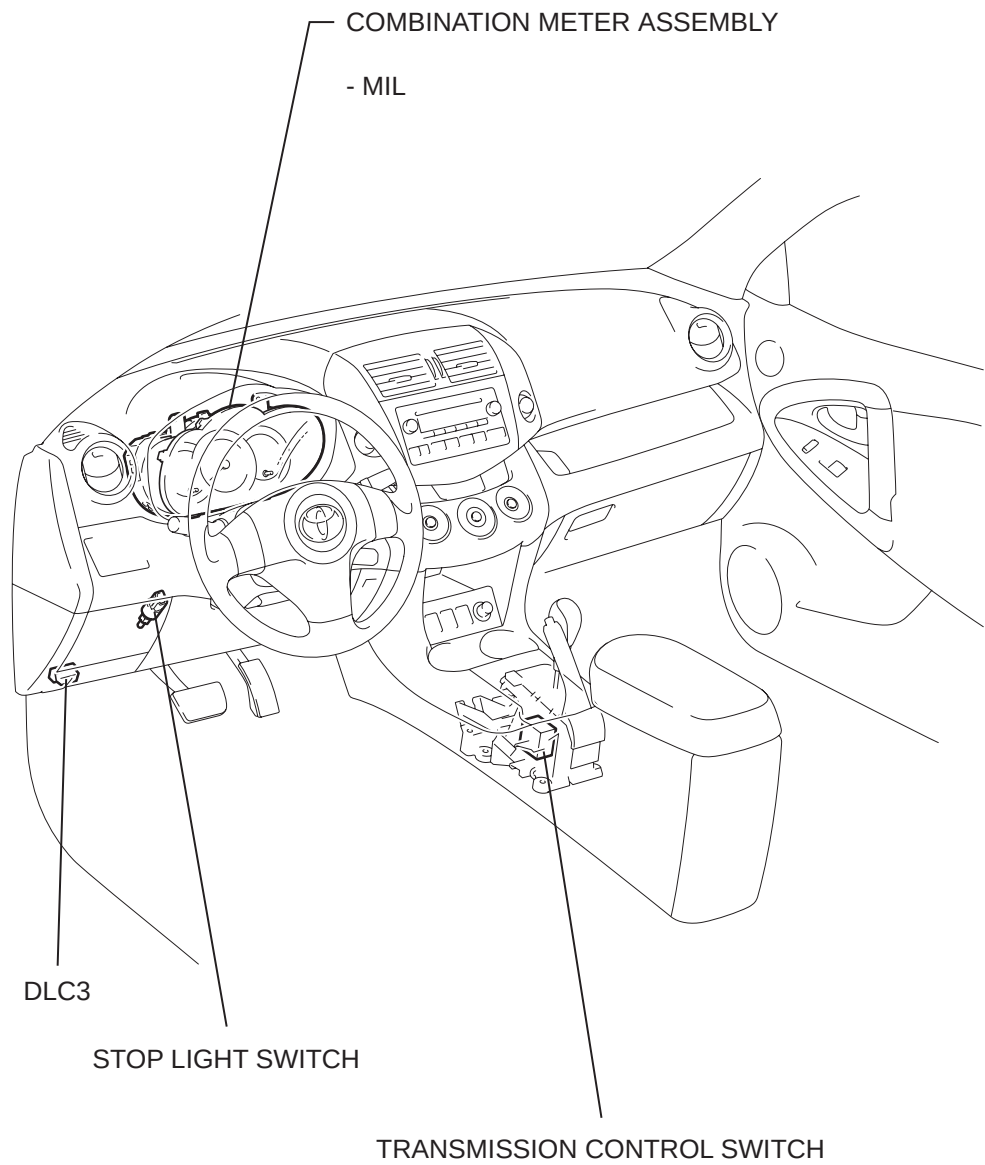
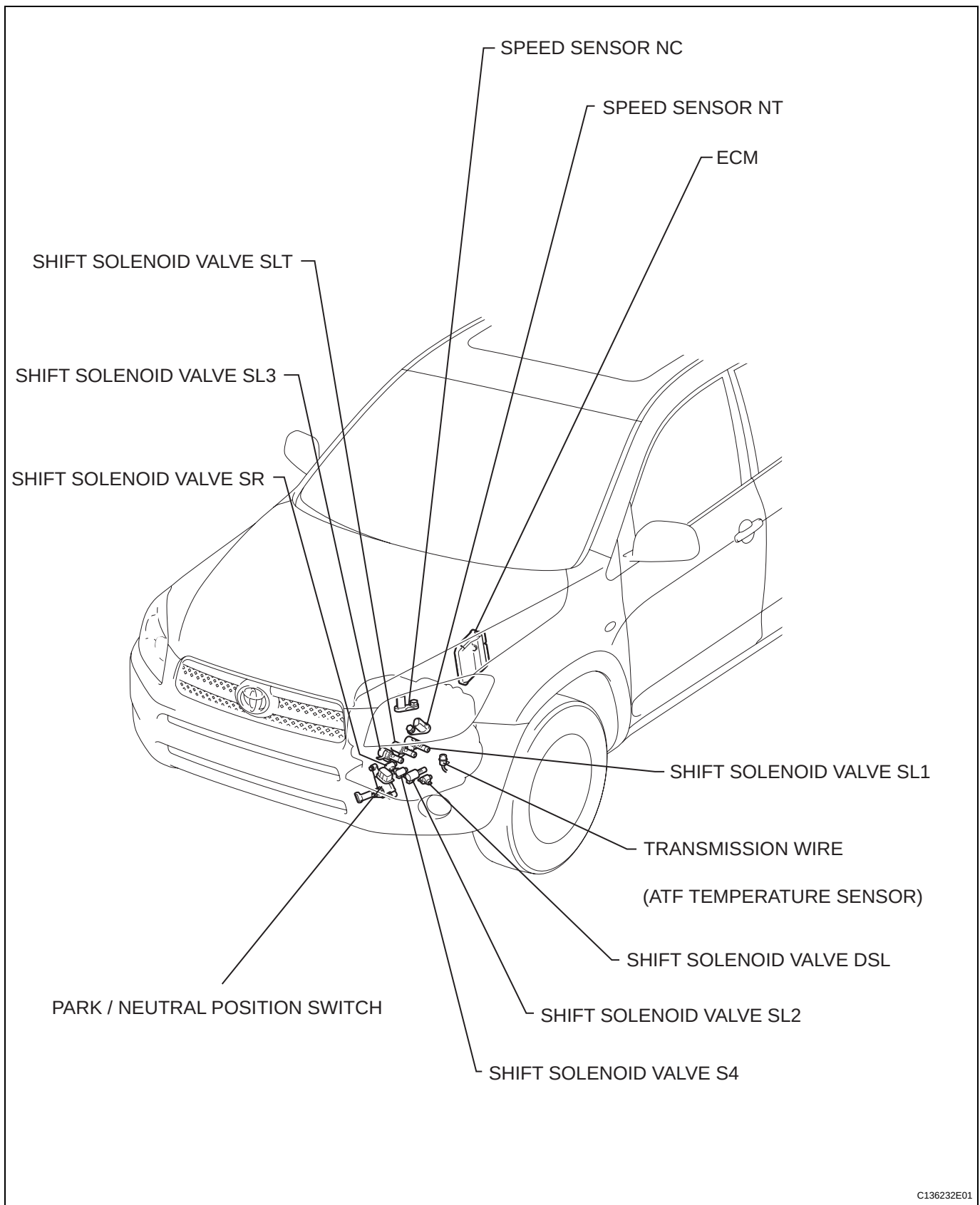


DEFINITION OF TERMS

Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	Diagnostic code.
Typical enabling condition	Preconditions that allow the ECM to detect malfunctions. 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. While another sensor is being monitored, the next sensor or component will not be monitored.
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. "Once per driving cycle" means that the ECM detects malfunction only 1 time during a single driving cycle. "Continuous" means that the ECM detects a malfunction every time the enabling condition is met.
Duration	The minimum time that the ECM must sense 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 will conclude that there is a malfunction and set a DTC.
MIL operation	MIL illumination timing after a defect is detected. "Immediate" means that the ECM illuminates the MIL the instant the ECM determines that there is a malfunction. "2 driving cycle" means that the ECM illuminates the MIL if the same malfunction is detected again in the 2nd driving cycle.
Component operating range	Normal operation range of sensors and solenoids under normal driving conditions. Use these ranges as a reference. They cannot be used to judge if a sensor or solenoid is defective or not.

PARTS LOCATION





REMOVAL

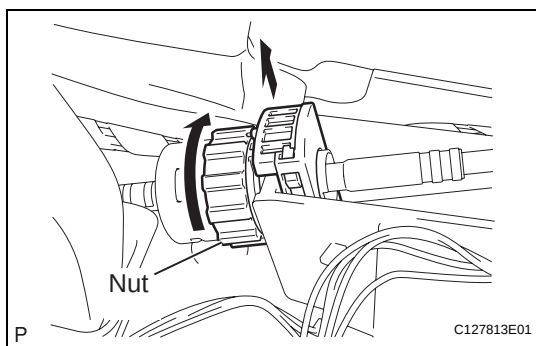
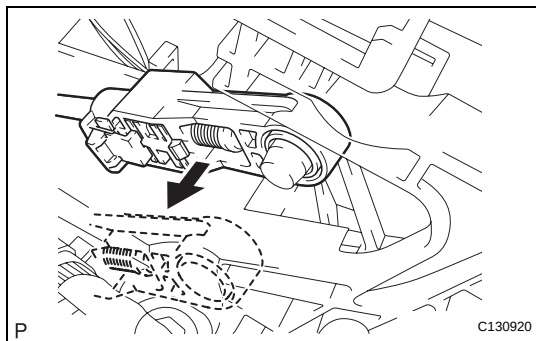
1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

CAUTION:

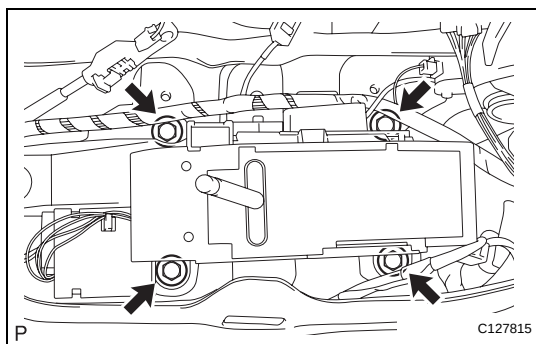
Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

2. **REMOVE SHIFT LEVER KNOB SUB-ASSEMBLY**
3. **REMOVE REAR CONSOLE BOX SUB-ASSEMBLY**
(a) Remove the console box (see page [IP-26](#)).
4. **DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**

(a) Disconnect the control cable from the shift lever.

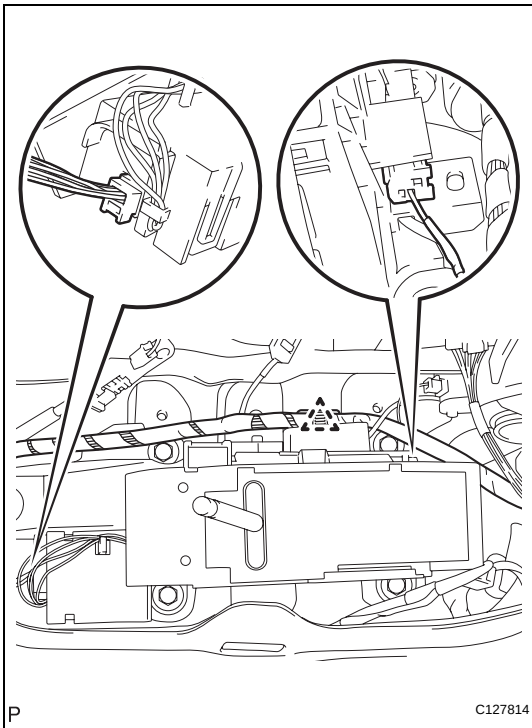


(b) Turn the nut and disconnect the control cable from the shift lever retainer.



5. **REMOVE FLOOR SHIFT ASSEMBLY**
(a) Remove the 4 bolts and floor shift.

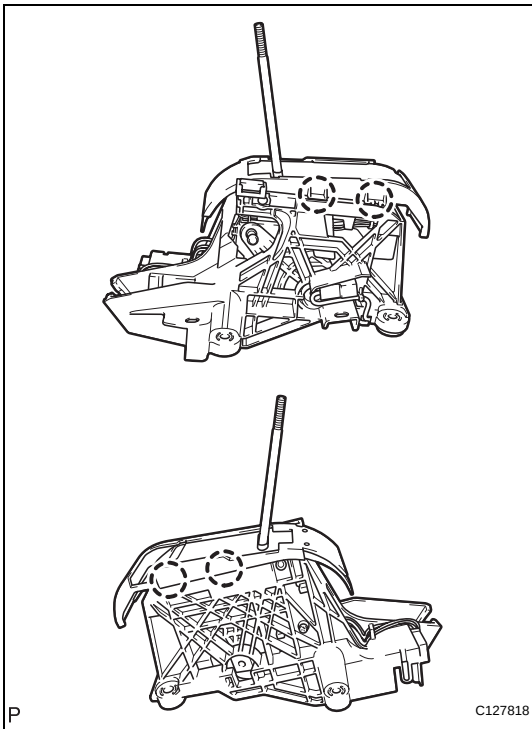
- (b) Disconnect the 2 connectors and detach the clamp.



DISASSEMBLY

1. REMOVE LOWER POSITION INDICATOR HOUSING

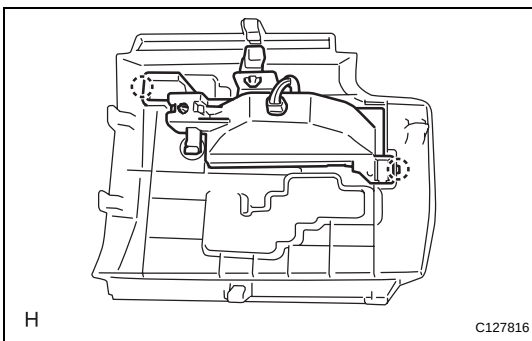
- (a) Detach the 4 claws and remove the housing.
- (b) Remove the position indicator slide cover with slide No. 2 cover.

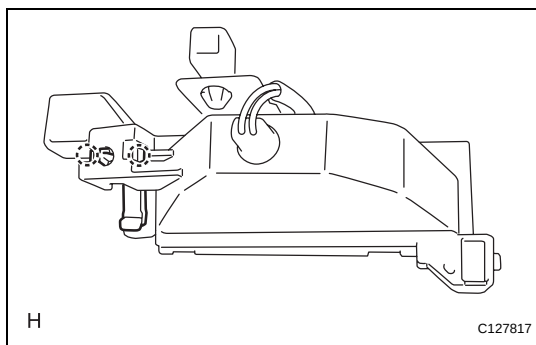


2. REMOVE POSITION INDICATOR LIGHT HOUSING

- (a) Detach the 2 claws and remove the indicator light housing from the floor shift position indicator housing.

3. REMOVE INDICATOR LIGHT WIRE SUB-ASSEMBLY

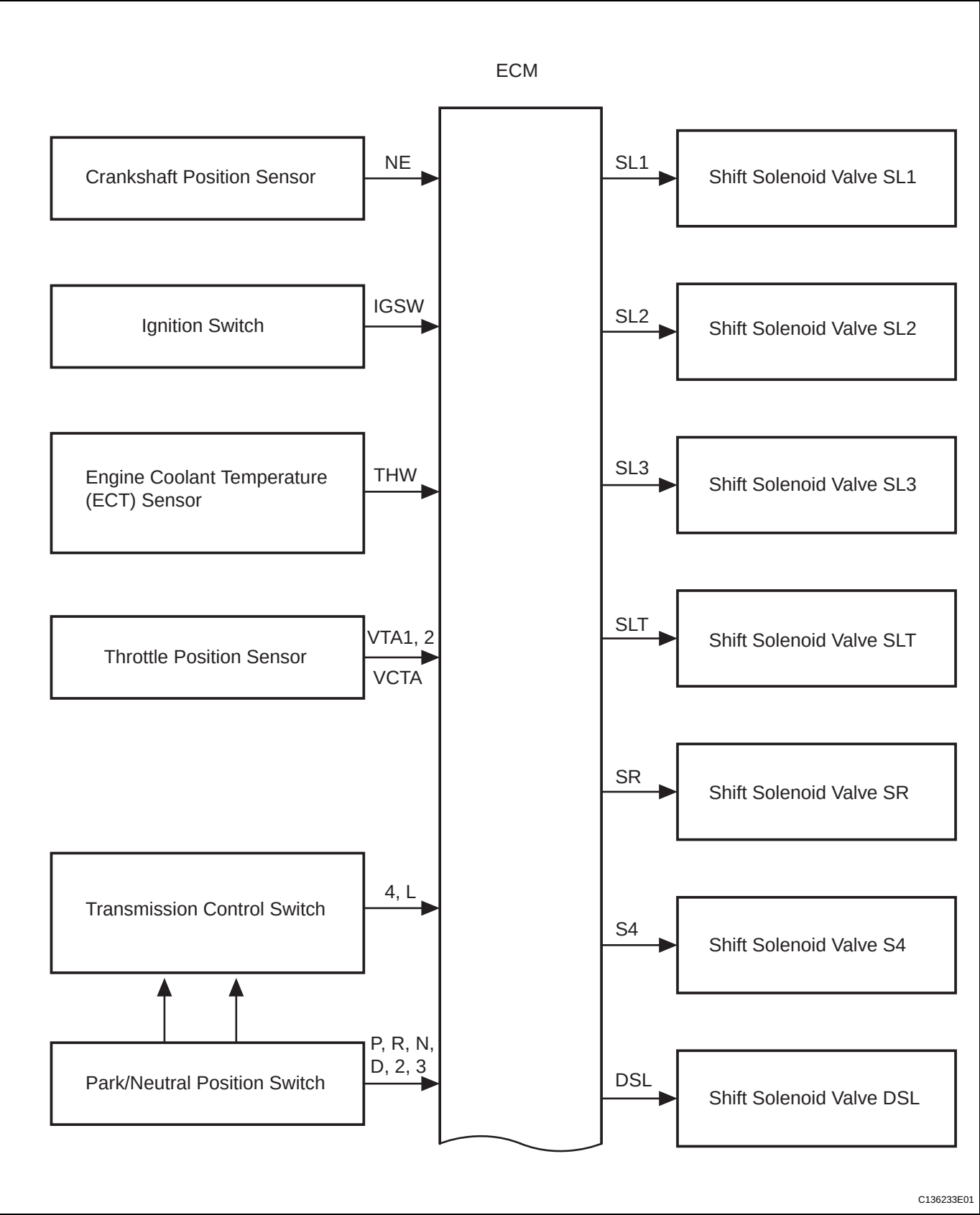


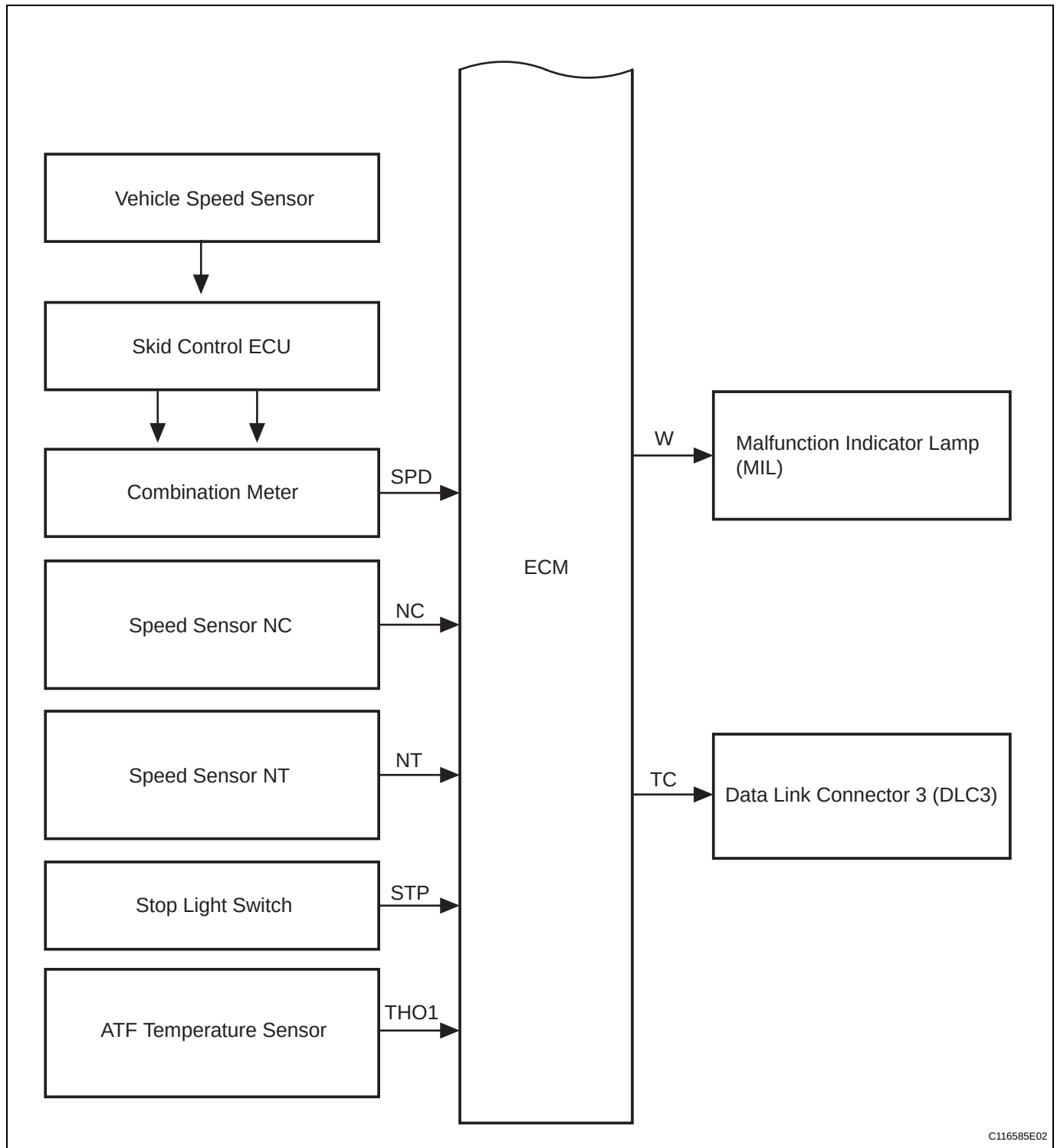
**4. REMOVE SHIFT LOCK RELEASE BUTTON**

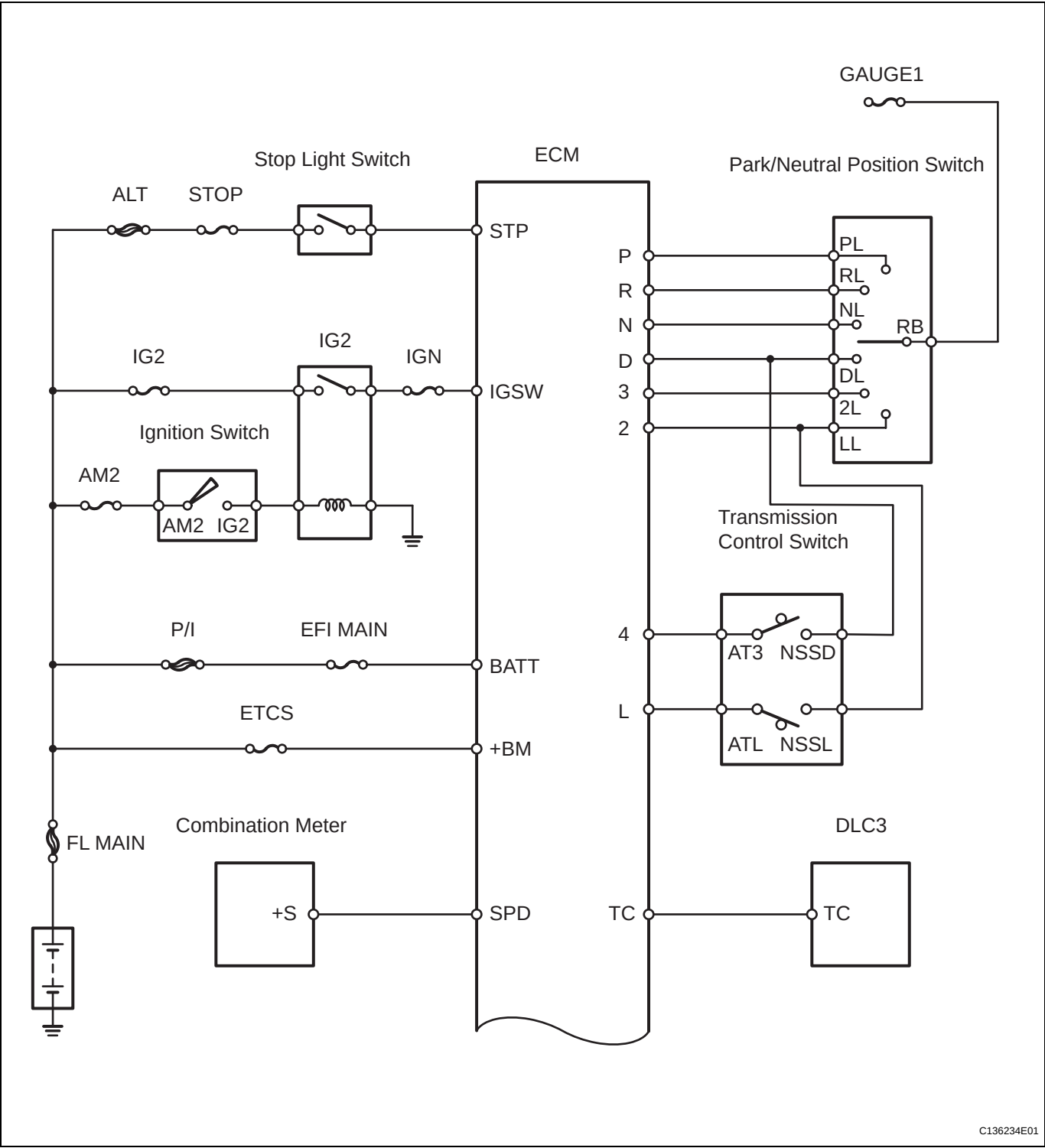
- (a) Detach the 2 claws and remove the button and spring from the position indicator light housing.

SYSTEM DIAGRAM

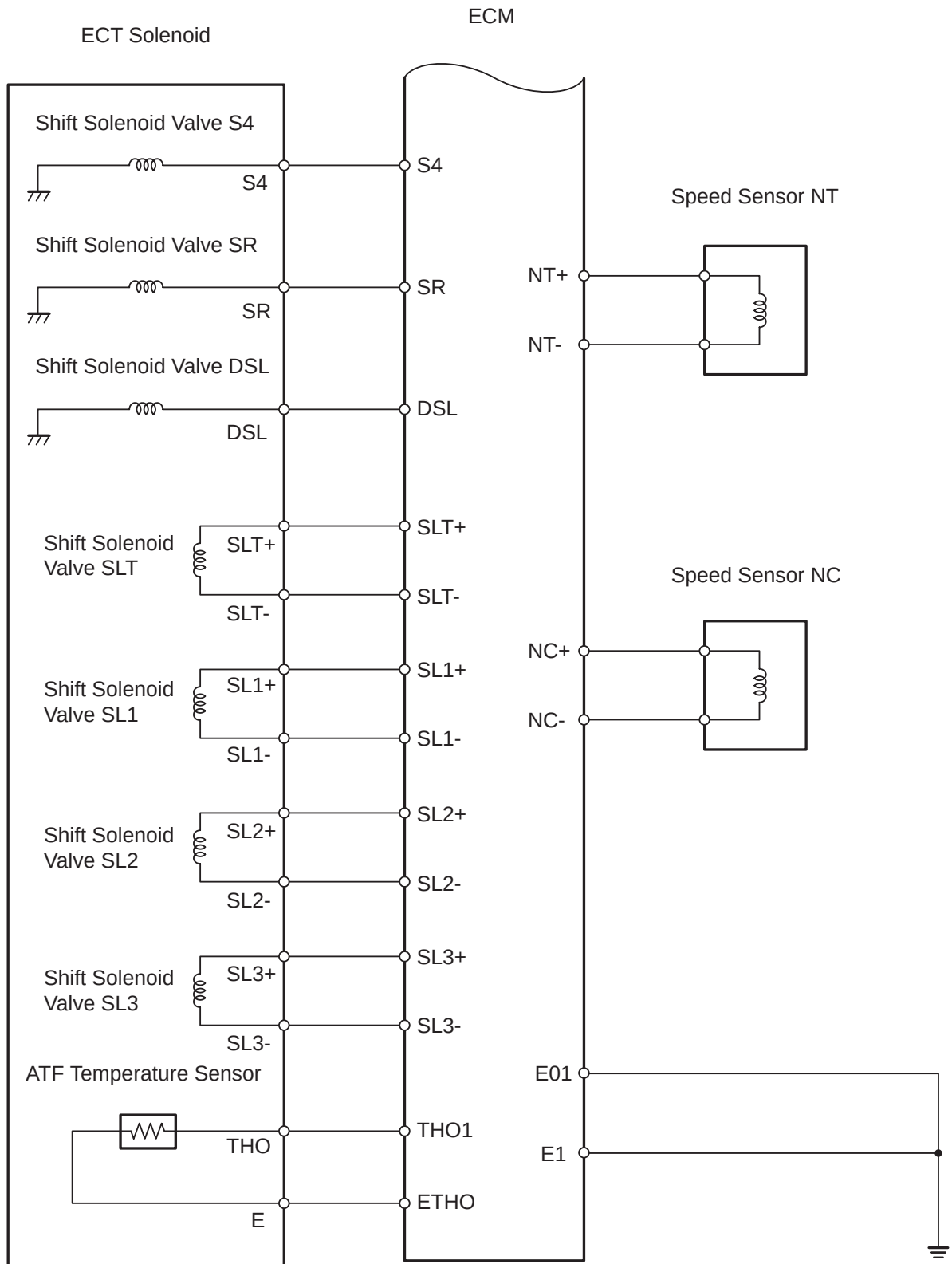
The configuration of the electronic control system in the U151E automatic transaxle is as shown in the following chart.







C136234E01



C136235E01

SYSTEM DESCRIPTION

1. SYSTEM DESCRIPTION

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

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

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

1 VEHICLE BROUGHT TO WORKSHOP

NEXT

2 CUSTOMER PROBLEM ANALYSIS

NEXT

3 INSPECT BATTERY VOLTAGE

Standard voltage:

11 to 14 V

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

NEXT

4 CONNECT INTELLIGENT TESTER TO DLC3*

NEXT

5 CHECK AND CLEAR DTCS AND FREEZE FRAME DATA*

(a) Refer to the DTC CHECK / CLEAR (see page [AX-33](#)).

NEXT

6 VISUAL INSPECTION

NEXT

7 SETTING CHECK MODE DIAGNOSIS*

(a) Refer to the CHECK MODE PROCEDURE (see page [AX-34](#)).

NEXT

8 PROBLEM SYMPTOM CONFIRMATION(a) Refer to the ROAD TEST (see page [AX-13](#)).**Result**

Result	Proceed to
Symptom does not occur	A
Symptom occurs	B

B**GO TO STEP 10****A****9 SYMPTOM SIMULATION**(a) Refer to the ELECTRONIC CIRCUIT INSPECTION PROCEDURE (see page [IN-37](#)).

NEXT

10 DTC CHECK*(a) Refer to the DTC CHECK / CLEAR (see page [AX-33](#)).**Result**

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

B**GO TO STEP 18****A****11 BASIC INSPECTION**(a) Refer to the AUTOMATIC TRANSMISSION FLUID (see page [AX-126](#)).(b) Refer to the PARK/NEUTRAL POSITION SWITCH (see page [AX-132](#)).(c) Refer to the FLOOR SHIFT ASSEMBLY (see page [AX-162](#)).**NG****GO TO STEP 21**

OK

12 MECHANICAL SYSTEM TESTS(a) Refer to the MECHANICAL SYSTEM TESTS (see page [AX-16](#)).

NG

GO TO STEP 17

OK

13 HYDRAULIC TEST(a) Refer to the HYDRAULIC TEST (see page [AX-18](#)).

NG

GO TO STEP 17

OK

14 MANUAL SHIFTING TEST(a) Refer to the MANUAL SHIFTING TEST (see page [AX-19](#)).

NG

GO TO STEP 16

OK

15 PROBLEM SYMPTOMS TABLE CHAPTER 1(a) Refer to the PROBLEM SYMPTOMS TABLE (see page [AX-23](#)).

NG

GO TO STEP 19

OK

16 PROBLEM SYMPTOMS TABLE CHAPTER 2(a) Refer to the PROBLEM SYMPTOMS TABLE (see page [AX-23](#)).

NEXT

17 PART INSPECTION

NG

GO TO STEP 21

OK

18 DTC CHART(a) Refer to the DIAGNOSTIC TROUBLE CODE CHART (see page [AX-40](#)).

NEXT

19	CIRCUIT INSPECTION
----	--------------------

NEXT

20	IDENTIFICATION OF PROBLEM
----	---------------------------

NEXT

21	REPAIR OR REPLACE
----	-------------------

NEXT

22	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 transaxle does not shift up, shift down, or the shift point is too high or too low, conduct the following road test referring to the automatic shift schedule and simulate the problem symptoms.

2. ROAD TEST

NOTICE:

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

- (a) D position test:

Move the shift lever to D and fully depress the accelerator pedal. Check the following:

- (1) Check up-shift operation.

Check that the 1 → 2, 2 → 3, 3 → 4 and 4 → 5th up-shifts take place at the shift point shown in the automatic shift schedule (see page [SS-43](#)).

HINT:

5th Gear Up-shift Prohibition Control

- Engine coolant temperature is 55°C (131°F) or less and vehicle speed is at 80 km/h (50 mph) or less.
- ATF temperature is -2°C (28°F) or less.

4th Gear Up-shift Prohibition Control

- Engine coolant temperature is 47°C (117°F) or less and vehicle speed is at 55 km/h (34 mph) or less.

5th and 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 for shift shock and slip.

Check for shock and slip 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 → 5th while driving with the shift lever on D, 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.

(4) Check kick-down operation.

While driving the vehicle in the 2nd, 3rd, 4th and 5th gears with the shift lever on D, check that the possible kick-down vehicle speed limits for 2 → 1, 3 → 2, 4 → 3 and 5 → 4 kick-downs conform to those indicated in the automatic shift schedule (see page [SS-43](#)).

(5) Check for abnormal shock and slip at kick-down.

(6) Check the lock-up mechanism.

- Drive the vehicle in the 5th gear with the shift lever on D. Maintain a steady speed (lock-up ON).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

HINT:

- There is no lock-up in the 1st, 2nd and 3rd gear.
- 4th lock-up operates while uphill-downhill control is active with the shift lever on D.
- If there is a sudden increase in engine speed, there is no lock-up.

(b) 4 (O/D OFF) position test:

Move the shift lever to 4 and fully depress the accelerator pedal. Check the following:

(1) Check up-shift operation.

Check that the 1 → 2, 2 → 3 and 3 → 4 up-shifts take place and that the shifts point conforms to the automatic shift schedule (see page [SS-43](#)).

HINT:

There is no 5th up-shift in the 4 position.

(2) Check engine braking.

While driving the vehicle in the 4th gear with the shift lever on 4, release the accelerator pedal and check the engine braking effect.

(3) Check for abnormal noise during acceleration and deceleration, and for shock at up-shift and down-shift.

(c) 3 position test:

Move the shift lever to 3 and fully depress the accelerator pedal. Check the following:

(1) Check up-shift operation.

Check that the 1 → 2 and 2 → 3 up-shifts take place and that the shifts point conforms to the automatic shift schedule (see page [SS-43](#)).

HINT:

There is no 3rd up-shift and lock-up in the 3 position.

(2) Check engine braking.

While driving the vehicle in the 3rd gear with the shift lever on 3, release the accelerator pedal and check the engine braking effect.

- (3) Check for abnormal noise during acceleration and deceleration, and for shock at up-shift and down-shift.
- (d) 2 position test:
Move the shift lever to 2 and fully depress the accelerator pedal. Check the following:
 - (1) Check up-shift operation.
Check that the 1 → 2 up-shifts take place and that the shift point conforms to the automatic shift schedule (see page [SS-43](#)).
HINT:
There is no 3rd up-shift and lock-up when the shift lever is on 2.
 - (2) Check engine braking.
While driving the vehicle in the 2nd gear with the shift lever on 2, release the accelerator pedal and check the engine braking effect.
 - (3) Check for abnormal noise during acceleration and deceleration, and for shock at up-shift and down-shift.
- (e) L position test:
Move the shift lever to L and fully depress the accelerator pedal. Check the following:
 - (1) Check no up-shift.
While driving the vehicle with the shift lever on L, check that there is no up-shift to 2nd gear.
HINT:
There is no lock-up in L.
 - (2) Check engine braking.
While driving the vehicle with the shift lever on L, release the accelerator pedal and check the engine braking effect.
 - (3) Check for abnormal noises during acceleration and deceleration.
- (f) R position test:
Move the shift lever to R and lightly depress the accelerator pedal. Check that the vehicle moves backward without any abnormal noise or vibration.
CAUTION:
Before conducting this test, ensure that no people or obstacles are in the test area.
- (g) P position test:
Stop the vehicle on an incline (more than 5°). Then move the shift lever to P and release the parking brake. Check that the parking lock pawl holds the vehicle in place.
- (h) Uphill/downhill control function test:
 - (1) Check that the gear does not up-shift to the 4th or 5th gear while the vehicle is driving uphill.
 - (2) Check that the gear automatically down-shifts from 5 → 4 or from 4 → 3 when the brake is applied while the vehicle is driving downhill.

MECHANICAL SYSTEM TESTS

1. STALL SPEED TEST

HINT:

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

NOTICE:

- **Do not perform the stall speed test longer than 10 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 with 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) Move the shift lever to the D 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:

2,030 to 2,330 rpm

Evaluation:

Test Result	Possible Cause
Stall speed is lower than standard value	• Engine power output may be insufficient • Stator one-way clutch not operating properly HINT: If the value is less than the specified value by 600 rpm or more, the torque converter could be faulty.
Stall speed is higher than standard value	• Line pressure is too low • Forward clutch slipping • U/D (underdrive) brake slipping • U/D (underdrive) one-way clutch is not operating properly • No. 1 one-way clutch not operating properly • Improper fluid level

NOTICE:

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

2. SHIFT TIME LAG TEST

HINT:

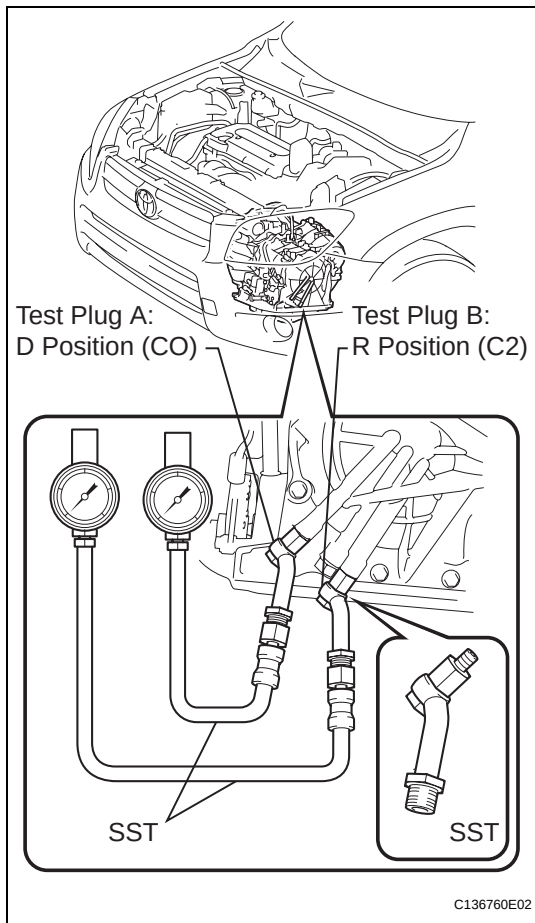
This test is to check the condition of the direct clutch, forward clutch, 1st brake and reverse brake.

- (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) Move the shift lever to N and wait for 1 minute.
 - (2) Move the shift lever to D 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) Move the shift lever to N and wait for 1 minute.
 - (2) Move the shift lever to R 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 too low • Forward clutch worn • No. 1 one-way clutch is not operating properly • U/D (underdrive) one-way clutch is not operating • U/D (underdrive) brake worn
R range time lag exceeds standard value	• Line pressure is too low • Reverse clutch worn • 1st and reverse brake worn • U/D (underdrive) brake worn



HYDRAULIC TEST

1. PERFORM HYDRAULIC TEST

- (a) Measure the line pressure.

NOTICE:

- Perform the test at the normal operating ATF temperature: 50 to 80°C (122 to 176°F).
- The line pressure test should always be performed with at least 2 people. One person should observe the condition of the wheels or wheel chocks while the other is performing the test.
- Be careful to prevent SST's hose from interfering with the exhaust pipe.
- This test must be performed after checking and adjusting the engine.
- Perform the test with the A/C OFF.
- When conducting the stall test, do not continue for more than 10 seconds.

- (1) Warm up the ATF (Automatic Transmission Fluid).
- (2) Lift the vehicle up.
- (3) Remove the engine under cover.
- (4) Connect the intelligent tester to the DLC3.
- (5) Remove the test plug A on the transaxle case front left side and install SST.

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

NOTICE:

There is a difference between the installation point of the D position and R position.

- (6) Start the engine.
- (7) Using intelligent tester, shift to D position and hold 3rd gear by active test, and measure the line pressure in idling.

Specified line pressure:

Condition	D position kPa (kgf/cm ² , psi)
Idling	372 to 412 kPa (3.8 to 4.2 kgf/cm ² , 54 to 60 psi)

- (8) Turn the ignition switch off.
- (9) Disconnect the connector of the transmission wire.

HINT:

Disconnect the connector only when performing the position stall test.

- (10) Start the engine.
- (11) Firmly depress the brake pedal, shift to the D position, depress the accelerator pedal all the way down and check the line pressure while the stall test is performed.

Specified line pressure:

Condition	D position kPa (kgf/cm ² , psi)
Stall test	931 to 1,031 kPa (9.5 to 10.5 kgf/cm ² , 135 to 150 psi)

(12) Turn the ignition switch off.

(13) Remove SST, and install the test plug A.

(14) Remove the test plug B, install SST and start the engine.

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

(15) Connect the transmission wire connector, depress the brake pedal firmly, shift to the R position and check the line pressure while the engine is idling and during the stall test.

Specified line pressure:

Condition	R position kPa (kgf/cm ² , psi)
Idling	672 to 742 kPa (6.9 to 7.6 kgf/cm ² , 97 to 108 psi)
Stall test	1,768 to 1,968 kPa (18.0 to 20.0 kgf/cm ² , 256 to 285 psi)

(16) Remove SST, and install the test plug B.

(17) Clear the DTC.

Evaluation:

Problem	Possible cause
Measured values at all positions are higher than specified	- Shift solenoid valve SLT defective - Regulator valve defective
Measured values at all positions are lower than specified	- Shift solenoid valve SLT defective - Regulator valve defective - Oil pump defective - U/D (underdrive) direct clutch defective
Pressure is low when shift lever is on D only	- D position circuit fluid leak - Forward clutch defective
Pressure is low when shift lever is on R only	- R position circuit fluid leak - Reverse clutch defective 1st and reverse brake defective

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 transaxle.
- If any abnormalities are found in the following test, the problem is in the transaxle itself.

(a) Disconnect the connector of the transmission wire.

HINT:

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

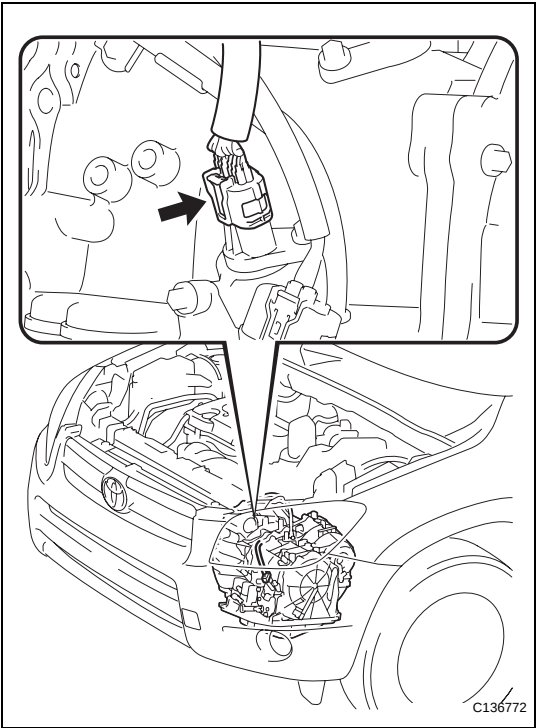
(b) Drive with the transmission wire disconnected. Move the shift lever to each position to check whether the gear position changes as shown in the table below.

Shift Lever Position	Shifting Condition
L ↔ 2	Not Shift (Not Change)
2 ↔ 3	Down Shift ←→ Up Shift
3 ↔ 4 ↔ D	Not Shift (Not Change)

HINT:

While driving with the transmission wire disconnected:

- When the shift lever position is in L or 2, the gear position is held in 3rd.
 - When the shift lever position is in 3, 4 or D, the gear position is held in 4th.
 - When the shift lever position is in R or P, the operation is the same as usual.
- (c) Connect the connector of the transmission wire.
- (d) Clear the DTC (see page [AX-33](#)).



INITIALIZATION

1. RESET MEMORY

NOTICE:

- Perform the RESET MEMORY procedures (A/T initialization) when replacing the automatic transaxle assembly, engine assembly or ECM.
- RESET MEMORY can be performed only with the intelligent tester.

HINT:

The ECM memorizes the vehicle conditions when the ECT controls the automatic transaxle assembly and engine assembly. Therefore, when the automatic transaxle assembly, engine assembly, or ECM has been replaced, it is necessary to reset the memory so that the ECM can memorize the new information.

The reset procedures are as follows.

- (a) Turn the ignition switch OFF.
- (b) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
- (c) Turn the ignition switch ON and turn the tester ON.
- (d) Enter the following menus: DIAGNOSIS / ENHANCED OBD II.
- (e) Perform the reset memory procedures from the Engine menu.

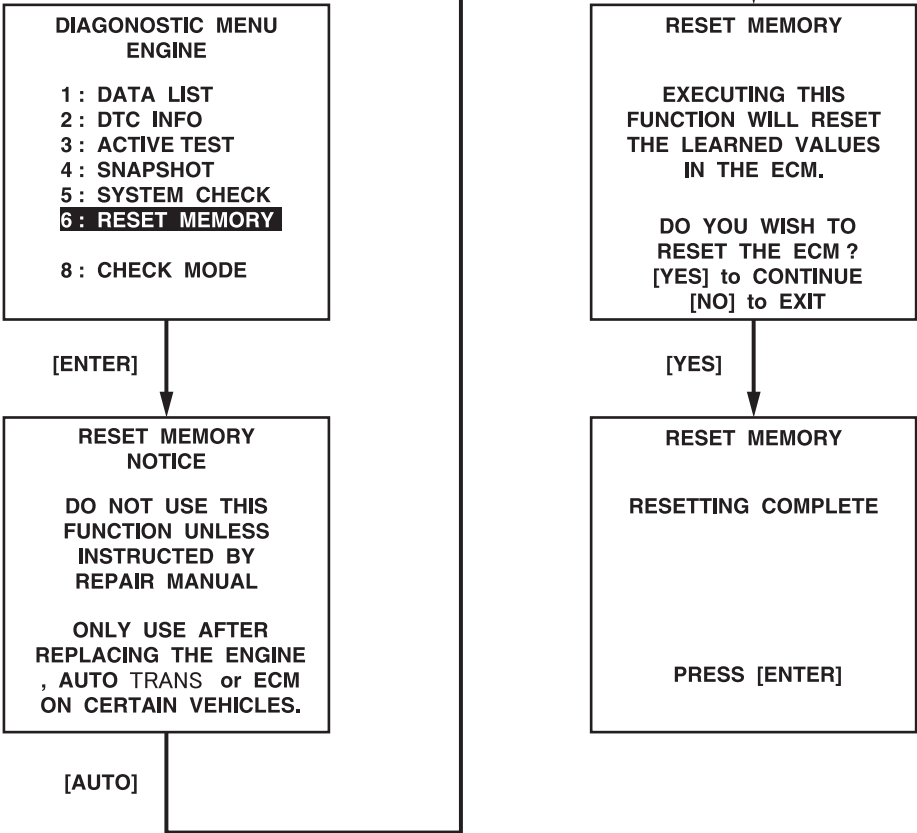
CAUTION:

After performing the RESET MEMORY procedures, be sure to perform the ROAD TEST (see page [AX-13](#)) as described earlier.

HINT:

The ECM learns through the ROAD TEST.

Tester Menu Flow:



MONITOR DRIVE PATTERN

1. TEST MONITOR DRIVE PATTERN FOR ECT

CAUTION:

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

HINT:

Performing this drive pattern is one method to simulate the ECT's malfunction detection conditions.

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

(a) Preparation for driving

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

(2) 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).

(b) Drive pattern

(1) Drive the vehicle through all the gears.

Stop → 1st → 2nd → 3rd → 4th → 5th → 5th (lock-up ON).

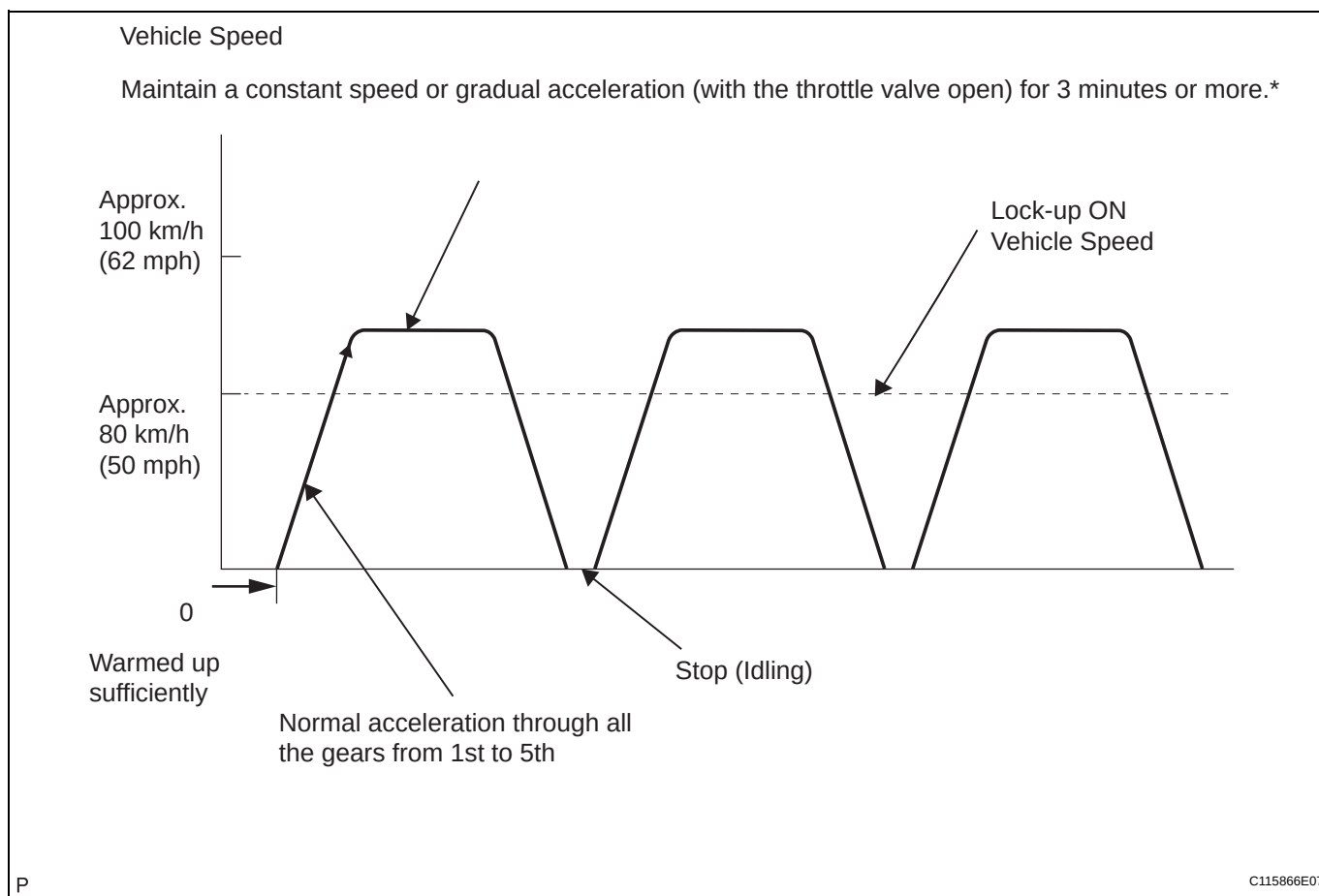
(2) Repeat the above drive pattern 3 times or more.

NOTICE:

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

CAUTION:

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

**HINT:**

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

NOTICE:

It is necessary to drive the vehicle for approximately 30 minutes to detect DTC P0711 (Transmission fluid temperature sensor "A" performance).

PROBLEM SYMPTOMS TABLE

HINT:

- Use the table below to help determine the cause of the problem symptom. The potential causes of the symptoms are listed in order of probability in the "Suspected area" column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.
- The Matrix Chart is divided into 2 chapters. When troubleshooting, check Chapter 1 first. If instructions are given in Chapter 1 to proceed to 2, proceed as instructed.
- If the instruction "Proceed to next circuit inspection shown in problem symptoms table" is given in the flowchart for each circuit, proceed to the next suspected area in the table.
- If the problem still occurs even though there are no malfunctions in any of the circuits, check the ECM and replace it if necessary.

1. Chapter 1: Electronic Circuit Matrix Chart

Symptom	Suspected area	See page
No down-shift (a particular gear, from 1st to 4th gear, is not down-shifted)	ECM	IN-37
No down-shift (5th -> 4th)	1. Transmission control switch (4 <--> D position) circuit	AX-44
	2. Shift solenoid valve S4 circuit*	AX-106
	3. ECM	IN-37
No up-shift (a particular gear, from 1st to 4th gear, is not up-shifted)	ECM	IN-37
No up-shift (4th -> 5th)	1. Transmission control switch (4 <--> D position) circuit	AX-44
	2. Shift solenoid valve S4 circuit*	AX-106
	3. ECM	IN-37
No lock-up	1. Stop light switch circuit*	AX-62
	2. Engine coolant temperature sensor circuit*	ES-56
	3. ECM	IN-37
No lock-up off	ECM	IN-37
Shift point too high or too low	1. Throttle position sensor circuit*	ES-56
	2. ECM	IN-37
Up-shift to 5th from 4th while shift lever on 4	1. Transmission control switch (4 <--> D position) circuit	AX-44
	2. ECM	IN-37
Up-shift to 5th from 4th while engine is cold	1. Engine coolant temperature sensor circuit*	ES-56
	2. ECM	IN-37
Up-shift to 2nd from 1st while shift lever is on L	1. Transmission control switch (2 <--> L position) circuit*	AX-44
	2. ECM	IN-37
Harsh engagement (N -> D)	1. Shift solenoid valve SL1 circuit*	AX-76
	2. ECM	IN-37
Harsh engagement (lock-up)	ECM	IN-37
Harsh engagement (any driving position)	ECM	IN-37
Poor acceleration	ECM	IN-37
No kick-down	ECM	IN-37
Engine stalls when starting off or stopping	ECM	IN-37
Malfunction in shifting	1. Park/Neutral position switch circuit*	AX-44
	2. Transmission control switch (4 <--> D position) circuit	AX-44
	3. ECM	IN-37

HINT:

*: When the circuit is defective, a DTC may be output.

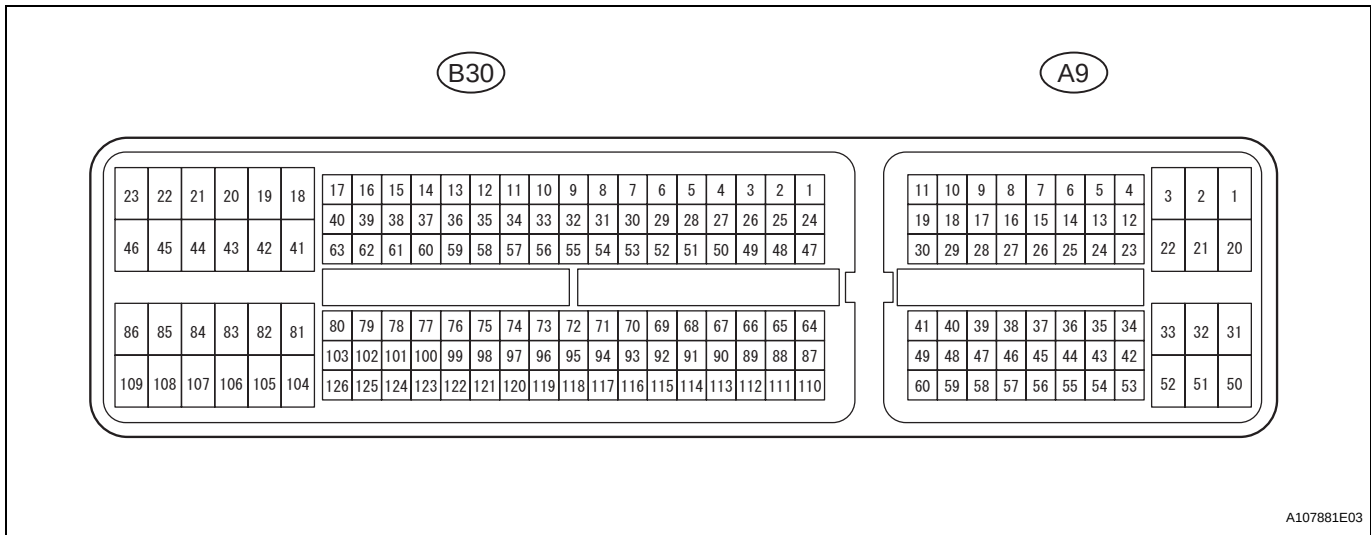
2. Chapter 2: On-Vehicle Repair and Off-Vehicle Repair

Symptom	Suspected area	See page
Vehicle does not move in any forward position and with the shift lever on R	1. Valve body assembly	AX-142
	2. B3 U/D brake	AX-180
	3. Torque converter clutch	AX-178
Vehicle does not move with shift lever on R	1. Valve body assembly	AX-142
	2. C2 reverse clutch	AX-180
	3. B2 1st and reverse brake	AX-180
No up-shift (1st -> 2nd)	1. Valve body assembly	AX-142
	2. B1 2nd and O/D brake	AX-180
No up-shift (2nd -> 3rd)	1. Valve body assembly	AX-142
	2. C0 direct and O/D clutch	AX-180
No up-shift (3rd -> 4th)	1. Valve body assembly	AX-142
	2. B1 2nd and O/D brake	AX-180
No up-shift (4th -> 5th)	1. Shift solenoid valve S4	AX-79
	2. Valve body assembly	AX-142
	3. C3 U/D clutch	AX-180
No down-shift (5th -> 4th)	1. Shift solenoid valve S4	AX-79
	2. Valve body assembly	AX-142
No down-shift (4th -> 3rd)	Valve body assembly	AX-142
No down-shift (3rd -> 2nd)	Valve body assembly	AX-142
No down-shift (2nd -> 1st)	Valve body assembly	AX-142
No lock-up or no lock-up off	1. Shift solenoid valve DSL	AX-65
	2. Valve body assembly	AX-142
	3. Torque converter clutch	AX-178
Harsh engagement (N -> D)	1. Shift solenoid valve SL1	AX-72
	2. Valve body assembly	AX-142
	3. C1 accumulator	AX-180
	4. C1 forward clutch	AX-180
	5. F1 No. 1 one-way clutch	AX-180
	6. F2 U/D one-way clutch	AX-180
Harsh engagement (lock-up)	1. Shift solenoid valve SL2	AX-87
	2. Valve body assembly	AX-142
	3. Torque converter clutch	AX-178
Harsh engagement (N -> R)	1. Valve body assembly	AX-142
	2. C2 accumulator	AX-180
	3. C2 reverse clutch	AX-180
	4. B2 1st and reverse brake	AX-180
Harsh engagement (1st -> 2nd -> 3rd -> 4th -> 5th)	1. Shift solenoid valve SLT	AX-120
	2. Valve body assembly	AX-142
Harsh engagement (1st -> 2nd)	1. Valve body assembly	AX-142
	2. B1 2nd and O/D brake	AX-180
Harsh engagement (2nd -> 3rd)	1. Valve body assembly	AX-142
	2. C0 accumulator	AX-180
	3. C0 direct and O/D clutch	AX-180
Harsh engagement (3rd -> 4th)	1. Valve body assembly	AX-142
	2. B1 2nd and O/D brake	AX-180

Symptom	Suspected area	See page
Harsh engagement (4th -> 5th)	1. Valve body assembly	AX-142
	2. C3 accumulator	AX-180
	3. B3 U/D clutch	AX-180
Harsh engagement (5th -> 4th)	1. Valve body assembly	AX-142
	2. B3 accumulator	AX-180
Slip or shudder (forward and reverse: after warm-up)	1. Valve body assembly	AX-142
	2. Oil strainer	AX-142
	3. C0 direct and O/D clutch	AX-180
	4. C1 forward clutch	AX-180
	5. C3 U/D clutch	AX-180
	6. B1 2nd and brake	AX-180
	7. B3 U/D brake	AX-180
	8. F1 No. 1 one-way clutch	AX-180
	9. F2 U/D one-way clutch	AX-180
	10. Torque converter clutch	AX-178
Slip or shudder (particular position: just after engine starts)	Torque converter clutch	AX-178
Slip or shudder (shift lever on R)	1. C2 reverse clutch	AX-180
	2. B2 1st and reverse brake	AX-180
Slip or shudder (1st)	1. C1 forward clutch	AX-180
	2. F1 No. 1 one-way clutch	AX-180
	3. F2 U/D one-way clutch	AX-180
Slip or shudder (2nd)	B1 2nd and O/D brake	AX-180
Slip or shudder (3rd)	C0 direct and O/D clutch	AX-180
Slip or shudder (4th)	B1 2nd and O/D brake	AX-180
Slip or shudder (5th)	C3 U/D clutch	AX-180
Shift position too high or too low	Shift solenoid valve SLT	AX-120
No engine braking (1st to 4th/shift lever on D)	B3 U/D brake	AX-180
No engine braking (1st/shift lever on L)	1. Valve body assembly	AX-142
	2. B2 1st and reverse brake	AX-180
No engine braking (2nd/shift lever on 2)	1. Valve body assembly	AX-142
	2. B1 2nd and O/D brake	AX-180
No engine braking (3rd/shift lever on 3)	B3 U/D brake	AX-180
No kick-down	Valve body assembly	AX-142
Poor acceleration (all positions)	1. Shift solenoid valve SLT	AX-120
	2. Torque converter clutch	AX-178
Poor acceleration (5th)	1. C3 U/D clutch	AX-180
	2. U/D planetary gear unit	AX-180
Engine stalls when starting off or stopping	1. Shift solenoid valve DSL	AX-65
	2. Torque converter clutch	AX-178

TERMINALS OF ECM

1. CHECK ECM



(a) Measure the voltage of the ECM connector.

HINT:

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

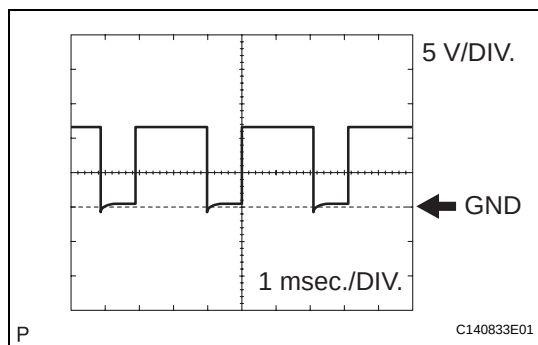
In the table, first follow the information under "Condition". Look under "Symbols (Terminal No.)" for the terminals to be inspected. The standard voltage between the terminals is shown under "Specified Condition".

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

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
P (B30-24) - E1 (B30-81)	R - BR	P shift position switch signal	Ignition switch ON and transfer shift lever on P	10 to 14 V
P (B30-24) - E1 (B30-81)	R - BR	P shift position switch signal	Ignition switch ON and transfer shift lever not on P	Below 1 V
R (B30-25) - E1 (B30-81)	B - BR	R shift position switch signal	Ignition switch ON and transfer shift lever on R	10 to 14 V
R (B30-25) - E1 (B30-81)	B - BR	R shift position switch signal	Ignition switch ON and transfer shift lever not on R	Below 1 V
N (B30-27) - E1 (B30-81)	L-B - BR	N shift position switch signal	Ignition switch ON and transfer shift lever on N	10 to 14 V
N (B30-27) - E1 (B30-81)	L-B - BR	N shift position switch signal	Ignition switch ON and transfer shift lever not on N	Below 1 V
D (B30-26) - E1 (B30-81)	L - BR	D shift position switch signal	Ignition switch ON and transfer shift lever on D or 3	10 to 14 V
D (B30-26) - E1 (B30-81)	L - BR	D shift position switch signal	Ignition switch ON and transfer shift lever not on D or 3	Below 1 V
4 (A9-25) - E1 (B30-81)	P - BR	4 shift position switch signal	Ignition switch ON and transfer shift lever on 4	10 to 14 V
4 (A9-25) - E1 (B30-81)	P - BR	4 shift position switch signal	Ignition switch ON and transfer shift lever not on 4	Below 1 V

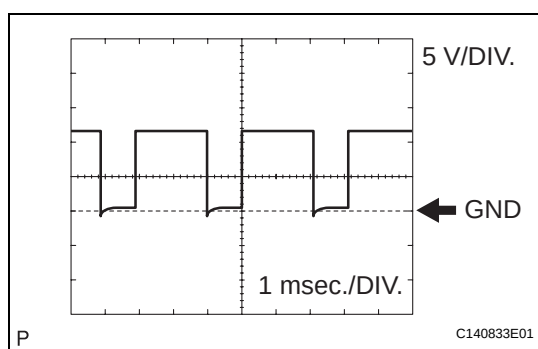
Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
3 (B30-29) - E1 (B30-81)	LG - BR	3 shift position switch signal	Ignition switch ON and transfer shift lever on 3	10 to 14 V
3 (B30-29) - E1 (B30-81)	LG - BR	3 shift position switch signal	Ignition switch ON and transfer shift lever not on 3	Below 1 V
2 (B30-28) - E1 (B30-81)	V - BR	2 shift position switch signal	Ignition switch ON and transfer shift lever on 2 and L	10 to 14 V
2 (B30-28) - E1 (B30-81)	V - BR	2 shift position switch signal	Ignition switch ON and transfer shift lever not on 2 and L	Below 1 V
L (A9-26) - E1 (B30-81)	V - BR	L shift position switch signal	Ignition switch ON and transfer shift lever on L	10 to 14 V
L (A9-26) - E1 (B30-81)	V - BR	L shift position switch signal	Ignition switch ON and transfer shift lever not on L	Below 1 V
STP (A9-36) - E1 (B30-81)	L - BR	Stop light switch signal	Brake pedal is depressed	Between 10 V and 14 V
STP (A9-36) - E1 (B30-81)	L - BR	Stop light switch signal	Brake pedal is released	Below 1 V
SL1+ (B30-16) - SL1- (B30-17)	P - LG	SL1 solenoid signal	Engine idle speed	Pulse generation (see waveform 1)
SL1+ (B30-16) - SL1- (B30-17)	P - LG	SL1 solenoid signal	Ignition switch ON	Pulse generation (see waveform 1)
SL1+ (B30-16) - SL1- (B30-17)	P - LG	SL1 solenoid signal	1st gear	Pulse generation (see waveform 1)
SL1+ (B30-16) - SL1- (B30-17)	P - LG	SL1 solenoid signal	Not on 1st gear	Below 1 V
SL2+ (B30-12) - SL2- (B30-13)	BR - R	SL2 solenoid signal	Engine idle speed	Pulse generation (see waveform 2)
SL2+ (B30-12) - SL2- (B30-13)	BR - R	SL2 solenoid signal	Ignition switch ON	Pulse generation (see waveform 2)
SL2+ (B30-12) - SL2- (B30-13)	BR - R	SL2 solenoid signal	1st or 2nd gear	Pulse generation (see waveform 2)
SL2+ (B30-12) - SL2- (B30-13)	BR - R	SL2 solenoid signal	3rd, 4th or 5th gear	Below 1 V
SL3+ (B30-14) - SL3- (B30-15)	GR - G-R	SL3 solenoid signal	Engine idle speed	Pulse generation (see waveform 3)
SL3+ (B30-14) - SL3- (B30-15)	GR - G-R	SL3 solenoid signal	Ignition switch ON	Pulse generation (see waveform 3)
SL3+ (B30-14) - SL3- (B30-15)	GR - G-R	SL3 solenoid signal	1st or 2nd gear	Pulse generation (see waveform 3)
SL3+ (B30-14) - SL3- (B30-15)	GR - G-R	SL3 solenoid signal	3rd, 4th or 5th gear	Below 1 V
DSL (B30-9) - E01 (B30-22)	V - BR	DSL solenoid signal	Vehicle speed 65 km/h (40 mph), lock-up (ON to OFF)	Below 1 V
DSL (B30-9) - E01 (B30-22)	V - BR	DSL solenoid signal	Vehicle driving under lock-up position	Pulse generation (see waveform 4)
SLT+ (B30-11) - SLT- (B30-10)	L - W	SLT solenoid signal	Engine idle speed	Pulse generation (see waveform 5)
SR (B30-8) - E01 (B30-22)	G - BR	SR solenoid signal	Ignition switch ON	Below 1 V
SR (B30-8) - E01 (B30-22)	G - BR	SR solenoid signal	3th, 4th or 5th gear	10 to 14 V
SR (B30-8) - E01 (B30-22)	G - BR	SR solenoid signal	1st or 2nd gear	Below 1 V
S4 (B30-7) - E01 (B30-22)	L-B - BR	S4 solenoid signal	Ignition switch ON	Below 1 V
S4 (B30-7) - E01 (B30-22)	L-B - BR	S4 solenoid signal	5th gear	10 to 14 V
S4 (B30-7) - E01 (B30-22)	L-B - BR	S4 solenoid signal	Not on 5th gear	Below 1 V
THO1 (B30-126) - ETHO (B30-124)	Y - B	ATF temperature sensor signal	ATF temperature 115°C (239°F) or more	Below 1.5 V
NT+ (B30-6) - NT- (B30-5)	B - G	Speed sensor (NT) signal	Vehicle speed 20 km/h (12 mph)	Pulse generation (see waveform 6)

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
NC+ (B30-4) - NC- (B30-3)	W - Y	Speed sensor (NC) signal	Vehicle speed 30 km/h (19 mph) (3rd gear) Engine speed 1,400 rpm	Pulse generation (see waveform 7)



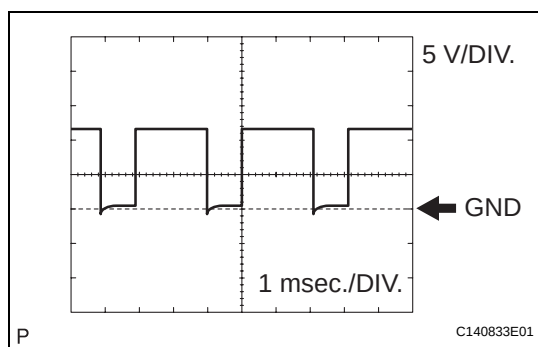
(b) Using an oscilloscope, check the waveform 1.
Waveform 1 (Reference)

Item	Content
Symbols (Terminal No.)	SL1+ (B30-16) - SL1- (B30-17)
Tool Setting	5 V/DIV., 1 msec./DIV.
Condition	Engine idle speed



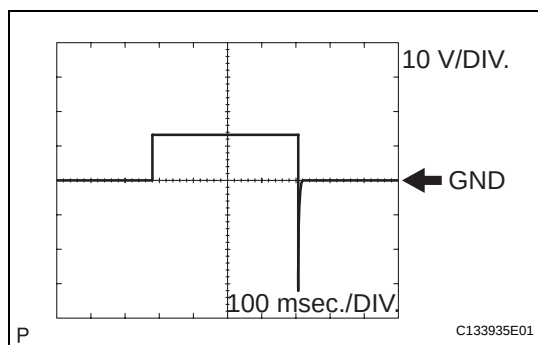
(c) Using an oscilloscope, check the waveform 2.
Waveform 2 (Reference)

Item	Content
Symbols (Terminal No.)	SL2+ (B30-12) - SL2- (B30-13)
Tool Setting	5 V/DIV., 1 msec./DIV.
Condition	Engine idle speed



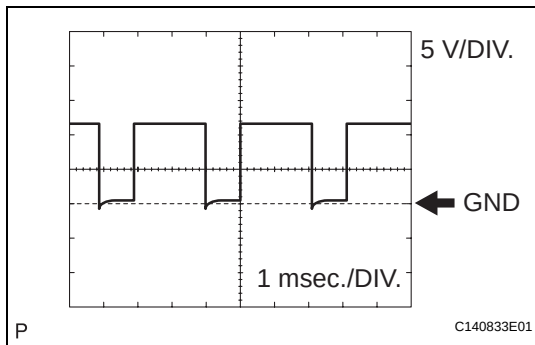
(d) Using an oscilloscope, check the waveform 3.
Waveform 3 (Reference)

Item	Content
Symbols (Terminal No.)	SL3+ (B30-14) - SL3- (B30-15)
Tool Setting	5 V/DIV., 1 msec./DIV.
Condition	Engine idle speed



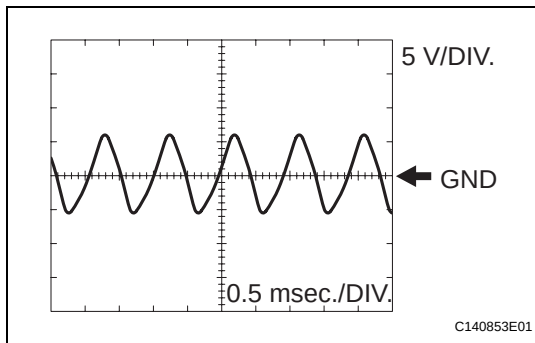
(e) Using an oscilloscope, check the waveform 4.
Waveform 4 (Reference)

Item	Content
Symbols (Terminal No.)	DSL (B30-9) - E01 (B30-22)
Tool Setting	10 V/DIV., 100 msec./DIV.
Condition	Vehicle speed 65 km/h (40 mph), lock-up (ON to OFF)



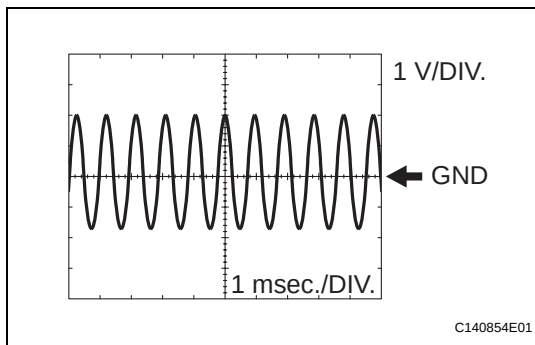
- (f) Using an oscilloscope, check the waveform 5.
Waveform 5 (Reference)

Item	Content
Symbols (Terminal No.)	SLT+ (B30-11) - SLT- (B30-10)
Tool Setting	5 V/DIV., 1 msec./DIV.
Condition	Engine idle speed



- (g) Using an oscilloscope, check the waveform 6.
Waveform 6 (Reference)

Item	Content
Symbols (Terminal No.)	NT+ (B30-6) - NT- (B30-5)
Tool Setting	5 V/DIV., 0.5 msec./DIV.
Condition	Vehicle speed 20 km/h (12 mph)



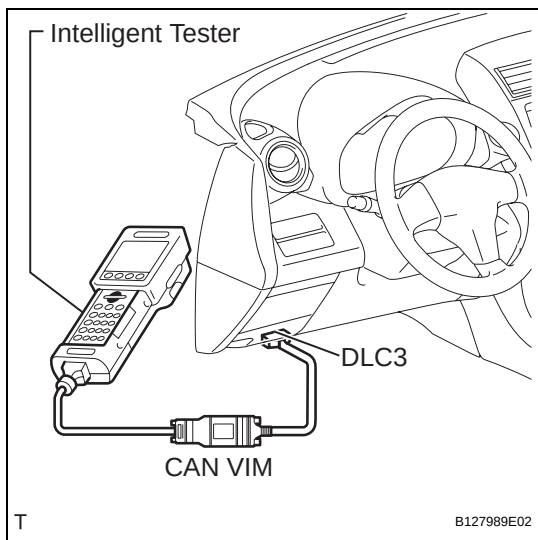
- (h) Using an oscilloscope, check the waveform 7.
Waveform 7 (Reference)

Item	Content
Symbols (Terminal No.)	NC+ (B30-4) - NC- (B30-3)
Tool Setting	1 V/DIV., 1 msec./DIV.
Condition	Vehicle speed 30 km/h (19 mph) (3rd gear) Engine speed 1,400 rpm

DIAGNOSIS SYSTEM

1. DESCRIPTION

- (a) When troubleshooting On-Board Diagnostic (OBD II) vehicles, the vehicle must be connected to the OBD II scan tool (complying with SAE J1987). Various data output from the vehicle's ECM can then be read.
- (b) OBD II regulations require that the vehicle's on-board computer illuminates the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in:
- (1) The emission control system/components
 - (2) The powertrain 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.
- When the malfunction does not reoccur, the MIL stays illuminated until the ignition switch is turned OFF, and the MIL turns OFF when the engine is started. However, the DTCs remain recorded in the ECM memory.
- (c) To check DTCs, connect the intelligent tester to the Data Link Connector 3 (DLC3) of the vehicle. The tester displays DTCs, the freeze frame data and a variety of the engine data.
- The DTCs and freeze frame data can be erased with the tester (see page [AX-40](#)).



2. NORMAL MODE AND CHECK MODE

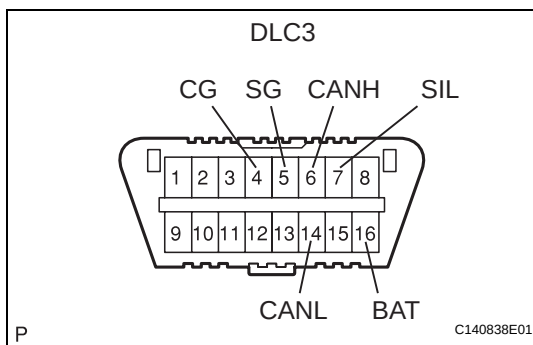
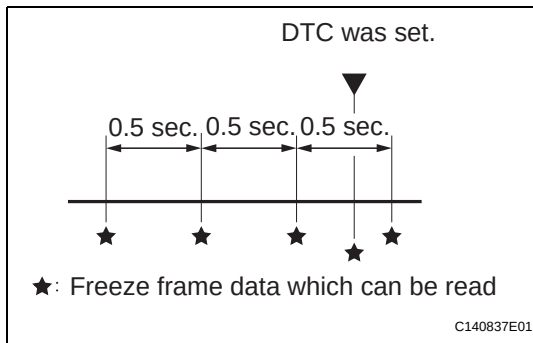
- (a) The diagnosis system operates in "normal mode" during normal vehicle use. In normal mode, "2 trip detection logic" is used to ensure accurate detection of malfunctions. "Check mode" is also available to technicians as an option. In check mode, "1 trip detection logic" is used for simulating malfunction 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 same malfunction is detected during the next drive cycle, the MIL is illuminated (2nd trip).

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



5. DATA LINK CONNECTOR 3 (DLC3)

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

Terminal of DLC3

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
SG (5) - Body ground	Signal ground	Always	Below 1 Ω
BAT (16) - Body ground	Battery positive	Always	9 to 14 V
CANH (6) - CANL (14)	CAN bus line	Ignition switch OFF*	54 to 69 Ω
CANH (6) - Battery positive	HIGH-level CAN bus line	Ignition switch OFF*	6 k Ω or higher
CANH (6) - CG (4)	HIGH-level CAN bus line	Ignition switch OFF*	200 Ω or higher
CANL (14) - Battery positive	LOW-level CAN bus line	Ignition switch OFF*	6 k Ω or higher
CANL (14) - CG (4)	LOW-level CAN bus line	Ignition switch OFF*	200 Ω 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 ON and attempt to use the tester. If the screen displays **UNABLE TO CONNECT TO VEHICLE**, a problem exists in the vehicle side or the tester side. If communication is normal when the tester is connected to another vehicle, inspect the DLC3 on the original vehicle. If communication is still not possible 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.

6. 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-430](#)).
- (b) When the engine is started, the MIL should turn off.

7. ALL READINESS

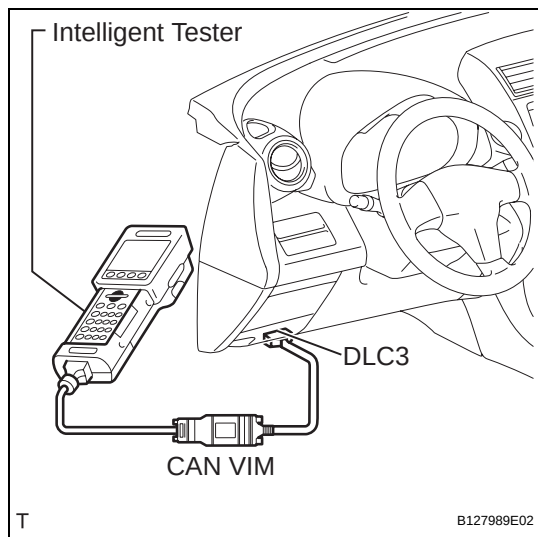
- (a) For this vehicle, using the intelligent tester allows readiness codes corresponding to all DTCs to be read. When the diagnosis (normal or malfunctioning) has been completed, readiness codes are set. Enter the following menus:
ENHANCED OBD II / MONITOR STATUS.

DTC CHECK / CLEAR**1. CHECK DTC**

- (a) DTCs which are stored in the ECM can be displayed with the intelligent tester.
The intelligent tester can display pending DTCs and current DTCs. Some DTCs are not stored unless a malfunction is detected in consecutive driving cycles. When a malfunction is detected in only one driving cycle, it is stored as a pending DTC.
 - (1) Connect the intelligent tester to the CAN VIM.
Then connect the CAN VIM to the DLC3.
 - (2) Turn the ignition switch ON and turn the tester ON.
 - (3) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES (or PENDING CODE).
 - (4) Confirm the DTCs and freeze frame data, and then write them down.
 - (5) Confirm the details of the DTCs (see page [AX-40](#)).

NOTICE:

When simulating a symptom with the scan tool to check for DTCs, use normal mode. For codes on the DIAGNOSTIC TROUBLE CODE CHART subject to "2 trip detection logic", perform the following actions.



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

2. CLEAR DTC

(a) When using the intelligent tester:

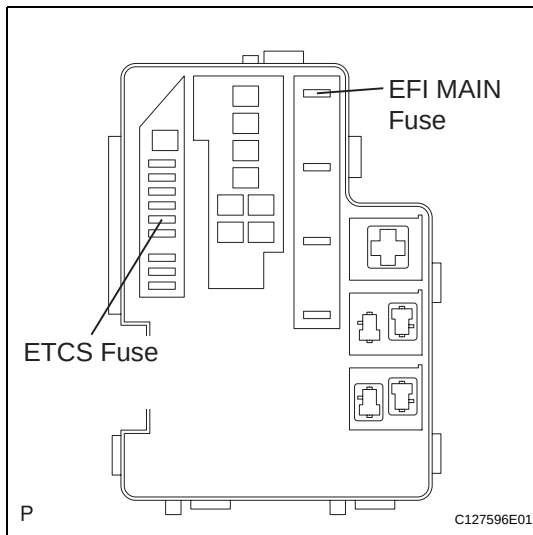
- (1) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
- (2) Turn the ignition switch ON and turn the tester ON.
- (3) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CLEAR CODES. Then press YES.

HINT:

When operating the tester to erase the codes, the DTCs and freeze frame data will be erased.

(b) When not using the intelligent tester:

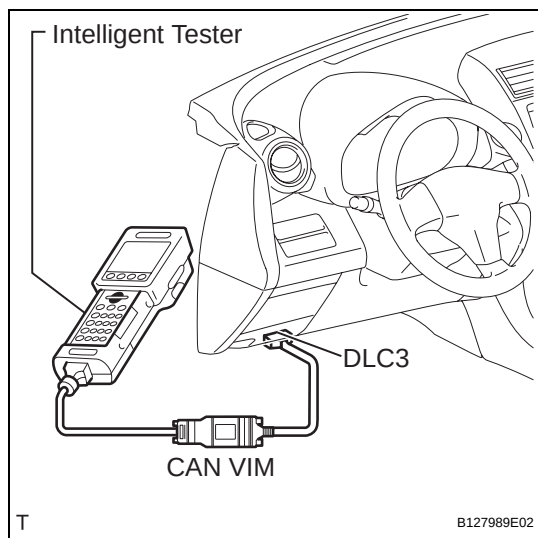
- (1) Disconnect the cable from the negative (-) battery terminal or remove the EFI MAIN and ETCS fuses from the engine room No. 1 relay block and engine room No. 1 junction block for 60 seconds or more. However, if you disconnect the cable from the negative (-) battery terminal, perform the "INITIALIZATION" procedure (see page [AX-20](#)).



CHECK MODE PROCEDURE

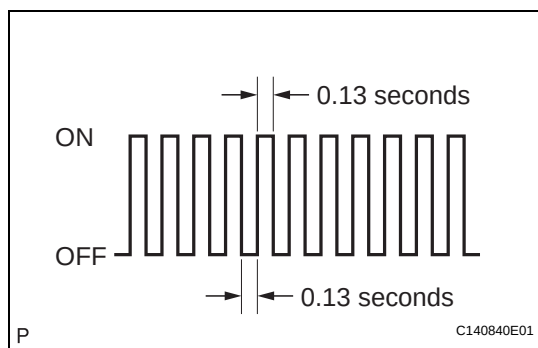
1. DESCRIPTION

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



2. CHECK MODE PROCEDURE

- (a) Make sure that the following conditions below are met:
- (1) Battery positive voltage 11 V or more
 - (2) Throttle valve fully closed
 - (3) Transaxle in the P or N position
 - (4) A/C OFF
- (b) Turn the ignition switch OFF.
- (c) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
- (d) Turn the ignition switch ON and turn the tester ON.
- (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 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 OFF.
- Before 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 [AX-21](#)).
(Or, simulate the conditions of the malfunction described by the customer.)
- (i) After simulating the malfunction conditions, use the tester to check the DTC and freeze frame data.

ADJUSTMENT

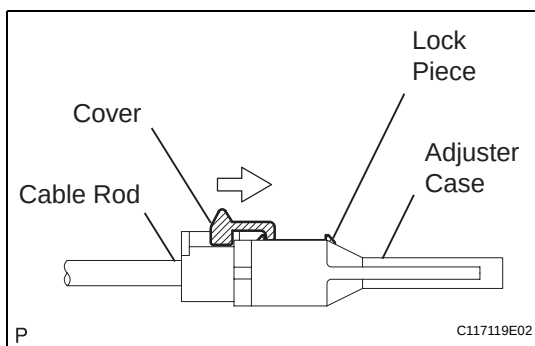
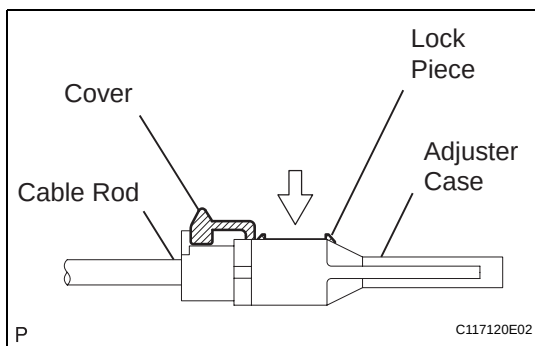
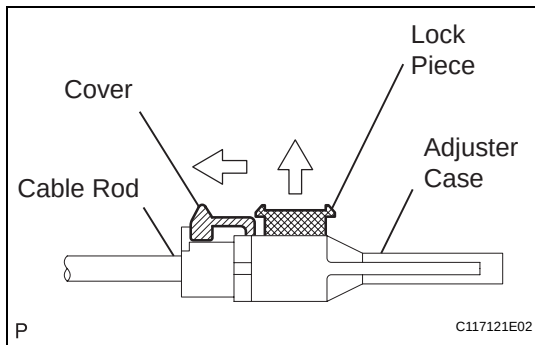
1. INSPECT SHIFT LEVER POSITION

- (a) When shifting the lever from P to the R position with the ignition switch ON and the brake pedal depressed, make sure that the shift lever moves smoothly and moves correctly into position.
- (b) Start the engine and make sure that the vehicle moves forward when shifting the lever from N to the D position and moves rearward when shifting the lever to the R position.

If the operation cannot be performed as specified, inspect the park/neutral position switch assembly and check the shift lever assembly installation condition.

2. ADJUST SHIFT LEVER POSITION

- (a) Shift the shift lever to the N position.
- (b) Slide the adjuster case cover in the direction shown in the illustration and pull out the lock piece.
- (c) Gently pull the cable rod toward the rear of the vehicle by hand to pull the cable taut.



- (d) Press the lock piece into the adjuster case and lock it.

- (e) Slide the cover in the direction shown in the illustration.

NOTICE:

Slide the cover past the protrusion of the lock piece.

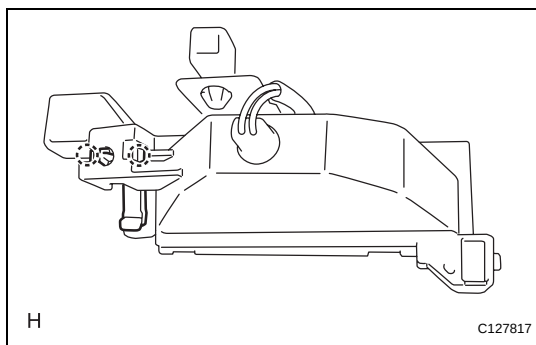
- (f) Inspect the operation.

REASSEMBLY

1. INSTALL SHIFT LOCK RELEASE BUTTON

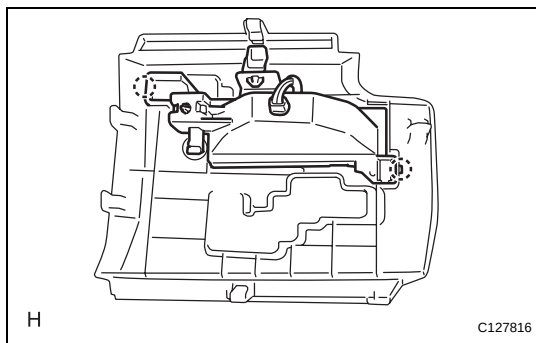
- (a) Install the spring and button and attach the claws to the position indicator light housing.

2. INSTALL INDICATOR LIGHT WIRE SUB-ASSEMBLY



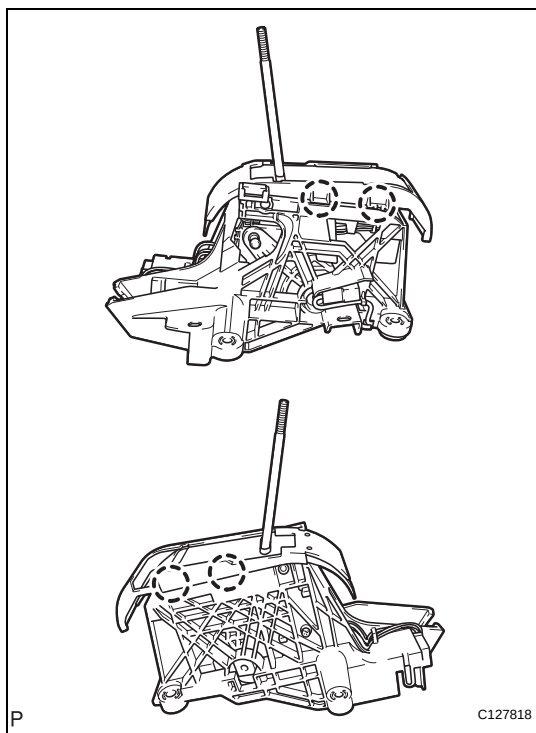
3. INSTALL POSITION INDICATOR LIGHT HOUSING

- (a) Install the indicator light housing and attach the 2 claws to the shift position indicator housing.



4. INSTALL LOWER POSITION INDICATOR HOUSING

- (a) Install the position indicator slide cover with slide No. 2 cover to the indicator housing.
- (b) Install the housing and attach the 4 claws to the floor shift assembly.

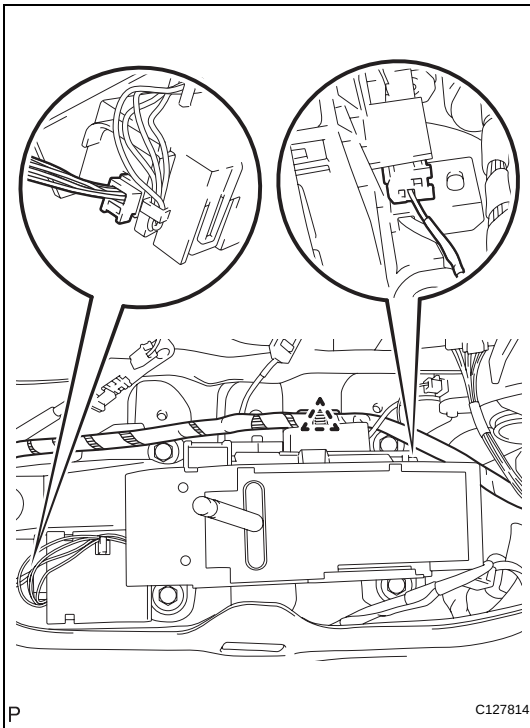


INSTALLATION

1. INSTALL FLOOR SHIFT ASSEMBLY

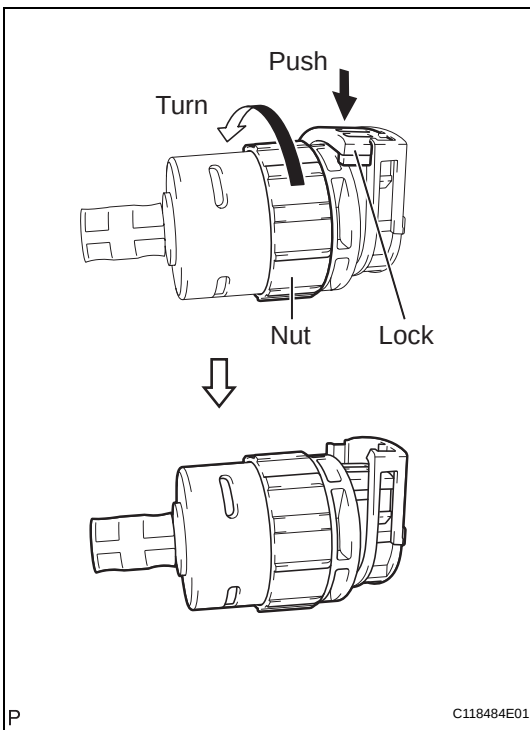
- Connect the 2 connectors and attach the clamp.
- Install the floor shift with the 4 bolts.

Torque: 12 N*m (122 kgf*cm, 9 ft.*lbf)



2. CONNECT TRANSMISSION CONTROL CABLE ASSEMBLY

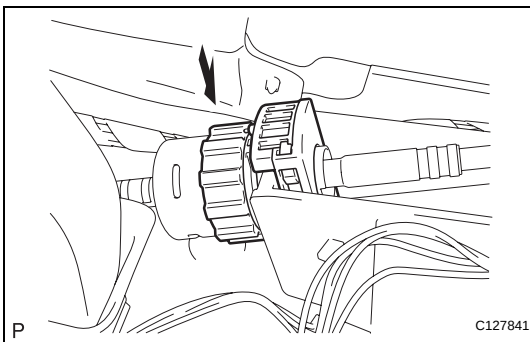
- Turn the nut of the control cable and push in the lock.

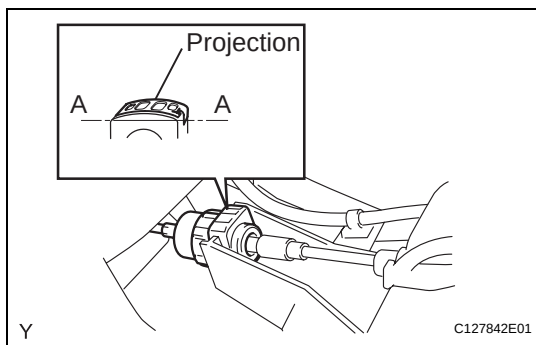


- Install the control cable onto the shift lever retainer.

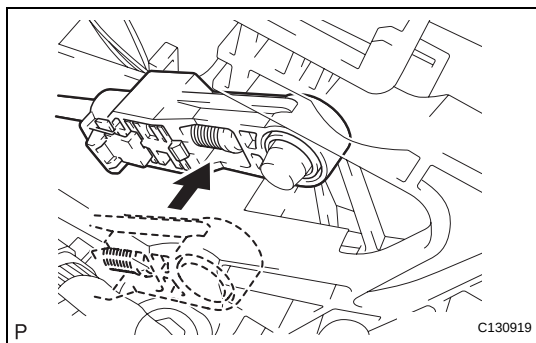
NOTICE:

- Install the cable with the protruding portion of the cable outer facing upward.





- After installing, check that the lock of the cable outer is protruding beyond portion A-A, as shown in the illustration.



- (c) Connect the control cable to the shift lever.

NOTICE:

Connect the control cable so that the adjusting mechanism lock of the control cable is installed on the driver side of the vehicle.

3. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
4. INSPECT SHIFT LEVER POSITION (See page [AX-164](#))
5. ADJUST SHIFT LEVER POSITION (See page [AX-164](#))
6. INSTALL REAR CONSOLE BOX SUB-ASSEMBLY
 - (a) Install the rear console box (see page [IP-28](#)).
7. INSTALL SHIFT LEVER KNOB SUB-ASSEMBLY

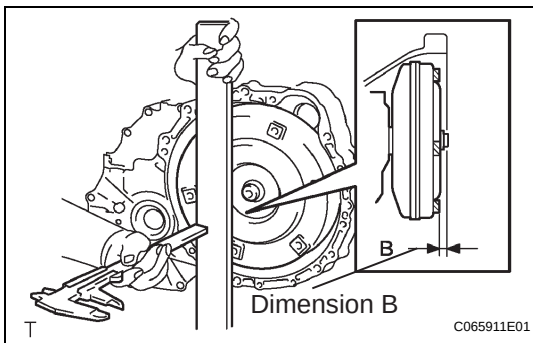
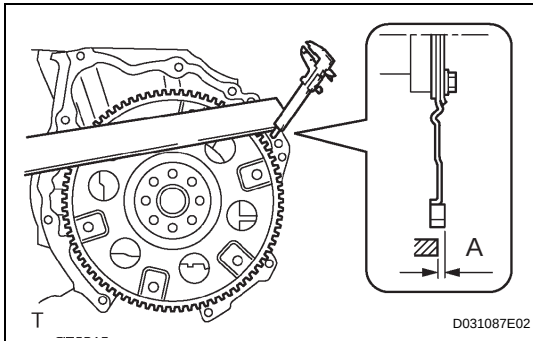
INSTALLATION

1. INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

- (a) Inspect the torque converter clutch (see page [AX-178](#)).

2. INSTALL TORQUE CONVERTER CLUTCH ASSEMBLY

- (a) Install the torque converter clutch to the automatic transaxle.
- (b) Using a vernier caliper, measure dimension A between the transaxle and end surface of the drive plate.



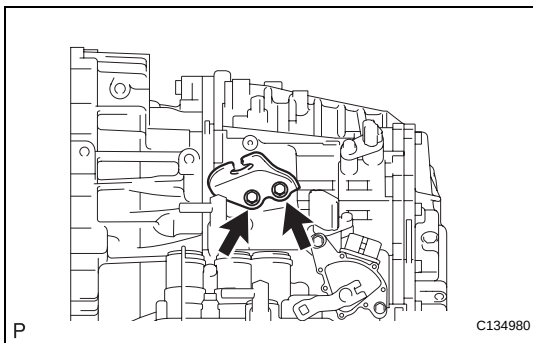
- (c) Using a vernier caliper and straightedge, measure dimension B shown in the illustration and check that B is greater than A.

Standard dimension:

A + 1.0 mm (0.039 in.) or more

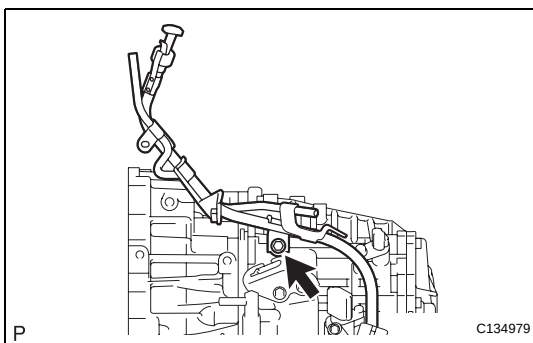
3. INSTALL AUTOMATIC TRANSMISSION CASE PROTECTOR

- (a) Install the protector with the 2 bolts.
Torque: 23 N*m (235 kgf*cm, 17 ft.*lbf)



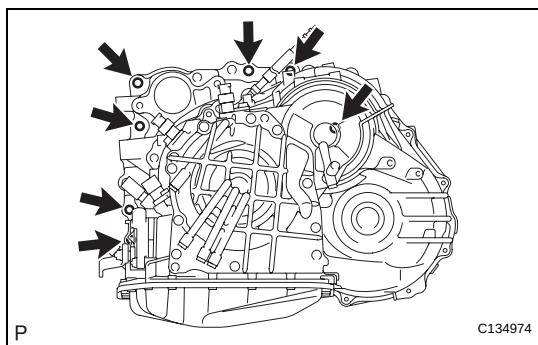
4. INSTALL NO. 1 TRANSMISSION CONTROL CABLE BRACKET

- (a) Install the cable bracket with the 2 bolts.
Torque: 12 N*m (122 kgf*cm, 9 ft.*lbf)



5. INSTALL TRANSMISSION OIL FILLER TUBE SUB-ASSEMBLY

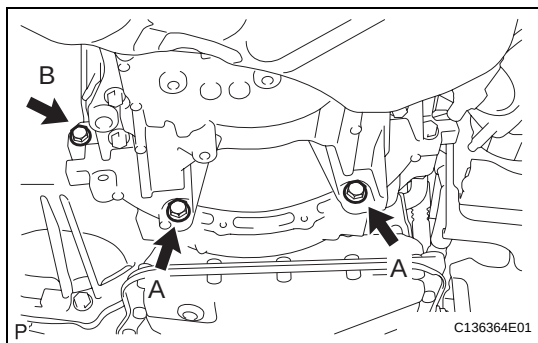
- (a) Install the filler tube with the bolt.
Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf)
- (b) Install the ATF dipstick.



6. INSTALL AUTOMATIC TRANSAXLE ASSEMBLY

- (a) Install the automatic transaxle to the engine with the 7 upper side mounting bolts.

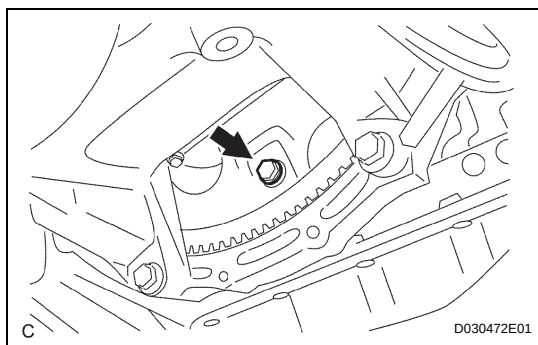
Torque: 64 N*m (653 kgf*cm, 47 ft.*lbf)



- (b) Install the 3 lower side mounting bolts.

Torque: 37 N*m (377 kgf*cm, 27 ft.*lbf) for bolt A

46 N*m (469 kgf*cm, 34 ft.*lbf) for bolt B

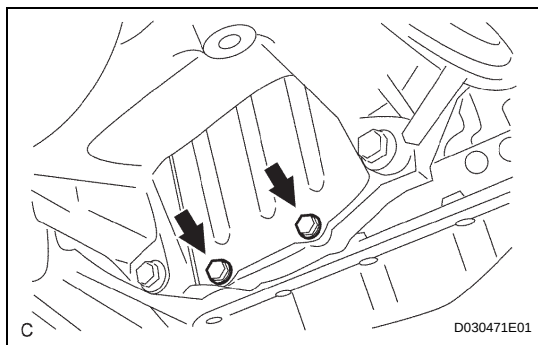


- (c) Install the 6 torque converter clutch mounting bolts.

Torque: 41 N*m (418 kgf*cm, 30 ft.*lbf)

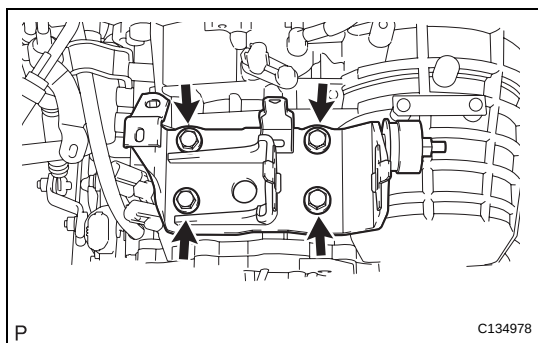
HINT:

First install the green colored bolt and then the other 5 bolts.



- (d) Install the flywheel housing under cover with the 2 bolts.

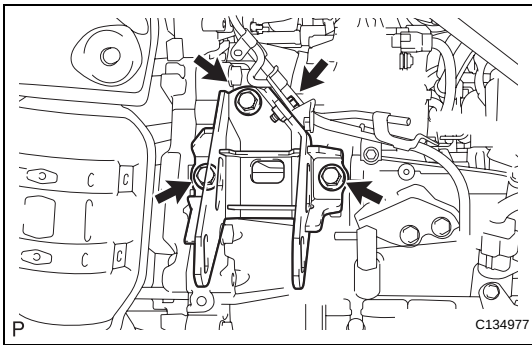
Torque: 7.8 N*m (80 kgf*cm, 69 in.*lbf)



7. INSTALL ENGINE MOUNTING BRACKET LH

- (a) Install the mounting bracket with the 4 bolts.

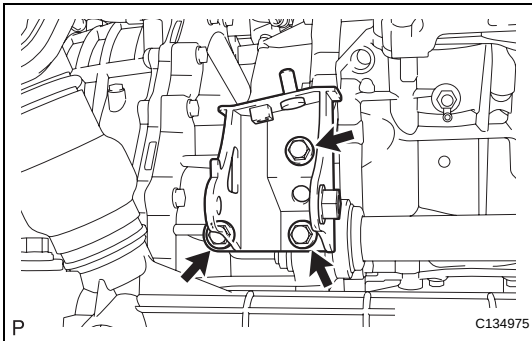
Torque: 64 N*m (653 kgf*cm, 47 ft.*lbf)

**8. INSTALL FRONT ENGINE MOUNTING BRACKET**

- (a) Install the mounting bracket with the 4 bolts.

Torque: 64 N*m (657 kgf*cm, 47 ft.*lbf)

Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf) for filler tube bolt

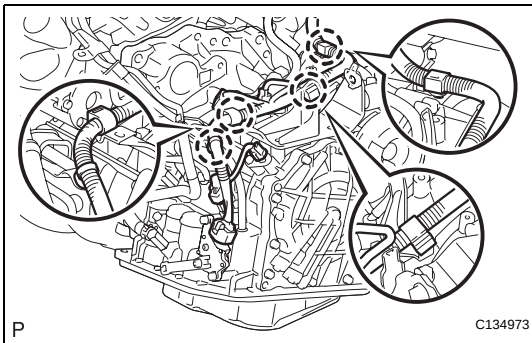
**9. INSTALL REAR ENGINE MOUNTING BRACKET**

- (a) Install the mounting bracket with the 3 bolts.

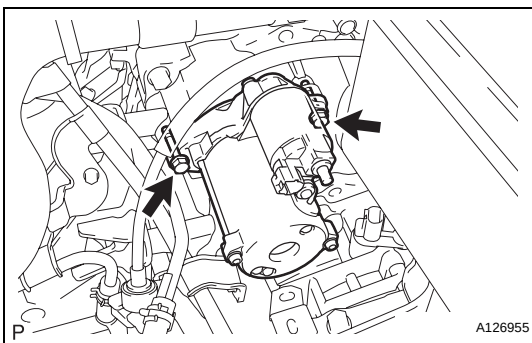
Torque: 45 N*m (459 kgf*cm, 33 ft.*lbf)

10. INSTALL TRANSMISSION OIL COOLER HOSES AND TUBE

- (a) Install the transmission oil cooler hoses and tube (see page [AX-152](#)).

**11. CONNECT WIRE HARNESS**

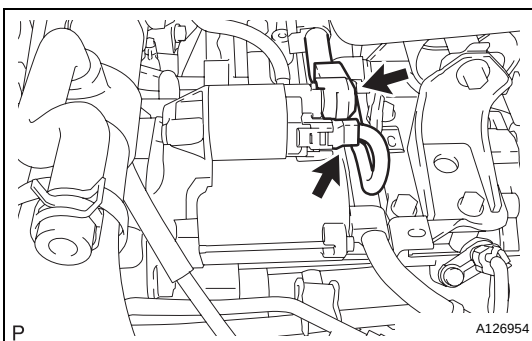
- (a) Connect the wire harness clamps.
 (b) Connect the 2 speed sensor connectors.
 (c) Connect the transaxle wire connector.
 (d) Connect the park/neutral position switch connector.

**12. INSTALL STARTER ASSEMBLY**

- (a) Install the starter with the 2 bolts.

Torque: 37 N*m (377 kgf*cm, 27 ft.*lbf)

- (b) Connect the starter connector.



- (c) Install the terminal nut and cover the nut with the cap.

Torque: 9.8 N*m (100 kgf*cm, 88 in.*lbf)

13. INSTALL ENGINE ASSEMBLY WITH TRANSAXLE

- (a) Install the engine with transaxle (see page [EM-31](#)).

14. ADD AUTOMATIC TRANSAXLE FLUID

Fluid type:

Toyota Genuine ATF WS

15. INSPECT AUTOMATIC TRANSAXLE FLUID

- (a) Inspect the automatic transaxle fluid (see page [AX-126](#)).

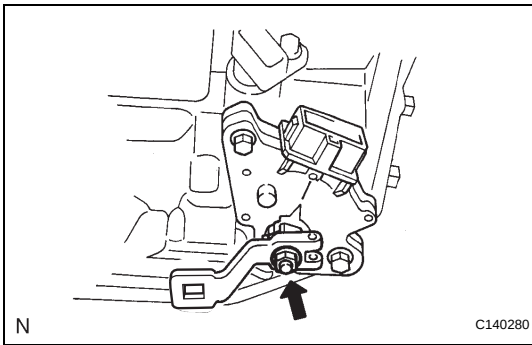
16. PERFORM RESET MEMORY

- (a) Perform the RESET MEMORY procedures (A/T initialization) (see page [AX-20](#)).

DISASSEMBLY

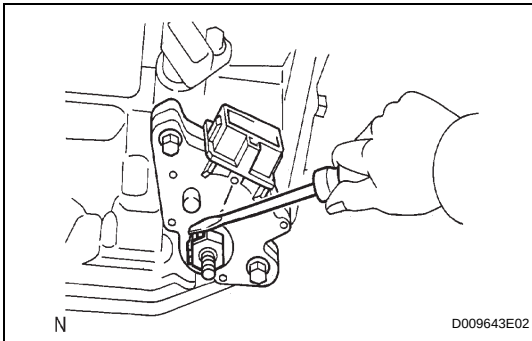
1. REMOVE PARK/NEUTRAL POSITION SWITCH ASSEMBLY

(a) Remove the nut, washer and control shaft lever.



(b) Using a screwdriver, pry off the lock plate.

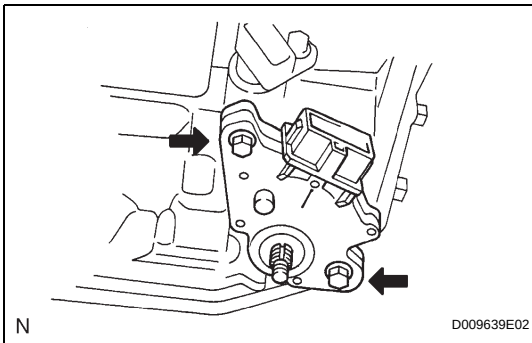
(c) Remove the nut and lock plate.



(d) Remove the 2 bolts and pull out the switch.

2. REMOVE BREATHER PLUG HOSE

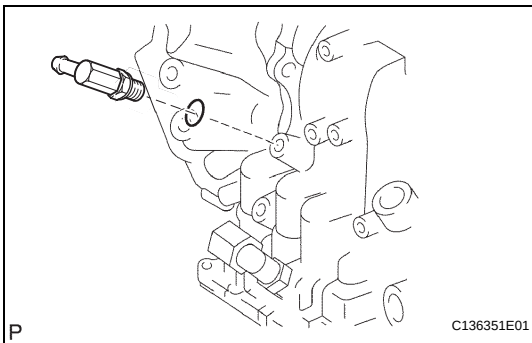
(a) Remove the breather plug hose from the transaxle case.



3. REMOVE OIL COOLER OUTLET TUBE ELBOW

(a) Remove the elbow.

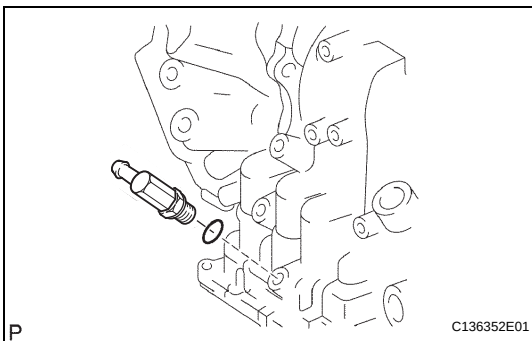
(b) Remove the O-ring from the elbow.

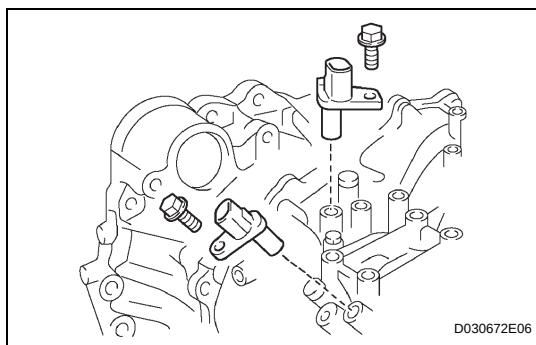


4. REMOVE OIL COOLER INLET TUBE ELBOW

(a) Remove the elbow.

(b) Remove the O-ring from the elbow.



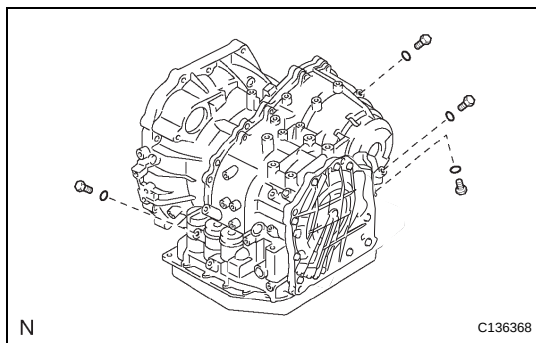


5. REMOVE SPEED SENSOR

- (a) Remove the 2 bolts and the 2 speed sensors from the transaxle.

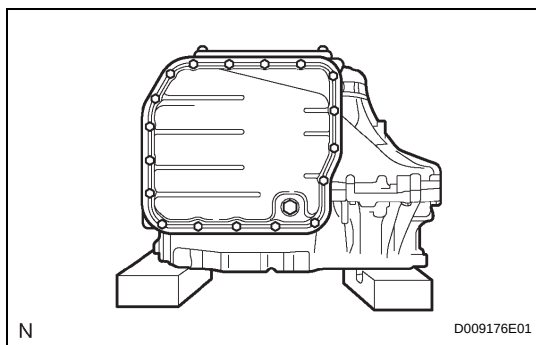
6. REMOVE SPEEDOMETER DRIVEN HOLE COVER SUB-ASSEMBLY

- (a) Remove the bolt and cover.
(b) Remove the O-ring from the cover.



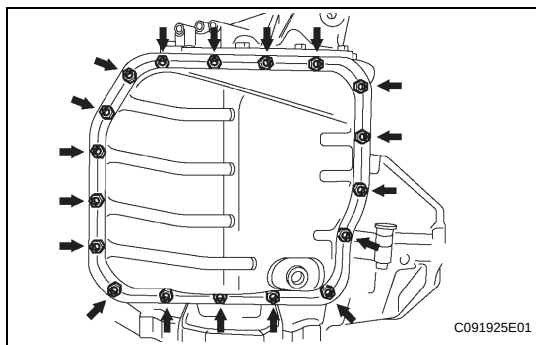
7. REMOVE NO. 1 TRANSAXLE CASE PLUG

- (a) Remove the 4 plugs from the transaxle case.
(b) Remove the 4 O-rings from the 4 plugs.



8. FIX AUTOMATIC TRANSAXLE ASSEMBLY

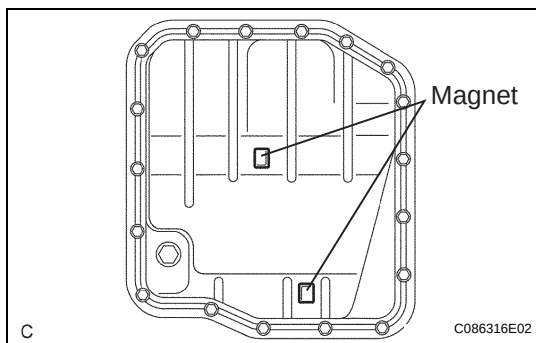
- (a) Fix the transaxle.

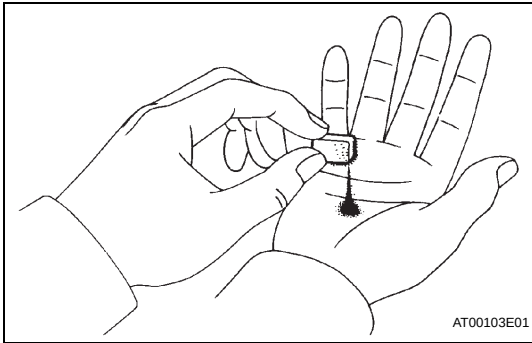


9. REMOVE AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY

- (a) Remove the 18 bolts, oil pan and gasket.

- (b) Remove the 2 magnets from the oil pan.



**10. INSPECT TRANSMISSION OIL CLEANER MAGNET**

- (a) Remove the magnets and use them to collect any steel chips. Examine the chips and particles in the pan and on the magnet to determine what type of wear has occurred in the transaxle.

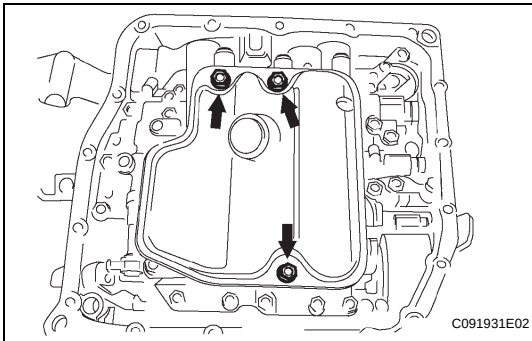
Result:

Steel (magnetic):

Wear of the bearing, gear and plate

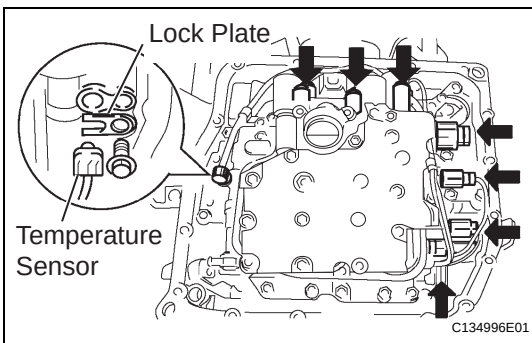
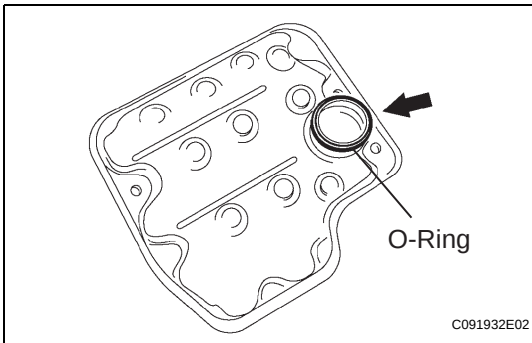
Brass (non-magnetic):

Wear of the bush

**11. REMOVE VALVE BODY OIL STRAINER ASSEMBLY**

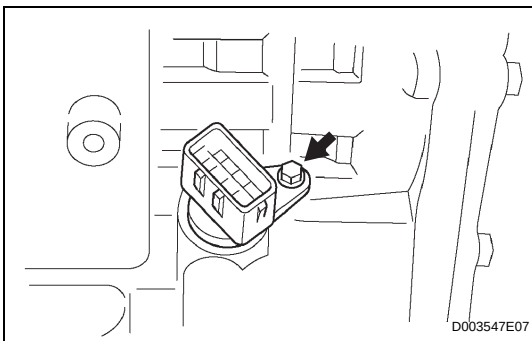
- (a) Remove the 3 bolts and oil strainer.

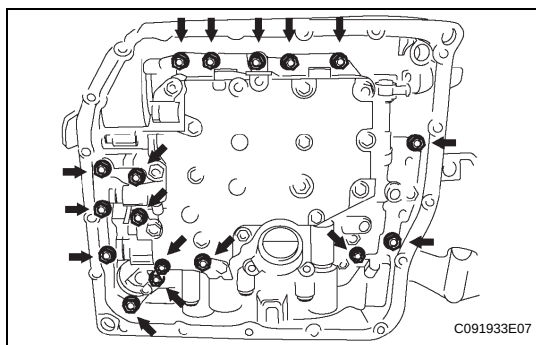
- (b) Remove the O-ring from the oil strainer.

**12. REMOVE TRANSMISSION WIRE**

- (a) Remove the 7 connectors from the shift solenoid valves.
- (b) Remove the bolt, lock plate and temperature sensor.

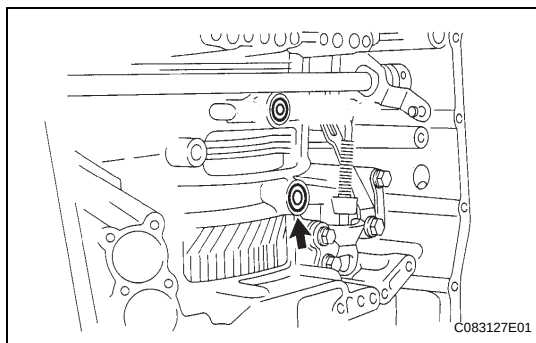
- (c) Remove the bolt and transmission wire from the transaxle case.





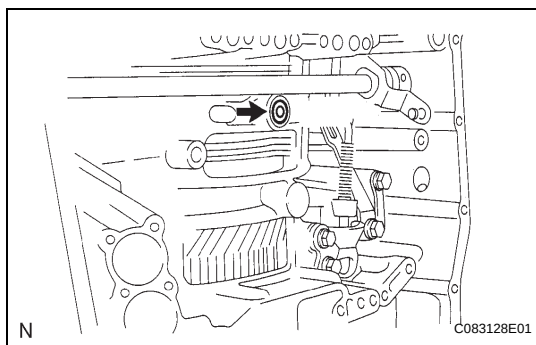
13. REMOVE TRANSMISSION VALVE BODY ASSEMBLY

- (a) Support the valve body and remove the 17 bolts and valve body.



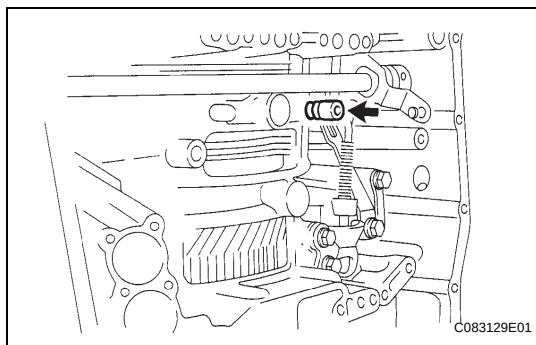
14. REMOVE NO. 1 GOVERNOR APPLY GASKET

- (a) Remove the gasket from the transaxle case.



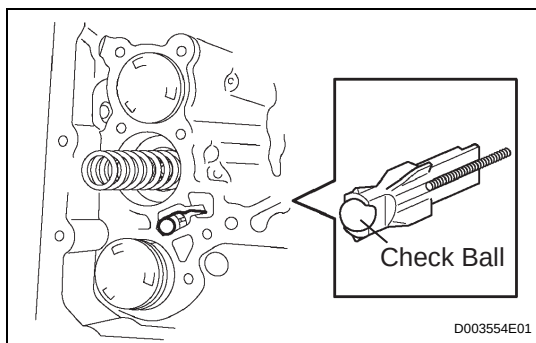
15. REMOVE TRANSAXLE CASE 2ND BRAKE GASKET

- (a) Remove the gasket from the transaxle case.



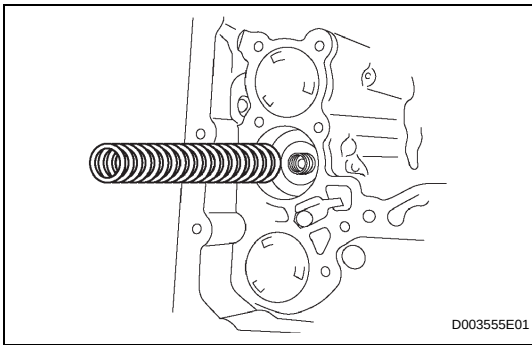
16. REMOVE BRAKE DRUM GASKET

- (a) Remove the gasket from the transaxle case.



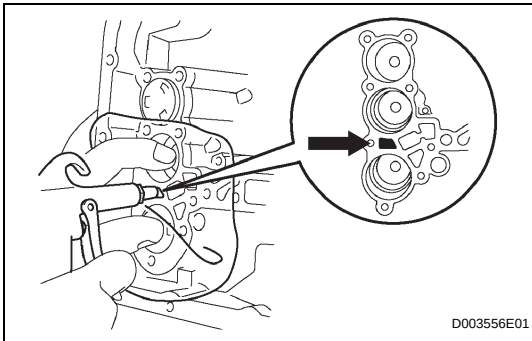
17. REMOVE CHECK BALL BODY

- (a) Remove the check ball body and spring from the transaxle case.



18. REMOVE C-3 ACCUMULATOR PISTON

- (a) Remove the spring from the C-3 accumulator piston.

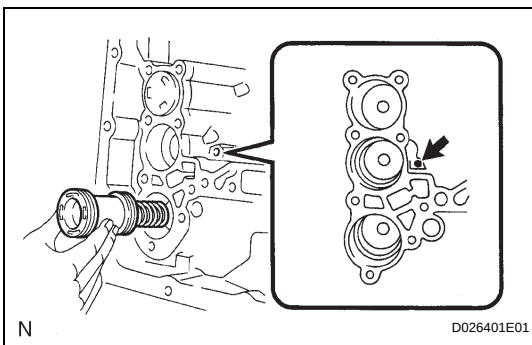
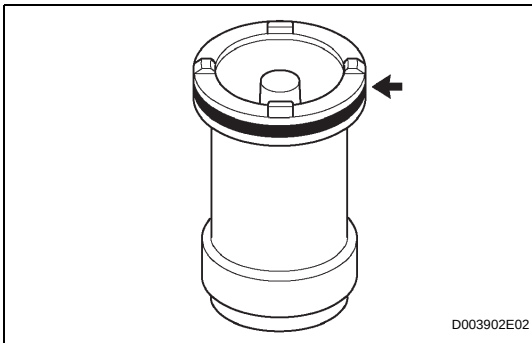


- (b) Apply compressed air (392 kPa, 4.0 kgf/cm², 57 psi) to the oil hole and remove the C-3 accumulator piston.

NOTICE:

- Applying compressed air may cause the piston to jump out. When removing the piston, hold it using a waste cloth.
- Take care not to splash ATF when applying compressed air.

- (c) Remove the O-ring from the C-3 accumulator piston.



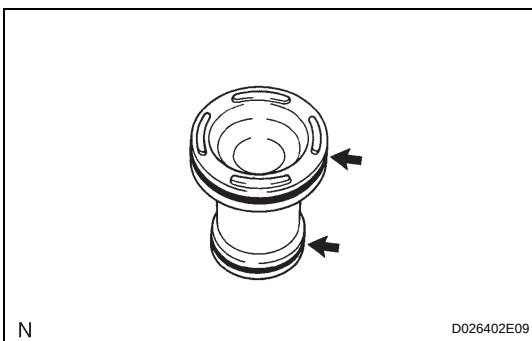
19. REMOVE REVERSE CLUTCH ACCUMULATOR PISTON

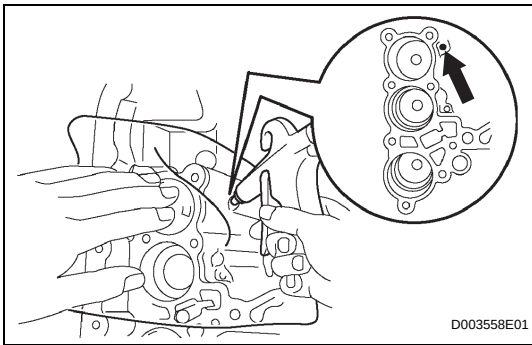
- (a) Apply compressed air (392 kPa, 4.0 kgf/cm², 57 psi) to the oil hole and remove the reverse accumulator piston and spring.

NOTICE:

- Applying compressed air may cause the piston to jump out. When removing the piston, hold it using a waste cloth.
- Take care not to splash ATF when applying compressed air.

- (b) Remove the 2 O-rings from the reverse clutch accumulator piston.





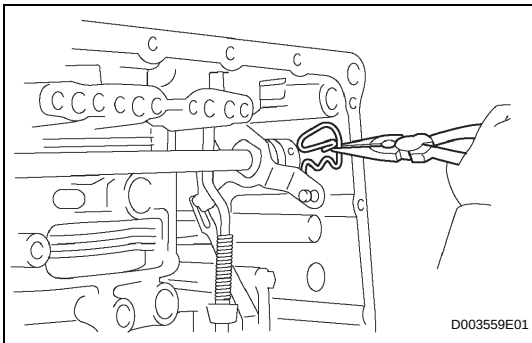
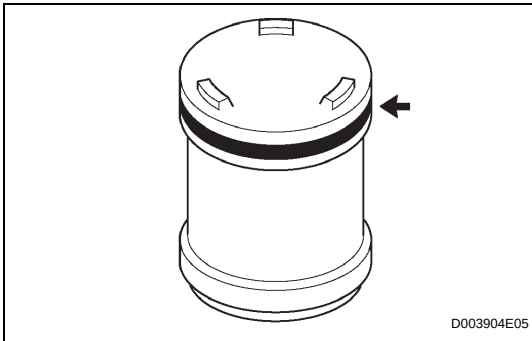
20. REMOVE B-3 ACCUMULATOR PISTON

- (a) Apply compressed air (392 kPa, 4.0 kgf/cm², 57 psi) to the oil hole and remove the B-3 accumulator piston and 2 springs.

NOTICE:

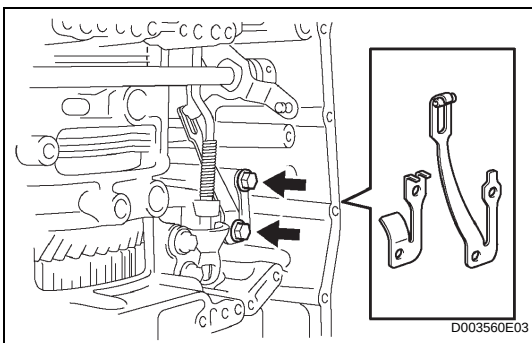
- Applying compressed air may cause the piston to jump out. When removing the piston, hold it using a waste cloth.
- Take care not to splash ATF when applying compressed air.

- (b) Remove the O-ring from the B-3 accumulator piston.



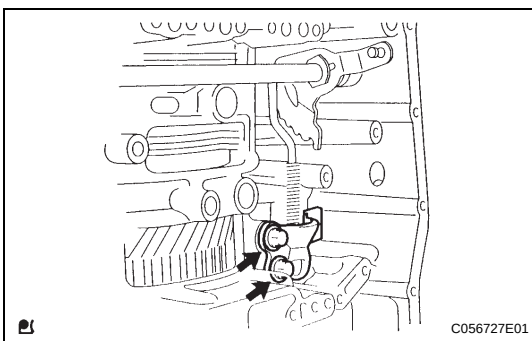
21. REMOVE MANUAL VALVE LEVER SHAFT RETAINER SPRING

- (a) Using needle-nose pliers, remove the manual valve lever shaft retainer spring.



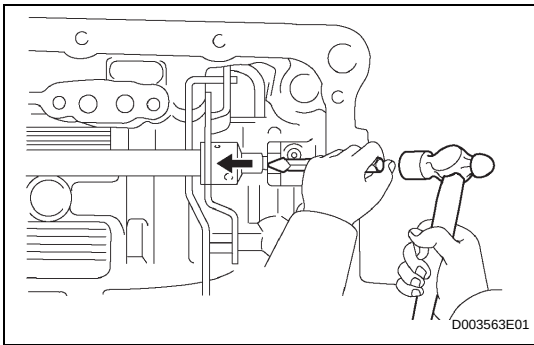
22. REMOVE MANUAL DETENT SPRING SUB-ASSEMBLY

- (a) Remove the 2 bolts, manual detent spring and cover.

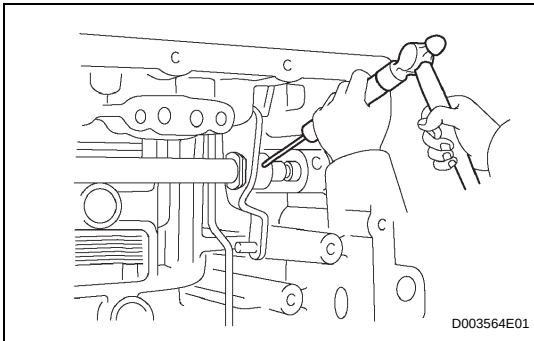


23. REMOVE PARKING LOCK PAWL BRACKET

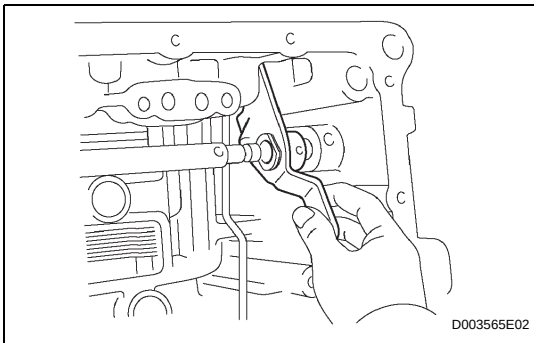
- (a) Remove the 2 bolts and parking lock pawl bracket.



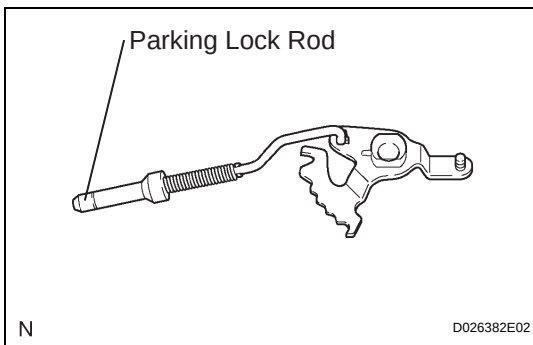
- 24. REMOVE MANUAL VALVE LEVER SUB-ASSEMBLY**
 (a) Using a chisel and hammer, cut off and remove the spacer.



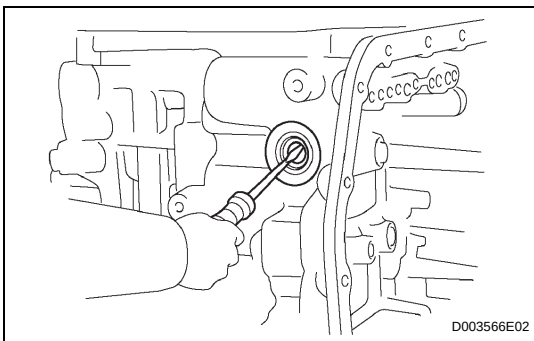
- (b) Using a pin punch ($\phi 35$ mm) and hammer, drive out the pin.
HINT:
 Slowly drive out the pin so that it does not fall into the transaxle case.



- (c) Remove the manual valve lever shaft and manual valve lever.



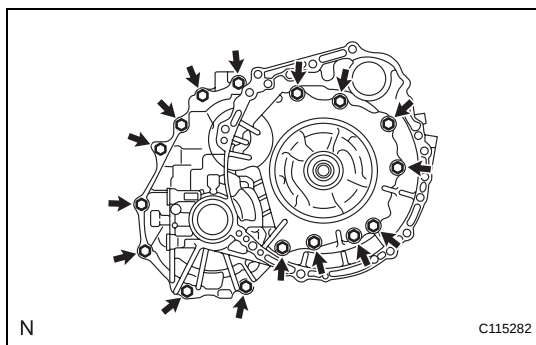
- 25. REMOVE PARKING LOCK ROD SUB-ASSEMBLY**
 (a) Remove the parking lock rod from the manual valve lever.



- 26. REMOVE MANUAL VALVE LEVER SHAFT OIL SEAL**
 (a) Using a screwdriver, pry out the oil seal from the transaxle case.
NOTICE:
 Do not apply excessive force when removing the oil seal.

- 27. FIX AUTOMATIC TRANSAXLE ASSEMBLY**
 (a) Fix the transaxle case in place with the oil pump side facing up.

- 28. INSPECT INPUT SHAFT ENDPLAY** (See page [AX-212](#))

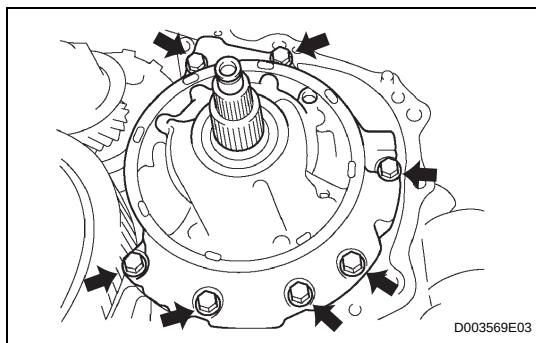


29. REMOVE TRANSAXLE HOUSING

- (a) Remove the 16 bolts.
- (b) Tap on the circumference of the transaxle housing with a plastic-faced hammer to remove the transaxle housing from the transaxle case.

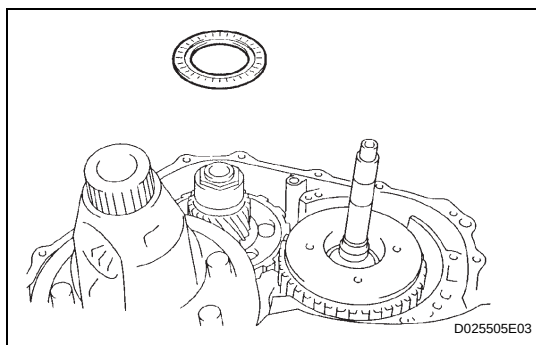
NOTICE:

The differential may be accidentally removed when the transaxle housing is removed.



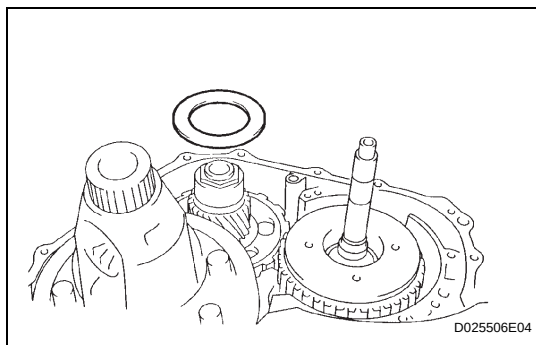
30. REMOVE OIL PUMP ASSEMBLY

- (a) Remove the 7 bolts and oil pump from the transaxle case.



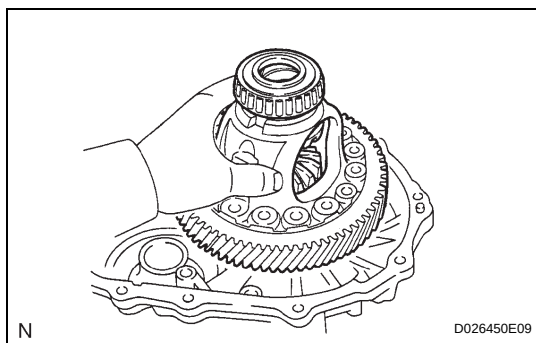
31. REMOVE THRUST NEEDLE ROLLER BEARING

- (a) Remove the thrust needle roller bearing from the underdrive planetary gear.



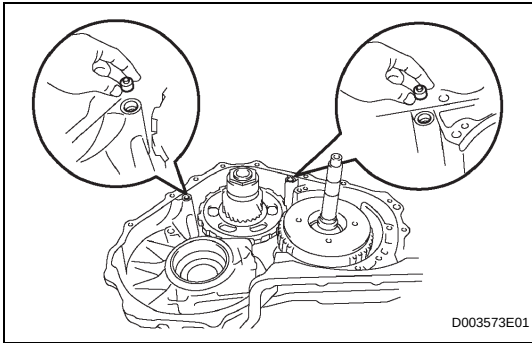
32. REMOVE NO. 2 THRUST BEARING UNDERDRIVE RACE

- (a) Remove the thrust bearing race from the underdrive planetary gear.

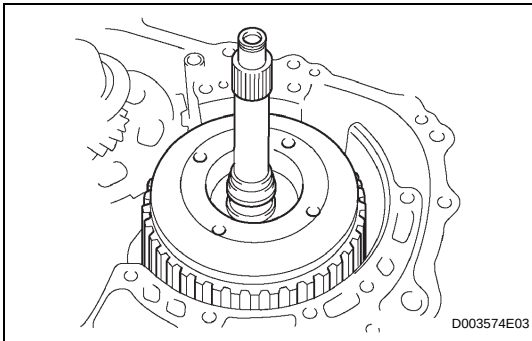


33. REMOVE DIFFERENTIAL GEAR ASSEMBLY

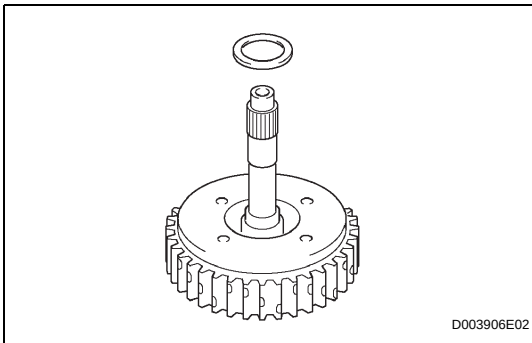
- (a) Remove the differential gear from the transaxle case.

**34. REMOVE OVERDRIVE BRAKE GASKET**

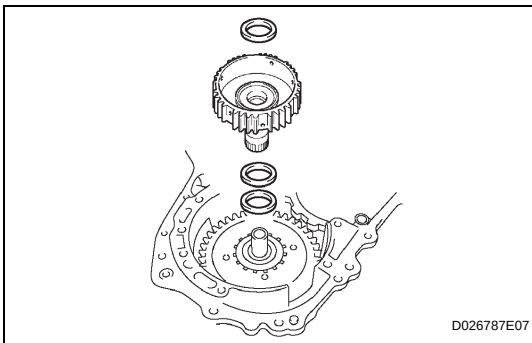
- (a) Remove the 2 overdrive brake gaskets from the transaxle case.

**35. REMOVE FORWARD CLUTCH ASSEMBLY**

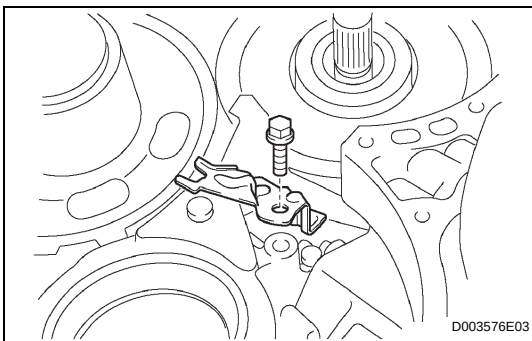
- (a) Remove the forward clutch from the transaxle case.



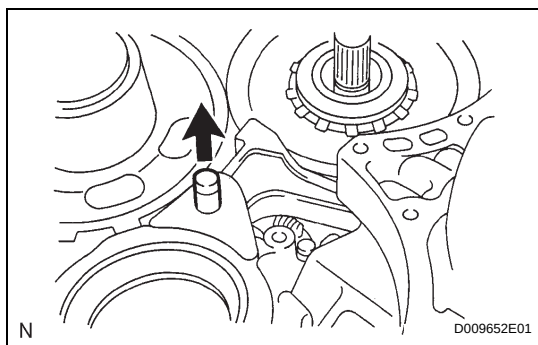
- (b) Remove the thrust needle roller bearing from the forward clutch.

**36. REMOVE MULTIPLE DISC CLUTCH HUB**

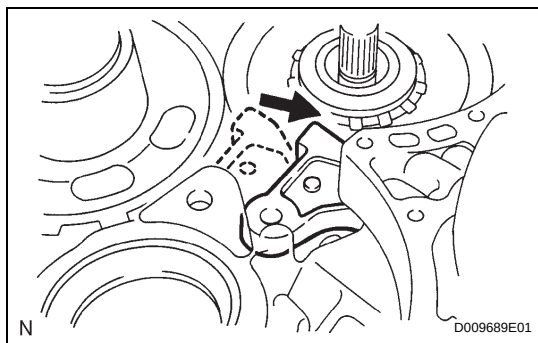
- (a) Remove the thrust needle roller bearing, multiple disc clutch hub, thrust needle roller bearing and No. 1 thrust bearing race from the transaxle case.

37. INSPECT MULTIPLE DISC CLUTCH HUB (See page [AX-209](#))**38. REMOVE UNDERDRIVE PLANETARY GEAR ASSEMBLY**

- (a) Remove the bolt and pawl shaft clamp.



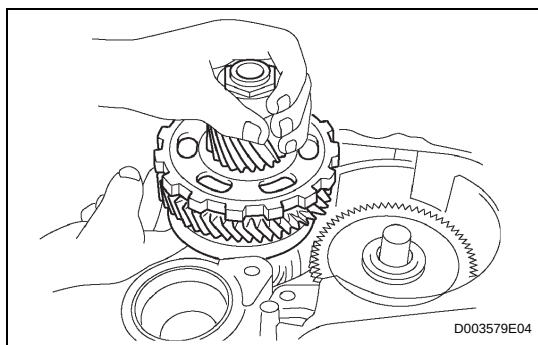
(b) Remove the parking lock pawl shaft.



(c) Push the parking lock pawl.

HINT:

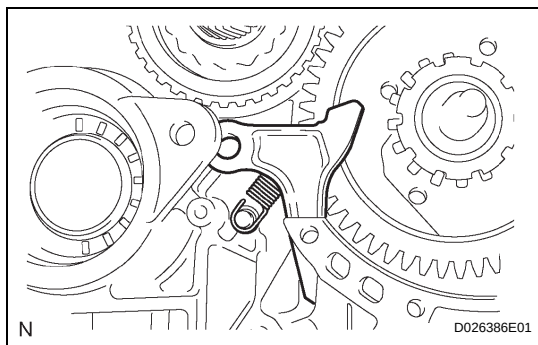
Failure to do so will cause interference when the underdrive planetary gear is removed.



(d) Remove the underdrive planetary gear from the transaxle case.

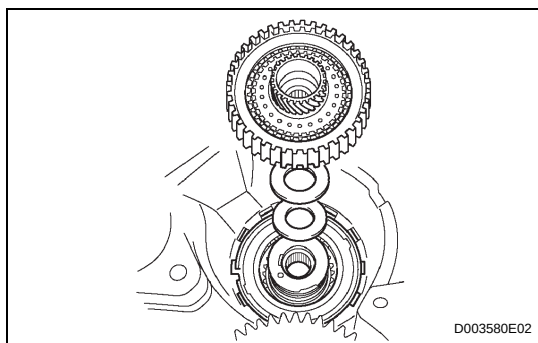
NOTICE:

Make sure that the underdrive planetary gear does not fall out.



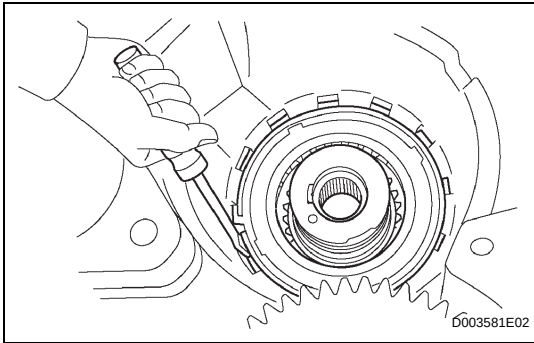
39. REMOVE PARKING LOCK PAWL

(a) Remove the spring, pawl pin and parking lock pawl.



40. REMOVE UNDERDRIVE CLUTCH ASSEMBLY

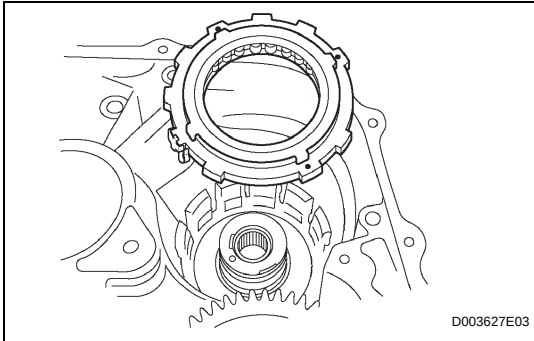
(a) Remove the underdrive clutch, thrust bearing and bearing race from the transaxle case.

**41. REMOVE UNDERDRIVE 1-WAY CLUTCH ASSEMBLY**

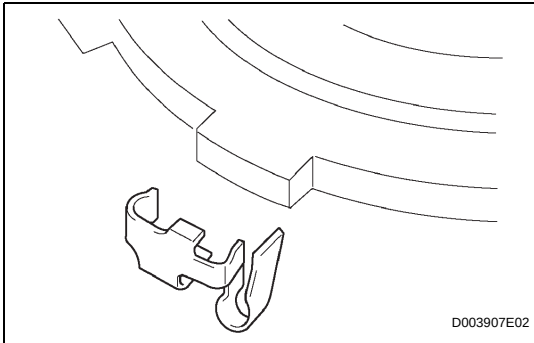
- (a) Using a screwdriver, remove the snap ring from the transaxle case.

NOTICE:

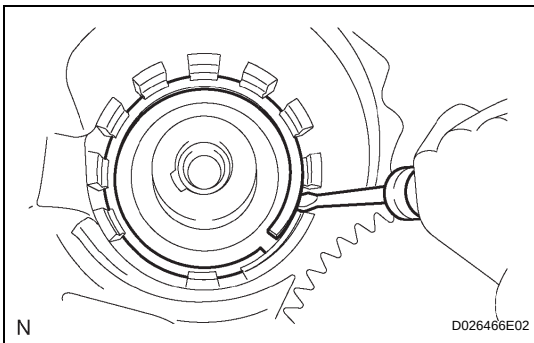
Do not apply excessive force when removing the snap ring.



- (b) Remove the underdrive 1-way clutch from the transaxle case.



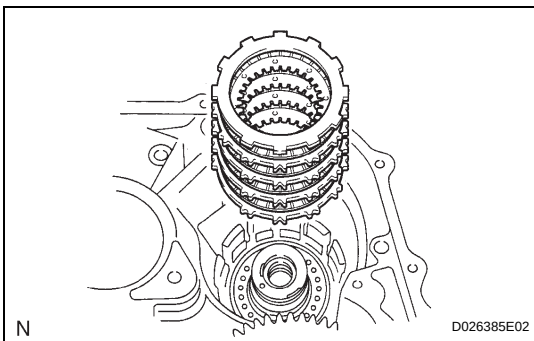
- (c) Remove the outer race retainer from the 1-way clutch.

**42. REMOVE NO. 2 UNDERDRIVE CLUTCH DISC**

- (a) Using a screwdriver, remove the snap ring.

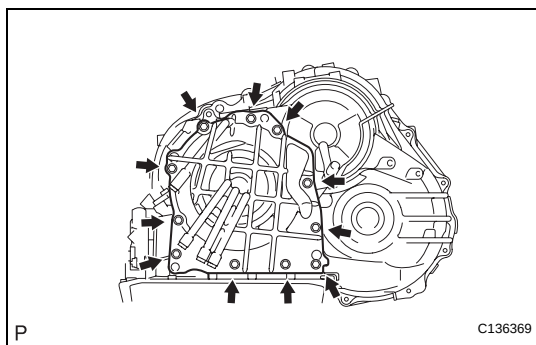
NOTICE:

Do not apply excessive force when removing the snap ring.



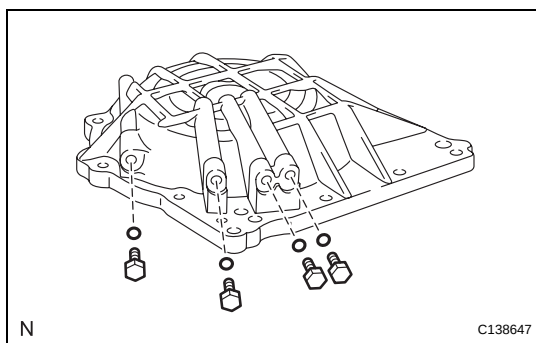
- (b) Remove the flange, 4 discs and 4 plates from the transaxle case.

43. INSPECT NO. 2 UNDERDRIVE CLUTCH DISC (See page [AX-209](#))



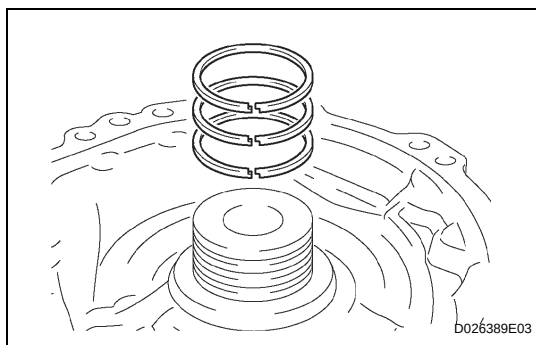
44. REMOVE TRANSAXLE REAR COVER SUB-ASSEMBLY

- (a) Remove the 11 bolts.
- (b) Tap on the circumference of the rear cover with a plastic hammer to remove the transaxle rear cover from the transaxle case.



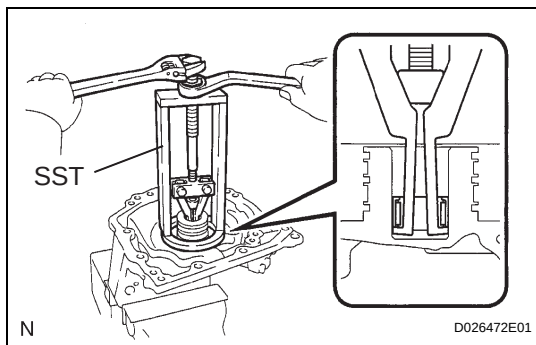
45. REMOVE NO. 1 TRANSAXLE CASE PLUG

- (a) Remove the 4 plugs from the transaxle rear cover.
- (b) Remove the 4 O-rings from the 4 plugs.



46. REMOVE REAR CLUTCH OIL SEAL RING OUTER

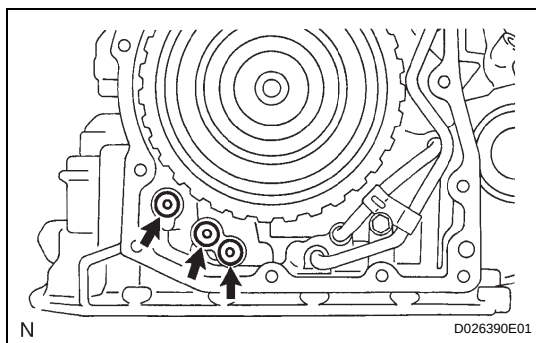
- (a) Remove the 3 rear clutch oil seal rings from the transaxle rear cover.



47. REMOVE NEEDLE ROLLER BEARING

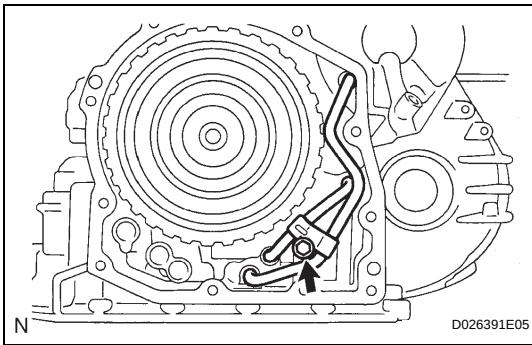
- (a) Using SST, remove the bearing from the transaxle rear cover.

SST 09387-00041 (09387-01021, 09387-01030, 09387-01040)



48. REMOVE NO. 1 GOVERNOR APPLY GASKET

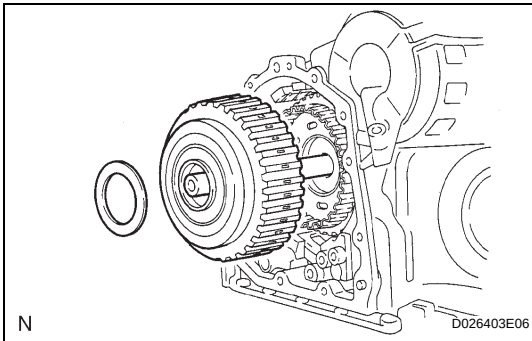
- (a) Using a screwdriver, remove the 3 apply gaskets.

**49. REMOVE BRAKE APPLY TUBE**

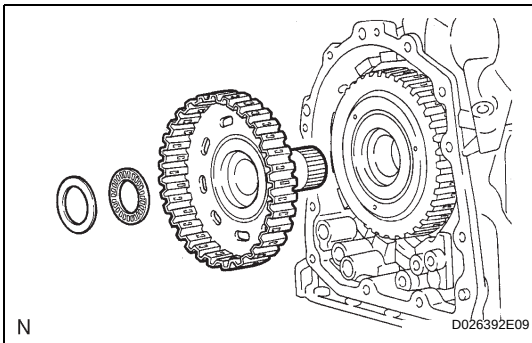
- (a) Remove the bolt, clamp and brake apply tube.
- (b) Remove the clutch apply tube.
- (c) Remove the brake apply tube from the clamp.

NOTICE:

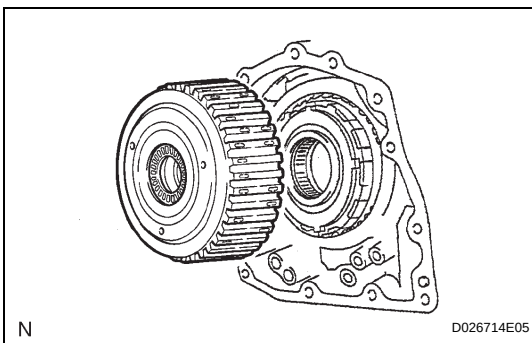
Do not bend the tubes.

**50. REMOVE DIRECT CLUTCH ASSEMBLY**

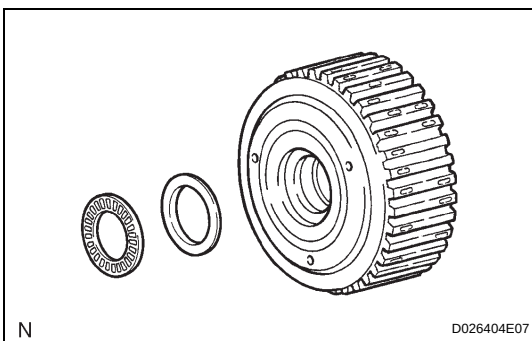
- (a) Remove the thrust bearing and the direct clutch from the transaxle case.

**51. REMOVE OVERDRIVE DIRECT CLUTCH HUB SUB-ASSEMBLY**

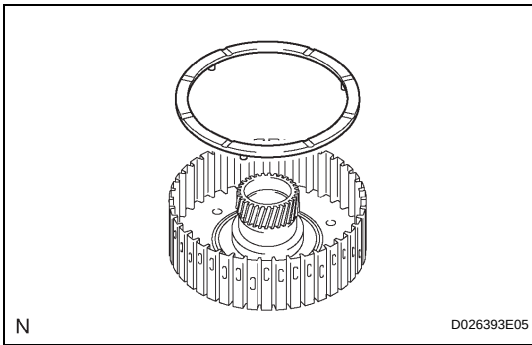
- (a) Remove the thrust bearing race, thrust bearing and overdrive direct clutch hub from the planetary gear.

52. INSPECT OVERDRIVE DIRECT CLUTCH DRUM SUB-ASSEMBLY (See page [AX-209](#))**53. REMOVE REAR PLANETARY SUN GEAR ASSEMBLY**

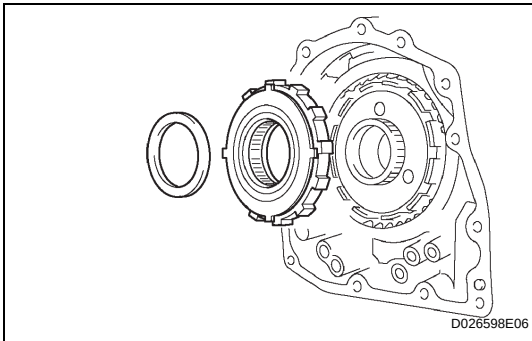
- (a) Remove the rear planetary sun gear from the transaxle case.



- (b) Remove the thrust needle roller bearing and thrust bearing race from the rear planetary sun gear.

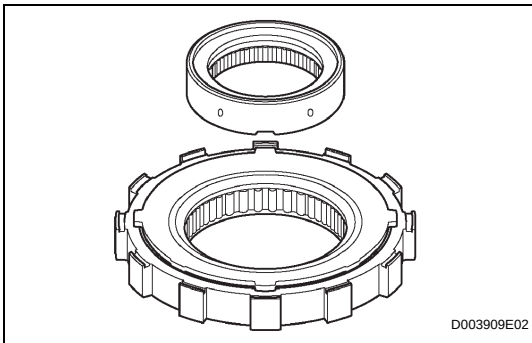


- (c) Remove the planetary carrier thrust washer from the rear planetary sun gear.

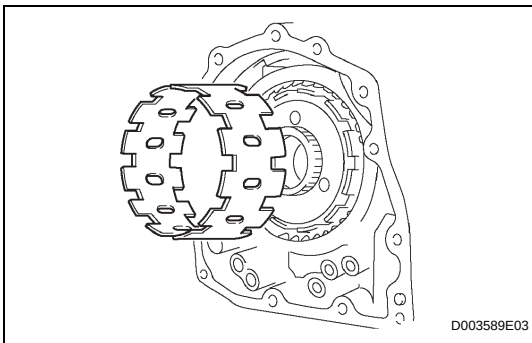


54. REMOVE 1-WAY CLUTCH ASSEMBLY

- (a) Remove the 1-way clutch and thrust needle roller bearing from the transaxle case.

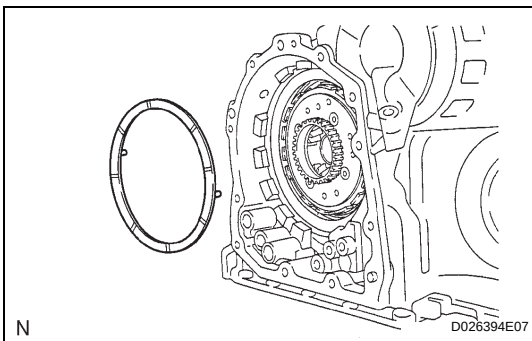


- (b) Remove the 1-way clutch inner race from the 1-way clutch.



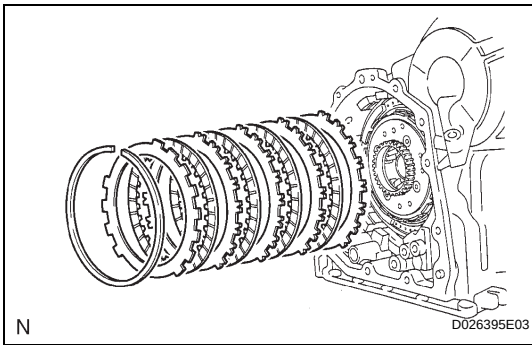
55. REMOVE 1-WAY CLUTCH SLEEVE OUTER

- (a) Remove the 1-way clutch sleeve outer from the transaxle case.

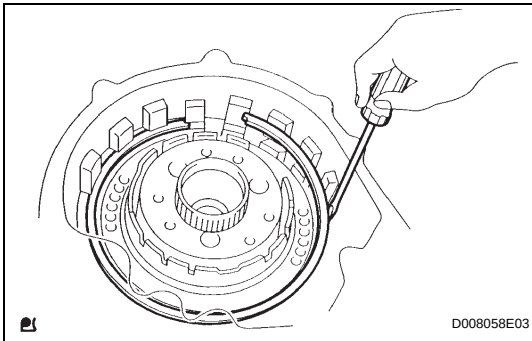


56. REMOVE NO. 1 PLANETARY CARRIER THRUST WASHER

- (a) Remove the planetary carrier thrust washer from the planetary gear.

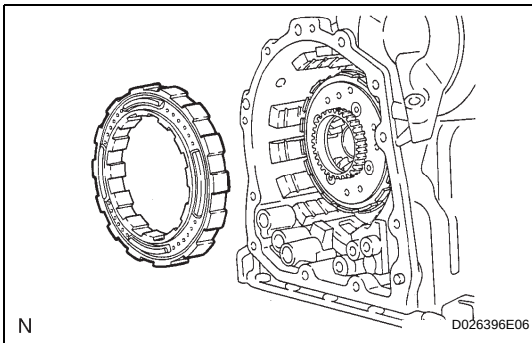
**57. REMOVE 2ND BRAKE CLUTCH DISC**

- (a) Using a screwdriver, remove the snap ring.
- (b) Remove the flange, 4 discs and 4 plates from the transaxle case.

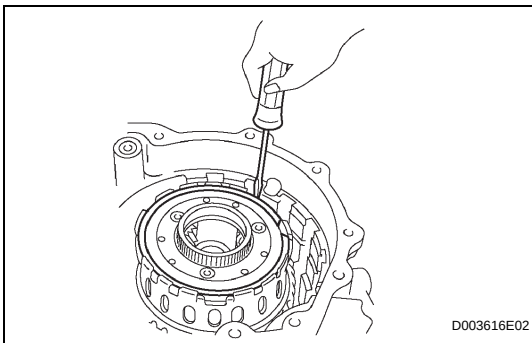
58. INSPECT 2ND BRAKE CLUTCH DISC (See page [AX-210](#))**59. REMOVE 2ND BRAKE PISTON ASSEMBLY**

- (a) Using a screwdriver, remove the snap ring.

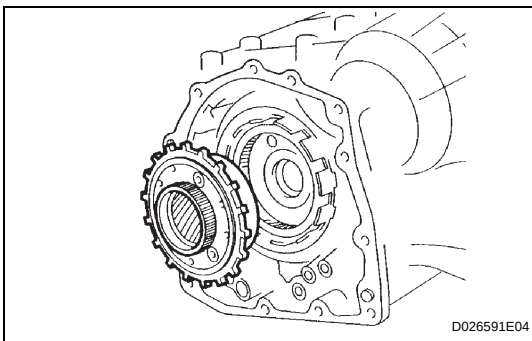
- (b) Remove the 2nd brake piston from the transaxle case.

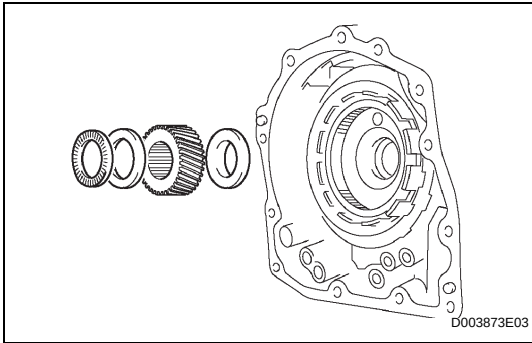
**60. REMOVE REAR PLANETARY GEAR ASSEMBLY**

- (a) Using a screwdriver, remove the snap ring.



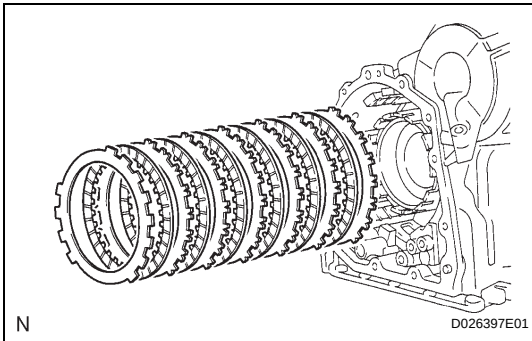
- (b) Remove the rear planetary gear from the transaxle case.





61. REMOVE INPUT SUN GEAR

- (a) Remove the 2 thrust needle roller bearings, thrust bearing race and input sun gear from the transaxle case.

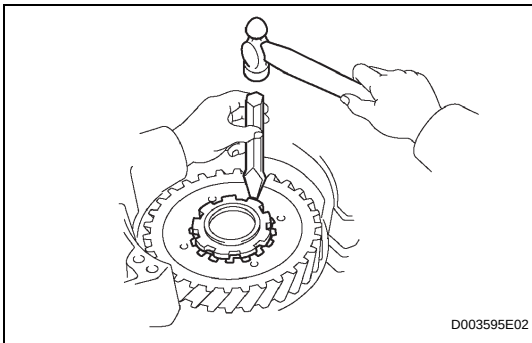


62. REMOVE 1ST AND REVERSE BRAKE CLUTCH DISC

- (a) Remove the flange, 6 discs and 6 plates from the transaxle case.

63. INSPECT 1ST AND REVERSE BRAKE CLUTCH DISC

(See page [AX-210](#))



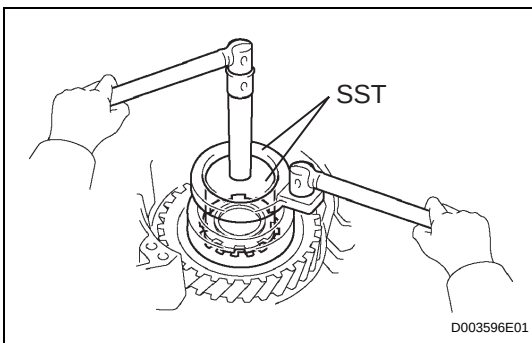
64. REMOVE FRONT PLANETARY GEAR ASSEMBLY

- (a) Using a chisel and hammer, unstick the lock washer.

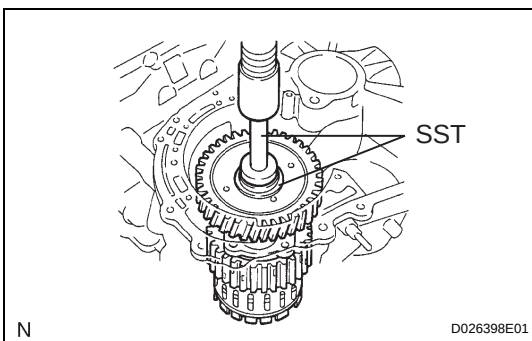
NOTICE:

Push down all the claws of the washer.

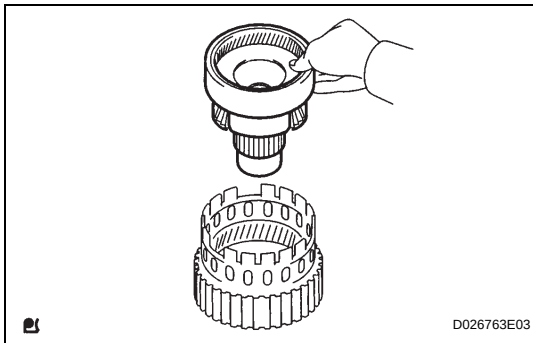
Otherwise SST cannot be fully pressed against the nut, and cannot loosen the nut.



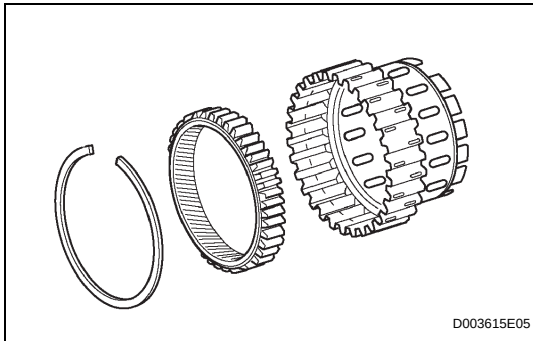
- (b) Using SST, remove the nut.
SST 09387-00030, 09387-00080



- (c) Using SST and a press, press out the front planetary gear from the counter drive gear.
SST 09950-60010 (09951-00450), 09950-70010 (09951-07100)

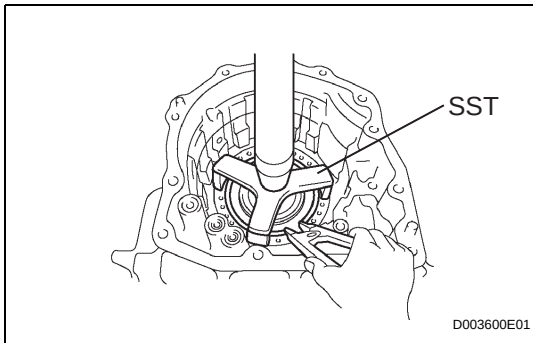


- (d) Remove the front planetary gear from the brake hub.



65. REMOVE FRONT PLANETARY RING GEAR

- (a) Using a screwdriver, remove the snap ring and front planetary ring gear from the brake hub.



66. REMOVE 1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY

- (a) Place SST on the return spring, and compress the return spring with a press.

NOTICE:

Stop the press when the spring seat is lowered 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove to prevent the spring seat from being deformed.

SST 09387-00070

- (b) Using a snap ring expander, remove the snap ring.

NOTICE:

Do not expand the snap ring excessively.

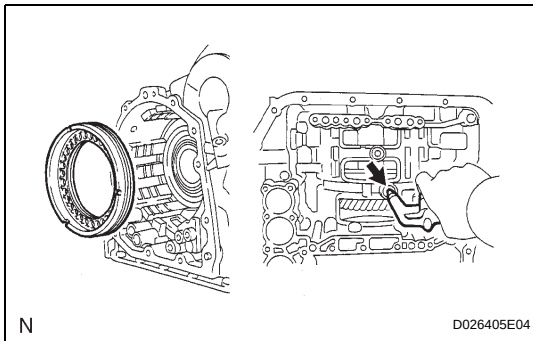
67. INSPECT 1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY (See page [AX-210](#))

68. REMOVE 1ST AND REVERSE BRAKE PISTON

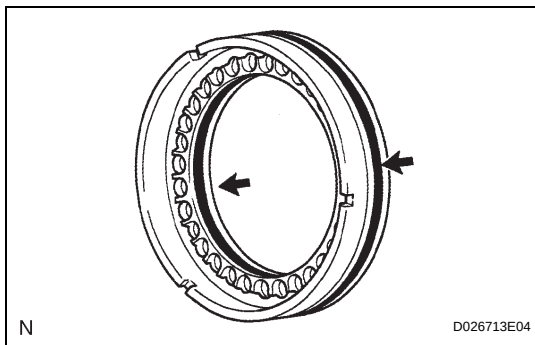
- (a) Apply compressed air (392 kPa, 4.0 kgf/cm², 57 psi) to the transaxle case to remove the 1st and reverse brake piston.

NOTICE:

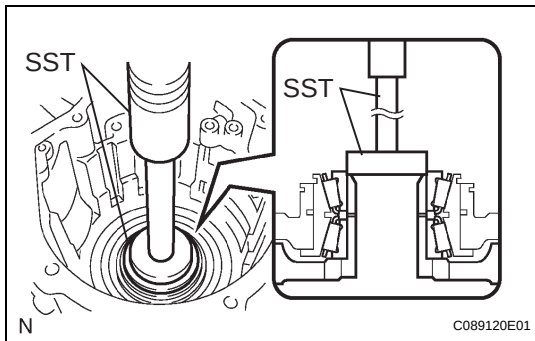
- Applying compressed air may cause the piston to jump out. When removing the piston, hold it using a waste cloth.
- Take care not to splash ATF when applying compressed air.



N

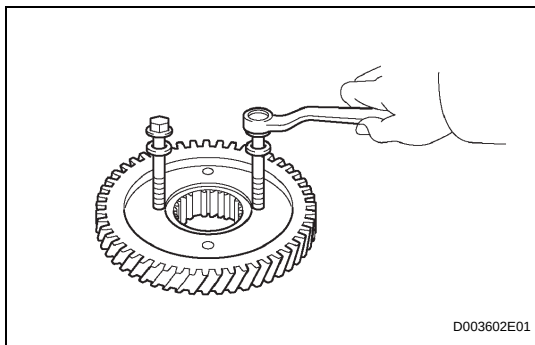


- (b) Remove the 2 O-rings from the 1st and reverse brake piston.

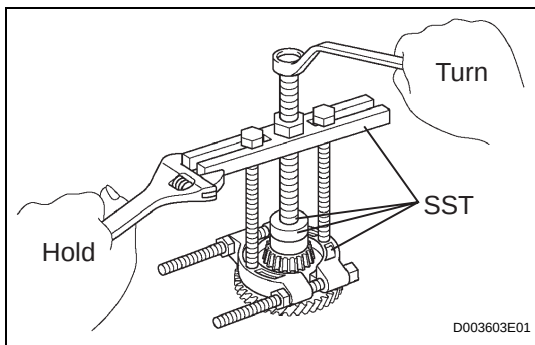


69. REMOVE COUNTER DRIVE GEAR

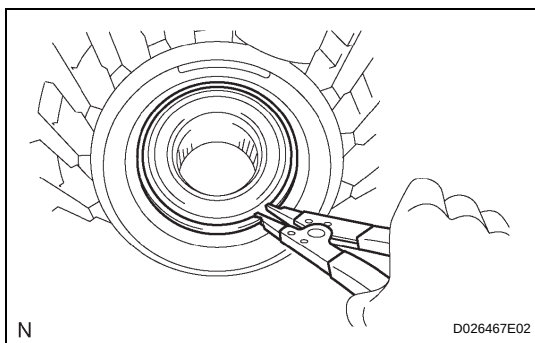
- (a) Using SST and a press, remove the counter drive gear from the transaxle case.
SST 09950-60010 (09951-00590), 09950-70010 (09951-07100)



- (b) As shown in the illustration, tighten the 2 bolts evenly and make a clearance of approximately 20.0 mm (0.787 in.) between the counter drive gear and the inner race.

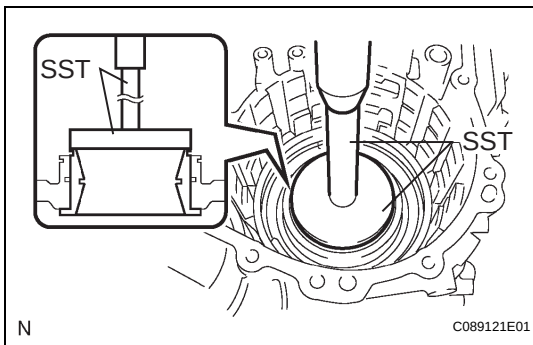


- (c) Using SST, remove the tapered roller bearing.
SST 09950-60010 (09951-00590), 09950-00020, 09950-00030, 09950-40011 (09957-04010)



70. REMOVE TRANSFER DRIVEN PINION FRONT BEARING

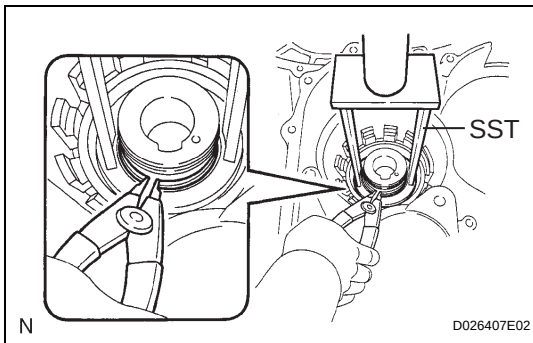
- (a) Using a snap ring expander, remove the snap ring.



- (b) Using SST and a press, remove the bearing outer race.

SST 09950-60020 (09951-00910)

71. REMOVE NO. 2 BREATHER PLUG



72. REMOVE UNDERDRIVE BRAKE RETURN SPRING SUB-ASSEMBLY

- (a) Place SST on the return spring, and compress the return spring with a press.

NOTICE:

Stop the press when the spring seat is lowered 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove to prevent the spring seat from being deformed.

SST 09387-00020

- (b) Using a snap ring expander, remove the snap ring.

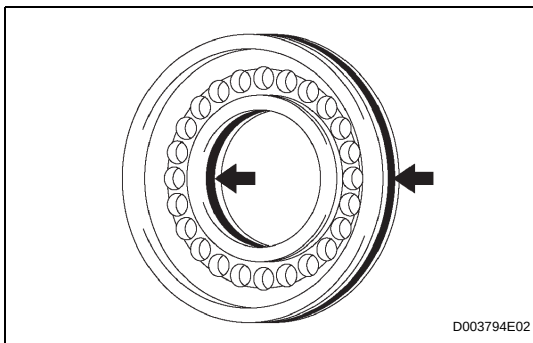
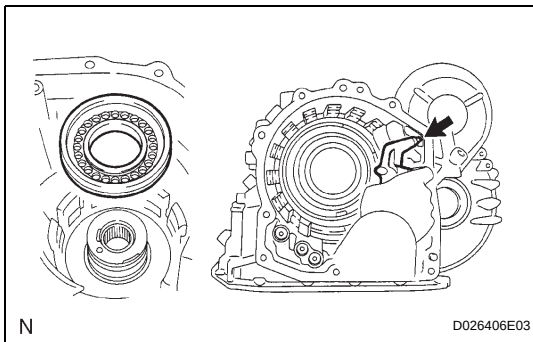
NOTICE:

Do not expand the snap ring excessively.

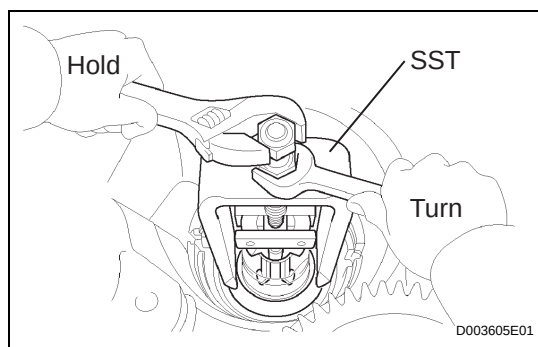
73. INSPECT UNDERDRIVE BRAKE RETURN SPRING SUB-ASSEMBLY (See page [AX-210](#))

74. REMOVE UNDERDRIVE BRAKE PISTON

- (a) Apply compressed air (392 kPa, 4.0 kgf/cm², 57 psi) to the transaxle case to remove the underdrive brake piston.



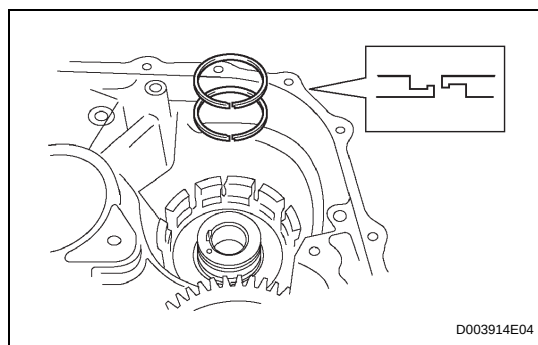
- (b) Remove the 2 O-rings from the underdrive brake piston.



75. REMOVE NEEDLE ROLLER BEARING

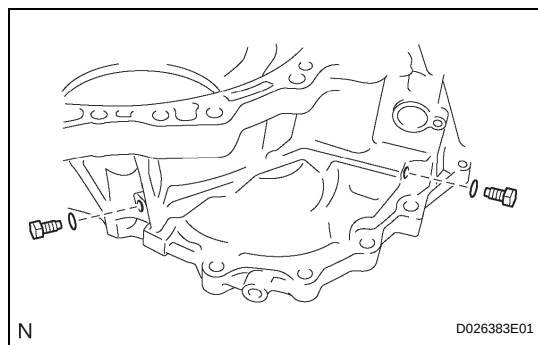
- (a) Using SST, remove the needle roller bearing from the transaxle case.

SST 09387-00041 (09387-01010, 09387-01030, 09387-01040)



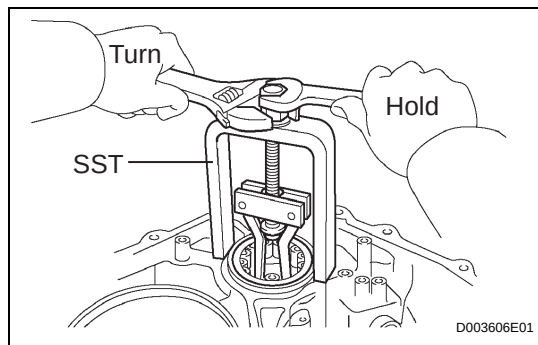
76. REMOVE UNDERDRIVE CLUTCH DRUM OIL SEAL RING

- (a) Remove the 2 oil seal rings from the transaxle case.



77. REMOVE NO. 1 TRANSAXLE CASE PLUG

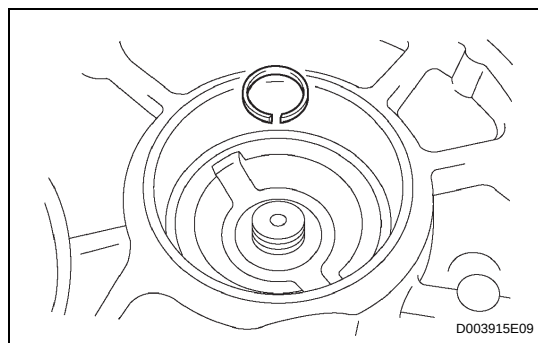
- (a) Remove the 2 transaxle case plugs.
(b) Remove the 2 O-rings from the 2 plugs.



78. REMOVE UNDERDRIVE CYLINDRICAL ROLLER BEARING

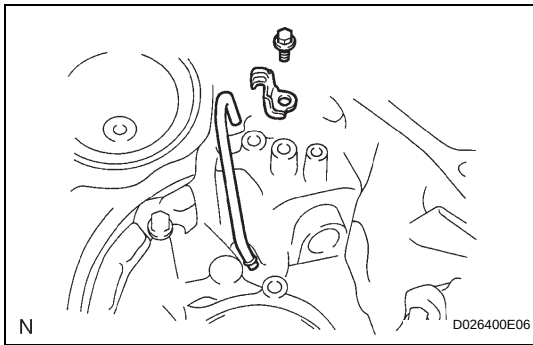
- (a) Using SST, remove the underdrive cylindrical roller bearing from the transaxle case.

SST 09514-35011



79. REMOVE UNDERDRIVE OUTPUT SHAFT OIL SEAL RING

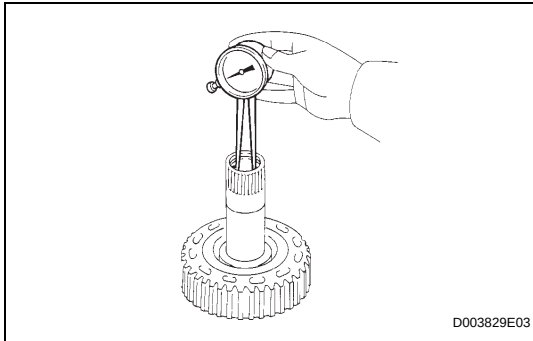
- (a) Remove the oil seal ring from the transaxle housing.

**80. REMOVE DIFFERENTIAL GEAR LUBE APPLY TUBE**

- (a) Remove the bolt, transaxle apply tube clamp and differential gear lube apply tube from the transaxle housing.

NOTICE:

Do not bend the tubes.

**INSPECTION****1. INSPECT MULTIPLE DISC CLUTCH HUB**

- (a) Using a caliper gauge, measure the inside diameter of the forward clutch hub bushing.

Standard inside diameter:

23.03 to 23.05 mm (0.9067 to 0.9075 in.)

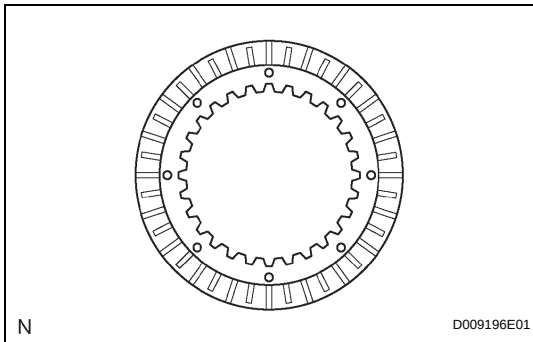
Maximum inside diameter:

23.09 mm (0.9091 in.)

NOTICE:

Check the contact surface of the bushing in the direct clutch shaft. If any scratch or discoloration is found, replace the direct clutch sub-assembly with a new one.

If the inside diameter is greater than the maximum, replace the forward clutch hub with a new one.

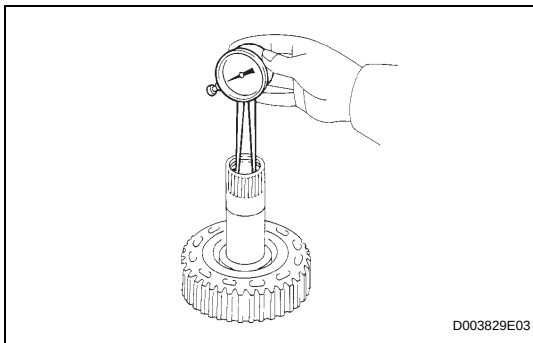
**2. INSPECT NO. 2 UNDERDRIVE CLUTCH DISC**

- (a) Check if the sliding surfaces of the disc, plate and flange are worn or burnt.

If necessary, replace them.

NOTICE:

- If the lining of the disc comes off or is discolored, or if a part of the groove is worn, replace all the discs.
- Before installing new discs, immerse them in ATF for at least 15 minutes.

**3. INSPECT OVERDRIVE DIRECT CLUTCH DRUM SUB-ASSEMBLY**

- (a) Using a caliper gauge, measure the inside diameter of the forward clutch hub bushing.

Standard inside diameter:

23.025 to 23.046 mm (0.9065 to 0.9073 in.)

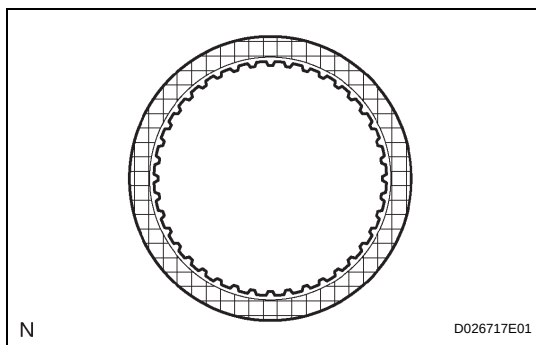
Maximum inside diameter:

23.09 mm (0.9091 in.)

NOTICE:

Check the contact surface of the bushing in the direct clutch shaft. If any scratch or discoloration is found, replace the direct clutch sub-assembly with a new one.

If the inside diameter is greater than the maximum, replace the forward clutch hub with a new one.

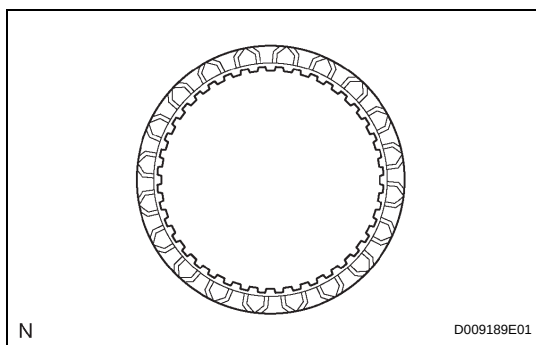


4. INSPECT 2ND BRAKE CLUTCH DISC

- (a) Check if the sliding surface of the disc, plate and flange are worn or burnt.
If necessary, replace them.

NOTICE:

- If the lining of the disc comes off or is discolored, or if a part of the groove is worn, replace all the discs.
- Before installing new discs, immerse them in ATF for at least 15 minutes.

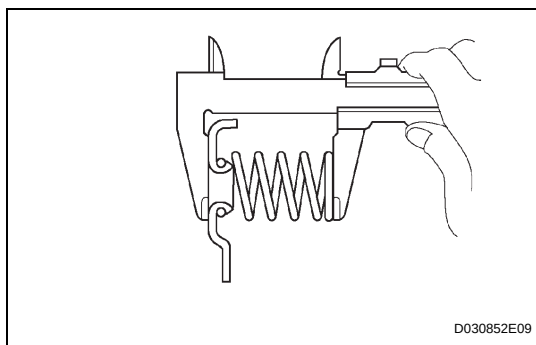


5. INSPECT 1ST AND REVERSE BRAKE CLUTCH DISC

- (a) Check if the sliding surface of the disc, plate and flange are worn or burnt.
If necessary, replace them.

NOTICE:

- If the lining of the disc comes off or is discolored, or if a part of the groove is worn, replace all the discs.
- Before installing new discs, immerse them in ATF for at least 15 minutes.



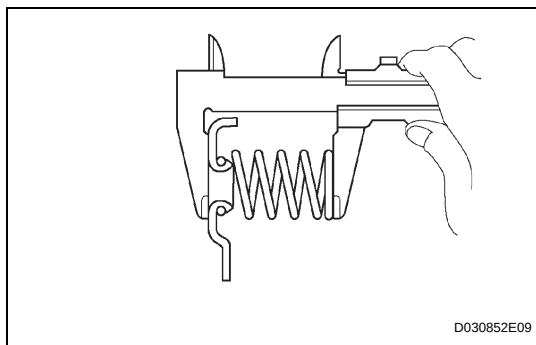
6. INSPECT 1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY

- (a) Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:

17.61 mm (0.6933 in.)

If the result is not as specified, replace the spring.



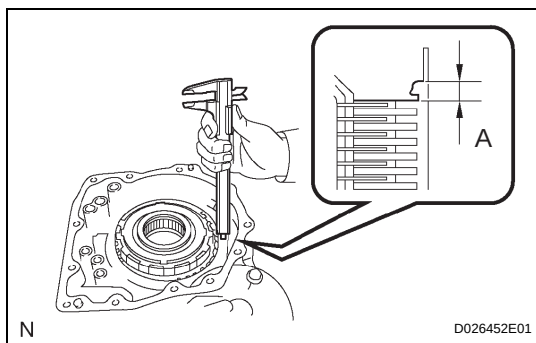
7. INSPECT UNDERDRIVE BRAKE RETURN SPRING SUB-ASSEMBLY

- (a) Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:

13.24 mm (0.5213 in.)

If the result is not as specified, replace the spring.



8. INSPECT PACK CLEARANCE OF 1ST AND REVERSE BRAKE

- (a) Using a vernier caliper, measure the distance between the disc surface and the contact surface of the 2nd brake cylinder and transaxle case (Dimension A).

- (b) Select an appropriate flange so that the pack clearance will meet the specified value.

Standard pack clearance:

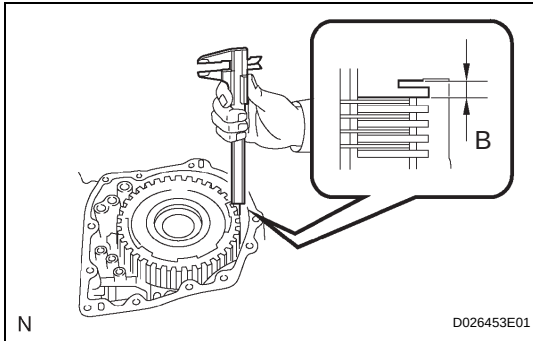
1.16 to 1.35 mm (0.0457 to 0.0531 in.)

HINT:

Piston stroke = Dimension A - Flange thickness

Standard flange thickness

Mark	Thickness	Mark	Thickness
1	1.8 mm (0.071 in.)	5	2.2 mm (0.087 in.)
2	1.9 mm (0.075 in.)	6	2.3 mm (0.091 in.)
3	2.0 mm (0.079 in.)	7	2.4 mm (0.094 in.)
4	2.1 mm (0.083 in.)	8	2.5 mm (0.098 in.)

**9. INSPECT PACK CLEARANCE OF 2ND BRAKE**

- Using a vernier caliper, measure the distance between the disc surface and snap ring surface (Dimension B).
- Select an appropriate flange so that the pack clearance will meet the specified value.

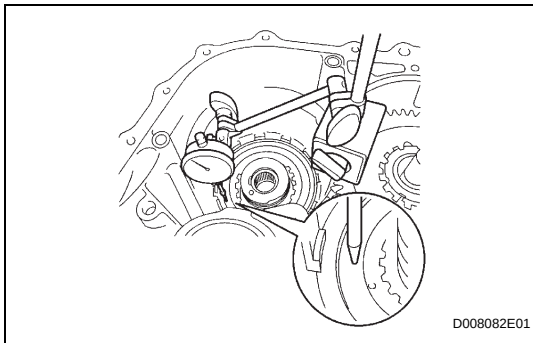
Standard pack clearance:**0.62 to 0.91 mm (0.0244 to 0.0358 in.)**

HINT:

Piston stroke = Dimension B - Flange thickness - Snap ring thickness 1.6 mm (0.063 in.)

Standard flange thickness

Mark	Thickness	Mark	Thickness
1	3.0 mm (0.118 in.)	5	3.4 mm (0.134 in.)
2	3.1 mm (0.122 in.)	6	3.5 mm (0.138 in.)
3	3.2 mm (0.126 in.)	7	3.6 mm (0.142 in.)
4	3.3 mm (0.130 in.)	-	-

**10. INSPECT PACK CLEARANCE OF UNDERDRIVE BRAKE**

- Using a dial indicator, measure the underdrive brake pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm², 57 psi).

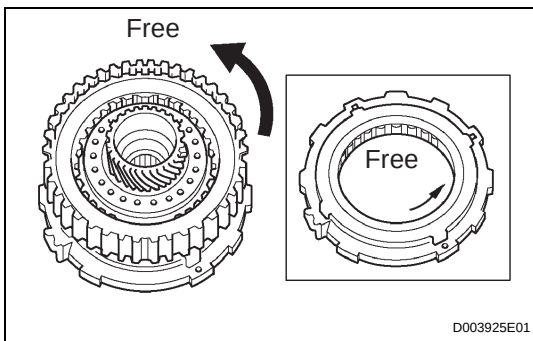
Standard pack clearance:**1.81 to 2.20 mm (0.0713 to 0.0866 in.)**

HINT:

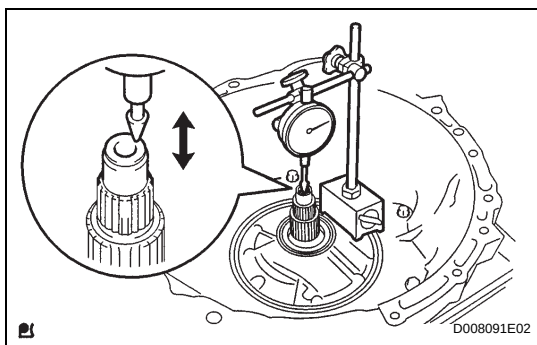
Select an appropriate flange from the table below so that it will meet the specified value.

Standard flange thickness

Mark	Thickness	Mark	Thickness
1	3.0 mm (0.118 in.)	4	3.1 mm (0.122 in.)
2	3.2 mm (0.126 in.)	5	3.3 mm (0.130 in.)
3	3.4 mm (0.134 in.)	-	-

**11. INSPECT UNDERDRIVE 1-WAY CLUTCH ASSEMBLY**

- Install the underdrive clutch assembly to the 1-way clutch.
- Check that the underdrive 1-way clutch locks when turned clockwise and rotates freely when turned counterclockwise as shown in the illustration. If the result is not as specified, replace the underdrive 1-way clutch.

**12. INSPECT INPUT SHAFT END PLAY**

- (a) Using a dial indicator, measure the input shaft end play.

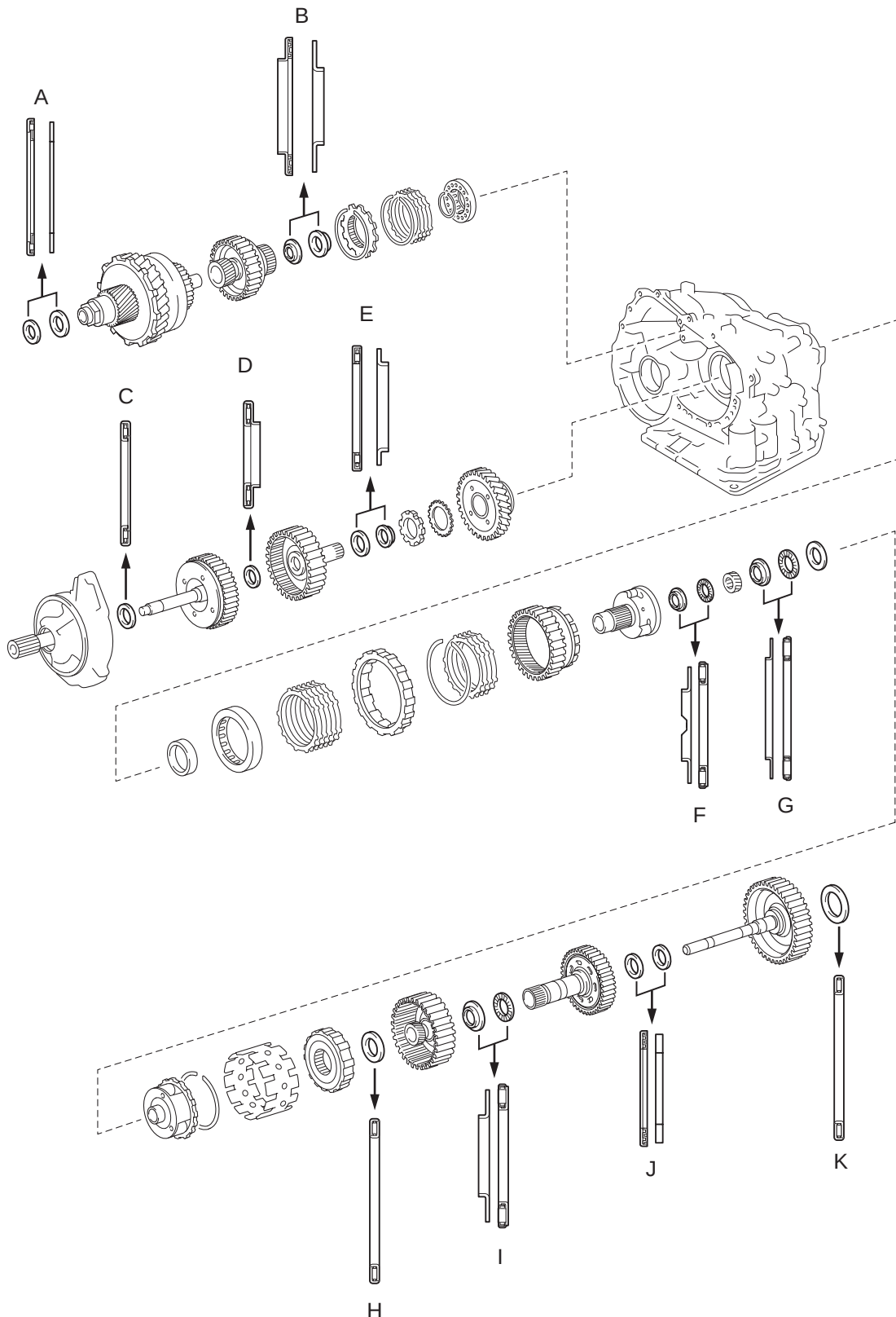
Standard end play:

0.262 to 1.244 mm (0.0103 to 0.0490 in.)

If the result is not as specified, replace the input shaft or thrust needle roller bearing.

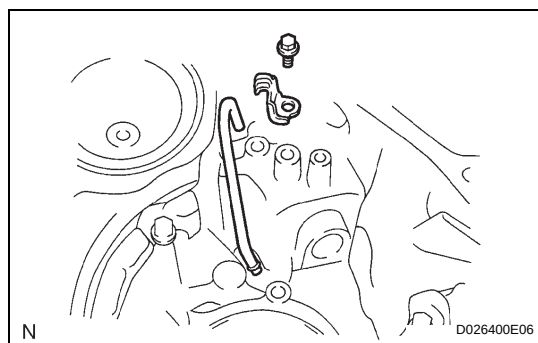
REASSEMBLY

1. BEARING POSITION



Standard bearing position

Mark	Front Race Diameter Inside / Outside	Thrust Bearing Diameter Inside / Outside	Rear Race Diameter Inside / Outside
A	-	57.2 mm (2.252 in.) / 84.96 mm (3.3449 in.)	56.4 mm (2.220 in.) / 83.0 mm (3.268 in.)
B	-	37.73 mm (1.4854 in.) / 58.0 mm (2.283 in.)	-
C	-	33.85 mm (1.3327 in.) / 52.2 mm (2.055 in.)	-
D	24.94 mm (0.982 in.)	23.5 mm (0.925 in.) / 44.0mm (1.732 in.)	-
E	-	36.3 mm (1.429 in.) / 51.93 mm (2.0445 in.)	34.5 mm (1.358 in.) / 48.35 mm (1.904 in.)
F	34.35 mm (1.3524 in.) / 56.57 mm (2.2272 in.)	32.45 mm (1.2776 in.) / 56.48 mm (2.2236 in.)	-
G	40.15 mm (1.5807 in.) / 59.25 mm (2.3327 in.)	38.65 mm (1.5217 in.) / 59.79 mm (2.3539 in.)	38.65 mm (1.5217 in.) / 59.25 mm (2.3327 in.)
H	-	53.6 mm (2.110 in.) / 69.6 mm (2.740 in.)	-
I	33.02 mm (1.3000 in.) / 45.8 mm (1.803 in.)	31.85 mm (1.2539 in.) / 57.3 mm (2.256 in.)	-
J	-	24.79 mm (0.9760 in.) / 39.5 mm (1.555 in.)	23.6 mm (0.929 in.) / 37.95 mm (1.4941 in.)
K	-	56.3 mm (2.216 in.) / 75.96 mm (2.9905 in.)	-



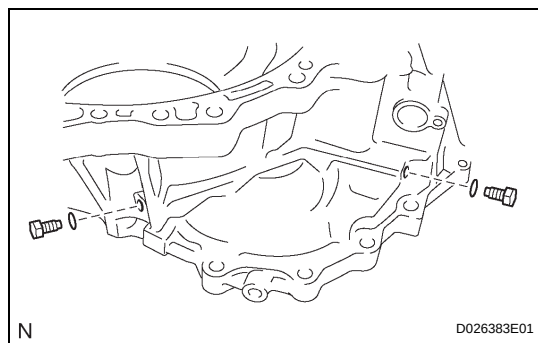
2. INSTALL DIFFERENTIAL GEAR LUBE APPLY TUBE

- (a) Install the differential gear lube apply tube and transaxle apply tube clamp to the transaxle housing with the bolt.

Torque: 9.8 N*m (100 kgf*cm, 87 in.*lbf)

NOTICE:

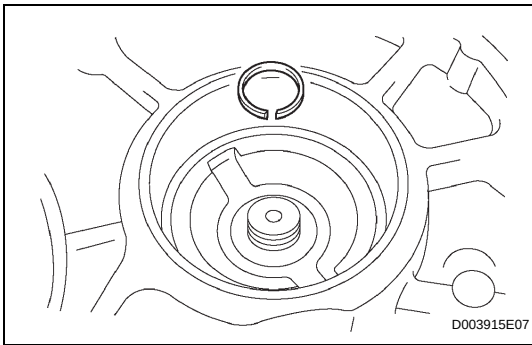
Make sure to insert the pipe to the stopper.



3. INSTALL NO. 1 TRANSAXLE CASE PLUG

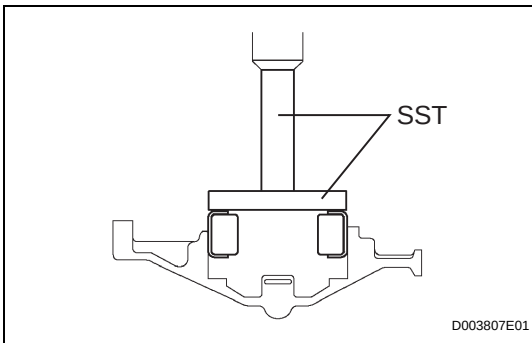
- (a) Install 2 new O-rings to the 2 plugs.
(b) Install the 2 plugs to the transaxle rear cover.

Torque: 7.4 N*m (75 kgf*cm, 65 in.*lbf)



4. INSTALL UNDERDRIVE OUTPUT SHAFT OIL SEAL RING

- (a) Coat a new oil seal ring with ATF and install it to the transaxle housing.

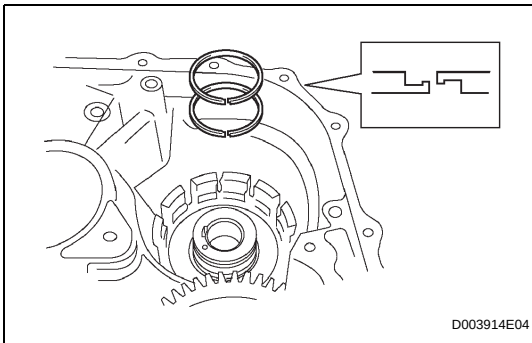


5. INSTALL UNDERDRIVE CYLINDRICAL ROLLER BEARING

- (a) Coat the underdrive cylindrical roller bearing with ATF.
- (b) Using SST and a press, press in the underdrive cylindrical roller bearing.
SST 09950-60020 (09951-00810), 09950-70010 (09951-07100)

NOTICE:

Do not apply excessive pressure to the bearing.

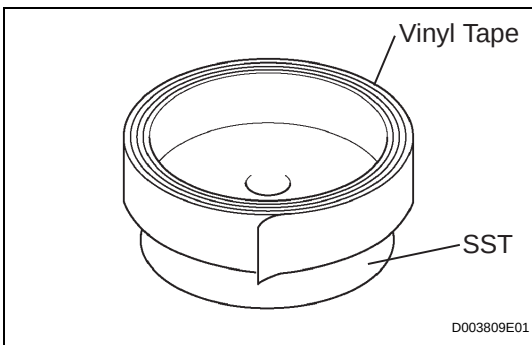


6. INSTALL UNDERDRIVE CLUTCH DRUM OIL SEAL RING

- (a) Coat 2 new oil seal rings with ATF, and install them to the transaxle rear cover.

NOTICE:

- **Do not expand the end gap of the oil seal ring too much.**
- **Fix the hooks firmly. Confirm that the oil seal ring rotates freely in its groove.**



7. INSTALL NEEDLE ROLLER BEARING

- (a) Wrap vinyl tape around SST 4.0 mm (0.157 in.) from the bottom of SST until the thickness of the tape is about 5.0 mm (0.197 in.).

SST 09950-60010 (09951-00320), 09950-70010 (09951-07100)

NOTICE:

Clean SST to remove deposited oil before wrapping vinyl tape.

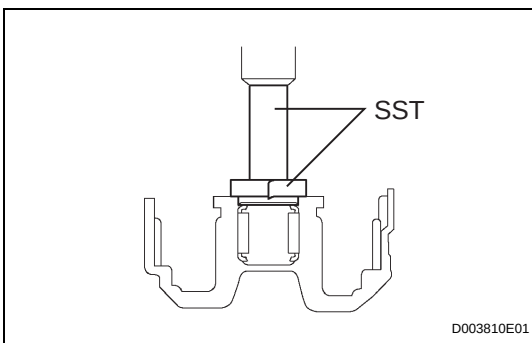
- (b) Coat the needle roller bearing with ATF.

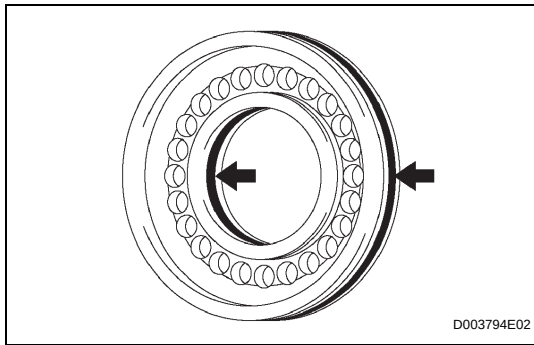
- (c) Using SST and a press, press in the needle-roller bearing to the transaxle case.

SST 09950-60010 (09951-00320), 09950-70010 (09951-07100)

NOTICE:

When the wrapped vinyl tape contacts the transaxle case, stop press-fitting.





8. INSTALL UNDERDRIVE BRAKE PISTON

- (a) Coat 2 new O-rings with ATF, and install them to the underdrive brake piston.

NOTICE:

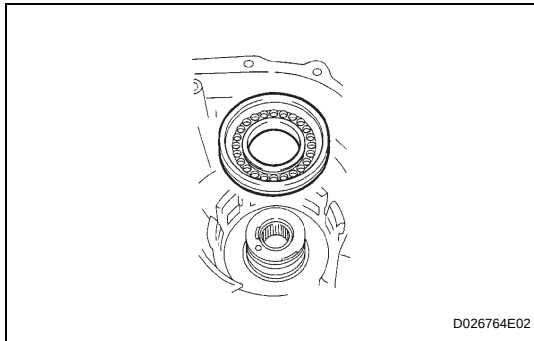
- Make sure that the O-rings are not twisted or pinched when they are installed.
- Apply sufficient ATF to the O-ring before installing.

- (b) Coat the underdrive brake piston with ATF.

- (c) Install the underdrive brake piston to the transaxle case.

NOTICE:

Be careful not to damage the O-ring.



9. INSTALL UNDERDRIVE BRAKE RETURN SPRING SUB-ASSEMBLY

- (a) Place SST on the return spring and compress the return spring with a press.

NOTICE:

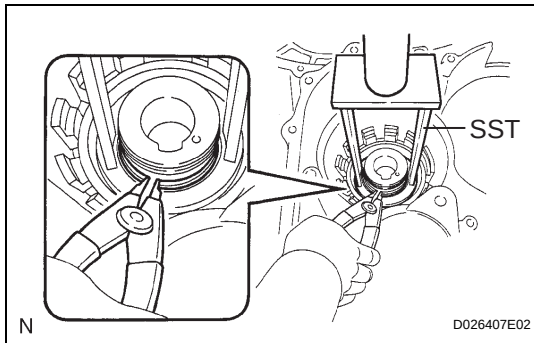
- Stop the press when the spring seat is lowered to a position 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove to prevent the spring seat from being deformed.
- After installing the return spring, check that all the return spring's springs fit in the piston correctly.

SST 09387-00020

- (b) Using a snap ring expander, press in the snap ring to the transaxle case.

NOTICE:

The snap ring must be fully engaged in the groove of the transaxle case.



10. INSTALL NO. 2 BREATHER PLUG

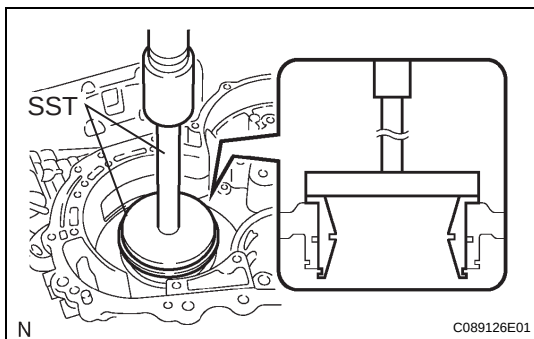
11. INSTALL COUNTER DRIVE GEAR BEARING

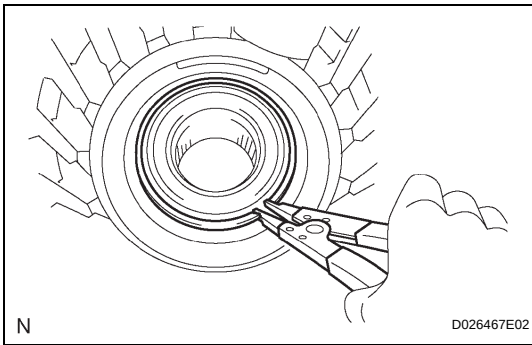
- (a) Coat the counter drive gear bearing with ATF.
- (b) Using SST and a press, press in the bearing outer race.

SST 09950-60020 (09951-01030), 09950-70010 (09951-07150), 09649-17010

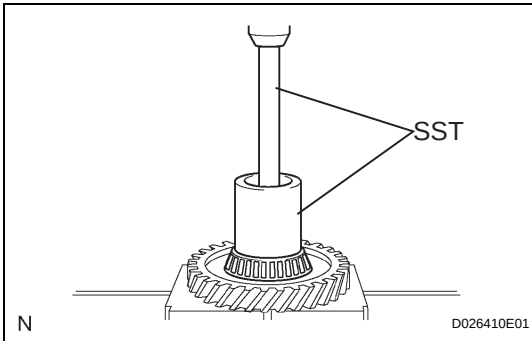
NOTICE:

- Do not apply excessive pressure to the bearing.
- Press-fit the bearing outer race until it contacts the transaxle case.



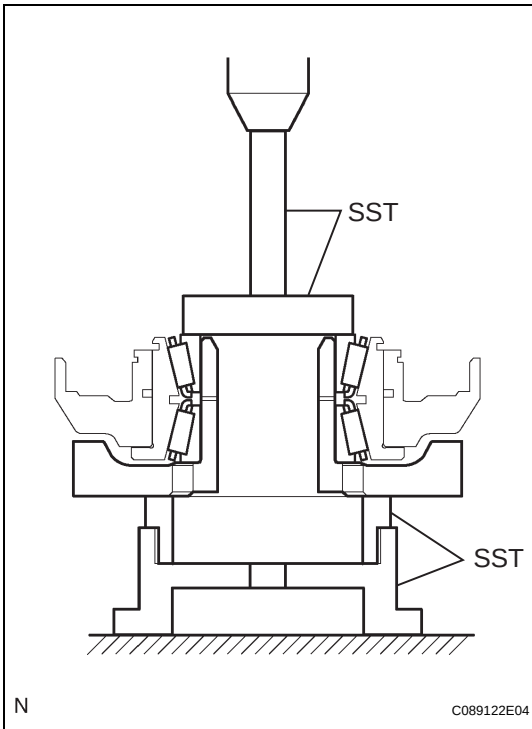


- (c) Using a snap ring expander, install the snap ring.
NOTICE:
 The white mark side of the snap ring should face upward.

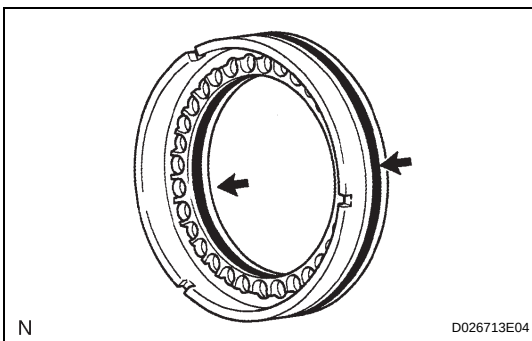


12. INSTALL COUNTER DRIVE GEAR

- (a) Coat the counter drive gear with ATF.
 (b) Using SST and a press, press in the tapered roller bearing to the counter drive gear.
SST 09950-70010 (09951-07150), 09649-17010
NOTICE:
 Do not apply excessive pressure to the bearing.



- (c) Using SST and a press, press in the counter drive gear and bearing to the transaxle case.
SST 09950-70010 (09951-07150), 09223-15030, 09527-17011, 09950-60020 (09951-00750)
NOTICE:
 Do not apply excessive pressure to the counter drive gear.

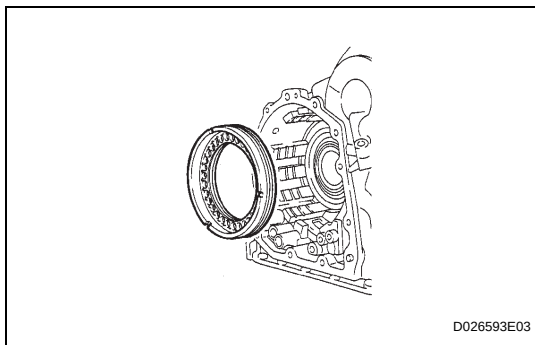


13. INSTALL 1ST AND REVERSE BRAKE PISTON

- (a) Coat 2 new O-rings with ATF.
 (b) Install the 2 O-rings to the 1st and reverse brake piston.

NOTICE:

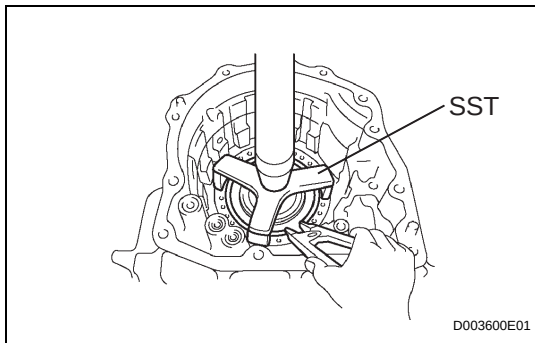
- Make sure that the O-rings are not twisted or pinched when they are installed.
- Apply sufficient ATF to the O-ring prior to assembling.



- (c) Coat the 1st and reverse brake piston with ATF, and install it to the transaxle case.

NOTICE:

Be careful not to damage the O-ring.



14. INSTALL 1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY

- (a) Place SST on the return spring and compress the return spring with a press.

NOTICE:

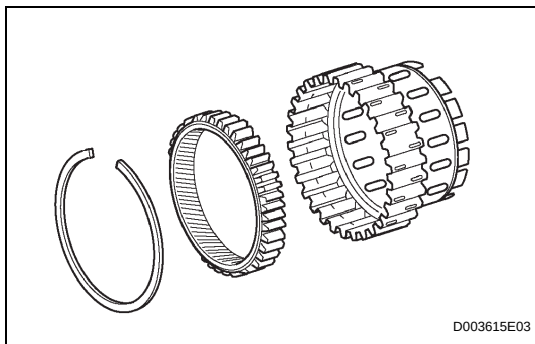
- Stop the press when the spring seat is lowered 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove to prevent the spring seat from being deformed.
- After installing the return spring, check that all the return spring's springs fit in the piston correctly.

SST 09387-00070

- (b) Using a snap ring expander, press in the snap ring to the transaxle case.

NOTICE:

- The snap ring must be fully engaged in the groove of the transaxle case.
- Fix the snap ring to the inside of the claw of the spring seat firmly.

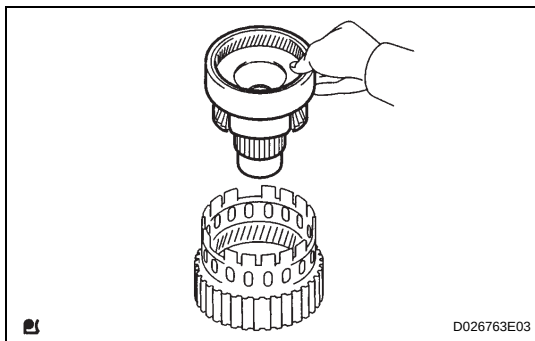


15. INSTALL FRONT PLANETARY RING GEAR

- (a) Using a screwdriver, install the front planetary ring gear and snap ring to the brake hub.

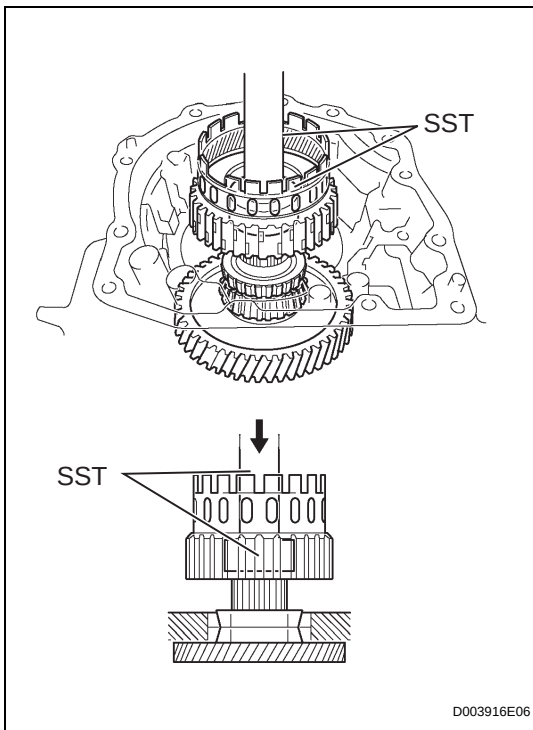
NOTICE:

Confirm that the snap ring is engaged in the groove of the brake hub correctly.



16. INSTALL FRONT PLANETARY GEAR ASSEMBLY

- (a) Install the front planetary gear to the brake hub.

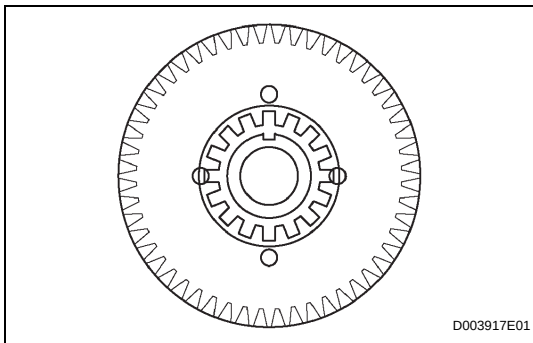


- (b) Using SST and a press, press-fit the front planetary gear.

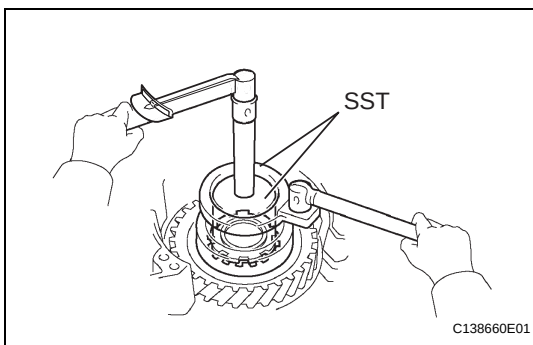
SST 09950-60010 (09951-00500), 09950-70010 (09951-07100)

NOTICE:

- Do not apply excessive pressure to the planetary gear.
- Press the inner race of the LH tapered roller bearing, counter gear and front planetary gear to the position where no preload should be applied to one pair of tapered roller bearings (left and right).



- (c) Install a new washer as shown in the illustration.



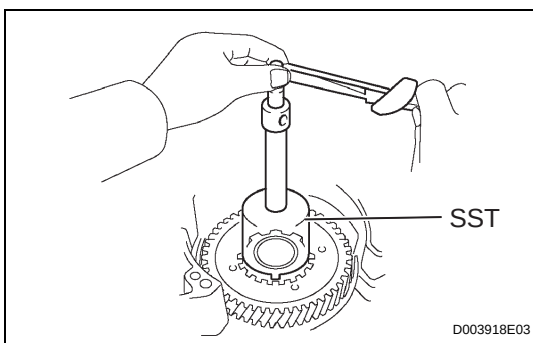
- (d) Using SST, install the nut.

SST 09387-00030, 09387-00080

Torque: 280 N*m (3,355 kgf*cm, 207 ft.*lbf)

NOTICE:

Assemble the washer after pressing each part, then tighten the nut to the standard torque.



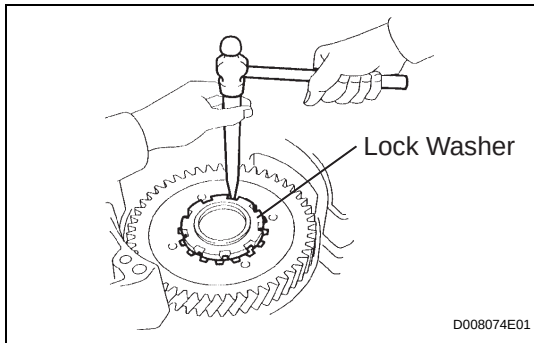
- (e) Using SST and a torque wrench, measure the turning torque of the bearing while rotating SST at 60 rpm. When the measured value is not as specified, gradually tighten the nut until it reaches the specified value.

SST 09387-00080

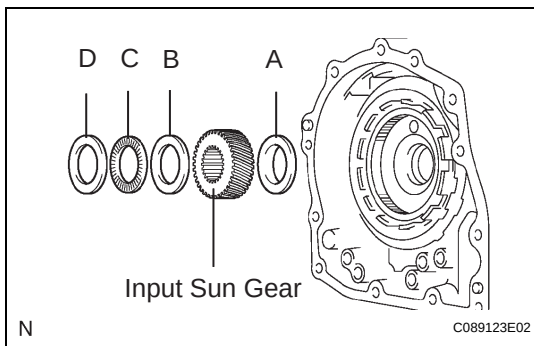
Standard turning torque at 60 rpm:

0.51 to 1.02 N*m (5.1 to 10.0 kgf*cm, 4.4 to 8.7 in.*lbf) for new bearing

0.26 to 0.51 N*m (2.7 to 5.2 kgf*cm, 2.3 to 4.5 in.*lbf) for used bearing



- (f) Tighten the nut gradually until the specified turning torque of the tapered roller bearing is measured.
Torque: 350 N*m (3,569 kgf*cm, 258 ft.*lbf)
- (g) Using a chisel and hammer, stake the front lock washer.



17. INSTALL INPUT SUN GEAR

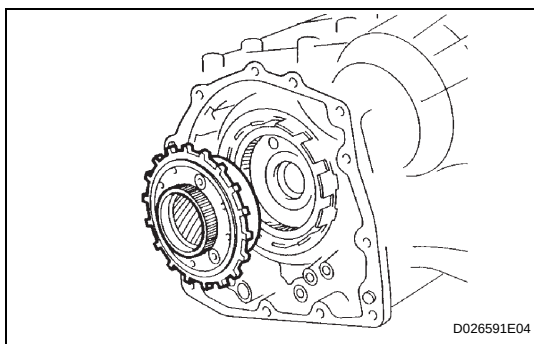
- (a) Coat the 2 thrust bearings with ATF.
 (b) Install the 2 thrust bearings, bearing race and input sun gear to the front planetary gear.

NOTICE:

- Install the bearing race on the side of the front planetary carrier. Be careful about the direction of the race.
- When installing the thrust bearing and front sun gears, be careful about the direction of the parts.
- When install the bearing race on the side of the front sun gear, be careful of the direction of the race.
- Install the thrust bearing and the race after holding the parts on the input sun gear by applying grease. Make sure that the assembling order is correct.

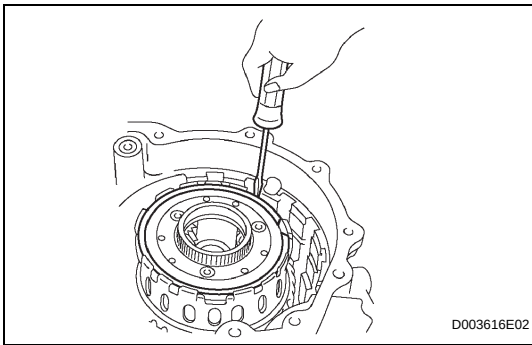
Standard thrust bearing and bearing race diameter

Item	Inside	Outside
Thrust Bearing, A	32.5 mm (1.28 in.)	56.5 mm (2.224 in.)
Thrust Bearing, C	38.6 mm (1.520 in.)	59.7 mm (2.35 in.)
Bearing Race, B	40.2 mm (1.583 in.)	59.3 mm (2.335 in.)
Bearing Race, D	38.6 mm (1.520 in.)	59.3 mm (2.335 in.)



18. INSTALL REAR PLANETARY GEAR ASSEMBLY

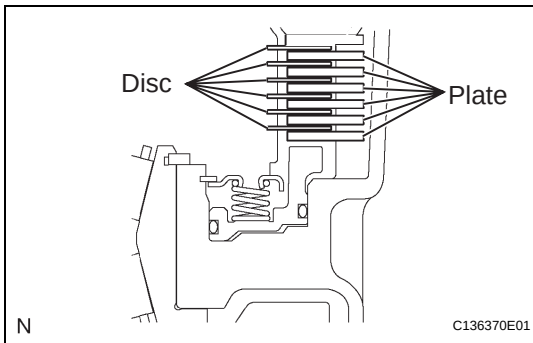
- (a) Install the rear planetary gear to the rear planetary ring gear.



- (b) Using a screwdriver, install the snap ring.

NOTICE:

Confirm that the snap ring is fixed in the groove of the 1st and reverse brake hub correctly.

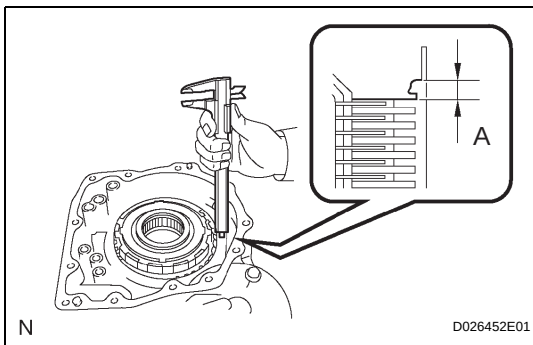


19. INSTALL 1ST AND REVERSE BRAKE CLUTCH DISC

- (a) Coat the 6 discs with the ATF.
(b) Install the 6 plates and 6 discs.

NOTICE:

Make sure that the plates and discs are installed as shown in the illustration.



20. INSPECT PACK CLEARANCE OF FIRST AND REVERSE BRAKE

- (a) Using a vernier caliper, measure the distance between the disc surface and the contact surface of the 2nd brake cylinder and transaxle case (Dimension A).
(b) Select an appropriate flange so that the pack clearance will meet the specified value.

Standard pack clearance:

1.16 to 1.35 mm (0.0457 to 0.0531 in.)

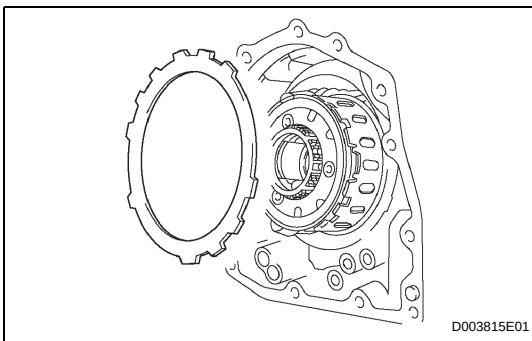
HINT:

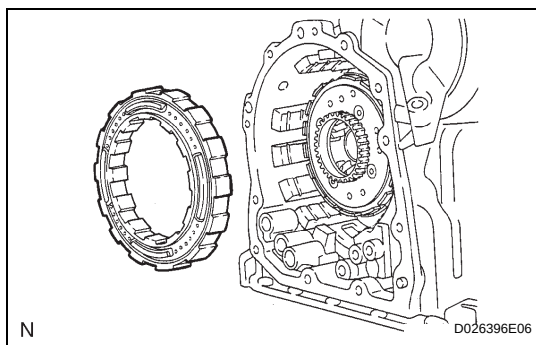
Piston stroke = Dimension A - Flange thickness

Standard flange thickness

Mark	Thickness	Mark	Thickness
1	1.8 mm (0.071 in.)	5	2.2 mm (0.087 in.)
2	1.9 mm (0.075 in.)	6	2.3 mm (0.091 in.)
3	2.0 mm (0.079 in.)	7	2.4 mm (0.094 in.)
4	2.1 mm (0.083 in.)	8	2.5 mm (0.098 in.)

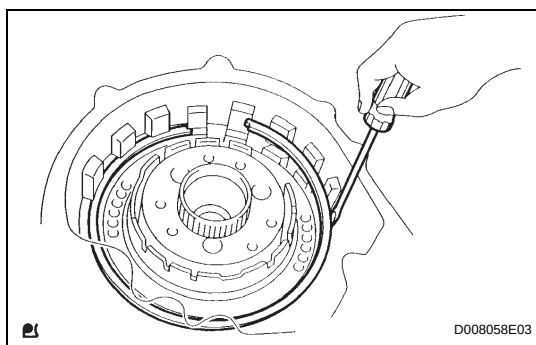
- (c) Install the flange.





21. INSTALL SECOND BRAKE PISTON ASSEMBLY

- (a) Install the second brake piston to the transaxle case.



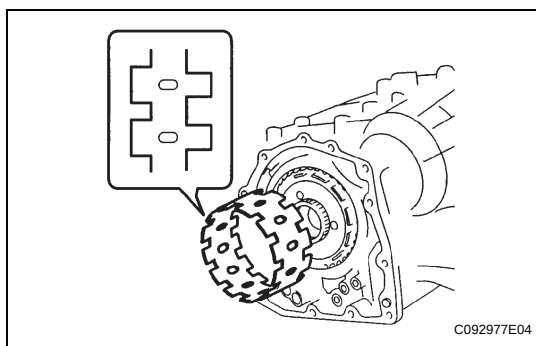
- (b) Install the snap ring and measure the inside diameter.

Inside diameter:

Greater than 167 mm (6.57 in.)

NOTICE:

- Make sure that the taper snap ring is installed in the correct direction.
- When the diameter does not meet the specified value, replace the snap ring with a new one.
- After installing the snap ring, confirm that there is no clearance between the 2nd brake cylinder and the fitting surface of the cylinder in the transaxle case.

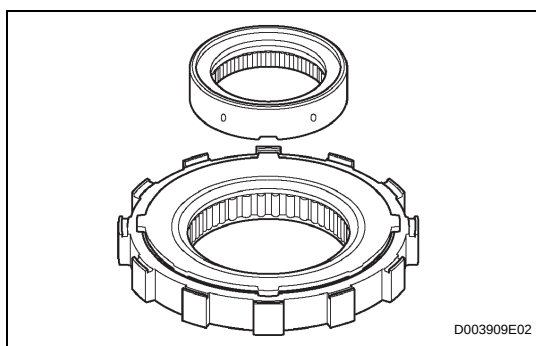


22. INSTALL 1-WAY CLUTCH SLEEVE OUTER

- (a) Install the 1-way clutch sleeve outer to the 2nd brake cylinder.

NOTICE:

Make sure that the outer sleeve is installed in the correct direction.

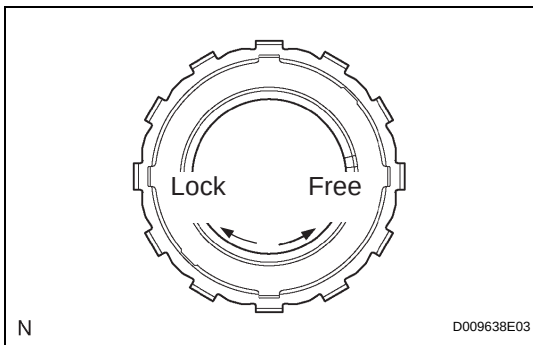


23. INSTALL 1-WAY CLUTCH ASSEMBLY

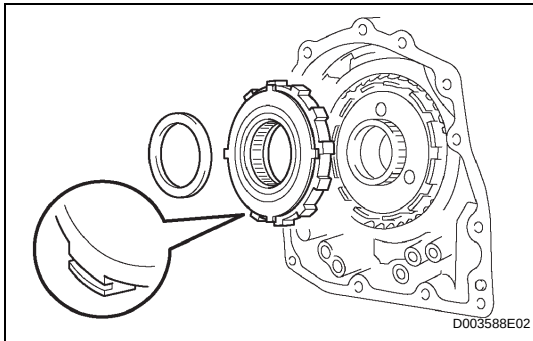
- (a) Install the 1-way clutch inner race to the 1-way clutch.

NOTICE:

- Make sure that the inner race is installed in the correct direction.
- Confirm that the discrimination mark is visible.



- (b) Check that the 1-way clutch locks when turned clockwise and rotates freely when turned counterclockwise as shown in the illustration. If the result is not as specified, replace the 1-way clutch.



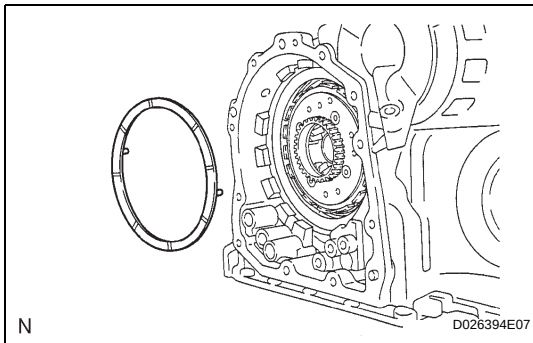
- (c) Install the 1-way clutch and thrust needle roller bearing to the 1-way clutch sleeve outer.

Standard bearing diameter

Item	Inside	Outside
Bearing	53.6 mm (2.110 in.)	69.4 mm (2.732 in.)

NOTICE:

Install the thrust bearing properly so that the non-colored race will be visible.

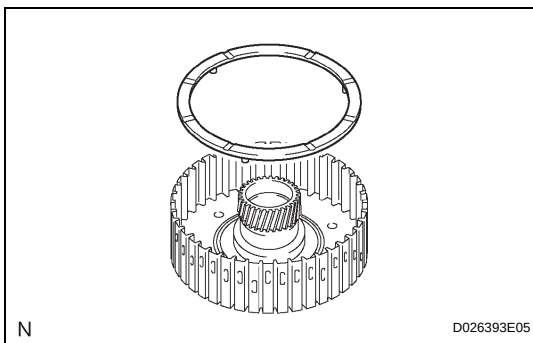


24. INSTALL NO. 1 PLANETARY CARRIER THRUST WASHER

- (a) Coat the planetary carrier thrust washer with yellow petrolatum, and install the washer onto the planetary sun gear.

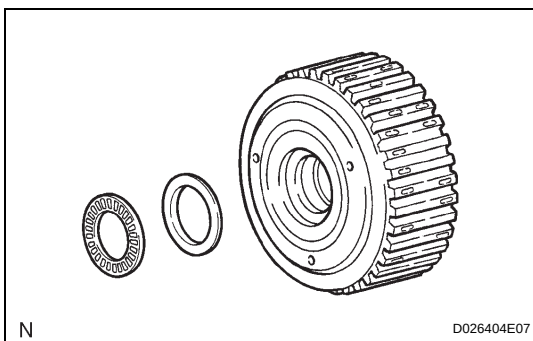
NOTICE:

After installing the washer, confirm that the projection of the washer is fixed firmly in the hole of the planetary sun gear.



25. REMOVE REAR PLANETARY SUN GEAR ASSEMBLY

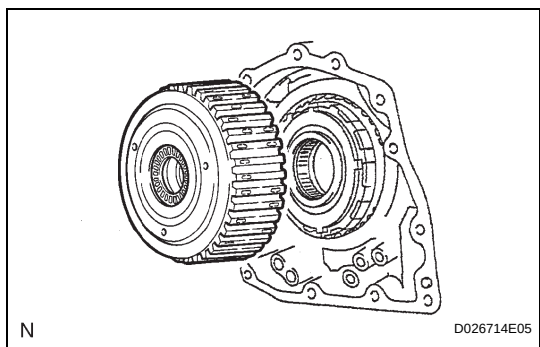
- (a) Coat the planetary carrier thrust washer with yellow petrolatum, and install the washer onto the rear planetary sun gear.



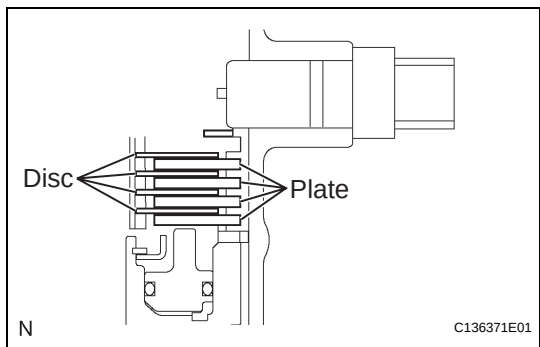
- (b) Coat the bearing with yellow petrolatum, and install the bearing onto the rear planetary sun gear.

Standard bearing diameter

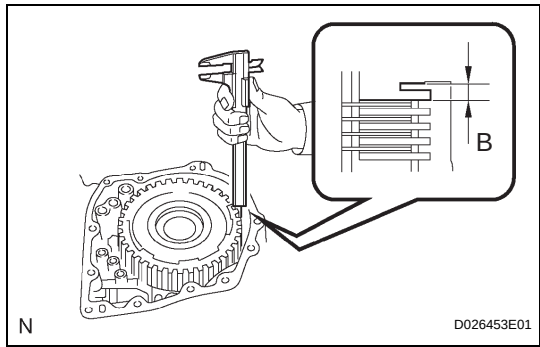
Item	Inside	Outside
Race	33.0 mm (1.299 in.)	45.4 mm (1.787 in.)
Bearing	31.85 mm (1.254 in.)	45.2 mm (1.78 in.)



- (c) Install the rear planetary sun gear to the rear planetary gear.
- NOTICE:**
After installing the rear planetary sun gear, make sure that the B1 discs are engaged.

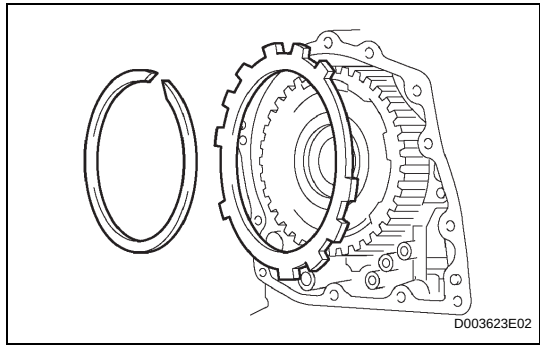


- 26. INSTALL 2ND BRAKE CLUTCH DISC**
- (a) Coat the 4 discs with ATF.
- (b) Install the 4 plates and 4 discs to the transaxle case.
- NOTICE:**
Make sure that the plates and discs are installed as shown in the illustration.
- (c) Temporarily install the snap ring.

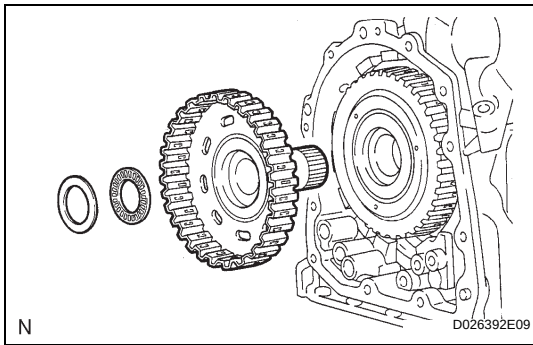


- 27. INSPECT PACK CLEARANCE OF 2ND BRAKE**
- (a) Using a vernier caliper, measure the distance between the disc surface and snap ring surface (Dimension B).
- (b) Select an appropriate flange so that the pack clearance will meet the specified value.
- Standard clearance:**
0.62 to 0.91 mm (0.0244 to 0.0358 in.)
- HINT:**
Piston stroke = Dimension B - Flange thickness - Snap ring thickness 1.6 mm (0.063 in.)
- Standard flange thickness**

Mark	Thickness	Mark	Thickness
1	3.0 mm (0.118 in.)	5	3.4 mm (0.134 in.)
2	3.1 mm (0.122 in.)	6	3.5 mm (0.138 in.)
3	3.2 mm (0.126 in.)	7	3.6 mm (0.142 in.)
4	3.3 mm (0.130 in.)	8	-



- (c) Temporarily remove the snap ring, attach the selected flange and reinstall the snap ring.
- NOTICE:**
Secure the snap ring so that the ends are visible through the groove of the transaxle case.



28. INSTALL OVERDRIVE DIRECT CLUTCH HUB SUB-ASSEMBLY

- (a) Install the direct clutch hub to the planetary gear.

NOTICE:

Be careful not to damage the bushing inside the overdrive clutch hub during installation.

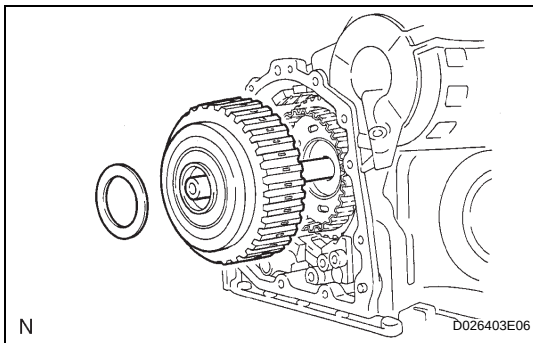
- (b) Coat the thrust bearing with ATF.
(c) Install the bearing race and the thrust bearing to the direct clutch hub.

NOTICE:

Be careful not to drop the bearing when it is installed.

Standard bearing and race diameter

Item	Inside	Outside
Bearing	24.7 mm (0.972 in.)	39.5 mm (1.555 in.)
Race	23.6 mm (0.929 in.)	38.0 mm (1.496 in.)

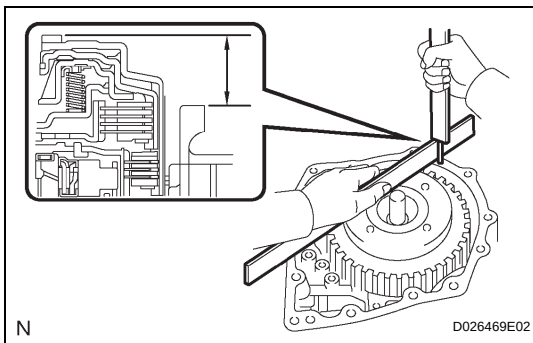


29. INSTALL DIRECT CLUTCH ASSEMBLY

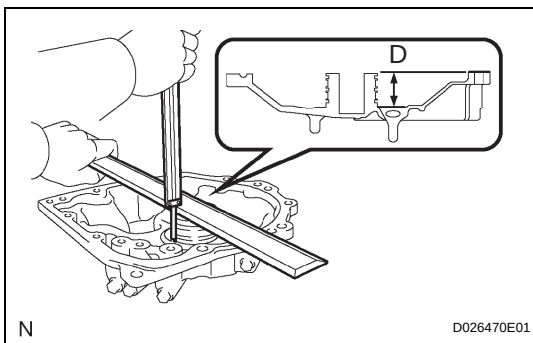
- (a) Coat the thrust bearing with ATF.
(b) Install the direct clutch and thrust bearing to the rear planetary sun gear.

NOTICE:

The disc in the direct clutch should completely match with the hub attached outside the rear planetary sun gear. Otherwise, the rear cover cannot be installed.



- (c) Clean the connecting part of the transaxle case and the rear cover.
(d) As shown in the illustration, place a straightedge on the direct clutch drum and measure the distance between the transaxle case and the straightedge using a vernier caliper (Dimension C).



- (e) Using a vernier caliper and straightedge, measure the dimension shown in the illustration (Dimension D).
(f) Calculate the end play value using the following formula. Select a thrust bearing which satisfies the end play value and install the selected bearing.

Standard end play:

0.244 to 0.901 mm (0.0096 to 0.0355 in.)

NOTICE:

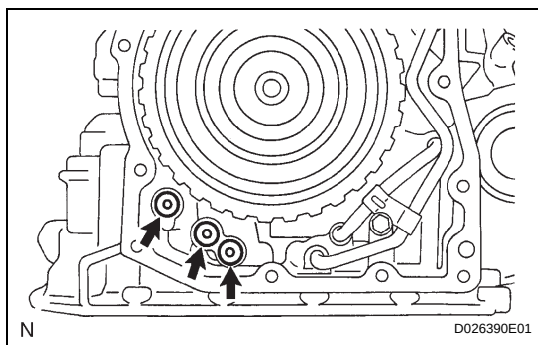
Make sure that the non-collared race side is facing the direct clutch.

HINT:

End play = Dimension D - Dimension C

Standard bearing thickness and diameter

Thickness	Inside	Outside
3.6 mm (0.1417 in.)	56.3 mm (2.217 in.)	75.7 mm (2.980 in.)
3.8 mm (0.1496 in.)	56.3 mm (2.217 in.)	75.7 mm (2.980 in.)

**30. INSTALL NO. 1 GOVERNOR APPLY GASKET**

- (a) Install 3 new governor apply gaskets to the transaxle case.

31. INSTALL BRAKE APPLY TUBE

- (a) Install the clamp to the brake apply tube.

NOTICE:

Make sure to install the clamp to the apply tube before installing the apply tube to the transaxle case. This prevents the apply tube from being deformed or damaged.

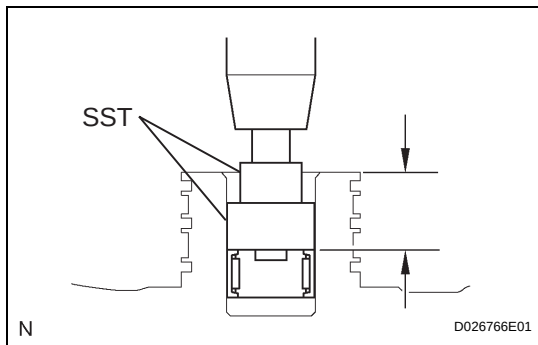
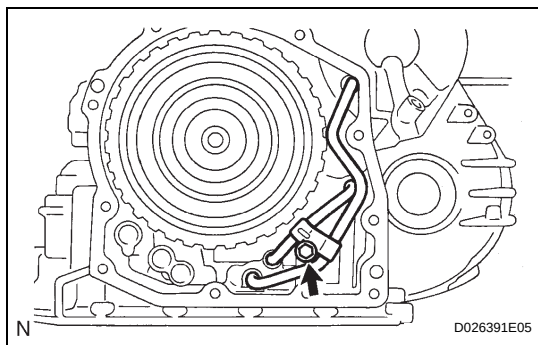
- (b) Install the clutch apply tube.

- (c) Install the brake apply tube to the transaxle case with the bolt.

Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)

NOTICE:

The tube should be securely inserted until it reaches the stopper.

**32. INSTALL NEEDLE ROLLER BEARING**

- (a) Using SST and a press, press the needle roller bearing into the transaxle rear cover.

SST 09950-60010 (09951-00230, 09952-06010)

Standard depth:

20.55 to 21.25 mm (0.8091 to 0.8366 in.)

NOTICE:

- The engraved mark side of the bearing should face upward.
- Continue pressing until the specified value is obtained.

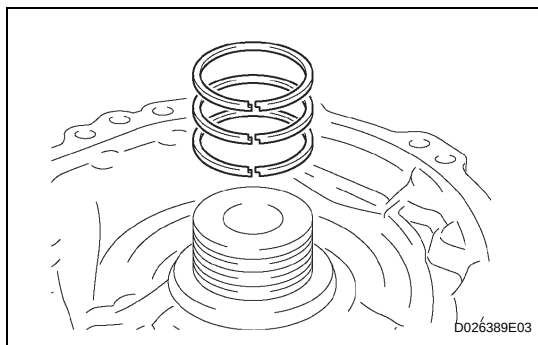
- (b) Coat a needle roller bearing with ATF.

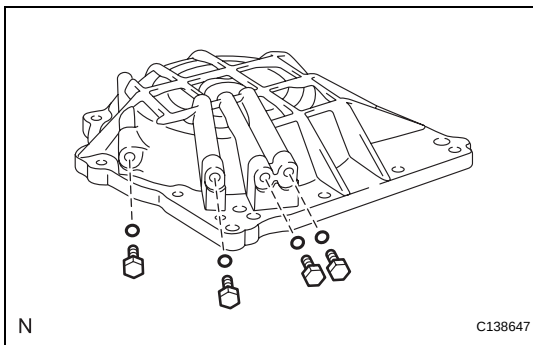
33. INSTALL REAR CLUTCH OIL SEAL RING OUTER

- (a) Coat 3 new rear clutch oil seal rings with ATF, and install them to the transaxle rear cover.

NOTICE:

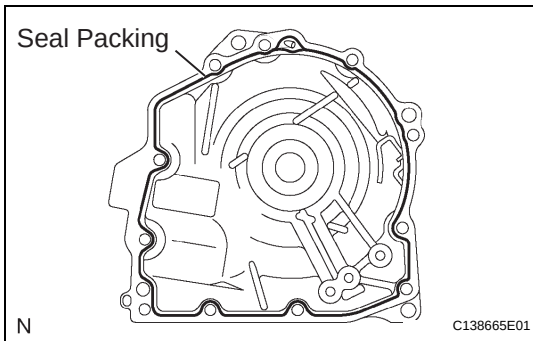
The snap ring should be fully engaged in the groove of the drum.



**34. INSTALL NO. 1 TRANSAXLE CASE PLUG**

- (a) Coat 4 new O-rings with ATF.
- (b) Install the 4 O-rings to the 4 plugs.
- (c) Install the 4 plugs to the transaxle rear cover.

Torque: 7.4 N*m (75 kgf*cm, 65 in.*lbf)

**35. INSTALL TRANSAXLE REAR COVER SUB-ASSEMBLY**

- (a) Remove any packing material and be careful not to spill oil on the contact surfaces of the transaxle rear cover or the transaxle case.
- (b) Apply FIPG to the cover.

Seal packing:

**Toyota Genuine Seal Packing 1281,
Three Bond 1281 or Equivalent**

NOTICE:

Make sure that the seal packing is applied in a bead (section diameter: $\phi 1.2$ mm (0.047 in.)) so that the entire sealing surface will be evenly sealed. The seal packing should also protrude slightly from the flange after the installation of the cover has been completed.

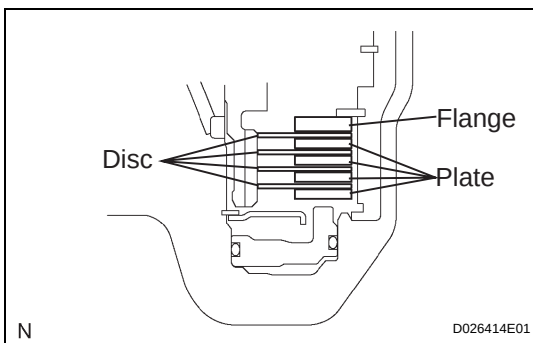
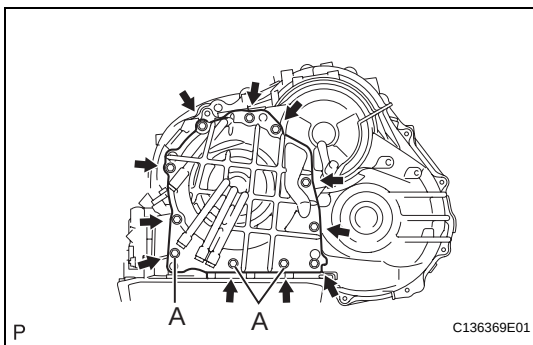
- (c) Apply adhesive to the threads of bolt A.

Adhesive:

**Toyota Genuine Adhesive 1344,
Three Bond 1344 or Equivalent**

- (d) Install the cover with the 11 bolts.

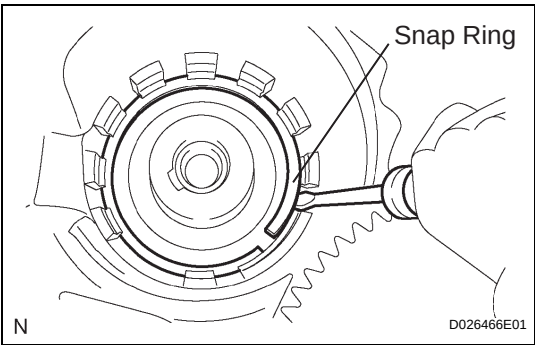
**Torque: 19 N*m (194 kgf*cm, 14 ft.*lbf) for bolt A
25 N*m (255 kgf*cm, 18 ft.*lbf) for other bolts**

**36. INSTALL NO. 2 UNDERDRIVE CLUTCH DISC**

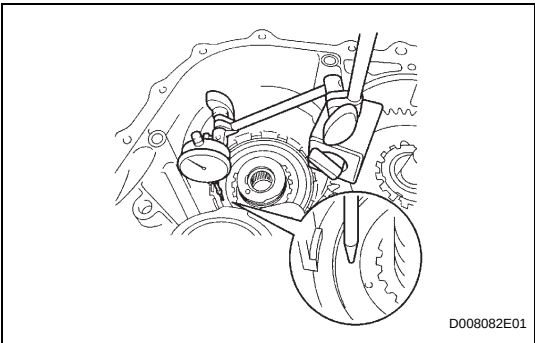
- (a) Coat the 4 discs with ATF.
- (b) Install the 4 discs, 4 plates and flange to the transaxle case.

NOTICE:

Be careful of the order of the discs, plate and flange.



- (c) Using a screwdriver, install the snap ring.
NOTICE:
The snap ring should be fully engaged in the groove of the drum.



37. INSPECT PACK CLEARANCE OF UNDERDRIVE BRAKE

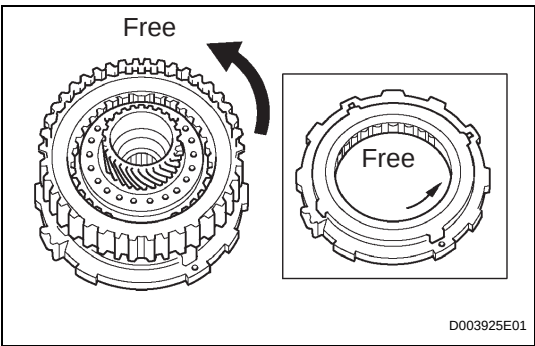
- (a) Using a dial indicator, measure the underdrive brake pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm², 57 psi).
Standard pack clearance:
1.81 to 2.20 mm (0.0713 to 0.0866 in.)

HINT:
Select an appropriate flange from the table below so that it will meet the specified value.

Standard flange thickness

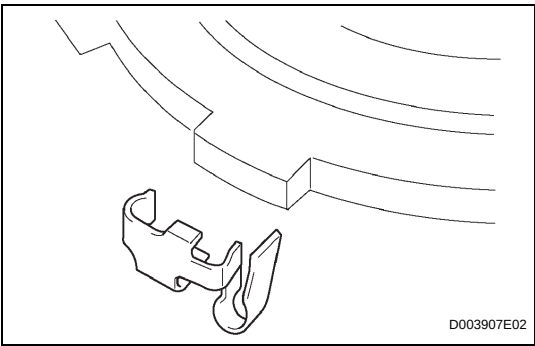
Mark	Thickness	Mark	Thickness
1	3.0 mm (0.118 in.)	4	3.1 mm (0.122 in.)
2	3.2 mm (0.126 in.)	5	3.3 mm (0.130 in.)
3	3.4 mm (0.134 in.)	-	-

- (b) Temporarily remove the snap ring, attach the selected flange and reinstall the snap ring.
(c) Reinstall the snap ring.



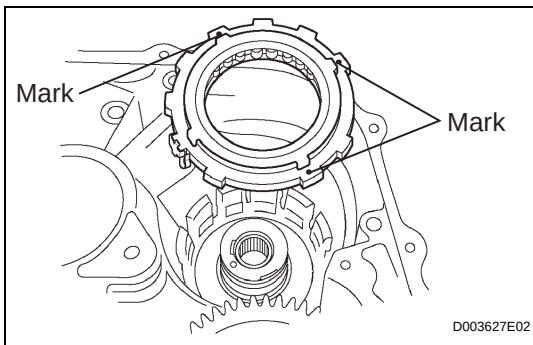
38. INSPECT UNDERDRIVE 1-WAY CLUTCH ASSEMBLY

- (a) Install the underdrive clutch to the 1-way clutch.
(b) Check that the underdrive 1-way clutch locks when turned clockwise and rotates freely when turned counterclockwise as shown in the illustration. If the result is not as specified, replace the underdrive 1-way clutch.



39. INSTALL UNDERDRIVE 1-WAY CLUTCH ASSEMBLY

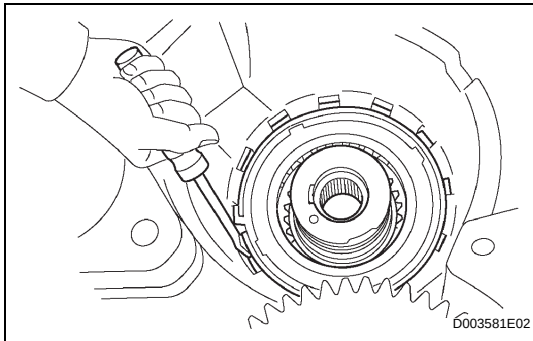
- (a) Install the outer race retainer to the 1-way clutch.
NOTICE:
Fix the outer race retainer to the external tooth of the 1-way clutch firmly.



- (b) Install the 1-way clutch to the transaxle case.

NOTICE:

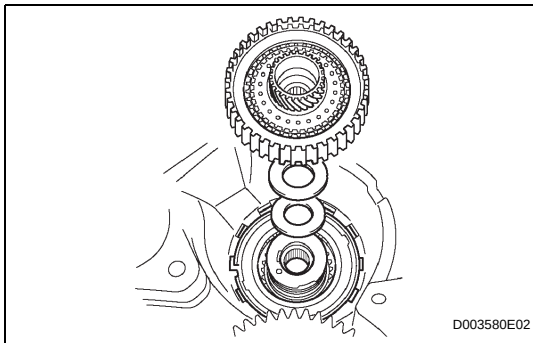
Make sure that the mark on the 1-way clutch outer race is visible.



- (c) Using a screwdriver, install the snap ring to the transaxle case.

NOTICE:

The snap ring should be fully engaged in the groove of the transaxle case.



40. INSTALL UNDERDRIVE CLUTCH ASSEMBLY

- (a) Coat the bearing and bearing race with petrolatum, and install them onto the underdrive clutch.

Standard bearing and bearing race diameter

Item	Inside	Outside
Bearing	37.73 mm (1.4854 in.)	58.0 mm (2.2835 in.)
Race	29.9 mm (1.1772 in.)	55.5 mm (2.185 in.)

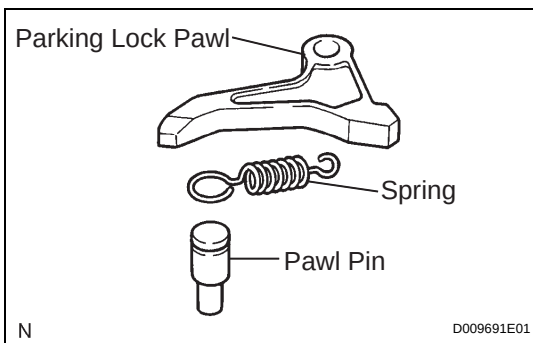
- (b) Install the underdrive clutch to the transaxle case.

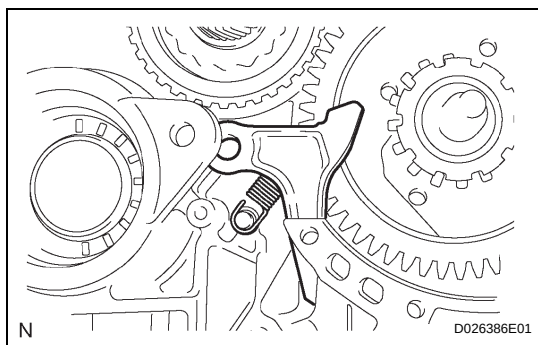
NOTICE:

Do not damage the oil seal when installing the underdrive clutch drum.

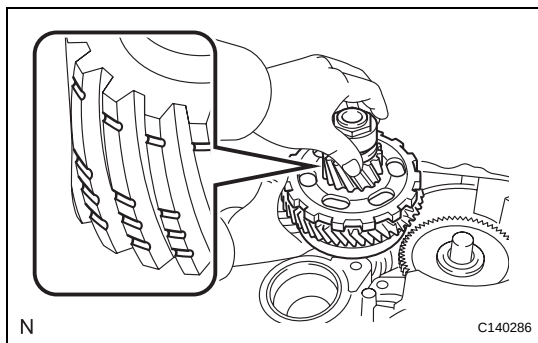
41. INSTALL PARKING LOCK PAWL

- (a) Install the pawl pin and spring to the parking lock pawl.





- (b) Temporarily install the parking lock pawl, shaft and spring to the transaxle case, as shown in the illustration.



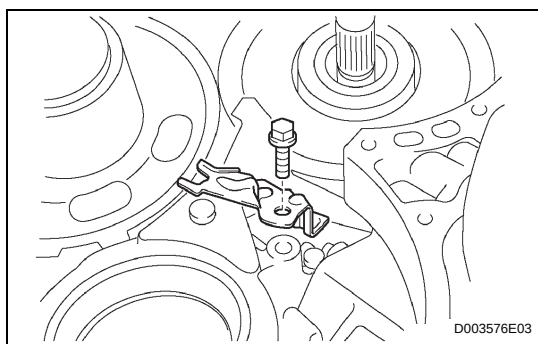
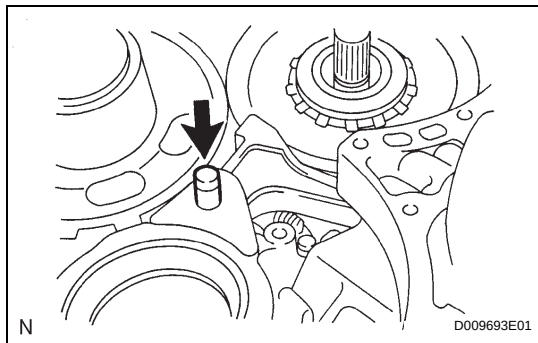
42. INSTALL UNDERDRIVE PLANETARY GEAR ASSEMBLY

- (a) Install the underdrive planetary gear to the transaxle case.

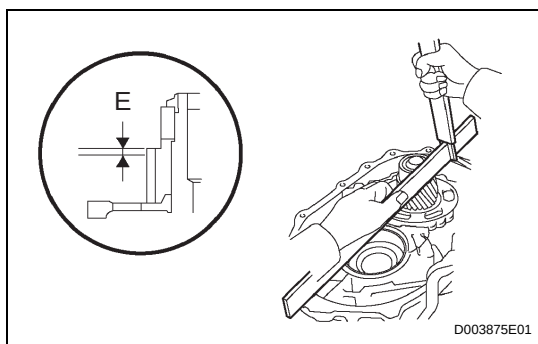
NOTICE:

- Fully engage all the discs of underdrive clutch and hub splines of the underdrive planetary gear and install them securely.
- Check the position and number of the grooves on each end face of the differential drive pinion gear.

- (b) Install the parking lock pawl shaft.



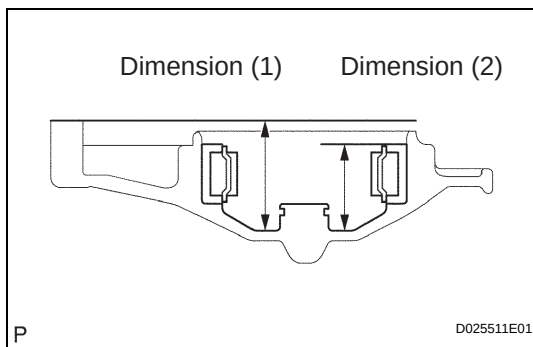
- (c) Install the pawl shaft clamp with the bolt.
Torque: 9.8 N*m (100 kgf*cm, 87 in.*lbf)



- (d) Using a straightedge and vernier caliper as shown in the illustration, measure the gap between the top of the differential drive pinion in the underdrive planetary gear and the contact surface of the transaxle case and housing (Dimension E).

NOTICE:

Record dimension E for the following process.



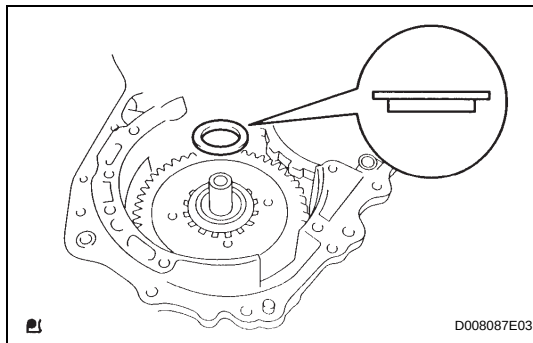
- (e) As shown in the illustration, measure the 2 places of the transaxle housing, and calculate dimension F using the formula below.

NOTICE:

Record dimension F for the following process.

HINT:

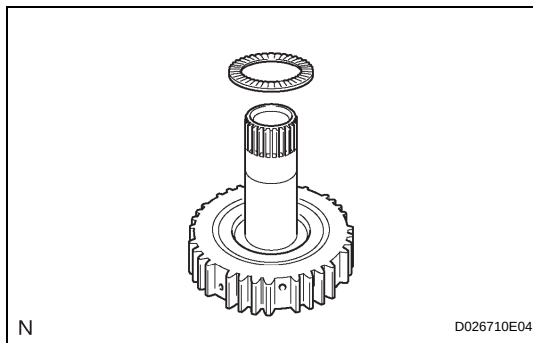
Dimension F = Dimension (1) - Dimension (2)

**43. INSTALL MULTIPLE DISC CLUTCH HUB**

- (a) Install the thrust bearing race to the transaxle case while checking its direction.

Standard bearing race diameter

Item	Inside	Outside
Bearing race	39.5 mm (1.555 in.)	45.8 mm (1.803 in.)

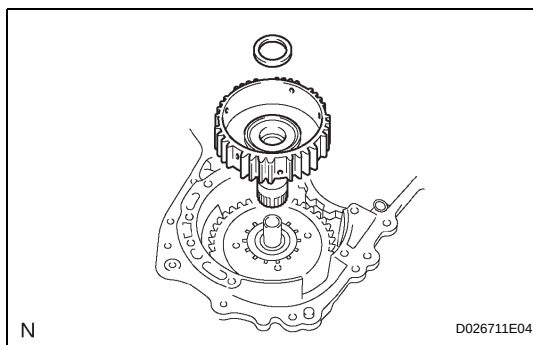


- (b) Coat the thrust needle roller bearing and race with yellow petrolatum, and install them onto the multiple disc clutch hub.

Standard thrust bearing and race diameter

Item	Inside	Outside
Thrust Bearing	36.4 mm (1.433 in.)	52.2 mm (2.055 in.)

- (c) Coat the needle roller bearing with ATF.

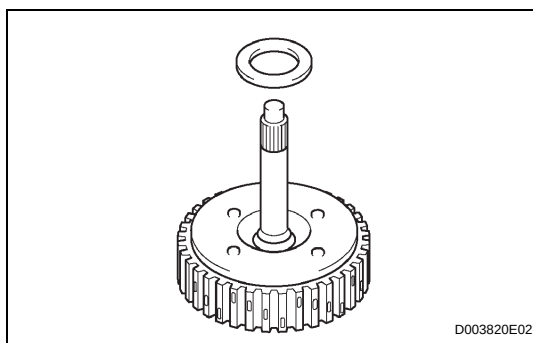


- (d) Install the needle roller bearing to the multiple clutch hub.

Standard bearing diameter

Item	Inside	Outside
Bearing	23.6 mm (0.929 in.)	44 mm (1.732 in.)

- (e) Install the multiple clutch hub to the transaxle case.

**44. INSTALL FORWARD CLUTCH ASSEMBLY**

- (a) Coat the thrust needle roller bearing with ATF.
(b) Install the thrust needle roller bearing to the forward clutch.

Standard thrust bearing diameter

Item	Inside	Outside
Thrust Bearing	33.58 mm (1.3220 in.)	51.9 mm (2.043 in.)

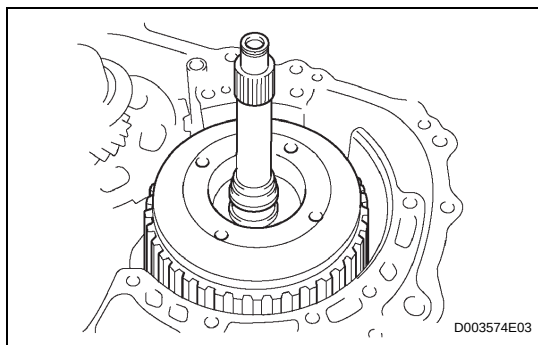
NOTICE:

Install the thrust bearing properly so that the non-collared race or blue ink jet race will be visible.

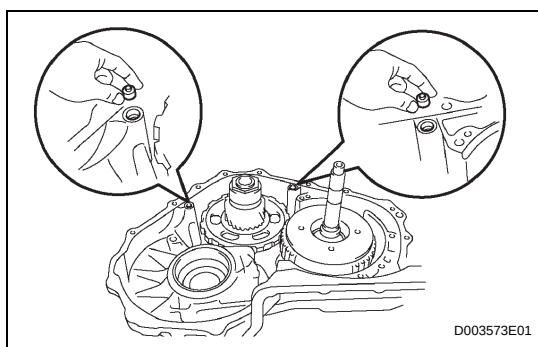
- (c) Install the forward clutch to the transaxle case.

NOTICE:

- Align the splines of all discs in the forward clutch with those of multiple clutch hub to install them securely.
- Be careful not to damage the bushing inside of the forward clutch hub during installation.

**45. INSTALL OVERDRIVE BRAKE GASKET**

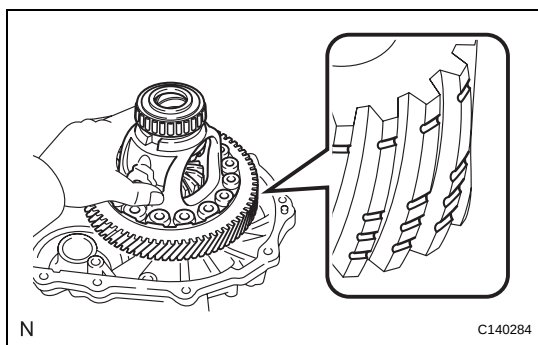
- (a) Install 2 new overdrive brake gaskets.

**46. INSTALL DIFFERENTIAL GEAR ASSEMBLY**

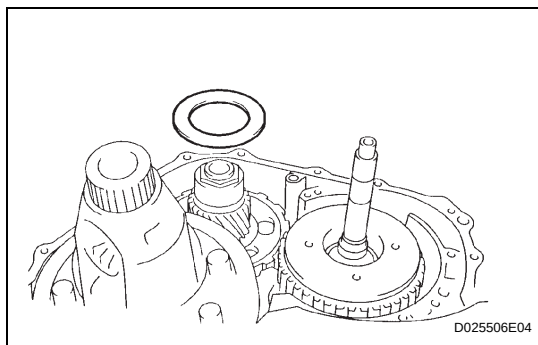
- (a) Install the differential gear to the transaxle case.

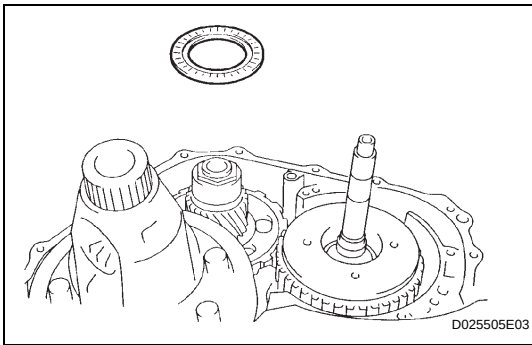
NOTICE:

Check the position and number of the grooves on each end face of the differential ring gear.

**47. INSTALL NO. 2 THRUST BEARING UNDERDRIVE RACE**

- (a) Install the thrust bearing underdrive race to the underdrive planetary gear.



**48. INSTALL THRUST NEEDLE ROLLER BEARING**

- Coat the thrust needle roller bearing with ATF.
- Calculate the end play value using the following formula and values of Dimension E and F that were measured when installing the cylindrical roller bearing and underdrive planetary gear. Select an appropriate underdrive planetary gear thrust bearing race which satisfies the specified end play value, and install the selected bearing race.

Standard end play:

0.498 to 0.993 mm (0.0196 to 0.0391 in.)

HINT:

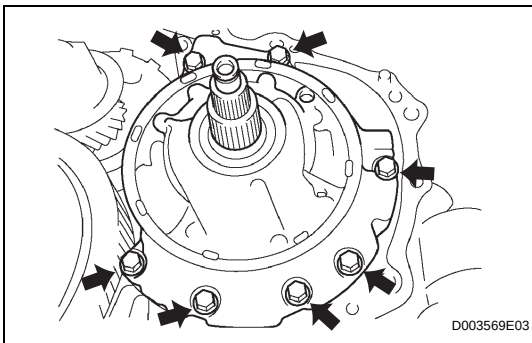
End play = Dimension F - Dimension E - thrust bearing thickness 2.5 mm (0.0984 in.) - underdrive thrust bearing race thickness.

Standard race thickness

F - E	Thickness
Less than 7.72 mm (0.3039 in.)	3.5 mm (0.138 in.)
7.72 mm (0.3039 in.)	3.8 mm (0.150 in.)

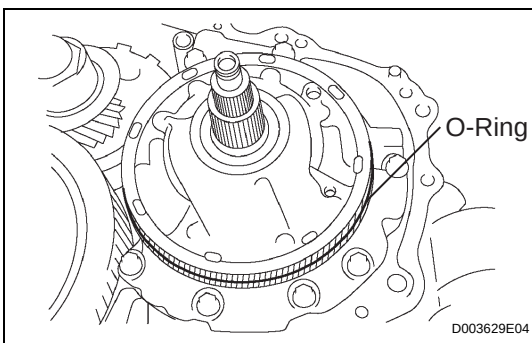
Standard bearing and bearing race diameter

Item	Inside	Outside
Bearing	57.2 mm (2.252 in.)	84.96 mm (3.345 in.)
Bearing race	56.4 mm (2.22 in.)	83 mm (3.268 in.)

**49. INSTALL OIL PUMP ASSEMBLY**

- Install the oil pump to the transaxle case with the 7 bolts.

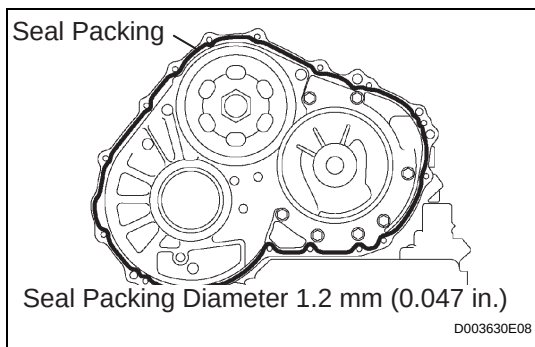
Torque: 22 N*m (226 kgf*cm, 16 ft.*lbf)



- Coat the O-ring of oil pump with ATF.

NOTICE:

Confirm that the input shaft rotates smoothly by manual operation after installing the oil pump.



50. INSTALL TRANSAXLE HOUSING

- Remove any packing material and be careful not to spill oil on the contact surface of the transaxle case or transaxle housing.
- Apply seal packing to the transaxle case.

Seal packing:

**Toyota Genuine Seal Packing 1281,
Three Bond 1281 or Equivalent**

- Apply adhesive or equivalent to bolts A and D.

Adhesive:

**Toyota Genuine Adhesive 1344,
Three Bond 1344 or Equivalent**

- Install the transaxle housing and 16 bolts to the transaxle case.

Torque: 22 N*m (224 kgf*cm, 16 ft.*lbf) for bolt A
 29 N*m (295 kgf*cm, 21 ft.*lbf) for bolt B
 29 N*m (295 kgf*cm, 21 ft.*lbf) for bolt C
 22 N*m (226 kgf*cm, 16 ft.*lbf) for bolt D

HINT:

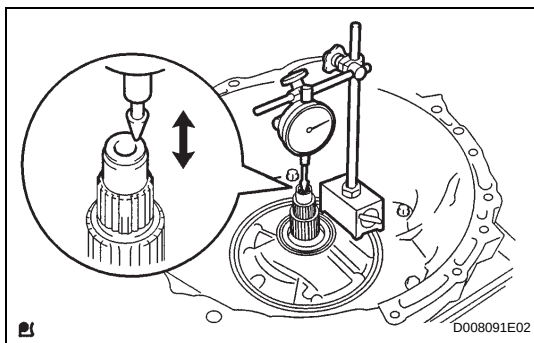
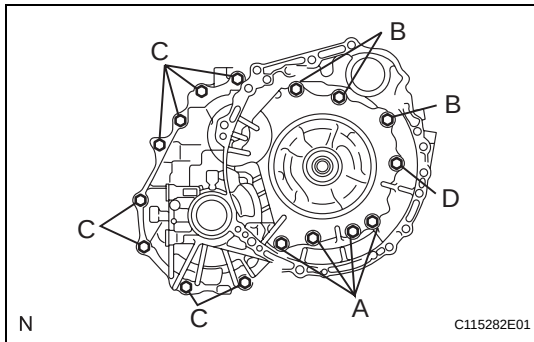
Each bolt length is indicated below.

Bolt length:

50 mm (1.97 in.) for bolt A
 50 mm (1.97 in.) for bolt B
 42 mm (1.65 in.) for bolt C
 72 mm (2.84 in.) for bolt D

NOTICE:

Tighten the bolts within 10 minutes of adhesive application.

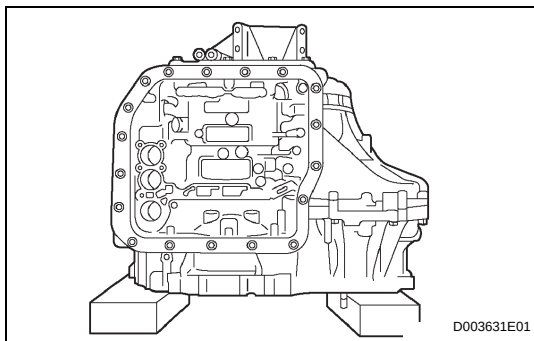


51. INSPECT INPUT SHAFT END PLAY

- Using a dial indicator, measure the input shaft end play.

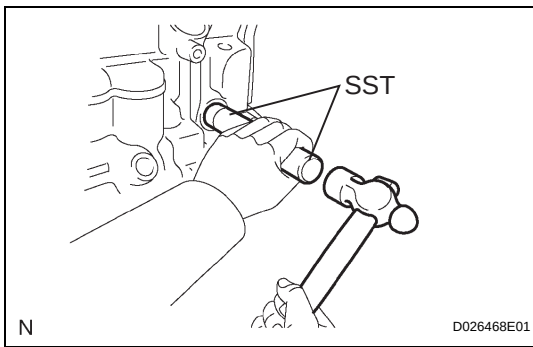
Standard end play:

0.262 to 1.249 mm (0.0100 to 0.0494 in.)



52. FIX AUTOMATIC TRANSAXLE ASSEMBLY

- Fix the transaxle.

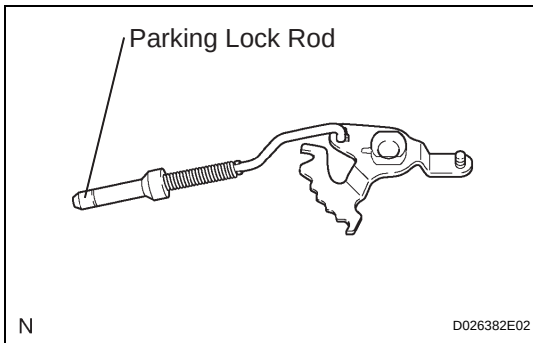
**53. INSTALL MANUAL VALVE LEVER SHAFT OIL SEAL**

- (a) Coat a new oil seal with MP grease.
- (b) Install the oil seal to the transaxle case.

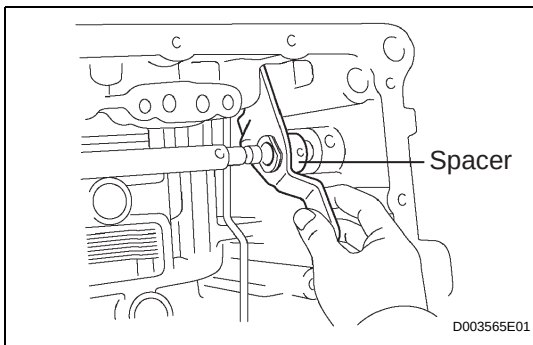
SST 09950-60010 (09951-00230), 09950-70010 (09951-07100)

Standard depth:

0 $\pm$ 0.5 mm (0 $\pm$ 0.197 in.)

**54. INSTALL PARKING LOCK ROD SUB-ASSEMBLY**

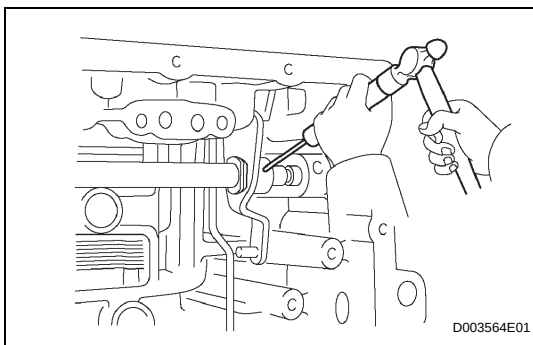
- (a) Install the parking lock rod to the manual valve lever.

**55. INSTALL MANUAL VALVE LEVER SUB-ASSEMBLY**

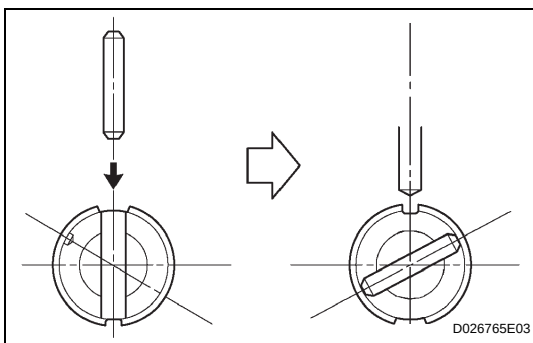
- (a) Install a new spacer and manual valve lever shaft to the transaxle case.

NOTICE:

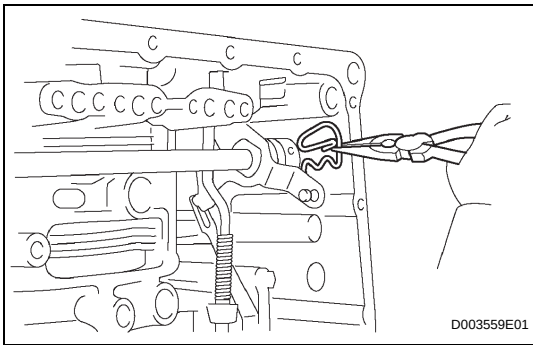
Do not damage the oil seal when installing the shaft to the transaxle case.



- (b) Using a pin punch and hammer, drive in a new pin.

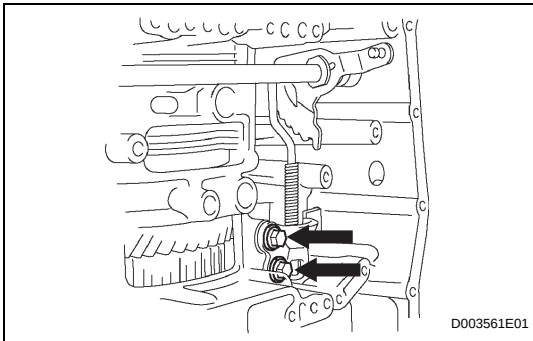


- (c) Turn the spacer and the lever shaft to align the small hole for locating the staking position in the spacer with the staking position mark on the lever shaft.
- (d) Using a pin punch, stake the spacer through the small hole.
- (e) Check that the spacer does not turn.



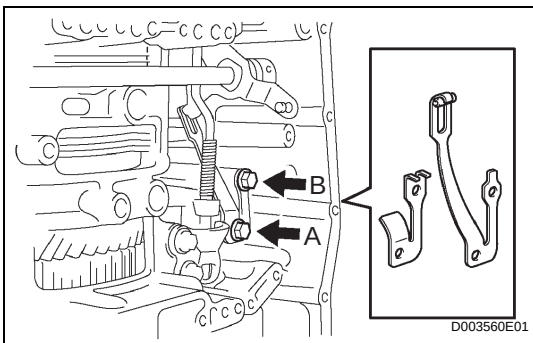
56. INSTALL MANUAL VALVE LEVER SHAFT RETAINER SPRING

- (a) Using needle-nose pliers, install the retainer spring.
NOTICE:
 Hang the spring on the shaft firmly.



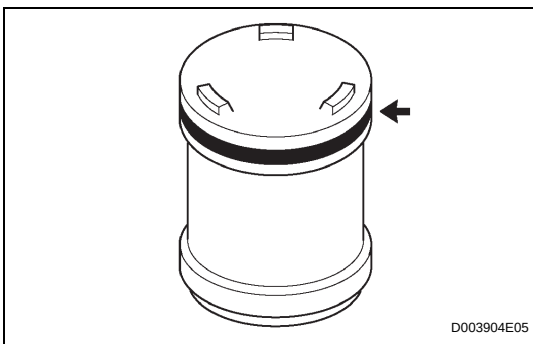
57. INSTALL PARKING LOCK PAWL BRACKET

- (a) Install the parking lock pawl bracket with the 2 bolts.
Torque: 20 N*m (205 kgf*cm, 15 ft.*lbf)
HINT:
 The bolt length is indicated below.
Bolt length:
 25.0 mm (0.984 in.)
NOTICE:
 Make sure that the parking rod is placed between the parking pawl and the guide of the parking bracket when the parking bracket is installed.



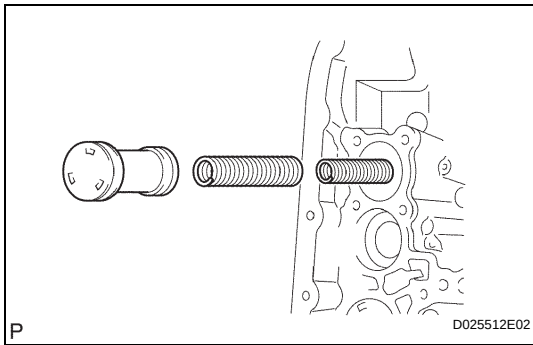
58. INSTALL MANUAL DETENT SPRING SUB-ASSEMBLY

- (a) Install the manual detent spring and cover with the 2 bolts.
Torque: 20 N*m (205 kgf*cm, 15 ft.*lbf) for bolt A
12 N*m (122 kgf*cm, 9 ft.*lbf) for bolt B
HINT:
 - Tighten bolt A first, and then bolt B.
 - Each bolt length is indicated below.**Bolt length:**
 27 mm (1.06 in.) for bolt A
 16 mm (0.63 in.) for bolt B
NOTICE:
 Make sure to install the manual detent spring and cover in this order.



59. INSTALL B-3 ACCUMULATOR PISTON

- (a) Coat a new O-ring with ATF, and install it to the B-3 accumulator piston.
NOTICE:
 Make sure that the O-ring is not twisted and that it does not protrude abnormally from the accumulator piston. Apply sufficient ATF before installing the O-ring. The O-ring must be installed in the correct position.



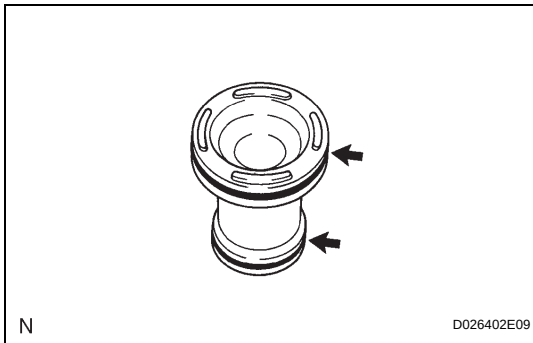
- (b) Install the accumulator piston to the transaxle case.
- (1) Coat the piston with ATF.
 - (2) Install the 2 springs to the piston, and install the piston (with springs) to the transaxle case.

NOTICE:

Before installing the springs, check the identification color of each spring. Standard accumulator spring

Standard accumulator spring

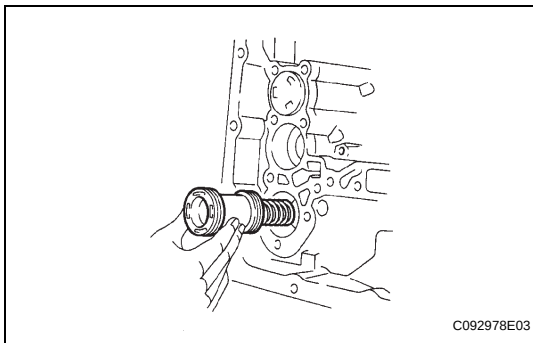
Spring	Free length / Outer diameter	Identification Color
Inner	Inner 62.00 mm (2.4409 in.) / 15.50 mm (0.610 in.)	Purple
Outer	Outer 74.23 mm (2.9224 in.) / 21.70 mm (0.8543 in.)	

**60. INSTALL REVERSE CLUTCH ACCUMULATOR PISTON**

- (a) Coat 2 new O-rings with ATF, and install them to the reverse accumulator piston.

NOTICE:

Make sure that the O-ring is not twisted and that it does not protrude abnormally from the accumulator piston. Apply sufficient ATF before installing the O-ring. The O-ring must be installed in the correct position.



- (b) Install the piston to the transaxle case.
- (1) Coat the accumulator piston with ATF.
 - (2) Install the spring to the piston, and install the piston (with spring) to the transaxle case.

NOTICE:

Before installing the spring, check the identification color of the spring.

Standard accumulator spring

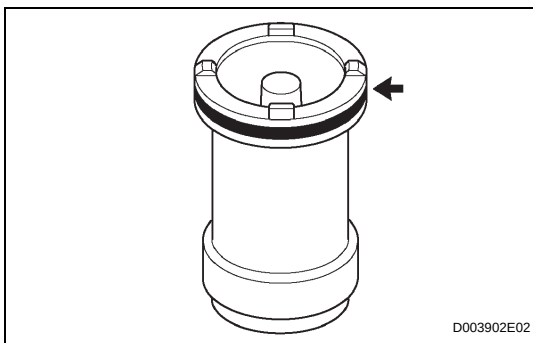
Free length / Outer diameter	Identification Color
60.96 mm (2.3999 in.) / 14.10 mm (0.5551 in.)	Yellow

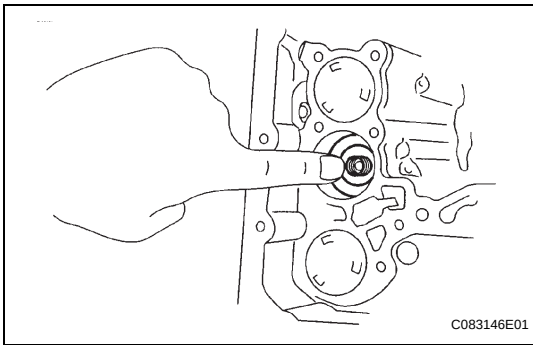
61. INSTALL C-3 ACCUMULATOR PISTON

- (a) Coat a new O-ring with ATF, and install it to the C-3 accumulator piston.

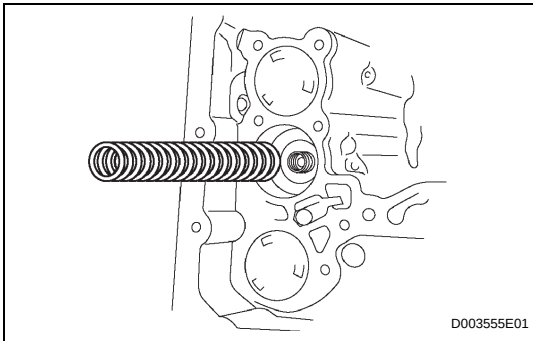
NOTICE:

Make sure that the O-ring is not twisted and that it does not protrude abnormally from the accumulator piston. Apply sufficient ATF before installing the O-ring. The O-ring must be installed in the correct position.





- (b) Install the piston to the transaxle case and coat the piston with ATF.

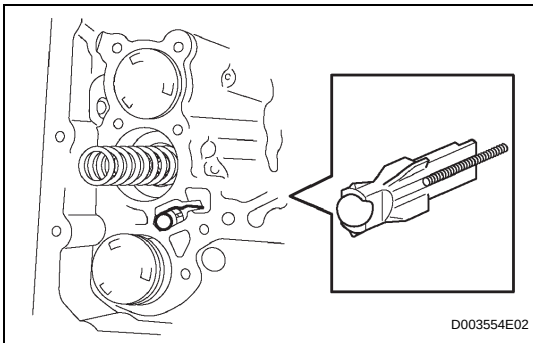


- (c) Install the spring to the C-3 accumulator piston.
(d) Install the spring to the C-3 accumulator piston.

NOTICE:

Before installing the spring, check the identification color of the spring.
Standard accumulator spring

Free length Outer diameter	Color
72.20 mm (2.8425 in.) / 19.0 mm (0.748 in.)	Colorless

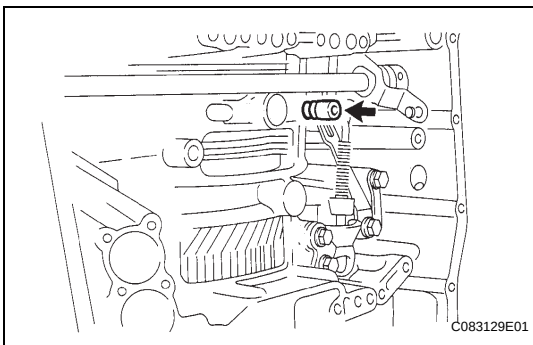


62. INSTALL CHECK BALL BODY

- (a) Coat the check ball body with ATF.
(b) Install the check ball body and spring.

NOTICE:

Be sure to place the spring in the hole in the check ball body. Be careful of the direction of the parts.

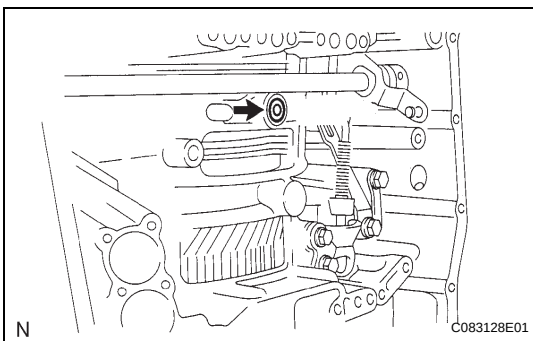


63. INSTALL BRAKE DRUM GASKET

- (a) Coat a new brake drum gasket with ATF, and install it to the transaxle case.

NOTICE:

Be sure not to damage the lip of the transaxle case brake gasket when inserting the gasket to the case. Apply sufficient ATF to the gasket before installation. Be careful of the direction of parts.

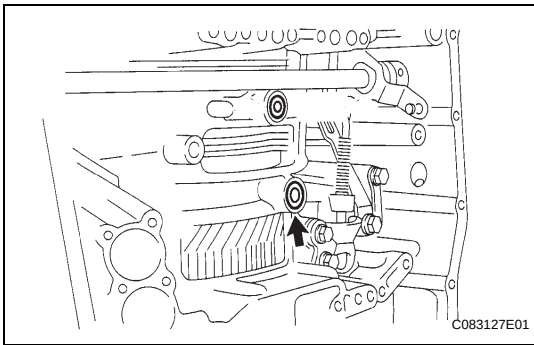


64. INSTALL TRANSAXLE CASE 2ND BRAKE GASKET

- (a) Coat a new transaxle case 2nd brake gasket with ATF, and install it to the transaxle case.

NOTICE:

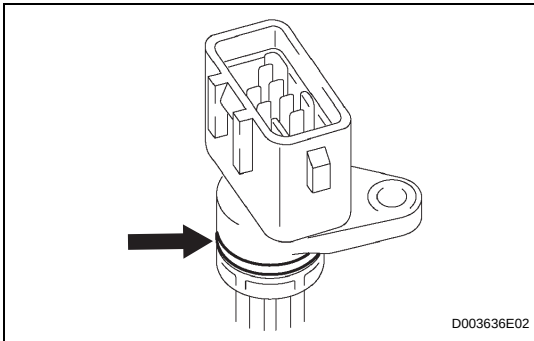
Be sure not to damage the lip of the transaxle case brake gasket when inserting the gasket to the case. Apply sufficient ATF to the gasket before installation. Be careful of the direction of parts.

**65. INSTALL NO. 1 GOVERNOR APPLY GASKET**

- (a) Coat a new governor apply gasket with ATF, and install it to the transaxle case.

NOTICE:

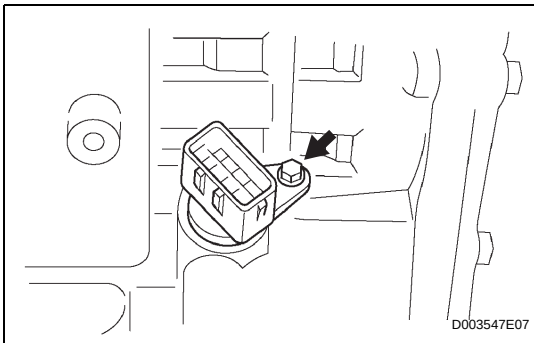
Be sure not to damage the lip of the transaxle case brake gasket when inserting the gasket to the case. Apply sufficient ATF to the gasket before installation. Be careful of the direction of parts.

**66. INSTALL TRANSMISSION WIRE**

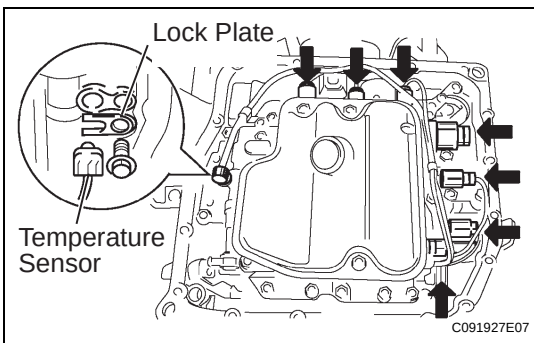
- (a) Coat a new O-ring with ATF, and install it to the transmission wire.

NOTICE:

Make sure that the O-ring is not twisted, protruded, or pinched when installing the wire transmission to the transaxle case. Apply sufficient ATF to the O-ring before installation.



- (b) Install the transmission wire retaining bolt.
Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)

**67. CONNECT TRANSMISSION WIRE**

- (a) Coat the O-ring of the ATF temperature sensor with ATF.
(b) Apply ATF to the bolt.
(c) Install the ATF temperature sensor with the lock plate and bolt.
Torque: 6.6 N*m (67 kgf*cm, 58 in.*lbf)
(d) Connect the 7 solenoid valve connectors.

68. INSTALL TRANSMISSION VALVE BODY ASSEMBLY

- (a) Apply ATF to the 17 bolts.
(b) While positioning the manual valve lever position, install the valve body to the transaxle case with the 17 bolts.

Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)

HINT:

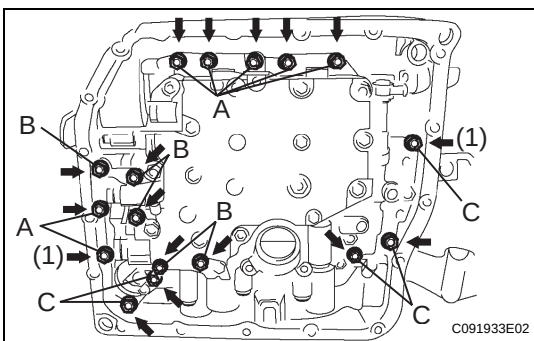
Each bolt length is indicated below.

Bolt length:

25.0 mm (0.984 in.) for bolt A

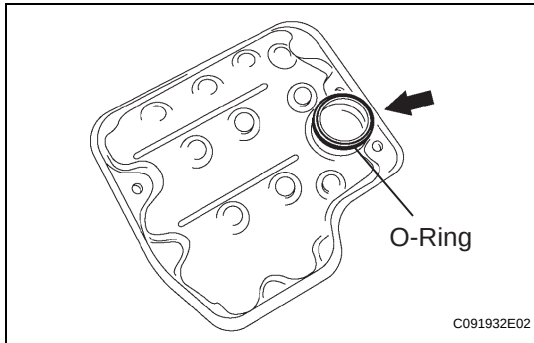
57.0 mm (2.244 in.) for bolt B

41.0 mm (1.614 in.) for bolt C



NOTICE:

- Push the valve body against the accumulator piston spring and the check ball body to install the valve body.
- When installing the valve body to the transaxle case, do not hold the solenoids.
- Temporarily tighten the bolts marked with (1) in the illustration first because they are positioning bolts.

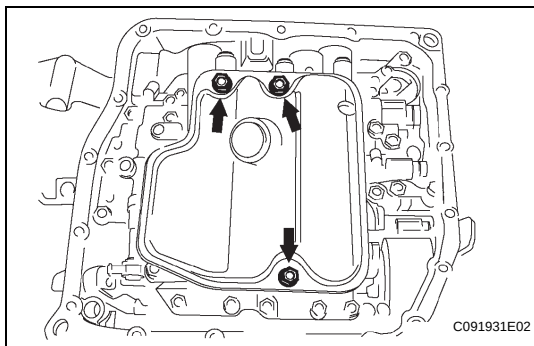
**69. INSTALL VALVE BODY OIL STRAINER ASSEMBLY**

- (a) Coat a new O-ring with ATF and install it to the oil strainer.

NOTICE:

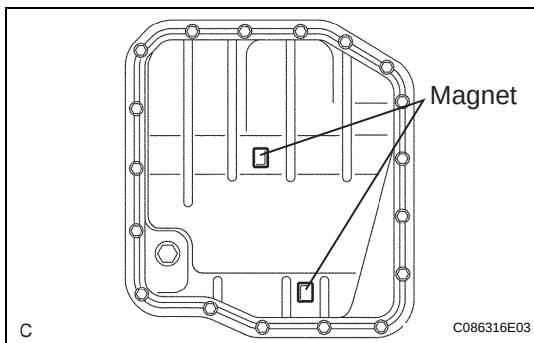
Make sure that the O-ring is not twisted or pinched. Apply sufficient ATF to the O-ring before installation.

- (b) Apply ATF to the 3 bolts.

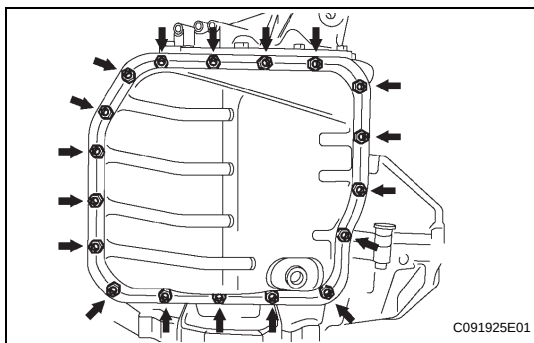


- (c) Install the oil strainer to the valve body with the 3 bolts.

Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)

**70. INSTALL AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY**

- (a) Install the 2 magnets to the oil pan.

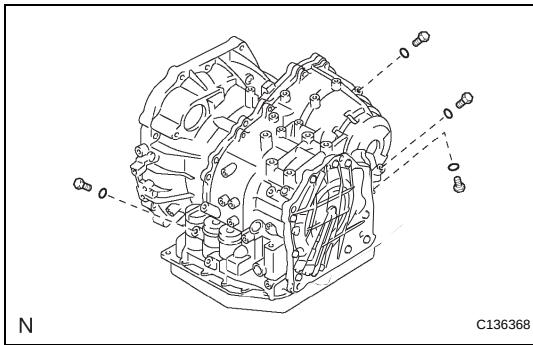


- (b) Install the oil pan and a new oil pan gasket to the transaxle case with the 18 bolts.

Torque: 7.6 N*m (77 kgf*cm, 67 in.*lbf)

NOTICE:

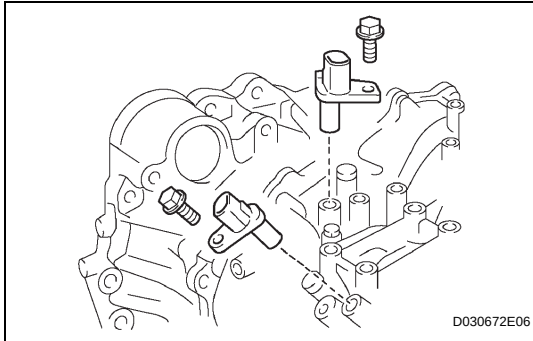
Completely remove any oil or grease from the contact surface of the transaxle case and the oil pan with the gasket before installing the oil pan to the case.

**71. INSTALL NO. 1 TRANSAXLE CASE PLUG**

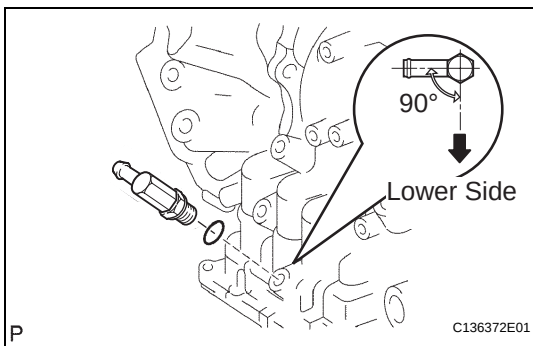
- (a) Coat 4 new O-rings with ATF, and install them to the 4 plugs.
- (b) Install the 4 plugs to the transaxle case.
Torque: 7.4 N*m (75 kgf*cm, 65 in.*lbf)

72. INSTALL SPEEDOMETER DRIVEN HOLE COVER SUB-ASSEMBLY

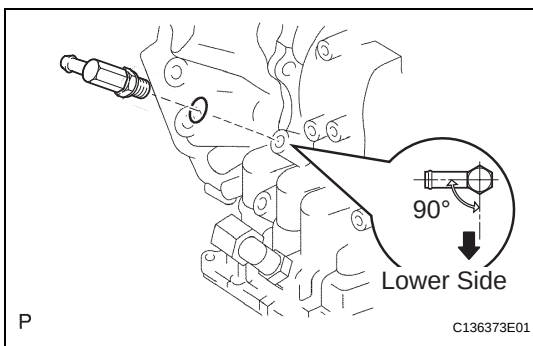
- (a) Coat a new O-ring with ATF, and install it to the cover.
- (b) Install the cover with the bolt.
Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf)

**73. INSTALL SPEED SENSOR**

- (a) Coat 2 new O-rings with ATF and install them to the 2 sensors.
- (b) Install the 2 sensors to the transaxle case with the 2 bolts.
Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)

**74. INSTALL OIL COOLER INLET TUBE ELBOW**

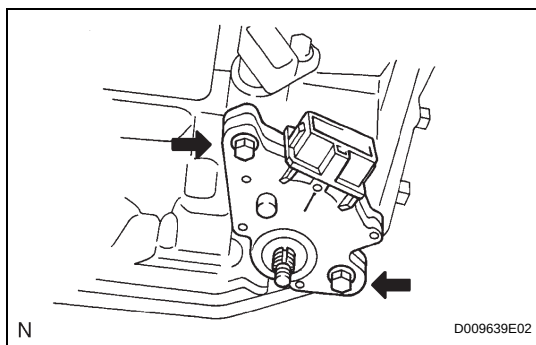
- (a) Coat a new O-ring with ATF, and install it to the elbow.
- (b) Install the elbow to the transaxle case.
Torque: 27 N*m (276 kgf*cm, 20 ft.*lbf)

**75. INSTALL OIL COOLER OUTLET TUBE ELBOW**

- (a) Coat a new O-ring with ATF, and install it to the elbow.
- (b) Install the elbow to the transaxle case.
Torque: 27 N*m (276 kgf*cm, 20 ft.*lbf)

76. INSTALL BREATHER PLUG HOSE

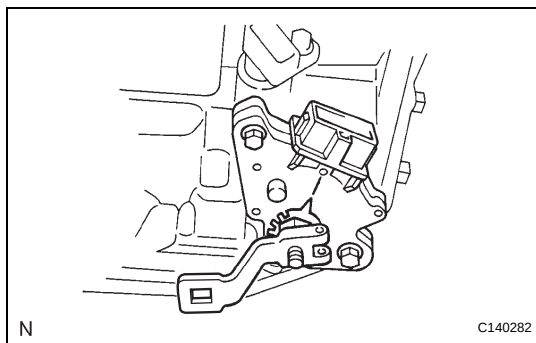
- (a) Install the breather plug hose to the transaxle case firmly.



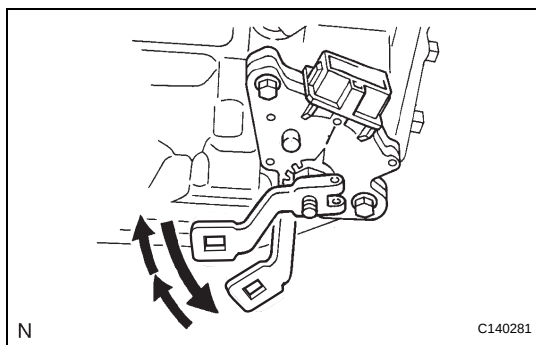
77. INSTALL PARK/NEUTRAL POSITION SWITCH ASSEMBLY

- (a) Install the switch to the manual valve shaft.
- (b) Temporarily install the 2 bolts.
- (c) Install a new lock washer and tighten the manual valve shaft nut.

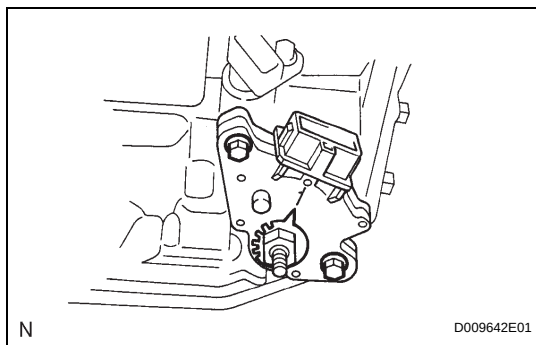
Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)



- (d) Temporarily install the control shaft lever.

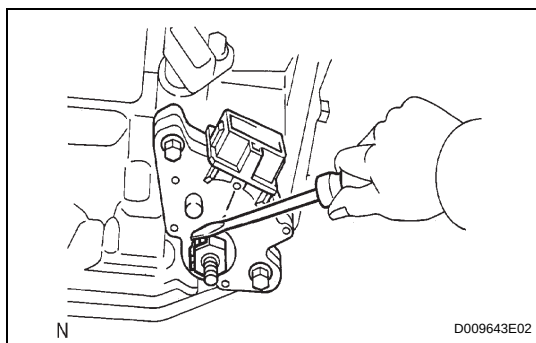


- (e) Turn the lever counterclockwise until it stops, and then turn it clockwise 2 notches.
- (f) Remove the control shaft lever.

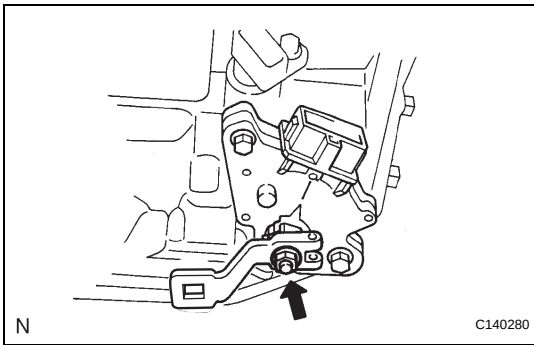


- (g) Align the groove and neutral basic line.
- (h) Hold the switch in this position and tighten the 2 bolts.

Torque: 6.9 N*m (70 kgf*cm, 61 in.*lbf)



- (i) Using a screwdriver, stake the nut with the lock washer.



- (j) Install the control shaft lever with the washer and nut.

Torque: 13 N*m (130 kgf*cm, 9 ft.*lbf)

78. INSTALL SPEEDOMETER DRIVEN HOLE COVER SUB-ASSEMBLY

- (a) Coat a new O-ring with ATF and install it to the speedometer driven hole cover.

- (b) Install the bolt and hole cover to the transaxle.

Torque: 6.9 N*m (70 kgf*cm, 61 in.*lbf)

REASSEMBLY

1. INSTALL FRONT OIL PUMP OIL SEAL

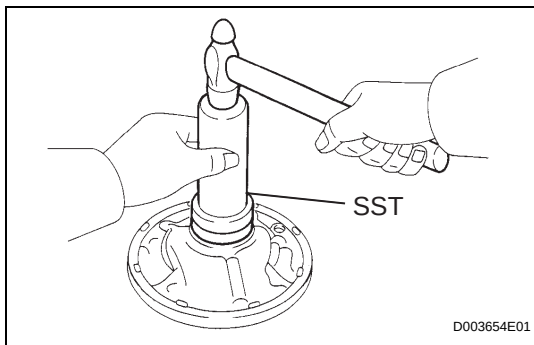
- (a) Using SST and a hammer, tap in a new oil seal to the oil pump body.

SST 09350-32014 (09351-32140)

HINT:

The seal end should be flat with the outer edge of the oil pump.

- (b) Coat the lip of the oil seal with MP grease.

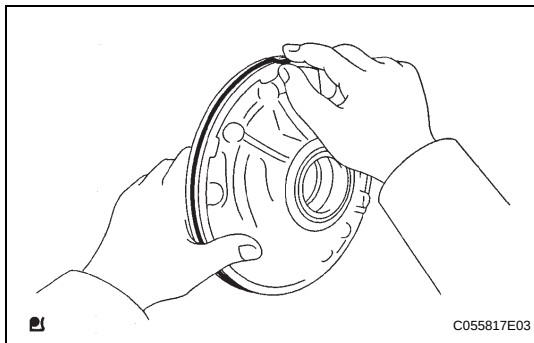


2. INSTALL FRONT OIL PUMP BODY O-RING

- (a) Coat a new O-ring with ATF, and install it to the oil pump body.

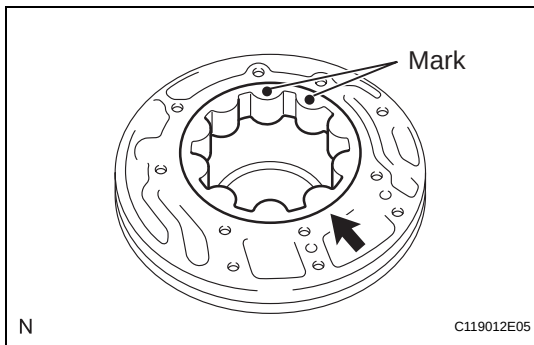
NOTICE:

- Make sure that the O-ring is not twisted or pinched.
- Apply enough ATF to the O-ring before installation.



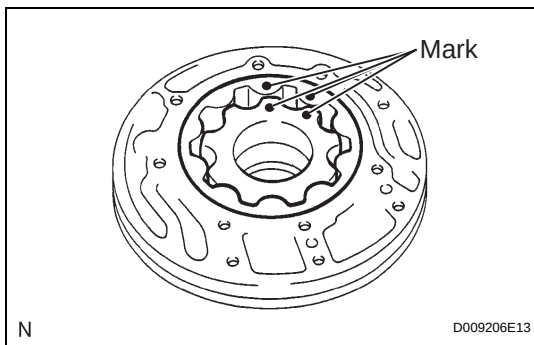
3. INSTALL FRONT OIL PUMP DRIVEN GEAR

- (a) Coat the front oil pump driven gear with ATF, and install it to the oil pump body with the marked side facing upward.



4. INSTALL FRONT OIL PUMP DRIVE GEAR

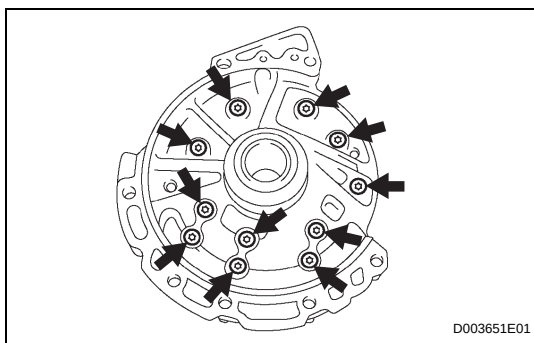
- (a) Coat the front oil pump drive gear with ATF, and install it to the oil pump body with the marked side facing upward.

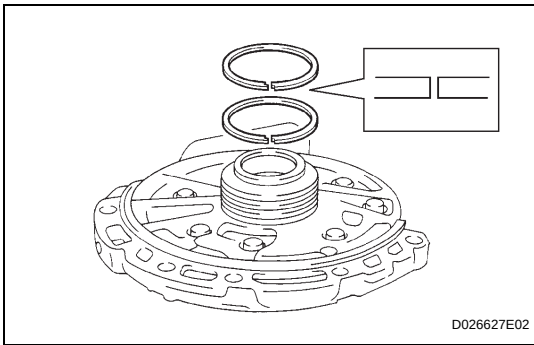


5. INSTALL STATOR SHAFT ASSEMBLY

- (a) Set the stator shaft and align it with each bolt hole.
- (b) Using a T30 "torx" socket, install the 11 bolts.

Torque: 9.8 N*m (100 kgf*cm, 87 in.*lbf)



**6. INSTALL CLUTCH DRUM OIL SEAL RING**

- (a) Coat 2 new oil seal rings with ATF.
- (b) Install 2 new clutch drum oil seal rings.

NOTICE:

Do not expand the ring ends excessively.

7. INSPECT OIL PUMP ASSEMBLY (See page [AX-246](#))

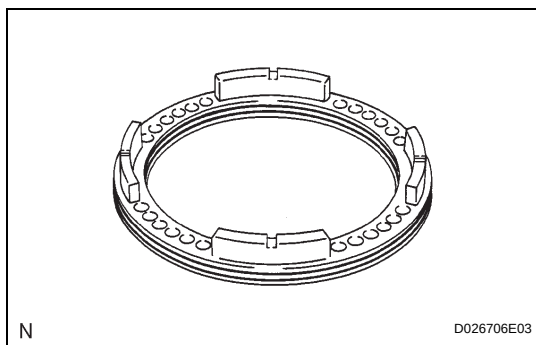
REASSEMBLY

1. INSTALL 2ND BRAKE PISTON O-RING

- (a) Coat 2 new O-rings with ATF, and install them in the 2nd brake piston.

NOTICE:

Make sure that the O-ring is not twisted or pinched.

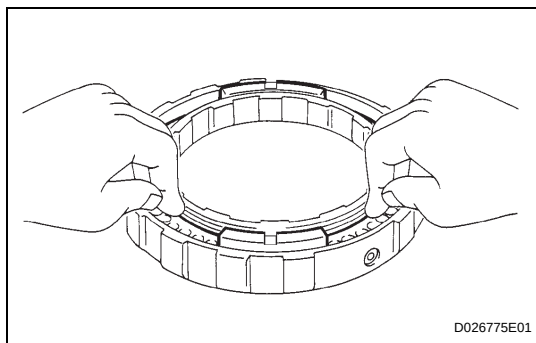


2. INSTALL 2ND BRAKE PISTON

- (a) Coat the 2nd brake piston with ATF, and install it to the 2nd brake cylinder.

NOTICE:

Be careful not to damage the O-ring.

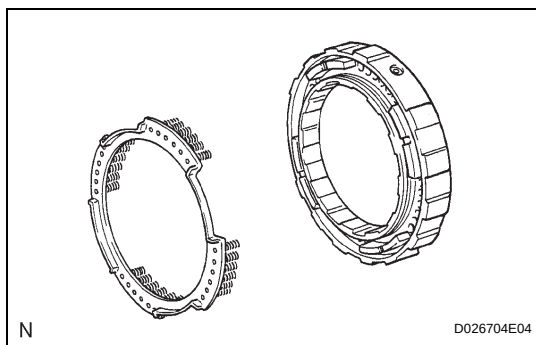


3. INSTALL 2ND BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

- (a) Install the 2nd brake piston return spring.

NOTICE:

After installing the spring, check that all of the springs fit in the piston correctly.



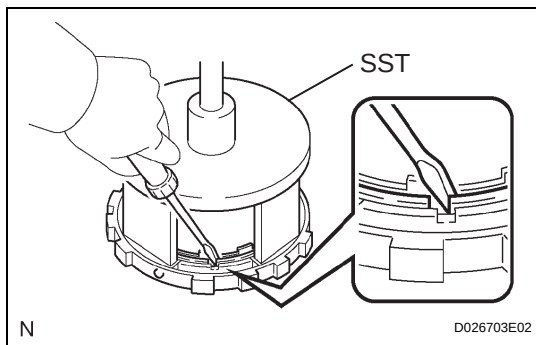
- (b) Place SST on the piston return spring, and compress the piston return spring with a press.

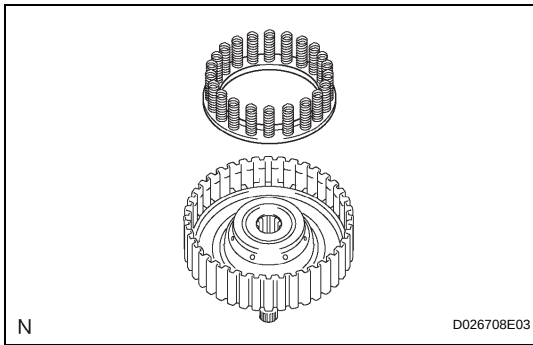
SST 09387-00060

- (c) Using a screwdriver, install the snap ring.
 (d) Be sure that the end gap of the snap ring is not aligned with the spring retainer claw.

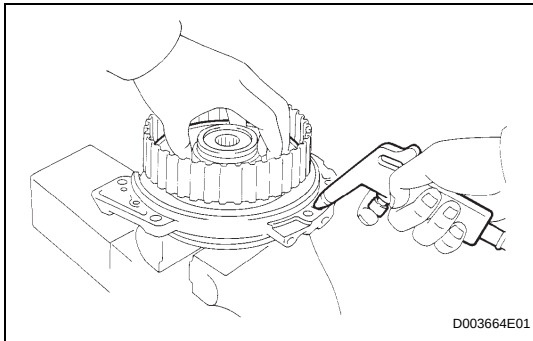
NOTICE:

Stop the press when the spring seat is lowered to a position 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove. This prevents the spring seat from being deformed.





- (d) Remove the forward clutch return spring from the input shaft.

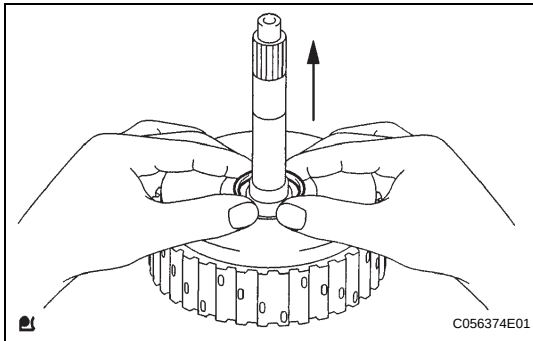


4. REMOVE FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY

- (a) Place the forward clutch drum onto the oil pump.
 (b) Holding the forward clutch piston by hand, apply compressed air (392 kPa, 4.0 kgf/cm², 57 psi) to the oil pump to remove the forward clutch piston.

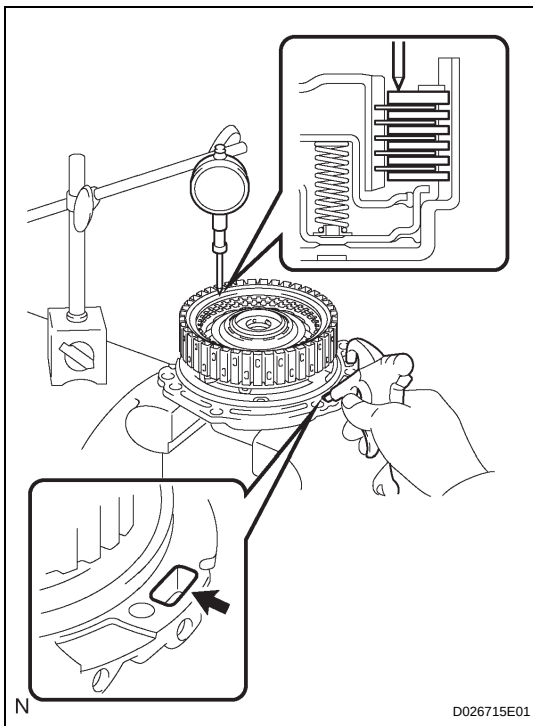
HINT:

When the piston cannot be removed because it is slanted, blow air again with the protruding side pushed, or remove the piston using needle nose pliers with vinyl tape on the tip.



5. REMOVE INPUT SHAFT OIL SEAL RING

- (a) Remove the input shaft oil seal ring from the input shaft.



INSPECTION

1. INSPECT PACK CLEARANCE OF FORWARD CLUTCH

- (a) Install the forward clutch on the oil pump.

NOTICE:

Be careful not to damage the oil seal ring of the oil pump.

- (b) Using a dial indicator, measure the forward clutch pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm², 57 psi).

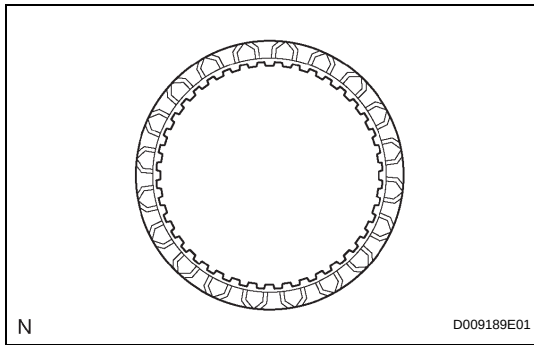
Standard pack clearance:

1.00 to 1.25 mm (0.0394 to 0.4921 in.)

If the clearance is not as specified, inspect the discs, plates and flange.

HINT:

If the opening is large, cover it with a piece of cloth to prevent the compressed air from being released.

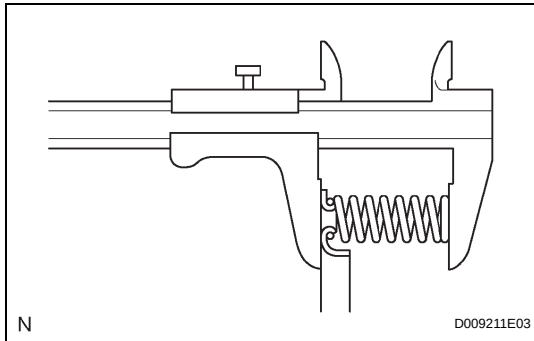


2. INSPECT FORWARD MULTIPLE DISC CLUTCH DISC

- (a) Check if the sliding surface of the disc, plate and flange are worn or burnt.
If necessary, replace them.

NOTICE:

- If the lining of the disc comes off or is discolored, or if a part of the groove is worn, replace all the discs.
- Before installing new discs, immerse them in ATF for at least 15 minutes.

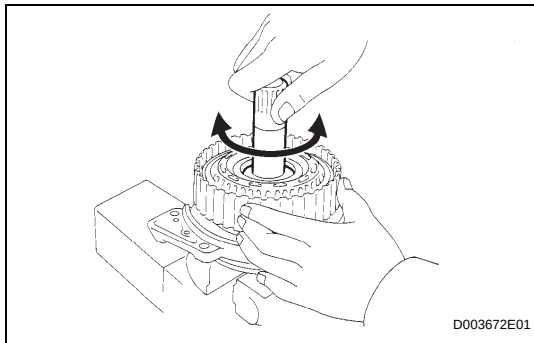


3. INSPECT FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY

- (a) Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:

26.74 mm (1.0528 in.)

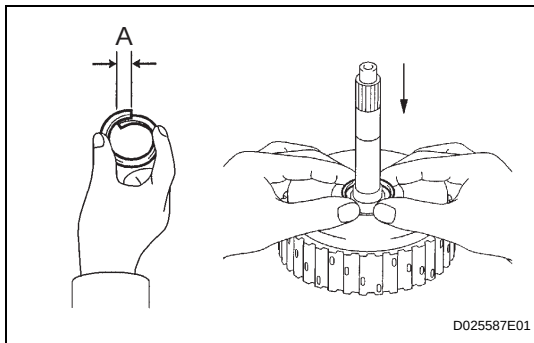


4. INSPECT FORWARD MULTIPLE DISC CLUTCH DISC

- (a) Check if the disc lightly rotates when rotating the forward clutch after inserting the multiple disc clutch into it.

NOTICE:

Do not place the forward clutch in a vise.



REASSEMBLY

1. INSTALL INPUT SHAFT OIL SEAL RING

- (a) Compress a new input shaft oil seal ring from both sides to reduce dimension A.

Dimension A:

5.0 mm (0.197 in.)

- (b) Coat the oil seal ring with ATF and install it to the forward clutch drum.

NOTICE:

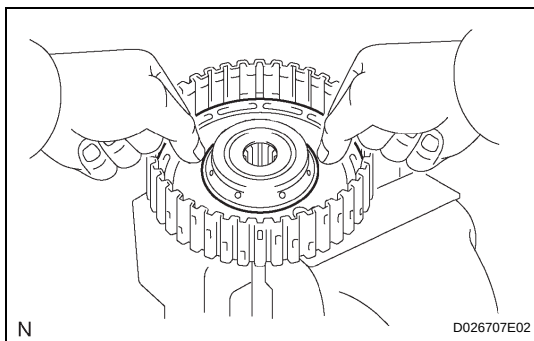
Do not expand the end gap of the oil seal ring too much. Fix the hooks firmly.

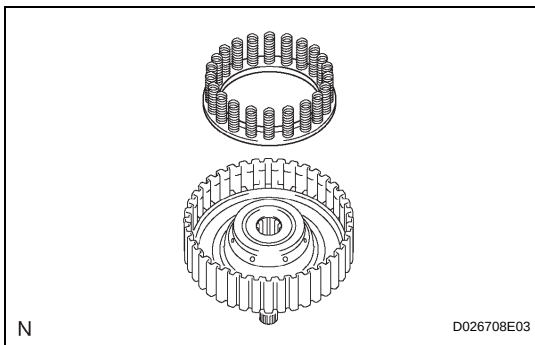
2. INSTALL FORWARD CLUTCH PISTON SUB-ASSEMBLY

- (a) Coat the forward clutch piston with ATF, and install it to the forward clutch drum.

NOTICE:

Be careful not to damage the lip of the forward clutch piston.





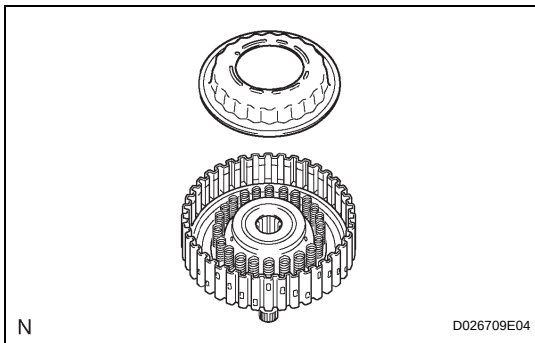
3. INSTALL FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY

- (a) Install the return spring to the forward clutch drum.

NOTICE:

After installing the spring, check that all of the springs fit in the piston correctly.

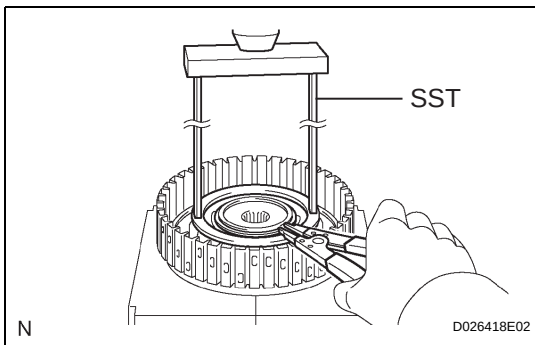
- (b) Coat the clutch balancer with ATF.



- (c) Install the clutch balancer to the forward clutch drum.

NOTICE:

- Be careful not to damage the lip of the forward clutch balancer.
- Make sure that the clutch balancer is not pinched and that there are no other defects on the lip.
- Apply sufficient ATF to the sealing lip before installation.



- (d) Place SST on the clutch balancer, and compress the clutch balancer with a press.

SST 09387-00020

- (e) Install the snap ring with a snap ring expander.
 (f) Be sure that the end gap of the snap ring is not aligned with the spring retainer claw.

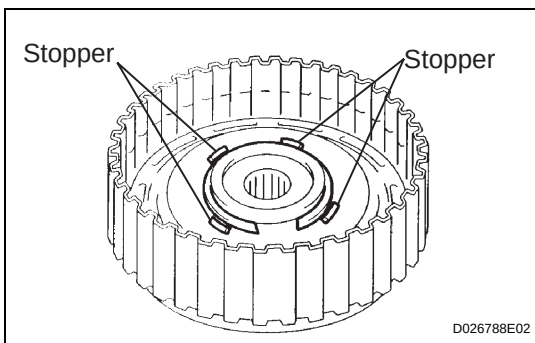
NOTICE:

- Stop the press when the spring seat is lowered to a position 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove. This prevents 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.

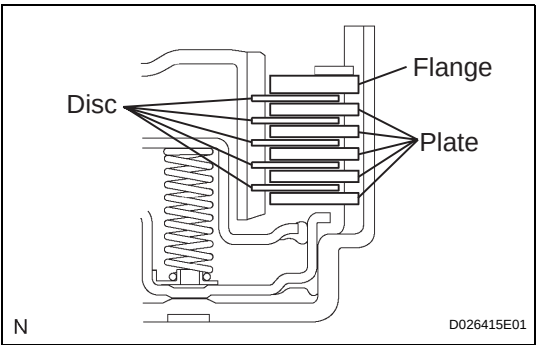
NOTICE:

The end gap of the snap ring should not align with any of the stoppers.

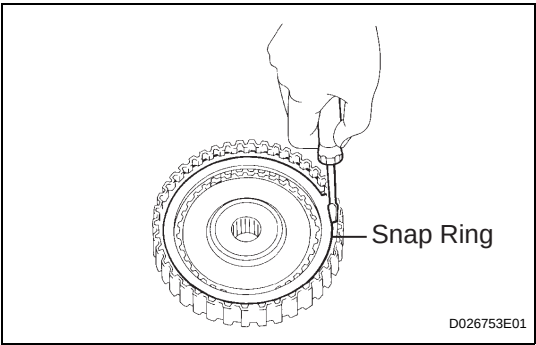


4. INSTALL FORWARD MULTIPLE DISC CLUTCH DISC

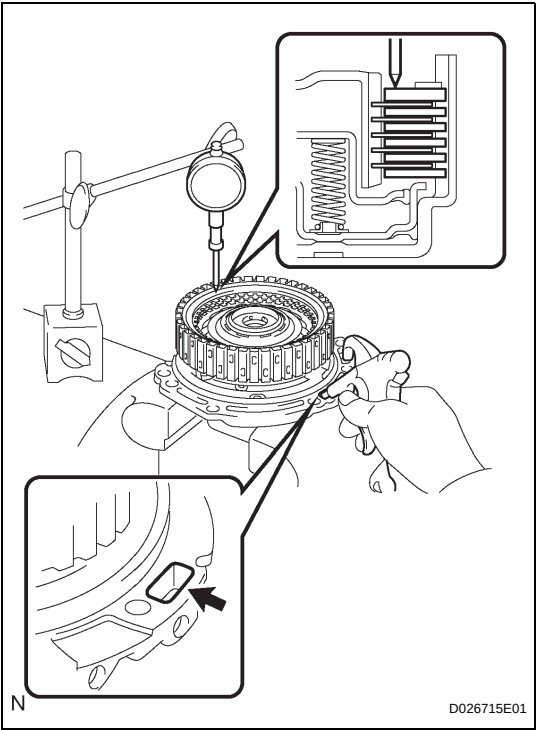
- (a) Coat the 5 discs with ATF.



- (b) Install the 5 plates, 5 discs and flange to the forward clutch drum.
- NOTICE:**
Make sure that the plates, discs, and flange are installed as shown in the illustration.



- (c) Using a screwdriver, install the snap ring.
- (d) Check that the end gap of the snap ring is not aligned with one of the cutouts.
- NOTICE:**
The snap ring should be fully engaged in the groove of the drum.



5. INSPECT PACK CLEARANCE OF FORWARD CLUTCH

- (a) Using a dial indicator, measure the forward clutch pack clearance while applying and releasing compressed air (392 kgf/cm², 4.0 kPa, 57 psi).

Pack clearance:
1.00 to 1.25 mm (0.0394 to 0.4921 in.)
If the piston stroke is less than the minimum, parts may be assembled incorrectly. Check and reassemble the parts again.
If the clearance is not as specified, select another flange.

HINT:
There are 5 different thicknesses of flanges available.

Standard flange thickness

No.	Thickness	No.	Thickness
1	3.00 mm (0.1181 in.)	4	3.45 mm (0.1358 in.)
2	3.15 mm (0.1240 in.)	5	3.60 mm (0.1417 in.)
3	3.30 mm (0.1299 in.)	-	-

6. INSPECT FORWARD MULTIPLE DISC CLUTCH DISC
(See page [AX-256](#))

FAIL-SAFE CHART

1. FAIL-SAFE CHART

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

- (a) Automatic Transmission Fluid (ATF) temperature sensor:
When the ATF temperature sensor has a malfunction, 5th up-shift is prohibited.
- (b) Counter gear speed sensor NC (Speed sensor NC):
When the counter gear speed sensor has a malfunction, 5th up-shift is prohibited.
- (c) Shift solenoid valve DSL:
When the solenoid valve DSL has a malfunction, the current to the solenoid valve is stopped.
This stops lock-up control, then fuel economy decreases.
- (d) Shift solenoid valve SL1, SL2, SL3 and S4:
If any of the shift solenoid valve circuits develops an open or short, the ECM turns the other shift solenoid "ON" and "OFF" in order to shift into the gear positions shown in the table below.
Manual shifting as shown in the following table must be done. In case of a short circuit, the ECM stops sending the current to the short circuited solenoid. Even if starting the engine in the fail-safe mode, the gear position remains in the same position.

HINT:

FL: Flex Lock-up

Normal	Solenoid Valve	SL1	ON	OFF	ON	OFF	OFF
		SL2	ON	ON	OFF	FL	FL
		SL3	OFF	OFF	OFF	ON	ON
		S4	OFF	OFF	OFF	OFF	ON
	Gear Position		1st	2nd	3rd	4th	5th
SL1 Malfunction (During driving at 1st or 2nd)	Solenoid Valve	SL1	OFF				
		SL2	ON	ON	OFF to ON	FL to ON	FL to ON
		SL3	OFF	OFF	OFF	ON to OFF	ON to OFF
		S4	OFF	OFF	OFF	OFF	ON to OFF
	Gear Position		1st to 2nd	2nd	3rd to 2nd	4th to 2nd	5th to 2nd
SL1 Malfunction (During driving at 3rd)	Solenoid Valve	SL1	OFF				
		SL2	ON to FL	ON to FL	OFF to FL	FL	FL
		SL3	OFF	OFF	OFF	ON to FL	ON to FL
		S4	OFF to ON	OFF to ON	OFF to ON	OFF to ON	ON
	Gear Position		1st to 4th	2nd to 4th	3rd to 4th	4th	5th to 4th
SL1 Malfunction (During driving at 4th or 5th)	Solenoid Valve	SL1	OFF				
		SL2	ON to FL	ON to FL	OFF to FL	FL	FL
		SL3	OFF to ON	OFF to ON	OFF to ON	ON	ON
		S4	OFF	OFF	OFF	OFF	ON
	Gear Position		1st to 4th	2nd to 4th	3rd to 4th	4th	5th to 4th

SL2 Malfunction	Solenoid Valve	SL1	ON	OFF to ON	ON	OFF to ON	OFF to ON
		SL2	OFF				
		SL3	OFF	OFF	OFF	ON to OFF	ON to OFF
		S4	OFF to ON	OFF to ON	OFF to ON	OFF to ON	ON
	Gear Position		1st to 4th	2nd to 4th	3rd to 4th	4th	5th to 4th
SL3 Malfunction	Solenoid Valve	SL1	ON	OFF	ON	OFF to ON	OFF to ON
		SL2	ON	ON	OFF	FL	FL
		SL3	OFF				
		S4	OFF	OFF	OFF	OFF to ON	ON
	Gear Position		1st	2nd	3rd	4th	5th to 4th
S4 Malfunction	Solenoid Valve	SL1	ON	OFF	ON	OFF	OFF
		SL2	ON	ON	OFF	FL	FL
		SL3	OFF	OFF	OFF	ON	ON
		S4	OFF				
	Gear Position		1st	2nd	3rd	4th	5th to 4th
SL1, SL2, SL3, and S4 Malfunction	Solenoid Valve	SL1	OFF				
		SL2	OFF				
		SL3	OFF				
		S4	OFF				
	Gear Position		1st to 4th	2nd to 4th	3rd to 4th	4th	5th to 4th

DATA LIST / ACTIVE TEST

1. READ DATA LIST

HINT:

Using the intelligent tester's DATA LIST allows switch, sensor, actuator, and other item values to be read without removing any parts. Reading the DATA LIST early in troubleshooting is one way to save time.

NOTICE:

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

- (a) Warm up the engine.
- (b) Turn the ignition switch OFF.
- (c) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
- (d) Turn the ignition switch ON and turn the tester ON.
- (e) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
- (f) Follow the instructions on the tester and read the DATA LIST.

ECM:

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
SPD (NC)	Counter gear speed/ Min.: 0 rpm Max.: 12,750 rpm	3rd gear when shift lever is on D (after warming up the engine); Intermediate shaft speed (NC) becomes close to the engine speed	Data is displayed in increments of 50 rpm
SPD (NT)	Input turbine speed/ Min.: 0 rpm Max.: 12,750 rpm	- Lock-up ON (after warming up engine): Input turbine speed (NT) is equal to engine speed. - Lock-up OFF (idling with shift lever on N): Input turbine speed (NT) is nearly equal to engine speed.	Data is displayed in increments of 50 rpm
PNP SW [NSW]	PNP switch status/ ON or OFF	Shift lever is: On P or N: ON Not on P or N: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect HINT: When failure still occurs even after adjusting these parts, refer to DTC P0705 (see page AX-44)
STOP LIGHT SW	Stop light switch status/ ON or OFF	- Brake pedal is depressed: ON - Brake pedal is released: OFF	-
SHIFT	ECM gear shift command/ 1st, 2nd, 3rd, 4th and 5th	Shift lever position is: - On L: 1st - On 2: 1st or 2nd - On 3: 1st, 2nd or 3rd - On 4: 1st, 2nd, 3rd or 4th - On D: 1st, 2nd, 3rd, 4th or 5th	-

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
REVERSE	PNP switch status/ ON or OFF	Shift lever is: On R: ON Not on R: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect HINT: When failure still occurs even after adjusting these parts, refer to DTC P0705 (see page AX-44)
PARKING	PNP switch status/ ON or OFF	Shift lever is: On P: ON Not on P: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect HINT: When failure still occurs even after adjusting these parts, refer to DTC P0705 (see page AX-44)
NEUTRAL	PNP switch status/ ON or OFF	Shift lever is: On N: ON Not on N: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect HINT: When failure still occurs even after adjusting these parts, refer to DTC P0705 (see page AX-44)
DRIVE	PNP switch status/ ON or OFF	Shift lever is: On 4 or D: ON Not on 4 or D: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect HINT: When failure still occurs even after adjusting these parts, refer to DTC P0705 (see page AX-44)
4TH/DRIVE	PNP switch status/ ON or OFF	Shift lever is: On 4: ON Not on 4: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect HINT: When failure still occurs even after adjusting these parts, refer to DTC P0705 (see page AX-44)
3RD	PNP switch status/ ON or OFF	Shift lever is: On 3: ON Not on 3: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect HINT: When failure still occurs even after adjusting these parts, refer to DTC P0705 (see page AX-44)
2ND	PNP switch status/ ON or OFF	Shift lever is: On 2 or L: ON Not on 2 or L: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect HINT: When failure still occurs even after adjusting these parts, refer to DTC P0705 (see page AX-44)

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
LOW	PNP switch status/ ON or OFF	Shift lever is: On L: ON Not on L: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect HINT: When failure still occurs even after adjusting these parts, refer to DTC P0705 (see page AX-44)
A/T OIL TEMP1	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 while engine is cold	If value is -40°C (-40°F) or "150°C (302°F) or more", ATF temperature sensor circuit is open or short circuited
LOCK UP SOL	Lock-up solenoid status/ ON or OFF	- Lock-up: ON - Not on lock-up: OFF	-
SOLENOID (SLT)	Shift solenoid SLT status/ ON or OFF	- Accelerator pedal is depressed: OFF - Accelerator pedal is released: ON	-

2. PERFORM ACTIVE TEST

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.

- Warm up the engine.
- Turn the ignition switch OFF.
- Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
- Turn the ignition switch ON and turn the tester ON.
- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
- Perform the ACTIVE TEST.

ECM:

Tester Display	Test Part	Control Range	Diagnostic Note
SHIFT	[Test Details] Operate shift solenoid valve and set each shift lever position by yourself [Vehicle Condition] - IDL: ON 50 km/h (31 mph) or less [Other information] - Press "→" button: Shift up - Press "←" button: Shift down	-	Possible to check operation of shift solenoid valves
SOLENOID (S4)	[Test Details] Operate the shift solenoid S4 [Vehicle Condition] - Vehicle stopped - Shift lever P or N position	-	-
SOLENOID (SL1)	[Test Details] Operate the shift solenoid SL1 [Vehicle Condition] - Vehicle stopped - Shift lever P or N position	-	-

Tester Display	Test Part	Control Range	Diagnostic Note
SOLENOID (SL2)	[Test Details] Operate the shift solenoid SL2 [Vehicle Condition] • Vehicle stopped • Shift lever P or N position	-	-
SOLENOID (SL3)	[Test Details] Operate the shift solenoid SL3 [Vehicle Condition] • Vehicle stopped • Shift lever P or N position	-	-
LOCK UP	[Test Details] Control shift solenoid DSL to set automatic transaxle to the lock-up condition [Vehicle Condition] • Throttle valve opening angle: Less than 35% • Vehicle speed: 60 km/h (36 mph) or more	-	Possible to check shift solenoid valve DSL operation
SOLENOID (DSL)	[Test Details] Operate the shift solenoid DSL [Vehicle Condition] • Vehicle stopped • Shift lever P or N position	-	-
SOLENOID (SR)	[Test Details] Operate the shift solenoid SR [Vehicle Condition] • Vehicle stopped • Shift lever P or N position	-	-
SOLENOID (SLT)*	[Test Details] Operate shift solenoid SLT and raise line pressure [Vehicle Condition] • Vehicle stopped • IDL: ON HINT: OFF: Line pressure up (when Active Test "SOLENOID (SLT)" is performed, ECM commands SLT solenoid to turn OFF) ON: No action (normal operation)	-	-

HINT:

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

DIAGNOSTIC TROUBLE CODE CHART

HINT:

- If a DTC is displayed during the DTC check, check the circuit listed in the table below and proceed to the page given.
- *1: "Comes on" means the Malfunction Indicator Lamp (MIL) illuminates.
- *2: "DTC stored" means the ECM memorizes the malfunction code if the ECM detects the DTC detection condition.
- These DTCs may be output when the clutch, brake, gear components, etc., inside the automatic transaxle are damaged.

Automatic transaxle system:

DTC No.	Detection Item	Trouble Area	MIL*1	Memory*2	See page
P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	- Open or short in park/neutral position switch circuit - Park/Neutral position switch - ECM	Comes on	DTC stored	AX-44
P0710	Transmission Fluid Temperature Sensor "A" Circuit	- Open or short in ATF temperature sensor circuit - ATF temperature sensor - ECM	Comes on	DTC stored	AX-51
P0711	Transmission Fluid Temperature Sensor "A" Performance	- Open or short in ATF temperature sensor circuit - ATF temperature sensor - ECM	Comes on	DTC stored	AX-55
P0712	Transmission Fluid Temperature Sensor "A" Circuit Low Input	- Short in ATF temperature sensor circuit - ATF temperature sensor - ECM	Comes on	DTC stored	AX-51
P0713	Transmission Fluid Temperature Sensor "A" Circuit High Input	- Open in ATF temperature sensor circuit - ATF temperature sensor - ECM	Comes on	DTC stored	AX-51
P0717	Input Speed Sensor Circuit No Signal	- Open or short in speed sensor NT circuit - Speed sensor NT - ECM	Comes on	DTC stored	AX-58
P0724	Brake Switch "B" Circuit High	- Short in stop light switch circuit - Stop light switch - ECM	Comes on	DTC stored	AX-62

DTC No.	Detection Item	Trouble Area	MIL*1	Memory*2	See page
P0741	Torque Converter Clutch Solenoid Performance (Shift Solenoid Valve DSL)	- Shift solenoid valve DSL remains open or closed - Valve body is blocked - Shift solenoid valve DSL - Torque converter clutch - Automatic transaxle (clutch, brake, gear, etc.) - Line pressure is too low - ECM	Comes on	DTC stored	AX-65
P0746	Pressure Control Solenoid "A" Performance (Shift Solenoid Valve SL1)	- Shift solenoid valve SL1 remains open or closed - Valve body is blocked - Shift solenoid valve SL1 - Automatic transaxle (clutch, brake, gear, etc.) - ECM	Comes on	DTC stored	AX-72
P0748	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	- Open or short in shift solenoid valve SL1 circuit - Shift solenoid valve SL1 - ECM	Comes on	DTC stored	AX-76
P0766	Shift Solenoid "D" Performance (Shift Solenoid Valve S4)	- Shift solenoid valve S4 remains open or closed - Valve body is blocked - Shift solenoid valve S4 - Automatic transaxle (clutch, brake, gear, etc.) - ECM	Comes on	DTC stored	AX-79
P0771	Shift Solenoid "E" Performance (Shift Solenoid Valve SR)	- Shift solenoid valve SR remains open or closed - Valve body is blocked - Shift solenoid valve SR - Automatic transaxle (clutch, brake, gear, etc.)	Comes on	DTC stored	AX-83
P0776	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)	- Shift solenoid valve SL2 remains open or closed - Valve body is blocked - Shift solenoid valve SL2 - Automatic transaxle (clutch, brake, gear, etc.) - ECM	Comes on	DTC stored	AX-87

DTC No.	Detection Item	Trouble Area	MIL*1	Memory*2	See page
P0778	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	- Open or short in shift solenoid valve SL2 circuit - Shift solenoid valve SL2 - ECM	Comes on	DTC stored	AX-92
P0793	Intermediate Shaft Speed Sensor "A"	- Open or short in speed sensor NC circuit - Speed sensor NC - ECM	Comes on	DTC stored	AX-95
P0796	Pressure Control Solenoid "C" Performance (Shift Solenoid Valve SL3)	- Shift solenoid valve SL3 remains open or closed - Valve body is blocked Automatic transaxle (clutch, brake, gear, etc.)	Comes on	DTC stored	AX-99
P0798	Pressure Control Solenoid "C" Electrical (Shift Solenoid Valve SL3)	- Open or short in shift solenoid valve SL3 circuit - Shift solenoid valve SL3 - ECM	Comes on	DTC stored	AX-103
P0982	Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)	- Short in shift solenoid valve S4 circuit - Shift solenoid valve S4 - ECM	Comes on	DTC stored	AX-106
P0983	Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)	- Open in shift solenoid valve S4 circuit - Shift solenoid valve S4 - ECM	Comes on	DTC stored	AX-106
P0985	Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)	- Short in shift solenoid valve SR circuit - Shift solenoid valve SR - ECM	Comes on	DTC stored	AX-110
P0986	Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)	- Open in shift solenoid valve SR circuit - Shift solenoid valve SR - ECM	Comes on	DTC stored	AX-110
P2714	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)	- Shift solenoid valve SLT remains closed - Valve body is blocked - Torque converter clutch - Automatic transaxle (clutch, brake, gear, etc.) - ECM	Comes on	DTC stored	AX-114
P2716	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	- Open or short in shift solenoid valve SLT circuit - Shift solenoid valve SLT - ECM	Comes on	DTC stored	AX-120

DTC No.	Detection Item	Trouble Area	MIL*1	Memory*2	See page
P2769	Torque Converter Clutch Solenoid Circuit Low (Shift Solenoid Valve DSL)	- Short in shift solenoid valve DSL circuit - Shift solenoid valve DSL - ECM	Comes on	DTC stored	AX-123
P2770	Torque Converter Clutch Solenoid Circuit High (Shift Solenoid Valve DSL)	- Open in shift solenoid valve DSL circuit - Shift solenoid valve DSL - ECM	Comes on	DTC stored	AX-123

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

DESCRIPTION

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

DTC No.	DTC Detection Condition	Trouble Area
P0705	When one of following conditions is met: (A) Any 2 or more of the P, N, R, D, 3 and 2 input signals are ON simultaneously (2 trip detection logic) (B) Any 2 or more of the NSW, R, D, 3 and 2 input signals are ON simultaneously (2 trip detection logic) (C) When both conditions below are met (2 trip detection logic) - One of the NSW, P, N or R input signal is ON - One of the 4 or L input signal is ON (D) All of the NSW, P, N, R, D, 3 and 2 input signals are OFF (2 trip detection logic)	- Open or short in park/neutral position switch circuit - Park/Neutral position switch - ECM

MONITOR DESCRIPTION

These DTCs indicate a problem with the park/neutral position switch and the wire harness in the park/neutral position switch circuit.

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

For security, the park/neutral position switch detects the shift lever position so that the engine can be started only when the shift lever is on P or N.

The park/neutral position switch sends a signal to the ECM according to the shift lever position (R, D, 4, 3, 2 or L).

The ECM determines that there is a problem with the switch or related parts if it receives more than 1 position signal simultaneously. The ECM will illuminate the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P0705: Park/Neutral position switch/Verify switch input
Required sensors/Components	Park/Neutral position switch
Frequency of operation	Continuous
Duration	2 seconds: Condition (A), (B) and (C) 60 seconds: Condition (D)
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present.	None
Ignition switch	ON
Battery voltage	10.5 V or more

TYPICAL MALFUNCTION THRESHOLDS**1. One of the following conditions is met: Condition (A), (B), (C) or (D)****Condition (A)**

Number of the following signal input at the same time	2 or more
P switch	ON
R switch	ON

N switch	ON
D switch	ON
3 switch	ON
2 switch	ON

Condition (B)

Number of the following signal input at the same time	2 or more
NSW switch	ON
R switch	ON
D switch	ON
3 switch	ON
2 switch	ON

Condition (C)

Both of the following conditions are met:	Condition 1 and 2
1. One of the following conditions is met:	Condition (a), (b), (c) or (d)
(a) NSW switch	ON
(b) P switch	ON
(c) R switch	ON
(d) N switch	ON
2. One of the following conditions is met:	Condition (a) or (b)
(a) 4 switch	ON
(b) L switch	ON

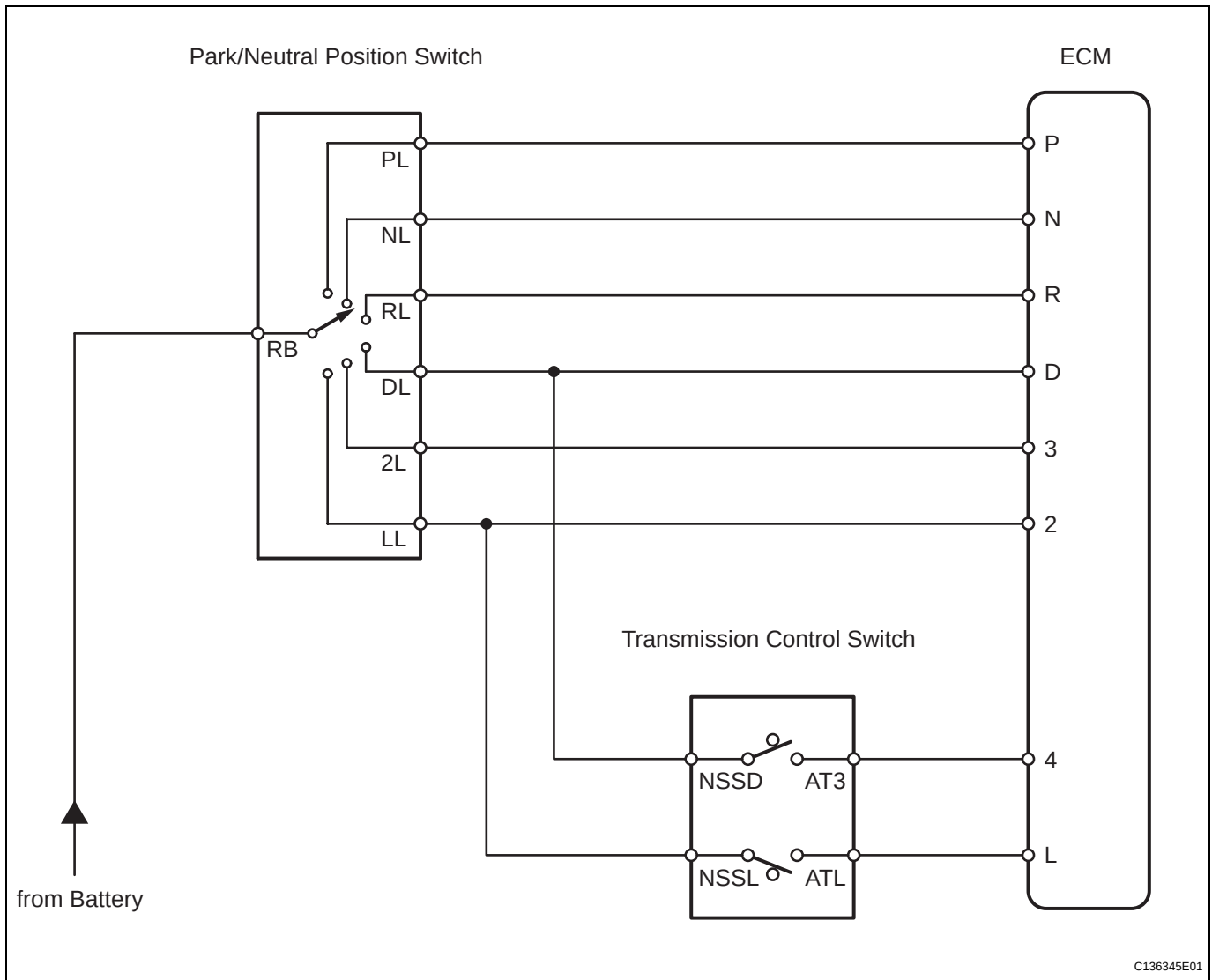
Condition (D)

When all conditions below are met:	Condition (a), (b), (c), (d), (e), (f) and (g)
(a) NSW switch	OFF
(b) P switch	OFF
(c) R switch	OFF
(d) N switch	OFF
(e) D switch	OFF
(f) 3 switch	OFF
(g) 2 switch	OFF

COMPONENT OPERATING RANGE

Park/Neutral position switch	Park/Neutral position switch sends only one signal to ECM.
------------------------------	--

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Using the intelligent tester's DATA LIST allows switch, sensor, actuator and other item values to be read without removing any parts. Reading the DATA LIST early in troubleshooting is one way to save time.

NOTICE:

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

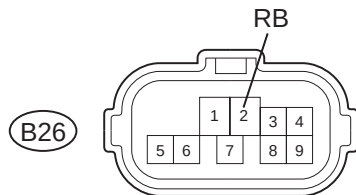
1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
6. Follow the instructions on the tester and read the DATA LIST.

ECM:

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
PNP SW (NSW)	PNP switch status/ ON or OFF	Shift lever is: On P or N: ON Not on P or N: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect
REVERSE	PNP switch status/ ON or OFF	Shift lever is: On R: ON Not on R: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect
PARKING	PNP switch status/ ON or OFF	Shift lever is: On P: ON Not on P: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect
NEUTRAL	PNP switch status/ ON or OFF	Shift lever is: On N: ON Not on N: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect
4TH/DRIVE	PNP switch status/ ON or OFF	Shift lever is: On 4 or D: ON Not on 4 or D: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect
3RD	PNP switch status/ ON or OFF	Shift lever is: On 3: ON Not on 3: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect
2ND	PNP switch status/ ON or OFF	Shift lever is: On 2 or L: ON Not on 2 or L: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect
LOW	PNP switch status/ ON or OFF	Shift lever is: On L: ON Not on L: OFF	When shift lever position displayed on intelligent tester differs from actual position, adjustment of PNP switch or shift cable may be incorrect

1 CHECK WIRE HARNESS (PARK/NEUTRAL POSITION SWITCH - BATTERY)

Wire Harness Side



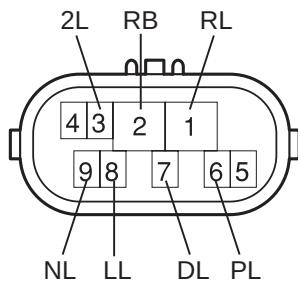
Y

C117645E02

- Disconnect the B26 park/neutral position switch connector.
- Turn the ignition switch ON.
- Measure the voltage of the wire harness side connector.

Standard voltage

Tester Connection	Specified Condition
B26-2 (RB) - Body ground	10 to 14 V

NG**CHECK POWER SOURCE OF ECM****OK****2 INSPECT PARK/NEUTRAL POSITION SWITCH**

C140841E01

- Disconnect the B26 park/neutral position switch connector.
- Measure the resistance of the park/neutral position switch when the shift lever is moved to each position.

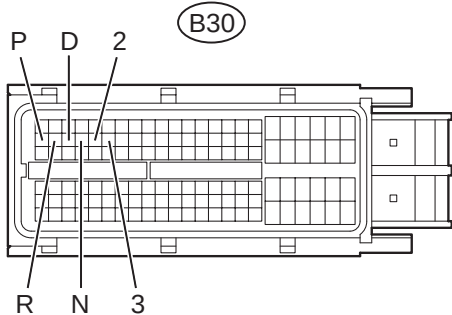
Standard resistance

Tester Connection	Shift Lever Position	Specified Condition
6 (PL) - 2 (RB)	P	Below 1 Ω
6 (PL) - 2 (RB)	Not on P	10 k Ω or higher
1 (RL) - 2 (RB)	R	Below 1 Ω
1 (RL) - 2 (RB)	Not on R	10 k Ω or higher
9 (NL) - 2 (RB)	N	Below 1 Ω
9 (NL) - 2 (RB)	Not on N	10 k Ω or higher
7 (DL) - 2 (RB)	D	Below 1 Ω
7 (DL) - 2 (RB)	Not on D	10 k Ω or higher
3 (2L) - 2 (RB)	2	Below 1 Ω
3 (2L) - 2 (RB)	Not on 2	10 k Ω or higher
8 (LL) - 2 (RB)	L	Below 1 Ω
8 (LL) - 2 (RB)	Not on L	10 k Ω or higher

NG**REPLACE PARK/NEUTRAL POSITION SWITCH****OK**

3 CHECK WIRE HARNESS (ECM - BATTERY)

Wire Harness Side



A107892E67

- Disconnect the B30 ECM connector.
- Turn the ignition switch ON.
- Measure the voltage of the wire harness side connector.

Standard voltage

Tester Connection	Shift Lever Position	Specified Condition
B30-24 (P) - Body ground	P	10 to 14 V
B30-24 (P) - Body ground	Not on P	Below 1 V
B30-25 (R) - Body ground	R	10 to 14 V*
B30-25 (R) - Body ground	Not on R	Below 1 V
B30-27 (N) - Body ground	N	10 to 14 V
B30-27 (N) - Body ground	Not on N	Below 1 V
B30-26 (D) - Body ground	D or 4	10 to 14 V
B30-26 (D) - Body ground	Not on D or 4	Below 1 V
B30-28 (2) - Body ground	2	10 to 14 V
B30-28 (2) - Body ground	Not on 2	Below 1 V
B30-29 (3) - Body ground	3 or L	10 to 14 V
B30-29 (3) - Body ground	Not on 3 or L	Below 1 V

HINT:

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

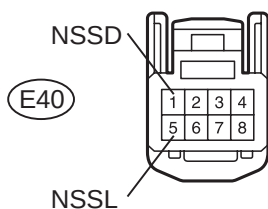
NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

4 CHECK WIRE HARNESS (PARK/NEUTRAL POSITION SWITCH - TRANSMISSION CONTROL SWITCH)

Wire Harness Side



P

A107783E26

- Disconnect the E40 switch connector.
- Turn the ignition switch ON.
- Measure the voltage when the shift lever is moved to each position.

Standard voltage

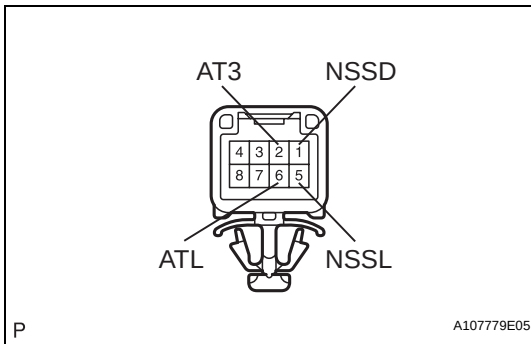
Tester Connection	Shift Lever Position	Specified Condition
1 (NSSD) - Body ground	D and 4	10 to 14 V
1 (NSSD) - Body ground	Not on D and 4	Below 1 V
5 (NSSL) - Body ground	3 and L	10 to 14 V
5 (NSSL) - Body ground	Not on 3 and L	Below 1 V

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

5 INSPECT TRANSMISSION CONTROL SWITCH



- Disconnect the E40 switch connector.
- Measure the resistance of the switch when the shift lever is moved to each position.

Standard resistance

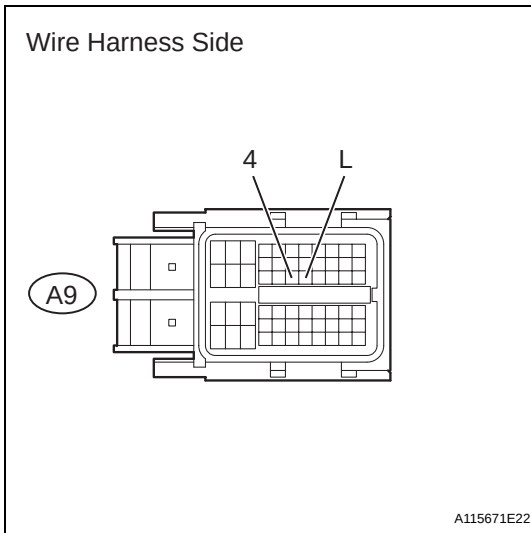
Tester Connection	Shift Lever Position	Specified Condition
1 (NSSD) - 2 (AT3)	D	10 k Ω or higher
1 (NSSD) - 2 (AT3)	3	Below 1 Ω
5 (NSSL) - 6 (ATL)	D	10 k Ω or higher
5 (NSSL) - 6 (ATL)	3	Below 1 Ω

NG

REPLACE TRANSMISSION CONTROL SWITCH

OK

6 CHECK WIRE HARNESS (TRANSMISSION CONTROL SWITCH - BATTERY)



- Disconnect the A9 ECM connector.
- Turn the ignition switch ON.
- Measure the voltage of the wire harness side connector.

Standard voltage

Tester Connection	Shift Lever Position	Specified Condition
A9-25 (4) - Body ground	4	10 to 14 V
A9-25 (4) - Body ground	Not on 4	Below 1 V
A9-26 (L) - Body ground	L	10 to 14 V
A9-26 (L) - Body ground	Not on L	Below 1 V

HINT:

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

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE ECM

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 Automatic Transmission Fluid (ATF) temperature sensor converts the ATF temperature into a resistance value which is input into the ECM.

The ECM applies a voltage to the temperature sensor through ECM terminal THO1.

The sensor resistance changes with the ATF temperature.

One terminal of the sensor is grounded so that the sensor resistance and voltage decrease as the temperature becomes higher.

The ECM calculates the ATF temperature based on the voltage signal.

DTC No.	DTC Detection Condition	Trouble Area
P0710	ATF temperature sensor resistance changes from (a) to (b) or from (b) to (a) in less than 0.5 sec., and P0712 and P0713 are not detected (1 trip detection logic): (a) ATF temperature sensor resistance is less than 79 Ω (b) ATF temperature sensor resistance is more than 156 k Ω	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM
P0712	ATF temperature sensor resistance is less than 79 Ω for 0.5 sec. or more (1 trip detection logic)	• Short in ATF temperature sensor circuit • ATF temperature sensor • ECM
P0713	15 minutes or more after the engine start, ATF temperature sensor resistance is more than 156 k Ω for 0.5 sec. or more (1 trip detection logic)	• Open in ATF temperature sensor circuit • ATF temperature sensor • ECM

MONITOR DESCRIPTION

ATF temperature sensor converts ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is less than 79 Ω *1 or more than 156 k Ω *2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM will illuminate the MIL and store the DTC.

HINT:

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

MONITOR STRATEGY

Related DTCs	P0710: ATF temperature sensor/Range check (Chattering) P0712: ATF temperature sensor/Range check (Low resistance) P0713: ATF temperature sensor/Range check (High resistance)
Required sensors/Components	ATF temperature sensor
Frequency of operation	Continuous
Duration	0.5 sec.

MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0710, P0712: Range check (Chattering, Low resistance)

The monitor will run whenever this DTC is not present.	None
The typical enabling condition is not available.	-

P0713: Range check (High resistance)

The monitor will run whenever this DTC is not present.	None
Time after engine start	15 min. or more

TYPICAL MALFUNCTION THRESHOLDS

P0710: Range check (Chattering)

ATF temperature sensor resistance	Less than 79 Ω or more than 156 k Ω
-----------------------------------	---

P0712: Range check (Low resistance)

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

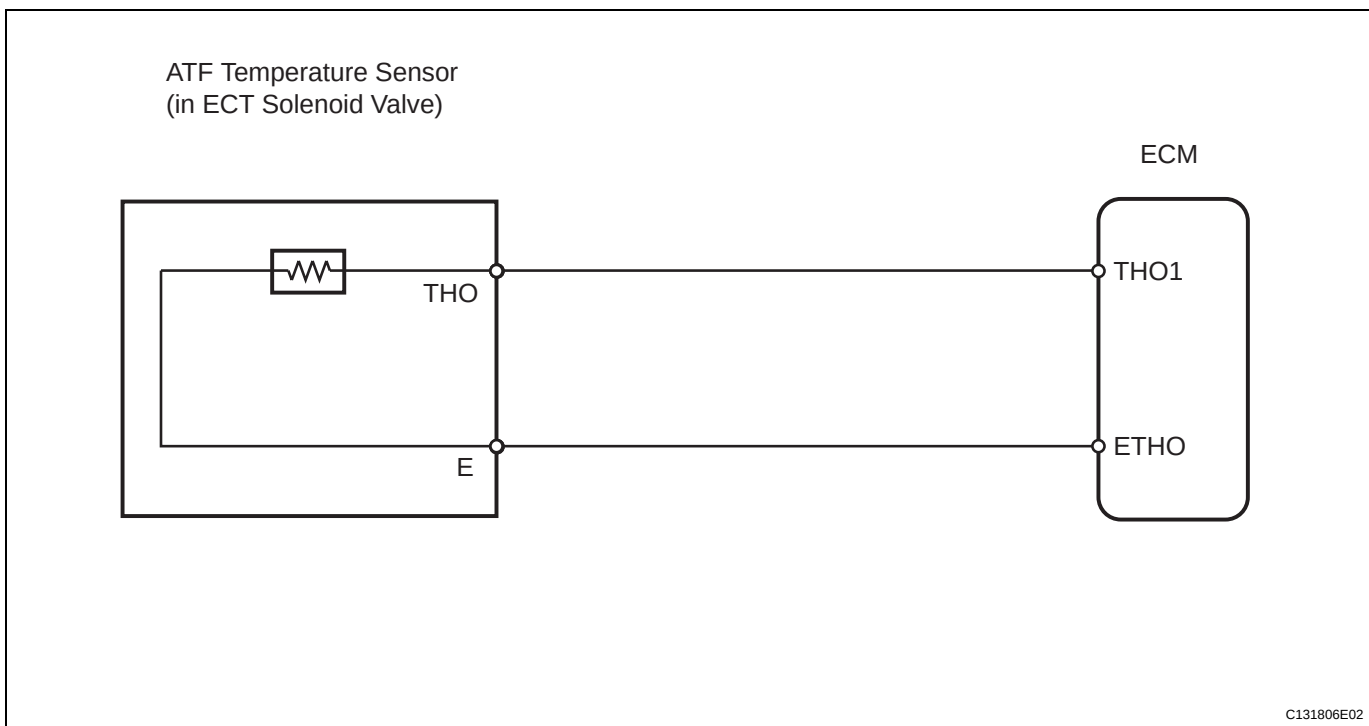
P0713: Range check (High resistance)

ATF temperature sensor resistance	More than 156 k Ω
-----------------------------------	--------------------------

COMPONENT OPERATING RANGE

ATF temperature sensor	Atmospheric temperature to approx. 130°C (266°F)
------------------------	--

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Using the intelligent tester's DATA LIST allows switch, sensor, actuator and other item values to be read without removing any parts. Reading the DATA LIST early in troubleshooting is one way to save time.

NOTICE:

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

1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
6. Follow the instructions on the tester and read the DATA LIST.

ECM:

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
A/T OIL TEMP1	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 while engine is cold	If value is -40°C (-40°F) or "150°C (302°F) or more", ATF temperature sensor circuit is open or short circuited

HINT:

- When DTC P0712 is output and the tester output is 150°C (302°F) or more, there is a short circuit.
 - When DTC P0713 is output and the tester output is -40°C (-40°F), there is an open circuit.
- Measure the resistance between terminal THO1 (THO) and the body ground.

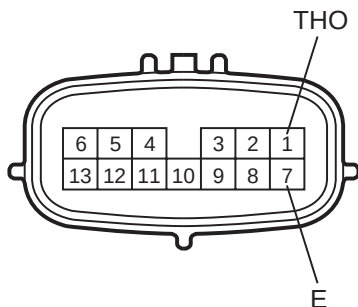
Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
150°C (302°F) or more	Short circuit

HINT:

- If a circuit related to the ATF temperature sensor becomes open, P0713 is set in approximately 0.5 seconds.
- It is not necessary to inspect the circuit when P0711 is set.

1 INSPECT TRANSMISSION WIRE (ATF TEMPERATURE SENSOR)

Wire Harness Side



C136383E01

- (a) Disconnect the B32 wire connector.
- (b) Measure the resistance of the transmission wire.

Standard resistance

Tester Connection	Specified Condition
1 (THO) - 7 (E)	79 Ω to 156 kΩ
1 (THO) - Body ground	1 MΩ or higher
7 (E) - Body ground	1 MΩ or higher

HINT:

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

Standard resistance

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

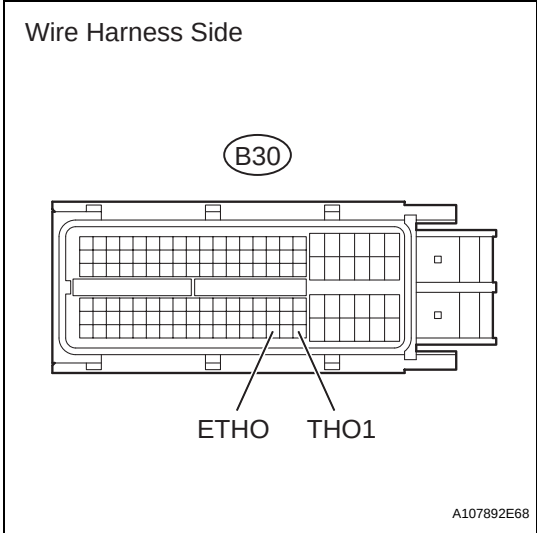
NG

REPAIR OR REPLACE TRANSMISSION WIRE

OK

2

CHECK WIRE HARNESS (TRANSMISSION WIRE - ECM)



- (a) Disconnect the B30 ECM connector.
- (b) Measure the resistance of the wire harness side connector.

Standard resistance

Tester Connection	Specified Condition
B30-126 (THO1) - B30-124 (ETHO)	79 Ω to 156 kΩ
B30-126 (THO1) - Body ground	1 MΩ or higher
B30-124 (ETHO) - Body ground	1 MΩ or higher

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE ECM

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

DESCRIPTION

The ATF (Automatic Transmission Fluid) temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.

DTC No.	DTC Detection Condition	Trouble Area
P0711	When either condition below is met: (A) Both (a) and (b) are detected: (2 trip detection logic) (a) Intake air and engine coolant temperatures are more than -10°C (14°F) at engine start (b) After normal driving for over 18 min. and 20 sec. and 9 km (5.6 mile) or more, ATF temp. is less than 20°C (68°F) (B) When engine coolant temp. is less than 35°C (95°F) at engine start, the ATF temp. is 110°C (230°F) or more after 17 min. of engine start (2 trip detection logic)	• Open or short in ATF temperature sensor circuit • ATF temperature sensor • ECM

MONITOR DESCRIPTION

The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature and detects an open or short in the ATF temperature circuit or a fault in the ATF temperature sensor.

After running the vehicle for a certain period, the ATF temperature should increase. If the ATF temperature is below 20°C (68°F) after running the vehicle for a certain period, the ECM interprets this as a fault, and turns on the MIL.

When the ATF temperature is 110°C (230°F) or more after 17 minutes of engine cold start, the ECM also determines this as a fault, turns on the MIL, and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0711: ATF temperature sensor/Rationality check
Required sensors/Components	ATF temperature sensor
Frequency of operation	Continuous
Duration	3 sec.: Condition (A) 10 sec.: Condition (B)
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

All:

The monitor will run whenever this DTC is not present.	None
Time after engine start	16 min. and 40 sec. or more
ECT (Engine coolant temperature)	-15°C (5°F) or more
ATF sensor circuit	Not circuit malfunction
ECT sensor circuit	Not circuit malfunction
IAT sensor circuit	Not circuit malfunction
ETCS	Not circuit malfunction

AX

Condition (A):

Time after engine start	18 min. and 20 sec.
Driving distance after engine start	9 km (5.6 mile) or more

IAT (Intake air temperature) (12 sec. after starting engine)	-10°C (14°F) or more
ECT (12 sec. after starting engine)	-10°C (14°F) or more

Condition (B):

ECT (Current temperature)	60°C (140°F) or more
ECT (12 sec. after engine start)	Less than 35°C (95°F)

TYPICAL MALFUNCTION THRESHOLDS**Condition (A):**

ATF temperature sensor	Less than 20°C (68°F)
------------------------	-----------------------

Condition (B):

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

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM

Refer to DTC P0710 (see page [AX-52](#)).

INSPECTION PROCEDURE**HINT:**

Using the intelligent tester's DATA LIST allows switch, sensor, actuator and other item values to be read without removing any parts. Reading the DATA LIST early in troubleshooting is one way to save time.

NOTICE:

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

1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
6. Follow the instructions on the tester and read the DATA LIST.

ECM:

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
A/T OIL TEMP1	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 while engine is cold	If value is -40°C (-40°F) or "150°C (302°F) or more", ATF temperature sensor circuit is open or short circuited

HINT:

- When DTC P0712 is output and the tester output is 150°C (302°F) or more, there is a short circuit.
- When DTC P0713 is output and the tester output is -40°C (-40°F), there is an open circuit.
Measure the resistance between terminal THO1 (THO) 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 set in approximately 0.5 seconds.
- It is not necessary to inspect the circuit when P0711 is set.

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

- (a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
- (b) Turn the ignition switch ON and turn the tester ON.
- (c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (d) Read the DTCs using the tester.

Result

Display (DTC output)	Proceed to
Only P0711 is output	A
P0711 and other DTCs are output	B

HINT:

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

B**GO TO DTC OUTPUT****A****2 CHECK TRANSAXLE FLUID LEVEL****OK:**

Automatic transaxle fluid level is correct.

NG**ADD FLUID****OK****REPAIR OR REPLACE TRANSMISSION WIRE**

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 transaxle. By comparing the input speed signal (NT) with the counter gear speed sensor signal (NC), the ECM detects the shift timing of the gears and controls the engine torque and hydraulic pressure according to various conditions. As a result, smooth gear shifting is achieved.

DTC No.	DTC Detection Condition	Trouble Area
P0717	ECM detects conditions (a), (b) and (c) continuously for 5 sec. or more (1 trip detection logic): (a) Vehicle speed: 50 km/h (31 mph) or more (b) Park/Neutral position switch (NSW, R and L) is OFF (c) Speed sensor NT: Less than 300 rpm	• Open or short in speed sensor NT circuit • Speed sensor NT • ECM

MONITOR DESCRIPTION

This DTC indicates that a pulse is not output from the speed sensor NT (input speed sensor) or is output only a little. The NT terminal of the ECM detects the revolving signal from the speed sensor (NT) (input RPM). The ECM outputs a gear shift signal comparing the input speed sensor (NT) with the output speed sensor (NC).

While the vehicle is operating in the 2nd, 3rd, 4th or 5th gear position with the shift lever on D, if the input shaft revolution is less than 300 rpm*1 and the output shaft revolution is 1,000 rpm or more*2, the ECM detects the trouble, illuminates the MIL and stores the DTC.

HINT:

*1: Pulse is not output or is irregularly output.

*2: The vehicle speed is approximately 50 km/h (31 mph) or more.

MONITOR STRATEGY

Related DTCs	P0717: Speed sensor (NT)/Verify pulse input
Required sensors/Components	Speed sensor (NT), Speed sensor (NC)
Frequency of operation	Continuous
Duration	5 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present.	P0500 (VSS) P0748 - P0798 (Trans solenoid (Range))
Shift change	Shift change is completed before starting next shift change operation
ECM selected gear	2nd, 3rd, 4th or 5th
Output shaft rpm	1,000 rpm or more
NSW switch	OFF
R switch	OFF
L switch	OFF
Engine	Running
Ignition switch	ON
Starter	OFF

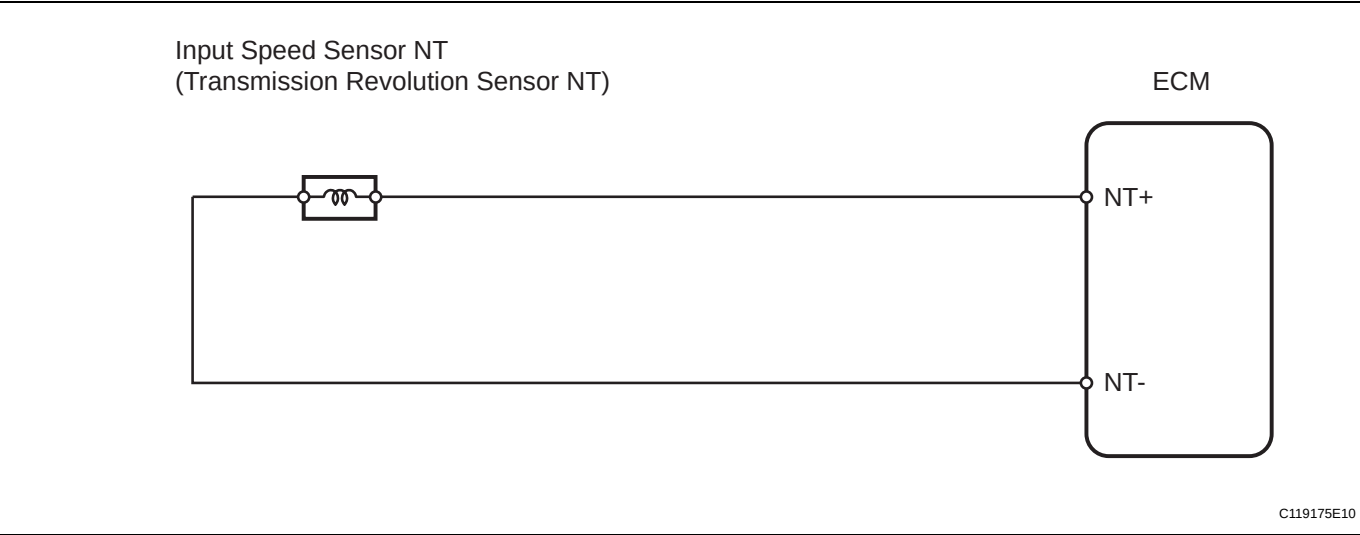
TYPICAL MALFUNCTION THRESHOLDS

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:

Using the intelligent tester's DATA LIST allows switch, sensor, actuator and other item values to be read without removing any parts. Reading the DATA LIST early in troubleshooting is one way to save time.

NOTICE:

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

1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
6. Follow the instructions on the tester and read the DATA LIST.

ECM:

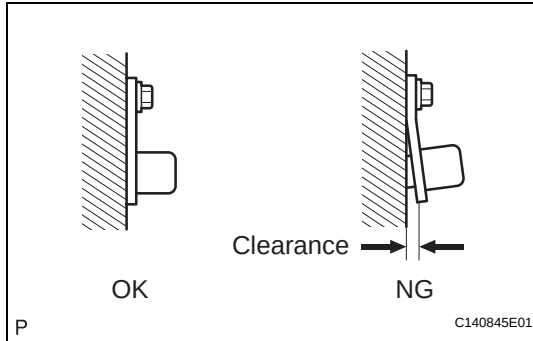
Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
SPD (NT)	Input turbine speed/ Min.: 0 rpm Max.: 12,750 rpm	• Lock-up ON (after warming up engine): Input turbine speed (NT) is equal to engine speed. • Lock-up OFF (idling with shift lever on N): Input turbine speed (NT) is nearly equal to engine speed.	Data is displayed in increments of 50 rpm

HINT:

- SPD (NT) is always 0 rpm while driving:
Open or short in the sensor or circuit.

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

1 INSPECT SPEED SENSOR (INSTALLATION)



- (a) Check the speed sensor NT installation.

OK:

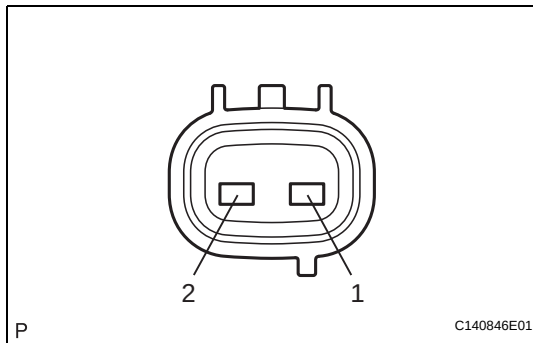
Installation bolt is tightened properly and there is no clearance between the sensor and transaxle case.

NG

SECURELY INSTALL SENSOR OR REPLACE SPEED SENSOR

OK

2 INSPECT SPEED SENSOR NT



- (a) Disconnect the B28 sensor connector from the transaxle.
(b) Measure the resistance of the sensor.

Standard resistance

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

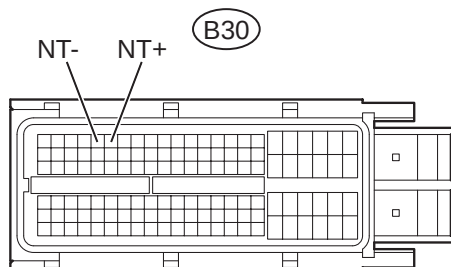
NG

REPLACE SPEED SENSOR NT

OK

3 CHECK WIRE HARNESS (SPEED SENSOR - ECM)

Wire Harness Side



- (a) Disconnect the B30 ECM connector.
(b) Measure the resistance of the wire harness side connector.

Standard resistance

Tester Connection	Condition	Specified Condition
B30-6 (NT+) - B30-5 (NT-)	20°C (68°F)	560 to 680 Ω
B30-6 (NT+) - Body ground	20°C (68°F)	10 k Ω or higher
B30-5 (NT-) - Body ground	20°C (68°F)	10 k Ω or higher

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

AX

OK

REPLACE ECM

DTC**P0724****Brake Switch "B" Circuit High****DESCRIPTION**

The purpose of this circuit is to prevent the engine from stalling while driving in the lock-up condition when the brakes are suddenly applied.

When the brake pedal is depressed, this switch sends a signal to the ECM. Then the ECM cancels the operation of the lock-up clutch while braking is in progress.

DTC No.	DTC Detection Condition	Trouble Area
P0724	Stop light switch remains ON even when vehicle is driven in GO (30 km/h (18.63 mph) or more) and STOP (less than 3 km/h (1.86 mph)) pattern 5 times (2 trip detection logic)	• Short in stop light switch signal circuit • Stop light switch • ECM

MONITOR DESCRIPTION

This DTC indicates that the stop light switch remains ON. When the stop light switch remains ON during GO and STOP driving, the ECM interprets this as a fault in the stop light switch. Then the MIL illuminates and the ECM stores the DTC. The vehicle must GO (30 km/h (18.63 mph) or more) and STOP (less than 3 km/h (1.86 mph)) 5 times for 2 driving cycles in order for the DTC to be output.

MONITOR STRATEGY

Related DTCs	P0724: Stop light switch/Range check/Rationality
Required sensors/Components	Stop light switch, Vehicle speed sensor
Frequency of operation	Continuous
Duration	GO and STOP 5 times
MIL operation	2 driving cycles
Sequence of operation	None

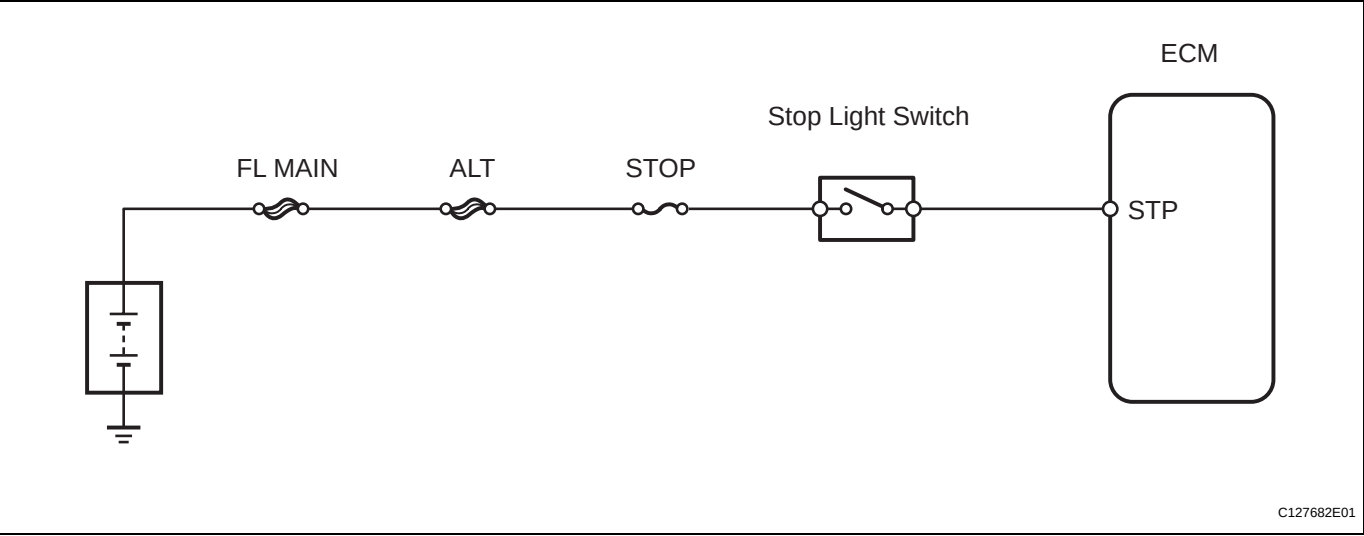
TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present.	None
Battery voltage	8 V or more
Starter	OFF
Ignition switch	ON
GO (Vehicle speed is 30 km/h (18.63 mph) or more)	Once
STOP (Vehicle speed is less than 3 km/h (1.86 mph))	Once

TYPICAL MALFUNCTION THRESHOLDS

Brake switch	Stuck ON
--------------	----------

WIRING DIAGRAM



C127682E01

INSPECTION PROCEDURE

HINT:
Using the intelligent tester's DATA LIST allows switch, sensor, actuator and other item values to be read without removing any parts. Reading the DATA LIST early in troubleshooting is one way to save time.

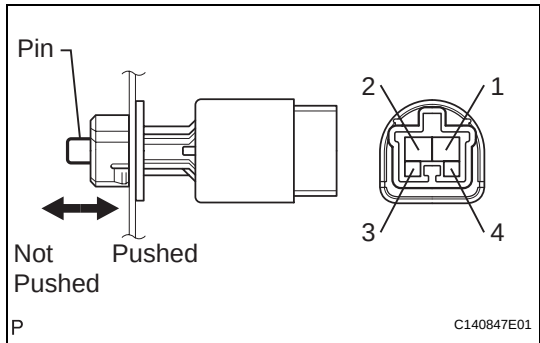
NOTICE:
In the table below, the values listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether a part is faulty or not.

- 1. Warm up the engine.
- 2. Turn the ignition switch OFF.
- 3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
- 4. Turn the ignition switch ON and turn the tester ON.
- 5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
- 6. Follow the instructions on the tester and read the DATA LIST.

ECM:

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
STOP LIGHT SW	Stop light switch status/ ON or OFF	• Brake pedal is depressed: ON • Brake pedal is released: OFF	-

1 INSPECT STOP LIGHT SWITCH



- (a) Remove the A3 stop light switch.
- (b) Measure the resistance of the switch.

Standard resistance

Tester Connection	Switch Condition	Specified Condition
1 - 2	Pin pushed (pedal released)	Below 1 Ω
1 - 2	Pin not pushed (pedal depressed)	10 kΩ or higher
3 - 4	Pin pushed (pedal released)	10 kΩ or higher
3 - 4	Pin not pushed (pedal depressed)	Below 1 Ω

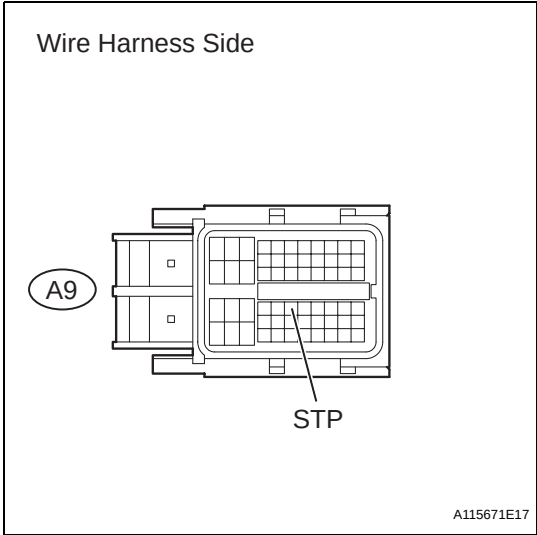
NG

REPLACE STOP LIGHT SWITCH

OK

2

CHECK WIRE HARNESS (ECM - BATTERY)



(a) Measure the voltage of the wire harness side connector.
Standard voltage

Tester Connection	Condition	Specified Condition
A9-36 (STP) - Body ground	Brake pedal is depressed	10 to 14 V
A9-36 (STP) - Body ground	Brake pedal is released	Below 1 V

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE ECM

DTC	P0741	Torque Converter Clutch Solenoid Performance (Shift Solenoid Valve DSL)
------------	--------------	--

DESCRIPTION

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

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

DTC No.	DTC Detection Condition	Trouble Area
P0741	Lock-up does not occur when driving in the lock-up range (normal driving at 80 km/h [50 mph]), or lock up remains ON in the lock-up OFF range (2 trip detection logic)	- Shift solenoid valve DSL remains open or closed - Valve body is blocked - Shift solenoid valve DSL - Torque converter clutch - Automatic transaxle (clutch, brake, gear, etc.) - Line pressure is too low - ECM

MONITOR DESCRIPTION

Torque converter lock-up is controlled by the ECM based on the speed sensor (NT), speed sensor (NC), engine rpm, engine load, engine temperature, vehicle speed, transmission temperature, and gear selection. The ECM determines the lock-up status of the torque converter by comparing the engine rpm (NE) to the input turbine rpm (NT). The ECM calculates the actual transmission gear by comparing input turbine rpm (NT) to counter gear rpm (NC). When conditions are appropriate, the ECM requests "lock-up" by applying control voltage to the shift solenoid DSL. When the DSL is turned on, it applies pressure to the lock-up relay valve and locks the torque converter clutch.

If the ECM detects no lock-up after lock-up has been requested or if it detects lock-up when it is not requested, the ECM interprets this as a fault in the shift solenoid valve DSL or lock-up system performance. The ECM will turn on the MIL and store the DTC.

HINT:

Example:

When either of the following is met, the system judges it as a malfunction.

- There is a difference in rotation between the input side (engine speed) and output side (input turbine speed) of the torque converter when the ECM commands lock-up.
(Engine speed is at least 75 rpm greater than input turbine speed.)
- There is no difference in rotation between the input side (engine speed) and output side (input turbine speed) of the torque converter when the ECM commands lock-up off.
(The difference between engine speed and input turbine speed is less than 35 rpm.)

MONITOR STRATEGY

Related DTCs	P0741: Shift solenoid valve DSL/OFF malfunction Shift solenoid valve DSL/ON malfunction
Required sensors/Components	Shift solenoid valve DSL, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE), Throttle position sensor (VPA1), Mass air flow sensor (MAF), Transmission temperature sensor (THO1), Engine coolant temperature sensor (ECT)
Frequency of operation	Continuous
Duration	OFF malfunction 3.5 sec. ON malfunction 1.8 sec.

MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

ALL:

The monitor will run whenever these DTCs are not present.	P0115 - P0118 (ECT sensor) P0125 (Insufficient ECT for closed loop) P0500 (VSS) P0748, P0778, P0798 (Shift solenoid valve (range))
ECT (Engine coolant temperature)	10°C (50°F) or more
Transmission range	"D"
ATF temperature	-20°C (-4°F) or more
ATF temperature sensor circuit	Not circuit malfunction
ECT sensor circuit	Not circuit malfunction
Turbine speed sensor circuit	Not circuit malfunction
Intermediate shaft speed sensor circuit	Not circuit malfunction
Output speed sensor circuit	Not circuit malfunction
Shift solenoid valve SL1 circuit	Not circuit malfunction
Shift solenoid valve SL2 circuit	Not circuit malfunction
Shift solenoid valve SL3 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve SR circuit	Not circuit malfunction
Shift solenoid valve DSL circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction

ECM lock-up command	ON
ECM selected gear	3rd, 4th or 5th
Vehicle speed	25 km/h (15.5 mph) or more

ON malfunction

ECM lock-up command	OFF
ECM selected gear	3rd, 4th or 5th
Throttle valve opening angle	7% or more
Vehicle speed	25 to 60 km/h (15.5 to 37.3 mph)

TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met: OFF malfunction or ON malfunction

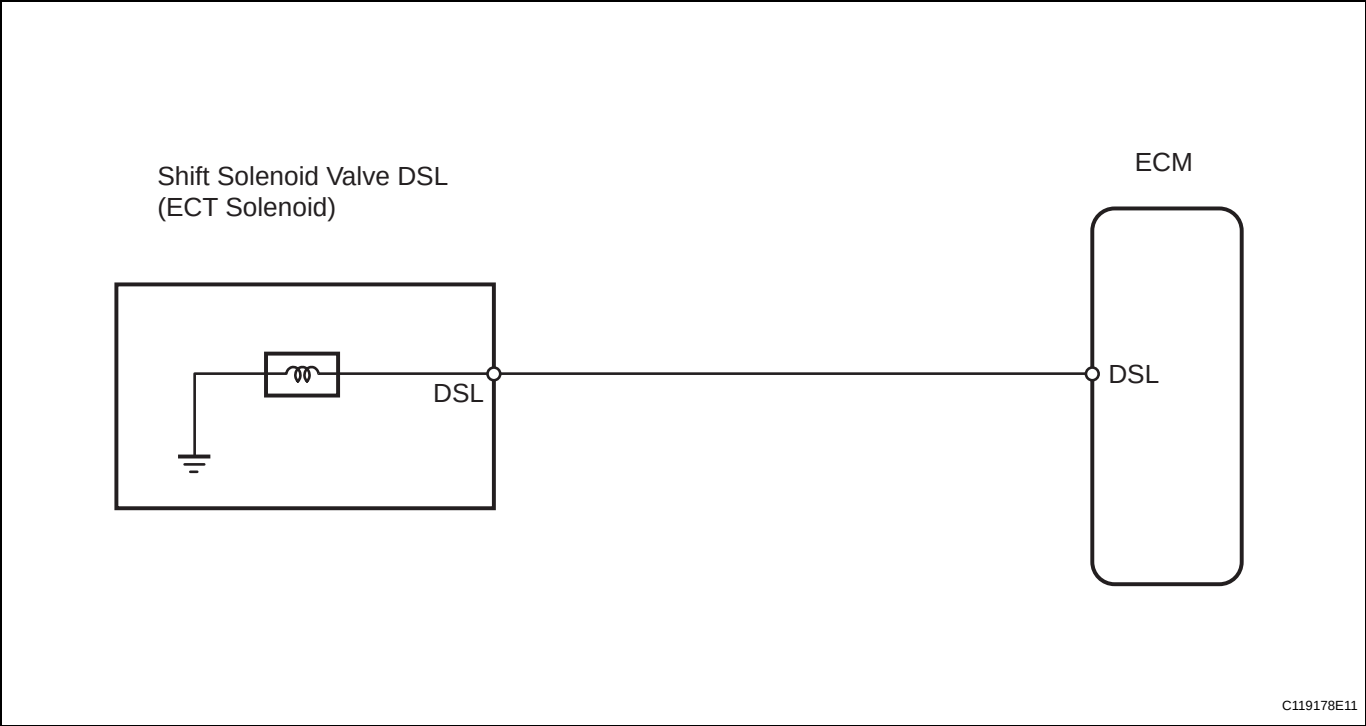
OFF malfunction:

Engine Speed - Input (turbine) speed	100 rpm or more
--------------------------------------	-----------------

ON malfunction:

Difference between engine speed and input (turbine) speed	Less than 35 rpm
---	------------------

WIRING DIAGRAM



INSPECTION PROCEDURE

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.

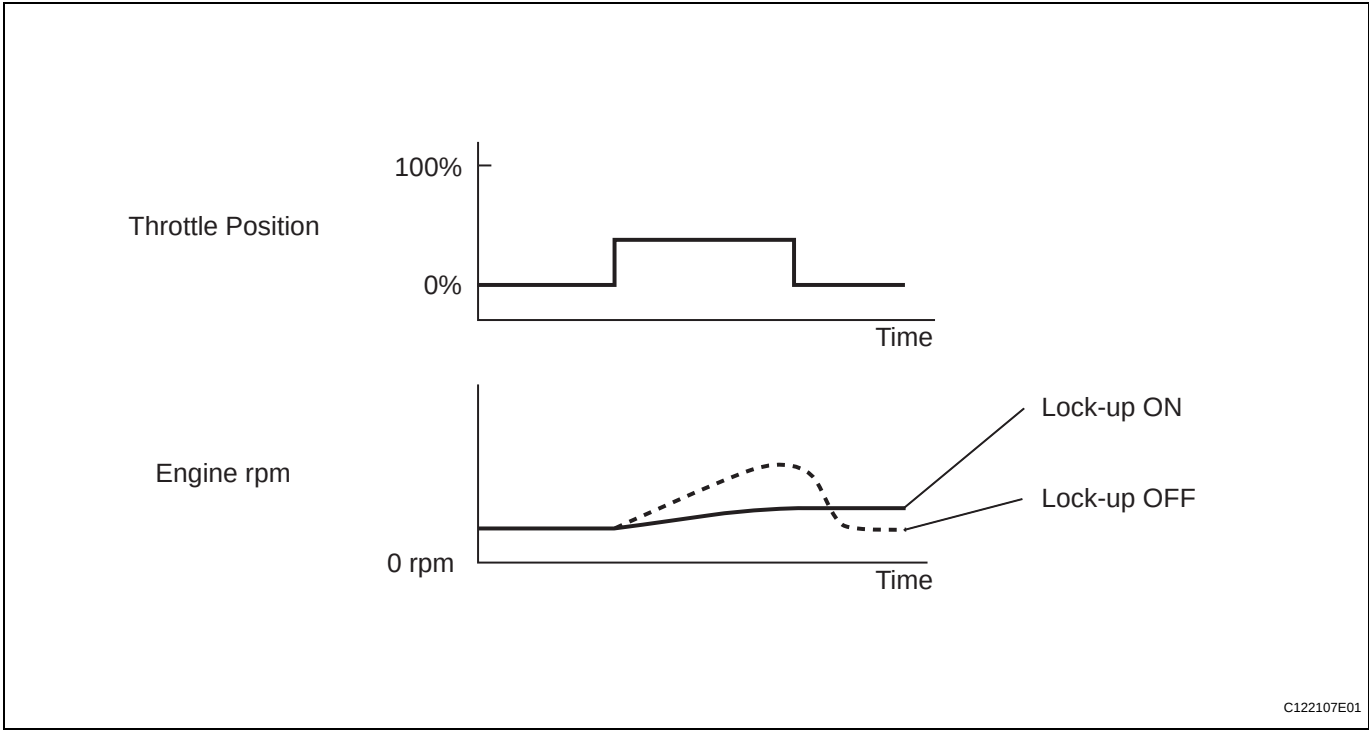
1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
6. Follow the instructions on the tester and perform the ACTIVE TEST.

ECM:

Item	Test Details	Diagnostic Note
LOCK UP	[Test Details] Control shift solenoid DSL to set automatic transaxle to the lock-up condition [Vehicle Condition] • Throttle valve opening angle: Less than 35% • Vehicle speed: 60 km/h (36 mph) or more	Possible to check shift solenoid valve DSL operation

- HINT:**
- This test can be conducted when the vehicle speed is 60 km/h (36 mph) or more.
 - This test can be conducted in the 5th gear.
7. Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

- HINT:**
- When changing the accelerator pedal opening angle while driving, if the engine speed does not change, lock-up is ON.
 - Slowly release the accelerator pedal in order to decelerate. (Do not fully release the pedal as that will close the throttle valve and lock-up may be turned OFF.)



1 CHECK OTHER DTC OUTPUT (IN ADDITION TO DTC P0741)

- (a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
- (b) Turn the ignition switch ON and turn the tester ON.
- (c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (d) Read the DTCs using the tester.

Result

Display (DTC output)	Proceed to
Only P0741 is output	A
P0741 and other DTCs are output	B

HINT:
If any other codes besides P0741 are output, perform troubleshooting for those DTCs first.

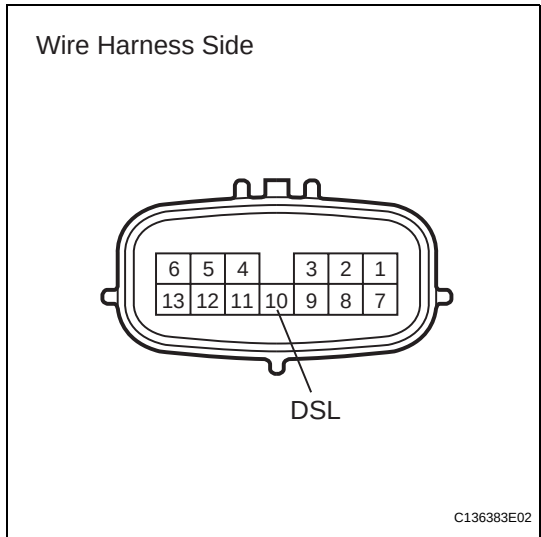
B

GO TO DTC CHART

A

2

INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE DSL)



- (a) Disconnect the B32 wire connector.
(b) Measure the resistance of the transmission wire.
Standard resistance

Tester Connection	Condition	Specified Condition
10 (DSL) - Body ground	20°C (68°F)	11 to 13 Ω

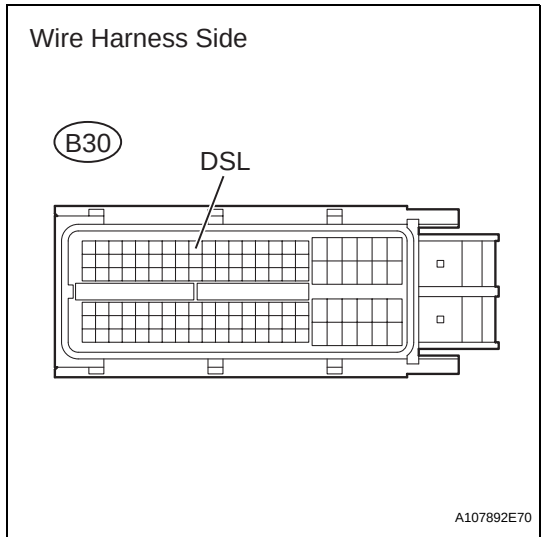
NG

Go to step 4

OK

3

CHECK WIRE HARNESS (TRANSMISSION WIRE - ECM)



- (a) Disconnect the B30 ECM connector.
(b) Measure the resistance of the wire harness side connector.
Standard resistance

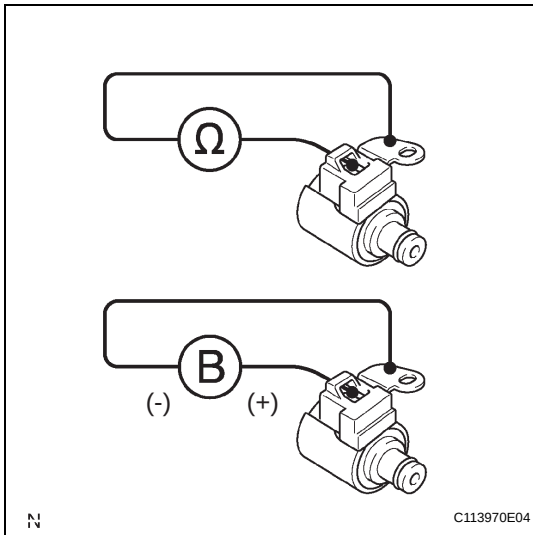
Tester Connection	Condition	Specified Condition
B30-9 (DSL) - Body ground	20°C (68°F)	11 to 13 Ω

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE ECM

4 INSPECT SHIFT SOLENOID VALVE DSL

- (a) Remove the shift solenoid valve DSL.
(b) Measure the resistance of the solenoid valve.

Standard resistance:

11 to 13 Ω at 20°C (68°F)

- (c) Connect the battery's positive (+) lead to the terminal of the solenoid valve connector, and the negative (-) lead to the solenoid body. Then check that the valve moves and makes an operating noise.

OK:

Valve moves and makes operating noise.

NG

REPLACE SHIFT SOLENOID VALVE DSL

OK

5 CHECK TRANSMISSION WIRE

OK:

The connectors and pins are securely installed.
There is no open or short on the wire harness.

NG

REPAIR OR REPLACE TRANSMISSION WIRE

OK

6 INSPECT TRANSMISSION VALVE BODY ASSEMBLY

- (a) Check the transmission valve body assembly.

OK:

There are no foreign objects on each valve.

NG

REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY

OK

7 INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

- (a) Check the torque converter clutch assembly (see page [AX-178](#)).

OK:

The torque converter clutch operates normally.

NG

REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY

AX

OK

REPAIR AUTOMATIC TRANSAXLE ASSEMBLY

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

DESCRIPTION

The ECM uses signals from the vehicle 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 transaxle (clutch, brake, gear, etc.).

DTC No.	DTC Detection Condition	Trouble Area
P0746	Gear required by the ECM does not match the actual gear when driving (2 trip detection logic)	- Shift solenoid valve SL1 remains open or closed - Valve body is blocked - Shift solenoid valve SL1 - Automatic transaxle (clutch, brake, gear, etc.) - ECM

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. According to the input shaft revolution, intermediate (counter) shaft revolution and output shaft revolution, the ECM detects the actual gear position (1st, 2nd, 3rd, 4th or 5th gear position). When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL.

HINT:

Example:

When either condition (a) or (b) is met, the ECM detects a malfunction.

(a) The ECM commands the 1st gear, but the actual gear is 2nd.

(b) The ECM commands the 2nd gear, but the actual gear is 1st.

MONITOR STRATEGY

Related DTCs	P0746: Shift solenoid valve SL1/OFF malfunction Shift solenoid valve SL1/ON malfunction
Required sensors/Components	Shift solenoid valve SL1, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	0.8 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

ALL:

The monitor will run whenever these DTCs are not present.	P0115 - P0118 (ECT sensor) P0125 (Insufficient ECT for closed loop) P0500 (VSS) P0748, P0778, P0798 (Shift solenoid valve (range))
ECT (Engine coolant temperature)	10°C (50°F) or more
Transmission range	"D"
ATF temperature	-20°C (-4°F) or more
ATF temperature sensor circuit	Not circuit malfunction
ECT sensor circuit	Not circuit malfunction
Turbine speed sensor circuit	Not circuit malfunction
Intermediate shaft speed sensor circuit	Not circuit malfunction

Output speed sensor circuit	Not circuit malfunction
Shift solenoid valve SL1 circuit	Not circuit malfunction
Shift solenoid valve SL2 circuit	Not circuit malfunction
Shift solenoid valve SL3 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve SR circuit	Not circuit malfunction
Shift solenoid valve DSL circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction:

ECM selected gear	1st
Vehicle speed	Less than 40 km/h (24.9 mph)
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (Varies with engine speed)

ON malfunction:

ECM selected gear	2nd
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (Varies with engine speed)

TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met: OFF malfunction or ON malfunction

OFF malfunction:

2 detections are necessary per driving cycle:

1st detection: temporary flag ON

2nd detection: pending fault code ON

Input (turbine) speed/Intermediate shaft speed	1.49 to 1.63
--	--------------

ON malfunction:

Input (turbine) speed/Intermediate shaft speed	2.72 to 2.86
--	--------------

INSPECTION PROCEDURE**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.

1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
6. Follow the instructions on the tester and perform the ACTIVE TEST.

HINT:

While driving, the shift position can be forcibly changed with the tester. Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (see page [AX-35](#)).

ECM:

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate shift solenoid valve and set each shift lever position by yourself [Vehicle Condition] • IDL: ON • 50 km/h (31 mph) or less [Other information] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check operation of shift solenoid valves

HINT:

- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or more.
- This shift position commanded by the ECM is shown in the DATA LIST/SHIFT display on the tester.

1**CHECK OTHER DTC OUTPUT (IN ADDITION TO DTC P0746)**

- Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
- Turn the ignition switch ON and turn the tester ON.
- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- Read the DTCs using the tester.

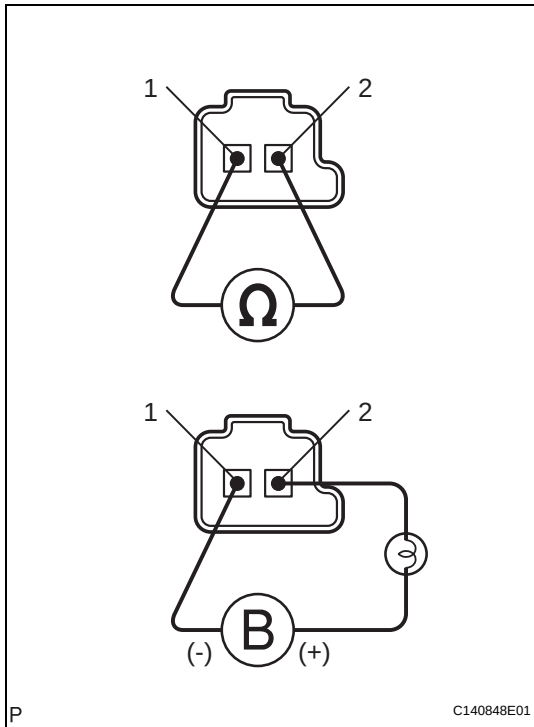
Result

Display (DTC output)	Proceed to
Only P0746 is output	A
P0746 and other DTCs are output	B

HINT:

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

B**GO TO DTC CHART****A**

2 INSPECT SHIFT SOLENOID VALVE SL1

- (a) Remove the shift solenoid valve SL1.
(b) Measure the resistance of the solenoid valve.

Standard resistance:

5.0 to 5.6 Ω at 20°C (68°F)

- (c) Connect the battery's positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating noise.

OK:

Valve moves and makes operating noise.

NG

REPLACE SHIFT SOLENOID VALVE SL1

OK

3 INSPECT TRANSMISSION VALVE BODY ASSEMBLY

- (a) Check the transmission valve body assembly.

OK:

There are no foreign objects on each valve.

NG

REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY

OK

4 INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

- (a) Check the torque converter clutch assembly (see page [AX-178](#)).

OK:

The torque converter clutch operates normally.

NG

REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY

OK

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 operation of the shift solenoid valves SL1, SL2, SL3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely (see page [AX-35](#)).

DTC No.	DTC Detection Condition	Trouble Area
P0748	Duty cycle to shift solenoid valve SL1 is 100% (1 trip detection logic)	- Open or short in shift solenoid valve SL1 circuit - Shift solenoid valve SL1 - ECM

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other normal shift solenoid valves ON/OFF. In case of an open or short circuit, the ECM stops sending current to the circuit (see page [AX-35](#)).

MONITOR STRATEGY

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

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present.	None
Battery voltage	10 V or more
Starter	OFF
Ignition switch	ON

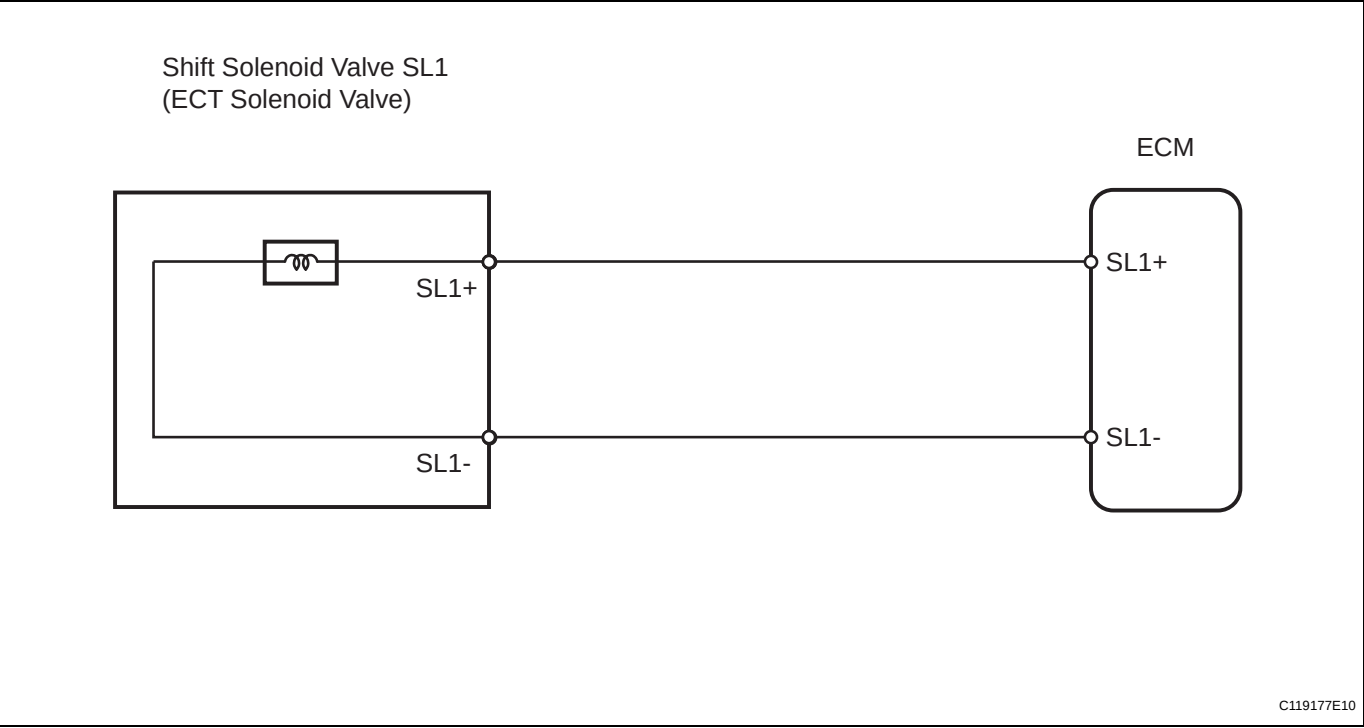
TYPICAL MALFUNCTION THRESHOLDS

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

COMPONENT OPERATING RANGE

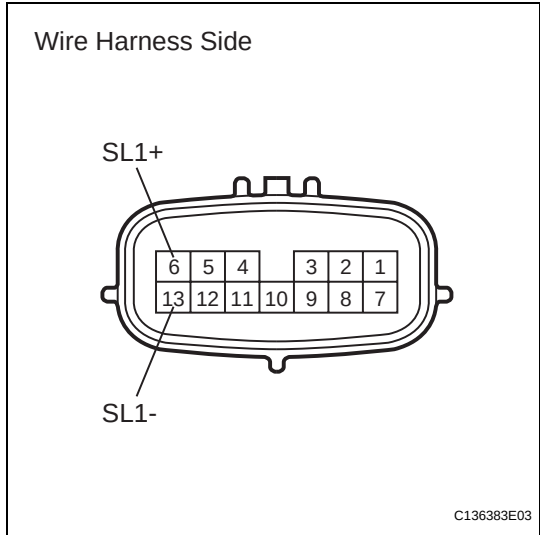
Output signal duty	Less than 100%
--------------------	----------------

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE SL1)



- (a) Disconnect the B32 wire connector.
 - (b) Measure the resistance of the transmission wire.
- Standard resistance**

Tester Connection	Condition	Specified Condition
6 (SL1+) - 13 (SL1-)	20°C (68°F)	5.0 to 5.6 Ω
6 (SL1+) - Body ground	20°C (68°F)	1 MΩ or higher
13 (SL1-) - Body ground	20°C (68°F)	1 MΩ or higher

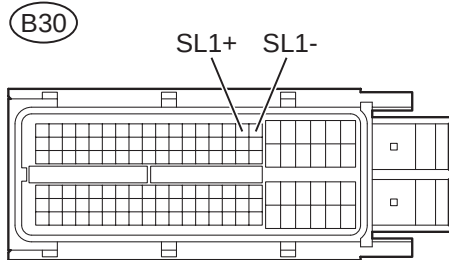
NG

Go to step 3

OK

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

Wire Harness Side

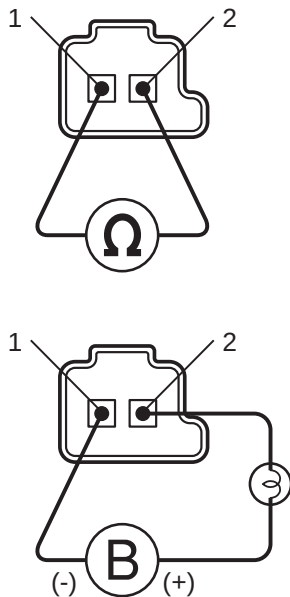


A107892E71

- (a) Disconnect the B30 ECM connector.
- (b) Measure the resistance of the wire harness side connector.

Standard resistance

Tester Connection	Condition	Specified Condition
B30-16 (SL1+) - B30-17 (SL1-)	20°C (68°F)	5.0 to 5.6 Ω
B30-16 (SL1+) - Body ground	20°C (68°F)	1 M Ω or higher
B30-17 (SL1-) - Body ground	20°C (68°F)	1 M Ω or higher

NG**REPAIR OR REPLACE HARNESS AND CONNECTOR****OK****REPLACE ECM****3****INSPECT SHIFT SOLENOID VALVE SL1**

P

C140848E01

- (a) Remove the shift solenoid valve SL1.
- (b) Measure the resistance of the solenoid valve.

Standard resistance:**5.0 to 5.6 Ω at 20°C (68°F)**

- (c) Connect the battery's positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating noise.

OK:**Valve moves and makes operating noise.****NG****REPLACE SHIFT SOLENOID VALVE SL1****OK****REPAIR OR REPLACE TRANSMISSION WIRE**

DTC	P0766	Shift Solenoid "D" Performance (Shift Solenoid Valve S4)
------------	--------------	---

SYSTEM DESCRIPTION

The ECM uses signals from the vehicle 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 transaxle (clutch, brake, gear, etc.).

DTC No.	DTC Detection Condition	Trouble Area
P0766	Gear required by the ECM does not match the actual gear when driving (2 trip detection logic)	- Shift solenoid valve S4 remains open or closed - Valve body is blocked - Shift solenoid valve S4 - Automatic transaxle (clutch, brake, gear, etc.) - ECM

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. According to the input shaft revolution, intermediate (counter) shaft revolution and output shaft revolution, the ECM detects the actual gear position (1st, 2nd, 3rd, 4th or 5th gear position). When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0766: Shift solenoid valve S4/OFF malfunction Shift solenoid valve S4/ON malfunction
Required sensors/Components	Shift solenoid valve S4, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	OFF malfunction (A) and ON malfunction (B) 1 sec. OFF malfunction (B) 1.2 sec. ON malfunction (A) 0.8 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

All:

The monitor will run whenever these DTCs are not present.	P0115 - P0118 (ECT sensor) P0125 (Insufficient ECT for closed loop) P0500 (VSS) P0748, P0778, P0798 (Shift solenoid valve (range))
ECT (Engine coolant temperature)	10°C (50°F) or more
Transmission range	"D"
ATF temperature	-20°C (-4°F) or more
ATF temperature sensor circuit	Not circuit malfunction
ECT sensor circuit	Not circuit malfunction
Turbine speed sensor circuit	Not circuit malfunction
Intermediate shaft speed sensor circuit	Not circuit malfunction
Output speed sensor circuit	Not circuit malfunction

Shift solenoid valve SL1 circuit	Not circuit malfunction
Shift solenoid valve SL2 circuit	Not circuit malfunction
Shift solenoid valve SL3 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve SR circuit	Not circuit malfunction
Shift solenoid valve DSL circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction (A):

ECM selected gear	5th
Throttle valve opening angle	5% or more
Vehicle speed	10 km/h (6.2 mph) or more

OFF malfunction (B):

ECM lock-up command	ON
ECM selected gear	3rd, 4th or 5th
Throttle valve opening angle	10% or more
Vehicle speed	25 to 100 km/h (15.5 to 62.1 mph)

ON malfunction (A):

ECM selected gear	4th or 5th
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (Varies with engine speed)

ON malfunction (B):

ECM selected gear	4th
Throttle valve opening angle	5% or more
Vehicle speed	10 km/h (6.2 mph) or more

TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met: OFF malfunction (A) and (B), or ON malfunction (A) and (B)

2 detections are necessary per driving cycle:

1st detection: temporary flag ON

2nd detection: pending fault code ON

OFF malfunction (A):

Intermediate shaft speed/Output speed	1.44 to 1.58
---------------------------------------	--------------

OFF malfunction (B):

Difference between engine speed and input (turbine) speed	Less than 35 rpm
---	------------------

ON malfunction (A):

Input (turbine) speed/Intermediate shaft speed	0.64 to 0.74
--	--------------

ON malfunction (B):

Intermediate shaft speed/Output speed	1.02 to 1.16
---------------------------------------	--------------

INSPECTION PROCEDURE**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.

1. Warm up the engine.

2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
6. Follow the instructions on the tester and perform the ACTIVE TEST.

HINT:

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

Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (see page [AX-35](#)).

ECM:

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift lever position by yourself [Vehicle Condition] • IDL: ON • 50 km/h (31 mph) or less [Other information] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves

HINT:

- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.
- The shift position commanded by the ECM is shown in the DATA LIST/SHIFT display on the tester.

1	CHECK OTHER DTC OUTPUT (IN ADDITION TO DTC P0766)
----------	--

- (a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
- (b) Turn the ignition switch ON and turn the tester ON.
- (c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (d) Read the DTCs using the tester.

Result

Display (DTC output)	Proceed to
Only P0766 is output	A
P0766 and other DTCs are output	B

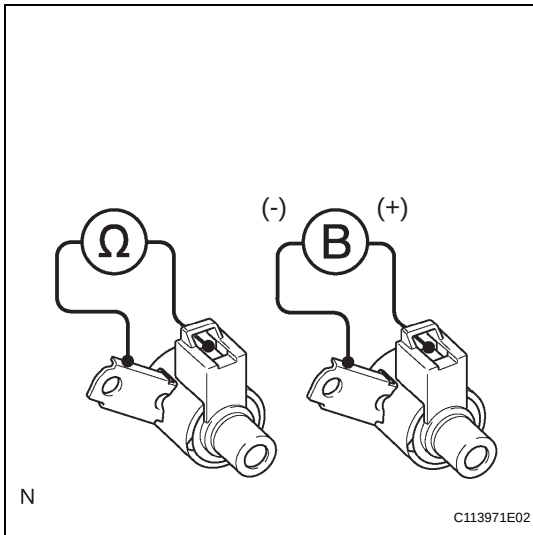
HINT:

If any other codes besides P0766 are output, perform troubleshooting for those DTCs first.

B

GO TO DTC CHART

A

2 INSPECT SHIFT SOLENOID VALVE S4

- (a) Remove the shift solenoid valve S4.
- (b) Measure the resistance between the solenoid valve terminal and solenoid valve body.

Standard resistance:

11 to 15 Ω at 20°C (68°F)

- (c) Connect the battery's positive (+) lead to the terminal of the solenoid valve connector, and the negative (-) lead to the solenoid body. Then check that the valve moves and makes an operating noise.

OK:

Valve moves and makes operating noise.

NG

REPLACE SHIFT SOLENOID VALVE S4

OK

3 INSPECT TRANSMISSION VALVE BODY ASSEMBLY

- (a) Check the transmission valve body assembly.

OK:

There are no foreign objects on each valve.

NG

REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY

OK

4 INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

- (a) Check the torque converter clutch assembly (see page [AX-178](#)).

OK:

The torque converter clutch operates normally.

NG

REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY

OK

REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSEMBLY

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

DESCRIPTION

The ECM uses signals from the vehicle 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 transaxle (clutch, brake, gear, etc.).

DTC No.	DTC Detection Condition	Trouble Area
P0771	Gear required by the ECM does not match the actual gear when driving (2 trip detection logic)	- Shift solenoid valve SR remains open or closed - Valve body is blocked - Shift solenoid valve SR - Automatic transaxle (clutch, brake, gear, etc.)

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. According to the input shaft revolution, intermediate (counter) shaft revolution and output shaft revolution, the ECM detects the actual gear position (1st, 2nd, 3rd, 4th or 5th gear position). When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0771: Shift solenoid valve SR/Rationality check
Required sensors/Components	Shift solenoid valve SR, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	OFF malfunction (A) 1 sec. OFF malfunction (B) 3.5 sec. ON malfunction (A) Continuous ON malfunction (B) and (C) 0.8 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

All:

The monitor will run whenever these DTCs are not present.	P0115 - P0118 (ECT sensor) P0125 (Insufficient ECT for closed loop) P0500 (VSS) P0748, P0778, P0798 (Shift solenoid valve (range))
ECT (Engine coolant temperature)	10°C (50°F) or more
Transmission range	"D"
ATF temperature	-20°C (-4°F) or more
ATF temperature sensor circuit	Not circuit malfunction
ECT sensor circuit	Not circuit malfunction
Turbine speed sensor circuit	Not circuit malfunction
Intermediate shaft speed sensor circuit	Not circuit malfunction
Output speed sensor circuit	Not circuit malfunction

Shift solenoid valve SL1 circuit	Not circuit malfunction
Shift solenoid valve SL2 circuit	Not circuit malfunction
Shift solenoid valve SL3 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve SR circuit	Not circuit malfunction
Shift solenoid valve DSL circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction (A):

ECM selected gear	5th
Throttle valve opening angle	5% or more
Vehicle speed	10 km/h (6.2 mph) or more

OFF malfunction (B):

ECM lock-up command	ON
ECM selected gear	3rd, 4th or 5th
Vehicle speed	25 km/h (15.5 mph) or more

ON malfunction (A):

ECM lock-up command	OFF
---------------------	-----

ON malfunction (B):

ECM selected gear	1st
Vehicle speed	Less than 40 km/h (24.9 mph)
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (Varies with engine speed)

ON malfunction (C):

ECM selected gear	3rd
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (Varies with engine speed)

ON malfunction (D):

Duration time from shift command of ECM	15 sec. or more
ECM selected gear	4th or 5th

TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met: OFF malfunction (A) and (B), or ON malfunction (A), (B), (C) and (D)

OFF malfunction (A):

Intermediate shaft speed/Output speed	1.44 to 1.58
---------------------------------------	--------------

OFF malfunction (B):

Engine speed - Input (turbine) speed	75 rpm or more
--------------------------------------	----------------

ON malfunction (A):

Difference between engine speed and input (turbine) speed	150 rpm or more
---	-----------------

ON malfunction (B):

Input (turbine) speed/Intermediate shaft speed	0.93 to 1.07
--	--------------

ON malfunction (C):

Input (turbine) speed/Intermediate shaft speed	0.93 to 1.07
--	--------------

ON malfunction (D):

Input (turbine) speed/Intermediate shaft speed	0.64 to 0.74
--	--------------

INSPECTION PROCEDURE

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.

1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
6. Follow the instructions on the tester and perform the ACTIVE TEST.

HINT:

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

Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (see page [AX-35](#)).

ECM:

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift lever position by yourself [Vehicle Condition] • IDL: ON • 50 km/h (31 mph) or less [Other information] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves

HINT:

- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.
- The shift position commanded by the ECM is shown in the DATA LIST/SHIFT display on the tester.

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

- (a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
- (b) Turn the ignition switch ON and turn the tester ON.
- (c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (d) Read the DTCs using the tester.

Result

Display (DTC output)	Proceed to
Only P0771 is output	A
P0771 and other DTCs are output	B

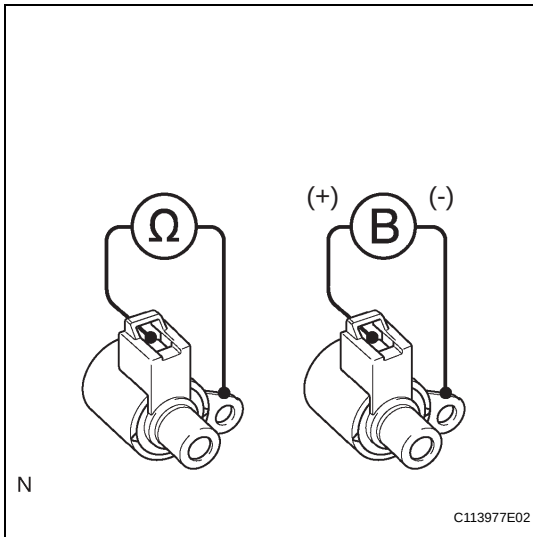
HINT:

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

B

GO TO DTC CHART

A

2 INSPECT SHIFT SOLENOID VALVE SR

- (a) Remove the shift solenoid valve SR.
- (b) Measure the resistance between the solenoid valve terminal and solenoid valve body.

Standard resistance:

11 to 15 Ω at 20°C (68°F)

- (c) Connect the battery's positive (+) lead to the terminal of the solenoid valve connector, and the negative (-) lead to the solenoid body. Then check that the valve moves and makes an operating noise.

OK:

Valve moves and makes operating noise.

NG

REPLACE SHIFT SOLENOID VALVE SR

OK

3 INSPECT TRANSMISSION VALVE BODY ASSEMBLY

- (a) Check the transmission valve body assembly.

OK:

There are no foreign objects on each valve.

NG

REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY

OK

4 INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

- (a) Check the torque converter clutch assembly (see page [AX-35](#)).

OK:

The torque converter clutch operates normally.

NG

REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY

OK

REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSEMBLY

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

DESCRIPTION

The ECM uses signals from the vehicle 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 transaxle (clutch, brake, gear, etc.).

DTC No.	DTC Detection Condition	Trouble Area
P0776	Gear required by the ECM does not match the actual gear when driving (2 trip detection logic)	- Shift solenoid valve SL2 remains open or closed - Valve body is blocked - Shift solenoid valve SL2 - Automatic transaxle (clutch, brake, gear, etc.) - ECM

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. According to the input shaft revolution, intermediate (counter) shaft revolution and output shaft revolution, the ECM detects the actual gear position (1st, 2nd, 3rd, 4th or 5th gear position). When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0776: Shift solenoid valve SL2/ON malfunction Shift solenoid valve SL2/OFF malfunction
Required sensors/Components	Shift solenoid valve SL2, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	OFF malfunction (A) 1.8 sec. OFF malfunction (B) and (C) 0.8 sec. ON malfunction (A) and (B) 0.8 sec. ON malfunction (C) 0.4 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

All:

The monitor will run whenever these DTCs are not present.	P0115 - P0118 (ECT sensor) P0125 (Insufficient ECT for closed loop) P0500 (VSS) P0748, P0778, P0798 (Shift solenoid valve (range))
ECT (Engine coolant temperature)	10°C (50°F) or more
Transmission range	"D"
ATF temperature	-20°C (-4°F) or more
ATF temperature sensor circuit	Not circuit malfunction
ECT sensor circuit	Not circuit malfunction
Turbine speed sensor circuit	Not circuit malfunction
Intermediate shaft speed sensor circuit	Not circuit malfunction

Output speed sensor circuit	Not circuit malfunction
Shift solenoid valve SL1 circuit	Not circuit malfunction
Shift solenoid valve SL2 circuit	Not circuit malfunction
Shift solenoid valve SL3 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve SR circuit	Not circuit malfunction
Shift solenoid valve DSL circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction (A):

ECM lock-up command	OFF
Vehicle speed	Less than 60 km/h (37.3 mph)
Throttle valve opening angle	7% or more

OFF malfunction (B):

ECM selected gear	1st
Vehicle speed	Less than 40 km/h (24.9 mph)
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (Varies with engine speed)

OFF malfunction (C):

ECM selected gear	3rd
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (Varies with engine speed)

OFF malfunction (D):

Duration time from shift command of ECM	15 sec. or more
ECM selected gear	4th or 5th

ON malfunction (A):

ECM selected gear	1st
Vehicle speed	Less than 40 km/h (24.9 mph)
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (Varies with engine speed)

ON malfunction (B):

ECM selected gear	3rd
Throttle valve opening angle	5.0% or more at output speed 1,400 rpm (Varies with engine speed)
Malfunction of pressure control solenoid "B" (SL2) and "C" (SL3)	Not detected

ON malfunction (C):

Throttle valve opening angle	7.0% or more at output speed 1,050 rpm (Varies with engine speed)
Malfunction of pressure control solenoid "B" (SL2)	Not detected

TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met: OFF malfunction (A), (B), (C) and (D), or ON malfunction (A), (B) and (C)

OFF malfunction (A):

Difference between engine speed and input (turbine) speed	Less than 35 rpm
---	------------------

OFF malfunction (B) and (C):

Input (turbine) speed/Intermediate shaft speed	0.93 to 1.07
--	--------------

OFF malfunction (D):

Input (turbine) speed/Intermediate shaft speed	0.64 to 0.74
--	--------------

ON malfunction (A):

Input (turbine) speed/Intermediate shaft speed	2.72 to 2.86
--	--------------

ON malfunction (B):

Input (turbine) speed - Intermediate shaft speed	700 rpm or more
--	-----------------

ON malfunction (C):

Input (turbine) speed - Intermediate shaft speed	Less than -500 rpm or 700 rpm or more
--	---

INSPECTION PROCEDURE**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.

1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
6. Follow the instructions on the tester and perform the ACTIVE TEST.

HINT:

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

Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (see page [AX-35](#)).

ECM:

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift lever position by yourself [Vehicle Condition] • IDL: ON • 50 km/h (31 mph) or less [Other information] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves

HINT:

- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.
- The shift position commanded by the ECM is shown in the DATA LIST/SHIFT display on the tester.

1**CHECK OTHER DTC OUTPUT (IN ADDITION TO DTC P0776)**

- (a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
- (b) Turn the ignition switch ON and turn the tester ON.
- (c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (d) Read the DTCs using the tester.

Result

Display (DTC output)	Proceed to
Only P0776 is output	A
P0776 and other DTCs are output	B

HINT:

If any other codes besides P0776 are output, perform troubleshooting for those DTCs first.

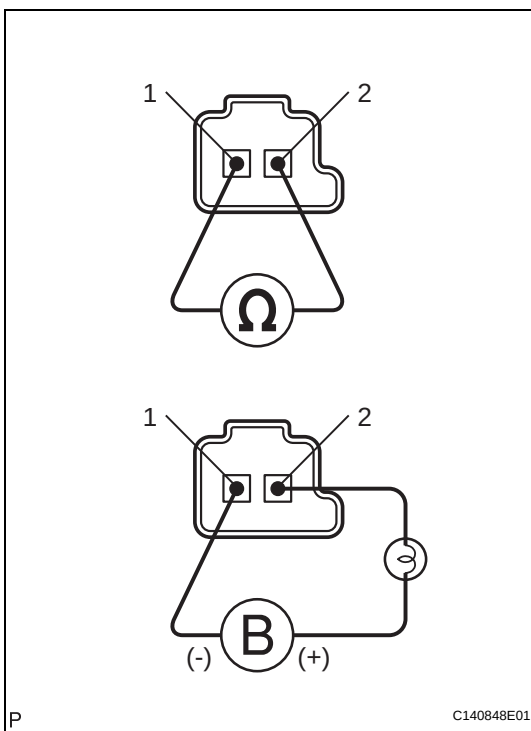
B

GO TO DTC CHART

A

2

INSPECT SHIFT SOLENOID VALVE SL2



- (a) Remove the shift solenoid valve SL2.
 (b) Measure the resistance of the solenoid valve.

Standard resistance:

5.0 to 5.6 Ω at 20°C (68°F)

- (c) Connect the battery's positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating noise.

OK:

Valve moves and makes operating noise.

NG

REPLACE SHIFT SOLENOID VALVE SL2

OK

3

INSPECT TRANSMISSION VALVE BODY ASSEMBLY

- (a) Check the transmission valve body assembly.

OK:

There are no foreign objects on each valve.

NG

REPAIR TRANSMISSION VALVE BODY ASSEMBLY

OK

4**INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY**

- (a) Check the torque converter clutch assembly (see page [AX-178](#)).

OK:

The torque converter clutch operates normally.

NG**REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY****OK****REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSEMBLY**

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 SL1, SL2, SL3, S4 and SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely (see page [AX-35](#)).

DTC No.	DTC Detection Condition	Trouble Area
P0778	ECM checks for an open or short circuit in shift solenoid valves SL2 (1 trip detection logic) Hybrid IC for solenoid indicates fail	- Open or short in shift solenoid valve SL2 circuit - Shift solenoid valve SL2 - ECM

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other normal shift solenoid valves ON/OFF. In case of an open or short circuit, the ECM stops sending current to the circuit (see page [AX-35](#)).

MONITOR STRATEGY

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

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present.	None
Battery voltage	11 V or more
Starter	OFF
Ignition switch	ON
Solenoid current cut status	Not cut
CPU commanded duty	19% or more

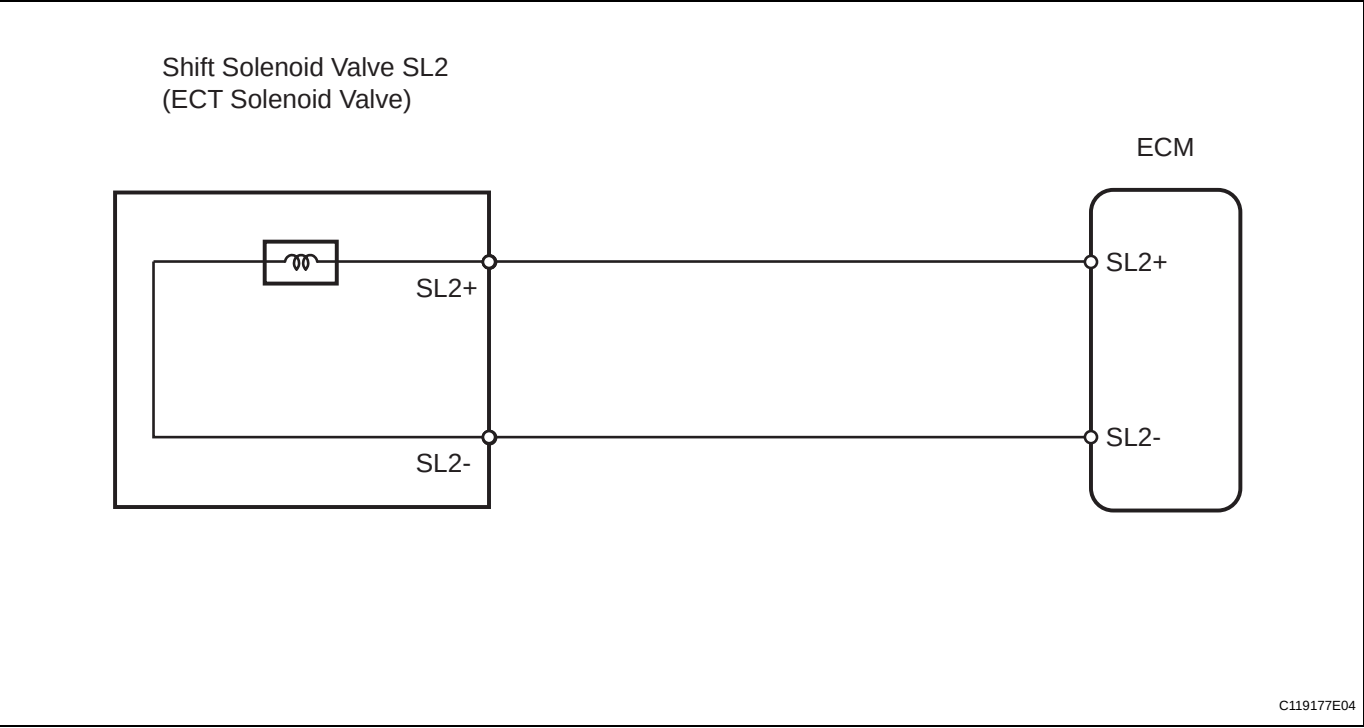
TYPICAL MALFUNCTION THRESHOLDS

Solenoid status from MIC	Fail
--------------------------	------

COMPONENT OPERATING RANGE

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

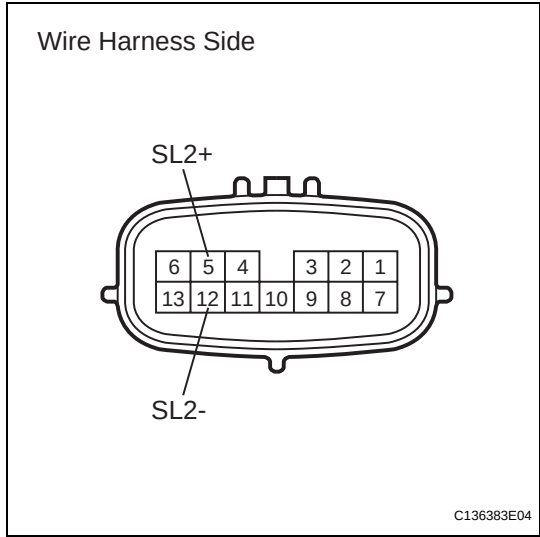
WIRING DIAGRAM



INSPECTION PROCEDURE

1

INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE SL2)



- (a) Disconnect the B32 wire connector.
(b) Measure the resistance of the transmission wire.
- Standard resistance**

Tester Connection	Condition	Specified Condition
5 (SL2+) - 12 (SL2-)	20°C (68°F)	5.0 to 5.6 Ω
5 (SL2+) - Body ground	20°C (68°F)	1 MΩ or higher
12 (SL2-) - Body ground	20°C (68°F)	1 MΩ or higher

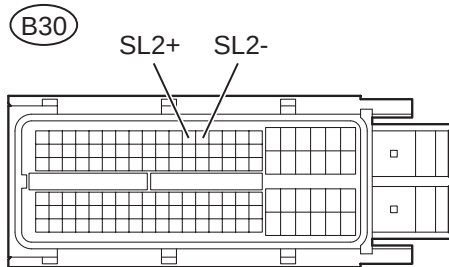
NG

Go to step 3

OK

2 CHECK WIRE HARNESS (TRANSMISSION WIRE - ECM)

Wire Harness Side



A107892E72

- Disconnect the B30 ECM connector.
- Measure the resistance of the wire harness side connector.

Standard resistance

Tester Connection	Condition	Specified Condition
B30-12 (SL2+) - B30-13 (SL2-)	20°C (68°F)	5.0 to 5.6 Ω
B30-12 (SL2+) - Body ground	20°C (68°F)	1 M Ω or higher
B30-13 (SL2-) - Body ground	20°C (68°F)	1 M Ω or higher

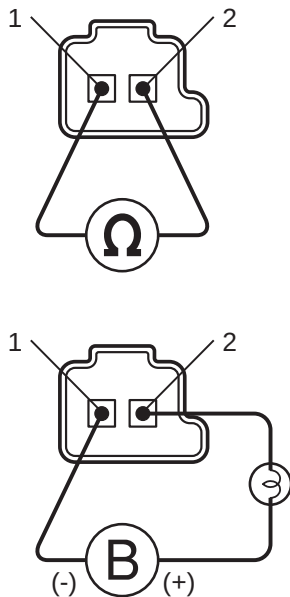
NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE SL2



P

C140848E01

- Remove the shift solenoid valve SL2.
- Measure the resistance of the solenoid valve.

Standard resistance:

5.0 to 5.6 Ω at 20°C (68°F)

- Connect the battery's positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating noise.

OK:

Valve moves and makes operating noise.

NG

REPLACE SHIFT SOLENOID VALVE SL2

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC**P0793****Intermediate Shaft Speed Sensor "A"****DESCRIPTION**

This sensor detects the rotation speed of the counter gear. By comparing the counter gear speed signal (NC) with the direct clutch speed sensor signal (NT), the ECM detects the shift timing of the gears and approximately controls the engine torque and hydraulic pressure according to various conditions. Thus smooth gear shifting is performed.

DTC No.	DTC Detection Condition	Trouble Area
P0793	ECM detects conditions (a), (b) and (c) continuously for 5 sec. or more (1 trip detection logic): (a) Vehicle speed: 50 km/h (31 mph) or more (b) Park/Neutral position switch (NSW) is OFF (c) Speed sensor NC: Less than 300 rpm	• Open or short in speed sensor NC circuit • Speed sensor NC • ECM

MONITOR DESCRIPTION

The NC terminal of the ECM detects revolution signals from speed sensor NC (counter gear rpm). The ECM calculates gear shifts by comparing speed sensor NT with speed sensor NC.

While the vehicle is operating in the 2nd, 3rd, 4th or 5th gear position with the shift lever on D, if the counter gear revolution is less than 300 rpm*1 and the output shaft revolution is more than 1,000 rpm*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 50 km/h (31 mph) or more.

MONITOR STRATEGY

Related DTCs	P0793: Speed sensor (NC)/Verify pulse input
Required sensors/Components	Speed sensor (NC), Speed sensor (NT), NSW switch
Frequency of operation	Continuous
Duration	5 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever these DTCs are not present.	P0500 (VSS) P0748 - P0798 (Trans solenoid (Range))
Engine	Running
NSW switch	OFF
Output shaft rpm	1,000 rpm or more

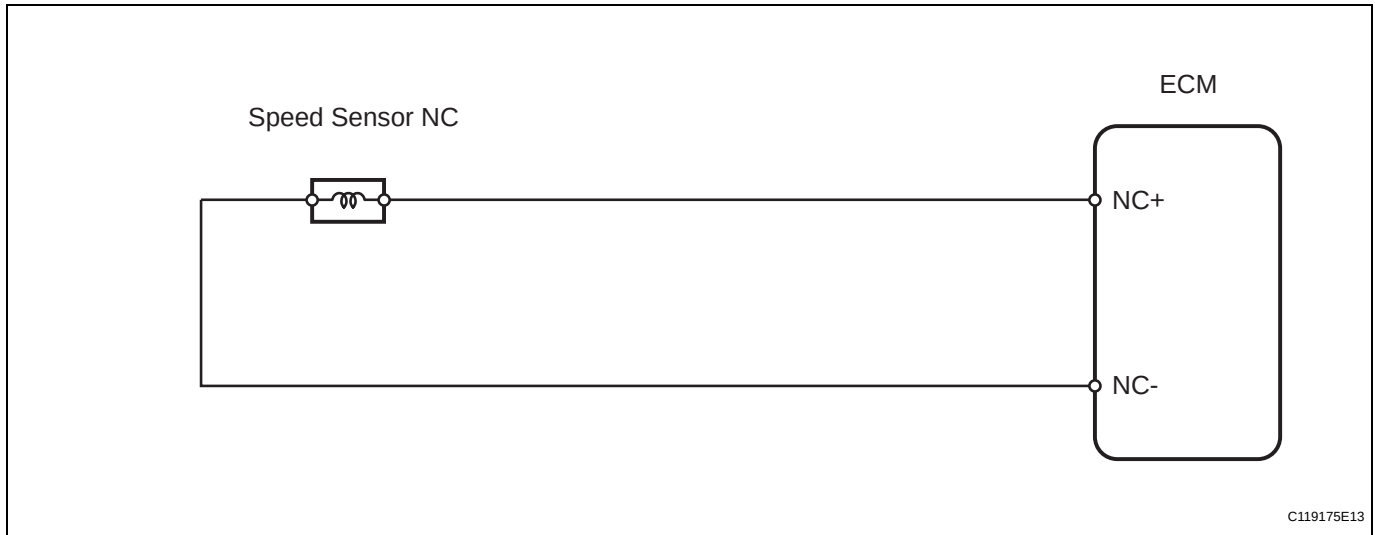
TYPICAL MALFUNCTION THRESHOLDS

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

COMPONENT OPERATING RANGE

Counter gear speed sensor (NC)	3rd gear when shift lever is on D (after warming up the engine); Intermediate shaft speed (NC) becomes close to the engine speed
--------------------------------	---

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT:

Using the intelligent tester's DATA LIST allows switch, sensor, actuator and other item values to be read without removing any parts. Reading the DATA LIST early in troubleshooting is one way to save time.

NOTICE:

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

1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DATA LIST.
6. Follow the instructions on the tester and read the DATA LIST.

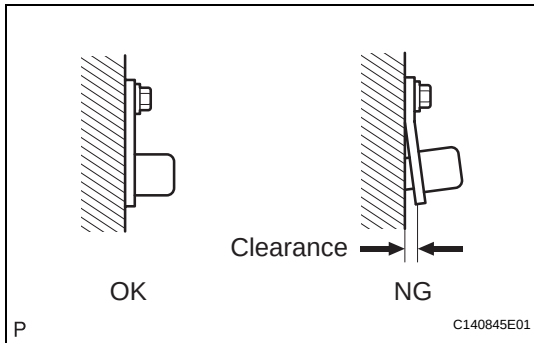
ECM:

Item	Measurement Item/ Range (Display)	Normal Condition	Diagnostic Note
SPD (NC)	Counter gear speed/ Min.: 0 rpm Max.: 12,750 rpm	3rd gear when shift lever is on D (after warming up the engine); Intermediate shaft speed (NC) becomes close to the engine speed	Data is displayed in increments of 50 rpm

HINT:

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

1 INSPECT SPEED SENSOR (INSTALLATION)



(a) Check the speed sensor NC installation.

OK:

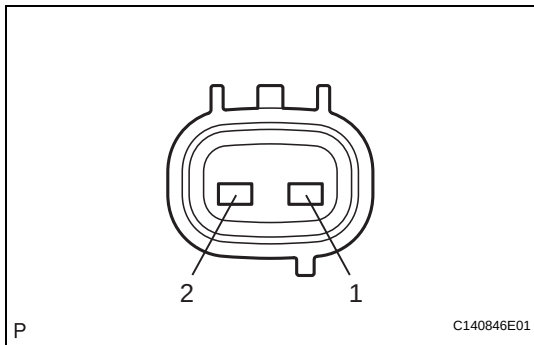
Installation bolt is tightened properly and there is no clearance between the sensor and transaxle case.

NG

REPLACE SPEED SENSOR NC

OK

2 INSPECT SPEED SENSOR NC



(a) Disconnect the B24 sensor connector from the transaxle.

(b) Measure the resistance of the sensor.

Standard resistance

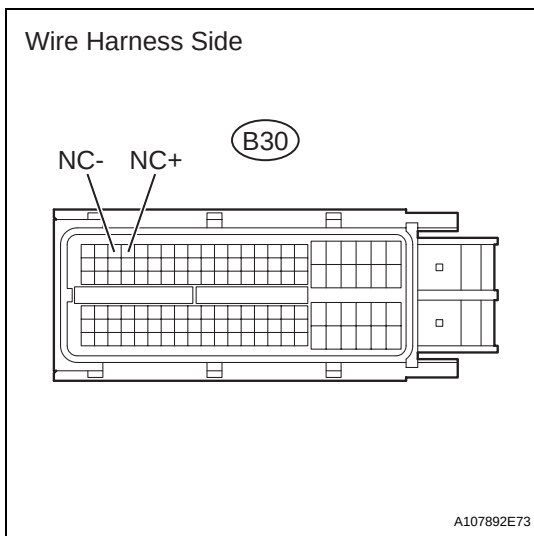
Tester Connection	Condition	Specified Condition
1 - 2	20°C (68°F)	560 to 680 Ω

NG

REPLACE SPEED SENSOR NC

OK

3 CHECK WIRE HARNESS (SPEED SENSOR - ECM)



(a) Disconnect the B30 ECM connector.

(b) Measure the resistance of the wire harness side connector.

Standard resistance

Tester Connection	Specified Condition
B30-4 (NC+) - B30-3 (NC-)	560 to 680 Ω
B30-4 (NC+) - Body ground	10 k Ω or higher
B30-3 (NC-) - Body ground	10 k Ω or higher

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE ECM

DTC	P0796	Pressure Control Solenoid "C" Performance (Shift Solenoid Valve SL3)
------------	--------------	---

DESCRIPTION

The ECM uses signals from the vehicle 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 transaxle (clutch, brake, gear, etc.).

DTC No.	DTC Detection Condition	Trouble Area
P0796	Gear required by the ECM does not match the actual gear when driving (2 trip detection logic)	- Shift solenoid valve SL3 remains open or closed - Valve body is blocked - Automatic transaxle (clutch, brake, gear, etc.)

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. According to the input shaft revolution, intermediate (counter) shaft revolution and output shaft revolution, the ECM detects the actual gear position (1st, 2nd, 3rd, 4th or 5th gear position). When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0796: Shift solenoid valve SL3/OFF malfunction Shift solenoid valve SL3/ON malfunction
Required sensors/Components	Shift solenoid valve SL3, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	OFF malfunction (A) 0.8 sec. OFF malfunction (B) 1 sec. ON malfunction (A) and (B) 0.8 sec. ON malfunction (C) 0.4 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

All:

The monitor will run whenever these DTCs are not present.	P0115 - P0118 (ECT sensor) P0125 (Insufficient ECT for closed loop) P0500 (VSS) P0748, P0778, P0798 (Shift solenoid valve (range))
ECT (Engine coolant temperature)	10°C (50°F) or more
Transmission range	"D"
ATF temperature	-20°C (-4°F) or more
ATF temperature sensor circuit	Not circuit malfunction
ECT sensor circuit	Not circuit malfunction
Turbine speed sensor circuit	Not circuit malfunction
Intermediate shaft speed sensor circuit	Not circuit malfunction
Output speed sensor circuit	Not circuit malfunction

Shift solenoid valve SL1 circuit	Not circuit malfunction
Shift solenoid valve SL2 circuit	Not circuit malfunction
Shift solenoid valve SL3 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve SR circuit	Not circuit malfunction
Shift solenoid valve DSL circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction (A):

ECM selected gear	4th or 5th
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (Varies with engine speed)

OFF malfunction (B):

ECM selected gear	4th
Throttle valve opening angle	5% or more
Vehicle speed	10 km/h (6.2 mph) or more

ON malfunction (A):

ECM selected gear	1st
Vehicle speed	Less than 40 km/h (24.9 mph)
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (Varies with engine speed)

ON malfunction (B):

ECM selected gear	3rd
Throttle valve opening angle	5.0% or more at output speed 1,400 rpm (Varies with engine speed)
Malfunction of pressure control solenoid "B" (SL2) and "C" (SL3)	Not detected

ON malfunction (C):

Throttle valve opening angle	7.0% or more at output speed 1,050 rpm (Varies with engine speed)
Malfunction of pressure control solenoid "B" (SL2)	Not detected

TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met: OFF malfunction (A) and (B), or ON malfunctions (A), (B) and (C)

2 detections are necessary per driving cycle:

1st detection: temporary flag ON

2nd detection: pending fault code ON

OFF malfunction (A):

Input (turbine) speed/Intermediate shaft speed	0.93 to 1.07
--	--------------

OFF malfunction (B):

Intermediate shaft speed/Output speed	1.02 to 1.16
---------------------------------------	--------------

ON malfunction (A):

Input (turbine) speed/Intermediate shaft speed	0.93 to 1.07
--	--------------

ON malfunction (B):

Input (turbine) speed - Intermediate shaft speed	700 rpm or more
--	-----------------

ON malfunction (C):

Input (turbine) speed - Intermediate shaft speed	Less than -500 rpm or 700 rpm or more
--	---

INSPECTION PROCEDURE

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.

1. Warm up the engine.
2. Turn the ignition switch OFF.
3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
4. Turn the ignition switch ON and turn the tester ON.
5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
6. Follow the instructions on the tester and perform the ACTIVE TEST.

HINT:

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

Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (see page [AX-35](#)).

ECM:

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift lever position by yourself [Vehicle Condition] • IDL: ON • 50 km/h (31 mph) or less [Other information] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves

HINT:

- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.
- The shift position commanded by the ECM is shown in the DATA LIST/SHIFT display on the tester.

1	CHECK OTHER DTCS OUTPUT (IN ADDITION TO DTC P0796)
----------	---

- (a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
- (b) Turn the ignition switch ON and turn the tester ON.
- (c) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- (d) Read the DTCs using the tester.

Result

Display (DTC output)	Proceed to
Only P0796 is output	A
P0796 and other DTCs are output	B

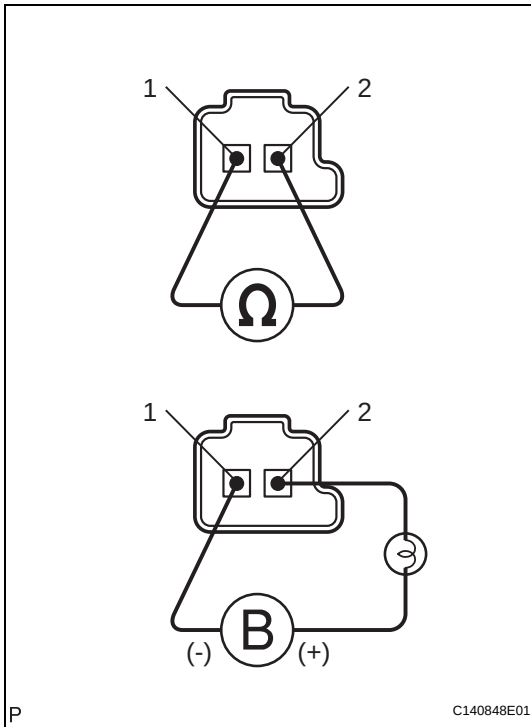
HINT:

If any other codes besides P0796 are output, perform troubleshooting for those DTCs first.

B

GO TO DTC CHART

A

2**INSPECT SHIFT SOLENOID VALVE SL3**

- (a) Remove the shift solenoid valve SL3.
(b) Measure the resistance of the solenoid valve.

Standard resistance:**5.0 to 5.6 Ω at 20°C (68°F)**

- (c) Connect the battery's positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating noise.

OK:**Valve moves and makes operating noise.****NG****REPLACE SHIFT SOLENOID VALVE SL3****OK****3****INSPECT TRANSMISSION VALVE BODY ASSEMBLY**

- (a) Check the transmission valve body assembly.

OK:**There are no foreign objects on each valve.****NG****REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY****OK****4****INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY**

- (a) Check the torque converter clutch assembly (see page [AX-178](#)).

OK:**The torque converter clutch operates normally.****NG****REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY****OK****REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSEMBLY****AX**

DTC	P0798	Pressure Control Solenoid "C" Electrical (Shift Solenoid Valve SL3)
------------	--------------	--

DESCRIPTION

Shifting from 1st to 5th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, SL3, S4 or SR which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely (see page [AX-35](#)).

DTC No.	DTC Detection Condition	Trouble Area
P0798	The ECM checks for an open or short in the shift solenoid valve SL3 circuit while driving and shifting gears (1 trip detection logic)	- Open or short in shift solenoid valve SL3 circuit - Shift solenoid valve SL3 - ECM

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other normal shift solenoid valves ON/OFF. In case of an open or short circuit, the ECM stops sending current to the circuit (see page [AX-35](#)).

MONITOR STRATEGY

Related DTCs	P0798: Shift solenoid valve SL3/Range check
Required sensors/Components	Shift solenoid valve SL3
Frequency of operation	Continuous
Duration	1 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present.	None
Battery voltage	10 V or more
Ignition switch	ON
Starter	OFF

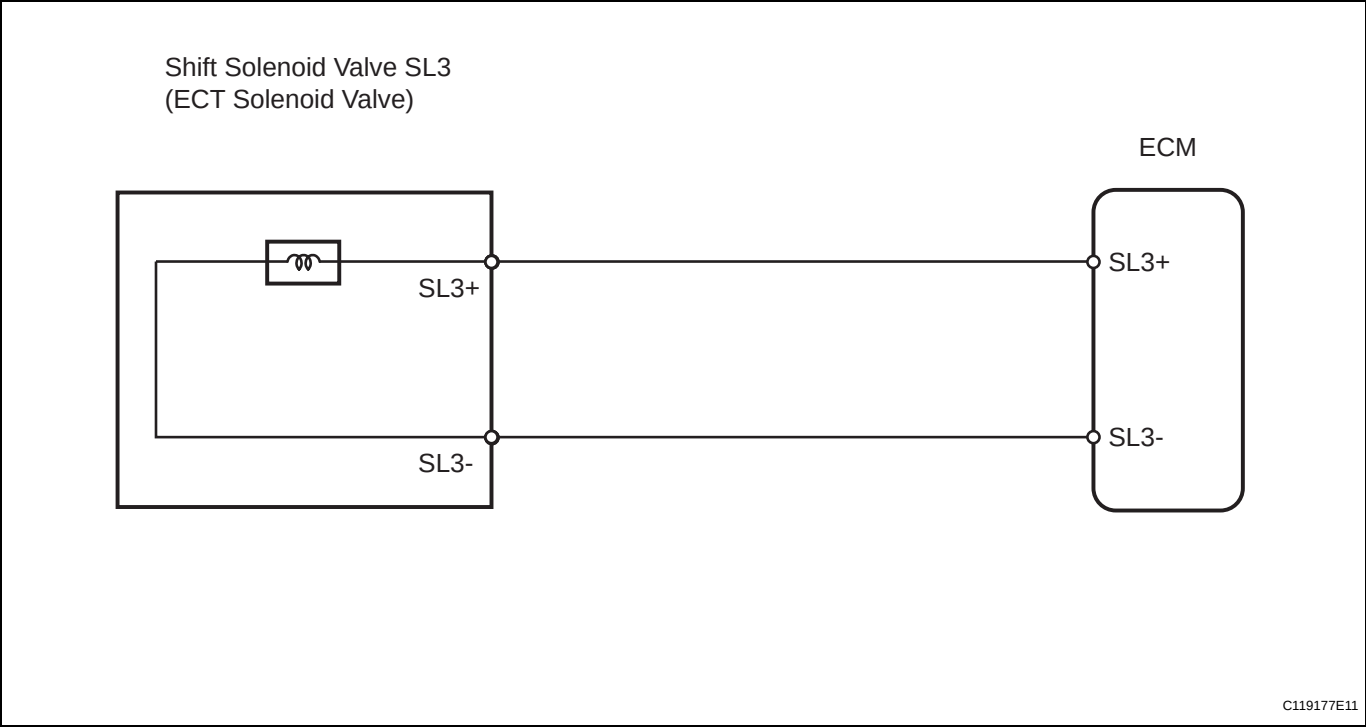
TYPICAL MALFUNCTION THRESHOLDS

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

COMPONENT OPERATING RANGE

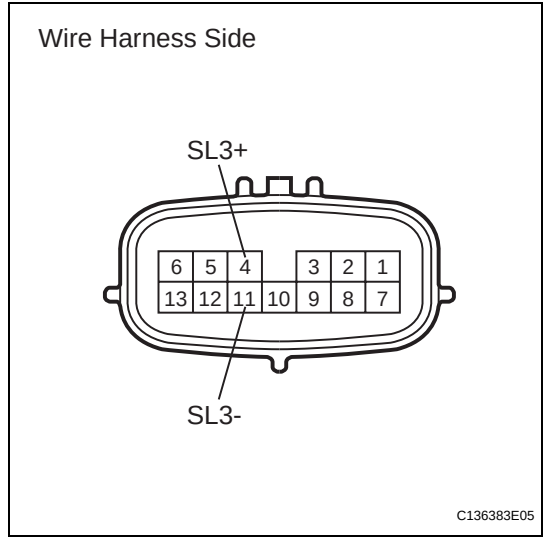
Output signal duty	Less than 100%
--------------------	----------------

WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE SL3)



- (a) Disconnect the B32 wire connector.
(b) Measure the resistance of the transmission wire.
Standard resistance

Tester Connection	Condition	Specified Condition
4 (SL3+) - 11 (SL3-)	20°C (68°F)	5.0 to 5.6 Ω
4 (SL3+) - Body ground	20°C (68°F)	1 MΩ or higher
11 (SL3-) - Body ground	20°C (68°F)	1 MΩ or higher

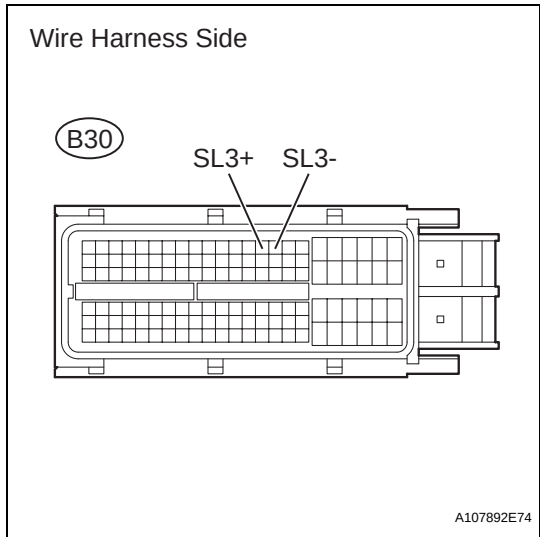
NG

Go to step 3

OK

2

CHECK WIRE HARNESS (TRANSMISSION WIRE - ECM)



- (a) Disconnect the B30 ECM connector.
- (b) Measure the resistance of the wire harness side connector.

Standard resistance

Tester Connection	Condition	Specified Condition
B30-14 (SL3+) - B30-15 (SL3-)	20°C (68°F)	5.0 to 5.6 Ω
B30-14 (SL3+) - Body ground	20°C (68°F)	1 MΩ or higher
B30-15 (SL3-) - Body ground	20°C (68°F)	1 MΩ or higher

NG

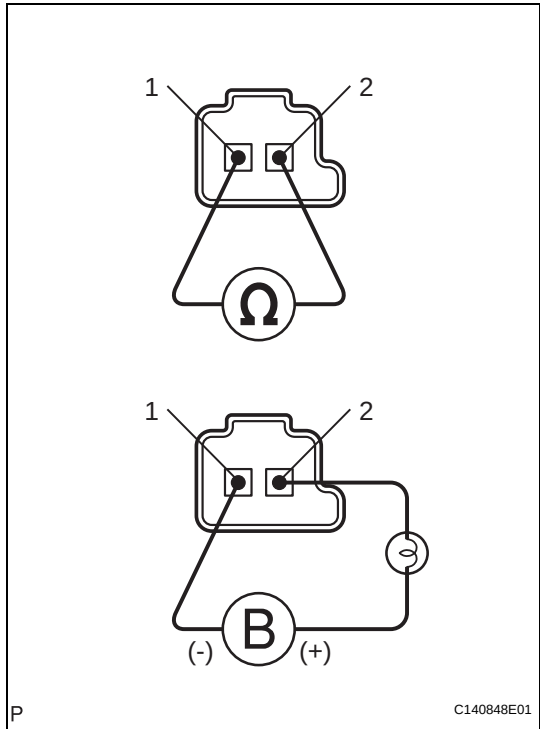
REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE ECM

3

INSPECT SHIFT SOLENOID VALVE SL3



- (a) Remove the shift solenoid valve SL3.
- (b) Measure the resistance of the solenoid valve.
Standard resistance:
5.0 to 5.6 Ω at 20°C (68°F)
- (c) Connect the battery's positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating noise.

OK:
Valve moves and makes operating noise.

NG

REPLACE SHIFT SOLENOID VALVE SL3

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P0982	Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)
DTC	P0983	Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)

DESCRIPTION

Shifting from 1st to 5th is performed in combination with the ON and OFF operation of the shift solenoid valves SL1, SL2, SL3, S4 or SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely (see page [AX-35](#)).

DTC No.	DTC Detection Condition	Trouble Area
P0982	ECM detects short in solenoid valve S4 circuit 2 times when solenoid valve S4 is operated (1 trip detection logic)	- Short in shift solenoid valve S4 circuit - Shift solenoid valve S4 - ECM
P0983	ECM detects open in solenoid valve S4 circuit 2 times when solenoid valve S4 is not operated (1 trip detection logic)	- Open in shift solenoid valve S4 circuit - Shift solenoid valve S4 - ECM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve S4 circuit. The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. Also, the ECM performs the fail-safe function and turns the other normal shift solenoid valves ON/OFF. In case of an open or short circuit, the ECM stops sending current to the circuit (see page [AX-35](#)).

MONITOR STRATEGY

Related DTCs	P0982: Shift solenoid valve S4/Range check (Low resistance) P0983: Shift solenoid valve S4/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S4
Frequency of operation	Continuous
Duration	0.064 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0982: Range check (Low resistance)

The monitor will run whenever this DTC is not present.	None
Shift solenoid valve S4	ON
Battery voltage	8 V or more
Ignition switch	ON
Starter	OFF

P0983: Range check (High resistance)

The monitor will run whenever this DTC is not present.	None
Shift solenoid valve S4	OFF
Battery voltage	8 V or more
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

P0982: Range check (Low resistance)

Shift solenoid valve S4 resistance	8 Ω or less
------------------------------------	-------------

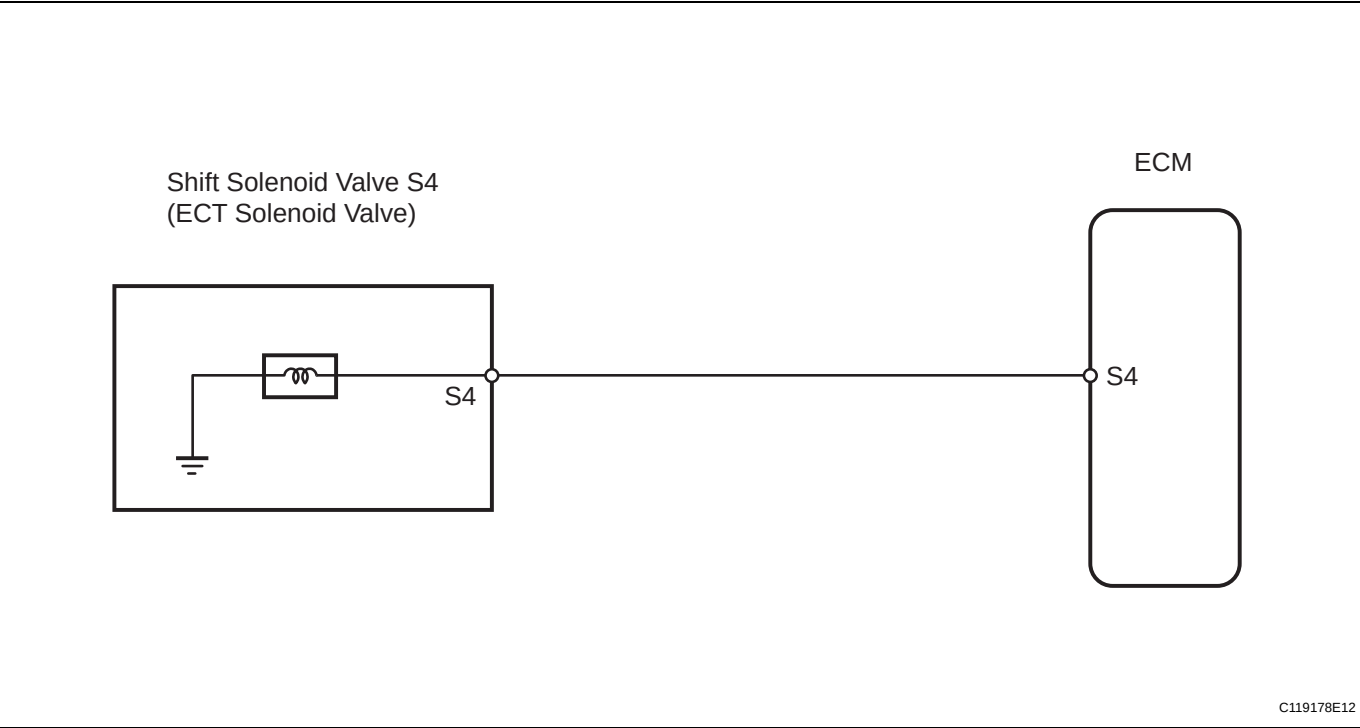
P0983: Range check (High resistance)

Shift solenoid valve S4 resistance	100 kΩ or more
------------------------------------	----------------

COMPONENT OPERATING RANGE

Shift solenoid valve S4	Resistance: 11 to 15 Ω at 20°C (68°F)
-------------------------	---------------------------------------

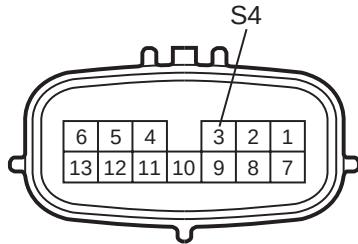
WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE S4)

Wire Harness Side



C136383E06

- (a) Disconnect the B32 wire connector.
 (b) Measure the resistance of the transmission wire.

Standard resistance

Tester Connection	Condition	Specified Condition
3 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

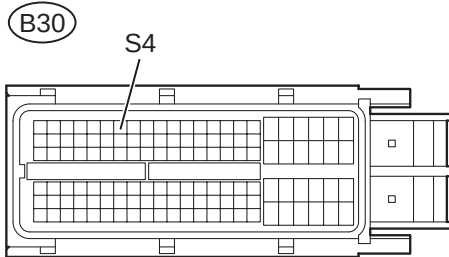
NG

Go to step 3

OK

2 CHECK WIRE HARNESS (TRANSMISSION WIRE - ECM)

Wire Harness Side



A107892E75

- (a) Disconnect the B30 ECM connector.
 (b) Measure the resistance of the wire harness side connector.

Standard resistance

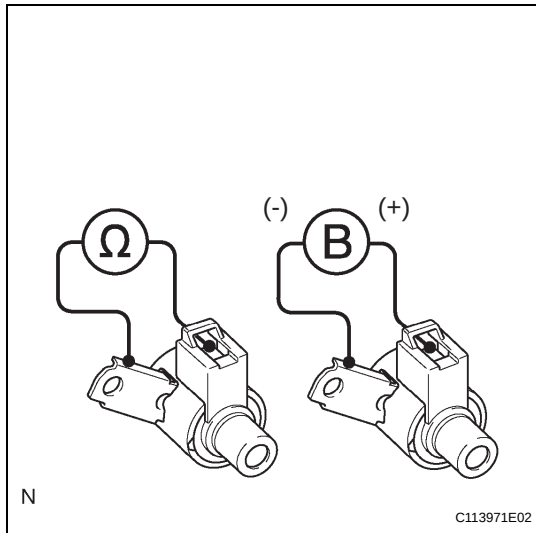
Tester Connection	Condition	Specified Condition
B30-7 (S4) - Body ground	20°C (68°F)	11 to 15 Ω

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE S4

- (a) Remove the shift solenoid valve S4.
- (b) Measure the resistance of the solenoid valve.

Standard resistance:

11 to 15 Ω at 20°C (68°F)

- (c) Connect the battery's positive (+) lead to the terminal of the solenoid valve connector, and the negative (-) lead to the solenoid body. Then check that the valve moves and makes an operating noise.

OK:

Valve moves and makes operating noise.

NG

REPLACE SHIFT SOLENOID VALVE S4

OK

REPAIR OR REPLACE TRANSMISSION WIRE

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 operation of the shift solenoid valves SL1, SL2, SL3, S4 or SR, which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated safely (see page [AX-35](#)).

DTC No.	DTC Detection Condition	Trouble Area
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 - Shift solenoid valve SR - 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 - Shift solenoid valve SR - ECM

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves ON/OFF. When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other normal shift solenoid valves ON/OFF. In case of an open or short circuit, the ECM stops sending current to the circuit (see page [AX-35](#)).

MONITOR STRATEGY

Related DTCs	P0985: Shift solenoid valve SR/Range check (Low resistance) P0986: Shift solenoid valve SR/Range check (High resistance)
Required sensors/Components	Shift solenoid valve SR
Frequency of operation	Continuous
Duration	0.064 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0985: Range check (Low resistance):

The monitor will run whenever this DTC is 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 this DTC is 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
------------------------------------	-------------

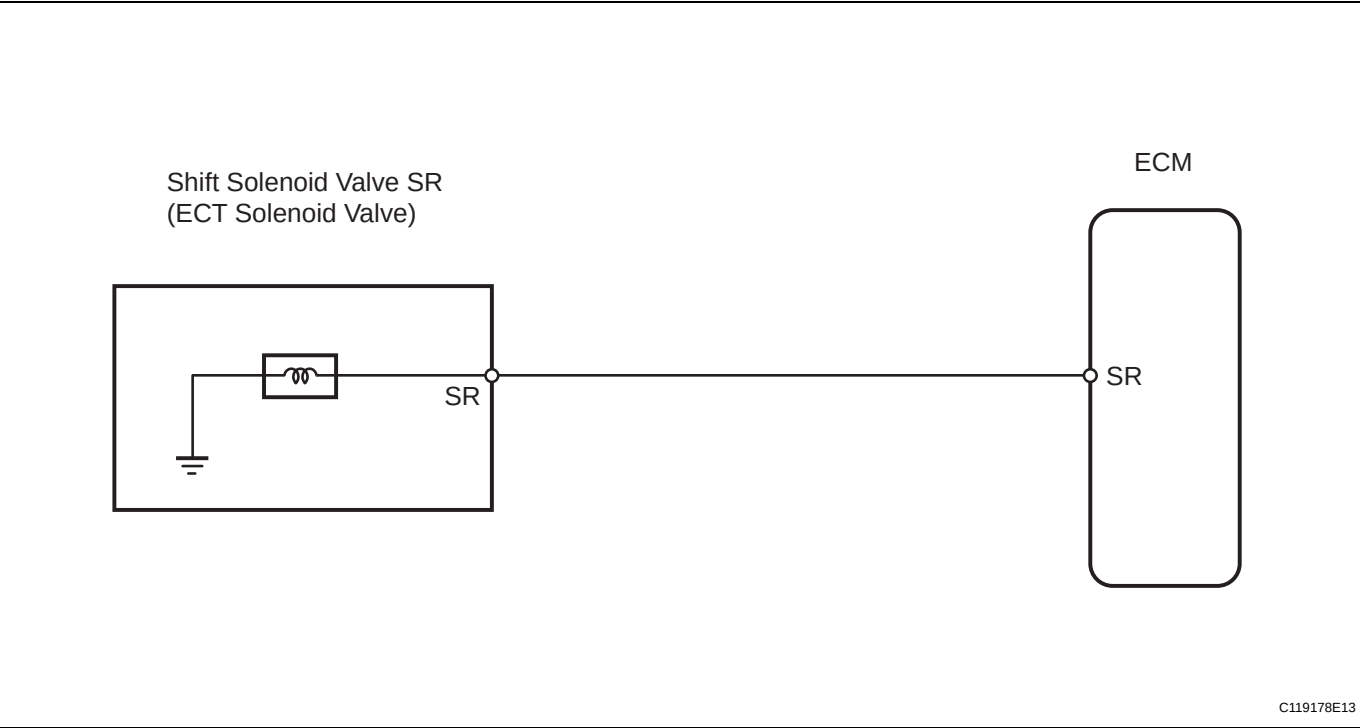
P0986: Range check (High resistance):

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)
-------------------------	---------------------------------------

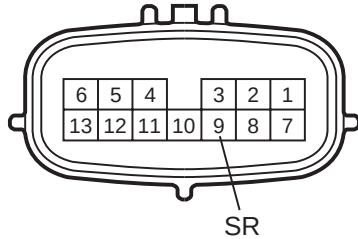
WIRING DIAGRAM



INSPECTION PROCEDURE

1 INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE SR)

Wire Harness Side



C136383E10

- (a) Disconnect the B32 wire connector.
 (b) Measure the resistance of the transmission wire.

Standard resistance

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

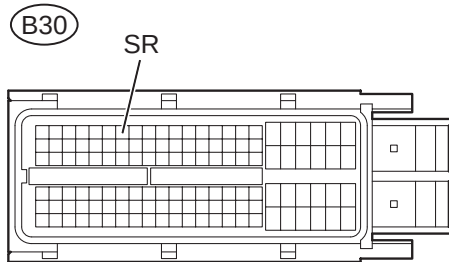
NG

Go to step 3

OK

2 CHECK WIRE HARNESS (TRANSMISSION - ECM)

Wire Harness Side



A107892E82

- (a) Disconnect the B30 ECM connector.
 (b) Measure the resistance of the wire harness side connector.

Standard resistance

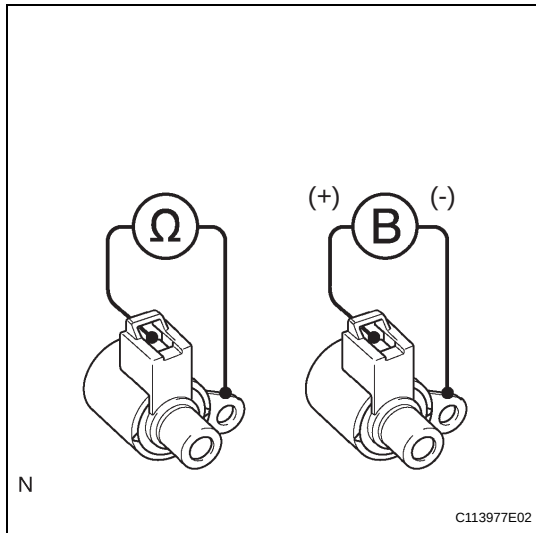
Tester Connection	Condition	Specified Condition
B30-8 (SR) - Body ground	20°C (68°F)	11 to 15 Ω

NG

REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE SR

- (a) Remove the shift solenoid valve SR.
- (b) Measure the resistance of the solenoid valve.

Standard resistance:

11 to 15 Ω at 20°C (68°F)

- (c) Connect the battery's positive (+) lead to the terminal of the solenoid valve connector, and the negative (-) lead to the solenoid body. Then check that the valve moves and makes an operating noise.

OK:

Valve moves and makes operating noise.

NG

REPLACE SHIFT SOLENOID VALVE SR

OK

REPAIR OR REPLACE TRANSMISSION WIRE

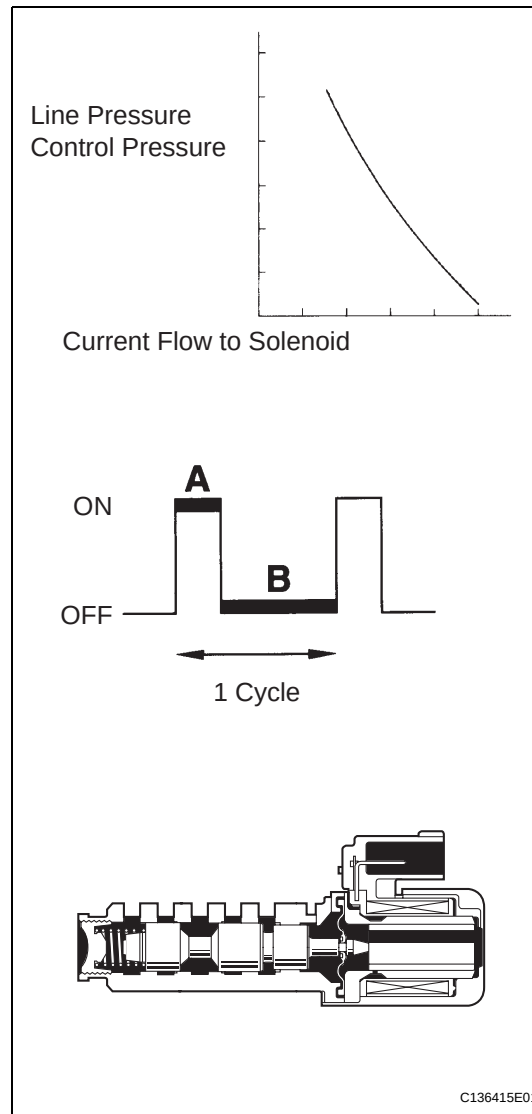
DTC**P2714****Pressure Control Solenoid "D" Performance
(Shift Solenoid Valve SLT)****DESCRIPTION**

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 to control hydraulic line pressure coming from the primary regulator valve. Appropriate line pressure assures smooth shifting with varying engine outputs.

HINT:

*: The duty ratio is the ratio of the current ON time (A) to the total of the current ON and OFF time (A + B).

Duty Ratio (%) = $A / (A + B) \times 100$



C136415E01

DTC No.	DTC Detection Condition	Trouble Area
P2714	ECM detects malfunction on SLT (ON side) according to difference in revolutions of turbine (input), intermediate and output shaft (2 trip detection logic)	- Shift solenoid valve SLT remains closed - Valve body is blocked - Torque converter clutch - Automatic transaxle (clutch, brake, gear, etc.) - ECM

MONITOR DESCRIPTION

In any forward position, when the difference between the revolutions of the turbine, intermediate and output shaft exceeds the specified value (varies with intermediate, output speed) determined by the ECM, the ECM illuminates the MIL and outputs the DTC. When shift solenoid valve SLT remains on, the oil pressure goes down and the clutch engagement force decreases.

NOTICE:

If you continue driving 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	Shift solenoid valve SLT, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	0.5 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

ON malfunction:

The monitor will run whenever this DTC is not present.	None
Transmission range	"D"
ATF temperature	-20°C (-4°F) or more
ATF temperature sensor circuit	Not circuit malfunction
Turbine speed sensor circuit	Not circuit malfunction
Intermediate shaft speed sensor circuit	Not circuit malfunction
Output speed sensor circuit	Not circuit malfunction
Shift solenoid valve SL1 circuit	Not circuit malfunction
Shift solenoid valve SL2 circuit	Not circuit malfunction
Shift solenoid valve SL3 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve SR circuit	Not circuit malfunction
Shift solenoid valve DSL circuit	Not circuit malfunction
Shift solenoid valve SLT circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

ON malfunction (a):

ECM gearshift command	2nd
Temporary MAIN gear	1st, 2nd, 3rd or 4th
NT - NC x Temporary MAIN gear ratio NT: Input (turbine) speed NC: Intermediate shaft speed	100 rpm or more at intermediate shaft speed 1,000 rpm
Temporary U/D gear	Low or High
NC - NO x Temporary U/D gear ratio NO: Output speed	300 rpm or more at output speed 1,000 rpm
TT: Turbine Torque	192 N*m or more
NT	250 rpm or more
NC	250 rpm or more
NO	250 rpm or more

ON malfunction (b):

ECM gearshift command	1st, 3rd or 3.5th (MAIN: 3rd and U/D: High)
-----------------------	---

Temporary MAIN gear	1st, 2nd, 3rd or 4th
NT - NC x Temporary MAIN gear ratio NT: Input (turbine) speed NC: Intermediate shaft speed	100 rpm or more at intermediate shaft speed 1,000 rpm
Temporary U/D gear	Low or High
NC - NO x Temporary U/D gear ratio NO: Output speed	300 rpm or more at output speed 1,000 rpm
TT: Turbine Torque	900 N*m or more
NT	250 rpm or more
NC	250 rpm or more
NO	250 rpm or more

ON malfunction (c):

ECM gearshift command	4th or 5th
Temporary MAIN gear	1st, 2nd, 3rd or 4th
NT - NC x Temporary MAIN gear ratio NT: Input (turbine) speed NC: Intermediate shaft speed	100 rpm or more at intermediate shaft speed 1,000 rpm
Temporary U/D gear	Low or High
NC - NO x Temporary U/D gear ratio NO: Output speed	300 rpm or more at output speed 1,000 rpm
TT: Turbine Torque	189 N*m or more
NT	250 rpm or more
NC	250 rpm or more
NO	250 rpm or more

TYPICAL MALFUNCTION THRESHOLDS**[ON malfunction]**

Detection condition: Total accumulated time of ON malfunctions (a), (b) and (c) is 1 second or more

ON malfunction (a):

NT - NC x 2nd gear ratio	100 rpm or more at intermediate shaft speed 1,000 rpm
NC - NO x Low gear ratio	300 rpm or more at output speed 1,000 rpm
Duration	1 sec. or more

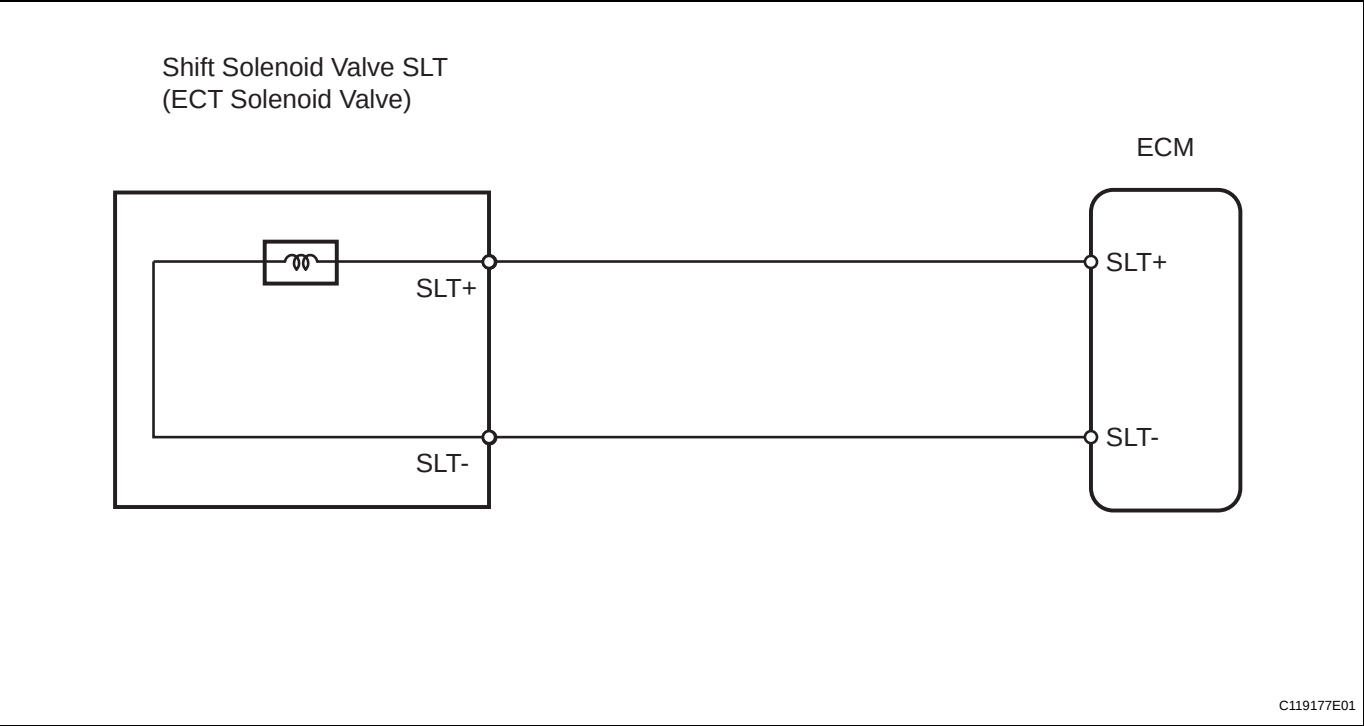
ON malfunction (b):

NT - NC x 1st gear ratio, NT - NC x 3rd gear ratio or NT - NC x 3.5th gear ratio	100 rpm or more at intermediate shaft speed 1,000 rpm
NC - NO x Low gear ratio or NC - NO x High gear ratio	300 rpm or more at output speed 1,000 rpm
Duration	1 sec. or more

ON malfunction (c):

NT - NC x 4th gear ratio or NT - NC x 5th gear ratio	100 rpm or more at intermediate shaft speed 1,000 rpm
NC - NO x Low gear ratio or NC - NO x High gear ratio	300 rpm or more at output speed 1,000 rpm
Duration	1 sec. or more

WIRING DIAGRAM



INSPECTION PROCEDURE

- 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.
1. Warm up the engine.
 2. Turn the ignition switch OFF.
 3. Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
 4. Turn the ignition switch ON and turn the tester ON.
 5. Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
 6. Perform the ACTIVE TEST.

ECM:

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

HINT:

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

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

- Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
- Turn the ignition switch ON and turn the tester ON.
- Enter the following menus: DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES.
- Read the DTCs using the tester.

Result

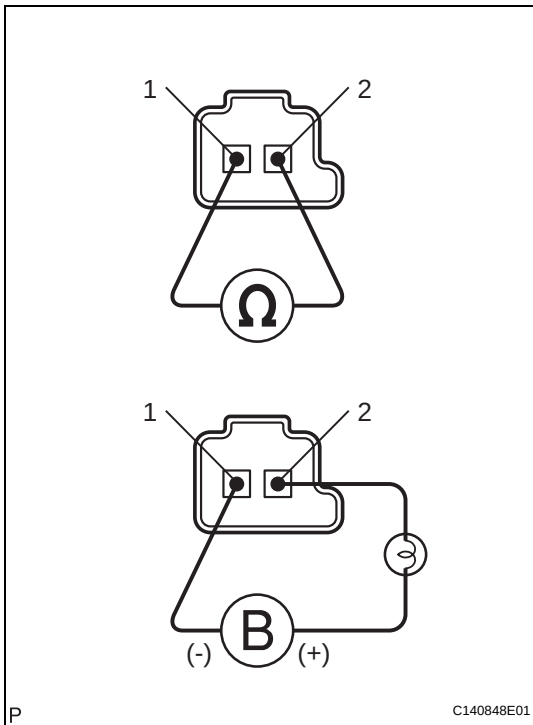
Display (DTC output)	Proceed to
Only P2714 is output	A
P2714 and other DTCs are output	B

HINT:

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

B **GO TO DTC CHART**

A

2 INSPECT SHIFT SOLENOID VALVE SLT

- Remove the shift solenoid valve SLT.
 - Measure the resistance of the solenoid valve.
- Standard resistance:**
5.0 to 5.6 Ω at 20°C (68°F)
- Connect the battery's positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating noise.

OK:

Valve moves and makes operating noise.

NG **REPLACE SHIFT SOLENOID VALVE SLT**

OK

3 INSPECT TRANSMISSION VALVE BODY ASSEMBLY

- Check the transmission valve body assembly.

OK:

There are no foreign objects on each valve.

NG

REPAIR OR REPLACE TRANSMISSION
VALVE BODY ASSEMBLY

OK

4

INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

- (a) Check the torque converter clutch assembly (see page [AX-178](#)).

OK:

The torque converter clutch operates normally.

NG

REPLACE TORQUE CONVERTER CLUTCH
ASSEMBLY

OK

REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSEMBLY

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

DESCRIPTION

Refer to DTC P2714 (see page [AX-114](#)).

DTC No.	DTC Detection Condition	Trouble Area
P2716	Conditions (a) and (b) below are detected for 1 sec. or more (1 trip detection logic): (a) SLT - terminal: 0 V (b) SLT - terminal: 12 V	- Open or short in shift solenoid valve SLT circuit - Shift solenoid valve SLT - ECM

MONITOR DESCRIPTION

When an open or short in the shift solenoid valve SLT circuit is detected, the ECM interprets this as a fault. The ECM will illuminate the MIL and store 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	1 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present.	None
Battery voltage	11 V or more
Solenoid current cut status	Not cut
CPU command duty ratio to SLT	19% or more
Starter	OFF
Ignition switch	ON

TYPICAL MALFUNCTION THRESHOLDS

Solenoid status from IC	Fail (open or short)
-------------------------	----------------------

COMPONENT OPERATING RANGE

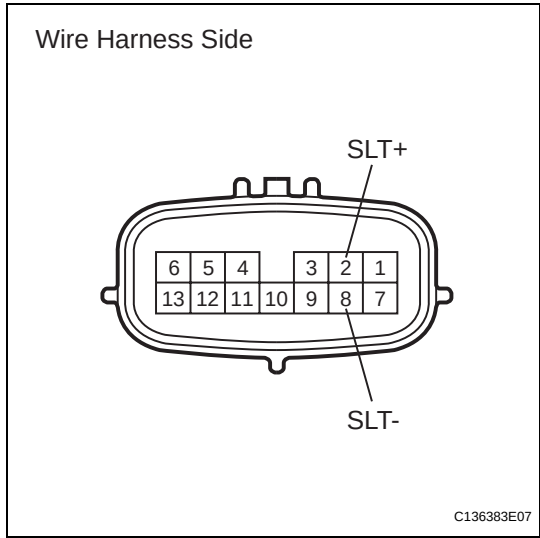
Shift solenoid valve SLT	Resistance: 5.0 to 5.6 Ω at 20°C (68°F)
--------------------------	--

WIRING DIAGRAM

Refer to DTC P2714 (see page [AX-117](#)).

INSPECTION PROCEDURE

1INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE SLT)



- (a) Disconnect the B32 wire connector.
(b) Measure the resistance of the transmission wire.

Standard resistance

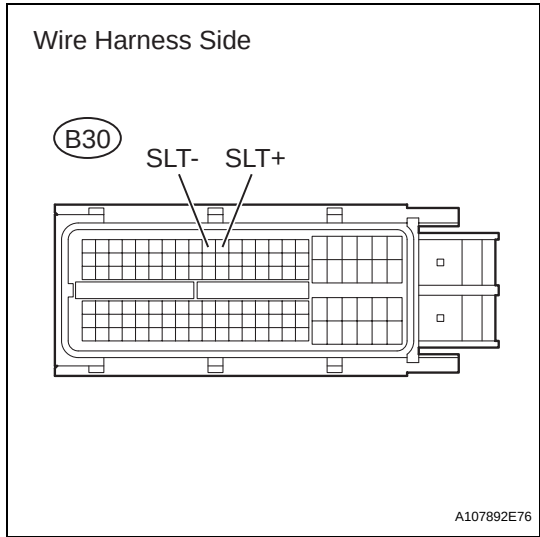
Tester Connection	Condition	Specified Condition
2 (SLT+) - 8 (SLT-)	20°C (68°F)	5.0 to 5.6 Ω
2 (SLT+) - Body ground	20°C (68°F)	1 MΩ or higher
8 (SLT-) - Body ground	20°C (68°F)	1 MΩ or higher

NG

Go to step 3

OK

2CHECK WIRE HARNESS (TRANSMISSION WIRE - ECM)



- (a) Disconnect the B30 ECM connector.
(b) Measure the resistance of the wire harness side connector.

Standard resistance

Tester Connection	Condition	Specified Condition
B30-11 (SLT+) - B30-10 (SLT-)	20°C (68°F)	5.0 to 5.6 Ω
B30-11 (SLT+) - Body ground	20°C (68°F)	1 MΩ or higher
B30-10 (SLT-) - Body ground	20°C (68°F)	1 MΩ or higher

NG

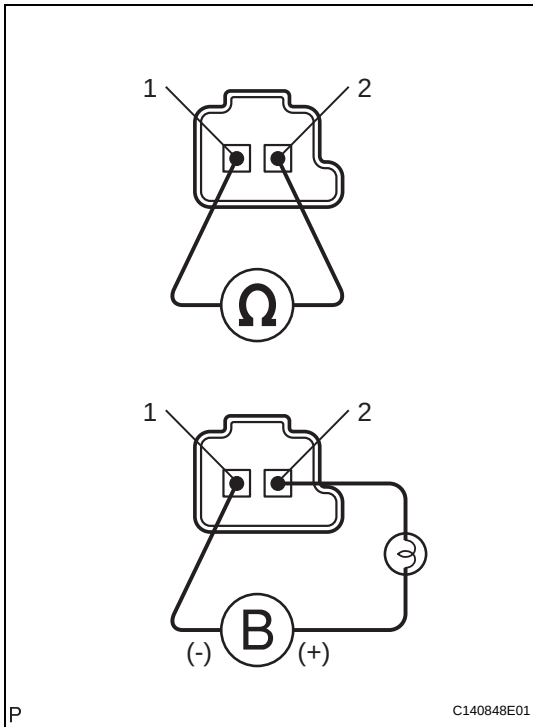
REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE ECM

3

INSPECT SHIFT SOLENOID VALVE SLT



- (a) Remove the shift solenoid valve SLT.
- (b) Measure the resistance of the solenoid valve.

Standard resistance:**5.0 to 5.6 Ω at 20°C (68°F)**

- (c) Connect the battery's positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating noise.

OK:**Valve moves and makes operating noise.****NG****REPLACE SHIFT SOLENOID VALVE SLT****OK****REPAIR OR REPLACE TRANSMISSION WIRE**

DTC	P2769	Torque Converter Clutch Solenoid Circuit Low (Shift Solenoid Valve DSL)
DTC	P2770	Torque Converter Clutch Solenoid Circuit High (Shift Solenoid Valve DSL)

DESCRIPTION

The shift solenoid valve DSL is turned ON and OFF by signals from the ECM to control the hydraulic pressure acting on the lock-up relay valve, which then controls operation of the lock-up clutch.

DTC No.	DTC Detection Condition	Trouble Area
P2769	ECM detects short in shift solenoid valve DSL circuit when shift solenoid valve DSL is operated (2 trip detection logic)	- Short in shift solenoid valve DSL circuit - Shift solenoid valve DSL - ECM
P2770	ECM detects open in shift solenoid valve DSL circuit when shift solenoid valve DSL is not operated (2 trip detection logic)	- Open in shift solenoid valve DSL circuit - Shift solenoid valve DSL - ECM

Fail-safe function:

If the ECM detects a malfunction, it turns the shift solenoid valve DSL OFF.

MONITOR DESCRIPTION

Torque converter lock-up is controlled by the ECM based on engine rpm, engine load, engine temperature, vehicle speed, transmission temperature, and shift position selection. The ECM determines the lock-up status of the torque converter by comparing the engine rpm (NE) to the input rpm (NT). The ECM calculates the actual transmission gear by comparing the input rpm (NT) to the output rpm (SP2). When conditions are appropriate, the ECM requests "lock-up" by applying control voltage to the shift solenoid valve DSL. When the shift solenoid valve DSL is opened, the shift solenoid valve DSL applies pressure to the lock-up relay valve and locks the torque converter clutch. If the ECM detects an open or short in the shift solenoid valve DSL circuit, the ECM interprets this as a fault in the shift solenoid valve DSL or its circuit. The ECM will illuminate the MIL and store a DTC.

MONITOR STRATEGY

Related DTCs	P2769: Shift solenoid valve DSL/Range check (Low resistance) P2770: Shift solenoid valve DSL/Range check (High resistance)
Requires sensors/Components	Shift solenoid valve DSL
Frequency of operation	Continuous
Duration	0.064 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P2769: Range check (Low resistance)

The monitor will run whenever this DTC is not present	None
Shift solenoid valve DSL	ON
Solenoid current cut status	Not cut
Battery voltage	8 V or more
Starter	OFF
Ignition switch	ON

P2770: Range check (High resistance)

The monitor will run whenever this DTC is not present	None
---	------

Shift solenoid valve DSL	ON
Battery voltage	8 V or more
Starter	OFF
Ignition switch	ON

TYPICAL MALFUNCTION THRESHOLDS

P2769: Range check (Low resistance)

Shift solenoid valve DSL resistance	8 Ω or less
-------------------------------------	--------------------

P2770: Range check (High resistance)

Shift solenoid valve DSL resistance	100 k Ω or more
-------------------------------------	------------------------

COMPONENT OPERATING RANGE

Shift solenoid valve DSL	Resistance: 11 to 13 Ω at 20°C (68°F)
--------------------------	--

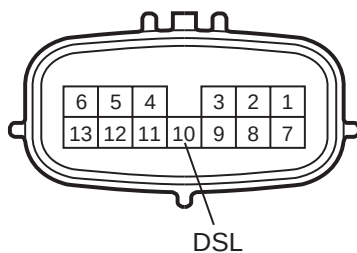
WIRING DIAGRAM

Refer to DTC P0741 (see page [AX-67](#)).

INSPECTION PROCEDURE

1 INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE DSL)

Wire Harness Side



C136383E08

- Disconnect the B32 wire connector.
- Measure the resistance of the transmission wire.

Standard resistance

Tester Connection	Condition	Specified Condition
10 (DSL) - Body ground	20°C (68°F)	11 to 13 Ω

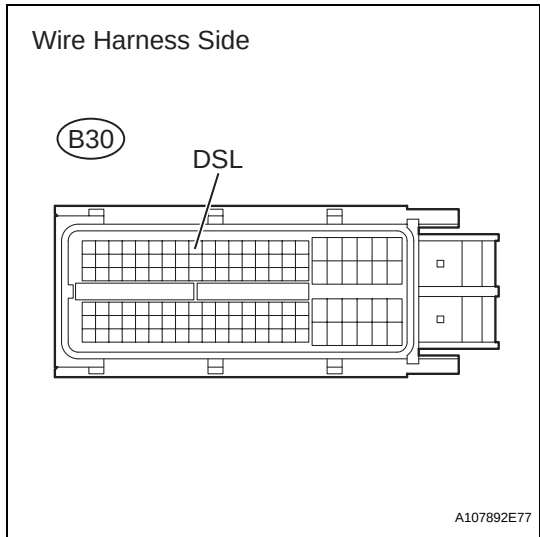
NG

Go to step 3

OK

2

CHECK WIRE HARNESS (TRANSMISSION WIRE - ECM)



- (a) Disconnect the B30 ECM connector.
- (b) Measure the resistance of the wire harness side connector.

Standard resistance

Tester Connection	Condition	Specified Condition
B30-9 (DSL) - Body ground	20°C (68°F)	11 to 13 Ω

NG

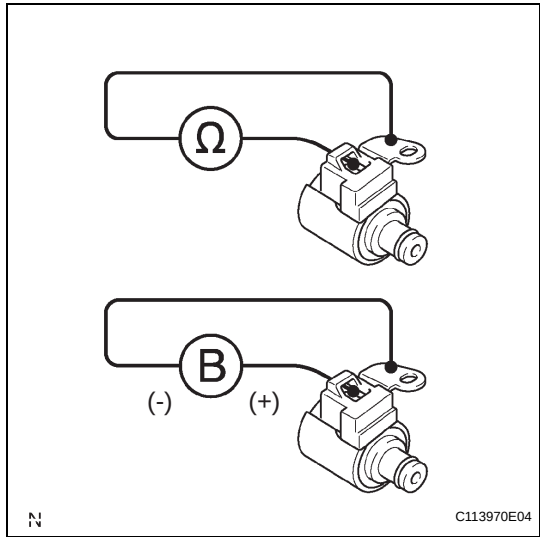
REPAIR OR REPLACE HARNESS AND CONNECTOR

OK

REPLACE ECM

3

INSPECT SHIFT SOLENOID VALVE DSL



- (a) Remove the shift solenoid valve DSL.
- (b) Measure the resistance between the solenoid valve terminal and solenoid valve body.
Standard resistance:
11 to 13 Ω at 20°C (68°F)
- (c) Connect the battery's positive (+) lead to the terminal of the solenoid valve connector, and the negative (-) lead to the solenoid body. Then check that the valve moves and makes an operating noise.

OK:
Valve moves and makes operating noise.

NG

REPLACE SHIFT SOLENOID VALVE DSL

OK

REPAIR OR REPLACE TRANSMISSION WIRE

REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

CAUTION:

Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

2. **REMOVE NO. 1 ENGINE UNDER COVER**

3. **DRAIN AUTOMATIC TRANSAXLE FLUID**

(a) Remove the drain plug and gasket, and drain the ATF.

(b) Install a new gasket and the drain plug.

Torque: 47 N*m (479 kgf*cm, 35 ft.*lbf)

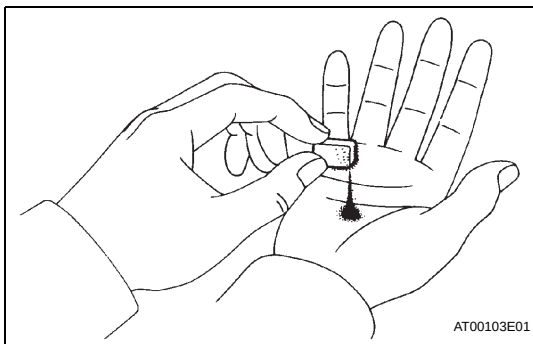
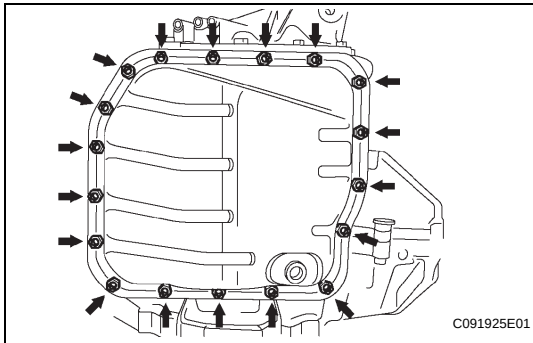
4. **REMOVE AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY**

(a) Remove the 18 bolts, oil pan and gasket.

NOTICE:

Some fluid will remain in the oil pan. Carefully remove the oil pan.

(b) Remove the 2 magnets from the oil pan.



(c) Examine the particles in the pan.

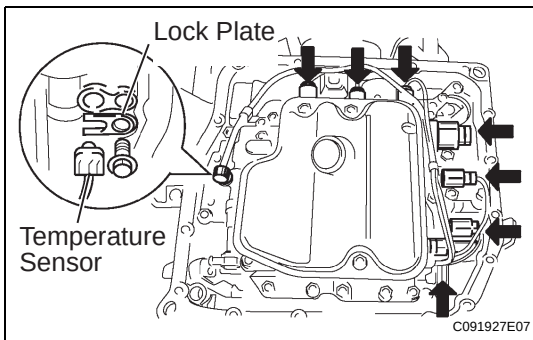
(1) Use the removed magnets to collect any steel chips. Look carefully at the chips and particles in the pan and on the magnet to anticipate what type of wear you will find in the transaxle.

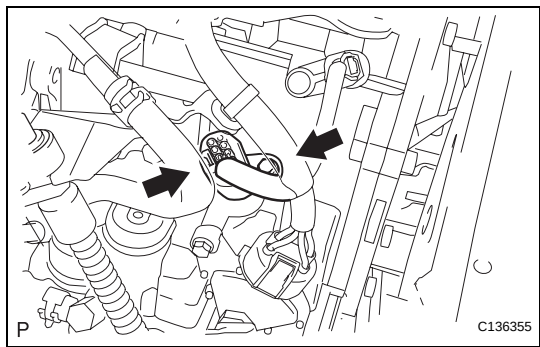
Steel (magnetic): bearing, gear and plate wear
Brass (non-magnetic): bush wear

5. **REMOVE TRANSMISSION WIRE**

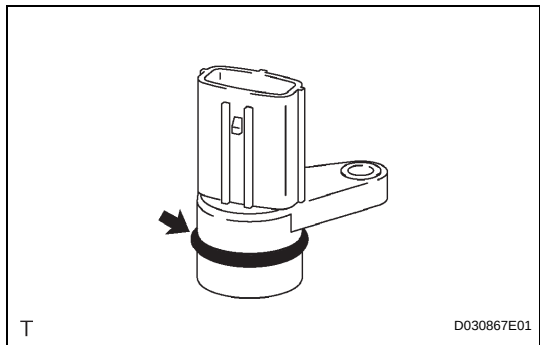
(a) Disconnect the 7 shift solenoid valve connectors.

(b) Remove the bolt, lock plate and ATF temperature sensor.

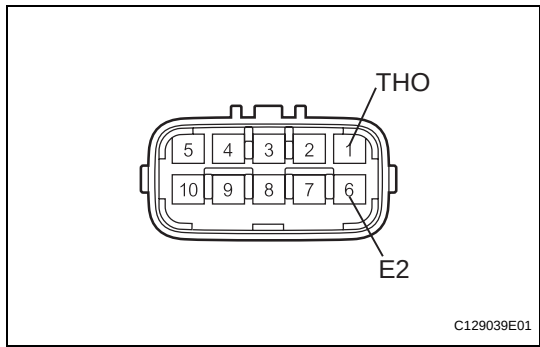




- (c) Disconnect the transmission wire connector.
- (d) Remove the bolt and transmission wire.



- (e) Remove the O-ring from the transmission wire connector.



INSPECTION

1. INSPECT TRANSMISSION WIRE

- (a) Measure the resistance of the transmission wire.
Standard resistance

Tester Connection	Specified Condition
1 (THO) - 6 (E2)	90 Ω to 156 kΩ
1 (THO) - Body ground	1 MΩ or higher
6 (E2) - Body ground	1 MΩ or higher

If the result is not as specified, replace the wire.

HINT:

If the resistance is not as specified for either of the ATF temperatures shown in the table below, the drivability of the vehicle may decrease.

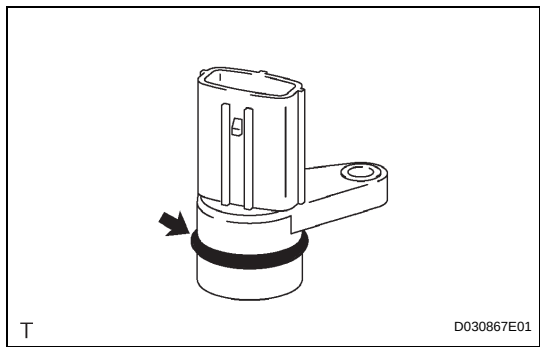
Standard resistance

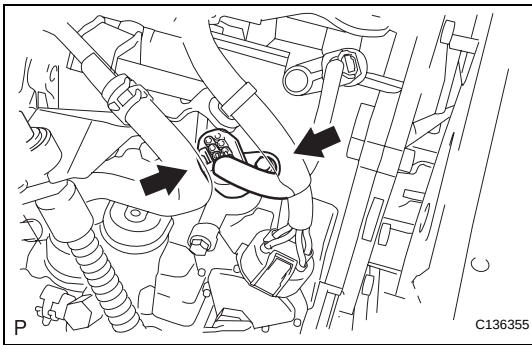
ATF Temperature	Specified Condition
10°C (68°F)	6.4 kΩ
110°C (230°F)	0.2 kΩ

INSTALLATION

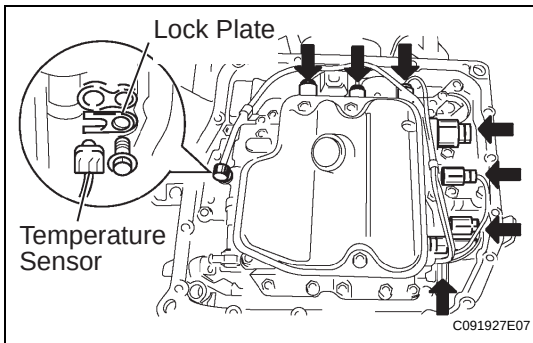
1. INSTALL TRANSMISSION WIRE

- (a) Coat a new O-ring of the transmission wire connector with ATF.
- (b) Install the O-ring to the transmission wire connector.

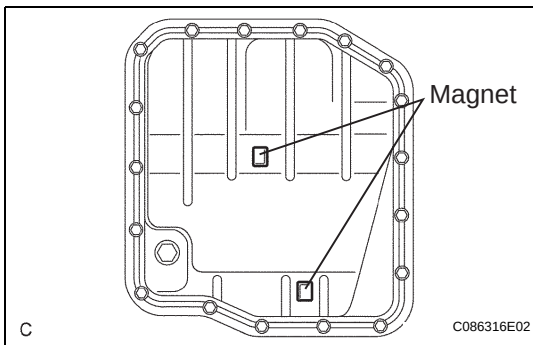




- (c) Install the transmission wire.
- (d) Install the bolt.
- (e) Connect the connector.

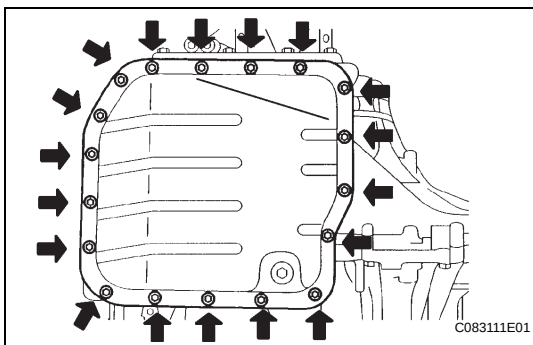


- (f) Coat the O-ring of the ATF temperature sensor with ATF.
- (g) Apply ATF to the bolt.
- (h) Install the ATF temperature sensor with the lock plate and bolt.
Torque: 6.6 N*m (67 kgf*cm, 58 in.*lbf)
- (i) Connect the 7 shift solenoid valve connectors.



2. INSTALL AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY

- (a) Install the 2 magnets in the oil pan.



- (b) Install a new gasket and the oil pan with the 18 bolts.
Torque: 7.6 N*m (80 kgf*cm, 69 in.*lbf)

3. INSTALL NO. 1 ENGINE UNDER COVER

4. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

5. ADD AUTOMATIC TRANSAXLE FLUID

Fluid type:

Toyota Genuine ATF WS

6. INSPECT TRANSAXLE FLUID LEVEL

- (a) Inspect the fluid level (see page [AX-126](#)).

7. PERFORM RESET MEMORY

- (a) Perform the RESET MEMORY procedures (A/T initialization) (see page [AX-20](#)).

REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

CAUTION:

Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

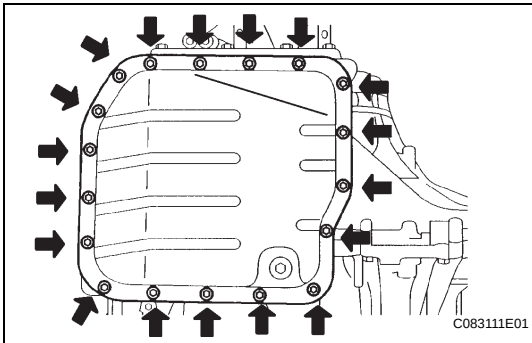
2. **REMOVE NO. 1 ENGINE UNDER COVER**

3. **DRAIN AUTOMATIC TRANSAXLE FLUID**

(a) Remove the drain plug and gasket, and drain the ATF.

(b) Install a new gasket and the drain plug.

Torque: 47 N*m (479 kgf*cm, 35 ft.*lbf)



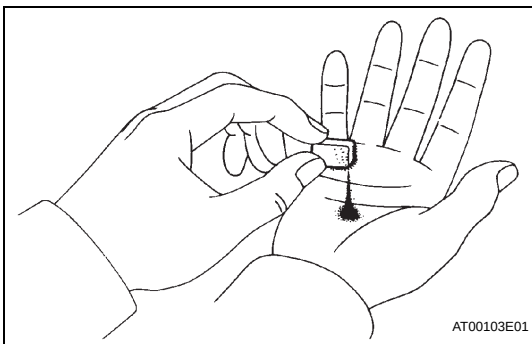
4. **REMOVE AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY**

(a) Remove the 18 bolts, oil pan and gasket.

NOTICE:

Some fluid will remain in the oil pan. Carefully remove the oil pan sub-assembly.

(b) Remove the 2 magnets from the oil pan.

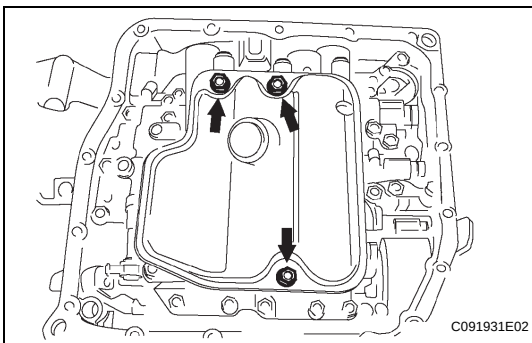


(c) Examine the particles in the pan.

(1) Use the removed magnets to collect any steel chips. Look carefully at the chips and particles in the pan and on the magnet to anticipate what type of wear you will find in the transaxle.

Steel (magnetic): bearing, gear and plate wear

Brass (non-magnetic): bush wear

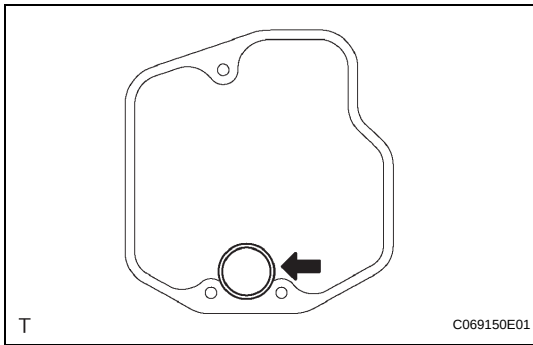


5. **REMOVE VALVE BODY OIL STRAINER ASSEMBLY**

(a) Remove the 3 bolts and oil strainer.

NOTICE:

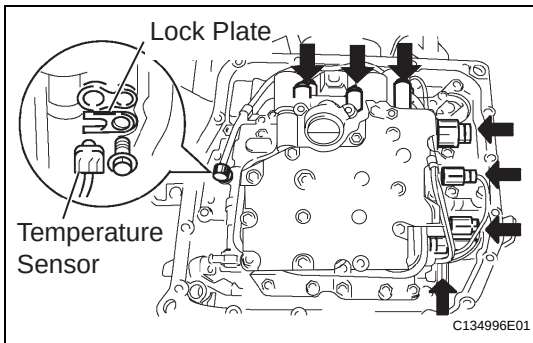
Be careful as some fluid will come out with the oil strainer.



(b) Remove the O-ring from the oil strainer.

6. DISCONNECT TRANSMISSION WIRE

- (a) Disconnect the 7 connectors.
- (b) Remove the bolt and lock plate, and remove the ATF temperature sensor.

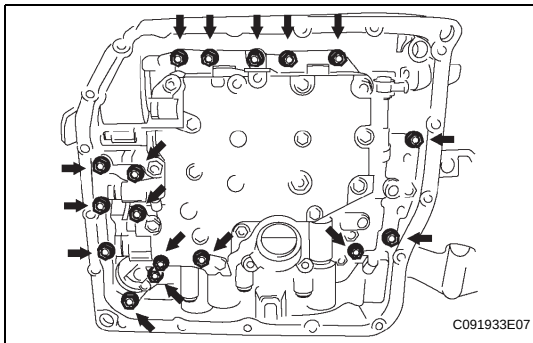


7. REMOVE TRANSMISSION VALVE BODY ASSEMBLY

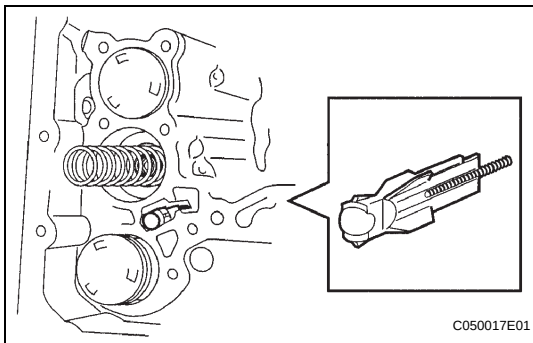
- (a) Support the valve body and remove the 17 bolts and valve body.

NOTICE:

Be careful not to drop the check valve body, spring and accumulator piston.



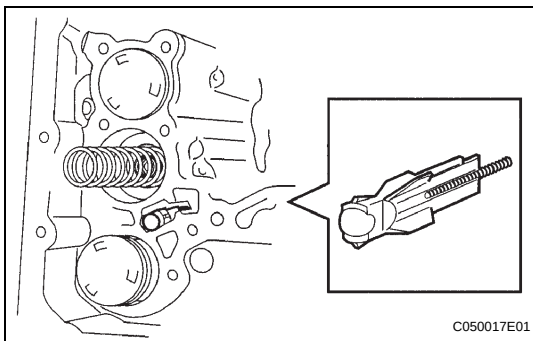
- (b) Remove the check ball body and spring.

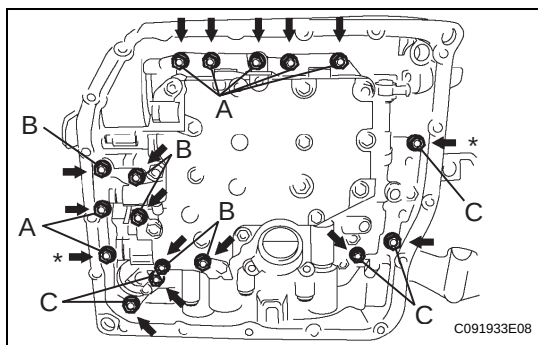


INSTALLATION

1. INSTALL TRANSMISSION VALVE BODY ASSEMBLY

- (a) Install the spring and check ball body.





- (b) Align the groove of the manual valve with the pin of the lever.
- (c) Apply ATF to the 17 bolts.
- (d) Install the 17 bolts.

Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)

NOTICE:

- Push the valve body against the accumulator piston spring and the check ball body to install it.
- Tighten the bolts marked by * in the illustration first temporarily because they are positioning bolts.

HINT:

Each bolt length is indicated below.

Bolt length:

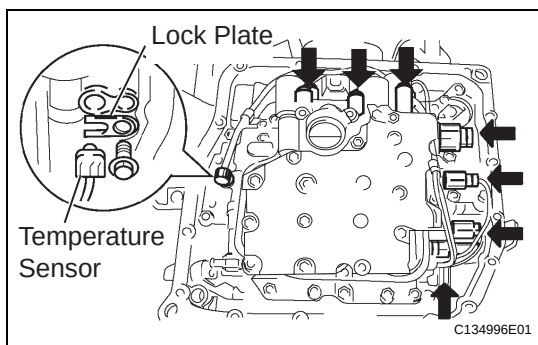
25 mm (0.984 in.) for bolt A

57 mm (2.244 in.) for bolt B

41 mm (1.614 in.) for bolt C

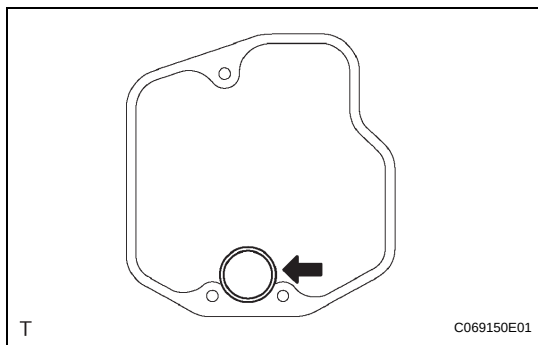
2. CONNECT TRANSMISSION WIRE

- (a) Coat the O-ring with ATF.
 - (b) Apply ATF to the bolt.
 - (c) Install the ATF temperature sensor with the lock plate and bolt.
- Torque: 6.6 N*m (67 kgf*cm, 58 in.*lbf)**
- (d) Connect the 7 shift solenoid valve connectors.

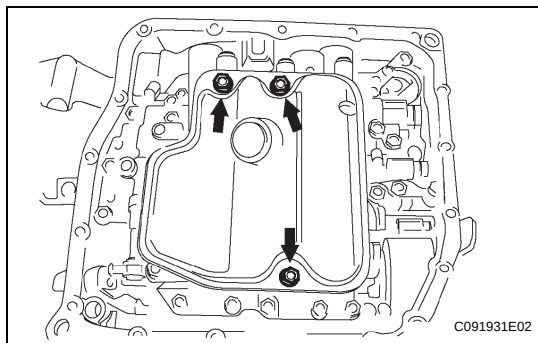


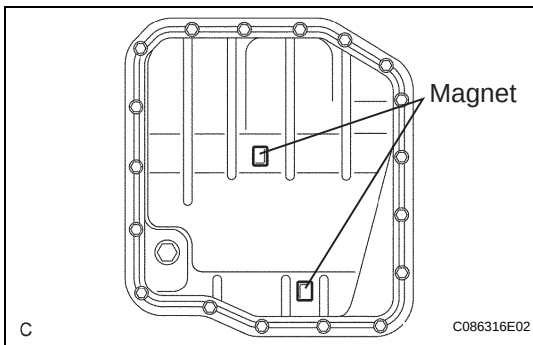
3. INSTALL VALVE BODY OIL STRAINER ASSEMBLY

- (a) Coat a new O-ring with ATF.
- (b) Install the O-ring to the oil strainer.
- (c) Apply ATF to the 3 bolts.



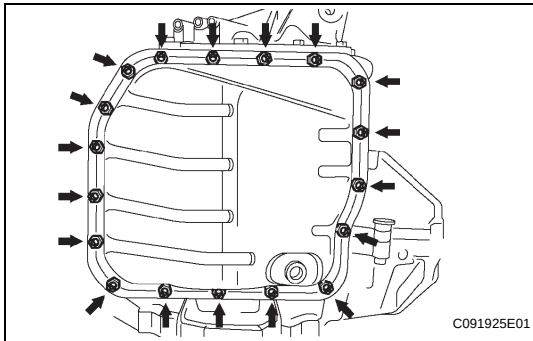
- (d) Install the oil strainer with the 3 bolts.
- Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)**





4. INSTALL AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY

- (a) Install the 2 magnets in the oil pan.



- (b) Install a new gasket and the oil pan with the 18 bolts.

Torque: 7.6 N*m (77 kgf*cm, 67 in.*lbf)

5. INSTALL NO. 1 ENGINE UNDER COVER

6. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

7. ADD AUTOMATIC TRANSAXLE FLUID

Fluid type:

Toyota Genuine ATF WS

8. INSPECT TRANSAXLE FLUID LEVEL

- (a) Inspect the fluid level (see page [AX-126](#)).

9. PERFORM RESET MEMORY

- (a) Perform the RESET MEMORY procedures (A/T initialization) (see page [AX-20](#)).

REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

CAUTION:

Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

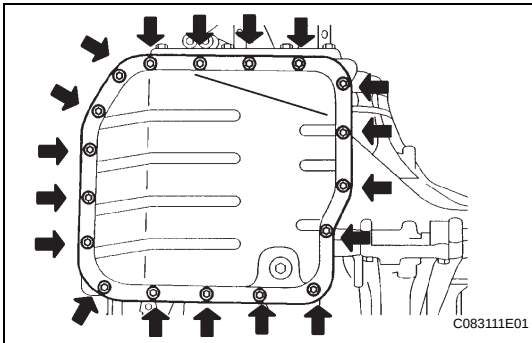
2. **REMOVE NO. 1 ENGINE UNDER COVER**

3. **DRAIN AUTOMATIC TRANSAXLE FLUID**

(a) Remove the drain plug and gasket, and drain the ATF.

(b) Install a new gasket and the drain plug.

Torque: 47 N*m (479 kgf*cm, 35 ft.*lbf)



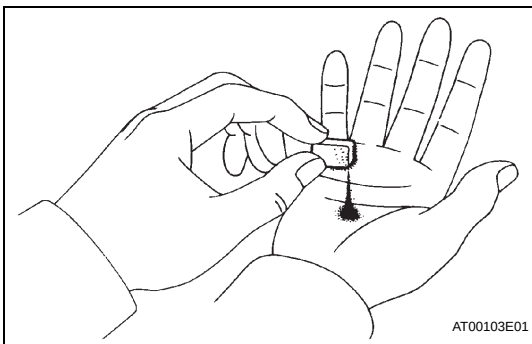
4. **REMOVE AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY**

(a) Remove the 18 bolts, oil pan and gasket.

NOTICE:

Some fluid will remain in the oil pan. Carefully remove the oil pan sub-assembly.

(b) Remove the 2 magnets from the oil pan.

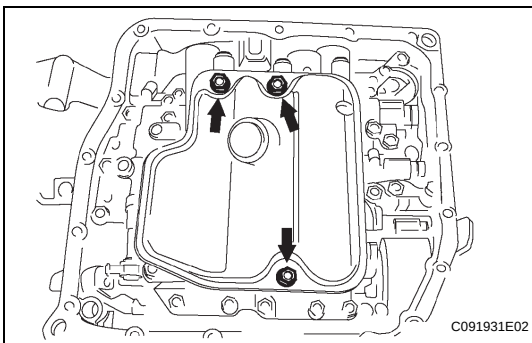


(c) Examine the particles in the pan.

(1) Use the removed magnets to collect any steel chips. Look carefully at the chips and particles in the pan and on the magnet to anticipate what type of wear you will find in the transaxle.

Steel (magnetic): bearing, gear and plate wear

Brass (non-magnetic): bush wear

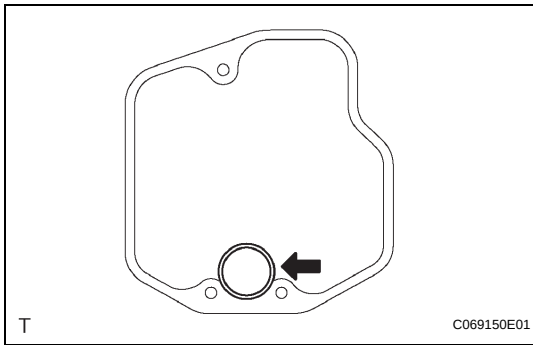


5. **REMOVE VALVE BODY OIL STRAINER ASSEMBLY**

(a) Remove the 3 bolts and oil strainer.

NOTICE:

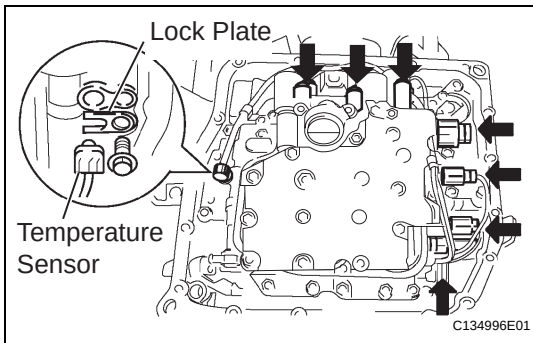
Be careful as some fluid will come out with the oil strainer.



(b) Remove the O-ring from the oil strainer.

6. DISCONNECT TRANSMISSION WIRE

- (a) Disconnect the 7 connectors.
- (b) Remove the bolt and lock plate, and remove the ATF temperature sensor.

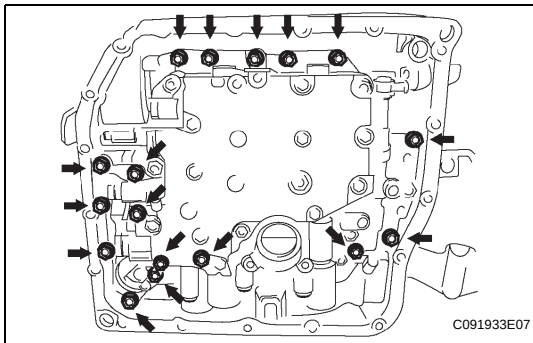


7. REMOVE TRANSMISSION VALVE BODY ASSEMBLY

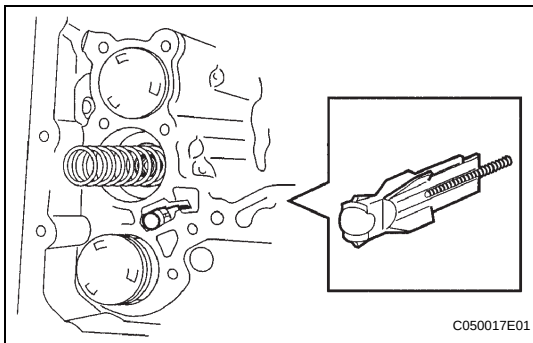
- (a) Support the valve body and remove the 17 bolts and valve body.

NOTICE:

Be careful not to drop the check valve body, spring and accumulator piston.



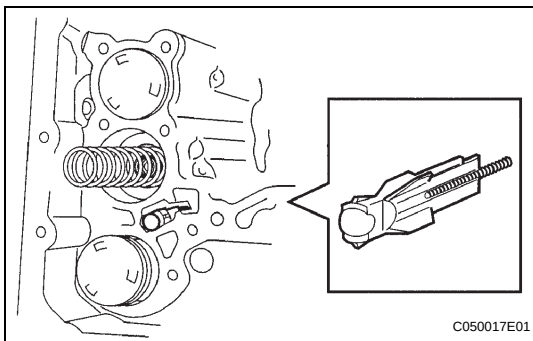
- (b) Remove the check ball body and spring.

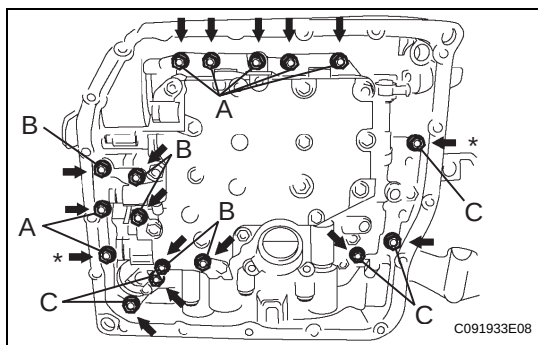


INSTALLATION

1. INSTALL TRANSMISSION VALVE BODY ASSEMBLY

- (a) Install the spring and check ball body.





- (b) Align the groove of the manual valve with the pin of the lever.
- (c) Apply ATF to the 17 bolts.
- (d) Install the 17 bolts.

Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)

NOTICE:

- Push the valve body against the accumulator piston spring and the check ball body to install it.
- Tighten the bolts marked by * in the illustration first temporarily because they are positioning bolts.

HINT:

Each bolt length is indicated below.

Bolt length:

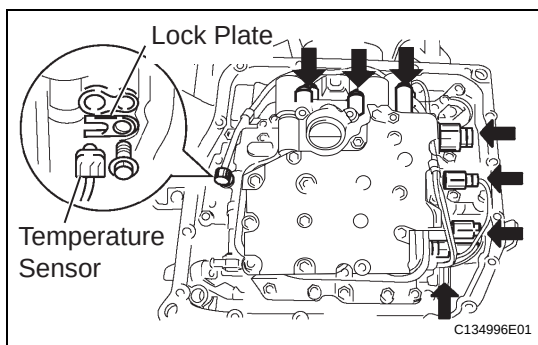
25 mm (0.984 in.) for bolt A

57 mm (2.244 in.) for bolt B

41 mm (1.614 in.) for bolt C

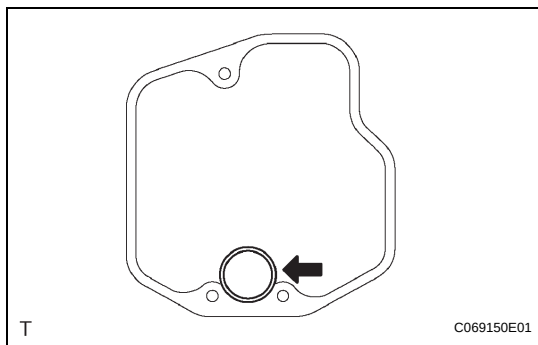
2. CONNECT TRANSMISSION WIRE

- (a) Coat the O-ring with ATF.
 - (b) Apply ATF to the bolt.
 - (c) Install the ATF temperature sensor with the lock plate and bolt.
- Torque: 6.6 N*m (67 kgf*cm, 58 in.*lbf)**
- (d) Connect the 7 shift solenoid valve connectors.

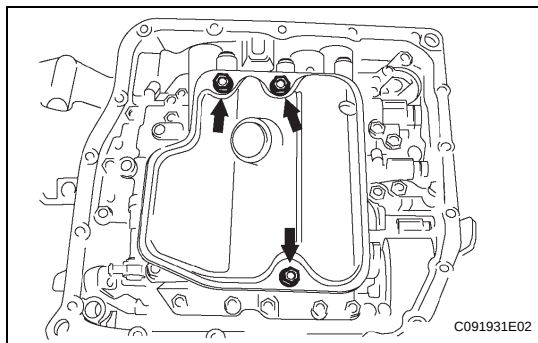


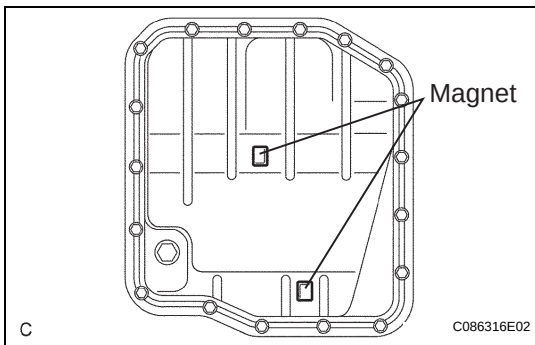
3. INSTALL VALVE BODY OIL STRAINER ASSEMBLY

- (a) Coat a new O-ring with ATF.
- (b) Install the O-ring to the oil strainer.
- (c) Apply ATF to the 3 bolts.



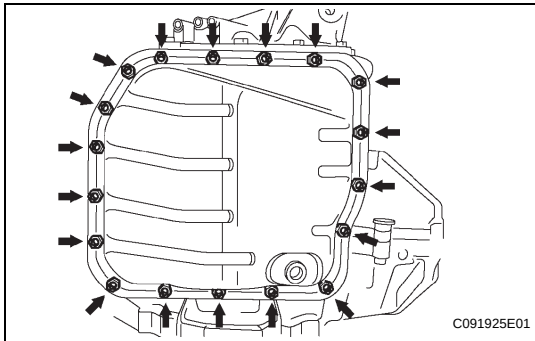
- (d) Install the oil strainer with the 3 bolts.
- Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)**





4. INSTALL AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY

(a) Install the 2 magnets in the oil pan.



(b) Install a new gasket and the oil pan with the 18 bolts.

Torque: 7.6 N*m (77 kgf*cm, 67 in.*lbf)

5. INSTALL NO. 1 ENGINE UNDER COVER

6. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

7. ADD AUTOMATIC TRANSAXLE FLUID

Fluid type:

Toyota Genuine ATF WS

8. INSPECT TRANSAXLE FLUID LEVEL

(a) Inspect the fluid level (see page [AX-126](#)).

9. PERFORM RESET MEMORY

(a) Perform the RESET MEMORY procedures (A/T initialization) (see page [AX-20](#)).

ON-VEHICLE INSPECTION

1. CHECK SHIFT LOCK OPERATION

- Move the shift lever to P.
- Turn the ignition switch OFF.
- Check that the shift lever cannot be moved to any position other than P.
- Turn the ignition switch ON, depress the brake pedal and check that the shift lever can be moved to other positions.

2. CHECK SHIFT LOCK RELEASE BUTTON OPERATION

- When operating the shift lever with the shift lock release button pressed, check that the lever can be moved to any position other than P. If the operation cannot be performed as specified, check the shift lever assembly.

3. REMOVE KEY INTERLOCK OPERATION

- Turn the ignition switch ON.
- Depress the brake pedal and move the shift lever to any position other than P. Check that the ignition switch cannot be turned OFF.
- Move the shift lever to P, turn the ignition switch OFF and check that the key can be removed. If the results are not as specified, inspect the shift lock control unit.

4. CHECK SHIFT LOCK CONTROL UNIT ASSEMBLY

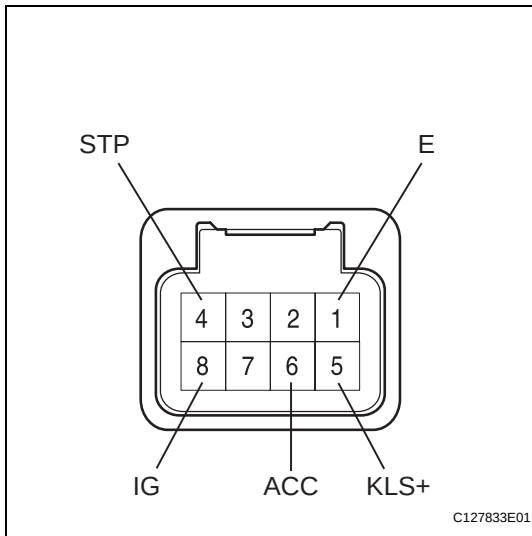
- Measure the voltage of the connector.

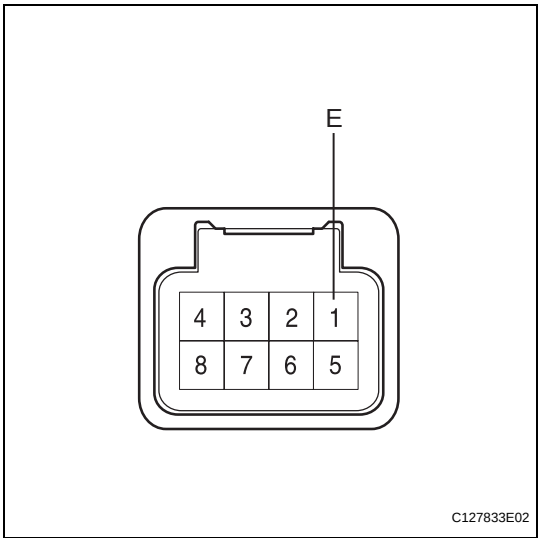
HINT:

Do not disconnect the shift lock control ECU connector.

Standard voltage

Tester Connection	Condition	Specified Condition
6 (ACC) - 1 (E)	Ignition switch ON	10 to 14 V
6 (ACC) - 1 (E)	Ignition switch ACC	10 to 14 V
6 (ACC) - 1 (E)	Ignition switch OFF	Below 1 V
4 (STP) - 1 (E)	Depress brake pedal	10 to 14 V
4 (STP) - 1 (E)	Release brake pedal	Below 1 V
5 (KLS+) - 1 (E)	Ignition switch ACC and shift lever on P	Below 1 V
5 (KLS+) - 1 (E)	Ignition switch ACC and shift lever not on P	7.5 to 11 V
5 (KLS+) - 1 (E)	Ignition switch ACC and shift lever not on P (after approx. 1 second)	6 to 9 V
8 (IG) - 1 (E)	Ignition switch ON	10 to 14 V
8 (IG) - 1 (E)	Ignition switch OFF	Below 1 V



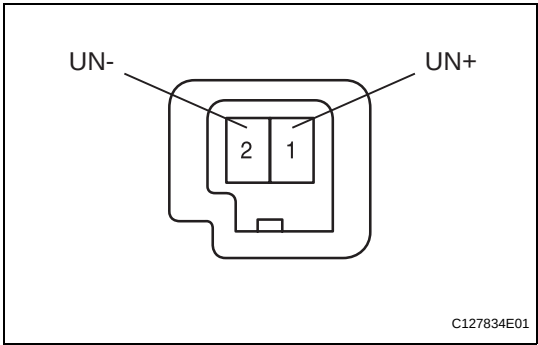


- (b) Measure the resistance of the connector.
HINT:
Do not disconnect the shift lock control ECU connector.

Standard resistance

Tester Connection	Measuring Condition	Specified Condition
1 (E) - Body ground	Always	Below 1 Ω

If the result is not as specified, replace the shift lock control ECU.



INSPECTION

1. INSPECT KEY INTERLOCK SOLENOID

- (a) Disconnect the solenoid connector.
(b) Connect the battery's positive (+) lead to terminal 1 (UN+) and the battery's negative (-) lead to terminal 2 (UN-). Check that the operating noise of the solenoid can be heard.
If the result is not as specified, replace the solenoid.

AUTOMATIC TRANSAXLE SYSTEM

PRECAUTION

NOTICE:

- Perform the RESET MEMORY procedures (A/T initialization) when replacing the automatic transaxle assembly, engine assembly or ECM (see page [AX-20](#)).
- Perform the REGISTRATION (VIN registration) when replacing the ECM (see page [ES-14](#)).

HINT:

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

CAUTION:

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

NOTICE:

- The automatic transaxle is composed of precision-made parts, necessitating careful inspection before reassembly because even a small nick could cause fluid leakage or affect performance.
- The procedures are organized so that you work on only one component group at a time. This will help avoid confusion with similar-looking parts of different sub-assemblies being on your workbench at the same time.
- The component groups are inspected and repaired from the converter housing side.
- Whenever possible, complete the inspection, repair and reassembly before proceeding to the next component group. If a defect is found in a certain component group during reassembly, inspect and repair this group immediately. If a component group cannot be assembled because parts are being ordered, be sure to keep all parts of the group in a separate container while proceeding with disassembly, inspection, repair and reassembly of other component groups.
- Use of Toyota Genuine ATF WS is recommended.
- All disassembled parts should be washed clean, and compressed air should be blown through any fluid passages and holes.
- Dry all parts with compressed air. Never use cloth.
- The recommended ATF or kerosene should be used for cleaning.
- After cleaning, the parts should be arranged in the order they were removed for efficient inspection, repairs, and reassembly.
- 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.
- Check the thrust bearings and races for wear or damage. Replace them if necessary.
- Use petroleum jelly to keep parts in place.
- When working with FIPG material, perform the following:
 - Using a razor blade and gasket scraper, remove all old FIPG material from the gasket surface.
 - Clean all components thoroughly to remove all foreign matter.
 - Clean both sealing surfaces with a non-residue solvent.
 - Apply FIPG material in a continuous line 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.

AUTOMATIC TRANSAXLE FLUID

ON-VEHICLE INSPECTION

1. CHECK FLUID LEVEL

HINT:

Drive the vehicle so that the engine and transaxle are at normal operating temperature.

Fluid temperature:

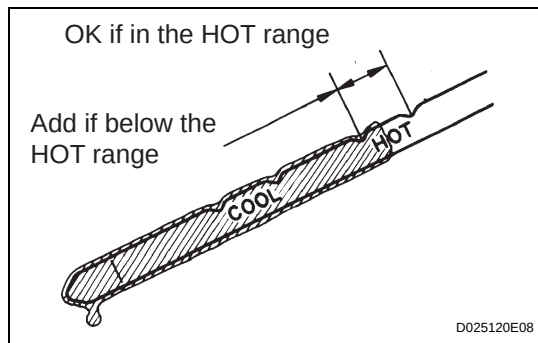
70 to 80°C (158 to 176°F)

- (a) Park the vehicle on a level surface and set the parking brake.
- (b) With the engine idling and the brake pedal depressed, move the shift lever to each position from the P to L position, and return it to the P position.
- (c) Take out the dipstick and wipe it clean.
- (d) Fully push the dipstick back into the pipe.
- (e) Take the dipstick out and check that the fluid level is in the HOT range.

If the level is not in the HOT range, add transaxle fluid.

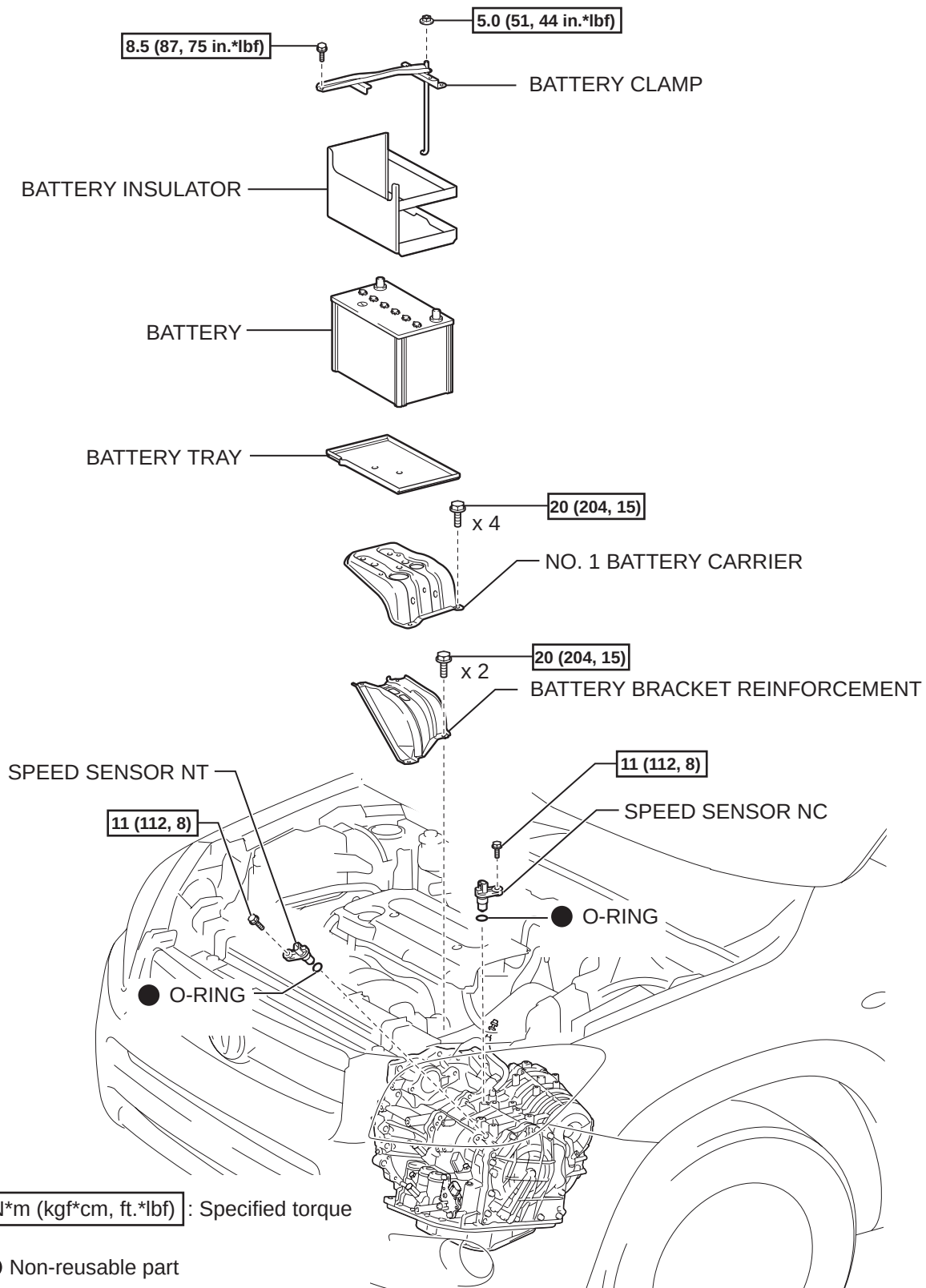
CAUTION:

Wear gloves when working.



SPEED SENSOR

COMPONENTS



REMOVAL

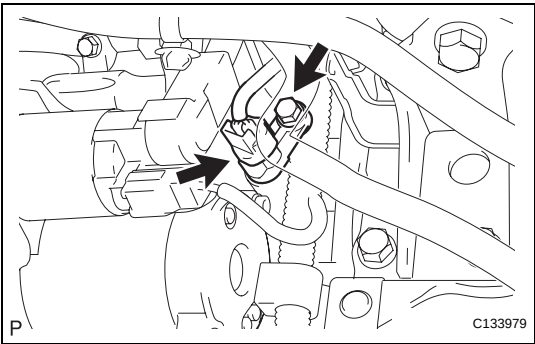
1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

CAUTION:

Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

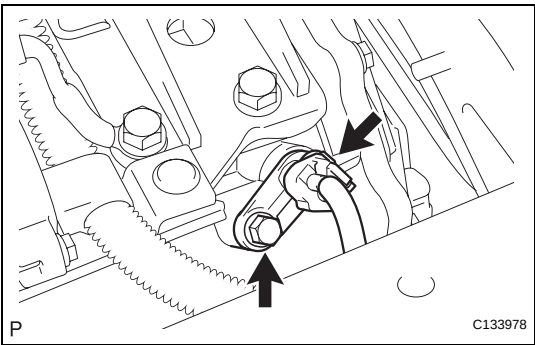
2. REMOVE BATTERY

- (a) Loosen the nut and remove the bolt and battery clamp.
- (b) Remove the battery and insulator.
- (c) Remove the battery tray.
- (d) Remove the 4 bolts and battery carrier.
- (e) Remove the 2 bolts and battery bracket reinforcement.



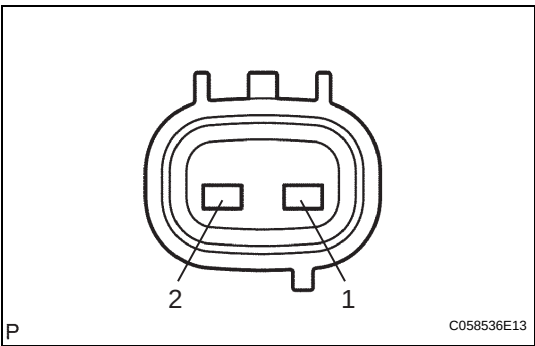
3. REMOVE SPEED SENSOR NC

- (a) Disconnect the sensor connector.
- (b) Remove the bolt and sensor.
- (c) Remove the O-ring from the sensor.



4. REMOVE SPEED SENSOR NT

- (a) Disconnect the sensor connector.
- (b) Remove the bolt and sensor.
- (c) Remove the O-ring from the sensor.



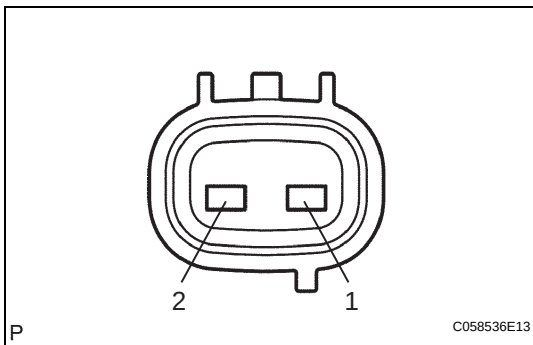
INSPECTION

1. INSPECT SPEED SENSOR NT

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 SPEED SENSOR NC

Measure the resistance of the sensor.

Standard resistance

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

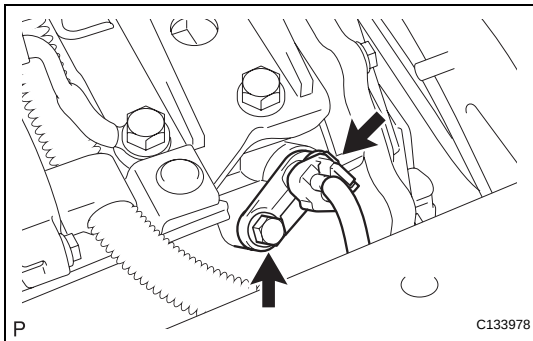
INSTALLATION

1. INSTALL SPEED SENSOR NT

- Coat a new O-ring with ATF.
- Install the O-ring to the sensor.
- Install the sensor with the bolt.

Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)

- Connect the sensor connector.

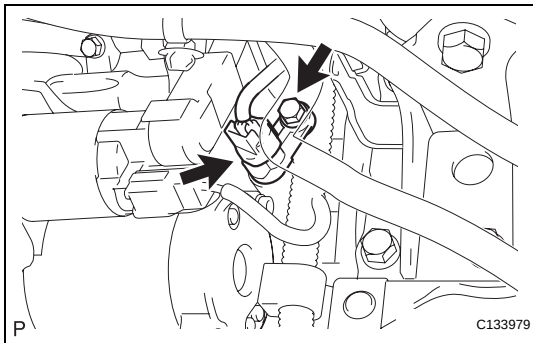


2. INSTALL SPEED SENSOR NC

- Coat a new O-ring with ATF.
- Install the O-ring to the sensor.
- Install the sensor with the bolt.

Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)

- Connect the sensor connector.



3. INSTALL BATTERY

- Install the battery bracket reinforcement with the 2 bolts.

Torque: 20 N*m (204 kgf*cm, 15 ft.*lbf)

- Install the battery carrier with the 4 bolts.

Torque: 20 N*m (204 kgf*cm, 15 ft.*lbf)

- Install the battery tray.

- Install the battery and insulator with the battery clamp.

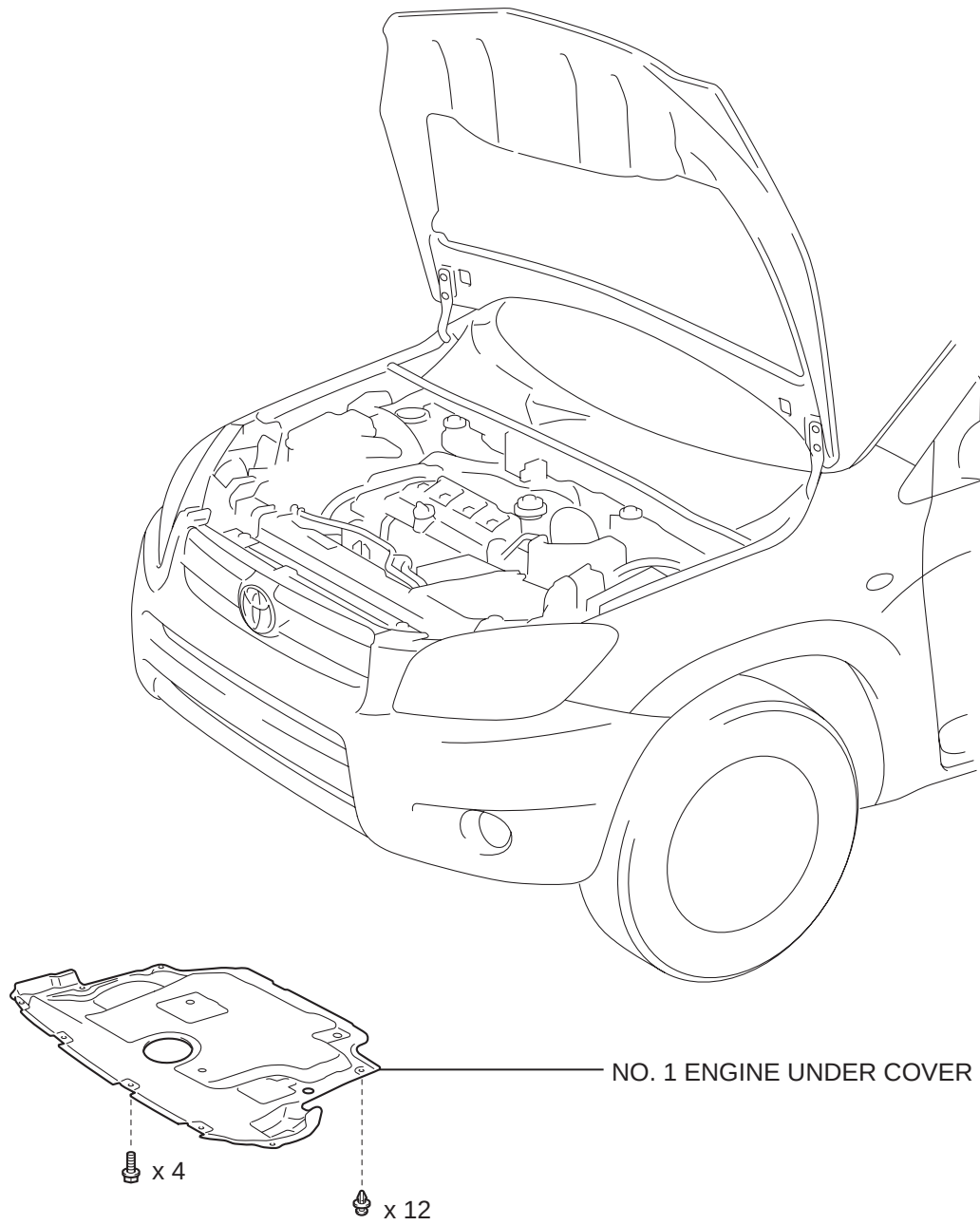
Torque: 8.5 N*m (87 kgf*cm, 75 in.*lbf) for bolt

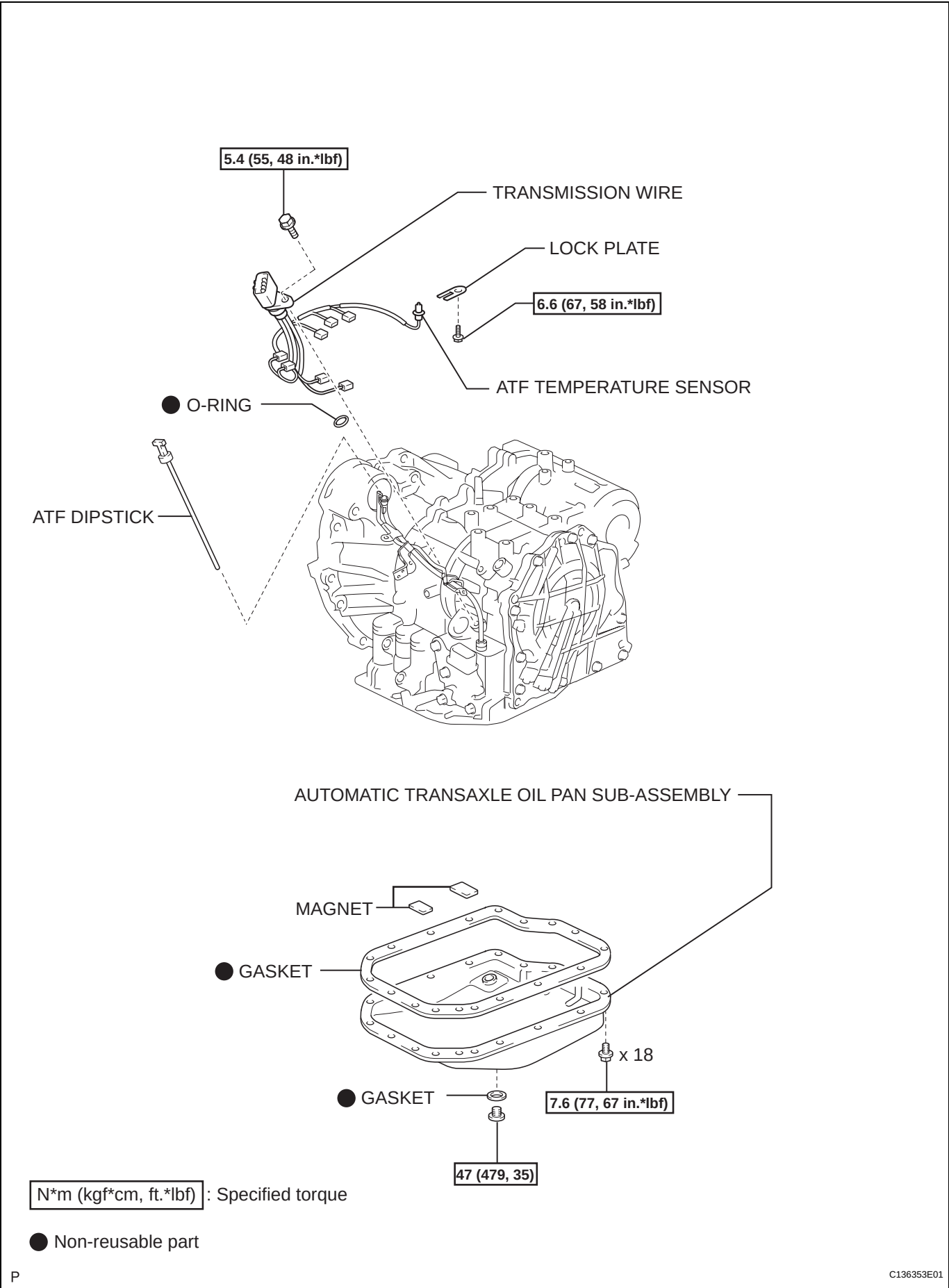
5.0 N*m (51 kgf*cm, 44 in.*lbf) for nut

4. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

TRANSMISSION WIRE

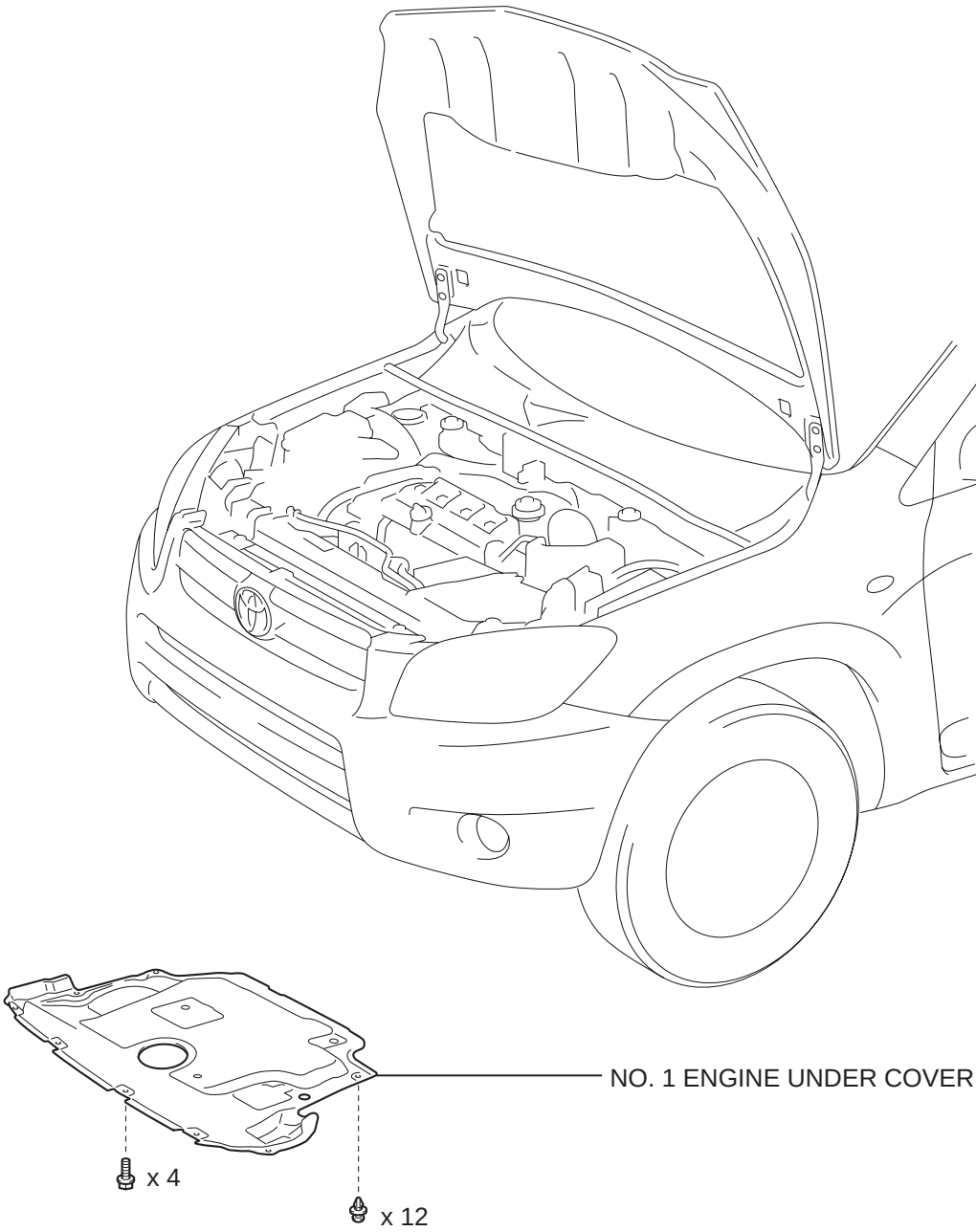
COMPONENTS

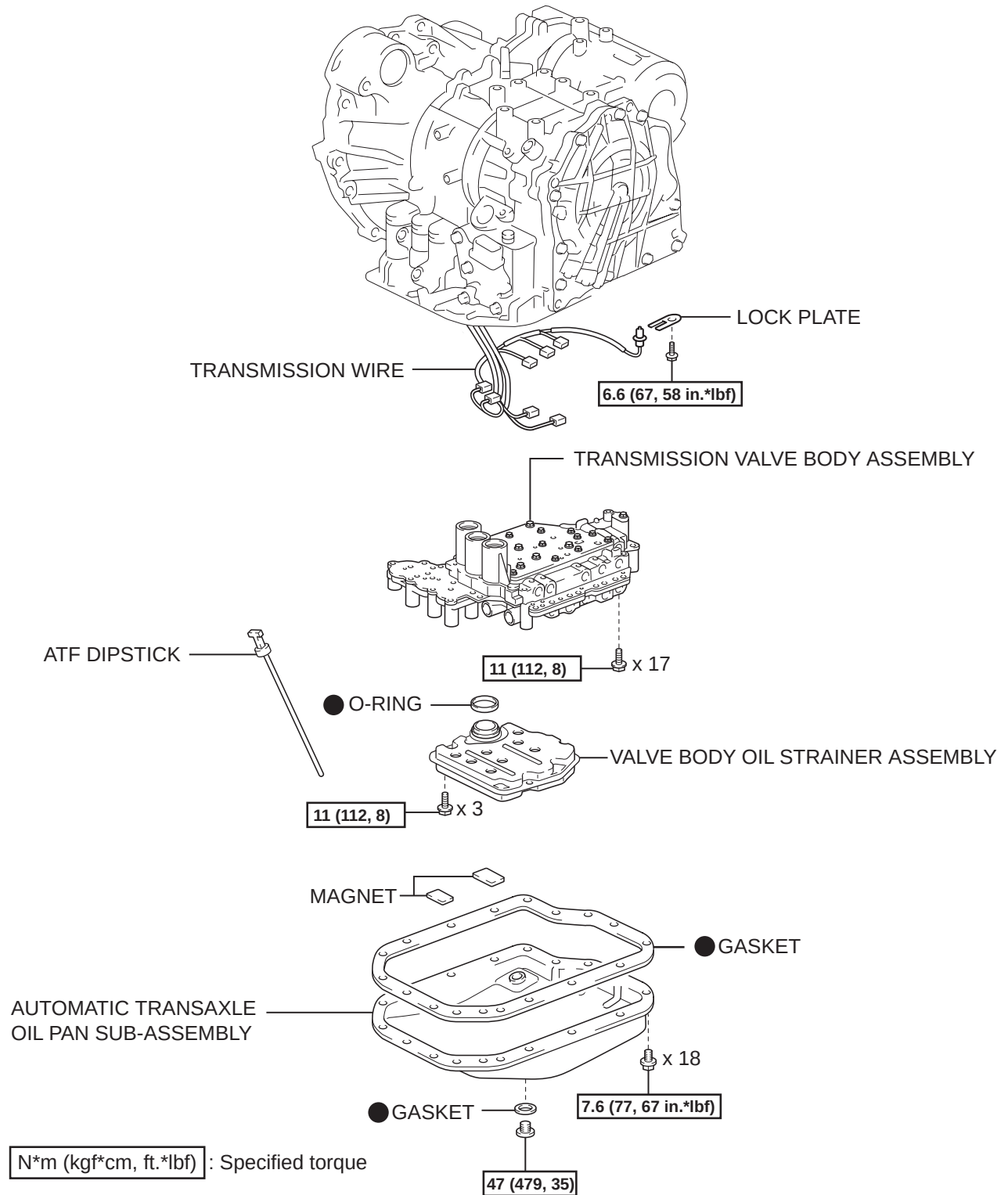




VALVE BODY ASSEMBLY

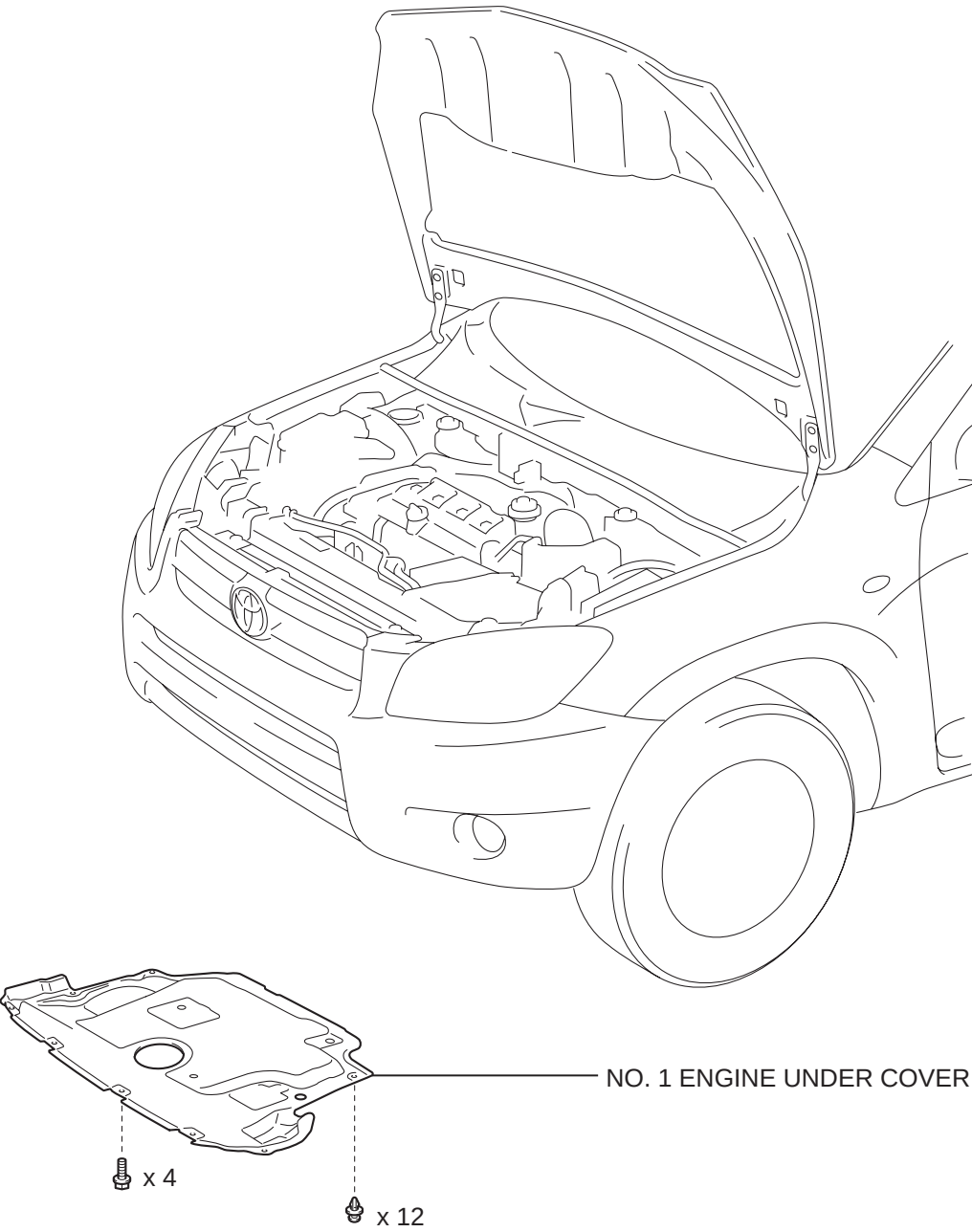
COMPONENTS

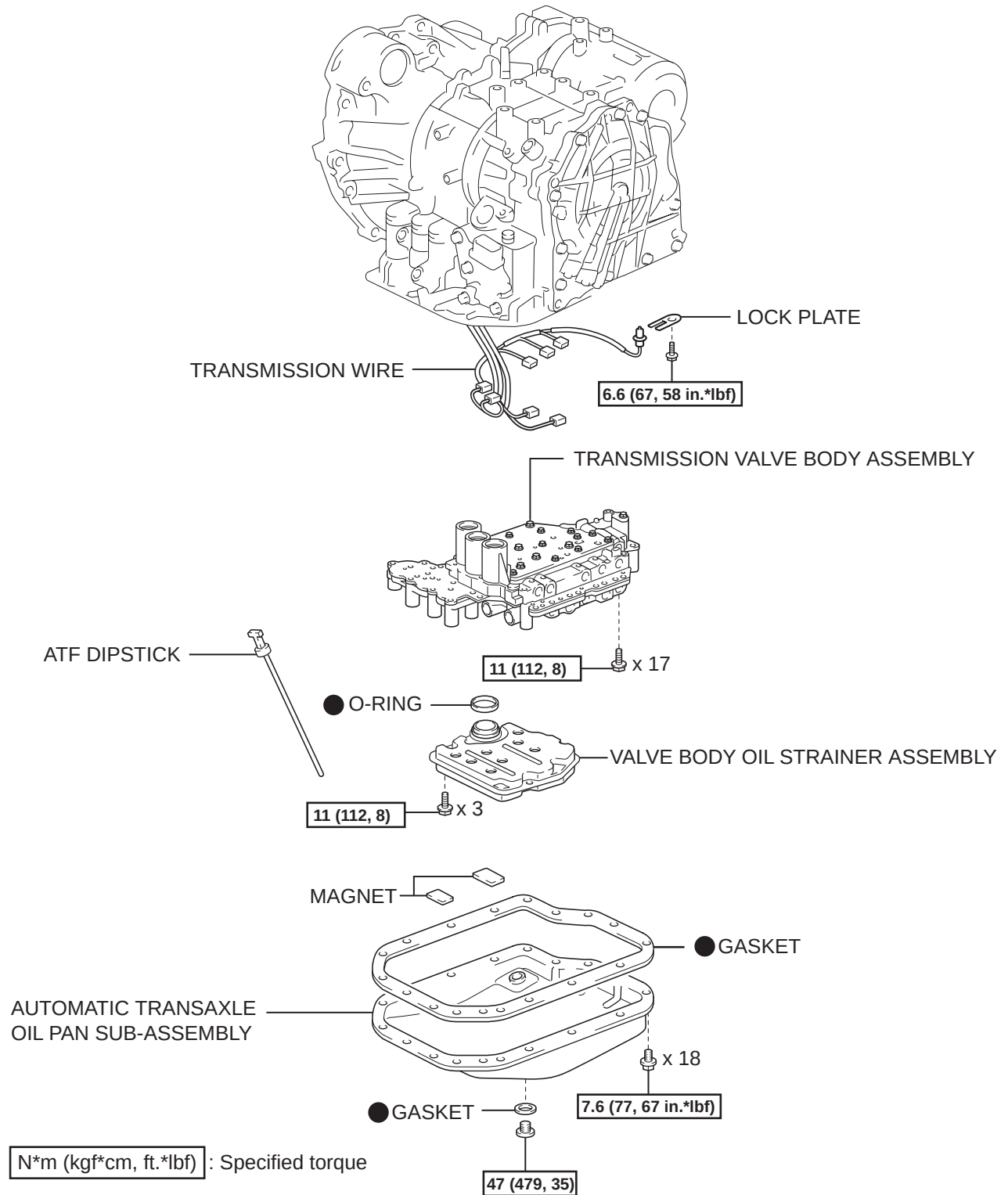




VALVE BODY ASSEMBLY

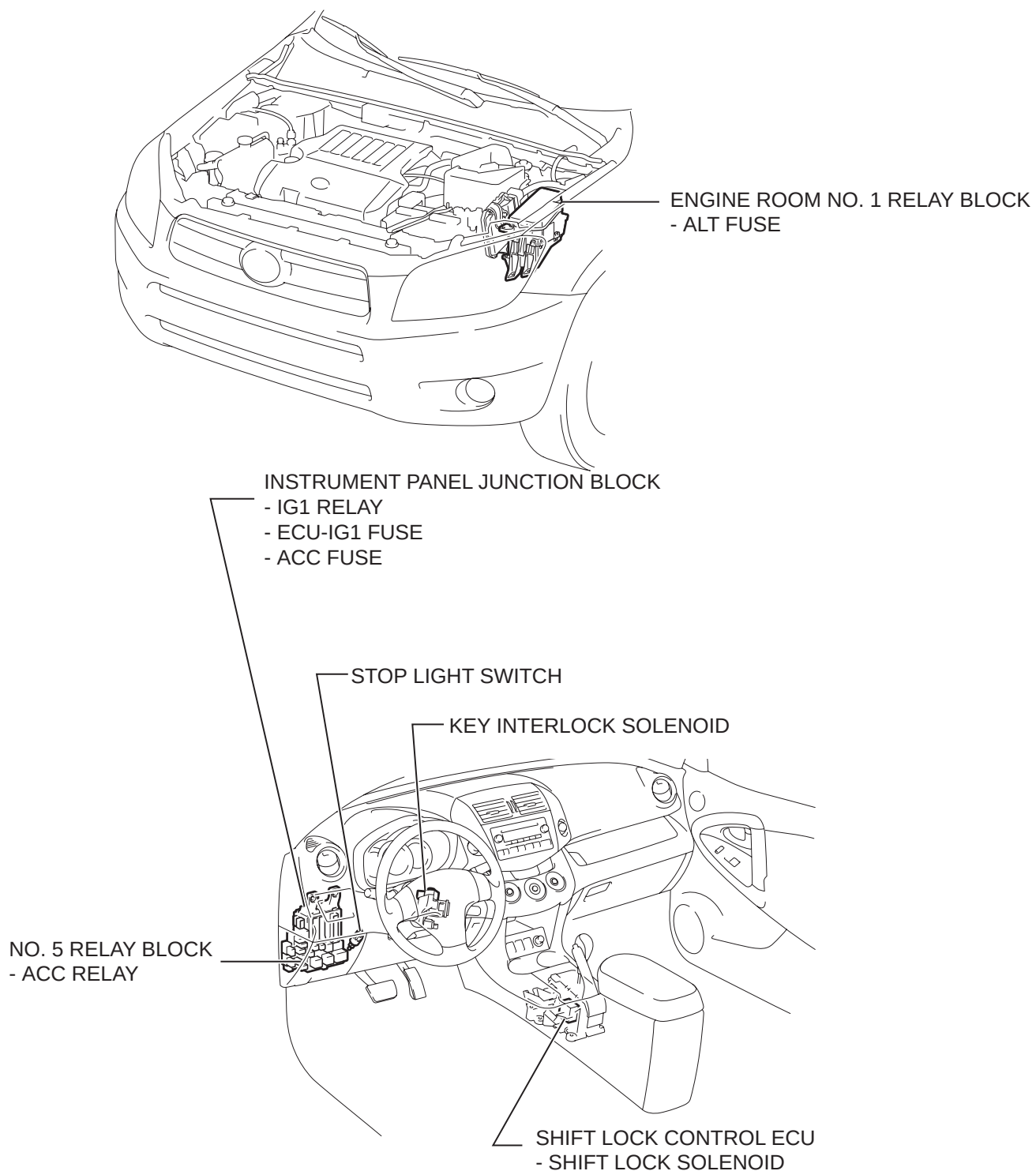
COMPONENTS



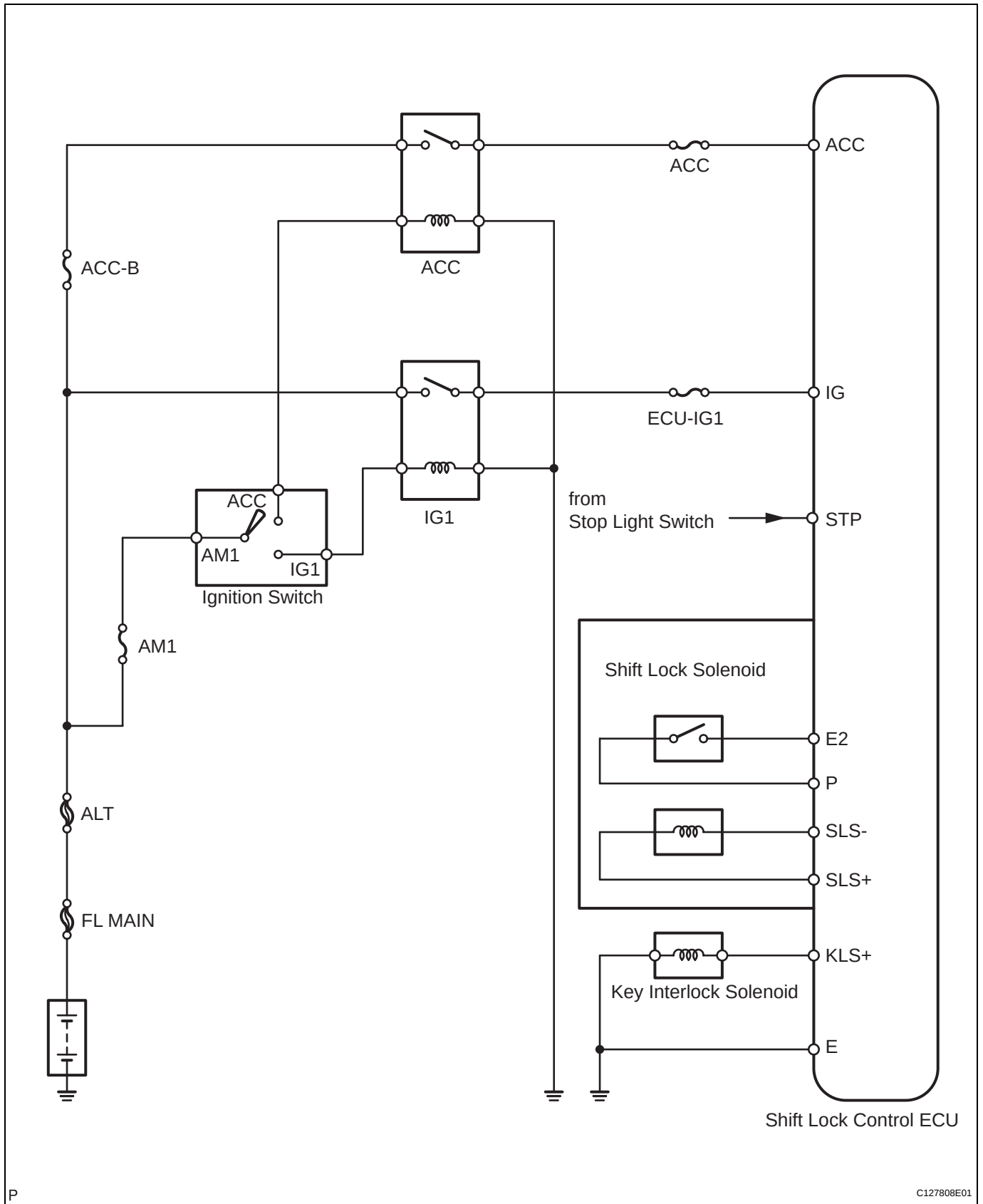


SHIFT LOCK SYSTEM

PARTS LOCATION

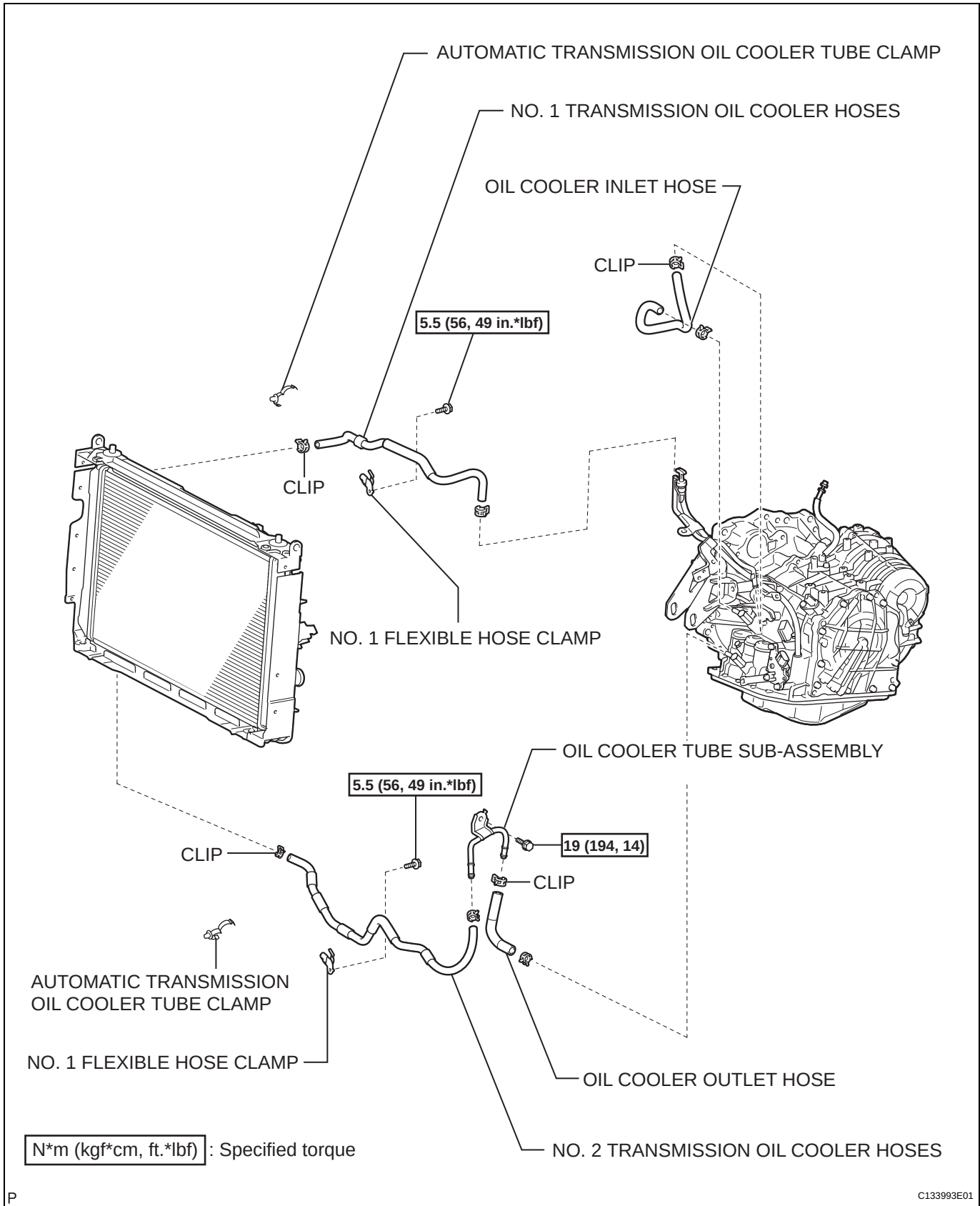


SYSTEM DIAGRAM



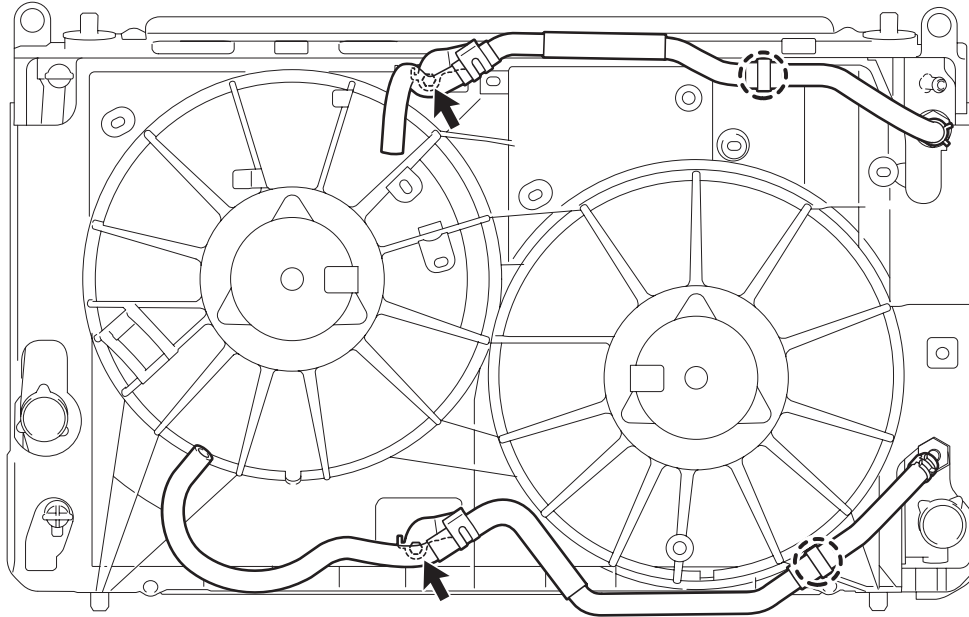
TRANSMISSION OIL COOLER

COMPONENTS



REMOVAL

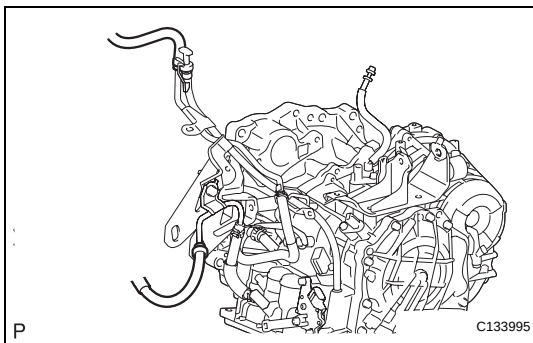
1. DISCONNECT NO. 1 AND NO. 2 TRANSMISSION OIL COOLER HOSES



P

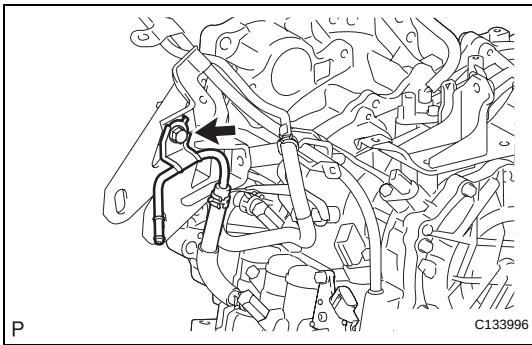
C133014

- (a) Disconnect the 2 hoses from the 2 No. 1 flexible hose clamps.
- (b) Detach the 2 claws to open the 2 automatic transmission oil cooler tube clamps.
- (c) Disconnect the 2 hoses from the radiator.
- (d) Remove the 2 bolts and 2 No. 1 flexible hose clamps.
- (e) Remove the 2 automatic transmission oil cooler tube clamps.
- (f) Disconnect the 2 hoses from the transmission oil filler tube and oil cooler tube.



P

C133995

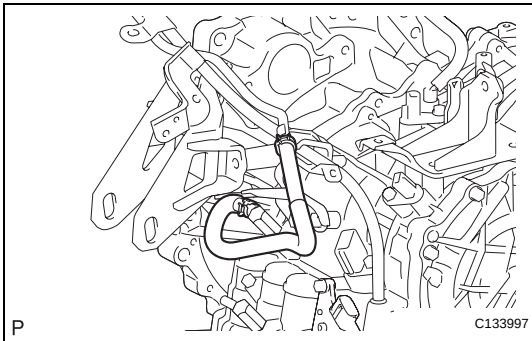


2. DISCONNECT OIL COOLER TUBE SUB-ASSEMBLY

- (a) Disconnect the oil cooler outlet hose from the oil cooler tube and transaxle.
- (b) Remove the bolt and oil cooler tube.

3. DISCONNECT OIL COOLER OUTLET HOSE

- (a) Disconnect the oil cooler outlet hose from the transaxle.



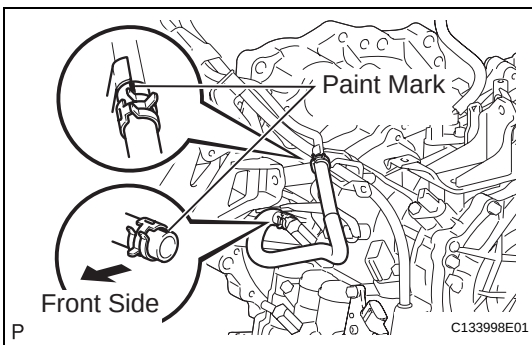
4. DISCONNECT OIL COOLER INLET HOSE

- (a) Disconnect the hose from the transmission oil filler tube and transaxle, and remove it.

INSTALLATION

1. CONNECT OIL COOLER INLET HOSE

- (a) Connect the hose to the transaxle and transmission oil filler tube.

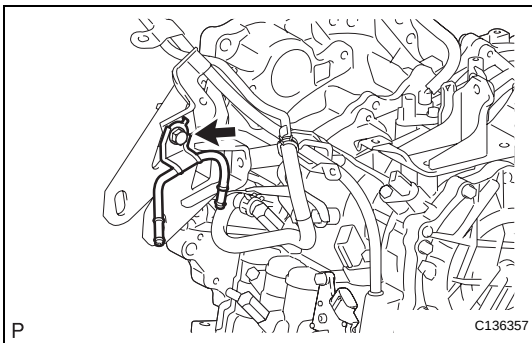


2. INSTALL OIL COOLER TUBE SUB-ASSEMBLY

- (a) Install the tube with the bolt.
Torque: 19 N*m (194 kgf*cm, 14 ft.*lbf)

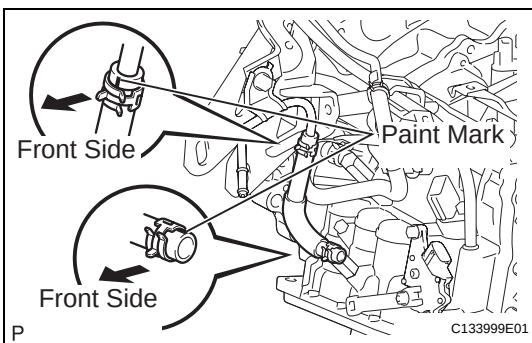
NOTICE:

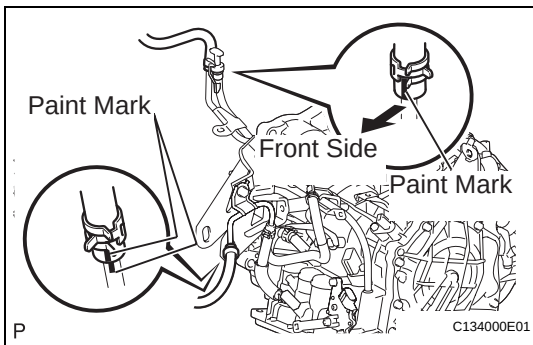
Make sure the rotation stopper of the tube contacts the top part of the front engine mounting bracket.



3. CONNECT OIL COOLER OUTLET HOSE

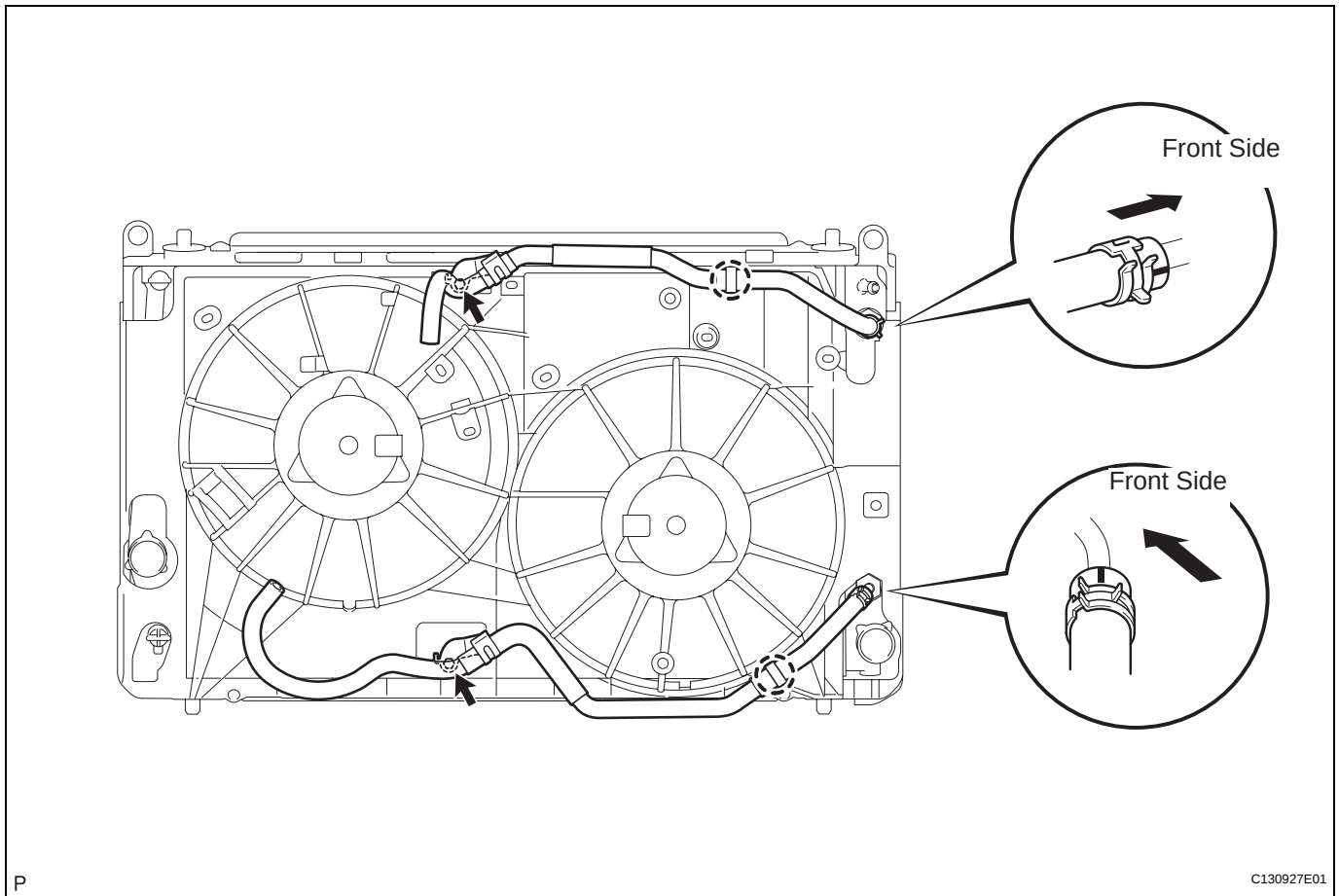
- (a) Connect the hose to the transaxle and oil cooler tube.





4. CONNECT NO. 1 AND NO. 2 TRANSMISSION OIL COOLER HOSES

- Connect the 2 hoses to the transmission oil filler tube and oil cooler tube.
- Install the 2 automatic transmission oil cooler tube clamps to the radiator.



- Install the 2 No. 1 flexible hose clamps to the radiator with the 2 bolts.
Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf)
- Connect the 2 hoses to the radiator.
- Pass the 2 hoses through the 2 automatic transmission oil cooler tube clamps.
- Connect the 2 hoses to the 2 No. 1 flexible hose clamps, and close the 2 clamps.

5. ADD AUTOMATIC TRANSAXLE FLUID

6. INSPECT AUTOMATIC TRANSAXLE FLUID

- Inspect the automatic transaxle fluid (see page [AX-126](#)).

TRANSMISSION CONTROL CABLE ASSEMBLY

REPLACEMENT

1. **REMOVE REAR CONSOLE BOX SUB-ASSEMBLY**
 - (a) Remove the console box (see page [IP-20](#)).

2. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**

CAUTION:

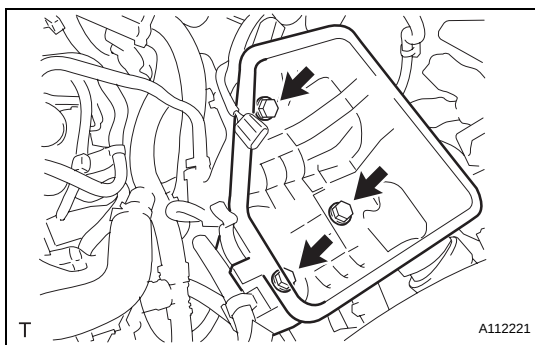
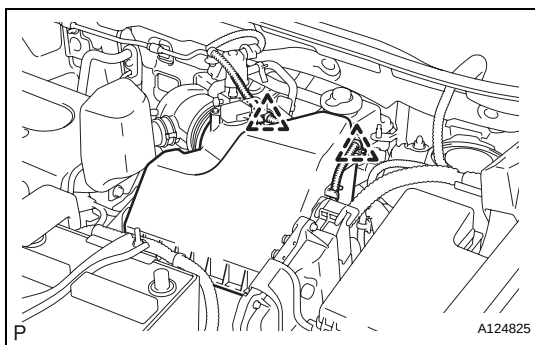
Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.

3. **REMOVE BATTERY**

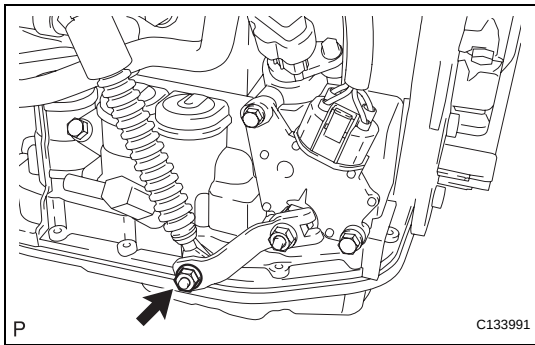
- (a) Loosen the nut and remove the bolt and battery clamp.
- (b) Remove the battery and insulator.
- (c) Remove the battery tray.
- (d) Remove the 4 bolts and battery carrier.
- (e) Remove the 2 bolts and battery bracket reinforcement.

4. **REMOVE AIR CLEANER ASSEMBLY**

- (a) Disconnect the mass air flow meter connector.
- (b) Remove the 2 clamps of the engine wire.

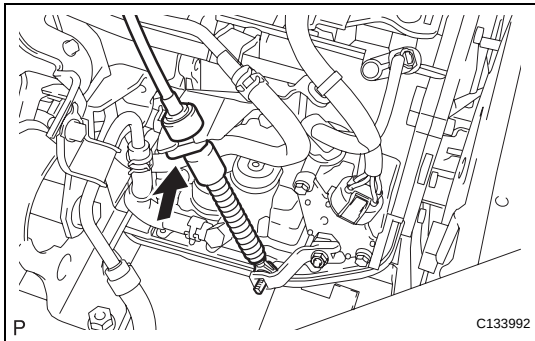


- (c) Remove the 3 bolts from the air cleaner case.
- (d) Disconnect the air cleaner case from the No. 1 air cleaner inlet.

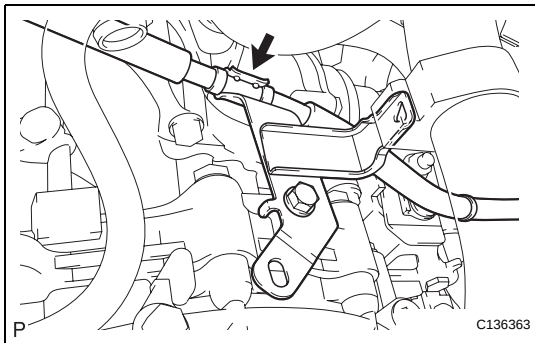


5. REMOVE TRANSAXLE CONTROL CABLE ASSEMBLY

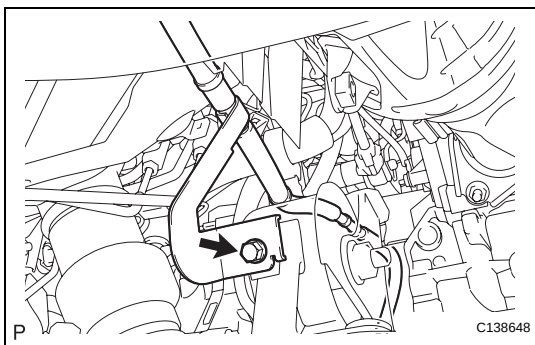
- (a) Remove the nut and disconnect the control cable from the control shaft lever.



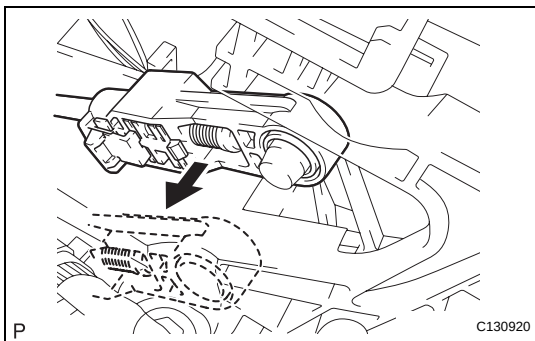
- (b) Remove the clip and disconnect the control cable from the control cable bracket.



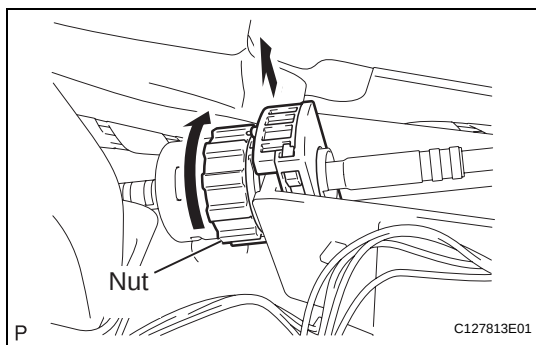
- (c) Disconnect the control cable from the control cable support.



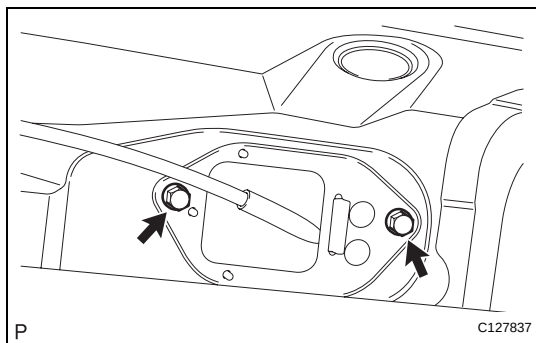
- (d) Remove the bolt and disconnect the clamp of the control cable.



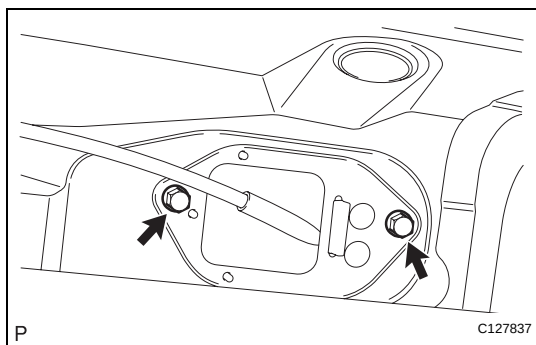
- (e) Disconnect the control cable from the shift lever.



- (f) Turn the nut and disconnect the control cable from the shift lever retainer.

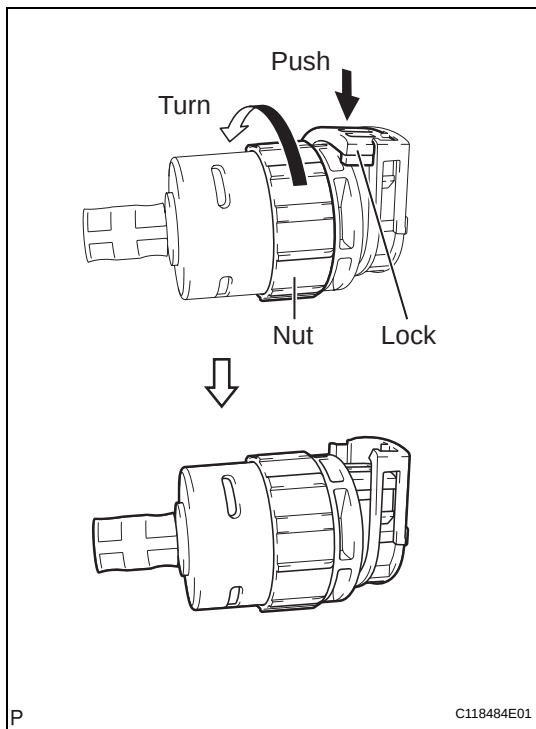


- (g) Remove the 2 bolts and control cable.

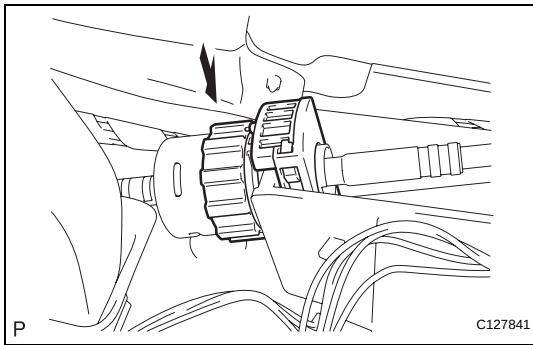


6. INSTALL TRANSAXLE CONTROL CABLE ASSEMBLY

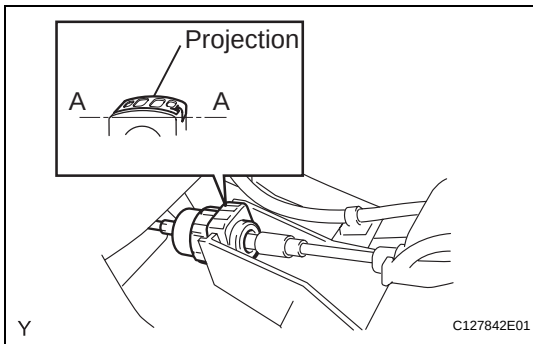
- (a) Install the control cable with the 2 bolts.
Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)



- (b) Turn the nut of the control cable and push in the lock.

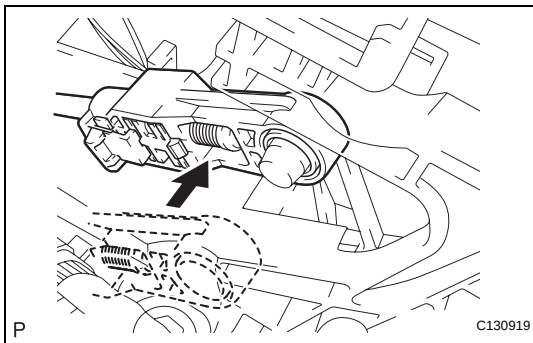


- (c) Install the control cable onto the shift lever retainer.



NOTICE:

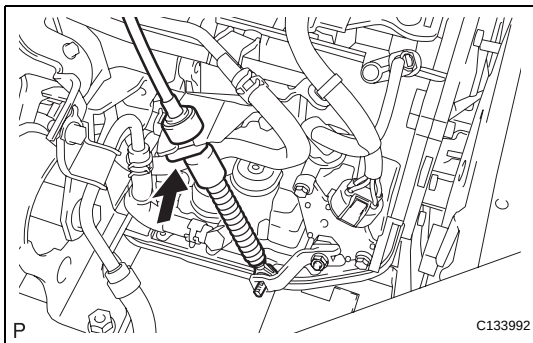
- Install the cable with the protruding portion of the cable outer facing upward.
- After installing, check that the lock of the cable outer is protruding beyond portion A-A, as shown in the illustration.



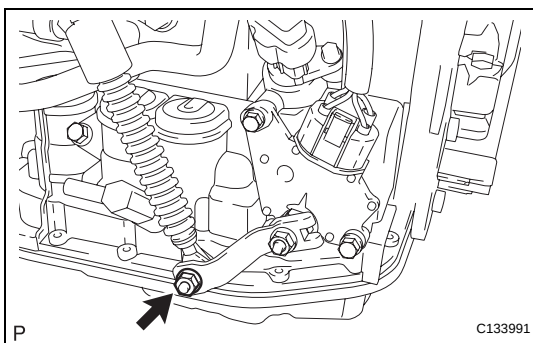
- (d) Connect the control cable to the shift lever.

NOTICE:

Connect the control cable so that the adjusting mechanism lock of the control cable is installed on the driver side of the vehicle.

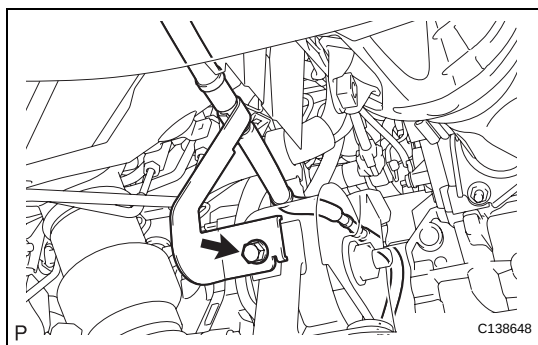


- (e) Fix the control cable onto the control cable bracket with the clip.

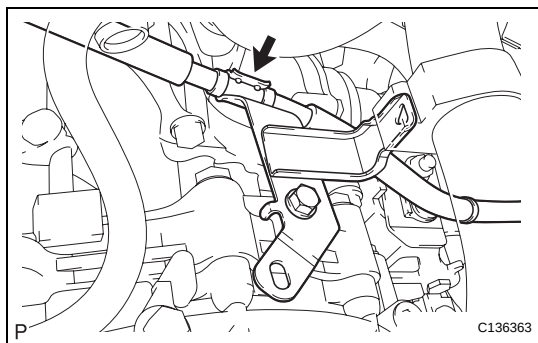


- (f) Connect the control cable onto the control shaft lever with the nut.

Torque: 13 N*m (133 kgf*cm, 10 ft.*lbf)



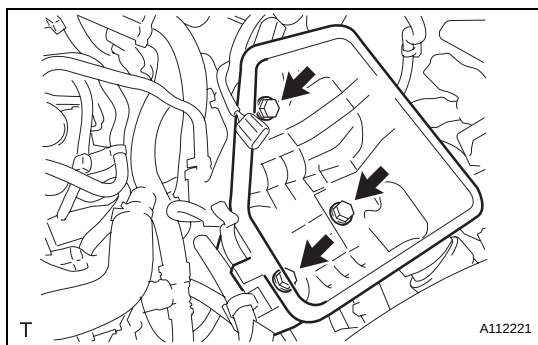
- (g) Connect the clamp of the control cable with the bolt.
Torque: 12 N*m (122 kgf*cm, 9 ft.*lbf)



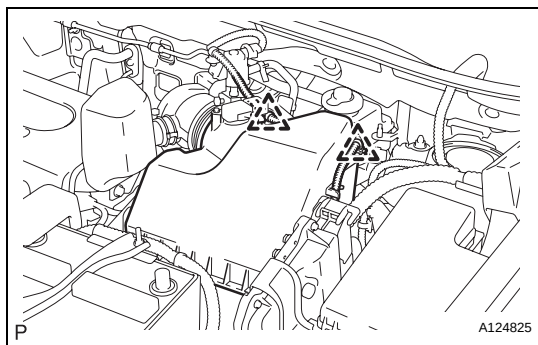
- (h) Connect the control cable to the cable support.

7. INSTALL AIR CLEANER ASSEMBLY

- (a) Connect the air cleaner case to the No. 1 air cleaner inlet.



- (b) Install the air cleaner case with the 3 bolts.
Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)



- (c) Connect the 2 clamps of the engine wire.
 (d) Connect the mass air flow meter connector.

8. INSTALL BATTERY

- (a) Install the battery bracket reinforcement with the 2 bolts.

Torque: 20 N*m (204 kgf*cm, 15 ft.*lbf)

- (b) Install the battery carrier with the 4 bolts.

Torque: 20 N*m (204 kgf*cm, 15 ft.*lbf)

- (c) Install the battery tray.

- (d) Connect the 2 clamps of the engine wire.

- (e) Install the battery and insulator with the battery clamp.

Torque: 8.5 N*m (87 kgf*cm, 75 in.*lbf) for bolt
5.0 N*m (51 kgf*cm, 44 in.*lbf) for nut

9. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

10. INSPECT SHIFT LEVER POSITION

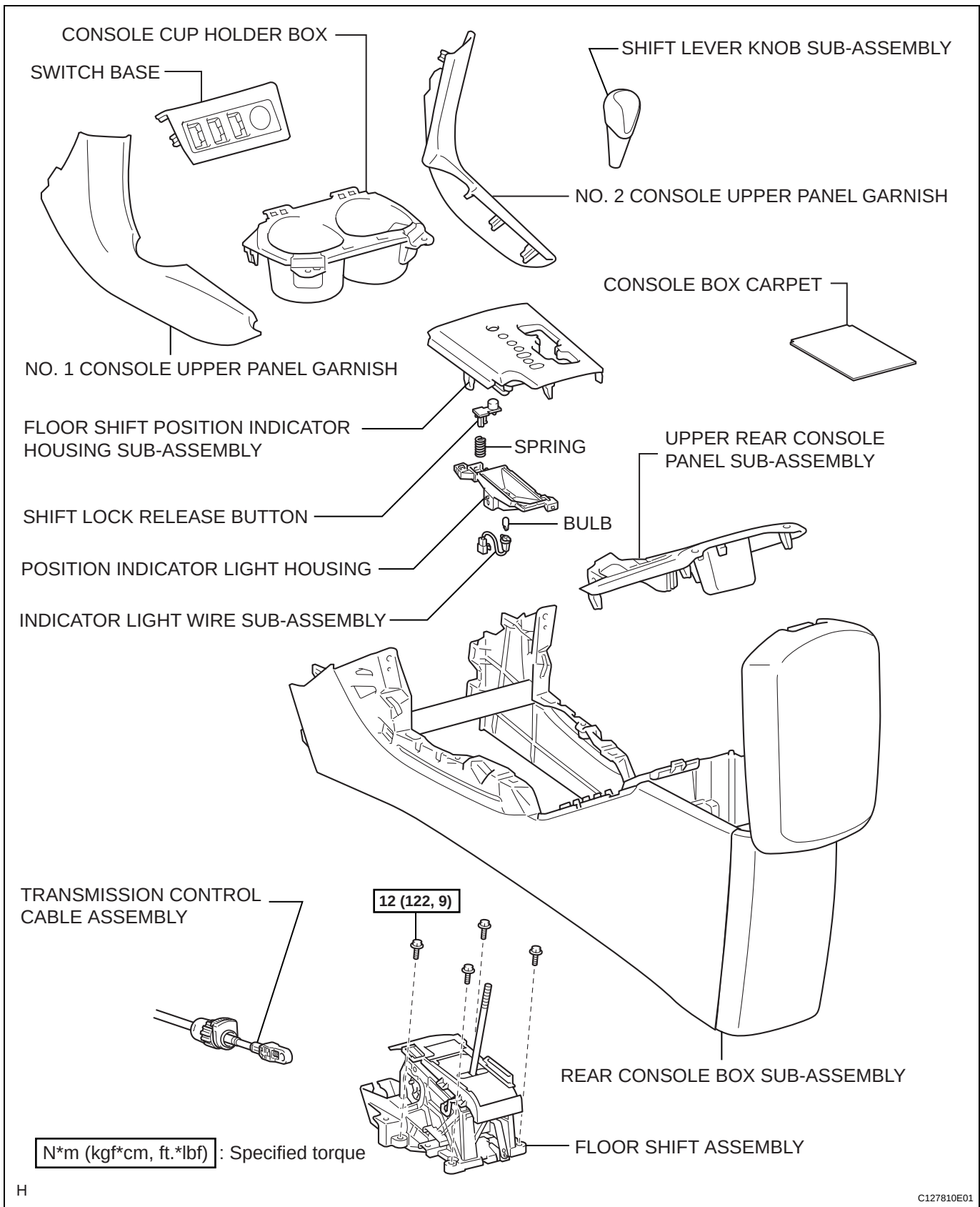
- (a) When shifting the lever from P to the R position with the ignition switch ON and the brake pedal depressed, make sure that the shift lever moves smoothly and moves correctly into position.
- (b) Start the engine and make sure that the vehicle moves forward when shifting the lever from N to the D position and moves rearward when shifting the lever to the R position.
If the operation cannot be performed as specified, inspect the park/neutral position switch and check the shift lever installation condition.

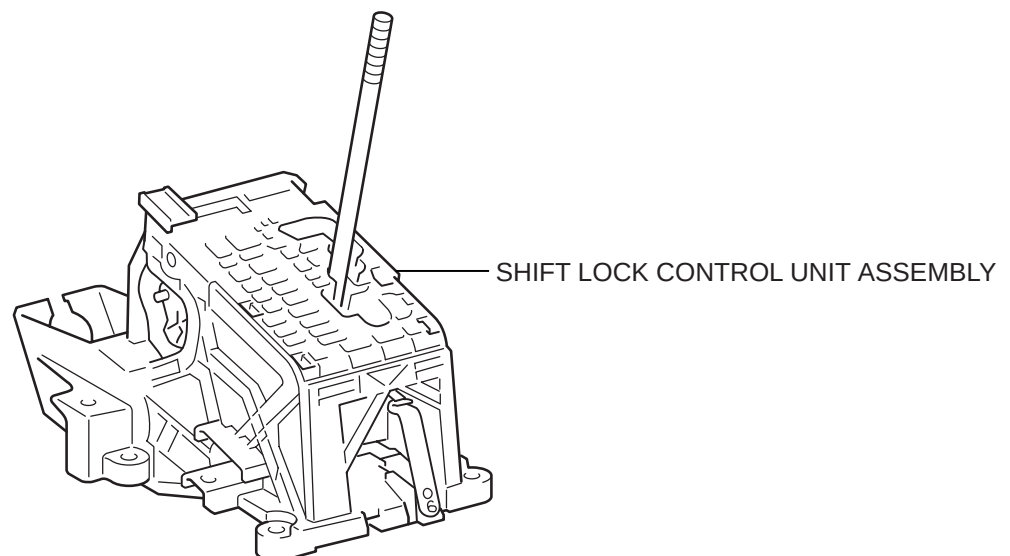
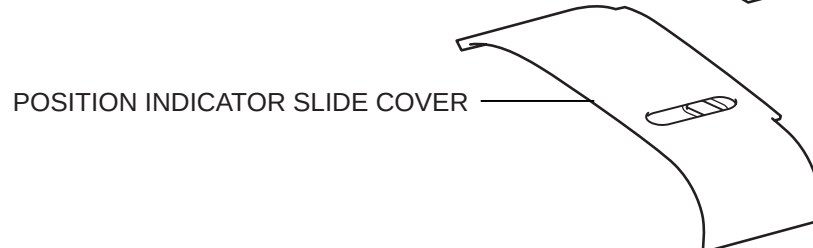
11. ADJUST SHIFT LEVER POSITION (See page [AX-164](#))**12. INSTALL REAR CONSOLE BOX SUB-ASSEMBLY**

- (a) Install the rear console box (see page [IP-26](#)).

FLOOR SHIFT ASSEMBLY

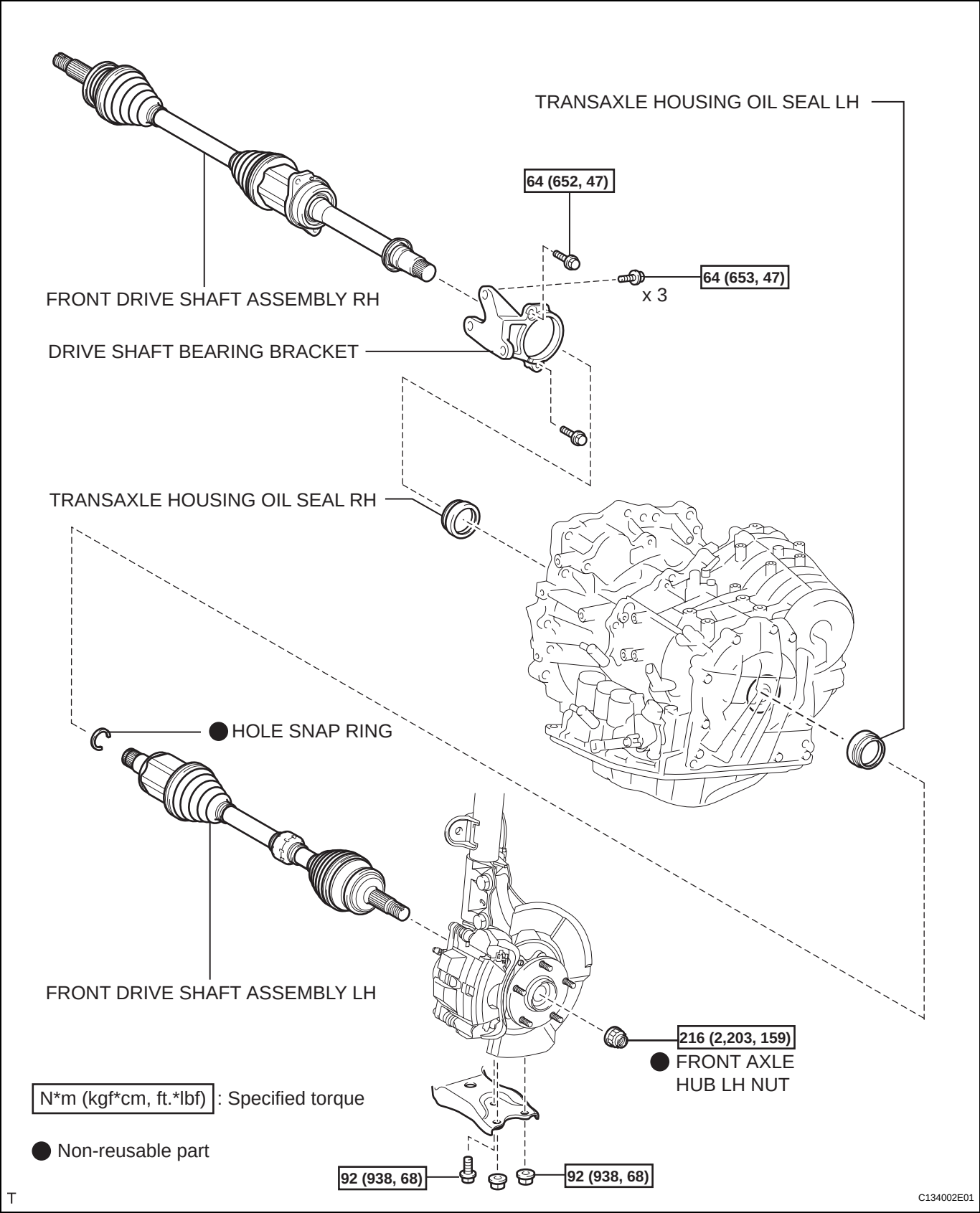
COMPONENTS





DIFFERENTIAL OIL SEAL

COMPONENTS



REPLACEMENT

1. DRAIN AUTOMATIC TRANSAXLE FLUID

- Remove the drain plug, gasket and drain the ATF.
- Install a new gasket and drain plug.

Torque: 47 N*m (479 kgf*cm, 35 ft.*lbf)

2. REMOVE FRONT DRIVE SHAFT ASSEMBLY

- Remove the drive shaft (see page [DS-8](#)).

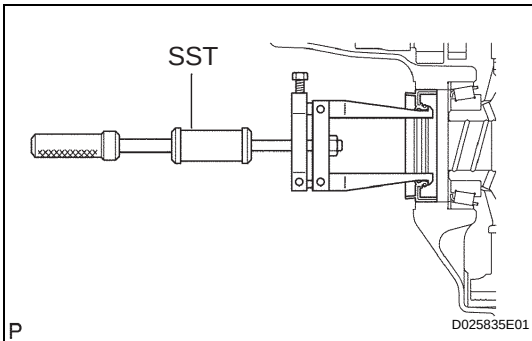
3. REMOVE DRIVE SHAFT BEARING BRACKET

- Remove the 3 bolts and bracket.

4. REMOVE TRANSAXLE HOUSING OIL SEAL LH AND RH

- Using SST, tap out the oil seal LH.

SST 09308-00010

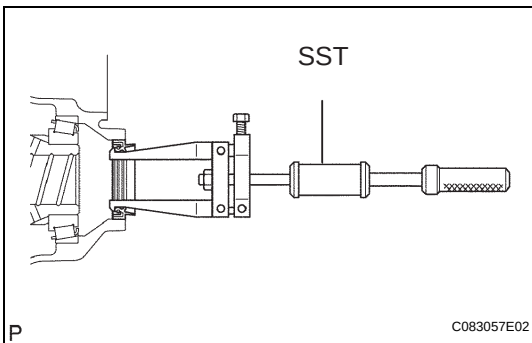


- Using SST, tap out the oil seal RH.

SST 09308-00010

5. INSTALL TRANSAXLE HOUSING OIL SEAL LH AND RH

- Coat the lip of a new oil seal LH with MP grease.



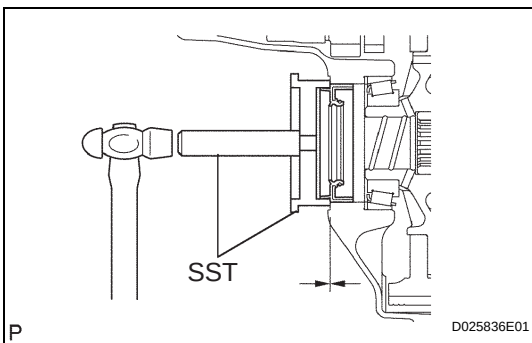
- Using SST and a hammer, tap in the oil seal LH.

SST 09223-15020, 09950-70010 (09951-07150)

Standard depth:

0 +0.5 mm (0 +0.020 in.)

- Coat the lip of a new oil seal RH with MP grease.



- Using SST and a hammer, tap in the oil seal RH.

SST 09316-60011 (09316-00011)

Standard depth:

0 +0.5 mm (0 +0.020 in.)

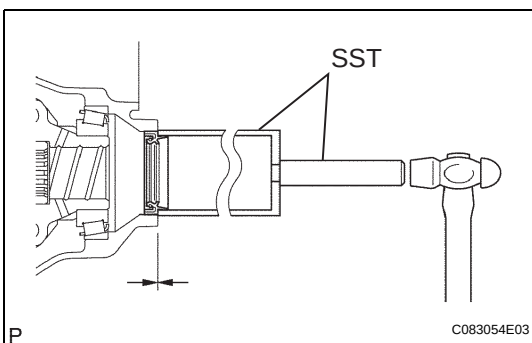
6. INSTALL DRIVE SHAFT BEARING BRACKET

- Install the bracket with the 3 bolts.

Torque: 64 N*m (653 kgf*cm, 47 ft.*lbf)

7. INSTALL FRONT DRIVE SHAFT ASSEMBLY

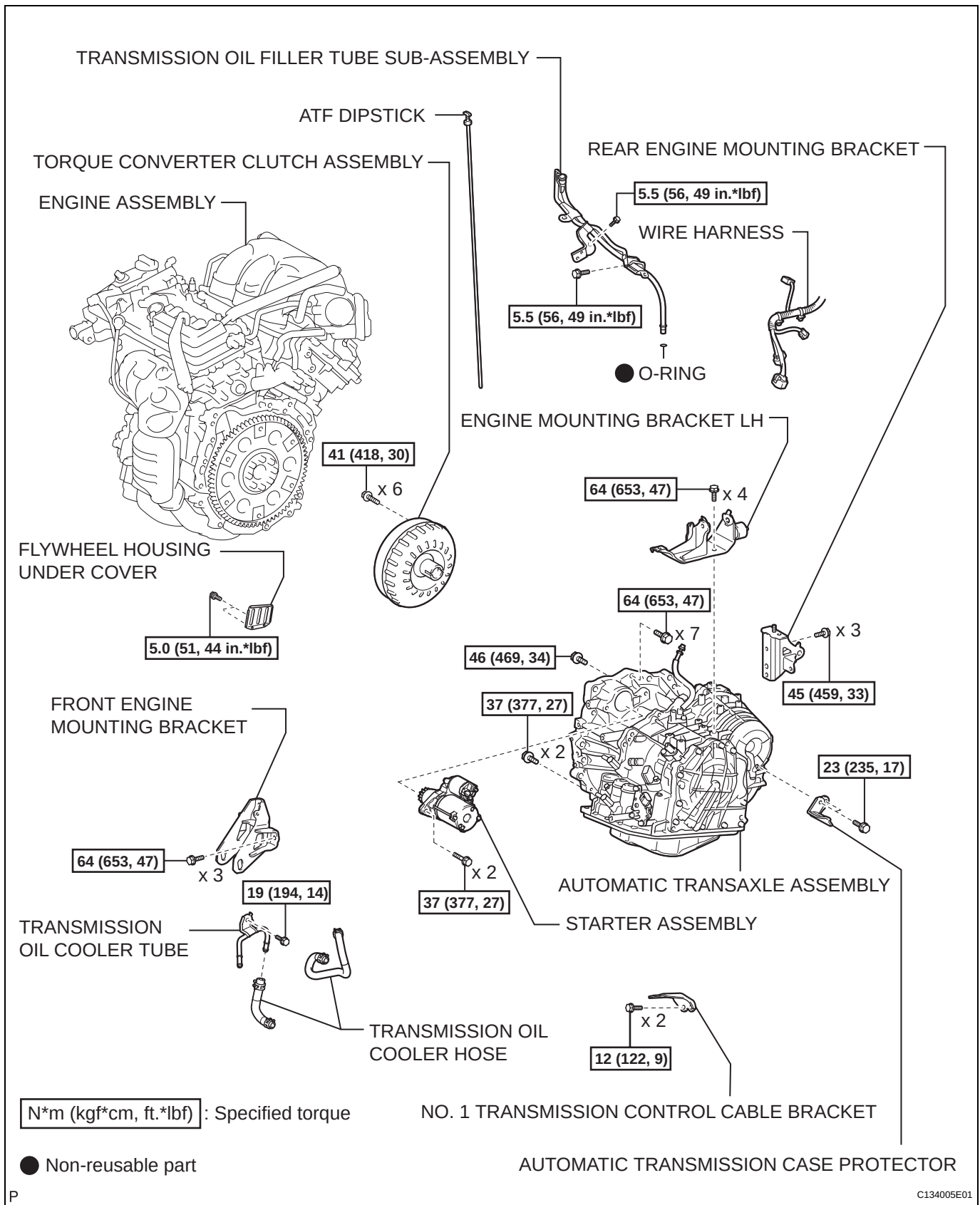
- Install the front drive shaft (see page [DS-33](#)).



8. ADD AUTOMATIC TRANSAXLE FLUID**Fluid type:****Toyota Genuine ATF WS****9. INSPECT TRANSAXLE FLUID LEVEL**(a) Inspect the transaxle fluid level (see page [AX-126](#)).

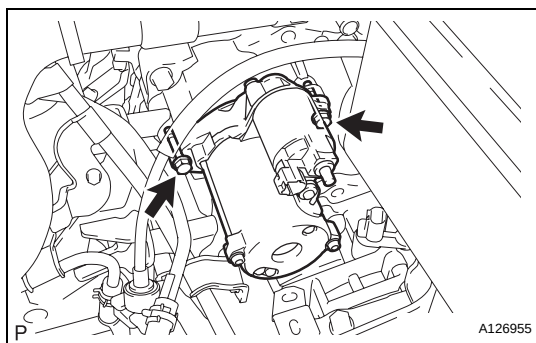
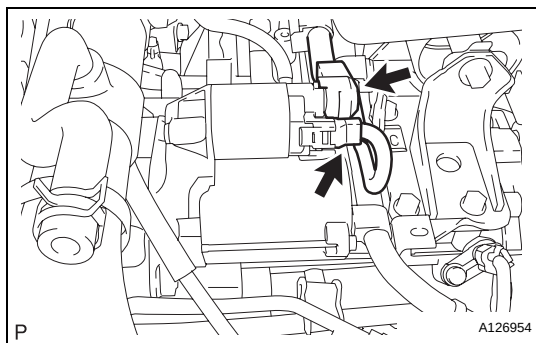
AUTOMATIC TRANSAXLE ASSEMBLY

COMPONENTS

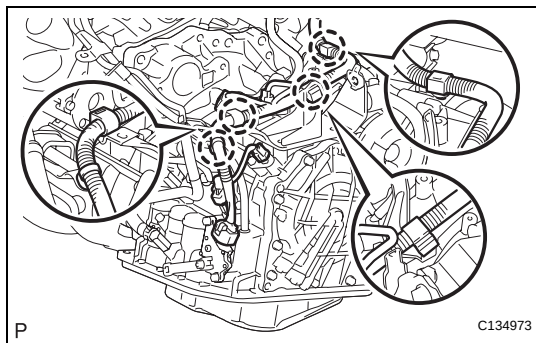


REMOVAL

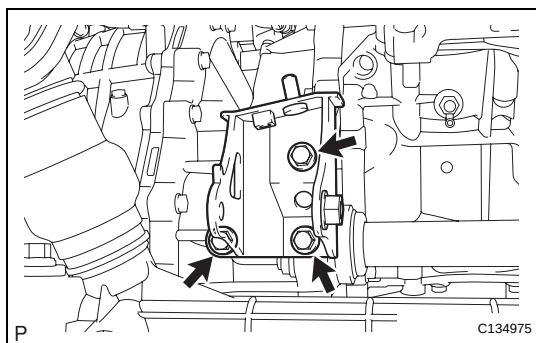
1. **REMOVE ENGINE ASSEMBLY WITH TRANSAXLE**
 - (a) Remove the engine with transaxle (see page [EM-21](#)).
2. **DRAIN AUTOMATIC TRANSAXLE FLUID**
 - (a) Remove the drain plug and gasket, and drain the ATF.
 - (b) Install a new gasket and the drain plug.
Torque: 47 N*m (479 kgf*cm, 35 ft.*lbf)
3. **REMOVE STARTER ASSEMBLY**
 - (a) Disconnect the starter connector.
 - (b) Open the terminal cap, and remove the nut and disconnect the starter wire.

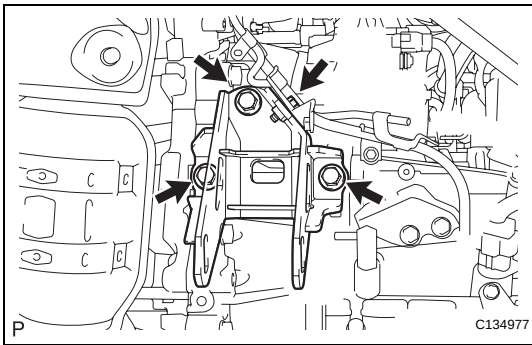


- (c) Remove the 2 bolts and starter.

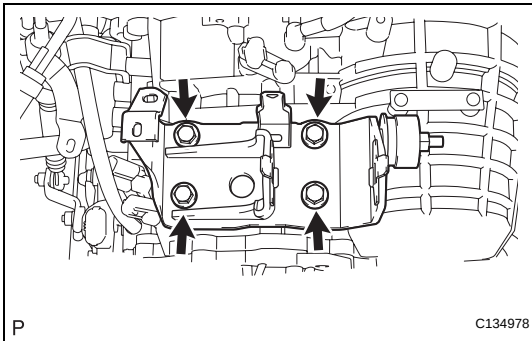


4. **DISCONNECT WIRE HARNESS**
 - (a) Disconnect the park/neutral position switch connector.
 - (b) Disconnect the transaxle wire connector.
 - (c) Disconnect the 2 speed sensor connectors.
 - (d) Disconnect the wire harness clamps.
5. **REMOVE TRANSMISSION OIL COOLER HOSE AND TUBE**
 - (a) Remove the oil cooler hoses and tube (see page [AX-151](#)).
6. **REMOVE REAR ENGINE MOUNTING BRACKET**
 - (a) Remove the 3 bolts and mounting bracket.

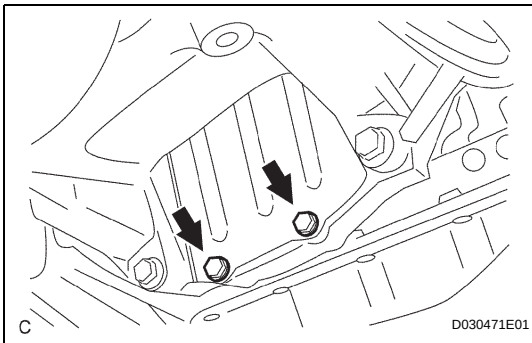


**7. REMOVE FRONT ENGINE MOUNTING BRACKET**

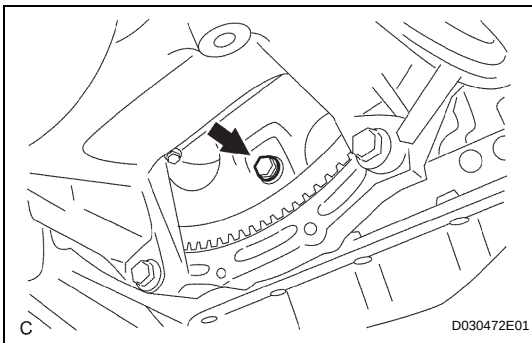
- (a) Remove the 4 bolts and mounting bracket.

**8. REMOVE ENGINE MOUNTING BRACKET LH**

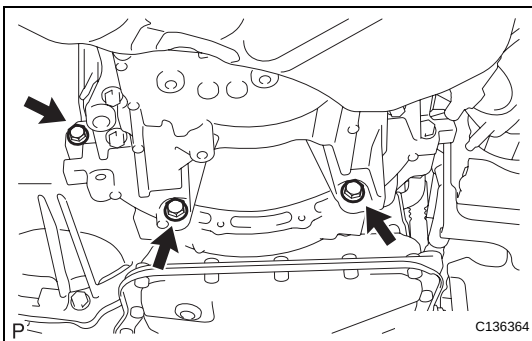
- (a) Remove the 4 bolts and mounting bracket.

**9. REMOVE AUTOMATIC TRANSAXLE ASSEMBLY**

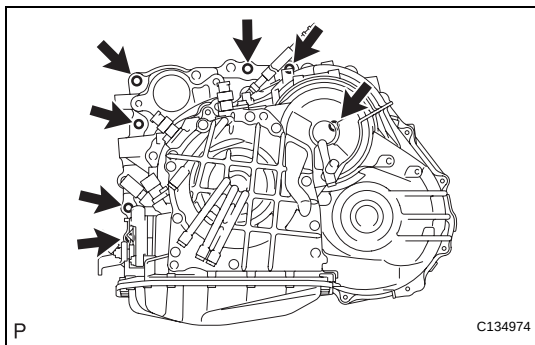
- (a) Remove the 2 bolts and flywheel housing under cover.



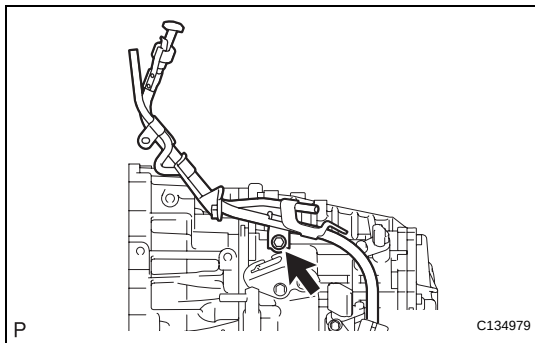
- (b) Turn the crankshaft to gain access and remove the 6 bolts while holding the crankshaft pulley bolt with a wrench.



- (c) Remove the 3 lower side mounting bolts.

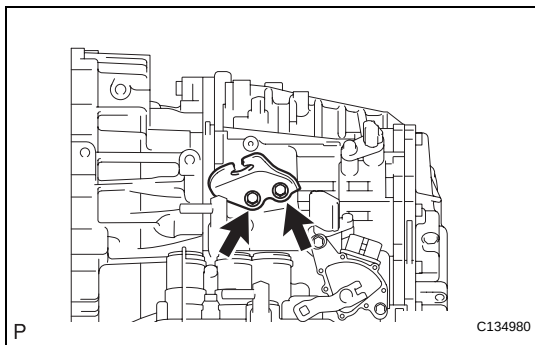


- (d) Remove the 7 upper side mounting bolts.
- (e) Separate and remove the automatic transaxle.



10. REMOVE TRANSMISSION OIL FILLER TUBE SUB-ASSEMBLY

- (a) Remove the ATF dipstick.
- (b) Remove the bolt and oil filler tube.



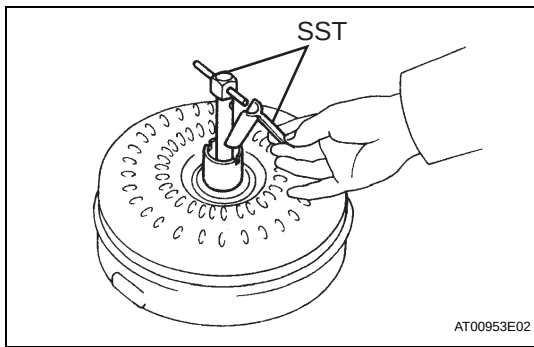
11. REMOVE NO. 1 TRANSMISSION CONTROL CABLE BRACKET

- (a) Remove the 2 bolts and cable bracket.

12. REMOVE AUTOMATIC TRANSMISSION CASE PROTECTOR

- (a) Remove the 2 bolts and protector.

13. REMOVE TORQUE CONVERTER CLUTCH ASSEMBLY

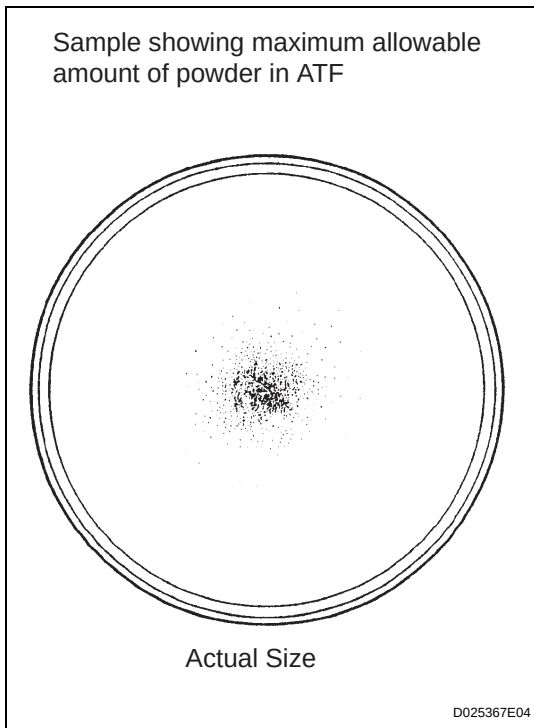
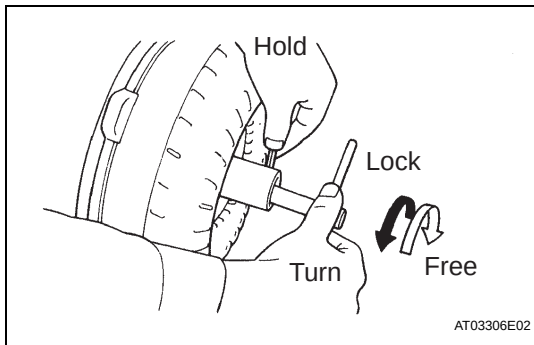


TORQUE CONVERTER AND DRIVE PLATE

INSPECTION

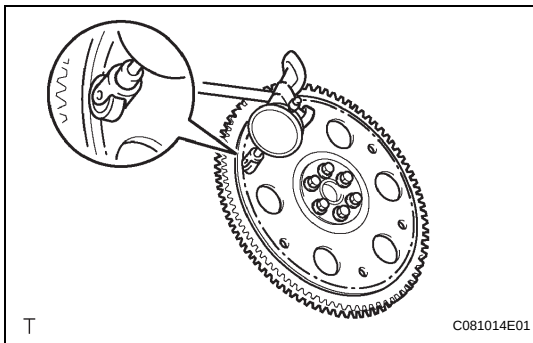
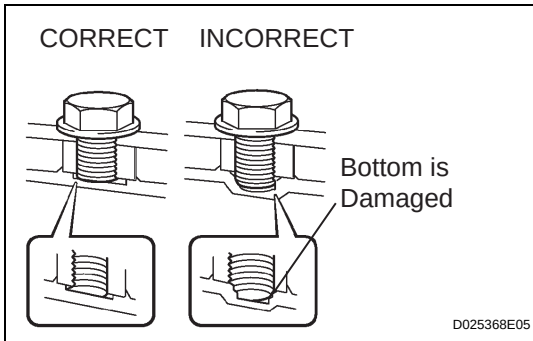
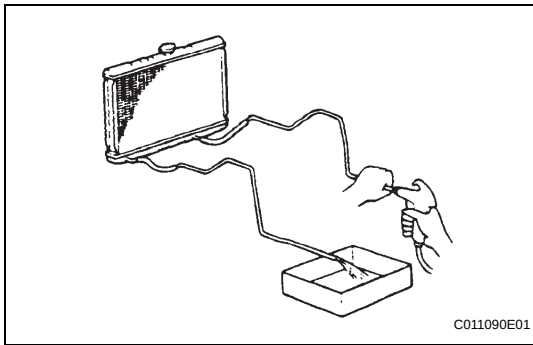
1. INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

- (a) Inspect the one-way clutch.
 - (1) Install SST to the inner race of the one-way clutch.
SST 09350-32014 (09351-32010)
 - (2) Set SST so that it fits in the notch of the converter hub and in the outer race of the one-way clutch.
SST 09350-32014 (09351-32020)
 - (3) With the torque converter standing on its side, check that the clutch locks when SST is turned counterclockwise and rotates freely and smoothly when turned clockwise. 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 on 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 upward.



- (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.
 - Apply compressed air of 196 kPa (2 kgf/cm², 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 DRIVE PLATE AND RING GEAR SUB-ASSEMBLY

- (a) Set up a dial indicator and measure the drive plate runout.

Maximum runout:
0.20 mm (0.0079 in.)

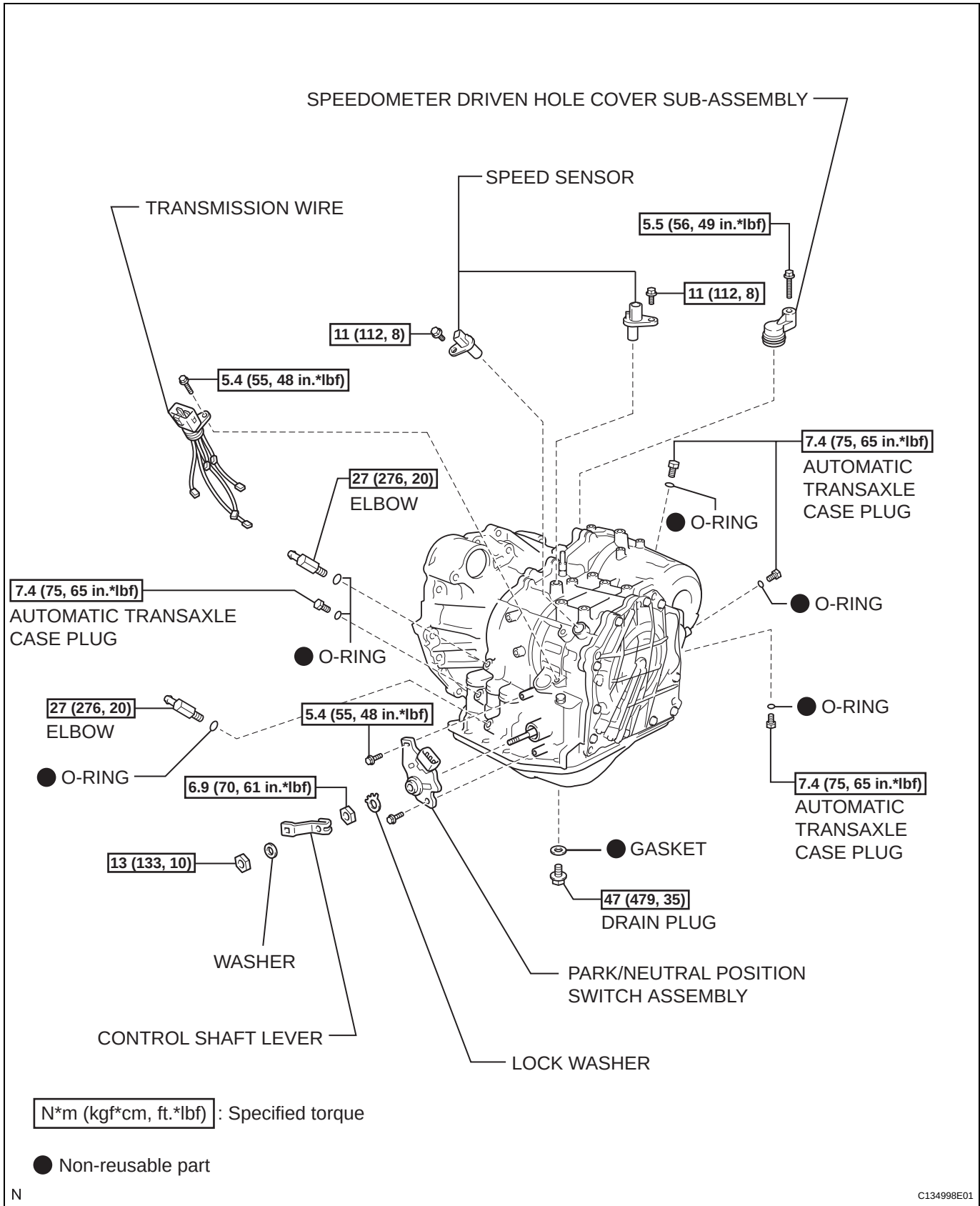
If the runout is greater than the maximum or if the ring gear is damaged, replace the drive plate. If installing a new drive plate, be careful of the orientation of the spacers and tighten the bolts.

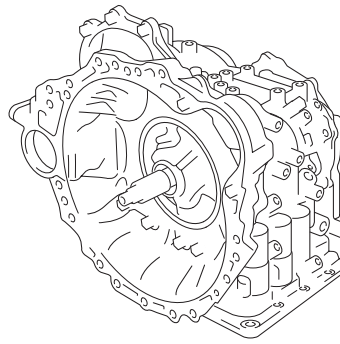
Torque: 98 N*m (999 kgf*cm, 72 ft.*lbf)
- (b) Check the ring gear for any damage.

If the ring gear is damaged, replace the drive plate.

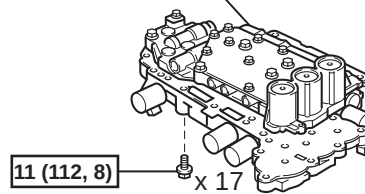
AUTOMATIC TRANSAXLE UNIT

COMPONENTS

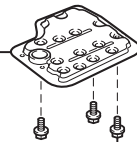




TRANSMISSION VALVE BODY ASSEMBLY

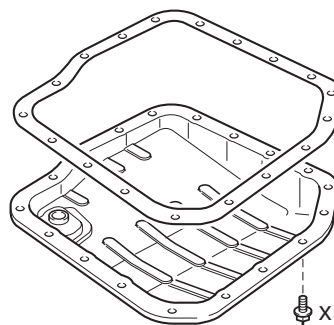


VALVE BODY OIL STRAINER ASSEMBLY



11 (112, 8)

MAGNET

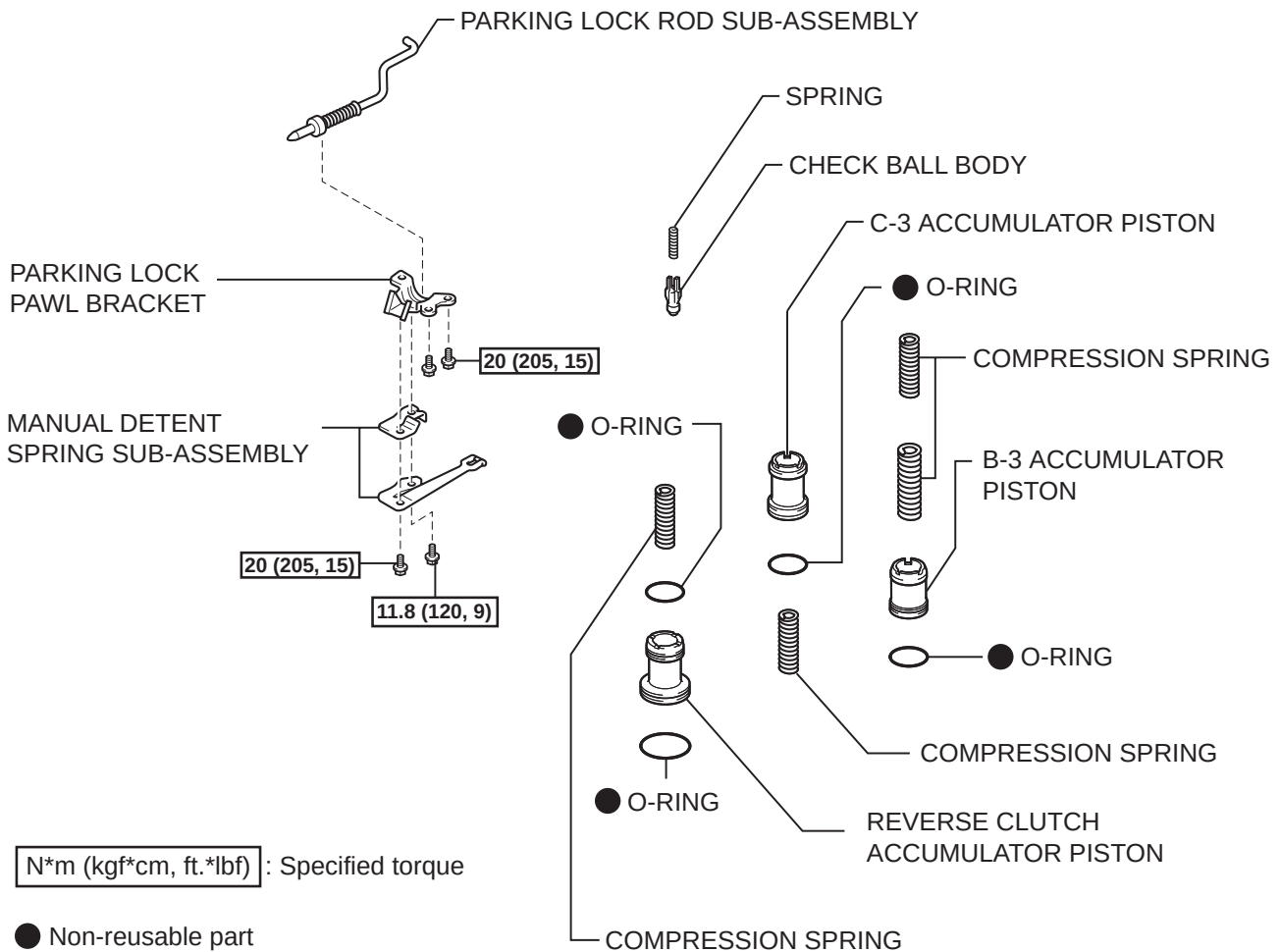
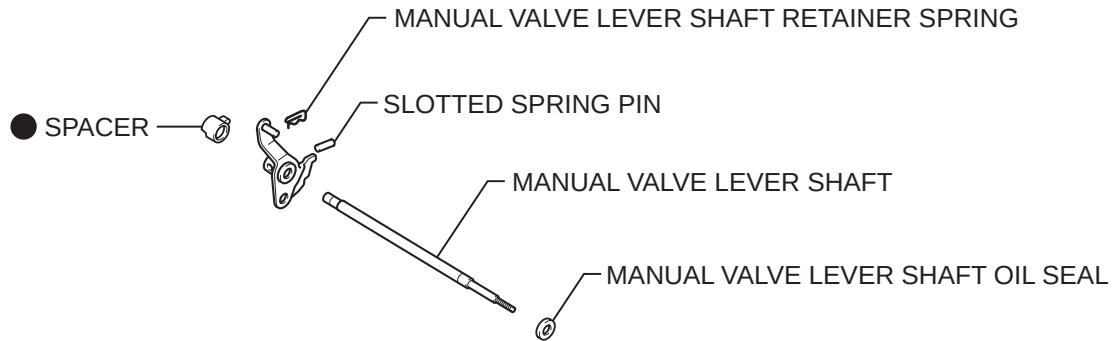
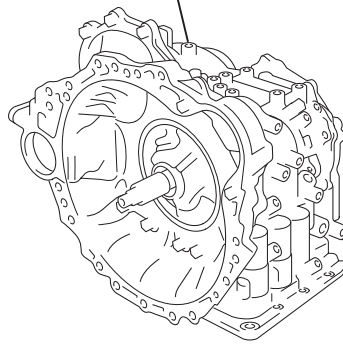
AUTOMATIC TRANSAXLE
OIL PAN SUB-ASSEMBLY

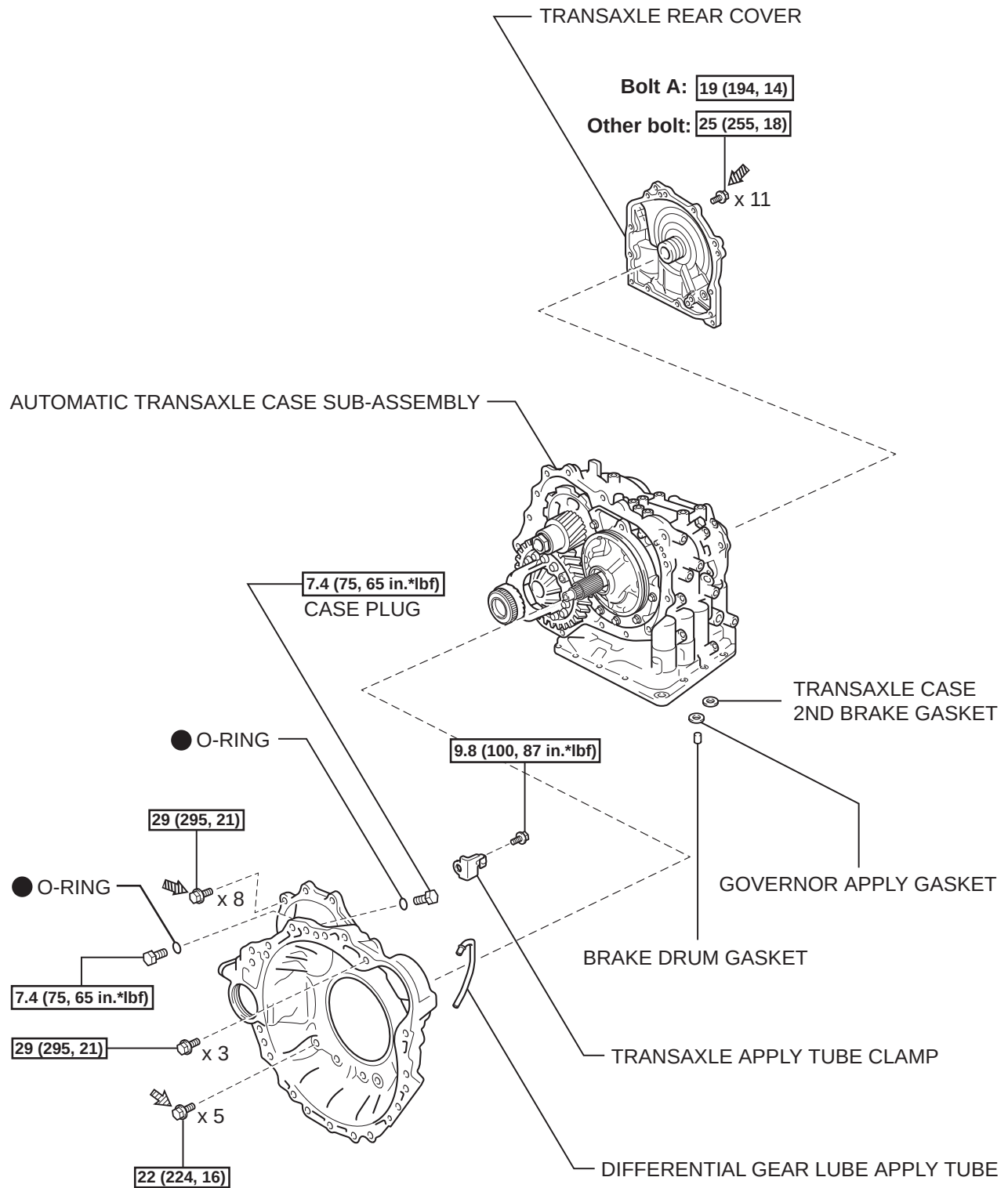
7.6 (77, 67 in.*lbf)

N*m (kgf*cm, ft.*lbf) : Specified torque

● Non-reusable part

AUTOMATIC TRANSAXLE CASE SUB-ASSEMBLY



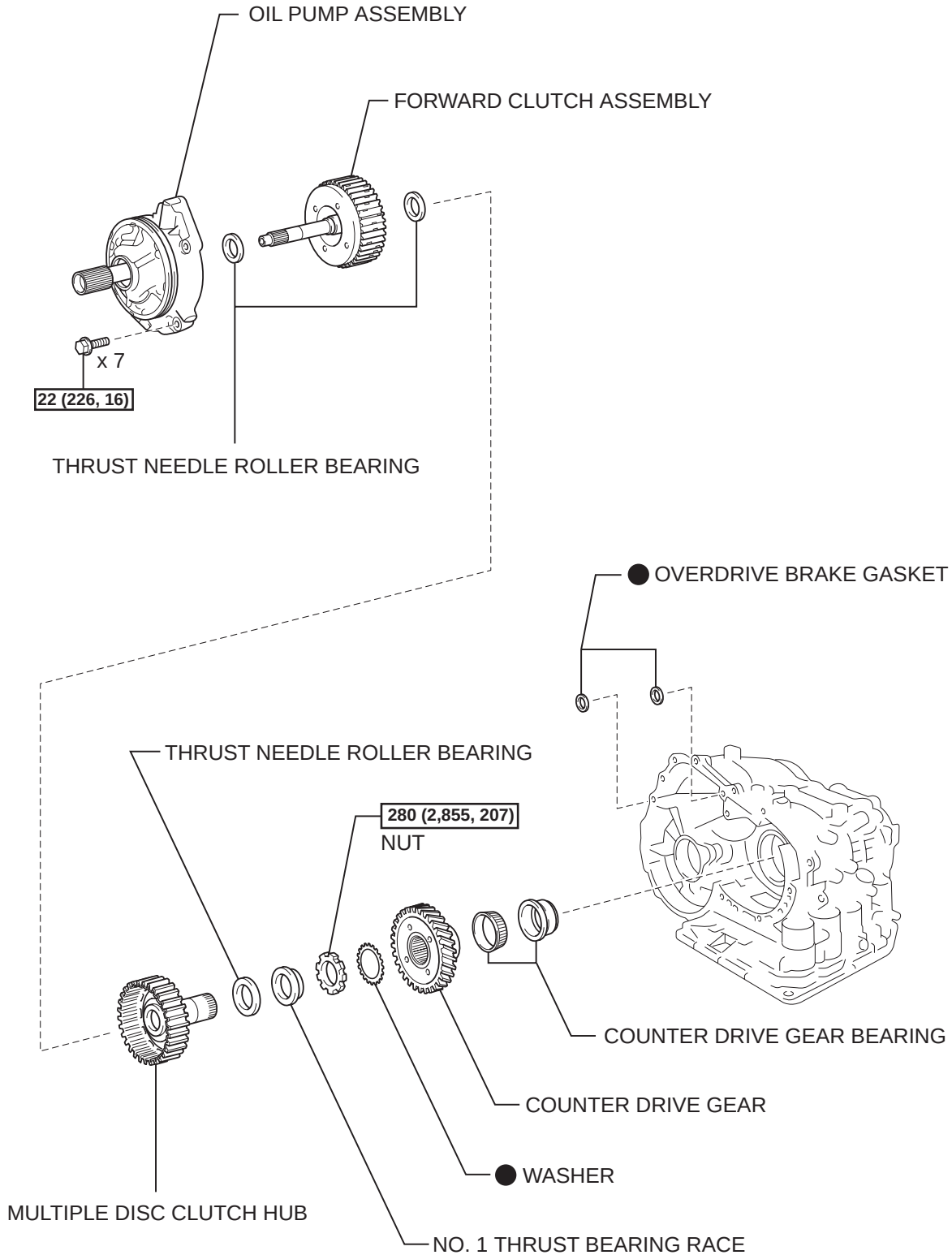


N*m (kgf*cm, ft.*lbf) : Specified torque

● Non-reusable part

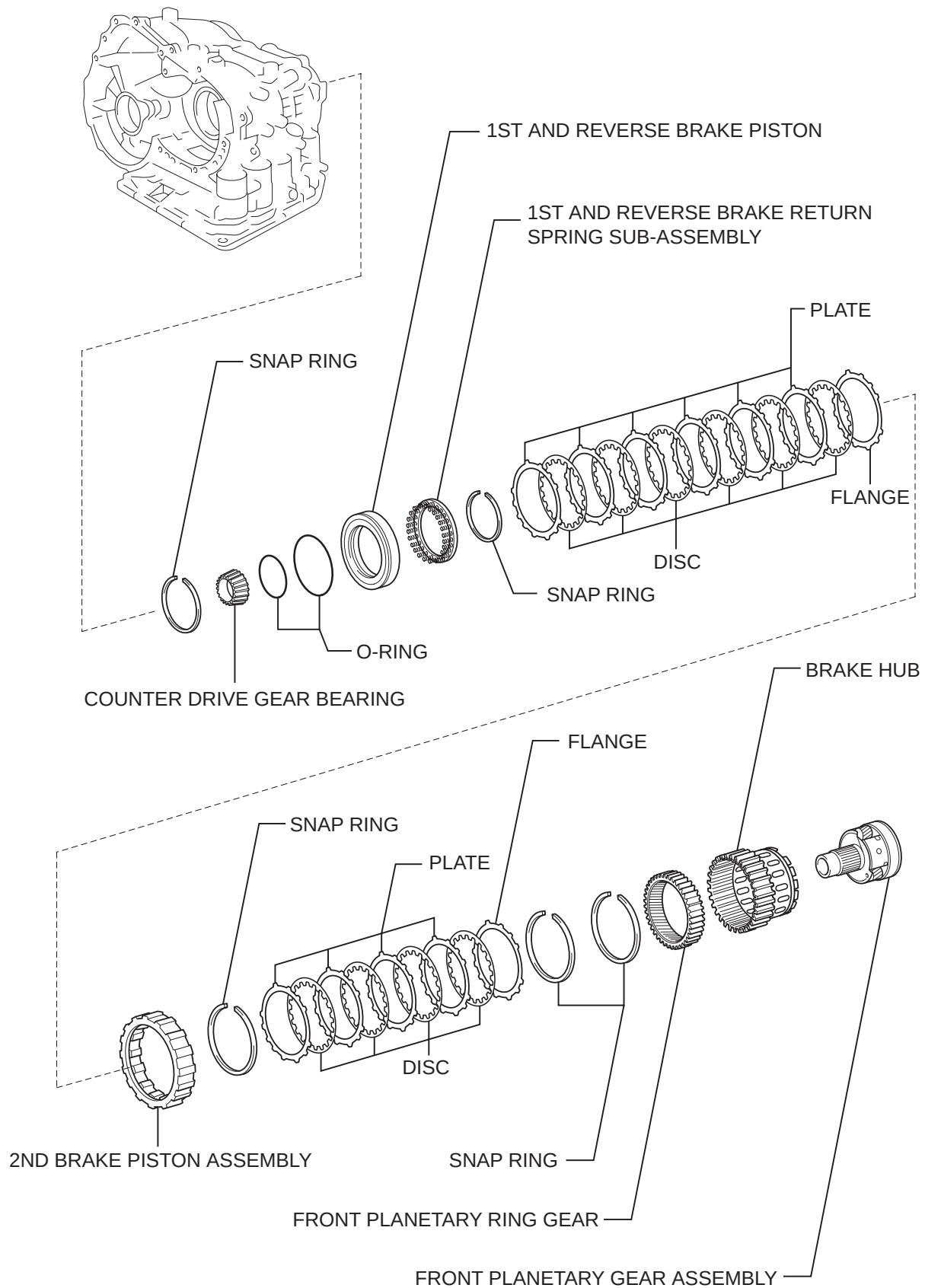
◀ Precoated part

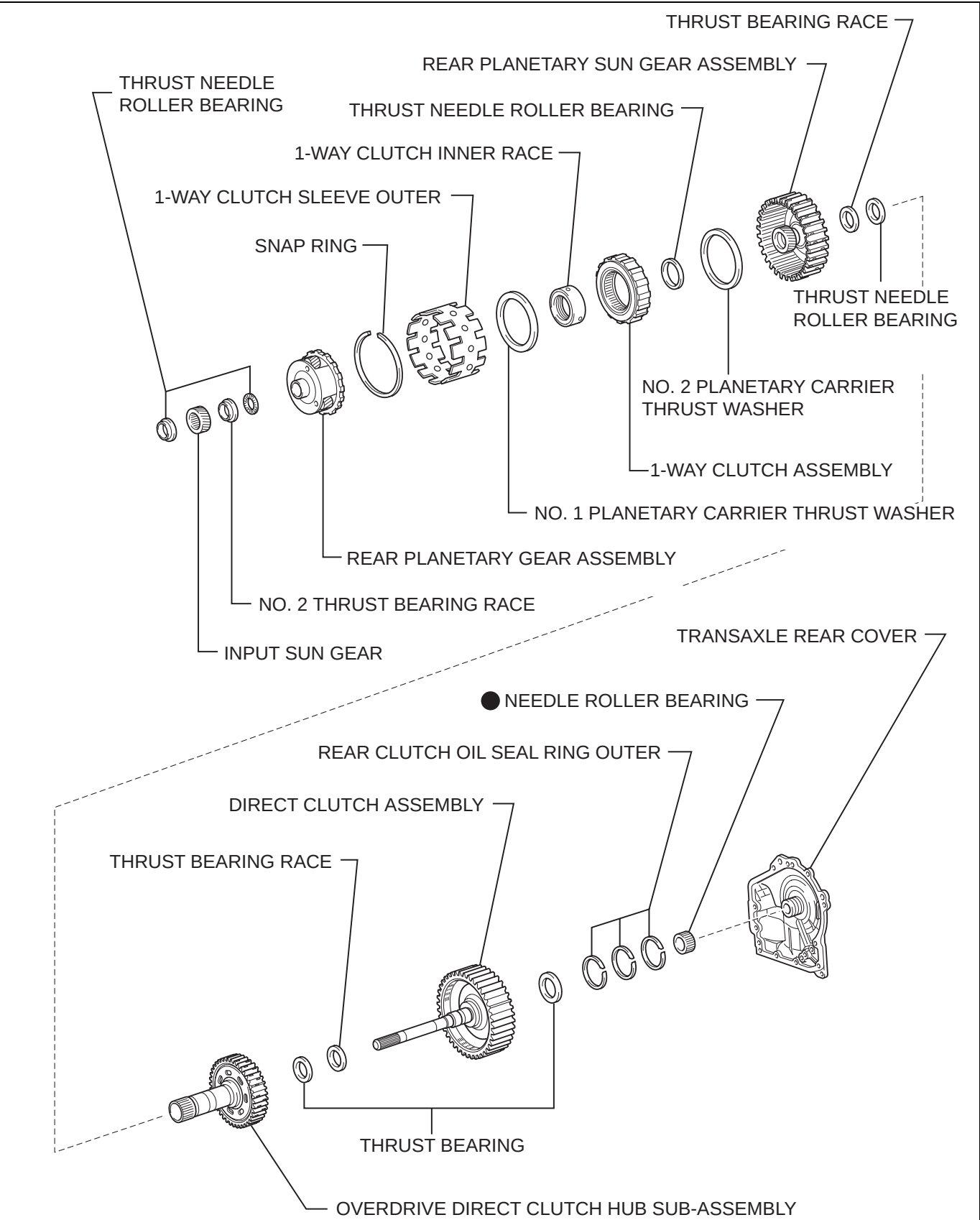
AX

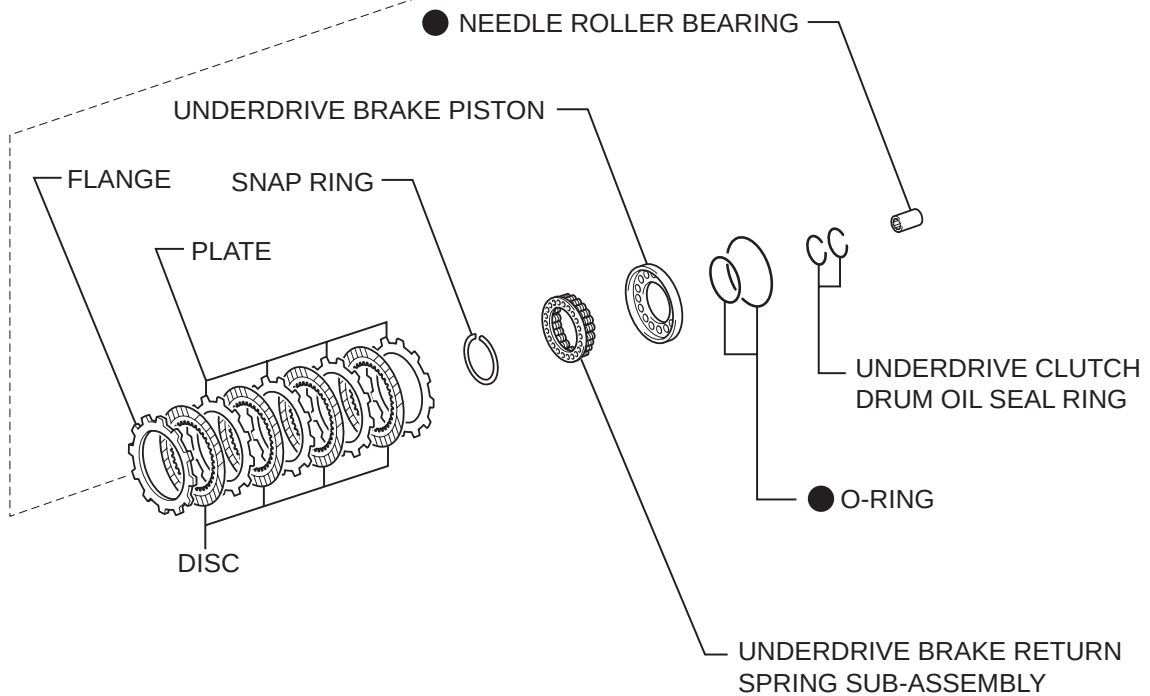
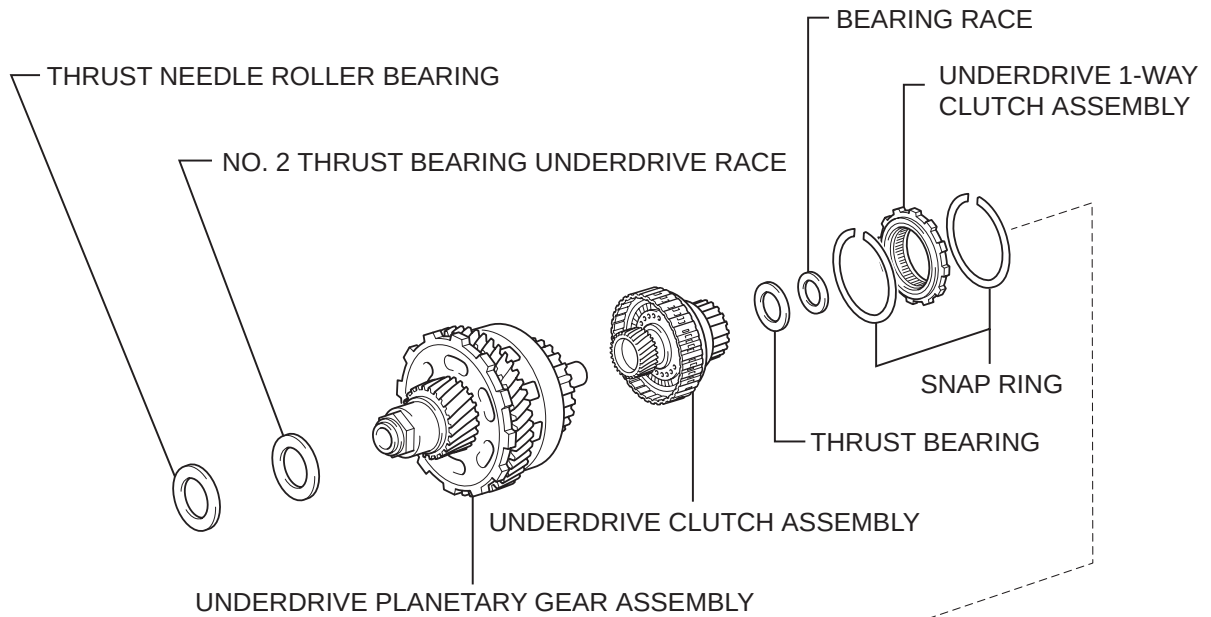


N*m (kgf*cm, ft.*lbf) : Specified torque

● Non-reusable part

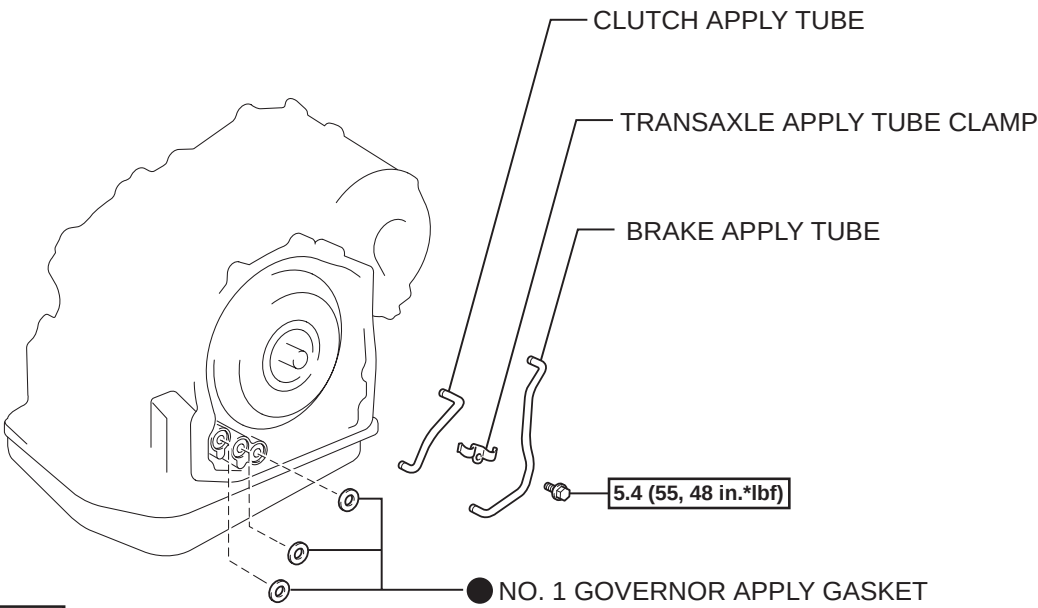
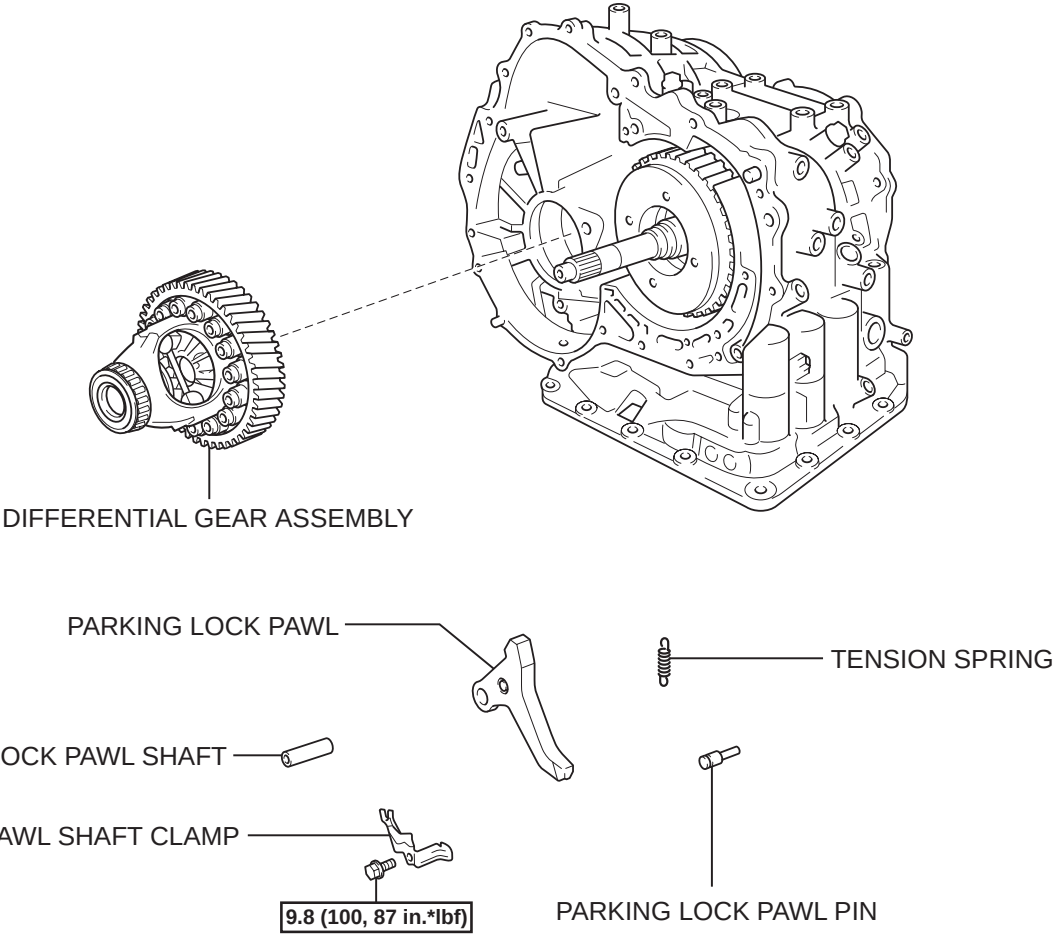






● Non-reusable part

AX

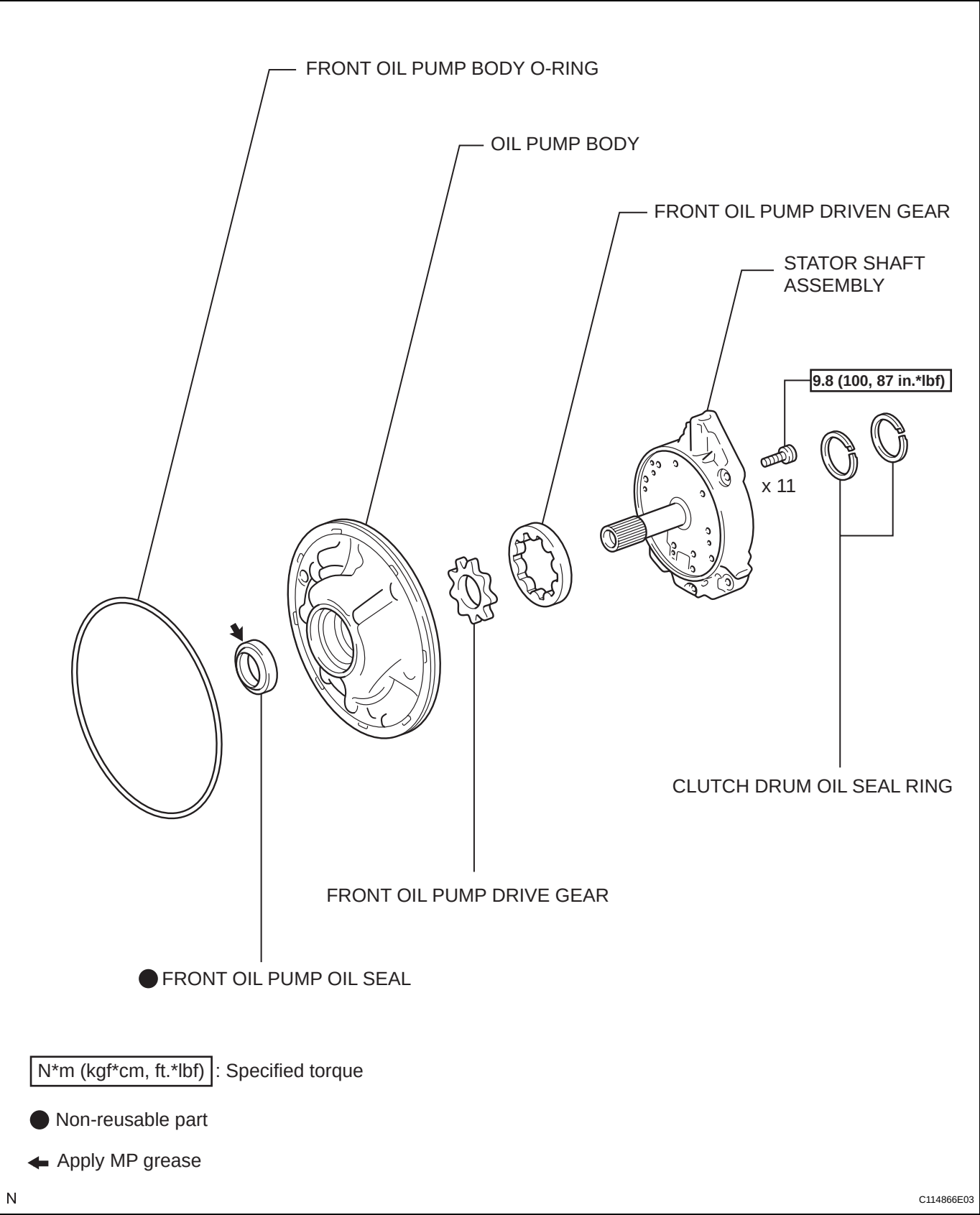


N*m (kgf*cm, ft.*lbf) : Specified torque

● Non-reusable part

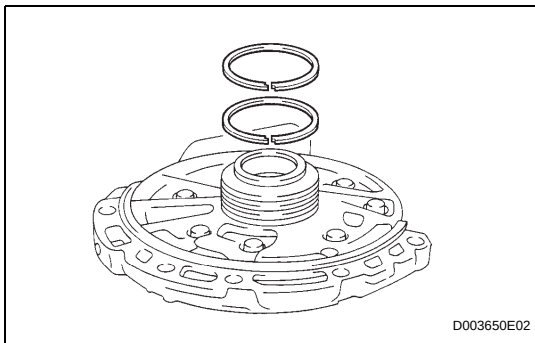
OIL PUMP

COMPONENTS

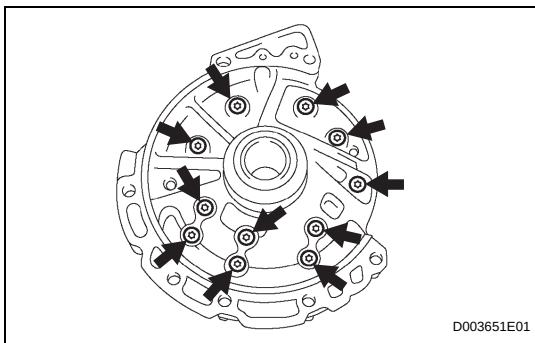


DISASSEMBLY

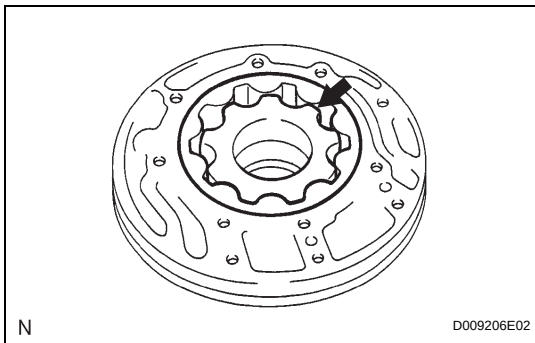
1. INSPECT OIL PUMP ASSEMBLY (See page [AX-246](#))
2. REMOVE CLUTCH DRUM OIL SEAL RING
 - (a) Remove the 2 clutch drum oil seal rings.



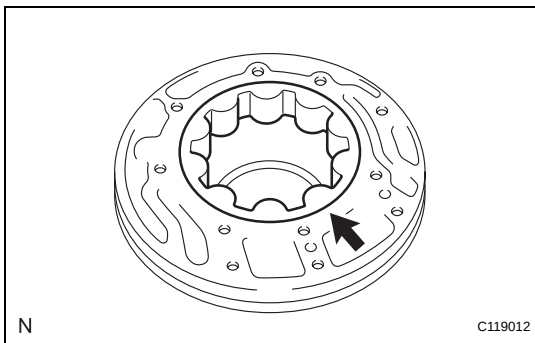
3. REMOVE STATOR SHAFT ASSEMBLY
 - (a) Using a T30 "torx" socket, remove the 11 bolts and stator shaft.
4. INSPECT CLEARANCE OF OIL PUMP ASSEMBLY (See page [AX-246](#))

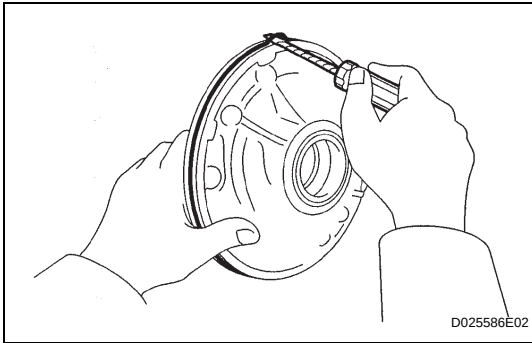


5. REMOVE FRONT OIL PUMP DRIVE GEAR



6. REMOVE FRONT OIL PUMP DRIVEN GEAR



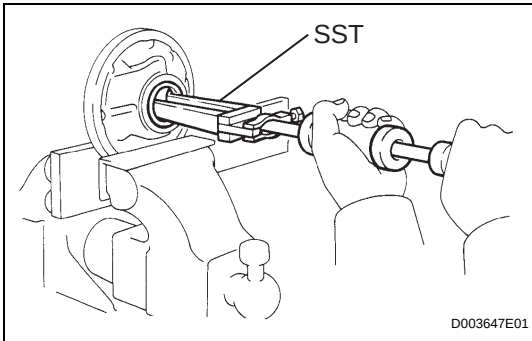


7. REMOVE FRONT OIL PUMP BODY O-RING

- (a) Using a screwdriver, pry out the O-ring.

HINT:

Tape the screwdriver tip before use.

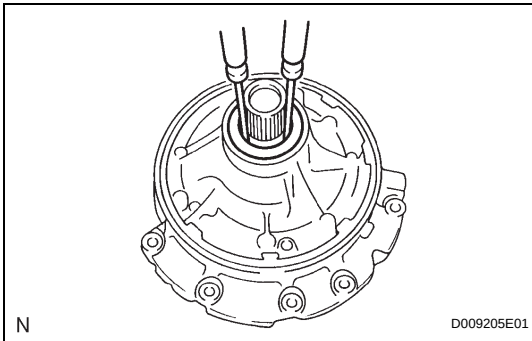


8. REMOVE FRONT OIL PUMP OIL SEAL

- (a) Mount the oil pump in a soft jaw vise.

- (b) Using SST, remove the oil seal from the oil pump body.

SST 09308-00010



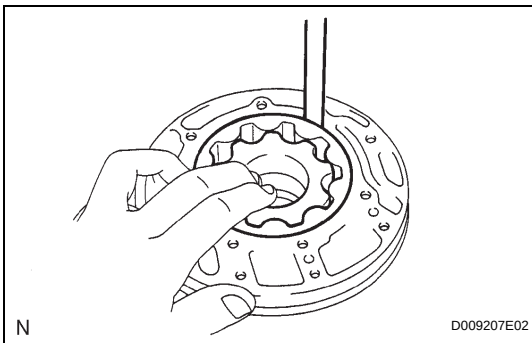
INSPECTION

1. INSPECT OIL PUMP ASSEMBLY

- (a) Turn the drive gear with 2 screwdrivers and make sure that it rotates smoothly.

NOTICE:

Be careful not to damage the lip of the oil seal.



2. INSPECT CLEARANCE OF OIL PUMP ASSEMBLY

- (a) Push the driven gear to one side of the body.
 (b) Using a feeler gauge, measure the body clearance between the driven gear and oil pump body.

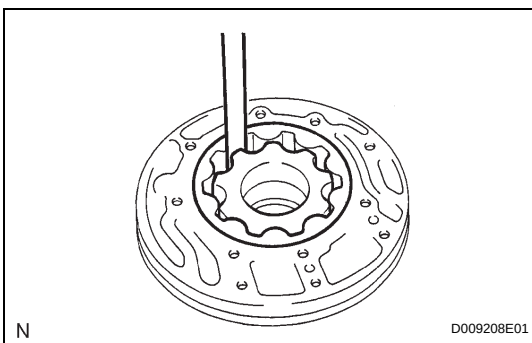
Standard body clearance:

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 the oil pump body sub-assembly.



- (c) Using a feeler gauge, measure the tip clearance between the driven gear teeth and drive gear teeth.

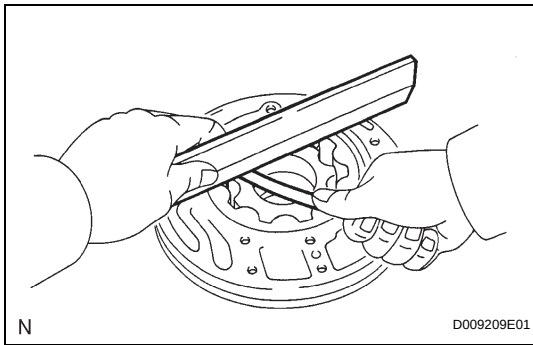
Standard tip clearance:

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 the oil pump body.



- (d) Using a straightedge 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:

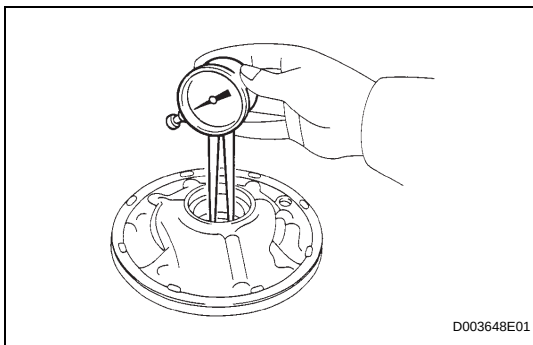
0.05 mm (0.0020 in.)

Standard drive gear thickness

Mark	Thickness
A	11.690 to 11.699 mm (0.4602 to 0.4606 in.)
B	11.700 to 11.709 mm (0.4606 to 0.4610 in.)
C	11.710 to 11.720 mm (0.4610 to 0.4614 in.)
D	11.721 to 11.730 mm (0.4615 to 0.4618 in.)
E	11.731 to 11.740 mm (0.4619 to 0.4622 in.)

Standard driven gear thickness

Mark	Thickness
A	11.690 to 11.699 mm (0.4602 to 0.4606 in.)
B	11.700 to 11.709 mm (0.4606 to 0.4610 in.)
C	11.710 to 11.720 mm (0.4610 to 0.4614 in.)
D	11.721 to 11.730 mm (0.4615 to 0.4618 in.)
E	11.731 to 11.740 mm (0.4619 to 0.4622 in.)



3. INSPECT FRONT OIL PUMP AND GEAR BODY SUB-ASSEMBLY

- (a) Using a caliper gauge, measure the inside diameter of the oil pump body bushing.

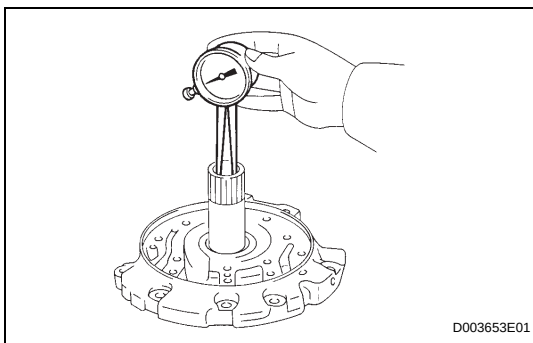
Standard inside diameter:

38.113 to 38.138 mm (1.5005 to 1.5015 in.)

Maximum inside diameter:

38.188 mm (1.5035 in.)

If the inside diameter is greater than the maximum, replace the oil pump body sub-assembly.



4. INSPECT STATOR SHAFT ASSEMBLY

- (a) Using a caliper gauge, measure the inside diameter of the stator shaft.

Standard inside diameter:

21.500 to 21.526 mm (0.8465 to 0.8475 in.)

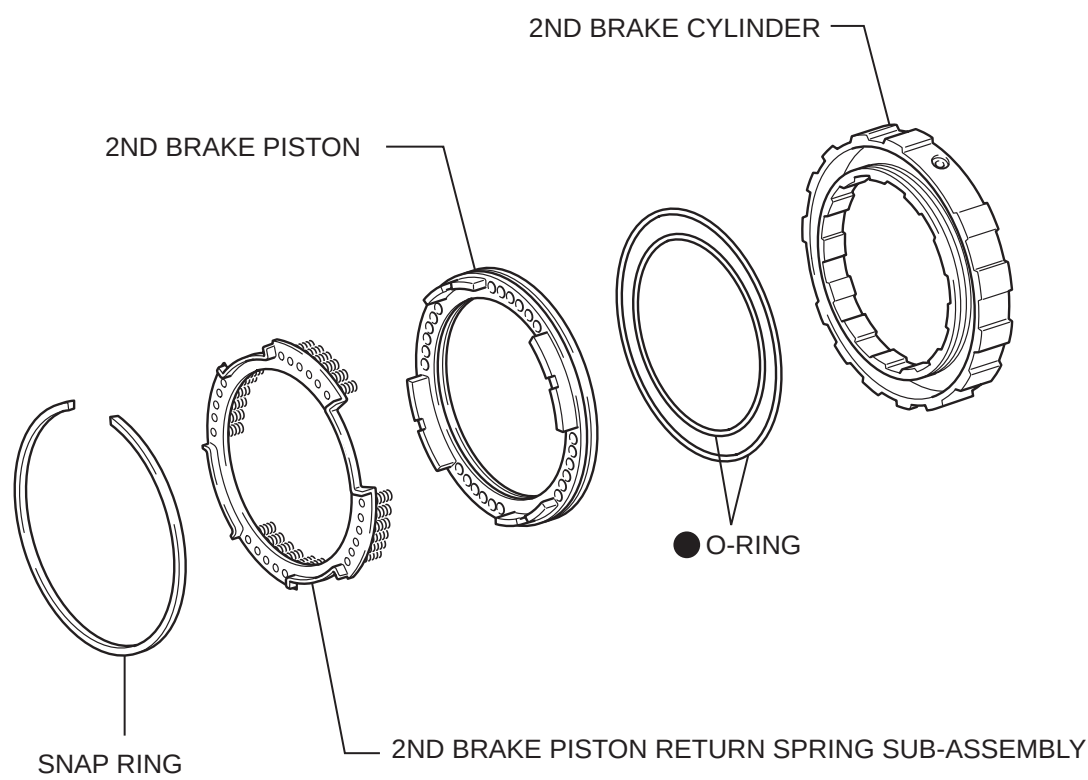
Maximum inside diameter:

21.57 mm (0.8492 in.)

If the inside diameter is greater than the maximum, replace the stator shaft.

SECOND BRAKE PISTON

COMPONENTS



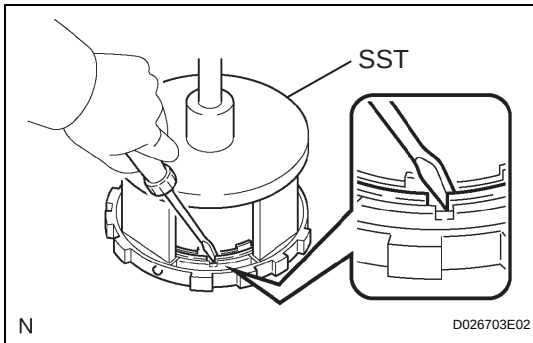
DISASSEMBLY

1. REMOVE 2ND BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

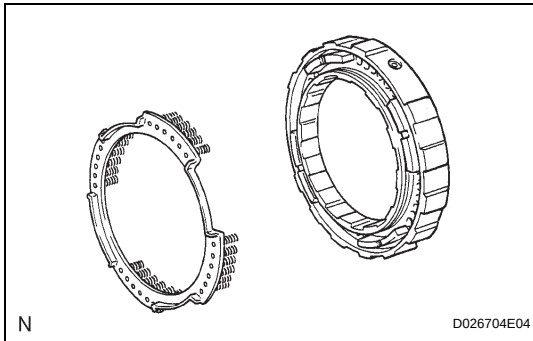
- (a) Place SST on the return spring and compress the return spring with a press.

SST 09387-00060

- (b) Using a screwdriver, remove the snap ring.



- (c) Remove the 2nd brake piston return spring.

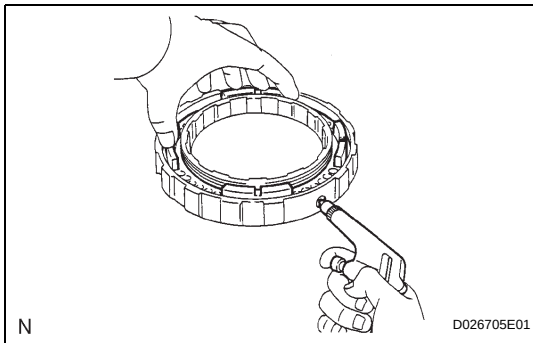


2. REMOVE 2ND BRAKE PISTON

- (a) Hold the 2nd brake piston and apply compressed air (392 kPa, 4.0 kgf/cm², 57 psi) to the 2nd brake cylinder to remove the 2nd brake piston.

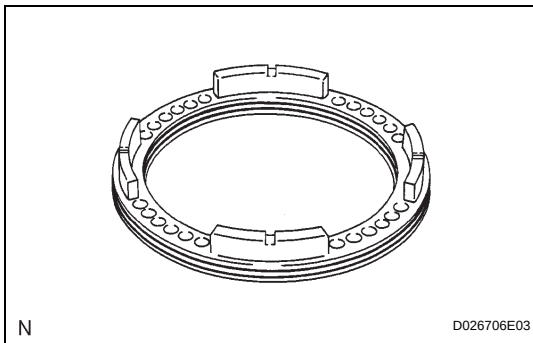
NOTICE:

Hold the piston with a shop rag or a piece of cloth when removing the piston. Failure to do so may result in the piston jumping out from the cylinder.



3. REMOVE 2ND BRAKE PISTON O-RING

- (a) Remove the 2 O-rings from the 2nd brake piston.



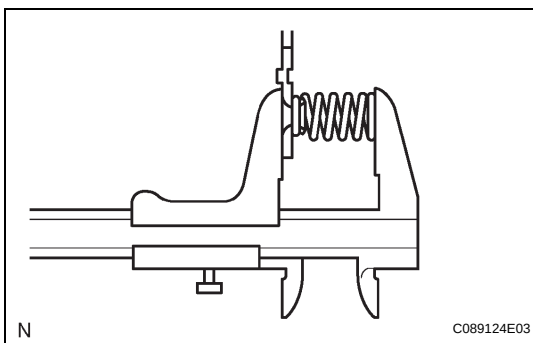
INSPECTION

1. INSPECT 2ND BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

- (a) Using a vernier caliper, measure the free length of the spring together with the spring seat.

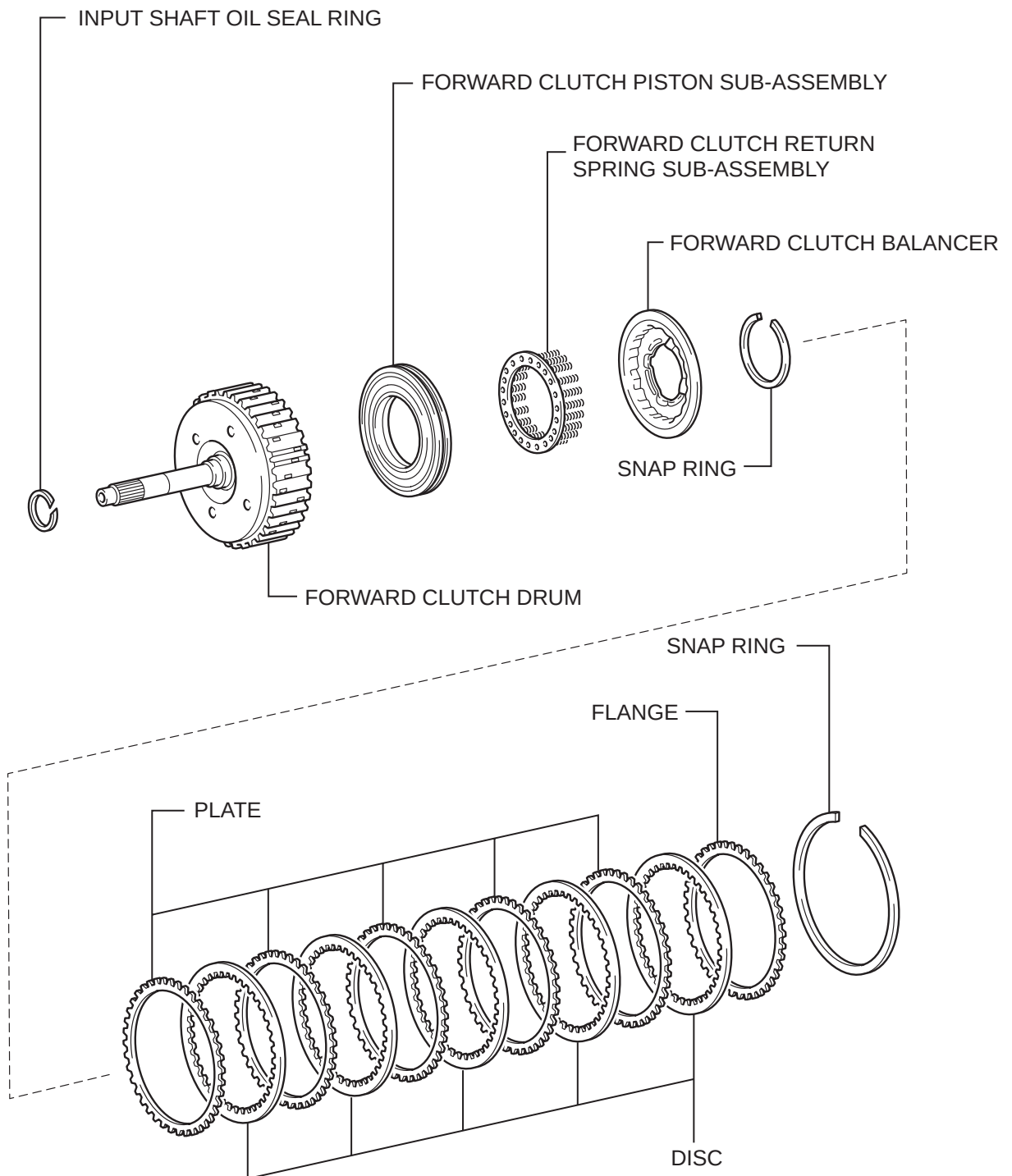
Standard free length:

16.61 mm (0.6539 in.)



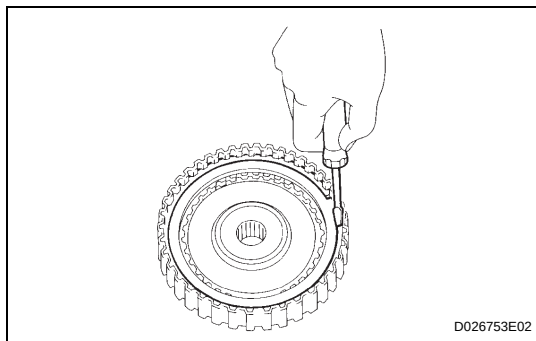
FORWARD CLUTCH

COMPONENTS

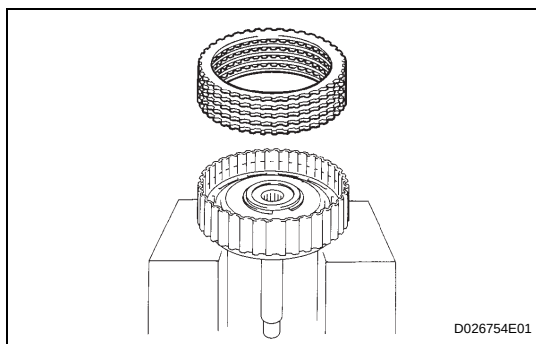


DISASSEMBLY

1. **INSPECT PACK CLEARANCE OF FORWARD CLUTCH** (See page [AX-255](#))
2. **REMOVE FORWARD MULTIPLE DISC CLUTCH DISC**
 - (a) Using a screwdriver, remove the snap ring.



- (b) Remove the flange, 5 discs and 5 plates from the forward clutch drum.



3. **REMOVE FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY**

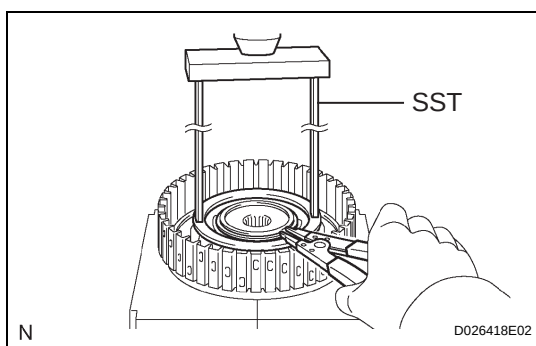
- (a) Place SST on the spring retainer and compress the return spring with a press.

SST 09387-00020

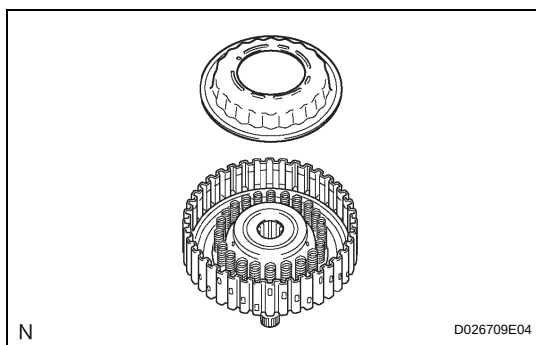
- (b) Using a snap ring expander, remove the snap ring.

NOTICE:

- Stop the press when the spring seat is lowered to a position 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.

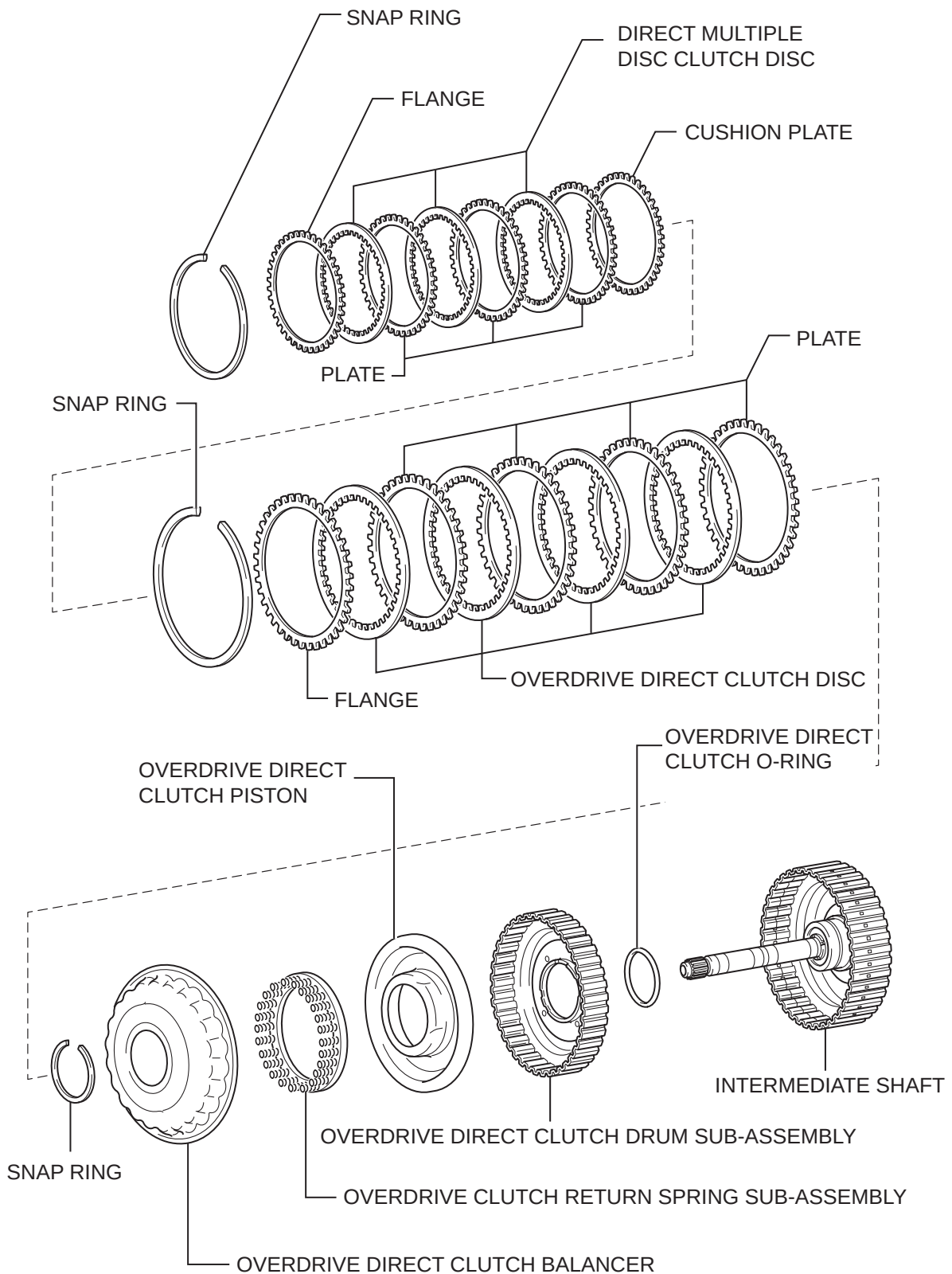


- (c) Remove the clutch balancer from the forward clutch drum.



DIRECT CLUTCH

COMPONENTS



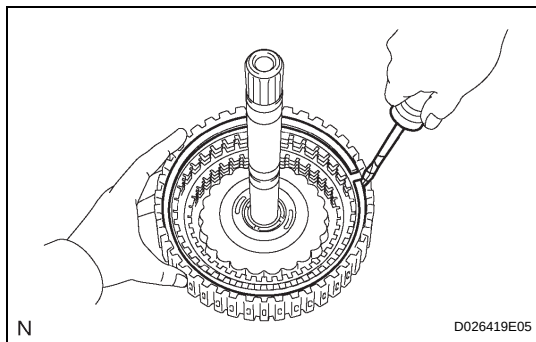
DISASSEMBLY

1. INSPECT PACK CLEARANCE OF REVERSE CLUTCH
(See page [AX-262](#))

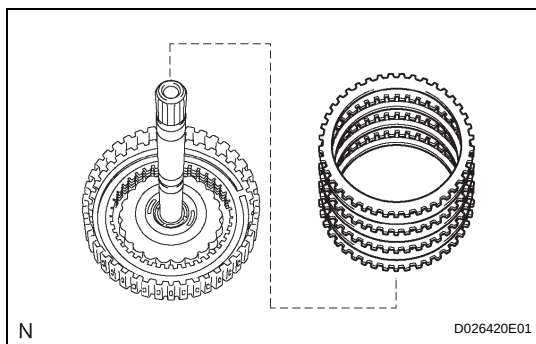
2. INSPECT PACK CLEARANCE OF DIRECT CLUTCH AND OVERDRIVE CLUTCH (See page [AX-262](#))

3. REMOVE DIRECT MULTIPLE DISC CLUTCH DISC

- (a) Using a screwdriver, remove the snap ring from the intermediate shaft.

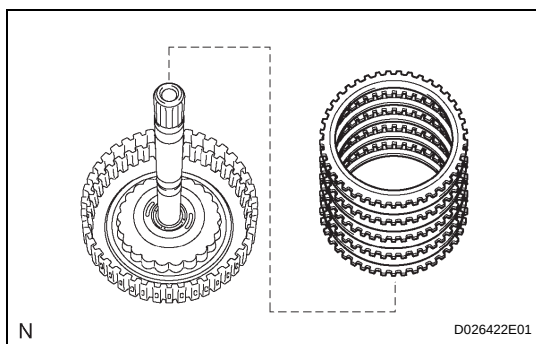


- (b) Remove the flange, 3 discs, 3 plates and cushion plate from the intermediate shaft.



4. REMOVE OVERDRIVE DIRECT CLUTCH DISC

- (a) Using a screwdriver, remove the snap ring from the intermediate shaft.
- (b) Remove the flange, 4 discs and 4 plates from the intermediate shaft.



5. REMOVE OVERDRIVE CLUTCH RETURN SPRING SUB-ASSEMBLY

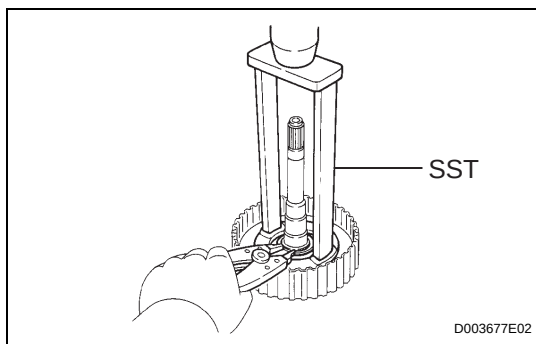
- (a) Place SST on the clutch balancer and compress the spring with a press.

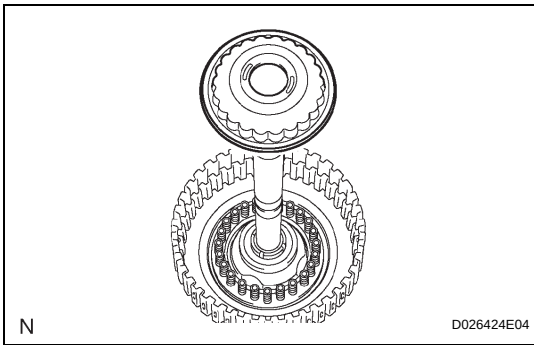
SST 09387-00020

- (b) Using a snap ring expander, remove the snap ring from the direct clutch drum.

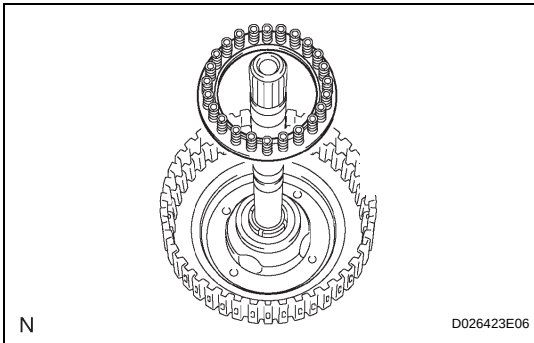
NOTICE:

- Stop the press when the spring seat is lowered to a position 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove. This prevents the spring seat from being deformed.
- Do not expand the snap ring excessively.

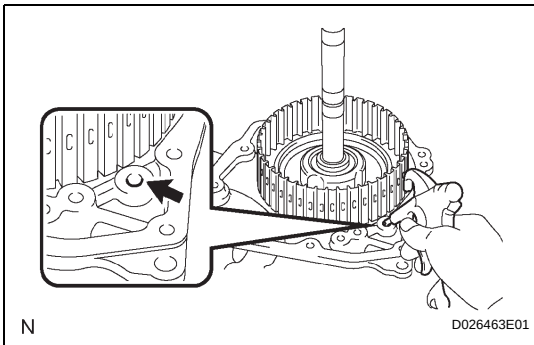




- (c) Remove the clutch balancer from the direct clutch drum.

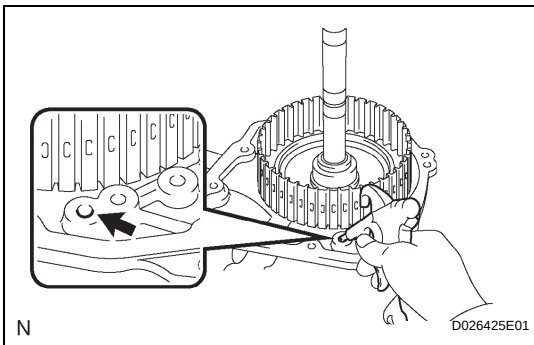


- (d) Remove the overdrive clutch return spring from the direct clutch drum.



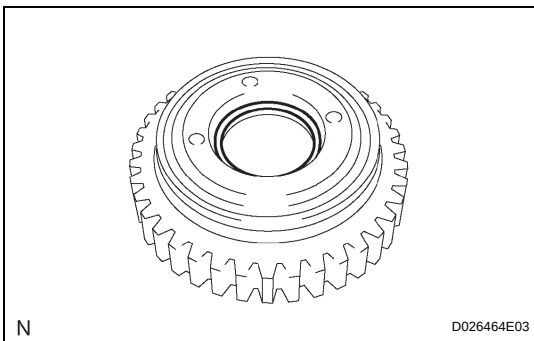
6. REMOVE OVERDRIVE DIRECT CLUTCH PISTON

- (a) Install the intermediate shaft on the transaxle rear cover.
- (b) Holding the direct clutch piston with your hand, apply compressed air (392 kPa, 4.0 kgf/cm², 57 psi) to the transaxle rear cover to remove the direct clutch piston.



7. REMOVE OVERDRIVE DIRECT CLUTCH DRUM SUB-ASSEMBLY

- (a) Holding the direct clutch drum by hand, apply compressed air (392 kPa, 4.0 kgf/cm², 57 psi) to the transaxle rear cover to remove the direct clutch drum.



8. REMOVE OVERDRIVE DIRECT CLUTCH O-RING

- (a) Using a screwdriver, remove the O-ring from the direct clutch drum.

INSPECTION

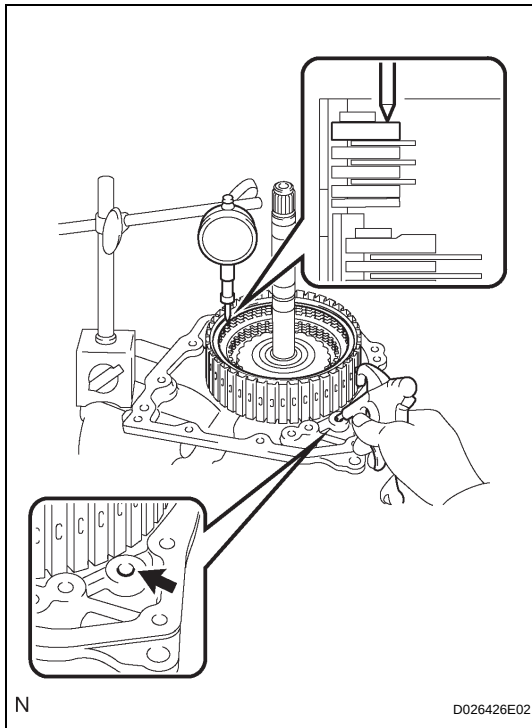
1. INSPECT PACK CLEARANCE OF REVERSE CLUTCH

- Install the intermediate shaft and needle roller bearing onto the transaxle rear cover.
- Using a dial indicator, measure the reverse clutch pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm², 57 psi).

Standard pack clearance:

0.60 to 0.82 mm (0.0236 to 0.0323 in.)

If the pack clearance is not as specified, inspect the discs, plates and flange.



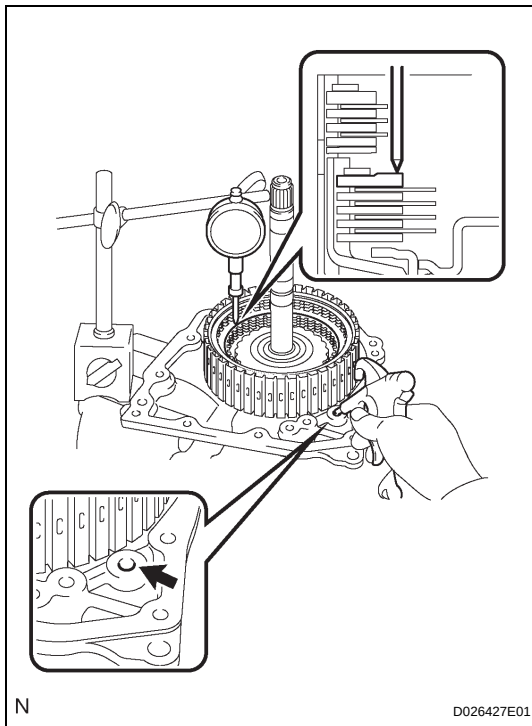
2. INSPECT PACK CLEARANCE OF DIRECT CLUTCH AND OVERDRIVE CLUTCH

- Using a dial indicator, measure the direct clutch and overdrive clutch pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm², 57 psi).

Standard pack clearance:

0.61 to 0.83 mm (0.0240 to 0.0327 in.)

If the pack clearance is not as specified, inspect the discs, plates and flange.

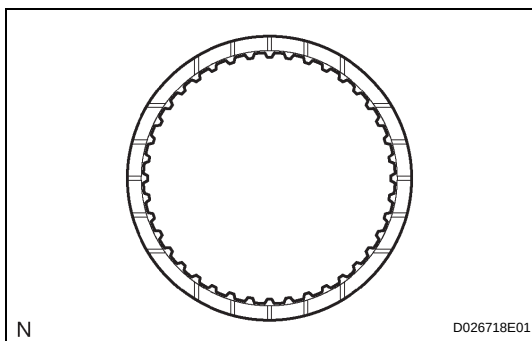


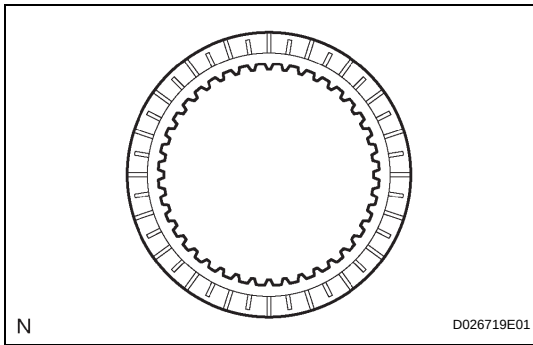
3. INSPECT DIRECT MULTIPLE DISC CLUTCH DISC

- Check if the sliding surfaces of the disc, plate and flange are worn or burnt. If necessary, replace them.

NOTICE:

- If the lining of the disc comes off or is discolored, or if a part of the groove is worn, replace all the discs.
- Before installing new discs, immerse them in ATF for at least 15 minutes.



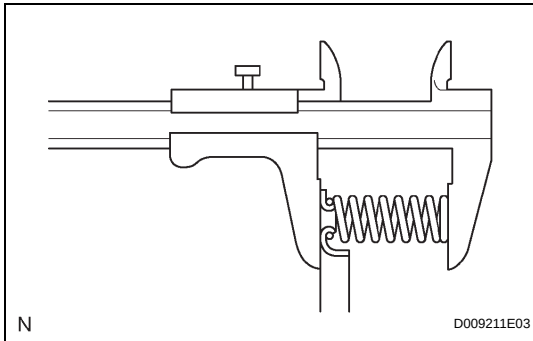


4. INSPECT OVERDRIVE DIRECT CLUTCH DISC

- (a) Check if the sliding surface of the disc, plate and flange are worn or burnt.
If necessary, replace them.

NOTICE:

- If the lining of the disc comes off or is discolored, or if a part of the groove is worn, replace all the discs.
- Before installing new discs, immerse them in ATF for at least 15 minutes.



5. INSPECT OVERDRIVE CLUTCH RETURN SPRING SUB-ASSEMBLY

- (a) Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:

25.91 mm (1.0201 in.)

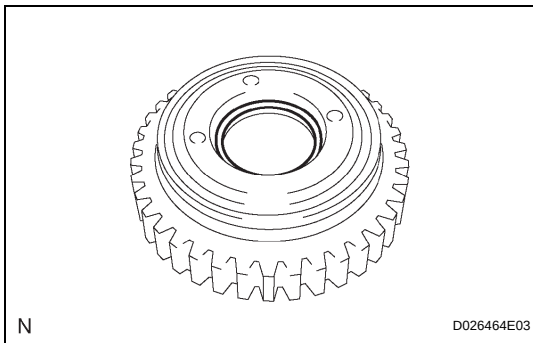
REASSEMBLY

1. INSTALL OVERDRIVE DIRECT CLUTCH O-RING

- (a) Coat the O-ring with ATF, and install it to the direct clutch drum.

NOTICE:

Make sure that the O-ring is not twisted or pinched when it is installed.

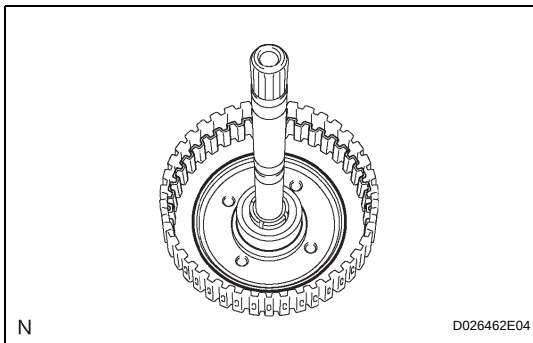


2. INSTALL OVERDRIVE DIRECT CLUTCH DRUM SUB-ASSEMBLY

- (a) Coat the direct clutch drum with ATF, and install it to the intermediate shaft.

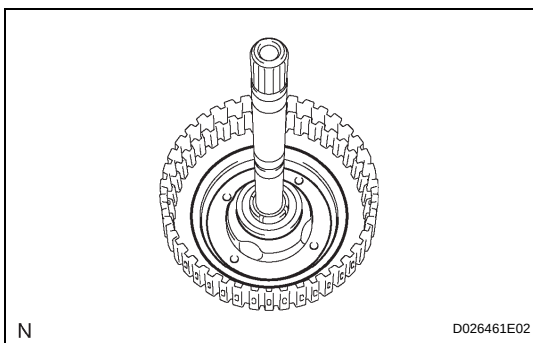
NOTICE:

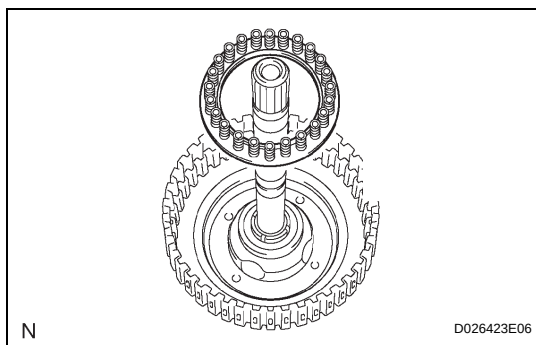
- Be careful not to damage the O-ring.
- Be careful not to damage the lip of the direct clutch drum.



3. INSTALL OVERDRIVE DIRECT CLUTCH PISTON

- (a) Coat the overdrive direct clutch piston with ATF, and install it to the direct clutch drum.





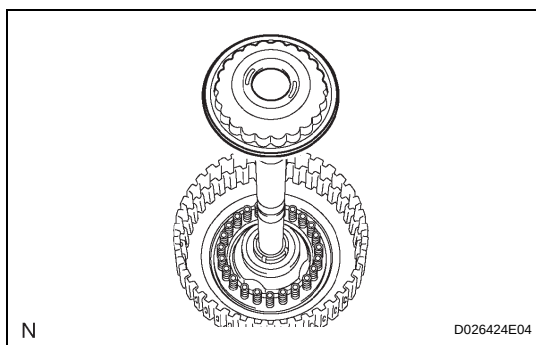
4. INSTALL OVERDRIVE CLUTCH RETURN SPRING SUB-ASSEMBLY

- (a) Install the overdrive clutch return spring to the direct clutch drum.

NOTICE:

After installing the spring sub-assembly, check that all of the springs fit in the piston correctly.

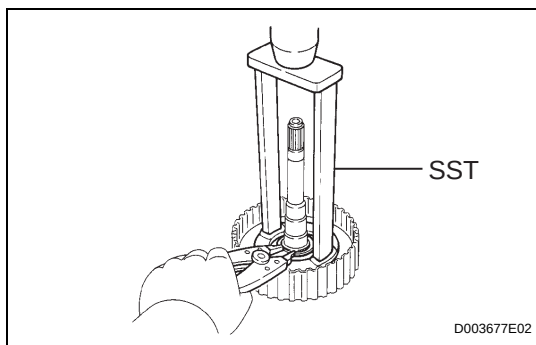
- (b) Coat the clutch balancer with ATF.



- (c) Install the clutch balancer to the direct clutch drum.

NOTICE:

- Be careful not to damage the lip of the direct clutch balancer.
- Make sure that the lip of the seal is not pinched and that it has no other defects.
- Apply sufficient ATF to the sealing lip before installing the clutch balancer.



- (d) Place SST on the clutch balancer and compress the overdrive clutch return spring with a press.

SST 09387-00020

- (e) Using a snap ring expander, install the snap ring to the direct clutch drum.
- (f) Be sure that the end gap of the snap ring is not aligned with the spring retainer claw.

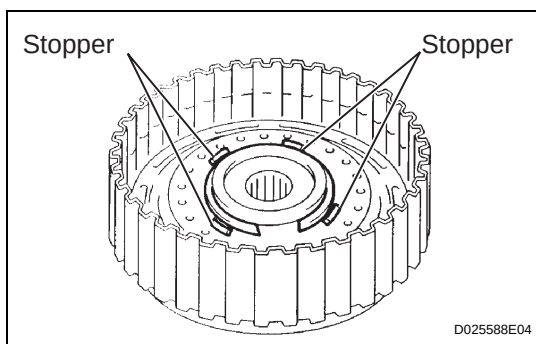
NOTICE:

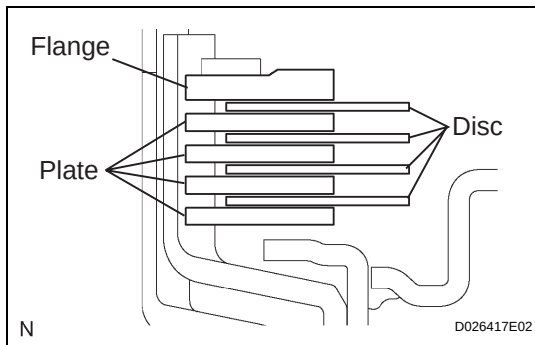
- Stop the press when the spring seat is lowered to a position 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove. This prevents the spring seat from being deformed.
- Do not expand the snap ring excessively.

- (g) Set the end gap of the snap ring in the piston shown in the illustration.

NOTICE:

The end gap of the snap ring should not align with any of the stoppers.



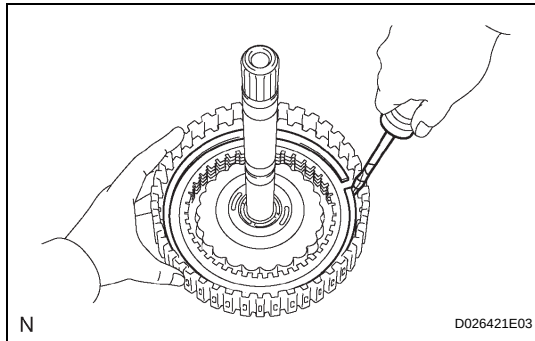


5. INSTALL OVERDRIVE DIRECT CLUTCH DISC

- (a) Coat the 4 discs with ATF.
- (b) Install the 4 plates, 4 discs and flange to the intermediate shaft.

NOTICE:

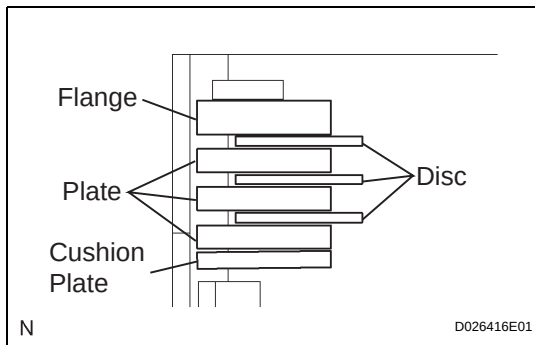
Make sure that the plates, discs and flange are installed as shown in the illustration.



- (c) Using a screwdriver, install the snap ring.
- (d) Check that the end gap of the snap ring is not aligned with one of the cutouts.

NOTICE:

The snap ring should be fully engaged in the groove of the drum.

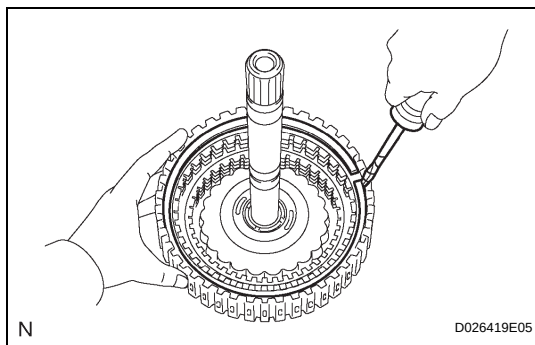


6. INSTALL DIRECT MULTIPLE DISC CLUTCH DISC

- (a) Coat the 3 discs with ATF.
- (b) Install the cushion plate, 3 plates, 3 discs and flange to the intermediate shaft.

NOTICE:

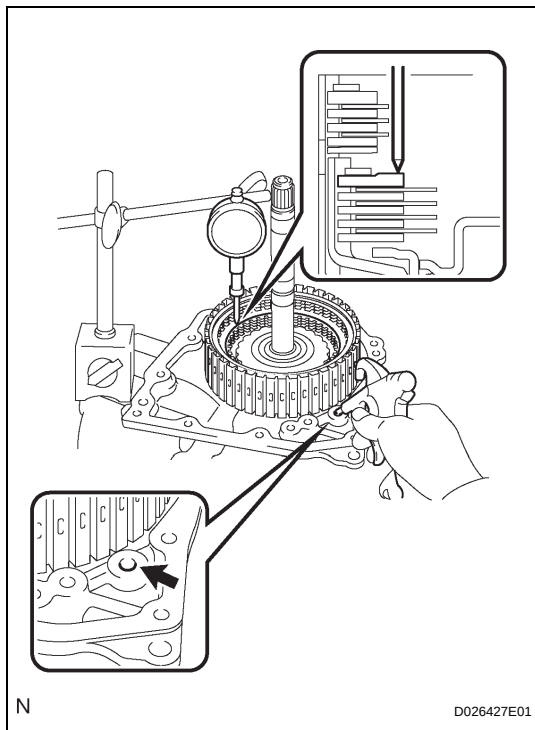
- Install the cushion plate with the mark on the white surface facing towards the plate.
- Be careful of the order of cushion plate discs, plate and flange.



- (c) Using a screwdriver, install the snap ring.
- (d) Check that the end gap of the snap ring is not aligned with one of the cutouts.

NOTICE:

The snap ring should be fully engaged in the groove of the drum.



7. INSPECT PACK CLEARANCE OF DIRECT CLUTCH AND OVERDRIVE CLUTCH

- (a) Using a dial indicator, measure the direct clutch and overdrive clutch pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm², 57 psi).

Standard pack clearance:

0.61 to 0.83 mm (0.0240 to 0.0327 in.)

If the pack clearance is less than the minimum, parts may have been assembled incorrectly, so check and reassemble them again. If the clearance is not as specified, select another flange.

HINT:

There are 7 different thicknesses of flanges available.

Standard flange thickness

No.	Thickness	No.	Thickness
0	2.5 mm (0.098 in.)	4	2.9 mm (0.114 in.)
1	2.6 mm (0.102 in.)	5	3.0 mm (0.118 in.)
2	2.7 mm (0.106 in.)	6	3.1 mm (0.122 in.)
3	2.8 mm (0.110 in.)	-	-

8. INSPECT PACK CLEARANCE OF REVERSE CLUTCH

- (a) Install the intermediate shaft onto the transaxle rear cover.
- (b) Using a dial indicator, measure the direct clutch pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm², 57 psi).

Standard clearance:

0.60 to 0.82 mm (0.0236 to 0.0323 in.)

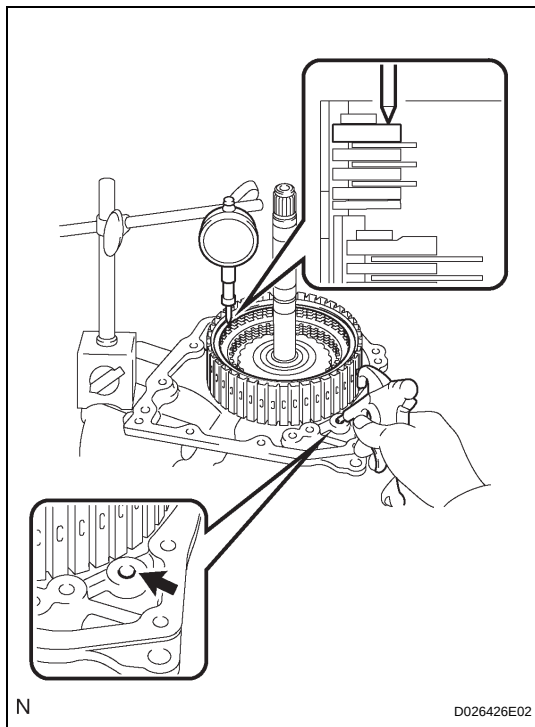
If the pack clearance is less than the minimum, parts may have been assembled incorrectly, so check and reassemble them again. If the clearance is not as specified, select another flange.

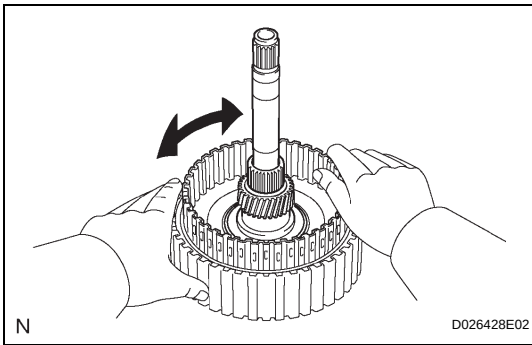
HINT:

There are 7 different thicknesses of flanges available.

Standard flange thickness

No.	Thickness	No.	Thickness
1	3.0 mm (0.118 in.)	5	3.4 mm (0.134 in.)
2	3.1 mm (0.122 in.)	6	3.5 mm (0.138 in.)
3	3.2 mm (0.126 in.)	7	3.6 mm (0.142 in.)
4	3.3 mm (0.130 in.)	-	-



**9. INSPECT DIRECT CLUTCH ASSEMBLY**

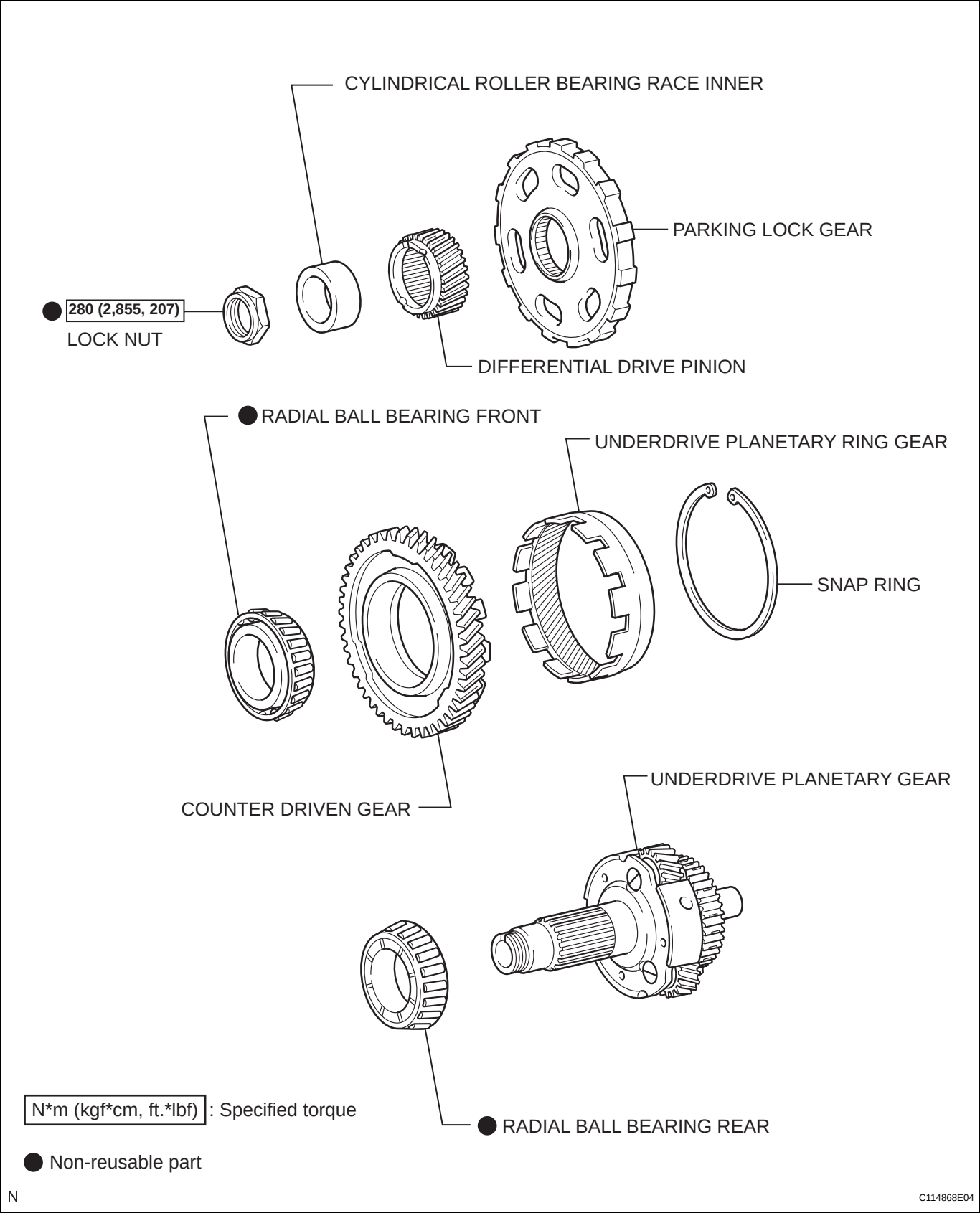
- (a) Check that the disc rotates when rotating the disc after inserting the rear planetary sun gear.

NOTICE:

Do not place the rear planetary sun gear in a vise.

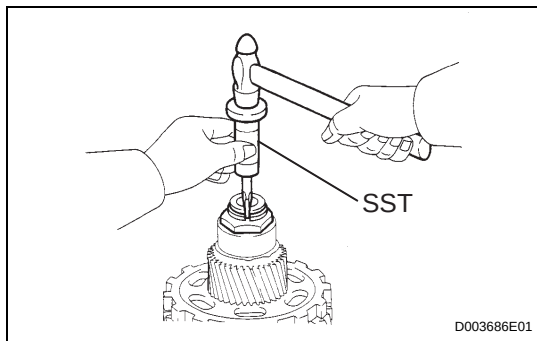
UNDERDRIVE PLANETARY GEAR

COMPONENTS



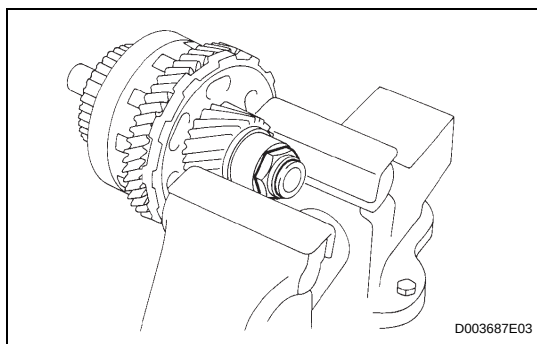
DISASSEMBLY

1. INSPECT UNDERDRIVE PLANETARY GEAR PRELOAD (See page [AX-270](#))



2. REMOVE FRONT PLANETARY GEAR NUT

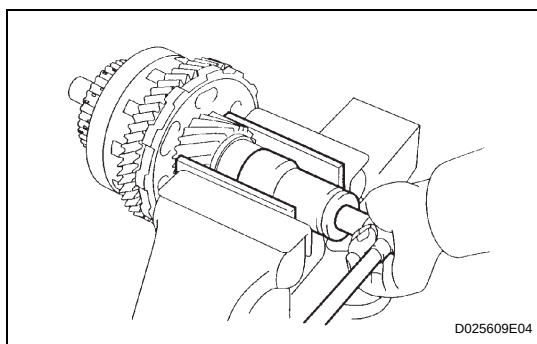
- (a) Using SST, loosen the staked part of the lock nut.
SST 09930-00010 (09931-00010, 09931-00020), 09387-00050



- (b) Place the underdrive planetary gear in a soft jaw vise.

NOTICE:

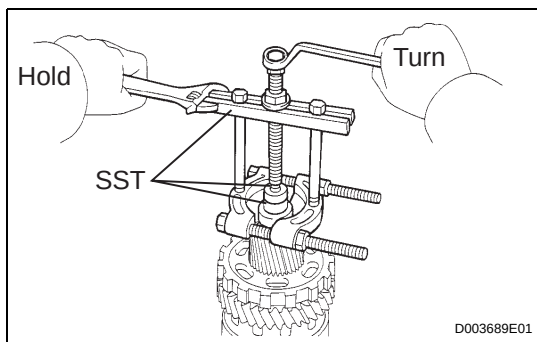
Be careful not to damage the differential drive pinion.

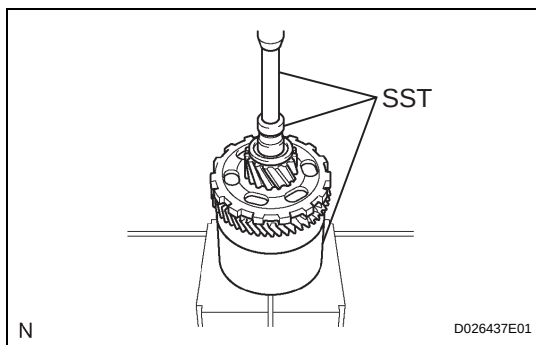


- (c) Using a socket wrench, remove the lock nut.

3. REMOVE CYLINDRICAL ROLLER BEARING RACE INNER

- (a) Using SST, remove the cylindrical roller bearing race inner.
SST 09950-00020, 09950-00030, 09950-60010 (09951-00320, 09957-04010)

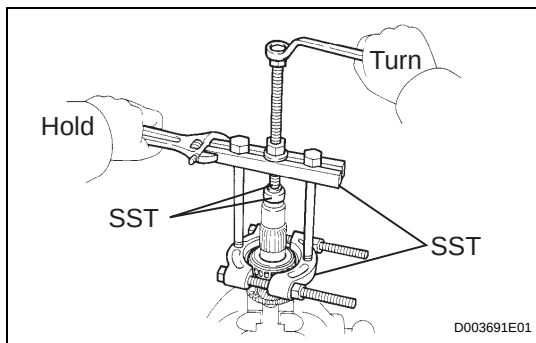




4. REMOVE UNDERDRIVE PLANETARY GEAR ASSEMBLY

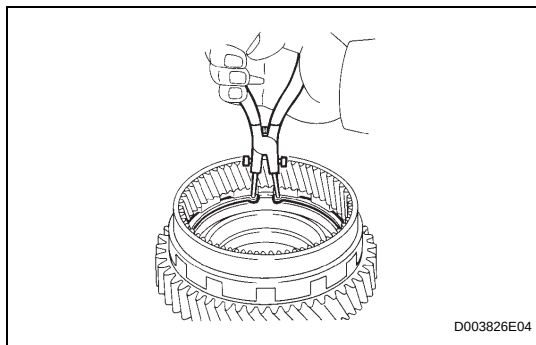
- (a) Using SST and a press, press out the differential drive pinion, parking lock gear, counter driven gear with underdrive planetary ring gear and radial ball bearing front.

SST 09950-60010 (09951-00320), 09387-00050, 09950-00020, 09950-00030, 09950-40011 (09957-04010)



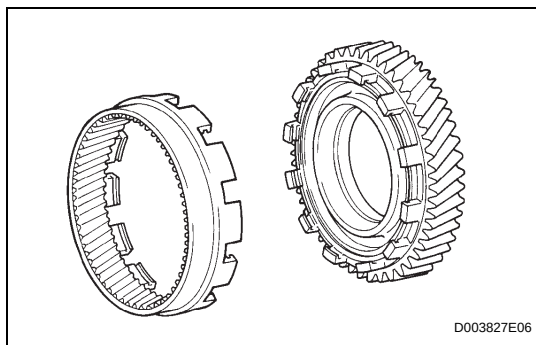
- (b) Place the underdrive planetary gear in a soft jaw vise.
(c) Using SST, remove the radial ball bearing rear from the underdrive planetary gear.

SST 09950-60010 (09951-00320), 09950-00030, 09950-40011 (09957-04010)

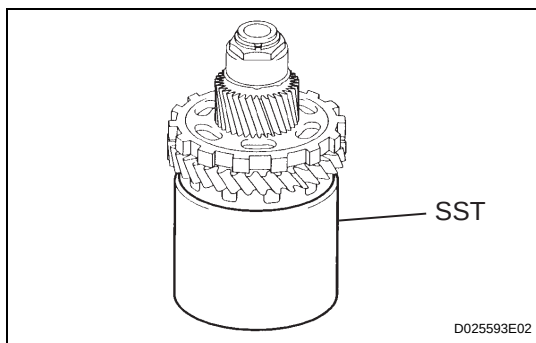


5. REMOVE UNDERDRIVE PLANETARY RING GEAR

- (a) Using snap ring pliers, remove the snap ring.



- (b) Remove the underdrive planetary ring gear from the counter driven gear.

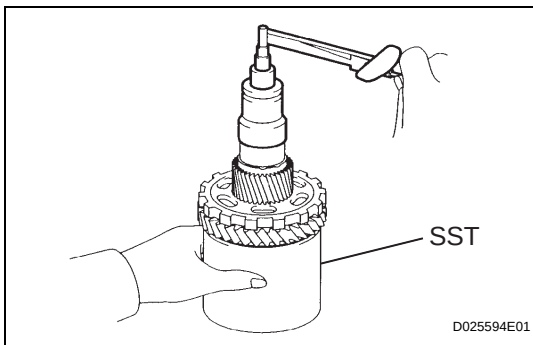


INSPECTION

1. INSPECT UNDERDRIVE PLANETARY GEAR PRELOAD

- (a) Using SST, fix the underdrive planetary gear.

SST 09387-00050



- (b) Using SST and a torque wrench, measure the turning torque of the underdrive planetary gear assembly while rotating the torque wrench at 60 rpm.

SST 09387-00050

Torque: Standard turning torque at 60 rpm

0.50 to 1.42 N*m (5.1 to 14.5 kgf*cm, 4.4 to 12.6 in.*lbf)

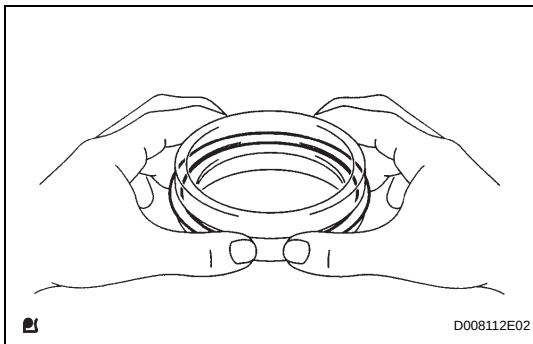
REASSEMBLY

1. INSTALL UNDERDRIVE PLANETARY RING GEAR

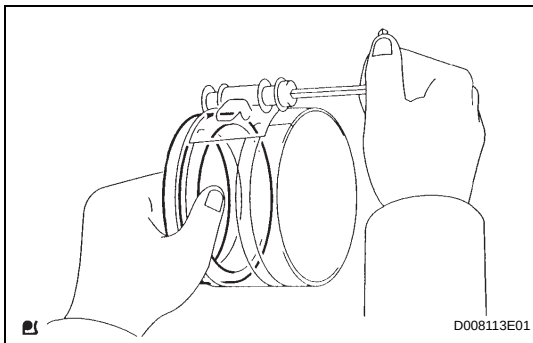
- (a) Install a new snap ring to the outer race of the radial ball bearing rear.

HINT:

When replacing the bearing, also replace the counter driven gear with a new one.



- (b) Using a piston ring compressor, squeeze the snap ring.

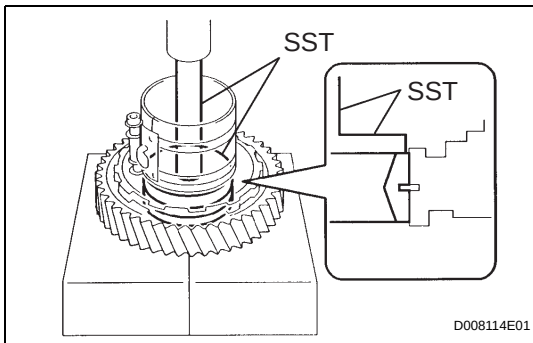


- (c) Using SST and a press, press in the outer race of the radial ball bearing rear.

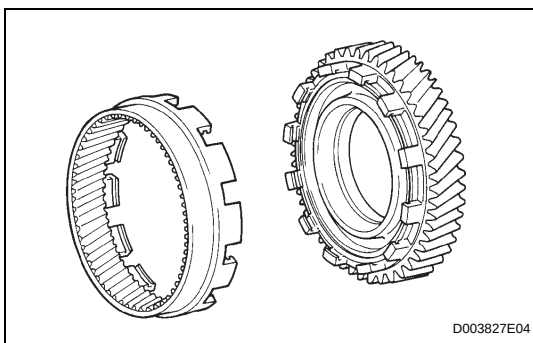
SST 09950-60020 (09951-00890), 09950-70010 (09951-07100)

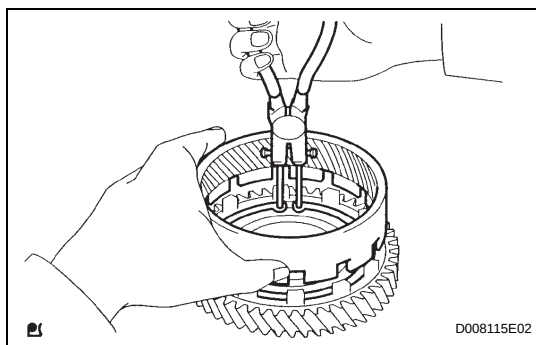
NOTICE:

Be sure not to damage the snap ring during outer race installation.

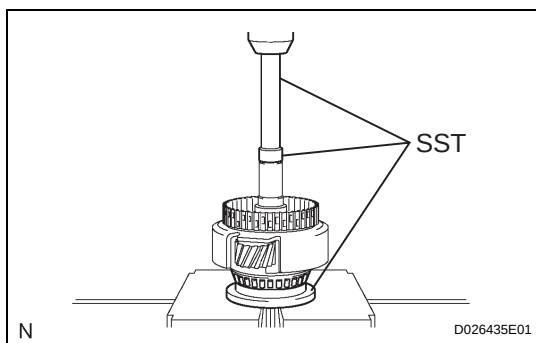


- (d) Install the underdrive planetary ring gear to the counter driven gear.





(e) Using snap ring pliers, install the snap ring.

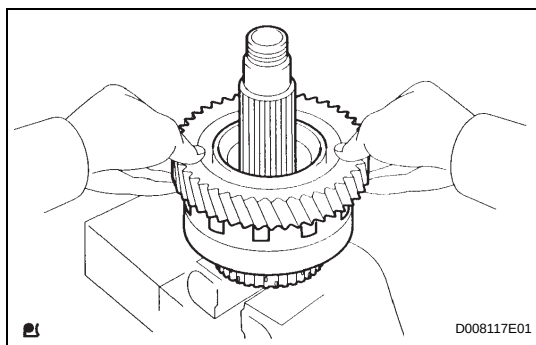


2. INSTALL UNDERDRIVE PLANETARY GEAR ASSEMBLY

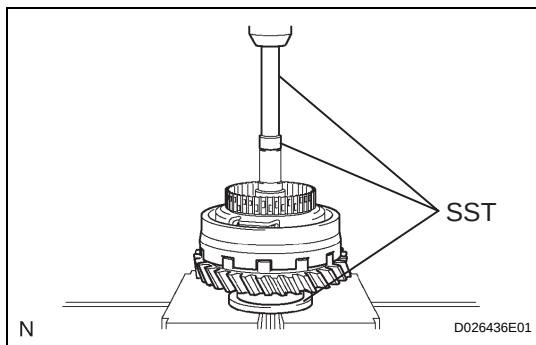
- (a) Using SST and a press, press in the radial ball bearing rear to the underdrive planetary gear.
SST 09502-12010, 09950-60010 (09951-00260), 09950-70010 (09951-07100)

NOTICE:

Press the bearing until it becomes flat at the bottom.



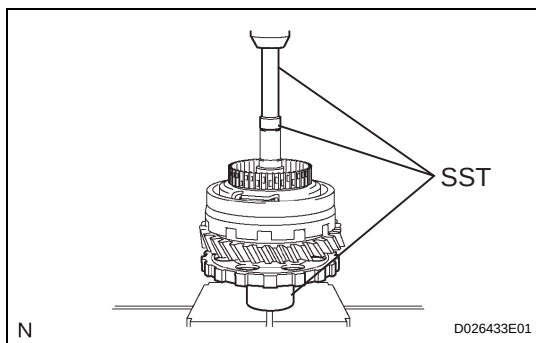
- (b) Install the counter driven gear with planetary ring gear to the underdrive planetary gear.



- (c) Using SST and a press, press in the radial ball bearing front.
SST 09502-12010, 09950-60010 (09951-00260), 09950-70010 (09951-07100)

NOTICE:

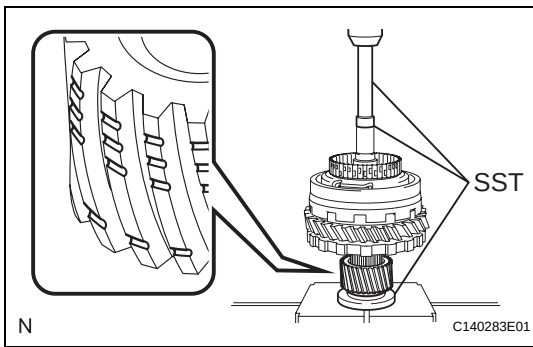
Press the counter driven gear while rotating it.



- (d) Using SST and a press, press in the parking lock gear.
SST 09502-12010, 09950-60010 (09951-00260), 09950-70010 (09951-07100)

NOTICE:

Press the counter driven gear while rotating it.



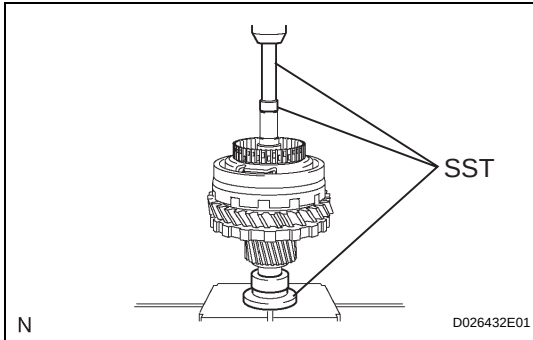
3. INSTALL DIFFERENTIAL DRIVE PINION

- (a) Using SST and a press, press in the differential drive pinion.

SST 09726-40010, 09950-60010 (09951-00260),
09950-70010 (09951-07100)

NOTICE:

- Press the counter driven gear while rotating it.
- Check the position and number of the grooves on each end face of the differential drive pinion gear.



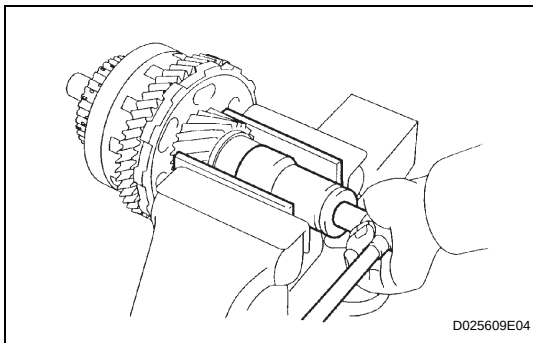
4. INSTALL CYLINDRICAL ROLLER BEARING RACE INNER

- (a) Using SST and a press, press in the cylindrical roller bearing race inner.

SST 09506-35010, 09950-60010 (09951-00260),
09950-70010 (09951-07100)

NOTICE:

Press the counter driven gear while rotating it.



5. INSTALL FRONT PLANETARY GEAR NUT

- (a) Place the underdrive planetary gear in a soft jaw vise.

NOTICE:

Be careful not to damage the differential drive pinion.

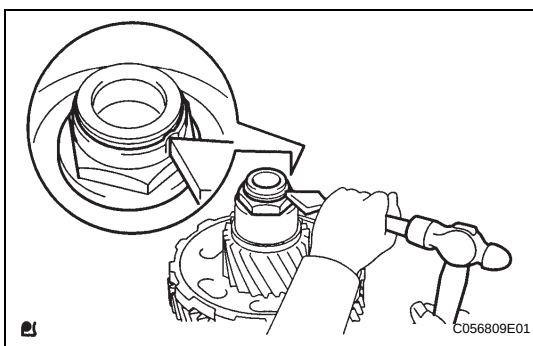
- (b) Using a socket wrench, install a new lock nut.
Torque: 280 N*m (2,885 kgf*cm, 207 ft.*lbf)

- (c) Using a pin punch and hammer, stake the lock nut.

NOTICE:

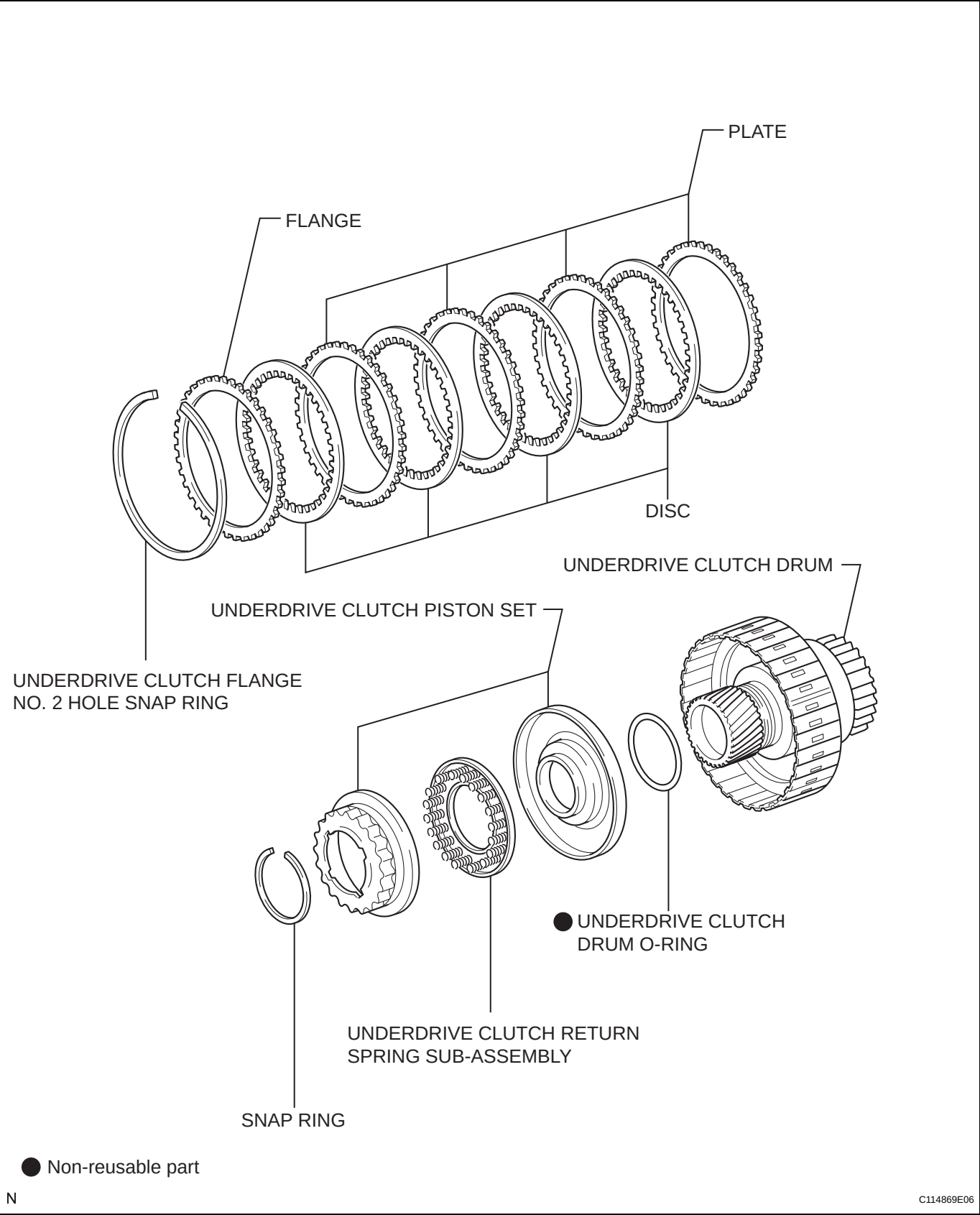
Be sure that there are no cracks on the nut.

6. INSPECT UNDERDRIVE PLANETARY GEAR PRELOAD (See page [AX-270](#))



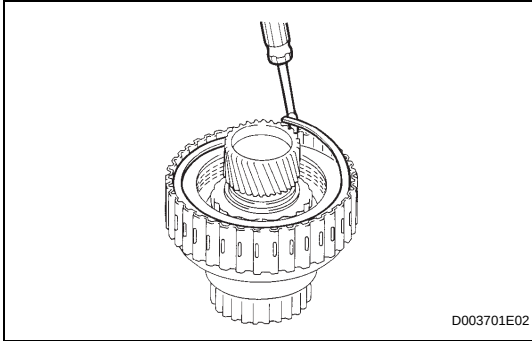
UNDERDRIVE CLUTCH

COMPONENTS



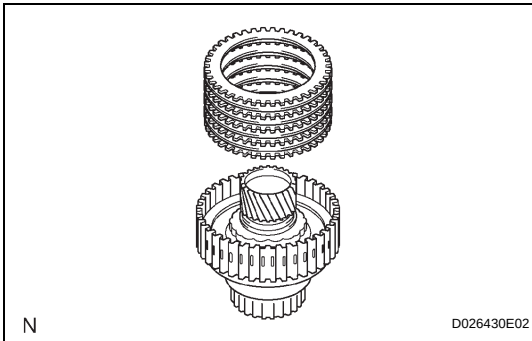
DISASSEMBLY

1. **INSPECT UNDERDRIVE PACK CLEARANCE** (See page [AX-276](#))



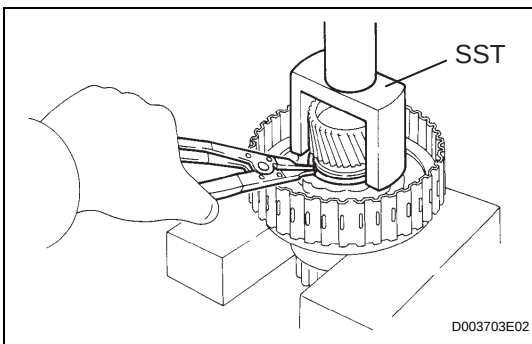
2. **REMOVE UNDERDRIVE CLUTCH FLANGE NO. 2 HOLE SNAP RING**

(a) Using a screwdriver, remove the snap ring.



3. **REMOVE NO. 1 UNDERDRIVE CLUTCH DISC**

(a) Remove the flange, 4 discs and 4 plates from the underdrive clutch drum.



4. **REMOVE UNDERDRIVE CLUTCH RETURN SPRING SUB-ASSEMBLY**

(a) Place SST on the clutch balancer and compress the spring with a press.

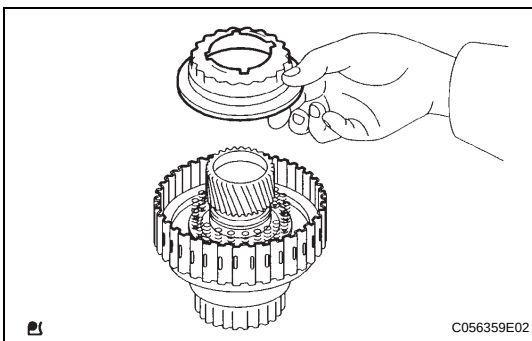
SST 09350-32014

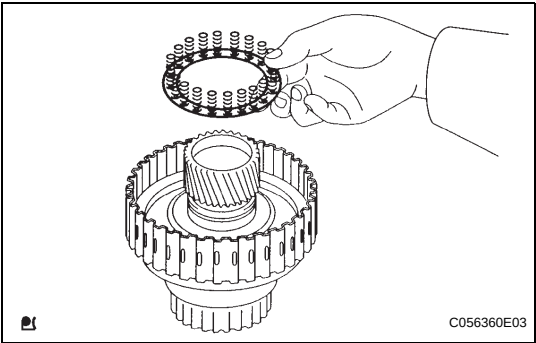
(b) Using a snap ring expander, remove the snap ring.

NOTICE:

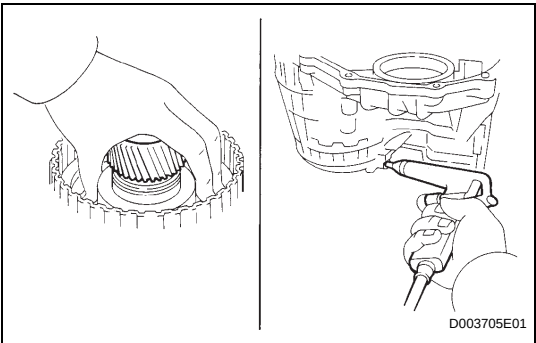
- Stop the press when the spring seat is lowered to a position 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove. This prevents the spring seat from being deformed.
- Do not expand the snap ring excessively.

(c) Remove the clutch balancer from the underdrive clutch drum.



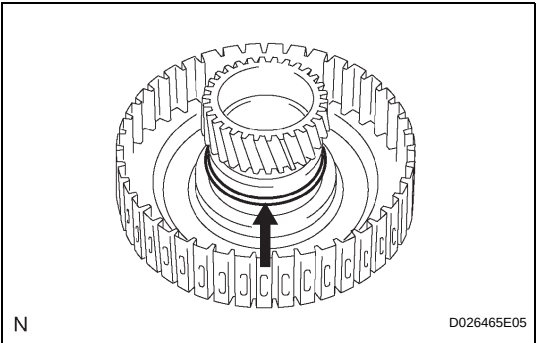


- (d) Remove the return spring from the underdrive clutch drum.



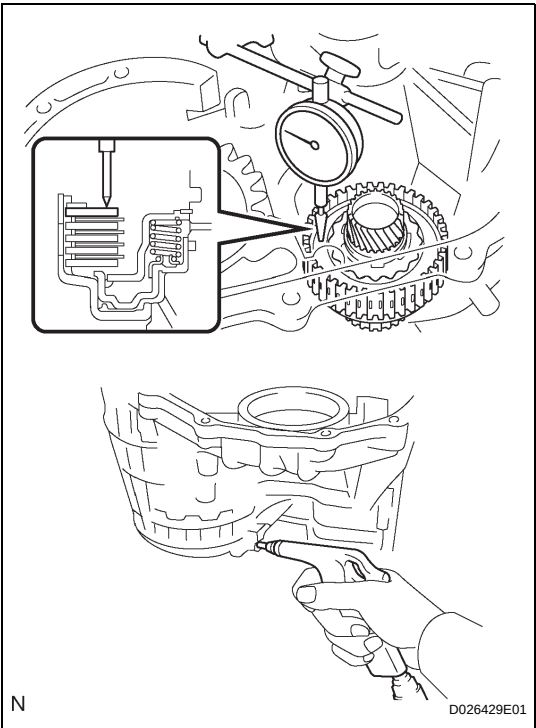
5. REMOVE UNDERDRIVE CLUTCH PISTON SET

- (a) Install the underdrive clutch to the transaxle case.
NOTICE:
Be careful not to damage the oil seal ring.
(b) Holding the underdrive clutch piston by hand, apply compressed air (392 kPa, 4.0 kgf/cm², 57 psi) to the transaxle case to remove the underdrive clutch piston.



6. REMOVE UNDERDRIVE CLUTCH DRUM O-RING

- (a) Using a screwdriver, remove the O-ring from the underdrive clutch drum.



INSPECTION

1. INSPECT UNDERDRIVE PACK CLEARANCE

- (a) Install the underdrive clutch to the transaxle case.
NOTICE:
Be careful not to damage the oil seal rings.
(b) Install a dial indicator as shown in the illustration.
(c) Measure the underdrive clutch pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm², 57 psi).

Standard pack clearance:

1.51 to 1.71 mm (0.0594 to 0.0673 in.)

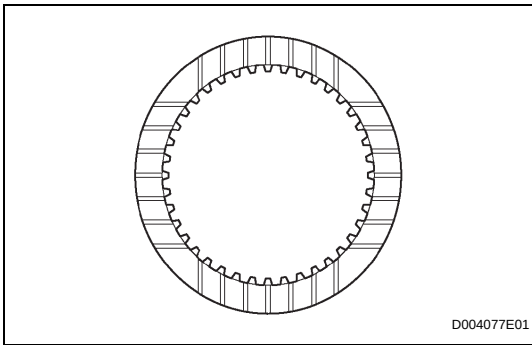
If the pack clearance is not as specified, inspect the discs, plates and flange.

HINT:

There are 5 different thicknesses flanges available.

Standard flange thickness

Mark	Thickness	Mark	Thickness
1	3.0 mm (0.118 in.)	4	3.6 mm (0.122 in.)
2	3.2 mm (0.126 in.)	5	3.8 mm (0.130 in.)
3	3.4 mm (0.134 in.)	-	-

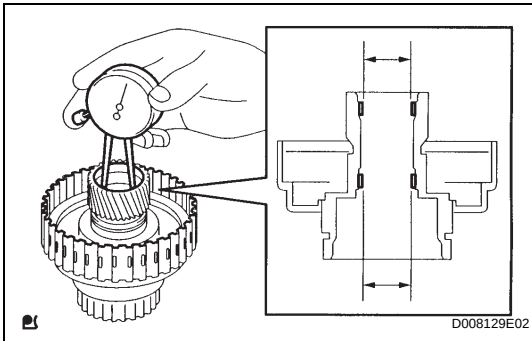


2. INSPECT NO. 1 UNDERDRIVE CLUTCH DISC

- (a) Check if the sliding surface of the disc, plate and flange are worn or burnt. If necessary, replace them.

NOTICE:

- If the lining of the disc comes off or is discolored, or if a part of the groove is worn, replace all the discs.
- Before installing new discs, immerse them in ATF for at least 15 minutes.



3. INSPECT UNDERDRIVE CLUTCH DRUM SUB-ASSEMBLY

- (a) Using a caliper gauge, measure the inside diameter of the underdrive clutch drum bushing.

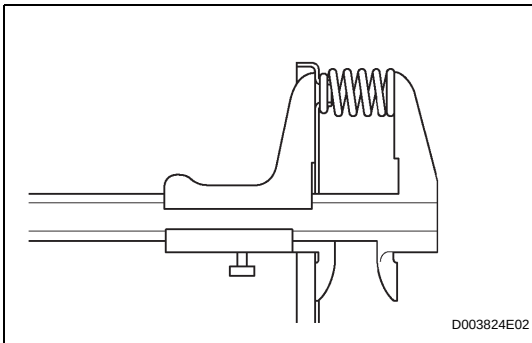
Standard drum bushing:

37.06 to 37.08 mm (1.4591 to 1.4598 in.)

Maximum drum bushing:

37.13 mm (1.4618 in.)

If the inside diameter is greater than the maximum, replace the underdrive clutch drum sub-assembly.



4. INSPECT UNDERDRIVE CLUTCH RETURN SPRING SUB-ASSEMBLY

- (a) Using a vernier caliper, measure the free length of the spring together with the spring seat.

Standard free length:

17.14 mm (0.6752 in.)

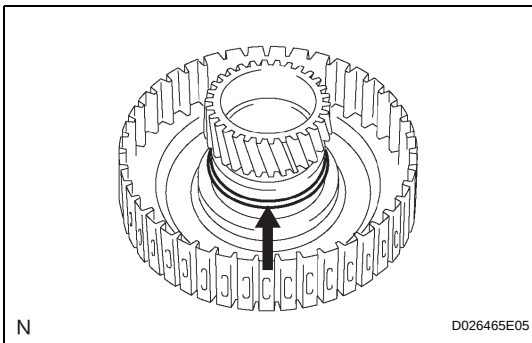
REASSEMBLY

1. INSTALL UNDERDRIVE CLUTCH DRUM O-RING

- (a) Coat a new O-ring with ATF, and install it to the underdrive clutch drum.

NOTICE:

Make sure that the O-ring is not twisted or pinched.

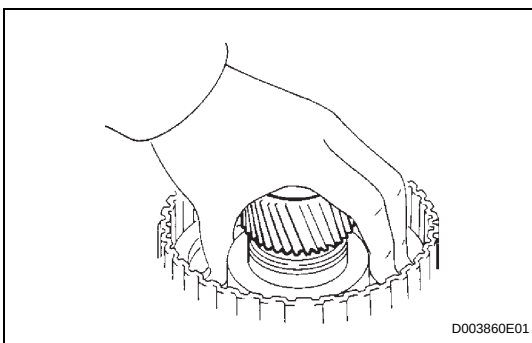


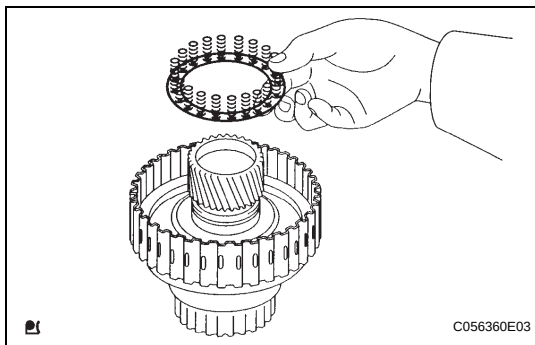
2. INSTALL UNDERDRIVE CLUTCH PISTON SET

- (a) Coat the underdrive clutch piston with ATF, and install it to the underdrive clutch piston drum.

NOTICE:

- Be careful not to damage the O-ring.
- Be careful not to damage the lip of the piston.





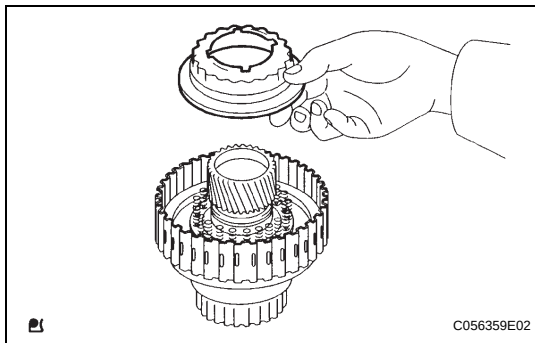
3. INSTALL UNDERDRIVE CLUTCH RETURN SPRING SUB-ASSEMBLY

- (a) Install the return spring to the underdrive clutch drum.

NOTICE:

After installing the spring sub-assembly, check that all of the springs fit in the piston correctly.

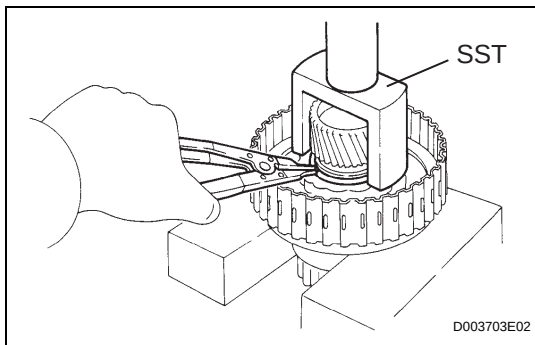
- (b) Coat the clutch balancer with ATF.



- (c) Install the clutch balancer to the underdrive clutch drum.

NOTICE:

Be careful not to damage the lip of the clutch balancer.



- (d) Place SST on the clutch balancer and compress the piston return spring with a press.

SST 09350-32014 (09351-32070)

- (e) Using a snap ring expander, install the snap ring to the underdrive clutch drum.

- (f) Be sure that the end gap of the snap ring is not aligned with the spring retainer claw.

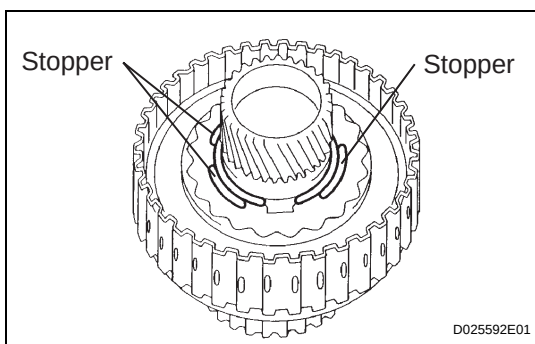
NOTICE:

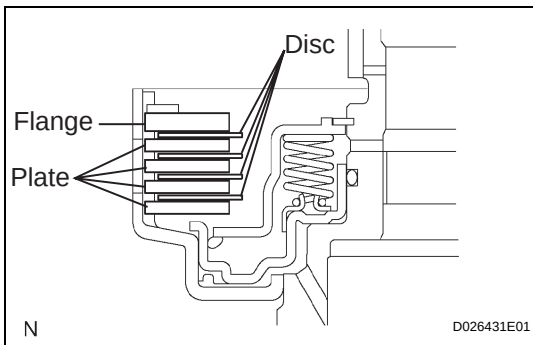
- Stop the press when the spring seat is lowered to a position 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove. This prevents the spring seat from being deformed.
- Do not expand the snap ring excessively.

- (g) Set the end gap of the snap ring in the underdrive clutch drum as shown in the illustration.

NOTICE:

The end gap of the snap ring should not align with any of the stoppers.

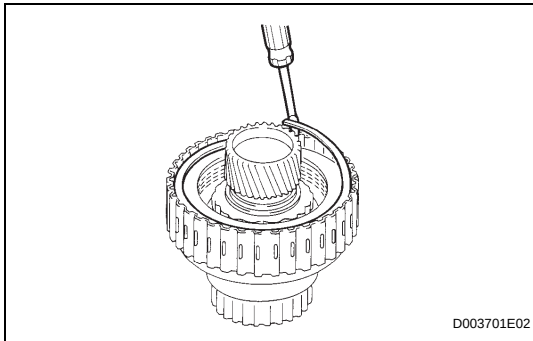


**4. INSTALL NO. 1 UNDERDRIVE CLUTCH DISC**

- (a) Coat the 4 discs with ATF.
- (b) Install the 4 plates, 4 discs and flange to the underdrive clutch drum.

NOTICE:

Make sure that the plates, discs and flange are installed as shown in the illustration.

**5. INSTALL 1ST AND REVERSE BRAKE RETURN SPRING SHAFT SNAP RING**

- (a) Using a screwdriver, install the underdrive clutch flange hole snap ring.
- (b) Check that the end gap of the snap ring is not aligned with one of the cutouts.

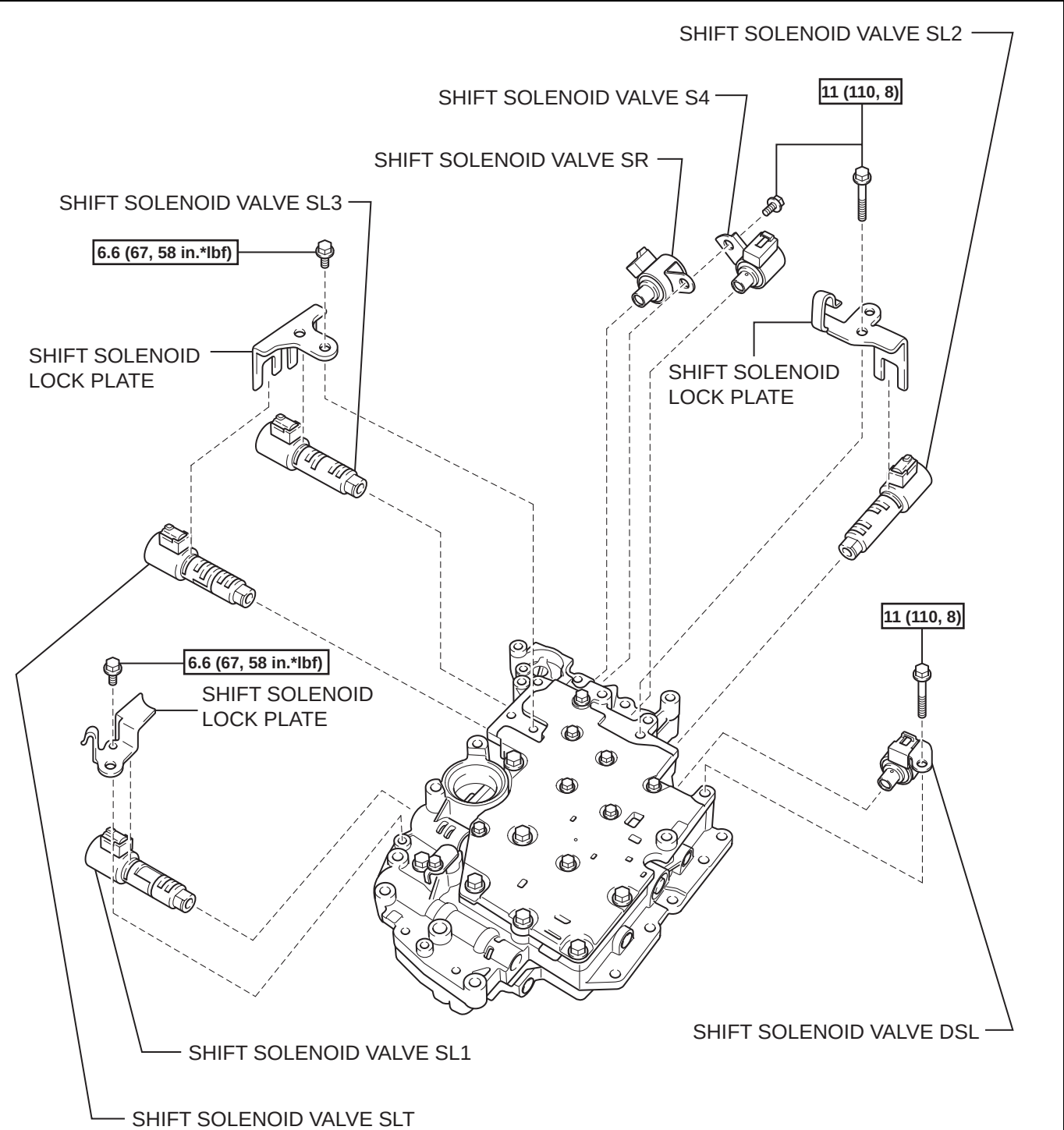
NOTICE:

The snap ring should be fully engaged in the groove of the drum.

6. INSPECT UNDERDRIVE PACK CLEARANCE (See page [AX-276](#))

VALVE BODY

COMPONENTS

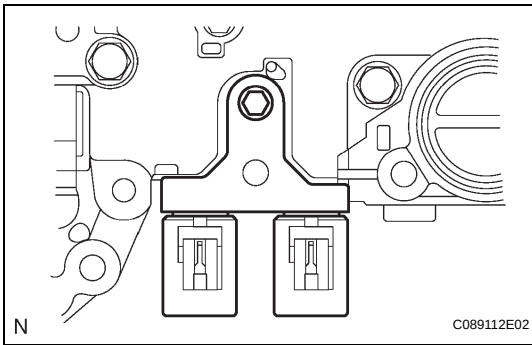


N*m (kgf*cm, ft.*lbf) : Specified torque

DISASSEMBLY

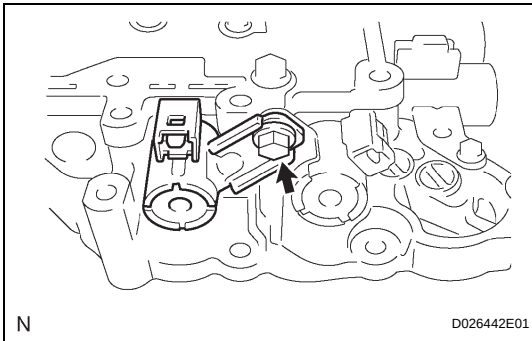
1. REMOVE SHIFT SOLENOID VALVE SLT AND SL3

- (a) Remove the bolt, lock plate and shift solenoid valve SL3 and SLT from the valve body.



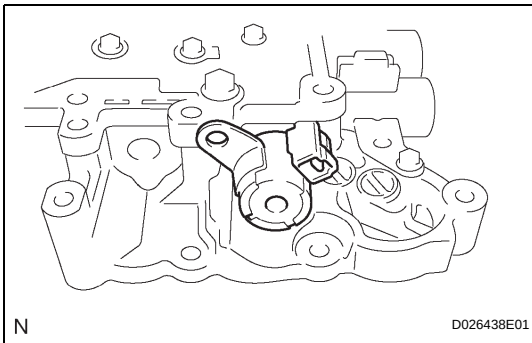
2. REMOVE SHIFT SOLENOID VALVE S4

- (a) Remove the bolt and shift solenoid valve S4 from the valve body.



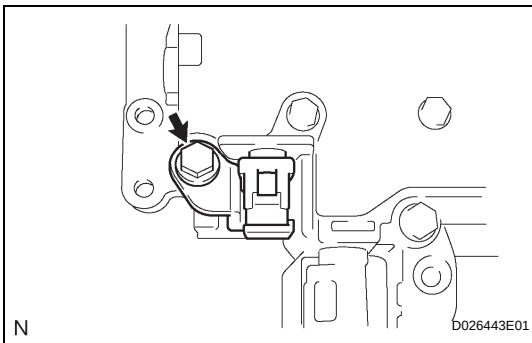
3. REMOVE SHIFT SOLENOID VALVE SR

- (a) Remove the shift solenoid valve SR from the valve body.



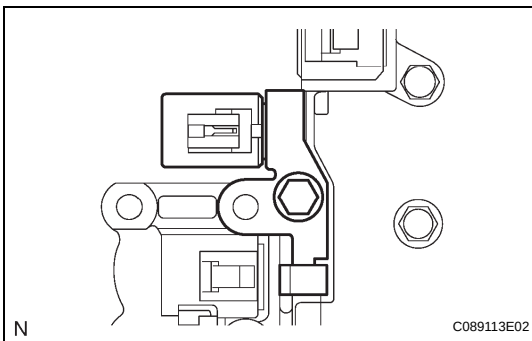
4. REMOVE SHIFT SOLENOID VALVE DSL

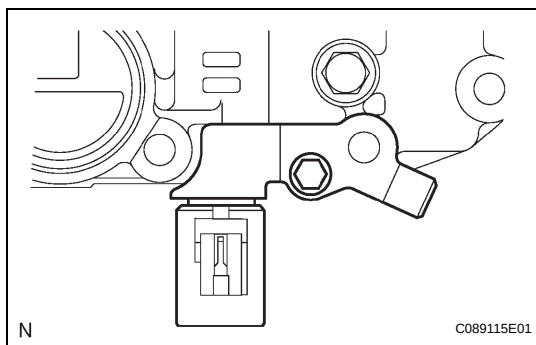
- (a) Remove the bolt and shift solenoid valve DSL from the valve body.



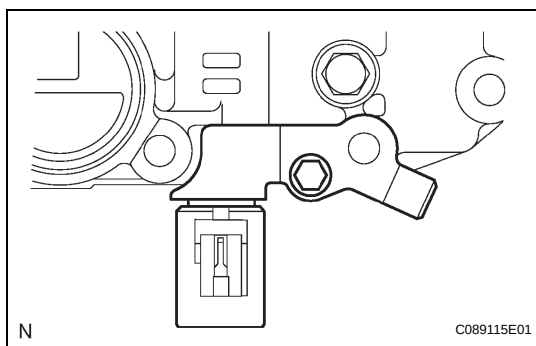
5. REMOVE SHIFT SOLENOID VALVE SL2

- (a) Remove the bolt, lock plate and shift solenoid valve SL2 from the valve body.



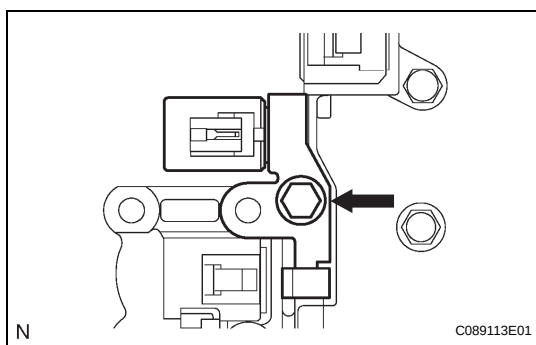
**6. REMOVE SHIFT SOLENOID VALVE SL1**

- (a) Remove the bolt, lock plate and shift solenoid valve SL1 from the valve body.

**REASSEMBLY****1. INSTALL SHIFT SOLENOID VALVE SL1**

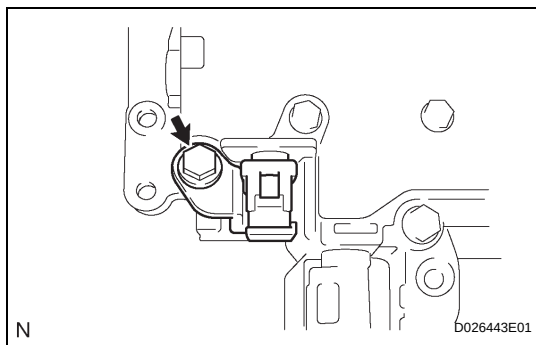
- (a) Install the shift solenoid valve SL1 and lock plate to the valve body with the bolt.

Torque: 6.6 N*m (67 kgf*cm, 58 in.*lbf)

**2. INSTALL SHIFT SOLENOID VALVE SL2**

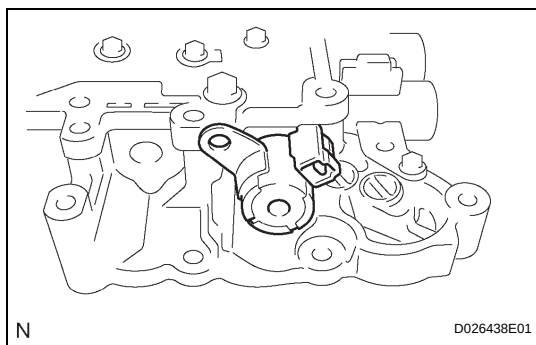
- (a) Install the shift solenoid valve SL2 and lock plate to the valve body with the bolt.

Torque: 11 N*m (110 kgf*cm, 8 ft.*lbf)

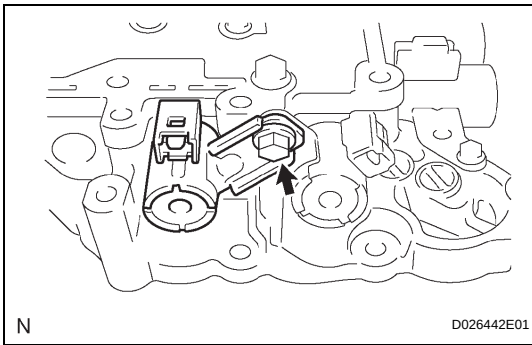
**3. INSTALL SHIFT SOLENOID VALVE DSL**

- (a) Install the shift solenoid valve DSL and lock plate to the valve body with the bolt.

Torque: 11 N*m (110 kgf*cm, 8 ft.*lbf)

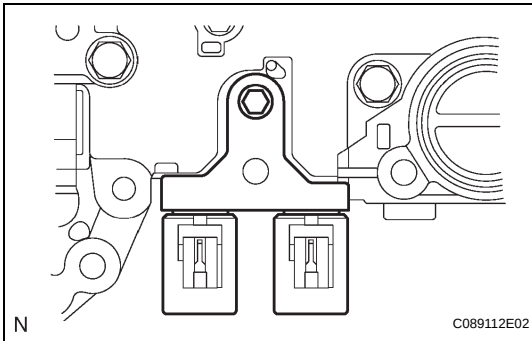
**4. INSTALL SHIFT SOLENOID VALVE SR**

- (a) Install the shift solenoid valve SR to the valve body.

**5. INSTALL SHIFT SOLENOID VALVE S4**

- (a) Install the shift solenoid valve S4 to the valve body with the bolt.

Torque: 11 N*m (110 kgf*cm, 8 ft.*lbf)

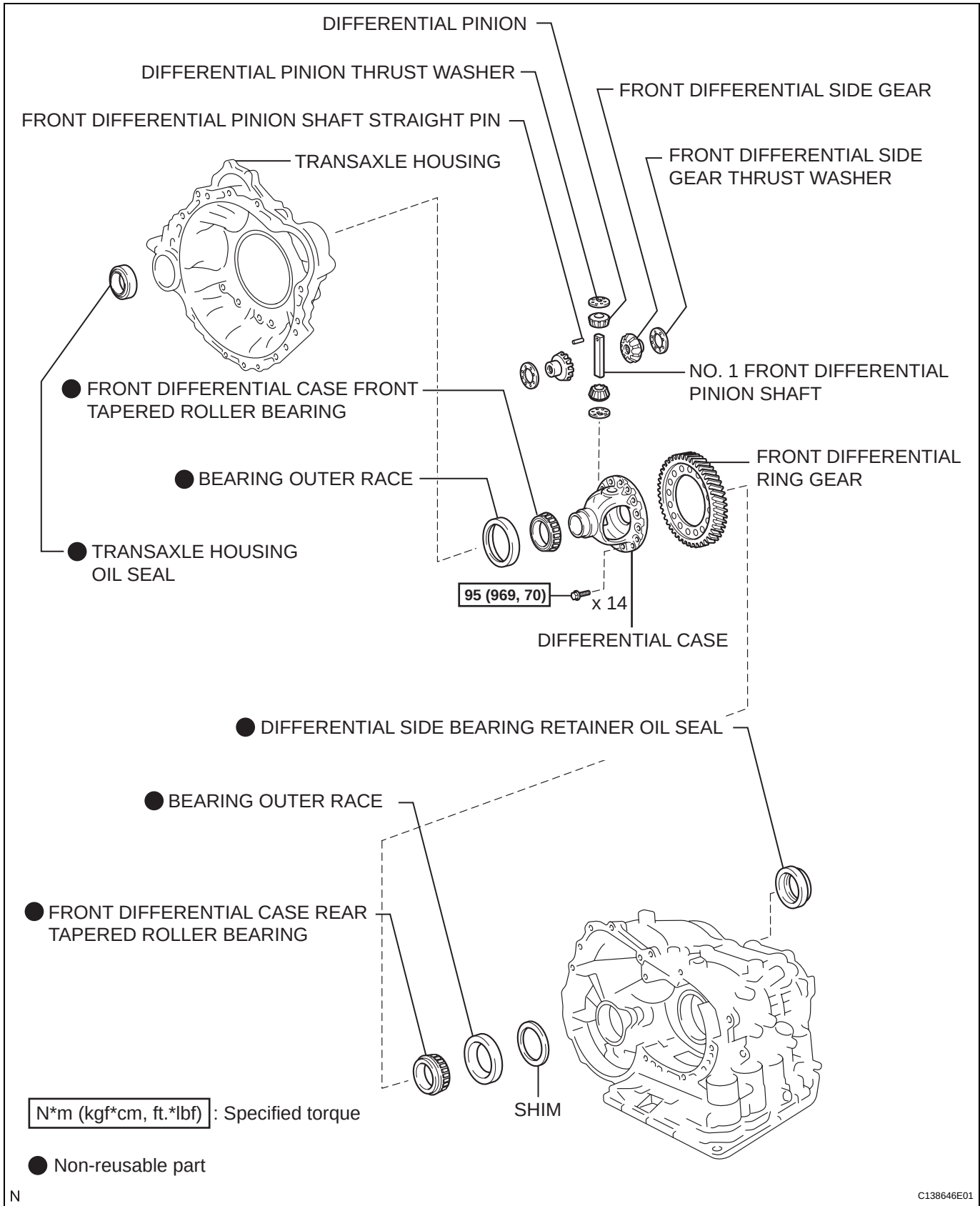
**6. INSTALL SHIFT SOLENOID VALVE SL3 AND SLT**

- (a) Install the shift solenoid valve SL3 and SLT and lock plate to the valve body with the bolt.

Torque: 6.6 N*m (67 kgf*cm, 58 in.*lbf)

DIFFERENTIAL CASE

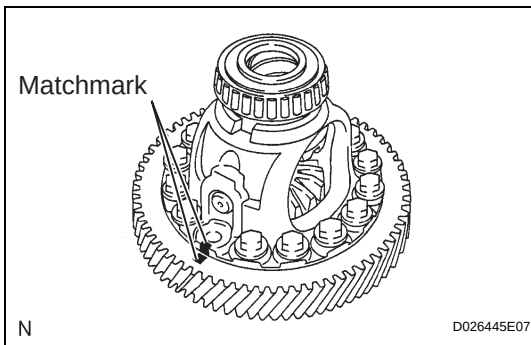
COMPONENTS



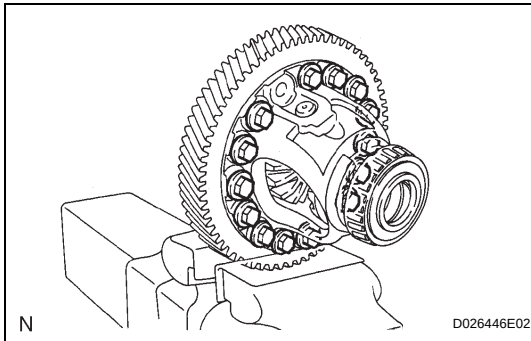
DISASSEMBLY

1. REMOVE FRONT DIFFERENTIAL RING GEAR

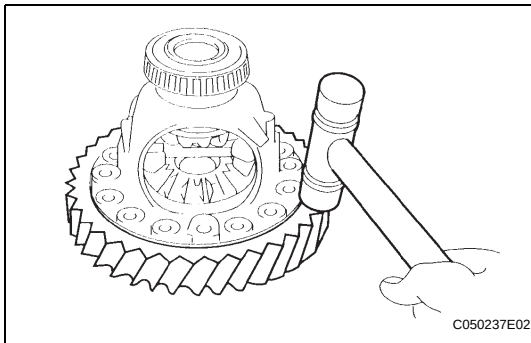
- (a) Place matchmarks on the ring gear and differential case.



- (b) Remove the 14 bolts.



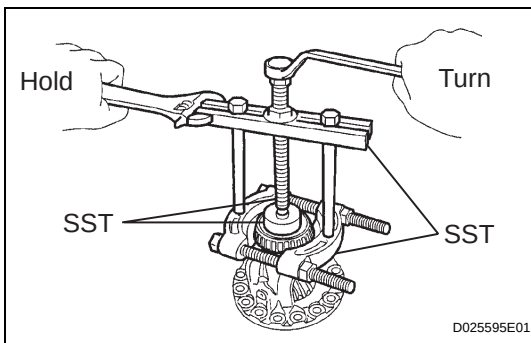
- (c) Using a plastic-faced hammer, tap on the ring gear to remove it from the case.



2. REMOVE FRONT DIFFERENTIAL CASE FRONT TAPERED ROLLER BEARING

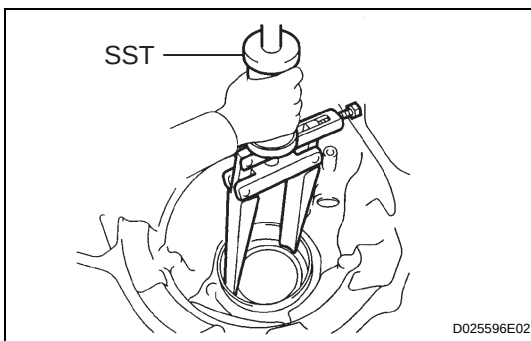
- (a) Using SST, remove the bearing from the differential case.

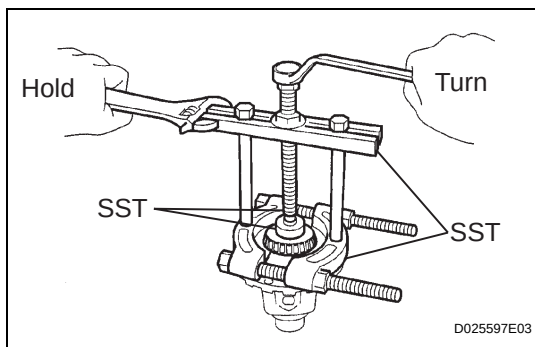
SST 09950-00020, 09950-00030, 09950-60010 (09951-00490), 09950-40011 (09957-04010)



- (b) Using SST, remove the front differential case front tapered roller bearing outer race.

SST 09308-00010

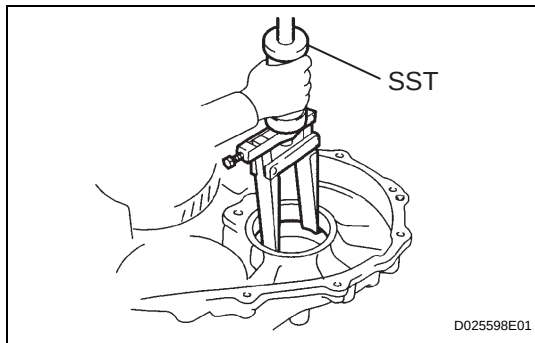




3. REMOVE FRONT DIFFERENTIAL CASE REAR TAPERED ROLLER BEARING

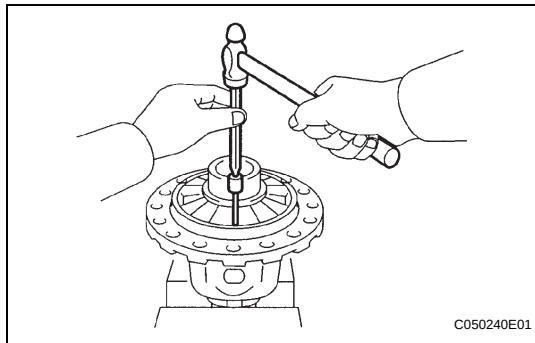
- (a) Using SST, remove the bearing from the differential case.

SST 09950-00020, 09950-00030, 09950-60010 (09951-00490), 09950-40011 (09957-04010), 09308-00010



- (b) Using SST, remove the front differential case rear tapered roller bearing outer race.

SST 09308-00010

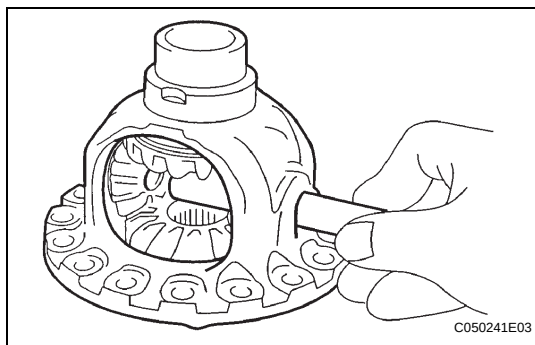


4. REMOVE FRONT DIFFERENTIAL PINION SHAFT STRAIGHT PIN

- (a) Using a pin punch and hammer, remove the straight pin.

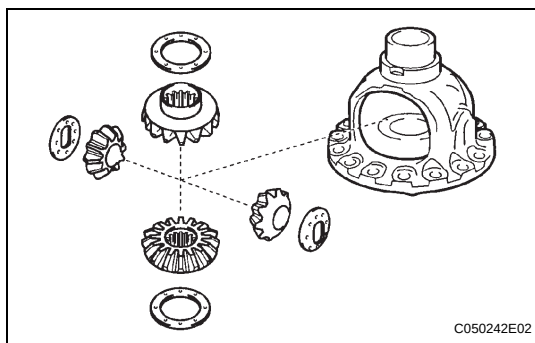
NOTICE:

Before removing the straight pin, unstake it with a pin punch.



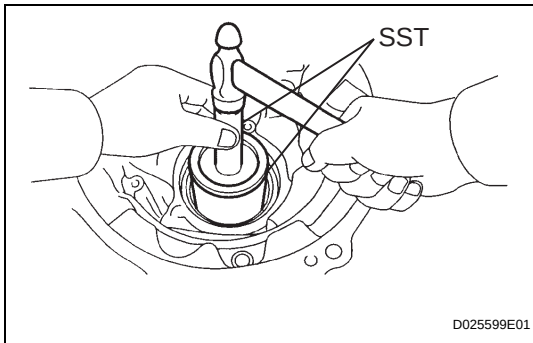
5. REMOVE NO. 1 FRONT DIFFERENTIAL PINION SHAFT

- (a) Remove the front differential pinion shaft from the differential case.



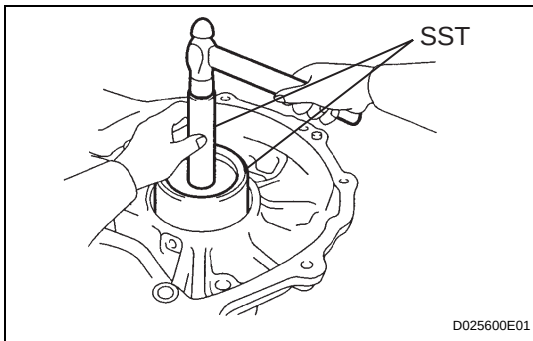
6. REMOVE FRONT DIFFERENTIAL SIDE GEAR

- (a) Remove the 2 front differential pinions, 2 pinion thrust washers, 2 front differential side gears and 2 side gear thrust washers from the differential case.



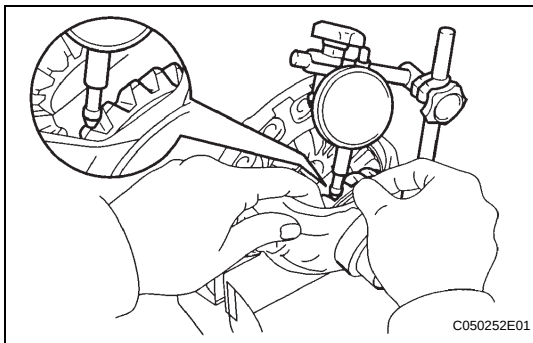
7. REMOVE TRANSAXLE HOUSING OIL SEAL

- (a) Using SST and a hammer, tap out the oil seal.
SST 09950-70010 (09951-07100), 09215-00013 (09215-00471)



8. REMOVE DIFFERENTIAL SIDE BEARING RETAINER OIL SEAL

- (a) Using SST, tap out the oil seal.
SST 09950-70010 (09951-07100), 09608-10010



INSPECTION

1. INSPECT BACKLASH

- (a) Using a dial indicator, inspect the backlash of the side gear.

Standard backlash:

0.05 to 0.20 mm (0.0020 to 0.0079 in.)

Standard thrust washer thickness:

1.625 mm (0.0640 in.)

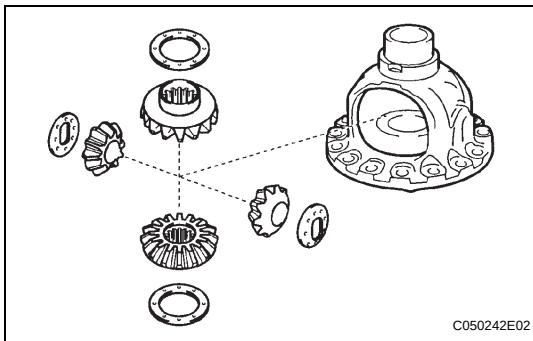
1.725 mm (0.0679 in.)

1.825 mm (0.0719 in.)

REASSEMBLY

1. INSTALL FRONT DIFFERENTIAL SIDE GEAR

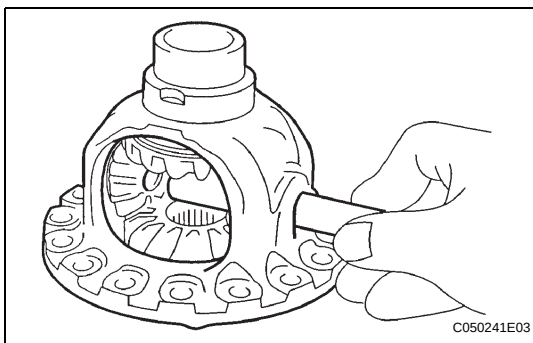
- (a) Apply ATF to the 2 front differential side gears, 2 side gear thrust washers, 2 front differential pinions and 2 pinion thrust washers and install them to the differential case.

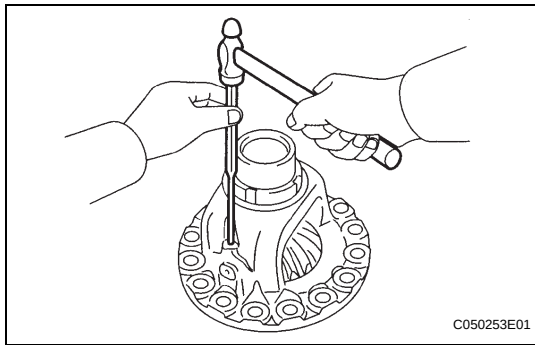


2. INSTALL NO. 1 FRONT DIFFERENTIAL PINION SHAFT

- (a) Coat the No. 1 front differential pinion shaft with ATF, and install it to the differential case.

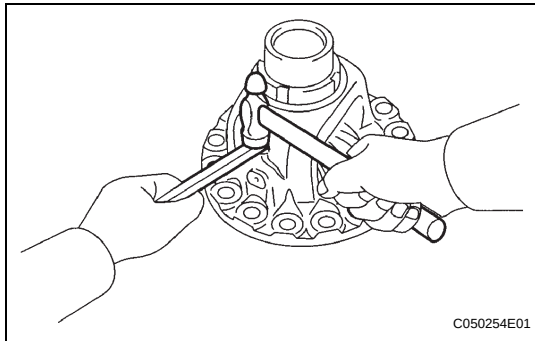
3. INSPECT BACKLASH (See page [AX-287](#))





4. INSTALL FRONT DIFFERENTIAL PINION SHAFT STRAIGHT PIN

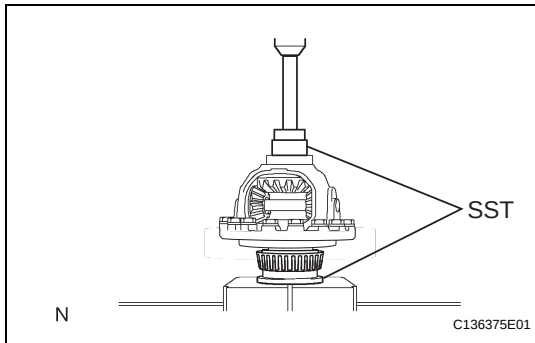
- (a) Using a pin punch and hammer, install the pinion shaft straight pin.



- (b) Using a chisel and hammer, stake the differential case.

NOTICE:

Stake the differential case after adjusting the backlash.



5. INSTALL FRONT DIFFERENTIAL CASE REAR TAPERED ROLLER BEARING

- (a) Using SST and a press, press in the front differential case front tapered roller bearing to the differential case.

SST 09316-12010, 09550-60010 (09951-00490), 09950-70010 (09951-07100, 09951-07150)

NOTICE:

- When replacing a bearing of the differential case, be sure to replace it together with the outer race.
- When replacing a bearing of the differential case, replace both the front and rear bearings together.
- Do not damage the bearing case when installing the bearing inner race.

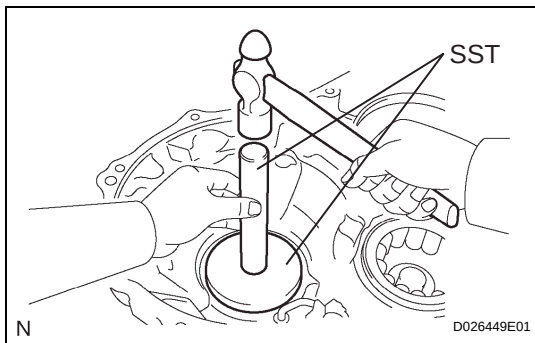
- (b) Install the front differential case rear shim to the transaxle housing.

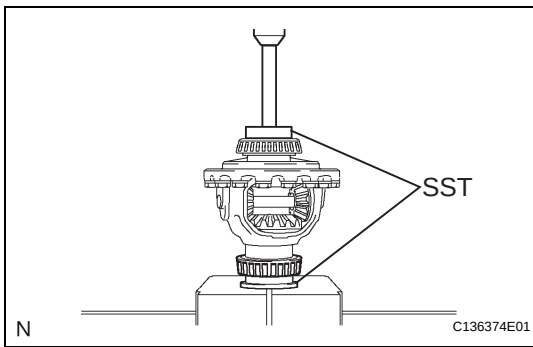
- (c) Using SST and a hammer, tap in the front differential case rear tapered roller bearing outer race to the transaxle housing.

SST 09950-70010 (09951-07100, 09951-07150), 09950-60020 (09951-00890)

NOTICE:

- When replacing the bearing, be sure to replace it together with the outer race.
- No clearance is allowed between the bearing and transaxle housing.





6. INSTALL FRONT DIFFERENTIAL CASE FRONT TAPERED ROLLER BEARING

- (a) Using SST and a press, press in the front differential case front tapered roller bearing to the differential case.

SST 09316-12010, 09550-60010 (09951-00490), 09950-70010 (09951-07100)

NOTICE:

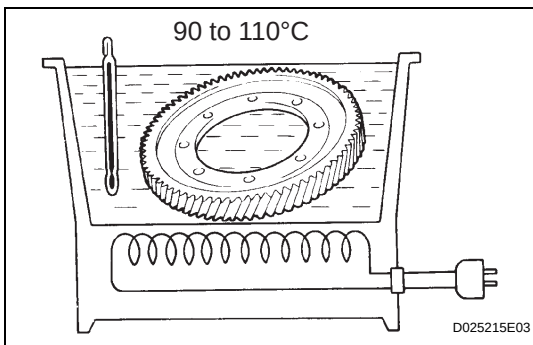
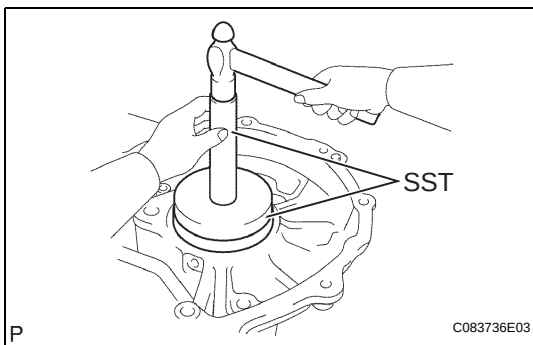
- When replacing a bearing of the differential case, be sure to replace it together with the outer race.
- When replacing a bearing of the differential case, replace both the front and rear bearings together.
- Do not damage the bearing case when installing the bearing inner race.

- (b) Using SST and a hammer, tap in the front differential case front tapered roller bearing outer race to the transaxle housing.

SST 09550-60010 (09951-00490), 09950-60020 (09951-00910)

NOTICE:

When replacing the bearing, be sure to replace it together with the outer race.



7. INSTALL FRONT DIFFERENTIAL RING GEAR

- (a) Using ATF and a heater, heat the front differential ring gear to 90 to 110°C (194 to 230°F).

NOTICE:

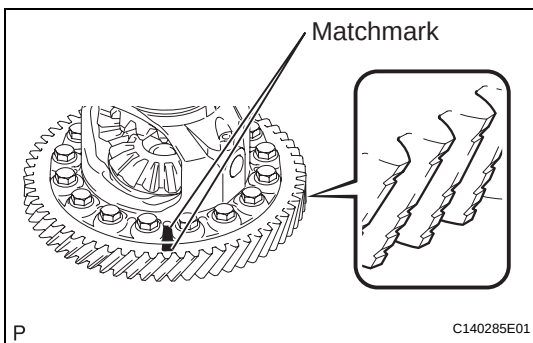
Do not heat the ring gear to more than 110°C (230.0°F).

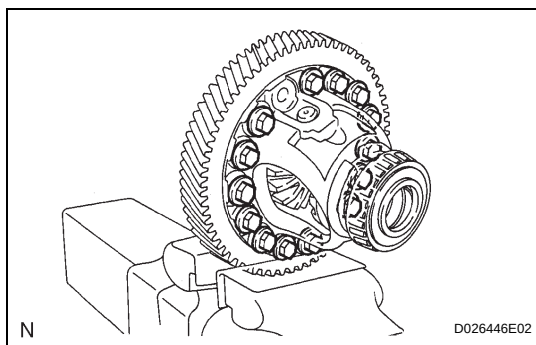
- (b) Clean the contact surface of the front differential case.

- (c) Align the matchmarks, and install the front differential ring gear case quickly.

NOTICE:

- Do not install the bolts while the ring gear is hot.
- Check the position and number of the grooves on each end face of the differential ring gear.



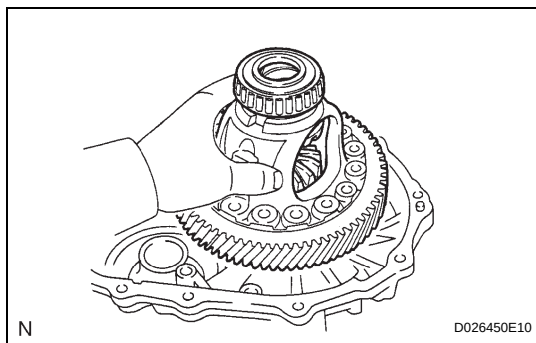


(d) Tighten the 14 bolts.

Torque: 95 N*m (969 kgf*cm, 70 ft.*lbf)

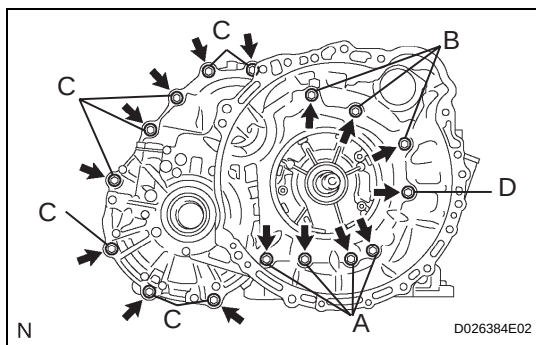
NOTICE:

Tighten the bolts a little at a time in a diagonal pattern.



8. ADJUST DIFFERENTIAL SIDE BEARING PRELOAD

(a) Install the differential assembly to the transaxle case.



(b) Clean the mating surfaces of the transaxle case and transaxle housing.

(c) Install the transaxle housing to the transaxle case and tighten them with the 16 bolts.

Torque: 22 N*m (224 kgf*cm, 16 ft.*lbf) for bolt A

29 N*m (295 kgf*cm, 21 ft.*lbf) for bolt B

29 N*m (295 kgf*cm, 21 ft.*lbf) for bolt C

22 N*m (226 kgf*cm, 16 ft.*lbf) for bolt D

HINT:

- Each bolt length is indicated below.

Bolt length:

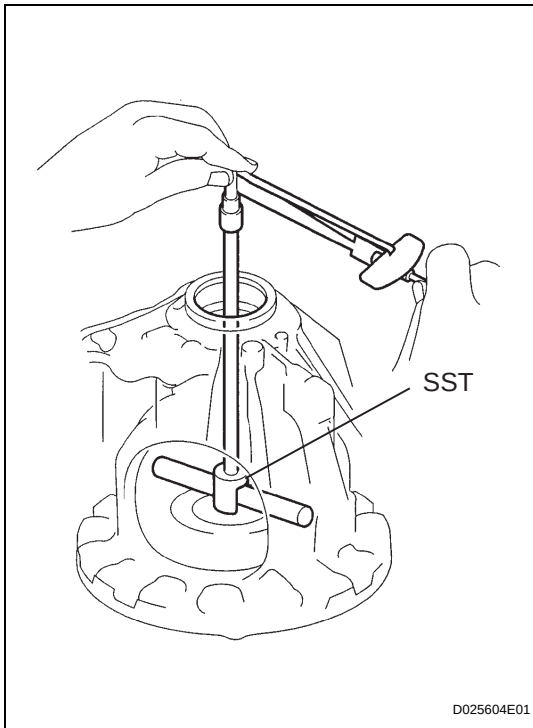
50 mm (1.969 in.) for bolt A

50 mm (1.969 in.) for bolt B

42 mm (1.654 in.) for bolt C

72 mm (2.835 in.) for bolt D

- Usually, bolt A is non-reusable. In this case, however, the bolt can be used after cleaning it.



- (d) Using SST, turn the differential assembly to the right and left 2 or 3 times to settle the bearing.

SST 09564-32011

- (e) Using SST and a torque wrench, measure the turning torque of the differential.

SST 09564-32011

Torque: Standard turning torque at 60 rpm

0.20 to 0.69 N*m (2.0 to 7.0 kgf*cm, 1.8 to 6.1 in.*lbf) for new bearing

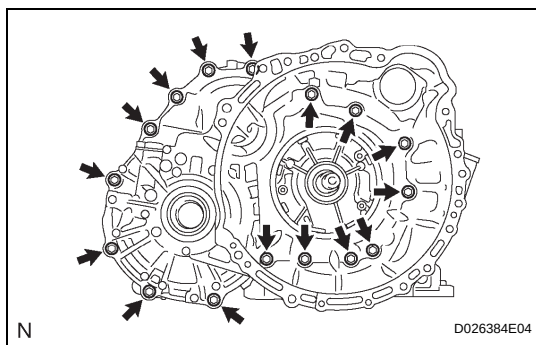
0.10 to 0.35 N*m (1.0 to 3.6 kgf*cm, 0.9 to 3.1 in.*lbf) for used bearing

HINT:

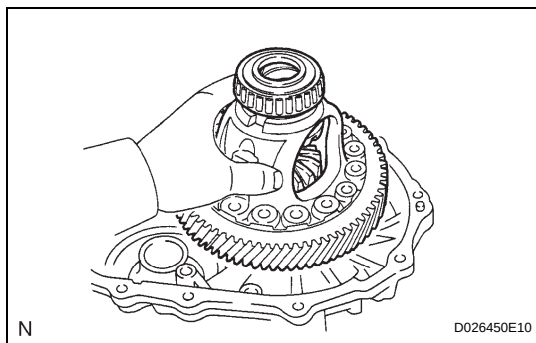
If the turning torque is not as specified, refer to the table below to select a front differential case rear shim so that the specified value is achieved.

Standard flange thickness

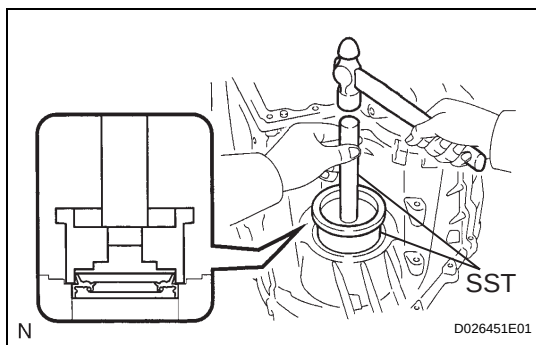
Mark	Thickness	Mark	Thickness
0	2.00 mm (0.0787 in.)	J	2.025 mm (0.07972 in.)
1	2.05 mm (0.0807 in.)	K	2.075 mm (0.08169 in.)
2	2.10 mm (0.0827 in.)	L	2.125 mm (0.08366 in.)
3	2.15 mm (0.0846 in.)	M	2.175 mm (0.08563 in.)
4	2.20 mm (0.0866 in.)	N	2.225 mm (0.08760 in.)
5	2.25 mm (0.0886 in.)	P	2.275 mm (0.08957 in.)
6	2.30 mm (0.0906 in.)	Q	2.325 mm (0.09154 in.)
7	2.35 mm (0.0925 in.)	R	2.375 mm (0.09350 in.)
8	2.40 mm (0.0945 in.)	S	2.425 mm (0.09547 in.)
9	2.45 mm (0.0965 in.)	T	2.475 mm (0.09744 in.)
A	2.50 mm (0.0984 in.)	U	2.525 mm (0.09941 in.)
B	2.55 mm (0.1004 in.)	V	2.575 mm (0.10138 in.)
C	2.60 mm (0.1024 in.)	W	2.625 mm (0.10335 in.)
D	2.65 mm (1.1043 in.)	X	2.675 mm (0.10531 in.)
E	2.70 mm (0.1063 in.)	Y	2.725 mm (0.10728 in.)
F	2.75 mm (0.1083 in.)	AA	2.775 mm (0.10925 in.)
G	2.80 mm (0.1102 in.)	AB	2.825 mm (0.11122 in.)
H	2.85 mm (0.1122 in.)	-	-



(f) Remove the 16 bolts and the transaxle housing.

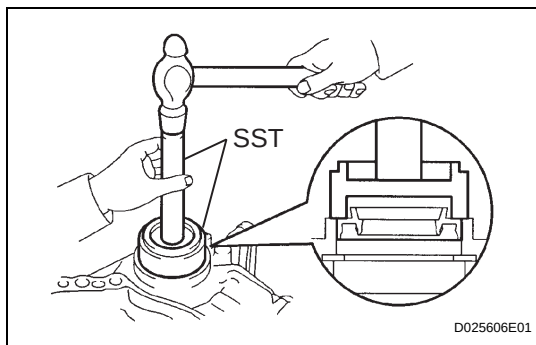


(g) Remove the differential assembly.



9. INSTALL TRANSAXLE HOUSING OIL SEAL

- (a) Using SST and a hammer, tap in a new oil seal.
SST 09223-15020, 09950-70010 (09951-07150)
- (b) Coat the lip of the oil seal with a little amount of MP grease.
Standard depth:
0 +0.5 mm (0 +0.0197 in.)



10. INSTALL DIFFERENTIAL SIDE BEARING RETAINER OIL SEAL

- (a) Using SST and a hammer, tap in a new oil seal.
SST 09710-30050, 09950-70010 (09951-07150)
- (b) Coat the lip of the oil seal with a little amount of MP grease.
Standard depth:
0 +0.5 mm (0 +0.0197 in.)