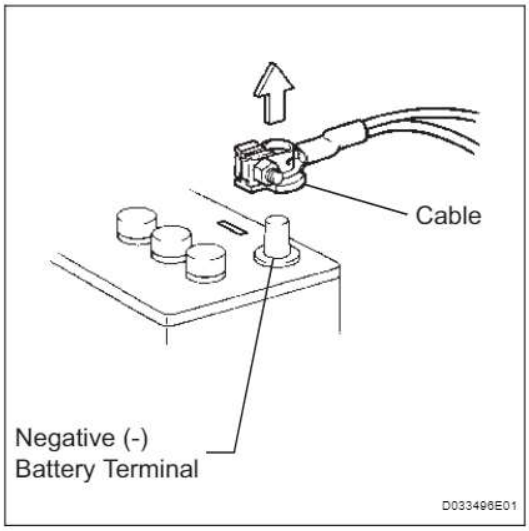
# AUTOMATIC TRANSMISSION SYSTEM

## PRECAUTION

1. **PRECAUTION**
   **NOTICE:**
   - **Perform the RESET MEMORY (AT initialization) when replacing the automatic transmission assembly, engine assembly or ECM (See page AT-19).**
   - **Perform the REGISTRATION (VIN registration) when replacing the ECM (See page ES-15).**

   HINT:
   RESET MEMORY cannot be completed by only disconnecting the negative cable from the battery.




2. **DISCONNECT AND RECONNECT CABLE OF NEGATIVE BATTERY TERMINAL**
   (a) Before performing electronic work, disconnect the cable from the negative (-) battery terminal in order to prevent it from shorting and burning out.
   (b) Before disconnecting and reconnecting the battery cable, turn the ignition switch OFF and the headlight dimmer switch OFF. Then loosen the terminal nut completely. Do not damage the cable or terminal.
   (c) When the battery cable is disconnected, the clock and radio settings and stored DTCs are erased. Therefore, before disconnecting the battery cable, make a notes of them.

**NOTICE:**
**When the cable is disconnected from the negative (-) battery terminal, initialize the following system(s) after the cable is reconnected.**

| System Name | See Procedure |
|---|---|
| Meter / Gauge system | ME-10 |

3. **CONNECT BATTERY NEGATIVE TERMINAL**
   (a) Connect the battery negative terminal to the cable and run the engine at no less than 2,000 rpm for 2 minutes.
   **NOTICE:**
   **If the engine exceeds 2,000 rpm, the A/C magnet clutch is automatically disengaged by the compressor protection control system.**

4. **PRECAUTION FOR DISASSEMBLY AND REASSEMBLY**
   **CAUTION:**
   **When using compressed air, always aim away from yourself to prevent Automatic Transmission Fluid (ATF) or kerosene from spraying on your face.**

AT

**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.**
- **When changing the automatic transmission fluid, use only "Toyota Genuine ATF WS" (ATF JWS3324 or NWS9638).**
- **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.**
- **When disassembling a valve body, be sure to match each valve with its corresponding spring.**
- **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.**

AT

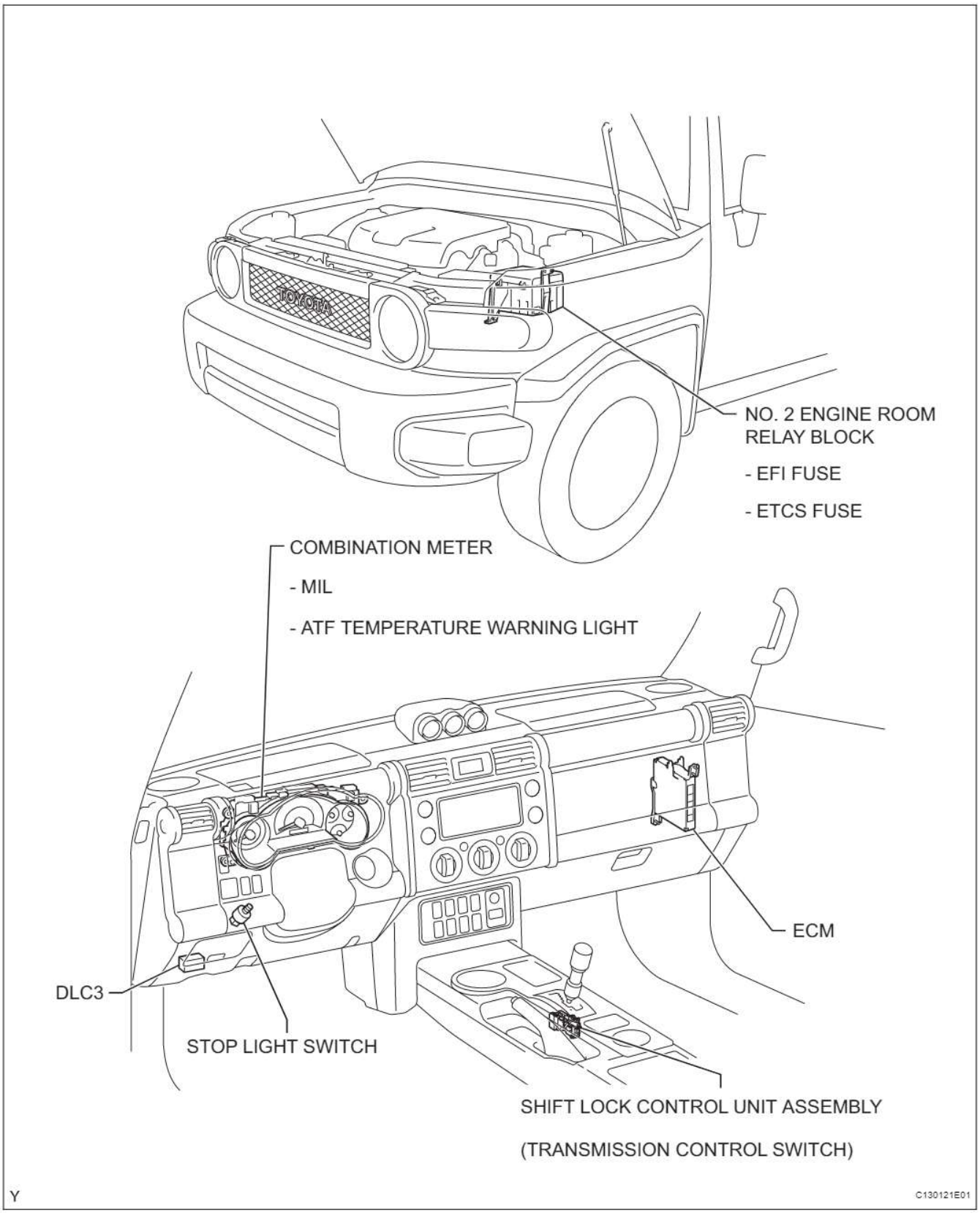
- Check the thrust bearings and races for wear or damage. Replace if necessary.
- Use petroleum jelly to keep parts in place.
- When working with FIPG material, perform the following:
  Using a razor blade and gasket scraper, remove all old FIPG material from the gasket surface.
  Clean all components thoroughly to remove all foreign matter.
  Clean both sealing surfaces with a non-residue solvent.
  Apply FIPG material in a continuous line approximately 1 mm (0.04 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.

# DEFINITION OF TERMS

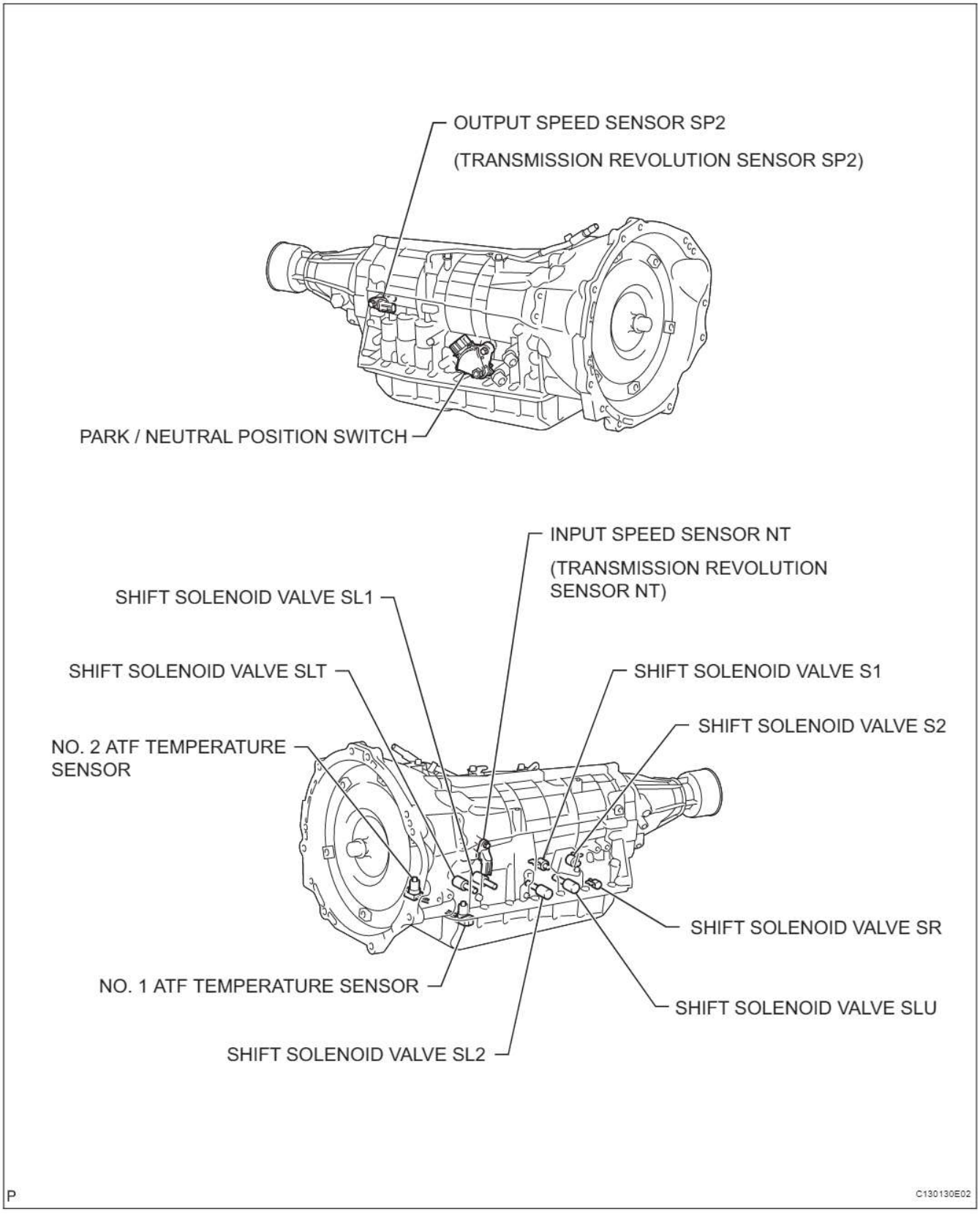
| Term | Definition |
|---|---|
| Monitor description | Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details). |
| Related DTCs | A group of diagnostic trouble codes that are output by the ECM based on the same malfunction detection logic. |
| Typical enabling conditions | Preconditions that allow the ECM to detect malfunctions.<br>With all preconditions satisfied, the ECM sets the DTC when the monitored value(s) exceeds the malfunction threshold(s). |
| Sequence of operation | The priority order that is applied to monitoring, if multiple sensors and components are used to detect the malfunction.<br>While one sensor is being monitored, the next sensor or component will not be monitored until the previous monitoring has been completed. |
| Required sensor/components | The sensors and components that are used by the ECM to detect malfunctions. |
| Frequency of operation | The number of times that the ECM checks for malfunctions per driving cycle.<br>"Once per driving cycle" means that the ECM detects the malfunction only one time during a single driving cycle.<br>"Continuous" means that the ECM detects the malfunction every time the enabling conditions are met. |
| Duration | The minimum time that the ECM must detect a continuous deviation in the monitored value(s) before setting a DTC. This timing begins after the "typical enabling conditions" are met. |
| Malfunction thresholds | Beyond this value, the ECM determines that there is a malfunction and sets a DTC. |
| MIL operation | MIL illumination timing after a defect is detected.<br>"Immediate" means that the ECM illuminates the MIL the instant the ECM determines that there is a malfunction.<br>"2 driving cycles" means that the ECM illuminates the MIL if the same malfunction is detected again in a 2nd driving cycle. |
| Component operating range | Normal operation range of sensors and solenoids under normal driving conditions.<br>These ranges are for a reference.<br>They cannot be used to determine whether a sensor or solenoid is defective or not. |

AT

# PARTS LOCATION



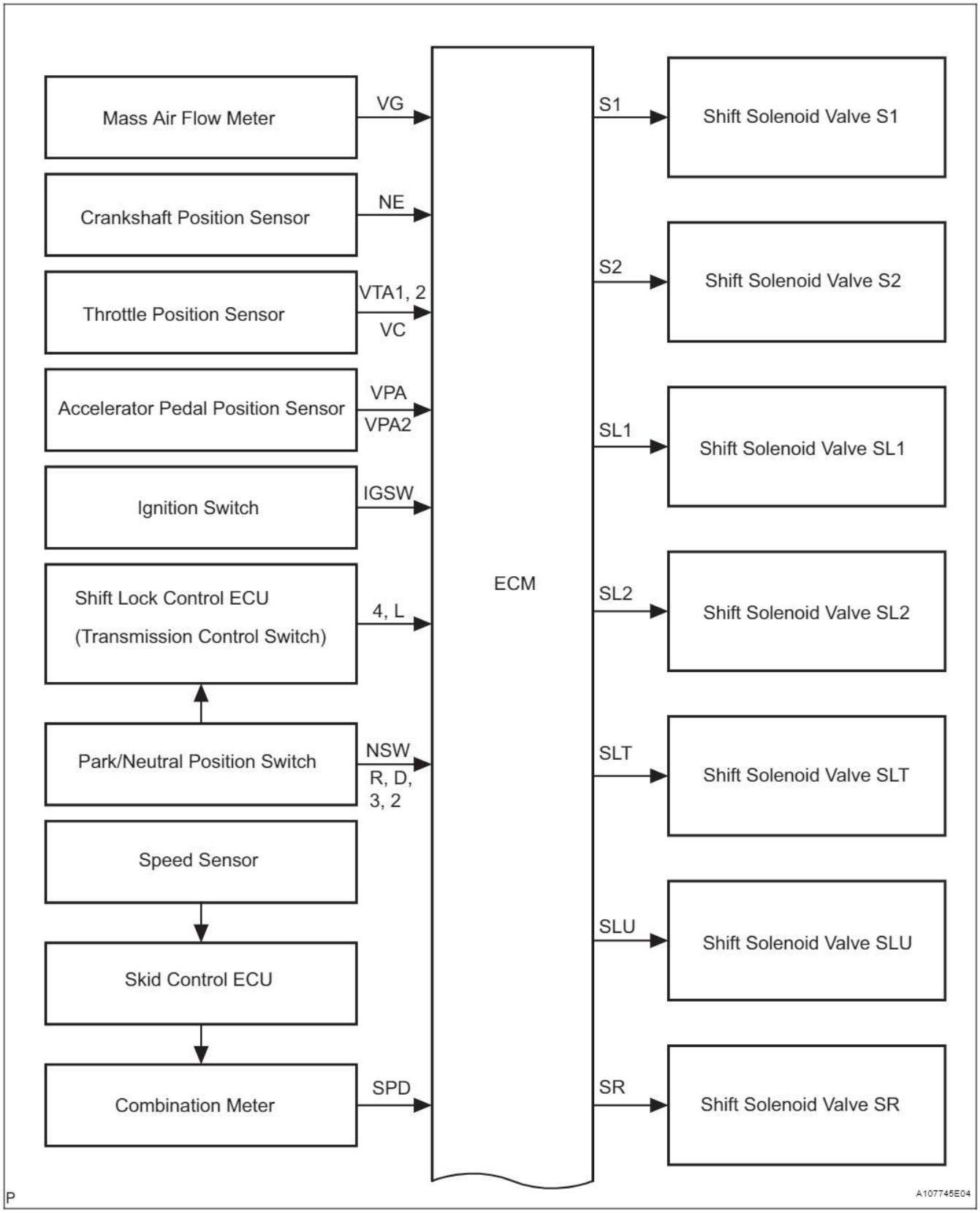

AT


OUTPUT SPEED SENSOR SP2
(TRANSMISSION REVOLUTION SENSOR SP2)
PARK / NEUTRAL POSITION SWITCH
INPUT SPEED SENSOR NT
(TRANSMISSION REVOLUTION SENSOR NT)
SHIFT SOLENOID VALVE SL1
SHIFT SOLENOID VALVE SLT
SHIFT SOLENOID VALVE S1
SHIFT SOLENOID VALVE S2
NO. 2 ATF TEMPERATURE SENSOR
SHIFT SOLENOID VALVE SR
NO. 1 ATF TEMPERATURE SENSOR
SHIFT SOLENOID VALVE SLU
SHIFT SOLENOID VALVE SL2
P
C130130E02

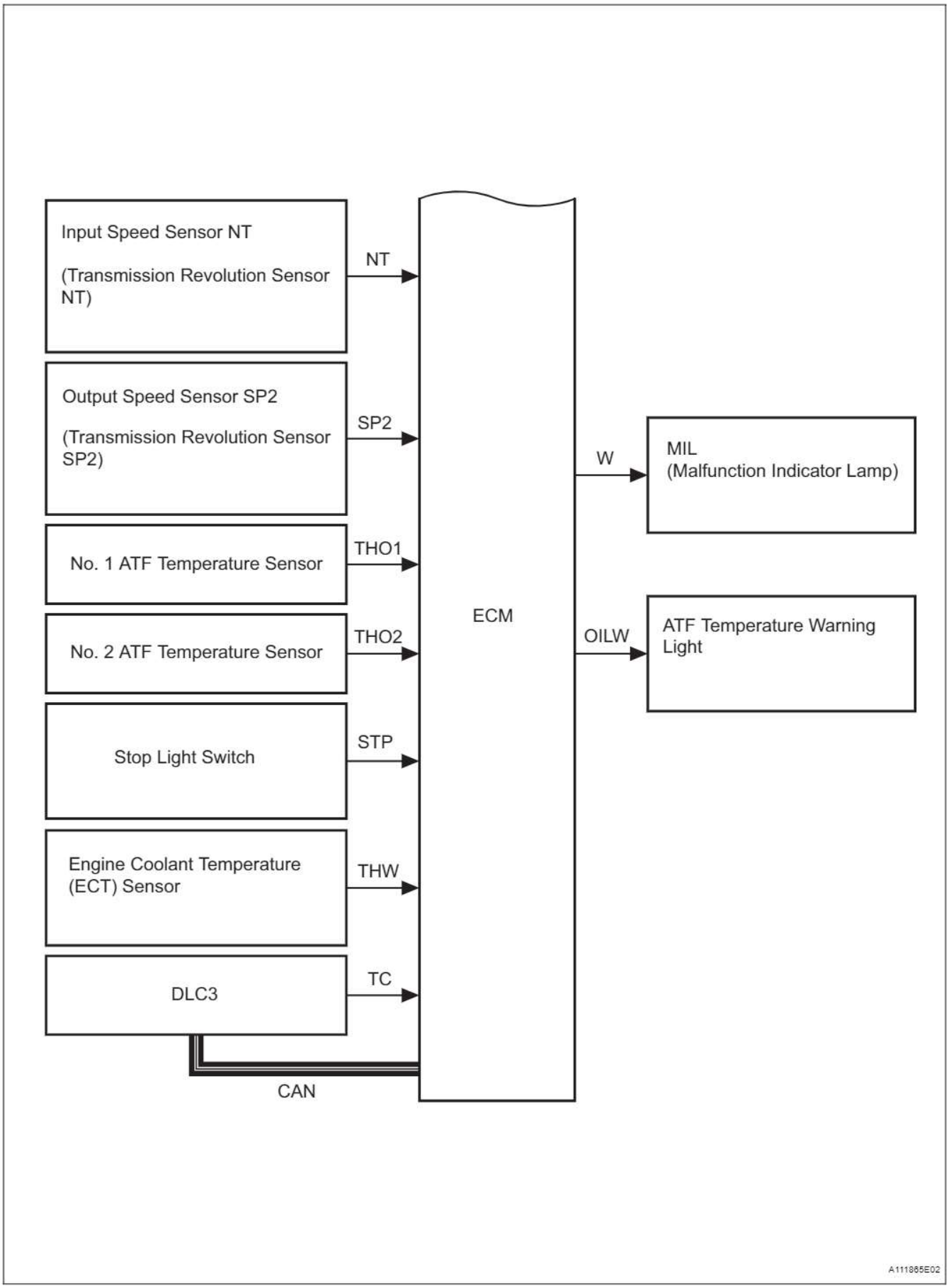
AT

## SYSTEM DIAGRAM

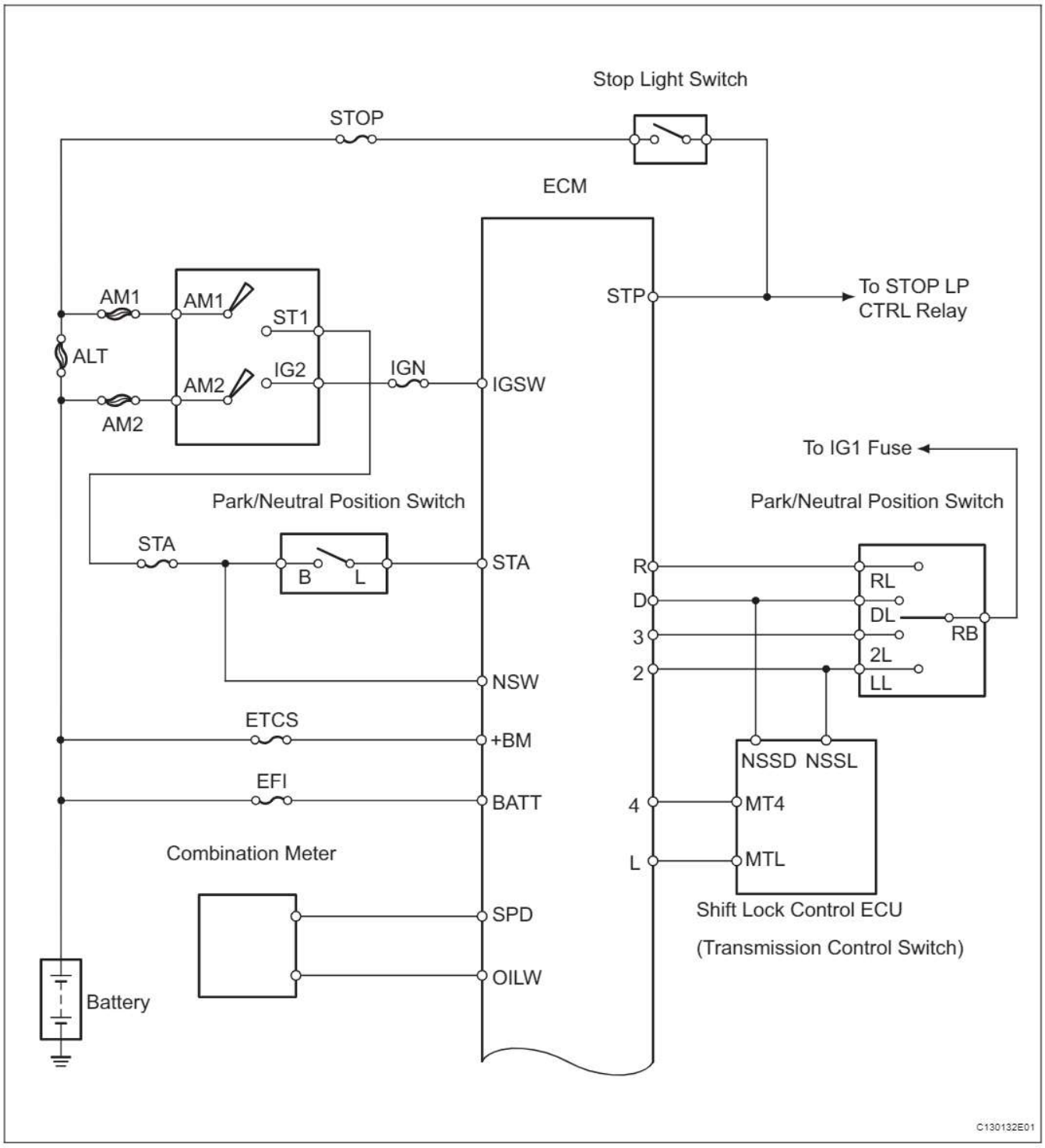
The configuration of the electronic control system in the A750E automatic transmission is as shown in the following chart.



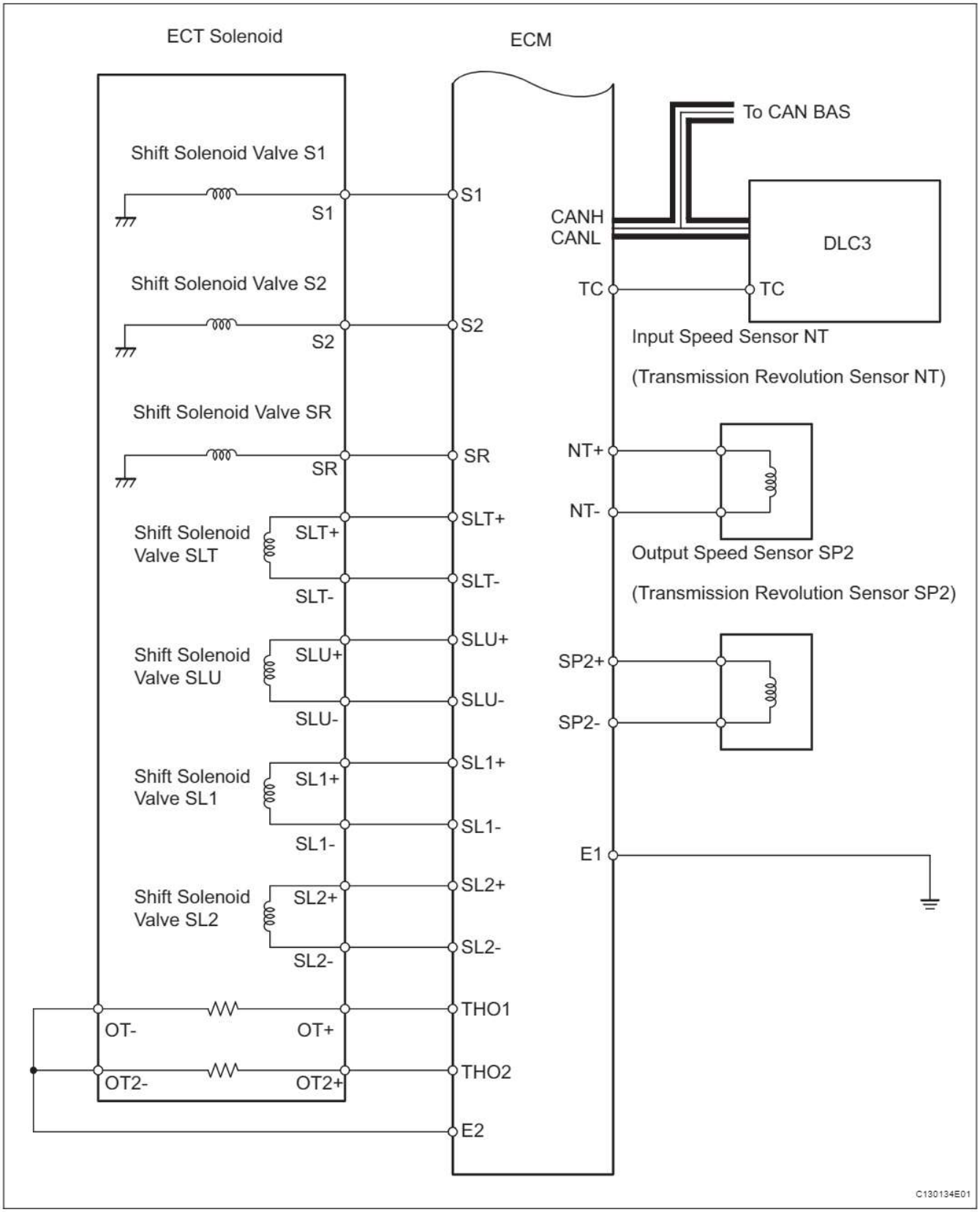

AT


Input Speed Sensor NT
(Transmission Revolution Sensor NT)
NT
Output Speed Sensor SP2
(Transmission Revolution Sensor SP2)
SP2
No. 1 ATF Temperature Sensor
THO1
No. 2 ATF Temperature Sensor
THO2
Stop Light Switch
STP
Engine Coolant Temperature (ECT) Sensor
THW
DLC3
TC
CAN
ECM
W
MIL
(Malfunction Indicator Lamp)
OILW
ATF Temperature Warning Light
A111865E02

AT


Stop Light Switch
STOP
ECM
AM1
AM1
ST1
ALT
IG2
IGN
IGSW
AM2
AM2
STP
To STOP LP
CTRL Relay
To IG1 Fuse
Park/Neutral Position Switch
Park/Neutral Position Switch
STA
B
L
STA
R
D
3
2
RL
DL
RB
2L
LL
NSW
ETCS
+BM
NSSD NSSL
EFI
BATT
4
MT4
L
MTL
Combination Meter
Shift Lock Control ECU
(Transmission Control Switch)
SPD
OILW
Battery
C130132E01

AT


ECT Solenoid
ECM
Shift Solenoid Valve S1
S1
S1
Shift Solenoid Valve S2
S2
S2
Shift Solenoid Valve SR
SR
SR
Shift Solenoid Valve SLT
SLT+
SLT-
SLT+
SLT-
Shift Solenoid Valve SLU
SLU+
SLU-
SLU+
SLU-
Shift Solenoid Valve SL1
SL1+
SL1-
SL1+
SL1-
Shift Solenoid Valve SL2
SL2+
SL2-
SL2+
SL2-
OT-
OT+
OT2-
OT2+
THO1
THO2
E2
To CAN BAS
CANH
CANL
DLC3
TC
TC
Input Speed Sensor NT
(Transmission Revolution Sensor NT)
NT+
NT-
Output Speed Sensor SP2
(Transmission Revolution Sensor SP2)
SP2+
SP2-
E1
C130134E01

AT

# SYSTEM DESCRIPTION

## 1. SYSTEM DESCRIPTION

(a) The ECT (Electronic controlled automatic transmission) is an automatic transmission that electronically controls shift timing using the 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 has been reduced by controlling the engine and transmission simultaneously.
In addition, the ECT has features such as follows:
- Diagnostic function.
- Fail-safe function when a malfunction occurs.

AT

# HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

- The ECM of this system is connected to the CAN communication system. Therefore, before starting troubleshooting, make sure 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 | CONNECT INTELLIGENT TESTER TO DLC3 * |

NEXT

| | |
|---|---|
| 4 | CHECK AND CLEAR DTCS AND FREEZE FRAME DATA * |

Refer to the DTC CHECK / CLEAR (See page AT-33).

NEXT

AT

| | |
|---|---|
| 5 | VISUAL INSPECTION |

NEXT

| | |
|---|---|
| 6 | SETTING CHECK MODE DIAGNOSIS * |

Refer to the CHECK MODE PROCEDURE (See page AT-33).

NEXT

| | |
|---|---|
| 7 | PROBLEM SYMPTOM CONFIRMATION |

Refer to the ROAD TEST (See page AT-13).

**Result**

| Result | Proceed to |
|---|---|
| Symptom does not occur | A |
| Symptom occurs | B |

B → GO TO STEP 9

A

| 8 | SYMPTOM SIMULATION |
|---|---|

Refer to the ELECTRONIC CIRCUIT INSPECTION PROCEDURE (See page IN-44).

NEXT

| 9 | DTC CHECK * |
|---|---|

Refer to the DTC CHECK / CLEAR (See page AT-33).

**Result**

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

B → GO TO STEP 17

A

| 10 | BASIC INSPECTION |
|---|---|

Refer to the AUTOMATIC TRANSMISSION FLUID (See page AT-140).
Refer to the PARK/NEUTRAL POSITION SWITCH (See page AT-154).
Refer to the FLOOR SHIFT ASSEMBLY (See page AT-166).

NG → GO TO STEP 19

OK

| 11 | MECHANICAL SYSTEM TEST |
|---|---|

Refer to the MECHANICAL SYSTEM TEST (See page AT-16).

NG → GO TO STEP 16

OK

| 12 | HYDRAULIC TEST |
|---|---|

Refer to the HYDRAULIC TEST (See page AT-18).

NG → GO TO STEP 16

OK

| | |
|---|---|
| 13 | MANUAL SHIFTING TEST |

Refer to the MANUAL SHIFTING TEST (See page AT-19).

NG → GO TO STEP 15

OK

| | |
|---|---|
| 14 | PROBLEM SYMPTOMS TABLE CHAPTER 1 |

Refer to the PROBLEM SYMPTOMS TABLE (See page AT-22).

NG → GO TO STEP 18

OK

| | |
|---|---|
| 15 | PROBLEM SYMPTOMS TABLE CHAPTER 2 |

Refer to the PROBLEM SYMPTOMS TABLE (See page AT-22).

NEXT

| | |
|---|---|
| 16 | PART INSPECTION |

NEXT → GO TO STEP 19

AT

| | |
|---|---|
| 17 | DTC CHART |

Refer to the DIAGNOSTIC TROUBLE CODE CHART (See page AT-40).

NEXT

| | |
|---|---|
| 18 | CIRCUIT INSPECTION |

NEXT

| | |
|---|---|
| 19 | REPAIR OR REPLACE |

NEXT

| 20 | CONFIRMATION TEST |
|---|---|

NEXT

END

# ROAD TEST

1. **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, shift down, or the shift point is too high or too low, conduct the following road test while referring to the automatic shift schedule and simulate the problem symptoms.
2. **ROAD TEST**
   **NOTICE:**
   **Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature: 50° to 80°C (122° to 176°F).**
   (a) D position test:
   Shift into the D position, fully depress the accelerator pedal and check the following points.
   (1) Check up-shift operation.
   Check that 1 → 2, 2 → 3, 3 → 4 and 4 → 5th up-shifts take place, and that the shift points conform to the automatic shift schedule (See page SS-21).
   HINT:
   5th Gear Up-shift Prohibition Control
   • Engine coolant temperature is 55°C (131°F) or less and vehicle speed is 32 mph (51 km/h) or less.
   4th Gear Up-shift Prohibition Control
   • Engine coolant temperature is 47°C (116.6°F) or less and vehicle speed is 30.4 mph (49 km/h) or less.
   5th Gear Lock-up Prohibition Control
   • Brake pedal is depressed.
   • Accelerator pedal is released.
   • Engine coolant temperature is 60°C (140°F) or less.
   (2) Check for shift shock and slippage
   Check for shock and slippage at the 1 → 2, 2 → 3, 3 → 4 and 4 → 5th up-shifts.
   (3) Check for abnormal noise and vibration.
   Check for abnormal noise and vibration when up-shifting from 1 → 2, 2 → 3, 3 → 4 and 4 → 5 while driving with the shift lever in the D position, and check while driving in the lock-up condition.
   HINT:
   The check for the cause of abnormal noise and vibration must be done thoroughly as it could also be due to loss of balance in the differential, torque converter clutch, etc.

AT

(4) Check kick-down operation.
Check vehicle speeds when the 2 → 1, 3 → 2, 4 → 3, and 5 → 4 kick-downs take place while driving with the shift lever in the D position. Confirm that each speed is within the applicable vehicle speed range indicated in the automatic shift schedule (See page SS-21).
(5) Check for abnormal shock and slippage at kick-down.
(6) Check the lock-up mechanism.
- Drive in the D position (5th gear), at a steady speed (lock-up ON).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

HINT:
If there is a sudden increase in engine speed, there is no lock-up.

(b) 4 position test:
Shift into the 4 position, fully depress the accelerator pedal and check the following points.
(1) Check up-shift operation.
Check that the 1 → 2, 2 → 3 and 3 → 4 up-shifts take place and that the shift points conform to the automatic shift schedule (See page SS-21).
HINT:
- There is no 5th up-shift in the 4 position.
- 4th Gear Lock-up Prohibition Control
- Brake pedal is depressed.
- Accelerator pedal is released.
- Engine coolant temperature is 60°C (140°F) or less.

(2) Check engine braking.
While driving in the 4 position and 4th gear, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noises during acceleration and deceleration, and for shock at up-shift and down-shift.
(4) Check the lock-up mechanism.
- Drive in the 4 position and 4th gear, at a steady speed (lock-up ON).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

HINT:
If there is a sudden increase in engine speed, there is no lock-up.

AT

(c) 3 position test:
Shift into the 3 position, fully depress the accelerator pedal and check the following points.
(1) Check up-shift operation.
Check that the 1 → 2 and 2 → 3 up-shifts take place and that the shift points conform to the automatic shift schedule (See page SS-21).
HINT:
There is no 4th up-shift and lock-up in the 3 position.
(2) Check engine braking.
While running in the 3 position and 3rd gear, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noises during acceleration and deceleration, and for shock at up-shift and down-shift.

(d) 2 position test:
Shift into the 2 position, fully depress the accelerator pedal and check the following points.
(1) Check up-shift operation.
Check that the 1 → 2 up-shift takes place and that the shift point conforms to the automatic shift schedule (See page SS-21).
HINT:
There is no 3rd up-shift and lock-up in the 2 position.
(2) Check engine braking.
While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noises during acceleration and deceleration, and for shock at up-shift and down-shift.

AT

(e) L position test:
Shift into the L position and fully depress the accelerator pedal and check the following points.
(1) Check no up-shift.
While running in the L position, check that there is no up-shift to 2nd gear.
(2) Check engine braking.
While running in the L position, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noises during acceleration and deceleration.

(f) R position test:
Shift into the R position, lightly depress the accelerator pedal, and check that the vehicle moves backward without any abnormal noise or vibration.
**CAUTION:**
**Before conducting this test, ensure that the test area is free from people and obstructions.**

(g) P position test:
Stop the vehicle on a grade (more than 5°) and after shifting into the P position, release the parking brake. Then, check that the parking lock pawl holds the vehicle in place.

# MECHANICAL SYSTEM TESTS

## 1. STALL SPEED TEST

HINT:

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

**NOTICE:**

- **Do not perform the stall speed test for longer than 5 seconds.**
- **To ensure safety, perform this test in an open and level area that provides good traction.**
- **The stall speed test should always be performed by at least 2 people. One person should observe the condition of the wheels and wheel chocks while the other is performing the test.**

(a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM 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 air conditioning OFF.

(d) Chock all 4 wheels.

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

(f) Shift the shift lever into the drive position.

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

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

**Standard value:**

**2,250 to 2,550 rpm**

**Evaluation:**

AT

| Test Result | Possible Cause |
|---|---|
| Stall speed is lower than standard value | • Stator one-way clutch is not operating properly<br>• Torque converter is faulty (stall speed is less than standard value by 600 rpm or more)<br>• Engine power may be insufficient |
| Stall speed is higher than standard value | • Line pressure is low<br>• No. 1 clutch (C1) slipping<br>• No. 3 one-way clutch (F3) is not operating properly<br>• Improper fluid level |

## 2. 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 CAN VIM. Then connect the CAN VIM to the DLC3.

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

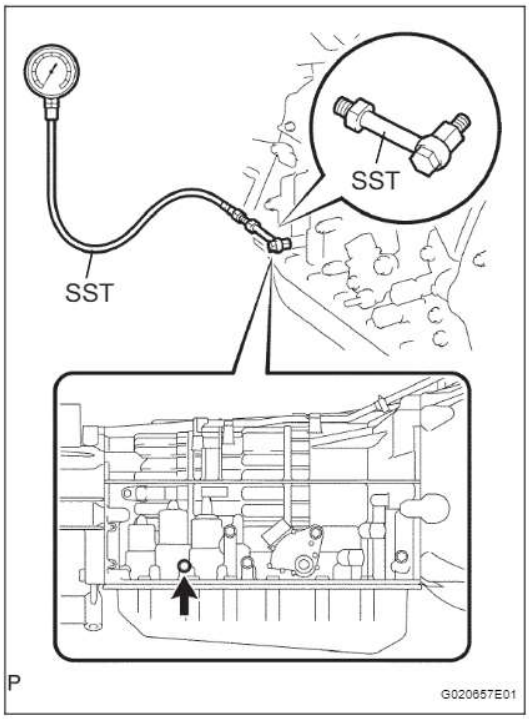
(c) Allow the engine to idle with the air conditioning OFF.

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

(e) Check the D range time lag.
(1) Shift the shift lever into the N position and wait for 1 minute.
(2) Shift the shift lever into the D position and measure the time until the shock is felt.
(3) Repeat the 2 procedures above 3 times, and calculate the average time of the 3 tests.
(f) Check the R range time lag.
(1) Shift the shift lever into the N position and wait for 1 minute.
(2) Shift the shift lever into the R position and measure the time until the shock is felt.
(3) Repeat the 2 procedures above 3 times, and calculate the average time of the 3 tests.
**Standard value:**
**D range time lag is less than 1.2 seconds**
**R range time lag is less than 1.5 seconds**

**Evaluation:**

| Test Result | Possible Cause |
|---|---|
| D range time lag exceeds standard value | • Line pressure is low<br>• No. 1 clutch (C1) is worn<br>• No. 3 one-way clutch (F3) is not operating properly |
| R range time lag exceeds standard value | • Line pressure is low<br>• No. 3 clutch (C3) is worn<br>• No. 4 brake (B4) is worn<br>• No. 1 one-way clutch (F1) is not operating properly |




# HYDRAULIC TEST

**1. PERFORM HYDRAULIC TEST**

(a) Measure the line pressure.
**NOTICE:**
- **Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature of 50° to 80°C (122° to 176°F).**
- **The line pressure test should always be carried out in pairs. One technician should observe the condition of the wheels or wheel stoppers outside the vehicle while the other is doing the test.**
- **Be careful to prevent the SST hose from interfering with the exhaust pipe.**
- **This check must be conducted after checking and adjusting the engine.**
- **Perform with the A/C OFF.**
- **Do not conduct stall tests for longer than 5 seconds continuously.**

(1) Warm up the ATF.
(2) Lift the vehicle up.
(3) Remove the test plug on the transmission case center right side and connect SST.
**SST 09992-00095 (09992-00151, 09992-00271)**
(4) Fully apply the parking brake and chock the 4 wheels.
(5) Start the engine and check the idling speed.

AT

(6) Keep your left foot pressing firmly on the brake pedal and shift into the D position.
(7) Measure the line pressure while the engine is idling.
(8) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when the engine speed reaches the stall speed.
(9) In the same manner, do the test in the R position.

**Specified line pressure**

| Condition | D position | R position |
|---|---|---|
| Idling | 356 to 426 kPa (3.6 to 4.3 kgf/cm$^2$ , 52 to 62 psi) | 500 to 600 kPa (5.1 to 6.1 kgf/cm$^2$, 73 to 87 psi) |
| Stall test | 1,367 to 1,477 kPa (14.0 to 15.1 kgf/cm$^2$, 198 to 214 psi) | 1,278 to 1,506 kPa (13.0 to 15.4 kgf/cm$^2$, 185 to 218 psi) |

**Evaluation:**

| Problem | Possible cause |
|---|---|
| Measured values are higher than specified in all positions | • Shift solenoid valve SLT defective<br>• Regulator valve defective |
| Measured values are lower than specified in all positions | • Shift solenoid valve SLT defective<br>• Regulator valve defective<br>• Oil pump defective |
| Pressure is low in D position only | • D position circuit fluid leakage<br>• No. 1 clutch ($C_1$) defective |
| Pressure is low in R position only | • R position circuit fluid leakage<br>• No. 3 clutch ($C_3$) defective<br>• No. 4 brake ($B_4$) defective |

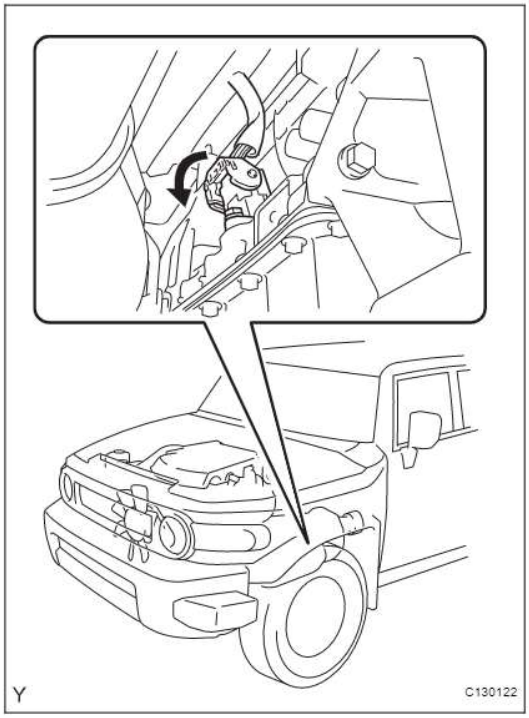
AT

# MANUAL SHIFTING TEST

## 1. MANUAL SHIFTING TEST

HINT:

- Through this test, it can be determined whether the trouble occurs in the 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. Shift the shift lever to each position to check whether the gear position changes as shown in the table below.

| Shift Lever Position | Gear Position |
|---|---|
| D | 4th |
| 4 | 4th |
| 3 | 3rd |
| 2 | 1st |
| L | 1st |
| R | R |
| P | P |

(c) Connect the connector of the transmission wire.

(d) Clear the DTC (See page AT-33).

AT

# INITIALIZATION

1. **RESET MEMORY**

**CAUTION:**

**Perform the RESET MEMORY (AT initialization) when replacing the automatic transmission assembly, engine assembly or ECM.**

**NOTICE:**

**Intelligent tester only**

HINT:

The ECM stores the conditions under which the ECT (Electronic Controlled Automatic Transmission) controls the automatic transmission and engine assemblies according to their characteristics. Therefore, when the automatic transmission assembly, engine assembly, or ECM has been replaced, it is necessary to reset the memory so that the ECM can store the new information. Reset procedure is as follows.

(a) Turn the ignition switch off.

(b) Connect the intelligent tester together with the CAN VIN (controller area network vehicle interface module) to the DLC3.

(c) Turn the ignition switch to the ON position and push the intelligent tester main switch on.

(d) Select the items "DIAGNOSIS / ENHANCED OBD II".

(e) Perform the reset memory procedure from the ENGINE menu.

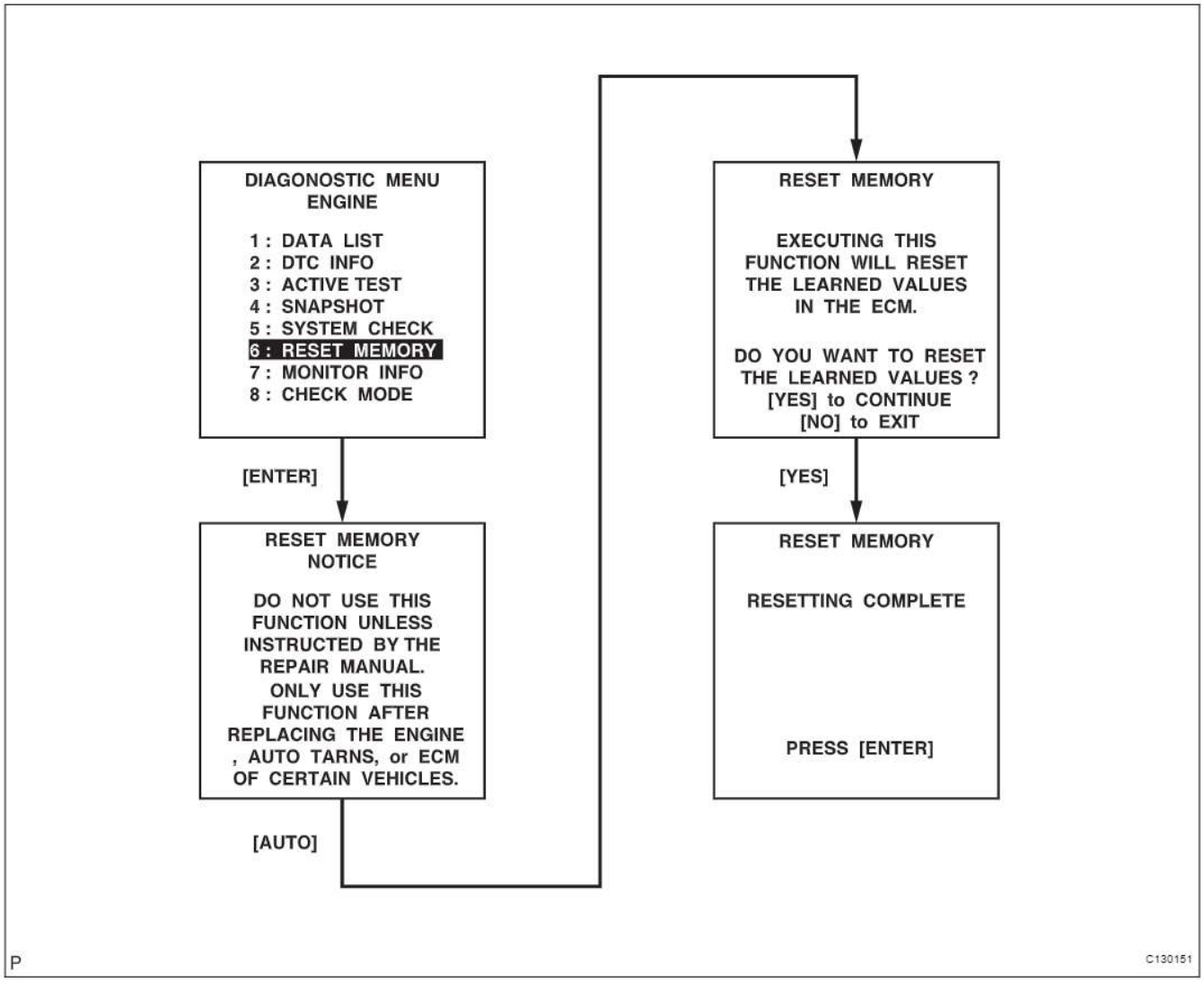
**CAUTION:**

**After performing the RESET MEMORY, be sure to perform the ROAD TEST (See page AT-13) described earlier.**

HINT:

The ECM stores the new information during the ROAD TEST.

AT


DIAGONOSTIC MENU
ENGINE
1 : DATA LIST
2 : DTC INFO
3 : ACTIVE TEST
4 : SNAPSHOT
5 : SYSTEM CHECK
6 : RESET MEMORY
7 : MONITOR INFO
8 : CHECK MODE
[ENTER]
RESET MEMORY
NOTICE
DO NOT USE THIS FUNCTION UNLESS INSTRUCTED BY THE REPAIR MANUAL. ONLY USE THIS FUNCTION AFTER REPLACING THE ENGINE , AUTO TARNS, or ECM OF CERTAIN VEHICLES.
[AUTO]
RESET MEMORY
EXECUTING THIS FUNCTION WILL RESET THE LEARNED VALUES IN THE ECM.
DO YOU WANT TO RESET THE LEARNED VALUES ?
[YES] to CONTINUE
[NO] to EXIT
[YES]
RESET MEMORY
RESETTING COMPLETE
PRESS [ENTER]
P
C130151

AT

# MONITOR DRIVE PATTERN

## 1. MONITOR DRIVE PATTERN FOR ECT TEST

(a) Perform this drive pattern as one method to simulate the detection conditions of the ECT (Electronic Controlled Automatic Transmission) malfunctions.
(The DTCs may not be detected due to the actual driving conditions. And some DTCs may not be detected through this drive pattern.)
HINT:
Preparation for driving

- Warm up the engine sufficiently. (Engine coolant temperature should be 60°C (140°F) or higher)
- Drive the vehicle when the atmospheric temperature is -10°C (14°F) or higher. (Malfunction is not detected when the atmospheric temperature is less than -10°C (14°F))

Notice in driving

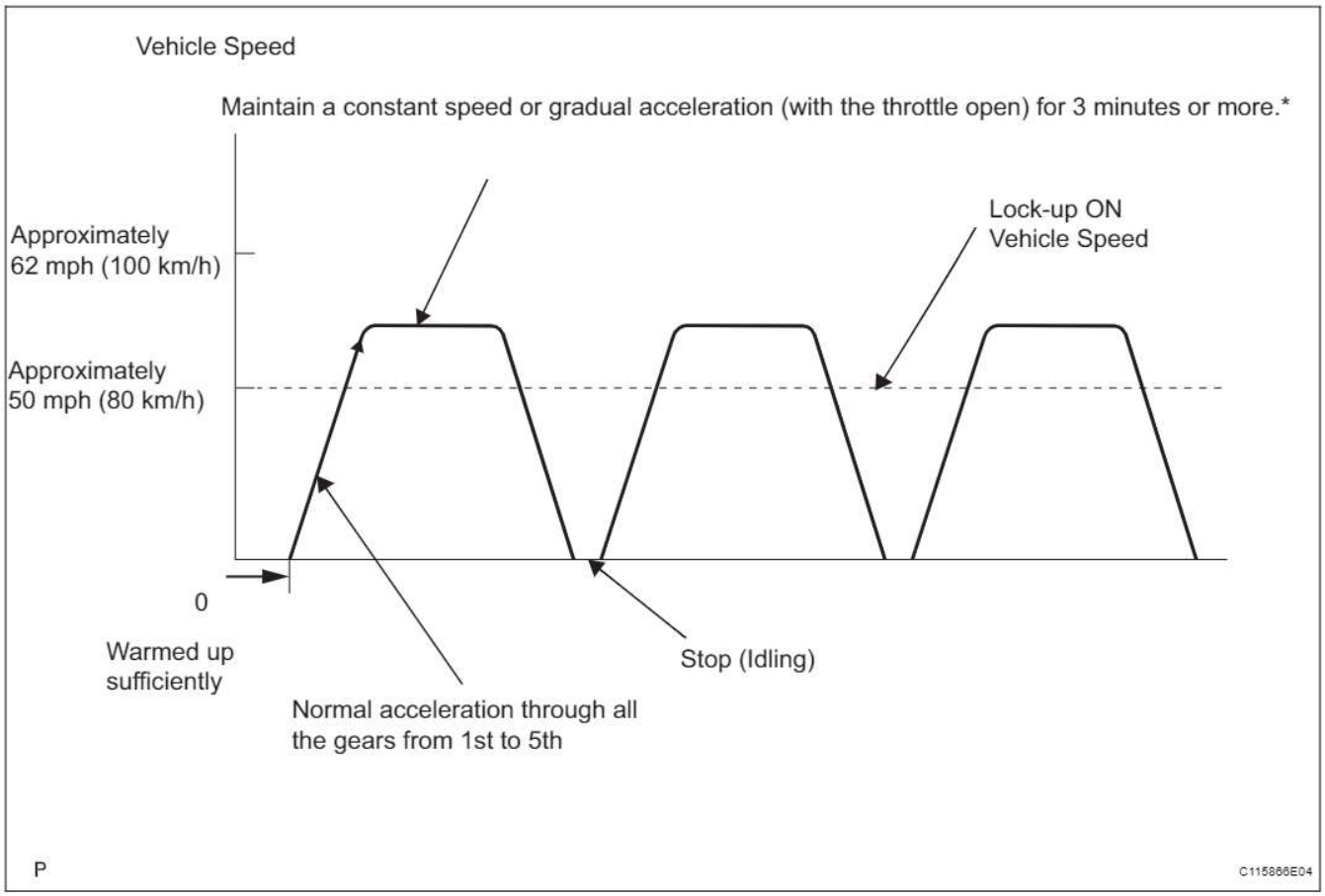
- Drive the vehicle through all gears. Stop → 1st → 2nd → 3rd → 4th → 5th → 5th (lock-up ON).
- Repeat the above driving pattern three times or more.

**NOTICE:**

- **The monitor status can be checked using the intelligent tester. When using the intelligent tester, monitor status can be found in the "ENHANCED OBD II / DATA LIST" or under "CARB OBD II".**
- **In the event that the drive pattern must be interrupted (possibly due to traffic conditions or other factors), the drive pattern can be resumed and, in most cases, the monitor can be completed.**

**CAUTION:**
**Perform this drive pattern on as level a road as possible and strictly observe the posted speed limits and traffic laws while driving.**

AT




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

**NOTICE:**
**It is necessary to drive the vehicle for approximately 30 minutes to detect DTC P0711 (ATF temperature sensor malfunction).**

AT

# PROBLEM SYMPTOMS TABLE

HINT:

- If no DTCs are displayed 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 on the following pages and proceed to the page given for troubleshooting.
- The Matrix Chart is divided into 2 chapters.
- *1: Denotes that when there are malfunctions in the circuit, DTCs may be set.

**Chapter 1: Electronic Circuit Matrix Chart**

Refer to the table below when the cause of the trouble is considered to be electrical.
If the trouble still occurs even though there are no abnormalities in any of the other circuits, check and replace the ECM.

| Symptom | Suspected area | See page |
|---|---|---|
| No up-shift (A particular gear, from 1st to 4th gear, is not up-shifted) | 1. Shift solenoid valve (S1) circuit *1 | AT-103 |
| | 2. Shift solenoid valve (S2) circuit *1 | AT-107 |
| | 3. ECM | IN-44 |
| No up-shift (4th to 5th) | 1. Transmission control switch circuit (D - 4) *1 | AT-45 |
| | 2. Engine coolant temperature sensor circuit *1 | ES-57 |
| | 3. Speed sensor NT circuit *1 | AT-59 |
| | 4. Shift solenoid valve (SL1) circuit *1 | AT-69 |
| | 5. Shift solenoid valve (SL2) circuit *1 | AT-94 |
| | 6. Shift solenoid valve (SR) circuit *1 | AT-111 |
| | 7. ECM | IN-44 |
| No up-shift (3rd to 4th) | 1. Engine coolant temperature sensor circuit *1 | ES-57 |
| | 2. Shift solenoid valve (S2) circuit *1 | AT-107 |
| | 3. ECM | IN-44 |
| No up-shift (1st to 2nd) | 1. Transmission control switch circuit (2 - L) *1 | AT-45 |
| | 2. Shift solenoid valve (S2) circuit *1 | AT-107 |
| | 3. ECM | IN-44 |
| No down-shift (5th to 4th) | 1. Transmission control switch circuit (D - 4) *1 | AT-45 |
| | 2. Shift solenoid valve (SL1) circuit *1 | AT-69 |
| | 3. Shift solenoid valve (SL2) circuit *1 | AT-94 |
| | 4. Shift solenoid valve (SR) circuit *1 | AT-111 |
| | 5. ECM | IN-44 |
| No down-shift (2nd to 1st) | 1. Transmission control switch circuit (2 - L) *1 | AT-45 |
| | 2. Shift solenoid valve (S2) circuit *1 | AT-107 |
| | 3. ECM | IN-44 |
| No down-shift (A particular gear, from 1st to 4th gear, is not down-shifted) | 1. Shift solenoid valve (S1) circuit *1 | AT-103 |
| | 2. Shift solenoid valve (S2) circuit *1 | AT-107 |
| | 3. ECM | IN-44 |
| No lock-up | 1. No. 1 ATF temperature sensor circuit *1 | AT-51 |
| | 2. Stop light switch circuit *1 | ES-57 |
| | 3. Speed sensor NT circuit *1 | AT-59 |
| | 4. Shift solenoid valve (SLU) circuit *1 | AT-136 |
| | 5. Engine coolant temperature sensor circuit *1 | ES-57 |
| | 6. ECM | IN-44 |
| No lock-up off | 1. Shift solenoid valve (SLU) circuit *1 | AT-136 |
| | 2. ECM | IN-44 |

AT

| Symptom | Suspected area | See page |
|---|---|---|
| Shift point too high or too low | 1. Shift solenoid valve (SLT) circuit *1 | AT-122 |
| | 2. Speed sensor NT circuit *1 | AT-59 |
| | 3. Speed sensor SP2 circuit *1 | AT-64 |
| | 4. Throttle position sensor circuit *1 | ES-57 |
| | 5. No. 1 ATF temperature sensor circuit *1 | AT-51 |
| | 6. ECM | IN-44 |
| Up-shift from 4th to 5th while shift lever is in 4 position | 1. Transmission control switch circuit (D - 4) *1 | AT-45 |
| | 2. ECM | IN-44 |
| Up-shift from 4th to 5th while engine is cold | 1. Engine coolant temperature sensor circuit *1 | ES-57 |
| | 2. ECM | IN-44 |
| Up-shift from 3rd to 4th while shift lever is in 3 position | 1. Park/neutral position switch circuit *1 | AT-45 |
| | 2. ECM | IN-44 |
| Up-shift from 2nd to 3rd while shift lever is in 2 position | 1. Park/neutral position switch circuit *1 | AT-45 |
| | 2. ECM | IN-44 |
| Up-shift from 1st to 2nd while shift lever is in L position | 1. Transmission control switch circuit (2 - L) *1 | AT-45 |
| | 2. ECM | IN-44 |
| Harsh engagement (N to D) | 1. Speed sensor NT circuit *1 | AT-59 |
| | 2. Shift solenoid valve (SL1) circuit *1 | AT-69 |
| | 3. Shift solenoid valve (SLT) circuit *1 | AT-122 |
| | 4. ECM | IN-44 |
| Harsh engagement (Lock-up) | 1. Speed sensor NT circuit *1 | AT-59 |
| | 2. Speed sensor SP2 circuit *1 | AT-64 |
| | 3. Shift solenoid valve (SLU) circuit *1 | AT-136 |
| | 4. ECM | IN-44 |
| Harsh engagement (Any driving position) | ECM | IN-44 |
| Poor acceleration | 1. No. 2 ATF temperature sensor circuit *1 | AT-126 |
| | 2. Engine coolant temperature sensor circuit *1 | ES-57 |
| | 3. Shift solenoid valve (SLT) circuit *1 | AT-122 |
| | 4. ECM | IN-44 |
| No engine braking | ECM | IN-44 |
| No kick-down | ECM | IN-44 |
| Engine stalls when starting off or stopping | 1. Shift solenoid valve (SLU) circuit *1 | AT-136 |
| | 2. ECM | IN-44 |
| ATF temperature warning light remains on | 1. No. 2 ATF temperature sensor circuit *1 | AT-126 |
| | 2. Engine coolant temperature sensor circuit *1 | ES-57 |
| | 3. ECM | IN-44 |
| Lock-up at 3rd gear | 1. No. 2 ATF temperature sensor circuit *1 | AT-126 |
| | 2. Engine coolant temperature sensor circuit *1 | ES-57 |
| | 3. ECM | IN-44 |
| Shift point too high | 1. No. 2 ATF temperature sensor circuit *1 | AT-126 |
| | 2. Engine coolant temperature sensor circuit *1 | ES-57 |
| | 3. ECM | IN-44 |

## Chapter 2: On-Vehicle Repair and Off-Vehicle Repair

| Symptom | Suspected area | See page |
|---|---|---|
| Vehicle does not move with shift lever in any forward position and reverse position | 1. Transmission control cable | AT-181 |
| | 2. Manual valve | AT-186 |
| | 3. Parking lock pawl | AT-186 |
| | 4. Rear planetary gear unit | AT-186 |
| | 5. Torque converter clutch | AT-179 |

| Symptom | Suspected area | See page |
|---|---|---|
| Vehicle does not move with shift lever in R position | 1. Valve body assembly | AT-156 |
| | 2. No. 3 clutch (C3) | AT-186 |
| | 3. No. 4 brake (B4) | AT-186 |
| | 4. No. 1 one-way clutch (F1) | AT-186 |
| No up-shift (1st to 2nd) | 1. Valve body assembly | AT-156 |
| | 2. No. 3 brake (B3) | AT-186 |
| | 3. No. 1 one-way clutch (F1) | AT-186 |
| | 4. No. 2 one-way clutch (F2) | AT-186 |
| No up-shift (2nd to 3rd) | 1. Valve body assembly | AT-156 |
| | 2. No. 3 clutch (C3) | AT-186 |
| No up-shift (3rd to 4th) | 1. Valve body assembly | AT-156 |
| | 2. No. 2 clutch (C2) | AT-186 |
| No up-shift (4th to 5th) | 1. Valve body assembly | AT-156 |
| | 2. No. 1 brake (B1) | AT-186 |
| | 3. No. 1 clutch (C1) | AT-186 |
| No down-shift (5th to 4th) | Valve body assembly | AT-156 |
| No down-shift (4th to 3rd) | Valve body assembly | AT-156 |
| No down-shift (3rd to 2nd) | Valve body assembly | AT-156 |
| No down-shift (2nd to 1st) | Valve body assembly | AT-156 |
| No lock-up or No lock-up off | 1. Shift solenoid valve (SLU) | AT-131 |
| | 2. Valve body assembly | AT-156 |
| | 3. Torque converter clutch | AT-179 |
| Harsh engagement (N to D) | 1. Shift solenoid valve (SL1) | AT-84 |
| | 2. Valve body assembly | AT-156 |
| | 3. C1 accumulator | AT-186 |
| | 4. No. 1 clutch (C1) | AT-186 |
| | 5. No. 3 one-way clutch (F3) | AT-186 |
| Harsh engagement (Lock-up) | 1. Shift solenoid valve (SLU) | AT-131 |
| | 2. Valve body assembly | AT-156 |
| | 3. Torque converter clutch | AT-179 |
| Harsh engagement (N to R) | 1. Shift solenoid valve (SLT) | AT-115 |
| | 2. Shift solenoid valve (SLU) | AT-131 |
| | 3. Valve body assembly | AT-156 |
| | 4. C3 accumulator | AT-186 |
| | 5. No. 3 clutch (C3) | AT-186 |
| | 6. No. 4 brake (B4) | AT-186 |
| | 7. No. 1 one-way clutch (F1) | AT-186 |
| Harsh engagement (1st to 2nd, 2nd to 3rd, 3rd to 4th and 4th to 5th) | 1. Shift solenoid valve (SLT) | AT-115 |
| | 2. Shift solenoid valve (SL1) | AT-84 |
| | 3. Valve body assembly | AT-156 |
| Harsh engagement (1st to 2nd) | 1. Valve body assembly | AT-156 |
| | 2. B3 accumulator | AT-186 |
| | 3. No. 3 brake (B3) | AT-186 |
| | 4. No. 1 one-way clutch (F1) | AT-186 |
| | 5. No. 2 one-way clutch (F2) | AT-186 |
| Harsh engagement (2nd to 3rd) | 1. Valve body assembly | AT-156 |
| | 2. C3 accumulator | AT-186 |
| | 3. No. 3 clutch (C3) | AT-186 |

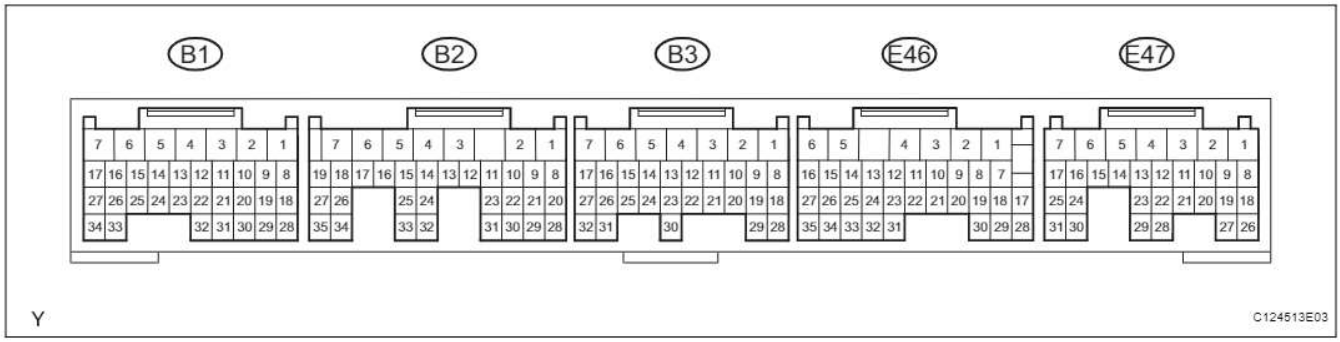
AT

| Symptom | Suspected area | See page |
|---|---|---|
| Harsh engagement (3rd to 4th) | 1. Valve body assembly | AT-156 |
| | 2. C2 accumulator | AT-186 |
| | 3. No. 2 clutch (C2) | AT-186 |
| Harsh engagement (4th to 5th) | 1. Shift solenoid valve (SL1) | AT-84 |
| | 2. Shift solenoid valve (SL2) | AT-89 |
| | 3. Valve body assembly | AT-156 |
| | 4. No. 1 brake (B1) | AT-186 |
| | 5. No. 1 clutch (C1) | AT-186 |
| Slippage or shuddering (Forward and reverse: After warm-up) | 1. Valve body assembly | AT-156 |
| | 2. Oil strainer | AT-156 |
| | 3. No. 1 one-way clutch (F1) | AT-186 |
| | 4. No. 3 clutch (C3) | AT-186 |
| | 5. Torque converter clutch | AT-179 |
| Slippage or shuddering (Particular position: Just after engine starts) | Torque converter clutch | AT-179 |
| Slippage or shuddering (R position) | 1. No. 4 brake (B4) | AT-186 |
| | 2. No. 1 one-way clutch (F1) | AT-186 |
| | 3. No. 3 clutch (C3) | AT-186 |
| Slippage or shuddering (1st) | 1. No. 1 clutch (C1) | AT-186 |
| | 2. No. 3 one-way clutch (F3) | AT-186 |
| Slippage or shuddering (2nd) | 1. No. 1 clutch (C1) | AT-186 |
| | 2. No. 3 brake (B3) | AT-186 |
| | 3. No. 1 one-way clutch (F1) | AT-186 |
| | 4. No. 2 one-way clutch (F2) | AT-186 |
| Slippage or shuddering (3rd) | 1. No. 1 clutch (C1) | AT-186 |
| | 2. No. 3 clutch (C3) | AT-186 |
| | 3. No. 1 one-way clutch (F1) | AT-186 |
| Slippage or shuddering (4th) | 1. No. 1 clutch (C1) | AT-186 |
| | 2. No. 2 clutch (C2) | AT-186 |
| Slippage or shuddering (5th) | 1. No. 2 clutch (C2) | AT-186 |
| | 2. No. 3 clutch (C3) | AT-186 |
| | 3. No. 1 brake (B1) | AT-186 |
| Engine brake does not work only in 1st to 4th gear in D position | No. 1 clutch (C1) | AT-186 |
| Engine brake does not work only in 1st gear in L position | 1. Valve body assembly | AT-156 |
| | 2. No. 4 brake (B4) | AT-186 |
| Engine brake does not work only in 2nd gear in 2 position | 1. Valve body assembly | AT-156 |
| | 2. Brake No. 2 (B2) | AT-186 |
| Engine brake does not work only in 3rd gear in 3 position | 1. Valve body assembly | AT-156 |
| | 2. No. 1 brake (B1) | AT-186 |
| No kick-down | Valve body assembly | AT-156 |
| Shift point too high or too low | 1. Shift solenoid valve (SLT) | AT-115 |
| | 2. Shift solenoid valve (SL1) | AT-84 |
| | 3. Valve body assembly | AT-156 |
| Poor acceleration (All positions) | 1. Shift solenoid valve (SLT) | AT-115 |
| | 2. Valve body assembly | AT-156 |
| | 3. Torque converter clutch | AT-179 |

AT

| Symptom | Suspected area | See page |
|---|---|---|
| Poor acceleration (5th) | 1. No. 1 clutch (C1) | AT-186 |
| | 2. No. 3 clutch (C3) | AT-186 |
| | 3. No. 1 brake (B1) | AT-186 |
| | 4. Front planetary gear unit | AT-186 |
| Engine stalls when starting off or stopping | 1. Shift solenoid valve (SLU) | AT-131 |
| | 2. Valve body assembly | AT-156 |
| | 3. Torque converter clutch | AT-179 |

# TERMINALS OF ECM




HINT:
The standard voltage of each ECM terminal is shown in the table below.
In the table, first follow the information under "Condition".
Look under "Symbols (Terminal No.)" 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.

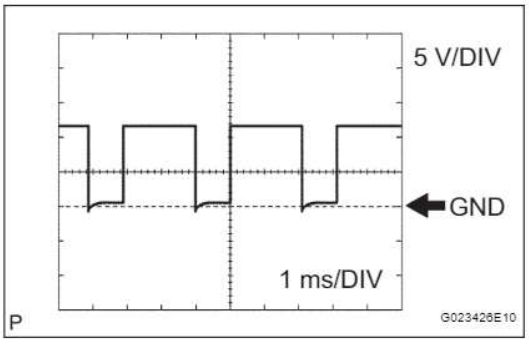
## Standard voltage

| Symbols (Terminal No.) | Wiring Color | Terminal Description | Condition | Specified Condition |
|---|---|---|---|---|
| STP (E47-15) - E1 (B3-1) | G-Y - BR | Stop light switch signal | Brake pedal is depressed | 7.5 to 14 V |
| | | | Brake pedal is released | Below 1.5 V |
| L (E46-9) - E1 (B3-1) | B-L - BR | L shift position switch signal | Ignition switch ON and shift lever L position | 11 to 14 V |
| | | | Ignition switch ON and shift lever other than L position | Below 1 V |
| 2 (E46-10) - E1 (B3-1) | G-R - BR | 2 shift position switch signal | Ignition switch ON and shift lever 2 or L positions | 11 to 14 V |
| | | | Ignition switch ON and shift lever other than 2 and L positions | Below 1 V |
| R (E46-11) - E1 (B3-1) | R-Y - BR | R shift position switch signal | Ignition switch ON and shift lever R position | 11 to 14 V |
| | | | Ignition switch ON and shift lever other than R position | Below 1 V |
| 3 (E46-19) - E1 (B3-1) | W-R - BR | 3 shift position switch signal | Ignition switch ON and shift lever 3 position | 11 to 14 V |
| | | | Ignition switch ON and shift lever other than 3 position | Below 1 V |
| 4 (E46-20) - E1 (B3-1) | B-O - BR | 4 shift position switch signal | Ignition switch ON and shift lever 4 position | 11 to 14 V |
| | | | Ignition switch ON and shift lever other than 4 position | Below 1 V |

AT

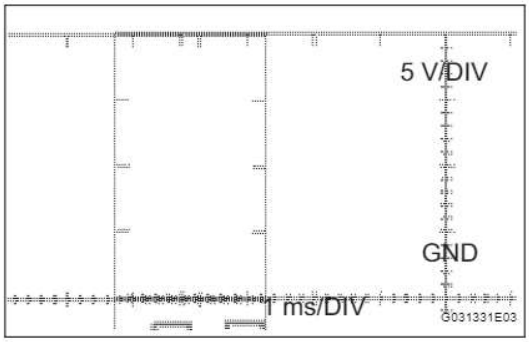
| Symbols (Terminal No.) | Wiring Color | Terminal Description | Condition | Specified Condition |
|---|---|---|---|---|
| D (E46-21) - E1 (B3-1) | V - BR | D shift position switch signal | Ignition switch ON and shift lever D or 4 positions | 11 to 14 V |
| | | | Ignition switch ON and shift lever other than D and 4 positions | Below 1 V |
| NSW (B2-8) - E1 (B3-1) | L-Y - BR | Park or neutral shift position switch signal | Ignition switch ON and shift lever P or N positions | Below 2 V |
| | | | Ignition switch ON and shift lever other than P and N positions | 11 to 14 V |
| SR (B2-9) - E1 (B3-1) | P-L - BR | SR solenoid signal | 5th gear | 11 to 14 V |
| | | | 1st gear | Below 1 V |
| S2 (B2-10) - E1 (B3-1) | W-L - BR | S2 solenoid signal | 2nd or 3rd gear | 11 to 14 V |
| | | | 1st, 4th or 5th gear | Below 1 V |
| S1 (B2-11) - E1 (B3-1) | GR - BR | S1 solenoid signal | 1st or 2nd gear | 11 to 14 V |
| | | | 3rd, 4th or 5th gear | Below 1 V |
| SLT+ (B2-13) - SLT- (B2-12) | LG-B - L-R | SLT solenoid signal | Engine is idling | Pulse generation (See waveform 1) |
| SLU+ (B2-15) - SLU- (B2-14) | R-B - R-W | SLU solenoid signal | 5th (lock-up) gear | Pulse generation (See waveform 2) |
| SL2+ (B2-17) - SL2- (B2-16) | B-W - B-R | SL2 solenoid signal | Engine idling speed | Pulse generation (See waveform 3) |
| SL1+ (B2-19) - SL1- (B2-18) | G-B - B-Y | SL1 solenoid signal | Engine idling speed | Pulse generation (See waveform 4) |
| THO2 (B2-32) - E2 (B1-28) | L - W-G | No. 2 ATF temperature sensor signal | ATF temperature: 115°C (239°F) or more | Below 1.5 V |
| THO1 (B2-24) - E2 (B1-28) | Y-G - W-G | No. 1 ATF temperature sensor signal | ATF temperature: 115°C (239°F) or more | Below 1.5 V |
| SP2+ (B2-34) - SP2- (B2-26) | Y - L | Speed sensor (SP2) signal | Vehicle speed 12 mph (20 km/h) | Pulse generation (See waveform 5) |
| NT+ (B2-35) - NT- (B2-27) | P - V | Speed sensor (NT) signal | Engine is idling | Pulse generation (See waveform 6) |

AT



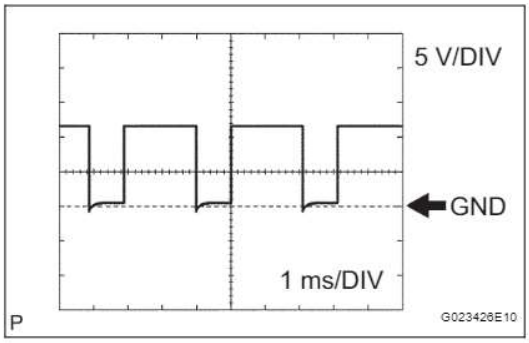

## 1. Waveform 1

| Item | Condition |
|---|---|
| Terminal | SLT+ - SLT- |
| Tool setting | 5 V/DIV, 1 ms/DIV |
| Vehicle condition | Engine idling speed |



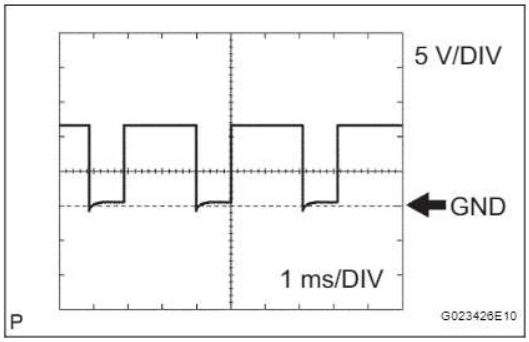

## 2. Waveform 2

| Item | Condition |
|---|---|
| Terminal | SLU+ - SLU- |
| Tool setting | 5 V/DIV, 1 ms/DIV |
| Vehicle condition | 5th (lock-up) gear |



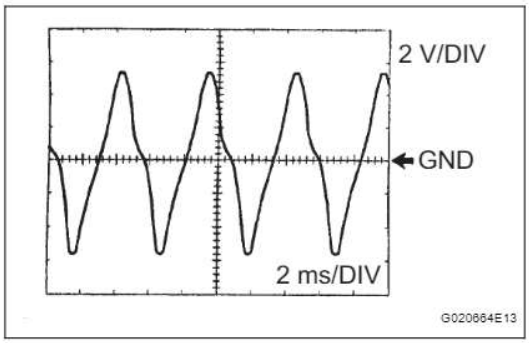

## 3. Waveform 3

| Item | Condition |
|---|---|
| Terminal | SL2+ - SL2- |
| Tool setting | 5 V/DIV, 1 ms/DIV |
| Vehicle condition | Engine idling speed |



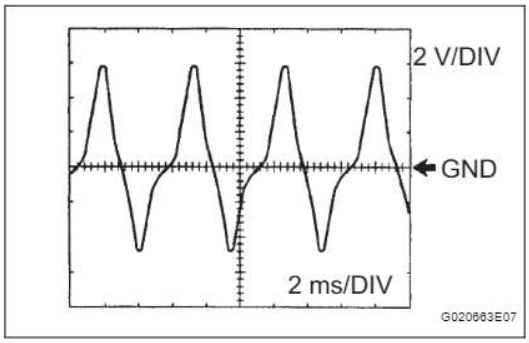

## 4. Waveform 4

| Item | Condition |
|---|---|
| Terminal | SL1+ - SL1- |
| Tool setting | 5 V/DIV, 1 ms/DIV |
| Vehicle condition | Engine idling speed |




## 5. Waveform 5

| Item | Condition |
|---|---|
| Terminal | SP2+ - SP2- |
| Tool setting | 2 V/DIV, 2 ms/DIV |
| Vehicle condition | Vehicle speed 12 mph (20 km/h) |




## 6. Waveform 6

| Item | Condition |
|---|---|
| Terminal | NT+ - NT- |
| Tool setting | 2 V/DIV, 2 ms/DIV |
| Vehicle condition | Engine idling speed |

AT

# DIAGNOSIS SYSTEM

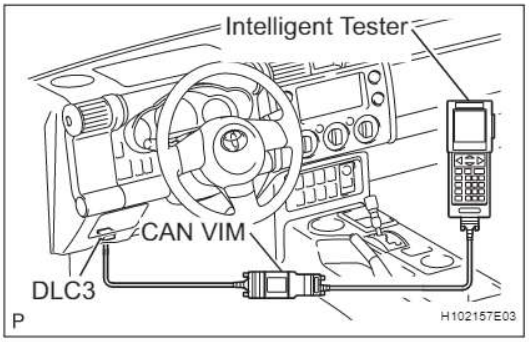
## 1. DESCRIPTION

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




(b) OBD II regulations require that the vehicle's on-board computer illuminate the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in:
1. The emission control system/components
2. The power train control components (which affect vehicle emissions)
3. The computer

In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the ECM memory.
If the malfunction does not recur in 3 consecutive trips, the MIL turns off automatically but the DTCs remain recorded in the ECM memory.




(c) To check DTCs, connect the intelligent tester to the Data Link Connector 3 (DLC3) of the vehicle. The intelligent tester displays DTCs, the freeze frame data and a variety of the engine data.
The DTCs and freeze frame data can be erased with the intelligent tester (See page AT-33).

(d) In order to enhance OBD function on vehicles and develop the Off-Board diagnosis system, CAN communication has been introduced in this system (CAN: Controller Area Network). It minimizes the gap between technician skills and vehicle technology. CAN is a network, which uses a pair of data transmission lines, spanning multiple computers and sensors. It allows high speed communication between the systems and simplification of the wire harness connection. Since this system is equipped with CAN communication, CAN VIM (VIM: Vehicle Interface Module) connecting with intelligent tester is necessary to display any information from the ECM on the tester. (Also communication between the intelligent tester and the ECM uses a CAN communication signal.) When confirming DTCs and any data of the ECM, connect the CAN VIM between the DLC3 and the intelligent tester.

AT

**2. NORMAL MODE AND CHECK MODE**

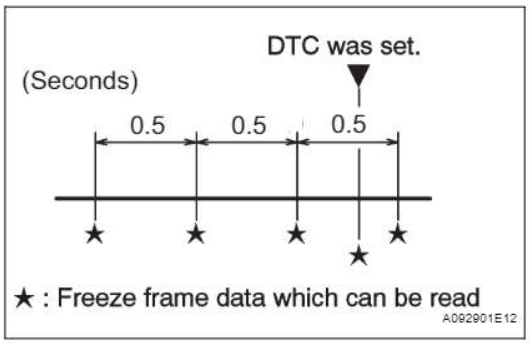
(a) The diagnosis system operates in "normal mode" during normal vehicle use. In normal mode, "2 trip detection logic" is used to ensure accurate detection of malfunctions. "Check mode" is also available to technicians as an option. In check mode, "1 trip detection logic" is used for simulating malfunction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

**3. 2 TRIP DETECTION LOGIC**

(a) When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory (1st trip). If the ignition switch is turned OFF and then ON again, and the same malfunction is detected again, the MIL will illuminate.

**4. 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 running or stopped, 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.



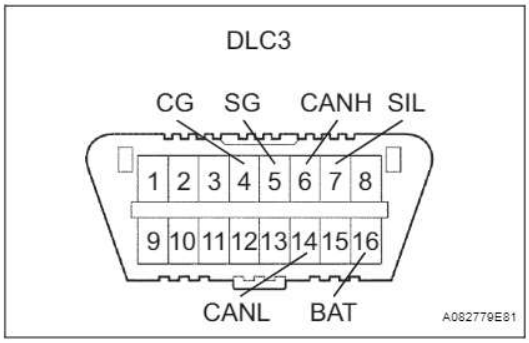

(b) The ECM records engine conditions in the form of freeze frame data every 0.5 seconds. Using the intelligent tester, five separate sets of freeze frame data, including the data values at the time when the DTC was set, can be checked.

- 3 data sets before the DTC was set
- 1 data set when the DTC was set
- 1 data set after the DTC was set

These data sets can be used to simulate the condition of the vehicle around the time the occurrence of the malfunction. The data may assist in identifying of the cause of the malfunction, and in judging whether it was temporary or not.

**5. DATA LINK CONNECTOR 3 (DLC3)**

(a) The vehicle's ECM uses the ISO 15765-4 communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 15765-4 format.




| Symbols (Terminal No.) | Terminal Description | Condition | Specified Condition |
|---|---|---|---|
| SIL (7) - SG (5) | Bus "+" line | During transmission | Pulse generation |
| CG (4) - Body ground | Chassis ground | Always | Below 1 Ω |

| Symbols (Terminal No.) | Terminal Description | Condition | Specified Condition |
|---|---|---|---|
| SG (5) - Body ground | Signal ground | Always | Below 1 Ω |
| BAT (16) - Body ground | Battery positive | Always | 11 to 14 V |
| CANH (6) - CANL (14) | CAN bus line | Ignition switch OFF* | 54 to 69 Ω |
| CANH (6) - CG (4) | HIGH-level CAN bus line | Ignition switch OFF* | 200 Ω or higher |
| CANL (14) - CG (4) | LOW-level CAN bus line | Ignition switch OFF* | 200 Ω or higher |
| CANH (6) - BAT (16) | HIGH-level CAN bus line | Ignition switch OFF* | 6 kΩ or higher |
| CANL (14) - BAT (16) | LOW-level CAN bus line | Ignition switch OFF* | 6 kΩ or higher |

**NOTICE:**

***: Before measuring the resistance, leave the vehicle as is for at least 1 minute and do not operate the ignition switch, any other switches or the doors.**

If the result is not as specified, the DLC3 may have a malfunction. Repair or replace the harness and connector.

HINT:

Connect the cable of the intelligent tester to the DLC3, turn the ignition switch to the ON position and attempt to use the intelligent tester. If the screen displays UNABLE TO CONNECT TO VEHICLE, a problem exists in the vehicle side or the tester side.

If the communication is normal when the tester is connected to another vehicle, inspect the DLC3 on the original vehicle.

If the communication is still impossible when the tester is connected to another vehicle, the problem is probably in the tester itself. Consult the Service Department listed in the tester's instruction manual.

AT

**6. CHECK BATTERY VOLTAGE**

**Standard voltage:**

**11 to 14 V**

(a) If the voltage is below 11 V, replace the battery before proceeding.

**7. CHECK MIL**

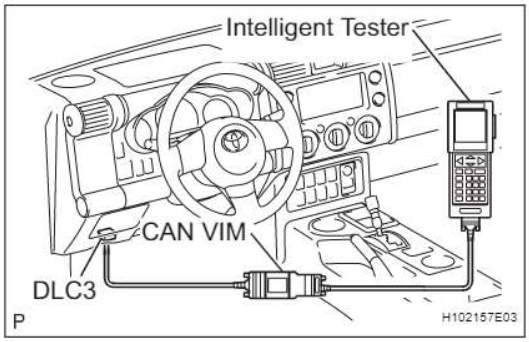
(a) Check that the MIL illuminates when turning the ignition switch ON.

If the MIL does not illuminate, there is a problem in the MIL circuit (See page ES-404).

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

**8. ALL READINESS**

(a) For this vehicle, using the intelligent tester allows readiness codes corresponding to all DTCs to be read. When diagnosis (normal or malfunctioning) has been completed, readiness codes are set. Enter the following menus: ENHANCED OBD II / MONITOR INFO on the intelligent tester.




# DTC CHECK / CLEAR

**1. CHECK DTC**

DTCs which are stored in the ECM can be displayed with the intelligent tester.

The tester can display pending DTCs and current DTCs. Some DTCs are not stored if the ECM does not detect a malfunction during consecutive driving cycles. However, malfunctions detected during a single driving cycle are stored as pending DTCs.

(a) Connect the intelligent tester together with the Controller Area Network Vehicle Interface Module (CAN VIN) to the DLC3.

(b) Turn the ignition switch to the ON position.

(c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES (or PENDING CODE).

(d) Confirm the DTCs and freeze frame data and then write them down.

(e) Confirm the details of the DTCs (See page AT-40).

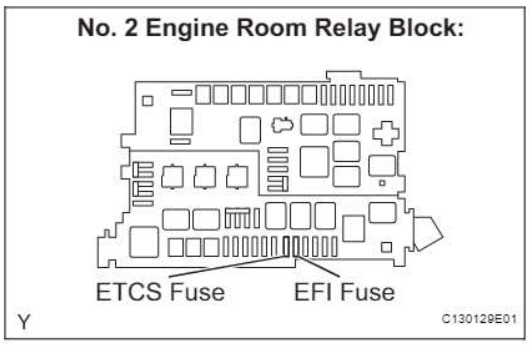
**2. CLEAR DTC**

(a) When using the intelligent tester:

(1) Connect the intelligent tester together with the Controller Area Network Vehicle Interface Module (CAN VIN) to the DLC3.

(2) Turn the ignition switch to the ON position.

(3) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CLEAR CODES and press YES.




(b) When not using the intelligent tester:

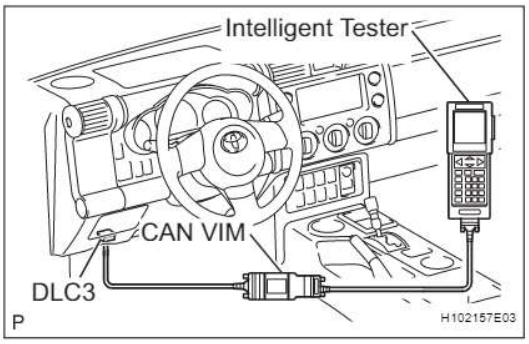
(1) Disconnect the battery terminal or remove the EFI and ETCS fuses from the No. 2 engine room relay block for 60 seconds or more. However, if you disconnect the battery terminal, perform the "INITIALIZATION" procedure (See page AT-19).

AT

# CHECK MODE PROCEDURE

## 1. DESCRIPTION

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 detected with 1 trip detection logic.




## 2. CHECK MODE PROCEDURE

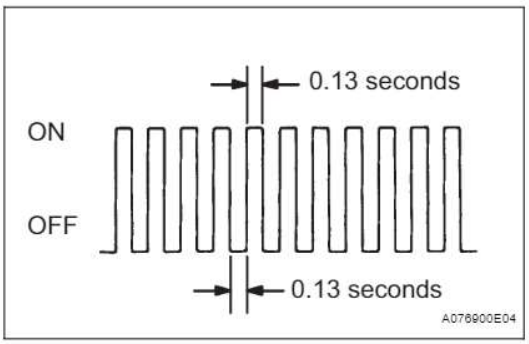
(a) Ensure the following conditions:
  (1) Battery positive voltage 11 V or more
  (2) Throttle valve fully closed
  (3) Transmission in the P or N position
  (4) A/C switched off

(b) Turn the ignition switch off.

(c) Connect the intelligent tester together with the Controller Area Network Vehicle Interface Module (CAN VIM) to the DLC3.

(d) Turn the ignition switch to the ON position.

(e) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / CHECK MODE.




(f) Change the ECM to check mode. Make sure the MIL flashes as shown in the illustration.

**NOTICE:**

**All recorded DTCs and freeze frame data will be erased 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 LOCK.**

**Before entering 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 "MONITOR DRIVE PATTERN" for the ECT test (See page AT-21).
 (Or, simulate the conditions of the malfunction described by the customer).

(i) After simulating the malfunction conditions, use the intelligent tester diagnosis selector to check the DTC and freeze frame data.

AT

# FAIL-SAFE CHART

## 1. FAIL-SAFE CHART

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

| Malfunction Part | Function |
|---|---|
| DTC P0710, P0712 and P0713:<br>No. 1 ATF Temperature Sensor | During a No. 1 ATF temperature sensor malfunction, up-shift to the 5th gear and flex lock-up clutch control are prohibited. |
| DTC P0722:<br>Output Speed Sensor (SP2) | During an output speed sensor malfunction, shift control is effected through the input speed sensor signal (NT). |
| DTC P0751, P0756, P0771, P0973, P0974, P0976, P0977, P0985 and P0986:<br>Shift Solenoid Valve S1, S2 and SR | The current to the failed solenoid valve is cut off and control is effected by operating the other solenoid valves with normal operation.<br>Shift control is effected depending on the failed solenoid as described in the table below. |
| DTC P0748, P0776 and P0778:<br>Shift Solenoid Valve SL1 and SL2 | During a solenoid valve SL1 or SL2 malfunction, up-shift to the 5th gear is prohibited. |
| DTC P02714 and P2716:<br>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 effected through normal clutch pressure control. |
| DTC P2757:<br>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. |

(b) 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.

AT

| Position | Normal | | | | | | Shift Solenoid S1 Malfunction | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Gear | S1 | S2 | SR | SL1 | SL2 | Gear | S1 | S2 | SR | SL1 | SL2 |
| R | R | ON | OFF | OFF | OFF | ON | R | X | OFF | OFF | OFF | ON |
| D | 1st | ON | OFF | OFF | OFF | ON | 4th ↓ 3rd | X | OFF ↓ ON | OFF | OFF | ON |
| | 2nd | ON | ON | OFF | OFF | ON | 3rd | X | ON | OFF | OFF | ON |
| | 3rd | OFF | ON | OFF | OFF | ON | 3rd | X | ON | OFF | OFF | ON |
| | 4th | OFF | OFF | OFF | OFF | ON | 4th | X | OFF | OFF | OFF | ON |
| | 5th | OFF | OFF | ON | ON | OFF | 5th | X | OFF | ON | ON | OFF |
| 4 | 1st | ON | OFF | OFF | OFF | ON | 4th ↓ 3rd | X | OFF ↓ ON | OFF | OFF | ON |
| | 2nd | ON | ON | OFF | OFF | ON | 3rd | X | ON | OFF | OFF | ON |
| | 3rd | OFF | ON | OFF | OFF | ON | 3rd | X | ON | OFF | OFF | ON |
| | 4th | OFF | OFF | OFF | OFF | ON | 4th | X | OFF | OFF | OFF | ON |

| Position | Normal | | | | | | Shift Solenoid S1 Malfunction | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Gear | S1 | S2 | SR | SL1 | SL2 | Gear | S1 | S2 | SR | SL1 | SL2 |
| 3 | 1st | ON | OFF | OFF | OFF | ON | 3rd ↓ 3rd E/B | X | OFF ↓ ON | OFF | OFF | ON ↓ OFF |
| | 2nd | ON | ON | OFF | OFF | ON | 3rd ↓ 3rd E/B | X | ON | OFF | OFF | ON ↓ OFF |
| | 3rd E/B | OFF | ON | OFF | OFF | OFF | 3rd E/B | X | ON | OFF | OFF | OFF |
| 2 | 1st | ON | OFF | OFF | OFF | ON | 1st | X | OFF | OFF | OFF | ON |
| | 2nd E/B | ON | ON | ON | OFF | OFF | 3rd E/B | X | ON | ON | OFF | OFF |
| L | 1st E/B | ON | OFF | OFF | OFF | OFF | 1st E/B | X | OFF | OFF | OFF | OFF |

X: Malfunction

| Position | Shift Solenoid S2 Malfunction | | | | | | Shift Solenoid SR Malfunction | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Gear | S1 | S2 | SR | SL1 | SL2 | Gear | S1 | S2 | SR | SL1 | SL2 |
| R | R | ON | X | OFF | OFF | ON | R | ON | OFF | X | OFF | ON |
| D | 1st | ON | X | OFF | OFF | ON | 1st | ON | OFF | X | OFF | ON |
| | 1st ↓ 4th | ON ↓ OFF | X | OFF | OFF | ON | 2nd | ON | ON | X | OFF | ON |
| | 4th | OFF | X | OFF | OFF | ON | 3rd | OFF | ON | X | OFF | ON |
| | 4th | OFF | X | OFF | OFF | ON | 4th | OFF | OFF | X | OFF | ON |
| | 5th | OFF | X | ON | ON | OFF | 4th | OFF | OFF | X | ON | OFF |
| 4 | 1st | ON | X | OFF | OFF | ON | 1st | ON | OFF | X | OFF | ON |
| | 1st ↓ 4th | ON ↓ OFF | X | OFF | OFF | ON | 2nd | ON | ON | X | OFF | ON |
| | 4th | OFF | X | OFF | OFF | ON | 3rd | OFF | ON | X | OFF | ON |
| | 4th | OFF | X | OFF | OFF | ON | 4th | OFF | OFF | X | OFF | ON |
| 3 | 1st | ON | X | OFF | OFF | ON | 1st | ON | OFF | X | OFF | ON |
| | 1st ↓ 3rd E/B | ON ↓ OFF | X | OFF | OFF | ON ↓ OFF | 2nd | ON | ON | X | OFF | ON |
| | 3rd E/B | OFF | X | OFF | OFF | OFF | 3rd E/B ↓ 3rd | OFF | ON | X | OFF | OFF ↓ ON |
| 2 | 1st | ON | X | OFF | OFF | ON | 1st | ON | OFF | X | OFF | ON |
| | 2nd E/B ↓ 4th | ON ↓ OFF | X | ON | OFF | OFF ↓ ON | 2nd | ON | ON | X | OFF | OFF |
| L | 1st E/B | ON | X | OFF | OFF | OFF | 1st E/B | ON | OFF | X | OFF | OFF |

X: Malfunction

| Position | Shift Solenoid S1 and S2 Malfunction | | | | | | Shift Solenoid S1 and SR Malfunction | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Gear | S1 | S2 | SR | SL1 | SL2 | Gear | S1 | S2 | SR | SL1 | SL2 |
| R | R | X | X | OFF | OFF | ON | R | X | OFF | X | OFF | ON |
| D | 4th | X | X | OFF | OFF | ON | 4th ↓ 3rd | X | OFF ↓ ON | X | OFF | ON |
| | 4th | X | X | OFF | OFF | ON | 3rd | X | ON | X | OFF | ON |
| | 4th | X | X | OFF | OFF | ON | 3rd | X | ON | X | OFF | ON |
| | 4th | X | X | OFF | OFF | ON | 4th | X | OFF | X | OFF | ON |
| | 5th | X | X | ON | ON | OFF | 4th | X | OFF | X | ON ↓ OFF | OFF ↓ ON |

| Position | Shift Solenoid S1 and S2 Malfunction | | | | | | Shift Solenoid S1 and SR Malfunction | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Gear | S1 | S2 | SR | SL1 | SL2 | Gear | S1 | S2 | SR | SL1 | SL2 |
| 4 | 4th | X | X | OFF | OFF | ON | 4th ↓ 3rd | X | OFF ↓ ON | X | OFF | ON |
| | 4th | X | X | OFF | OFF | ON | 3rd | X | ON | X | OFF | ON |
| | 4th | X | X | OFF | OFF | ON | 3rd | X | ON | X | OFF | ON |
| | 4th | X | X | OFF | OFF | ON | 4th | X | OFF | X | OFF | ON |
| 3 | 3rd ↓ 3rd E/B | X | X | OFF | OFF | ON ↓ OFF | 3rd | X | OFF ↓ ON | X | OFF | ON |
| | 3rd ↓ 3rd E/B | X | X | OFF | OFF | ON ↓ OFF | 3rd | X | ON | X | OFF | ON |
| | 3rd E/B | X | X | OFF | OFF | OFF | 3rd E/B ↓ 3rd | X | ON | X | OFF | OFF ↓ ON |
| 2 | 1st | X | X | OFF | OFF | ON | 1st | X | OFF | X | OFF | ON |
| | 4th | X | X | ON | OFF | OFF ↓ ON | 2nd | X | ON | X | OFF | OFF |
| L | 1st E/B | X | X | OFF | OFF | OFF | 1st E/B | X | OFF | X | OFF | OFF |

X: Malfunction

| Position | Shift Solenoid S2 and SR Malfunction | | | | | | Shift Solenoid S1, S2 and SR Malfunction | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Gear | S1 | S2 | SR | SL1 | SL2 | Gear | S1 | S2 | SR | SL1 | SL2 |
| R | R | ON | X | X | OFF | ON | R | X | X | X | OFF | ON |
| D | 1st | ON | X | X | OFF | ON | 4th | X | X | X | OFF | ON |
| | 1st ↓ 4th | ON ↓ OFF | X | X | OFF | ON | 4th | X | X | X | OFF | ON |
| | 4th | OFF | X | X | OFF | ON | 4th | X | X | X | OFF | ON |
| | 4th | OFF | X | X | OFF | ON | 4th | X | X | X | OFF | ON |
| | 4th | OFF | X | X | ON ↓ OFF | OFF ↓ ON | 4th | X | X | X | ON ↓ OFF | OFF ↓ ON |
| 4 | 1st | ON | X | X | OFF | ON | 4th | X | X | X | OFF | ON |
| | 1st ↓ 4th | ON ↓ OFF | X | X | OFF | ON | 4th | X | X | X | OFF | ON |
| | 4th | OFF | X | X | OFF | ON | 4th | X | X | X | OFF | ON |
| | 4th | OFF | X | X | OFF | ON | 4th | X | X | X | OFF | ON |
| 3 | 1st | ON | X | X | OFF | ON | 3rd | X | X | X | OFF | ON |
| | 1st ↓ 3rd | ON ↓ OFF | X | X | OFF | ON | 3rd | X | X | X | OFF | ON |
| | 3rd E/B ↓ 3rd | OFF | X | X | OFF | OFF ↓ ON | 3rd E/B ↓ 3rd | X | X | X | OFF | OFF ↓ ON |
| 2 | 1st | ON | X | X | OFF | ON | 1st | X | X | X | OFF | ON |
| | 1st E/B ↓ 1st | ON | X | X | OFF | OFF ↓ ON | 1st E/B ↓ 1st | X | X | X | OFF | OFF ↓ ON |
| L | 1st E/B | ON | X | X | OFF | OFF | 1st E/B | X | X | X | OFF | OFF |

X: Malfunction

AT

HINT:

- ↓: Condition in the electrical malfunction is shown above "↓".
- ↓: Condition in the fail-safe mode is shown below "↓".
- E/B: Engine brake.

AT

# DATA LIST / ACTIVE TEST

## 1. DATA LIST

HINT:

According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.

**NOTICE:**

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

(a) Warm up the engine.

(b) Turn the ignition switch off.

(c) Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.

(d) Turn the ignition switch to the ON position.

(e) Push the "ON" button of the tester.

(f) Select the items "DIAGNOSIS / ENHANCED OBD II / DATA LIST / A/T".

(g) According to the display on the tester, read the "DATA LIST".

| Item | Measurement Item/ Display (Range) | Normal Condition | Diagnostic Note |
|---|---|---|---|
| SPD (SP2) | Counter Gear Speed / min.: 0 mph (0 km/h) max.: 158 mph (255 km/h) | Vehicle stopped: 0 mph (0 km/h) | - |
| SPD (NT) | Input Turbine Speed/ display: 50 rpm | [HINT]<br>• Lock-Up ON (After warming up the engine); Input turbine speed (NT) equal to the engine speed.<br>• Lock-Up OFF (Idling in N position); Input turbine speed (NT) nearly equal to the engine speed. | - |
| PNP SW [NSW] | PNP Switch Status/ ON or OFF | Shift lever position is;<br>P or N: ON<br>Except P and N: OFF | When the shift lever position displayed on the intelligent tester differs from the actual position, adjustment of the PNP switch or the shift cable may be incorrect.<br>HINT:<br>When the failure still occurs even after adjusting these parts. (See page AT-45) |
| STOP LIGHT SW | Stop Light Switch Status/ ON or OFF | • Brake Pedal is depressed: ON<br>• Brake Pedal is released: OFF | - |
| SHIFT | ECM gear shift command/ 1st, 2nd, 3rd, 4th or 5th | Shift lever position is;<br>• L: 1st<br>• 2: 1st or 2nd<br>• 3: 1st, 2nd or 3rd<br>• 4: 1st, 2nd, 3rd or 4th<br>• D: 1st, 2nd, 3rd, 4th or 5th | - |
| REVERSE | PNP Switch Status/ ON or OFF | Shift lever position is;<br>R: ON<br>Except R: OFF | Same as PNP SW [NSW] |

AT

| Item | Measurement Item/ Display (Range) | Normal Condition | Diagnostic Note |
|---|---|---|---|
| DRIVE | PNP Switch Status/ ON or OFF | Shift lever position is; D or 4: ON Except D and 4: OFF | Same as PNP SW [NSW] |
| 4TH/DRIVE | PNP Switch Status/ ON or OFF | Shift lever position is; 4: ON Except 4: OFF | Same as PNP SW [NSW] |
| 3RD | PNP Switch Status/ ON or OFF | Shift lever position is; 3: ON Except 3: OFF | Same as PNP SW [NSW] |
| 2ND | PNP Switch Status/ ON or OFF | Shift lever position is; 2 or L: ON Except 2 and L: OFF | Same as PNP SW [NSW] |
| LOW | PNP Switch Status/ ON or OFF | Shift lever position is; L: ON Except L: OFF | Same as PNP SW [NSW] |
| AT OIL TEMP1 | No. 1 ATF Temperature Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F) | • After Stall Test; Approximately 80°C (176°F) • Equal to ambient temperature during cold soak | If the value is "-40°C (-40°F)" or "150°C (302°F) or more", No. 1 ATF temperature sensor circuit is open or short. |
| AT OIL TEMP2 | No. 2 ATF Temperature Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F) | • After Stall Test; Approximately 80°C (176°F) • Equal to ambient temperature during cold soak | If the value is "-40°C (-40°F)" or "150°C (302°F) or more", No. 2 ATF temperature sensor circuit is open or short. |
| LOCK UP | Lock-up status/ ON or OFF | • Lock-up: ON • Expect lock-up: OFF | - |
| LOCK UP SOL | Lock Up Solenoid Status/ ON or OFF | • Lock Up: ON • Except Lock Up: OFF | - |
| SOLENOID (SLU) | Shift Solenoid SLU Status/ ON or OFF | • Lock Up: ON • Except Lock Up: OFF | - |
| SOLENOID (SLT) | Shift Solenoid SLT Status/ ON or OFF | • Accelerator pedal is depressed: OFF • Accelerator pedal is released: ON | - |

AT

## 2. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time. It is possible to display the DATA LIST during the ACTIVE TEST.

(a) Warm up the engine.
(b) Turn the ignition switch off.
(c) Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
(d) Turn the ignition switch to the ON position.
(e) Push the "ON" button of the tester.
(f) Select the items "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST".

(g) According to the display on the tester, perform the "ACTIVE TEST".

| Item | Test Details | Diagnostic Note |
|---|---|---|
| SOLENOID (SLU) | [Test Details]<br>Operate the shift solenoid SLU<br>[Vehicle Condition]<br>• Vehicle Stopped.<br>• Shift lever P or N position | - |
| SOLENOID (SLT)* | [Test Details]<br>Operate the shift solenoid SLT and raise the line pressure.<br>[Vehicle Condition]<br>• Vehicle Stopped.<br>• Engine Idling<br>HINT:<br>OFF: Line pressure up (When the active test of "SOLENOID (SLT)" is performed, the ECM commands the SLT solenoid to turn off).<br>ON: No action (normal operation) | - |
| SOLENOID (S1) | [Test Details]<br>Operate the shift solenoid S1<br>[Vehicle Condition]<br>• Vehicle Stopped.<br>• Shift lever P or N position | - |
| SOLENOID (S2) | [Test Details]<br>Operate the shift solenoid S2<br>[Vehicle Condition]<br>• Vehicle Stopped.<br>• Shift lever P or N position | - |
| LOCK UP | [Test Details]<br>Control the shift solenoid SLU to set the automatic transmission to the lock-up condition.<br>[Vehicle Condition]<br>Vehicle Speed: 36 mph (60 km/h) or more | Possible to check the SLU operation. |
| SHIFT | [Test Details]<br>Operate the shift solenoid valve and set each shift position manually.<br>[Vehicle Condition]<br>Vehicle Speed: Less than 30 mph (50 km/h)<br>[Others]<br>• Press →button: Shift up<br>• Press ←button: Shift down | Possible to check the operation of the shift solenoid valves.<br>HINT:<br>Shifting to the 5th gear is possible only when the vehicle is stationary with the engine idling. |
| SOLENOID (SR) | [Test Details]<br>Operate the shift solenoid SR<br>[Vehicle Condition]<br>• Vehicle Stopped.<br>• Shift lever P or N position | - |
| SOLENOID (SL1) | [Test Details]<br>Operate the shift solenoid SL1<br>[Vehicle Condition]<br>• Vehicle Stopped.<br>• Shift lever P or N position | - |
| SOLENOID (SL2) | [Test Details]<br>Operate the shift solenoid SL2<br>[Vehicle Condition]<br>• Vehicle Stopped.<br>• Shift lever P or N position | - |

*: "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 (See page AT-18) as well.

AT

HINT:
The pressure values in ACTIVE TEST and HYDRAULIC TEST are different from each other.

# DIAGNOSTIC TROUBLE CODE CHART

If a DTC is displayed during the DTC check, check the circuit listed in the table below and proceed to the page given.

HINT:

- *1: "Comes on" means that the MIL illuminates.
- *2: "DTC stored" means that the ECM memorizes the malfunction code if the DTC detection condition(s) are met.
- These DTCs may be output when the clutch, brake and gear components, etc., inside the automatic transmission are damaged.

| DTC No. | Detection Item | Trouble Areas | MIL *1 | Memory *2 | See page |
|---|---|---|---|---|---|
| P0705 | Transmission Range Sensor Circuit Malfunction (PRNDL Input) | - Open or short in park/neutral position switch circuit<br>- Park/neutral position switch<br>- ECM | Comes on | DTC stored | AT-45 |
| P0710 | Transmission Fluid Temperature Sensor "A" Circuit | - Open or short in No. 1 ATF temperature sensor circuit<br>- Transmission wire (No. 1 ATF temperature sensor)<br>- ECM | Comes on | DTC stored | AT-51 |
| P0711 | Transmission Fluid Temperature Sensor "A" Performance | - Transmission wire (No. 1 ATF temperature sensor)<br>- ECM | Comes on | DTC stored | AT-56 |
| P0712 | Transmission Fluid Temperature Sensor "A" Circuit Low Input | - Short in No. 1 ATF temperature sensor circuit<br>- Transmission wire (No. 1 ATF temperature sensor)<br>- ECM | Comes on | DTC stored | AT-51 |
| P0713 | Transmission Fluid Temperature Sensor "A" Circuit High Input | - Open in No. 1 ATF temperature sensor circuit<br>- Transmission wire (No. 1 ATF temperature sensor)<br>- ECM | Comes on | DTC stored | AT-51 |
| P0717 | Input Speed Sensor Circuit No Signal | - Open or short in speed sensor (NT) circuit<br>- Speed sensor (NT)<br>- ECM | Comes on | DTC stored | AT-59 |
| P0722 | Output Speed Sensor Circuit No Signal | - Open or short in speed sensor (SP2) circuit<br>- Speed sensor (SP2)<br>- ECM | Comes on | DTC stored | AT-64 |
| P0748 | Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1) | - Open or short in shift solenoid valve SL1 circuit<br>- Shift solenoid valve SL1<br>- ECM | Comes on | DTC stored | AT-69 |

AT

| DTC No. | Detection Item | Trouble Areas | MIL *1 | Memory *2 | See page |
|---|---|---|---|---|---|
| P0751 | Shift Solenoid "A" Performance (Shift Solenoid Valve S1) | - Shift solenoid valve S1 remains open or closed<br>- Shift solenoid valve SLT remains open or closed<br>- Valve body is blocked<br>- Automatic transmission (clutch, brake or gear, etc.) | Comes on | DTC stored | AT-72 |
| P0756 | Shift Solenoid "B" Performance (Shift Solenoid Valve S2) | - Shift solenoid valve S2 remains open or closed<br>- Shift solenoid valve SLT remains open or closed<br>- Valve body is blocked<br>- Automatic transmission (clutch, brake or gear, etc.) | Comes on | DTC stored | AT-78 |
| P0771 | Shift Solenoid "E" Performance (Shift Solenoid Valve SR) | - Shift solenoid valve SR remains open or closed<br>- Shift solenoid valve SL1 remains open or closed<br>- Shift solenoid valve SLT remains open or closed<br>- Valve body is blocked<br>- Automatic transmission (clutch, brake or gear, etc.) | Comes on | DTC stored | AT-84 |
| P0776 | Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2) | - Shift solenoid valve SL2 remains open<br>- Shift solenoid valve SLT remains open or closed<br>- Valve body is blocked<br>- Automatic transmission (clutch, brake or gear, etc.) | Comes on | DTC stored | AT-89 |
| P0778 | Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2) | - Open or short in shift solenoid valve SL2 circuit<br>- Shift solenoid valve SL2<br>- ECM | Comes on | DTC stored | AT-94 |
| P0781 | 1-2 Shift (1-2 Shift Valve) | - Valve body is blocked up or stuck (1-2 shift valve)<br>- Shift solenoid valve SLT remains open or closed<br>- Automatic transmission (clutch, brake or gear, etc.) | Comes on | DTC stored | AT-98 |
| P0973 | Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1) | - Short in shift solenoid valve S1 circuit<br>- Shift solenoid valve S1<br>- ECM | Comes on | DTC stored | AT-103 |

| DTC No. | Detection Item | Trouble Areas | MIL *1 | Memory *2 | See page |
|---|---|---|---|---|---|
| P0974 | Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1) | - Open in shift solenoid valve S1 circuit<br>- Shift solenoid valve S1<br>- ECM | Comes on | DTC stored | AT-103 |
| P0976 | Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2) | - Short in shift solenoid valve S2 circuit<br>- Shift solenoid valve S2<br>- ECM | Comes on | DTC stored | AT-107 |
| P0977 | Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2) | - Open in shift solenoid valve S2 circuit<br>- Shift solenoid valve S2<br>- ECM | Comes on | DTC stored | AT-107 |
| P0985 | Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR) | - Short in shift solenoid valve SR circuit<br>- Shift solenoid valve SR<br>- ECM | Comes on | DTC stored | AT-111 |
| P0986 | Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR) | - Open in shift solenoid valve SR circuit<br>- Shift solenoid valve SR<br>- ECM | Comes on | DTC stored | AT-111 |
| P2714 | Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT) | - Shift solenoid valve SLT remains open or closed<br>- Shift solenoid valve S1, S2, SR, SL1 or SL2 remains open or closed<br>- Valve body is blocked<br>- Automatic transmission (clutch, brake or gear, etc.) | Comes on | DTC stored | AT-115 |
| P2716 | Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT) | - Open or short in shift solenoid valve SLT circuit<br>- Shift solenoid valve SLT<br>- ECM | Comes on | DTC stored | AT-122 |
| P2740 | Transmission Fluid Temperature Sensor "B" Circuit | - Open or short in No. 2 ATF temperature sensor circuit<br>- No. 2 ATF temperature sensor<br>- ECM | Comes on | DTC stored | AT-126 |
| P2742 | Transmission Fluid Temperature Sensor "B" Circuit Low Input | - Short in No. 2 ATF temperature sensor circuit<br>- No. 2 ATF temperature sensor<br>- ECM | Comes on | DTC stored | AT-126 |

AT

| DTC No. | Detection Item | Trouble Areas | MIL *1 | Memory *2 | See page |
|---|---|---|---|---|---|
| P2743 | Transmission Fluid Temperature Sensor "B" Circuit High Input | - Open in No. 2 ATF temperature sensor circuit<br>- No. 2 ATF temperature sensor<br>- ECM | Comes on | DTC stored | AT-126 |
| P2757 | Torque Converter Clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU) | - Shift solenoid valve SLU remains open or closed<br>- Valve body is blocked- Shift solenoid valve SLU<br>- Torque converter clutch<br>- Automatic transmission (clutch, brake or gear, etc.)<br>- Line pressure is too low | Comes on | DTC stored | AT-131 |
| P2759 | Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU) | - Open or short in shift solenoid valve SLU circuit<br>- Shift solenoid valve SLU<br>- ECM | Comes on | DTC stored | AT-136 |

AT

| DTC | P0705 | Transmission Range Sensor Circuit Malfunction (PRNDL Input) |
|---|---|---|

## DESCRIPTION

The park/neutral position switch detects the shift lever position and sends signals to the ECM.

| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| P0705 | When any one of following conditions (A) to (C) is met (2-trip detection logic):<br>(A) Any 2 or more of the following signals are ON simultaneously.<br>– NSW input signal is ON.<br>– R input signal is ON.<br>– D input signal is ON.<br>– 3 input signal is ON.<br>– 2 input signal is ON.<br>(B) All switches are OFF simultaneously for P (NSW), R, N (NSW), D, 3 and 2 positions.<br>(C) When NSW or R input signal is ON, 4 or L input signal is ON. | • Open or short in park/neutral position switch circuit<br>• Park/neutral position switch<br>• ECM |

## MONITOR DESCRIPTION

The DTC indicates a problem with the park/neutral position switch and the wire harness in the park/neutral position switch circuit.
For security, the park/neutral position switch detects the shift lever position so that the engine can be started only when the vehicle is in the P or N shift position.
When the park/neutral position switch sends more than one signal at a time from switch positions P, R, N, D, 3 or 2, the ECM interprets this as a fault in the switch. The ECM will turn on the MIL and store the DTC.

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P0705: Park/neutral position switch/Verify switch input |
| Required sensors/Components | Park/neutral position switch |
| Frequency of operation | Continuous |
| Duration | Conditions (A) and (C):<br>2 seconds<br>Condition (B):<br>60 seconds |
| MIL operation | 2 driving cycles |
| Sequence of operation | None |

AT

## TYPICAL ENABLING CONDITIONS

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | None |
| Ignition switch | ON |
| Battery voltage | 10.5 V or more |

## TYPICAL MALFUNCTION THRESHOLDS

One of the following conditions is met: Condition (A), (B) or (C)

**Condition (A)**

| | |
|---|---|
| Number of the following signals input at the same time | 2 or more |
| Park/neutral position switch | ON |
| R switch | ON |
| D switch | ON |
| 3 switch | ON |

| | |
|---|---|
| 2 switch | ON |

**Condition (B)**

All of following conditions are met

| | |
|---|---|
| Park/neutral position switch | OFF |
| R switch | OFF |
| D switch | OFF |
| 3 switch | OFF |
| 2 switch | OFF |

**Condition (C)**

Both (i) and (ii) are met

(i) One of following conditions is met

| | |
|---|---|
| Park/neutral position switch | ON |
| R switch | ON |

(ii) One of following conditions is met

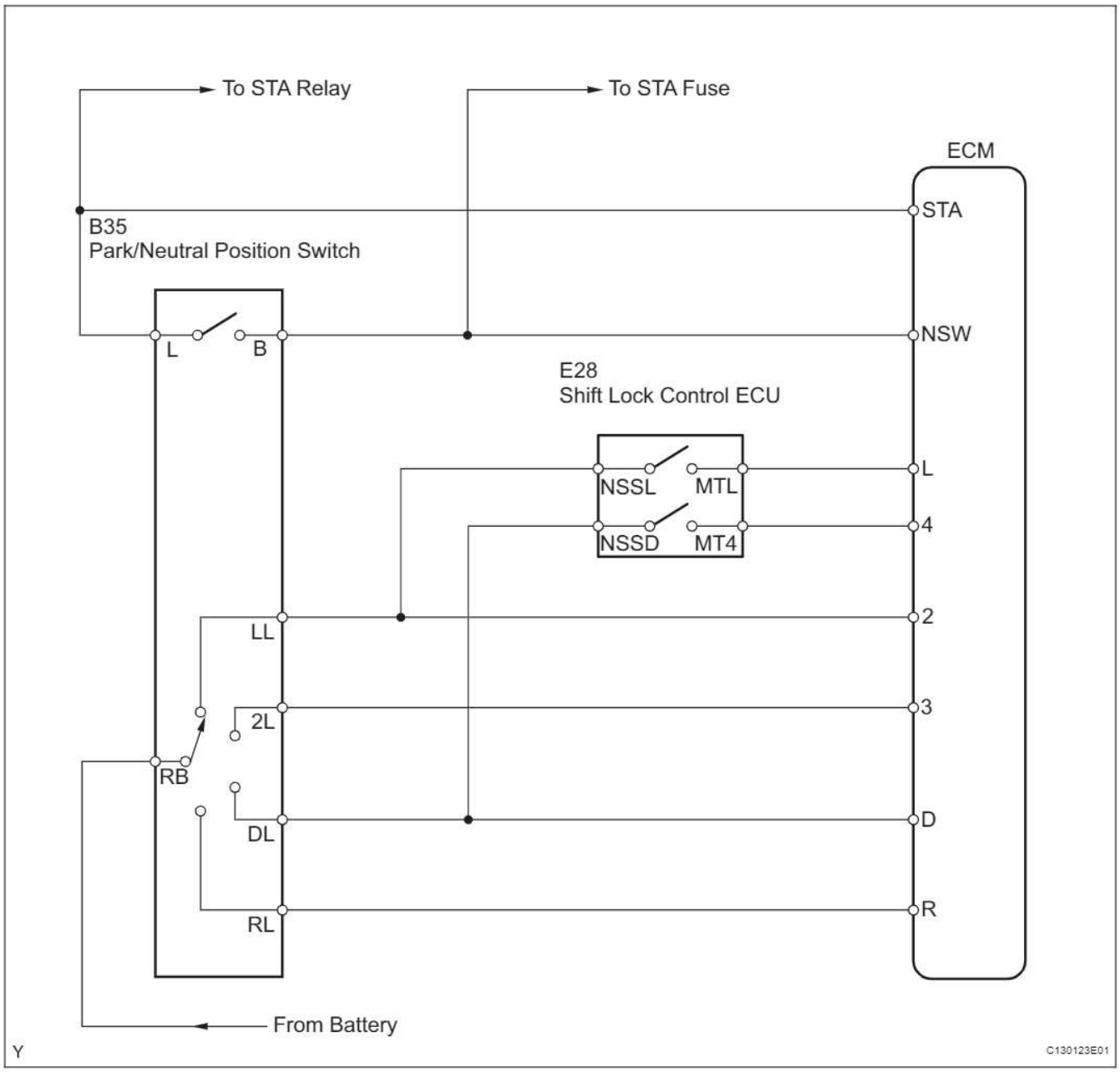
| | |
|---|---|
| 4 switch | ON |
| L switch | ON |

## COMPONENT OPERATING RANGE

| | |
|---|---|
| Park/neutral position switch | The park/neutral position switch sends only one signal to the ECM |

AT

## WIRING DIAGRAM




## INSPECTION PROCEDURE

HINT:

According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.

**NOTICE:**

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

1. Connect the intelligent tester together with the CAN VIM (Controller Area Network Vehicle Interface Module) to the DLC3.
2. Turn the ignition switch to the ON position.
3. Push the "ON" button of the tester.
4. Select the items "DIAGNOSIS / ENHANCED OBD II / DATA LIST / A/T".

AT

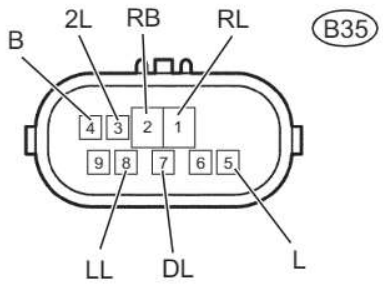
5. According to the display on the tester, read the "DATA LIST".

| Item | Measurement Item/ Display (Range) | Normal Condition | Diagnostic Note |
|---|---|---|---|
| PNP SW [NSW] | PNP Switch Status/ ON or OFF | Shift lever position is; P or N: ON Except P and N: OFF | When the shift lever position displayed on the intelligent tester differs from the actual position, adjustment of the PNP switch or the shift cable may be incorrect. |
| REVERSE | PNP Switch Status/ ON or OFF | Shift lever position is; R: ON Except R: OFF | |
| DRIVE | PNP Switch Status/ ON or OFF | Shift lever position is; D or 4: ON Except D and 4: OFF | |
| 4th/DRIVE | PNP Switch Status/ ON or OFF | Shift lever position is; 4: ON Except 4: OFF | |
| 3RD | PNP Switch Status/ ON or OFF | Shift lever position is; 3: ON Except 3: OFF | |
| 2ND | PNP Switch Status/ ON or OFF | Shift lever position is; 2 or L: ON Except 2 and L: OFF | |
| LOW | PNP Switch Status/ ON or OFF | Shift lever position is; L: ON Except L: OFF | |

**1 INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY**

**Switch Side:**

**(Connector Front View)**




C130119E05

(a) Disconnect the park/neutral position switch connector.
(b) Measure the resistance when the shift lever is moved to each position.

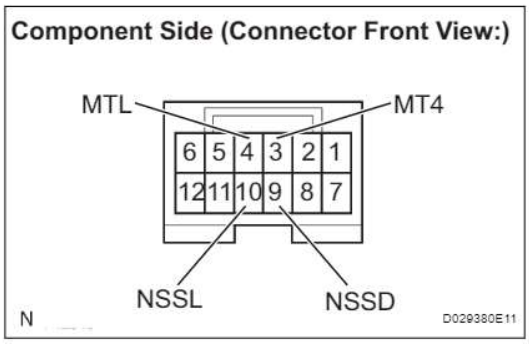
**Standard resistance**

| Shift Position | Tester Connection | Specified Condition |
|---|---|---|
| P or N | 4 (B) - 5 (L) | Below 1 Ω |
| Except P and N | 4 (B) - 5 (L) | 10 kΩ or higher |
| R | 1 (RL) - 2 (RB) | Below 1 Ω |
| Except R | 1 (RL) - 2 (RB) | 10 kΩ or higher |
| D or 4 | 2 (RB) - 7 (DL) | Below 1 Ω |
| Except D and 4 | 2 (RB) - 7 (DL) | 10 kΩ or higher |
| 3 | 2 (RB) - 3 (2L) | Below 1 Ω |
| Except 3 | 2 (RB) - 3 (2L) | 10 kΩ or higher |
| 2 or L | 2 (RB) - 8 (LL) | Below 1 Ω |
| Except 2 and L | 2 (RB) - 8 (LL) | 10 kΩ or higher |

NG → **REPLACE PARK/NEUTRAL POSITION SWITCH ASSEMBLY**

OK

## 2 INSPECT SHIFT LOCK CONTROL ECU SUB-ASSEMBLY




(a) Connect the park/neutral position switch connector.
(b) Disconnect the shift lock control ECU connector.
(c) Measure the resistance when the shift lever is moved to each position.

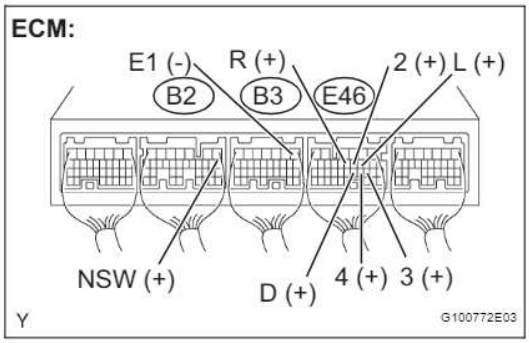
**Standard resistance**

| Shift Position | Tester Connection | Specified Condition |
|---|---|---|
| D | 9 (NSSD) - 3 (MT4) | 10 kΩ or higher |
| 4 | 9 (NSSD) - 3 (MT4) | Below 1 Ω |
| 2 | 10 (NSSL) - 4 (MTL) | 10 kΩ or higher |
| L | 10 (NSSL) - 4 (MTL) | Below 1 Ω |

NG → REPLACE SHIFT LOCK CONTROL ECU SUB-ASSEMBLY

OK

## 3 CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH - ECM)




(a) Connect the shift lock control ECU connector.
(b) Turn the ignition switch to the ON position.
(c) Measure the voltage when the shift lever is moved to each position.

**Standard voltage**

| Shift Position | Tester Connection | Specified Condition |
|---|---|---|
| P or N | B2-8 (NSW) - B3-1 (E1) | Below 2 V |
| Except P and N | B2-8 (NSW) - B3-1 (E1) | 11 to 14 V |
| R | E46-11 (R) - B3-1 (E1) | 11 to 14 V* |
| Except R | E46-11 (R) - B3-1 (E1) | Below 1 V |
| D or 4 | E46-21 (D) - B3-1 (E1) | 11 to 14 V |
| Except D and 4 | E46-21 (D) - B3-1 (E1) | Below 1 V |
| 4 | E46-20 (4) - B3-1 (E1) | 11 to 14 V |
| Except 4 | E46-20 (4) - B3-1 (E1) | Below 1 V |
| 3 | E46-19 (3) - B3-1 (E1) | 11 to 14 V |
| Except 3 | E46-19 (3) - B3-1 (E1) | Below 1 V |
| 2 or L | E46-10 (2) - B3-1 (E1) | 11 to 14 V |
| Except 2 and L | E46-10 (2) - B3-1 (E1) | Below 1 V |
| L | E46-9 (L) - B3-1 (E1) | 11 to 14 V |
| Except L | E46-9 (L) - B3-1 (E1) | Below 1 V |

HINT:
*: The voltage will drop slightly due to illumination of the back up light.

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

AT

OK

REPLACE ECM

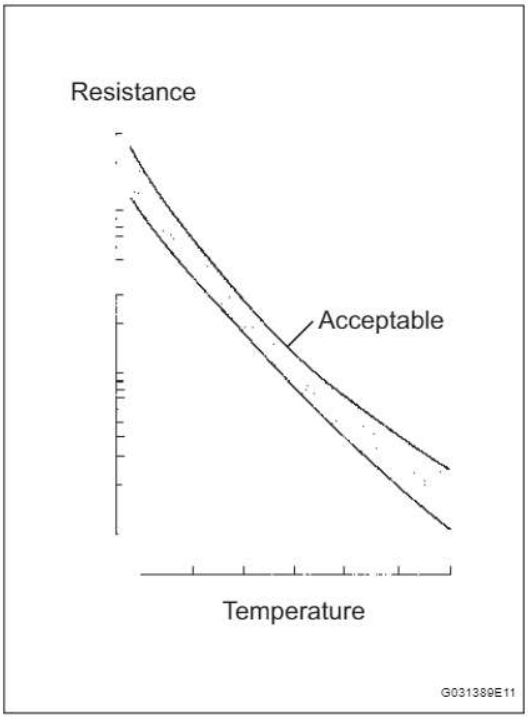
AT

| DTC | P0710 | Transmission Fluid Temperature Sensor "A" Circuit |
|---|---|---|

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

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

## DESCRIPTION




The ATF (Automatic Transmission Fluid) 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 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 and the voltage decrease as the temperature becomes higher.
The ECM calculates the fluid temperature based on the voltage signal.

| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| P0710 | (a) and (b) are detected momentarily within 0.5 seconds when neither P0712 nor P0713 is detected. (1-trip detection logic)<br>(a) No. 1 ATF temperature sensor resistance is less than 79 Ω.<br>(b) No. 1 ATF temperature sensor resistance is more than 156 kΩ.<br>HINT:<br>Within 0.5 seconds, the malfunction changes from (a) to (b) or from (b) to (a). | • Open or short in No. 1 ATF temperature sensor circuit<br>• Transmission wire (No. 1 ATF temperature sensor)<br>• ECM |

| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| P0712 | No. 1 ATF temperature sensor resistance is less than 79 Ω for 0.5 seconds or more. (1-trip detection logic) | • Short in No. 1 ATF temperature sensor circuit<br>• Transmission wire (No. 1 ATF temperature sensor)<br>• ECM |
| P0713 | No. 1 ATF temperature sensor resistance is more than 156 kΩ for 0.5 seconds or more 15 minutes or more after starting engine. (1-trip detection logic) | • Open in No. 1 ATF temperature sensor circuit<br>• Transmission wire (No. 1 ATF temperature sensor)<br>• 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 detects any open or short malfunctions in the ATF temperature circuit. If the resistance value of the ATF temperature is less than 79 Ω*1 or more than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or its wiring. The ECM turns on the MIL and stores a DTC.

*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.

HINT:

The ATF temperature can be checked on the intelligent tester display.

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P0710: ATF temperature sensor/Range check (Fluttering)<br>P0712: ATF temperature sensor/Range check (Low resistance)<br>P0713: ATF temperature sensor/Range check (High resistance) |
| Required sensors/Components | ATF temperature sensor |
| Frequency of operation | Continuous |
| Duration | 0.5 seconds |
| MIL operation | Immediate |
| Sequence of operation | None |

AT

## TYPICAL ENABLING CONDITIONS

### P0710: Range check (Fluttering)

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | None |
| The typical enabling condition is not available. | - |

### P0712: Range check (Low resistance)

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | None |
| The typical enabling condition is not available. | - |

### P0713: Range check (High resistance)

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | None |
| Time after engine start | 15 minutes or more |

## TYPICAL MALFUNCTION THRESHOLDS

### P0710: Range check (Fluttering)

| | |
|---|---|
| ATF temperature sensor resistance | Less than 79 Ω<br>or<br>More than 156 kΩ |

### P0712: Range check (Low resistance)

| | |
|---|---|
| ATF temperature sensor resistance | Less than 79 Ω |

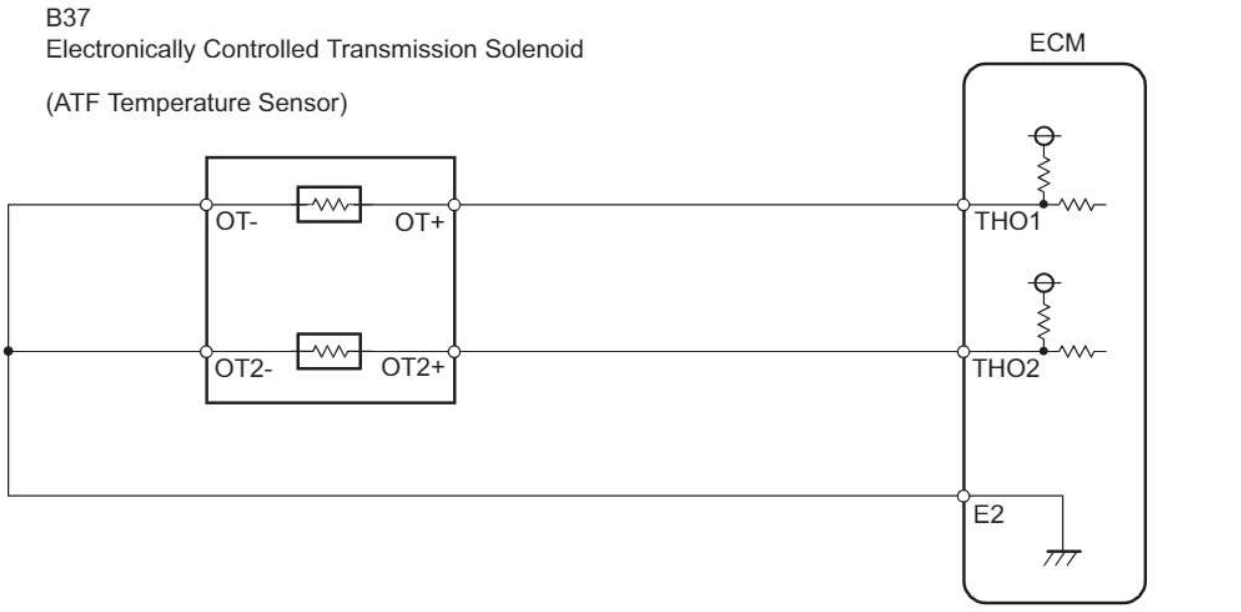
**P0713: Range check (High resistance)**

| | |
|---|---|
| ATF temperature sensor resistance | More than 156 kΩ |

## COMPONENT OPERATING RANGE

| | |
|---|---|
| ATF temperature sensor | Atmospheric temperature up to approximately 130°C (266°F) |

## WIRING DIAGRAM




## INSPECTION PROCEDURE

AT

HINT:

According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.

**NOTICE:**

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

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (Controller Area Network Vehicle Interface Module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Select the items "DIAGNOSIS / ENHANCED OBD II / DATA LIST / A/T".
7. According to the display on the tester, read the "DATA LIST".

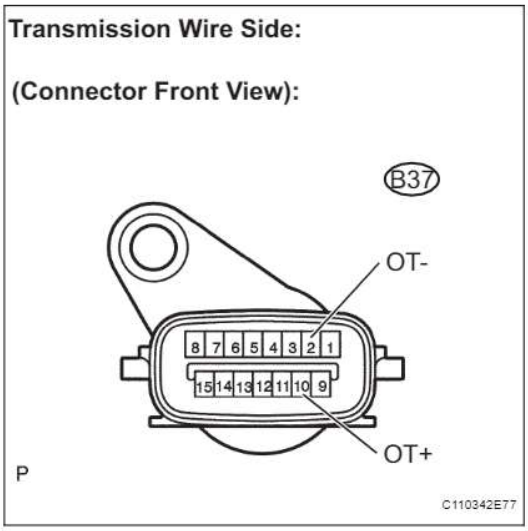
| Item | Measurement Item/ Range (display) | Normal Condition |
|---|---|---|
| AT OIL TEMP1 | No. 1 ATF Temperature Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F) | • After Stall Test: Approximately 80°C (176°F)<br>• Equal to ambient temperature during cold soak |

HINT:
When DTC P0712 is output and intelligent tester reading is 150°C (302°F) or more, there is a short circuit.
When DTC P0713 is output and intelligent tester reading 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 |

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

**1 INSPECT TRANSMISSION WIRE (ATF TEMPERATURE SENSOR)**




(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| 2 (OT-) - 10 (OT+) | 79 Ω to 156 kΩ |

(c) Measure the resistance.
**Standard resistance (Check for short)**

| Tester Connection | Specified Condition |
|---|---|
| 2 (OT-) - Body ground | 10 kΩ or higher |
| 10 (OT+) - Body ground | 10 kΩ or higher |

HINT:
If the resistance is outside the specified range at either of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

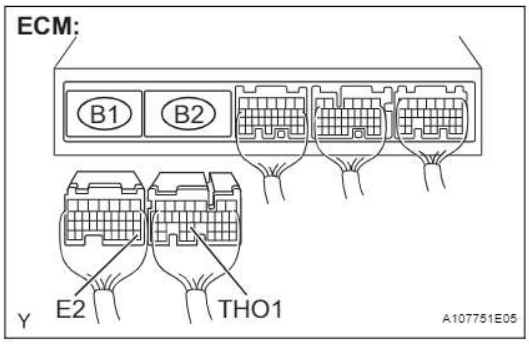
| ATF Temperature | Specified Condition |
|---|---|
| 20°C (68°F) | 3 to 5 kΩ |
| 110°C (230°F) | 0.22 to 0.28 kΩ |

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

AT

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




(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connectors.
(c) Measure the resistance.
**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| B2-24 (THO1) - B1-28 (E2) | 79 Ω to 156 kΩ |

(d) Measure the resistance.
**Standard resistance (Check for short)**

| Tester Connection | Specified Condition |
|---|---|
| B2-24 (THO1) - Body ground | 10 kΩ or higher |
| B1-28 (E2) - Body ground | 10 kΩ or higher |

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM

AT

| DTC | P0711 | Transmission Fluid Temperature Sensor "A" Performance |
|---|---|---|

## DESCRIPTION

Refer to DTC P0710 (See page AT-51).

| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| P0711 | Either of the following Condition (A) or (B) is met:<br>Condition (A):<br>All of (a), (b) and (c) are detected (2-trip detection logic):<br>(a) Intake air and engine coolant temperatures are more than -10°C (14°F) at engine start.<br>(b) After normal driving for over 6 minutes and 5.6 miles (9 km) or more, ATF temperature is less than 20°C (68°F).<br>(c) 22 minutes or more have elapsed after engine start.<br>Condition (B):<br>Both (a) and (b) are detected (2-trip detection logic)<br>(a) Engine coolant temperature is less than 35°C (95°F) at engine start.<br>(b) ATF temperature is 110°C (230°F) or more when engine coolant temperature reaches 60°C (140°F). | • Transmission wire (No. 1 ATF temperature sensor)<br>• ECM |

## MONITOR DESCRIPTION

This DTC indicates that there is a problem with the output from the ATF (Automatic Transmission Fluid) 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 any open or short malfunctions in the ATF temperature circuit or a fault of 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.

When the ATF temperature is 110°C (230°F) or more and engine coolant temperature reaches 60°C (140°F) after cold start, the ECM also determines this as a fault, turns on the MIL, and stores the DTC.

AT

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P0711: ATF temperature sensor/Rationality check |
| Required sensors/Components | ATF temperature sensor |
| Frequency of operation | Continuous |
| Duration | Condition (A): 3 seconds<br>Condition (B): 10 seconds |
| MIL operation | 2 driving cycles |
| Sequence of operation | None |

## TYPICAL ENABLING CONDITIONS

The following conditions are common to Condition (A) and (B).

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | None |
| ATF temperature sensor "A" circuit | No circuit malfunction |
| ECT (Engine Coolant Temperature) sensor circuit | No circuit malfunction |
| IAT (Intake Air Temperature) sensor circuit | No circuit malfunction |

### Condition (A)

| | |
|---|---|
| Time after engine start | 21 minutes and 40 seconds or more |

| | |
|---|---|
| Driving distance after engine start | 5.6 miles (9 km) or more |
| Accumulated driving time | 5 minutes and 30 seconds or more |
| ECT | -15°C (5°F) or more |
| IAT (12 seconds after engine start) | -10°C (14°F) or more |
| ECT (12 seconds after engine start) | -10°C (14°F) or more |

**Condition (B)**

| | |
|---|---|
| ECT (Current temperature) | 60°C (140°F) or more |
| ECT (12 seconds after engine start) | Less than 35°C (95°F) |
| ATF temperature (12 seconds after engine start) | 110°C (230°F) or more |

## TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met: Condition (A) or (B)

**Condition (A)**

| | |
|---|---|
| ATF temperature | Less than 20°C (68°F)<br>(Conditions vary with ATF temperature at engine start) |

**Condition (B)**

| | |
|---|---|
| ATF temperature | 110°C (230°F) or more |

## WIRING DIAGRAM

Refer to DTC P0710 (See page AT-53).

## INSPECTION PROCEDURE

HINT:

According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.

**NOTICE:**

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

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (Controller Area Network Vehicle Interface Module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Select the items "DIAGNOSIS / ENHANCED OBD II / DATA LIST / A/T".
7. According to the display on the tester, read the "DATA LIST".

| Item | Measurement Item/ Range (display) | Normal Condition |
|---|---|---|
| AT OIL TEMP1 | No. 1 ATF Temperature Sensor Value/<br>min.: -40°C (-40°F)<br>max.: 215°C (419°F) | • After Stall Test:<br>Approximately 80°C (176°F)<br>• Equal to ambient temperature during cold soak |

HINT:

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

When DTC P0713 is output and intelligent tester reading 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 |

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

| 1 | CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P0711) |
|---|---|

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

**Result:**

| Display (DTC Output) | Proceed to |
|---|---|
| Only "P0711" is output | A |
| "P0711" and other DTCs | B |

HINT:
If any codes besides "P0711" are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART

A

| 2 | CHECK TRANSMISSION FLUID LEVEL |
|---|---|

**OK:**
**Automatic transmission fluid level is correct.**

NG → ADD FLUID

AT

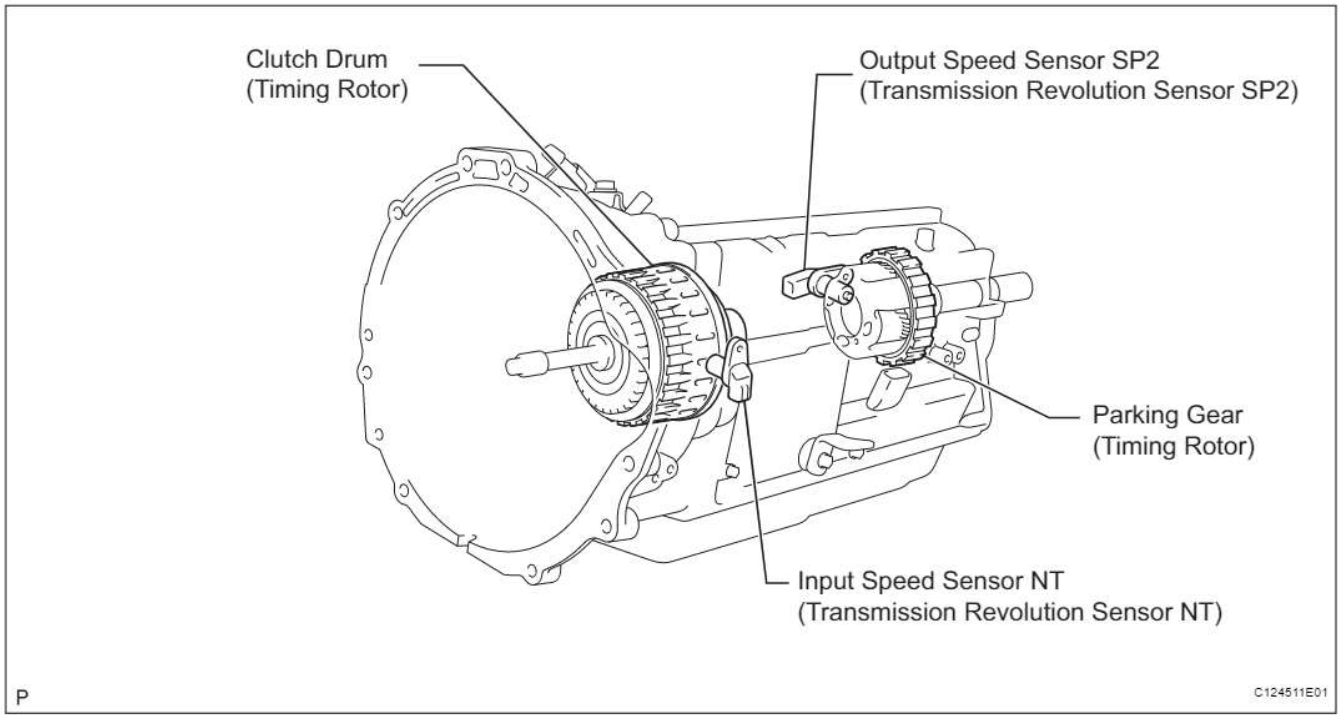
OK

REPLACE TRANSMISSION WIRE (ATF TEMPERATURE SENSOR)

| DTC | P0717 | Input Speed Sensor Circuit No Signal |
|---|---|---|

## DESCRIPTION

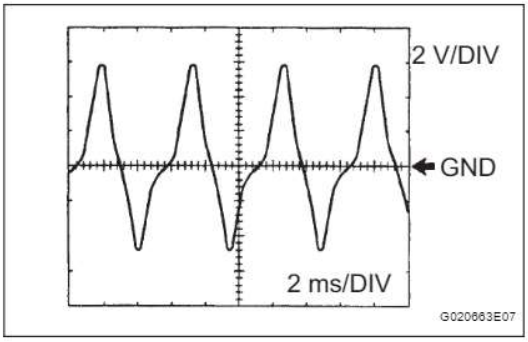
This sensor detects the rotation speed of the turbine which shows the input revolution of the transmission. By comparing the input turbine speed signal (NT) with the counter gear speed sensor signal (SP2), the ECM detects the shift timing of the gears and appropriately controls the engine torque and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




| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| P0717 | All conditions below are detected for 5 seconds or more. (1-trip detection logic)<br>(a) Gear change is not being performed.<br>(b) Gear position: 4th or 5th<br>(c) T/M input shaft rpm: 300 rpm or less<br>(d) T/M output shaft rpm: 1,000 rpm or more<br>(e) Park/neutral position switch (NSW, R and L) is OFF<br>(f) Shift solenoid valves, park/neutral position switch and vehicle speed sensor are in normal operation. | • Open or short in speed sensor (NT) circuit<br>• Speed sensor (NT)<br>• ECM |

AT

Reference (Using an oscilloscope):




Check the waveform between terminals NT+ and NT- of the ECM connector.

**Standard:**

**Refer to the illustration.**

| Item | Condition |
|---|---|
| Terminal | NT+ - NT- |
| Tool setting | 2 V/DIV, 2 ms/DIV |
| Vehicle condition | Engine idling speed (P or N position) |

## MONITOR DESCRIPTION

This DTC indicates that a pulse is not output from the speed sensor NT (Turbine (input) speed sensor) or is weak. The NT terminal of the ECM detects the revolution signal from the speed sensor (NT) (input RPM). The ECM outputs a gearshift 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 in the shift position of D, if the input shaft revolution is less than 300 rpm*1 although the output shaft revolution is more than 1,000 rpm or more*2, the ECM detects the trouble, illuminates the MIL and stores the DTC.
*1: Pulse is not output or is irregularly output.
*2: The vehicle speed is approximately 31 mph (50 km/h) or more.

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P0717: Speed sensor (NT)/Verify pulse input |
| Required sensors/Components (Main) | Speed sensor (NT) |
| Required sensors/Components (Related) | Speed sensor (SP2) |
| Frequency of operation | Continuous |
| Duration | 5 seconds |
| MIL operation | Immediate |
| Sequence of operation | None |

## TYPICAL ENABLING CONDITIONS

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | P0500: VSS<br>P0748 - P0799: Trans solenoid (range) |
| Shift change | Each shift change is completed before starting next shift change operation |
| ECM selected gear | 4th or 5th |
| Output shaft rpm | 1,000 rpm or more |
| Park/neutral position switch | OFF |
| R switch | OFF |
| L switch | OFF |
| Engine | Running |
| Ignition Switch | ON |
| Starter | OFF |

AT

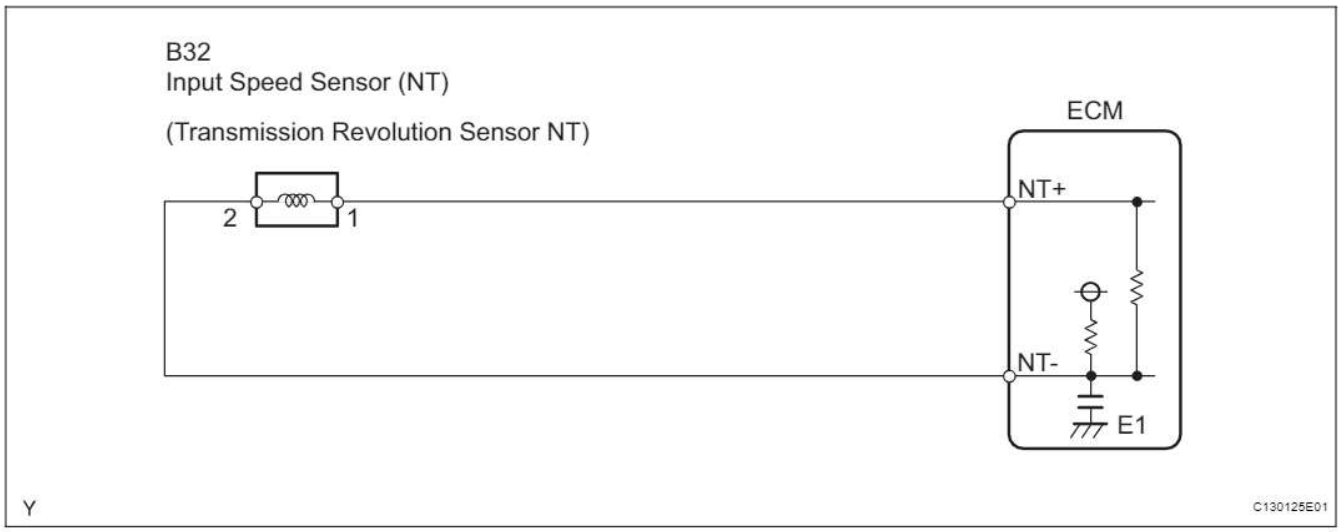
## TYPICAL MALFUNCTION THRESHOLDS

| | |
|---|---|
| Sensor signal rpm | Less than 300 rpm |

## COMPONENT OPERATING RANGE

| | |
|---|---|
| Speed sensor (NT) | Input speed is equal to engine speed when lock-up ON |

## WIRING DIAGRAM




## INSPECTION PROCEDURE

HINT:
According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (Controller Area Network Vehicle Interface Module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Select the items "DIAGNOSIS / ENHANCED OBD II / DATA LIST / A/T".
7. According to the display on the tester, read the "DATA LIST".

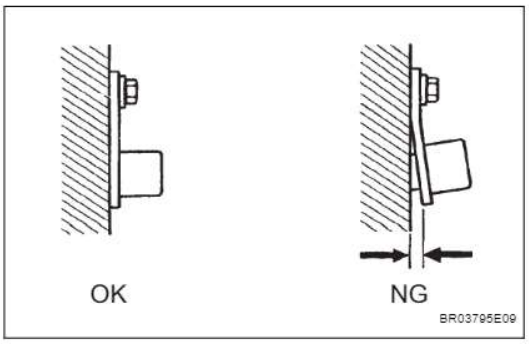
| Item | Measurement Item/ Range (display) | Normal Condition |
|---|---|---|
| SPD (NT) | Input Turbine Speed/ display: 50 rpm | [HINT]<br>• Lock-up ON (After warming up the engine); Input turbine speed (NT) equal to the engine speed.<br>• Lock-up OFF (Idling at N position); Input turbine speed (NT) nearly equal to the engine speed. |

AT

HINT:

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

## 1 INSPECT SPEED SENSOR (NT) INSTALLATION

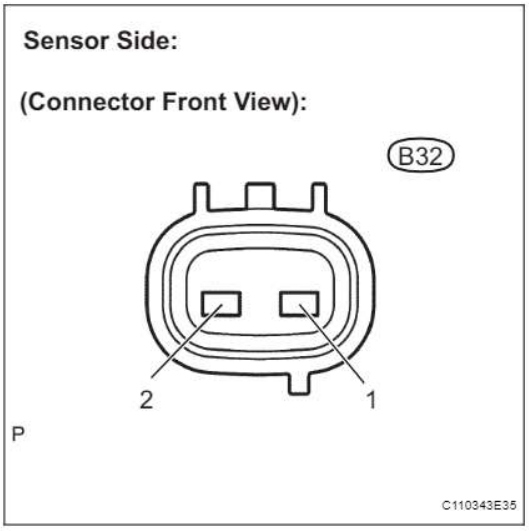



(a) Check the speed sensor (NT) installation.
**OK:**
**The installation bolt is tightened properly and there is no clearance between the sensor and transmission case.**

NG → **SECURELY INSTALL OR REPLACE SPEED SENSOR (NT)**

OK

## 2 INSPECT SPEED SENSOR (NT)



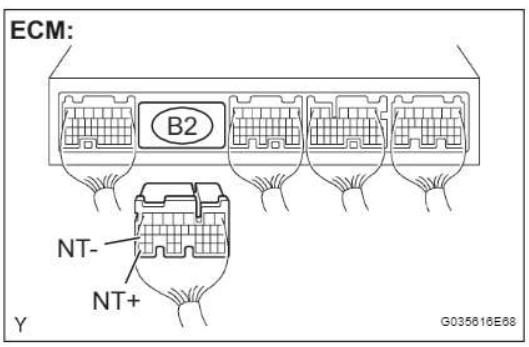

(a) Disconnect the speed sensor (NT) connector from the transmission.
(b) Measure the resistance.
**Standard resistance**

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

NG → **REPLACE SPEED SENSOR (NT)**

OK

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




(a) Connect the speed sensor (NT) connector.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| B2-35 (NT+) - B2-27 (NT-) | 560 to 680 Ω at 20°C (68°F) |

(d) Measure the resistance.
**Standard resistance (Check for short)**

| Tester Connection | Specified Condition |
|---|---|
| B2-35 (NT+) - Body ground | 10 kΩ or higher |
| B2-27 (NT-) - Body ground | 10 kΩ or higher |

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

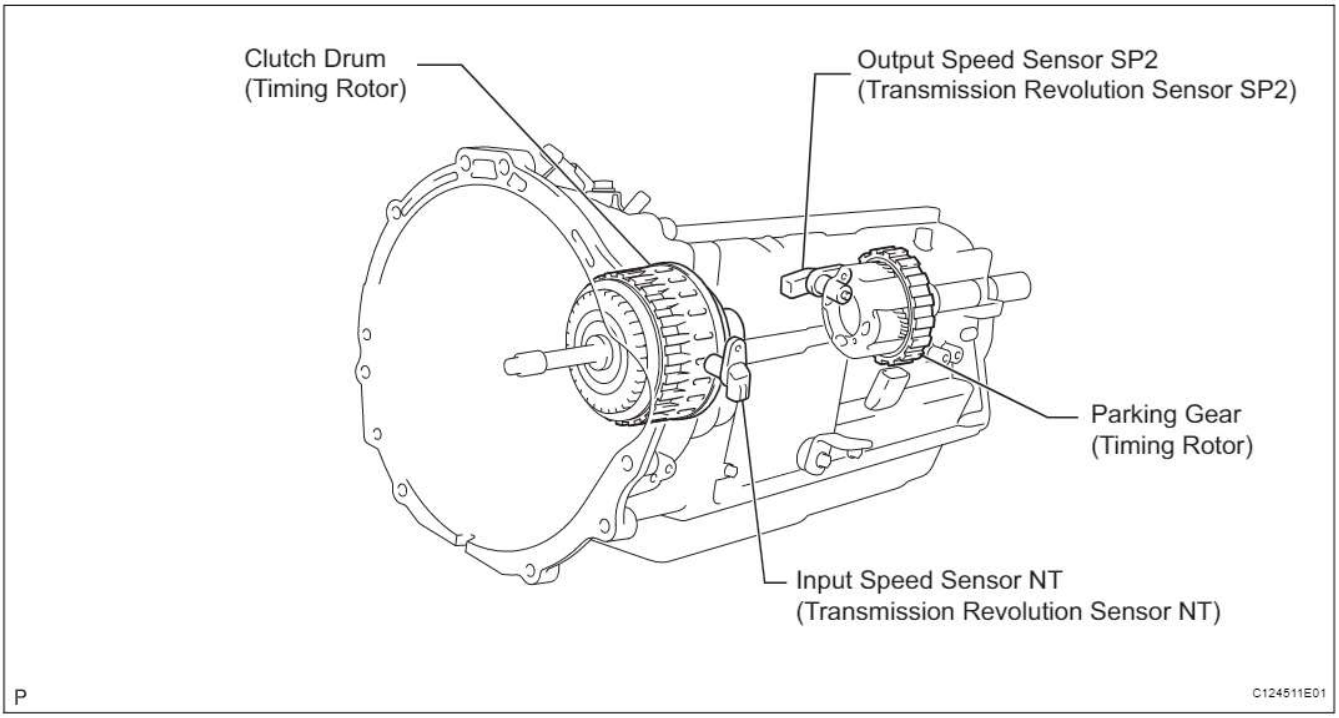
OK

REPLACE ECM

| DTC | P0722 | Output Speed Sensor Circuit No Signal |
|---|---|---|

## DESCRIPTION

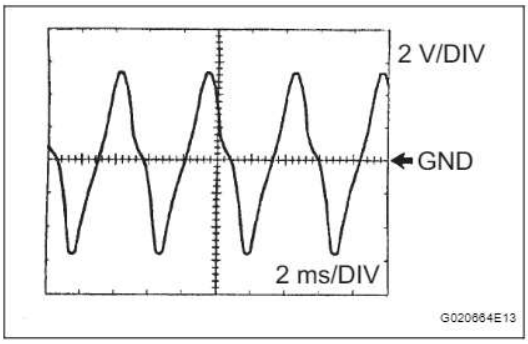
The speed sensor SP2 detects the rotation speed of the transmission output shaft and sends signals to the ECM. The ECM determines the vehicle speed based on these signals. An AC voltage is generated in the speed sensor SP2 coil as the parking gear mounted on the rear planetary gear assembly rotates, 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 the vehicle speed sensor and the throttle position sensor.




AT

| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| P0722 | All conditions below are detected 500 times or more continuously. (1-trip detection logic)<br>(a) No signal from speed sensor (SP2) is input to ECM while 4 pulses of No. 1 vehicle speed sensor signal are sent.<br>(b) Vehicle speed is 5.6 mph (9 km/h) or more for at least 4 seconds.<br>(c) Park/neutral position switch is OFF. | • Open or short in speed sensor (SP2) circuit<br>• Speed sensor (SP2)<br>• ECM |

Reference (Using an oscilloscope):




Check the waveform between terminals SP2+ and SP2- of the ECM connector.

**Standard:**

**Refer to the illustration.**

| Item | Condition |
|---|---|
| Terminal | SP2+ - SP2- |
| Tool setting | 2 V/DIV, 2 ms/DIV |
| Vehicle condition | Vehicle speed 12 mph (20 km/h) |

## MONITOR DESCRIPTION

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

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P0722: Speed sensor SP2/Verify pulse input |
| Required sensors/Components | Speed sensor SP2 |
| Frequency of operation | Continuous |
| Duration | 500 output shaft revolutions |
| MIL operation | Immediate |
| Sequence of operation | None |

## TYPICAL ENABLING CONDITIONS

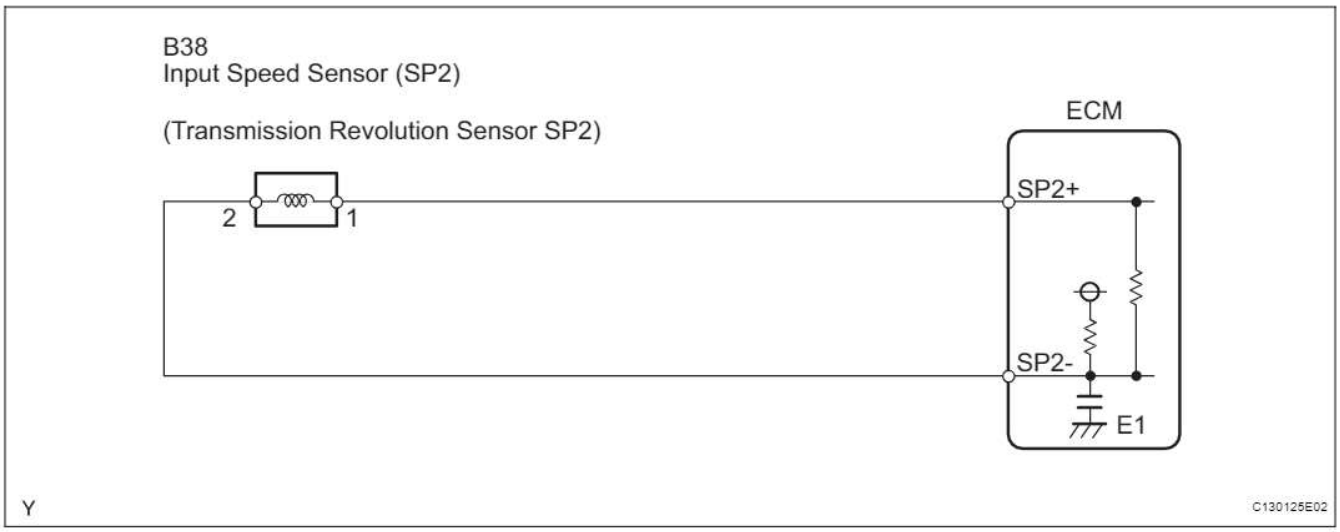
| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | P0500: VSS<br>P0748 - P0799: Trans solenoid (range) |
| Vehicle speed sensor pulse input | 4 times |
| Vehicle speed range (4 seconds or more) | 5.6 mph (9 km/h) or more |
| Park/neutral position switch | OFF |
| Battery voltage | 8 V or more |
| Ignition switch | ON |
| Starter | OFF |

AT

## TYPICAL MALFUNCTION THRESHOLDS

| | |
|---|---|
| Output speed sensor pulse input | No input |

## WIRING DIAGRAM




## INSPECTION PROCEDURE

HINT:
According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.

**NOTICE:**
**In the table below, the values listed under "Normal Condition" are for reference only. Do not depend solely on these reference values when judging whether a part is faulty or not.**

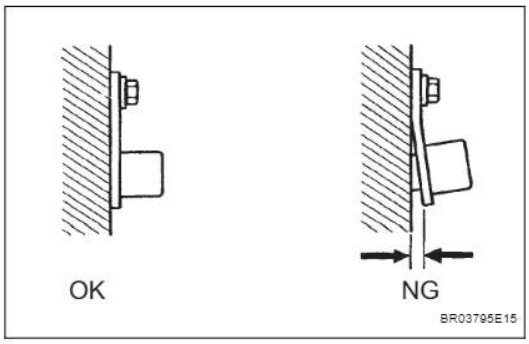
1. Connect the intelligent tester together with the CAN VIM (Controller Area Network Vehicle Interface Module) to the DLC3.
2. Turn the ignition switch to the ON position.
3. Push the "ON" button of the tester.
4. Select the items "DIAGNOSIS / ENHANCED OBD II / DATA LIST / A/T".
5. According to the display on the tester, read the "DATA LIST".

AT

| Item | Measurement Item/ Range (display) | Normal Condition |
|---|---|---|
| SPD (SP2) | Counter Gear Speed display/ min.: 0 mph (0 km/h) max.: 158 mph (255 km/h) | Vehicle stopped: 0 mph (0 km/h) [HINT] 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

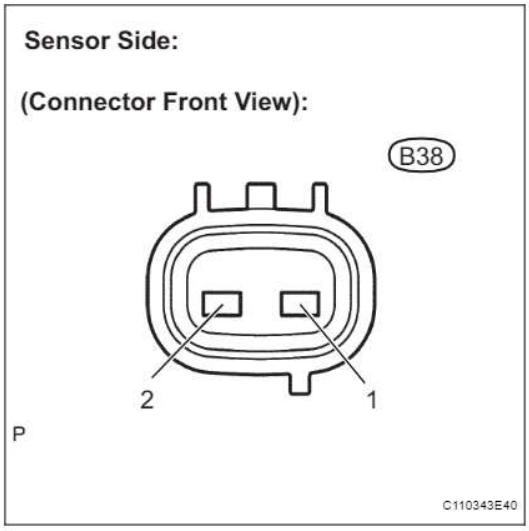



(a) Check the speed sensor (SP2) installation.
**OK:**
**The installation bolt is tightened properly and there is no clearance between the sensor and transmission case.**

NG → **SECURELY INSTALL OR REPLACE SPEED SENSOR (SP2)**

OK

## 2 INSPECT SPEED SENSOR (SP2)



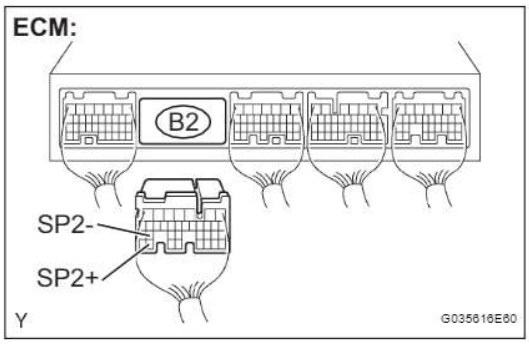

(a) Disconnect the speed sensor (SP2) connector from the transmission.
(b) Measure the resistance.
**Standard resistance**

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

NG → **REPLACE SPEED SENSOR (SP2)**

OK

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




(a) Connect the speed sensor connector.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| B2-34 (SP2+) - B2-26 (SP2-) | 560 to 680 Ω at 20°C (68°F) |

(d) Measure the resistance.
**Standard resistance (Check for short)**

| Tester Connection | Specified Condition |
|---|---|
| B2-34 (SP2+) - Body ground | 10 kΩ or higher |
| B2-26 (SP2-) - Body ground | 10 kΩ or higher |

AT

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM

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

## DESCRIPTION

Shifting from 1st to 5th is performed in combination with the ON and OFF operations of the shift solenoid valves S1, S2, SR, SL1 and SL2 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 driven smoothly (See page AT-34).

| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| P0748 | The ECM checks for an open or short in the shift solenoid valve SL1 circuit. (1-trip detection logic)<br>• Output signal duty equals to 100 %. (NOTE: SL1 output signal duty is less than 100 % under normal condition.) | • Open or short in shift solenoid valve SL1 circuit<br>• Shift solenoid valve SL1<br>• ECM |

## MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL1 circuit. The ECM controls the gearshift 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. And the ECM performs the fail-safe function and turns the other functioning shift solenoid valves "ON/OFF". (If an open or short circuit is detected, the ECM cuts the current to the circuit.)
If the ECM detects an open or short in the shift solenoid valve SL1 circuit, the ECM determines that there is a malfunction (See page AT-34).

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P0748 : Shift solenoid valve SL1/Range check |
| Required sensors/Components | Shift solenoid valve SL1 |
| Frequency of operation | Continuous |
| Duration | 1 second |
| MIL operation | Immediate |
| Sequence of operation | None |

AT

## TYPICAL ENABLING CONDITIONS

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | None |
| Battery voltage | 10 V or more |
| CPU commanded duty | Less than 75 % |
| Ignition switch | ON |
| Starter | OFF |

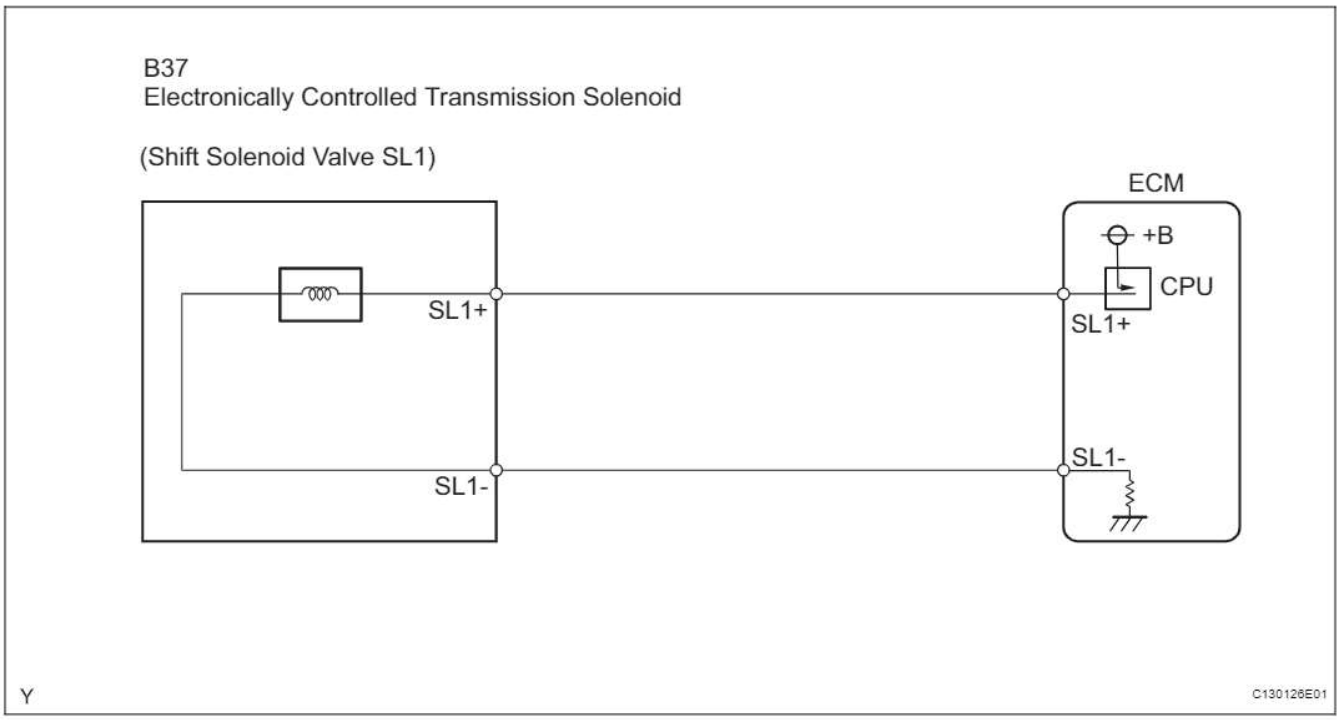
## TYPICAL MALFUNCTION THRESHOLDS

| | |
|---|---|
| Output signal duty | 100 % |

## COMPONENT OPERATING RANGE

| | |
|---|---|
| Output signal duty | Less than 100 % |

## WIRING DIAGRAM




## INSPECTION PROCEDURE

HINT:

The shift solenoid valve SL1 is turned on/off normally when the shift lever is in the D position:

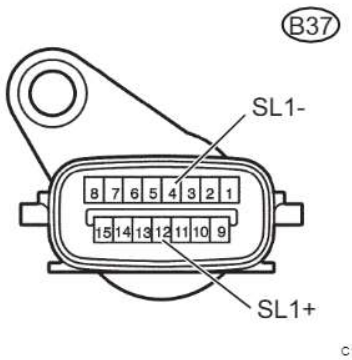
| Gearshift controlled by ECM | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|
| Shift solenoid valve SL1 | OFF | OFF | OFF | OFF | ON |

AT

**1 INSPECT TRANSMISSION WIRE (SL1)**

**Transmission Wire Side:**

**(Connector Front View):**




(a) Disconnect the transmission wire connector from the transmission.

(b) Measure the resistance.

**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| 12 (SL1+) - 4 (SL1-) | 5.0 to 5.6 Ωat 20°C (68°F) |

(c) Measure the resistance.

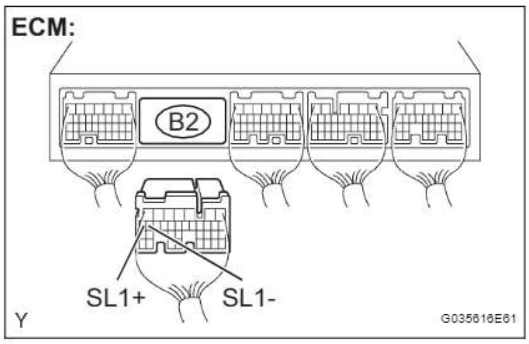
**Standard resistance (Check for short)**

| Tester Connection | Specified Condition |
|---|---|
| 12 (SL1+) - Body ground | 10 kΩ or higher |
| 4 (SL1-) - Body ground | 10 kΩ or higher |

NG → Go to step 3

OK

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




(a) Connect the transmission connector to the transmission.
(b) Disconnect the connector from the ECM.
(c) Measure the resistance.
**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| B2-19 (SL1+) - B2-18 (SL1-) | 5.0 to 5.6 Ω at 20°C (68°F) |

(d) Measure the resistance.
**Standard resistance (Check for short)**

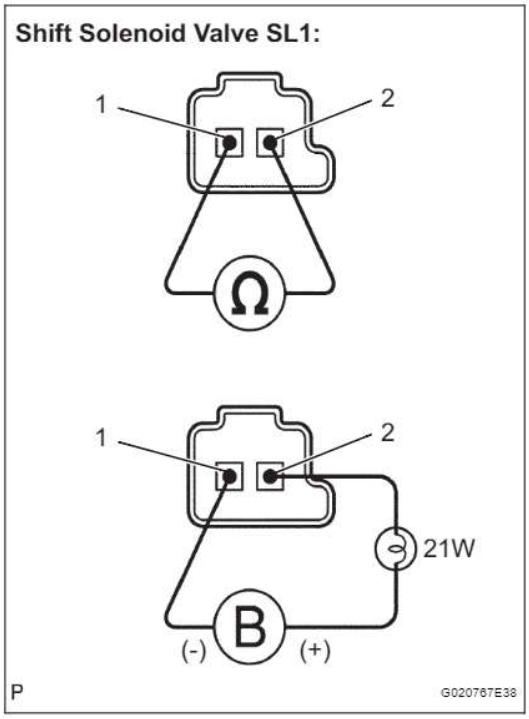
| Tester Connection | Specified Condition |
|---|---|
| B2-19 (SL1+) - Body ground | 10 kΩ or higher |
| B2-18 (SL1-) - Body ground | 10 kΩ or higher |

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM

## 3 INSPECT SHIFT SOLENOID VALVE SL1




(a) Remove the shift solenoid valve SL1.
(b) Measure the resistance.
**Standard resistance**

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

(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.
**OK:**
**The solenoid makes operating sounds.**

NG → REPLACE SHIFT SOLENOID VALVE SL1

OK

REPAIR OR REPLACE TRANSMISSION WIRE

AT

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

## 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 of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| P0751 | S1 stuck ON malfunction*1:<br>The ECM determines that there is a malfunction when the following conditions are met (2-trip detection logic):<br>(a) When the ECM directs the gearshift to switch to 4th gear, the actual gear is shifted to 1st.<br>(b) When the ECM directs the gearshift to switch to 1st gear, the actual gear is also shifted to 1st. | • Shift solenoid valve S1 remains open<br>• Shift solenoid valve SLT remains open or closed<br>• Valve body is blocked<br>• Automatic transmission (clutch, brake or gear, etc.) |
| | S1 stuck OFF malfunction*2:<br>The ECM determines that there is a malfunction when the following conditions are met (2-trip detection logic):<br>(a) When the ECM directs the gearshift to switch to 1st gear, the actual gear is shifted to 4th.<br>(b) When the ECM directs the gearshift to switch to 5th gear, the actual gear is also shifted to 5th. | • Shift solenoid valve S1 remains closed<br>• Shift solenoid valve SLT remains open or closed<br>• Valve body is blocked<br>• Automatic transmission (clutch, brake or gear, etc.) |

HINT:
Gear positions in the event of a solenoid valve mechanical problem:

| Gearshift controlled by ECM | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|
| *1: Actual gear position under S1 stuck ON malfunction | 1st | 2nd | 2nd | 1st | N* |
| *2: Actual gear position under S1 stuck OFF malfunction | 4th | 3rd | 3rd | 4th | 5th |

N*: Neutral

AT

## MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve S1. The ECM controls the gearshifts by turning the shift solenoid valves "ON/OFF". When the gear position directed by the ECM and the actual gear position do not match, the ECM illuminates the MIL and stores the DTC.

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P0751:<br>Shift solenoid valve S1/OFF malfunction<br>Shift solenoid valve S1/ON malfunction |
| Required sensors/Components (Main) | Shift solenoid valve S1 |
| Required sensors/Components (Related) | Vehicle speed sensor, Throttle position sensor, Speed sensor (NT), Speed sensor (SP2) |
| Frequency of operation | Continuous |
| Duration | OFF malfunctions (A) and (B):<br>0.4 seconds<br>OFF malfunction (C):<br>Immediate<br>ON malfunctions (A), (B) and (C):<br>0.4 seconds<br>ON malfunction (D):<br>3 seconds<br>ON malfunction (E):<br>0.5 seconds |
| MIL operation | 2 driving cycles |

| | |
|---|---|
| Sequence of operation | None |

## TYPICAL ENABLING CONDITIONS

The following conditions are common to all OFF malfunctions (A), (B) and (C) and ON malfunctions (A), (B), (C), (D) and (E).

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | P0115 - P0118: ECT sensor<br>P0125: Insufficient ECT for Closed Loop<br>P0500: VSS<br>P0748 - P0799: Trans solenoid (range) |
| Turbine speed sensor (NT) circuit | No circuit malfunction |
| Output speed sensor (SP2) circuit | No circuit malfunction |
| Shift solenoid "A" (S1) circuit | No circuit malfunction |
| Shift solenoid "B" (S2) circuit | No circuit malfunction |
| Shift solenoid "E" (SR) circuit | No circuit malfunction |
| Pressure control solenoid "A" (SL1) circuit | No circuit malfunction |
| Pressure control solenoid "B" (SL2) circuit | No circuit malfunction |
| ECT (Engine Coolant Temperature) sensor circuit | No circuit malfunction |
| Knock sensor circuit | No circuit malfunction |
| ETCS (Electronic Throttle Control System) | System not down |
| Transmission shift position | "D" |
| ECT | 40°C (104°F) or more |
| Spark advance from max. retard timing by knock sensor control | 0° CA or more |
| Engine | Starting |

### OFF malfunction (A)

| | |
|---|---|
| ECM selected gear | 1st |
| Vehicle speed | 1.2 to 24.9 mph (2 to 40 km/h) |
| Throttle valve opening angle | 8 % or more<br>and<br>6.5 % or more at engine speed of 2,000 rpm<br>(Conditions vary with engine speed) |

### OFF malfunction (B)

| | |
|---|---|
| Current ECM selected gear | 5th |
| Last ECM selected gear | 4th |
| Continuous time of ECM selecting 4th gear | 2 seconds or more |
| Actual gear when ECM selected 4th gear | 4th |

### OFF malfunction (C)

| | |
|---|---|
| Current ECM selected gear | 5th |
| Last ECM selected gear | 4th |

### ON malfunction (A)

| | |
|---|---|
| ECM selected gear | 1st |
| Vehicle speed | 1.2 to 24.9 mph (2 to 40 km/h) |
| Throttle valve opening angle | 6.5 % or more at engine speed of 2,000 rpm<br>(Conditions vary with engine speed) |

### ON malfunction (B)

| | |
|---|---|
| ECM selected gear | 4th |
| Vehicle speed | 1.2 mph (2 km/h) or more |
| Throttle valve opening angle | 6.5 % or more at engine speed of 2,000 rpm<br>(Conditions vary with engine speed) |

AT

**ON malfunction (C)**

| | |
|---|---|
| ECM selected gear | 3rd |
| Vehicle speed | 1.2 mph (2 km/h) or more |
| Throttle valve opening angle | 6.5 % or more at engine speed of 2,000 rpm<br>(Conditions vary with engine speed) |

**ON malfunction (D)**

| | |
|---|---|
| Current ECM selected gear | 5th |
| Last ECM selected gear | 4th |
| Vehicle speed<br>(During transition from 4th to 5th gear) | Less than 62.2 mph (100 km/h) |

**ON malfunction (E)**

| | |
|---|---|
| ECM selected gear | 5th |
| Engine speed - Turbine speed (NE - NT)<br>(After transition from 4th to 5th gear) | 150 rpm or less |
| Vehicle speed<br>(After transition from 4th to 5th gear) | Less than 62.2 mph (100 km/h) |

## TYPICAL MALFUNCTION THRESHOLDS

[OFF malfunction]
All of the following conditions are met: OFF malfunctions (A), (B) and (C)
2 detections are necessary in 1 driving cycle.
1st detection; temporary flag ON
2nd detection; pending fault code ON

**OFF malfunction (A)**

| | |
|---|---|
| Turbine speed/Output speed | 0.93 to 1.07<br>(Actual gear is 4th) |

**OFF malfunction (B)**

| | |
|---|---|
| Turbine speed/Output speed | 0.65 to 0.79<br>(Actual gear is 5th) |

AT

**OFF malfunction (C)**

| | |
|---|---|
| Output record from ECM for 4th → 5th upshifting | Recorded |

[ON malfunction]
Either of the following conditions is met:
- ON malfunctions (A) and (B)
- ON malfunction (B) or (C) and ON malfunction (D) or (E)

**ON malfunction (A)**

| | |
|---|---|
| Turbine speed/Output speed | 3.30 to 7.50<br>(Actual gear is 1st) |

**ON malfunction (B)**

| | |
|---|---|
| Turbine speed/Output speed | 3.30 to 7.50<br>(Actual gear is 1st) |

**ON malfunction (C)**

| | |
|---|---|
| Turbine speed/Output speed | 1.91 to 2.35<br>(Actual gear is 2nd) |

**ON malfunction (D)**

| | |
|---|---|
| Turbine speed - Output speed x 4th gear ratio | 1,000 rpm or more |

**ON malfunction (E)**

| | |
|---|---|
| Turbine speed - Output speed x 5th gear ratio | 1,000 rpm or more |

## INSPECTION PROCEDURE

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (Controller Area Network Vehicle Interface Module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / SHIFT".
8. According to the display on the tester, perform the "ACTIVE TEST".

HINT:
While driving, the shift position can be changed with the intelligent tester.
Comparing the shift position directed by the ACTIVE TEST with the actual shift position enables the problem to be confirmed (See page AT-34).

| Item | Test Details | Diagnostic Note |
|---|---|---|
| SHIFT | [Test Details]<br>Operate the shift solenoid valve and set each shift position manually.<br>[Vehicle Condition]<br>Vehicle Speed: Less than 30 mph (50 km/h)<br>[Others]<br>• Press → button: Shift up<br>• Press ← button: Shift down | Possible to check the operation of the shift solenoid valves.<br>HINT:<br>Shifting to the 5th gear is possible only when the vehicle is stationary with the engine idling. |

HINT:

- This test can be conducted when the vehicle speed is 30 mph (50 km/h) or less.
- The 4th to 5th up-shifting must be performed with the accelerator pedal released.
- The 5th to 4th down-shifting 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 directed by the ECM is shown in the DATA LIST / SHIFT display on the intelligent tester.
- The shift solenoid valve S1 is turned on/off normally when the shift lever is in the D position:

| Gearshift controlled by ECM | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|
| Shift solenoid valve S1 | ON | ON | OFF | OFF | OFF |

AT

| 1 | CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P0751) |
|---|---|

(a) Connect the the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

**Result:**

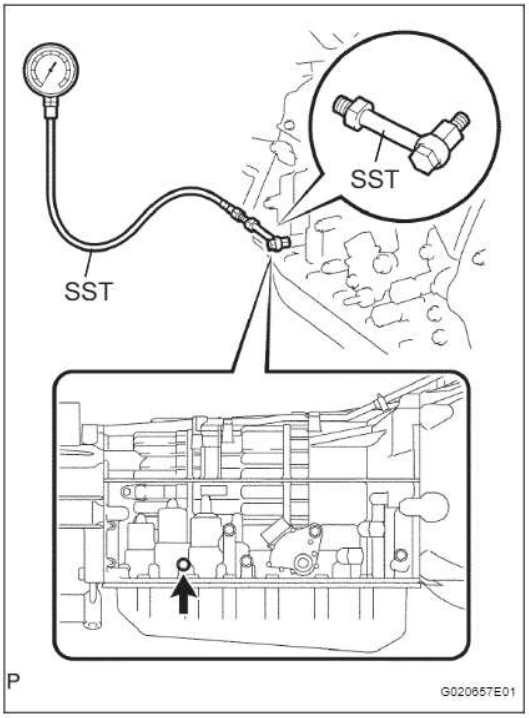
| Display (DTC Output) | Proceed to |
|---|---|
| Only "P0751" is output | A |
| "P0751" and other DTCs | B |

HINT:
If any codes besides "P0751" are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART

A

## 2 PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SOLENOID (SLT))




**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's hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C OFF.**

HINT:
Performing the intelligent tester's ACTIVE TEST allows relay, VSV, actuator and other items to be operated without removing any parts. Performing the ACTIVE TEST early in troubleshooting is one way to save time.
The DATA LIST can be displayed during the ACTIVE TEST.

(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: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
(g) Follow the instructions on the tester and perform the ACTIVE TEST.
(h) Measure the line pressure with SST.

AT

| Item | Test Details | Diagnostic Note |
|---|---|---|
| SOLENOID (SLT)* | [Test Details]<br>Operate shift solenoid SLT and raise line pressure.<br>[Vehicle Condition]<br>• Vehicle stopped<br>• IDL: ON<br>HINT:<br>OFF: Line pressure up (when Active Test of "SOLENOID (SLT)" is performed, ECM commands SLT solenoid to turn off)<br>ON: No action (normal operation) | - |

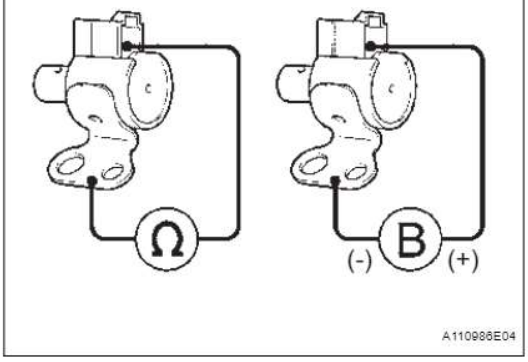
*: "SOLENOID (SLT)" in the ACTIVE TEST is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the HYDRAULIC TEST (See page AT-18) as well. Please note that the pressure values in the ACTIVE TEST and HYDRAULIC TEST are different.

NG → REPLACE SHIFT SOLENOID VALVE SLT

OK

| 3 | INSPECT SHIFT SOLENOID VALVE S1 |
|---|---|

Shift Solenoid Valve S1:




(a) Remove the shift solenoid valve S1.
(b) Measure the resistance.
**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| Solenoid Connector (S1) - Solenoid Body (S1) | 11 to 15 Ω at 20°C (68°F) |

(c) Connect the positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.
**OK:**
**The solenoid makes operating sounds.**

NG → REPLACE SHIFT SOLENOID VALVE S1

OK

| 4 | INSPECT TRANSMISSION VALVE BODY ASSEMBLY (See chapter 2 in the problem symptoms table) |
|---|---|

**OK:**
**There are no foreign objects on any valves and they operate smoothly.**

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY

AT

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY

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

## 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 of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| P0756 | S2 stuck ON malfunction*1;<br>The ECM determines that there is a malfunction when the following conditions are met (2-trip detection logic):<br>(a) When the ECM directs the gearshift to switch to 1st gear, the actual gear is shifted to 2nd.<br>(b) When the ECM directs the gearshift to switch to 5th gear, the engine overruns (clutch slips). | • Shift solenoid valve S2 remains open<br>• Shift solenoid valve SLT remains open or closed<br>• Valve body is blocked<br>• Automatic transmission (clutch, brake or gear, etc.) |
| | S2 stuck OFF malfunction*2:<br>The ECM determines that there is a malfunction when the following conditions are met (2-trip detection logic):<br>(a) When the ECM directs the gearshift to switch to 1st gear, the actual gear is also shifted to 1st.<br>(b) When the ECM directs the gearshift to switch to 2nd gear, the actual gear is shifted to 1st.<br>(c) When the ECM directs the gearshift to switch to 5th gear, the actual gear is also shifted to 5th. | • Shift solenoid valve S2 remains closed<br>• Shift solenoid valve SLT remains open or closed<br>• Valve body is blocked<br>• Automatic transmission (clutch, brake or gear, etc.) |

HINT:
Gear positions in the event of a solenoid valve mechanical problem:

| Gearshift controlled by ECM | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|
| *1: Actual gear position under S2 stuck ON malfunction | 2nd | 2nd | 3rd | 3rd | N* |
| *2: Actual gear position under S2 stuck OFF malfunction | 1st | 1st | 4th | 4th | 5th |

N*: Neutral

AT

## MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve S2. The ECM controls the gearshifts by turning the shift solenoid valves "ON/OFF". When the gear position directed by the ECM and the actual gear position do not match, the ECM illuminates the MIL and stores the DTC.

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P0756:<br>Shift solenoid valve S2/OFF malfunction<br>Shift solenoid valve S2/ON malfunction |
| Required sensors/Components (Main) | Shift solenoid valve S2 |
| Required sensors/Components (Related) | Vehicle speed sensor, Throttle position sensor, Speed sensor (NT), Speed sensor (SP2) |
| Frequency of operation | Continuous |

| | |
|---|---|
| Duration | OFF malfunctions (A), (B) and (C):<br>0.4 seconds<br>OFF malfunction (D):<br>Immediate<br>ON malfunctions (A) and (B):<br>0.4 seconds<br>ON malfunction (C):<br>3 seconds<br>ON malfunction (D):<br>0.5 seconds |
| MIL operation | 2 driving cycles |
| Sequence of operation | None |

## TYPICAL ENABLING CONDITIONS

The following conditions are common to all OFF malfunctions (A), (B), (C) and (D) and ON malfunctions (A), (B), (C) and (D).

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | P0115 - P0118: ECT sensor<br>P0125: Insufficient ECT for Closed Loop<br>P0500: VSS<br>P0748 - P799: Trans solenoid (range) |
| Turbine speed sensor (NT) circuit | No circuit malfunction |
| Output speed sensor (SP2) circuit | No circuit malfunction |
| Shift solenoid "A" (S1) circuit | No circuit malfunction |
| Shift solenoid "B" (S2) circuit | No circuit malfunction |
| Shift solenoid "E" (SR) circuit | No circuit malfunction |
| Pressure control solenoid "A" (SL1) circuit | No circuit malfunction |
| Pressure control solenoid "B" (SL2) circuit | No circuit malfunction |
| ECT (Engine Coolant Temperature) sensor circuit | No circuit malfunction |
| Knock sensor circuit | No circuit malfunction |
| ETCS (Electronic Throttle Control System) | System not down |
| Transmission shift position | "D" |
| ECT | 40°C (104°F) or more |
| Spark advance from max. retard timing by knock sensor control | 0° CA or more |
| Engine | Starting |

AT

### OFF malfunction (A)

| | |
|---|---|
| ECM selected gear | 1st |
| Vehicle speed | 1.2 to 24.9 mph (2 to 40 km/h) |
| Throttle valve opening angle | 6.5 % or more at engine speed of 2,000 rpm<br>(Conditions vary with engine speed) |

### OFF malfunction (B)

| | |
|---|---|
| ECM selected gear | 2nd |
| Vehicle speed | 1.2 mph (2 km/h) or more |
| Output speed | 2nd → 1st down shift point or more |
| Throttle valve opening angle | 6.5 % or more at engine speed of 2,000 rpm<br>(Conditions vary with engine speed) |

### OFF malfunction (C)

| | |
|---|---|
| Current ECM selected gear | 5th |
| Last ECM selected gear | 4th |
| Continuous time of ECM selecting 4th gear | 2 seconds or more |
| Actual gear when ECM selected 4th gear | 4th |

### OFF malfunction (D)

| | |
|---|---|
| Current ECM selected gear | 5th |

| | |
|---|---|
| Last ECM selected gear | 4th |

**ON malfunction (A)**

| | |
|---|---|
| ECM selected gear | 1st |
| Vehicle speed | 1.2 to 24.9 mph (2 to 40 km/h) |
| Throttle valve opening angle | 6.5 % or more at engine speed of 2,000 rpm<br>(Conditions vary with engine speed) |

**ON malfunction (B)**

| | |
|---|---|
| ECM selected gear | 4th |
| Vehicle speed | 1.2 mph (2 km/h) or more |
| Throttle valve opening angle | 6.5 % or more at engine speed of 2,000 rpm<br>(Conditions vary with engine speed) |

**ON malfunction (C)**

| | |
|---|---|
| Current ECM selected gear | 5th |
| Last ECM selected gear | 4th |
| Vehicle speed<br>(During transition from 4th to 5th gear) | Less than 62.2 mph (100 km/h) |

**ON malfunction (D)**

| | |
|---|---|
| ECM selected gear | 5th |
| Engine speed - Turbine speed (NE - NT)<br>(After transition from 4th to 5th gear) | 150 rpm or less |
| Vehicle speed<br>(After transition from 4th to 5th gear) | Less than 62.2 mph (100 km/h) |

## TYPICAL MALFUNCTION THRESHOLDS

[OFF malfunction]
All of the following conditions are met: OFF malfunctions (A), (B), (C) and (D)
2 detections are necessary in 1 driving cycle.
1st detection; temporary flag ON
2nd detection; pending fault code ON

AT

**OFF malfunction (A)**

| | |
|---|---|
| Turbine speed/Output speed | 3.30 to 7.50<br>(Actual gear is 1st) |

**OFF malfunction (B)**

| | |
|---|---|
| Turbine speed/Output speed | 3.30 to 7.50<br>(Actual gear is 1st) |

**OFF malfunction (C)**

| | |
|---|---|
| Turbine speed/Output speed | 0.65 to 0.79<br>(Actual gear is 5th) |

**OFF malfunction (D)**

| | |
|---|---|
| Output record from ECM for 4th → 5th upshifting | Recorded |

[ON malfunction]
ON malfunction (A) or (B) and ON malfunction (C) or (D) are met:

**ON malfunction (A)**

| | |
|---|---|
| Turbine speed/Output speed | 1.91 to 2.35<br>(Actual gear is 2nd) |

**ON malfunction (B)**

| | |
|---|---|
| Turbine speed/Output speed | 1.28 to 1.53<br>(Actual gear is 3rd) |

**ON malfunction (C)**

| | |
|---|---|
| Turbine speed - Output speed x 4th gear ratio | 1,000 rpm or more |

**ON malfunction (D)**

| | |
|---|---|
| Turbine speed - Output speed x 5th gear ratio | 1,000 rpm or more |

## INSPECTION PROCEDURE

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (Controller Area Network Vehicle Interface Module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / SHIFT".
8. According to the display on the tester, perform the "ACTIVE TEST".

HINT:
While driving, the shift position can be changed with the intelligent tester.
Comparing the shift position directed by the ACTIVE TEST with the actual shift position enables the problem to be confirmed (See page AT-34).

| Item | Test Details | Diagnostic Note |
|---|---|---|
| SHIFT | [Test Details]<br>Operate the shift solenoid valve and set each shift position manually.<br>[Vehicle Condition]<br>Vehicle Speed: Less than 30 mph (50 km/h)<br>[Others]<br>• Press → button: Shift up<br>• Press ← button: Shift down | Possible to check the operation of the shift solenoid valves.<br>HINT:<br>Shifting to the 5th gear is possible only when the vehicle is stationary with the engine idling. |

AT

HINT:

- This test can be conducted when the vehicle speed is 30 mph (50 km/h) or less.
- The 4th to 5th up-shifting must be performed with the accelerator pedal released.
- The 5th to 4th down-shifting 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 directed by the ECM is shown in the DATA LIST / SHIFT display on the intelligent tester.
- The shift solenoid valve S2 is turned on/off normally when the shift lever is in the D position:

| Gearshift controlled by ECM | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|
| Shift solenoid valve S2 | OFF | ON | ON | OFF | OFF |

| 1 | CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P0756) |
|---|---|

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

(d) Read the DTCs using the intelligent tester.

**Result:**

| Display (DTC Output) | Proceed to |
|---|---|
| Only "P0756" is output | A |
| "P0756" and other DTCs | B |

HINT:
If any codes besides "P0756" are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART**

A

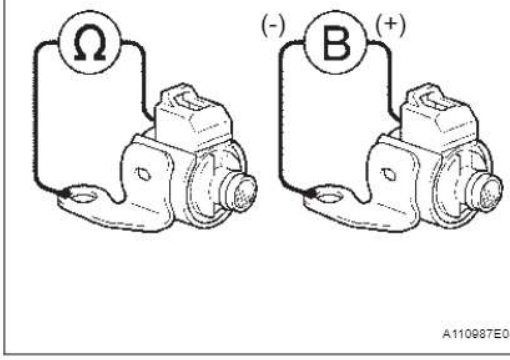
**2** **PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SOLENOID (SLT)) (See page AT-84)**

NG → **REPLACE SHIFT SOLENOID VALVE SLT**

OK

**3** **INSPECT SHIFT SOLENOID VALVE S2**

**Shift Solenoid Valve S2:**




(a) Remove the shift solenoid valve S2.
(b) Measure the resistance.
**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| Solenoid Connector (S2) - Solenoid Body (S2) | 11 to 15 Ωat 20°C (68°F) |

(c) Connect the positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.
**OK:**
**The solenoid makes operating sounds.**

NG → **REPLACE SHIFT SOLENOID VALVE S2**

OK

**4** **INSPECT TRANSMISSION VALVE BODY ASSEMBLY (See chapter 2 in the problem symptoms table)**

**OK:**
**There are no foreign objects on any valves and they operate smoothly.**

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY**

AT

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY

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

## 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 of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| P0771 | SR stuck ON malfunction*1:<br>The ECM determines that there is a malfunction when the following condition is met (2-trip detection logic):<br>(a) When the ECM directs the gearshift to switch to 2nd gear, the engine overruns (clutch slips). | • Shift solenoid valve SR remains open<br>• Shift solenoid valve SL1 remains open<br>• Shift solenoid valve SLT remains open or closed<br>• Valve body is blocked<br>• Automatic transmission (clutch, brake or gear, etc.) |
| | SR stuck OFF malfunction*2:<br>The ECM determines that there is a malfunction when the following condition is met (2-trip detection logic):<br>(a) When the ECM directs the gearshift to switch to 5th gear, the actual gear is shifted to 4th. | • Shift solenoid valve SR remains closed<br>• Shift solenoid valve SL1 remains closed<br>• Shift solenoid valve SLT remains open or closed<br>• Valve body is blocked<br>• Automatic transmission (clutch, brake or gear, etc.) |

HINT:
Gear positions in the event of a solenoid valve mechanical problem:

| Gearshift controlled by ECM | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|
| *1: Actual gear position under SR stuck ON malfunction | 1st | 2nd | 3rd | 4th | 5th |
| *2: Actual gear position under SR stuck OFF malfunction | 1st | 2nd | 3rd | 4th | 4th |

N*: Neutral

## MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve SR or SL1. The ECM controls the gearshifts by turning the shift solenoid valves "ON/OFF". When the gear position directed by the ECM and the actual gear position do not match, the ECM illuminates the MIL and stores the DTC.

AT

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P0771:<br>Shift solenoid valve SR/OFF malfunction<br>Shift solenoid valve SR/ON malfunction |
| Required sensors/Components (Main) | Shift solenoid valve SR |
| Required sensors/Components (Related) | Speed sensor (NT), Speed sensor (SP2), Crankshaft position sensor (NE) |
| Frequency of operation | Continuous |
| Duration | OFF malfunction (A):<br>0.4 seconds<br>OFF malfunctions (B) and (C):<br>Immediate<br>ON malfunction:<br>0.15 seconds |
| MIL operation | 2 driving cycles |
| Sequence of operation | None |

## TYPICAL ENABLING CONDITIONS

The following conditions are common to all OFF malfunctions (A), (B) and (C) and ON malfunction.

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | P0115 - P0118: ECT sensor<br>P0125: Insufficient ECT for Closed Loop<br>P0500: VSS<br>P0748 - P0799: Trans solenoid (range) |
| Turbine speed sensor (NT) circuit | No circuit malfunction |
| Output speed sensor (SP2) circuit | No circuit malfunction |
| Shift solenoid "A" (S1) circuit | No circuit malfunction |
| Shift solenoid "B" (S2) circuit | No circuit malfunction |
| Shift solenoid "E" (SR) circuit | No circuit malfunction |
| Pressure control solenoid "A" (SL1) circuit | No circuit malfunction |
| Pressure control solenoid "B" (SL2) circuit | No circuit malfunction |
| ECT (Engine Coolant Temperature) sensor circuit | No circuit malfunction |
| Knock sensor circuit | No circuit malfunction |
| ETCS (Electronic Throttle Control System) | System not down |
| Transmission shift position | "D" |
| ECT | 40°C (104°F) or more |
| Spark advance from max. retard timing by knock sensor control | 0° CA or more |
| Engine | Starting |

### OFF malfunction (A)

| | |
|---|---|
| ECM selected gear | 5th |
| Vehicle speed | 1.2 mph (2 km/h) or more |
| Throttle valve opening angle | 6.5 % or more at engine speed of 2,000 rpm<br>(Conditions vary with engine speed) |

### OFF malfunction (B)

| | |
|---|---|
| Current ECM selected gear | 5th |
| Last ECM selected gear | 4th |
| Continuous time of ECM selecting 4th gear | 2 seconds or more |

### OFF malfunction (C)

| | |
|---|---|
| Current ECM selected gear | 5th |
| Last ECM selected gear | 4th |

### ON malfunction

| | |
|---|---|
| Current ECM selected gear | 2nd |
| Last ECM selected gear | 1st |
| Throttle valve opening angle<br>(During transition from 1st to 2nd gear) | 3.5 % or more at engine speed of 2,000 rpm<br>(Conditions vary with engine speed) |

## TYPICAL MALFUNCTION THRESHOLDS

[OFF malfunction]

All of the following conditions are met: OFF malfunctions (A), (B) and (C)

2 detections are necessary in 1 driving cycle.

1st detection; temporary flag ON

2nd detection; pending fault code ON

### OFF malfunction (A)

| | |
|---|---|
| Turbine speed/Output speed | 0.93 to 1.07<br>(Actual gear is 4th) |

**OFF malfunction (B)**

| | |
|---|---|
| Turbine speed/Output speed | No change as follows:<br>0.93 to 1.07 (Actual gear is 4th)<br>↓<br>0.65 to 0.79 (Actual gear is 5th) |

**OFF malfunction (C)**

| | |
|---|---|
| Output record from ECM for 4th → 5th upshifting | Recorded |

[ON malfunction]
2 detections are necessary in 1 driving cycle.
1st detection; temporary flag ON
2nd detection; pending fault code ON

| | |
|---|---|
| Turbine speed - Output speed x 1st gear ratio | 150 rpm or more |

## INSPECTION PROCEDURE

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (Controller Area Network Vehicle Interface Module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / SHIFT".
8. According to the display on the tester, perform the "ACTIVE TEST".

HINT:
While driving, the shift position can be changed with the intelligent tester.
Comparing the shift position directed by the ACTIVE TEST with the actual shift position enables the problem to be confirmed (See page AT-34).

AT

| Item | Test Details | Diagnostic Note |
|---|---|---|
| SHIFT | [Test Details]<br>Operate the shift solenoid valve and set each shift position manually.<br>[Vehicle Condition]<br>Vehicle Speed: Less than 30 mph (50 km/h)<br>[Others]<br>• Press → button: Shift up<br>• Press ← button: Shift down | Possible to check the operation of the shift solenoid valves.<br>HINT:<br>Shifting to the 5th gear is possible only when the vehicle is stationary with the engine idling. |

HINT:

- This test can be conducted when the vehicle speed is 30 mph (50 km/h) or less.
- The 4th to 5th up-shifting must be performed with the accelerator pedal released.
- The 5th to 4th down-shifting 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 directed by the ECM is shown in the DATA LIST / SHIFT display on the intelligent tester.
- The shift solenoid valve SR and SL1 are turned on/off normally when the shift lever is in the D position:

| Gearshift controlled by ECM | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|
| Shift solenoid valve SR | OFF | OFF | OFF | OFF | ON |
| Shift solenoid valve SL1 | OFF | OFF | OFF | OFF | ON |

| 1 | CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P0771) |
|---|---|

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

**Result:**

| Display (DTC Output) | Proceed to |
|---|---|
| Only "P0771" is output | A |
| "P0771" and other DTCs | B |

HINT:
If any codes besides "P0771" are output, perform troubleshooting for those DTCs first

B → GO TO DTC CHART

A

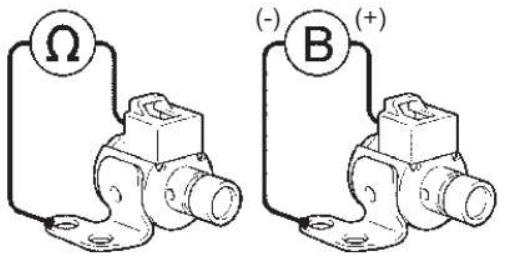
| 2 | PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SOLENOID (SLT)) (See page AT-84) |
|---|---|

NG → REPLACE SHIFT SOLENOID VALVE SLT

OK

| 3 | INSPECT SHIFT SOLENOID VALVE SR |
|---|---|

**Shift Solenoid Valve SR:**




A110988E05

(a) Remove the shift solenoid valve SR.
(b) Measure the resistance.
**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| Solenoid Connector (SR) - Solenoid Body (SR) | 11 to 15 Ω at 20°C (68°F) |

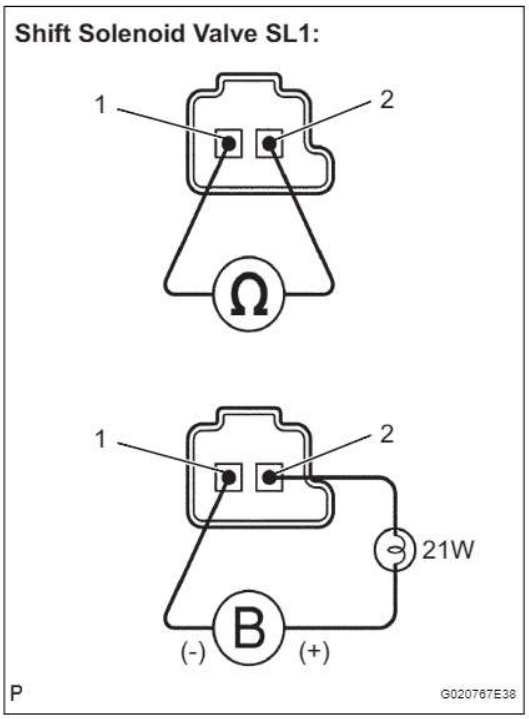
(c) Connect the positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.
**OK:**
**The solenoid makes operating sounds**

NG → REPLACE SHIFT SOLENOID VALVE SR

OK

AT

| 4 | INSPECT SHIFT SOLENOID VALVE SL1 |
|---|---|




(a) Remove the shift solenoid valve SL1.
(b) Measure the resistance.
**Standard resistance**

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

(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.
**OK:**
**The solenoid makes operating sounds.**

NG → **REPLACE SHIFT SOLENOID VALVE SL1**

OK

| 5 | INSPECT TRANSMISSION VALVE BODY ASSEMBLY (See chapter 2 in the problem symptoms table) |
|---|---|

AT

**OK:**
**There are no foreign objects on any valves and they operate smoothly.**

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY**

OK

**REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY**

| DTC | P0776 | Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2) |
|---|---|---|

## 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 of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| P0776 | SL2 stuck ON malfunction*1:<br>The ECM determines that there is a malfunction when the following conditions are met (2-trip detection logic):<br>(a) When the ECM directs the gearshift to switch to 4th gear, the actual gear is also shifted to 4th.<br>(b) When the ECM directs the gearshift to switch to 5th gear, the engine overruns (clutch slips). | • Shift solenoid valve SL2 remains open<br>• Shift solenoid valve SLT remains open or closed<br>• Valve body is blocked<br>• Automatic transmission (clutch, brake or gear, etc.) |

HINT:
Gear positions in the event of a solenoid valve mechanical problem:

| Gearshift controlled by ECM | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|
| *1: Actual gear position under SL2 stuck ON malfunction | 1st | 2nd | 3rd | 4th | N* |

N*: Neutral

## MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" of the shift solenoid valve SL2.
The ECM controls the gearshifts by turning the shift solenoid valves "ON/OFF". When the gear position directed by the ECM and the actual gear position do not match, the ECM illuminates the MIL and stores the DTC.

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P0776: Shift solenoid valve SL2/ON malfunction |
| Required sensors/Components (Main) | Shift solenoid valve SL2 |
| Required sensors/Components (Related) | Speed sensor (NT), Speed sensor (SP2), Crankshaft position sensor (NE) |
| Frequency of operation | Continuous |
| Duration | ON malfunctions (A), (B) and (C):<br>0.4 seconds<br>ON malfunction (D):<br>3 seconds<br>ON malfunction (E):<br>0.5 seconds |
| MIL operation | 2 driving cycles |
| Sequence of operation | None |

AT

## TYPICAL ENABLING CONDITIONS

The following conditions are common to all ON malfunctions (A), (B), (C), (D) and (E).

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | P0115 - P0118: ECT sensor<br>P0125: Insufficient ECT for Closed Loop<br>P0500: VSS<br>P0748 - P0799: Trans solenoid (range) |
| Turbine speed sensor (NT) circuit | No circuit malfunction |
| Output speed sensor (SP2) circuit | No circuit malfunction |
| Shift solenoid "A" (S1) circuit | No circuit malfunction |

| | |
|---|---|
| Shift solenoid "B" (S2) circuit | No circuit malfunction |
| Shift solenoid "E" (SR) circuit | No circuit malfunction |
| Pressure control solenoid "A" (SL1) circuit | No circuit malfunction |
| Pressure control solenoid "B" (SL2) circuit | No circuit malfunction |
| ECT (Engine Coolant Temperature) sensor circuit | No circuit malfunction |
| Knock sensor circuit | No circuit malfunction |
| ETCS (Electronic Throttle Control System) | System not down |
| Transmission shift position | "D" |
| ECT | 40°C (104°F) or more |
| Spark advance from max. retard timing by knock sensor control | 0° CA or more |
| Engine | Starting |

**ON malfunction (A)**

| | |
|---|---|
| ECM selected gear | 1st |
| Vehicle speed | 1.2 to 24.9 mph (2 to 40 km/h) |
| Throttle valve opening angle | 6.5 % or more at engine speed of 2,000 rpm<br>(Conditions vary with engine speed) |

**ON malfunction (B)**

| | |
|---|---|
| ECM selected gear | 3rd |
| Vehicle speed | 1.2 mph (2 km/h) or more |
| Throttle valve opening angle | 6.5 % or more at engine speed of 2,000 rpm<br>(Conditions vary with engine speed) |

**ON malfunction (C)**

| | |
|---|---|
| ECM selected gear | 4th |
| Vehicle speed | 1.2 mph (2 km/h) or more |
| Throttle valve opening angle | 6.5 % or more at engine speed of 2,000 rpm<br>(Conditions vary with engine speed) |

**ON malfunction (D)**

| | |
|---|---|
| Current ECM selected gear | 5th |
| Last ECM selected gear | 4th |
| Vehicle speed<br>(During transition from 4th to 5th gear) | Less than 62.2 mph (100 km/h) |

AT

**ON malfunction (E)**

| | |
|---|---|
| ECM selected gear | 5th |
| Engine speed - Turbine speed (NE - NT)<br>(After transition from 4th to 5th gear) | 150 rpm or less |
| Vehicle speed<br>(After transition from 4th to 5th gear) | Less than 62.2 mph (100 km/h) |

## TYPICAL MALFUNCTION THRESHOLDS

[ON malfunction]
Both of the following conditions are met:

- ON malfunctions (A) and (B), or ON malfunction (C)
- ON malfunction (D) or (E)

**ON malfunction (A)**

| | |
|---|---|
| Turbine speed/Output speed | 3.30 to 7.50<br>(Actual gear is 1st) |

**ON malfunction (B)**

| | |
|---|---|
| Turbine speed/Output speed | 1.28 to 1.53<br>(Actual gear is 3rd) |

**ON malfunction (C)**

| | |
|---|---|
| Turbine speed/Output speed | 0.93 to 1.07<br>(Actual gear is 4th) |

**ON malfunction (D)**

| | |
|---|---|
| Turbine speed - Output speed x 4th gear ratio | 1,000 rpm or more |

**ON malfunction (E)**

| | |
|---|---|
| Turbine speed - Output speed x 5th gear ratio | 1,000 rpm or more |

## INSPECTION PROCEDURE

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (Controller Area Network Vehicle Interface Module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / SHIFT".
8. According to the display on the tester, perform the "ACTIVE TEST".

HINT:
While driving, the shift position can be changed with the intelligent tester.
Comparing the shift position directed by the ACTIVE TEST with the actual shift position enables the problem to be confirmed (See page AT-34).

| Item | Test Details | Diagnostic Note |
|---|---|---|
| SHIFT | [Test Details]<br>Operate the shift solenoid valve and set each shift position manually.<br>[Vehicle Condition]<br>Vehicle Speed: Less than 30 mph (50 km/h)<br>[Others]<br>• Press → button: Shift up<br>• Press ← button: Shift down | Possible to check the operation of the shift solenoid valves.<br>HINT:<br>Shifting to the 5th gear is possible only when the vehicle is stationary with the engine idling. |

AT

HINT:

- This test can be conducted when the vehicle speed is 30 mph (50 km/h) or less.
- The 4th to 5th up-shifting must be performed with the accelerator pedal released.
- The 5th to 4th down-shifting 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 directed by the ECM is shown in the DATA LIST / SHIFT display on the intelligent tester.
- The shift solenoid valve SL2 is turned on/off normally when the shift lever is in the D position:

| Gearshift controlled by ECM | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|
| Shift solenoid valve SL2 | ON | ON | ON | ON | OFF |

| 1 | CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P0776) |
|---|---|

(a) Connect the intelligent tester to the DLC3.

(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

**Result:**

| Display (DTC Output) | Proceed to |
|---|---|
| Only "P0776" is output | A |
| "P0776" and other DTCs | B |

HINT:
If any codes besides "P0776" are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART

A

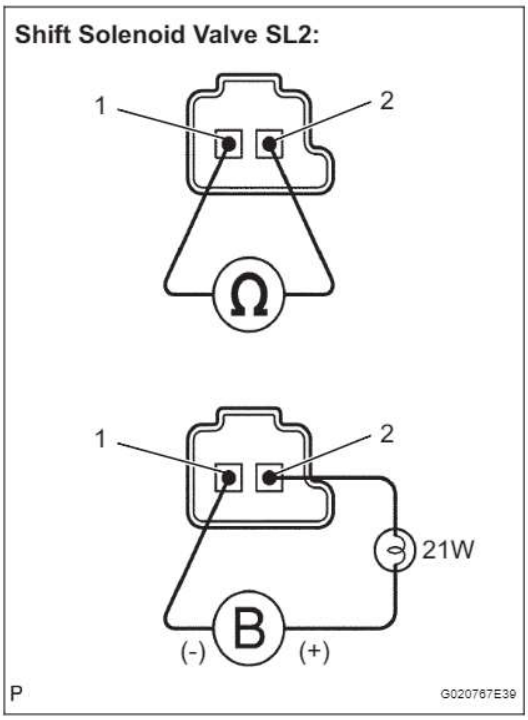
**2** PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SOLENOID (SLT)) (See page AT-84)

NG → REPLACE SHIFT SOLENOID VALVE SLT

OK

**3** INSPECT SHIFT SOLENOID VALVE SL2

**Shift Solenoid Valve SL2:**




(a) Remove the shift solenoid valve SL2.
(b) Measure the resistance.
**Standard resistance**

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

(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.
**OK:**
**The solenoid makes operating sounds.**

NG → REPLACE SHIFT SOLENOID VALVE SL2

OK

AT

| | |
|---|---|
| 4 | INSPECT TRANSMISSION VALVE BODY ASSEMBLY (See chapter 2 in the problem symptoms table) |

OK:
There are no foreign objects on any valves and they operate smoothly.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY

OK ↓

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY

AT

| DTC | P0778 | Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2) |
|---|---|---|

## DESCRIPTION

Shifting from 1st to 5th is performed in combination with the ON and OFF operation of the shift solenoid valves S1, S2, SR, SL1 and SL2 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 driven smoothly (See page AT-34).

| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| P0778 | The ECM checks for an open or short in the shift solenoid valve SL2 circuit (1-trip detection logic):<br>• Output signal duty equals 100 %.<br>(NOTE: SL2 output signal duty is less than 100 % under normal conditions) | • Open or short in shift solenoid valve SL2 circuit<br>• Shift solenoid valve SL2<br>• ECM |

## MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL2 circuit. The ECM controls the gearshift 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. And the ECM performs the fail-safe function and turns the other functioning shift solenoid valves "ON/OFF". (If an open or short circuit is detected, the ECM cuts the current to the circuit.)
If the ECM detects an open or short in the shift solenoid valve SL2 circuit, the ECM determines that there is a malfunction (See page AT-34).

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P0778: Shift solenoid valve SL2/Range check |
| Required sensors/Components | Shift solenoid valve SL2 |
| Frequency of operation | Continuous |
| Duration | 1 second |
| MIL operation | Immediate |
| Sequence of operation | None |

AT

## TYPICAL ENABLING CONDITIONS

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | None |
| Battery voltage | 10 V or more |
| CPU requested duty ratio to SL2 | Less than 75 % |
| Ignition switch | ON |
| Starter | OFF |

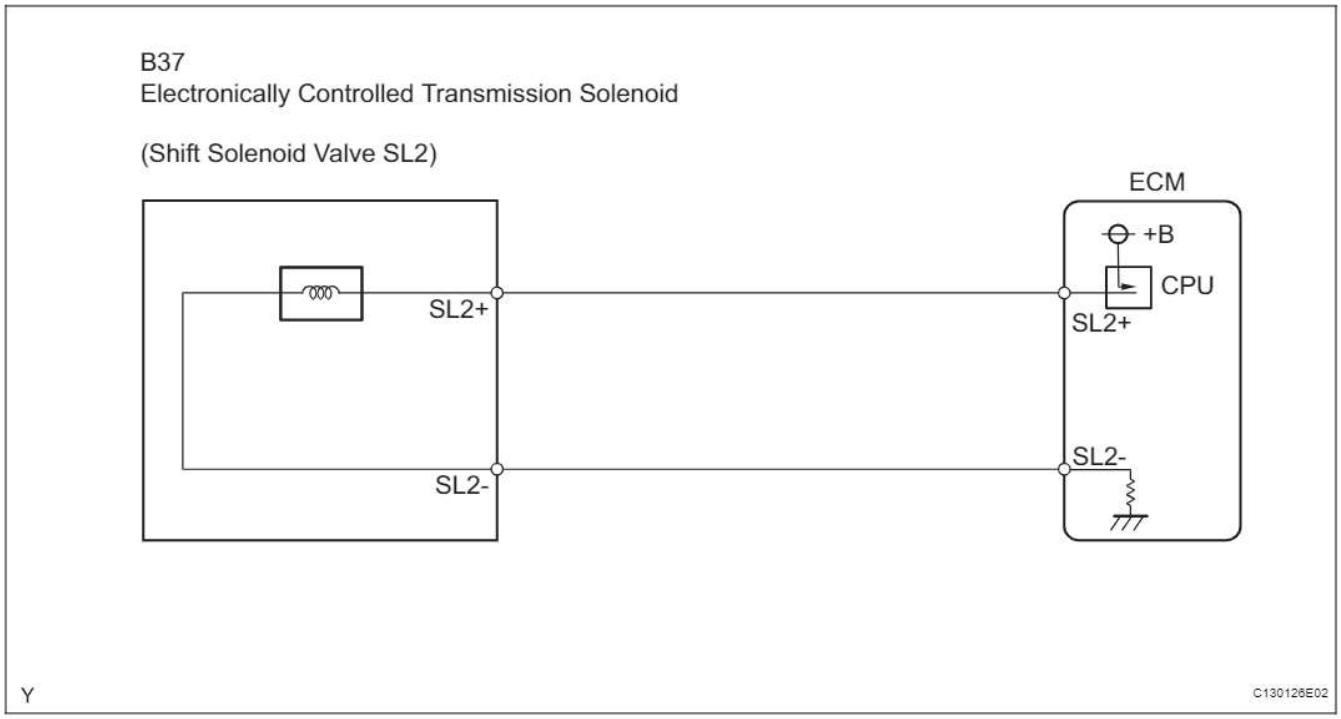
## TYPICAL MALFUNCTION THRESHOLDS

| | |
|---|---|
| Output signal duty | 100 % |

## COMPONENT OPERATING RANGE

| | |
|---|---|
| Output signal duty | Less than 100 % |

## WIRING DIAGRAM




## INSPECTION PROCEDURE

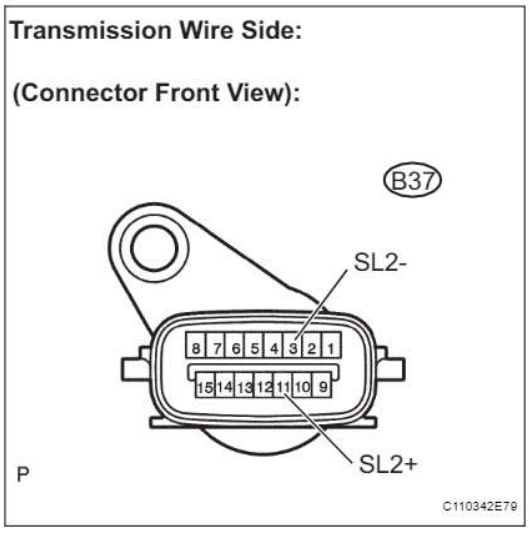
HINT:

The shift solenoid valve SL2 is turned on/off normally when the shift lever is in the D position:

| Gearshift controlled by ECM | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|
| Shift solenoid valve SL2 | ON | ON | ON | ON | OFF |

AT

### 1 INSPECT TRANSMISSION WIRE (SL2)




(a) Disconnect the transmission wire connector from the transmission.

(b) Measure the resistance.

**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| 11 (SL2+) - 3 (SL2-) | 5.0 to 5.6 Ωat 20°C (68°F) |

(c) Measure the resistance.

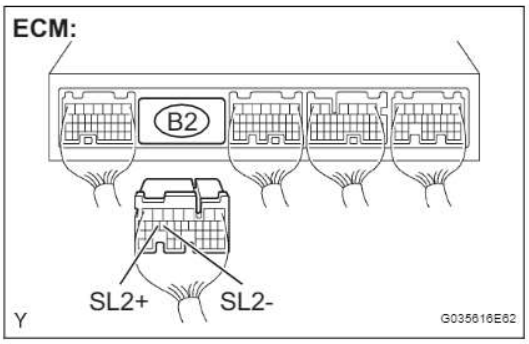
**Standard resistance (Check for short):**

| Tester Connection | Specified Condition |
|---|---|
| 11 (SL2+) - Body ground | 10 kΩ or higher |
| 3 (SL2-) - Body ground | 10 kΩ or higher |

NG → Go to step 3

OK

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




(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| B2-17 (SL2+) - B2-16 (SL2-) | 5.0 to 5.6 Ω at 20°C (68°F) |

(d) Measure the resistance.
**Standard resistance (Check for short)**

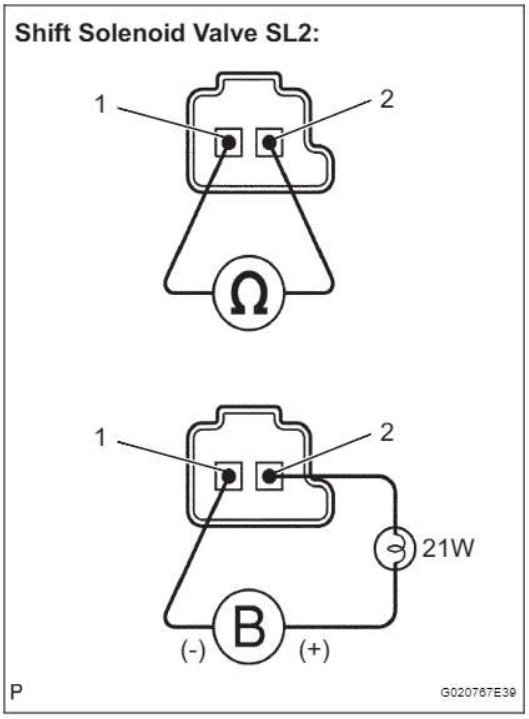
| Tester Connection | Specified Condition |
|---|---|
| B2-17 (SL2+) - Body ground | 10 kΩ or higher |
| B2-16 (SL2-) - Body ground | 10 kΩ or higher |

NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

**REPLACE ECM**

**3 INSPECT SHIFT SOLENOID VALVE SL2**




(a) Remove the shift solenoid valve SL2.
(b) Measure the resistance.
**Standard resistance**

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

(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.
**OK:**
**The solenoid makes operating sounds.**

NG → **REPLACE SHIFT SOLENOID VALVE SL2**

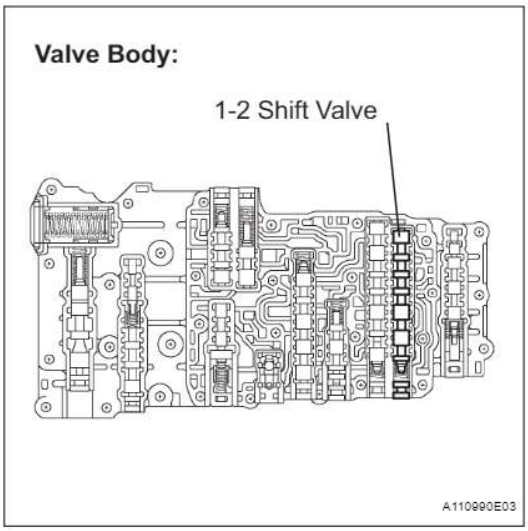
AT

OK

REPAIR OR REPLACE TRANSMISSION WIRE

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

## DESCRIPTION




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

| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| P0781 | 1-2 shift valve malfunction:<br>The ECM determines that there is a malfunction when the following conditions (a) and (b), or (a) and (c) are met (2-trip detection logic):<br>(a) When the ECM directs the gearshift to switch to 2nd gear, the actual gear is shifted to 1st.<br>(b) When the ECM directs the gearshift to switch to 4th gear, the actual gear is shifted to 3rd.<br>(c) When the ECM directs the gearshift to switch to 5th gear, the engine overruns (clutch slips) | • Valve body is blocked up or stuck (1-2 shift valve)<br>• Shift solenoid valve SLT remains open or closed<br>• Automatic transmission (clutch, brake or gear, etc.) |

AT

HINT:

Gear positions in the event of a 1-2 shift valve mechanical problem:

| Gearshift controlled by ECM | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|
| Actual gear position under malfunction | 1st | 1st | 3rd | 3rd | N* |

N*: Neutral

## MONITOR DESCRIPTION

This DTC indicates that the 1-2 shift valve in the valve body is locked in the direction of the spring compression. The ECM controls the gearshifts 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, and the 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 .

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P0781: Valve body/Rationality check |
| Required sensors/Components (Main) | Valve body |
| Required sensors/Components (Related) | Automatic transmission assembly, Speed sensor (NT), Speed sensor (SP2), Vehicle speed sensor, Throttle position sensor |

| | |
|---|---|
| Frequency of operation | Continuous |
| Duration | Conditions (A) and (B)<br>0.4 seconds<br>Condition (C)<br>3 seconds<br>Condition (D)<br>0.5 seconds |
| MIL operation | 2 driving cycles |
| Sequence of operation | None |

## TYPICAL ENABLING CONDITIONS

The following conditions are common to all Conditions (A), (B), (C) and (D).

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | P0115 - P0118: ECT sensor<br>P0125: Insufficient ECT for Closed Loop<br>P0500: VSS<br>P0748 - P0799: Trans Solenoid (range) |
| Turbine speed sensor (NT) circuit | No circuit malfunction |
| Output speed sensor (SP2) circuit | No circuit malfunction |
| Shift solenoid "A" (S1) circuit | No circuit malfunction |
| Shift solenoid "B" (S2) circuit | No circuit malfunction |
| Shift solenoid "E" (SR) circuit | No circuit malfunction |
| Pressure control solenoid "A" (SL1) circuit | No circuit malfunction |
| Pressure control solenoid "B" (SL2) circuit | No circuit malfunction |
| ECT (Engine Coolant Temperature) sensor circuit | No circuit malfunction |
| Knock sensor circuit | No circuit malfunction |
| ETCS (Electronic Throttle Control System) | System not down |
| Transmission shift position | "D" |
| ECT | 40°C (104°F) or more |
| Spark advance from max. retard timing by knock sensor control | 0°CA or more |
| Engine | Starting |

### Condition (A)

| | |
|---|---|
| ECM selected gear | 2nd |
| Vehicle speed | 1.2 mph (2 km/h) or more |
| Output speed | 2nd → 1st down shift point or more |
| Throttle valve opening angle | 6.5 % or more at engine speed of 2,000 rpm<br>(Conditions vary with engine speed) |

### Condition (B)

| | |
|---|---|
| ECM selected gear | 4th |
| Vehicle speed | 1.2 mph (2 km/h) or more |
| Throttle valve opening angle | 6.5 % or more at engine speed of 2,000 rpm<br>(Conditions vary with engine speed) |

### Condition (C)

| | |
|---|---|
| Current ECM selected gear | 5th |
| Last ECM selected gear | 4th |
| Vehicle speed<br>(During transition from 4th to 5th gear) | Less than 62.2 mph (100 km/h) |

### Condition (D)

| | |
|---|---|
| ECM selected gear | 5th |
| Engine speed - Turbine speed (NE - NT)<br>(After transition from 4th to 5th gear) | 150 rpm or less |

AT

| | |
|---|---|
| Vehicle speed<br>(After transition from 4th to 5th gear) | Less than 62.2 mph (100 km/h) |

## TYPICAL MALFUNCTION THRESHOLDS

Condition (A) and Conditions (B), (C) or (D) are met:

**Condition (A)**

| | |
|---|---|
| Turbine speed/Output speed | 3.30 to 7.50<br>(Actual gear is 1st) |

**Condition (B)**

| | |
|---|---|
| Turbine speed/Output speed | 1.28 to 1.53<br>(Actual gear is 3rd) |

**Condition (C)**

| | |
|---|---|
| Turbine speed - Output speed x 4th gear ratio | 1,000 rpm or more |

**Condition (D)**

| | |
|---|---|
| Turbine speed - Output speed x 5th gear ratio | 1,000 rpm or more |

## INSPECTION PROCEDURE

| 1 | CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P0781) |
|---|---|

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the main switch ON.
(c) Select the items "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

**Result:**

| Display (DTC Output) | Proceed to |
|---|---|
| Only "P0781" is output | A |
| "P0781" and other DTCs | B |

AT

HINT:
If any codes besides "P0781" are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART

A

| 2 | PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT) |
|---|---|

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.
1. Warm up the engine.
2. Turn the ignition switch off.

3. Connect the intelligent tester together with the CAN VIM (Controller Area Network Vehicle Interface Module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / SHIFT".
8. According to the display on the tester, perform the "ACTIVE TEST".

HINT:
While driving, the shift position can be changed with the intelligent tester.
Comparing the shift position directed by the ACTIVE TEST with the actual shift position enables the problem to be confirmed (See page AT-34).

| Item | Test Details | Diagnostic Note |
|---|---|---|
| SHIFT | [Test Details]<br>Operate the shift solenoid valve and set each shift position manually.<br>[Vehicle Condition]<br>Vehicle Speed: Less than 30 mph (50 km/h)<br>[Others]<br>• Press →button: Shift up<br>• Press ←button: Shift down | Possible to check the operation of the shift solenoid valves.<br>HINT:<br>Shifting to the 5th gear is possible only when the vehicle is stationary with the engine idling. |

HINT:
- This test can be conducted when the vehicle speed is 30 mph (50 km/h) or less.
- The 4th to 5th up-shifting must be performed with the accelerator pedal released.
- The 5th to 4th down-shifting 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 directed by the ECM is shown in the DATA LIST/ SHIFT display on the intelligent tester.
- Gear positions in the event of a solenoid valve mechanical problem:

| Gearshift operated by tester | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|
| Actual gear position under malfunction | 1st | 1st | 3rd | 3rd | N* |

N*: Neutral

**OK:**

**Gear position changes in accordance with the tester operation.**

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY**

OK

| | |
|---|---|
| 3 | PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SOLENOID (SLT)) (See page AT-84) |

NG → REPLACE SHIFT SOLENOID VALVE SLT

OK ↓

| | |
|---|---|
| 4 | CLEAR DTC AND PERFORM RUNNING TEST |

(a) Clear the DTC, and check for the DTC again after conducting the "MONITOR DRIVE PATTERN FOR ECT TEST" (See page AT-21).
**OK:**
**No DTC**

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY

OK ↓

END

AT

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

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

## DESCRIPTION

Shifting from 1st to 5th is performed in combination with the ON and OFF operations of the shift solenoid valves S1, S2, SR, SL1 and SL2 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 valve to allow the vehicle to be driven smoothly (See page AT-34).

| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| P0973 | ECM detects short in solenoid valve S1 circuit 2 times when solenoid valve S1 is operated. (1-trip detection logic) | • Short in shift solenoid valve S1 circuit<br>• Shift solenoid valve S1<br>• ECM |
| P0974 | ECM detects open in solenoid valve S1 circuit 2 times when solenoid valve S1 is not operated. (1-trip detection logic) | • Open in shift solenoid valve S1 circuit<br>• Shift solenoid valve S1<br>• 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 circuits, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S1 is ON, if the resistance is 8 Ω or less, the ECM determines that there is a short malfunction in the shift solenoid valve S1 circuit.
When the shift solenoid valve S1 is OFF, if the resistance is 100 kΩ or more, the ECM determines that the shift solenoid valve S1 circuit is open (See page AT-34).

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P0973: Shift solenoid valve S1/Range check (Low resistance)<br>P0974: Shift solenoid valve S1/Range check (High resistance) |
| Required sensors/Components | Shift solenoid valve S1 |
| Frequency of operation | Continuous |
| Duration | 0.128 seconds or more |
| MIL operation | Immediate |
| Sequence of operation | None |

AT

## TYPICAL ENABLING CONDITIONS

### P0973: Range check (Low resistance)

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | None |
| Shift solenoid valve S1 | ON |

### P0974: Range check (High resistance)

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | None |
| Shift solenoid valve S1 | OFF |

## TYPICAL MALFUNCTION THRESHOLDS

### P0973: Range check (Low resistance)

| | |
|---|---|
| Shift solenoid valve S1 resistance | 8 Ω or less |

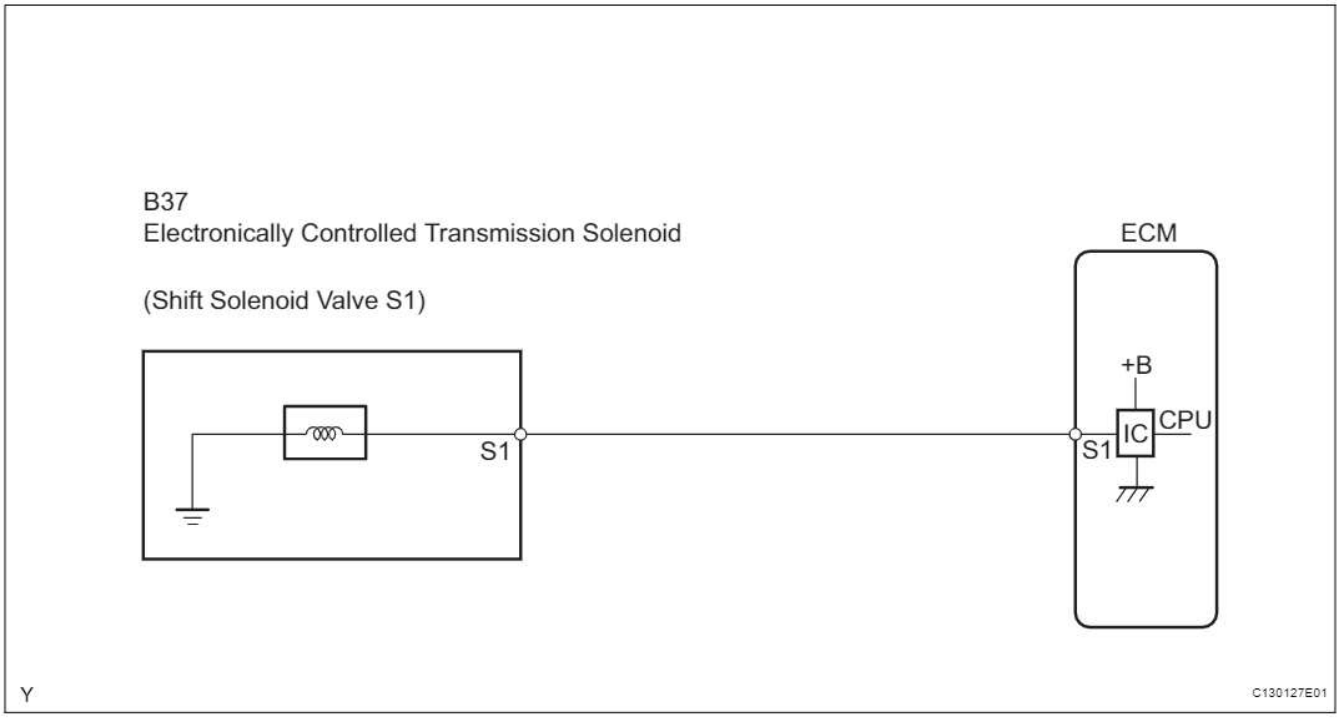
### P0974: Range check (High resistance)

| | |
|---|---|
| Shift solenoid valve S1 resistance | 100 kΩ or more |

## COMPONENT OPERATING RANGE

| | |
|---|---|
| Shift solenoid valve S1 resistance | 11 to 15 Ω at 20°C (68°F) |

## WIRING DIAGRAM




AT

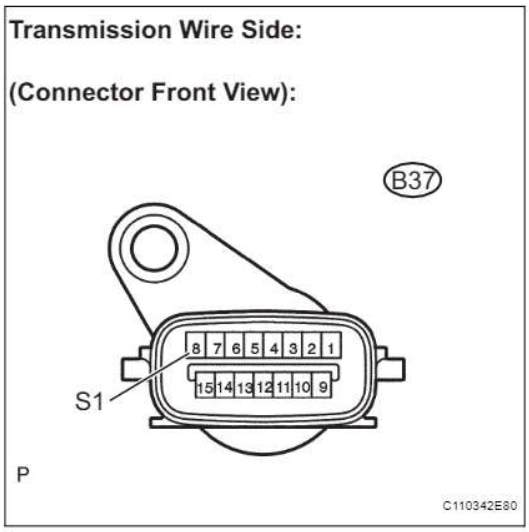
## INSPECTION PROCEDURE

HINT:

The shift solenoid valve S1 is turned on/off normally when the shift lever is in the D position:

| Gearshift controlled by ECM | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|
| Shift solenoid valve S1 | ON | ON | OFF | OFF | OFF |

**1 INSPECT TRANSMISSION WIRE (S1)**



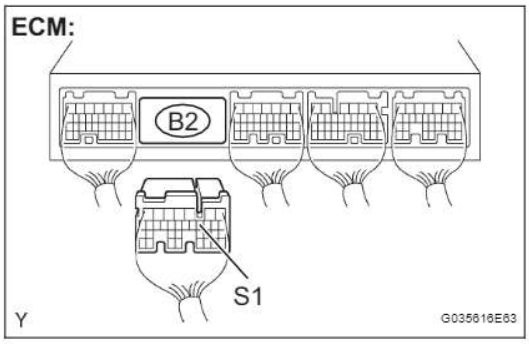

(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
**Standard resistance**

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

NG → Go to step 3

OK

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




(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| B2-11 (S1) - Body ground | 11 to 15 Ω at 20°C (68°F) |

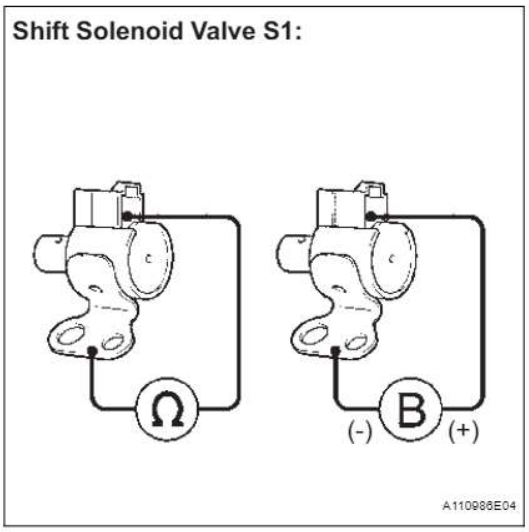
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

**REPLACE ECM**

AT

| 3 | INSPECT SHIFT SOLENOID VALVE S1 |
|---|---|




(a) Remove the shift solenoid valve S1.
(b) Measure the resistance.
**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| Solenoid Connector (S1) - Solenoid Body (S1) | 11 to 15 Ω at 20°C (68°F) |

(c) Connect the positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.
**OK:**
**The solenoid makes operating sounds.**

NG → **REPLACE SHIFT SOLENOID VALVE S1**

OK →

**REPAIR OR REPLACE TRANSMISSION WIRE**

AT

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

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

## DESCRIPTION

Shifting from 1st to 5th is performed in combination with the ON and OFF operations of the shift solenoid valves S1, S2, SR, SL1 and SL2 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 valve to allow the vehicle to be driven smoothly (See page AT-34).

| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| P0976 | ECM detects short in solenoid valve S2 circuit 2 times when solenoid valve S2 is operated. (1-trip detection logic) | • Short in shift solenoid valve S2 circuit<br>• Shift solenoid valve S2<br>• ECM |
| P0977 | ECM detects open in solenoid valve S2 circuit 2 times when solenoid valve S2 is not operated. (1-trip detection logic) | • Open in shift solenoid valve S2 circuit<br>• Shift solenoid valve S2<br>• 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 circuits, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve S2 is ON, if the resistance is 8 Ω or less, the ECM determines that there is a short malfunction in the shift solenoid valve S2 circuit.
When the shift solenoid valve S2 is OFF, if the resistance is 100 kΩ or more, the ECM determines that the shift solenoid valve S2 circuit is open (See page AT-34).

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P0976: Shift solenoid valve S2/Range check (Low resistance)<br>P0977: Shift solenoid valve S2/Range check (High resistance) |
| Required sensors/Components | Shift solenoid valve S2 |
| Frequency of operation | Continuous |
| Duration | 0.128 seconds or more |
| MIL operation | Immediate |
| Sequence of operation | None |

AT

## TYPICAL ENABLING CONDITIONS

### P0976: Range check (Low resistance)

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | None |
| Shift solenoid valve S2 | ON |

### P0977: Range check (High resistance)

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | None |
| Shift solenoid valve S2 | OFF |

## TYPICAL MALFUNCTION THRESHOLDS

### P0976: Range check (Low resistance)

| | |
|---|---|
| Shift solenoid valve S2 resistance | 8 Ω or less |

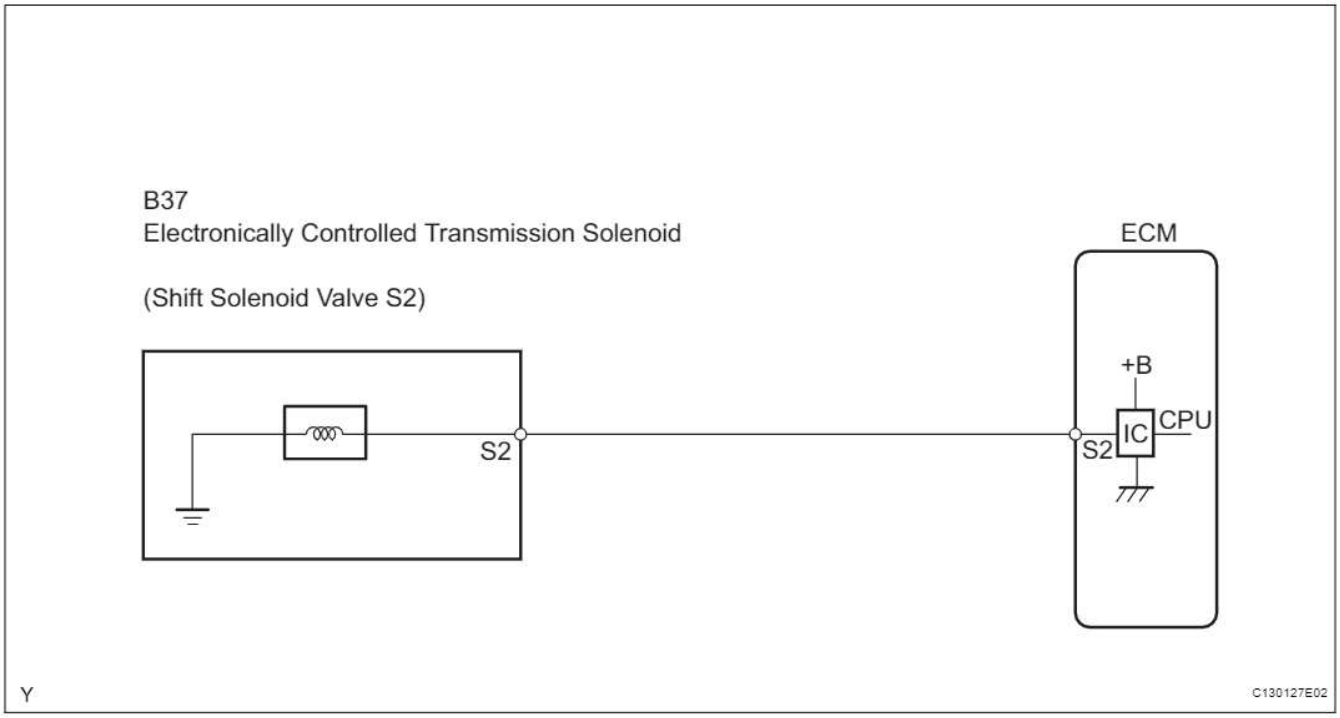
### P0977: Range check (High resistance)

| | |
|---|---|
| Shift solenoid valve S2 resistance | 100 kΩ or more |

## COMPONENT OPERATING RANGE

| | |
|---|---|
| Shift solenoid valve S2 resistance | 11 to 15 Ω at 20°C (68°F) |

## WIRING DIAGRAM




AT

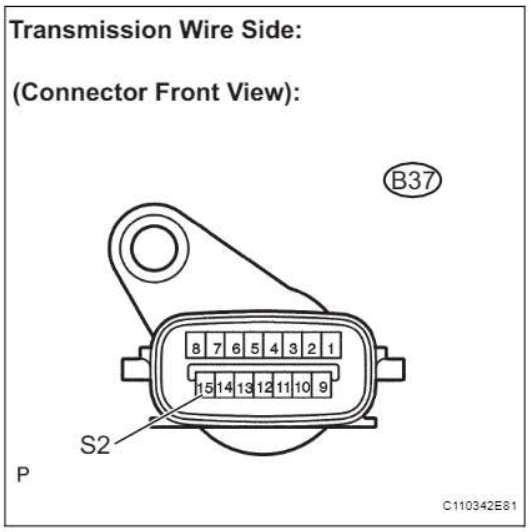
## INSPECTION PROCEDURE

HINT:

The shift solenoid valve S2 is turned on/off normally when the shift lever is in the D position:

| Gearshift controlled by ECM | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|
| Shift solenoid valve S2 | OFF | ON | ON | OFF | OFF |

| 1 | INSPECT TRANSMISSION WIRE (S2) |
|---|---|



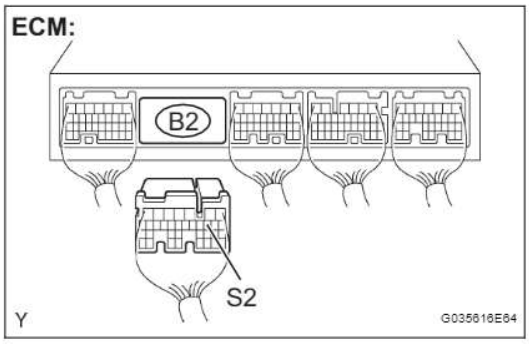

(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
**Standard resistance**

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

NG → Go to step 3

OK

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




(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| B2-10 (S2) - Body ground | 11 to 15 Ω at 20°C (68°F) |

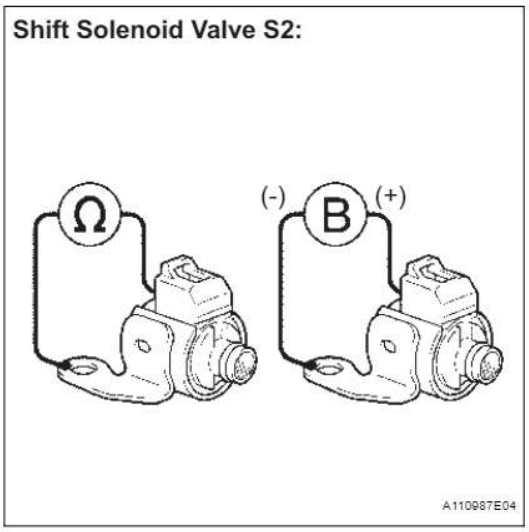
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM

AT

| 3 | INSPECT SHIFT SOLENOID VALVE S2 |
|---|---|




(a) Remove the shift solenoid valve S2.
(b) Measure the resistance.
**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| Solenoid Connector (S2) - Solenoid Body (S2) | 11 to 15 Ω at 20°C (68°F) |

(c) Connect the positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.
**OK:**
**The solenoid makes operating sounds.**

NG → **REPLACE SHIFT SOLENOID VALVE S2**

OK

**REPAIR OR REPLACE TRANSMISSION WIRE**

AT

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

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

## DESCRIPTION

Shifting from 1st to 5th is performed in combination with the ON and OFF operations of the shift solenoid valves S1, S2, SR, SL1 and SL2 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 driven smoothly (See page AT-34).

| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| P0985 | ECM detects short in solenoid valve SR circuit 2 times when solenoid valve SR is operated. (1-trip detection logic) | • Short in shift solenoid valve SR circuit<br>• Shift solenoid valve SR<br>• ECM |
| P0986 | ECM detects open in solenoid valve SR circuit 2 times when solenoid valve SR is not operated. (1-trip detection logic) | • Open in shift solenoid valve SR circuit<br>• Shift solenoid valve SR<br>• 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 circuits, the ECM detects the problem, illuminates the MIL and stores the DTC. When the shift solenoid valve SR is ON, if the resistance is 8 Ω or less, the ECM determines that there is a short malfunction in the shift solenoid valve SR circuit.
When the shift solenoid valve SR is OFF, if the resistance is 100 kΩ or more, the ECM determines that the shift solenoid valve SR circuit is open (See page AT-34).

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P0985: Shift solenoid valve SR/Range check (Low resistance)<br>P0986: Shift solenoid valve SR/Range check (High resistance) |
| Required sensors/Components | Shift solenoid valve SR |
| Frequency of operation | Continuous |
| Duration | 0.128 seconds |
| MIL operation | Immediate |
| Sequence of operation | None |

AT

## TYPICAL ENABLING CONDITIONS

### P0985: Range check (Low resistance)

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | None |
| Shift solenoid valve SR | ON |
| Battery voltage | 8 V or more |
| Ignition switch | ON |
| Starter | OFF |

### P0986: Range check (High resistance)

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | None |
| Shift solenoid valve SR | OFF |
| Battery voltage | 8 V or more |
| Ignition switch | ON |
| Starter | OFF |

## TYPICAL MALFUNCTION THRESHOLDS

### P0985: Range check (Low resistance)

| | |
|---|---|
| Shift solenoid valve SR resistance | 8 Ω or less |

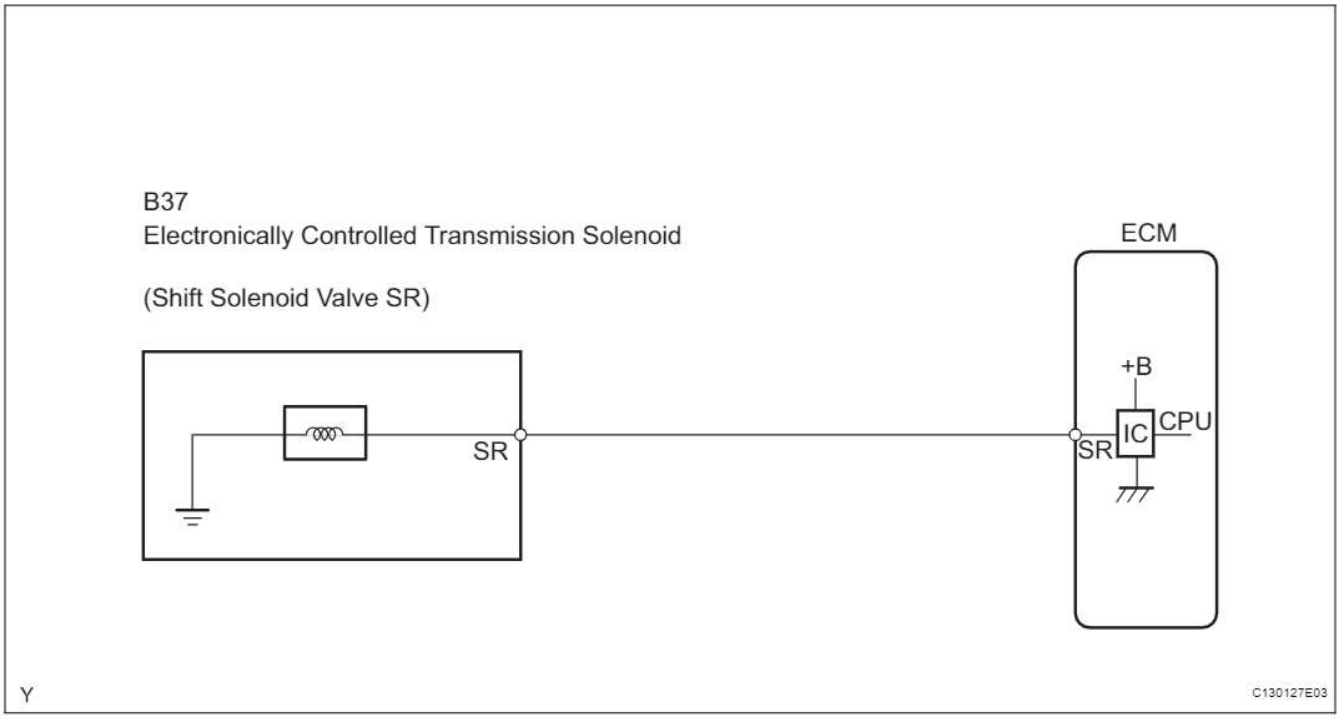
### P0986: Range check (High resistance)

| | |
|---|---|
| Shift solenoid valve SR resistance | 100 kΩ or more |

## COMPONENT OPERATING RANGE

| | |
|---|---|
| Shift solenoid valve SR resistance | 11 to 15 Ω at 20°C (68°F) |

## WIRING DIAGRAM




AT

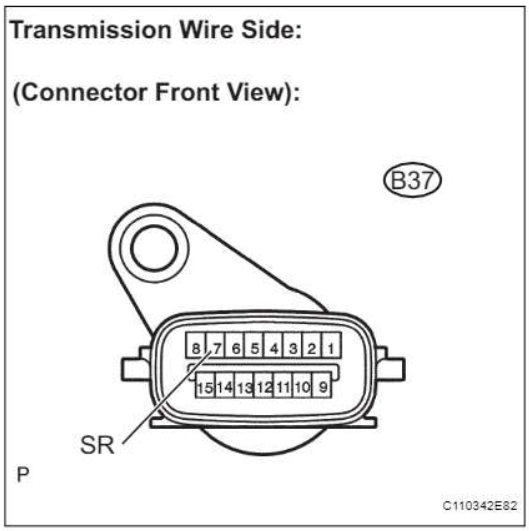
## INSPECTION PROCEDURE

HINT:

The shift solenoid valve SR is turned on/off normally when the shift lever is in the D position:

| Gearshift controlled by ECM | 1st | 2nd | 3rd | 4th | 5th |
|---|---|---|---|---|---|
| Shift solenoid valve SR | OFF | OFF | OFF | OFF | ON |

| 1 | INSPECT TRANSMISSION WIRE (SR) |
|---|---|



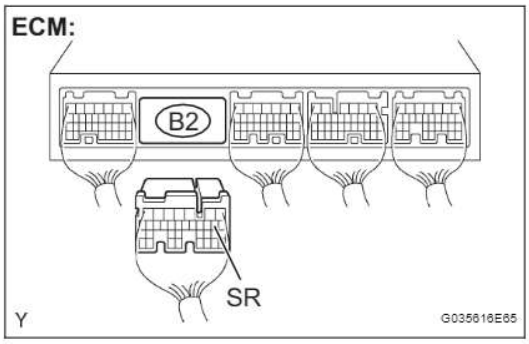

(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
**Standard resistance**

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

NG → Go to step 3

OK

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




(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| B2-9 (SR) - Body ground | 11 to 15 Ω at 20°C (68°F) |

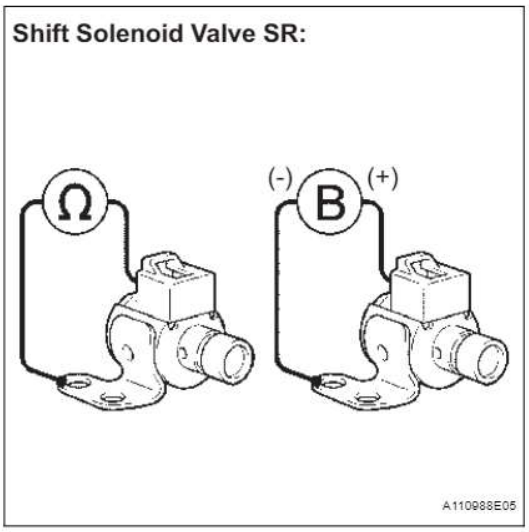
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM

AT

| 3 | INSPECT SHIFT SOLENOID VALVE SR |
|---|---|




(a) Remove the shift solenoid valve SR.
(b) Measure the resistance.
**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| Solenoid Connector (SR) - Solenoid Body (SR) | 11 to 15 Ω at 20°C (68°F) |

(c) Connect the positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.
**OK:**
**The solenoid makes operating sounds.**

NG → **REPLACE SHIFT SOLENOID VALVE SR**

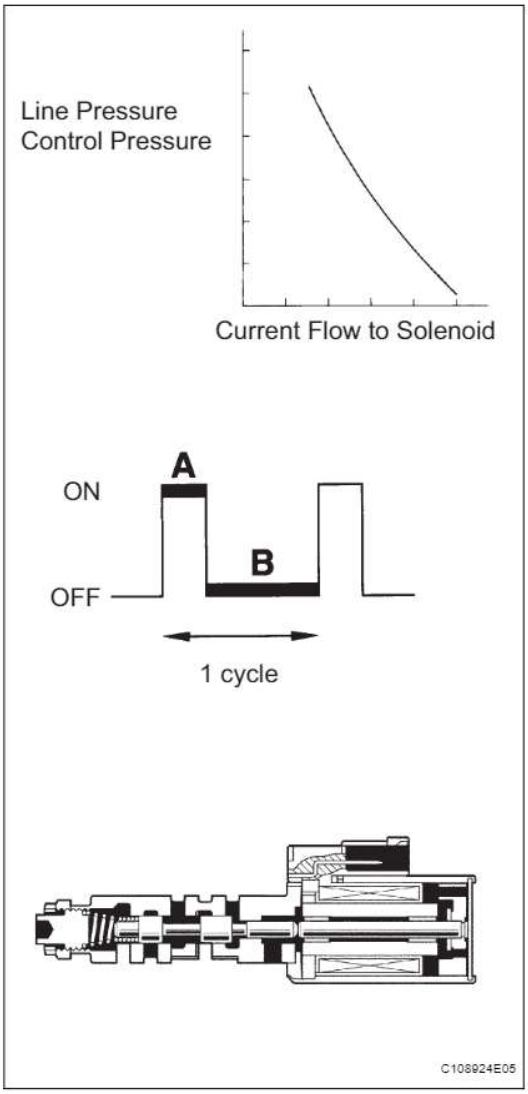
OK

**REPAIR OR REPLACE TRANSMISSION WIRE**

AT

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

## DESCRIPTION




The linear 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 duty ratio* of the SLT solenoid valve output signal to control the hydraulic line pressure coming from the primary regulator valve. Appropriate line pressure assures smooth shifting with varying engine outputs.
*: The duty ratio is the ratio of the continuity to non-continuity in one cycle.
For example, if A is the period of continuity in one cycle, and B is the period of non-continuity, then Duty Ratio=A/(A+B) x 100 (%)

| DTC No. | DTC Detection Condition | Trouble Area |
|---|---|---|
| P2714 | ECM detects malfunctions on SLT (ON side) according to the revolution difference between the turbine and the output shaft, and also by monitoring the oil pressure. (2 trip detection logic) | • Shift solenoid valve SLT remains open or closed<br>• Shift solenoid valve S1, S2, SR, SL1 or SL2 remains open or closed<br>• Valve body is blocked<br>• Automatic transmission (clutch, brake or gear, etc.) |

AT

## 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 outputs this DTC when the amount of heat absorption exceeds the specified value.
When the shift solenoid valve SLT remains on, the oil pressure goes down and the clutch engagement force decreases.
NOTE: If driving continues under these conditions, the clutch will burn out and the vehicle will no longer be drivable.

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P2714 : Shift solenoid valve SLT/ON malfunction |
| Required sensors/Components (Main) | Shift solenoid valve SLT |
| Required sensors/Components (Related) | Valve body, ATF temperature sensor, Speed sensor (NT), Speed sensor (SP2) |
| Frequency of operation | Continuous |
| Duration | Immediate |
| MIL operation | 2 driving cycles |
| Sequence of operation | None |

## TYPICAL ENABLING CONDITIONS

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | None |
| Turbine speed sensor (NT) circuit | No circuit malfunction |
| Output speed sensor (SP2) circuit | No circuit malfunction |
| Transmission fluid temperature sensor "A" circuit | No circuit malfunction |
| Shift solenoid "A" (S1) circuit | No circuit malfunction |
| Shift solenoid "B" (S2) circuit | No circuit malfunction |
| Shift solenoid "E" (SR) circuit | No circuit malfunction |
| Pressure control solenoid "A" (SL1) circuit | No circuit malfunction |
| Pressure control solenoid "B" (SL2) circuit | No circuit malfunction |
| Pressure control solenoid "D" (SLT) circuit | No circuit malfunction |
| ECT (Engine Coolant Temperature) sensor circuit | No circuit malfunction |
| Knock sensor circuit | No circuit malfunction |
| ETCS (Electronic Throttle Control System) | System not down |
| Transmission shift position | "D" |
| ECT | 40°C (104°F) or more |
| Spark advance from max. retard timing by knock sensor control | 0° CA or more |
| Engine | Starting |
| ATF temperature | 10°C (50°F) or more |

AT

## TYPICAL MALFUNCTION THRESHOLDS

| | |
|---|---|
| Summation of C1 clutch heat generations<br>= SUM (Turbine speed - Output speed x Temporary gear ratio) | Specified value |

## INSPECTION PROCEDURE

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (Controller Area Network Vehicle Interface Module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / SOLENOID (SLT)".
8. According to the display on the tester, perform the "ACTIVE TEST".

| Item | Test Details | Diagnostic Note |
|---|---|---|
| SOLENOID (SLT) * | [Test Details]<br>Operate the shift solenoid SLT to raise the line pressure.<br>[Vehicle Condition]<br>• Vehicle Stopped<br>• IDL: ON<br>[HINT]<br>OFF: Line pressure up (When the active test of "SOLENOID (SLT)" is performed the ECM commands the SLT solenoid to turn off).<br>ON: No action (normal operation) | - |

*: "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 (See page AT-18) as well.

HINT:

- The pressure values in ACTIVE TEST and HYDRAULIC TEST are different from each other.
- Normally, the line pressure detected in the ACTIVE TEST is approximately half of the value detected in the HYDRAULIC TEST's stall test.

**1 CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P2714)**

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

AT

**Result:**

| Display (DTC Output) | Proceed to |
|---|---|
| Only "P2714" is output | A |
| "P2714" and other DTCs | B |

HINT:
If any codes besides "P2714" are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART**

A

**2 PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SOLENOID (SLT)) (See page AT-84)**

NG → **Go to step 9**

OK

| 3 | PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT) |
|---|---|

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Turn the intelligent tester ON.
(d) Clear the DTC (See page AT-33).
(e) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
(f) Follow the instructions on the tester and perform the ACTIVE TEST.

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

| Item | Test Details | Diagnostic Note |
|---|---|---|
| SHIFT | [Test Details]<br>Operate the shift solenoid valve and set each shift position.<br>[Vehicle Condition]<br>• IDL: ON<br>• Less than 30 mph (50 km/h)<br>[Other information]<br>• Press "→" button: Shift up<br>• Press "←" button: Shift down | Possible to check the operation of the shift solenoid valves.<br>HINT:<br>Shifting to the 5th gear is possible only when the vehicle is stationary with the engine idling. |

HINT:
- This test can be conducted when the vehicle speed is 30 mph (50 km/h) 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 (SHIFT) display on the intelligent tester.

(g) Compare the ECM gear shift command and the actual gear position.

| ECM gear shift command | | | 1st | 2nd | 3rd | 4th | 5th | Proceed to |
|---|---|---|---|---|---|---|---|---|
| Actual gear position under malfunction | Shift solenoid S1 | Stuck ON | 1st | 2nd | 2nd | 1st | N*1 | A |
| | | Stuck OFF | 4th | 3rd | 3rd | 4th | 5th | |
| | Shift solenoid S2 | Stuck ON*2 | 2nd | 2nd | 3rd | 3rd | N*1 | B |
| | | Stuck OFF*3 | 1st | 1st | 4th | 4th | 5th | |
| | Shift solenoid SL2 | Stuck ON | 1st | 2nd | 3rd | 4th | N*1 | C |
| | | Stuck OFF | 1st | 2nd | 3rd | 4th | 5th | |
| | Shift solenoid SR | Stuck ON*4 | 1st | 2nd | 3rd | 4th | 5th | D |
| | | Stuck OFF*5 | 1st | 2nd | 3rd | 4th | 4th | |

HINT:
- *1: Neutral
- *2: When shift solenoid S2 is stuck ON, the vehicle cannot drive in reverse.

AT

- *3: When shift solenoid 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: Stuck ON condition can be determined by checking if shift shock has increased excessively.
- *5: When shift solenoid 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 rpm.

| | |
|---|---|
| B | Go to step 5 |
| C | Go to step 6 |
| D | Go to step 7 |
| OK | Go to step 9 |

A

| | |
|---|---|
| 4 | INSPECT SHIFT SOLENOID VALVE S1 (See page AT-114) |

| | |
|---|---|
| OK | Go to step 10 |

NG

REPLACE SHIFT SOLENOID VALVE S1

| | |
|---|---|
| 5 | INSPECT SHIFT SOLENOID VALVE S2 (See page AT-118) |

AT

| | |
|---|---|
| OK | Go to step 10 |

NG

REPLACE SHIFT SOLENOID VALVE S2

| | |
|---|---|
| 6 | INSPECT SHIFT SOLENOID VALVE SL2 (See page AT-104) |

| | |
|---|---|
| OK | Go to step 10 |

NG

REPLACE SHIFT SOLENOID VALVE SL2

| 7 | INSPECT SHIFT SOLENOID VALVE SR (See page AT-122) |
|---|---|

NG → REPLACE SHIFT SOLENOID VALVE SR

OK

| 8 | INSPECT SHIFT SOLENOID VALVE SL1 (See page AT-79) |
|---|---|

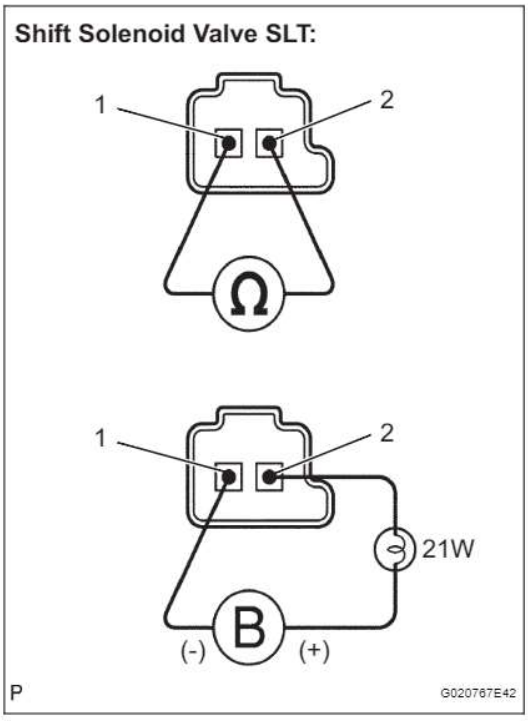
OK → Go to step 10

NG

REPLACE SHIFT SOLENOID VALVE SL1

| 9 | INSPECT SHIFT SOLENOID VALVE SLT |
|---|---|

Shift Solenoid Valve SLT:




(a) Remove the shift solenoid valve SLT.
(b) Measure the resistance.
**Standard resistance**

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

(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.
**OK:**
**The solenoid makes operating sounds.**

NG → REPLACE SHIFT SOLENOID VALVE SLT

OK

| 10 | INSPECT TRANSMISSION VALVE BODY ASSEMBLY (See chapter 2 in the problem symptoms table) |
|---|---|

**OK:**
**There are no foreign objects on any valves and they operate smoothly.**

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY

AT

OK

| 11 | INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY |
|---|---|

(a) Check the torque converter clutch assembly (See page AT-179).
**OK:**
**The torque converter clutch operates normally.**

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY

AT

| DTC | P2716 | Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT) |
|---|---|---|

## DESCRIPTION

Refer to DTC P2714 (See page AT-115).

| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| 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<br>• Shift solenoid valve SLT<br>• ECM |

## MONITOR DESCRIPTION

When an open or short is detected in the linear solenoid valve (SLT) circuit, the ECM interprets this as a fault.
The ECM turns on the MIL and stores the DTC.

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P2716: Shift solenoid valve SLT/Range check |
| Required sensors/Components | Shift solenoid valve SLT |
| Frequency of operation | Continuous |
| Duration | Condition (A) and (B): 1 second |
| MIL operation | Immediate |
| Sequence of operation | None |

## TYPICAL ENABLING CONDITIONS

The following conditions are common to Condition (A) and (B).

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | None |
| Ignition switch | ON |
| Starter | OFF |

AT

### Condition (A)

| | |
|---|---|
| Solenoid current cut status | Not cut |
| Battery voltage | 11 V or more |

### Condition (B)

| | |
|---|---|
| Battery voltage | 8 V or more |

## TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met: Condition (A) or (B)

### Condition (A)

| | |
|---|---|
| Solenoid status (SLT) from Hybrid IC | Fail |

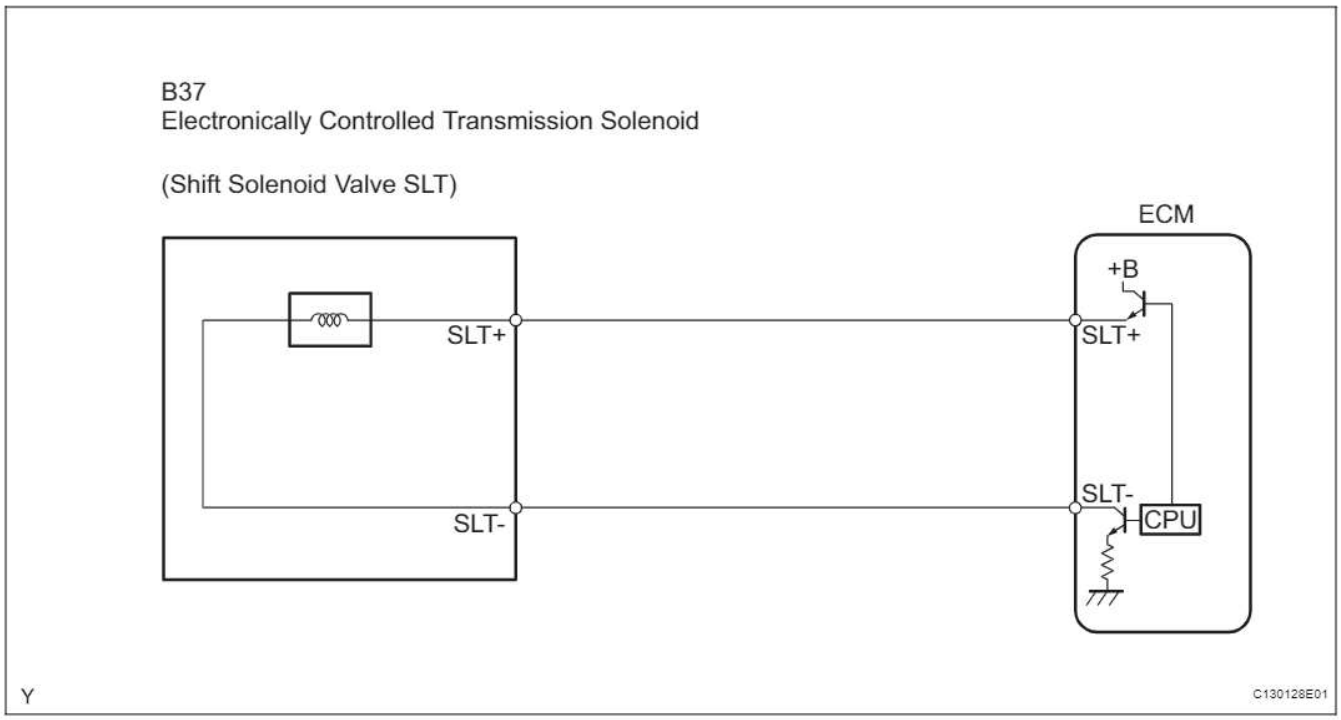
### Condition (B)

| | |
|---|---|
| Hybrid IC status | Fail |

## COMPONENT OPERATING RANGE

| | |
|---|---|
| Shift solenoid valve SLT | Resistance: 5.0 to 5.6 Ω at 20°C (68°F) |

## WIRING DIAGRAM

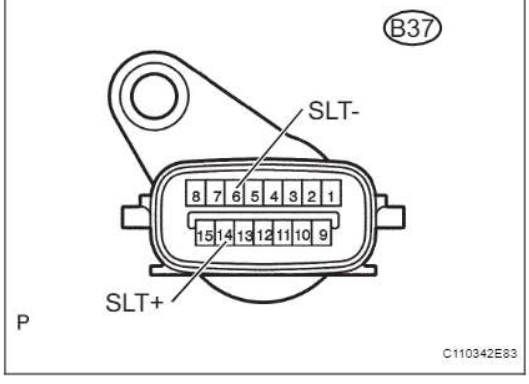



## INSPECTION PROCEDURE

| 1 | INSPECT TRANSMISSION WIRE (SLT) |
|---|---|

**Transmission Wire Side:**

**(Connector Front View):**




(a) Disconnect the transmission wire connector from the transmission.

(b) Measure the resistance.

**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| 14 (SLT+) - 6 (SLT-) | 5.0 to 5.6 Ω at 20°C (68°F) |

(c) Measure the resistance.

**Standard resistance (Check for short)**

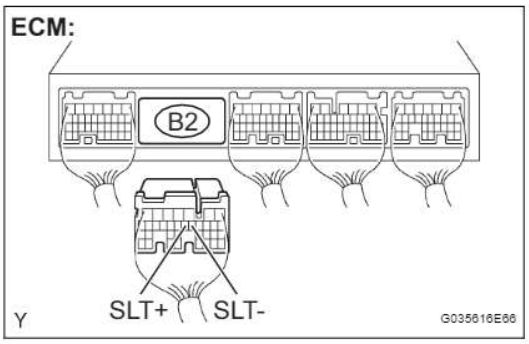
| Tester Connection | Specified Condition |
|---|---|
| 14 (SLT+) - Body ground | 10 kΩ or higher |
| 6 (SLT-) - Body ground | 10 kΩ or higher |

NG → Go to step 3

OK →

AT

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




(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| B2-13 (SLT+) - B2-12 (SLT-) | 5.0 to 5.6 Ω at 20°C (68°F) |

(d) Measure the resistance.
**Standard resistance (Check for short)**

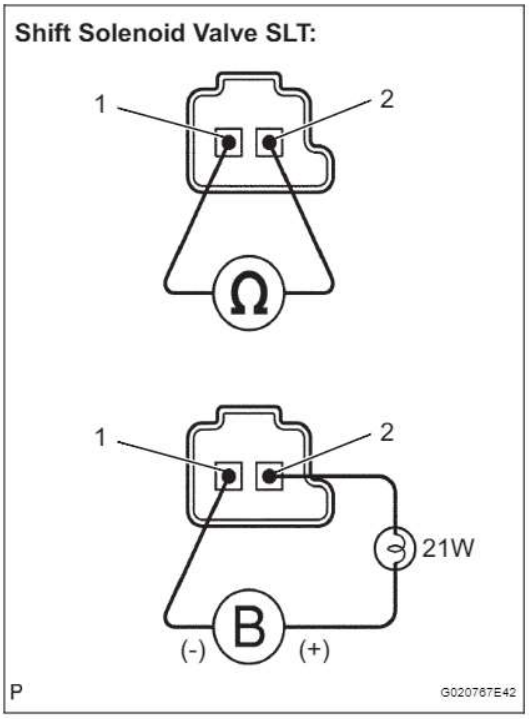
| Tester Connection | Specified Condition |
|---|---|
| B2-13 (SLT+) - Body ground | 10 kΩ or higher |
| B2-12 (SLT-) - Body ground | 10 kΩ or higher |

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM

| 3 | INSPECT SHIFT SOLENOID VALVE SLT |
|---|---|




(a) Remove the shift solenoid valve SLT.
(b) Measure the resistance.
**Standard resistance**

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

(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.
**OK:**
**The solenoid makes operating sounds.**

NG → REPLACE SHIFT SOLENOID VALVE SLT

AT

OK

REPAIR OR REPLACE TRANSMISSION WIRE

| DTC | P2740 | Transmission Fluid Temperature Sensor "B" Circuit |
|---|---|---|

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

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

## DESCRIPTION

The No. 2 Automatic Transmission Fluid (ATF) temperature sensor is on the transmission, just before the oil cooler inlet pipeline.
If the ECM detects an abnormally high ATF temperature through this sensor, it illuminates the warning light to indicate the problem to the driver.
HINT:

- The ATF temperature is liable to increase under vehicle conditions such as towing, climbing hills and in traffic.
- If there is a short malfunction in the No. 2 ATF temperature sensor, the ECM receives signals from the sensor, which indicate that the ATF temperature is 150°C (302°F) or more.

The symptoms and recovery conditions, when the sensor is normal or there is a short malfunction in the sensor, are as shown in the table below.

| No.2 ATF Temperature Sensor Status | 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) *2 |
| | • 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 continually<br>(a) ATF temperature more than130°C (266°F)<br>(b) Engine coolant temperature more than 95°C (203°F) | • Lock-up in 3rd gear *1 | • ATF temperature less than 110°C (230°F) *2 and engine coolant temperature less than 95°C (203°F) |
| Sensor is short | • Any conditions | • ATF temperature warning light remains on<br>• Shift point too high | • Symptoms still occur |
| | • Engine coolant temperature more than 95°C (203°F) | • Lock-up in 3rd gear *1 | • Symptom still occurs |

AT

HINT:
*1: When the ATF temperature is normal, the transmission locks up in 5th gear with the shift lever in the D position and in 4th gear with the shift lever in the 4th position.
*2: When the ATF temperature is in the normal range, it decreases to less than 135°C (275°F) within 5 minutes of the shift lever being moved to the P or N position, while idling.

| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| P2740 | Conditions (a) and (b) are detected momentarily within 0.5 seconds when neither P2742 nor P2743 is detected. (1-trip detection logic)<br>(a) No. 2 ATF temperature sensor resistance (voltage) is less than 25 Ω (0.046 V).<br>(b) No. 2 ATF temperature sensor resistance (voltage) is more than 156 kΩ (4.915 V).<br>HINT:<br>Within 0.5 seconds the malfunction changes from (a) to (b) or (b) to (a). | • Open or short in No.2 ATF temperature sensor circuit<br>• No.2 ATF temperature sensor<br>• ECM |

| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| P2742 | No. 2 ATF temperature sensor resistance (voltage) 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<br>• No.2 ATF temperature sensor<br>• ECM |
| P2743 | No. 2 ATF temperature sensor resistance (voltage) is more than 156 kΩ (4.915 V) for 0.5 seconds or more 15 minutes or more after starting engine (1-tip detection logic) | • Open in No.2 ATF temperature sensor circuit<br>• No.2 ATF temperature sensor<br>• ECM |

## MONITOR DESCRIPTION

These DTCs indicate an open or short in the No. 2 Automatic Transmission Fluid (ATF) temperature sensor circuit. The No. 2 ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and detects any open or short malfunctions in the No. 2 ATF temperature sensor circuit. If the resistance (voltage) of the No. 2 ATF temperature sensor is less than 25 Ω (0.046 V) or more than 156 kΩ (4.915 V), the ECM interprets this as a fault in the No. 2 ATF temperature sensor or its wiring. The ECM turns on the MIL and stores a DTC.

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P2740 : No. 2 ATF temperature sensor/Range check (Fluttering)<br>P2742 : No. 2 ATF temperature sensor/Range check (Low voltage)<br>P2743 : No. 2 ATF temperature sensor/Range check (High voltage) |
| Required sensors/Components | No. 2 ATF temperature sensor |
| Frequency of operation | Continuous |
| Duration | 0.5 seconds |
| MIL operation | Immediate |
| Sequence of operation | None |

## TYPICAL ENABLING CONDITIONS

### P2740: Range check (Fluttering)

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | None |
| The typical enabling condition is not available. | - |

### P2742: Range check (Low voltage)

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | None |
| The typical enabling condition is not available. | - |

### P2743: Range check (High voltage)

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | None |
| Time after engine start | 15 minutes or more |

## TYPICAL MALFUNCTION THRESHOLDS

### P2740: Range check (Fluttering)

| | |
|---|---|
| No. 2 ATF temperature sensor voltage | Less than 0.046 V<br>or<br>More than 4.915 V |

### P2742: Range check (Low voltage)

| | |
|---|---|
| No. 2 ATF temperature sensor voltage | Less than 0.046 V |

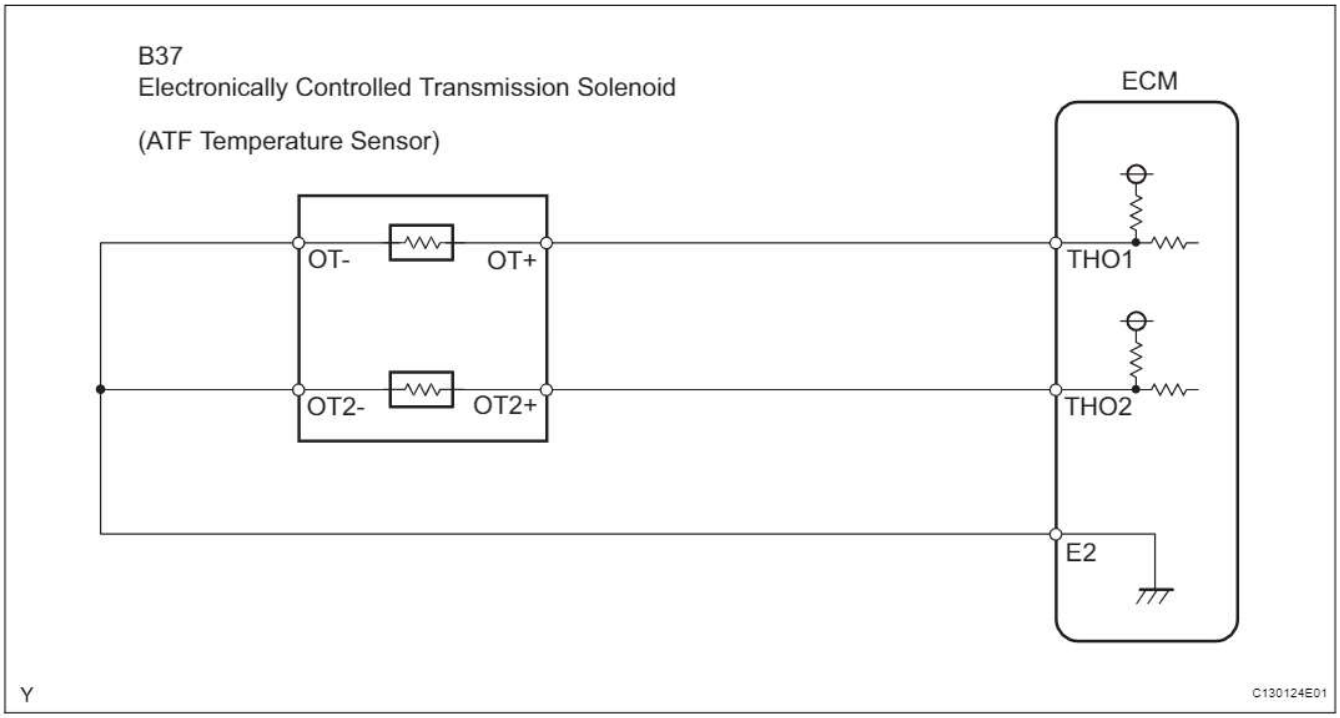
### P2743: Range check (High voltage)

| | |
|---|---|
| No. 2 ATF temperature sensor voltage | More than 4.915 V |

## COMPONENT OPERATING RANGE

| | |
|---|---|
| ATF temperature sensor | Atmospheric temperature up to approximately 130°C (266°F) |

## WIRING DIAGRAM




## INSPECTION PROCEDURE

HINT:

According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors, actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.

AT

**NOTICE:**

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

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (Controller Area Network Vehicle Interface Module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Select the items "DIAGNOSIS / ENHANCED OBD II / DATA LIST" / A/T.
7. According to the display on the tester, read the "DATA LIST".

| Item | Measurement Item/ Range (display) | Normal Condition |
|---|---|---|
| AT OIL TEMP2 | No. 2 ATF Temperature Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F) | • After Stall Test: Approximately 80°C (176°F)<br>• Equal to ambient temperature during cold soak |

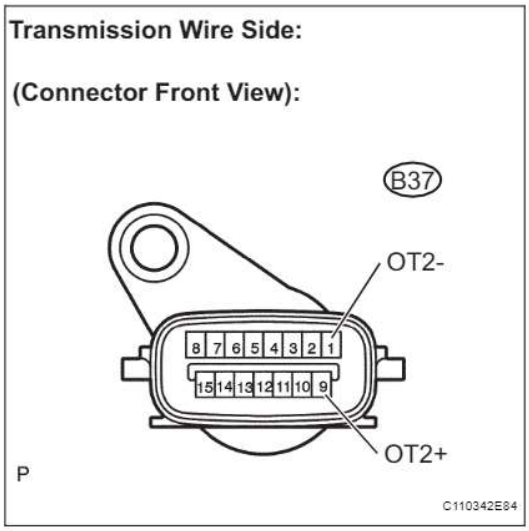
HINT:

When DTC P2742 is output and intelligent tester reading is 150°C (302°F) or more, there is a short circuit.
When DTC P2743 is output and intelligent tester reading 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 TRANSMISSION WIRE (NO.2 ATF TEMPERATURE SENSOR)




(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| 1 (OT2-) - 9 (OT2+) | 79 Ω to 156 kΩ |

(c) Measure the resistance.
**Standard resistance (Check for short)**

| Tester Connection | Specified Condition |
|---|---|
| 1 (OT2-) - Body ground | 10 kΩ or higher |
| 9 (OT2+) - Body ground | 10 kΩ or higher |

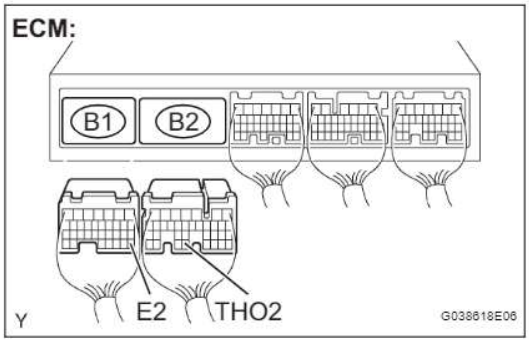
HINT:
If the resistance is outside the specified range at either of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

| ATF Temperature | Specified Condition |
|---|---|
| 20°C (68°F) | 3 to 5 kΩ |
| 110°C (230°F) | 0.22 to 0.28 kΩ |

NG → REPAIR OR REPLACE TRANSMISSION WIRE

OK

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




(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connectors.
(c) Measure the resistance.
**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| B2-32 (THO2) - B1-28 (E2) | 79 Ω to 156 kΩ |

(d) Measure the resistance.
**Standard resistance (Check for short)**

| Tester Connection | Specified Condition |
|---|---|
| B2-32 (THO2) - Body ground | 10 kΩ or higher |
| B1-28 (E2) - Body ground | 10 kΩ or higher |

AT

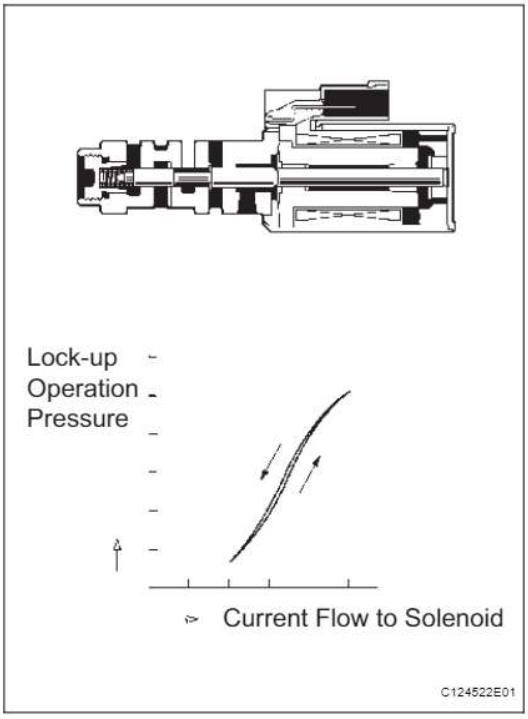
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM

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

## DESCRIPTION




The ECM uses the signals from the throttle position sensor, mass 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 any mechanical problems with the shift solenoid valve SLU, valve body or torque converter clutch.

AT

| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| P2757 | Lock-up does not occur when driving in the lock-up range (normal driving at 50 mph [80 km/h]), or lock-up remains ON in the lock-up OFF range.<br>(2-trip detection logic) | • Shift solenoid valve SLU remains open or closed<br>• Valve body is blocked<br>• Shift solenoid valve SLU<br>• Torque converter clutch<br>• Automatic transmission (clutch, brake or gear, etc.)<br>• Line pressure is too low |

## MONITOR DESCRIPTION

Torque converter lock-up is controlled by the ECM based on turbine (input) speed sensor NT, output speed sensor SP2, the engine rpm, engine load, engine coolant temperature, vehicle speed, transmission fluid temperature, and gear selection. The ECM determines the lock-up status of the torque converter by comparing the engine rpm (NE) with the input turbine rpm (NT). The ECM calculates the actual transmission gear by comparing the input turbine rpm (NT) with the output shaft rpm (SP2). When the conditions are appropriate, the ECM requests "lock-up" by applying the control voltage to the shift solenoid SLU. When the SLU is turned on, solenoid SLU 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 turns on the MIL and stores the DTC.

Example:
When either of the following is met, the ECM interprets it as a malfunction.
1. There is a difference in rotation between before and after the torque converter even when the ECM requests lock-up.
   (Engine speed is at least 70 rpm greater than the input turbine speed.)
2. There is no difference in rotation between before and after the torque converter even when the ECM requests lock-up off.
   (The difference between the engine speed and input turbine speed is less than 35 rpm.)

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P2757:<br>Shift solenoid valve SLU/OFF malfunction<br>Shift solenoid valve SLU/ON malfunction |
| Required sensors/Components (Main) | Shift solenoid valve SLU |
| Required sensors/Components (Related) | Valve body, Vehicle speed sensor, Throttle position sensor, Speed sensor (NT), Speed sensor (SP2) |
| Frequency of operation | Continuous |
| Duration | OFF malfunction (A):<br>2 seconds<br>OFF malfunction (B):<br>0.4 seconds<br>ON malfunction:<br>1.8 seconds |
| MIL operation | 2 driving cycles |
| Sequence of operation | None |

## TYPICAL ENABLING CONDITIONS

The following conditions are common to all OFF malfunctions (A), (B) and ON malfunction.

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | None |
| Turbine speed sensor (NT) circuit | No circuit malfunction |
| Output speed sensor (SP2) circuit | No circuit malfunction |
| Shift solenoid "A" (S1) circuit | No circuit malfunction |
| Shift solenoid "B" (S2) circuit | No circuit malfunction |
| Shift solenoid "E" (SR) circuit | No circuit malfunction |
| Torque converter clutch pressure control solenoid circuit | No circuit malfunction |
| Knock sensor circuit | No circuit malfunction |
| ETCS (Electronic Throttle Control System) | System not down |
| Transmission shift position | "D" |
| ECT (Engine Coolant Temperature) | 40°C (104°F) or more |
| Spark advance from max. retard timing by knock sensor control | 0° CA or more |
| Engine | Starting |
| ECM selected gear | 4th or 5th |
| Vehicle speed | 15.5 mph (25 km/h) or more |
| Shift solenoid "A" (S1) circuit | No circuit malfunction |
| Shift solenoid "B" (S2) circuit | No circuit malfunction |
| Pressure control solenoid "B" (SL2) circuit | No circuit malfunction |
| 1-2 shift valve | No circuit malfunction |
| Transfer neutral position switch | OFF |

### OFF malfunction (A)

| | |
|---|---|
| ECM lock-up command | ON<br>(SLU pressure: 513 kPa or more) |
| Vehicle speed | Less than 62.2 mph (100 km/h) |

**OFF malfunction (B)**

| | |
|---|---|
| ECM selected gear | 2nd |
| Vehicle speed | 1.2 mph (2 km/h) or more |
| Output speed | 2nd → 1st down shift point or more |
| Throttle valve opening angle | 6.5 % or more at engine speed of 2,000 rpm<br>(Conditions vary with engine speed) |

**ON malfunction**

| | |
|---|---|
| ECM lock-up command | OFF<br>(SLU pressure: less than 4 kPa) |
| Throttle valve opening angle | 7 % or more |
| Vehicle speed | 4th gear: Less than 37.3 mph (60 km/h)<br>(Conditions vary with gear position) |

## TYPICAL MALFUNCTION THRESHOLDS

Both of the following conditions are met: OFF malfunction (A) and (B)

**OFF malfunction (A)**

| | |
|---|---|
| Engine speed - Turbine speed | 70 rpm or more |

**OFF malfunction (B)**

| | |
|---|---|
| Turbine speed/Output speed | Not<br>3.30 to 7.50 |

[ON malfunction]
2 detections are necessary in 1 driving cycle.
1st detection; temporary flag ON
2nd detection; pending fault code ON
Vehicle speed must be under 6.2 mph (10 km/h) once before the 2nd detection.

**ON malfunction**

| | |
|---|---|
| Difference between engine speed and turbine speed | Less than 35 rpm |

## INSPECTION PROCEDURE

AT

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as, the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (Controller Area Network Vehicle Interface Module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / LOCK UP".
8. According to the display on the tester, perform the "ACTIVE TEST".

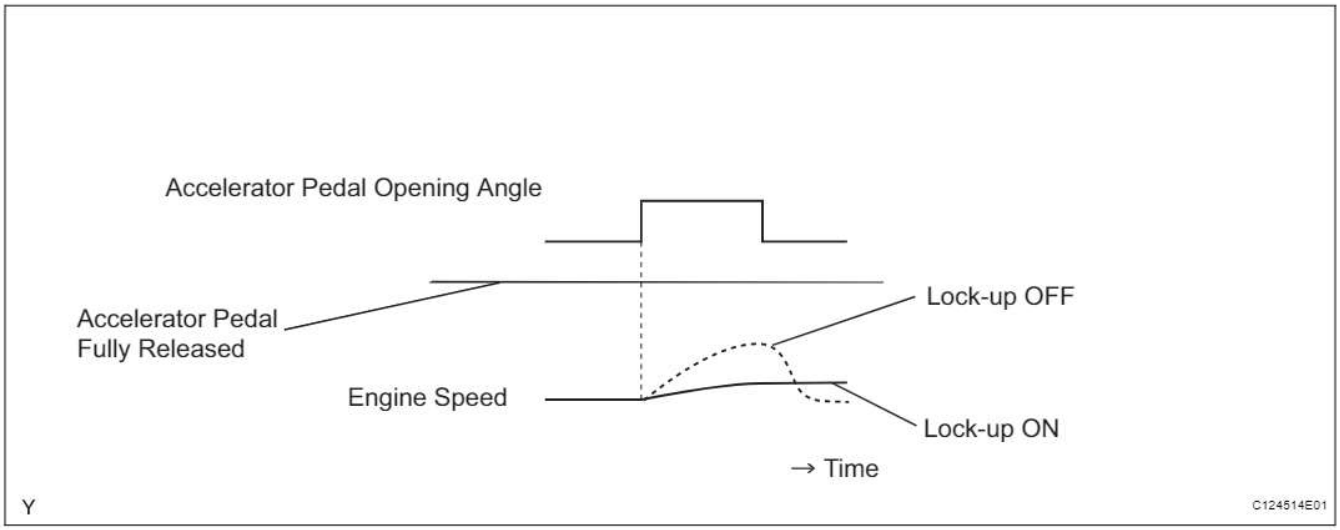
| Item | Test Details | Diagnostic Note |
|---|---|---|
| LOCK UP | [Test Details]<br>Control the shift solenoid SLU to set the automatic transmission to the lock-up condition.<br>[Vehicle Condition]<br>Vehicle Speed: 36 mph (60 km/h) or more | Possible to check the SLU operation. |

HINT:
This test can be conducted when the vehicle speed is 36 mph (60 km/h) or more.

9. 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, but not fully, the accelerator pedal in order to decelerate. (Fully releasing the pedal causes closure of the throttle valve and lock-up may be turned off automatically.)




| 1 | CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P2757) |
|---|---|

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

AT

**Result:**

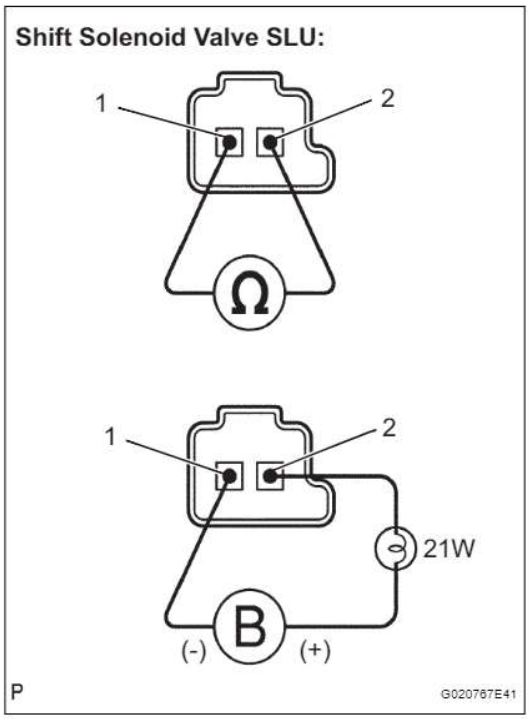
| Display (DTC Output) | Proceed to |
|---|---|
| Only "P2757" is output | A |
| P2757" and other DTCs | B |

HINT:
If any codes besides "P2757" are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART

A

| 2 | INSPECT SHIFT SOLENOID VALVE SLU |
|---|---|




(a) Remove the shift solenoid valve SLU.
(b) Measure the resistance.
**Standard resistance**

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

(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.
**OK:**
**The solenoid makes operating sounds.**

NG → **REPLACE SHIFT SOLENOID VALVE SLU**

OK

| 3 | INSPECT TRANSMISSION VALVE BODY ASSEMBLY (See chapter 2 in the problem symptoms table) |
|---|---|

**OK:**
**There are no foreign objects on any valves and they operate smoothly.**

NG → **REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY**

OK

| 4 | INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY |
|---|---|

(a) Inspect the torque converter clutch assembly (See page AT-179).
**OK:**
**The torque converter clutch operates normally.**

NG → **REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY**

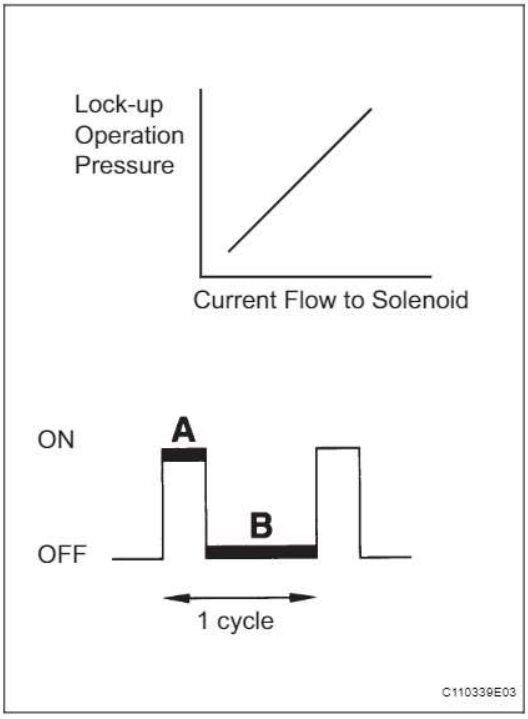
OK

**REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY**

AT

| DTC | P2759 | Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU) |
|---|---|---|

## DESCRIPTION




The current flow to the solenoid is controlled by the duty ratio* of the ECM output signal. The higher the duty ratio becomes, the higher the lock-up hydraulic pressure becomes during the lock-up operation.
*: The duty ratio is the ratio of the continuity to non-continuity in one cycle.
For example, if A is the period of continuity in one cycle, and B is the period of non-continuity, then Duty Ratio = A/(A+B) x 100(%).

AT

| DTC No. | DTC Detection Conditions | Trouble Areas |
|---|---|---|
| P2759 | Open or short is detected in 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<br>• Shift solenoid valve SLU<br>• ECM |

## MONITOR DESCRIPTION

When an open or short is detected in the shift solenoid valve (SLU) circuit, the ECM determines that there is a malfunction. The ECM turns on the MIL and stores this DTC.

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P2759: Shift solenoid valve SLU/Range check |
| Required sensors/Components | Shift solenoid valve SLU |
| Frequency of operation | Continuous |
| Duration | Condition (A) and (B): 1 second |
| MIL operation | Immediate |
| Sequence of operation | None |

## TYPICAL ENABLING CONDITIONS

The following conditions are common to Condition (A) and (B).

| | |
|---|---|
| The monitor will run whenever the following DTCs are not present. | None |
| Ignition switch | ON |
| Starter | OFF |

### Condition (A)

| | |
|---|---|
| Solenoid current cut status | Not cut |
| Battery voltage | 11 V or more |

### Condition (B)

| | |
|---|---|
| Battery voltage | 8 V or more |

## TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met: Condition (A) or (B)

### Condition (A)

| | |
|---|---|
| Solenoid status (SLU) from Hybrid IC | Fail |

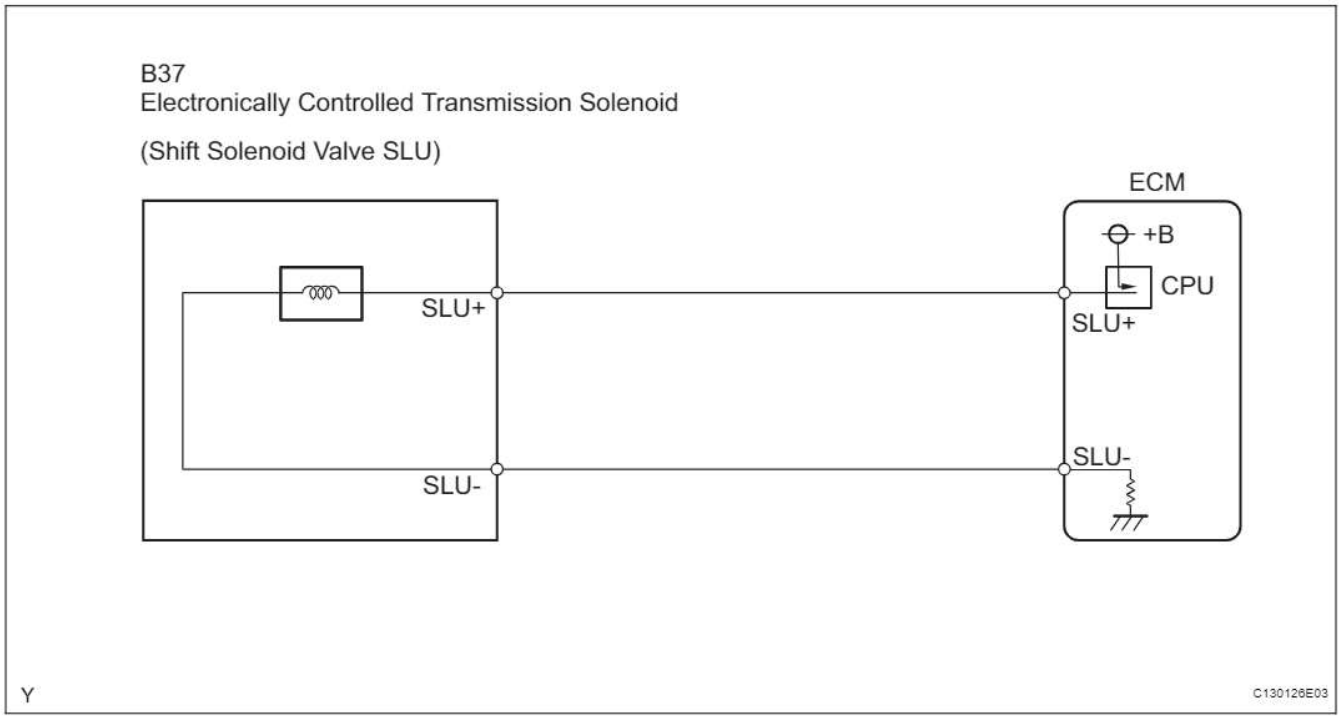
### Condition (B)

| | |
|---|---|
| Hybrid IC status | Fail |

## COMPONENT OPERATING RANGE

| | |
|---|---|
| Shift solenoid valve SLU | Resistance: 5.0 to 5.6 Ω at 20°C (68°F) |

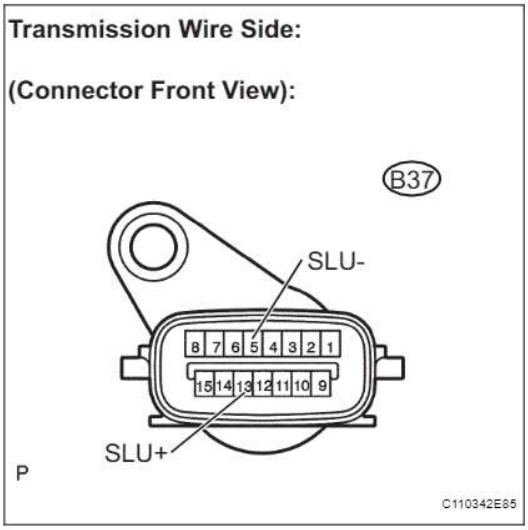
## WIRING DIAGRAM




AT

## INSPECTION PROCEDURE

### 1 INSPECT TRANSMISSION WIRE (SLU)




(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| 13 (SLU+) - 5 (SLU-) | 5.0 to 5.6 Ω at 20°C (68°F) |

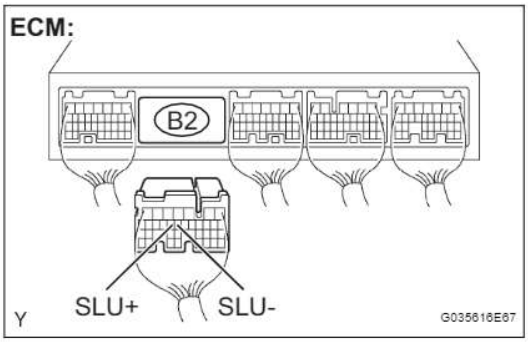
(c) Measure the resistance.
**Standard resistance (Check for short)**

| Tester Connection | Specified Condition |
|---|---|
| 13 (SLU+) - Body ground | 10 kΩ or higher |
| 5 (SLU-) - Body ground | 10 kΩ or higher |

NG → Go to step 3

OK

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




(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| B2-15 (SLU+) - B2-14 (SLU-) | 5.0 to 5.6 Ω at 20°C (68°F) |

(d) Measure the resistance.
**Standard resistance (Check for short)**

| Tester Connection | Specified Condition |
|---|---|
| B2-15 (SLU+) - Body ground | 10 kΩ or higher |
| B2-14 (SLU-) - Body ground | 10 kΩ or higher |

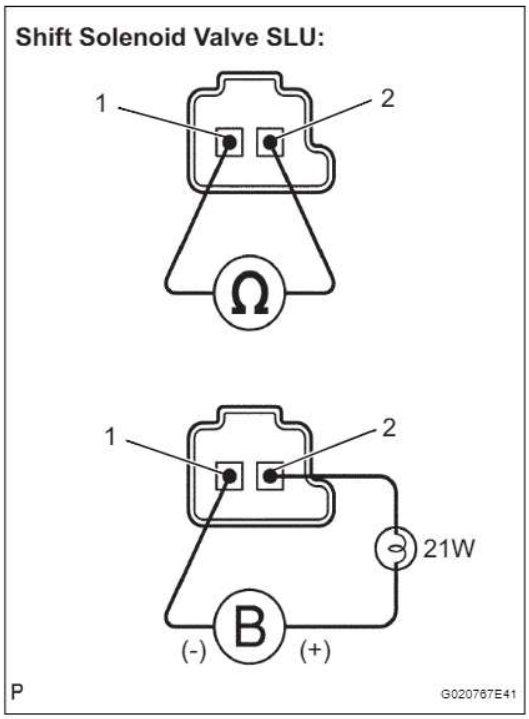
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM

AT

| 3 | INSPECT SHIFT SOLENOID VALVE SLU |
|---|---|




(a) Remove the shift solenoid valve SLU.
(b) Measure the resistance.
**Standard resistance**

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

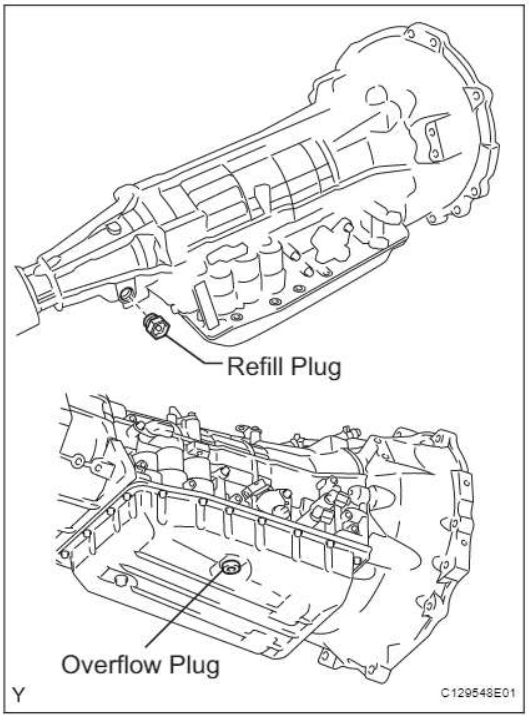
(c) Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.
**OK:**
**The solenoid makes operating sounds.**

NG → **REPLACE SHIFT SOLENOID VALVE SLU**

OK →

**REPAIR OR REPLACE TRANSMISSION WIRE**

AT




# AUTOMATIC TRANSMISSION FLUID

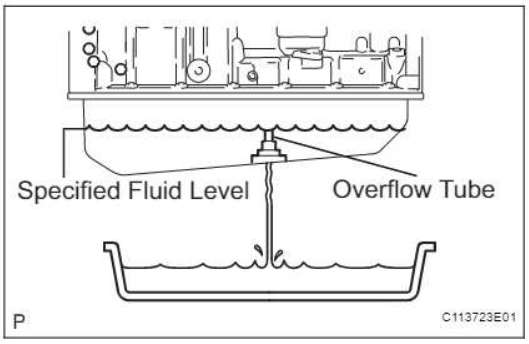
## ADJUSTMENT

### 1. BEFORE REFILL 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.
- Maintain the vehicle in a horizontal position while adjusting the fluid level.
- If the transmission pan, drain plug, valve body or torque converter is replaced, proceed to the "transmission pan fill" procedures.
- If the transmission hose or output shaft oil seal is replaced, remove the refill plug and proceed to the "transmission fill" procedures.
- If the entire transmission is replaced, proceed to the "fluid circulation" procedures.

  HINT:

  New transmissions are already filled with transmission fluid.




### 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.

(b) Reinstall the refill plug to prevent the fuel from splashing.

**Standard capacity**

| Repair | Fill Amount |
|---|---|
| Transmission hose and pipe removal | 0.6 liters (0.63 US qts, 0.53 Imp.qts) |
| Output shaft oil seal replacement | 0.4 liters (0.42 US qts, 0.35 Imp.qts) |
| Transmission pan and drain plug removal | 1.7 liters (1.8 US qts, 1.5 Imp.qts) |
| Transmission valve body removal | 4.3 liters (4.54 US qts, 3.78 Imp.qts) |
| Torque converter removal | 5.4 liters (5.71 US qts, 4.75 Imp.qts) |

HINT:

If the amount of fluid listed in the table cannot be added, perform the next step.

(c) When the amount of fluid listed in table cannot be added:

(1) Install the refill plug.

(2) Allow the engine to idle with the air conditioning OFF.

(3) Move the shift lever through the entire gear range to circulate fluid.

(4) Wait for 30 seconds with the engine idling.

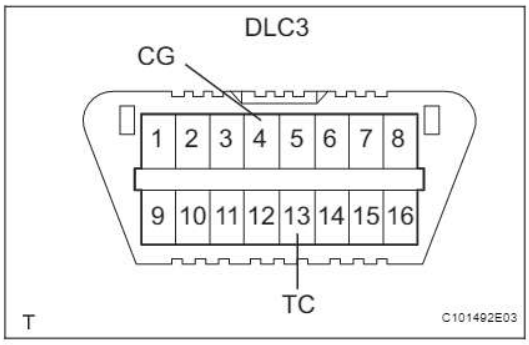
AT

(5) Stop the engine.
(6) Remove the refill plug and add fluid.
(7) Reinstall the refill plug.

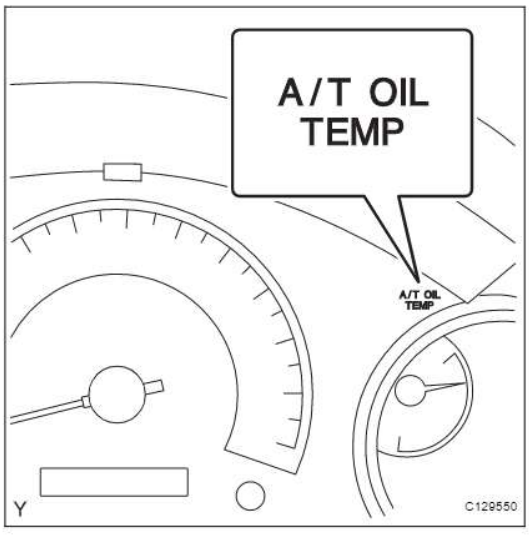
**4. FLUID CIRCULATION**

(a) Allow the engine to idle with the air conditioning OFF.
(b) Move the shift lever through the entire gear range to circulate fluid.
(c) Allow the engine to idle until the fluid temperature reaches 46°C (115°F). Proceed to the step to the next to check fluid temperature.
HINT:
The fluid temperature should be less than 30°C (86°F) before starting the engine.

**5. FLUID TEMPERATURE CHECK**

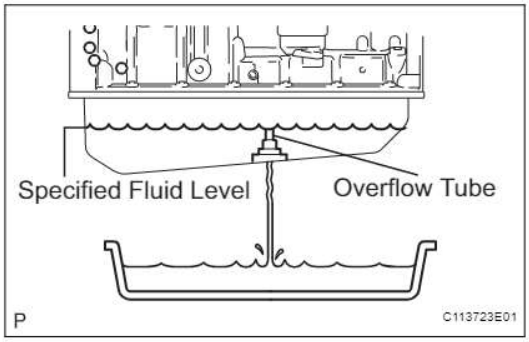



(a) Using SST, connect terminals TC and CG of the DLC3.
**SST 09843-18040**
(b) Move the shift lever back and forth between N and D at 1.5 second intervals for 6 seconds.




(c) The A/T OIL TEMP indicator turns on for 2 seconds when the combination meter starts to detect the fluid temperature.
(d) The A/T OIL TEMP indicator turns on again when the fluid temperature reaches 46°C (115°F) and blinks when it exceeds 56°C (130°F).

AT




**6. FLUID LEVEL CHECK**

**NOTICE:**

- **The fluid temperature must be between 46°C (115°F) and 56°C (130°F) to check the fluid level.**
- **Do not insert the fill nozzle into the refill hole more than 30 mm (1.2 in.), to avoid contact with the moving parts.**

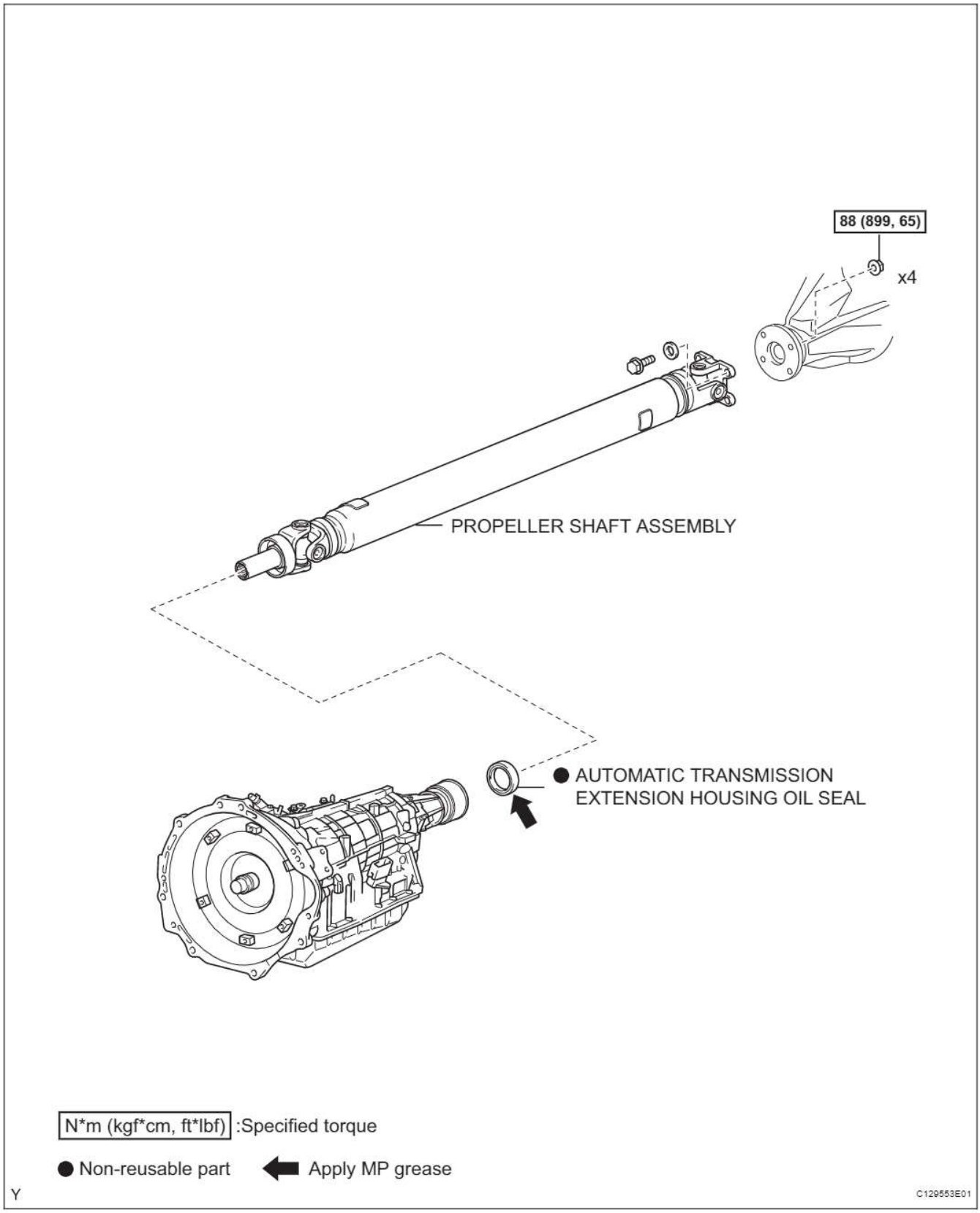
(a) Remove the overflow plug with the engine idling.
(b) Check that the fluid comes out of the overflow tube.
(c) Wait until the overflow slows to a trickle.
If fluid does not come out, perform the following.
(1) Install the overflow plug.

(2) Stop the engine.
(3) Remove the refill plug.
(4) Add 0.4 liters (0.21 US qts, 0.18 Imp qts) of fluid.
(5) Allow the engine to idle.
(6) Remove the overflow plug.
(7) Wait until fluid begins to trickle out of the overflow tube.

AT

# EXTENSION HOUSING REAR OIL SEAL

## COMPONENTS

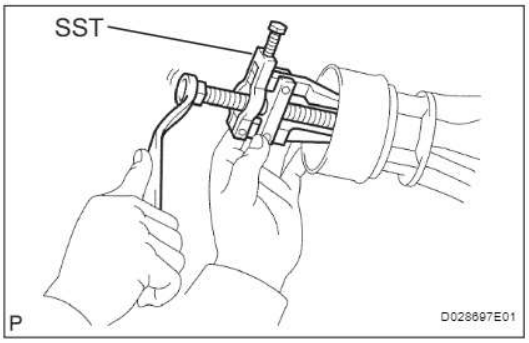



AT

# REMOVAL

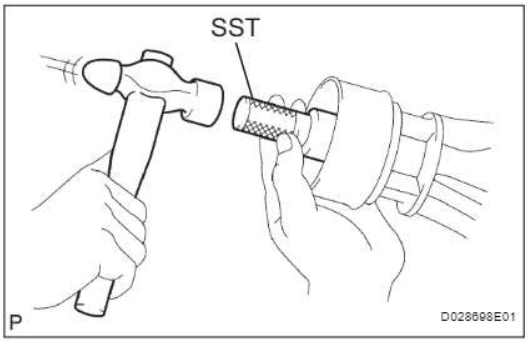
1. **REMOVE PROPELLER SHAFT ASSEMBLY (See page PR-9)**

2. **DRAIN AUTOMATIC TRANSMISSION FLUID**
   (a) Remove the drain plug and gasket, and drain ATF.
   (b) Install a new gasket and the drain plug.
   **Torque: 28 N*m (285 kgf*cm, 21 ft.*lbf)**




3. **REMOVE AUTOMATIC TRANSMISSION EXTENSION HOUSING OIL SEAL**
   (a) Using SST, remove the oil seal.
   **SST 09308-00010**

# INSTALLATION




1. **INSTALL AUTOMATIC TRANSMISSION EXTENSION HOUSING OIL SEAL**
   (a) Coat the lip of the oil seal with MP grease.
   (b) Using SST and a hammer, carefully tap in a new oil seal in as far as possible.
   **SST 09325-40010**
   **Oil seal depth from flat end:**
   **5.4 to 5.8 mm (0.213 to 0.228 in.)**

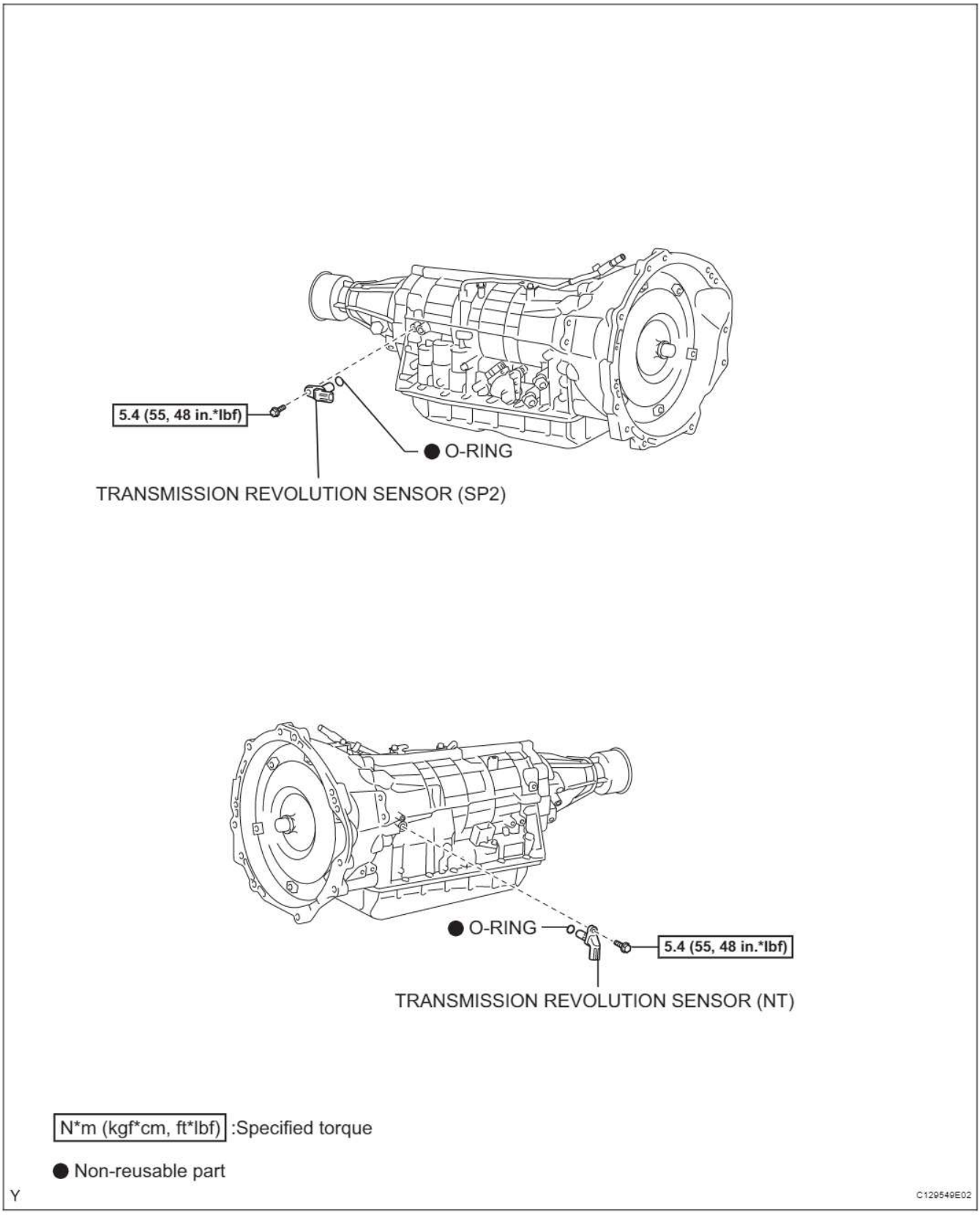
2. **INSTALL PROPELLER SHAFT ASSEMBLY (See page PR-14)**

3. **ADJUST AUTOMATIC TRANSMISSION FLUID**
   (See page AT-140)

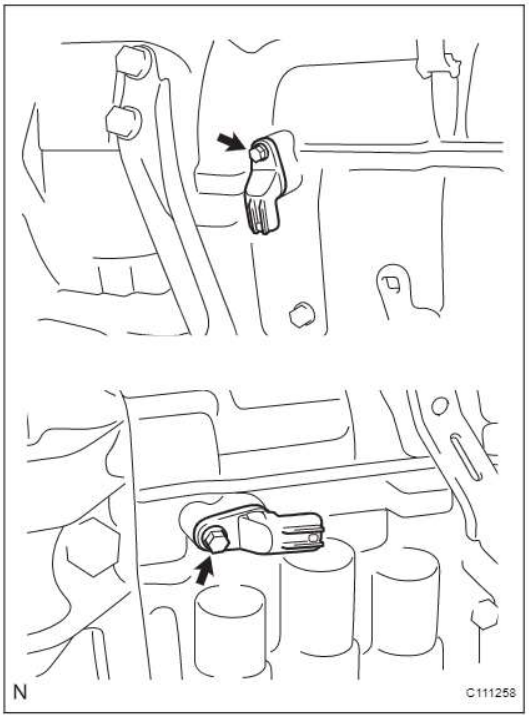
AT

# SPEED SENSOR

## COMPONENTS




AT



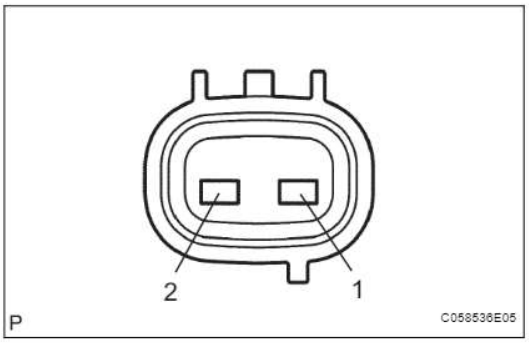

# REMOVAL

**1. REMOVE TRANSMISSION REVOLUTION SENSOR**

(a) Disconnect the 2 sensor connectors.

(b) Remove the 2 bolts and transmission revolution sensors.

(c) Remove the O-ring from each sensor.



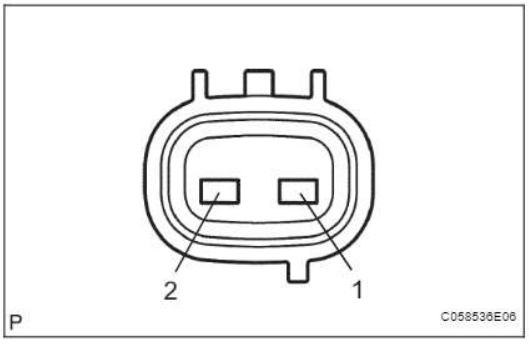

# INSPECTION

**1. INSPECT TRANSMISSION REVOLUTION SENSOR (NT)**

(a) Measure the resistance of the sensor.

**Standard resistance**

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

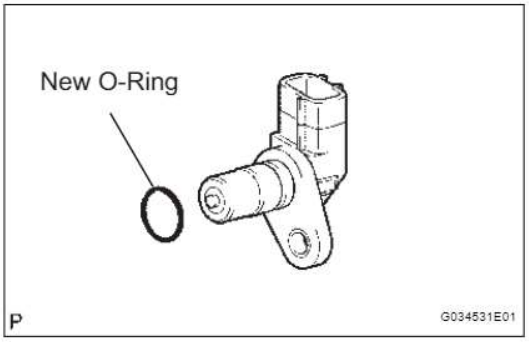



**2. INSPECT TRANSMISSION REVOLUTION SENSOR (SP2)**

(a) Measure the resistance of the sensor.

**Standard resistance**

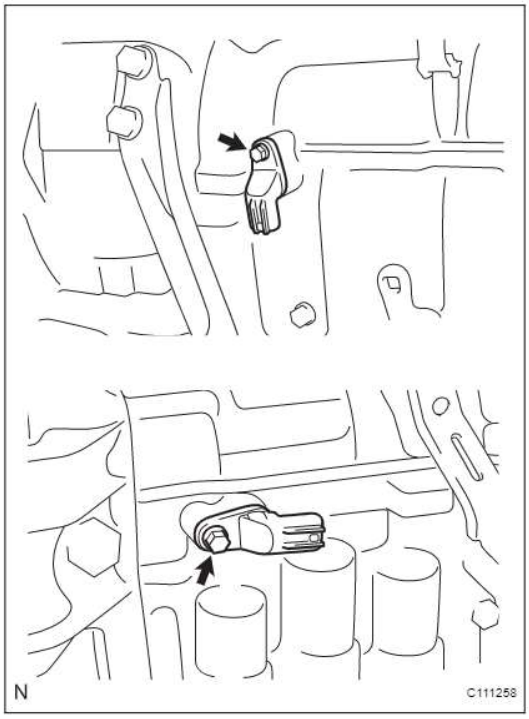
| Tester Connection | Condition | Specified Condition |
|---|---|---|
| 1 - 2 | 20°C (68°F) | 560 to 680 Ω |




# INSTALLATION

**1. INSTALL TRANSMISSION REVOLUTION SENSOR**

(a) Coat 2 new O-rings with ATF and install one onto each transmission revolution sensor.

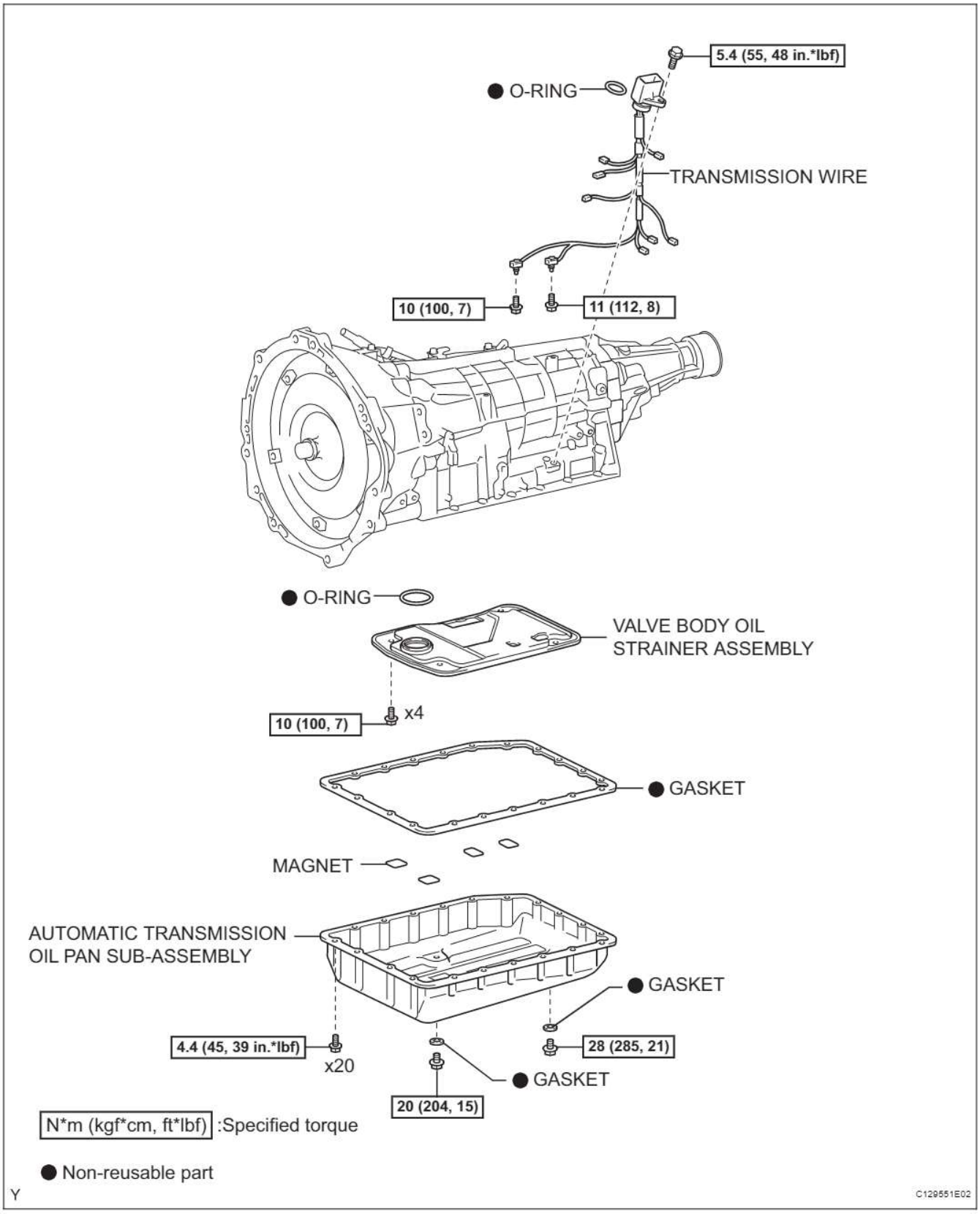



(b) Install the 2 transmission revolution sensors with the 2 bolts.
**Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)**
(c) Connect the 2 sensor connectors.

AT

# TRANSMISSION WIRE

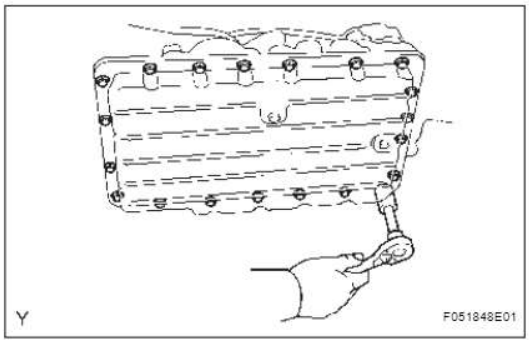
## COMPONENTS



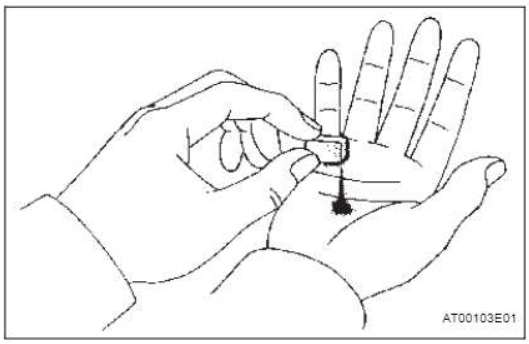
# REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

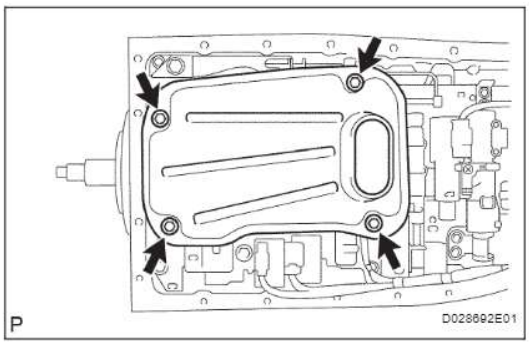
2. **DRAIN AUTOMATIC TRANSMISSION FLUID**
   (a) Remove the drain plug and gasket, and drain ATF.
   (b) Install a new gasket and the drain plug.
   **Torque: 28 N*m (285 kgf*cm, 21 ft.*lbf)**




3. **REMOVE AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY**
   **NOTICE:**
   **Some fluid will remain in the oil pan.**
   (a) Remove the 20 bolts and the oil pan.

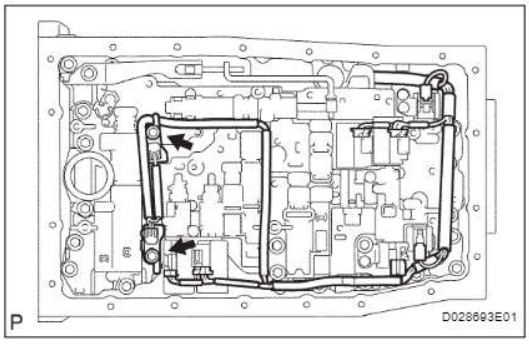



   (b) Examine the particles in the pan.
      (1) Remove the magnets and use them to collect steel particles. Carefully inspect the foreign matter and particles in the pan and on the magnets to anticipate the type of wear you will find in the transmission.
      Steel (magnetic): bearing, gear and clutch plate wear
      Brass (non-magnetic): bushing wear

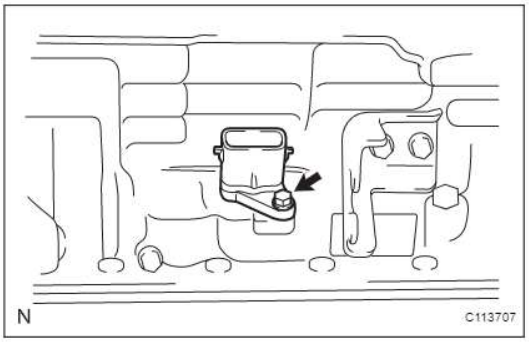



4. **REMOVE VALVE BODY OIL STRAINER ASSEMBLY**
   (a) Remove the 4 bolts and the oil strainer.
   **NOTICE:**
   **Be careful as some fluid will come out of the oil strainer.**

AT



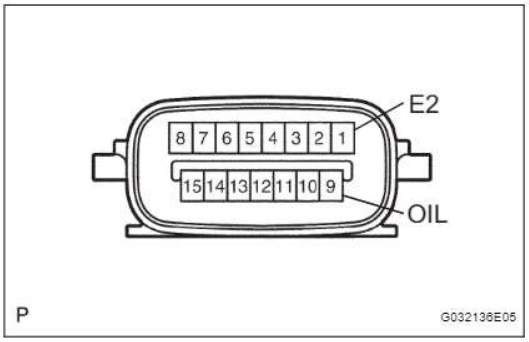

5. **SEPARATE TRANSMISSION WIRE**
   (a) Remove the 2 bolts and 2 clamps.
   (b) Disconnect the ATF temperature sensor.
   (c) Disconnect the 7 connectors from the solenoid valves.




**6. REMOVE TRANSMISSION WIRE**

(a) Disconnect the transmission wire connector.

(b) Remove the bolt and pull out the transmission wire.



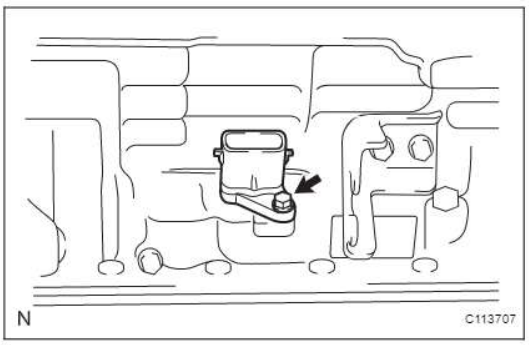

# INSPECTION

**1. INSPECT TRANSMISSION WIRE**

(a) Using an ohmmeter, measure the resistance between the terminals.

**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| 1 (E2) - 9 (OIL) | 3 to 4 kΩ at 20 °C (68°F) |
| 1 (E2) - 9 (OIL) | 0.22 to 0.28 kΩ at 110°C (230°F) |




# INSTALLATION

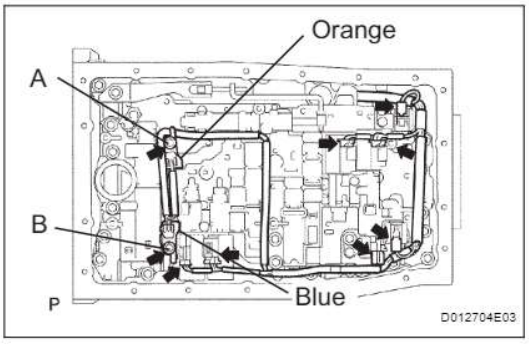
**1. INSTALL TRANSMISSION WIRE**

(a) Install the transmission wire with the bolt.

**Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)**

(b) Connect the transmission wire connector.

AT




**2. CONNECT TRANSMISSION WIRE**

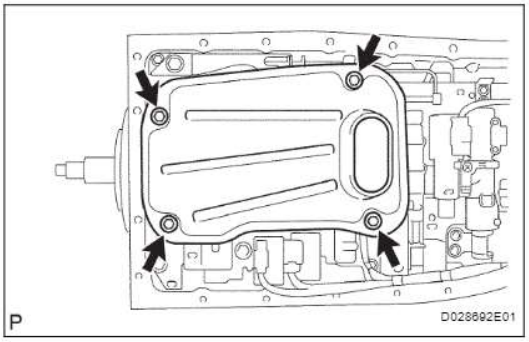
(a) Connect the 7 connectors to the solenoid valves.

(b) Install the 2 clamps with the 2 bolts.

**Torque: 10 N*m (100 kgf*cm, 7 ft.*lbf) for bolt A**
**11 N*m (112 kgf*cm, 8 ft.*lbf) for bolt B**

**Bolt length:**
**12 mm (0.47 in.) for bolt A**
**36 mm (1.42 in.) for bolt B**

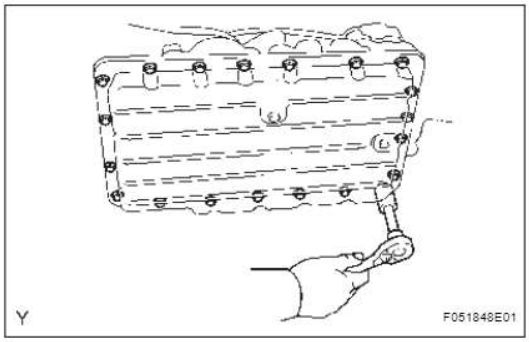
(c) Connect the ATF temperature sensor.




**3. INSTALL VALVE BODY OIL STRAINER ASSEMBLY**

(a) Install a new O-ring and oil strainer with the 4 bolts.

**Torque: 10 N*m (100 kgf*cm, 7 ft.*lbf)**




4. **INSTALL AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY**
HINT:
Remove the gasket and be careful not to spill oil on the contacting surfaces of the transmission case and oil pan.
(a) Install the oil pan with the 20 bolts.
**Torque: 4.4 N*m (45 kgf*cm, 39 in.*lbf)**

5. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
**Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)**

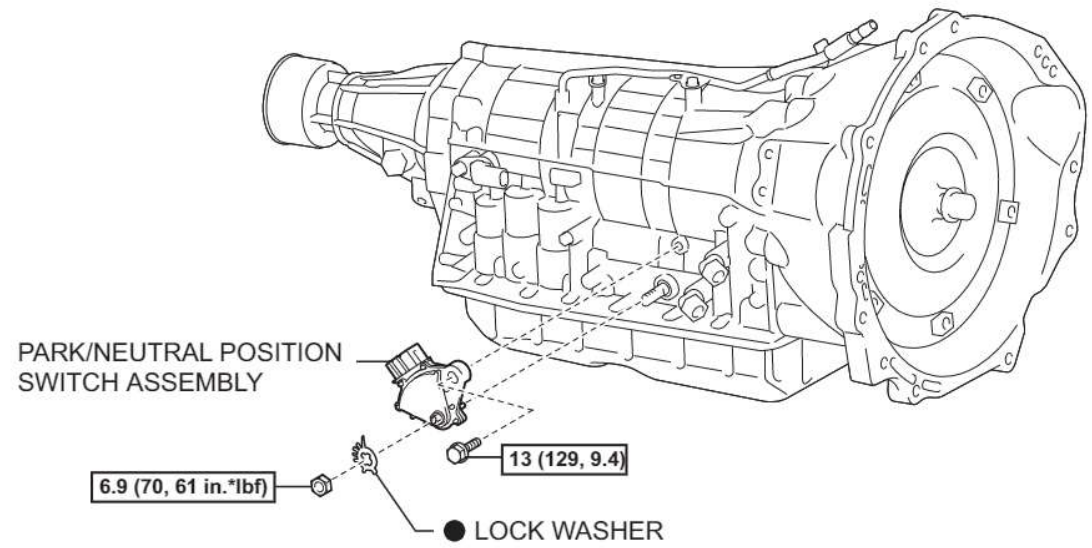
6. **PERFORM INITIALIZATION**
(See page AT-19)

7. **ADJUST AUTOMATIC TRANSMISSION FLUID**
(See page AT-140)

AT

# PARK / NEUTRAL POSITION SWITCH

## COMPONENTS




N*m (kgf*cm, ft*lbf) :Specified torque

● Non-reusable part

P

C111262E03

# ON-VEHICLE INSPECTION

**1. INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY**

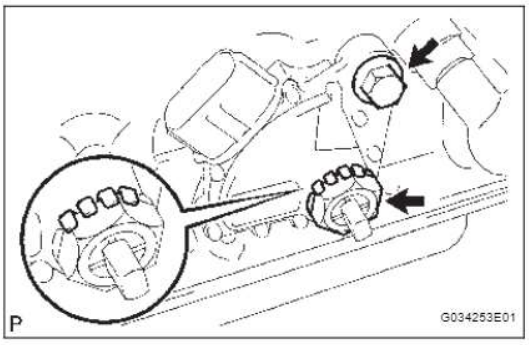
(a) Apply the parking brake and turn the ignition switch ON.

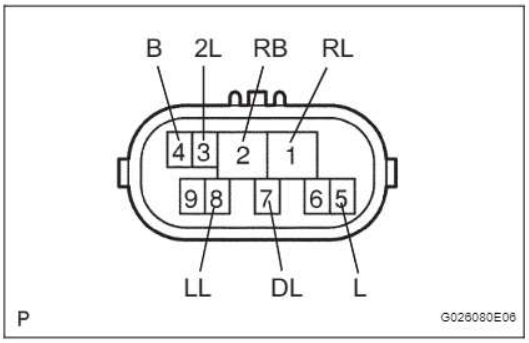
(b) Depress the brake pedal and check that the engine starts when the shift lever is in N or P, but does not start in other positions.

(c) Check that the back-up light illuminates and the reverse warning buzzer sounds when the shift lever is in R, but not in other positions.

# REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
2. **DISCONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR**
3. **REMOVE PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
   (a) Using a screwdriver, pry out the lock washer.
   (b) Remove the lock nut and lock washer.
   (c) Remove the bolt and park/neutral position switch.



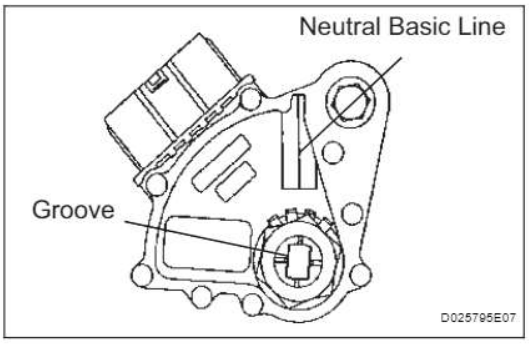

# INSPECTION

1. **INSPECT PARK/NEUTRAL POSITION SWITCH**
   (a) Measure the resistance of the PNP switch when the shift lever is moved to each position.
   **Standard resistance**

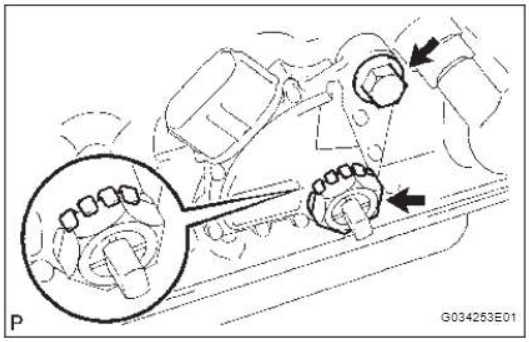
| Tester Connection | Shift Lever Position | Specified Condition |
|---|---|---|
| 4 (B) - 5 (L) | P or N | Below 1 Ω |
| 4 (B) - 5 (L) | Except P and N | 10 kΩ or higher |
| 1 (RL) - 2 (RB) | R | Below 1 Ω |
| 1 (RL) - 2 (RB) | Except R | 10 kΩ or higher |
| 2 (RB) - 7 (DL) | D | Below 1 Ω |
| 2 (RB) - 7 (DL) | Except D | 10 kΩ or higher |
| 2 (RB) - 3 (2L) | 2 | Below 1 Ω |
| 2 (RB) - 3 (2L) | Except 2 | 10 kΩ or higher |
| 2 (RB) - 8 (LL) | L | Below 1 Ω |
| 2 (RB) - 8 (LL) | Except L | 10 kΩ or higher |

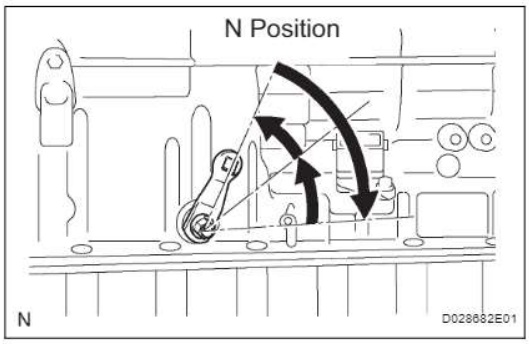
AT

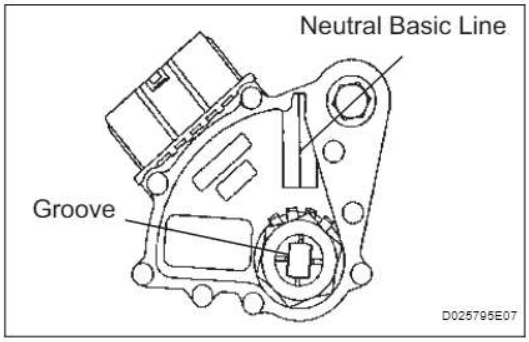
# ADJUSTMENT




1. **ADJUST PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
   (a) Loosen the park/neutral position switch bolt and move the shift lever to N.
   (b) Align the switch groove with the neutral basic line.
   (c) Hold the switch in position and tighten the bolt.
   **Torque: 13 N*m (129 kgf*cm, 9.4 ft.*lbf)**
   (d) After adjustment, perform the inspection.




# INSTALLATION

1. **INSTALL PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
   (a) Install the park/neutral position switch onto 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) Push the control shaft rearward as much as possible.
   (e) Return the control shaft lever 2 notches to the N position.

   (f) Align the neutral basic line with the switch groove, and tighten the bolt.
   **Torque: 13 N*m (129 kgf*cm, 9.4 ft.*lbf)**
   (g) Using a screwdriver, bend the tabs of the lock washer.

2. **CONNECT PARK / NEUTRAL POSITION SWITCH CONNECTOR**

3. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
   **Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)**

4. **PERFORM INITIALIZATION**
   (See page AT-19)

5. **INSPECT SHIFT LEVER POSITION (See page AT-166)**

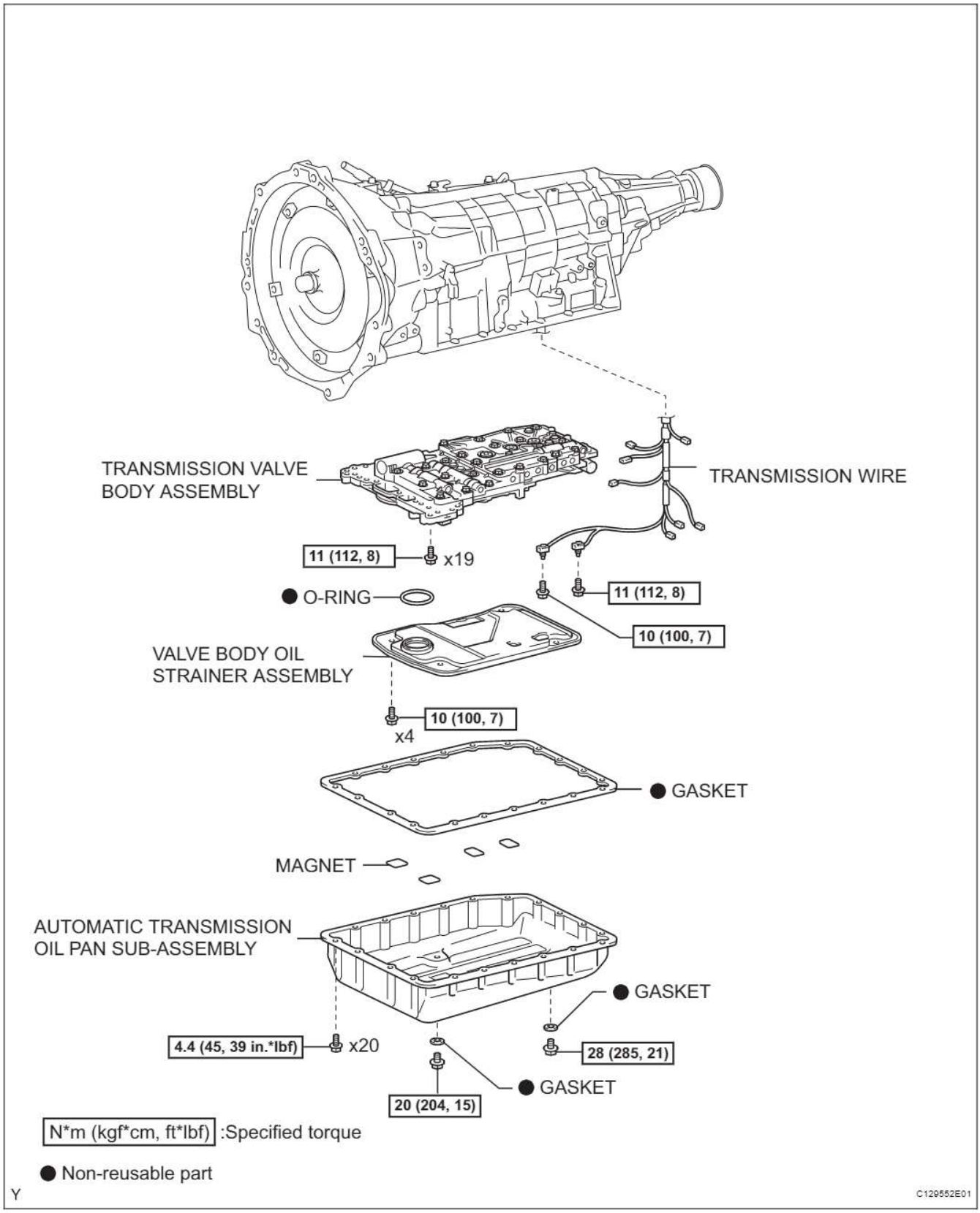
6. **ADJUST SHIFT LEVER POSITION (See page AT-167)**

7. **INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY (See page AT-153)**

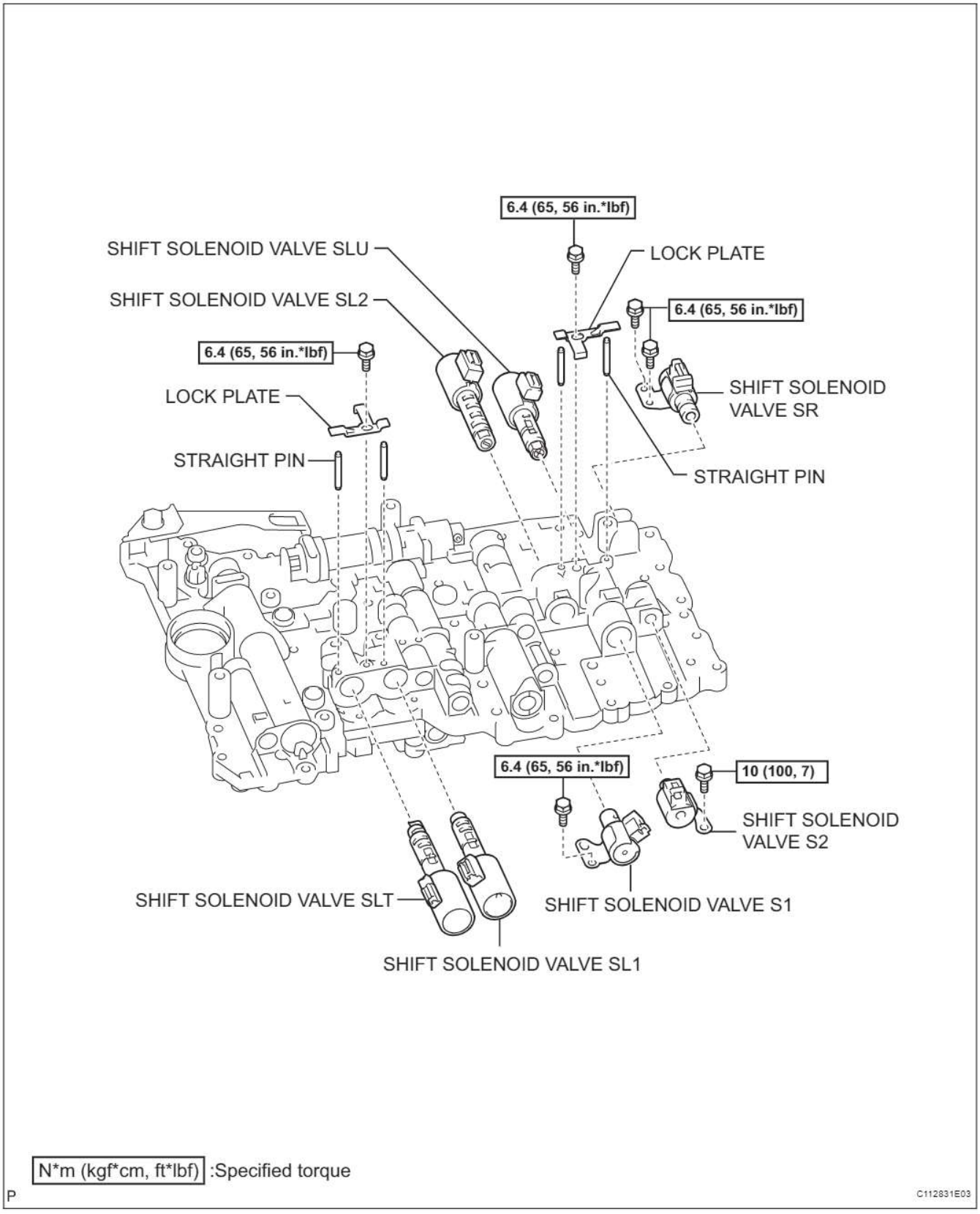
AT

# VALVE BODY ASSEMBLY

## COMPONENTS




AT


6.4 (65, 56 in.*lbf)
SHIFT SOLENOID VALVE SLU
LOCK PLATE
SHIFT SOLENOID VALVE SL2
6.4 (65, 56 in.*lbf)
6.4 (65, 56 in.*lbf)
LOCK PLATE
SHIFT SOLENOID VALVE SR
STRAIGHT PIN
STRAIGHT PIN
6.4 (65, 56 in.*lbf)
10 (100, 7)
SHIFT SOLENOID VALVE S2
SHIFT SOLENOID VALVE SLT
SHIFT SOLENOID VALVE S1
SHIFT SOLENOID VALVE SL1
N*m (kgf*cm, ft*lbf) :Specified torque
P
C112831E03

AT

# REMOVAL

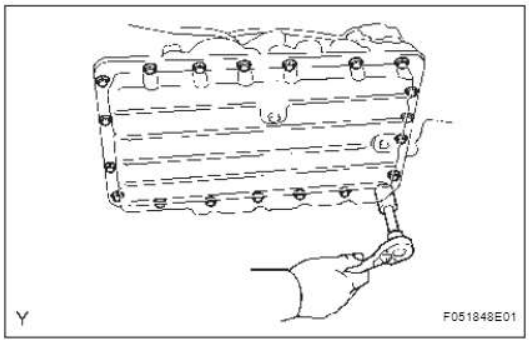
**1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

**2. DRAIN AUTOMATIC TRANSMISSION FLUID**

(a) Remove the drain plug and gasket, and drain ATF.

(b) Install a new gasket and the drain plug.

**Torque: 28 N*m (285 kgf*cm, 21 ft.*lbf)**

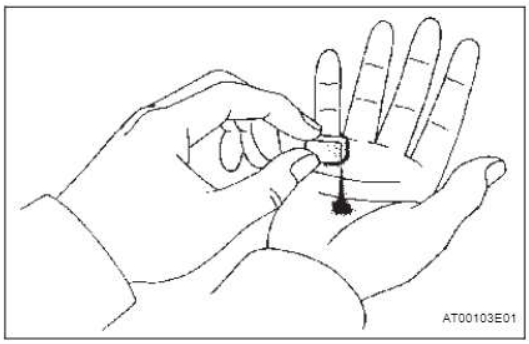



**3. REMOVE AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY**

**NOTICE:**

**Some fluid will remain in the oil pan.**

(a) Remove the 20 bolts and oil pan.




(b) Examine the particles in the oil pan.

(1) Remove all the magnets and use them to collect steel particles. Carefully look at the foreign matter and particles in the pan and on the magnets to determine the type of wear you will find in the transmission.

Steel (magnetic): bearing, gear and clutch plate wear

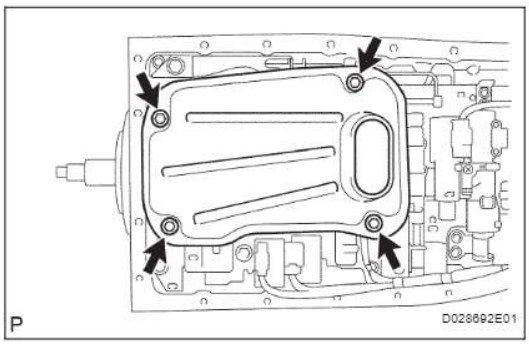
Brass (non-magnetic): bushing wear

**4. 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.**

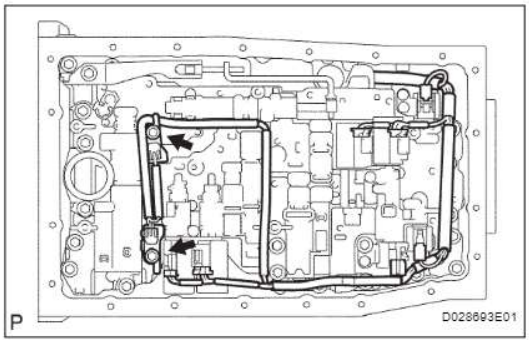



**5. DISCONNECT TRANSMISSION WIRE**

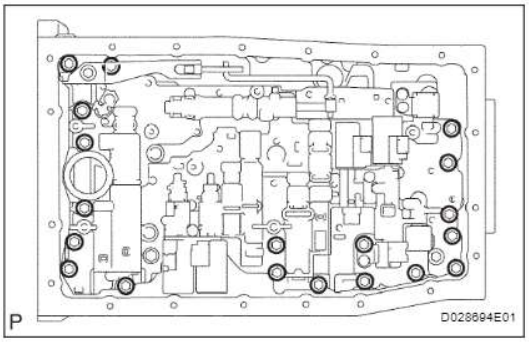
(a) Remove the 2 bolts and 2 clamps.

(b) Disconnect the ATF temperature sensor.

(c) Disconnect the 7 connectors from the solenoid valves.

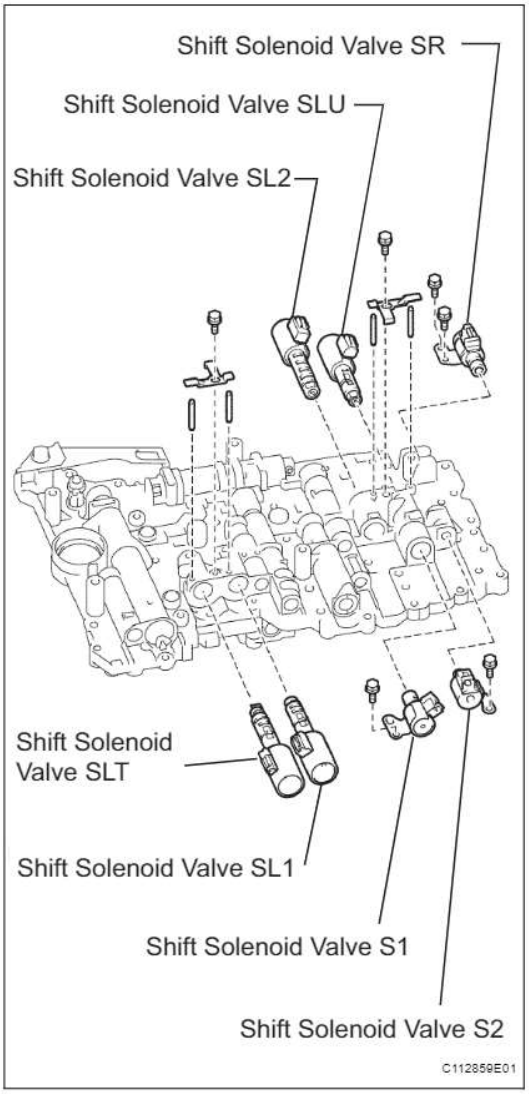



AT




**6. REMOVE TRANSMISSION VALVE BODY ASSEMBLY**

(a) Remove the 19 bolts and valve body.
(b) Remove the 3 drum seal gaskets.

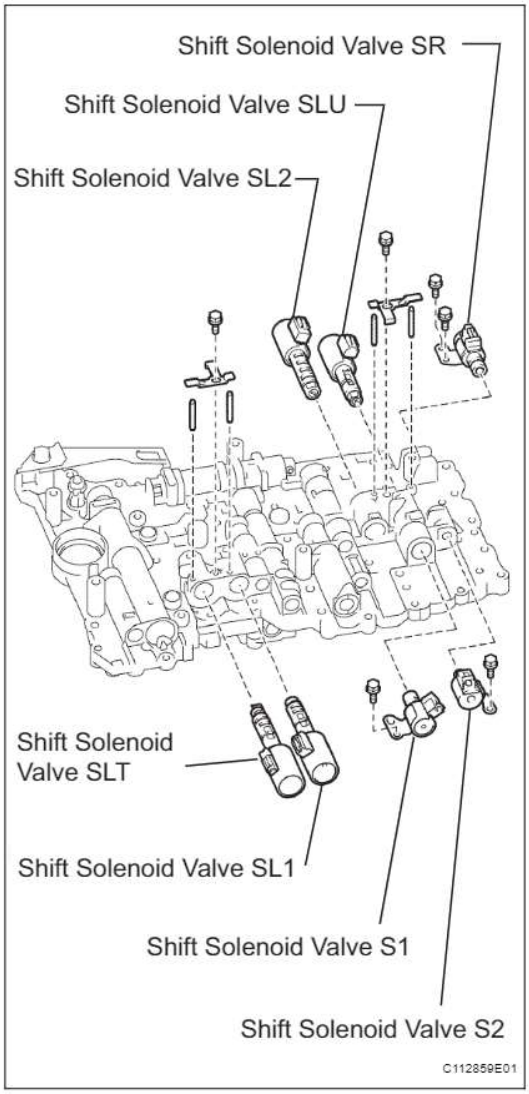



## DISASSEMBLY

**1. REMOVE SHIFT SOLENOID VALVE**

(a) Remove the bolt, lock plate, 2 pins and shift solenoid valves SLT and SL1.
(b) Remove the bolt, lock plate, 2 pins and shift solenoid valves SLU and SL2.
(c) Remove the 2 bolts and shift solenoid valve SR.
(d) Remove the bolt and shift solenoid valve S1.
(e) Remove the bolt and shift solenoid valve S2.

AT




# REASSEMBLY

**1. INSTALL SHIFT SOLENOID VALVE**

(a) Install the shift solenoid valve S2 with the bolt.
**Torque: 10 N*m (100 kgf*cm, 7 ft.*lbf)**

(b) Install the shift solenoid valve S1 with the bolt.
**Torque: 6.4 N*m (65 kgf*cm, 56 in.*lbf)**

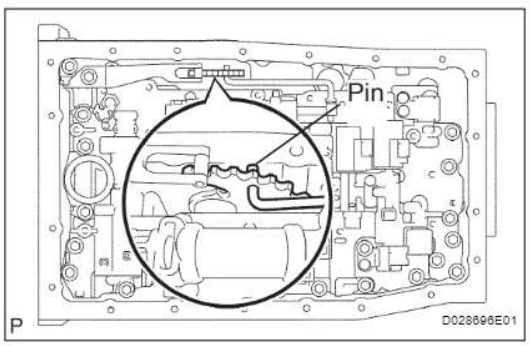
(c) Install the shift solenoid valve SR with the 2 bolts.
**Torque: 6.4 N*m (65 kgf*cm, 56 in.*lbf)**

(d) Install the shift solenoid valves SLU and SL2 with the 2 pins, lock plate and bolt.
**Torque: 6.4 N*m (65 kgf*cm, 56 in.*lbf)**

(e) Install the shift solenoid valves SLT and SL1 with the 2 pins, lock plate and bolt.
**Torque: 6.4 N*m (65 kgf*cm, 56 in.*lbf)**

AT

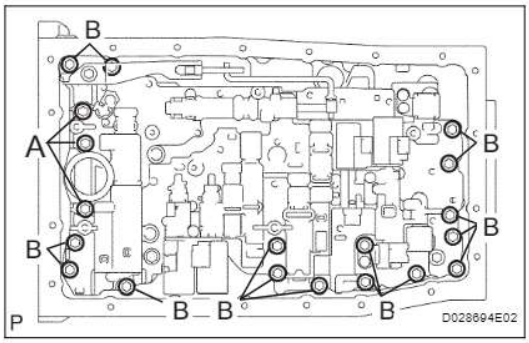
# INSTALLATION



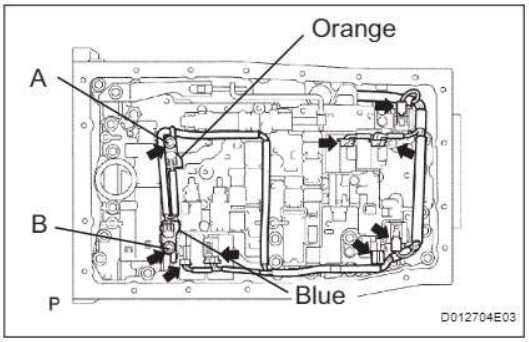

**1. INSTALL TRANSMISSION VALVE BODY ASSEMBLY**

(a) Insert the pin of the lever into the hole of the manual valve.

(b) Install 3 new drum seal gaskets onto the transmission case.




(c) Install the 19 bolts.
**Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)**
HINT:
Bolt length:
36 mm (1.42 in.) for bolt A
25 mm (0.98 in.) for bolt B




**2. CONNECT TRANSMISSION WIRE**

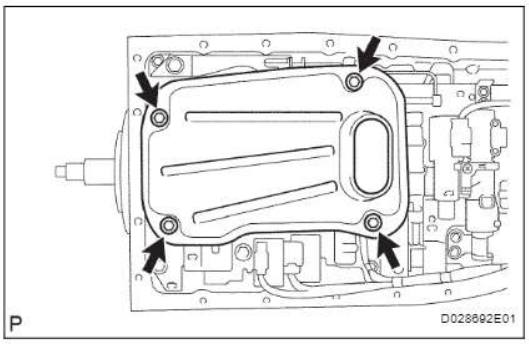
(a) Connect the 7 connectors to the solenoid valves.

(b) Install the 2 clamps with the 2 bolts.

**Torque: 10 N*m (100 kgf*cm, 7 in.*lbf) for bolt A**
**11 N*m (112 kgf*cm, 8 ft.*lbf) for bolt B**

**Bolt length:**
**12 mm (0.47 in.) for bolt A**
**36 mm (1.42 in.) for bolt B**

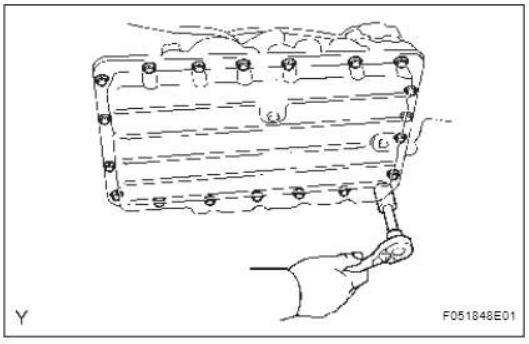
(c) Connect the ATF temperature sensor.




**3. INSTALL VALVE BODY OIL STRAINER ASSEMBLY**

(a) Install a new O-ring and the oil strainer with the 4 bolts.

**Torque: 10 N*m (100 kgf*cm, 7 ft.*lbf)**




**4. INSTALL AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY**

HINT:

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. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

**Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)**

**6. PERFORM INITIALIZATION**

(See page AT-19)

**7. ADJUST AUTOMATIC TRANSMISSION FLUID**

(See page AT-140)

AT

# SHIFT LOCK SYSTEM

## ON-VEHICLE INSPECTION

### 1. CHECK SHIFT LOCK OPERATION

(a) Shift the shift lever to the P position.
(b) Turn the ignition switch to LOCK.
(c) Check that the shift lever cannot be shifted to any positions other than P.
(d) Turn the ignition switch to ON, depress the brake pedal, and check that the shift lever can be shifted to other positions.

### 2. CHECK SHIFT LOCK RELEASE LINK OPERATION

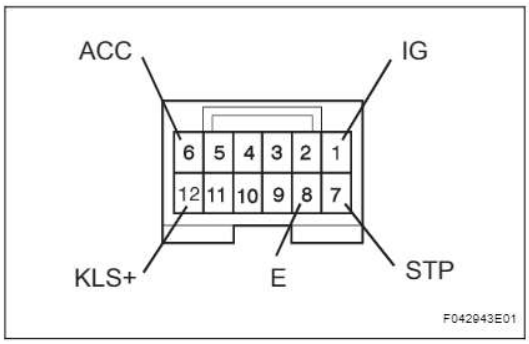
(a) Using a small screwdriver, remove the shift lever cap.
(b) When operating the shift lever with the shift lock release link pressed, check that the lever can be shifted to any positions other than P.

### 3. CHECK KEY INTERLOCK OPERATION

(a) Turn the ignition switch to ON.
(b) Depress the brake pedal and shift the shift lever to any positions other than P.
(c) Check that the ignition key cannot be turned to LOCK.
(d) Shift the shift lever to the P position, turn the ignition key to LOCK, and check that the ignition key can be removed.

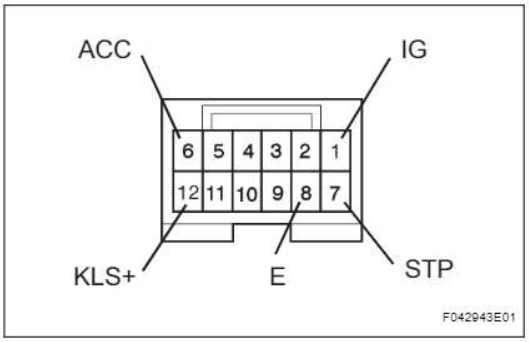
### 4. INSPECT SHIFT LOCK CONTROL ECU SUB-ASSEMBLY

(a) Using a voltmeter, measure the voltage of the connector.
HINT:
Do not disconnect the shift lock control ECU connector.



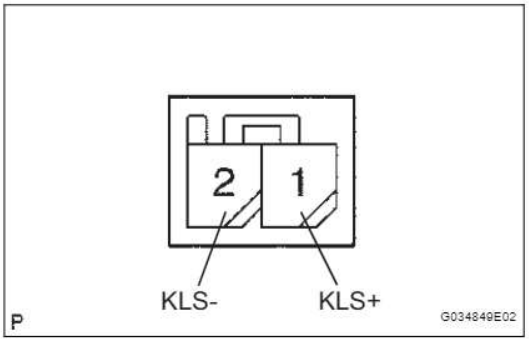

| Tester Connection | Condition | Specified Condition (V) |
|---|---|---|
| 12 (KLS+) - 8 (E) | Ignition switch ACC and P position | 0 |
| | Ignition switch ACC and except P position | 7.5 to 11 |
| | Ignition switch ACC and except P position (After approx. 1 second) | 6 to 9 |
| 6 (ACC) - 8 (E) | Ignition switch ON | 10 to 14 |
| | Ignition switch ACC | 10 to 14 |
| | Ignition switch OFF | 0 |
| 7 (STP) - 8 (E) | Depress brake pedal | 10 to 14 |
| | Release brake pedal | 0 |
| 1 (IG) - 8 (E) | Ignition switch ON | 10 to 14 |
| | Ignition switch OFF | 0 |

AT




(b) Using an ohmmeter, measure the resistance at terminal E (8) and body ground.
HINT:
Do not disconnect the shift lock control ECU connector.

| Tester Connection | Condition | Specified Condition |
|---|---|---|
| 8 (E) - Body ground | Always | Below 1 Ω |




**5. INSPECT KEY INTER LOCK SOLENOID**

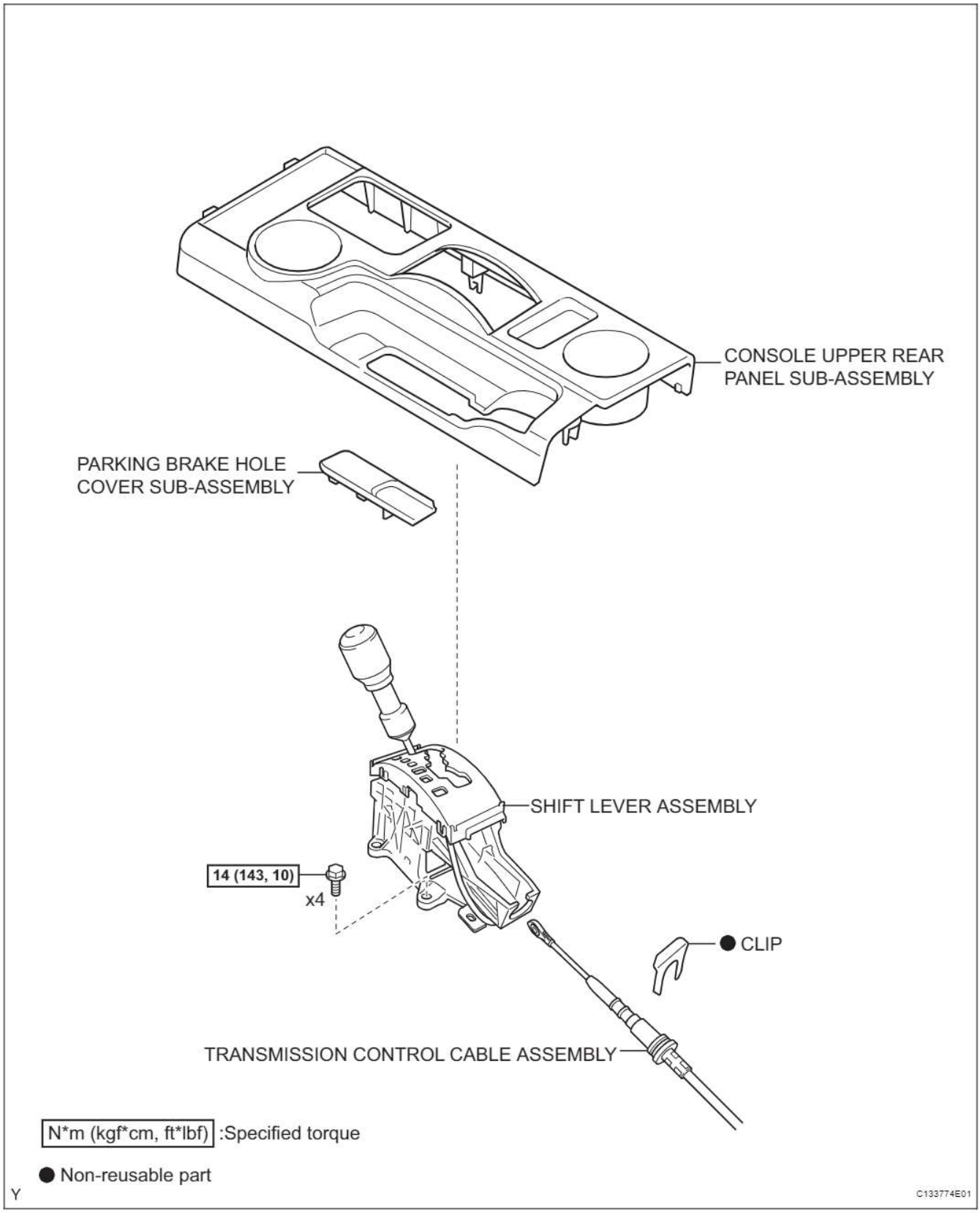
(a) Disconnect the solenoid connector.

(b) Connect KLS+ (1) terminal to the battery positive (+) terminal, and KLS- (2) terminal to the battery negative (-) terminal, and apply about 12 V between KLS+ and KLS- terminals.
Check that operation noise can be heard from the solenoid.
If the solenoid does not operate, replace the solenoid.

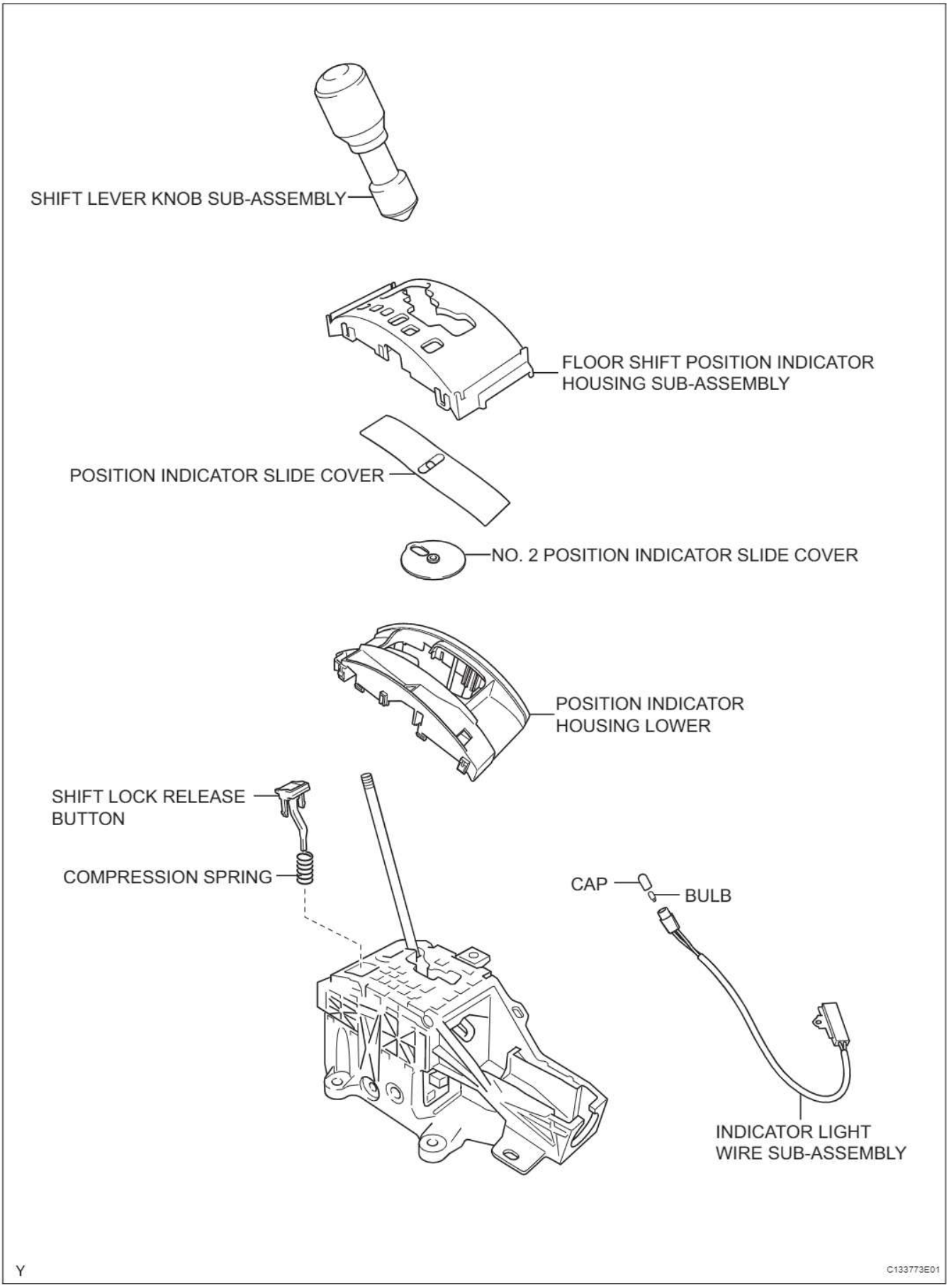
AT

# FLOOR SHIFT ASSEMBLY

## COMPONENTS



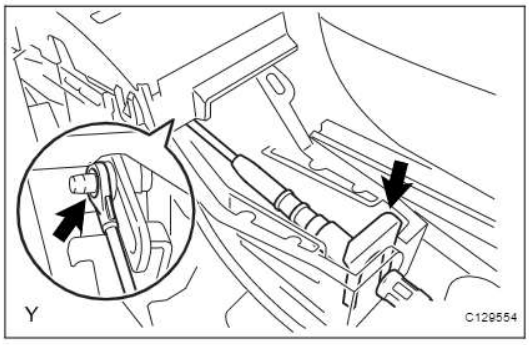

AT


SHIFT LEVER KNOB SUB-ASSEMBLY
FLOOR SHIFT POSITION INDICATOR HOUSING SUB-ASSEMBLY
POSITION INDICATOR SLIDE COVER
NO. 2 POSITION INDICATOR SLIDE COVER
POSITION INDICATOR HOUSING LOWER
SHIFT LOCK RELEASE BUTTON
COMPRESSION SPRING
CAP
BULB
INDICATOR LIGHT WIRE SUB-ASSEMBLY
Y
C133773E01

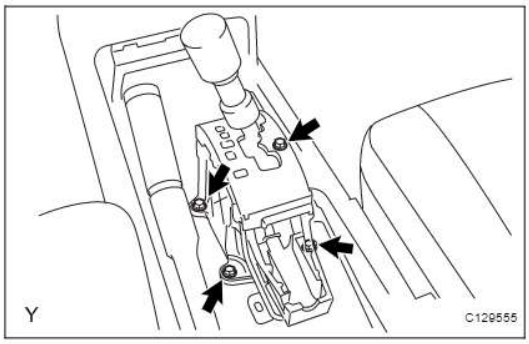
AT

# REMOVAL

1. **REMOVE PARKING BRAKE HOLE COVER SUB-ASSEMBLY (See page IP-11)**
2. **REMOVE CONSOLE UPPER REAR PANEL SUB-ASSEMBLY (See page IP-12)**
3. **DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**
   (a) Remove the lock clip and disconnect the control cable from the shift lever.



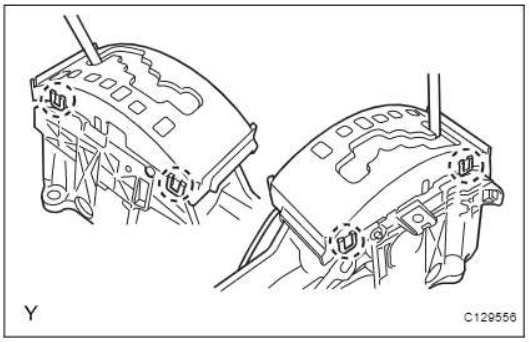

4. **REMOVE SHIFT LEVER ASSEMBLY**
   (a) Disconnect the shift lock control computer connector.
   (b) Disconnect the indicator light connector.
   (c) Remove the 4 bolts and the shift lever assembly.



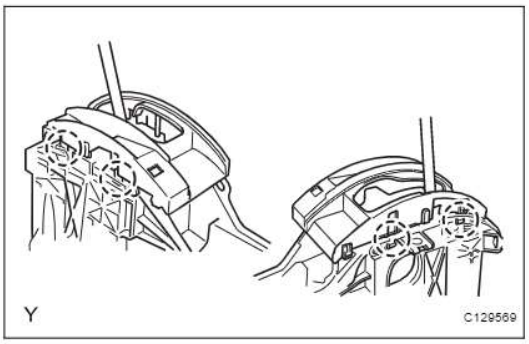

AT

# DISASSEMBLY

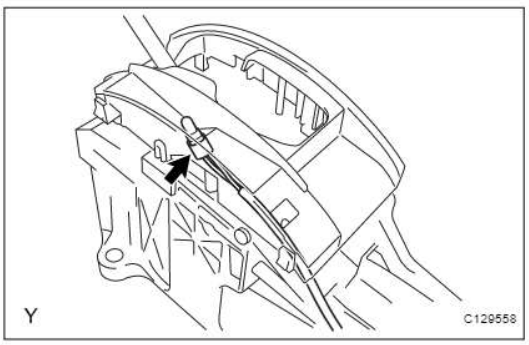
1. **REMOVE SHIFT LEVER KNOB SUB-ASSEMBLY**
2. **REMOVE FLOOR SHIFT POSITION INDICATOR HOUSING SUB-ASSEMBLY**
   (a) Disengage the 4 claws and remove the position indicator housing from the shift lever assembly.
3. **REMOVE POSITION INDICATOR SLIDE COVER**
4. **REMOVE NO. 2 POSITION INDICATOR SLIDE COVER**



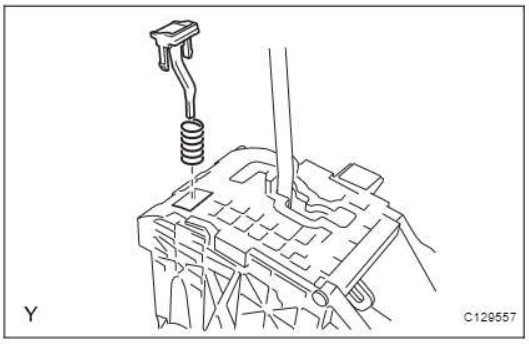

5. **REMOVE POSITION INDICATOR HOUSING LOWER**
   (a) Disengage the 4 claws and remove the position indicator housing lower from the shift lever assembly.



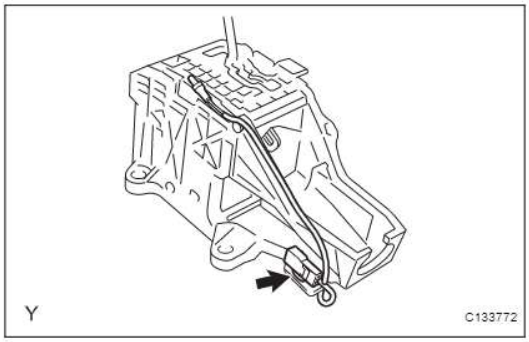

   (b) Disconnect the indicator light wire from the position indicator housing lower.




6. **REMOVE SHIFT LOCK RELEASE BUTTON**
   (a) Remove the shift lock release button and compression spring from the shift lever assembly.

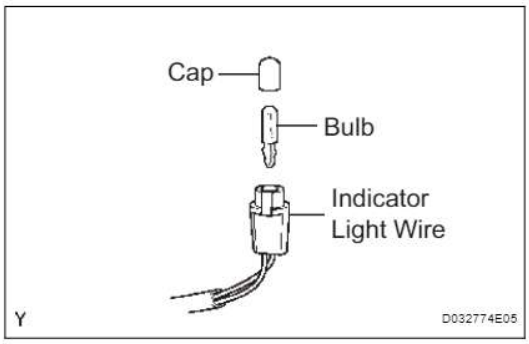



AT




**7. REMOVE INDICATOR LIGHT WIRE SUB-ASSEMBLY**

(a) Disconnect the indicator light wire from the shift lever assembly.




(b) Remove the bulb and cap from the indicator light wire.

AT

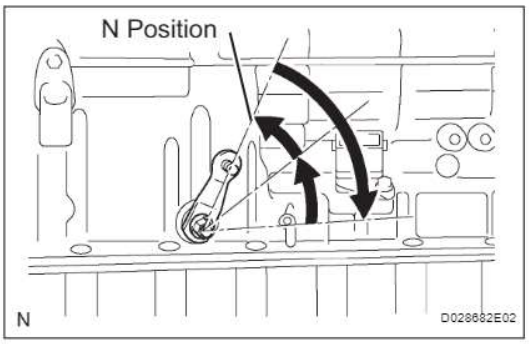
# ADJUSTMENT

**1. INSPECT SHIFT LEVER POSITION**

(a) Check that the shift lever moves smoothly and appropriately from the P to the R position, only when the ignition switch is turned to ON and the brake pedal is depressed.

(b) When starting the engine, make sure that the vehicle moves forward when shifting the lever from the N to the D position and moves rearward when shifting the lever to the R position.

**2. ADJUST SHIFT LEVER POSITION**




(a) Push the control shaft fully rearward.

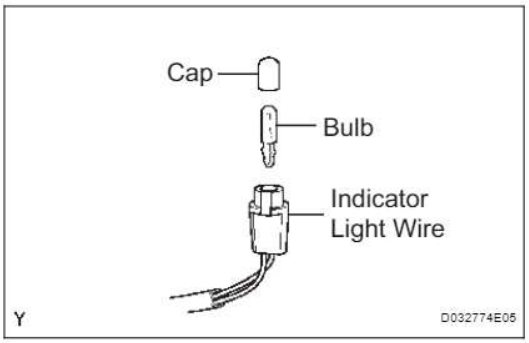
(b) Turn the control shaft lever 2 notches counterclockwise to the N position.

(c) Set the shift lever to the N position.

# REASSEMBLY

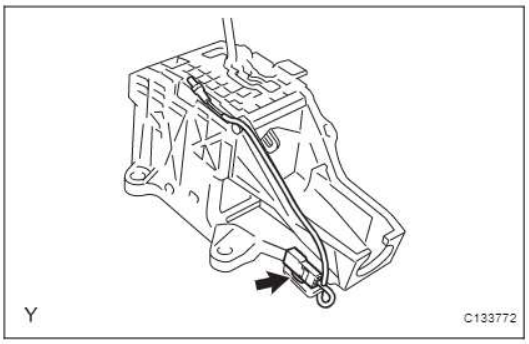
**1. INSTALL INDICATOR LIGHT WIRE SUB-ASSEMBLY**

(a) Install the bulb and cap onto the indicator light wire.




AT

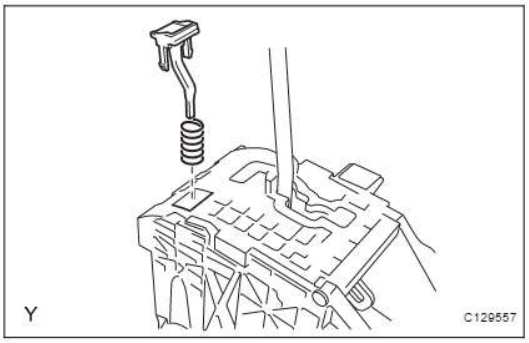
(b) Connect the indicator light wire connector onto the shift lever assembly.

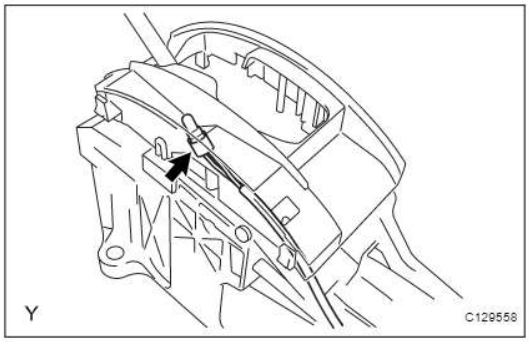



**2. INSTALL SHIFT LOCK RELEASE BUTTON**

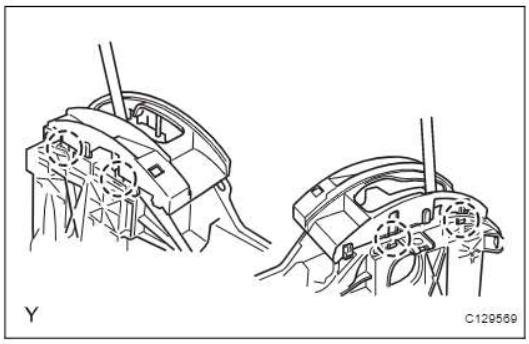
(a) Apply MP grease to the shift lock release button and spring.

(b) Install the shift lock release button and spring onto the shift lever.

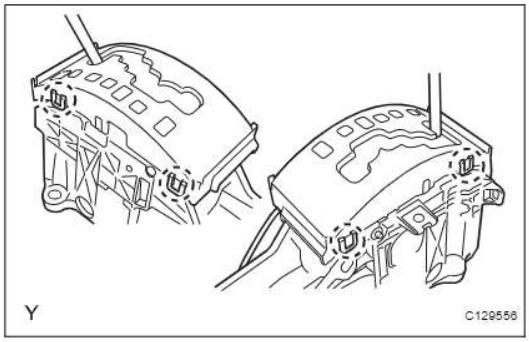





3. **INSTALL POSITION INDICATOR HOUSING LOWER**
   (a) Connect the indicator light wire connector onto the position indicator housing lower.

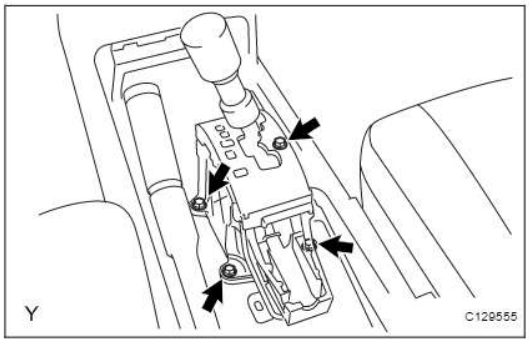



   (b) Engage the 4 claws to install the position indicator housing lower.
4. **INSTALL NO. 2 POSITION INDICATOR SLIDE COVER**
5. **INSTALL POSITION INDICATOR SLIDE COVER**

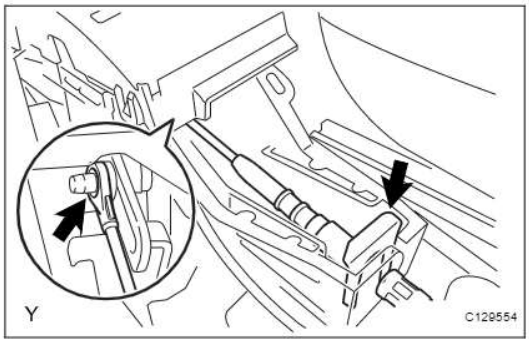



6. **INSTALL FLOOR SHIFT POSITION INDICATOR HOUSING SUB-ASSEMBLY**
   (a) Engage the 4 claws to install the position indicator housing.
7. **INSTALL SHIFT LEVER KNOB SUB-ASSEMBLY**

# INSTALLATION




1. **INSTALL SHIFT LEVER ASSEMBLY**
   (a) Install the shift lever with the 4 bolts.
   **Torque: 14 N*m (143 kgf*cm, 10 ft.*lbf)**
   (b) Connect the indicator light connector.
   (c) Connect the shift lock control computer connector.

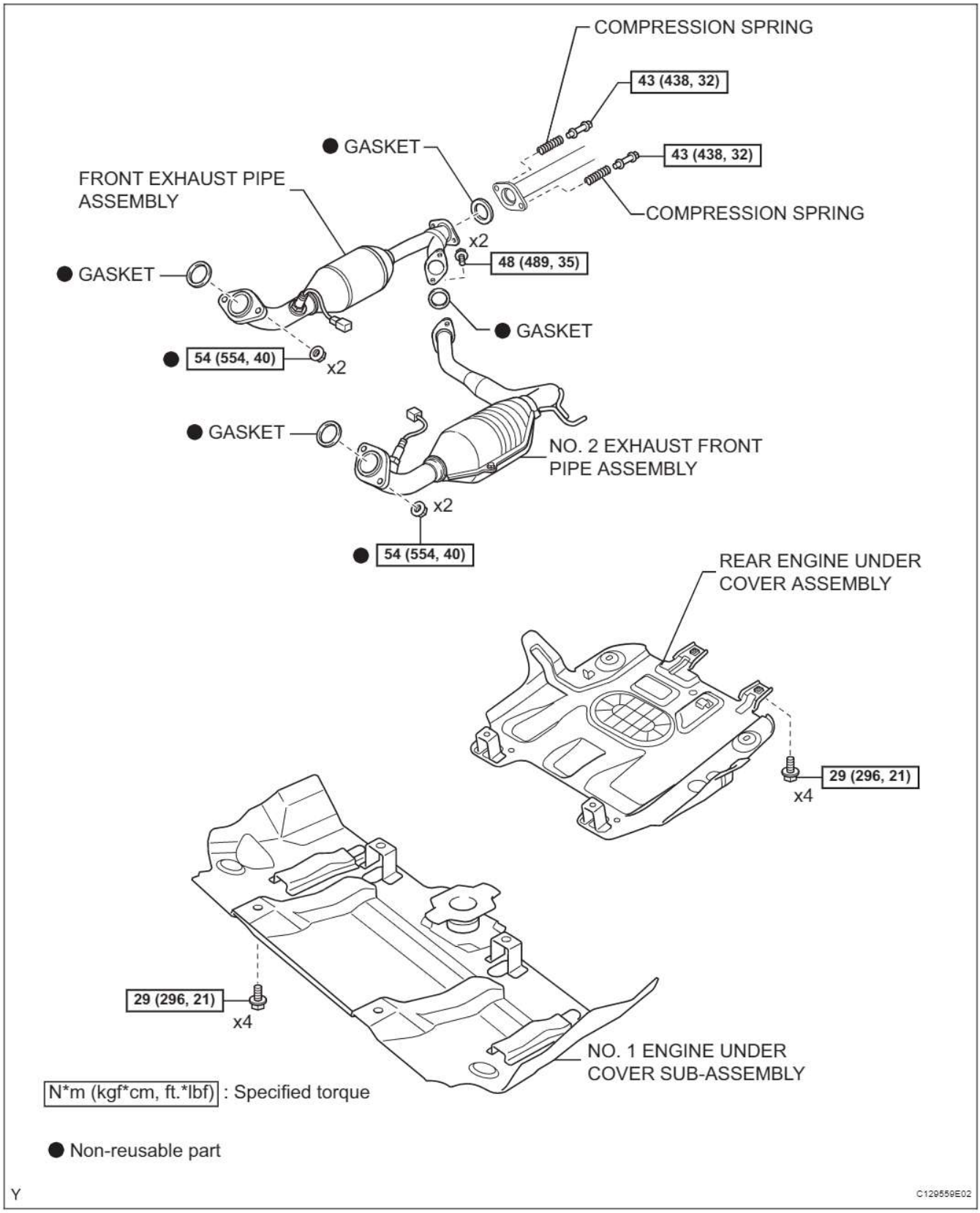



2. **CONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**
   (a) Connect the control cable with the lock clip.
3. **INSTALL CONSOLE UPPER REAR PANEL SUB-ASSEMBLY (See page IP-31)**
4. **INSTALL PARKING BRAKE HOLE COVER SUB-ASSEMBLY (See page IP-32)**
5. **INSPECT SHIFT LEVER POSITION (See page AT-166)**
6. **ADJUST SHIFT LEVER POSITION (See page AT-167)**

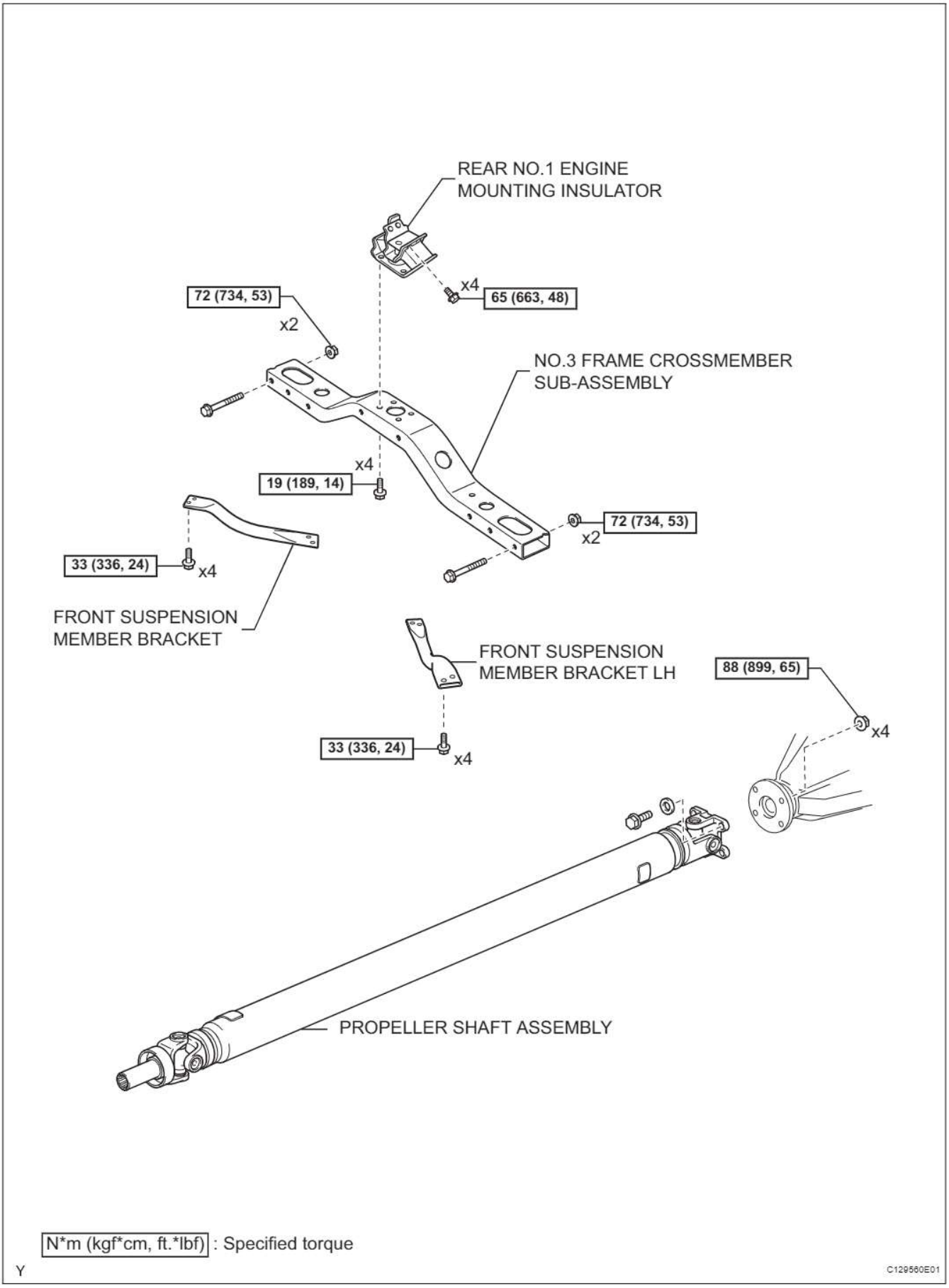
AT

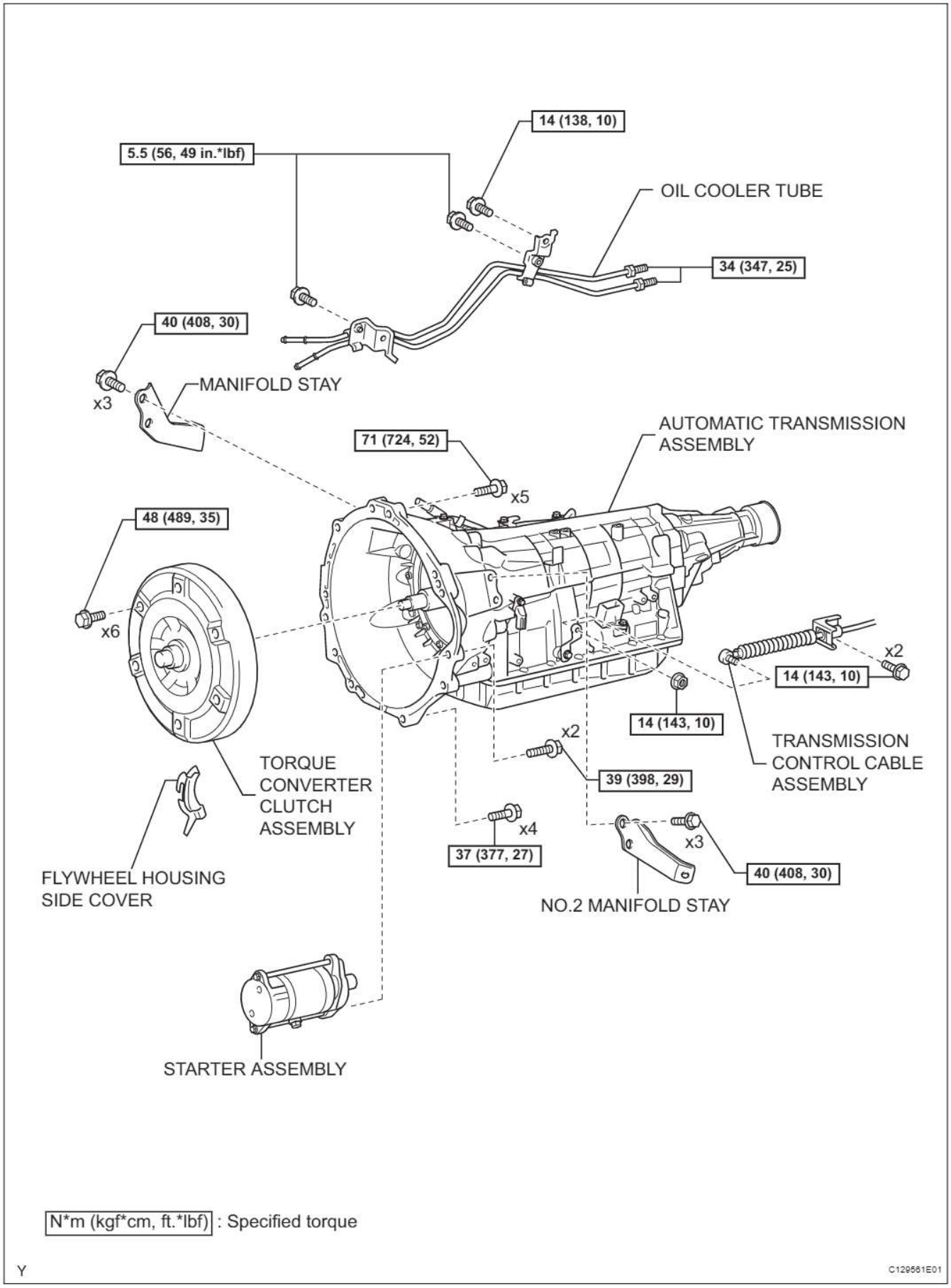
# AUTOMATIC TRANSMISSION ASSEMBLY

## COMPONENTS




AT

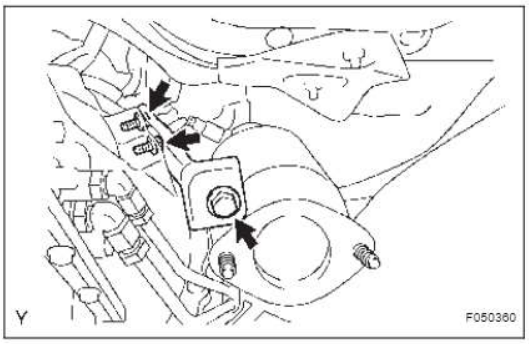

REAR NO.1 ENGINE MOUNTING INSULATOR
x4
65 (663, 48)
72 (734, 53)
x2
NO.3 FRAME CROSSMEMBER SUB-ASSEMBLY
x4
19 (189, 14)
72 (734, 53)
x2
33 (336, 24)
x4
FRONT SUSPENSION MEMBER BRACKET
FRONT SUSPENSION MEMBER BRACKET LH
88 (899, 65)
x4
33 (336, 24)
x4
PROPELLER SHAFT ASSEMBLY
N*m (kgf*cm, ft.*lbf) : Specified torque
Y
C129560E01


14 (138, 10)
5.5 (56, 49 in.*lbf)
OIL COOLER TUBE
34 (347, 25)
40 (408, 30)
x3
MANIFOLD STAY
71 (724, 52)
AUTOMATIC TRANSMISSION ASSEMBLY
x5
48 (489, 35)
x6
x2
14 (143, 10)
14 (143, 10)
x2
TRANSMISSION CONTROL CABLE ASSEMBLY
39 (398, 29)
TORQUE CONVERTER CLUTCH ASSEMBLY
x4
37 (377, 27)
x3
40 (408, 30)
FLYWHEEL HOUSING SIDE COVER
NO.2 MANIFOLD STAY
STARTER ASSEMBLY
N*m (kgf*cm, ft.*lbf) : Specified torque
Y
C129561E01

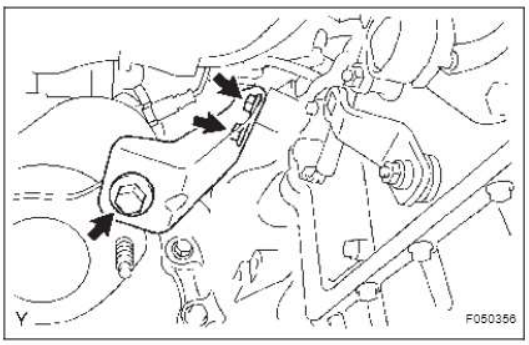
AT

# REMOVAL

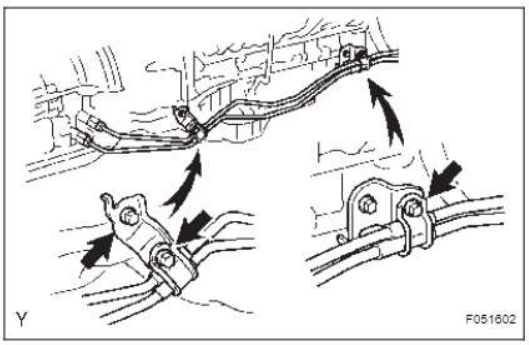
1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
2. **REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY**
3. **REMOVE REAR ENGINE UNDER COVER ASSEMBLY**
4. **DISCONNECT OXYGEN SENSOR**
5. **REMOVE NO. 2 EXHAUST FRONT PIPE ASSEMBLY (See page EX-4)**
6. **REMOVE FRONT EXHAUST PIPE ASSEMBLY (See page EX-4)**
7. **REMOVE PROPELLER SHAFT ASSEMBLY (See page PR-9)**
8. **DRAIN AUTOMATIC TRANSMISSION FLUID**
   (a) Remove the drain plug and gasket, and drain ATF.
   (b) Install a new gasket and drain plug.
   **Torque: 28 N*m (285 kgf*cm, 21 ft.*lbf)**
9. **REMOVE MANIFOLD STAY**
   (a) Remove the 3 bolts and manifold stay.



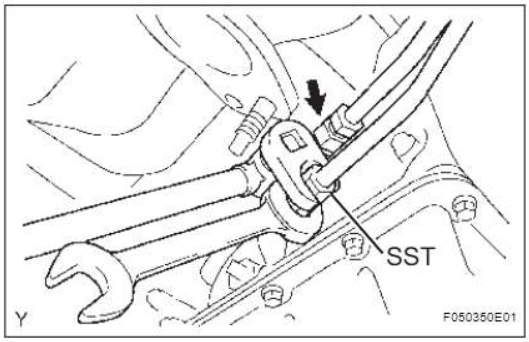

AT



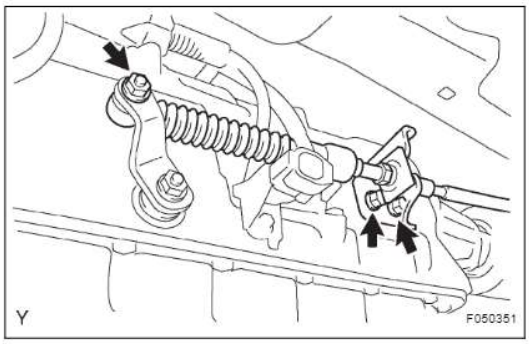

10. **REMOVE NO.2 MANIFOLD STAY**
    (a) Remove the 3 bolts and No. 2 manifold stay.




11. **DISCONNECT OIL COOLER TUBE**
    (a) Remove the 3 bolts and 2 clamps.




(b) Using SST, disconnect the No. 1 oil cooler inlet tube.
**SST 09023-12701**
(c) Using SST, disconnect the No. 1 oil cooler outlet tube.
**SST 09023-12701**

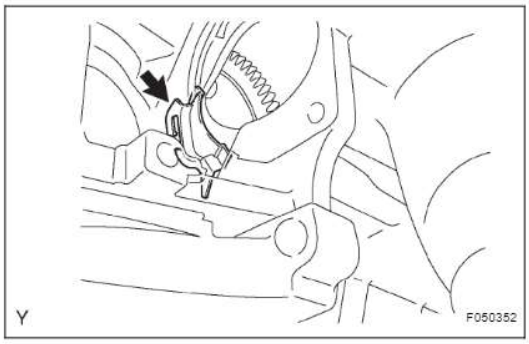



**12. DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**
(a) Remove the nut and disconnect the transmission control cable.
(b) Remove the 2 bolts and disconnect the transmission control cable.

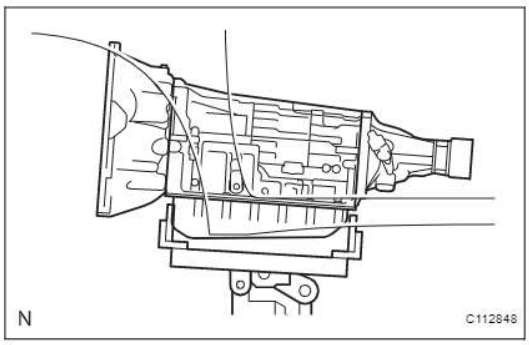
**13. DISCONNECT CONNECTOR**
(a) Disconnect the park/neutral position switch connector.
(b) Disconnect the transmission wire connector.
(c) Disconnect the 2 speed sensor connectors.

**14. DISCONNECT WIRE HARNESS**

**15. REMOVE STARTER ASSEMBLY (See page ST-7)**

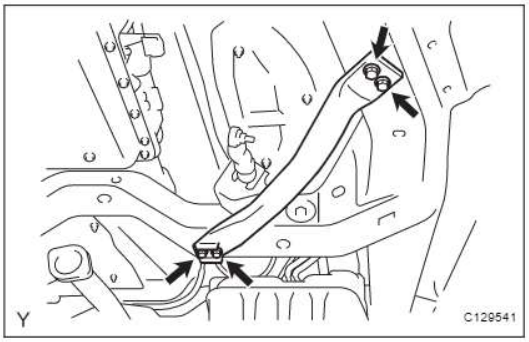



**16. REMOVE FLYWHEEL HOUSING SIDE COVER**
(a) Remove the flywheel housing side cover from the cylinder block.



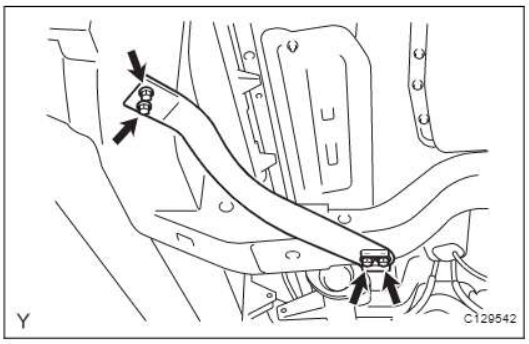

**17. SUPPORT AUTOMATIC TRANSMISSION ASSEMBLY**
(a) Support the automatic transmission assembly with a transmission jack.

AT



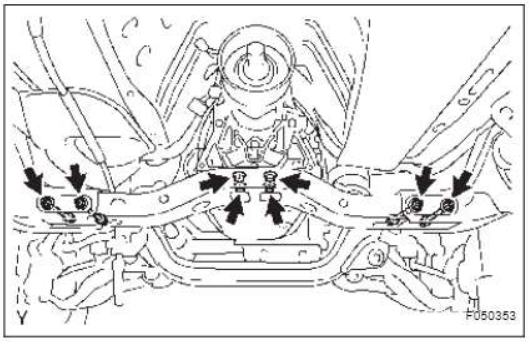

**18. REMOVE FRONT SUSPENSION MEMBER BRACKET LH**

(a) Remove the 4 bolts and front suspension member bracket LH.




**19. REMOVE FRONT SUSPENSION MEMBER BRACKET**

(a) Remove the 4 bolts and front suspension member bracket RH.

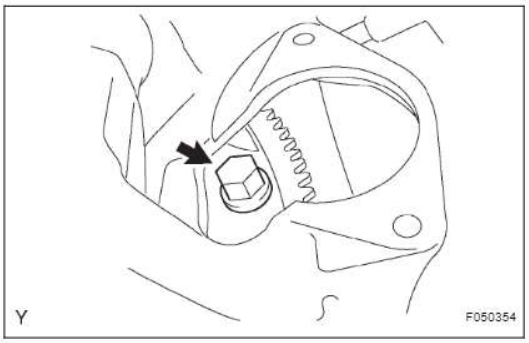



**20. REMOVE NO.3 FRAME CROSSMEMBER SUB-ASSEMBLY**

(a) Remove the 4 bolts on the No. 3 frame crossmember sub-assembly.

(b) Remove the 4 nuts, 4 bolts and No. 3 frame crossmember sub-assembly.

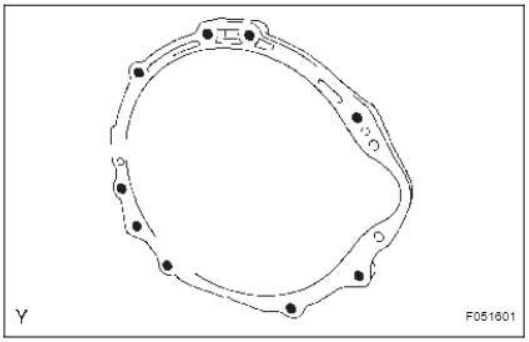
AT




**21. REMOVE AUTOMATIC TRANSMISSION ASSEMBLY**

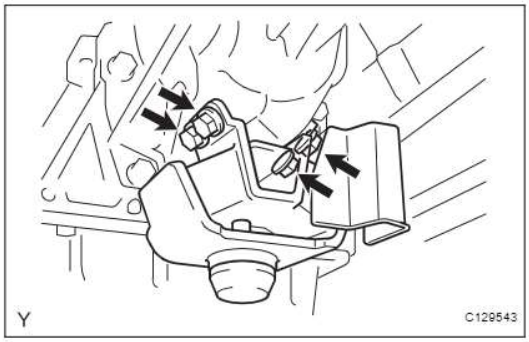
(a) Turn the crankshaft to gain access to each bolt.

(b) Hold the crankshaft pulley nut with a wrench and remove the 6 bolts.




(c) Remove the 9 bolts.

(d) Separate and remove the automatic transmission.




**22. REMOVE REAR NO.1 ENGINE MOUNTING INSULATOR**

(a) Remove the 4 bolts and engine mounting insulator rear from the automatic transmission.

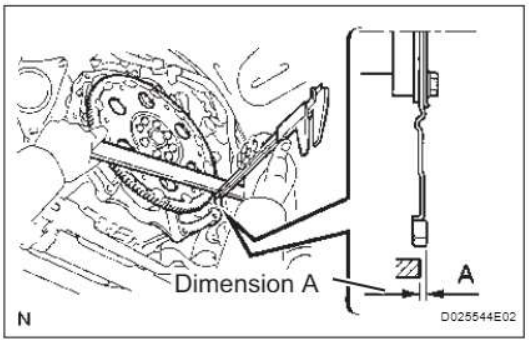
**23. REMOVE TORQUE CONVERTER CLUTCH ASSEMBLY**

AT

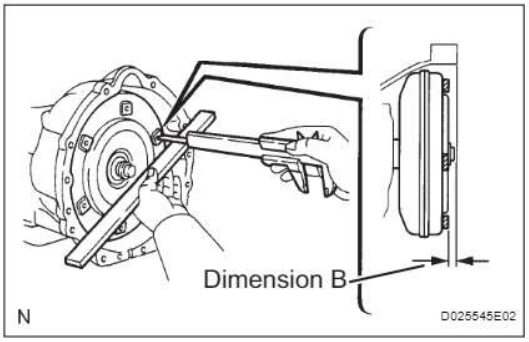
# INSTALLATION

1. **INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY (See page AT-179)**

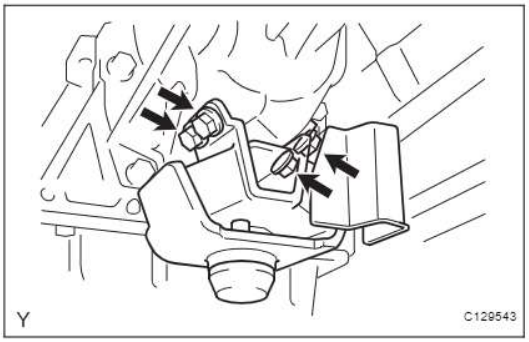
2. **INSTALL TORQUE CONVERTER CLUTCH ASSEMBLY**
   (a) Install the torque converter clutch onto the automatic transmission.
   (b) Using calipers and a straight edge, measure dimension A, between the engine and the end surface of the drive plate, as shown in the illustration.
   **Standard:**
   **A = 21.2 mm (0.835 in.)**



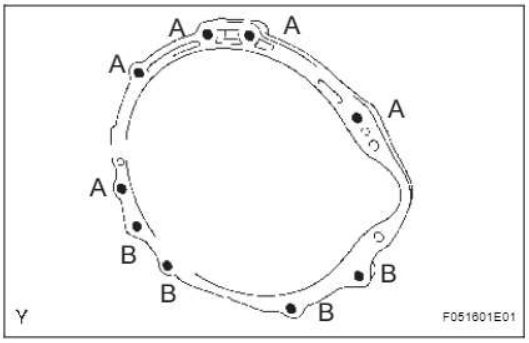

   (c) Using calipers and a straight edge, measure dimension B shown in the illustration. Check that B is greater than A.
   **Standard:**
   **B = A + 1.0 mm (0.0394 in.) or more**

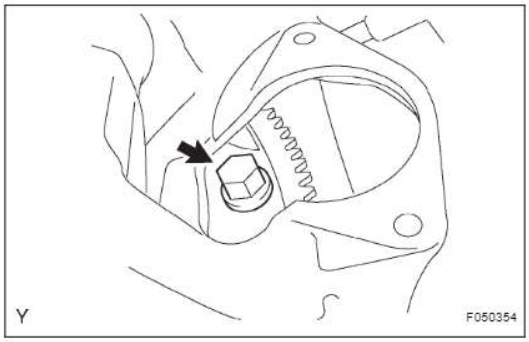



3. **INSTALL REAR NO.1 ENGINE MOUNTING INSULATOR**
   (a) Install the engine mounting insulator rear onto the automatic transmission with the 4 bolts.
   **Torque: 65 N*m (663 kgf*cm, 48 ft.*lbf)**

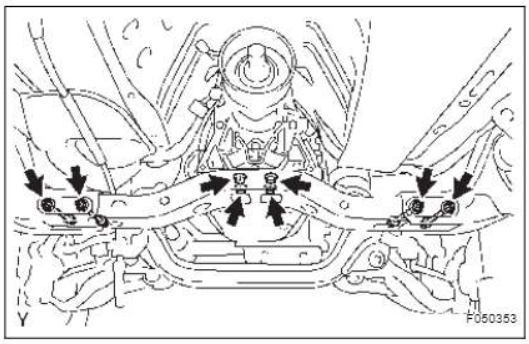



4. **INSTALL AUTOMATIC TRANSMISSION ASSEMBLY**
   (a) Install the automatic transmission onto the engine with the 9 bolts.
   **Torque: 71 N*m (720 kgf*cm, 53 ft.*lbf) for bolt A**
   **37 N*m (380 kgf*cm, 27 ft.*lbf) for bolt B**





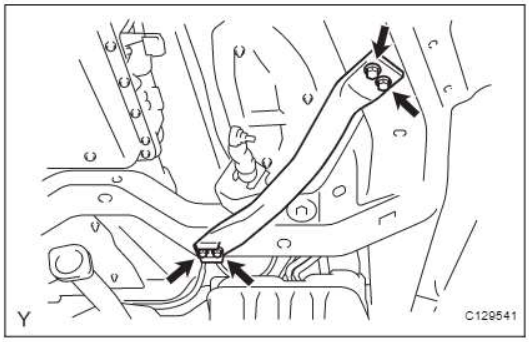

(b) Install the 6 torque converter clutch mounting bolts.
**Torque: 48 N*m (489 kgf*cm, 35 ft.*lbf)**
HINT:
First install the black bolt and then the other 5 bolts.




**5. INSTALL NO.3 FRAME CROSSMEMBER SUB-ASSEMBLY**

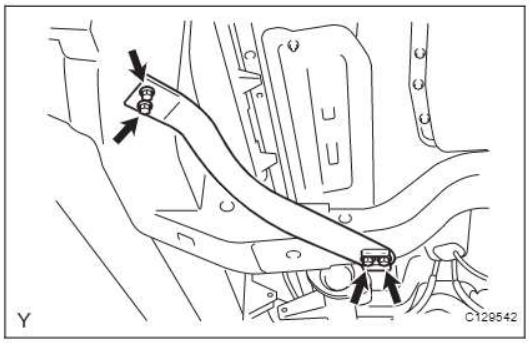
(a) Install the No. 3 frame crossmember sub-assembly with the 4 bolts and 4 nuts.
**Torque: 72 N*m (734 kgf*cm, 53 ft.*lbf)**

(b) Install the No. 3 frame crossmember sub-assembly with the 4 bolts.
**Torque: 19 N*m (189 kgf*cm, 14 ft.*lbf)**



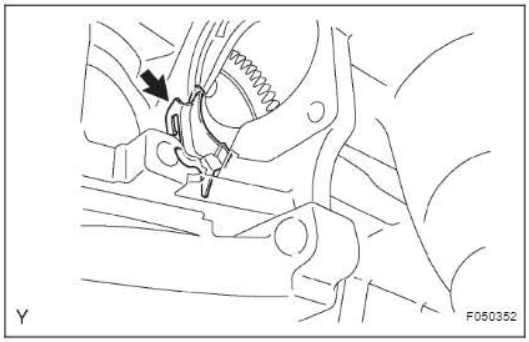

**6. INSTALL FRONT SUSPENSION MEMBER BRACKET LH**

(a) Install the front suspension member bracket LH with the 4 bolts.
**Torque: 33 N*m (336 kgf*cm, 24 ft.*lbf)**




**7. INSTALL FRONT SUSPENSION MEMBER BRACKET**

(a) Install the front suspension member bracket RH with the 4 bolts.
**Torque: 33 N*m (336 kgf*cm, 24 ft.*lbf)**




**8. INSTALL FLYWHEEL HOUSING SIDE COVER**

(a) Install the flywheel housing side cover onto the cylinder block.

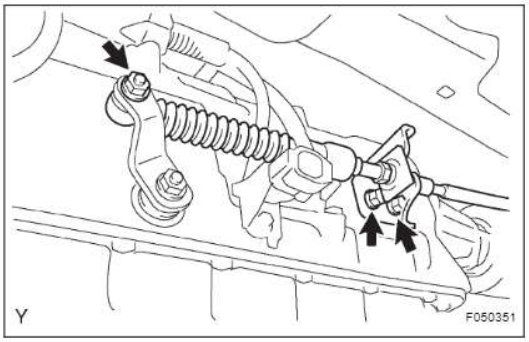
**9. INSTALL STARTER ASSEMBLY (See page ST-15)**

**10. CONNECT WIRE HARNESS**

**11. CONNECT CONNECTOR**

(a) Connect the park/neutral position switch connector.
(b) Connect the transmission wire connector.
(c) Connect the 2 speed senor connectors.

AT




**12. INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY**

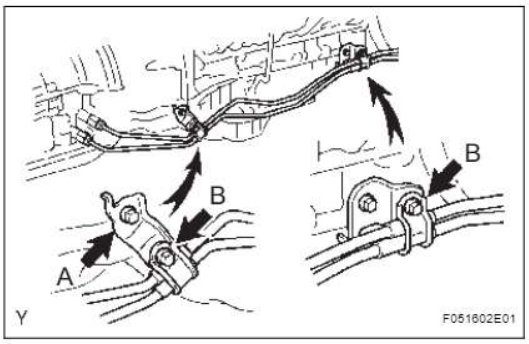
(a) Install the transmission control cable bracket with the 2 bolts.
**Torque: 14 N*m (143 kgf*cm, 10 ft.*lbf)**

(b) Connect the transmission control cable with the nut.
**Torque: 14 N*m (143 kgf*cm, 10 ft.*lbf)**

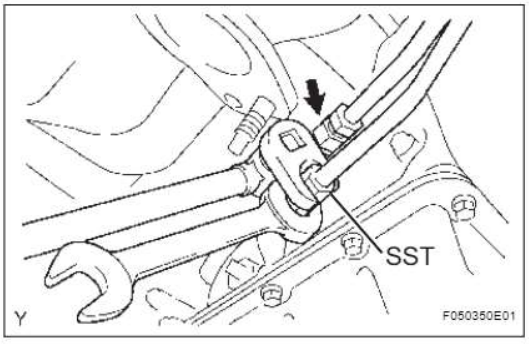
**13. INSTALL OIL COOLER TUBE**

(a) Provisionally install the No. 1 oil cooler outlet tube.

(b) Provisionally install the No. 1 oil cooler inlet tube.




(c) Install the 2 clamps and 3 bolts.
**Torque: 14 N*m (138 kgf*cm, 10 ft.*lbf) for bolt A**
**5.5 N*m (56 kgf*cm, 49 in.*lbf) for bolt B**

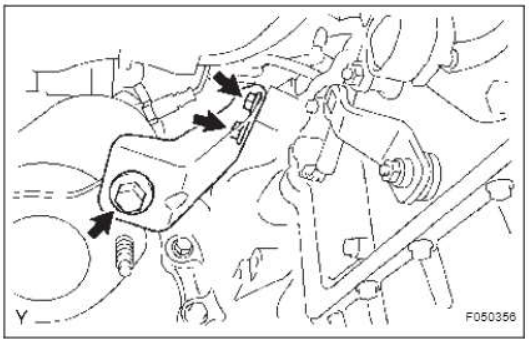



(d) Using SST, tighten the No. 1 oil cooler outlet tube.
**SST 09023-12701**
**Torque: 34 N*m (350 kgf*cm, 25 ft.*lbf) for use without SST**
**30 N*m (306 kgf*cm, 22 ft.*lbf) for use with SST**
HINT:
- Use a torque wrench with a fulcrum length of 300 mm (11.81 in.).
- This torque value is effective when SST is parallel to the torque wrench.

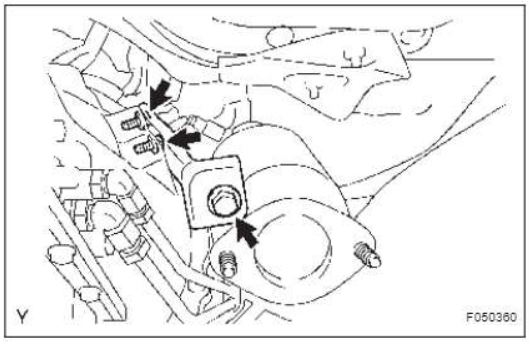
(e) Using SST, tighten the No. 1 oil cooler inlet tube.
**SST 09023-12701**
**Torque: 34 N*m (350 kgf*cm, 25 ft.*lbf) for use without SST**
**30 N*m (306 kgf*cm, 22 ft.*lbf) for use with SST**
HINT:
- Use a torque wrench with a fulcrum length of 300 mm (11.81 in.).
- This torque value is effective when SST is parallel to the torque wrench.

**14. INSTALL NO.2 MANIFOLD STAY**

(a) Install the No. 2 manifold stay with the 3 bolts.
**Torque: 40 N*m (408 kgf*cm, 30 ft.*lbf)**

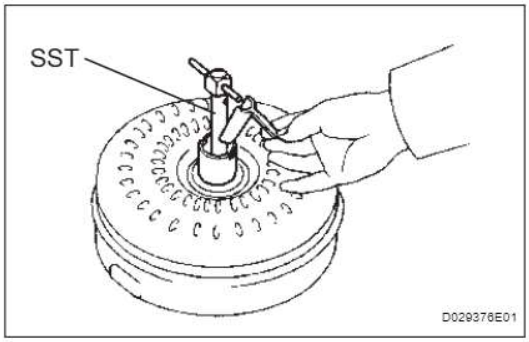


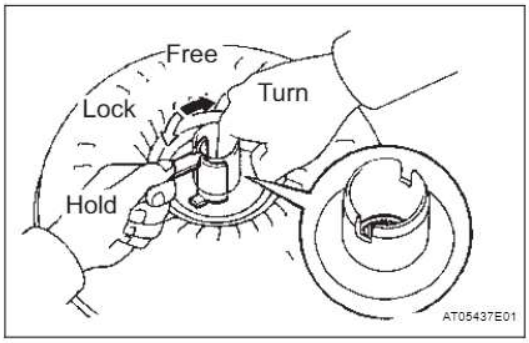

AT

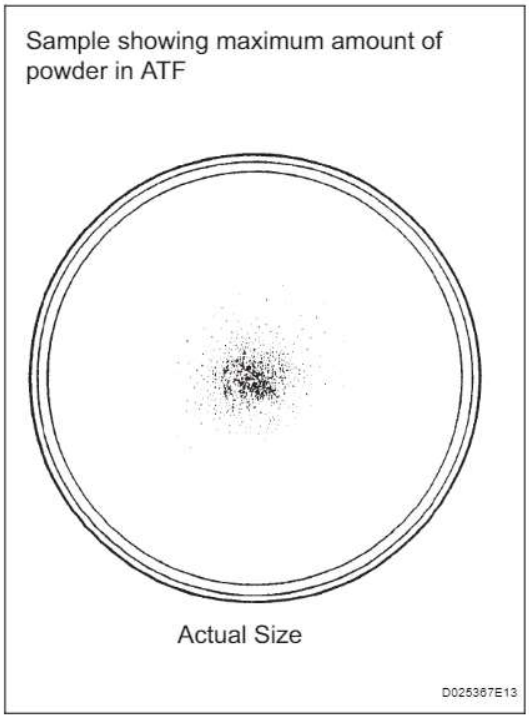



15. **INSTALL MANIFOLD STAY**
    (a) Install the manifold stay with the 3 bolts.
    **Torque: 40 N*m (408 kgf*cm, 30 ft.*lbf)**
16. **INSTALL PROPELLER SHAFT ASSEMBLY (See page PR-14)**
17. **INSTALL FRONT EXHAUST PIPE ASSEMBLY (See page EX-4)**
18. **INSTALL NO. 2 EXHAUST FRONT PIPE ASSEMBLY (See page EX-5)**
19. **INSTALL OXYGEN SENSOR**
20. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
    **Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)**
21. **PERFORM INITIALIZATION**
    (See page AT-19)
22. **ADJUST AUTOMATIC TRANSMISSION FLUID**
    (See page AT-140)
23. **INSPECT SHIFT LEVER POSITION (See page AT-166)**
24. **ADJUST SHIFT LEVER POSITION (See page AT-167)**
25. **CHECK FOR EXHAUST GAS LEAKAGE**
26. **INSTALL REAR ENGINE UNDER COVER ASSEMBLY**
27. **INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY**

AT




# TORQUE CONVERTER CLUTCH AND DRIVE PLATE

## INSPECTION

**1. INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY**

(a) Inspect the one-way clutch.

(1) Install SST in the inner race of the one-way clutch.

**SST 09350-32014 (09351-32020)**

(2) Press on the serrations of the starter with a finger and rotate it.

Check if it rotates smoothly when turned clockwise and locks when turned counterclockwise.

If the results are not as specified, clean the converter and recheck the one-way clutch. If the results still are not as specified, replace the converter.

(b) Determine the condition of the torque converter clutch.

(1) 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 one-way clutch turns in one direction and locks in the other direction.
- The amount of powder in the ATF is not greater than the sample shown in the illustration.

If the results are not as specified, replace the torque converter clutch assembly.

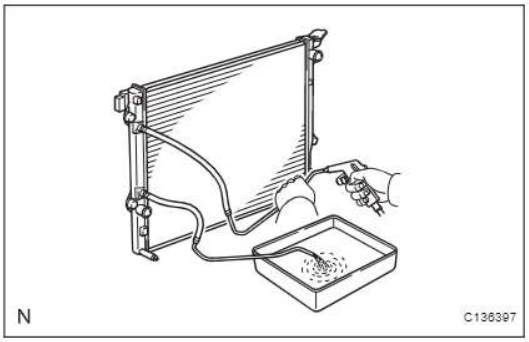
HINT:

The sample illustration shows approximately 0.25 liters (0.26 US qts, 0.22 Imp. qts) of the ATF taken from a removed torque converter clutch.

(c) Replace the ATF in the torque converter clutch.

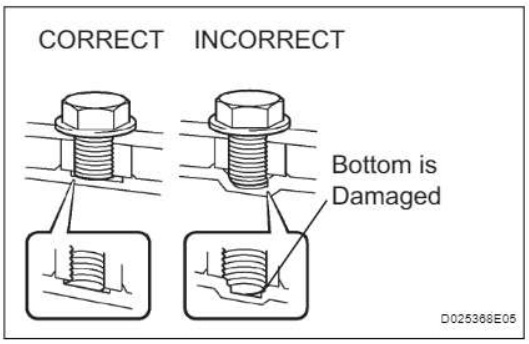
(1) If the ATF is discolored and/or has a foul odor, stir the ATF in the torque converter clutch thoroughly and drain the ATF with the torque converter facing up.

AT

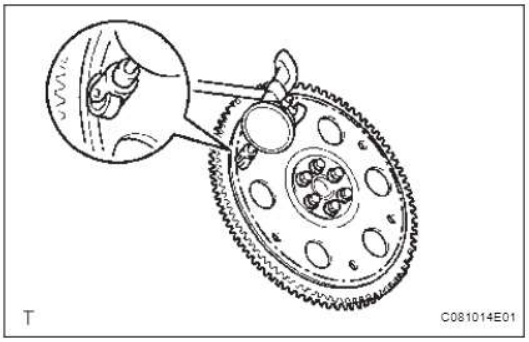



(d) Clean and check the oil cooler and oil pipe line.
(1) If the torque converter clutch is inspected or the ATF is replaced, clean the oil cooler and oil pipe line.
HINT:
- Apply compressed air of 196 kPa (2 kgf/cm$^2$, 28 psi) into the inlet hose.
- If a large amount of powder is found in the ATF, add new ATF using a bucket pump and clean the oil cooler and oil pipe line again.

(2) If the ATF is cloudy, inspect the oil cooler (radiator).

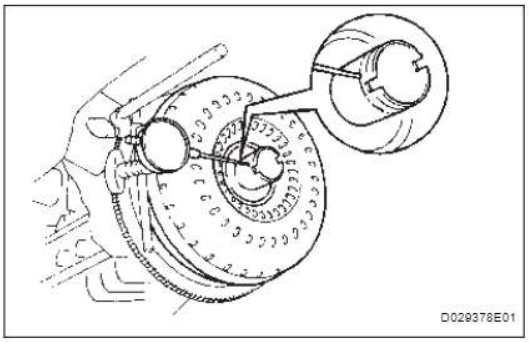



(e) Prevent deformation of the torque converter clutch and damage to the oil pump gear.
(1) When any marks due to interference are found on the end of the bolt for the torque converter clutch and on the bottom of the bolt hole, replace the bolt and torque converter clutch.
(2) All of the bolts should be the same length.
(3) 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 (0.0079 in.)**
If the runout is greater than the maximum or if the ring gear is damaged, replace the drive plate. If installing a new drive plate, note the orientation of the spacers and tighten the bolts.
**Torque: 83 N*m (846 kgf*cm, 61 ft.*lbf)**




**3. INSPECT RUNOUT OF TORQUE CONVERTER CLUTCH ASSEMBLY**

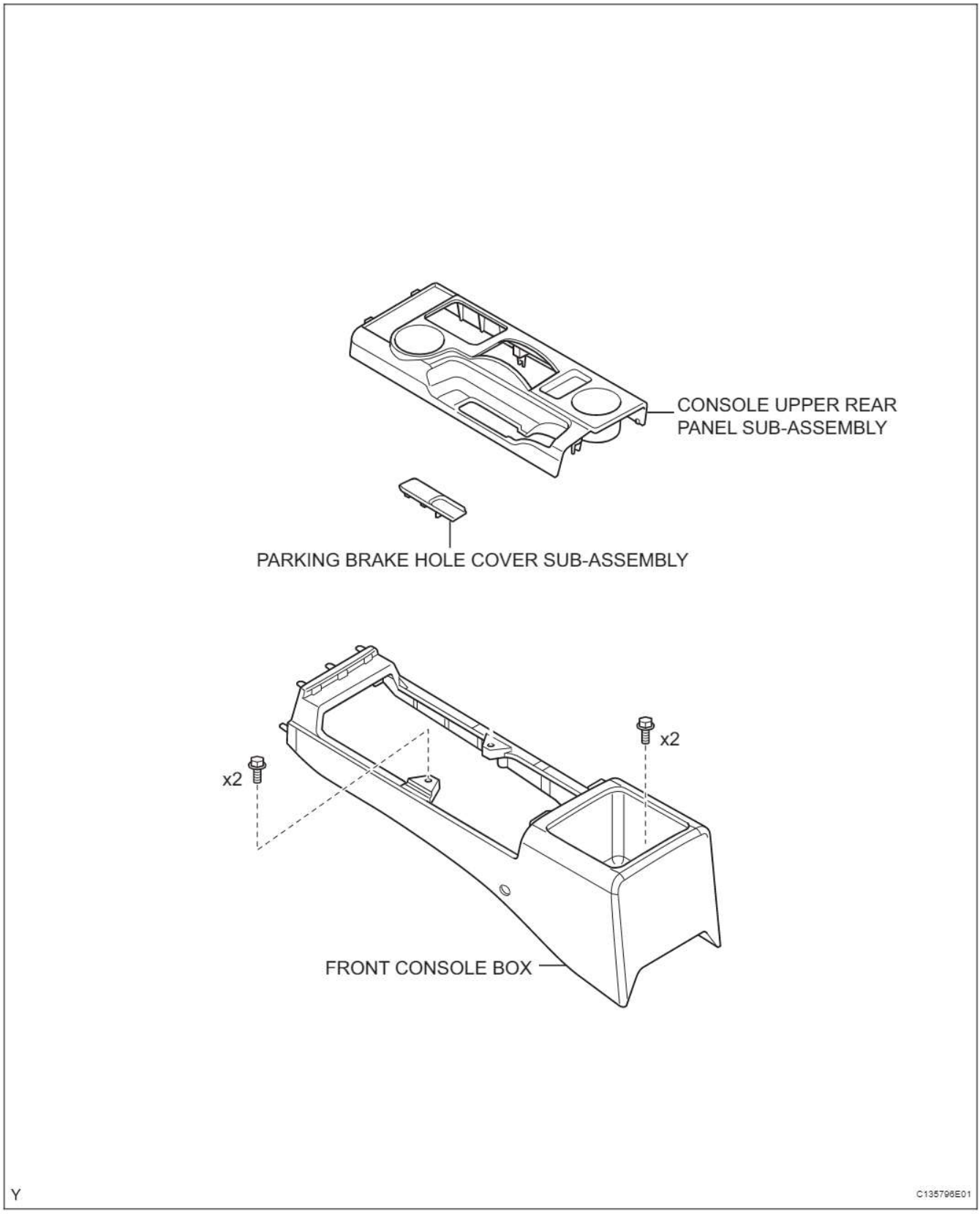
(a) Temporarily mount the torque converter clutch to the drive plate. Set up a dial indicator.
**Maximum runout:**
**0.30mm (0.0118 in.)**
If the runout is greater than the maximum, try to correct it by changing the installation direction of the torque converter clutch.
If the runout cannot be corrected, 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.

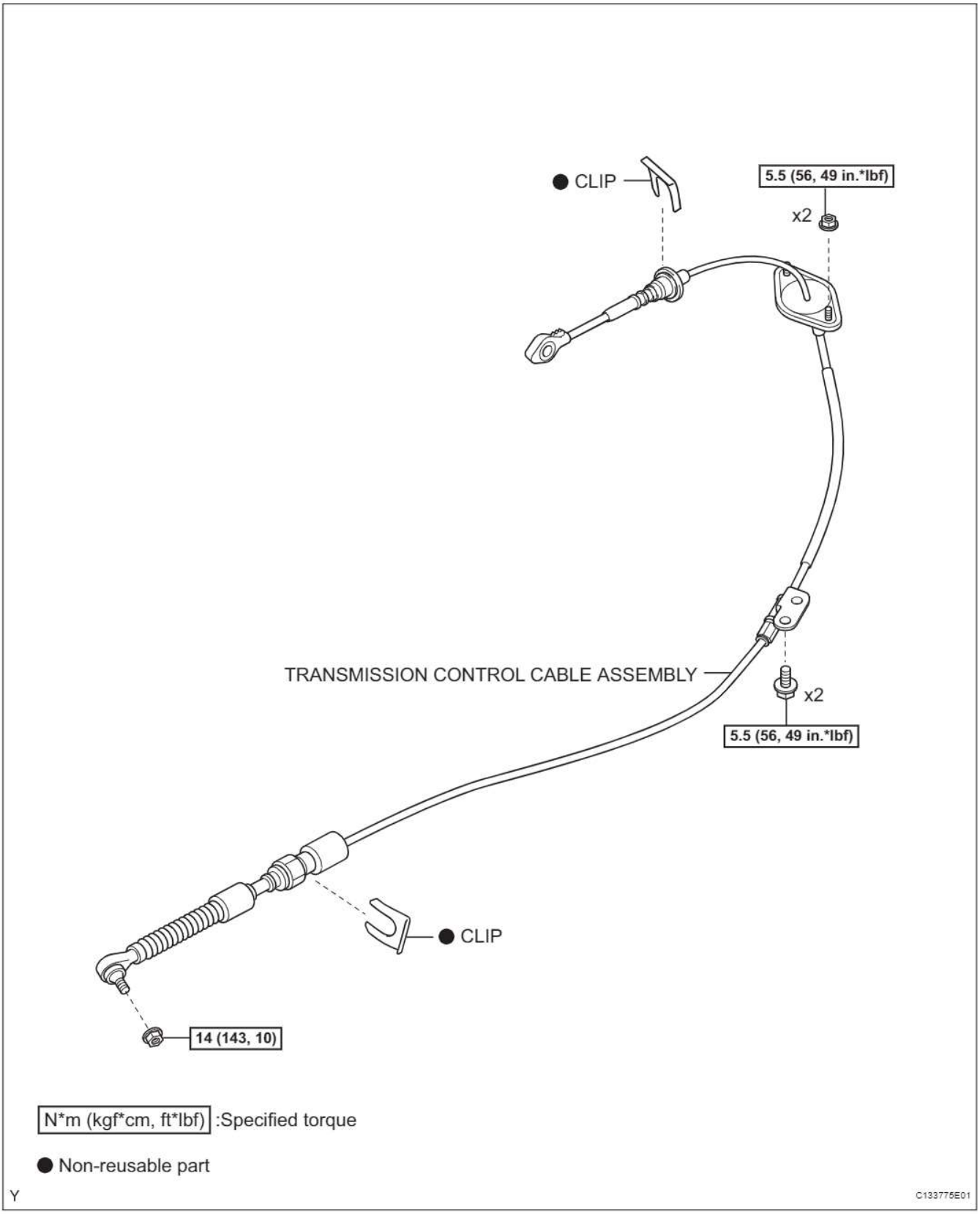
AT

# TRANSMISSION CONTROL CABLE

## COMPONENTS




AT

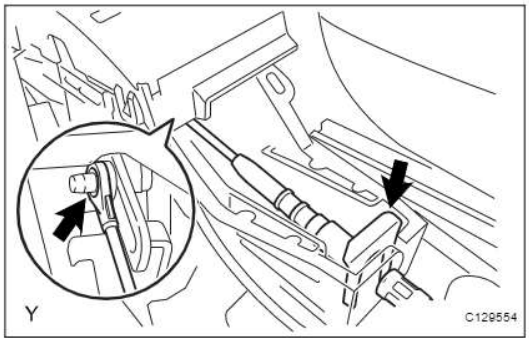

● CLIP
5.5 (56, 49 in.*lbf)
x2
TRANSMISSION CONTROL CABLE ASSEMBLY
x2
5.5 (56, 49 in.*lbf)
● CLIP
14 (143, 10)
N*m (kgf*cm, ft*lbf) :Specified torque
● Non-reusable part
Y
C133775E01

AT

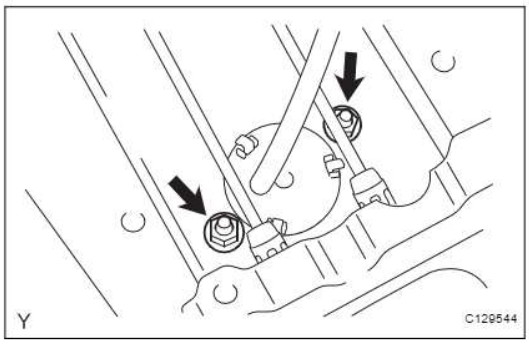
# REMOVAL

1. **REMOVE PARKING BRAKE HOLE COVER SUB-ASSEMBLY (See page IP-11)**
2. **REMOVE CONSOLE UPPER REAR PANEL SUB-ASSEMBLY (See page IP-12)**
3. **REMOVE FRONT CONSOLE BOX (See page IP-12)**
4. **REMOVE TRANSMISSION CONTROL CABLE ASSEMBLY**

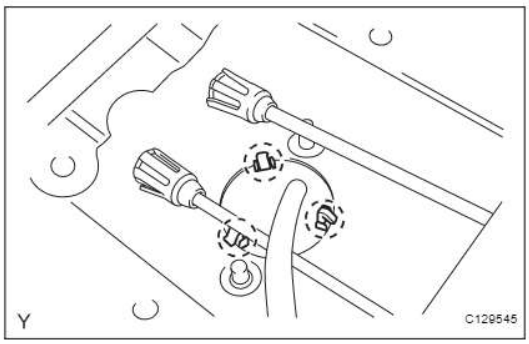
(a) Remove the lock clip and disconnect the control cable from the shift lever.



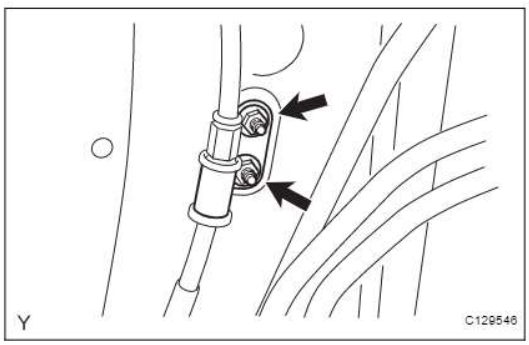

(b) Remove the 2 nuts and disconnect the control cable from the vehicle body.



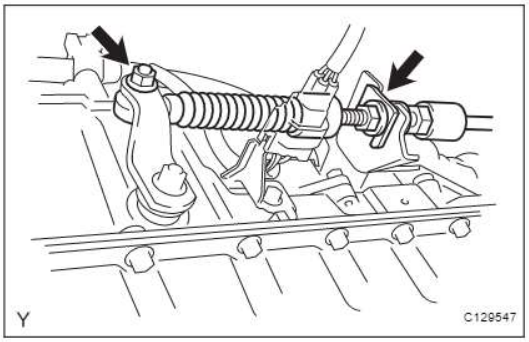

(c) Disengage the 3 claws and disconnect the control cable.




(d) Remove the 2 nuts and disconnect the control cable from the vehicle body.




AT

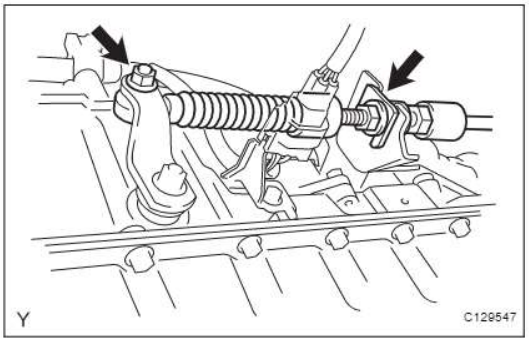



(e) Remove the nut and clip then disconnect the control cable.

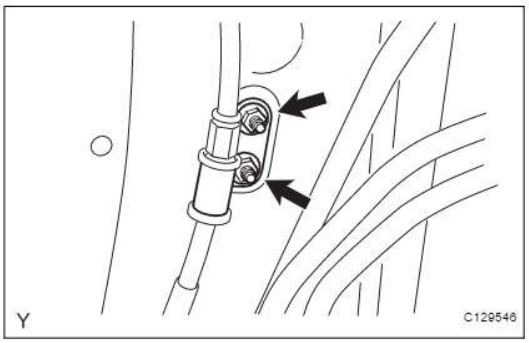
# INSTALLATION

**1. INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY**

(a) Connect the control cable to the transmission with the nut and a new clip.
**Torque: 14 N*m (143 kgf*cm, 10 ft.*lbf)**

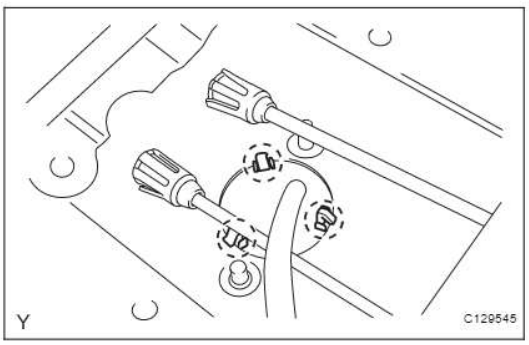



(b) Connect the control cable to the body with the 2 nuts.
**Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf)**

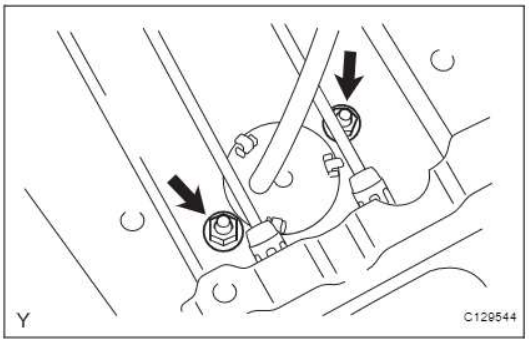


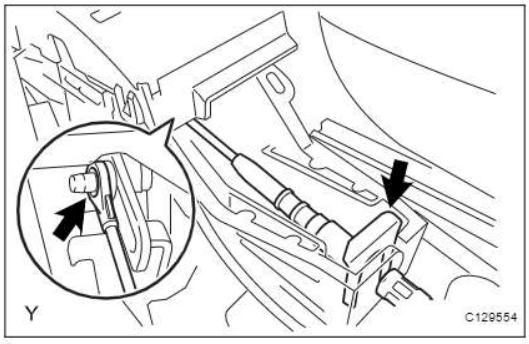

AT

(c) Engage the 3 claws to connect the control cable.




(d) Connect the control cable to the body with the 2 nuts.
**Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf)**





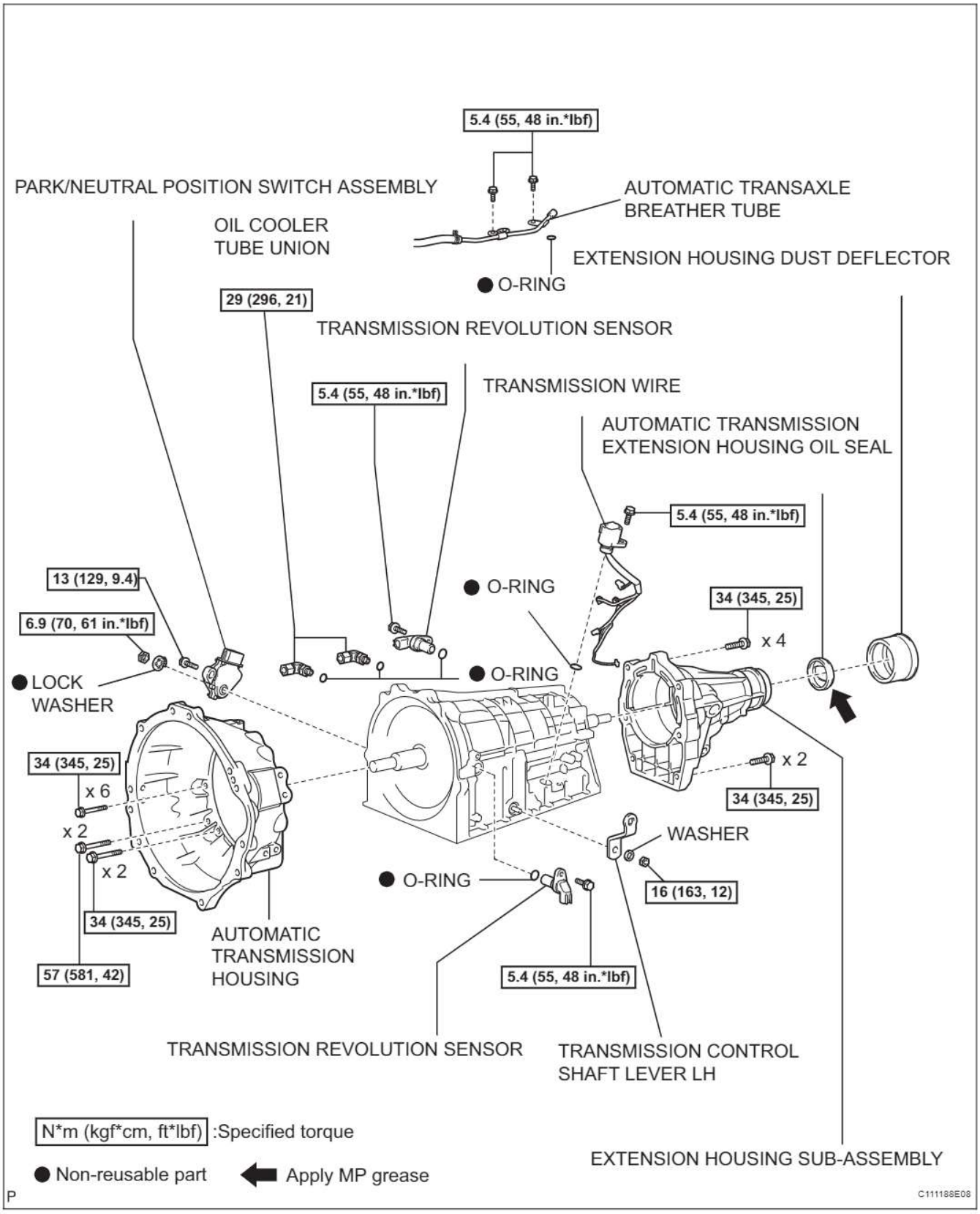

(e) Connect the control cable with a new lock clip.

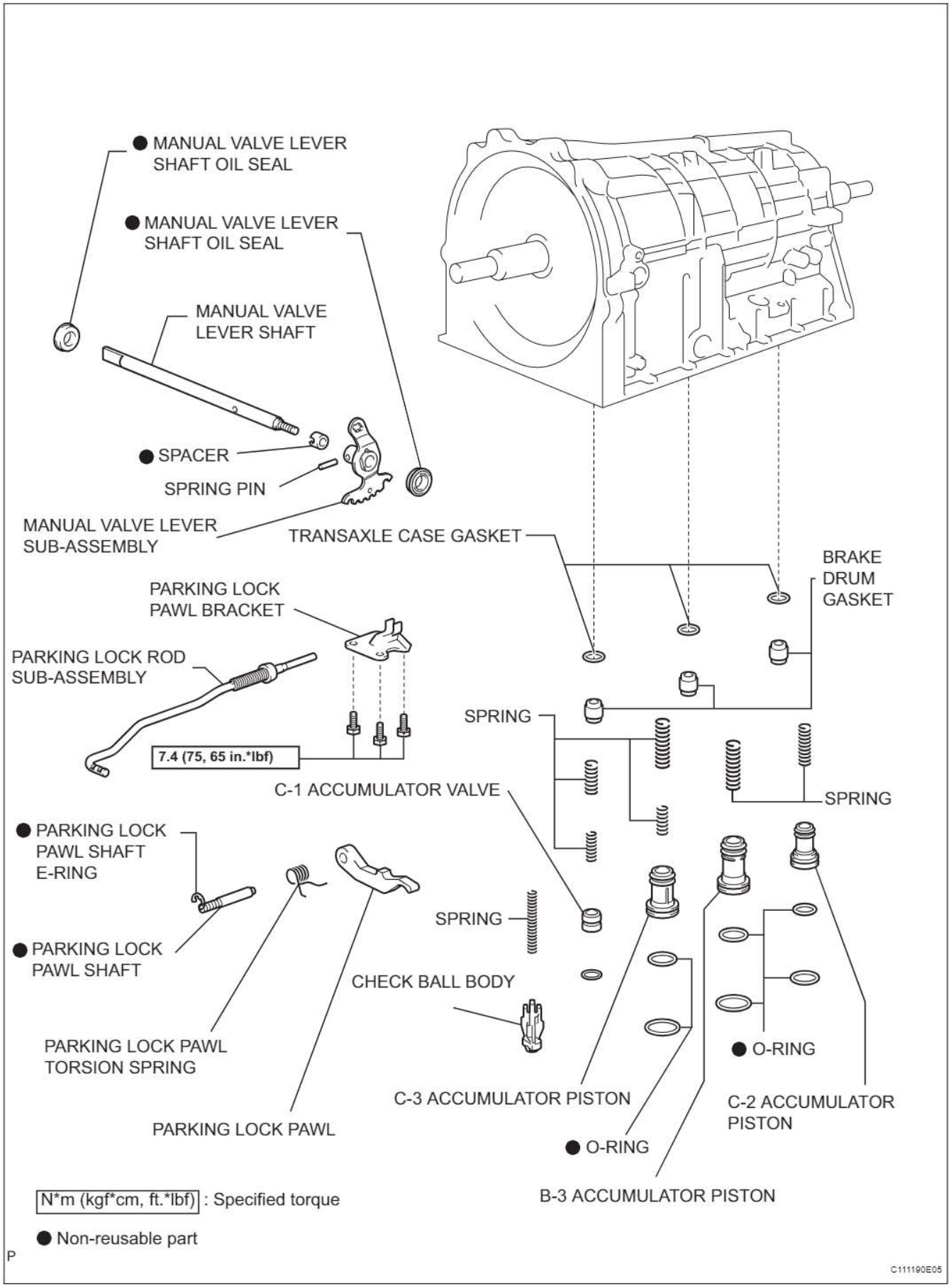
2. **INSTALL FRONT CONSOLE BOX (See page IP-31)**
3. **INSTALL CONSOLE UPPER REAR PANEL SUB-ASSEMBLY (See page IP-31)**
4. **INSTALL PARKING BRAKE HOLE COVER SUB-ASSEMBLY (See page IP-32)**

AT

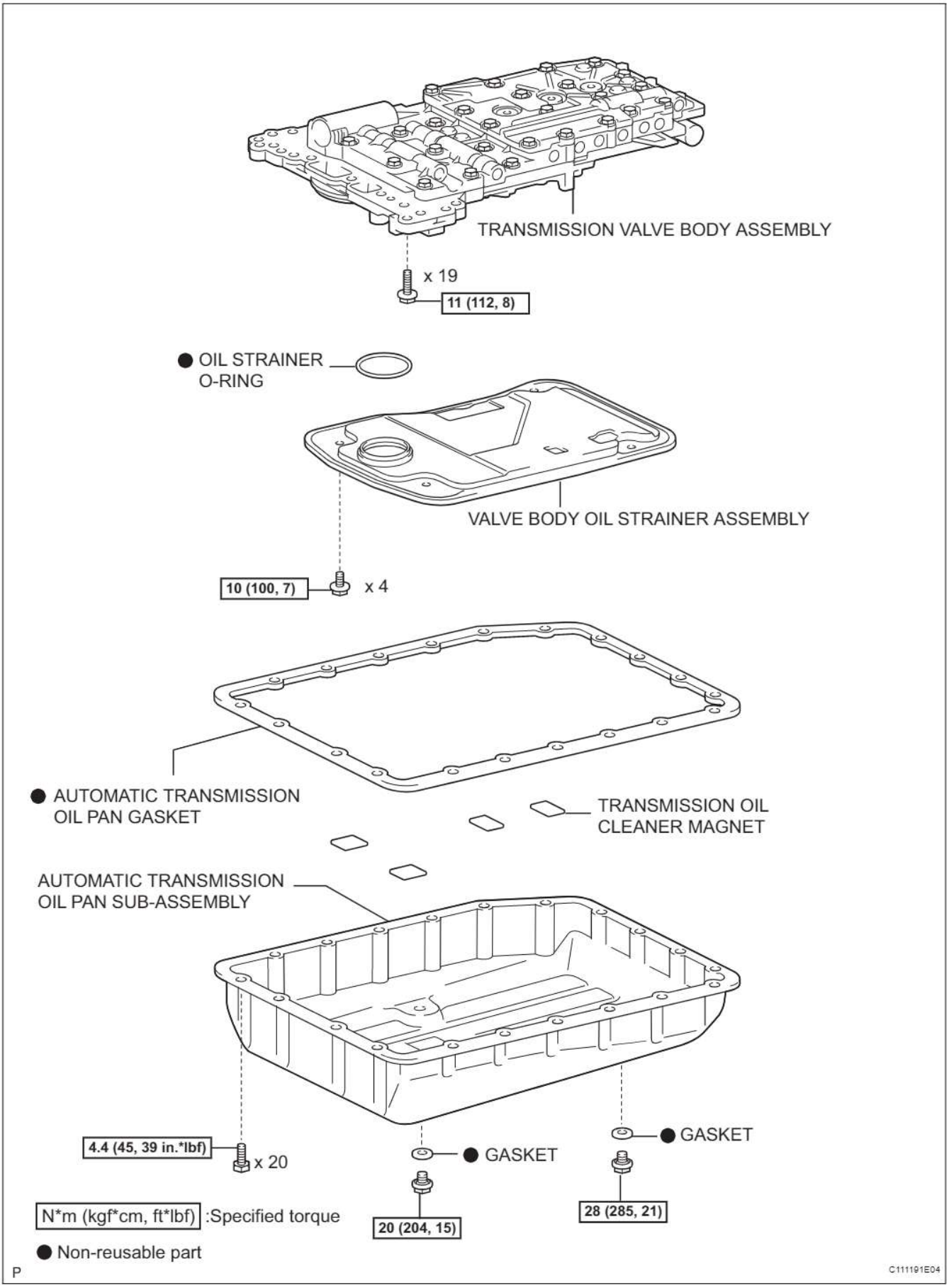
# AUTOMATIC TRANSMISSION UNIT

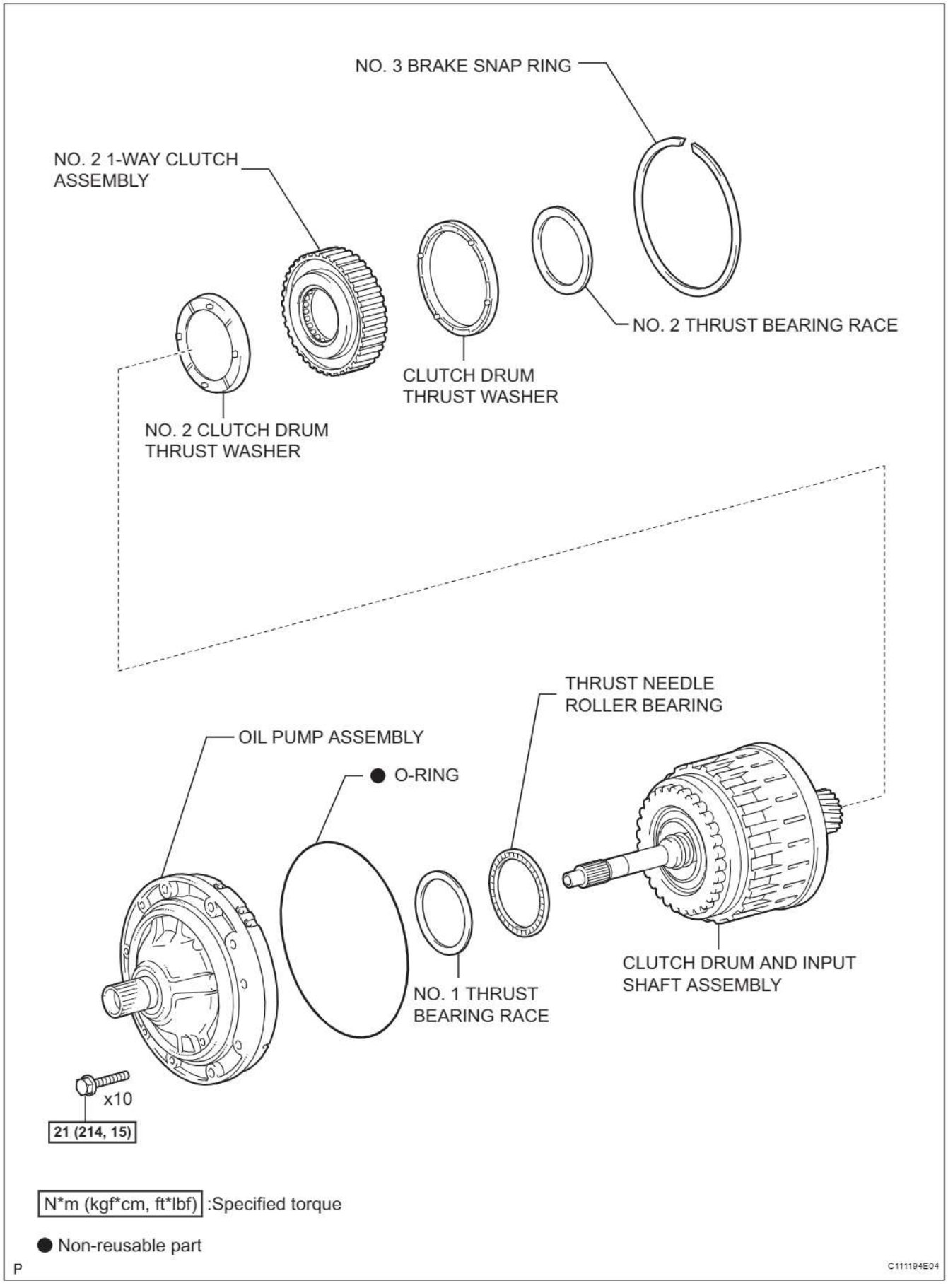
## COMPONENTS



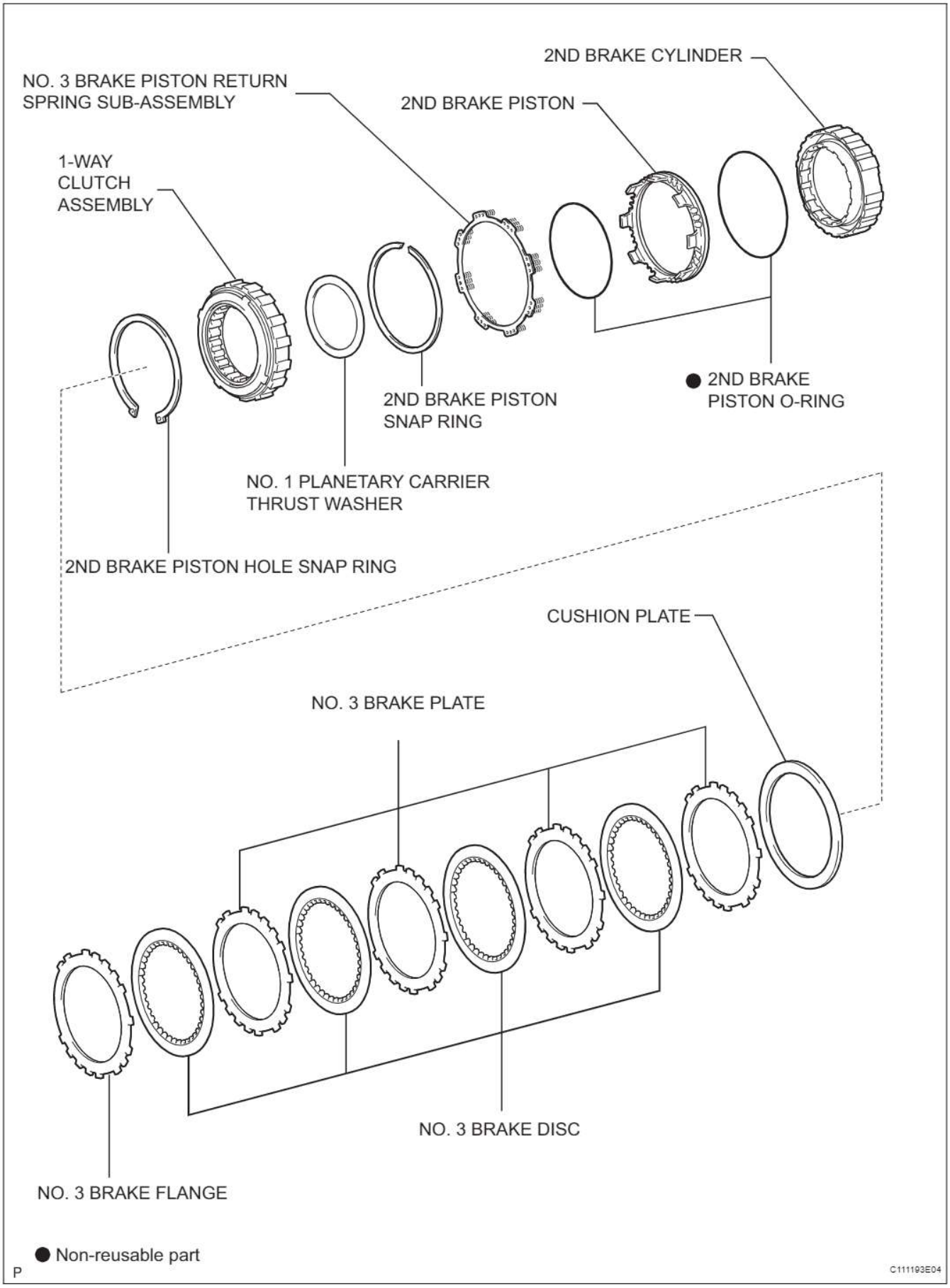

● MANUAL VALVE LEVER SHAFT OIL SEAL
● MANUAL VALVE LEVER SHAFT OIL SEAL
MANUAL VALVE LEVER SHAFT
● SPACER
SPRING PIN
MANUAL VALVE LEVER SUB-ASSEMBLY
TRANSAXLE CASE GASKET
BRAKE DRUM GASKET
PARKING LOCK PAWL BRACKET
PARKING LOCK ROD SUB-ASSEMBLY
7.4 (75, 65 in.*lbf)
SPRING
C-1 ACCUMULATOR VALVE
SPRING
● PARKING LOCK PAWL SHAFT E-RING
● PARKING LOCK PAWL SHAFT
SPRING
CHECK BALL BODY
● O-RING
PARKING LOCK PAWL TORSION SPRING
C-3 ACCUMULATOR PISTON
C-2 ACCUMULATOR PISTON
PARKING LOCK PAWL
● O-RING
B-3 ACCUMULATOR PISTON
N*m (kgf*cm, ft.*lbf) : Specified torque
● Non-reusable part
P
C111190E05

AT

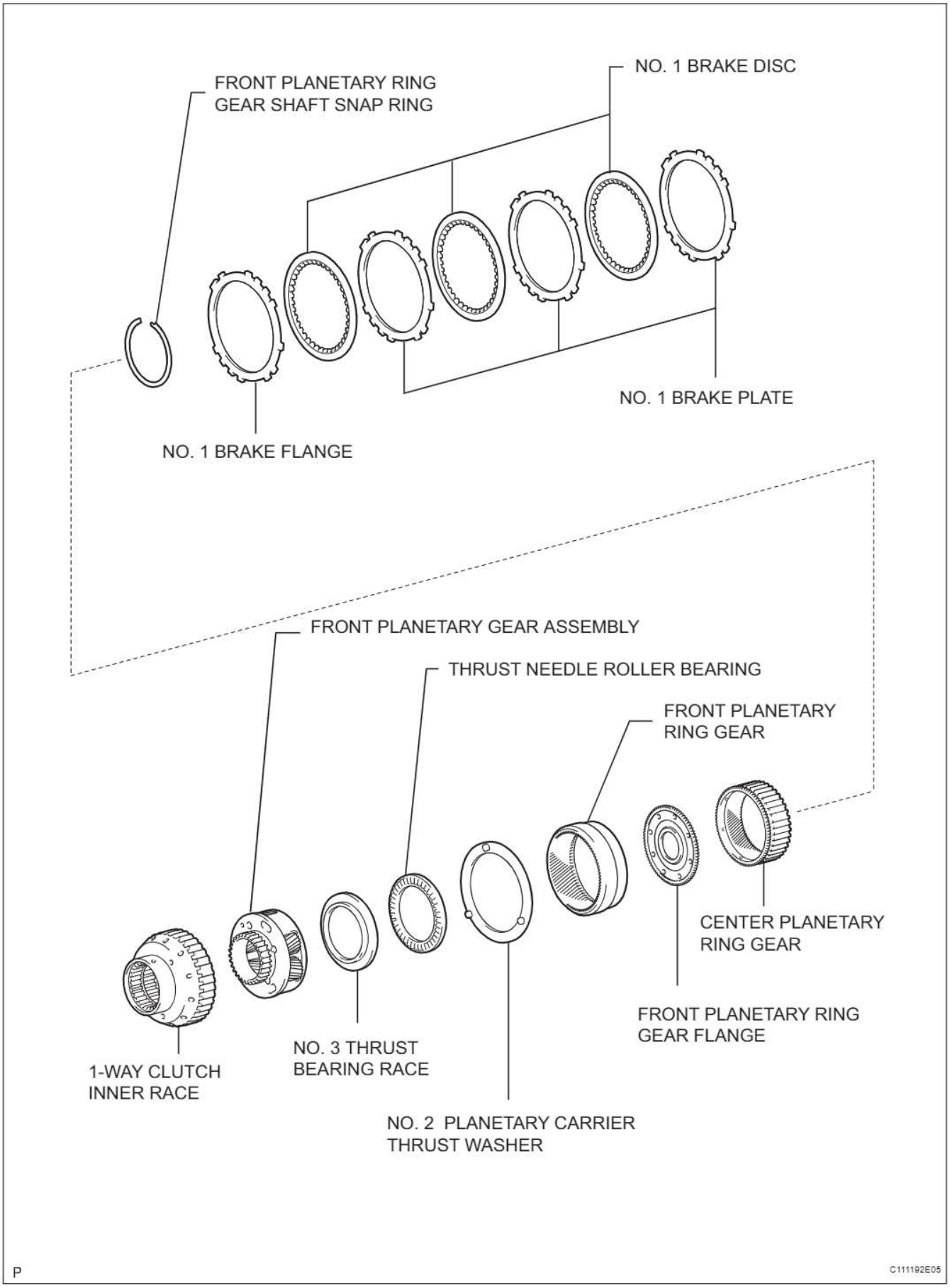

TRANSMISSION VALVE BODY ASSEMBLY
x 19
11 (112, 8)
● OIL STRAINER
O-RING
VALVE BODY OIL STRAINER ASSEMBLY
10 (100, 7)
x 4
● AUTOMATIC TRANSMISSION
OIL PAN GASKET
TRANSMISSION OIL
CLEANER MAGNET
AUTOMATIC TRANSMISSION
OIL PAN SUB-ASSEMBLY
4.4 (45, 39 in.*lbf)
x 20
● GASKET
● GASKET
20 (204, 15)
28 (285, 21)
N*m (kgf*cm, ft*lbf) :Specified torque
● Non-reusable part
P
C111191E04


NO. 3 BRAKE SNAP RING
NO. 2 1-WAY CLUTCH ASSEMBLY
NO. 2 THRUST BEARING RACE
CLUTCH DRUM THRUST WASHER
NO. 2 CLUTCH DRUM THRUST WASHER
THRUST NEEDLE ROLLER BEARING
OIL PUMP ASSEMBLY
● O-RING
CLUTCH DRUM AND INPUT SHAFT ASSEMBLY
NO. 1 THRUST BEARING RACE
x10
21 (214, 15)
N*m (kgf*cm, ft*lbf) :Specified torque
● Non-reusable part
P
C111194E04

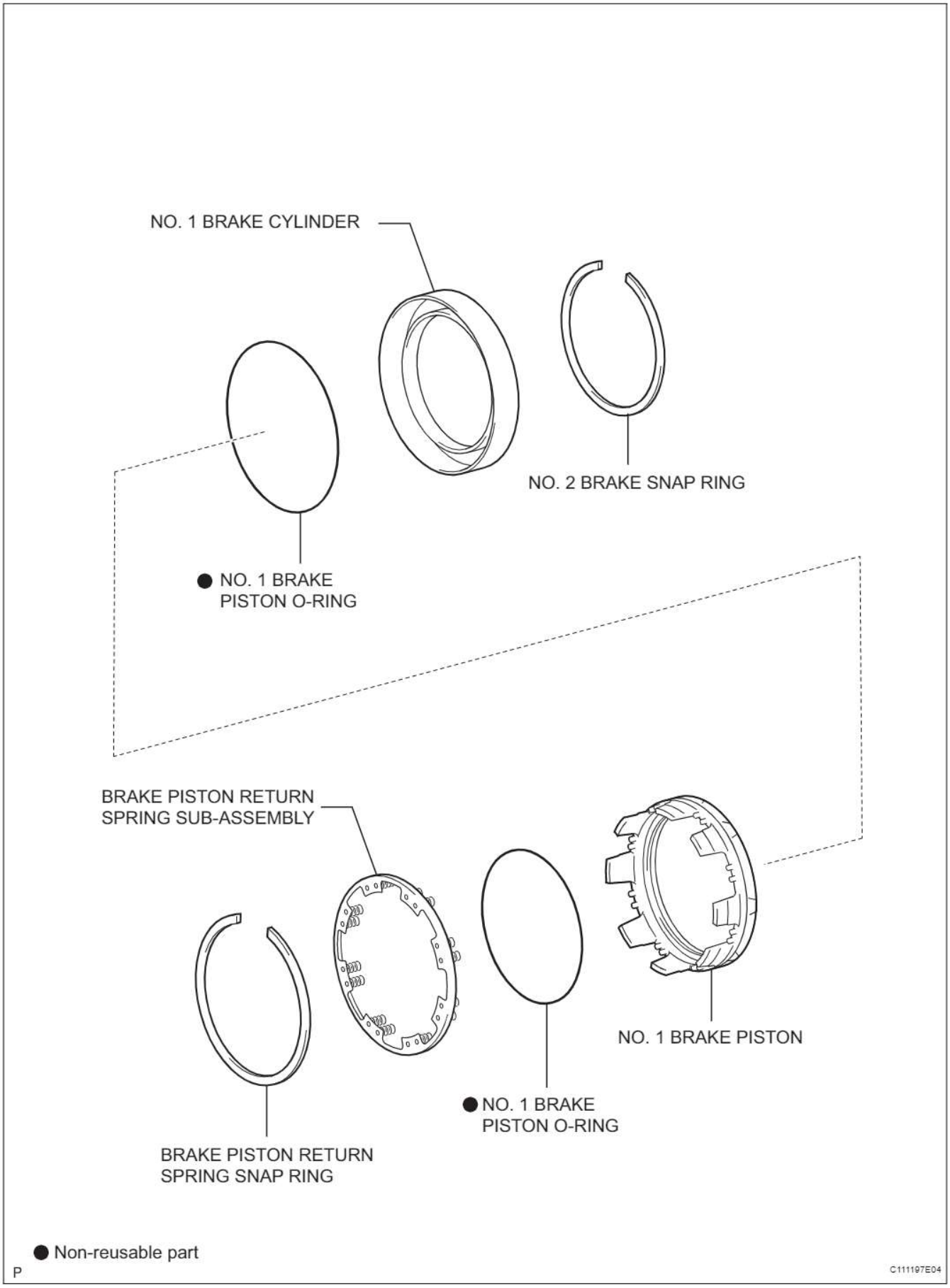
AT

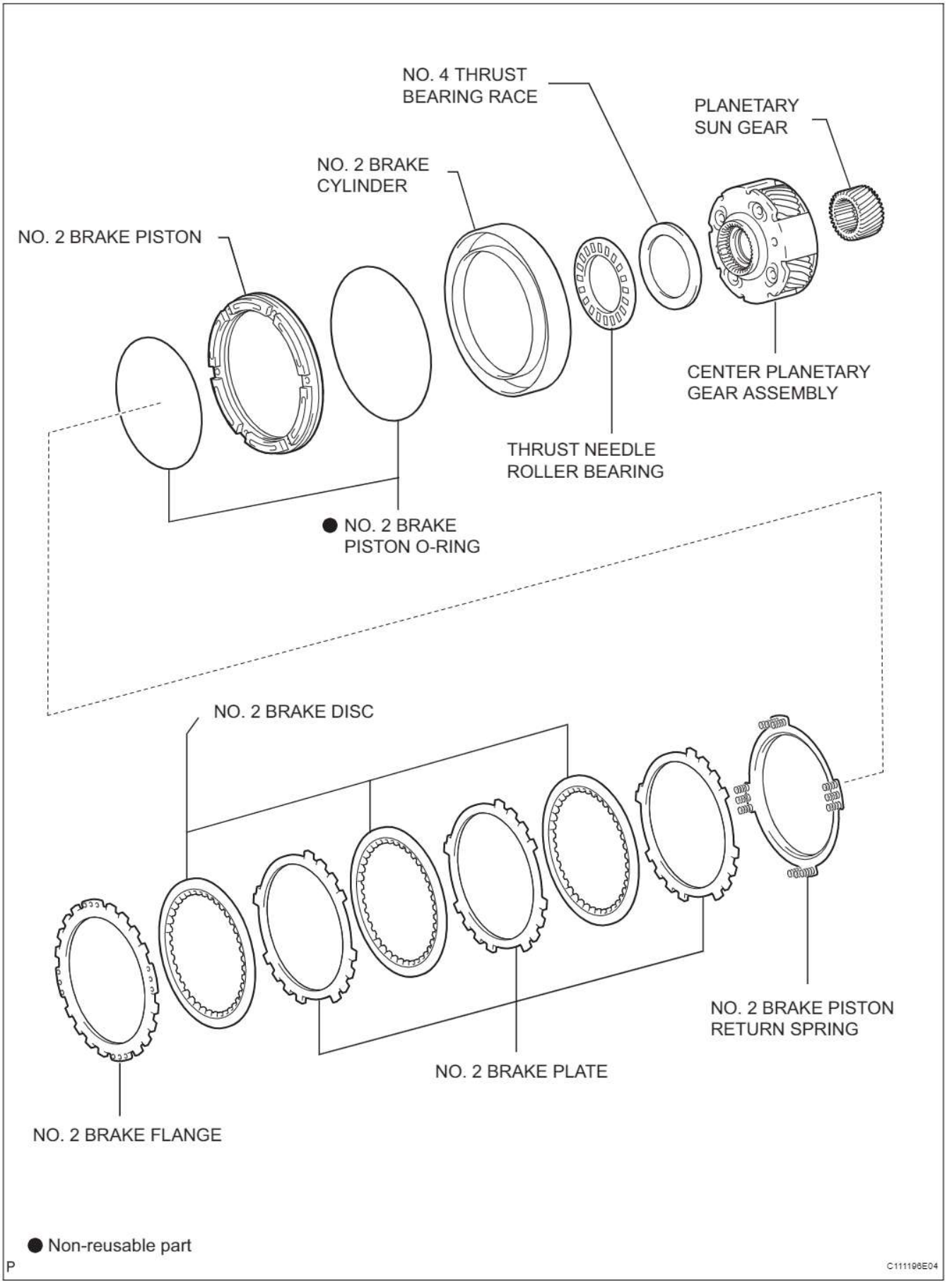

2ND BRAKE CYLINDER
NO. 3 BRAKE PISTON RETURN SPRING SUB-ASSEMBLY
2ND BRAKE PISTON
1-WAY CLUTCH ASSEMBLY
2ND BRAKE PISTON SNAP RING
● 2ND BRAKE PISTON O-RING
NO. 1 PLANETARY CARRIER THRUST WASHER
2ND BRAKE PISTON HOLE SNAP RING
CUSHION PLATE
NO. 3 BRAKE PLATE
NO. 3 BRAKE DISC
NO. 3 BRAKE FLANGE
● Non-reusable part
P
C111193E04

AT

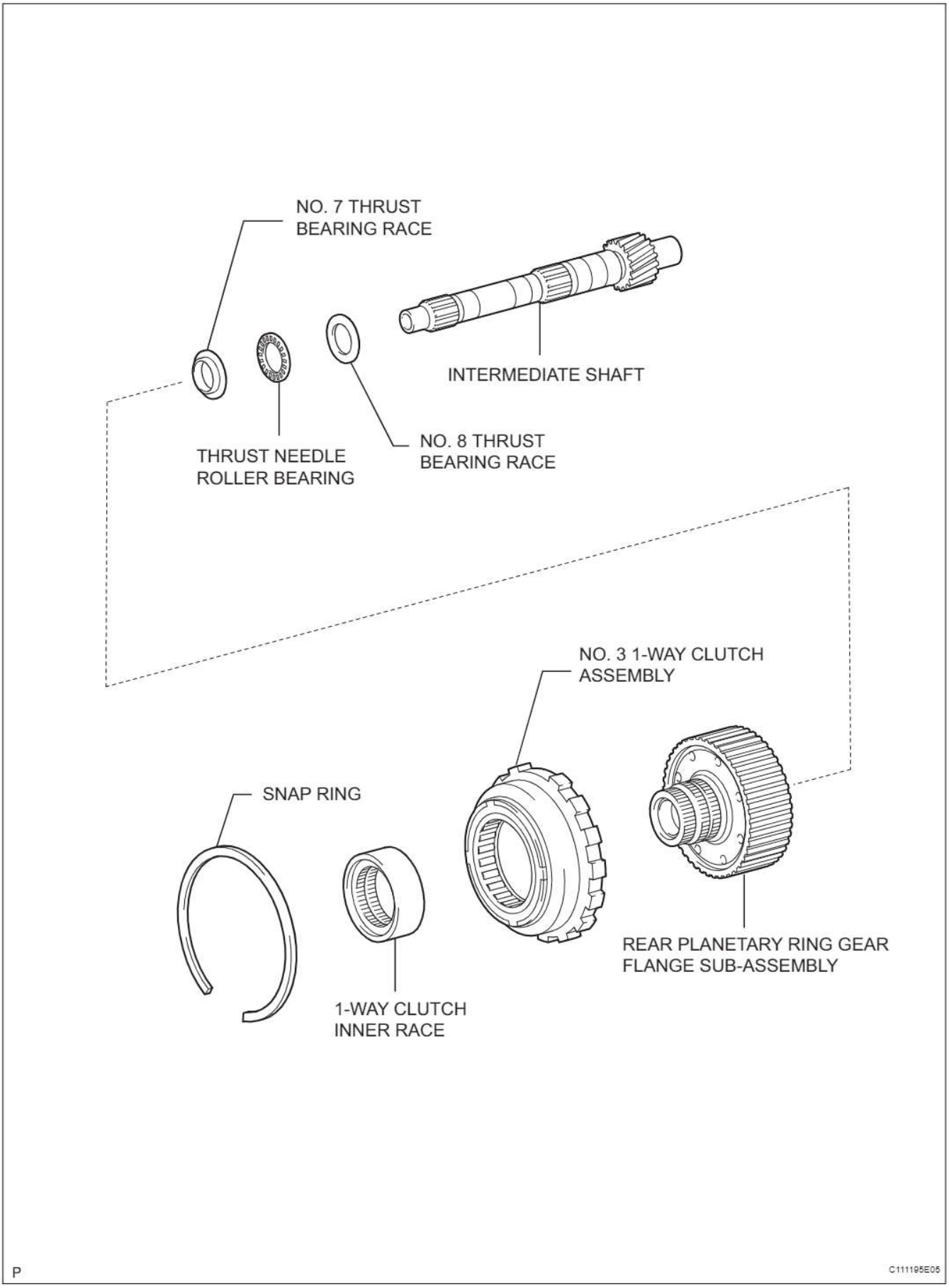

FRONT PLANETARY RING GEAR SHAFT SNAP RING
NO. 1 BRAKE DISC
NO. 1 BRAKE PLATE
NO. 1 BRAKE FLANGE
FRONT PLANETARY GEAR ASSEMBLY
THRUST NEEDLE ROLLER BEARING
FRONT PLANETARY RING GEAR
CENTER PLANETARY RING GEAR
FRONT PLANETARY RING GEAR FLANGE
1-WAY CLUTCH INNER RACE
NO. 3 THRUST BEARING RACE
NO. 2 PLANETARY CARRIER THRUST WASHER
P
C111192E05

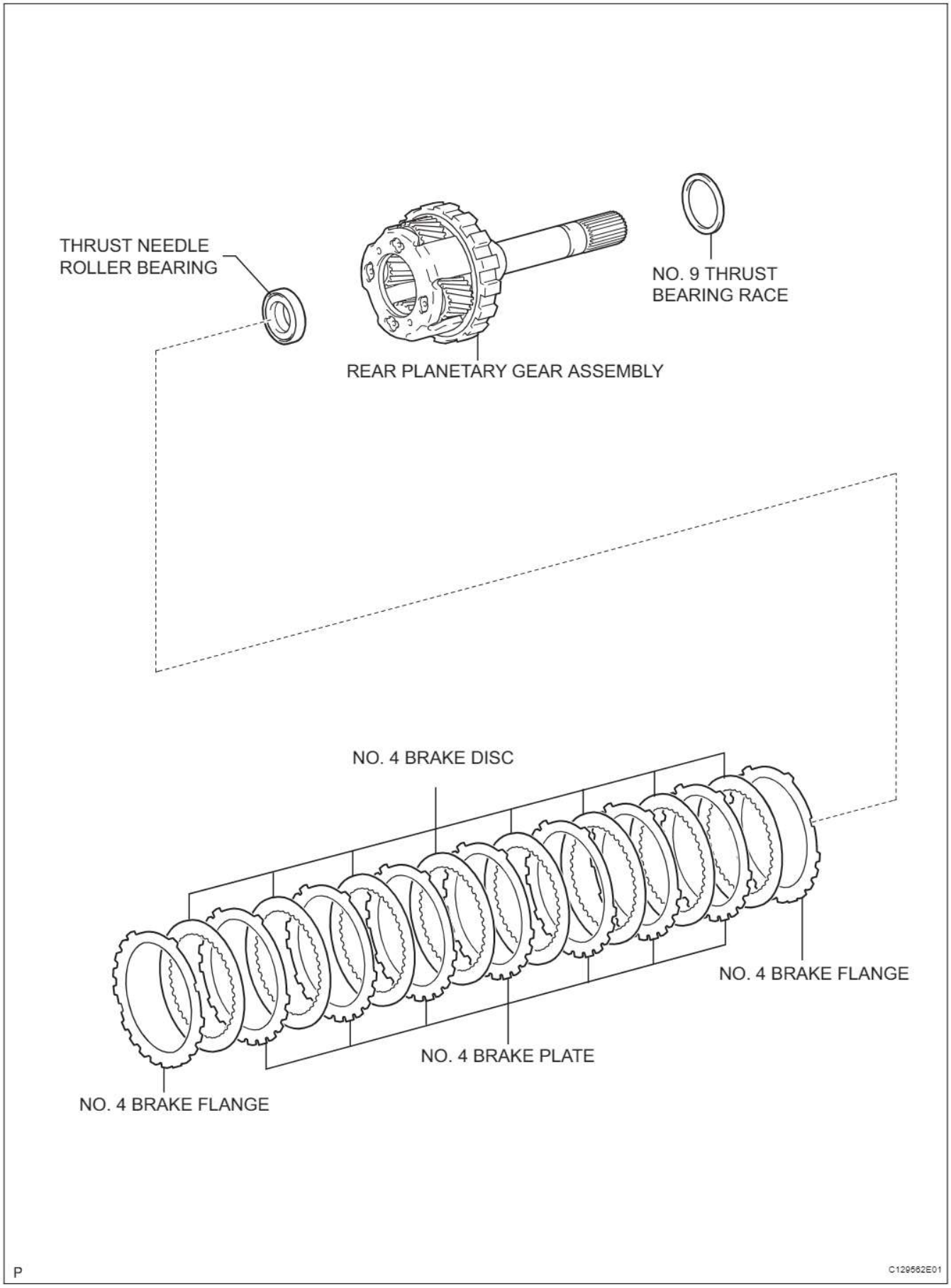
AT


NO. 1 BRAKE CYLINDER
NO. 2 BRAKE SNAP RING
● NO. 1 BRAKE PISTON O-RING
BRAKE PISTON RETURN SPRING SUB-ASSEMBLY
NO. 1 BRAKE PISTON
● NO. 1 BRAKE PISTON O-RING
BRAKE PISTON RETURN SPRING SNAP RING
● Non-reusable part
P
C111197E04

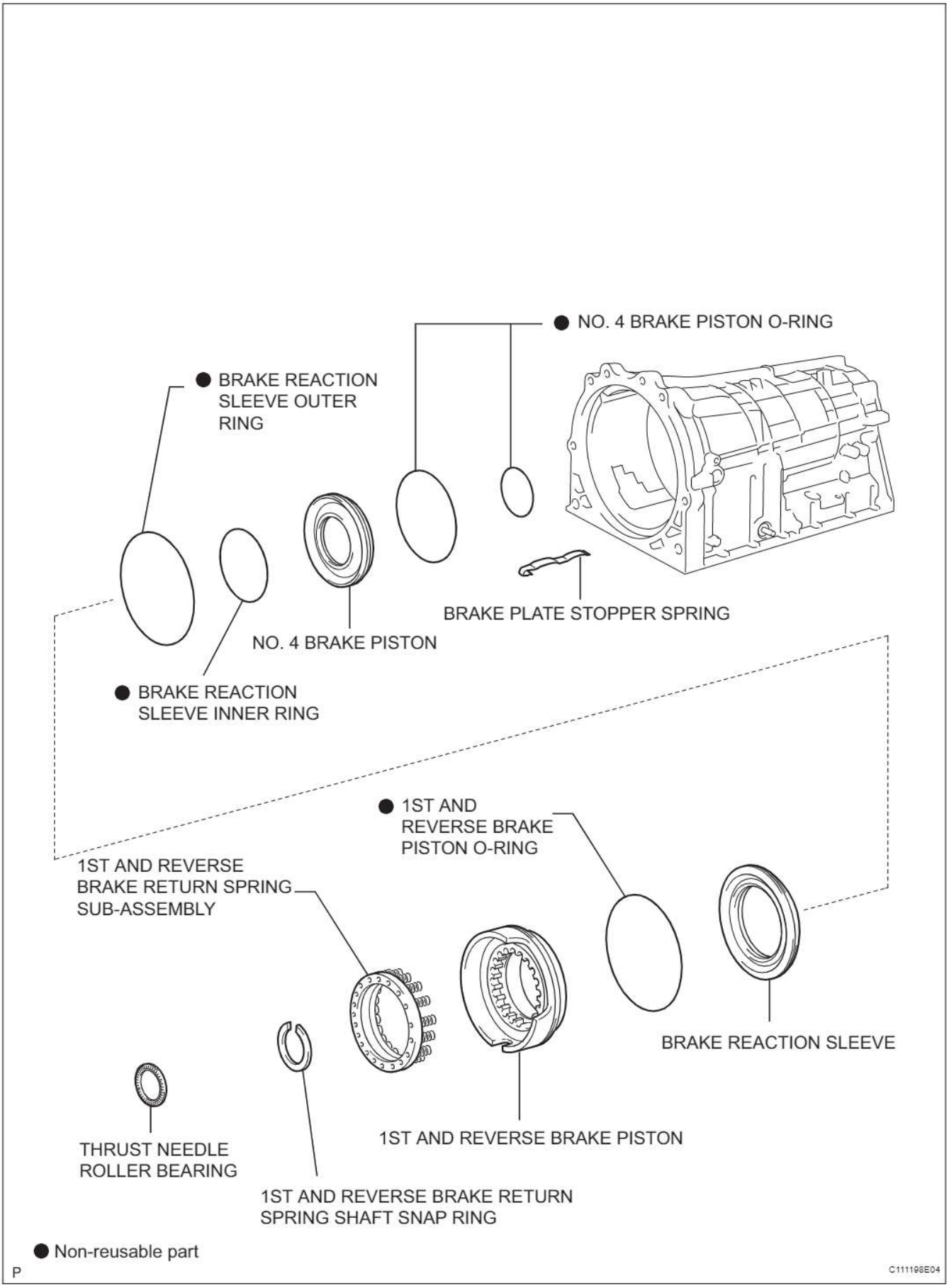

NO. 4 THRUST BEARING RACE
PLANETARY SUN GEAR
NO. 2 BRAKE CYLINDER
NO. 2 BRAKE PISTON
CENTER PLANETARY GEAR ASSEMBLY
THRUST NEEDLE ROLLER BEARING
● NO. 2 BRAKE PISTON O-RING
NO. 2 BRAKE DISC
NO. 2 BRAKE PISTON RETURN SPRING
NO. 2 BRAKE PLATE
NO. 2 BRAKE FLANGE
● Non-reusable part
P
C111196E04

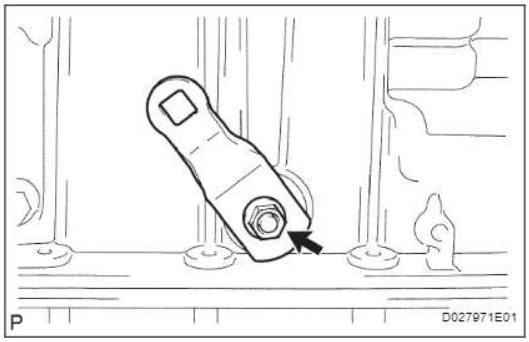
AT


NO. 7 THRUST BEARING RACE
INTERMEDIATE SHAFT
THRUST NEEDLE ROLLER BEARING
NO. 8 THRUST BEARING RACE
NO. 3 1-WAY CLUTCH ASSEMBLY
SNAP RING
REAR PLANETARY RING GEAR FLANGE SUB-ASSEMBLY
1-WAY CLUTCH INNER RACE
P
C111195E05


THRUST NEEDLE ROLLER BEARING
NO. 9 THRUST BEARING RACE
REAR PLANETARY GEAR ASSEMBLY
NO. 4 BRAKE DISC
NO. 4 BRAKE FLANGE
NO. 4 BRAKE PLATE
NO. 4 BRAKE FLANGE
P
C129562E01

AT

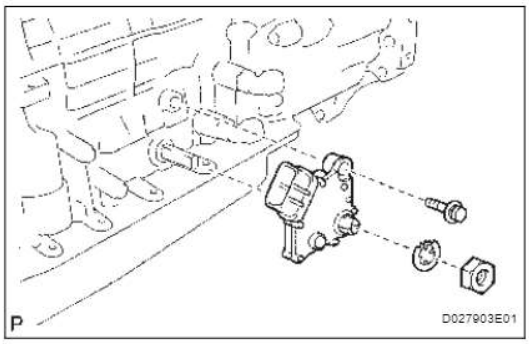

● NO. 4 BRAKE PISTON O-RING
● BRAKE REACTION SLEEVE OUTER RING
BRAKE PLATE STOPPER SPRING
NO. 4 BRAKE PISTON
● BRAKE REACTION SLEEVE INNER RING
● 1ST AND REVERSE BRAKE PISTON O-RING
1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY
BRAKE REACTION SLEEVE
THRUST NEEDLE ROLLER BEARING
1ST AND REVERSE BRAKE PISTON
1ST AND REVERSE BRAKE RETURN SPRING SHAFT SNAP RING
● Non-reusable part
P
C111198E04




# DISASSEMBLY

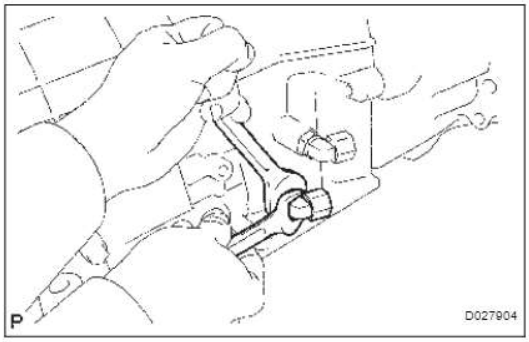
**1. REMOVE TRANSMISSION CONTROL SHAFT LEVER LH**

(a) Remove the nut, washer and control shaft lever LH.




**2. REMOVE PARK/NEUTRAL POSITION SWITCH ASSEMBLY**

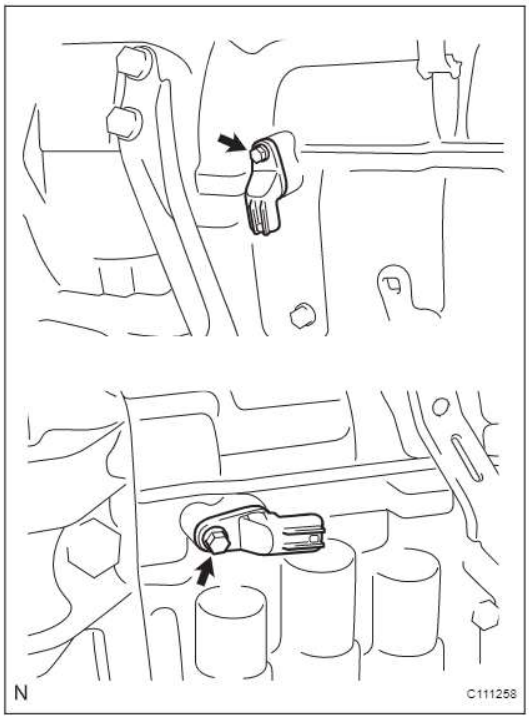
(a) Using a screwdriver, pry out the lock washer.
(b) Remove the nut, lock washer and bolt.
(c) Remove the park/neutral position switch.




**3. REMOVE OIL COOLER TUBE UNION**

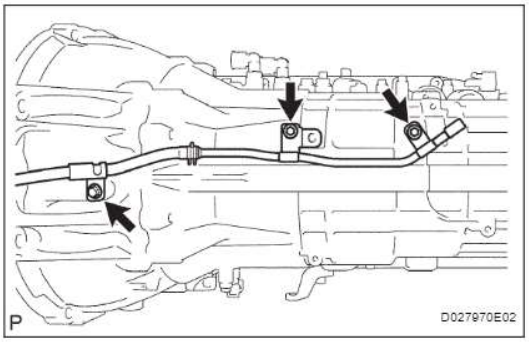
(a) Remove the 2 oil cooler tube unions.
(b) Remove the O-ring from the oil cooler tube union.

AT



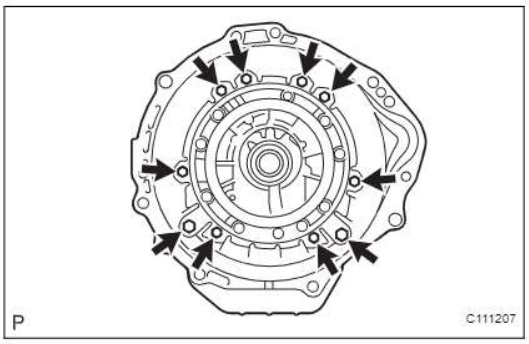

**4. REMOVE TRANSMISSION REVOLUTION SENSOR**

(a) Remove the 2 bolts and 2 transmission revolution sensors.
(b) Remove the O-ring from each sensor.



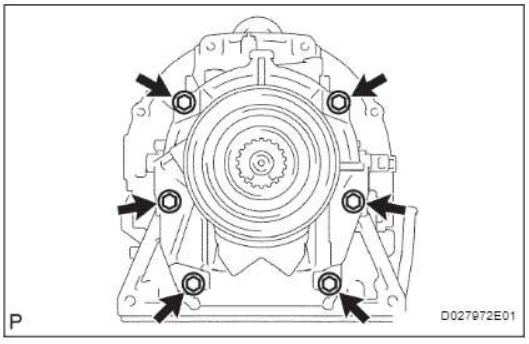

**5. REMOVE AUTOMATIC TRANSAXLE BREATHER TUBE**

(a) Remove the 3 bolts.
(b) Remove the breather tube.
(c) Remove the O-ring from breather tube.




**6. REMOVE AUTOMATIC TRANSMISSION HOUSING**

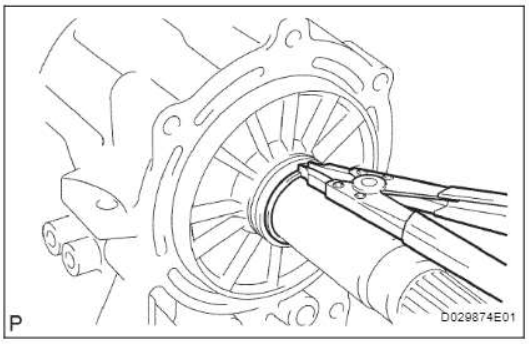
(a) Remove the 10 bolts.
(b) Remove the transmission housing.



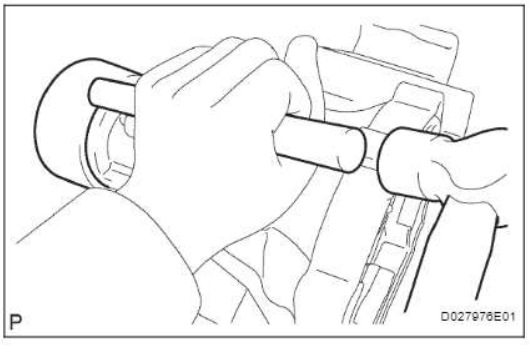

**7. REMOVE EXTENSION HOUSING SUB-ASSEMBLY**

(a) Remove the 6 bolts.
(b) Remove the extension housing assembly.
HINT:
Use a brass bar and hammer to remove the extension housing assembly.
(c) Remove the gasket from the extension housing assembly.

AT

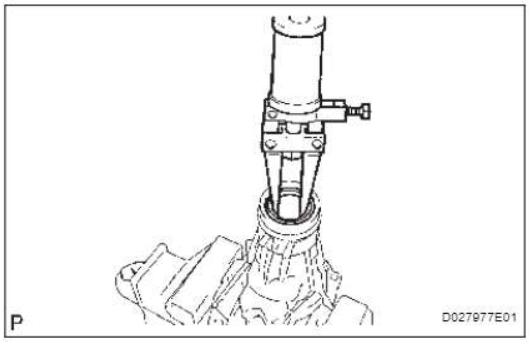



(d) Using a snap ring expander, remove the snap ring.
(e) Remove the thrust needle roller bearing and 2 bearing races.



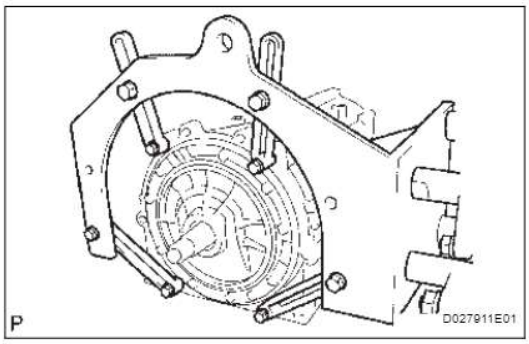

**8. REMOVE EXTENSION HOUSING DUST DEFLECTOR**

(a) Using a brass bar and hammer, remove the extension housing dust deflector.




**9. REMOVE AUTOMATIC TRANSMISSION EXTENSION HOUSING OIL SEAL**

(a) Using SST, tap out the oil seal.
**SST 09308-00010**




**10. FIX AUTOMATIC TRANSMISSION CASE SUB-ASSEMBLY**

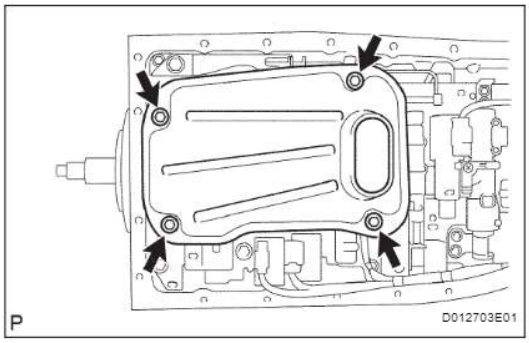
(a) Install the transmission case onto the overhaul attachment.

**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.**

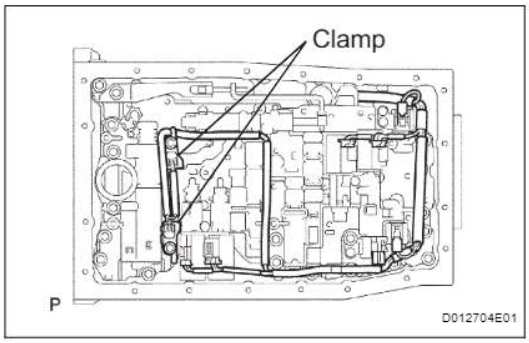
(a) Remove the drain plug and 20 bolts.

**12. INSPECT AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY (See page AT-211)**




**13. REMOVE VALVE BODY OIL STRAINER ASSEMBLY**

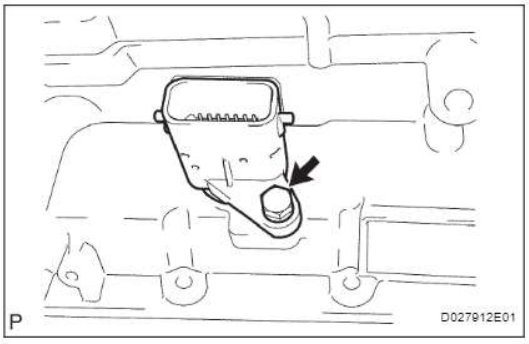
(a) Turn over the transmission.
(b) Remove the 4 bolts holding the valve body oil strainer assembly from the valve body.
(c) Remove the O-ring form the valve body oil strainer assembly.



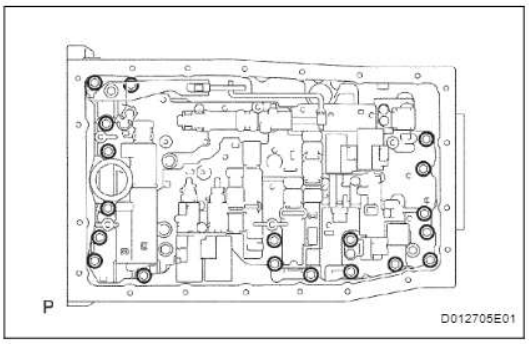

**14. REMOVE TRANSMISSION WIRE**

(a) Remove the ATF temperature sensor.
(b) Remove the 2 bolts and 2 clamps.
(c) Disconnect the 7 connectors from the shift solenoid valves.

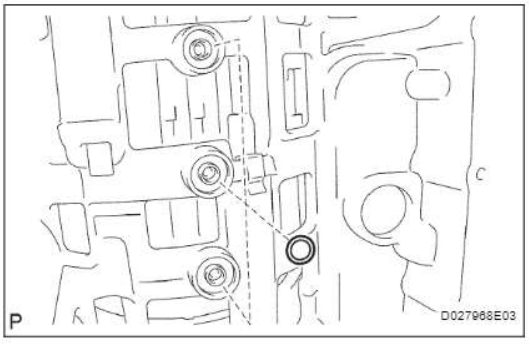
AT




(d) Remove the bolt from the case.
(e) Pull the transmission wire out of the transmission case.
(f) Remove the O-ring from the transmission wire.

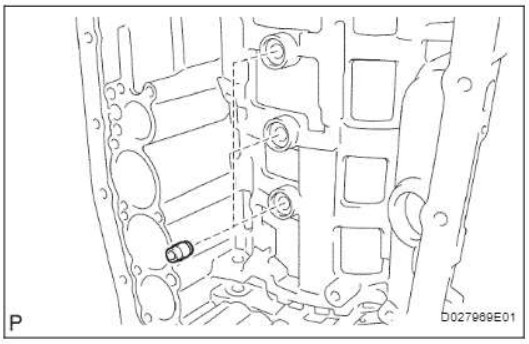



**15. REMOVE TRANSMISSION VALVE BODY ASSEMBLY**
(a) Remove the 19 bolts.
(b) Remove the valve body assembly.

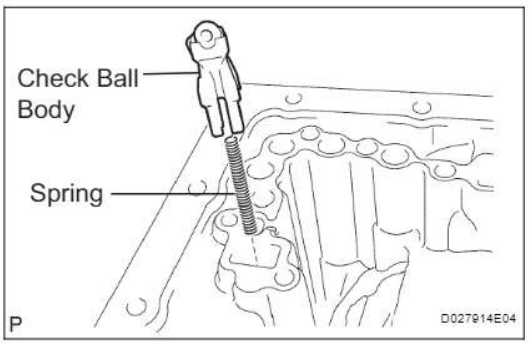



**16. REMOVE TRANSAXLE CASE GASKET**
(a) Remove the 3 transaxle case gaskets.

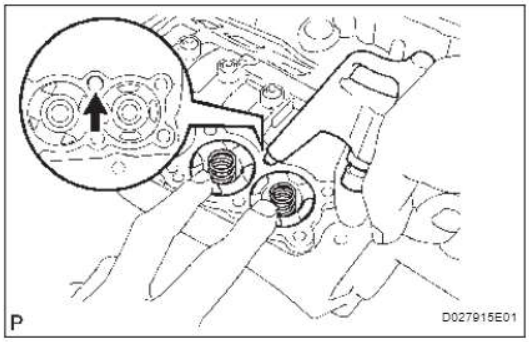
AT




**17. REMOVE BRAKE DRUM GASKET**
(a) Remove the 3 brake drum gaskets.




**18. REMOVE CHECK BALL BODY**
(a) Remove the check ball body and spring.



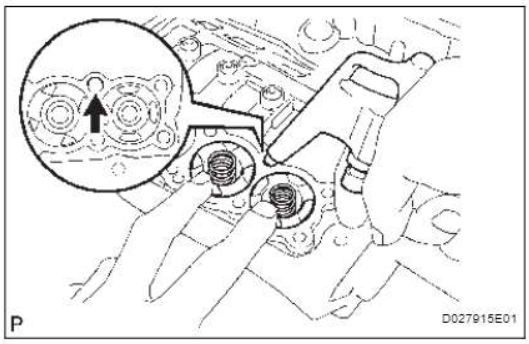

**19. REMOVE C-2 ACCUMULATOR PISTON**

(a) Applying compressed air to the oil hole, 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.**



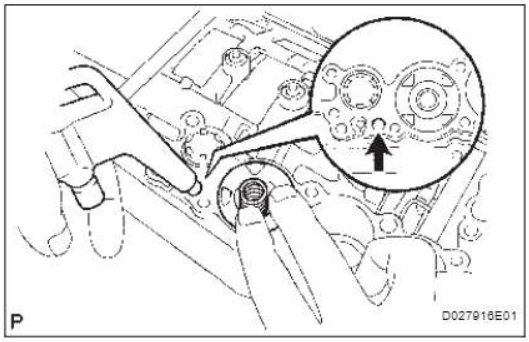

**20. REMOVE B-3 ACCUMULATOR PISTON**

(a) Applying compressed air to the oil hole, 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.**

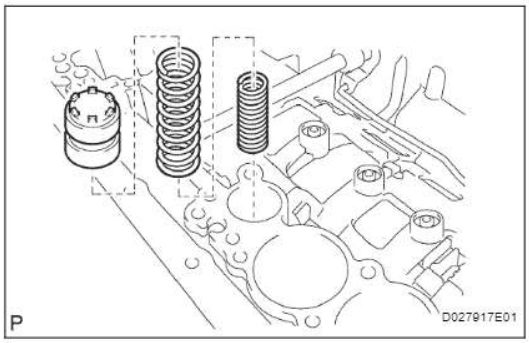



**21. REMOVE C-3 ACCUMULATOR PISTON**

(a) Applying compressed air to the oil hole, remove the C-3 accumulator piston and the 2 springs.

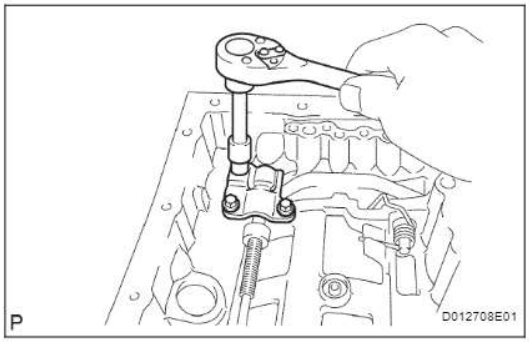
(b) Remove the 2 O-rings from the piston.

AT



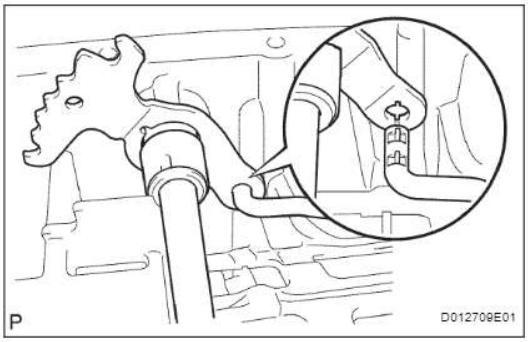

**22. REMOVE C-1 ACCUMULATOR VALVE**

(a) Remove the C-1 accumulator valve and 2 springs.



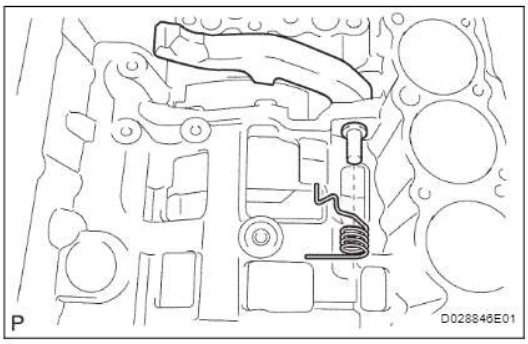

**23. REMOVE PARKING LOCK PAWL BRACKET**

(a) Remove the 3 bolts and parking lock pawl bracket.




**24. REMOVE PARKING LOCK ROD SUB-ASSEMBLY**

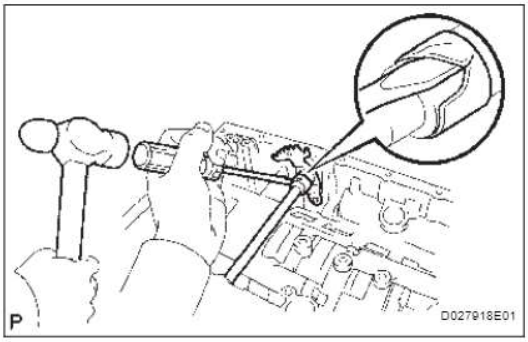
(a) Disconnect the parking lock rod from the manual valve lever.




**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.

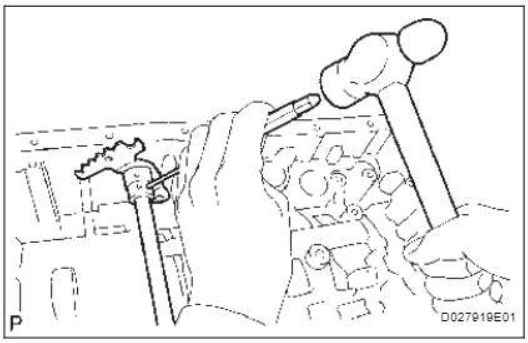
(b) Remove the E-ring from the shaft.




**26. REMOVE MANUAL VALVE LEVER SUB-ASSEMBLY**

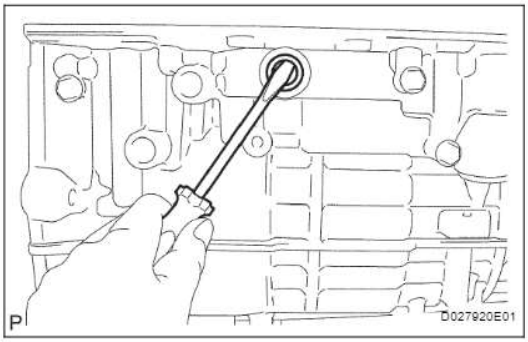
(a) Using a hammer and screwdriver, cut off the spacer and remove it from the shaft.

AT



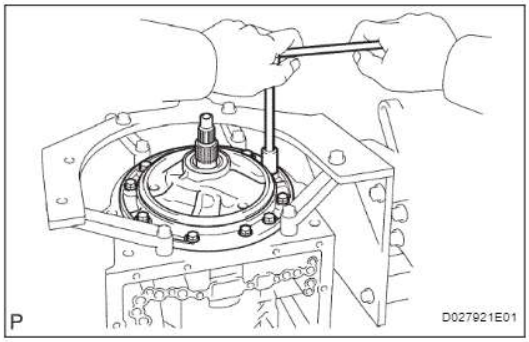

(b) Using a pin punch and hammer, tap out the spring pin.
HINT:
Slowly drive out the spring pin so that it does not fall into the transmission case.

(c) Pull the manual valve lever shaft out through the case, and remove the manual valve lever.



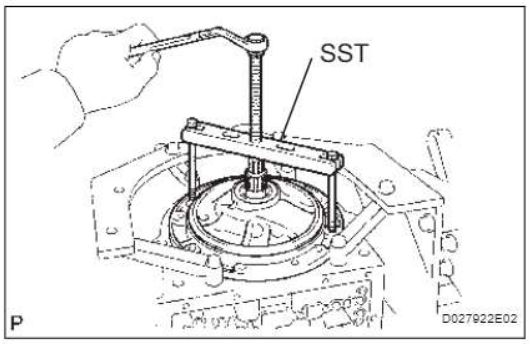

**27. REMOVE MANUAL VALVE LEVER SHAFT OIL SEAL**

(a) Using a screwdriver, remove the 2 oil seals.

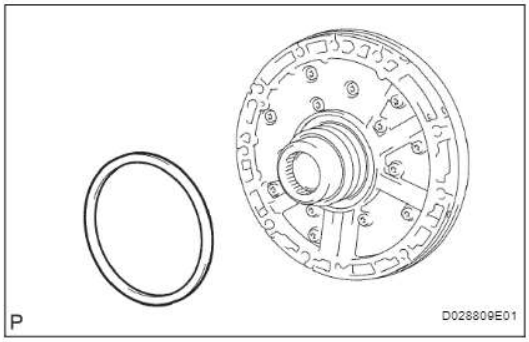



**28. REMOVE OIL PUMP ASSEMBLY**

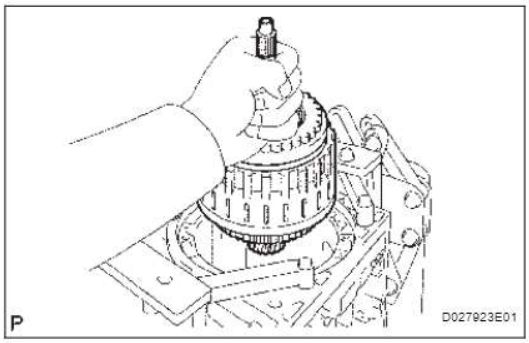
(a) Remove the 10 bolts holding the oil pump from the transmission case.




(b) Using SST, remove the oil pump.
**SST 09350-30020 (09350-07020)**



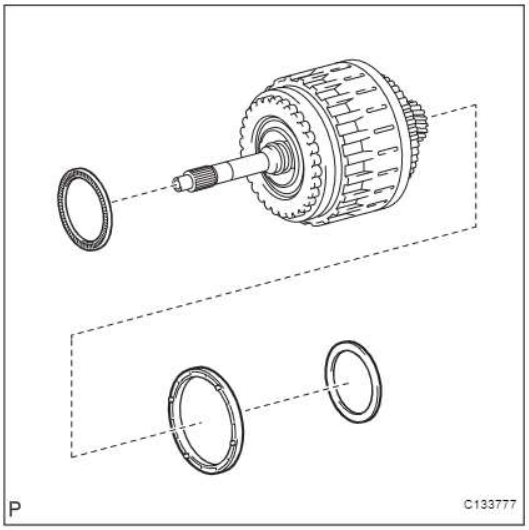

(c) Remove the No. 1 thrust bearing race from the front oil pump.




**29. REMOVE CLUTCH DRUM AND INPUT SHAFT ASSEMBLY**

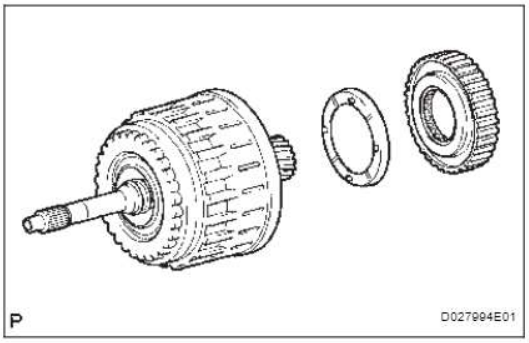
(a) Remove the clutch drum and input shaft drum assembly from the transmission case.

AT



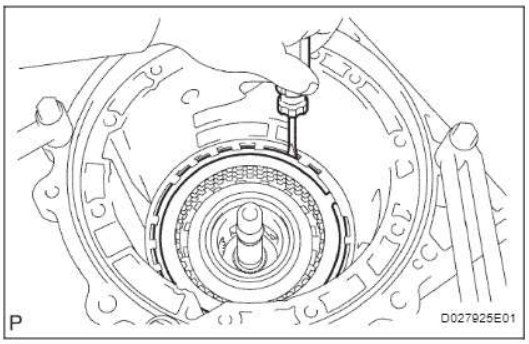

(b) Remove the clutch drum thrust washer, No. 2 thrust bearing race and thrust needle roller bearing.

**30. INSPECT NO. 2 1-WAY CLUTCH ASSEMBLY (See page AT-212)**




**31. REMOVE NO. 2 1-WAY CLUTCH ASSEMBLY**

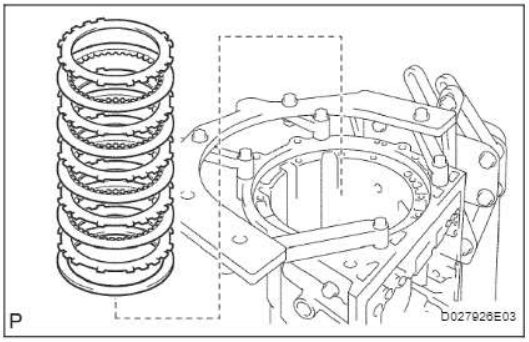
(a) Remove the No. 2 1-way clutch assembly and No. 2 clutch drum thrust washer from the clutch drum and input shaft assembly.




**32. REMOVE NO. 3 BRAKE SNAP RING**

(a) Using a screwdriver, remove the No. 3 brake snap ring from the case.

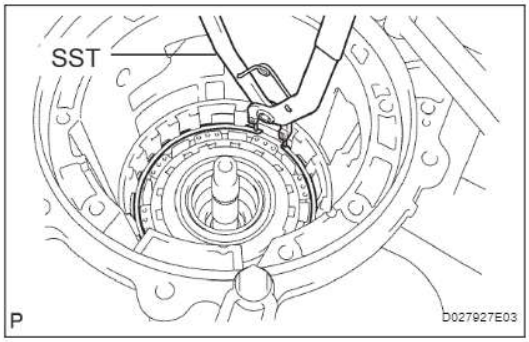
AT




**33. REMOVE NO. 3 BRAKE DISC**

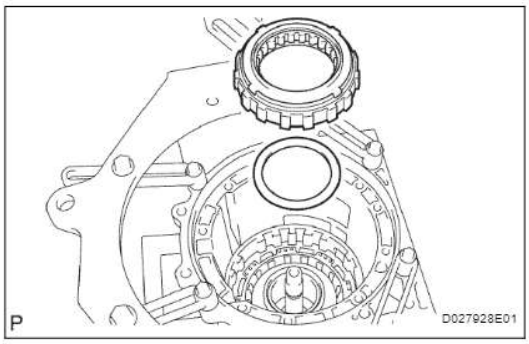
(a) Remove the flange, cushion plate, 4 discs and 4 plates from the case.

**34. INSPECT NO. 3 BRAKE DISC (See page AT-212)**



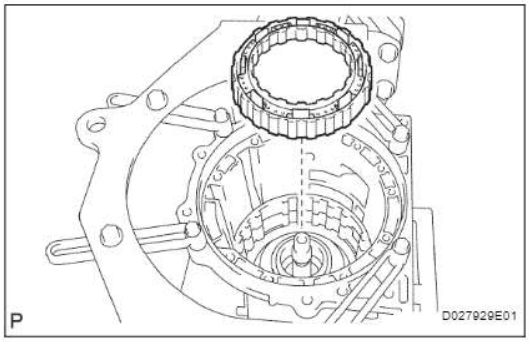

**35. REMOVE 2ND BRAKE PISTON HOLE SNAP RING**

(a) Using SST, remove the snap ring.
**SST 09350-30020 (09350-07060)**



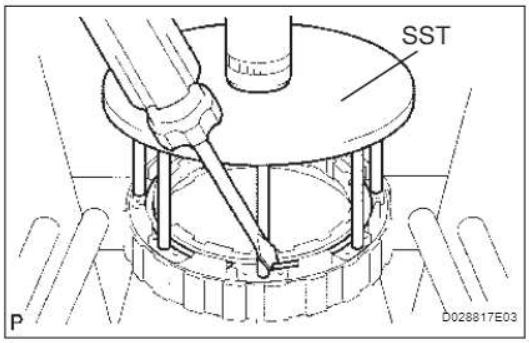

**36. REMOVE 1-WAY CLUTCH ASSEMBLY**

(a) Remove the 1-way clutch assembly and the No. 1 planetary carrier thrust washer from the case.




**37. REMOVE 2ND BRAKE CYLINDER**

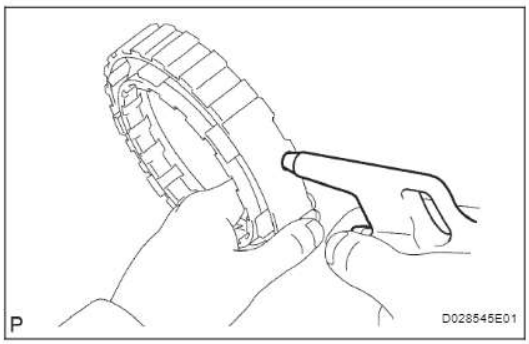
(a) Remove the 2nd brake cylinder from the case.




**38. REMOVE 2ND BRAKE PISTON**

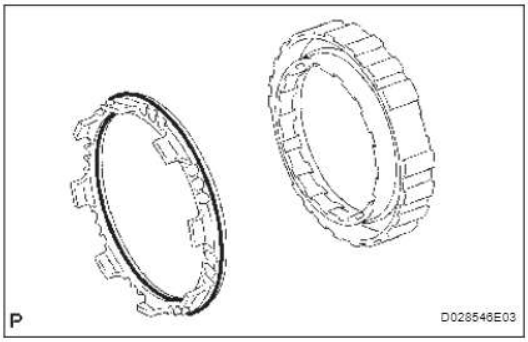
(a) Using SST and a press, remove the snap ring.
**SST 09351-40010**

(b) Remove the 2nd brake piston return spring from the 2nd brake piston.



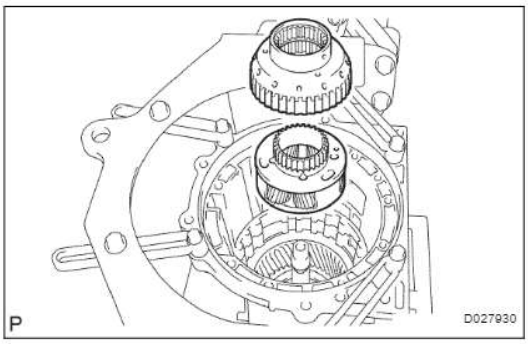

(c) Hold the 2nd brake piston and apply compressed air (392 kPa, 4.0 kgf/cm$^2$, 57 psi) to the brake cylinder to remove the 2nd brake piston.

AT



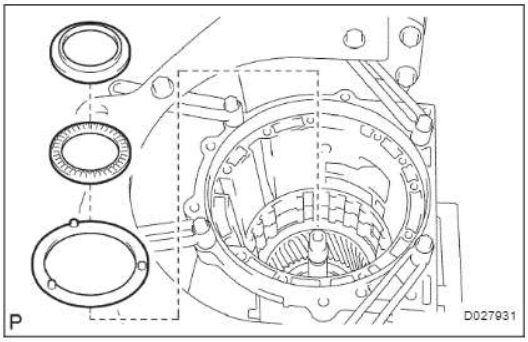

(d) Remove the 2 O-rings from the 2nd brake piston.

**39. INSPECT NO. 3 BRAKE PISTON RETURN SPRING SUB-ASSEMBLY (See page AT-212)**




**40. REMOVE FRONT PLANETARY GEAR ASSEMBLY**

(a) Remove the front planetary gear and 1 way clutch inner race from the case.

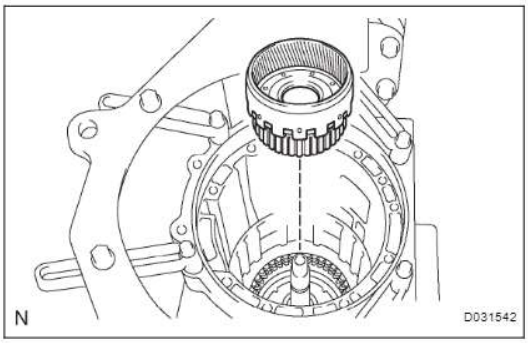



(b) Remove the thrust needle roller bearing, thrust bearing race No. 3 and planetary carrier thrust washer No. 2 from the front planetary gear.

**41. INSPECT FRONT PLANETARY GEAR ASSEMBLY (See page AT-212)**

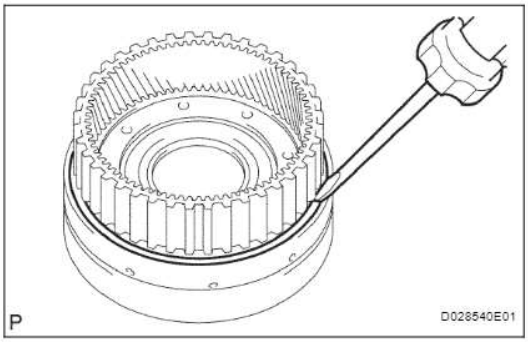
**42. INSPECT 1-WAY CLUTCH ASSEMBLY (See page AT-213)**

AT



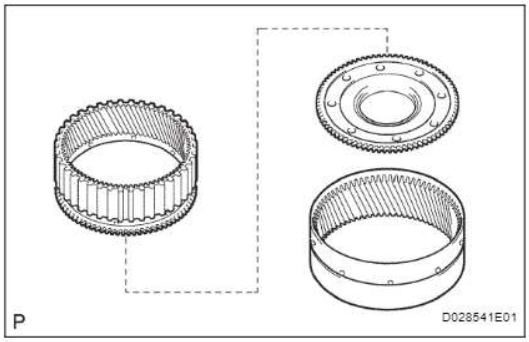

**43. REMOVE FRONT PLANETARY RING GEAR**

(a) Remove the front planetary ring gear from the transmission case.

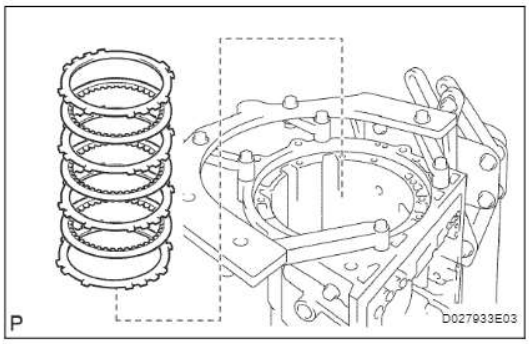



**44. REMOVE CENTER PLANETARY RING GEAR**

(a) Using a screwdriver, remove the snap ring.



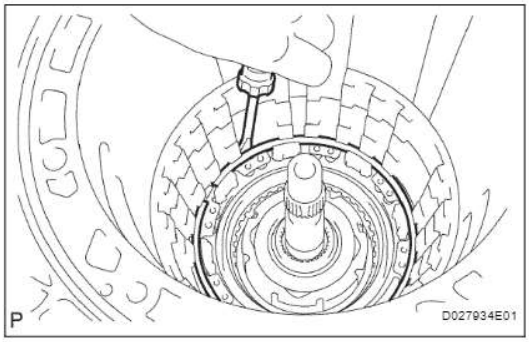

(b) Remove the center planetary ring gear and front planetary ring gear flange from the front planetary ring gear.




**45. REMOVE NO. 1 BRAKE DISC**

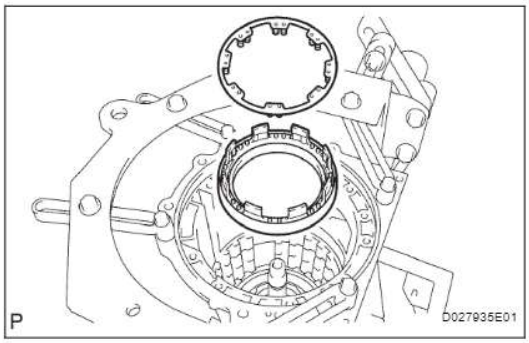
(a) Remove the flange, 3 discs and 3 plates from the case.

**46. INSPECT NO. 1 BRAKE DISC (See page AT-213)**




**47. REMOVE BRAKE PISTON RETURN SPRING SNAP RING**

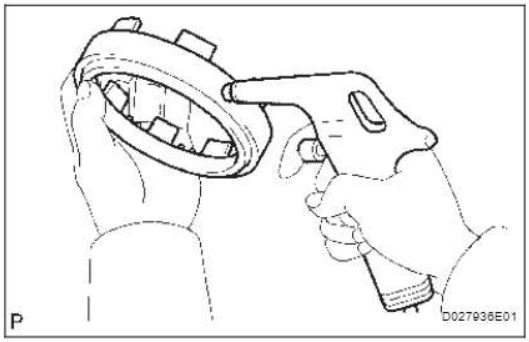
(a) Using a screwdriver, remove the brake piston return spring snap ring from the case.




**48. REMOVE BRAKE PISTON RETURN SPRING SUB-ASSEMBLY**

(a) Remove the brake piston return spring and No. 1 brake piston with the No. 1 brake cylinder from the transmission case.

**49. INSPECT BRAKE PISTON RETURN SPRING SUB-ASSEMBLY (See page AT-213)**

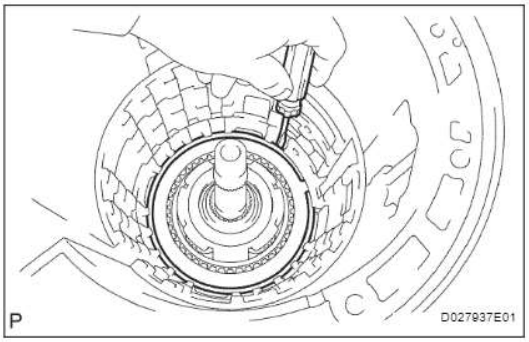



**50. REMOVE NO. 1 BRAKE PISTON**

(a) Hold the No. 1 brake piston and apply compressed air (392 kPa, 4 kgf/cm$^2$, 57 psi) to the transmission case 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.

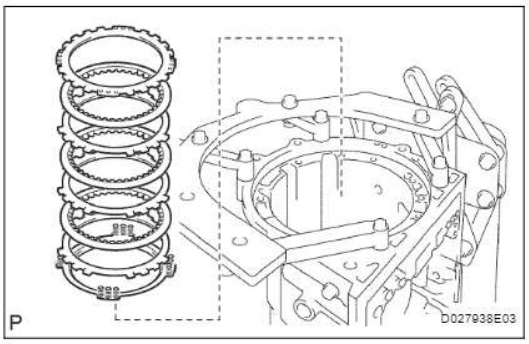
(b) Remove the 2 O-rings from the No. 1 brake piston.

AT




**51. REMOVE NO. 2 BRAKE DISC**

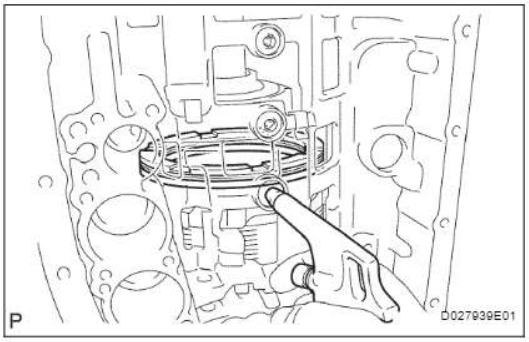
(a) Using a screwdriver, remove the snap ring from the case.




(b) Remove the flange, the brake piston return spring, the 3 discs and the 3 plates from the case.

**52. INSPECT NO. 2 BRAKE DISC (See page AT-213)**

**53. INSPECT NO.2 BRAKE PISTON RETURN SPRING SUB-ASSEMBLY (See page AT-213)**

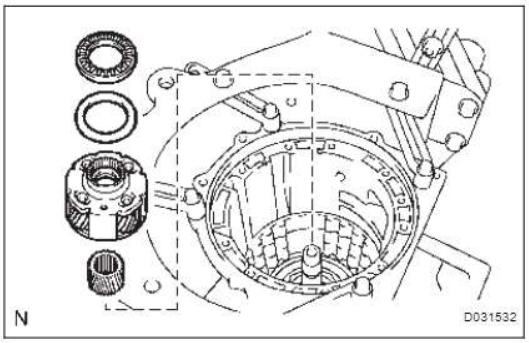



**54. REMOVE NO. 2 BRAKE PISTON**

(a) Hold the No. 2 brake piston and apply compressed air (392 kPa, 4 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.

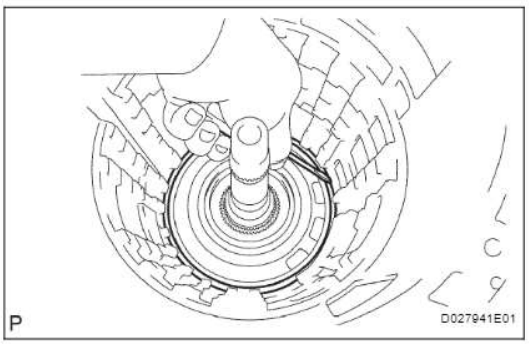
AT




**55. REMOVE CENTER PLANETARY GEAR ASSEMBLY**

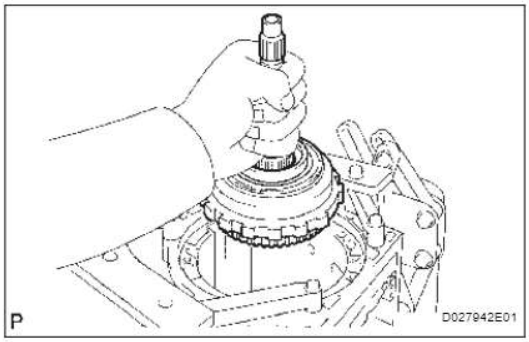
(a) Remove the center planetary gear assembly, planetary sun gear, thrust needle roller bearing and No. 4 thrust bearing race from the case.

**56. INSPECT CENTER PLANETARY GEAR ASSEMBLY (See page AT-214)**



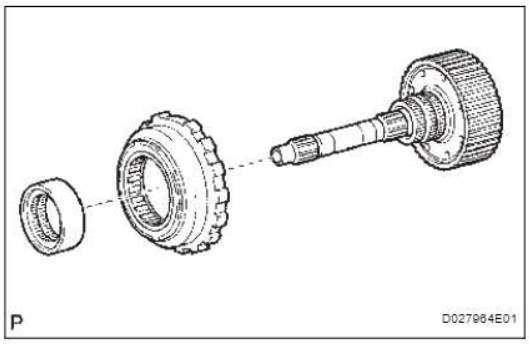

**57. REMOVE INTERMEDIATE SHAFT**

(a) Using a screwdriver, remove the snap ring from the case.



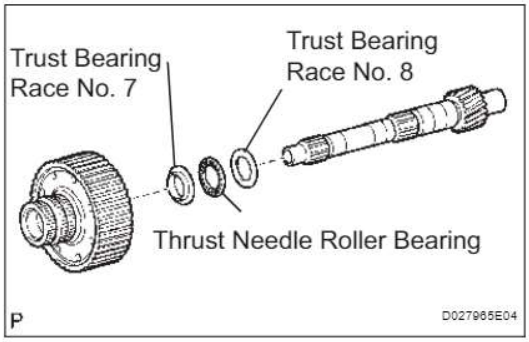

(b) Remove the intermediate shaft with the No. 3 1-way clutch assembly from the case.

**58. INSPECT NO. 3 1-WAY CLUTCH ASSEMBLY (See page AT-214)**




**59. 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.

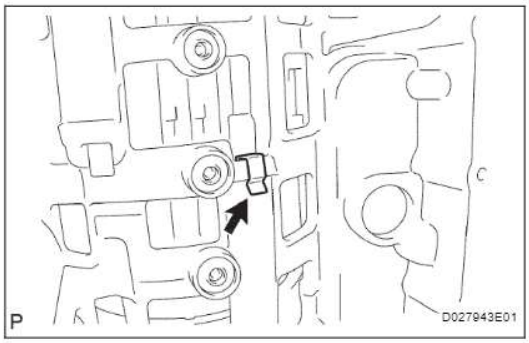



**60. REMOVE REAR PLANETARY RING GEAR FLANGE SUB-ASSEMBLY**

(a) Remove the No. 8 thrust bearing race, thrust needle roller bearing, No. 7 thrust bearing race and rear planetary ring gear flange from the intermediate shaft.

**61. INSPECT REAR PLANETARY RING GEAR FLANGE SUB-ASSEMBLY (See page AT-214)**

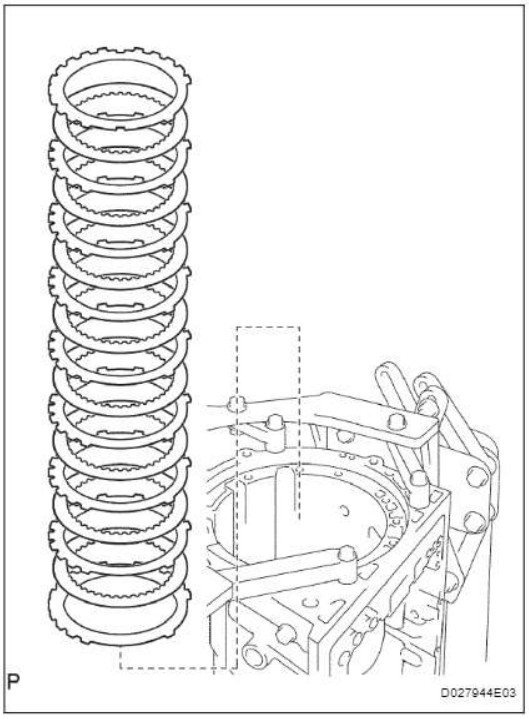
**62. INSPECT INTERMEDIATE SHAFT (See page AT-214)**




**63. REMOVE BRAKE PLATE STOPPER SPRING**

(a) Remove the brake plate stopper spring from the case.

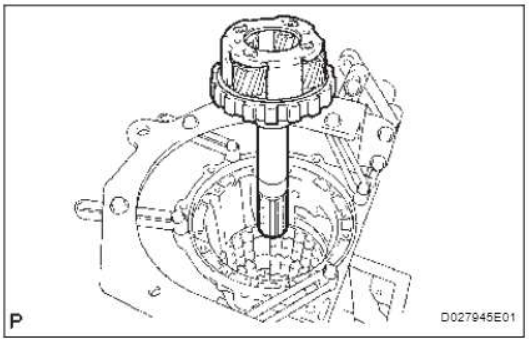
AT




**64. REMOVE NO. 4 BRAKE DISC**

(a) Remove the 7 plates, the 8 discs and the 2 flanges from the case.

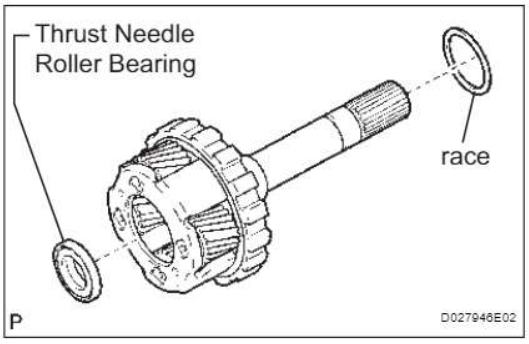
**65. INSPECT NO. 4 BRAKE DISC (See page AT-215)**



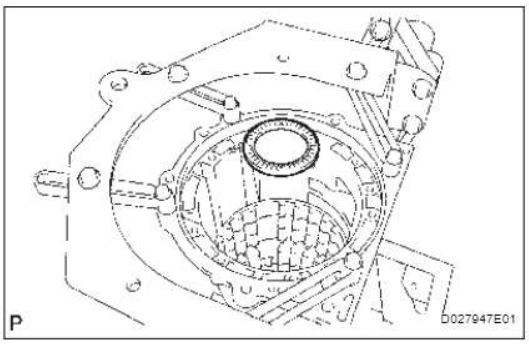

**66. REMOVE REAR PLANETARY GEAR ASSEMBLY**

(a) Remove the rear planetary gear assembly from the case.

AT

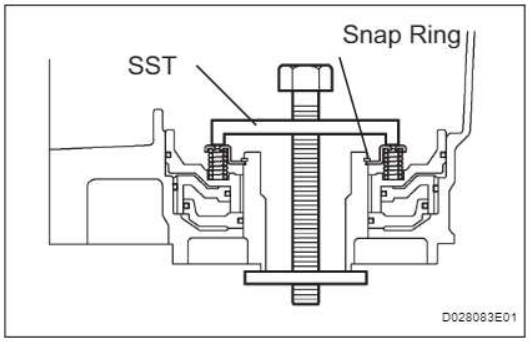



(b) Remove the No. 9 thrust bearing race and the thrust needle roller bearing from the rear planetary gear assembly.




(c) Remove the thrust needle roller bearing from the case.

**67. INSPECT REAR PLANETARY GEAR ASSEMBLY (See page AT-214)**

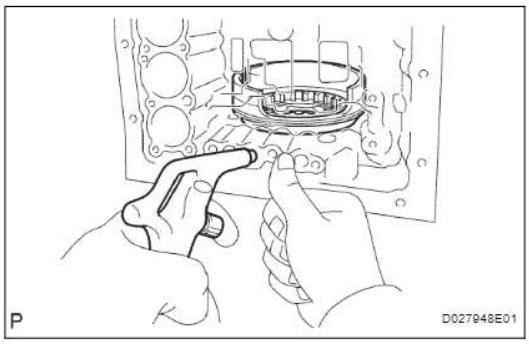



**68. REMOVE 1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY**

(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 the 1st and reverse brake return spring.
**SST 09350-30020 (09350-07070)**

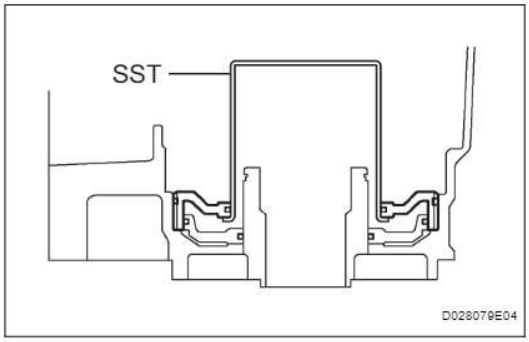
**69. INSPECT 1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY (See page AT-216)**




**70. REMOVE 1ST AND REVERSE BRAKE PISTON**

(a) Hold the 1st and reverse brake piston and apply compressed air (392 kPa, 4 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.

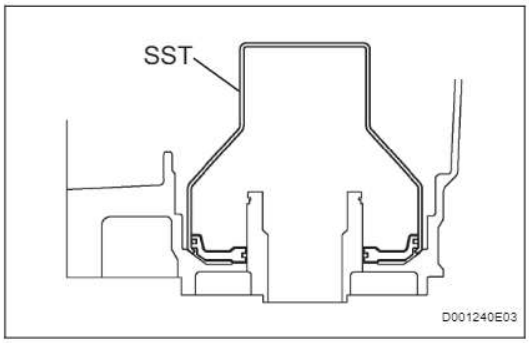
(b) Remove the O-ring from the 1st and reverse brake piston.




**71. REMOVE BRAKE REACTION SLEEVE**

(a) Using SST, remove the reaction sleeve.
**SST 09350-30020 (09350-07080)**

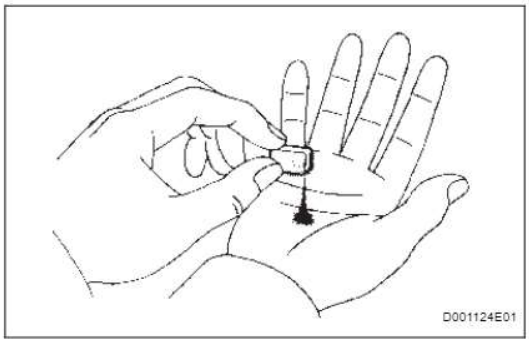
(b) Remove the 2 O-rings from the reaction sleeve.




**72. REMOVE NO. 4 BRAKE PISTON**

(a) Using SST, remove the No. 4 brake piston.
**SST 09350-30020 (09350-07090)**

(b) Remove the 2 O-rings from the No. 4 piston.



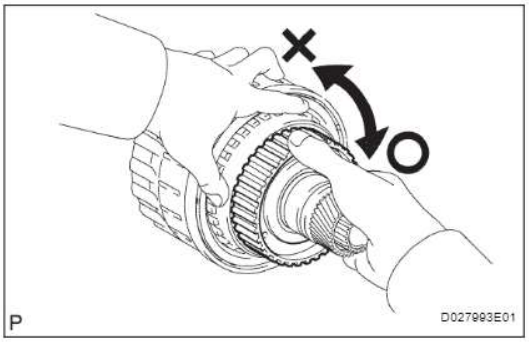

# INSPECTION

**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

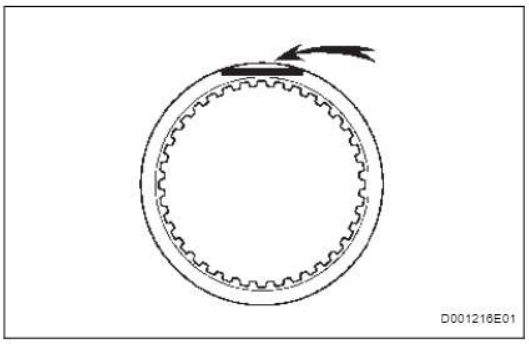
AT




**2. INSPECT NO. 2 1-WAY CLUTCH ASSEMBLY**

(a) Hold the reverse clutch hub and turn the No. 2 1-way clutch assembly.

(b) Check that the No. 2 1-way clutch assembly turns freely clockwise and locks when turned counterclockwise.

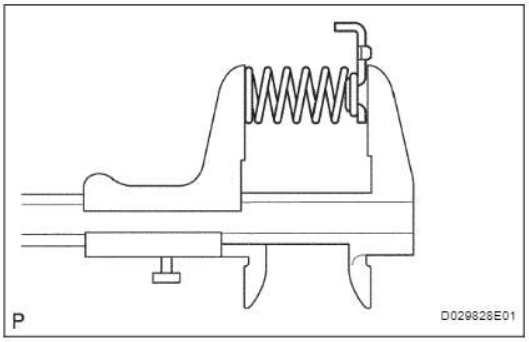



**3. INSPECT NO. 3 BRAKE DISC**

(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 slight damage.

**NOTICE:**

**Before assembling new discs, soak them in ATF for at least 15 minutes.**



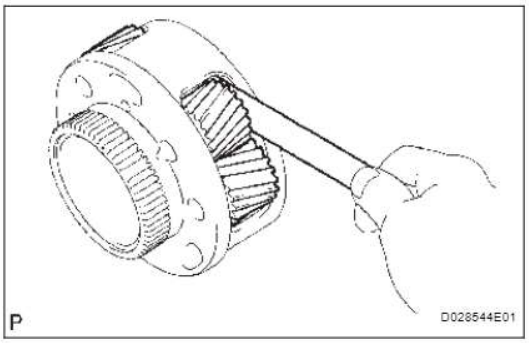

**4. INSPECT NO. 3 BRAKE PISTON RETURN SPRING SUB-ASSEMBLY**

(a) Using vernier calipers, measure the free length of the spring together with the spring seat.

**Standard free length:**

**15.72 mm (0.619 in.)**

AT




**5. INSPECT FRONT PLANETARY GEAR ASSEMBLY**

(a) Using a feeler gauge, measure the front planetary pinion gear thrust clearance.

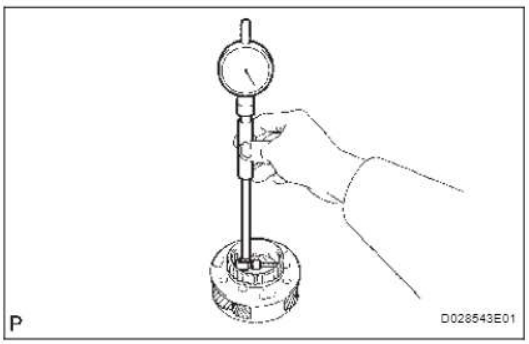
**Standard clearance:**

**0.2 to 0.60 mm (0.008 to 0.024 in.)**

**Maximum clearance:**

**0.65 mm (0.026 in.)**

If the clearance is greater than the maximum, replace the front planetary gear assembly.

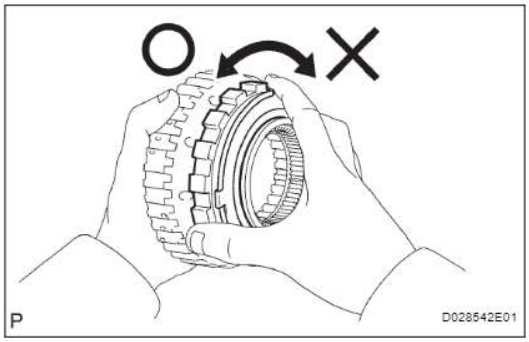



(b) Using a dial indicator, measure the inside diameter of the front planetary gear bushing.

**Maximum inside diameter:**

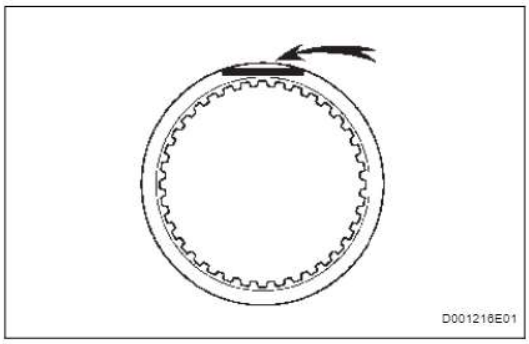
**57.48 mm (2.263 in.)**

If the inside diameter is greater than the maximum, replace the front planetary gear.



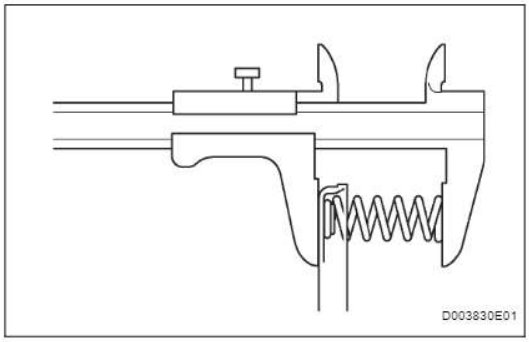

**6. INSPECT 1-WAY CLUTCH ASSEMBLY**

(a) Install the 1-way clutch assembly onto the 1-way clutch inner race.
(b) Hold the 1-way clutch inner race and turn the 1-way clutch assembly.
(c) Check that the 1-way clutch assembly turns freely counterclockwise and locks when turned clockwise.
(d) Remove the 1-way clutch assembly from the 1-way clutch inner race.




**7. INSPECT NO. 1 BRAKE DISC**

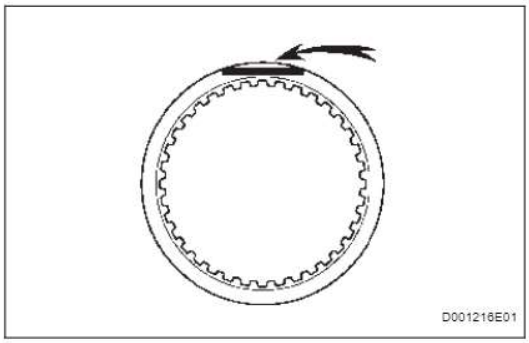
(a) Replace all discs if one of the following problems is present: 1) a disc, plate or flange is worn or burnt, 2) the lining of a disc is peeled off or discolored, or 3) grooves or printed numbers have even slight damage.
**NOTICE:**
**Before assembling new discs, soak them in ATF for at least 15 minutes.**




**8. INSPECT BRAKE PISTON RETURN SPRING SUB-ASSEMBLY**

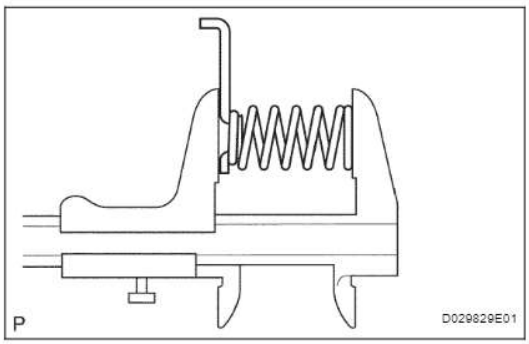
(a) Using vernier calipers, measure the free length of the spring together with the spring seat.
**Standard free length:**
**17.05 mm (0.671 in.)**

AT



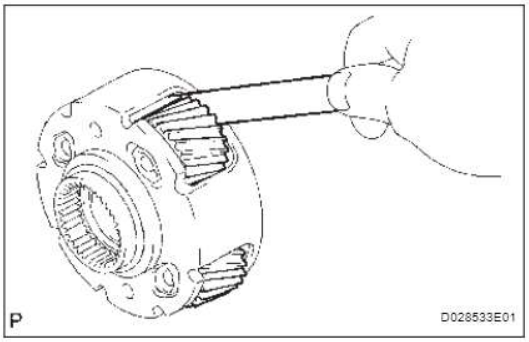

**9. INSPECT NO. 2 BRAKE DISC**

(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 slight damage.
**NOTICE:**
**Before assembling new discs, soak them in ATF for at least 15 minutes.**




**10. INSPECT NO. 2 BRAKE PISTON RETURN SPRING SUB-ASSEMBLY**

(a) Using vernier calipers, measure the free length of the spring together with the spring seat.
**Standard free length:**
**17.45 mm (0.687 in.)**

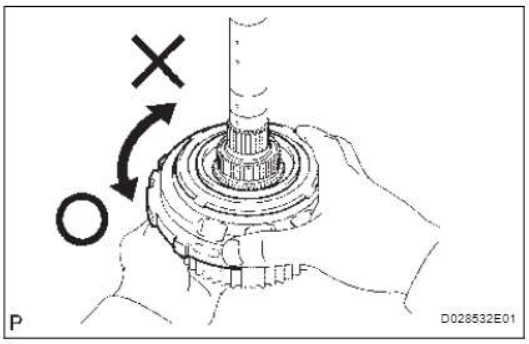



**11. INSPECT CENTER PLANETARY GEAR ASSEMBLY**

(a) Using a feeler gauge, measure the center planetary gear pinion thrust clearance.

**Standard clearance:**
**0.12 to 0.68 mm (0.005 to 0.027 in.)**
**Maximum clearance:**
**0.73 mm (0.029 in.)**

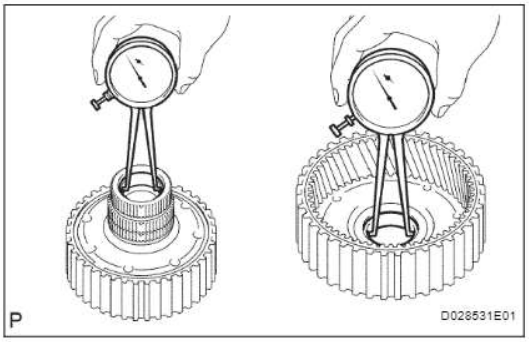
If the clearance is greater than the maximum, replace the center planetary gear assembly.




**12. INSPECT NO. 3 1-WAY CLUTCH ASSEMBLY**

(a) Hold the rear planetary ring gear flange sub-assembly, and turn the 1-way clutch assembly.

(b) Check that the 1-way clutch assembly turns freely counterclockwise and locks when turned clockwise.



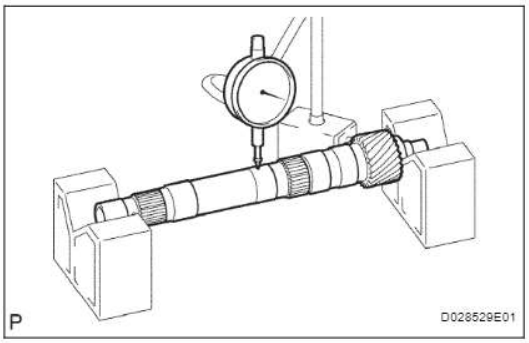

**13. INSPECT REAR PLANETARY RING GEAR FLANGE SUB-ASSEMBLY**

(a) Using a dial indicator, measure the inside diameter of the rear planetary ring gear bushing.

**Maximum inside diameter:**
**32.18 mm (1.2667 in.)**

If the inside diameter is greater than the maximum, replace the rear planetary ring gear.

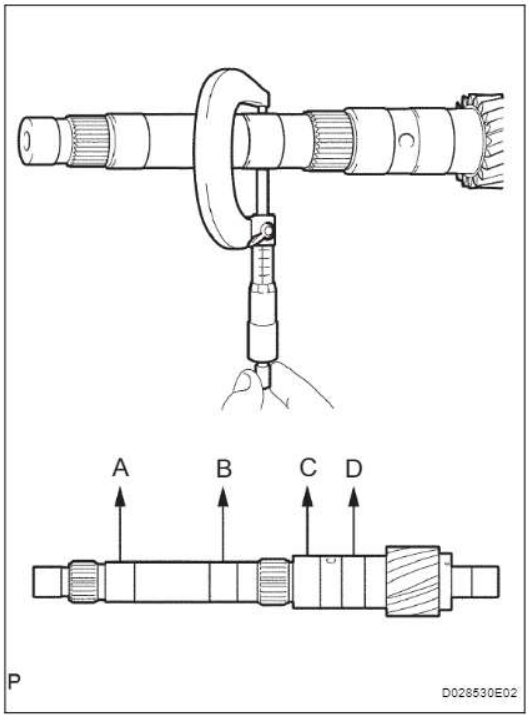
AT




**14. INSPECT INTERMEDIATE SHAFT**

(a) Using a dial indicator, check the intermediate shaft runout.

**Maximum runout:**
**0.08 mm (0.003 in.)**
**NOTICE:**
**If the bend exceeds the specification, replace the intermediate shaft with a new one.**




(b) Using a micrometer, check the outer diameter of the intermediate shaft positions shown in the diagram.

**Standard diameter:**

**A:**
**25.962 to 25.975 mm (1.022 to 1.023 in.)**

**B:**
**25.962 to 25.975 mm (1.022 to 1.023 in.)**

**C:**
**32.062 to 32.075 mm (1.262 to 1.263 in.)**

**D:**
**32.062 to 32.075 mm (1.262 to 1.263 in.)**

**Minimum diameter:**

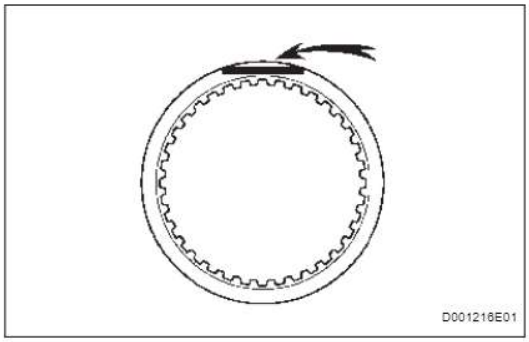
**A:**
**25.912 mm (1.020 in.)**

**B:**
**25.912 mm (1.020in.)**

**C:**
**32.012 mm (1.260 in.)**

**D:**
**32.012 mm (1.260 in.)**

**NOTICE:**
**If the outer diameter is outside the standard, replace the intermediate shaft with a new one.**

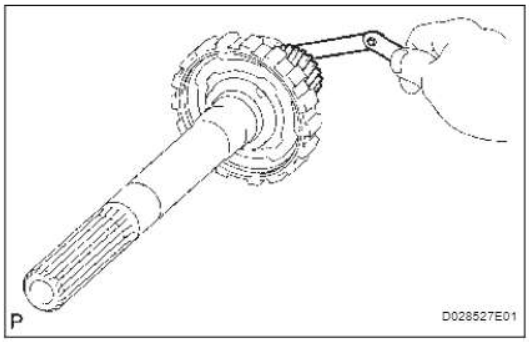



**15. INSPECT NO. 4 BRAKE DISC**

(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 slight damage.

**NOTICE:**
**Before assembling new discs, soak them in ATF for at least 15 minutes.**

AT



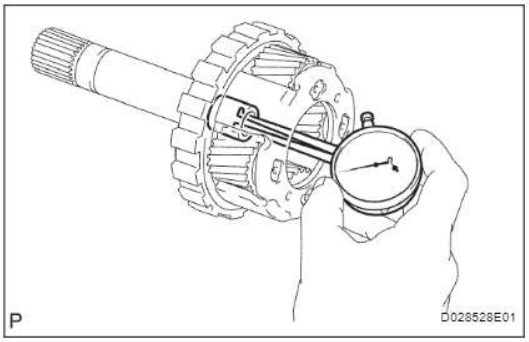

**16. INSPECT REAR PLANETARY GEAR ASSEMBLY**

(a) Using a feeler gauge, measure the rear planetary gear pinion thrust clearance.

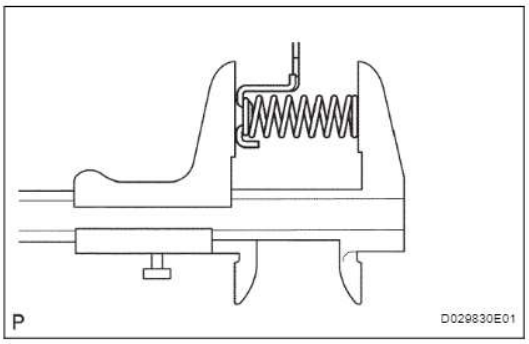
**Standard clearance:**
**0.2 to 0.6 mm (0.008 to 0.024 in.)**

**Maximum clearance:**
**0.65 mm (0.026 in.)**

If the clearance is greater than the maximum, replace the planetary gear assembly.

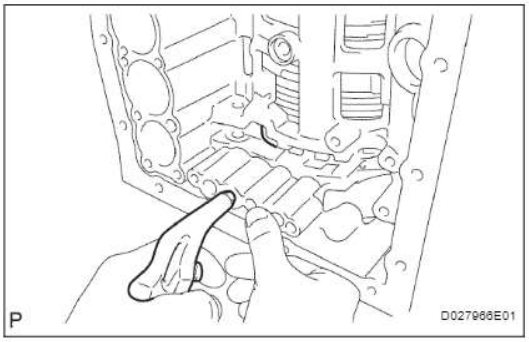



(b) Using a dial indicator, measure the inside diameter of the rear planetary gear bushing.
**Maximum inside diameter:**
**20.075 mm (0.7904 in.)**
If the inside diameter is greater than the maximum, replace the rear planetary gear assembly.




**17. INSPECT 1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY**

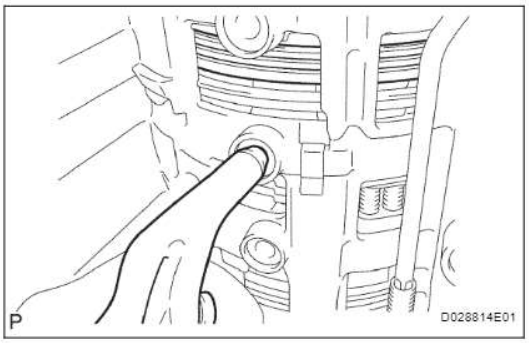
(a) Using vernier calipers, measure the free length of the spring together with the spring seat.
**Standard free length:**
**23.74 mm (0.9347 in.)**




**18. INSPECT PACK CLEARANCE OF FIRST AND REVERSE BRAKE**

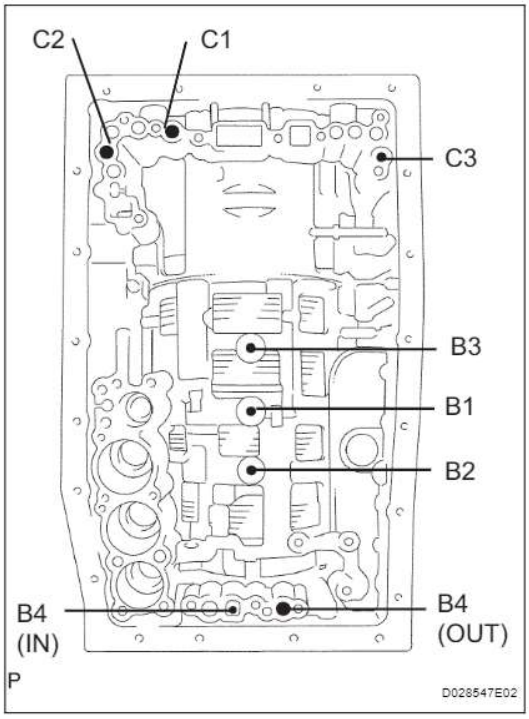
(a) Make sure the 1st and reverse brake pistons move smoothly when applying and releasing the compressed air into the transmission case.

AT




**19. INSPECT NO. 1 PISTON STROKE OF BRAKE PISTON**

(a) Make sure the No. 1 brake piston moves smoothly when applying and releasing the compressed air into the transmission case.



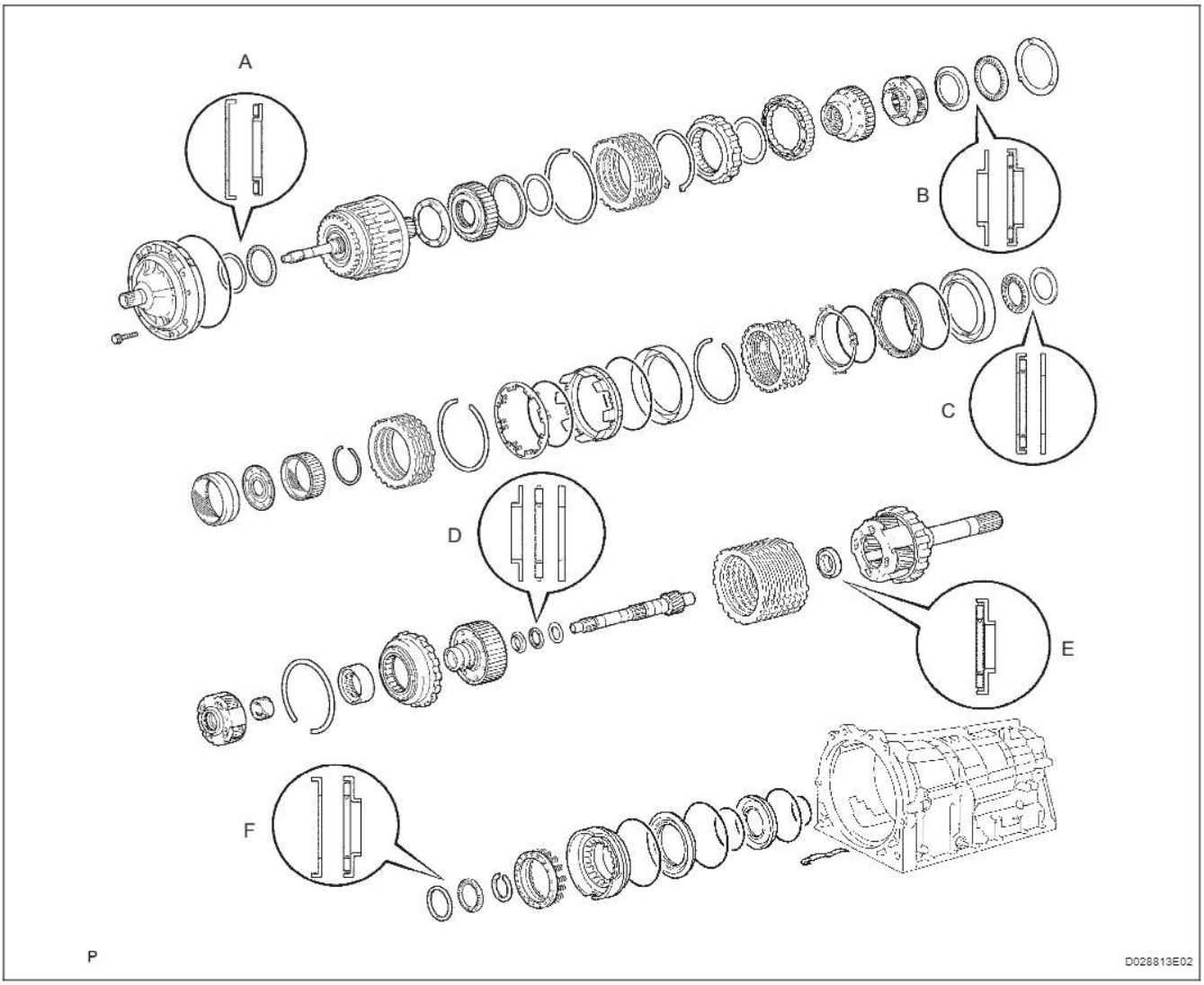

**20. INSPECT INDIVIDUAL PISTON OPERATION**
**INSPECTION**

(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, use the C3 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)

AT

# REASSEMBLY

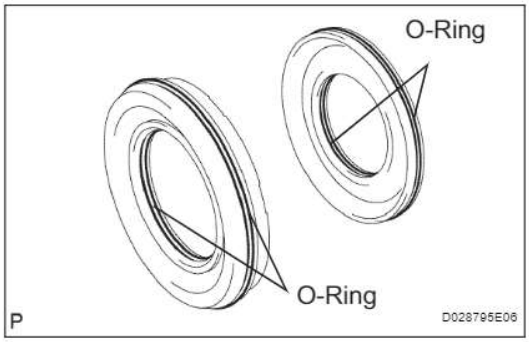
## 1. BEARING POSITION




### Bearing diameter

| Mark | Front Race Diameter Inside / Outside | Thrust Bearing Diameter Inside / Outside | Rear Race Diameter Inside / Outside |
|---|---|---|---|
| A | 73.6 mm (2.898 in.) / 102.0 mm (4.016 in.) | 71.9 mm (2.831 in.) / 85.6 mm (3.370 in.) | - |
| B | 38.0 mm (1.496 in.) / 57.0 mm (2.244 in.) | 43.4 mm (1.709 in.) / 58.3 mm (2.295 in.) | - |
| C | - | 55.7 mm (2.193 in.) / 76.4 mm (3.008 in.) | 53.7 mm (2.114 in.) / 74.0 mm (2.913 in.) |
| D | 33.4 mm (1.315 in.) / 49.0 mm (1.929 in.) | 32.1 mm (1.264 in.) / 49.35 mm (1.943 in.) | 32.1 mm (1.2649 in.)/ 49.0 mm (1.929 in.) |
| E | - | 21.5 mm(0.847 in.) / 40.8 mm (1.606 in.) | - |
| F | 48.5 mm (1.909 in.) / 62.7 mm (2.469 in.) | 45.9 mm (1.807 in.) / 64.0 mm (2.520 in.) | - |

AT

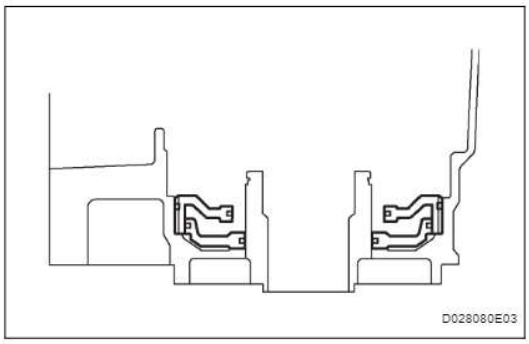



**2. INSTALL NO. 4 BRAKE PISTON**

(a) Coat 2 new O-rings with ATF, and install them onto the brake reaction sleeve.

(b) Coat 2 new O-rings with ATF, and install them onto the No. 4 brake piston.

(c) Install the No. 4 brake piston onto the reaction sleeve.

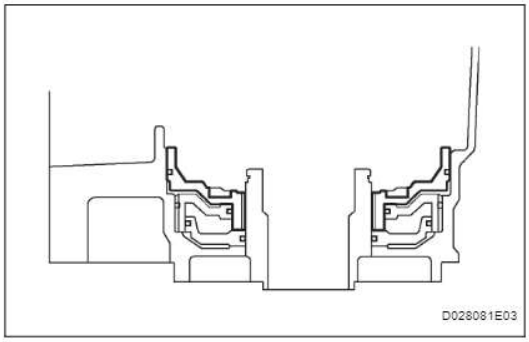



**3. INSTALL BRAKE REACTION SLEEVE**

(a) With the No. 4 brake piston underneath (the rear side), install the brake reaction sleeve and No. 4 brake piston onto the transmission case.

**NOTICE:**

**Be careful not to damage the O-rings.**




**4. INSTALL 1ST AND REVERSE BRAKE PISTON**

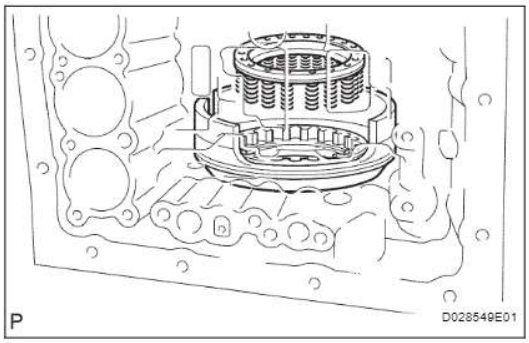
(a) Coat a new O-ring with ATF.

(b) Install the O-ring onto the 1st and reverse brake piston.

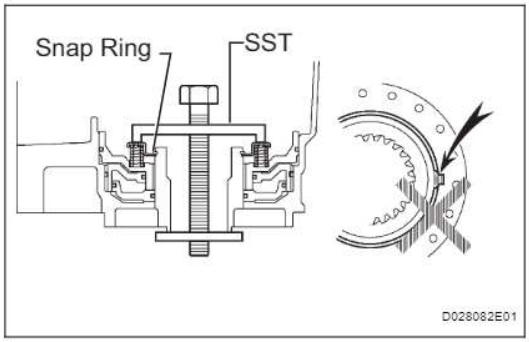
(c) With the spring seat of the piston facing upward (the front side), place the piston in the transmission case.

**NOTICE:**

**Be careful not to damage the O-ring.**




(d) Place the 1st and reverse brake return spring onto the 1st and reverse brake piston.




**5. INSTALL 1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY**

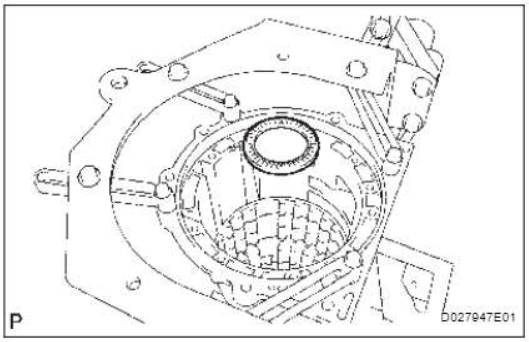
(a) Place SST on the spring retainer, and compress the return spring.

**SST 09350-30020 (09350-07050)**

(b) Using SST, install the snap ring.

**SST 09350-30020 (09350-07070)**

AT

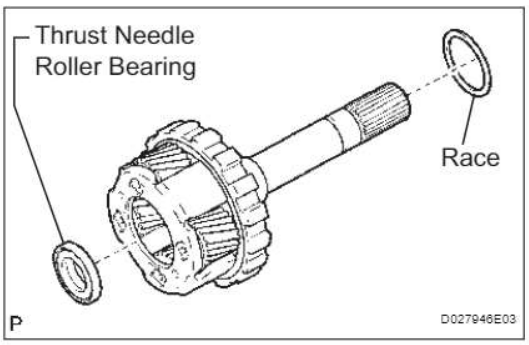



## 6. INSTALL REAR PLANETARY GEAR ASSEMBLY

(a) Install the thrust needle roller bearing.

**Thrust needle roller bearing diameter**

| Item | Inside | Outside |
|---|---|---|
| Thrust needle roller bearing | 45.9 mm (1.807 in.) | 64.0 mm (2.520 in.) |

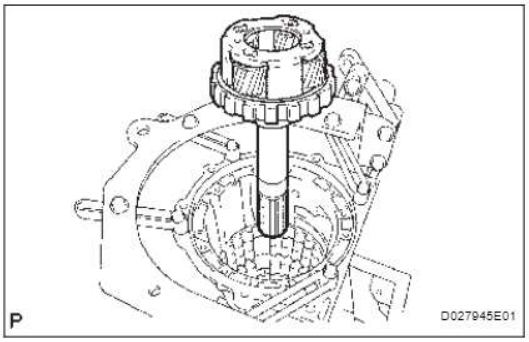



(b) Install the thrust needle roller bearing.

(c) Coat the No. 9 thrust bearing race with petroleum jelly, and install it onto the rear planetary gear.

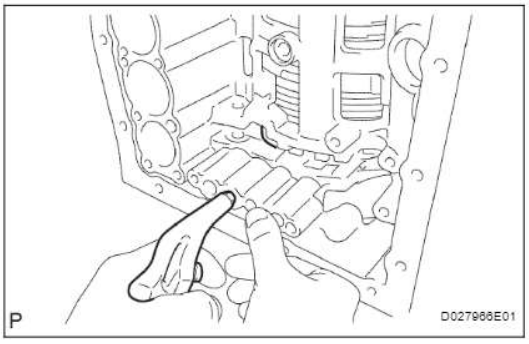
**Bearing and race diameter**

| Item | Inside | Outside |
|---|---|---|
| Bearing | 21.5 mm (0.847 in.) | 40.8 mm (1.606 in.) |
| Race | 48.5 mm (1.909 in.) | 62.7 mm (2.469 in.) |



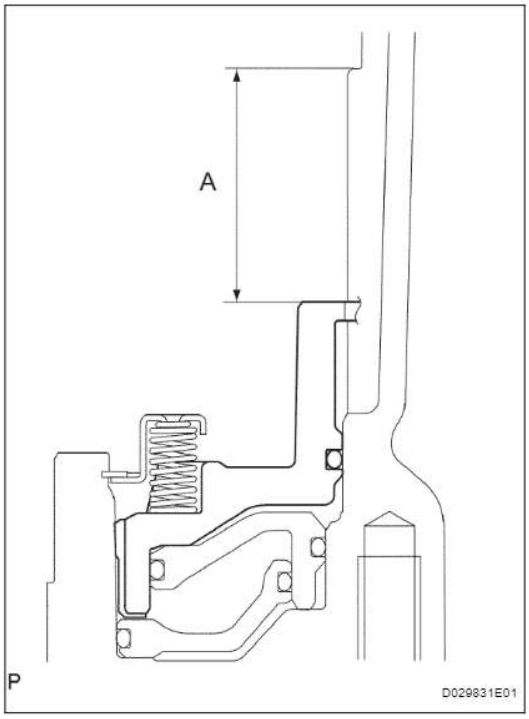

(d) Install the rear planetary gear assembly.

AT




## 7. INSPECT PACK CLEARANCE OF FIRST AND REVERSE BRAKE

(a) Make sure the 1st and reverse brake pistons move smoothly when applying and releasing the compressed air into the transmission case.



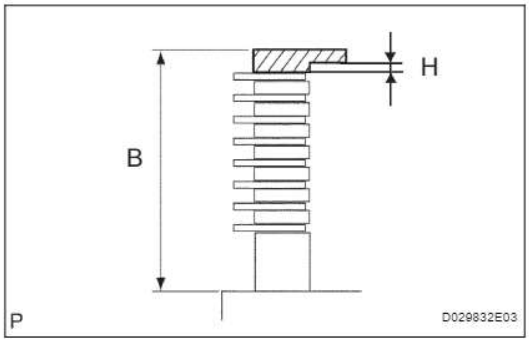

(b) Using vernier calipers, measure the level difference (length A) between the upper surface of the 1st and reverse brake piston and the hitting surface of the No. 4 brake flange at both ends across a diameter, and calculate the average.

**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 (1.431 to 1.460 in.)




(c) Using vernier calipers, measure the thickness (length B) of the 2 brake flanges, the 7 No. 4 brake plates and the 8 No. 4 brake discs altogether at both ends across a diameter, and calculate the average.

HINT:

Pack clearance = Length A - Length B - 0.25 mm - 1.8 mm

Length B = 36.04 to 37.14 mm (1.419 to 1.462 in.)

**Pack clearance:**

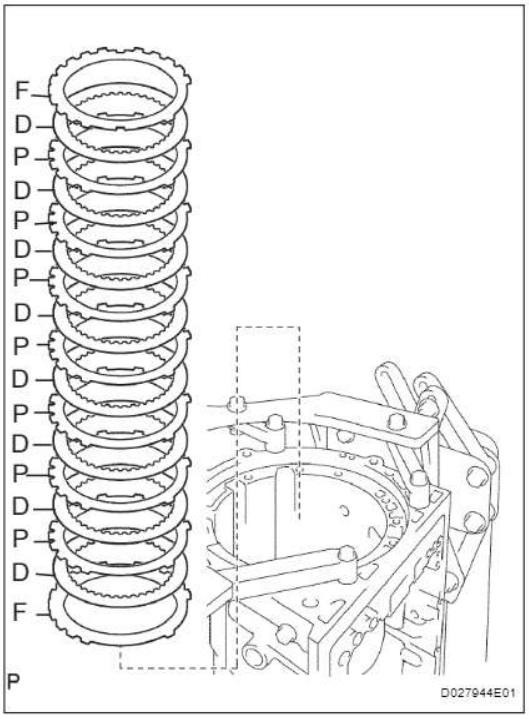
**0.8 to 1.1 mm (0.031 to 0.043 in.)**

(d) 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 | No. | Thickness |
|---|---|---|---|
| 0 | 0 mm (0 in.) | 8 | 0.8 mm (0.031 in.) |
| 2 | 0.2 mm(0.008 in.) | 10 | 1.0 mm (0.039 in.) |
| 4 | 0.4 mm (0.016 in.) | 12 | 1.2 mm (0.047 in.) |
| 6 | 0.6 mm (0.024 in.) | 14 | 1.4 mm (0.055 in.) |

AT




**8. INSTALL NO. 4 BRAKE DISC**

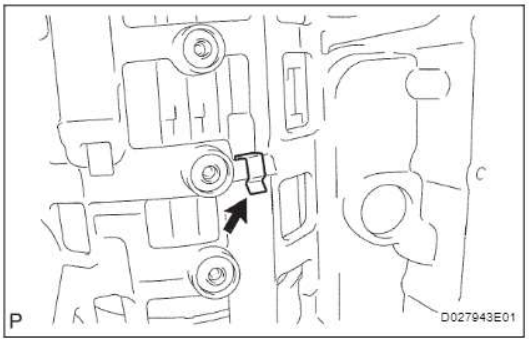
(a) Install the 7 plates, the 8 discs and the 2 flanges.

**Install in order:**

**F - D - P - D - P - D- P - D -P - D - P - D - P - D - P - D - F**

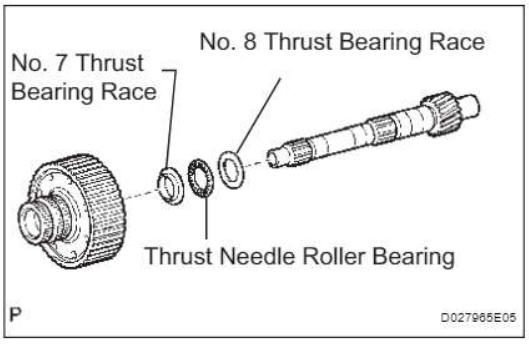
HINT:

P = Plate, D = Disc, F = Flange




**9. INSTALL BRAKE PLATE STOPPER SPRING**

(a) Install the brake stopper spring.



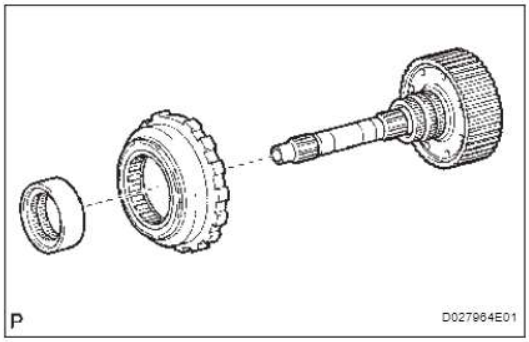

**10. INSTALL REAR PLANETARY RING GEAR FLANGE SUB-ASSEMBLY**

(a) Install the No. 8 thrust bearing race, thrust needle roller bearing, No. 7 thrust bearing race and planetary ring gear flange onto the intermediate shaft.

**Bearing and race diameter**

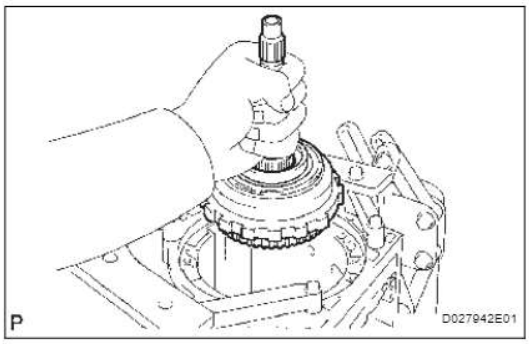
| Item | Inside | Outside |
|---|---|---|
| No. 7 thrust bearing race | 33.4 mm (1.315 in.) | 49.0 mm (1.929 in.) |
| Thrust needle roller bearing | 32.1 mm (1.264 in.) | 49.35 mm (1.943 in.) |
| No. 8 thrust bearing race | 32.1 mm (1.264 in.) | 49.0 mm (1.929 in.) |

(b) Install the rear planetary ring gear flange onto the intermediate shaft.



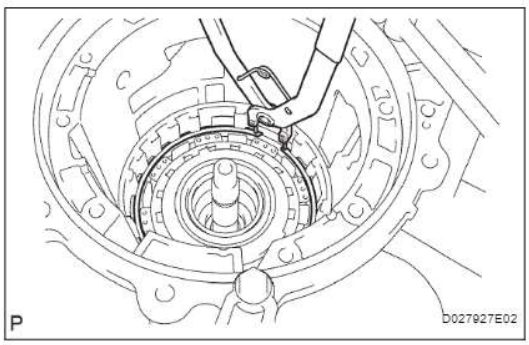

**11. INSTALL NO. 3 1-WAY CLUTCH ASSEMBLY**

(a) Install the No. 3 1-way clutch assembly and 1-way clutch inner race onto the intermediate shaft.

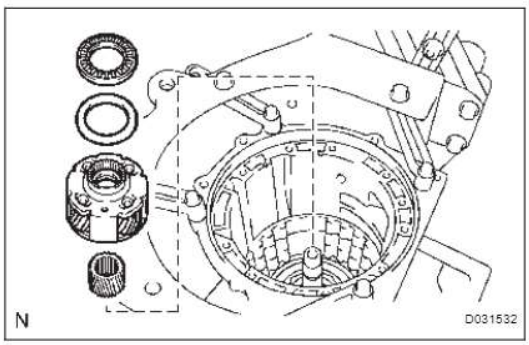



**12. INSTALL INTERMEDIATE SHAFT**

(a) Install the intermediate shaft with the No. 3 1-way clutch assembly into the case.




(b) Using SST, install the snap ring.
**SST 09350-30020 (09350-07050, 09350-07060)**

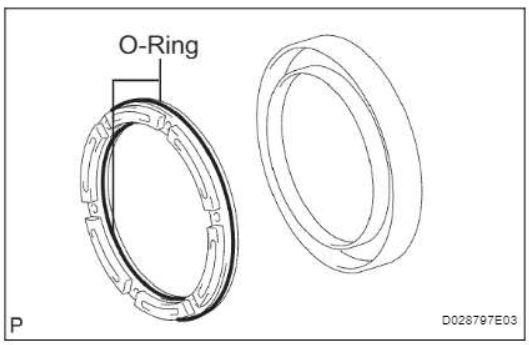



**13. INSTALL CENTER PLANETARY GEAR ASSEMBLY**

(a) Install the center planetary gear assembly and planetary sun gear into the case.

(b) Coat the No. 4 thrust bearing race and thrust needle roller bearing with petroleum jelly, and install them onto the center planetary ring gear.
**Race and Bearing diameter**

| Item | Inside | Outside |
|---|---|---|
| Race | 53.7 mm (2.114 in.) | 74.0 m (2.913 in.) |
| Bearing | 55.7 mm (2.192 in.) | 76.4 mm (3.008 in.) |



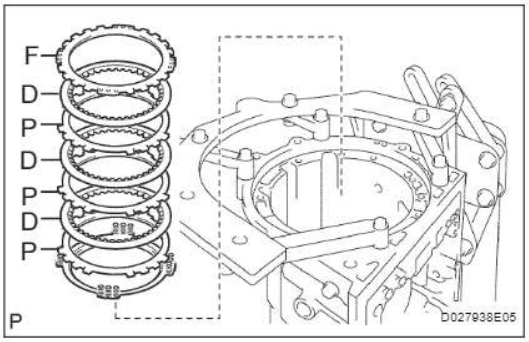

**14. INSTALL NO. 2 BRAKE PISTON**

(a) Coat 2 new O-rings with ATF, and install them onto the No. 2 brake piston.

(b) Be careful not to damage the O-rings. Press the No. 2 brake piston into the No. 2 brake cylinder with both hands.

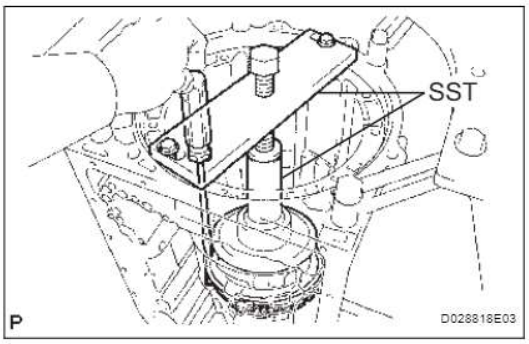
(c) Install the No. 2 brake piston onto the case.

AT

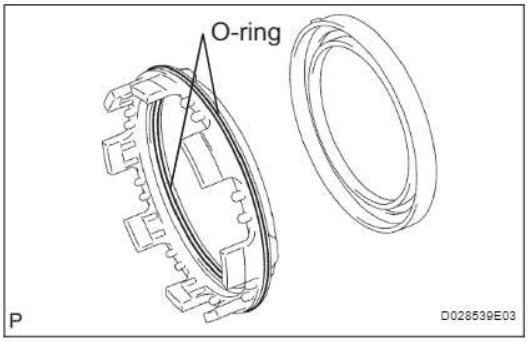



**15. INSTALL NO. 2 BRAKE DISC**

(a) Install flange, 3 plates, 3 discs and No. 2 brake piston return spring.
**Install in order:**
**F - D - P - D - P - D - P**
HINT:
P = Plate, D = Disc, F = Flange




(b) Using SST and press, install the No. 2 brake spring snap ring.
**SST 09351-40010**

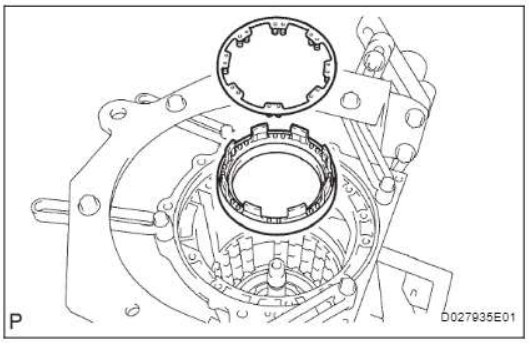



**16. INSTALL NO. 1 BRAKE PISTON**

(a) Coat 2 new O-rings with ATF, and install them onto the No. 1 brake piston.

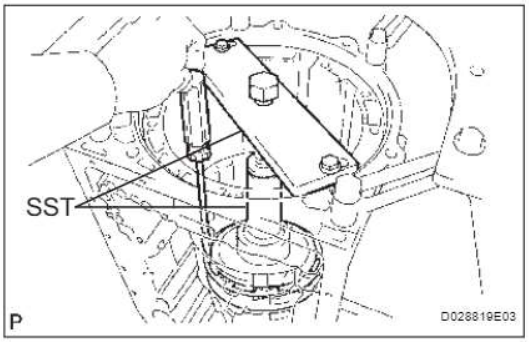
(b) Be careful not to damage the O-rings. Press the No. 1 brake piston into the No. 1 brake cylinder with both hands.

AT



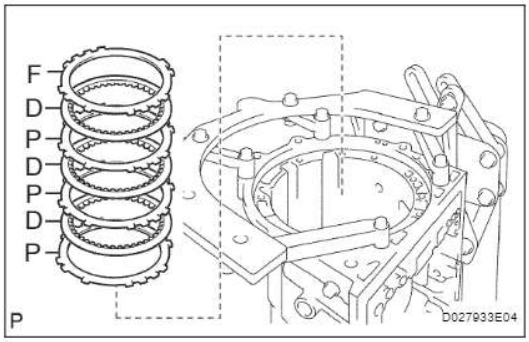

**17. INSTALL BRAKE PISTON RETURN SPRING SUB-ASSEMBLY**

(a) Install the brake piston return spring and the No. 1 brake piston with the No. 1 brake cylinder into the transmission case.



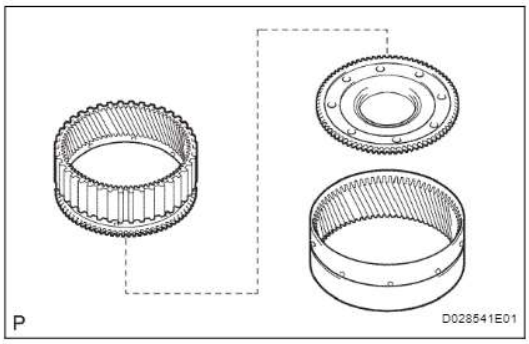

**18. INSTALL BRAKE PISTON RETURN SPRING SNAP RING**

(a) Using SST and a press, install the brake piston return spring snap ring.
**SST 09351-40010**



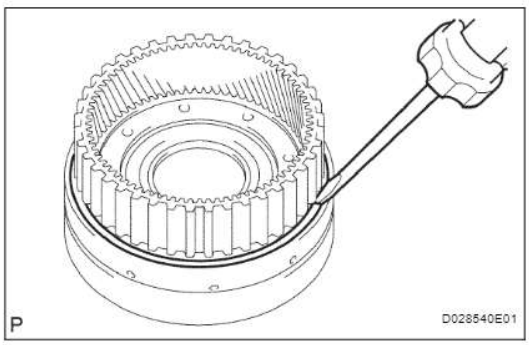

**19. INSTALL NO. 1 BRAKE DISC**

(a) Install the 3 plates, 3 discs and flange.
**Install in order:**
**F - D - P - D - P - D - P**
HINT:
P = Plate, D = Disc, F = Flange

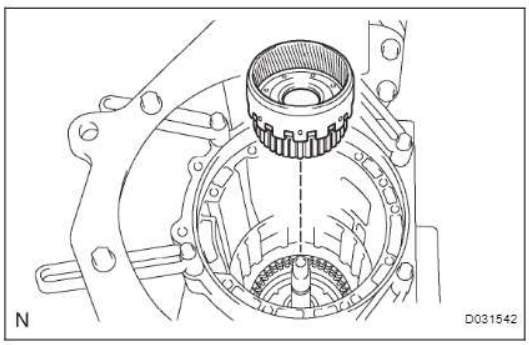



**20. INSTALL CENTER PLANETARY RING GEAR**

(a) Install the center planetary ring gear and front planetary ring gear flange into the front planetary ring gear.

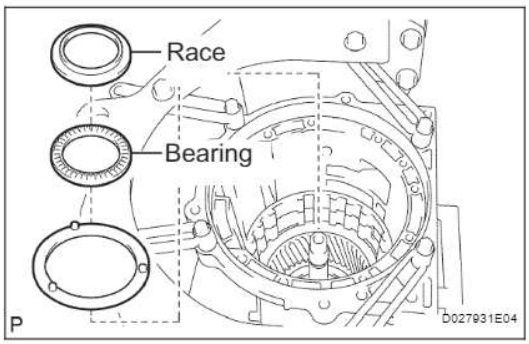



(b) Using a screwdriver, install the snap ring.




**21. INSTALL FRONT PLANETARY RING GEAR**

(a) Install the front planetary ring gear into the case.



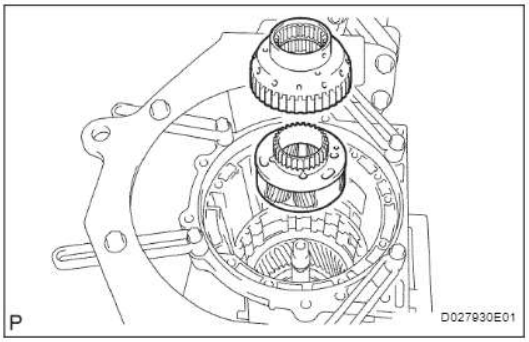

**22. INSTALL FRONT PLANETARY GEAR ASSEMBLY**

(a) Install the thrust needle roller bearing and the No. 2 planetary carrier thrust washer.

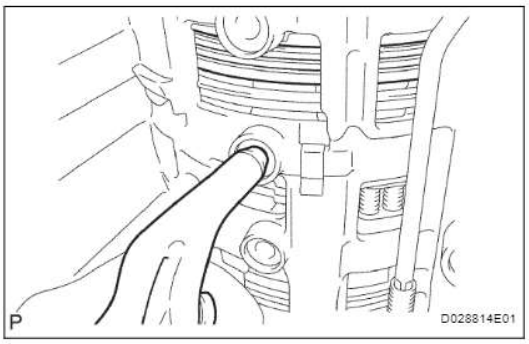
(b) Coat the No. 3 thrust bearing race with petroleum jelly, and install it onto the front planetary ring gear.
**Thrust needle roller bearing and race diameter**

| Item | Inside | Outside |
|---|---|---|
| Thrust needle roller bearing | 43.4 mm (1.709 in.) | 58.3 mm (2.295 in.) |
| Race | 38.0 mm (1.496 in.) | 57.0 mm (2.244 in.) |

AT

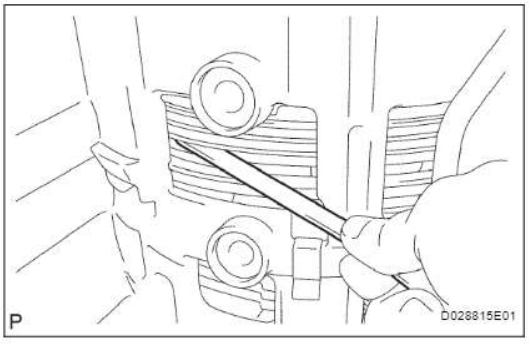



(c) Install the front planetary gear assembly and 1-way clutch inner race into the case.




**23. INSPECT NO. 1 PISTON STROKE OF BRAKE PISTON**

(a) Make sure the No. 1 brake piston moves smoothly when applying and releasing the compressed air into the transmission case.




(b) Using a feeler gauge, measure the B3 brake pack clearance between the snap ring and flange.

**Piston stroke:**

**0.42 to 0.72 mm (0.017 to 0.028 in.)**

If the piston stroke is outside the specification, parts may have been assembled incorrectly.

Perform the reassembly again.

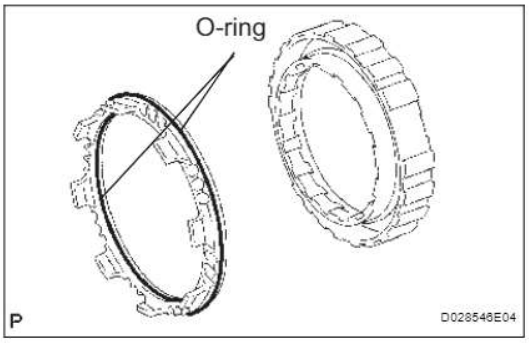
If the piston stroke is still outside the specification, select another flange.

HINT:

There are 4 different thicknesses for the flange.

**Flange thickness**

| No. | Thickness | No. | Thickness |
|---|---|---|---|
| 0 | 2.0 mm (0.079 in.) | 2 | 2.4 mm (0.094 in.) |
| 1 | 2.2 mm (0.087 in.) | 3 | 2.6 mm (0.102 in.) |

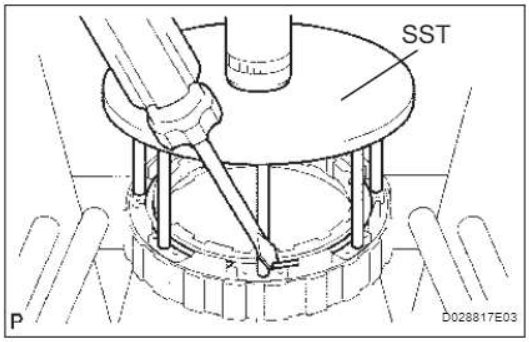



**24. INSTALL 2ND BRAKE PISTON**

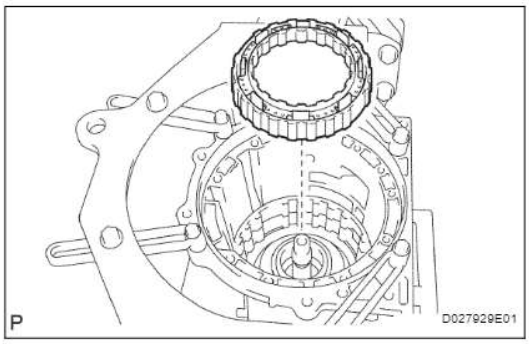
(a) Coat 2 new O-rings with ATF, and install them onto the 2nd brake piston.

(b) Be careful not to damage the O-rings. Press the 2nd brake cylinder into the 2nd brake piston with both hands.

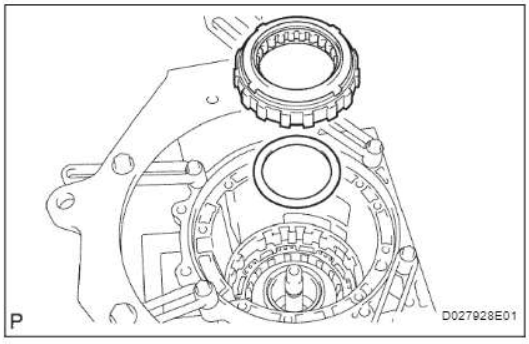
AT



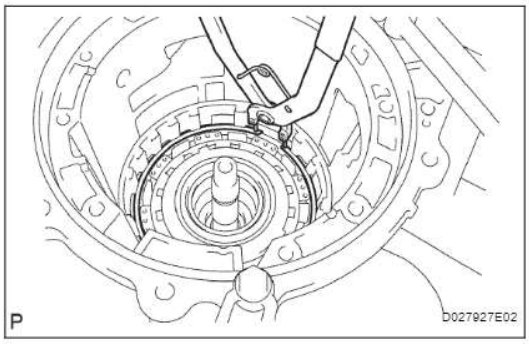

(c) Using SST and press, install the snap ring.
**SST 09351-40010**
**NOTICE:**
**Make sure that the end gap of the snap ring is not aligned with the spring retainer claw.**



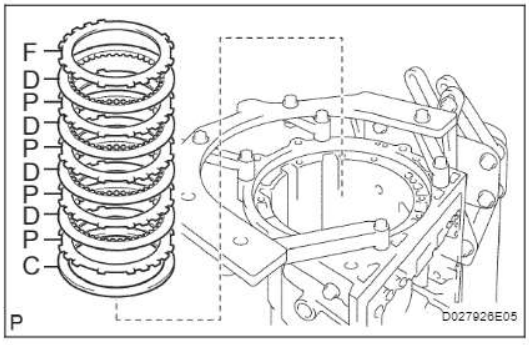

**25. INSTALL 2ND BRAKE CYLINDER**
(a) Install the 2nd brake cylinder into the case.




**26. INSTALL 1-WAY CLUTCH ASSEMBLY**
(a) Install the 1-way clutch assembly and the thrust washer into the case.

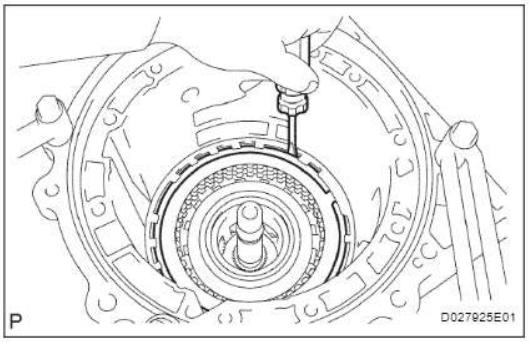



**27. INSTALL 2ND BRAKE PISTON HOLE SNAP RING**
(a) Using SST, install the snap ring.
**SST 09350-30020 (09350-07060)**



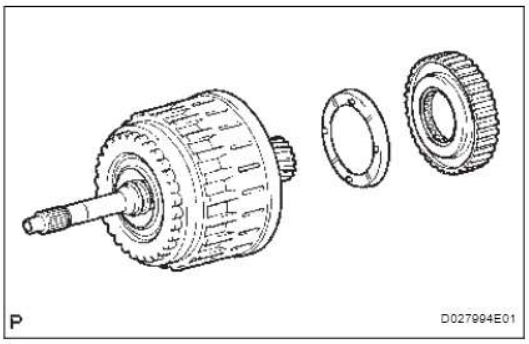

**28. INSTALL NO. 3 BRAKE DISC**
(a) Install the flange, the 4 discs, the 4 plates and the cushion plate into the case.
**Install in order:**
**F - D - P - D - P - D - P - D - P - C**
HINT:
P = Plate, D = Disc, F = Flange C = Cushion

AT



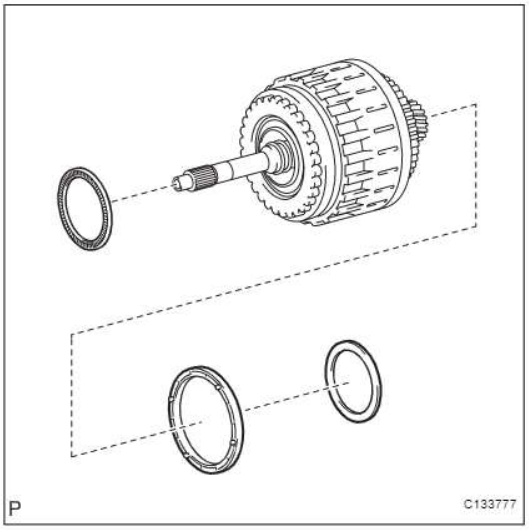

**29. INSTALL NO. 3 BRAKE SNAP RING**

(a) Using a screwdriver, install the snap ring.




**30. INSTALL NO. 2 1-WAY CLUTCH ASSEMBLY**

(a) Install the No. 2 1-way clutch assembly and No. 2 clutch drum thrust washer onto the clutch drum and input shaft.




**31. INSTALL CLUTCH DRUM AND INPUT SHAFT ASSEMBLY**

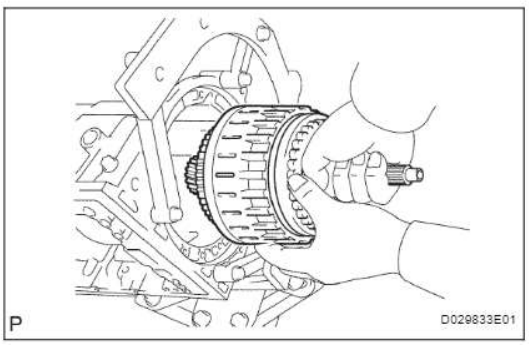
(a) Install the thrust needle roller bearing.

(b) Coat the race with petroleum jelly and install it onto the clutch drum thrust washer.

**Thrust needle roller bearing and diameter**

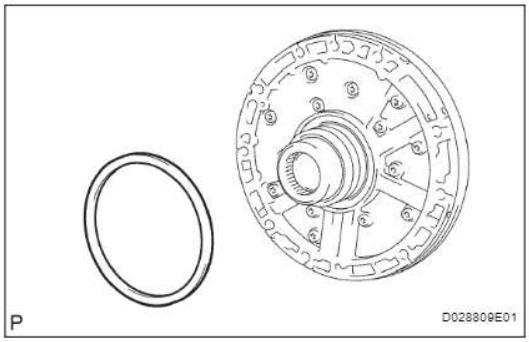
| Item | Inside | Outside |
|---|---|---|
| Thrust needle roller bearing | 71.9 mm (2.831 in.) | 85.6 mm (3.370 in.) |
| Race | 73.6 mm (2.898 in.) | 102.0 mm (4.016 in.) |

(c) Install the clutch drum thrust washer and race onto the clutch drum and input shaft assembly.




(d) Install the input shaft sub-assembly with the direct and reverse multiple disc assembly onto the transmission case.

AT

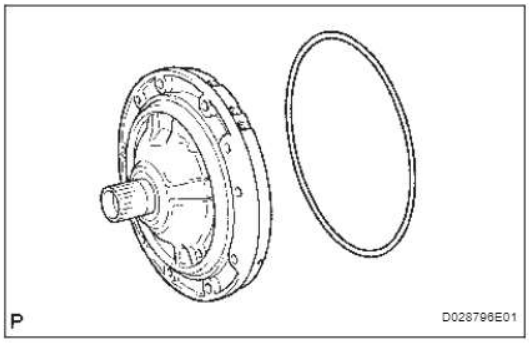



**32. INSTALL OIL PUMP ASSEMBLY**

(a) Install the No. 1 thrust bearing race onto the front oil pump.

**No. 1 Thrust bearing race diameter**

| Item | Inside | Outside |
|---|---|---|
| Race | 74.2 mm (2.921 in.) | 87.74 mm (3.454 in.) |

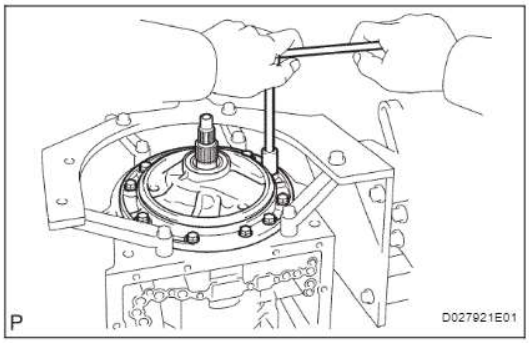



(b) Coat a new O-ring with ATF, and install it onto the oil pump assembly.

(c) Place the oil pump through the input shaft, and align the bolt holes in 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.

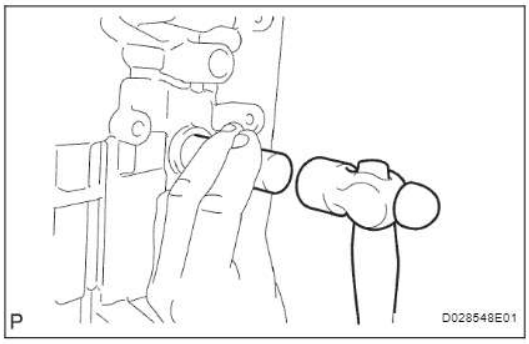
**NOTICE:**
**Do not push on the oil pump strongly, as the oil seal ring will stick to the direct clutch drum.**




(e) Install the 10 bolts.

**Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)**

AT



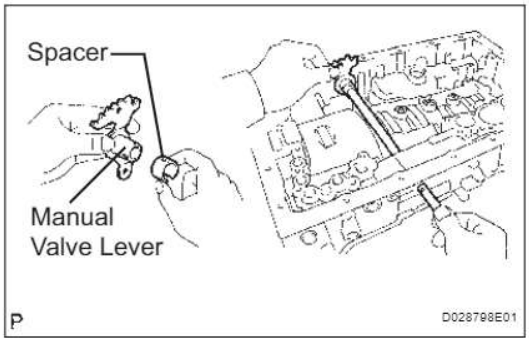

**33. INSTALL MANUAL VALVE LEVER SHAFT OIL SEAL**

(a) Using SST, drive in 2 new oil seals.

**SST 09350-30020 (09350-07110)**

(b) Coat the oil seal lips with MP grease.

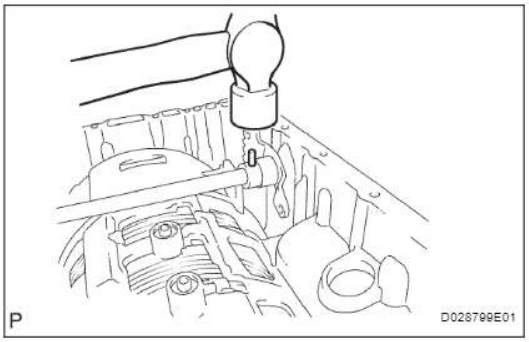
**34. INSPECT INDIVIDUAL PISTON OPERATION**
**INSPECTION (See page AT-217)**



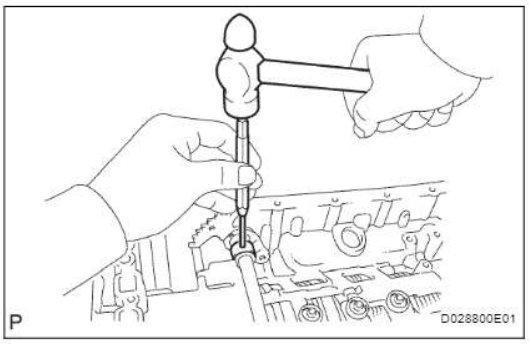

**35. INSTALL MANUAL VALVE LEVER SUB-ASSEMBLY**

(a) Install a new spacer onto the manual valve lever.

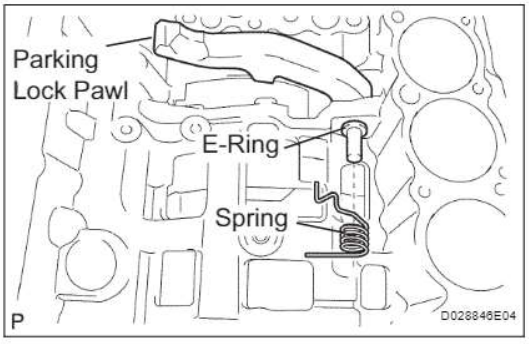
(b) Install the manual valve lever shaft onto the transmission case through the manual valve lever.




(c) Using a hammer, tap in a new spring pin.



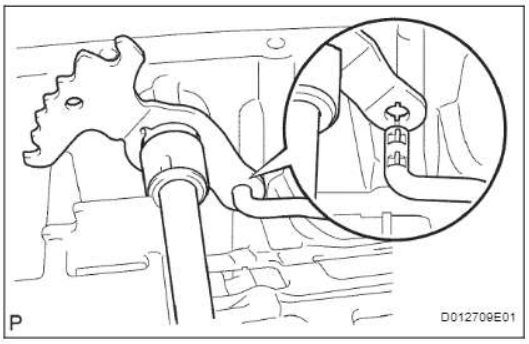

(d) Align the manual valve lever indentation with the spacer hole, and stake them together with a punch.
(e) Make sure the shaft rotates smoothly.




**36. INSTALL PARKING LOCK PAWL SHAFT**

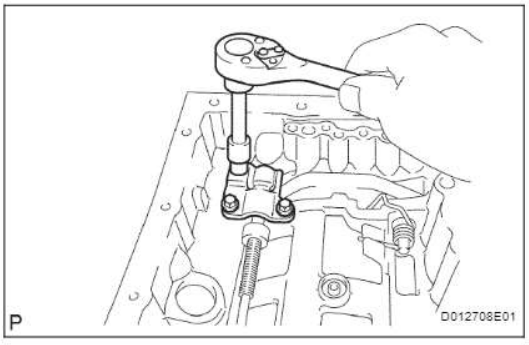
(a) Install the E-ring onto the shaft.
(b) Install the parking lock pawl, shaft and spring.

AT



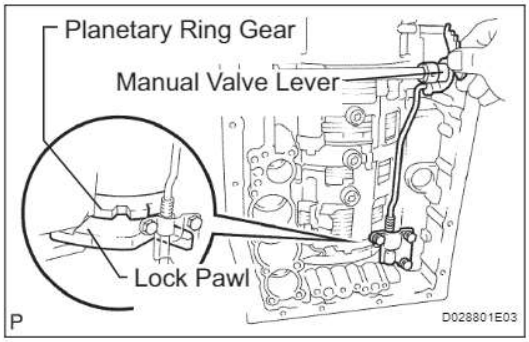

**37. INSTALL PARKING LOCK ROD SUB-ASSEMBLY**

(a) Connect the parking lock rod to the manual valve lever.

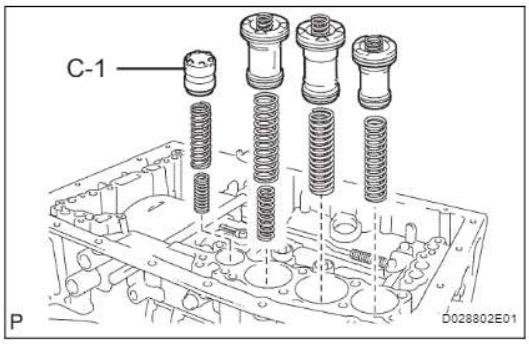



**38. INSTALL PARKING LOCK PAWL BRACKET**

(a) Place the parking lock pawl bracket onto the transmission case and tighten the 3 bolts.
**Torque: 7.4 N*m (75 kgf*cm, 65 in.*lbf)**

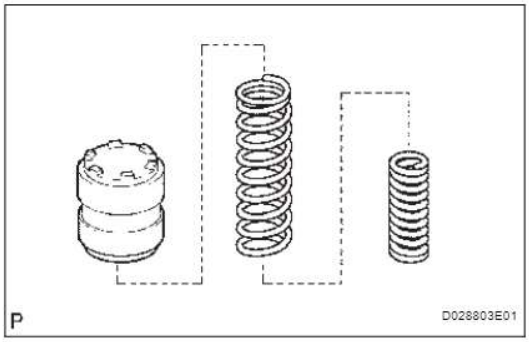



(b) Shift the manual valve lever to the P position, and confirm that the planetary ring gear is correctly locked up by the lock pawl.




**39. INSTALL C-1 ACCUMULATOR VALVE**

(a) Coat a new O-ring with ATF, and install it onto the piston.




(b) Install the 2 springs and accumulator valve into the hole.

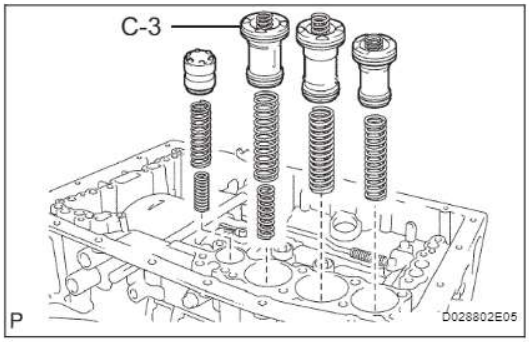
**Accumulator spring**

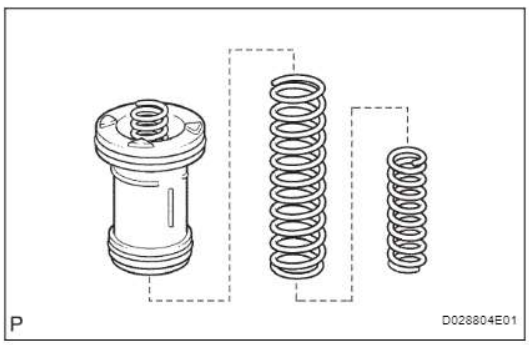
| Spring | Free length<br>Outer diameter | Color |
|---|---|---|
| C-1 Inner | 30.40 mm (1.197 in.)<br>11.40 mm (0.449 in.) | Pink |
| C-1 Outer | 48.76 mm (1.920 in.)<br>16.60 mm (0.654 in.) | Light green |

AT

**40. INSTALL C-3 ACCUMULATOR PISTON**

(a) Coat a new O-ring with ATF, and install it onto the piston.

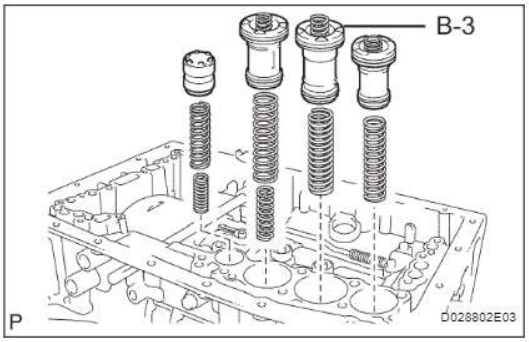



(b) Install the 2 springs and accumulator piston into the hole.

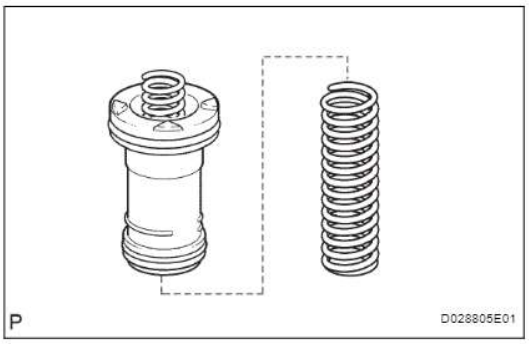
**Accumulator spring**

| Spring | Free length<br>Outer diameter | Color |
|---|---|---|
| C-3 Inner | 44.0 mm (1.732 in.)<br>14.0 mm (0.551 in.) | Yellow |
| C-3 Outer | 73.35 mm (2.888 in.)<br>19.90 mm (0.784 in.) | Red |




**41. INSTALL B-3 ACCUMULATOR PISTON**

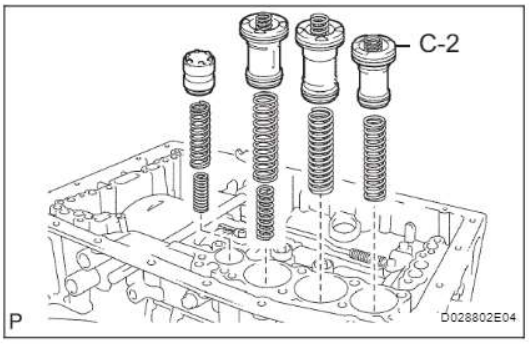
(a) Coat 2 new O-rings with ATF, and install them onto the piston.




(b) Install the spring and accumulator piston into the hole.

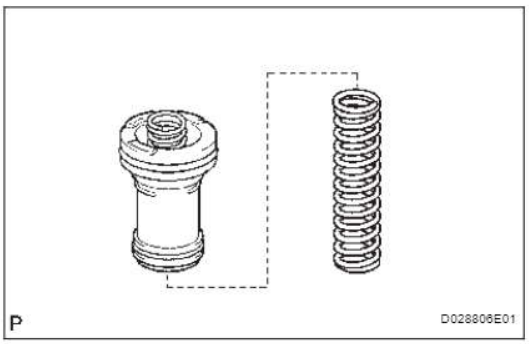
**Accumulator spring**

| Spring | Free length<br>Outer diameter | Color |
|---|---|---|
| B-3 | 70.5 mm (2.776 in.)<br>19.7 mm (0.776 in.) | Purple |




**42. INSTALL C-2 ACCUMULATOR PISTON**

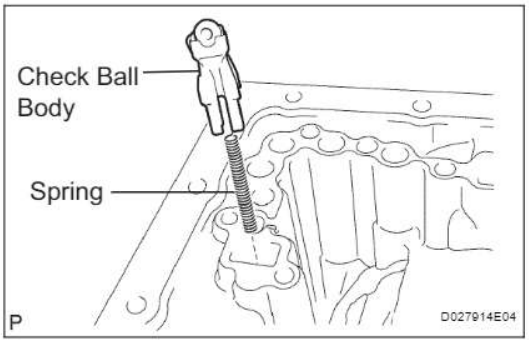
(a) Coat 2 new O-rings with ATF, and install them onto the piston.




(b) Install the spring and accumulator piston into the hole.

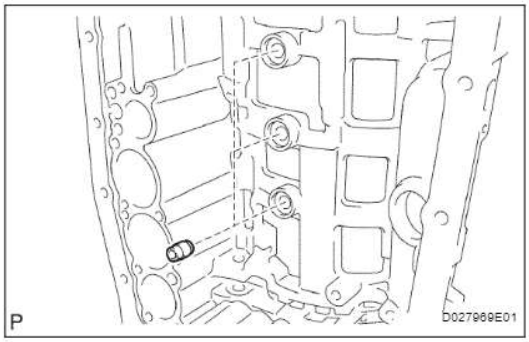
**Accumulator spring**

| Spring | Free length<br>Outer diameter | Color |
|---|---|---|
| C-2 | 62.0 mm (2.441 in.)<br>15.9 mm (0.626 in.) | White |



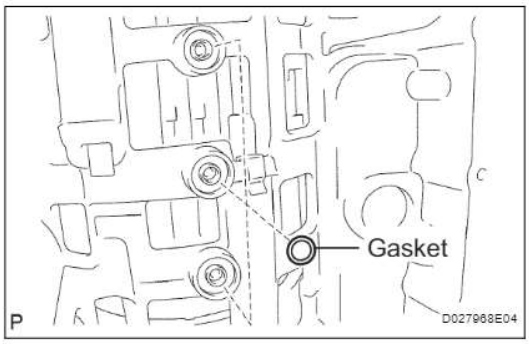

**43. INSTALL CHECK BALL BODY**

(a) Install the check ball body and the spring.



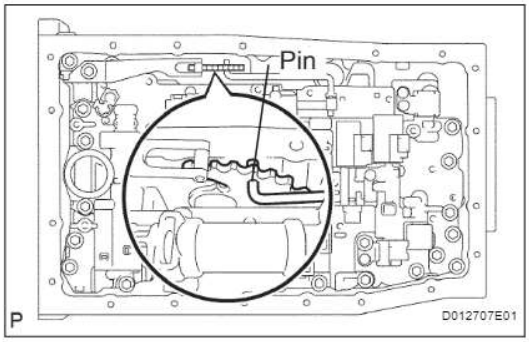

**44. INSTALL BRAKE DRUM GASKET**

(a) Install the 3 brake drum gaskets.



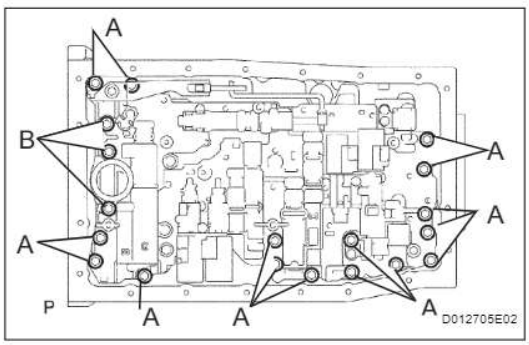

**45. INSTALL TRANSAXLE CASE GASKET**

(a) Install the 3 transaxle case gaskets.

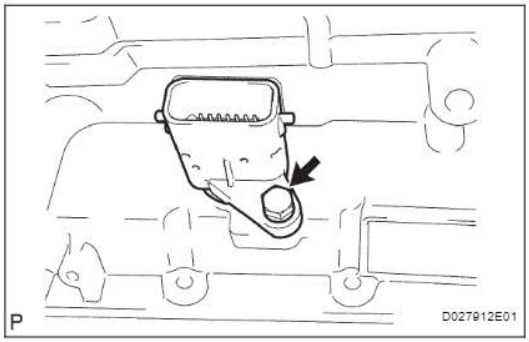



**46. INSTALL TRANSMISSION VALVE BODY ASSEMBLY**

(a) Align the groove of the manual valve with the pin of the lever.



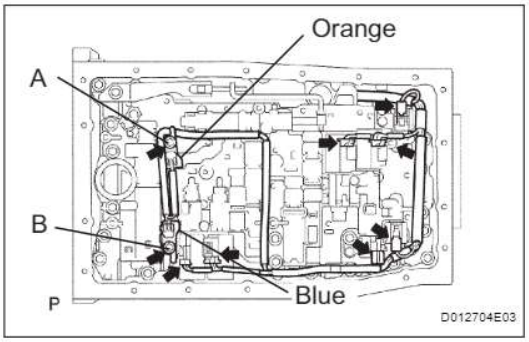

(b) Install the 19 bolts.
**Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)**
HINT:
- Each bolt length is as indicated below.
- Bolt length:
  25 mm (0.98 in.) for bolt A
  36 mm (1.42 in.) for bolt B



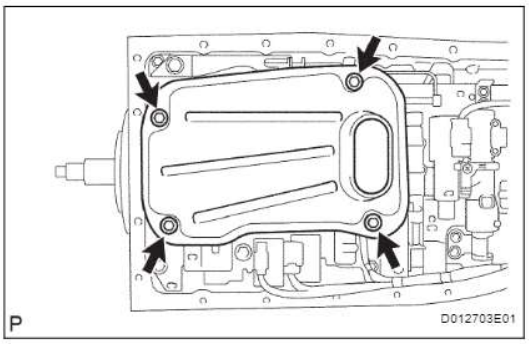

**47. INSTALL TRANSMISSION WIRE**

(a) Install a new O-ring onto 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 solenoid connector.

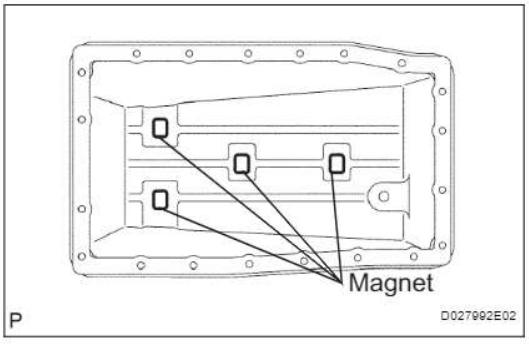
AT




(e) Connect the 7 solenoid connectors.
(f) Install the ATF temperature sensor.
(g) Install the 2 clamps and the 2 bolts.
**Torque: 10 N*m (100 kgf*cm, 7 ft.*lbf) for bolt A**
**11 N*m (112 kgf*cm, 8 ft.*lbf) for bolt B**
HINT:
- Each bolt length is as indicated below.
- Bolt length:
  12 mm (0.47 in.) for bolt A
  36 mm (1.42 in.) for bolt B



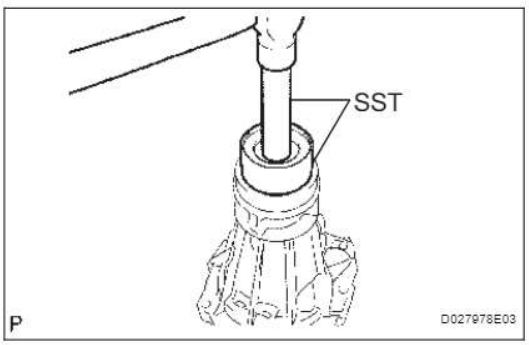

**48. INSTALL VALVE BODY OIL STRAINER ASSEMBLY**
(a) Coat a new O-ring with ATF, and install them onto the valve body oil strainer assembly.
(b) Install the oil strainer with the 4 bolts.
**Torque: 10 N*m (100 kgf*cm, 7 ft.*lbf)**



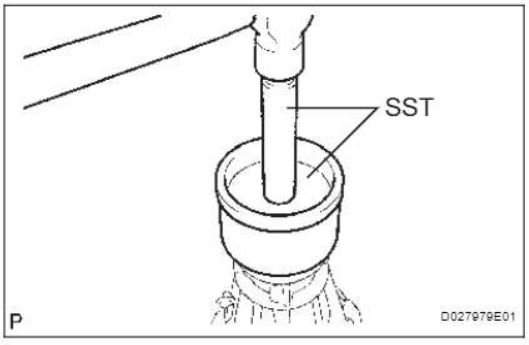

**49. INSTALL TRANSMISSION OIL CLEANER MAGNET**
(a) Install the 4 transmission oil cleaner magnets.

**50. INSTALL AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY**
(a) Install a new gasket onto the oil pan.
(b) Install the 20 bolts.
**Torque: 4.4 N*m (45 kgf*cm, 39 in.*lbf)**
(c) Install the drain plug.
**Torque: 28 N*m (285 kgf*cm, 21 ft.*lbf)**

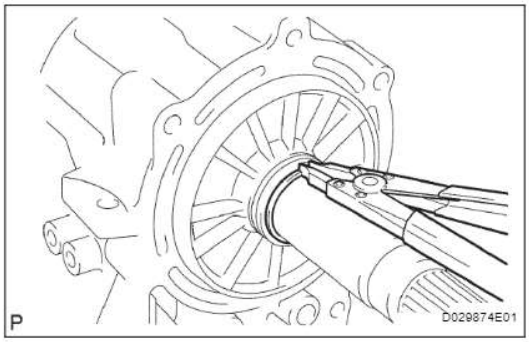
AT




**51. INSTALL AUTOMATIC TRANSMISSION EXTENSION HOUSING OIL SEAL**
(a) Using SST and a hammer, tap in a new oil seal.
**SST 09710-30050, 09950-70010 (09951-07100)**



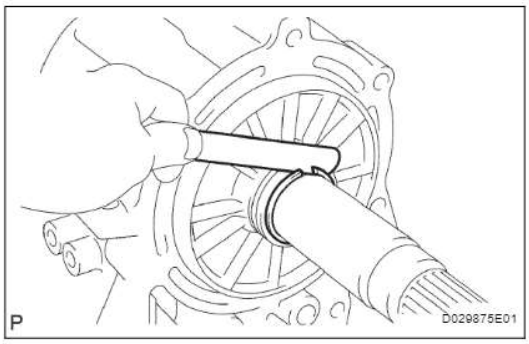

**52. INSTALL EXTENSION HOUSING DUST DEFLECTOR**
(a) Using SST and a hammer, tap in a new extension housing dust deflector.
**SST 09223-15020, 09950-70010 (09951-07100)**




**53. INSTALL EXTENSION HOUSING SUB-ASSEMBLY**

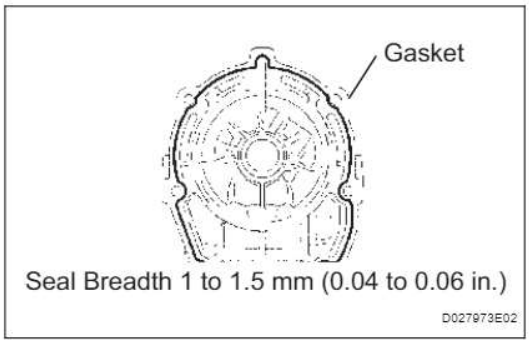
(a) Install the thrust needle roller bearing and the 2 bearing races.

(b) Using a snap ring expander, install the snap ring.




(c) Using a feeler gauge, measure the clearance between the snap ring and the race.
**Clearance:**
**0.05 to 0.33 mm (0.002 to 0.013 in.)**
If the Clearance is still standard, select another race.
HINT:
There are 6 different thickness for the race.
**Race thickness**

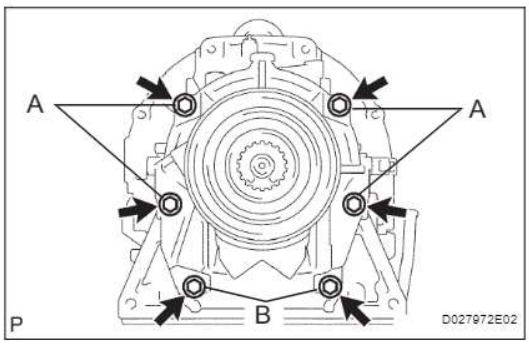
| No. | Thickness | No. | Thickness |
|---|---|---|---|
| 1 | 3.7 mm (0.146 in.) | 4 | 4.0 mm (0.158 in.) |
| 2 | 3.8 mm (0.150 in.) | 5 | 4.1 mm (0.161 in.) |
| 3 | 3.9 mm (0.154in.) | 6 | 4.2 mm (0.165 in.) |




(d) Install the gasket to the extension housing.
HINT:
Take care not to drop the gasket.

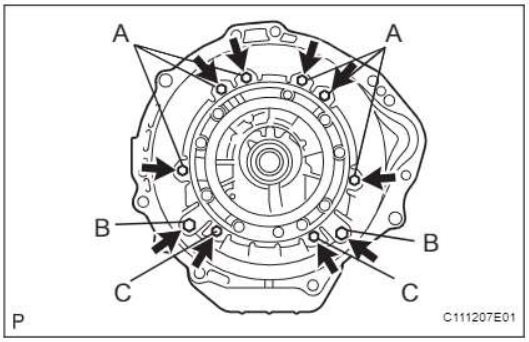
(e) Clean the threads of the bolts and the case with white gasoline.

(f) Apply FIPG to the extension housing.
**FIPG:**
**Toyota Genuine Seal Packing 1281, Three Bond 1281 or Equivalent**




(g) Install the extension housing with 6 bolts.
**Torque: 34 N*m (345 kgf*cm, 25 ft.*lbf)**
HINT:
- Each bolt length is indicated below.
- Bolt length:
  45 mm (1.722 in.) for bolt A
  35 mm (1.378 in.) for bolt B

AT




**54. INSTALL AUTOMATIC TRANSMISSION HOUSING**

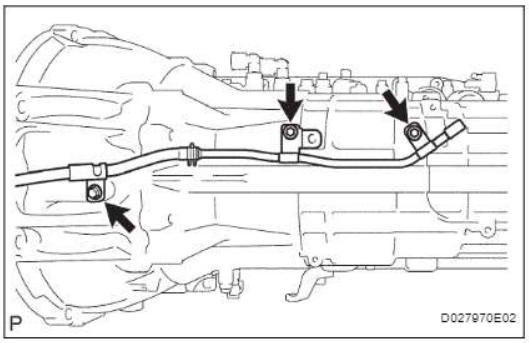
(a) Clean the threads of the bolts and the case with white gasoline.

(b) Install the transmission housing with the 10 bolts.

**Torque: 34 N*m (345 kgf*cm, 25 ft.*lbf) for bolt A**
**57 N*m (581 kgf*cm, 42 ft.*lbf) for bolt B**
**34 N*m (345 kgf*cm, 25 ft.*lbf) for bolt C**

HINT:

- Each bolt length is indicated below.
- Bolt length:
  Bolt A: 14 mm
  Bolt B: 17 mm
  Bolt C: 14 mm

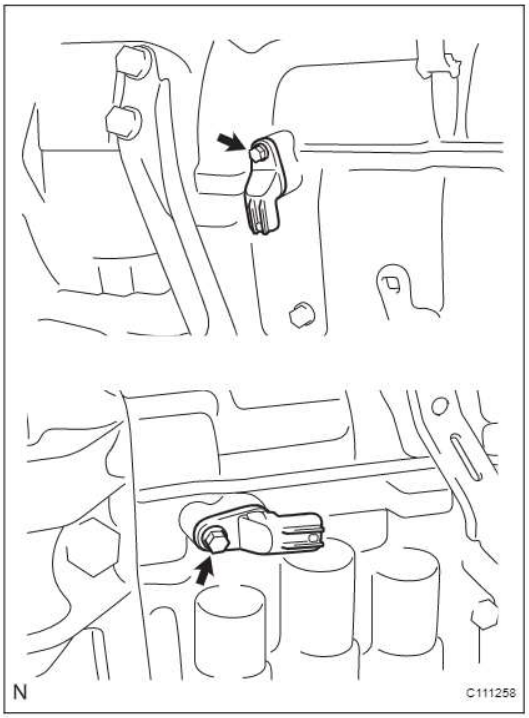



**55. INSTALL AUTOMATIC TRANSAXLE BREATHER TUBE**

(a) Install a new O-ring onto the breather tube.

(b) Install the breather tube with the 3 bolts.

**Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)**




**56. INSTALL TRANSMISSION REVOLUTION SENSOR**

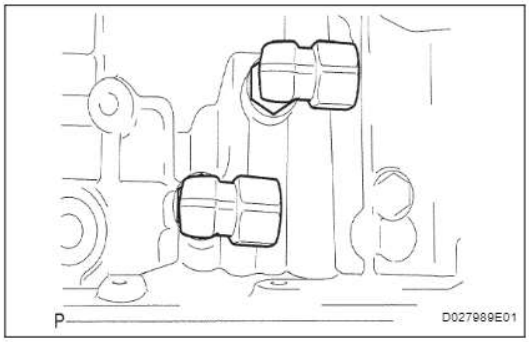
(a) Coat 2 new O-rings with AFT, and install one onto each transmission revolution sensor.

(b) Install the 2 transmission revolution sensors.

(c) Install the 2 bolts.

**Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)**

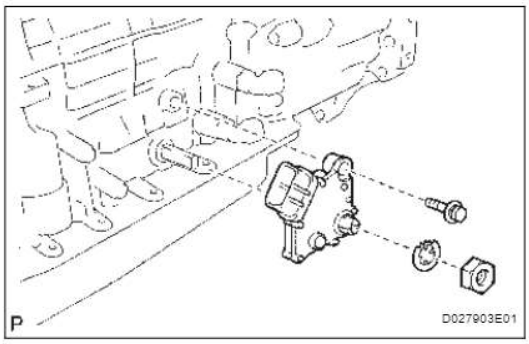
AT




**57. INSTALL OIL COOLER TUBE UNION**

(a) Coat 2 new O-rings with ATF, and install one onto each oil cooler tube union.

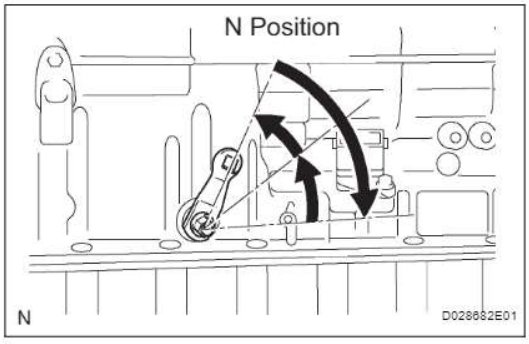
(b) Install the 2 oil cooler tube unions.
**Torque: 29 N*m (296 kgf*cm, 21 ft.*lbf)**




**58. INSTALL PARK/NEUTRAL POSITION SWITCH ASSEMBLY**

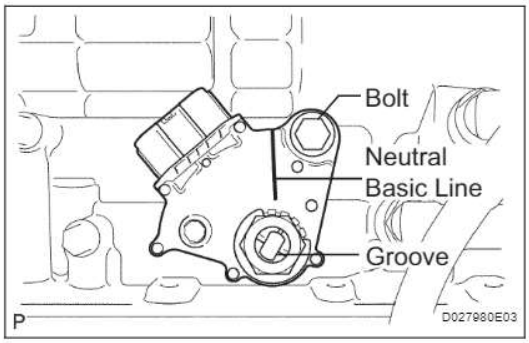
(a) Install the park/neutral position switch onto the manual valve lever shaft, and temporarily install the adjusting bolt.

(b) Install a new lock washer and the nut.
**Torque: 6.9 N*m (70 kgf*cm, 61 in.*lbf)**

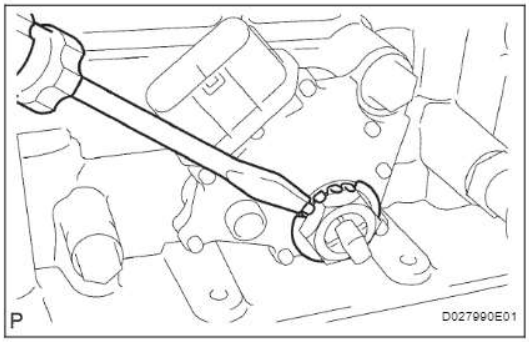



(c) Push the control shaft rearward as much as possible.

(d) Return the control shaft lever 2 notches to the N position.

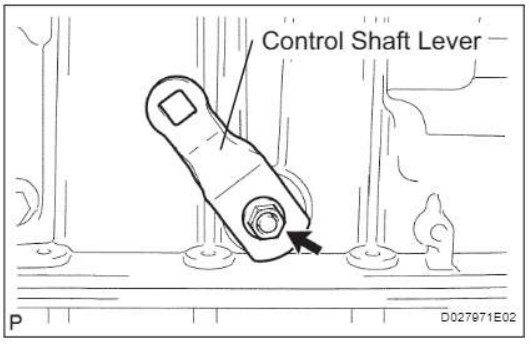



(e) Align the neutral basic line with the switch groove as shown in the illustration, and tighten the adjusting bolt.
**Torque: 13 N*m (129 kgf*cm, 9.4 ft.*lbf)**




(f) Using a screwdriver, bend the tabs of the lock washer.
HINT:
Bend at least 2 of the lock washer tabs.

AT



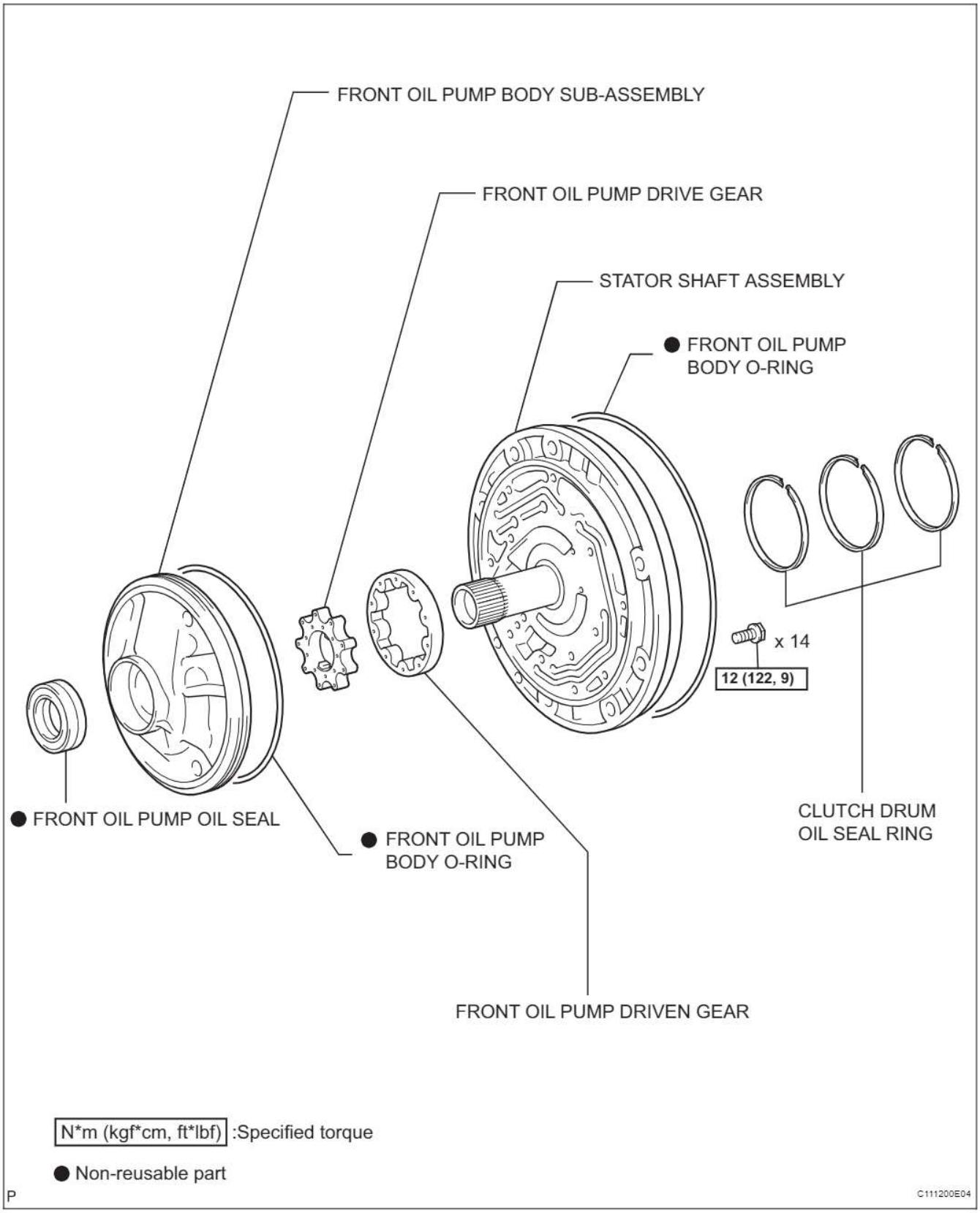

**59. INSTALL TRANSMISSION CONTROL SHAFT LEVER LH**

(a) Install the control shaft lever LH with the washer and nut.
**Torque: 16 N*m (163 kgf*cm, 12 ft.*lbf)**

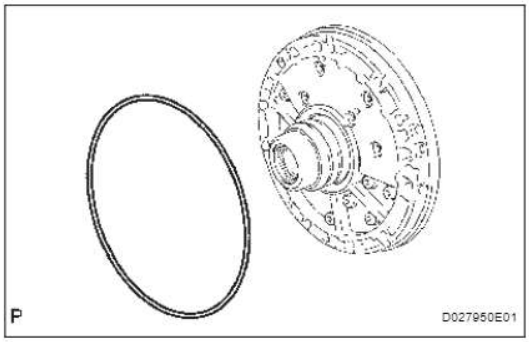
AT

# OIL PUMP

## COMPONENTS

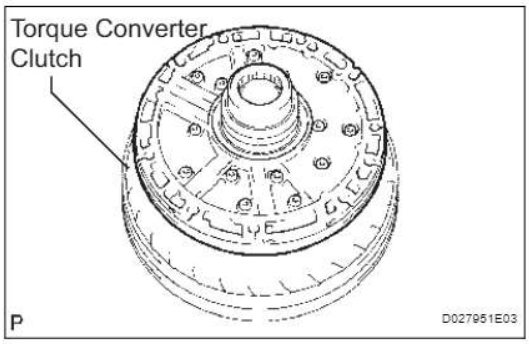


# DISASSEMBLY



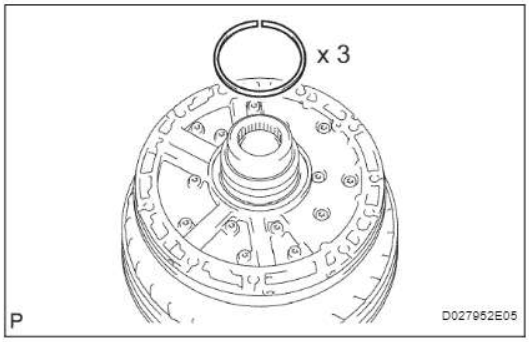

**1. REMOVE FRONT OIL PUMP BODY O-RING**

(a) Remove the O-ring from the oil pump assembly.



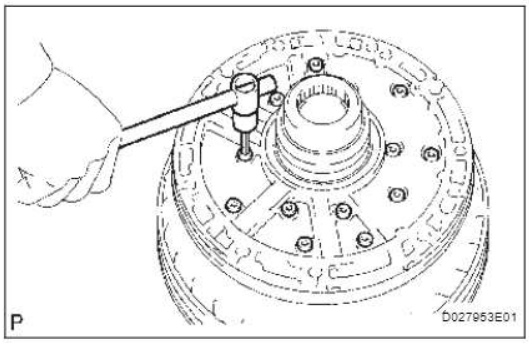

**2. FIX OIL PUMP ASSEMBLY**

(a) Place the oil pump body on the torque converter clutch.



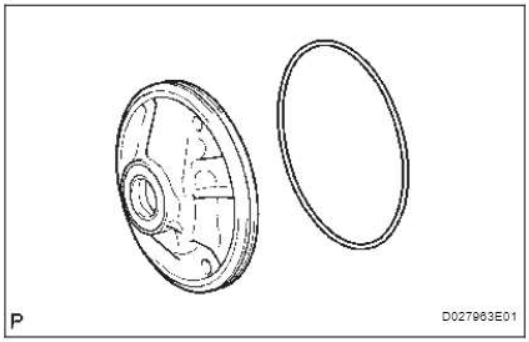

**3. REMOVE CLUTCH DRUM OIL SEAL RING**

(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.

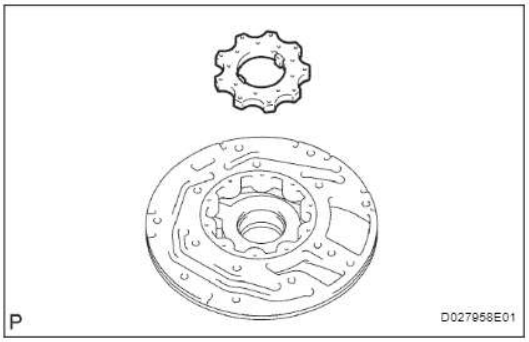
(b) Remove the oil pump body from the torque converter clutch.

**6. INSPECT FRONT OIL PUMP BODY SUB-ASSEMBLY (See page AT-240)**

**7. INSPECT STATOR SHAFT ASSEMBLY (See page AT-240)**

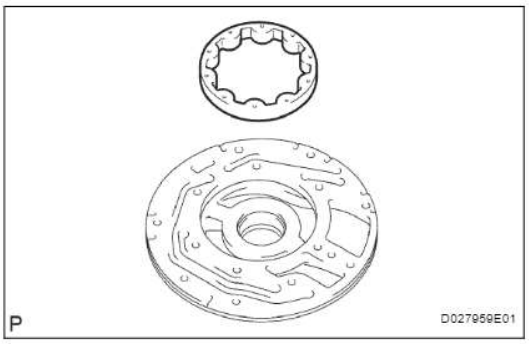
**8. INSPECT CLEARANCE OF OIL PUMP ASSEMBLY**

AT



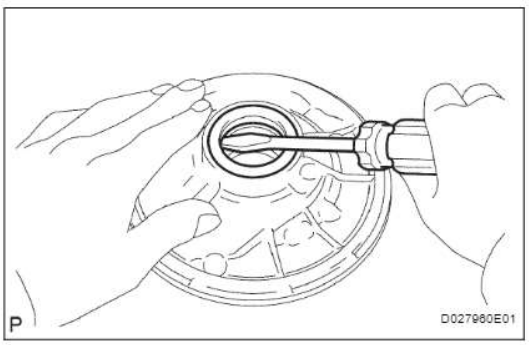

**9. REMOVE FRONT OIL PUMP DRIVE GEAR**

(a) Remove the front oil pump drive gear from the front oil pump body.




**10. REMOVE FRONT OIL PUMP DRIVEN GEAR**

(a) Remove the front oil pump driven gear from the front oil pump body.




**11. REMOVE FRONT OIL PUMP OIL SEAL**

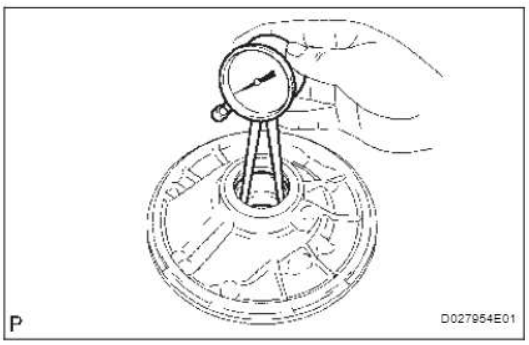
(a) Using a screwdriver, remove the oil seal.

**NOTICE:**

**Be careful not to damage the bushing and oil pump body.**

AT

## INSPECTION



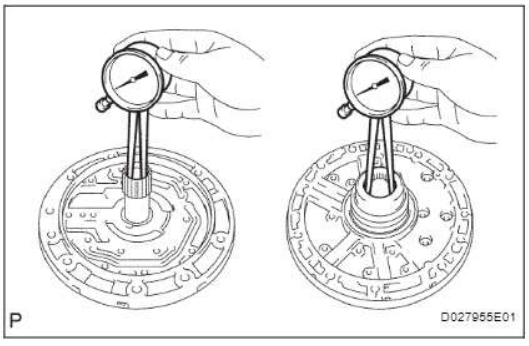

**1. INSPECT FRONT OIL PUMP BODY SUB-ASSEMBLY**

(a) Using a dial indicator, measure the inside diameter of the oil pump body bushing.

**Maximum inside diameter:**

**38.188 mm (1.504 in.)**

If the inside diameter is greater than the maximum, replace the oil pump body.




**2. INSPECT STATOR SHAFT ASSEMBLY**

(a) Using a dial indicator, measure the inside diameter of the stator shaft bushing.

**Maximum inside diameter:**

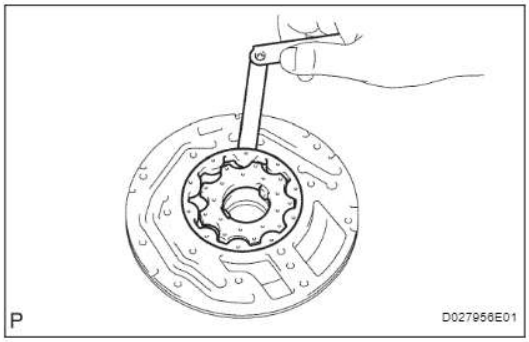
**Front side:**

**21.577 mm (0.850 in.)**

**Rear side:**

**32.08 mm (1.263 in.)**

If the inside diameter is grater than the maximum, replace the stator shaft.



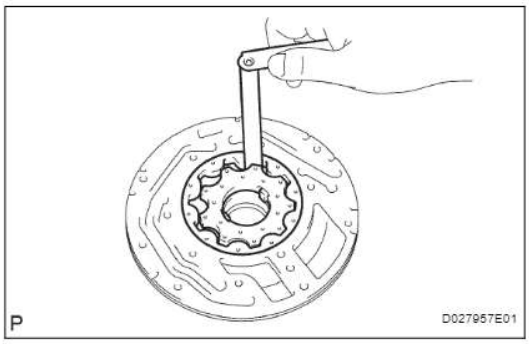

### 3. INSPECT CLEARANCE OF OIL PUMP ASSEMBLY

(a) Push the driven gear to one side of the body.

(b) Using a feeler gauge, measure the clearance.

**Standard body clearance:**
**0.10 to 0.17 mm (0.0039 to 0.0067 in.)**
**Maximum body clearance:**
**0.17 mm (0.0067 in.)**

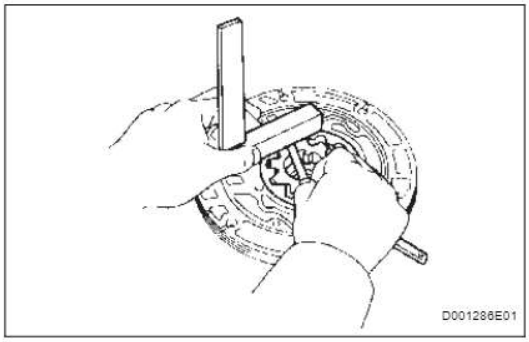
If the body clearance is greater than the maximum, replace drive gear, the driven gear or pump body.




(c) Using a feeler gauge, measure the clearance between the driven gear teeth and drive gear teeth.

**Standard tip clearance:**
**0.07 to 0.15 mm (0.0028 to 0.0059 in.)**
**Maximum tip clearance:**
**0.15 mm (0.0059 in.)**

If the tip clearance is greater than the maximum, replace drive gear, the driven gear or pump body.




(d) Using a steel straight edge and feeler gauge, measure the side clearance of both gears.

**Standard side clearance:**
**0.02 to 0.05 mm (0.0008 to 0.0020 in.)**
**Maximum side clearance:**
**0.05 mm (0.0020 in.)**

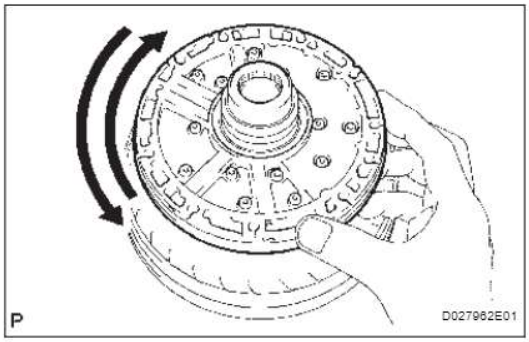
(e) There are 5 different thicknesses for the drive and driven gears.

**Drive and drive gears thickness**

| Mark | Thickness |
|---|---|
| 0 | 10.740 to 10.749 mm (0.4228 to 0.4232 in.) |
| 1 | 10.750 to 10.759 mm (0.4232 to 0.4236 in.) |
| 2 | 10.760 to 10.769 mm (0.4236 to 0.4240 in.) |
| 3 | 10.770 to 10.779 mm (0.4240 to 0.4244 in.) |
| 4 | 10.780 to 10.789 mm (0.4244 to 0.4248 in.) |

If the side clearance is greater than the maximum, replace drive gear, driven gear or pump body.

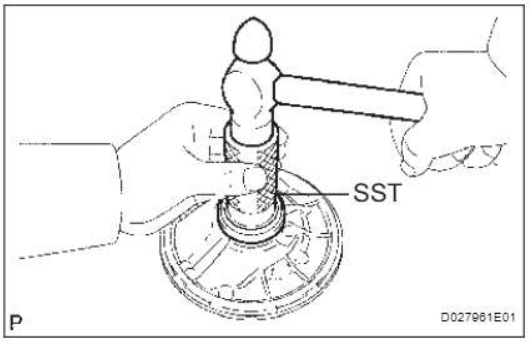
AT




### 4. INSPECT FRONT OIL PUMP DRIVE GEAR ROTATION

(a) Make sure the drive gear rotates smoothly.

(b) Remove the oil pump assembly from the torque converter.




# REASSEMBLY

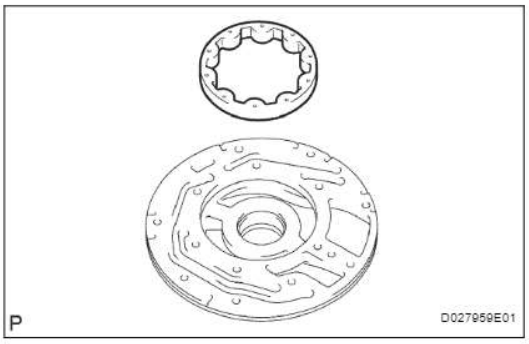
**1. INSTALL FRONT OIL PUMP OIL SEAL**

(a) Using SST and a hammer, install 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 oil seal lip with MP grease.

**2. FIX FRONT OIL PUMP BODY SUB-ASSEMBLY**

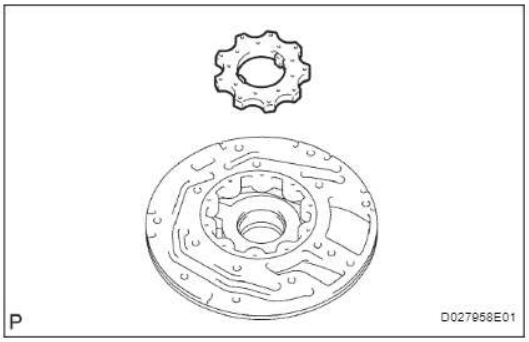
(a) Place the oil pump body on the torque converter clutch.




**3. INSTALL FRONT OIL PUMP DRIVEN GEAR**

(a) Coat the driven gear with ATF.

(b) Install the driven gear onto the oil pump body.

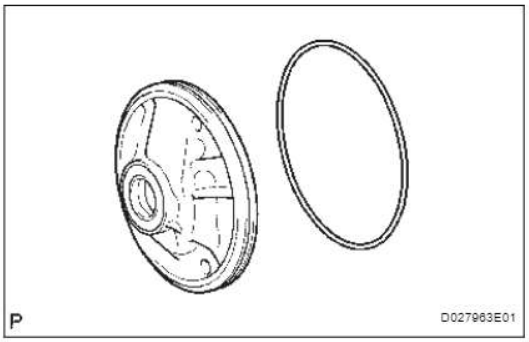



**4. INSTALL FRONT OIL PUMP DRIVE GEAR**

(a) Coat the drive gear with ATF.

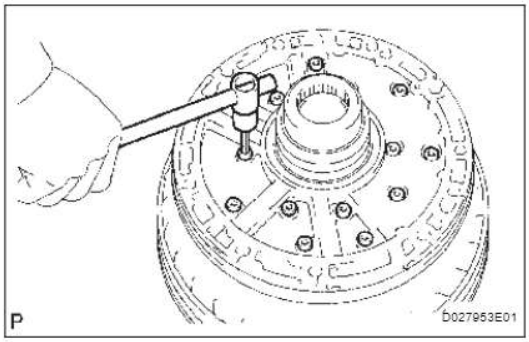
(b) Install the drive gear onto the oil pump body.

AT

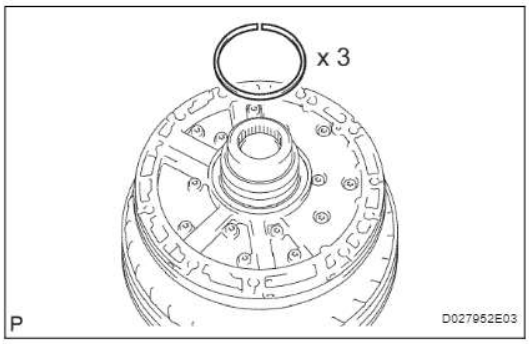



**5. INSTALL FRONT OIL PUMP BODY O-RING**

(a) Install a new O-ring onto the oil pump body.

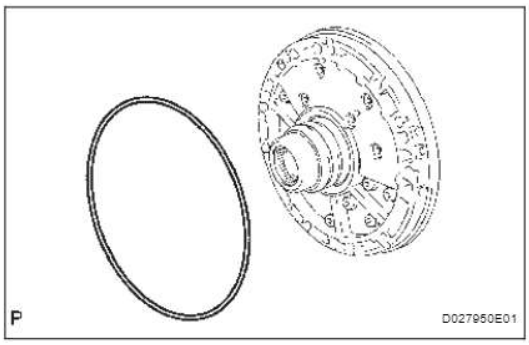



6. **INSTALL STATOR SHAFT ASSEMBLY**
   (a) Align the bolt holes of the stator shaft and oil pump body and install the stator shaft.
   (b) Install the 14 bolts.
   **Torque: 12 N*m (122 kgf*cm, 9 ft.*lbf)**




7. **INSTALL CLUTCH DRUM OIL SEAL RING**
   (a) Coat the 3 oil seal rings with ATF.
   (b) Put together the ends of the 3 oil seal rings together with the overlap distance 8 mm (0.314 in.) or less, and then install them onto the stator shaft groove.
   **NOTICE:**
   **Do not over-widen the ring ends.**
   HINT:
   After installing the oil seal rings, check that they rotate smoothly.

8. **INSPECT OIL PUMP DRIVE GEAR ROTATION (See page AT-241)**

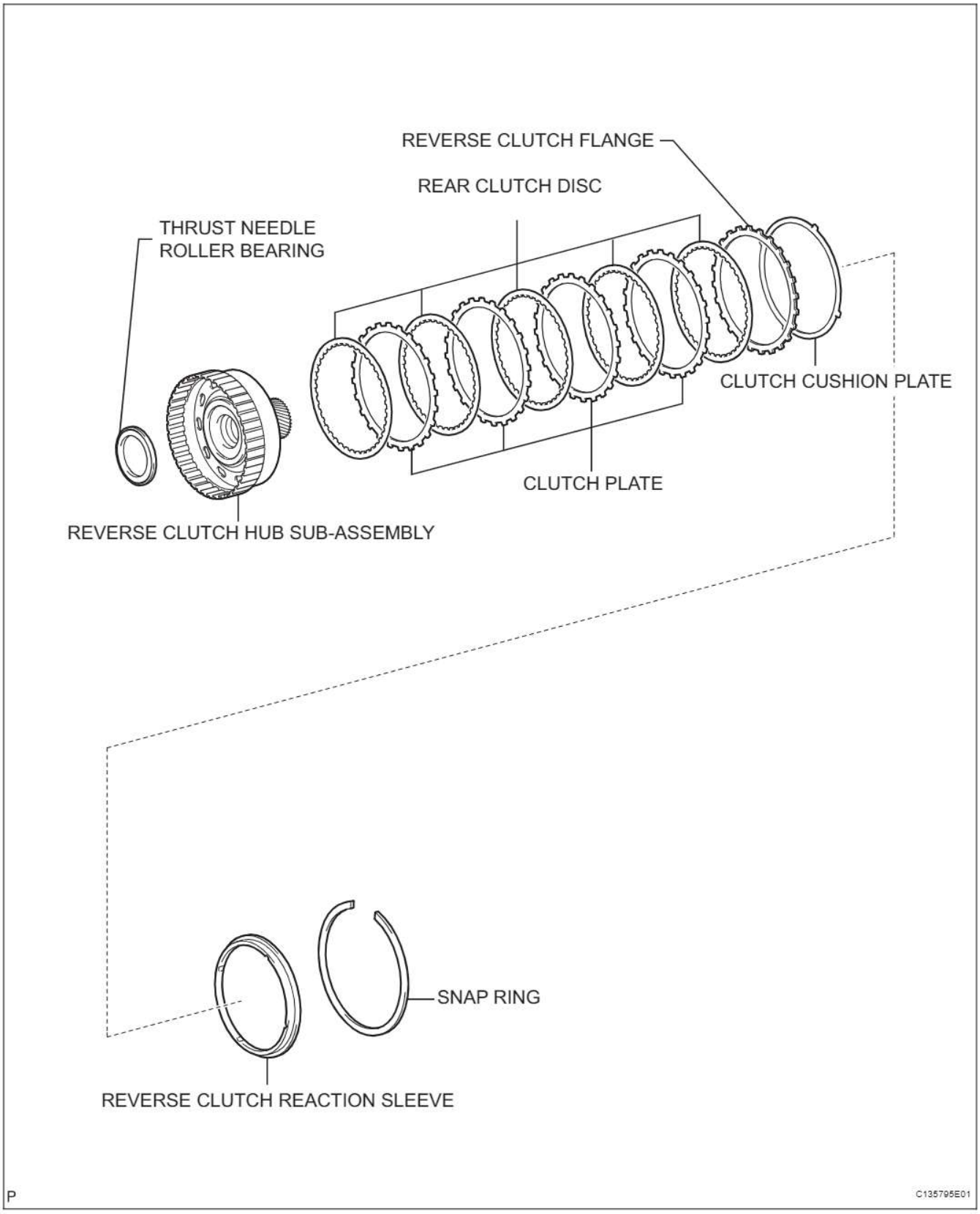



9. **INSTALL FRONT OIL PUMP BODY O-RING**
   (a) Install a new O-ring onto the oil pump assembly.

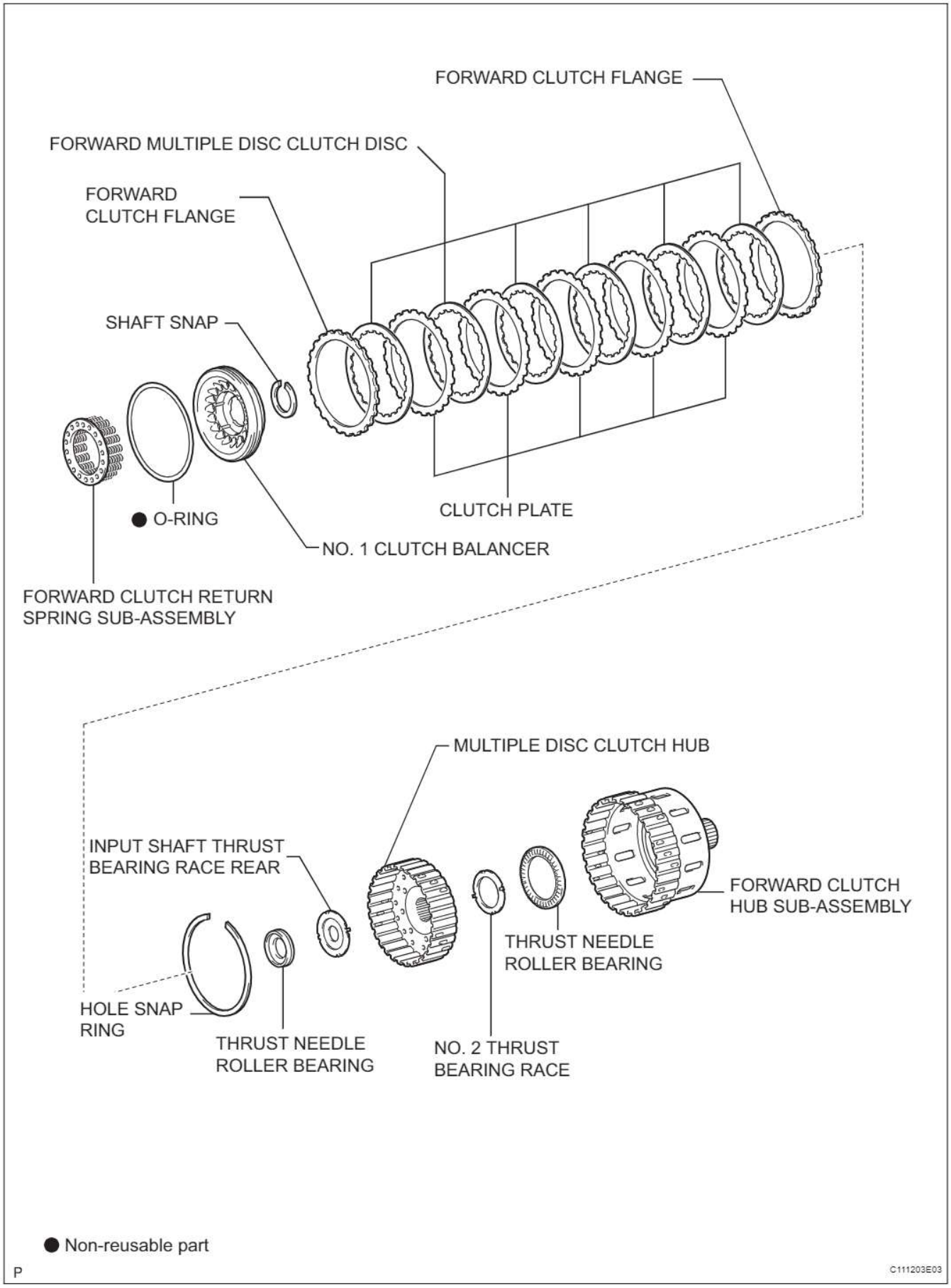
AT

# CLUTCH DRUM AND INPUT SHAFT ASSEMBLY

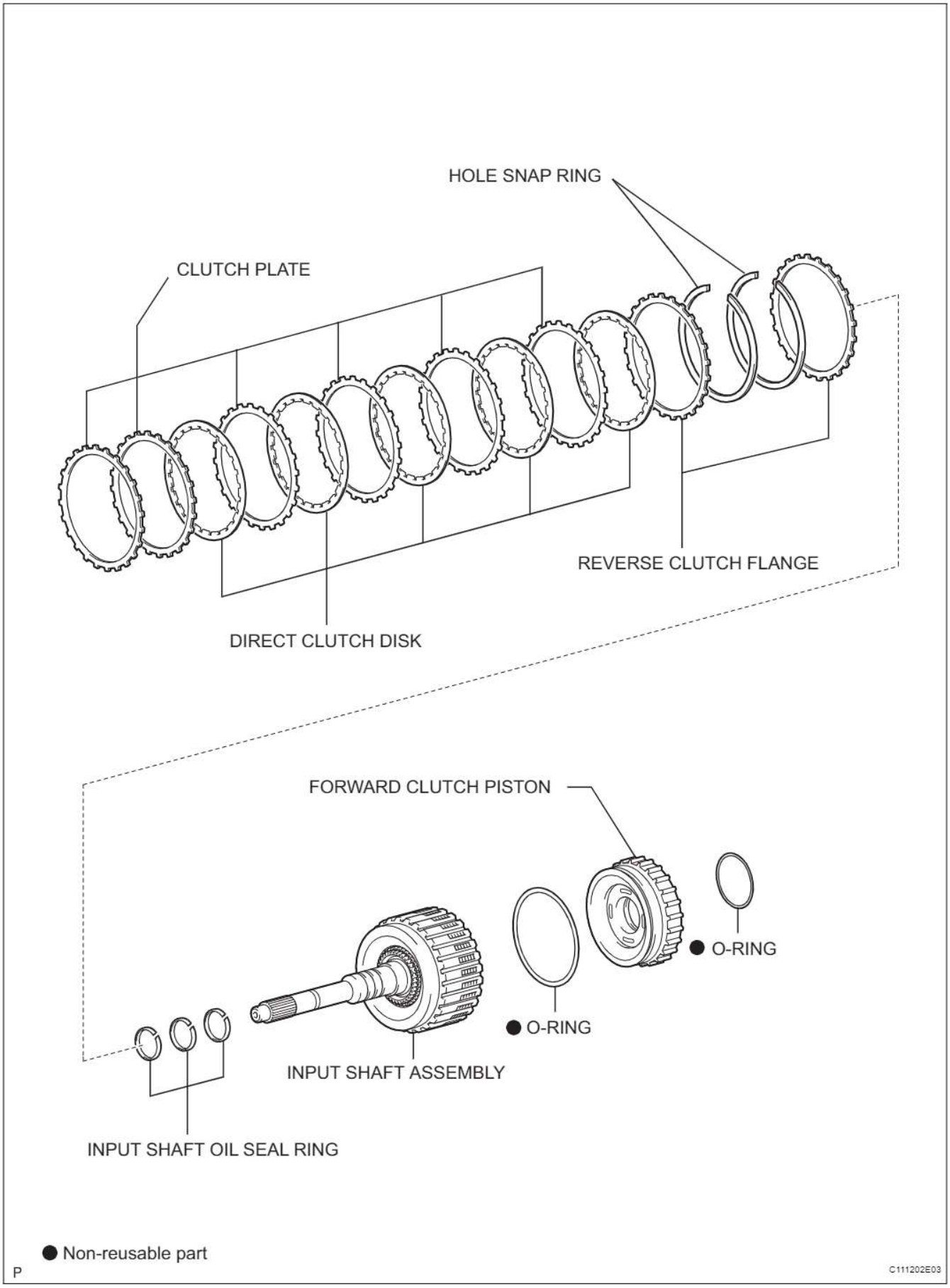
## COMPONENTS

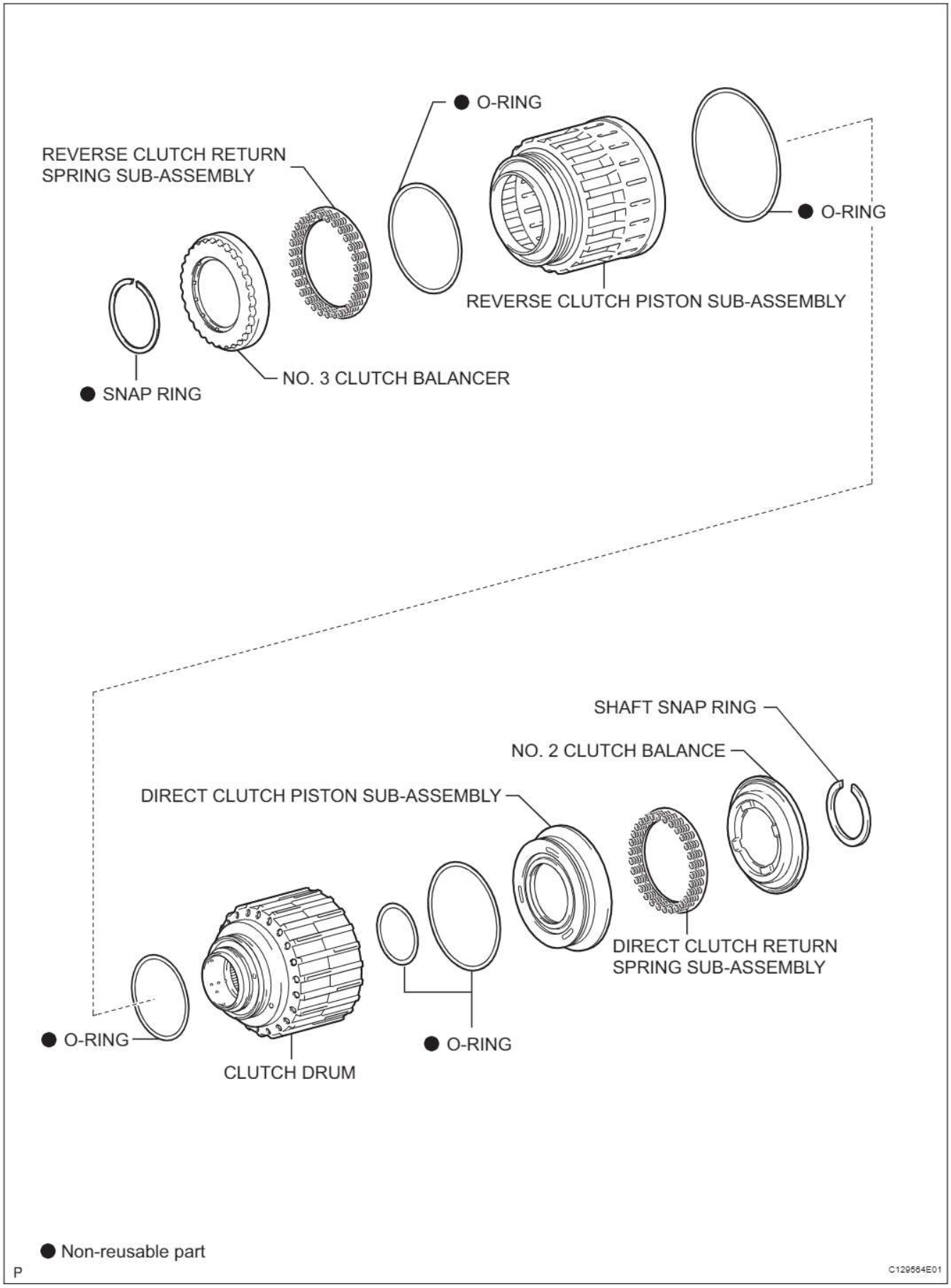



AT

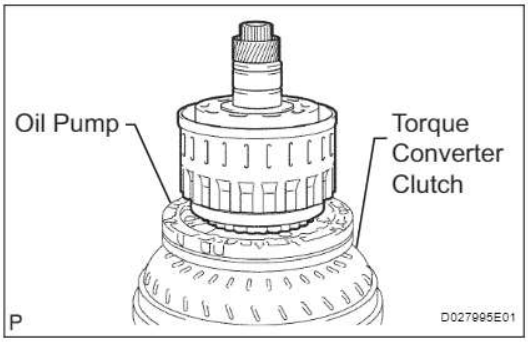

FORWARD CLUTCH FLANGE
FORWARD MULTIPLE DISC CLUTCH DISC
FORWARD CLUTCH FLANGE
SHAFT SNAP
● O-RING
CLUTCH PLATE
NO. 1 CLUTCH BALANCER
FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY
MULTIPLE DISC CLUTCH HUB
INPUT SHAFT THRUST BEARING RACE REAR
FORWARD CLUTCH HUB SUB-ASSEMBLY
THRUST NEEDLE ROLLER BEARING
HOLE SNAP RING
THRUST NEEDLE ROLLER BEARING
NO. 2 THRUST BEARING RACE
● Non-reusable part
P
C111203E03

AT


HOLE SNAP RING
CLUTCH PLATE
REVERSE CLUTCH FLANGE
DIRECT CLUTCH DISK
FORWARD CLUTCH PISTON
● O-RING
● O-RING
INPUT SHAFT ASSEMBLY
INPUT SHAFT OIL SEAL RING
● Non-reusable part
P
C111202E03


● O-RING
REVERSE CLUTCH RETURN SPRING SUB-ASSEMBLY
● O-RING
REVERSE CLUTCH PISTON SUB-ASSEMBLY
NO. 3 CLUTCH BALANCER
● SNAP RING
SHAFT SNAP RING
NO. 2 CLUTCH BALANCE
DIRECT CLUTCH PISTON SUB-ASSEMBLY
DIRECT CLUTCH RETURN SPRING SUB-ASSEMBLY
● O-RING
● O-RING
CLUTCH DRUM
● Non-reusable part
P
C129564E01

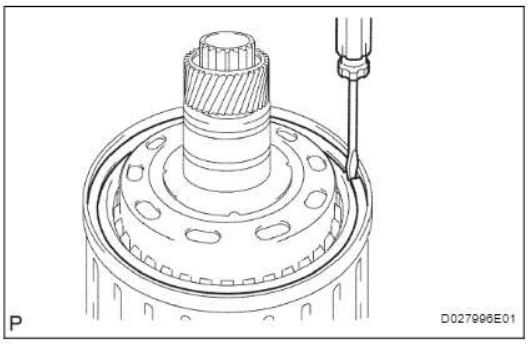
AT




# DISASSEMBLY

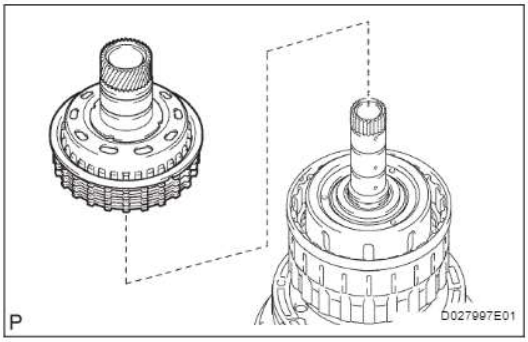
**1. FIX CLUTCH DRUM AND INPUT SHAFT ASSEMBLY**

(a) Place the oil pump onto the torque converter clutch, and then place the clutch drum and input shaft assembly onto the oil pump.

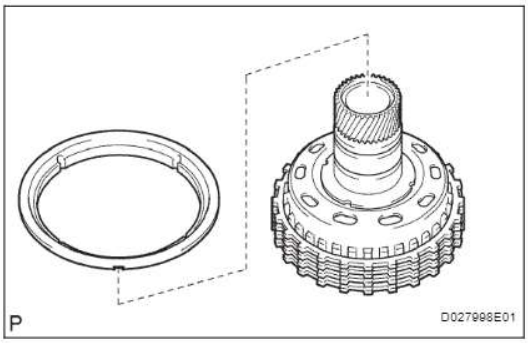



**2. REMOVE REVERSE CLUTCH HUB SUB-ASSEMBLY**

(a) Using a screwdriver, remove the snap ring from the clutch drum and input shaft assembly.

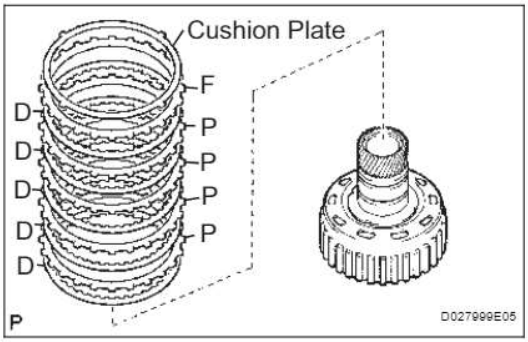



(b) Remove the reverse clutch hub sub-assembly, reverse clutch reaction sleeve, clutch cushion plate reverse clutch flange, 5 reverse clutch discs and 4 clutch plates from the clutch drum assembly.




**3. REMOVE REVERSE CLUTCH REACTION SLEEVE**

(a) Remove the reverse clutch reaction sleeve from the reverse clutch hub sub-assembly.

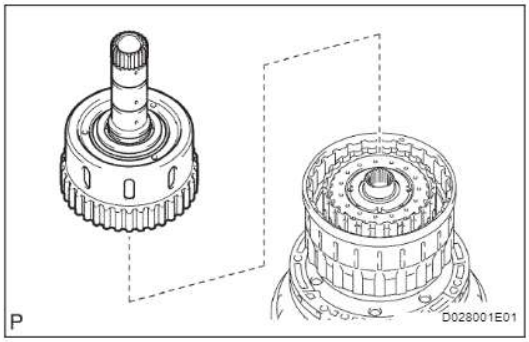



**4. REMOVE REAR CLUTCH DISC**

(a) Remove the clutch cushion plate, reverse clutch flange, 4 plates and 5 discs from the reverse clutch hub.

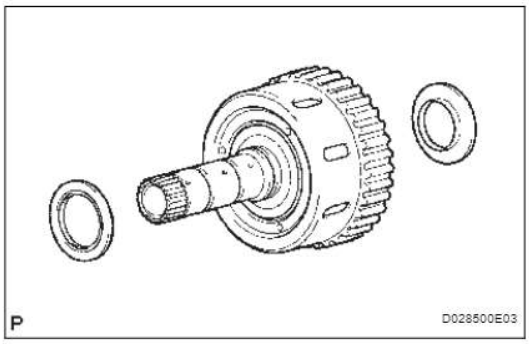
**5. INSPECT REAR CLUTCH DISC (See page AT-254)**

**6. INSPECT REVERSE CLUTCH HUB SUB-ASSEMBLY (See page AT-255)**



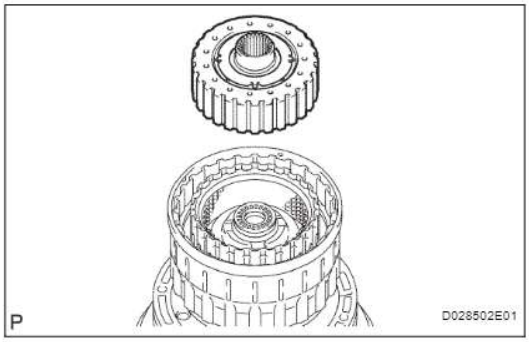

**7. REMOVE FORWARD CLUTCH HUB SUB-ASSEMBLY**

(a) Remove the forward clutch hub sub-assembly from the clutch drum assembly.



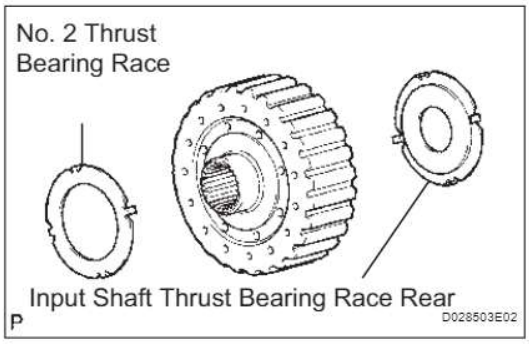

(b) Remove the 2 thrust needle roller bearings from the forward clutch hub sub-assembly.

**8. INSPECT FORWARD CLUTCH HUB SUB-ASSEMBLY (See page AT-255)**

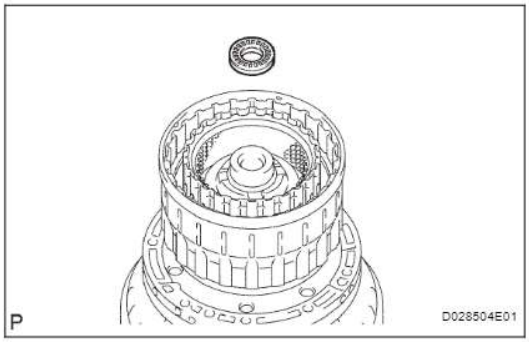



**9. REMOVE MULTIPLE DISC CLUTCH HUB**

(a) Remove the multiple disc clutch hub from the clutch drum assembly.



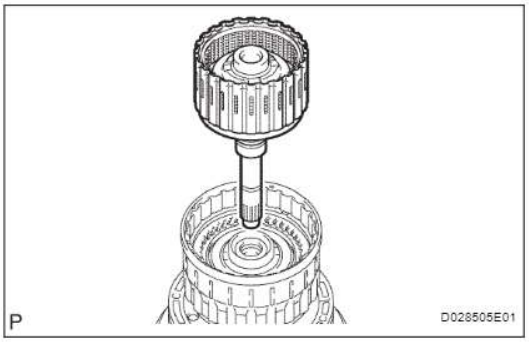

(b) Remove the No. 2 thrust bearing race and input shaft thrust bearing race rear from the multiple disc clutch hub.



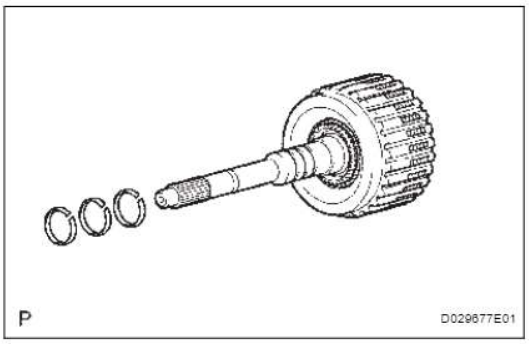

**10. REMOVE INPUT SHAFT ASSEMBLY**

(a) Remove the thrust needle roller bearing from the clutch drum assembly.

AT

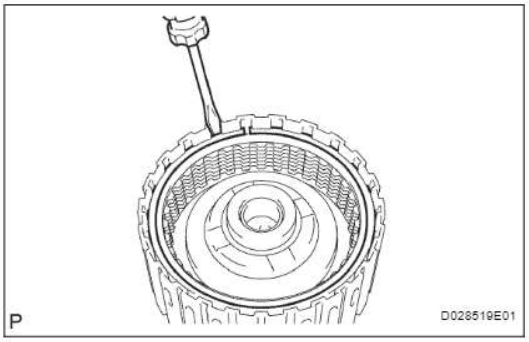



(b) Remove the input shaft assembly from the clutch drum assembly.




**11. REMOVE INPUT SHAFT OIL SEAL RING**

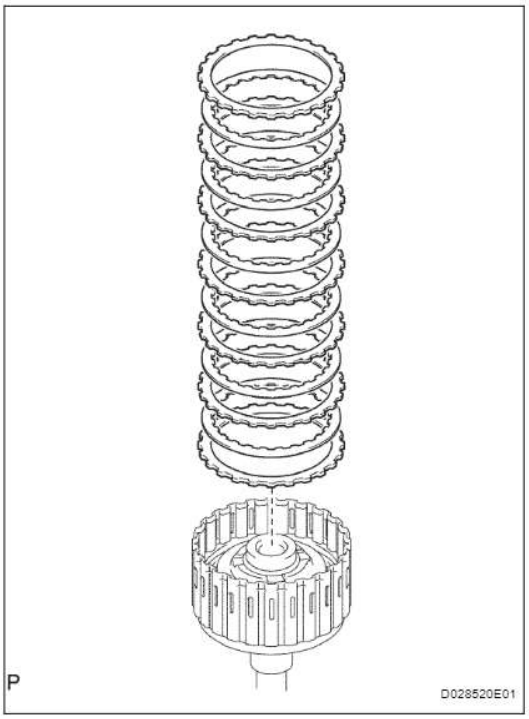
(a) Remove the 3 oil seal rings from the input shaft assembly.




**12. REMOVE FORWARD MULTIPLE DISC CLUTCH DISC**

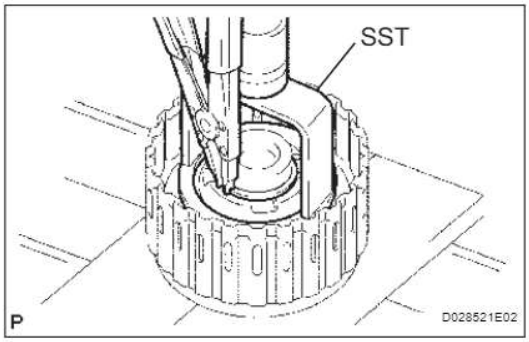
(a) Using a screwdriver, remove the hole snap ring.

AT



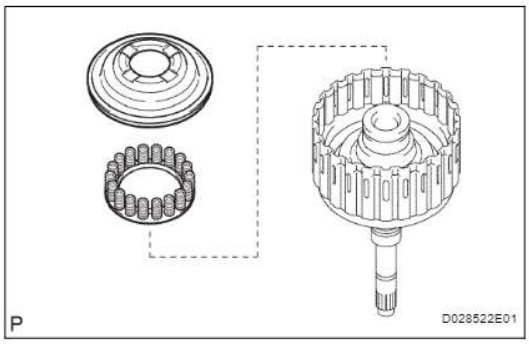

(b) Remove the 2 flanges, 6 discs and 5 plates from the input shaft assembly.

**13. INSPECT FORWARD MULTIPLE DISC CLUTCH DISC (See page AT-255)**

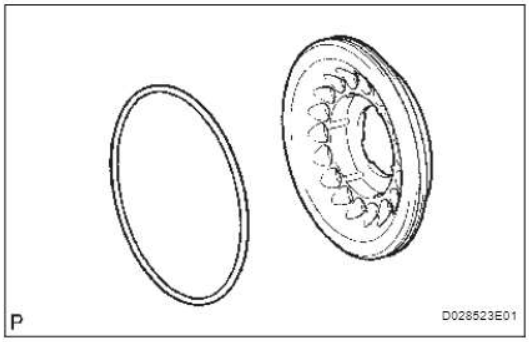



**14. REMOVE NO. 1 CLUTCH BALANCER**

(a) Place SST on the No. 1 clutch balancer, and compress the return spring with a press.
**SST 09350-30020 (09350-07040, 09350-07070)**

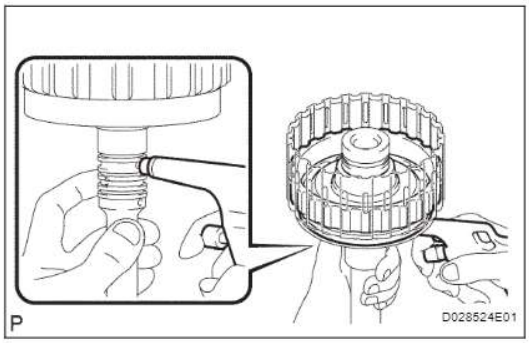



(b) Remove the No. 1 clutch balancer and forward clutch return spring from the input shaft assembly.



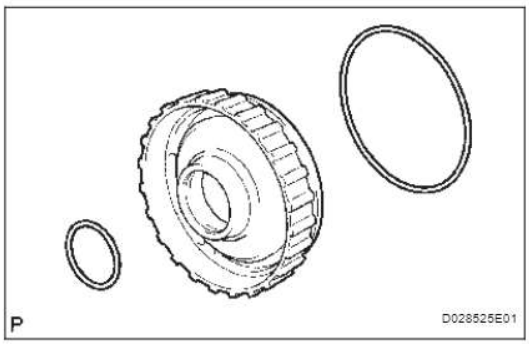

(c) Remove the O-ring from the No. 1 clutch balancer.

**15. INSPECT FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY (See page AT-255)**



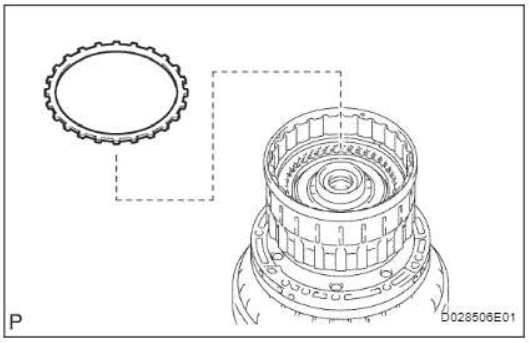

**16. REMOVE FORWARD CLUTCH PISTON**

(a) Holding the forward clutch piston by hand, apply compressed air (392 kPa, 4.0 kgf/cm$^2$, 57 psi) to the input shaft to remove the forward clutch piston.



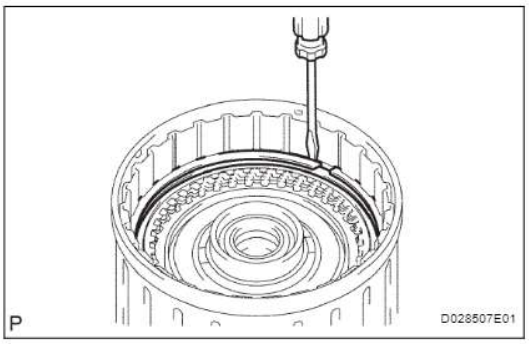

(b) Remove the 2 O-rings from the forward clutch piston.

AT



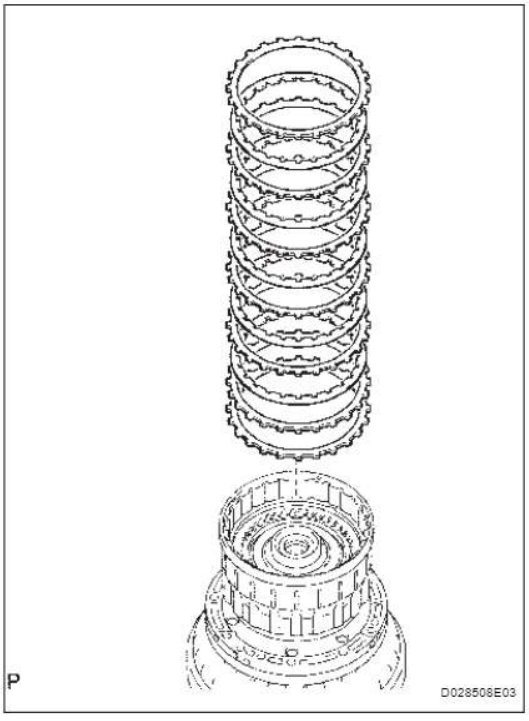

**17. REMOVE REVERSE CLUTCH FLANGE**

(a) Remove the reverse clutch flange from the clutch drum assembly.



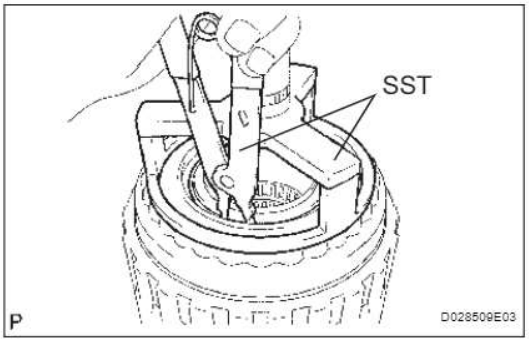

**18. REMOVE DIRECT CLUTCH DISK**

(a) Using a screwdriver, remove the 2 hole snap rings from the clutch drum assembly.




(b) Remove the reverse clutch flange, 6 plates and 5 discs from the clutch drum assembly.

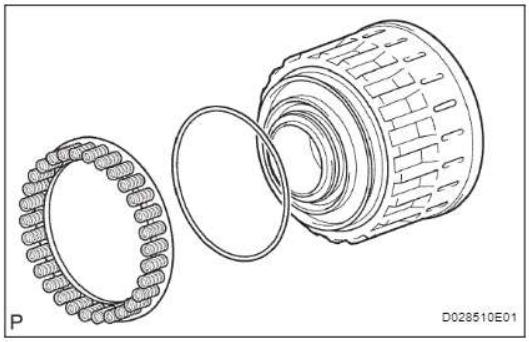
**19. INSPECT DIRECT CLUTCH DISK**




**20. REMOVE NO. 3 CLUTCH BALANCER**

(a) Place SST on the No. 3 clutch balancer, and compress the return spring with a press.
**SST 09387-00070, 09350-30020 (09350-07070)**

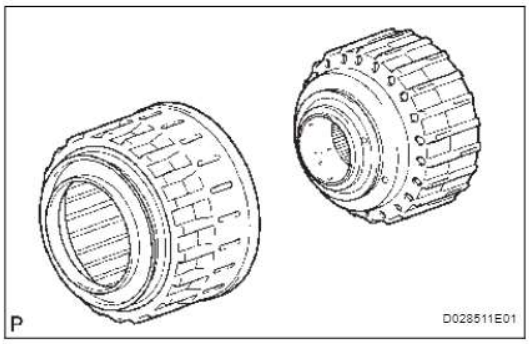
(b) Remove the snap ring.




**21. REMOVE REVERSE CLUTCH RETURN SPRING SUB-ASSEMBLY**

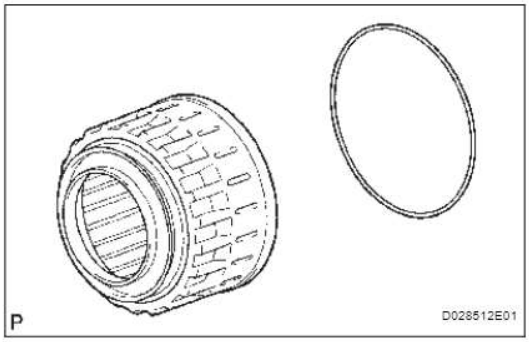
(a) Remove the reverse clutch return spring and O-ring from the reverse clutch piston.

**22. INSPECT REVERSE CLUTCH RETURN SPRING SUB-ASSEMBLY (See page AT-256)**

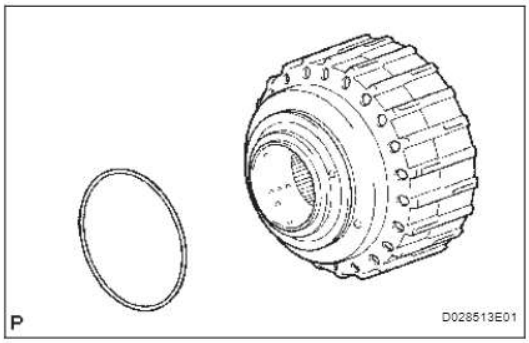



**23. REMOVE REVERSE CLUTCH PISTON SUB-ASSEMBLY**

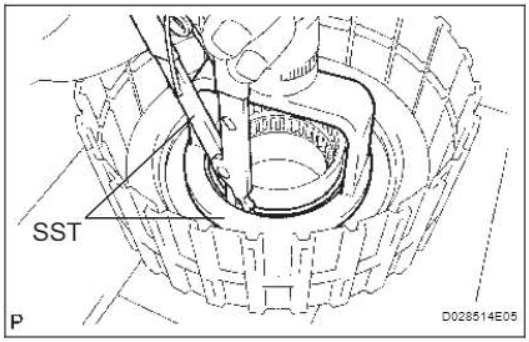
(a) Remove the reverse clutch piston sub-assembly from the clutch drum sub-assembly.




(b) Remove the O-ring from the reverse clutch piston sub-assembly.




(c) Remove the O-ring from the clutch drum sub-assembly.

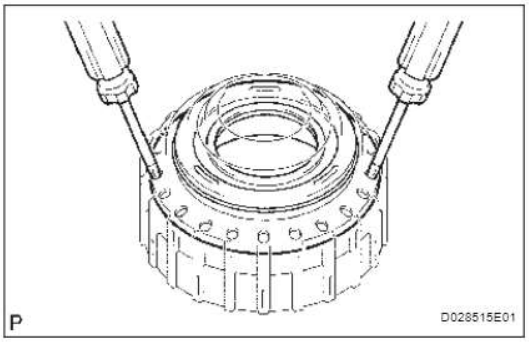



**24. REMOVE DIRECT CLUTCH PISTON SUB-ASSEMBLY**

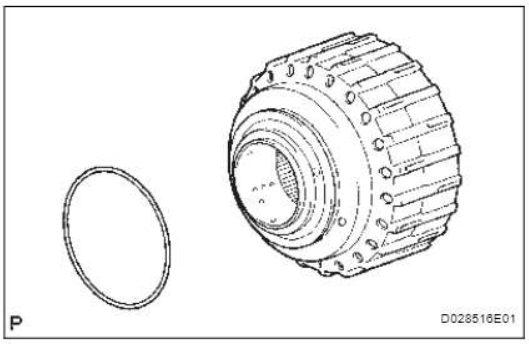
(a) Place SST on the direct clutch piston, and compress the return spring with a press.
**SST 09320-89010, 09350-30020 (09350-07070)**

(b) Remove the snap ring.

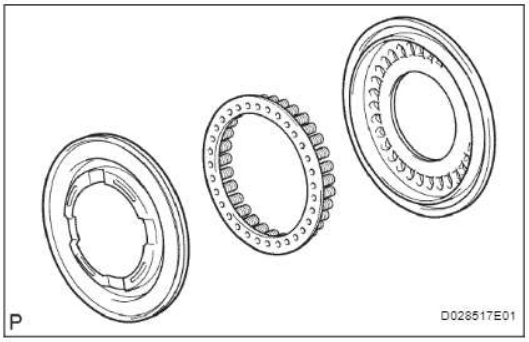
AT




(c) Using 2 screwdrivers, remove the direct clutch piston sub-assembly from the clutch drum.

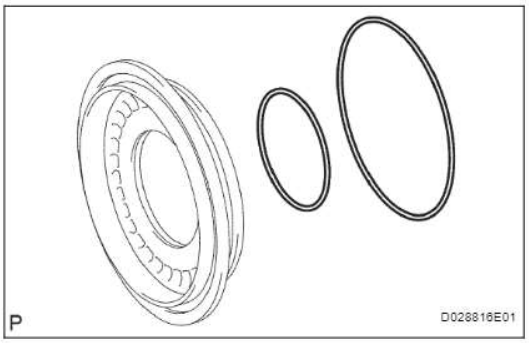



(d) Remove the O-ring from the clutch drum.



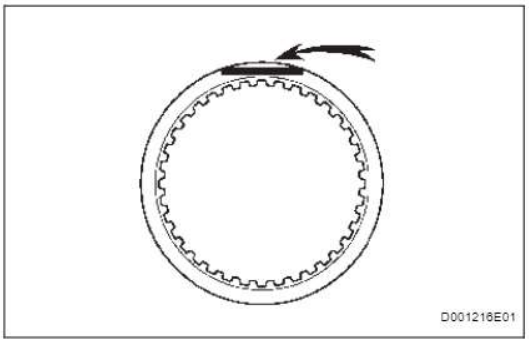

(e) Remove the No. 2 clutch balancer and direct clutch return spring sub-assembly from the direct clutch piston sub-assembly.

AT




(f) Remove the 2 O-rings from the direct clutch piston sub-assembly.

**25. INSPECT DIRECT CLUTCH RETURN SPRING SUB-ASSEMBLY (See page AT-256)**



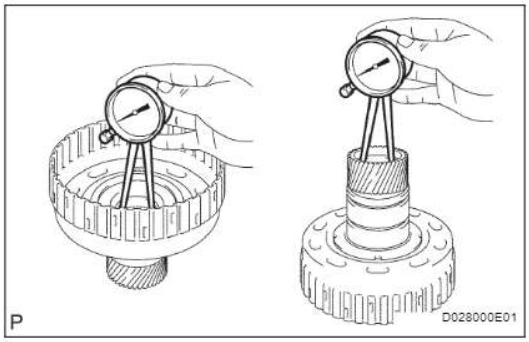

# INSPECTION

**1. 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 or printed numbers have even slight damage.

**NOTICE:**

**Before assembling new discs, soak them in ATF for at least 15 minutes.**

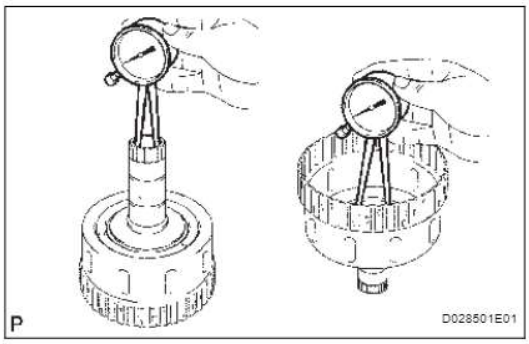



**2. INSPECT REVERSE CLUTCH HUB SUB-ASSEMBLY**

(a) Using a dial indicator, measure the inside diameter of the reverse clutch hub bushing.

**Standard drum bushing:**
**35.812 to 35.837 mm (1.4099 to 1.4109 in.)**
**Maximum drum bushing:**
**35.887 mm (1.4129 in.)**

If the inside diameter is greater than the maximum, replace the reverse clutch hub.

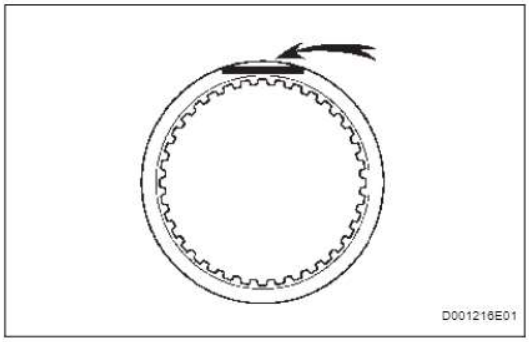



**3. INSPECT FORWARD CLUTCH HUB SUB-ASSEMBLY**

(a) Using a dial indicator, measure the inside diameter of the forward clutch hub bushing.

**Standard drum bushing:**
**26.037 to 26. 062 mm (1.0251 to 1.0261 in.)**
**Maximum drum bushing:**
**26.112 mm (1.028 in.)**

If the inside diameter is greater than the maximum, replace the forward clutch hub.

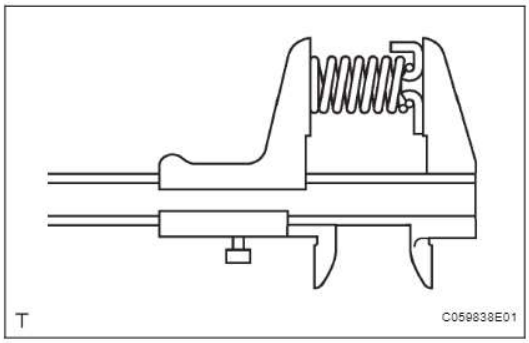



**4. INSPECT FORWARD MULTIPLE DISC CLUTCH DISC**

(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 slight damage.

**NOTICE:**
**Before assembling new discs, soak them in ATF for at least 15 minutes.**

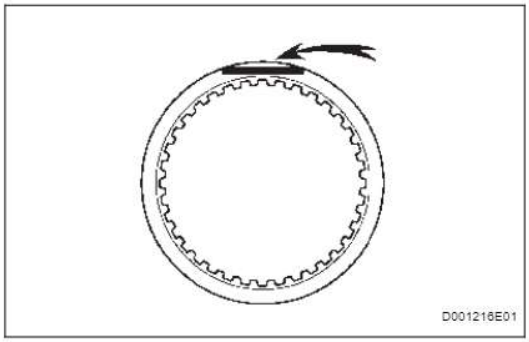
AT




**5. INSPECT FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY**

(a) Using vernier calipers, measure the free length of the spring together with the spring seat.

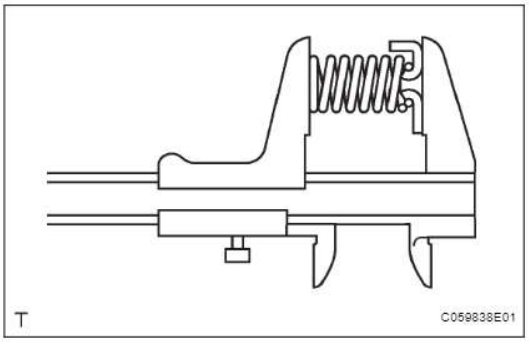
**Standard free length:**
**26.74 mm (1.053 in.)**




**6. INSPECT DIRECT CLUTCH DISK**

(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 slight damage.

**NOTICE:**
**Before assembling new discs, soak them in ATF for at least 15 minutes.**

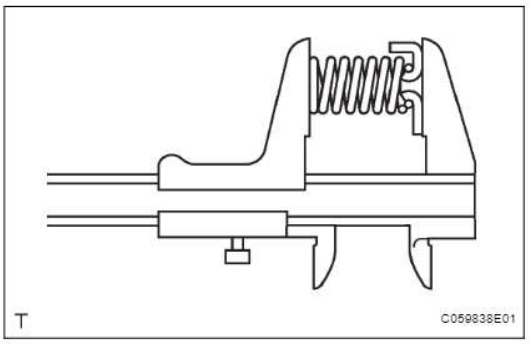



**7. INSPECT REVERSE CLUTCH RETURN SPRING SUB-ASSEMBLY**

(a) Using vernier calipers, measure the free length of the spring together with the spring seat.

**Standard free length:**

**21.04 mm (0.828 in.)**

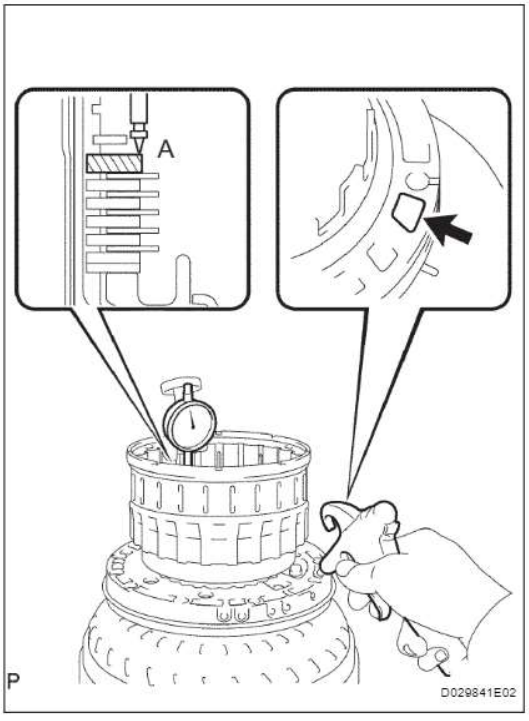



**8. INSPECT DIRECT CLUTCH RETURN SPRING SUB-ASSEMBLY**

(a) Using vernier calipers, measure the free length of the spring together with the spring seat.

**Standard free length:**

**19.51 mm (0.768 in.)**




**9. INSPECT PACK CLEARANCE OF DIRECT CLUTCH**

(a) Using a dial gauge, measure the moving distance (distance A) of the clutch flange at both ends across a diameter while blowing air from the oil hole as shown in the illustration, and calculate the average.

**Pack clearance:**

**0.5 to 0.8 mm (0.020 to 0.032 in.)**

**NOTICE:**

**Install a selective flange (3.4 mm (0.134 in.)) when measuring the moving distance (shaded area in the illustration).**

HINT:

Flange moving distance A = 0.26 to 1.14 mm (0.010 to 0.045 in.)

Pack clearance = Flange moving distance A - 0.05 mm (0.002 in.)

(b) If the pack clearance is outside the standard, select and install a clutch flange that makes the pack clearance within the standard.

**Flange thickness**

| No. | Thickness | No. | Thickness |
|---|---|---|---|
| 0 | 3.0 mm (0.118 in.) | 5 | 3.5 mm (0.138 in.) |
| 1 | 3.1 mm (0.122 in.) | 6 | 3.6 mm (0.142 in.) |
| 2 | 3.2 mm (0.126 in.) | 7 | 3.7 mm (0.146 in.) |
| 3 | 3.3 mm (0.130 in.) | 8 | 3.8 mm (0.150 in.) |
| 4 | 3.4 mm (0.134 in.) | - | - |

AT

**10. INSPECT PACK CLEARANCE OF REVERSE CLUTCH**

(a) Using a dial gauge, measure the reverse clutch piston stroke (distance A) and the moving distance (distance B) of the reverse flange at the both ends across a diameter while blowing air (392 kPa, 4 kgf/cm$^2$, 57 psi) from the oil hole as shown in the illustration, and calculate the average.

**Pack clearance:**

**0.5 to 0.8 mm (0.020 to 0.032 in.)**

**NOTICE:**

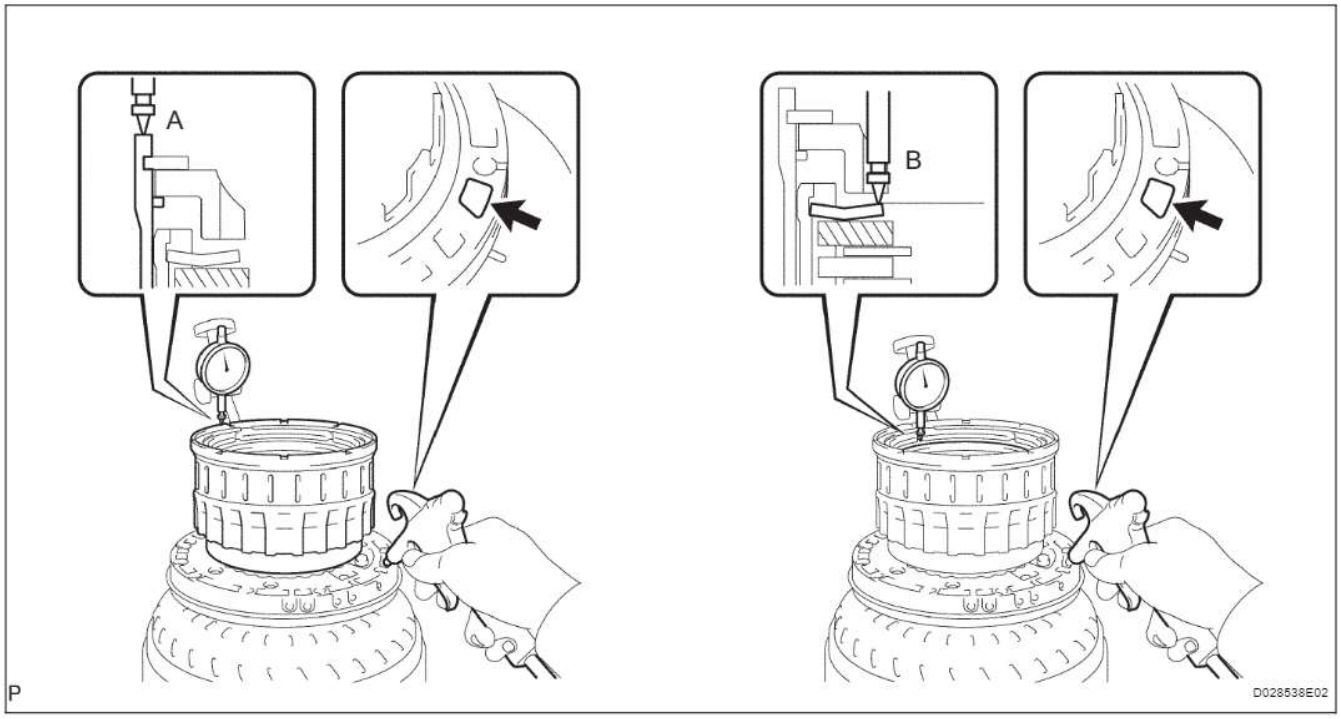
**Install a selective flange (3.3 mm (0.130 in.)) when measuring the moving distance (shaded area in the illustration).**

HINT:

Piston stroke A = 1.05 to 2.15 mm (0.041 to 0.085 in.)

Flange moving distance B = 0.72 to 1.08 mm (0.029 to 0.043 in.)

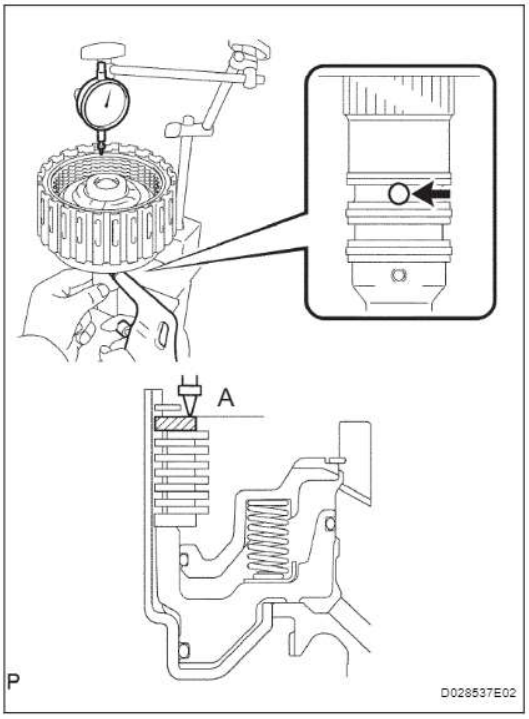
Pack clearance = Piston stroke A - Flange moving distance B - 0.06 mm (0.002 in.)




(b) If the pack clearance is outside the standard, select and install a clutch flange that makes the pack clearance within the standard.

**Flange thickness**

| No. | Thickness | No. | Thickness |
|---|---|---|---|
| 0 | 2.8 mm (0.110 in.) | 6 | 3.4 mm (0.134 in.) |
| 1 | 2.9 mm (0.114 in.) | 7 | 3.5 mm (0.138 in.) |
| 2 | 3.0 mm (0.118 in.) | 8 | 3.6 mm (0.142 in.) |
| 3 | 3.1 mm (0.122 in.) | 9 | 3.7 mm (0.146 in.) |
| 4 | 3.2 mm (0.126 in.) | A | 3.8 mm (0.150 in.) |
| 5 | 3.3 mm (0.130 in.) | | - |




**11. INSPECT PACK CLEARANCE OF FORWARD CLUTCH**

(a) Using a dial gauge, measure the moving distance (distance A) of the clutch flange at boths end across a diameter while blowing air from the oil hole as shown in the illustration, and calculate the average.

**Pack clearance:**

**0.6 to 0.9 mm (0.024 to 0.035 in.)**

**NOTICE:**

**Install a selective flange (3.4 mm (0.134 in.)) when measuring the moving distance (shaded area in the illustration).**

HINT:

Flange moving distance A = 0.26 to 1.36 mm (0.010 to 0.054 in.)

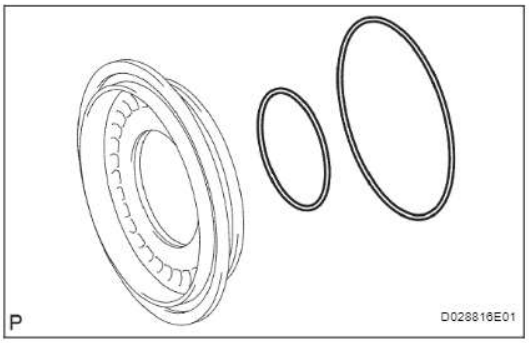
Pack clearance = Flange moving distance A - 0.01 mm (0.0003 in.)

(b) If the pack clearance is outside the standard, select and install a clutch flange that makes the pack clearance within the standard.

**Flange thickness**

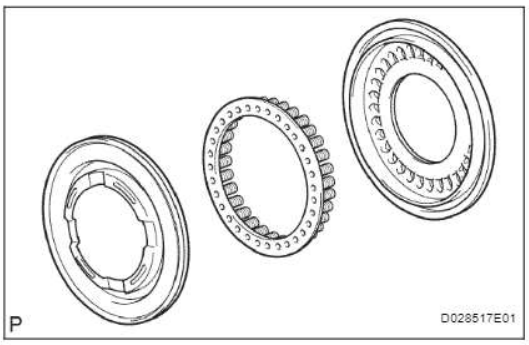
| No. | Thickness | No. | Thickness |
|---|---|---|---|
| 0 | 3.0 mm (0.118 in.) | 6 | 3.6 mm (0.142 in.) |
| 1 | 3.1 mm (0.122 in.) | 7 | 3.7 mm (0.146 in.) |
| 2 | 3.2 mm (0.126 in.) | 8 | 3.8 mm (0.150 in.) |
| 3 | 3.3 mm (0.130 in.) | 9 | 3.9 mm (0.154 in.) |
| 4 | 3.4 mm (0.134 in.) | A | 4.0 mm (0.158 in.) |
| 5 | 3.5 mm (0.138 in.) | | - |

# REASSEMBLY

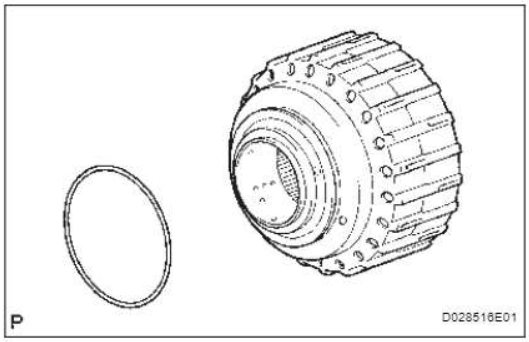



**1. INSTALL DIRECT CLUTCH PISTON SUB-ASSEMBLY**

(a) Coat 2 new O-rings with ATF, and install them onto the direct clutch piston.

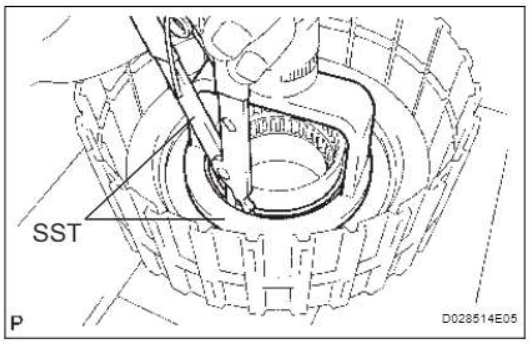



(b) Install the No. 2 clutch balancer and direct clutch return spring onto the direct clutch piston sub-assembly.



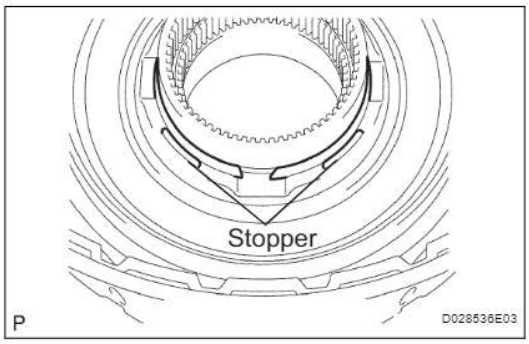

(c) Coat a new O-ring with ATF, and install them onto the clutch drum sub-assembly.

(d) Be careful not to damage the O-rings. Press in the direct clutch piston into the clutch drum with both hands.

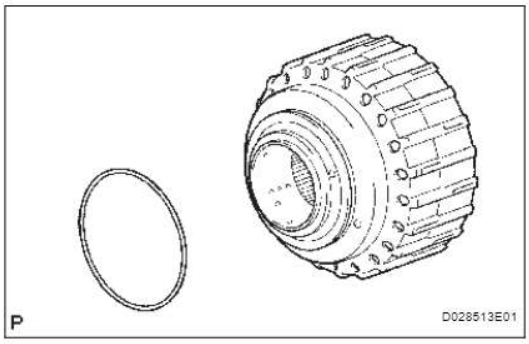



(e) Place SST on the direct clutch piston, and compress the return spring with a press.
**SST 09320-89010, 09350-30020 (09350-07070)**

(f) Install the snap ring with a snap ring expander.
**NOTICE:**
- **Make sure that the end gap of the snap ring is not aligned with the spring retainer claw.**
- **Stop pressing when the spring seat is lowered to the place 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove to prevent the spring seat from being deformed.**
- **Do not expand the snap ring excessively.**



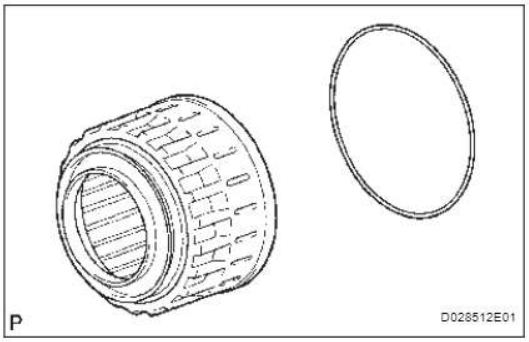

(g) Set the end gap of the snap ring in the piston as shown in the illustration.



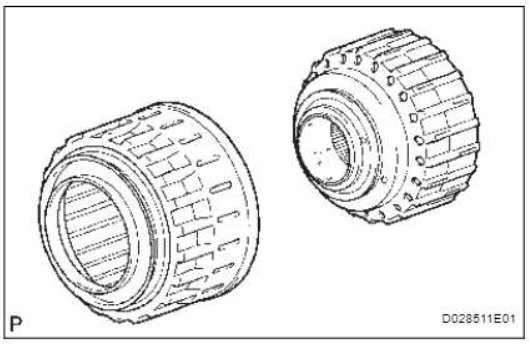

**2. INSTALL REVERSE CLUTCH PISTON SUB-ASSEMBLY**

(a) Coat a new O-ring with ATF, and install it onto the clutch drum sub-assembly.

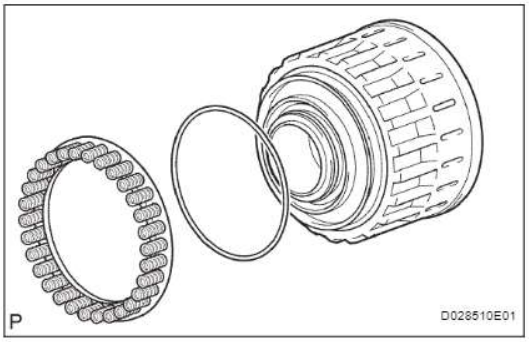
AT




(b) Coat a new O-ring with ATF, and install it onto the reverse clutch piston sub-assembly.




(c) Be careful not to damage the O-ring. Press in the clutch drum sub-assembly into the reverse clutch piston with both hands.

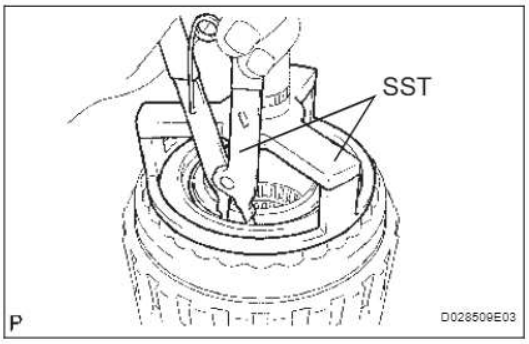



**3. INSTALL REVERSE CLUTCH RETURN SPRING SUB-ASSEMBLY**

(a) Coat a new O-ring with ATF, and install it onto the reverse clutch piston sub-assembly.

(b) Install the reverse clutch return spring onto the reverse clutch piston sub-assembly.

AT



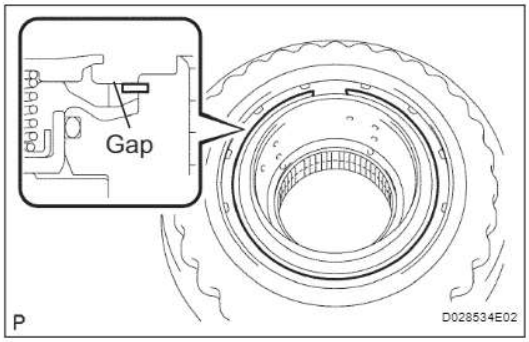

**4. INSTALL NO. 3 CLUTCH BALANCER**

(a) Place SST on the No. 3 clutch balancer, and compress the return spring with a press.
**SST 09387-00070, 09350-30020 (09350-07070)**

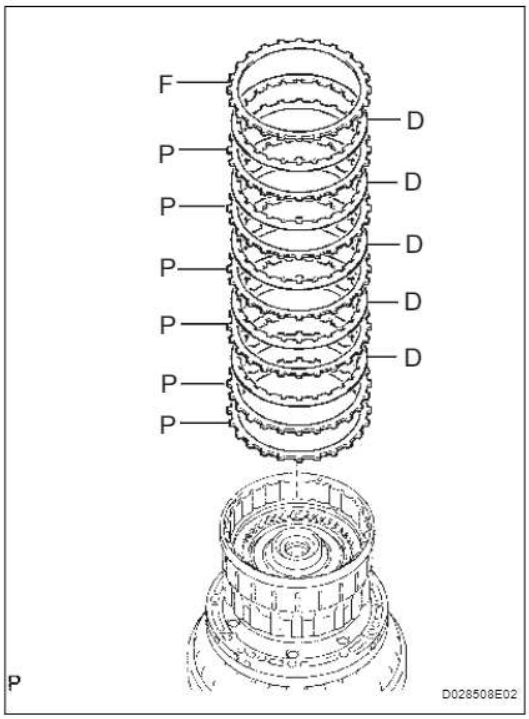
(b) Install the snap ring with a snap ring expander.

(c) Make sure that the end gap of the snap ring is not aligned with the spring retainer claw.
**NOTICE:**

- **Stop pressing when the spring seat is lowered to the place 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove to prevent the spring seat from being deformed.**
- **Do not expand the snap ring excessively.**




(d) Set the end gap of the snap ring in the piston as shown in the illustration.




**5. INSTALL DIRECT CLUTCH DISK**

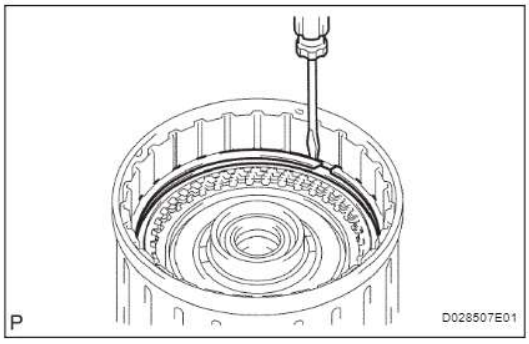
(a) Install the reverse clutch flange, 6 plates and 5 discs onto the clutch drum sub-assembly.

**Install in order:**

**P - P - D - P - D - P - D - P - D - P - D - F**

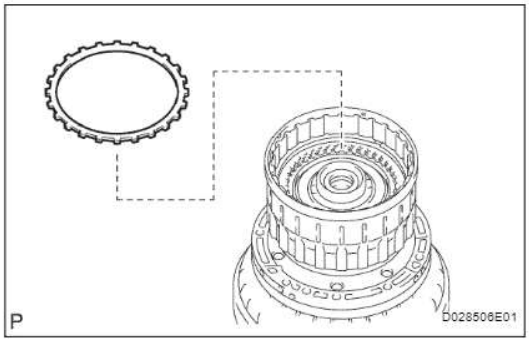
HINT:

P = Plate, D = Disc, F = Flange




(b) Using a screwdriver, install the 2 hole snap rings onto the clutch drum sub-assembly.

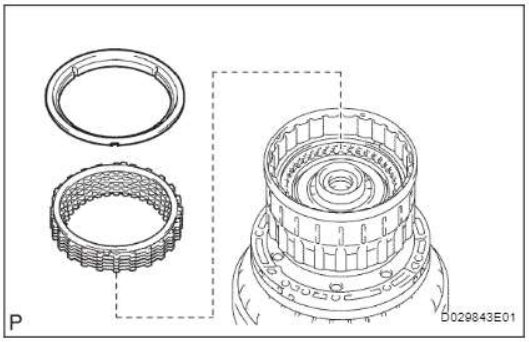
**6. INSPECT PACK CLEARANCE OF DIRECT CLUTCH (See page AT-256)**




**7. INSTALL REVERSE CLUTCH FLANGE**

(a) Install the reverse clutch flange onto the clutch drum sub-assembly.

AT

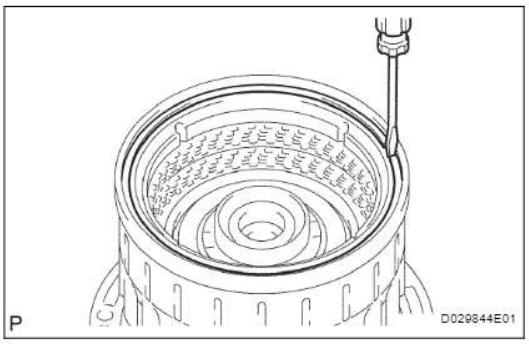



**8. INSTALL REVERSE CLUTCH REACTION SLEEVE**

(a) Install the reverse clutch reaction sleeve, clutch cushion plate, reverse clutch flange, 5 reverse clutch discs, and 4 clutch plates onto the reverse clutch hub.

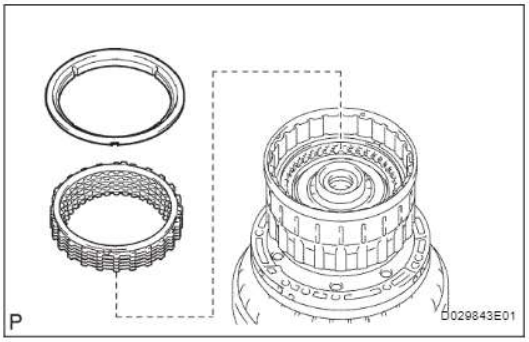
(b) Using a screwdriver, install the hole snap ring.

**9. INSPECT PACK CLEARANCE OF REVERSE CLUTCH (See page AT-257)**



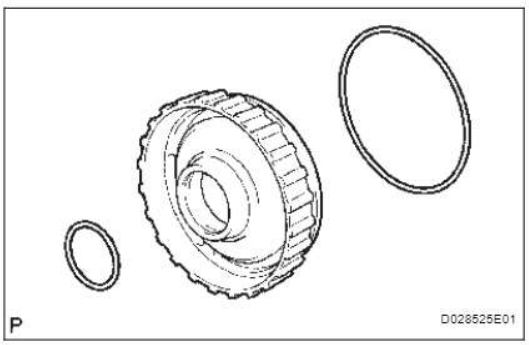

**10. REMOVE REVERSE CLUTCH REACTION SLEEVE**

(a) Using a screwdriver, remove the snap ring from the clutch drum assembly.



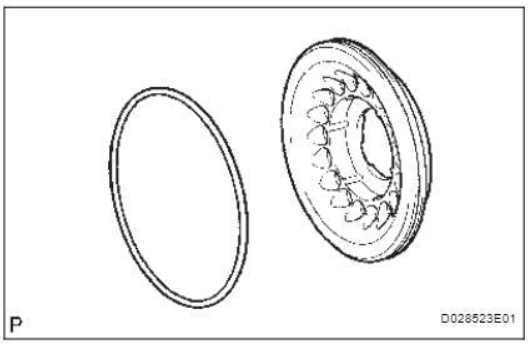

(b) Remove the reverse clutch reaction sleeve, clutch cushion plate, reverse clutch flange, 5 reverse clutch discs, and 4 clutch plates from the reverse clutch hub sub-assembly.

AT



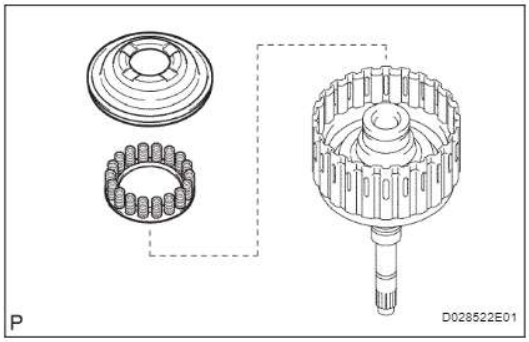

**11. INSTALL FORWARD CLUTCH PISTON**

(a) Coat 2 new O-rings with ATF, and install them onto the No. 1 forward clutch piston.

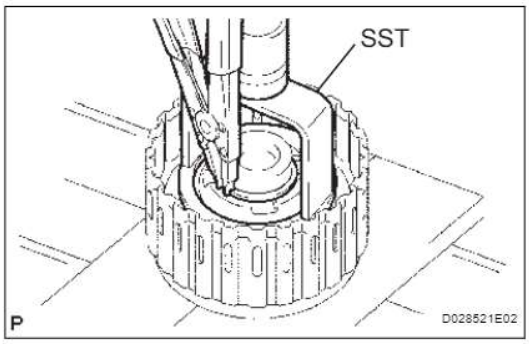



**12. INSTALL NO. 1 CLUTCH BALANCER**

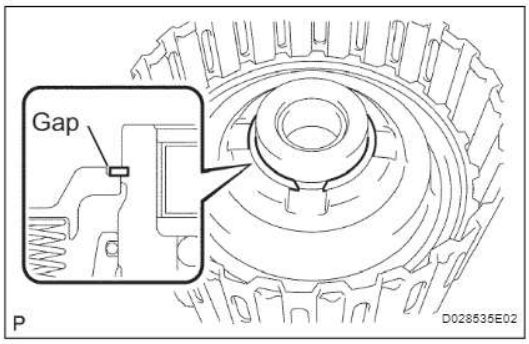
(a) Coat a new O-ring with ATF and install it onto the clutch balancer.




(b) Install the No. 1 clutch balancer and forward clutch return spring sub-assembly.
**NOTICE:**
**Be careful not to damage the O-ring.**

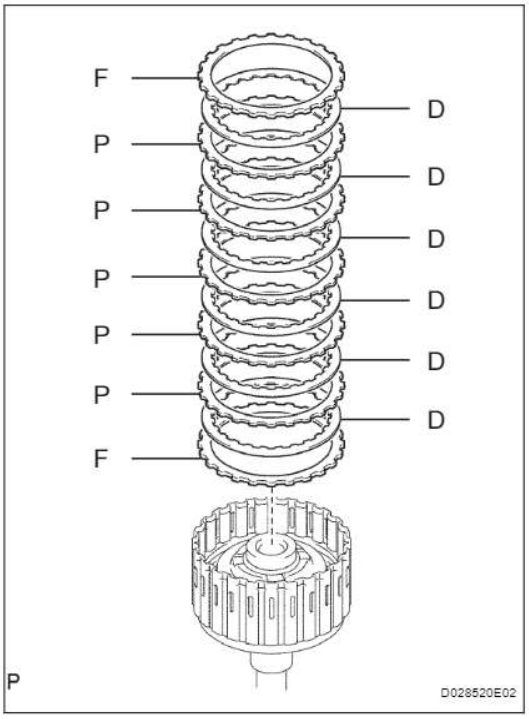



(c) Place SST on the No. 1 clutch balancer, and compress the return spring with a press.
**SST 09350-30020 (09350-07040, 09350-07070)**
(d) Install the snap ring with a snap ring expander.
(e) Make sure that the end gap of the snap ring is not aligned with the spring retainer claw.
**NOTICE:**
- **Stop pressing when the spring seat is lowered to the place 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove to prevent the spring seat from being deformed.**
- **Do not expand the snap ring excessively.**



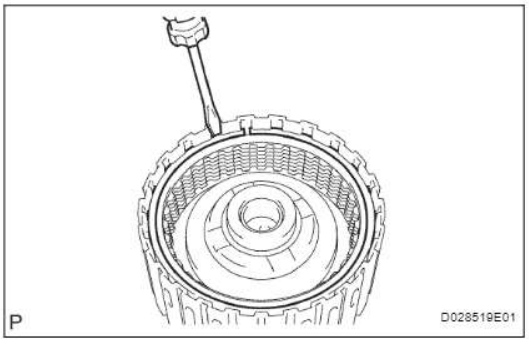

(f) Set the end gap of the snap ring in the piston as shown in the illustration.

AT




**13. INSTALL FORWARD MULTIPLE DISC CLUTCH DISC**

(a) Install the 2 flanges, 6 discs and 5 plates onto the input shaft assembly.




**(b) Install in order:**

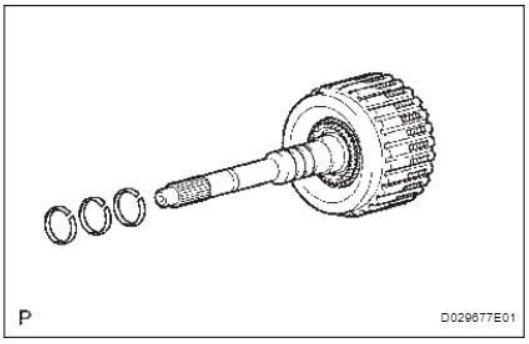
**F- D - P - D - P - D - P - D - P - D - P - D - F**

HINT:

P = Plate, D = Disc, F = Flange

Using a screwdriver, install the hole snap ring.

AT




**14. INSTALL INPUT SHAFT OIL SEAL RING**

(a) Coat the 3 oil seal rings with ATF.

(b) Put together the ends of the 3 oil seal rings together, and then install them onto the stator shaft groove.

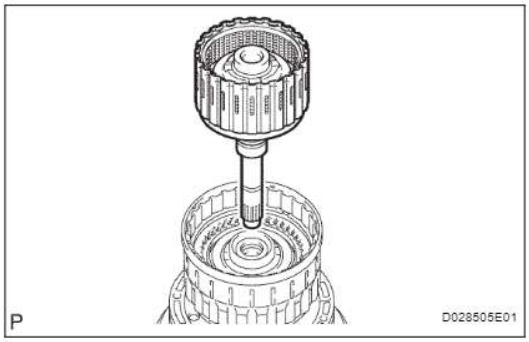
**NOTICE:**

**Do not over-widen the ring ends.**

HINT:

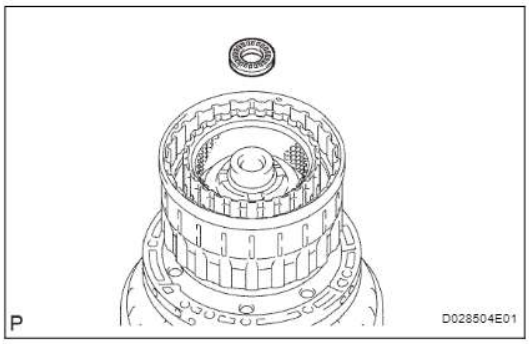
After installing the oil seal rings, check that they rotate smoothly.

**15. INSPECT PACK CLEARANCE OF FORWARD CLUTCH (See page AT-258)**




### 16. INSTALL INPUT SHAFT ASSEMBLY

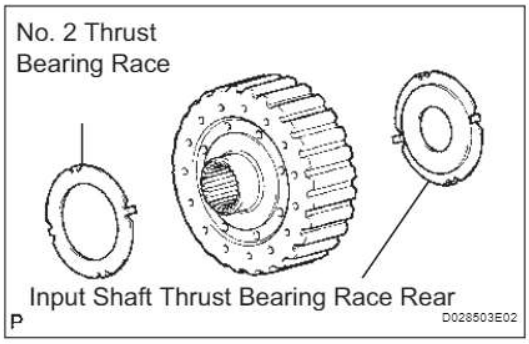
(a) Install the input shaft assembly onto the clutch drum.




(b) Install the thrust needle roller bearing onto the clutch drum assembly.

**Thrust needle roller bearing diameter**

| Item | Inside | Outside |
|---|---|---|
| Thrust needle roller bearing | 21.3 mm (0.839 in.) | 41.1 mm (1.618 in.) |



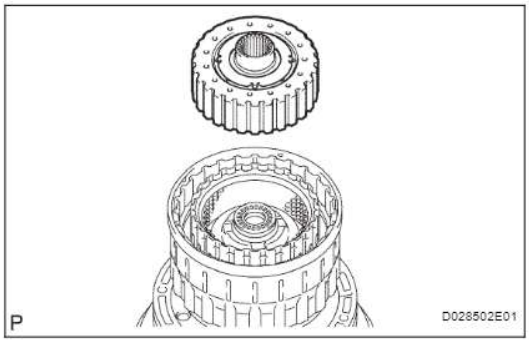

### 17. INSTALL MULTIPLE DISC CLUTCH HUB

(a) Install the No. 2 thrust bearing race and input shaft thrust bearing race rear onto the multiple disc clutch hub.

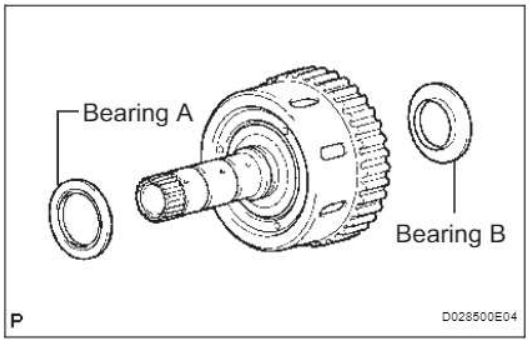
**Bearing and race diameter**

| Item | Inside | Outside |
|---|---|---|
| Thrust bearing race No. 2 | 38.4 mm (1.512 in.) | 63.0 mm (2.480 in.) |
| Input shaft bearing race RR | 22.6 mm (0.890 in.) | 60.0 mm (2.362 in.) |

AT




(b) Install the multiple disc clutch hub into the clutch drum assembly.

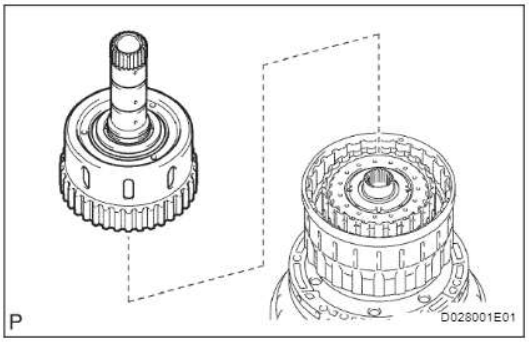



### 18. INSTALL FORWARD CLUTCH HUB SUB-ASSEMBLY

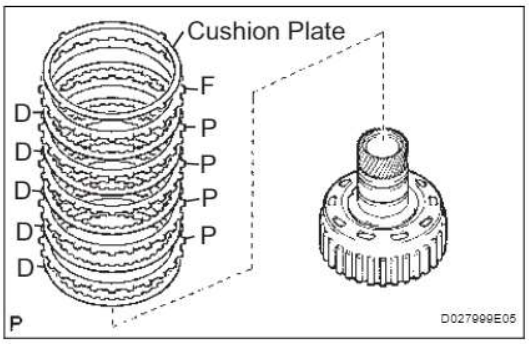
(a) Install the 2 thrust needle roller bearings onto the forward clutch hub sub-assembly.

**Bearing and race diameter**

| Item | Inside | Outside |
|---|---|---|
| Bearing A | 42.5 mm (1.673 in.) | 61.2 mm (2.409 in.) |
| Bearing B | 33.3 mm (1.311 in.) | 56.6 mm (2.228 in.) |




(b) Install the forward clutch hub sub-assembly onto the clutch drum assembly.




**19. INSTALL REAR CLUTCH DISC**

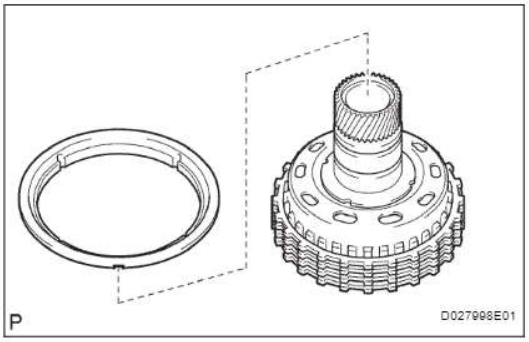
(a) Install the clutch cushion plate, reverse clutch flange, 4 plates and 5 discs onto the reverse clutch hub.

**Install in order:**

**D - P - D - P - D - P - D - P - D - F**

HINT:

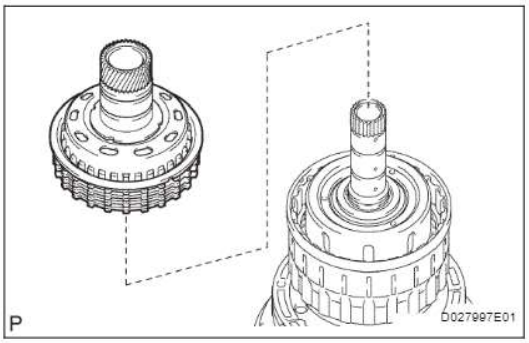
P = Plate, D = Disc, F = Flange




**20. INSTALL REVERSE CLUTCH REACTION SLEEVE**

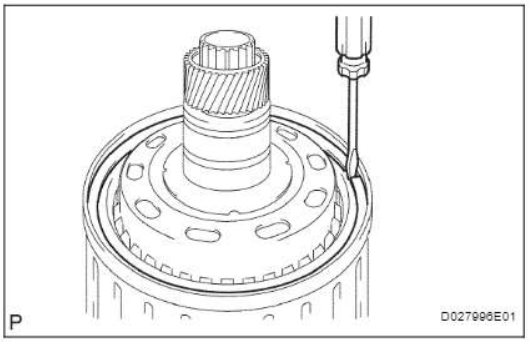
(a) Install the reverse clutch reaction sleeve onto the reverse clutch hub.

AT




**21. INSTALL REVERSE CLUTCH HUB SUB-ASSEMBLY**

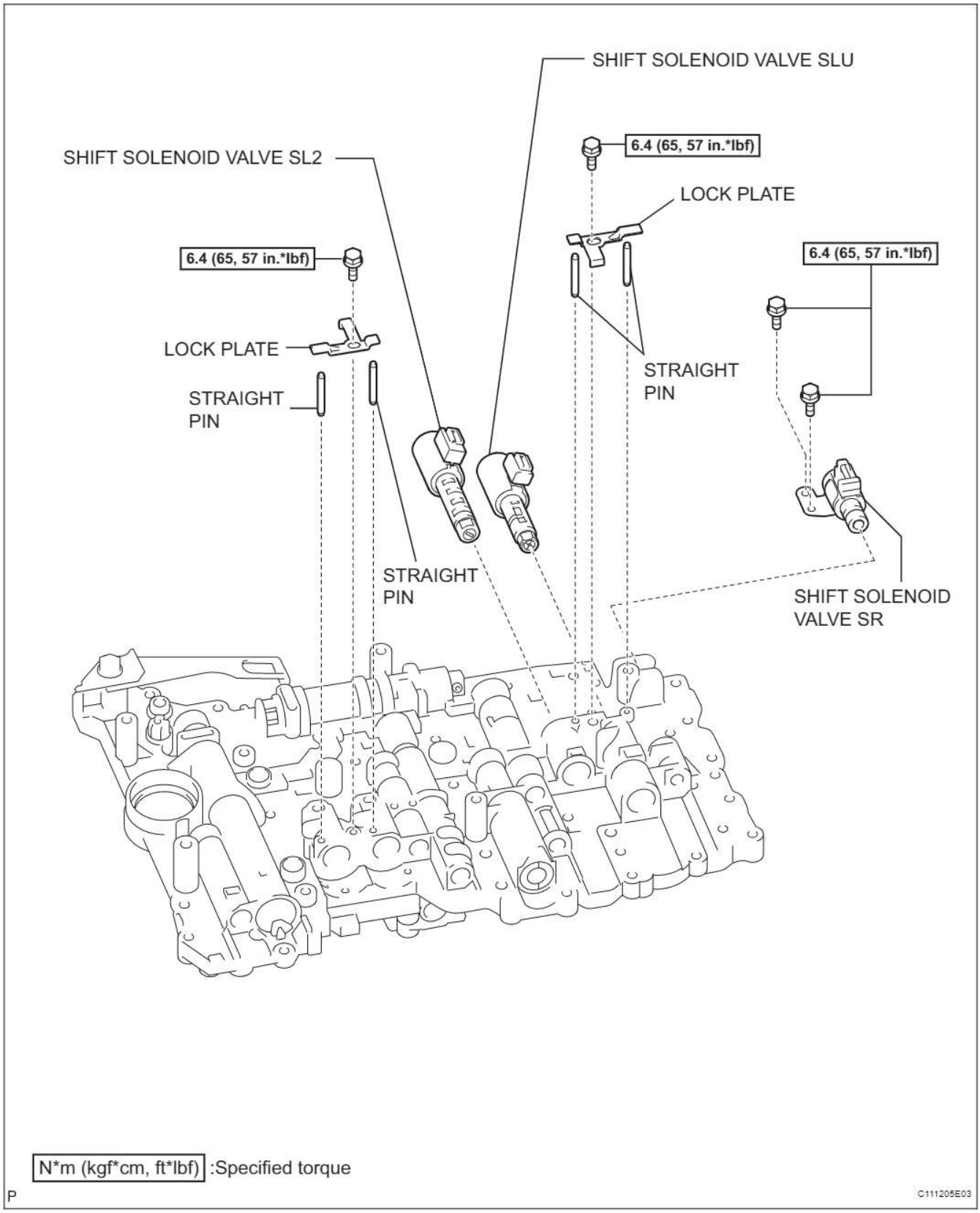
(a) Install the reverse clutch hub sub-assembly, reverse clutch reaction sleeve, clutch cushion plate, reverse clutch flange, 5 reverse clutch discs, and 4 clutch plates onto the clutch drum assembly.



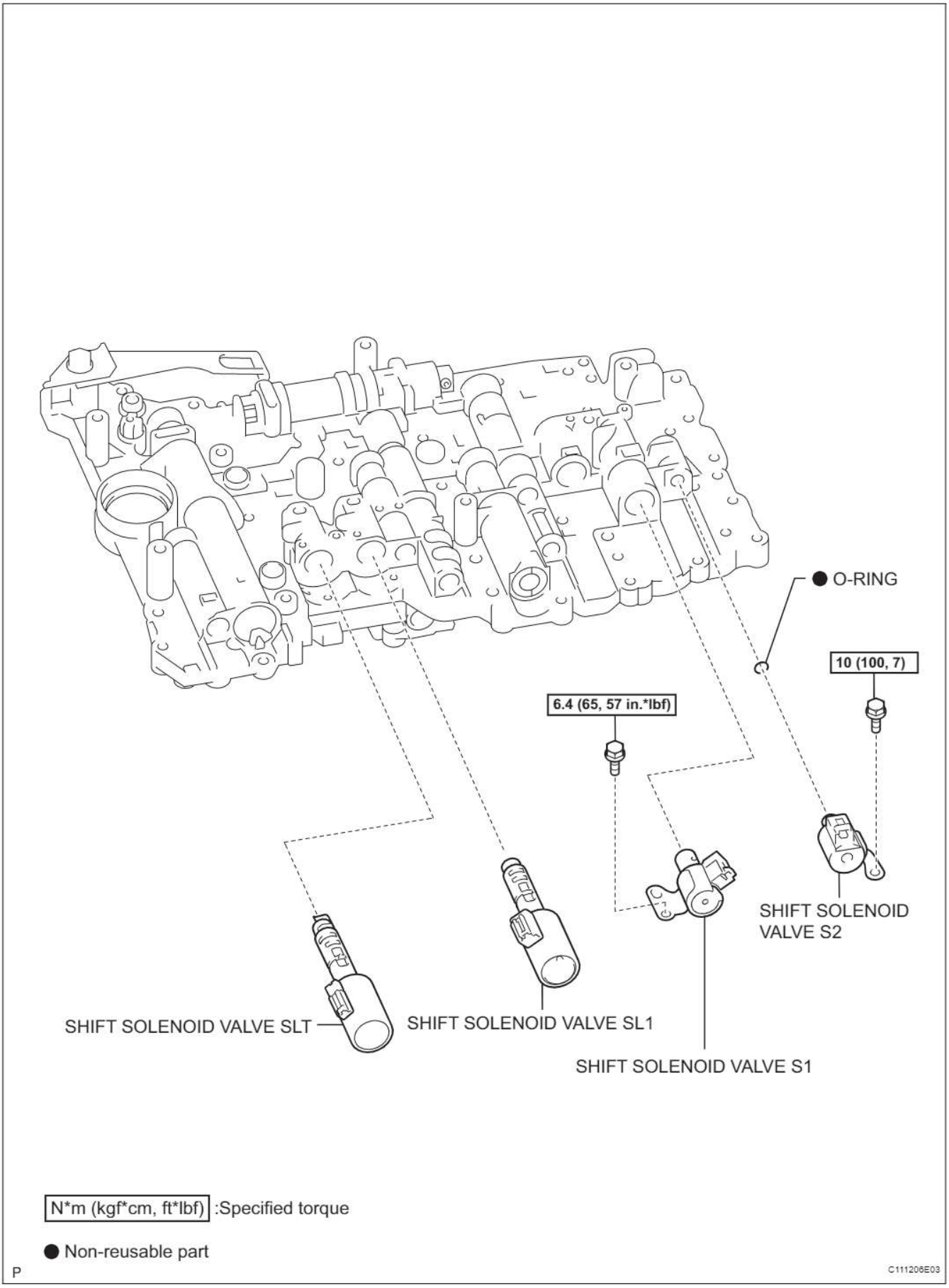

(b) Using a screwdriver, install the snap ring onto the clutch drum and input shaft assembly.

# VALVE BODY

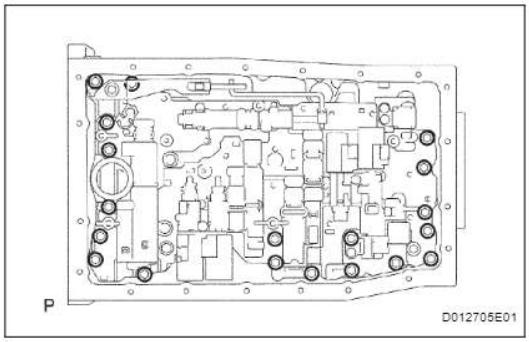
## COMPONENTS




AT


● O-RING
10 (100, 7)
6.4 (65, 57 in.*lbf)
SHIFT SOLENOID VALVE S2
SHIFT SOLENOID VALVE SLT
SHIFT SOLENOID VALVE SL1
SHIFT SOLENOID VALVE S1
N*m (kgf*cm, ft*lbf) :Specified torque
● Non-reusable part
P
C111206E03

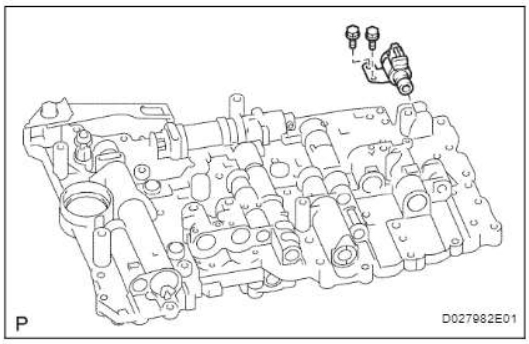
# DISASSEMBLY




**1. REMOVE TRANSMISSION VALVE BODY ASSEMBLY**

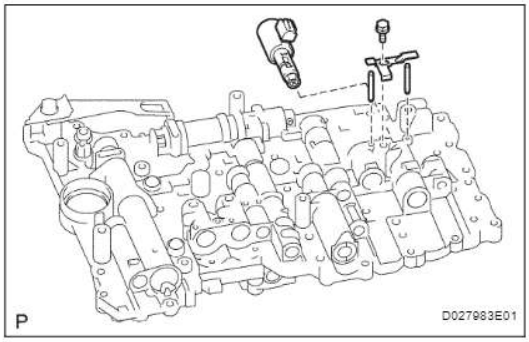
(a) Remove the 19 bolts.

(b) Remove the valve body assembly.




**2. REMOVE SHIFT SOLENOID VALVE SR**

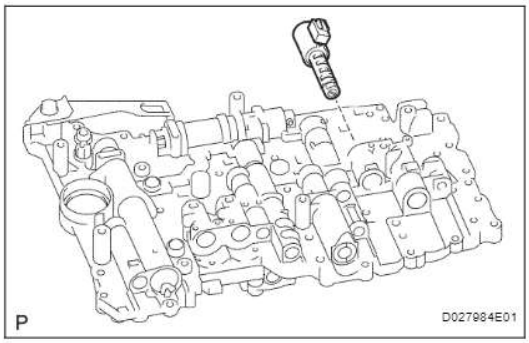
(a) Remove the 2 bolts and the shift solenoid valve SR.




**3. REMOVE SHIFT SOLENOID VALVE SLU**

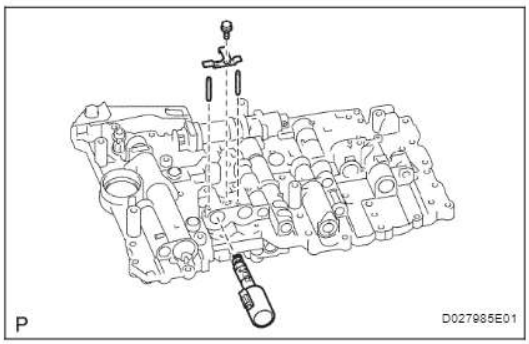
(a) Remove the bolt, 2 straight pins and the solenoid lock plate.

(b) Remove the shift solenoid valve SLU.




**4. REMOVE SHIFT SOLENOID VALVE SL2**

(a) Remove the shift solenoid valve SL2.

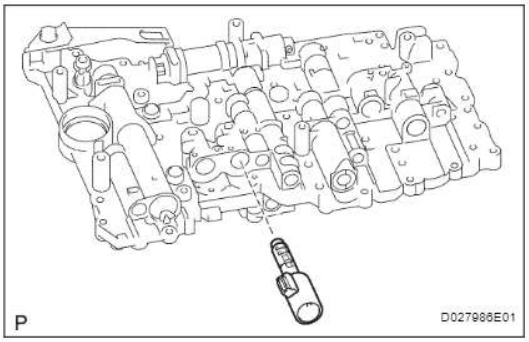



**5. REMOVE SHIFT SOLENOID VALVE SLT**

(a) Remove the bolt, 2 straight pins and the solenoid lock plate.

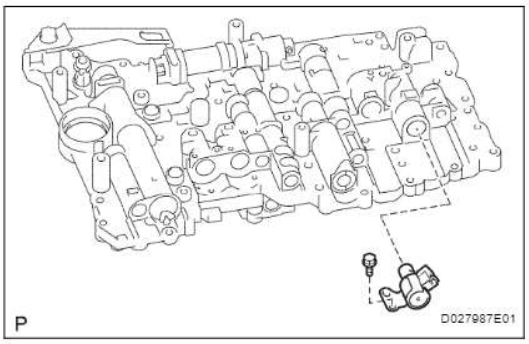
(b) Remove the shift solenoid valve SLT.

AT



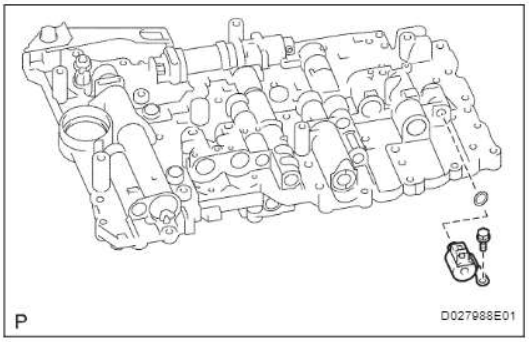

**6. REMOVE SHIFT SOLENOID VALVE SL1**

(a) Remove the shift solenoid valve SL1.




**7. REMOVE SHIFT SOLENOID VALVE S1**

(a) Remove the bolt and the shift solenoid valve S1.



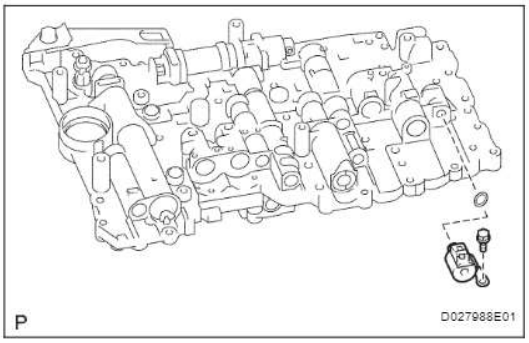

**8. REMOVE SHIFT SOLENOID VALVE S2**

(a) Remove the bolt and the shift solenoid valve S2.

(b) Remove the O-ring from the shift solenoid valve S2.

AT

## REASSEMBLY

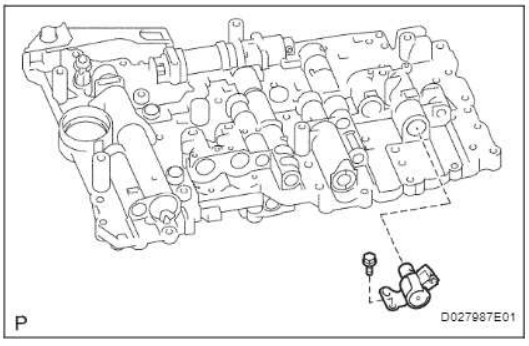



**1. INSTALL SHIFT SOLENOID VALVE S2**

(a) Install a new O-ring onto the shift solenoid valve S2.

(b) Install the shift solenoid valve S2 with the bolt.

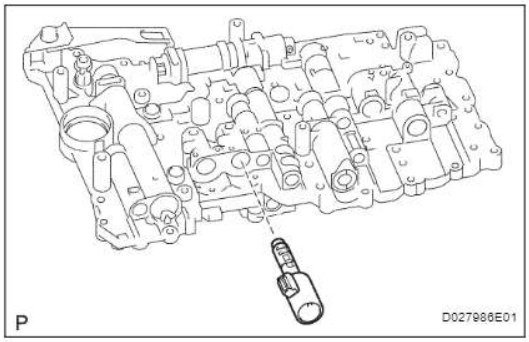
**Torque: 10 N*m (100 kgf*cm, 7 ft.*lbf)**




**2. INSTALL SHIFT SOLENOID VALVE S1**

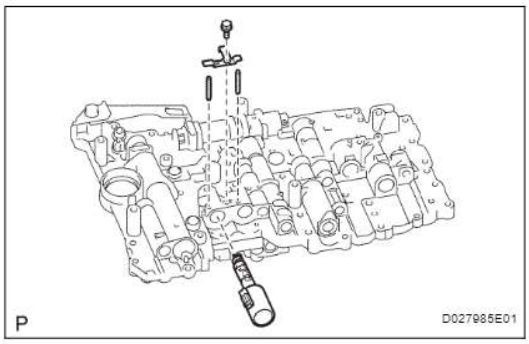
(a) Install the shift solenoid valve S1 with the bolt.

**Torque: 6.4 N*m (65 kgf*cm, 57 in.*lbf)**




**3. INSTALL SHIFT SOLENOID VALVE SL1**

(a) Install the shift solenoid valve SL1.

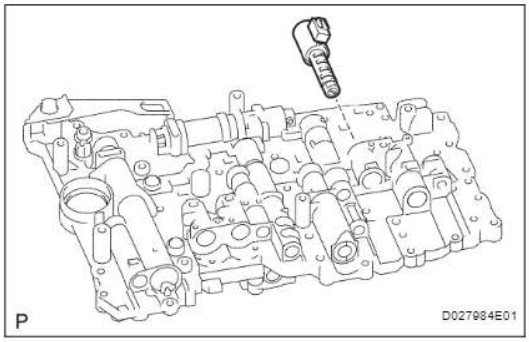



**4. INSTALL SHIFT SOLENOID VALVE SLT**

(a) Install the shift solenoid valve SLT.

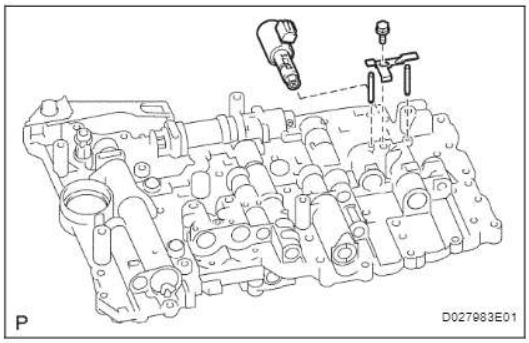
(b) Install the bolt, 2 straight pins and solenoid lock plate.

**Torque: 6.4 N*m (65 kgf*cm, 57 in.*lbf)**




**5. INSTALL SHIFT SOLENOID VALVE SL2**

(a) Install the shift solenoid valve SL2.

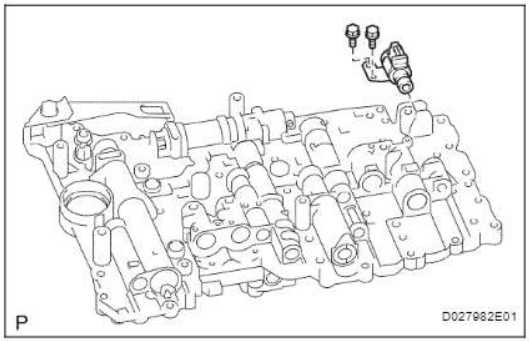



**6. INSTALL SHIFT SOLENOID VALVE SLU**

(a) Install the shift solenoid valve SLU.

(b) Install the bolt, 2 straight pins and the solenoid lock plate.

**Torque: 6.4 N*m (65 kgf*cm, 57 in.*lbf)**

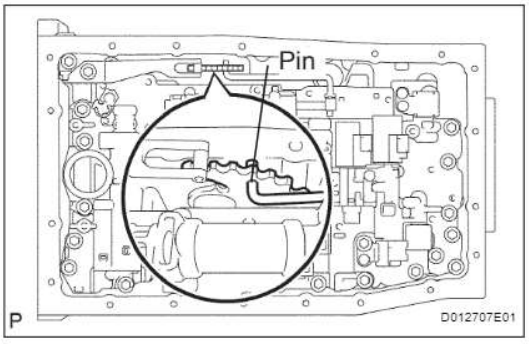



**7. INSTALL SHIFT SOLENOID VALVE SR**

(a) Install the shift solenoid valve SR with the 2 bolts.

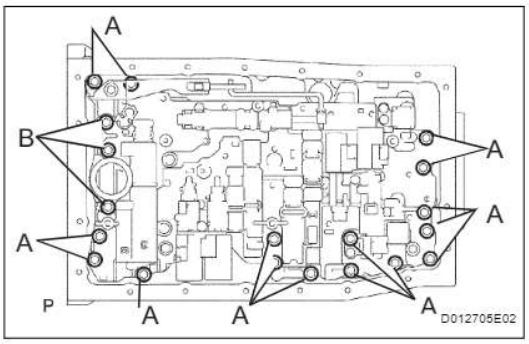
**Torque: 6.4 N*m (65 kgf*cm, 57 in.*lbf)**

AT




**8. INSTALL TRANSMISSION VALVE BODY ASSEMBLY**

(a) Align the groove 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:
Bolt length:
25 mm (0.98 in.) for bolt A
36 mm (1.42 in.) for bolt B

AT