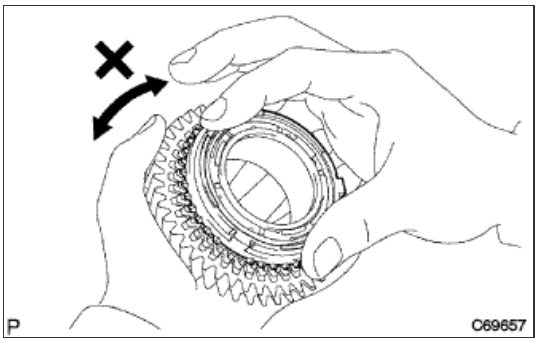
Standard Clearance:
1.15 to 2.05 mm (0.0453 to 0.0807 in.)

Minimum Clearance:
1.15 mm (0.0453 in.)

If the clearance is less than the minimum, replace the synchronizer ring.



b. Coat the 3rd gear cone with gear oil. Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the 3rd gear cone. Check that the ring locks.



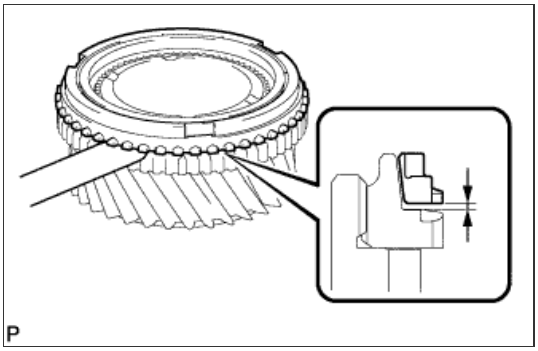
10. INSPECT NO. 3 SYNCHRONIZER RING (FOR 5TH GEAR)

a. Using a feeler gauge, measure the clearance between the synchronizer ring and the 5th gear.

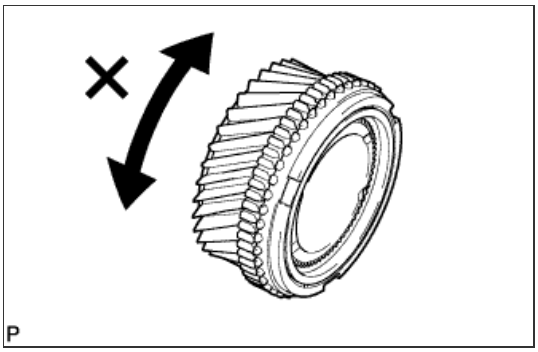
Standard Clearance:
0.80 to 1.60 mm (0.0315 to 0.0629 in.)

Minimum Clearance:
0.80 mm (0.0315 in.)

If the clearance is less than the minimum, replace the synchronizer ring.



b. Coat the 5th gear cone with gear oil. Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the 5th gear cone. Check that the ring locks.



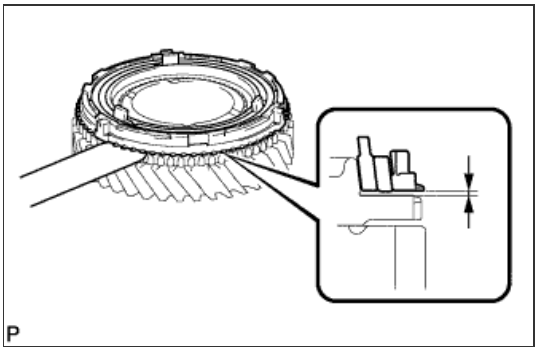
11. INSPECT NO. 2 SYNCHRONIZER RING SET (FOR 2ND GEAR)

a. Using a feeler gauge, measure the clearance between the synchronizer ring and 2nd gear.

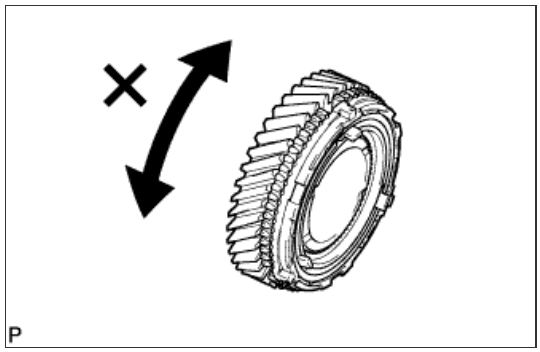
Standard Clearance:
1.23 to 2.13 mm (0.0485 to 0.0838 in.)

Minimum Clearance:
1.23 mm (0.0485 in.)

If the clearance is less than the minimum, replace the synchronizer ring.



b. Coat the 2nd gear cone with gear oil. Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the 2nd gear cone. Check that the ring locks.



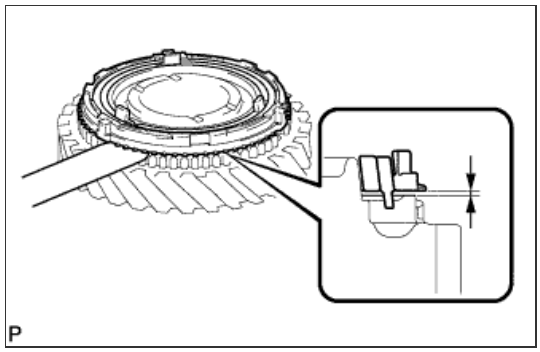
12. INSPECT NO.1 SYNCHRONIZER RING SET (FOR 1ST GEAR)

a. Using a feeler gauge, measure the clearance between the synchronizer ring and 1st gear.

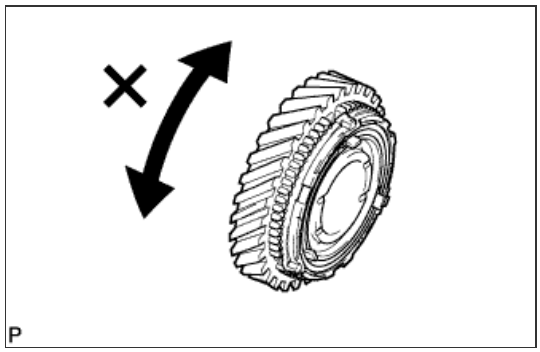
Standard Clearance:
1.25 to 2.15 mm (0.0493 to 0.0846 in.)

Minimum Clearance:
1.25 mm (0.0493 in.)

If the clearance is less than the minimum, replace the synchronizer ring.



b. Coat the 1st gear cone with gear oil. Check the braking effect of the synchronizer ring. Turn the synchronizer ring in one direction while pushing it to the 1st gear cone. Check that the ring locks.



for Preparation Click here

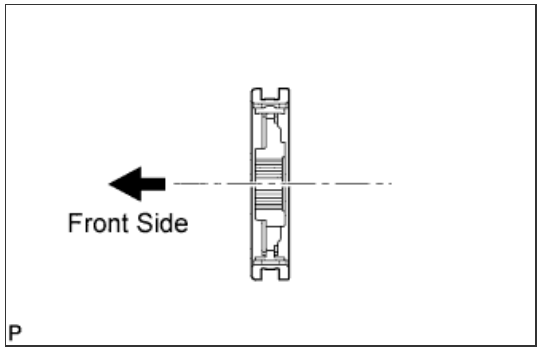
1. INSTALL NO. 2 TRANSMISSION HUB SLEEVE

a. Apply a light coat of gear oil to the No. 2 transmission hub sleeve and No. 2 transmission clutch hub.

b. Install the No. 2 transmission hub sleeve and 3 shifting keys to the No. 2 transmission clutch hub.

NOTICE:

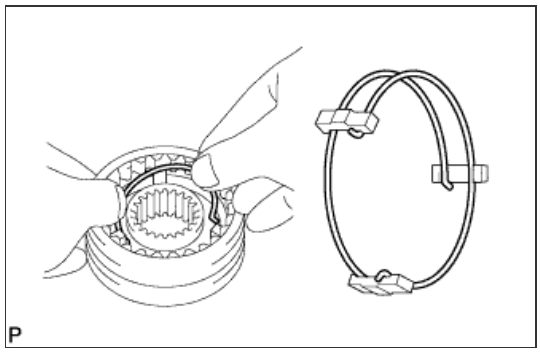
Do not mistake the installation direction of the No. 2 transmission hub sleeve and No. 2 transmission clutch hub.



c. Insert the 2 springs under the shifting keys.

NOTICE:

Position the key springs so that their end gaps are not aligned.



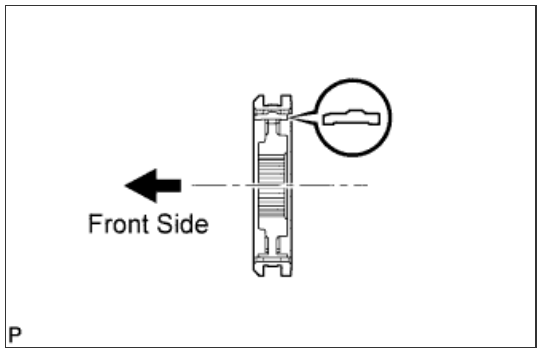
2. INSTALL NO. 3 TRANSMISSION HUB SLEEVE

a. Apply a light coat of gear oil to the No. 3 transmission hub sleeve and No. 3 transmission clutch hub.

b. Install the No. 3 transmission hub sleeve and 3 shifting keys to the No. 3 transmission clutch hub.

NOTICE:

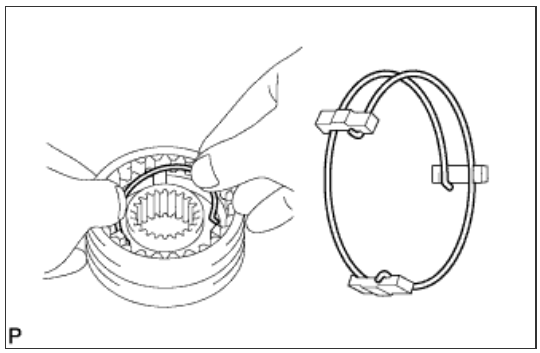
Do not mistake the installation direction of the No. 3 transmission hub sleeve, No. 3 transmission clutch hub, and shifting keys.



c. Insert the 2 springs under the shifting keys.

NOTICE:

Position the key springs so that their end gaps are not aligned.



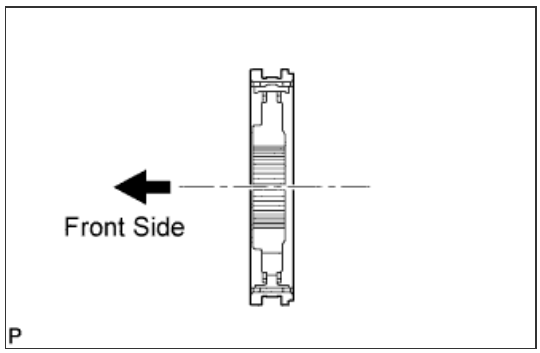
3. INSTALL NO. 1 TRANSMISSION HUB SLEEVE

a. Apply a light coat of gear oil to the No. 1 transmission hub sleeve and No. 1 transmission clutch hub.

b. Install the No. 1 transmission hub sleeve and 3 shifting keys to the No. 1 transmission clutch hub.

NOTICE:

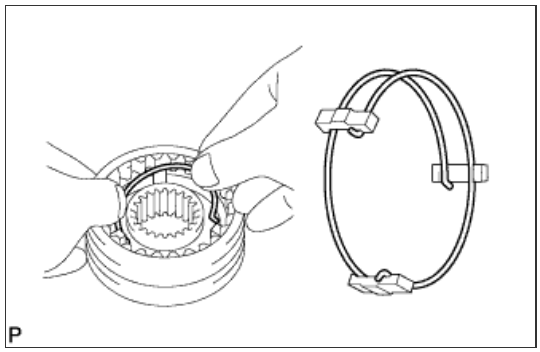
Do not mistake the installation direction of the No. 1 transmission hub sleeve and No. 1 transmission clutch hub.



c. Insert the 2 springs under the shifting keys.

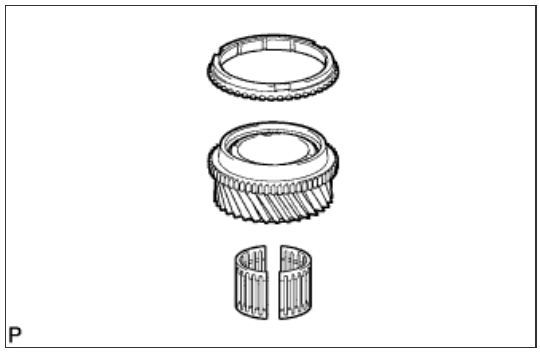
NOTICE:

Position the key springs so that their end gaps are not aligned.



4. INSTALL 5TH COUNTER GEAR BEARING

a. Coat the 5th counter gear bearing with gear oil, then install it to the 5th gear.



5. INSTALL 5TH GEAR

a. Coat the 5th gear and No. 3 synchronizer ring with gear oil, and set them onto the output shaft.

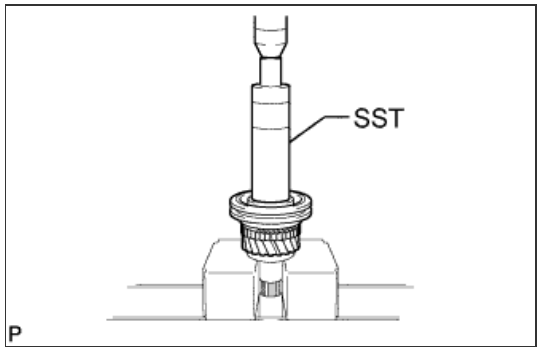
b. Using SST and a press, install the 5th gear, No. 3 synchronizer ring and transmission hub sleeve to the output shaft.

SST

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HINT:

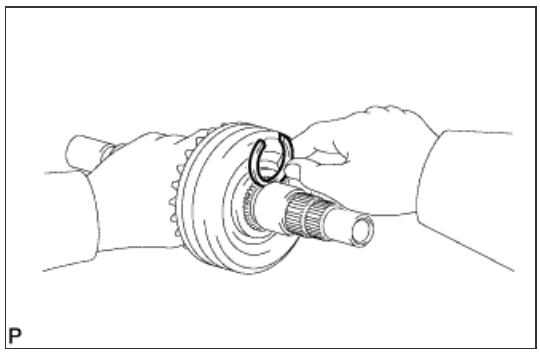
Align the convex portion of the synchronizer ring with the groove of the transmission hub sleeve.



c. Check that the 5th gear, No. 3 synchronizer ring, and transmission hub sleeve move smoothly.

6. INSTALL NO. 3 TRANSMISSION CLUTCH HUB SHAFT SNAP RING

a. Select a new snap ring that will allow minimum clearance.

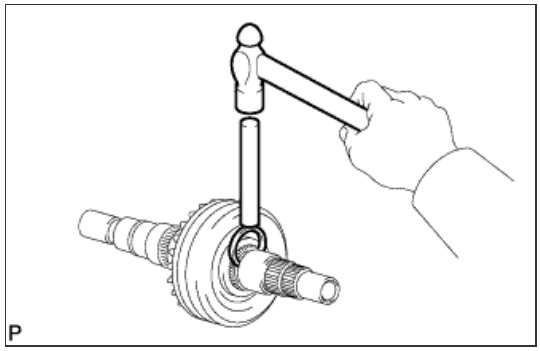


Standard Clearance:
0.1 mm (0.00393 in.) or less

Snap Ring Thickness:

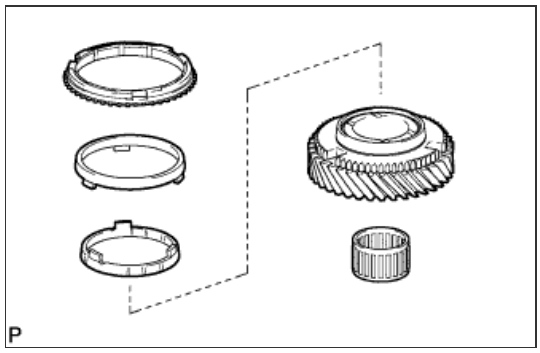
Part No.	Thickness	Mark
90520-34018	2.40 to 2.45 mm (0.0945 to 0.0965 in.)	A
90520-34019	2.45 to 2.50 mm (0.0965 to 0.0984 in.)	B
90520-34020	2.50 to 2.55 mm (0.0984 to 0.100 in.)	C
90520-34021	2.55 to 2.60 mm (0.100 to 0.102 in.)	D
90520-34022	2.60 to 2.65 mm (0.102 to 0.104 in.)	E
90520-34023	2.65 to 2.70 mm (0.104 to 0.106 in.)	F

b. Using a brass bar and hammer, install the snap ring to the output shaft.



7. INSTALL 3RD GEAR NEEDLE ROLLER BEARING

a. Coat the 3rd gear needle roller bearing with gear oil, and install it to the 3rd gear.



8. INSTALL 3RD GEAR

a. Coat the 3rd gear and No. 3 synchronizer ring set with gear oil, and set them onto the output shaft.

HINT:

Align the protrusions of the middle ring of the synchronizer ring set with the notches of the gear.

b. Using SST and a press, install the 3rd gear, No. 3 synchronizer ring set and

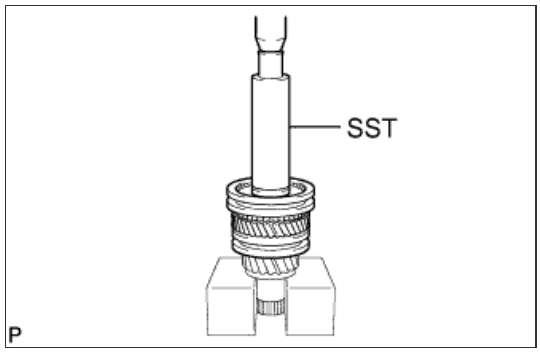
transmission hub sleeve to the output shaft.

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HINT:

Align the convex portion of the synchronizer ring with the groove of the transmission hub sleeve.

c. Check that the 3rd gear, No. 3 synchronizer ring set, and transmission hub sleeve move smoothly.



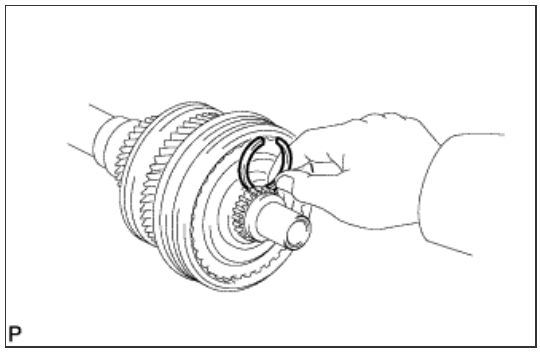
9. INSTALL NO. 2 CLUTCH HUB SETTING SHAFT SNAP RING

a. Select a new snap ring that will allow minimum clearance.

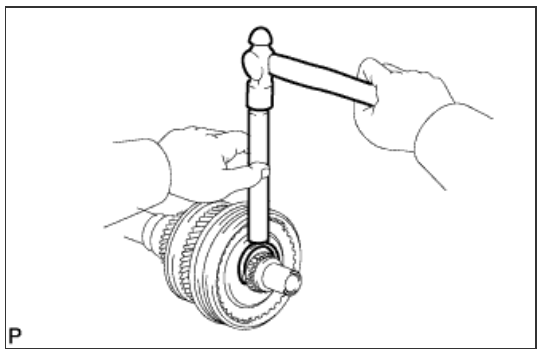
Standard Clearance:
0.1 mm (0.00393 in.) or less

Snap Ring Thickness:

Part No.	Thickness	Mark
90520-28054	1.90 to 1.95 mm (0.0748 to 0.0768 in.)	4
90520-28055	1.95 to 2.00 mm (0.0768 to 0.0787 in.)	5
90520-28056	2.00 to 2.05 mm (0.0787 to 0.0807 in.)	6
90520-28057	2.05 to 2.10 mm (0.0807 to 0.0827 in.)	7
90520-28058	2.10 to 2.15 mm (0.0827 to 0.0847 in.)	8
90520-28059	2.15 to 2.20 mm (0.0847 to 0.0866 in.)	9

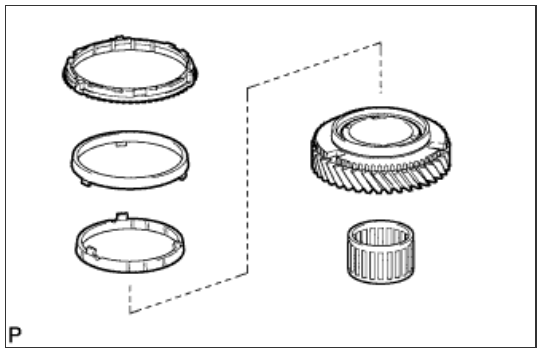


b. Using a snap ring expander, install the snap ring to the output shaft.



10. INSTALL 2ND GEAR NEEDLE ROLLER BEARING

a. Coat the 2nd gear needle roller bearing with gear oil, and install it to the output shaft.



11. INSTALL 2ND GEAR

a. Coat the 2nd gear and No. 2 synchronizer ring set with gear oil, then install them to the output shaft.

HINT:

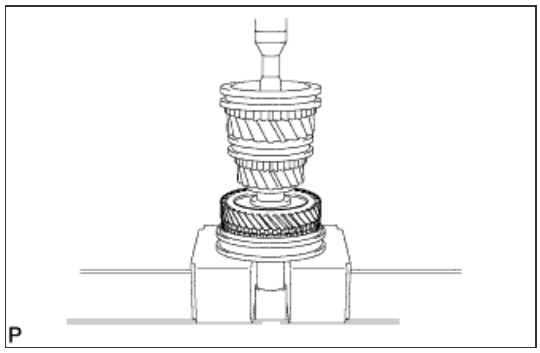
Align the protrusions of the middle ring of the synchronizer ring set with the notches of the gear.

b. Using a press, install the 2nd gear, No. 2 synchronizer ring set and transmission hub sleeve to the output shaft.

HINT:

Align the convex portion of the synchronizer ring with the groove of the transmission hub sleeve.

c. Check that the 2nd gear, No. 2 synchronizer ring set, and transmission hub sleeve move smoothly.



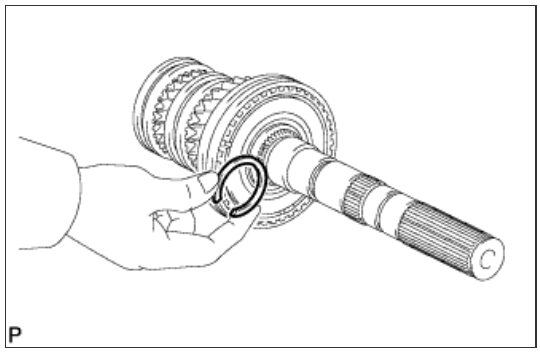
12. INSTALL NO. 1 CLUTCH HUB SHAFT SNAP RING

a. Select a new snap ring that will allow minimum clearance.

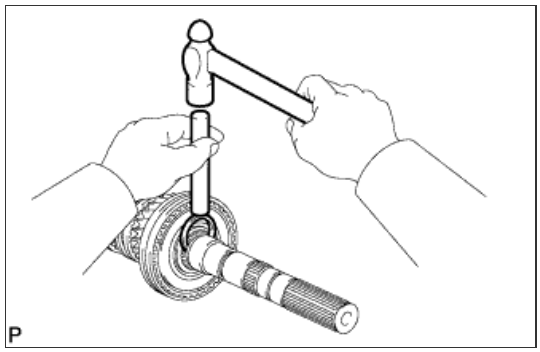
Standard Clearance:
0.1 mm (0.00393 in.) or less

Snap Ring Thickness:

Part No.	Thickness	Mark
90520-46004	2.90 to 2.95 mm (0.114 to 0.116 in.)	A
90520-46005	2.95 to 3.00 mm (0.116 to 0.118 in.)	B
90520-46006	3.00 to 3.05 mm (0.118 to 0.120 in.)	C
90520-46007	3.05 to 3.10 mm (0.120 to 0.122 in.)	D
90520-46008	3.10 to 3.15 mm (0.122 to 0.124 in.)	E
90520-46009	3.15 to 3.20 mm (0.124 to 0.126 in.)	F

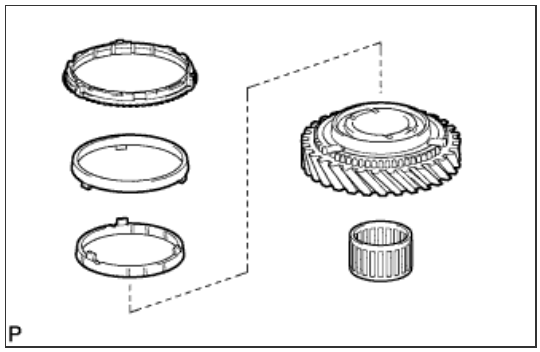


b. Using a brass bar and a hammer, install the snap ring to the output shaft.



13. INSTALL 1ST GEAR NEEDLE ROLLER BEARING

a. Coat the 1st gear needle roller bearing with gear oil, and install it to the output shaft.



14. INSTALL 1ST GEAR

a. Coat the 1st gear and No. 1 synchronizer ring set with gear oil, and set them onto the output shaft.

HINT:

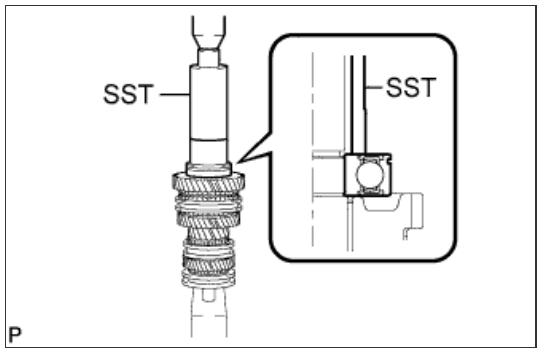
Align the protrusions of the middle ring of the synchronizer ring set with the notches of the gear.

b. Using SST and press, install the 1st gear, No. 1 synchronizer ring set, and output shaft rear bearing to the output shaft.

SST
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09523-36010

HINT:

- **Make sure that the groove of the bearing faces the correct direction as shown in the illustration.**
- **Align the convex portion of the synchronizer ring with the groove of the transmission hub sleeve.**



c. Check that the transmission hub sleeve, 1st gear and No. 1 synchronizer ring set move smoothly.

15. INSTALL REVERSE GEAR SNAP RING

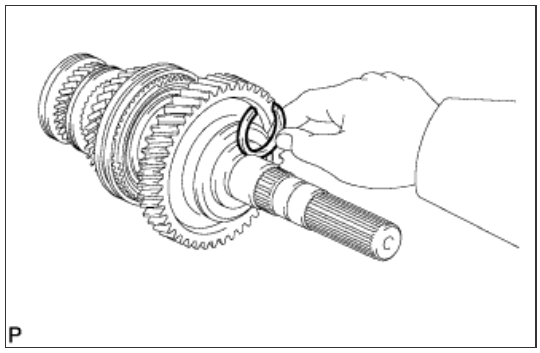
a. Select a new snap ring that will allow minimum clearance.

Standard Clearance:
0.1 mm (0.00393 in.) or less

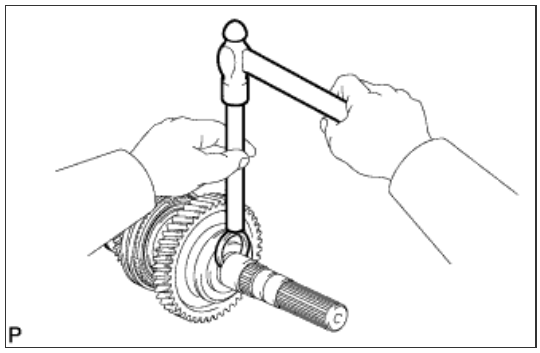
Snap Ring Thickness:

Part No.	Thickness	Mark
90520-41006	2.40 to 2.45 mm (0.0945 to 0.0965 in.)	A

90520-41007	2.45 to 2.50 mm (0.0965 to 0.0984 in.)	B
90520-41008	2.50 to 2.55 mm (0.0984 to 0.100 in.)	C
90520-41009	2.55 to 2.60 mm (0.100 to 0.102 in.)	D
90520-41010	2.60 to 2.65 mm (0.102 to 0.104 in.)	E
90520-41011	2.65 to 2.70 mm (0.104 to 0.106 in.)	F
90520-41012	2.70 to 2.75 mm (0.106 to 0.108 in.)	G
90520-41013	2.75 to 2.80 mm (0.108 to 0.110 in.)	H



b. Using a brass bar and a hammer, install the snap ring to the output shaft.

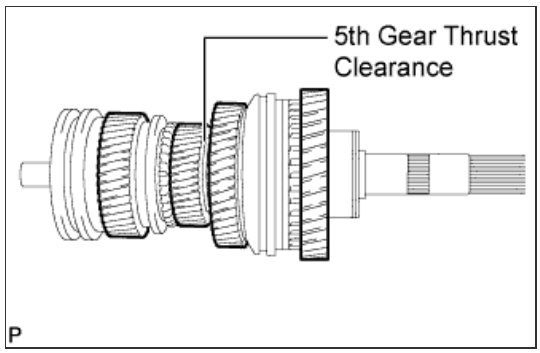


16. INSPECT 5TH GEAR THRUST CLEARANCE

a. Using a feeler gauge, measure the 5th gear thrust clearance.

Standard Clearance:
0.10 to 0.35 mm (0.00394 to 0.0137 in.)

If the clearance is outside the specification, replace the defective gear or shaft.

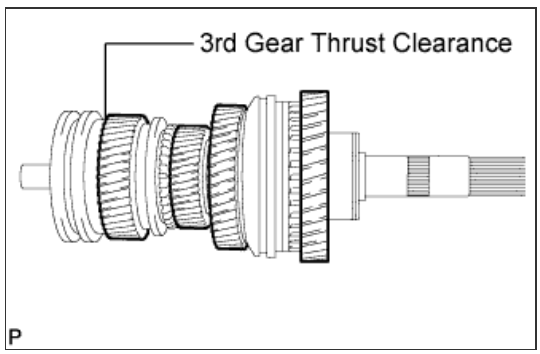


17. INSPECT 3RD GEAR THRUST CLEARANCE

a. Using a feeler gauge, measure the 3rd gear thrust clearance.

Standard Clearance:
0.10 to 0.45 mm (0.00394 to 0.0177 in.)

If the clearance is outside the specification, replace the defective gear, transmission clutch hub or shaft.

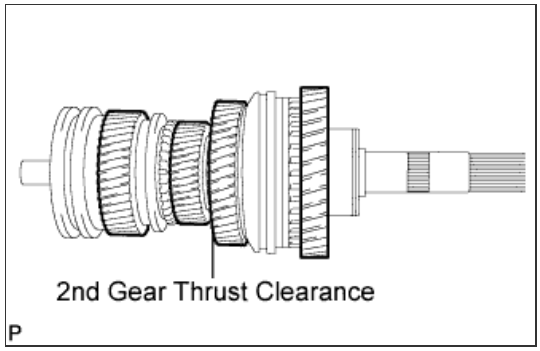


18. INSPECT 2ND GEAR THRUST CLEARANCE

a. Using a feeler gauge, measure the 2nd gear thrust clearance.

Standard Clearance:
0.10 to 0.35 mm (0.00394 to 0.0137 in.)

If the clearance is outside the specification, replace the defective gear, transmission clutch hub or shaft.

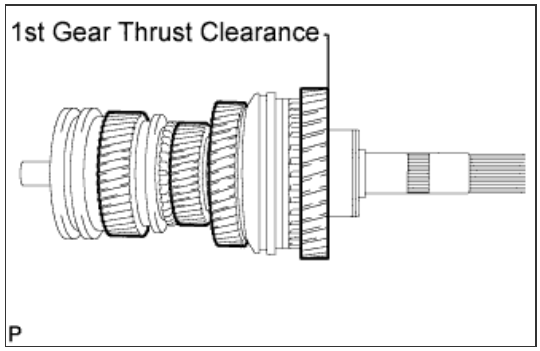


19. INSPECT 1ST GEAR THRUST CLEARANCE

a. Using a feeler gauge, measure the 1st gear thrust clearance.

Standard Clearance:
0.10 to 0.45 mm (0.00394 to 0.0177 in.)

If the clearance is outside the specification, replace the defective gear, transmission clutch hub or shaft.

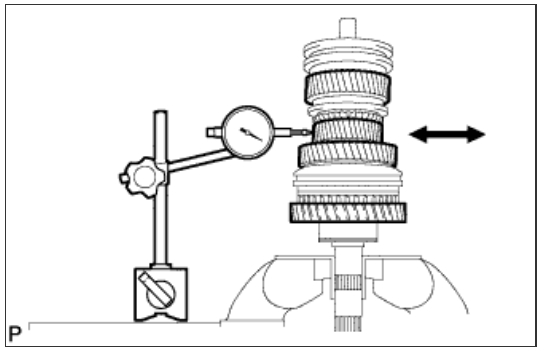


20. INSPECT 5TH GEAR RADIAL CLEARANCE

a. Using a dial indicator, measure the 5th gear radial clearance.

Standard Clearance:
0.015 to 0.068 mm (0.000591 to 0.00267 in.)

If the clearance is outside the specification, replace the defective gear, needle roller bearing or shaft.

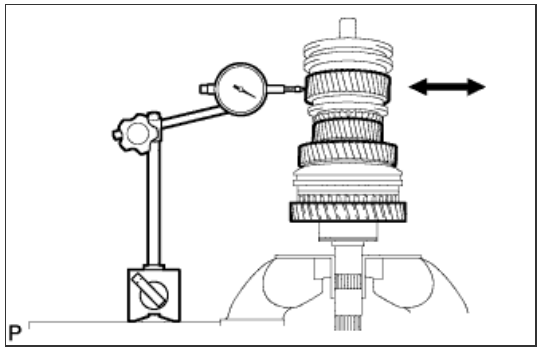


21. INSPECT 3RD GEAR RADIAL CLEARANCE

a. Using a dial indicator, measure the 3rd gear radial clearance.

Standard Clearance:
0.020 to 0.073 mm (0.000788 to 0.00287 in.)

If the clearance is outside the specification, replace the defective gear, needle roller bearing or shaft.

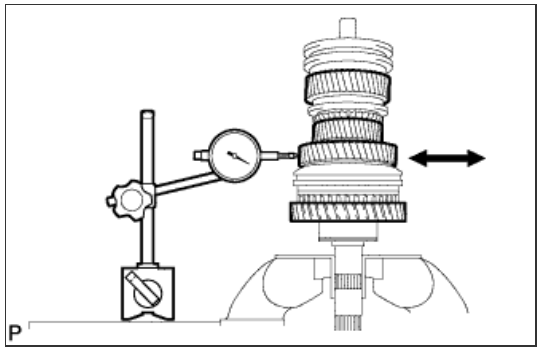


22. INSPECT 2ND GEAR RADIAL CLEARANCE

a. Using a dial indicator, measure the 2nd gear radial clearance.

Standard Clearance:
0.015 to 0.068 mm (0.000591 to 0.00267 in.)

If the clearance is outside the specification, replace the defective gear, needle roller bearing or shaft.

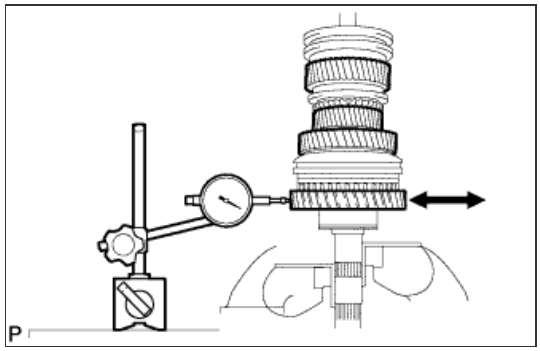


23. INSPECT 1ST GEAR RADIAL CLEARANCE

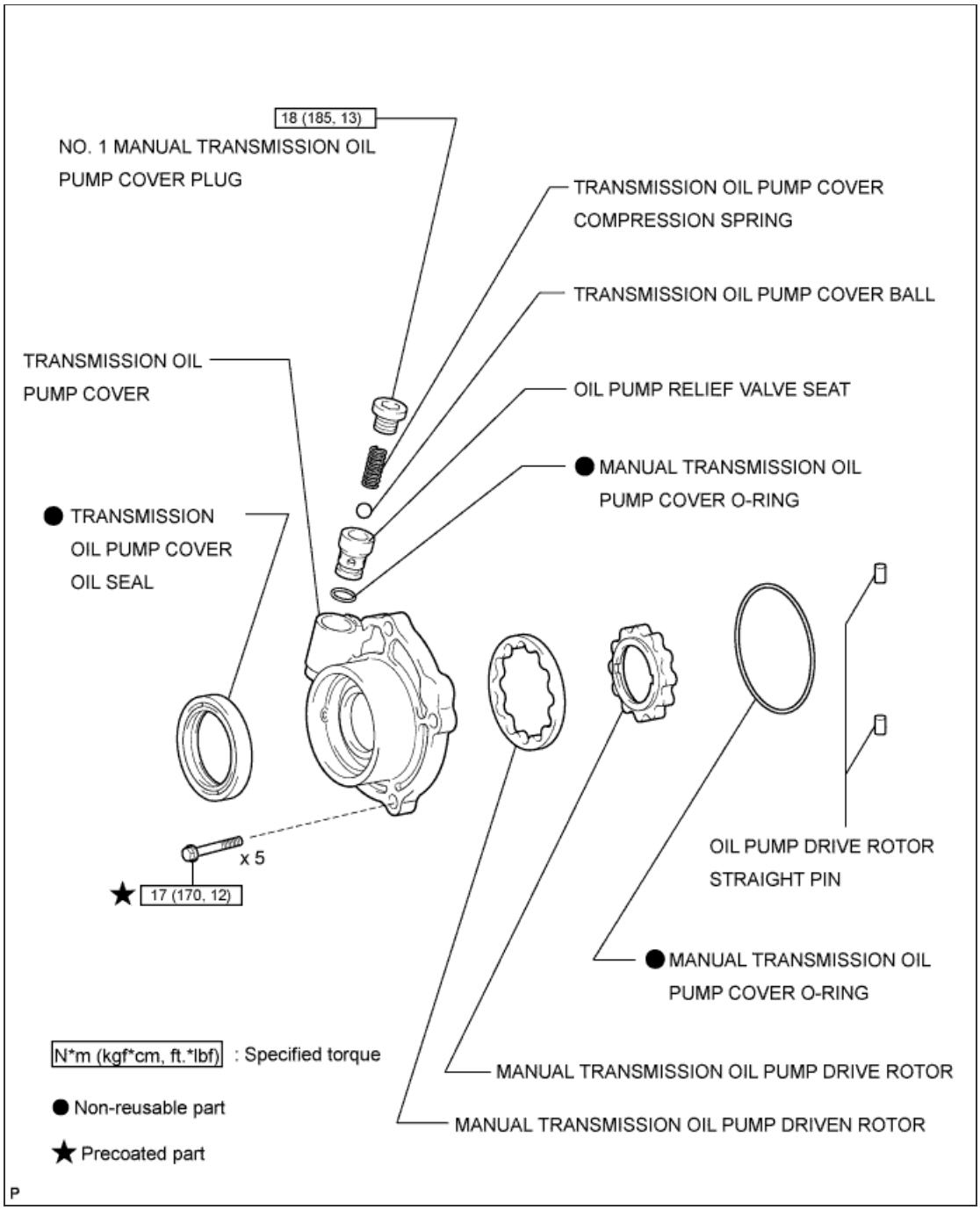
a. Using a dial indicator, measure the 1st gear radial clearance.

Standard Clearance:
0.020 to 0.073 mm (0.000788 to 0.00287 in.)

If the clearance is outside the specification, replace the defective gear, needle roller bearing or shaft.



for Preparation Click here



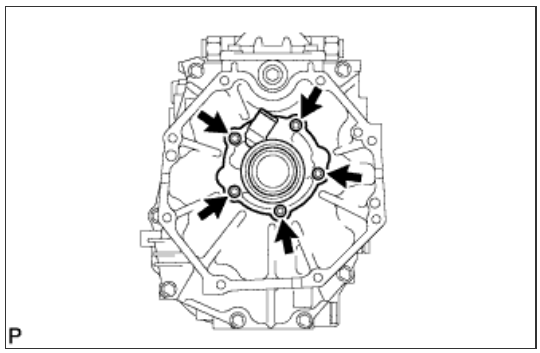
for Preparation Click here

1. REMOVE TRANSFER ASSEMBLY

a. Remove the transfer assembly (Click here).

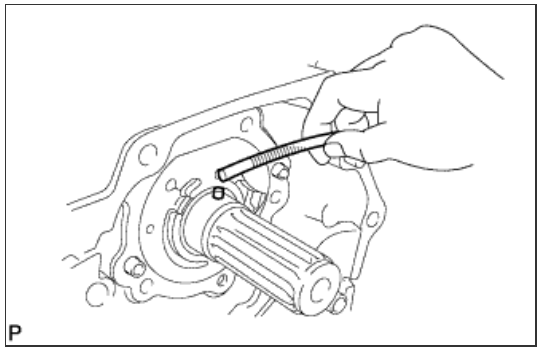
2. REMOVE TRANSMISSION OIL PUMP COVER

a. Remove the 5 bolts and oil pump cover.



3. REMOVE OIL PUMP DRIVE ROTOR STRAIGHT PIN

a. Using a magnet hand, remove the 2 pins.



4. REMOVE MANUAL TRANSMISSION OIL PUMP COVER O-RING

a. Remove the oil pump cover O-ring from the oil pump cover.

for Preparation Click here

1. REMOVE TRANSMISSION OIL PUMP COVER OIL SEAL

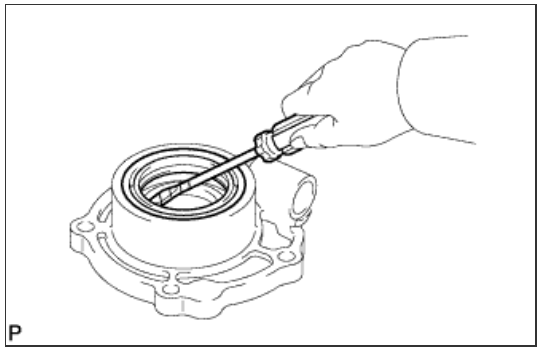
a. Using a screwdriver, pry out the oil pump cover oil seal.

NOTICE:

Be careful not to damage the oil seal and oil pump cover contact surfaces.

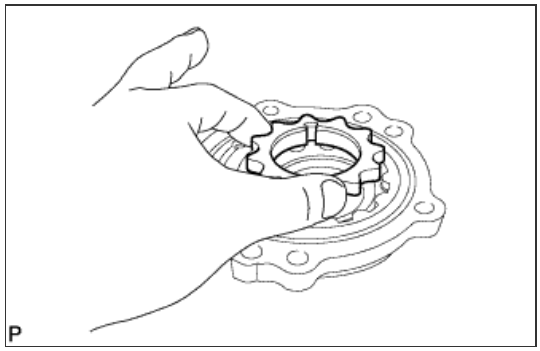
HINT:

Tape the screwdriver tip before use.



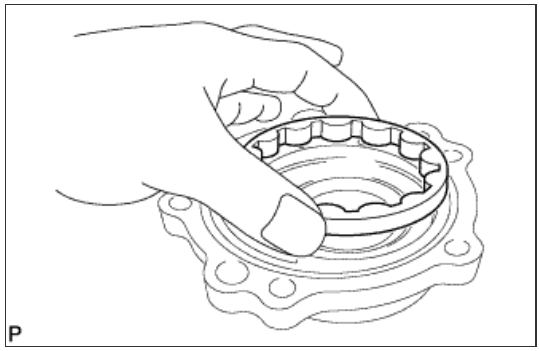
2. REMOVE MANUAL TRANSMISSION OIL PUMP DRIVE ROTOR

a. Remove the oil pump drive rotor.



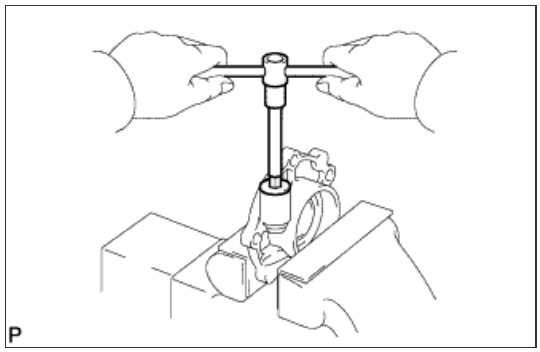
3. REMOVE MANUAL TRANSMISSION OIL PUMP DRIVEN ROTOR

a. Remove the oil pump driven rotor.



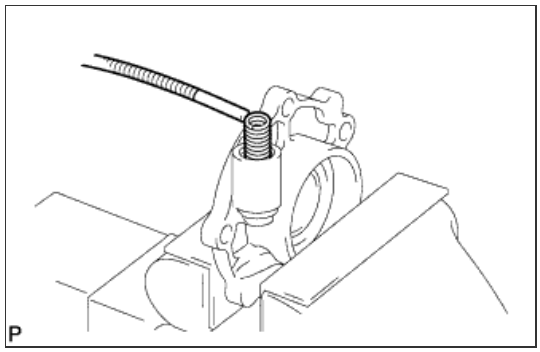
4. REMOVE NO. 1 MANUAL TRANSMISSION OIL PUMP COVER PLUG

a. Using a hexagon wrench, remove the oil pump cover plug.



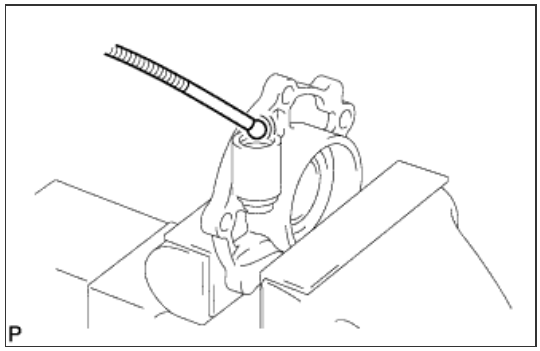
5. REMOVE TRANSMISSION OIL PUMP COVER COMPRESSION SPRING

a. Using a magnet hand, remove the compression spring.



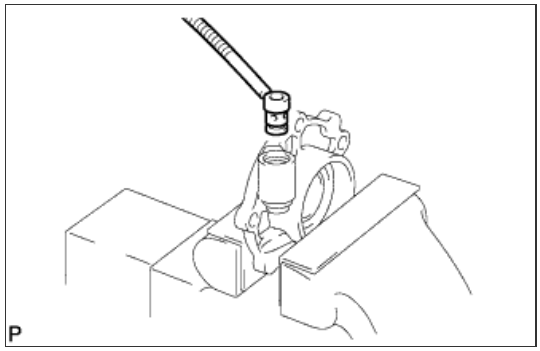
6. REMOVE TRANSMISSION OIL PUMP COVER BALL

a. Using a magnet hand, remove the ball.



7. REMOVE OIL PUMP RELIEF VALVE SEAT

a. Using a magnet hand, remove the valve seat.



8. REMOVE MANUAL TRANSMISSION OIL PUMP COVER O-RING

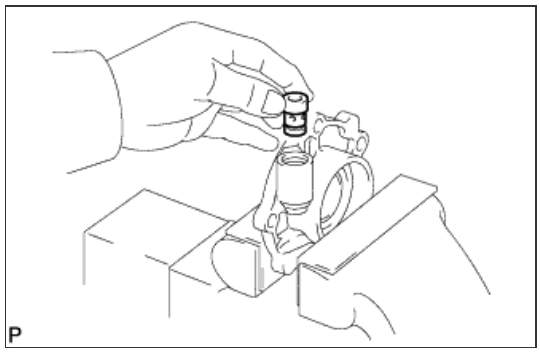
a. Remove the O-ring from the valve seat.

for Preparation Click here

1. INSPECT OIL PUMP RELIEF VALVE

a. Coat the relief valve with engine oil.

b. Check that the relief valve falls smoothly into the valve hole by its own weight. If the relief valve does not, replace it. If necessary, replace the oil pump cover assembly.



2. INSPECT OIL PUMP ROTOR SET

a. Install the rotors to the oil pump cover assembly. Check that the rotors revolve smoothly.

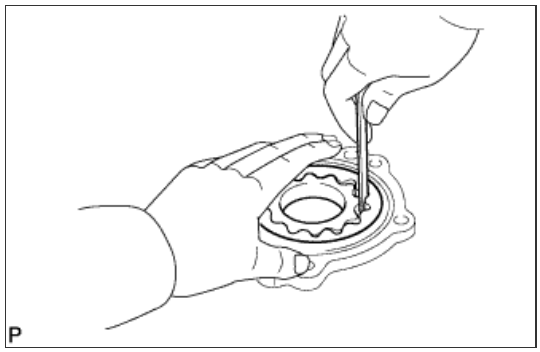
b. Check the tip clearance.

i. Using a feeler gauge, measure the clearance between the drive and driven rotor tips, as shown in the illustration.

Standard Tip Clearance:
0.10 to 0.22 mm (0.00394 to 0.00866 in.)

Maximum Tip Clearance:
0.22 mm (0.00866 in.)

If the tip clearance is more than the maximum, replace the oil pump cover assembly.



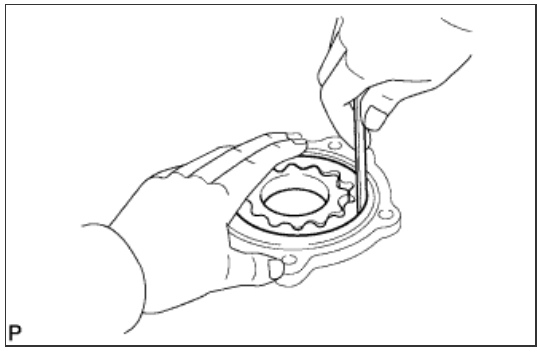
c. Check the body clearance.

i. Using a feeler gauge, measure the clearance between the timing chain cover and driven rotor, as shown in the illustration.

Standard Body Clearance:
0.075 to 0.170 mm (0.00296 to 0.00669 in.)

Maximum Body Clearance:
0.170 mm (0.00669 in.)

If the body clearance is more than the maximum, replace the oil pump cover assembly.



for Preparation Click here

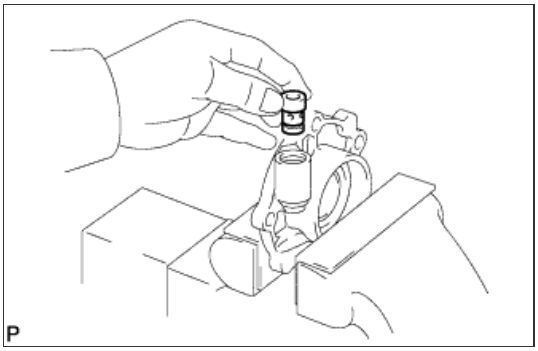
1. INSTALL MANUAL TRANSMISSION OIL PUMP COVER O-RING

a. Install a new O-ring to the oil pump relief valve seat.

2. INSTALL OIL PUMP RELIEF VALVE SEAT

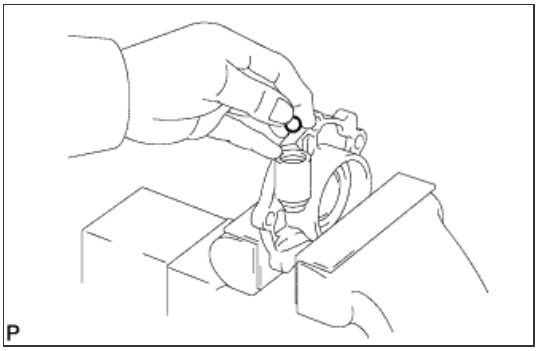
a. Coat the oil pump relief valve seat with gear oil.

b. Install the relief valve seat into the oil pump cover.



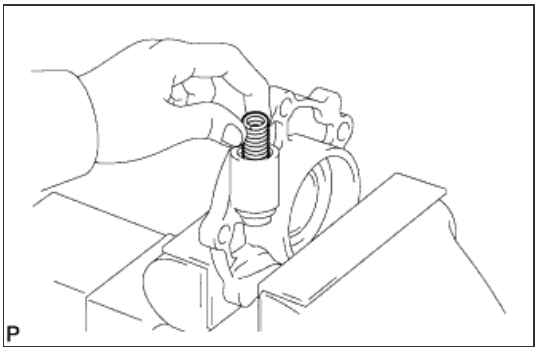
3. INSTALL TRANSMISSION OIL PUMP COVER BALL

a. Install the ball into the oil pump cover.



4. INSTALL TRANSMISSION OIL PUMP COVER COMPRESSION SPRING

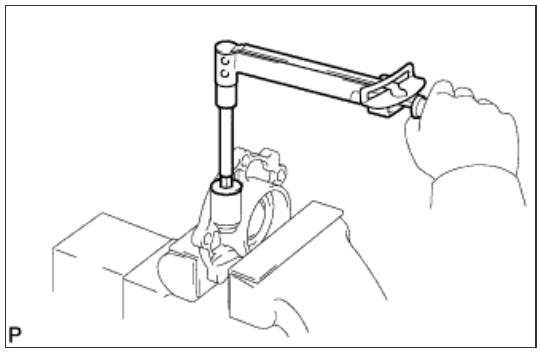
a. Install the compression spring into the oil pump cover.



5. INSTALL NO. 1 MANUAL TRANSMISSION OIL PUMP COVER PLUG

a. Using a hexagon wrench, install the oil pump cover plug.

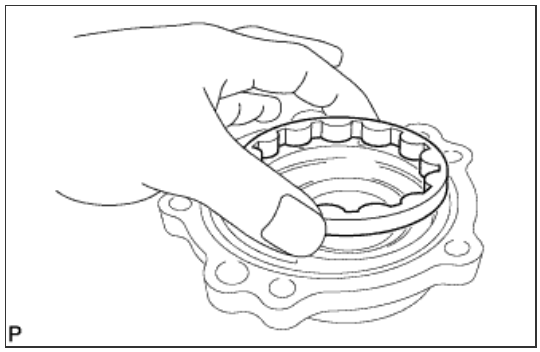
Torque:
18 N*m{ 185 kgf*cm , 13 ft.*lbf }



6. INSTALL MANUAL TRANSMISSION OIL PUMP DRIVEN ROTOR

a. Coat the oil pump driven rotor with gear oil.

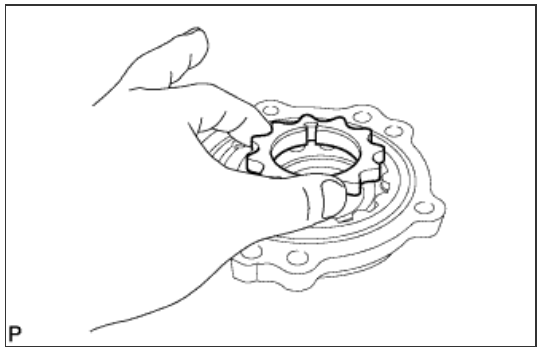
b. Install the oil pump driven rotor into the oil pump cover.



7. INSTALL MANUAL TRANSMISSION OIL PUMP DRIVE ROTOR

a. Coat the oil pump drive rotor with gear oil.

b. Install the oil pump drive rotor into the oil pump cover.

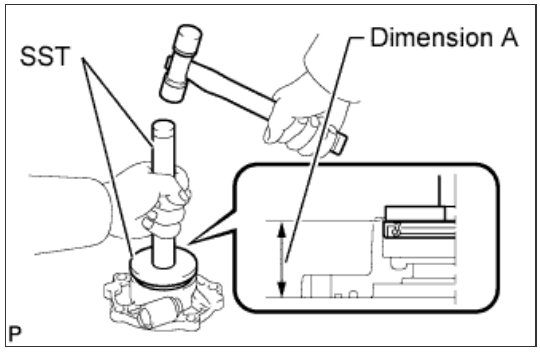


8. INSTALL TRANSMISSION OIL PUMP COVER OIL SEAL

a. Using SST and a hammer, tap a new oil seal into the oil pump cover in accordance with the dimension specified in the illustration.

SST
09950-70010 (09951-07150)
09950-60010 (09951-00640)

Dimension A:
35.3 to 35.9 mm (1.39 to 1.41 in.)



for Preparation Click here

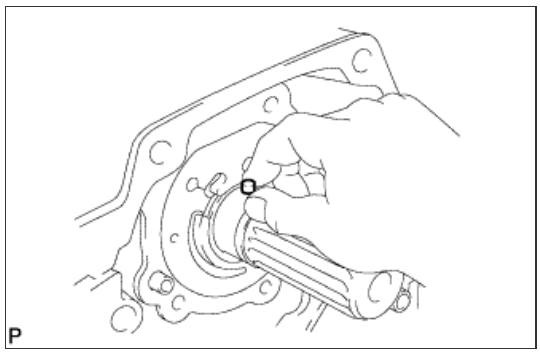
1. INSTALL MANUAL TRANSMISSION OIL PUMP COVER O-RING

a. Install a new oil pump cover O-ring to the oil pump cover.

2. INSTALL OIL PUMP DRIVE ROTOR STRAIGHT PIN

a. Apply MP grease to the straight pins.

b. Install the 2 straight pins.



3. INSTALL TRANSMISSION OIL PUMP COVER

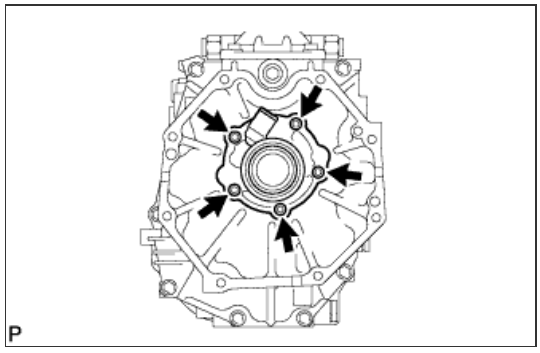
a. Align the oil pump drive rotor groove with the straight pin, and install the oil pump cover to the transfer adapter.

b. Apply adhesive to 2 or 3 threads of the bolts.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

c. Install the oil pump cover with the 5 bolts.

Torque:
17 N*m{ 170 kgf*cm , 12 ft.*lbf }



4. INSTALL TRANSFER ASSEMBLY

a. Install the transfer assembly (Click here).

for Preparation Click here

1.Before disassembling the transfer assembly, thoroughly clean it by removing any foreign matter. This will help prevent contamination during disassembly and reassembly.

2.When removing the transfer cover or any other light alloy parts, do not pry them off with a screwdriver or other tool that may cause damage. Instead, tap off the parts with a plastic-faced hammer.

3.Always arrange removed parts in the order they were removed and protect them from foreign matter.

4.Before installation of each part, thoroughly clean and dry it. Then apply hypoid gear oil to it. Do not use alkaline chemicals to clean aluminum parts, rubber parts or ring gear set bolts. Also, do not use non-residue solvent or other cleaning oils to clean O-rings, oil seals or rubber parts.

5.Coat any sliding surface or rotating part with hypoid gear oil.

6.Do not directly fix a part in a vise. Place aluminum plates between the part and vise.

7.Replace any damaged or deformed snap rings with new ones.

8.Do not allow the mating surface of the case to be scratched. Scratches may lead to oil leakage.

9.Using a razor blade and gasket scraper, remove any old seal packing from the seal surface.

10.Clean all parts to remove excess seal packing completely.

11.Clean the sealing surface with solvent so that no residue remains on the seal surface.

12.Apply seal packing in a continuous line of approximately 1.2 mm (0.0472 in.) in diameter along the sealing surface.

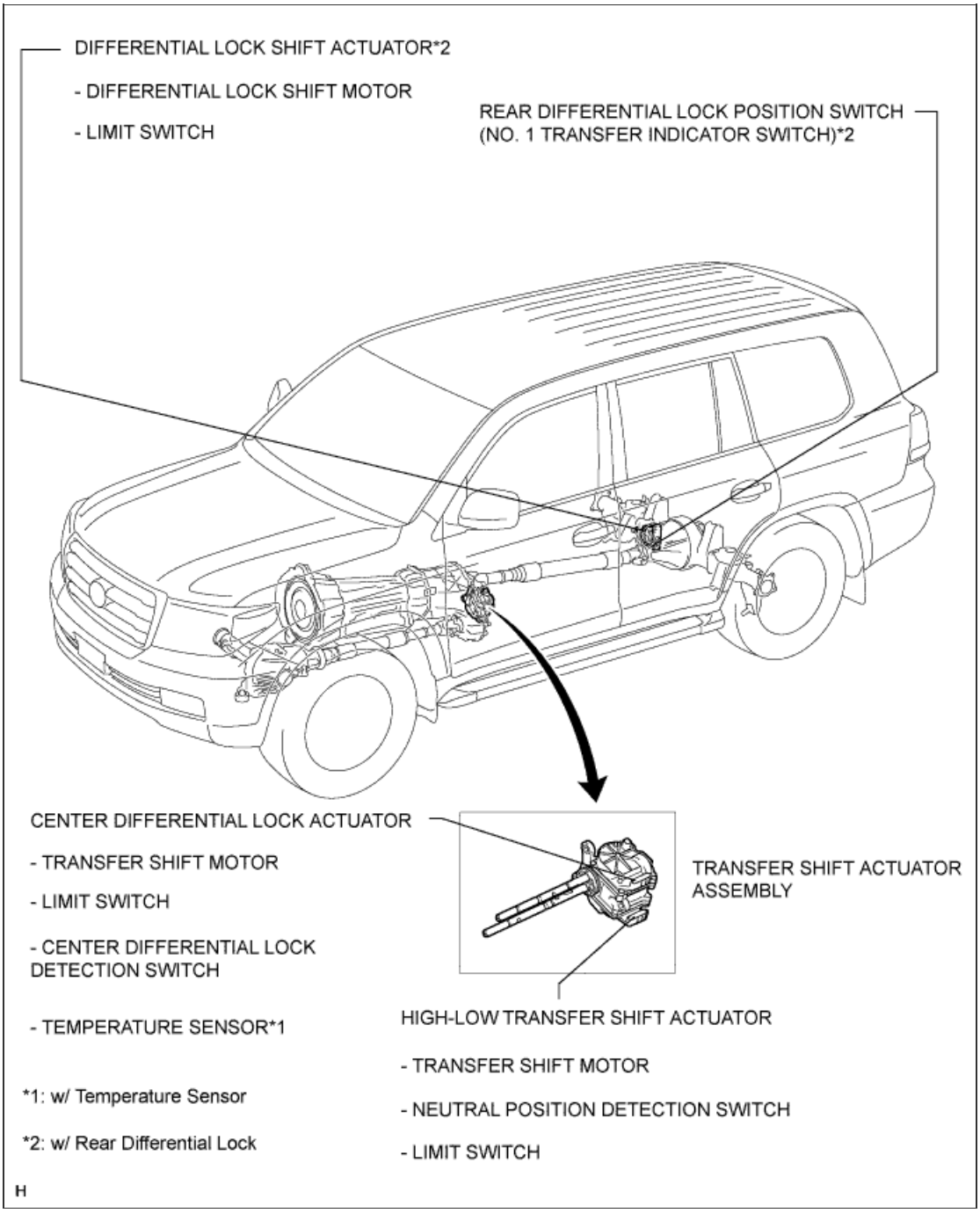
13.Be sure to assemble parts within 10 minutes of seal packing application. Otherwise, the FIPG must be removed and reapplied.

14.After sealing parts, do not allow oil to contact the seal for at least 1 hour.

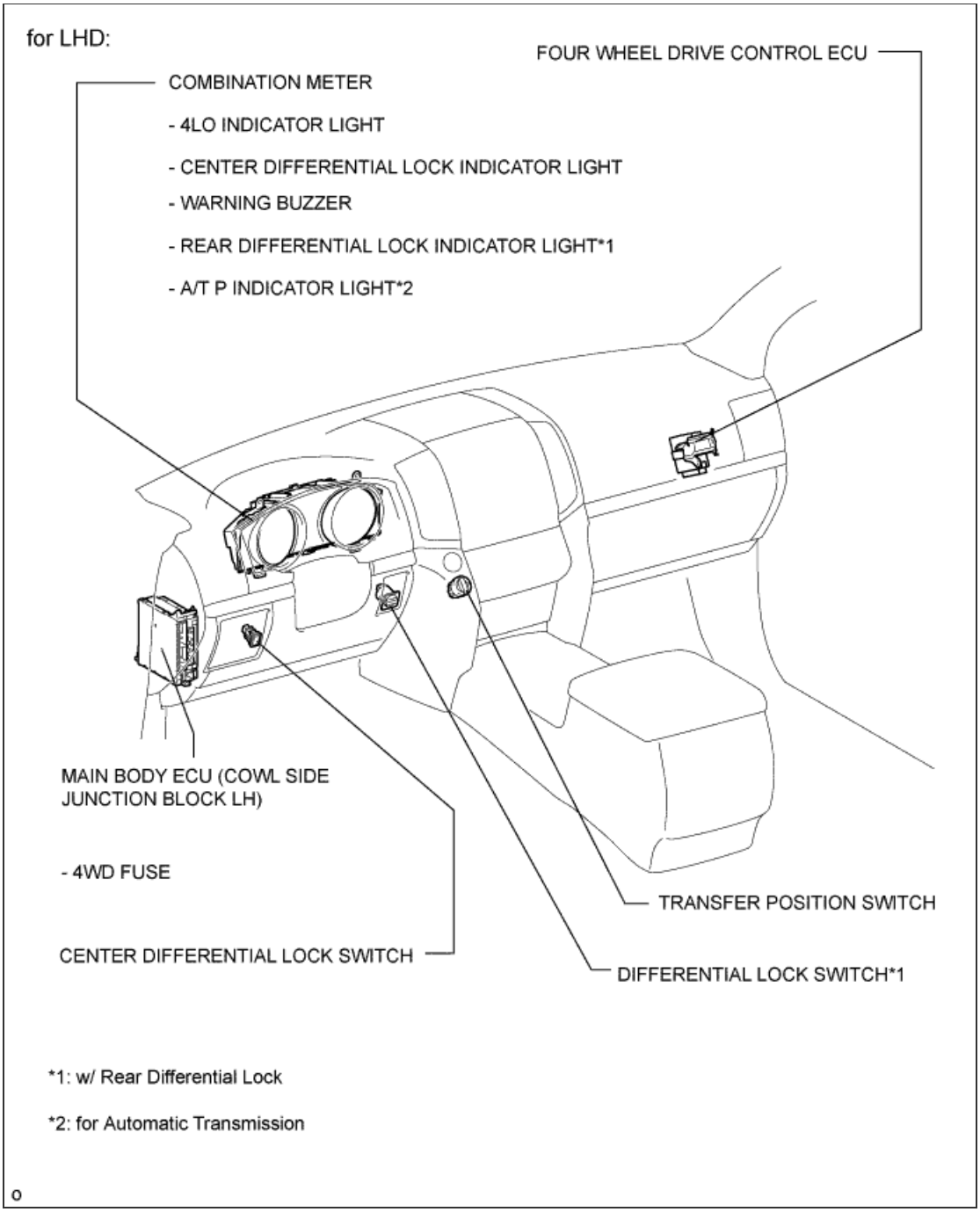
15.Do not allow scratches where a part contacts an oil seal or gasket. Scratches may lead to oil leakage.

16.When press-fitting an oil seal, be careful not to damage the lip of the oil seal and its periphery.

for Preparation Click here



for LHD:

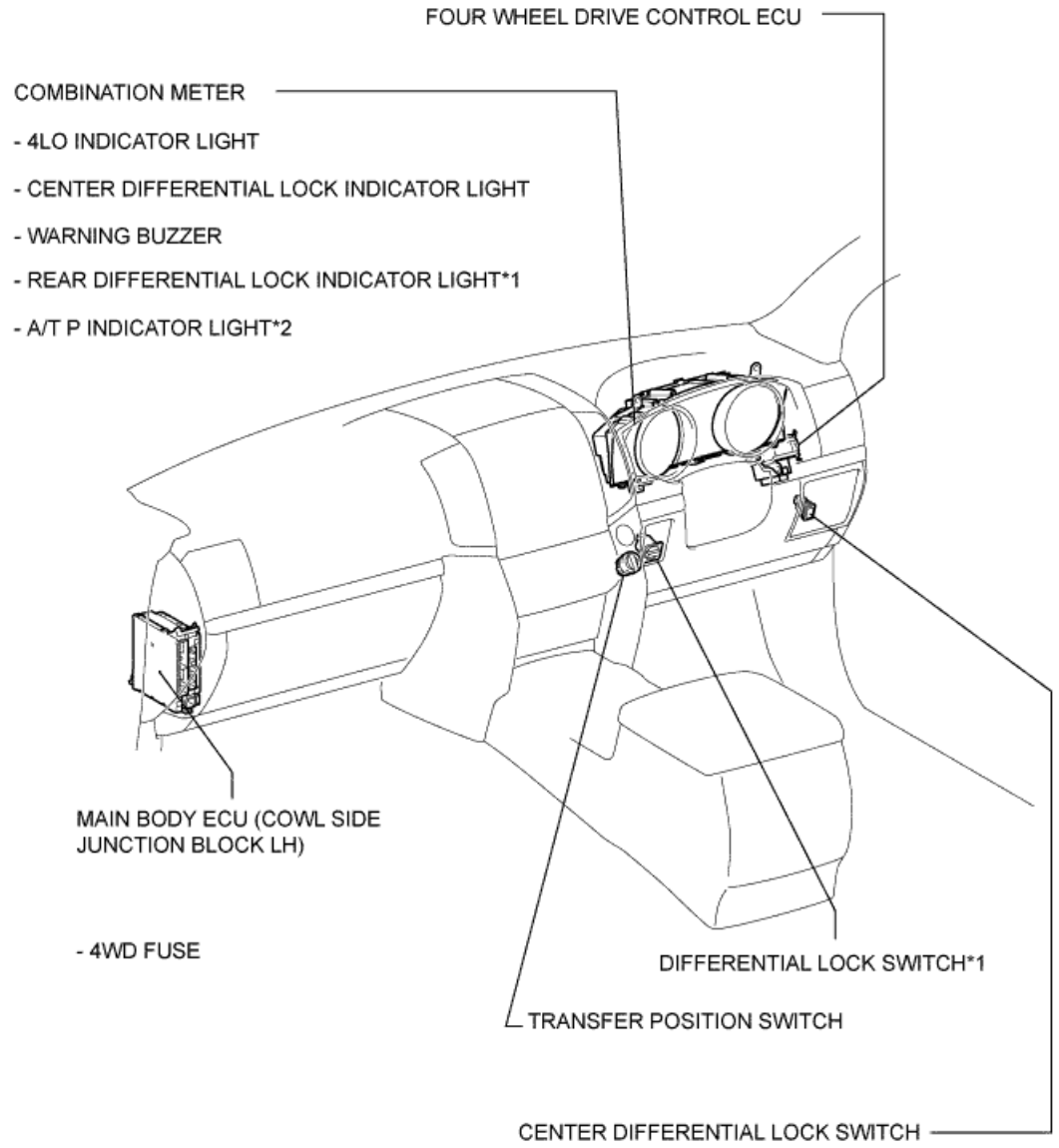


*1: w/ Rear Differential Lock

*2: for Automatic Transmission

o

for RHD:

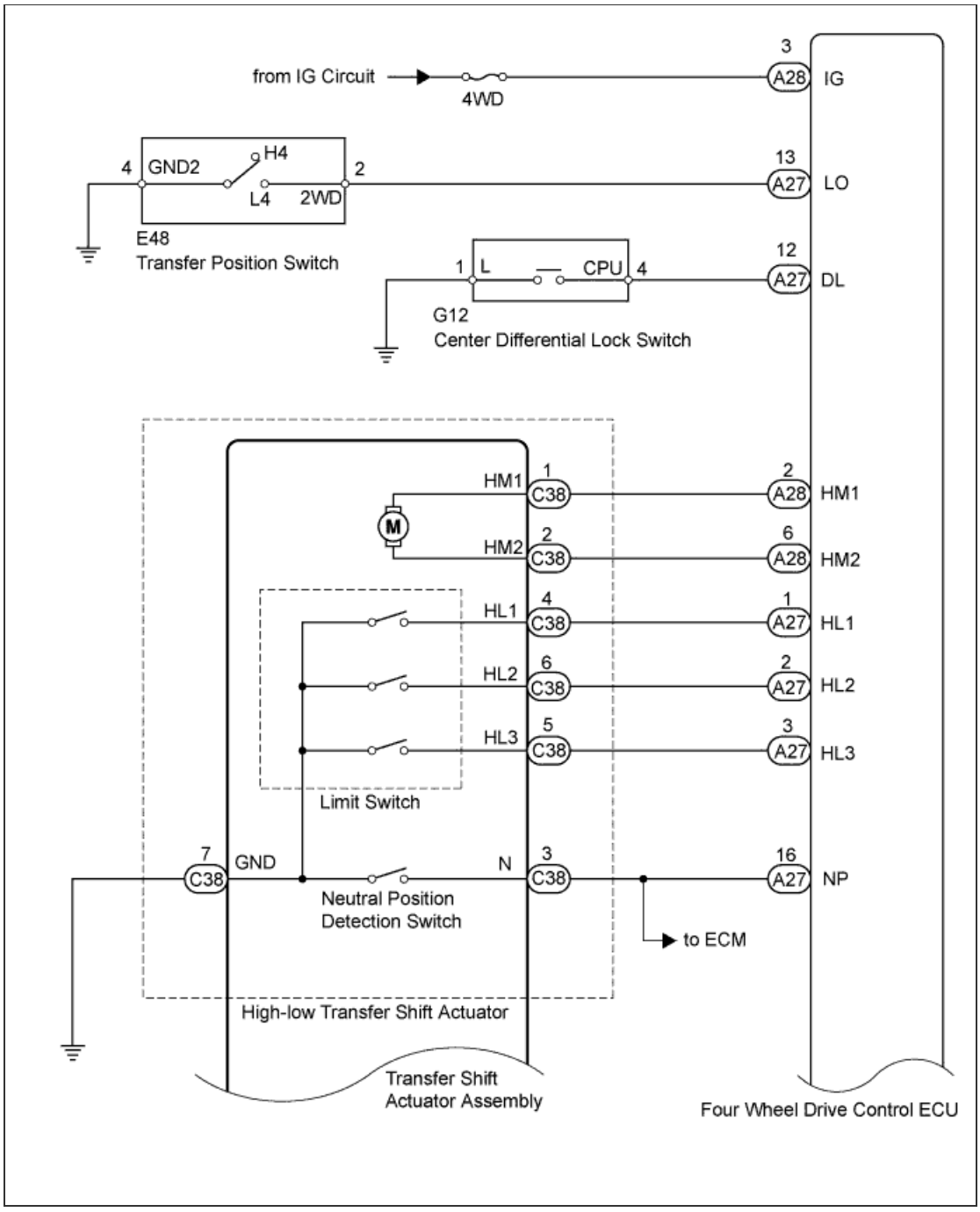


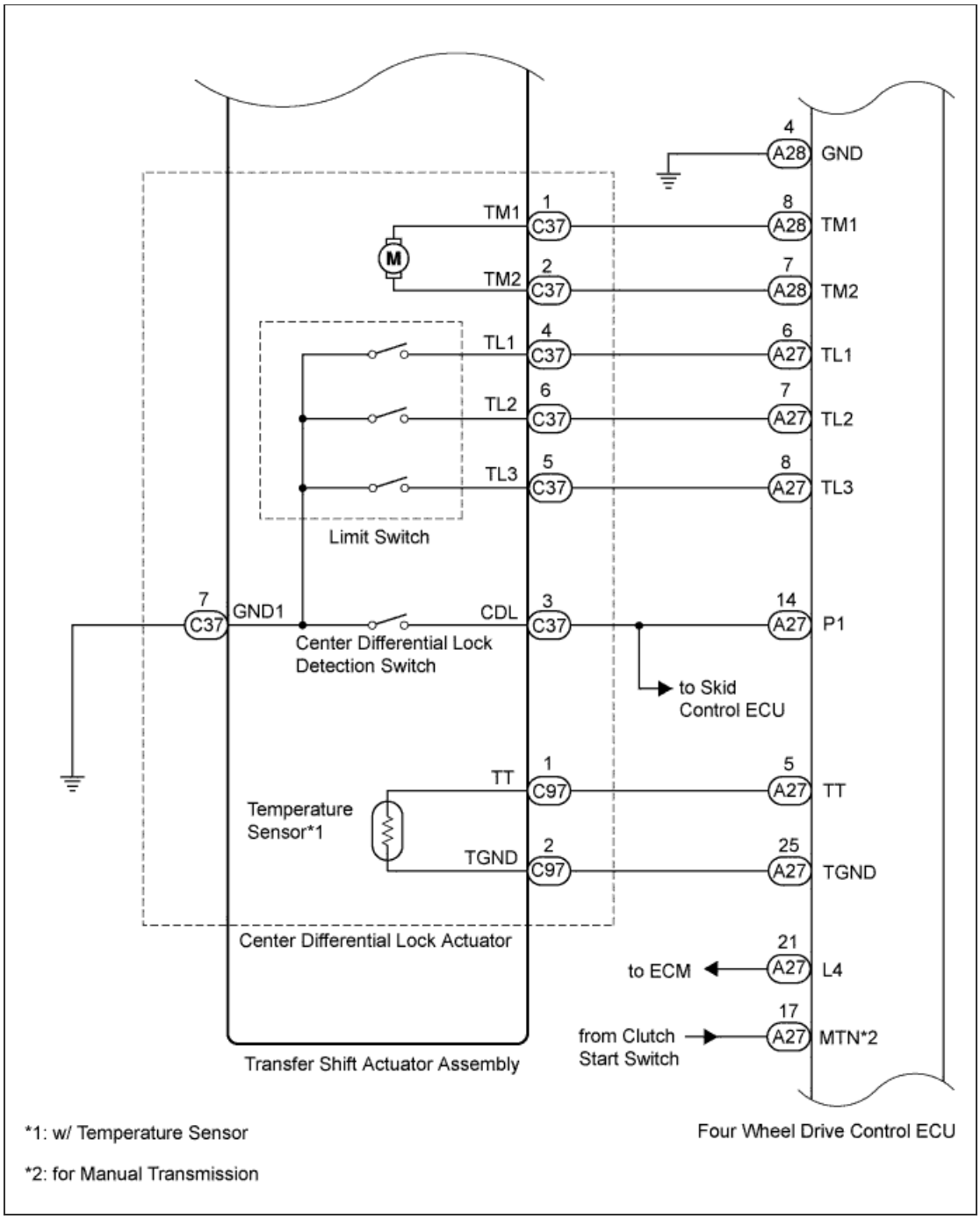
*1: w/ Rear Differential Lock

*2: for Automatic Transmission

o

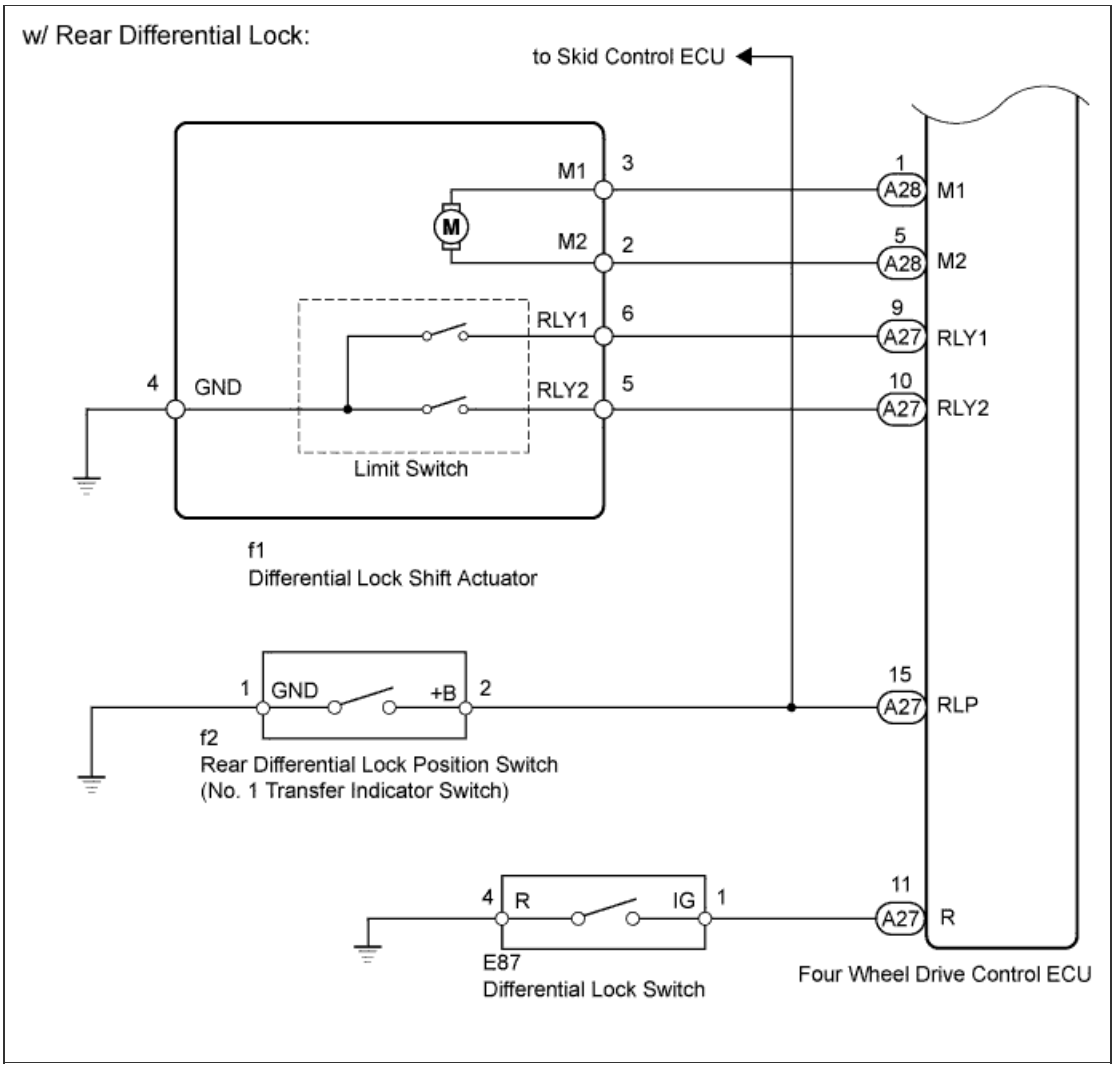
for Preparation Click here

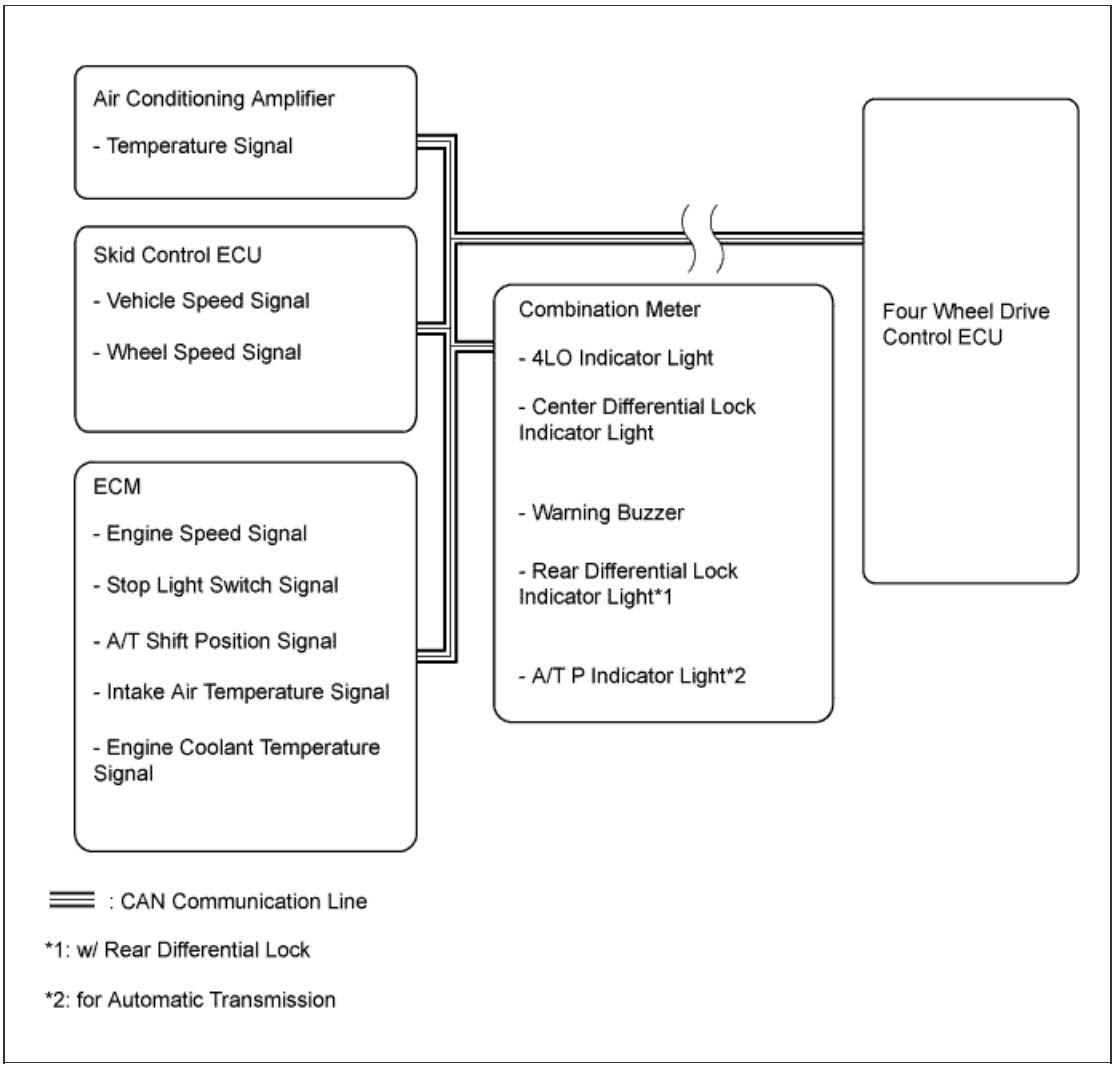




*1: w/ Temperature Sensor

*2: for Manual Transmission


w/ Rear Differential Lock:
to Skid Control ECU
M1
3
M2
2
RLY1
6
RLY2
5
4
GND
Limit Switch
f1
Differential Lock Shift Actuator
1
GND
+B
2
f2
Rear Differential Lock Position Switch
(No. 1 Transfer Indicator Switch)
4
R
IG
1
E87
Differential Lock Switch
1
A28
M1
5
A28
M2
9
A27
RLY1
10
A27
RLY2
15
A27
RLP
11
A27
R
Four Wheel Drive Control ECU


Air Conditioning Amplifier
- Temperature Signal
Skid Control ECU
- Vehicle Speed Signal
- Wheel Speed Signal
ECM
- Engine Speed Signal
- Stop Light Switch Signal
- A/T Shift Position Signal
- Intake Air Temperature Signal
- Engine Coolant Temperature Signal
Combination Meter
- 4LO Indicator Light
- Center Differential Lock Indicator Light
- Warning Buzzer
- Rear Differential Lock Indicator Light*1
- A/T P Indicator Light*2
Four Wheel Drive Control ECU
: CAN Communication Line
*1: w/ Rear Differential Lock
*2: for Automatic Transmission

for Preparation Click here

HINT:

- **Use the table below to help determine the cause of problem symptoms. If multiple suspected areas are listed, the potential causes of the symptoms are listed in order of probability in the "Suspected Area" column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.**
- **Inspect the fuses and relays related to this system before inspecting the suspected areas below.**

Transfer System

Symptom	Suspected Area	See page
Noise	Oil (Level low)	Click here
	Oil (Wrong)	Click here
	Transfer faulty	Click here
Oil leakage	Oil (Level too high)	Click here
	Gasket (Damaged)	Click here
	Oil seal (Worn or damaged)	Click here
	O-ring (Worn or damaged)	Click here
Switch from high to low impossible	Harness or connector	Click here
	Transfer shift actuator	Click here
	CAN communication system (for LHD)	Click here
	CAN communication system (for RHD)	Click here
	Transfer position switch	Click here
	Four wheel drive control ECU	Click here
	Transfer faulty	Click here
Switch from free to lock impossible	Harness or connector	Click here
	Transfer shift actuator	Click here
	CAN communication system (for LHD)	Click here
	CAN communication system (for RHD)	Click here
	Center differential lock switch	Click here
	Four wheel drive control ECU	Click here
	Transfer faulty	Click here
Rear differential does not lock*	Harness or connector	Click here
	Transfer shift actuator	Click here
	Transfer position switch	Click here
	Differential lock switch	Click here
	Differential lock shift actuator	Click here
	CAN communication system (for LHD)	Click here
	CAN communication system (for RHD)	Click here
	Four wheel drive control ECU	Click here
	Rear differential	Click here

HINT:

*: w/ Rear Differential Lock

for Preparation Click here

1. INSPECT INDICATOR LIGHT

a. Check the 4LO indicator light.

i. Start the engine.

ii. Stop the vehicle.

iii. for Automatic Transmission: Move the shift lever to N.
for Manual Transmission: Depress the clutch pedal.

iv. Turn the transfer position switch from H4 to L4.

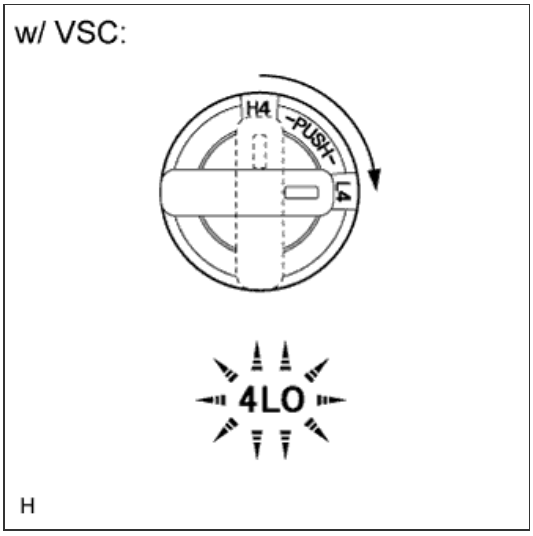
v. Check the 4LO indicator light.

- w/ VSC:

OK:

Switch Condition	Specified Condition
Turned from H4 to L4	4LO indicator light comes on immediately or comes on after blinking

If there is a malfunction, inspect the switch, ECU and transfer shift actuator. If the system is normal, there may be a malfunction in the CAN communication system or combination meter. In that case, first check the CAN communication system for LHD (Click here), for RHD (Click here). Then check the combination meter (Click here).

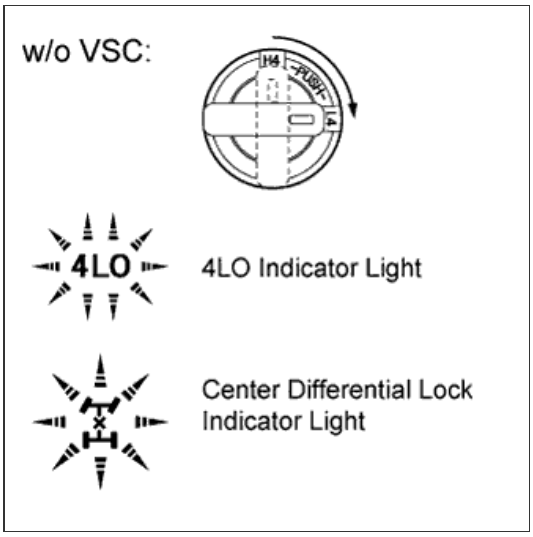


- w/o VSC:

OK:

Switch Condition	Specified Condition
Turned from H4 to L4	4LO indicator light and center differential lock indicator light come on immediately or come on after blinking

If there is a malfunction, inspect the switch, ECU and transfer shift actuator. If the system is normal, there may be a malfunction in the CAN communication system or combination meter. In that case, first check the CAN communication system for LHD (Click here), for RHD (Click here). Then check the combination meter (Click here).



HINT:

For vehicles without VSC (Vehicle Stability Control), when the transfer position switch is turned from H4 to L4, the center differential will lock.

b. Check the center differential lock indicator light.

i. Start the engine.

ii. Push the center differential lock switch.

NOTICE:

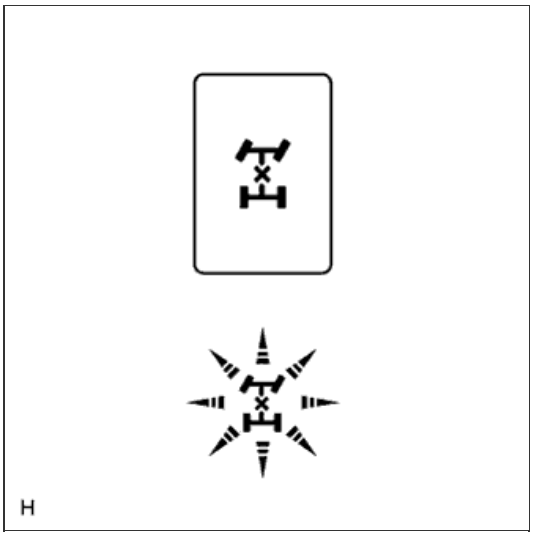
- **Do not push the switch while the vehicle is turning.**
- **Push the switch at a vehicle speed less than 100 km/h (60 mph).**

iii. Check the center differential lock indicator light.

OK:

Switch Condition	Specified Condition
Pushed	Center differential lock indicator light comes on immediately or comes on after blinking

If there is a malfunction, inspect the switch, ECU and transfer shift actuator. If the system is normal, there may be a malfunction in the CAN communication system or combination meter. In that case, first check the CAN communication system for LHD (Click here), for RHD (Click here). Then check the combination meter (Click here).



c. w/ Rear Differential Lock:
Check the rear differential lock indicator light.

i. Start the engine.

ii. Stop the vehicle.

iii. for Automatic Transmission: Move the shift lever to N.
for Manual Transmission: Depress the clutch pedal.

iv. Turn the transfer position switch from H4 to L4.

HINT:

The rear differential can be locked only when the following conditions are met: 1) The transfer is in low, and 2) the center differential is locked. As vehicles with a rear differential lock do not have a vehicle stability control system, these conditions will be satisfied after the transfer position switch is turned to L4, the transfer shifts to low, and the center differential locks.

v. Turn the differential lock switch from OFF to RR.

NOTICE:

When locking the rear differential, make sure that the vehicle speed is less than 8 km/h (5 mph).

vi. Check the rear differential lock indicator light.

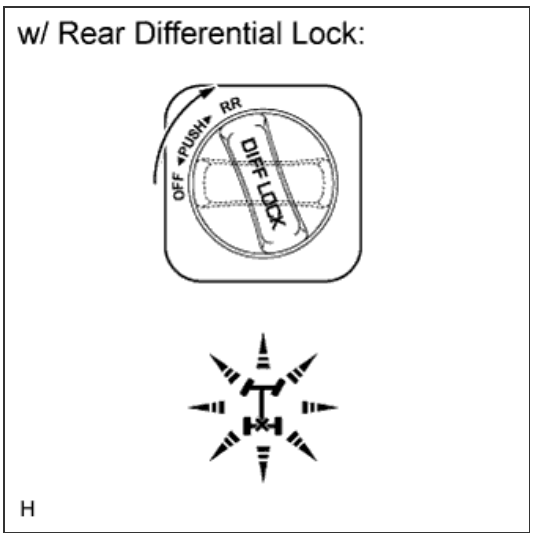
OK:

Switch Condition	Specified Condition
After transfer position switch is turned from H4 to L4, differential lock switch is turned from OFF to RR	Rear differential lock indicator light comes on immediately or comes on after blinking

If there is a malfunction, inspect the switch, ECU and differential lock shift actuator.

HINT:

- **The 4LO indicator light and center differential lock indicator light are both illuminated.**
- **When the rear differential is locked, if the transfer position switch is returned to H4, the rear differential becomes free. However, since the differential lock switch is on RR, the rear differential lock indicator light blinks, and when the differential lock switch is turned to OFF, the indicator light turns off.**



2. INSPECT FUSE

a. Remove the 4WD fuse from the main body ECU (cowl side junction block LH).

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
4WD fuse	Always	Below 1 Ω

If a fuse is blown, inspect the harness connected to the fuse for a short circuit, and repair or replace the harness or replace the fuse.

3. INSPECT TRANSFER POSITION SWITCH

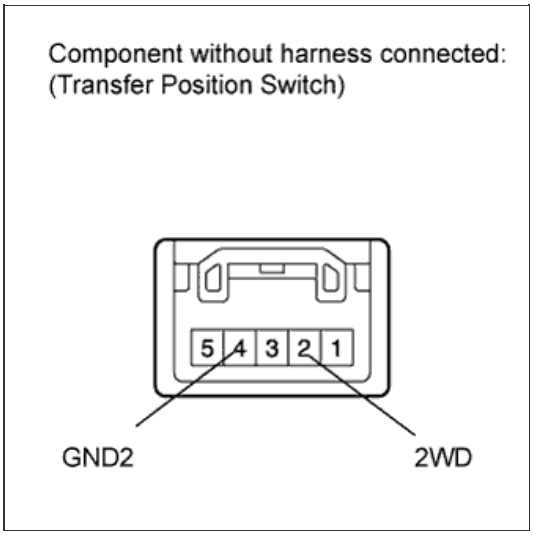
a. Remove the transfer position switch (Click here).

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
2 (2WD) - 4 (GND2)	H4 position	100 kΩ or higher
	L4 position	Below 1 Ω

If there is a malfunction, replace the transfer position switch.

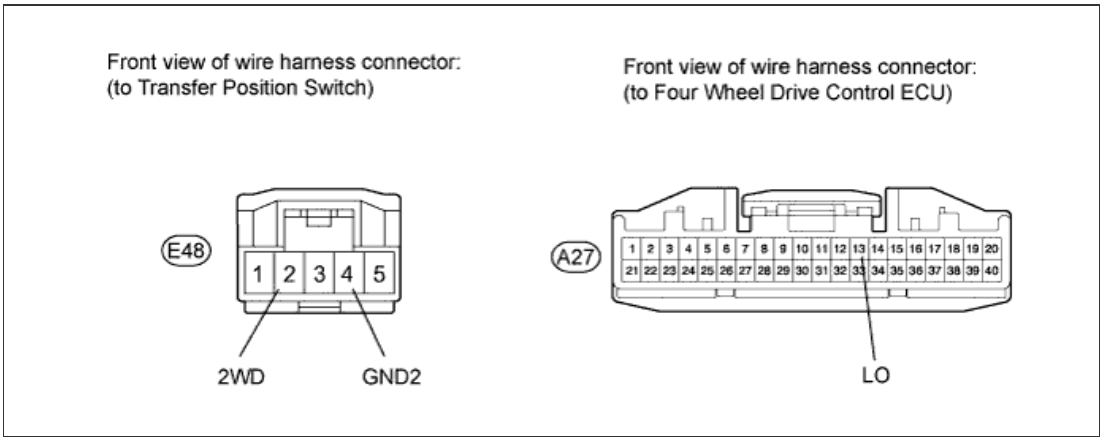


c. Check the harness and connector (ECU - transfer position switch and body ground).

i. Disconnect the A27 ECU connector.

ii. Disconnect the E48 transfer position switch connector.

iii. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
E48-2 (2WD) - A27-		

13 (LO)	Always	Below 1 Ω
E48-2 (2WD) - Body ground	Always	100 kΩ or higher
E48-4 (GND2) - Body ground	Always	Below 1 Ω

If there is a malfunction, repair or replace the harness or connector.

4. INSPECT CENTER DIFFERENTIAL LOCK SWITCH

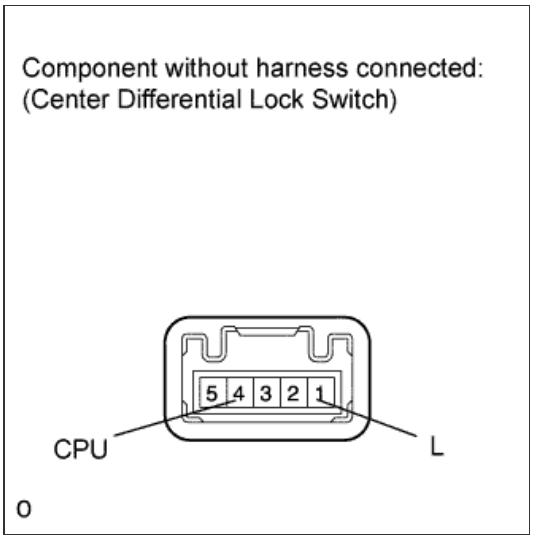
a. Remove the center differential lock switch (Click here).

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
1 (L) - 4 (CPU)	Switch is pressed and held	Below 1 Ω
	Switch is not pressed	100 kΩ or higher

If there is a malfunction, replace the center differential lock switch.

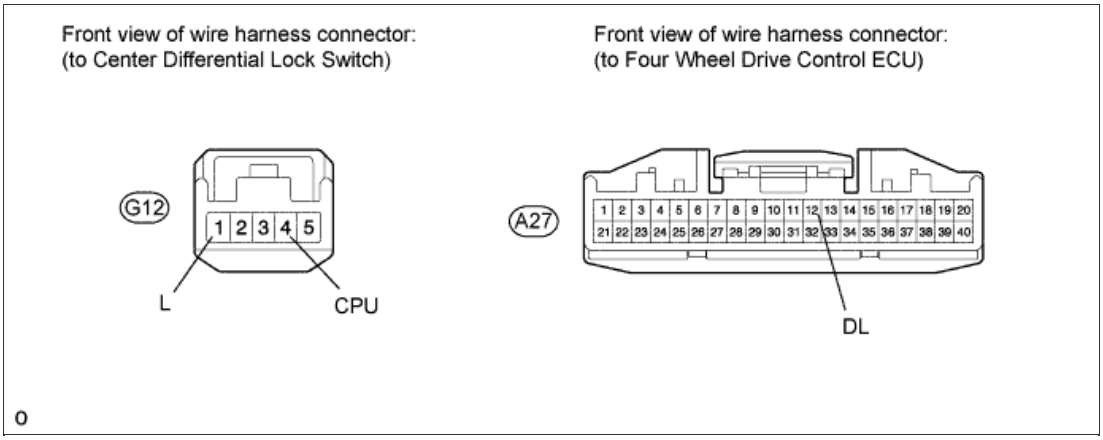


c. Check the harness and connector (ECU - center differential lock switch and body ground).

i. Disconnect the ECU connector.

ii. Disconnect the center differential lock switch connector.

iii. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
A27-12 (DL) - G12-4 (CPU)	Always	Below 1 Ω

A27-12 (DL) - Body ground	Always	100 kΩ or higher
G12-1 (L) - Body ground	Always	Below 1 Ω

If there is a malfunction, repair or replace the harness or connector.

5. INSPECT DIFFERENTIAL LOCK SWITCH (w/ Rear Differential Lock)

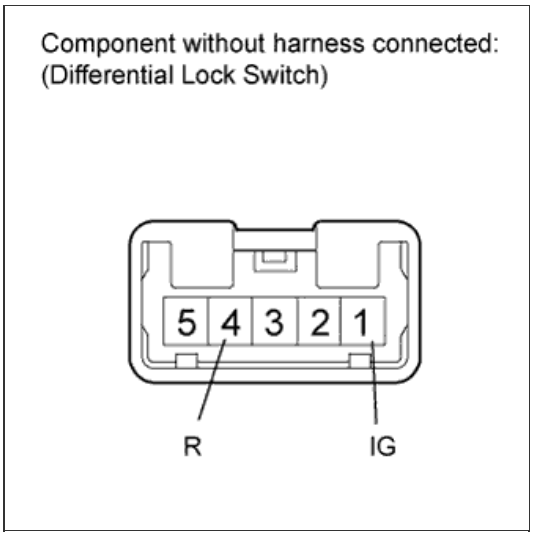
a. Remove the differential lock switch (Click here).

b. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
1 (IG) - 4 (R)	OFF	10 kΩ or higher
	RR	Below 1 Ω

If there is a malfunction, replace the differential lock switch.

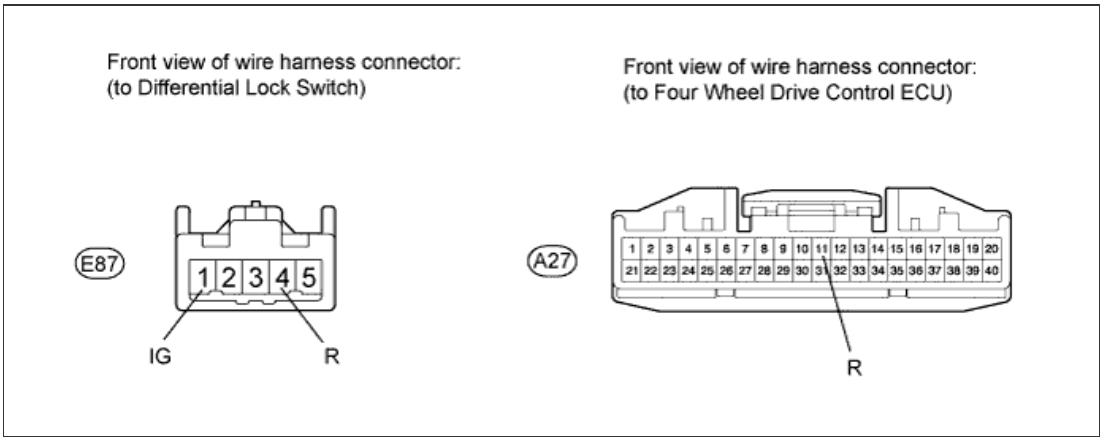


c. Check the harness and connector (ECU - differential lock switch and body ground).

i. Disconnect the A27 ECU connector.

ii. Disconnect the E87 differential lock switch connector.

iii. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
A27-11 (R) - E87-1 (IG)	Always	Below 1 Ω
A27-11 (R) - Body ground	Always	100 kΩ or higher
E87-4 (R) - Body ground	Always	Below 1 Ω

If there is a malfunction, repair or replace the harness or connector.

6. INSPECT TRANSFER SHIFT ACTUATOR ASSEMBLY (HIGH-LOW TRANSFER SHIFT ACTUATOR)

HINT:

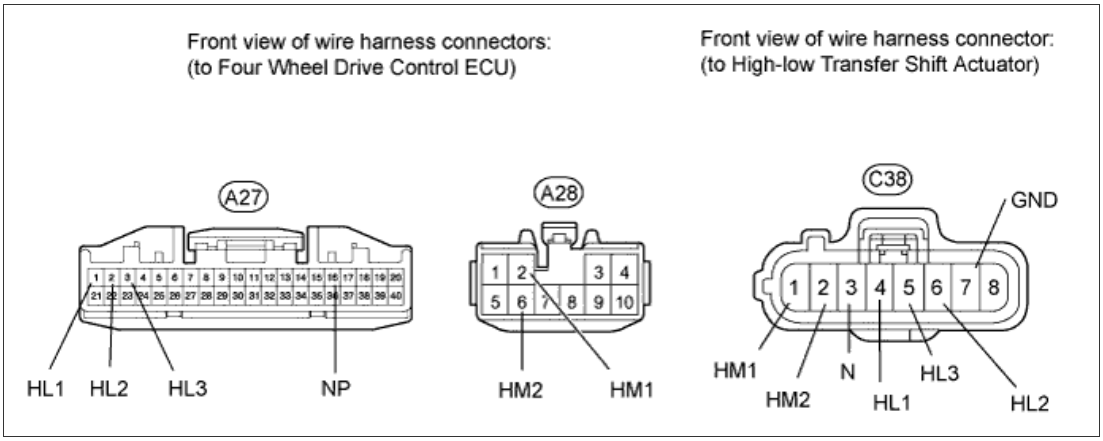
After inspecting the ECU power supply or transfer position switch, check the high-low transfer shift actuator.

a. Check the harness and connector (ECU - high-low transfer shift actuator).

i. Disconnect the C38 actuator connector.

ii. Disconnect the A27 and A28 ECU connectors.

iii. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
A27-1 (HL1) - C38-4 (HL1)	Always	Below 1 Ω
A27-1 (HL1) - Body ground	Always	100 kΩ or higher
A27-2 (HL2) - C38-6 (HL2)	Always	Below 1 Ω
A27-2 (HL2) - Body ground	Always	100 kΩ or higher
A27-3 (HL3) - C38-5 (HL3)	Always	Below 1 Ω
A27-3 (HL3) - Body ground	Always	100 kΩ or higher
A27-16 (NP) - C38-3 (N)	Always	Below 1 Ω
A27-16 (NP) - Body ground	Always	100 kΩ or higher
A28-2 (HM1) - C38-1 (HM1)	Always	Below 1 Ω
A28-2 (HM1) - Body ground	Always	100 kΩ or higher
A28-6 (HM2) - C38-2 (HM2)	Always	Below 1 Ω
A28-6 (HM2) - Body ground	Always	100 kΩ or higher
C38-7 (GND) - Body ground	Always	Below 1 Ω

If there is a malfunction, repair or replace the harness or connector.

b. Check the high-low transfer shift actuator.

i. Turn the engine switch on (IG).

ii. Stop the vehicle.

iii. for Automatic Transmission: Move the shift lever to N.
for Manual Transmission: Depress the clutch pedal.

iv. Check that there is an operating noise from the transfer shift actuator when the transfer position switch is turned from H4 to L4, or L4 to H4.

OK:
There is an operating noise.

HINT:

- **If the actuator fork cannot move from high to low, or low to high even though there is an operating noise, there may be a mechanical malfunction in the transfer.**
- **If there is no operating noise, there may be a malfunction in the high-low transfer shift actuator. However, it may also be a result of a mechanical malfunction in the transfer, so inspect each part.**

v. Remove the transfer shift actuator assembly (Click here).

vi. Check the high to low switch.

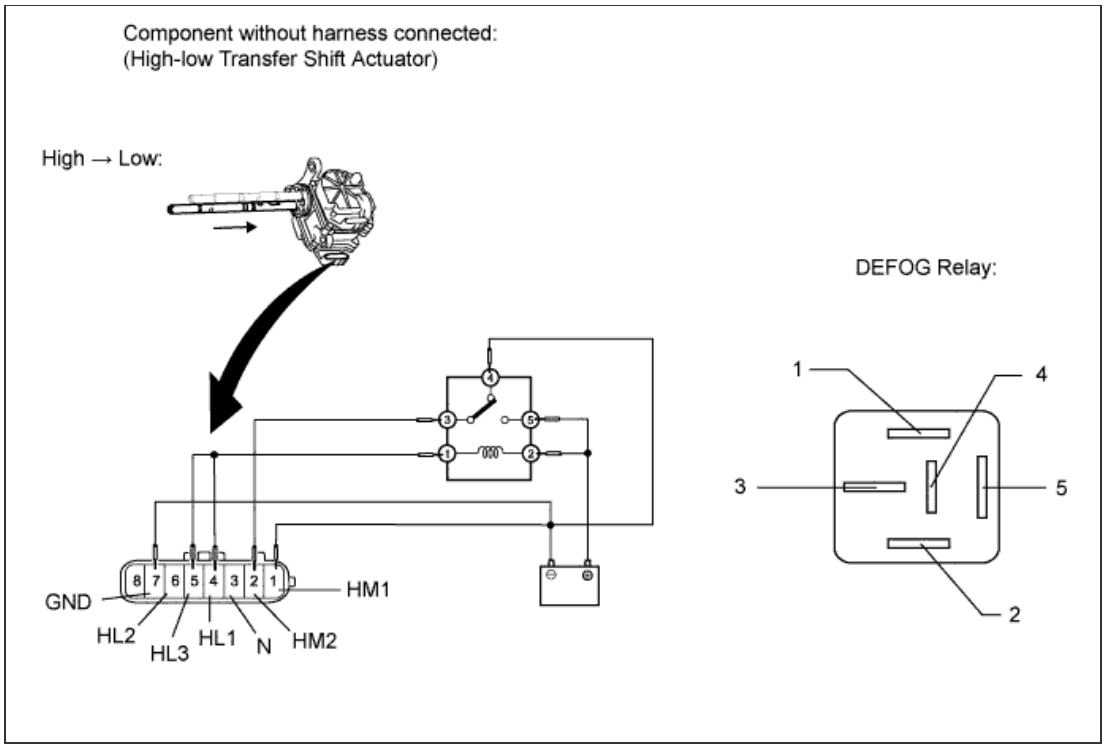
1. Connect lines via a relay as shown in the illustration, and check that the actuator fork moves from the high to low position.

NOTICE:

- **Make sure to perform this inspection with the actuator removed from the vehicle. If this inspection is performed with the actuator installed to the vehicle, the actuator will be damaged.**
- **When inspecting the actuator, make sure to operate it with the lines connected via a relay. If the lines are not connected via a relay and battery voltage is directly applied to the actuator, the actuator will be damaged.**

HINT:

When performing the operation described above, use the DEFOG relay.



2. After the high to low switch is complete, check the neutral position detection switch and limit switch.
   1. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester		Specified

Connection	Condition	Condition
3 (N) - 7 (GND)	After high to low switch is complete	100 kΩ or higher
4 (HL1) - 7 (GND)	After high to low switch is complete	100 kΩ or higher
5 (HL3) - 7 (GND)	After high to low switch is complete	100 kΩ or higher
6 (HL2) - 7 (GND)	After high to low switch is complete	Below 1 Ω

If there is a malfunction, replace the transfer shift actuator assembly.

vii. Check the low to high switch.

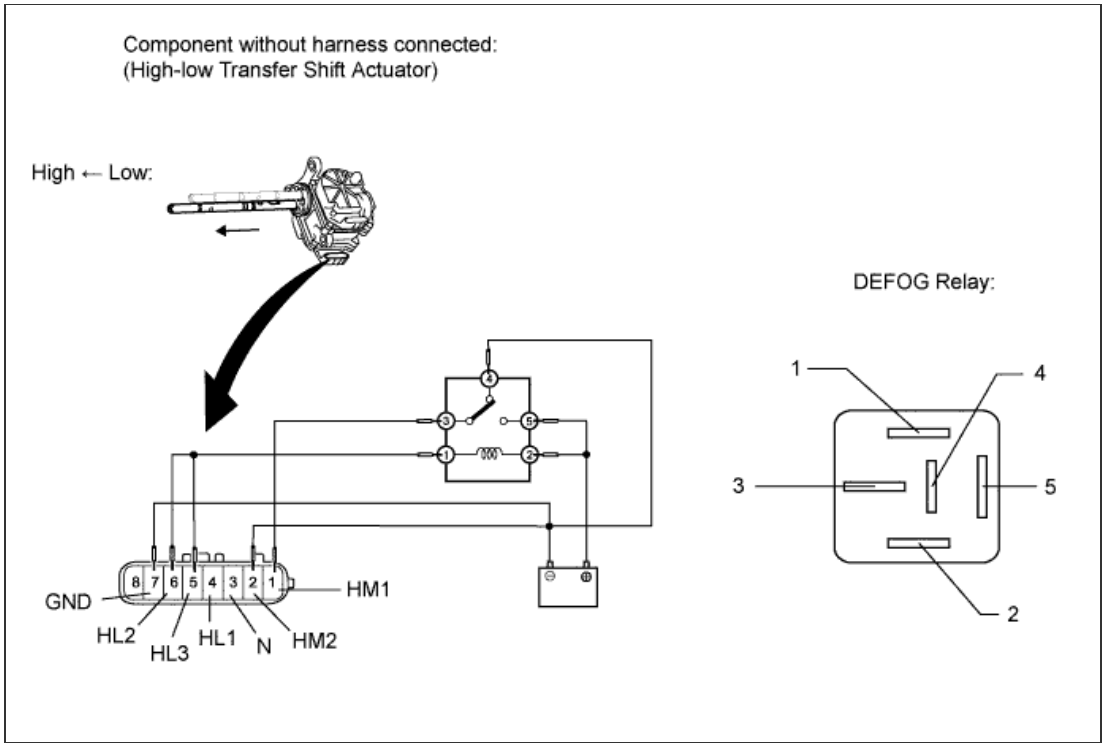
1. Connect lines via a relay as shown in the illustration, and check that the actuator fork moves from the low to high position.

NOTICE:

- **Make sure to perform this inspection with the actuator removed from the vehicle. If this inspection is performed with the actuator installed to the vehicle, the actuator will be damaged.**
- **When inspecting the actuator, make sure to operate it with the lines connected via a relay. If the lines are not connected via a relay and battery voltage is directly applied to the actuator, the actuator will be damaged.**

HINT:

When performing the operation described above, use the DEFOG relay.



2. After the low to high switch is complete, check the neutral position detection switch and limit switch.
    1. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
3 (N) - 7 (GND)	After low to high switch is	100 kΩ or higher

	complete	
4 (HL1) - 7 (GND)	After low to high switch is complete	Below 1 Ω
5 (HL3) - 7 (GND)	After low to high switch is complete	100 kΩ or higher
6 (HL2) - 7 (GND)	After low to high switch is complete	100 kΩ or higher

If there is a malfunction, replace the transfer shift actuator assembly.

7. INSPECT TRANSFER SHIFT ACTUATOR ASSEMBLY (CENTER DIFFERENTIAL LOCK ACTUATOR)

HINT:

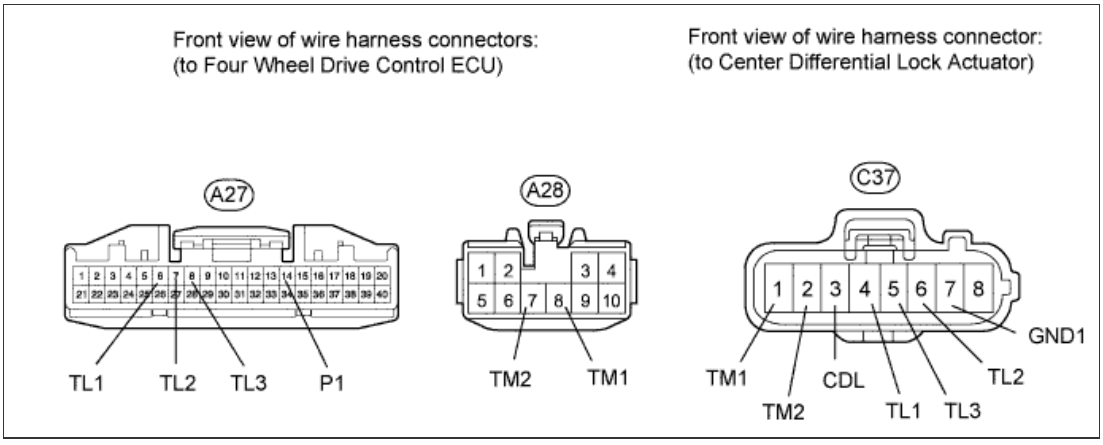
After inspecting the ECU power supply or center differential lock switch, inspect the center differential lock actuator.

a. Check the harness and connector (ECU - center differential lock actuator).

i. Disconnect the C37 actuator connector.

ii. Disconnect the A27 and A28 ECU connectors.

iii. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
A27-6 (TL1) - C37-4 (TL1)	Always	Below 1 Ω
A27-6 (TL1) - Body ground	Always	100 kΩ or higher
A27-7 (TL2) - C37-6 (TL2)	Always	Below 1 Ω
A27-7 (TL2) - Body ground	Always	100 kΩ or higher
A27-8 (TL3) - C37-5 (TL3)	Always	Below 1 Ω
A27-8 (TL3) - Body ground	Always	100 kΩ or higher
A27-14 (P1) - C37-3 (CDL)	Always	Below 1 Ω
A27-14 (P1) - Body ground	Always	100 kΩ or higher

A28-7 (TM2) - C37-2 (TM2)	Always	Below 1 Ω
A28-7 (TM2) - Body ground	Always	100 kΩ or higher
A28-8 (TM1) - C37-1 (TM1)	Always	Below 1 Ω
A28-8 (TM1) - Body ground	Always	100 kΩ or higher
C37-7 (GND) - Body ground	Always	Below 1 Ω

If there is a malfunction, repair or replace the harness or connector.

b. Check the center differential lock actuator.

i. Turn the engine switch on (IG).

ii. Check that there is an operating noise from the transfer shift actuator when the center differential lock switch is pressed to switch from free to lock, or lock to free.

OK:
There is an operating noise.

HINT:

- **If the actuator fork cannot move from free to lock, or lock to free even though there is an operating noise, there may be a mechanical malfunction in the transfer.**
- **If there is no operating noise, there may be a malfunction in the center differential lock actuator. However, it may also be a result of a mechanical malfunction in the transfer, so inspect each part.**

iii. Remove the transfer shift actuator assembly (Click here).

iv. Check the free to lock switch.

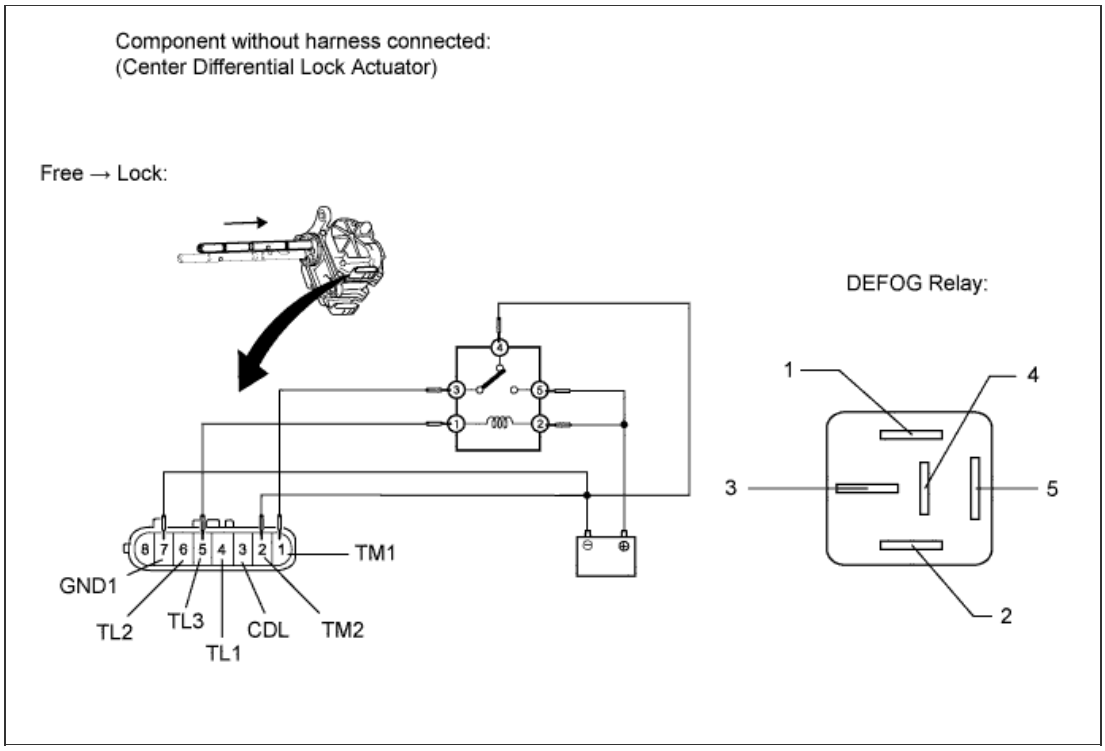
1. Connect lines via a relay as shown in the illustration, and check that the actuator fork moves from the free to lock position.

NOTICE:

- **Make sure to perform this inspection with the actuator removed from the vehicle. If this inspection is performed with the actuator installed to the vehicle, the actuator will be damaged.**
- **When inspecting the actuator, make sure to operate it with the lines connected via a relay. If the lines are not connected via a relay and battery voltage is directly applied to the actuator, the actuator will be damaged.**

HINT:

When performing the operation described above, use the DEFOG relay.



2. After the free to lock switch is complete, check the center differential lock detection switch and limit switch.
    1. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
3 (CDL) - 7 (GND1)	After free to lock switch is complete	Below 1 Ω
4 (TL1) - 7 (GND1)	After free to lock switch is complete	100 kΩ or higher
5 (TL3) - 7 (GND)	After free to lock switch is complete	100 kΩ or higher
6 (TL2) - 7 (GND1)	After free to lock switch is complete	Below 1 Ω

If there is a malfunction, replace the transfer shift actuator assembly.

v. Check the lock to free switch.

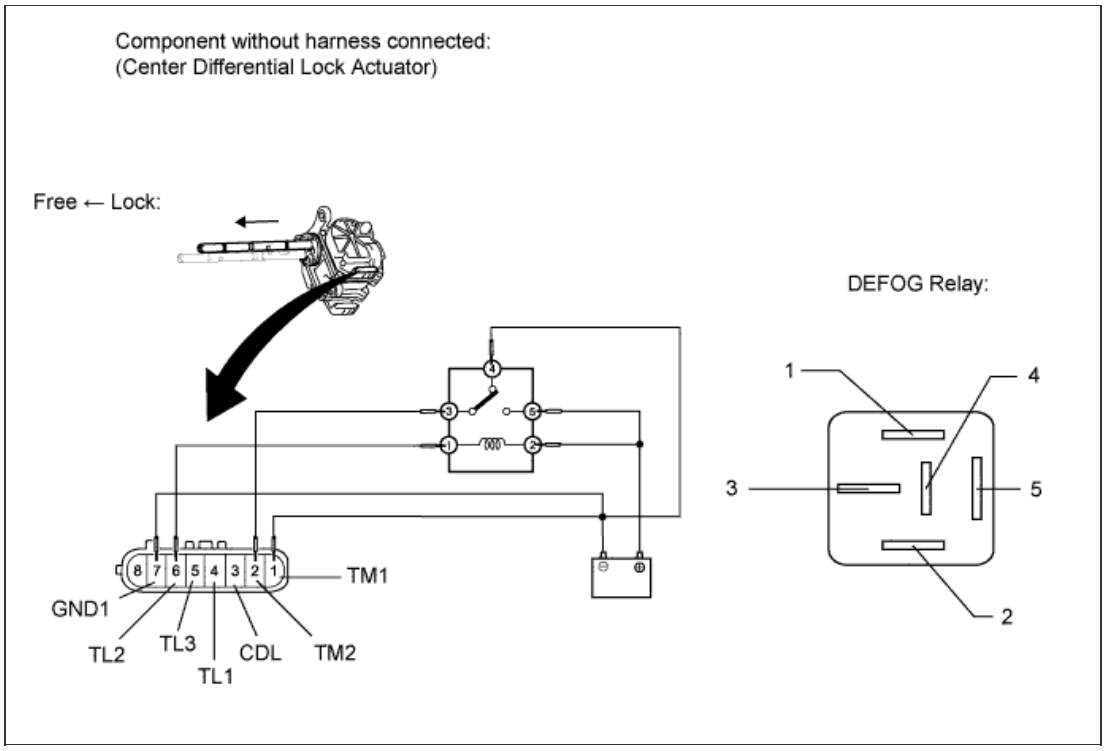
1. Connect lines via a relay as shown in the illustration, and check that the actuator fork moves from the lock to free position.

NOTICE:

- **Make sure to perform this inspection with the actuator removed from the vehicle. If this inspection is performed with the actuator installed to the vehicle, the actuator will be damaged.**
- **When inspecting the actuator, make sure to operate it with the lines connected via a relay. If the lines are not connected via a relay and battery voltage is directly applied to the actuator, the actuator will be damaged.**

HINT:

When performing the operation described above, use the DEFOG relay.



2. After the lock to free switch is complete, check the center differential lock detection switch and limit switch.
   1. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
3 (CDL) - 7 (GND1)	After lock to free switch is complete	100 kΩ or higher
4 (TL1) - 7 (GND1)	After lock to free switch is complete	100 kΩ or higher
5 (TL3) - 7 (GND1)	After lock to free switch is complete	Below 1 Ω
6 (TL2) - 7 (GND1)	After lock to free switch is complete	100 kΩ or higher

If there is a malfunction, replace the transfer shift actuator assembly.

8. INSPECT DIFFERENTIAL LOCK SHIFT ACTUATOR (w/ Rear Differential Lock)

HINT:

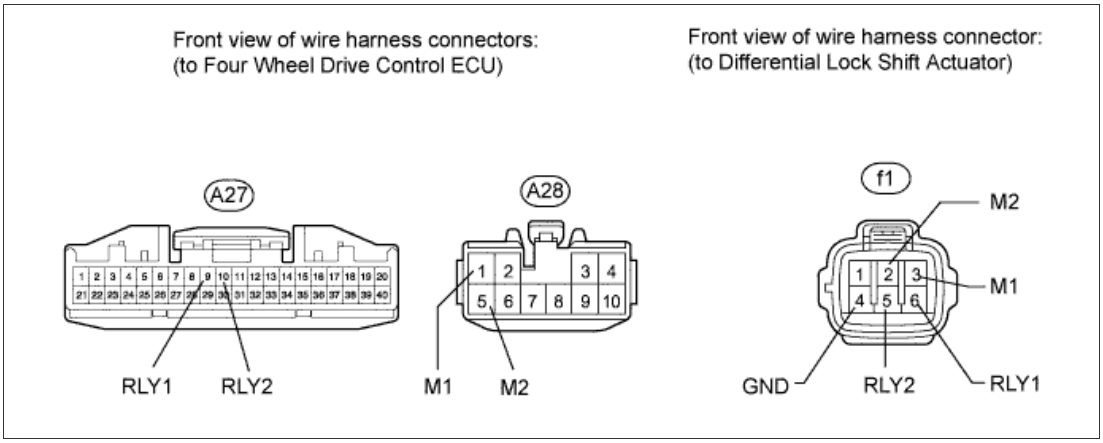
After inspecting the transfer position switch, transfer shift actuator and differential lock switch, check the differential lock shift actuator.

a. Check the harness and connector (ECU - differential lock shift actuator).

i. Disconnect the f1 actuator connector.

ii. Disconnect the A27 and A28 ECU connectors.

iii. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
A27-9 (RLY1) - f1-6 (RLY1)	Always	Below 1 Ω
A27-9 (RLY1) - Body ground	Always	100 kΩ or higher
A27-10 (RLY2) - f1-5 (RLY2)	Always	Below 1 Ω
A27-10 (RLY2) - Body ground	Always	100 kΩ or higher
A28-1 (M1) - f1-3 (M1)	Always	Below 1 Ω
A28-1 (M1) - Body ground	Always	100 kΩ or higher
A28-5 (M2) - f1-2 (M2)	Always	Below 1 Ω
A28-5 (M2) - Body ground	Always	100 kΩ or higher
f1-4 (GND) - Body ground	Always	Below 1 Ω

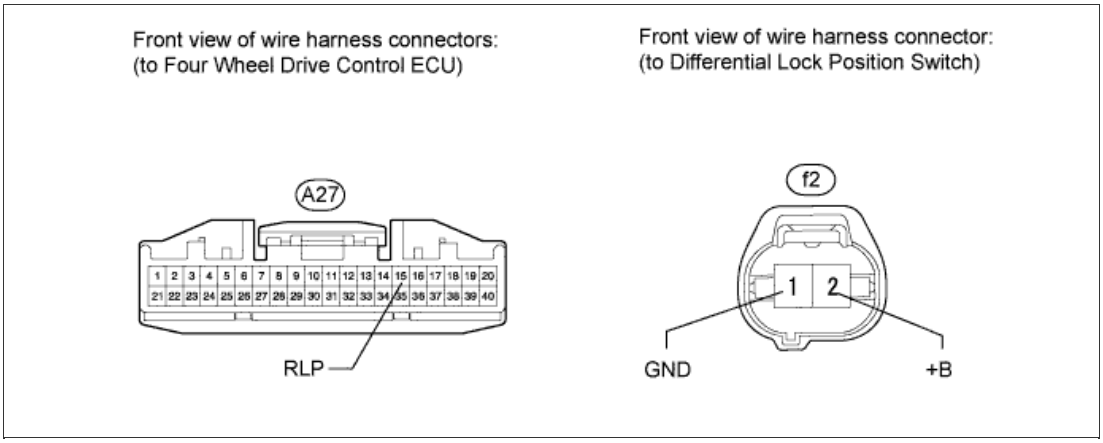
If there is a malfunction, repair or replace the harness or connector.

b. Check the harness and connector (ECU - differential lock position switch).

i. Disconnect the f2 differential lock position switch connector.

ii. Disconnect the A27 ECU connector.

iii. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Condition	Specified Condition
A27-15 (RLP) - f2-2 (+B)	Always	Below 1 Ω
A27-15 (RLP) - Body ground	Always	100 kΩ or higher
f2-1 (GND) - Body ground	Always	Below 1 Ω

If there is a malfunction, repair or replace the harness or connector.

c. Check the differential lock shift actuator.

i. Turn the engine switch on (IG).

ii. Check that there is an operating noise from the differential lock shift actuator when the differential lock switch is switch from OFF to RR (free to lock), or RR to OFF (lock to free).

NOTICE:

- **Perform this operation when the transfer is in low and the center differential is locked.**
- **When locking the rear differential, make sure that the vehicle speed is less than 8 km/h (5 mph).**

HINT:

Perform this operation when the transfer is in low and the center differential is locked.

OK:
There is an operating noise.

HINT:

- **If the actuator fork cannot move from free to lock or lock to free even though there is an operating noise, there may be a mechanical malfunction in the rear differential.**
- **If there is no operating noise, there may be a malfunction in the differential lock shift actuator. However, it may also be a result of a mechanical malfunction in the rear differential, so inspect each part.**

iii. Remove the differential lock shift actuator assembly (Click here).

iv. Check the free to lock switch.

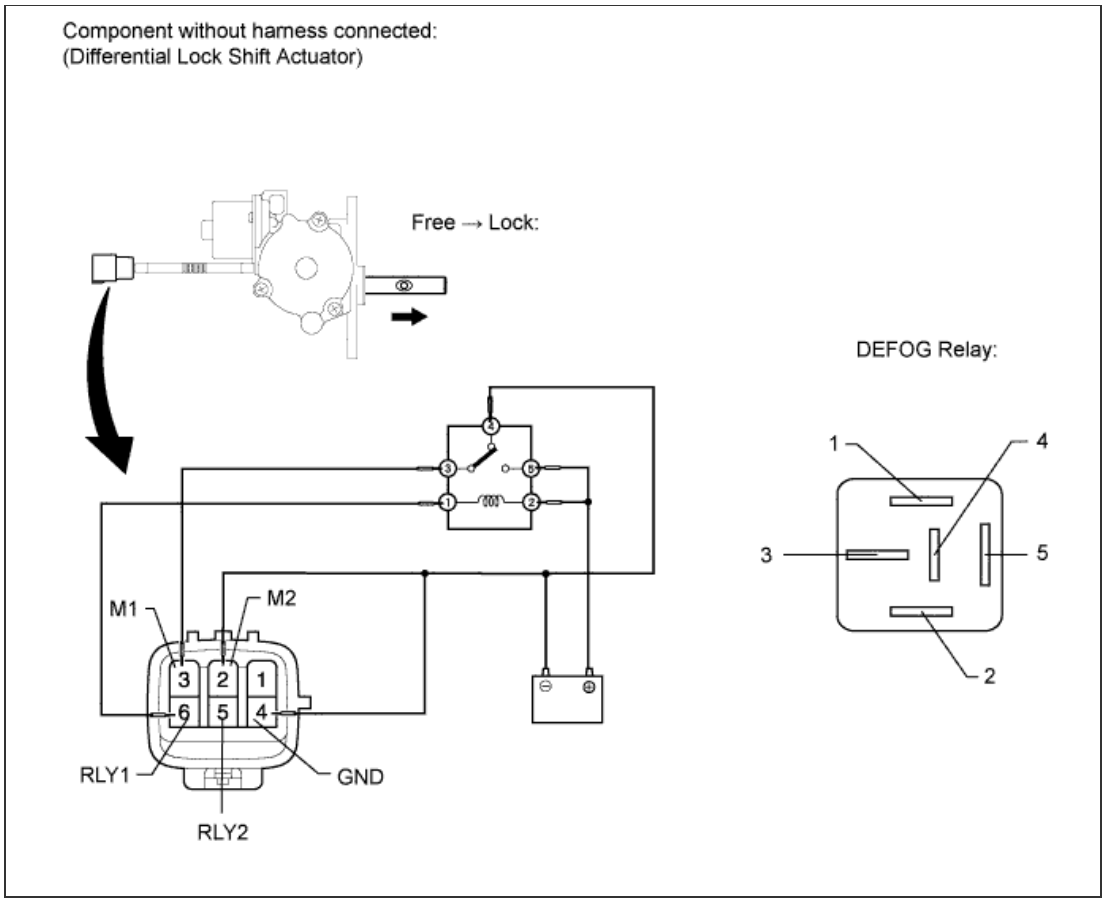
1. Connect lines via a relay as shown in the illustration, and check that the actuator fork moves from the free to lock position.

NOTICE:

- **Make sure to perform this inspection with the actuator removed from the vehicle. If this inspection is performed with the actuator installed to the vehicle, the actuator will be damaged.**
- **When inspecting the actuator, make sure to operate it with the lines connected via a relay. If the lines are not connected via a relay and battery voltage is directly applied to the actuator, the actuator will be damaged.**

HINT:

When performing the operation described above, use the DEFOG relay.



2. After the free to lock switch is complete, check the limit switch.
    1. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Condition	Specified Condition
5 (RLY2) - 4 (GND)	After free to lock switch is complete	Below 12.5 Ω
6 (RLY1) - 4 (GND)	After free to lock switch is complete	500 kΩ or higher

If there is a malfunction, replace the differential lock shift actuator assembly.

v. Check the lock to free switch.

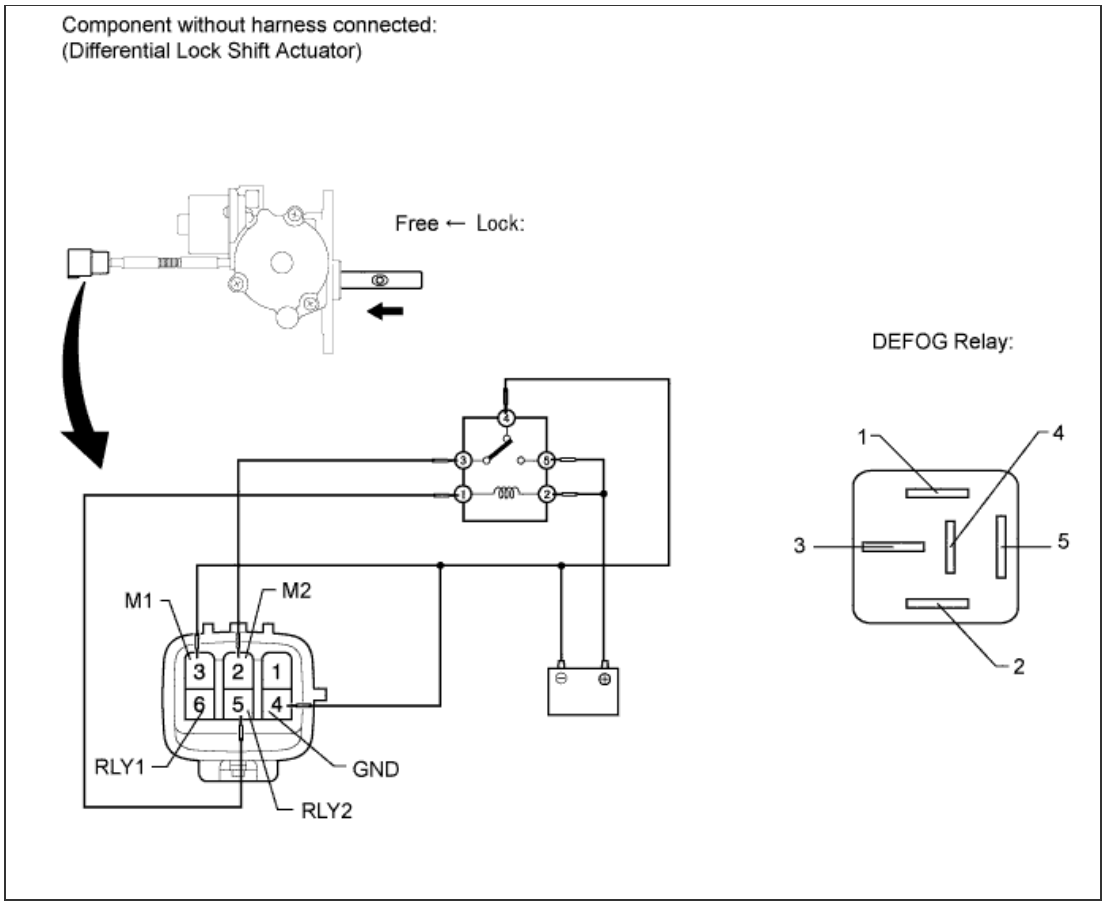
1. Connect lines via a relay as shown in the illustration, and check that the actuator fork moves from the lock to free position.

NOTICE:

- **Make sure to perform this inspection with the actuator removed from the vehicle. If this inspection is performed with the actuator installed to the vehicle, the actuator will be damaged.**
- **When inspecting the actuator, make sure to operate it with the lines connected via a relay. If the lines are not connected via a relay and battery voltage is directly applied to the actuator, the actuator will be damaged.**

HINT:

When performing the operation described above, use the DEFOG relay.



2. After the lock to free switch is complete, check the limit switch.
    1. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

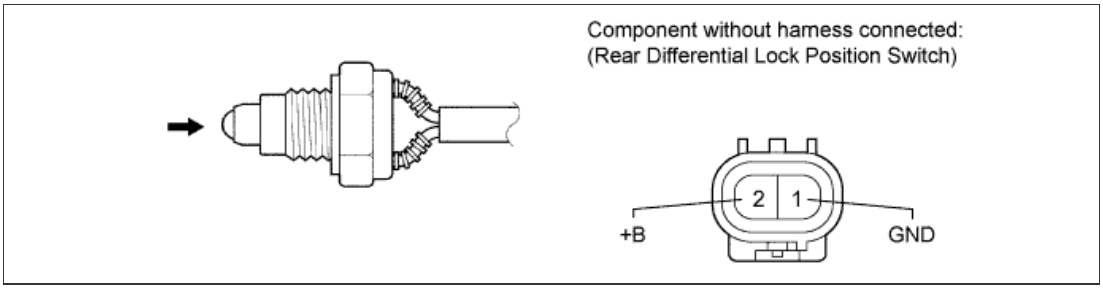
Tester Connection	Condition	Specified Condition
5 (RLY2) - 4 (GND)	After lock to free switch is complete	500 kΩ or higher
6 (RLY1) - 4 (GND)	After lock to free switch is complete	Below 12.5 Ω

If there is a malfunction, replace the differential lock shift actuator assembly.

d. Inspect the rear differential lock position switch.

i. Remove the rear differential lock position switch (Click here).

ii. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

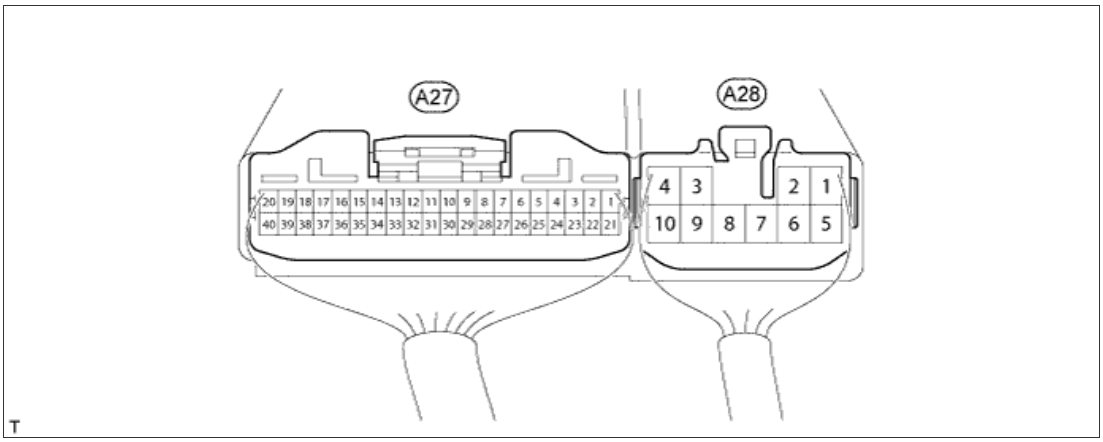
Tester Connection	Switch Condition	Specified Condition
2 (+B) - 1 (GND)	Pushed	Below 1 Ω
	Not pushed	100 kΩ or higher

If there is a malfunction, replace the rear differential lock position switch.

9. INSPECT 4 WHEEL DRIVE CONTROL ECU

a. Check the four wheel drive control ECU.

i. Measure the resistance and voltage according to the value(s) in the table below.



Tester Connection	Terminal Description	Condition	Specified Condition
A27-1 (HL1) - A28-4 (GND)	High-low transfer shift actuator limit switch	Engine switch on (IG) Transfer in high position	Below 1.5 V
		Engine switch on (IG) Transfer in low position	11 to 14 V
		Engine switch on (IG) Transfer in neutral position	11 to 14 V
A27-2 (HL2) - A28-4 (GND)	High-low transfer shift actuator limit switch	Engine switch on (IG) Transfer in high position	11 to 14 V
		Engine switch on (IG) Transfer in low position	Below 1.5 V
		Engine switch on (IG) Transfer in neutral position	11 to 14 V
A27-3 (HL3) - A28-4 (GND)	High-low transfer shift actuator limit switch	Engine switch on (IG) Transfer in high position	11 to 14 V
		Engine switch on (IG) Transfer in low position	11 to 14 V
		Engine switch on (IG) Transfer in neutral position	Below 1.5 V
A27-5 (TT) - A27-25 (TGND)*1	Temperature sensor	Engine switch on (IG)	0 to 5 V
A27-6 (TL1) - A28-4 (GND)	Center differential lock actuator limit switch	Engine switch on (IG) Center differential in free position	11 to 14 V
		Engine switch on (IG) Center differential in lock position	11 to 14 V

		Engine switch on (IG) Transfer in neutral position	Below 1.5 V
A27-7 (TL2) - A28-4 (GND)	Center differential lock actuator limit switch	Engine switch on (IG) Center differential in free position	11 to 14 V
		Engine switch on (IG) Center differential in lock position	Below 1.5 V
		Engine switch on (IG) Transfer in neutral position	11 to 14 V
A27-8 (TL3) - A28-4 (GND)	Center differential lock actuator limit switch	Engine switch on (IG) Center differential in free position	Below 1.5 V
		Engine switch on (IG) Center differential in lock position	11 to 14 V
		Engine switch on (IG) Transfer in neutral position	11 to 14 V
A27-9 (RLY1) - A28-4 (GND)*2	Differential lock shift actuator limit switch	Engine switch on (IG) Rear differential in free position	Below 0.5 V
		Engine switch on (IG) Rear differential in lock position	11 to 14 V
A27-10 (RLY2) - A28-4 (GND)*2	Differential lock shift actuator limit switch	Engine switch on (IG) Rear differential in free position	11 to 14 V
		Engine switch on (IG) Rear differential in lock position	Below 0.5 V
A27-11 (R) - A28-4 (GND)*2	Differential lock switch	Engine switch on (IG) Differential lock switch in OFF position	11 to 14 V
		Engine switch on (IG) Differential lock switch in RR position	Below 1.5 V
A27-12 (DL) - A28-4 (GND)	Transfer position switch	Engine switch on (IG) Transfer in high position	11 to 14 V
		Engine switch on (IG) Transfer in low position	Below 1.5 V
A27-13 (LO) - A28-4 (GND)	Center differential lock switch	Engine switch on (IG) Center differential lock switch pressed and held	Below 1.5 V
		Engine switch on (IG) Center differential lock switch not pressed	11 to 14 V
A27-14 (P1) - A28-4 (GND)	Center differential lock detection switch	Engine switch on (IG) Center differential in free position	11 to 14 V
		Engine switch on (IG) Center differential in lock position	Below 1.5 V
A27-15 (RLP) - A28-4 (GND)*2	Rear differential lock position switch	Engine switch on (IG) Rear differential in free position	11 to 14 V
		Engine switch on (IG) Rear differential in lock position	Below 1.5 V
A27-16 (NP) - A28-4 (GND)	Transfer shift actuator neutral position detection switch	Engine switch on (IG) Transfer in neutral position	Below 1.5 V
		Engine switch on (IG) Transfer in high or low position	11 to 14 V
A27-17 (MTN) - A28-4 (GND)*3	Clutch start switch	Engine switch on (IG) Clutch pedal released	11 to 14 V
		Engine switch on (IG) Clutch pedal depressed	Below 2 V
A27-19 (CAN+) - A27-20 (CAN-)	CAN communication line	Engine switch off	54 to 69 Ω

A27-21 (L4) - A28-4 (GND)	Transfer shift actuator Low detection switch	Transfer position switch in H4 position	11 to 14 V
		Engine switch on (IG) Transfer position switch in L4 position	Below 1.5 V
A28-1 (M1) - A28-4 (GND)*2	Differential lock shift actuator motor	Engine switch on (IG) Transfer in low position Center differential in lock position Differential lock switch OFF → RR (During operation of differential lock shift actuator motor from free to lock)	11 to 14 V
		Engine switch on (IG) Transfer in low position Center differential in lock position Differential lock switch RR → OFF or transfer position switch L4 → H4 (During operation of differential lock shift actuator motor from lock to free)	Below 1.5 V
A28-2 (HM1) - A28-4 (GND)	High-low transfer shift actuator motor	Engine switch on (IG) Transfer position switch H4 → L4 (During operation of high-low transfer shift actuator motor from high to low)	Below 1.5 V or alternating between below 1.5 V and 11 to 14 V
		Engine switch on (IG) Transfer position switch L4 → H4 (During operation of high-low transfer shift actuator motor from low to high)	11 to 14 V
A28-3 (IG) - A28-4 (GND)	IG power	Engine switch on (IG)	11 to 14 V
A28-4 (GND) - Body ground	Ground	Always	Below 1 Ω
A28-5 (M2) - A28-4 (GND)*2	Differential lock shift actuator motor	Engine switch on (IG) Transfer in low position Center differential in lock position Differential lock switch OFF → RR (During operation of differential lock shift actuator motor from free to lock)	Below 1.5 V
		Engine switch on (IG) Transfer in low position Center differential in lock position Differential lock switch RR → OFF or transfer position switch L4 → H4 (During operation of differential lock shift actuator motor from lock to free)	11 to 14 V
A28-6 (HM2) - A28-4 (GND)	High-low transfer shift actuator motor	Engine switch on (IG) Transfer position switch H4 → L4 (During operation of high-low transfer shift actuator motor from high to low)	11 to 14 V
		Engine switch on (IG) Transfer position switch L4 → H4 (During operation of high-low transfer shift actuator motor from low to high)	Below 1.5 V or alternating between below 1.5 V and 11 to 14 V
A28-7 (TM2) - A28-4 (GND)	Center differential lock actuator motor	Engine switch on (IG) Center differential position free → lock	Below 1.5 V or alternating between below 1.5 V and 11 to 14 V
		Engine switch on (IG)	

		Center differential position lock → free	11 to 14 V
A28-8 (TM1) - A28-4 (GND)	Center differential lock actuator motor	Engine switch on (IG) Center differential position free → lock	11 to 14 V
		Engine switch on (IG) Center differential position lock → free	Below 1.5 V or alternating between below 1.5 V and 11 to 14 V

If there is a malfunction, inspect the harnesses, connectors, transfer position switch, center differential lock switch, and transfer shift actuator assembly. If these are normal, replace the four wheel drive control ECU (Click here).

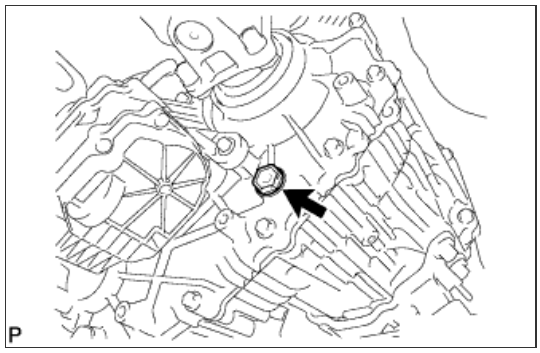
HINT:

- ***1: w/ Temperature Sensor**
- ***2: w/ Rear Differential Lock**
- ***3: for Manual Transmission**

for Preparation Click here

1. CHECK TRANSFER OIL

a. Remove the filler plug and gasket.



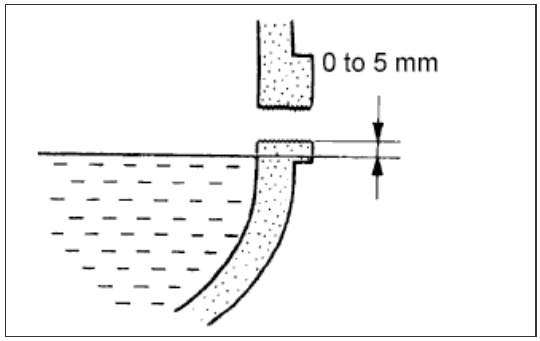
b. Check that the oil level is between 0 to 5.0 mm (0 to 0.197 in.) from the bottom lip of the filler plug hole.
If the result is not as specified, add transfer oil.

Viscosity:
SAE 75W

Standard Capacity:
1.4 to 1.5 liters (1.5 to 1.6 US qts, 1.2 to 1.3 Imp. qts)

NOTICE:

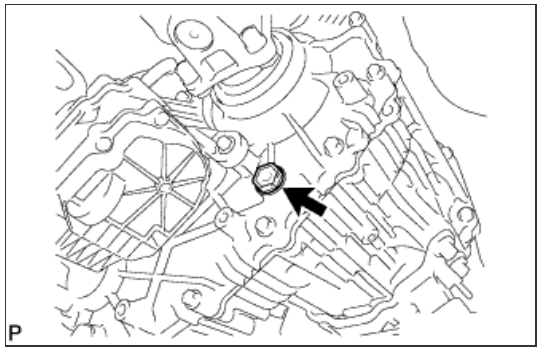
Too much or too little oil will lead to transfer problems.



c. When the oil level is too low, check for oil leaks.

d. Install a new gasket onto the filler plug and then tighten the plug.

Torque:
37 N*m{ 377 kgf*cm , 27 ft.*lbf }



2. ADD TRANSFER OIL

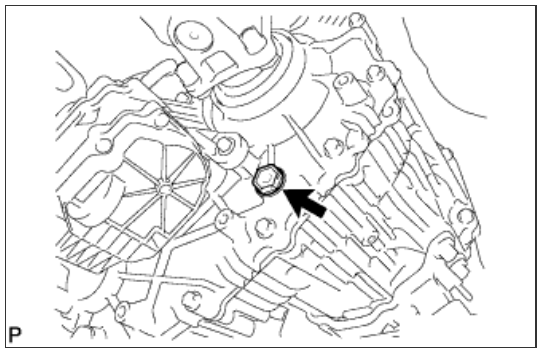
a. Remove the filler plug and gasket.

b. Add oil so that the oil level is between 0 to 5.0 mm (0 to 0.197 in.) from the bottom lip of the filler plug hole.

NOTICE:

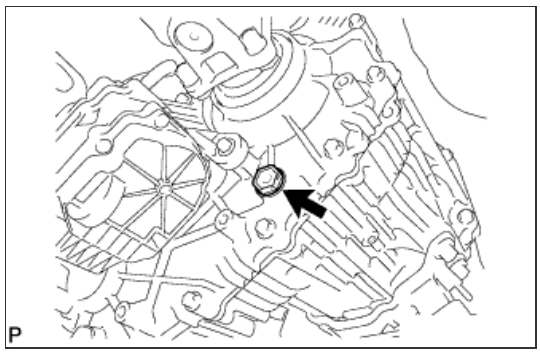
- **Add oil slowly.**
- **Add oil a little at a time, waiting several minutes between each addition of oil.**

c. Wait approximately 5 minutes and check that the oil level has not changed.



d. Install a new gasket onto the filler plug and then tighten the plug.

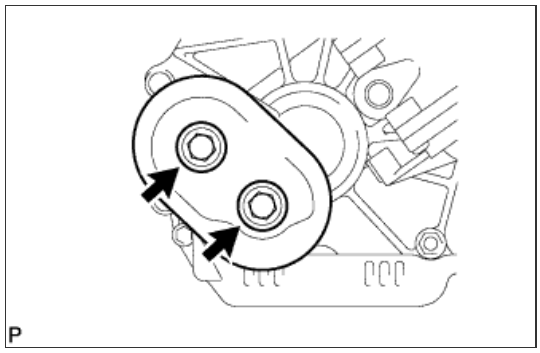
Torque:
37 N*m{ 377 kgf*cm , 27 ft.*lbf }



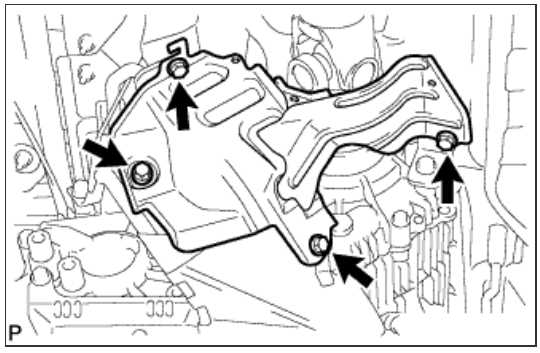
for Preparation Click here

1. DRAIN TRANSFER OIL

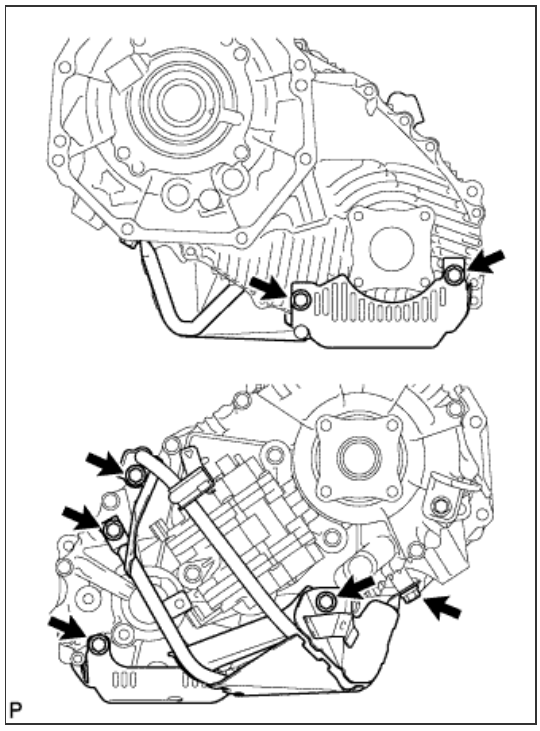
a. except 1GR-FE:
Remove the 2 bolts and transfer dynamic damper.



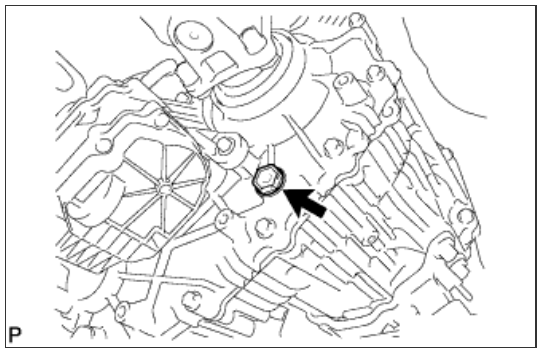
b. Remove the 4 bolts and transfer heat insulator.



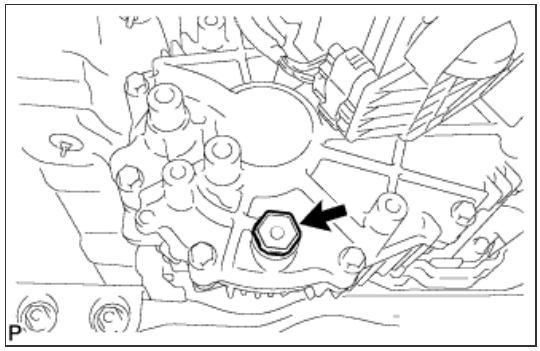
c. Remove the 7 bolts and lower transfer case protector.



d. Remove the filler plug and gasket.



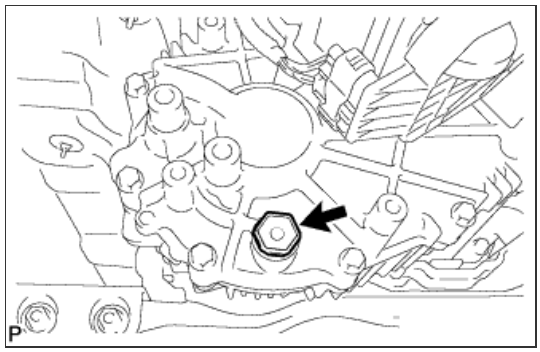
e. Remove the drain plug and gasket, and drain the transfer oil.



2. ADD TRANSFER OIL

a. Install a new gasket onto the drain plug and then install the plug.

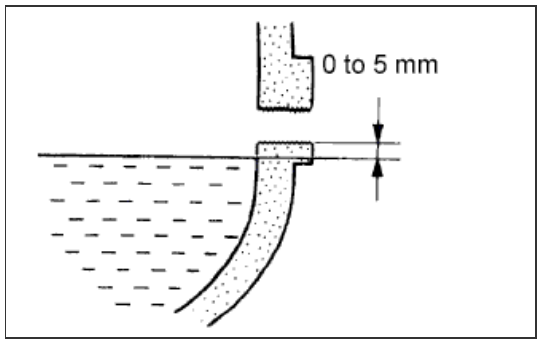
Torque:
37 N*m{ 377 kgf*cm , 27 ft.*lbf }



b. Add oil so that the oil level is between 0 to 5.0 mm (0 to 0.197 in.) from the bottom lip of the filler plug hole.

NOTICE:

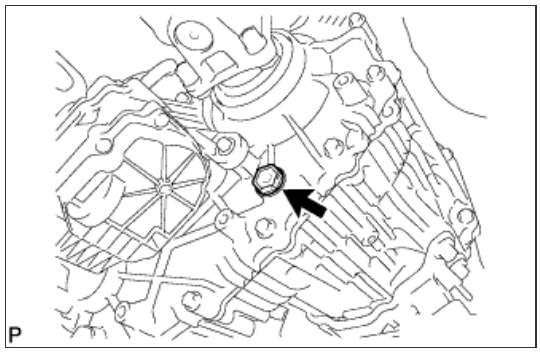
- **Add oil slowly.**
- **Add oil a little at a time, waiting several minutes between each addition of oil.**



c. Wait approximately 5 minutes and check that the oil level has not changed.

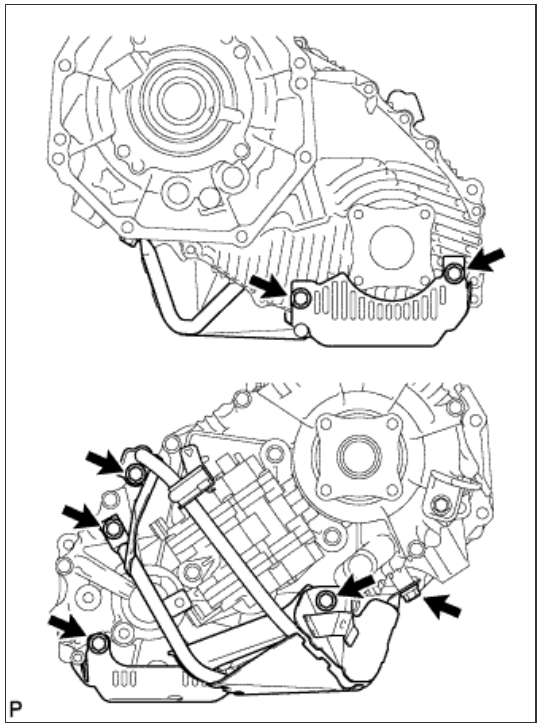
d. Install a new gasket onto the filler plug and then install the plug.

Torque:
37 N*m{ 377 kgf*cm , 27 ft.*lbf }



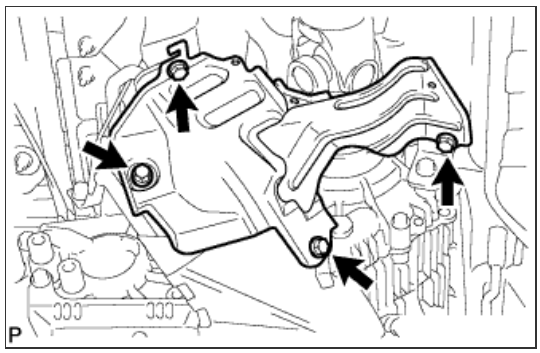
e. Install the lower transfer case protector with the 7 bolts.

Torque:
14 N*m{ 139 kgf*cm , 10 ft.*lbf }



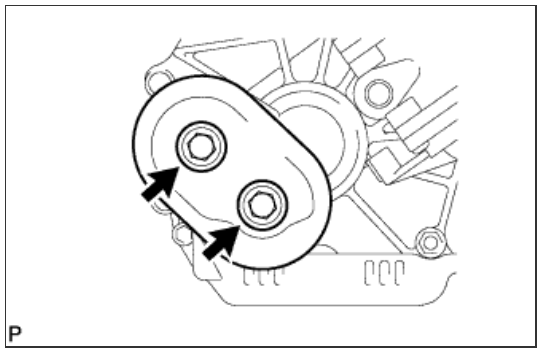
f. Install the transfer heat insulator with the 4 bolts.

Torque:
30 N*m{ 306 kgf*cm , 22 ft.*lbf }

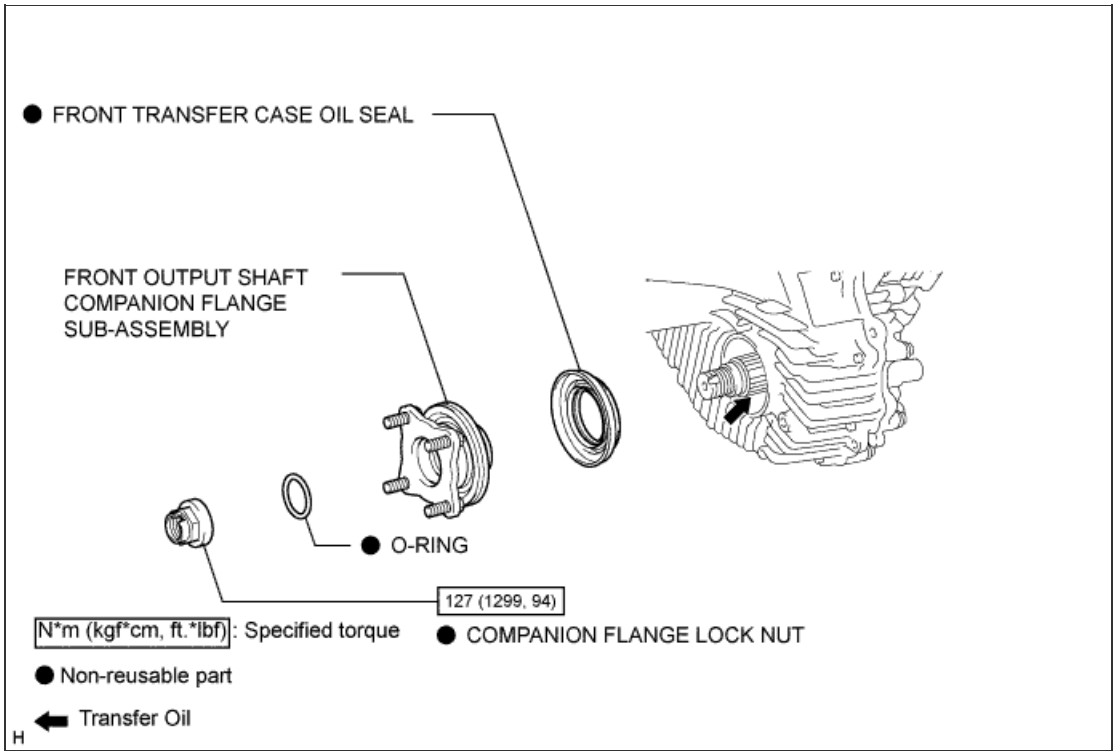


g. except 1GR-FE:
Install the transfer dynamic damper with the 2 bolts.

Torque:
12 N*m{ 122 kgf*cm , 9 ft.*lbf }



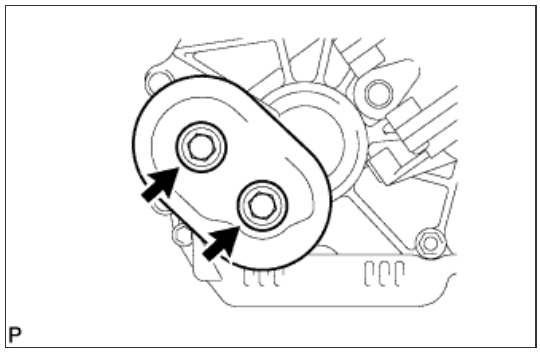
for Preparation Click here



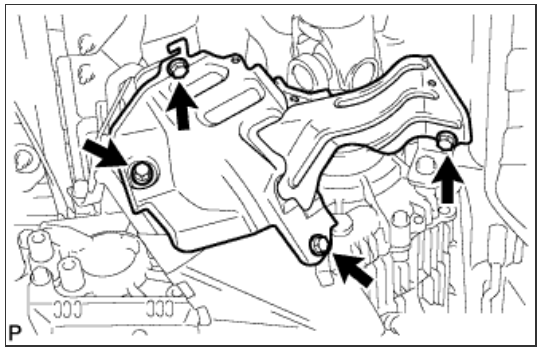
for Preparation Click here

1. DRAIN TRANSFER OIL

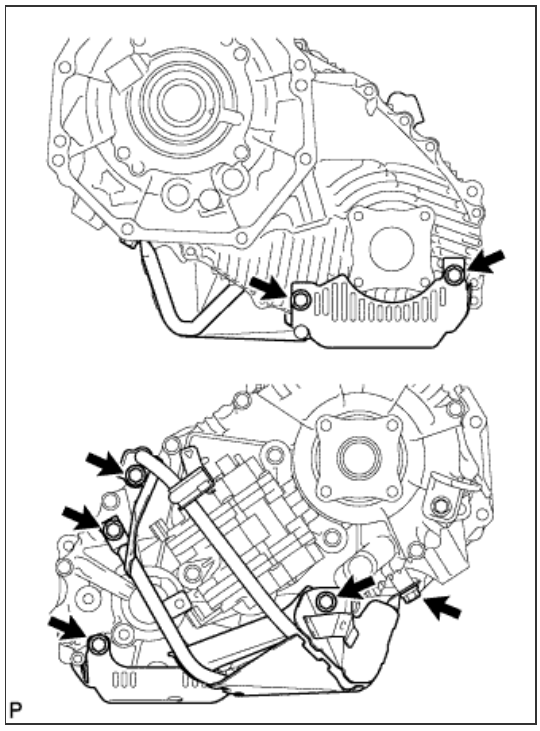
a. except 1GR-FE:
Remove the 2 bolts and transfer dynamic damper.



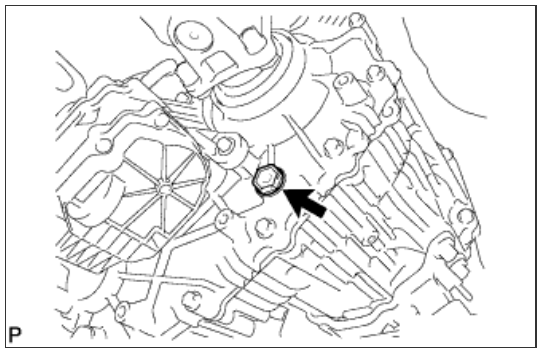
b. Remove the 4 bolts and transfer heat insulator.



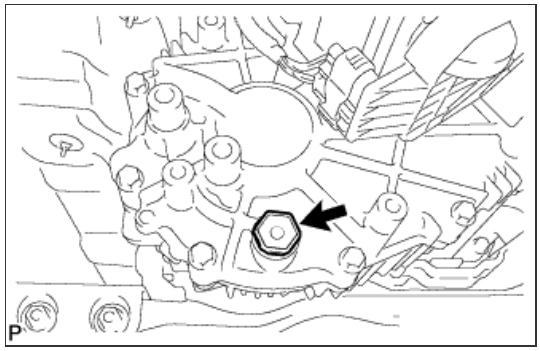
c. Remove the 7 bolts and lower transfer case protector.



d. Remove the filler plug and gasket.



e. Remove the drain plug and gasket, and drain the transfer oil.



2. REMOVE FRONT PROPELLER SHAFT ASSEMBLY

(Click here)

3. REMOVE FRONT OUTPUT SHAFT COMPANION FLANGE SUB-ASSEMBLY

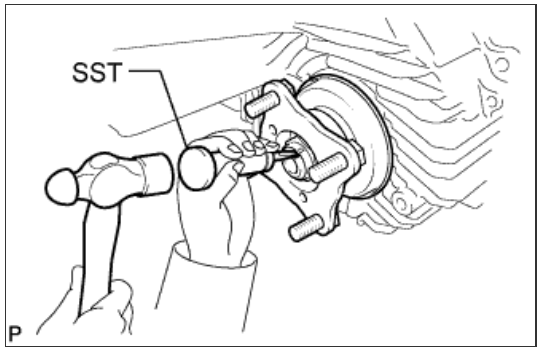
a. Using SST and a hammer, release the staked part of the nut.

SST

09930-00010 (09931-00010, 09931-00020)

NOTICE:

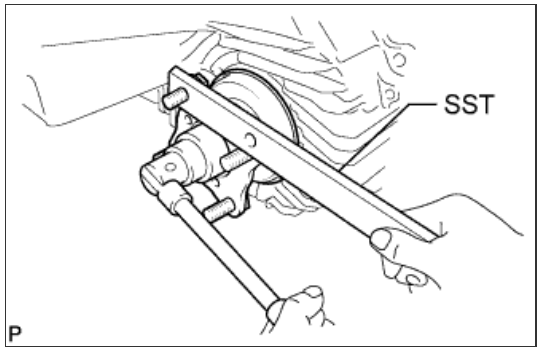
- **Be sure to use SST with the tapered surface facing the shaft.**
- **Do not grind the tip of SST with a grinder, etc.**
- **Completely loosen the staked part of the nut when removing it.**
- **Do not damage the threads of the transfer driven sprocket.**



b. Using SST to hold the companion flange, remove the lock nut.

SST

09330-00021

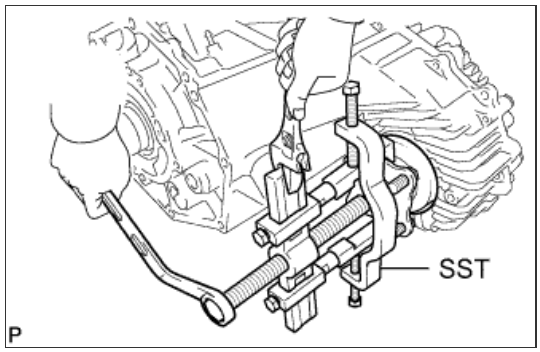


c. Using SST, remove the companion flange.

SST

09950-40011 (09951-04020, 09952-04010, 09953-04030, 09954-04010, 09955-04051, 09957-04010, 09958-04011)

d. Remove the O-ring from the companion flange.



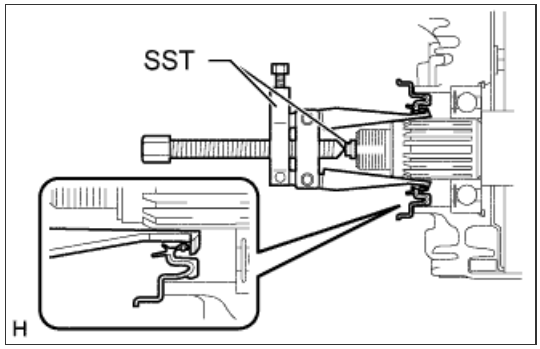
4. REMOVE FRONT TRANSFER CASE OIL SEAL

a. Using SST, remove the front transfer case oil seal.

SST
09308-10010
09950-40011 (09957-04010)

NOTICE:

- **Be careful not to damage the front transfer case oil seal and front transfer case contact surface.**
- **Apply grease to the tip of SST center bolt before use.**



5. INSTALL FRONT TRANSFER CASE OIL SEAL

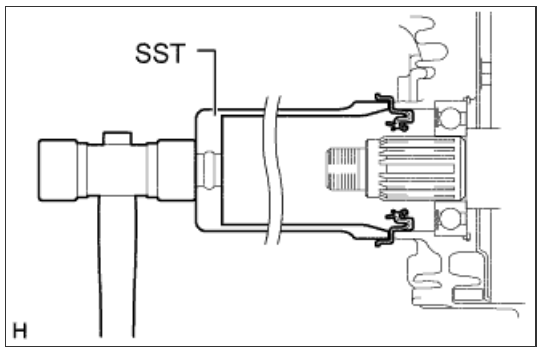
a. Apply transfer oil to the spline of the driven sprocket.

b. Using SST and a hammer, tap in a new front transfer case oil seal.

SST
09613-26010

NOTICE:

The front transfer case oil seal should be installed completely.



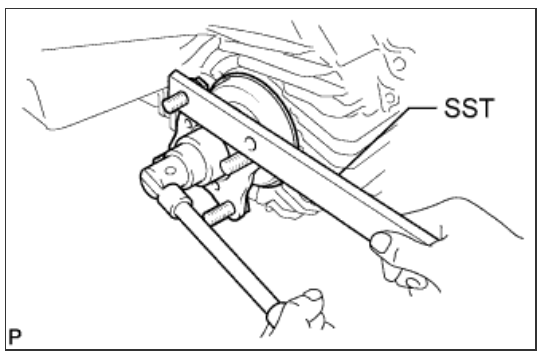
6. INSTALL FRONT OUTPUT SHAFT COMPANION FLANGE SUB-ASSEMBLY

a. Install the companion flange onto the drive sprocket.

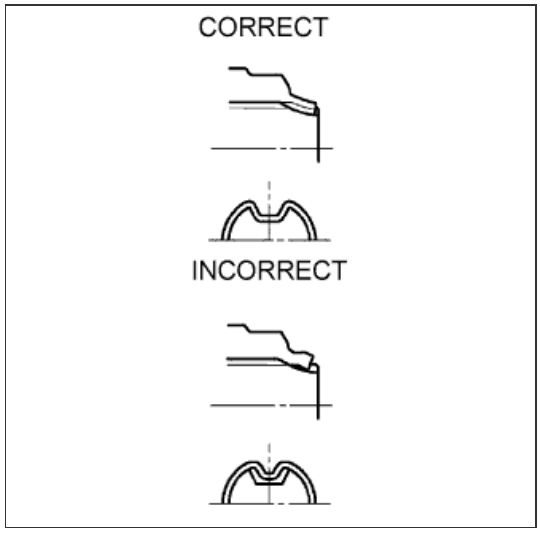
b. Using SST to hold the companion flange, install a new O-ring and a new companion flange lock nut.

SST
09330-00021

Torque:
127 N*m{ 1299 kgf*cm , 94 ft.*lbf }



c. Using a chisel and hammer, stake the companion flange lock nut.



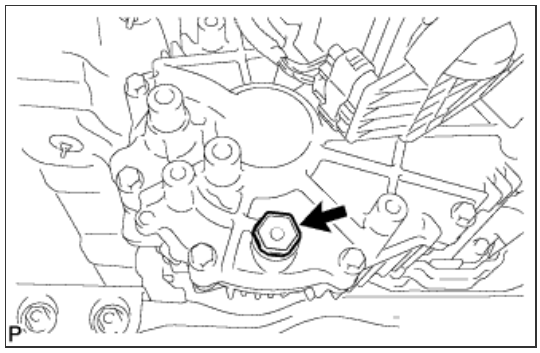
7. INSTALL FRONT PROPELLER SHAFT ASSEMBLY

(Click here)

8. ADD TRANSFER OIL

a. Install a new gasket onto the drain plug and then install the plug.

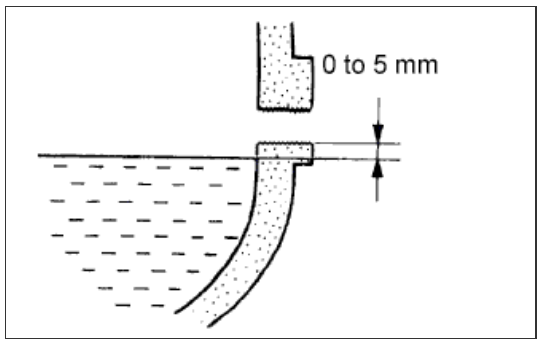
Torque:
37 N*m{ 377 kgf*cm , 27 ft.*lbf }



b. Add oil so that the oil level is between 0 to 5.0 mm (0 to 0.197 in.) from the bottom lip of the filler plug hole.

NOTICE:

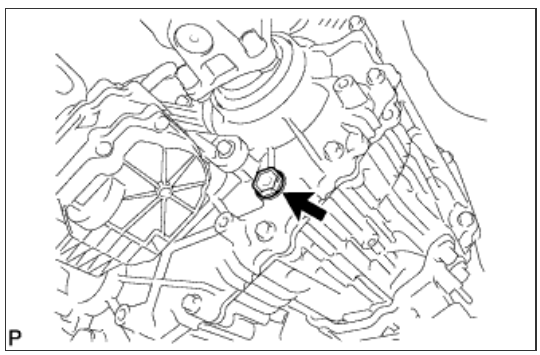
- **Add oil slowly.**
- **Add oil a little at a time, waiting several minutes between each addition of oil.**



c. Wait approximately 5 minutes and check that the oil level has not changed.

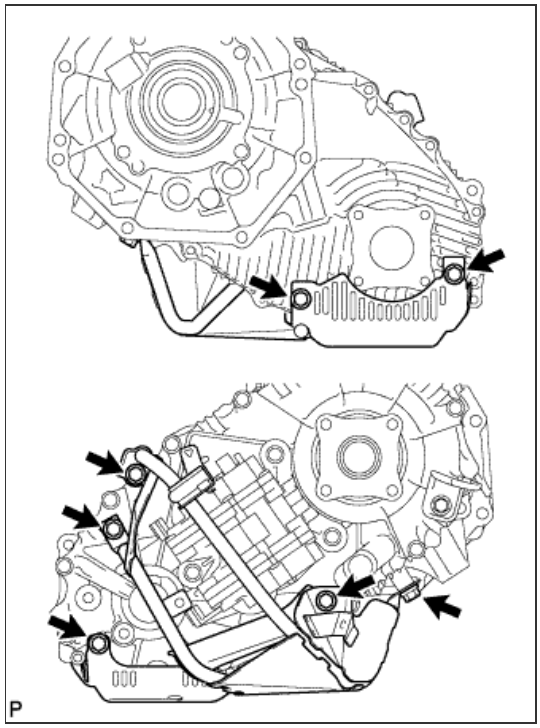
d. Install a new gasket onto the filler plug and then install the plug.

Torque:
37 N*m{ 377 kgf*cm , 27 ft.*lbf }



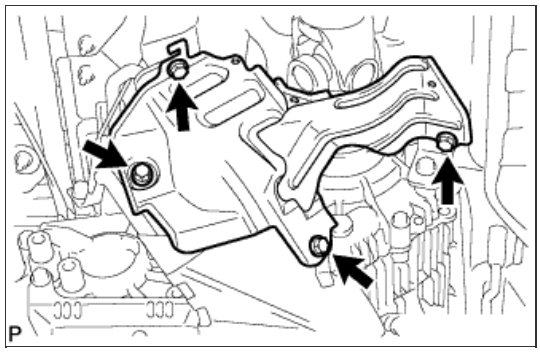
e. Install the lower transfer case protector with the 7 bolts.

Torque:
14 N*m{ 139 kgf*cm , 10 ft.*lbf }



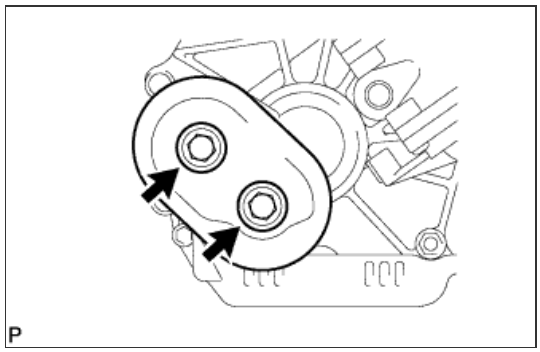
f. Install the transfer heat insulator with the 4 bolts.

Torque:
30 N*m{ 306 kgf*cm , 22 ft.*lbf }



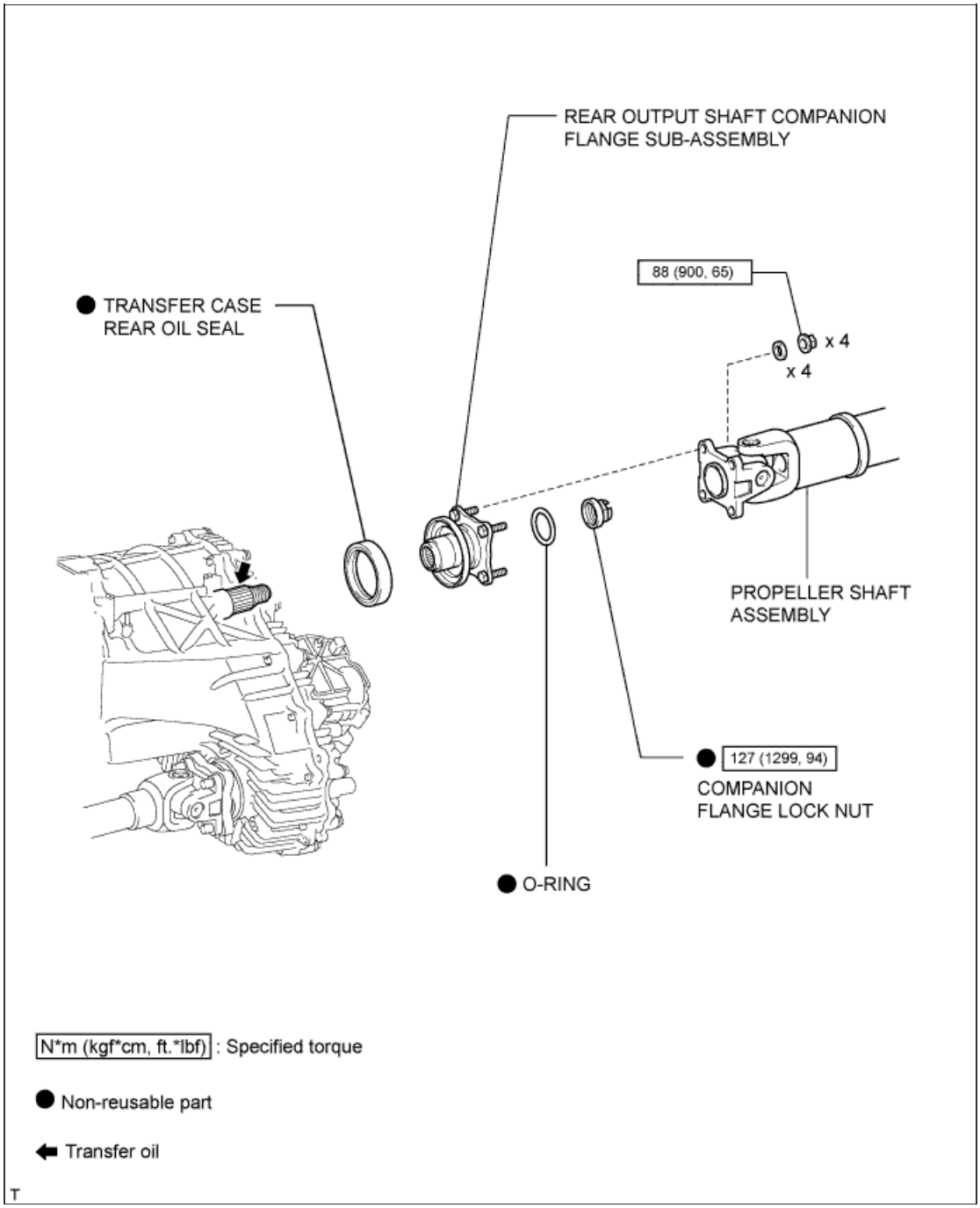
g. except 1GR-FE:
Install the transfer dynamic damper with the 2 bolts.

Torque:
12 N*m{ 122 kgf*cm , 9 ft.*lbf }



9. CHECK FOR TRANSFER OIL LEAK

for Preparation Click here



for Preparation Click here

1. REMOVE PROPELLER SHAFT ASSEMBLY

(Click here)

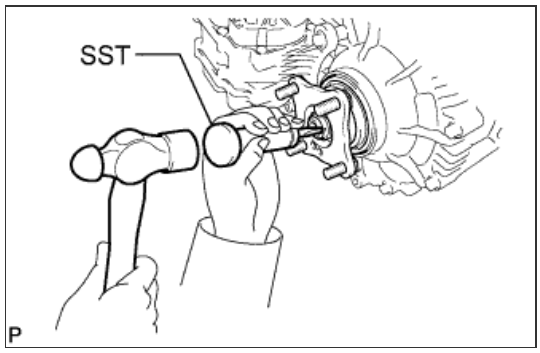
2. REMOVE REAR OUTPUT SHAFT COMPANION FLANGE SUB-ASSEMBLY

a. Using SST and a hammer, release the staked part of the nut.

SST
09930-00010 (09931-00010, 09931-00020)

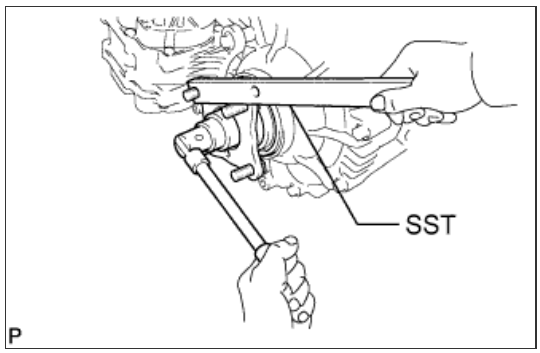
NOTICE:

- **Be sure to use SST with the tapered surface facing the shaft.**
- **Do not grind the tip of SST with a grinder, etc.**
- **Completely loosen the staked part of the nut when removing it.**
- **Do not damage the threads of the rear transfer output shaft.**



b. Using SST to hold the companion flange, remove the lock nut.

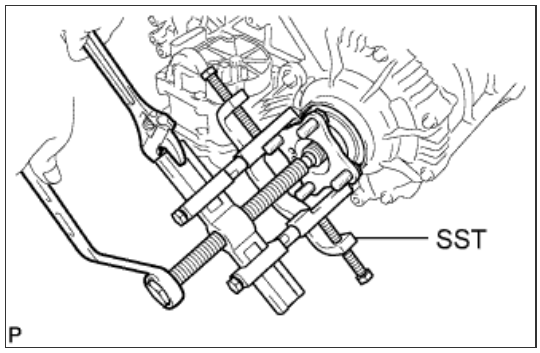
SST
09330-00021



c. Using SST, remove the companion flange.

SST
09950-40011 (09951-04020, 09952-04010, 09953-04030, 09954-04010, 09955-04051, 09957-04010, 09958-04011)

d. Remove the O-ring from the companion flange.



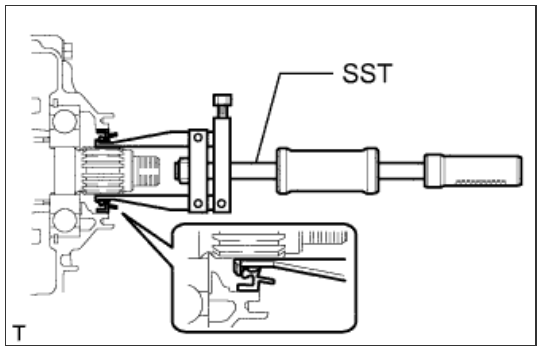
3. REMOVE TRANSFER CASE REAR OIL SEAL

a. Using SST, tap out the oil seal.

SST
09308-00010

NOTICE:

Be careful not to damage the oil seal and rear transfer case contact surface.

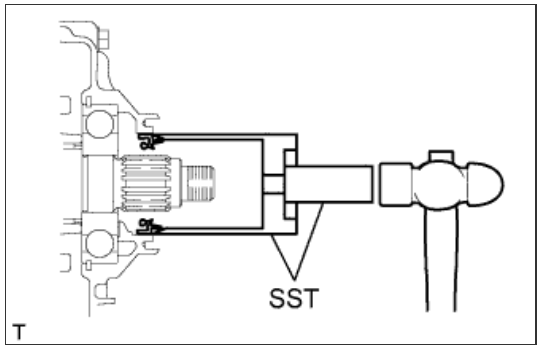


4. INSTALL TRANSFER CASE REAR OIL SEAL

a. Apply transfer oil to the spline of the output shaft.

b. Using SST and a hammer, tap in a new oil seal until its surface is flush with the housing upper surface.

SST
09649-17010
09950-70010 (09951-07150)



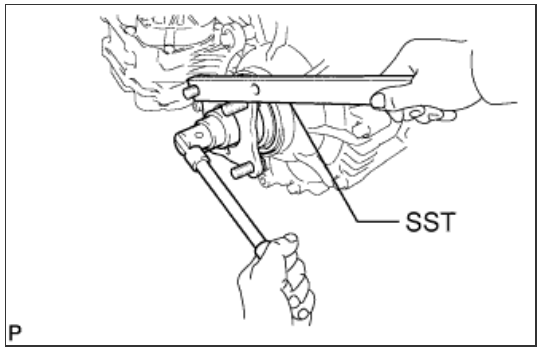
5. INSTALL REAR OUTPUT SHAFT COMPANION FLANGE SUB-ASSEMBLY

a. Install the companion flange onto the output shaft.

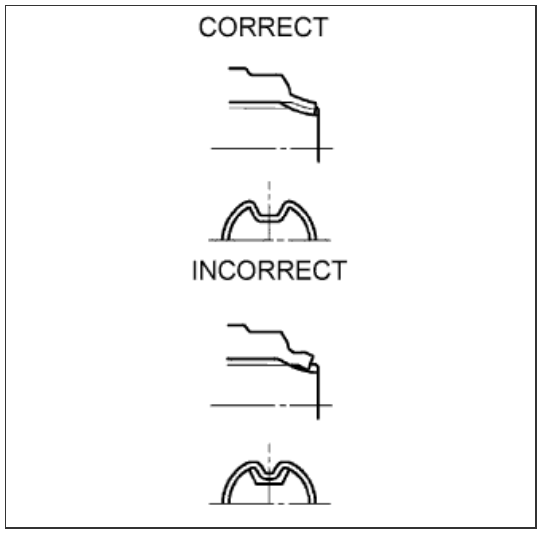
b. Using SST to hold the companion flange, install a new O-ring and a new companion flange lock nut.

SST
09330-00021

Torque:
127 N*m{ 1299 kgf*cm , 94 ft.*lbf }



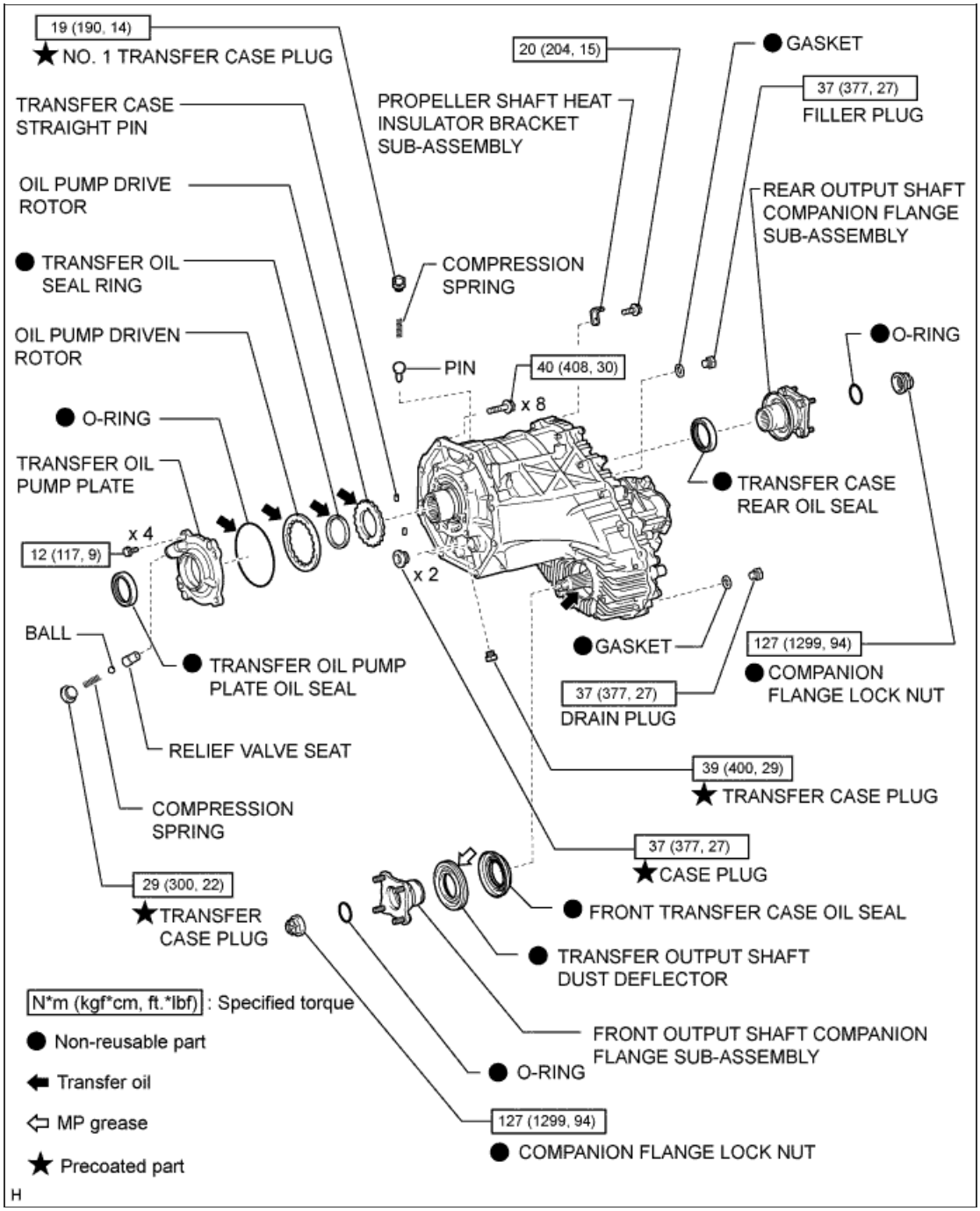
c. Using a chisel and hammer, stake the companion flange lock nut.

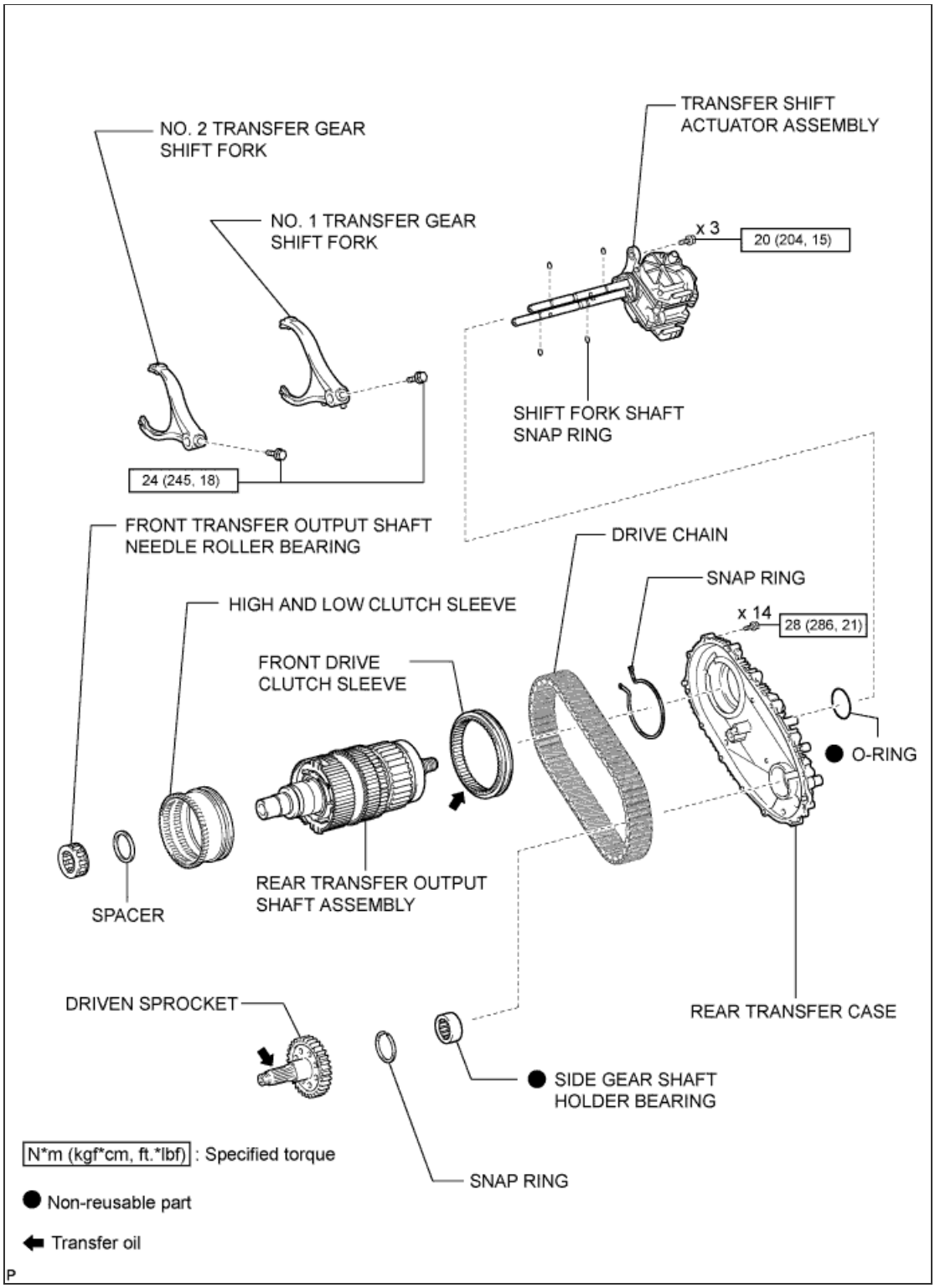


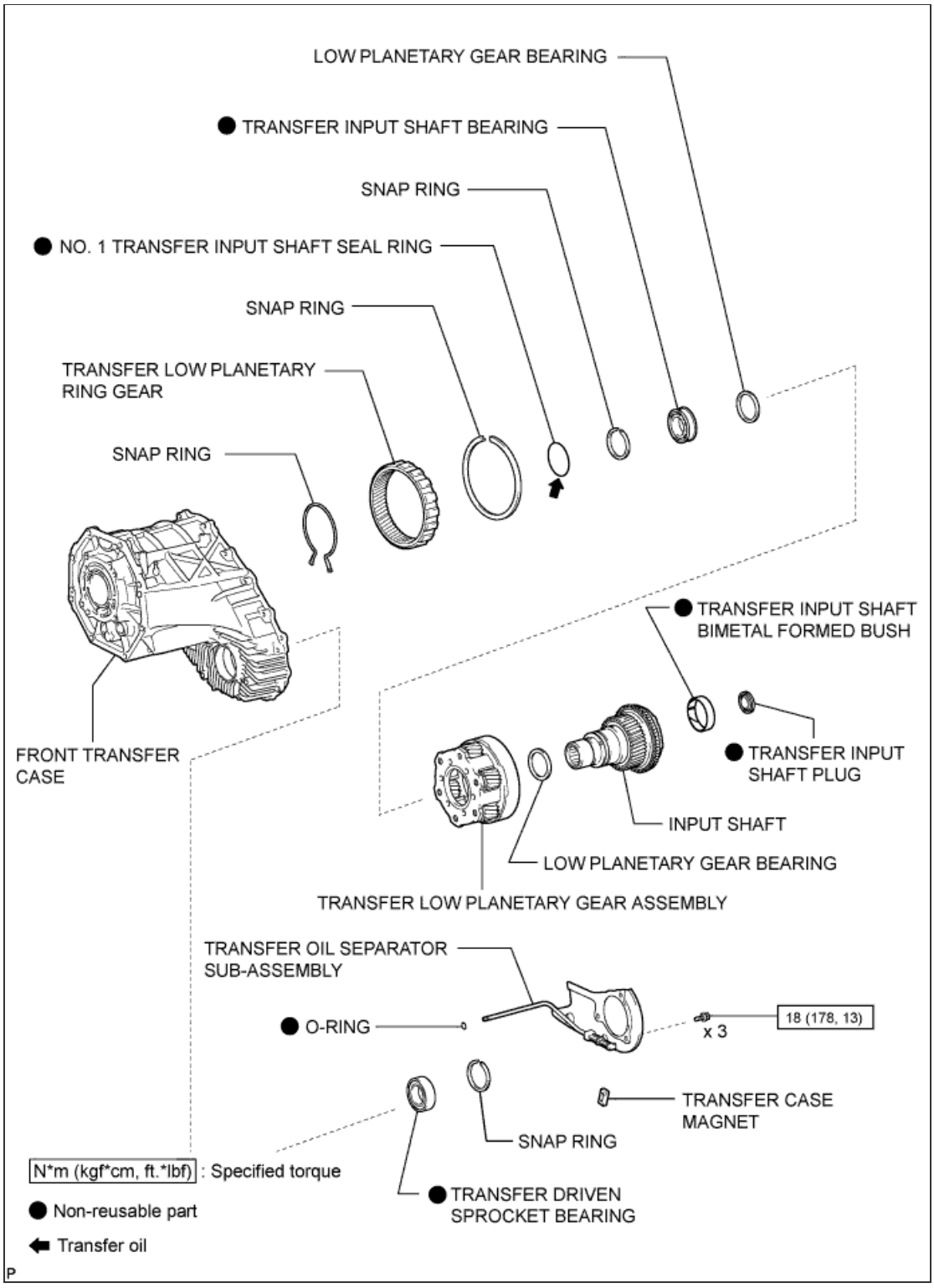
6. INSTALL PROPELLER SHAFT ASSEMBLY

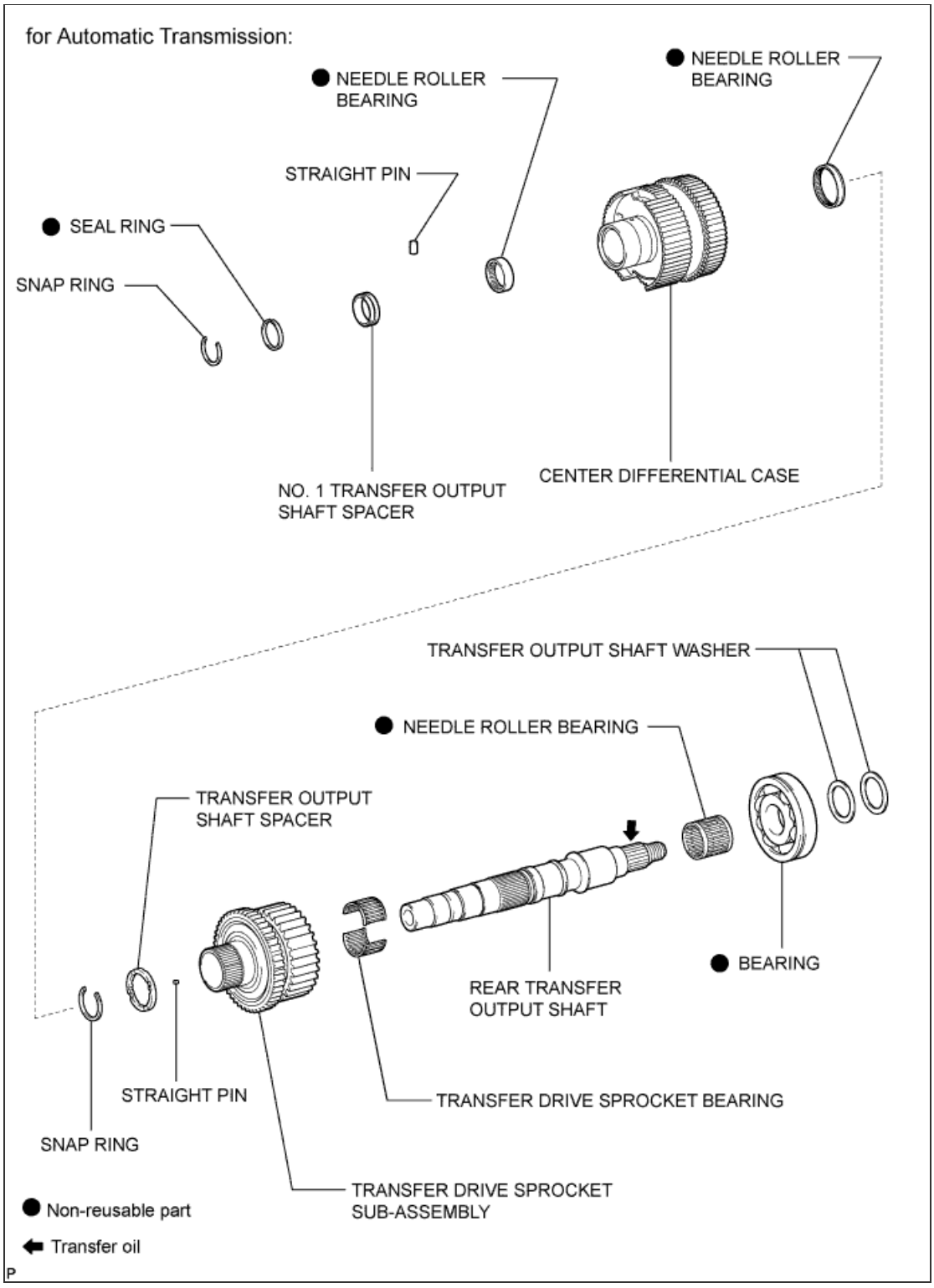
(Click here)

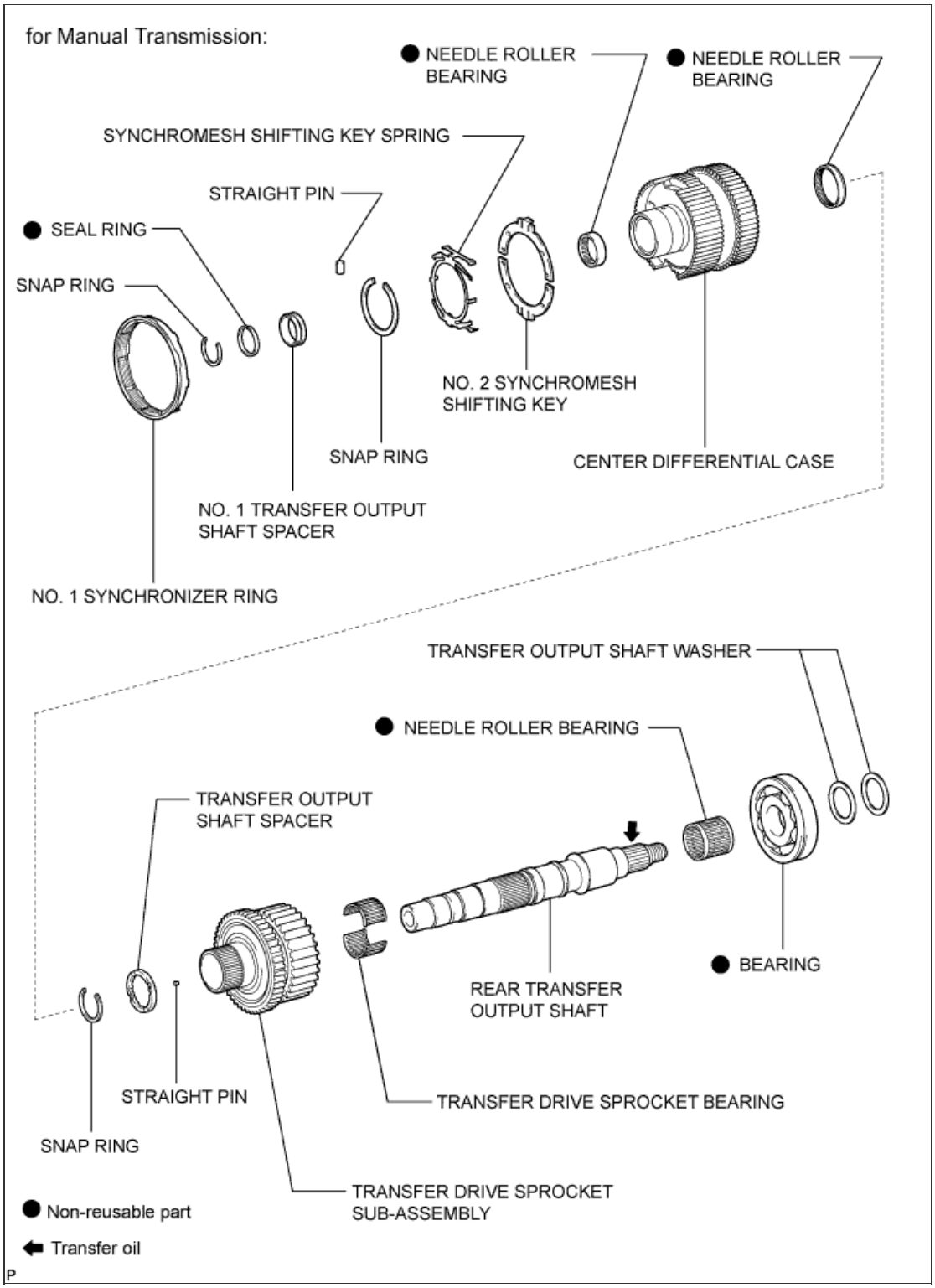
for Preparation [Click here]




NO. 2 TRANSFER GEAR SHIFT FORK
NO. 1 TRANSFER GEAR SHIFT FORK
TRANSFER SHIFT ACTUATOR ASSEMBLY
x 3
20 (204, 15)
SHIFT FORK SHAFT SNAP RING
24 (245, 18)
FRONT TRANSFER OUTPUT SHAFT NEEDLE ROLLER BEARING
DRIVE CHAIN
SNAP RING
HIGH AND LOW CLUTCH SLEEVE
x 14
28 (286, 21)
FRONT DRIVE CLUTCH SLEEVE
O-RING
SPACER
REAR TRANSFER OUTPUT SHAFT ASSEMBLY
DRIVEN SPROCKET
REAR TRANSFER CASE
SIDE GEAR SHAFT HOLDER BEARING
SNAP RING
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
Transfer oil
P


LOW PLANETARY GEAR BEARING
● TRANSFER INPUT SHAFT BEARING
SNAP RING
● NO. 1 TRANSFER INPUT SHAFT SEAL RING
SNAP RING
TRANSFER LOW PLANETARY RING GEAR
SNAP RING
● TRANSFER INPUT SHAFT BIMETAL FORMED BUSH
● TRANSFER INPUT SHAFT PLUG
FRONT TRANSFER CASE
INPUT SHAFT
LOW PLANETARY GEAR BEARING
TRANSFER LOW PLANETARY GEAR ASSEMBLY
TRANSFER OIL SEPARATOR SUB-ASSEMBLY
● O-RING
x 3
18 (178, 13)
TRANSFER CASE MAGNET
SNAP RING
● TRANSFER DRIVEN SPROCKET BEARING
N*m (kgf*cm, ft.*lbf) : Specified torque
● Non-reusable part
Transfer oil
P

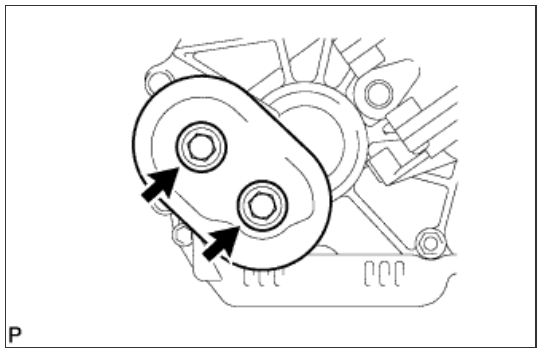

for Automatic Transmission:
NEEDLE ROLLER BEARING
NEEDLE ROLLER BEARING
STRAIGHT PIN
SEAL RING
SNAP RING
NO. 1 TRANSFER OUTPUT SHAFT SPACER
CENTER DIFFERENTIAL CASE
TRANSFER OUTPUT SHAFT WASHER
NEEDLE ROLLER BEARING
TRANSFER OUTPUT SHAFT SPACER
REAR TRANSFER OUTPUT SHAFT
BEARING
STRAIGHT PIN
TRANSFER DRIVE SPROCKET BEARING
SNAP RING
TRANSFER DRIVE SPROCKET SUB-ASSEMBLY
Non-reusable part
Transfer oil
P


for Manual Transmission:
NEEDLE ROLLER BEARING
NEEDLE ROLLER BEARING
SYNCHROMESH SHIFTING KEY SPRING
STRAIGHT PIN
SEAL RING
SNAP RING
NO. 2 SYNCHROMESH SHIFTING KEY
SNAP RING
CENTER DIFFERENTIAL CASE
NO. 1 TRANSFER OUTPUT SHAFT SPACER
NO. 1 SYNCHRONIZER RING
TRANSFER OUTPUT SHAFT WASHER
NEEDLE ROLLER BEARING
TRANSFER OUTPUT SHAFT SPACER
BEARING
REAR TRANSFER OUTPUT SHAFT
STRAIGHT PIN
TRANSFER DRIVE SPROCKET BEARING
SNAP RING
TRANSFER DRIVE SPROCKET SUB-ASSEMBLY
Non-reusable part
Transfer oil
P

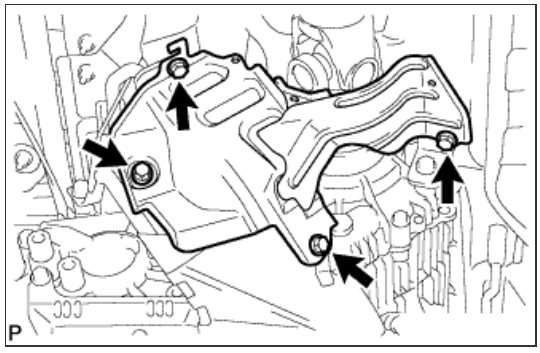
for Preparation Click here

1. DRAIN TRANSFER OIL

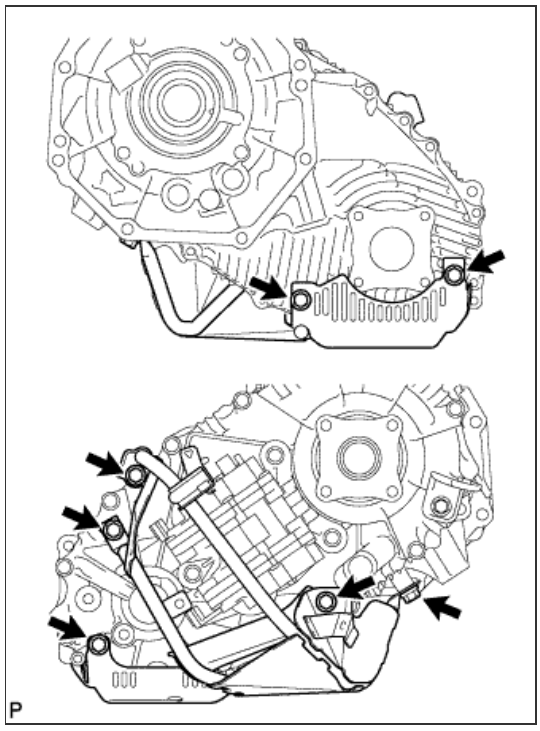
a. except 1GR-FE:
Remove the 2 bolts and transfer dynamic damper.



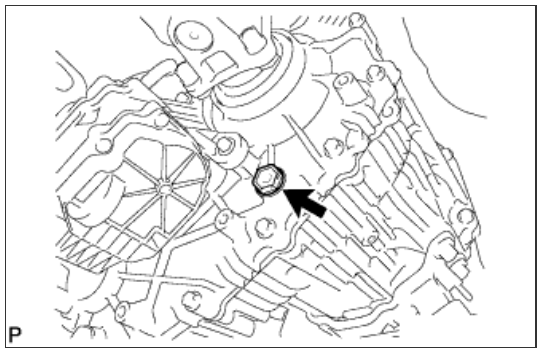
b. Remove the 4 bolts and transfer heat insulator.



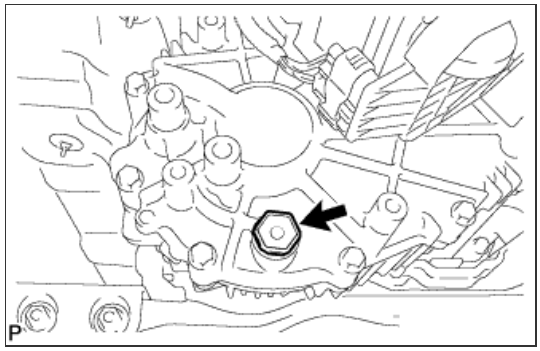
c. Remove the 7 bolts and lower transfer case protector.



d. Remove the filler plug and gasket.



e. Remove the drain plug and gasket, and drain the transfer oil.



2. REMOVE AUTOMATIC TRANSMISSION WITH TRANSFER ASSEMBLY (for A750F)

(Click here)

3. REMOVE AUTOMATIC TRANSMISSION WITH TRANSFER ASSEMBLY (for AB60F)

a. for 1VD-FTV:
(Click here)

b. for 1UR-FE:
(Click here)

c. for 3UR-FE:
(Click here)

4. REMOVE MANUAL TRANSMISSION WITH TRANSFER ASSEMBLY (for H150F)

(Click here)

5. REMOVE TRANSFER ASSEMBLY

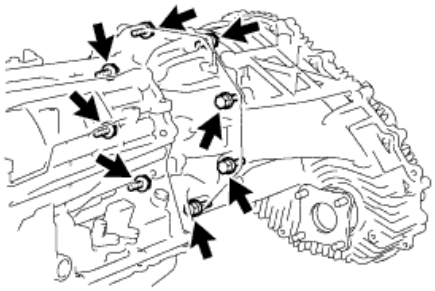
a. Remove the 8 transfer adaptor rear mounting bolts.

b. Pull the transfer straight up and remove it from the transmission.

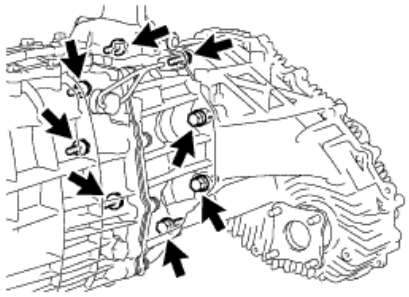
NOTICE:

Take care not to damage the adaptor oil seal with the transfer input shaft spline.

for A750F, AB60F:



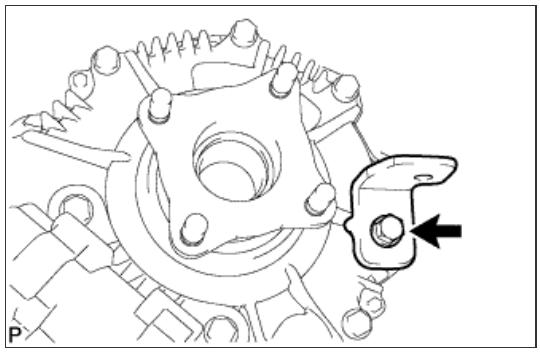
for H150F:



for Preparation Click here

1. REMOVE PROPELLER SHAFT HEAT INSULATOR BRACKET SUB-ASSEMBLY

a. Remove the bolt and bracket.



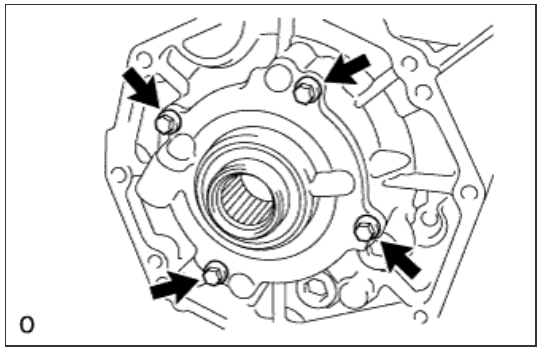
2. REMOVE TRANSFER OIL PUMP PLATE

a. Remove the 4 bolts, oil pump plate and oil pump driven rotor.

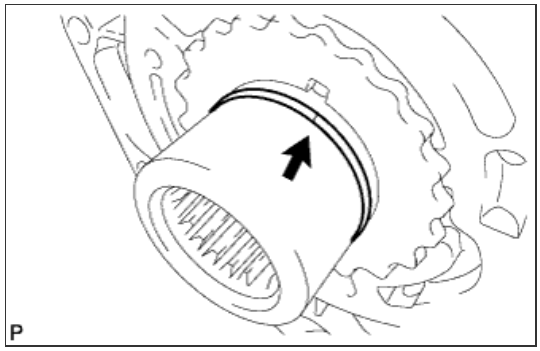
NOTICE:

Do not drop the oil pump driven rotor.

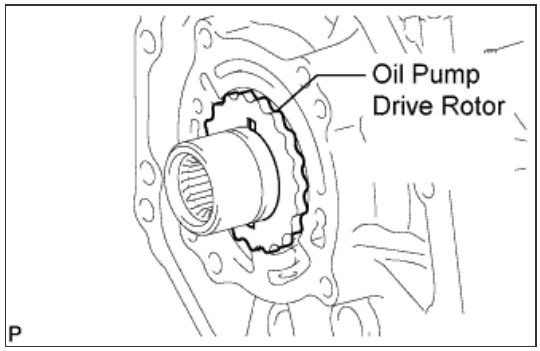
b. Remove the O-ring from the oil pump plate.



c. Remove the transfer oil seal ring from the input shaft.



d. Remove the oil pump drive rotor from the input shaft.

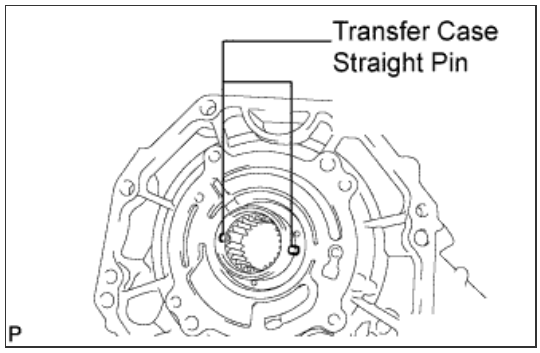


3. REMOVE TRANSFER CASE STRAIGHT PIN

a. Remove the 2 straight pins.

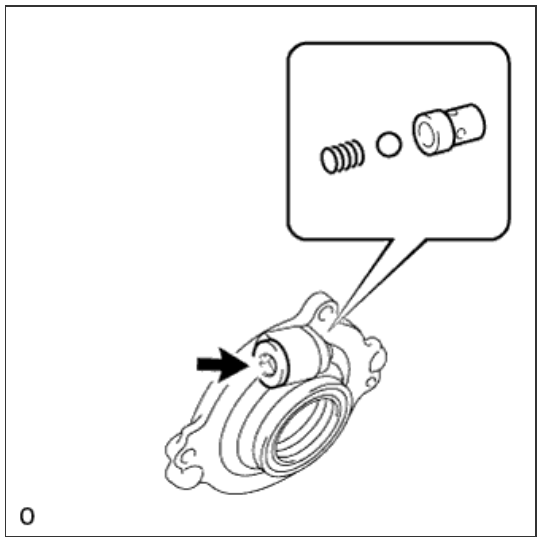
NOTICE:

Do not drop the straight pins.



4. REMOVE TRANSFER CASE PLUG

a. Using a 10 mm hexagon wrench, remove the case plug, compression spring, ball and relief valve seat.



5. REMOVE TRANSFER OIL PUMP PLATE OIL SEAL

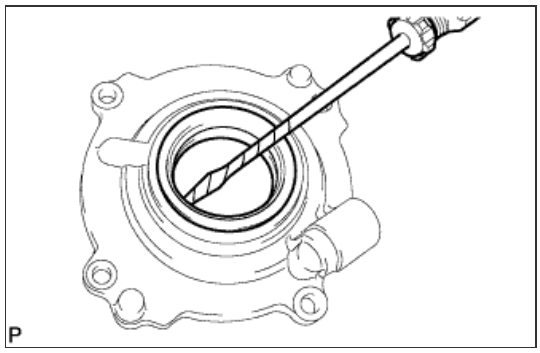
a. Using a screwdriver, pry out the oil seal from the oil pump plate.

NOTICE:

Be careful not to damage the oil seal and oil pump plate contact surfaces.

HINT:

Tape the screwdriver tip before use.



6. REMOVE FRONT OUTPUT SHAFT COMPANION FLANGE SUB-ASSEMBLY

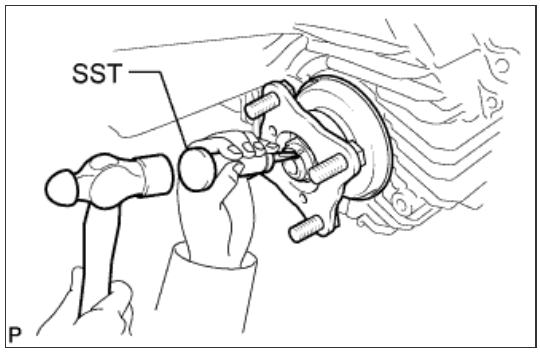
a. Using SST and a hammer, release the staked part of the nut.

SST

09930-00010 (09931-00010, 09931-00020)

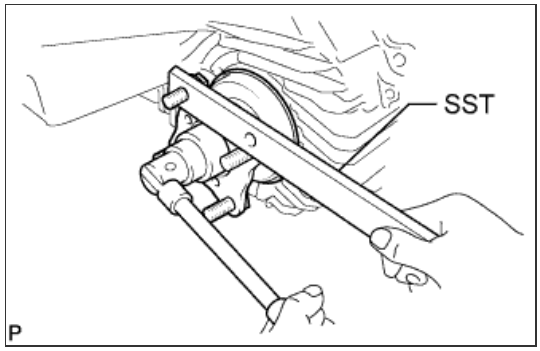
NOTICE:

- **Be sure to use SST with the tapered surface facing the shaft.**
- **Do not grind the tip of SST with a grinder, etc.**
- **Completely loosen the staked part of the nut when removing it.**
- **Do not damage the threads of the transfer driven sprocket.**



b. Using SST to hold the companion flange, remove the lock nut.

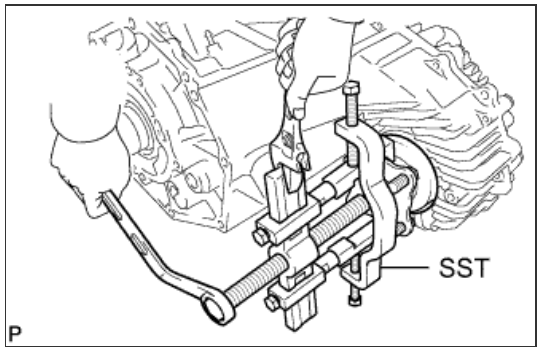
SST
09330-00021



c. Using SST, remove the companion flange.

SST
09950-40011 (09951-04020, 09952-04010, 09953-04030, 09954-04010, 09955-04051, 09957-04010, 09958-04011)

d. Remove the O-ring from the companion flange.



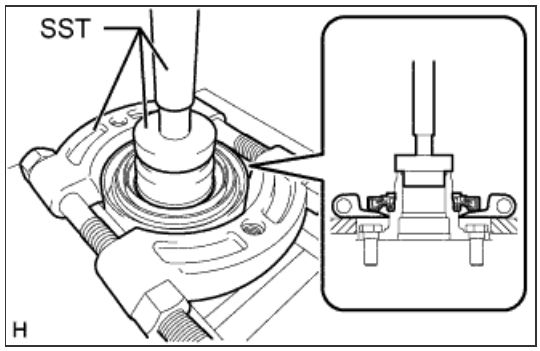
7. REMOVE TRANSFER OUTPUT SHAFT DUST DEFLECTOR

a. Using SST and a press, remove the transfer output shaft dust deflector.

SST
09950-00020
09950-60010 (09951-00340, 09951-00470, 09952-06010)
09950-70010 (09951-07100)

NOTICE:

Do not drop the front output shaft companion flange sub-assembly.



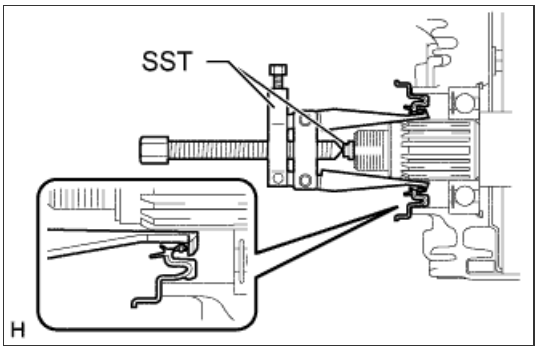
8. REMOVE TRANSFER CASE FRONT OIL SEAL

a. Using SST, remove the front transfer case oil seal.

SST
09308-10010
09950-40011 (09957-04010)

NOTICE:

- **Be careful not to damage the front transfer case oil seal and front transfer case contact surface.**
- **Apply grease to the tip of SST center bolt before use.**



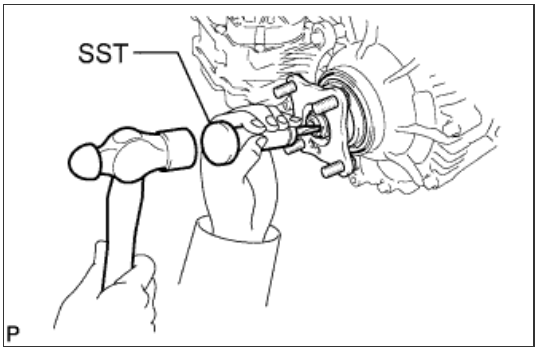
9. REMOVE REAR OUTPUT SHAFT COMPANION FLANGE SUB-ASSEMBLY

a. Using SST and a hammer, release the staked part of the nut.

SST
09930-00010 (09931-00010, 09931-00020)

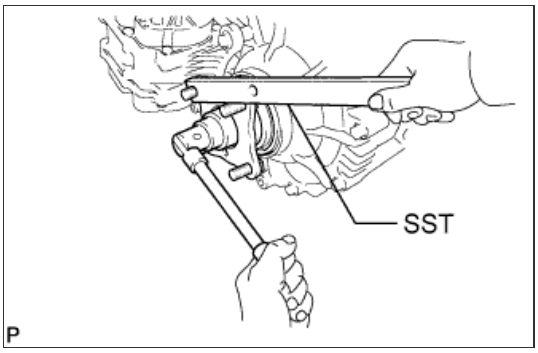
NOTICE:

- **Be sure to use SST with the tapered surface facing the shaft.**
- **Do not grind the tip of SST with a grinder, etc.**
- **Completely loosen the staked part of the nut when removing it.**
- **Do not damage the threads of the rear transfer output shaft.**



b. Using SST to hold the companion flange, remove the lock nut.

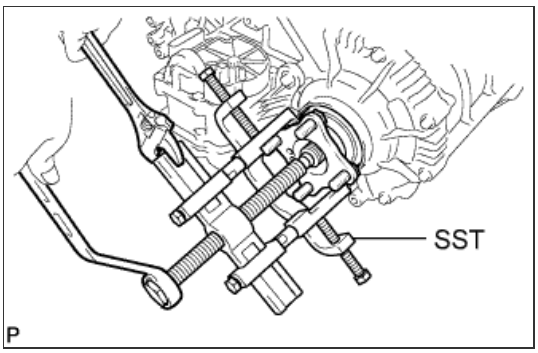
SST
09330-00021



c. Using SST, remove the companion flange.

SST
09950-40011 (09951-04020, 09952-04010, 09953-04030, 09954-04010, 09955-04051, 09957-04010, 09958-04011)

d. Remove the O-ring from the companion flange.



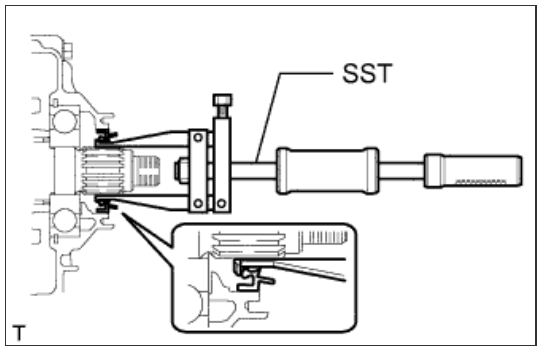
10. REMOVE TRANSFER CASE REAR OIL SEAL

a. Using SST, tap out the oil seal.

SST
09308-00010

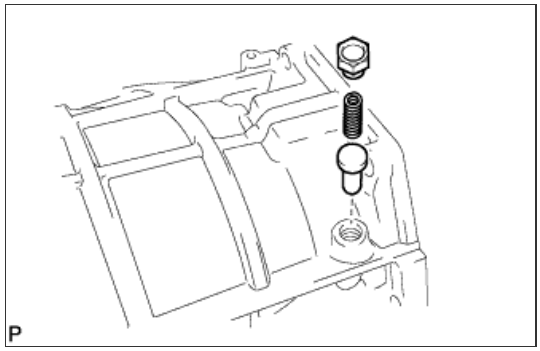
NOTICE:

Be careful not to damage the oil seal and rear transfer case contact surface.



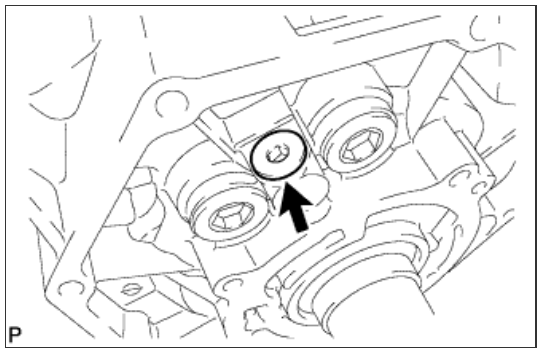
11. REMOVE NO. 1 TRANSFER CASE PLUG

a. Remove the plug, compression spring and pin.



12. REMOVE TRANSFER CASE PLUG

a. Using a 6 mm hexagon wrench, remove the plug.



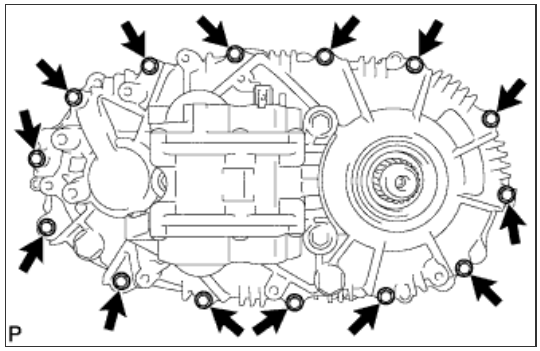
13. REMOVE REAR TRANSFER CASE ASSEMBLY

a. Remove the 14 bolts.

b. Remove the rear transfer case.

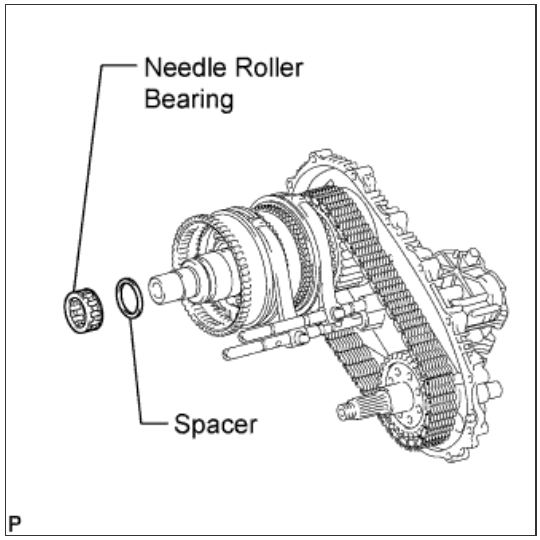
HINT:

If necessary, tap the rear transfer case with a plastic-faced hammer to remove it.



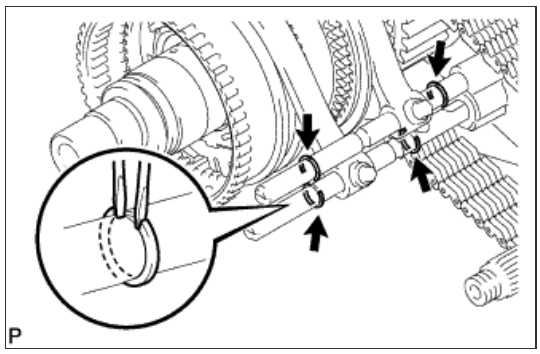
14. REMOVE FRONT TRANSFER OUTPUT SHAFT NEEDLE ROLLER BEARING

a. Remove the needle roller bearing and spacer from the output shaft.

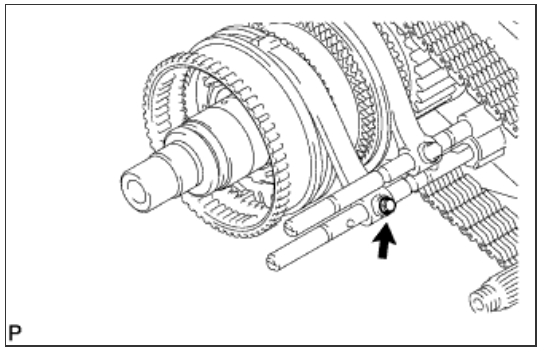


15. REMOVE NO. 2 TRANSFER GEAR SHIFT FORK

a. Using 2 screwdrivers and a hammer, tap out the 4 shift fork shaft snap rings.

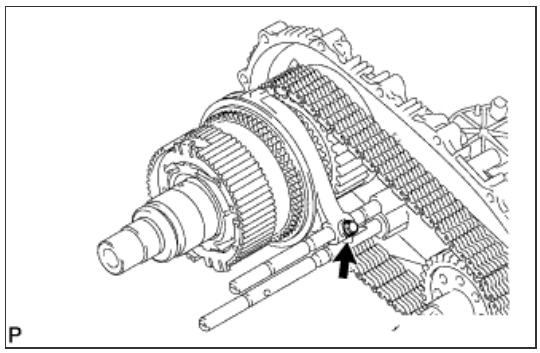


b. Remove the bolt. Then remove the No. 2 gear shift fork together with the high and low clutch sleeve from the shift actuator.

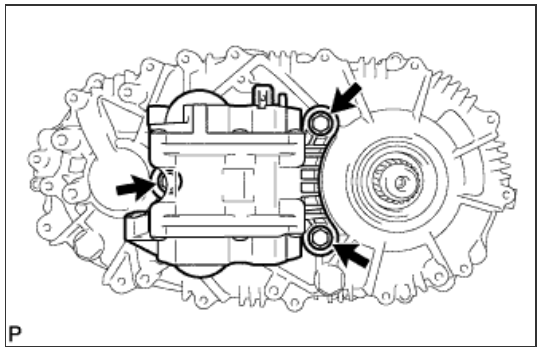


16. REMOVE TRANSFER SHIFT ACTUATOR ASSEMBLY

a. Remove the No. 1 gear shift fork bolt.



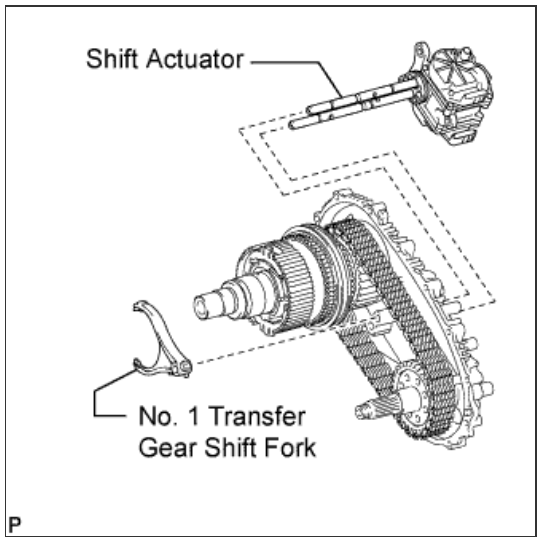
b. Remove the 3 bolts.



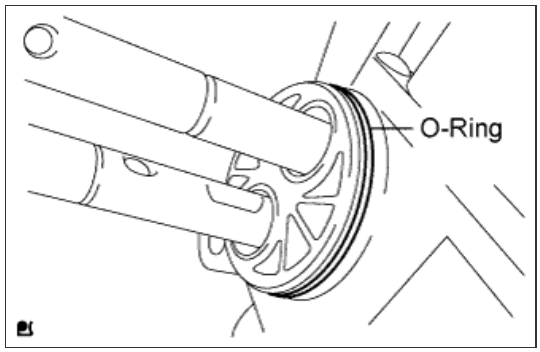
c. Remove the shift actuator and No. 1 gear shift fork from the rear transfer case.

NOTICE:

Take care not to drop the No. 1 gear shift fork.

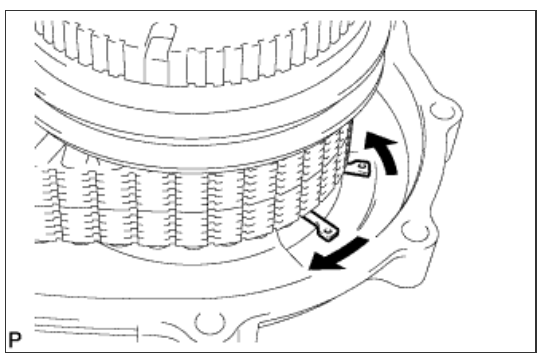


d. Remove the O-ring from the shift actuator.



17. REMOVE REAR TRANSFER OUTPUT SHAFT ASSEMBLY

a. Using a snap ring expander, expand the snap ring as shown in the illustration.

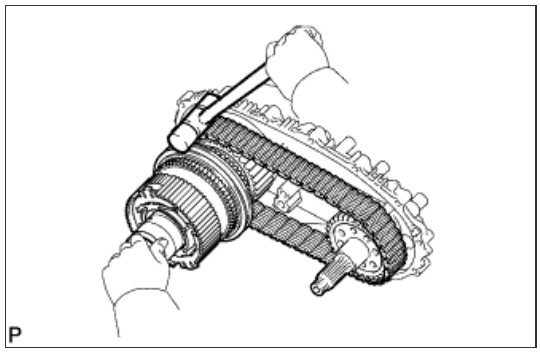


b. Using a plastic-faced hammer, carefully tap the rear transfer case, and remove the output shaft together with the drive chain and driven sprocket.

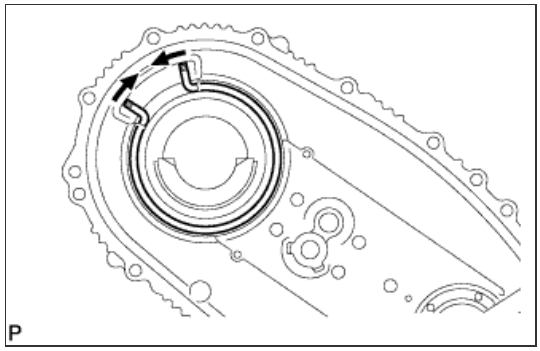
c. Remove the output shaft and driven sprocket from the drive chain.

NOTICE:

Do not drop the output shaft washers.

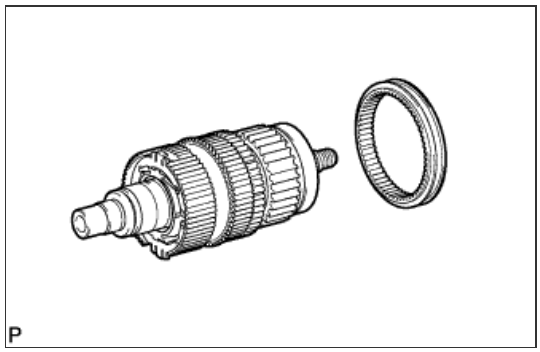


d. Using a snap ring expander, remove the snap ring from the rear transfer case.



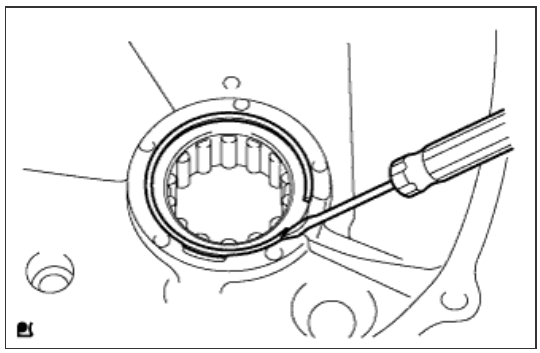
18. REMOVE FRONT DRIVE CLUTCH SLEEVE

a. Remove the clutch sleeve from the output shaft.



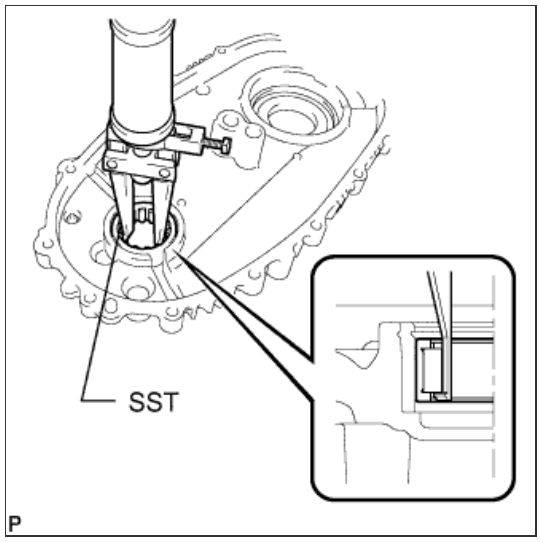
19. REMOVE SIDE GEAR SHAFT HOLDER BEARING

a. Using a screwdriver, remove the snap ring.



b. Using SST, remove the bearing.

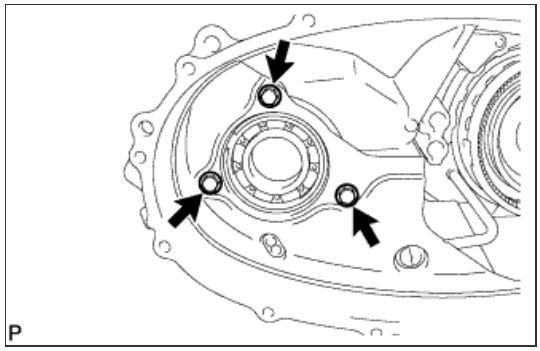
SST
09308-00010



20. REMOVE TRANSFER OIL SEPARATOR SUB-ASSEMBLY

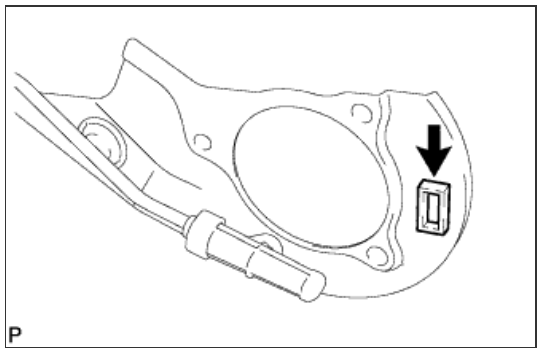
a. Remove the 3 bolts and oil separator.

b. Remove the O-ring from the oil separator.



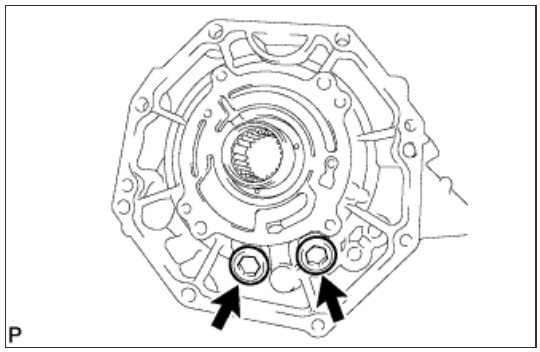
21. REMOVE TRANSFER CASE MAGNET

a. Remove the magnet from the oil separator.

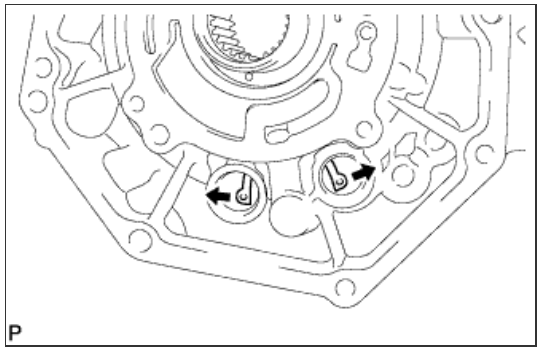


22. REMOVE TRANSFER INPUT SHAFT ASSEMBLY

a. Using a 14 mm hexagon wrench, remove the 2 case plugs from the front transfer case.

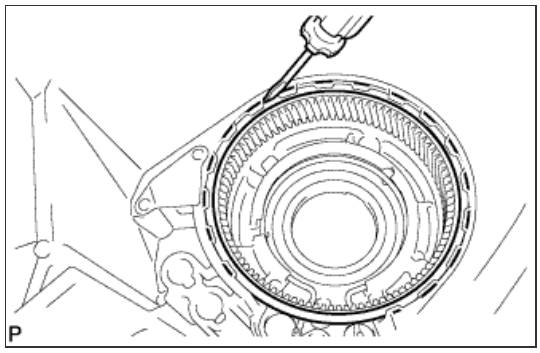


b. Using a snap ring expander, expand the snap ring as shown in the illustration. Then remove the input shaft from the front transfer case.

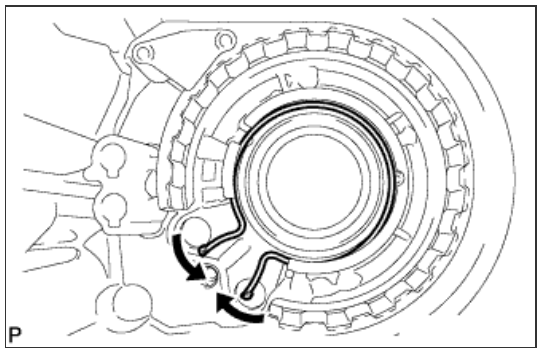


23. REMOVE TRANSFER LOW PLANETARY RING GEAR

a. Using a screwdriver, remove the snap ring. Then remove the low planetary ring gear from the front transfer case.

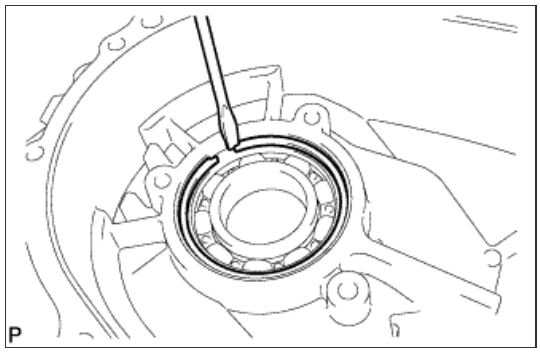


b. Using a snap ring expander, remove the snap ring from the front transfer case.



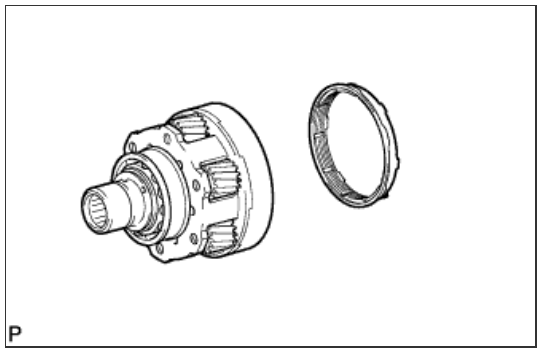
24. REMOVE TRANSFER DRIVEN SPROCKET BEARING

a. Using a screwdriver, remove the snap ring. Then remove the bearing from the front transfer case.



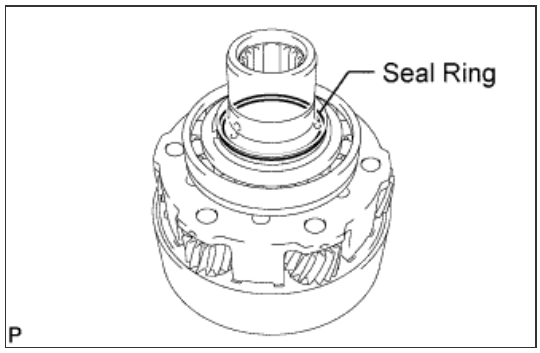
25. REMOVE NO. 1 SYNCHRONIZER RING (for Manual Transmission)

a. Remove the synchronizer ring from the input shaft.



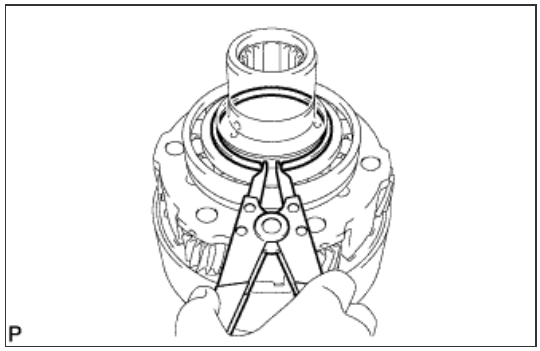
26. REMOVE NO. 1 TRANSFER INPUT SHAFT SEAL RING

a. Remove the seal ring from the input shaft.



27. REMOVE TRANSFER INPUT SHAFT BEARING

a. Using a snap ring expander, remove the snap ring.



b. Using SST and a press, press out the bearing.

SST

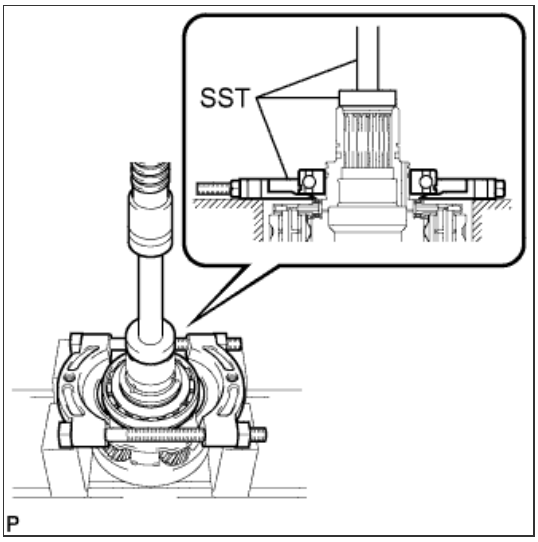
09555-55010
09950-60010 (09951-00490)
09950-70010 (09951-07100)

NOTICE:

Be careful not to drop or damage the input shaft, low planetary gear and low planetary gear bearings.

HINT:

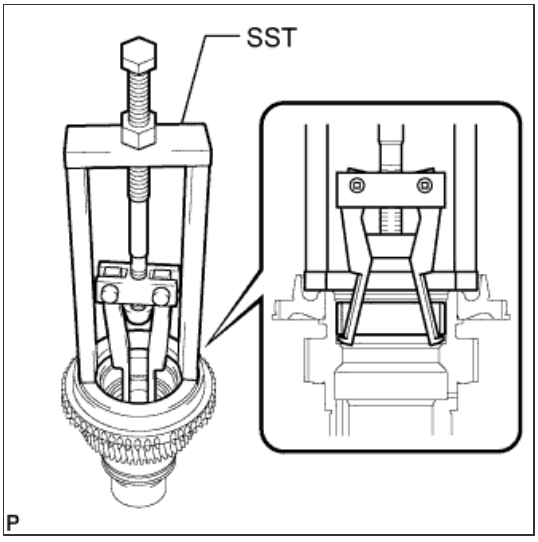
When the bearing is removed, the input shaft, low planetary gear, and 2 low planetary gear bearings will come off.



28. REMOVE TRANSFER INPUT SHAFT BIMETAL FORMED BUSH

a. Using SST, remove the bush.

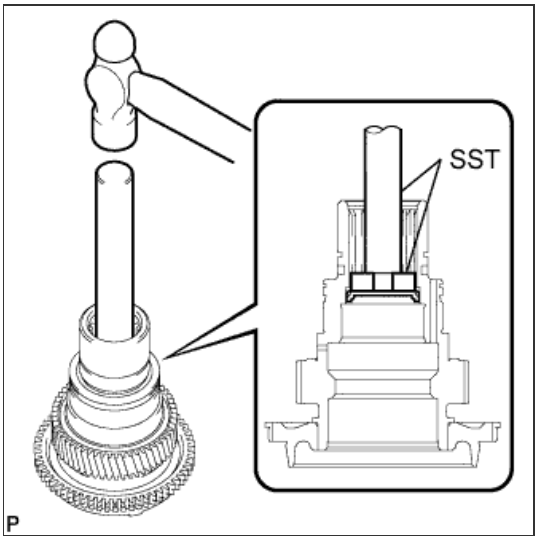
SST
09387-00041 (09387-01021, 09387-01030, 09387-01040)



29. REMOVE TRANSFER INPUT SHAFT PLUG

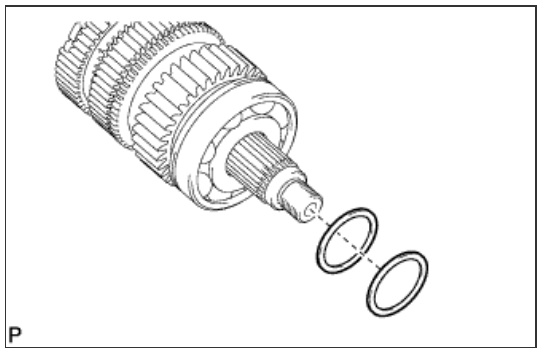
a. Using SST and a hammer, tap out the input shaft plug.

SST
09950-70010 (09951-07150)
09950-60010 (09951-00300)



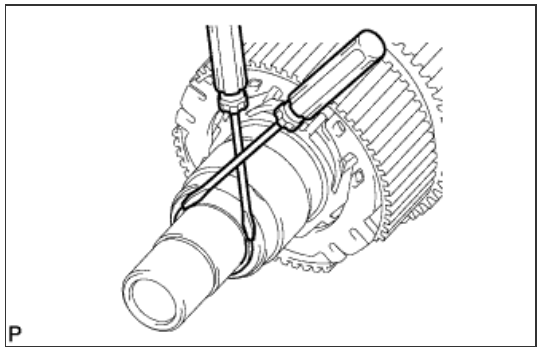
30. REMOVE TRANSFER OUTPUT SHAFT WASHER

a. Remove the 2 output shaft washers from the output shaft.

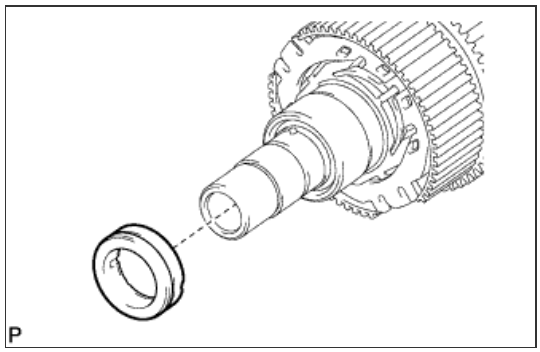


31. REMOVE NO. 1 TRANSFER OUTPUT SHAFT SPACER

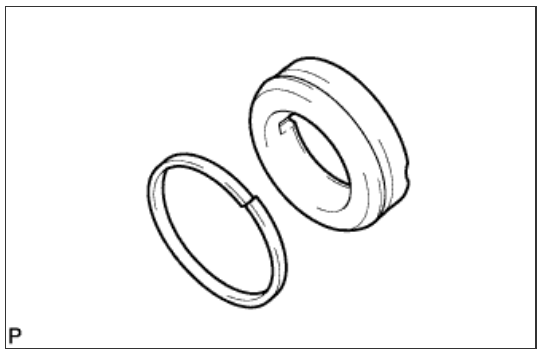
a. Using 2 screwdrivers and a hammer, tap out the snap ring.



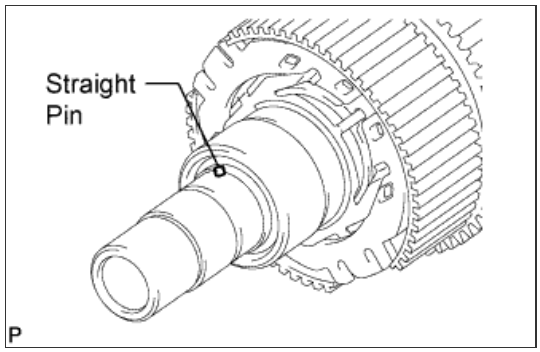
b. Remove the output shaft spacer from the output shaft.



c. Remove the seal ring from the output shaft spacer.

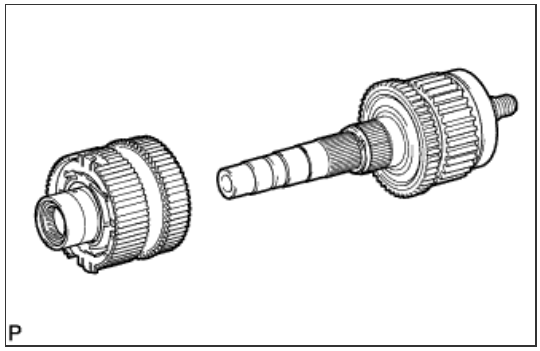


d. Remove the straight pin from the output shaft.

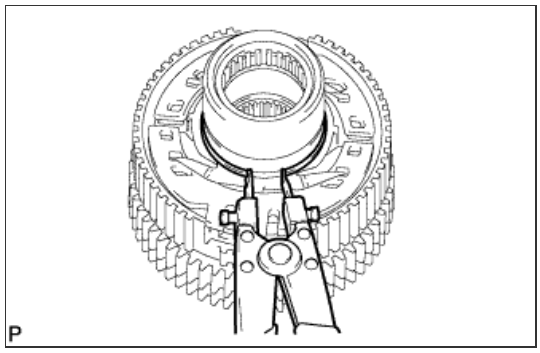


32. REMOVE CENTER DIFFERENTIAL CASE

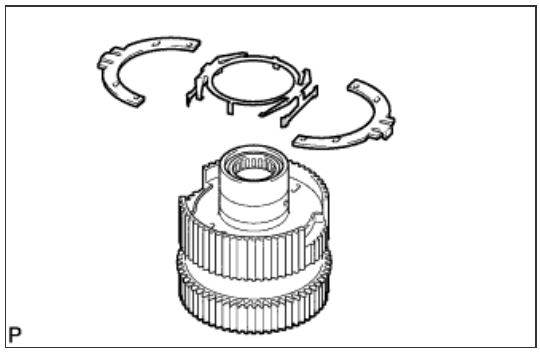
a. Remove the center differential case from the output shaft.



b. for Manual Transmission:
Using a snap ring expander, remove the snap ring.

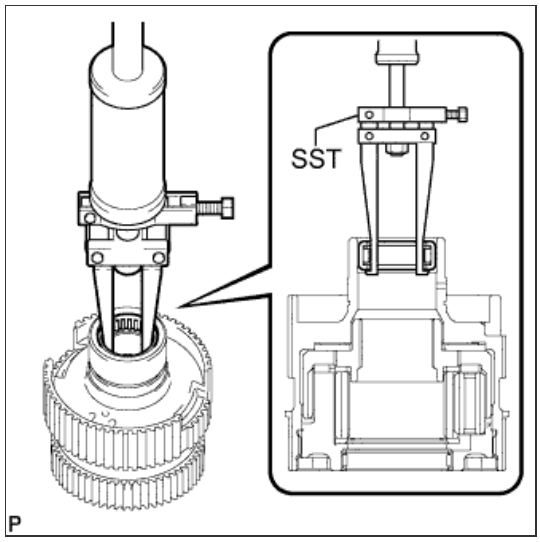


c. for Manual Transmission:
Remove the synchromesh shifting key spring and No. 2 synchromesh shifting keys from the center differential case.



d. Using SST, remove the needle roller bearing.

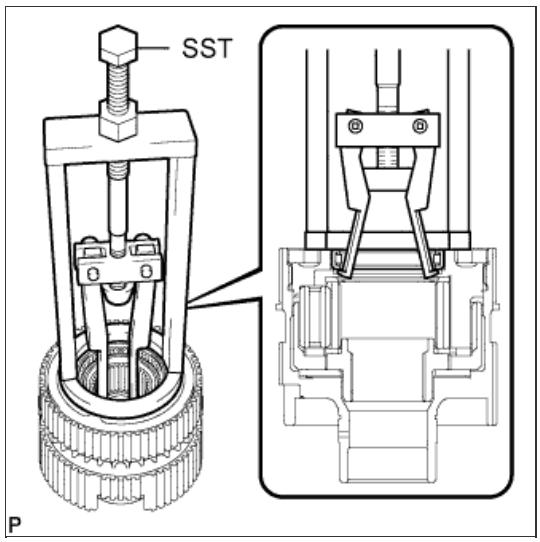
SST
09308-00010



e. Using SST, remove the needle roller bearing.

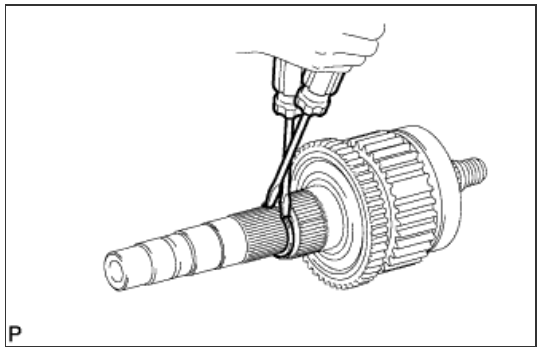
SST

09387-00041 (09387-01021, 09387-01030, 09387-01040)

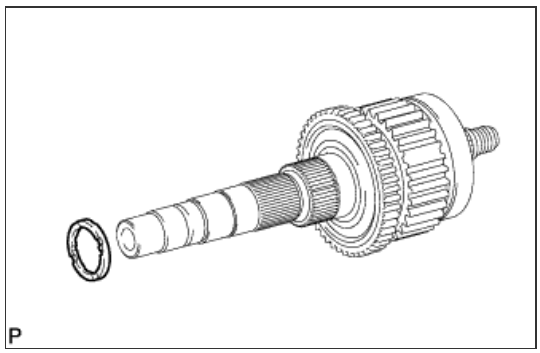


33. REMOVE TRANSFER OUTPUT SHAFT SPACER

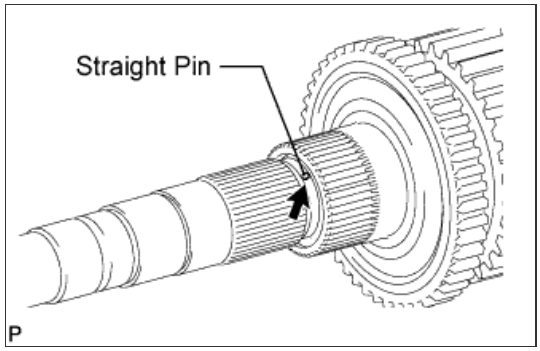
a. Using 2 screwdrivers and a hammer, tap out the snap ring.



b. Remove the output shaft spacer from the output shaft.

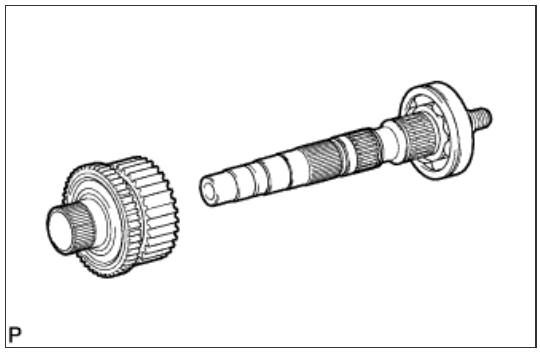


c. Remove the straight pin from the output shaft.



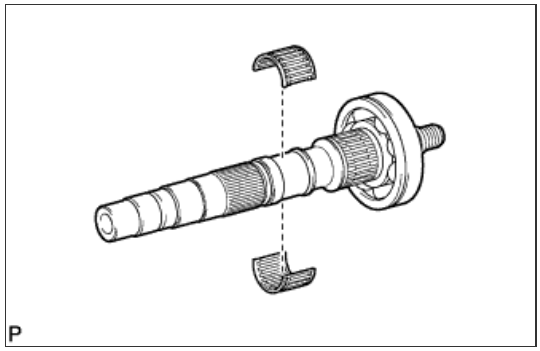
34. REMOVE TRANSFER DRIVE SPROCKET SUB-ASSEMBLY

a. Remove the drive sprocket from the output shaft.



35. REMOVE TRANSFER DRIVE SPROCKET BEARING

a. Remove the bearing from the output shaft.



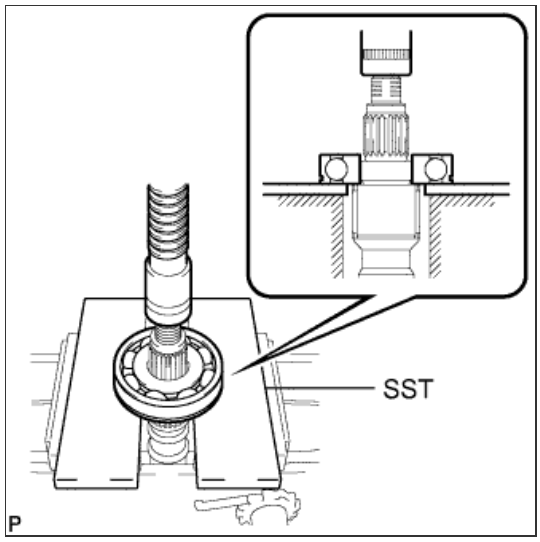
36. REMOVE REAR TRANSFER OUTPUT SHAFT

a. Using SST and a press, press out the bearing.

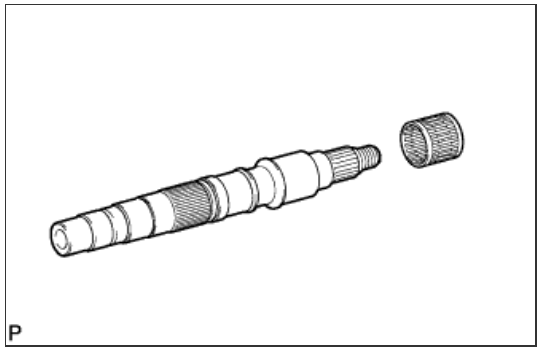
SST
09527-10011

NOTICE:

Be careful not to drop or damage the output shaft.



b. Remove the needle roller bearing from the output shaft.



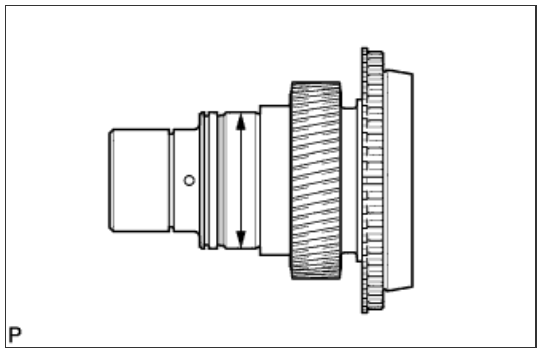
for Preparation Click here

1. INSPECT TRANSFER INPUT SHAFT

a. Using a micrometer, measure the diameter of the input shaft journal surface.

Minimum Diameter:
68 mm (2.68 in.)

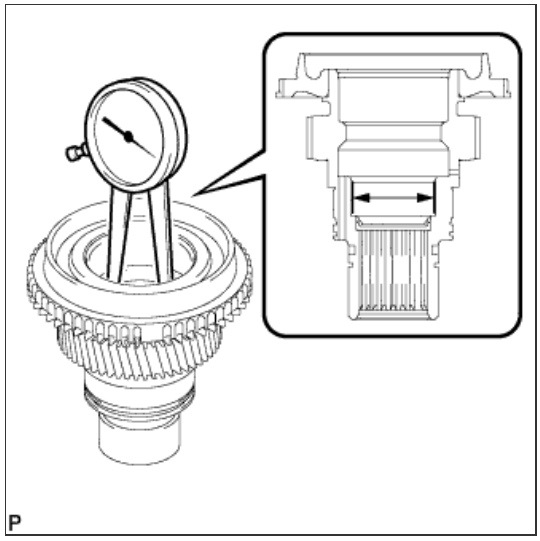
If the diameter is less than the minimum, replace the input shaft.



b. Using a dial indicator, measure the inside diameter of the input shaft bush.

Maximum Inside Diameter:
46 mm (1.81 in.)

If the inside diameter is more than the maximum, replace the input shaft.



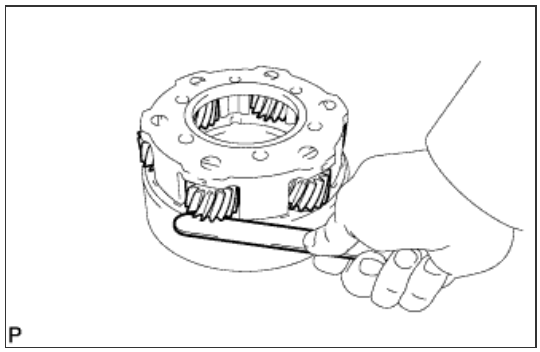
2. INSPECT TRANSFER LOW PLANETARY GEAR ASSEMBLY

a. Using a feeler gauge, measure the thrust clearance of the pinion gear.

Standard Clearance:
0.11 to 0.85 mm (0.00434 to 0.0334 in.)

Maximum Clearance:
0.85 mm (0.0334 in.)

If the clearance is more than the maximum, replace the low planetary gear assembly.

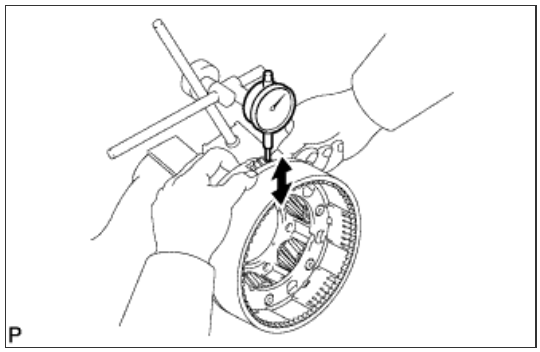


b. Using a dial indicator, measure the radial clearance of the pinion gear.

Standard Clearance:
0.01 to 0.04 mm (0.000434 to 0.00150 in.)

Maximum Clearance:
0.04 mm (0.00150 in.)

If the clearance is more than the maximum, replace the low planetary gear assembly.



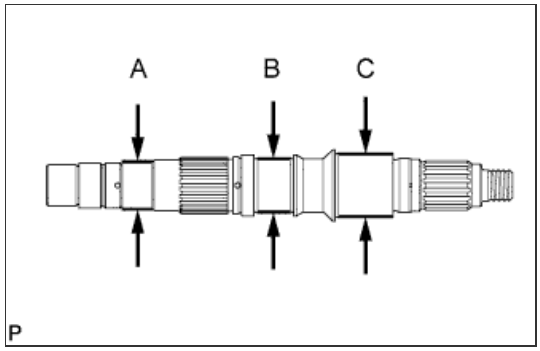
3. INSPECT REAR TRANSFER OUTPUT SHAFT

a. Using a micrometer, measure the diameter of the output shaft journals.

Minimum Diameter:

Journal	Specified Condition
A	38 mm (1.50 in.)
B	42 mm (1.65 in.)
C	49 mm (1.93 in.)

If the diameter is less than the minimum, replace the output shaft.

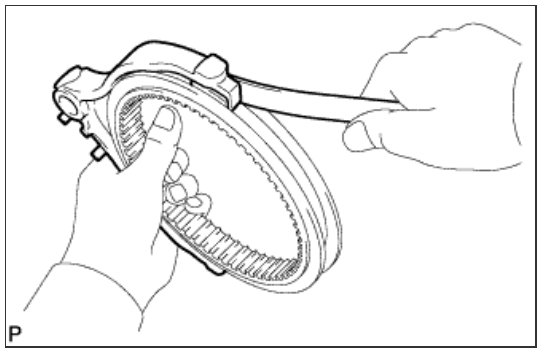


4. INSPECT NO. 1 TRANSFER GEAR SHIFT FORK AND FRONT DRIVE CLUTCH SLEEVE

a. Using a feeler gauge, measure the clearance between the clutch sleeve and gear shift fork.

Maximum Clearance:
0.8 mm (0.0315 in.)

If the clearance is more than the maximum, replace the clutch sleeve or shift fork.

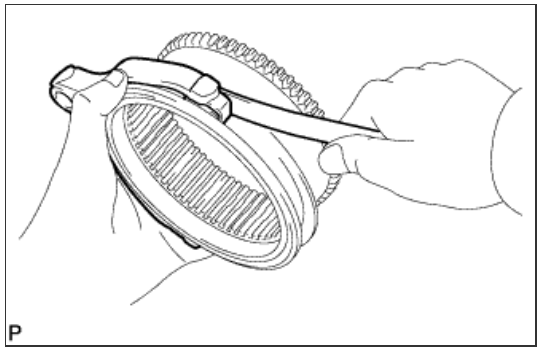


5. INSPECT NO. 2 TRANSFER GEAR SHIFT FORK AND HIGH AND LOW CLUTCH SLEEVE

a. Using a feeler gauge, measure the clearance between the clutch sleeve and gear shift fork.

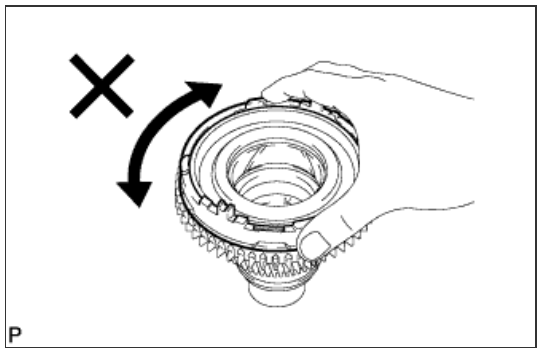
Maximum Clearance:
3.15 mm (0.124 in.)

If the clearance is more than the maximum, replace the clutch sleeve or shift fork.



6. INSPECT NO. 1 SYNCHRONIZER RING (for Manual Transmission)

a. Apply gear oil to the cone of the input shaft, and check that it does not turn in both directions while pushing the No. 1 synchronizer ring.
If it can turn, replace the No. 1 synchronizer ring.

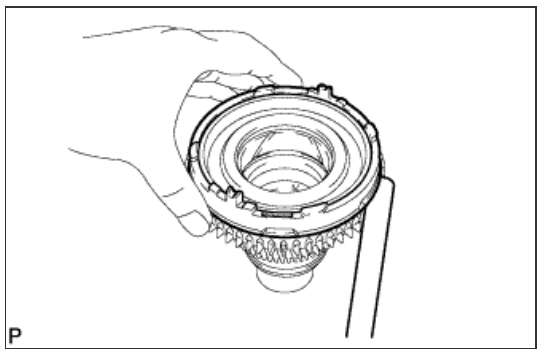


b. Push the No. 1 synchronizer ring to the cone of the input shaft. Measure the clearance between the No. 1 synchronizer ring and input shaft.

Standard Clearance:
0.86 to 1.54 mm (0.0339 to 0.0606 in.)

Minimum Clearance:
0.86 mm (0.0339 in.)

If the clearance is not as specified, replace the No. 1 synchronizer ring with a new one.



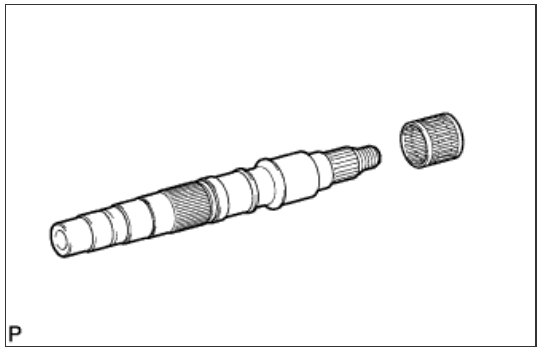
for Preparation Click here

HINT:

Coat all of the sliding and rotating surfaces with gear oil before reassembly.

1. INSTALL REAR TRANSFER OUTPUT SHAFT

a. Install a new needle roller bearing.

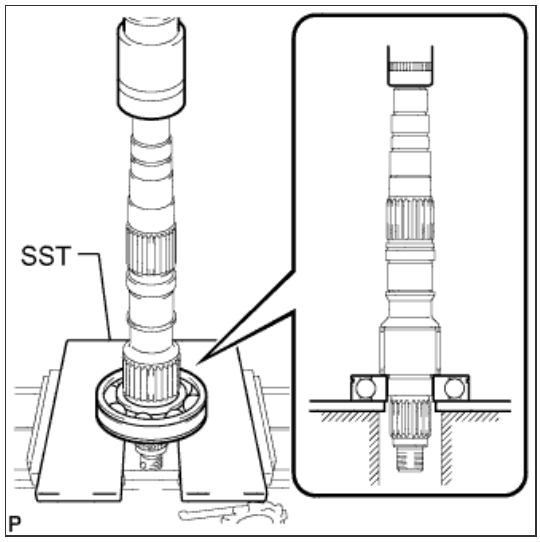


b. Using SST and a press, press in a new bearing.

SST
09527-10011

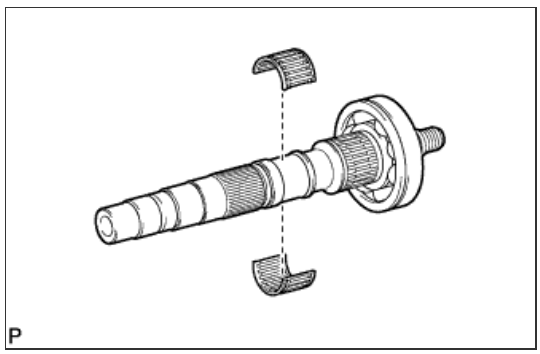
NOTICE:

Set the snap ring groove of the bearing to the front side.



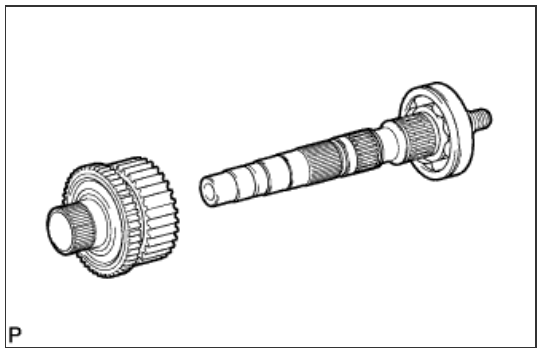
2. INSTALL TRANSFER DRIVE SPROCKET BEARING

a. Install the bearing to the output shaft.



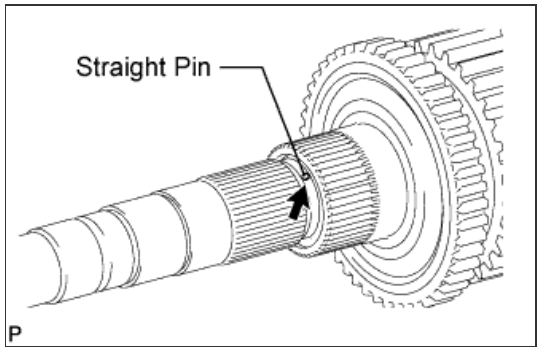
3. INSTALL TRANSFER DRIVE SPROCKET SUB-ASSEMBLY

a. Install the drive sprocket to the output shaft.

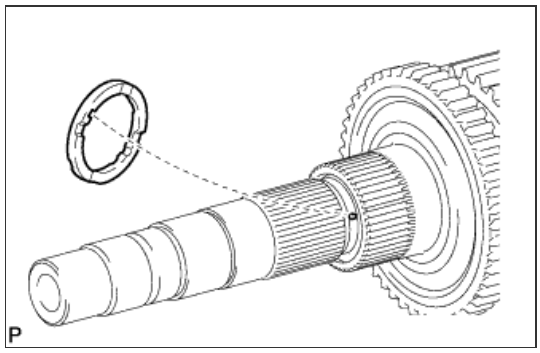


4. INSTALL TRANSFER OUTPUT SHAFT SPACER

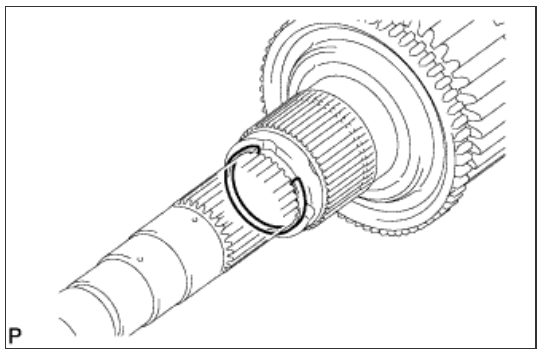
a. Install the straight pin to the output shaft.



b. Align the straight pin with the straight pin groove of the output shaft spacer, and slide on the output shaft spacer.



c. Using a screwdriver and hammer, tap on the snap ring.



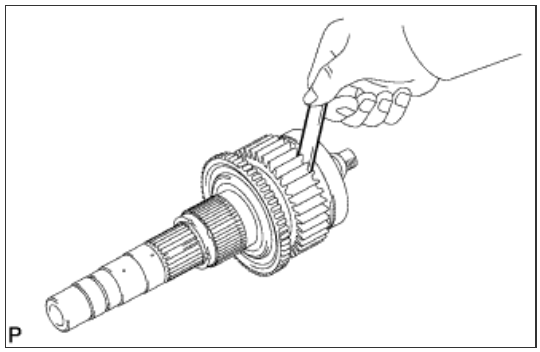
5. INSPECT TRANSFER DRIVE SPROCKET SUB-ASSEMBLY

a. Using a feeler gauge, measure the drive sprocket thrust clearance.

Standard Clearance:
0.10 to 0.47 mm (0.00394 to 0.0185 in.)

Maximum Clearance:
0.47 mm (0.0185 in.)

If the clearance is more than the maximum, replace the drive sprocket sub-assembly.



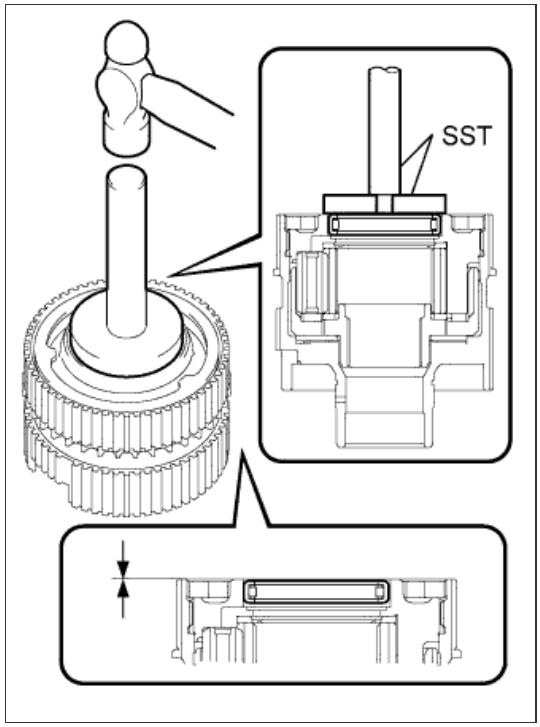
6. INSTALL CENTER DIFFERENTIAL CASE

a. Using SST and a hammer, tap in a new needle roller bearing until its surface is 0 to 0.5 mm (0 to 0.0197 in.) from the center differential case upper surface.

SST
09950-60020 (09951-00710)
09950-70010 (09951-07100)

NOTICE:

- **Be careful not to damage the center differential case.**
- **Install the bearing so that the mark is on the outside.**

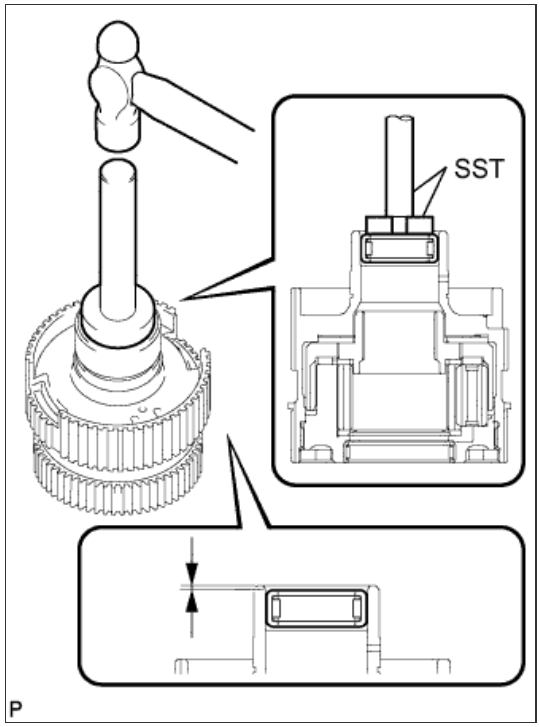


b. Using SST and a hammer, tap in a new needle roller bearing until its surface is 1.5 to 2.0 mm (0.0591 to 0.0787 in.) from the center differential case upper surface.

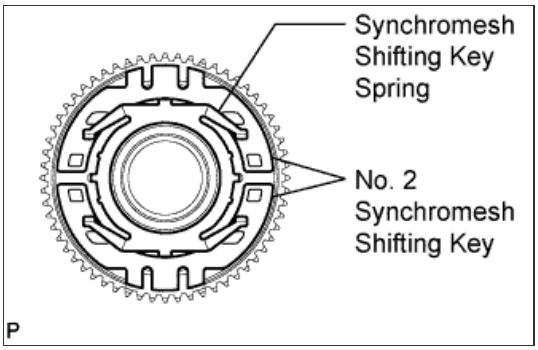
SST
09950-60010 (09951-00460)
09950-70010 (09951-07100)

NOTICE:

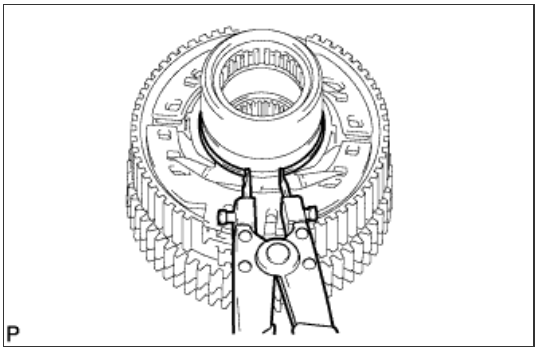
- **Be careful not to damage the center differential case.**
- **Install the bearing so that the mark is on the outside.**



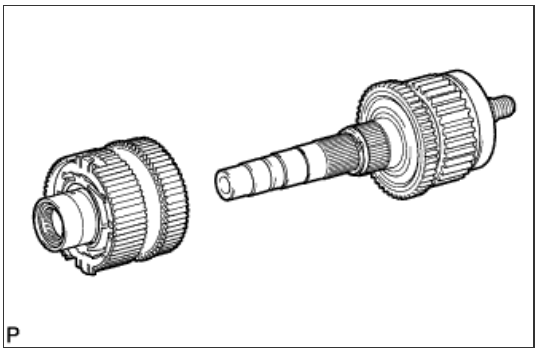
c. for Manual Transmission:
Install the synchromesh shifting key spring and No. 2 synchromesh shifting keys as shown in the illustration.



d. for Manual Transmission:
Using a snap ring expander, install the snap ring.

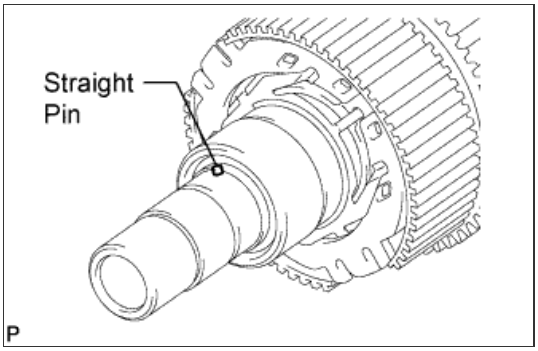


e. Install the center differential case to the output shaft.

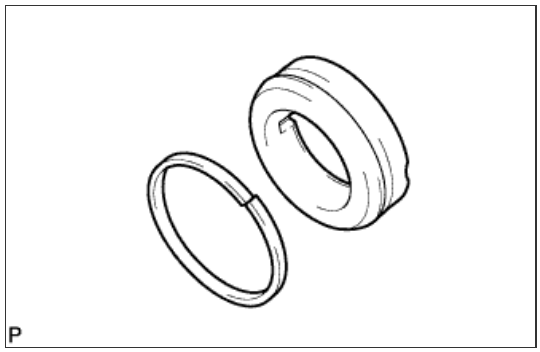


7. INSTALL NO. 1 TRANSFER OUTPUT SHAFT SPACER

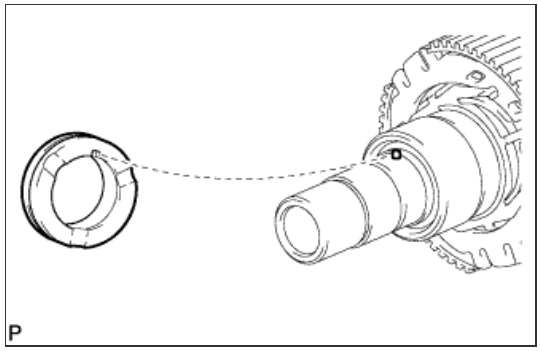
a. Install the straight pin to the output shaft.



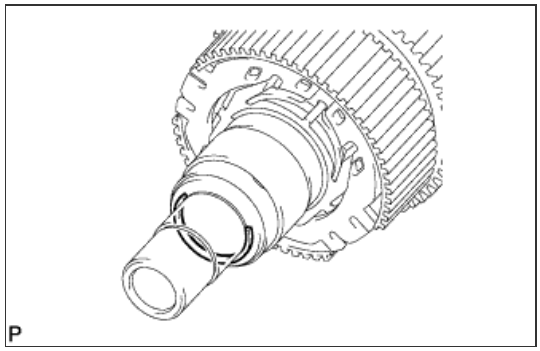
b. Install a new seal ring to the output shaft spacer.



c. Align the pin with the straight pin groove of the output shaft spacer, and slide on the output shaft spacer.

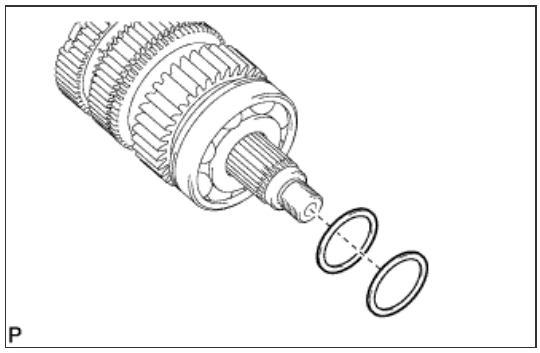


d. Using a screwdriver and hammer, tap on the snap ring.



8. INSTALL TRANSFER OUTPUT SHAFT WASHER

a. Install the 2 output shaft washers to the output shaft.



9. INSTALL TRANSFER INPUT SHAFT PLUG

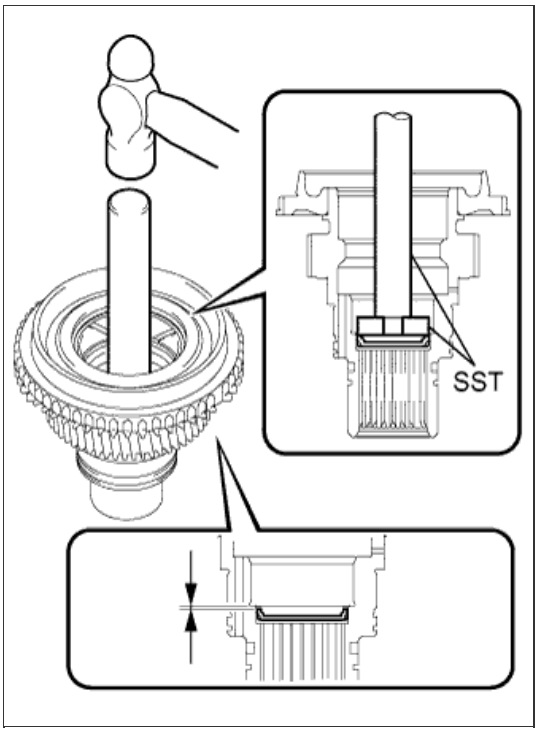
a. Using SST and a hammer, tap in a new input shaft plug until its surface is 1.0 to 1.8 mm (0.0394 to 0.0709 in.) from the input shaft upper surface.

SST

09950-60010 (09951-00410)
09950-70010 (09951-07150)

NOTICE:

Be careful not to damage or deform the input shaft plug when tapping it.



10. INSTALL TRANSFER INPUT SHAFT BIMETAL FORMED BUSH

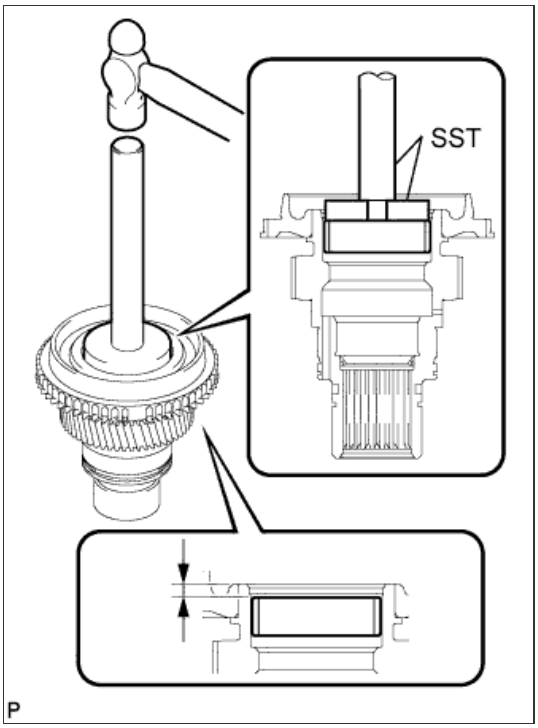
a. Using SST and a hammer, tap in a new bush until its surface is 5.5 to 5.9 mm (0.217 to 0.232 in.) from the input shaft upper surface.

SST

09950-70010 (09951-07150)
09950-60010 (09951-00610)

NOTICE:

Be careful not to damage the input shaft.

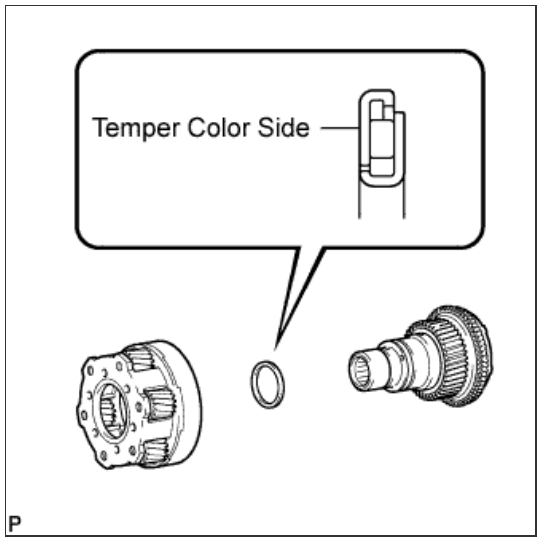


11. INSTALL TRANSFER INPUT SHAFT BEARING

a. Install the low planetary gear bearing and low planetary gear to the input shaft.

NOTICE:

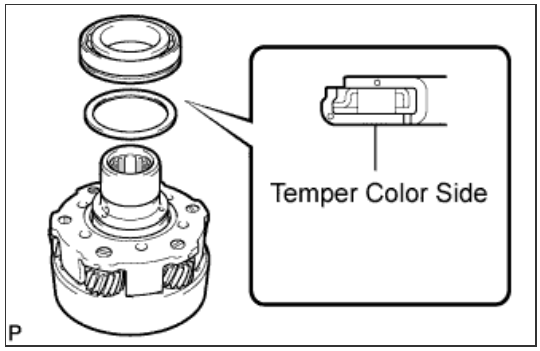
- **Make sure the low planetary gear bearing is installed in the correct direction.**
- **Install the low planetary gear bearing so that its temper color side faces the low planetary gear.**



b. Install the low planetary gear bearing and a new input shaft bearing to the input shaft.

NOTICE:

- **Make sure the input shaft bearing is installed in the correct direction.**
- **Make sure the low planetary gear bearing is installed in the correct direction.**
- **Install the low planetary gear bearing so that its temper color side faces the low planetary gear.**

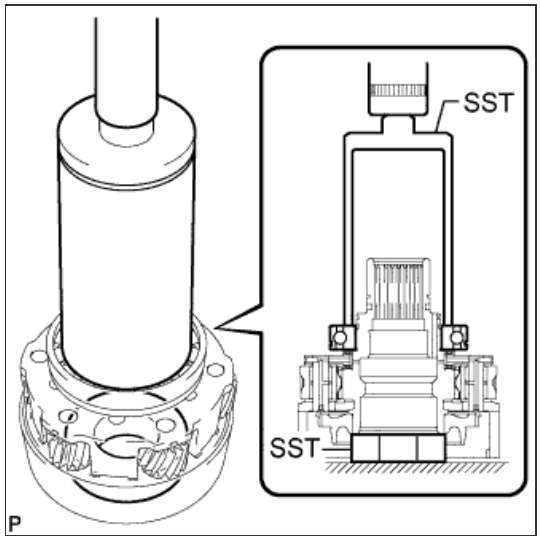


c. Using SST and a press, press in the bearing.

SST
09513-36040
09515-21010

NOTICE:

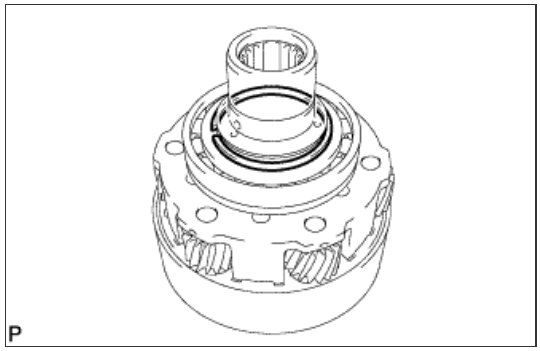
After press-fitting the bearing to the input shaft, check that the bearing moves smoothly.



d. Select a snap ring that allows for minimum axial play and install it to the shaft.

Standard Snap Ring Thickness:

Mark	Specified Condition
C	2.13 to 2.18 mm (0.0839 to 0.0858 in.)
D	2.18 to 2.23 mm (0.0858 to 0.0878 in.)
E	2.23 to 2.28 mm (0.0878 to 0.0898 in.)
F	2.28 to 2.33 mm (0.0898 to 0.0917 in.)
G	2.33 to 2.38 mm (0.0917 to 0.0937 in.)
H	2.38 to 2.43 mm (0.0937 to



	0.0957 in.)
J	2.43 to 2.48 mm (0.0957 to 0.0976 in.)

e. Using a snap ring expander, install the snap ring.

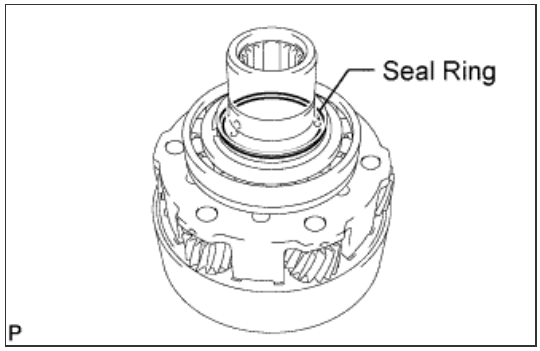
NOTICE:

Make sure that the snap ring is firmly installed to the groove.

12. INSTALL NO. 1 TRANSFER INPUT SHAFT SEAL RING

a. Apply transfer oil to a new seal ring.

b. Install a new seal ring to the input shaft.

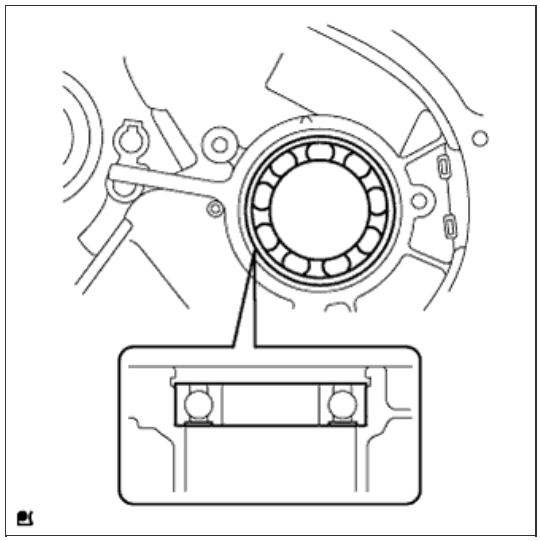


13. INSTALL TRANSFER DRIVEN SPROCKET BEARING

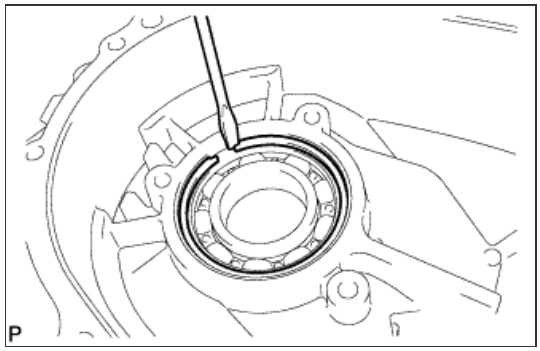
a. Install a new bearing to the front transfer case in the direction shown in the illustration.

NOTICE:

Make sure the bearing is installed in the correct direction.

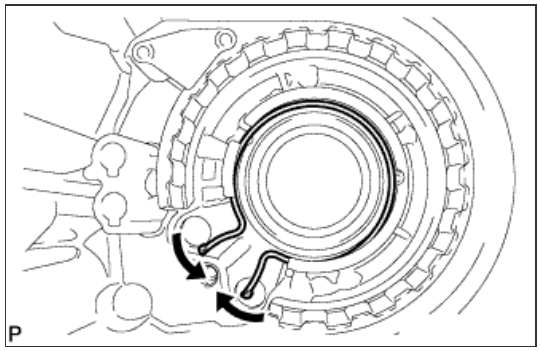


b. Using a screwdriver, install the snap ring.



14. INSTALL TRANSFER LOW PLANETARY RING GEAR

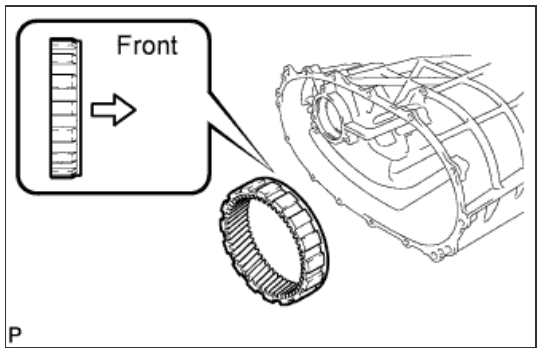
a. Using a snap ring expander, install the snap ring to the front transfer case.



b. Install the low planetary ring gear to the front transfer case.

NOTICE:

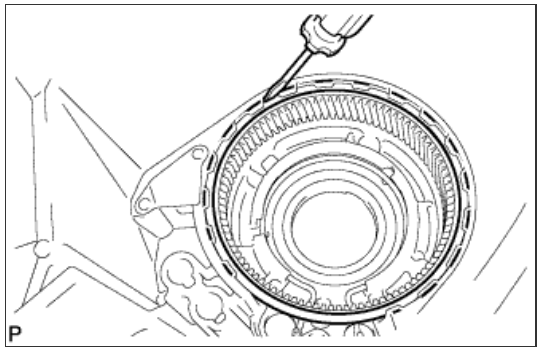
Make sure to install the low planetary ring gear in the correct direction.



c. Using a screwdriver, install the snap ring.

NOTICE:

Make sure that the snap ring is firmly installed to the groove.



15. INSTALL INPUT SHAFT ASSEMBLY

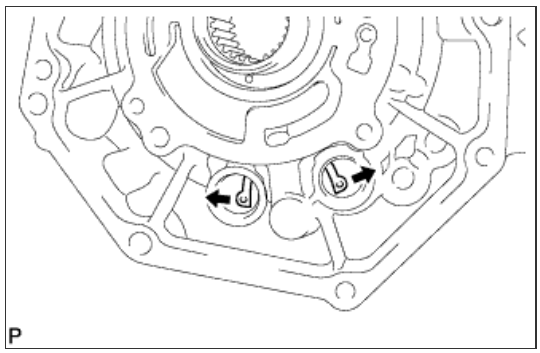
a. While expanding the snap ring, install the input shaft to the front transfer case.

b. Apply adhesive to the threads of the 2 case plugs.

Adhesive:
Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

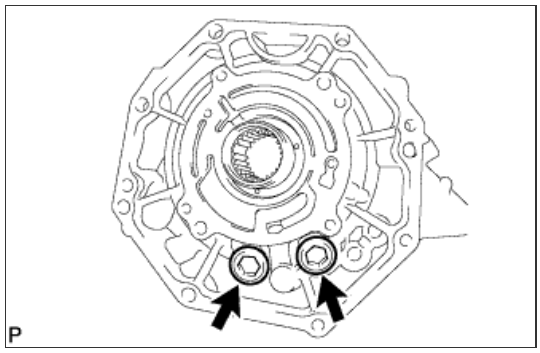
NOTICE:

Install the plugs within 3 minutes of application.



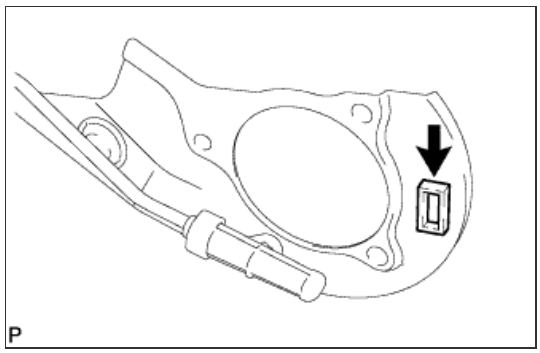
c. Using a 14 mm hexagon wrench, install the 2 case plugs.

Torque:
37 N*m{ 377 kgf*cm , 27 ft.*lbf }



16. INSTALL TRANSFER CASE MAGNET

a. Install the magnet to the oil separator.

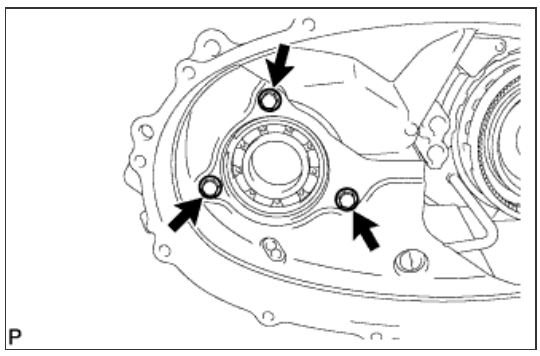


17. INSTALL TRANSFER OIL SEPARATOR SUB-ASSEMBLY

a. Install a new O-ring to the oil separator.

b. Install the oil separator with the 3 bolts.

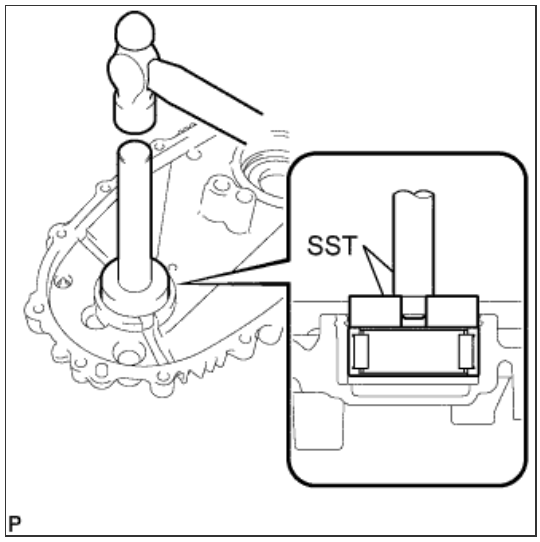
Torque:
18 N*m{ 178 kgf*cm , 13 ft.*lbf }



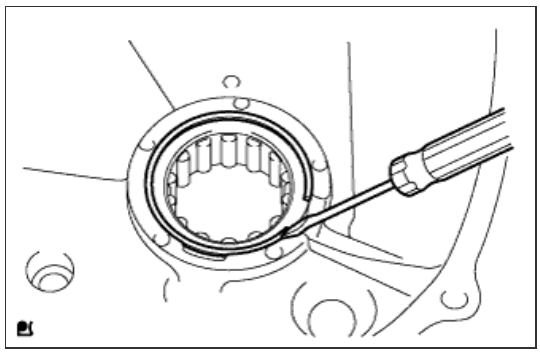
18. INSTALL SIDE GEAR SHAFT HOLDER BEARING

a. Using SST and a hammer, tap in a new bearing to the rear transfer case.

SST
09950-60010 (09951-00590)
09950-70010 (09951-07100)



b. Using a screwdriver, install the snap ring.



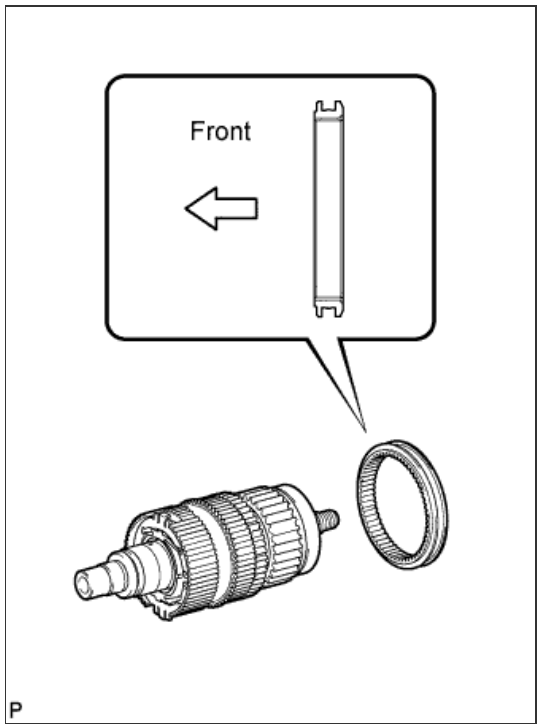
19. INSTALL FRONT DRIVE CLUTCH SLEEVE

a. Apply gear oil to the connecting areas of the clutch sleeve and center differential case.

b. Install the clutch sleeve onto the output shaft.

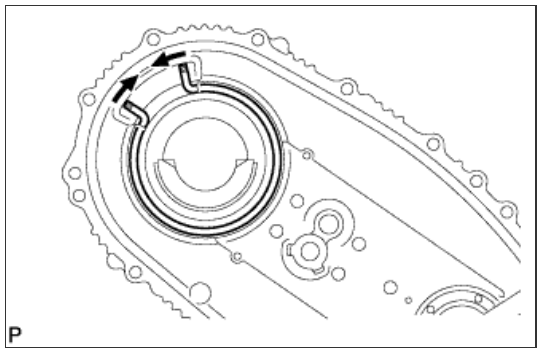
NOTICE:

Make sure that the clutch sleeve is installed facing the correct direction.



20. INSTALL REAR TRANSFER OUTPUT SHAFT ASSEMBLY

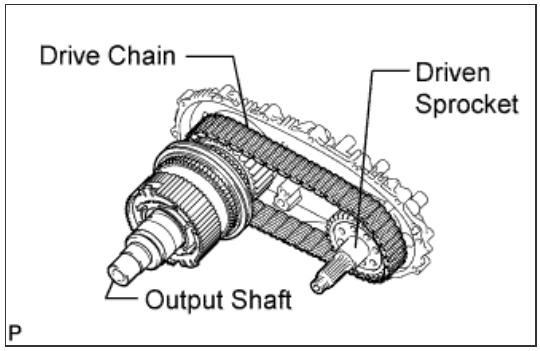
a. Install the snap ring to the rear transfer case.



b. Install the output shaft, drive chain and driven sprocket.

NOTICE:

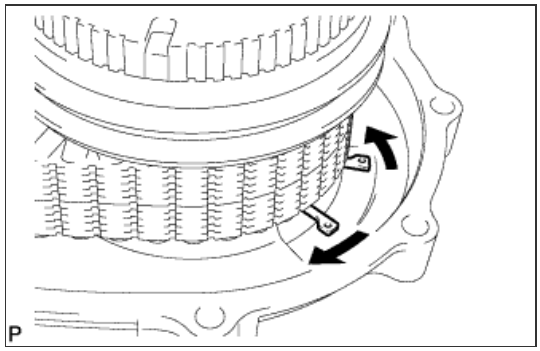
Do not drop the output shaft washers.



c. Using a snap ring expander, install the snap ring to the output shaft.

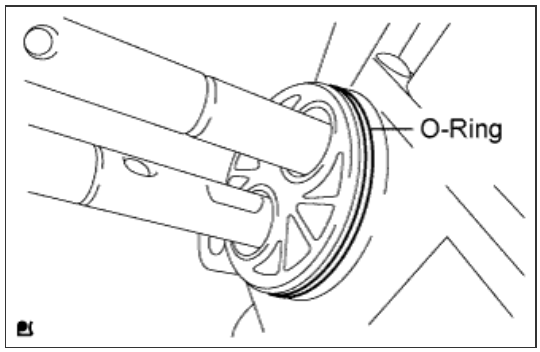
NOTICE:

Make sure that the snap ring is firmly installed to the groove.

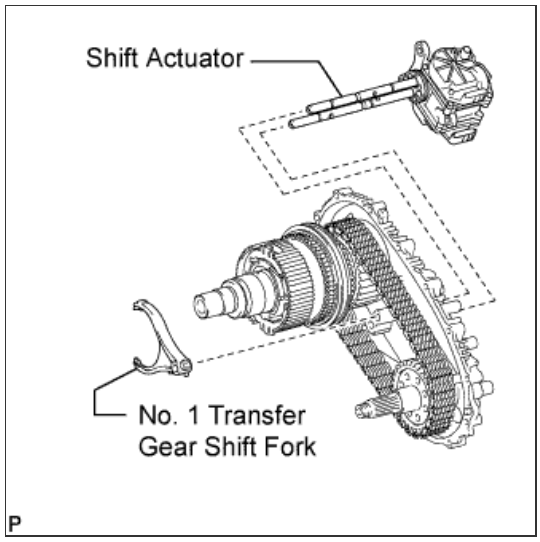


21. INSTALL TRANSFER SHIFT ACTUATOR ASSEMBLY

a. Install a new O-ring to the shift actuator.

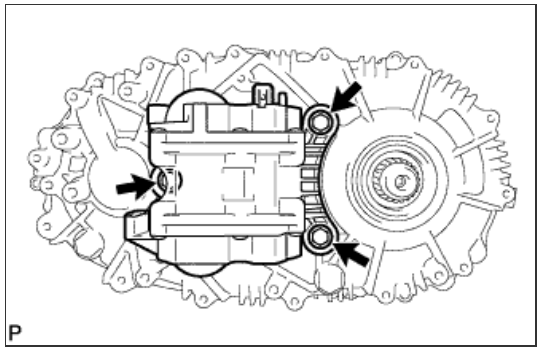


b. Set the No. 1 gear shift fork to the front drive clutch sleeve.



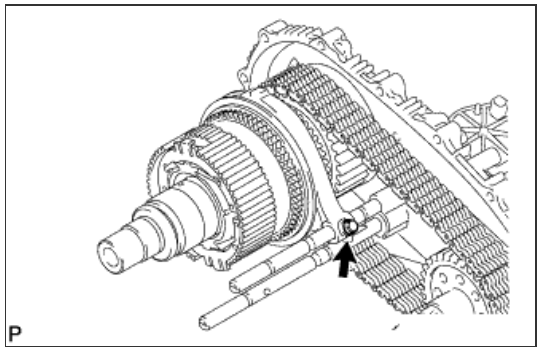
c. Install the shift actuator to the rear transfer case with the 3 bolts.

Torque:
20 N*m{ 204 kgf*cm , 15 ft.*lbf }



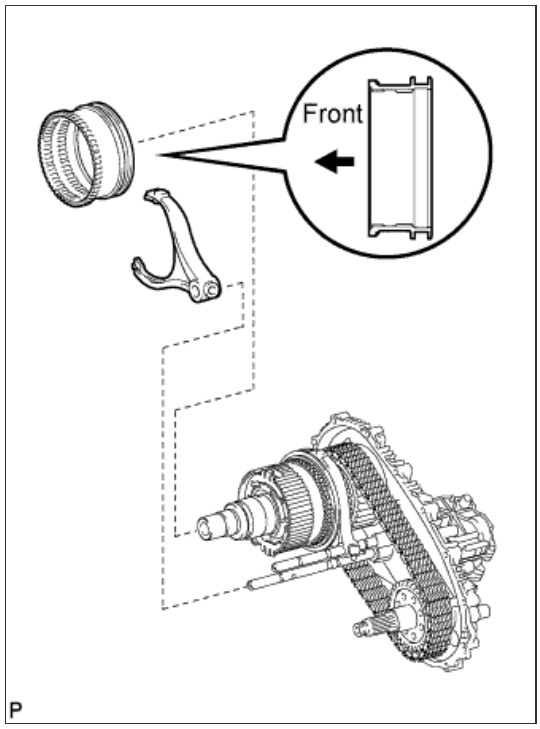
d. Install the No. 1 gear shift fork to the shift actuator with the bolt.

Torque:
24 N*m{ 245 kgf*cm , 18 ft.*lbf }



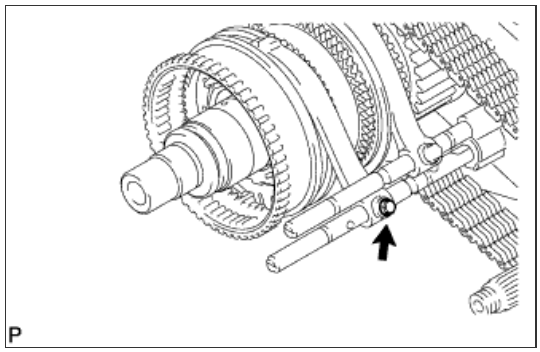
22. INSTALL NO. 2 TRANSFER GEAR SHIFT FORK

a. Set the No. 2 gear shift fork together with the high and low clutch sleeve to the shift actuator.

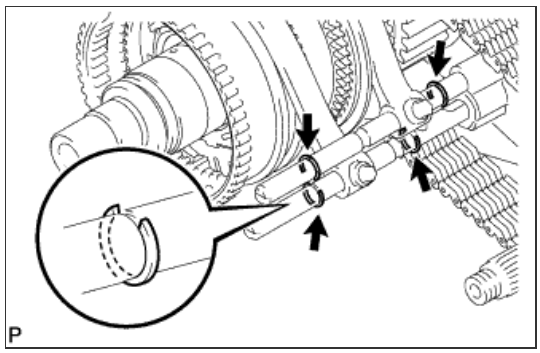


b. Install the No. 2 gear shift fork to the shift actuator with the bolt.

Torque:
24 N*m{ 245 kgf*cm , 18 ft.*lbf }

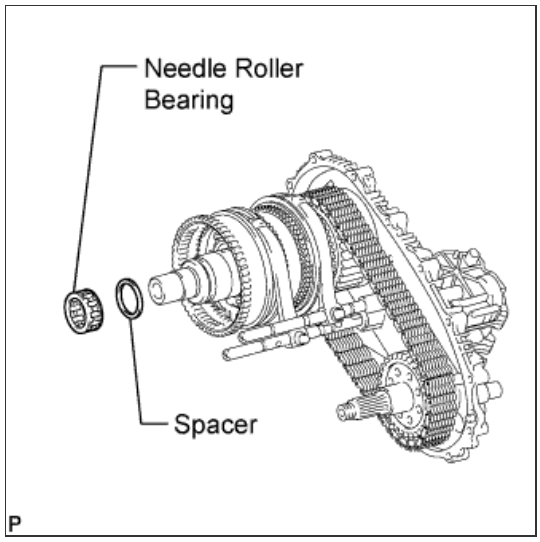


c. Using a screwdriver and hammer, tap the 4 shift fork shaft snap rings onto the shift fork shaft.



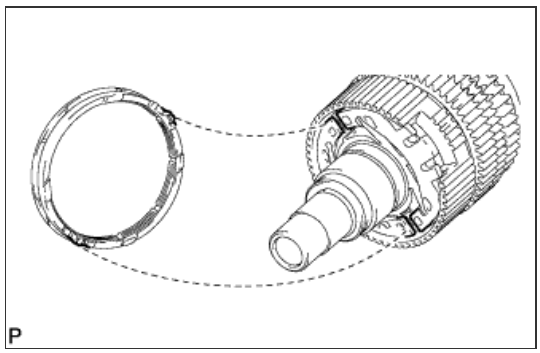
23. INSTALL FRONT TRANSFER OUTPUT SHAFT NEEDLE ROLLER BEARING

a. Install the needle roller bearing and spacer to the output shaft.



24. INSTALL NO. 1 SYNCHRONIZER RING (for Manual Transmission)

a. Align the protrusion of the synchronizer ring with the notch on the differential case and install it.



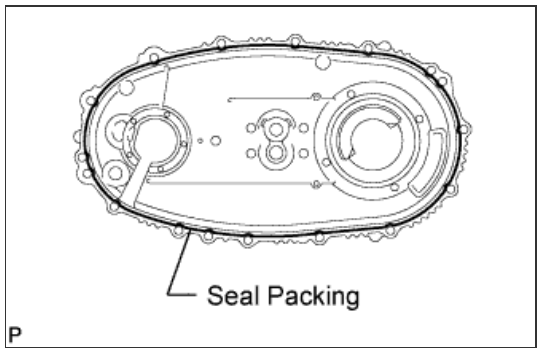
25. INSTALL REAR TRANSFER CASE ASSEMBLY

a. Apply seal packing to the rear transfer case as shown in the illustration.

Seal Packing:
Toyota Genuine Seal Packing 1281, Three Bond 1281 or equivalent

NOTICE:

If the removed rear transfer case will be reused: After removing the rear transfer case, be sure to perform the following before reinstalling it: 1) using a knife, cut off any old FIPG on the rear transfer case contact surface, 2) clean off any remaining old FIPG from the rear transfer case contact surface, and 3) reapply seal packing to the rear transfer case.

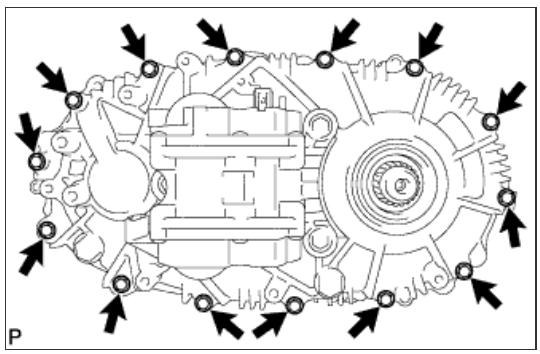


b. Install the rear transfer case with the 14 bolts.

Torque:
28 N*m{ 286 kgf*cm , 21 ft.*lbf }

NOTICE:

Tighten the bolts within 10 minutes of applying the seal packing. The seal packing will dry very quickly.



26. INSTALL TRANSFER CASE PLUG

a. Apply adhesive to the threads of the plug.

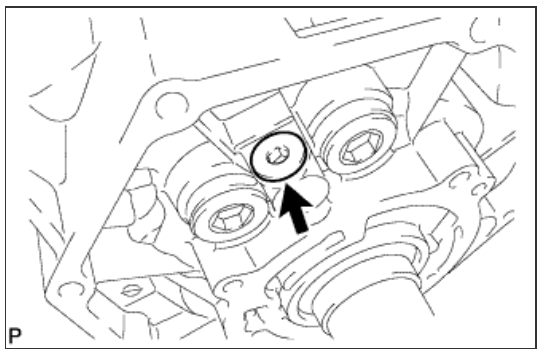
Adhesive:
Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

NOTICE:

Install the plug within 3 minutes of application.

b. Using a 6 mm hexagon wrench, install the plug.

Torque:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }



27. INSTALL NO. 1 TRANSFER CASE PLUG

a. Install the pin and compression spring to the front transfer case.

b. Apply adhesive to the threads of the plug.

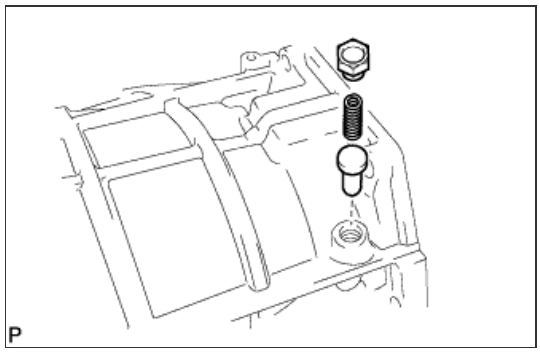
Adhesive:
Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

NOTICE:

Install the plug within 3 minutes of application.

c. Install the plug.

Torque:
19 N*m{ 190 kgf*cm , 14 ft.*lbf }

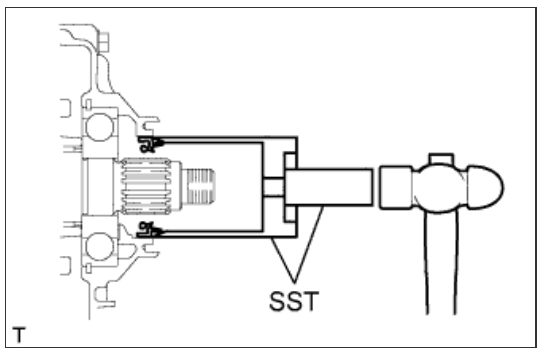


28. INSTALL TRANSFER CASE REAR OIL SEAL

a. Apply transfer oil to the spline of the output shaft.

b. Using SST and a hammer, tap in a new oil seal until its surface is flush with the housing upper surface.

SST
09649-17010
09950-70010 (09951-07150)



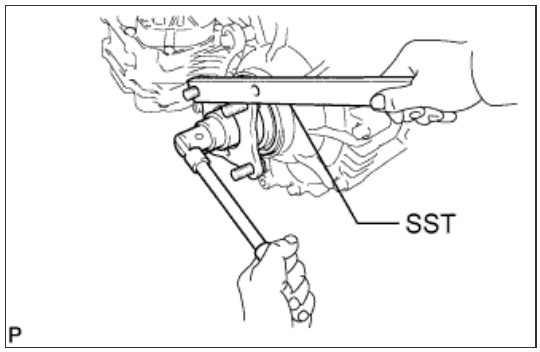
29. INSTALL REAR OUTPUT SHAFT COMPANION FLANGE SUB-ASSEMBLY

a. Install the companion flange onto the output shaft.

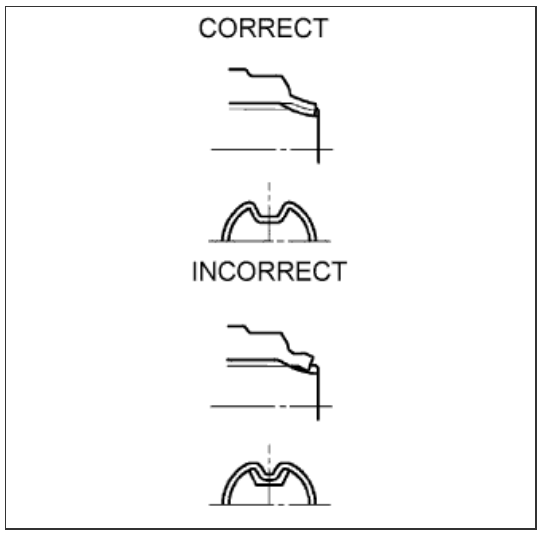
b. Using SST to hold the companion flange, install a new O-ring and a new companion flange lock nut.

SST
09330-00021

Torque:
127 N*m{ 1299 kgf*cm , 94 ft.*lbf }



c. Using a chisel and hammer, stake the companion flange lock nut.



30. INSTALL TRANSFER CASE FRONT OIL SEAL

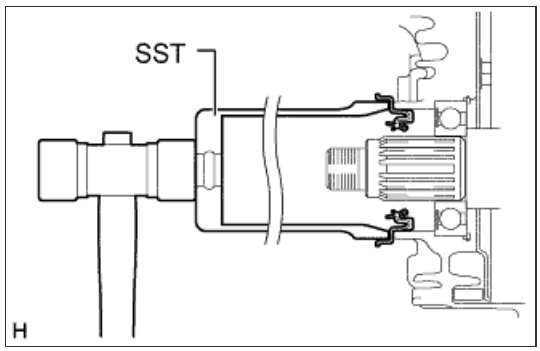
a. Apply transfer oil to the spline of the driven sprocket.

b. Using SST and a hammer, tap in a new front transfer case oil seal.

SST
09613-26010

NOTICE:

The front transfer case oil seal should be installed completely.



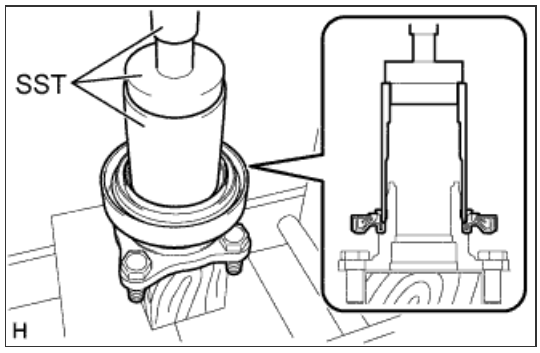
31. INSTALL TRANSFER OUTPUT SHAFT DUST DEFLECTOR

a. Using SST and a press, install a new transfer output shaft dust deflector.

SST
09523-36010
09950-60010 (09951-00460, 09951-00560, 09952-06010)
09950-70010 (09951-07100)

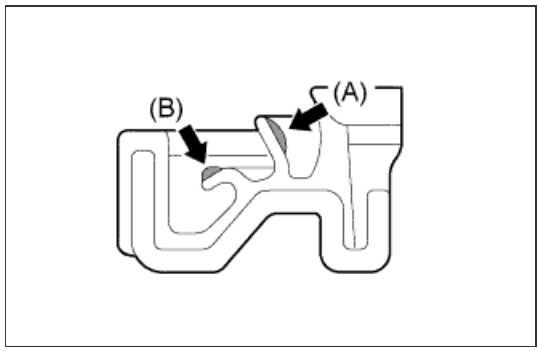
NOTICE:

- **Be careful not to damage the transfer output shaft dust deflector and front output shaft companion flange sub-assembly.**
- **The transfer output shaft dust deflector should be installed completely.**



b. Apply MP grease to the transfer output shaft dust deflector lip.

Standard Grease Capacity:
Location A:
0.4 to 0.6 g (0.015 to 0.021 oz.)
Location B:
0.1 g (0.0004 oz.)



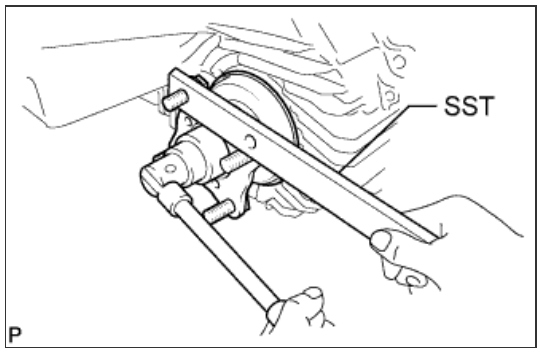
32. INSTALL FRONT OUTPUT SHAFT COMPANION FLANGE SUB-ASSEMBLY

a. Install the companion flange onto the drive sprocket.

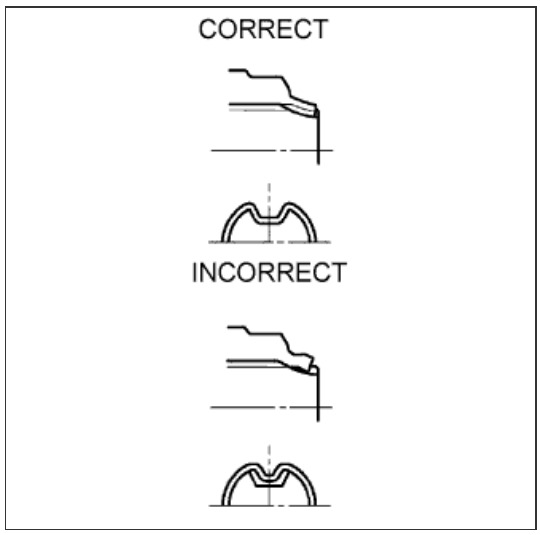
b. Using SST to hold the companion flange, install a new O-ring and a new companion flange lock nut.

SST
09330-00021

Torque:
127 N*m{ 1299 kgf*cm , 94 ft.*lbf }



c. Using a chisel and hammer, stake the companion flange lock nut.



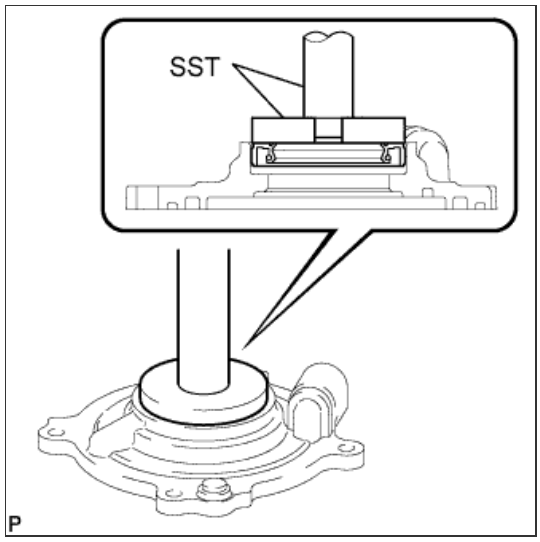
33. INSTALL TRANSFER OIL PUMP PLATE OIL SEAL

a. Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump plate upper surface.

SST
09950-60020 (09951-00680)
09950-70010 (09951-07100)

NOTICE:

Be careful not to damage the oil pump plate.



34. INSTALL TRANSFER CASE PLUG

a. Install the relief valve seat, ball and compression spring to the oil pump plate.

b. Apply adhesive to the threads of the plug.

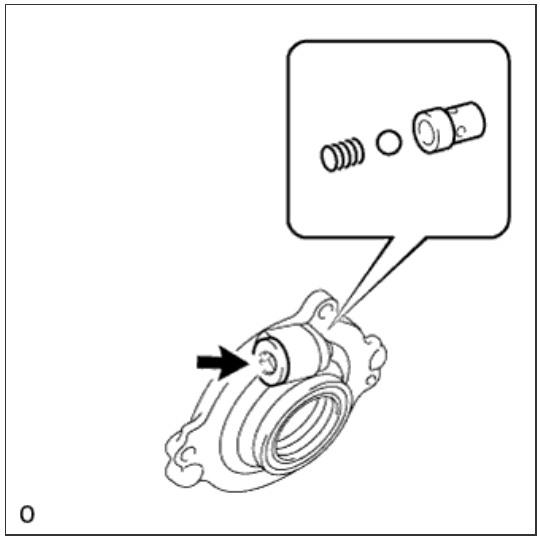
Adhesive:
Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

NOTICE:

Install the plug within 3 minutes of application.

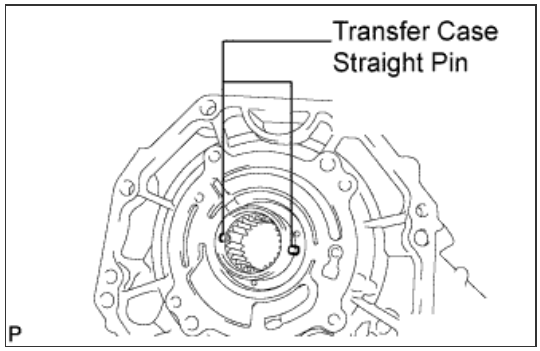
c. Using a 10 mm hexagon wrench, install the plug.

Torque:
29 N*m{ 300 kgf*cm , 22 ft.*lbf }



35. INSTALL TRANSFER CASE STRAIGHT PIN

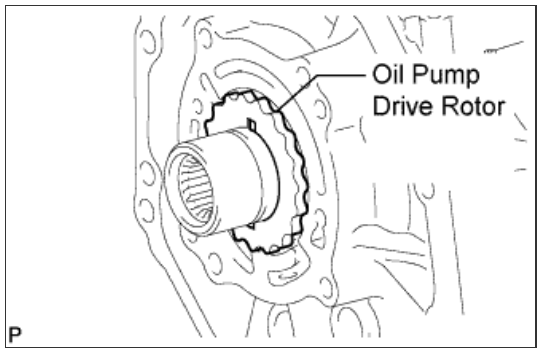
a. Install the 2 straight pins to the input shaft.



36. INSTALL TRANSFER OIL PUMP PLATE

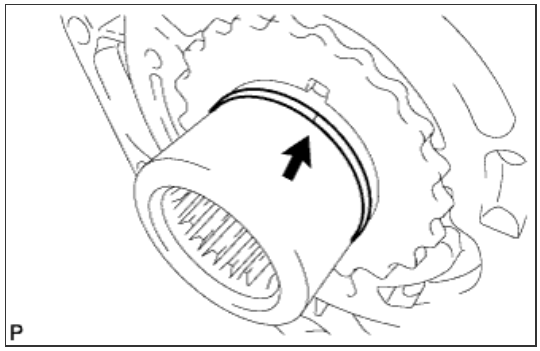
a. Apply transfer oil to a new O-ring, drive rotor, driven rotor and a new transfer oil seal ring.

b. Install the drive rotor to the input shaft.



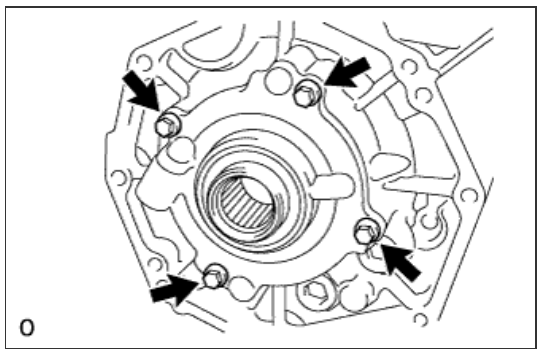
c. Install the transfer oil seal ring to the input shaft.

d. Install the O-ring to the oil pump plate.



e. Install the oil pump plate and driven rotor to the front transfer case with the 4 bolts.

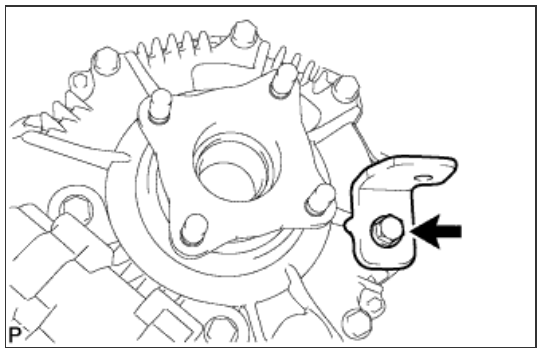
Torque:
12 N*m{ 117 kgf*cm , 9 ft.*lbf }



37. INSTALL PROPELLER SHAFT HEAT INSULATOR BRACKET SUB-ASSEMBLY

a. Install the bracket to the rear transfer case with the bolt.

Torque:
20 N*m{ 204 kgf*cm , 15 ft.*lbf }



for Preparation Click here

1. INSTALL TRANSFER ASSEMBLY

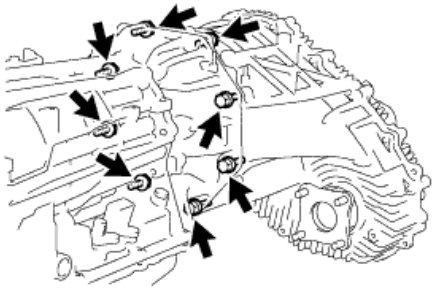
a. Install the transfer with the 8 bolts.

Torque:
40 N*m{ 408 kgf*cm , 30 ft.*lbf }

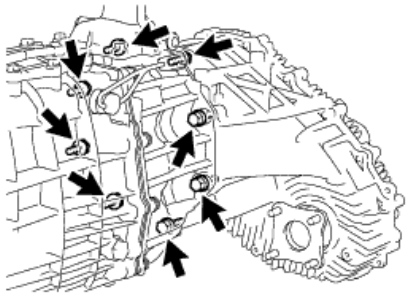
NOTICE:

Take care not to damage the adaptor oil seal with the transfer input shaft spline.

for A750F, AB60F:



for H150F:



2. INSTALL MANUAL TRANSMISSION WITH TRANSFER ASSEMBLY (for H150F)

(Click here)

3. INSTALL AUTOMATIC TRANSMISSION WITH TRANSFER ASSEMBLY (for AB60F)

a. for 1VD-FTV:
(Click here)

b. for 1UR-FE:
(Click here)

c. for 3UR-FE:
(Click here)

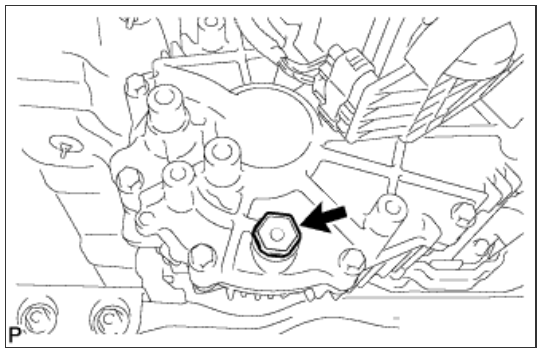
4. INSTALL AUTOMATIC TRANSMISSION WITH TRANSFER ASSEMBLY (for A750F)

(Click here)

5. ADD TRANSFER OIL

a. Install a new gasket onto the drain plug and then install the plug.

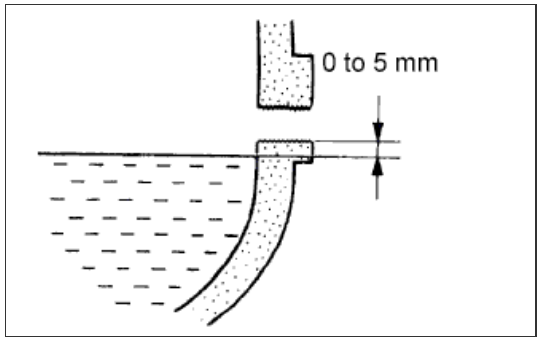
Torque:
37 N*m{ 377 kgf*cm , 27 ft.*lbf }



b. Add oil so that the oil level is between 0 to 5.0 mm (0 to 0.197 in.) from the bottom lip of the filler plug hole.

NOTICE:

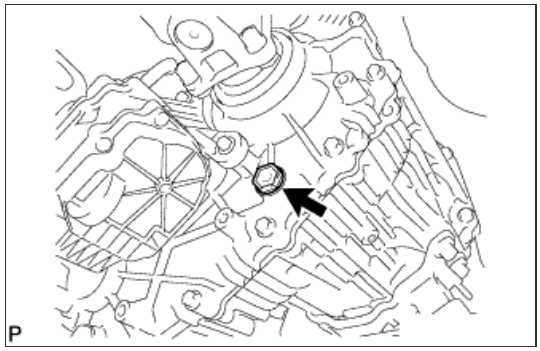
- **Add oil slowly.**
- **Add oil a little at a time, waiting several minutes between each addition of oil.**



c. Wait approximately 5 minutes and check that the oil level has not changed.

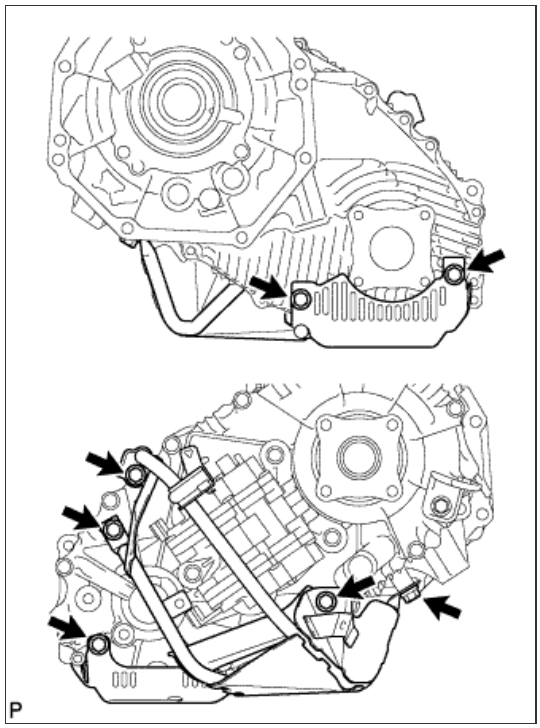
d. Install a new gasket onto the filler plug and then install the plug.

Torque:
37 N*m{ 377 kgf*cm , 27 ft.*lbf }



e. Install the lower transfer case protector with the 7 bolts.

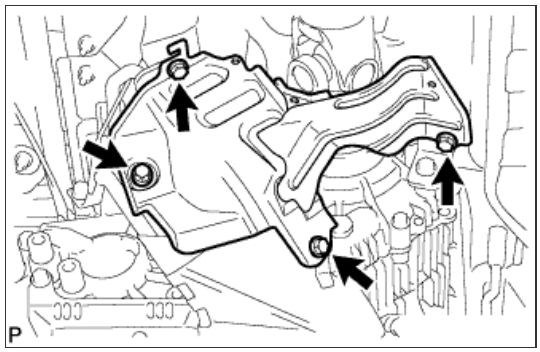
Torque:
14 N*m{ 139 kgf*cm , 10 ft.*lbf }



f. Install the transfer heat insulator with the 4 bolts.

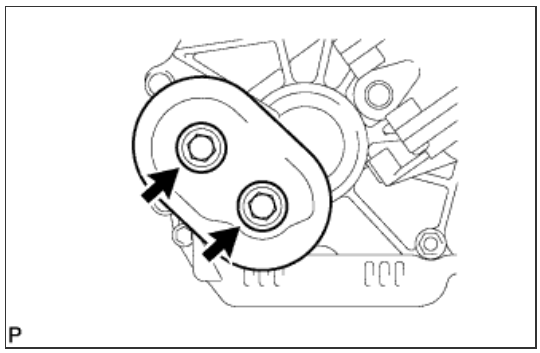
Torque:

30 N*m{ 306 kgf*cm , 22 ft.*lbf }



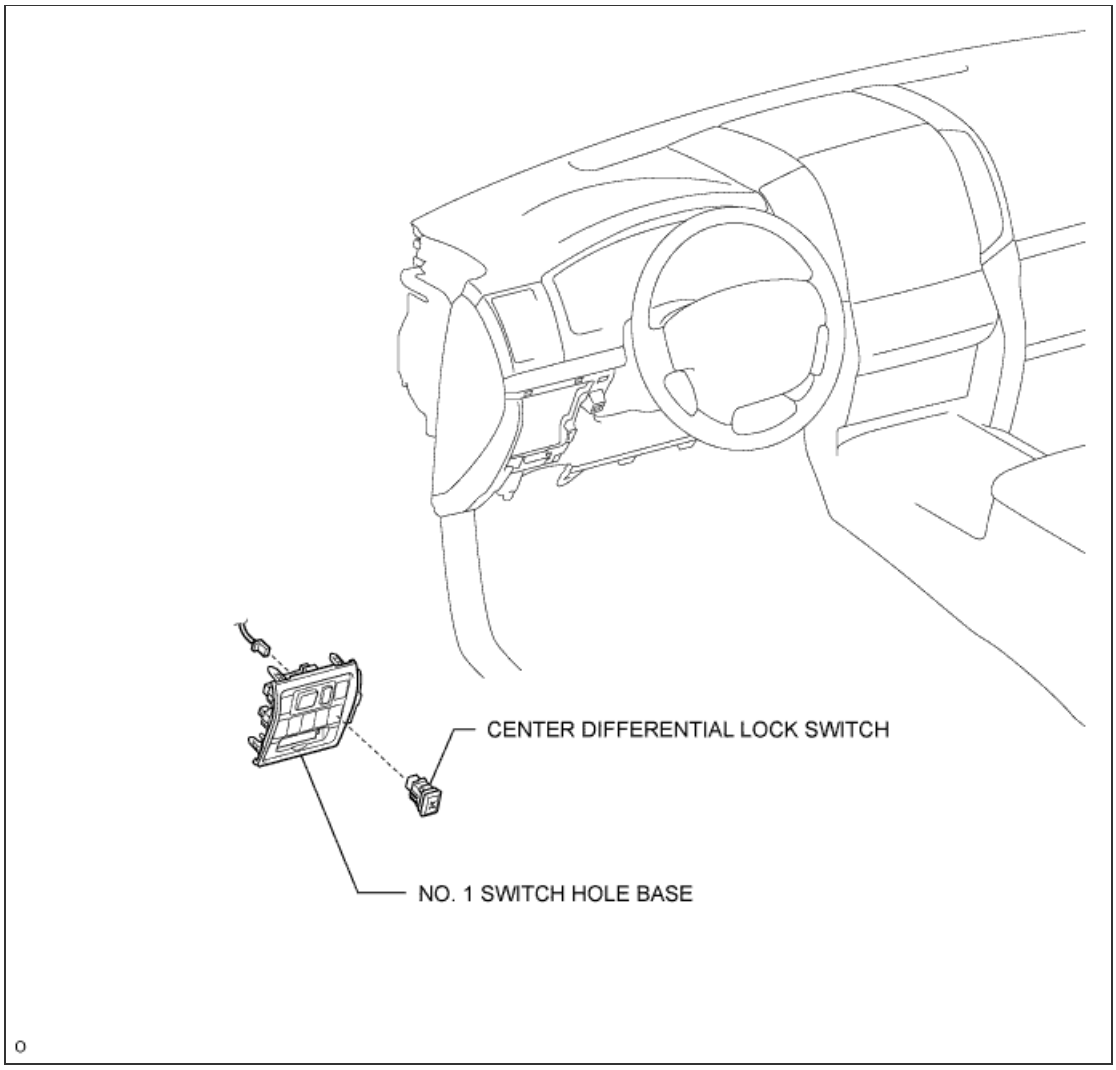
g. except 1GR-FE:
Install the transfer dynamic damper with the 2 bolts.

Torque:
12 N*m{ 122 kgf*cm , 9 ft.*lbf }



6. CHECK FOR TRANSFER OIL LEAK

for Preparation Click here



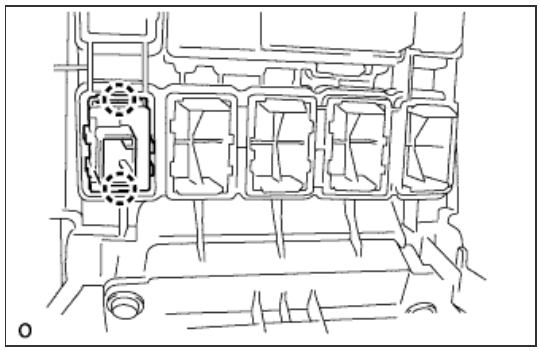
for Preparation Click here

1. REMOVE NO. 1 SWITCH HOLE BASE

(Click here)

2. REMOVE CENTER DIFFERENTIAL LOCK SWITCH

a. Detach the 2 claws to remove the switch.



for Preparation Click here

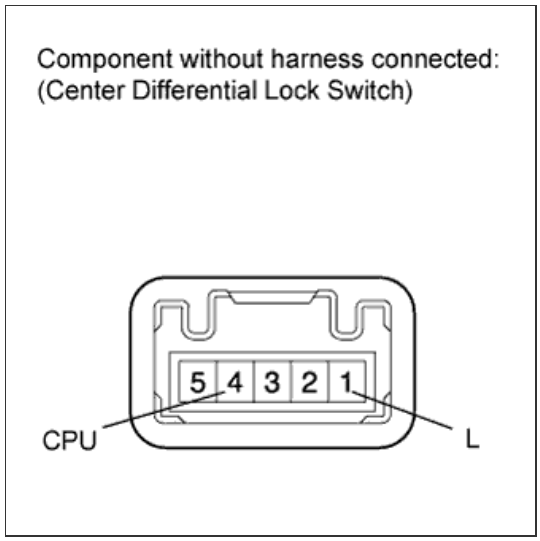
1. INSPECT CENTER DIFFERENTIAL LOCK SWITCH

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
1 (L) - 4 (CPU)	Switch pressed and held	Below 1 Ω
	Switch not pressed	100 kΩ or higher

If the result is not as specified, replace the center differential lock switch.



for Preparation Click here

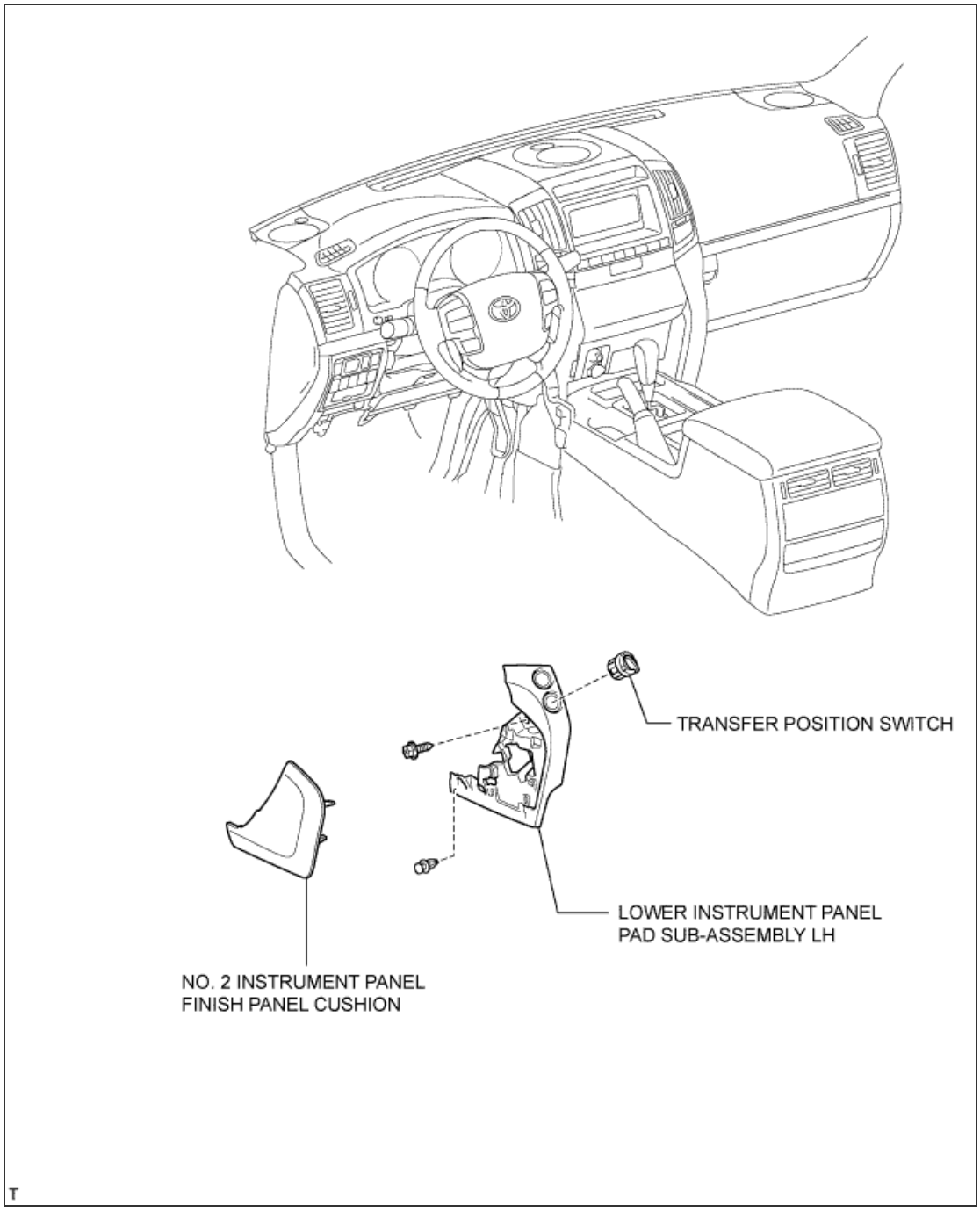
1. INSTALL CENTER DIFFERENTIAL LOCK SWITCH

a. Attach the 2 claws to install the switch.

2. INSTALL NO. 1 SWITCH HOLE BASE

(Click here)

for Preparation Click here



for Preparation Click here

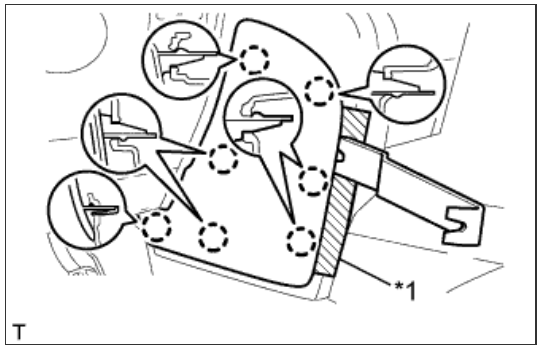
1. REMOVE NO. 2 INSTRUMENT PANEL FINISH PANEL CUSHION

a. Put protective tape around the No. 2 instrument panel finish panel cushion.

Text in Illustration

*1	Protective Tape

b. Using a moulding remover, detach the 7 claws and remove the No. 2 instrument panel finish panel cushion.

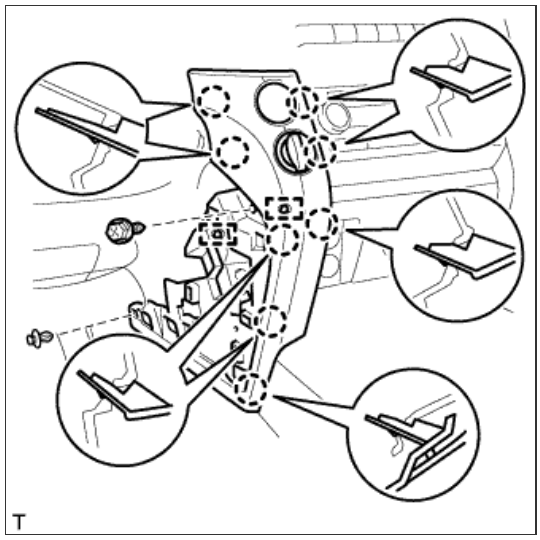


2. REMOVE LOWER INSTRUMENT PANEL PAD SUB-ASSEMBLY LH

a. Remove the clip and screw.

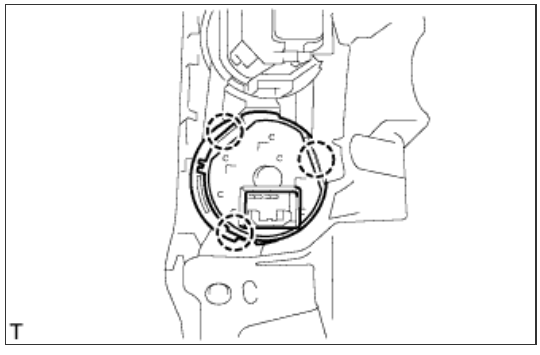
b. Detach the 8 claws.

c. Disconnect the connectors, detach the 2 clamps and remove the lower instrument panel pad sub-assembly.



3. REMOVE TRANSFER POSITION SWITCH

a. Detach the 3 claws to remove the switch.



for Preparation Click here

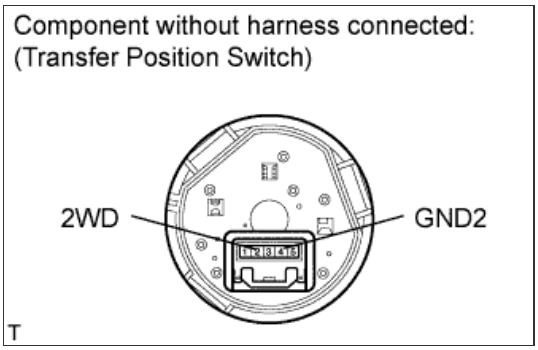
1. INSPECT TRANSFER POSITION SWITCH

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
2 (2WD) - 4 (GND2)	H4 Position	100 kΩ or higher
	L4 Position	Below 1 Ω

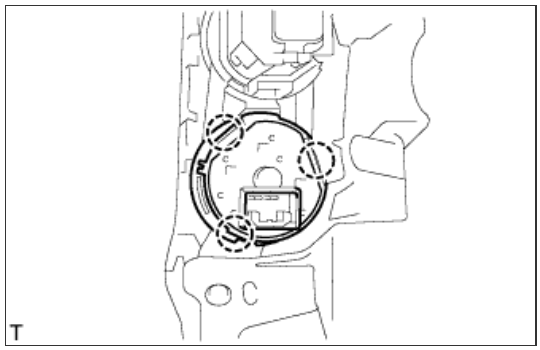
If the result is not as specified, replace the transfer position switch.



for Preparation Click here

1. INSTALL TRANSFER POSITION SWITCH

a. Attach the 3 claws to install the switch.

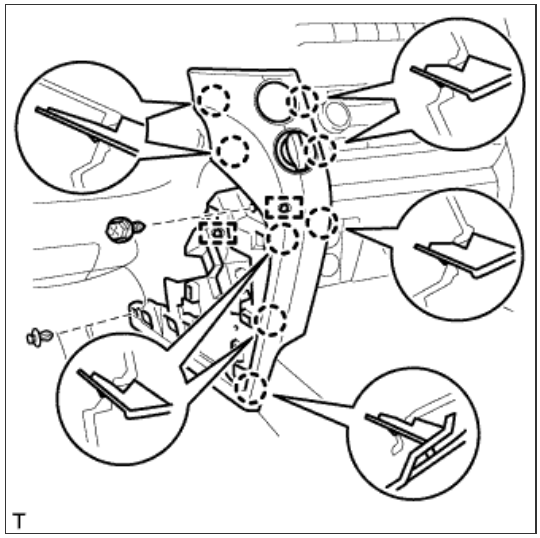


2. INSTALL LOWER INSTRUMENT PANEL PAD SUB-ASSEMBLY LH

a. Connect the connectors and attach the 2 clamps.

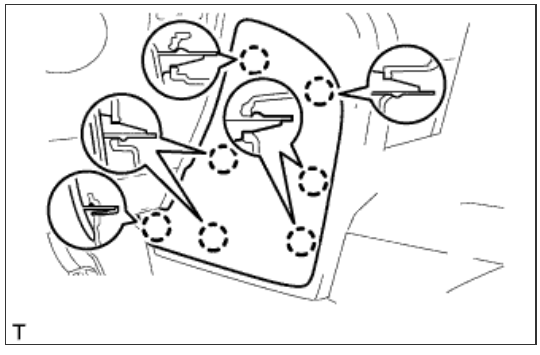
b. Attach the 8 claws to install the lower instrument panel pad sub-assembly.

c. Install the clip and screw.

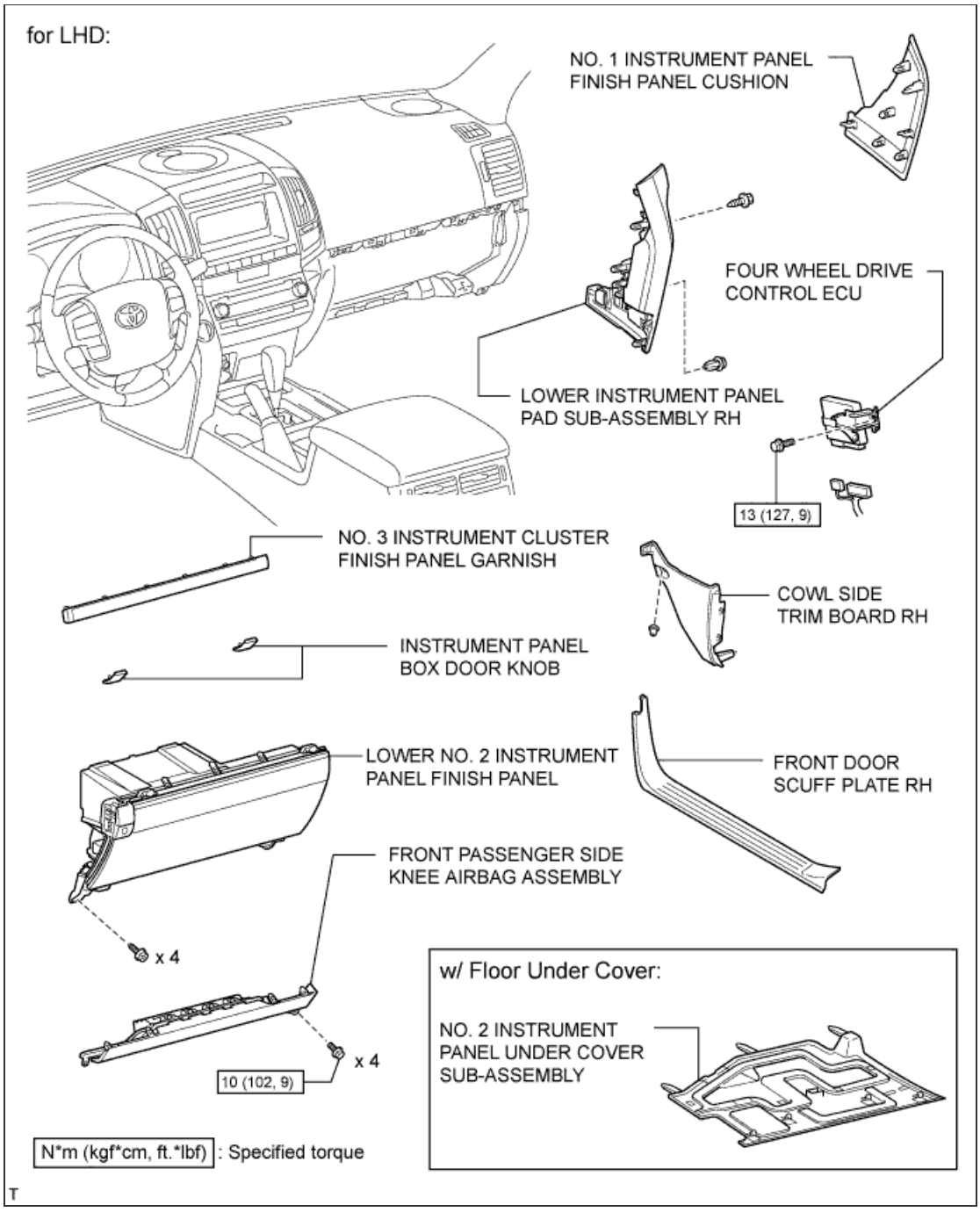


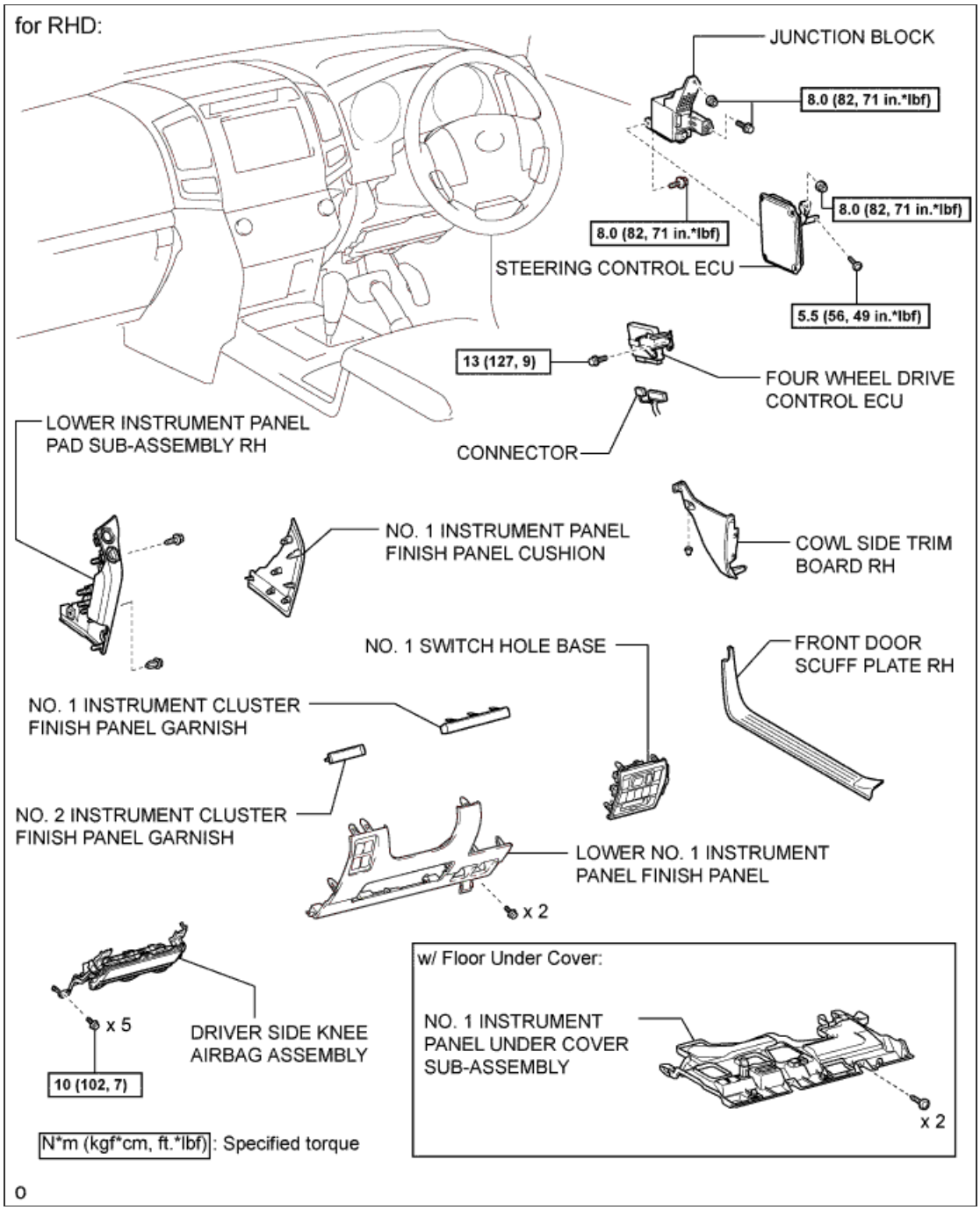
3. INSTALL NO. 2 INSTRUMENT PANEL FINISH PANEL CUSHION

a. Attach the 7 claws to install the No. 2 instrument panel finish panel cushion.



for Preparation Click here




for RHD:
JUNCTION BLOCK
8.0 (82, 71 in.*lbf)
8.0 (82, 71 in.*lbf)
8.0 (82, 71 in.*lbf)
STEERING CONTROL ECU
5.5 (56, 49 in.*lbf)
13 (127, 9)
FOUR WHEEL DRIVE CONTROL ECU
CONNECTOR
LOWER INSTRUMENT PANEL PAD SUB-ASSEMBLY RH
NO. 1 INSTRUMENT PANEL FINISH PANEL CUSHION
COWL SIDE TRIM BOARD RH
NO. 1 SWITCH HOLE BASE
FRONT DOOR SCUFF PLATE RH
NO. 1 INSTRUMENT CLUSTER FINISH PANEL GARNISH
NO. 2 INSTRUMENT CLUSTER FINISH PANEL GARNISH
LOWER NO. 1 INSTRUMENT PANEL FINISH PANEL
x 2
x 5
DRIVER SIDE KNEE AIRBAG ASSEMBLY
10 (102, 7)
w/ Floor Under Cover:
NO. 1 INSTRUMENT PANEL UNDER COVER SUB-ASSEMBLY
x 2
N*m (kgf*cm, ft.*lbf): Specified torque

o

for Preparation Click here

1. PRECAUTION

NOTICE:

After turning the ignition switch off, waiting time may be required before disconnecting the cable from the negative (-) battery terminal. Therefore, make sure to read the disconnecting the cable from the negative (-) battery terminal notice before proceeding with work (Click here).

2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

NOTICE:

When disconnecting the cable, some systems need to be initialized after the cable is reconnected (Click here).

3. REMOVE FRONT DOOR SCUFF PLATE RH

HINT:

Use the same procedures described for the LH side.

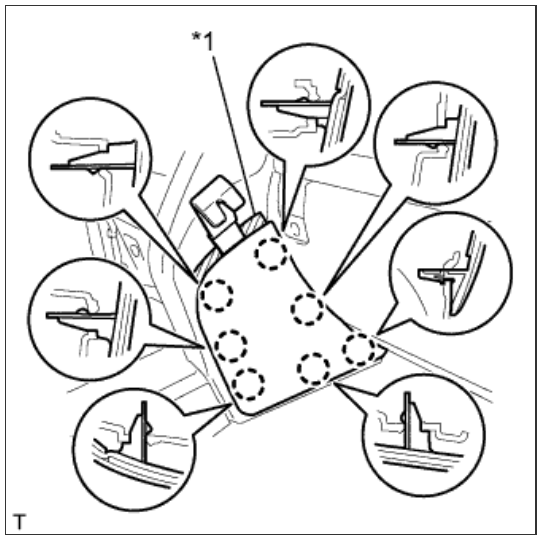
4. REMOVE NO. 1 INSTRUMENT PANEL FINISH PANEL CUSHION

a. Put protective tape around the No. 1 instrument panel finish panel cushion.

Text in Illustration

*1	Protective Tape

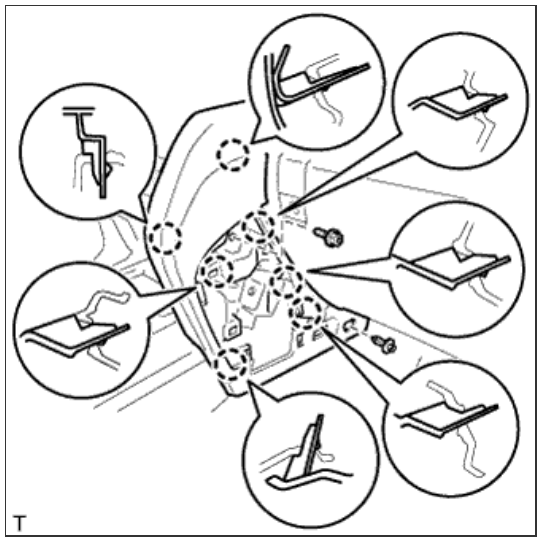
b. Using a moulding remover, detach the 7 claws and remove the No. 1 instrument panel finish panel cushion.



5. REMOVE LOWER INSTRUMENT PANEL PAD SUB-ASSEMBLY RH

a. Remove the clip and screw.

b. Detach the 7 claws and remove the lower instrument panel pad sub-assembly.



6. REMOVE NO. 2 INSTRUMENT PANEL UNDER COVER SUB-ASSEMBLY (for LHD)

w/ Floor Under Cover: (Click here)

7. REMOVE FRONT PASSENGER SIDE KNEE AIRBAG ASSEMBLY (for LHD)

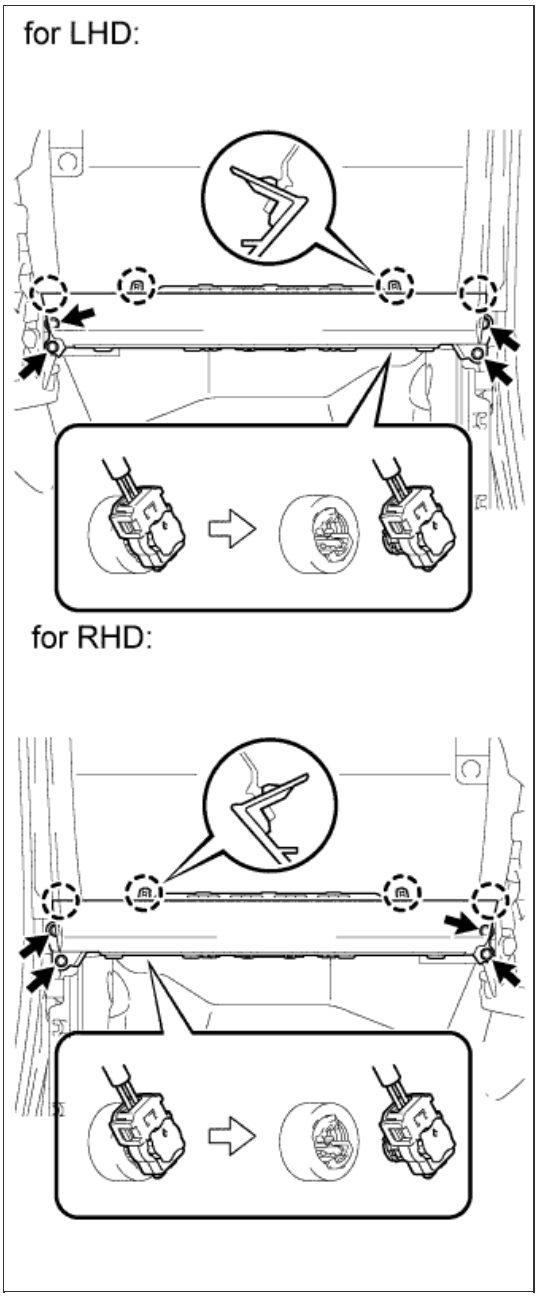
a. Remove the 4 bolts.

b. Detach the 4 claws and remove the front passenger side knee airbag.

c. Disconnect the connector.

NOTICE:

When handling the airbag connector, take care not to damage the airbag wire harness.



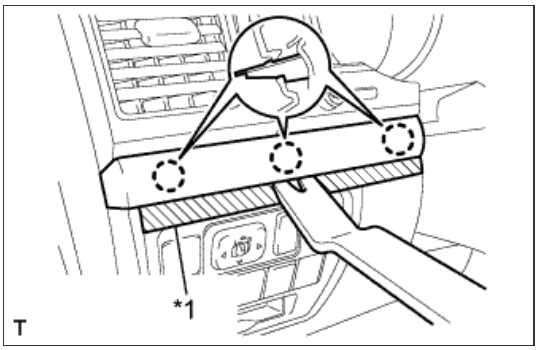
8. REMOVE NO. 1 INSTRUMENT CLUSTER FINISH PANEL GARNISH (for RHD)

a. Place protective tape as shown in the illustration.

Text in Illustration

*1	Protective Tape

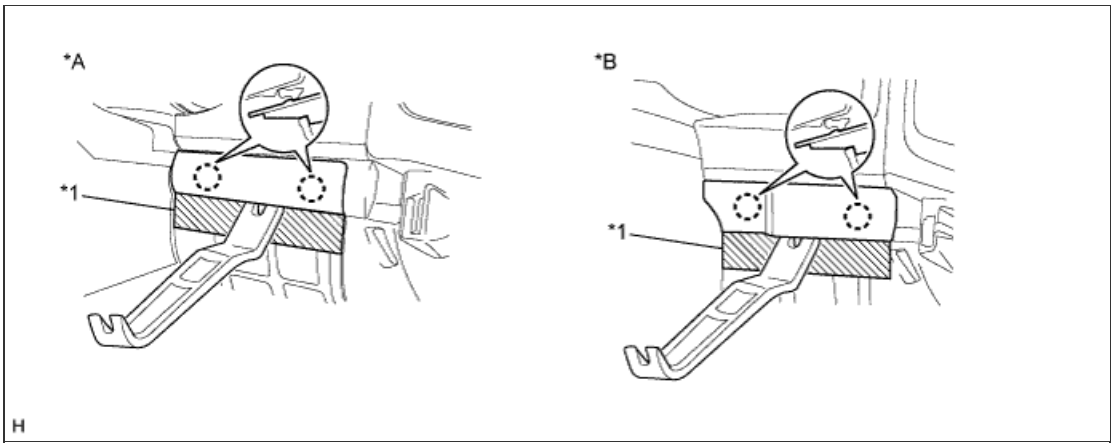
b. Using a moulding remover, detach the 3 claws and remove the No. 1 instrument cluster finish panel garnish.



9. REMOVE NO. 2 INSTRUMENT CLUSTER FINISH PANEL GARNISH (for RHD)

a. Place protective tape as shown in the illustration.

b. Using a moulding remover, detach the 2 claws and remove the No. 2 instrument cluster finish panel garnish.



Text in Illustration

*A	w/ Entry and Start System	*B	w/o Entry and Start System
*1	Protective Tape	-	-

10. REMOVE NO. 1 INSTRUMENT PANEL UNDER COVER SUB-ASSEMBLY (for RHD)

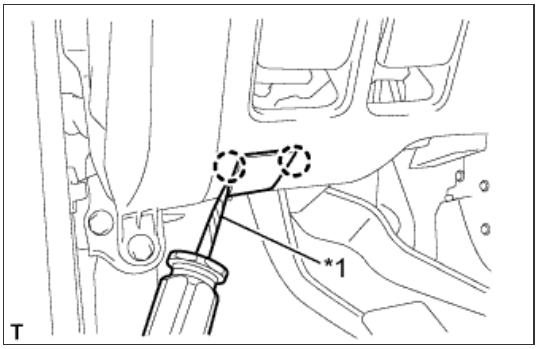
w/ Floor Under Cover: (Click here)

11. REMOVE LOWER NO. 1 INSTRUMENT PANEL FINISH PANEL (for RHD)

a. Using a screwdriver, detach the 2 claws and open the hole cover.

HINT:

Tape the screwdriver tip before use.



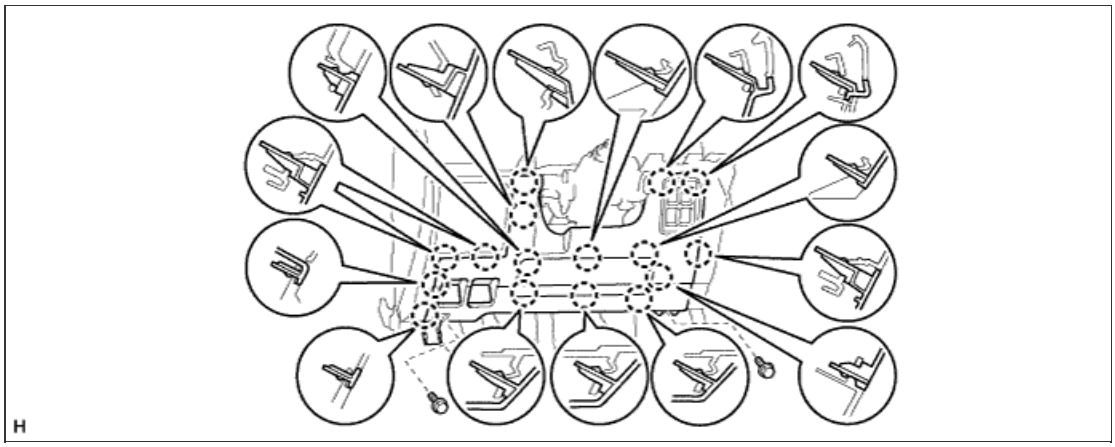
Text in Illustration

*1	Protective Tape

b. w/ Driver Side Knee Airbag:

i. Remove the 2 bolts.

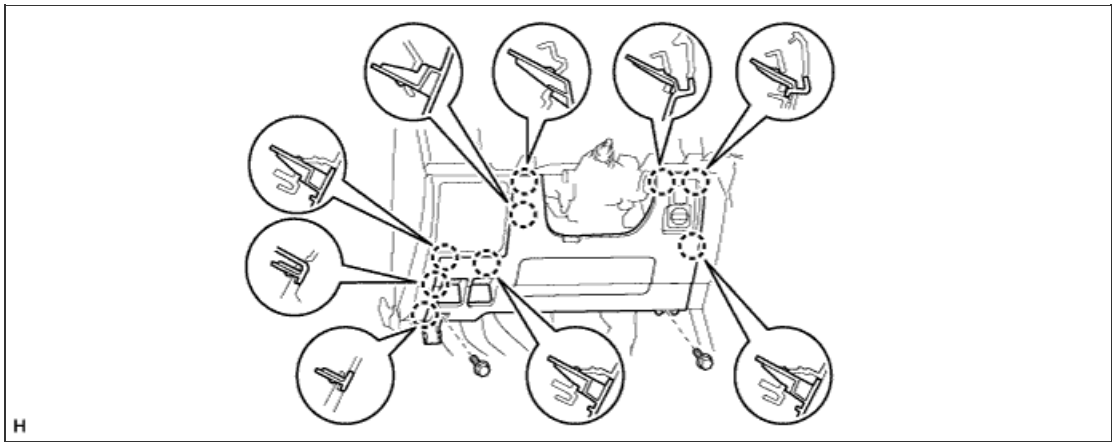
ii. Detach the 16 claws.



c. w/o Driver Side Knee Airbag:

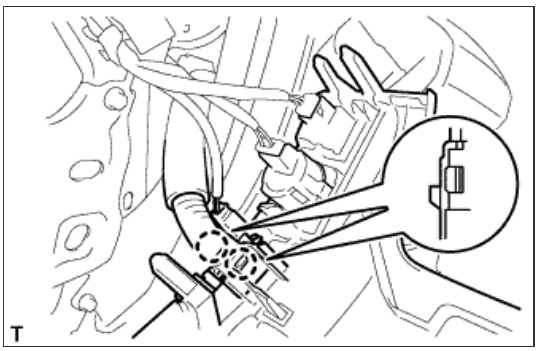
i. Remove the 2 bolts.

ii. Detach the 9 claws.



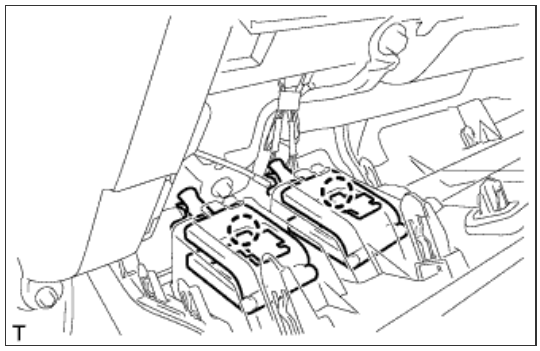
d. for Automatic Air Conditioning System:

i. Detach the 2 claws and remove the room temperature sensor.



e. Detach the 2 claws and disconnect the 2 control cables.

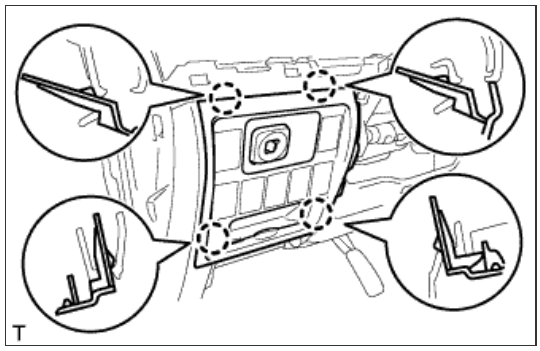
f. Disconnect the connectors and remove the lower No. 1 instrument panel finish panel.



12. REMOVE NO. 1 SWITCH HOLE BASE (for RHD)

a. Detach the 4 claws.

b. Disconnect the connectors and remove the No. 1 switch hole cover.



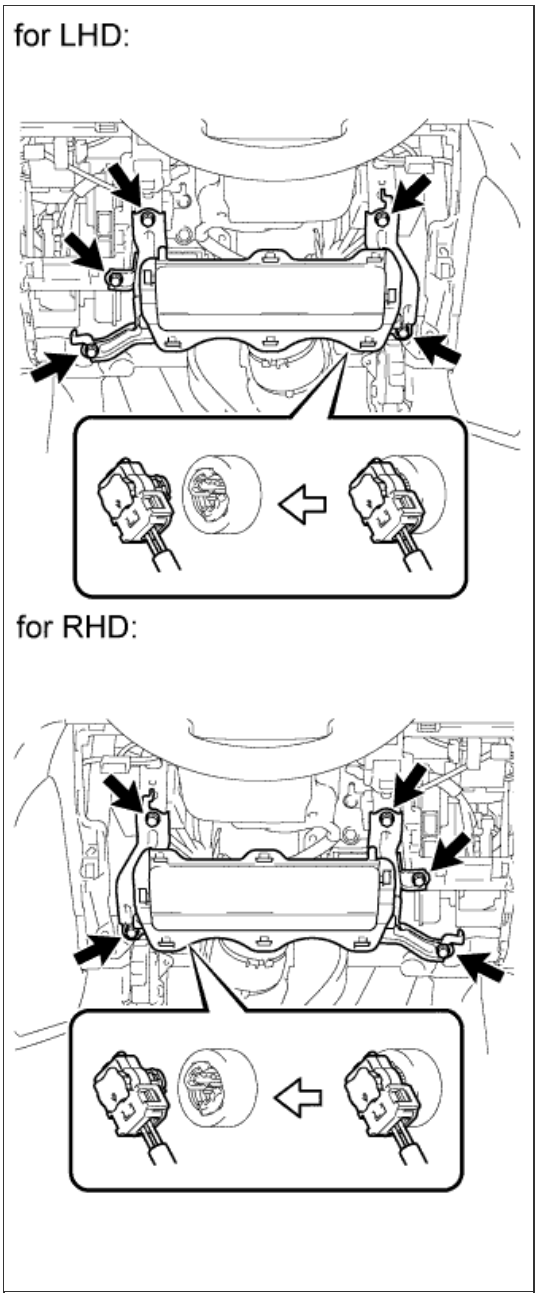
13. REMOVE DRIVER SIDE KNEE AIRBAG ASSEMBLY (for RHD)

a. Remove the 5 bolts and driver side knee airbag.

b. Disconnect the connector.

NOTICE:

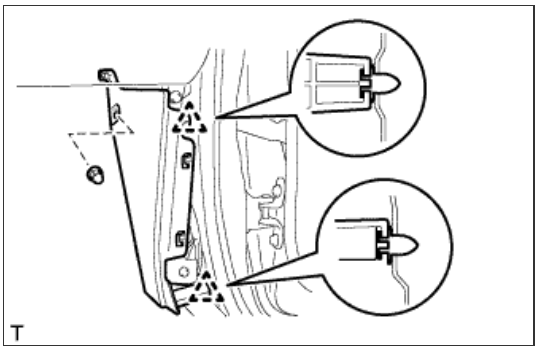
When handling the airbag connector, take care not to damage the airbag wire harness.



14. REMOVE COWL SIDE TRIM BOARD RH

a. Remove the cap nut.

b. Detach the 2 clips and remove the cowl side trim board.



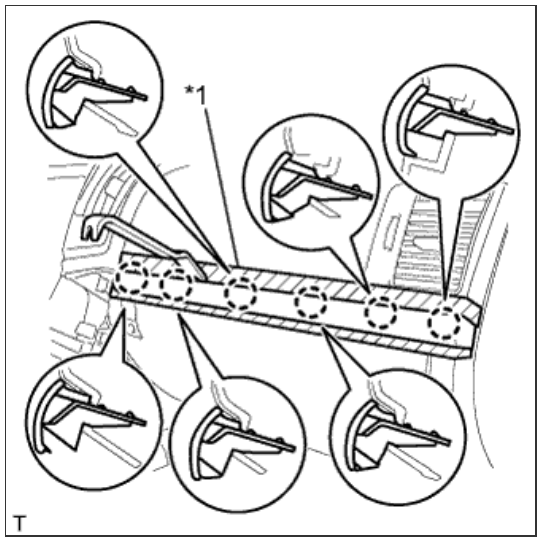
15. REMOVE NO. 3 INSTRUMENT CLUSTER FINISH PANEL GARNISH (for LHD)

a. Place protective tape as shown in the illustration.

Text in Illustration

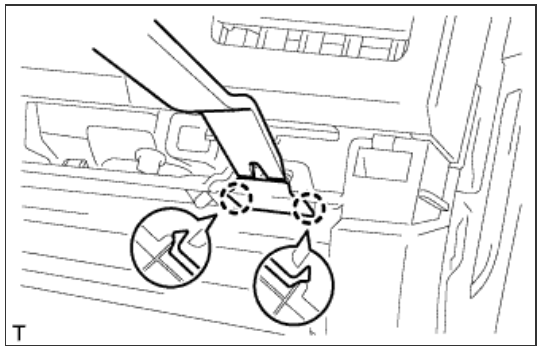
*1	Protective Tape

b. Using a moulding remover, detach the 6 claws and remove the No. 3 instrument cluster finish panel garnish.



16. REMOVE INSTRUMENT PANEL BOX DOOR KNOB (for LHD)

a. Using a moulding remover, detach the 2 claws and remove the instrument panel box door knob.

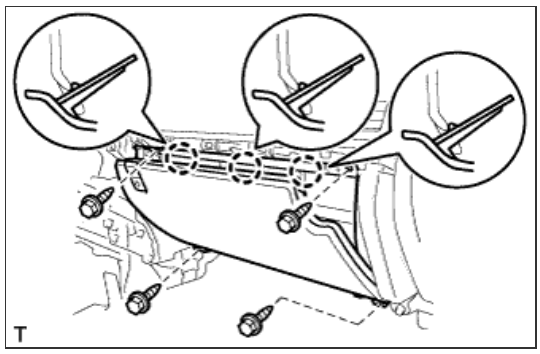


17. REMOVE LOWER NO. 2 INSTRUMENT PANEL FINISH PANEL (for LHD)

a. Remove the 4 bolts.

b. Detach the 3 claws.

c. Disconnect the connector and remove the lower No. 2 instrument panel finish panel.



18. REMOVE STEERING CONTROL WITH JUNCTION BLOCK (for RHD)

a. Rear side:

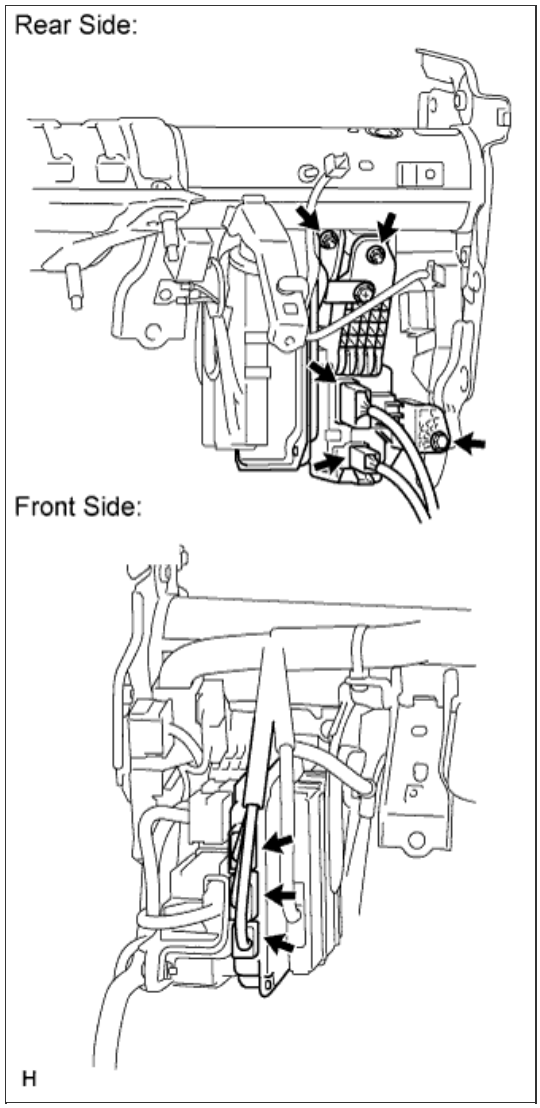
i. Disconnect the 2 connectors.

ii. Remove the bolt and 2 nuts.

b. Front side:

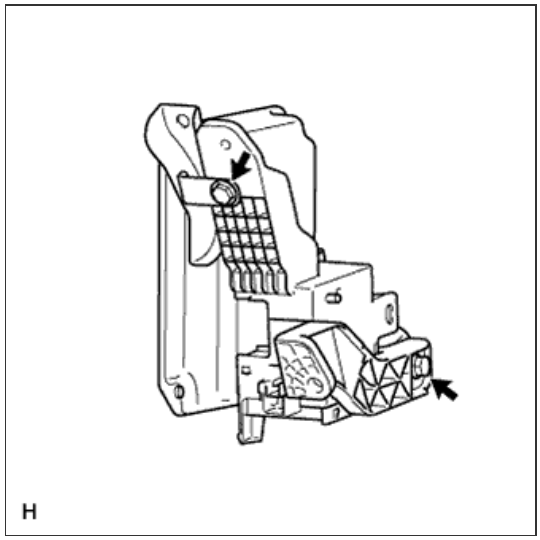
i. Disconnect the 3 connectors.

c. Remove the steering control ECU with the junction block.



19. REMOVE STEERING CONTROL ECU (for RHD)

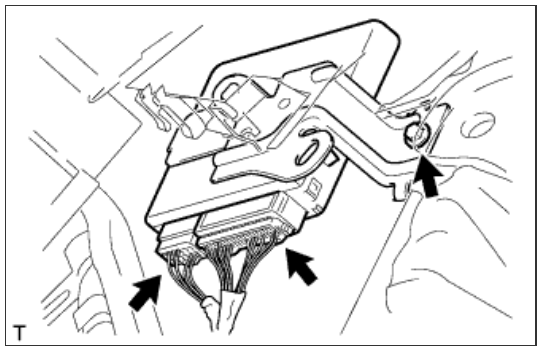
a. Remove the 2 bolts and separate the steering control ECU from the junction block.



20. REMOVE FOUR WHEEL DRIVE CONTROL ECU

a. Disconnect the 2 ECU connectors.

b. Remove the bolt and ECU.



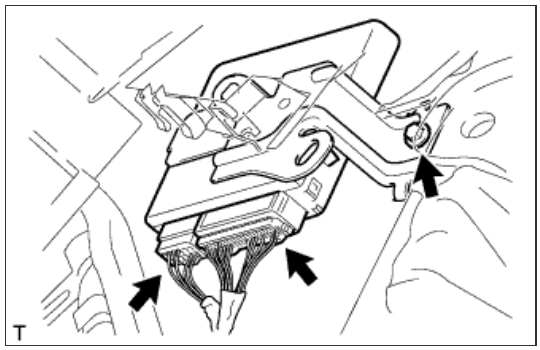
for Preparation Click here

1. INSTALL FOUR WHEEL DRIVE CONTROL ECU

a. Install the ECU with the bolt.

Torque:
13 N*m{ 127 kgf*cm , 9 ft.*lbf }

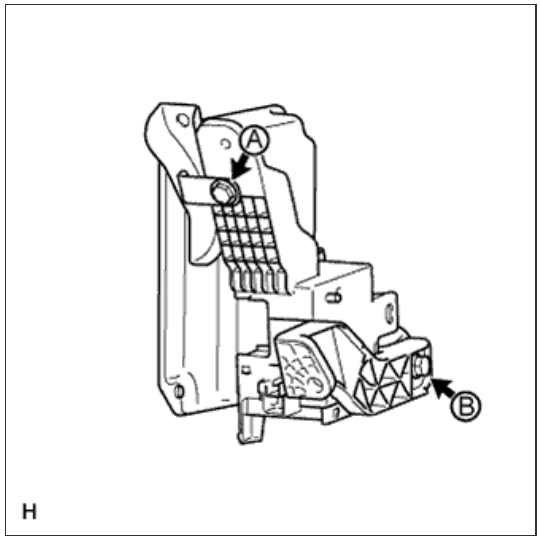
b. Connect the 2 ECU connectors.



2. INSTALL STEERING CONTROL ECU (for RHD)

a. Install the steering control ECU to the junction block with the 2 bolts.

Torque:
for bolt A:
5.5 N*m{ 56 kgf*cm , 49 in.*lbf }
for bolt B:
8.0 N*m{ 82 kgf*cm , 71 in.*lbf }



3. INSTALL STEERING CONTROL WITH JUNCTION BLOCK (for RHD)

a.

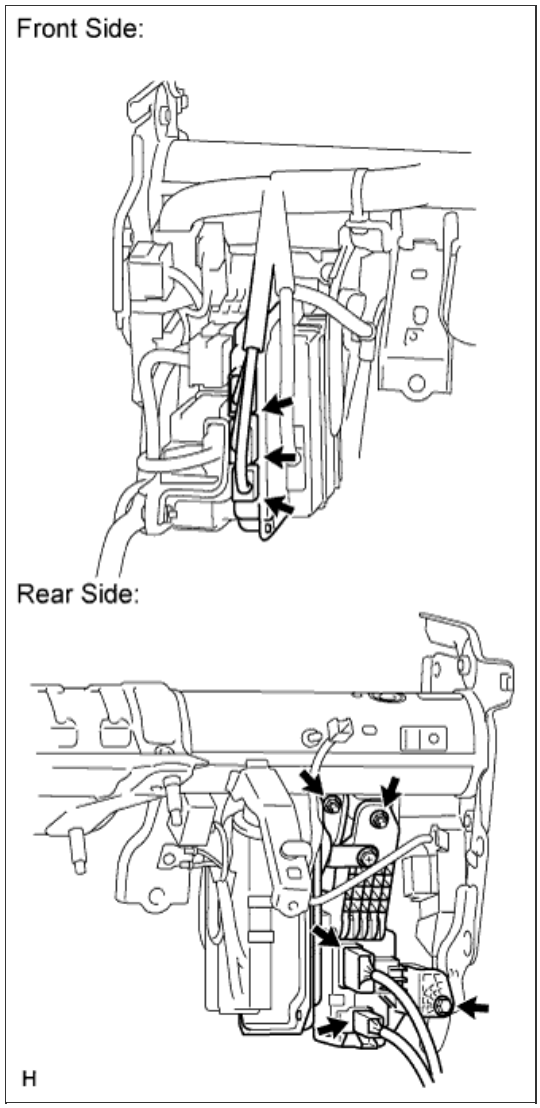
i. Front side:
Connect the 3 connectors.

b. Rear side:

i. Install the steering control ECU with junction block with the bolt and 2 nuts.

Torque:
8.0 N*m{ 82 kgf*cm , 71 in.*lbf }

ii. Connect the 2 connectors.

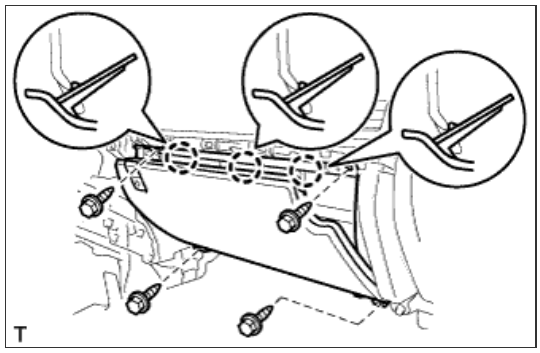


4. INSTALL LOWER NO. 2 INSTRUMENT PANEL FINISH PANEL (for LHD)

a. Connect the connector.

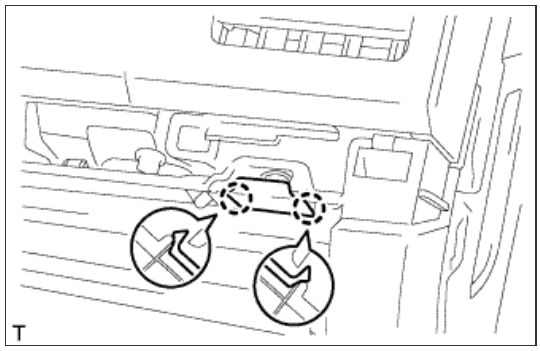
b. Attach the 3 claws to install the lower No. 2 instrument panel finish panel.

c. Install the 4 bolts.



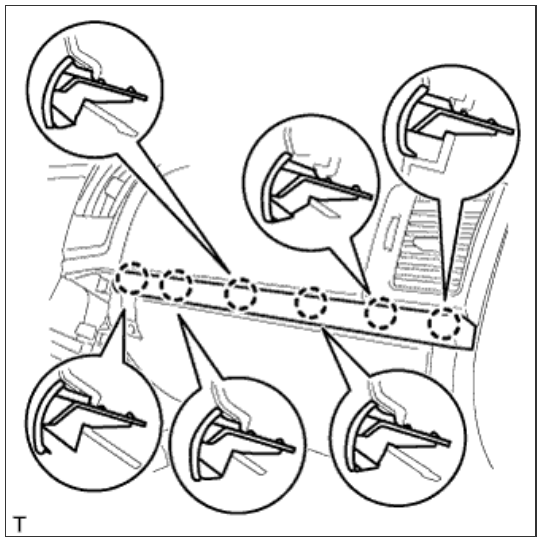
5. INSTALL INSTRUMENT PANEL BOX DOOR KNOB (for LHD)

a. Attach the 2 claws to install the instrument panel box door knob.



6. INSTALL NO. 3 INSTRUMENT CLUSTER FINISH PANEL GARNISH (for LHD)

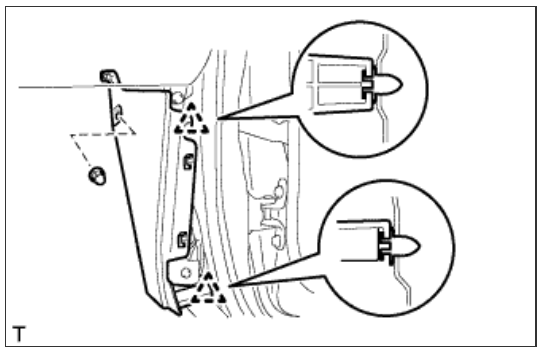
a. Attach the 6 claws to install the No. 3 instrument cluster finish panel garnish.



7. INSTALL COWL SIDE TRIM BOARD RH

a. Attach the 2 clips to install the cowl side trim board.

b. Install the cap nut.



8. INSTALL DRIVER SIDE KNEE AIRBAG ASSEMBLY (for RHD)

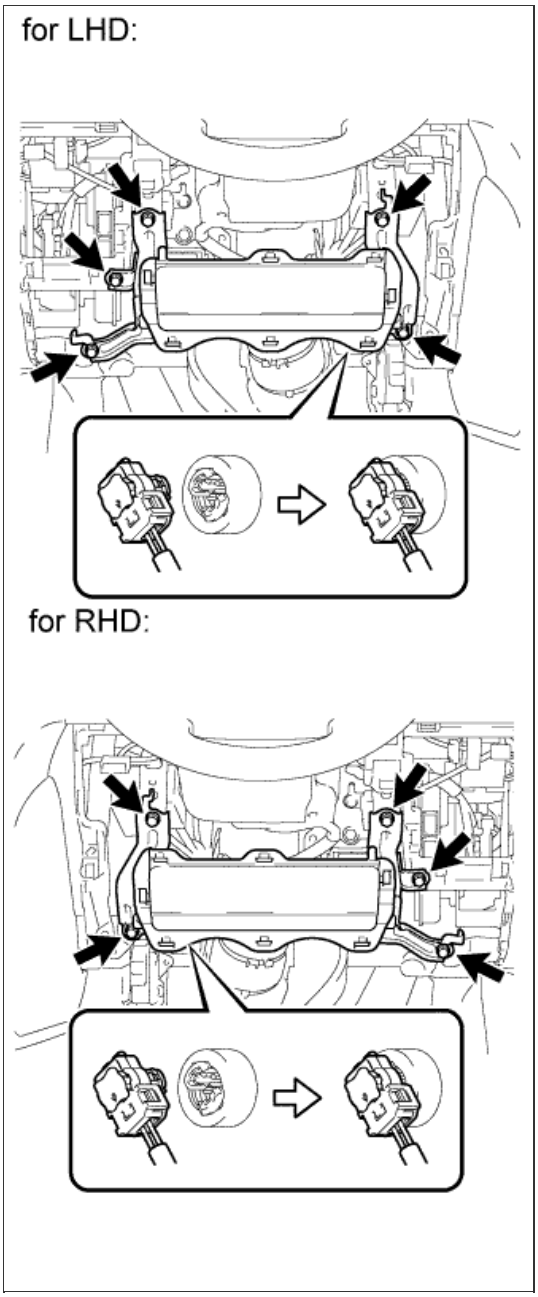
a. Connect the connector.

NOTICE:

When handling the airbag connector, take care not to damage the airbag wire harness.

b. Install the driver side knee airbag with the 5 bolts.

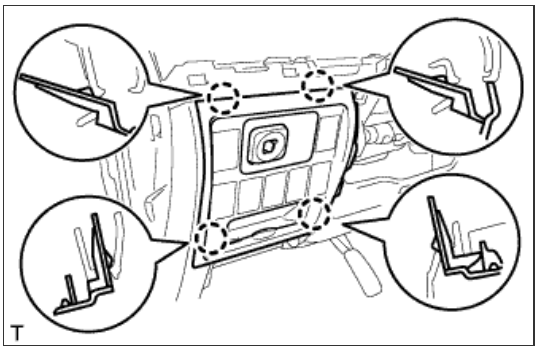
Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }



9. INSTALL NO. 1 SWITCH HOLE BASE (for RHD)

a. Connect the connectors.

b. Attach the 4 claws to install the No. 1 switch hole base.

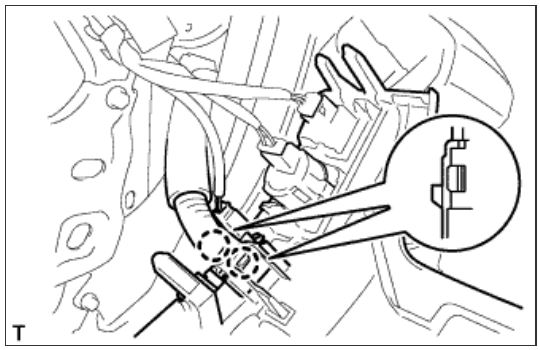


10. INSTALL LOWER NO. 1 INSTRUMENT PANEL FINISH PANEL (for RHD)

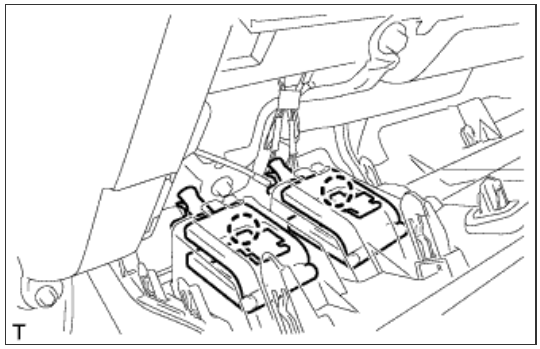
a. Connect the connectors.

b. for Automatic Air Conditioning System:

i. Attach the 2 claws to install the room temperature sensor.



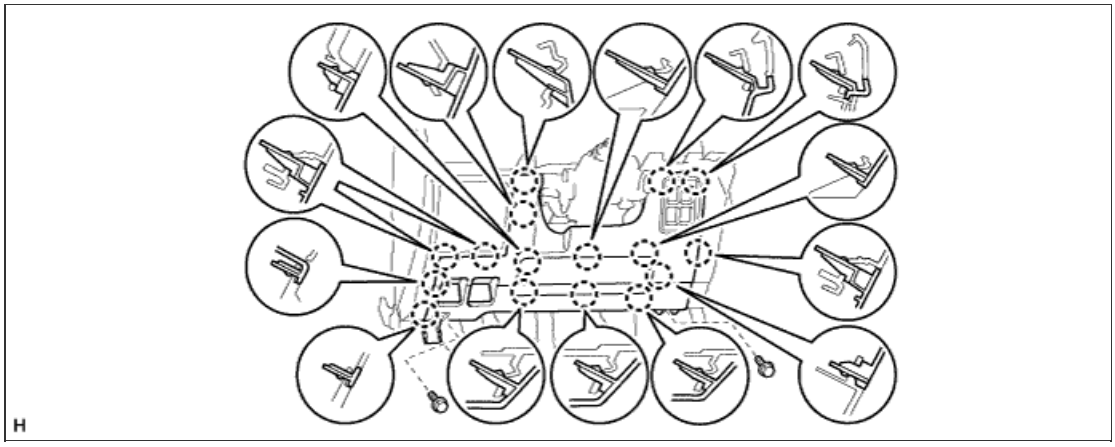
c. Attach the 2 claws to connect the 2 control cables.



d. w/ Driver Side Knee Airbag:

i. Attach the 16 claws to install the lower No. 1 instrument panel finish panel.

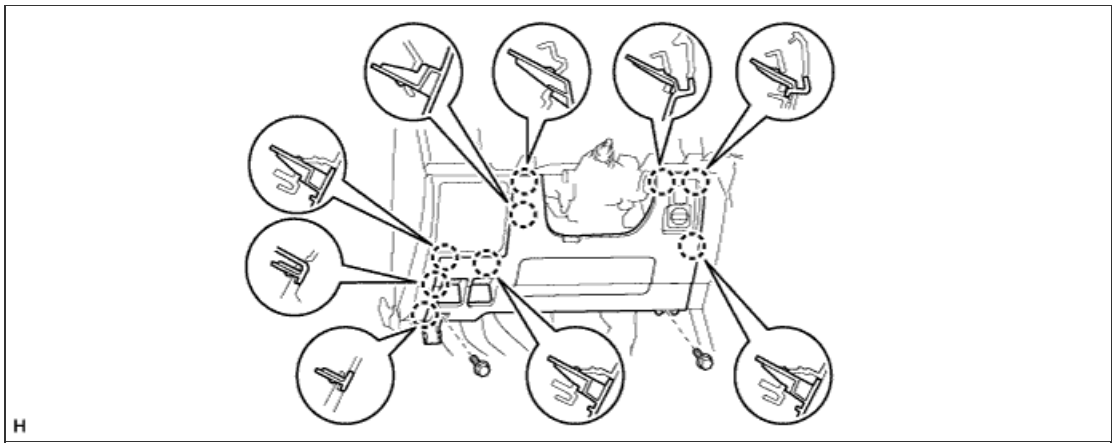
ii. Install the 2 bolts.



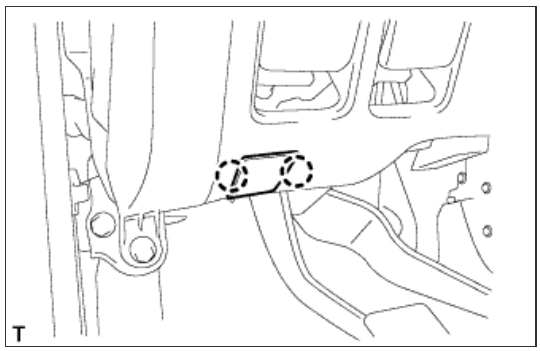
e. w/o Driver Side Knee Airbag:

i. Attach the 9 claws to install the lower No. 1 instrument panel finish panel.

ii. Install the 2 bolts.



f. Attach the 2 claws to close the hole cover.

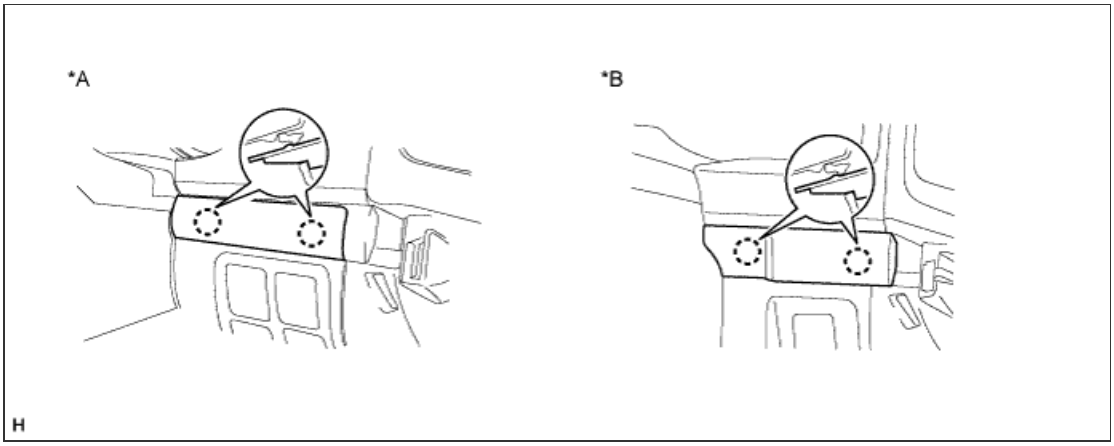


11. INSTALL NO. 1 INSTRUMENT PANEL UNDER COVER SUB-ASSEMBLY (for RHD)

w/ Floor Under Cover: (Click here)

12. INSTALL NO. 2 INSTRUMENT CLUSTER FINISH PANEL GARNISH (for RHD)

a. Attach the 2 claws to install the No. 2 instrument cluster finish panel garnish.

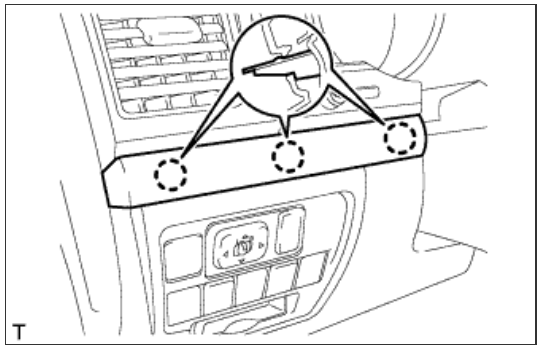


Text in Illustration

*A	w/ Entry and Start System	*B	w/o Entry and Start System

13. INSTALL NO. 1 INSTRUMENT CLUSTER FINISH PANEL GARNISH (for RHD)

a. Attach the 3 claws to install the No. 1 instrument cluster finish panel garnish.



14. INSTALL FRONT PASSENGER SIDE KNEE AIRBAG ASSEMBLY (for LHD)

a. Connect the connector.

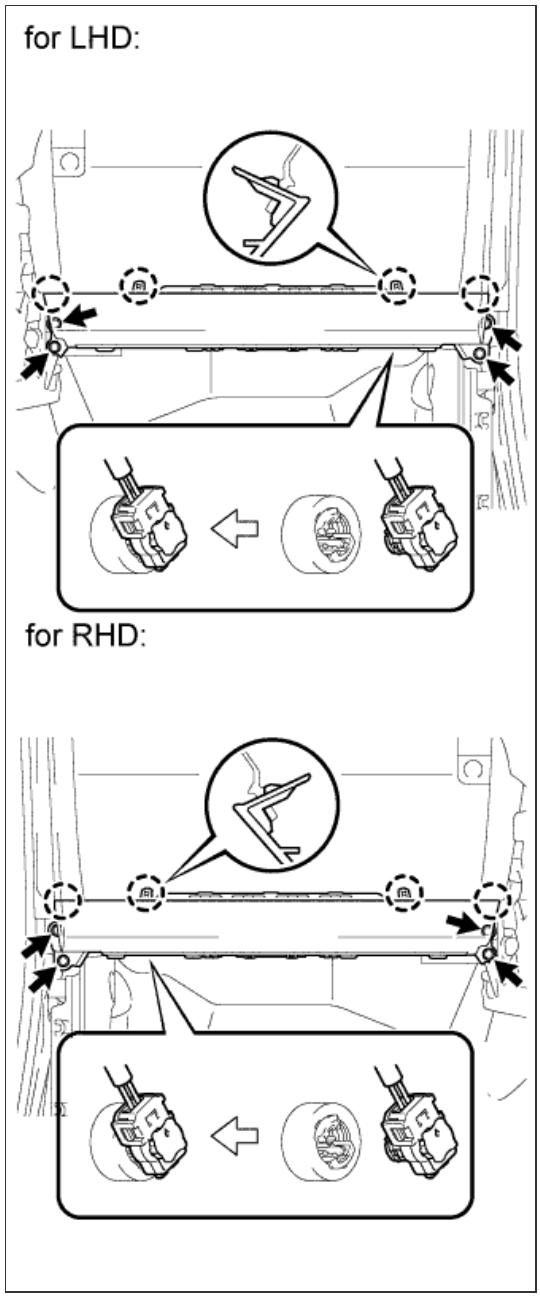
NOTICE:

When handling the airbag connector, take care not to damage the airbag wire harness.

b. Attach the 4 claws to install the front passenger side knee airbag.

c. Install the 4 bolts.

Torque:
10 N*m{ 102 kgf*cm , 7 ft.*lbf }



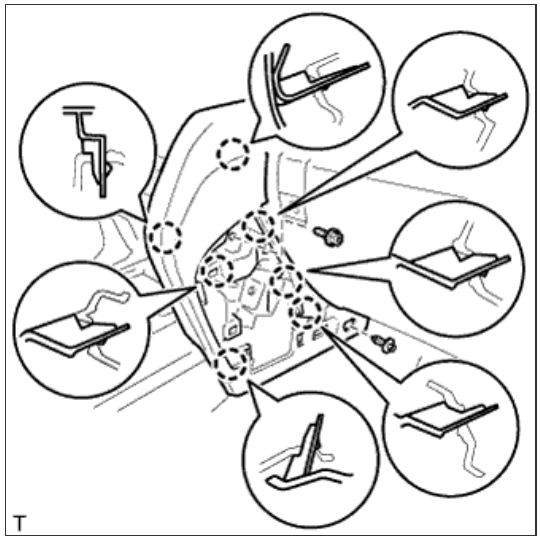
15. INSTALL NO. 2 INSTRUMENT PANEL UNDER COVER SUB-ASSEMBLY (for LHD)

w/ Floor Under Cover: (Click here)

16. INSTALL LOWER INSTRUMENT PANEL PAD SUB-ASSEMBLY RH

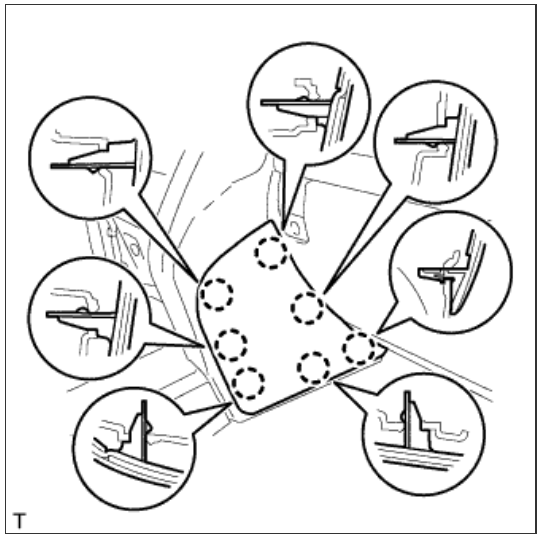
a. Attach the 7 claws to install the lower instrument panel pad sub-assembly.

b. Install the clip and screw.



17. INSTALL NO. 1 INSTRUMENT PANEL FINISH PANEL CUSHION

a. Attach the 7 claws to install the No. 1 instrument panel finish panel cushion.



18. INSTALL FRONT DOOR SCUFF PLATE RH

HINT:

Use the same procedures described for the LH side.

19. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

NOTICE:

When disconnecting the cable, some systems need to be initialized after the cable is reconnected (Click here).

20. CHECK SRS WARNING LIGHT

(Click here)

for Preparation Click here

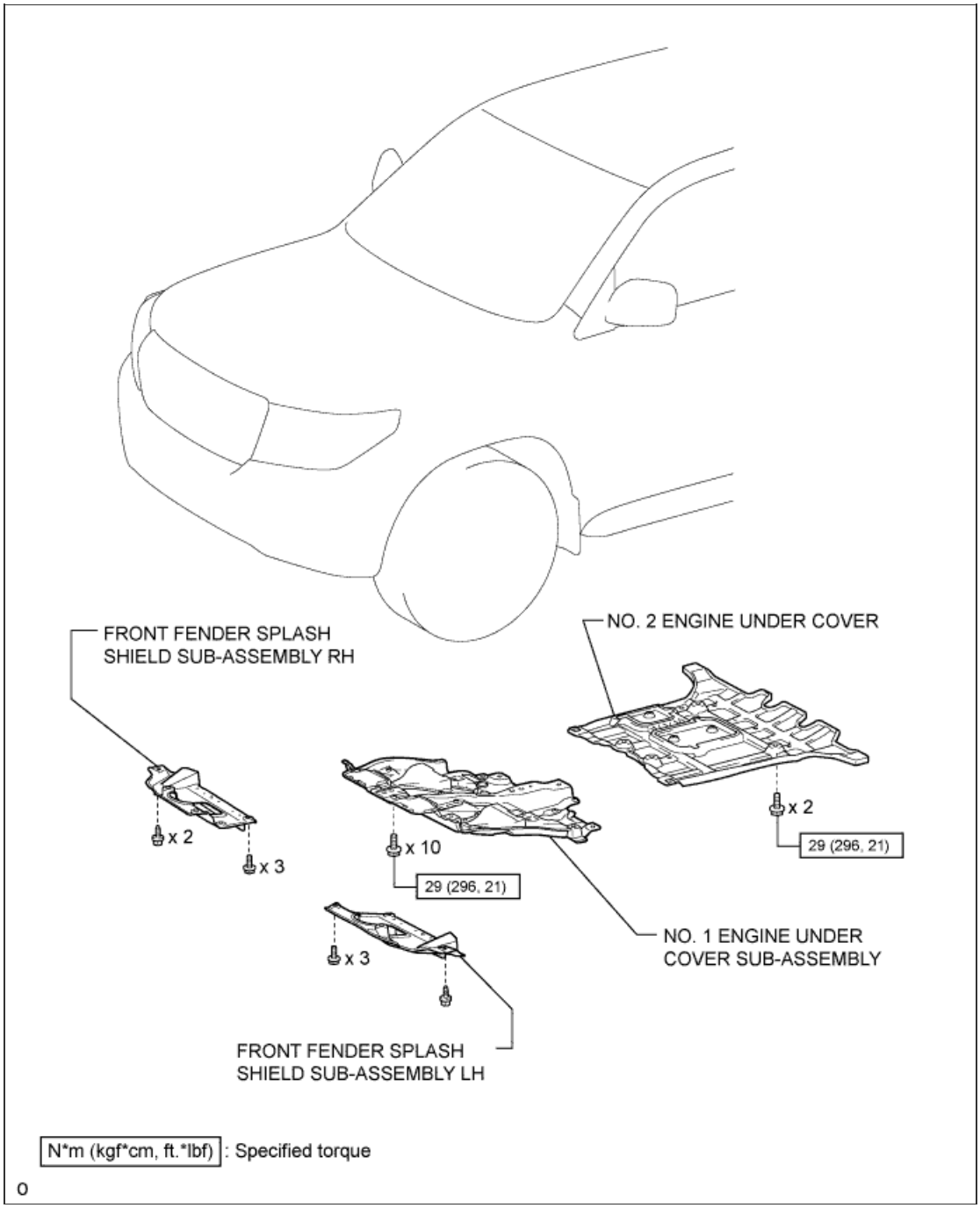
HINT:

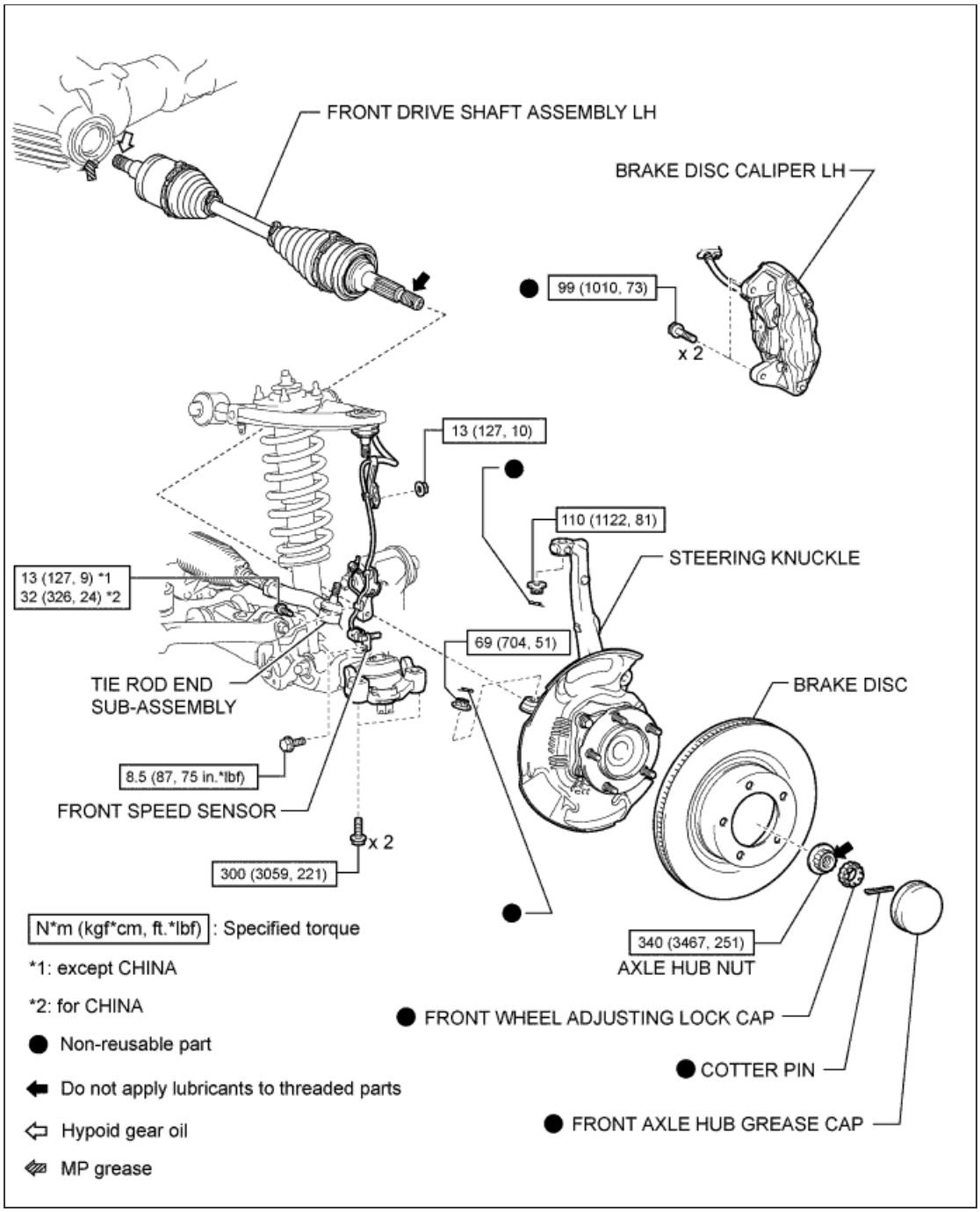
Use the table below to help determine the cause of problem symptoms. If multiple suspected areas are listed, the potential causes of the symptoms are listed in order of probability in the "Suspected Area" column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.

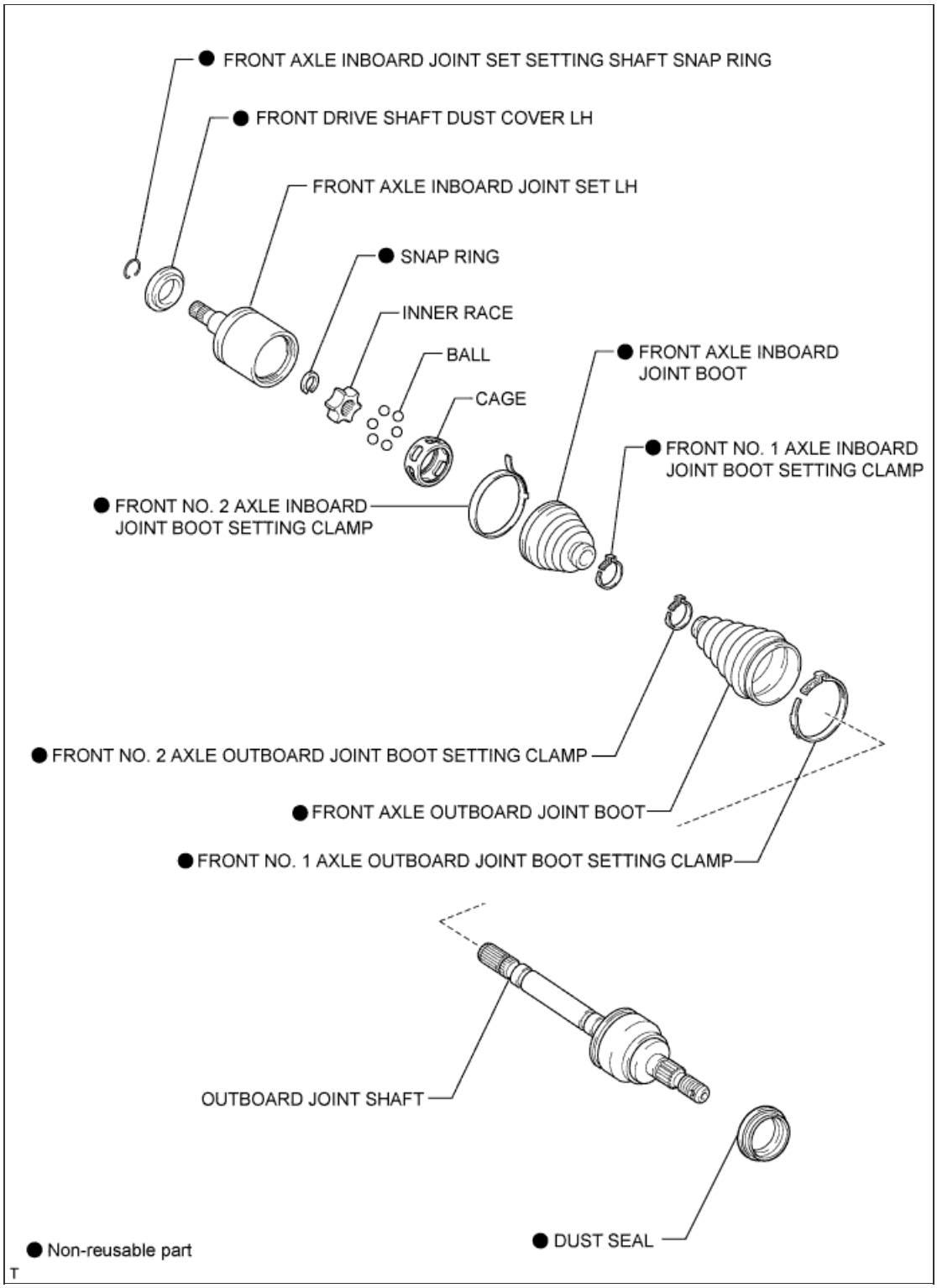
Drive Shaft System

Symptom	Suspected Area	See page
Front wheel shimmy	Front drive shaft (worn)	Click here

for Preparation Click here




FRONT DRIVE SHAFT ASSEMBLY LH
BRAKE DISC CALIPER LH
99 (1010, 73)
x 2
13 (127, 10)
110 (1122, 81)
STEERING KNUCKLE
13 (127, 9) *1
32 (326, 24) *2
69 (704, 51)
TIE ROD END
SUB-ASSEMBLY
BRAKE DISC
8.5 (87, 75 in.*lbf)
FRONT SPEED SENSOR
x 2
300 (3059, 221)
N*m (kgf*cm, ft.*lbf) : Specified torque
*1: except CHINA
*2: for CHINA
Non-reusable part
Do not apply lubricants to threaded parts
Hypoid gear oil
MP grease
340 (3467, 251)
AXLE HUB NUT
FRONT WHEEL ADJUSTING LOCK CAP
COTTER PIN
FRONT AXLE HUB GREASE CAP


● FRONT AXLE INBOARD JOINT SET SETTING SHAFT SNAP RING
● FRONT DRIVE SHAFT DUST COVER LH
FRONT AXLE INBOARD JOINT SET LH
● SNAP RING
INNER RACE
BALL
CAGE
● FRONT AXLE INBOARD JOINT BOOT
● FRONT NO. 1 AXLE INBOARD JOINT BOOT SETTING CLAMP
● FRONT NO. 2 AXLE INBOARD JOINT BOOT SETTING CLAMP
● FRONT NO. 2 AXLE OUTBOARD JOINT BOOT SETTING CLAMP
● FRONT AXLE OUTBOARD JOINT BOOT
● FRONT NO. 1 AXLE OUTBOARD JOINT BOOT SETTING CLAMP
OUTBOARD JOINT SHAFT
● DUST SEAL
● Non-reusable part
T

for Preparation Click here

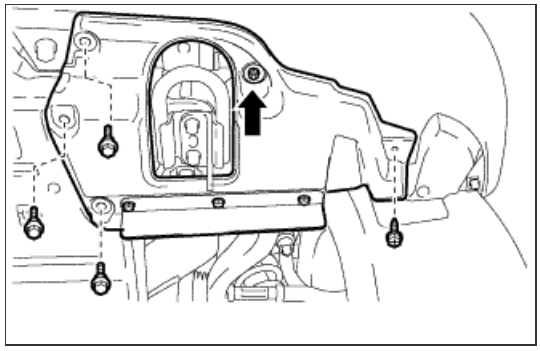
HINT:

- **Use the same procedures for the RH side and LH side.**
- **The procedures listed below are for the LH side.**

1. REMOVE FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY LH

a. Remove the 3 bolts and screw.

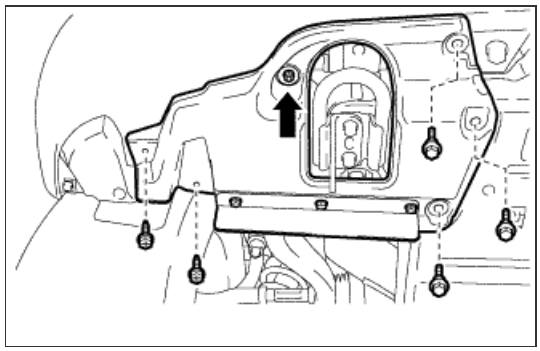
b. Turn the clip indicated by the arrow in the illustration to remove the front fender splash shield sub-assembly LH.



2. REMOVE FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY RH

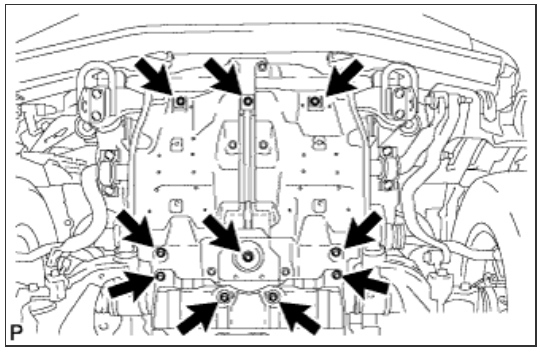
a. Remove the 3 bolts and 2 screws.

b. Turn the clip indicated by the arrow in the illustration to remove the front fender splash shield sub-assembly RH.



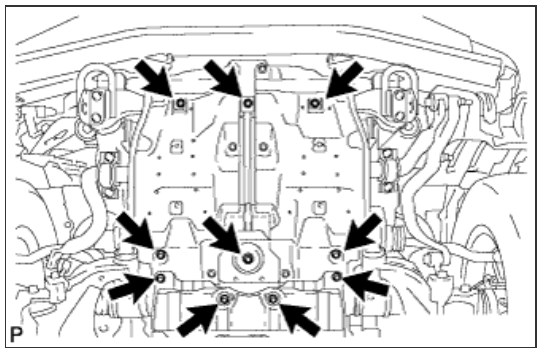
3. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

a. Remove the 10 bolts and No. 1 engine under cover.



4. REMOVE NO. 2 ENGINE UNDER COVER

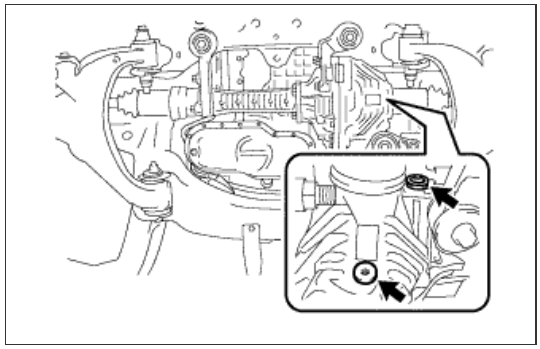
a. Remove the 10 bolts and No. 1 engine under cover.



5. DRAIN DIFFERENTIAL OIL

a. Stop the vehicle on a level place.

b. for Front Differential:



i. Remove the engine under cover.

ii. Using a 10 mm hexagon wrench, remove the filler plug and gasket.

iii. Using a 10 mm hexagon wrench, remove the drain plug and gasket, and drain the oil.

iv. Using a 10 mm hexagon wrench, install a new gasket and the drain plug.

Torque:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }

c. for Rear Differential:

i. Remove the filler plug and gasket.

ii. Remove the drain plug and gasket, and drain the oil.

iii. Install a new gasket and the drain plug.

Torque:
49 N*m{ 500 kgf*cm , 36 ft.*lbf }

6. REMOVE FRONT AXLE ASSEMBLY LH

(Click here)

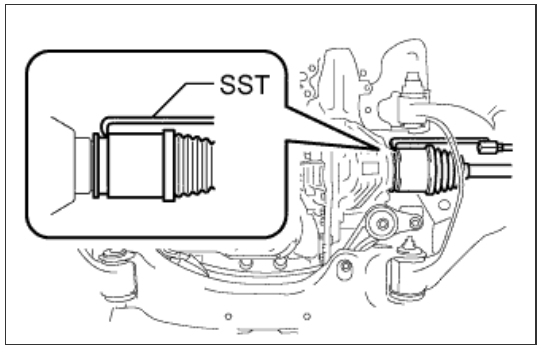
7. REMOVE FRONT DRIVE SHAFT ASSEMBLY LH

a. Using SST, remove the drive shaft.

SST
09520-01010
09520-24010 (09520-32040)

NOTICE:

Be careful not to damage the dust cover and oil seal.



for Preparation Click here

HINT:

- **Use the same procedure for the RH and LH sides.**
- **The procedure listed below is for the LH side.**

NOTICE:

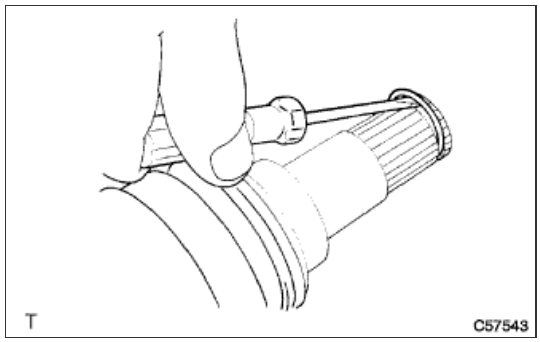
- **When using a vise, place aluminum plates between the part and vise.**
- **When using a vise, do not overtighten it.**
- **Do not allow brake fluid, front differential oil, gasoline, or battery fluid to contact the front axle inboard joint boot and front axle outboard joint boot, as the front axle inboard joint boot and front axle outboard joint boot may be damaged.**

1. REMOVE FRONT AXLE INBOARD JOINT SET SETTING SHAFT SNAP RING

a. Using a screwdriver, remove the snap ring from the inboard joint shaft.

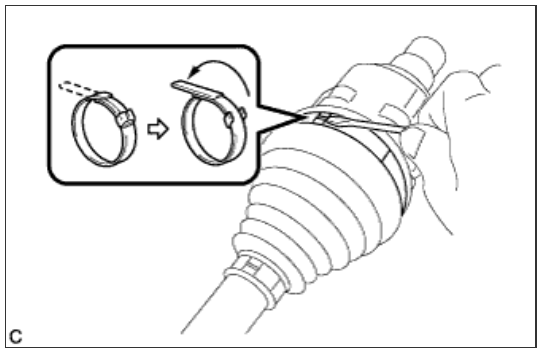
CAUTION:

Do not damage the spline of the front axle inboard joint set LH.



2. DISCONNECT FRONT NO. 2 AXLE INBOARD JOINT BOOT SETTING CLAMP

a. Using a screwdriver, release the staked part of the front No. 2 axle inboard joint boot setting clamp and disconnect the front No. 2 axle inboard joint boot setting clamp as shown in the illustration.



3. DISCONNECT FRONT NO. 1 AXLE INBOARD JOINT BOOT SETTING CLAMP

a. Using a side cutter, cut the front No. 1 axle inboard joint boot setting clamp and disconnect it.

4. DISCONNECT FRONT AXLE INBOARD JOINT BOOT

a. Disconnect the front axle inboard joint boot from the front axle inboard joint set LH.

5. REMOVE FRONT AXLE INBOARD JOINT SET LH

a. Remove any old grease from the front axle inboard joint set LH.

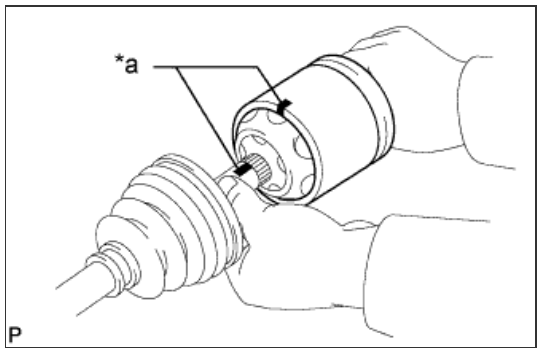
b. Place matchmarks on the front axle inboard joint set LH and outboard joint shaft.

Text in Illustration

*a	Matchmark

NOTICE:

Do not use a punch to make the matchmarks.



c. Remove the front axle inboard joint set LH from the outboard joint shaft.

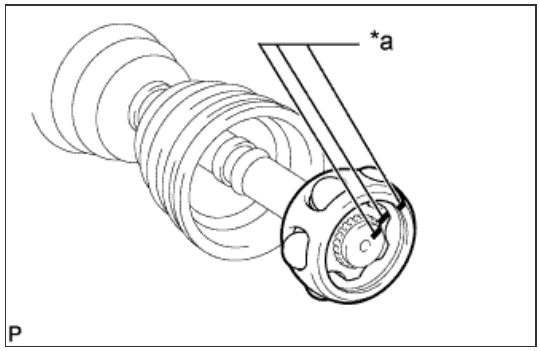
d. Place matchmarks on the outboard joint shaft, inner race and cage.

Text in Illustration

*a	Matchmark

NOTICE:

Do not use a punch to make the matchmarks.



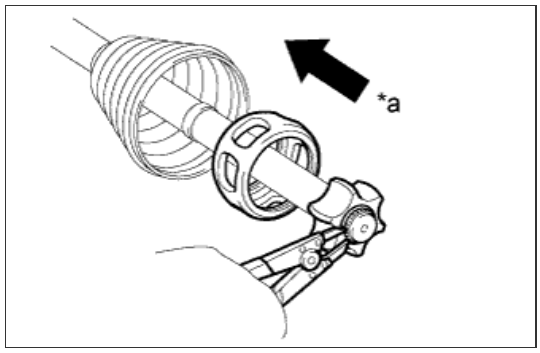
e. Remove the 6 balls.

f. Slide the cage to the outboard joint side.

g. Using a snap ring expander, remove the snap ring.

Text in Illustration

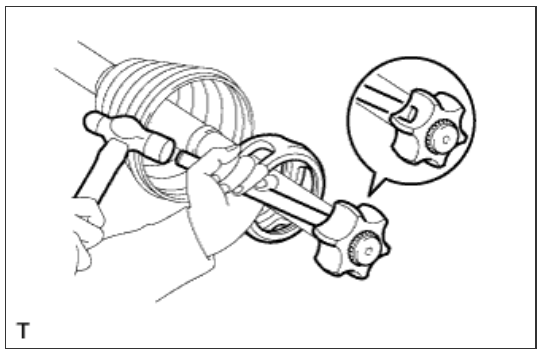
*a	Outboard joint side



h. Using a brass bar and hammer, remove the inner race.

NOTICE:

Do not damage the inner race.



i. Remove the cage.

j. Remove the front No. 2 axle inboard joint boot setting clamp and front No. 1 axle inboard joint boot setting clamp, front axle inboard joint boot from the outboard joint shaft.

6. DISCONNECT FRONT NO. 1 AXLE OUTBOARD JOINT BOOT SETTING CLAMP

a. Using a side cutter, cut the front No. 1 axle outboard joint boot setting clamp and disconnect it.

7. DISCONNECT FRONT NO. 2 AXLE OUTBOARD JOINT BOOT SETTING CLAMP

HINT:

Use the same procedure described for the front No. 1 axle outboard joint boot setting clamp.

8. REMOVE FRONT AXLE OUTBOARD JOINT BOOT

a. Remove any old grease from the front axle outboard joint boot.

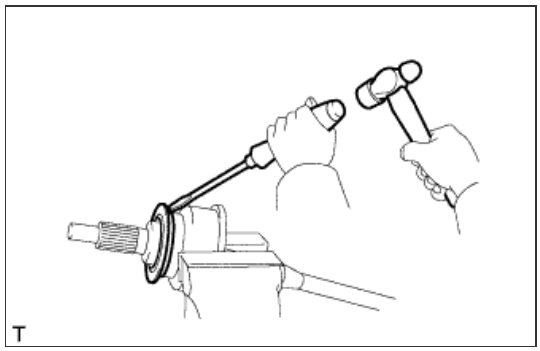
b. Remove the front No. 2 axle outboard joint boot setting clamp and front axle outboard joint boot, front No. 1 axle outboard joint boot setting clamp from the outboard joint shaft.

9. REMOVE DUST SEAL

a. Using a screwdriver and a hammer, remove the dust seal.

NOTICE:

Do not drop the outboard joint shaft.



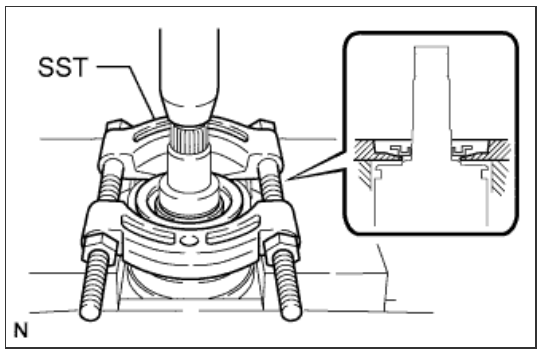
10. REMOVE FRONT DRIVE SHAFT DUST COVER LH

a. Using SST and a press, press out the front drive shaft dust cover LH.

SST
09950-00020

NOTICE:

Do not drop the front axle inboard joint set LH.



for Preparation Click here

1. INSPECT FRONT DRIVE SHAFT ASSEMBLY

NOTICE:

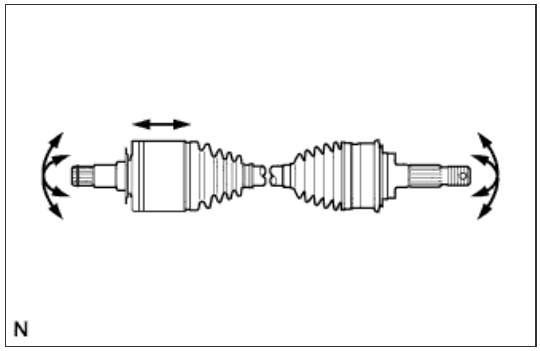
Move the drive shaft while keeping it level.

a. Check if there is excessive play in the outboard joint.

b. Check if the inboard joint shaft slides smoothly in the thrust direction.

c. Check if there is excessive play in the radial direction of the inboard joint shaft.

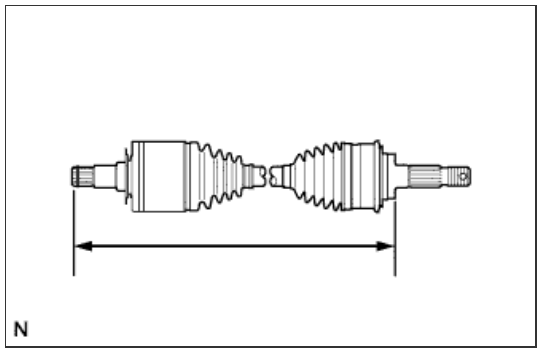
d. Check the boots for damage.



e. Check that the 2 boots are not stretched or contracted when the drive shaft is at standard length.

Standard drive shaft length:
583 mm (1.91 ft.)

If the boots are stretched or contracted, correct them.



for Preparation Click here

HINT:

- **Use the same procedure for the RH and LH sides.**
- **The procedure listed below is for the LH side.**

NOTICE:

- **When using a vise, place aluminum plates between the part and vise.**
- **When using a vise, do not overtighten it.**
- **Do not allow brake fluid, front differential oil, gasoline, or battery fluid to contact the front axle inboard joint boot and front axle outboard joint boot, as the front axle inboard joint boot and front axle outboard joint boot may be damaged.**

1. INSTALL FRONT DRIVE SHAFT DUST COVER LH

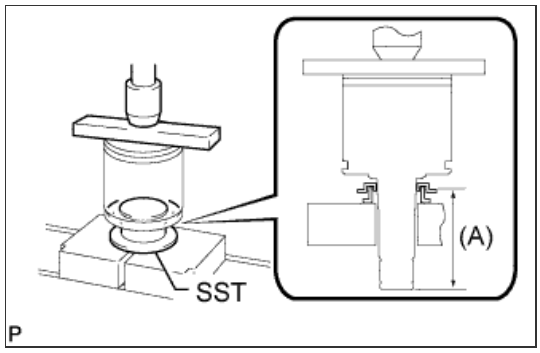
a. Using SST, a steel plate and press, press in a new front drive shaft dust cover LH.

SST
09316-20011

Standard Distance (A):
108.4 to 109.0 mm (4.27 to 4.29 in.)

NOTICE:

Do not damage the front drive shaft dust cover LH.



2. INSTALL DUST SEAL

a. Using SST and a press, press in a new dust seal until it reaches the end of the outboard joint shaft.

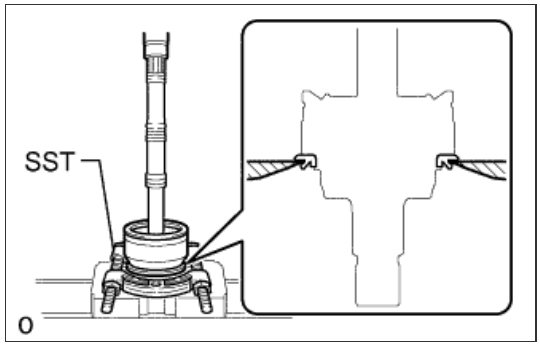
SST
09950-00020

NOTICE:

Do not damage the dust seal.

HINT:

Place SST on a level surface.



3. INSTALL FRONT AXLE OUTBOARD JOINT BOOT

a. Before installing the front axle outboard joint boot, wrap protective tape around the spline of the outboard joint shaft to prevent damaging the front axle outboard joint boot.

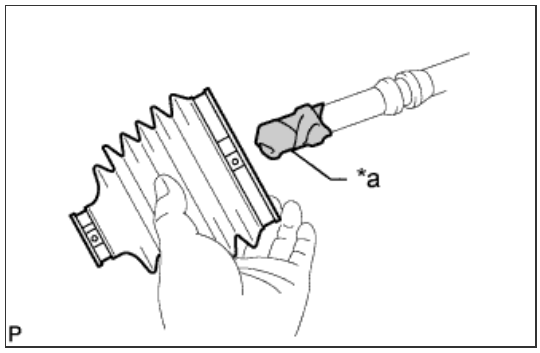
b. Install new parts to the outboard joint shaft in the following order.

i. Front No. 1 axle outboard joint boot setting clamp

ii. Front axle outboard joint boot

iii. Front No. 2 axle outboard joint boot setting clamp

c. Slide the front axle outboard joint boot onto the outboard joint shaft.



Text in Illustration

*a	Protective Tape

d. Pack the outboard joint shaft and front axle outboard joint boot with grease from the boot kit.

Standard grease capacity:
310 to 320 g (11.0 to 11.2 oz.)

e. Install the front axle outboard joint boot to the outboard joint shaft groove.

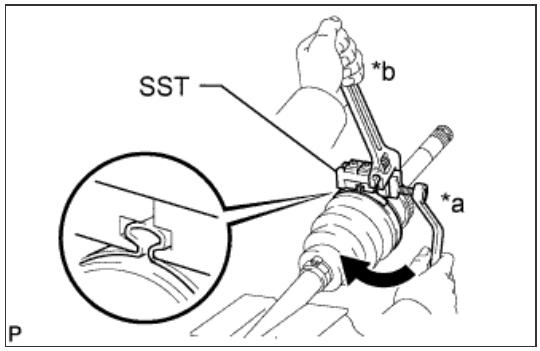
NOTICE:

- **Do not allow grease to adhere to the front No. 1 axle outboard joint boot setting clamp and front No. 2 axle outboard joint boot setting clamp track of the front axle outboard joint boot.**
- **Keep the inside of the front axle outboard joint boot free of foreign matter.**

4. INSTALL FRONT NO.1 AXLE OUTBOARD JOINT BOOT SETTING CLAMP

a. Secure the front No. 1 axle outboard joint boot setting clamp to the front axle outboard joint boot.

b. Place SST onto the front No. 1 axle outboard joint boot setting clamp.



SST
09521-24010

c. Tighten SST so that the front No. 1 axle outboard joint boot setting clamp is pinched.

Text in Illustration

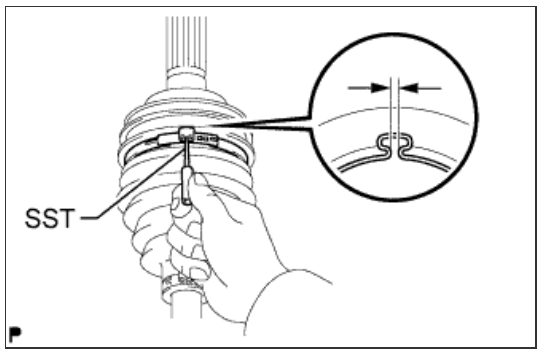
*a	Turn
*b	Hold

NOTICE:

Do not overtighten SST.

d. Remove SST.

e. Using SST, adjust the clearance of the front No. 1 axle outboard joint boot setting clamp.



SST
09240-00020

Standard clearance:
1.5 mm (0.0590 in.) or less

If the clearance is more than the standard, retighten the front No. 1 axle outboard joint boot setting clamp.

5. INSTALL FRONT NO.2 AXLE OUTBOARD JOINT BOOT SETTING CLAMP

a. Use the same procedure described for the front No. 1 axle outboard joint boot setting clamp.

6. INSTALL FRONT AXLE INBOARD JOINT SET LH

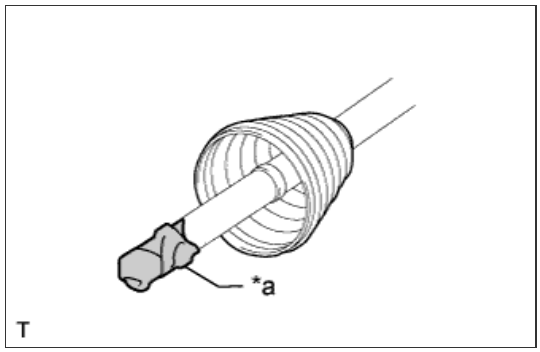
a. Slide a new front axle inboard joint boot onto the outboard joint shaft.

Text in Illustration

*a	Protective Tape

HINT:

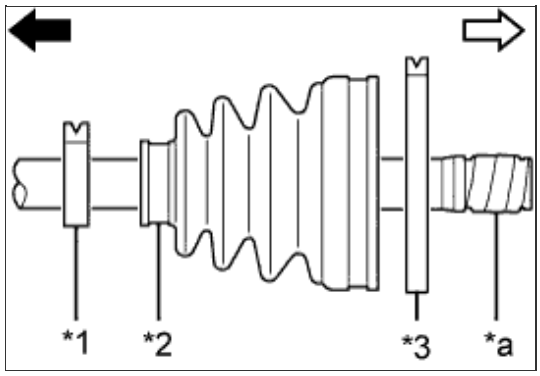
Before installing the front axle inboard joint boot, wrap protective tape around the spline of the outboard joint shaft to prevent damaging the front axle inboard joint boot.



b. Install new parts to the outboard joint shaft in the following order.

Text in Illustration

*1	Front No. 1 Axle Inboard Joint Boot Setting Clamp
*2	Front Axle Inboard Joint Boot
*3	Front No. 2 Axle Inboard Joint Boot Setting Clamp
*a	Protective Tape
➡	Outboard Joint Side
⇨	Inboard Joint Side



i. Front No. 1 axle inboard joint boot setting clamp

ii. Front axle inboard joint boot

iii. Front No. 2 axle inboard joint boot setting clamp

c. Remove the protective tape from the outboard joint shaft.

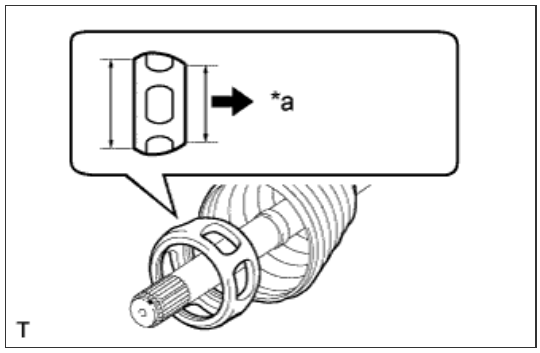
d. Install the cage to the outboard joint shaft.

Text in Illustration

*a	Outboard Joint Side

NOTICE:

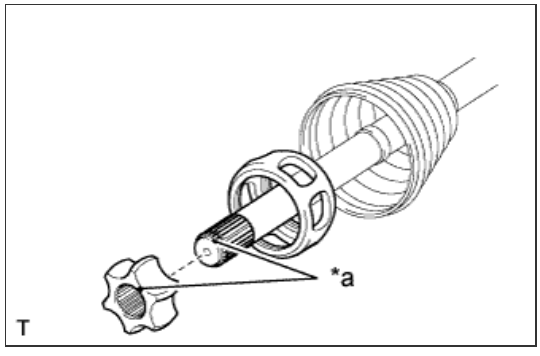
Insert the cage with its smaller inner diameter side facing the outboard joint.



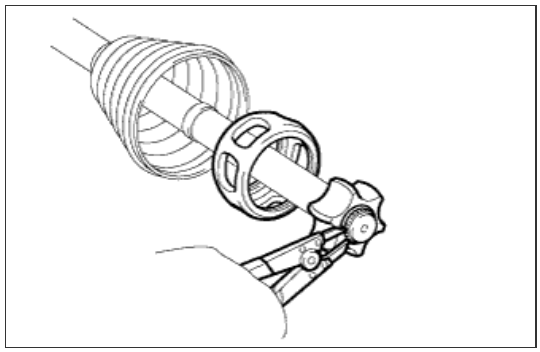
e. Align the matchmarks and install the inner race to the outboard joint shaft.

Text in Illustration

*a	Matchmark



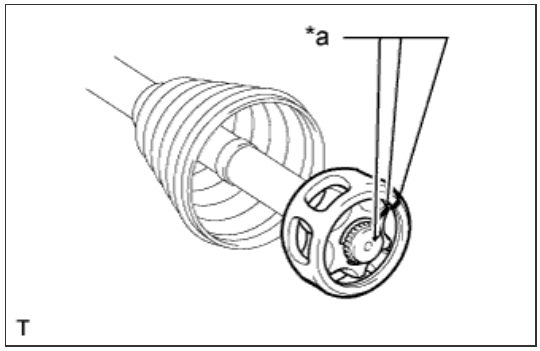
f. Using a snap ring expander, install a new snap ring.



g. Align the matchmarks placed before removal, and install the cage to the inner race.

Text in Illustration

*a	Matchmark



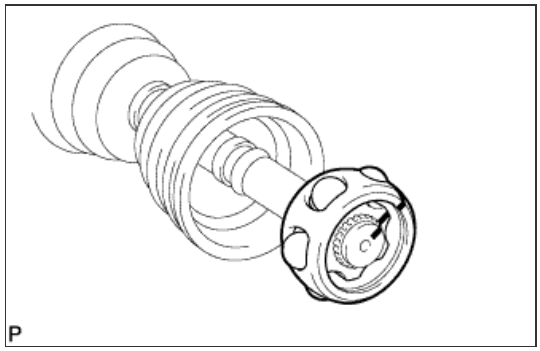
h. Install the 6 balls.

HINT:

Apply grease onto the balls to keep them from falling out.

i. Pack the front axle inboard joint set LH and front axle inboard joint boot with grease from a boot kit.

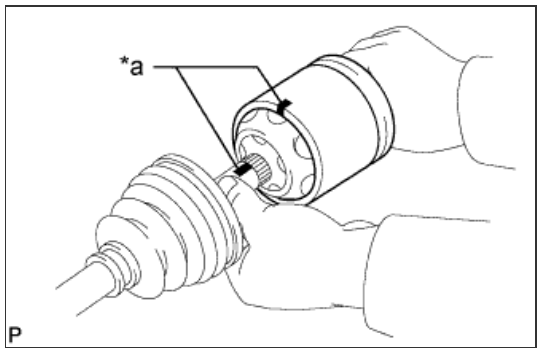
Standard grease capacity:
314 to 324 g (11.1 to 11.4 oz.)



j. Align the matchmarks placed before removal, and install the front axle inboard joint set LH to the outboard joint shaft.

Text in Illustration

*a	Matchmark



7. INSTALL FRONT AXLE INBOARD JOINT BOOT

a. Install the front axle inboard joint boot to the front drive inboard joint set LH.

HINT:

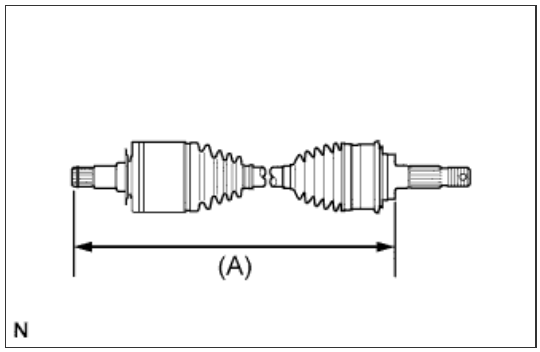
Make sure that the front axle inboard joint boot is on the outboard joint shaft groove.

b. Check that the 2 joint boots are not stretched or contracted when the front drive shaft assembly is at the standard length.

Length (A):
582.67 mm (1.91 ft.)

If the front axle inboard joint boot and front axle outboard joint boot are stretched

or contracted, correct them.

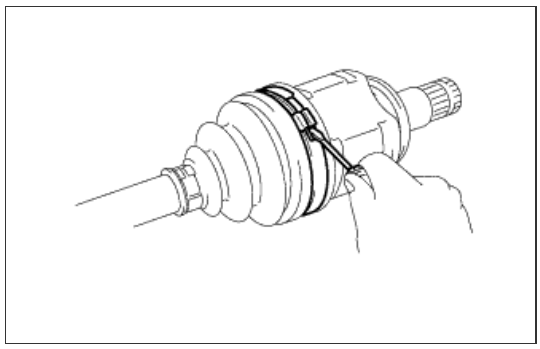


8. INSTALL FRONT AXLE INBOARD JOINT BOOT SETTING NO.2 CLAMP

a. Using a screwdriver, install the front No. 2 axle inboard joint boot setting clamp as shown in the illustration.

NOTICE:

- **Be sure to install the front No. 2 axle inboard joint boot setting clamp in the correct position.**
- **Do not damage the front axle inboard joint boot.**



9. INSTALL FRONT NO.1 AXLE INBOARD JOINT BOOT SETTING CLAMP

a. Secure the front No. 1 axle inboard joint boot setting clamp to the front axle inboard joint boot.

b. Place SST onto the front No. 1 axle inboard joint boot setting clamp.

SST
09521-24010

c. Tighten SST so that the front No. 1 axle inboard joint boot setting clamp is pinched.

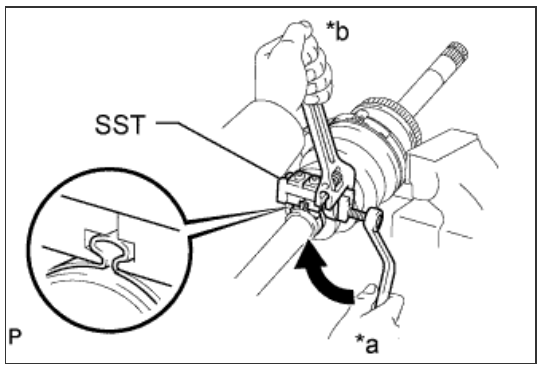
Text in Illustration

*a	Turn
*b	Hold

NOTICE:

Do not overtighten SST.

d. Remove SST.

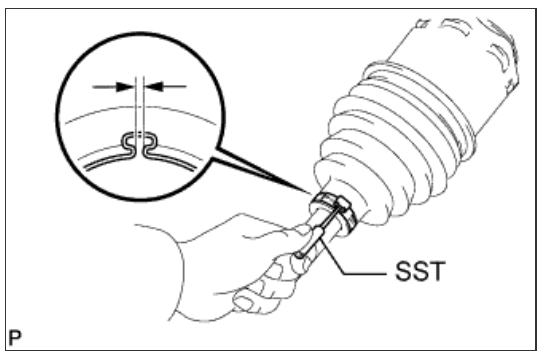


e. Using SST, adjust the clearance of the front No. 1 axle inboard joint boot setting clamp.

SST
09240-00020

Standard clearance:
1.5 mm (0.0590 in.) or less

If the clearance is more than the standard, retighten the front No. 1 axle inboard joint boot setting clamp.

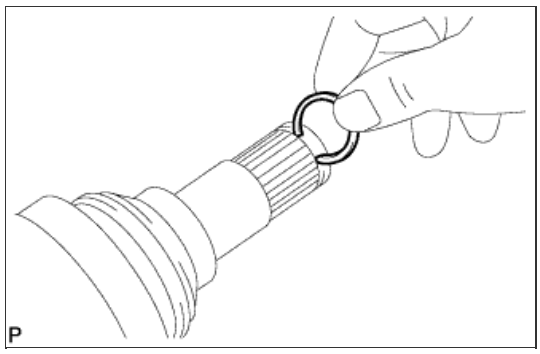


10. INSTALL FRONT AXLE INBOARD JOINT SET SETTING SHAFT SNAP RING

a. Install a new front axle inboard joint set setting shaft snap ring to the front axle inboard joint set LH.

CAUTION:

Do not damage the spline of the front axle inboard joint set LH.



11. INSPECT FRONT DRIVE SHAFT ASSEMBLY

NOTICE:

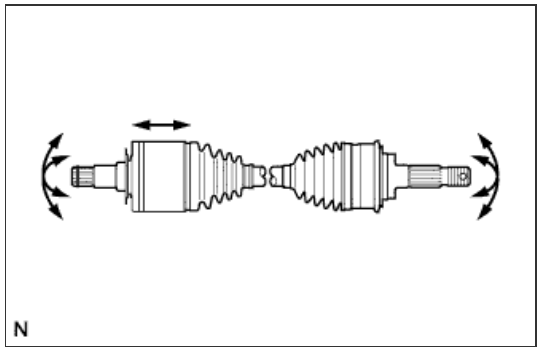
Move the drive shaft while keeping it level.

a. Check if there is excessive play in the outboard joint.

b. Check if the inboard joint shaft slides smoothly in the thrust direction.

c. Check if there is excessive play in the radial direction of the inboard joint shaft.

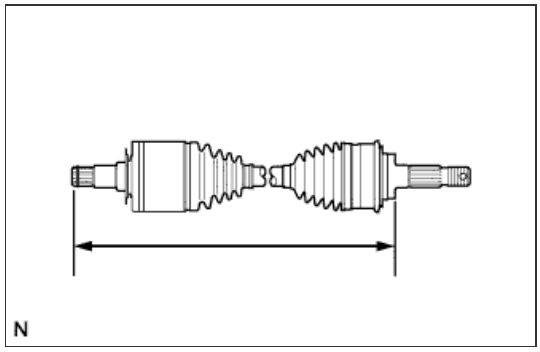
d. Check the boots for damage.



e. Check that the 2 boots are not stretched or contracted when the drive shaft is at standard length.

Standard drive shaft length:
583 mm (1.91 ft.)

If the boots are stretched or contracted, correct them.



for Preparation Click here

1. INSTALL FRONT DRIVE SHAFT ASSEMBLY LH

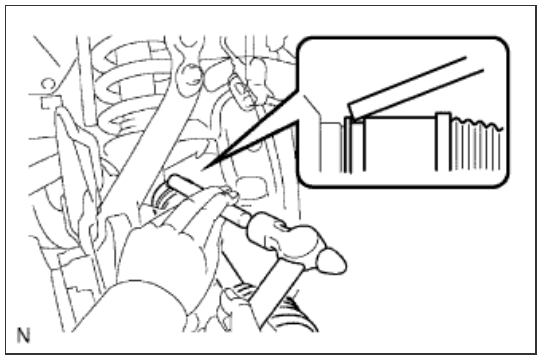
a. Coat the lip of the differential oil seal with MP grease.

HINT:

Inspect the oil seal for wear or damage.

b. Coat the spline of the inboard joint shaft assembly with hypoid gear oil.

c. Align the shaft splines and install the drive shaft with a brass bar and hammer.



NOTICE:

- **Set the snap ring with the opening side facing downward.**
- **Be careful not to damage the oil seal.**
- **If the outboard joint shaft is new, remove the anti-rust oil on the screw end with non-residue solvent.**

HINT:

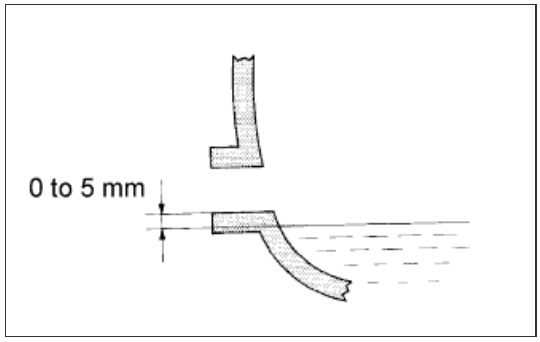
Whether the inboard joint shaft is in contact with the pinion shaft or not can be confirmed from the sound or feeling when tapping in the shaft.

2. INSTALL FRONT AXLE ASSEMBLY LH

(Click here)

3. ADD DIFFERENTIAL OIL

a. Add differential oil so that the oil level is between 0 to 5 mm (0 to 0.197 in.) from the bottom lip of the differential filler plug hole.



NOTICE:

- **Too much or too little oil will lead to differential problems.**
- **After changing the oil, drive the vehicle and then check the oil level again.**

Front differential oil type and viscosity:
Toyota Genuine Differential gear oil LT 75W-85 GL-5 or equivalent

Rear Differential Oil Type and Viscosity:

Item	Oil Type and Viscosity
w/o LSD	Toyota Genuine Differential gear oil LT 75W-85 GL-5 or equivalent
w/ LSD	Toyota Genuine Differential gear oil LX 75W-85 GL-5 or equivalent

Front differential capacity:
1.85 to 1.95 liters (1.96 to 2.06 US qts., 1.63 to 1.71 Imp. qts.)

Rear Differential Capacity:

Item	Specified Condition
Standard	4.15 to 4.25 liters (4.39 to 4.49 US qts., 3.66 to 3.74 Imp. qts.)
w/ LSD	4.10 to 4.20 liters (4.34 to

w/ Differential lock	4.43 US qts., 3.60 to 3.69 Imp. qts.)

b. for Front Differential:

i. Using a 10 mm hexagon wrench, install a new gasket and the filler plug.

Torque:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }

ii. Install the engine under cover.

c. for Rear Differential:

i. Install a new gasket and the filler plug.

Torque:
49 N*m{ 500 kgf*cm , 36 ft.*lbf }

4. INSTALL FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY LH

a. Push in the clip to install the front fender splash shield sub-assembly LH.

b. Install the 3 bolts and screw.

5. INSTALL FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY RH

a. Push in the clip to install the front fender splash shield sub-assembly RH.

b. Install the 3 bolts and 2 screws.

6. INSTALL NO. 2 ENGINE UNDER COVER

a. Install the No. 2 engine under cover with the 2 bolts.

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

7. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

a. Install the No. 1 engine under cover with the 10 bolts.

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

for Preparation Click here

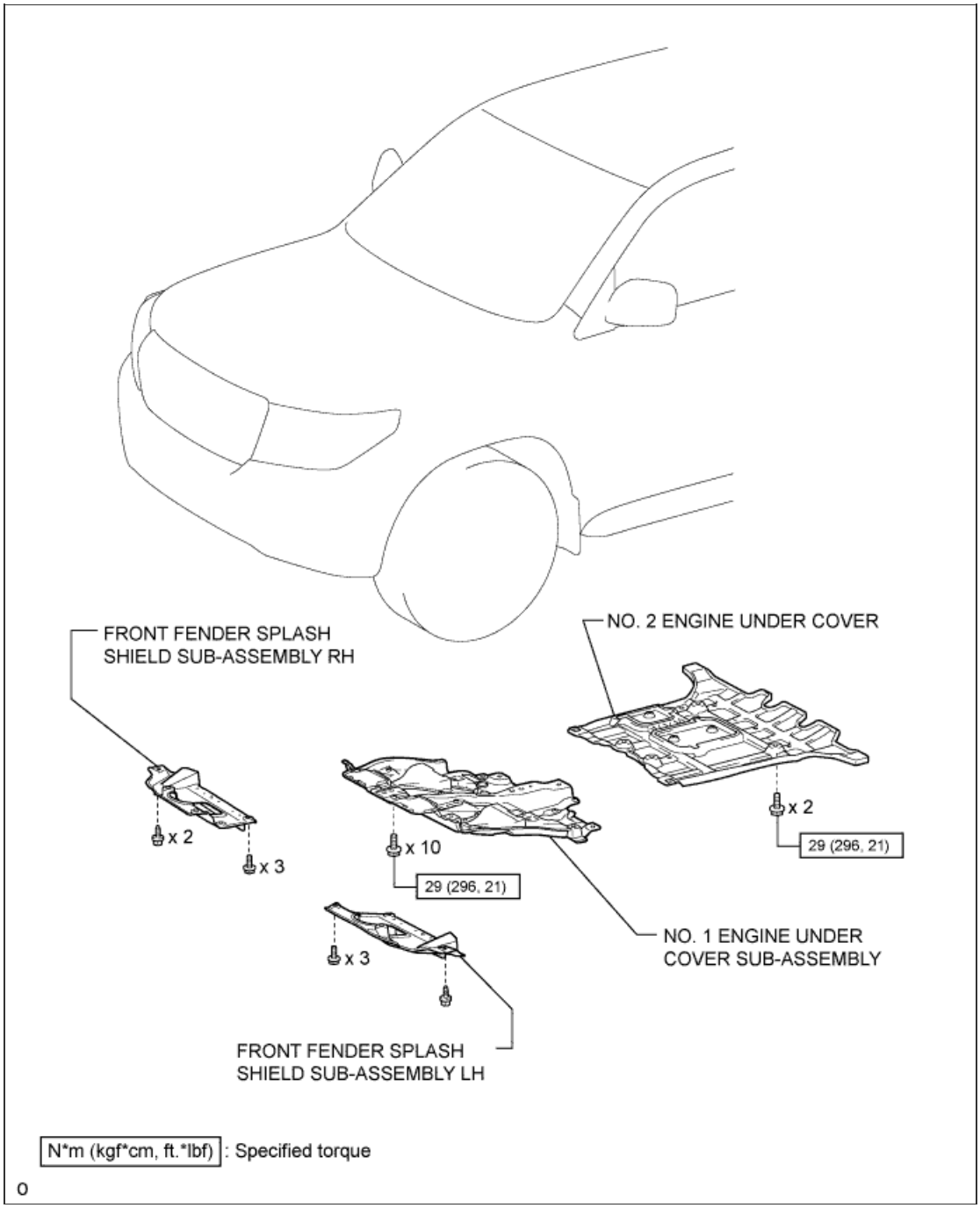
HINT:

Use the table below to help determine the cause of problem symptoms. If multiple suspected areas are listed, the potential causes of the symptoms are listed in order of probability in the "Suspected Area" column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.

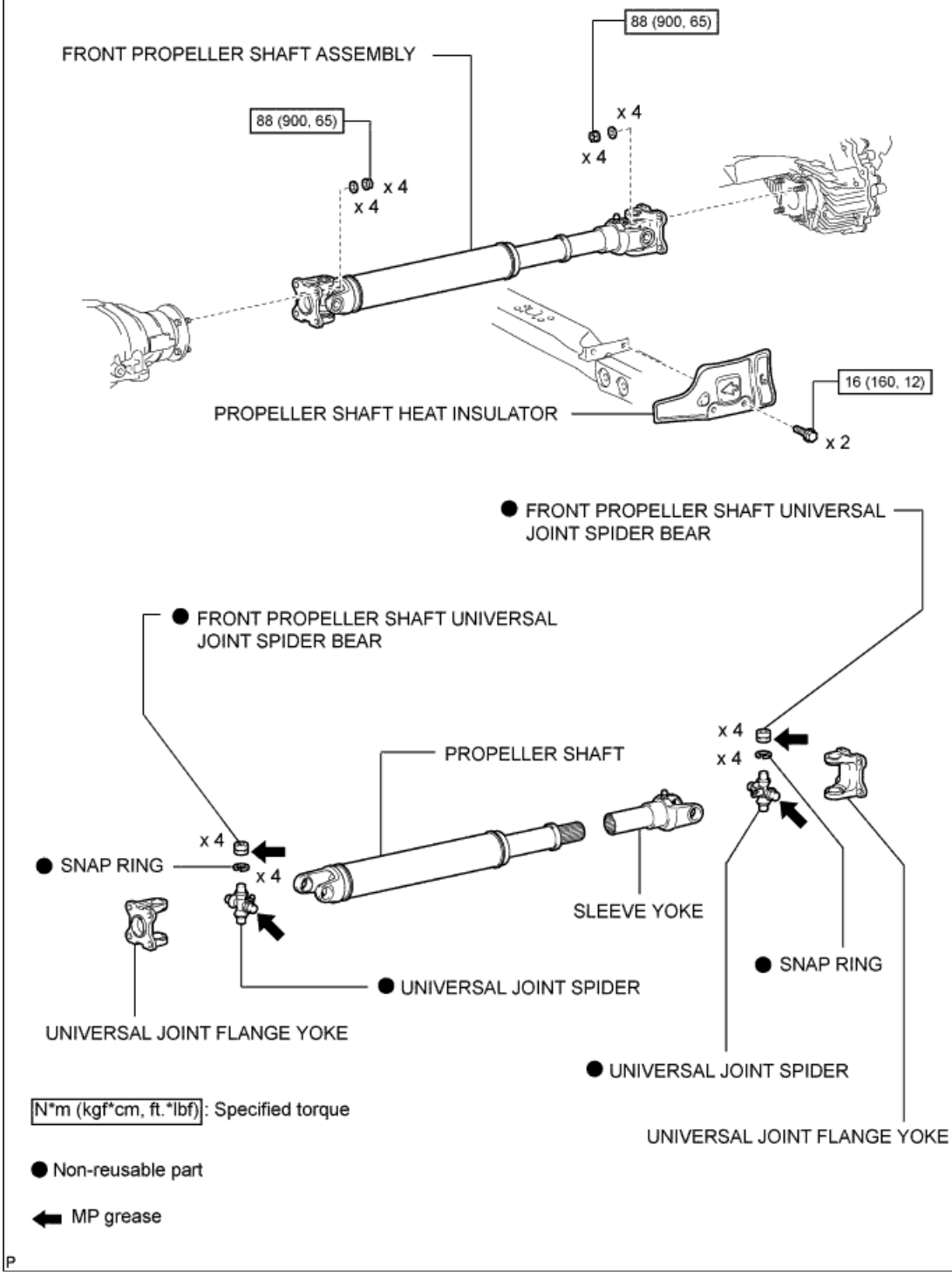
Propeller Shaft System

Symptom	Suspected Area	See page
Noise and vibration from the front propeller shaft	Front propeller shaft	Click here
Noise and vibration from the rear propeller shaft	Rear propeller shaft	Click here

for Preparation Click here

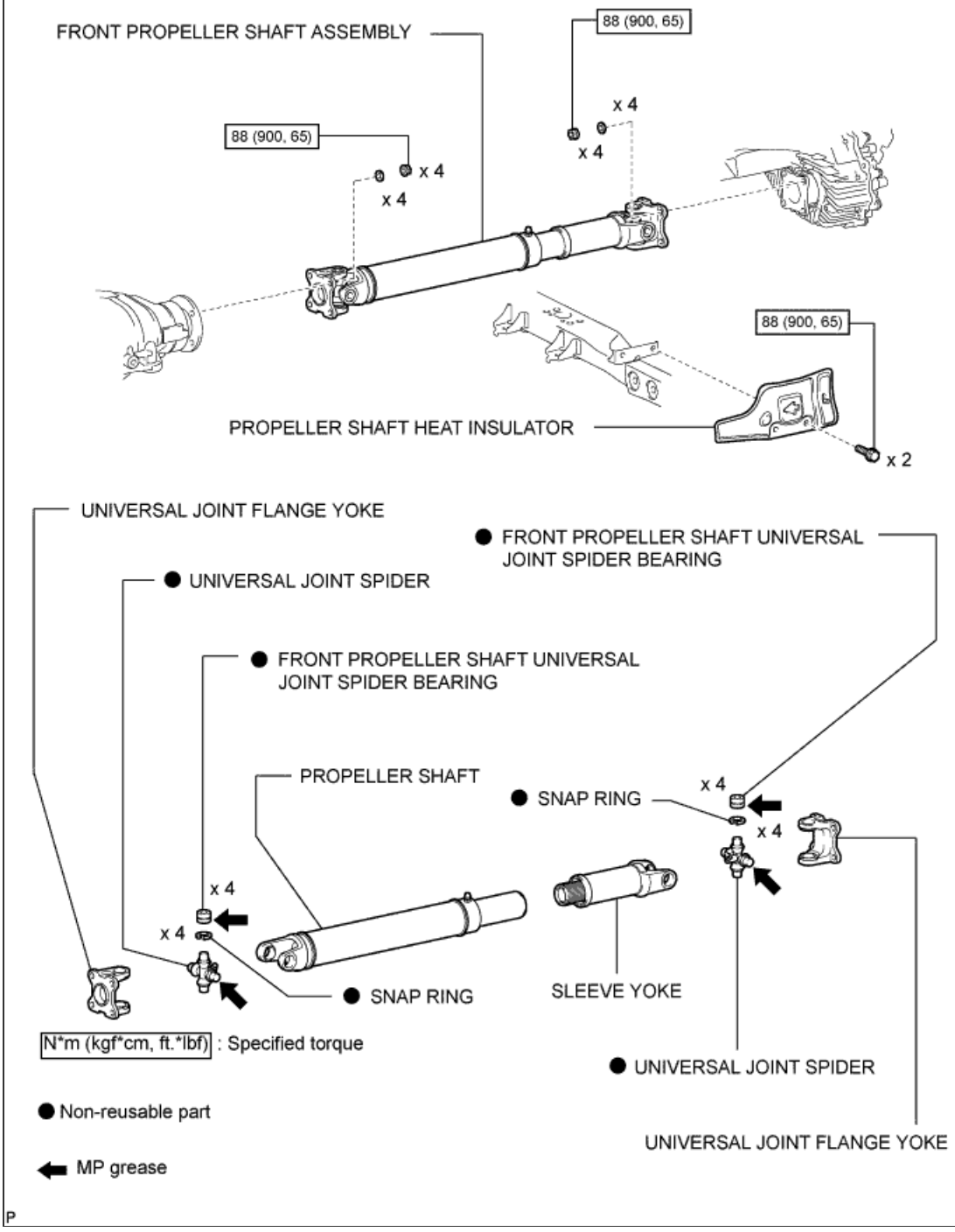


w/o CENTER GREASE FITTING TYPE:



P

w/ CENTER GREASE FITTING TYPE:

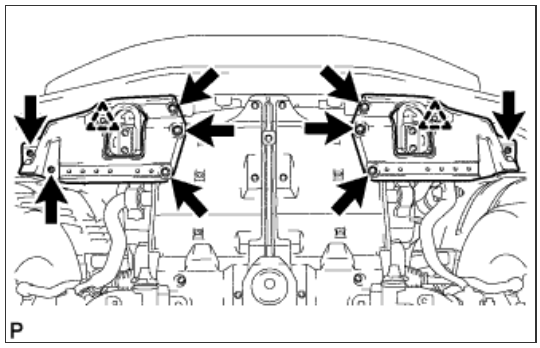


for Preparation Click here

1. REMOVE FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY LH

a. Remove the 3 bolts and screw.

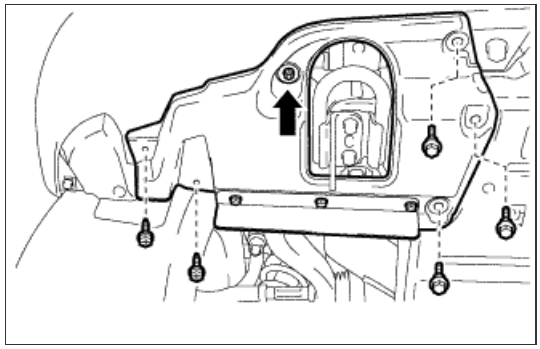
b. Loosen the clip and remove the front fender splash shield LH.



2. REMOVE FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY RH

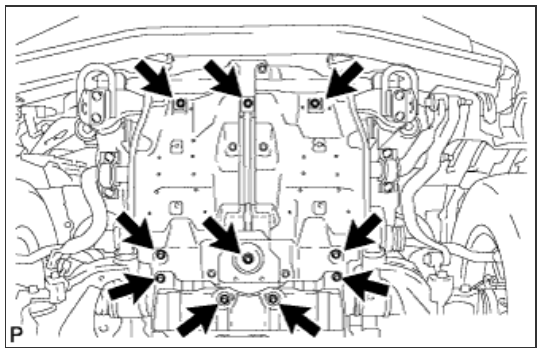
a. Remove the 3 bolts and 2 screws.

b. Turn the clip indicated by the arrow in the illustration to remove the front fender splash shield sub-assembly RH.



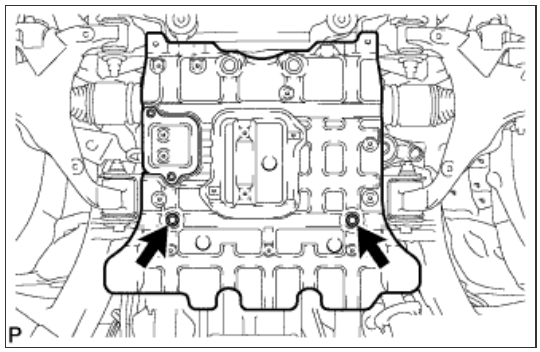
3. REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

a. Remove the 10 bolts and No. 1 engine under cover.



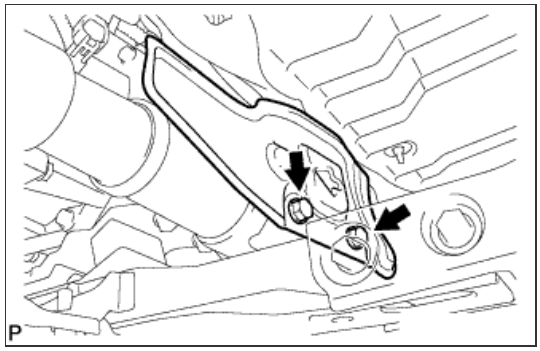
4. REMOVE NO. 2 ENGINE UNDER COVER

a. Remove the 2 bolts and No. 2 engine under cover.



5. REMOVE PROPELLER SHAFT HEAT INSULATOR

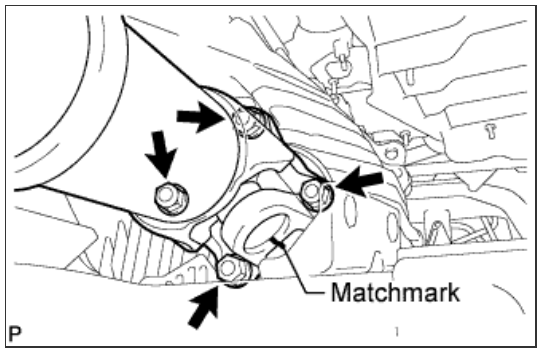
a. Remove the 2 bolts and insulator.



6. REMOVE FRONT PROPELLER SHAFT ASSEMBLY

a. Place matchmarks on the propeller shaft flange and transfer flange.

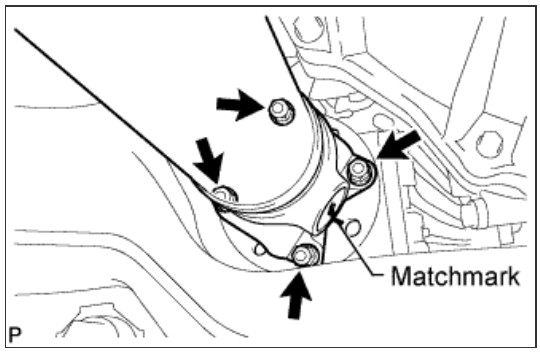
b. Remove the 4 nuts and 4 washers.



c. Place matchmarks on the propeller shaft flange and differential.

d. Remove the 4 nuts and 4 washers.

e. Remove the front propeller shaft.



for Preparation Click here

NOTICE:

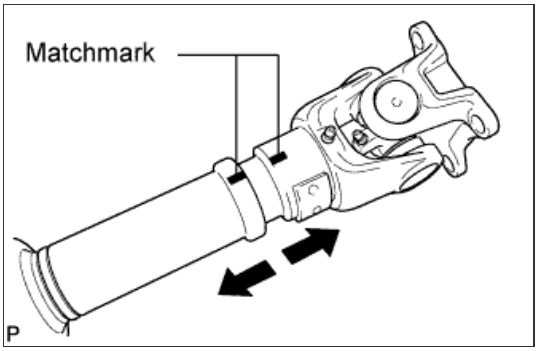
Be careful not to grip the propeller shaft tube too tightly in a vise as this will cause deformation.

1. CLEAN PROPELLER SHAFT GREASE

a. Place matchmarks on the propeller shaft and sleeve yoke.

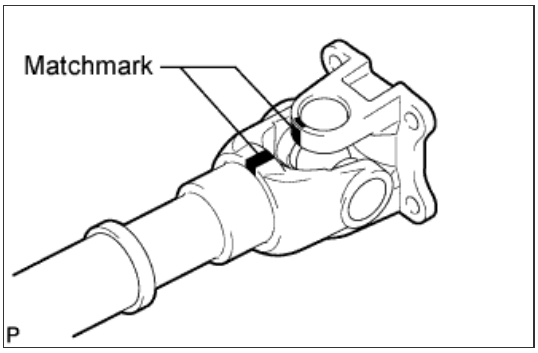
b. Disconnect the sleeve yoke from the propeller shaft.

c. Clean off any grease on the spline.



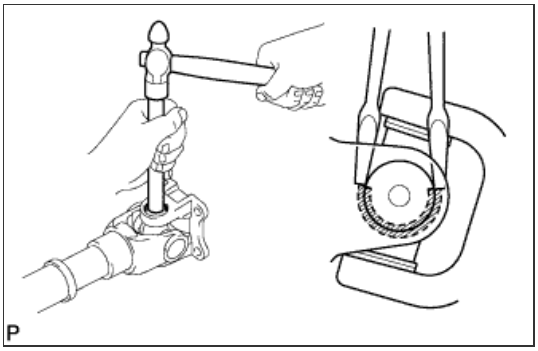
2. REMOVE FRONT PROPELLER SHAFT UNIVERSAL JOINT SPIDER ASSEMBLY

a. Place matchmarks on the flange yoke and sleeve yoke or propeller shaft.



b. Using a brass bar and hammer, slightly tap in the spider bearing outer races.

c. Using 2 screwdrivers, remove the 4 snap rings from the grooves.



d. Using SST, push out the bearing from the flange.

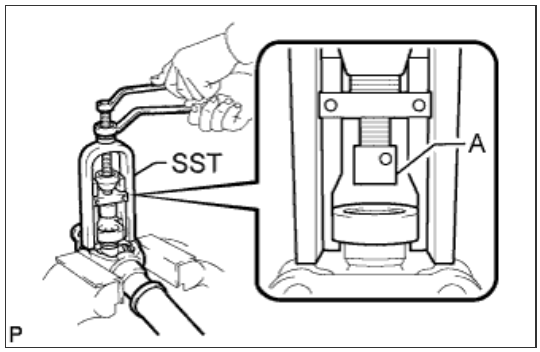
SST

09332-25010

HINT:

Before installing SST, sufficiently raise the part labeled A. If part A is too low,

SST may be difficult to install.

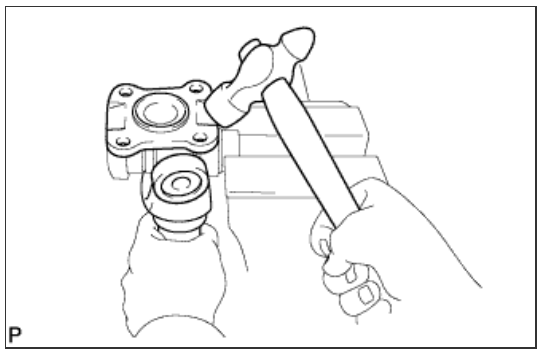


e. Clamp the bearing outer race in a vise and tap off the flange with a hammer.

HINT:

Remove the bearing on the opposite side using the same procedure.

f. Remove the flange yoke from the sleeve yoke (or propeller shaft).



g. Install the 2 removed bearing outer races to the spider.

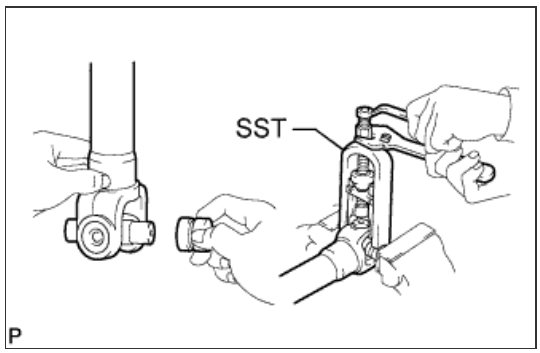
h. Using SST, push out the bearing from the yoke.

SST
09332-25010

i. Clamp the outer bearing race in a vise and tap off the yoke with a hammer.

HINT:

Remove the bearing on the opposite side using the same procedure.



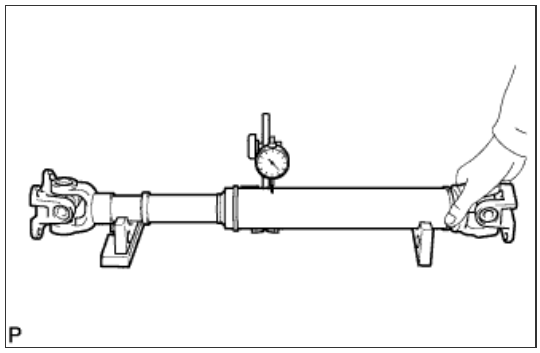
for Preparation Click here

1. INSPECT FRONT PROPELLER SHAFT ASSEMBLY

a. Using a dial indicator, measure the propeller shaft runout.

Maximum runout:
0.8 mm (0.031 in.)

If the shaft runout is more than the maximum, replace the shaft.



2. INSPECT SPIDER BEARING

NOTICE:

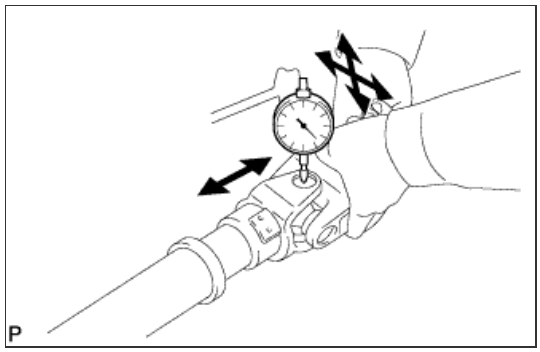
Be careful not to grip the propeller shaft tube too tightly in a vise as this will cause deformation.

a. Check the spider bearings for wear or damage.

b. Check the spider bearing axial play by turning the yoke while holding the shaft tightly.

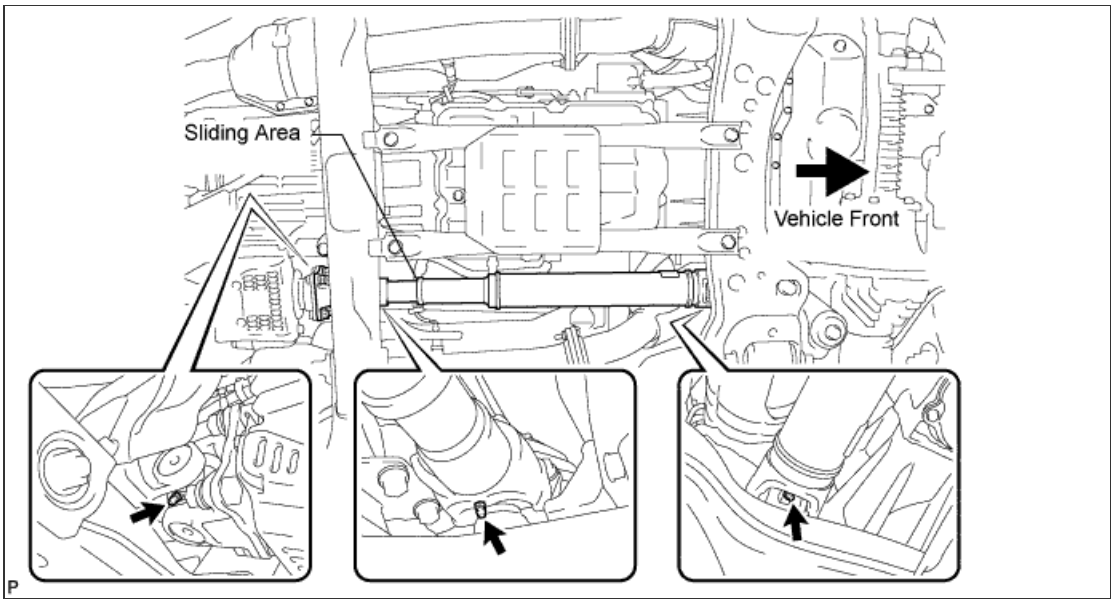
Maximum bearing axial play:
0 mm (0 in.)

If the axial play is more than the maximum, replace the spider bearing.



3. FILL PROPELLER SHAFT WITH GREASE

a. Fill each of the grease fitting holes of the propeller shaft with MP grease.



NOTICE:

Stop filling the grease fitting hole on the middle portion of the propeller shaft once the sliding portion starts extending.

b. Drive the vehicle.

NOTICE:

Check the safety of the surrounding areas.

HINT:

Move the vehicle forward and in reverse 5 times and strongly apply the brake.

c. Lift up the vehicle and wipe off any excess grease as a result of driving.

for Preparation Click here

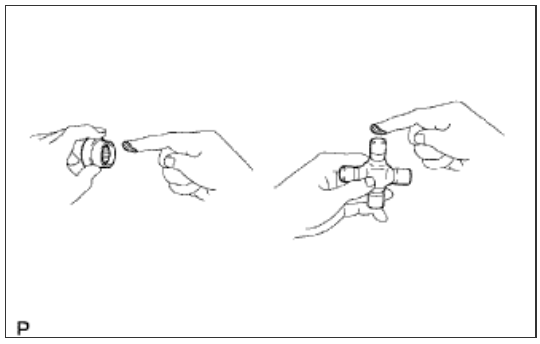
1. INSTALL FRONT PROPELLER SHAFT UNIVERSAL JOINT SPIDER ASSEMBLY

a. Apply MP grease to a new spider and new bearings.

NOTICE:

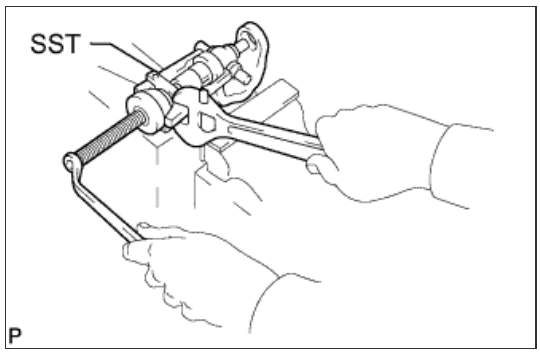
Be careful not to apply too much grease.

b. Fit the spider into the flange yoke.



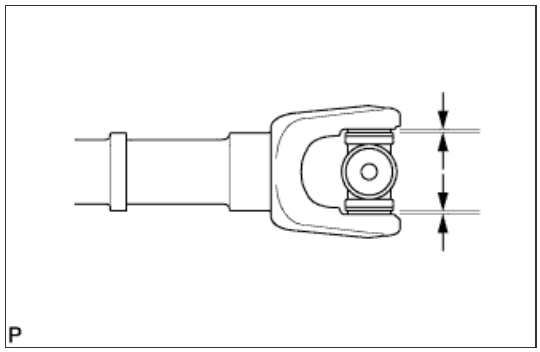
c. Using SST, install the bearings to the spider.

SST
09332-25010



d. Using SST, adjust both bearings so that the snap ring grooves are at maximum and equal in width.

SST
09332-25010



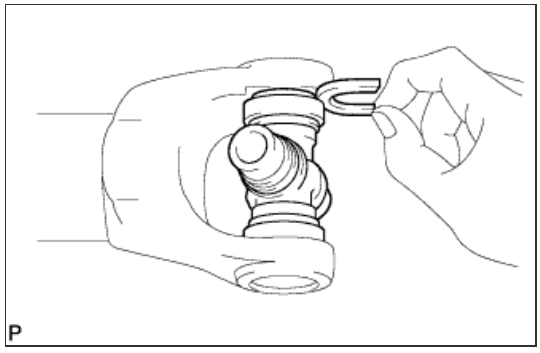
e. Install 2 new snap rings of equal thickness which will allow 0 mm (0 in.) of axial play.

HINT:

Do not reuse the snap rings.

Standard Snap Ring Thickness :

Color	Mark	Specified Condition
-	J	2.18 to 2.20 mm (0.0858 to 0.0866 in.)
-	K	2.20 to 2.22 mm (0.0866 to 0.0874 in.)
-	F	2.22 to 2.24 mm (0.0874 to 0.0882



		in.)
-	G	2.24 to 2.26 mm (0.0882 to 0.0890 in.)
-	H	2.26 to 2.28 mm (0.0890 to 0.0898 in.)
-	1	2.28 to 2.30 mm (0.0898 to 0.0906 in.)
-	2	2.30 to 2.32 mm (0.0906 to 0.0913 in.)
-	-	2.32 to 2.34 mm (0.0913 to 0.0921 in.)
Brown	-	2.34 to 2.36 mm (0.0921 to 0.0929 in.)
Blue	-	2.36 to 2.38 mm (0.0929 to 0.0937 in.)
-	6	2.38 to 2.40 mm (0.0937 to 0.0945 in.)
-	7	2.40 to 2.42 mm (0.0945 to 0.0953 in.)
-	8	2.42 to 2.44 mm (0.0953 to 0.0961 in.)
-	九	2.44 to 2.46 mm (0.0961 to 0.0969 in.)
-	10	2.46 to 2.48 mm (0.0969 to 0.0976 in.)
-	A	2.48 to 2.50 mm (0.0976 to 0.0984 in.)
-	B	2.50 to 2.52 mm (0.0984 to 0.0992 in.)
-	C	2.52 to 2.54 mm (0.0992 to 0.1000 in.)
-	D	2.54 to 2.56 mm (0.1000 to 0.1008 in.)
-	E	2.56 to 2.58 mm (0.1008 to 0.1016 in.)

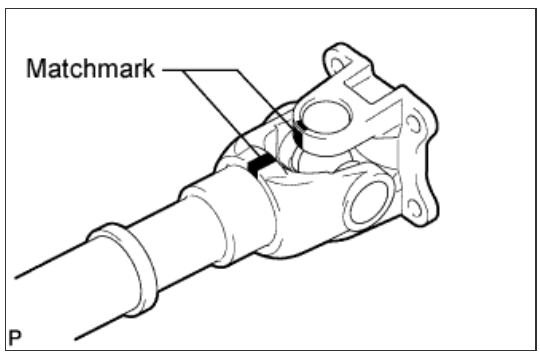
f. Using a hammer, tap the yoke until there is no clearance between the bearing outer race and snap ring.

g. Align the matchmarks on the propeller shaft and flange yoke or flange yoke and sleeve yoke.

h. Install the flange yoke to the sleeve yoke or propeller shaft.

HINT:

Install 2 new spider bearings and snap rings on the flange yoke side using the procedure described above.



2. APPLY MP GREASE

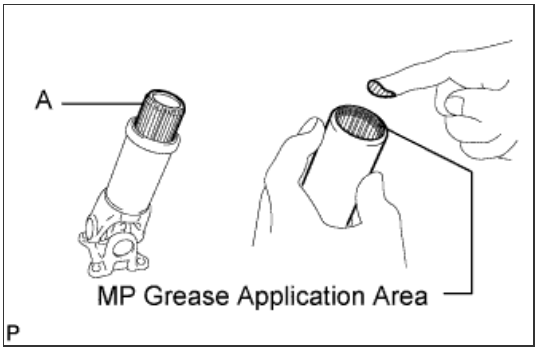
a. Apply MP grease to the propeller shaft (the edge of the spline) as shown in the illustration.

Amount (Reference):

Spline A	Amount
Silver	44 to 54 g (1.56 to 1.90 oz.)
Black	9 to 17 g (0.32 to 0.59 oz.)

HINT:

The amount of grease differs depending on the color of the spline portion of the sleeve yoke.



b. Align the matchmarks and install the sleeve yoke to the propeller shaft.

NOTICE:

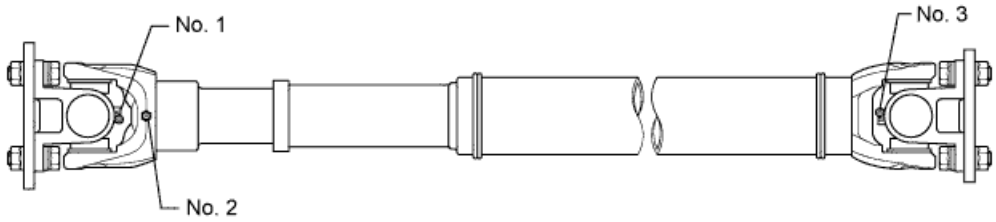
- **Do not scratch the spline portion.**
- **Make sure that there is no foreign matter.**

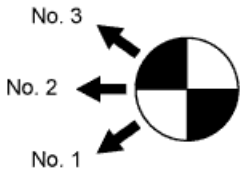
3. INSPECT PROPELLER SHAFT GREASE FITTING DIRECTION

HINT:

When replacing a spider bearing, be sure that the grease fitting hole is facing the direction shown in the illustration.

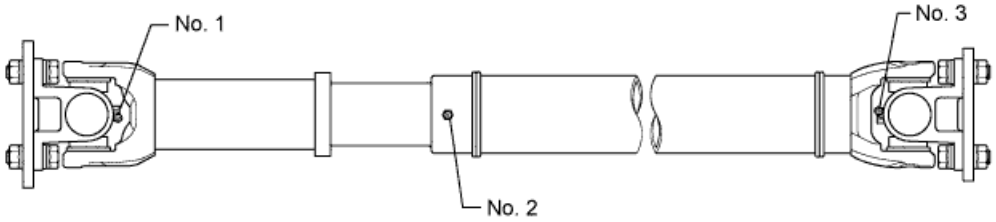
w/o Center Grease Fitting Type:

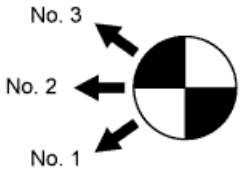




The figure at left shows the locations of the grease fittings as seen from the rear.

w/ Center Grease Fitting Type:





The figure at left shows the locations of the grease fittings as seen from the rear.

P

4. INSPECT SPIDER BEARING

NOTICE:

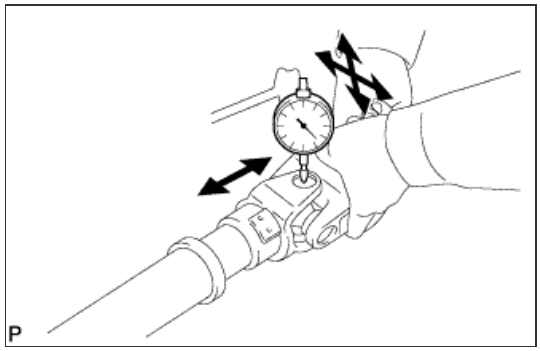
Be careful not to grip the propeller shaft tube too tightly in a vise as this will cause deformation.

a. Check the spider bearings for wear or damage.

b. Check the spider bearing axial play by turning the yoke while holding the shaft tightly.

Maximum bearing axial play:
0 mm (0 in.)

If the axial play is more than the maximum, replace the spider bearing.



P

for Preparation Click here

1. INSTALL FRONT PROPELLER SHAFT ASSEMBLY

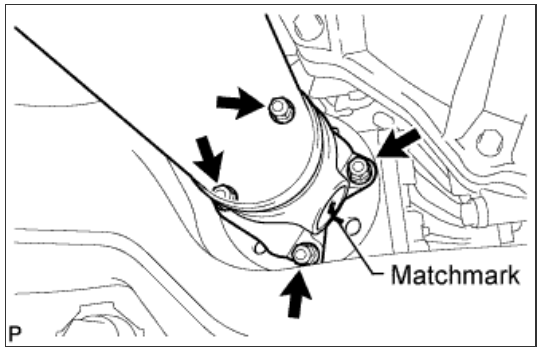
NOTICE:

Refer to the components illustration for the installation direction of the propeller shaft.

a. Align the matchmarks on the propeller shaft flange and differential.

b. Connect the propeller shaft with the 4 washers and 4 nuts.

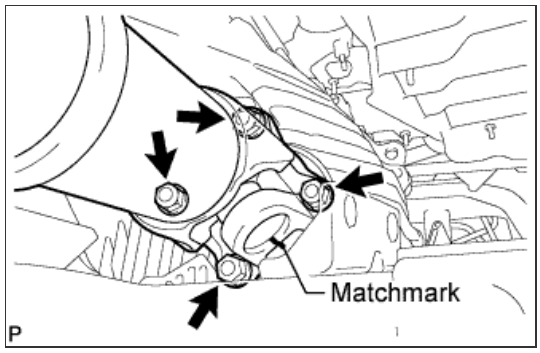
Torque:
88 N*m{ 900 kgf*cm , 65 ft.*lbf }



c. Align the matchmarks on the propeller shaft flange and transfer flange.

d. Install the propeller shaft with the 4 washers and 4 nuts.

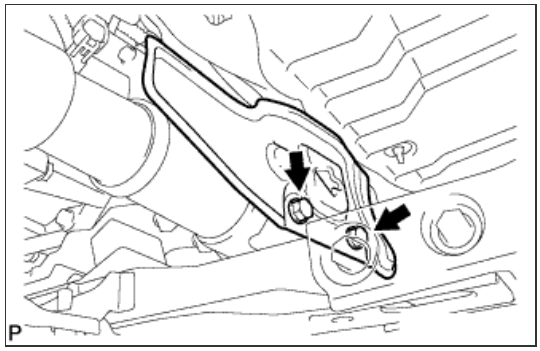
Torque:
88 N*m{ 900 kgf*cm , 65 ft.*lbf }



2. INSTALL PROPELLER SHAFT HEAT INSULATOR

a. Install the insulator with the 2 bolts.

Torque:
16 N*m{ 160 kgf*cm , 12 ft.*lbf }



3. INSTALL NO. 2 ENGINE UNDER COVER

a. Install the No. 2 engine under cover with the 2 bolts.

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

4. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY

a. Install the No. 1 engine under cover with the 10 bolts.

Torque:
29 N*m{ 296 kgf*cm , 21 ft.*lbf }

5. INSTALL FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY LH

a. Push in the clip to install the front fender splash shield sub-assembly LH.

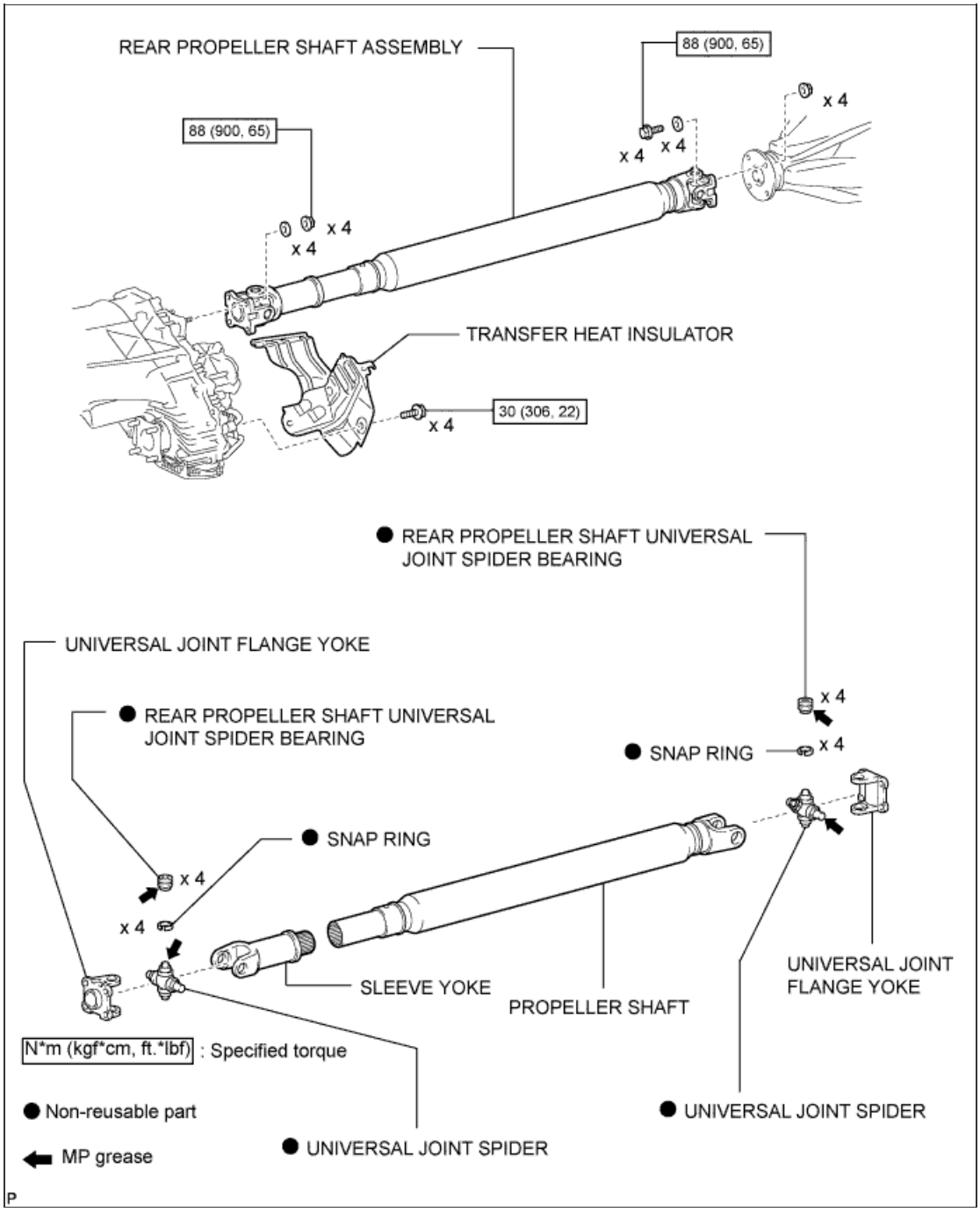
b. Install the 3 bolts and screw.

6. INSTALL FRONT FENDER SPLASH SHIELD SUB-ASSEMBLY RH

a. Push in the clip to install the front fender splash shield sub-assembly RH.

b. Install the 3 bolts and 2 screws.

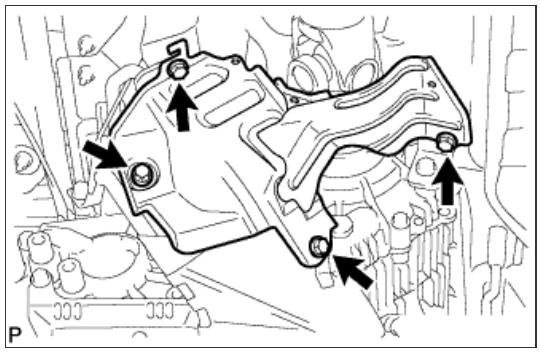
for Preparation [Click here]



for Preparation Click here

1. REMOVE TRANSFER HEAT INSULATOR

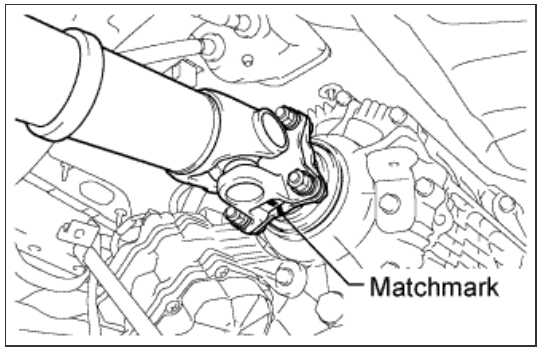
a. Remove the 4 bolts and insulator.



2. REMOVE REAR PROPELLER SHAFT ASSEMBLY

a. Place matchmarks on the propeller shaft flange and transfer.

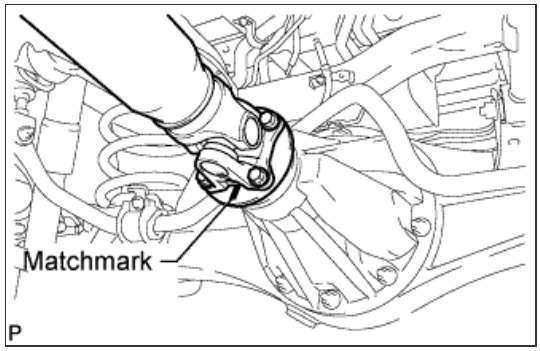
b. Remove the 4 nuts and 4 washers.



c. Place matchmarks on the propeller shaft flange and rear differential.

d. Remove the 4 nuts, 4 bolts and 4 washers.

e. Remove the rear propeller shaft.



for Preparation Click here

NOTICE:

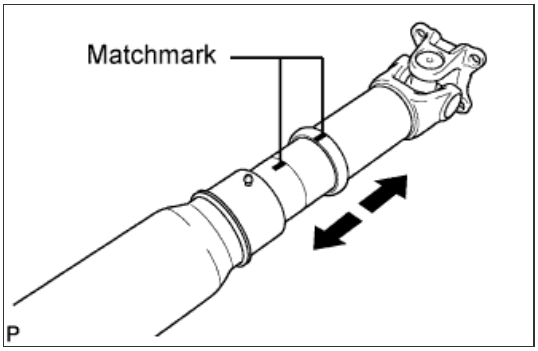
Be careful not to grip the propeller shaft tube too tightly in a vise as this will cause deformation.

1. CLEAN PROPELLER SHAFT GREASE

a. Place matchmarks on the propeller shaft and sleeve yoke.

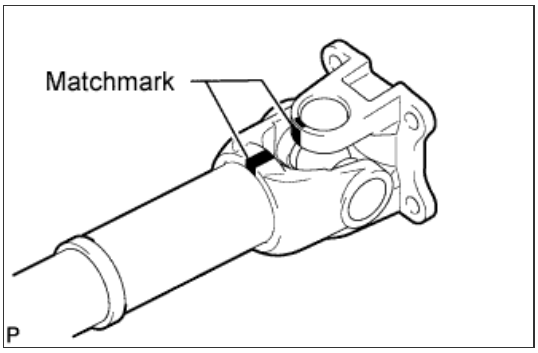
b. Disconnect the sleeve yoke from the propeller shaft.

c. Clean off any grease on the spline.



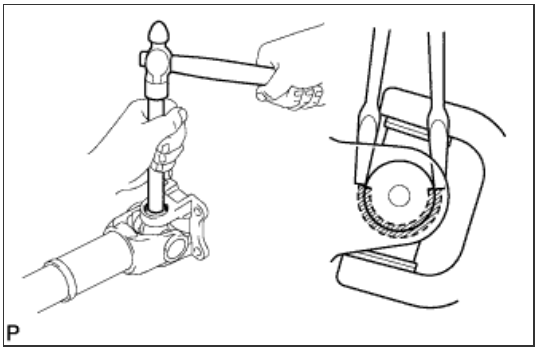
2. REMOVE REAR PROPELLER SHAFT UNIVERSAL JOINT SPIDER ASSEMBLY

a. Place matchmarks on the flange yoke and sleeve yoke or propeller shaft.



b. Using a brass bar and hammer, slightly tap in the spider bearing outer races.

c. Using 2 screwdrivers, remove the 4 snap rings from the grooves.



d. Using SST, push out the bearing from the flange.

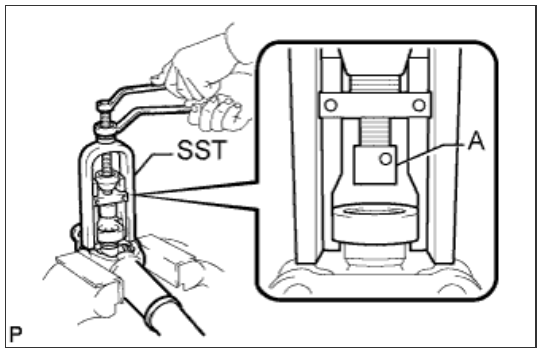
SST

09332-25010

HINT:

Before installing SST, sufficiently raise the part labeled A. If part A is too low,

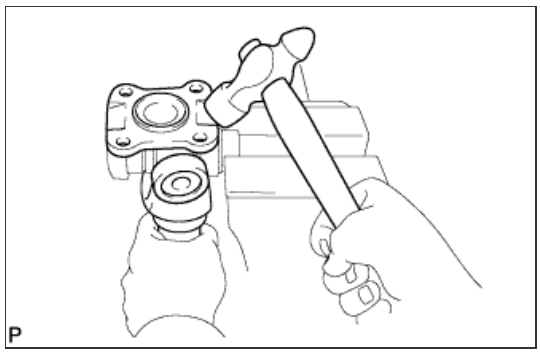
SST may be difficult to install.



e. Clamp the bearing outer race in a vise and tap off the flange with a hammer.

HINT:

Remove the bearing on the opposite side using the same procedure.

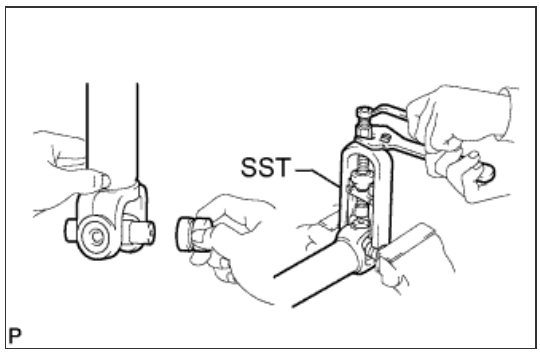


f. Remove the flange yoke from the sleeve yoke (or propeller shaft).

g. Install the 2 removed bearing outer races to the spider.

h. Using SST, push out the bearing from the yoke.

SST
09332-25010



i. Clamp the outer bearing race in a vise and tap off the yoke with a hammer.

HINT:

Remove the bearing on the opposite side using the same procedure.

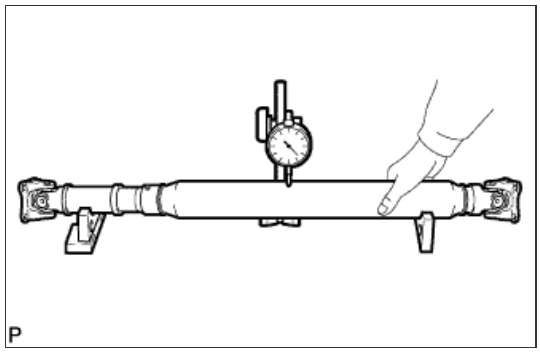
for Preparation Click here

1. INSPECT REAR PROPELLER SHAFT ASSEMBLY

a. Using a dial indicator, measure the propeller shaft runout.

Maximum runout:
0.8 mm (0.031 in.)

If the shaft runout is more than the maximum, replace the shaft.



2. INSPECT SPIDER BEARING

NOTICE:

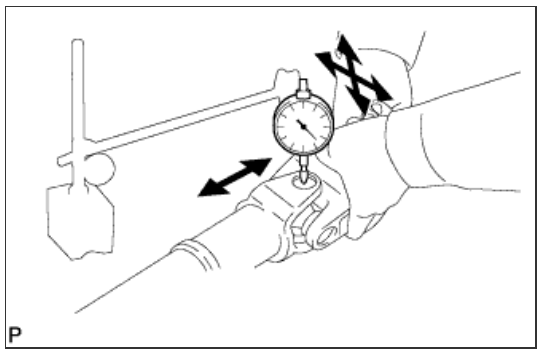
Be careful not to grip the propeller shaft tube too tightly in a vise as this will cause deformation.

a. Check the spider bearings for wear or damage.

b. Check the axial play of each spider bearing by turning the yoke while holding the shaft tightly.

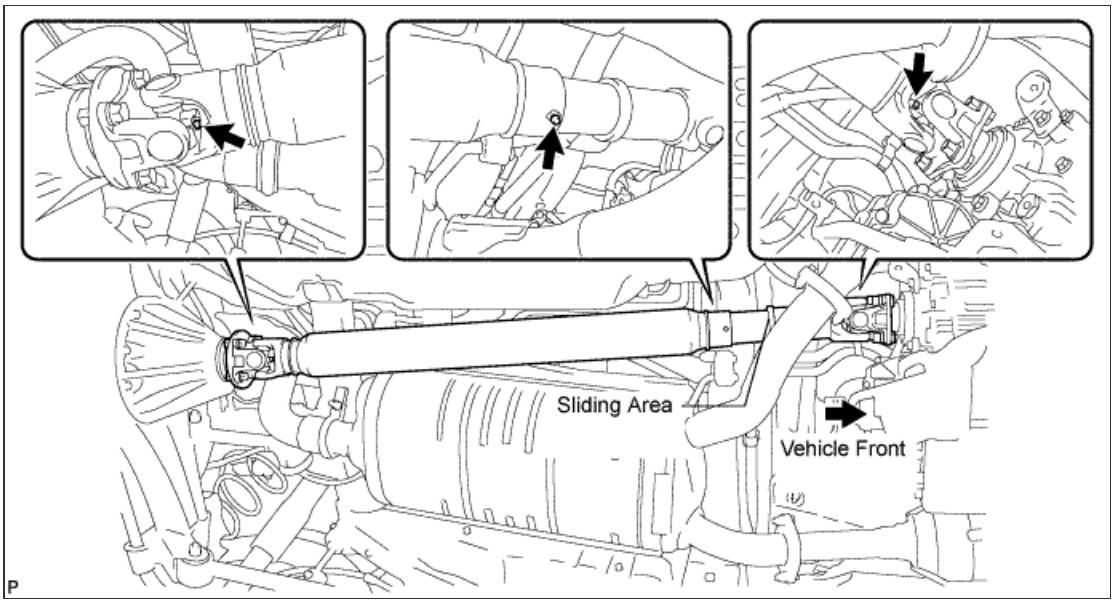
Maximum bearing axial play:
0 mm (0 in.)

If the axial play is more than the maximum, replace the spider bearing.



3. FILL PROPELLER SHAFT WITH GREASE

a. Fill each of the grease fitting holes of the propeller shaft with MP grease.



NOTICE:

Stop filling the grease fitting hole on the middle portion of the propeller shaft once the sliding portion starts extending.

b. Drive the vehicle.

NOTICE:

Check the safety of the surrounding areas.

HINT:

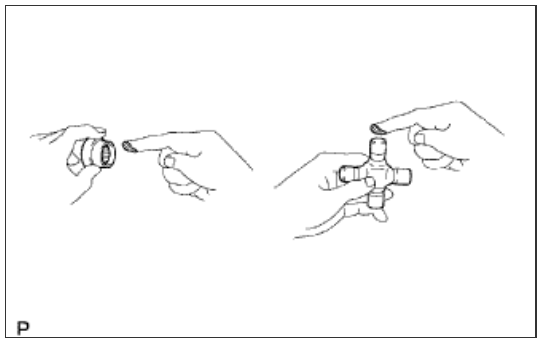
Move the vehicle forward and in reverse 5 times and strongly apply the brake.

c. Lift up the vehicle and wipe off any excess grease as a result of driving.

for Preparation Click here

1. INSTALL REAR PROPELLER SHAFT UNIVERSAL JOINT SPIDER ASSEMBLY

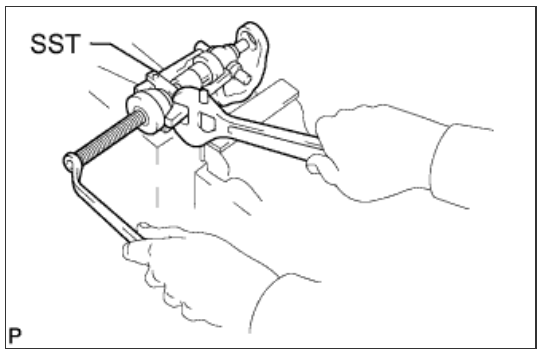
a. Apply MP grease to a new spider and new bearings.



b. Fit the spider into the flange yoke.

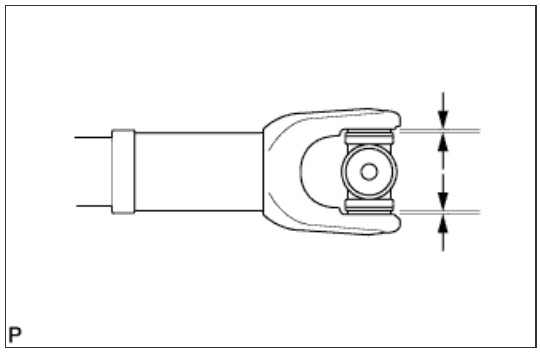
c. Using SST, install the bearings to the spider.

SST
09332-25010



d. Using SST, adjust both bearings so that the snap ring grooves are at maximum and equal in width.

SST
09332-25010



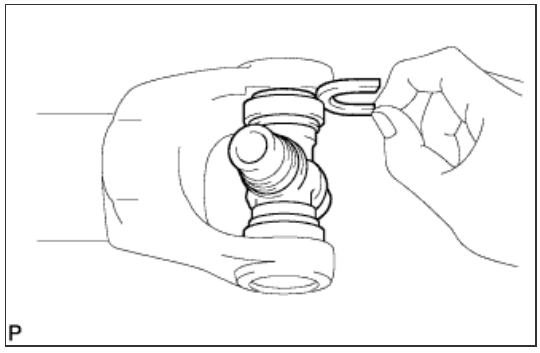
e. Install 2 new snap rings of equal thickness which will allow 0 mm (0 in.) of axial play.

HINT:

Do not reuse the snap rings.

Standard Snap Ring Thickness:

Color	Mark	Specified Condition
-	J	2.18 to 2.20 mm (0.0858 to 0.0866 in.)
-	K	2.20 to 2.22 mm (0.0866 to 0.0874 in.)
-	F	2.22 to 2.24 mm (0.0874 to 0.0882



		in.)
-	G	2.24 to 2.26 mm (0.0882 to 0.0890 in.)
-	H	2.26 to 2.28 mm (0.0890 to 0.0898 in.)
-	1	2.28 to 2.30 mm (0.0898 to 0.0906 in.)
-	2	2.30 to 2.32 mm (0.0906 to 0.0913 in.)
-	-	2.32 to 2.34 mm (0.0913 to 0.0921 in.)
Brown	-	2.34 to 2.36 mm (0.0921 to 0.0929 in.)
Blue	-	2.36 to 2.38 mm (0.0929 to 0.0937 in.)
-	6	2.38 to 2.40 mm (0.0937 to 0.0945 in.)
-	7	2.40 to 2.42 mm (0.0945 to 0.0953 in.)
-	8	2.42 to 2.44 mm (0.0953 to 0.0961 in.)
-	九	2.44 to 2.46 mm (0.0961 to 0.0969 in.)
-	10	2.46 to 2.48 mm (0.0969 to 0.0976 in.)
-	A	2.48 to 2.50 mm (0.0976 to 0.0984 in.)
-	B	2.50 to 2.52 mm (0.0984 to 0.0992 in.)
-	C	2.52 to 2.54 mm (0.0992 to 0.1000 in.)
-	D	2.54 to 2.56 mm (0.1000 to 0.1008 in.)
-	E	2.56 to 2.58 mm (0.1008 to 0.1016 in.)

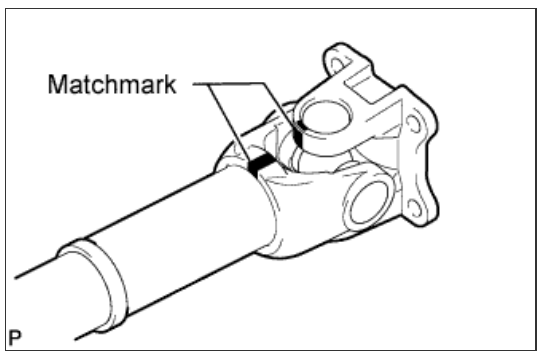
f. Using a hammer, tap the yoke until there is no clearance between the bearing outer race and snap ring.

g. Align the matchmarks on the propeller shaft and flange yoke or flange yoke and sleeve yoke.

h. Install the flange yoke to the sleeve yoke or propeller shaft.

HINT:

Install 2 new spider bearings and snap rings on the flange yoke side using the procedure described above.



2. APPLY MP GREASE

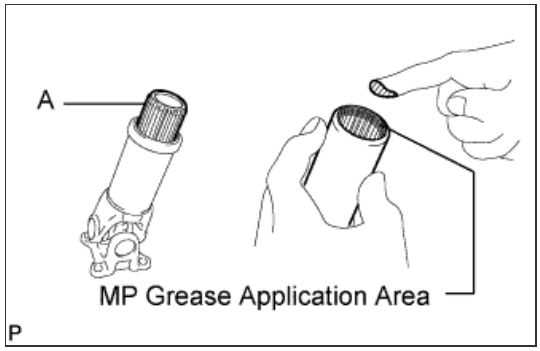
a. Apply MP grease to the propeller shaft (the edge of the spline) as shown in the illustration.

Amount (Reference):

Spline A	Amount
Silver	44 to 54 g (1.56 to 1.90 oz.)
Black	9 to 17 g (0.32 to 0.59 oz.)

HINT:

The amount of grease differs depending on the color of the spline portion of the sleeve yoke.



b. Align the matchmarks and install the sleeve yoke to the propeller shaft.

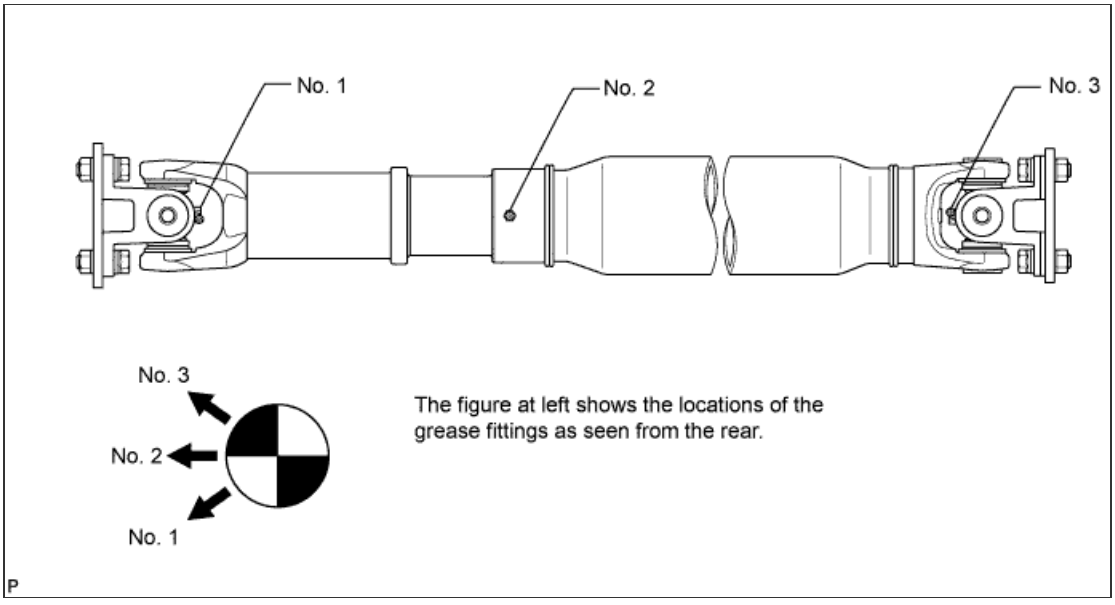
NOTICE:

- **Do not scratch the spline portion.**
- **Make sure that there is no foreign matter.**

3. INSPECT PROPELLER SHAFT GREASE FITTING DIRECTION

HINT:

When replacing a spider bearing, be sure that the grease fitting hole is facing the direction shown in the illustration.



4. INSPECT SPIDER BEARING

NOTICE:

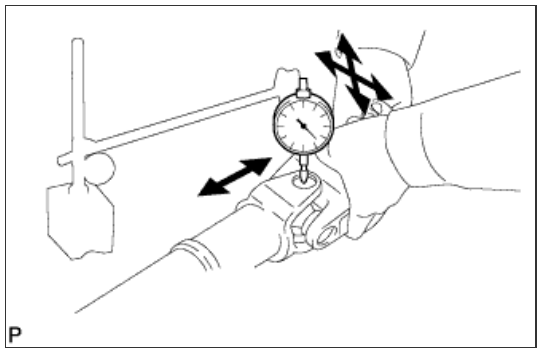
Be careful not to grip the propeller shaft tube too tightly in a vise as this will cause deformation.

a. Check the spider bearings for wear or damage.

b. Check the axial play of each spider bearing by turning the yoke while holding the shaft tightly.

Maximum bearing axial play:
0 mm (0 in.)

If the axial play is more than the maximum, replace the spider bearing.



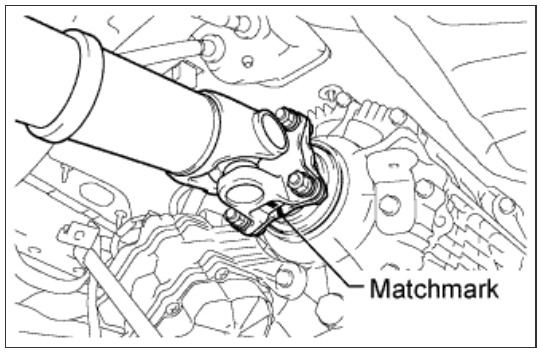
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1. INSTALL REAR PROPELLER SHAFT

a. Align the matchmarks on the propeller shaft flange and transfer.

b. Connect the propeller shaft with the 4 washers and 4 nuts.

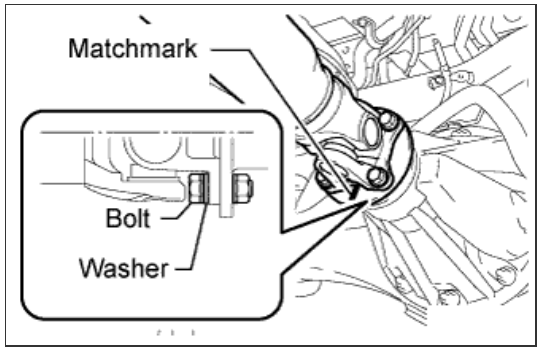
Torque:
88 N*m{ 900 kgf*cm , 65 ft.*lbf }



c. Align the matchmarks on the propeller shaft flange and rear differential.

d. Install the propeller shaft with the 4 bolts, 4 washers and 4 nuts.

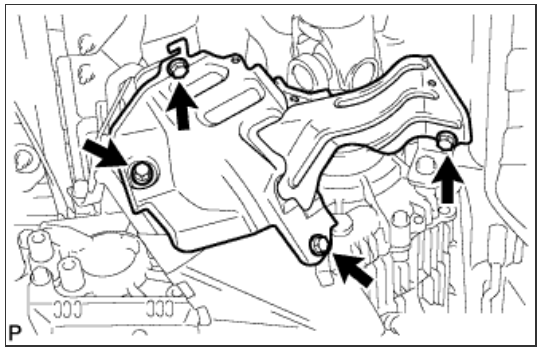
Torque:
88 N*m{ 900 kgf*cm , 65 ft.*lbf }



2. INSTALL TRANSFER HEAT INSULATOR

a. Install the insulator with the 4 bolts.

Torque:
30 N*m{ 306 kgf*cm , 22 ft.*lbf }



for Preparation Click here

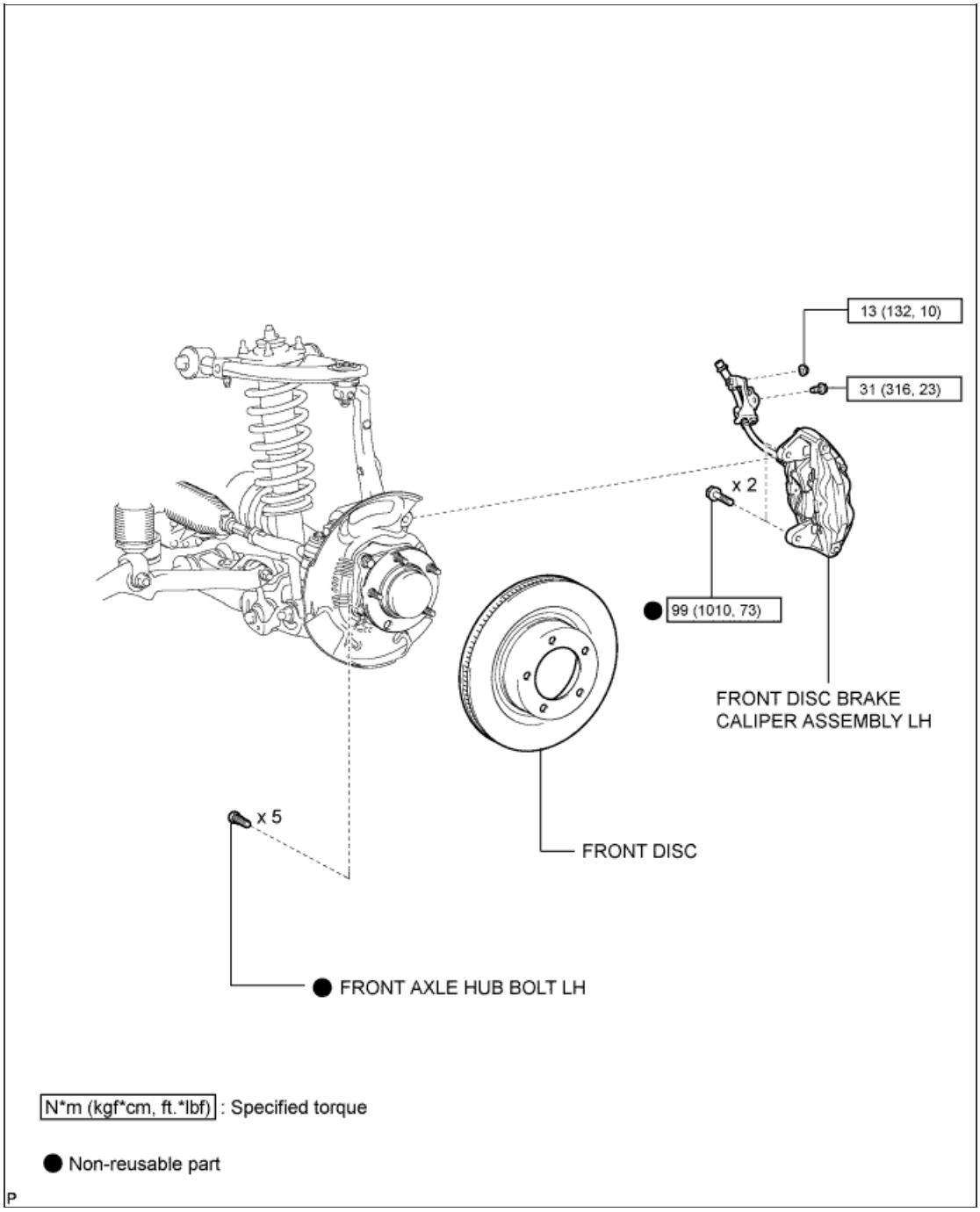
HINT:

Use the table below to help determine the cause of problem symptoms. If multiple suspected areas are listed, the potential causes of the symptoms are listed in order of probability in the "Suspected Area" column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.

Axle System

Symptom	Suspected Area	See page
Vehicle unstable	Tire (Worn or improperly inflated)	Click here
	Wheel alignment (Incorrect)	Click here
	Steering linkage (Loosen or worn)	-
	Hub bearing (Worn)	Click here
	Steering gear (Out of adjustment or broken)	-
	Suspension parts (Worn)	-
Front wheel shimmy	Tire (Worn or improperly inflated)	Click here
	Wheel (Out of balance)	Click here
	Front shock absorber (Worn)	Click here
	Wheel alignment (Incorrect)	Click here
	Upper ball joint (Worn)	Click here
	Lower ball joint (Worn)	Click here
	Hub bearing (Worn)	Click here
	Steering linkage (Loose or worn)	-
Rear wheel shimmy	Tire (Worn or improperly inflated)	Click here
	Wheel (Out of balance)	Click here
	Rear shock absorber (Worn)	Click here
	Rear axle shaft (Worn)	Click here

for Preparation [Click here]



for Preparation Click here

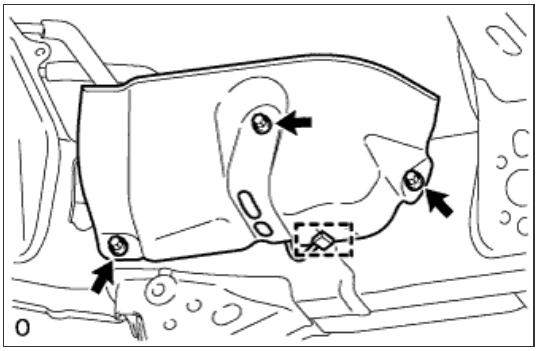
HINT:

- **Use the same procedures for the LH side and RH side.**
- **The procedures listed below are for the LH side.**

1. REMOVE STABILIZER CONTROL VALVE PROTECTOR (w/ KDSS)

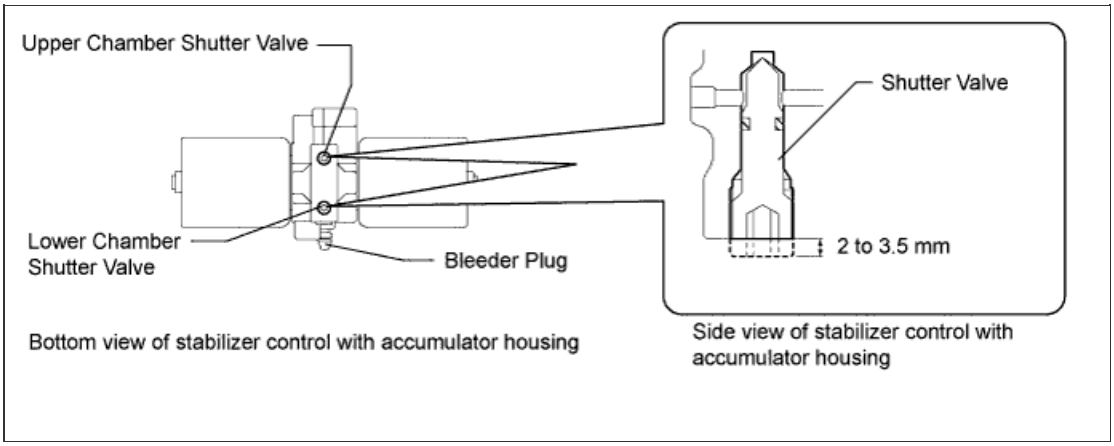
a. Detach the clamp, and disconnect the connector from the protector.

b. Remove the 3 bolts and protector.



2. OPEN STABILIZER CONTROL WITH ACCUMULATOR HOUSING SHUTTER VALVE (w/ KDSS)

a. Using a 5 mm hexagon socket wrench, loosen the lower and upper chamber shutter valves of the stabilizer control with accumulator housing 2.0 to 3.5 turns.



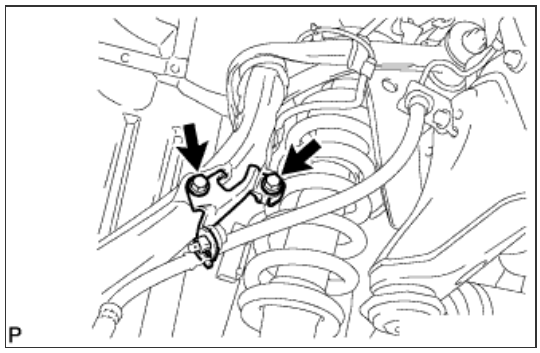
NOTICE:

- **When loosening a shutter valve, make sure that the end protrudes 2 to 3.5 mm (0.0787 to 0.137 in.) from the surface of the block, and do not turn the shutter valve any further.**
- **Do not remove the shutter valves.**

3. REMOVE FRONT WHEEL

4. DISCONNECT FRONT DISC BRAKE CALIPER ASSEMBLY LH

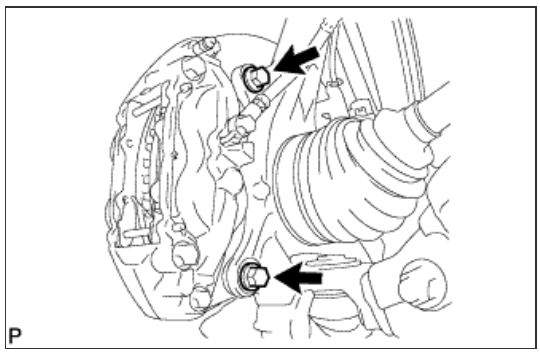
a. Remove the bolt and nut, and disconnect the brake tube bracket from the steering knuckle.



b. Remove the 2 bolts and disconnect the disc brake caliper from the steering knuckle.

NOTICE:

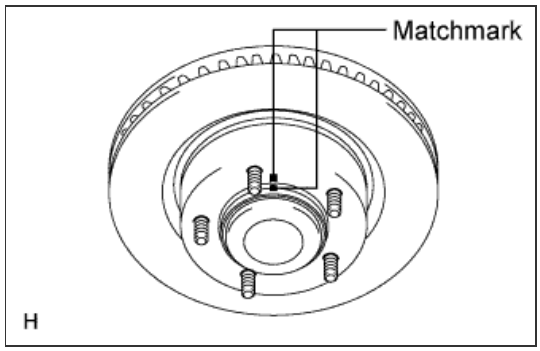
- **Do not disconnect the flexible hose from the disc brake caliper.**
- **Do not twist or bend the flexible hose.**



5. REMOVE FRONT DISC

a. Put matchmarks on the front disc and axle hub if planning to reuse the disc.

b. Remove the front disc.



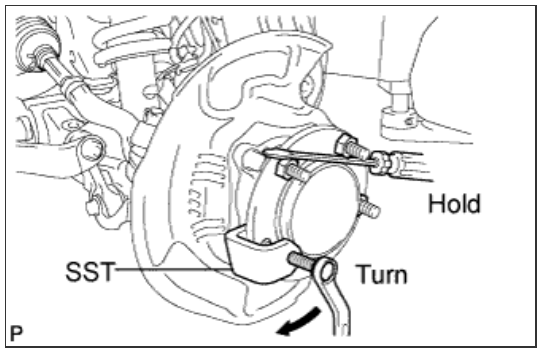
6. REMOVE FRONT AXLE HUB BOLT LH

a. Using SST and a screwdriver or equivalent to hold the axle hub, remove the front axle hub bolt.

SST
09650-17011

NOTICE:

Do not damage the threads of the hub bolt.



7. INSTALL FRONT AXLE HUB BOLT LH

a. Temporarily install a washer and hub nut to a new hub bolt as shown in the illustration.

NOTICE:

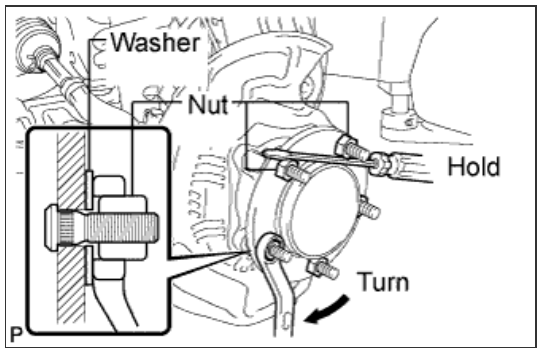
Install a hub nut to prevent damage to the hub bolt.

b. Using a screwdriver or equivalent to hold the hub, turn the hub nut until the bottom surface of the hub bolt head touches the axle hub.

c. Remove the washer and hub nut.

NOTICE:

Do not damage the threads of the hub bolt.



8. INSPECT FRONT AXLE HUB BEARING LOOSENESS

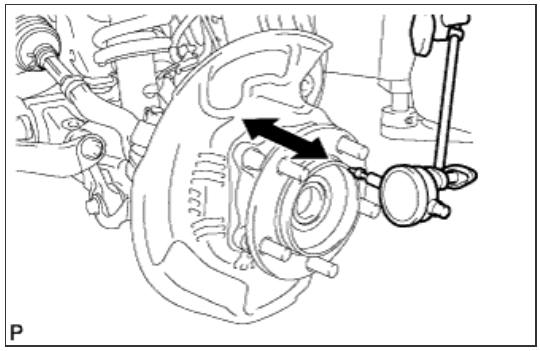
a. Using a dial indicator, measure the looseness near the center of the axle hub.

Maximum looseness:
0.05 mm (0.00197 in.)

NOTICE:

Ensure that the dial indicator is set at a right angle to the measurement surface.

If the looseness exceeds the maximum, replace the axle hub.



9. INSPECT FRONT AXLE HUB RUNOUT

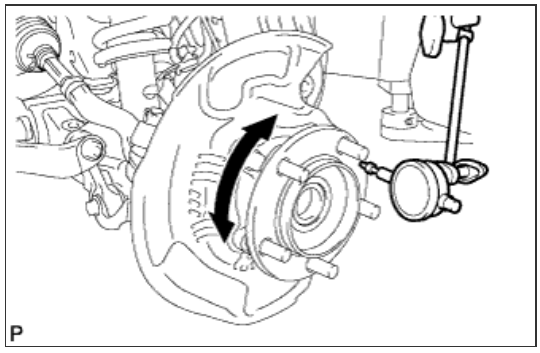
a. Using a dial indicator, measure the runout on the surface of the axle hub outside the hub bolt.

Maximum runout:
0.08 mm (0.00315 in.)

NOTICE:

Ensure that the dial indicator is set at a right angle to the measurement surface.

If the runout exceeds the maximum, replace the axle hub.

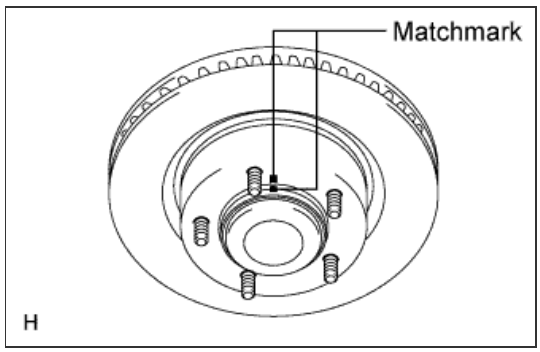


10. INSTALL FRONT DISC

a. Align the matchmarks, and then install the front disc.

HINT:

When replacing the front disc with a new one, select the installation position where the front disc has the minimum runout.



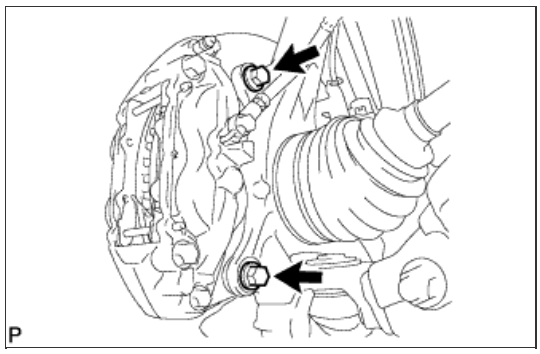
11. CONNECT FRONT DISC BRAKE CALIPER ASSEMBLY LH

a. Connect the front disc brake caliper and install 2 new bolts.

Torque:
99 N*m{ 1010 kgf*cm , 73 ft.*lbf }

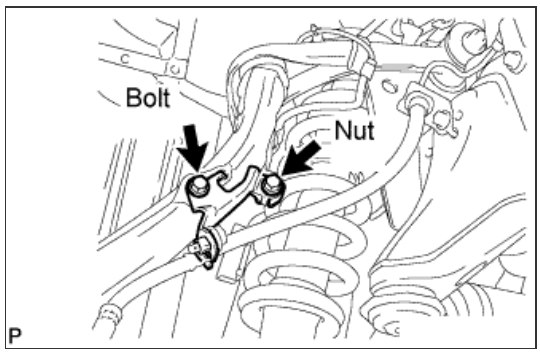
NOTICE:

- **Do not twist the flexible hose.**
- **Make sure that the bolts are free from damage and foreign matter.**
- **Do not overtighten the bolts.**



b. Connect the brake tube bracket to the steering knuckle with the bolt and nut.

Torque:
for bolt:
31 N*m{ 316 kgf*cm , 23 ft.*lbf }
for nut:
13 N*m{ 132 kgf*cm , 10 ft.*lbf }



12. INSTALL FRONT WHEEL

Torque:
for Aluminum Wheel:
131 N*m{ 1336 kgf*cm , 97 ft.*lbf }
for Steel Wheel:
209 N*m{ 2131 kgf*cm , 154 ft.*lbf }

13. MEASURE VEHICLE HEIGHT (w/ KDSS)

NOTICE:

- **Perform the inspection on a level surface.**
- **Ensure that the wheels are on the ground and facing straight ahead.**
- **Perform the inspection with the vehicle load completely on the suspension.**

HINT:

- **Perform this step with the fuel tank full.**
- **If there are any parts installed to the vehicle which place any unbalanced load on the left or right side of the vehicle, remove them.**

a. Set the tire pressure to the specified value(s) (Click here).

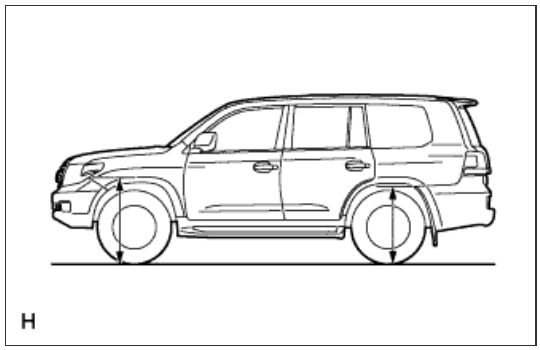
b. Bounce the vehicle to stabilize the suspension.

c. Measure the distance from the ground to the top of the bumper and calculate the difference in the vehicle height between left and right. Perform this procedure for both the front and rear wheels.

Height difference of left and right sides:
15 mm (0.591 in.) or less

HINT:

If not as specified, perform the vehicle tilt calibration.



14. CLOSE STABILIZER CONTROL WITH ACCUMULATOR HOUSING SHUTTER VALVE (w/ KDSS)

NOTICE:

- **Perform the inspection on a level surface.**
- **Ensure that the wheels are on the ground and facing straight ahead.**
- **Perform the inspection with the vehicle load completely on the suspension.**

HINT:

- **Perform this step with the fuel tank full.**
- **If there are any parts installed to the vehicle which place any unbalanced load on the left or right side of the vehicle, remove them.**

a. Using a 5 mm hexagon socket wrench, tighten the lower and upper chamber shutter valves of the stabilizer control with accumulator housing.

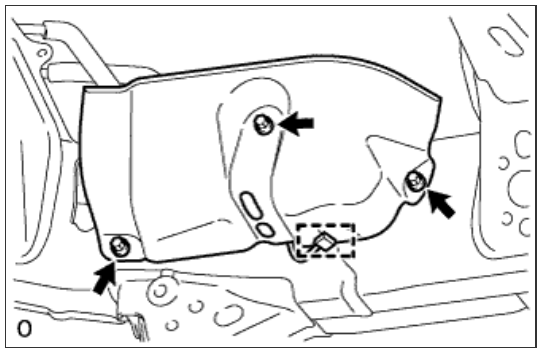
Torque:
14 N*m{ 143 kgf*cm , 10 ft.*lbf }

15. INSTALL STABILIZER CONTROL VALVE PROTECTOR (w/ KDSS)

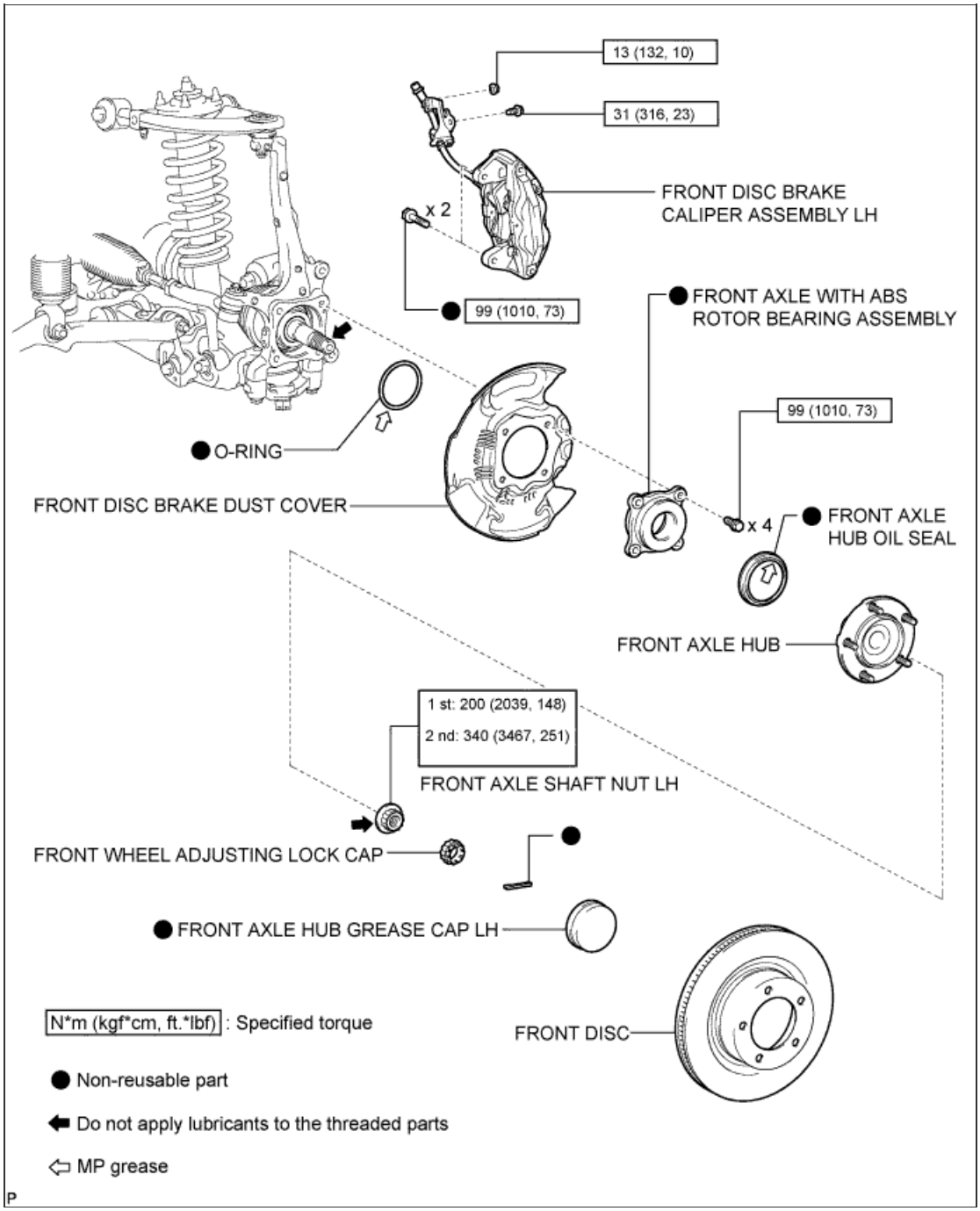
a. Install the valve protector with the 3 bolts.

Torque:
18 N*m{ 184 kgf*cm , 13 ft.*lbf }

b. Attach the clamp, and connect the connector to the valve protector.



for Preparation Click here

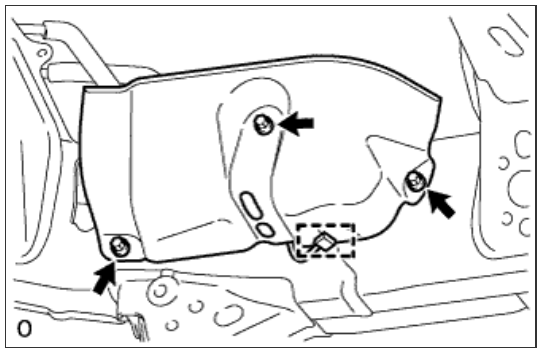


for Preparation Click here

1. REMOVE STABILIZER CONTROL VALVE PROTECTOR (w/ KDSS)

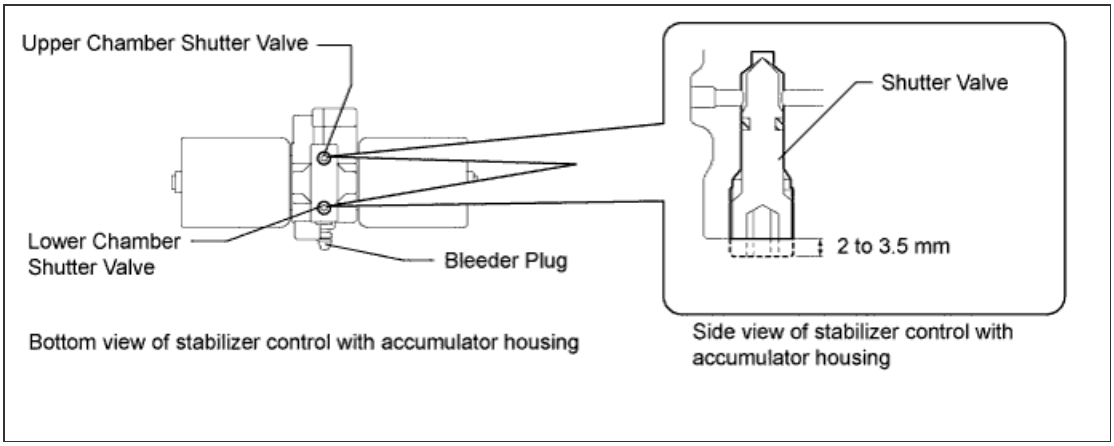
a. Detach the clamp, and disconnect the connector from the protector.

b. Remove the 3 bolts and protector.



2. OPEN STABILIZER CONTROL WITH ACCUMULATOR HOUSING SHUTTER VALVE (w/ KDSS)

a. Using a 5 mm hexagon socket wrench, loosen the lower and upper chamber shutter valves of the stabilizer control with accumulator housing 2.0 to 3.5 turns.



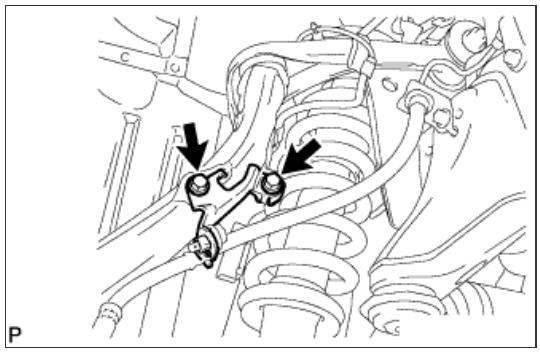
NOTICE:

- **When loosening a shutter valve, make sure that the end protrudes 2 to 3.5 mm (0.0787 to 0.137 in.) from the surface of the block, and do not turn the shutter valve any further.**
- **Do not remove the shutter valves.**

3. REMOVE FRONT WHEEL

4. DISCONNECT FRONT DISC BRAKE CALIPER ASSEMBLY LH

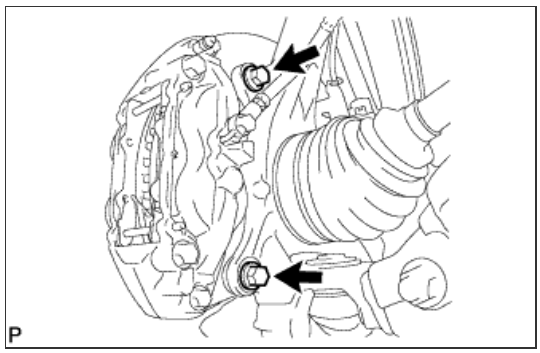
a. Remove the bolt and nut, and disconnect the brake tube bracket from the steering knuckle.



b. Remove the 2 bolts and disconnect the disc brake caliper from the steering knuckle.

NOTICE:

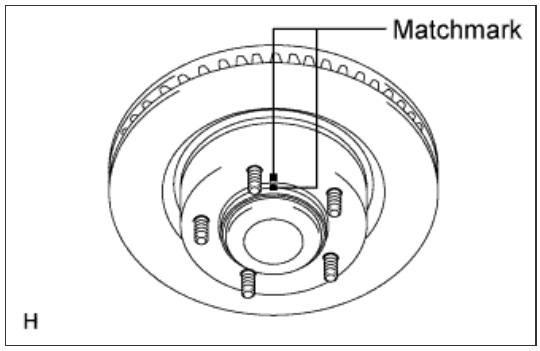
- **Do not disconnect the flexible hose from the disc brake caliper.**
- **Do not twist or bend the flexible hose.**



5. REMOVE FRONT DISC

a. Put matchmarks on the front disc and axle hub if planning to reuse the disc.

b. Remove the front disc.

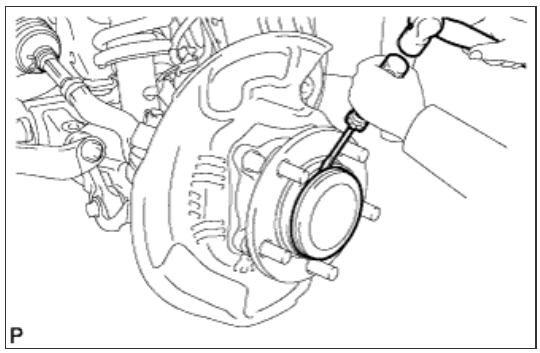


6. REMOVE FRONT AXLE HUB GREASE CAP LH

a. Using a screwdriver and hammer, remove the axle hub grease cap.

NOTICE:

Do not damage the axle hub.



7. INSPECT FRONT AXLE HUB BEARING LOOSENESS

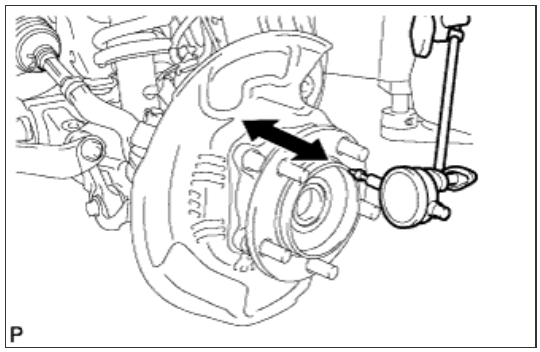
a. Using a dial indicator, measure the looseness near the center of the axle hub.

Maximum looseness:
0.05 mm (0.00197 in.)

NOTICE:

Ensure that the dial indicator is set at a right angle to the measurement surface.

If the looseness exceeds the maximum, replace the axle hub.



8. INSPECT FRONT AXLE HUB RUNOUT

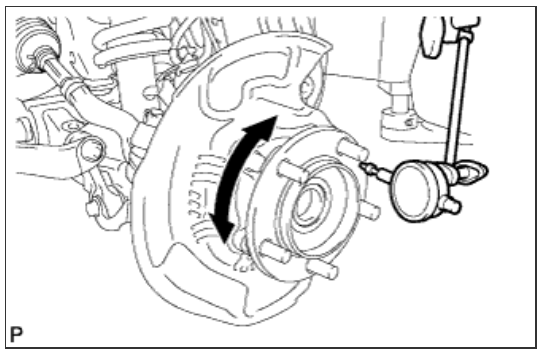
a. Using a dial indicator, measure the runout on the surface of the axle hub outside the hub bolt.

Maximum runout:
0.08 mm (0.00315 in.)

NOTICE:

Ensure that the dial indicator is set at a right angle to the measurement surface.

If the runout exceeds the maximum, replace the axle hub.



9. INSTALL FRONT AXLE HUB GREASE CAP LH

a. Install the axle hub grease cap.

NOTICE:

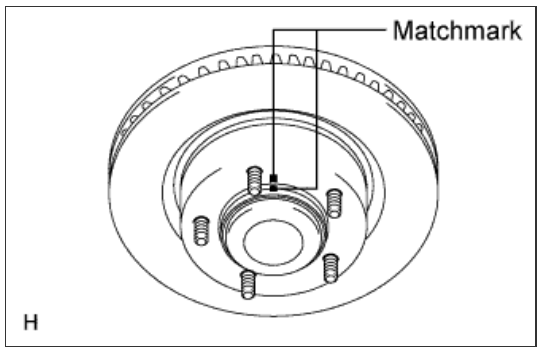
Make sure to securely fit the grease cap to the axle hub.

10. INSTALL FRONT DISC

a. Align the matchmarks, and then install the front disc.

HINT:

When replacing the front disc with a new one, select the installation position where the front disc has the minimum runout.



11. CONNECT FRONT DISC BRAKE CALIPER ASSEMBLY LH

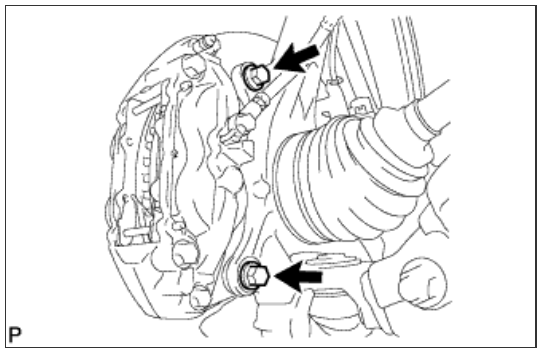
a. Connect the front disc brake caliper and install 2 new bolts.

Torque:
99 N*m{ 1010 kgf*cm , 73 ft.*lbf }

NOTICE:

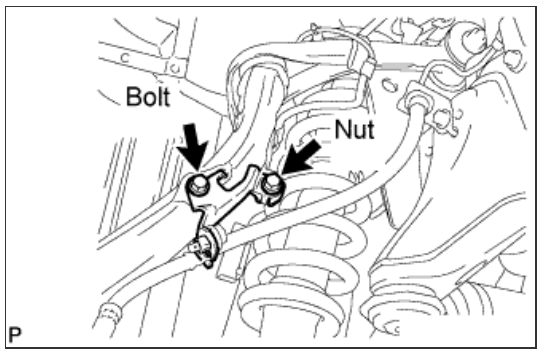
- **Do not twist the flexible hose.**

- Make sure that the bolts are free from damage and foreign matter.
- Do not overtighten the bolts.



b. Connect the brake tube bracket to the steering knuckle with the bolt and nut.

Torque:
for bolt:
31 N*m{ 316 kgf*cm , 23 ft.*lbf }
for nut:
13 N*m{ 132 kgf*cm , 10 ft.*lbf }



12. INSTALL FRONT WHEEL

Torque:
131 N*m{ 1336 kgf*cm , 97 ft.*lbf }

13. MEASURE VEHICLE HEIGHT (w/ KDSS)

NOTICE:

- **Perform the inspection on a level surface.**
- **Ensure that the wheels are on the ground and facing straight ahead.**
- **Perform the inspection with the vehicle load completely on the suspension.**

HINT:

- **Perform this step with the fuel tank full.**
- **If there are any parts installed to the vehicle which place any unbalanced load on the left or right side of the vehicle, remove them.**

a. Set the tire pressure to the specified value(s) (Click here).

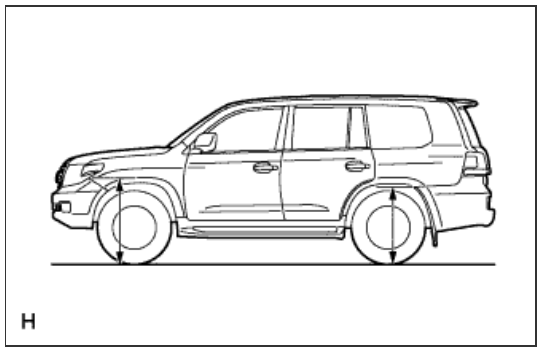
b. Bounce the vehicle to stabilize the suspension.

c. Measure the distance from the ground to the top of the bumper and calculate the difference in the vehicle height between left and right. Perform this procedure for both the front and rear wheels.

Height difference of left and right sides:
15 mm (0.591 in.) or less

HINT:

If not as specified, perform the vehicle tilt calibration.



14. CLOSE STABILIZER CONTROL WITH ACCUMULATOR HOUSING SHUTTER VALVE (w/ KDSS)

NOTICE:

- **Perform the inspection on a level surface.**

- **Ensure that the wheels are on the ground and facing straight ahead.**
- **Perform the inspection with the vehicle load completely on the suspension.**

HINT:

- **Perform this step with the fuel tank full.**
- **If there are any parts installed to the vehicle which place any unbalanced load on the left or right side of the vehicle, remove them.**

a. Using a 5 mm hexagon socket wrench, tighten the lower and upper chamber shutter valves of the stabilizer control with accumulator housing.

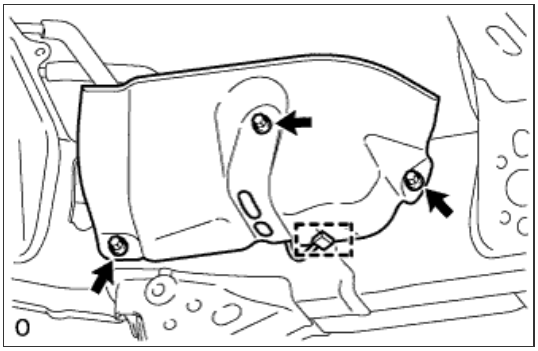
Torque:
14 N*m{ 143 kgf*cm , 10 ft.*lbf }

15. INSTALL STABILIZER CONTROL VALVE PROTECTOR (w/ KDSS)

a. Install the valve protector with the 3 bolts.

Torque:
18 N*m{ 184 kgf*cm , 13 ft.*lbf }

b. Attach the clamp, and connect the connector to the valve protector.



for Preparation Click here

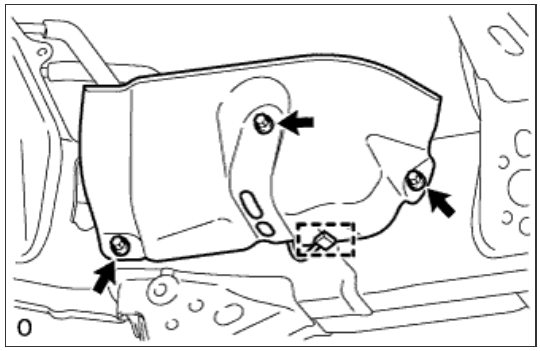
HINT:

- **Use the same procedures for the LH side and RH side.**
- **The procedures listed below are for the LH side.**

1. REMOVE STABILIZER CONTROL VALVE PROTECTOR (w/ KDSS)

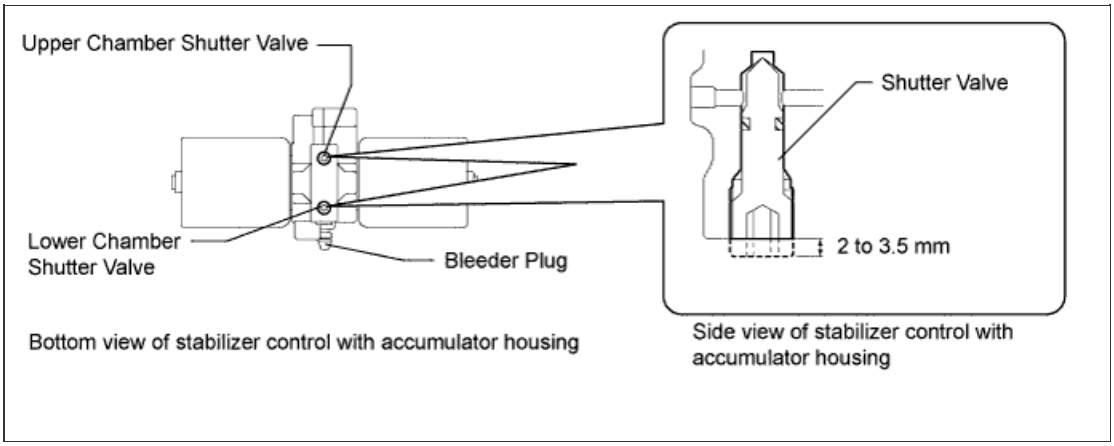
a. Detach the clamp, and disconnect the connector from the protector.

b. Remove the 3 bolts and protector.



2. OPEN STABILIZER CONTROL WITH ACCUMULATOR HOUSING SHUTTER VALVE (w/ KDSS)

a. Using a 5 mm hexagon socket wrench, loosen the lower and upper chamber shutter valves of the stabilizer control with accumulator housing 2.0 to 3.5 turns.



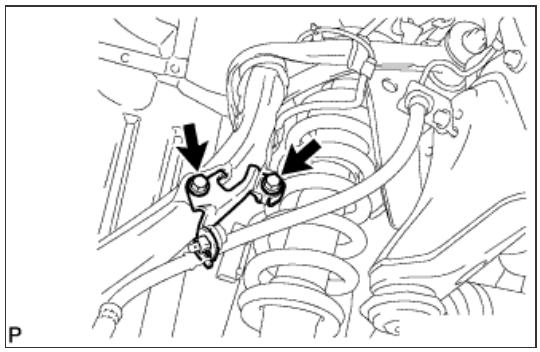
NOTICE:

- **When loosening a shutter valve, make sure that the end protrudes 2 to 3.5 mm (0.0787 to 0.137 in.) from the surface of the block, and do not turn the shutter valve any further.**
- **Do not remove the shutter valves.**

3. REMOVE FRONT WHEEL

4. DISCONNECT FRONT DISC BRAKE CALIPER ASSEMBLY LH

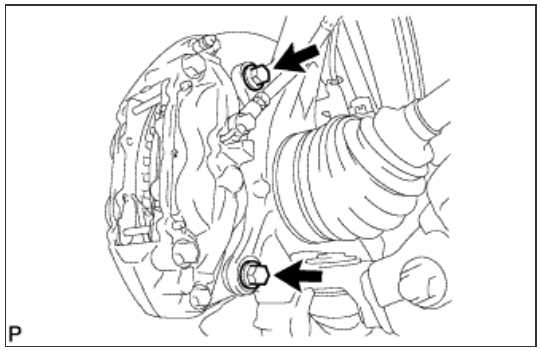
a. Remove the bolt and nut, and disconnect the brake tube bracket from the steering knuckle.



b. Remove the 2 bolts and disconnect the disc brake caliper from the steering knuckle.

NOTICE:

- **Do not disconnect the flexible hose from the disc brake caliper.**
- **Do not twist or bend the flexible hose.**



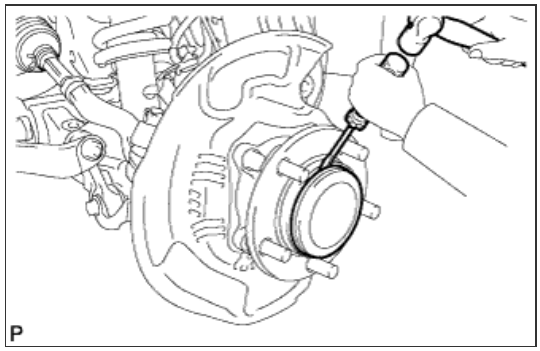
5. REMOVE FRONT DISC

6. REMOVE FRONT AXLE HUB GREASE CAP LH

a. Using a screwdriver and hammer, remove the axle hub grease cap.

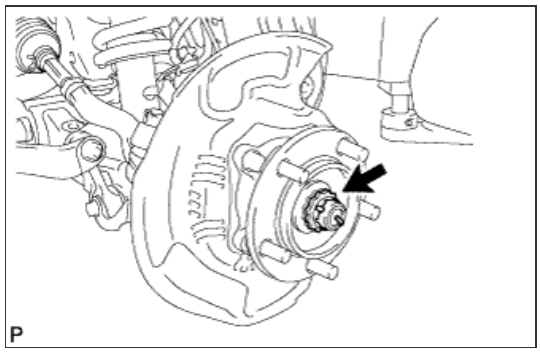
NOTICE:

Do not damage the axle hub.

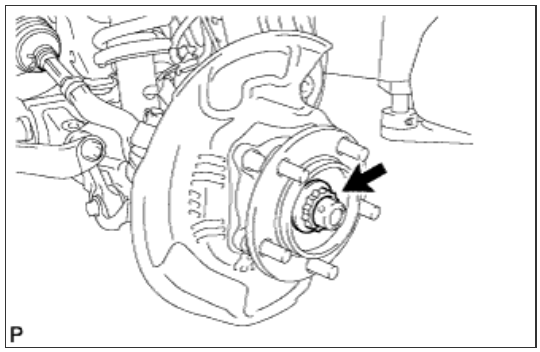


7. REMOVE FRONT AXLE SHAFT NUT LH

a. Remove the cotter pin and adjusting lock cap.

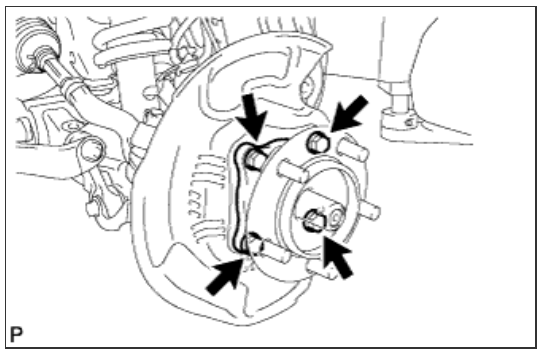


b. Using a 39 mm socket wrench, remove the axle hub nut.



8. REMOVE FRONT AXLE HUB SUB-ASSEMBLY LH

a. Remove the 4 bolts.

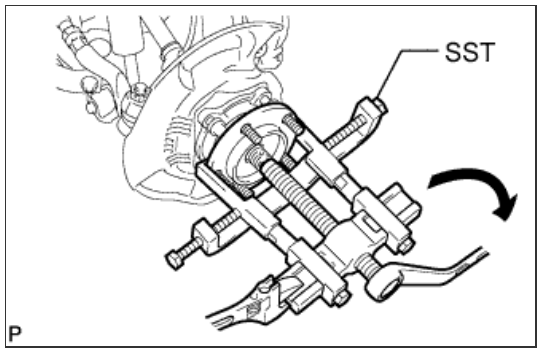


b. Using SST, remove the front axle hub together with the dust cover.

SST

09950-40011 (09951-04020, 09952-04010, 09953-04020, 09954-04010, 09955-04061, 09957-04010, 09958-04011)

c. Remove the O-ring.



for Preparation Click here

NOTICE:

Do not allow foreign matter, etc. to contact the ABS rotor bearing.

1. REMOVE FRONT AXLE WITH ABS ROTOR BEARING ASSEMBLY

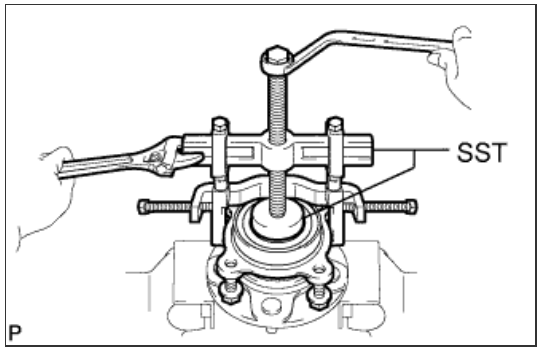
a. Gently fix the front axle hub in a vise.

NOTICE:

Do not damage the threads of the hub bolts.

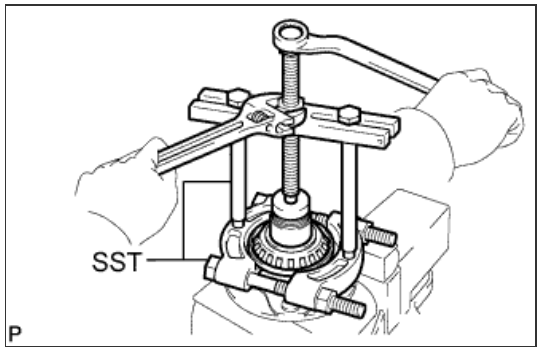
b. Using SST, remove the bearing.

SST
09950-40011 (09951-04020, 09952-04010, 09953-04020, 09954-04010, 09955-04061, 09957-04010, 09958-04011)
09950-60010 (09951-00550)



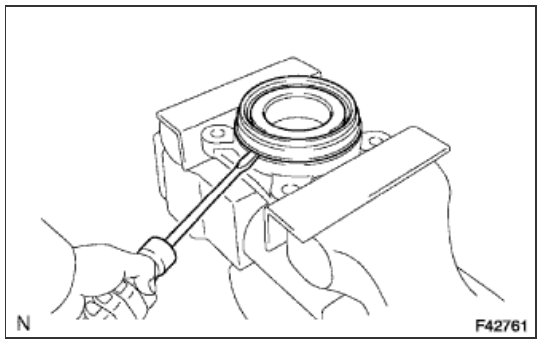
c. If part of the bearing remains in the front axle hub, use SST to remove it.

SST
09950-00020
09950-00030



2. REMOVE FRONT AXLE HUB OIL SEAL

a. Using a screwdriver, pry off the oil seal.



for Preparation Click here

NOTICE:

Do not allow foreign matter, etc. to contact the ABS rotor bearing.

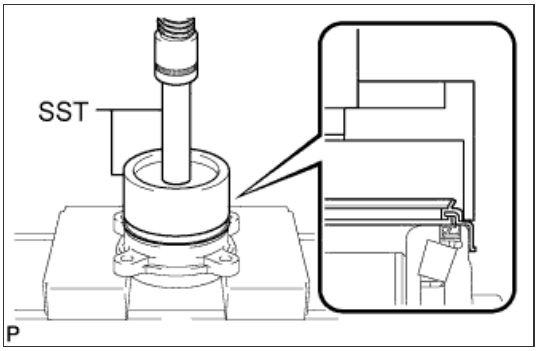
1. INSTALL FRONT AXLE HUB OIL SEAL

a. Using SST and a press, press in a new oil seal.

SST
09608-36010
09950-70010 (09951-07100)

NOTICE:

Do not damage the oil seal.



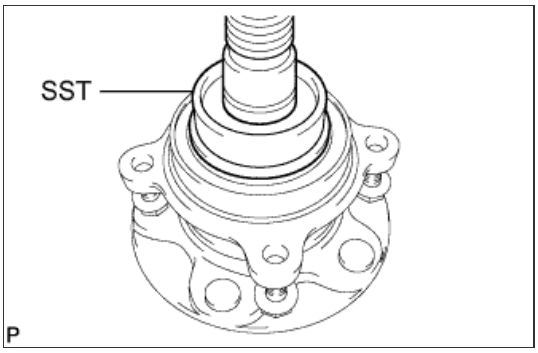
2. INSTALL FRONT AXLE WITH ABS ROTOR BEARING ASSEMBLY

a. Using SST and a press, press in a new bearing.

SST
09608-32010

NOTICE:

- **Insert 4 bolts into the bearing before installing the axle hub.**
- **Make sure to securely fit the bearing to the axle hub.**



for Preparation Click here

HINT:

- **Use the same procedures for the LH side and RH side.**
- **The procedures listed below are for the LH side.**

1. INSTALL FRONT AXLE HUB SUB-ASSEMBLY LH

a. Apply MP grease to a new O-ring.

b. Install the O-ring to the axle hub.

NOTICE:

Do not damage the O-ring.

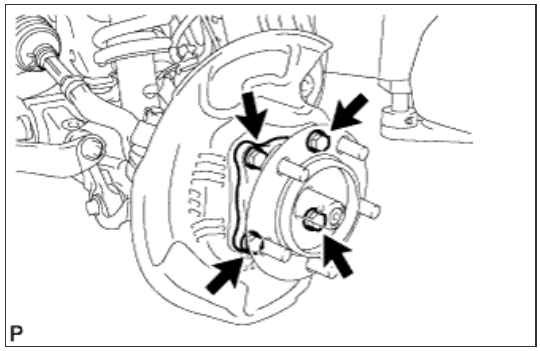
c. Connect the front drive shaft to the front axle hub.

NOTICE:

Be careful not to damage the front drive shaft boot.

d. Install the dust cover and axle hub to the steering knuckle with the 4 bolts.

Torque:
99 N*m{ 1010 kgf*cm , 73 ft.*lbf }

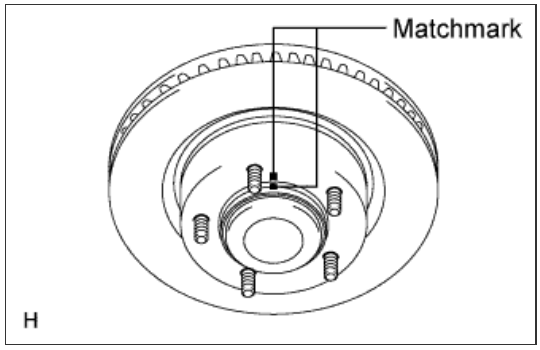


2. INSTALL FRONT DISC

a. Align the matchmarks, and then install the front disc.

HINT:

When replacing the front disc with a new one, select the installation position where the front disc has the minimum runout.



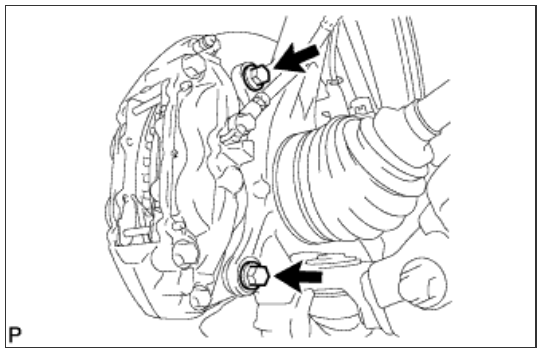
3. CONNECT FRONT DISC BRAKE CALIPER ASSEMBLY LH

a. Connect the front disc brake caliper and install 2 new bolts.

Torque:
99 N*m{ 1010 kgf*cm , 73 ft.*lbf }

NOTICE:

- **Do not twist the flexible hose.**
- **Make sure that the bolts are free from damage and foreign matter.**
- **Do not overtighten the bolts.**



4. INSTALL FRONT AXLE SHAFT NUT LH

a. Clean the threaded parts on the drive shaft and axle shaft nut using a non-residue solvent.

NOTICE:

- **Be sure to perform this work for a new drive shaft.**
- **Keep the threaded parts free of oil and foreign objects.**

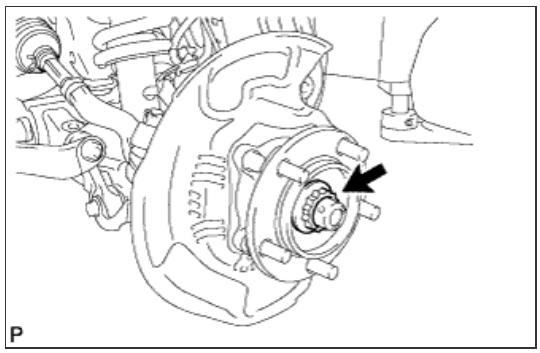
b. Using a 39 mm socket wrench, install the axle shaft nut.

Torque:
200 N*m{ 2039 kgf*cm , 148 ft.*lbf }

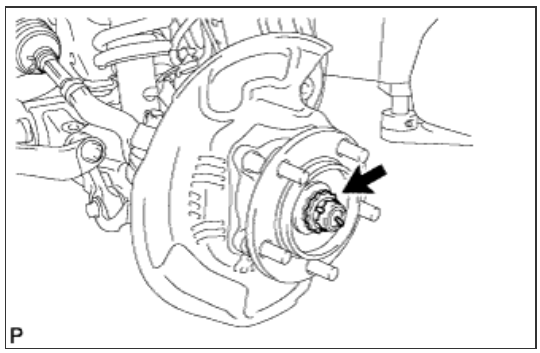
c. Using a 39 mm socket wrench, loosen the axle shaft nut.

d. Using a 39 mm socket wrench, retighten the axle shaft nut.

Torque:
340 N*m{ 3467 kgf*cm , 251 ft.*lbf }



e. Install the front wheel adjusting lock cap and a new cotter pin.

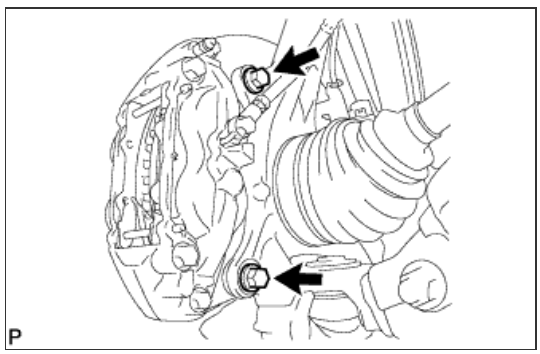


5. DISCONNECT FRONT DISC BRAKE CALIPER ASSEMBLY LH

a. Remove the 2 bolts and disconnect the disc brake caliper from the steering knuckle.

NOTICE:

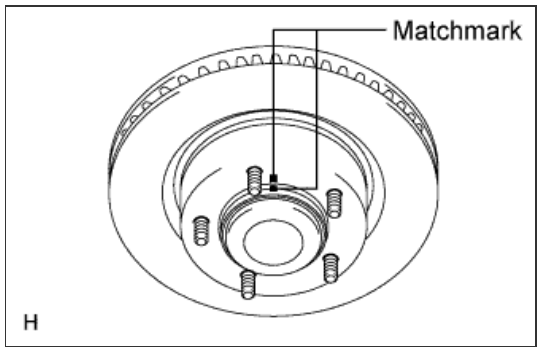
- **Do not disconnect the flexible hose from the disc brake caliper.**
- **Do not twist or bend the flexible hose.**



6. REMOVE FRONT DISC

a. Put matchmarks on the front disc and axle hub if planning to reuse the disc.

b. Remove the front disc.



7. INSPECT FRONT AXLE HUB

a. Inspect the front axle hub (Click here).

8. INSTALL FRONT AXLE HUB GREASE CAP LH

a. Install the axle hub grease cap.

NOTICE:

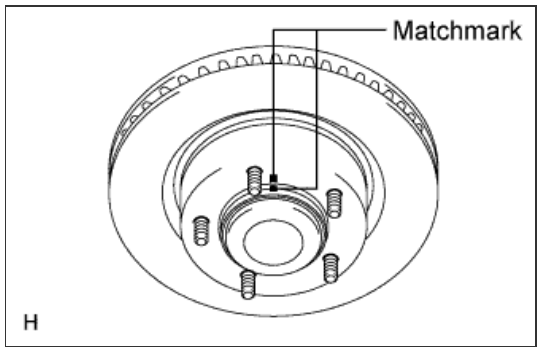
Make sure to securely fit the grease cap to the axle hub.

9. INSTALL FRONT DISC

a. Align the matchmarks, and then install the front disc.

HINT:

When replacing the front disc with a new one, select the installation position where the front disc has the minimum runout.



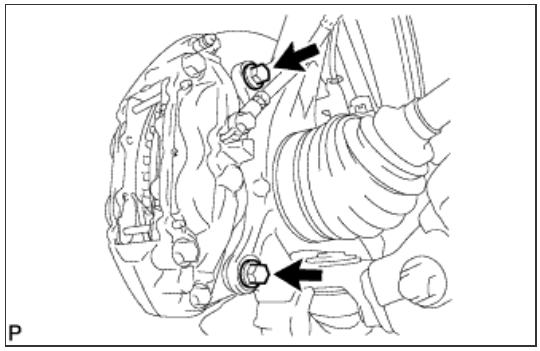
10. CONNECT FRONT DISC BRAKE CALIPER ASSEMBLY LH

a. Connect the front disc brake caliper and install 2 new bolts.

Torque:
99 N*m{ 1010 kgf*cm , 73 ft.*lbf }

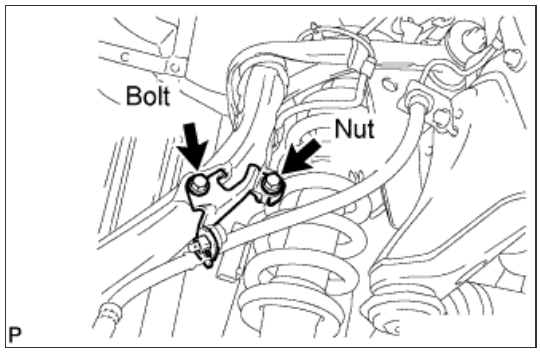
NOTICE:

- **Do not twist the flexible hose.**
- **Make sure that the bolts are free from damage and foreign matter.**
- **Do not overtighten the bolts.**



b. Connect the brake tube bracket to the steering knuckle with the bolt and nut.

Torque:
for bolt:
31 N*m{ 316 kgf*cm , 23 ft.*lbf }
for nut:
13 N*m{ 132 kgf*cm , 10 ft.*lbf }



11. INSTALL FRONT WHEEL

Torque:
for Aluminum Wheel:
131 N*m{ 1336 kgf*cm , 97 ft.*lbf }
for Steel Wheel:
209 N*m{ 2131 kgf*cm , 154 ft.*lbf }

12. MEASURE VEHICLE HEIGHT (w/ KDSS)

NOTICE:

- **Perform the inspection on a level surface.**
- **Ensure that the wheels are on the ground and facing straight ahead.**
- **Perform the inspection with the vehicle load completely on the suspension.**

HINT:

- **Perform this step with the fuel tank full.**
- **If there are any parts installed to the vehicle which place any unbalanced load on the left or right side of the vehicle, remove them.**

a. Set the tire pressure to the specified value(s) (Click here).

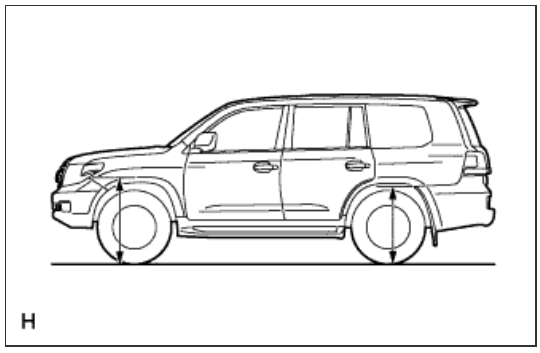
b. Bounce the vehicle to stabilize the suspension.

c. Measure the distance from the ground to the top of the bumper and calculate the difference in the vehicle height between left and right. Perform this procedure for both the front and rear wheels.

Height difference of left and right sides:
15 mm (0.591 in.) or less

HINT:

If not as specified, perform the vehicle tilt calibration.



13. CLOSE STABILIZER CONTROL WITH ACCUMULATOR HOUSING SHUTTER VALVE (w/ KDSS)

NOTICE:

- **Perform the inspection on a level surface.**
- **Ensure that the wheels are on the ground and facing straight ahead.**
- **Perform the inspection with the vehicle load completely on the suspension.**

HINT:

- **Perform this step with the fuel tank full.**
- **If there are any parts installed to the vehicle which place any unbalanced load on the left or right side of the vehicle, remove them.**

a. Using a 5 mm hexagon socket wrench, tighten the lower and upper chamber shutter valves of the stabilizer control with accumulator housing.

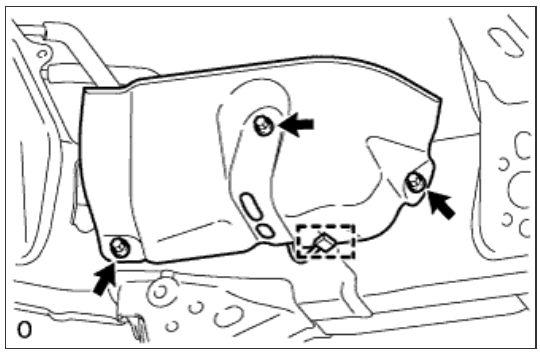
Torque:
14 N*m{ 143 kgf*cm , 10 ft.*lbf }

14. INSTALL STABILIZER CONTROL VALVE PROTECTOR (w/ KDSS)

a. Install the valve protector with the 3 bolts.

Torque:
18 N*m{ 184 kgf*cm , 13 ft.*lbf }

b. Attach the clamp, and connect the connector to the valve protector.

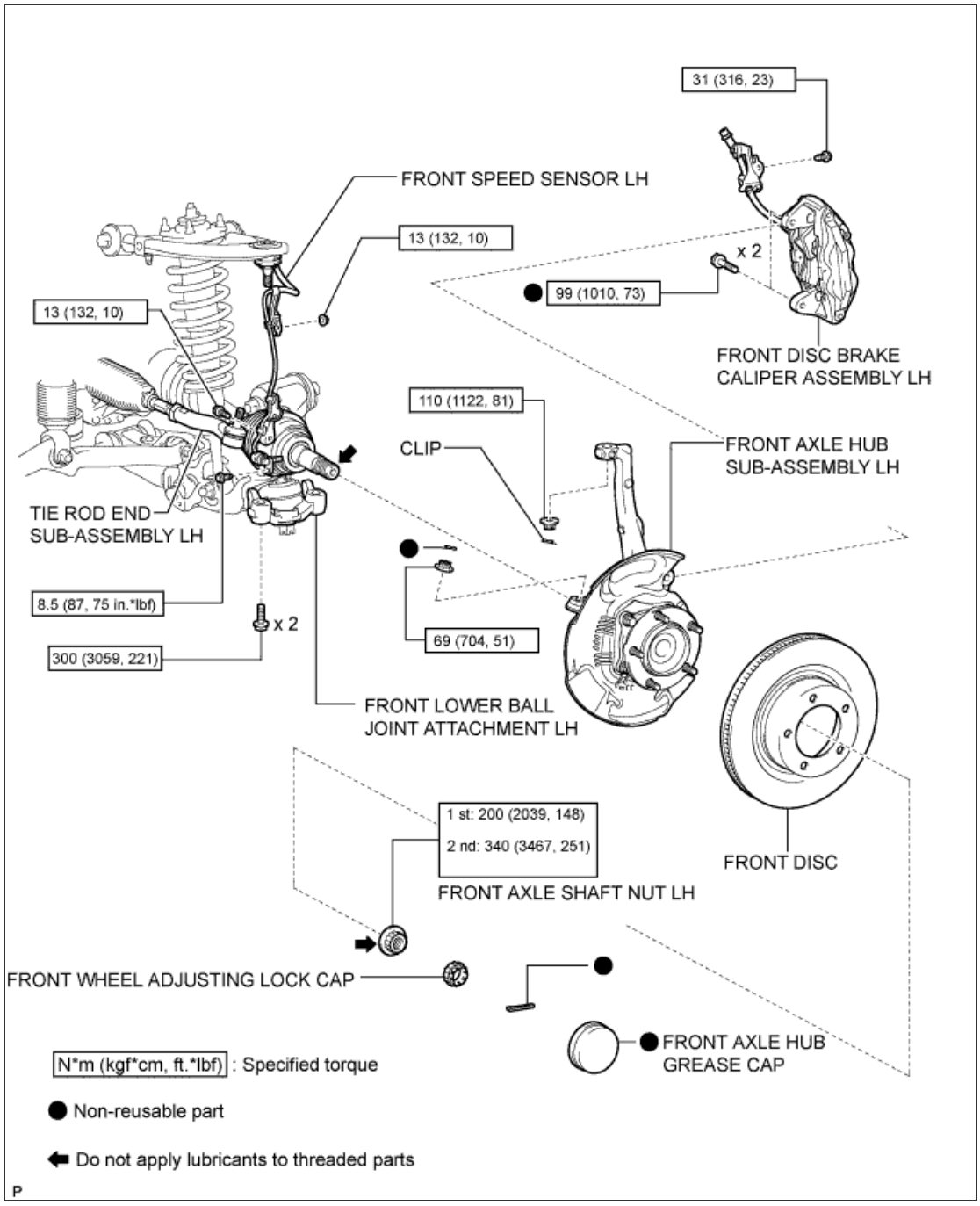


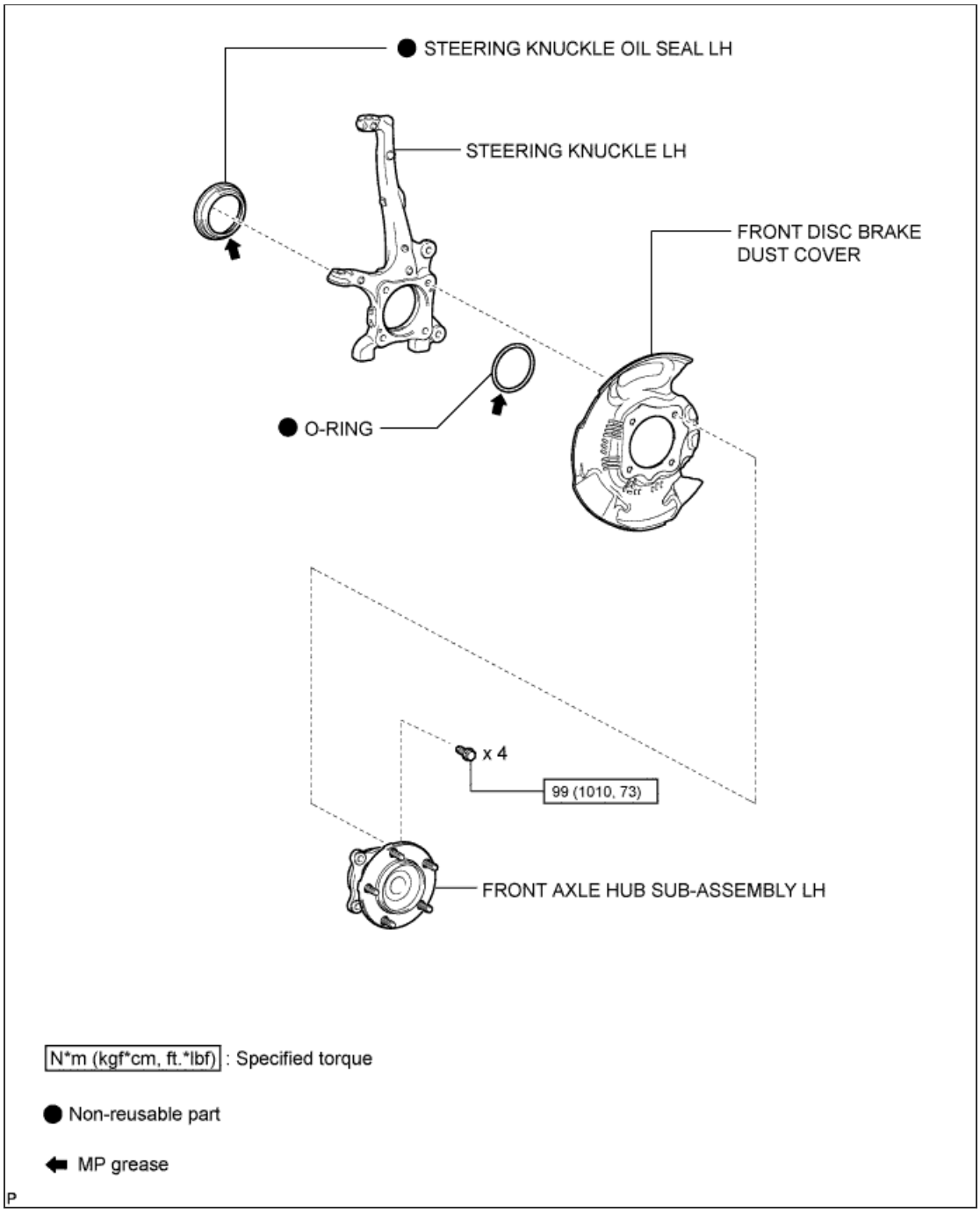
15. CHECK SPEED SENSOR SIGNAL

a. w/ VSC:
(Click here)

b. w/ ABS:
(Click here)

for Preparation Click here




STEERING KNUCKLE OIL SEAL LH
STEERING KNUCKLE LH
FRONT DISC BRAKE DUST COVER
O-RING
x 4
99 (1010, 73)
FRONT AXLE HUB SUB-ASSEMBLY LH
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
MP grease
P

for Preparation Click here

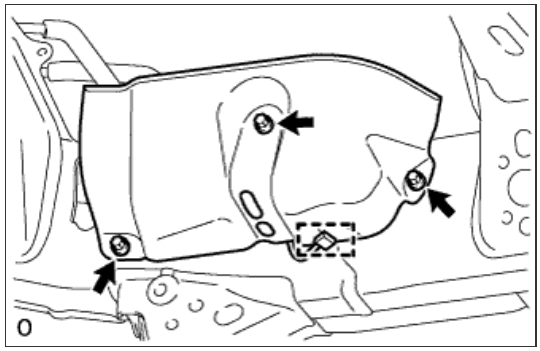
HINT:

- **Use the same procedures for the LH side and RH side.**
- **The procedures listed below are for the LH side.**

1. REMOVE STABILIZER CONTROL VALVE PROTECTOR (w/ KDSS)

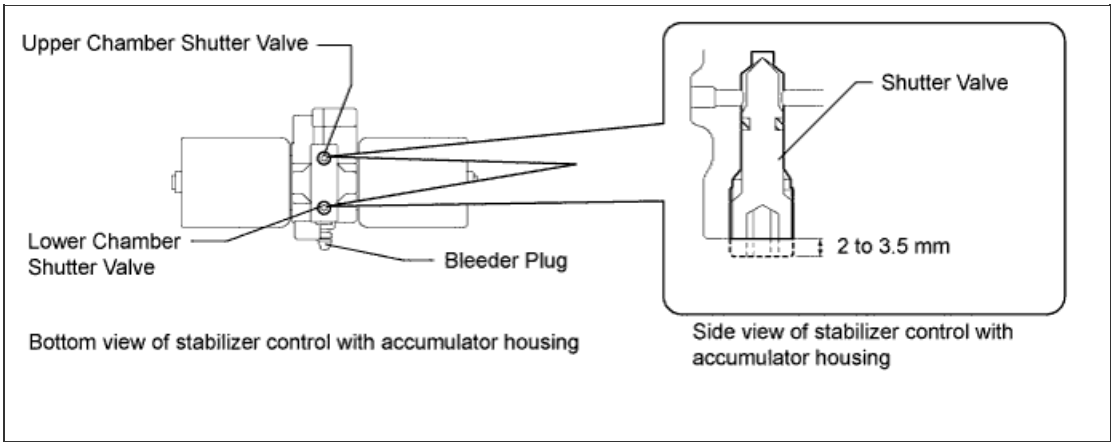
a. Detach the clamp, and disconnect the connector from the protector.

b. Remove the 3 bolts and protector.



2. OPEN STABILIZER CONTROL WITH ACCUMULATOR HOUSING SHUTTER VALVE (w/ KDSS)

a. Using a 5 mm hexagon socket wrench, loosen the lower and upper chamber shutter valves of the stabilizer control with accumulator housing 2.0 to 3.5 turns.



NOTICE:

- **When loosening a shutter valve, make sure that the end protrudes 2 to 3.5 mm (0.0787 to 0.137 in.) from the surface of the block, and do not turn the shutter valve any further.**
- **Do not remove the shutter valves.**

3. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

CAUTION:

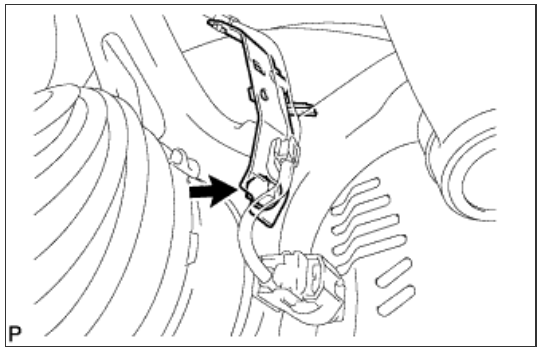
Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to disable the SRS system.

NOTICE:

When disconnecting the cable, some systems need to be initialized after the cable is reconnected (Click here).

4. DISCONNECT FRONT SPEED SENSOR LH

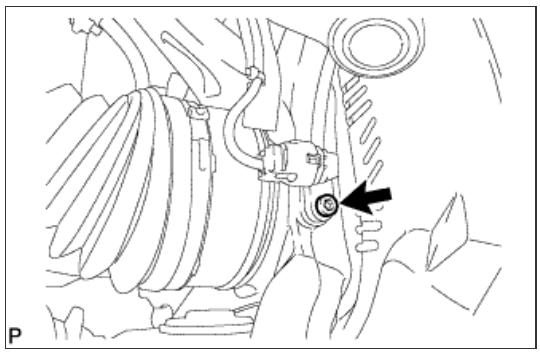
a. Remove the bolt, skid control sensor clamp and sensor wire.



b. Using a 5 mm hexagon socket, remove the bolt and speed sensor from the knuckle.

c. **NOTICE:**

Pull out the sensor while trying as much as possible not to rotate it.



5. REMOVE FRONT AXLE HUB SUB-ASSEMBLY LH

a. Remove the front axle hub (Click here).

6. DISCONNECT TIE ROD END SUB-ASSEMBLY LH

a. Remove the cotter pin and nut.

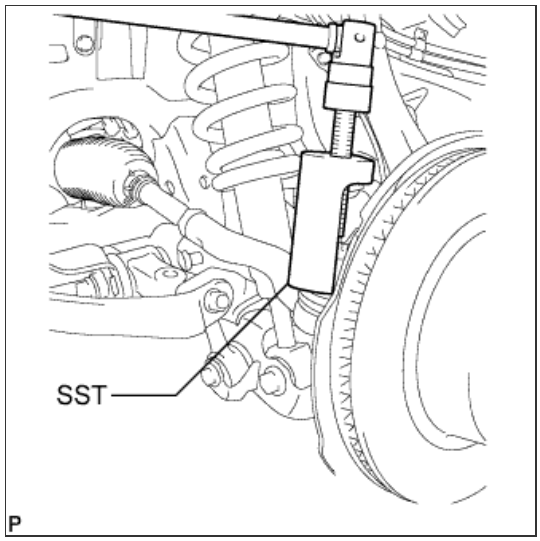
b. Using SST, disconnect the tie rod end LH from the steering knuckle.

SST

09610-20012

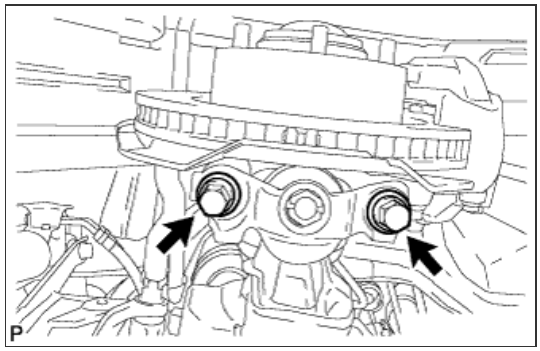
NOTICE:

- **Do not damage the front disc brake dust cover.**
- **Do not damage the ball joint dust cover.**
- **Do not damage the steering knuckle.**



7. DISCONNECT FRONT LOWER BALL JOINT ATTACHMENT LH

a. Remove the 2 bolts and disconnect the attachment from the steering knuckle.



8. REMOVE STEERING KNUCKLE LH

a. Support the front suspension lower arm LH with a jack.

b. Remove the clip and nut.

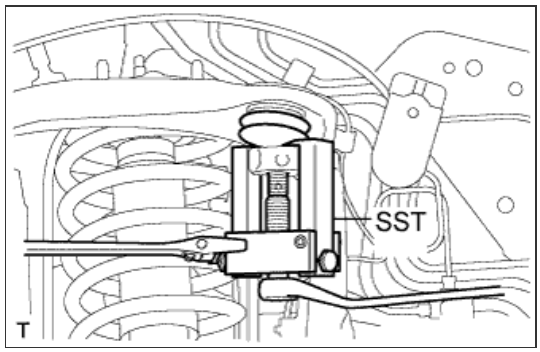
c. Using SST, disconnect the upper ball joint from the steering knuckle.

SST
09628-62011

NOTICE:

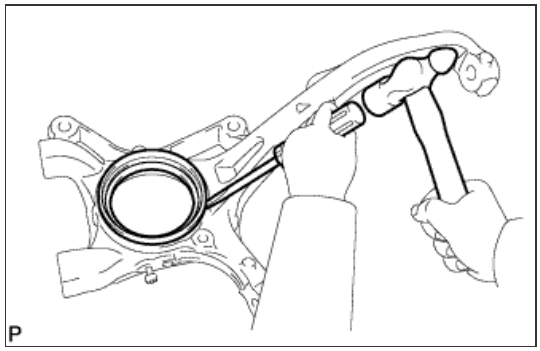
Do not damage the ball joint dust cover.

d. Remove the steering knuckle.



9. REMOVE STEERING KNUCKLE OIL SEAL LH

a. Using a screwdriver and hammer, tap out the oil seal.



for Preparation Click here

HINT:

- **Use the same procedures for the LH side and RH side.**
- **The procedures listed below are for the LH side.**

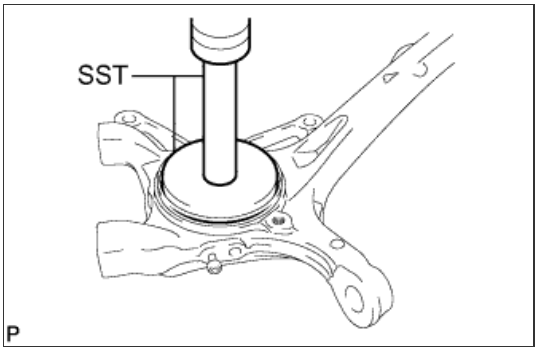
1. INSTALL STEERING KNUCKLE OIL SEAL LH

a. Using SST and a press, press in a new oil seal.

SST
09950-60020 (09951-01030)
09950-70010 (09951-07100)

NOTICE:

- **The oil seal is a non-reusable part.**
- **Do not damage the steering knuckle oil seal.**



2. INSTALL STEERING KNUCKLE LH

a. Install the steering knuckle to the front suspension upper arm with the nut.

Torque:
110 N*m{ 1122 kgf*cm , 81 ft.*lbf }

b. Install a new clip.

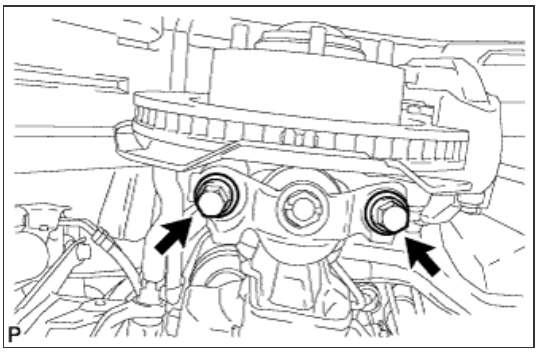
HINT:

If the holes for the clip are not aligned, tighten the nut up to another 60°.

3. CONNECT FRONT LOWER BALL JOINT ATTACHMENT LH

a. Connect the attachment to the steering knuckle with the 2 bolts.

Torque:
300 N*m{ 3059 kgf*cm , 221 ft.*lbf }



4. CONNECT TIE ROD END SUB-ASSEMBLY LH

a. Connect the tie rod end LH to the steering knuckle with the nut.

Torque:
69 N*m{ 704 kgf*cm , 51 ft.*lbf }

b. Install a new cotter pin.

HINT:

If the holes for the cotter pin are not aligned, tighten the nut up to another 60°.

5. INSTALL FRONT AXLE HUB SUB-ASSEMBLY LH

a. Install the front axle hub (Click here).

6. CONNECT FRONT SPEED SENSOR LH

Connect the front speed sensor (Click here).

7. INSTALL FRONT WHEEL

Torque:
for Aluminum Wheel:
131 N*m{ 1336 kgf*cm , 97 ft.*lbf }
for Steel Wheel:
209 N*m{ 2131 kgf*cm , 154 ft.*lbf }

8. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

NOTICE:

When disconnecting the cable, some systems need to be initialized after the cable is reconnected (Click here).

9. CHECK SPEED SENSOR SIGNAL

a. Check the speed sensor signal (Click here).

10. CHECK SRS WARNING LIGHT

a. Check the SRS warning light (Click here).

11. MEASURE VEHICLE HEIGHT (w/ KDSS)

NOTICE:

- **Perform the inspection on a level surface.**
- **Ensure that the wheels are on the ground and facing straight ahead.**
- **Perform the inspection with the vehicle load completely on the suspension.**

HINT:

- **Perform this step with the fuel tank full.**
- **If there are any parts installed to the vehicle which place any unbalanced load on the left or right side of the vehicle, remove them.**

a. Set the tire pressure to the specified value(s) (Click here).

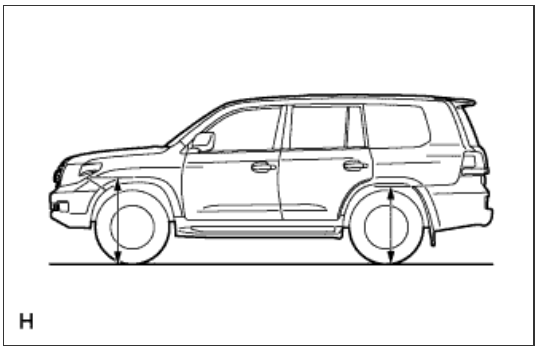
b. Bounce the vehicle to stabilize the suspension.

c. Measure the distance from the ground to the top of the bumper and calculate the difference in the vehicle height between left and right. Perform this procedure for both the front and rear wheels.

Height difference of left and right sides:
15 mm (0.591 in.) or less

HINT:

If not as specified, perform the vehicle tilt calibration.



12. CLOSE STABILIZER CONTROL WITH ACCUMULATOR HOUSING SHUTTER VALVE (w/ KDSS)

NOTICE:

- **Perform the inspection on a level surface.**
- **Ensure that the wheels are on the ground and facing straight ahead.**
- **Perform the inspection with the vehicle load completely on the suspension.**

HINT:

- **Perform this step with the fuel tank full.**
- **If there are any parts installed to the vehicle which place any unbalanced load on the left or right side of the vehicle, remove them.**

a. Using a 5 mm hexagon socket wrench, tighten the lower and upper chamber shutter valves of the stabilizer control with accumulator housing.

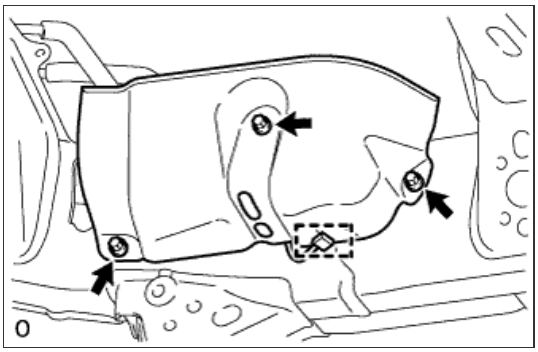
Torque:
14 N*m{ 143 kgf*cm , 10 ft.*lbf }

13. INSTALL STABILIZER CONTROL VALVE PROTECTOR (w/ KDSS)

a. Install the valve protector with the 3 bolts.

Torque:
18 N*m{ 184 kgf*cm , 13 ft.*lbf }

b. Attach the clamp, and connect the connector to the valve protector.



14. INSPECT AND ADJUST FRONT WHEEL ALIGNMENT

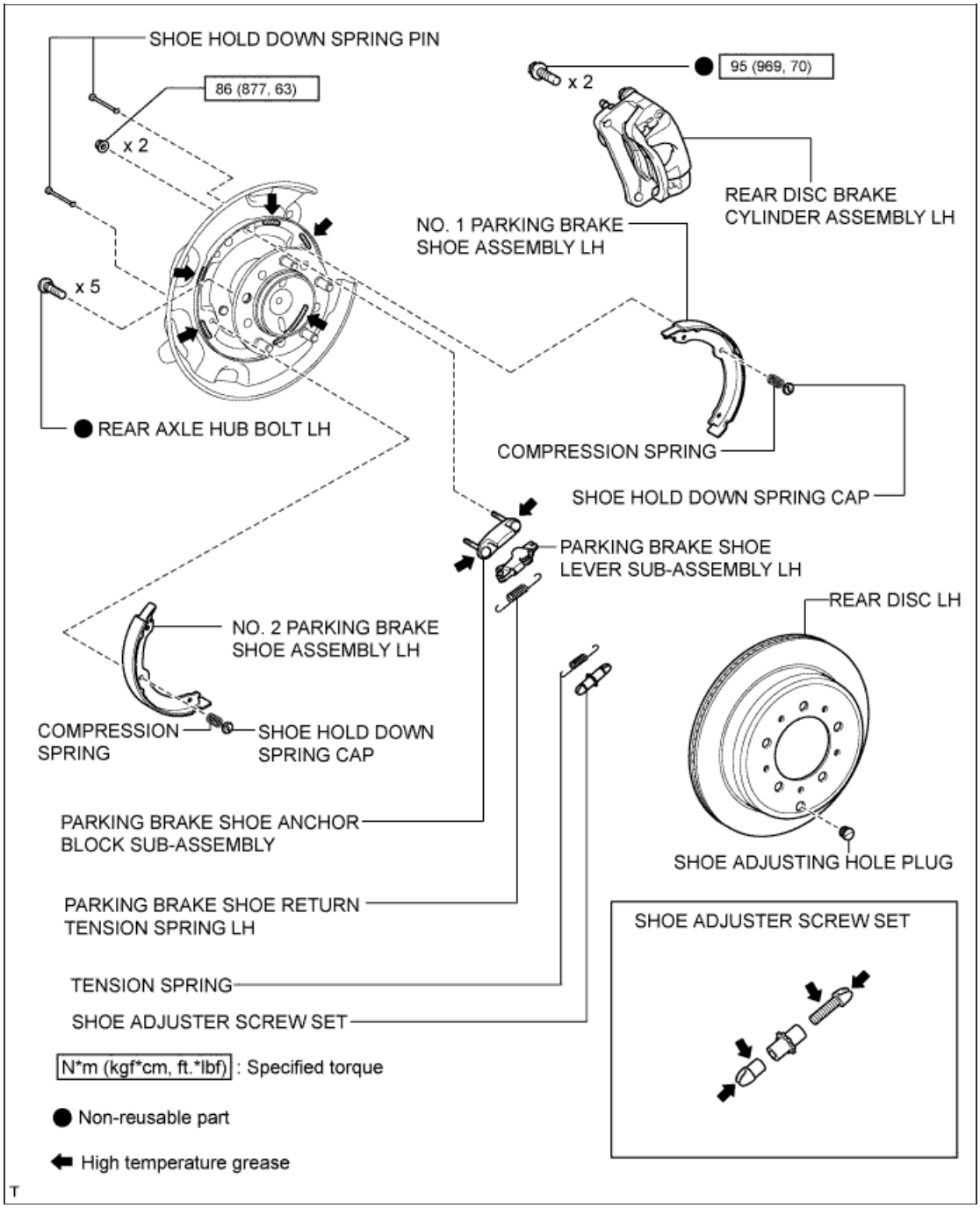
a. Inspect and adjust the front wheel alignment (Click here).

15. ADJUST HEADLIGHT ASSEMBLY

a. for Standard:
Adjust the headlight assembly (Click here).

b. for HID Headlight:
Adjust the headlight assembly (Click here).

for Preparation [Click here]



for Preparation Click here

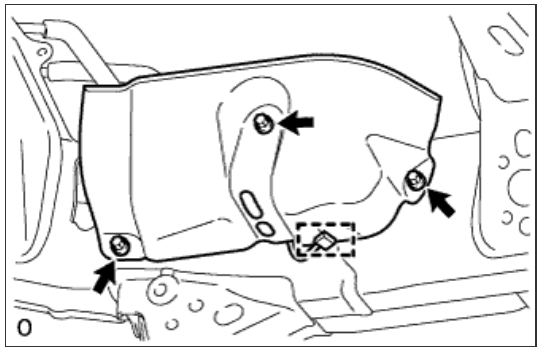
HINT:

- **Use the same procedures for the LH side and RH side.**
- **The procedures listed below are for the LH side.**

1. REMOVE STABILIZER CONTROL VALVE PROTECTOR (w/ KDSS)

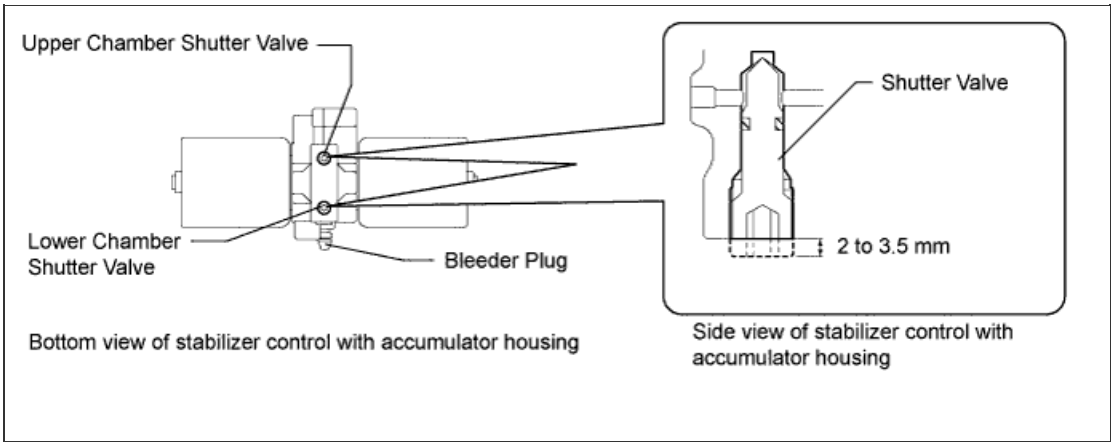
a. Detach the clamp, and disconnect the connector from the protector.

b. Remove the 3 bolts and protector.



2. OPEN STABILIZER CONTROL WITH ACCUMULATOR HOUSING SHUTTER VALVE (w/ KDSS)

a. Using a 5 mm hexagon socket wrench, loosen the lower and upper chamber shutter valves of the stabilizer control with accumulator housing 2.0 to 3.5 turns.



NOTICE:

- **When loosening a shutter valve, make sure that the end protrudes 2 to 3.5 mm (0.0787 to 0.137 in.) from the surface of the block, and do not turn the shutter valve any further.**
- **Do not remove the shutter valves.**

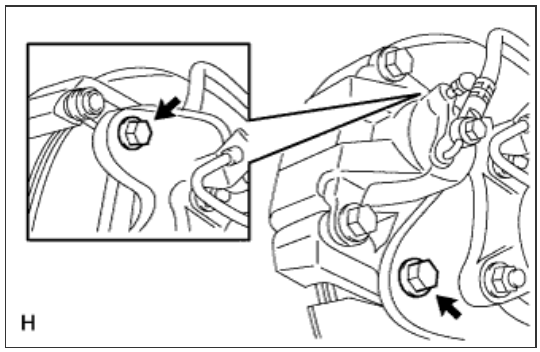
3. REMOVE REAR WHEEL LH

4. DISCONNECT REAR DISC BRAKE CYLINDER ASSEMBLY LH

a. Remove the 2 bolts and disconnect the rear disc brake cylinder.

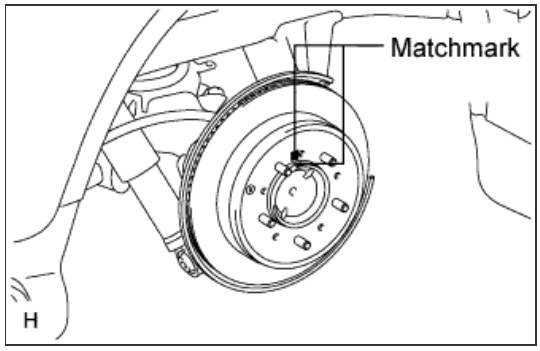
NOTICE:

- **Do not twist or bend the flexible hose.**
- **Do not disconnect the flexible hose from the disc brake cylinder.**

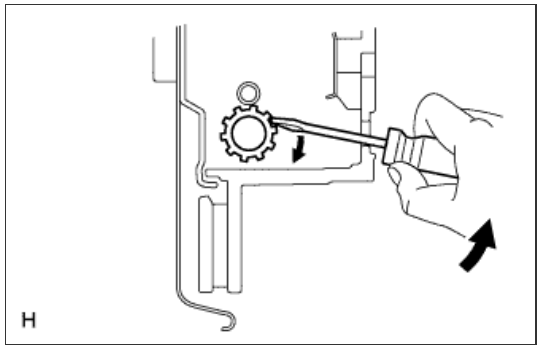


5. REMOVE REAR DISC LH

a. Put matchmarks on the rear disc and axle hub if planning to reuse the disc.



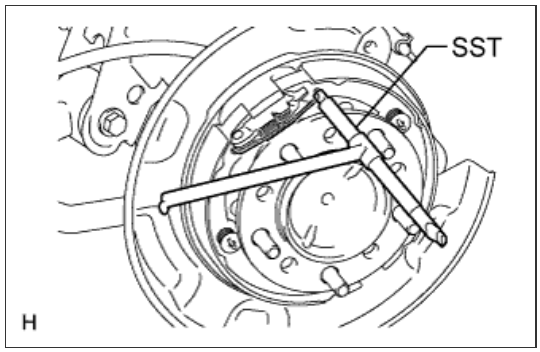
b. Turn the shoe adjuster as shown in the illustration until the disc turns freely, and then remove the disc.



6. REMOVE PARKING BRAKE SHOE RETURN TENSION SPRING LH

a. Using SST, remove the return spring.

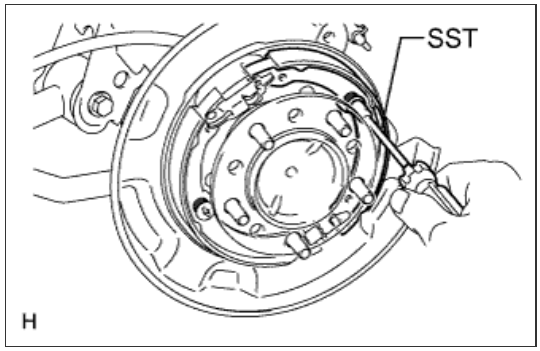
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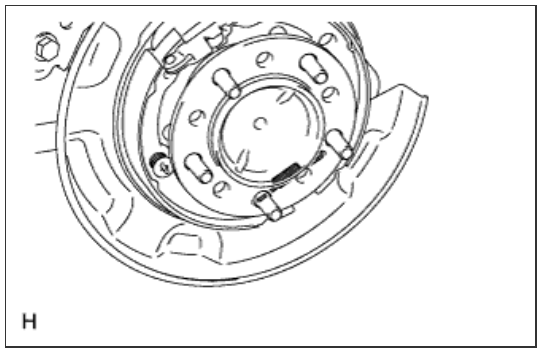
7. REMOVE NO. 1 PARKING BRAKE SHOE ASSEMBLY LH

a. Using SST, remove the shoe hold down spring cup, compression spring and shoe hold down spring pin.

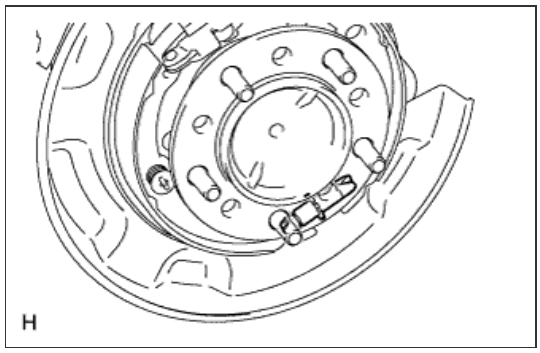
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b. Disconnect the tension spring from the No. 1 parking brake shoe.



c. Remove the No. 1 parking brake shoe and shoe adjuster screw set.

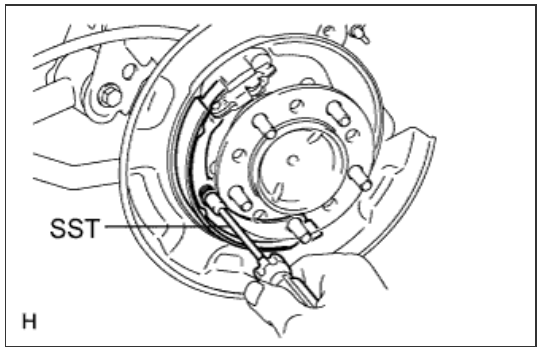


8. REMOVE NO. 2 PARKING BRAKE SHOE ASSEMBLY LH

a. Using SST, remove the shoe hold down spring cup, compression spring and shoe hold down spring pin.

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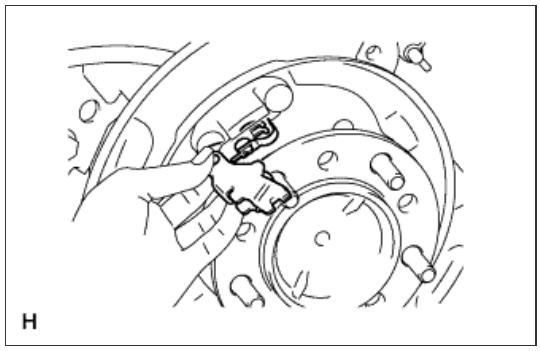
b. Remove the No. 2 parking brake shoe.



9. REMOVE PARKING BRAKE SHOE LEVER SUB-ASSEMBLY LH

a. Disconnect the No. 3 parking brake cable from the parking brake shoe lever.

b. Remove the parking brake shoe lever.



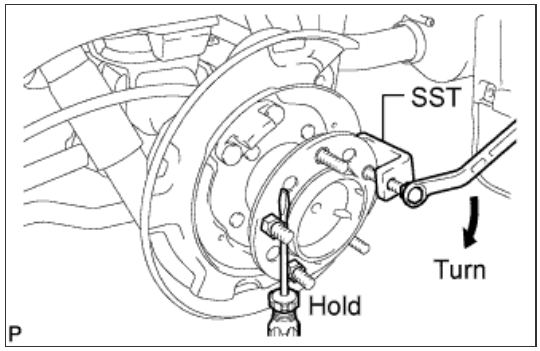
10. REMOVE REAR AXLE HUB BOLT LH

a. Using SST and a screwdriver or equivalent to hold the axle hub, remove the hub bolt.

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NOTICE:

- **Do not deform the oil deflector.**
- **Make sure to align the notch of SST with the flange of the oil deflector.**



11. INSTALL REAR AXLE HUB BOLT LH

a. Temporarily install a washer and hub nut to a new hub bolt as shown in the illustration.

NOTICE:

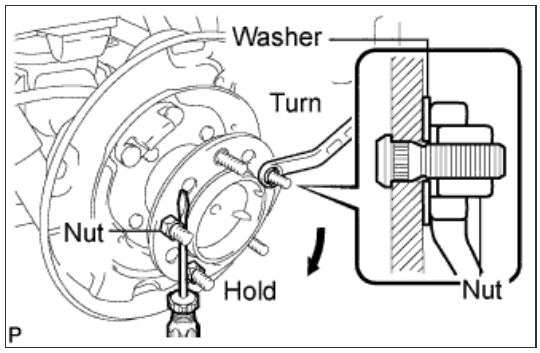
Install a hub nut to prevent damage to the hub bolt.

b. Using a screwdriver or equivalent to hold the hub, turn the hub nut until the bottom surface of the hub bolt head touches the axle hub.

c. Remove the washer and hub nut.

NOTICE:

Do not damage the threads of the hub bolt.



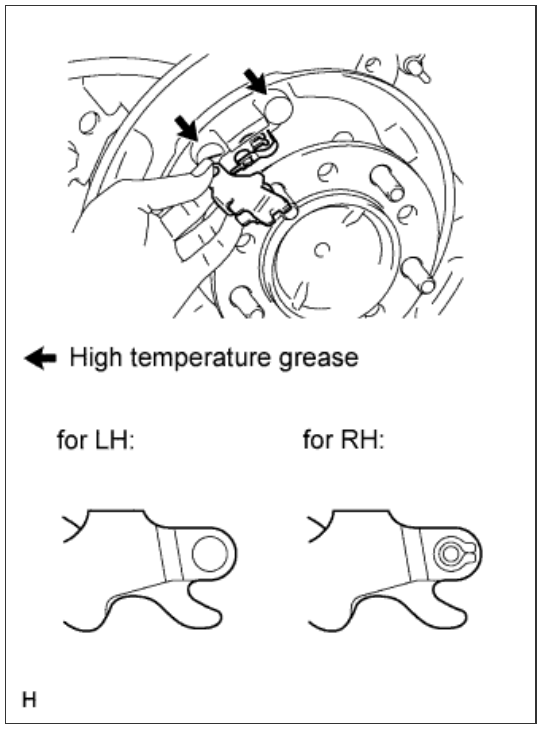
12. INSTALL PARKING BRAKE SHOE LEVER SUB-ASSEMBLY LH

a. Apply high temperature grease to the parking brake anchor block.

b. Install the parking brake shoe lever to the No. 3 parking brake cable.

NOTICE:

Be carefully to distinguish between the parking brake shoe lever RH and LH.

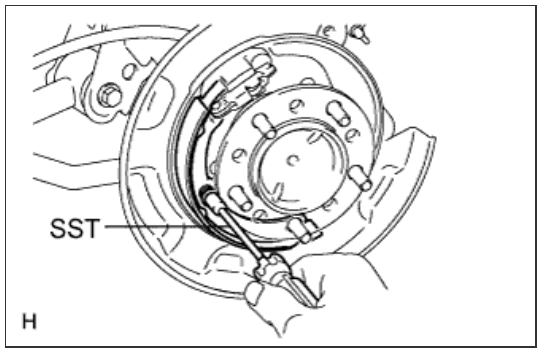


13. INSTALL NO. 2 PARKING BRAKE SHOE ASSEMBLY LH

a. Apply high temperature grease to the areas of the backing plate that contact the shoe.

b. Using SST, install the No. 2 parking brake shoe with the shoe hold down spring pin, compression spring and shoe hold down spring cup.

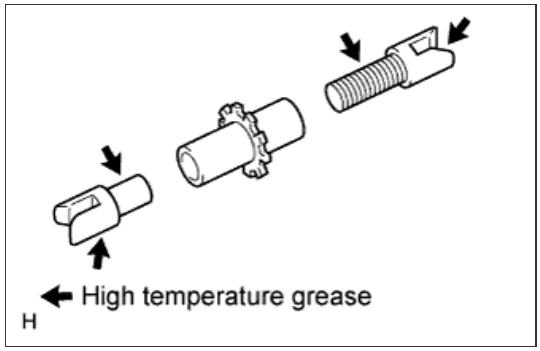
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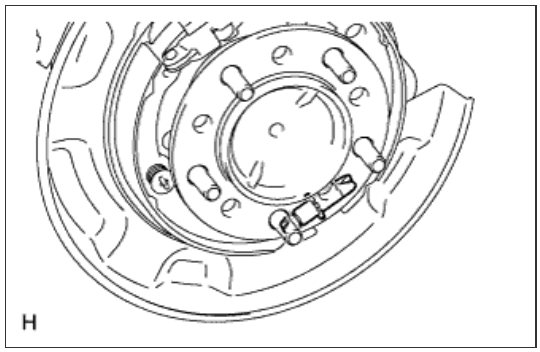
14. INSTALL NO. 1 PARKING BRAKE SHOE ASSEMBLY LH

a. Apply high temperature grease to the areas of the backing plate that contact the shoe.

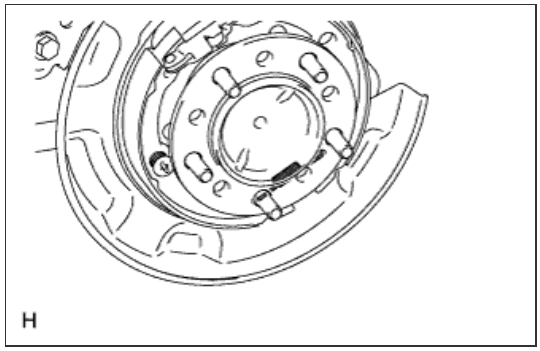
b. Apply high temperature grease to the thread and all joining areas of the parking brake shoe adjuster screw set.



c. Set the No. 1 parking brake shoe and shoe adjuster screw set in place.

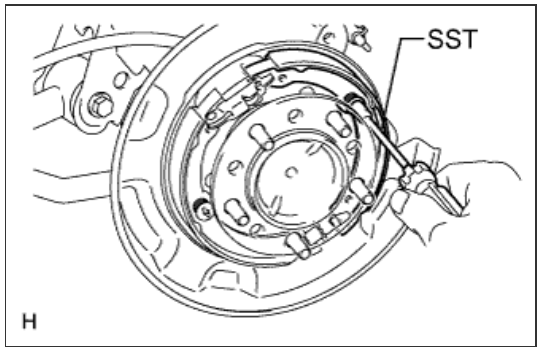


d. Connect the tension spring.



e. Using SST, install the shoe hold down spring pin, compression spring and shoe hold down spring cup.

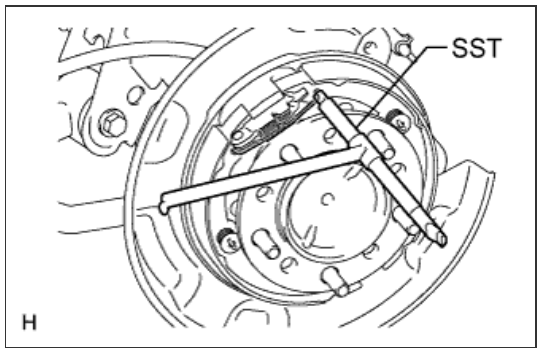
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15. INSTALL PARKING BRAKE SHOE RETURN TENSION SPRING LH

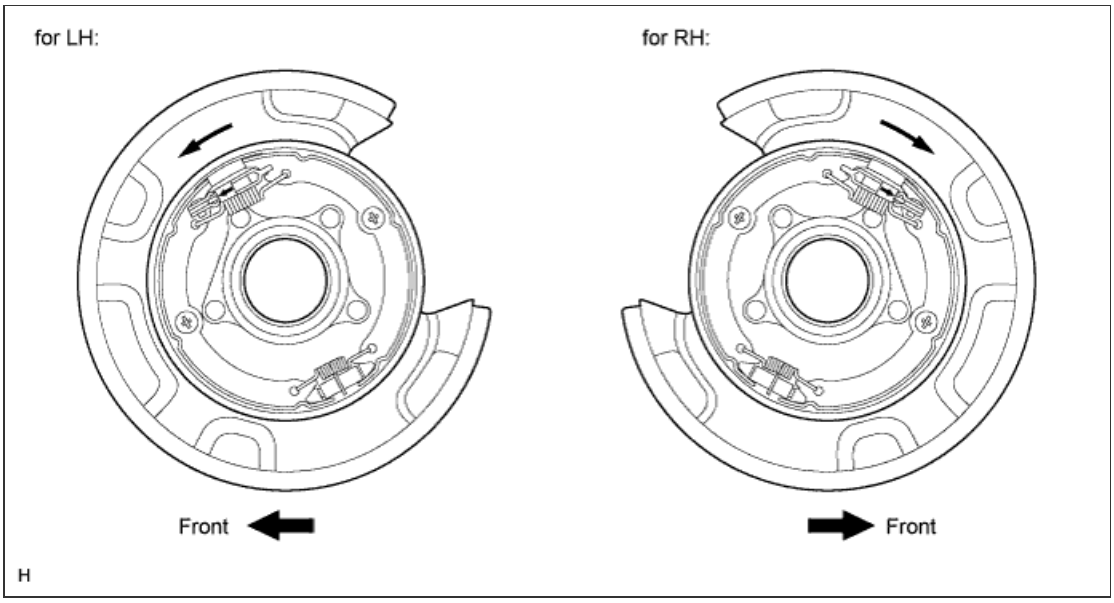
a. Using SST, install the shoe return spring.

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16. CHECK PARKING BRAKE INSTALLATION

a. Check that each part is installed properly.

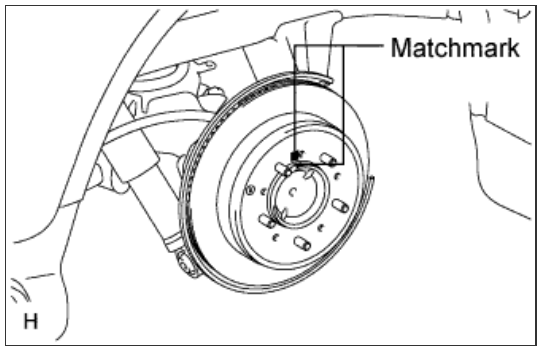


17. INSTALL REAR DISC LH

a. Align the matchmarks, and then install the rear disc.

HINT:

When replacing the rear disc with a new one, select the installation position where the rear disc has the minimum runout.



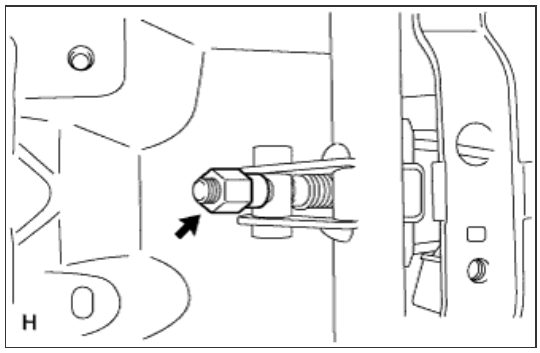
18. ADJUST PARKING BRAKE SHOE CLEARANCE

a. Completely release the parking brake lever.

b. Loosen the adjusting nut to completely release the parking brake cable.

c. Temporarily install the hub nuts.

d. Remove the hole plug.

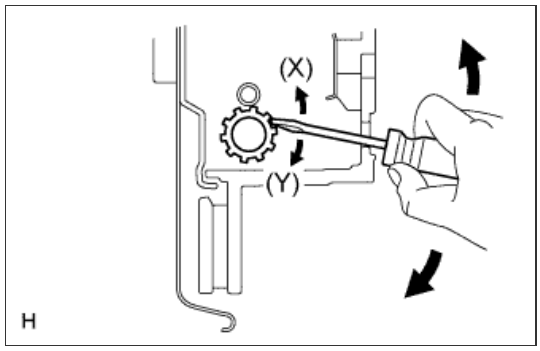


e. Insert an adjustment tool into the adjustment hole of the disc. Rotate the adjustment wheel in the "X" direction until the shoes are locked. Then rotate the adjustment wheel in the "Y" direction 8 notches.

f. Check that the disc can be rotated lightly. If not, rotate the adjustment wheel in the "Y" direction and check again.

g. Install the hole plug.

h. Remove the hub nuts.

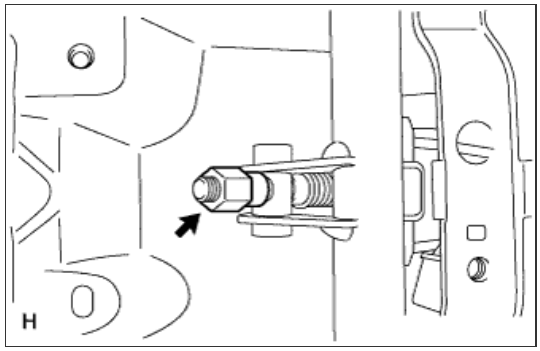


i. Turn the adjusting nut until the parking brake lever travel becomes correct.

Standard Parking Brake Lever Travel when Pulled with a Force of 200 N (20 kgf, 45 lbf):
5 to 7 clicks

j. Operate the parking brake lever 3 to 4 times, and check the parking brake lever travel.

Standard Parking Brake Lever Travel when Pulled with a Force of 200 N (20 kgf, 45 lbf):
5 to 7 clicks



k. Check whether the parking brake drags or not.

l. When operating the parking brake lever, check that the brake warning light comes on.

Standard Condition:
The brake warning light always illuminates at the first click.

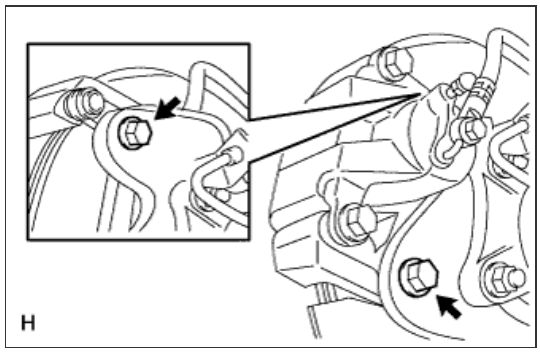
19. CONNECT REAR DISC BRAKE CYLINDER ASSEMBLY LH

a. Connect the rear disc brake cylinder and install 2 new bolts.

Torque:
95 N*m{ 969 kgf*cm , 70 ft.*lbf }

NOTICE:

- **Do not twist the flexible hose.**
- **Make sure that the bolts are free from damage and foreign matter.**
- **Do not overtighten the bolts.**



20. INSTALL REAR WHEEL LH

Torque:
for Aluminum Wheel:
131 N*m{ 1336 kgf*cm , 97 ft.*lbf }
for Steel Wheel:
209 N*m{ 2131 kgf*cm , 154 ft.*lbf }

21. CHECK PARKING BRAKE LEVER TRAVEL

a. Fully pull the parking brake lever to engage the parking brake.

b. Release the lever to disengage the parking brake.

c. Slowly pull the parking brake lever all the way, and count the number of clicks.

Standard Parking Brake Lever Travel when Pulled with a Force of 200 N (20 kgf, 45 lbf):
5 to 7 clicks

If the parking brake lever travel is not as specified, adjust the parking brake shoe clearance and parking brake lever travel.

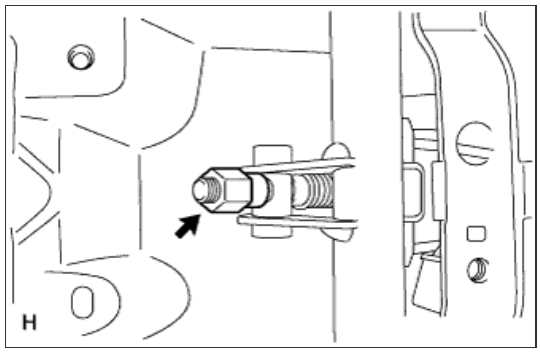
22. ADJUST PARKING BRAKE LEVER TRAVEL

a. Completely release the parking brake lever.

b. Loosen the adjusting nut to completely release the parking brake cable.

c. Temporarily install the hub nuts.

d. Remove the hole plug.

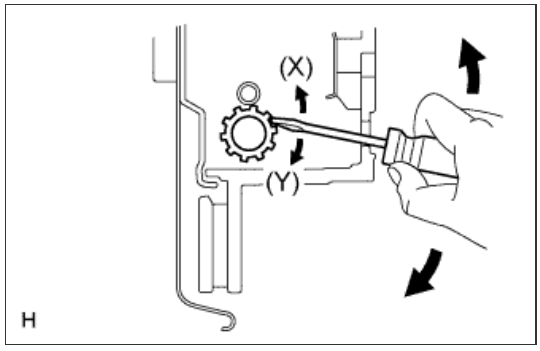


e. Insert an adjustment tool into the adjustment hole of the disc. Rotate the adjustment wheel in the "X" direction until the shoes are locked. Then rotate the adjustment wheel in the "Y" direction 8 notches.

f. Check that the disc can be rotated lightly. If not, rotate the adjustment wheel in the "Y" direction and check again.

g. Install the hole plug.

h. Remove the hub nuts.

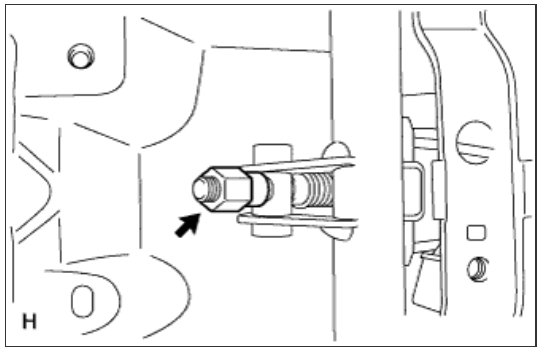


i. Turn the adjusting nut until the parking brake lever travel becomes correct.

Standard Parking Brake Lever Travel when Pulled with a Force of 200 N (20 kgf, 45 lbf):
5 to 7 clicks

j. Operate the parking brake lever 3 to 4 times, and check the parking brake lever travel.

Standard Parking Brake Lever Travel when Pulled with a Force of 200 N (20 kgf, 45 lbf):
5 to 7 clicks



k. Check whether the parking brake drags or not.

l. When operating the parking brake lever, check that the brake warning light comes on.

Standard Condition:
The brake warning light always illuminates at the first click.

23. MEASURE VEHICLE HEIGHT (w/ KDSS)

NOTICE:

- **Perform the inspection on a level surface.**
- **Ensure that the wheels are on the ground and facing straight ahead.**
- **Perform the inspection with the vehicle load completely on the suspension.**

HINT:

- **Perform this step with the fuel tank full.**
- **If there are any parts installed to the vehicle which place any unbalanced load on the left or right side of the vehicle, remove them.**

a. Set the tire pressure to the specified value(s) (Click here).

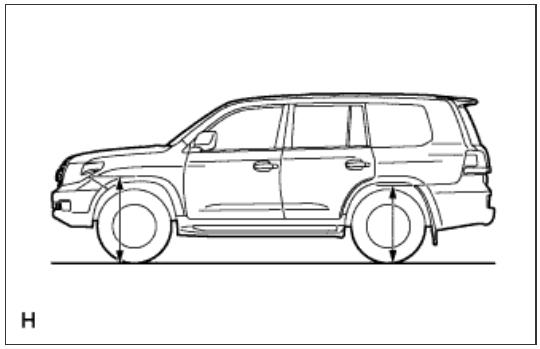
b. Bounce the vehicle to stabilize the suspension.

c. Measure the distance from the ground to the top of the bumper and calculate the difference in the vehicle height between left and right. Perform this procedure for both the front and rear wheels.

Height difference of left and right sides:
15 mm (0.591 in.) or less

HINT:

If not as specified, perform the vehicle tilt calibration.



24. CLOSE STABILIZER CONTROL WITH ACCUMULATOR HOUSING SHUTTER VALVE (w/ KDSS)

NOTICE:

- **Perform the inspection on a level surface.**
- **Ensure that the wheels are on the ground and facing straight ahead.**
- **Perform the inspection with the vehicle load completely on the suspension.**

HINT:

- **Perform this step with the fuel tank full.**
- **If there are any parts installed to the vehicle which place any unbalanced load on the left or right side of the vehicle, remove them.**

a. Using a 5 mm hexagon socket wrench, tighten the lower and upper chamber shutter valves of the stabilizer control with accumulator housing.

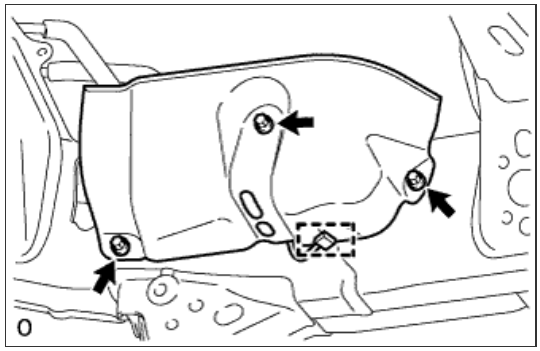
Torque:
14 N*m{ 143 kgf*cm , 10 ft.*lbf }

25. INSTALL STABILIZER CONTROL VALVE PROTECTOR (w/ KDSS)

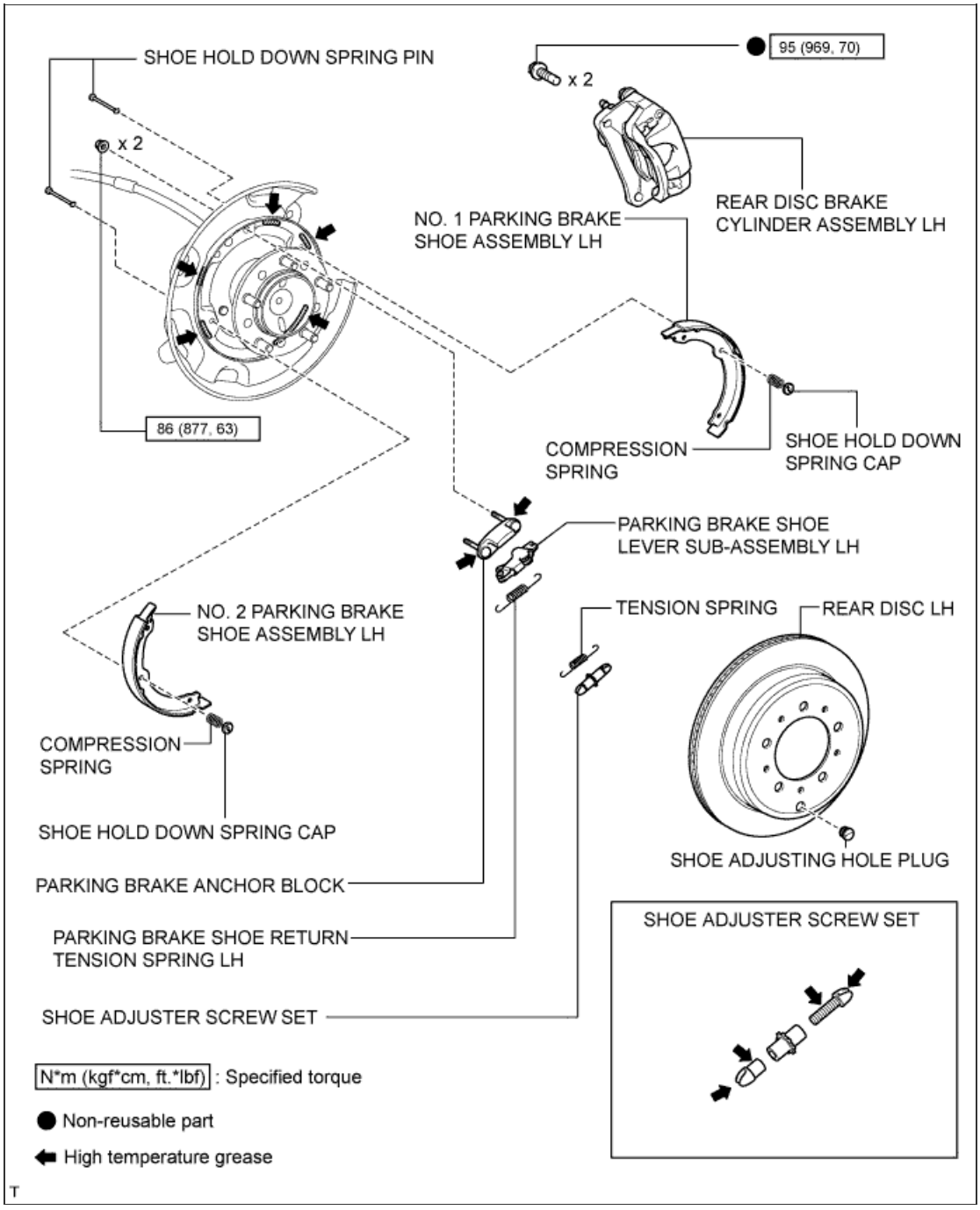
a. Install the valve protector with the 3 bolts.

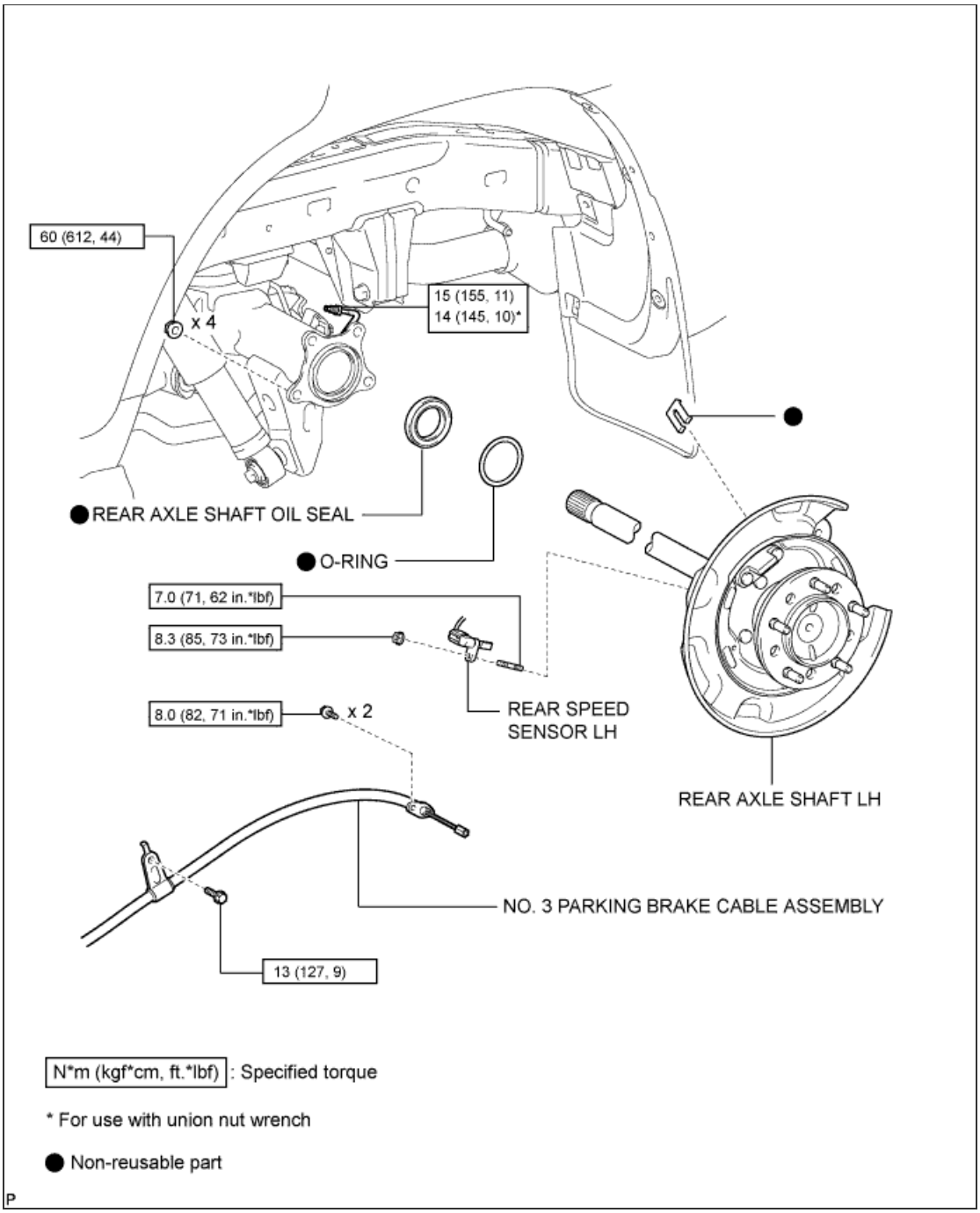
Torque:
18 N*m{ 184 kgf*cm , 13 ft.*lbf }

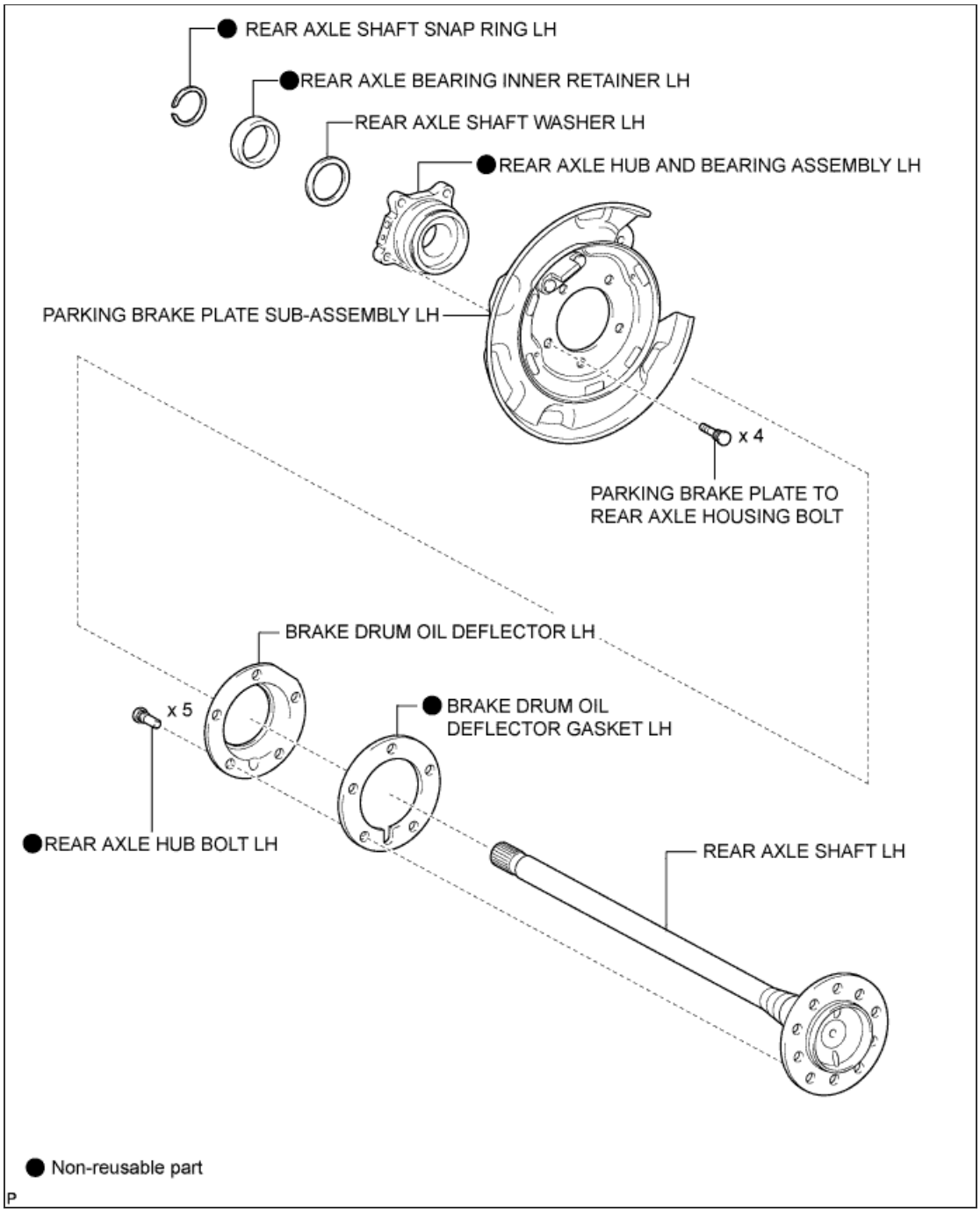
b. Attach the clamp, and connect the connector to the valve protector.



for Preparation Click here




60 (612, 44)
x 4
15 (155, 11)
14 (145, 10)*
REAR AXLE SHAFT OIL SEAL
O-RING
7.0 (71, 62 in.*lbf)
8.3 (85, 73 in.*lbf)
8.0 (82, 71 in.*lbf)
x 2
REAR SPEED SENSOR LH
REAR AXLE SHAFT LH
NO. 3 PARKING BRAKE CABLE ASSEMBLY
13 (127, 9)
N*m (kgf*cm, ft.*lbf) : Specified torque
* For use with union nut wrench
Non-reusable part
P


REAR AXLE SHAFT SNAP RING LH
REAR AXLE BEARING INNER RETAINER LH
REAR AXLE SHAFT WASHER LH
REAR AXLE HUB AND BEARING ASSEMBLY LH
PARKING BRAKE PLATE SUB-ASSEMBLY LH
x 4
PARKING BRAKE PLATE TO
REAR AXLE HOUSING BOLT
BRAKE DRUM OIL DEFLECTOR LH
x 5
BRAKE DRUM OIL
DEFLECTOR GASKET LH
REAR AXLE HUB BOLT LH
REAR AXLE SHAFT LH
Non-reusable part
P

for Preparation Click here

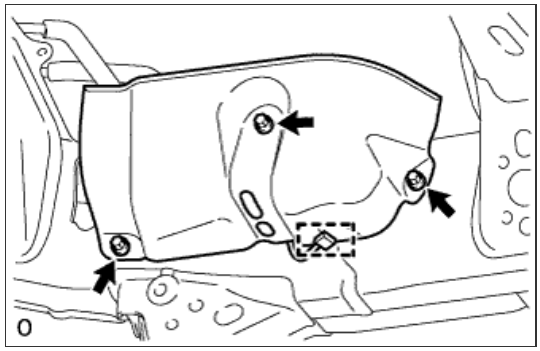
HINT:

- **Use the same procedures for the LH side and RH side.**
- **The procedures listed below are for the LH side.**

1. REMOVE STABILIZER CONTROL VALVE PROTECTOR (w/ KDSS)

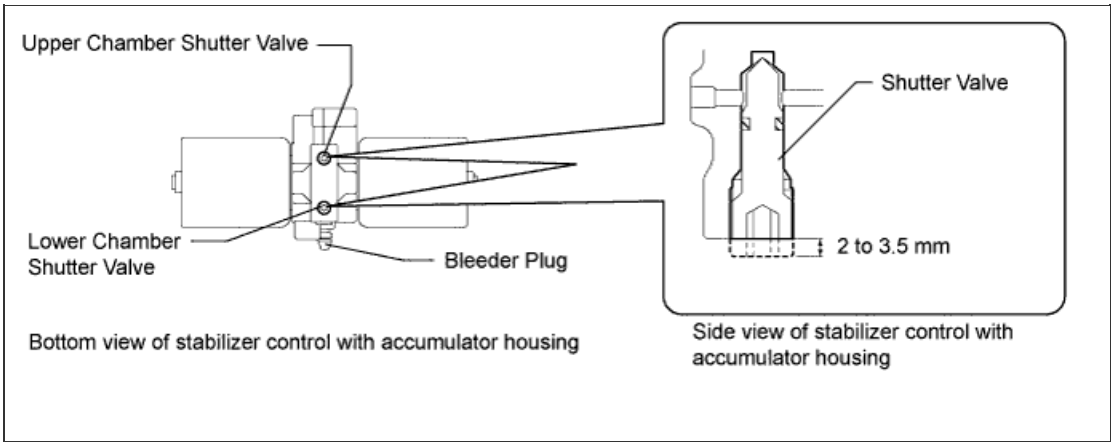
a. Detach the clamp, and disconnect the connector from the protector.

b. Remove the 3 bolts and protector.



2. OPEN STABILIZER CONTROL WITH ACCUMULATOR HOUSING SHUTTER VALVE (w/ KDSS)

a. Using a 5 mm hexagon socket wrench, loosen the lower and upper chamber shutter valves of the stabilizer control with accumulator housing 2.0 to 3.5 turns.



NOTICE:

- **When loosening a shutter valve, make sure that the end protrudes 2 to 3.5 mm (0.0787 to 0.137 in.) from the surface of the block, and do not turn the shutter valve any further.**
- **Do not remove the shutter valves.**

3. REMOVE REAR WHEEL LH

4. DRAIN BRAKE FLUID

NOTICE:

Wash off brake fluid immediately if it comes in contact with any painted surface.

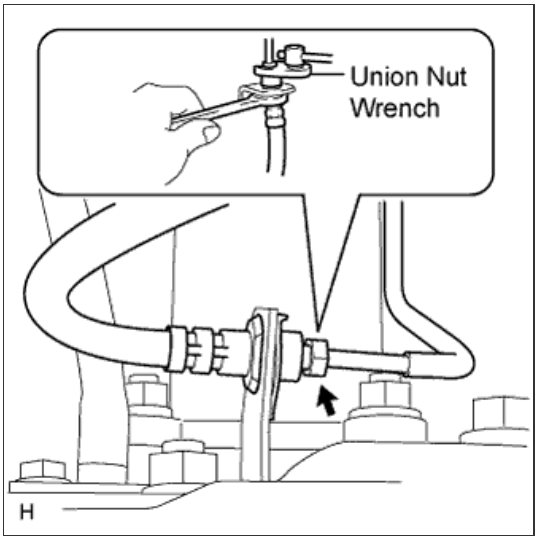
5. DISCONNECT REAR BRAKE FLEXIBLE HOSE

a. Disconnect the brake tube from the flexible hose with SST while holding the flexible hose with a wrench.

NOTICE:

- **Do not bend or damage the brake tube.**
- **Do not allow any foreign matter such as dirt and dust to enter the brake tube from the connecting point.**

b. Remove the clip.

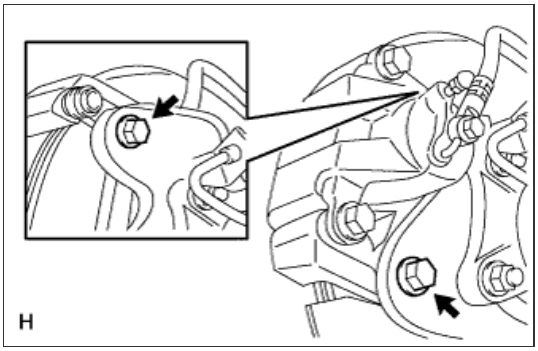


6. DISCONNECT REAR DISC BRAKE CYLINDER ASSEMBLY LH

a. Remove the 2 bolts and disconnect the rear disc brake cylinder.

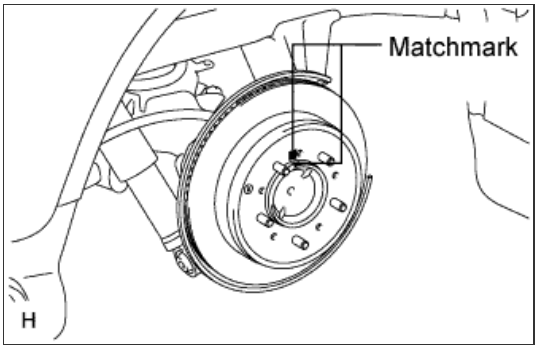
NOTICE:

- **Do not twist or bend the flexible hose.**
- **Do not disconnect the flexible hose from the disc brake cylinder.**

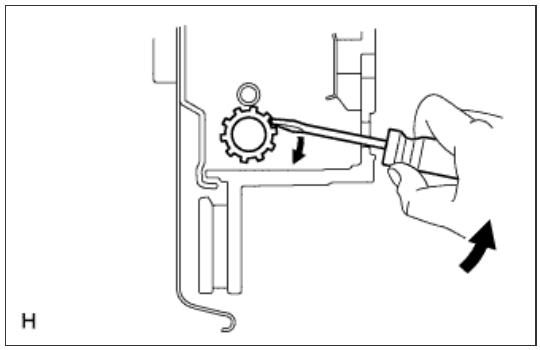


7. REMOVE REAR DISC LH

a. Put matchmarks on the rear disc and axle hub if planning to reuse the disc.



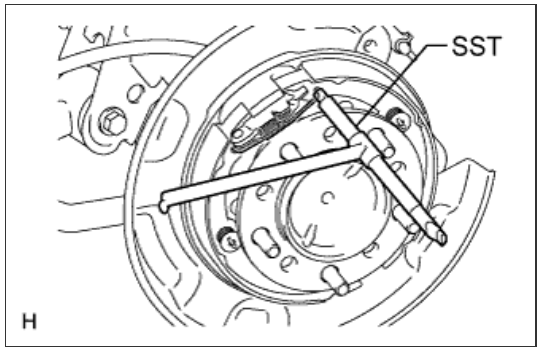
b. Turn the shoe adjuster as shown in the illustration until the disc turns freely, and then remove the disc.



8. REMOVE PARKING BRAKE SHOE RETURN TENSION SPRING LH

a. Using SST, remove the return spring.

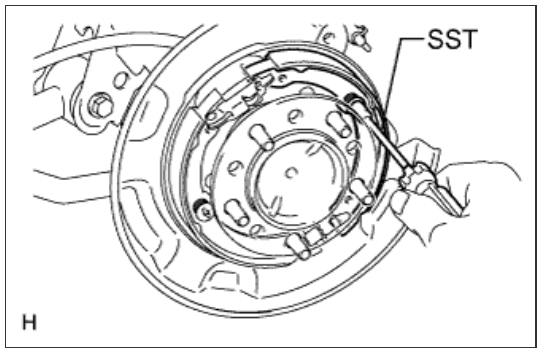
SST
09703-30011



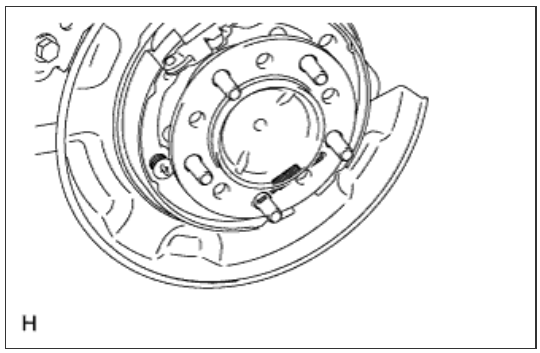
9. REMOVE NO. 1 PARKING BRAKE SHOE ASSEMBLY LH

a. Using SST, remove the shoe hold down spring cup, compression spring and shoe hold down spring pin.

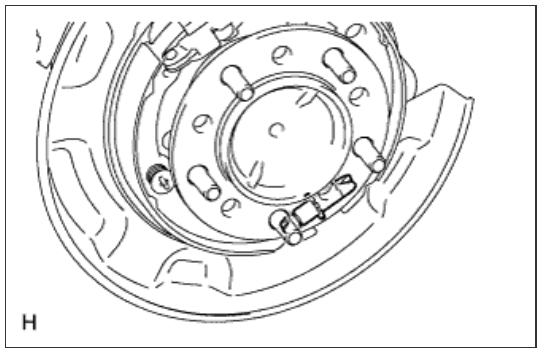
SST
09718-00011



b. Disconnect the tension spring from the No. 1 parking brake shoe.



c. Remove the No. 1 parking brake shoe and shoe adjuster screw set.

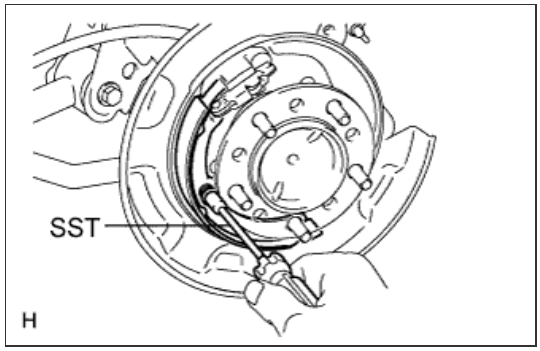


10. REMOVE NO. 2 PARKING BRAKE SHOE ASSEMBLY LH

a. Using SST, remove the shoe hold down spring cup, compression spring and shoe hold down spring pin.

SST
09718-00011

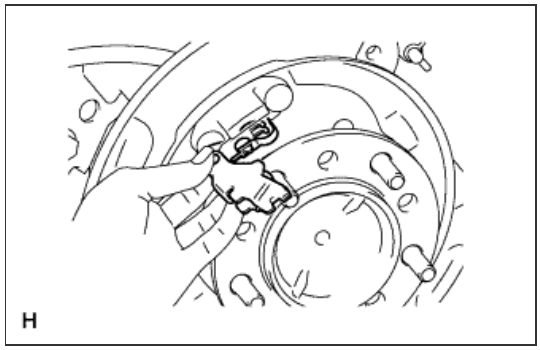
b. Remove the No. 2 parking brake shoe.



11. REMOVE PARKING BRAKE SHOE LEVER SUB-ASSEMBLY LH

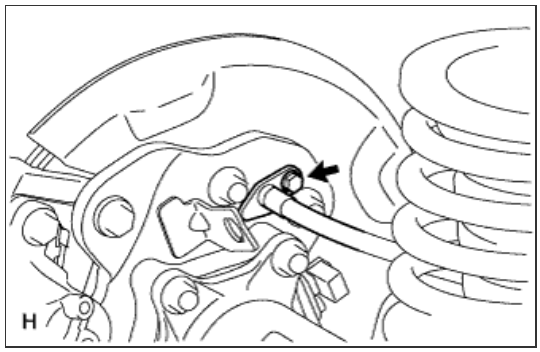
a. Disconnect the No. 3 parking brake cable from the parking brake shoe lever.

b. Remove the parking brake shoe lever.



12. DISCONNECT NO. 3 PARKING BRAKE CABLE ASSEMBLY

a. Remove the bolt and No. 3 parking brake cable.

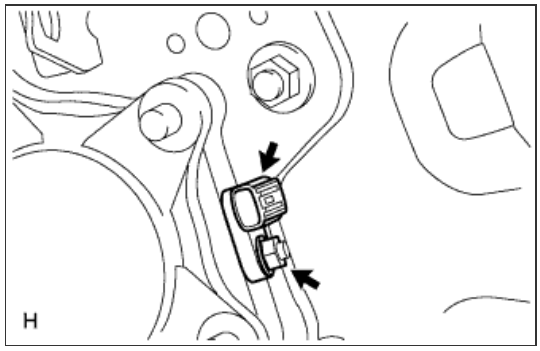


13. DISCONNECT REAR SPEED SENSOR LH

a. Remove the nut and speed sensor.

NOTICE:

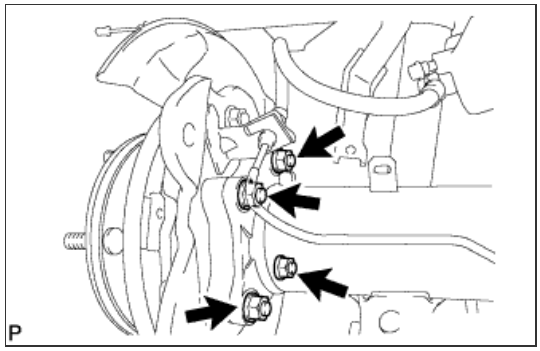
Pull out the sensor while trying as much as possible not to rotate it.



14. REMOVE REAR AXLE SHAFT LH

a. Remove the 4 nuts and rear axle shaft together with the parking brake plate.

b. Remove the O-ring.



15. REMOVE REAR AXLE SHAFT OIL SEAL LH

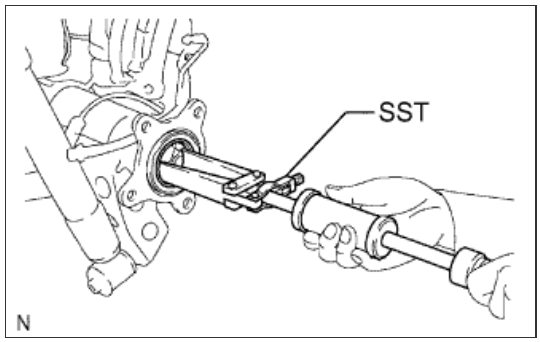
a. Using SST, tap out the oil seal.

SST

09308-00010

NOTICE:

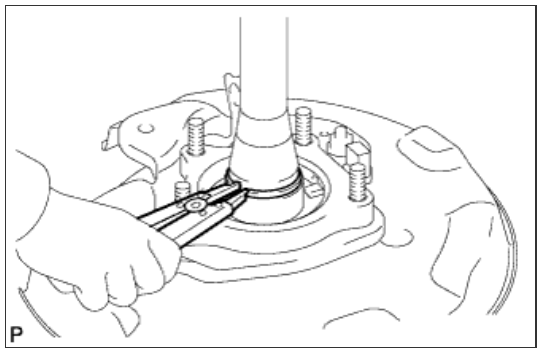
Be careful not to damage the axle housing hole.



for Preparation Click here

1. REMOVE REAR AXLE SHAFT SNAP RING

a. Using a snap ring expander, remove the snap ring.



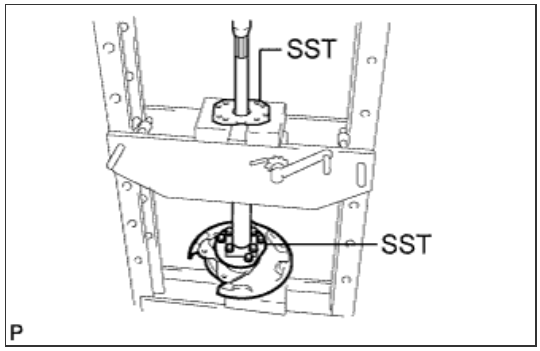
2. REMOVE REAR AXLE SHAFT LH

a. Using SST and a press, press out the rear axle shaft.

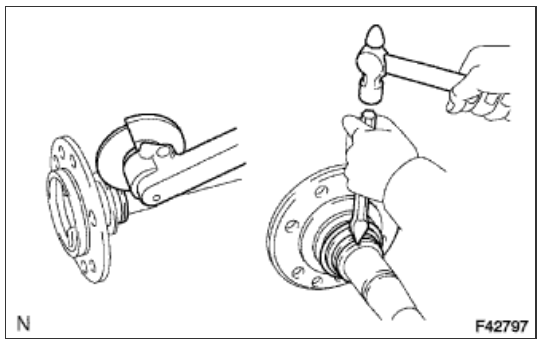
SST
09521-25011
09521-60010

b. Remove the rear axle bearing inner retainer from the axle hub.

c. Remove the rear axle shaft washer from the axle hub.



d. Grind the rear axle bearing inner race surface using a grinder, then remove it with a chisel.



3. REMOVE REAR AXLE HUB AND BEARING ASSEMBLY LH

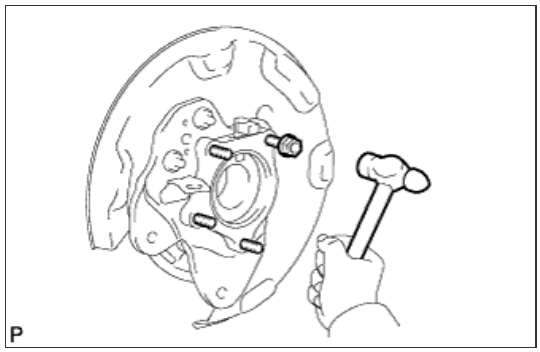
a. Temporarily install 4 nuts to the housing bolts.

NOTICE:

Do not use any nuts removed from the vehicle, as they may be damaged.

b. Using a hammer, remove the 4 housing bolts and rear axle hub and bearing.

c. Remove the 4 nuts.



4. REMOVE BRAKE DRUM OIL DEFLECTOR LH

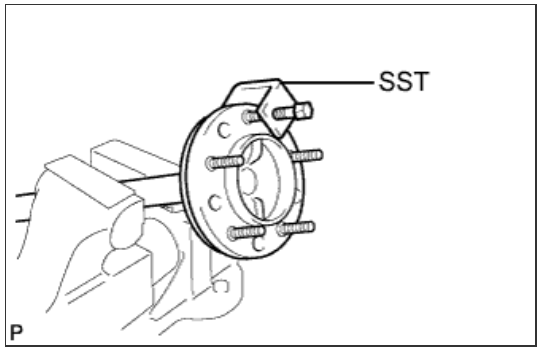
a. Using SST, remove the 5 hub bolts.

SST
09650-17011

NOTICE:

- **Do not deform the oil deflector.**
- **Make sure to align the notch of SST with the flange of the oil deflector.**

b. Remove the deflector and deflector gasket from the rear axle shaft.



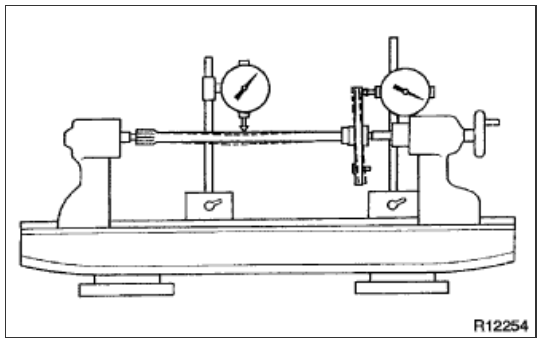
for Preparation Click here

1. INSPECT REAR AXLE SHAFT LH

a. Using a dial indicator, measure the rear axle shaft runout and flange runout.

Maximum runout:
Shaft runout:
1.50 mm (0.0591 in.)
Flange runout:
0.05 mm (0.00197 in.)

If the rear axle shaft or flange is damaged or worn, or if the runout is more than the maximum, replace the rear axle shaft.



for Preparation Click here

NOTICE:

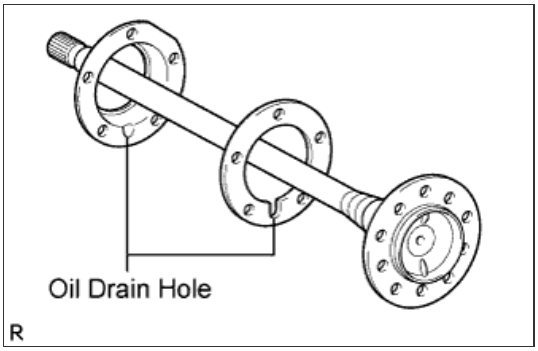
Do not allow foreign matter, etc. to contact the rear axle hub and bearing assembly.

1. INSTALL BRAKE DRUM OIL DEFLECTOR

a. Install a new deflector gasket and the deflector to the rear axle shaft.

HINT:

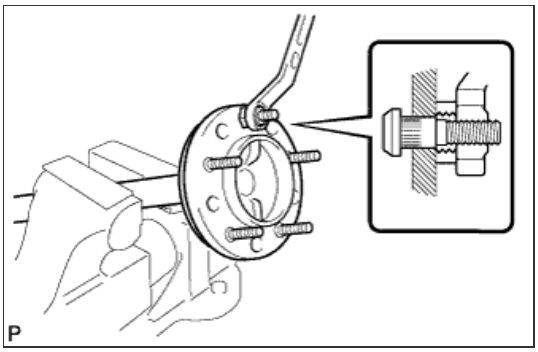
Align the 2 oil drain holes.



b. Temporarily install a washer and nut to 5 new hub bolts as shown in the illustration.

c. Install the hub bolts by tightening each nut.

d. Remove the washer and nut from each hub bolt.



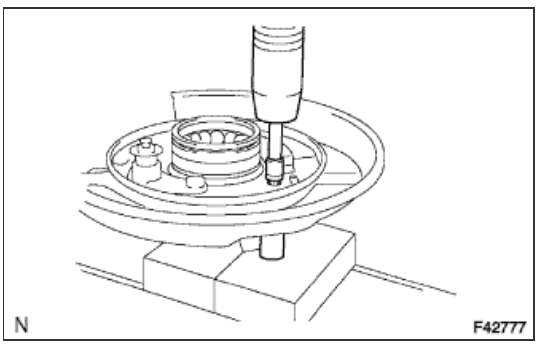
2. INSTALL REAR AXLE HUB AND BEARING ASSEMBLY LH

a. Position the parking brake plate on a new rear axle hub and bearing.

NOTICE:

Make sure to securely fit the parking brake plate to the bearing.

b. Using 2 socket wrenches and a press, press in the 4 housing bolts.



3. INSTALL REAR AXLE SHAFT LH

a. Install the washer and a new retainer to the axle hub as shown in the illustration.

NOTICE:

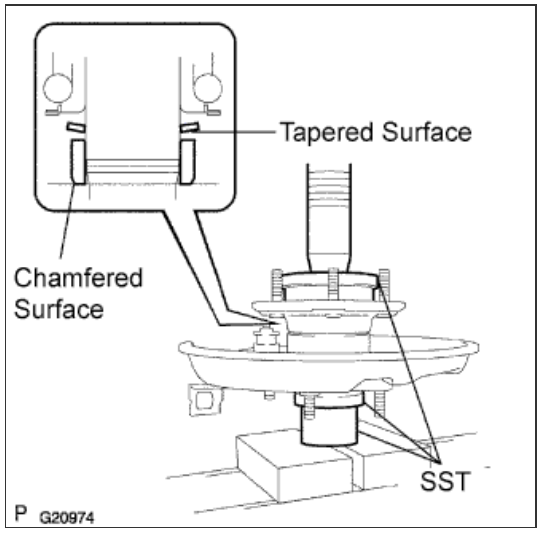
- **Install the washer with its tapered surface facing downward.**
- **Install the retainer with its chamfered surface facing downward.**

b. Using SST and a press, press in the rear axle shaft.

SST
09631-12090
09726-40010
09951-01100

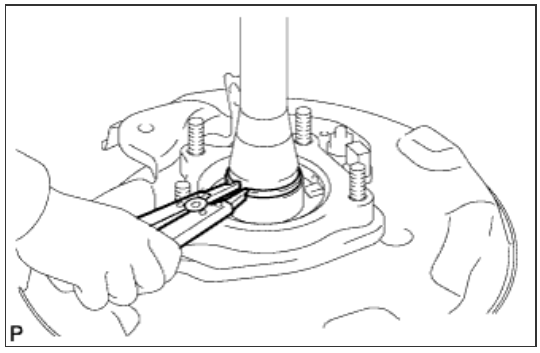
NOTICE:

Make sure to securely fit the bearing to the rear axle shaft.



4. INSTALL REAR AXLE SHAFT SNAP RING LH

a. Using a snap ring expander, install a new snap ring.



for Preparation Click here

1. INSTALL REAR AXLE SHAFT OIL SEAL LH

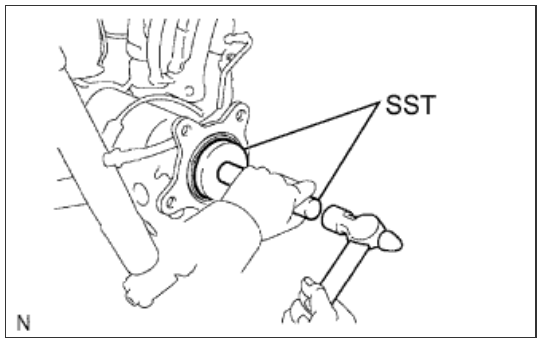
a. Using SST and a hammer, tap in a new oil seal.

NOTICE:

Do not allow foreign matter, etc. to contact the axle shaft housing hole.

SST

09950-60020 (09951-00770)
09950-70010 (09951-07150)

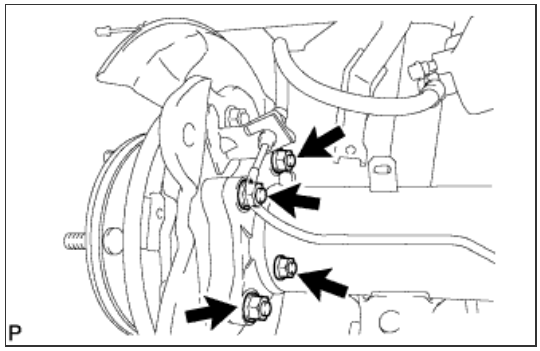


2. INSTALL REAR AXLE SHAFT LH

a. Install the O-ring to the axle housing.

b. Install the rear axle shaft and parking brake plate with the 4 nuts.

Torque:
60 N*m{ 612 kgf*cm , 44 ft.*lbf }



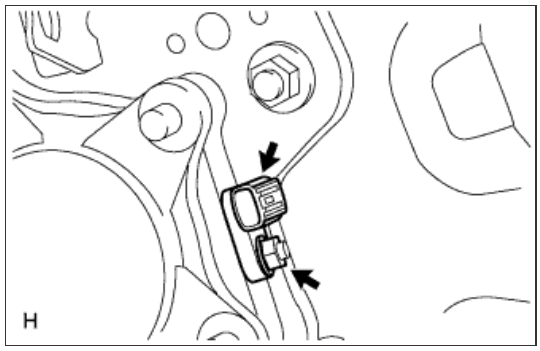
3. CONNECT REAR SPEED SENSOR LH

a. Install the speed sensor with the nut.

Torque:
8.3 N*m{ 85 kgf*cm , 73 in.*lbf }

NOTICE:

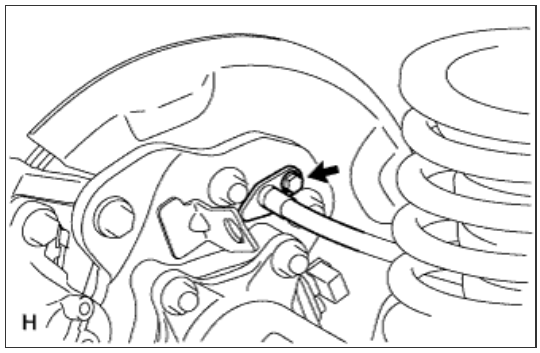
- **Make sure there are no pieces of iron or other foreign matter attached to the sensor tip.**
- **While inserting the speed sensor into the knuckle hole, do not strike or damage the sensor tip.**
- **After installing the speed sensor, make sure there is no clearance or foreign matter between the sensor stay part and the knuckle.**
- **Make sure there is no foreign matter attached to the speed sensor rotor.**



4. CONNECT NO. 3 PARKING BRAKE CABLE ASSEMBLY

a. Connect the No. 3 parking brake cable with the bolt.

Torque:
8.0 N*m{ 82 kgf*cm , 71 in.*lbf }



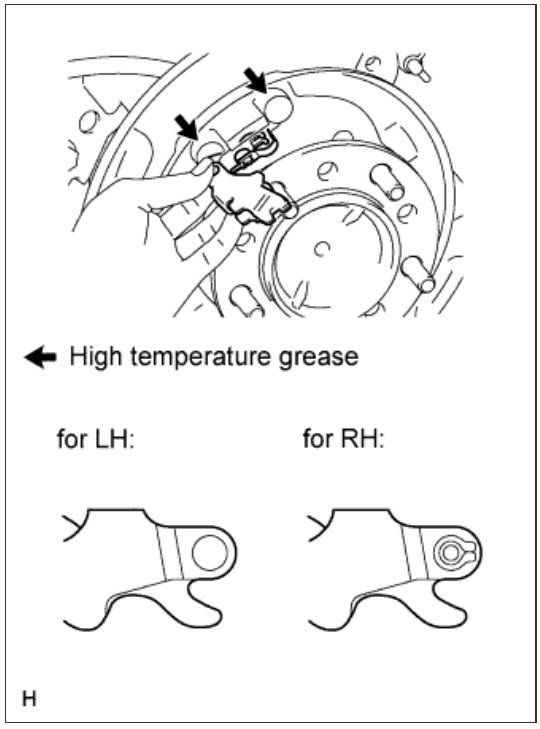
5. INSTALL PARKING BRAKE SHOE LEVER SUB-ASSEMBLY LH

a. Apply high temperature grease to the parking brake anchor block.

b. Install the parking brake shoe lever to the No. 3 parking brake cable.

NOTICE:

Be carefully to distinguish between the parking brake shoe lever RH and LH.

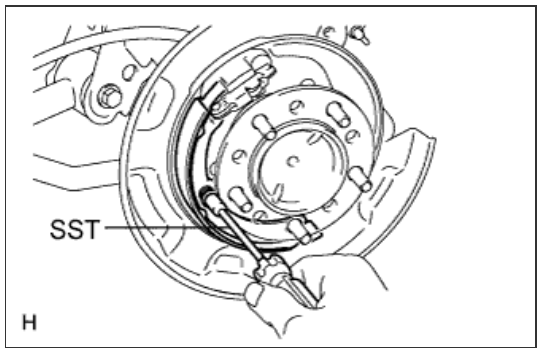


6. INSTALL NO. 2 PARKING BRAKE SHOE ASSEMBLY LH

a. Apply high temperature grease to the areas of the backing plate that contact the shoe.

b. Using SST, install the No. 2 parking brake shoe with the shoe hold down spring pin, compression spring and shoe hold down spring cup.

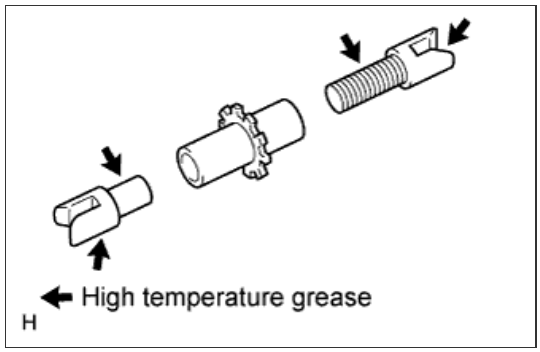
SST
09718-00011



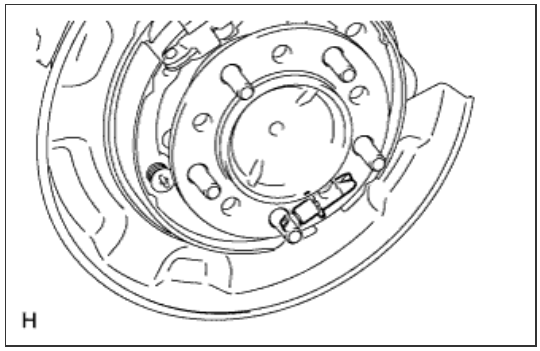
7. INSTALL NO. 1 PARKING BRAKE SHOE ASSEMBLY LH

a. Apply high temperature grease to the areas of the backing plate that contact the shoe.

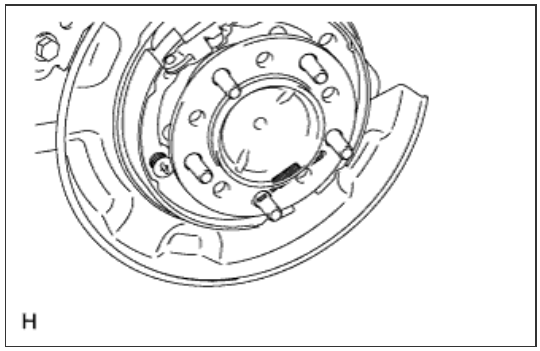
b. Apply high temperature grease to the thread and all joining areas of the parking brake shoe adjuster screw set.



c. Set the No. 1 parking brake shoe and shoe adjuster screw set in place.

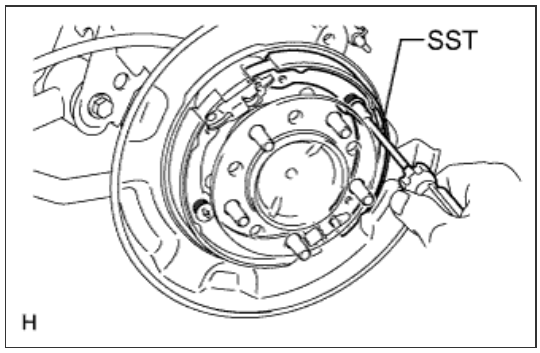


d. Connect the tension spring.



e. Using SST, install the shoe hold down spring pin, compression spring and shoe hold down spring cup.

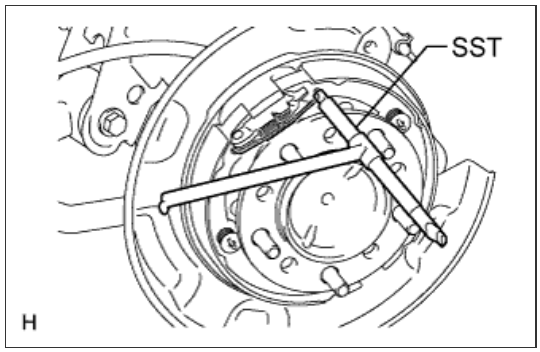
SST
09718-00011



8. INSTALL PARKING BRAKE SHOE RETURN TENSION SPRING LH

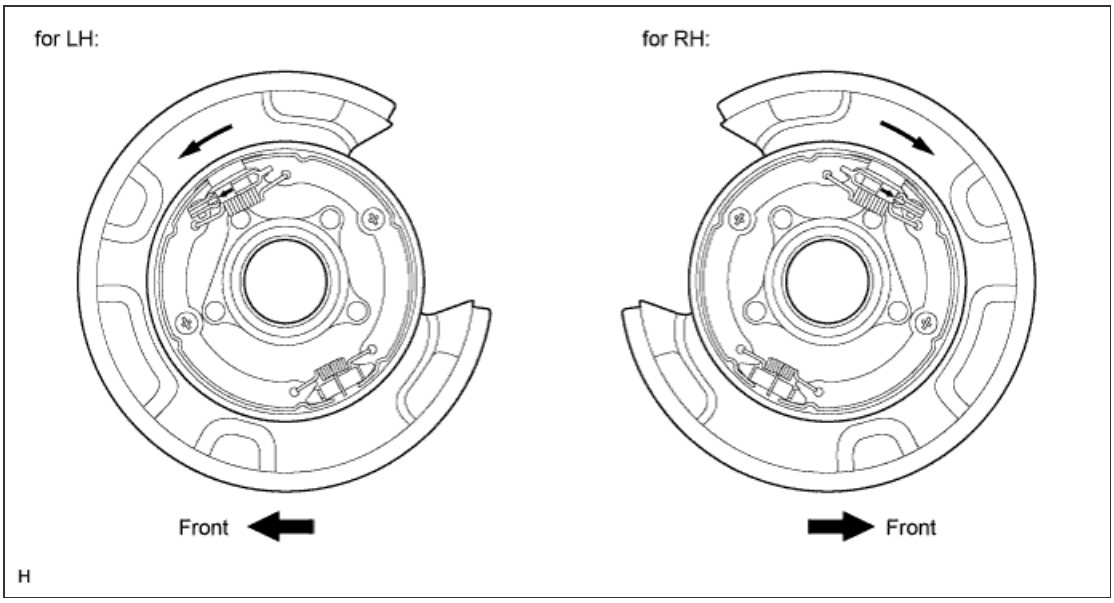
a. Using SST, install the shoe return spring.

SST
09703-30011



9. CHECK PARKING BRAKE INSTALLATION

a. Check that each part is installed properly.

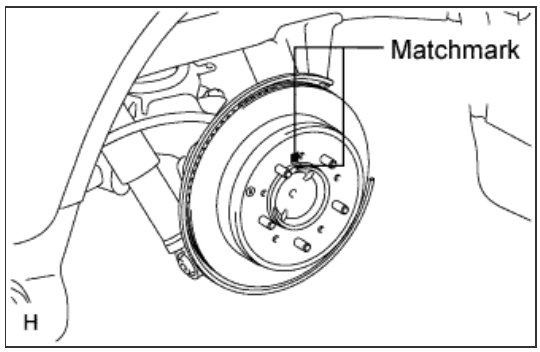


10. INSTALL REAR DISC LH

a. Align the matchmarks, and then install the rear disc.

HINT:

When replacing the rear disc with a new one, select the installation position where the rear disc has the minimum runout.



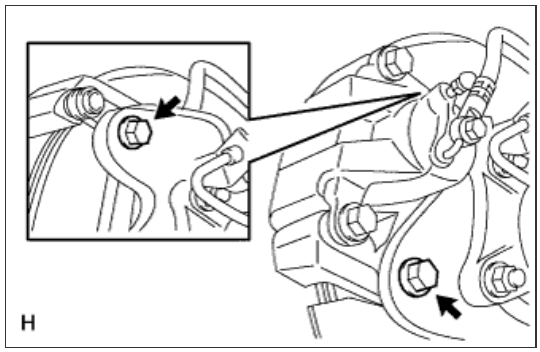
11. CONNECT REAR DISC BRAKE CYLINDER ASSEMBLY LH

a. Connect the rear disc brake cylinder and install 2 new bolts.

Torque:
95 N*m{ 969 kgf*cm , 70 ft.*lbf }

NOTICE:

- **Do not twist the flexible hose.**
- **Make sure that the bolts are free from damage and foreign matter.**
- **Do not overtighten the bolts.**



12. CONNECT REAR BRAKE FLEXIBLE HOSE

a. Connect the flexible hose to the connecting point with the brake tube, and then install a new clip.

b. Using a union nut wrench, connect the brake tube to the flexible hose while holding the flexible hose with a wrench.

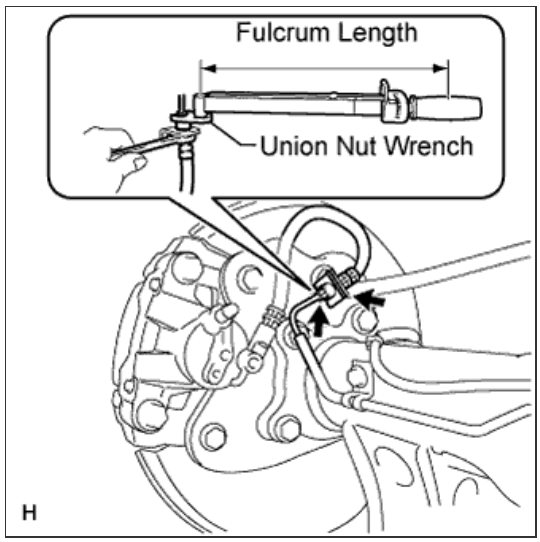
Torque:
without union nut wrench:
15 N*m{ 155 kgf*cm , 11 ft.*lbf }
with union nut wrench:
14 N*m{ 145 kgf*cm , 10 ft.*lbf }

NOTICE:

- **Do not bend or damage the brake tube.**
- **Do not allow any foreign matter such as dirt and dust to enter the brake tube from the connecting point.**

HINT:

- **Use a torque wrench with a fulcrum length of 300 mm (11.8 in.).**
- **The torque value for use with a union nut wrench is effective when the union nut wrench is parallel to the torque wrench.**

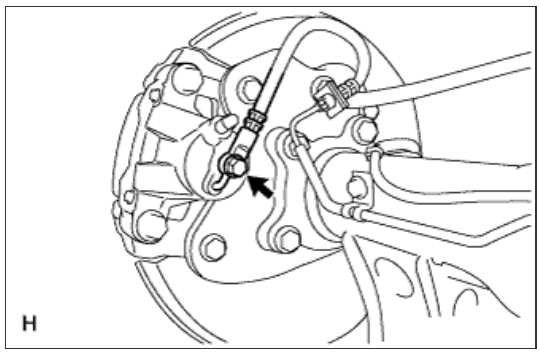


c. Install the flexible hose and a new gasket to the disc brake cylinder with the new union bolt.

Torque:
30 N*m{ 306 kgf*cm , 22 ft.*lbf }

HINT:

Install the flexible hose lock securely in the lock hole in the cylinder.



13. BLEED BRAKE LINE

a. Turn the ignition switch to ON.

b. Remove the brake master cylinder reservoir filler cap assembly.

c. Add brake fluid until the fluid level is between the MIN and MAX lines of the reservoir.

d. Repeatedly depress the brake pedal and bleed air from the bleeder plug of the front disc brake cylinder RH.

e. Repeat the step above until the air is completely bled, and then tighten the bleeder plug while depressing the brake pedal.

Torque:
11 N*m{ 110 kgf*cm , 8 ft.*lbf }

f. Bleed the air from the bleeder plug of the front disc brake cylinder LH using the same procedure as for the RH side.

g. With the brake pedal depressed, loosen the bleeder plug of the rear disc brake cylinder RH, continue to hold the brake pedal and allow brake

fluid to be drained from the bleeder plug while the pump motor operates.

HINT:

- **Air is bled as the pump motor operates while the brake pedal is being depressed.**
- **Be sure to release the brake pedal to stop the motor after approximately 100 seconds of continuous operation.**
- **As brake fluid is continuously drained while the pump operates, it is not necessary to repeatedly depress the brake pedal.**

h. When there is no more air in the brake fluid, tighten the bleeder plug, and then release the brake pedal.

Torque:
11 N*m{ 110 kgf*cm , 8 ft.*lbf }

i. Bleed the air from the bleeder plug of the rear disc brake cylinder LH using the same procedure as for the RH side.

j. Turn the ignition switch off.

k. Inspect for brake fluid leaks.

l. Check and adjust the brake fluid level (Click here).

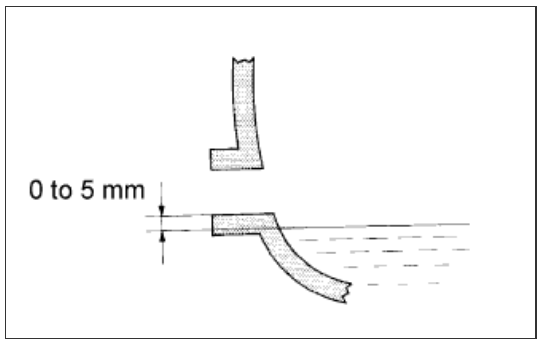
m. Clear the DTCs (Click here).

14. INSTALL REAR WHEEL LH

Torque:
for Aluminum Wheel:
131 N*m{ 1336 kgf*cm , 97 ft.*lbf }
for Steel Wheel:
209 N*m{ 2131 kgf*cm , 154 ft.*lbf }

15. INSPECT DIFFERENTIAL OIL

a. Add differential oil so that the oil level is between 0 to 5 mm (0 to 0.197 in.) from the bottom lip of the differential filler plug hole.



NOTICE:

- **Too much or too little oil will lead to differential problems.**
- **After changing the oil, drive the vehicle and then check the oil level again.**

Front differential oil type and viscosity:
Toyota Genuine Differential gear oil LT 75W-85 GL-5 or equivalent

Rear Differential Oil Type and Viscosity:

Item	Oil Type and Viscosity
w/o LSD	Toyota Genuine Differential gear oil LT 75W-85 GL-5 or equivalent
w/ LSD	Toyota Genuine Differential gear oil LX 75W-85 GL-5 or equivalent

Front differential capacity:
1.85 to 1.95 liters (1.96 to 2.06 US qts., 1.63 to 1.71 Imp. qts.)

Rear Differential Capacity:

Item	Specified Condition
Standard	4.15 to 4.25 liters (4.39 to 4.49 US qts., 3.66 to 3.74 Imp. qts.)
w/ LSD	4.10 to 4.20 liters (4.34 to 4.43 US qts., 3.60 to 3.69 Imp. qts.)
w/ Differential lock	

b. for Front Differential:

i. Using a 10 mm hexagon wrench, install a new gasket and the filler plug.

Torque:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }

ii. Install the engine under cover.

c. for Rear Differential:

i. Install a new gasket and the filler plug.

Torque:
49 N*m{ 500 kgf*cm , 36 ft.*lbf }

16. INSPECT FOR DIFFERENTIAL OIL LEAK

17. CHECK PARKING BRAKE LEVER TRAVEL

a. Fully pull the parking brake lever to engage the parking brake.

b. Release the lever to disengage the parking brake.

c. Slowly pull the parking brake lever all the way, and count the number of clicks.

Standard Parking Brake Lever Travel when Pulled with a Force of 200 N (20 kgf, 45 lbf):
5 to 7 clicks

If the parking brake lever travel is not as specified, adjust the parking brake shoe clearance and parking brake lever travel.

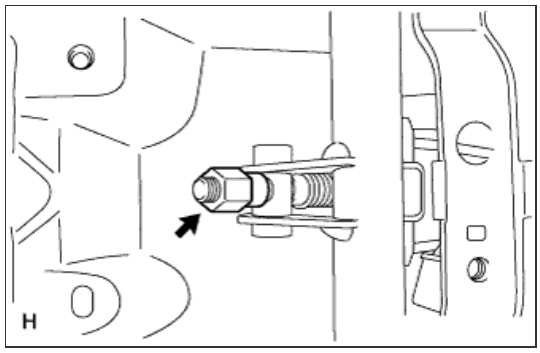
18. ADJUST PARKING BRAKE LEVER TRAVEL

a. Completely release the parking brake lever.

b. Loosen the adjusting nut to completely release the parking brake cable.

c. Temporarily install the hub nuts.

d. Remove the hole plug.

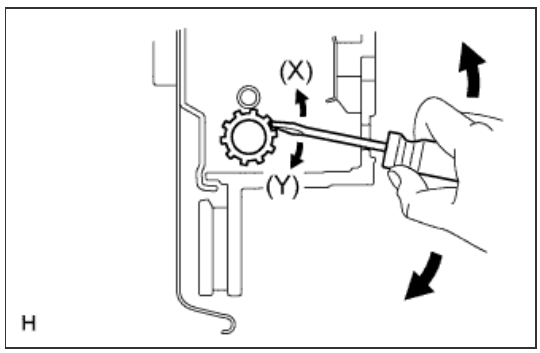


e. Insert an adjustment tool into the adjustment hole of the disc. Rotate the adjustment wheel in the "X" direction until the shoes are locked. Then rotate the adjustment wheel in the "Y" direction 8 notches.

f. Check that the disc can be rotated lightly. If not, rotate the adjustment wheel in the "Y" direction and check again.

g. Install the hole plug.

h. Remove the hub nuts.



i. Turn the adjusting nut until the parking brake lever travel becomes correct.

Standard Parking Brake Lever Travel when Pulled with a Force of 200 N (20

kgf, 45 lbf):
5 to 7 clicks

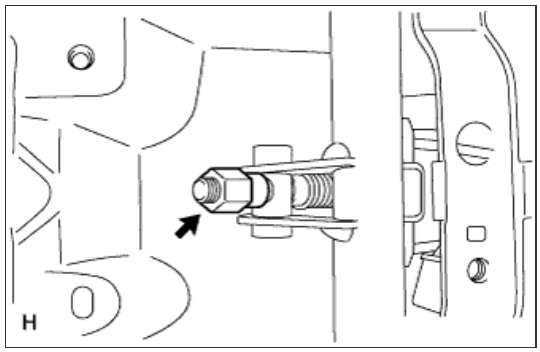
j. Operate the parking brake lever 3 to 4 times, and check the parking brake lever travel.

Standard Parking Brake Lever Travel when Pulled with a Force of 200 N (20 kgf, 45 lbf):
5 to 7 clicks

k. Check whether the parking brake drags or not.

l. When operating the parking brake lever, check that the brake warning light comes on.

Standard Condition:
The brake warning light always illuminates at the first click.



19. CHECK SPEED SENSOR SIGNAL

a. Check the speed sensor signal (Click here).

20. MEASURE VEHICLE HEIGHT (w/ KDSS)

NOTICE:

- **Perform the inspection on a level surface.**
- **Ensure that the wheels are on the ground and facing straight ahead.**
- **Perform the inspection with the vehicle load completely on the suspension.**

HINT:

- **Perform this step with the fuel tank full.**
- **If there are any parts installed to the vehicle which place any unbalanced load on the left or right side of the vehicle, remove them.**

a. Set the tire pressure to the specified value(s) (Click here).

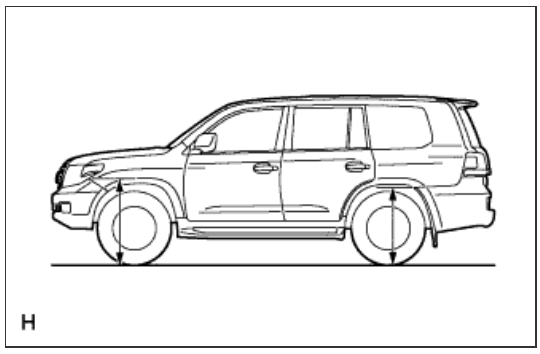
b. Bounce the vehicle to stabilize the suspension.

c. Measure the distance from the ground to the top of the bumper and calculate the difference in the vehicle height between left and right. Perform this procedure for both the front and rear wheels.

Height difference of left and right sides:
15 mm (0.591 in.) or less

HINT:

If not as specified, perform the vehicle tilt calibration.



21. CLOSE STABILIZER CONTROL WITH ACCUMULATOR HOUSING SHUTTER VALVE (w/ KDSS)

NOTICE:

- **Perform the inspection on a level surface.**
- **Ensure that the wheels are on the ground and facing straight ahead.**
- **Perform the inspection with the vehicle load completely on the suspension.**

HINT:

- **Perform this step with the fuel tank full.**
- **If there are any parts installed to the vehicle which place any unbalanced load on the left or right side of the vehicle, remove them.**

a. Using a 5 mm hexagon socket wrench, tighten the lower and upper chamber shutter valves of the stabilizer control with accumulator housing.

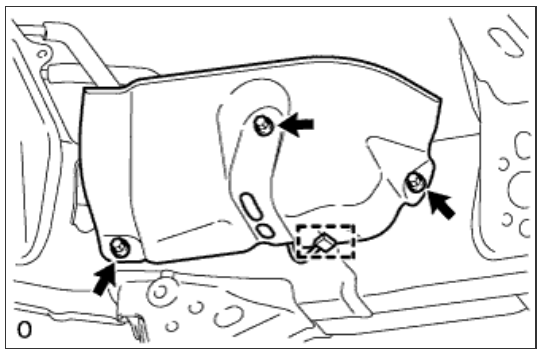
Torque:
14 N*m{ 143 kgf*cm , 10 ft.*lbf }

22. INSTALL STABILIZER CONTROL VALVE PROTECTOR (w/ KDSS)

a. Install the valve protector with the 3 bolts.

Torque:
18 N*m{ 184 kgf*cm , 13 ft.*lbf }

b. Attach the clamp, and connect the connector to the valve protector.



for Preparation Click here

1.Before disassembly, clean the outside of the differential assembly and remove any sand or mud to prevent it from entering the assembly during disassembly and installation.

2.When removing connected parts made of a light alloy, such as differential carrier covers, tap them off with a plastic-faced hammer. Do not attempt to pry them off with a screwdriver.

3.Always arrange disassembled parts in order and protect them from dust.

4.Before installation, thoroughly clean and dry each part and then apply hypoid gear oil to it. Do not use alkaline cleaner for aluminum or rubber parts and ring gear set bolts. Also, do not clean rubber parts such as O-rings or oil seals with non-residue solvent.

5.Coat all sliding surfaces and rotating parts with hypoid gear oil.

6.When holding a part with a vise, be sure to place an aluminum sheet between the part and vise. Do not put the part directly in the vise.

7.Be careful not to damage the contact surfaces of the case. Such damage could cause oil leakage.

8.Before applying new sealant, remove any old sealant and clean the part to be sealed using non-residue solvent.

9.Do not add differential oil immediately after installing sealed parts. Leave them for at least an hour.

10.Damage to the surfaces in direct contact with oil seals, O-rings or gaskets could cause oil leakage.

11.When press-fitting an oil seal, be careful not to damage the lip of the oil seal and outside periphery.

12.When replacing a bearing, replace the inner and outer races as a set.

13.Be careful not to damage and deform aluminum parts when clamping them in a vise.

for Preparation Click here

HINT:

Use the table below to help determine the cause of problem symptoms. If multiple suspected areas are listed, the potential causes of the symptoms are listed in order of probability in the "Suspected Area" column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.

Front Differential

Symptom	Suspected Area	See page
Oil leakage	Oil (level too high or wrong grade)	Click here
	Carrier oil seal (worn or damaged)	Click here
	Companion flange (loose or damaged)	Click here
Noise in front differential	Oil level (low or wrong grade)	Click here
	Ring gear or drive pinion (worn or chipped)	Click here
	Backlash adjustment (defective)	Click here
	Preload adjustment (defective)	Click here
	Tooth contact between ring gear and drive pinion (defective)	Click here
	Bearing (worn)	Click here

Rear Differential (for Standard)

Symptom	Suspected Area	See page
Oil leakage	Oil (level too high or wrong grade)	Click here
	Carrier oil seal (worn or damaged)	Click here
	Companion flange (loose or damaged)	Click here
Noise in rear differential	Oil level (low or wrong grade)	Click here
	Ring gear or drive pinion (worn or chipped)	Click here
	Backlash adjustment (defective)	Click here
	Preload adjustment (defective)	Click here
	Tooth contact between ring gear and drive pinion (defective)	Click here
	Bearing (worn)	Click here

Rear Differential (for LSD)

Symptom	Suspected Area	See page
Oil leakage	Oil (level too high or wrong grade)	Click here
	Carrier oil seal (worn or damaged)	Click here
	Companion flange (loose or damaged)	Click here
Noise in rear differential	Oil level (low or wrong grade)	Click here
	Ring gear or drive pinion (worn or chipped)	Click here
	Backlash adjustment (defective)	Click here
	Preload adjustment (defective)	Click here
	Tooth contact between ring gear and drive pinion (defective)	Click here
	Bearing (worn)	Click here

Rear Differential (w/ Differential Lock)

Symptom	Suspected Area	See page
Oil leakage	Oil (level too high or wrong grade)	Click here
	Carrier oil seal (worn or damaged)	Click here
	Companion flange (loose or damaged)	Click here
Noise in rear differential	Oil level (low or wrong grade)	Click here
	Ring gear or drive pinion (worn or chipped)	Click here
	Backlash adjustment (defective)	Click here
	Preload adjustment (defective)	Click here
	Tooth contact between ring gear and drive pinion (defective)	Click here

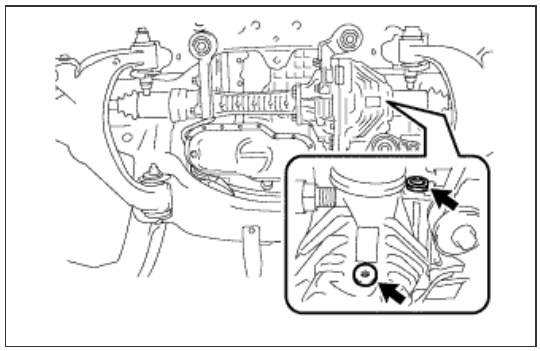
	Bearing (worn)	Click here
Differential lock does not lock	Harness and connector	Click here
	Transfer shift actuator	Click here
	Transfer position switch	Click here
	Differential lock switch	Click here
	Differential lock shift actuator	Click here
	CAN communication system	Click here
	Four wheel drive control ECU	Click here
	Rear Differential	Click here

for Preparation Click here

1. DRAIN DIFFERENTIAL OIL

a. Stop the vehicle on a level place.

b. for Front Differential:



i. Remove the engine under cover.

ii. Using a 10 mm hexagon wrench, remove the filler plug and gasket.

iii. Using a 10 mm hexagon wrench, remove the drain plug and gasket, and drain the oil.

iv. Using a 10 mm hexagon wrench, install a new gasket and the drain plug.

Torque:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }

c. for Rear Differential:

i. Remove the filler plug and gasket.

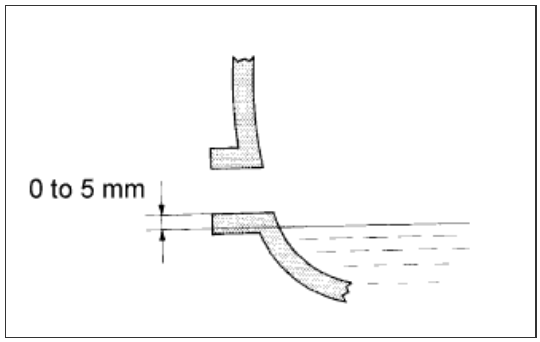
ii. Remove the drain plug and gasket, and drain the oil.

iii. Install a new gasket and the drain plug.

Torque:
49 N*m{ 500 kgf*cm , 36 ft.*lbf }

2. ADD DIFFERENTIAL OIL

a. Add differential oil so that the oil level is between 0 to 5 mm (0 to 0.197 in.) from the bottom lip of the differential filler plug hole.



NOTICE:

- **Too much or too little oil will lead to differential problems.**
- **After changing the oil, drive the vehicle and then check the oil level again.**

Front differential oil type and viscosity:
Toyota Genuine Differential gear oil LT 75W-85 GL-5 or equivalent

Rear Differential Oil Type and Viscosity:

Item	Oil Type and Viscosity
w/o LSD	Toyota Genuine Differential gear oil LT 75W-85 GL-5 or equivalent
w/ LSD	Toyota Genuine Differential gear oil LX 75W-85 GL-5 or equivalent

Front differential capacity:
1.85 to 1.95 liters (1.96 to 2.06 US qts., 1.63 to 1.71 Imp. qts.)

Rear Differential Capacity:

Item	Specified Condition
Standard	4.15 to 4.25 liters (4.39 to 4.49 US qts., 3.66 to 3.74

	Imp. qts.)
w/ LSD	4.10 to 4.20 liters (4.34 to 4.43 US qts., 3.60 to 3.69 Imp. qts.)
w/ Differential lock	

b. for Front Differential:

   i. Using a 10 mm hexagon wrench, install a new gasket and the filler plug.

      Torque:
      39 N*m{ 400 kgf*cm , 29 ft.*lbf }

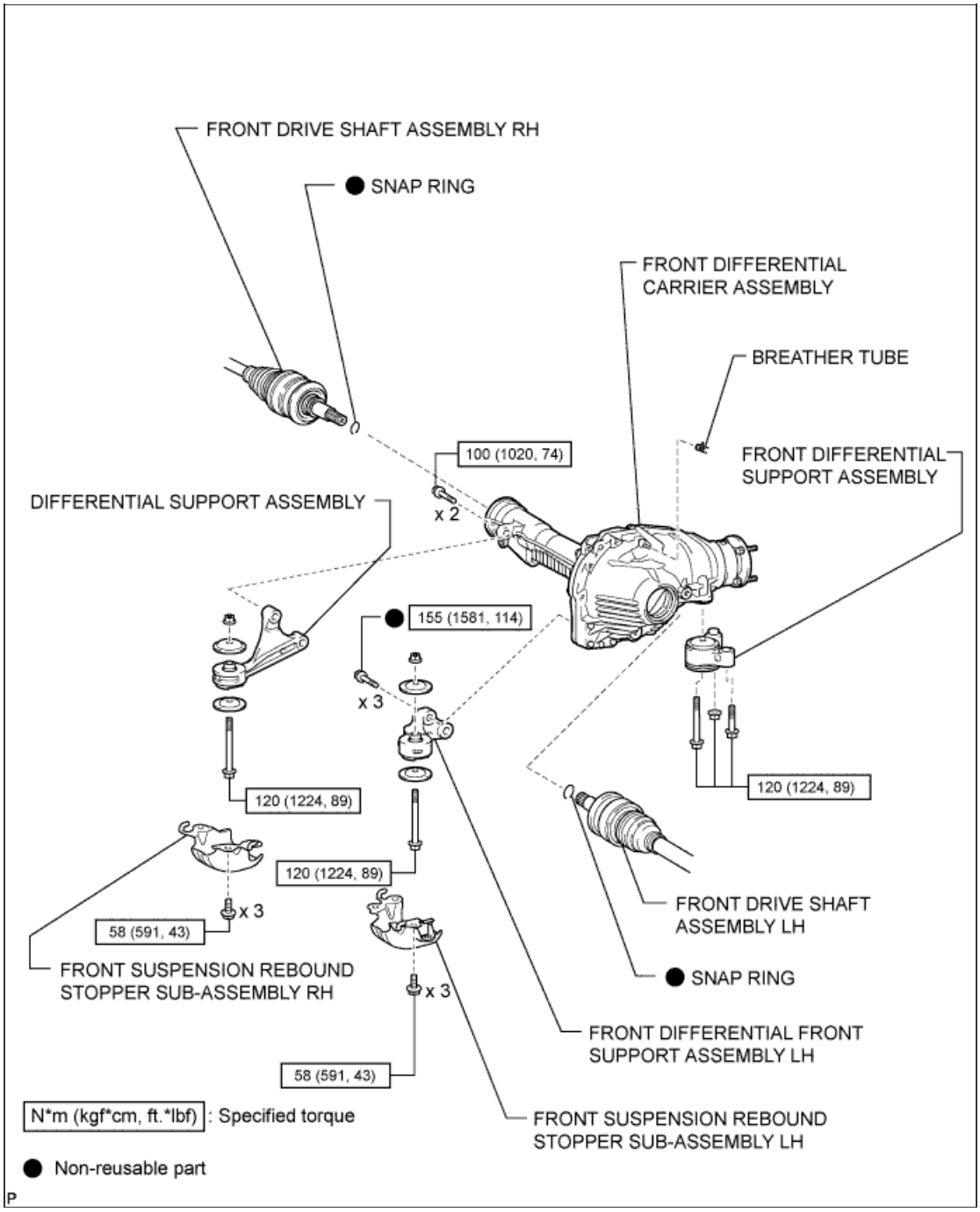
   ii. Install the engine under cover.

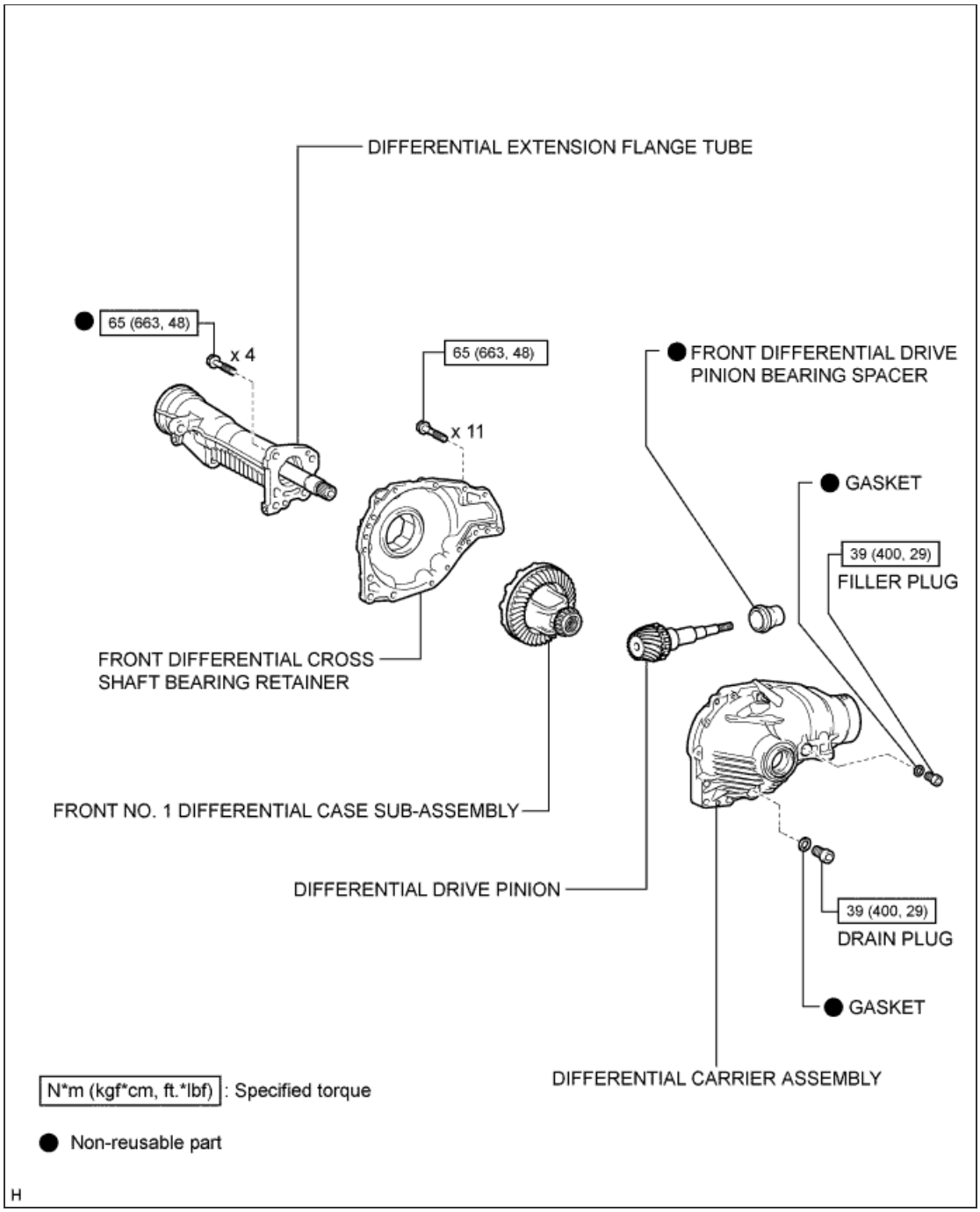
c. for Rear Differential:

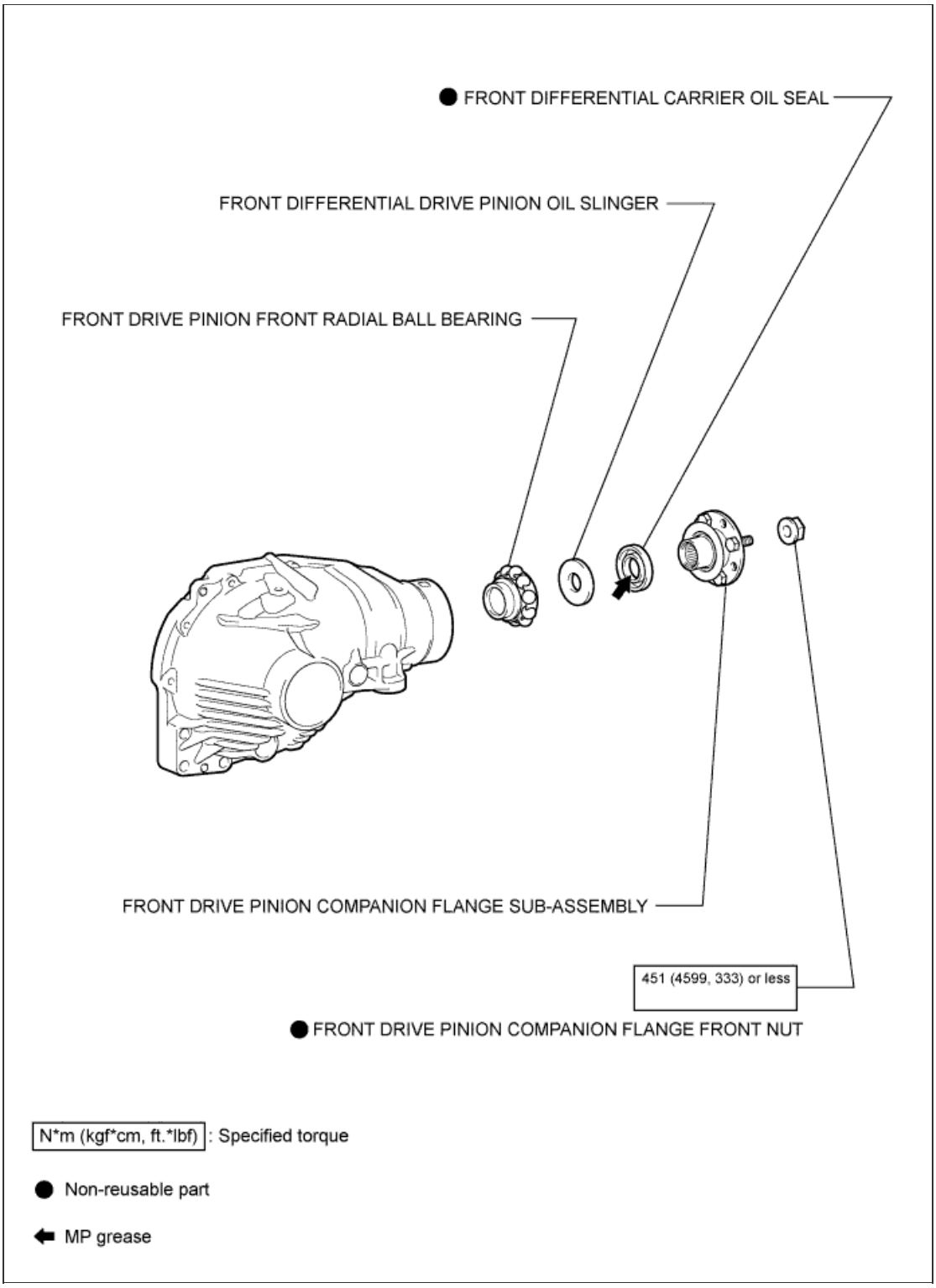
   i. Install a new gasket and the filler plug.

      Torque:
      49 N*m{ 500 kgf*cm , 36 ft.*lbf }

for Preparation Click here




DIFFERENTIAL EXTENSION FLANGE TUBE
65 (663, 48)
x 4
65 (663, 48)
x 11
FRONT DIFFERENTIAL DRIVE PINION BEARING SPACER
GASKET
39 (400, 29)
FILLER PLUG
FRONT DIFFERENTIAL CROSS SHAFT BEARING RETAINER
FRONT NO. 1 DIFFERENTIAL CASE SUB-ASSEMBLY
DIFFERENTIAL DRIVE PINION
39 (400, 29)
DRAIN PLUG
GASKET
DIFFERENTIAL CARRIER ASSEMBLY
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
H

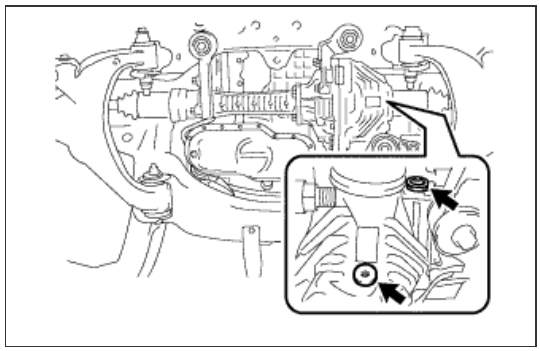

● FRONT DIFFERENTIAL CARRIER OIL SEAL
FRONT DIFFERENTIAL DRIVE PINION OIL SLINGER
FRONT DRIVE PINION FRONT RADIAL BALL BEARING
FRONT DRIVE PINION COMPANION FLANGE SUB-ASSEMBLY
451 (4599, 333) or less
● FRONT DRIVE PINION COMPANION FLANGE FRONT NUT
N*m (kgf*cm, ft.*lbf) : Specified torque
● Non-reusable part
⬅ MP grease

for Preparation Click here

1. DRAIN DIFFERENTIAL OIL

a. Stop the vehicle on a level place.

b. for Front Differential:



i. Remove the engine under cover.

ii. Using a 10 mm hexagon wrench, remove the filler plug and gasket.

iii. Using a 10 mm hexagon wrench, remove the drain plug and gasket, and drain the oil.

iv. Using a 10 mm hexagon wrench, install a new gasket and the drain plug.

Torque:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }

c. for Rear Differential:

i. Remove the filler plug and gasket.

ii. Remove the drain plug and gasket, and drain the oil.

iii. Install a new gasket and the drain plug.

Torque:
49 N*m{ 500 kgf*cm , 36 ft.*lbf }

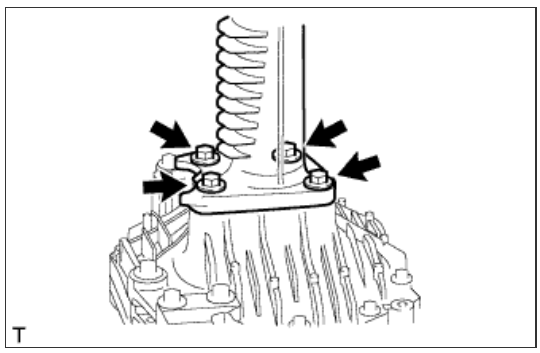
2. REMOVE FRONT DIFFERENTIAL CARRIER ASSEMBLY

a. Remove the differential carrier (Click here).

3. REMOVE DIFFERENTIAL EXTENSION FLANGE TUBE

a. Remove the 4 bolts.

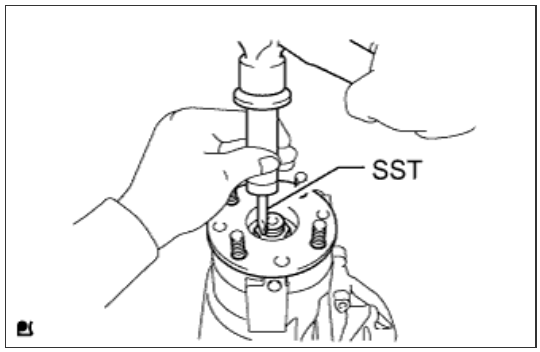
b. Using a plastic-faced hammer, remove the differential tube.



4. REMOVE FRONT DRIVE PINION COMPANION FLANGE FRONT NUT

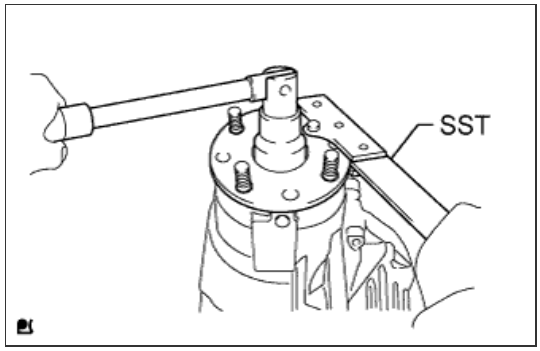
a. Using SST and a hammer, unstake the nut.

SST
09930-00010



b. Using SST to hold the companion flange, remove the nut.

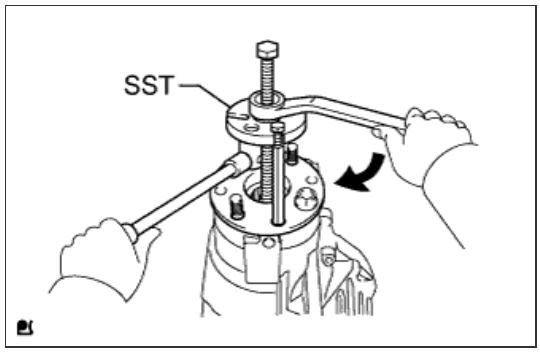
SST
09330-00021 (09330-00030)



5. REMOVE FRONT DRIVE PINION COMPANION FLANGE FRONT SUB-ASSEMBLY

a. Using SST, remove the companion flange from the differential carrier.

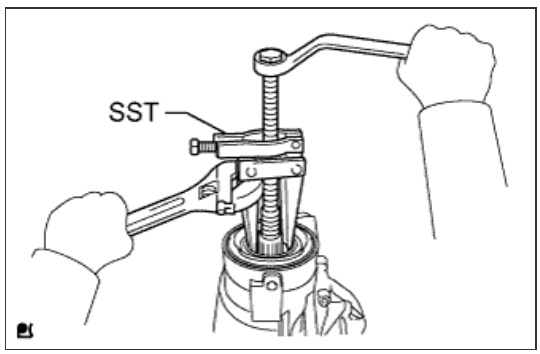
SST
09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03020)



6. REMOVE FRONT DIFFERENTIAL CARRIER OIL SEAL

a. Using SST, remove the oil seal.

SST
09308-10010



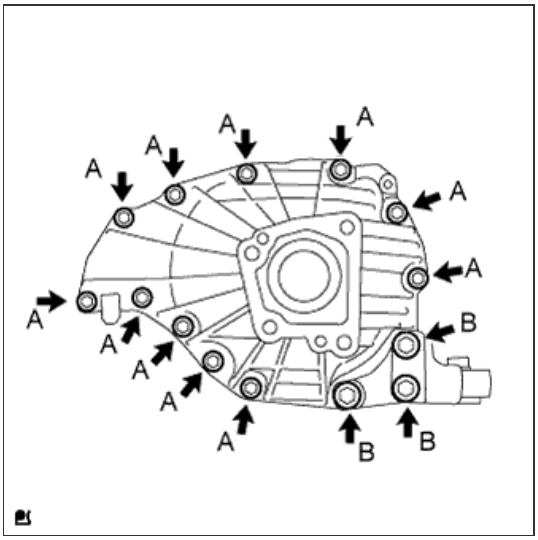
7. REMOVE FRONT DIFFERENTIAL DRIVE PINION OIL SLINGER

8. REMOVE FRONT DIFFERENTIAL CROSS SHAFT BEARING RETAINER

a. Remove the bolts labeled B and front differential front support assembly LH.

b. Remove the bolts labeled A.

c. Using a plastic-faced hammer, tap out the bearing retainer.



9. REMOVE FRONT NO. 1 DIFFERENTIAL CASE SUB-ASSEMBLY

a. Remove the differential case from the differential carrier.

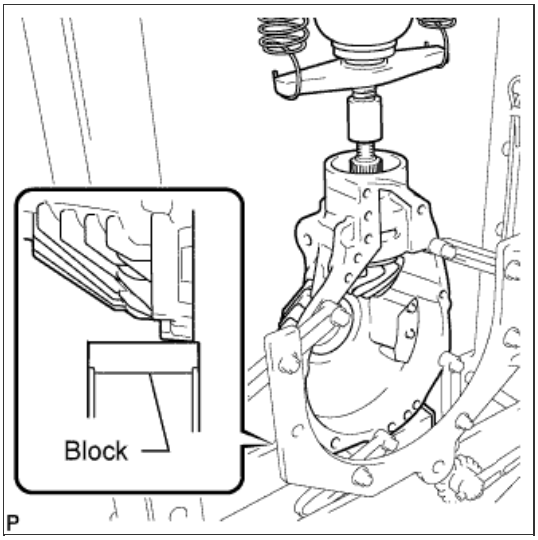
10. REMOVE DIFFERENTIAL DRIVE PINION

a. Set the differential carrier to an overhaul stand as shown in the illustration.

b. Using a press, press out the drive pinion.

NOTICE:

Do not drop the drive pinion.



11. REMOVE FRONT DRIVE PINION FRONT RADIAL BALL BEARING

a. Remove the bearing (inner race) from the differential carrier.

12. REPLACE FRONT DIFFERENTIAL DRIVE PINION BEARING SPACER

a. Replace the bearing spacer with a new one.

13. TEMPORARILY INSTALL DIFFERENTIAL DRIVE PINION

14. INSTALL FRONT NO. 1 DIFFERENTIAL CASE SUB-ASSEMBLY

15. INSTALL FRONT DIFFERENTIAL CROSS SHAFT BEARING RETAINER

a. Remove any old FIPG material and be careful not to drop oil on the contact surfaces of the differential carrier and shaft bearing retainer.

b. Wipe off any residual FIPG material on the contact surface using gasoline or alcohol.

c. Apply seal packing to the differential carrier as shown in the illustration.

Text in Illustration

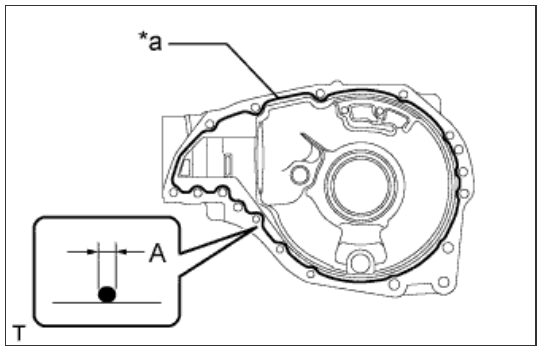
*a	Seal Packing

Seal packing:
Toyota Genuine Seal Packing 1281, Three Bond 1281 or equivalent

Seal Diameter (A):
2.0 to 3.0 mm (0.0788 to 0.118 in.)

HINT:

Install the shaft bearing retainer within 10 minutes of applying seal packing.

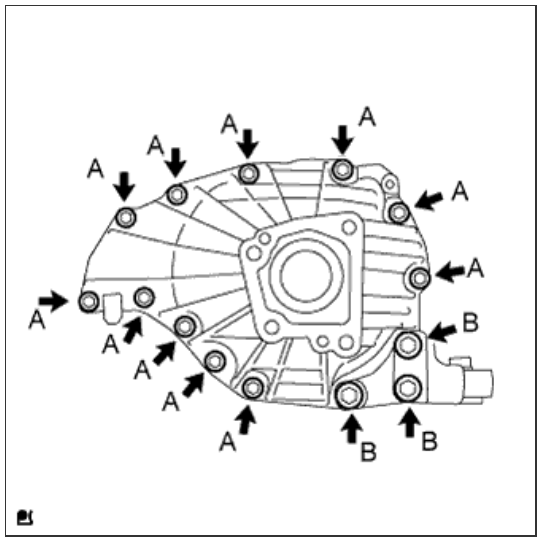


d. Install the front differential cross shaft bearing retainer and front differential front support assembly LH with the 11 bolts (A) and 3 new bolts (B).

Torque:
for bolt A:
65 N*m{ 663 kgf*cm , 48 ft.*lbf }
for bolt B:
155 N*m{ 1581 kgf*cm , 114 ft.*lbf }

NOTICE:

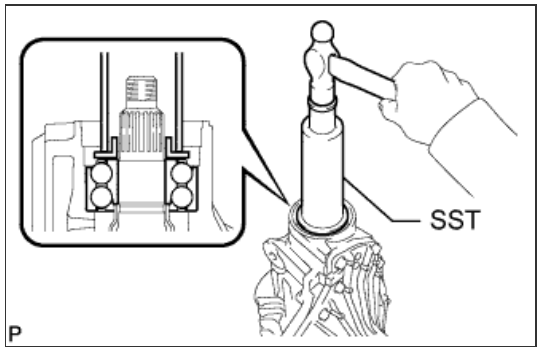
Do not add oil or drive the vehicle immediately after installing the cover, and leave it as is for at least an hour. Also, for 12 hours or less, avoid rapid acceleration/deceleration.



16. INSTALL FRONT DRIVE PINION FRONT RADIAL BALL BEARING

a. Using SST and a hammer, lightly tap in the bearing (inner race) to install it.

SST
09316-60011 (09316-00041)



17. INSTALL FRONT DIFFERENTIAL DRIVE PINION OIL SLINGER

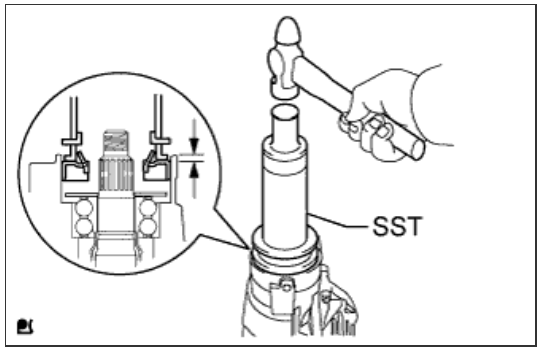
18. INSTALL FRONT DIFFERENTIAL CARRIER OIL SEAL

a. Using SST and a hammer, tap in a new oil seal.

SST
09502-12010
09316-60011 (09316-00041)

Standard oil seal depth:
5.6 to 6.6 mm (0.221 to 0.260 in.)

b. Coat the lip of the oil seal with MP grease.



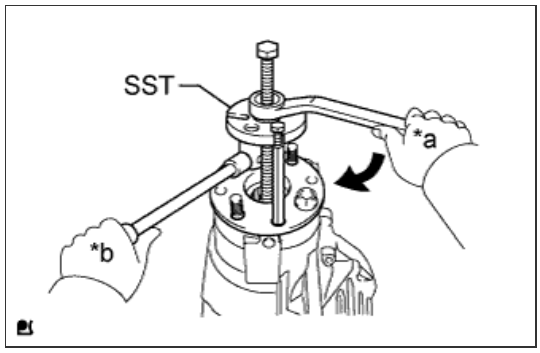
19. INSTALL FRONT DRIVE PINION COMPANION FLANGE SUB-ASSEMBLY

a. Using SST, install the companion flange.

SST
09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03020)

Text in Illustration

*a	Turn
*b	Hold



20. INSPECT DIFFERENTIAL DRIVE PINION PRELOAD

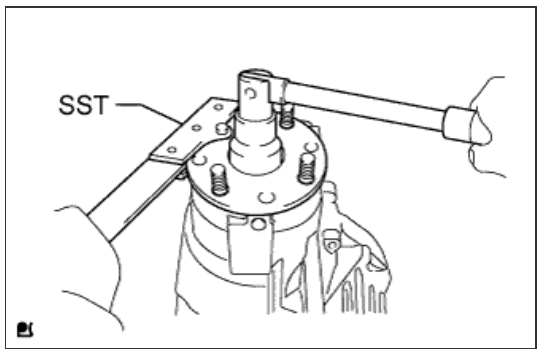
a. Using SST, hold the companion flange.

SST
09330-00021 (09330-00030)

b. Coat the threads of a new nut with hypoid gear oil.

c. Install the nut by tightening it until the standard preload is reached.

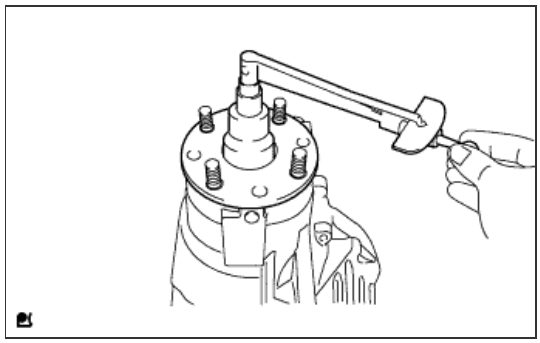
Torque:
451 N*m{ 4599 kgf*cm , 333 ft.*lbf } or less



d. Using a torque wrench, measure the preload of the backlash between the drive pinion and ring gear.

Standard Preload (at Starting):

Bearing	Specified Condition
New	2.97 to 3.47 N*m (31 to 35 kgf*cm, 27 to 30 in.*lbf)
Reused	2.14 to 2.45 N*m (22 to 24 kgf*cm, 19 to 21 in.*lbf)



If the preload is more than the specification, replace the bearing spacer.
If the preload is less than the specification, tighten the nut with 13 N*m (130 kgf*cm, 9 ft.*lbf) of torque at a time until the specified preload is reached.

Torque:
451 N*m{ 4599 kgf*cm , 333 ft.*lbf } or less

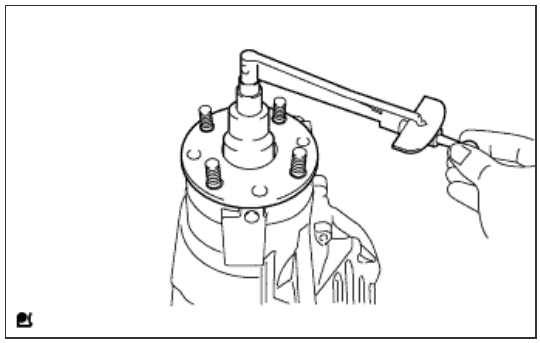
If the maximum torque is exceeded while tightening the nut, replace the bearing spacer and repeat the preload procedure.

HINT:

Do not loosen the nut to reduce the preload.

21. INSPECT TOTAL PRELOAD

a. With the drive pinion contacting the tooth side of the ring gear, use a torque wrench to measure the total preload.

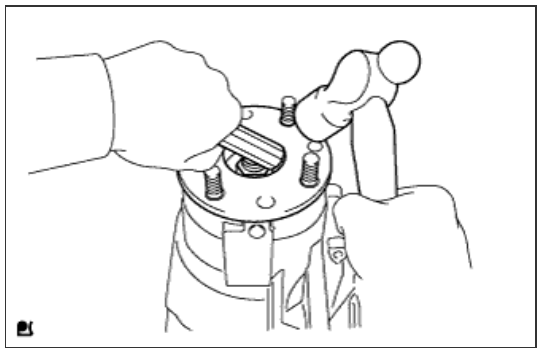


Standard Total Preload (at Starting):

Bearing	Specified Condition
New	4.58 to 5.88 N*m (47 to 59 kgf*cm, 41 to 52 in.*lbf)
Reused	3.47 to 4.58 N*m (36 to 46 kgf*cm, 31 to 40 in.*lbf)

22. STAKE FRONT DRIVE PINION COMPANION FLANGE FRONT NUT

a. Using a chisel and hammer, stake the nut.

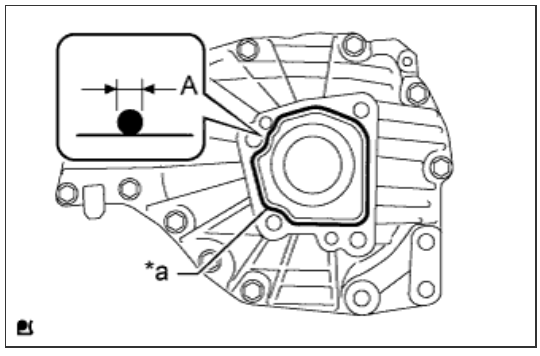


23. INSTALL DIFFERENTIAL EXTENSION FLANGE TUBE

a. Remove any old FIPG material and be careful not to drop oil on the contact surfaces of the differential tube and bearing retainer.

b. Wipe off any residual FIPG material on the contact surface using gasoline or alcohol.

c. Apply seal packing to the bearing retainer as shown in the illustration.



Text in Illustration

*a	Seal Packing

Seal packing:
Toyota Genuine Seal Packing 1281, Three Bond 1281 or equivalent

Seal Diameter (A):
2.0 to 3.0 mm (0.0788 to 0.118 in.)

HINT:

Install the differential tube within 10 minutes of applying seal packing.

d. Install the differential tube to the bearing retainer.

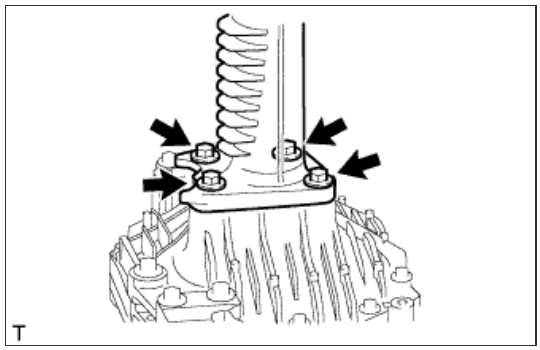
e. Install 4 new bolts.

Torque:
65 N*m{ 663 kgf*cm , 48 ft.*lbf } or less

NOTICE:

Do not add oil or drive the vehicle immediately after installing the cover, and

leave it as is for at least an hour. Also, for 12 hours or less, avoid rapid acceleration/deceleration.

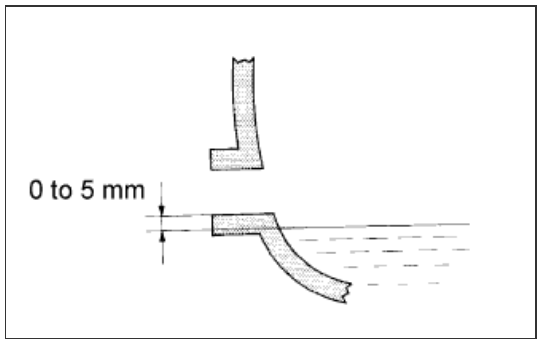


24. INSTALL FRONT DIFFERENTIAL CARRIER ASSEMBLY

a. Install the front differential carrier (Click here).

25. ADD DIFFERENTIAL OIL

a. Add differential oil so that the oil level is between 0 to 5 mm (0 to 0.197 in.) from the bottom lip of the differential filler plug hole.



NOTICE:

- **Too much or too little oil will lead to differential problems.**
- **After changing the oil, drive the vehicle and then check the oil level again.**

Front differential oil type and viscosity:
Toyota Genuine Differential gear oil LT 75W-85 GL-5 or equivalent

Rear Differential Oil Type and Viscosity:

Item	Oil Type and Viscosity
w/o LSD	Toyota Genuine Differential gear oil LT 75W-85 GL-5 or equivalent
w/ LSD	Toyota Genuine Differential gear oil LX 75W-85 GL-5 or equivalent

Front differential capacity:
1.85 to 1.95 liters (1.96 to 2.06 US qts., 1.63 to 1.71 Imp. qts.)

Rear Differential Capacity:

Item	Specified Condition
Standard	4.15 to 4.25 liters (4.39 to 4.49 US qts., 3.66 to 3.74 Imp. qts.)
w/ LSD	4.10 to 4.20 liters (4.34 to 4.43 US qts., 3.60 to 3.69 Imp. qts.)
w/ Differential lock	

b. for Front Differential:

i. Using a 10 mm hexagon wrench, install a new gasket and the filler plug.

Torque:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }

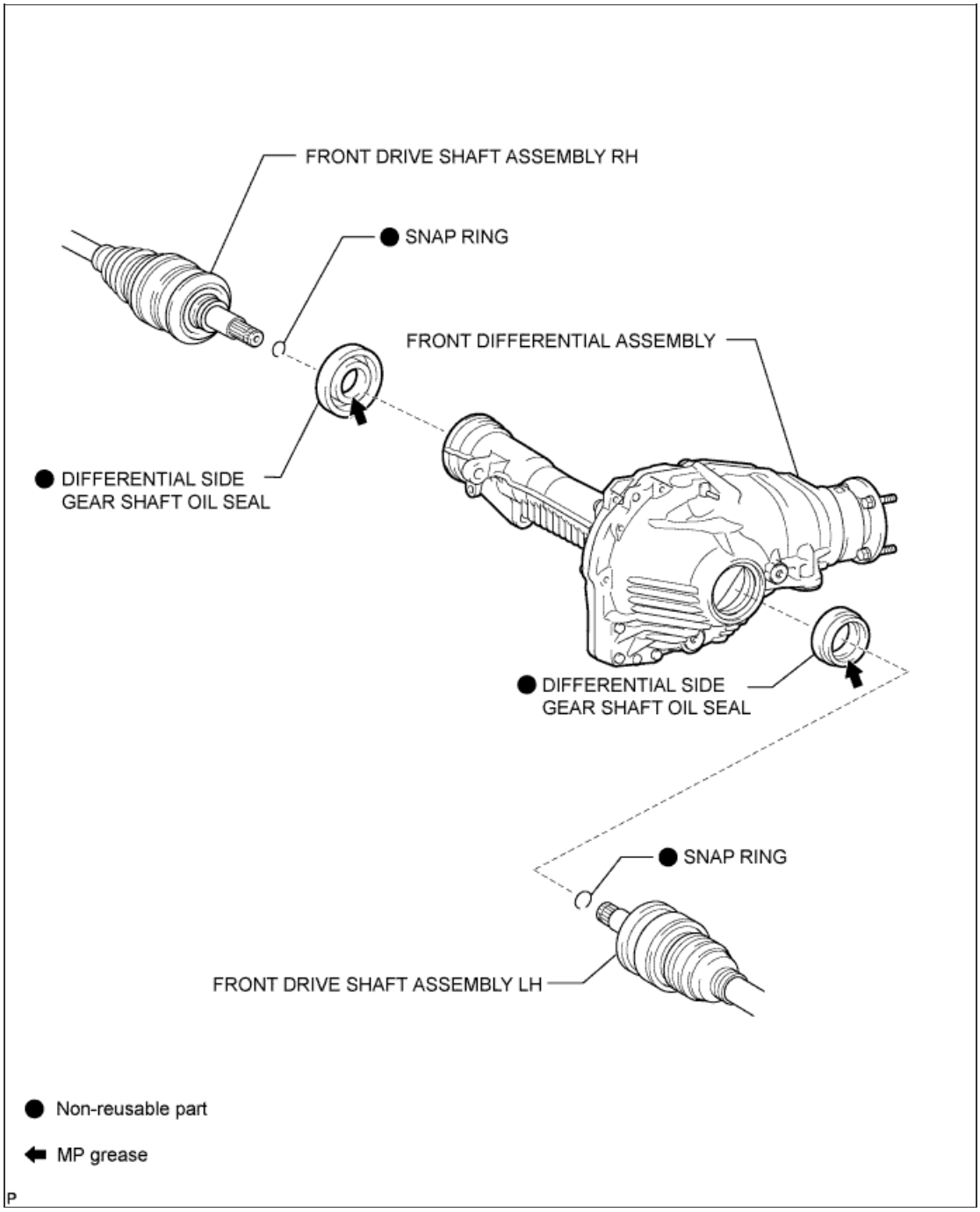
ii. Install the engine under cover.

c. for Rear Differential:

i. Install a new gasket and the filler plug.

Torque:
49 N*m{ 500 kgf*cm , 36 ft.*lbf }

for Preparation Click here



FRONT DIFFERENTIAL SIDE GEAR SHAFT OIL SEAL > REPLACEMENT

for Preparation Click here

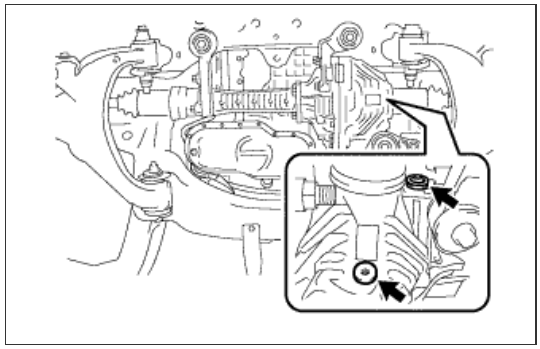
HINT:

The procedure described below is for the LH side. Use the same procedure for both the RH and LH sides, unless otherwise specified.

1. DRAIN DIFFERENTIAL OIL

a. Stop the vehicle on a level place.

b. for Front Differential:



i. Remove the engine under cover.

ii. Using a 10 mm hexagon wrench, remove the filler plug and gasket.

iii. Using a 10 mm hexagon wrench, remove the drain plug and gasket, and drain the oil.

iv. Using a 10 mm hexagon wrench, install a new gasket and the drain plug.

Torque:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }

c. for Rear Differential:

i. Remove the filler plug and gasket.

ii. Remove the drain plug and gasket, and drain the oil.

iii. Install a new gasket and the drain plug.

Torque:
49 N*m{ 500 kgf*cm , 36 ft.*lbf }

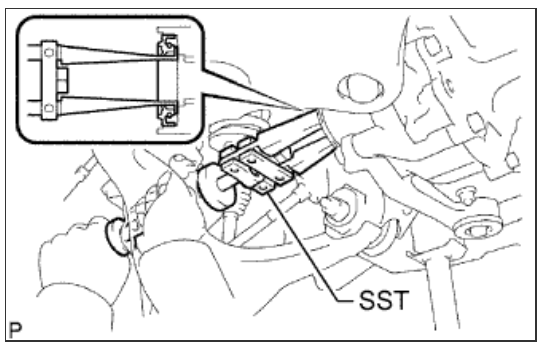
2. REMOVE FRONT DRIVE SHAFT ASSEMBLY LH

a. Remove the front drive shaft (Click here).

3. REMOVE DIFFERENTIAL SIDE GEAR SHAFT OIL SEAL

a. Using SST, tap out the 2 oil seals.

SST
09308-10010



4. INSTALL DIFFERENTIAL SIDE GEAR SHAFT OIL SEAL

a. Apply MP grease to 2 new oil seals.

b. Using SST and a hammer, tap in the 2 oil seals.

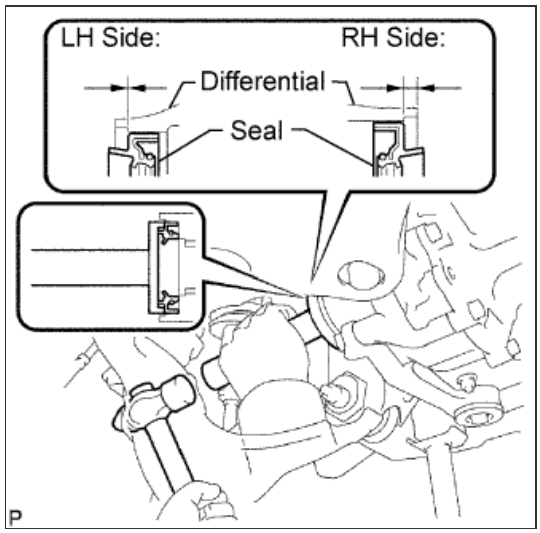
SST
09550-00032
09950-70010 (09951-07100)

NOTICE:

Make sure the LH and RH oil seals are installed in the proper locations.

Standard Oil Seal Depth:

Side	Specified Condition
LH	-0.45 to 0.45 mm (-0.0177 to 0.0177 in.)
RH	4.8 to 5.8 mm (0.189 to 0.228 in.)



5. INSTALL FRONT DRIVE SHAFT ASSEMBLY LH

a. Install the front drive shaft (Click here).

6. ADD DIFFERENTIAL OIL

a. Add differential oil so that the oil level is between 0 to 5 mm (0 to 0.197 in.) from the bottom lip of the differential filler plug hole.

NOTICE:

- **Too much or too little oil will lead to differential problems.**
- **After changing the oil, drive the vehicle and then check the oil level again.**

Front differential oil type and viscosity:
Toyota Genuine Differential gear oil LT 75W-85 GL-5 or equivalent

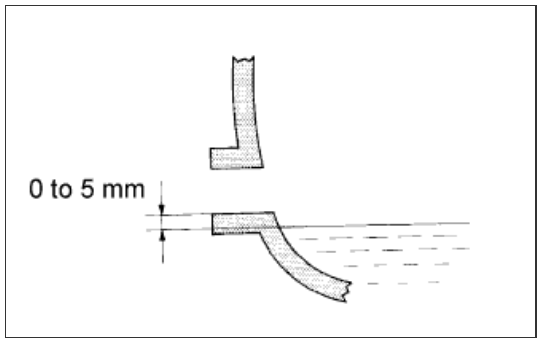
Rear Differential Oil Type and Viscosity:

Item	Oil Type and Viscosity
w/o LSD	Toyota Genuine Differential gear oil LT 75W-85 GL-5 or equivalent
w/ LSD	Toyota Genuine Differential gear oil LX 75W-85 GL-5 or equivalent

Front differential capacity:
1.85 to 1.95 liters (1.96 to 2.06 US qts., 1.63 to 1.71 Imp. qts.)

Rear Differential Capacity:

Item	Specified Condition
Standard	4.15 to 4.25 liters (4.39 to 4.49 US qts., 3.66 to 3.74 Imp. qts.)
w/ LSD	4.10 to 4.20 liters (4.34 to 4.43 US qts., 3.60 to 3.69 Imp. qts.)
w/ Differential lock	



b. for Front Differential:

i. Using a 10 mm hexagon wrench, install a new gasket and the filler plug.

Torque:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }

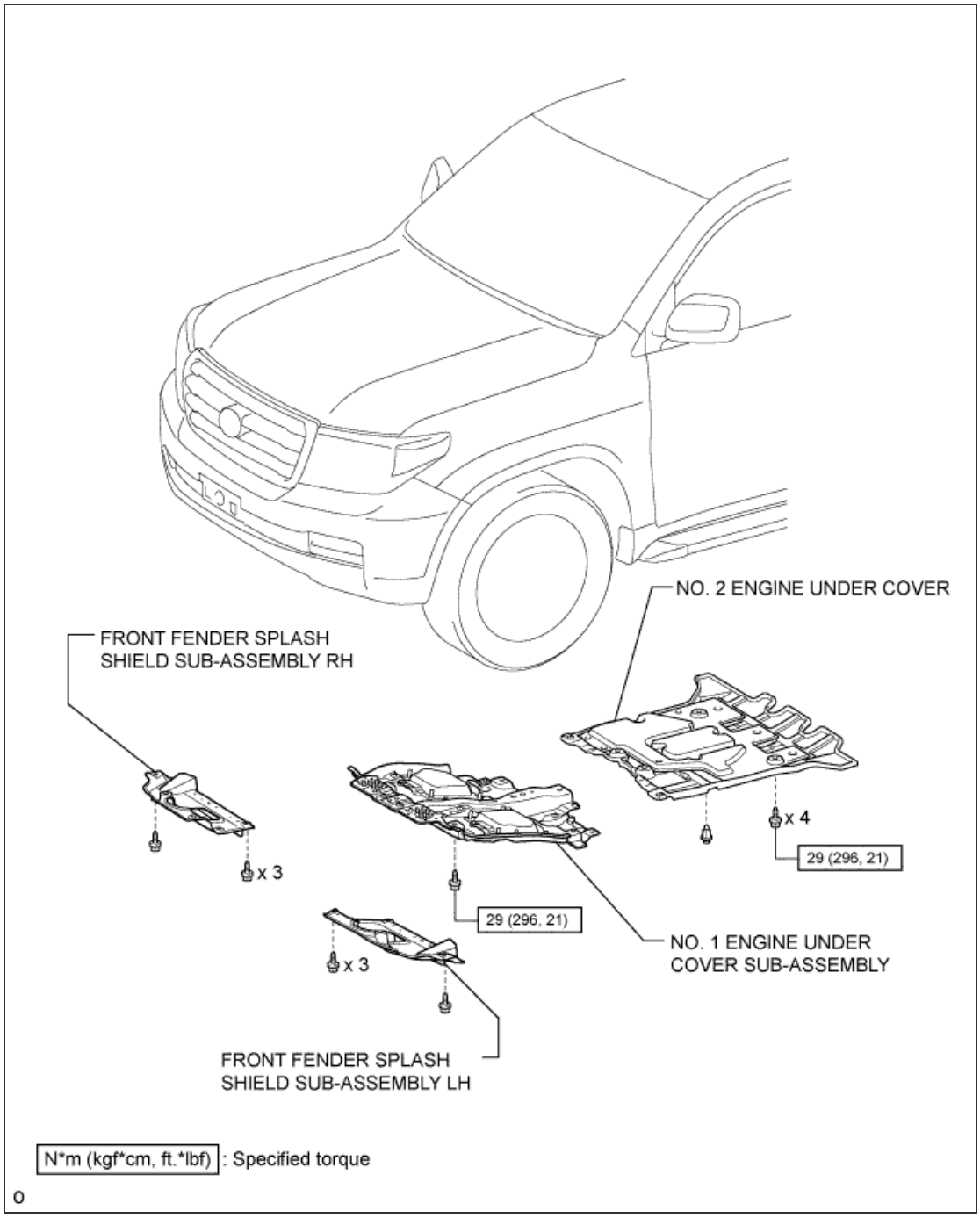
ii. Install the engine under cover.

c. for Rear Differential:

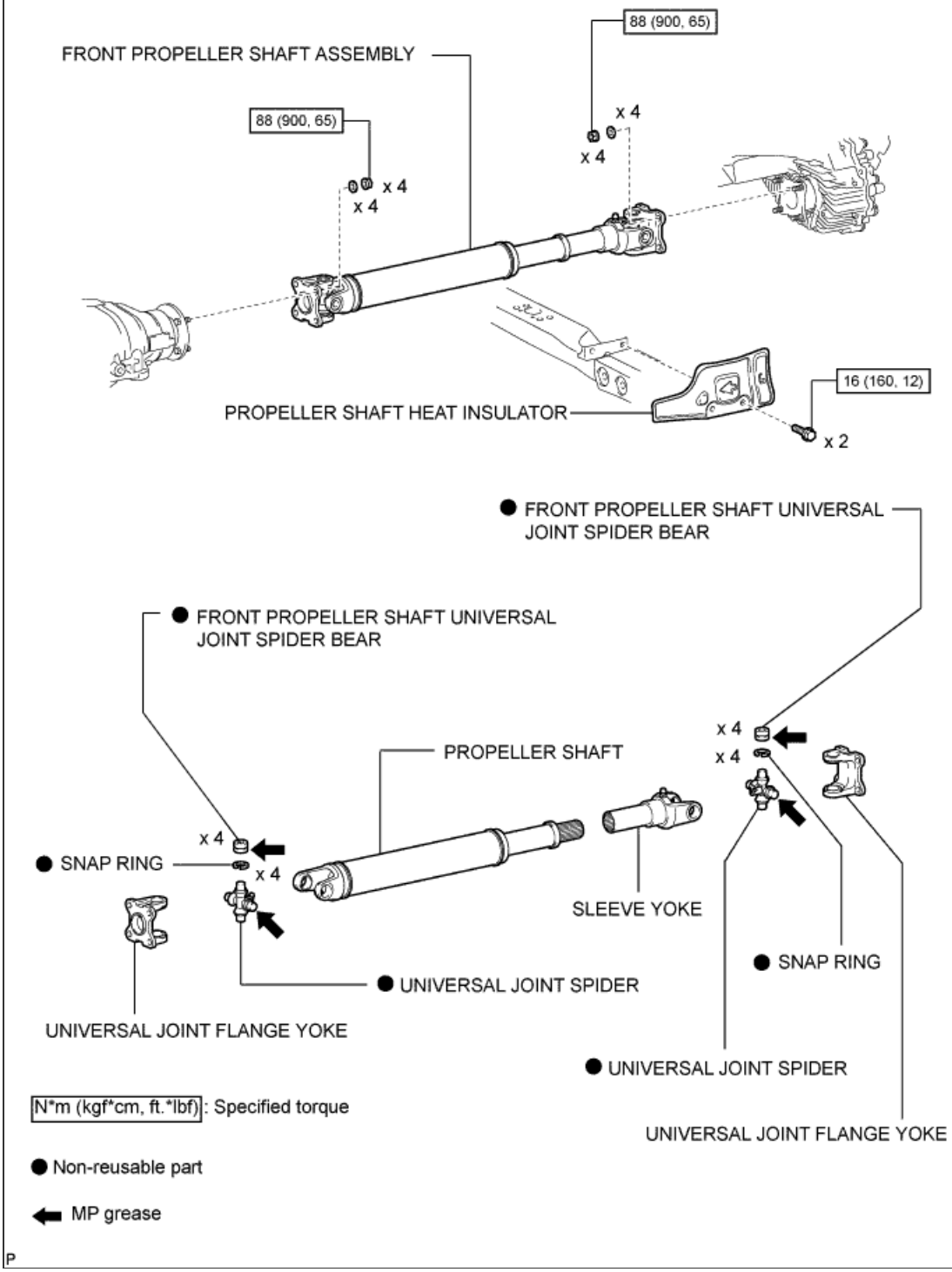
i. Install a new gasket and the filler plug.

Torque:
49 N*m{ 500 kgf*cm , 36 ft.*lbf }

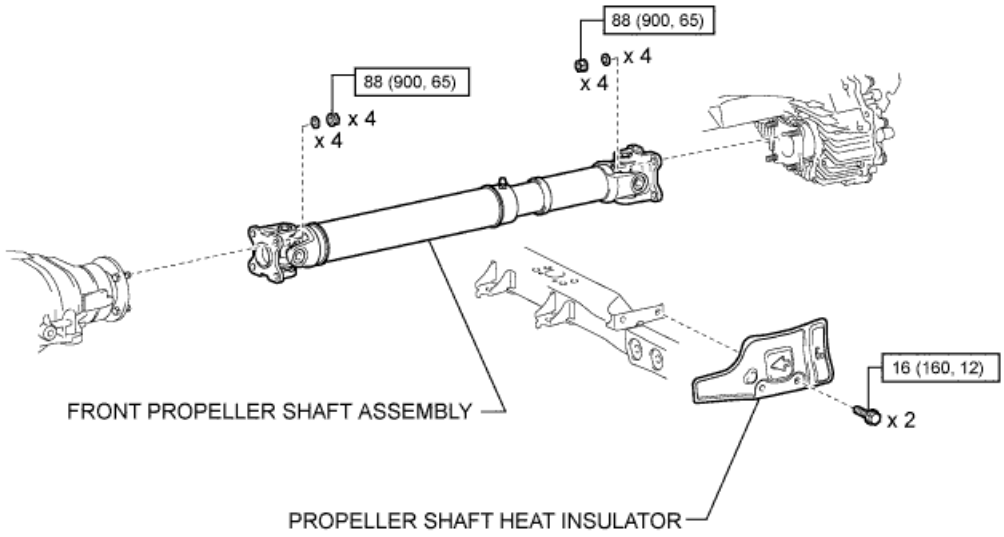
for Preparation Click here



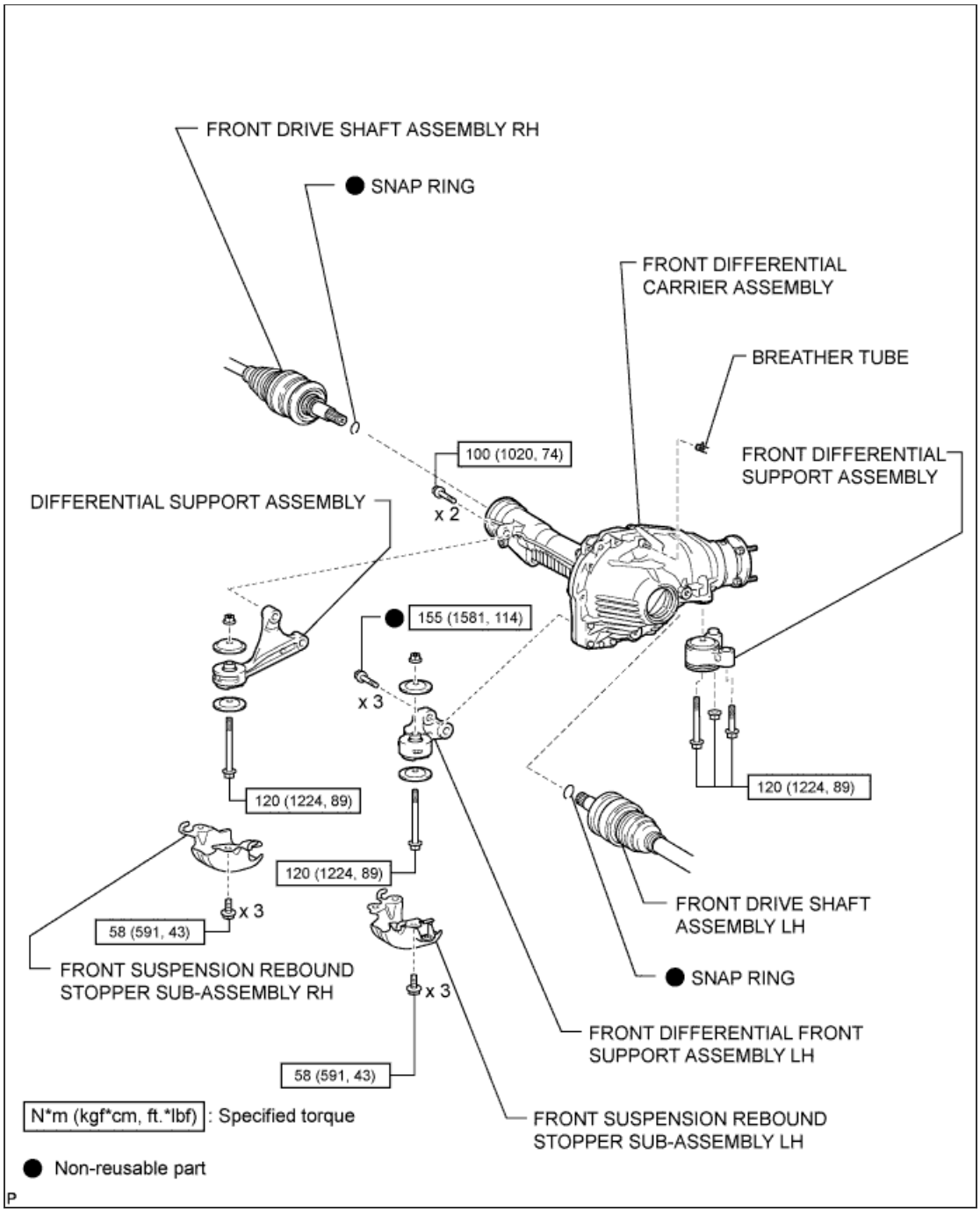
w/o CENTER GREASE FITTING TYPE:

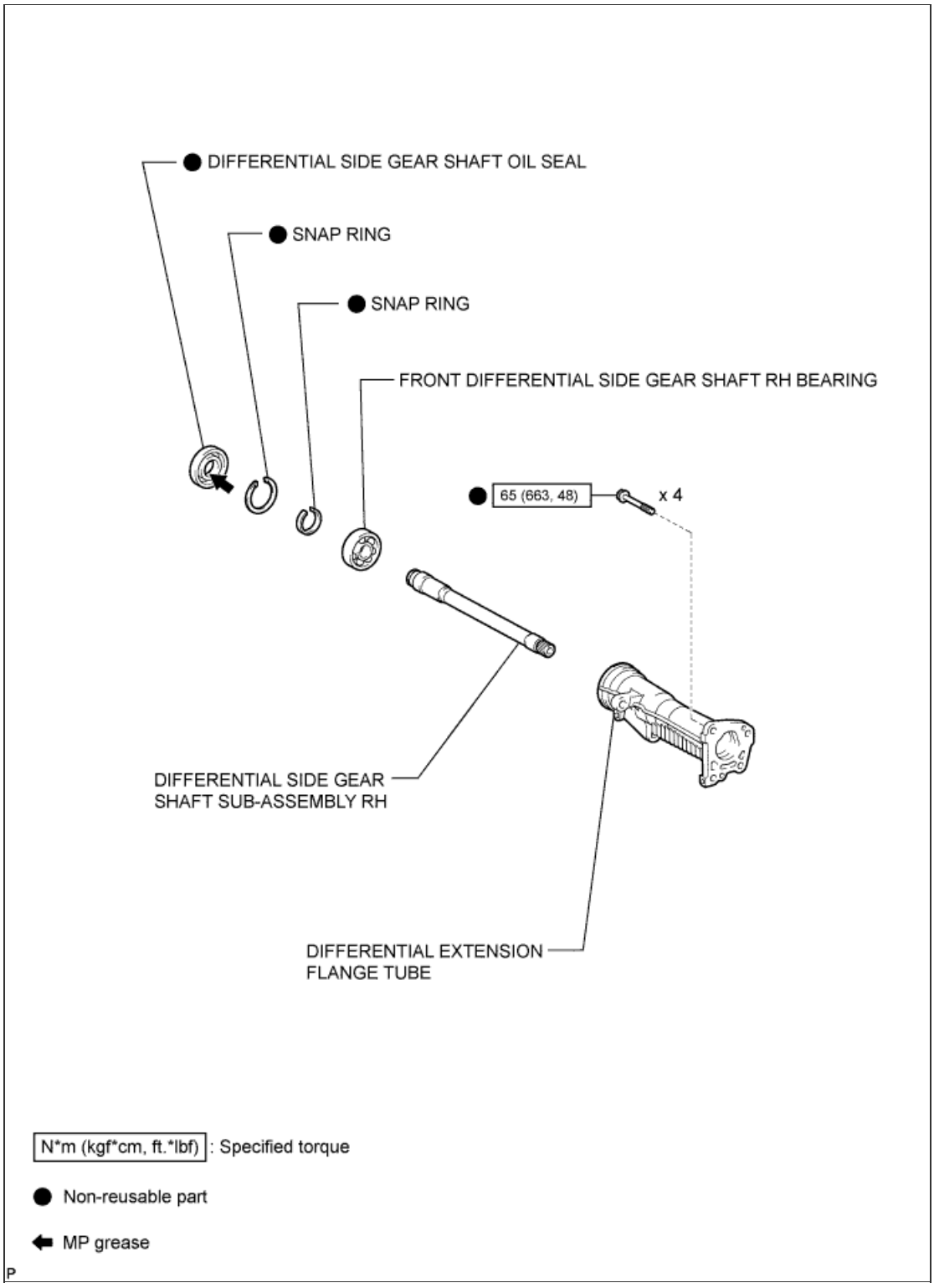


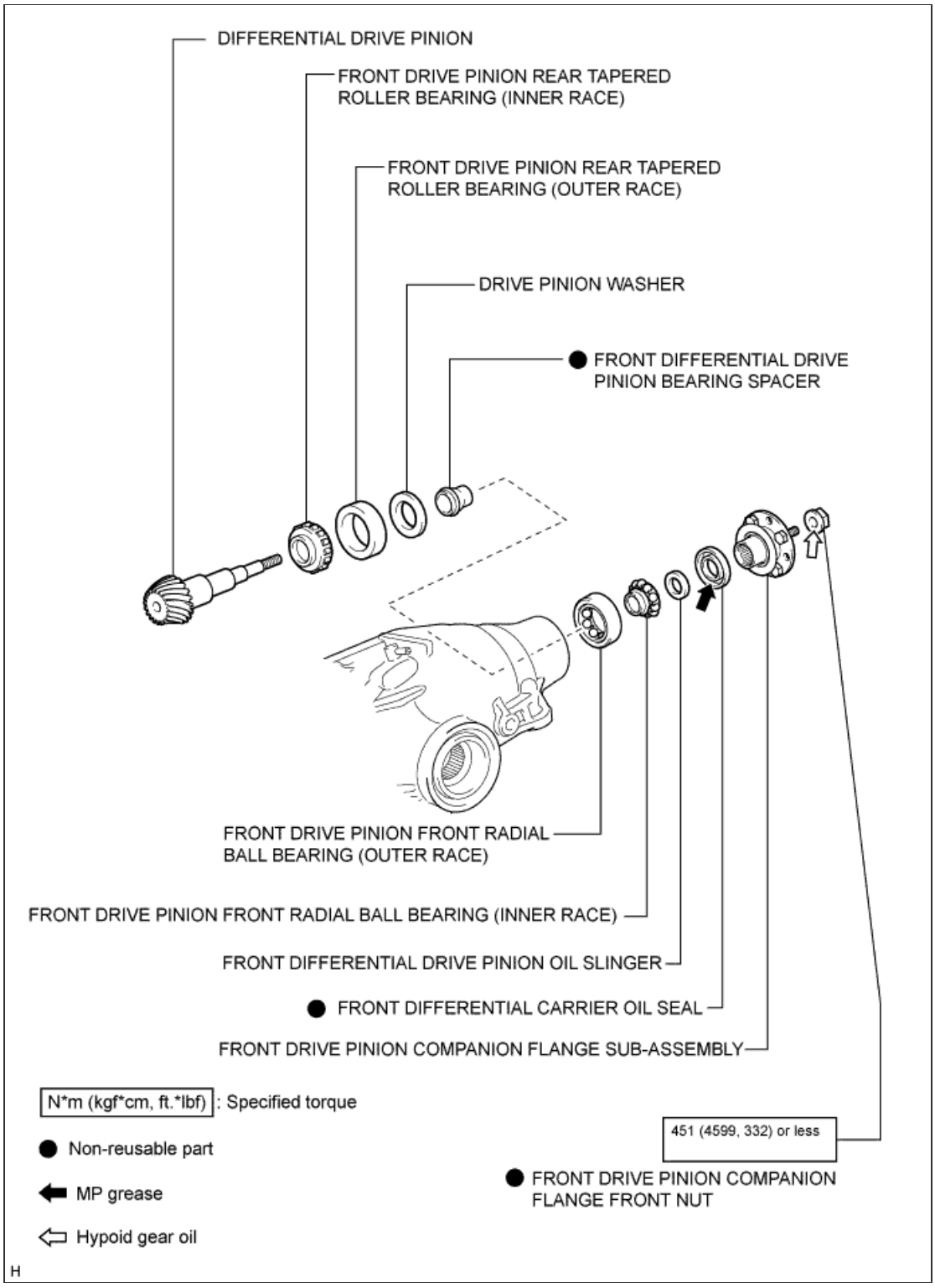
w/ CENTER GREASE FITTING TYPE :

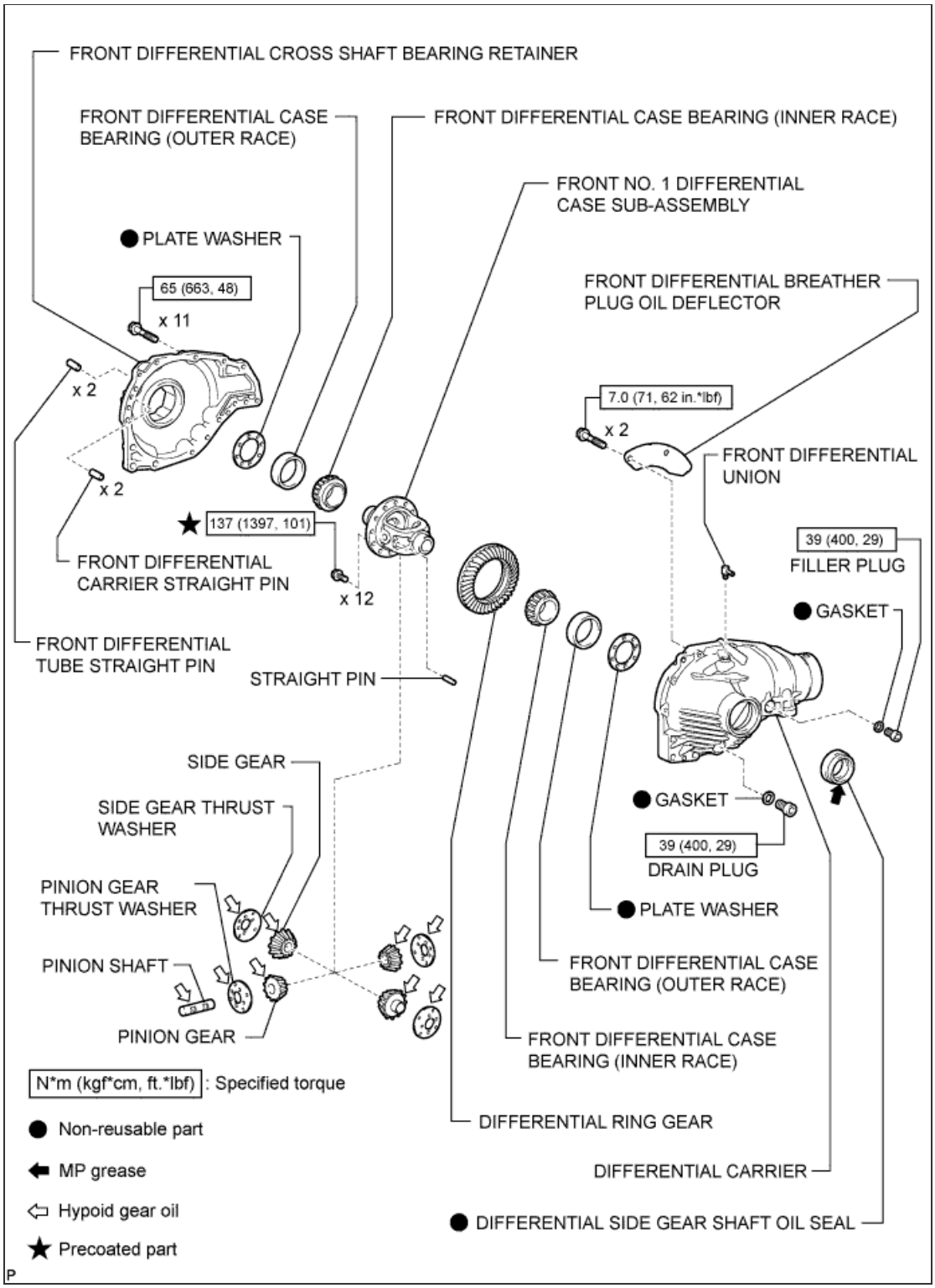


N*m (kgf*cm, ft.*lbf) : Specified torque


FRONT DRIVE SHAFT ASSEMBLY RH
SNAP RING
FRONT DIFFERENTIAL CARRIER ASSEMBLY
BREATHER TUBE
100 (1020, 74)
x 2
FRONT DIFFERENTIAL SUPPORT ASSEMBLY
DIFFERENTIAL SUPPORT ASSEMBLY
155 (1581, 114)
x 3
120 (1224, 89)
120 (1224, 89)
120 (1224, 89)
x 3
58 (591, 43)
FRONT SUSPENSION REBOUND STOPPER SUB-ASSEMBLY RH
FRONT DRIVE SHAFT ASSEMBLY LH
SNAP RING
x 3
FRONT DIFFERENTIAL FRONT SUPPORT ASSEMBLY LH
58 (591, 43)
N*m (kgf*cm, ft.*lbf) : Specified torque
FRONT SUSPENSION REBOUND STOPPER SUB-ASSEMBLY LH
Non-reusable part
P


DIFFERENTIAL SIDE GEAR SHAFT OIL SEAL
SNAP RING
SNAP RING
FRONT DIFFERENTIAL SIDE GEAR SHAFT RH BEARING
65 (663, 48)
x 4
DIFFERENTIAL SIDE GEAR SHAFT SUB-ASSEMBLY RH
DIFFERENTIAL EXTENSION FLANGE TUBE
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
MP grease
P


DIFFERENTIAL DRIVE PINION
FRONT DRIVE PINION REAR TAPERED ROLLER BEARING (INNER RACE)
FRONT DRIVE PINION REAR TAPERED ROLLER BEARING (OUTER RACE)
DRIVE PINION WASHER
● FRONT DIFFERENTIAL DRIVE PINION BEARING SPACER
FRONT DRIVE PINION FRONT RADIAL BALL BEARING (OUTER RACE)
FRONT DRIVE PINION FRONT RADIAL BALL BEARING (INNER RACE)
FRONT DIFFERENTIAL DRIVE PINION OIL SLINGER
● FRONT DIFFERENTIAL CARRIER OIL SEAL
FRONT DRIVE PINION COMPANION FLANGE SUB-ASSEMBLY
N*m (kgf*cm, ft.*lbf) : Specified torque
● Non-reusable part
MP grease
Hypoid gear oil
451 (4599, 332) or less
● FRONT DRIVE PINION COMPANION FLANGE FRONT NUT
H


FRONT DIFFERENTIAL CROSS SHAFT BEARING RETAINER
FRONT DIFFERENTIAL CASE BEARING (OUTER RACE)
FRONT DIFFERENTIAL CASE BEARING (INNER RACE)
FRONT NO. 1 DIFFERENTIAL CASE SUB-ASSEMBLY
PLATE WASHER
65 (663, 48)
x 11
FRONT DIFFERENTIAL BREATHER PLUG OIL DEFLECTOR
7.0 (71, 62 in.*lbf)
x 2
FRONT DIFFERENTIAL UNION
x 2
x 2
137 (1397, 101)
FRONT DIFFERENTIAL CARRIER STRAIGHT PIN
x 12
39 (400, 29)
FILLER PLUG
GASKET
FRONT DIFFERENTIAL TUBE STRAIGHT PIN
STRAIGHT PIN
SIDE GEAR
SIDE GEAR THRUST WASHER
GASKET
39 (400, 29)
DRAIN PLUG
PINION GEAR THRUST WASHER
PLATE WASHER
PINION SHAFT
FRONT DIFFERENTIAL CASE BEARING (OUTER RACE)
PINION GEAR
FRONT DIFFERENTIAL CASE BEARING (INNER RACE)
N*m (kgf*cm, ft.*lbf) : Specified torque
DIFFERENTIAL RING GEAR
Non-reusable part
MP grease
DIFFERENTIAL CARRIER
Hypoid gear oil
DIFFERENTIAL SIDE GEAR SHAFT OIL SEAL
Precoated part
P

for Preparation Click here

1. REMOVE FRONT PROPELLER SHAFT ASSEMBLY

a. Remove the front propeller shaft (Click here).

2. REMOVE FRONT DRIVE SHAFT ASSEMBLY LH

a. Remove the front drive shaft (Click here).

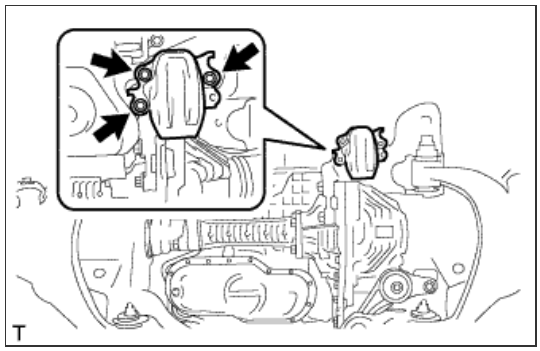
3. REMOVE FRONT DRIVE SHAFT ASSEMBLY RH

HINT:

Use the same procedure as the LH side.

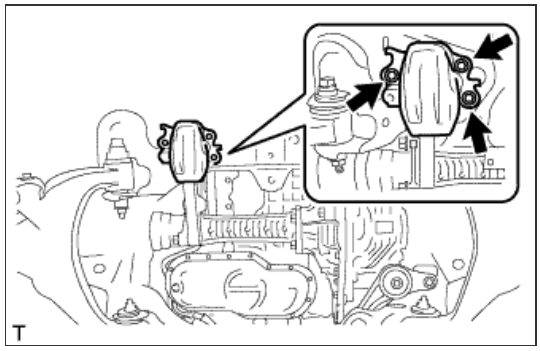
4. REMOVE FRONT SUSPENSION REBOUND STOPPER SUB-ASSEMBLY LH

a. Remove the 3 bolts and suspension rebound stopper LH.



5. REMOVE FRONT SUSPENSION REBOUND STOPPER SUB-ASSEMBLY RH

a. Remove the 3 bolts and suspension rebound stopper RH.



6. REMOVE FRONT DIFFERENTIAL CARRIER ASSEMBLY

a. Disconnect the breather tube from the front differential union.

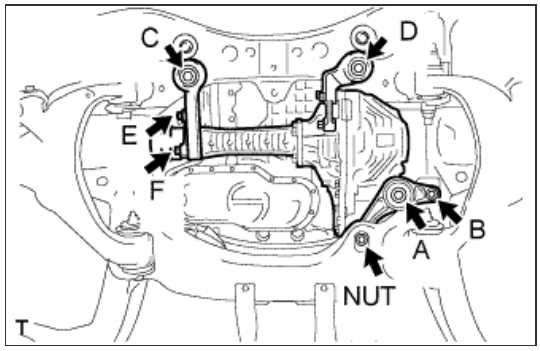
b. Support the front differential with a jack.

c. Remove bolts A and B, and the nut and front differential support assembly.

d. Remove bolts C and D.

e. Slowly lower the jack, and remove the front differential carrier.

f. Remove bolts E and F, and the differential support assembly.

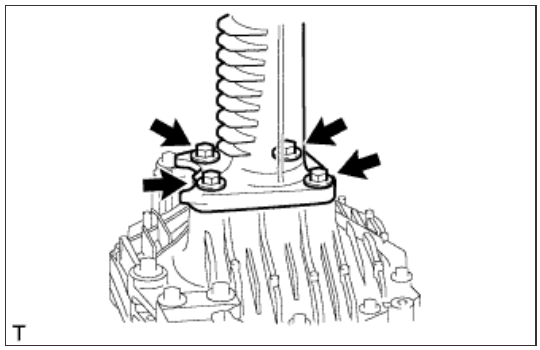


for Preparation Click here

1. REMOVE DIFFERENTIAL EXTENSION FLANGE TUBE

a. Remove the 4 bolts.

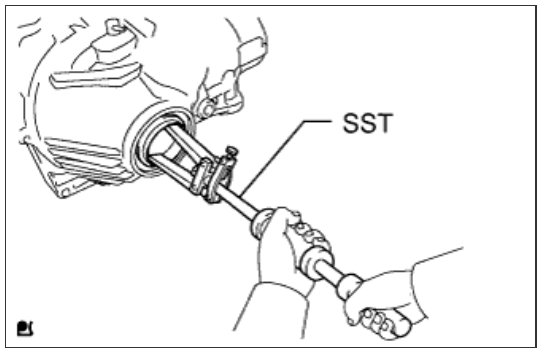
b. Using a plastic-faced hammer, remove the differential tube.



2. REMOVE DIFFERENTIAL SIDE GEAR SHAFT OIL SEAL

a. Using SST, tap out the oil seal.

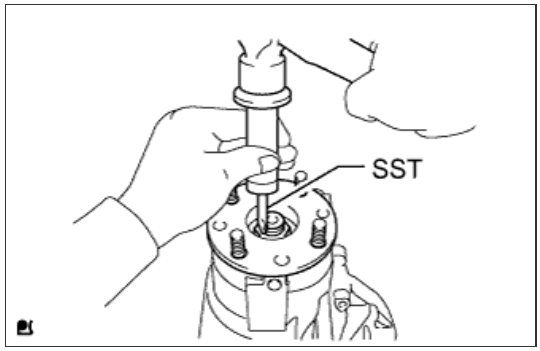
SST
09308-00010



3. REMOVE FRONT DRIVE PINION COMPANION FLANGE FRONT NUT

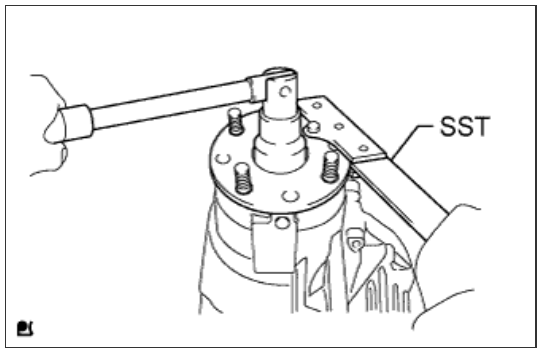
a. Using SST and a hammer, unstake the nut.

SST
09930-00010



b. Using SST to hold the companion flange, remove the nut.

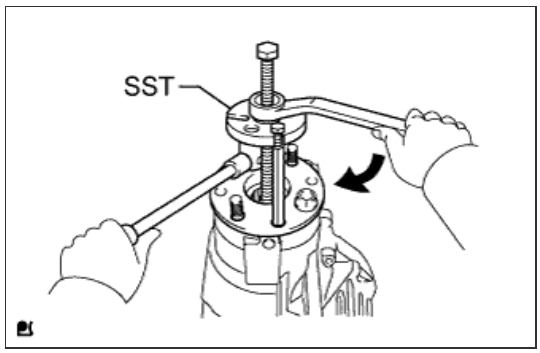
SST
09330-00021 (09330-00030)



4. REMOVE FRONT DRIVE PINION COMPANION FLANGE SUB-ASSEMBLY

a. Using SST, remove the companion flange from the differential carrier.

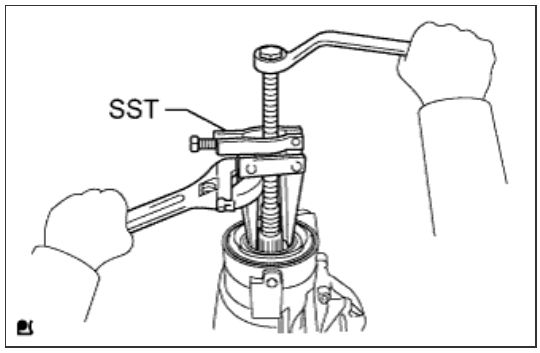
SST
09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03020)



5. REMOVE FRONT DIFFERENTIAL CARRIER OIL SEAL

a. Using SST, remove the oil seal.

SST
09308-10010



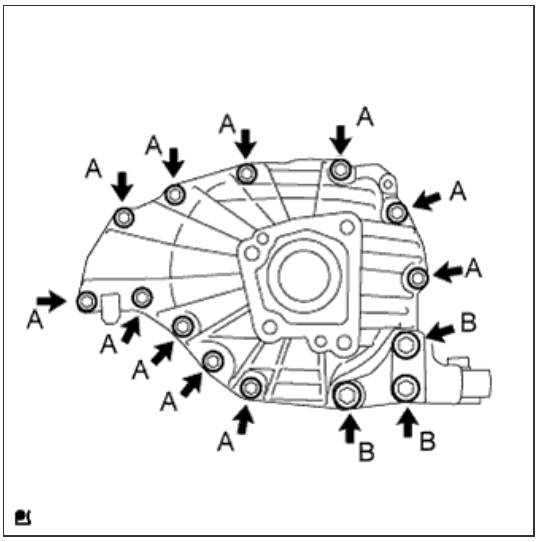
6. REMOVE FRONT DIFFERENTIAL DRIVE PINION OIL SLINGER

7. REMOVE FRONT DIFFERENTIAL CROSS SHAFT BEARING RETAINER

a. Remove the bolts labeled B and front differential front support assembly LH.

b. Remove the bolts labeled A.

c. Using a plastic-faced hammer, tap out the bearing retainer.



8. REMOVE FRONT NO. 1 DIFFERENTIAL CASE SUB-ASSEMBLY

a. Remove the differential case from the differential carrier.

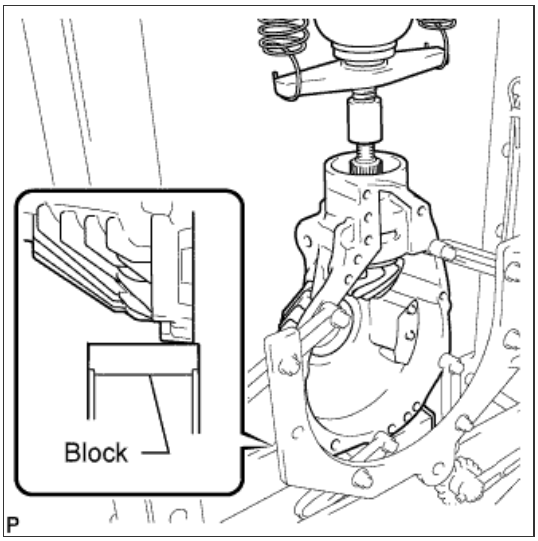
9. REMOVE DIFFERENTIAL DRIVE PINION

a. Set the differential carrier to an overhaul stand as shown in the illustration.

b. Using a press, press out the drive pinion.

NOTICE:

Do not drop the drive pinion.

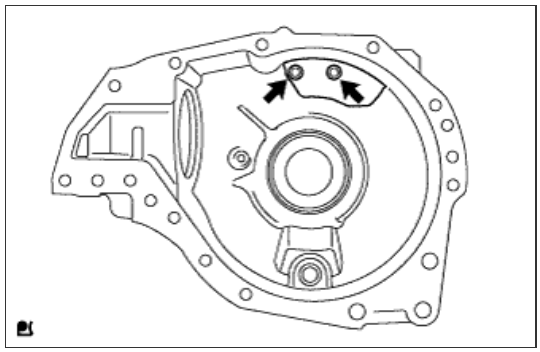


10. REMOVE FRONT DRIVE PINION FRONT RADIAL BALL BEARING

a. Remove the bearing (inner race) from the differential carrier.

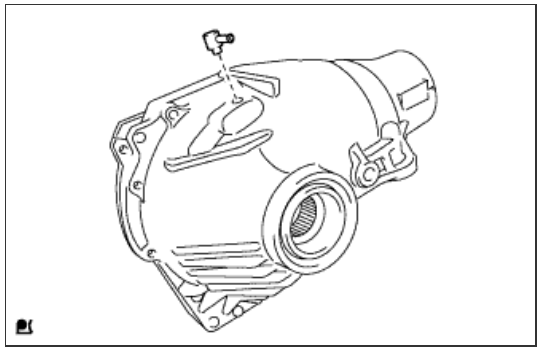
11. REMOVE FRONT DIFFERENTIAL BREATHER PLUG OIL DEFLECTOR

a. Remove the 2 bolts and oil deflector.



12. REMOVE FRONT DIFFERENTIAL UNION

a. Remove the front differential union from the differential carrier.

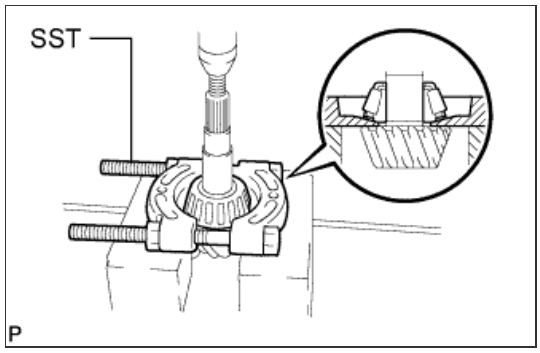


13. REMOVE FRONT DRIVE PINION REAR TAPERED ROLLER BEARING

a. Using SST and a press, press out the bearing (inner race) from the drive pinion.

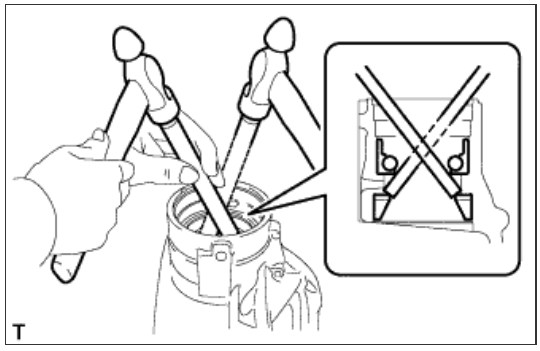
SST
09950-00020

If the drive pinion or ring gear is damaged, replace them as a set.



14. REMOVE FRONT DRIVE PINION REAR TAPERED ROLLER BEARING

a. Using a brass bar and hammer, tap out the bearing (outer race) and washer.

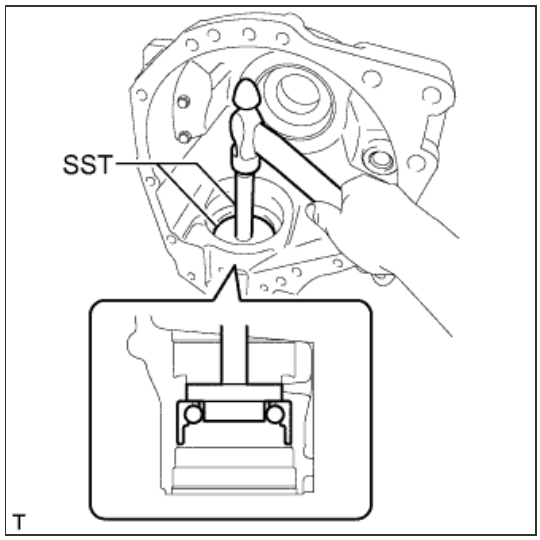


15. REMOVE FRONT DRIVE PINION FRONT RADIAL BALL BEARING

a. Using SST and a hammer, tap out the bearing (outer race) from the differential carrier.

SST

09950-70010 (09951-07100)
09950-60010 (09951-00450)
09950-60020 (09951-00710, 09952-06010)



16. REMOVE FRONT DIFFERENTIAL CASE BEARING

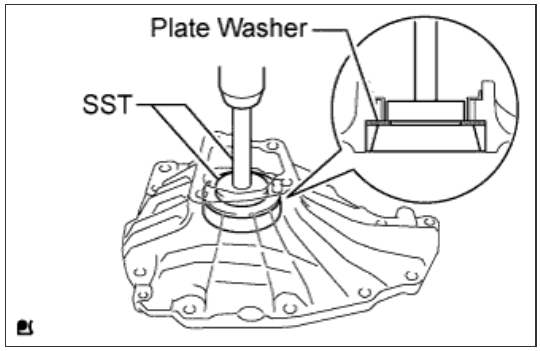
HINT:

- **Measure the plate washer and note its thickness.**
- **Tag the bearing outer races to show the location for reassembly.**

a. Using SST and a press, press out the bearing (outer race) and plate washer from the bearing retainer.

SST

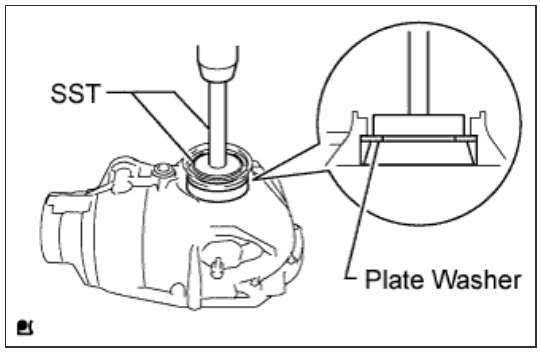
09950-60020 (09951-00680)
09950-70010 (09951-07150)



b. Using SST and a press, press out the bearing (outer race) and plate washer from the differential carrier.

SST

09950-60020 (09951-00680)
09950-70010 (09951-07150)

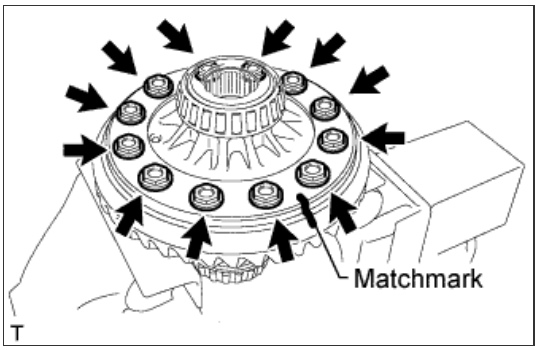


17. REMOVE DIFFERENTIAL RING GEAR

a. Place matchmarks on the ring gear and differential case.

b. Remove the 12 bolts.

c. Using a plastic-faced hammer, tap on the ring gear to disconnect it from the differential case.



18. REMOVE FRONT DIFFERENTIAL CASE BEARING

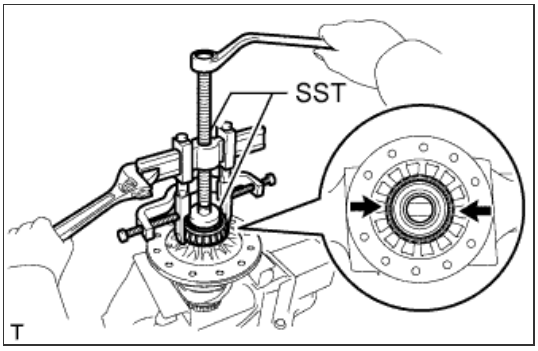
a. Using SST, remove the 2 bearings (inner race).

SST

09950-60010 (09951-00390)
09950-40011 (09951-04020, 09952-04010, 09953-04030, 09954-04010, 09955-04061, 09957-04010, 09958-04011)

HINT:

Fix the claws of SST into the notch in the differential case assembly.



19. DISASSEMBLE DIFFERENTIAL CASE

a. Using a pin punch and hammer, tap out the straight pin.

b. Remove these parts from the differential case assembly.

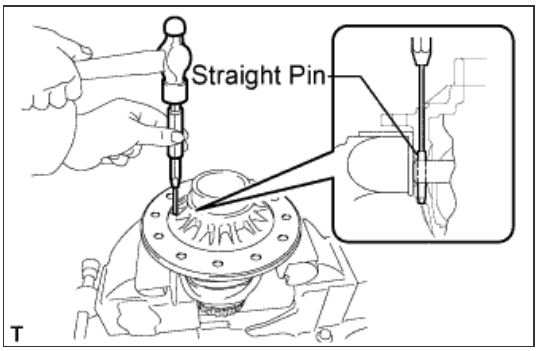
i. 2 differential side gears

ii. 2 differential side gear thrust washers

iii. Differential pinion shaft

iv. 2 differential pinion gears

v. 2 differential pinion gear thrust washers



20. INSPECT DIFFERENTIAL GEAR KIT

a. Check that there is no damage to the pinion gears and side gears.
If a pinion gear and/or side gear is damaged, replace the differential gear kit.

21. INSPECT FRONT NO. 1 DIFFERENTIAL CASE SUB-ASSEMBLY

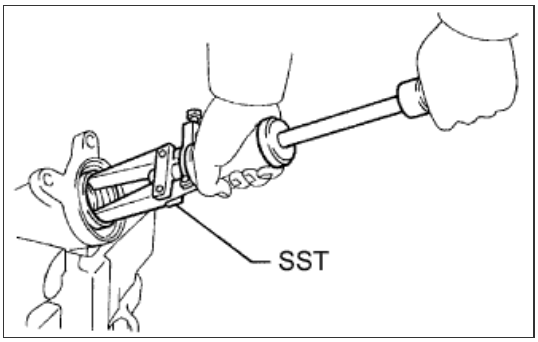
a. Check that the differential case is not damaged.
If the differential case is damaged, replace it.

22. REMOVE DIFFERENTIAL SIDE GEAR SHAFT OIL SEAL

a. Using SST, tap out the oil seal from the flange tube.

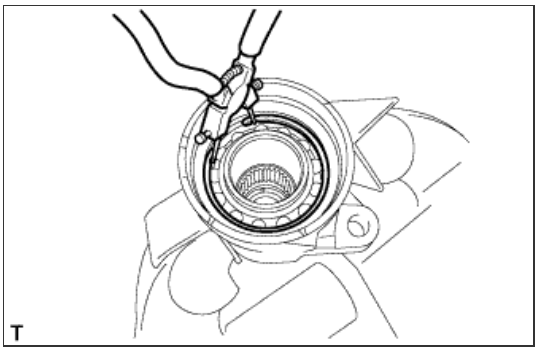
SST

09308-00010

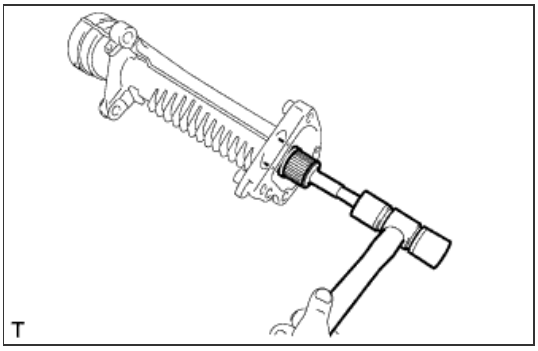


23. REMOVE DIFFERENTIAL SIDE GEAR SHAFT SUB-ASSEMBLY RH

a. Using a snap ring pliers, remove the snap ring.

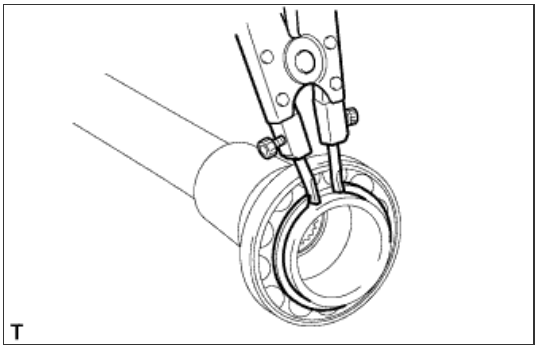


b. Using a plastic-faced hammer, tap out the side gear shaft.



24. REMOVE FRONT DIFFERENTIAL SIDE GEAR SHAFT RH BEARING

a. Using a snap ring expander, remove the snap ring.



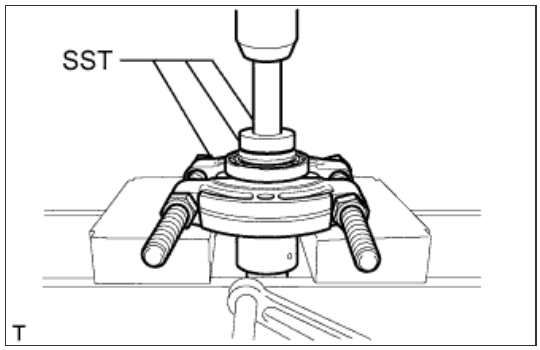
b. Using SST and a press, press out the bearing.

SST

09950-00020
09950-70010 (09951-07100)
09950-60010 (09951-00450)

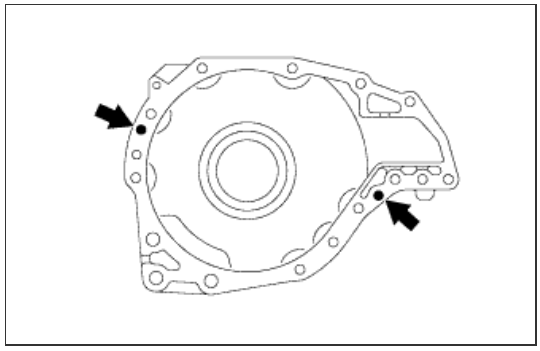
NOTICE:

Do not damage the bearing.



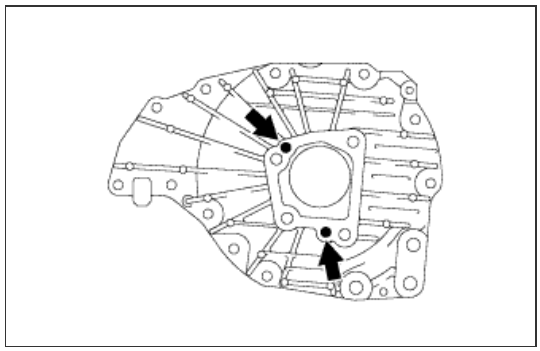
25. REMOVE FRONT DIFFERENTIAL CARRIER STRAIGHT PIN

a. Remove the straight pins from the bearing retainer.



26. REMOVE FRONT DIFFERENTIAL TUBE STRAIGHT PIN

a. Remove the straight pins from the bearing retainer.

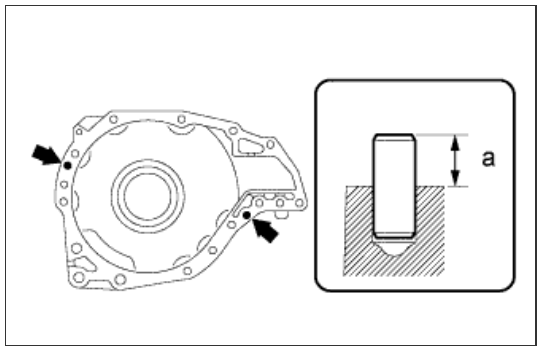


for Preparation Click here

1. INSTALL FRONT DIFFERENTIAL CARRIER STRAIGHT PIN

a. Using a plastic-faced hammer, tap in the straight pins until the protrusion height shown in the illustration is within the specification.

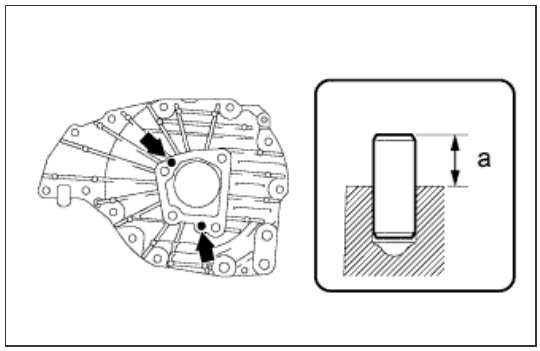
Standard height (a):
9.5 to 10.0 mm (0.374 to 0.394 in.)



2. INSTALL FRONT DIFFERENTIAL TUBE STRAIGHT PIN

a. Using a plastic-faced hammer, tap in the straight pins until the protrusion height shown in the illustration is within the specification.

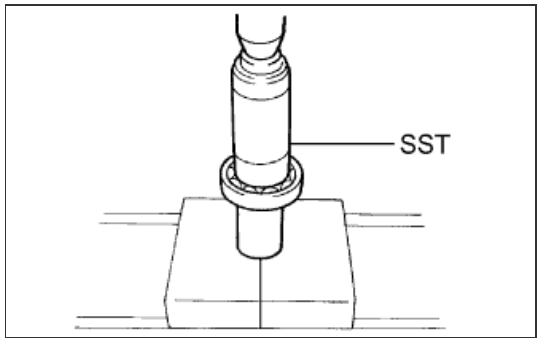
Standard height (a):
9.5 to 10.0 mm (0.374 to 0.394 in.)



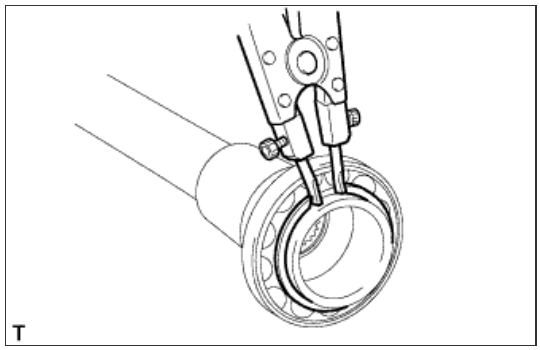
3. INSTALL FRONT DIFFERENTIAL SIDE GEAR SHAFT RH BEARING

a. Using SST and a press, press in the bearing.

SST
09223-00010



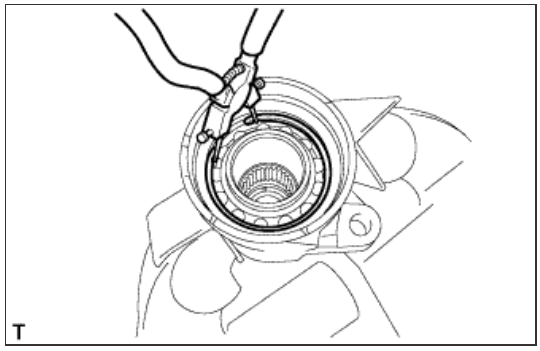
b. Using a snap ring expander, install a new snap ring.



4. INSTALL DIFFERENTIAL SIDE GEAR SHAFT SUB-ASSEMBLY RH

a. Install the side gear shaft into the differential tube.

b. Using snap ring pliers, install a new snap ring.



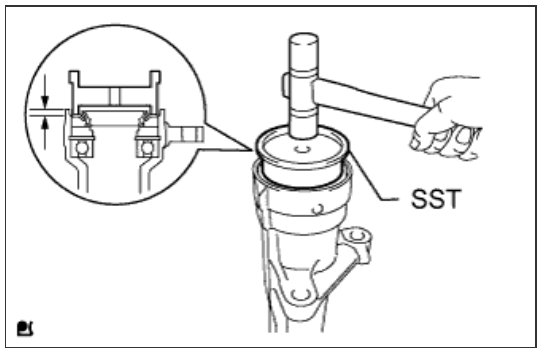
5. INSTALL DIFFERENTIAL SIDE GEAR SHAFT OIL SEAL

a. Using SST and a plastic-faced hammer, tap in a new oil seal.

SST
09608-32010

Standard oil seal depth:
4.8 to 5.8 mm (0.189 to 0.228 in.)

b. Coat the lip of the oil seal with MP grease.



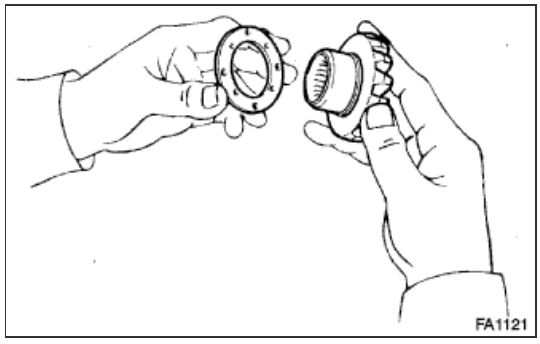
6. INSTALL FRONT NO. 1 DIFFERENTIAL CASE SUB-ASSEMBLY

a. Install the 2 side gear thrust washers onto the 2 side gears.

b. Install the 2 side gears (with thrust washers), 2 pinion gears, 2 pinion gear thrust washers and pinion shaft into the differential case assembly.

HINT:

- **Align the holes of the differential case assembly and pinion shaft.**
- **Apply hypoid gear oil to each sliding surface and rotating part.**

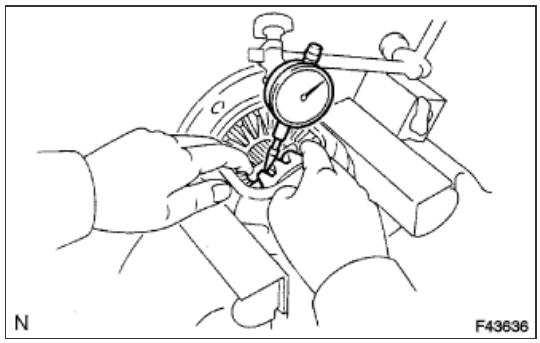


c. Measure the side gear backlash.

i. Using a dial indicator, measure the side gear backlash while holding one pinion gear toward the differential case assembly.

Standard backlash:
0.1 to 0.25 mm (0.00394 to 0.00984 in.)

If the backlash is not within the specification, replace the 2 side gear thrust washers. Use the table below to select 2 thrust washers of the same thickness which will ensure that the backlash is within the specification.

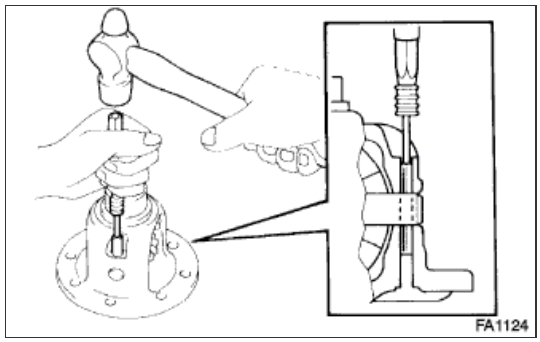


Standard Washer Thickness:

Specified Condition	Specified Condition
1.43 to 1.47 mm (0.0563 to 0.0578 in.)	1.68 to 1.72 mm (0.0662 to 0.0677 in.)
1.48 to 1.52 mm (0.0583 to 0.0598 in.)	1.73 to 1.77 mm (0.0682 to 0.0696 in.)
1.53 to 1.57 mm (0.0603 to 0.0618 in.)	1.78 to 1.82 mm (0.0701 to 0.0716 in.)
1.58 to 1.62 mm (0.0622 to 0.0637 in.)	1.83 to 1.87 mm (0.0721 to 0.0736 in.)
1.63 to 1.67 mm (0.0642 to 0.0657 in.)	-

d. Using a pin punch and hammer, tap in the straight pin through the differential case and hole of the pinion shaft.

e. Stake the differential case.



7. INSTALL DIFFERENTIAL RING GEAR

a. Clean the contact surfaces of the differential case and ring gear.

b. Heat the ring gear to about 100°C (212°F) in boiling water.

c. Carefully take the ring gear out of the boiling water.

d. After the moisture on the ring gear has completely evaporated, quickly align the matchmarks on the ring gear and differential case and set the ring gear onto the differential case. Then temporarily install the 12 bolts so that the bolt holes in the ring gear and differential case are aligned.

e. After the ring gear cools down sufficiently, remove the 12 bolts. Then apply adhesive to the 12 bolts and install them.

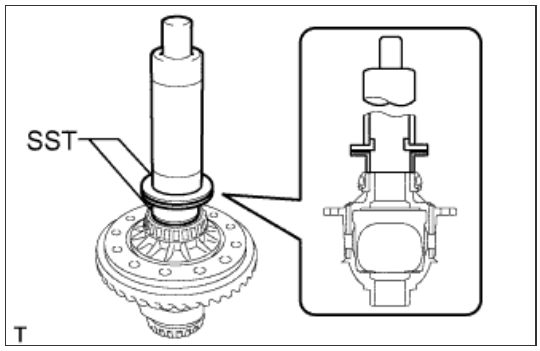
Torque:
137 N*m{ 1397 kgf*cm , 101 ft.*lbf }

Adhesive:
Toyota Genuine Adhesive 1360K, Three Bond 1360K or equivalent

8. INSTALL FRONT DIFFERENTIAL CASE BEARING

a. Using SST and a press, press in the 2 bearings (inner race).

SST
09316-20011
09316-60011 (09316-00041)



9. INSTALL FRONT DIFFERENTIAL CASE BEARING

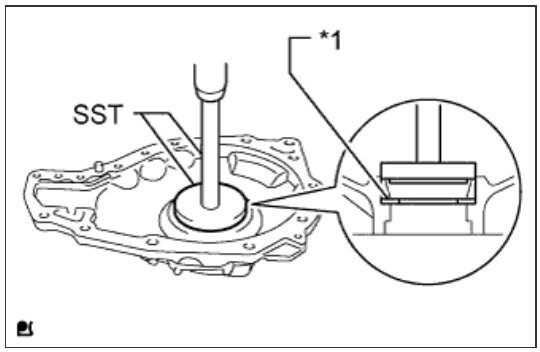
HINT:

When replacing the 2 differential case bearings, fit the thinnest washer to each bearing. When reusing the bearings, fit a washer of the same thickness as the one removed to each bearing.

a. Install a new plate washer to the shaft bearing retainer.

Text in Illustration

*1	Plate Washer



b. Using SST and a press, press the bearing (outer race) into the differential case bearing retainer.

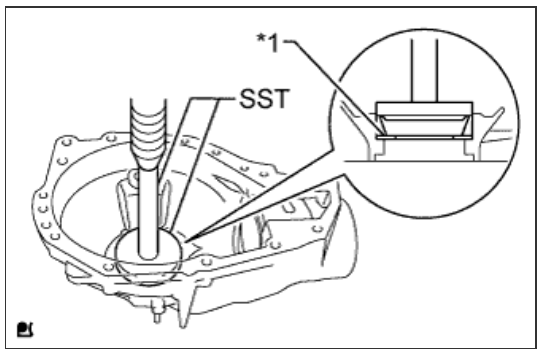
SST

09950-60020 (09951-00890)
09950-70010 (09951-07150)

c. Install a new plate washer to the differential carrier.

Text in Illustration

*1	Plate Washer



d. Using SST and a press, press the bearing (outer race) into the differential carrier assembly.

SST

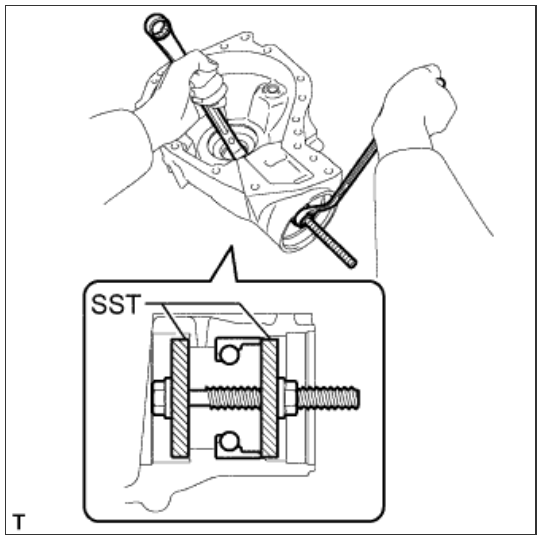
09950-60020 (09951-00890)
09950-70010 (09951-07150)

10. INSTALL FRONT DRIVE PINION FRONT RADIAL BALL BEARING

a. Using SST, install the bearing (outer race).

SST

09950-60020 (09951-00810, 09951-00890)



11. INSTALL FRONT DRIVE PINION REAR TAPERED ROLLER BEARING

a. Using SST, install the washer and bearing (outer race).

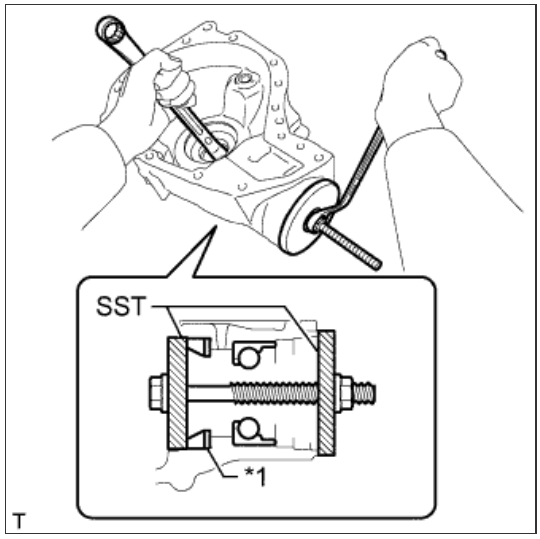
SST
09950-60020 (09951-00890, 09951-01030)

Text in Illustration

*1	Plate Washer

HINT:

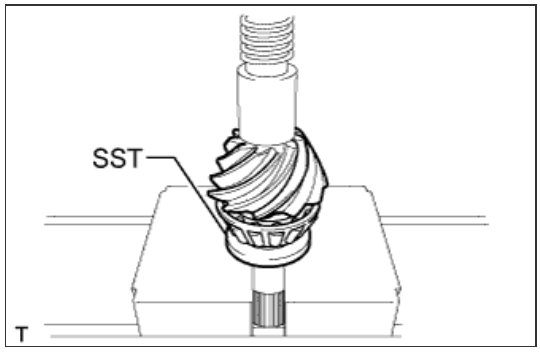
After installing the washer, check the tooth contact pattern. If necessary, replace the washer with one of a different thickness.



12. INSTALL FRONT DRIVE PINION REAR TAPERED ROLLER BEARING

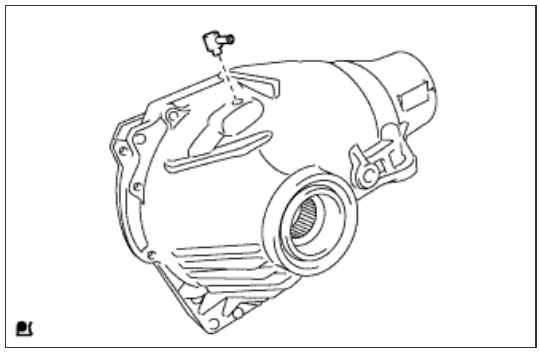
a. Using SST and a press, press in the bearing (inner race).

SST
09506-35010



13. INSTALL FRONT DIFFERENTIAL UNION

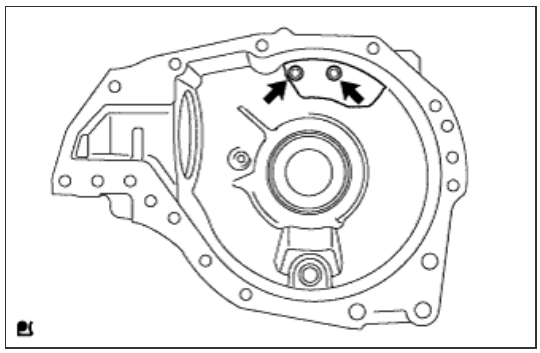
a. Install the front differential union to the differential carrier.



14. INSTALL FRONT DIFFERENTIAL BREATHER PLUG OIL DEFLECTOR

a. Install the 2 bolts and oil deflector.

Torque:
7.0 N*m{ 71 kgf*cm , 62 in.*lbf }



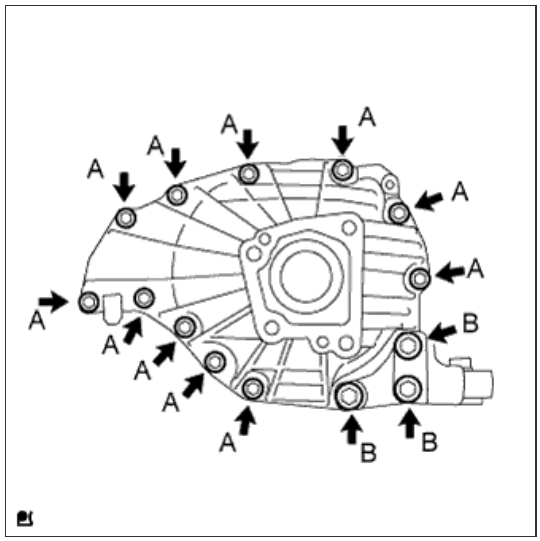
15. TEMPORARILY INSTALL DIFFERENTIAL DRIVE PINION

16. INSTALL FRONT NO. 1 DIFFERENTIAL CASE SUB-ASSEMBLY

17. INSTALL FRONT DIFFERENTIAL CROSS SHAFT BEARING RETAINER

a. Install the differential cross shaft bearing retainer and differential support with the 14 bolts.

Torque:
for bolt A:
65 N*m{ 663 kgf*cm , 48 ft.*lbf }
for bolt B:
155 N*m{ 1581 kgf*cm , 114 ft.*lbf }

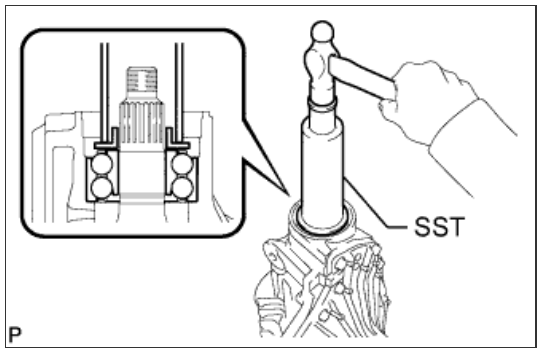


18. INSTALL FRONT DRIVE PINION FRONT RADIAL BALL BEARING

a. Using SST and a hammer, lightly tap in the bearing (inner race) to install it.

SST

09316-60011 (09316-00041)



19. INSTALL FRONT DIFFERENTIAL DRIVE PINION OIL SLINGER

20. INSPECT DIFFERENTIAL DRIVE PINION PRELOAD

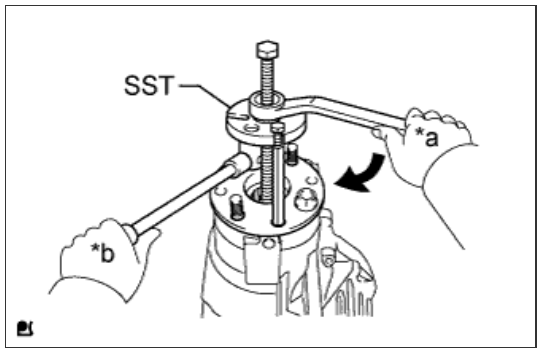
a. Using SST, install the companion flange.

SST

09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03020)

Text in Illustration

*a	Turn
*b	Hold

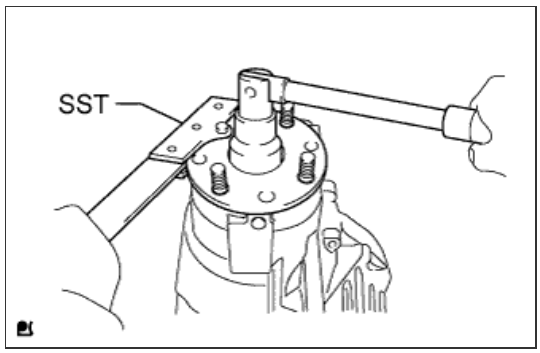


b. Coat the threads of the nut with hypoid gear oil.

c. Using SST, hold the companion flange.

SST

09330-00021 (09330-00030)



d. Install the nut by tightening it until the standard preload is reached.

Torque:

451 N*m{ 4599 kgf*cm , 333 ft.*lbf } or less

NOTICE:

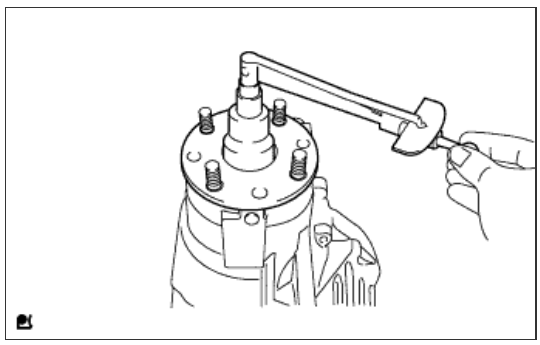
As there is no spacer, tighten the nut a little at a time, being careful not to overtighten it.

e. Using a torque wrench, measure the preload of the backlash between the drive pinion and ring gear.

Standard Preload (at Starting):

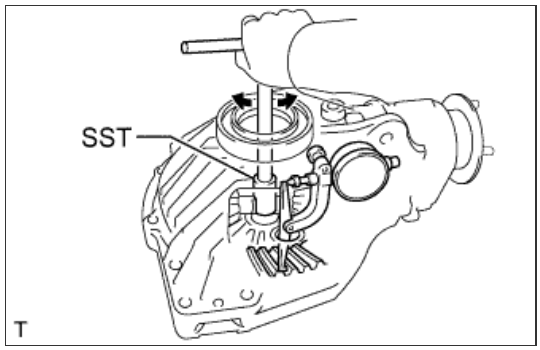
Bearing	Specified Condition
New	2.97 to 3.47 N*m (31 to 35 kgf*cm, 27 to 30 in.*lbf)
Reused	2.14 to 2.45 N*m (22 to 24 kgf*cm, 19 to 21 in.*lbf)

If necessary, disassemble and inspect the differential assembly.



21. ADJUST BACKLASH BETWEEN DIFFERENTIAL RING GEAR AND DIFFERENTIAL DRIVE PINION

a. Using SST and a dial indicator, measure the ring gear backlash.



SST
09564-33010

Standard backlash:
0.17 to 0.27 mm (0.00670 to 0.0106 in.)

If the backlash is not within the specification, adjust it by either increasing or decreasing the thickness of the washers on both sides by an equal amount.

HINT:

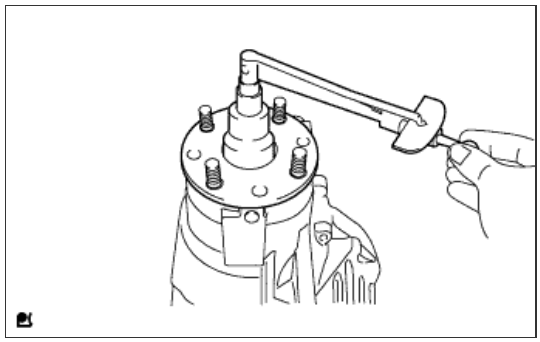
- **There should be no clearance between the plate washer and differential case.**
- **Make sure that there is ring gear backlash.**

Standard Washer Thickness:

Specified Condition	Specified Condition
1.49 to 1.51 mm (0.0587 to 0.0594 in.)	1.93 to 1.95 mm (0.0760 to 0.0767 in.)
1.51 to 1.53 mm (0.0595 to 0.0602 in.)	1.95 to 1.97 mm (0.0768 to 0.0775 in.)
1.53 to 1.55 mm (0.0603 to 0.0610 in.)	1.97 to 1.99 mm (0.0776 to 0.0783 in.)
1.55 to 1.57 mm (0.0610 to 0.0618 in.)	1.99 to 2.01 mm (0.0784 to 0.0791 in.)
1.57 to 1.59 mm (0.0619 to 0.0625 in.)	2.01 to 2.03 mm (0.0792 to 0.0799 in.)
1.59 to 1.61 mm (0.0626 to 0.0633 in.)	2.03 to 2.05 mm (0.0800 to 0.0807 in.)
1.61 to 1.63 mm (0.0634 to 0.0641 in.)	2.05 to 2.07 mm (0.0808 to 0.0814 in.)
1.63 to 1.65 mm (0.0642 to 0.0649 in.)	2.07 to 2.09 mm (0.0815 to 0.0822 in.)
1.65 to 1.67 mm (0.0650 to 0.0657 in.)	2.09 to 2.11 mm (0.0823 to 0.0830 in.)
1.67 to 1.69 mm (0.0658 to 0.0665 in.)	2.11 to 2.13 mm (0.0831 to 0.0838 in.)
1.69 to 1.71 mm (0.0666 to 0.0673 in.)	2.13 to 2.15 mm (0.0839 to 0.0846 in.)
1.71 to 1.73 mm (0.0674 to 0.0681 in.)	2.15 to 2.17 mm (0.0847 to 0.0854 in.)
1.73 to 1.75 mm (0.0682 to 0.0688 in.)	2.17 to 2.19 mm (0.0855 to 0.0862 in.)
1.75 to 1.77 mm (0.0689 to 0.0696 in.)	2.19 to 2.21 mm (0.0863 to 0.0870 in.)
1.77 to 1.79 mm (0.0697 to 0.0704 in.)	2.21 to 2.23 mm (0.0871 to 0.0877 in.)
1.79 to 1.81 mm (0.0705 to 0.0712 in.)	2.23 to 2.25 mm (0.0878 to 0.0885 in.)
1.81 to 1.83 mm (0.0713 to 0.0720 in.)	2.25 to 2.27 mm (0.0886 to 0.0893 in.)
1.83 to 1.85 mm (0.0720 to 0.0728 in.)	2.27 to 2.29 mm (0.0894 to 0.0901 in.)
1.85 to 1.87 mm (0.0729 to 0.0736 in.)	2.29 to 2.31 mm (0.0902 to 0.0909 in.)
1.87 to 1.89 mm (0.0737 to 0.0744 in.)	2.31 to 2.33 mm (0.0910 to 0.0917 in.)
1.89 to 1.91 mm (0.0745 to 0.0751 in.)	2.33 to 2.35 mm (0.0918 to 0.0925 in.)
1.91 to 1.93 mm (0.0752 to 0.0759 in.)	-

22. INSPECT TOTAL PRELOAD

a. Using a torque wrench, measure the preload with the teeth of the drive pinion and ring gear in contact.



Standard Total Preload (at Starting):

Bearing	Specified Condition
New	4.58 to 5.88 N*m (47 to 59 kgf*cm, 41 to 52 in.*lbf)
Reused	3.47 to 4.58 N*m (36 to 46 kgf*cm, 31 to 40 in.*lbf)

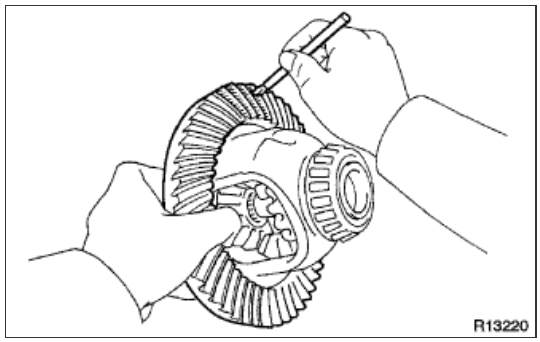
If necessary, disassemble and inspect the differential.

23. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

a. Remove the bearing retainer and differential case.

b. Coat 3 or 4 teeth at 3 different positions on the ring gear with Prussian blue.

c. Install the differential case to the differential carrier.

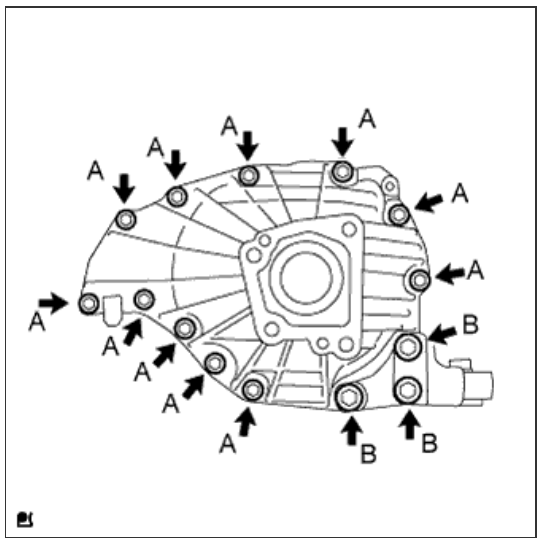


d. Install the differential cross shaft bearing retainer and front differential front support assembly LH with the 14 bolts.

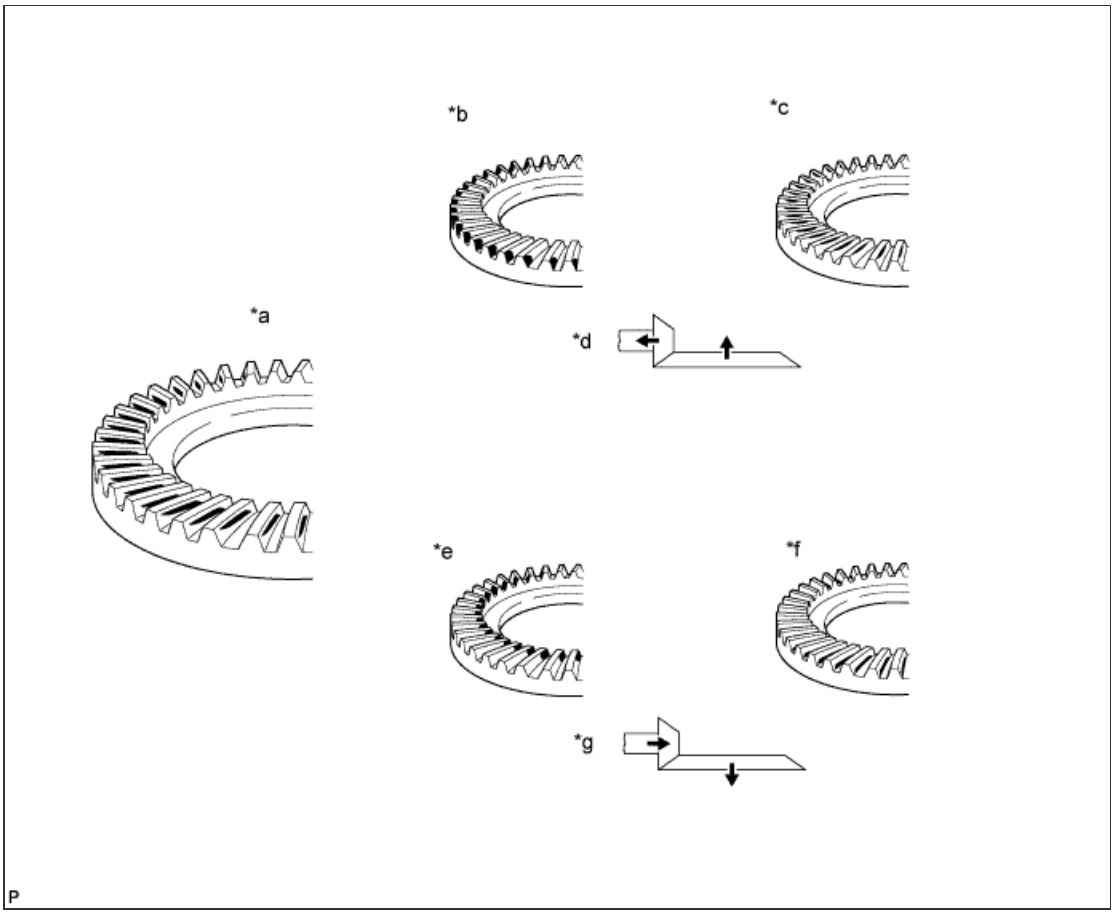
Torque:
for bolt A:
65 N*m{ 663 kgf*cm , 48 ft.*lbf }
for bolt B:
155 N*m{ 1581 kgf*cm , 114 ft.*lbf }

e. Hold the companion flange firmly and rotate it in both directions.

f. Remove the 14 bolts, differential case, shaft bearing retainer and front support.



g. Inspect the tooth contact pattern.



Text in Illustration

*a	Proper Contact	*b	Heel Contact
*c	Face Contact	*d	Select an adjusting washer that will shift the drive pinion closer to the ring gear (*b, *c)
*e	Toe Contact	*f	Flank Contact
*g	Select an adjusting washer that will shift the drive pinion away from the ring gear (*e, *f)	-	-

If the teeth are not engaged properly, use the following chart to select the appropriate washer for correction.

Standard Washer Thickness:

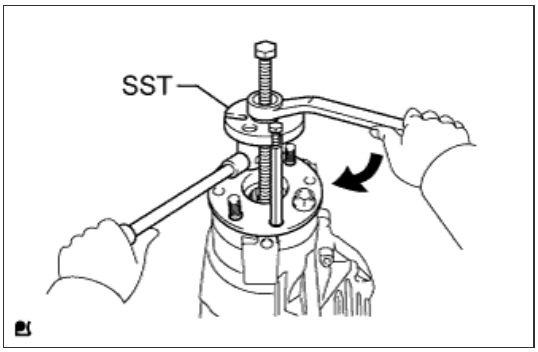
Specified Condition	Specified Condition
1.815 to 1.835 mm (0.0715 to 0.0722 in.)	2.065 to 2.085 mm (0.0813 to 0.0820 in.)
1.840 to 1.860 mm (0.0725 to 0.0732 in.)	2.090 to 2.110 mm (0.0823 to 0.0830 in.)
1.865 to 1.885 mm (0.0735 to 0.0742 in.)	2.115 to 2.135 mm (0.0833 to 0.0840 in.)
1.890 to 1.910 mm (0.0744 to 0.0752 in.)	2.140 to 2.160 mm (0.0843 to 0.0850 in.)
1.915 to 1.935 mm (0.0754 to 0.0762 in.)	2.165 to 2.185 mm (0.0853 to 0.0860 in.)
1.940 to 1.960 mm (0.0764 to 0.0772 in.)	2.190 to 2.210 mm (0.0863 to 0.0870 in.)
1.965 to 1.985 mm (0.0774 to 0.0781 in.)	2.215 to 2.235 mm (0.0872 to 0.0879 in.)
1.990 to 2.010 mm (0.0784 to 0.0791 in.)	2.240 to 2.260 mm (0.0882 to 0.0889 in.)
2.015 to 2.035 mm (0.0794 to 0.0801 in.)	2.265 to 2.285 mm (0.0892 to 0.0899 in.)
2.040 to 2.060 mm (0.0804 to 0.0811 in.)	-

24. REMOVE FRONT DRIVE PINION COMPANION FLANGE SUB-ASSEMBLY

a. Using SST, remove the companion flange from the differential carrier.

SST

09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03020)



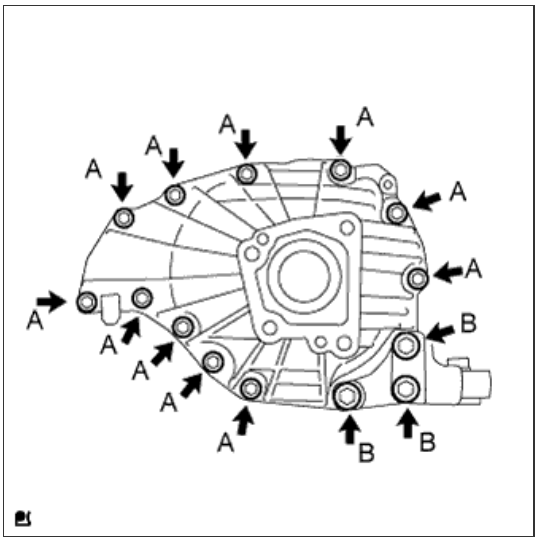
25. REMOVE FRONT DIFFERENTIAL DRIVE PINION OIL SLINGER

26. REMOVE FRONT DIFFERENTIAL CROSS SHAFT BEARING RETAINER

a. Remove the bolts labeled B and front differential front support assembly LH.

b. Remove the bolts labeled A.

c. Using a plastic-faced hammer, tap out the bearing retainer.



27. REMOVE NO. 1 FRONT DIFFERENTIAL CASE SUB-ASSEMBLY

a. Remove the differential case from the differential carrier.

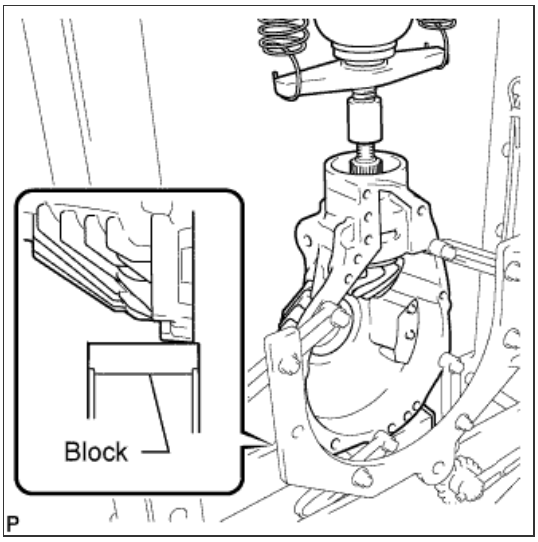
28. REMOVE DIFFERENTIAL DRIVE PINION

a. Set the differential carrier to an overhaul stand as shown in the illustration.

b. Using a press, press out the drive pinion.

NOTICE:

Do not drop the drive pinion.



29. REMOVE FRONT DRIVE PINION FRONT RADIAL BALL BEARING

30. INSTALL FRONT DIFFERENTIAL DRIVE PINION BEARING SPACER

a. Install a new bearing spacer.

31. TEMPORARILY INSTALL DIFFERENTIAL DRIVE PINION

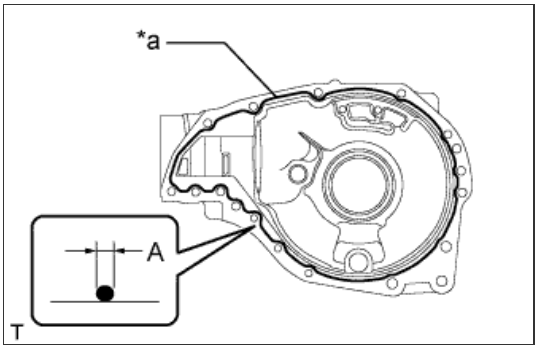
32. INSTALL NO. 1 FRONT DIFFERENTIAL CASE SUB-ASSEMBLY

33. INSTALL FRONT DIFFERENTIAL CROSS SHAFT BEARING RETAINER

a. Remove any old FIPG material and be careful not to drop oil on the contact surfaces of the differential carrier and shaft bearing retainer.

b. Wipe off any residual FIPG material on the contact surface using gasoline or alcohol.

c. Apply seal packing to the differential carrier as shown in the illustration.



Text in Illustration

*a	Seal Packing

Seal packing:
Toyota Genuine Seal Packing 1281, Three Bond 1281 or equivalent

Seal Diameter (A):
2.0 to 3.0 mm (0.0788 to 0.118 in.)

HINT:

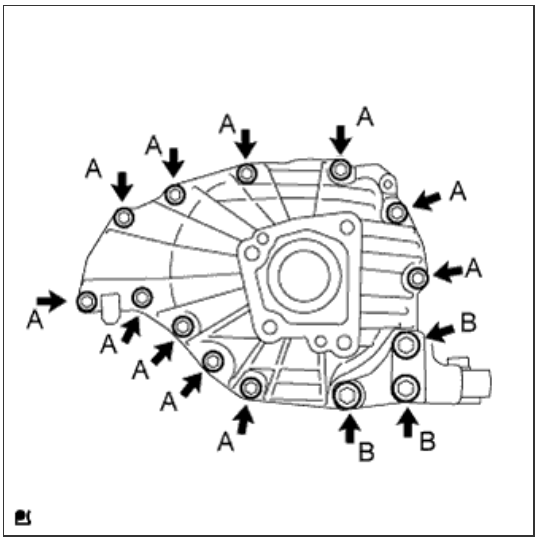
Install the shaft bearing retainer within 10 minutes of applying seal packing.

d. Install the front differential cross shaft bearing retainer and front differential front support assembly LH with the 11 bolts (A) and 3 new bolts (B).

Torque:
for bolt A:
65 N*m{ 663 kgf*cm , 48 ft.*lbf }
for bolt B:
155 N*m{ 1581 kgf*cm , 114 ft.*lbf }

NOTICE:

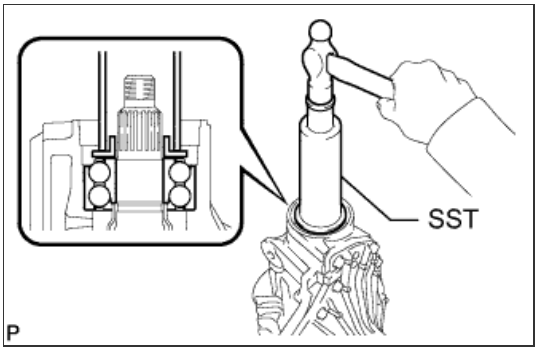
Do not add oil or drive the vehicle immediately after installing the cover, and leave it as is for at least an hour. Also, for 12 hours or less, avoid rapid acceleration/deceleration.



34. INSTALL FRONT DRIVE PINION FRONT RADIAL BALL BEARING

a. Using SST and a hammer, lightly tap in the bearing (inner race) to install it.

SST
09316-60011 (09316-00041)



35. INSTALL FRONT DIFFERENTIAL DRIVE PINION OIL SLINGER

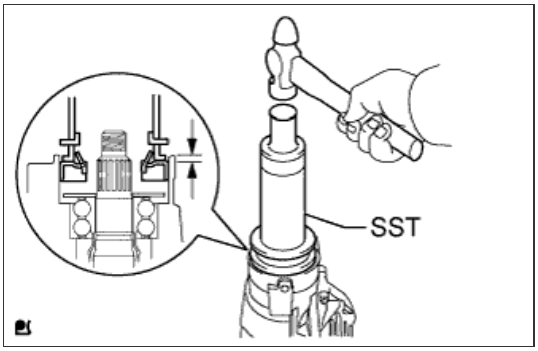
36. INSTALL FRONT DIFFERENTIAL CARRIER OIL SEAL

a. Using SST and a hammer, tap in a new oil seal.

SST
09502-12010
09316-60011 (09316-00041)

Standard oil seal depth:
5.6 to 6.6 mm (0.221 to 0.259 in.)

b. Coat the lip of the oil seal with MP grease.



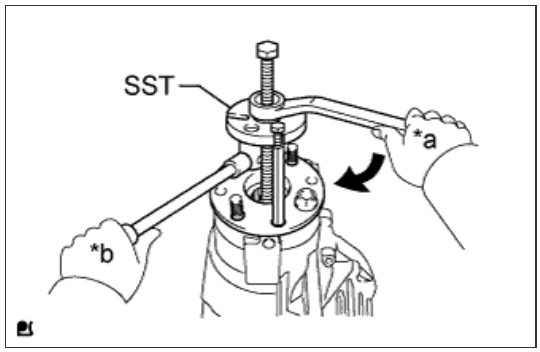
37. INSTALL FRONT DRIVE PINION COMPANION FLANGE SUB-ASSEMBLY

a. Using SST, install the companion flange.

SST
09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03020)

Text in Illustration

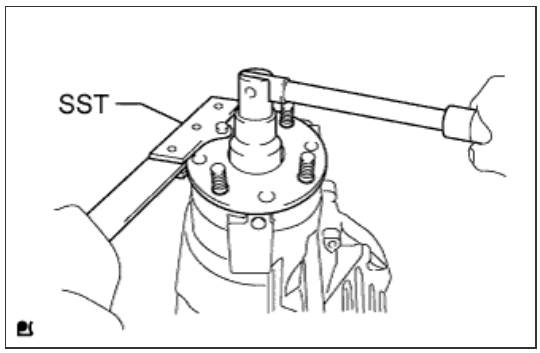
*a	Turn
*b	Hold



38. INSPECT DIFFERENTIAL DRIVE PINION PRELOAD

a. Using SST, hold the companion flange.

SST
09330-00021 (09330-00030)

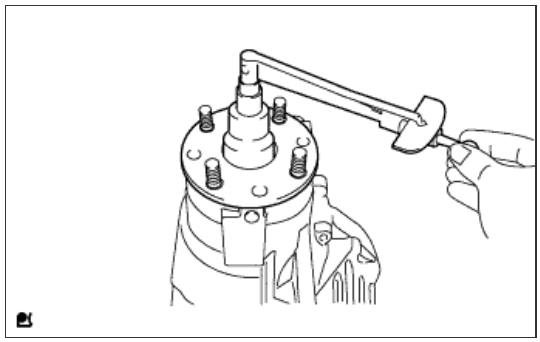


b. Coat the threads of a new nut with hypoid gear oil.

c. Install the nut by tightening it until the standard preload is reached.

Torque:
451 N*m{ 4599 kgf*cm , 333 ft.*lbf } or less

d. Using a torque wrench, measure the preload of the backlash between the drive pinion and ring gear.



Standard Preload (at Starting):

Bearing	Specified Condition
New	2.97 to 3.47 N*m (31 to 35 kgf*cm, 27 to 30 in.*lbf)
Reused	2.14 to 2.45 N*m (22 to 24 kgf*cm, 19 to 21 in.*lbf)

If the preload is more than the specification, replace the bearing spacer.
If the preload is less than the specification, tighten the nut with 13 N*m (130 kgf*cm, 9 ft.*lbf) of torque at a time until the specified preload is reached.

Torque:
451 N*m{ 4599 kgf*cm , 333 ft.*lbf } or less

If the maximum torque is exceeded while tightening the nut, replace the bearing spacer and repeat the preload procedure.

HINT:

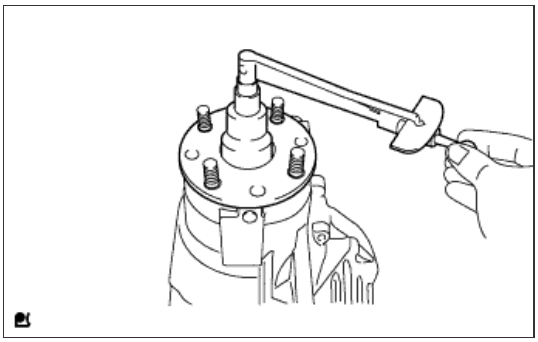
Do not loosen the nut to reduce the preload.

39. INSPECT TOTAL PRELOAD

a. With the drive pinion contacting the tooth side of the ring gear, use a torque wrench to measure the total preload.

Standard Total Preload (at Starting):

Bearing	Specified Condition
New	4.58 to 5.88 N*m (47 to 59 kgf*cm, 41 to 52 in.*lbf)
Reused	3.47 to 4.58 N*m (36 to 46 kgf*cm, 31 to 40 in.*lbf)

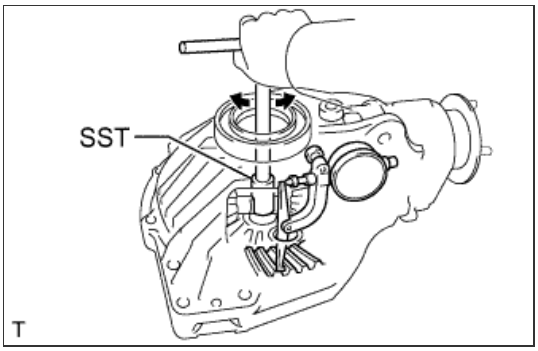


40. INSPECT BACKLASH BETWEEN DIFFERENTIAL RING GEAR AND DIFFERENTIAL DRIVE PINION

a. Using SST and a dial indicator, measure the ring gear backlash.

SST
09564-33010

Standard backlash:
0.17 to 0.27 mm (0.00670 to 0.0106 in.)



41. INSPECT RUNOUT OF FRONT DRIVE PINION COMPANION FLANGE SUB-ASSEMBLY

a. Using a dial indicator, measure the runout of the companion flange vertically and laterally.

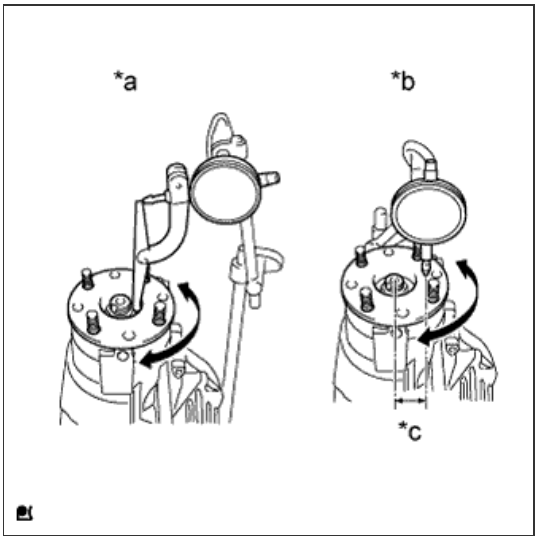
Maximum Runout:

Runout	Specified Condition
Vertical runout	0.10 mm (0.00394 in.)
Lateral runout	0.10 mm (0.00394 in.)

Text in Illustration

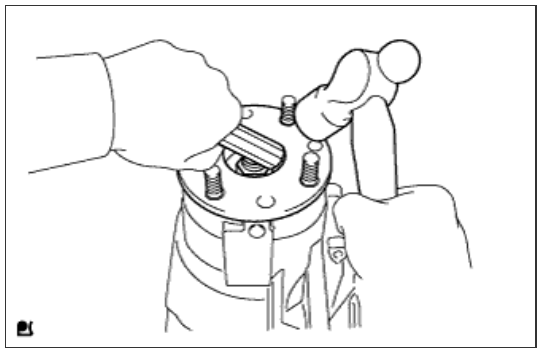
*a	Vertical Runout
*b	Lateral Runout
*c	55 mm (2.17 in.)

If the runout is more than the maximum, replace the companion flange.



42. STAKE FRONT DRIVE PINION COMPANION FLANGE FRONT NUT

a. Using a chisel and hammer, stake the nut.



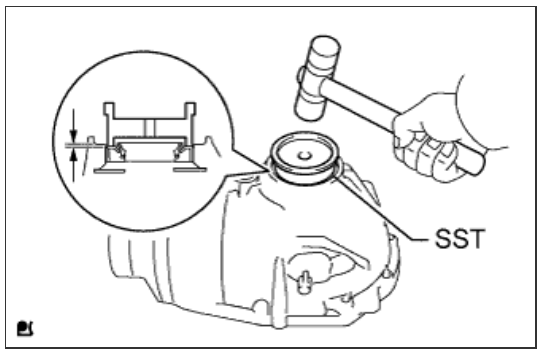
43. INSTALL DIFFERENTIAL SIDE GEAR SHAFT OIL SEAL

a. Using SST and a plastic-faced hammer, tap in a new oil seal until its surface is flush with the differential carrier end.

SST
09608-32010

b. Coat the lip of the oil seal with MP grease.

Standard oil seal depth:
-0.45 to 0.45 mm (-0.0177 to 0.0177 in.)



44. INSTALL DIFFERENTIAL EXTENSION FLANGE TUBE

a. Remove any old FIPG material and be careful not to drop oil on the contact surfaces of the differential tube and bearing retainer.

b. Wipe off any residual FIPG material on the contact surface using gasoline or alcohol.

c. Apply seal packing to the bearing retainer as shown in the illustration.

Text in Illustration

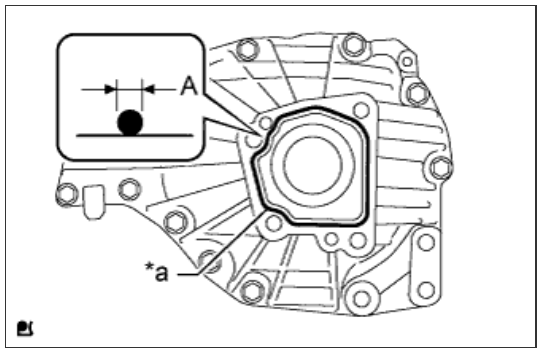
*a	Seal Packing

Seal packing:
Toyota Genuine Seal Packing 1281, Three Bond 1281 or equivalent

Seal Diameter (A):
2.0 to 3.0 mm (0.0788 to 0.118 in.)

HINT:

Install the differential tube within 10 minutes of applying seal packing.



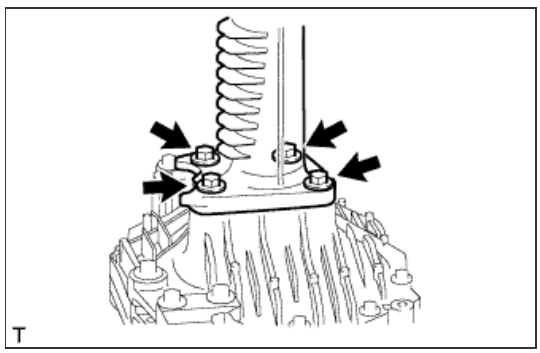
d. Install the differential tube to the bearing retainer.

e. Install 4 new bolts.

Torque:
65 N*m{ 663 kgf*cm , 48 ft.*lbf } or less

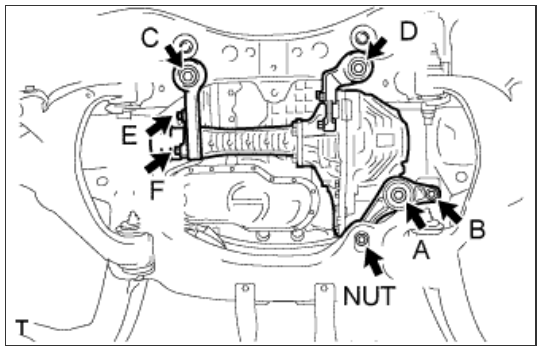
NOTICE:

Do not add oil or drive the vehicle immediately after installing the cover, and leave it as is for at least an hour. Also, for 12 hours or less, avoid rapid acceleration/deceleration.



for Preparation Click here

1. INSTALL FRONT DIFFERENTIAL CARRIER ASSEMBLY



a. Install the differential support assembly with bolts E and F.

Torque:
100 N*m{ 1020 kgf*cm , 74 ft.*lbf }

b. Using a jack, slowly raise the front differential carrier assembly to its installation position.

c. Temporarily install the front differential support assembly with bolts A and B and the nut.

d. Temporarily install the bolts C and D.

e. Tighten bolt A.

Torque:
120 N*m{ 1224 kgf*cm , 89 ft.*lbf }

f. Tighten bolt B and the nut.

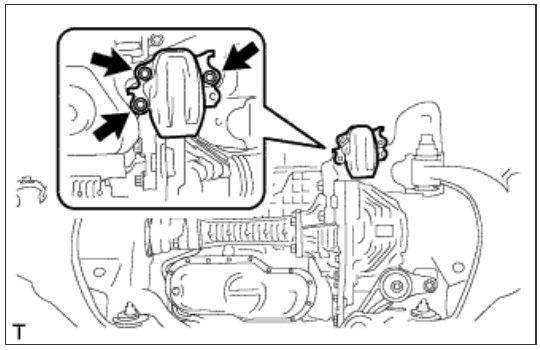
Torque:
120 N*m{ 1224 kgf*cm , 89 ft.*lbf }

g. Tighten bolts C and D.

Torque:
120 N*m{ 1224 kgf*cm , 89 ft.*lbf }

h. Connect the breather tube to the front differential union.

2. INSTALL FRONT SUSPENSION REBOUND STOPPER SUB-ASSEMBLY LH



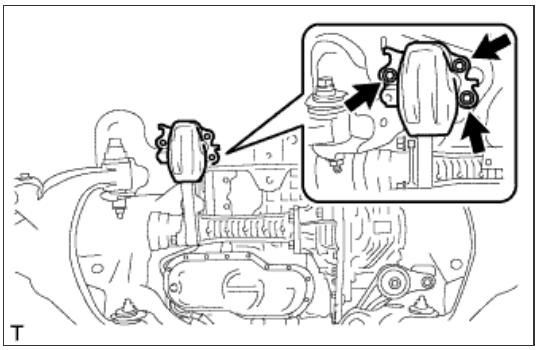
a. Install the suspension rebound stopper LH with the 3 bolts.

Torque:
58 N*m{ 591 kgf*cm , 43 ft.*lbf }

3. INSTALL FRONT SUSPENSION REBOUND STOPPER SUB-ASSEMBLY RH

a. Install the suspension rebound stopper RH with the 3 bolts.

Torque:
58 N*m{ 591 kgf*cm , 43 ft.*lbf }



4. INSTALL FRONT DRIVE SHAFT ASSEMBLY LH

a. Install the front drive shaft (Click here).

5. INSTALL FRONT DRIVE SHAFT ASSEMBLY RH

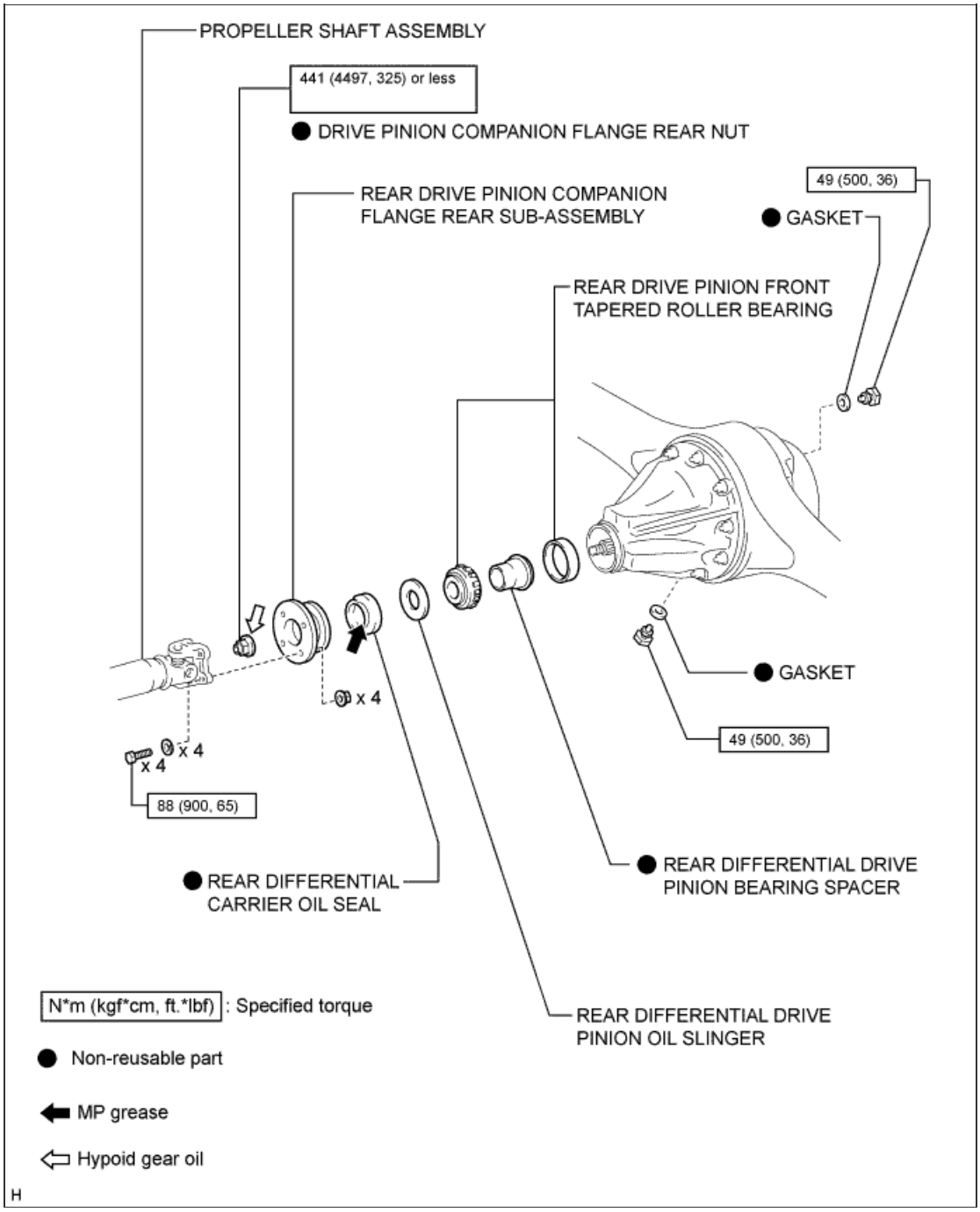
HINT:

Use the same procedure as the LH side.

6. INSTALL FRONT PROPELLER SHAFT ASSEMBLY

a. Install the front propeller shaft (Click here).

for Preparation Click here

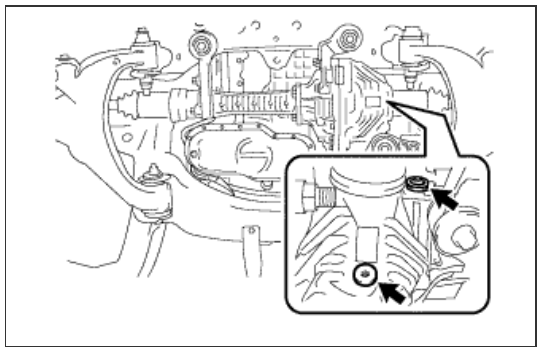


for Preparation Click here

1. DRAIN DIFFERENTIAL OIL

a. Stop the vehicle on a level place.

b. for Front Differential:



i. Remove the engine under cover.

ii. Using a 10 mm hexagon wrench, remove the filler plug and gasket.

iii. Using a 10 mm hexagon wrench, remove the drain plug and gasket, and drain the oil.

iv. Using a 10 mm hexagon wrench, install a new gasket and the drain plug.

Torque:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }

c. for Rear Differential:

i. Remove the filler plug and gasket.

ii. Remove the drain plug and gasket, and drain the oil.

iii. Install a new gasket and the drain plug.

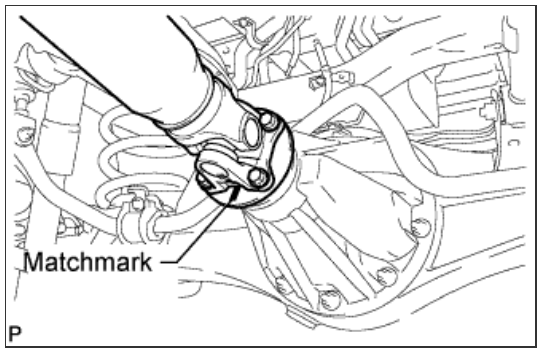
Torque:
49 N*m{ 500 kgf*cm , 36 ft.*lbf }

2. DISCONNECT PROPELLER SHAFT ASSEMBLY

a. Place matchmarks on the rear propeller shaft and companion flange.

b. Remove the 4 nuts, 4 washers and 4 bolts, and disconnect the propeller shaft from the differential side.

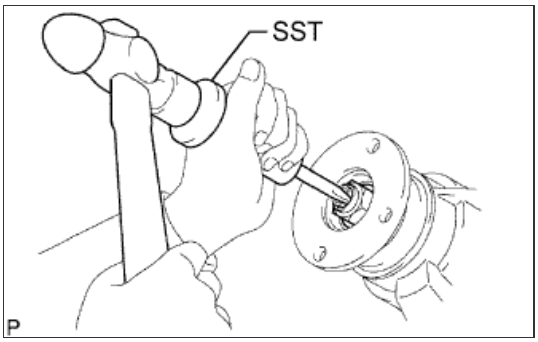
c. Support the propeller shaft securely.



3. REMOVE DRIVE PINION COMPANION FLANGE REAR NUT

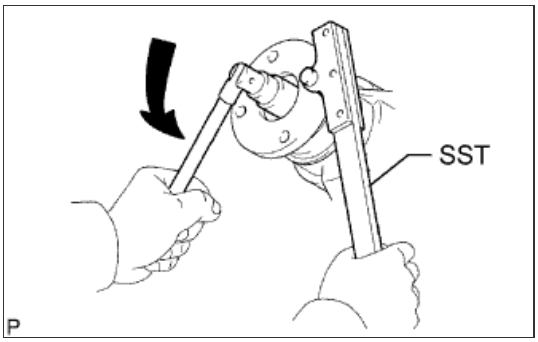
a. Using SST and a hammer, loosen the staked part of the nut.

SST
09930-00010



b. Using SST to hold the companion flange, remove the nut.

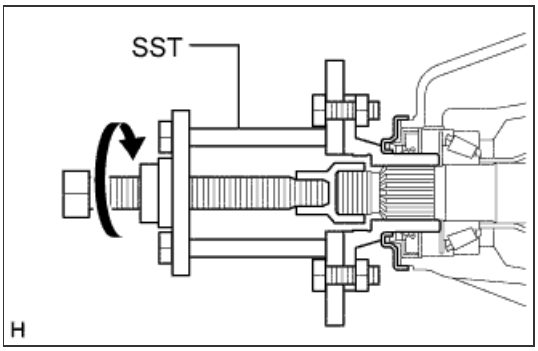
SST
09330-00021 (09330-00030)



4. REMOVE REAR DRIVE PINION COMPANION FLANGE REAR SUB-ASSEMBLY

a. Using SST, remove the companion flange.

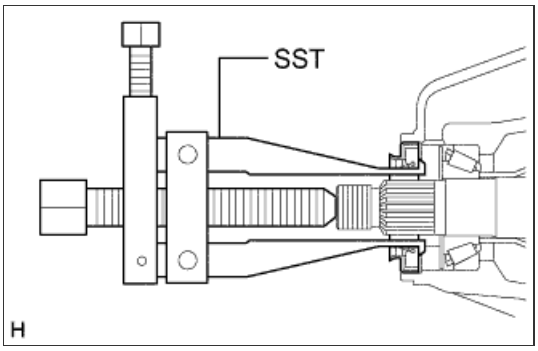
SST
09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03040)



5. REMOVE REAR DIFFERENTIAL CARRIER OIL SEAL

a. Using SST, remove the oil seal.

SST
09308-10010

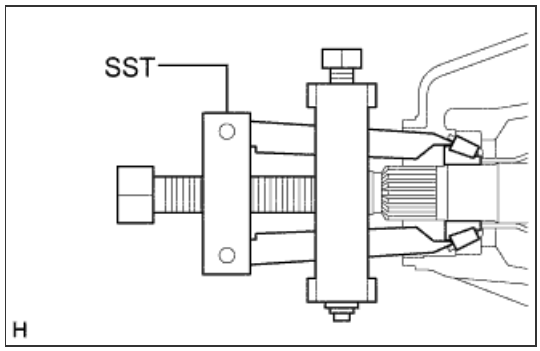


6. REMOVE REAR DIFFERENTIAL DRIVE PINION OIL SLINGER

7. REMOVE REAR DRIVE PINION FRONT TAPERED ROLLER BEARING

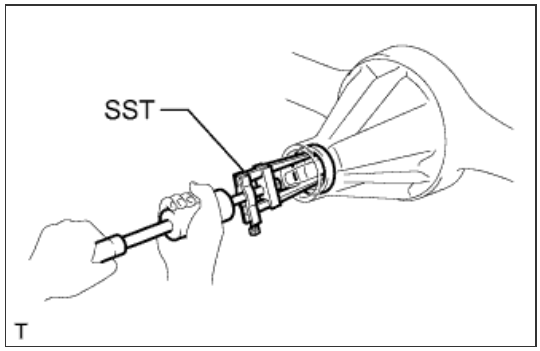
a. Using SST, remove the front bearing (inner race) from the drive pinion.

SST
09556-22010



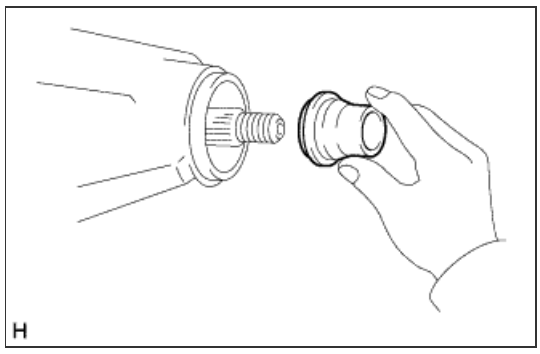
b. Using SST, remove the front bearing (outer race) from the drive pinion.

SST
09308-00010



8. REPLACE REAR DIFFERENTIAL DRIVE PINION BEARING SPACER

a. Replace the bearing spacer with a new one.

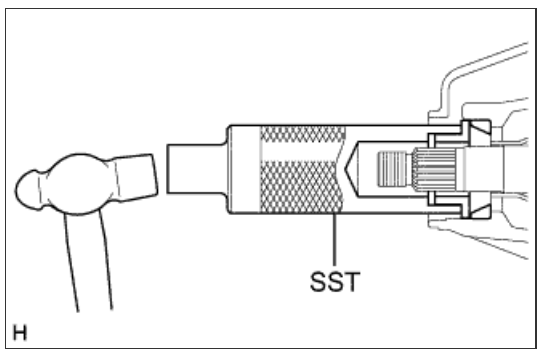


9. INSTALL REAR DRIVE PINION FRONT TAPERED ROLLER BEARING

a. Using SST and a hammer, tap in the bearing (outer race).

SST
09316-60011 (09316-00011, 09316-00021)

b. Install the bearing (inner race).



10. INSTALL REAR DIFFERENTIAL DRIVE PINION OIL SLINGER

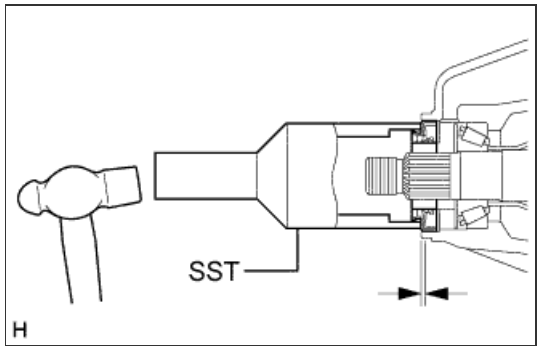
11. INSTALL REAR DIFFERENTIAL CARRIER OIL SEAL

a. Using SST and a hammer, tap in a new oil seal.

SST
09214-76011

Standard oil seal depth:
0.05 to 0.95 mm (0.00197 to 0.0374 in.)

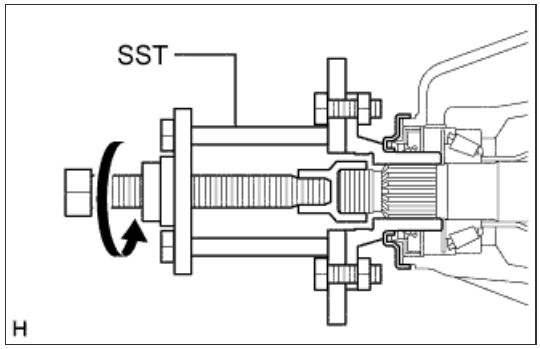
b. Coat the lip of the oil seal with MP grease.



12. INSTALL REAR DRIVE PINION COMPANION FLANGE REAR SUB-ASSEMBLY

a. Using SST, install the companion flange to the drive pinion.

SST
09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03040)



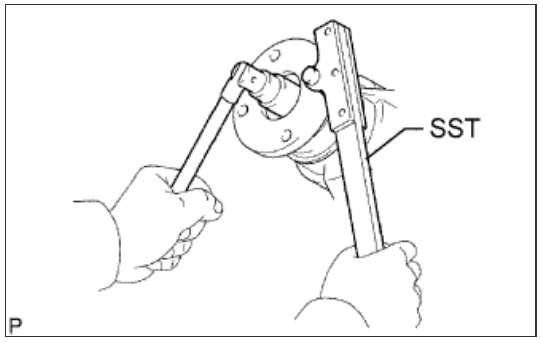
13. ADJUST DRIVE PINION PRELOAD

a. Coat the threads of a new nut with hypoid gear oil.

b. Using SST to hold the companion flange, install the nut by tightening it until the standard preload is reached.

SST
09330-00021 (09330-00030)

Torque:
441 N*m{ 4497 kgf*cm , 325 ft.*lbf } or less

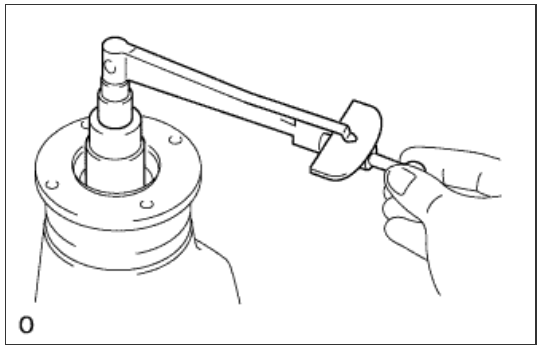


c. Using a torque wrench, measure the preload.

Standard Preload (at Starting):

Bearing	Specified Condition
New	1.04 to 1.69 N*m (11 to 17 kgf*cm, 10 to 14 in.*lbf)
Reused	0.85 to 1.37 N*m (9 to 13 kgf*cm, 8 to 12 in.*lbf)

If the preload is not within the specification, adjust the preload.

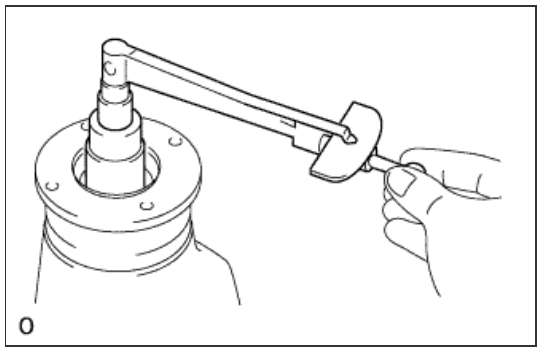


14. INSPECT TOTAL PRELOAD (for Standard)

a. Using a torque wrench, measure the preload with the teeth of the drive pinion and ring gear in contact.

Standard Drive Pinion Preload (at Starting):

Bearing	Specified Condition
New	1.42 to 2.32 N*m (15 to 23 kgf*cm, 13 to 20 in.*lbf)
Reused	1.23 to 2.00 N*m (13 to 20 kgf*cm, 11 to 17 in.*lbf)

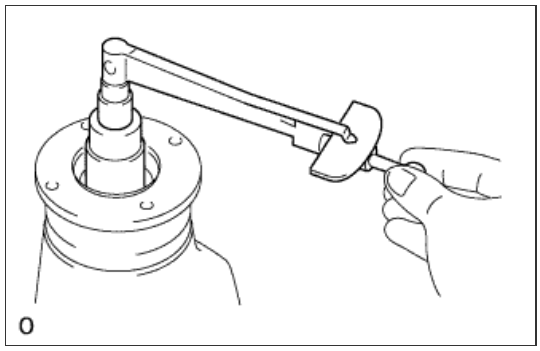


15. INSPECT TOTAL PRELOAD (for LSD)

a. Using a torque wrench, measure the preload with the teeth of the drive pinion and ring gear in contact.

Standard Drive Pinion Preload (at Starting):

Bearing	Specified Condition
New	1.42 to 2.32 N*m (15 to 23 kgf*cm, 13 to 20 in.*lbf)
Reused	1.23 to 2.00 N*m (13 to 20 kgf*cm, 11 to 17 in.*lbf)

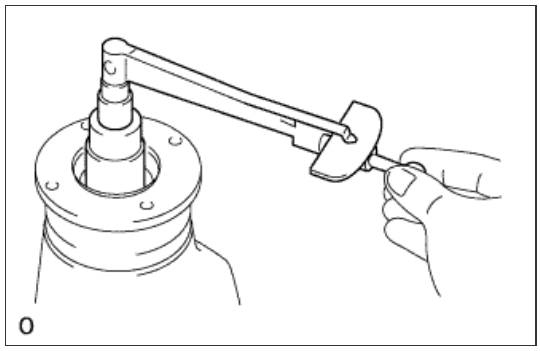


16. INSPECT TOTAL PRELOAD (w/ Differential Lock)

a. Using a torque wrench, measure the preload with the teeth of the drive pinion and ring gear in contact.

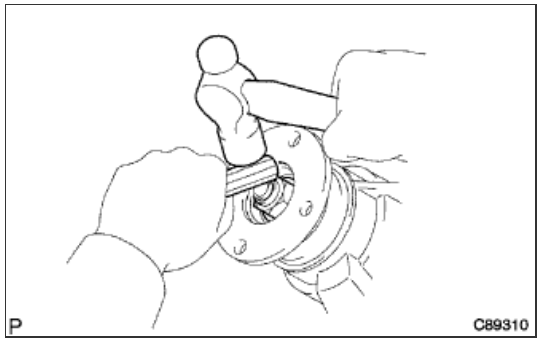
Standard Preload (at Starting):

Bearing	Specified Condition
New	1.33 to 2.18 N*m (14 to 22 kgf*cm, 12 to 19 in.*lbf)
Reused	1.14 to 1.86 N*m (12 to 18 kgf*cm, 11 to 16 in.*lbf)



17. STAKE DRIVE PINION COMPANION FLANGE REAR NUT

a. Using a chisel and hammer, stake the nut.

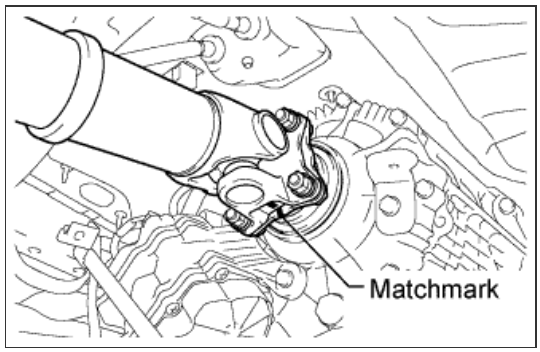


18. CONNECT PROPELLER SHAFT ASSEMBLY

a. Align the matchmarks on the propeller shaft flange and transfer.

b. Connect the propeller shaft with the 4 washers and 4 nuts.

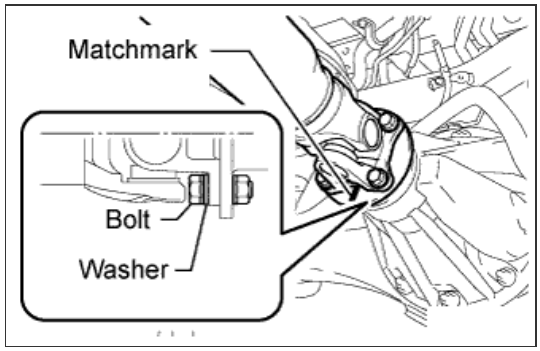
Torque:
88 N*m{ 900 kgf*cm , 65 ft.*lbf }



c. Align the matchmarks on the propeller shaft flange and rear differential.

d. Install the propeller shaft with the 4 bolts, 4 washers and 4 nuts.

Torque:
88 N*m{ 900 kgf*cm , 65 ft.*lbf }

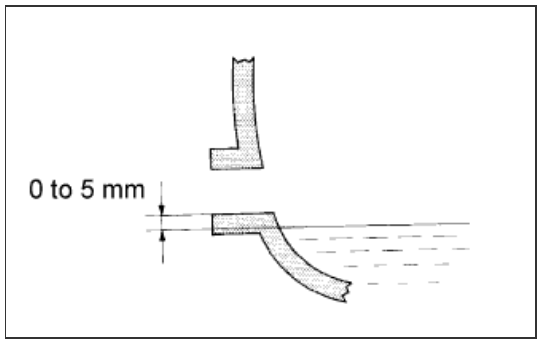


19. ADD DIFFERENTIAL OIL

a. Add differential oil so that the oil level is between 0 to 5 mm (0 to 0.197 in.) from the bottom lip of the differential filler plug hole.

NOTICE:

- **Too much or too little oil will lead to differential problems.**
- **After changing the oil, drive the vehicle and then check the oil level again.**



Front differential oil type and viscosity:
Toyota Genuine Differential gear oil LT 75W-85 GL-5 or equivalent

Rear Differential Oil Type and Viscosity:

Item	Oil Type and Viscosity
w/o LSD	Toyota Genuine Differential gear oil LT 75W-85 GL-5 or equivalent
w/ LSD	Toyota Genuine Differential gear oil LX 75W-85 GL-5 or equivalent

Front differential capacity:
1.85 to 1.95 liters (1.96 to 2.06 US qts., 1.63 to 1.71 Imp. qts.)

Rear Differential Capacity:

Item	Specified Condition
Standard	4.15 to 4.25 liters (4.39 to 4.49 US qts., 3.66 to 3.74 Imp. qts.)
w/ LSD	4.10 to 4.20 liters (4.34 to 4.43 US qts., 3.60 to 3.69 Imp. qts.)
w/ Differential lock	

b. for Front Differential:

i. Using a 10 mm hexagon wrench, install a new gasket and the filler plug.

Torque:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }

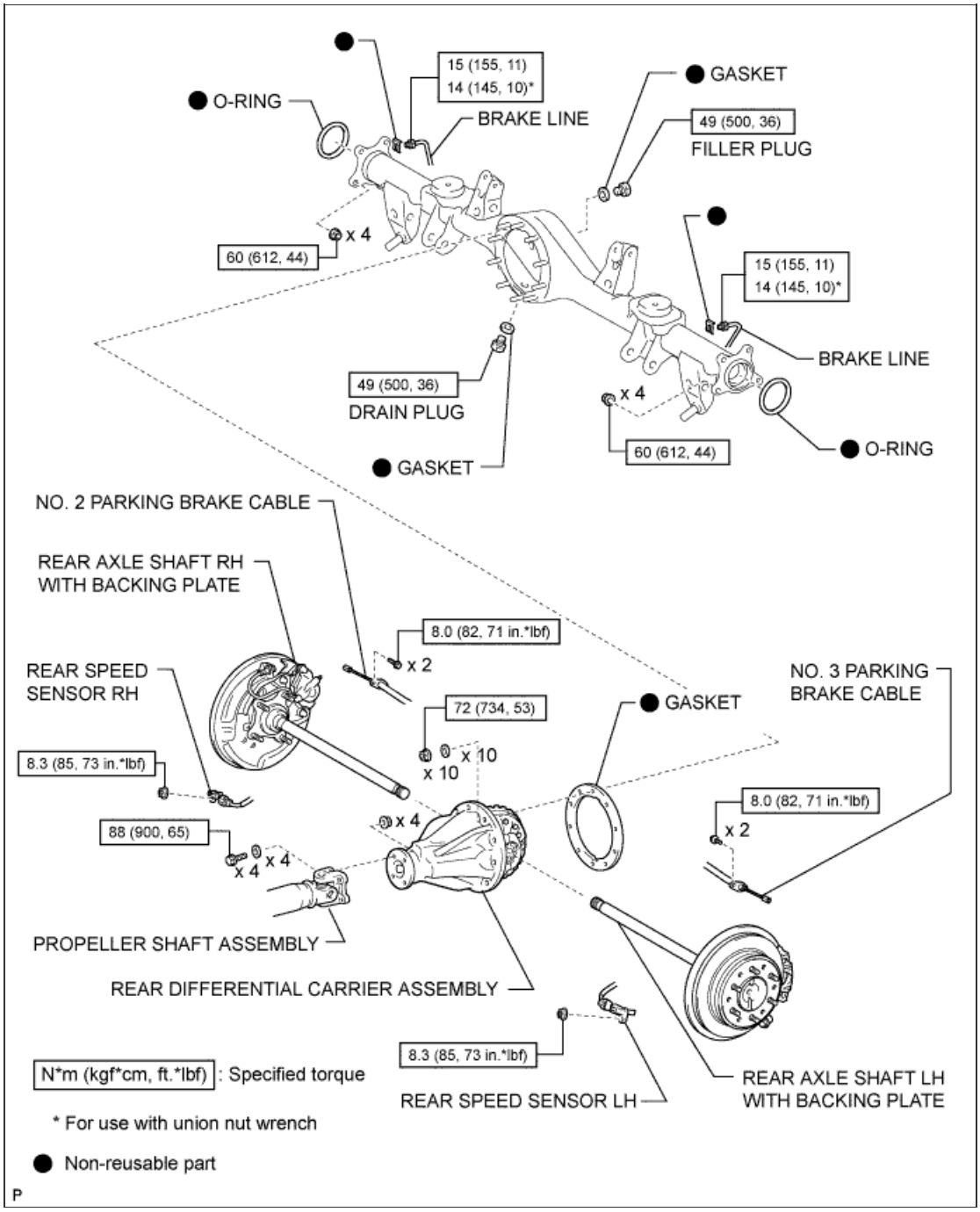
ii. Install the engine under cover.

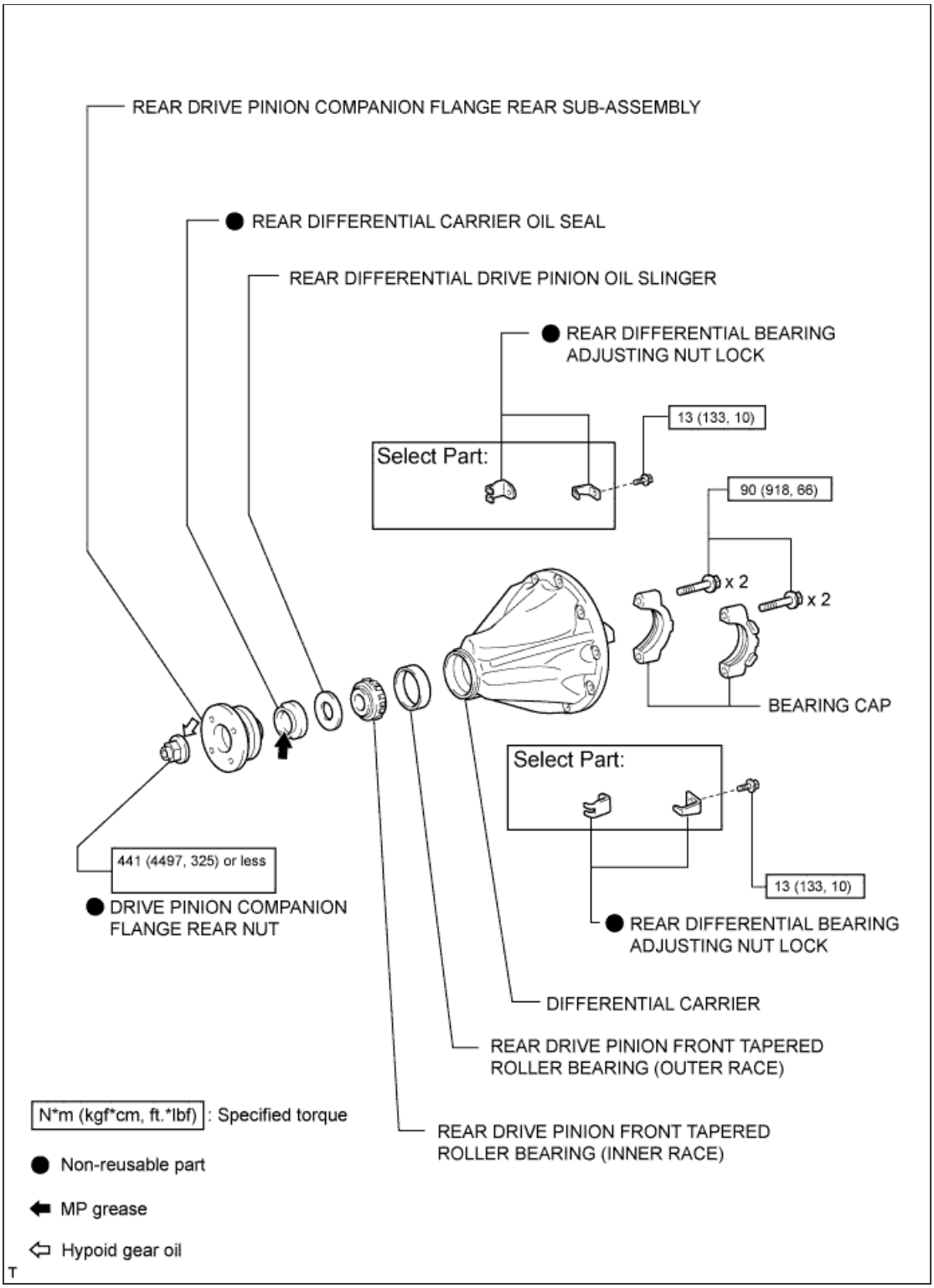
c. for Rear Differential:

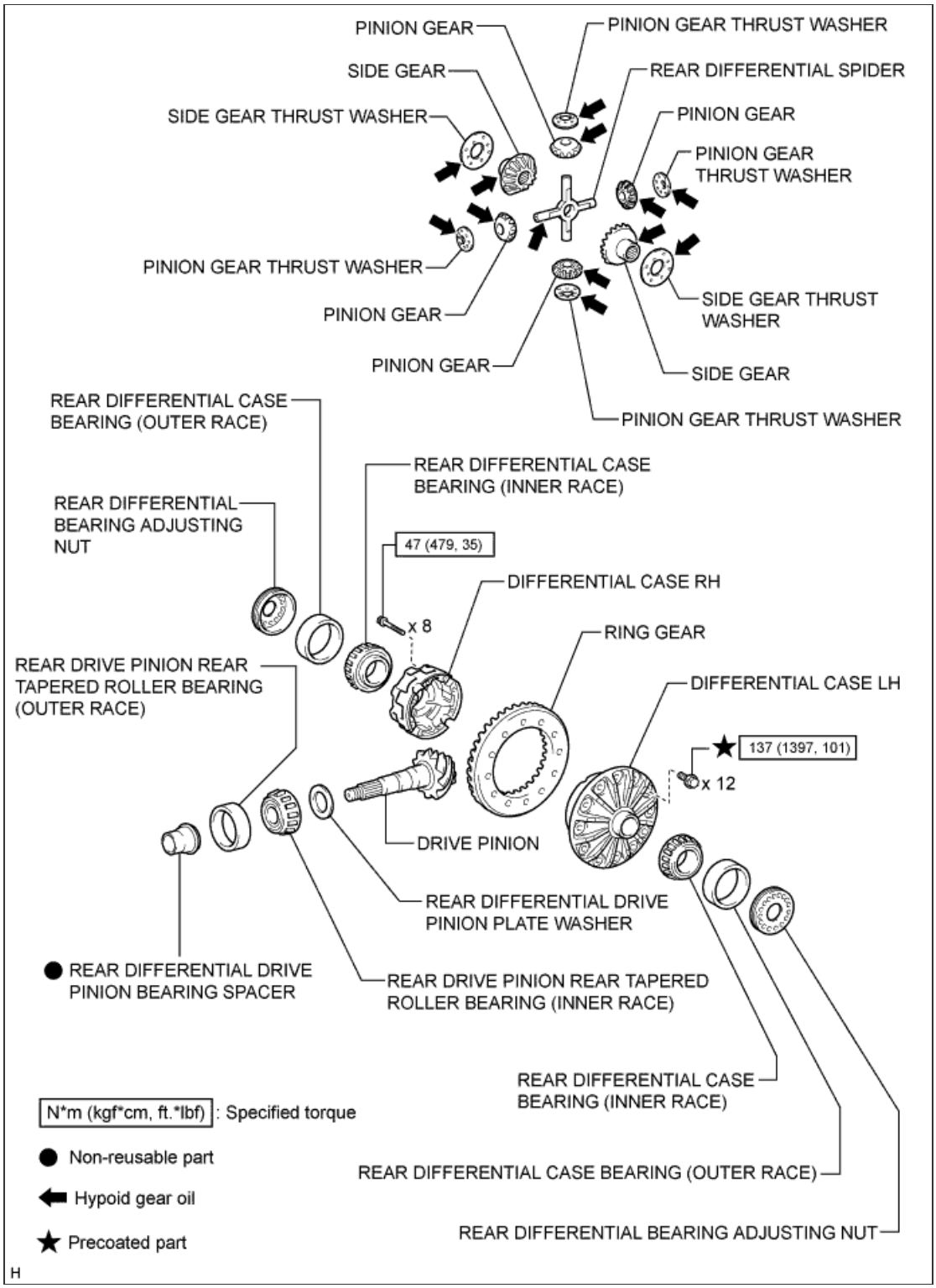
i. Install a new gasket and the filler plug.

Torque:
49 N*m{ 500 kgf*cm , 36 ft.*lbf }

for Preparation [Click here]




REAR DRIVE PINION COMPANION FLANGE REAR SUB-ASSEMBLY
REAR DIFFERENTIAL CARRIER OIL SEAL
REAR DIFFERENTIAL DRIVE PINION OIL SLINGER
REAR DIFFERENTIAL BEARING ADJUSTING NUT LOCK
13 (133, 10)
Select Part:
90 (918, 66)
x 2
x 2
BEARING CAP
Select Part:
13 (133, 10)
441 (4497, 325) or less
DRIVE PINION COMPANION FLANGE REAR NUT
REAR DIFFERENTIAL BEARING ADJUSTING NUT LOCK
DIFFERENTIAL CARRIER
REAR DRIVE PINION FRONT TAPERED ROLLER BEARING (OUTER RACE)
REAR DRIVE PINION FRONT TAPERED ROLLER BEARING (INNER RACE)
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
MP grease
Hypoid gear oil
T

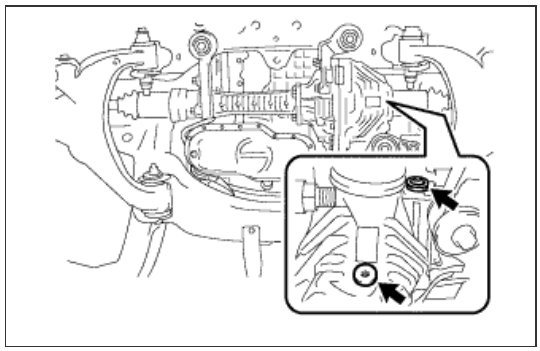

PINION GEAR
PINION GEAR THRUST WASHER
SIDE GEAR
REAR DIFFERENTIAL SPIDER
SIDE GEAR THRUST WASHER
PINION GEAR
PINION GEAR THRUST WASHER
PINION GEAR THRUST WASHER
PINION GEAR
SIDE GEAR THRUST WASHER
PINION GEAR
SIDE GEAR
PINION GEAR THRUST WASHER
REAR DIFFERENTIAL CASE BEARING (OUTER RACE)
REAR DIFFERENTIAL CASE BEARING (INNER RACE)
REAR DIFFERENTIAL BEARING ADJUSTING NUT
47 (479, 35)
DIFFERENTIAL CASE RH
x 8
RING GEAR
REAR DRIVE PINION REAR TAPERED ROLLER BEARING (OUTER RACE)
DIFFERENTIAL CASE LH
137 (1397, 101)
x 12
DRIVE PINION
REAR DIFFERENTIAL DRIVE PINION PLATE WASHER
REAR DIFFERENTIAL DRIVE PINION BEARING SPACER
REAR DRIVE PINION REAR TAPERED ROLLER BEARING (INNER RACE)
REAR DIFFERENTIAL CASE BEARING (INNER RACE)
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
Hypoid gear oil
Precoated part
REAR DIFFERENTIAL CASE BEARING (OUTER RACE)
REAR DIFFERENTIAL BEARING ADJUSTING NUT
H

for Preparation Click here

1. DRAIN DIFFERENTIAL OIL

a. Stop the vehicle on a level place.

b. for Front Differential:



i. Remove the engine under cover.

ii. Using a 10 mm hexagon wrench, remove the filler plug and gasket.

iii. Using a 10 mm hexagon wrench, remove the drain plug and gasket, and drain the oil.

iv. Using a 10 mm hexagon wrench, install a new gasket and the drain plug.

Torque:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }

c. for Rear Differential:

i. Remove the filler plug and gasket.

ii. Remove the drain plug and gasket, and drain the oil.

iii. Install a new gasket and the drain plug.

Torque:
49 N*m{ 500 kgf*cm , 36 ft.*lbf }

2. REMOVE REAR AXLE SHAFT

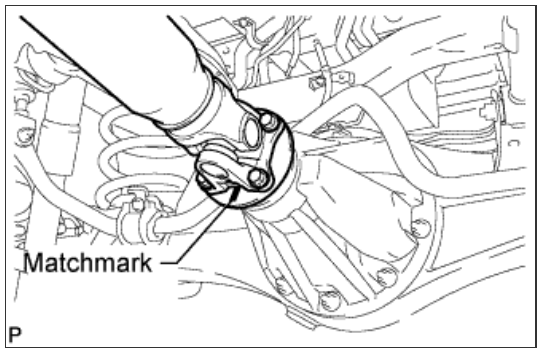
a. Remove the axle shaft (Click here).

3. DISCONNECT REAR PROPELLER SHAFT ASSEMBLY

a. Place matchmarks on the rear propeller shaft and companion flange.

b. Remove the 4 nuts, 4 washers and 4 bolts, and disconnect the propeller shaft from the differential side.

c. Support the propeller shaft securely.



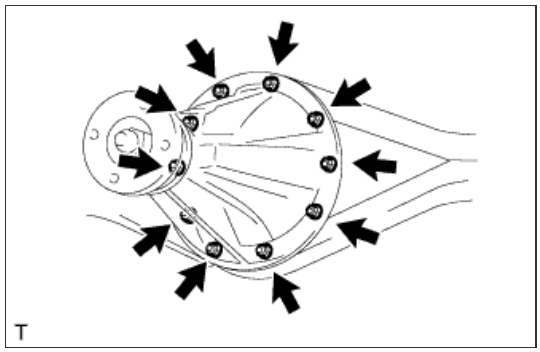
4. REMOVE REAR DIFFERENTIAL CARRIER SUB-ASSEMBLY

a. Remove the 10 nuts, 10 washers and differential carrier.

NOTICE:

Be careful not to damage the contact surfaces of the differential carrier and rear axle housing.

b. Remove the gasket.



for Preparation Click here

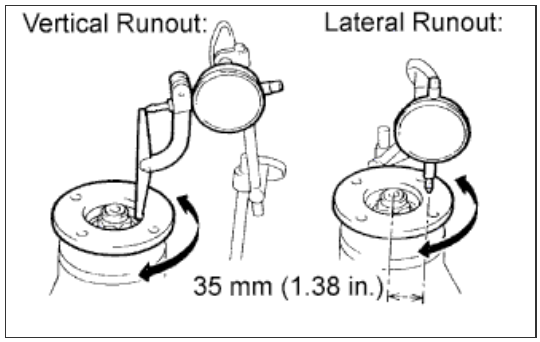
1. INSPECT RUNOUT OF REAR DRIVE PINION COMPANION FLANGE

a. Using a dial indicator, measure the runout of the companion flange vertically and laterally.

Maximum Runout:

Runout	Specified Condition
Vertical runout	0.10 mm (0.00394 in.)
Lateral runout	0.10 mm (0.00394 in.)

If the runout is more than the maximum, replace the companion flange.

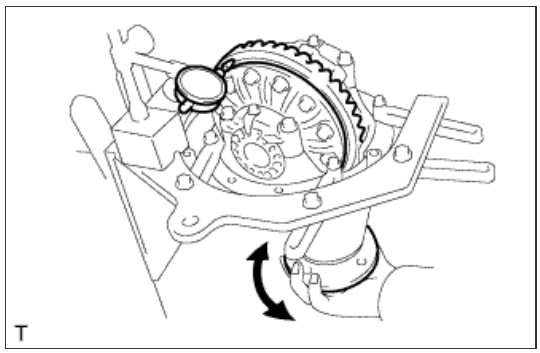


2. INSPECT RUNOUT OF DIFFERENTIAL RING GEAR

a. Using a dial indicator, measure the ring gear runout.

Maximum runout:
0.05 mm (0.00197 in.)

If the runout is more than the maximum, replace the ring gear.



3. INSPECT DIFFERENTIAL RING GEAR BACKLASH

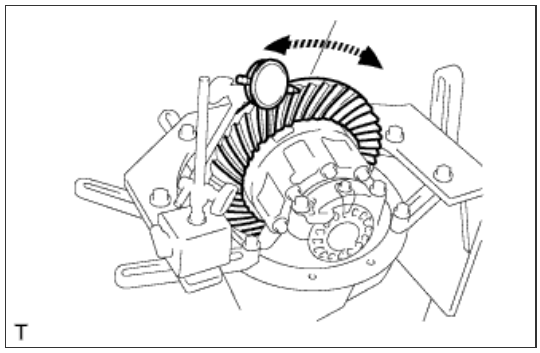
a. Using a dial indicator, measure the ring gear backlash.

Standard backlash:
0.10 to 0.20 mm (0.00394 to 0.00787 in.)

HINT:

Measure at 3 or more positions around the circumference of the ring gear.

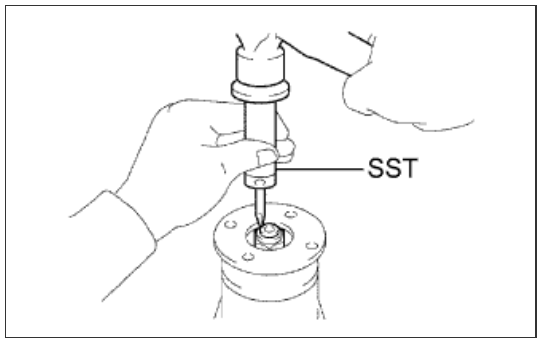
If the backlash is not as specified, adjust the side bearing preload or repair as necessary.



4. REMOVE DRIVE PINION COMPANION FLANGE REAR NUT

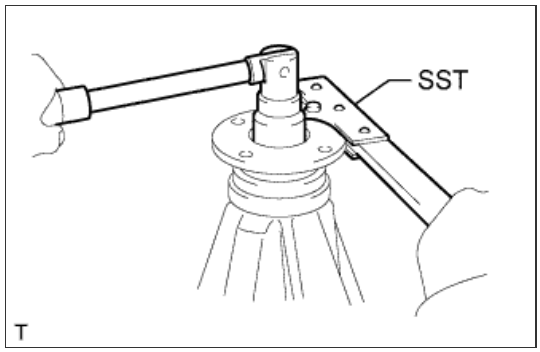
a. Using SST and a hammer, unstake the nut.

SST
09930-00010



b. Using SST to hold the companion flange, remove the nut.

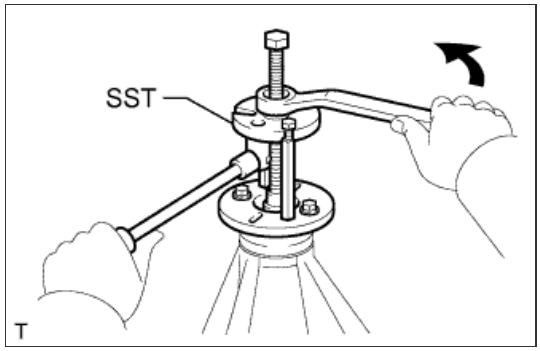
SST
09330-00021 (09330-00030)



5. REMOVE REAR DRIVE PINION COMPANION FLANGE REAR SUB-ASSEMBLY

a. Using SST, remove the companion flange.

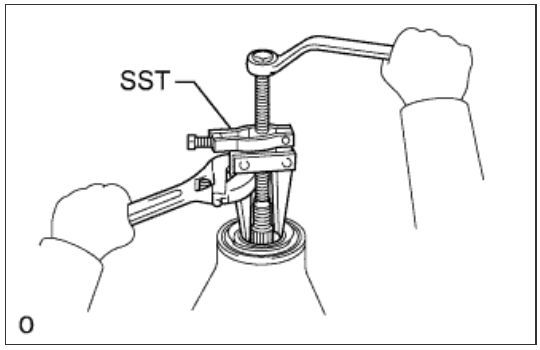
SST
09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03040)



6. REMOVE REAR DIFFERENTIAL CARRIER OIL SEAL

a. Using SST, remove the oil seal from the differential carrier.

SST
09308-10010



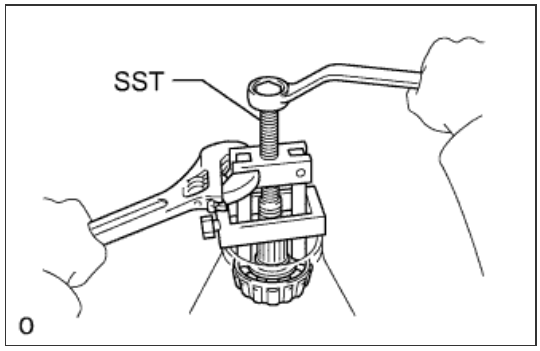
7. REMOVE REAR DIFFERENTIAL DRIVE PINION OIL SLINGER

8. REMOVE REAR DRIVE PINION FRONT TAPERED ROLLER BEARING

a. Using SST, remove the front bearing (inner race) from the drive pinion.

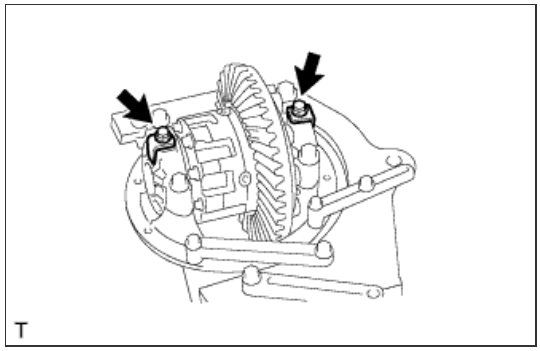
SST
09556-22010

If the front bearing is damaged or worn, replace the bearing.



9. REMOVE REAR DIFFERENTIAL BEARING ADJUSTING NUT LOCK

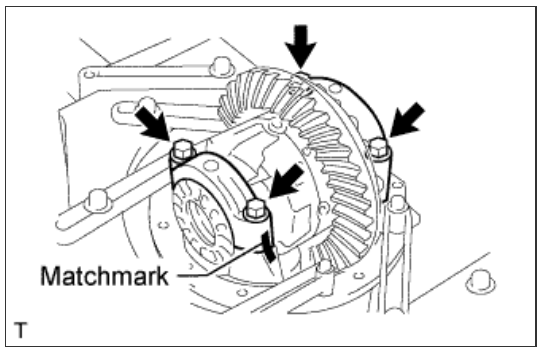
a. Remove the 2 bolts and 2 adjusting nut locks.



10. REMOVE DIFFERENTIAL CASE ASSEMBLY

a. Place matchmarks on the bearing caps and differential carrier.

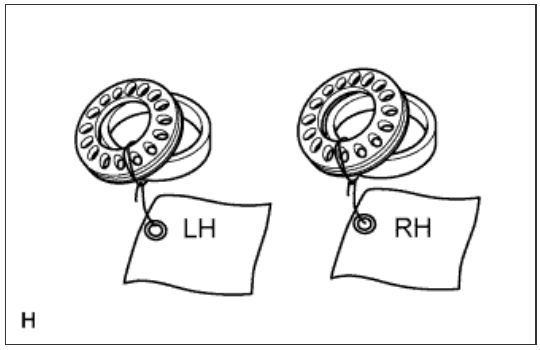
b. Remove the 4 bolts, 2 bearing caps, 2 adjusting nuts and 2 bearings (outer race).



c. Remove the differential case from the differential carrier.

HINT:

Tag the 2 case bearing outer races to show the location for reassembly.



11. REMOVE DIFFERENTIAL DRIVE PINION

a. Remove the differential drive pinion from the differential carrier.

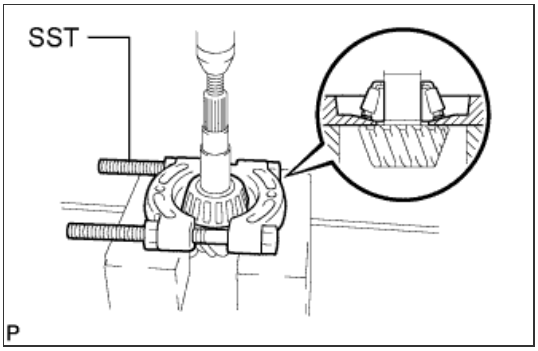
12. REMOVE REAR DIFFERENTIAL DRIVE PINION BEARING SPACER

13. REMOVE REAR DRIVE PINION REAR TAPERED ROLLER BEARING

a. Using SST and a press, press out the bearing (inner race).

SST
09950-00020

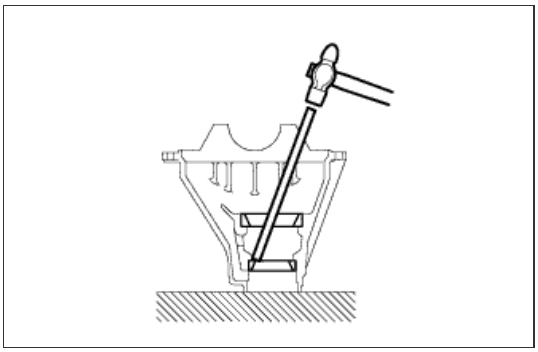
If either the drive pinion or ring gear is damaged, replace them as a set.



14. REMOVE REAR DIFFERENTIAL DRIVE PINION PLATE WASHER

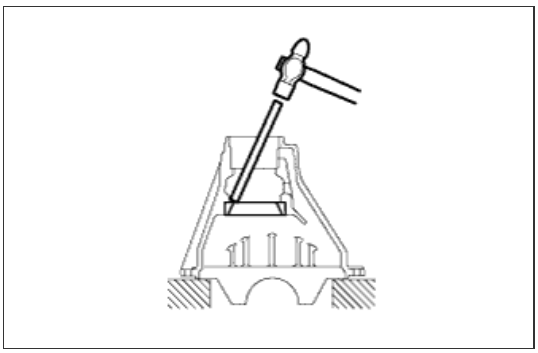
15. REMOVE REAR DRIVE PINION FRONT TAPERED ROLLER BEARING

a. Using a brass bar and hammer, tap out the bearing (outer race).



16. REMOVE REAR DRIVE PINION REAR TAPERED ROLLER BEARING

a. Using a brass bar and hammer, tap out the bearing (outer race).

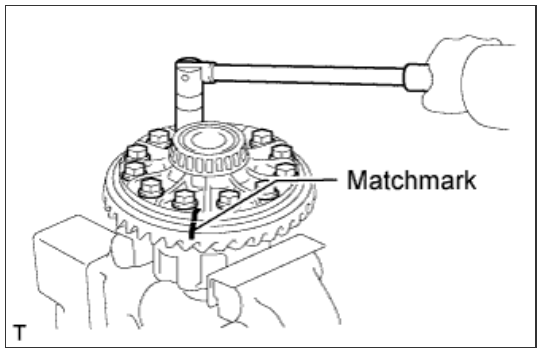


17. REMOVE DIFFERENTIAL RING GEAR

a. Place matchmarks on the ring gear and differential case.

b. Remove the 12 ring gear set bolts.

c. Using a plastic-faced hammer, tap on the ring gear to disconnect it from the differential case.



18. INSPECT RUNOUT OF DIFFERENTIAL CASE

HINT:

If the ring gear runout is at the maximum or less (refer to the "Inspect Runout of Differential Ring Gear" procedure), this inspection is not necessary.

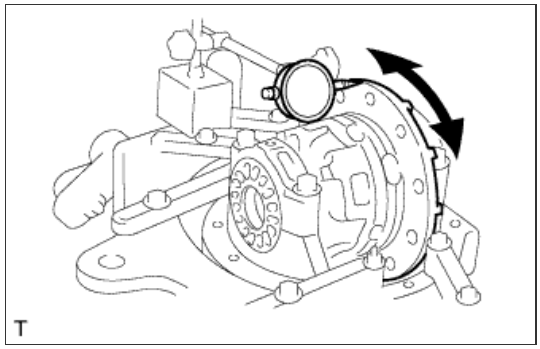
a. Install the differential case to the differential carrier.

b. Using a dial indicator, measure the differential case runout.

Maximum runout:
0.04 mm (0.00157 in.)

If the runout is more than the maximum, replace the differential case and side bearings as a set.

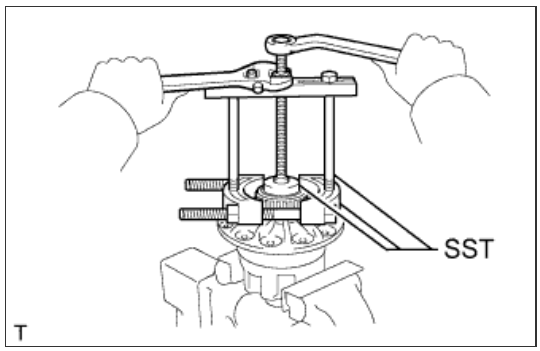
c. Remove the differential case from the differential carrier.



19. REMOVE REAR DIFFERENTIAL CASE BEARING

a. Using SST, remove the 2 side bearings (inner race) from the differential case.

SST
09950-00020
09950-00030
09950-40011 (09957-04010)
09950-60010 (09951-00480)



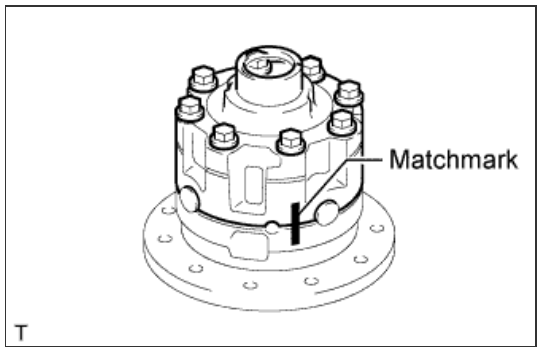
20. DISASSEMBLE DIFFERENTIAL CASE

a. Place matchmarks on the differential case LH and RH.

b. Remove the 8 bolts uniformly, a little at a time.

c. Using a plastic-faced hammer, disconnect the differential case LH and RH.

d. Remove the 2 side gear thrust washers, 2 side gears, spider, 4 pinion gears and 4 pinion gear thrust washers.



for Preparation Click here

1. INSPECT DIFFERENTIAL SIDE GEAR BACKLASH

a. Install the 2 thrust washers to the side gears.

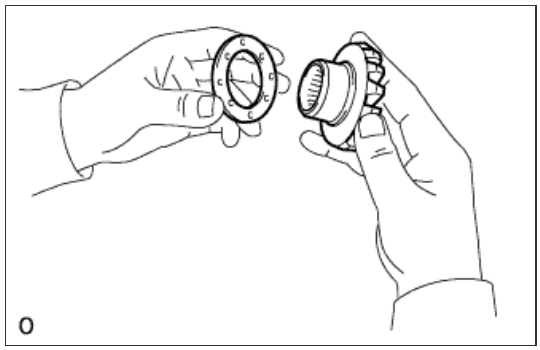
b. Install the side gears to the differential case.

c. Install the 4 pinion gears and 4 thrust washers to the spider.

d. Install the spider assembly to the differential case.

HINT:

Install the spider to the differential case tightly.



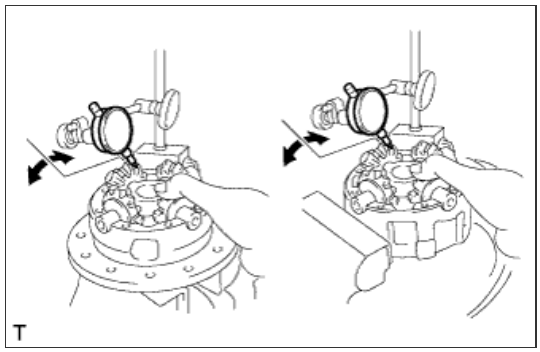
e. Using a dial indicator, measure the side gear backlash while holding the side gear and spider.

Standard backlash:
0.02 to 0.15 mm (0.000788 to 0.00590 in.)

HINT:

- **Measure at all 4 pinion gear locations.**
- **Measure the backlash at the differential case LH and RH.**
- **Apply hypoid gear oil to each sliding surface and rotating part.**

If the backlash is not within the specification, replace the side gear thrust washers with washers of a different thickness.



Standard Washer Thickness:

Specified Condition	Specified Condition
1.53 to 1.57 mm (0.0603 to 0.0618 in.)	1.83 to 1.87 mm (0.0720 to 0.0736 in.)
1.58 to 1.62 mm (0.0622 to 0.0637 in.)	1.88 to 1.92 mm (0.0740 to 0.0755 in.)
1.63 to 1.67 mm (0.0642 to 0.0657 in.)	1.93 to 1.97 mm (0.0760 to 0.0775 in.)
1.68 to 1.72 mm (0.0662 to 0.0677 in.)	1.98 to 2.02 mm (0.0780 to 0.0795 in.)
1.73 to 1.77 mm (0.0682 to 0.0696 in.)	2.03 to 2.07 mm (0.0800 to 0.0814 in.)
1.78 to 1.82 mm (0.0701 to 0.0716 in.)	2.08 to 2.12 mm (0.0819 to 0.0834 in.)

2. ASSEMBLE DIFFERENTIAL CASE

a. Install the spider assembly to the differential case.

HINT:

Install the spider to the differential case tightly.

b. Align the matchmarks and assemble the differential case LH and RH.

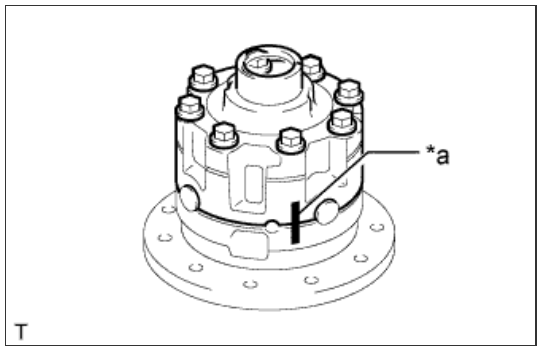
Text in Illustration

*a	Matchmark

c. Install the 8 bolts and tighten them uniformly, a little at a time.

Torque:

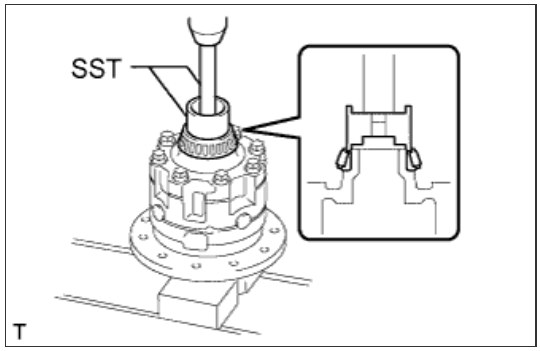
47 N*m{ 479 kgf*cm , 35 ft.*lbf }



3. INSTALL REAR DIFFERENTIAL CASE BEARING

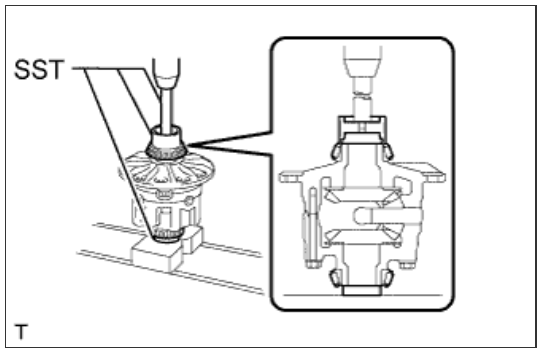
a. Using SST and a press, press the RH side bearing (inner race) into the differential case.

SST
09710-30050
09950-70010 (09951-07150)



b. Using SST and a press, press the LH side bearing (inner race) into the differential case.

SST
09710-30050
09950-60010 (09951-00480)
09950-70010 (09951-07150)



4. INSTALL DIFFERENTIAL RING GEAR

a. Clean the threads of the bolts and differential case with non-residue solvent.

b. Clean the contact surfaces of the differential case and ring gear.

c. Heat the ring gear to about 100°C (212°F) in boiling water.

d. Carefully take the ring gear out of the boiling water.

e. After the moisture on the ring gear has completely evaporated, quickly align the matchmarks on the ring gear and differential case and set the ring gear onto the differential case. Then temporarily install the 12 bolts so that the bolt holes in the ring gear and differential case are aligned.

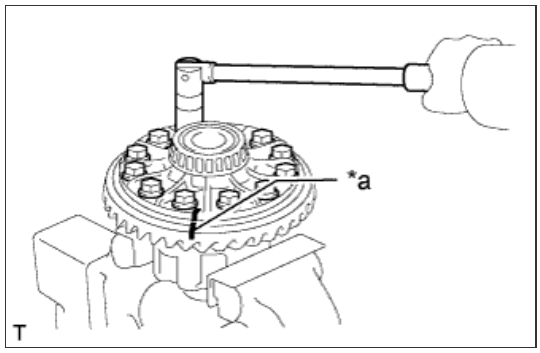
f. After the ring gear cools down sufficiently, remove the 12 bolts. Then apply thread lock adhesive to the 12 bolts and install them.

Text in Illustration

*a	Matchmark

Thread lock:
Toyota Genuine Adhesive 1360K, Three Bond 1360K or equivalent

Torque:
137 N*m{ 1397 kgf*cm , 101 ft.*lbf }



5. CHECK DIFFERENTIAL RING GEAR RUNOUT

a. Place the bearing outer races on their respective bearings.

HINT:

Do not interchange the left and right outer races.

b. Install the assembled plate washers to the side bearing.

c. Install the differential case to the differential carrier.

HINT:

If it is difficult to install the differential case to the carrier, replace the plate washer with a thinner one. However, select a plate washer that allows no clearance between it and the carrier.

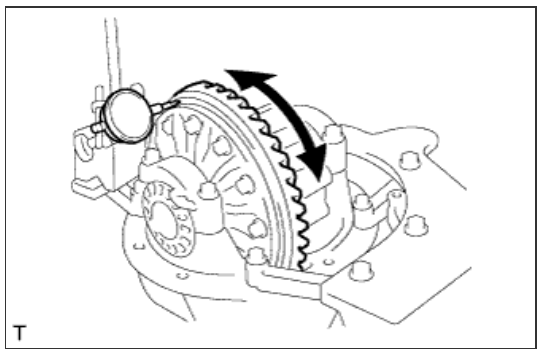
d. Align the matchmarks on the bearing caps and differential carrier.

e. Install and uniformly tighten the 4 bolts a little at a time.

f. Using a dial indicator, check the ring runout.

Maximum runout:
0.05 mm (0.00197)

If the runout is more than the maximum, replace the ring gear.

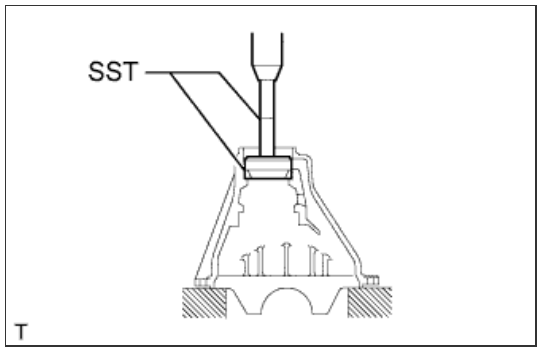


g. Remove the differential case.

6. INSTALL REAR DRIVE PINION FRONT TAPERED ROLLER BEARING

a. Using SST and a press, press in the bearing (outer race).

SST
09950-60020 (09951-00710)
09950-70010 (09951-07150)

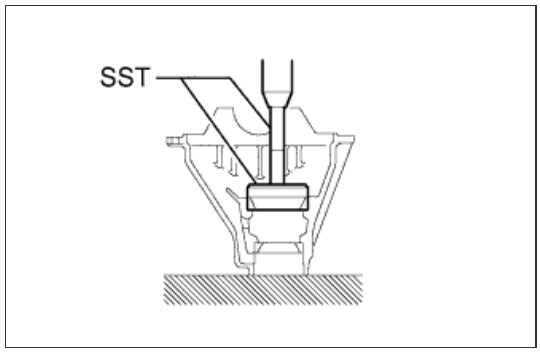


7. INSTALL REAR DRIVE PINION REAR TAPERED ROLLER BEARING

a. Using SST and a press, press in the bearing (outer race).

a. Using SST and a press, press in the bearing (outer race).

SST
09950-60020 (09951-00890)
09950-70010 (09951-07150)



8. INSTALL REAR DRIVE PINION REAR TAPERED ROLLER BEARING

a. Install the washer to the drive pinion.

HINT:

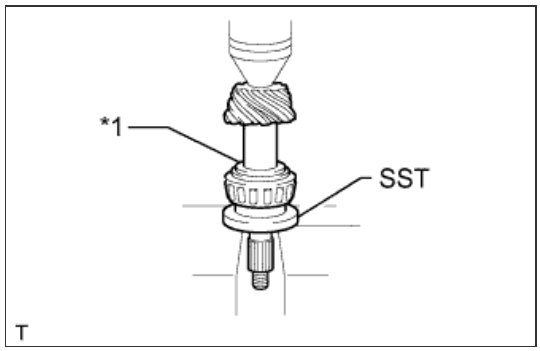
After installing the washer, check the tooth contact pattern. If necessary, replace the washer with one of a different thickness.

b. Using SST and a press, press the rear bearing (inner race) into the drive pinion.

SST
09506-35010

Text in Illustration

*1	Plate Washer

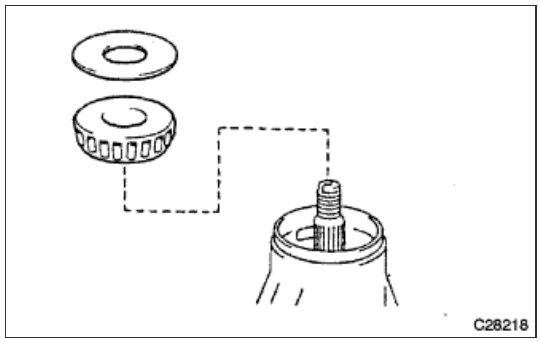


9. INSPECT DIFFERENTIAL DRIVE PINION PRELOAD

a. Install the drive pinion, front bearing (inner race) and oil slinger.

HINT:

Install the spacer and oil seal after adjusting the gear contact pattern.

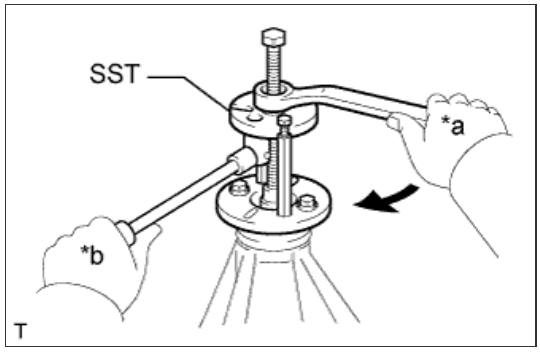


b. Using SST, install the companion flange.

SST
09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03040)

Text in Illustration

*a	Turn
*b	Hold



c. Using SST to hold the companion flange, install the nut.

SST

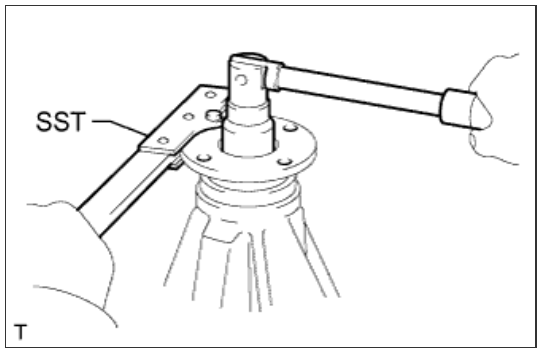
09330-00021 (09330-00030)

Torque:

441 N*m{ 4497 kgf*cm , 325 ft.*lbf } or less

NOTICE:

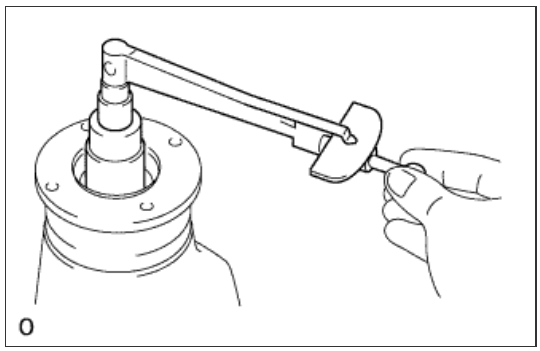
- **Apply hypoid gear oil to the nut.**
- **As there is no spacer, tighten a little at a time, being careful not to overtighten it.**



d. Using a torque wrench, measure the preload.

Standard Preload (at Starting):

Bearing	Specified Condition
New	1.04 to 1.69 N*m (11 to 17 kgf*cm, 10 to 14 in.*lbf)
Reused	0.85 to 1.37 N*m (9 to 13 kgf*cm, 8 to 12 in.*lbf)



HINT:

Measure the total preload after turning the bearing clockwise and counterclockwise several times to make the bearing smooth.

10. INSTALL DIFFERENTIAL CASE ASSEMBLY

a. Place the bearing (outer races) on their respective bearings.

HINT:

Do not interchange the left and right outer races.

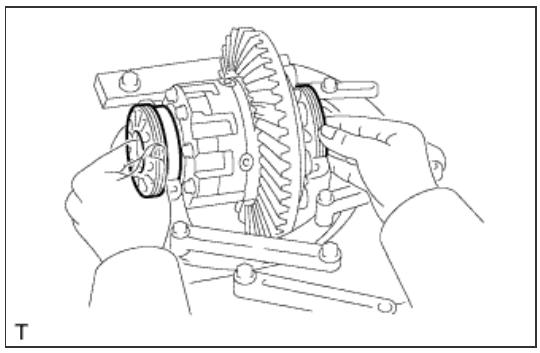
b. Install the differential case to the carrier.

HINT:

Make sure that there is backlash between the ring gear and drive pinion.

11. INSTALL REAR DIFFERENTIAL BEARING ADJUSTING NUT

a. Install the 2 adjusting nuts to the carrier, making sure the nuts are threaded properly.



12. INSPECT AND ADJUST DIFFERENTIAL RING GEAR BACKLASH

a. Align the matchmarks on the bearing caps and carrier. Screw in the 4 bearing cap bolts 2 or 3 turns and press down the bearing caps by hand.

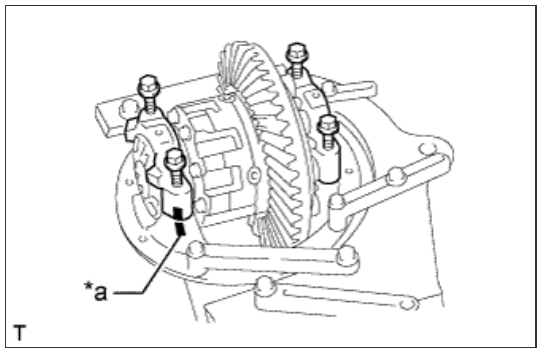
Text in Illustration

*a Matchmark

HINT:

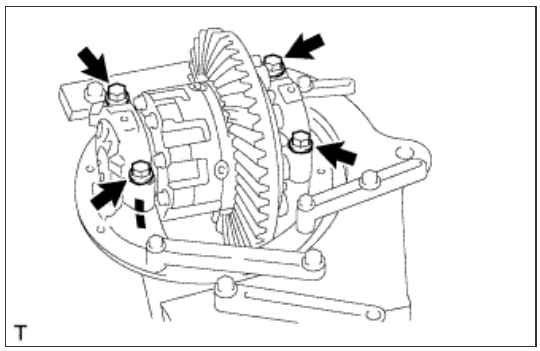
If the bearing caps do not fit tightly on the carrier, the adjusting nuts are not engaged properly.

Reinstall the adjusting nuts if necessary.



b. Tighten the 4 bolts.

Torque:
90 N*m{ 918 kgf*cm , 66 ft.*lbf }

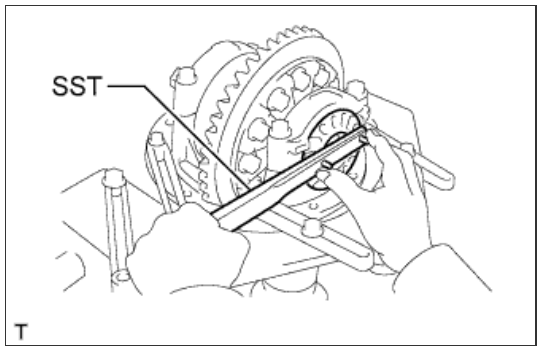


c. Loosen the 4 bolts to the point where the adjusting nuts can be turned by SST.

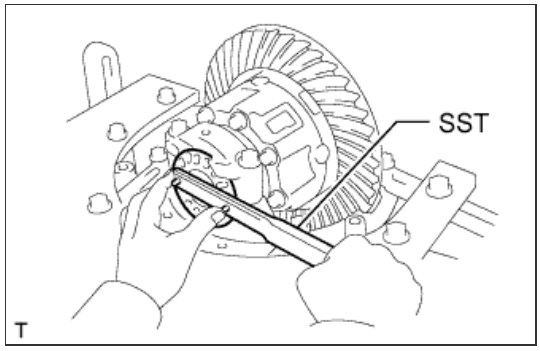
SST
09504-00011

d. Using SST, tighten the adjusting nut on the ring gear side until the ring gear has a backlash of about 0.2 mm (0.00787 in.).

SST
09504-00011

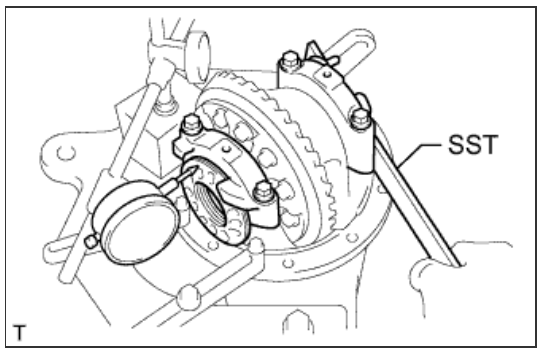


e. While turning the ring gear, use SST to tighten the adjusting nut on the drive pinion side. After the bearings are settled, loosen the adjusting nut on the drive pinion side.



f. Place a dial indicator on the top of the adjusting nut on the ring gear side.

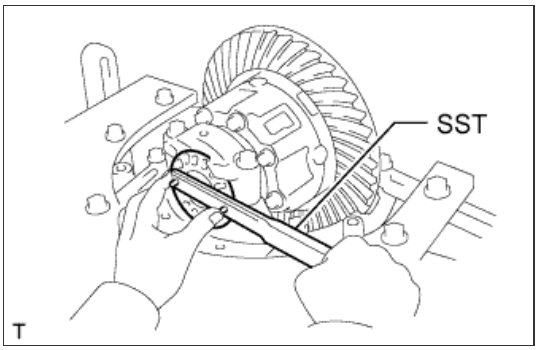
g. Adjust the side bearing to zero preload by tightening the other adjusting nut until the pointer on the indicator begins to move.



h. Using SST, tighten the adjusting nut 1 to 1.5 notches from the zero preload

position.

SST
09504-00011

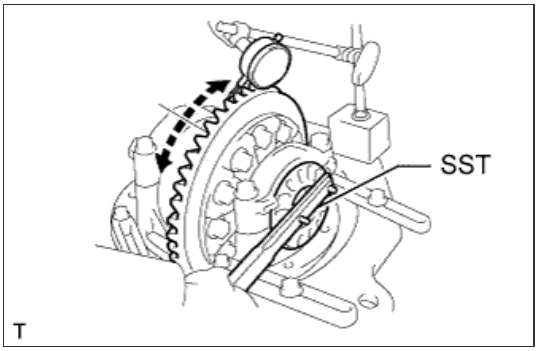


i. Using a dial indicator, adjust the ring gear backlash until it is within the specification.

Standard backlash:
0.10 to 0.20 mm (0.00394 to 0.00787 in.)

HINT:

The backlash is adjusted by turning the left and right adjusting nuts by an equal amount. For example, loosen the nut on the left side 1 notch and tighten the nut on the right side 1 notch.

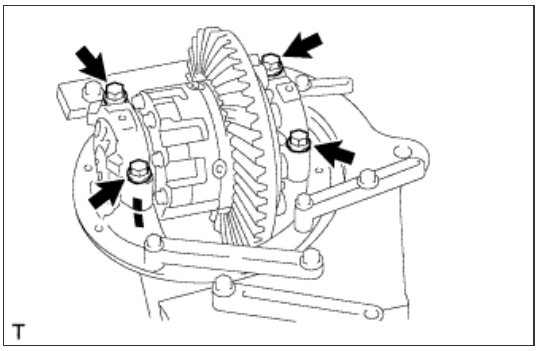


j. Tighten the 4 bearing cap bolts.

Torque:
90 N*m{ 918 kgf*cm , 66 ft.*lbf }

k. After rotating the ring gear 5 turns or more, recheck the ring gear backlash.

Standard backlash:
0.10 to 0.20 mm (0.00394 to 0.00787 in.)

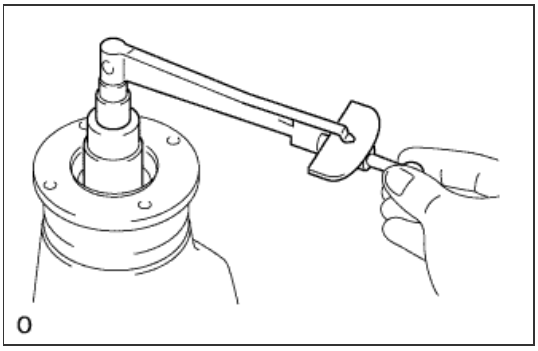


13. INSPECT TOTAL PRELOAD

a. Using a torque wrench, measure the preload with the teeth of the drive pinion and ring gear in contact.

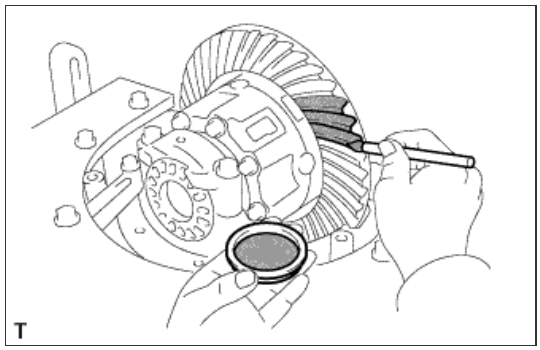
Standard Drive Pinion Preload (at Starting):

Bearing	Specified Condition
New	1.42 to 2.32 N*m (15 to 23 kgf*cm, 13 to 20 in.*lbf)
Reused	1.23 to 2.00 N*m (13 to 20 kgf*cm, 11 to 17 in.*lbf)

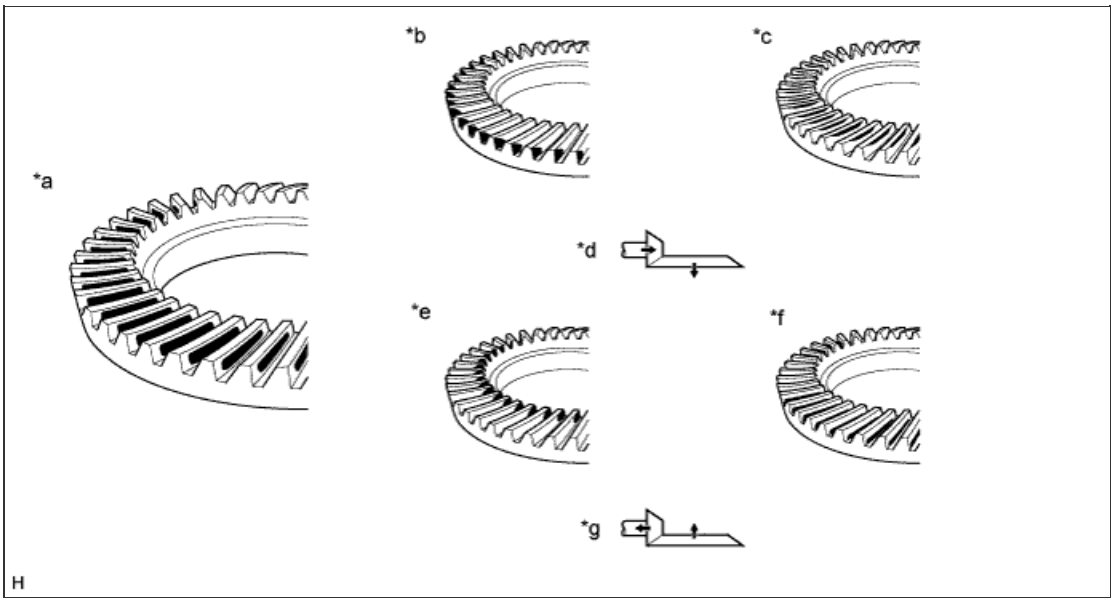


14. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

a. Coat 3 or 4 teeth at 3 different positions on the ring gear with Prussian blue.



b. Turn the companion flange in both directions and inspect the ring gear for proper tooth contact.



Text in Illustration

*a	Proper Contact	*b	Heel Contact
*c	Face Contact	*d	Select an adjusting washer that will shift the drive pinion closer to the ring gear (*b, *c)
*e	Toe Contact	*f	Flank Contact
*g	Select an adjusting washer that will shift the drive pinion away from the ring gear (*e, *f)	-	-

If the teeth are not contacting properly, use the following table and select a proper washer for correction.

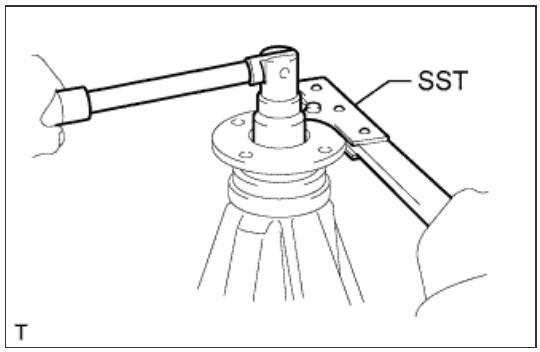
Standard Washer Thickness:

Specified Condition	Specified Condition
1.04 to 1.06 mm (0.0410 to 0.0417 in.)	1.315 to 1.335 mm (0.0518 to 0.0525 in.)
1.065 to 1.085 mm (0.0420 to 0.0427 in.)	1.34 to 1.36 mm (0.0528 to 0.0535 in.)
1.09 to 1.11 mm (0.0430 to 0.0437 in.)	1.365 to 1.385 mm (0.0538 to 0.0545 in.)
1.115 to 1.135 mm (0.0439 to 0.0446 in.)	1.39 to 1.41 mm (0.0548 to 0.0555 in.)
1.14 to 1.16 mm (0.0449 to 0.0456 in.)	1.415 to 1.435 mm (0.0557 to 0.0564 in.)
1.165 to 1.185 mm (0.0459 to 0.0466 in.)	1.44 to 1.46 mm (0.0567 to 0.0574 in.)
1.19 to 1.21 mm (0.0469 to 0.0476 in.)	1.465 to 1.485 mm (0.0577 to 0.0584 in.)
1.215 to 1.235 mm (0.04789 to 0.0486 in.)	1.49 to 1.51 mm (0.0587 to 0.0594 in.)
1.24 to 1.26 mm (0.0489 to 0.0496 in.)	1.515 to 1.535 mm (0.0597 to 0.0604 in.)
1.265 to 1.285 mm (0.0498 to 0.0505 in.)	1.54 to 1.56 mm (0.0607 to 0.0614 in.)
1.29 to 1.31 mm (0.0508 to 0.0515 in.)	-

15. REMOVE DRIVE PINION COMPANION FLANGE REAR NUT

a. Using SST to hold the flange, remove the nut.

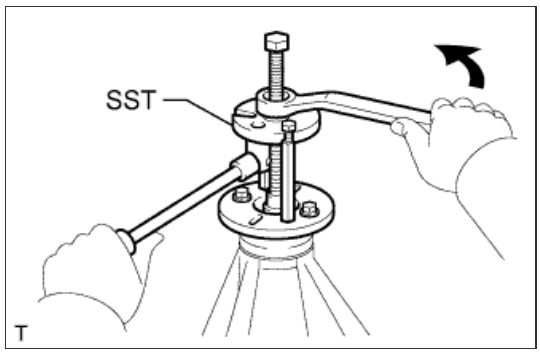
SST
09330-00021 (09330-00030)



16. REMOVE REAR DRIVE PINION REAR COMPANION FLANGE SUB-ASSEMBLY

a. Using SST, remove the companion flange.

SST
09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03040)



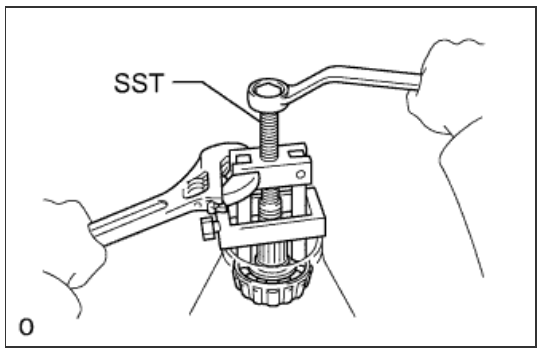
17. REMOVE REAR DIFFERENTIAL DRIVE PINION OIL SLINGER

18. REMOVE REAR DRIVE PINION FRONT TAPERED ROLLER BEARING

a. Using SST, remove the front bearing (inner race) from the drive pinion.

SST
09556-22010

If the front bearing is damaged or worn, replace the bearing.



19. INSTALL REAR DIFFERENTIAL DRIVE PINION BEARING SPACER

a. Install a new spacer to the drive pinion.

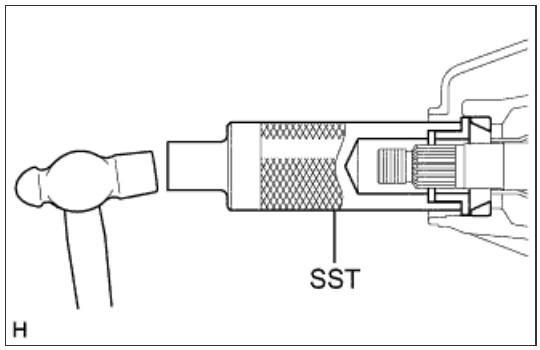
20. INSTALL REAR DRIVE PINION FRONT TAPERED ROLLER BEARING

a. Using SST and a hammer, tap in the bearing (outer race).

SST

09316-60011 (09316-00011, 09316-00021)

b. Install the bearing (inner race).



21. INSTALL REAR DIFFERENTIAL DRIVE PINION OIL SLINGER

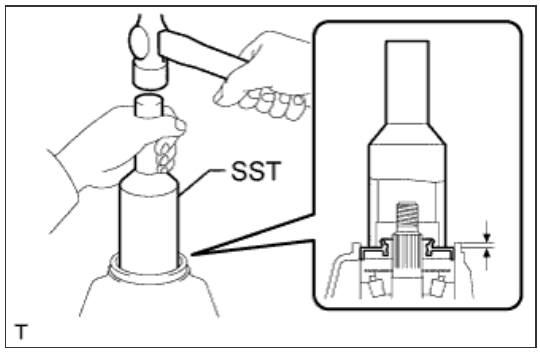
22. INSTALL REAR DIFFERENTIAL CARRIER OIL SEAL

a. Using SST and a hammer, tap in a new oil seal.

SST
09214-76011

Standard oil seal depth:
0.05 to 0.95 mm (0.00197 to 0.0374 in.)

b. Coat the lip of the oil seal with MP grease.



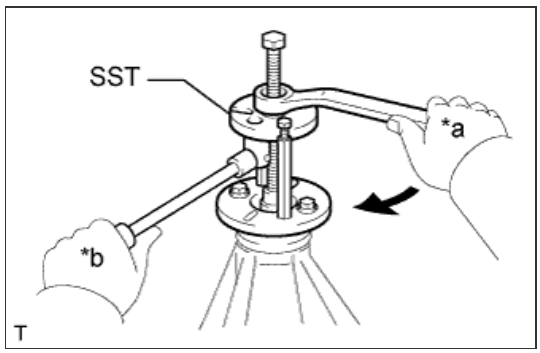
23. INSTALL REAR DRIVE PINION COMPANION FLANGE REAR SUB-ASSEMBLY

a. Using SST, install the companion flange.

SST
09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03040)

Text in Illustration

*a	Turn
*b	Hold



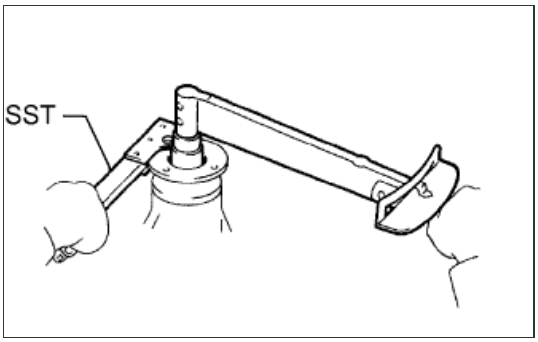
24. INSPECT DRIVE PINION PRELOAD

a. Coat the threads of a new nut with hypoid gear oil.

b. Using SST to hold the companion flange, install the nut by tightening it until the standard preload is reached.

SST
09330-00021 (09330-00030)

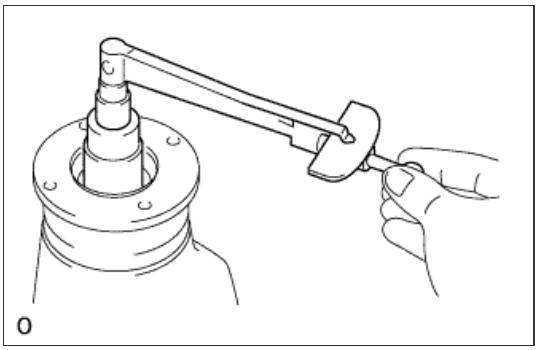
Torque:
441 N*m{ 4497 kgf*cm , 325 ft.*lbf } or less



c. Using a torque wrench, measure the preload.

Standard Preload (at Starting):

Bearing	Specified Condition
New	1.04 to 1.69 N*m (11 to 17 kgf*cm, 10 to 14 in.*lbf)
Reused	0.85 to 1.37 N*m (9 to 13 kgf*cm, 8 to 12 in.*lbf)

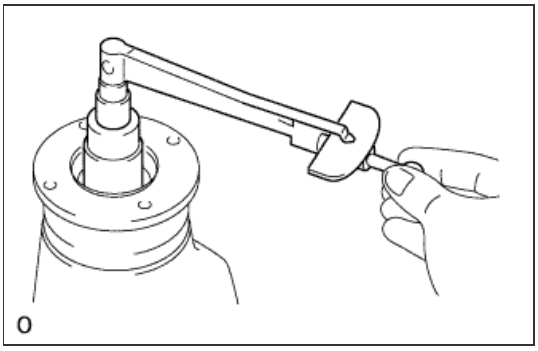


25. INSPECT TOTAL PRELOAD

a. Using a torque wrench, measure the preload with the teeth of the drive pinion and ring gear in contact.

Standard Drive Pinion Preload (at Starting):

Bearing	Specified Condition
New	1.42 to 2.32 N*m (15 to 23 kgf*cm, 13 to 20 in.*lbf)
Reused	1.23 to 2.00 N*m (13 to 20 kgf*cm, 11 to 17 in.*lbf)



26. INSPECT DIFFERENTIAL RING GEAR BACKLASH

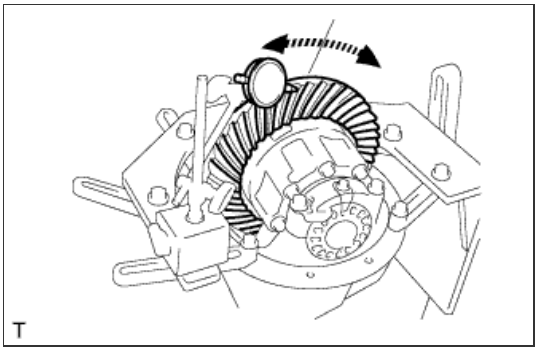
a. Using a dial indicator, measure the ring gear backlash.

Standard backlash:
0.10 to 0.20 mm (0.00394 to 0.00787 in.)

HINT:

Measure at 3 or more positions around the circumference of the ring gear.

If the backlash is not as specified, adjust the side bearing preload or repair as necessary.



27. INSPECT RUNOUT OF REAR DRIVE PINION COMPANION FLANGE REAR SUB-ASSEMBLY

a. Using a dial indicator, measure the runout of the companion flange vertically and laterally.

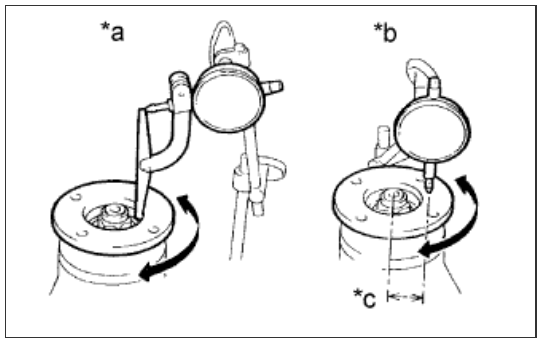
Maximum Runout:

Runout	Specified Condition
Vertical runout	0.10 mm (0.00394 in.)
Lateral runout	0.10 mm (0.00394 in.)

Text in Illustration

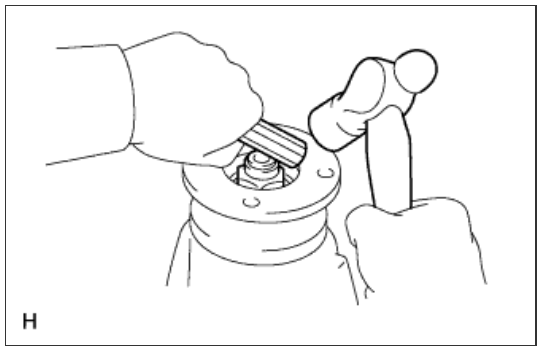
*a	Vertical Runout
*b	Lateral Runout
*c	35 mm (1.38 in.)

If the runout is more than the maximum, replace the companion flange.



28. STAKE DRIVE PINION COMPANION FLANGE REAR NUT

a. Using a chisel and hammer, stake the nut.

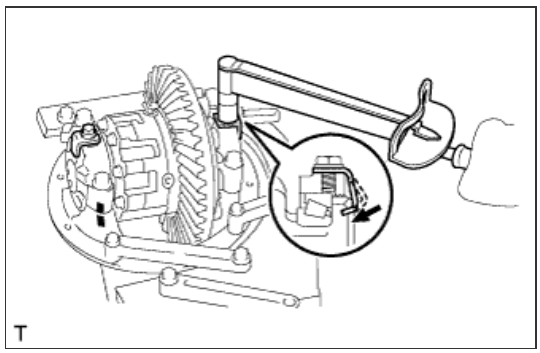


29. INSTALL REAR DIFFERENTIAL BEARING ADJUSTING NUT LOCK

a. Install 2 new nut locks to the bearing caps.

b. Install the 2 bolts, and bend the nut locks.

Torque:
13 N*m{ 133 kgf*cm , 10 ft.*lbf }



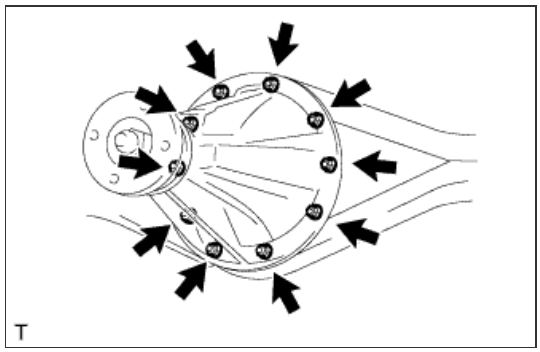
for Preparation Click here

1. INSTALL REAR DIFFERENTIAL CARRIER ASSEMBLY

a. Install a new gasket.

b. Install the differential carrier with the 10 washers and 10 nuts.

Torque:
72 N*m{ 734 kgf*cm , 53 ft.*lbf }

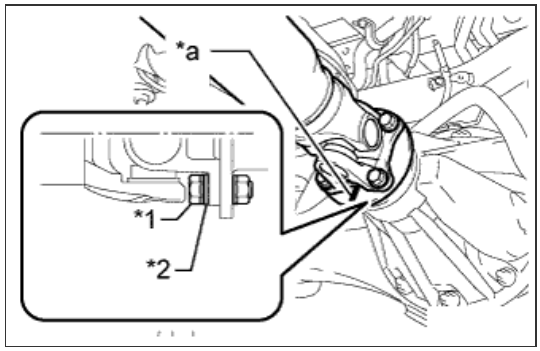


2. CONNECT PROPELLER SHAFT ASSEMBLY

a. Align the matchmarks on the propeller shaft flange and differential flange.

Text in Illustration

*1	Bolt
*2	Washer
*a	Matchmark



b. Connect the propeller shaft with the 4 bolts, 4 washers and 4 nuts.

Torque:
88 N*m{ 900 kgf*cm , 65 ft.*lbf }

3. INSTALL REAR AXLE SHAFT

a. Install the axle shaft (Click here).

4. ADD DIFFERENTIAL OIL

a. Add differential oil so that the oil level is between 0 to 5 mm (0 to 0.197 in.) from the bottom lip of the differential filler plug hole.

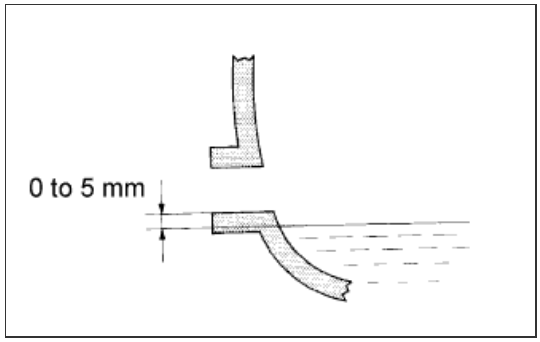
NOTICE:

- **Too much or too little oil will lead to differential problems.**
- **After changing the oil, drive the vehicle and then check the oil level again.**

Front differential oil type and viscosity:
Toyota Genuine Differential gear oil LT 75W-85 GL-5 or equivalent

Rear Differential Oil Type and Viscosity:

Item	Oil Type and Viscosity
w/o LSD	Toyota Genuine Differential gear oil LT 75W-85 GL-5 or



	equivalent
w/ LSD	Toyota Genuine Differential gear oil LX 75W-85 GL-5 or equivalent

Front differential capacity:
1.85 to 1.95 liters (1.96 to 2.06 US qts., 1.63 to 1.71 Imp. qts.)

Rear Differential Capacity:

Item	Specified Condition
Standard	4.15 to 4.25 liters (4.39 to 4.49 US qts., 3.66 to 3.74 Imp. qts.)
w/ LSD	4.10 to 4.20 liters (4.34 to 4.43 US qts., 3.60 to 3.69 Imp. qts.)
w/ Differential lock	

b. for Front Differential:

i. Using a 10 mm hexagon wrench, install a new gasket and the filler plug.

Torque:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }

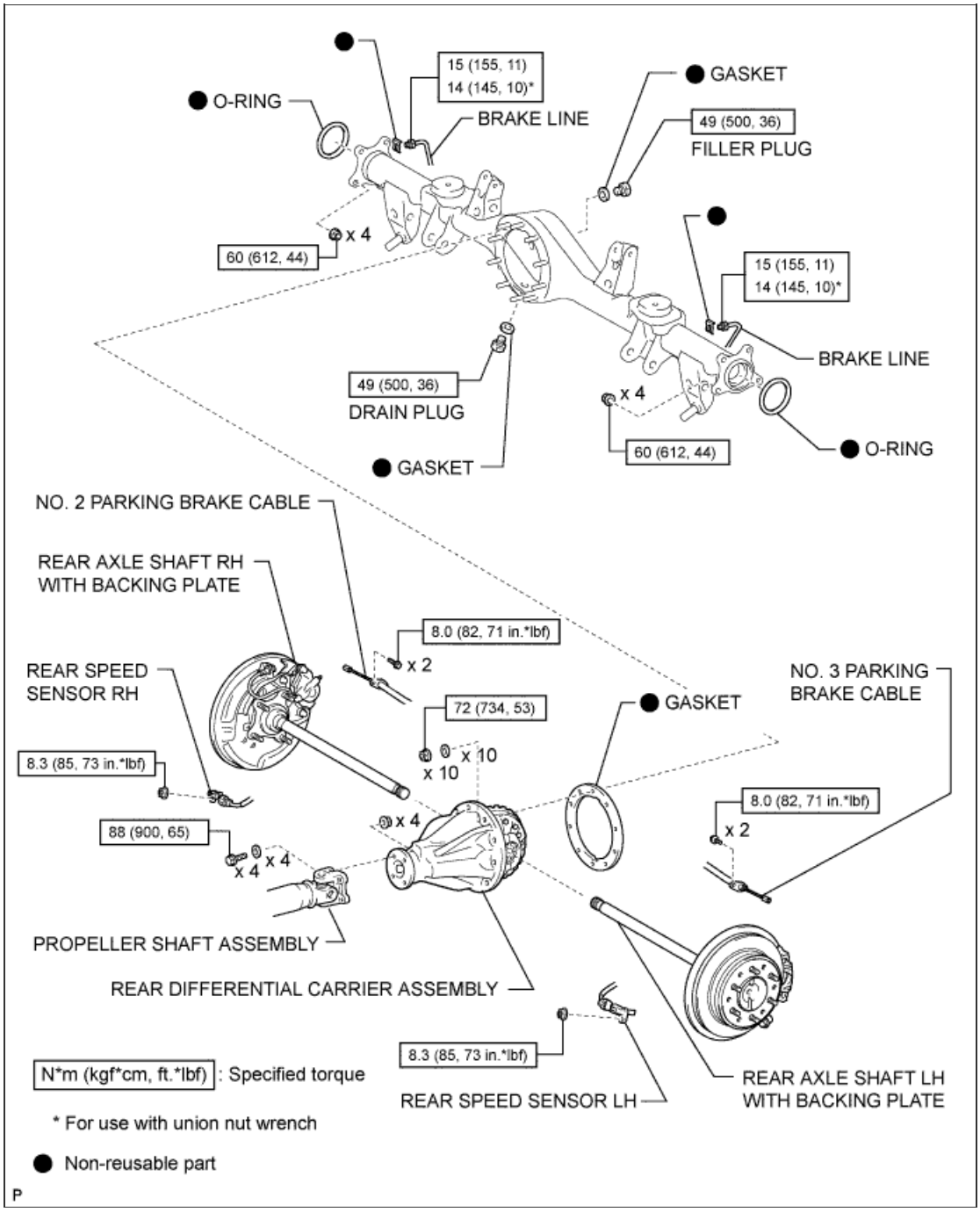
ii. Install the engine under cover.

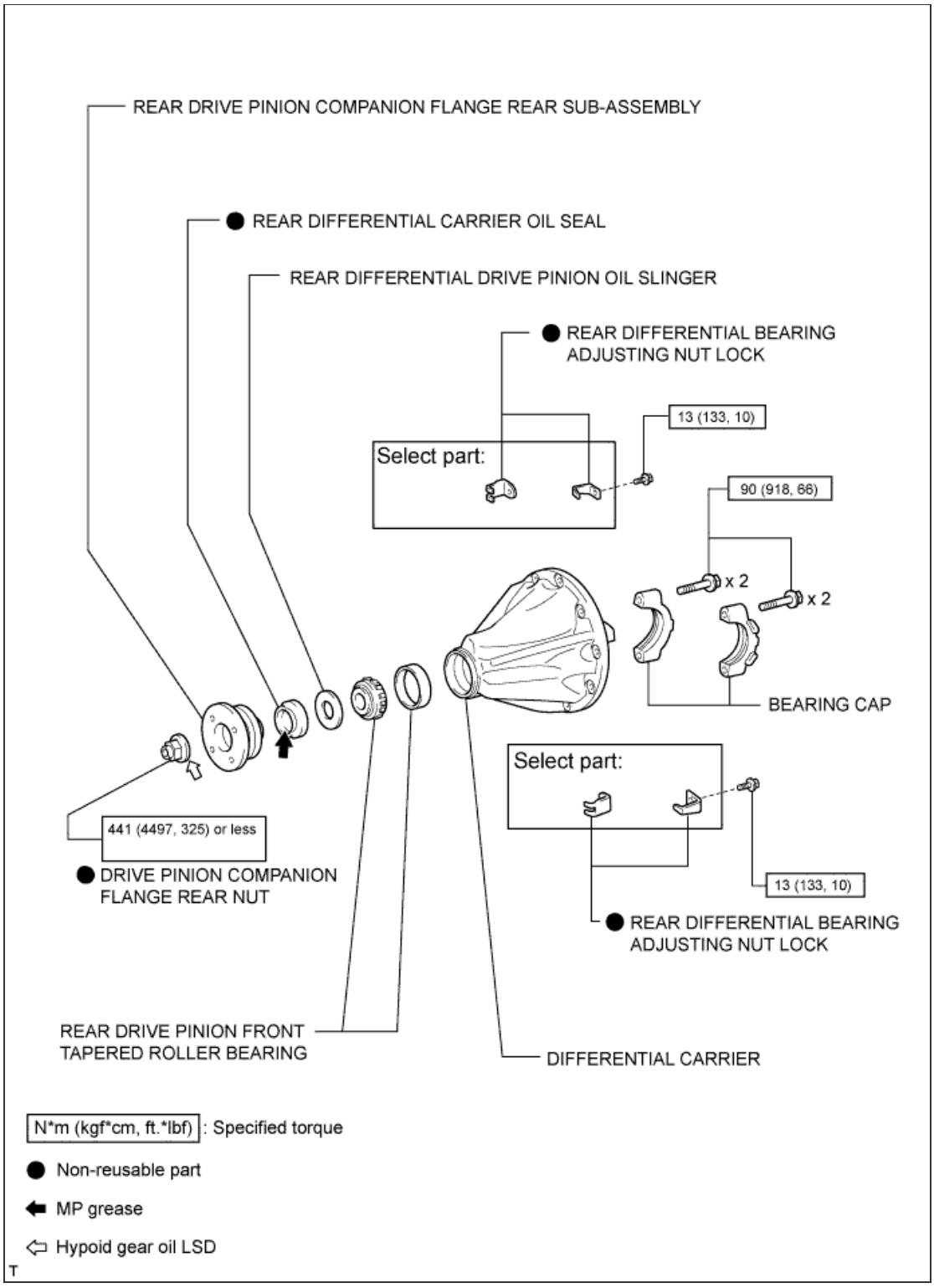
c. for Rear Differential:

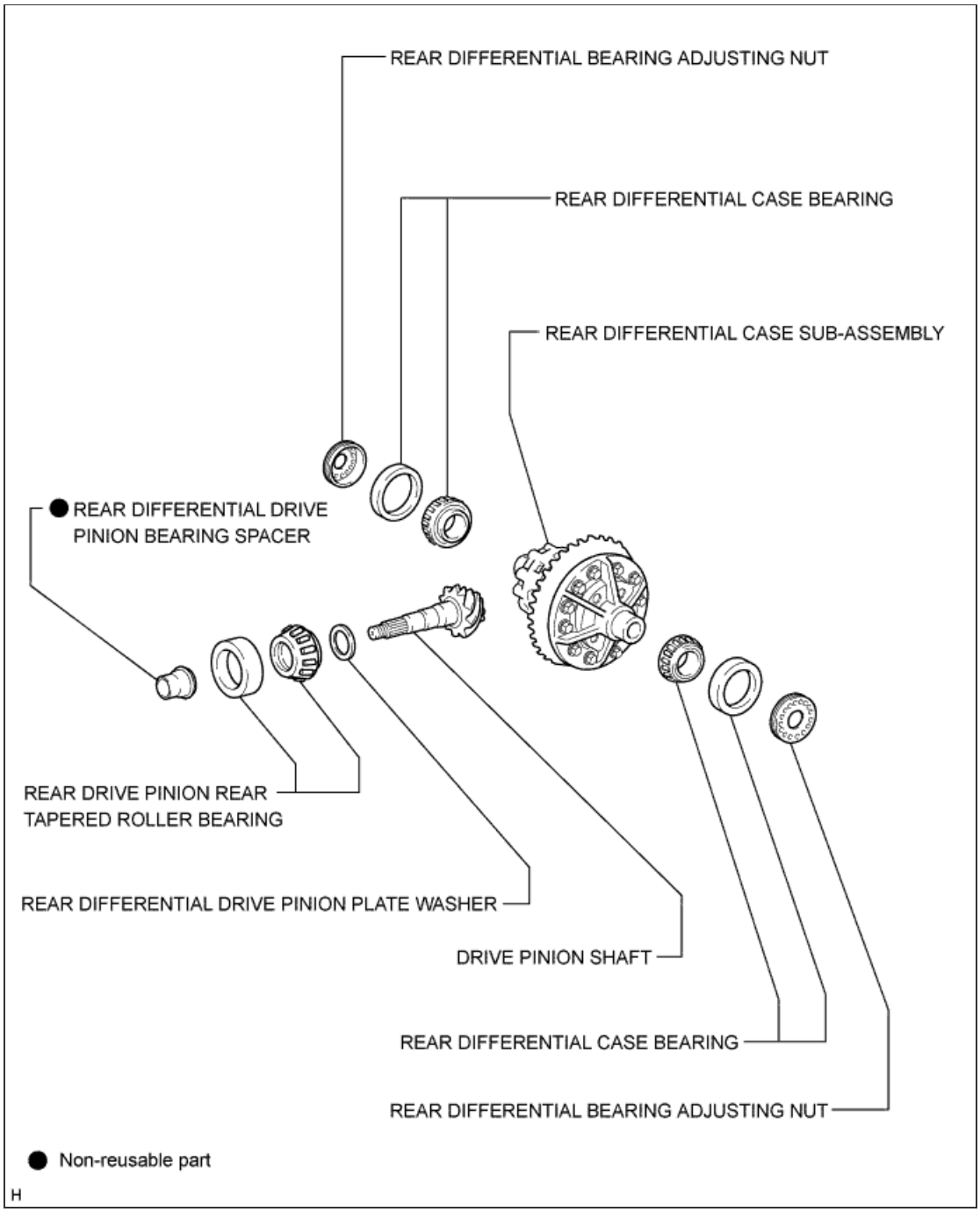
i. Install a new gasket and the filler plug.

Torque:
49 N*m{ 500 kgf*cm , 36 ft.*lbf }

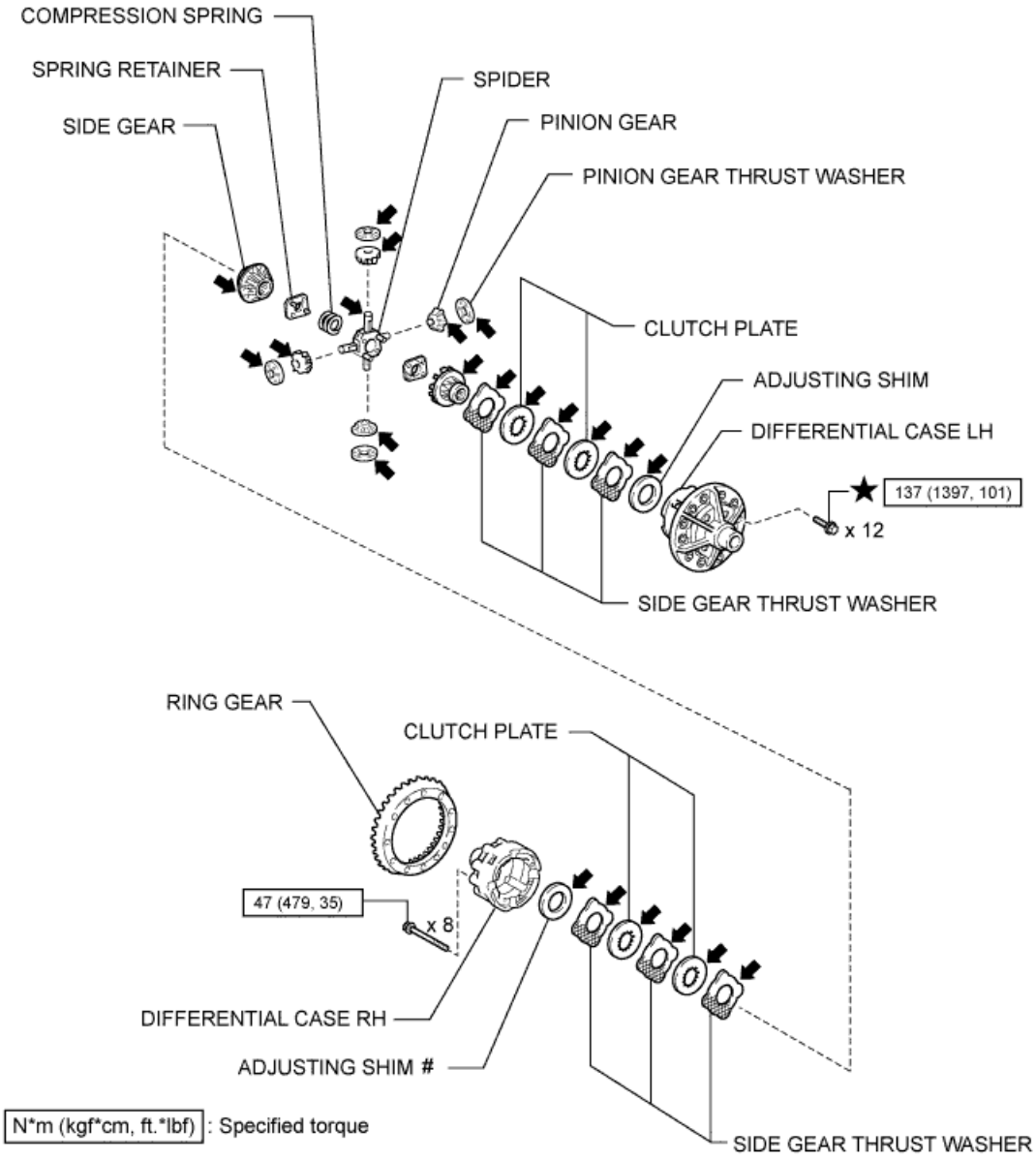
for Preparation Click here




REAR DRIVE PINION COMPANION FLANGE REAR SUB-ASSEMBLY
REAR DIFFERENTIAL CARRIER OIL SEAL
REAR DIFFERENTIAL DRIVE PINION OIL SLINGER
REAR DIFFERENTIAL BEARING ADJUSTING NUT LOCK
13 (133, 10)
Select part:
90 (918, 66)
x 2
x 2
BEARING CAP
Select part:
441 (4497, 325) or less
DRIVE PINION COMPANION FLANGE REAR NUT
13 (133, 10)
REAR DIFFERENTIAL BEARING ADJUSTING NUT LOCK
REAR DRIVE PINION FRONT TAPERED ROLLER BEARING
DIFFERENTIAL CARRIER
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
MP grease
Hypoid gear oil LSD
T


REAR DIFFERENTIAL BEARING ADJUSTING NUT
REAR DIFFERENTIAL CASE BEARING
REAR DIFFERENTIAL CASE SUB-ASSEMBLY
● REAR DIFFERENTIAL DRIVE PINION BEARING SPACER
REAR DRIVE PINION REAR TAPERED ROLLER BEARING
REAR DIFFERENTIAL DRIVE PINION PLATE WASHER
DRIVE PINION SHAFT
REAR DIFFERENTIAL CASE BEARING
REAR DIFFERENTIAL BEARING ADJUSTING NUT
● Non-reusable part
H

#: If the side gear backlash has been adjusted by TOYOTA dealer, adjusting shims are installed between the side gear



N*m (kgf*cm, ft.*lbf) : Specified torque

Hypoid gear oil LSD

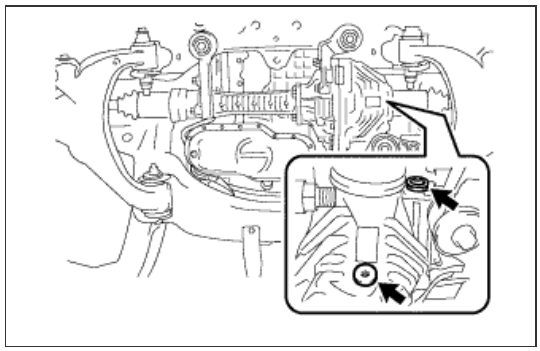
Precoated part

for Preparation Click here

1. DRAIN DIFFERENTIAL OIL

a. Stop the vehicle on a level place.

b. for Front Differential:



i. Remove the engine under cover.

ii. Using a 10 mm hexagon wrench, remove the filler plug and gasket.

iii. Using a 10 mm hexagon wrench, remove the drain plug and gasket, and drain the oil.

iv. Using a 10 mm hexagon wrench, install a new gasket and the drain plug.

Torque:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }

c. for Rear Differential:

i. Remove the filler plug and gasket.

ii. Remove the drain plug and gasket, and drain the oil.

iii. Install a new gasket and the drain plug.

Torque:
49 N*m{ 500 kgf*cm , 36 ft.*lbf }

2. REMOVE REAR AXLE SHAFT

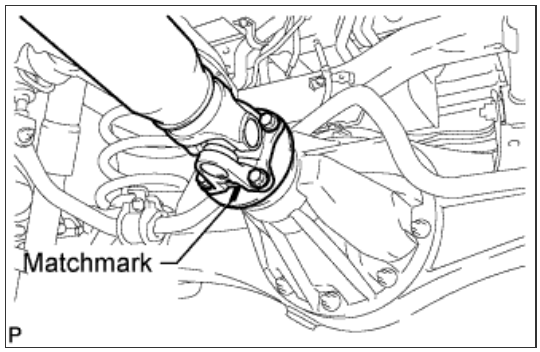
a. Remove the axle shaft (Click here).

3. DISCONNECT PROPELLER SHAFT ASSEMBLY

a. Place matchmarks on the rear propeller shaft and companion flange.

b. Remove the 4 nuts, 4 washers and 4 bolts, and disconnect the propeller shaft from the differential side.

c. Support the propeller shaft securely.



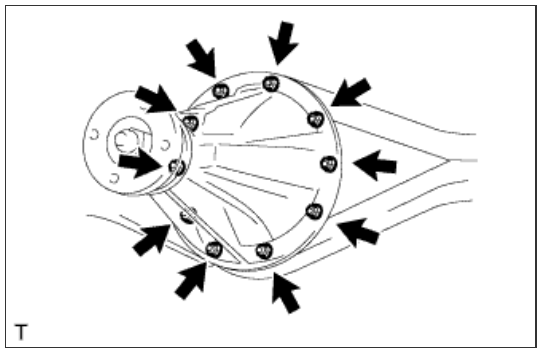
4. REMOVE REAR DIFFERENTIAL CARRIER SUB-ASSEMBLY

a. Remove the 10 nuts, 10 washers and differential carrier.

NOTICE:

Be careful not to damage the contact surfaces of the differential carrier and rear axle housing.

b. Remove the gasket.



for Preparation Click here

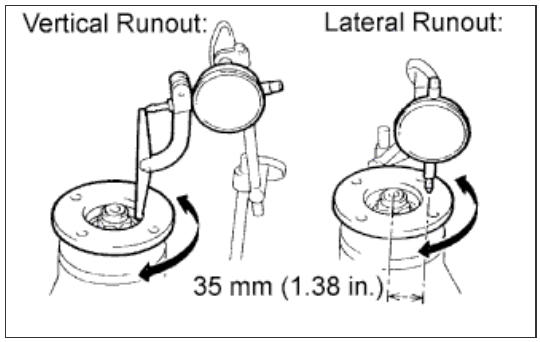
1. INSPECT RUNOUT OF REAR DRIVE PINION COMPANION FLANGE

a. Using a dial indicator, measure the runout of the companion flange vertically and laterally.

Maximum Runout:

Runout	Specified Condition
Vertical runout	0.10 mm (0.00394 in.)
Lateral runout	0.10 mm (0.00394 in.)

If the runout is more than the maximum, replace the companion flange.

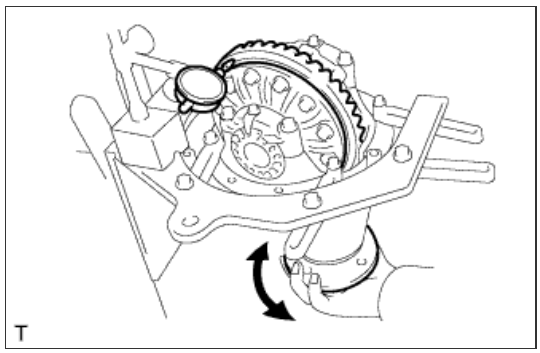


2. INSPECT RUNOUT OF DIFFERENTIAL RING GEAR

a. Using a dial indicator, measure the ring gear runout.

Maximum runout:
0.05 mm (0.00197 in.)

If the runout is more than the maximum, replace the ring gear.



3. INSPECT DIFFERENTIAL RING GEAR BACKLASH

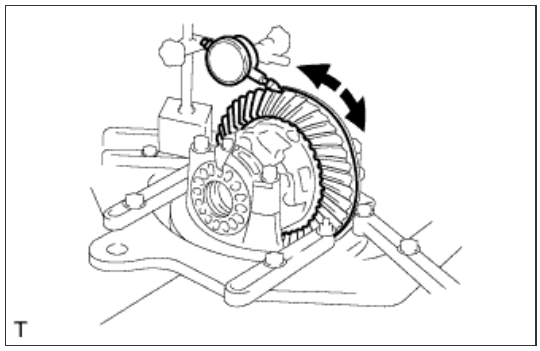
a. Using a dial indicator, measure the ring gear backlash.

Standard backlash:
0.10 to 0.20 mm (0.00394 to 0.00787 in.)

HINT:

Measure at 3 or more positions around the circumference of the ring gear.

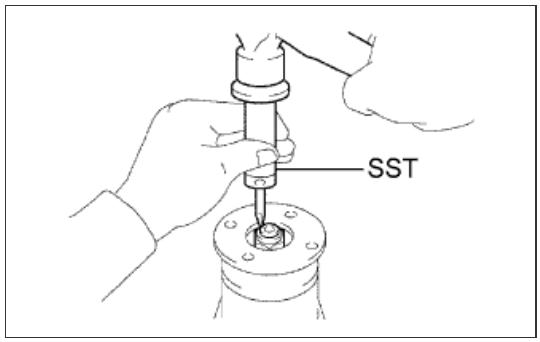
If the backlash is not as specified, adjust the side bearing preload or repair as necessary.



4. REMOVE DRIVE PINION COMPANION FLANGE REAR NUT

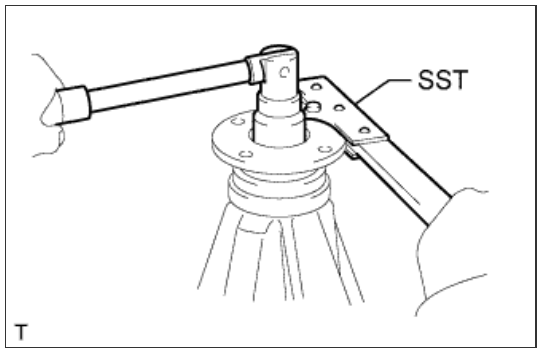
a. Using SST and a hammer, unstake the nut.

SST
09930-00010



b. Using SST to hold the flange, remove the nut.

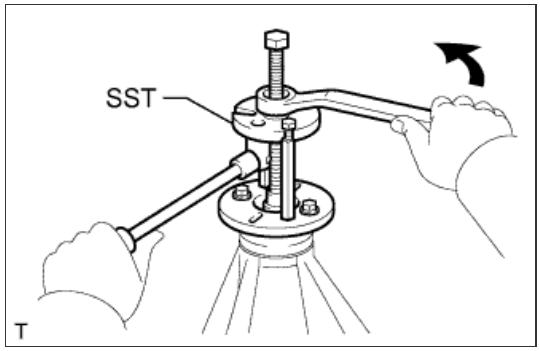
SST
09330-00021 (09330-00030)



5. REMOVE REAR DRIVE PINION REAR COMPANION FLANGE SUB-ASSEMBLY

a. Using SST, remove the companion flange.

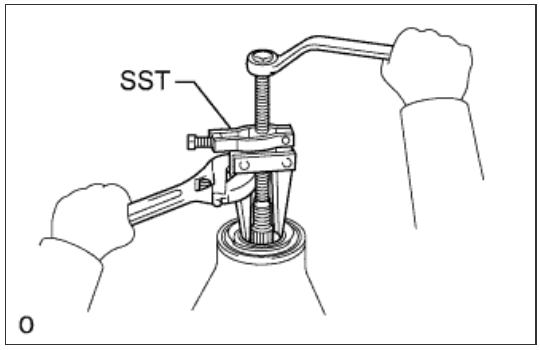
SST
09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03040)



6. REMOVE REAR DIFFERENTIAL CARRIER OIL SEAL

a. Using SST, remove the oil seal from the differential carrier.

SST
09308-10010



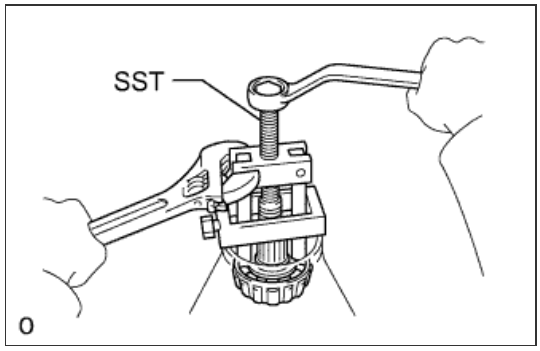
7. REMOVE REAR DIFFERENTIAL DRIVE PINION OIL SLINGER

8. REMOVE REAR DRIVE PINION FRONT TAPERED ROLLER BEARING

a. Using SST, remove the front bearing (inner race) from the drive pinion.

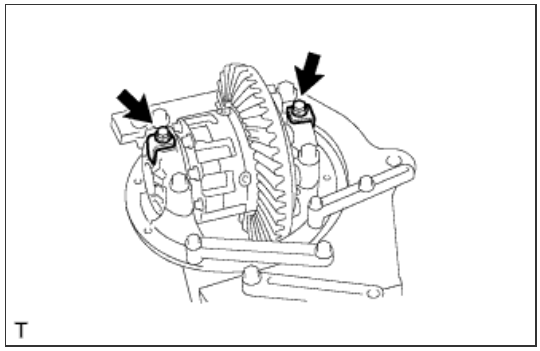
SST
09556-22010

If the front bearing is damaged or worn, replace the bearing.



9. REMOVE REAR DIFFERENTIAL BEARING ADJUSTING NUT LOCK

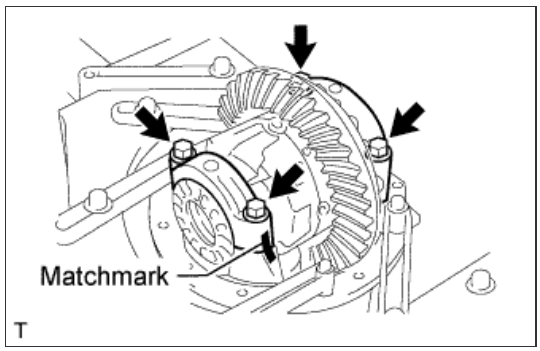
a. Remove the 2 bolts and 2 adjusting nut locks.



10. REMOVE DIFFERENTIAL CASE ASSEMBLY

a. Place matchmarks on the bearing caps and differential carrier.

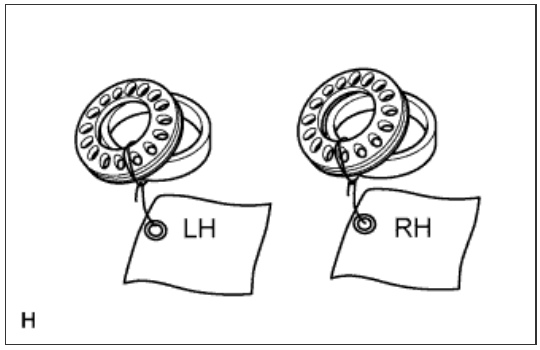
b. Remove the 4 bolts, 2 bearing caps, 2 adjusting nuts and 2 bearings (outer race).



c. Remove the differential case from the differential carrier.

HINT:

Tag the 2 case bearing outer races to show the location for reassembly.



11. REMOVE DIFFERENTIAL DRIVE PINION

a. Remove the differential drive pinion from the differential carrier.

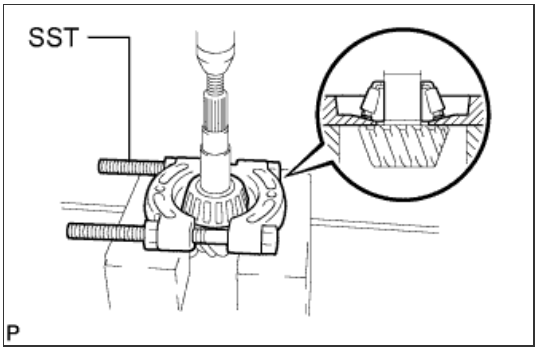
12. REMOVE REAR DIFFERENTIAL DRIVE PINION BEARING SPACER

13. REMOVE REAR DRIVE PINION REAR TAPERED ROLLER BEARING

a. Using SST and a press, press out the bearing (inner race).

SST
09950-00020

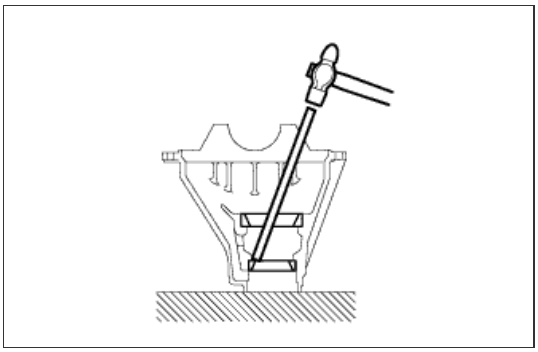
If either the drive pinion or ring gear is damaged, replace them as a set.



14. REMOVE REAR DIFFERENTIAL DRIVE PINION PLATE WASHER

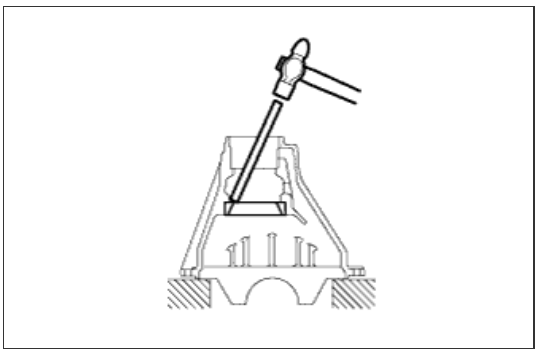
15. REMOVE REAR DRIVE PINION FRONT TAPERED ROLLER BEARING

a. Using a brass bar and hammer, tap out the bearing (outer race).



16. REMOVE REAR DRIVE PINION REAR TAPERED ROLLER BEARING

a. Using a brass bar and hammer, tap out the bearing (outer race).

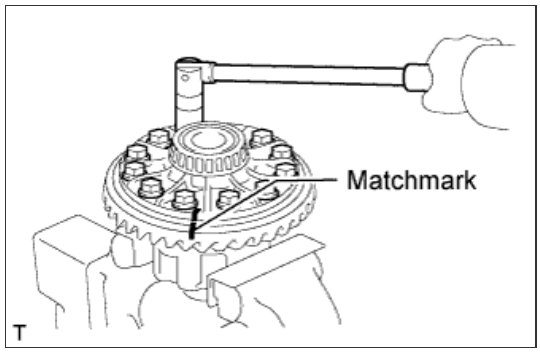


17. REMOVE DIFFERENTIAL RING GEAR

a. Place matchmarks on the ring gear and differential case.

b. Remove the 12 ring gear set bolts.

c. Using a plastic-faced hammer, tap on the ring gear to separate it from the differential case.



18. INSPECT RUNOUT OF DIFFERENTIAL CASE

HINT:

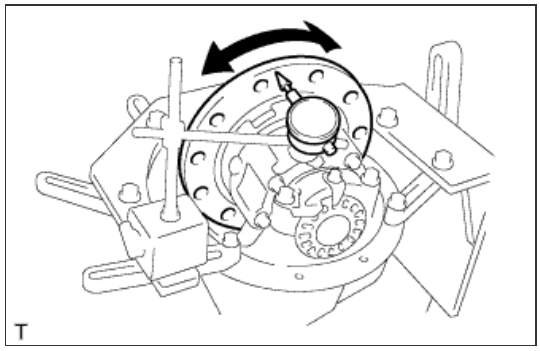
If the ring gear runout is at the maximum or less (refer to the "Inspect Runout of Differential Ring Gear" procedure), this inspection is not necessary.

a. Install the differential case to the differential carrier.

b. Using a dial indicator, measure the differential case runout.

Maximum runout:
0.04 mm (0.00157 in.)

If the runout is more than the maximum, replace the differential case and side bearings as a set.

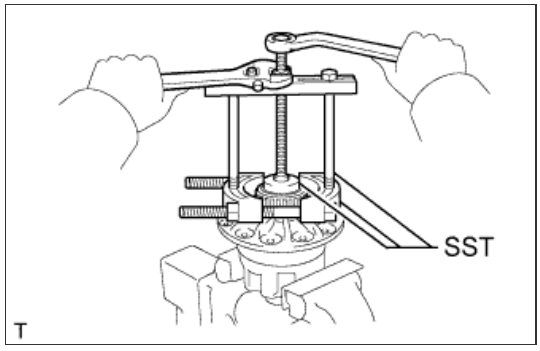


c. Remove the differential case from the differential carrier.

19. REMOVE REAR DIFFERENTIAL CASE BEARING

a. Using SST, remove the 2 side bearings (inner race) from the differential case.

SST
09950-00020
09950-00030
09950-40011 (09957-04010)
09950-60010 (09951-00480)



20. DISASSEMBLE DIFFERENTIAL CASE

a. Place matchmarks on the differential case LH and RH.

b. Remove the 8 bolts uniformly, a little at a time.

c. Using a plastic-faced hammer, separate the differential case LH and RH.

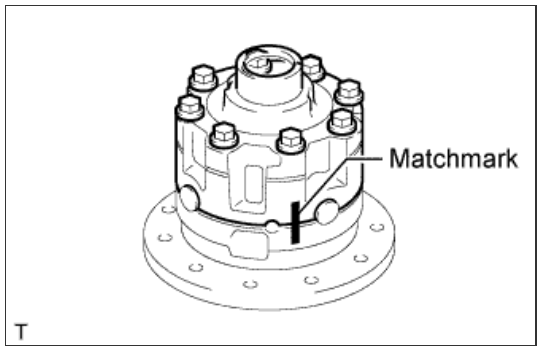
d. Remove the 2 side gears, 6 side gear thrust washers, 4 clutch plates, 2 spring retainers, compression spring, 4 pinion gears, 4 pinion gear thrust washers and spider from the differential case.

HINT:

- **Keep the disassembled parts in order.**

- **If the side gear backlash has been adjusted by a TOYOTA dealer, adjusting shims are installed between the side gear thrust washer and the differential case.**

If replacing a side gear, also replace the thrust washer that contacts it.



21. INSPECT REAR DIFFERENTIAL SIDE GEAR THRUST WASHER

HINT:

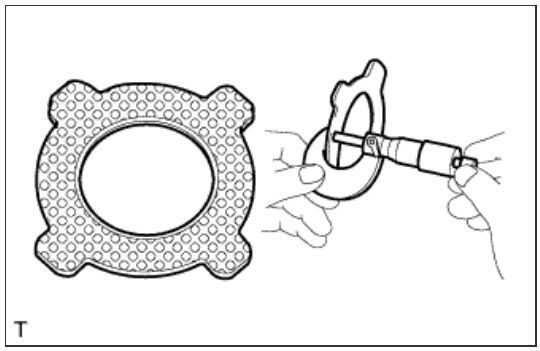
If replacing the thrust washer, also replace the clutch plate that contacts it.

a. Using a micrometer, check that the thickness of the thrust washer is even.

Thickness (Reference):
1.97 to 2.06 mm (0.0776 to 0.0811 in.)

If necessary, replace the thrust washer.

b. Visually check the thrust washer.
If bare metal is showing, replace the thrust washer.

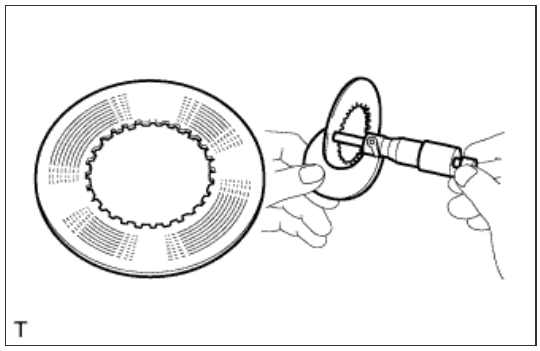


22. INSPECT CLUTCH PLATE

a. Using a micrometer, check that the thickness of the clutch plate is even.

Thickness (Reference):
1.97 to 2.03 mm (0.0776 to 0.0799 in.)

If necessary, replace the clutch plate.

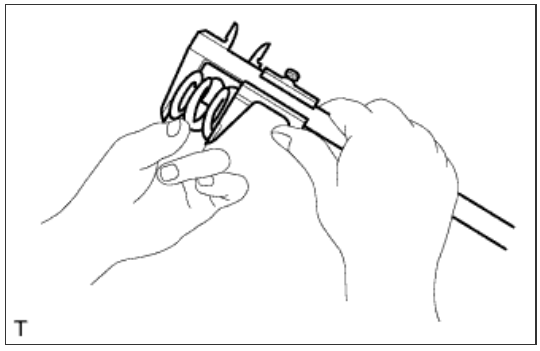


23. INSPECT COMPRESSION SPRING

a. Using vernier caliper, measure the free length of the spring.

Length (Reference):
32.8 mm (1.29134 in.)

If necessary, replace the compression spring.



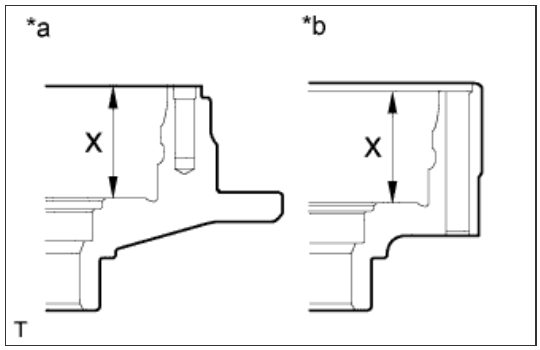
for Preparation Click here

1. INSPECT AND ADJUST ADJUSTING SHIM

a. Measure the differential case LH and RH dimensions labeled X shown in the illustration.

Text in Illustration

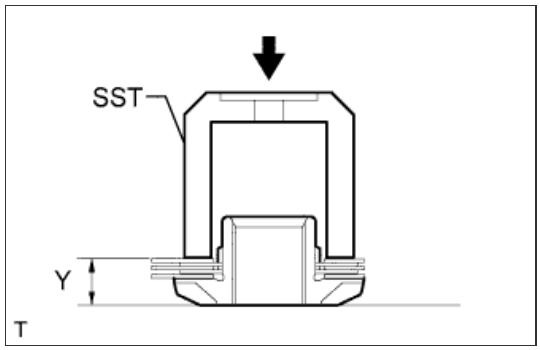
*a	RH
*b	LH



b. Install the 3 thrust washers and 2 clutch plates to the side gear.

c. Using SST to press down the thrust washers and clutch plates with a force of approximately 98 N (10 kgf, 22 lbf), measure dimension "Y" shown in the illustration.

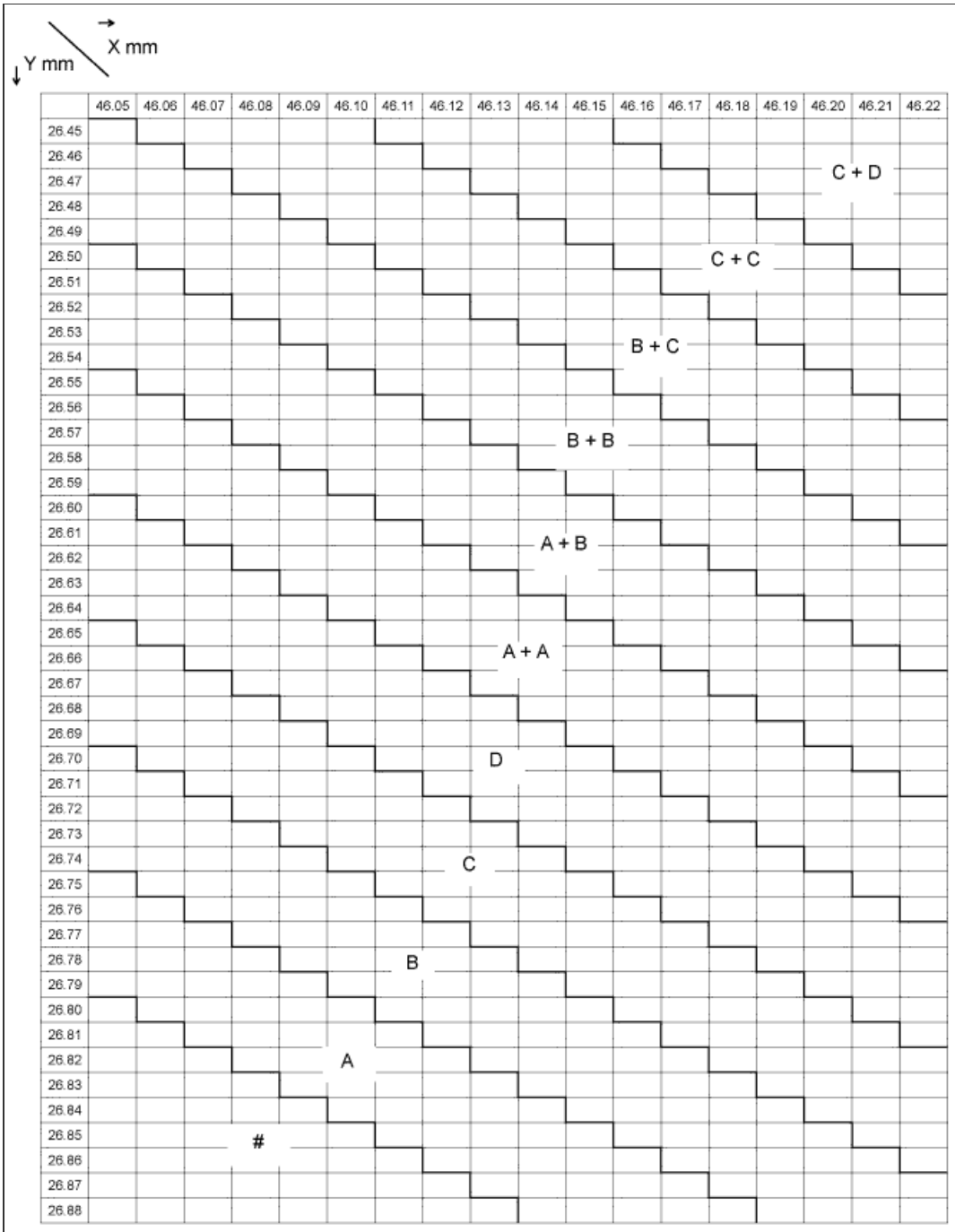
SST
09649-17010



d. Referring to the following table, select the proper adjusting shim.

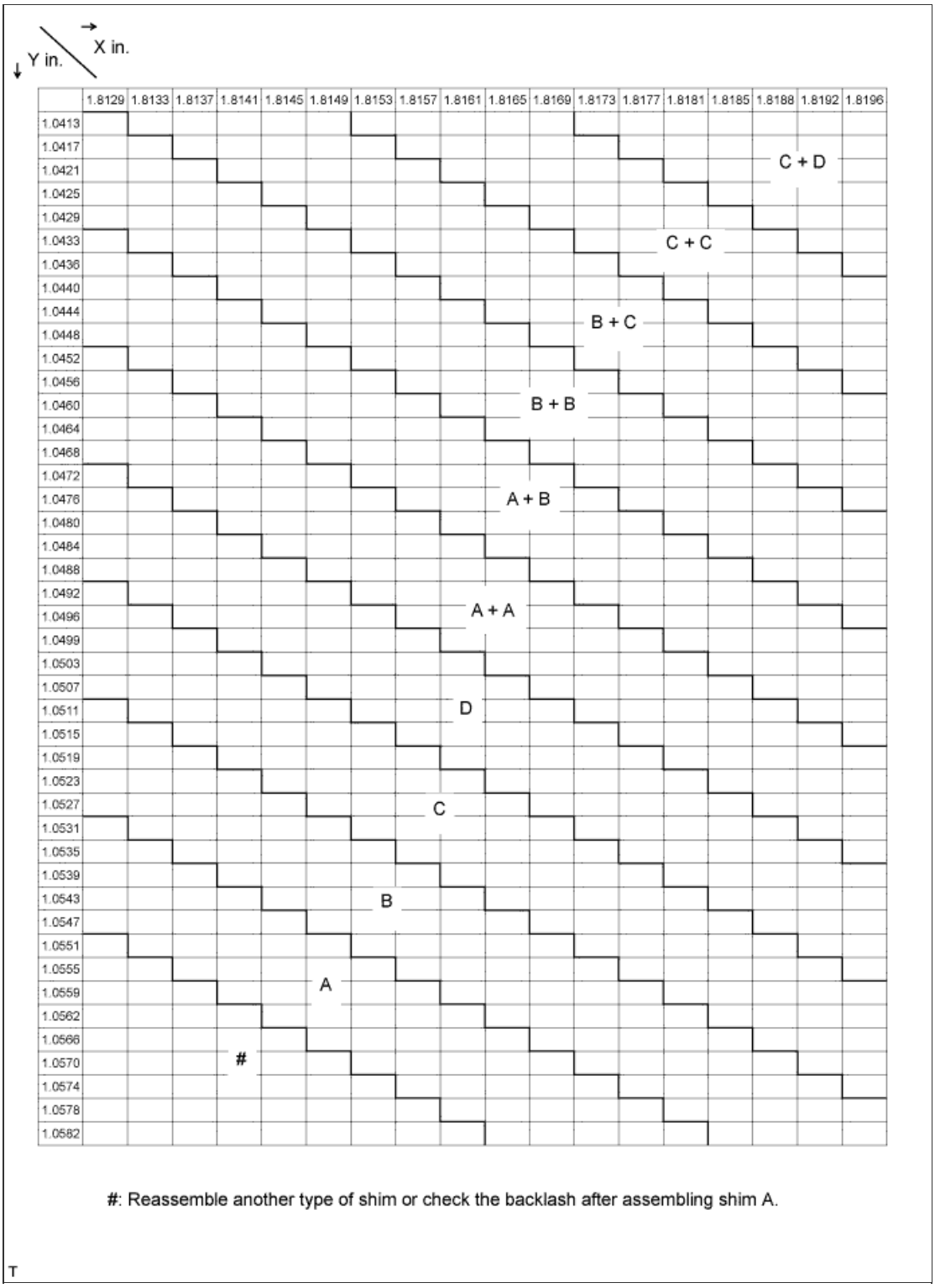
Standard Adjusting Shim Thickness:
Adjusting shim thickness = X - Y - 19.08 mm (0.751 in.)

Mark	Specified Condition
A	0.20 mm (0.00787 in.)
B	0.25 mm (0.00984 in.)
C	0.30 mm (0.0118 in.)
D	0.35 mm (0.0138 in.)



#: Reassemble another type of shim or check the backlash after assembling shim A.

T



T

2. INSPECT REAR DIFFERENTIAL SIDE GEAR

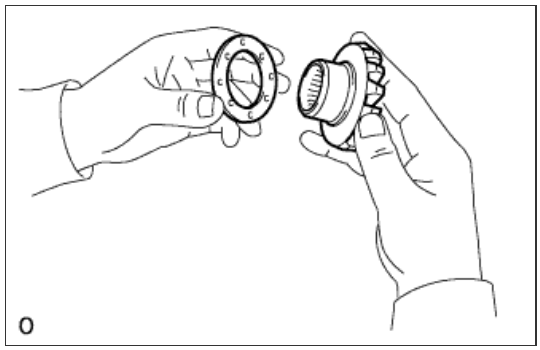
a. Install the thrust washers, clutch plates and adjusting shim to the side gear.

HINT:

When installing the adjusting shim, make sure the surface with no oil groove faces the differential case side.

b. Install the side gear to the differential case.

c. Install the 4 pinion gears and thrust washers to the spider.

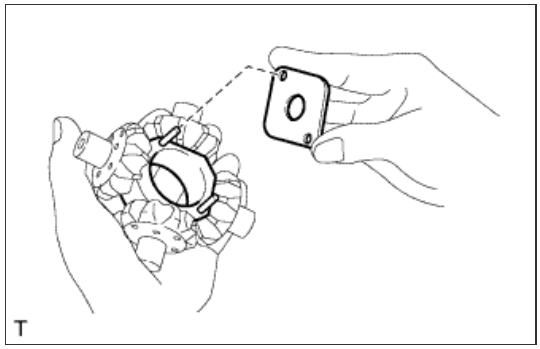


d. Align the spring retainer holes with the straight pins and install the retainer.

e. Install the spider assembly to the differential case.

HINT:

Install the spider to the differential case tightly and do not move the spring retainer.



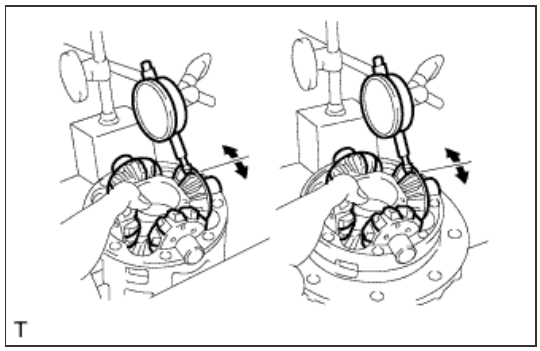
f. Using the dial indicator, measure the side gear backlash while holding the side gear and spider.

Standard backlash:
0.02 to 0.15 mm (0.000788 to 0.00590 in.)

HINT:

- **Measure at all 4 pinion gear locations.**
- **Measure the backlash at the differential case LH and RH.**
- **Apply hypoid gear oil LSD to each sliding surface and rotating part.**

If the backlash is not within the specification, replace the side gear thrust washers with washers of a different thickness.



3. ASSEMBLE DIFFERENTIAL CASE

a. Install the spider assembly to the differential case LH.

HINT:

Install the spider to the differential case LH tightly and do not move the spring retainer.

b. Install the compression spring and spring retainer RH.

c. Install the side gear assembly RH.

NOTICE:

- **Be careful not to drop the side gear.**
- **Check the pinion and side gear alignment.**

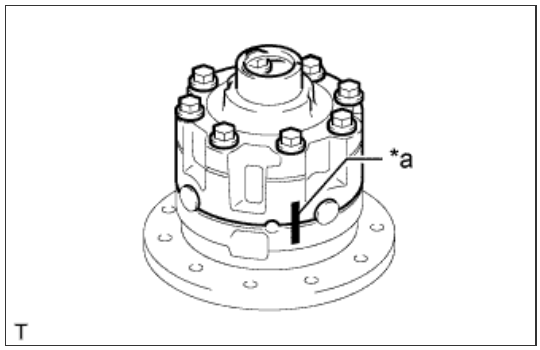
d. Align the matchmarks and assemble the differential case LH and RH.

Text in Illustration

*a	Matchmark

e. Install the 8 bolts and tighten them uniformly, a little at a time.

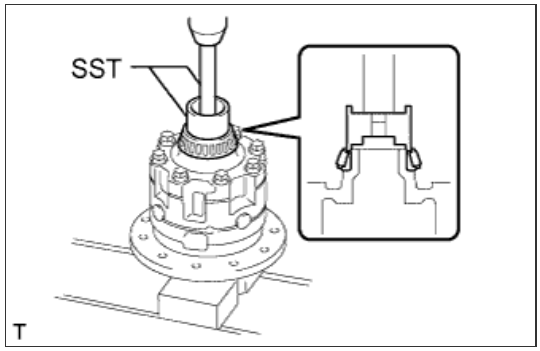
Torque:
47 N*m{ 479 kgf*cm , 35 ft.*lbf }



4. INSTALL REAR DIFFERENTIAL CASE BEARING

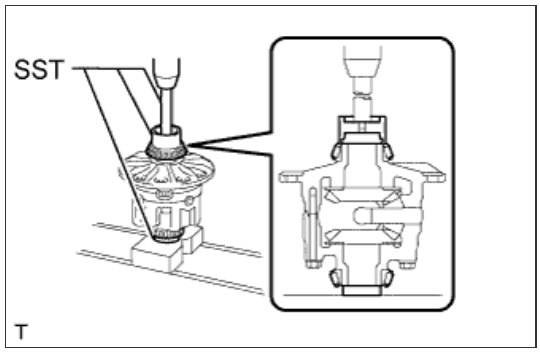
a. Using SST and a press, press the RH side bearing (inner race) into the differential case.

SST
09710-30050
09950-70010 (09951-07150)



b. Using SST and a press, press the LH side bearing (inner race) into the differential case.

SST
09710-30050
09950-60010 (09951-00480)
09950-70010 (09951-07150)



5. INSTALL DIFFERENTIAL RING GEAR

a. Clean the threads of the bolts and differential case with non-residue solvent.

b. Clean the contact surface of the differential case and ring gear.

c. Heat the ring gear to about 100°C (212°F) in boiling water.

d. Carefully take the ring gear out of the boiling water.

e. After the moisture on the ring gear has completely evaporated, quickly align the matchmarks on the ring gear and differential case and set the ring gear onto the differential case. Then temporarily install the 12 bolts so that the bolt holes in the ring gear and differential case are aligned.

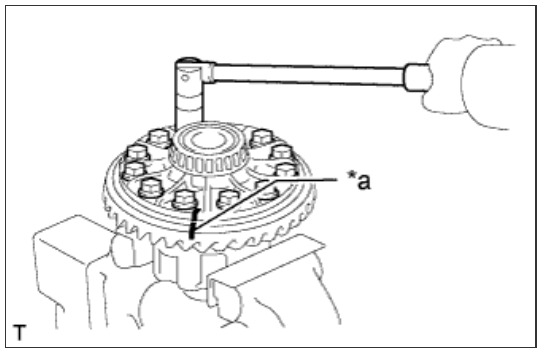
f. After the ring gear cools down sufficiently, remove the 12 bolts. Then apply thread lock adhesive to the 12 bolts and install them.

Text in Illustration

*a	Matchmark

Thread lock:
Toyota Genuine Adhesive 1360 K, Three Bond 1360 K or equivalent

Torque:
137 N*m{ 1397 kgf*cm , 101 ft.*lbf }



6. INSPECT DIFFERENTIAL RING GEAR RUNOUT

a. Place the bearing outer races on their respective bearings.

HINT:

Do not interchange the left and right outer races.

b. Install the assembled plate washers to the side bearing.

c. Install the differential case to the differential carrier.

HINT:

If it is difficult to install the differential case to the carrier, replace the plate washer with a thinner one. However, select a plate washer that allows no clearance between it and the carrier.

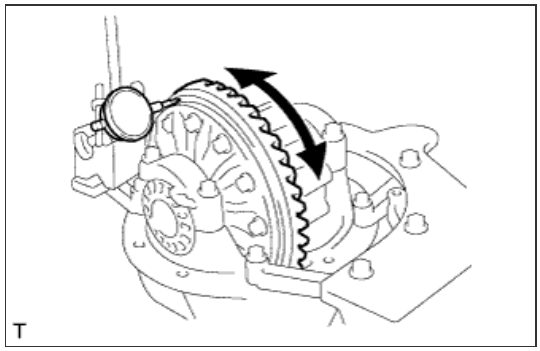
d. Align the matchmarks on the bearing caps and differential carrier.

e. Install and uniformly tighten the 4 bolts a little at a time.

f. Using a dial indicator, measure the ring gear runout.

Maximum runout:
0.05 mm (0.00197 in.)

If the runout is more than the maximum, replace the ring gear.

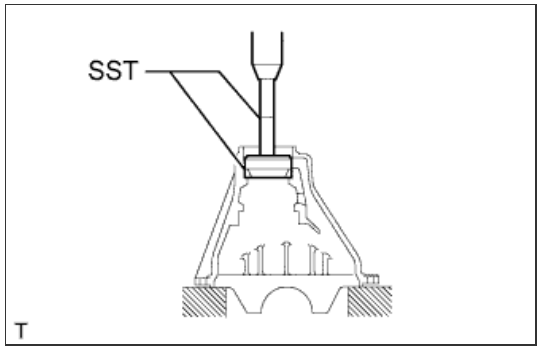


g. Remove the differential case.

7. INSTALL REAR DRIVE PINION FRONT TAPERED ROLLER BEARING

a. Using SST and a press, press in the bearing (outer race).

SST
09950-60020 (09951-00890)
09950-70010 (09951-07150)

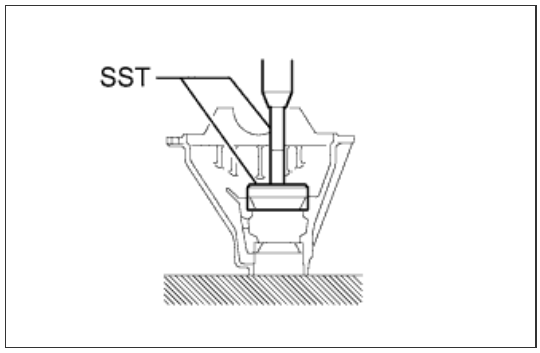


8. INSTALL REAR DRIVE PINION REAR TAPERED ROLLER BEARING

a. Using SST and a press, press in the bearing (outer race).

a. Using SST and a press, press in the bearing (outer race).

SST
09950-60020 (09951-00890)
09950-70010 (09951-07150)



9. INSTALL REAR DRIVE PINION REAR TAPERED ROLLER BEARING

a. Install the washer to the drive pinion.

HINT:

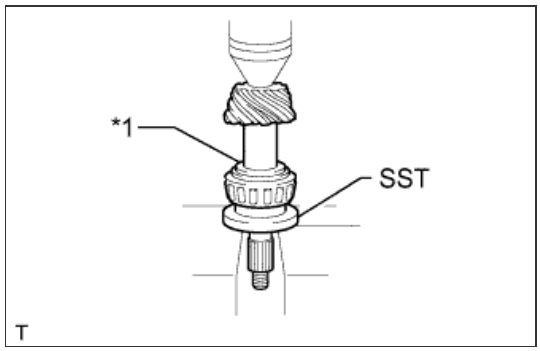
After installing the washer, check the tooth contact pattern. If necessary, replace the washer with one of a different thickness.

b. Using SST and a press, press the rear bearing (inner race) into the drive pinion.

SST
09506-35010

Text in Illustration

*1	Plate Washer

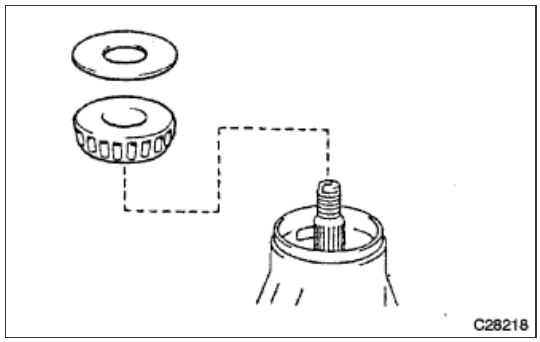


10. INSPECT DIFFERENTIAL DRIVE PINION PRELOAD

a. Install the drive pinion, front bearing (inner race) and oil slinger.

HINT:

Install the spacer and oil seal after adjusting the gear contact pattern.

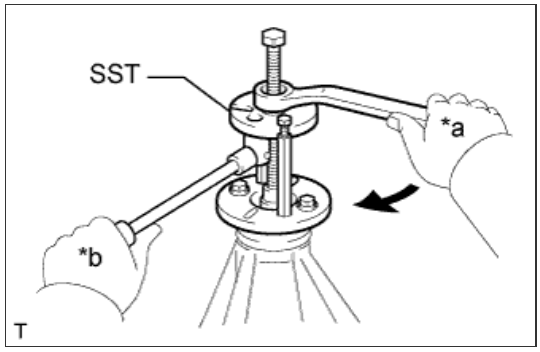


b. Using SST, install the companion flange.

SST
09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03040)

Text in Illustration

*a	Turn
*b	Hold



c. Using SST to hold the companion flange, install the nut.

SST

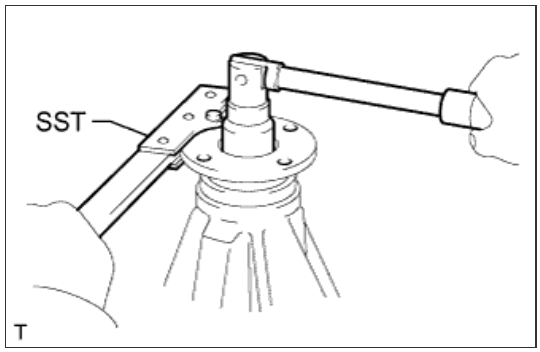
09330-00021 (09330-00030)

Torque:

441 N*m{ 4497 kgf*cm , 325 ft.*lbf } or less

NOTICE:

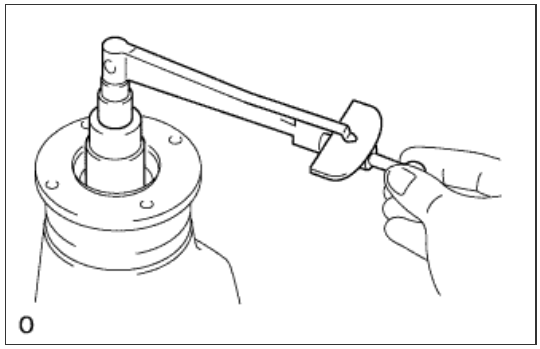
- **Apply hypoid gear oil LSD to the nut.**
- **As there is no spacer, tighten a little at a time, being careful not to overtighten it.**



d. Using a torque wrench, measure the preload.

Standard Preload (at Starting):

Bearing	Specified Condition
New	1.04 to 1.69 N*m (11 to 17 kgf*cm, 10 to 14 in.*lbf)
Reused	0.85 to 1.37 N*m (9 to 13 kgf*cm, 8 to 12 in.*lbf)



HINT:

Measure the total preload after turning the bearing clockwise and counterclockwise several times to make the bearing smooth.

11. INSTALL REAR DIFFERENTIAL CASE SUB-ASSEMBLY

a. Place the bearing outer races on their respective bearings.

HINT:

Do not interchange the left and right outer races.

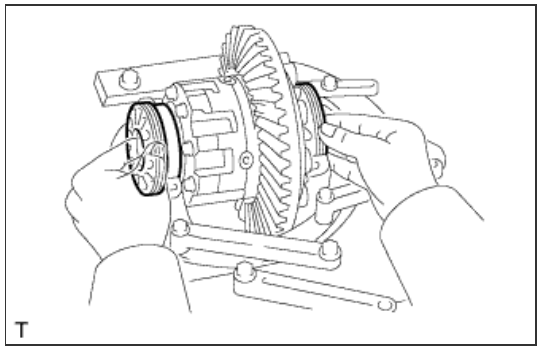
b. Install the differential case to the carrier.

HINT:

Make sure that there is backlash between the ring gear and drive pinion.

12. INSTALL REAR DIFFERENTIAL BEARING ADJUSTING NUT

a. Install the 2 adjusting nuts to the carrier, making sure the nuts are threaded properly.



13. INSPECT DIFFERENTIAL RING GEAR BACKLASH

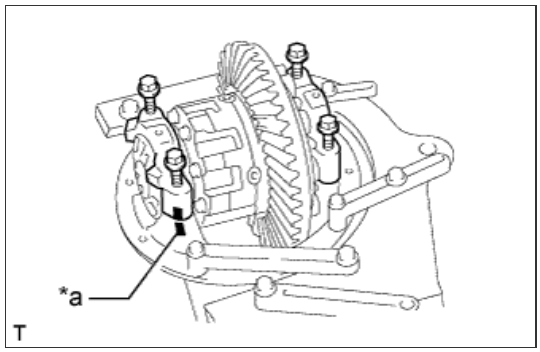
a. Align the matchmarks on the bearing caps and carrier. Screw in the 4 bearing cap bolts 2 or 3 turns and press down the bearing caps by hand.

Text in Illustration

*a Matchmark

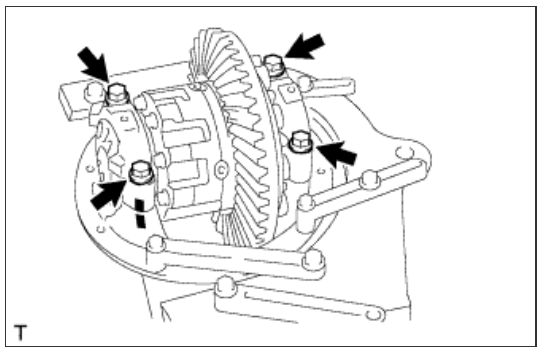
HINT:

If the bearing caps do not fit tightly on the carrier, the adjusting nuts are not engaged properly. Reinstall the adjusting nuts if necessary.



b. Tighten the 4 bolts.

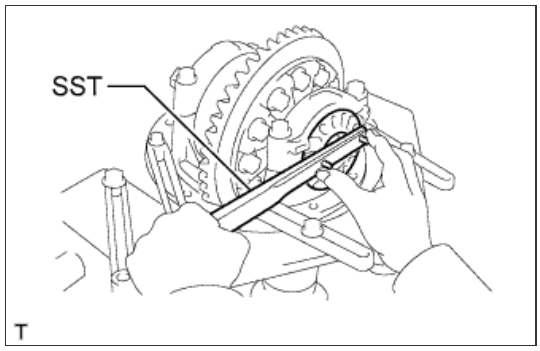
Torque:
90 N*m{ 918 kgf*cm , 66 ft.*lbf }



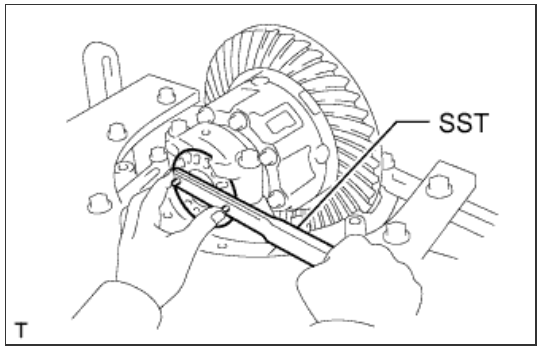
c. Loosen the 4 bolts to the point where the adjusting nuts can be turned by SST.

SST
09504-00011

d. Using SST, tighten the adjusting nut on the ring gear side until the ring gear has a backlash of about 0.2 mm (0.00787 in.).



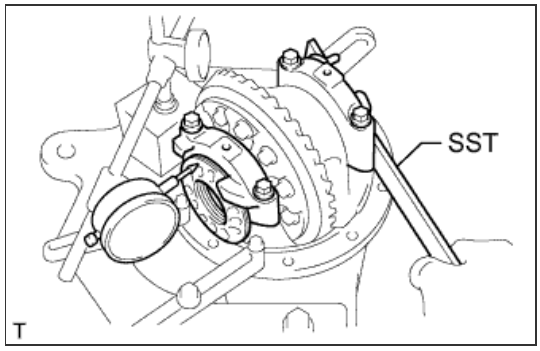
e. While turning the ring gear, use SST to tighten the adjusting nut on the drive pinion side. After the bearings are settled, loosen the adjusting nut on the drive pinion side.



f. Place a dial indicator on the top of the adjusting nut on the ring gear side.

SST
09504-00011

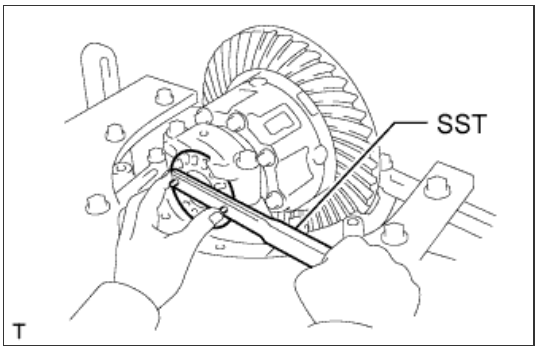
g. Adjust the side bearing to 0 preload by tightening the other adjusting nut until the pointer on the indicator begins to move.



h. Using SST, tighten the adjusting nut 1 to 1.5 notches from the 0 preload

position.

SST
09504-00011



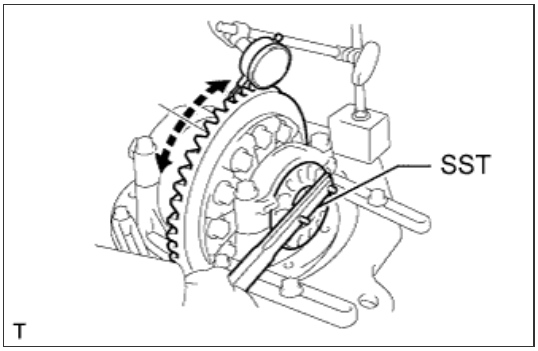
i. Using a dial indicator, adjust the ring gear backlash until it is within the specification.

SST
09504-00011

Standard backlash:
0.10 to 0.20 mm (0.00394 to 0.00787 in.)

HINT:

The backlash is adjusted by turning the left and right adjusting nuts by an equal amount. For example, loosen the nut on the left side 1 notch and tighten the nut on the right side 1 notch.



j. Tighten the 4 bearing cap bolts.

Torque:
90 N*m{ 918 kgf*cm , 66 ft.*lbf }

k. After rotating the ring gear 5 turns or more, recheck the ring gear backlash.

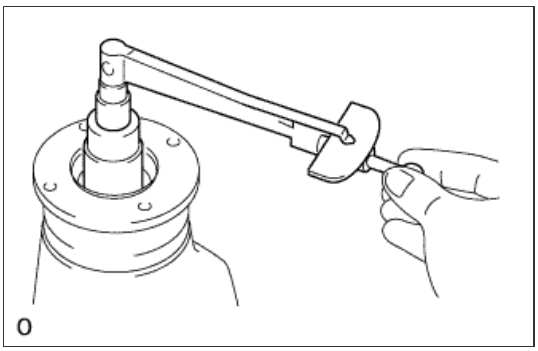
Standard backlash:
0.10 to 0.20 mm (0.00394 to 0.00787 in.)

14. INSPECT TOTAL PRELOAD

a. Using a torque wrench, measure the preload with the teeth of the drive pinion and ring gear in contact.

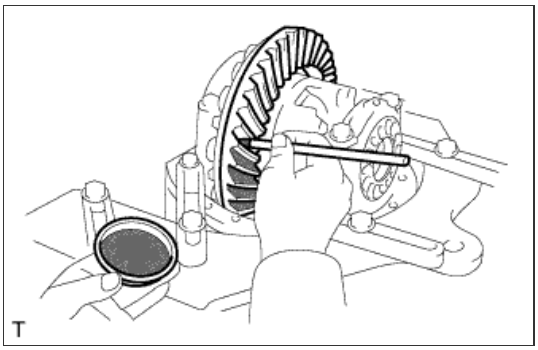
Standard Drive Pinion Preload (at Starting):

Bearing	Specified Condition
New	1.42 to 2.32 N*m (15 to 23 kgf*cm, 13 to 20 in.*lbf)
Reused	1.23 to 2.00 N*m (13 to 20 kgf*cm, 11 to 17 in.*lbf)

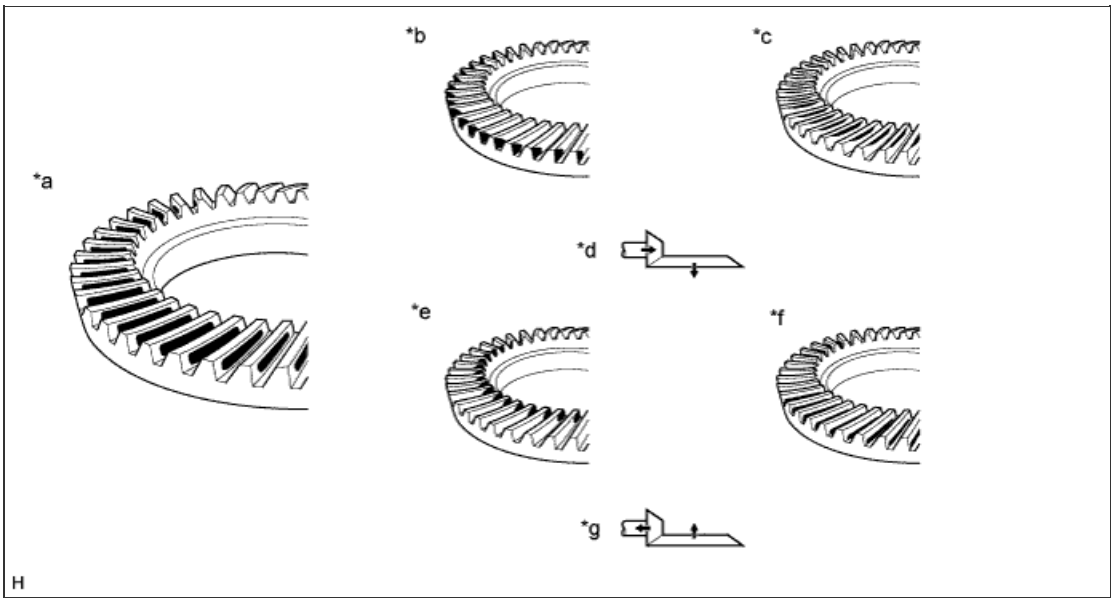


15. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

a. Coat 3 or 4 teeth at 3 different positions on the ring gear with Prussian blue.



b. Turn the companion flange in both directions to inspect the ring gear for proper tooth contact.



Text in Illustration

*a	Proper Contact	*b	Heel Contact
*c	Face Contact	*d	Select an adjusting washer that will shift the drive pinion closer to the ring gear (*b, *c)
*e	Toe Contact	*f	Flank Contact
*g	Select an adjusting washer that will shift the drive pinion away from the ring gear (*e, *f)	-	-

If the teeth are not contacting properly, use the following table to select a proper washer for correction.

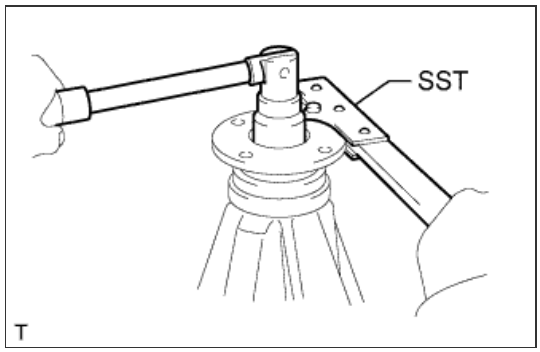
Standard Washer Thickness:

Specified Condition	Specified Condition
1.04 to 1.06 mm (0.0410 to 0.0417 in.)	1.315 to 1.335 mm (0.0518 to 0.0525 in.)
1.065 to 1.085 mm (0.0420 to 0.0427 in.)	1.34 to 1.36 mm (0.0528 to 0.0535 in.)
1.09 to 1.11 mm (0.0430 to 0.0437 in.)	1.365 to 1.385 mm (0.0538 to 0.0545 in.)
1.115 to 1.135 mm (0.0439 to 0.0446 in.)	1.39 to 1.41 mm (0.0548 to 0.0555 in.)
1.14 to 1.16 mm (0.0449 to 0.0456 in.)	1.415 to 1.435 mm (0.0557 to 0.0564 in.)
1.165 to 1.185 mm (0.0459 to 0.0466 in.)	1.44 to 1.46 mm (0.0567 to 0.0574 in.)
1.19 to 1.21 mm (0.0469 to 0.0476 in.)	1.465 to 1.485 mm (0.0577 to 0.0584 in.)
1.215 to 1.235 mm (0.04789 to 0.0486 in.)	1.49 to 1.51 mm (0.0587 to 0.0594 in.)
1.24 to 1.26 mm (0.0489 to 0.0496 in.)	1.515 to 1.535 mm (0.0597 to 0.0604 in.)
1.265 to 1.285 mm (0.0498 to 0.0505 in.)	1.54 to 1.56 mm (0.0607 to 0.0614 in.)
1.29 to 1.31 mm (0.0508 to 0.0515 in.)	-

16. REMOVE DRIVE PINION COMPANION FLANGE REAR NUT

a. Using SST to hold the flange, remove the nut.

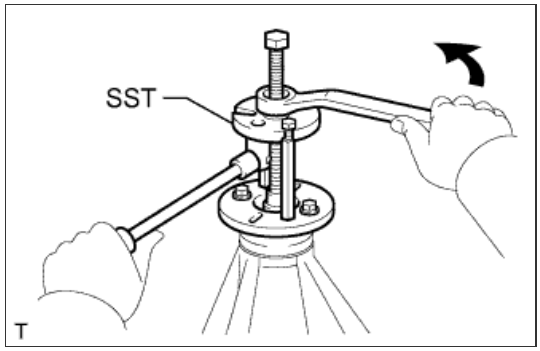
SST
09330-00021 (09330-00030)



17. REMOVE REAR DRIVE PINION COMPANION FLANGE REAR SUB-ASSEMBLY

a. Using SST, remove the companion flange.

SST
09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03040)



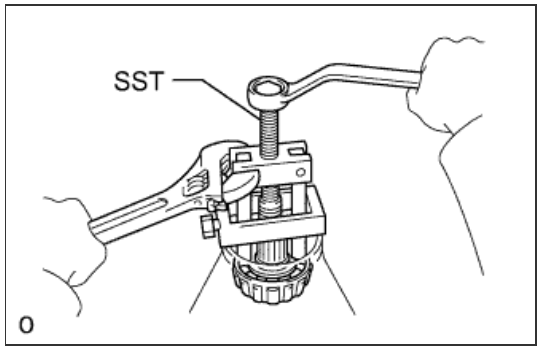
18. REMOVE REAR DIFFERENTIAL DRIVE PINION OIL SLINGER

19. REMOVE REAR DRIVE PINION FRONT TAPERED ROLLER BEARING

a. Using SST, remove the front bearing (inner race) from the drive pinion.

SST
09556-22010

If the front bearing is damaged or worn, replace the bearing.



20. INSTALL REAR DIFFERENTIAL DRIVE PINION BEARING SPACER

a. Install a new spacer to the drive pinion.

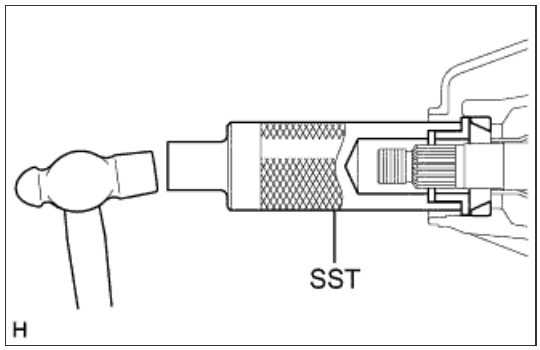
21. INSTALL REAR DRIVE PINION FRONT TAPERED ROLLER BEARING

a. Using SST and a hammer, tap in the bearing (outer race).

SST

09316-60011 (09316-00011, 09316-00021)

b. Install the bearing (inner race).



22. INSTALL REAR DIFFERENTIAL DRIVE PINION OIL SLINGER

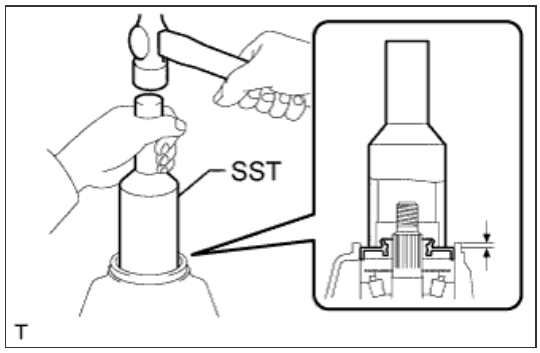
23. INSTALL REAR DIFFERENTIAL CARRIER OIL SEAL

a. Using SST and a hammer, tap in a new oil seal.

SST
09214-76011

Standard oil seal depth:
0.05 to 0.95 mm (0.00197 to 0.0374)

b. Coat the lip of the oil seal with MP grease.



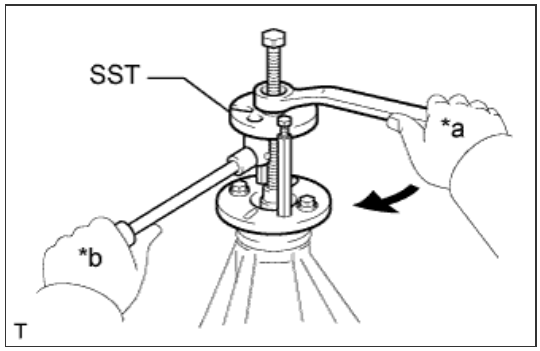
24. INSTALL REAR DRIVE PINION REAR COMPANION FLANGE SUB-ASSEMBLY

a. Using SST, install the companion flange.

SST
09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03040)

Text in Illustration

*a	Turn
*b	Hold



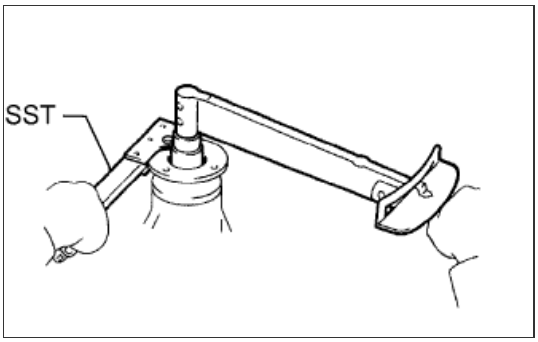
25. INSPECT DRIVE PINION PRELOAD

a. Coat the threads of a new nut with hypoid gear oil.

b. Using SST to hold the companion flange, install the nut by tightening it until the standard preload is reached.

SST
09330-00021 (09330-00030)

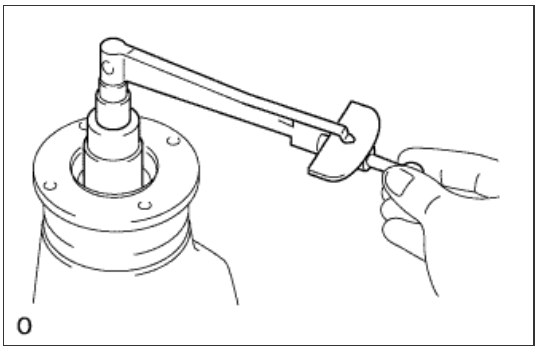
Torque:
441 N*m{ 4497 kgf*cm , 325 ft.*lbf } or less



c. Using a torque wrench, measure the preload.

Standard Preload (at Starting):

Bearing	Specified Condition
New	1.04 to 1.69 N*m (11 to 17 kgf*cm, 10 to 14 in.*lbf)
Reused	0.85 to 1.37 N*m (9 to 13 kgf*cm, 8 to 12 in.*lbf)

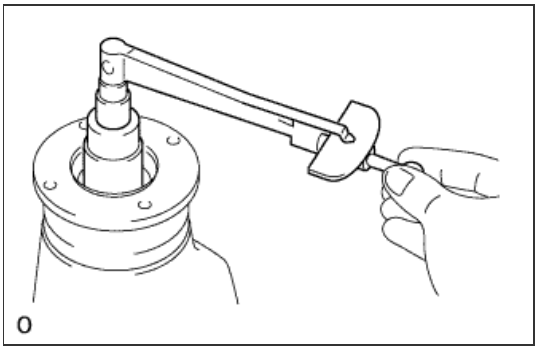


26. INSPECT TOTAL PRELOAD

a. Using a torque wrench, measure the preload with the teeth of the drive pinion and ring gear in contact.

Standard Drive Pinion Preload (at Starting):

Bearing	Specified Condition
New	1.42 to 2.32 N*m (15 to 23 kgf*cm, 13 to 20 in.*lbf)
Reused	1.23 to 2.00 N*m (13 to 20 kgf*cm, 11 to 17 in.*lbf)



27. INSPECT DIFFERENTIAL RING GEAR

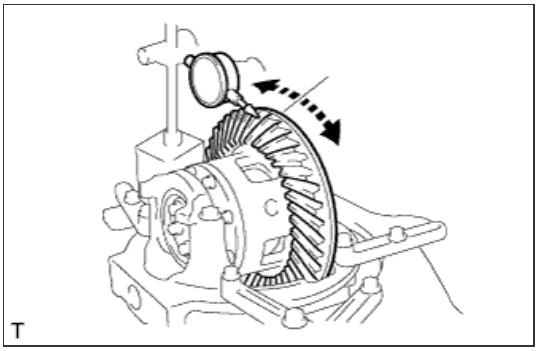
a. Using a dial indicator, measure the ring gear backlash.

Standard backlash:
0.10 to 0.20 mm (0.00394 to 0.00787 in.)

HINT:

Measure at 3 or more positions around the circumference of the ring gear.

If the backlash is not as specified, adjust the side bearing preload or repair as necessary.



28. INSPECT RUNOUT OF REAR DRIVE PINION COMPANION FLANGE REAR SUB-ASSEMBLY

a. Using a dial indicator, measure the runout of the companion flange vertically and laterally.

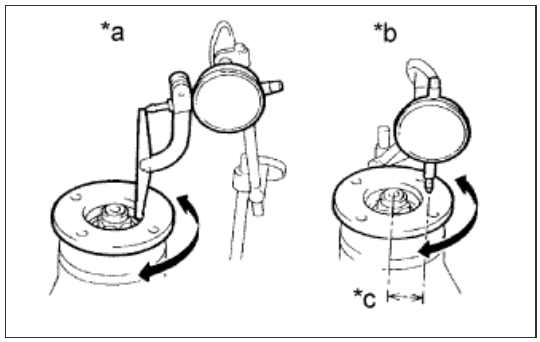
Maximum Runout:

Runout	Specified Condition
Vertical runout	0.10 mm (0.00394 in.)
Lateral runout	0.10 mm (0.00394 in.)

Text in Illustration

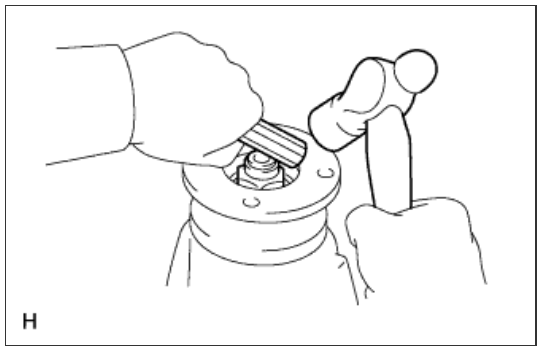
*a	Vertical Runout
*b	Lateral Runout
*c	35 mm (1.38 in.)

If the runout is more than the maximum, replace the companion flange.



29. STAKE DRIVE PINION COMPANION FLANGE REAR NUT

a. Using a chisel and hammer, stake the nut.

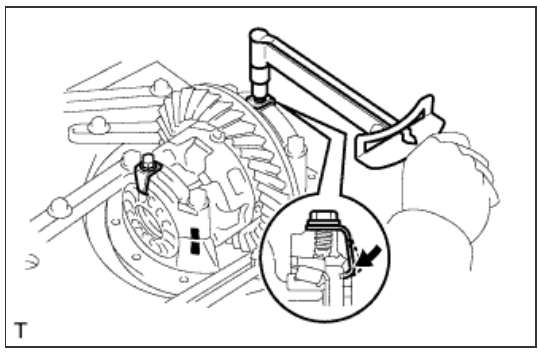


30. INSTALL REAR DIFFERENTIAL BEARING ADJUSTING NUT LOCK

a. Install 2 new nut locks to the bearing caps.

b. Install the 2 bolts, and bend the nut locks.

Torque:
13 N*m{ 133 kgf*cm , 10 ft.*lbf }



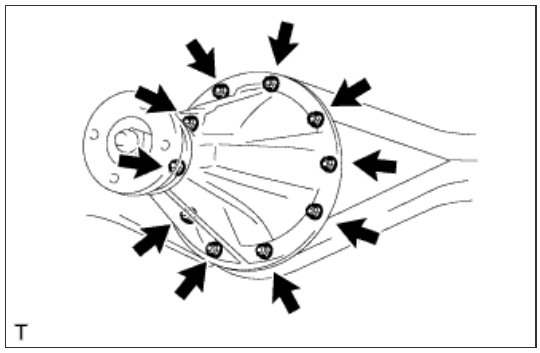
for Preparation Click here

1. INSTALL REAR DIFFERENTIAL CARRIER ASSEMBLY

a. Install a new gasket.

b. Install the differential carrier with the 10 washers and 10 nuts.

Torque:
72 N*m{ 734 kgf*cm , 53 ft.*lbf }



2. CONNECT PROPELLER SHAFT ASSEMBLY

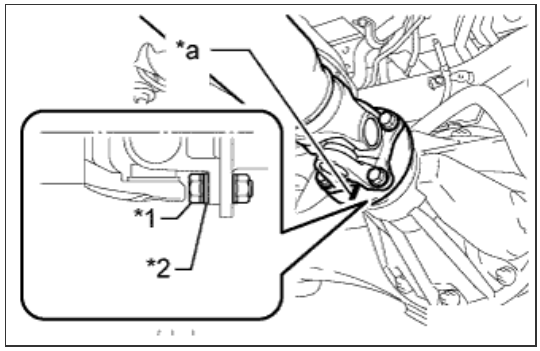
a. Align the matchmarks on the yoke and differential flange.

Text in Illustration

*1	Bolt
*2	Washer
*a	Matchmark

b. Connect the propeller shaft with the 4 bolts, 4 washers and 4 nuts.

Torque:
88 N*m{ 900 kgf*cm , 65 ft.*lbf }



3. INSTALL REAR AXLE SHAFT

a. Install the axle shaft (Click here).

4. ADD DIFFERENTIAL OIL

a. Add differential oil so that the oil level is between 0 to 5 mm (0 to 0.197 in.) from the bottom lip of the differential filler plug hole.

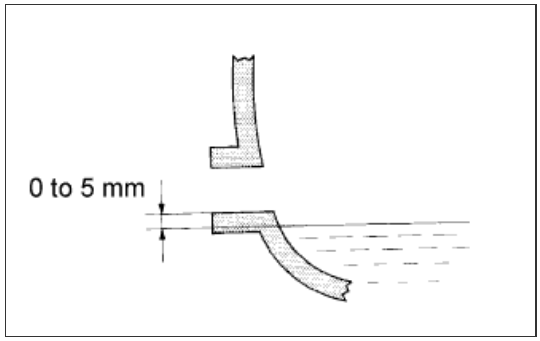
NOTICE:

- **Too much or too little oil will lead to differential problems.**
- **After changing the oil, drive the vehicle and then check the oil level again.**

Front differential oil type and viscosity:
Toyota Genuine Differential gear oil LT 75W-85 GL-5 or equivalent

Rear Differential Oil Type and Viscosity:

Item	Oil Type and Viscosity
w/o LSD	Toyota Genuine Differential gear oil LT 75W-85 GL-5 or equivalent



w/ LSD	Toyota Genuine Differential gear oil LX 75W-85 GL-5 or equivalent

Front differential capacity:
1.85 to 1.95 liters (1.96 to 2.06 US qts., 1.63 to 1.71 Imp. qts.)

Rear Differential Capacity:

Item	Specified Condition
Standard	4.15 to 4.25 liters (4.39 to 4.49 US qts., 3.66 to 3.74 Imp. qts.)
w/ LSD	4.10 to 4.20 liters (4.34 to 4.43 US qts., 3.60 to 3.69 Imp. qts.)
w/ Differential lock	

b. for Front Differential:

i. Using a 10 mm hexagon wrench, install a new gasket and the filler plug.

Torque:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }

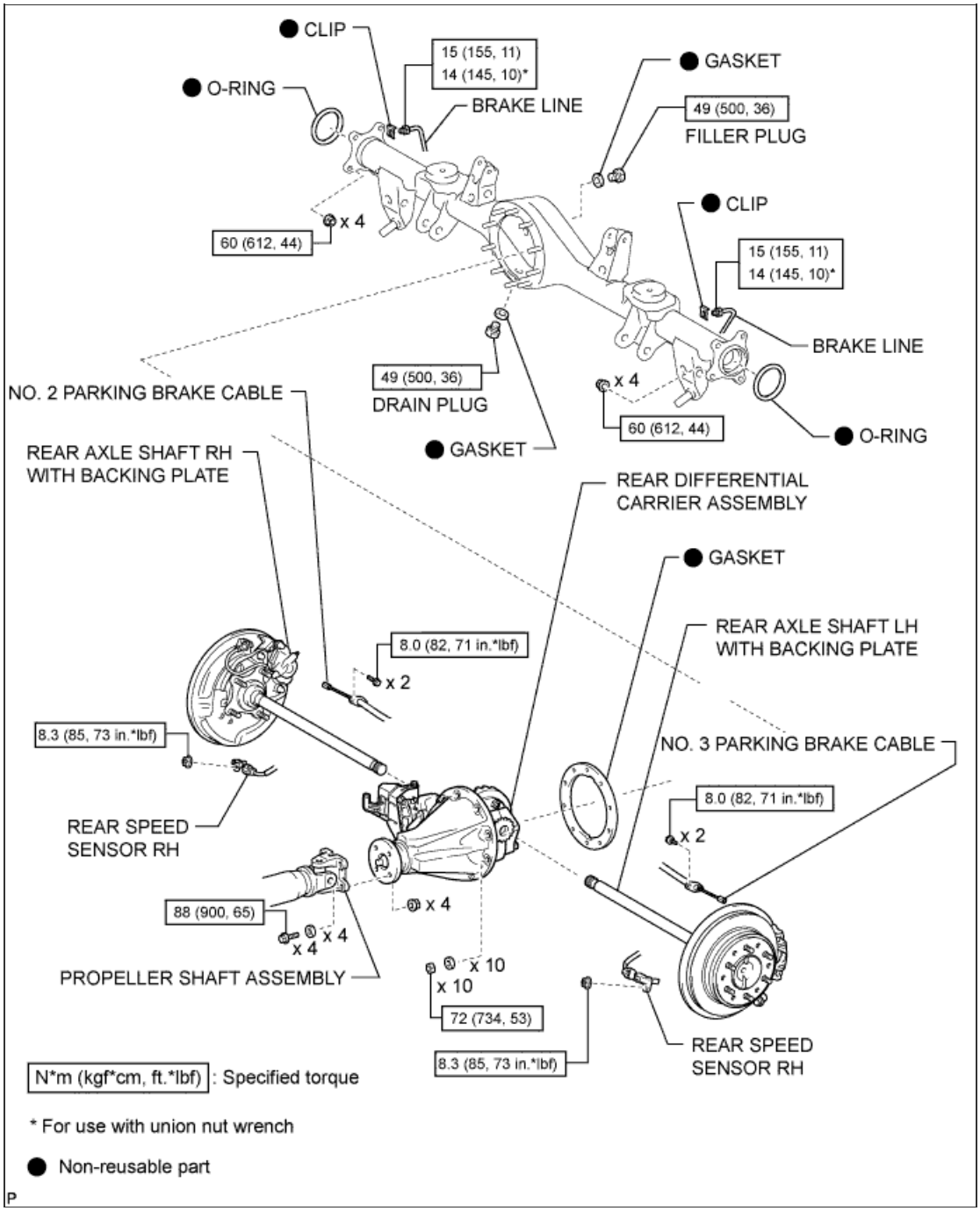
ii. Install the engine under cover.

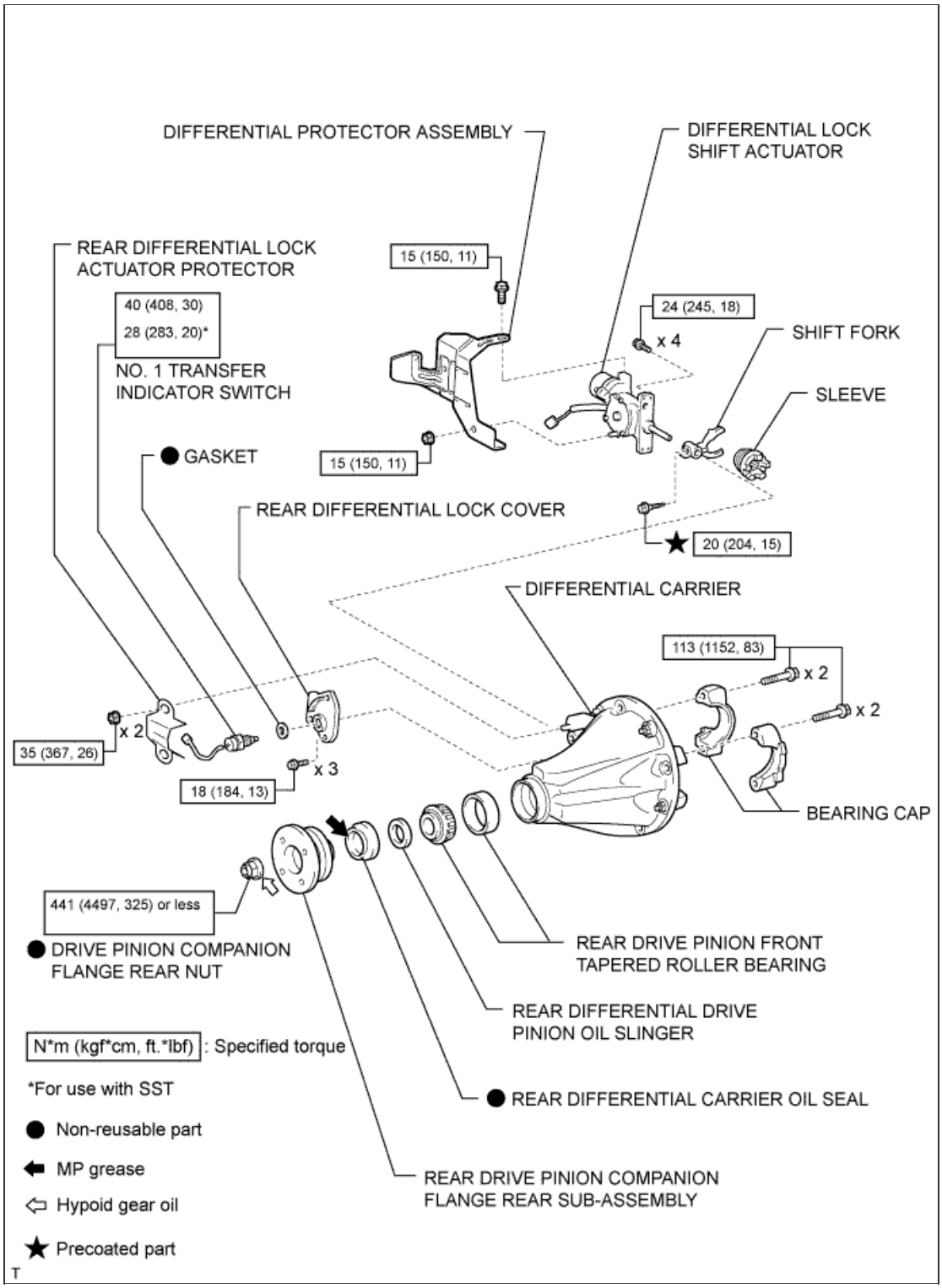
c. for Rear Differential:

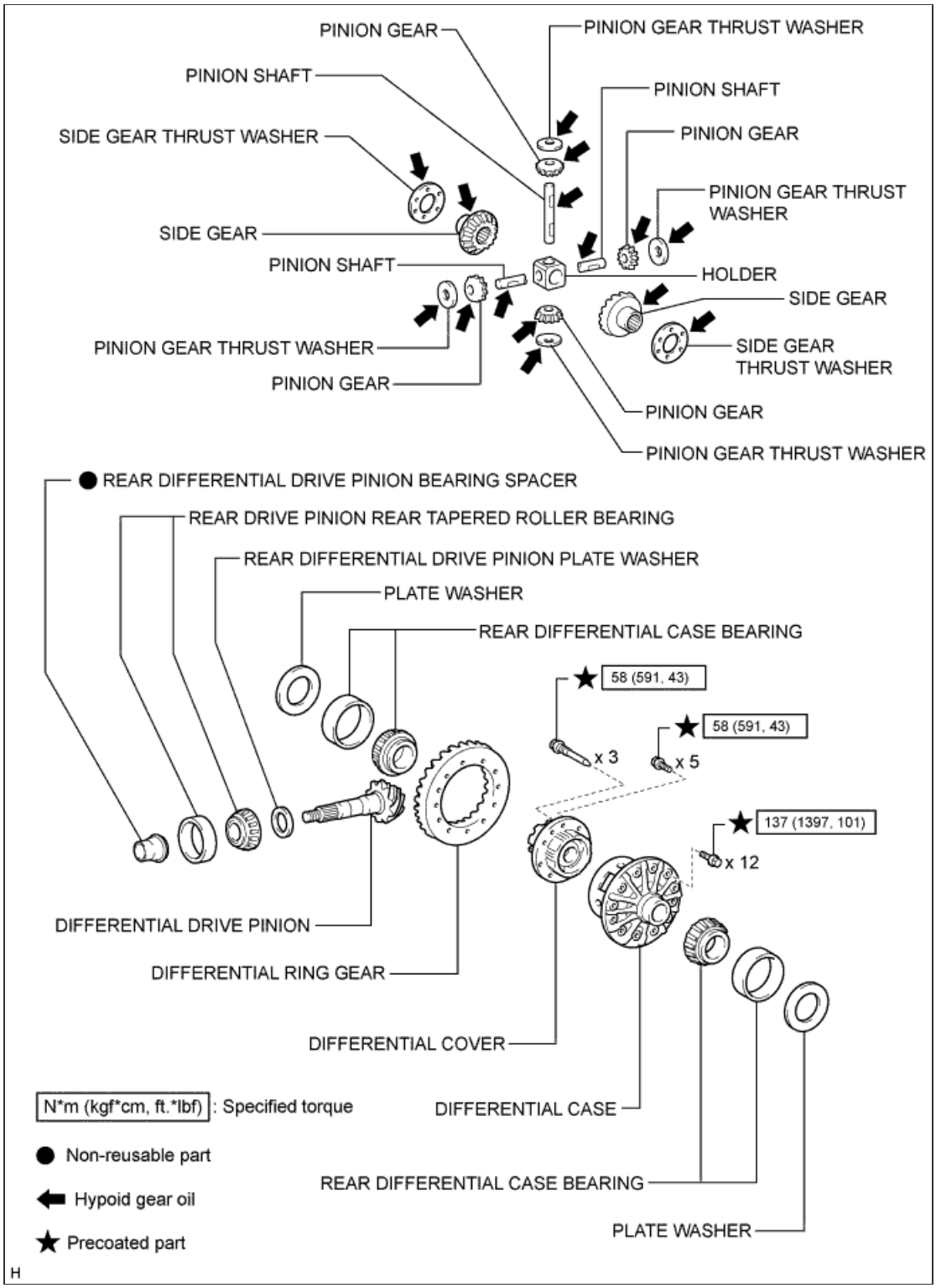
i. Install a new gasket and the filler plug.

Torque:
49 N*m{ 500 kgf*cm , 36 ft.*lbf }

for Preparation Click here




DIFFERENTIAL PROTECTOR ASSEMBLY
DIFFERENTIAL LOCK SHIFT ACTUATOR
REAR DIFFERENTIAL LOCK ACTUATOR PROTECTOR
15 (150, 11)
40 (408, 30)
28 (283, 20)*
NO. 1 TRANSFER INDICATOR SWITCH
24 (245, 18)
x 4
SHIFT FORK
SLEEVE
GASKET
15 (150, 11)
REAR DIFFERENTIAL LOCK COVER
20 (204, 15)
DIFFERENTIAL CARRIER
113 (1152, 83)
x 2
x 2
35 (367, 26)
x 2
x 3
18 (184, 13)
BEARING CAP
441 (4497, 325) or less
DRIVE PINION COMPANION FLANGE REAR NUT
REAR DRIVE PINION FRONT TAPERED ROLLER BEARING
REAR DIFFERENTIAL DRIVE PINION OIL SLINGER
REAR DIFFERENTIAL CARRIER OIL SEAL
REAR DRIVE PINION COMPANION FLANGE REAR SUB-ASSEMBLY
N*m (kgf*cm, ft.*lbf) : Specified torque
*For use with SST
Non-reusable part
MP grease
Hypoid gear oil
Precoated part
T


PINION GEAR
PINION GEAR THRUST WASHER
PINION SHAFT
PINION SHAFT
SIDE GEAR THRUST WASHER
PINION GEAR
PINION GEAR THRUST WASHER
SIDE GEAR
PINION SHAFT
HOLDER
SIDE GEAR
PINION GEAR THRUST WASHER
SIDE GEAR THRUST WASHER
PINION GEAR
PINION GEAR
PINION GEAR THRUST WASHER
● REAR DIFFERENTIAL DRIVE PINION BEARING SPACER
REAR DRIVE PINION REAR TAPERED ROLLER BEARING
REAR DIFFERENTIAL DRIVE PINION PLATE WASHER
PLATE WASHER
REAR DIFFERENTIAL CASE BEARING
★ 58 (591, 43)
★ 58 (591, 43)
x 3
x 5
★ 137 (1397, 101)
x 12
DIFFERENTIAL DRIVE PINION
DIFFERENTIAL RING GEAR
DIFFERENTIAL COVER
DIFFERENTIAL CASE
N*m (kgf*cm, ft.*lbf) : Specified torque
● Non-reusable part
Hypoid gear oil
★ Precoated part
REAR DIFFERENTIAL CASE BEARING
PLATE WASHER
H

for Preparation Click here

1. LOCK REAR DIFFERENTIAL

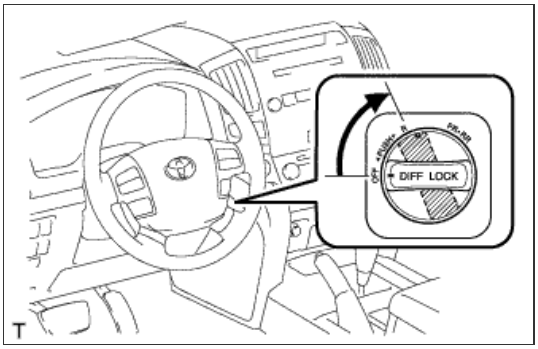
a. Turn the engine switch on (IG).

b. Push on the 4WD switch.

c. Turn the differential lock control switch to the RR position and lock the rear differential.

HINT:

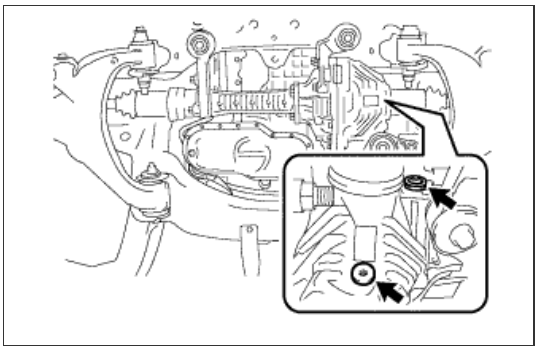
Rotate the rear wheels to check that they are in the differential lock condition.



2. DRAIN DIFFERENTIAL OIL

a. Stop the vehicle on a level place.

b. for Front Differential:



i. Remove the engine under cover.

ii. Using a 10 mm hexagon wrench, remove the filler plug and gasket.

iii. Using a 10 mm hexagon wrench, remove the drain plug and gasket, and drain the oil.

iv. Using a 10 mm hexagon wrench, install a new gasket and the drain plug.

Torque:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }

c. for Rear Differential:

i. Remove the filler plug and gasket.

ii. Remove the drain plug and gasket, and drain the oil.

iii. Install a new gasket and the drain plug.

Torque:
49 N*m{ 500 kgf*cm , 36 ft.*lbf }

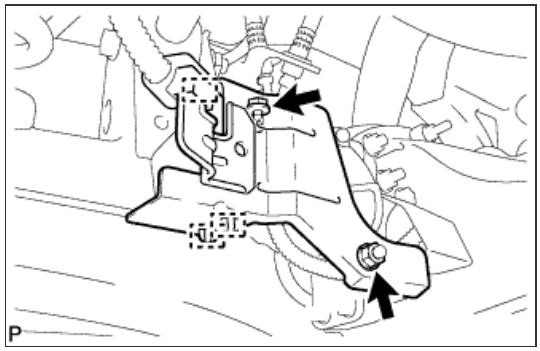
3. REMOVE REAR AXLE SHAFT

a. Remove the axle shaft (Click here).

4. REMOVE DIFFERENTIAL PROTECTOR ASSEMBLY

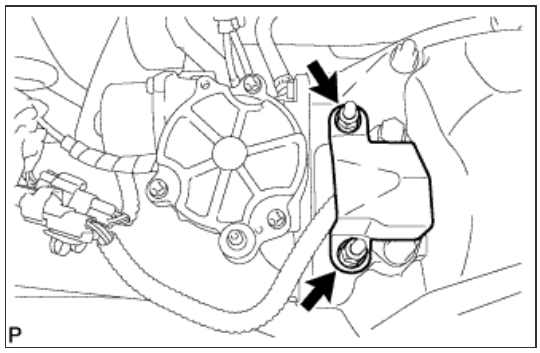
a. Detach the 2 connector clamps and wire harness clamp.

b. Remove the bolt, nut and protector.



5. REMOVE REAR DIFFERENTIAL LOCK ACTUATOR PROTECTOR

a. Remove the 2 nuts and protector.

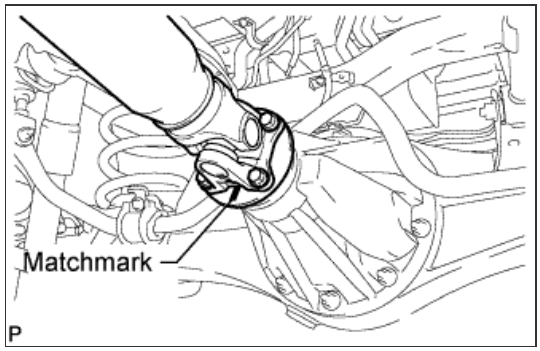


6. DISCONNECT REAR PROPELLER SHAFT ASSEMBLY

a. Place matchmarks on the rear propeller shaft and companion flange.

b. Remove the 4 nuts, 4 washers and 4 bolts, and disconnect the propeller shaft from the differential side.

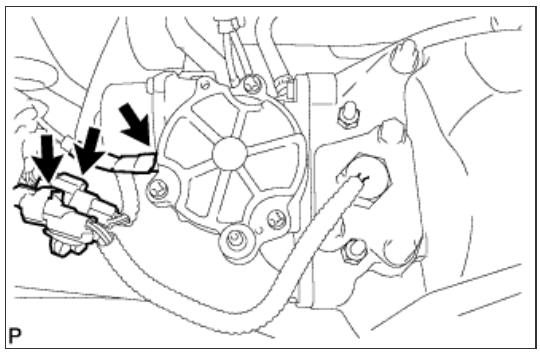
c. Support the propeller shaft securely.



7. REMOVE REAR DIFFERENTIAL CARRIER ASSEMBLY

a. Disconnect the lock differential lock shift actuator and No. 4 transfer indicator switch connectors.

b. Disconnect the breather hose.



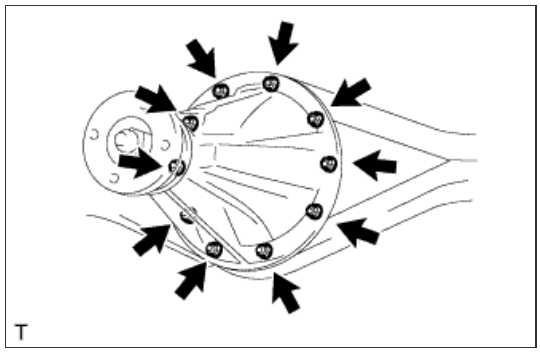
c. Remove the 10 nuts, 10 washers and differential carrier assembly.

c. Remove the 10 nuts, 10 washers and differential carrier assembly.

NOTICE:

Be careful not to damage the contact surfaces of the differential carrier and rear axle housing.

d. Remove the gasket.



for Preparation Click here

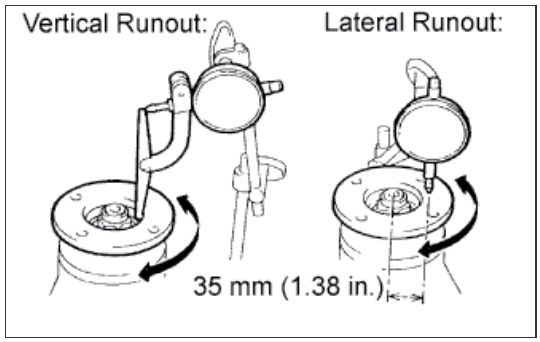
1. INSPECT RUNOUT OF REAR DRIVE PINION COMPANION FLANGE REAR SUB-ASSEMBLY

a. Using a dial indicator, measure the vertical and lateral runout of the companion flange.

Maximum Runout:

Runout	Specified Condition
Vertical runout	0.10 mm (0.00394 in.)
Lateral runout	0.10 mm (0.00394 in.)

If the runout is more than the maximum, replace the companion flange.

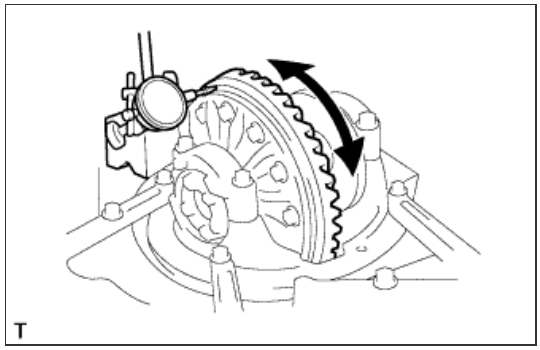


2. INSPECT RUNOUT OF DIFFERENTIAL RING GEAR

a. Using a dial indicator, measure the runout of the ring gear.

Maximum runout:
0.05 mm (0.00197 in.)

If the runout is more than the maximum, replace the ring gear with a new one.



3. INSPECT DIFFERENTIAL RING GEAR BACKLASH

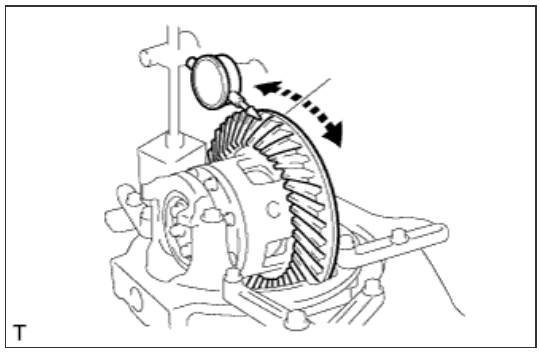
a. Using a dial indicator, measure the backlash of the ring gear.

Standard backlash:
0.10 to 0.20 mm (0.00394 to 0.00787 in.)

HINT:

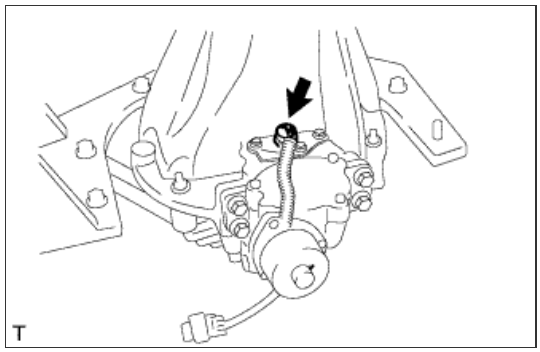
Measure at 3 or more positions around the circumference of the ring gear.

If the backlash is not as specified, adjust the side bearing preload or repair as necessary.



4. REMOVE NO. 1 TRANSFER INDICATOR SWITCH

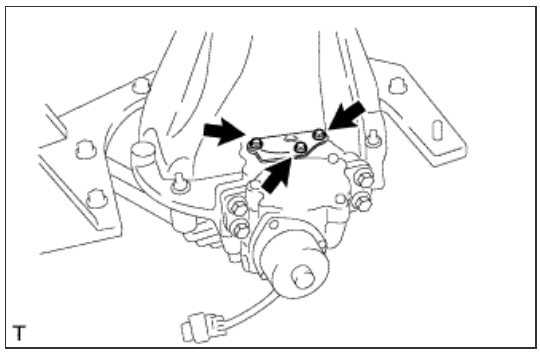
a. Remove the switch and gasket.



5. REMOVE REAR DIFFERENTIAL LOCK COVER

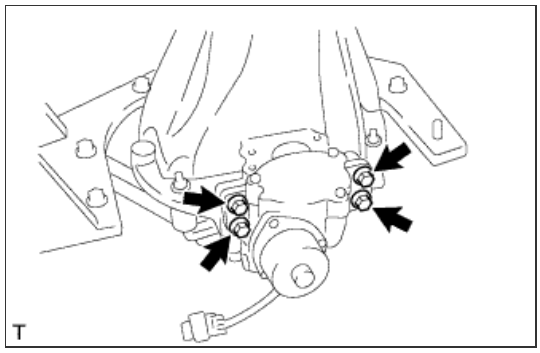
a. Remove the 3 bolts.

b. Using a brass bar and hammer, tap on the cover to remove it.



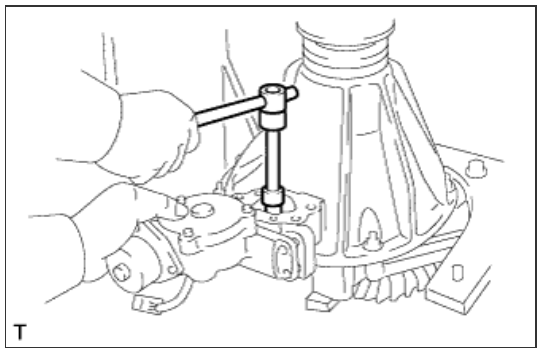
6. REMOVE DIFFERENTIAL LOCK SHIFT ACTUATOR

a. Remove the 4 bolts.



b. Remove the shift fork shaft bolt.

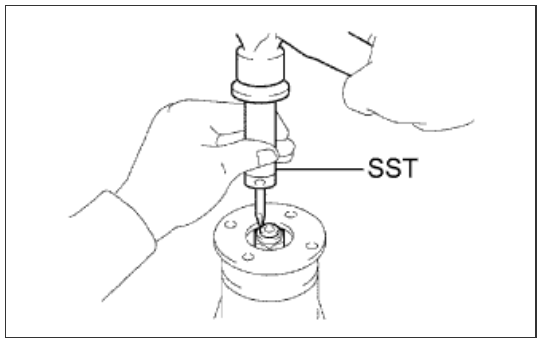
c. Using a screwdriver, pull out the actuator and remove the sleeve and shift fork.



7. REMOVE DRIVE PINION COMPANION FLANGE REAR NUT

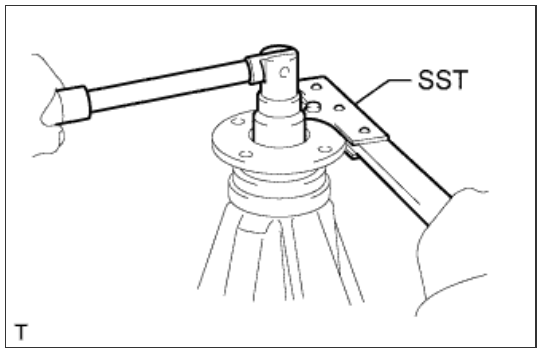
a. Using SST and a hammer, unstake the nut.

SST
09930-00010



b. Using SST to hold the companion flange, remove the nut.

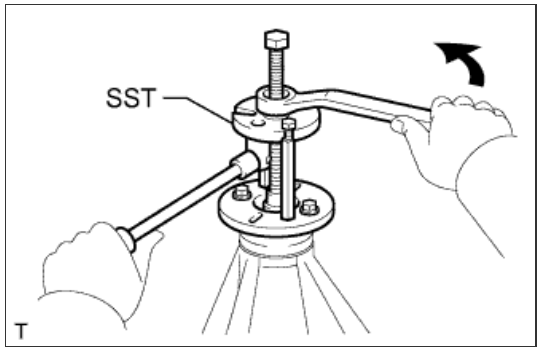
SST
09330-00021 (09330-00030)



8. REMOVE REAR DRIVE PINION COMPANION FLANGE REAR SUB-ASSEMBLY

a. Using SST, remove the companion flange.

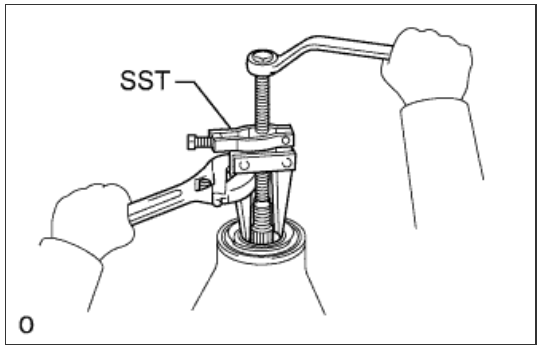
SST
09950-30012 (09951-03010, 09953-03010, 09954-03010, 09956-03030)



9. REMOVE REAR DIFFERENTIAL CARRIER OIL SEAL

a. Using SST, remove the oil seal.

SST
09308-10010



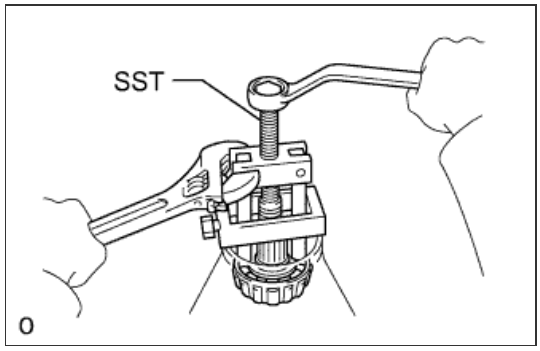
10. REMOVE REAR DIFFERENTIAL DRIVE PINION OIL SLINGER

11. REMOVE REAR DRIVE PINION FRONT TAPERED ROLLER BEARING

a. Using SST, remove the bearing (inner race).

SST
09556-22010

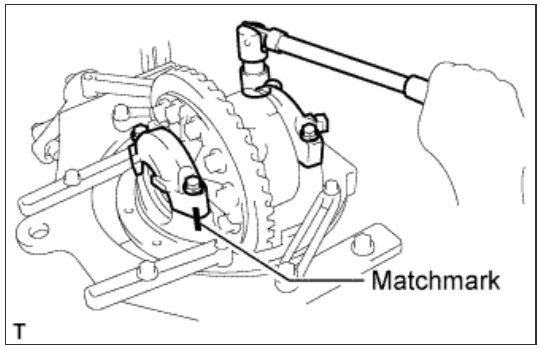
If the front bearing is damaged or worn, replace the bearing.



12. REMOVE REAR DIFFERENTIAL CASE SUB-ASSEMBLY

a. Place matchmarks on the bearing caps and differential carrier.

b. Remove the 4 bolts and 2 bearing caps.

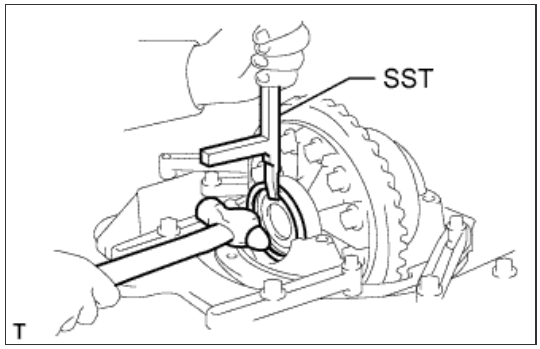


c. Using SST and a hammer, remove the plate washers.

SST
09504-22011

HINT:

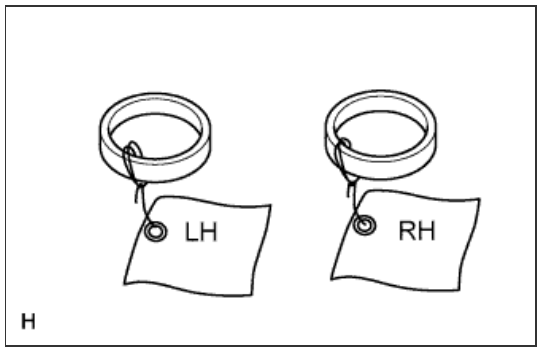
Measure the thickness of each plate washer and note it down.



d. Remove the differential case with the side bearing (outer race) from the differential carrier.

HINT:

Tag the bearing outer races to show the location for reassembly.



13. REMOVE DIFFERENTIAL DRIVE PINION

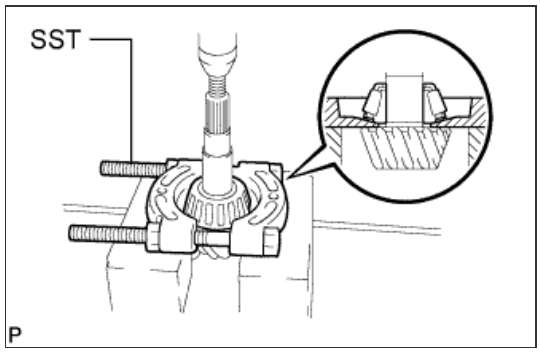
14. REMOVE REAR DIFFERENTIAL DRIVE PINION BEARING SPACER

15. REMOVE REAR DRIVE PINION REAR TAPERED ROLLER BEARING

a. Using SST and a press, press out the rear bearing (inner race) from the drive pinion.

SST
09950-00020

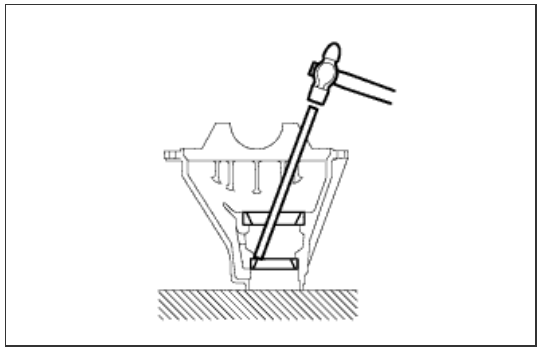
If the drive pinion or ring gear is damaged, replaced them as a set.



16. REMOVE REAR DIFFERENTIAL DRIVE PINION PLATE WASHER

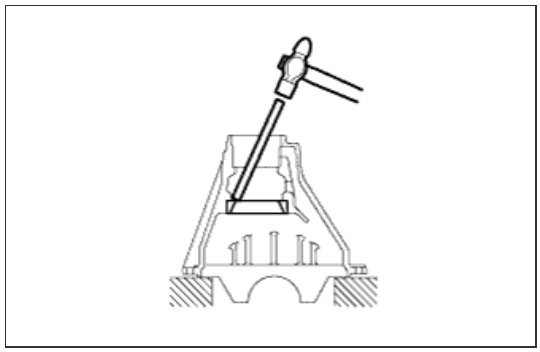
17. REMOVE REAR DRIVE PINION FRONT TAPERED ROLLER BEARING

a. Using a brass bar and hammer, tap out the bearing (outer race).



18. REMOVE REAR DRIVE PINION REAR TAPERED ROLLER BEARING

a. Using a brass bar and hammer, tap out the bearing (outer race).

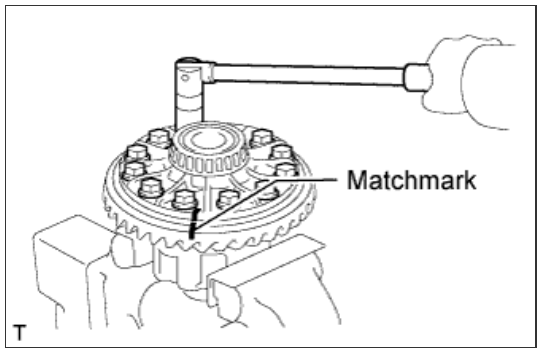


19. REMOVE DIFFERENTIAL RING GEAR

a. Place matchmarks on the ring gear and differential case.

b. Remove the 12 ring gear set bolts.

c. Using a plastic-faced hammer, tap on the ring gear to separate it from the differential case.



20. INSPECT RUNOUT OF DIFFERENTIAL CASE

a. Place the bearing outer races on their respective bearings.

HINT:

Do not interchange the left and right outer races.

b. Install the assembled plate washers to the side bearing.

c. Install the differential case to the differential carrier.

HINT:

If it is difficult to install the differential case to the carrier, replace the plate washer with a thinner one.

However, select a plate washer that allows no clearance between it and the carrier.

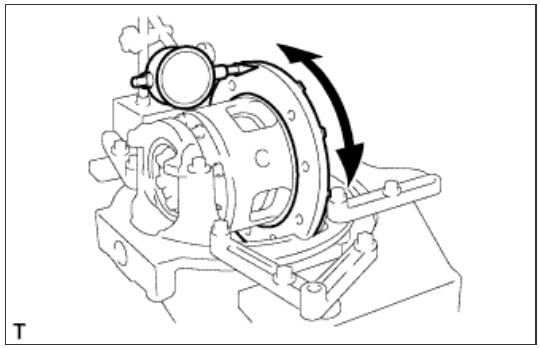
d. Align the matchmarks on the bearing caps and differential carrier.

e. Install and uniformly tighten the 4 bolts a little at a time.

f. Using a dial indicator, measure the differential case runout.

Maximum case runout:
0.04 mm (0.00157 in.)

If the runout is more than the maximum, replace the differential case and side bearings as a set.



g. Remove the differential case.

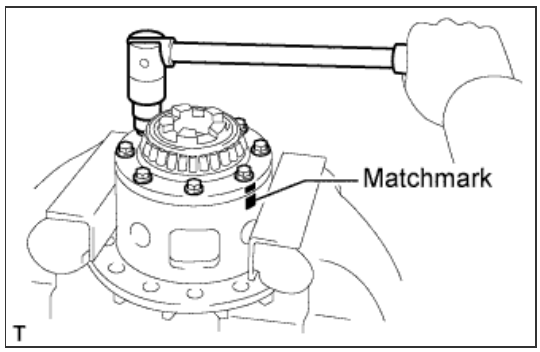
21. DISASSEMBLE DIFFERENTIAL CASE

a. Place matchmarks on the differential case and differential cover.

b. Using a T10 "TORX" socket, remove the 5 set bolts and 3 pinion shaft pins.

c. Separate the cover and case.

d. Remove the 2 side gears, 2 side gear thrust washers, 4 pinion gears, 4 pinion gear thrust washers, 3 pinion shafts and holder from the differential case.



22. REMOVE REAR DIFFERENTIAL CASE BEARING

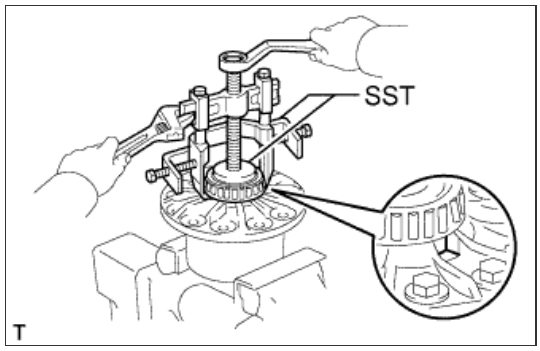
a. Using SST, remove the side bearing.

SST

09950-40011 (09952-04010, 09953-04020, 09954-04010, 09955-04061)

HINT:

Fix the claws of SST to the notches in the differential case.

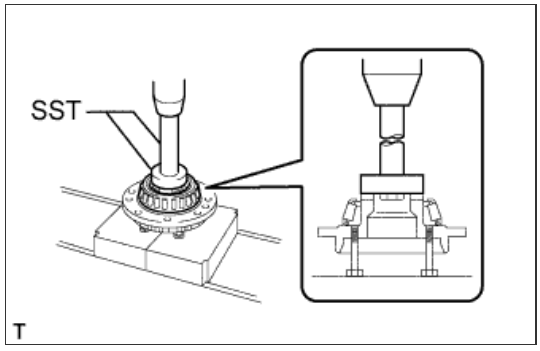


23. REMOVE REAR DIFFERENTIAL CASE BEARING

a. Using SST, 4 bolts and a press, remove the bearing.

SST

09950-60010 (09951-00580)
09950-70010 (09951-07150)

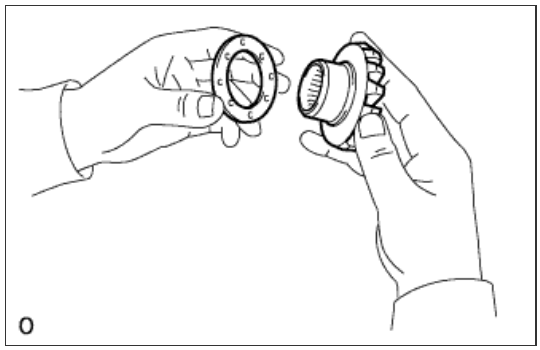


for Preparation Click here

1. INSPECT DIFFERENTIAL SIDE GEAR BACKLASH

a. Install the 2 thrust washers to the 2 side gears.

b. Install the 4 thrust washers to the 4 pinion gears.



c. Install the 2 side gears into the differential case.

d. Install the holder into the differential case.

e. Install the 4 pinion gears.

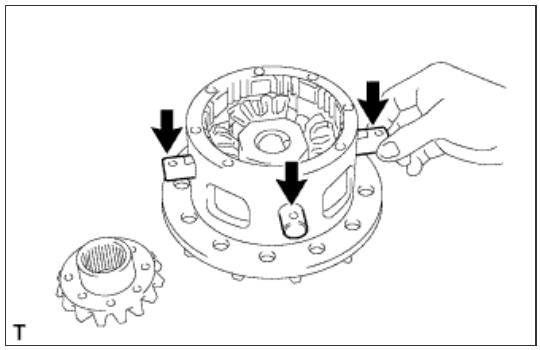
f. Align the holes of the differential case and pinion shaft, and install the 3 pinion shafts.

g. Align the matchmarks and install the differential cover to the differential case.

h. Temporarily install the 5 bolts and 3 pinion shaft pins.

i. Using a T10 "TORX" socket, tighten the 5 bolts and 3 pinion shaft pins.

Torque:
58 N*m{ 591 kgf*cm , 43 ft.*lbf }



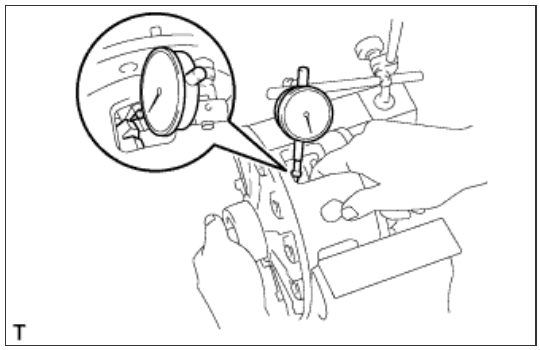
j. Using a dial indicator, while holding the side gear, measure the backlash.

Standard backlash:
0.05 to 0.15 mm (0.000788 to 0.00590 in.)

If the backlash is not within the specification, replace the side gear thrust washers with washers of a different thickness.

HINT:

- **Make sure the washers on both sides are the same size.**
- **Measure at all 4 pinion gear locations.**
- **Apply hypoid gear oil to each sliding surface and rotating part.**



Standard Washer Thickness:

Specified Condition	Specified Condition
1.53 to 1.57 mm (0.0603 to 0.0618 in.)	1.83 to 1.87 mm (0.0720 to 0.0736 in.)
1.58 to 1.62 mm (0.0622 to 0.0637 in.)	1.88 to 1.92 mm (0.0740 to 0.0755 in.)
1.63 to 1.67 mm (0.0642 to 0.0657 in.)	1.93 to 1.97 mm (0.0760 to 0.0775 in.)
1.68 to 1.72 mm (0.0662 to 0.0677 in.)	1.98 to 2.02 mm (0.0780 to 0.0795 in.)
1.73 to 1.77 mm (0.0682 to 0.0696 in.)	2.03 to 2.07 mm (0.0800 to 0.0814 in.)
1.78 to 1.82 mm (0.0701 to 0.0716 in.)	2.08 to 2.12 mm (0.0819 to 0.0834 in.)

k. After measuring the backlash, remove the 5 set bolts and 3 pinion shaft pins.

2. ASSEMBLE DIFFERENTIAL CASE

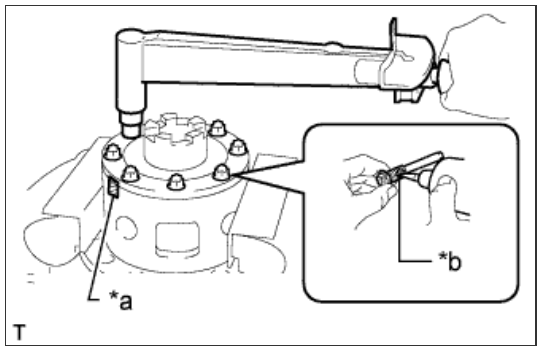
a. Clean the threads of the bolts, pinion shaft pins, case and cover with non-residue solvent.

b. Coat the threads of the bolts and pinion shafts with adhesive.

Text in Illustration

*a	Matchmark
*b	Adhesive

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent



c. Align the matchmarks of the case and cover.

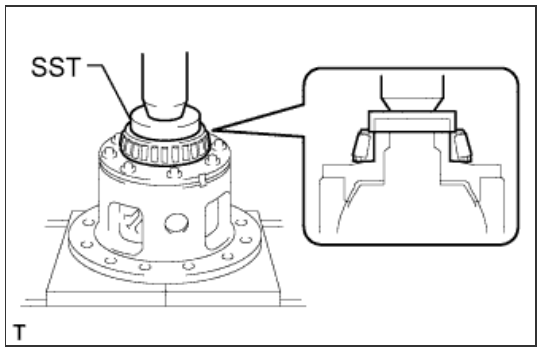
d. Using a T10 "TORX" socket, install the 5 bolts and 3 pinion shaft pins.

Torque:
58 N*m{ 591 kgf*cm , 43 ft.*lbf }

3. INSTALL REAR DIFFERENTIAL CASE BEARING

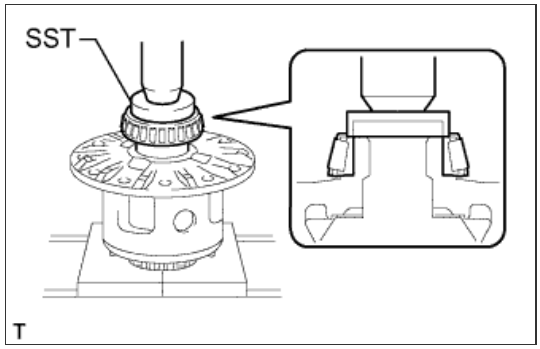
a. Differential Cover Side:
Using SST and a press, press the side bearing onto the differential cover.

SST
09550-60010



b. Ring Gear Side:
Using SST and a press, press the side bearing onto the differential case.

SST
09550-60010



4. INSTALL DIFFERENTIAL RING GEAR

a. Clean the threads of the bolts and differential case with non-residue solvent.

b. Clean the contact surface of the differential case and ring gear.

c. Heat the ring gear to about 100°C (212°F) in boiling water.

d. Carefully take the ring gear out of the boiling water.

e. After the moisture on the ring gear has completely evaporated, quickly align the matchmarks on the ring gear and differential case and set the ring gear onto the differential case. Then temporarily install the 12 bolts so that the bolt holes in the ring gear and differential case are aligned.

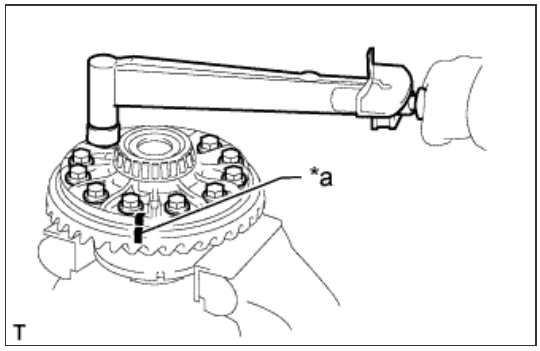
f. After the ring gear cools down sufficiently, remove the 12 bolts. Then apply thread lock adhesive to the 12 bolts and install them.

Text in Illustration

*a	Matchmark

Thread lock:
Toyota Genuine Adhesive 1360K, Three Bond 1360K or equivalent

Torque:
137 N*m{ 1397 kgf*cm , 101 ft.*lbf }



5. INSPECT RUNOUT OF DIFFERENTIAL RING GEAR

a. Place the bearing outer races on their respective bearings.

HINT:

Do not interchange the left and right outer races.

b. Install the assembled plate washers to the side bearing.

c. Install the differential case to the differential carrier.

HINT:

If it is difficult to install the differential case to the carrier, replace the plate washer with a thinner one.

However, select a plate washer that allows no clearance between it and the carrier.

d. Align the matchmarks on the bearing caps and differential carrier.

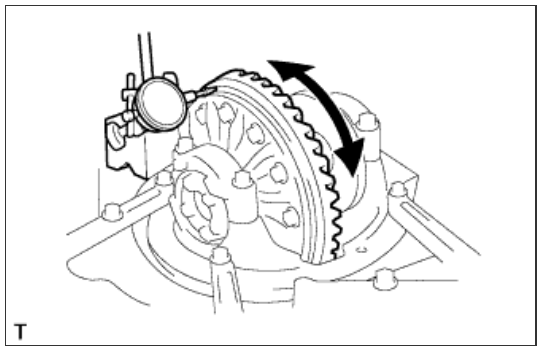
e. Install and uniformly tighten the 4 bolts a little at a time.

f. Using a dial indicator, check the ring gear runout.

Maximum runout:
0.05 mm (0.00197 in.)

If the runout is more than the maximum, replace the ring gear.

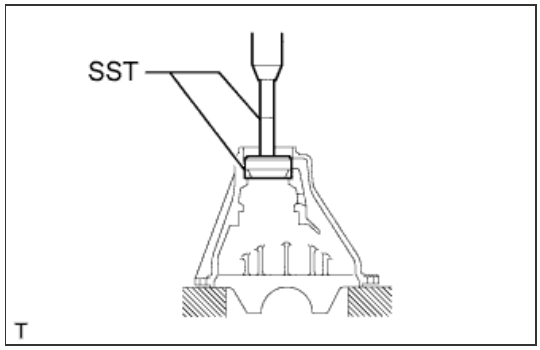
g. Remove the differential case.



6. INSTALL REAR DRIVE PINION FRONT TAPERED ROLLER BEARING

a. Using SST and a press, press in the front bearing outer race.

SST
09950-60020 (09951-00710)
09950-70010 (09951-07150)

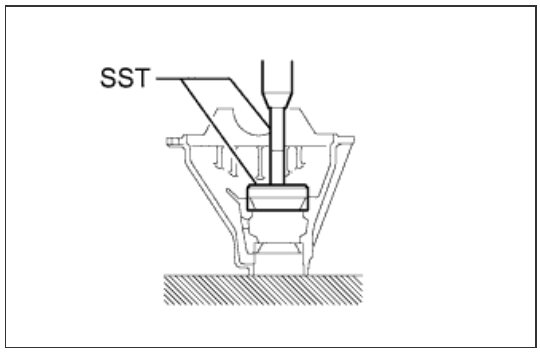


7. INSTALL REAR DRIVE PINION REAR TAPERED ROLLER BEARING

a. Using SST and a press, press in the rear bearing outer race.

SST

09950-60020 (09951-00890)
09950-70010 (09951-07150)



8. INSTALL REAR DRIVE PINION REAR TAPERED ROLLER BEARING

a. Install the washer to the drive pinion.

HINT:

After installing the washer, check the tooth contact pattern. If necessary, replace the washer with one of a different thickness.

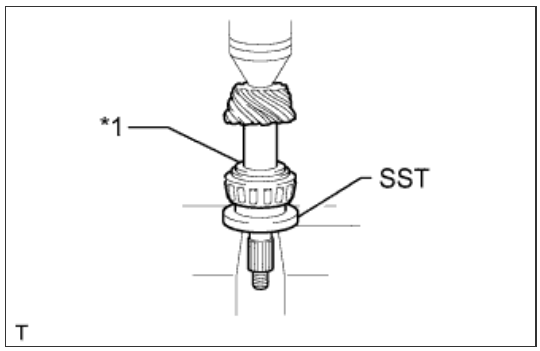
b. Using SST and a press, press the rear bearing into the drive pinion.

SST

09506-35010

Text in Illustration

*1	Plate Washer



9. INSPECT DRIVE PINION PRELOAD

a. Install the drive pinion and front bearing.

HINT:

Assemble the spacer and oil seal after adjusting the gear contact pattern.

b. Install the oil slinger.

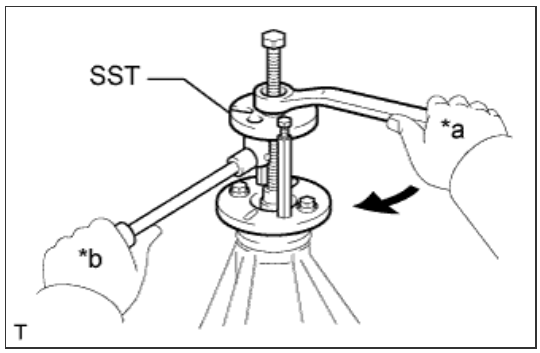
c. Using SST, install the companion flange.

SST

09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03040)

Text in Illustration

*a	Turn
*b	Hold



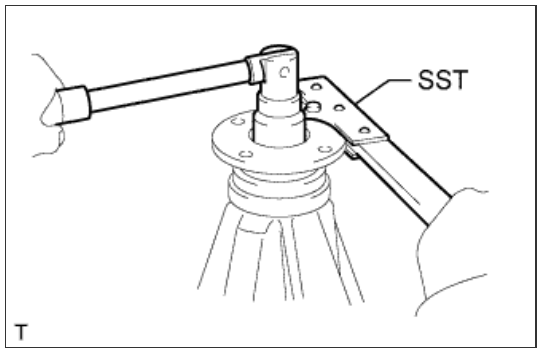
d. Using SST to hold the flange, adjust the drive pinion preload by tightening the nut.

SST

09330-00021 (09330-00030)

NOTICE:

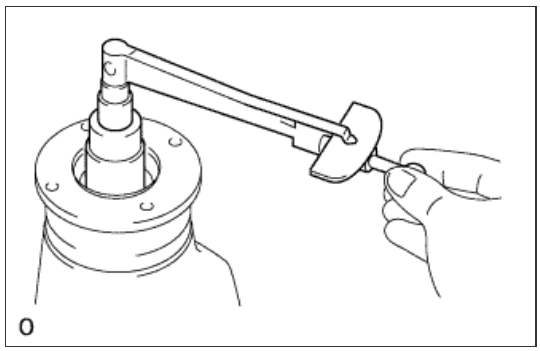
- **Coat the nut and threads of the drive pinion with gear oil.**
- **As there is no spacer, tighten the nut a little at a time, being careful not to overtighten it.**



e. Using a torque wrench, measure the preload.

Standard Preload (at Starting):

Bearing	Specified Condition
New	1.04 to 1.69 N*m (11 to 17 kgf*cm, 10 to 14 in.*lbf)
Reused	0.85 to 1.37 N*m (9 to 13 kgf*cm, 8 to 12 in.*lbf)



NOTICE:

Measure the total preload after turning the bearing clockwise and counterclockwise several times to make the bearing smooth.

10. INSTALL REAR DIFFERENTIAL CASE SUB-ASSEMBLY

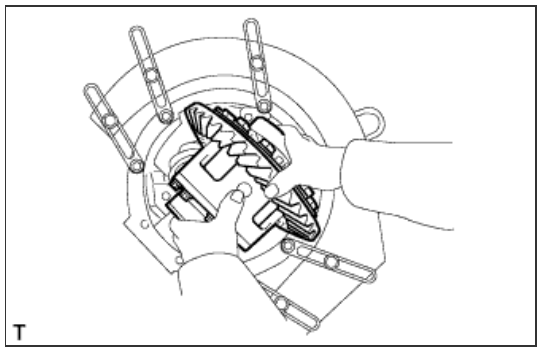
a. Place the bearing outer races on their respective bearings.

HINT:

Do not interchange the left and right outer races.

b. Install the assembled plate washer to the side bearing.

c. Install the differential case to the carrier.

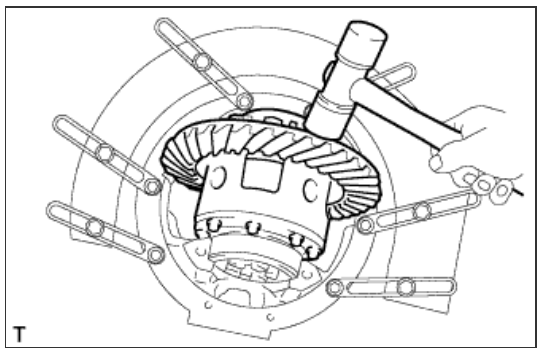


d. Using a plastic-faced hammer, tap on the ring gear to make sure the differential case is aligned with the carrier, and fit the bearings and plate washers into the carrier.

HINT:

If it is difficult to install the differential case to the carrier, replace the plate washer with a thinner one.

However, select a plate washer that allows no clearance between it and the carrier.

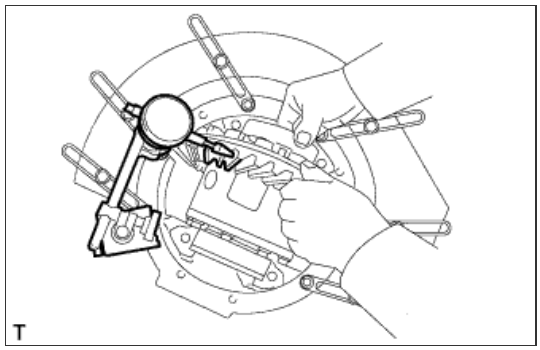


11. INSPECT DIFFERENTIAL RING GEAR BACKLASH

a. Using a dial indicator, measure the backlash while holding the side bearing of the ring gear side.

Standard backlash:
0.10 to 0.20 mm (0.00394 to 0.00787 in.)

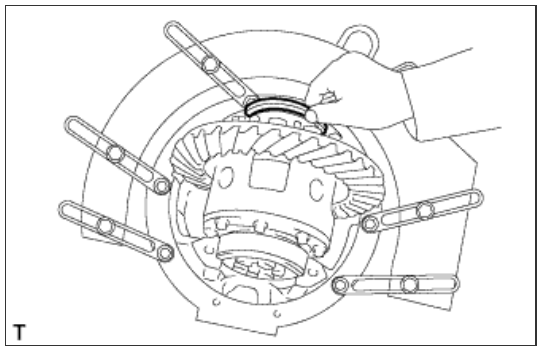
b. Select a case cover side plate washer using the backlash as a reference.



Standard Side Plate Washer Thickness:

Mark No.	Specified Condition	Mark No.	Specified Condition
01	2.66 to 2.68 mm (0.1048 to 0.1055 in.)	13	3.02 to 3.04 mm (0.1189 to 0.1196 in.)
02	2.69 to 2.71 mm (0.1059 to 0.1066 in.)	14	3.05 to 3.07 mm (0.1201 to 0.1208 in.)
03	2.72 to 2.74 mm (0.1071 to 0.1078 in.)	15	3.08 to 3.10 mm (0.1213 to 0.1220 in.)
04	2.75 to 2.77 mm (0.1083 to 0.1090 in.)	16	3.11 to 3.13 mm (0.1225 to 0.1232 in.)
05	2.78 to 2.80 mm (0.1095 to 0.1102 in.)	17	3.14 to 3.16 mm (0.1237 to 0.1244 in.)
06	2.81 to 2.83 mm (0.1107 to 0.1114 in.)	18	3.17 to 3.19 mm (0.1248 to 0.1255 in.)
07	2.84 to 2.86 mm (0.1119 to 0.1125 in.)	19	3.20 to 3.22 mm (0.1260 to 0.1267 in.)
08	2.87 to 2.89 mm (0.1130 to 0.1137 in.)	20	3.23 to 3.25 mm (0.1272 to 0.1279 in.)
09	2.90 to 2.92 mm (0.1142 to 0.1149 in.)	21	3.26 to 3.28 mm (0.1284 to 0.1291 in.)
10	2.93 to 2.95 mm (0.1154 to 0.1161 in.)	22	3.29 to 3.31 mm (0.1296 to 0.1303 in.)
11	2.96 to 2.98 mm (0.1166 to 0.1173 in.)	23	3.32 to 3.34 mm (0.1307 to 0.1314 in.)
12	2.99 to 3.01 mm (0.1178 to 0.1185 in.)	-	-

c. Select a ring gear teeth side plate washer so that there is no clearance between the outer race and case.

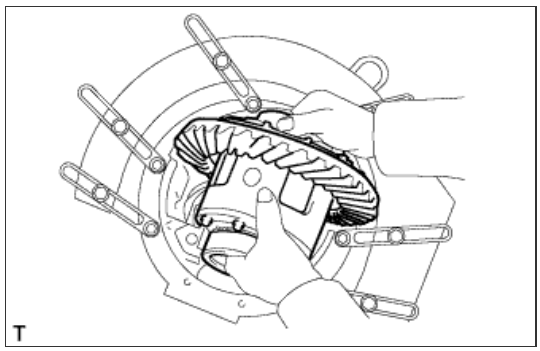


d. Remove the 2 plate washers and differential carrier.

e. Install the selected plate washer into the lower part of the carrier.

f. Place the selected plate washer onto the differential case together with the outer races, and install the differential case with the outer races to the carrier.

g. Using a plastic-faced hammer, tap on the ring gear to make sure the differential case is aligned with the carrier, and fit the bearings and plate washers into the carrier.



h. Using a dial indicator, measure the ring gear backlash.

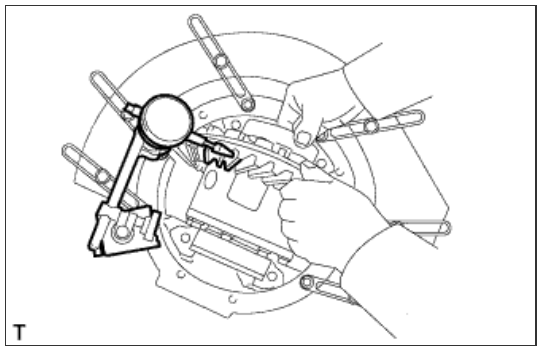
Standard backlash:
0.10 to 0.20 mm (0.00394 to 0.00787 in.)

If the backlash is not within the specification, adjust it by either increasing or decreasing the thickness of washers on both sides by an equal amount.

HINT:

There should be no clearance between the plate washers and case.

i. Ensure that there is ring gear backlash.



12. ADJUST SIDE BEARING PRELOAD

a. Remove the ring gear side plate washer.

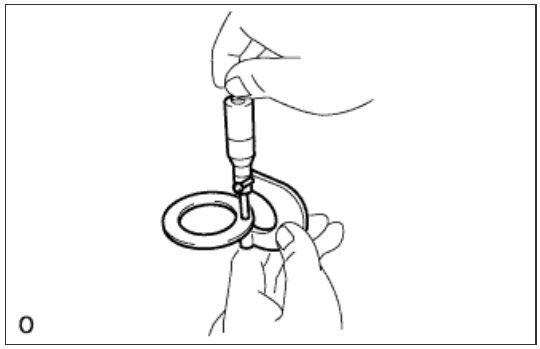
b. Using a micrometer, measure the thickness.

c. Using the backlash as a reference, select a washer that is 0.06 to 0.09 mm (0.00236 to 0.00354 in.) thicker than the removed washer.

HINT:

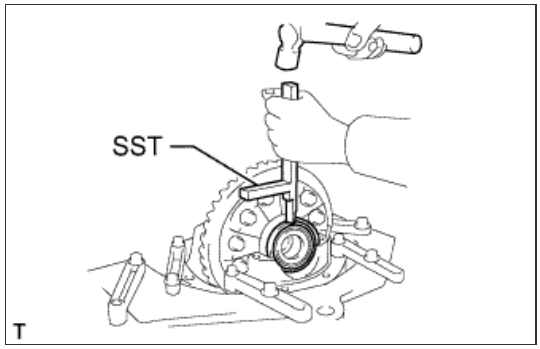
Select a washer which can be pressed in 2/3 of the full amount with your finger.

d. Install the selected plate washer.



e. Using SST and plastic-faced hammer, tap the plate washer so that it fits to the bearing.

SST
09504-22011



f. Align the matchmarks on the caps and carrier.

Text in Illustration

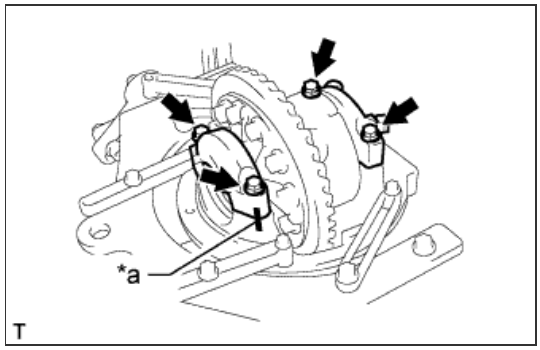
*a	Matchmark

g. Install the 4 bearing cap bolts to the specified torque.

Torque:
113 N*m{ 1152 kgf*cm , 83 ft.*lbf }

h. Using a dial indicator, adjust the ring gear backlash until it is within the specification.

Standard backlash:
0.10 to 0.20 mm (0.00394 to 0.00787 in.)

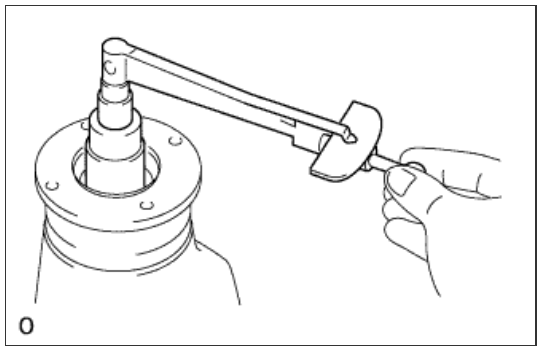


13. INSPECT TOTAL PRELOAD

a. Using a torque wrench, measure the preload with the teeth of the drive pinion and ring gear in contact.

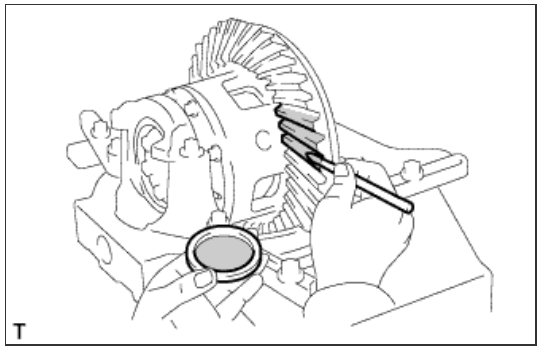
Standard Total Preload (at starting):

Bearing	Specified Condition
New	1.33 to 2.18 N*m (14 to 22 kgf*cm, 12 to 19 in.*lbf)
Reused	1.14 to 1.86 N*m (12 to 18 kgf*cm, 11 to 16 in.*lbf)

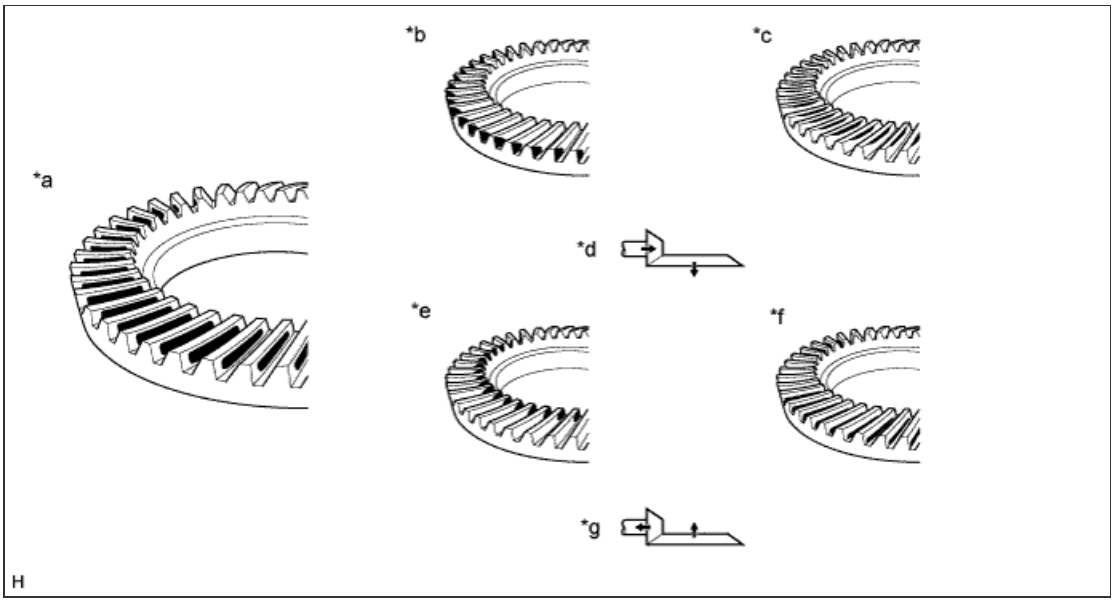


14. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

a. Coat 3 or 4 teeth at 3 different positions on the ring gear with Prussian blue.



b. Turn the companion flange in both directions to inspect the ring gear for proper tooth contact.



Text in Illustration

*a	Proper Contact	*b	Heel Contact
*c	Face Contact	*d	Select an adjusting washer that will shift the drive pinion closer to the ring gear (*b, *c)
*e	Toe Contact	*f	Flank Contact
*g	Select an adjusting washer that will shift the drive pinion away from the ring gear (*e, *f)	-	-

If the teeth are not contacting properly, use the following table to select a proper washer for correction.

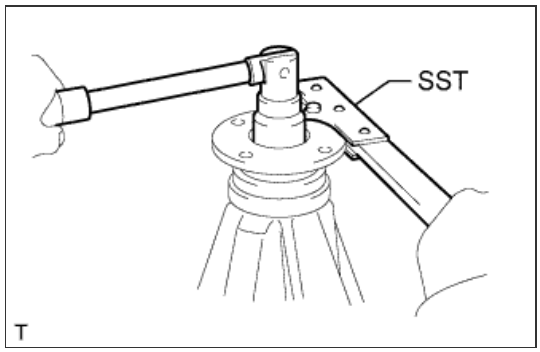
Standard Washer Thickness:

Specified Condition	Specified Condition
1.04 to 1.06 mm (0.0410 to 0.0417 in.)	1.315 to 1.335 mm (0.0518 to 0.0525 in.)
1.065 to 1.085 mm (0.0420 to 0.0427 in.)	1.34 to 1.36 mm (0.0528 to 0.0535 in.)
1.09 to 1.11 mm (0.0430 to 0.0437 in.)	1.365 to 1.385 mm (0.0538 to 0.0545 in.)
1.115 to 1.135 mm (0.0439 to 0.0446 in.)	1.39 to 1.41 mm (0.0548 to 0.0555 in.)
1.14 to 1.16 mm (0.0449 to 0.0456 in.)	1.415 to 1.435 mm (0.0557 to 0.0564 in.)
1.165 to 1.185 mm (0.0459 to 0.0466 in.)	1.44 to 1.46 mm (0.0567 to 0.0574 in.)
1.19 to 1.21 mm (0.0469 to 0.0476 in.)	1.465 to 1.485 mm (0.0577 to 0.0584 in.)
1.215 to 1.235 mm (0.04789 to 0.0486 in.)	1.49 to 1.51 mm (0.0587 to 0.0594 in.)
1.24 to 1.26 mm (0.0489 to 0.0496 in.)	1.515 to 1.535 mm (0.0597 to 0.0604 in.)
1.265 to 1.285 mm (0.0498 to 0.0505 in.)	1.54 to 1.56 mm (0.0607 to 0.0614 in.)
1.29 to 1.31 mm (0.0508 to 0.0515 in.)	-

15. REMOVE DRIVE PINION COMPANION FLANGE REAR NUT

a. Using SST to hold the flange, remove the nut.

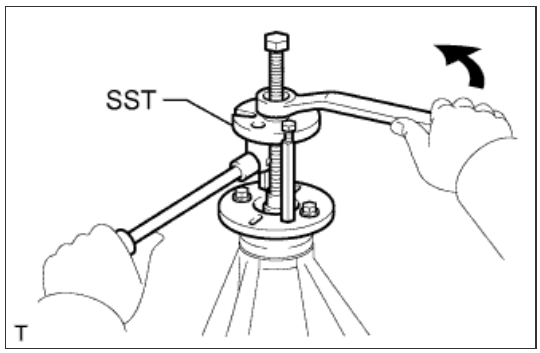
SST
09330-00021 (09330-00030)



16. REMOVE REAR DRIVE PINION REAR COMPANION FLANGE SUB-ASSEMBLY

a. Using SST, remove the companion flange.

SST
09950-30012 (09951-03010, 09953-03010, 09954-03010, 09956-03030)



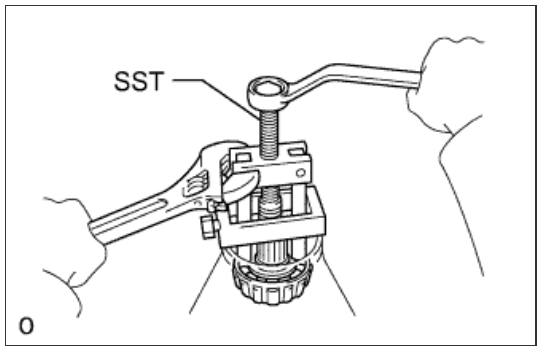
17. REMOVE REAR DIFFERENTIAL DRIVE PINION OIL SLINGER

18. REMOVE REAR DRIVE PINION FRONT TAPERED ROLLER BEARING

a. Using SST, remove the bearing (inner race).

SST
09556-22010

If the front bearing is damaged or worn, replace the bearing.



19. INSTALL REAR DIFFERENTIAL DRIVE PINION BEARING SPACER

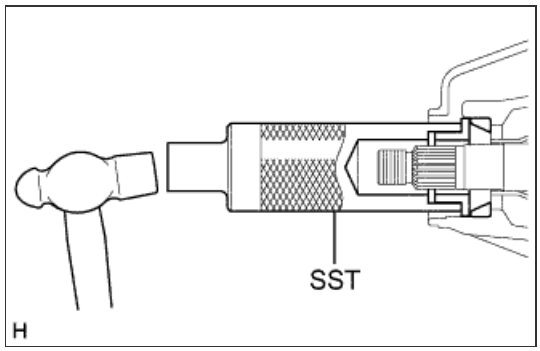
a. Install a new spacer to the drive pinion.

20. INSTALL REAR DRIVE PINION FRONT TAPERED ROLLER BEARING

a. Using SST and a hammer, tap in the bearing (outer race).

SST
09316-60011 (09316-00011, 09316-00021)

b. Install the bearing (inner race).



21. INSTALL REAR DIFFERENTIAL DRIVE PINION OIL SLINGER

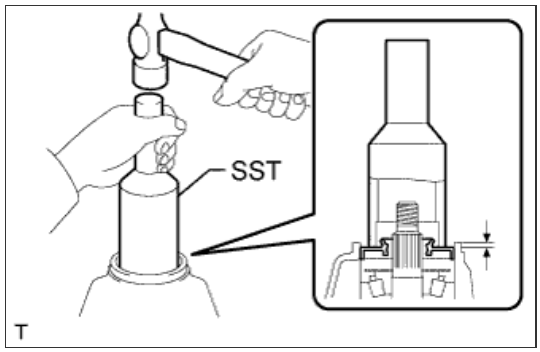
22. INSTALL REAR DIFFERENTIAL CARRIER OIL SEAL

a. Using SST and a hammer, tap in a new oil seal.

SST
09214-76011

Standard oil seal depth:
0.05 to 0.95 mm (0.00197 to 0.0374)

b. Coat the lip of the oil seal with MP grease.



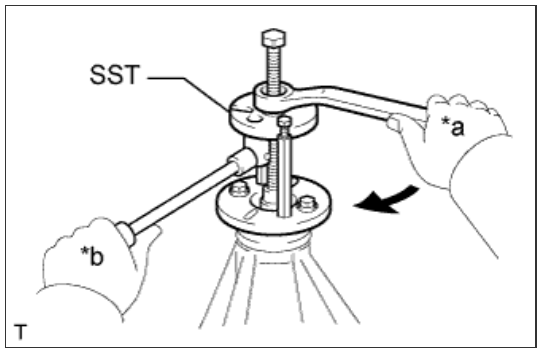
23. INSTALL REAR DRIVE PINION REAR COMPANION FLANGE SUB-ASSEMBLY

a. Using SST, install the companion flange.

SST
09950-30012 (09951-03010, 09953-03010, 09954-03010, 09955-03030, 09956-03040)

Text in Illustration

*a	Turn
*b	Hold



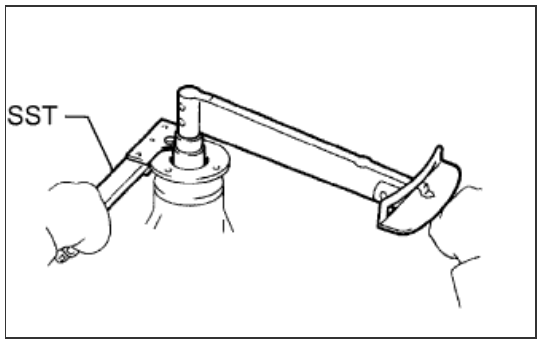
24. INSPECT DRIVE PINION PRELOAD

a. Coat the threads of a new nut with hypoid gear oil.

b. Using SST to hold the companion flange, install the nut by tightening it until the standard preload is reached.

SST
09330-00021 (09330-00030)

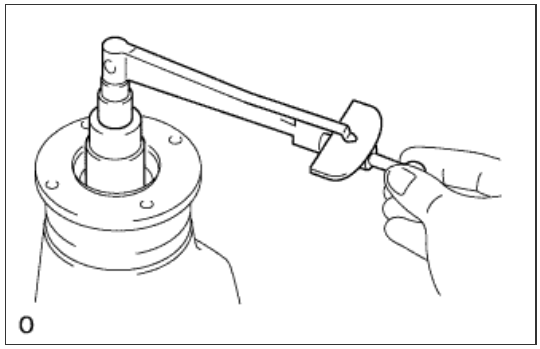
Torque:
441 N*m{ 4497 kgf*cm , 325 ft.*lbf } or less



c. Using a torque wrench, measure the preload.

Standard Preload (at Starting):

Bearing	Specified Condition
New	1.04 to 1.69 N*m (11 to 17 kgf*cm, 10 to 14 in.*lbf)
Reused	0.85 to 1.37 N*m (9 to 13 kgf*cm, 8 to 12 in.*lbf)

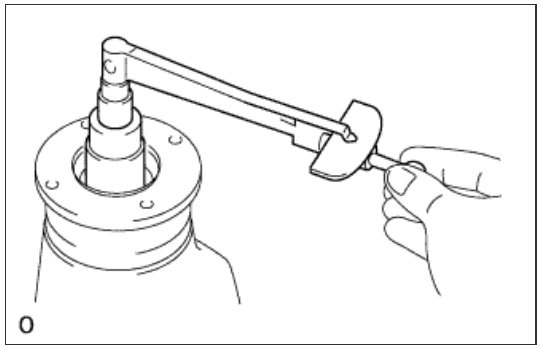


25. INSPECT TOTAL PRELOAD

a. Using a torque wrench, measure the preload with the teeth of the drive pinion and ring gear in contact.

Standard Preload (at Starting):

Bearing	Specified Condition
New	1.33 to 2.18 N*m (14 to 22 kgf*cm, 12 to 19 in.*lbf)
Reused	1.14 to 1.86 N*m (12 to 18 kgf*cm, 11 to 16 in.*lbf)



26. INSPECT DIFFERENTIAL RING GEAR BACKLASH

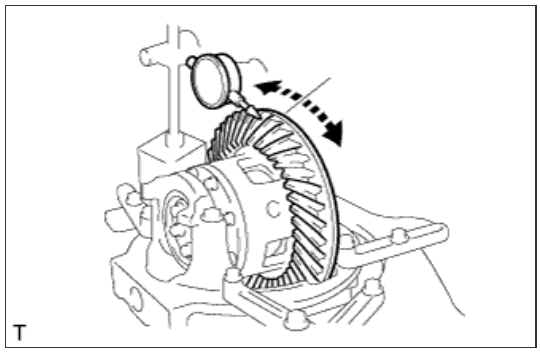
a. Using a dial indicator, measure the ring gear backlash.

Standard backlash:
0.10 to 0.20 mm (0.00394 to 0.00787 in.)

HINT:

Measure at 3 or more positions around the circumference of the ring gear.

If the backlash is not as specified, adjust the side bearing preload or repair as necessary.



27. INSPECT RUNOUT OF REAR DRIVE PINION REAR COMPANION FLANGE SUB-ASSEMBLY

a. Using a dial indicator, measure the runout of the companion flange vertically and laterally.

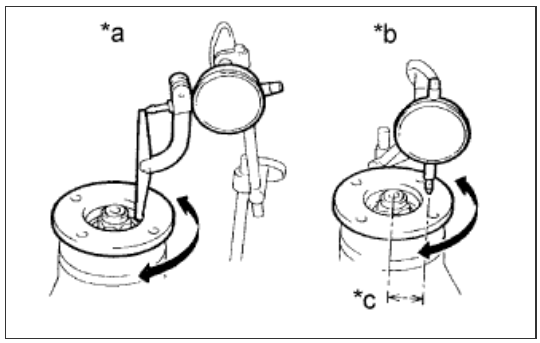
Maximum Runout:

Runout	Specified Condition
Vertical runout	0.10 mm (0.00394 in.)
Lateral runout	0.10 mm (0.00394 in.)

Text in Illustration

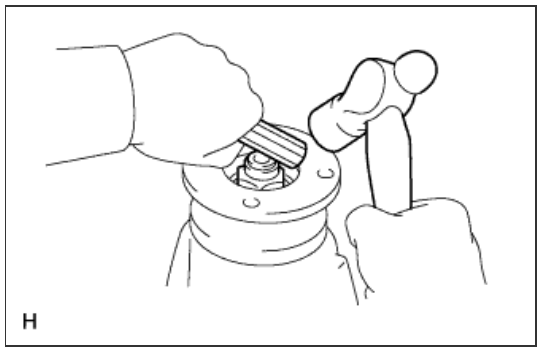
*a	Vertical Runout
*b	Lateral Runout
*c	35 mm (1.38 in.)

If the runout is more than the maximum, replace the companion flange.



28. STAKE DRIVE PINION COMPANION FLANGE REAR NUT

a. Using a chisel and hammer, stake the nut.



29. INSTALL DIFFERENTIAL LOCK SHIFT ACTUATOR

a. Remove any old FIPG material.

b. Clean the contact surfaces of any residual FIPG material using non-residue solvent.

c. Apply seal packing to the actuator.

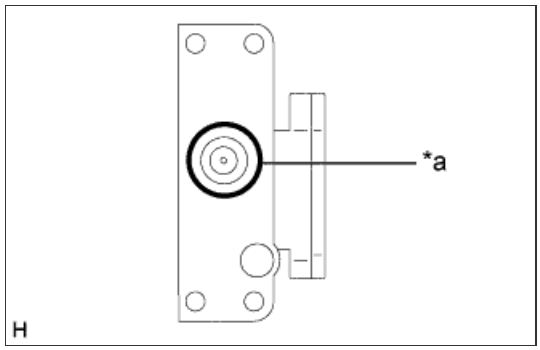
Text in Illustration

*a	Seal Packing Width: 1 to 2 mm (0.0394 to 0.0315 in.)

Seal packing:
Toyota Genuine Seal Packing 1281, Three Bond 1281 or equivalent

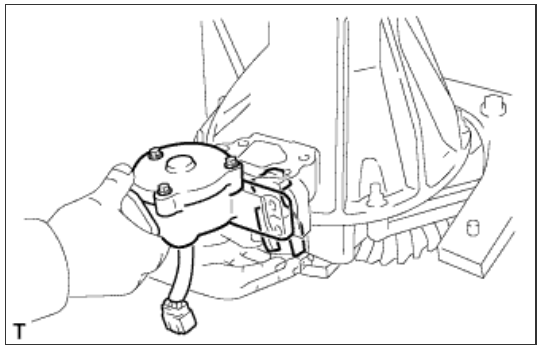
HINT:

Install the actuator within 10 minutes after applying seal packing.



d. Install the shift fork and actuator to the differential and align the shift fork hole with the shift lock.

e. Clean the threads of the set bolt and fork shaft with non-residue solvent.



f. Coat the threads of the set bolt with adhesive.

Text in Illustration

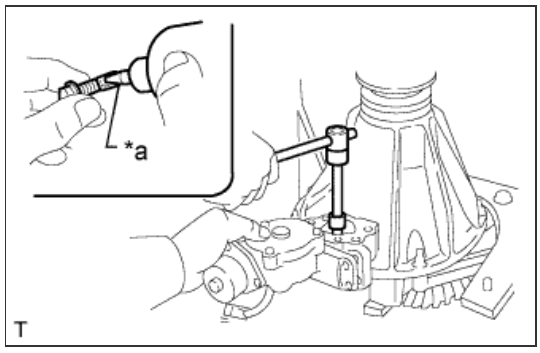
*a	Adhesive

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

g. Install the shift fork shaft set bolt.

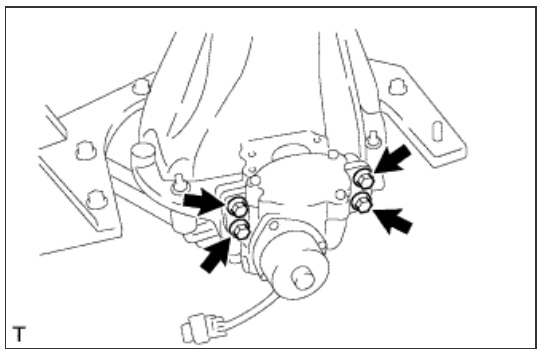
Torque:
20 N*m{ 204 kgf*cm , 15 ft.*lbf }

h. Engage the sleeve with the dog clutch of the differential case.



i. Install the 4 bolts.

Torque:
24 N*m{ 245 kgf*cm , 18 ft.*lbf }



30. INSTALL REAR DIFFERENTIAL LOCK COVER

a. Remove any old FIPG material.

b. Clean the contact surfaces of any residual FIPG material using non-residue solvent.

c. Apply seal packing to the cover

Text in Illustration

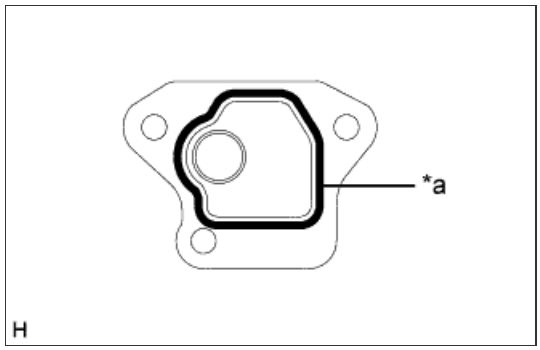
*a	Seal Packing Width: 1 to 2 mm (0.0394 to 0.0315 in.)

Seal packing:

Toyota Genuine Seal Packing 1281, Three Bond 1281 or equivalent

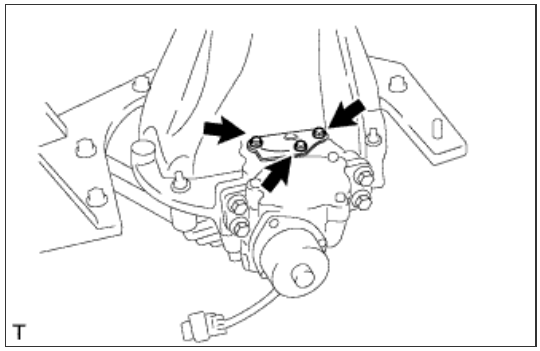
HINT:

Install the cover within 10 minutes after applying seal packing.



d. Install the cover with the 3 bolts.

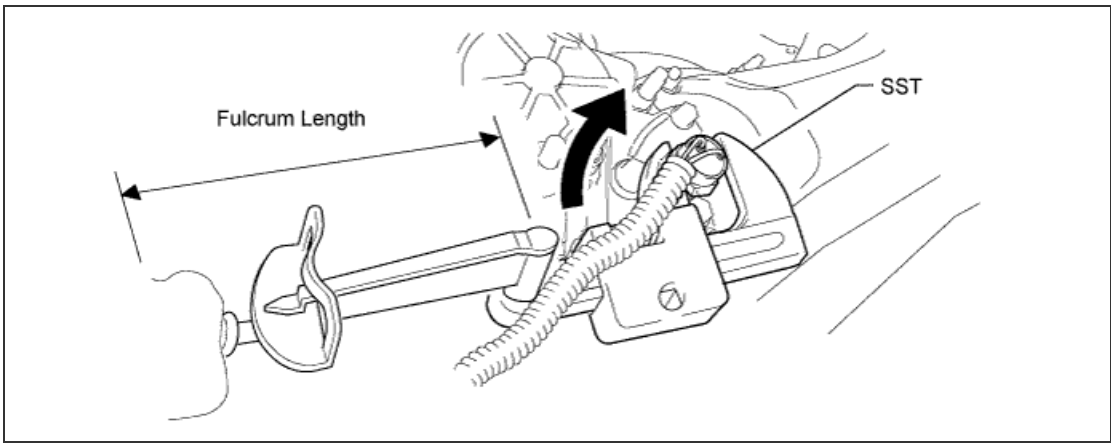
Torque:
18 N*m{ 184 kgf*cm , 13 ft.*lbf }



31. INSTALL NO. 1 TRANSFER INDICATOR SWITCH

a. Using a SST, install a new gasket and the indicator switch.

SST
09922-10010



Torque:
without SST:
40 N*m{ 408 kgf*cm , 30 ft.*lbf }
with SST:
28 N*m{ 283 kgf*cm , 20 ft.*lbf }

NOTICE:

- **Rotate SST in the direction shown in the illustration.**
- **Use a torque wrench with a fulcrum length of 300 mm (11.8 in.).**

b. Connect the connector.

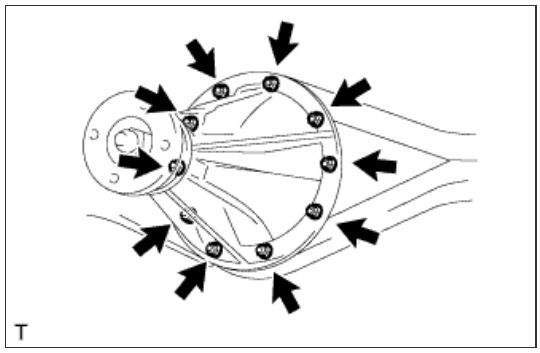
for Preparation Click here

1. INSTALL REAR DIFFERENTIAL CARRIER ASSEMBLY

a. Install a new gasket.

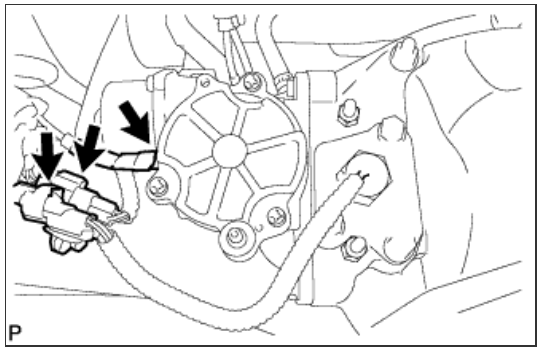
b. Install the differential carrier with the 10 washers and 10 nuts.

Torque:
72 N*m{ 734 kgf*cm , 53 ft.*lbf }



c. Connect the differential lock shift actuator and No. 4 transfer indicator switch clamps.

d. Connect the breather hose.



2. CONNECT PROPELLER SHAFT ASSEMBLY

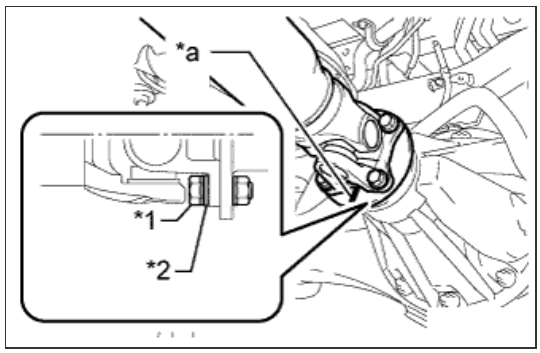
a. Align the matchmarks on the yoke and differential flange.

Text in Illustration

*1	Bolt
*2	Washer
*3	Matchmark

b. Connect the propeller shaft with the 4 bolts, 4 washers and 4 nuts.

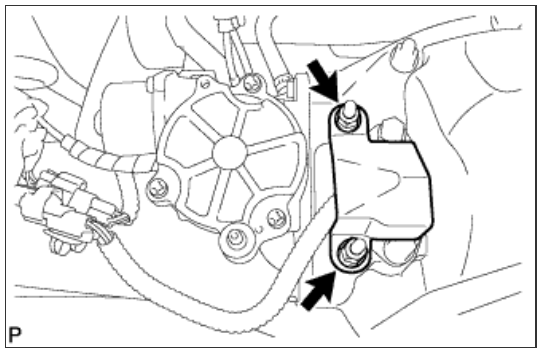
Torque:
88 N*m{ 900 kgf*cm , 65 ft.*lbf }



3. INSTALL REAR DIFFERENTIAL LOCK ACTUATOR PROTECTOR

a. Install the protector with the 2 nuts.

Torque:
35 N*m{ 357 kgf*cm , 26 ft.*lbf }



4. INSTALL DIFFERENTIAL PROTECTOR ASSEMBLY

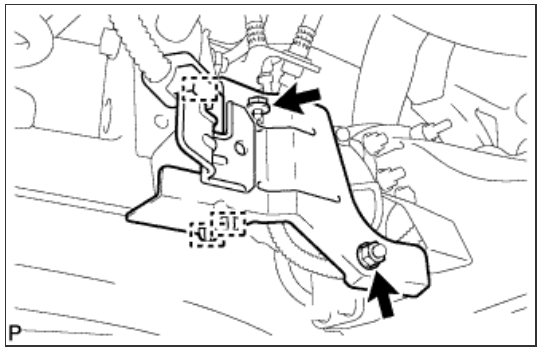
a. Attach the protector with the bolt and nut.

Torque:
15 N*m{ 150 kgf*cm , 11 ft.*lbf }

b. Connect the 2 connector clamps and wire harness clamp.

NOTICE:

Make sure the wire harness of the No. 4 transfer indicator switch fits inside the protector.



5. INSTALL REAR AXLE SHAFT

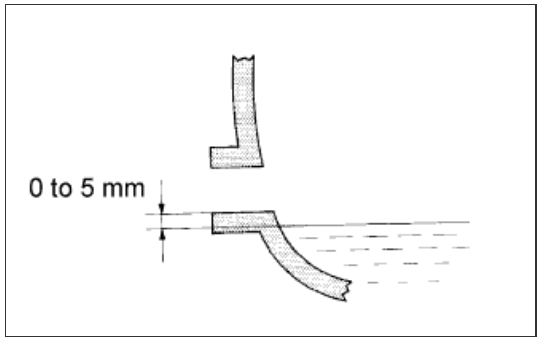
a. Install the rear axle shaft (Click here).

6. ADD DIFFERENTIAL OIL

a. Add differential oil so that the oil level is between 0 to 5 mm (0 to 0.197 in.) from the bottom lip of the differential filler plug hole.

NOTICE:

- **Too much or too little oil will lead to differential problems.**
- **After changing the oil, drive the vehicle and then check the oil level again.**



Front differential oil type and viscosity:
Toyota Genuine Differential gear oil LT 75W-85 GL-5 or equivalent

Rear Differential Oil Type and Viscosity:

Item	Oil Type and Viscosity
w/o LSD	Toyota Genuine Differential gear oil LT 75W-85 GL-5 or equivalent
w/ LSD	Toyota Genuine Differential gear oil LX 75W-85 GL-5 or equivalent

Front differential capacity:
1.85 to 1.95 liters (1.96 to 2.06 US qts., 1.63 to 1.71 Imp. qts.)

Rear Differential Capacity:

Item	Specified Condition
Standard	4.15 to 4.25 liters (4.39 to 4.49 US qts., 3.66 to 3.74 Imp. qts.)
w/ LSD	4.10 to 4.20 liters (4.34 to

w/ Differential lock	4.43 US qts., 3.60 to 3.69 Imp. qts.)

b. for Front Differential:

i. Using a 10 mm hexagon wrench, install a new gasket and the filler plug.

Torque:
39 N*m{ 400 kgf*cm , 29 ft.*lbf }

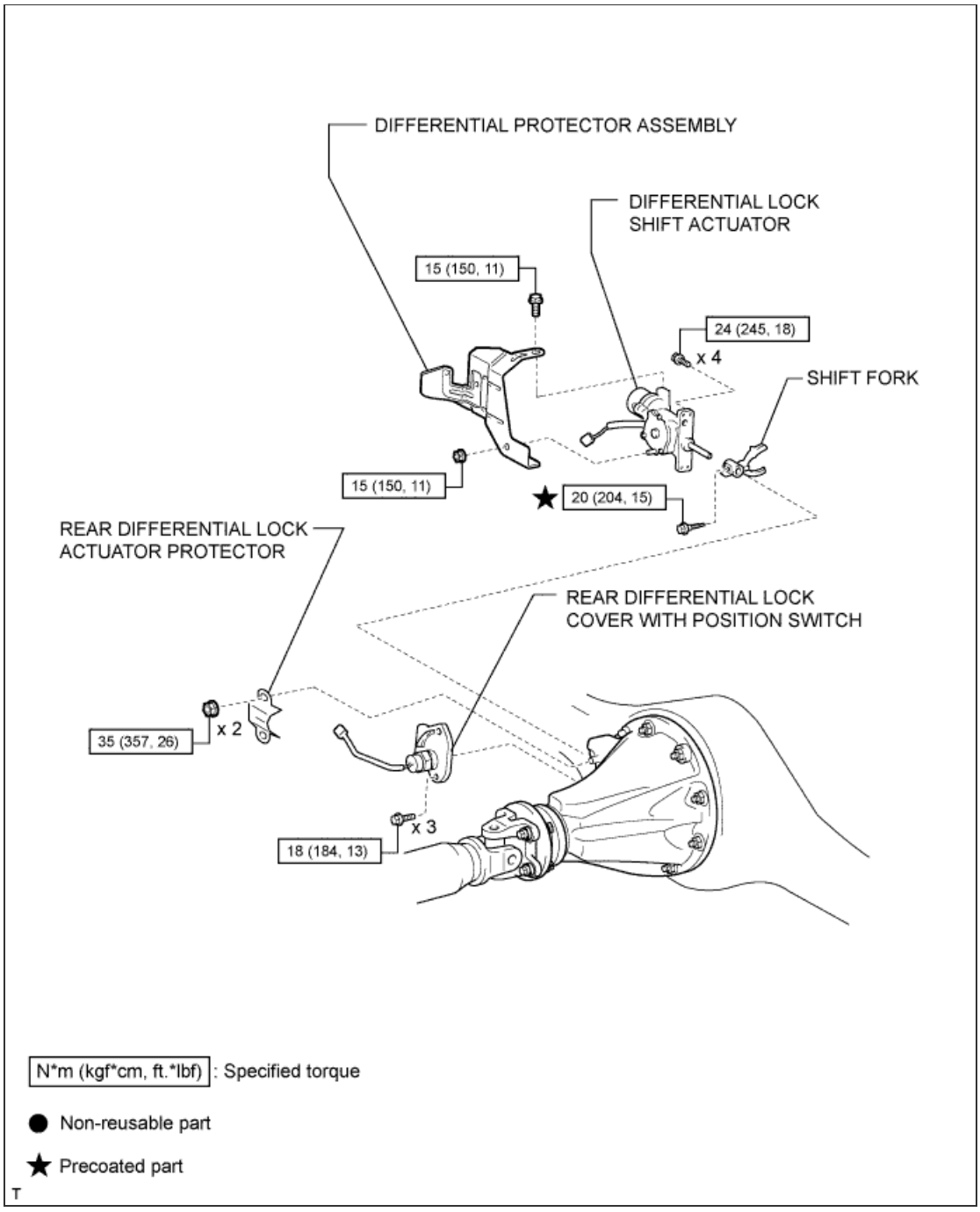
ii. Install the engine under cover.

c. for Rear Differential:

i. Install a new gasket and the filler plug.

Torque:
49 N*m{ 500 kgf*cm , 36 ft.*lbf }

for Preparation Click here

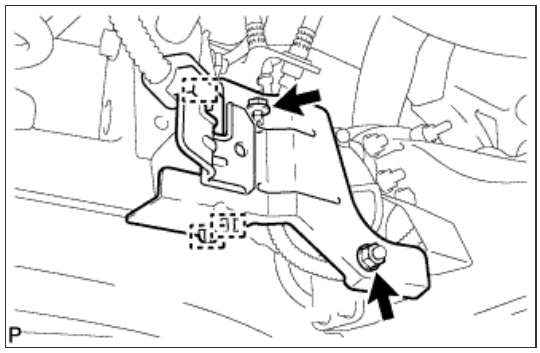


for Preparation Click here

1. REMOVE DIFFERENTIAL PROTECTOR ASSEMBLY

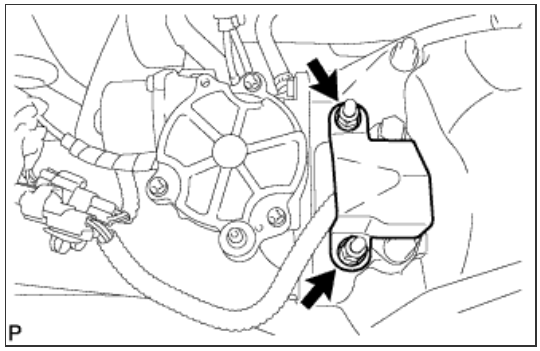
a. Detach the 2 connector clamps and wire harness clamp.

b. Remove the bolt, nut and protector.



2. REMOVE REAR DIFFERENTIAL LOCK ACTUATOR PROTECTOR

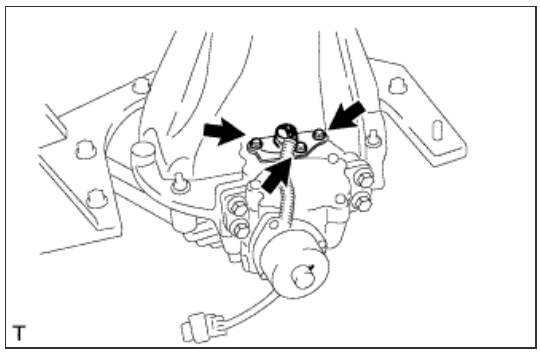
a. Remove the 2 nuts and protector.



3. REMOVE REAR DIFFERENTIAL LOCK COVER WITH POSITION SWITCH

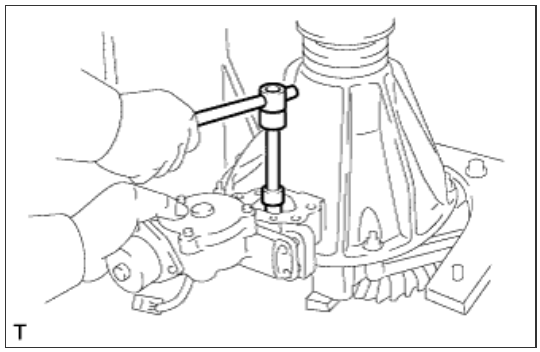
a. Remove the 3 bolts and differential lock cover with position switch.

b. Using a brass bar and hammer, tap on the cover to remove it.



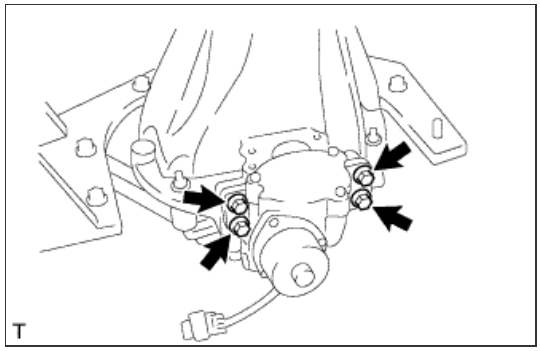
4. REMOVE DIFFERENTIAL LOCK SHIFT ACTUATOR

a. Remove the shift fork shaft bolt.



b. Remove the 4 bolts and differential lock shift actuator.

c. Using a screwdriver, pull out the actuator and remove the sleeve and shift fork.



for Preparation Click here

1. INSPECT DIFFERENTIAL LOCK SHIFT ACTUATOR

a. Check the free to lock switch.

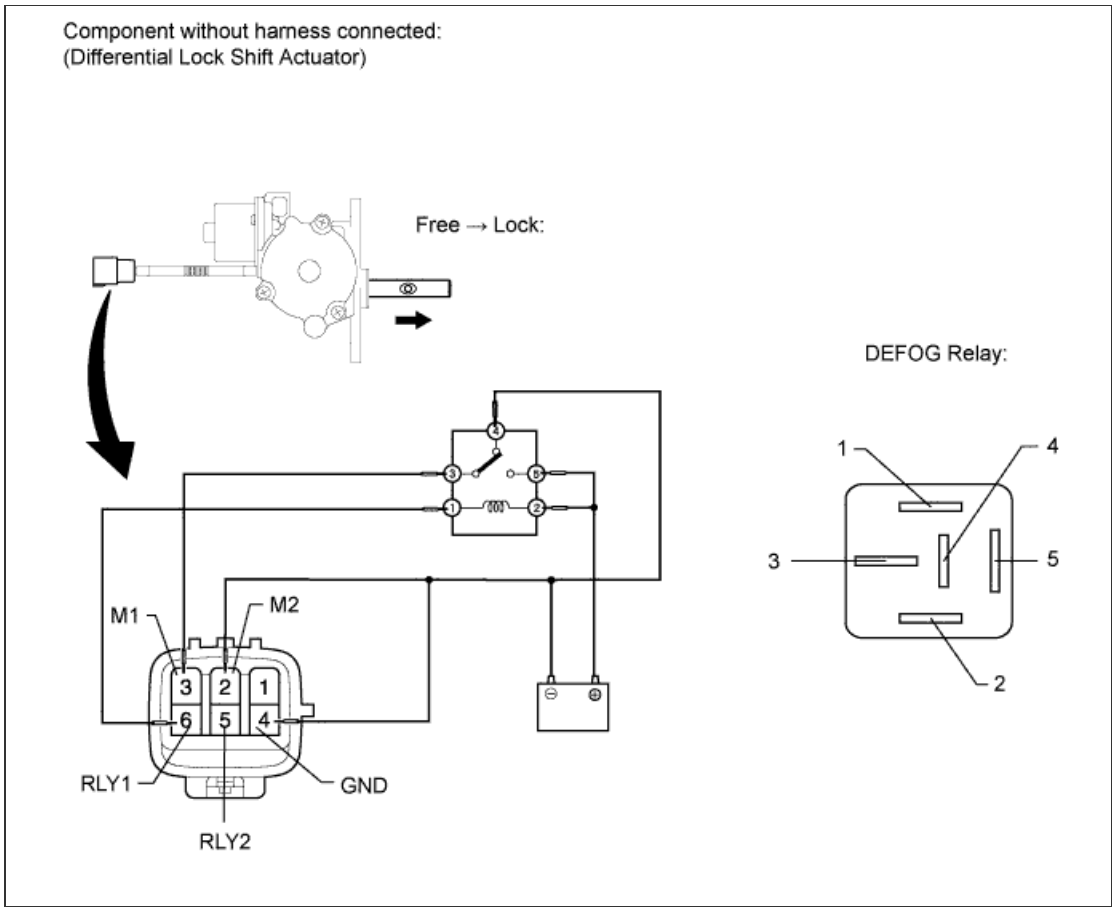
i. Connect lines via a relay as shown in the illustration, and check that the actuator fork moves from the free to lock position.

NOTICE:

- **Make sure to perform this inspection with the actuator removed from the vehicle. If this inspection is performed with the actuator installed to the vehicle, the actuator will be damaged.**
- **When inspecting the actuator, make sure to operate it with the lines connected via a relay. If the lines are not connected via a relay and battery voltage is directly applied to the actuator, the actuator will be damaged.**

HINT:

When performing the operation described above, use the DEFOG relay.



ii. After the free to lock switch is complete, check the limit switch of the shift actuator.

Standard Resistance:

Tester Connection	Condition	Specified Condition
5 (RLY2) - 4 (GND)	After free to lock switch is complete	Below 12.5 Ω

6 (RLY1) - 4 (GND)	After free to lock switch is complete	500 kΩ or higher

If the result is not as specified, replace the differential lock shift actuator assembly.

b. Check the lock to free switch.

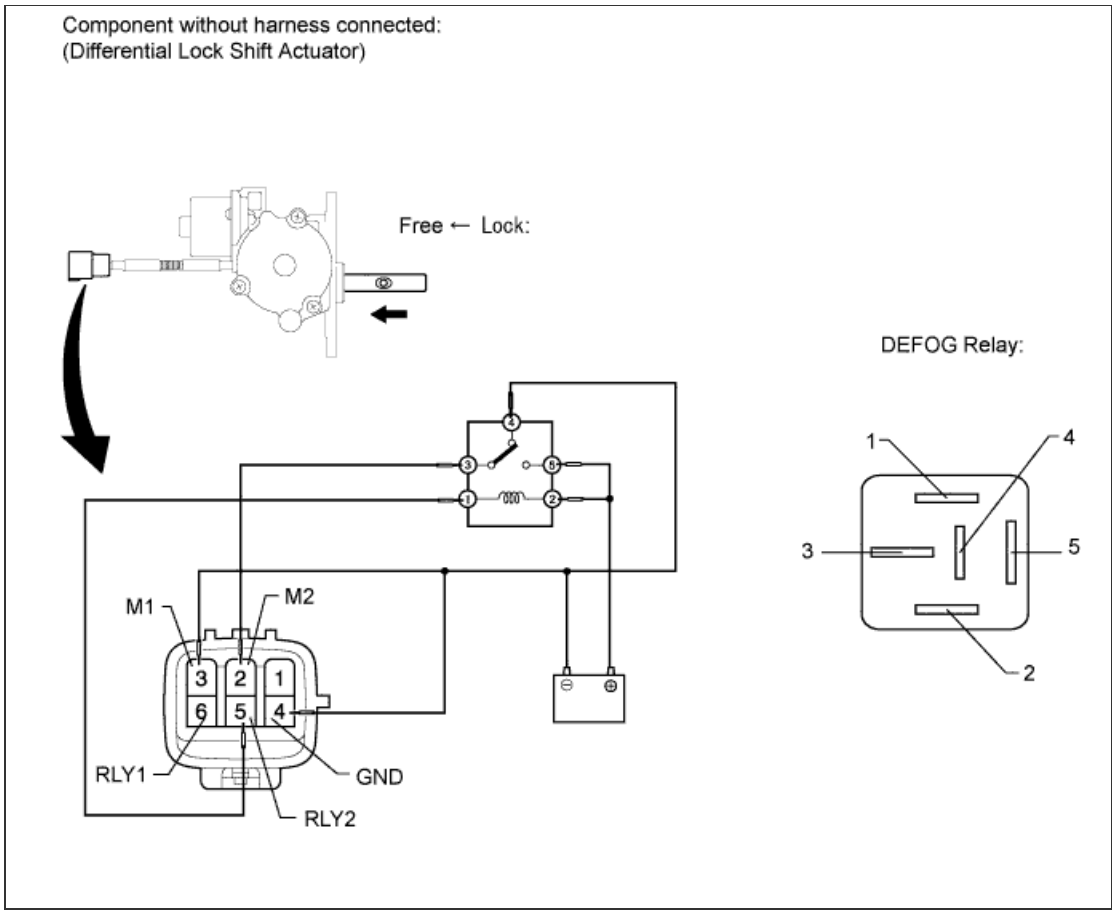
i. Connect lines via a relay as shown in the illustration, and check that the actuator fork moves from the lock to free position.

NOTICE:

- **Make sure to perform this inspection with the actuator removed from the vehicle. If this inspection is performed with the actuator installed to the vehicle, the actuator will be damaged.**
- **When inspecting the actuator, make sure to operate it with the lines connected via a relay. If the lines are not connected via a relay and battery voltage is directly applied to the actuator, the actuator will be damaged.**

HINT:

When performing the operation described above, use the DEFOG relay.



ii. After the lock to free switch is complete, check the limit switch of the shift actuator.

Standard Resistance:

Tester Connection	Condition	Specified Condition
5 (RLY2) - 4 (GND)	After lock to free switch is complete	500 kΩ or higher
6 (RLY1) - 4 (GND)	After lock to free switch is complete	Below 12.5 Ω

If the result is not as specified, replace the differential lock shift actuator assembly.

for Preparation Click here

1. INSTALL DIFFERENTIAL LOCK SHIFT ACTUATOR

a. Remove any old FIPG material.

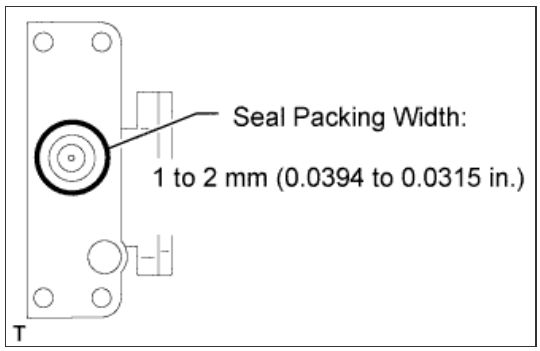
b. Clean the contact surfaces of any residual FIPG material using non-residue solvent.

c. Apply seal packing to the actuator.

Seal packing:
Toyota Genuine Seal Packing 1281, Three Bond 1281 or equivalent:

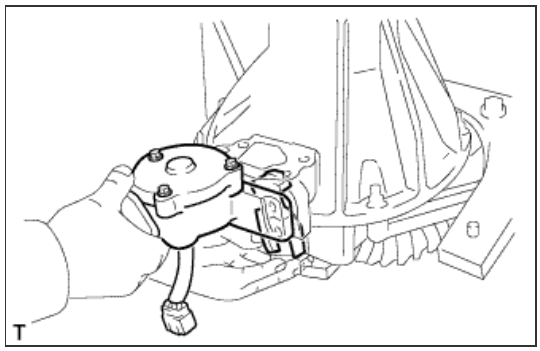
HINT:

Install the actuator within 10 minutes after applying seal packing.



d. Install the shift fork and actuator to the differential and align the shift fork hole with the shift lock.

e. Clean the threads of the set bolt and fork shaft with non-residue solvent.



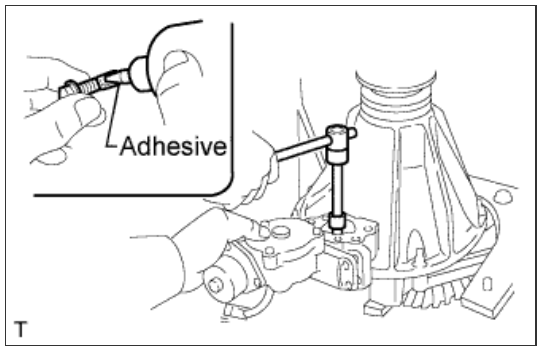
f. Coat the threads of the set bolt with adhesive.

Adhesive:
Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent

g. Install the shift fork shaft set bolt.

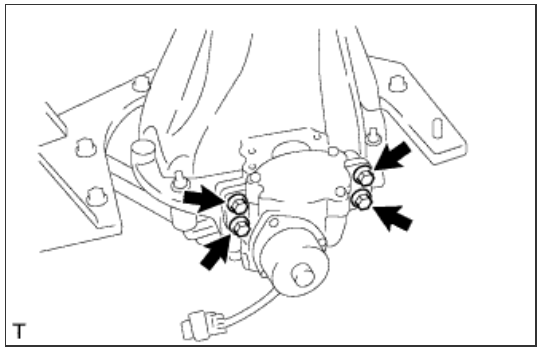
Torque:
20 N*m{ 204 kgf*cm , 15 ft.*lbf }

h. Engage the sleeve with the dog clutch of the differential case.



i. Install the 4 bolts.

Torque:
24 N*m{ 245 kgf*cm , 18 ft.*lbf }



2. INSTALL REAR DIFFERENTIAL LOCK COVER WITH POSITION SWITCH

a. Remove any old FIPG material.

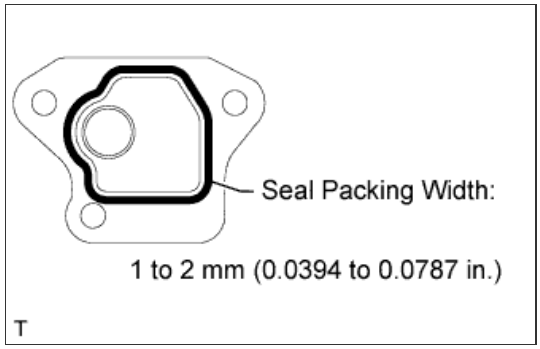
b. Clean the contact surfaces of any residual FIPG material using non-residue solvent.

c. Apply seal packing to the cover.

Seal packing:
Toyota Genuine Seal Packing 1281, Three Bond 1281 or equivalent

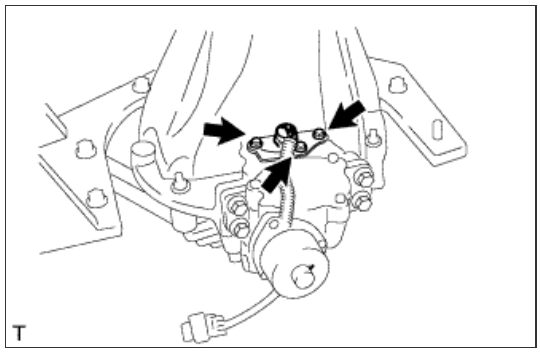
HINT:

Install the cover within 10 minutes after applying seal packing.



d. Install the cover with the 3 bolts.

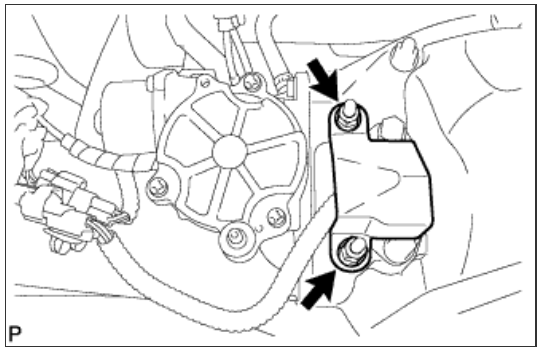
Torque:
18 N*m{ 184 kgf*cm , 13 ft.*lbf }



3. INSTALL REAR DIFFERENTIAL LOCK ACTUATOR PROTECTOR

a. Install the protector with the 2 nuts.

Torque:
35 N*m{ 357 kgf*cm , 26 ft.*lbf }



4. INSTALL DIFFERENTIAL PROTECTOR ASSEMBLY

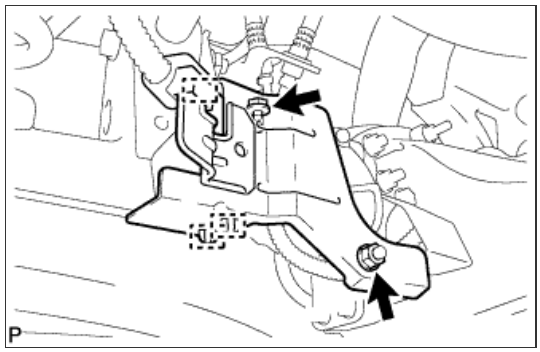
a. Attach the protector with the bolt and nut.

Torque:
15 N*m{ 150 kgf*cm , 11 ft.*lbf }

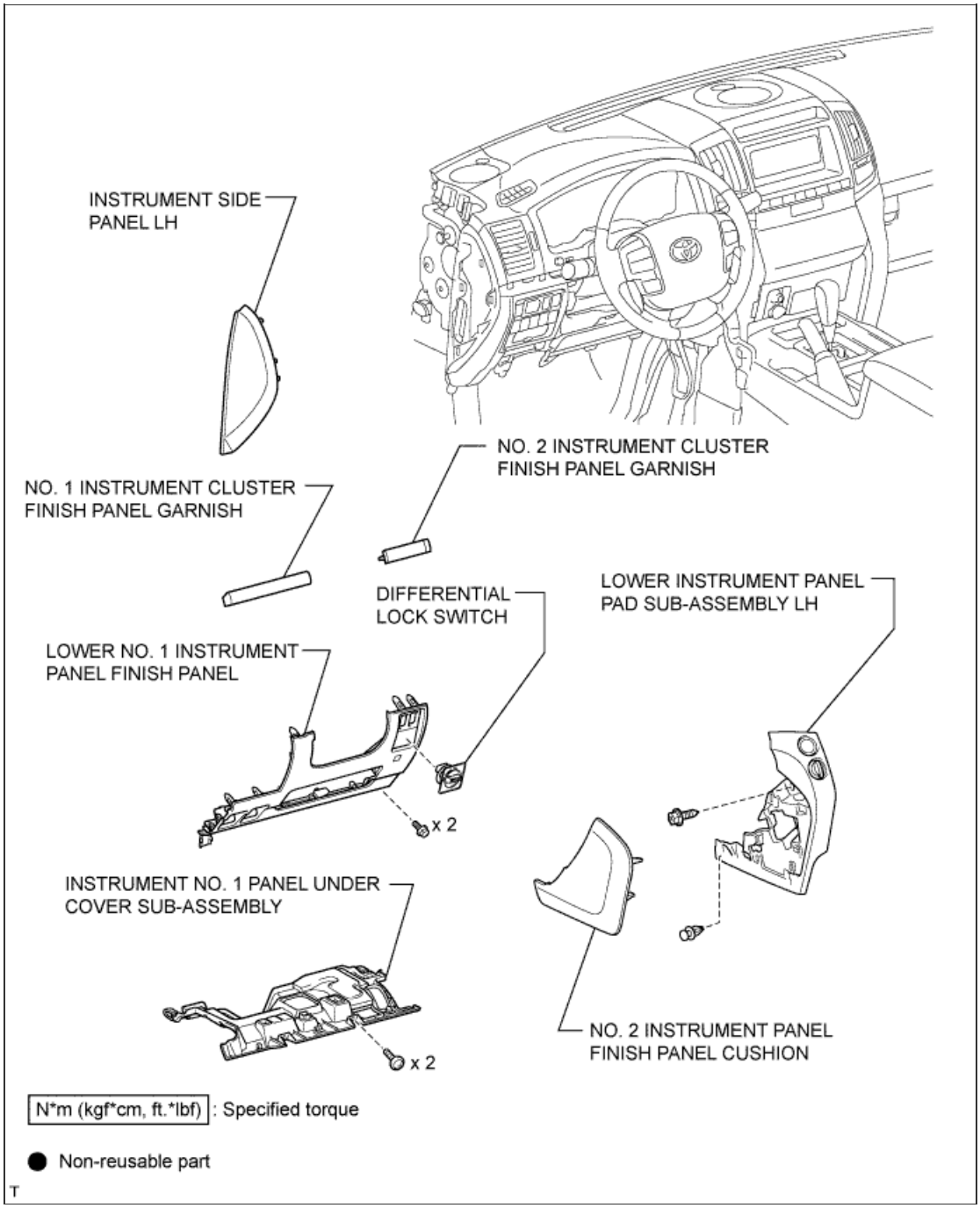
b. Connect the 2 connector clamps and wire harness clamp.

NOTICE:

Make sure the wire harness of the No. 4 transfer indicator switch fits inside the protector.



for Preparation Click here



for Preparation Click here

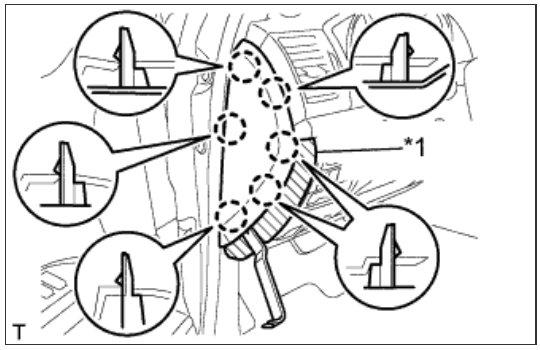
1. CLEAN INSTRUMENT SIDE PANEL LH

a. Place protective tape as shown in the illustration.

Text in Illustration

*1	Protective Tape

b. Using a moulding remover, detach the 6 claws and remove the instrument side panel.



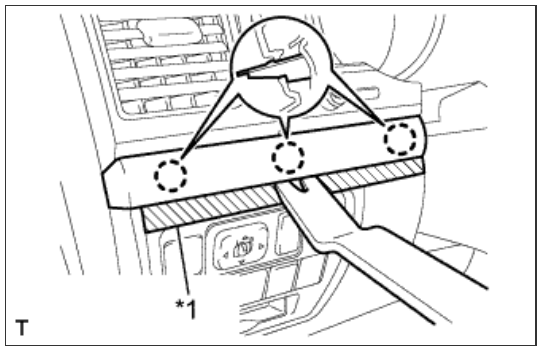
2. REMOVE NO. 1 INSTRUMENT CLUSTER FINISH PANEL GARNISH

a. Place protective tape as shown in the illustration.

Text in Illustration

*1	Protective Tape

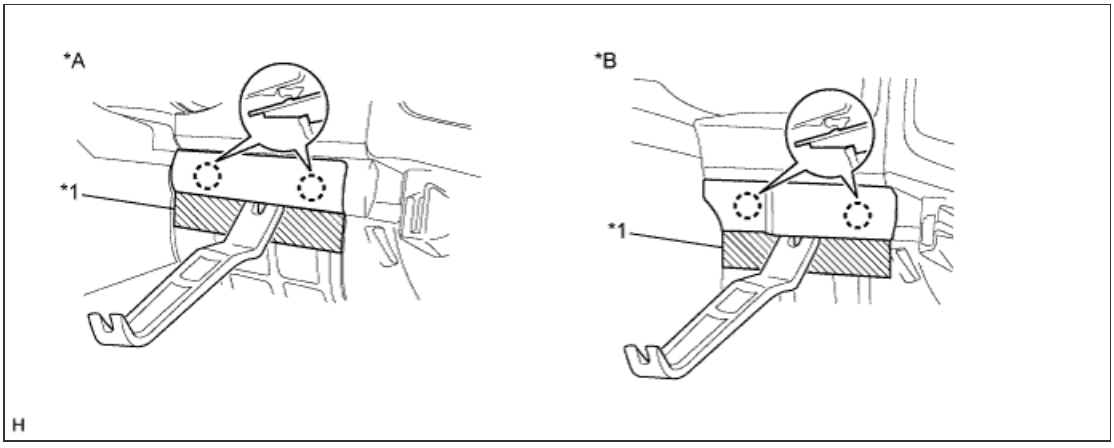
b. Using a moulding remover, detach the 3 claws and remove the No. 1 instrument cluster finish panel garnish.



3. REMOVE NO. 2 INSTRUMENT CLUSTER FINISH PANEL GARNISH

a. Place protective tape as shown in the illustration.

b. Using a moulding remover, detach the 2 claws and remove the No. 2 instrument cluster finish panel garnish.



Text in Illustration

*A	w/ Entry and Start System	*B	w/o Entry and Start System

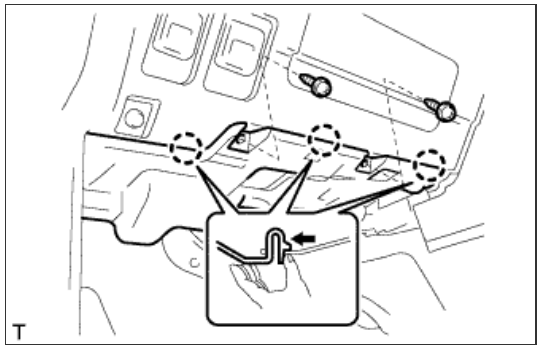
*1	Protective Tape	-	-

4. REMOVE NO. 1 INSTRUMENT PANEL UNDER COVER SUB-ASSEMBLY

a. Remove the 2 screws.

b. Detach the 3 claws.

c. Disconnect the connectors and remove the No. 1 instrument panel under cover.



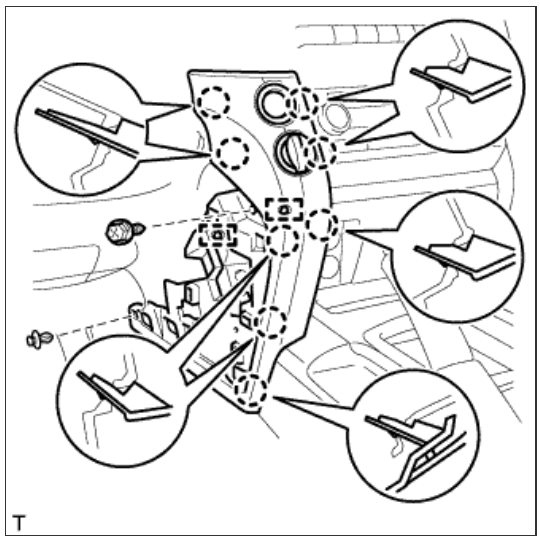
5. REMOVE LOWER INSTRUMENT PANEL PAD SUB-ASSEMBLY LH

a. Remove the clip.

b. Remove the screw.

c. Detach the 8 claws.

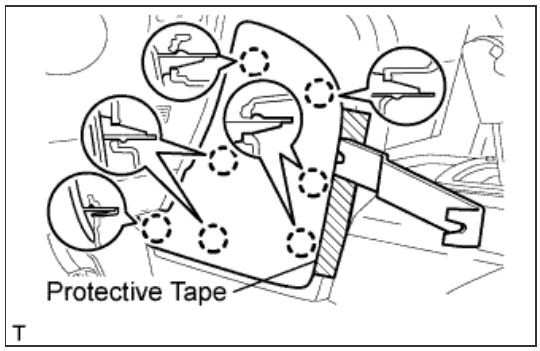
d. Remove the panel pad and disconnect the connectors and 2 clamps.



6. REMOVE NO. 2 INSTRUMENT PANEL FINISH PANEL CUSHION

a. Place protective tape as shown in the illustration.

b. Using a moulding remover, detach the 7 claws and remove the panel cushion.



7. REMOVE LOWER NO. 1 INSTRUMENT PANEL FINISH PANEL

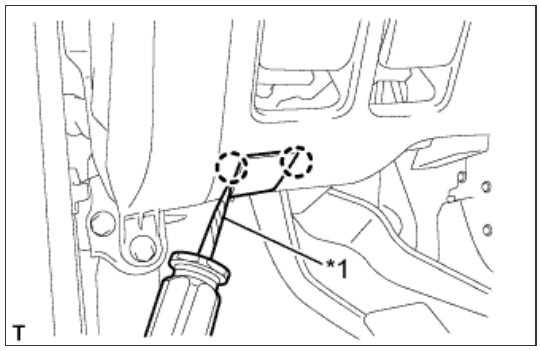
a. Using a screwdriver, detach the 2 claws and open the hole cover.

HINT:

Tape the screwdriver tip before use.

Text in Illustration

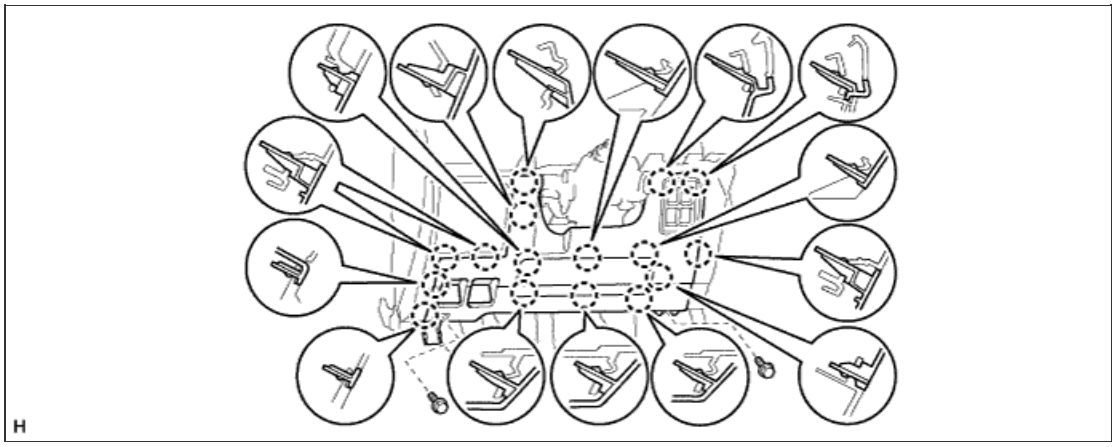
*1	Protective Tape



b. w/ Driver Side Knee Airbag:

i. Remove the 2 bolts.

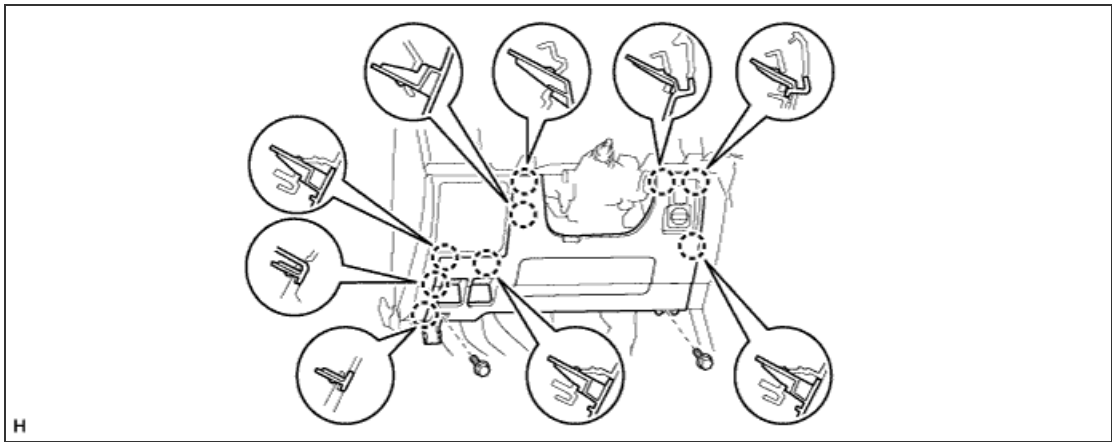
ii. Detach the 16 claws.



c. w/o Driver Side Knee Airbag:

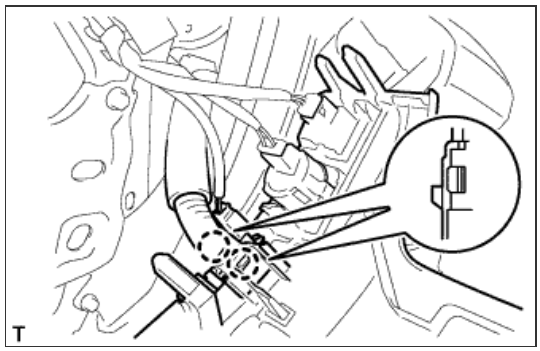
i. Remove the 2 bolts.

ii. Detach the 9 claws.



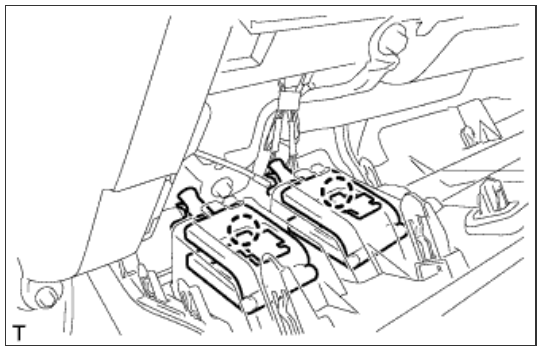
d. for Automatic Air Conditioning System:

i. Detach the 2 claws and remove the room temperature sensor.



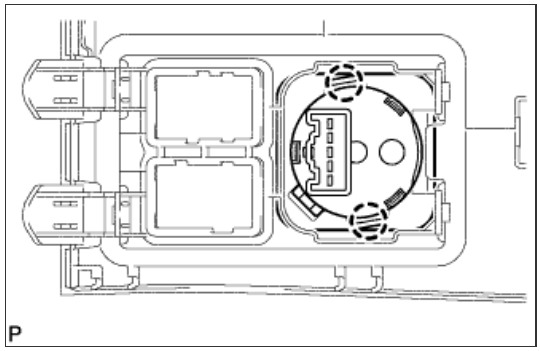
e. Detach the 2 claws and disconnect the 2 control cables.

f. Disconnect the connectors and remove the lower No. 1 instrument panel finish panel.



8. REMOVE DIFFERENTIAL LOCK SWITCH

a. Detach the 2 claws and remove the switch.



for Preparation Click here

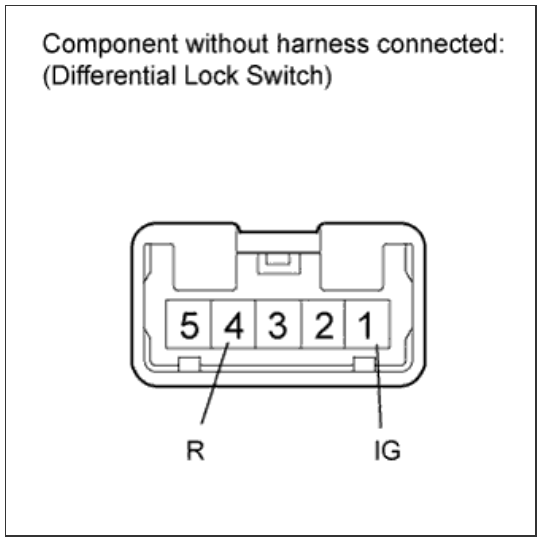
1. INSPECT DIFFERENTIAL LOCK SWITCH

a. Measure the resistance according to the value(s) in the table below.

Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
1 (IG) - 4 (R)	OFF	10 kΩ or higher
	RR	Below 1 Ω

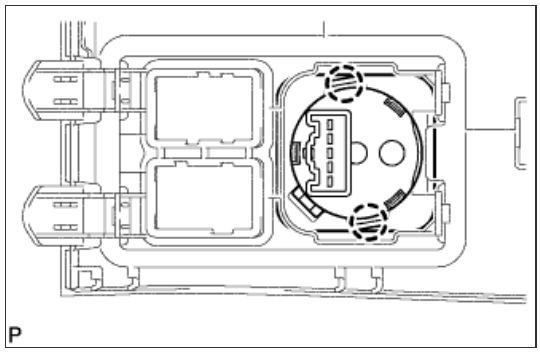
If the result is not as specified, replace the switch.



for Preparation Click here

1. INSTALL DIFFERENTIAL LOCK SWITCH

a. Attach the 2 claws to install the switch.

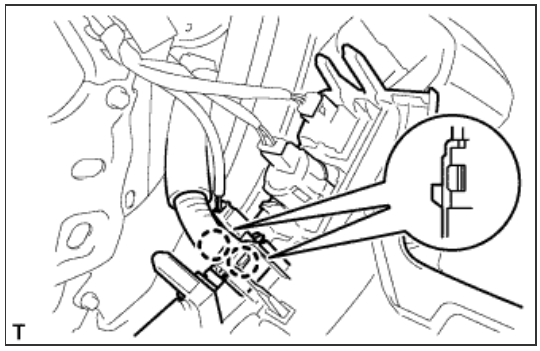


2. INSTALL LOWER NO. 1 INSTRUMENT PANEL FINISH PANEL

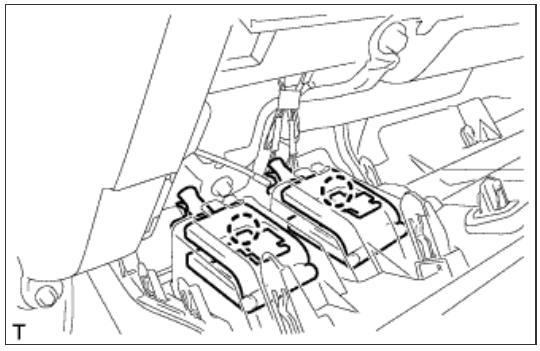
a. Connect the connectors.

b. for Automatic Air Conditioning System:

i. Attach the 2 claws to install the room temperature sensor.



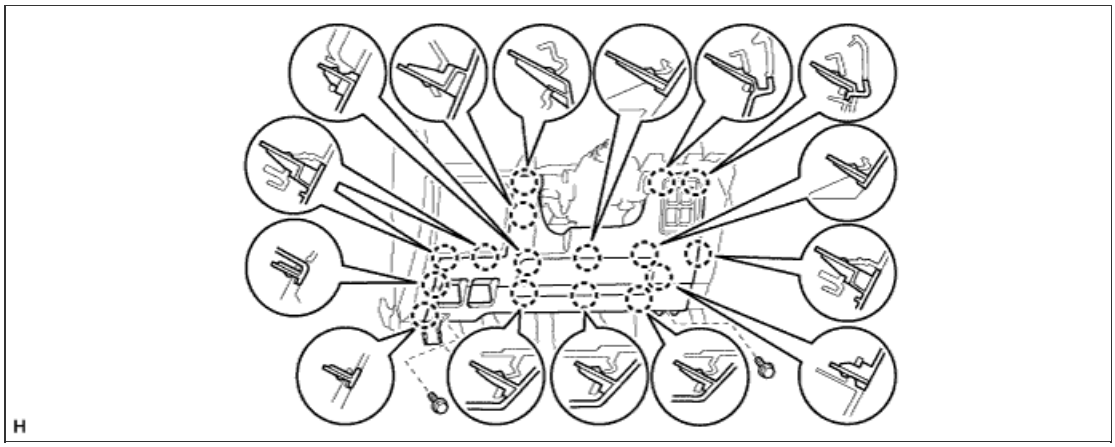
c. Attach the 2 claws to connect the 2 control cables.



d. w/ Driver Side Knee Airbag:

i. Attach the 16 claws to install the lower No. 1 instrument panel finish panel.

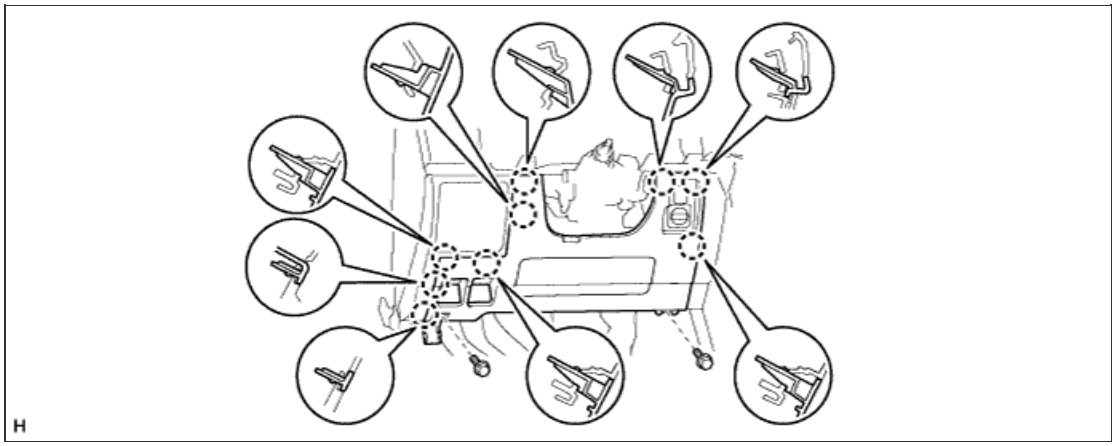
ii. Install the 2 bolts.



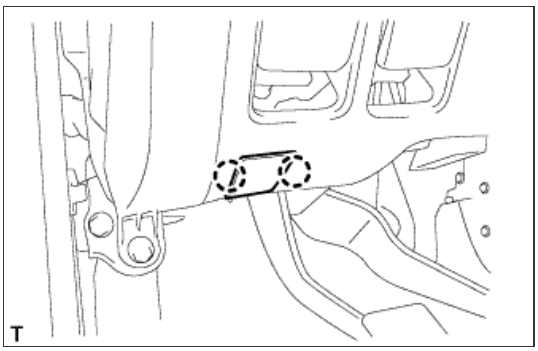
e. w/o Driver Side Knee Airbag:

i. Attach the 9 claws to install the lower No. 1 instrument panel finish panel.

ii. Install the 2 bolts.

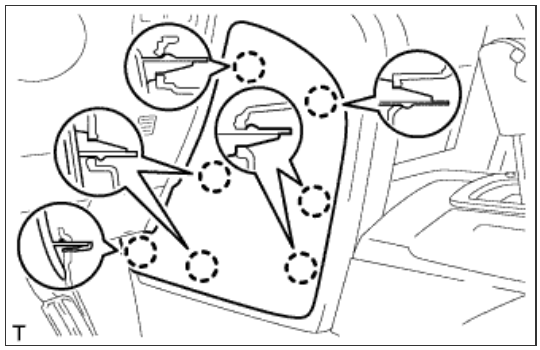


f. Attach the 2 claws to close the hole cover.



3. INSTALL NO. 2 INSTRUMENT PANEL FINISH PANEL CUSHION

a. Attach the 7 claws to install the panel cushion.



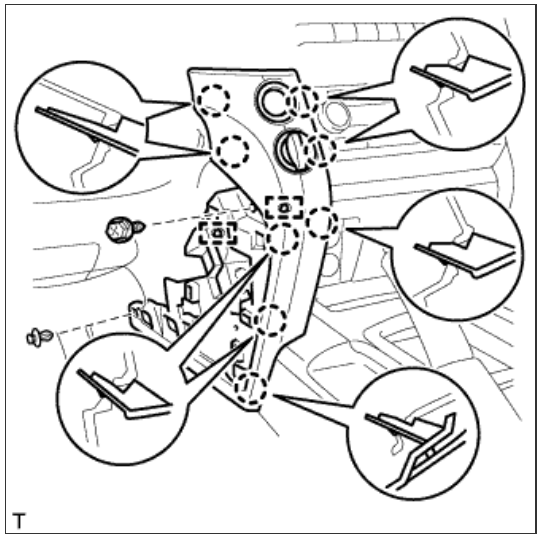
4. INSTALL LOWER INSTRUMENT PANEL PAD SUB-ASSEMBLY LH

a. Connect the connectors and 2 clamps.

b. Attach the 8 claws to install the panel pad.

c. Install the screw.

d. Install the clip.

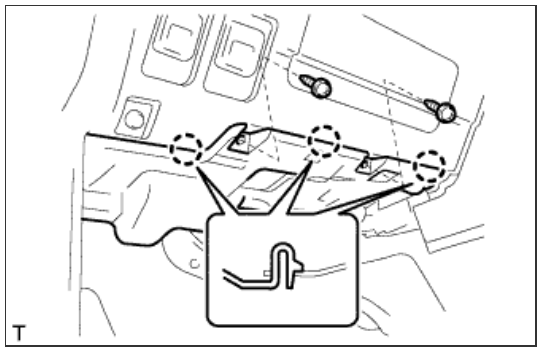


5. INSTALL NO. 1 INSTRUMENT PANEL UNDER COVER SUB-ASSEMBLY

a. Connect the connectors.

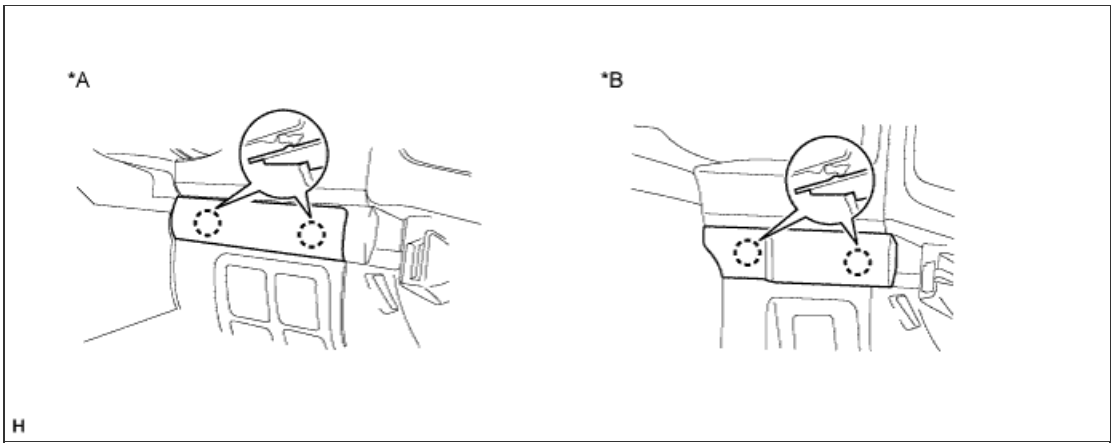
b. Attach the 3 claws to install the No. 1 instrument panel under cover.

c. Install the 2 screws.



6. INSTALL NO. 2 INSTRUMENT CLUSTER FINISH PANEL GARNISH

a. Attach the 2 claws to install the No. 2 instrument cluster finish panel garnish.

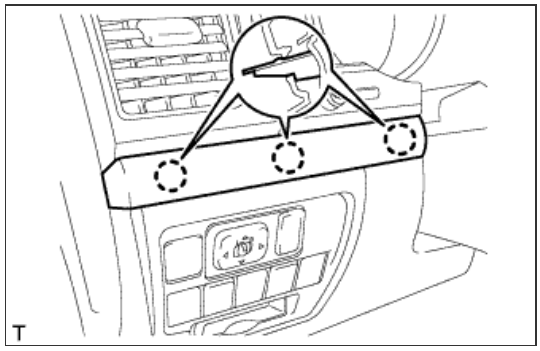


Text in Illustration

*A	w/ Entry and Start System	*B	w/o Entry and Start System

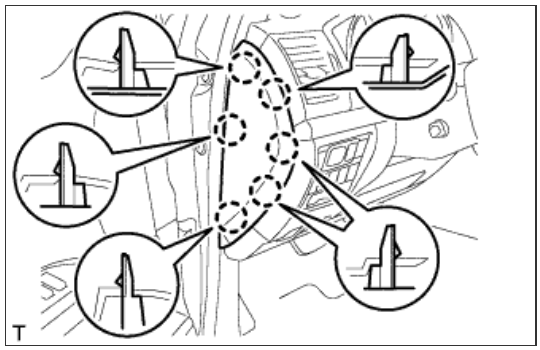
7. INSTALL NO. 1 INSTRUMENT CLUSTER FINISH PANEL GARNISH

a. Attach the 3 claws to install the No. 1 instrument cluster finish panel garnish.

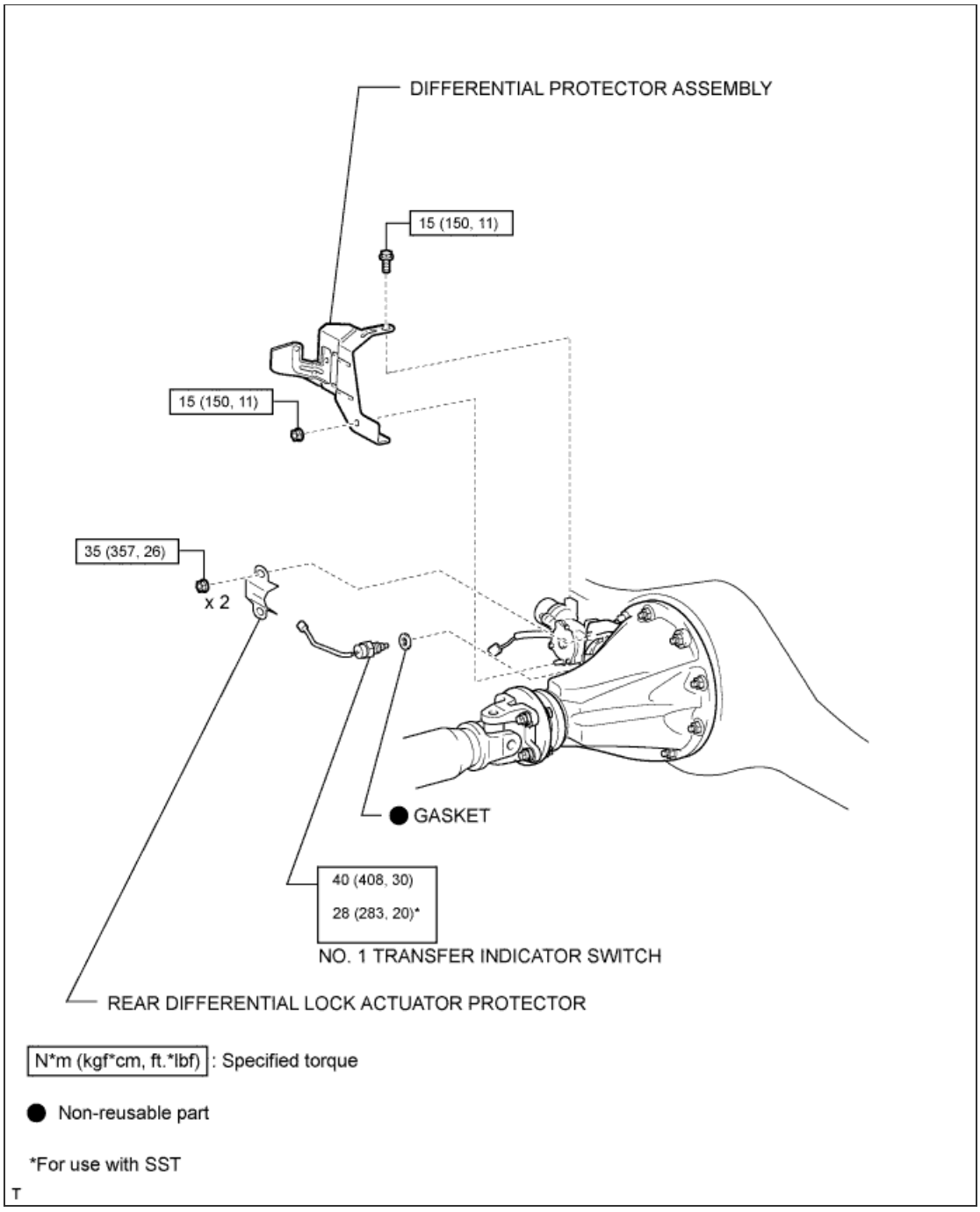


8. INSTALL INSTRUMENT SIDE PANEL LH

a. Attach the 6 claws to install the instrument side panel.



for Preparation Click here



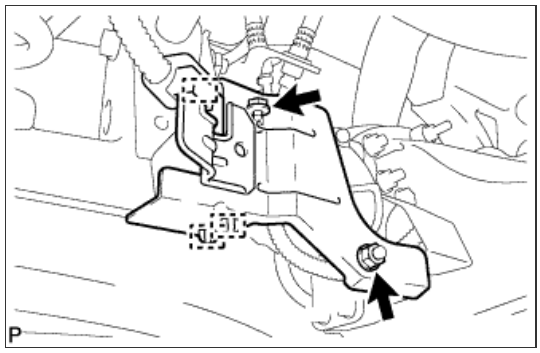
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for Preparation Click here

1. REMOVE DIFFERENTIAL PROTECTOR ASSEMBLY

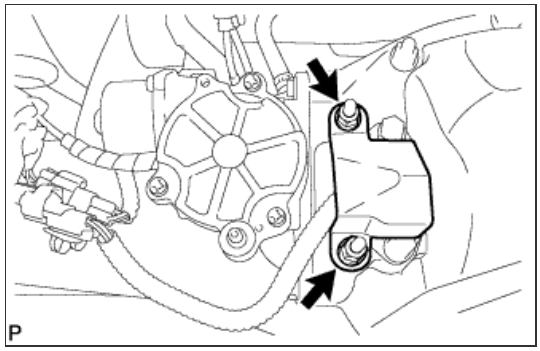
a. Detach the 2 connector clamps and wire harness clamp.

b. Remove the bolt, nut and protector.



2. REMOVE REAR DIFFERENTIAL LOCK ACTUATOR PROTECTOR

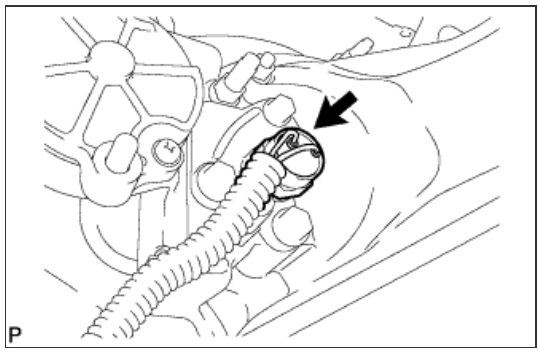
a. Remove the 2 nuts and protector.



3. REMOVE NO. 1 TRANSFER INDICATOR SWITCH

a. Disconnect the connector.

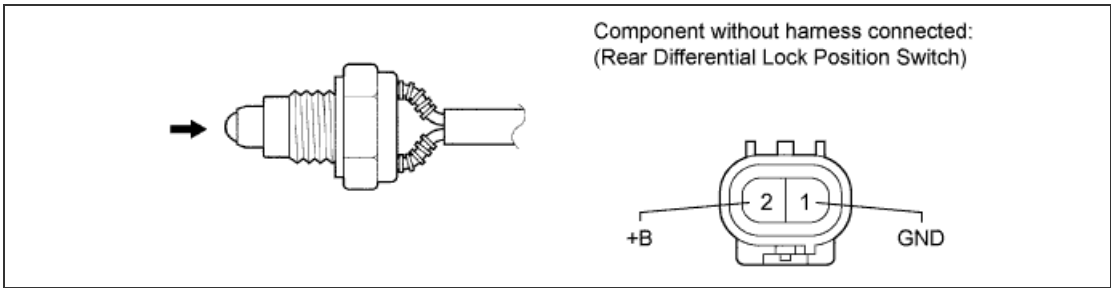
b. Remove the switch and gasket.



for Preparation Click here

1. INSPECT REAR DIFFERENTIAL LOCK POSITION SWITCH (NO. 1 TRANSFER INDICATOR SWITCH)

a. Measure the resistance according to the value(s) in the table below.



Standard Resistance:

Tester Connection	Switch Condition	Specified Condition
2 (+B) - 1 (GND)	Pushed	Below 1 Ω
	Not pushed	100 kΩ or higher

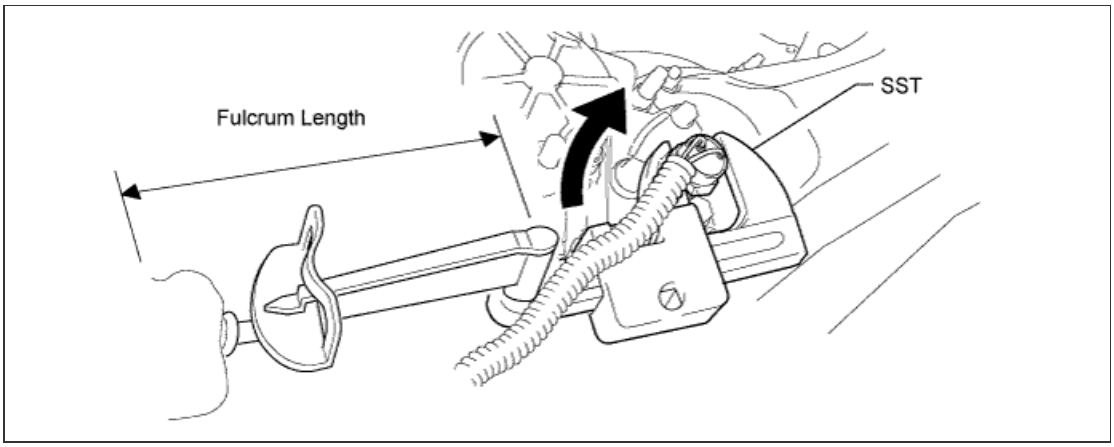
If the result is not as specified, replace the rear differential lock position switch.

for Preparation Click here

1. INSTALL NO. 1 TRANSFER INDICATOR SWITCH

a. Using a SST, install a new gasket and the indicator switch.

SST
09922-10010



Torque:
without SST:
40 N*m{ 408 kgf*cm , 30 ft.*lbf }
with SST:
28 N*m{ 283 kgf*cm , 20 ft.*lbf }

NOTICE:

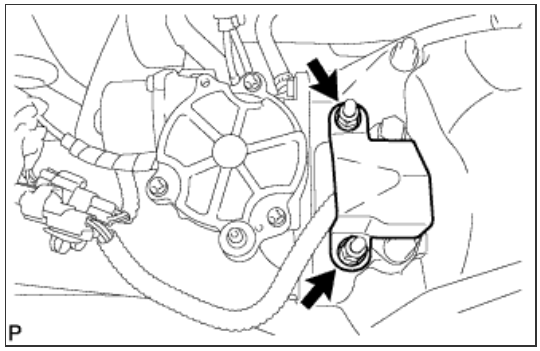
- **Rotate SST in the direction shown in the illustration.**
- **Use a torque wrench with a fulcrum length of 300 mm (11.8 in.).**

b. Connect the connector.

2. INSTALL REAR DIFFERENTIAL LOCK ACTUATOR PROTECTOR

a. Install the protector with the 2 nuts.

Torque:
35 N*m{ 357 kgf*cm , 26 ft.*lbf }



3. INSTALL DIFFERENTIAL PROTECTOR ASSEMBLY

a. Attach the protector with the bolt and nut.

Torque:
15 N*m{ 150 kgf*cm , 11 ft.*lbf }

b. Connect the 2 connector clamps and wire harness clamp.

NOTICE:

Make sure the wire harness of the No. 4 transfer indicator switch fits inside the protector.

