2009 Toyota Highlander Limited
2009 TRANSMISSION Automatic Transaxle (U760E) - Highlander

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Automatic Transaxle (U760E) - Highlander

AUTOMATIC TRANSAXLE SYSTEM

PRECAUTION

1. EXPRESSIONS OF IGNITION SWITCH

The type of ignition switch used on this model differs according to the specifications of the vehicle. The expressions listed in the table below are used in this article.

IGNITION SWITCH EXPRESSIONS CHART

Expression	Switch Type	
	Ignition Switch (Position)	Engine Switch (Condition)
Ignition switch off	LOCK	off
Ignition switch ON	ON	on (IG)
Ignition switch ACC	ACC	on (ACC)
Engine start	START	start

NOTE:

- **When disconnecting the cable from the negative (-) battery terminal, initialize the following systems after the cable is reconnected.**

SYSTEM REFERENCE

System Name	See Procedure
Power Back Door System	INITIALIZATION

- **If automatic transaxle parts are replaced, perform the following as necessary referring to the table below:**
  - **Registration of the transaxle compensation code (See REGISTRATION).**
  - **Initialization of the transaxle compensation code (See INITIALIZATION).**
  - **Road test (See INITIALIZATION).**
  - **Reset Memory (learned values) (See INITIALIZATION).**

Parts Replacement Compensation Table

PARTS REPLACEMENT COMPENSATION CHART

Replaced Part	Transaxle Compensation Code	Road Test	Reset Memory (Learned

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				Values)
Automatic Transaxle Assembly		Input	Necessary	Reset
Valve Body Assembly		Initialize	Necessary	Reset
Shift Solenoid Valve SL1 and/or SL2		-	Necessary	-
Shift Solenoid Valve SL3 and/or SL4		Initialize	Necessary	Reset
TCM (If possible, read the transaxle compensation code from the previous TCM)	Possible	Input (Into the new TCM)	Necessary	Reset
	Impossible	Initialize	Necessary	Reset

- Reset Memory cannot be completed by only disconnecting and 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.

NOTE:

- 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.

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- **After cleaning, the parts should be arranged in the order they were removed for efficient inspection, repairs, and reassembly.**
- **New discs for the brakes and clutches that will be used for replacement must be soaked in ATF for at least 15 minutes before reassembly.**
- **All oil seal rings, clutch discs, clutch plates, rotating parts, and sliding surfaces should be coated with ATF prior to reassembly.**
- **All old gaskets rubber O-rings must be replaced.**
- **Do not apply adhesive cement to gaskets 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, the following must be observed:**
  - **Using a razor blade and a gasket scraper, remove all the old packing (FIPG) material from the gasket surface.**
  - **Thoroughly clean all components to remove any loose material.**
  - **Clean both sealing surfaces with a non-residue solvent.**
  - **Parts must be reassembled within 10 minutes of application. Otherwise, the packing (FIPG) material must be removed and reapplied.**

DEFINITION OF TERMS

TERMS DEFINITION REFERENCE

Term	Definition
Monitor description	Description of what the TCM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	Diagnostic code
Typical enabling condition	Preconditions that allow the TCM to detect malfunctions. With all preconditions satisfied, the TCM 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 until the previous monitoring has concluded.
Required sensor/components	The sensors and components that are used by the TCM to detect malfunctions.

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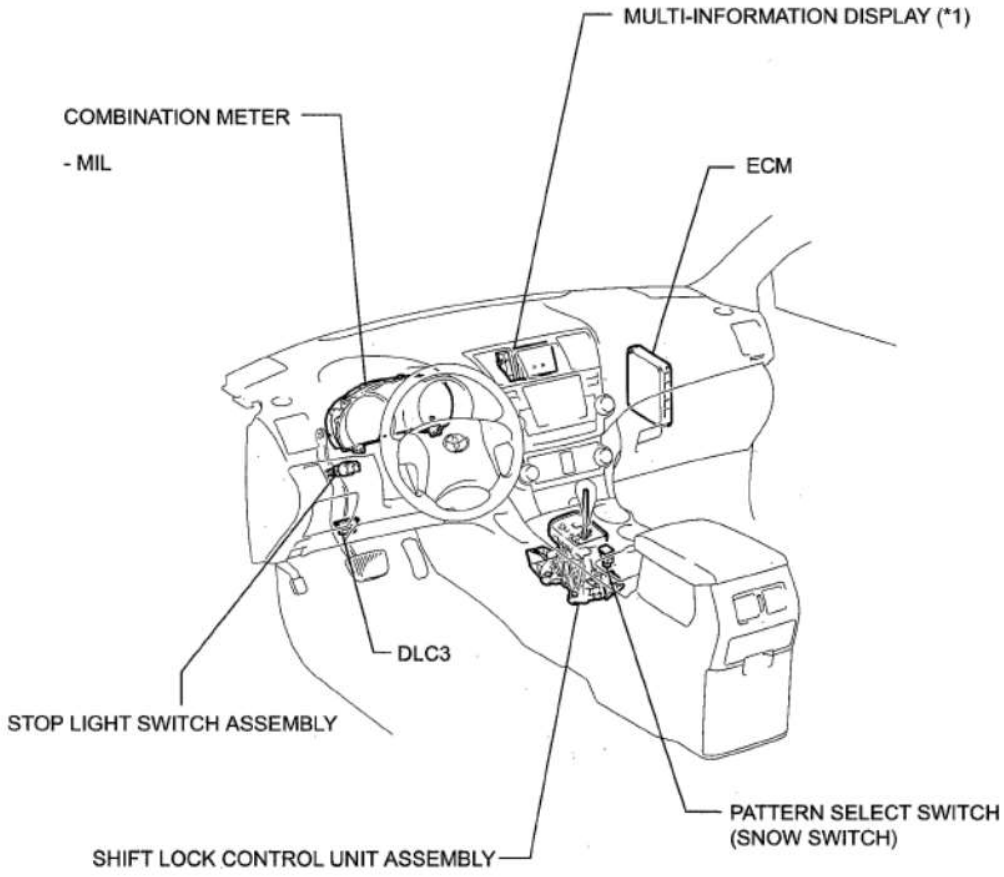
Frequency of operation	The number of times that the TCM checks for malfunctions per driving cycle. "Once per driving cycle" means that the TCM detects malfunction only one time during a single driving cycle. "Continuous" means that the TCM detects malfunction every time when the enabling conditions are met.
Duration	The minimum time that the TCM 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 TCM will conclude that there is a malfunction and set a DTC.
MIL operation	MIL illumination timing after a defect is detected. "Immediately" means that the TCM illuminates MIL the instant the TCM determines that there is a malfunction. "2 driving cycle" means that the TCM illuminates 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.

PARTS LOCATION

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*1: with MULTI-INFORMATION DISPLAY

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Fig. 1: Identifying Automatic Transaxle System Parts Location (1 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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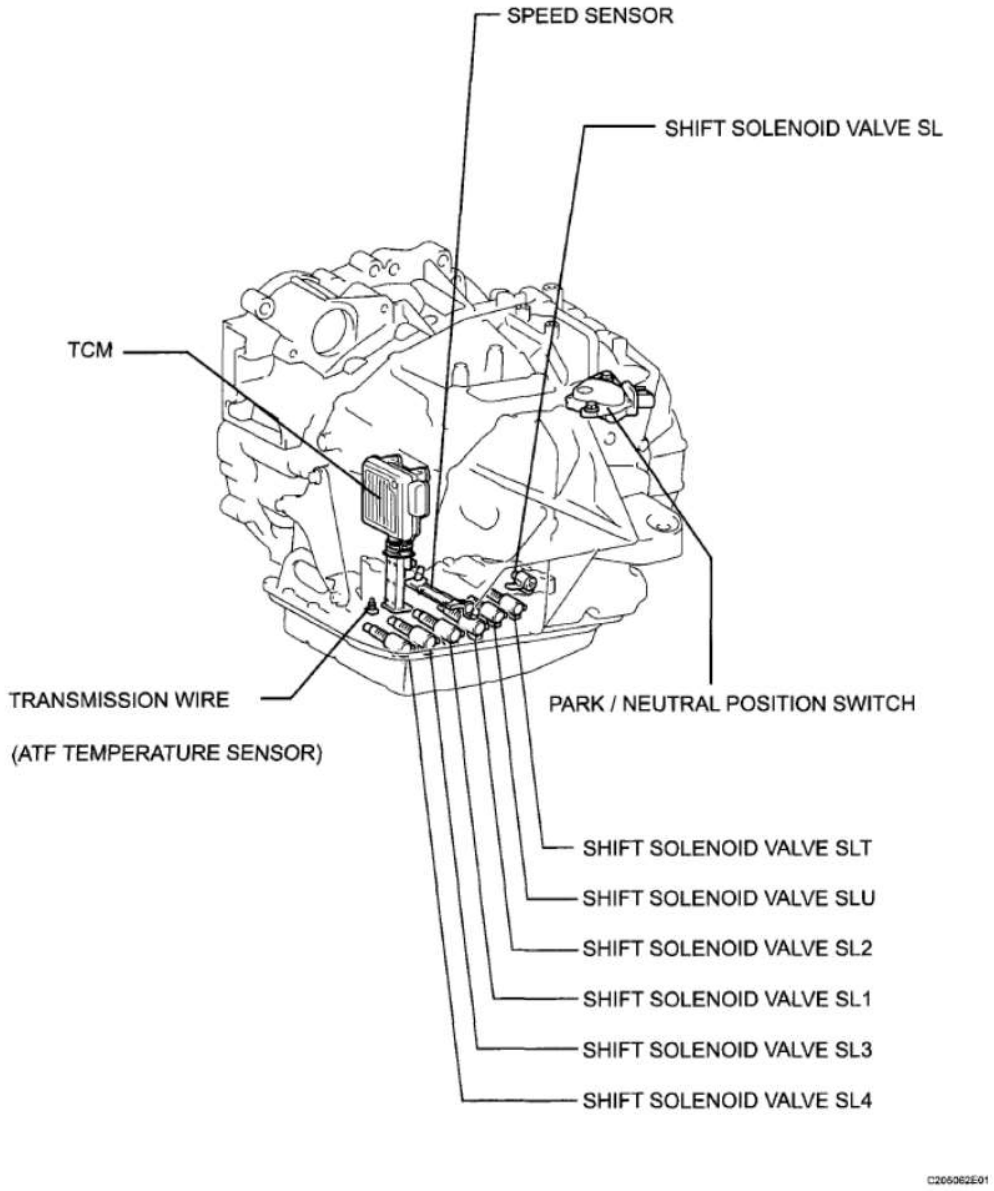


Fig. 2: Identifying Automatic Transaxle System Parts Location (2 Of 2)
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SYSTEM DIAGRAM

The configuration of the electronic control system in the U760E automatic transaxle is as shown in the following chart.

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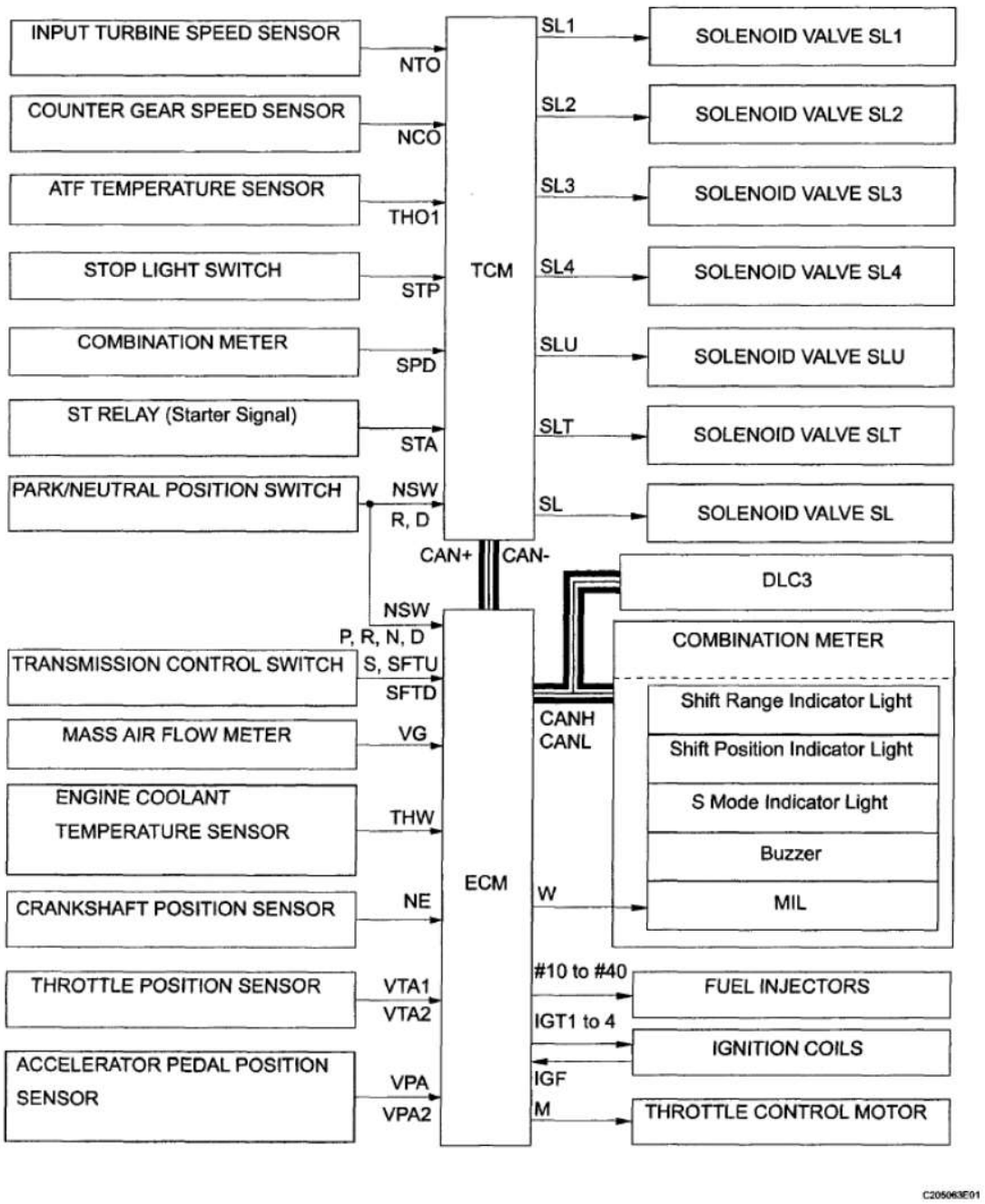


Fig. 3: Automatic Transaxle System Diagram (1 Of 3)
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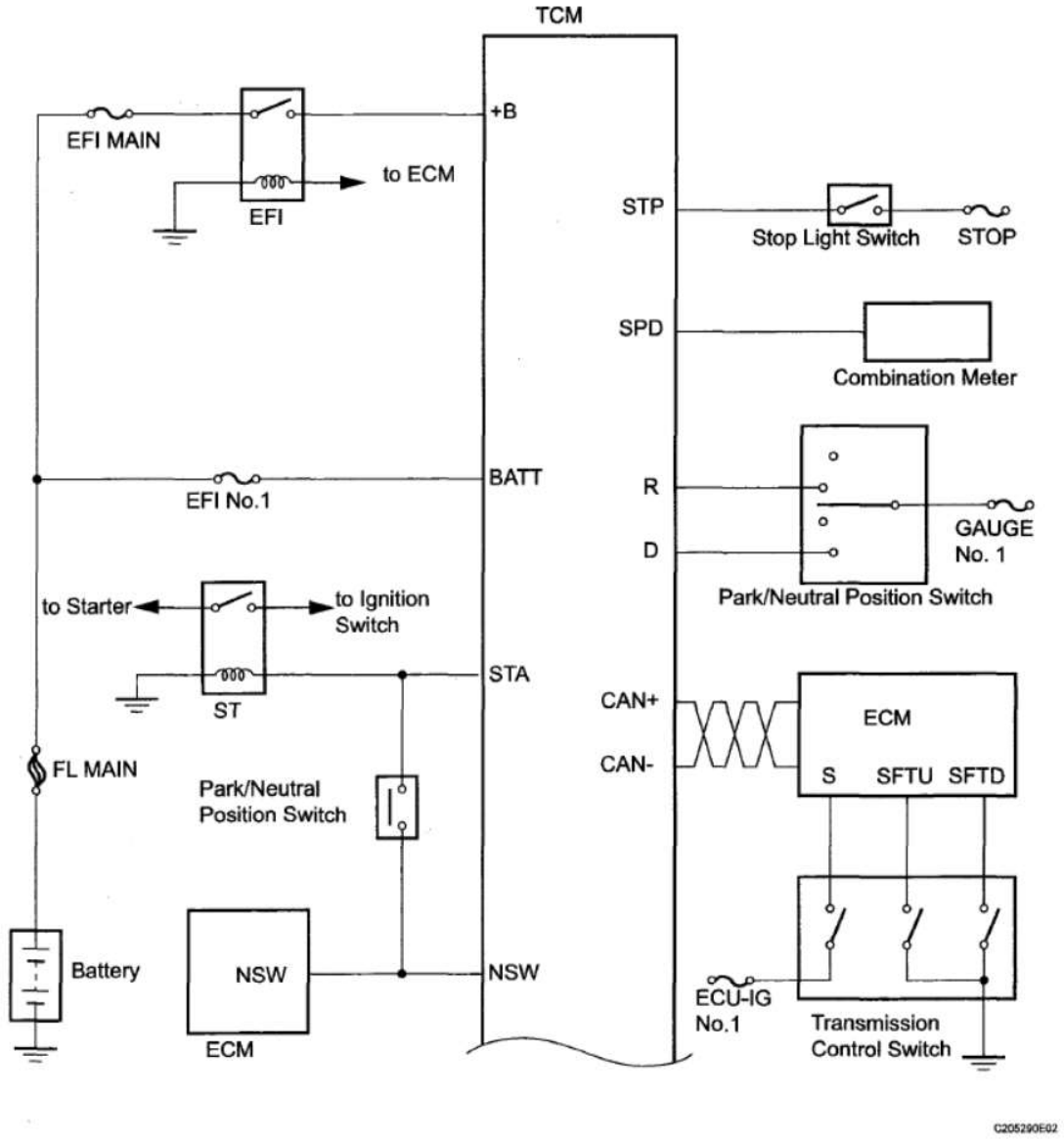


Fig. 4: Automatic Transaxle System Diagram (2 Of 3)
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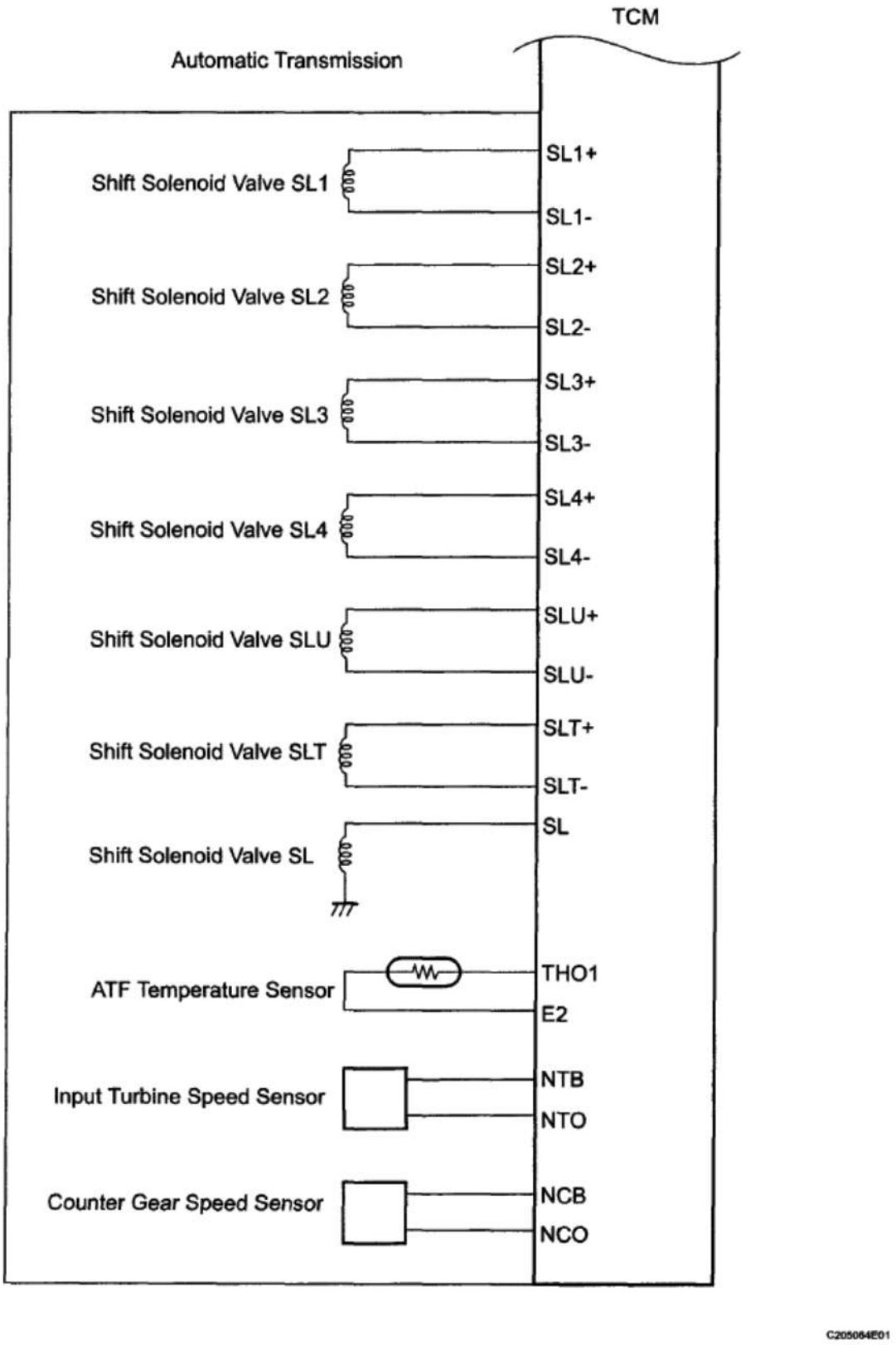


Fig. 5: Automatic Transaxle System Diagram (3 Of 3)

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SYSTEM DESCRIPTION

1. **SYSTEM DESCRIPTION**
   a. The Electronic Controlled Automatic Transaxle (ECT) is an automatic transaxle that has its shift timing electronically controlled by the Transmission Control Module (TCM). The TCM detects electrical signals that indicate engine and driving conditions, and controls the shift point, based on driver's habits and road conditions. As a result, fuel efficiency and transaxle performance are improved. Shift shock has been reduced by controlling the engine and transaxle simultaneously. In addition, the ECT has features such as:
      - Diagnostic function.
      - Fail-safe function for use when a malfunction occurs.

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

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

1. **VEHICLE BROUGHT TO WORKSHOP**
2. **CUSTOMER PROBLEM ANALYSIS**
3. **INSPECT BATTERY VOLTAGE**

   Standard Voltage:

   11 to 14 V

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

4. **CONNECT TECHSTREAM TO DLC3***
5. **CHECK AND CLEAR DTCS AND FREEZE FRAME DATA***
   a. Refer to **DTC CHECK/CLEAR** (See **DTC CHECK/CLEAR**).
6. **VISUAL INSPECTION**
7. **SELECT CHECK MODE DIAGNOSIS***
   a. Refer to **CHECK MODE PROCEDURE** (See **CHECK MODE PROCEDURE**).
8. **PROBLEM SYMPTOM CONFIRMATION**
   a. Refer to **ROAD TEST** (See **ROAD TEST**).

   Result

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RESULT CHART

Result	Proceed to
Symptom does not occur	A
Symptom occurs	B

B: GO TO STEP 10

A: Go to next step

9. **SYMPTOM SIMULATION**
   a. Refer to Symptom Simulation (See **HOW TO PROCEED WITH TROUBLESHOOTING**).
10. **DTC CHECK***
    a. Refer to **DTC CHECK/CLEAR** (See **DTC CHECK/CLEAR**).

Result

RESULT CHART

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

B: GO TO STEP 18

A: Go to next step

11. **BASIC INSPECTION**
    a. Refer to **AUTOMATIC TRANSMISSION FLUID** (See **AUTOMATIC TRANSAXLE FLUID**).
    b. Refer to Park/Neutral Position Switch (See **INSPECTION**).
    c. Refer to Shift Lever Assembly (See **ADJUSTMENT**).

NG: GO TO STEP 21

OK: Go to next step

12. **MECHANICAL SYSTEM TESTS**
    a. Refer to **MECHANICAL SYSTEM TESTS** (See **MECHANICAL SYSTEM TESTS**).

NG: GO TO STEP 17

OK: Go to next step

13. **HYDRAULIC TEST**
    a. Refer to **HYDRAULIC TEST** (See **HYDRAULIC TEST**).

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NG: GO TO STEP 17

OK: Go to next step

14. **MANUAL SHIFTING TEST**
    a. Refer to **MANUAL SHIFTING TEST** (See **MANUAL SHIFTING TEST**).

NG: GO TO STEP 16

OK: Go to next step

15. **PROBLEM SYMPTOMS TABLE CHAPTER 1**
    a. Refer to **PROBLEM SYMPTOMS TABLE** (See **PROBLEM SYMPTOMS TABLE**).

NG: GO TO STEP 19

OK: Go to next step

16. **PROBLEM SYMPTOMS TABLE CHAPTER 2**
    a. Refer to **PROBLEM SYMPTOMS TABLE** (See **PROBLEM SYMPTOMS TABLE**).
17. **COMPONENT INSPECTION**

NEXT: GO TO STEP 21

18. **DTC CHART**
    a. Refer to **DIAGNOSTIC TROUBLE CODE CHART** (See **DIAGNOSTIC TROUBLE CODE CHART**).
19. **CIRCUIT INSPECTION**
20. **IDENTIFICATION OF PROBLEM**
21. **REPAIR OR REPLACE**
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 or down, or the shift point is too high or too low, conduct the following road test referring to the automatic shift schedule and attempt to duplicate the problem symptoms.
2. **ROAD TEST**

NOTE: Perform the test at an Automatic Transmission Fluid (ATF) temperature 50

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to 80°C (122 to 176°F) in the normal operation.

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 to 2, 2 to 3, 3 to 4, 4 to 5 and 5 to 6 up-shifts take place, and that the shift points conform to the automatic shift schedule.

   HINT:

   6th Gear Up-shift Prohibition Control

   - Engine coolant temperature is 55°C (131°F) or less and vehicle speed is 51 km/h (32 mph) or less.
   - ATF temperature is 0°C (32°F) or less.

   5th Gear Up-shift Prohibition Control

   - Engine coolant temperature is 55°C (131°F) or less and vehicle speed is 51 km/h (32 mph) or less.
   - ATF temperature is 0°C (32°F) or less.

   4th Gear Up-shift Prohibition Control

   - Engine coolant temperature is 55°C (131°F) or less and vehicle speed is 49 km/h (31 mph) or less.

   Lock-up Prohibition Control

   - Brake pedal is depressed.
   - Accelerator pedal is released.
   - Engine coolant temperature is 60°C (140°F) or less.
2. Check for shift shock and slippage.

   Check for shock and slippage at the 1 to 2, 2 to 3, 3 to 4, 4 to 5 and 5 to 6 up-shifts.

3. Check for abnormal noise and vibration. Check for abnormal noise and vibration when up-shifting from 1 to 2, 2 to 3, 3 to 4,4 to 5 and 5 to 6 while driving with the shift lever in D, and also 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

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also be due to loss of balance in the differential, torque converter clutch, etc.

4. Check kick-down operation.

   Check vehicle speeds when the 2 to 1, 3 to 2, 4 to 3, 5 to 4, and 6 to 5 kick-downs take place while driving with the shift lever in D. Confirm that each speed is within the applicable vehicle speed range indicated in the automatic shift schedule.

5. Check for abnormal shock and slippage at kick-down.
6. Check the lock-up mechanism.
   - Drive the vehicle with the shift lever in D (4th, 5th or 6th gear) at 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 function in 1st, 2nd and 3rd gears.
- If there is a jump in engine speed, this indicates that lock-up is not operating.

b. S position test

Move the shift lever to S and check the following:

1. Check shift operation.
   - With the shift lever in S (while the vehicle is stopped), repeatedly move the shift lever toward "+" and check that the shift position on the combination meter changes as follows: 1 to 2, 2 to 3, 3 to 4, 4 to 5 and 5 to 6.
   - While driving in 5th gear with the S5 range selected (at a vehicle speed of approximately 55 to 65 km/h (34 to 40 mph), move the shift lever toward "-" and check if the down-shift to 4th gear and proper engine braking occurs.
   - While driving in 4th gear with the S4 range selected (at a vehicle speed of approximately 35 to 45 km/h (22 to 28 mph), move the shift lever toward "-" and check if the down-shift to 3rd gear and proper engine braking occurs.
   - While driving in 3rd gear with the S3 range selected (at a vehicle speed of approximately 20 to 30 km/h (12 to 19 mph), move the shift lever toward "-" and check if the down-shift to 2nd gear and proper engine braking occurs.
   - While driving in 2nd gear with the S2 range selected (at a vehicle speed of approximately 15 to 25 km/h (9 to 16 mph), move the shift lever toward "-" and check if the down-shift to 1st gear and proper engine braking occurs.

HINT:

Changing ranges (with the shift lever in S position) is prohibited under either of the following conditions:

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- If down-shifting may cause excessive engine speed.
- If the driver continuously down-shifts. (Downshifting to 1st may not be performed.)

c. 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 the test area is free from people and obstructions.

d. 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.

MECHANICAL SYSTEM TESTS

1. STALL SPEED TEST

HINT:

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

CAUTION:

- **Driving test should be done on a paved surface (a surface that is not slippery).**
- **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.**

NOTE: Do not perform the stall speed test for longer than 5 seconds.

a. Connect the Techstream 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 and headlights off.
d. Chock all 4 wheels.
e. Set the parking brake and keep the brake pedal depressed firmly with your left foot.
f. Move the shift lever to D.
g. Depress the accelerator pedal as much as possible with your right foot.
h. Read the engine rpm (stall speed) and release the accelerator pedal immediately.

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Standard value

SPEED VALUE REFERENCE

Stall Speed	
2810 rpm	+ 200 rpm
	- 400 rpm

Evaluation

EVALUATION CHART

Test Result	Possible Cause
Stall speed is lower than standard value	• Engine power output may be insufficient • Stator one-way clutch is 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 • Clutch No. 1 (C_1) is slipping • One-way clutch (F_1) is not operating properly • Improper fluid level

2. **SHIFT TIME LAG TEST**

HINT:

When the shift lever is moved while the engine is idling, there will be a certain time lapse or lag before the shock can be felt. This is used for checking the condition of the clutch, and brake.

a. Connect the Techstream 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 position 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 steps above 3 times, and calculate the average time of the 3 tests.
f. Check the R position 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 steps above 3 times, and calculate the average time of the 3 tests.

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Standard value:

D position time lag is less than 1.2 seconds

R position time lag is less than 1.5 seconds

Evaluation (If N to D or N to R time lag is longer than the specified time)

EVALUATION CHART

Test Result	Possible Cause
D position time lag exceeds standard value	• Line pressure is too low • Clutch No.1 (C_1) is worn • One-way clutch (F_1) is not operating properly
R position time lag exceeds standard value	• Line pressure is too low • Brake No. 2 (B_2) is worn • Brake No. 3 (B_3) is worn

HYDRAULIC TEST

1. **PERFORM HYDRAULIC TEST**
   a. Measure the line pressure.

CAUTION: The line pressure test should always be carried out with at least 2 people. One person should observe the condition of wheels and wheel chocks while the other is performing the test.

NOTE:

- **Perform a test at the normal operating Automatic Transmission Fluid (ATF) temperature: 50 to 80°C (122 to 176°F)**
- **Be careful to prevent the SST hose from interfering with the exhaust pipe.**
- **This check must be conducted after checking and confirming that the engine is normal.**
- **Perform the test with the A/C off.**
- **Do not perform the stall test for longer than 5 seconds.**

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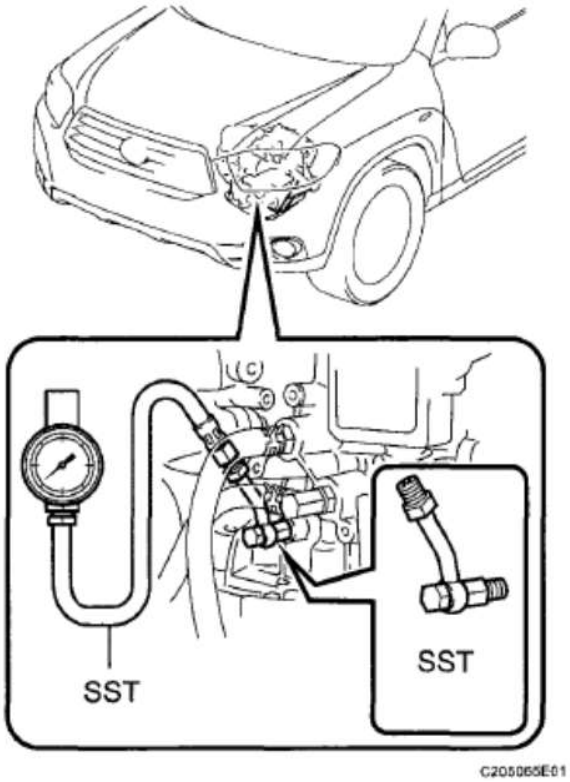


Fig. 6: Measuring Line Pressure Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Warm up the Automatic Transmission Fluid (ATF).
2. Lift the vehicle up.
3. Remove the engine under cover.
4. Remove the test plug on the transaxle case front left side and install the SST.

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

5. Lower the vehicle.
6. Fully apply the parking brake and chock the 4 wheels.
7. Connect the Techstream to the DLC3.
8. Start the engine.
9. Enter the following menus: Powertrain/ECT/Active Test/Control the Shift Position.
10. Move the shift lever to D, and then use the Techstream to hold 3rd gear using Active Test. Measure the line pressure while the engine is idling.

    Specified Line Pressure

LINE PRESSURE SPECIFICATION

Condition	D Position kPa (kgf/cm^2 , psi)

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Idling	360 to 430 kPa (3.7 to 4.4 kgf/cm^2 , 52 to 62 psi)

11. Turn the ignition switch off.
12. Disconnect the connector of the TCM.

HINT:

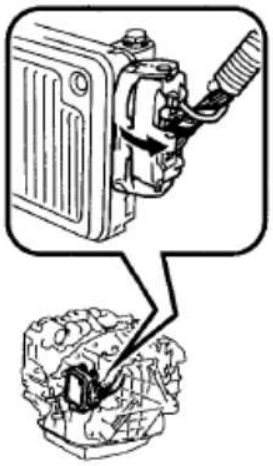
Disconnect the connector only when performing the D position stall test.

13. Start the engine.
14. Firmly depress the brake pedal, move the shift lever to D, depress the accelerator pedal all the way down, and check the line pressure while the stall test is performed.

Specified Line Pressure

LINE PRESSURE SPECIFICATION

Condition	D Position kPa (kgf/cm^2 , psi)
Stall test	1160 to 1350 kPa (11.8 to 13.8 kgf/cm^2 , 168 to 196 psi)



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Fig. 7: Disconnecting Connector Of TCM
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. Turn the ignition switch off.
16. Connect the TCM connector, depress the brake pedal firmly, move the shift lever to R, and check that the line pressure while the engine is idling and during the stall test.

Specified Line Pressure

LINE PRESSURE SPECIFICATION

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Condition	R Position kPa (kgf/cm^2 , psi)
Idling	670 to 820 kPa (6.8 to 8.4 kgf/cm^2 , 97 to 119 psi)
Stall test	1900 to 2200 kPa (19.4 to 22.4 kgf/cm^2 , 276 to 319 psi)

17. Remove the SST, install the test plug.
18. Clear the DTCs.

Evaluation

EVALUATION CHART

Test Result	Possible Cause
Measured values are higher than the specified value in all positions	• Shift solenoid valve (SLT) defective • Regulator valve defective
Measured values are lower than the specified value in all positions	• Shift solenoid valve (SLT) defective • Regulator valve defective • Oil pump defective
Pressure is low in D only	• D position circuit fluid leak • Clutch No. 1 (C_1) defective
Pressure is low in R only	• R position circuit fluid leak • Brake No. 2 (B_2) defective Brake No. 3 (B_3) defective

MANUAL SHIFTING TEST

1. **PERFORM MANUAL SHIFTING TEST**

HINT:

- Using this test, it can be determined whether a problem is in an 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 TCM.

HINT:

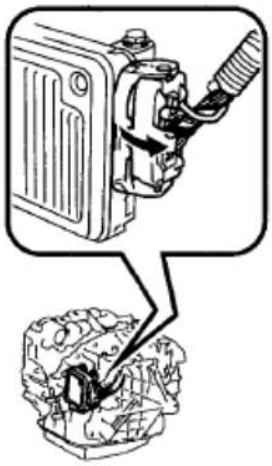
It is possible to deactivate the electrical shift control by disconnecting the TCM connector. The gears can then be changed mechanically with the shift lever.

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

SHIFT LEVER POSITION REFERENCE

Shift Lever Position	Gear
P	P
R	R
D	3rd No Shift (Gears will not change)



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Fig. 8: Disconnecting Connector Of TCM
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Connect the connector of the TCM.
d. Clear the DTCs (See **DTC CHECK/CLEAR**).

REGISTRATION

NOTE:

- **When the automatic transaxle is replaced, the transaxle compensation code must be input into the TCM (proceed to Procedure 1). After the automatic transaxle is reinstalled, the Quick Response (QR) code label will be positioned where the code cannot be read. Therefore, before reinstalling the automatic transaxle, record the transaxle compensation codes or input them in the Techstream.**
- **When the TCM is replaced, the existing transaxle compensation codes must be input into the new TCM (proceed to Procedure 2).**

1. **INPUT TRANSAXLE COMPENSATION CODE INTO TCM (Procedure 1)**

NOTE: **Transaxle compensation codes are unique, 60-digit alphanumeric values**

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printed on a QR label on the transaxle. If an incorrect transaxle compensation code is input into the TCM, shift shock may occur.

a. Record the transaxle compensation code specified on the QR label.

HINT:

The transaxle compensation code is imprinted on the QR label.

b. Move the shift lever to N or P.
c. Connect the Techstream to the DLC3.
d. Turn the ignition switch to ON.
e. Turn the Techstream on.

NOTE: Do not start the engine.

f. Enter the following menus: Powertrain/ECT/Utility/A/T Code Registration.
g. Select "Set Compensation Code".
h. Register the compensation code.
   1. Press "Input".
   2. Manually input the transaxle compensation code. The code is a 60-digit alphanumeric value printed on the QR label. After inputting the code, press "OK".

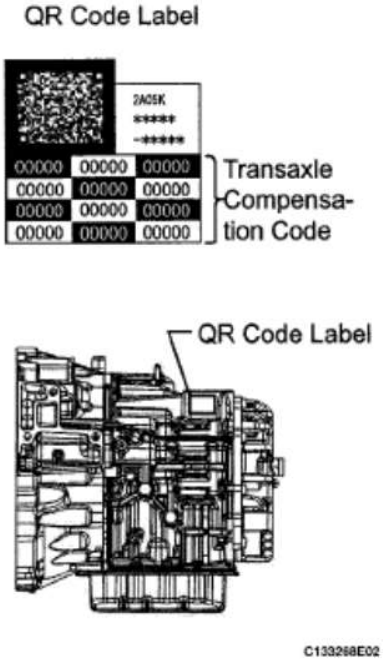


Fig. 9: Identifying Transaxle Compensation Code On QR Label
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i. Check that the compensation code displayed on the screen is correct by comparing it with the 60-digit alphanumeric value on the QR label.

NOTE: If an incorrect transaxle compensation code is input into the TCM, shift shock will occur.

j. Press "NEXT" to set the compensation code to the TCM.

HINT:

- If the registration process fails, the compensation code may be incorrect. Check the compensation code again.
- If the attempted compensation code is correct, a problem with the wire harness or a bad connection with the DLC3 may cause a registration failure. Check the wire harness and the DLC3 connection. If no problem is found, the TCM may be malfunctioning. Check the TCM and repeat this operation.

k. Press "EXIT".

2. **TRANSFER TRANSAXLE COMPENSATION CODE (Procedure 2)**

NOTE: Transaxle compensation codes are 60-digit alphanumeric values imprinted on a QR label on the transaxle. If an incorrect transaxle compensation code is input into the TCM, shift shock may occur.

HINT:

The following operation is available for use with TCMs that can transmit the registered transaxle compensation code to Techstream.

a. Move the shift lever to N or P.
b. Connect the Techstream to the DLC3.
c. Turn the ignition switch to ON.
d. Turn the Techstream on.

NOTE: Do not start the engine.

HINT:

The transaxle compensation code is imprinted on the QR label.

e. Read the transaxle compensation code.
   1. Enter the following menus: Powertrain/ECT/Utility/A/T Code Registration.
   2. Select "Read Compensation Code".
   3. Press "Save".

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4. Press "Save" or "Overwrite".

   HINT:

   Press "Overwrite".

   NOTE: Do not use the code specified on the transaxle QR label even if the transaxle compensation code cannot be read using the Techstream. The code printed on an in-service transaxle may not match its current characteristics. Replace the TCM with a new one and perform a road test to allow the TCM to learn.

5. Press "EXIT".
6. Turn the ignition switch off.

f. Replace the TCM.

g. Set the transaxle compensation code.

1. Turn the ignition switch to ON.
2. Turn the Techstream on.
3. Enter the following menus: Powertrain/ECT/Utility/A/T Code Registration.
4. Select "Set Compensation Code".
5. Press "Open".
6. Press "Open" again to proceed.
7. Press "Exit".

INITIALIZATION

1. RESET TRANSAXLE COMPENSATION CODE

NOTE:

- **If the following parts have been replaced, initialize the TCM and perform the following "Reset Memory" and "Perform Road Test to Allow TCM to learn" steps.**
  - **Valve body assembly**
  - **Shift solenoid valve SL3**
  - **Shift solenoid valve SL4**
  - **TCM**
- **The transaxle compensation code can only be initialize with the Techstream.**

HINT:

The TCM memorizes the condition that the ECT controls the automatic transaxle assembly according to those characteristics. Therefore, when the automatic transaxle assembly, or TCM has been replaced, it is

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necessary to reset the memory so that the TCM can memorize the new information. Reset procedure is as follows:

a. Move the shift lever to N or P.
b. Turn the ignition switch off.
c. Connect the Techstream to the DLC3.
d. Turn the ignition switch to ON.
e. Turn the Techstream on.
f. Enter the following menus: Powertrain/ECT/Utility/A/T Code Reset.
g. Press "Next" again to proceed.

NOTE: After the transaxle compensation code is initialized, perform the following "Reset Memory" and "Perform Road Test to Allow TCM to learn" steps.

h. Press "Exit".

2. **PERFORM ROAD TEST TO ALLOW TCM TO LEARN**

NOTE: Perform the following procedure while strictly observing all traffic laws and speed limits.

a. Warm up the engine.
b. Turn the ignition switch off.
c. Connect the Techstream to the DLC3.
d. Turn the ignition switch to ON.
e. Turn the Techstream on.
f. Enter the following menus: Powertrain/ECT/Data List/Throttle Position from EFI.
g. From a standstill, achieve highest possible speed with the accelerator pedal opened 15% or less. Keep the accelerator pedal angle steady while driving the vehicle.

HINT:

"Throttle Position from EFI": 15% or less

h. Repeat the previous step until shift shock no longer occurs.
i. From a standstill, achieve highest possible speed with the accelerator pedal opened 25% to 35%. Keep the accelerator pedal angle steady while driving the vehicle.

HINT:

"Throttle Position from EFI": 25% to 35%

j. Repeat the previous step until shift shock no longer occurs.

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3. **RESET MEMORY**

NOTE: Reset Memory can be performed only with the Techstream.

HINT:

The TCM (ECT) memorizes the vehicle conditions when controlling the automatic transaxle assembly and engine assembly.

Therefore, when the automatic transaxle assembly, valve body assembly, shift solenoid valve SL3, shift solenoid valve SL4, or TCM has been replaced, it is necessary to reset the memory so that the TCM can memorize the new information.

a. Reset procedure is as follows.
   1. Turn the ignition switch off.
   2. Connect the Techstream to the DLC3.
   3. Turn the ignition switch to ON.
   4. Turn the Techstream on.
   5. Enter the following menus: "Powertrain/ECT/Utility/Reset Memory". Then, press "Next".

NOTE: After performing Reset Memory, be sure to perform "Perform Road Test to Allow TCM to Learn" described earlier.

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 TCM (ECT) malfunction detection conditions. Some 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. Some malfunctions are not detected when the atmospheric temperature is less than -10°C

b. Drive pattern
   1. Drive the vehicle through all the gears. Stop --> 1st --> 2nd --> 3rd --> 4th --> 5th --> 6th --> 6th (lock-up ON).

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2. Confirm engine braking using the S position. While driving with S6 range selected and 6th gear operating with lock-up on, move the shift lever toward "-" to downshift from 6 to 5, 5 to 4,4 to 3, 3 to 2, 2 to 1.
3. Repeat the above drive pattern three times or more.

NOTE:

- **When using the Techstream, the monitor status can be checked in the Data List (See DATA LIST/ACTIVE TEST).**
- **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.**

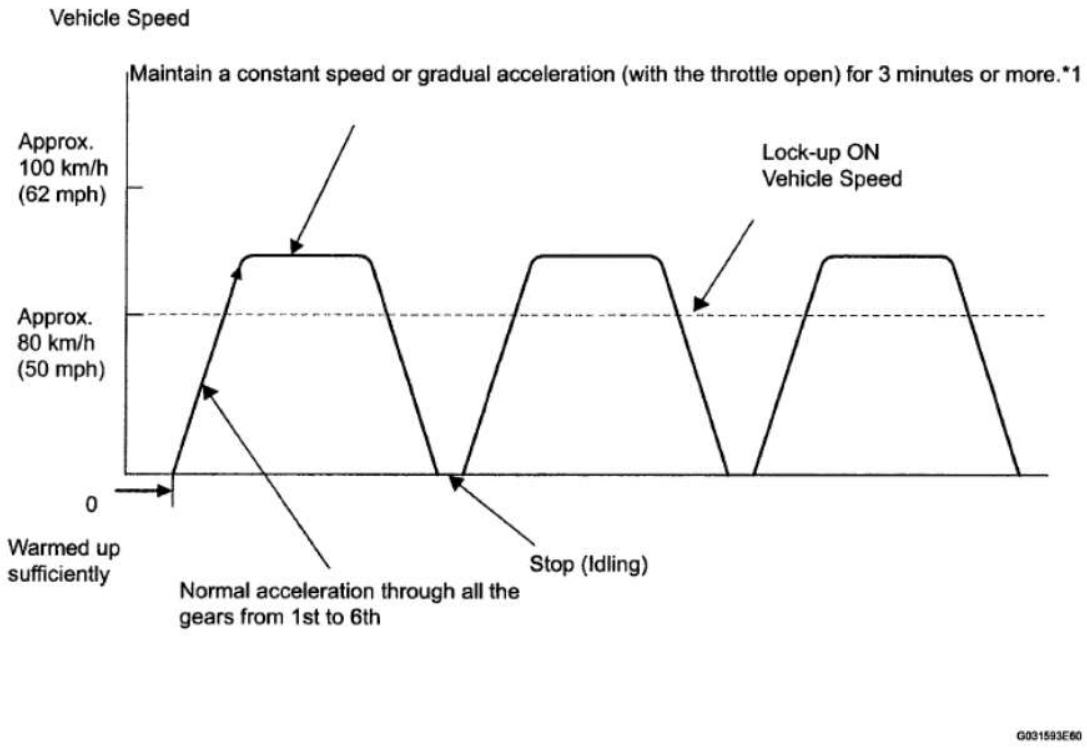


Fig. 10: Driving Pattern Of Vehicle Speed
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HINT:

*1: Drive the vehicle at a speed in top gear that will cause lock-up to engage. The vehicle can be driven at a speed lower than that in the above diagram under the lock-up condition.

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

PROBLEM SYMPTOMS TABLE

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HINT:

- Use the table below to help determine the cause of problem symptoms. If multiple suspected areas are listed, the potential causes of the symptoms are listed in order of probability in the "Suspected Area" column of the table. Check each symptom by checking the suspected areas in the order they are listed. Replace parts as necessary.
- The Matrix Chart is divided into 2 chapters. When troubleshooting, check Chapter 1 first. If instructions are given in Chapter 1 to proceed to 2, proceed as instructed.
- If the instruction "Proceed to next suspected area 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 TCM and replace it if necessary.
- *1: When the circuit is defective, a DTC may be output.

1. **Chapter 1: Electronic Circuit Matrix Chart**

ELECTRONIC CIRCUIT MATRIX CHART

Symptom	Suspected Area	Refer to
No up-shift(1st to 2nd)	Shift solenoid valve (SL3) circuit*1	**DTC P0798 PRESSURE CONTROL SOLENOID "C" ELECTRICAL (SHIFT SOLENOID VALVE SL3)**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
No up-shift (2nd to 3rd)	Shift solenoid valve (SL4) circuit*1	**DTC P2810 PRESSURE CONTROL SOLENOID "G" ELECTRICAL (SHIFT SOLENOID VALVE SL4)**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
No up-shift (3rd to 4th)	Shift solenoid valve (SL2) circuit*1	**DTC P0778 PRESSURE CONTROL SOLENOID "B" ELECTRICAL (SHIFT SOLENOID VALVE SL2)**
	Engine coolant temp, sensor circuit*1	**DIAGNOSTIC TROUBLE CODE CHART**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
No up-shift (4th to 5th)	Shift solenoid valve (SL1) circuit*1	**DTC P0748 PRESSURE CONTROL SOLENOID "A" ELECTRICAL (SHIFT SOLENOID VALVE SL1)**
	Shift solenoid valve (SL4) circuit*1	**DTC P2810 PRESSURE CONTROL SOLENOID "G" ELECTRICAL (SHIFT SOLENOID VALVE SL4)**
	Engine coolant temp, sensor circuit*1	**DIAGNOSTIC TROUBLE CODE CHART**

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	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
No up-shift (5th to 6th)	Engine coolant temp, sensor circuit*1	**DIAGNOSTIC TROUBLE CODE CHART**
	Shift solenoid valve (SL3) circuit*1	**DTC P0798 PRESSURE CONTROL SOLENOID "C" ELECTRICAL (SHIFT SOLENOID VALVE SL3)**
	Shift solenoid valve (SL4) circuit*1	**DTC P2810 PRESSURE CONTROL SOLENOID "G" ELECTRICAL (SHIFT SOLENOID VALVE SL4)**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
No down-shift (6th to 5th)	Shift solenoid valve (SL4) circuit*1	**DTC P2810 PRESSURE CONTROL SOLENOID "G" ELECTRICAL (SHIFT SOLENOID VALVE SL4)**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
No down-shift (5th to 4th)	Shift solenoid valve (SL1) circuit*1	**DTC P0748 PRESSURE CONTROL SOLENOID "A" ELECTRICAL (SHIFT SOLENOID VALVE SL1)**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
No down-shift (4th to 3rd)	Shift solenoid valve (SL2) circuit*1	**DTC P0778 PRESSURE CONTROL SOLENOID "B" ELECTRICAL (SHIFT SOLENOID VALVE SL2)**
	Shift solenoid valve (SL4) circuit*1	**DTC P2810 PRESSURE CONTROL SOLENOID "G" ELECTRICAL (SHIFT SOLENOID VALVE SL4)**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
No down-shift (3rd to 2nd)	Shift solenoid valve (SL4) circuit*1	**DTC P2810 PRESSURE CONTROL SOLENOID "G" ELECTRICAL (SHIFT SOLENOID VALVE SL4)**
	Shift solenoid valve (SL3) circuit*1	**DTC P0798 PRESSURE CONTROL SOLENOID "C" ELECTRICAL (SHIFT SOLENOID VALVE SL3)**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
No down-shift (2nd to 1st)	Shift solenoid valve (SL3) circuit*1	**DTC P0798 PRESSURE CONTROL SOLENOID "C" ELECTRICAL (SHIFT SOLENOID VALVE SL3)**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
		DTC P2759 TORQUE CONVERTER

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No lock-up	Shift solenoid valve (SLU) circuit*1	**CLUTCH PRESSURE CONTROL SOLENOID CONTROL CIRCUIT ELECTRICAL (SHIFT SOLENOID VALVE SLU)**
	Shift solenoid valve (SL) circuit*1	**DTC P2769 SHORT IN TORQUE CONVERTER CLUTCH SOLENOID CIRCUIT (SHIFT SOLENOID VALVE SL)**
	Engine coolant temp, sensor circuit*1	**DIAGNOSTIC TROUBLE CODE CHART**
	Stop light switch circuit*1	**DTC P0724 BRAKE SWITCH "B" CIRCUIT HIGH**
	Speed sensor NT circuit*1	**DTC P0715 INPUT/TURBINE SPEED SENSOR CIRCUIT MALFUNCTION**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
No lock-up off	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
Shift point too high or too low	Shift solenoid valve (SLT) circuit*1	**DTC P2716 PRESSURE CONTROL SOLENOID "D" ELECTRICAL (SHIFT SOLENOID VALVE SLT)**
	Speed sensor NT circuit*1	**DTC P0715 INPUT/TURBINE SPEED SENSOR CIRCUIT MALFUNCTION**
	Speed sensor NC circuit*1	**DTC P0791 INTERMEDIATE SHAFT SPEED SENSOR "A" CIRCUIT**
	Accelerator pedal position sensor circuit*1	**DIAGNOSTIC TROUBLE CODE CHART**
	ATF temperature sensor circuit*1	**DTC P0712 TRANSMISSION FLUID TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
Lip-shift from 3rd to 4th while engine is cold	Engine coolant temp, sensor circuit*1	**DIAGNOSTIC TROUBLE CODE CHART**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
Up-shift from 4th to 5th while engine is cold	Engine coolant temp, sensor circuit*1	**DIAGNOSTIC TROUBLE CODE CHART**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
	Transmission control switch	**TRANSMISSION CONTROL SWITCH CIRCUIT**

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	circuit	
No gear change by moving shift lever to "+" or "-" while in S	ECM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
Harsh engagement (N to D)	Shift solenoid valve (SL1) circuit* 1	**DTC P0748 PRESSURE CONTROL SOLENOID "A" ELECTRICAL (SHIFT SOLENOID VALVE SL1)**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
Harsh engagement (Lock-up)	Speed sensor NT circuit*1	**DTC P0715 INPUT/TURBINE SPEED SENSOR CIRCUIT MALFUNCTION**
	Speed sensor NC circuit*1	**DTC P0791 INTERMEDIATE SHAFT SPEED SENSOR "A" CIRCUIT**
	Shift solenoid valve (SLU) circuit*1	**DTC P2759 TORQUE CONVERTER CLUTCH PRESSURE CONTROL SOLENOID CONTROL CIRCUIT ELECTRICAL (SHIFT SOLENOID VALVE SLU)**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
Harsh engagement (Any driving position)	Accelerator pedal position sensor circuit*1	**DIAGNOSTIC TROUBLE CODE CHART**
	Shift solenoid valve (SLT) circuit*1	**DTC P2716 PRESSURE CONTROL SOLENOID "D" ELECTRICAL (SHIFT SOLENOID VALVE SLT)**
	Speed sensor NC circuit*1	**DTC P0791 INTERMEDIATE SHAFT SPEED SENSOR "A" CIRCUIT**
	Speed sensor NT circuit*1	**DTC P0715 INPUT/TURBINE SPEED SENSOR CIRCUIT MALFUNCTION**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
Poor acceleration	Shift solenoid valve (SLT) circuit*1	**DTC P2716 PRESSURE CONTROL SOLENOID "D" ELECTRICAL (SHIFT SOLENOID VALVE SLT)**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
No engine braking	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
No kick-down	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
Engine stalls when starting off or stopping	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
	Park/neutral	**DTC P0705 TRANSMISSION RANGE**

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Shifting malfunction	position switch circuit*1	**SENSOR CIRCUIT MALFUNCTION (PRNDL INPUT)**
	Transmission control switch circuit	**TRANSMISSION CONTROL SWITCH CIRCUIT**
	ECM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
Shifting malfunction (Vehicle is stuck in 3rd or 5th gear)	ECU power source circuit	**ECU POWER SOURCE CIRCUIT**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
Slip or shudder (5th to 6th and 6th to 5th)	Shift solenoid valve (SLT) circuit*1	**DTC P2716 PRESSURE CONTROL SOLENOID "D" ELECTRICAL (SHIFT SOLENOID VALVE SLT)**
Initial acceleration or subsequent acceleration is improper. Vehicle is stuck in a gear (1st to 6th).	Shift solenoid valve (SL1) circuit*1	**DTC P0748 PRESSURE CONTROL SOLENOID "A" ELECTRICAL (SHIFT SOLENOID VALVE SL1)**
	Shift solenoid valve (SLT) circuit*1	**DTC P2716 PRESSURE CONTROL SOLENOID "D" ELECTRICAL (SHIFT SOLENOID VALVE SLT)**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
Acceleration is improper when the gear is 4th or higher.	Shift solenoid valve (SL2) circuit*1	**DTC P0778 PRESSURE CONTROL SOLENOID "B" ELECTRICAL (SHIFT SOLENOID VALVE SL2)**
	Shift solenoid valve (SLT) circuit*1	**DTC P2716 PRESSURE CONTROL SOLENOID "D" ELECTRICAL (SHIFT SOLENOID VALVE SLT)**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
Initial acceleration or subsequent acceleration is improper. Vehicle does not shift down (from 4th to 3rd). Vehicle is stuck in a gear (1st to 4th).	Shift solenoid valve (SL2) circuit*1	**DTC P0778 PRESSURE CONTROL SOLENOID "B" ELECTRICAL (SHIFT SOLENOID VALVE SL2)**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
Acceleration is improper when the gear is 6th.	Shift solenoid valve (SL3) circuit*1	**DTC P0798 PRESSURE CONTROL SOLENOID "C" ELECTRICAL (SHIFT SOLENOID VALVE SL3)**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
	Shift solenoid valve (SL4) circuit*1	**DTC P2810 PRESSURE CONTROL SOLENOID "G" ELECTRICAL (SHIFT SOLENOID VALVE SL4)**

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Acceleration is improper when the gear is 3rd or 5th.	Shift solenoid valve (SLT) circuit*1	**DTC P2716 PRESSURE CONTROL SOLENOID "D" ELECTRICAL (SHIFT SOLENOID VALVE SLT)**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
Initial acceleration or subsequent acceleration is improper. Vehicle does not shift down (from 3rd to 2nd). No up-shift (5th to 6th).	Shift solenoid valve (SL4) circuit*1	**DTC P2810 PRESSURE CONTROL SOLENOID "G" ELECTRICAL (SHIFT SOLENOID VALVE SL4)**
	TCM	**ELECTRONIC CIRCUIT INSPECTION PROCEDURE**
HINT: *1: When the circuit is defective, a DTC may be output.		

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

ON-VEHICLE REPAIR AND OFF-VEHICLE REPAIR PROBLEM SYMPTOMS CHART

Symptom	Suspected Area	Refer to
Vehicle does not move in any forward or reverse positions.	Valve body assembly	**REMOVAL**
	Torque converter clutch	**TORQUE CONVERTER CLUTCH AND DRIVE PLATE**
Vehicle does not move with shift lever in R	Valve body assembly	**REMOVAL**
	Brake No. 2 (B2)	**AUTOMATIC TRANSAXLE UNIT**
	Brake No. 3 (B3)	**AUTOMATIC TRANSAXLE UNIT**
	Shift solenoid valve (SL4)*1	**DTC P2808 PRESSURE CONTROL SOLENOID "G" PERFORMANCE (SHIFT SOLENOID VALVE SL4)**
No up-shift (1st to 2nd)	Valve body assembly	**REMOVAL**
	Brake No. 1 (B1)	**AUTOMATIC TRANSAXLE UNIT**
	Shift solenoid valve (SL3)*1	**DTC P0796 PRESSURE CONTROL SOLENOID "C" PERFORMANCE (SHIFT SOLENOID VALVE SL3)**
No up-shift (2nd to 3rd)	Valve body assembly	**REMOVAL**
	Brake No. 3 (B3)	**AUTOMATIC TRANSAXLE UNIT**
	Shift solenoid valve (SL4)*1	**DTC P2808 PRESSURE CONTROL SOLENOID "G" PERFORMANCE (SHIFT SOLENOID VALVE SL4)**
No up-shift (3rd to 4th)	Valve body assembly	**REMOVAL**
	Clutch No. 2	**AUTOMATIC TRANSAXLE UNIT**

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	(C2)	
	Shift solenoid valve (SL2)*1	**DTC P0776 PRESSURE CONTROL SOLENOID "B" PERFORMANCE (SHIFT SOLENOID VALVE SL2)**
No up-shift (4th to 5th)	Valve body assembly	**REMOVAL**
	Brake No. 3 (B3)	**AUTOMATIC TRANSAXLE UNIT**
	Shift solenoid valve (SL4)*1	**DTC P2808 PRESSURE CONTROL SOLENOID "G" PERFORMANCE (SHIFT SOLENOID VALVE SL4)**
	Shift solenoid valve (SL1)*1	**DTC P0746 PRESSURE CONTROL SOLENOID "A" PERFORMANCE (SHIFT SOLENOID VALVE SL1)**
No up-shift (5th to 6th)	Valve body assembly	**REMOVAL**
	Brake No. 1 (B1)	**AUTOMATIC TRANSAXLE UNIT**
	Shift solenoid valve (SL3)*1	**DTC P0796 PRESSURE CONTROL SOLENOID "C" PERFORMANCE (SHIFT SOLENOID VALVE SL3)**
	Shift solenoid valve (SL4)*1	**DTC P2808 PRESSURE CONTROL SOLENOID "G" PERFORMANCE (SHIFT SOLENOID VALVE SL4)**
No down-shift (6th to 5th)	Brake No. 3 (B3)	**AUTOMATIC TRANSAXLE UNIT**
	Shift solenoid valve (SL4)*1	**DTC P2808 PRESSURE CONTROL SOLENOID "G" PERFORMANCE (SHIFT SOLENOID VALVE SL4)**
	Valve body assembly	**REMOVAL**
No down-shift (5th to 4th)	Shift solenoid valve (SL1)*1	**DTC P0746 PRESSURE CONTROL SOLENOID "A" PERFORMANCE (SHIFT SOLENOID VALVE SL1)**
	Clutch No. 1 (C1)	**AUTOMATIC TRANSAXLE UNIT**
	Valve body assembly	**REMOVAL**
No down-shift (4th to 3rd)	Brake No. 3 (B3)	**AUTOMATIC TRANSAXLE UNIT**
	Shift solenoid valve (SL4)*1	**DTC P2808 PRESSURE CONTROL SOLENOID "G" PERFORMANCE (SHIFT SOLENOID VALVE SL4)**
	Shift solenoid valve (SL2)*1	**DTC P0776 PRESSURE CONTROL SOLENOID "B" PERFORMANCE (SHIFT SOLENOID VALVE SL2)**
	Valve body assembly	**REMOVAL**
No down-shift (3rd to 2nd)	Brake No. 1 (B1)	**AUTOMATIC TRANSAXLE UNIT**
	Shift solenoid valve (SL3)*1	**DTC P0796 PRESSURE CONTROL SOLENOID "C" PERFORMANCE (SHIFT SOLENOID VALVE SL3)**
	Shift solenoid	**DTC P2808 PRESSURE CONTROL SOLENOID "G"**

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	valve (SL4)*1	**PERFORMANCE (SHIFT SOLENOID VALVE SL4)**
	Valve body assembly	**REMOVAL**
No down-shift (2nd to 1st)	Valve body assembly	**REMOVAL**
	Shift solenoid valve (SL3)*1	**DTC P0796 PRESSURE CONTROL SOLENOID "C" PERFORMANCE (SHIFT SOLENOID VALVE SL3)**
No lock-up or No lock-up off	Valve body assembly	**REMOVAL**
	Torque converter clutch	**TORQUE CONVERTER CLUTCH AND DRIVE PLATE**
Harsh engagement (N to D)	Valve body assembly	**REMOVAL**
	C1 accumulator	**AUTOMATIC TRANSAXLE UNIT**
	One-way clutch No. 1 (F1)	**AUTOMATIC TRANSAXLE UNIT**
	Clutch No. 1 (C1)	**AUTOMATIC TRANSAXLE UNIT**
	Shift solenoid valve (SL1)*1	**DTC P0746 PRESSURE CONTROL SOLENOID "A" PERFORMANCE (SHIFT SOLENOID VALVE SL1)**
Harsh engagement (Lock-up)	Valve body assembly	**REMOVAL**
	Torque converter clutch	**TORQUE CONVERTER CLUTCH AND DRIVE PLATE**
	Shift solenoid valve (SLU)*1	**DTC P2759 TORQUE CONVERTER CLUTCH PRESSURE CONTROL SOLENOID CONTROL CIRCUIT ELECTRICAL (SHIFT SOLENOID VALVE SLU)**
Harsh engagement (N to R)	Valve body assembly	**REMOVAL**
	Brake No. 2 (B2)	**AUTOMATIC TRANSAXLE UNIT**
	Brake No. 3 (B3)	**AUTOMATIC TRANSAXLE UNIT**
	Shift solenoid valve (SL4)*1	**DTC P2808 PRESSURE CONTROL SOLENOID "G" PERFORMANCE (SHIFT SOLENOID VALVE SL4)**
Harsh engagement (1 to 2 to 3 to 4 to 5 to 6)	Valve body assembly	**REMOVAL**
	Shift solenoid valve (SLT)*1	**DTC P0746 PRESSURE CONTROL SOLENOID "A" PERFORMANCE (SHIFT SOLENOID VALVE SL1)**
Harsh engagement (1st to 2nd)	Valve body assembly	**REMOVAL**
	B1 accumulator	**AUTOMATIC TRANSAXLE UNIT**
	Brake No. 1	**AUTOMATIC TRANSAXLE UNIT**

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	(B1)	
	Shift solenoid valve (SL3)*1	**DTC P0796 PRESSURE CONTROL SOLENOID "C" PERFORMANCE (SHIFT SOLENOID VALVE SL3)**
Harsh engagement (2nd to 3rd)	Valve body assembly	**REMOVAL**
	B3 accumulator	**AUTOMATIC TRANSAXLE UNIT**
	Brake No. 3 (B3)	**AUTOMATIC TRANSAXLE UNIT**
	Shift solenoid valve (SL4)*1	**DTC P2808 PRESSURE CONTROL SOLENOID "G" PERFORMANCE (SHIFT SOLENOID VALVE SL4)**
Harsh engagement (3rd to 4th)	Valve body assembly	**REMOVAL**
	C2 accumulator	**AUTOMATIC TRANSAXLE UNIT**
	Clutch No. 2 (C2)	**AUTOMATIC TRANSAXLE UNIT**
	Shift solenoid valve (SL2)*1	**DTC P0776 PRESSURE CONTROL SOLENOID "B" PERFORMANCE (SHIFT SOLENOID VALVE SL2)**
Harsh engagement (4th to 5th)	Valve body assembly	**REMOVAL**
	B3 accumulator	**AUTOMATIC TRANSAXLE UNIT**
	Brake No. 3 (B3)	**AUTOMATIC TRANSAXLE UNIT**
	Shift solenoid valve (SL4)*1	**DTC P2808 PRESSURE CONTROL SOLENOID "G" PERFORMANCE (SHIFT SOLENOID VALVE SL4)**
Harsh engagement (5th to 6th)	Valve body assembly	**REMOVAL**
	B1 accumulator	**AUTOMATIC TRANSAXLE UNIT**
	Brake No. 1 (B1)	**AUTOMATIC TRANSAXLE UNIT**
	Shift solenoid valve (SL3)*1	**DTC P0796 PRESSURE CONTROL SOLENOID "C" PERFORMANCE (SHIFT SOLENOID VALVE SL3)**
Harsh engagement (6th to 5th)	Valve body assembly	**REMOVAL**
	B3 accumulator	**AUTOMATIC TRANSAXLE UNIT**
	Brake No. 3 (B3)	**AUTOMATIC TRANSAXLE UNIT**
	Shift solenoid valve (SL4)*1	**DTC P2808 PRESSURE CONTROL SOLENOID "G" PERFORMANCE (SHIFT SOLENOID VALVE SL4)**
	Valve body assembly	**REMOVAL**
	Oil strainer	**REMOVAL**
	Brake No. 1 (B1)	**AUTOMATIC TRANSAXLE UNIT**
	Brake No. 2	

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Slip or shudder (Forward and reverse: After warm-up)	(B2)	**AUTOMATIC TRANSAXLE UNIT**
	Brake No. 3 (B3)	**AUTOMATIC TRANSAXLE UNIT**
	One-way clutch No. 1 (F1)	**AUTOMATIC TRANSAXLE UNIT**
	Clutch No. 1 (C1)	**AUTOMATIC TRANSAXLE UNIT**
	Clutch No. 2 (C2)	**AUTOMATIC TRANSAXLE UNIT**
Slip or shudder (Particular position: just after engine starts)	Torque converter clutch	**TORQUE CONVERTER CLUTCH AND DRIVE PLATE**
Slip or shudder (shift lever in R)	Brake No. 2 (B2)	**AUTOMATIC TRANSAXLE UNIT**
	Brake No. 3 (B3)	**AUTOMATIC TRANSAXLE UNIT**
Slip or shudder (1st)	One-way clutch No. 1 (F1)	**AUTOMATIC TRANSAXLE UNIT**
	Clutch No. 1 (C1)	**AUTOMATIC TRANSAXLE UNIT**
Slip or shudder (2nd)	Brake No. 1 (B1)	**AUTOMATIC TRANSAXLE UNIT**
	Clutch No. 1 (C1)	**AUTOMATIC TRANSAXLE UNIT**
Slip or shudder (3rd)	Brake No. 3 (B3)	**AUTOMATIC TRANSAXLE UNIT**
	Clutch No. 1 (C1)	**AUTOMATIC TRANSAXLE UNIT**
Slip or shudder (4th)	Clutch No. 1 (C1)	**AUTOMATIC TRANSAXLE UNIT**
	Clutch No. 2 (C2)	**AUTOMATIC TRANSAXLE UNIT**
Slip or shudder (5th)	Brake No. 3 (B3)	**AUTOMATIC TRANSAXLE UNIT**
	Clutch No. 2 (C2)	**AUTOMATIC TRANSAXLE UNIT**
Slip or shudder (6th)	Brake No. 1 (B1)	**AUTOMATIC TRANSAXLE UNIT**
	Clutch No. 2 (C2)	**AUTOMATIC TRANSAXLE UNIT**
No engine braking (1st)	Valve body assembly	**REMOVAL**
	Brake No. 2 (B2)	**AUTOMATIC TRANSAXLE UNIT**

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No engine braking (2nd)	Valve body assembly	**REMOVAL**
	Brake No. 1 (B1)	**AUTOMATIC TRANSAXLE UNIT**
No engine braking (3rd)	Valve body assembly	**REMOVAL**
	Brake No. 3 (B3)	**AUTOMATIC TRANSAXLE UNIT**
No engine braking (4th)	Valve body assembly	**REMOVAL**
	Clutch No. 2 (C2)	**AUTOMATIC TRANSAXLE UNIT**
No kick-down	Valve body assembly	**REMOVAL**
Shift point too high or too low	Valve body assembly	**REMOVAL**
Poor acceleration (All positions)	Valve body assembly	**REMOVAL**
	Torque converter clutch	**TORQUE CONVERTER CLUTCH AND DRIVE PLATE**
Poor acceleration (6th)	Brake No. 1 (B1)	**AUTOMATIC TRANSAXLE UNIT**
	Clutch No. 2 (C2)	**AUTOMATIC TRANSAXLE UNIT**
Engine stalls when starting off or stopping	Valve body assembly	**REMOVAL**
	Torque converter clutch	**TORQUE CONVERTER CLUTCH AND DRIVE PLATE**
HINT: *1: When the circuit is defective, a DTC may be output.		

TERMINALS OF ECU

1. **TCM**

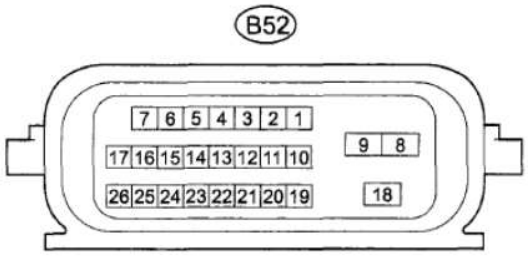


Fig. 11: Identifying TCM Connector Terminal
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HINT:

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

In the table, first follow the information under "Condition". Look under "Terminal No. (Symbol)" for the terminals to be inspected. The standard voltage between the terminals is shown under "Specified Condition". Use the illustration above as a reference for the TCM terminals.

VOLTAGE SPECIFICATION

Terminal No. (Symbol)	Wiring Color	Terminal Description	Condition	Specified Condition
B52-15 (R) - B52-8 (E1)	B - W-B	R shift position switch signal	Ignition switch ON and shift lever in R	11 to 14 V
			Ignition switch ON and shift lever in any position except R	Below 1 V
B52-16 (D) - B52-8 (E1)	G - W-B	D shift position switch signal	Ignition switch ON and shift lever in D and S	11 to 14 V
			Ignition switch ON and shift lever in any position except D and S	Below 1 V
B52-12 (STP) - B52-8 (E1)	V - W-B	Stop light switch signal	Brake pedal is depressed	7.5 to 14 V
			Brake pedal is released	Below 1.5 V
B52-11 (NSW) - B52-8 (E1)	P - W-B	Park/neutral switch signal	Ignition switch ON and shift lever in P or N	Below 2 V
			Ignition switch ON and shift lever in any position except P or N	11 to 14 V
B52-10 (STA) - B52-8 (E1)	W - W-B	Starter signal	Cranking (shift lever in P or N, engine switch START)	11 to 14 V
			Ignition switch ON and shift lever in any position except P or N	Below 2 V
B52-3 (SPD) - B52-8 (E1)	G - W-B	Speed signal from combination meter	Vehicle speed 20 km/h (12 mph)	Pulse generation (see waveform 1)
B52-1 (BATT) - B52-8 (E1)	Y - W-B	Battery (for measuring battery voltage and for TCM memory)	Always	9 to 14 V
B52-13 (IGSW) - B52-8 (E1)	W - W-B	Ignition switch	Ignition switch ON	9 to 14 V
B52-18 (+B) - B52-8 (E1)	GR - W-B	Power source of TCM	Ignition switch ON	9 to 14 V
B52-6 (CAN+) - B52-8 (E1)	B - W-B	CAN communication line	Ignition switch ON	Pulse generation (see waveform 2 a)

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B52-7 (CAN-) - B52-8 (E1)	W - W-B	CAN communication line	Ignition switch ON	Pulse generation (see waveform 3 b)

a. Waveform 1

Reference

WAVEFORM REFERENCE

Terminal	SPD - E1
Tool setting	2 V/DIV., 20 ms./DIV.
Vehicle condition	Vehicle speed 20 km/h (12 mph)

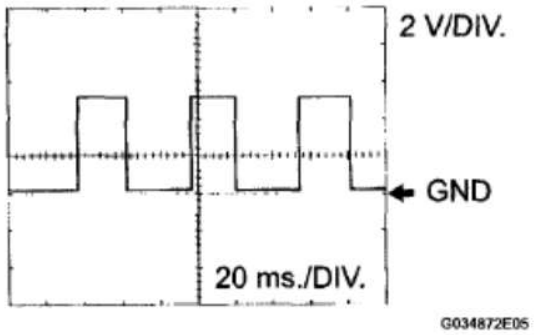


Fig. 12: Identifying Waveform 1
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Waveform 2

Reference

WAVEFORM REFERENCE

Terminal	CAN+ -E1
Tool setting	1 V/DIV., 10 ms./DIV.
Vehicle condition	Engine is stopped, ignition switch ON

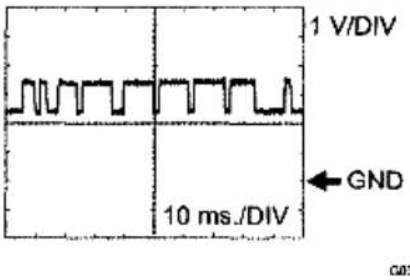


Fig. 13: Identifying Waveform 2
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c. Waveform 3

Reference

WAVEFORM REFERENCE

Terminal	CAN- - E1
Tool setting	1 V/DIV., 10 ms./DIV.
Vehicle condition	Engine is stopped, ignition switch ON

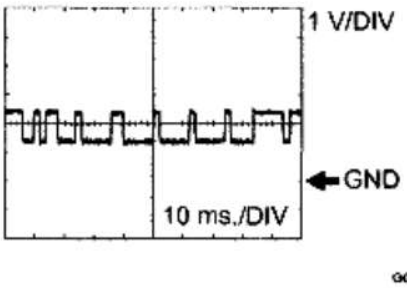


Fig. 14: Identifying Waveform 3
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **ECM**

HINT:

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

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

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

Component without harness connected:
(ECM)

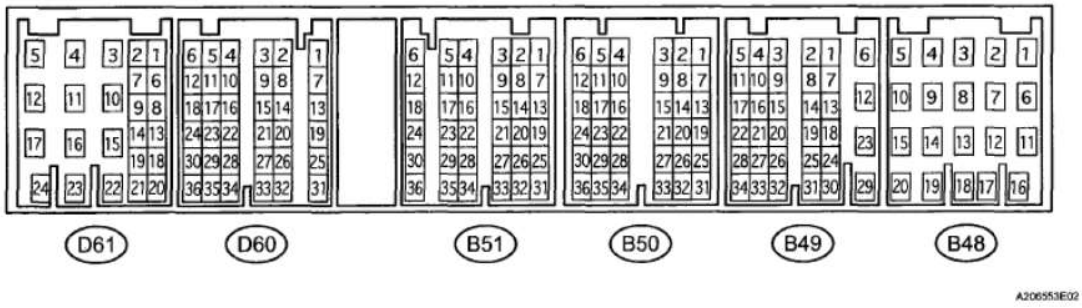


Fig. 15: Identifying ECM Connector Terminal

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VOLTAGE SPECIFICATION

Terminal No. (Symbol)	Wiring Color	Terminal Description	Condition	Specified Condition
D60-30 (S) - B49-1 (E1)	SB - W-B	S shift position switch signal	Ignition switch ON and shift lever in S	11 to 14 V
			Ignition switch ON and shift lever in any position except S	Below 1 V
D60-28 (SFTU) - B49-1 (E1)	V - W-B	Up shift switch signal	Ignition switch ON and shift lever in S	11 to 14 V
			Ignition switch ON and shift lever in "+" (Up shift)	Below 1 V
D60-4 (SFTD) - B49-1 (E1)	Y - W-B	Down shift switch signal	Ignition switch ON and shift lever in S	11 to 14 V
			Ignition switch ON and shift lever in "-" (Down shift)	Below 1 V

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 TCM can then be read.
   b. OBD II regulations require that the vehicle on-board computer illuminate the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in:
      1. The emission control system/components
      2. The powertrain control components (which affect vehicle emissions)



Fig. 16: Identifying Malfunction Indicator Lamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

      3. The computer

In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the TCM memory. When a malfunction does not reoccur, the MIL stays illuminated until the ignition switch is turned off, and the MIL turns off when the engine is

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started. However, the DTCs will remain recorded in the TCM memory.

c. To check DTCs, connect the Techstream to the Data Link Connector 3 (DLC3) of the vehicle. The Techstream displays DTCs, freeze frame data and a variety of engine data.

The DTCs and freeze frame data can be cleared with the Techstream (See **DTC CHECK/CLEAR**).

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. **TRIP DETECTION LOGIC**
   a. When a malfunction is first detected, the malfunction is temporarily stored in the TCM 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. The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can be helpful in determining whether the vehicle was running or stopped, whether the engine was warmed up or not, whether the air/fuel ratio was lean or rich, as well as other data recorded at the time of a malfunction.
   b. The Techstream 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 sets of data can be used to simulate the vehicle condition around the time when the malfunction occurred. The data may help in finding the cause of the malfunction, or in judging if the DTC was caused by a temporary malfunction.
5. **CHECK DATA LINK CONNECTOR 3 (DLC3)**
   a. Check the DLC3 (See **HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS**)

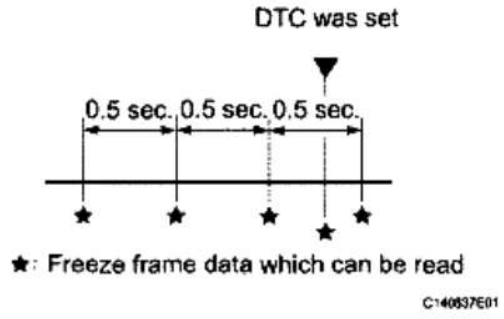


Fig. 17: Identifying Freeze Frame Data Point
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6. **CHECK MIL**
   a. Check that the MIL illuminates when turning the ignition switch to ON.

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If the MIL does not illuminate, there is a problem in the MIL circuit (See **MIL CIRCUIT**).

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

DTC CHECK/CLEAR

NOTE: When the diagnosis system is changed from normal mode to check mode or vice versa, all DTCs and freeze frame data recorded in normal mode are cleared. Before changing modes, always check and make a note of DTCs and freeze frame data.

HINT:

- DTCs which are stored in the TCM can be displayed on the Techstream. The Techstream can display the current, pending and permanent DTCs.
- If a malfunction is detected during the current driving cycle, current and permanent DTCs are stored.
- Some DTCs are not stored if the TCM does not detect the same malfunction again during a second consecutive driving cycle. However, such malfunctions, detected on only one occasion, are stored as pending DTCs.
- Current and pending DTCs can be cleared by using the Techstream or by disconnecting the cable from the negative battery terminal. However, permanent DTCs cannot be cleared using either of these two methods.
- After clearing current DTCs using the Techstream (or by disconnecting the cable from the negative battery terminal), permanent DTCs can be cleared when the system is determined to be normal for the relevant DTCs and then the universal trip is performed.

2 Trip Detection Examples

TRIP DETECTION EXAMPLES REFERENCE

Pending DTC	Store condition	Malfunction detected
	Clear condition	System determined to be normal or DTCs cleared using Techstream or Cable disconnected from negative battery terminal
Current DTC	Store condition	Malfunction detected (2nd trip)
	Clear condition	No malfunctions in 40 driving cycles or DTCs cleared using Techstream or Cable disconnected from negative battery terminal
Permanent DTC	Store condition	Malfunction detected (2nd trip)
	Clear condition	Ignition switch turned to ON after no malfunction is detected in 3 consecutive driving cycles or After DTCs cleared using Techstream or cable disconnected from negative battery terminal, malfunction not detected when universal trip driving performed
	ON	Malfunction detected (2nd trip)
		Ignition switch turned to ON after no malfunction is detected in 3 consecutive

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MIL	OFF	driving cycles or DTCs cleared using Techstream or Cable disconnected from negative battery terminal

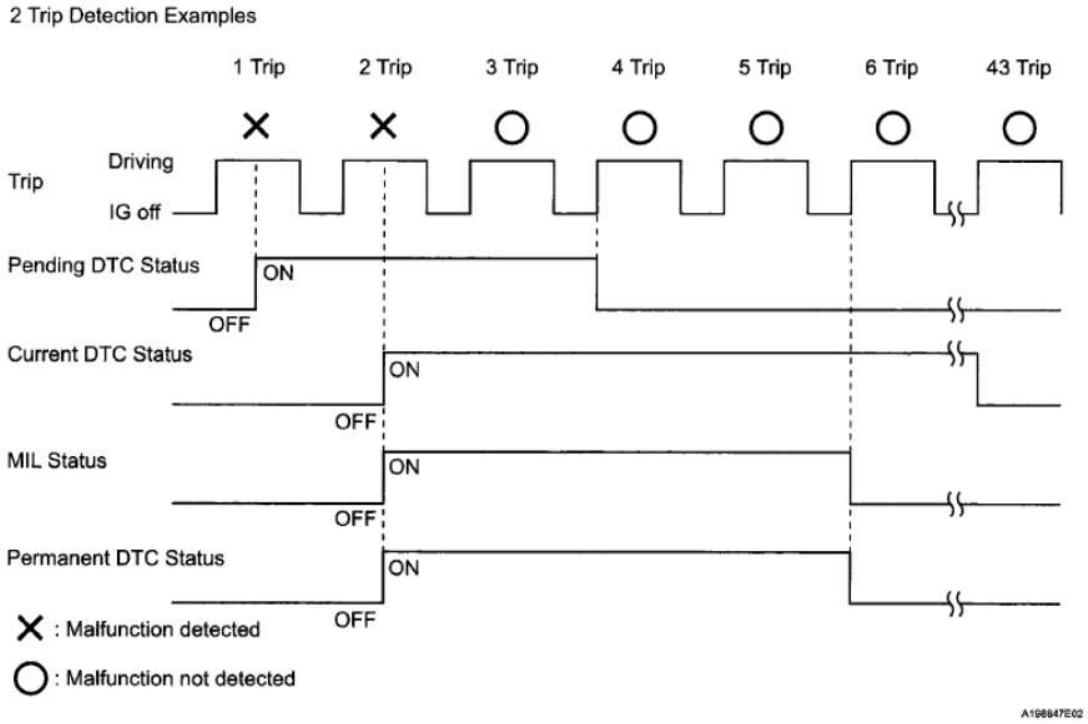


Fig. 18: Driving Pattern Of 2 Trip Detection Examples
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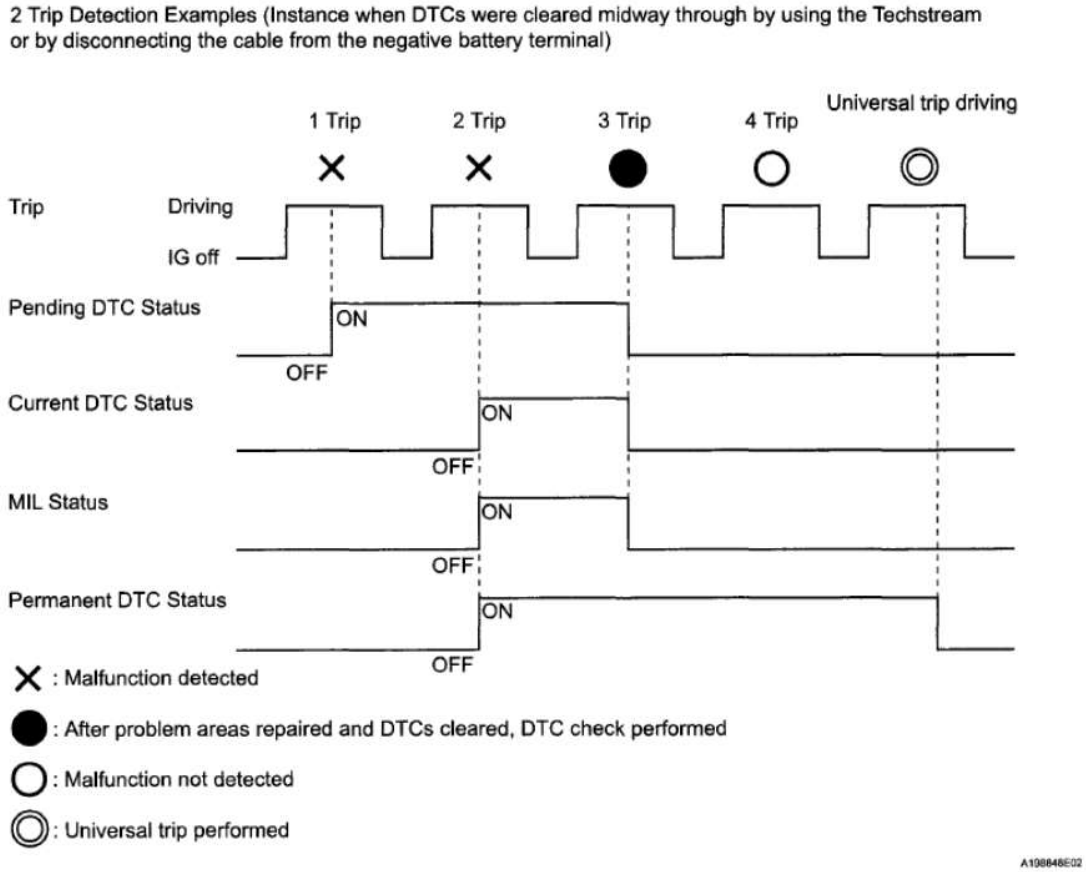


Fig. 19: Driving Pattern Of 2 Trip Detection Examples (Disconnecting Cable From Negative Terminal)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. **CHECK DTC**
   a. Connect the Techstream to the DLC3.
   b. Turn the ignition switch to ON.
   c. Turn the Techstream on.
   d. Enter the following menus: Powertrain/ECT/Trouble Codes.
   e. Check the DTC (s) and freeze frame data, and then write them down.
   f. Check the details of the DTC (s) (See **DIAGNOSTIC TROUBLE CODE CHART**).
2. **CLEAR DTC (Pending and Current DTC)**
   a. Connect the Techstream to the DLC3.
   b. Turn the ignition switch to ON.
   c. Turn the Techstream on.
   d. Enter the following menus: Powertrain/ECT/Trouble Codes.
   e. Clear the DTCs.
3. **CLEAR PERMANENT DTC**

   HINT:

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Even if the following procedure is not performed, permanent DTCs are cleared if no malfunction are detected during 3 consecutive driving cycles.

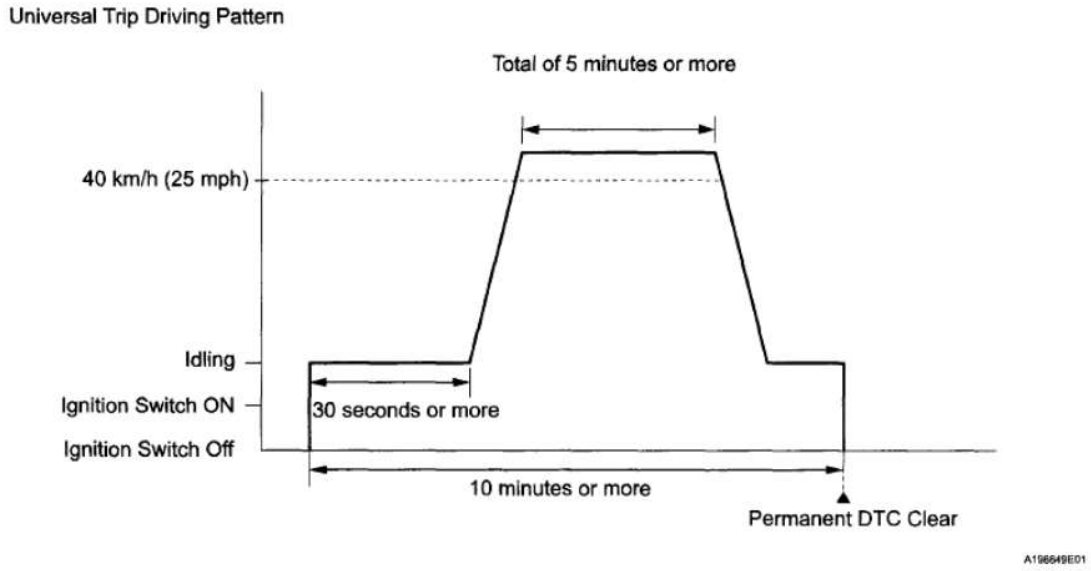


Fig. 20: Driving Pattern Of Universal Trip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Connect the Techstream to the DLC3.
b. Turn the ignition switch to ON.
c. Turn the Techstream on.
d. Enter the following menus: Powertrain/Engine and ECT/Trouble Codes.
e. Check if permanent DTCs are stored.

HINT:

If permanent DTCs are not output, it is not necessary to continue this procedure.

f. Clear DTCs.
g. Perform the universal trip.
    1. Idle the engine for 30 seconds or more.
    2. Drive the vehicle at 40 km/h (25 mph) or more for a total of 5 minutes or more.

HINT:

- It is possible to complete the drive pattern even if the vehicle decelerates to less than 40 km/h (25 mph) during the driving cycle provided that the vehicle is driven at 40 km/h (25 mph) or more for a total of 5 minutes.
- When accelerating through the gears, make sure the vehicle is driven so all gears are used in order and no gears are skipped.

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3. Allow 10 minutes or more to elapse from the time the engine is started.

h. Turn the ignition switch off.
i. Wait 15 seconds.
j. Turn the ignition switch to ON.
k. Enter the following menus: Powertrain/ECT/Trouble Codes.
l. Check that the permanent DTCs have been cleared.

HINT:

- If the permanent DTCs have not been cleared, perform the universal trip again.
- The permanent DTCs are cleared when the universal trip is completed.

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 are met:
      1. Battery positive voltage 11 V or more.
      2. Throttle valve fully closed.
      3. Shift lever in P or N.
      4. A/C off.
   b. Turn the ignition switch off.
   c. Connect the Techstream to the DLC3.
   d. Turn the ignition switch to ON.
   e. Turn the Techstream on.
   f. Enter the following menus: Powertrain/ECT/Check Mode.
   g. Change the TCM to check mode. Make sure the MIL flashes as shown in the illustration.

NOTE: **All DTCs and freeze frame data will be cleared if: 1) the Techstream is used to change the TCM 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 entering check mode, make notes of the DTCs and freeze frame data.

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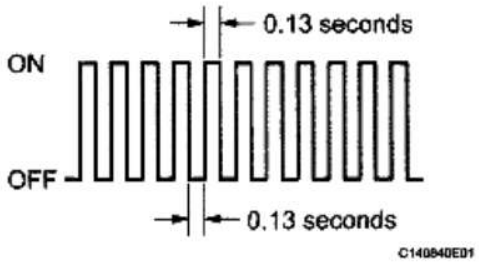


Fig. 21: Driving Pattern Of MIL Flashes
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h. Start the engine. The MIL should turn off after the engine starts.
i. Perform Monitor Drive Pattern for the ECT test (See **MONITOR DRIVE PATTERN**).

(Or, simulate the conditions of the malfunction described by the customer.)

j. After simulating the malfunction conditions, use the Techstream to check the DTC and freeze frame data.

FAIL-SAFE CHART

1. **Fail-safe**

This function minimizes the loss of operation when any abnormality occurs in a sensor or solenoid.

Fail-safe Control List

FAIL-SAFE CONTROL CHART

Malfunction Part	Function
Input Turbine Speed Sensor	Shifting to only either 1st or 3rd gears is allowed.
Counter Gear Speed Sensor	• The counter gear speed is determined based on the signals from the skid control ECU (speed sensor signals). • Shifting between 1st to 4th gears is allowed.
ATF Temp. Sensor	Shifting between 1st to 4th gears is allowed.
ECT ECU Power Supply (Voltage is Low)	When the vehicle is being driven in 6th gear, the transaxle is fixed in 6th gear. When being driven in any of 1st to 5th gears, the transaxle is fixed in 5th gear.
CAN communication	Shifting to only either 1st or 3rd gears is allowed.
Knock Sensor	Shifting between 1st to 4th gears is allowed.
Solenoid Valve SL1, SL2, SL3 and SL4	The current to the failed solenoid valve is cut off and operating the other solenoid valves with normal operation performs shift control. (Shift controls in fail-safe mode are described in the table on the next page. For details, refer to Fail-Safe Control Chart)

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Solenoid Valve Operation when Normal

SOLENOID VALVE OPERATION REFERENCE

Gear		1st	2nd	3rd	4th	5th	6th
Solenoid	SL1	ON	ON	ON	ON	OFF	OFF
	SL2	OFF	OFF	OFF	ON	ON	ON
	SL3	OFF	ON	OFF	OFF	OFF	ON
	SL4	OFF	OFF	ON	OFF	ON	OFF

Fail-safe Control Chart

FAIL-SAFE CONTROL CHART

	Gear in Normal Conditions	1st	2nd	3rd	4th	5th	6th
SL1	ON Malfunction (without Fail-safe Control) (1)	1st	2nd	3rd	4th	4th	4th
	OFF Malfunction (without Fail-safe Control)	1st to N	2nd to N	3rd to N	4th to N	5th	6th
	Fail-safe Control during OFF Malfunction	Fixed in 3rd or 5th					
SL2	ON Malfunction (without Fail-safe Control) (1)	1st to 4th	2nd to 4th	3rd to 4th	4th	5th	6th
	OFF Malfunction (without Fail-safe Control)	1st	2nd	3rd	4th to 1st	5th to N	6th to N
	Fail-safe Control during OFF malfunction	1st	2nd	3rd	3rd	3rd	3rd
SL3	ON Malfunction (without Fail-safe Control) (1)	1st to 2nd	2nd	3rd	4th	5th	6th
	OFF Malfunction (without Fail-safe Control)	1st	2nd to 1st	3rd	4th	5th	6th to N
	Fail-safe Control during OFF malfunction	1st	3rd	3rd	4th	5th	5th
SL4	ON Malfunction (without Fail-safe Control) (1)	3rd	3rd	3rd	4th	5th	5th
	OFF Malfunction (without Fail-safe Control)	1st	2nd	3rd to 1st	4th	5th to N	6th
	Fail-safe Control during OFF malfunction	1st(2)	2nd(2)	4th(2)	4th(2)	6th	6th

(1) Fail-safe control is not actuated when an ON malfunction occurs.

(2) Shifting to 5th and 6th gears is prohibited.

DATA LIST/ACTIVE TEST

1. **DATA LIST**

HINT:

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

NOTE: 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 Techstream to the DLC3.
d. Turn the ignition switch to ON.
e. Turn the Techstream on.
f. Enter the following menus: Powertrain/ECT/Data List.
g. According to the display on the Techstream, read the Data List.

DATA LIST REFERENCE

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
Calculate Load	Calculated load by ECM/Min.: 0%, Max.: 100%	• 15.0 to 35.0%: Idling • 10.0 to 30.0%: Running without load (2000 rpm)	-
Engine Speed	Engine speed/Min.: 0 rpm, Max.: 16383.75 rpm	550 to 800 rpm: Idling	-
Vehicle Speed	Vehicle speed/Min.: 0 km/h (0 mph), Max.: 255 km/h (158mph)	Actual vehicle speed	-
Coolant Temp	Engine coolant temperature/Min.: -40° C (-40°F), Max.: 140°C (284°F)	80 to 105°C (176 to 221°F): After warming up	• If value -40°C (-40°F): sensor circuit open • If value 140°C (284°F): sensor circuit shorted
Throttle Position	Throttle position/Min.: 0%, Max.: 100%	10 to 22%: Idling	Calculated value based on VTA1
SPD(NC)	Counter gear speed/Min.: 0 rpm, Max.: 12750 rpm	-	-
		Lock-up is • ON (After warming up the engine): Input	

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SPD (NT)	Input turbine speed/ display: 50 r/min	turbine speed (NT) is equal to engine speed • OFF (idling with shift lever in N): Input turbine speed (NT) is nearly equal to engine speed	-
Closed Throttle Position SW	Closed throttle position switch/ON or OFF	• ON: Throttle fully closed • OFF: Throttle open	-
Starter Signal	Starter signal/ ON or OFF	ON: Cranking	-
Neutral Position SW Signal	PNP switch status/ ON or OFF	• ON: Shift lever is in P or N • OFF: Shift lever is not in P or N	When the shift lever position displayed on the Techstream differs from the actual position, adjustment of the PNP switch or the shift cable may be incorrect. HINT: When the failure still occurs even after adjusting these parts, see **DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (PRNDL INPUT)**.
Stop Light Switch	Stop light switch status/ ON or OFF	Brake pedal is • ON: Depressed • OFF: Released	-
Battery Voltage	Battery voltage/Min.: 0, Max.: 65.535 V	9 to 14 V: Idling	-
TC and TE1	TC and TE1 terminals of DLC3/ON or OFF	-	Active Test support data
Idle Fuel Cut	Fuel cut idle/ON or OFF	Fuel cut is • ON: Operating • OFF: Not operating	FC IDL= "ON" when throttle valve fully closed and engine speed over 2800 rpm
FC TAU	Fuel cut TAU (Fuel cut during very light load)/ON or OFF	Fuel cut is • ON: Operating • OFF: Not operating	Fuel cut performed under very light load to prevent engine combustion from becoming incomplete
Shift Status	TCM gear shift command/ 1st, 2nd, 3rd, 4th, 5th or 6th	Same as actual gear	-
			When the shift lever position

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Shift SW Status (R Range)	PNP switch status/ ON or OFF	• ON: Shift lever is in R • OFF: Shift lever is not in R	displayed on the Techstream differs from the actual position, adjustment of the PNP switch or the shift cable may be incorrect. HINT: When the failure still occurs even after adjusting these parts, see **DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (PRNDL INPUT)**
Shift SW Status (D Range)	PNP switch status/ ON or OFF	• ON: Shift lever is in D or S • OFF: Shift lever is not in D or S	When the shift lever position displayed on the Techstream differs from the actual position, adjustment of the PNP switch or the shift cable may be incorrect. HINT: When the failure still occurs even after adjusting these parts, see **DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (PRNDL INPUT)**
Sports Shift Up SW	Sport shift up switch status/ ON or OFF	• ON: Continuously shift to "+" (up-shift) • OFF: Release "+" (up-shift)	-
Sports Shift Down SW	Sport shift down switch status/ ON or OFF	• ON: Continuously shift to "-" (down-shift) • OFF: Release "-" (down-shift)	-
Sports Mode Selection SW	Sport mode select switch status/ ON or OFF	Shift lever is: • ON: S, "+" or "-" • OFF: Not in S,"+" or "-"	-
A/T Oil Temperature 1	ATF temp, sensor value/ min.: -40°C (-40°F) max.:215°C (419°F)	• After stall test; Approx. 80°C (176° F) • Equal to ambient temperature when cold soak	If the value is "-40°C (-40°F)" or "215°C (419°F)", ATF temp, sensor circuit is open or shorted.
NT Sensor	Input turbine speed sensor output voltage /	0.1 to 1.9 V	-

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Voltage	Min.: 0 V, Max.: 5V		
NC Sensor Voltage	Counter gear speed sensor output voltage / Min.: 0V, Max.: 5V	0.1 to 1.9 V	-
AT Fluid	Flex lockup judder judgment flag / 0: OFF/1: ON	-	-
Lock Up	Lock up / 0: OFF/1: ON	Lock up: ON	-
Lock Up Solenoid Status	Lock up solenoid status/ ON or OFF	• ON: Lock up • OFF: Except lock up	-
SLU Solenoid Status	Shift Solenoid SLU Status/ ON or OFF	• ON: Lock up • OFF: Except lock up	-
SLT Solenoid Status	Shift solenoid SLT status/ ON or OFF	• Accelerator pedal is depressed: OFF • Accelerator pedal is released: ON	-
Engine Speed from EFI	Engine speed / Min.: 0 rpm, Max.: 16383.75 rpm	550 to 800 rpm: Idling	-
Intake-Air Temp from EFI	Intake air temperature / Min.: -40°C (-40°F), Max.: 215°C (419°F)	Equivalent to ambient air temperature	• If value -40°C (-40°F): sensor circuit open • If value 215°C (419°F): sensor circuit shorted
Coolant Temp from EFI	Engine coolant temperature / Min.: -40°C (-40°F), Max.: 215°C (419°F)	80 to 105°C (176 to 221°F): After warming up	• If value -40°C (-40°F): sensor circuit open • If value 140°C (284°F): sensor circuit shorted
Throttle Position from EFI	Throttle sensor position / Min.: 0%, Max.: 100%	• 0%: Accelerator pedal released • 64 to 96%: Accelerator pedal fully depressed	Recognition value for throttle opening angle on ECM
Accel Position from EFI	Absolute Accelerator Pedal Position / Min.: 0%, Max.: 100%	• 10 to 22%: Accelerator pedal released • 54 to 86%: Accelerator pedal fully depressed	-
#Codes	# of Codes / Min.: 0, Max.: 255	-	Number of detected DTCs

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Check Mode	Check mode / 0: OFF, 1: ON	ON: Check mode ON	-
SPD Test	Check mode result for vehicle speed sensor / 0: COMPL, 1: INCMPL	-	-
MIL	MIL status/ ON or OFF	ON: MIL ON	-
MIL ON Run Distance	MIL ON run distance / Min.: 0 km (0 mile), Max.: 65535 km (40723 mile)	Distance after DTC detected	-
Running Time from MIL ON	Running time from MIL ON / Min.: 0 minute, Max.: 65535 minutes	Equivalent to running time after MIL ON	-
Engine Run Time	Engine run time / Min.: 0 second, Max.: 65535 seconds	Time after engine start	-
Time after DTC Cleared	Time after DTC cleared / Min.: 0 minute, Max.: 65535 minutes	Equivalent to time after DTCs cleared	-
Distance from DTC Cleared	Distance after DTC cleared / Min.: 0 km (0 mile) Max.: 65535 km (40723 mile)	Equivalent to time after DTCs cleared	-
Warmup Cycle Cleared DTC	Warm-up cycle after DTC cleared / Min.: 0, Max.: 255	-	Number of warm-up cycles after DTCs cleared
Complete Parts Monitor	Comprehensive component monitor / 0: NOT AVL, 1: AVAIL	-	Comprehensive Component Monitor
Model Code	Model code	-	Identifying model code: GSV40#
Engine Type	Engine type	-	Identifying engine type: #####
Transmission (Engine) Type	Transmission type	-	Identifying transmission type: 6AT
Model Year	Model year / Min.: 1900, Max.: 2155	-	Identifying model year: 200#
System Identification	System identification	-	Identifying engine type: Gasoline (gasoline engine)

2. **ACTIVE TEST**

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HINT:

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

a. Warm up the engine.
b. Turn the ignition switch off.
c. Connect the Techstream to the DLC3.
d. Turn the ignition switch to ON.
e. Turn the Techstream on.
f. Enter the following menus: Powertrain/ECT/Active Test.
g. According to the display on the Techstream, perform the Active Test.

ACTIVE TEST REFERENCE

Tester Display	Test Part	Control Range	Diagnostic Note
Connect the TC and TE1	Connects and disconnects TC and TE1. (transitions into the fluid temperature detection mode)	ON/OFF	The MIL will not blink when "Connect the TC and TE1/ON" is selected.
Control the Shift Position	Operates the shift solenoid valves to allow gears to selected manually.	• Press "-->" button: Upshift occurs • Press "<--" button: Downshift occurs	Can be used to check the operation of the shift solenoid valves. Upshifts and downshifts should be performed consecutively. A 10-second interval is required between gear changes. Do not downshift at high speeds. Doing so will damage the automatic transaxle. [Vehicle Condition] 50 km/h (30 mph) or less
Activate the Lock Up	Controls the shift solenoid SLU and SL to set the automatic transaxle to the lock-up condition.	ON/OFF	Can be used to check SLU and SL solenoid operation. [Vehicle Condition] Vehicle speed: 60 km/h (37 mph) or more
Activate the Solenoid	Operates shift solenoid	ON/OFF	[Vehicle Condition]

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(SL1)	SL1		• Engine stopped • Shift lever in P or N
Activate the Solenoid (SL2)	Operates shift solenoid SL2	ON/OFF	[Vehicle Condition] • Engine stopped • Shift lever in P or N
Activate the Solenoid (SL3)	Operates shift solenoid SL3	ON/OFF	[Vehicle Condition] • Engine stopped • Shift lever in P or N
Activate the Solenoid (SL4)	Operates shift solenoid SL4	ON/OFF	[Vehicle Condition] • Engine stopped • Shift lever in P or N
Activate the Solenoid (SL)	Operates shift solenoid SL	ON/OFF	[Vehicle Condition] • Engine stopped • Shift lever in P or N
Activate the Solenoid (SLT)(1)	Operates shift solenoid SLT to raise the line pressure.	ON/OFF HINT: ON: No action (normal operation) OFF: Line pressure up (When the Active Test of "Activate the Solenoid (SLT)" is performed, the TCM commands the SLT solenoid to turn off).	[Vehicle Condition] • Vehicle Stopped • IDL: ON
Activate the Solenoid (SLU)	Operates shift solenoid SLU	ON/OFF	[Vehicle Condition] • Engine stopped • Shift lever in P or N
(1) The "Activate the solenoid (SLT)" Active Test is performed to allow confirmation that the line pressure changes. The line pressure changes are confirmed using the same SST that is used for the Hydraulic Test (See **HYDRAULIC TEST**).			

HINT:

Note that the pressure readings for the Active Test and Hydraulic Test are different.

DIAGNOSTIC TROUBLE CODE CHART

HINT:

- If a DTC is displayed during the DTC check, check the parts listed in the table below and proceed to the "Refer to" given.

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- If multiple suspected areas are listed, the potential causes of the symptoms are listed in order of probability in the "Trouble Area" column of the table.
- *1: "Comes on" means the Malfunction Indicator Lamp (MIL) illuminates.
- *2: "DTC stored" means the TCM memorizes the trouble code if the TCM detects the DTC detection condition.
- These DTCs may be output when clutches, brakes, gear components, etc., inside the automatic transaxle are damaged.

Automatic Transaxle System

AUTOMATIC TRANSAXLE SYSTEM DTC CHART

DTC Code	Detection Item	Trouble Area	MIL*1	Memory*2
P0500	Vehicle Speed Sensor "A"	1. Open or short in vehicle speed signal circuit 2. Combination meter 3. Vehicle speed sensor (Brake control system) 4. Skid control ECU (Brake control system) 5. TCM	Comes on	DTC stored
P0560	System Voltage	1. Open in back-up power source circuit 2. SFI system 3. TCM	Comes on	DTC stored
P0617	Starter Relay Circuit High	1. Park/neutral position switch 2. Starter relay circuit 3. Cranking holding function circuit 4. TCM	Comes on	DTC stored
P062F	Internal Control	TCM	Comes on	DTC stored

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	Module EEPROM Error			
P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	1. Open or short in park/neutral position switch circuit 2. Park/neutral position switch 3. TCM	Comes on	DTC stored
P0711	Transmission Fluid Temperature Sensor "A" Performance	ATF temperature sensor	Comes on	DTC stored
P0712	Transmission Fluid Temperature Sensor "A" Circuit Low Input	1. Short in ATF temperature sensor circuit 2. Transmission wire 3. ATF temperature sensor 4. TCM	Comes on	DTC stored
P0713	Transmission Fluid Temperature Sensor "A" Circuit High Input	1. Open in ATF temperature sensor circuit 2. Transmission wire 3. ATF temperature sensor 4. TCM	Comes on	DTC stored
P0715	Input/Turbine Speed Sensor Circuit Malfunction	1. Transmission revolution sensor (speed sensor NT) 2. Transmission wire 3. TCM	Comes on	DTC stored
P0717	Input Speed Sensor Circuit No Signal	1. Transmission revolution sensor (speed sensor NT)	Comes on	DTC stored

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		2. Transmission wire 3. TCM		
P0724	Brake Switch "B" Circuit High	1. Short in stop light switch signal circuit 2. Stop light switch 3. TCM	Comes on	DTC stored
P0741	Torque Converter Clutch Solenoid Performance (Shift Solenoid Valve SL)	1. Shift solenoid valve SL remains closed 2. Valve body is blocked 3. Torque converter clutch 4. Automatic transaxle (clutch, brake or gear etc.) 5. Line pressure is too low	Comes on	DTC stored
P0746	Pressure Control Solenoid "A" Performance (Shift Solenoid Valve SL1)	1. Shift solenoid valve SL1 remains open or closed 2. Valve body is blocked 3. Automatic transaxle (clutch, brake or gear etc.)	Comes on	DTC stored
P0748	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	1. Open or short in shift solenoid valve SL1 circuit 2. Shift solenoid valve SL1 3. TCM	Comes on	DTC stored
P0776	Pressure Control		Comes on	DTC stored

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	Solenoid "B" Performance (Shift Solenoid Valve SL2)	1. Shift solenoid valve SL2 remains open or closed 2. Valve body is blocked 3. Automatic transaxle (clutch, brake or gear etc.)		
P0778	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	1. Open or short in shift solenoid valve SL2 circuit 2. Shift solenoid valve SL2 3. TCM	Comes on	DTC stored
P0791	Intermediate Shaft Speed Sensor "A" Circuit	1. Transmission revolution sensor (speed sensor NC) 2. Transmission wire 3. TCM	Comes on	DTC stored
P0793	Intermediate Shaft Speed Sensor "A"	1. Transmission revolution sensor (speed sensor NC) 2. Transmission wire 3. TCM	Comes on	DTC stored
P0796	Pressure Control Solenoid "C" Performance (Shift Solenoid Valve SL3)	1. Shift solenoid valve SL3 remains open or closed 2. Valve body is blocked 3. Automatic transaxle (clutch, brake or gear etc.)	Comes on	DTC stored
P0798	Pressure Control	1. Open or short	Comes on	DTC stored

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	Solenoid "C" Electrical (Shift Solenoid Valve SL3)	in shift solenoid valve SL3 circuit 2. Shift solenoid valve SL3 3. TCM		
P2714	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)	1. Shift solenoid valve SLT remains open 2. Shift solenoid valve SL1, SL2, SL3 or SL4 remains open or closed 3. Valve body is blocked 4. Automatic transaxle (clutch, brake or gear, etc.)	Comes on	DTC stored
P2716	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	1. Open or short in shift solenoid valve SLT circuit 2. Shift solenoid valve SLT 3. TCM	Comes on	DTC stored
P2757	Torque Converter Clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU)	1. Shift solenoid valve SLU remains open or closed 2. Valve body is blocked 3. Torque converter clutch 4. Automatic transaxle (clutch, brake or gear, etc.)	Comes on	DTC stored

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		5. Line pressure is too low		
P2759	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)	1. Open or short in shift solenoid valve SLU circuit 2. Shift solenoid valve SLU 3. TCM	Comes on	DTC stored
P2769	Short in Torque Converter Clutch Solenoid Circuit (Shift Solenoid Valve SL)	1. Short in shift solenoid valve SL circuit 2. Shift solenoid valve SL 3. TCM	Comes on	DTC stored
P2770	Open in Torque Converter Clutch Solenoid Circuit (Shift Solenoid Valve SL)	1. Open in shift solenoid valve SL circuit 2. Shift solenoid valve SL 3. TCM	Comes on	DTC stored
P2808	Pressure Control Solenoid "G" Performance (Shift Solenoid Valve SL4)	1. Shift solenoid valve SL4 remains open or closed 2. Valve body is blocked 3. Automatic transaxle (clutch, brake or gear etc.)	Comes on	DTC stored
P2810	Pressure Control Solenoid "G" Electrical (Shift Solenoid Valve SL4)	1. Open or short in shift solenoid valve SL4 circuit 2. Shift solenoid valve SL4 3. TCM	Comes on	DTC stored

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U0100	Lost Communication with ECM/PCM "A"	1. Harness and connector 2. ECM 3. TCM	Comes on	DTC stored

DTC P0500 VEHICLE SPEED SENSOR "A"

DESCRIPTION

The speed sensors detect the wheel speed and send the appropriate signals to the skid control ECU. The skid control ECU converts these wheel speed signals into a 4-pulse signal and outputs it to the TCM via the combination meter. The TCM determines the vehicle speed based on the frequency of these pulse signals.

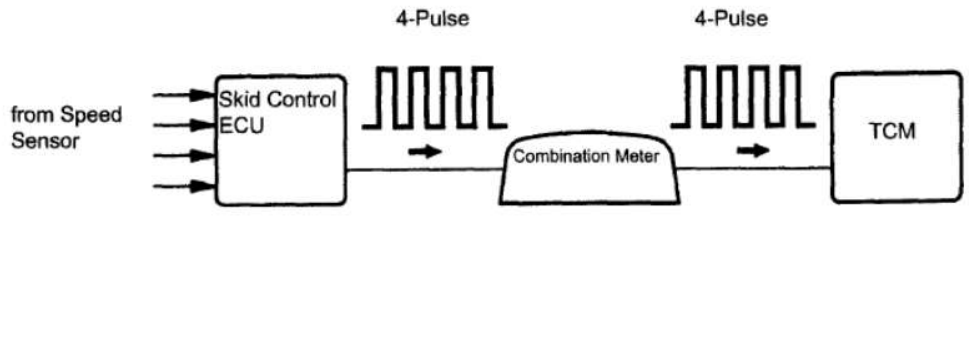


Fig. 22: Driving Pattern Of Combination Meter
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
P0500	When the ECT sensor is normal and the counter gear speed is 300 rpm or more, the vehicle speed signal is not input for 2 seconds or more.	• Open or short in vehicle speed signal circuit • Combination meter • Vehicle speed sensor (Brake control system) • Skid control ECU (Brake control system) • TCM

MONITOR DESCRIPTION

The TCM assumes that the vehicle is being driven when the transmission counter gear indicates more than 300 rpm and over 30 seconds have passed since the park/neutral position switch was turned off. If there is no vehicle speed signal with these conditions satisfied, the TCM concludes that there is a vehicle speed signal malfunction. The TCM will turn on the MIL and a DTC will be set.

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MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0500: Vehicle Speed Sensor Circuit
Required sensors/components (Main)	Vehicle speed sensor, Combination meter, ABS ECU
Required sensors/components (Sub)	Counter gear Speed (CS) sensor, ECT sensor
Frequency of operation	Continuous
Duration	2 seconds
MIL operation	Immediately
Sequence operation	None

TYPICAL ENABLING CONDITIONS

TYPICAL ENABLING CONDITIONS

Engine	Running
Transmission counter gear revolution	300 rpm or more
Battery voltage	8 V or more
Ignition switch	ON
Starter	OFF
Either a or b is met (See below)	
a. All of the following conditions are met	
ECT	20°C (68°F) or more
ECT sensor fail	Not detected
Time after PNP switch ON to OFF	2 sec. or more
b. All of the following conditions are met	
ECT	Less than 20°C (68°F)
ECT sensor fail	Detected
Time after PNP switch ON to OFF	30 sec. or more

TYPICAL MALFUNCTION THRESHOLDS

TYPICAL MALFUNCTION THRESHOLDS

Vehicle speed sensor signal	No pulse input

WIRING DIAGRAM

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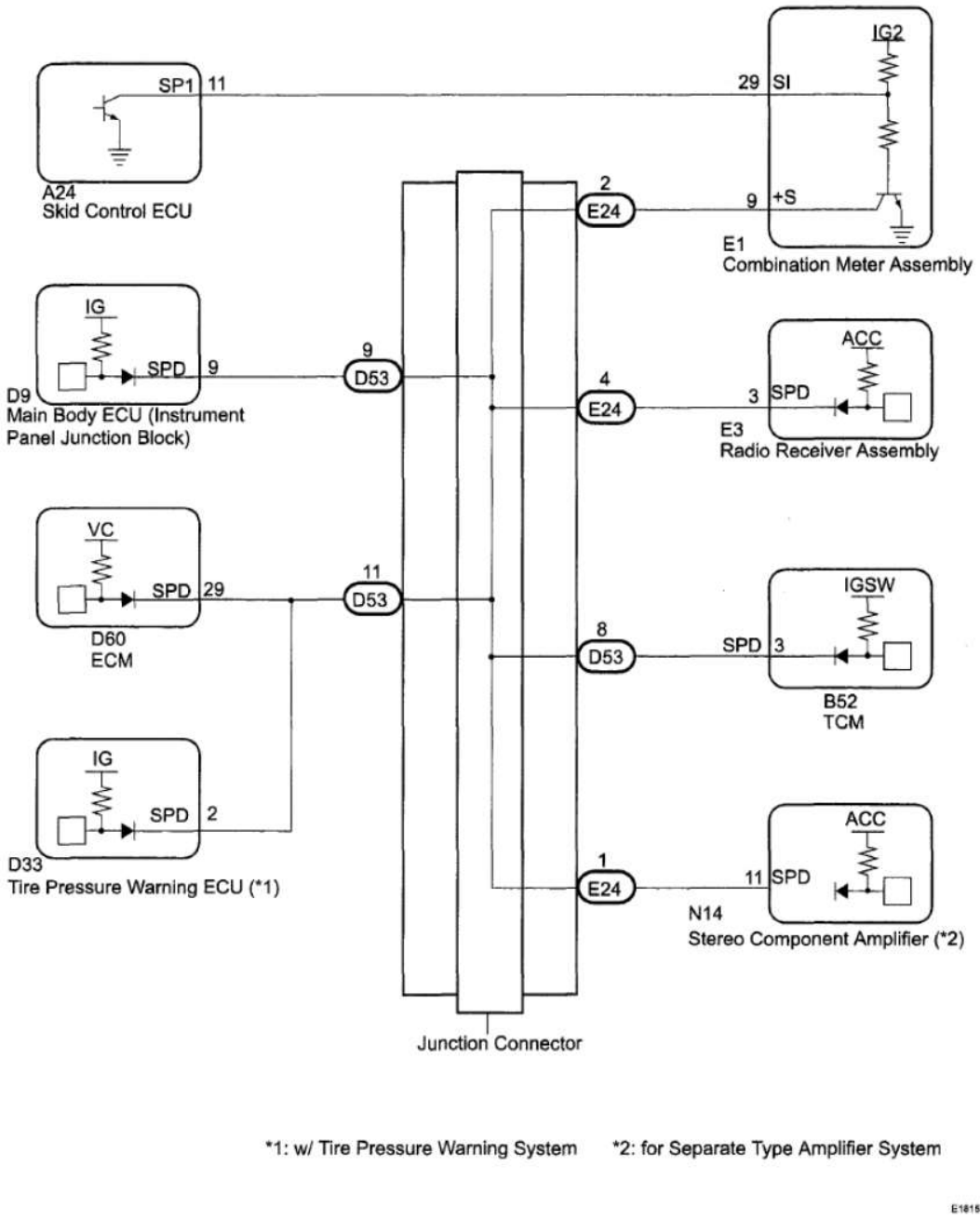


Fig. 23: Junction Connector - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

1. **READ VALUE USING TECHSTREAM (VEHICLE SPEED)**
   a. Drive the vehicle and check whether the operation of the speedometer in the combination meter

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assembly is normal.

HINT:

- The vehicle speed sensor is operating normally if the speedometer reading is normal.
- If the speedometer does not operate, check it by following the procedure described for a speedometer malfunction.

b. Connect the Techstream to the DLC3.
c. Turn the ignition switch to ON.
d. Turn the Techstream on.
e. Enter the following menus: Powertrain/ECT/Data List/Vehicle Speed.
f. Drive the vehicle.
g. Read the value displayed on the Techstream.

OK:

Vehicle speeds displayed on tester and speedometer display are equal.

NG: Go to step 2

OK: SYMPTOM SIMULATION AND DTC CHECK (See **HOW TO PROCEED WITH TROUBLESHOOTING**)

2. **CHECK COMBINATION METER ASSEMBLY (SPD SIGNAL WAVEFORM)**
   a. Inspect the combination meter assembly using an oscilloscope.
      1. Move the shift lever to N.
      2. Jack up the vehicle.
      3. Turn the ignition switch to ON.
      4. Measure the voltage between the terminal of the combination meter assembly and the body ground while the wheel is turned slowly.

Standard Voltage

VOLTAGE SPECIFICATION

Tester Connection	Switch Condition	Specified Condition
E1-9 (+S) - Body ground	Ignition switch ON	Voltage generated intermittently

HINT:

The output voltage should fluctuate up and down, similarly to the diagram, when the wheel is turned slowly.

NG: GO TO METER/GAUGE SYSTEM (SPEED SIGNAL CIRCUIT) (See **SPEED SIGNAL CIRCUIT**)

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Component with harness connected:
(Combination Meter Assembly)

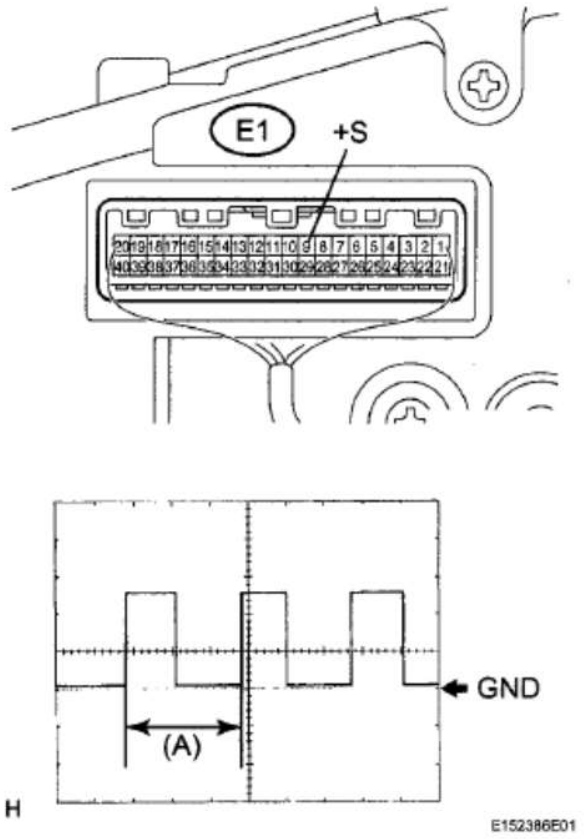


Fig. 24: Identifying Combination Meter Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

3. **CHECK HARNESS AND CONNECTOR (COMBINATION METER ASSEMBLY - TCM)**
   a. Disconnect the combination meter assembly connector.
   b. Disconnect the TCM connector.
   c. Measure the resistance according to the value (s) in the table below.

Standard Resistance (Check for Open)

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
E1-9 (+S) - B52-3 (SPD)	Always	Below 1 ohms

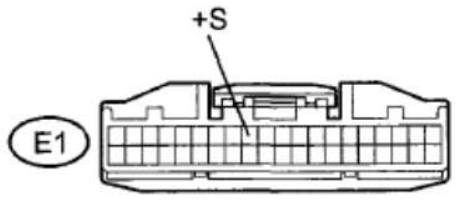
   d. Reconnect the combination meter assembly connector.

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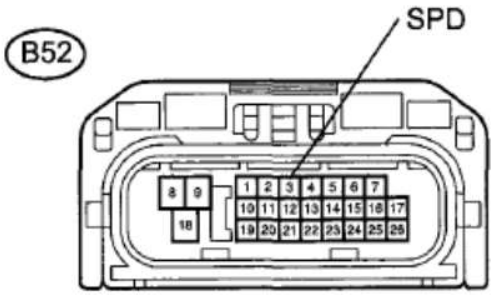
e. Reconnect the TCM connector.

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR (COMBINATION METER ASSEMBLY - TCM)

Front view of wire harness connector
(to Combination Meter Assembly)



Front view of wire harness connector
(to TCM)



C205067E01

Fig. 25: Identifying E1 Combination Meter Assembly Connector And B52 TCM Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPLACE TCM (See **REMOVAL**)

DTC P0560 SYSTEM VOLTAGE

DESCRIPTION

The battery supplies electricity to the TCM even when the ignition switch is off. This power allows the TCM to store data such as DTC history and freeze frame data. If the battery voltage falls below a minimum level, these memories are cleared and the TCM determines that there is a malfunction in the power supply circuit. When the engine is next started, the TCM will illuminate the MIL and set the DTC.

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DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
P0560	Open in TCM back-up power source circuit. DTC is detected for 3 sec. or more (1 trip detection logic).	• Open in back-up power source circuit • SFI system • TCM

HINT:

If DTC P0560 is set, the TCM does not store other DTCs.

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0560: TCM system voltage
Required Sensors/Components (Main)	TCM
Required Sensors/Components (Sub)	-
Frequency of Operation	Continuous
Duration	3 seconds
MIL Operation	Immediate (MIL illuminated after next engine start)
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs are not present:	None
Stand-by RAM	Initialized

TYPICAL MALFUNCTION THRESHOLDS

TYPICAL MALFUNCTION THRESHOLDS

TCM power source	Less than 3.5 V

WIRING DIAGRAM

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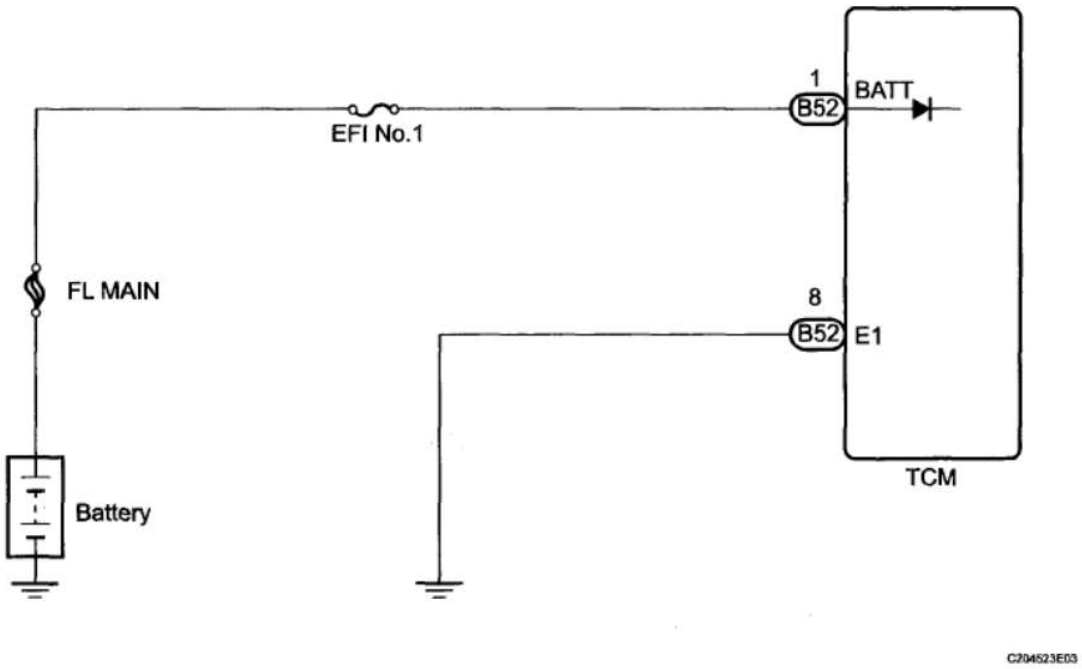


Fig. 26: TCM - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

1. **CHECK DTC OUTPUT**
   a. Connect the Techstream to the DLC3.
   b. Turn the ignition switch to ON.
   c. Turn the Techstream on.
   d. Enter the following menus: Powertrain/Engine/DTC.
   e. Read the DTCs using the Techstream.

Result

RESULT CHART

Display (DTC Output)	Proceed to
No DTC	A
P0560 is output (engine control system)	B

B: GO TO DTC P0560 (ENGINE CONTROL SYSTEM/SFI SYSTEM) (See **DIAGNOSTIC TROUBLE CODE CHART**)

A: Go to next step

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2. **INSPECT TCM (POWER SOURCE, GROUND)**
   a. Disconnect the TCM connector.
   b. Measure the voltage according to the value (s) in the table below.

Standard Voltage

VOLTAGE SPECIFICATION

Tester Connection	Condition	Specified Condition
B52-1 (BATT) - B52-8 (E1)	Always	11 to 14 V

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

Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
B52-8 (E1) - Body ground	Always	Below 1 ohms

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR (TCM - BATTERY, BODY GROUND)

Front view of wire harness connector
(to TCM)

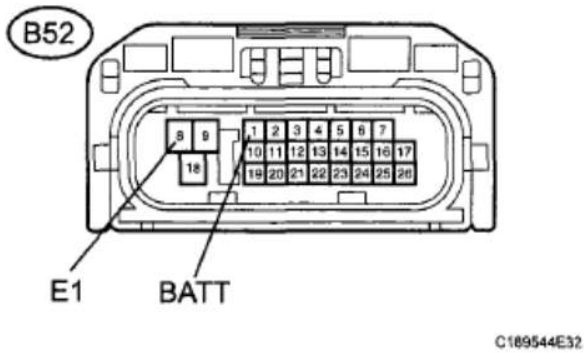


Fig. 27: Identifying B52 TCM Connector Terminal
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OK: REPLACE TCM (See **REMOVAL**)

DTC P0617 STARTER RELAY CIRCUIT HIGH

DESCRIPTION

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While the engine is being cranked, battery voltage is applied to terminal STA of the TCM. If the TCM detects the Starter Control (STA) signal while the vehicle is being driven, it determines that there is a malfunction in the STA circuit. The TCM then illuminates the MIL and sets the DTC. This monitor runs when the vehicle is driven at 20 km/h (12.4 mph) for over 20 seconds.

DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
P0617	When conditions (a), (b) and (c) are met, positive (+B) battery voltage 10.5 V or more applied to TCM for 20 seconds (1 trip detection logic): a. Vehicle speed more than 20 km/h (12.4 mph) b. Engine speed more than 1000 rpm c. STA signal ON	• Park/Neutral Position switch • Starter relay circuit • Cranking holding function circuit • TCM

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0617: Starter signal
Required Sensors/Components (Main)	STARTER relay, PMP switch, ignition switch
Required Sensors/Components (Sub)	Vehicle speed sensor (VSS), Crankshaft Position (CKP) sensor
Frequency of Operation	Continuous
Duration	20 seconds
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

TYPICAL ENABLING CONDITIONS

Monitor runs whenever these DTCs are not present:	None
Battery voltage	10.5 V or more
Vehicle speed	12.43 mph (20 km/h) or more
Engine speed	1,000 rpm or more

TYPICAL MALFUNCTION THRESHOLDS

TYPICAL MALFUNCTION THRESHOLDS

Starter signal	ON

WIRING DIAGRAM

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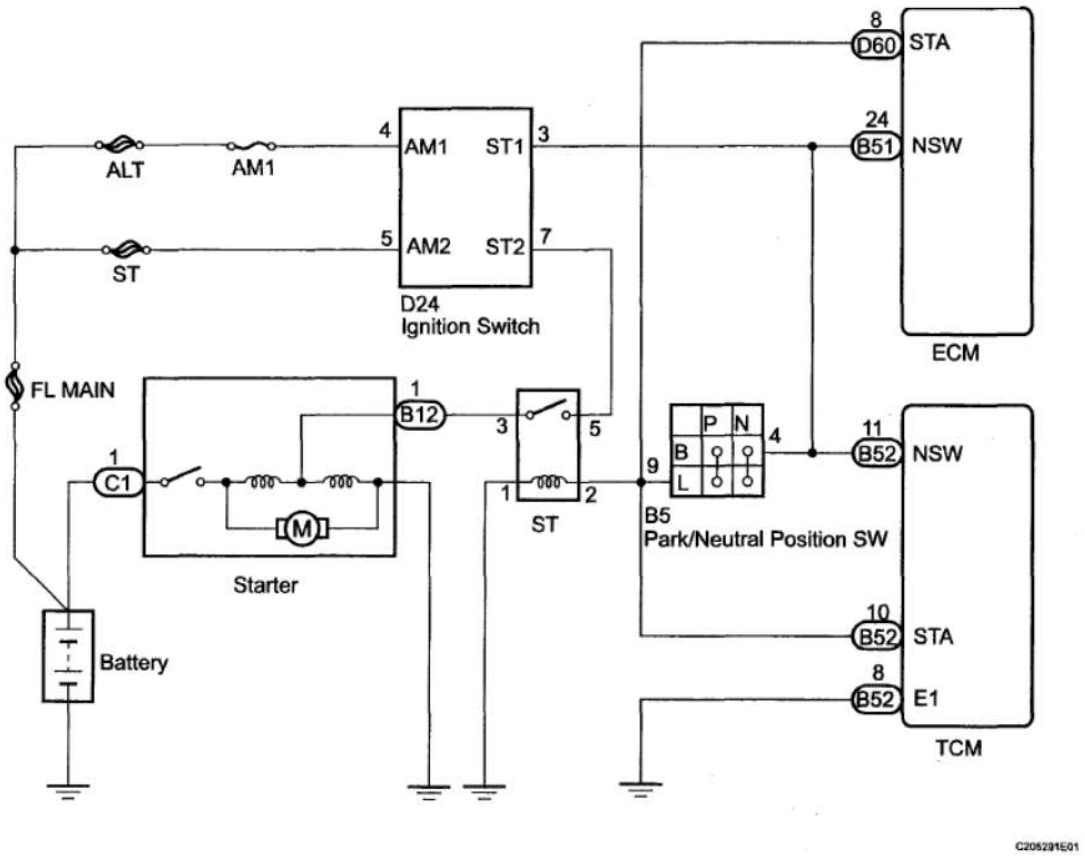


Fig. 28: TCM And Ignition Switch - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

HINT:

- The following troubleshooting flowchart is based on the premise that the engine is cranked normally. If the engine does not crank, proceed to the problem symptoms table (See **PROBLEM SYMPTOMS TABLE**).
- Read freeze frame data using the Techstream. The TCM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can be helpful in determining whether the vehicle was running or stopped, whether the engine was warmed up or not, whether the air-fuel ratio was lean or rich, as well as other data recorded at the time of a malfunction (See **FREEZE FRAME DATA**).

1. **READ VALUE USING TECHSTREAM (STARTER SIGNAL)**
   a. Connect the Techstream to the DLC3.
   b. Turn the ignition switch to ON.

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c. Turn the Techstream on.
d. Enter the following menus: Powertrain/ECT/Data List.
e. Read the value displayed on the Techstream.
f. Crank the engine.
g. Read the value displayed on the Techstream.

TESTER DISPLAY REFERENCE

Tester Display	Condition	Standard
Starter Signal	Ignition switch ON	OFF
Starter Signal	Engine is cranking	ON

Result

RESULT CHART

Result	Proceed to
NG	A
OK	B

B: Go to step 3

A: Go to next step

2. **INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
   a. Disconnect the park/neutral position switch connector.
   b. Measure the resistance according to the value (s) in the table below when the shift lever is moved to each position.

Standard Resistance

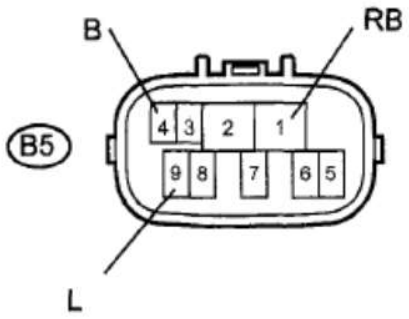
RESISTANCE SPECIFICATION

Tester Connection	Shift Lever Position	Specified Condition
4 (B) - 9 (L)	P	Below 1 ohms
	N	Below 1 ohms
	Except P and N	10 kohms or higher
1 (RB) - 9 (L)	P	10 kohms or higher
	R	10 kohms or higher
	N	10 kohms or higher
	D	10 kohms or higher

NG: REPLACE PARK/NEUTRAL POSITION SWITCH ASSEMBLY (See **ON-VEHICLE INSPECTION**)

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Component without harness connected
(Park/Neutral Position Switch)



A107908E57

Fig. 29: Identifying B5 Park/Neutral Position Switch Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

3. **CHECK TCM (STA VOLTAGE)**
   a. Connect the park/neutral position switch connector.
   b. Disconnect the TCM connector.
   c. Measure the voltage according to the value (s) in the table below.

Standard Voltage

VOLTAGE SPECIFICATION

Tester Connection	Condition	Specified Condition
B52-10 (STA) - Body ground	ignition switch ON and shift lever in P or N	Below 2 V
	Ignition switch ON and shift lever not in P or N	Below 1 V

NG: Go to step 4

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Front view of wire harness connector
(to TCM)

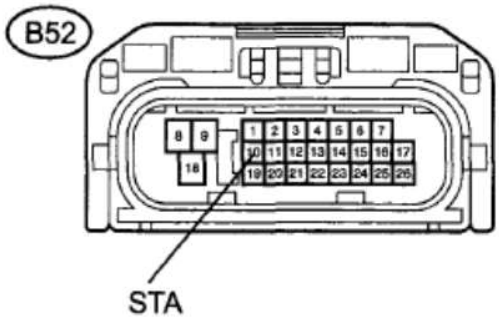


Fig. 30: Identifying B52 Park/Neutral Position Switch Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPLACE TCM (See **REMOVAL**)

4. **CHECK HARNESS AND CONNECTOR (TCM - PARK/NEUTRAL POSITION SWITCH)**
   a. Disconnect the TCM connector.
   b. Remove the ST relay from the engine room relay block.
   c. Disconnect the park/neutral position switch connector.
   d. Measure the voltage according to the value (s) in the table below.

Standard Voltage

VOLTAGE SPECIFICATION

Tester Connection	Condition	Specified Condition
B52-10 (STA) -Body ground	ignition switch ON	Below 1 V

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

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Front view of wire harness connector
(to TCM)

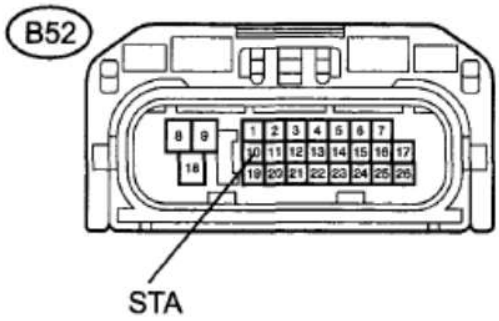


Fig. 31: Identifying B52 TCM Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: CHECK STARTER SIGNAL CIRCUIT (See **STARTER SIGNAL CIRCUIT**)

DTC P062F INTERNAL CONTROL MODULE EEPROM ERROR

DESCRIPTION

The TCM monitors its internal operation and it will set this DTC when it detects an internal malfunction.

DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
P062F	TCM internal error (EEPROM)	TCM

MONITOR DESCRIPTION

The TCM monitors its internal operation. If the internal operation is malfunctioning, the TCM illuminates the MIL and sets a DTC.

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P062F: Internal control module EEPROM error
Required sensors/Components (Main)	TCM
Required sensors/Components (Related)	-
Frequency of operation	Once per driving cycle
Duration	11 seconds
MIL operation	Immediate

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Sequence of operation	None

TYPICAL ENABLING CONDITIONS

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not present	None
Time after engine start	10 seconds or more
Battery voltage	8 V or higher
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

TYPICAL MALFUNCTION THRESHOLDS

Permanent fault code data	Mismatch (3 times or more)

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

1. **READ OUTPUT DTC (DTC P062F)**
   a. Connect the Techstream to the DLC3.
   b. Turn the ignition switch to ON.
   c. Turn the Techstream on.
   d. Clear DTCs (See **DTC CHECK/CLEAR**).
   e. Turn the ignition switch off and turn the Techstream off.
   f. Disconnect the Techstream.
   g. Disconnect the cable from the negative (-) battery terminal and wait for 1 minute.
   h. Connect the cable to the negative (-) battery terminal,
   i. Connect the Techstream to the DLC3.
   j. Turn the ignition switch to ON.
   k. Turn the Techstream on.
   l. Select the following menu items: Powertrain/ECT/Trouble Codes.
   m. Read DTCs.

Result

RESULT CHART

Result	Proceed to
No output	A
P062F	B

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B: REPLACE TCM (See **REMOVAL**)

A: CHECK FOR INTERMITTENT PROBLEMS (See **HOW TO PROCEED WITH TROUBLESHOOTING**)

DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (PRNDL INPUT)

DESCRIPTION

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

DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
P0705	A. Any 2 or more signals of the following are ON simultaneously (2-trip detection logic) • NSW input signal is ON. • R input signal is ON. • D input signal is ON. B. All switches are OFF simultaneously for NSW, R and D.	• Open or short in park/neutral position switch circuit • Park/neutral position switch • TCM

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 signals to the TCM.

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

The park/neutral position switch sends a signal to the TCM according to the shift lever position (R or D). The TCM determines that there is a problem with the switch or related parts if it receives more than 1 position signal simultaneously. The TCM will turn on the MIL and store the DTC.

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0705: Park/neutral position switch/Verify switch input
Required sensors/Components	Park/neutral position switch
Frequency of operation	Continuous
Duration	Condition (A): 2 sec. Condition (B): 60 sec.
MIL operation	2 driving cycles

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Sequence of operation	None

TYPICAL ENABLING CONDITIONS

TYPICAL ENABLING CONDITIONS

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

TYPICAL MALFUNCTION THRESHOLDS

When either condition below is met: Condition (A) or (B)

Condition (A)

When 2 or more of the following signals are input at the same time:

TYPICAL MALFUNCTION THRESHOLDS

Park neutral position switch	ON
R position switch	ON
D position switch	ON

Condition (B)

When all conditions below are met:

TYPICAL MALFUNCTION THRESHOLDS

Park neutral position switch	OFF
R position switch	OFF
D position switch	OFF

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

Park/neutral position switch	The park/neutral position switch sends only one signal to the TCM

WIRING DIAGRAM

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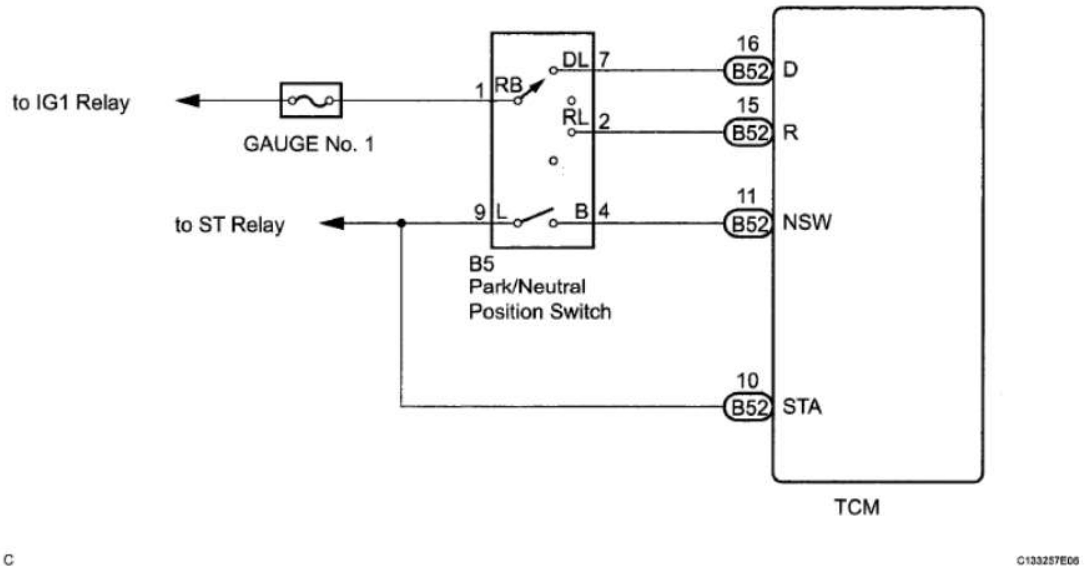


Fig. 32: Park/Neutral Position Switch And TCM - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

HINT:

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

NOTE: 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 Techstream to the DLC3.
4. Turn the ignition switch to ON.
5. Turn the Techstream on.
6. Enter the following menus: Powertrain/ECT/Data List.
7. According to the display on the Techstream, read the Data List.

DATA LIST REFERENCE

Tester	Measurement	Normal	Diagnostic Note

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Display	Item/Range	Condition	
Neutral Position SW Signal	PNP switch status/ON or OFF	• ON: Shift lever is in P or N • OFF: Shift lever is not in P or N	When the shift lever position displayed on the Techstream differs from the actual position, adjustment of the PNP switch or the shift cable may be incorrect.
Shift SW Status (R Range)	PNP switch status/ON or OFF	• ON: Shift lever is in R • OFF: Shift lever is not in R	When the shift lever position displayed on the Techstream differs from the actual position, adjustment of the PNP switch or the shift cable may be incorrect.
Shift SW Status (D Range)	PNP switch status/ON or OFF	• ON: Shift lever is in D or S • OFF: Shift lever is not in D or S	When the shift lever position displayed on the Techstream differs from the actual position, adjustment of the PNP switch or the shift cable may be incorrect.

1. **CHECK HARNESS AND CONNECTOR (BATTERY - PARK/NEUTRAL POSITION SWITCH)**
   a. Disconnect the park/neutral position switch connector.
   b. Turn the ignition switch to ON.
   c. Measure the voltage according to the value (s) in the table below.

Standard Voltage

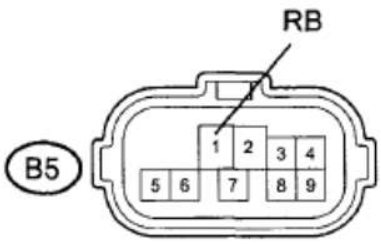
VOLTAGE SPECIFICATION

Tester Connection	Switch Condition	Specified Condition
B5-1 (RB) - Body ground	Ignition switch ON	11 to 14 V

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

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Front view of wire harness connector
(to Park/Neutral Positin Swtich)



Y C190067E12

Fig. 33: Identifying B5 Park/Neutral Position Switch Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

2. **CHECK HARNESS AND CONNECTOR (OUTPUT SIGNAL)**
   a. Turn the ignition switch to ON.
   b. Measure the voltage according to the value (s) in the table below.

Standard Voltage

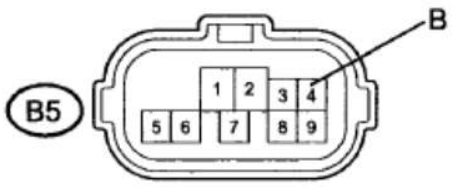
VOLTAGE SPECIFICATION

Tester Connection	Switch Condition	Specified Condition
B5-4 (B) - Body ground	Ignition switch ON	11 to 14 V

NG: Go to step 5

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



Y C190067E13

Fig. 34: Identifying B5 Park/Neutral Position Switch Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

3. **INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
   a. Disconnect the park/neutral position switch connector.
   b. Measure the resistance according to the value (s) in the table below when the shift lever is moved to each position.

Standard Resistance

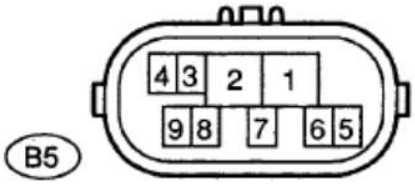
RESISTANCE SPECIFICATION

Tester Connection	Shift Lever Position	Specified Condition
4 - 9	P or N	Below 1 ohms
	Except P and N	10 ohms or higher
1 - 2	R	Below 1 ohms
	Except R	10 ohms or higher
1 - 7	D, S, "+" or "-11	Below 1 ohms
	Except D, S, "+" and "-"	10 ohms or higher

NG: REPLACE PARK/NEUTRAL POSITION SWITCH ASSEMBLY (See **ON-VEHICLE INSPECTION**)

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Component without harness connected
(Park/Neutral Position Swtich)



P

C179092E10

Fig. 35: Identifying B5 Park/Neutral Position Switch Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

4. **CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH - TCM)**
   a. Connect the park/neutral position switch connector.
   b. Disconnect the TCM connectors.
   c. Turn the ignition switch to ON, and measure the voltage according to the value (s) in the table below when the shift lever is moved to each position.

Standard Voltage

VOLTAGE SPECIFICATION

Tester Connection	Shift Lever Position	Specified Condition
B52-15 (R) - Body ground	R	11 to 14 V(1)
	Except R	Below 1 V
B52-16 (D) - Body ground	D, S, "+" or "-"	11 to 14 V
	Except D, S, "+" and "-"	Below 1 V
HINT: (1) The voltage will drop slightly due to lighting up of the back up light.		

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

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Front view of wire harness connector
(to TCM)

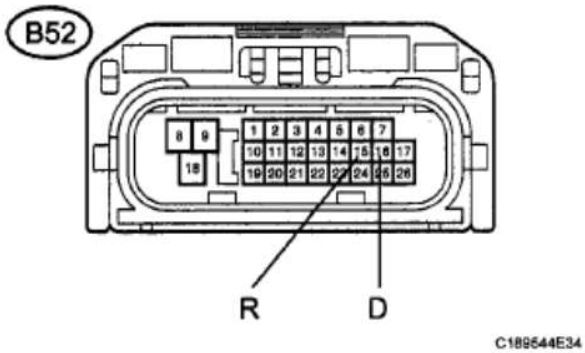


Fig. 36: Identifying B52 Park/Neutral Position Switch Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPLACE TCM (See **REMOVAL**)

5. **CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH - TCM)**
   a. Turn the ignition switch off.
   b. Disconnect the TCM connector.
   c. Disconnect the park/neutral position switch connector.
   d. Measure the resistance according to the value (s) in the table below.

Standard Resistance (Check for Open)

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
B5-4 (B) - B52-11 (NSW)	Always	Below 1 ohms

Standard Resistance (Check for Short)

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
B5-4 (B) or B52-11 (NSW) - Body ground	Always	10 kohms or higher

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

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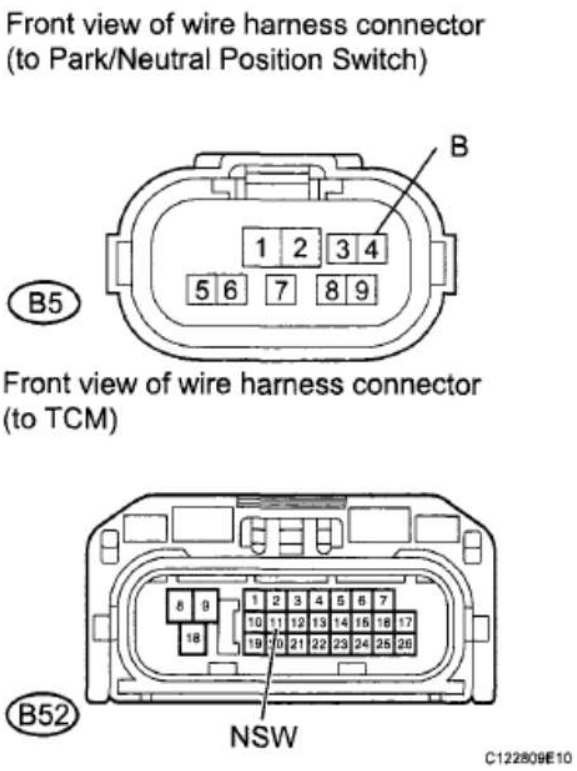


Fig. 37: Identifying B5 Park/Neutral Position Switch Connector Terminal And B52 Park/Neutral Position Switch Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPLACE TCM (See **REMOVAL**)

DTC P0711 TRANSMISSION FLUID TEMPERATURE SENSOR "A" PERFORMANCE

DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor converts the fluid temperature into a resistance value for use by the TCM.

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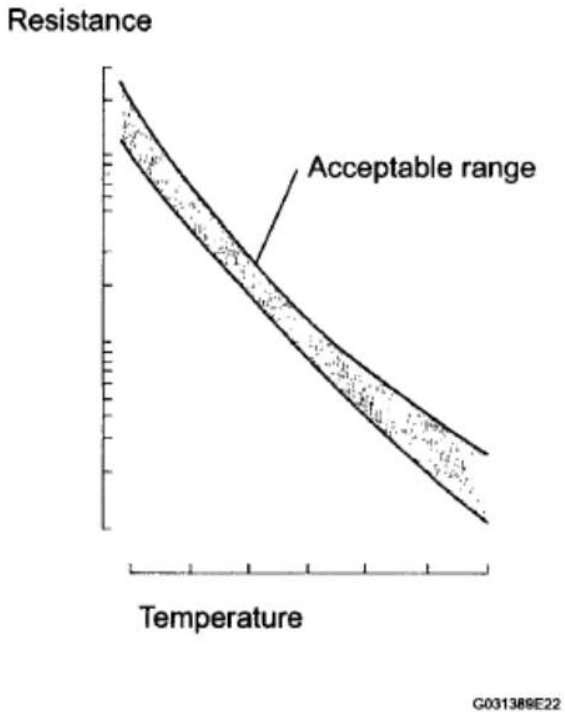


Fig. 38: Resistance And Temperature Graph
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

The TCM applies a voltage to the temperature sensor through terminal OIL of the TCM.

The sensor resistance changes with the transmission fluid temperature. As the temperature becomes higher, the sensor resistance decreases.

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

The TCM calculates the fluid temperature based on the voltage signal.

DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
	One of the following conditions (A), (B) or (C) is met: A. (a), (b) and (c) are detected: (2-trip detection logic) a. Intake air and engine coolant temperatures are more than 15°C (59°F) at engine start b. Soak time is more than 5 hours c. After normal driving for over 10 min. and 5 km (3 mile) or more, ATF temperature is less than 20°C (68°F) B. Both (a) and (b) are detected: (2-trip detection logic)	ATF temperature

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P0711	• Intake air and engine coolant temperatures are more than -10°C (14°F) at engine start • After normal driving for over 19 min. and 8 km (5 mile) or more, ATF temperature is less than 20°C (68°F) C. Both (a) and (b) are detected: (2-trip detection logic) • Engine coolant temperature is less than 35°C (95°F) at engine start • ATF temperature is 110°C (230°F) or more when engine coolant temperature reaches 60°C (140°F)	sensor

MONITOR DESCRIPTION

This DTC indicates that there is a problem with output signals from the automatic transmission fluid (ATF) temperature sensor and that the sensor itself is defective. The ATF temperature sensor converts the ATF temperature into an electrical resistance value. Based on the resistance, the TCM determines the ATF temperature and detects an open or short in the ATF temperature circuit or a fault of the ATF temperature sensor.

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

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0711: ATF temperature sensor
Required sensors/Components	ATF temperature sensor (TFT sensor)
Frequency of operation	Continuous
Duration	Condition A, B, C and D: 3 sec. Condition. E: Continuous
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

ALL:

TYPICAL ENABLING CONDITIONS

The monitor will run whenever	P0712, P0713 (ATF temperature sensor circuit (TFT sensor)) P0115, P0117, P0118 (ECT sensor circuit) P0112, P0113 (IAT sensor circuit) P0715, P0717 (Turbine speed sensor circuit) P0791, P0793 (Intermediate shaft speed sensor circuit) P0748 (Shift solenoid valve SL1 circuit) P0778 (Shift solenoid valve SL2 circuit)

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this DTC is not present. (Not circuit malfunction)	P0798 (Shift solenoid valve SL3 circuit) P2810 (Shift solenoid valve SL4 circuit) P0327, P0328, (KCS sensor circuit) P0120, P0121, P0122, P0123, P0220, P0222, P0223, P0604, P0606, P060A, P060B, P060D, P060E, P0657, P1607, P2102, P2103, P2111, P2112, P2118, P2119, P2135((ETCS) Electronic throttle control system) U0100 (CAN communication system) P2610 (Soak timer circuit)
TFT (Transmission fluid temperature) sensor circuit	No circuit malfunction
ECT (Engine coolant temperature) sensor circuit	No circuit malfunction
IAT (Intake air temperature) sensor circuit	No circuit malfunction
Turbine speed sensor circuit	No circuit malfunction
Intermediate shaft speed sensor	No circuit malfunction
Shift solenoid valve SL1 circuit	No circuit malfunction
Shift solenoid valve SL2 circuit	No circuit malfunction
Shift solenoid valve SL3 circuit	No circuit malfunction
Shift solenoid valve SL4 circuit	No circuit malfunction
(KCS) Knock control sensor circuit	No circuit malfunction
Soak timer circuit	No circuit malfunction
(ETCS) Electronic throttle control system	Not system down
CAN communication system	Not system down
Engine	Starting
Time after engine start	12 sec. or more
ECT (Engine coolant temperature)	-15°C (5°F) or more

Condition A:

TYPICAL ENABLING CONDITIONS

Time after engine start	10 min.
Driving distance after engine start	3 miles (5 km) or more
IAT (12 sec. after engine start)	15°C (59°F) or more
ECT (12 sec. after engine start)	15°C (59°F) or more
Soak time	5 hours
Accumulated driving time *1	130 sec. or more
*1: Following conditions are met	
Engine speed - Turbine speed	50 rpm or more
Output speed	400 rpm or more

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Throttle valve opening angle	3% or more
Shift position	Not "N" or "P"

Condition B:

TYPICAL ENABLING CONDITIONS

Time after engine start	18 min. and 20 sec.
Driving distance after engine start	5 miles (8 km) or more
IAT (12 sec. after engine start)	-10°C (14°F) or more
ECT (12 sec. after engine start)	-10°C (14°F) or more
Accumulated driving time *1	200 sec. or more

Condition C:

TYPICAL ENABLING CONDITIONS

Time after engine start	30 min.
Driving distance after engine start	9.3 miles (15 km)
IAT (12 sec. after engine start)	-15°C (5°F) or more
ECT (12 sec. after engine start)	-15°C (5°F) or more
Accumulated driving time *1	400 sec. or more

Condition D:

TYPICAL ENABLING CONDITIONS

Time after engine start	40 min.
Driving distance after engine start	12.4 miles (20 km)
Accumulated driving time *1	550 sec. or more

Condition E:

TYPICAL ENABLING CONDITIONS

Time after ECT reaches 60°C (140°F)	10 sec. or more
TFT (12 sec. after engine start)	110°C (230°F) or more
ECT (12 sec. after engine start)	35°C (95°F) or less

TYPICAL MALFUNCTION THRESHOLDS

Condition A, B, C and D:

TYPICAL MALFUNCTION THRESHOLDS

TFT	Less than 20°C (68°F) (THO = -10°C (14°F) at engine start) (Conditions vary with THO at engine)

Condition E:

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TYPICAL MALFUNCTION THRESHOLDS

TFT	110°C (230°F) or more

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

TFT	Atmospheric temperature - approx. 130°C (266°F)

WIRING DIAGRAM

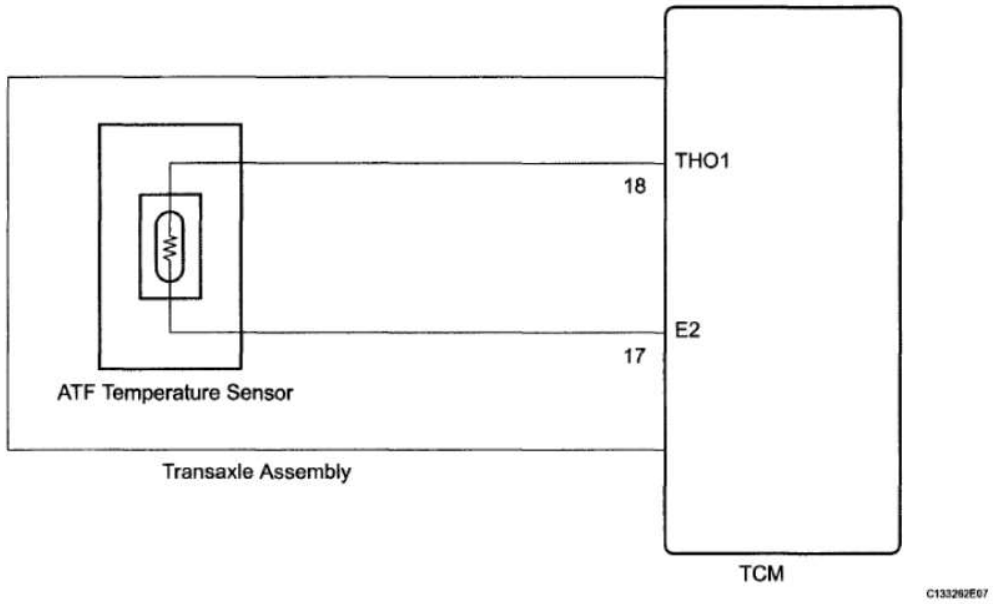


Fig. 39: Transaxle Assembly And TCM - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

NOTE:

- **Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).**
- **If DTCs P0711 and P2610 are output simultaneously, confirm that the ATF temperature is as specified in "Normal Condition" using the Techstream first. When the ATF temperature is as specified in "Normal Condition", perform troubleshooting for DTC P2610 (See DIAGNOSTIC TROUBLE CODE CHART).**
- **In the table below, the value listed under "Normal Condition" are reference values.**

HINT:

Using the Techstream to read the Data List allows the values or states of switches, sensors, actuators and other

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items to be read without removing any parts. This non-intrusive inspection can be very useful because intermittent conditions or signals may be discovered before parts or wiring is disturbed. Reading the Data List information early in troubleshooting is one way to save diagnostic time.

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the Techstream to the DLC3.
4. Turn the ignition switch to ON.
5. Turn the Techstream on.
6. Enter the following menus: Powertrain/ECT/Data List.
7. According to the display on the Techstream, read the Data List.

TCM

TCM DATA LIST REFERENCE

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 1	ATF temperature sensor value/ Min.: -40°C (-40°F) Max.: 215°C (419°F)	• After stall speed test: Approximately 80°C (176°F) • While engine is cold: Equal to ambient temperature	If value is -40°C (-40°F) or 150°C (302°F), ATF temperature sensor circuit is open or short circuited

HINT:

When DTC P0712 is output and the Techstream indicates 150°C (302°F) or more, there is a short circuit.

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

Measure the resistance between terminal THO1 (OT) and body ground.

TEMPERATURE DISPLAYED REFERENCE

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

HINT:

If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately set (in 0.5 seconds). When P0713 is set, P0711 cannot be detected.

It is not necessary to inspect the circuit when P0711 is set.

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1. **CHECK OTHER DTCS OUTPUT (IN ADDITION TO DTC P0711)**
   a. Connect the Techstream to the DLC3.
   b. Turn the ignition switch to ON.
   c. Turn the Techstream on.
   d. Enter the following menus: Powertrain/ECT/Trouble Codes.
   e. Read the DTCs using the Techstream.

   Result

   RESULT CHART

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

   HINT:

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

   B: GO TO DTC CHART (See **DIAGNOSTIC TROUBLE CODE CHART**)

   A: Go to next step

2. **CHECK TRANSMISSION FLUID LEVEL**
   a. Check the transmission fluid level (See **AUTOMATIC TRANSAXLE FLUID**).

   OK:

   Automatic transmission fluid level is correct.

   NG: ADJUST FLUID LEVEL

   OK: REPLACE TRANSMISSION WIRE (ATF TEMPERATURE SENSOR) (See **REMOVAL**)

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 fluid temperature into a resistance value for use by the TCM.

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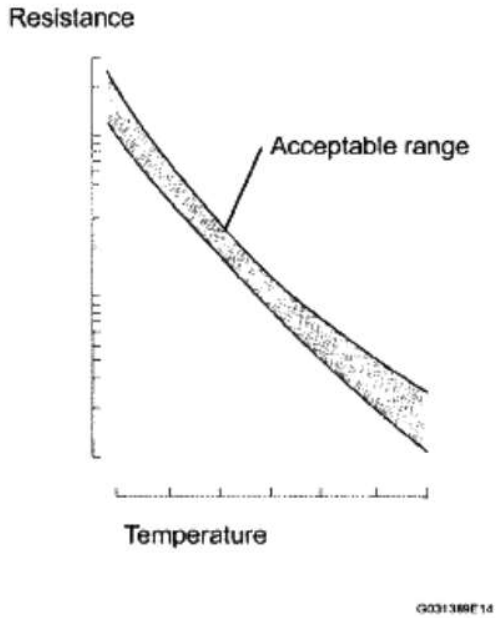


Fig. 40: Resistance And Temperature Graph
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

The TCM applies a voltage to the temperature sensor through terminal OIL of the TCM.

The sensor resistance changes with the transmission fluid temperature. As the temperature becomes higher, the sensor resistance decreases.

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

The TCM calculates the fluid temperature based on the voltage signal.

DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
P0712	ATF temperature sensor resistance is less than 79 ohms for 0.5 sec. or more (1-trip detection logic)	• Short in ATF temperature sensor circuit • Transmission wire • ATF temperature sensor • TCM
P0713	Either of the following conditions is met (1-trip detection logic) A. 15 minutes or more after the engine is started, ATF temperature sensor resistance is more than 156 kohms for 0.5	• Open in ATF temperature sensor circuit • Transmission wire

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	sec. or more. B. The condition (A) of "TYPICAL ENABLING CONDITIONS" for DTC P0711 is met and ATF temperature sensor resistance is more than 156 kohms for 0.5 sec. or more.	• ATF temperature sensor • TCM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the automatic transmission fluid (ATF) temperature sensor circuit. The automatic transmission fluid (ATF) temperature sensor converts ATF temperature into an electrical resistance value. Based on the resistance, the TCM determines the ATF temperature, and the TCM detects an open or short in the ATF temperature circuit. If the resistance value of the ATF temperature is less than 79 ohms*1 or more than 156 kohms*2, the TCM interprets this as a fault in the ATF sensor or wiring. The TCM will turn on the MIL and store the DTC.

*1: 150°C (302°F) or more is indicated regardless of the actual ATF temperature.

*2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.

HINT:

The ATF temperature can be checked on the Techstream display.

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0712: ATF temperature sensor/Range check (Low resistance) P0713: ATF temperature sensor/Range check (High resistance)
Required sensors/Components	ATF temperature sensor (TFT sensor)
Frequency of operation	Continuous
Duration	0.5 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0712: Range check (Low resistance)

TYPICAL ENABLING CONDITIONS

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

P0713: Range check (High resistance)

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

Condition (A)

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TYPICAL ENABLING CONDITIONS

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

Condition (B)

The condition (A) of "TYPICAL ENABLING CONDITIONS" for DTC P0711 is met

TYPICAL MALFUNCTION THRESHOLDS

P0712: Range check (Low resistance)

TYPICAL MALFUNCTION THRESHOLDS

TFT sensor resistance	Less than 79 ohms

P0713: Range check (High resistance)

TYPICAL MALFUNCTION THRESHOLDS

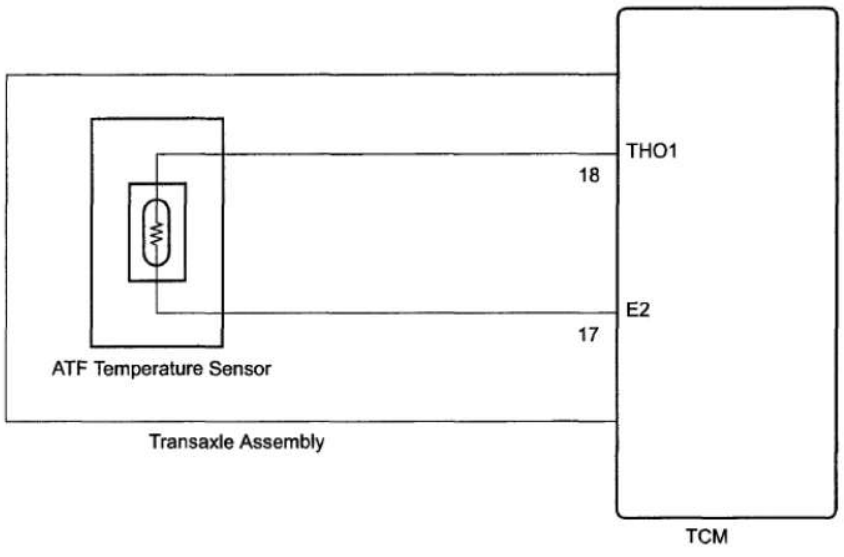
TFT sensor resistance	More than 156kohms

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM



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Fig. 41: Transaxle Assembly And TCM - Wiring Diagram
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INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

HINT:

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

NOTE: 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 Techstream to the DLC3.
4. Turn the ignition switch to ON.
5. Turn the Techstream on.
6. Enter the following menus: Powertrain/ECT/Data List.
7. According to the display on the Techstream, read the Data List.

TCM

TCM DATA LIST REFERENCE

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T Oil Temperature 1	ATF temperature sensor value/ Min.: -40°C (-40°F) Max.:215°C (419°F)	• After stall speed test: Approximately 80°C (176°F) • While engine is cold: Equal to ambient temperature	If value is -40°C (-40°F) or 150°C (302°F), ATF temperature sensor circuit is open or short circuited

HINT:

When DTC P0712 is output and the Techstream indicates 150°C (302°F) or more, there is a short circuit.

When DTC P0713 is output and the Techstream indicates -40°C (-40°F), there is an open circuit. Measure the resistance between terminal THO1 (OT) and body ground.

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TEMPERATURE DISPLAYED REFERENCE

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

HINT:

If the circuit related to the ATF temperature sensor becomes open, P0713 is immediately set (in 0.5 seconds). When P0713 is set, P0711 cannot be detected.

It is not necessary to inspect the circuit when P0711 is set.

1. **INSPECT TRANSMISSION WIRE (ATF TEMPERATURE SENSOR)**
   a. Remove the TCM from the transaxle.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
17 (E2) - 18 (THO1)	Always	79ohms to 156 kohms
17 (E2) - Body ground	Always	10 kohms or higher
18 (THO1) - Body ground	Always	10 kohms or higher

HINT:

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

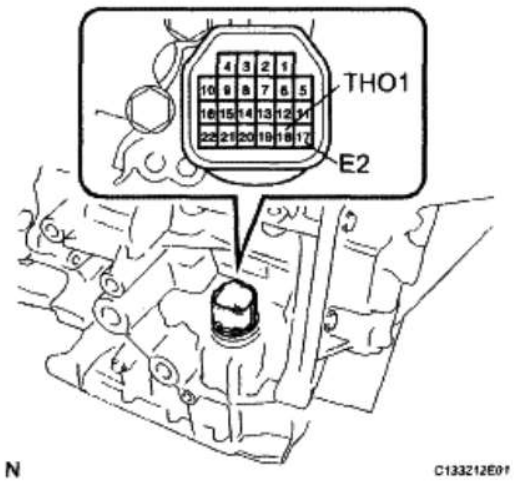


Fig. 42: Identifying TCM Location
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ATF TEMPERATURE SPECIFICATION

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

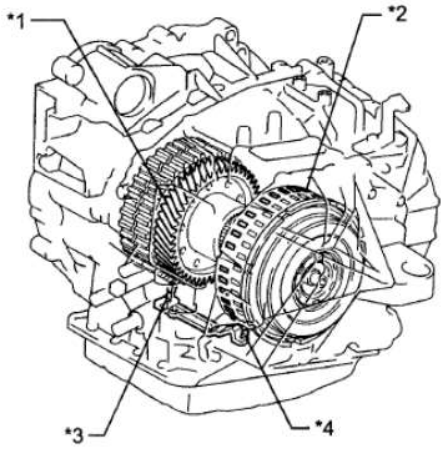
NG: REPLACE TRANSMISSION WIRE (ATF TEMPERATURE SENSOR) (See **REMOVAL**)

OK: REPLACE TCM (See **REMOVAL**)

DTC P0715 INPUT/TURBINE SPEED SENSOR CIRCUIT MALFUNCTION; DTC P0717 INPUT SPEED SENSOR CIRCUIT NO SIGNAL

DESCRIPTION

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



N C133219E04

Fig. 43: Identifying Counter Gear, Clutch Drum, Input Speed Sensor And Output Speed Sensor
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Text in Illustration

LEGEND REFERENCE

*1	Counter Gear	*2	Clutch Drum
*3	Output Speed Sensor NC	*4	Input Speed Sensor NT

DTC DETECTION CONDITION CHART

DTC		

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No.	DTC Detection Condition	Trouble Area
P0715	When the speed sensor input voltage is either more than 1.9 V or less than 0.1 V for 4.5 seconds or more. (1-trip detection logic)	• Transmission revolution sensor (speed sensor NT) • Transmission wire • TCM
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 (STAR and R) is OFF c. Speed sensor (NT): less than 300 rpm	

MONITOR DESCRIPTION

The NT terminal of the TCM detects a revolution signal from the speed sensor (NT) (input RPM). The TCM calculates gear shifts comparing the speed sensor (NT) with the speed sensor (NC). While the vehicle is operating in 2nd, 3rd, 4th or 5th gear with the shift lever in D, if the input shaft revolution (speed) is less than 300 rpm*1 although the output shaft revolution (speed) is more than 1000 rpm*2, the TCM interprets this as a fault, 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

MONITOR STRATEGY

Related DTCs	P0715: Speed sensor (NT)/Range check 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

P0715:

TYPICAL ENABLING CONDITIONS

Battery voltage	8 V or more
Ignition switch	ON
Starter	OFF

P0717:

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TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present.	P0500 (VSS) P0748, P0778, P0798 (Shift solenoid valve (range))
Shift change	Shift change is completed before starting next shift change operation
TCM selected gear	2nd, 3rd, 4th, 5th or 6th
Output shaft rpm	1,000 rpm or more
STAR switch	OFF
R switch	OFF
Engine	Running
Battery voltage	8 V or more
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

P0715:

TYPICAL MALFUNCTION THRESHOLDS

Sensor voltage	Less than 0.1 V or more than 1.9 V

P0717:

TYPICAL ENABLING CONDITIONS

Sensor signal rpm	Less than 300 rpm

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

Speed sensor (NT)	Turbine speed is equal to engine speed with lock-up ON

WIRING DIAGRAM

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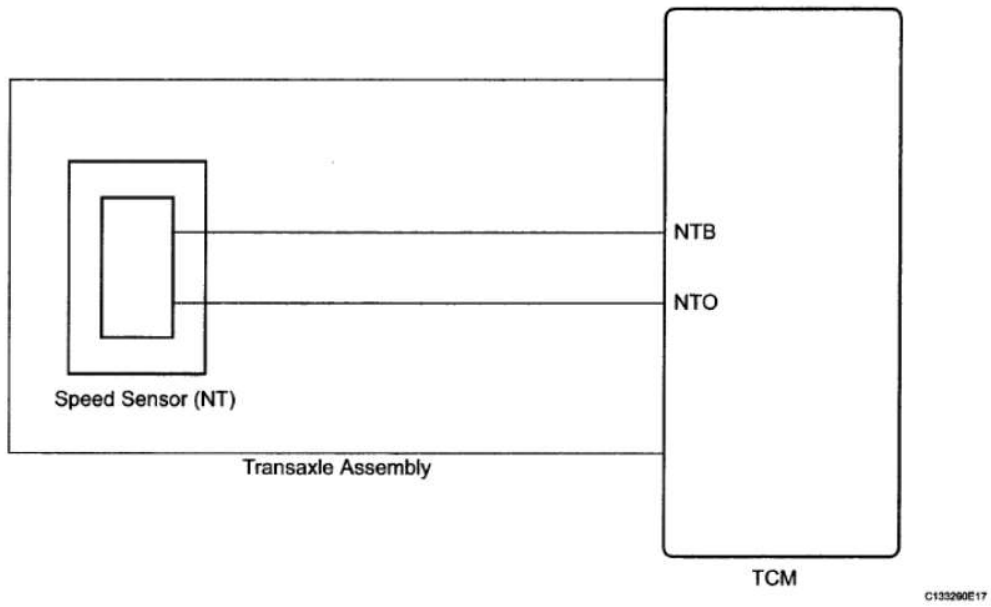


Fig. 44: Transaxle Assembly - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

HINT:

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

NOTE: 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 Techstream to the DLC3.
4. Turn the ignition switch to ON.
5. Turn the Techstream on.
6. Enter the following menus: Powertrain/ECT/Data List.
7. According to the display on the Techstream, read the Data List.

TCM

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TCM DATA LIST REFERENCE

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
SPD (NT)	Input shaft speed/ Min.: 0 rpm Max.: 12750 rpm	Lock-up is • ON (after warming up engine): Input turbine speed (NT) is equal to engine speed • OFF (idling with shift lever in 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 while driving: Open or short in the sensor or circuit.
- SPD (NT) is always more than 0 and less than 300 rpm while driving the vehicle at 50 km/h (31 mph) or more: Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

1. **INSPECT SPEED SENSOR (SENSOR INSTALLATION)**
   a. Remove the valve body assembly.
   b. Make sure that the connector is properly connected, and check the speed sensor installation.

   OK:

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

   NG: REPAIR OR REPLACE SPEED SENSOR (See **REMOVAL**)

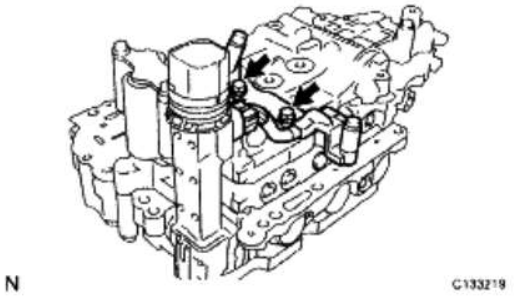


Fig. 45: Locating Speed Sensor Bolt
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   OK: Go to next step

2. **INSPECT TRANSMISSION WIRE**
   a. Remove the TCM.

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b. Disconnect the speed sensor connector from the transmission wire.
c. Measure the resistance according to the value (s) in the table below.

Standard Resistance

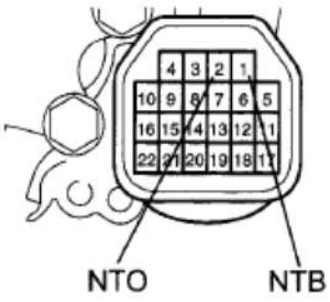
RESISTANCE SPECIFICATION

Tester Condition	Condition	Specified Condition
1 (NTB) sensor side -1 (NTB) TCM side	Always	Below 1 ohms
2 (NTO) sensor side - 2 (NTO) TCM side	Always	Below 1 ohms
1 (NTB) sensor side-Body ground	Always	10 kohms or higher
2 (NTO) sensor side-Body ground	Always	10 kohms or higher
1 (NTB) sensor side-All other terminals except 2 (NTO) sensor side	Always	10 kohms or higher
2 (NTO) sensor side-All other terminals except 1 (NTB) sensor side	Always	10 kohms or higher

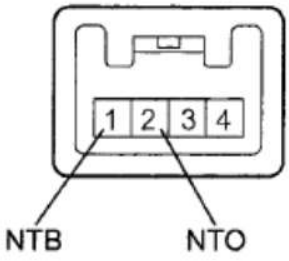
NG: REPLACE TRANSMISSION WIRE (See **REMOVAL**)

Component without harness connected
(Transmission Wire)

TCM Side



Sensor Side



C189545E05

Fig. 46: Identifying TCM Connector Terminal

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OK: Go to next step

3. **REPLACE SPEED SENSOR**
   a. (See **REMOVAL**).
4. **CHECK IF DTC OUTPUT RECURS (SEE IF DTC P0715 AND/OR P0717 OUTPUT AGAIN)**
   a. Connect the Techstream to the DLC3.
   b. Start the engine and turn the Techstream on.
   c. Enter the following menus: Powertrain/ECT/DTC/Clear.

      HINT:

      Write down the currently output DTCs before clearing them.

   d. Perform the monitor drive pattern (See **MONITOR DRIVE PATTERN**).
   e. Enter the following menus: Powertrain/ECT/DTC.
   f. Read the DTCs using the Techstream.

Result

RESULT CHART

Display (DTC Output)	Proceed to
Only "P0715 or P0717" is output	A
No output	B

B: END

A: REPLACE TCM (See **REMOVAL**)

DTC P0724 BRAKE SWITCH "B" CIRCUIT HIGH

DESCRIPTION

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

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

DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
		• Short in stop light

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P0724	The stop light switch remains ON even when the vehicle is driven in a STOP (less than 3 km/h (2 mph)) and GO (30 km/h (19 mph) or more) fashion 5 times. (2-trip detection logic).	switch signal circuit • Stop light switch • TCM

MONITOR DESCRIPTION

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

MONITOR STRATEGY

MONITOR STRATEGY

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

TYPICAL ENABLING CONDITIONS

The stop light switch remains ON during GO and STOP 5 times.

GO and STOP are defined as follows;

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present.	None
GO: (Vehicle speed is 18.63 mph (30 km/h) or more)	18.7 mph (30 km/h) or more
STOP: (Vehicle speed is less than 1.86 mph (3 km/h))	Less than 1.86 mph (3 km/h)
Starter	OFF
Battery voltage	8 V or more
Ignition switch	ON

TYPICAL MALFUNCTION THRESHOLDS

TYPICAL MALFUNCTION THRESHOLDS

Switch status	ON stuck

WIRING DIAGRAM

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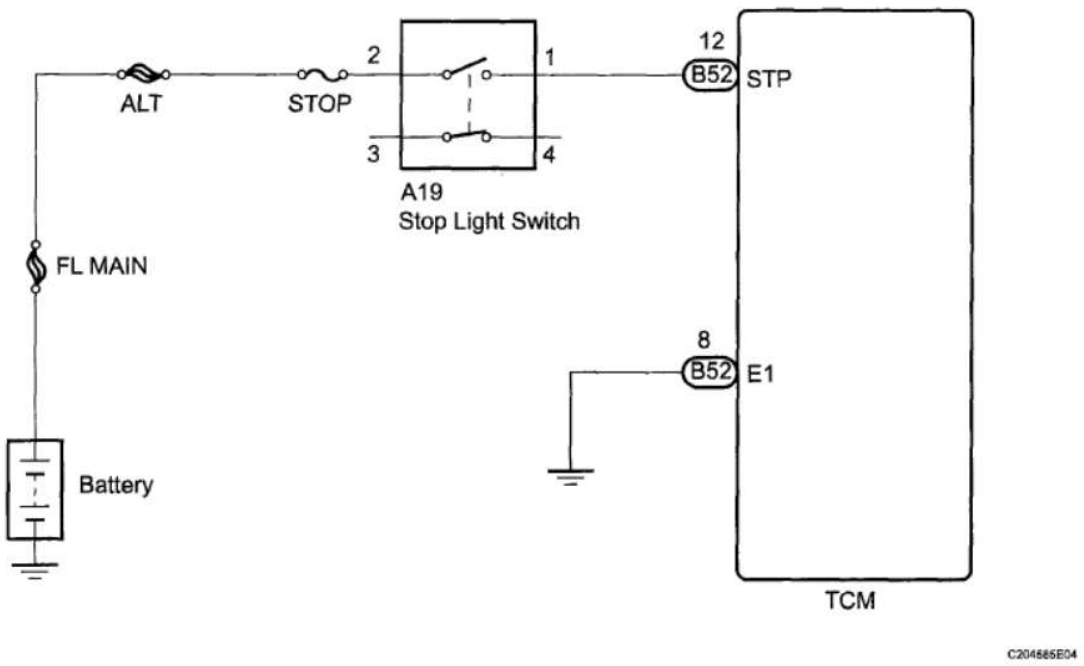


Fig. 47: Stop Light Switch - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

1. **READ VALUE USING DATA LIST (STP SIGNAL)**

   HINT:

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

   NOTE: 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. Turn the ignition switch off.
   b. Connect the Techstream to the DLC3.
   c. Turn the ignition switch to ON.
   d. Turn the Techstream on.
   e. Enter the following menus: Powertrain/ECT/Data List.
   f. According to the display on the Techstream, read the Data List.

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Standard

DATA LIST REFERENCE

Item	Measurement Item/ Range (display)	Normal Condition
Stop Light Switch	Stop light switch status/ ON or OFF	• Brake pedal Is depressed: ON • Brake pedal is released: OFF

NOTE: In the table above, the conditions listed under "Normal Condition" are reference conditions. Do not depend solely on these reference conditions when deciding whether a part is faulty.

Result

RESULT CHART

Result	Proceed to
OK	B
NG	A

B: Go to step 3

A: Go to next step

2. **INSPECT STOP LIGHT SWITCH ASSEMBLY**
   a. Remove the stop light switch assembly.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

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

NG: REPLACE STOP LIGHT SWITCH ASSEMBLY

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Component without harness connected:
(Stop Light Switch)

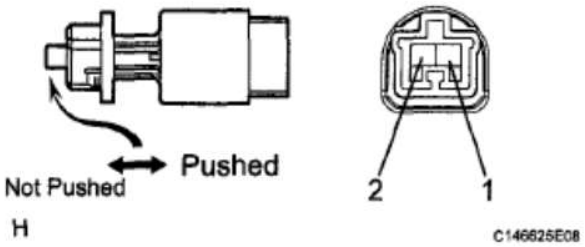


Fig. 48: Removing Stop Light Switch Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

3. **CHECK HARNESS AND CONNECTOR (STOP LIGHT SWITCH ASSEMBLY - TCM)**
   a. Install the stop light switch assembly.
   b. Connect the stop light switch connector.
   c. Disconnect the TCM connector.
   d. Measure the voltage according to the value (s) in the table below when the brake pedal is depressed and released.

Standard Voltage

VOLTAGE SPECIFICATION

Tester Connection	Condition	Specified Condition
B52-12 (STP) - Body ground	Brake pedal is depressed	7.5 to 14 V
B52-12 (STP) - Body ground	Brake pedal is released	Below 1 V

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

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Front view of wire harness connector
(to TCM)

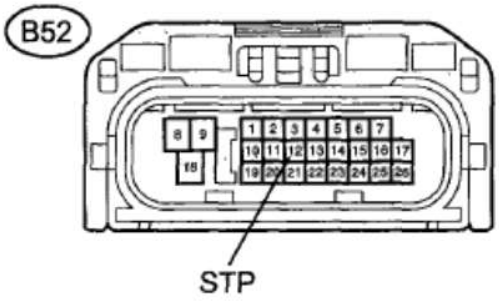


Fig. 49: Identifying Stop Light Switch Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPLACE TCM (See **REMOVAL**)

DTC P0741 TORQUE CONVERTER CLUTCH SOLENOID PERFORMANCE (SHIFT SOLENOID VALVE SL)

SYSTEM DESCRIPTION

The TCM uses signals from the throttle position sensor, air-flow meter, turbine (input) speed sensor, intermediate (counter gear) speed sensor and crankshaft position sensor to help determine the engagement timing of the lock-up clutch. The TCM monitors the engagement of the clutch using the turbine (input) speed sensor, intermediate (counter gear) speed sensor and crankshaft position sensor. Then the TCM compares the engagement condition of the lock-up clutch with the lock-up schedule in the TCM memory to detect shift solenoid valve SL, valve body and torque converter clutch mechanical problems.

DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
P0741	Lock-up does not occur when requested. (2-trip detection logic):	• Shift solenoid valve SL remains closed • Valve body is blocked • Torque converter clutch • Automatic transaxle (clutch, brake or gear etc.) • Line pressure is too low

MONITOR DESCRIPTION

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Torque converter lock-up is controlled by the TCM based on the speed sensor (NT), speed sensor (NC), engine rpm, engine load, engine temperature, vehicle speed, transmission fluid temperature, and gear selection. The TCM determines the lock-up status of the torque converter by comparing the engine rpm (NE) to the input turbine rpm (NT). The TCM calculates the actual transmission gear by comparing the input turbine rpm (NT) to the counter gear rpm (NC). When conditions are appropriate, the TCM requests "lock-up" by applying control voltage to shift solenoid SL. When SL is turned on, it applies pressure to the lock-up relay valve and locks the torque converter clutch.

If the TCM detects no lock-up after lock-up has been requested or if it detects lock-up when it is not requested, the TCM interprets this as a fault in shift solenoid valve SL or lock-up system performance. The TCM will turn on the MIL and store the DTC.

HINT:

Example:

When any of the following is met, the system judges it as a malfunction.

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

(The difference between the engine speed and input turbine speed is less than 20 rpm.)

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0741: Shift solenoid valve SL OFF malfunction Shift solenoid valve SL ON malfunction
Required sensors/Components	Shift solenoid valve SL, 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.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

ALL:

TYPICAL ENABLING CONDITIONS

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The monitor will run whenever this DTC is not present. (Not circuit malfunction)	P0712, P0713 (ATF temperature sensor circuit (TFT sensor)) P0115, P0117, P0118 (ECT sensor circuit) P0715, P0717 (Turbine speed sensor circuit) P0791, P0793 (Intermediate shaft speed sensor circuit) P0748 (Shift solenoid valve SL1 circuit) P0778 (Shift solenoid valve SL2 circuit) P0798 (Shift solenoid valve SL3 circuit) P2810 (Shift solenoid valve SL4 circuit) P2759 (Shift solenoid valve SLU circuit) P2769, P2770 (Shift solenoid valve SL circuit) P0327, P0328, (KCS sensor circuit) P0120, P0121, P0122, P0123, P0220, P0222, P0223, P0604, P0606, P060A, P060B, P060D, P060E, P0657, P1607, P2102, P2103, P2111, P2112, P2118, P2119, P2135((ETCS) Electronic throttle control system) U0100 (CAN communication system)
ECT (Engine coolant temperature)	40°C (104°F) or more
Spark advance from Max. retard timing by KCS control	0°CA or more
Transmission range	"D"
TFT (Transmission fluid temperature)	-10°C (14°F) or more
TFT (Transmission fluid temperature) sensor circuit	No circuit malfunction
ECT (Engine coolant temperature) sensor circuit	No circuit malfunction
Turbine speed sensor circuit	No circuit malfunction
Intermediate shaft speed sensor circuit	No circuit malfunction
Shift solenoid valve SL1 circuit	No circuit malfunction
Shift solenoid valve SL2 circuit	No circuit malfunction
Shift solenoid valve SL3 circuit	No circuit malfunction
Shift solenoid valve SL4 circuit	No circuit malfunction
Shift solenoid valve SLU circuit	No circuit malfunction
Shift solenoid valve SL circuit	No circuit malfunction
(KCS) Knock control sensor circuit	No circuit malfunction
(ETCS) Electronic throttle control system	Not system down
CAN communication system	Not system down
Engine	Starting
TCM selected gear	Not 1st
Vehicle speed	15.5 mph (25 km/h) or more

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Turbine speed/Output speed (NT/NO) with 1st	3.232 to 7.556
Turbine speed/Output speed (NT/NO) with 2nd	1.860 to 2.289
Turbine speed/Output speed (NT/NO) with 3rd	1.369 to 1.613
Turbine speed/Output speed (NT/NO) with 4th	0.976 to 1.113
Turbine speed/Output speed (NT/NO) with 5th	0.690 to 0.818
Turbine speed/Output speed (NT/NO) with 6th	0.556 to 0.680

TYPICAL MALFUNCTION THRESHOLDS

OFF malfunction:

TYPICAL MALFUNCTION THRESHOLDS

Engine Speed - Turbine speed	70 rpm or more

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

HINT:

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

1. **PERFORM ACTIVE TEST**
   a. Warm up the engine.
   b. Turn the ignition switch off.
   c. Connect the Techstream to the DLC3.
   d. Turn the ignition switch to ON.
   e. Turn the Techstream on.
   f. Enter the following menus: Powertrain/ECT/Active Test.
   g. According to the display on the Techstream, perform the Active Test.

ACTIVE TEST REFERENCE

Tester Display	Test Part	Control Range	Diagnostic Note

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Activate the Lock Up	[Test Details] Controls the shift solenoid SLU and SL to set the automatic transaxle to the lock-up condition. [Vehicle Condition] Vehicle speed: 60 km/h (37 mph) or more	[Lock-up] 0: OFF 1: ON	Possible to check SLU and SL solenoid operation.

HINT:

This test can be conducted when the vehicle speed is 60 km/h (37 mph) or more.

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

HINT:

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

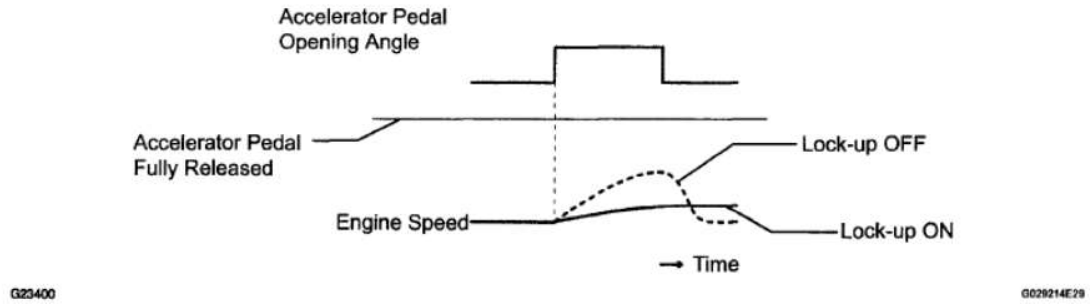


Fig. 50: Accelerator Pedal Opening Angle Graph
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. **CHECK OTHER DTCS OUTPUT (IN ADDITION TO DTC P0741)**
   a. Connect the Techstream to the DLC3.
   b. Turn the ignition switch to ON.
   c. Turn the Techstream on.
   d. Enter the following menus: Powertrain/ECT/Trouble Codes.
   e. Read the DTCs using the Techstream.

Result

RESULT CHART

Display (DTC Output)	Proceed to
Only "P0741" is output	A
"P0741" and other DTCs	B

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HINT:

If any other codes besides "P0741" are output, perform the troubleshooting for those DTCs first.

B: GO TO DTC CHART (See **DIAGNOSTIC TROUBLE CODE CHART**)

A: Go to next step

2. **CHECK TRANSMISSION WIRE**
   a. Remove the TCM from the transaxle.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
6 (SL) - Body ground	20°C (68°F)	11 to 15 ohms

Result

RESULT CHART

Result	Proceed to
OK	B
NG	A

B: Go to step 4

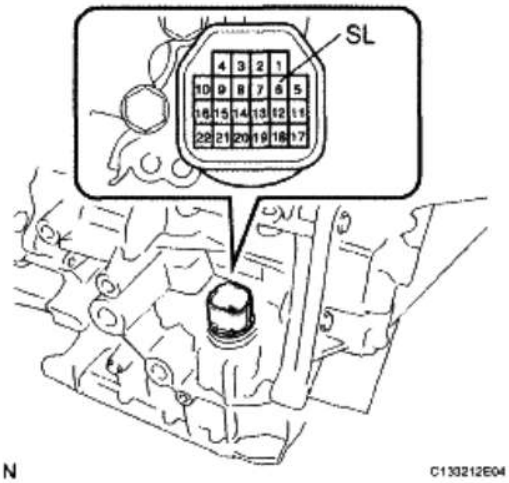


Fig. 51: Identifying TCM Of Transaxle
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

A: Go to next step

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3. **INSPECT SHIFT SOLENOID VALVE SL (RESISTANCE)**
   a. Remove shift solenoid valve SL.
   b. Measure the resistance according to the value (s) in the table below.

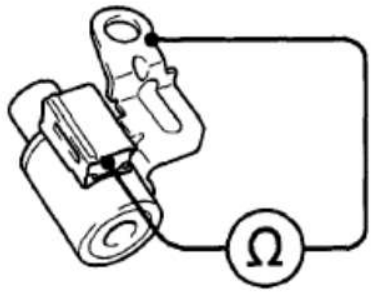
Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
Solenoid Connector (SL) - Solenoid Body (SL)	20°C (68°F)	11 to 15 ohms

NG: REPLACE SHIFT SOLENOID VALVE SL (See **REMOVAL**)

Shift Solenoid Valve SL:



C133217E01

Fig. 52: Inspecting Shift Solenoid Valve Sl (Resistance)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPLACE TRANSMISSION WIRE (See **REMOVAL**)

4. **INSPECT SHIFT SOLENOID VALVE SL (OPERATION)**
   a. Remove shift solenoid valve SL.
   b. Connect a battery positive (+) lead to the terminal of the solenoid valve connector, and a negative (-) lead to the solenoid body. Then check that the valve moves and makes an operating sound.

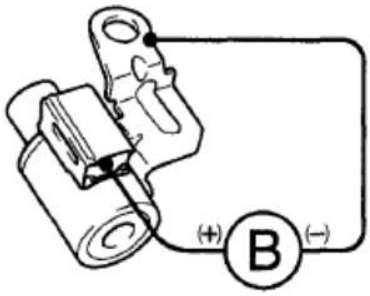
OK:

Valve moves and makes an operating sound.

NG: REPLACE SHIFT SOLENOID VALVE SL (See **REMOVAL**)

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Shift Solenoid Valve SL:



C133218E01

Fig. 53: Inspecting Shift Solenoid Valve Sl (Operation)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

5. **INSPECT TRANSMISSION VALVE BODY ASSEMBLY**
   a. Check the transmission valve body assembly (See **REMOVAL**).

OK:

There are no foreign objects on each valve and they operate smoothly.

NG: REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (See **REMOVAL**)

OK: Go to next step

6. **INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY**
   a. Check the torque converter clutch assembly (See **TORQUE CONVERTER CLUTCH AND DRIVE PLATE**).

OK:

The torque converter clutch operates normally.

NG: REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY (See **REMOVAL**)

OK: REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSEMBLY (See **REMOVAL**)

DTC P0746 PRESSURE CONTROL SOLENOID "A" PERFORMANCE (SHIFT SOLENOID VALVE SL1)

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SYSTEM DESCRIPTION

The TCM uses the vehicle speed signal and signals from the transmission speed sensors (NC, NT) to detect the actual gear (1st, 2nd, 3rd, 4th, 5th or 6th gear).

Then the TCM compares the actual gear with the shift schedule in the TCM memory to detect mechanical problems of the shift solenoid valves and valve body.

DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
P0746	The engine revs freely when 1st, 2nd, 3rd, or 4th gear is commanded (2-trip detection logic). When either of the following is detected twice (2-trip detection logic): • When 5th gear is commanded, 4th gear is engaged. • When 6th gear is commanded, 4th gear is engaged	• Shift solenoid valve SL1 remains open or closed • Valve body is blocked • Automatic transaxle (clutch, brake or gear etc.)

MONITOR DESCRIPTION

The TCM commands gear shifts by turning the shift solenoid valves on and off. According to the input shaft revolution (speed), intermediate (counter) shaft revolution (speed) and output shaft revolution (speed), the TCM detects the actual gear (1st, 2nd, 3rd, 4th, 5th or 6th gear). When the gear commanded by the TCM and the actual gear are not the same, the TCM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

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	ON malfunction: 0.8 sec. OFF malfunction: 0.5 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

ALL:

TYPICAL ENABLING CONDITIONS

	P0712, P0713 (ATF temperature sensor circuit (TFT sensor))

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The monitor will run whenever this DTC is not present. (Not circuit malfunction)	P0115, P0117, P0118 (ECT sensor circuit) P0715, P0717 (Turbine speed sensor circuit) P0791, P0793 (Intermediate shaft speed sensor circuit) P0748 (Shift solenoid valve SL1 circuit) P0778 (Shift solenoid valve SL2 circuit) P0798 (Shift solenoid valve SL3 circuit) P2810 (Shift solenoid valve SL4 circuit) P0327, P0328, (KCS sensor circuit) P0120, P0121, P0122, P0123, P0220, P0222, P0223, P0604, P0606, P060A, P060B, P060D, P060E, P0657, P1607, P2102, P2103, P2111, P2112, P2118, P2119, P2135((ETCS) Electronic throttle control system) U0100 (CAN communication system)
Transmission range	"D"
TFT (Transmission fluid temperature)	-10°C (14°F) or more
TFT (Transmission fluid temperature) sensor circuit	No circuit malfunction
ECT (Engine coolant temperature) sensor circuit	No circuit malfunction
Turbine speed sensor circuit	No circuit malfunction
Intermediate shaft speed sensor circuit	No circuit malfunction
Shift solenoid valve SL1 circuit	No circuit malfunction
Shift solenoid valve SL2 circuit	No circuit malfunction
Shift solenoid valve SL3 circuit	No circuit malfunction
Shift solenoid valve SL4 circuit	No circuit malfunction
(KCS) Knock control sensor circuit	No circuit malfunction
(ETCS) Electronic throttle control system	Not system down
CAN communication system	Not system down
Engine	Starting

OFF malfunction:

TYPICAL ENABLING CONDITIONS

TCM selected gear	1st, 2nd, 3rd or 4th
TCM indicated pressure value of SL1	1,200 kPa
Throttle valve opening angle	3% or more

ON malfunction:

TYPICAL ENABLING CONDITIONS

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TCM selected gear	5th or 6th
Vehicle speed	1.2 mph (2 km/h) or more
ETC (Engine coolant temperature)	40°C (104°F) or more
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Varies with engine speed)

TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met:

OFF malfunction:

TYPICAL MALFUNCTION THRESHOLDS

Turbine speed - Output speed x Gear ratio	1,000 rpm or more

ON malfunction:

TYPICAL ENABLING CONDITIONS

Input (turbine) speed/Intermediate shaft speed when output speed less than 1,000 rpm	0.976 to 1.113

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

1. **CHECK OTHER DTCS OUTPUT (IN ADDITION TO DTC P0746)**
   a. Connect the Techstream to the DLC3.
   b. Turn the ignition switch to ON.
   c. Turn the Techstream on.
   d. Enter the following menus: Powertrain/ECT/Trouble Codes.
   e. Read the DTCs using the Techstream.

Result

RESULT CHART

Display (DTC Output)	Proceed to
Only "P0746" is output	A
"P0746" and other DTCs	B

HINT:

If a solenoid is stuck OFF, DTCs for several solenoids including the malfunctioning solenoid will be detected.

A: Go to step 3

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B: Go to next step

2. **PERFORM ACTIVE TEST USING TECHSTREAM**

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

a. Warm up the engine.
b. Turn the ignition switch off.
c. Connect the Techstream to the DLC3.
d. Turn the ignition switch to ON.
e. Turn the Techstream on.
f. Enter the following menus: Powertrain/ECT/Active Test.
g. According to the display on the Techstream, perform the Active Test.

HINT:

Comparing the gear commanded by the Active Test with the actual gear enables confirmation of the problem (See **FAIL-SAFE CHART**).

ACTIVE TEST REFERENCE

Item	Test Details	Diagnostic Note
Control the Shift Position	[Test Details] Operates the shift solenoid valves to allow gears to selected manually. [Others] • Press "-->" button: Upshift occurs • Press "<--" button: Downshift occurs	Can be used to check the operation of the shift solenoid valves.

NOTE:

- **This test can be conducted when the vehicle is stopped.**
- **When shifting gears using the Active Test function, do not operate the accelerator pedal for 2 seconds before and after shifting gears.**

HINT:

The gear commanded by the TCM is shown in the Data List/Shift Status display on the Techstream.

h. Check the vehicle speed and the gear when the engine speed is 1000 rpm.

HINT:

Because the torque converter clutch has not engaged, it may be difficult to obtain the speeds specified in 4th, 5th, and 6th gear, however a difference of speed should still be evident following

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each gear change.

Standard

GEAR CHANGE REFERENCE

1st	2nd	3rd	4th	5th	6th
8 to 12km/h (5 to 7.5 mph)	15 to 19km/h (9.3 to 11.8 mph)	21 to 25 km/h (13.0 to 15.5 mph)	31 to 35 km/h (19.3 to 21.7 mph)	44 to 48 km/h (27.3 to 29.8 mph)	52 to 56 km/h (32.3 to 34.8 mph)

i. Compare the TCM commanded gear and the actual gear.

Result

RESULT CHART

Actuator Gear during Malfunction		TCM Commanded Gear						Proceed to
		1st	2nd	3rd	4th	5th	6th	
Shift solenoid SL1	Stuck ON	1st	2nd	3rd	4th	4th	4th	A
	Stuck OFF	N*1	N*1	N*1	N*1	5th	6th	
Shift solenoid SL2	Stuck ON	4th	4th	4th	4th	5th	6th	B
	Stuck OFF	1st	2nd	3rd	1st	N*1	N*1	
Shift solenoid SL3	Stuck ON	2nd	2nd	3rd	4th	5th	6th	C
	Stuck OFF	1st	1st	3rd	4th	5th	N*1	
Shift solenoid SL4	Stuck ON*3	3rd	3rd	3rd	4th	5th	5th	D
	Stuck OFF	1st	2nd	1st	4th	N*1	6th	
Shift solenoid SLT	Stuck ON	N*2	N*2	N*2	N*2	N*2	N*2	E
	Stuck OFF*3	1st	2nd	3rd	4th	5th	6th	

HINT:

- *1: Neutral
- *2: If shift solenoid SLT is stuck on, the line pressure will be low. Therefore, the amount of torque that can be transmitted by each gear is lower than the normal limit. When the engine power exceeds this lowered limit, the engine speed will increase freely.
- *3: When shift solenoid SLT is stuck off, gear shifting is normal.

B: GO TO DTC CHART (RELATED SHIFT SOLENOID VALVE (SL2) PERFORMANCE DTC P0776) (See **DTC P0776 PRESSURE CONTROL SOLENOID "B" PERFORMANCE (SHIFT SOLENOID VALVE SL2)**)

C: GO TO DTC CHART (RELATED SHIFT SOLENOID VALVE (SL3) PERFORMANCE DTC P0796) (See **DTC P0796 PRESSURE CONTROL SOLENOID "C" PERFORMANCE (SHIFT SOLENOID VALVE SL3)**)

D: GO TO DTC CHART (RELATED SHIFT SOLENOID VALVE (SL4) PERFORMANCE DTC

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P2808) (See **DTC P2808 PRESSURE CONTROL SOLENOID "G" PERFORMANCE (SHIFT SOLENOID VALVE SL4)**)

E: GO TO DTC CHART (RELATED SHIFT SOLENOID VALVE (SLT) PERFORMANCE DTC P2714) (See **DTC P2714 PRESSURE CONTROL SOLENOID "D" PERFORMANCE (SHIFT SOLENOID VALVE SLT)**)

A: Go to next step

3. **INSPECT SHIFT SOLENOID VALVE SL1**
   a. Remove shift solenoid valve SL1.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

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

   c. Connect a battery positive (+) lead with a 21 W bulb to terminal 2 and a negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating sound.

OK:

Valve moves and makes an operating sound.

NG: REPLACE SHIFT SOLENOID VALVE SL1 (See **REMOVAL**)

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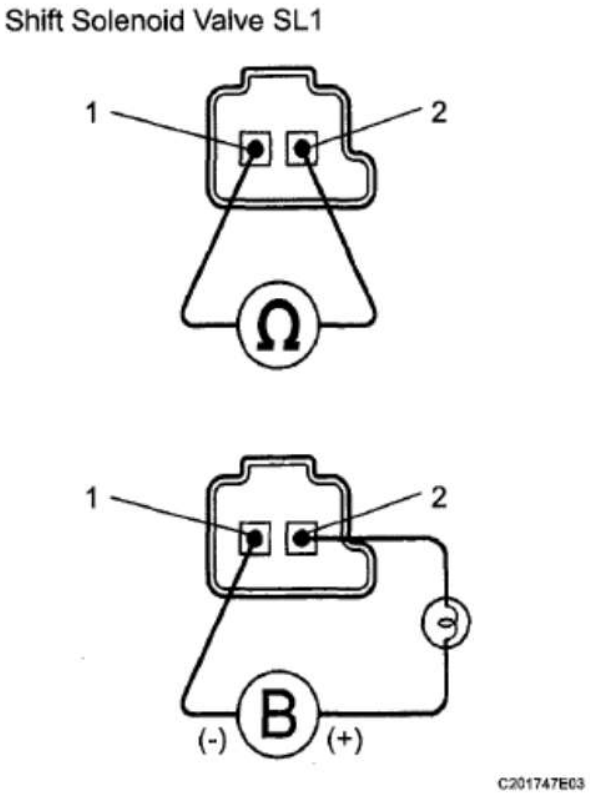


Fig. 54: Identifying Shift Solenoid Valve Sl1
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

4. **INSPECT TRANSMISSION VALVE BODY ASSEMBLY**
   a. Check the transmission valve body assembly (See **REMOVAL**).

OK:

There are no foreign objects on each valve and they operate smoothly.

NG: REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (See **REMOVAL**)

OK: REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSEMBLY (See **REMOVAL**)

DTC P0748 PRESSURE CONTROL SOLENOID "A" ELECTRICAL (SHIFT SOLENOID VALVE SL1)

DESCRIPTION

Changing from 1st to 6th is performed by the TCM turning shift solenoid valves SL1, SL2, SL3, SL4 and SL on and off. If an open or short circuit occurs in any of the shift solenoid valves, the TCM controls the remaining normal shift solenoid valves to allow the vehicle to be operated (See **FAIL-SAFE CHART**).

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DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
P0748	The TCM checks for an open or short in the shift solenoid valve SL1 circuit while driving and shifting between 4th and 5th gears. (1-trip detection logic) • Output signal duty equals 100%. **NOTE:** **SL1 output signal duty is less than 100% under normal condition.**	• Open or short in shift solenoid valve • SL1 circuit Shift solenoid valve SL1 • TCM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL1 circuit. The TCM commands gear shifts by turning the shift solenoid valves on or off. When there is an open or short circuit in any shift solenoid valve circuit, the TCM detects the problem and illuminates the MIL and stores the DTC. The TCM also performs the fail-safe function and turns the other normal shift solenoid valves on or off. (In case of an open or short circuit, the TCM stops sending current to the circuit.)

While driving and shifting between 4th and 5th gears, if the TCM detects an open or short in the shift solenoid valve SL1 circuit, the TCM determines there is a malfunction (See **FAIL-SAFE CHART**).

MONITOR STRATEGY

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

All

TYPICAL ENABLING CONDITIONS

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

Condition (A)

TYPICAL ENABLING CONDITIONS

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Battery voltage	12 V or more

Condition (B)

TYPICAL ENABLING CONDITIONS

Battery voltage	10 V or more and less than 12V
Target current	Less than 0.75 A

Condition (C)

TYPICAL ENABLING CONDITIONS

Battery voltage	8 V or more
Target current	0.25 A or more

TYPICAL MALFUNCTION THRESHOLDS

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

Condition (A) and (B)

TYPICAL MALFUNCTION THRESHOLDS

Output signal duty	100% or more

Condition (C)

TYPICAL ENABLING CONDITIONS

Output signal duty	0% or less

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

Output signal duty	More than 3% and less than 100%

WIRING DIAGRAM

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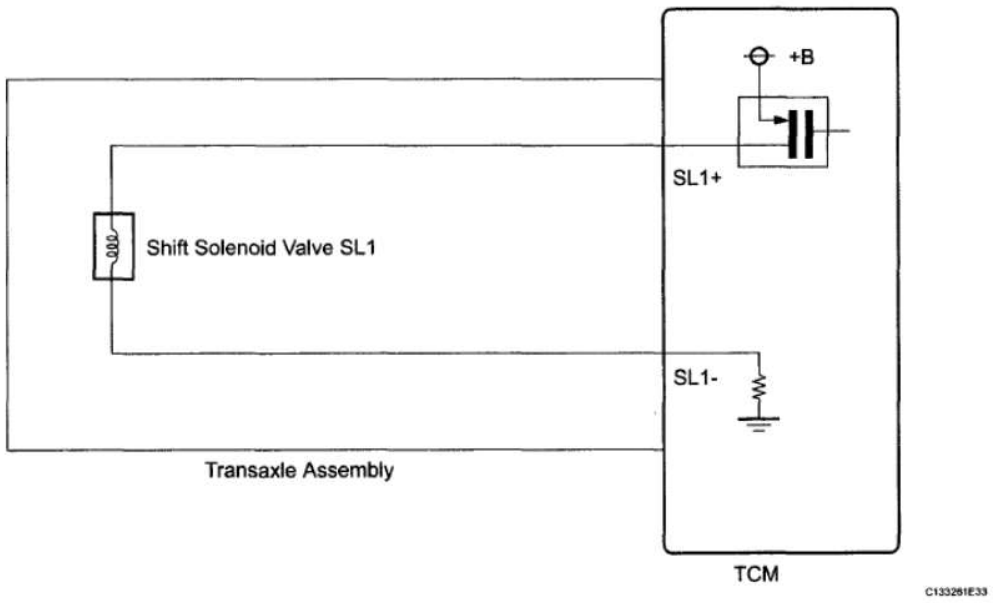


Fig. 55: Shift Solenoid Valve SL1 - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

HINT:

The following table shows normal operation of the shift solenoid valve SL1 when the shift lever is in D:

SHIFT SOLENOID VALVE OPERATION CHART

TCM commanded gear	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve SL1	ON	ON	ON	ON	OFF	OFF

1. **INSPECT TRANSMISSION WIRE (SL1)**
   a. Remove the TCM from the transaxle.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
14 (SL1+) - 13 (SL1-)	20°C (68°F)	5.0 to 5.6 ohms
14 (SL1+) - Body ground	Always	10 kohms or higher
13 (SL1-) - Body ground	Always	10 kohms or higher
14 (SL1+) - All other terminals except 13 (SL1-)	Always	10 kohms or higher

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13 (SL1-) - All other terminals except 14 (SL1+)	Always	10 kohms or higher

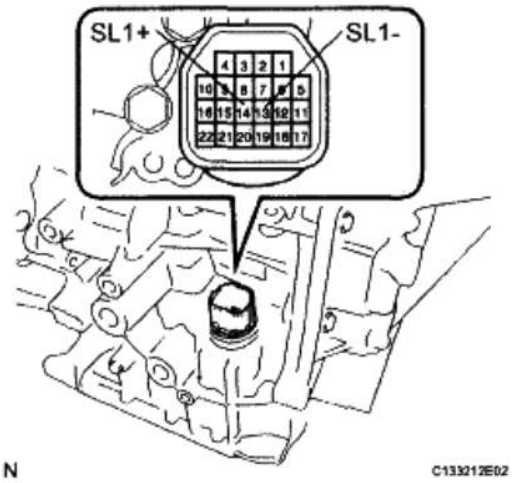


Fig. 56: Identifying TCM Connector Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Result

RESULT CHART

Result	Proceed to
OK	B
NG	A

B: REPLACE TCM (See **REMOVAL**)

A: Go to next step

2. **INSPECT SHIFT SOLENOID VALVE SL1**
   a. Remove shift solenoid valve SL1.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

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

Text in Illustration

LEGEND REFERENCE

*1	Shift Solenoid Valve SL1

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c. Connect a battery positive (+) lead with a 21 W bulb to terminal 2 and a negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating sound.

OK:

Valve moves and makes an operating sound.

NG: REPLACE SHIFT SOLENOID VALVE SL1 (See **REMOVAL**)

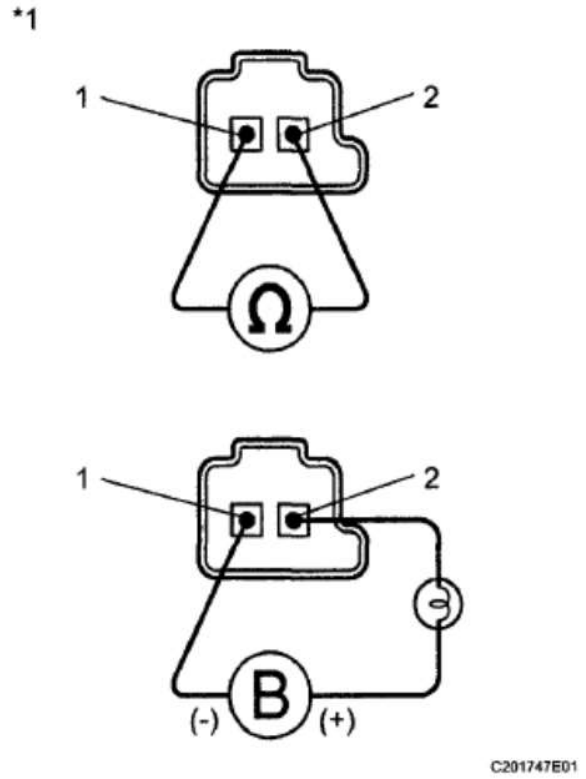


Fig. 57: Identifying Shift Solenoid Valve SL1
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPLACE TRANSMISSION WIRE (See **REMOVAL**)

DTC P0776 PRESSURE CONTROL SOLENOID "B" PERFORMANCE (SHIFT SOLENOID VALVE SL2)

SYSTEM DESCRIPTION

The TCM uses the vehicle speed signal and signals from the transmission speed sensors (NC, NT) to detect the actual gear (1st, 2nd, 3rd, 4th, 5th or 6th gear).

Then the TCM compares the actual gear with the shift schedule in the TCM memory to detect mechanical

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problems of the shift solenoid valves and valve body.

DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
P0776	The engine revs freely when 4th, 5th, or 6th gear is commanded (2-trip detection logic). When any of the following is detected twice (2-trip detection logic): • When 1st gear is commanded, 4th gear is engaged. • When 2nd gear is commanded, 4th gear is engaged. • When 3rd gear is commanded, 4th gear is engaged.	• Shift solenoid valve SL2 remains open or closed • Valve body is blocked • Automatic transaxle (clutch, brake or gear etc.)

MONITOR DESCRIPTION

The TCM commands gear shifts by turning the shift solenoid valves on and off. According to the input shaft revolution (speed), intermediate (counter) shaft revolution (speed) and output shaft revolution (speed), the TCM detects the actual gear (1st, 2nd, 3rd, 4th, 5th or 6th gear). When the gear commanded by the TCM and the actual gear are not the same, the TCM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0776: Shift solenoid valve SL2/OFF malfunction Shift solenoid valve SL2/ON 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 0.5 sec. ON malfunction 0.8 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

ALL:

TYPICAL ENABLING CONDITIONS

	P0712, P0713 (ATF temperature sensor circuit (TFT sensor)) P0115, P0117, P0118 (ECT sensor circuit) P0715, P0717 (Turbine speed sensor circuit) P0791, P0793 (Intermediate shaft speed sensor circuit)

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The monitor will run whenever this DTC is not present. (Not circuit malfunction)	P0748 (Shift solenoid valve SL1 circuit) P0778 (Shift solenoid valve SL2 circuit) P0798 (Shift solenoid valve SL3 circuit) P2810 (Shift solenoid valve SL4 circuit) P0327, P0328, (KCS sensor circuit) P0120, P0121, P0122, P0123, P0220, P0222, P0223, P0604, P0606, P060A, P060B, P060D, P060E, P0657, P1607, P2102, P2103, P2111, P2112, P2118, P2119, P2135((ETCS) Electronic throttle control system) U0100 (CAN communication system)
Transmission range	"D"
TFT (Transmission fluid temperature)	-10°C (14°F) or more
TFT (Transmission fluid temperature) sensor circuit	No circuit malfunction
ECT (Engine coolant temperature) sensor circuit	No circuit malfunction
Turbine speed sensor circuit	No circuit malfunction
Intermediate shaft speed sensor circuit	No circuit malfunction
Shift solenoid valve SL1 circuit	No circuit malfunction
Shift solenoid valve SL2 circuit	No circuit malfunction
Shift solenoid valve SL3 circuit	No circuit malfunction
Shift solenoid valve SL4 circuit	No circuit malfunction
(KCS) Knock control sensor circuit	No circuit malfunction
(ETCS) Electronic throttle control system	Not system down
CAN communication system	Not system down
Engine	Starting

OFF malfunction:

TYPICAL ENABLING CONDITIONS

TCM selected gear	4th, 5th or 6th
TCM indicated pressure value of SL2	1,200 kPa
Throttle valve opening angle	3% or more

ON malfunction (A):

TYPICAL ENABLING CONDITIONS

TCM selected gear	1st
Vehicle speed	1.2 mph (2 km/h) to 24.9 mph (40 km/h)
ECT (Engine coolant temperature)	40°C (104°F) or more

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Engine speed - Turbine speed	50 rpm or more

ON malfunction (B):

TYPICAL ENABLING CONDITIONS

TCM selected gear	2nd
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Varies with engine speed)
Vehicle speed	1.2 mph (2 km/h) or more
ECT (Engine coolant temperature)	40°C (104°F) or more

ON malfunction (C):

TYPICAL ENABLING CONDITIONS

TCM selected gear	3rd
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (Varies with engine speed)
Vehicle speed	1.2 mph (2 km/h) or more
ECT (Engine coolant temperature)	40°C (104°F) or more

TYPICAL MALFUNCTION THRESHOLDS

OFF malfunction:

TYPICAL MALFUNCTION THRESHOLDS

Input (turbine) speed-Intermediate shaft speed x Gear ratio	1,000 rpm or more

ON malfunction:

TYPICAL ENABLING CONDITIONS

Input (turbine) speed/Intermediate shaft speed when output speed less than 1,000 rpm	0.976 to 1.113

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

1. **CHECK OTHER DTCS OUTPUT (IN ADDITION TO DTC P0776)**
   a. Connect the Techstream to the DLC3.
   b. Turn the ignition switch to ON.
   c. Turn the Techstream on.
   d. Enter the following menus: Powertrain/ECT/Trouble Codes.
   e. Read the DTCs using the Techstream.

Result

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RESULT CHART

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

HINT:

If a solenoid is stuck OFF, DTCs for several solenoids including the malfunctioning solenoid will be detected.

A: Go to step 3

B: Go to next step

2. **PERFORM ACTIVE TEST USING TECHSTREAM**

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

a. Warm up the engine.
b. Turn the ignition switch off.
c. Connect the Techstream to the DLC3.
d. Turn the ignition switch to ON.
e. Turn the Techstream on.
f. Enter the following menus: Powertrain/ECT/Active Test.
g. According to the display on the Techstream, perform the Active Test.

HINT:

Comparing the gear commanded by the Active Test with the actual gear enables confirmation of the problem (See **FAIL-SAFE CHART**).

ACTIVE TEST REFERENCE

Item	Test Details	Diagnostic Note
Control the Shift Position	[Test Details] Operates the shift solenoid valves to allow gears to selected manually. [Others] • Press "-->" button: Upshift occurs • Press "<--" button: Downshift occurs	Can be used to check the operation of the shift solenoid valves.

NOTE:

- **This test can be conducted when the vehicle is stopped.**
- **When shifting gears using the Active Test function, do not**

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operate the accelerator pedal for 2 seconds before and after shifting gears.

HINT:

The gear commanded by the TCM is shown in the Data List/Shift Status display on the Techstream.

h. Check the vehicle speed and the gear when the engine speed is 1000 rpm.

HINT:

Because the torque converter clutch has not engaged, it may be difficult to obtain the speeds specified in 4th, 5th, and 6th gear, however a difference of speed should still be evident following each gear change.

Standard

GEAR CHANGE REFERENCE

1st	2nd	3rd	4th	5th	6th
8 to 12km/h (5 to 7.5 mph)	15 to 19km/h (9.3 to 11.8 mph)	21 to 25km/h (13.0 to 15.5 mph)	31 to 35 km/h (19.3 to 21.7 mph)	44 to 48 km/h (27.3 to 29.8 mph)	52 to 56 km/h (32.3 to 34.8 mph)

i. Compare the TCM commanded gear and the actual gear.

Result

RESULT CHART

Actuator Gear during Malfunction		TCM Commanded Gear						Proceed to
		1st	2nd	3rd	4th	5th	6th	
Shift solenoid SL1	Stuck ON	1st	2nd	3rd	4th	4th	4th	A
	Stuck OFF	N*1	N*1	N*1	N*1	5th	6th	
Shift solenoid SL2	Stuck ON	4th	4th	4th	4th	5th	6th	B
	Stuck OFF	1st	2nd	3rd	1st	N*1	N*1	
Shift solenoid SL3	Stuck ON	2nd	2nd	3rd	4th	5th	6th	C
	Stuck OFF	1st	1st	3rd	4th	5th	N*1	
Shift solenoid SL4	Stuck ON*3	3rd	3rd	3rd	4th	5th	5th	D
	Stuck OFF	1st	2nd	1st	4th	N*1	6th	
Shift solenoid SLT	Stuck ON	N*2	N*2	N*2	N*2	N*2	N*2	E
	Stuck OFF*3	1st	2nd	3rd	4th	5th	6th	

HINT:

- *1: Neutral
- *2: If shift solenoid SLT is stuck on, the line pressure will be low. Therefore, the amount of torque

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that can be transmitted by each gear is lower than the normal limit. When the engine power exceeds this lowered limit, the engine speed will increase freely.

- *3: When shift solenoid SLT is stuck off, gear shifting is normal.

A: GO TO DTC CHART (RELATED SHIFT SOLENOID VALVE (SL1) PERFORMANCE DTC P0746) (See **DTC P0746 PRESSURE CONTROL SOLENOID "A" PERFORMANCE (SHIFT SOLENOID VALVE SL1)**)

C: GO TO DTC CHART (RELATED SHIFT SOLENOID VALVE (SL3) PERFORMANCE DTC P0796) (See **DTC P0796 PRESSURE CONTROL SOLENOID "C" PERFORMANCE (SHIFT SOLENOID VALVE SL3)**)

D: GO TO DTC CHART (RELATED SHIFT SOLENOID VALVE (SL4) PERFORMANCE DTC P2808) (See **DTC P2808 PRESSURE CONTROL SOLENOID "G" PERFORMANCE (SHIFT SOLENOID VALVE SL4)**)

E: GO TO DTC CHART (RELATED SHIFT SOLENOID VALVE (SLT) PERFORMANCE DTC P2714) (See **DTC P2714 PRESSURE CONTROL SOLENOID "D" PERFORMANCE (SHIFT SOLENOID VALVE SLT)**)

B: Go to next step

3. **INSPECT SHIFT SOLENOID VALVE SL2**
   a. Remove shift solenoid valve SL2.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

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

   c. Connect a battery positive (+) lead with a 21 W bulb to terminal 2 and a negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating sound.

OK:

Valve moves and makes an operating sound.

NG: REPLACE SHIFT SOLENOID VALVE SL2 (See **SHIFT SOLENOID VALVE**)

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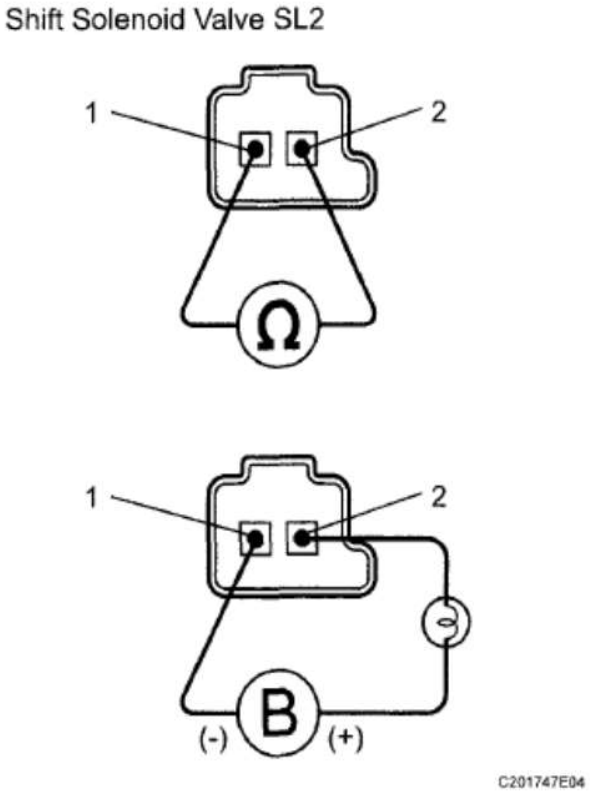


Fig. 58: Inspecting Shift Solenoid Valve SL2
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

4. **INSPECT TRANSMISSION VALVE BODY ASSEMBLY**
   a. Check the transmission valve body assembly (See **REMOVAL**).

OK:

There are no foreign objects on each valve and they operate smoothly.

NG: REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (See **REMOVAL**)

OK: REPLACE AUTOMATIC TRANSAXLE ASSEMBLY (See **REMOVAL**)

DTC P0778 PRESSURE CONTROL SOLENOID "B" ELECTRICAL (SHIFT SOLENOID VALVE SL2)

DESCRIPTION

Changing from 1st to 6th is performed by the TCM turning shift solenoid valves SL1, SL2, SL3, SL4 and SL on and off. If an open or short circuit occurs in any of the shift solenoid valves, the TCM controls the remaining normal shift solenoid valves to allow the vehicle to be operated (See **FAIL-SAFE CHART**).

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DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
P0778	The TCM checks for an open or short in the shift solenoid valve SL2 circuit while driving and shifting gears. (1-trip detection logic) • Output signal duty equals to 100%. **NOTE:** **SL2 output signal duty is less than 100% under normal condition.**	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • TCM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL2 circuit. The TCM commands gear shifts by turning the shift solenoid valves on or off. When there is an open or short circuit in any of the shift solenoid valve circuits, the TCM detects the problem and illuminates the MIL and stores the DTC. The TCM also performs the fail-safe function and turns the other normal shift solenoid valves on or off. (In case of an open or short circuit, the TCM stops sending current to the circuit.)

While driving and shifting gears, if the TCM detects an open or short in the shift solenoid valve SL2 circuit, the TCM determines there is a malfunction (See **FAIL-SAFE CHART**).

MONITOR STRATEGY

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

All

TYPICAL ENABLING CONDITIONS

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

Condition (A)

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TYPICAL ENABLING CONDITIONS

Battery voltage	12 V or more

Condition (B)

TYPICAL ENABLING CONDITIONS

Battery voltage	10 V or more and less than 12 V
Target current	Less than 0.75 A

Condition (C)

TYPICAL ENABLING CONDITIONS

Battery voltage	8 V or more
Target current	0.25 A or more

TYPICAL MALFUNCTION THRESHOLDS

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

Condition (A) and (B)

TYPICAL MALFUNCTION THRESHOLDS

Output signal duty	100% or more

Condition (C)

TYPICAL ENABLING CONDITIONS

Output signal duty	0% or less

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

Output signal duty	More than 3% and less than 100%

WIRING DIAGRAM

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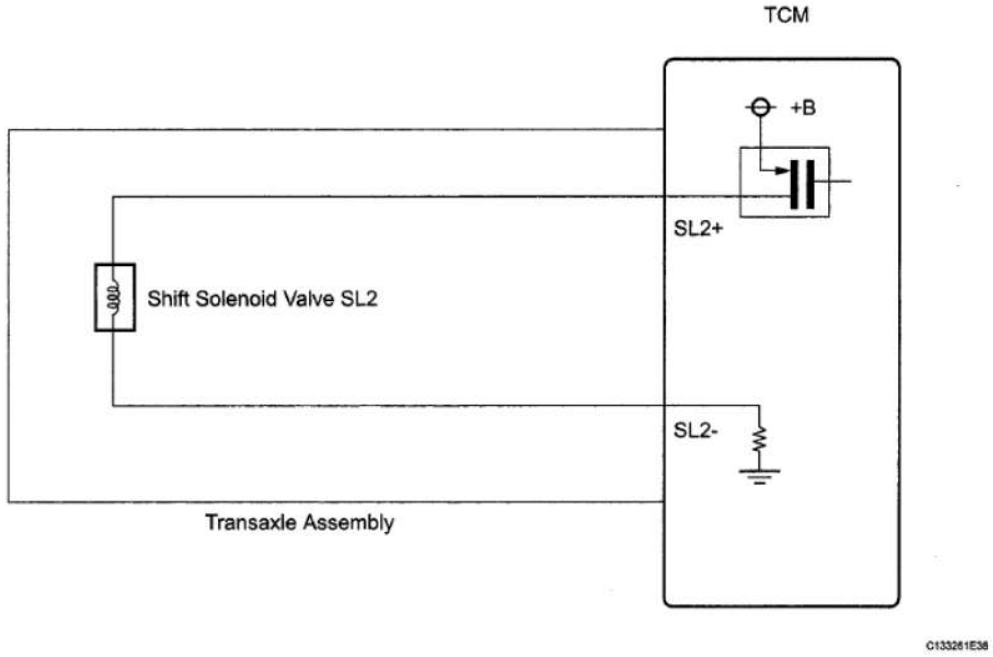


Fig. 59: Transaxle Assembly - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

HINT:

The following table shows normal operation of the shift solenoid valve SL2 when the shift lever is in D:

SHIFT SOLENOID VALVE OPERATION CHART

TCM commanded gear	1st	2nd	3rd	4th	5th	6th
Shift solenoid valve SL2	OFF	OFF	OFF	ON	ON	ON

1. **INSPECT TRANSMISSION WIRE (SL2)**
   a. Remove the TCM from the transaxle.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
9 (SL2+) - 8 (SL2-)	20°C (68°F)	5.0 to 5.6 ohms
9 (SL2+) - Body ground	Always	10 kohms or higher
8 (SL2-) - Body ground	Always	10 kohms or higher

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9 (SL2+) - All other terminals except 8 (SL2-)	Always	10 kohms or higher
8 (SL2-) - All other terminals except 9 (SL2+)	Always	10 kohms or higher

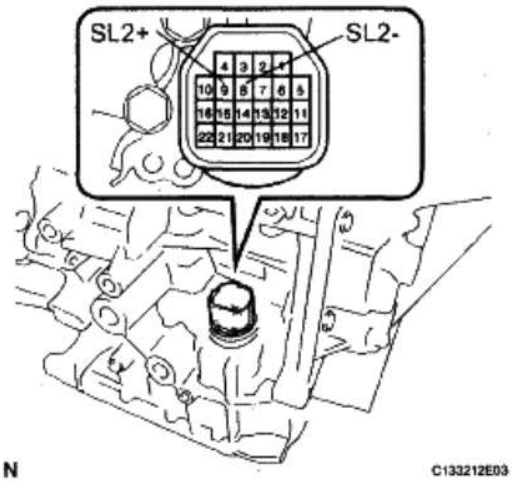


Fig. 60: Identifying TCM Connector Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Result

RESULT CHART

Result	Proceed to
OK	B
NG	A

B: REPLACE TCM (See **REMOVAL**)

A: Go to next step

2. **INSPECT SHIFT SOLENOID VALVE SL2**
   a. Remove shift solenoid valve SL2.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

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

   c. Connect a battery positive (+) lead with a 21 W bulb to terminal 2 and a negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating sound.

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OK:

Valve moves and makes an operating sound.

NG: REPLACE SHIFT SOLENOID VALVE SL2 (See **REMOVAL**)

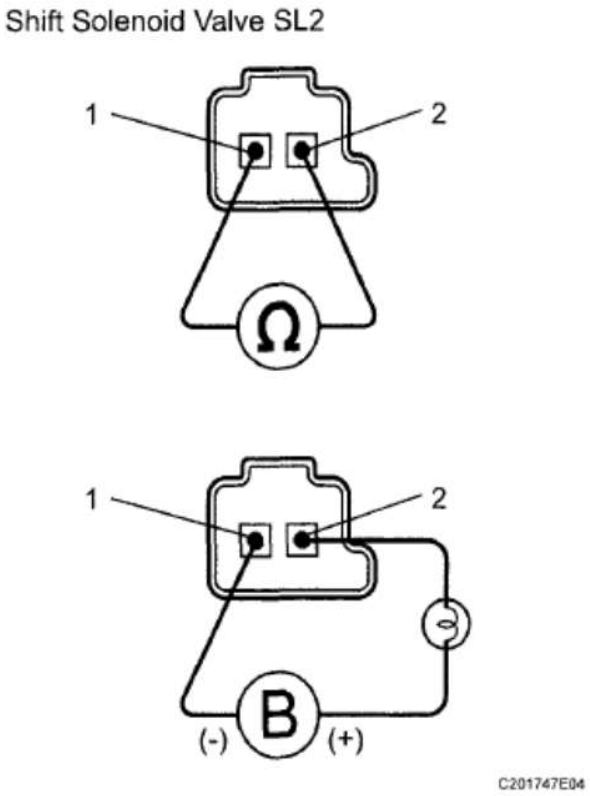


Fig. 61: Inspecting Shift Solenoid Valve SL2
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPAIR OR REPLACE TRANSMISSION WIRE (See **REMOVAL**)

DTC P0791 INTERMEDIATE SHAFT SPEED SENSOR "A" CIRCUIT; DTC P0793 INTERMEDIATE SHAFT SPEED SENSOR "A"

DESCRIPTION

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

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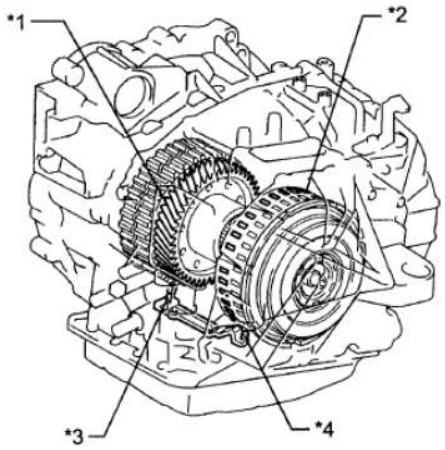


Fig. 62: Identifying Counter Gear, Clutch Drum, Input Speed Sensor And Output Speed Sensor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Text in Illustration

LEGEND REFERENCE

*1	Counter Gear	*2	Clutch Drum
*3	Output Speed Sensor NC	*4	Input Speed Sensor NT

DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
P0791	When the speed sensor input voltage is either more than 1.9 V or less than 0.1 V for 2 seconds or more. (1-trip detection logic)	• Transmission revolution sensor (speed sensor NC) • Transmission wire • TCM
P0793	When the vehicle speed is 25 km/h (15.5 mph) or higher, the counter gear speed is less than 300 rpm for 2 seconds or more. (1 -trip detection logic)	

MONITOR DESCRIPTION

The NT terminal of the TCM detects a revolution signal from the speed sensor (NT) (input RPM). The TCM calculates a gear shifts by comparing the speed sensor (NT) with the speed sensor (NC).

While the vehicle is operating in 2nd, 3rd, 4th or 5th gear with the shift lever in D, if the input shaft revolution is less than 300 rpm*1 although the output shaft revolution is more than 1000 rpm*2, the TCM interprets this as a fault, 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.

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MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0791: Speed sensor (NC)/Range check P0793: Speed sensor (NC)/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

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present.	P0500 (VSS) P0748, P0778, P0798 (Shift solenoid valve (range))
Vehicle speed	15.5 mph (25 km/h) or more
Battery voltage	8 V or more
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

P0791:

TYPICAL MALFUNCTION THRESHOLDS

Sensor voltage	Less than 0.1 V or more than 1.9 V

P0793:

TYPICAL ENABLING CONDITIONS

Sensor signal rpm	Less than 300 rpm

WIRING DIAGRAM

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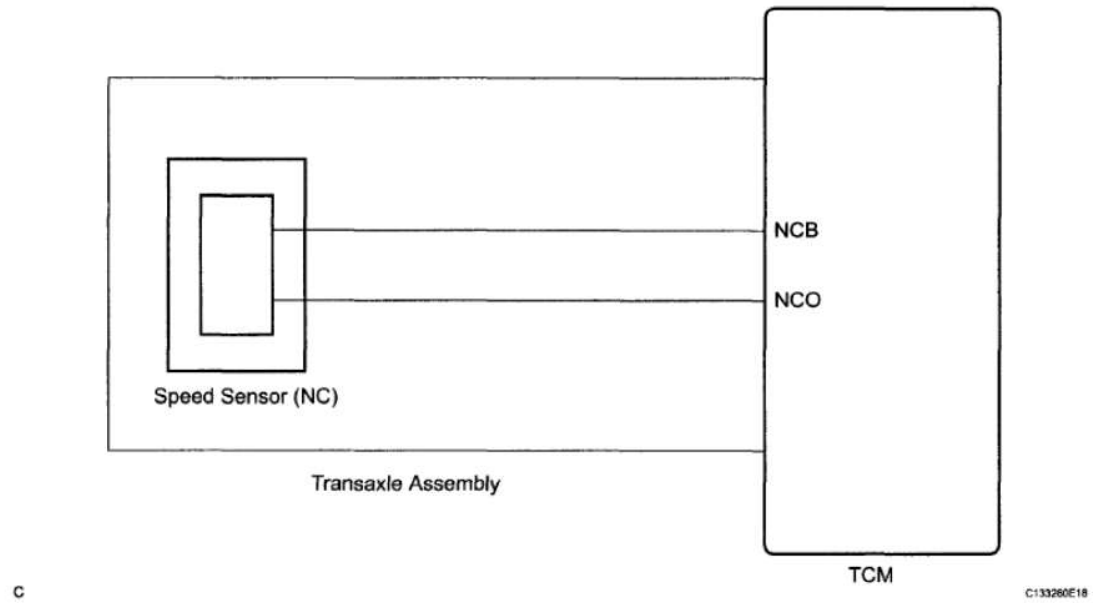


Fig. 63: Transaxle Assembly And TCM - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

1. **DATA LIST**

HINT:

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

NOTE: 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 Techstream to the DLC3.
d. Turn the ignition switch to ON.
e. Turn the Techstream on.
f. Enter the following menus: Powertrain/ECT/Data List.
g. According to the display on the Techstream, read the Data List.

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DATA LIST REFERENCE

Item	Measurement Item/Range (display)	Normal Condition
SPD (NC)	Counter Gear Speed/ display: 50 r/min	-

HINT:

- SPD (NC) is always 0 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 (SENSOR INSTALLATION)**
   a. Remove the valve body assembly.
   b. Make sure that the connector is properly connected, and check the speed sensor installation.

OK:

The installation bolts are tightened properly and there is no clearance between the sensor and transaxle case.

NG: REPAIR OR REPLACE SPEED SENSOR (See **REMOVAL**)

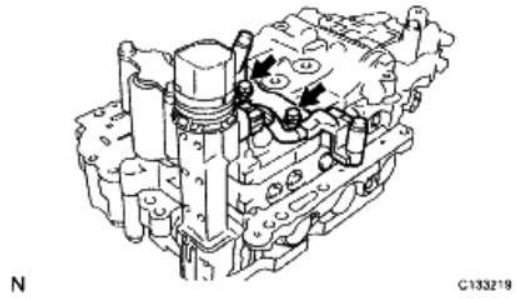


Fig. 64: Locating Speed Sensor Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

2. **INSPECT TRANSMISSION WIRE**
   a. Remove the TCM.
   b. Disconnect the speed sensor connector from the transmission wire.
   c. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

Tester Condition	Condition	Specified Condition

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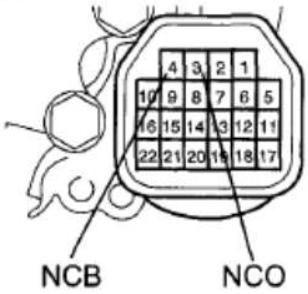
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3 (NCO) sensor side - 3 (NCO) TCM side	Always	Below 1 ohms
4 (NCB) sensor side - 4 (NCB) TCM side	Always	Below 1 ohms
3 (NCO) sensor side - Body ground	Always	10 kohms or higher
4 (NCB) sensor side - Body ground	Always	10 kohms or higher
3 (NCO) sensor side - All other terminals except 4 (NCB) sensor side	Always	10 kohms or higher
4 (NCB) sensor side - All other terminals except 3 (NCO) sensor side	Always	10 kohms or higher

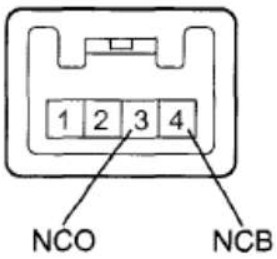
NG: REPLACE TRANSMISSION WIRE (See **REMOVAL**)

Component without harness connected
(Transmission Wire)

TCM Side



Sensor Side



C189545E06

Fig. 65: Identifying TCM Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

3. **REPLACE SPEED SENSOR**
   a. (See **REMOVAL**).
4. **CHECK IF DTC OUTPUT RECURS (SEE IF DTC P0791 AND/OR P0793 IS OUTPUT AGAIN)**

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a. Connect the Techstream to the DLC3.
b. Start the engine and turn the Techstream on.
c. Enter the following menus:/ECT/DTC/Clear.

HINT:

Write down the currently output DTCs before clearing them.

d. Perform the monitor drive pattern (See **MONITOR DRIVE PATTERN**).
e. Enter the following menus:/ECT/DTC.
f. Read the DTCs using the Techstream.

Result

RESULT CHART

Display (DTC Output)	Proceed to
Only "P0791 or P0793" is output	A
No output	B

B: END

A: REPLACE TCM (See **REMOVAL**)

DTC P0796 PRESSURE CONTROL SOLENOID "C" PERFORMANCE (SHIFT SOLENOID VALVE SL3)

SYSTEM DESCRIPTION

The TCM uses the vehicle speed signal and signals from the transmission speed sensors (NC, NT) to detect the actual gear (1st, 2nd, 3rd, 4th, 5th or 6th gear).

Then the TCM compares the actual gear with the shift schedule in the TCM memory to detect mechanical problems of the shift solenoid valves and valve body.

DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
P0796	The engine revs freely when 2nd or 6th gear is commanded (2-trip detection logic). When the following is detected twice (2-trip detection logic): • When 1st gear is commanded, 2nd gear is engaged.	• Shift solenoid valve SL3 remains open or closed. • Valve body is blocked. • Automatic transaxle (clutch, brake or gear etc.)

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MONITOR DESCRIPTION

The TCM commands gear shifts by turning the shift solenoid valves on and off. According to the input shaft revolution (speed), intermediate (counter) shaft revolution (speed) and output shaft revolution (speed), the TCM detects the actual gear (1st, 2nd, 3rd, 4th, 5th or 6th gear). When the gear commanded by the TCM and the actual gear are not the same, the TCM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

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) and (B) 0.5 sec. OFF malfunction (C) and (D) 0.8 sec. ON malfunction 0.8 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

ALL:

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present. (Not circuit malfunction)	P0712, P0713 (ATF temperature sensor circuit (TFT sensor)) P0115, P0117, P0118 (ECT sensor circuit) P0715, P0717 (Turbine speed sensor circuit) P0791, P0793 (Intermediate shaft speed sensor circuit) P0748 (Shift solenoid valve SL1 circuit) P0778 (Shift solenoid valve SL2 circuit) P0798 (Shift solenoid valve SL3 circuit) P2810 (Shift solenoid valve SL4 circuit) P0327, P0328, (KCS sensor circuit) P0120, P0121, P0122, P0123, P0220, P0222, P0223, P0604, P0606, P060A, P060B, P060D, P060E, P0657, P1607, P2102, P2103, P2111, P2112, P2118, P2119, P2135((ETCS) Electronic throttle control system) U0100 (CAN communication system)
Transmission range	"D"
TFT (Transmission fluid	-10°C (14°F) or more

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temperature)	
TFT (Transmission fluid temperature) sensor circuit	No circuit malfunction
ECT (Engine coolant temperature) sensor circuit	No circuit malfunction
Turbine speed sensor circuit	No circuit malfunction
Intermediate shaft speed sensor circuit	No circuit malfunction
Shift solenoid valve SL1 circuit	No circuit malfunction
Shift solenoid valve SL2 circuit	No circuit malfunction
Shift solenoid valve SL3 circuit	No circuit malfunction
Shift solenoid valve SL4 circuit	No circuit malfunction
(KCS) Knock control sensor circuit	No circuit malfunction
(ETCS) Electronic throttle control system	Not system down
CAN communication system	Not system down
Engine	Starting

OFF malfunction (A):

TYPICAL ENABLING CONDITIONS

TCM selected gear	2nd
Throttle valve opening angle	3% or more
TCM indicated pressure value of SL1	1,200 kPa
TCM indicated pressure value of SL2	0 kPa
TCM indicated pressure value of SL3	1,200 kPa

OFF malfunction (B):

TYPICAL ENABLING CONDITIONS

TCM selected gear	6th
Throttle valve opening angle	6.5% or more
TCM indicated pressure value of SL1	0 kPa
TCM indicated pressure value of SL2	1,200 kPa
TCM indicated pressure value of SL3	1,200 kPa

OFF malfunction (C):

TYPICAL ENABLING CONDITIONS

TCM selected gear	2nd
Throttle valve opening angle:	
(When condition "D" is not	6.5% or more at engine speed 2,000 rpm (condition varies with engine

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detected)	speed)
(When condition "D" is detected)	2.0% or more at engine speed 750 rpm (condition varies with output speed)
ECT (engine coolant temperature)	40°C (104°F) or more

OFF malfunction (D):

TYPICAL ENABLING CONDITIONS

Throttle valve opening angle	2.0% or more at engine speed 750 rpm (condition varies with output speed)

ON malfunction:

TYPICAL ENABLING CONDITIONS

TCM selected gear	1st
Vehicle speed	1.2 mph (2 km/h) or more
Engine speed - Turbine speed	50 rpm or more
ECT (engine coolant temperature)	40°C (104°F) or more

TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met: OFF malfunction (A) or (B) or((C) and (D)), or ON malfunctions

2 detections are necessary per driving cycle:

1st detection; temporary flag ON

2nd detection; pending fault code ON

OFF malfunction (A):

TYPICAL MALFUNCTION THRESHOLDS

Turbine speed - Output speed x 2nd gear ratio	1,000 rpm or more

OFF malfunction (B):

TYPICAL MALFUNCTION THRESHOLDS

Turbine speed - Output speed x 6th gear ratio	1,000 rpm or more

OFF malfunction (C):

TYPICAL MALFUNCTION THRESHOLDS

Input (turbine) speed/Intermediate shaft speed	3.232 to 7.556

OFF malfunction (D):

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TYPICAL MALFUNCTION THRESHOLDS

Input (turbine) speed/Intermediate shaft speed	3.232 to 7.556

ON malfunction:

TYPICAL MALFUNCTION THRESHOLDS

Input (turbine) speed/Intermediate shaft speed	1.860 to 2.289

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

1. **CHECK OTHER DTCS OUTPUT (IN ADDITION TO DTC P0796)**
   a. Connect the Techstream to the DLC3.
   b. Turn the ignition switch to ON.
   c. Turn the Techstream on.
   d. Enter the following menus: Powertrain/ECT/Trouble Codes.
   e. Read the DTCs using the Techstream.

   Result

   RESULT CHART

Display (DTC Output)	Proceed to
Only "P0796" Is output	A
"P0796" and other DTCs are output	B

   HINT:

   If a solenoid is stuck off, DTCs for several solenoids including the malfunctioning solenoid will be detected.

   A: Go to step 3

   B: Go to next step

2. **PERFORM ACTIVE TEST USING TECHSTREAM**

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

   a. Warm up the engine.
   b. Turn the ignition switch off.
   c. Connect the Techstream to the DLC3.
   d. Turn the ignition switch to ON.

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e. Turn the Techstream on.
f. Enter the following menus: Powertrain/ECT/Active Test.
g. According to the display on the Techstream, perform the Active Test.

HINT:

Comparing the gear commanded by the Active Test with the actual gear enables confirmation of the problem (See **FAIL-SAFE CHART**).

ACTIVE TEST REFERENCE

Item	Test Details	Diagnostic Note
Control the Shift Position	[Test Details] Operates the shift solenoid valves to allow gears to selected manually. [Others] • Press "-->" button: Upshift occurs • Press "<--" button: Downshift occurs	Can be used to check the operation of the shift solenoid valves.

NOTE:

- **This test can be conducted when the vehicle is stopped.**
- **When shifting gears using the Active Test function, do not operate the accelerator pedal for 2 seconds before and after shifting gears.**

HINT:

The gear commanded by the TCM is shown in the Data List/Shift Status display on the Techstream.

h. Check the vehicle speed and the gear when the engine speed is 1000 rpm.

HINT:

Because the torque converter clutch has not engaged, it may be difficult to obtain the speeds specified in 4th, 5th, and 6th gear, however a difference of speed should still be evident following each gear change.

Standard

GEAR CHANGE REFERENCE

1st	2nd	3rd	4th	5th	6th
8 to 12km/h (5 to 7.5 mph)	15 to 19km/h (9.3 to 11.8 mph)	21 to 25km/h (13.0 to 1S.5 mph)	31 to 35 km/h (19.3 to 21.7 mph)	44 to 48 km/h (27.3 to 29.8 mph)	52 to 56 km/h (32.3 to 34.8 mph)

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i. Compare the TCM commanded gear and the actual gear.

Result

RESULT CHART

Actuator Gear during Malfunction		TCM Commanded Gear						Proceed to
		1st	2nd	3rd	4th	5th	6th	
Shift solenoid SL1	Stuck ON	1st	2nd	3rd	4th	4th	4th	A
	Stuck OFF	N*1	N*1	N*1	N*1	5th	6th	
Shift solenoid SL2	Stuck ON	4th	4th	4th	4th	5th	6th	B
	Stuck OFF	1st	2nd	3rd	1st	N*1	N*1	
Shift solenoid SL3	Stuck ON	2nd	2nd	3rd	4th	5th	6th	C
	Stuck OFF	1st	1st	3rd	4th	5th	N*1	
Shift solenoid SL4	Stuck ON*3	3rd	3rd	3rd	4th	5th	5th	D
	Stuck OFF	1st	2nd	1st	4th	N*1	6th	
Shift solenoid SLT	Stuck ON	N*2	N*2	N*2	N*2	N*2	N*2	E
	Stuck OFF*3	1st	2nd	3rd	4th	5th	6th	

HINT:

- *1: Neutral
- *2: If shift solenoid SLT is stuck on, the line pressure will be low. Therefore, the amount of torque that can be transmitted by each gear is lower than the normal limit. When the engine power exceeds this lowered limit, the engine speed will increase freely.
- *3: When shift solenoid SLT is stuck off, gear shifting is normal.

A: GO TO DTC CHART (RELATED SHIFT SOLENOID VALVE (SL1) PERFORMANCE DTC P0746) (See **DTC P0746 PRESSURE CONTROL SOLENOID "A" PERFORMANCE (SHIFT SOLENOID VALVE SL1)**)

B: GO TO DTC CHART (RELATED SHIFT SOLENOID VALVE (SL2) PERFORMANCE DTC P0776) (See **DTC P0776 PRESSURE CONTROL SOLENOID "B" PERFORMANCE (SHIFT SOLENOID VALVE SL2)**)

D: GO TO DTC CHART (RELATED SHIFT SOLENOID VALVE (SL4) PERFORMANCE DTC P2808) (See **DTC P2808 PRESSURE CONTROL SOLENOID "G" PERFORMANCE (SHIFT SOLENOID VALVE SL4)**)

E: GO TO DTC CHART (RELATED SHIFT SOLENOID VALVE (SLT) PERFORMANCE DTC P2714) (See **DTC P2714 PRESSURE CONTROL SOLENOID "D" PERFORMANCE (SHIFT SOLENOID VALVE SLT)**)

C: Go to next step

3. **INSPECT SHIFT SOLENOID VALVE SL3**

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a. Remove shift solenoid valve SL3.
b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

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

c. Connect a battery positive (+) lead with a 21 W bulb to terminal 2 and a negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating sound.

OK:

Valve moves and makes an operating sound.

NG: REPLACE SHIFT SOLENOID VALVE SL3 (See **REMOVAL**)

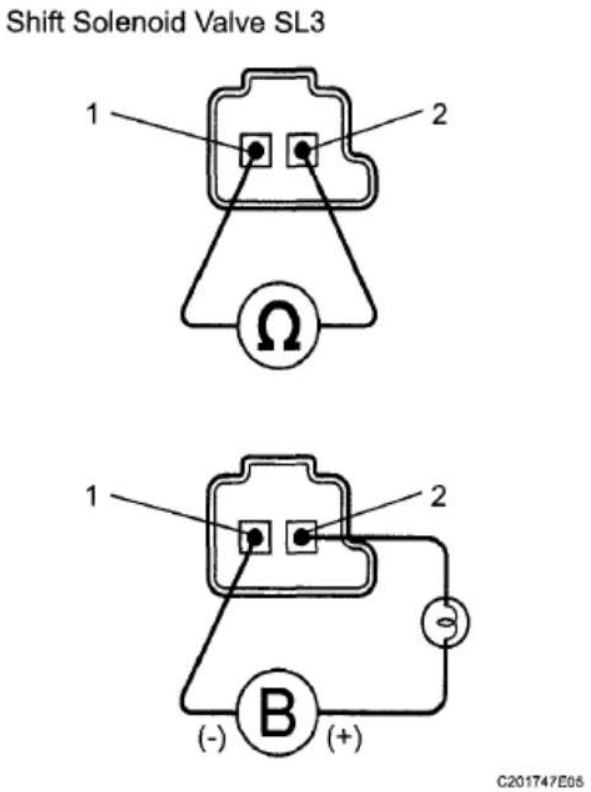


Fig. 66: Inspecting Shift Solenoid Valve SL3
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

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4. **INSPECT TRANSMISSION VALVE BODY ASSEMBLY**
   a. Check the transmission valve body assembly (See **REMOVAL**).

OK:

There are no foreign objects on each valve and they operate smoothly.

NG: REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (See **REMOVAL**)

OK: REPLACE AUTOMATIC TRANSAXLE ASSEMBLY (See **REMOVAL**)

DTC P0798 PRESSURE CONTROL SOLENOID "C" ELECTRICAL (SHIFT SOLENOID VALVE SL3)

DESCRIPTION

Changing from 1st to 6th is performed by the TCM turning shift solenoid valves SL1, SL2, SL3, SL4 and SL on and off. If an open or short circuit occurs in any of the shift solenoid valves, the TCM controls the remaining normal shift solenoid valves to allow the vehicle to be operated (See **FAIL-SAFE CHART**).

DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
P0798	The TCM checks for an open or short in the shift solenoid valve SL3 circuit while driving and shifting gears. (1-trip detection logic) • Output signal duty equals to 100%. **NOTE:** **(SL3 output signal duty is less than 100% under normal condition.)**	• Open or short in shift solenoid valve SL3 circuit • Shift solenoid valve SL3 • TCM

MONITOR DESCRIPTION

The TCM commands gear shifts by turning the shift solenoid valves on or off. When there is an open or short circuit in any shift solenoid valve circuit, the TCM detects the problem and illuminates the MIL and stores the DTC. And the TCM performs the fail-safe function and turns the other normal shift solenoid valves on or off (In case of an open or short circuit, the TCM stops sending current to the circuit.) (See **FAIL-SAFE CHART**).

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0798: Shift solenoid valve SL3/Range check
Required sensors/Components	Shift solenoid valve SL3
Frequency of operation	Continuous

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Duration	1 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

All

TYPICAL ENABLING CONDITIONS

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

Condition (A)

TYPICAL ENABLING CONDITIONS

Battery voltage	12 V or more

Condition (B)

TYPICAL ENABLING CONDITIONS

Battery voltage	10 V or more and less than 12 V
Target current	Less than 0.75 A

Condition (C)

TYPICAL ENABLING CONDITIONS

Battery voltage	8 V or more
Target current	0.25 A or more

TYPICAL MALFUNCTION THRESHOLDS

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

Condition (A) and (B)

TYPICAL MALFUNCTION THRESHOLDS

Output signal duty	100% or more

Condition (C)

TYPICAL MALFUNCTION THRESHOLDS

Output signal duty	0% or less

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COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

Output signal duty	More than 3% and less than 100%

WIRING DIAGRAM

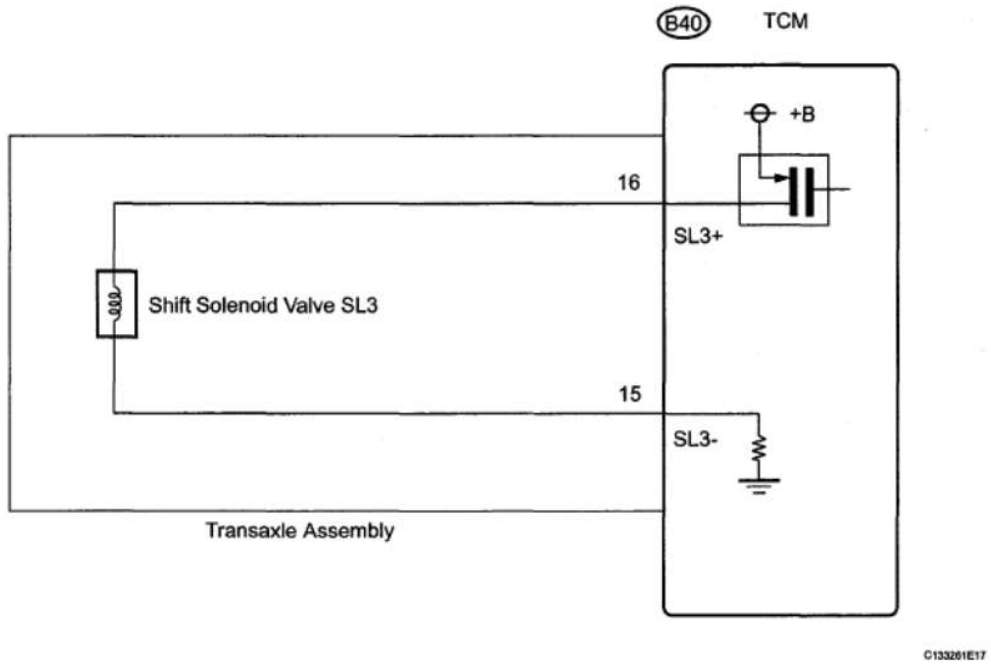


Fig. 67: Transaxle Assembly And TCM - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

1. **INSPECT TRANSMISSION WIRE (SL3)**
   a. Remove the TCM from the transaxle.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
16 (SL3+) - 15 (SL3-)	20°C (68°F)	5.0 to 5.6 ohms
16 (SL3+) - Body ground	Always	10 kohms or higher
15 (SL3-) - Body ground	Always	10 kohms or higher
16 (SL3+) - All other terminals except 15 (SL3-)	Always	10 kohms or higher

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15 (SL3-) - All other terminals except 16 (SL3+)	Always	10 kohms or higher

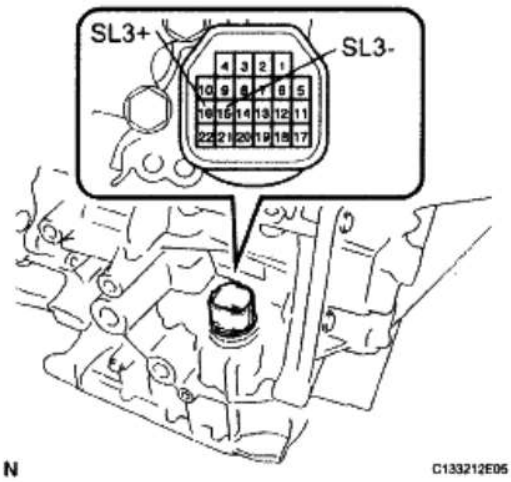


Fig. 68: Identifying TCM Connector Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Result

RESULT CHART

Result	Proceed to
OK	B
NG	A

B: REPLACE TCM (See **REMOVAL**)

A: Go to next step

2. **INSPECT SHIFT SOLENOID VALVE SL3**
   a. Remove shift solenoid valve SL3.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

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

   c. Connect a battery positive (+) lead with a 21 W bulb to terminal 2 and a negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating sound.

OK:

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Valve moves and makes an operating sound.

NG: REPLACE SHIFT SOLENOID VALVE SL3 (See **REMOVAL**)

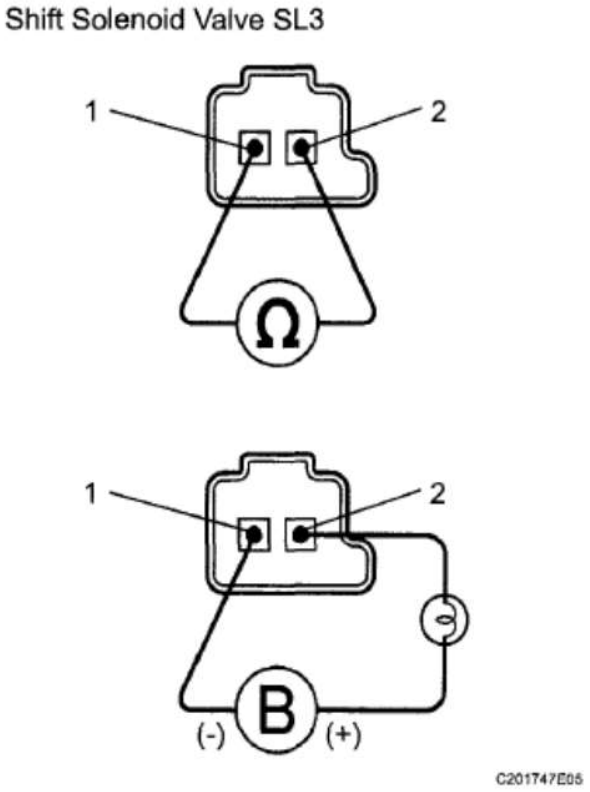


Fig. 69: Inspecting Shift Solenoid Valve SL3
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPLACE TRANSMISSION WIRE (See **REMOVAL**)

DTC P2714 PRESSURE CONTROL SOLENOID "D" PERFORMANCE (SHIFT SOLENOID VALVE SLT)

SYSTEM 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 TCM 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.

*: Duty Ratio

The duty ratio is the ratio of the electrical current on time (A) to the total of the electrical current on and off time (A + B).

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Duty Ratio (%) = (A/(A + B)) x 100

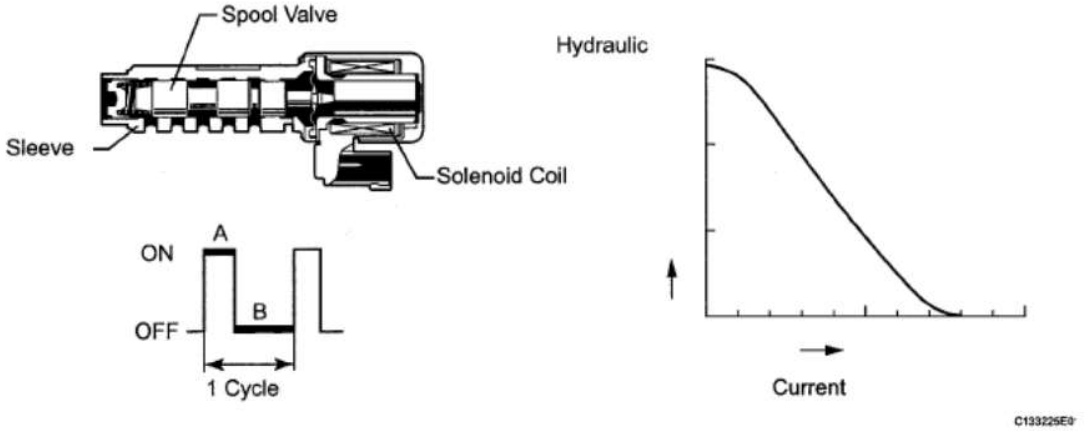


Fig. 70: Identifying Pressure Control Solenoid
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
P2714	The ECM detects a malfunction in the shift solenoid valve SLT (ON side) according to the difference in the speed between the turbine and the output shaft, and also by the transmission fluid pressure. (2-trip detection logic)	• Shift solenoid valve SLT remains open • Shift solenoid valve SL1, SL2, SL3 or SL4 remains open or closed • Valve body is blocked • Automatic transaxle (clutch, brake or gear, etc.)

MONITOR DESCRIPTION

The TCM calculates the amount of clutch slip based on the turbine speed, output shaft speed, and gear ratio. If the amount of clutch slip exceeds a specified level, the TCM will set this DTC and illuminate the MIL.

When shift solenoid valve SLT remains on, the line pressure goes down and clutch engagement force decreases.

NOTE: If driving continues under these conditions, clutches will burn out and the vehicle will no longer be drivable.

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P2714: Shift solenoid valve SLT/ON malfunction

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Required sensors/Components	Shift solenoid valve SLT
Frequency of operation	Continuous
Duration	2 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

ON malfunction:

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present. (Not circuit malfunction)	P0712, P0713 (ATF temperature sensor circuit (TFT sensor)) P0115, P0117, P0118 (ECT sensor circuit) P0715, P0717 (Turbine speed sensor circuit) P0791, P0793 (Intermediate shaft speed sensor circuit) P0748 (Shift solenoid valve SL1 circuit) P0778 (Shift solenoid valve SL2 circuit) P0798 (Shift solenoid valve SL3 circuit) P2810 (Shift solenoid valve SL4 circuit) P2716 (Shift solenoid valve SLT circuit) P0327, P0328, (KCS sensor circuit) P0120, P0121, P0122, P0123, P0220, P0222, P0223, P0604, P0606, P060A, P060B, P060D, P060E, P0657, P1607, P2102, P2103, P2111, P2112, P2118, P2119, P2135((ETCS) Electronic throttle control system) U0100 (CAN communication system)
Transmission range	"D"
TFT (Transmission fluid temperature)	-10°C (14°F) or more
TFT (Transmission fluid temperature) sensor circuit	No circuit malfunction
ECT (Engine coolant temperature) sensor circuit	No circuit malfunction
Turbine speed sensor circuit	No circuit malfunction
Intermediate shaft speed sensor circuit	No circuit malfunction
Shift solenoid valve SL1 circuit	No circuit malfunction
Shift solenoid valve SL2 circuit	No circuit malfunction
Shift solenoid valve SL3 circuit	No circuit malfunction
Shift solenoid valve SL4 circuit	No circuit malfunction
Shift solenoid valve SLT circuit	No circuit malfunction
(KCS) Knock control sensor circuit	No circuit malfunction
(ETCS) Electronic throttle control system	Not system down

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CAN communication system	Not system down
Engine	Starting
Input turbine torque	100 N*m or more
Turbine speed	250 rpm or more
Output speed	250 rpm or more

TYPICAL MALFUNCTION THRESHOLDS

ON malfunction:

TYPICAL MALFUNCTION THRESHOLDS

Detection criteria	Threshold
Turbine speed - Output speed x Gear ratio at output speed 1,000 rpm (Condition varies with output speed)	75 rpm or more

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

1. **CHECK OTHER DTCS OUTPUT (IN ADDITION TO DTC P2714)**
   a. Connect the Techstream to the DLC3.
   b. Turn the ignition switch to ON.
   c. Turn the Techstream on.
   d. Enter the following menus: Powertrain/ECT/Trouble Codes.
   e. Read the DTCs using the Techstream.

   Result

   RESULT CHART

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

   HINT:

   If a solenoid is stuck ON, DTCs for several solenoids including the malfunctioning solenoid will be detected.

   A: Go to step 4

   B: Go to next step

2. **PERFORM ACTIVE TEST USING TECHSTREAM (SHIFT SOLENOID VALVE SLT)**

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NOTE:

- **Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature: 50 to 80°C (122 to 176°F)**
- **Be sure to prevent SST hose from interfering with the exhaust pipe.**
- **This check must be conducted after checking and adjusting the engine.**
- **Perform the test with the A/C OFF.**

HINT:

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

a. Turn the ignition switch off.
b. Lift the vehicle up.
c. Remove the test plug on the transmission case center right side connect SST.

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

d. Lower the vehicle.
e. Fully apply the parking brake and chock the 4 wheels.
f. Connect the Techstream to the DLC3.
g. Start the engine.
h. Warm up the Automatic Transmission Fluid (ATF).
i. Measure the line pressure when the engine is idling.
j. Turn the Techstream on.
k. Enter the following menus: Powertrain/ECT/Active Test.
l. Follow the instructions on the Techstream and perform the Active Test.
m. Measure the line pressure with SST.

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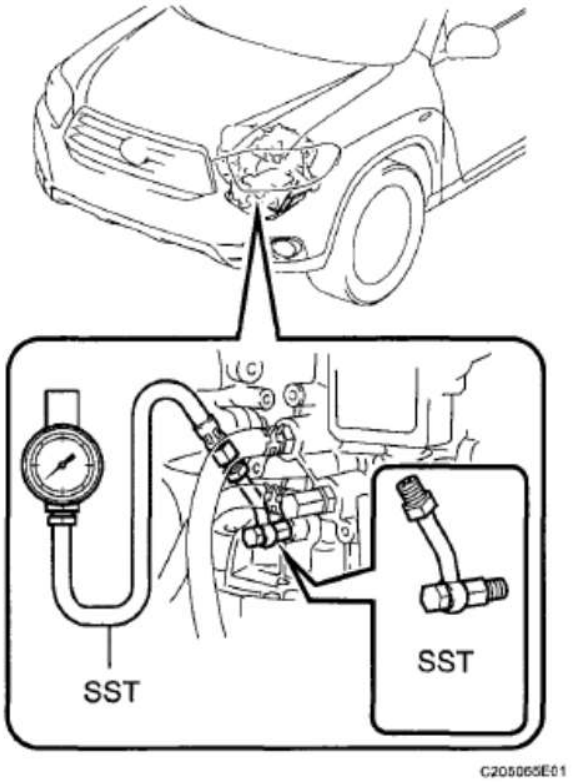


Fig. 71: Measuring Line Pressure Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ACTIVE TEST REFERENCE

Item	Test Details
Activate the Solenoid (SLT)(1)	[Test Details] Operates shift solenoid SLT to raise the line pressure. [Vehicle Condition] • Vehicle Stopped • IDL: ON HINT: ON: No action (normal operation) OFF: Line pressure up (When the Active Test of "Activate the Solenoid (SLT)" is performed, the ECM commands the SLT solenoid to turn off).
(1) "Activate the Solenoid (SLT)" in the Active Test is performed to check that the line pressure changes by connecting the SST to the automatic transaxle. The same SST is used in the Hydraulic Test (See **MANUAL SHIFTING TEST**) as well.	

HINT:

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The pressure values in Active Test and Hydraulic Test are different from each other.

OK:

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

NG: Go to step 4

OK: Go to next step

3. **PERFORM ACTIVE TEST USING TECHSTREAM (SHIFTING TEST)**

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

a. Warm up the engine.
b. Turn the ignition switch off.
c. Connect the Techstream to the DLC3.
d. Turn the ignition switch to ON.
e. Turn the Techstream on.
f. Enter the following menus: Powertrain/ECT/Active Test.
g. According to the display on the Techstream, perform the Active Test.

HINT:

Comparing the gear commanded by the Active Test with the actual gear enables confirmation of the problem (See **FAIL-SAFE CHART**).

ACTIVE TEST REFERENCE

Item	Test Details	Diagnostic Note
Control the Shift Position	[Test Details] Operates the shift solenoid valves to allow gears to selected manually. [Others] • Press "-->" button: Upshift occurs • Press "<--" button: Downshift occurs	Can be used to check the operation of the shift solenoid valves.

NOTE:

- **This test can be conducted when the vehicle is stopped.**
- **When shifting gears using the Active Test function, do not operate the accelerator pedal for 2 seconds before and after shifting gears.**

HINT:

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The gear commanded by the TCM is shown in the Data List/Shift Status display on the Techstream.

h. Check the vehicle speed and the gear when the engine speed is 1000 rpm.

HINT:

Because the torque converter clutch has not engaged, it may be difficult to obtain the speeds specified in 4th, 5th, and 6th gear, however a difference of speed should still be evident following each gear change.

Standard

GEAR CHANGE REFERENCE

1st	2nd	3rd	4th	5th	6th
8 to 12km/h (5 to 7.5 mph)	15 to 19km/h (9.3 to 11.8 mph)	21 to 25 km/h (13.0 to 15.5 mph)	31 to 35 km/h (19.3 to 21.7 mph)	44 to 48 to 29 km/h (27.3.8 mph)	52 to 56 km/h (32.3 to 34.8 mph)

i. Compare the TCM commanded gear and the actual gear.

Result

RESULT CHART

Actuator Gear during Malfunction		TCM Commanded Gear						Proceed to
		1st	2nd	3rd	4th	5th	6th	
Shift solenoid SL1	Stuck ON	1st	2nd	3rd	4th	4th	4th	A
	Stuck OFF	N*1	N*1	N*1	N*1	5th	6th	
Shift solenoid SL2	Stuck ON	4th	4th	4th	4th	5th	6th	B
	Stuck OFF	1st	2nd	3rd	1st	N*1	N*1	
Shift solenoid SL3	Stuck ON	2nd	2nd	3rd	4th	5th	6th	C
	Stuck OFF	1st	1st	3rd	4th	5th	N*1	
Shift solenoid SL4	Stuck ON*3	3rd	3rd	3rd	4th	5th	5th	D
	Stuck OFF	1st	2nd	1st	4th	N*1	6th	
Shift solenoid SLT	Stuck ON	N*2	N*2	N*2	N*2	N*2	N*2	E
	Stuck OFF*3	1st	2nd	3rd	4th	5th	6th	

HINT:

- *1: Neutral
- *2: If shift solenoid SLT is stuck on, the line pressure will be low. Therefore, the amount of torque that can be transmitted by each gear is lower than the normal limit. When the engine power exceeds this lowered limit, the engine speed will increase freely.
- *3: When shift solenoid SLT is stuck off, gear shifting is normal.

A: GO TO DTC CHART (RELATED SHIFT SOLENOID VALVE (SL1) PERFORMANCE DTC

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P0746) (See **DTC P0746 PRESSURE CONTROL SOLENOID "A" PERFORMANCE (SHIFT SOLENOID VALVE SL1)**)

B: GO TO DTC CHART (RELATED SHIFT SOLENOID VALVE (SL2) PERFORMANCE DTC P0776) (See **DTC P0776 PRESSURE CONTROL SOLENOID "B" PERFORMANCE (SHIFT SOLENOID VALVE SL2)**)

C: GO TO DTC CHART (RELATED SHIFT SOLENOID VALVE (SL3) PERFORMANCE DTC P0796) (See **DTC P0796 PRESSURE CONTROL SOLENOID "C" PERFORMANCE (SHIFT SOLENOID VALVE SL3)**)

D: GO TO DTC CHART (RELATED SHIFT SOLENOID VALVE (SL4) PERFORMANCE DTC P2808) (See **DTC P2808 PRESSURE CONTROL SOLENOID "G" PERFORMANCE (SHIFT SOLENOID VALVE SL4)**)

E: Go to next step

4. **INSPECT SHIFT SOLENOID VALVE SLT**
   a. Remove shift solenoid valve SLT.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

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

   c. Connect a battery positive (+) lead with a 21 W bulb to terminal 2 and a negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating sound.

OK:

Valve moves and makes an operating sound.

NG: REPLACE SHIFT SOLENOID VALVE SLT (See **REPLACEMENT**)

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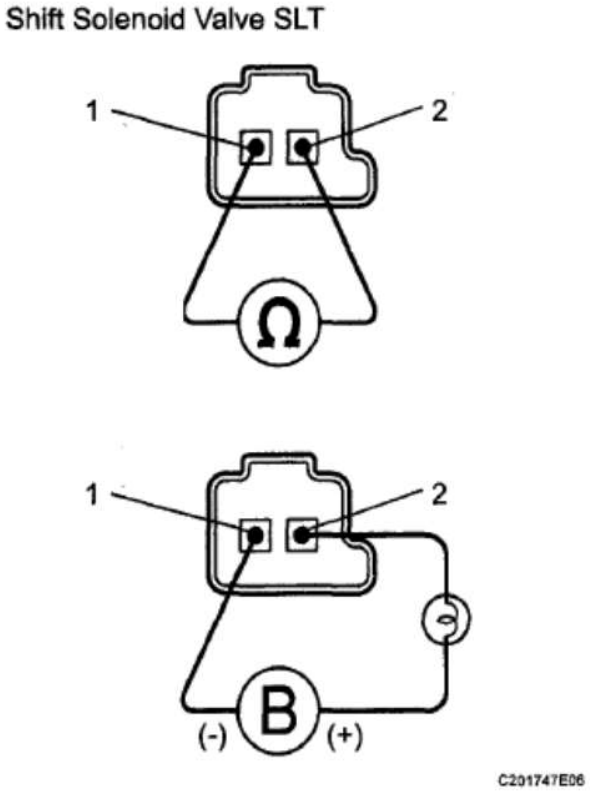


Fig. 72: Inspecting Shift Solenoid Valve SLT
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

5. **INSPECT TRANSMISSION VALVE BODY ASSEMBLY**
   a. Check the transmission valve body assembly (See **REMOVAL**).

OK:

There are no foreign objects on each valve and they operate smoothly.

NG: REPLACE TRANSMISSION VALVE BODY ASSEMBLY (See **REMOVAL**)

OK: REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (See **REMOVAL**)

DTC P2716 PRESSURE CONTROL SOLENOID "D" ELECTRICAL (SHIFT SOLENOID VALVE SLT)

DESCRIPTION

Refer to DTC P2714 (See **DTC P2714 PRESSURE CONTROL SOLENOID "D" PERFORMANCE (SHIFT SOLENOID VALVE SLT)**).

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DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
P2716	Open or short is detected in shift solenoid valve SLT circuit for 1 second or more while driving (1 -trip detection logic).	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • TCM

MONITOR DESCRIPTION

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

MONITOR STRATEGY

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

ALL:

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present	None
Solenoid current cut status	Not cut
Ignition switch	ON
Starter	OFF

Malfunction (A):

TYPICAL ENABLING CONDITIONS

Battery voltage	10 V to 12 V

Malfunction (B):

TYPICAL ENABLING CONDITIONS

Battery voltage	10 V or more and less than 12 V
Target current	0.75 A

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Malfunction (C):

TYPICAL ENABLING CONDITIONS

Battery voltage	8 V or more
Target current	1 A

Malfunction (D):

TYPICAL ENABLING CONDITIONS

Battery voltage	11 V or more
Target current	1 A or more

Malfunction (E):

TYPICAL ENABLING CONDITIONS

Battery voltage	11 V or more
Target current	0.1 A or more
Commanded voltage - Last commanded voltage	Less than 0.000019 V

TYPICAL MALFUNCTION THRESHOLDS

Malfunction (A) and (B):

TYPICAL MALFUNCTION THRESHOLDS

Output signal duty	100% or more

Malfunction (C):

TYPICAL MALFUNCTION THRESHOLDS

Output signal duty	0% or less

Malfunction (D):

TYPICAL MALFUNCTION THRESHOLDS

Output signal monitor	No signal

Malfunction (E):

TYPICAL MALFUNCTION THRESHOLDS

Commanded voltage - Last commanded voltage	0.000019 V or more

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

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Output signal duty	Less than 100%

WIRING DIAGRAM

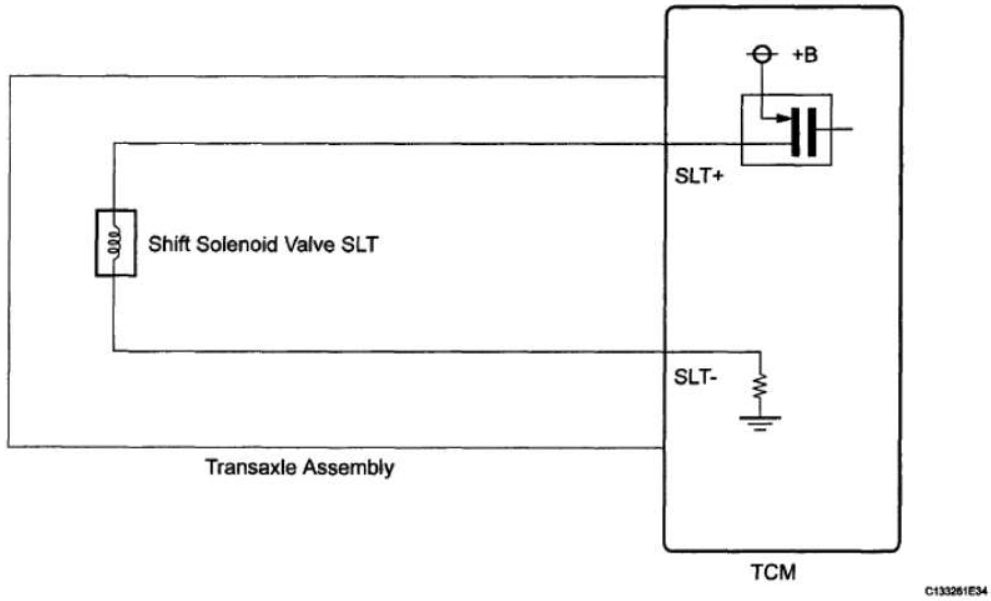


Fig. 73: Shift Solenoid Valve Slt And Transaxle Assembly - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

1. **INSPECT TRANSMISSION WIRE (SLT)**
   a. Remove the TCM from the transaxle.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
12 (SLT+) - 7 (SLT-)	20°C (68°F)	5.0 to 5.6 ohms
12 (SLT+) - Body ground	Always	10 kohms or higher
7 (SLT-) - Body ground	Always	10 kohms or higher
12 (SLT+) - All other terminals except 7 (SLT-)	Always	10 kohms or higher
7 (SLT-) - All other terminals except 12 (SLT+)	Always	10 kohms or higher

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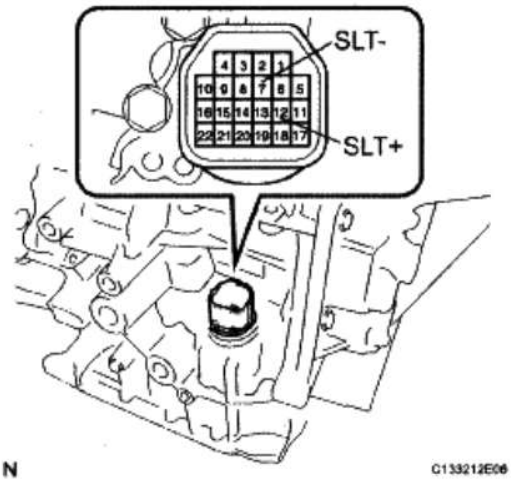


Fig. 74: Identifying TCM Connector Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Result

RESULT CHART

Result	Proceed to
OK	B
NG	A

B: REPLACE TCM (See **REMOVAL**)

A: Go to next step

2. **INSPECT SHIFT SOLENOID VALVE SLT**
   a. Remove shift solenoid valve SLT.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

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

   c. Connect a battery positive (+) lead with a 21 W bulb to terminal 2 and a negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating sound.

OK:

Valve moves and makes an operating sound.

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NG: REPLACE SHIFT SOLENOID VALVE SLT (See **REMOVAL**)

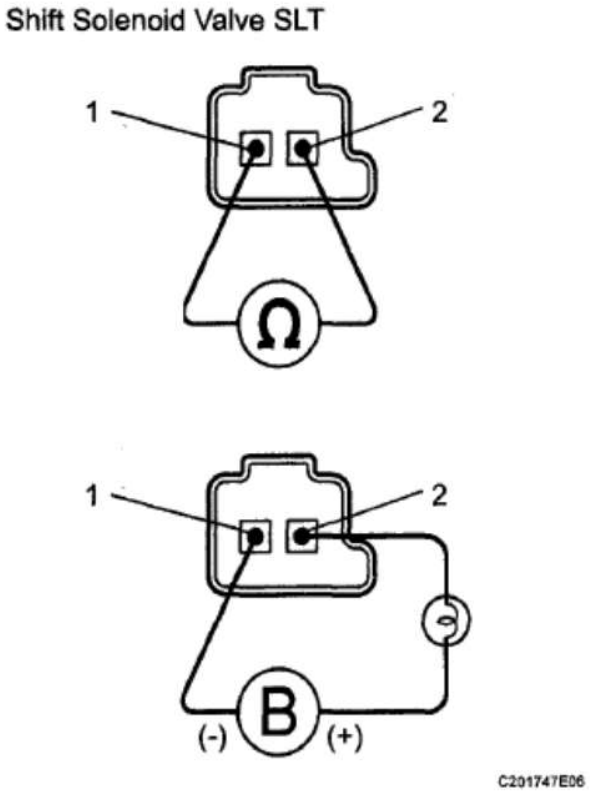


Fig. 75: Inspecting Shift Solenoid Valve SLT
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPLACE TRANSMISSION WIRE (See **REMOVAL**)

DTC P2757 TORQUE CONVERTER CLUTCH PRESSURE CONTROL SOLENOID PERFORMANCE (SHIFT SOLENOID VALVE SLU)

SYSTEM DESCRIPTION

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

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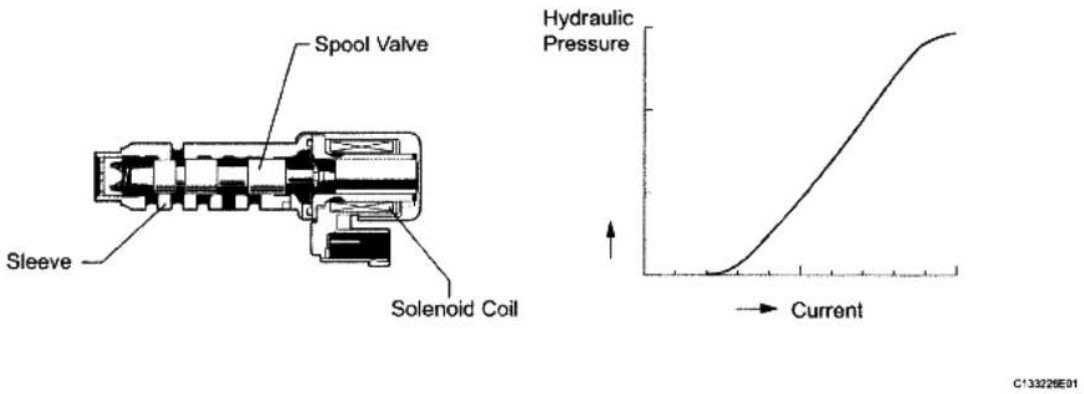


Fig. 76: Hydraulic Pressure And Current Graph
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
P2757	• Lock-up does not occur when requested. • Lock-up occurs when shift solenoid valve SLU is requested to turn on in the lock-up range. (2-trip detection logic)	• Shift solenoid valve SLU remains open or closed • Valve body is blocked • Torque converter clutch • Automatic transaxle (clutch, brake or gear, etc.) • Line pressure is too low

MONITOR DESCRIPTION

Torque converter lock-up is controlled by the TCM based on the turbine (input) speed sensor NT, output speed sensor NC, engine rpm, engine load, engine temperature, vehicle speed, transmission fluid temperature, and gear selection. The TCM determines the lock-up status of the torque converter by comparing the engine rpm (NE) to the input turbine rpm (NT). The TCM calculates the actual transmission gear by comparing input turbine rpm (NT) to output shaft rpm (NC). When conditions are appropriate, the TCM requests "lock-up" by applying control voltage to shift solenoid SLU. When SLU is turned on, it applies pressure to the lock-up relay valve and locks the torque converter clutch.

If the TCM detects no lock-up after lock-up has been requested or if it detects lock-up when it is not requested, the TCM interprets this as a fault in shift solenoid valve SLU or lock-up system performance.

The TCM will turn on the MIL and store the DTC.

Example:

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When any of the following is met, the system judges it as a malfunction.

- There is a difference in rotation (speed) between the input side (engine speed) and output side (input turbine speed) of the torque converter when the TCM commands lock-up.

  (Engine speed is at least 70 rpm greater than input turbine speed.)

- There is no difference in rotation (speed) between the input side (engine speed) and output side (input turbine speed) of the torque converter when the TCM commands lock-up off.

(The difference between engine speed and input turbine speed is less than 20 rpm.)

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P2757: Shift solenoid valve SLU OFF malfunction Shift solenoid valve SLU ON malfunction
Required sensors/Components	Shift solenoid valve SLU
Frequency of operation	Continuous
Duration	OFF malfunction (a): 3.5 sec. OFF malfunction (b): 0.05 sec. ON malfunction (a): 1.8 sec. ON malfunction (b): 0.6 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The following items are common to all conditions below.

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present. (Not circuit malfunction)	P0712, P0713 (ATF temperature sensor circuit (TFT sensor)) P0115, P0117, P0118 (ECT sensor circuit) P0715, P0717 (Turbine speed sensor circuit) P0791, P0793 (Intermediate shaft speed sensor circuit) P0748 (Shift solenoid valve SL1 circuit) P0778 (Shift solenoid valve SL2 circuit) P0798 (Shift solenoid valve SL3 circuit) P2810 (Shift solenoid valve SL4 circuit) P2759 (Shift solenoid valve SLU circuit) P2769, P2770 (Shift solenoid valve SL circuit) P0327, P0328, (KCS sensor circuit) P0120, P0121, P0122, P0123, P0220, P0222, P0223, P0604, P0606, P060A, P060B, P060D, P060E, P0657, P1607, P2102, P2103, P2111, P2112, P2118, P2119, P2135((ETCS) Electronic throttle control system)

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	U0100 (CAN communication system)
ECT (Engine coolant temperature)	40°C (104°F) or more
Spark advance from Max. retard timing by KCS control	0°CA or more
Transmission range	"D"
TFT (Transmission fluid temperature)	-10°C (14°F) or more
TFT (Transmission fluid temperature) sensor circuit	No circuit malfunction
ECT (Engine coolant temperature) sensor circuit	No circuit malfunction
Turbine speed sensor circuit	No circuit malfunction
Intermediate shaft speed sensor circuit	No circuit malfunction
Shift solenoid valve SL1 circuit	No circuit malfunction
Shift solenoid valve SL2 circuit	No circuit malfunction
Shift solenoid valve SL3 circuit	No circuit malfunction
Shift solenoid valve SL4 circuit	No circuit malfunction
Shift solenoid valve SLU circuit	No circuit malfunction
Shift solenoid valve SL circuit	No circuit malfunction
(KCS) Knock control sensor circuit	No circuit malfunction
(ETCS) Electronic throttle control system	Not system down
CAN communication system	Not system down
Engine	Starting
TCM selected gear	Not 1st
Vehicle speed	15.5 mph (25 km/h) or more
Turbine speed/Output speed (NT/NO) with 1st	3.232 to 7.556
Turbine speed/Output speed (NT/NO) with 2nd	1.860 to 2.289
Turbine speed/Output speed (NT/NO) with 3rd	1.369 to 1.613
Turbine speed/Output speed (NT/NO) with 4th	0.976 to 1.113
Turbine speed/Output speed (NT/NO) with 5th	0.690 to 0.818
Turbine speed/Output speed (NT/NO) with 6th	0.556 to 0.680

OFF malfunction:

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TYPICAL ENABLING CONDITIONS

TCM lock-up command	ON
Duration time from lock-up on command	3 sec. or more

TYPICAL MALFUNCTION THRESHOLDS

OFF malfunction:

TYPICAL MALFUNCTION THRESHOLDS

Following conditions are met	(a) and (b)
(a) Engine speed - Turbine speed	70 rpm or more
(b) Transmission fluid pressure switch	OFF

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

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

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

HINT:

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

1. **ACTIVE TEST**
   a. Warm up the engine.
   b. Turn the ignition switch off.
   c. Connect the Techstream to the DLC3.
   d. Turn the ignition switch to ON.
   e. Turn the Techstream on.
   f. Enter the following menus: Powertrain/ECT/Active Test.
   g. According to the display on the Techstream, perform the Active Test.

ACTIVE TEST REFERENCE

Tester Display	Test Part	Control Range	Diagnostic Note
	[Test Details] Control the shift solenoid SLU and SL to		

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Activate the Lock Up	set the automatic transaxle to the lock-up condition. [Vehicle Condition] Vehicle speed: 60 km/h (37 mph) or more	[Lock-up] 0: OFF 1: ON	Can be used to check SLU and SL solenoid operation.

HINT:

This test can be conducted when the vehicle speed is 60 km/h (37 mph) or more.

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

HINT:

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

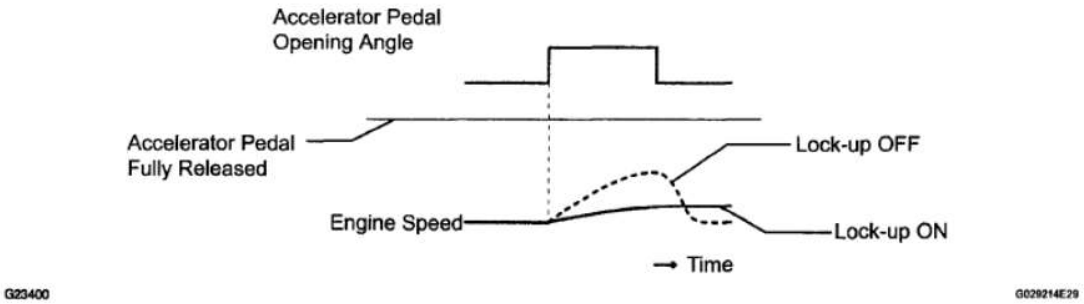


Fig. 77: Accelerator Pedal Opening Angle Graph
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. **CHECK OTHER DTCS OUTPUT (IN ADDITION TO DTC P2757)**
   a. Connect the Techstream to the DLC3.
   b. Turn the ignition switch to ON.
   c. Turn the Techstream on.
   d. Enter the following menus: Powertrain/ECT/Trouble Codes.
   e. Read the DTCs using the Techstream.

Result

RESULT CHART

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

HINT:

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

B: GO TO DTC CHART

A: Go to next step

2. **INSPECT SHIFT SOLENOID VALVE SLU**
   a. Remove shift solenoid valve SLU.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

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

   c. Connect a battery positive (+) lead with a 21 W bulb to terminal 2 and a negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating sound.

OK:

Valve moves and makes an operating sound.

NG: REPLACE SHIFT SOLENOID VALVE SLU (See **REMOVAL**)

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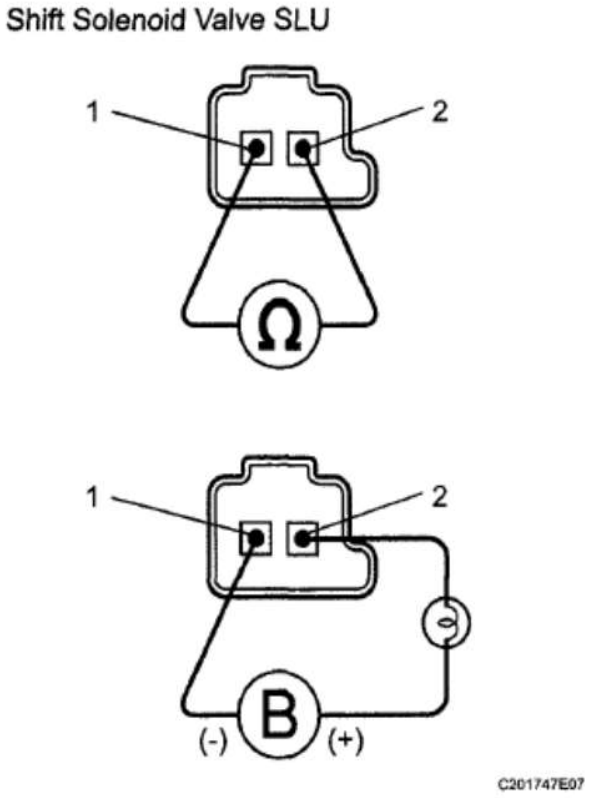


Fig. 78: Inspecting Shift Solenoid Valve SLU
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

3. **INSPECT TRANSMISSION VALVE BODY ASSEMBLY**
   a. Check the transmission valve body assembly (See **REMOVAL**).

OK:

There are no foreign objects on each valve and they operate smoothly.

NG: REPLACE TRANSMISSION VALVE BODY ASSEMBLY (See **REMOVAL**)

OK: Go to next step

4. **INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY**
   a. Check the torque converter clutch assembly (See **TORQUE CONVERTER CLUTCH AND DRIVE PLATE**).

OK:

The torque converter clutch operates normally.

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NG: REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY (See **REMOVAL**)

OK: REPLACE AUTOMATIC TRANSMISSION ASSEMBLY (See **REMOVAL**)

DTC P2759 TORQUE CONVERTER CLUTCH PRESSURE CONTROL SOLENOID CONTROL CIRCUIT ELECTRICAL (SHIFT SOLENOID VALVE SLU)

DESCRIPTION

The amount of current flow to the solenoid is controlled by the duty ratio* of the TCM output signal. The higher the duty ratio becomes, the higher the lock-up hydraulic pressure becomes during the lock-up operation.

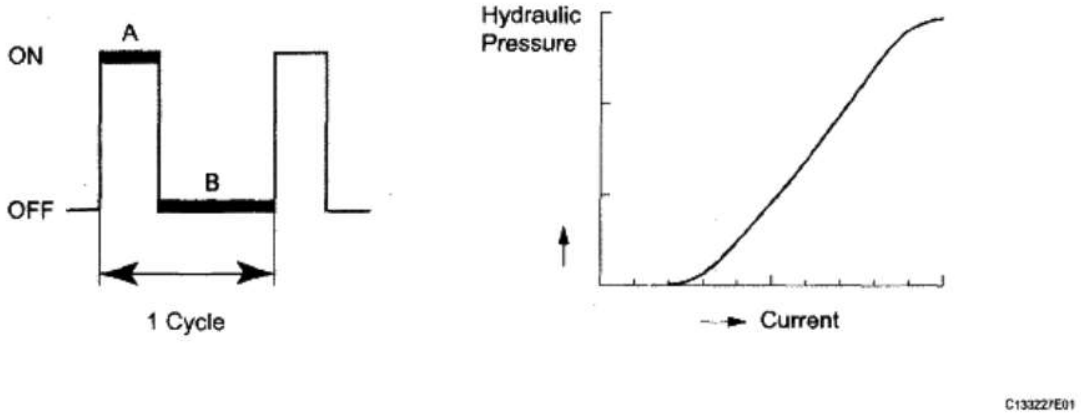


Fig. 79: Hydraulic Pressure And Current Graph
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

*: Duty Ratio

The duty ratio is the ratio of the electrical current on time (A) to the total of the electrical current on and off time (A + B).

Duty Ratio (%) = (A/(A + B)) x 100

DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
P2759	Open or short is detected in shift solenoid valve SLU circuit for 1 second or more while driving (1-trip detection logic).	• Open or short in shift solenoid valve SLU circuit • Shift solenoid valve SLU • TCM

MONITOR DESCRIPTION

When an open or short in a shift solenoid valve (SLU) circuit is detected, the TCM determines there is a malfunction. The TCM will turn on the MIL and store this DTC.

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MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P2759: Shift solenoid valve SLU/Range check
Required sensors/Components	Shift solenoid valve SLU
Frequency of operation	Continuous
Duration	1 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

All

TYPICAL ENABLING CONDITIONS

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

Condition (A)

TYPICAL ENABLING CONDITIONS

Battery voltage	12 V or more

Condition (B)

TYPICAL ENABLING CONDITIONS

Battery voltage	10 V or more and less than 12 V
Target current	Less than 0.75 A

Condition (C)

TYPICAL ENABLING CONDITIONS

Battery voltage	8 V or more
Target current	0.25 A or more

TYPICAL MALFUNCTION THRESHOLDS

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

Condition (A) and (B)

TYPICAL MALFUNCTION THRESHOLDS

Output signal duty	100% or more

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Condition (C)

TYPICAL MALFUNCTION THRESHOLDS

Output signal duty	0% or less

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

Output signal duty	More than 3% and less than 100%

WIRING DIAGRAM

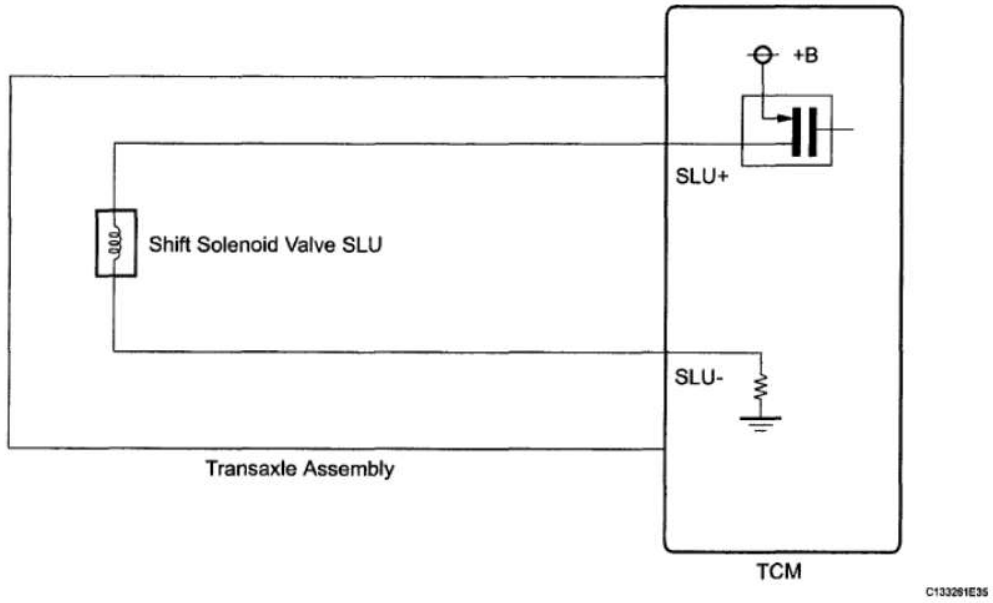


Fig. 80: Shift Solenoid Valve SLU - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

1. **INSPECT TRANSMISSION WIRE (SLU)**
   a. Remove the TCM from the transaxle.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
11 (SLU+) - 5 (SLU-)	20°C (68°F)	5.0 to 5.6 ohms

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11 (SLU+) - Body ground or other terminals	Always	10 kohms or higher
5 (SLU-) - Body ground or other terminals	Always	10 kohms or higher
11 (SLU+) - All other terminals except 5 (SLU-)	Always	10 kohms or higher
5 (SLU-) - All other terminals except 11 (SLU+)	Always	10 kohms or higher

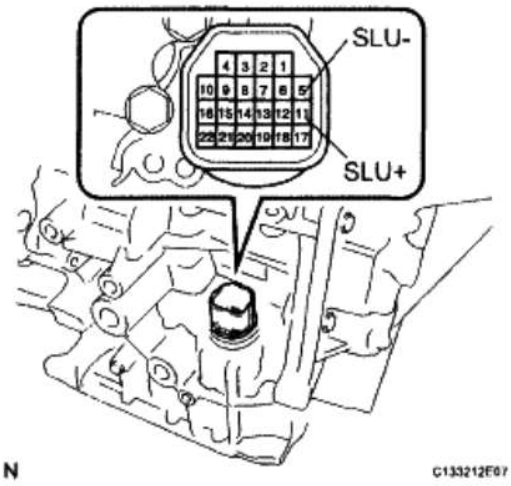


Fig. 81: Identifying TCM Connector Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Result

RESULT CHART

Result	Proceed to
OK	B
NG	A

B: REPLACE TCM (See **REMOVAL**)

A: Go to next step

2. **INSPECT SHIFT SOLENOID VALVE SLU**
   a. Remove shift solenoid valve SLU.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

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

   c. Connect a battery positive (+) lead with a 21 W bulb to terminal 2 and a negative (-) lead to

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terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating sound.

OK:

Valve moves and makes an operating sound.

NG: REPLACE SHIFT SOLENOID VALVE SLU (See **REMOVAL**)

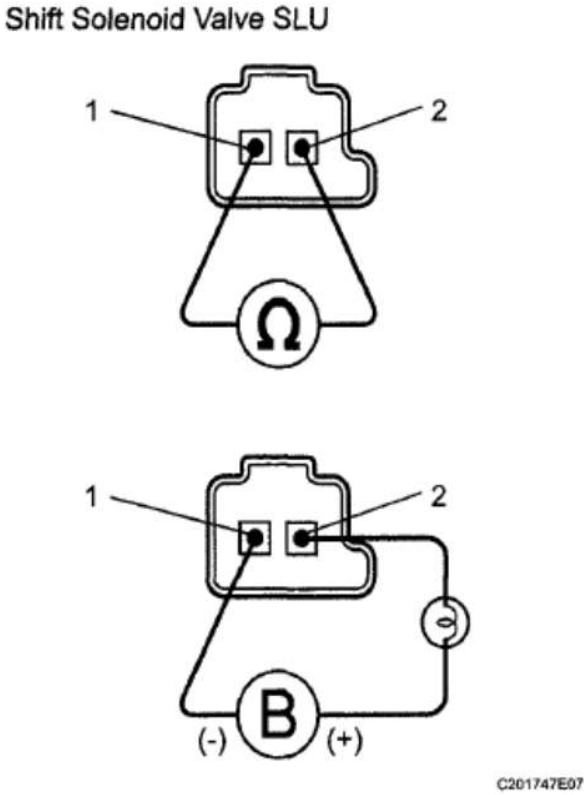


Fig. 82: Inspecting Shift Solenoid Valve SLU
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPLACE TRANSMISSION WIRE (See **REMOVAL**)

DTC P2769 SHORT IN TORQUE CONVERTER CLUTCH SOLENOID CIRCUIT (SHIFT SOLENOID VALVE SL) DTC P2770 OPEN IN TORQUE CONVERTER CLUTCH SOLENOID CIRCUIT (SHIFT SOLENOID VALVE SL)

DESCRIPTION

Shift solenoid valve SL is turned on and off by signals from the TCM to control the hydraulic pressure acting on the lock-up relay valve, which then controls operation of the lock-up clutch.

DTC DETECTION CONDITION CHART

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DTC No.	DTC Detection Condition	Trouble Area
P2769	TCM detects a short in the shift solenoid valve SL circuit when the shift solenoid valve SL is operated (2 trip detection logic).	• Short in shift solenoid valve SL circuit • Shift solenoid valve SL • TCM
P2770	TCM detects an open in the shift solenoid valve SL circuit when the shift solenoid valve SL is not operated (2 trip detection logic).	• Open in shift solenoid valve SL circuit • Shift solenoid valve SL • TCM

Fail-safe function:

If the TCM detects a malfunction, it turns shift solenoid valve SL off.

MONITOR DESCRIPTION

Based on the signals from the throttle position sensor, the air flow meter and the crankshaft position sensor, the TCM sends a signal to shift solenoid valve SL to regulate the hydraulic pressure and provide smoother torque converter clutch engagement. Shift solenoid valve SL responds to commands from the TCM. The valve controls the lock-up relay valve to perform the torque-converter lock-up function. If the TCM detects an open or short circuit for shift solenoid valve SL, it will illuminate the MIL.

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P2769: Shift solenoid valve SL/Range check (Low resistance) P2770: Shift solenoid valve SL/Range check (High resistance)
Required sensors/Components	Shift solenoid valve SL
Frequency of operation	Continuous
Duration	1 time
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P2769: Range check (Low resistance):

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	None
Solenoid	ON
Time after solenoid OFF to ON	More than 0.008 sec.

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P2770: Range check (High resistance):

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present	None
Solenoid	ON
Time after solenoid ON to OFF	More than 0.008 sec.

TYPICAL MALFUNCTION THRESHOLDS P2769

Range check (Low resistance):

TYPICAL MALFUNCTION THRESHOLDS

Intelligent power MOS diagnosis fall signals detected while the solenoid is operated	Fail at solenoid resistance: 8 ohms or less

P2770: Range check (High resistance):

TYPICAL MALFUNCTION THRESHOLDS

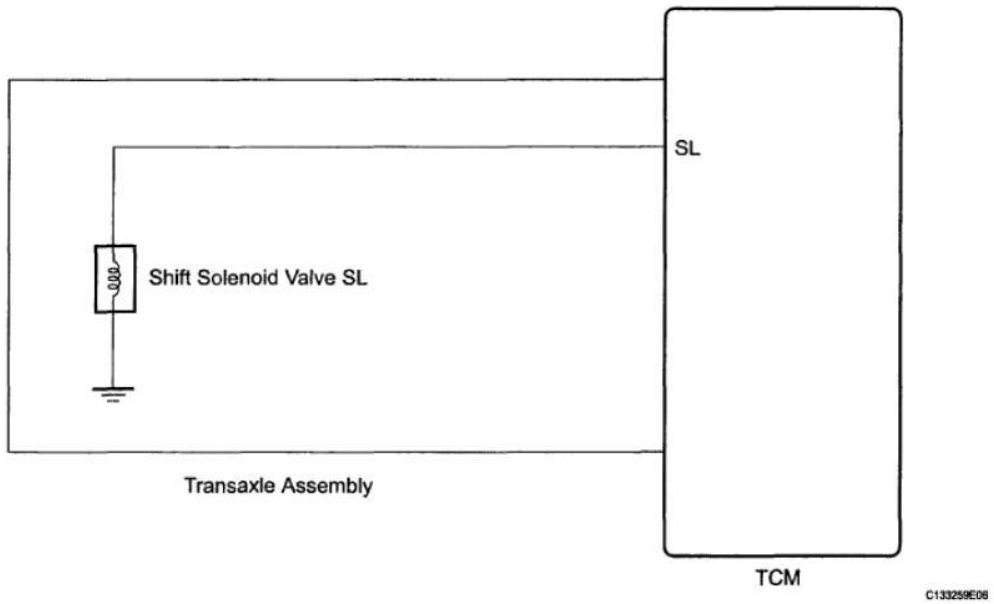
Intelligent power MOS diagnosis fail signals detected while the solenoid is not operated	Fail at solenoid resistance: 100 kohms or more

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

Shift solenoid valve SL	Resistance: 11 to 15 ohms at 20°C (68°F)

WIRING DIAGRAM



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Fig. 83: Shift Solenoid Valve SL And TCM - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

1. **INSPECT TRANSMISSION WIRE (SHIFT SOLENOID VALVE SL)**
   a. Remove the TCM from the transaxle.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
6 (SL) - Body ground	20°C (68°F)	11 to 15 ohms

Result

RESULT CHART

Result	Proceed to
OK	B
NG	A

B: REPLACE TCM (See **REMOVAL**)

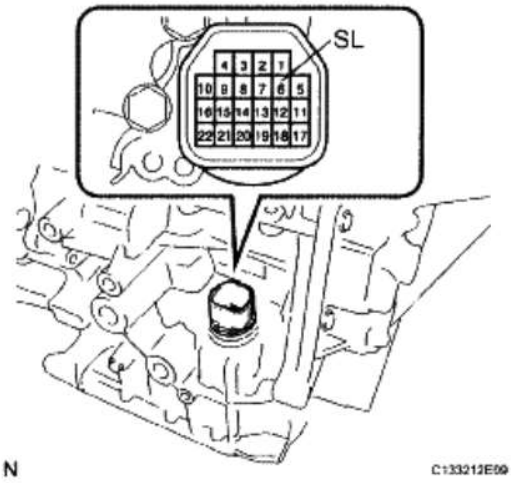


Fig. 84: Inspecting Transmission Wire (Shift Solenoid Valve SL)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

A: Go to next step

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2. **INSPECT SHIFT SOLENOID VALVE SL**
   a. Remove shift solenoid valve SL.
   b. Measure the resistance according to the value (s) in the table below.

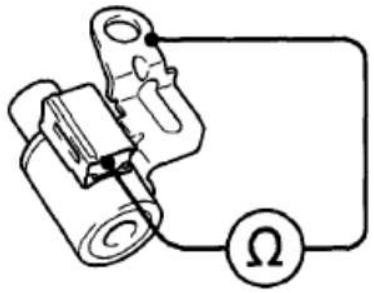
Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
Solenoid Connector (SL) - Solenoid Body (SL)	20°C (68°F)	11 to 15 ohms

NG: REPLACE SHIFT SOLENOID VALVE SL (See **REMOVAL**)

Shift Solenoid Valve SL:



C133217E01

Fig. 85: Inspecting Shift Solenoid Valve SL
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPLACE TRANSMISSION WIRE (See **REMOVAL**)

DTC P2808 PRESSURE CONTROL SOLENOID "G" PERFORMANCE (SHIFT SOLENOID VALVE SL4)

DESCRIPTION

The TCM uses the vehicle speed signal and signals from the transmission speed sensors (NC, NT) to detect the actual gear (1st, 2nd, 3rd, 4th, 5th or 6th gear).

Then the TCM compares the actual gear with the shift schedule in the TCM memory to detect mechanical problems of the shift solenoid valves and valve body.

DTC DETECTION CONDITION CHART

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DTC No.	DTC Detection Condition	Trouble Area
P2808	The engine revs freely when 3rd or 5th gear is commanded. (2-trip detection logic) When any of the following is detected. In addition, the condition that 4th gear is engaged when 4th gear is commanded occurs twice. (2-trip detection logic) • When 1st gear is commanded, 3rd gear is engaged. • When 2nd gear is commanded, 3rd gear is engaged. • When 6th gear is commanded, 5th gear is engaged.	• Shift solenoid valve SL4 remains open or closed • Valve body is blocked • Automatic transaxle (clutch, brake or gear etc.)

MONITOR DESCRIPTION

The TCM commands gear shifts by turning the shift solenoid valves on and off. According to the input shaft revolution (speed), intermediate (counter) shaft revolution (speed) and output shaft revolution (speed), the TCM detects the actual gear (1st, 2nd, 3rd, 4th, 5th or 6th gear). When the gear commanded by the TCM and the actual gear are not the same, the TCM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P2808: Shift solenoid valve SL4/OFF malfunction Shift solenoid valve SL4/ON malfunction
Required sensors/Components	Shift solenoid valve SL4, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	OFF malfunction (A): 0.5 sec. OFF malfunction (B): 0.8 sec. ON malfunction: 0.8 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

ALL:

TYPICAL ENABLING CONDITIONS

The monitor will run whenever	P0712, P0713 (ATF temperature sensor circuit (TFT sensor)) P0115, P0117, P0118 (ECT sensor circuit) P0715, P0717 (Turbine speed sensor circuit) P0791, P0793 (Intermediate shaft speed sensor circuit) P0748 (Shift solenoid valve SL1 circuit) P0778 (Shift solenoid valve SL2 circuit) P0798 (Shift solenoid valve SL3 circuit)

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this DTC is not present. (Not circuit malfunction)	P2810 (Shift solenoid valve SL4 circuit) P0327, P0328, (KCS sensor circuit) P0120, P0121, P0122, P0123, P0220, P0222, P0223, P0604, P0606, P060A, P060B, P060D, P060E, P0657, P1607, P2102, P2103, P2111, P2112, P2118, P2119, P2135((ETCS) Electronic throttle control system) U0100 (CAN communication system)
Transmission range	"D"
TFT (Transmission fluid temperature)	-10°C (14°F) or more
TFT (Transmission fluid temperature) sensor circuit	No circuit malfunction
ECT (Engine coolant temperature) sensor circuit	No circuit malfunction
Turbine speed sensor circuit	No circuit malfunction
Intermediate shaft speed sensor circuit	No circuit malfunction
Shift solenoid valve SL1 circuit	No circuit malfunction
Shift solenoid valve SL2 circuit	No circuit malfunction
Shift solenoid valve SL3 circuit	No circuit malfunction
Shift solenoid valve SL4 circuit	No circuit malfunction
(KCS) Knock control sensor circuit	No circuit malfunction
(ETCS) Electronic throttle control system	Not system down
CAN communication system	Not system down
Engine	Starting

OFF malfunction (A):

TYPICAL ENABLING CONDITIONS

TCM select gear	3rd or 5th
Throttle valve opening angle	3% or more

OFF malfunction (B):

TYPICAL ENABLING CONDITIONS

TCM select gear	3rd
Throttle valve opening angle	6.5% or more
Vehicle speed	1.2 mph (2 km/h) or more
ECT (Engine coolant temperature)	40°C (104°F) or more
Turbine speed/Output speed (NT/NO) with 1st	3.232 to 7.556
Turbine speed/Output speed (NT/NO) with 2nd	1.860 to 2.289

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Turbine speed/Output speed (NT/NO) with 3rd	1.369 to 1.613
Turbine speed/Output speed (NT/NO) with 4th	0.976 to 1.113
Turbine speed/Output speed (NT/NO) with 5th	0.690 to 0.818
Turbine speed/Output speed (NT/NO) with 6th	0.556 to 0.680

ON malfunction (A):

TYPICAL ENABLING CONDITIONS

TCM select gear	1st
Time after transmission to 1st gear	0.1 sec. or more
Vehicle speed	1.2 mph (2 km/h) to 24.9 mph (40 km/h)
ECT (Engine coolant temperature)	40°C (104°F) or more
Turbine speed/Output speed (NT/NO) with 1st	3.232 to 7.556
Turbine speed/Output speed (NT/NO) with 2nd	1.860 to 2.289
Turbine speed/Output speed (NT/NO) with 3rd	1.369 to 1.613
Turbine speed/Output speed (NT/NO) with 4th	0.976 to 1.113
Turbine speed/Output speed (NT/NO) with 5th	0.690 to 0.818
Turbine speed/Output speed (NT/NO) with 6th	0.556 to 0.680

ON malfunction (B):

TYPICAL ENABLING CONDITIONS

TCM select gear	2nd
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (condition varies with engine speed)
Vehicle speed	1.2 mph (2 km/h) or more
ECT (Engine coolant temperature)	40°C (104°F) or more
Turbine speed/Output speed (NT/NO) with 1st	3.232 to 7.556
Turbine speed/Output speed (NT/NO) with 2nd	1.860 to 2.289
Turbine speed/Output speed (NT/NO) with 3rd	1.369 to 1.613
Turbine speed/Output speed (NT/NO) with 4th	0.976 to 1.113
Turbine speed/Output speed (NT/NO) with 5th	0.690 to 0.818
Turbine speed/Output speed (NT/NO) with 6th	0.556 to 0.680

ON malfunction (C):

TYPICAL ENABLING CONDITIONS

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TCM select gear	6th
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (condition varies with engine speed)
Vehicle speed	1.2 mph (2 km/h) or more
ECT (Engine coolant temperature)	40°C (104°F) or more
Turbine speed/Output speed (NT/NO) with 1st	3.232 to 7.556
Turbine speed/Output speed (NT/NO) with 2nd	1.860 to 2.289
Turbine speed/Output speed (NT/NO) with 3rd	1.369 to 1.613
Turbine speed/Output speed (NT/NO) with 4th	0.976 to 1.113
Turbine speed/Output speed (NT/NO) with 5th	0.690 to 0.818
Turbine speed/Output speed (NT/NO) with 6th	0.556 to 0.680

ON malfunction (D):

TYPICAL ENABLING CONDITIONS

TCM select gear	4th
Throttle valve opening angle	6.5% or more at engine speed 2,000 rpm (condition vary with engine speed)
Vehicle speed	1.2 mph (2 km/h) or more
ECT (Engine coolant temperature)	40°C (104°F) or more
Turbine speed/Output speed (NT/NO) with 1st	3.232 to 7.556
Turbine speed/Output speed (NT/NO) with 2nd	1.860 to 2.289
Turbine speed/Output speed (NT/NO) with 3rd	1.369 to 1.613
Turbine speed/Output speed (NT/NO) with 4th	0.976 to 1.113
Turbine speed/Output speed (NT/NO) with 5th	0.690 to 0.818
Turbine speed/Output speed (NT/NO) with 6th	0.556 to 0.680

TYPICAL MALFUNCTION THRESHOLDS

OFF malfunction (A):

TYPICAL MALFUNCTION THRESHOLDS

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Turbine speed - Output speed x Gear ratio	1,000 rpm or more

OFF malfunction (B):

TYPICAL MALFUNCTION THRESHOLDS

Turbine speed/Output speed	3.232 to 7.556

ON malfunction (A) and (B):

TYPICAL MALFUNCTION THRESHOLDS

Turbine speed/Output speed	1.369 to 1.613

ON malfunction (C):

TYPICAL MALFUNCTION THRESHOLDS

Turbine speed/Output speed	0.690 to 0.818

ON malfunction (D):

TYPICAL MALFUNCTION THRESHOLDS

Turbine speed/Output speed	0.976 to 1.113

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

1. **CHECK OTHER DTCS OUTPUT (IN ADDITION TO DTC P2808)**
   a. Connect the Techstream to the DLC3.
   b. Turn the ignition switch to ON.
   c. Turn the Techstream on.
   d. Enter the following menus: Powertrain/ECT/Trouble Codes.
   e. Read the DTCs using the Techstream.

Result

RESULT CHART

Display (DTC output)	Proceed to
Only "P2808" is output	A
"P2808" and other DTCs are output	B

HINT:

If a solenoid is stuck OFF, DTCs for several solenoids including the malfunctioning solenoid will be

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detected.

A: Go to step 3

B: Go to next step

2. **PERFORM ACTIVE TEST USING TECHSTREAM**

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

a. Warm up the engine.
b. Turn the ignition switch off.
c. Connect the Techstream to the DLC3.
d. Turn the ignition switch to ON.
e. Turn the Techstream on.
f. Enter the following menus: Powertrain/ECT/Active Test.
g. According to the display on the Techstream, perform the Active Test.

HINT:

Comparing the gear commanded by the Active Test with the actual gear enables confirmation of the problem (See **FAIL-SAFE CHART**).

ACTIVE TEST REFERENCE

Item	Test Details	Diagnostic Note
Control the Shift Position	[Test Details] Operates the shift solenoid valves to allow gears to selected manually. [Others] • Press "-->" button: Upshift occurs • Press "<--" button: Downshift occurs	Can be used to check the operation of the shift solenoid valves.

NOTE:

- **This test can be conducted when the vehicle is stopped.**
- **When shifting gears using the Active Test function, do not operate the accelerator pedal for 2 seconds before and after shifting gears.**

HINT:

The gear commanded by the TCM is shown in the Data List/Shift Status display on the Techstream.

h. Check the vehicle speed and the gear when the engine speed is 1000 rpm.

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HINT:

Because the torque converter clutch has not engaged, it may be difficult to obtain the speeds specified in 4th, 5th, and 6th gear, however a difference of speed should still be evident following each gear change.

Standard

GEAR CHANGE REFERENCE

1st	2nd	3rd	4th	5th	6th
8 to 12 km/h (5 to 7.5 mph)	15 to 19 km/h (9.3 to 11.8 mph)	21 to 25 km/h (13.0 to 15.5 mph)	31 to 35 km/h (19.3 to 21.7 mph)	44 to 48 km/h (27.3 to 29.8 mph)	52 to 56 km/h (32.3 to 34.8 mph)

i. Compare the TCM commanded gear and the actual gear.

Result

RESULT CHART

Actuator Gear during Malfunction		TCM Commanded Gear						Proceed to
		1st	2nd	3rd	4th	5th	6th	
Shift solenoid SL1	Stuck ON	1st	2nd	3rd	4th	4th	4th	A
	Stuck OFF	N*1	N*1	N*1	N*1	5th	6th	
Shift solenoid SL2	Stuck ON	4th	4th	4th	4th	5th	6th	B
	Stuck OFF	1st	2nd	3rd	1st	N*1	N*1	
Shift solenoid SL3	Stuck ON	2nd	2nd	3rd	4th	5th	6th	C
	Stuck OFF	1st	1st	3rd	4th	5th	N*1	
Shift solenoid SL4	Stuck ON*3	3rd	3rd	3rd	4th	5th	5th	D
	Stuck OFF	1st	2nd	1st	4th	N*1	6th	
Shift solenoid SLT	Stuck ON	N*2	N*2	N*2	N*2	N*2	N*2	E
	Stuck OFF*3	1st	2nd	3rd	4th	5th	6th	

HINT:

- *1: Neutral
- *2: If shift solenoid SLT is stuck on, the line pressure will be low. Therefore, the amount of torque that can be transmitted by each gear is lower than the normal limit. When the engine power exceeds this lowered limit, the engine speed will increase freely.
- *3: When shift solenoid SLT is stuck off, gear shifting is normal.

A: GO TO DTC CHART (RELATED SHIFT SOLENOID VALVE (SL1) PERFORMANCE DTC P0746) (See **DTC P0746 PRESSURE CONTROL SOLENOID "A" PERFORMANCE (SHIFT SOLENOID VALVE SL1)**)

B: GO TO DTC CHART (RELATED SHIFT SOLENOID VALVE (SL2) PERFORMANCE DTC

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P0776) (See **DTC P0776 PRESSURE CONTROL SOLENOID "B" PERFORMANCE (SHIFT SOLENOID VALVE SL2)**)

C: GO TO DTC CHART (RELATED SHIFT SOLENOID VALVE (SL3) PERFORMANCE DTC P0796) (See **DTC P0796 PRESSURE CONTROL SOLENOID "C" PERFORMANCE (SHIFT SOLENOID VALVE SL3)**)

E: GO TO DTC CHART (RELATED SHIFT SOLENOID VALVE (SLT) PERFORMANCE DTC P2714) (See **DTC P2714 PRESSURE CONTROL SOLENOID "D" PERFORMANCE (SHIFT SOLENOID VALVE SLT)**)

D: Go to next step

3. **INSPECT SHIFT SOLENOID VALVE SL4**
   a. Remove shift solenoid valve SL4.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

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

   c. Connect a battery positive (+) lead with a 21 W bulb to terminal 2 and a negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating sound.

OK:

Valve moves and makes an operating sound.

NG: REPLACE SHIFT SOLENOID VALVE SL4 (See **REMOVAL**)

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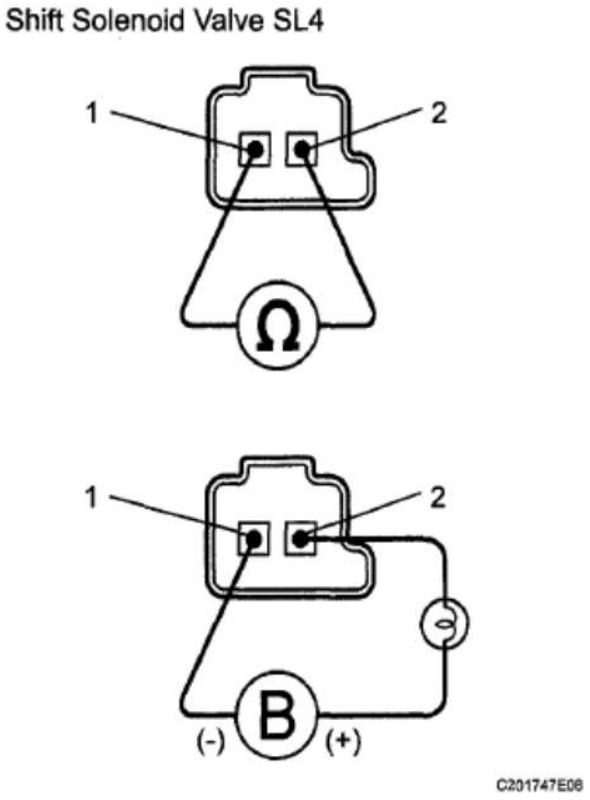


Fig. 86: Inspecting Shift Solenoid Valve SL4
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

4. **INSPECT TRANSMISSION VALVE BODY ASSEMBLY**
   a. Check the transmission valve body assembly (See **REMOVAL**).

OK:

There are no foreign objects on each valve and they operate smoothly.

NG: REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY (See **REMOVAL**)

OK: REPLACE AUTOMATIC TRANSAXLE ASSEMBLY (See **REMOVAL**)

DTC P2810 PRESSURE CONTROL SOLENOID "G" ELECTRICAL (SHIFT SOLENOID VALVE SL4)

DESCRIPTION

Changing from 1st to 6th is performed by the TCM turning shift solenoid valves SL1, SL2, SL3, SL4 and SL on and off. If an open or short circuit occurs in any of the shift solenoid valves, the TCM controls the remaining normal shift solenoid valves to allow the vehicle to be operated (See **FAIL-SAFE CHART**)

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DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
P2810	The TCM checks for an open or short in the shift solenoid valve SL4 circuit while driving and shifting gears. (1-trip detection logic) • Output signal duty equals to 100%. **NOTE:** **(SL4 output signal duty is less than 100% under normal condition.)**	• Open or short in shift solenoid valve SL4 circuit • Shift solenoid valve SL4 • TCM

MONITOR DESCRIPTION

The TCM commands gear shifts by turning the shift solenoid valves on or off. When there is an open or short circuit in any shift solenoid valve circuit, the TCM detects the problem and illuminates the MIL and stores the DTC. And the TCM performs the fail-safe function and turns the other normal shift solenoid valves on or off (In case of an open or short circuit, the TCM stops sending current to the circuit.) (See **FAIL-SAFE CHART**).

MONITOR STRATEGY

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

All

TYPICAL ENABLING CONDITIONS

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

Condition (A)

TYPICAL ENABLING CONDITIONS

Battery voltage	12 V or more

Condition (B)

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TYPICAL ENABLING CONDITIONS

Battery voltage	10V or more and less than 12 V
Target current	Less than 0.75 A

Condition (C)

TYPICAL ENABLING CONDITIONS

Battery voltage	8 V or more
Target current	0.25 A or more

TYPICAL MALFUNCTION THRESHOLDS

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

Condition (A) and (B)

TYPICAL MALFUNCTION THRESHOLDS

Output signal duty	100% or more

Condition (C)

TYPICAL MALFUNCTION THRESHOLDS

Output signal duty	0% or less

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

Output signal duty	More than 3% and less than 100%

WIRING DIAGRAM

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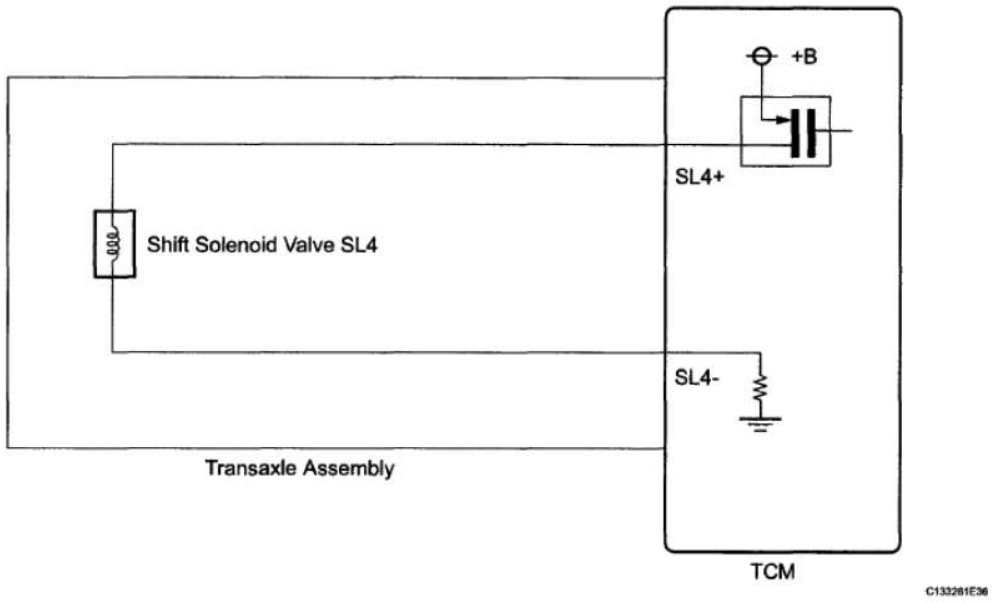


Fig. 87: Transaxle Assembly - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

1. **INSPECT TRANSMISSION WIRE (SL4)**
   a. Remove the TCM from the transaxle.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
22 (SL4+) - 21 (SL4-)	20°C (68°F)	5.0 to 5.6 ohms
22 (SL4+) - Body ground	Always	10 kohms or higher
21 (SL4-) - Body ground	Always	10 kohms or higher
22 (SL4+) - All other terminals except 21 (SL4-)	Always	10 kohms or higher
21 (SL4-) - All other terminals except 22 (SL4+)	Always	10 kohms or higher

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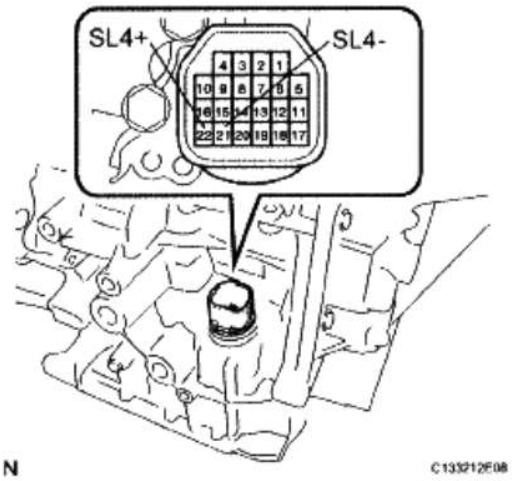


Fig. 88: Identifying TCM Connector Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Result

RESULT CHART

Result	Proceed to
OK	B
NG	A

B: REPLACE TCM (See **REMOVAL**)

A: Go to next step

2. **INSPECT SHIFT SOLENOID VALVE SL4**
   a. Remove shift solenoid valve SL4.
   b. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

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

   c. Connect a battery positive (+) lead with a 21 W bulb to terminal 2 and a negative (-) lead to terminal 1 of the solenoid valve connector. Then check that the valve moves and makes an operating sound.

OK:

Valve moves and makes an operating sound.

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NG: REPLACE SHIFT SOLENOID VALVE SL4 (See **REMOVAL**)

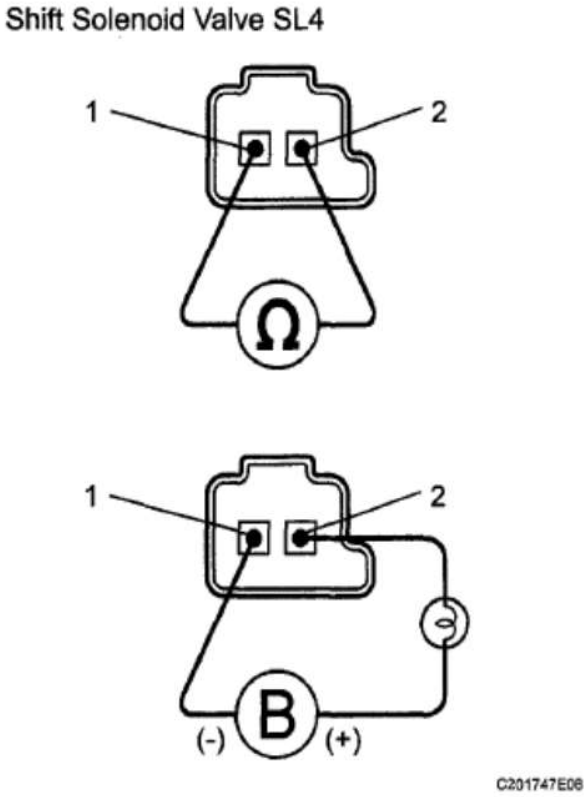


Fig. 89: Inspecting Shift Solenoid Valve SL4
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPLACE TRANSMISSION WIRE (See **REMOVAL**)

DTC U0100 LOST COMMUNICATION WITH ECM/PCM "A"

DESCRIPTION

The engine control unit communicates with the TCM using the Controller Area Network (CAN). If there is a problem in this communication, the TCM sets a DTC.

DTC DETECTION CONDITION CHART

DTC No.	DTC Detection Condition	Trouble Area
U0100	Following conditions are met for 1.25 seconds (1 trip detection logic): • Ignition switch ON • Battery voltage is 10.5 V or more • No communication between the engine control ECU and	• Harness and connector • ECM • TCM

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	TCM	

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	U0100: Verify communication
Required Sensors/Components (Main)	TCM
Required Sensors/Components (Related)	-
Frequency of Operation	Continuous
Duration	1.25 seconds
MIL Operation	Immediate
Sequence of Operation	None

TYPICAL ENABLING CONDITIONS

TYPICAL ENABLING CONDITIONS

Monitor runs whenever following DTCs not present	None
Battery Voltage	10.5 V or more
Ignition Switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

TYPICAL MALFUNCTION THRESHOLDS

Communication between TCM and ECM	No communication

WIRING DIAGRAM

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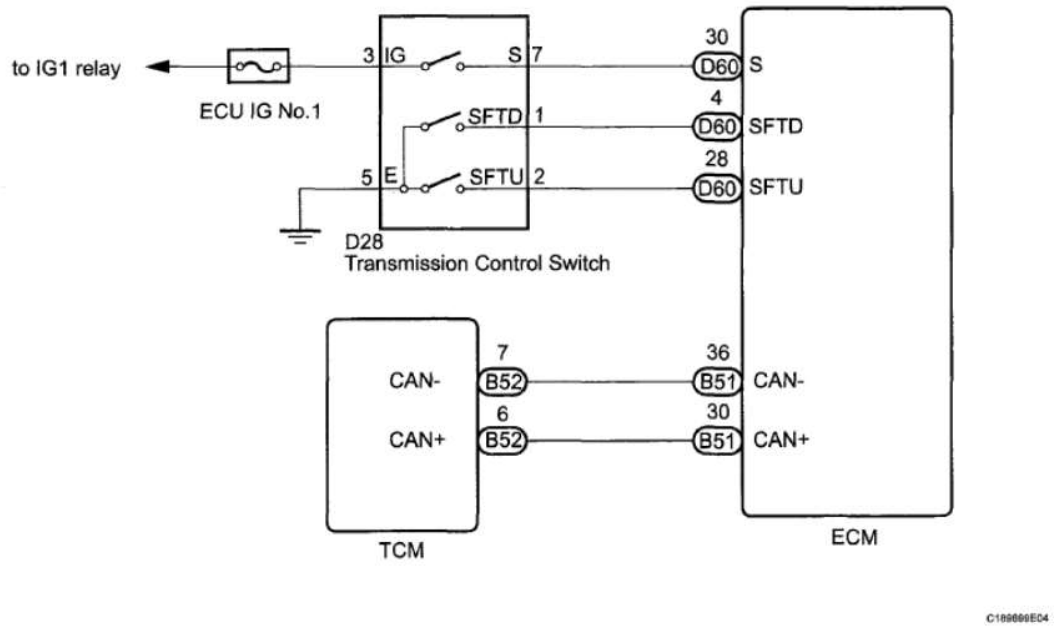


Fig. 90: Transmission Control Switch - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

NOTE: Perform the universal trip to clear permanent DTCs (See DTC CHECK/CLEAR).

HINT:

- Refer to inspection procedure for CAN communication system.
- If the CAN communication malfunctions, the TCM cannot receive the current data from the ECM. In this case, the freeze frame data output from the TCM has not been updated, so the data will not be useful for the inspection. However, reading the Data List as the first step in troubleshooting is effective to find malfunctions.
- The malfunction area can be checked using the Bus Check function on the Techstream (See **DIAGNOSIS SYSTEM**).

1. **CHECK ECU TERMINAL VOLTAGE (+B AND E1 TERMINALS)**
   a. Disconnect the TCM connector.
   b. Turn the ignition switch to ON.
   c. Measure the voltage according to the value (s) in the table below.

Standard Voltage

VOLTAGE SPECIFICATION

Tester Connection	Switch Condition	Specified Condition
B52-18 (+B) - B52-8 (E1)	Ignition switch ON	9 to 14 V

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d. Turn the ignition switch off.
e. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
B52-8 (E1) - Body ground	Always	Below 1 ohms

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

Front view of wire harness connector
(to TCM)

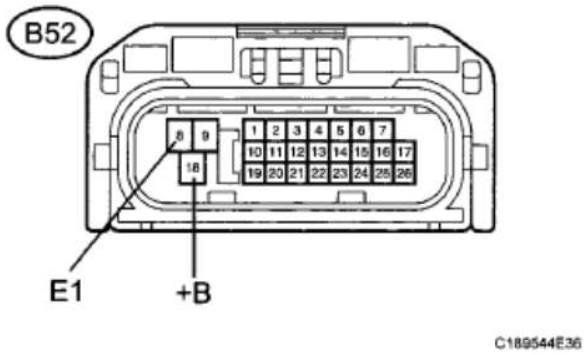


Fig. 91: Identifying B52 TCM Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

2. **CHECK HARNESS AND CONNECTOR (TCM - ECM)**
   a. Disconnect the TCM connector.

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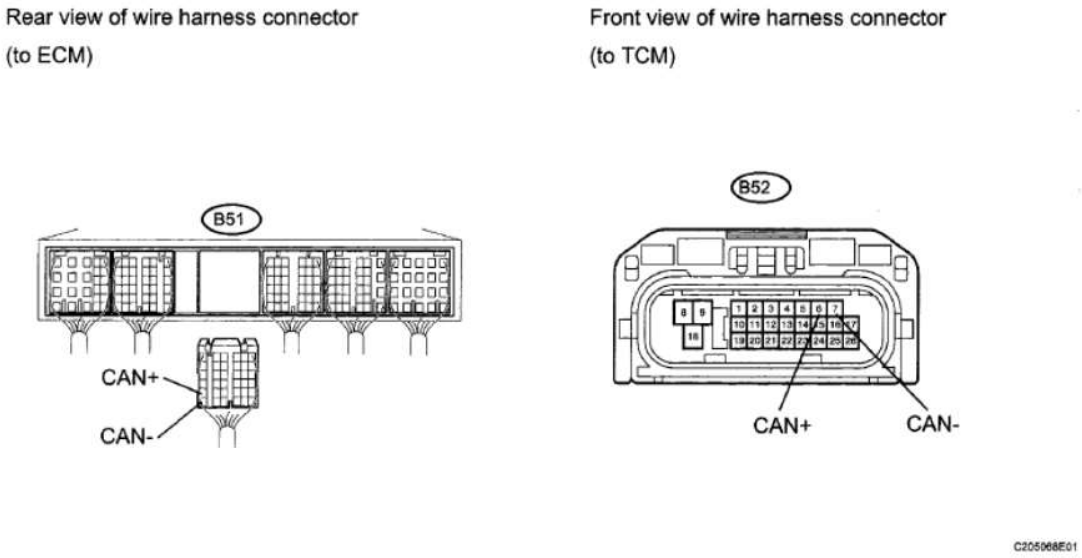


Fig. 92: Identifying TCM Connector Terminal And ECM Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Disconnect the ECM connector.
c. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
B52-6 (CAN+) - B51-30 (CAN+)	Always	Below 1 ohms
B52-7 (CAN-) - B51-36 (CAN-)	Always	Below 1 ohms
B52-6 (CAN+) or B51-30 (CAN+) -Body ground or other terminals	Always	1 Mohms or higher
B52-7 (CAN-) or B51-36 (CAN-) -Body ground or other terminals	Always	1 Mohms or higher

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

OK: Go to next step

3. **CHECK IF DTC OUTPUT RECURS**
   a. Connect the Techstream to the DLC3.
   b. Clear the DTCs.
   c. Replace the TCM.

      HINT:

      Replace the TCM with a TCM from a normally functioning vehicle of the same model.

   d. Start the engine.

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e. Read the DTCs.

Result

RESULT CHART

Display (DTC Output)	Proceed to
U0100	A
No DTC	B

B: REPLACE TCM (See **REMOVAL**)

A: REPLACE ECM (See **REMOVAL**)

TRANSMISSION CONTROL SWITCH CIRCUIT

DESCRIPTION

When the shift lever is in S and it is moved toward "-" or "+", it is possible to select different shift ranges (1st through 6th ranges).

Moving the shift lever toward "+" increases the shift range by one, and moving the shift lever toward "-" decreases the shift range by one.

WIRING DIAGRAM

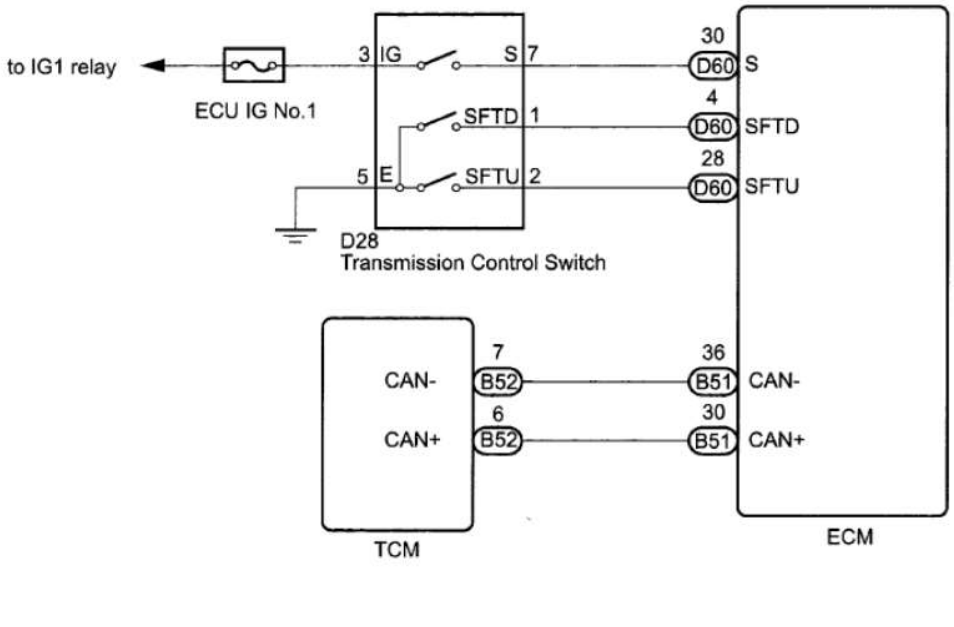


Fig. 93: Transmission Control Switch - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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INSPECTION PROCEDURE

1. **CHECK HARNESS AND CONNECTOR (BATTERY - TRANSMISSION CONTROL SWITCH)**
   a. Disconnect the transmission control switch connector of shift lock control unit assembly.
   b. Measure the voltage according to the value (s) in the table below.

Standard Voltage

VOLTAGE SPECIFICATION

Tester Condition	Condition	Specified Condition
D28-3 (IG) - Body ground or other terminals	Ignition switch ON	11 to 14 V
	Ignition switch off	Below 1 V

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

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

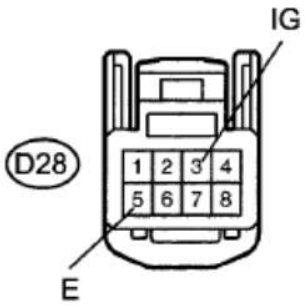


Fig. 94: Identifying D28 Transmission Control Switch Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

2. **CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL SWITCH - BODY GROUND)**
   a. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
D28-5 (E) - Body ground or other terminals	Always	Below 1 ohms

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NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

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

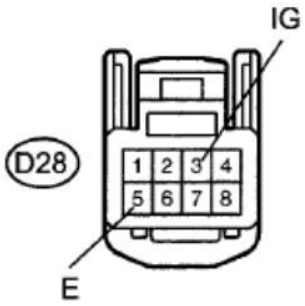


Fig. 95: Identifying D28 Transmission Control Switch Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

3. **INSPECT SHIFT LOCK CONTROL UNIT ASSEMBLY (TRANSMISSION CONTROL SWITCH)**
   a. Measure the resistance between each terminal of the transmission control switch when the shift lever is moved to each position.

Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
3 (IG) - 7 (S)	Shift lever in S, "+" or "-"	Below 1 ohms
	Shift lever not in S, "+" or "-"	10 kohms or higher
2 (SFTU) - 5 (E)	Shift lever held in "+" (Up-shift)	Below 1 ohms
	Shift lever not held in "+"	10 kohms or higher
1 (SFTD) - 5 (E)	Shift lever held in "-" (Down-shift)	Below 1 ohms
	Shift lever not held in "-"	10 kohms or higher

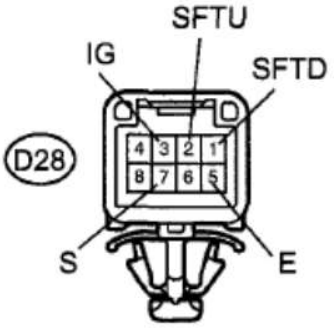
NG: REPLACE SHIFT LOCK CONTROL UNIT ASSEMBLY (TRANSMISSION CONTROL SWITCH) (See **ON-VEHICLE INSPECTION**)

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Component without harness connected:
(Transmission Control Switch)



C168599E07

Fig. 96: Inspecting Shift Lock Control Unit Assembly (Transmission Control Switch)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

4. **CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL SWITCH - ECM)**
   a. Connect the transmission control switch connector.
   b. Disconnect the ECM connector.
   c. Turn the ignition switch to ON.
   d. Measure the voltage according to the value (s) in the table below.

Standard Voltage

VOLTAGE SPECIFICATION

Tester Connection	Condition	Specified Condition
A60-30 (S) - Body ground or other terminals	• Ignition switch ON • Shift lever in S, "+" or "-"	11 to 14 V
A60-30 (S) - Body ground or other terminals	• Ignition switch ON • Shift lever not in S, "+" or "-"	Below 1 V

   e. Turn the ignition switch off.
   f. Disconnect the spiral cable connector.
   g. Measure the resistance according to the value (s) in the table below.

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Rear view of wire harness connector
(to ECM)

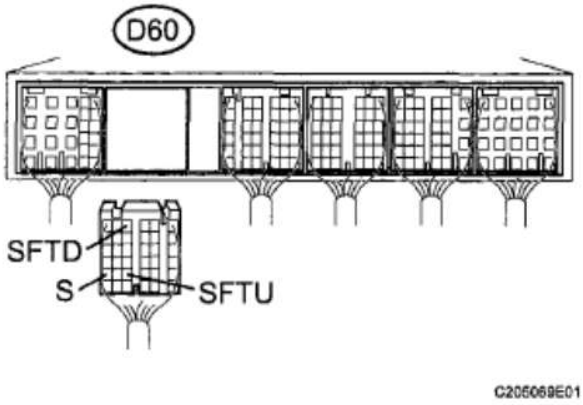


Fig. 97: Identifying D60 Transmission Control Switch Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
D60-28 (SFTU) - Body ground or other terminals	Shift lever held in "+" (Up-shift)	Below 1 ohms
	Shift lever not held in "+"	10 kohms or higher
D60-4 (SFTD) - Body ground or other terminals	Shift lever held in "-" (Down-shift)	Below 1 ohms
	Shift lever not held in "-"	10 kohms or higher

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

OK: PROCEED TO NEXT SUSPECTED AREA SHOWN IN PROBLEM SYMPTOMS TABLE
(See **PROBLEM SYMPTOMS TABLE**)

ECU POWER SOURCE CIRCUIT

DESCRIPTION

When the ignition switch is turned to ON, voltage from the ECM's MREL terminal is applied to the EFI MAIN relay. This causes the contacts of the EFI MAIN relay to close, which supplies power to terminal +B of the TCM.

WIRING DIAGRAM

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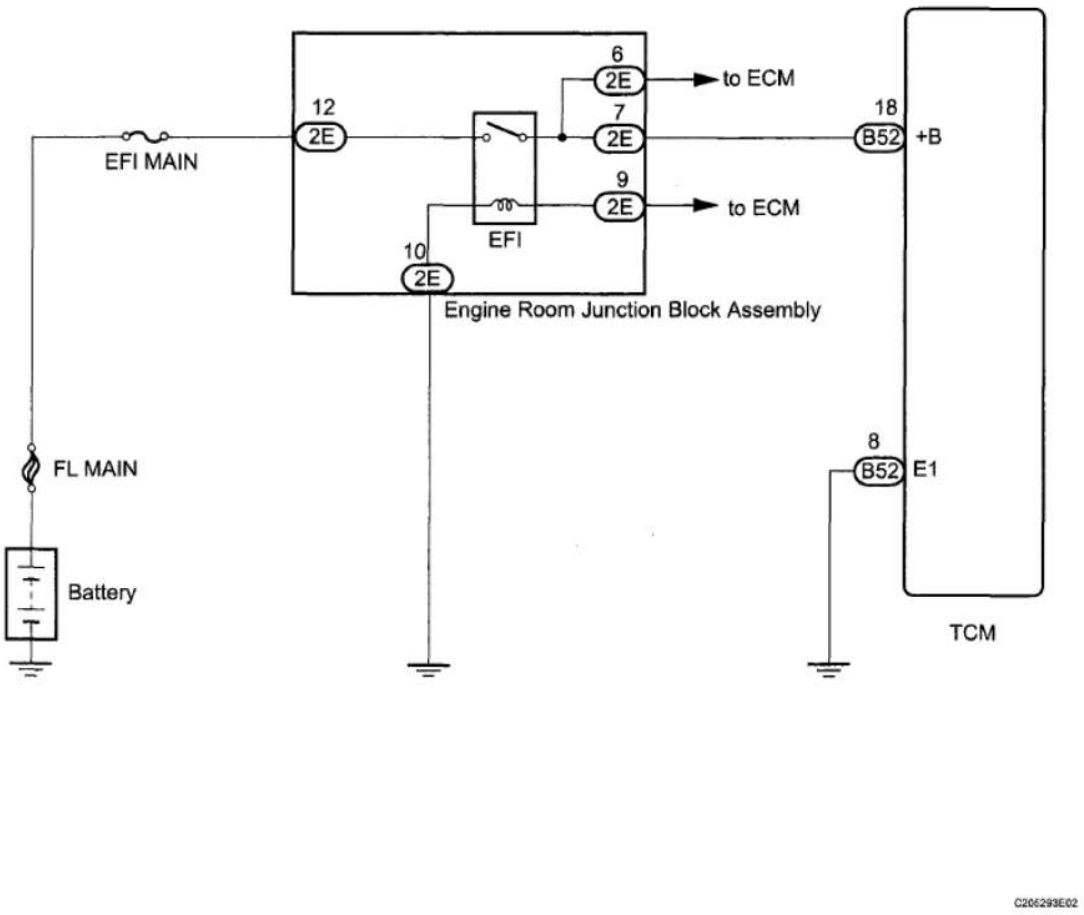


Fig. 98: Engine Room Junction Block Assembly - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

1. **CHECK HARNESS AND CONNECTOR (TCM - BODY GROUND)**
   a. Turn the ignition switch off.
   b. Disconnect the TCM connectors.
   c. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
B52-8 (E1) - Body ground	Always	Below 1 ohms

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

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Front view of wire harness connector
(to TCM)

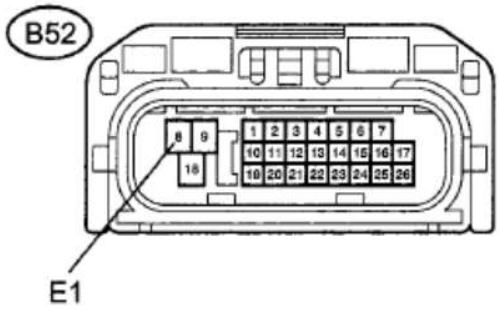


Fig. 99: Identifying B52 TCM Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to next step

2. **INSPECT ECU TERMINAL VOLTAGE (+B TERMINAL)**
   a. Disconnect the TCM connectors.
   b. Turn the ignition switch to ON.
   c. Measure the voltage according to the value (s) in the table below.

Standard Voltage

VOLTAGE SPECIFICATION

Tester Connection	Switch Condition	Specified Condition
B52-18 (+B) - Body ground	Ignition switch ON	11 to 14 V

NG: Go to step 3

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Front view of wire harness connector
(to TCM)

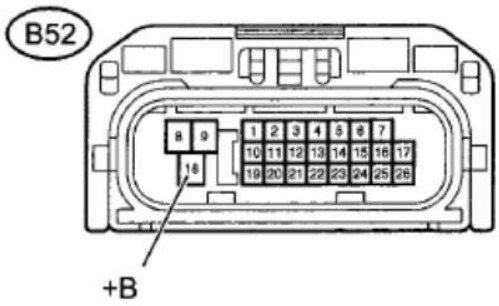


Fig. 100: Identifying B52 TCM Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: PROCEED TO NEXT SUSPECTED AREA SHOWN IN PROBLEM SYMPTOMS TABLE
(See **PROBLEM SYMPTOMS TABLE**)

3. **CHECK HARNESS AND CONNECTOR (TCM - ENGINE ROOM JUNCTION BLOCK ASSEMBLY)**
   a. Turn the ignition switch off.
   b. Disconnect the TCM connector.
   c. Remove the engine room junction block assembly from the engine room relay block.
   d. Measure the resistance according to the value (s) in the table below.

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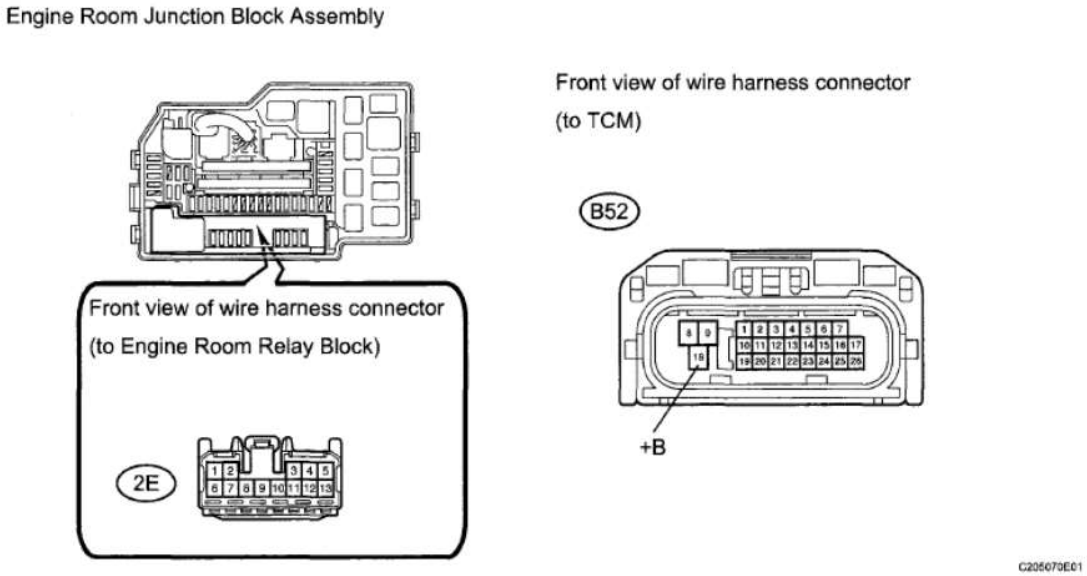


Fig. 101: Identifying Engine Room Junction Block Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard Resistance (Check for Open)

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
B52-18 (+B) - 2E-7	Always	Below 1 ohms

Standard Resistance (Check for Short)

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
B52-18 (+B) or 2E-7-Body ground	Always	10 kohms or higher

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

OK: GO TO ECM POWER SOURCE CIRCUIT (ENGINE CONTROL SYSTEM/SFI SYSTEM)
(See **ECM POWER SOURCE CIRCUIT**)

AUTOMATIC TRANSAXLE FLUID

ADJUSTMENT

1. **PRECAUTIONS AND WORK DESCRIPTION**
   a. The U760E automatic transaxle does not have an oil filler tube and oil level gauge. When adding fluid, add fluid through the refill hole on the transaxle case. The fluid level can be adjusted by draining excess fluid (allowing excess fluid to overflow) through the overflow tube of the oil pan.

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HINT:

"Overflow" indicates the condition under which fluid comes out of the overflow plug hole.

b. Before adjusting the fluid level, add the specified amount of fluid when the engine is cold and warm up the engine to circulate the fluid in the transaxle. Ensure that the fluid temperature is as specified and the engine is idling.

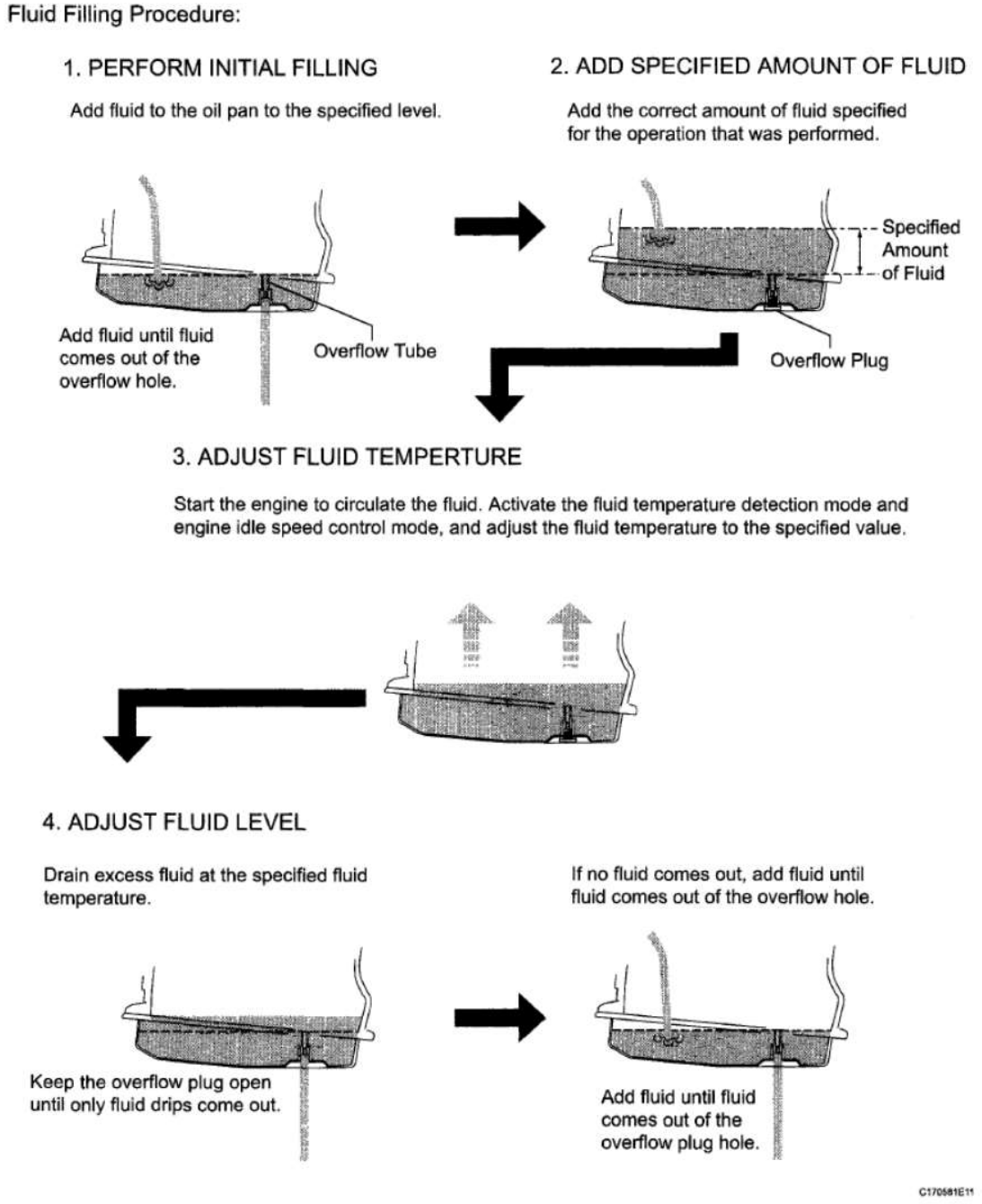


Fig. 102: Fluid Filling Procedure Chart

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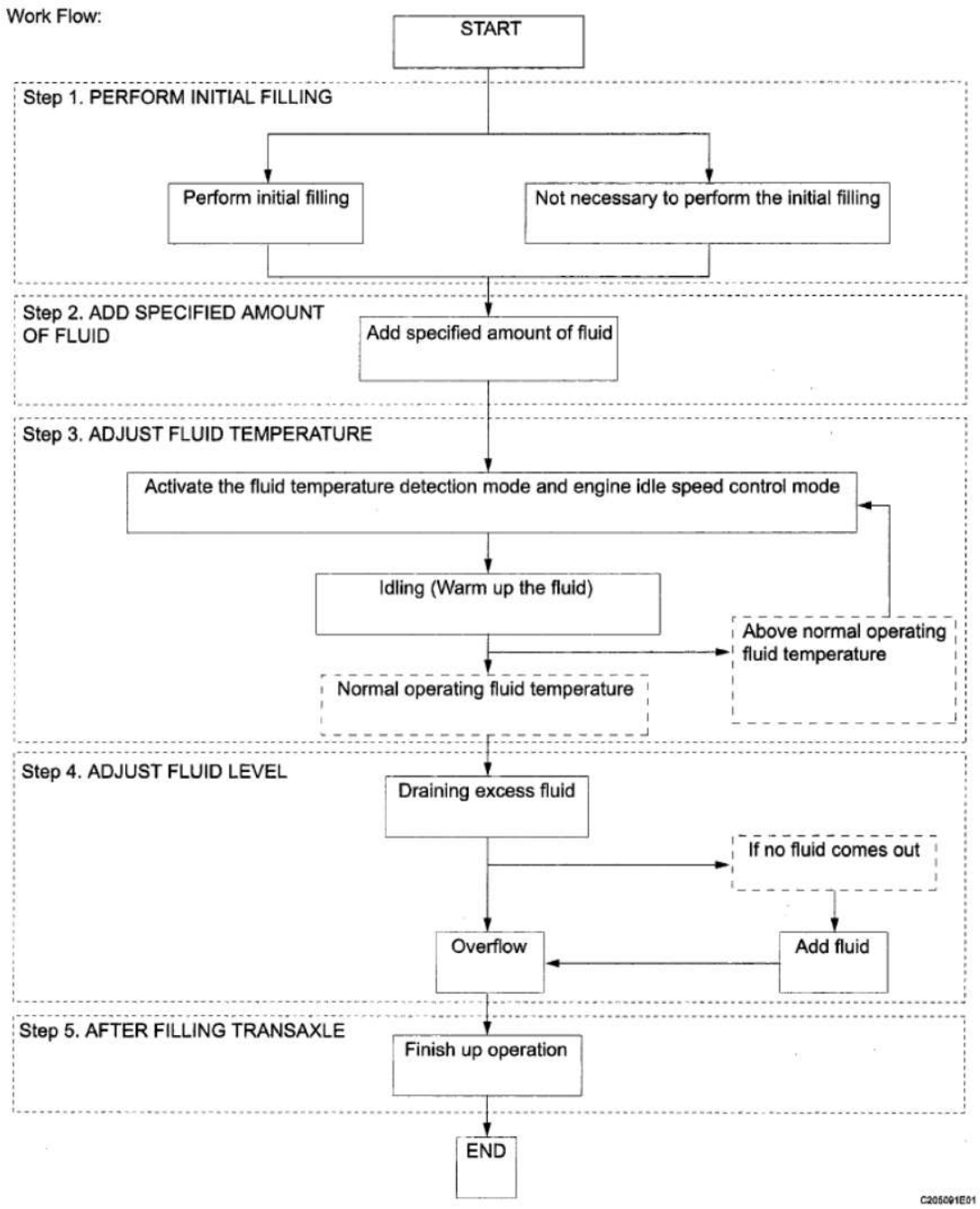
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. The U760E automatic transaxle requires Toyota Genuine ATF WS.

d. The adjustment should be performed according to the procedures and notes.

2. **WORK FLOW**

a. The adjustment should be performed according to the procedures referenced in the work flow below.



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Fig. 103: Automatic Transaxle Work Flow Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **BEFORE FILLING TRANSAXLE WITH FLUID**
   a. Lift the vehicle.

NOTE: **Set the vehicle on a lift so that the vehicle is kept level when it is lifted up.**

   b. Remove the front fender liner LH and front fender apron seal LH.

4. **PERFORM INITIAL FILLING**

NOTE: **If the transaxle is hot (ATF temperature is high), wait until the fluid temperature becomes the same as the ambient temperature before starting the following procedure. (Recommended ATF temperature: around 20°C [68°F])**

   a. Remove the refill plug and gasket from the automatic transaxle.

NOTE: **After performing any of the following operations, it is not necessary to perform the initial filling procedure. Proceed to the next "ADD SPECIFIED AMOUNT OF FLUID" procedure.**

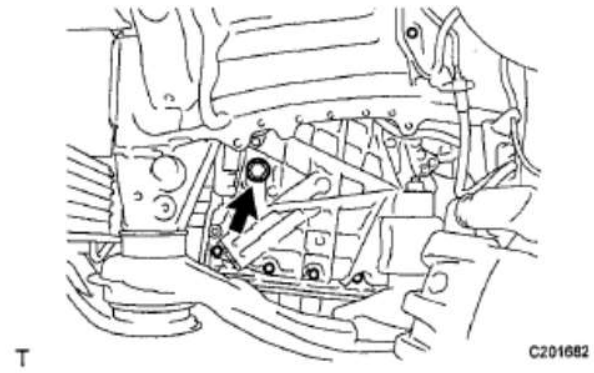


Fig. 104: Locating Refill Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

FLUID AMOUNT REFERENCE

Operation that does not require initial filling
• Disconnection of the oil cooler tube or oil cooler hose • Repair of fluid leakage due to a loose case plug, or a faulty plug gasket or Citing • Replacement of a new transaxle with torque converter (filled fluid parts)

   b. Using a 6 mm hexagon socket wrench, remove the overflow plug and gasket from the automatic

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transaxle.

NOTE:

- **If ATF comes out after removing the overflow plug, wait until the fluid flow slows and only drips come out.**
- **If ATF comes out, it is not necessary to perform the initial filling procedure. After checking the tightening torque of the overflow tube, temporarily tighten the overflow plug.**

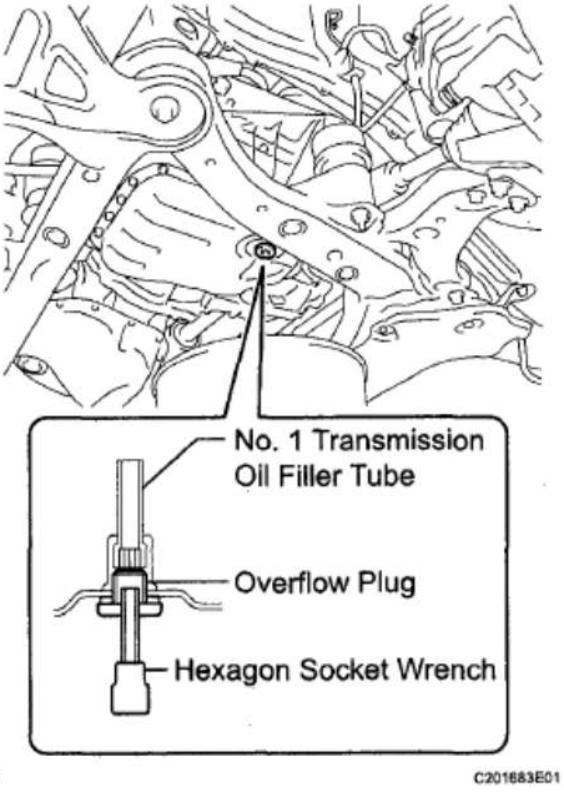


Fig. 105: Identifying No.1 Transmission Oil Filler Tube Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Using a 6 mm hexagon socket wrench, check that the overflow tube is tightened to the specified torque.

Torque: 0.8 N*m (8 kgf*cm, 7 in.*lbf)

NOTE: **If the transmission overflow tube is not tightened to the specified torque, the amount of fluid cannot be precisely adjusted.**

HINT:

To check the torque of the overflow tube, insert the hexagon socket into the overflow hole.

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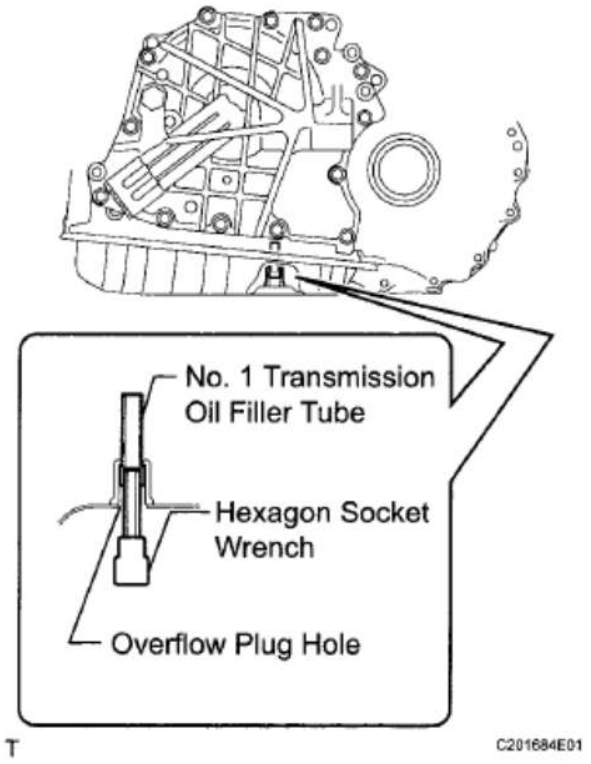


Fig. 106: Identifying No.1 Transmission Oil Filler Tube Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Perform initial filling.
   1. Fill the transaxle through the refill hole until fluid begins to trickle out of the overflow plug hole.

NOTE: Use Toyota Genuine ATF WS.

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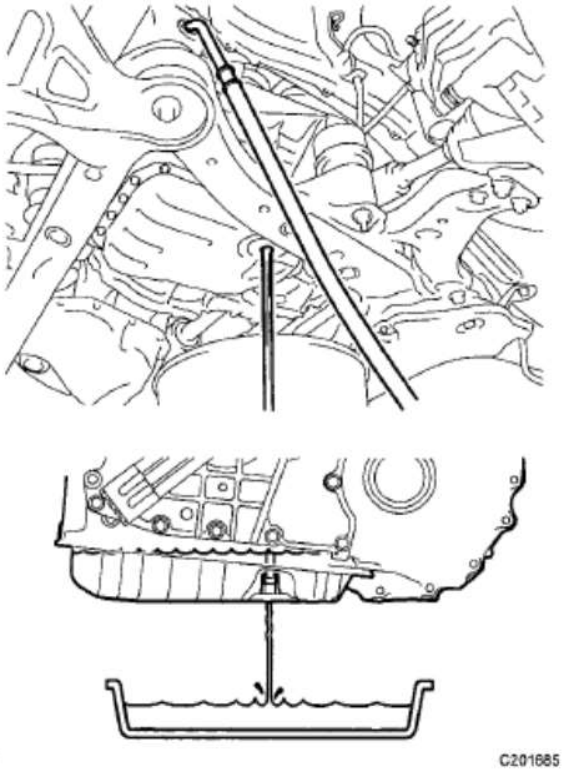


Fig. 107: Filling Transmission Oil
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Wait until the fluid flow slows and only drips come out.

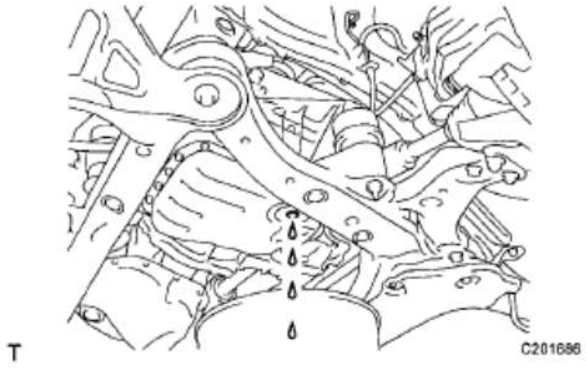


Fig. 108: Identifying Transmission Fluid Flow
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Temporarily install the overflow plug.

HINT:

Reuse the old gasket. The plug will be removed again to adjust the fluid level.

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5. **ADD SPECIFIED AMOUNT OF FLUID**

a. Fill the transaxle with the correct amount of fluid as listed in the table below.

NOTE: Refill amount differs depending on the operation that was performed.

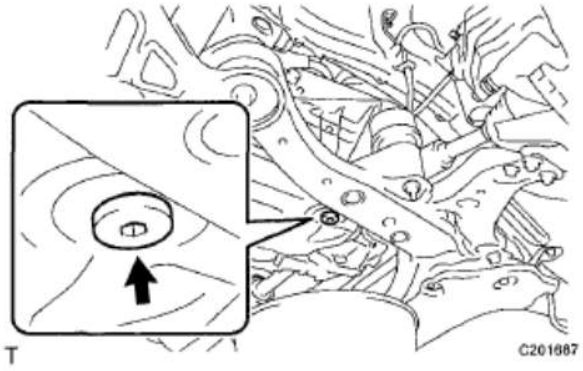


Fig. 109: Locating Overflow Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard capacity

STANDARD CAPACITY REFERENCE

Performed Repair	Fill Amount
• Disconnection of the oil cooler tube or oil cooler hose • Repair of fluid leakage due to a loose case plug, or a faulty plug gasket or O-ring • Replacement of a new transaxle with torque converter (filled fluid parts)	0.5 liters (0.5 US qts, 0.4 Imp. qts)
• Removal & installation of drive shaft • Removal & installation of transaxle case oil seal • Removal & installation of oil pan	2.7 liters (2.9 US qts, 2.4 Imp. qts)
Removal & installation of valve body	3.2 liters (3.4 US qts, 2.8 Imp. qts)
Removal & installation of transaxle (remove torque converter)	3.4 liters (3.6 US qts, 3.0 Imp. qts)
Replacement of transaxle (torque converter new)	5.1 liters (5.4 US qts, 4.5 Imp. qts)
Replacement of transaxle (torque converter reused)	3.5 liters (3.7 US qts, 3.1 Imp. qts)

b. Temporarily install the refill plug to avoid fluid splash.

HINT:

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Reuse the old gasket. The plug will be removed again to adjust the fluid level.

c. Lower the vehicle.

6. **ADJUST FLUID TEMPERATURE**

a. When using the Techstream:

HINT:

The actual ATF temperature can be checked on the data list using the Techstream.

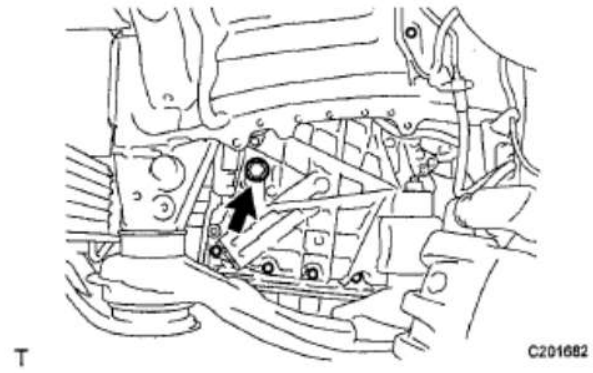


Fig. 110: Locating Refill Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. Connect the Techstream to the DLC3 with the ignition switch off.
2. Turn the ignition switch to ON and turn the Techstream on.

NOTE: Check that electrical systems such as the air conditioning system, audio system and lighting system are off.

3. Enter the following menus: Powertrain/ECT/Active Test/Connect the TC and TE1.
4. Select the date list menu: A/T Oil Temperature 1.
5. Check A/T Oil Temperature 1.

NOTE:

- **If the fluid temperature is below 35°C (95°F), proceed to the next step. (Recommended ATF temperature: 30°C [86°F] or less)**
- **If the fluid temperature is 45°C (113°F) or more, turn the ignition switch off and wait until the fluid temperature drops below 35°C (95°F).**

6. Push the active test menu: Connect the TC and TE1/ON.

HINT:

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The indicator lights on the meter will not blink to indicate a DTC output when "Connect the TC and TE1/ON" is performed.

7. Depress and hold down the brake pedal.
8. Start the engine.
9. Slowly move the shift lever from P to D, then back to P.

HINT:

Slowly move the shift lever to circulate the fluid through each part of the transaxle.

10. While observing the D shift indicator on the combination meter, move the shift lever back and forth between N and D at an interval of 1.5 seconds for 6 seconds or more.

NOTE: Do not pause for more than 1.5 seconds.

HINT:

Performing this operation will cause the vehicle to enter the fluid temperature detection mode.

11. Check that the D shift indicator comes on for 2 seconds.

HINT:

- When the fluid temperature detection mode is activated, the D shift indicator on the combination meter comes on for 2 seconds.
- If the D shift indicator does not come on for 2 seconds, return to the step where terminal TC is first turned on and perform the procedure again.

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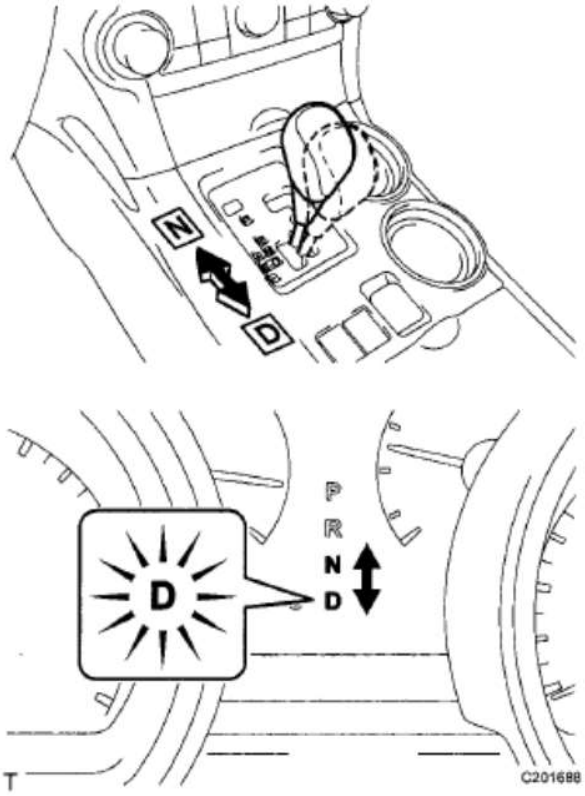


Fig. 111: Checking D Shift Indicator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. Move the shift lever from N to P.
13. Release the brake pedal.
14. Push the active test menu: TC and TE1/ OFF.

NOTE: Be sure to turn terminals TC and TE1 off. If the terminals are on, the fluid level cannot be precisely adjusted due to fluctuations in idle speed.

HINT:

- Turning terminals TC and TE1 off activates the engine idle speed control mode.
- In the engine idle speed control mode, engine idle speed control starts when the fluid temperature becomes 35°C (95°F) or more and the engine speed is maintained at approximately 800 rpm.
- Even after terminals TC and TE1 are turned off, the fluid temperature detection mode is active until the ignition switch is turned off.

15. Warm up the engine with the engine idling until the fluid temperature reaches the normal operating temperature (35 to 45°C [95 to 113°F)).

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TEMPERATURE SPECIFICATION

Below Normal Operating Temperature	Normal Operating Temperature	Above Normal Operating Temperature
35°C or less (95°F or less)	35 to 45°C (95 to 113°F)	45°C or more (113°F or more)

NOTE:

- **If the fluid temperature is within the normal operating temperature range, immediately proceed to the "ADJUST FLUID LEVEL" procedure.**
- **If the fluid temperature is 45°C (113°F) or more, stop the engine and wait until the fluid temperature drops to 35°C (95°F) or less. Then perform the "ADJUST FLUID TEMPERATURE" procedure again from the beginning.**

HINT:

In the fluid temperature detection mode, the D shift indicator comes on, goes off, or blinks depending on the fluid temperature.

D shift indicator

TEMPERATURE SPECIFICATION

Below Normal Operating Temperature (35°C or less) (95°F or less)	Normal Operating Temperature (35 to 45°C) (95 to 113°F)	Above Normal Operating Temperature (45°C or more) (113°F or more)
OFF	ON	Blinks

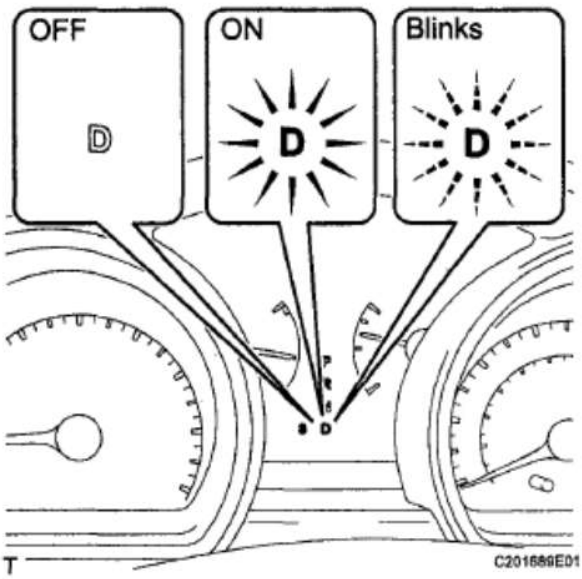


Fig. 112: Identifying D Shift Indicator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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b. When not using the Techstream:

1. Using SST, connect terminals 13 (TC) and 4 (CG) of the DLC3 with the ignition switch off.

   SST 09843-18040

2. Depress and hold down the brake pedal.
3. Start the engine.

   NOTE: Check that electrical systems such as the air conditioning system, audio system and lighting system are off.

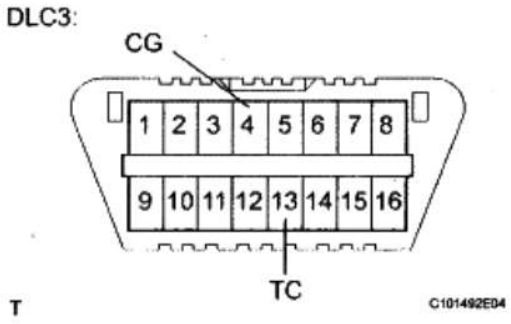


Fig. 113: Identifying DLC3 Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Indicator lights of the meter do the DTC output blinking when terminals TC and CG are connected.

4. Slowly move the shift lever from P to D, then back to P.

   HINT:

   Slowly move the shift lever to circulate the fluid through each part of the transaxle.

5. While observing the D shift indicator on the combination meter, move the shift lever back and forth between N and D at an interval of 1.5 seconds for 6 seconds or more.

   NOTE: Do not pause for more than 1.5 seconds.

   HINT:

   Performing this operation will cause the vehicle to enter the fluid temperature detection mode.

6. Check that the D shift indicator comes on for 2 seconds.

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HINT:

- When the fluid temperature detection mode is activated, the D shift indicator on the combination meter comes on for 2 seconds.
- If the D shift indicator does not come on for 2 seconds, return to the step where terminal TC is first turned on and perform the procedure again.

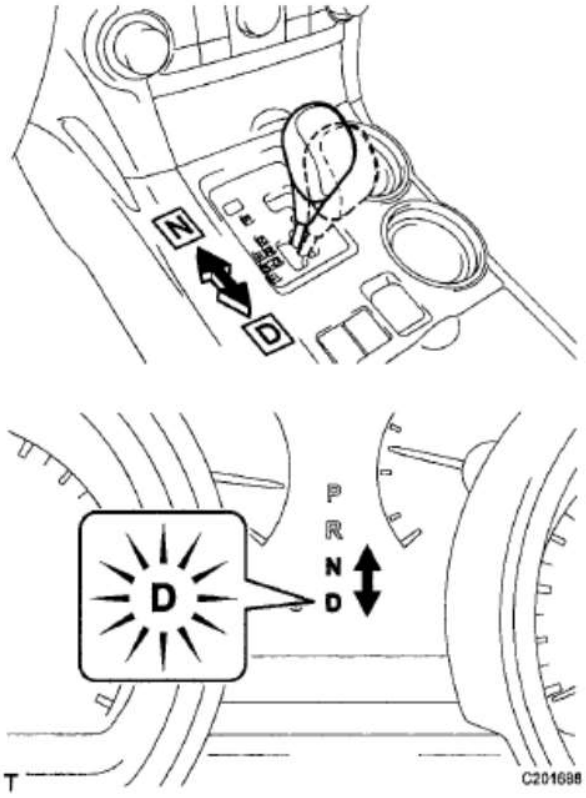


Fig. 114: Checking D Shift Indicator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. Move the shift lever from N to P.
8. Release the brake pedal.
9. Remove SST from terminals 13 (TC) and 4 (CG).

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NOTE: Be sure that terminals TC and CG are not connected. If the terminals are connected, the fluid level cannot be precisely adjusted due to fluctuations in engine speed.

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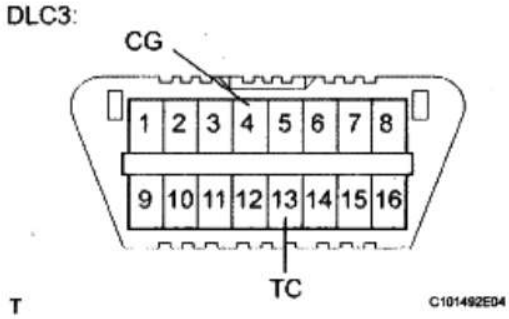


Fig. 115: Identifying DLC3 Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

- When terminals TC and CG are disconnected, the engine idle control mode is activated.
- In the engine idle speed control mode, engine idle speed control starts when the fluid temperature becomes 35°C (95°F) or more and the engine speed is maintained at approximately 800 rpm.
- Even after terminals TC and CG are disconnected, the fluid temperature detection mode is active until the ignition switch is turned off.

10. Allow the engine to idle until the D shift indicator comes on again.

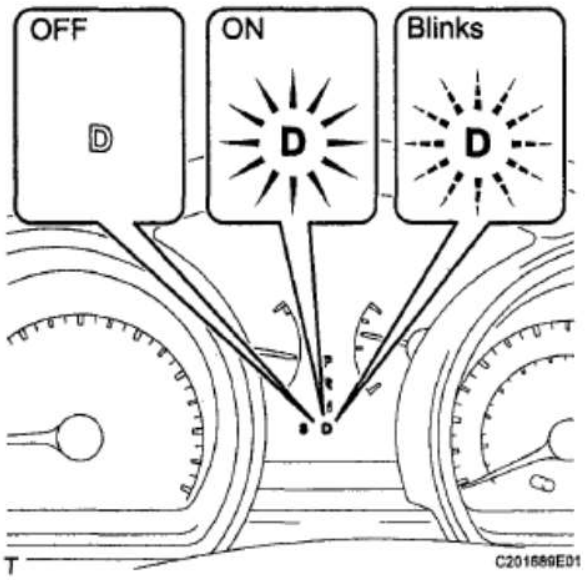


Fig. 116: Identifying D Shift Indicator Comes
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D shift indicator

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TEMPERATURE SPECIFICATION

Below Normal Operating Temperature (35°C or less) (95°F or less)	Normal Operating Temperature (35 to 45°C) (95 to 113°F)	Above Normal Operating Temperature (45°C or more) (113°F or more)
OFF	ON	Blinks

NOTE:

- **If the D shift indicator is on, immediately proceed to the "ADJUST FLUID LEVEL" procedure.**
- **If the D shift indicator blinks, stop the engine and wait until the fluid temperature drops to 35°C (95°F) or less (the indicator goes off). Then perform the "ADJUST FLUID TEMPERATURE" procedure again from the beginning.**

HINT:

- In the fluid temperature detection mode, the D shift indicator comes on, goes off, or blinks depending on the fluid temperature.
- Fluid filling procedure should be performed when the D shift indicator is on (the fluid temperature is within the normal operating temperature range).

7. **ADJUST FLUID LEVEL**

CAUTION: Use caution as the engine is running and the radiator fan is operating during the following procedure.

a. Lift the vehicle.

b. Adjust fluid level

1. Using a 6 mm hexagon socket wrench, remove the overflow plug and gasket.

CAUTION: Be careful as the fluid coming out of the overflow hole is hot.

2. Check the amount of fluid that comes out of the overflow plug hole.

NOTE: If only a small amount of fluid (approximately 1 cc) comes out of the overflow hole, then only fluid remaining in the overflow tube has come out. This condition is not considered as overflow, so it is necessary to add fluid.

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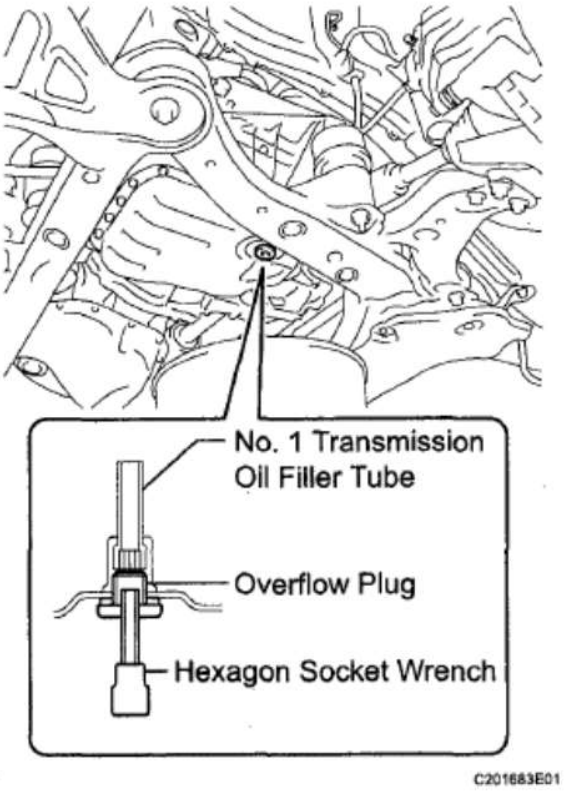


Fig. 117: Identifying No.1 Transmission Oil Filler Tube Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. If the amount of fluid that comes out of the overflow hole is large, wait until the fluid flow slows and only drips come out.

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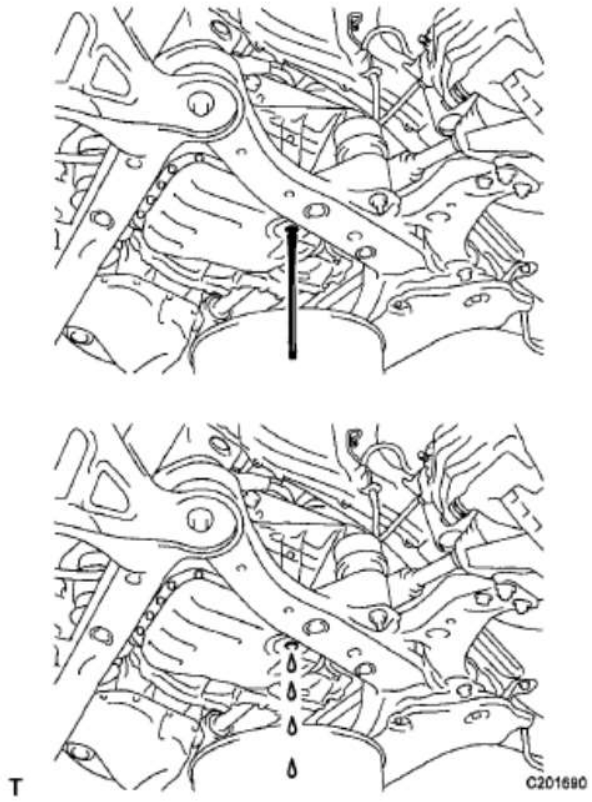


Fig. 118: Draining Transaxle Oil
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. If no fluid comes out of the overflow hole, remove the refill plug and gasket. Then add transaxle fluid through the refill hole until fluid comes out of the overflow hole. Wait until the fluid flow slows and only drips come out.

NOTE: Use Toyota Genuine ATF WS.

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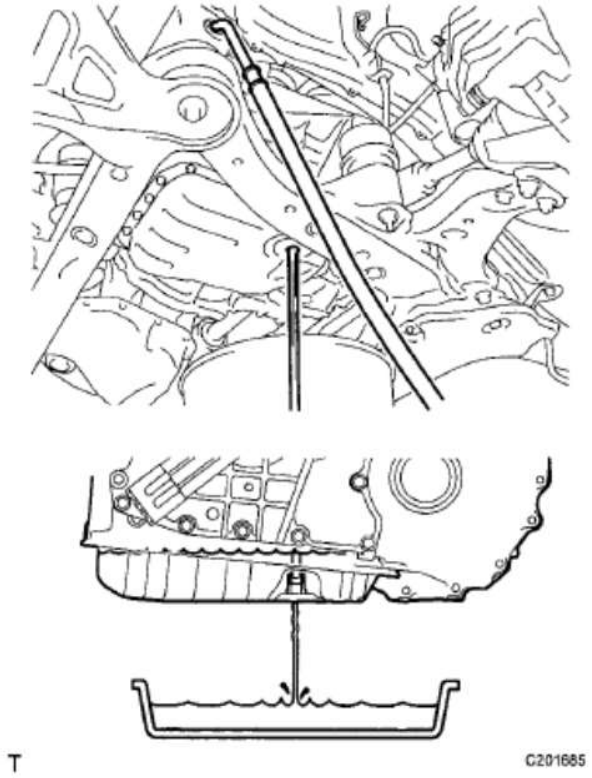


Fig. 119: Filling Transmission Oil
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. Check that the fluid flow has slowed and only drips come out.

   HINT:

   The fluid flow will not completely stop because the fluid expands as its temperature increases.

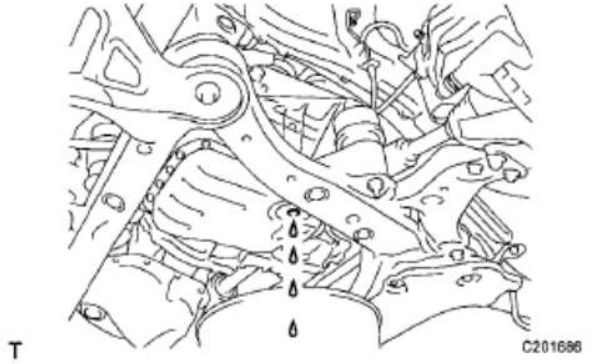


Fig. 120: Identifying Transmission Fluid Flow
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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c. Install the overflow plug with a new gasket.

Torque: 40 N*m (408 kgf*cm, 30 ft.*lbf)

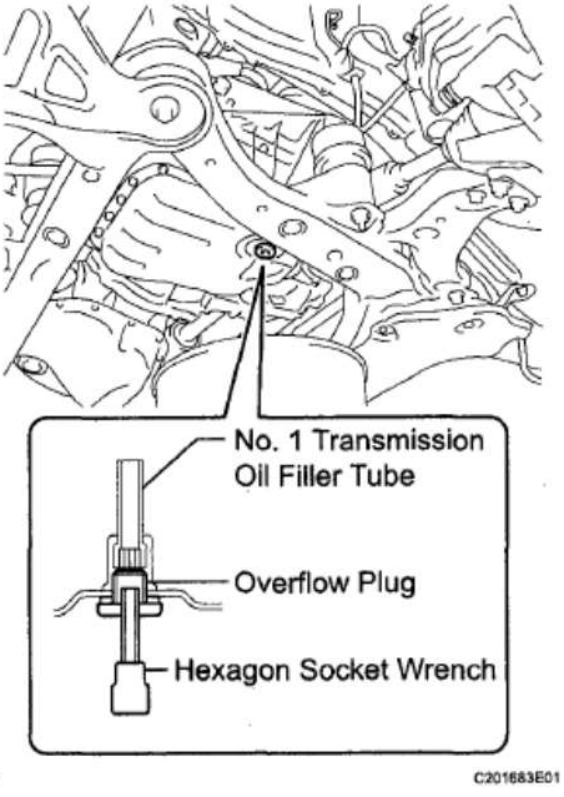


Fig. 121: Identifying No.1 Transmission Oil Filler Tube Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Install the refill plug with a new gasket.

Torque: 49 N*m (500 kgf*cm, 36 ft.*lbf)

e. Lower the vehicle.
f. Turn the ignition switch off.

HINT:

Turning the ignition switch off exits the fluid temperature detection mode.

g. Remove the Techstream from the DLC3 (when using the Techstream).

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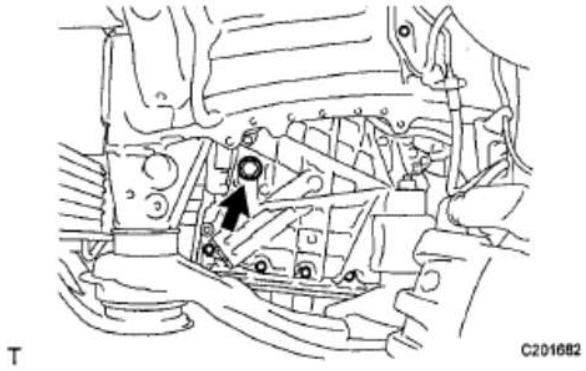


Fig. 122: Locating Refill Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **AFTER FILLING TRANSAXLE**
   a. Lift the vehicle.
   b. Clean each part.
   c. Check for fluid leaks.
   d. Install the front fender liner LH and front fender apron seal LH.
   e. Lower the vehicle.

SPEED SENSOR

COMPONENTS

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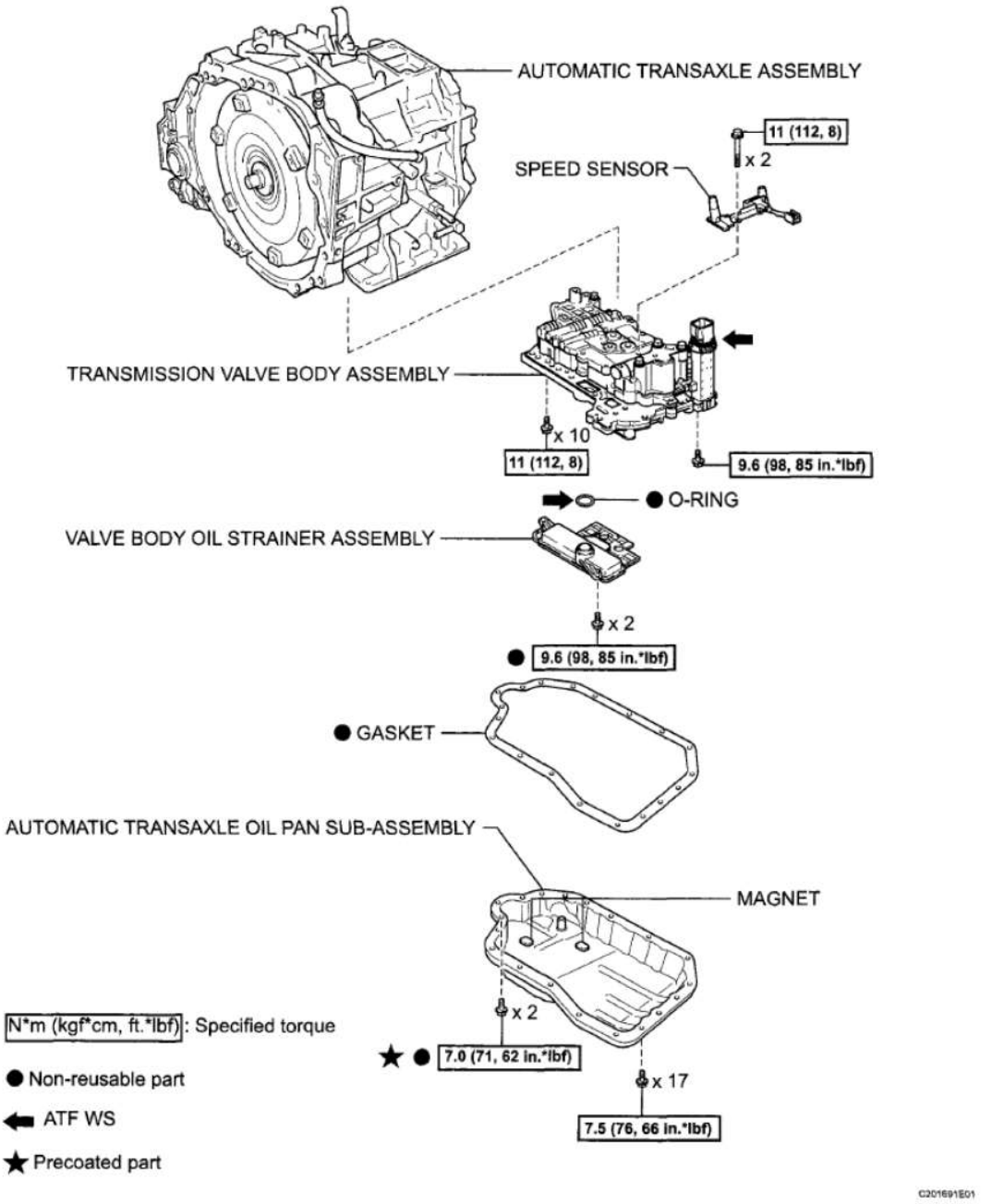


Fig. 123: Identifying Automatic Transaxle Assembly And Components With Torque Specification
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **REMOVE AUTOMATIC TRANSAXLE ASSEMBLY**

   HINT:

   See **REMOVAL**

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2. **REMOVE AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY** (See **REMOVAL**)
3. **REMOVE VALVE BODY OIL STRAINER ASSEMBLY** (See **REMOVAL**)
4. **REMOVE TRANSMISSION VALVE BODY ASSEMBLY** (See **INSTALLATION**)
5. **REMOVE SPEED SENSOR**
   a. Disconnect the connector.
   b. Remove the 2 bolts and speed sensor from the valve body.

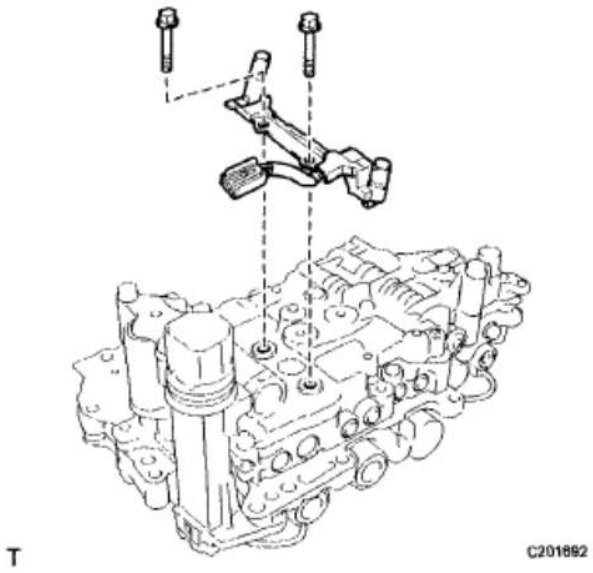


Fig. 124: Identifying Speed Sensor Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. **INSTALL SPEED SENSOR**
   a. Install the speed sensor to the valve body with the 2 bolts.

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

   b. Connect the connector.
2. **INSTALL TRANSMISSION VALVE BODY ASSEMBLY** (See **INSTALLATION**)
3. **INSTALL VALVE BODY OIL STRAINER ASSEMBLY** (See **AIR COOLED OIL COOLER**)
4. **INSTALL AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY** (See **AIR COOLED OIL COOLER**)

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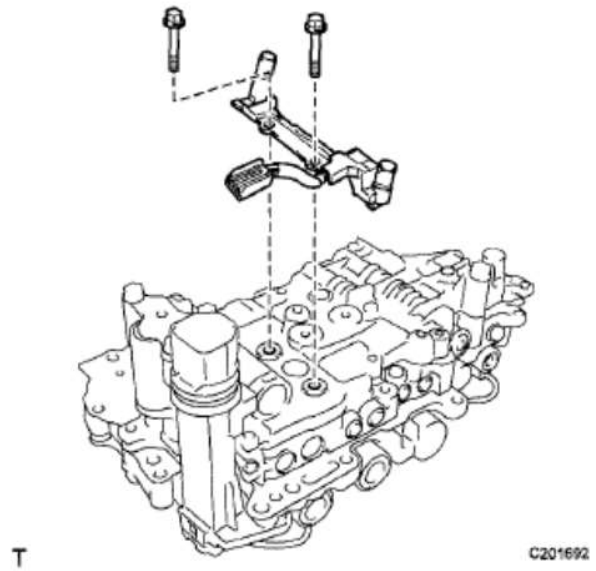


Fig. 125: Identifying Valve Body Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **INSTALL AUTOMATIC TRANSAXLE ASSEMBLY**

HINT:

See **INSTALLATION**

PARK/NEUTRAL POSITION SWITCH

COMPONENTS

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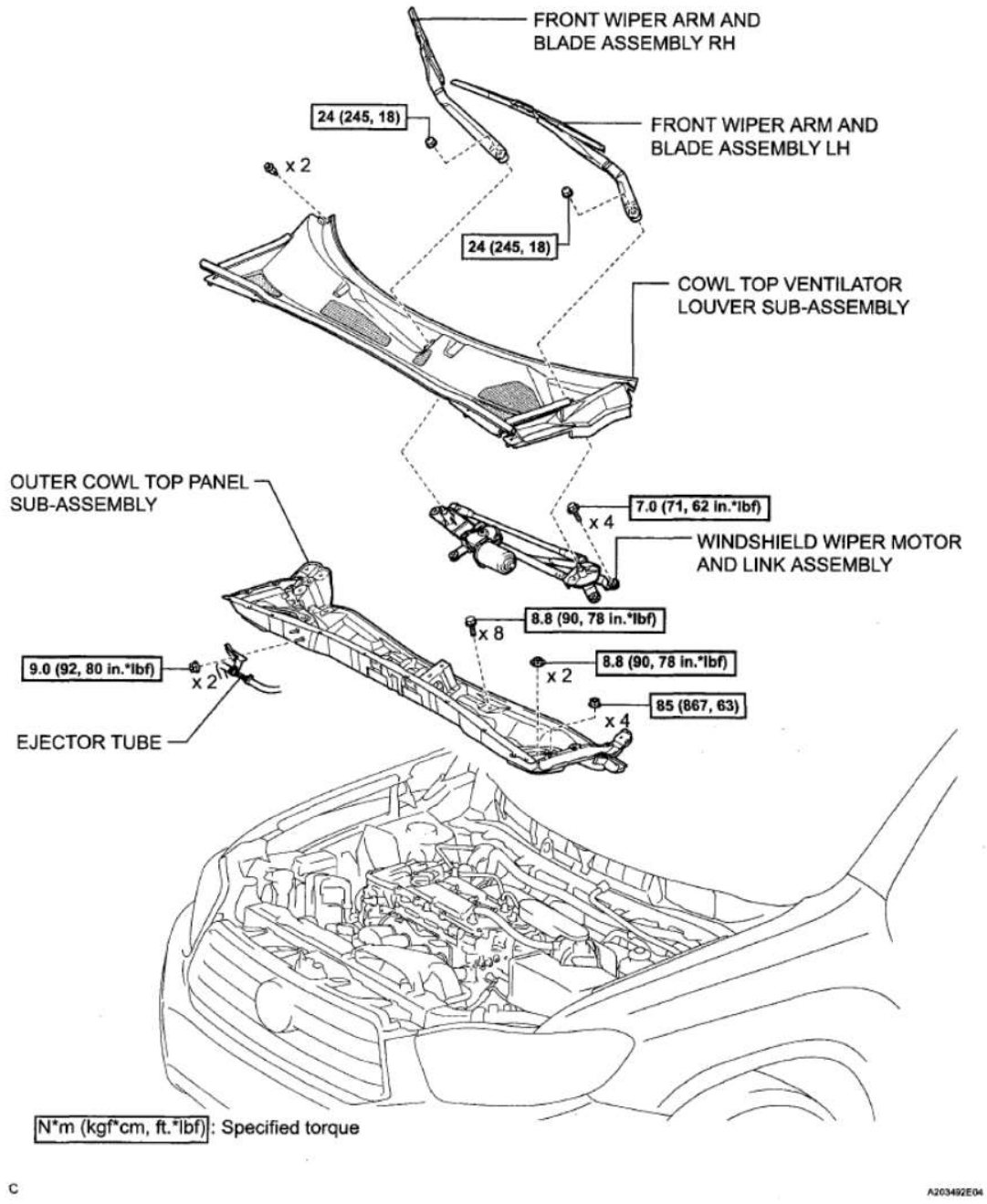


Fig. 126: Identifying Park/Neutral Position Switch Components With Torque Specification (1 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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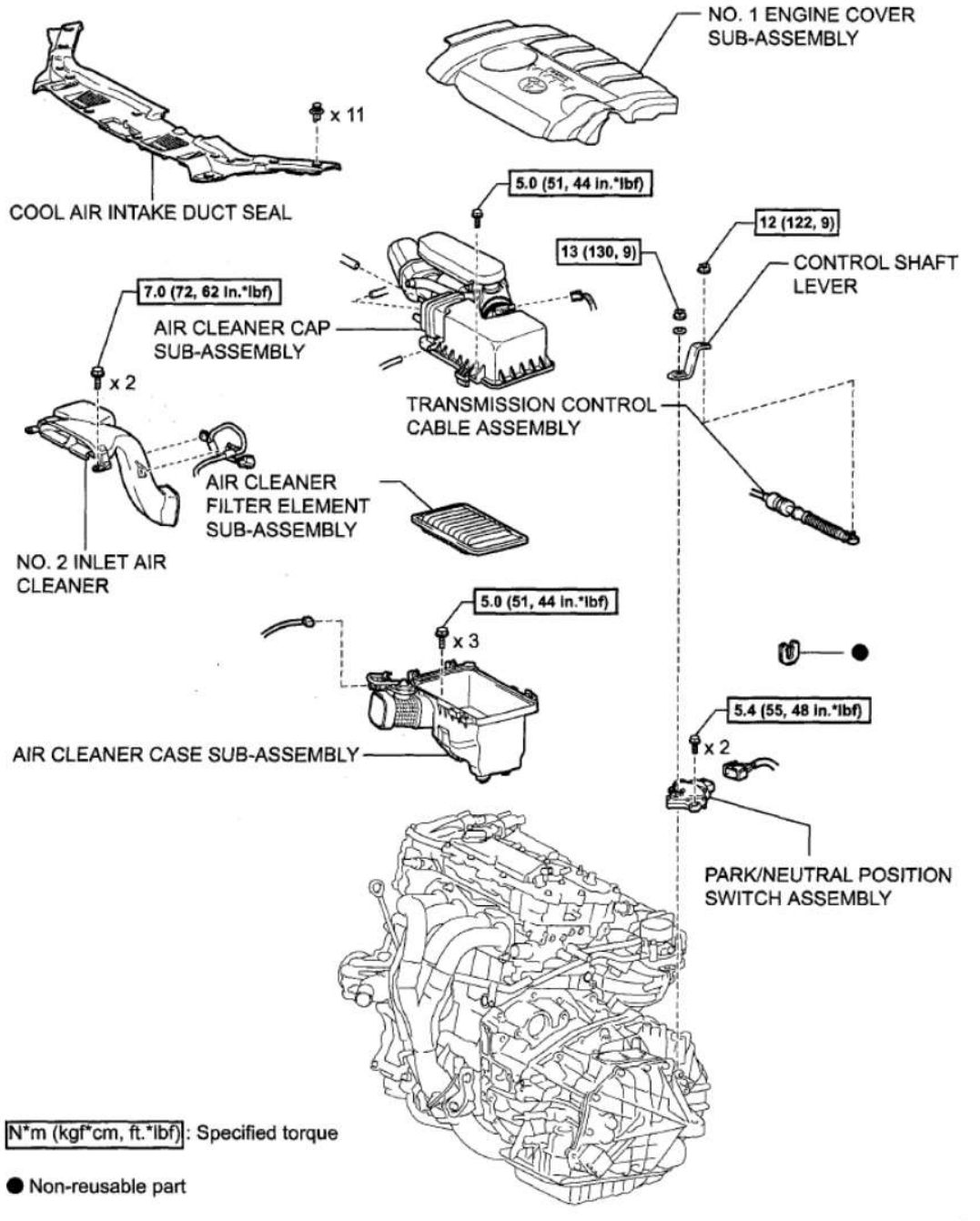


Fig. 127: Identifying Park/Neutral Position Switch Components With Torque Specification (2 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ON-VEHICLE INSPECTION

1. **INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY OPERATION**
   a. Apply the parking brake.
   b. Turn the ignition switch to ON.

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c. Depress the brake pedal and check that the engine starts when the shift lever is in N or P, but does not start in other positions.

d. Check that the back-up light comes on when the shift lever is moved to R, but the light does not operate in other positions. If the operation cannot be done as specified, check the park/neutral position switch for continuity.

REMOVAL

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

NOTE: When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).

2. **REMOVE COOL AIR INTAKE DUCT SEAL** (See **REMOVAL**)
3. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See **REMOVAL**)
4. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See **REMOVAL**)
5. **REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See **REMOVAL**)
6. **REMOVE WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See **REMOVAL**)
7. **SEPARATE EJECTOR TUBE** (See **REMOVAL**)
8. **REMOVE OUTER COWL TOP PANEL SUB-ASSEMBLY** (See **REMOVAL**)
9. **REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY** (See **REMOVAL**)
10. **REMOVE NO. 2 INLET AIR CLEANER** (See **REMOVAL**)
11. **REMOVE AIR CLEANER CAP SUB-ASSEMBLY** (See **REMOVAL**)
12. **REMOVE AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY** (See **REMOVAL**)
13. **REMOVE AIR CLEANER CASE SUB-ASSEMBLY** (See **REMOVAL**)
14. **REMOVE PARK/NEUTRAL POSITION SWITCH ASSEMBLY**

a. Move the shift lever to N.

b. While expanding the claws of the clip, remove the transmission control cable assembly and clip from the transmission cable bracket.

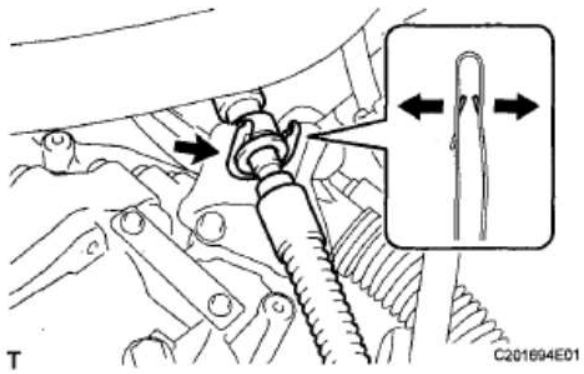


Fig. 128: Removing Transmission Control Cable Assembly

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Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Remove the nut and transmission control cable assembly from the control shaft lever.
d. Disconnect the park/neutral position switch connector and clamp.
e. Remove the clip from the transmission control cable assembly.

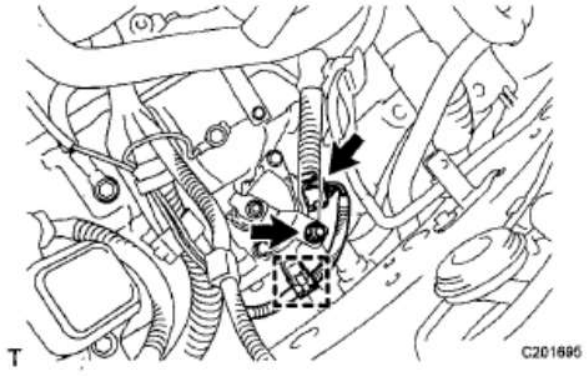


Fig. 129: Locating Park/Neutral Position Switch Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Remove the nut, washer and control shaft lever from the control shaft.

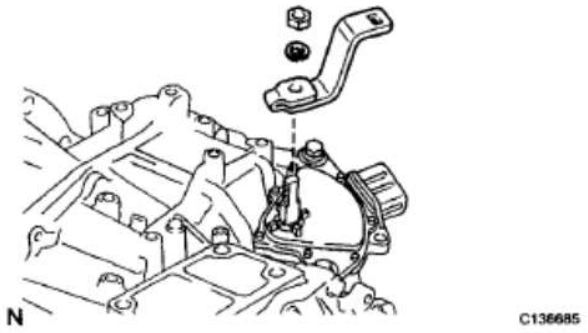


Fig. 130: Identifying Control Shaft Lever, Washer And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Remove the 2 bolts and park/neutral position switch from the control shaft.

NOTE: Before removing the park/neutral position switch, remove any dirt or rust on the installation portion of the control shaft. Be sure to remove the switch straight along the shaft while being careful not to deform the plate spring that supports the shaft. If the plate spring is deformed, the park/neutral position switch cannot be reinstalled correctly.

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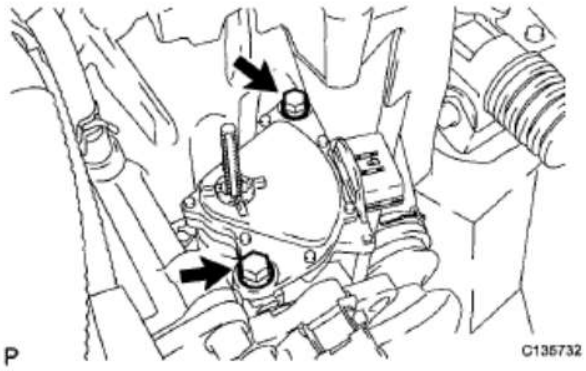


Fig. 131: Locating Park/Neutral Position Switch Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. **INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
   a. Measure the resistance according to the value (s) in the table below when the shift lever is moved to each position.

Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
1 (RB) - 3 (PL) 4 (B) - 9 (L)	P	Below 1 ohms
	Except P	10 kohms or higher
1 (RB) - 2 (RL)	R	Below 1 ohms
	Except R	10 kohms or higher
1 (RB) - 8 (NL) 4 (B) - 9 (L)	N	Below 1 ohms
	Except N	10 kohms or higher
1 (RB) - 7 (DL)	D, S, "+" or "-11	Below 1 ohms
	Except D, S, "+" and "-"	10 kohms or higher

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Component without harness connected:
(Park/Neutral Position Switch)

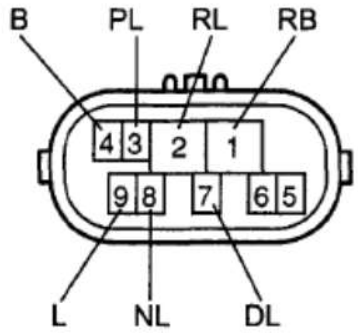


Fig. 132: Identifying Park/Neutral Position Switch Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If the result is not as specified, replace the park/ neutral position switch assembly.

ADJUSTMENT

1. **ADJUST PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
   a. Remove the control shaft lever.

      HINT:

      See the steps from "Disconnect Cable from Negative Battery Terminal" through "Remove Park/ neutral Position Switch Assembly" (See **ON-VEHICLE INSPECTION**).

   b. Loosen the 2 bolts of the park/neutral position switch.

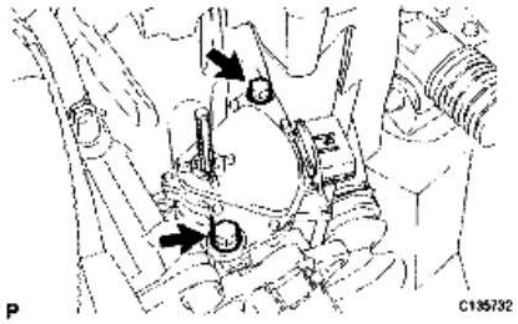


Fig. 133: Identifying Park/Neutral Position Switch Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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c. Align the protrusions of the park/neutral position switch.

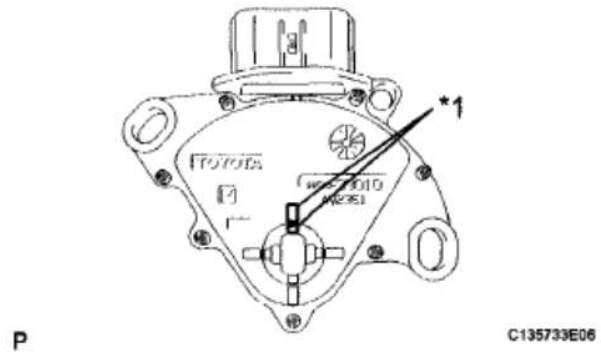


Fig. 134: Aligning Protrusions Of Park/Neutral Position Switch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Hold the park/neutral position switch in position and tighten the 2 bolts.

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

NOTE: After installing the park/neutral position switch, confirm that the 2 protrusions on the switch are aligned.

e. Install the control shaft lever.

HINT:

See the steps from "Install Park/neutral Position Switch Assembly" through "Connect Cable to Negative Battery Terminal" (See **INSTALLATION**).

f. After the adjustment, perform the switch operation check (See **ON-VEHICLE INSPECTION**).

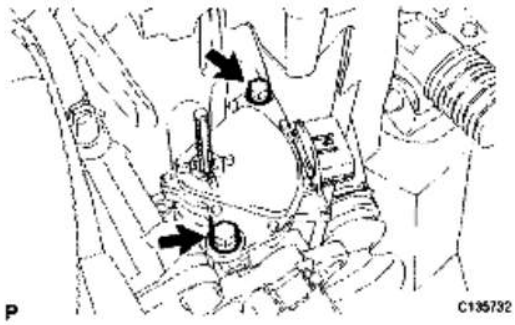


Fig. 135: Identifying Park/Neutral Position Switch Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

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1. **INSTALL PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
   a. Align the protrusions of the park/neutral position switch.

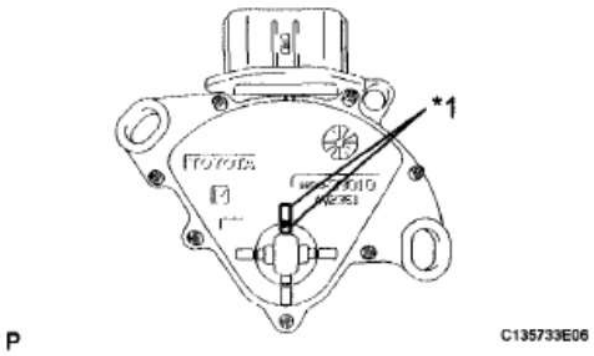


Fig. 136: Aligning Protrusions Of Park/Neutral Position Switch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Install the park/neutral position switch to the control shaft with the 2 bolts.

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

NOTE:

- **Before installing the park/neutral position switch, remove any dirt or rust on the installation portion of the control shaft. Be sure to install the switch straight along the shaft while being careful not to deform the plate spring that supports the shaft. If the plate spring is deformed, the park/neutral position switch cannot be reinstalled correctly.**
- **After installing the park/neutral position switch, confirm that the 2 protrusions on the switch are aligned.**

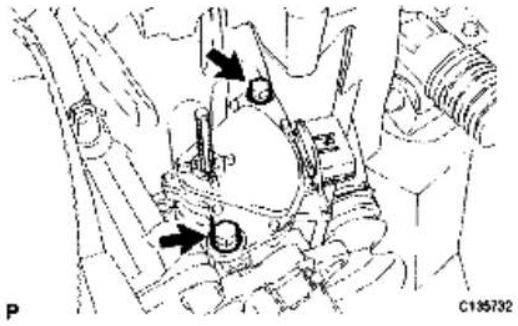


Fig. 137: Identifying Park/Neutral Position Switch Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   c. Install the control shaft lever to the control shaft with the nut and washer.

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

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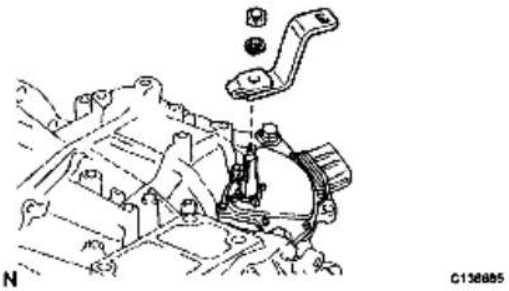


Fig. 138: Identifying Control Shaft Lever
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Connect the park/neutral position switch connector and clamp.
e. Connect the transmission control cable assembly to the control shaft lever with the nut.

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

NOTE: Before connecting the transmission control cable assembly, check that the park/neutral position switch and the shift lever are in neutral.

f. Install a new clip to the transmission control cable bracket.

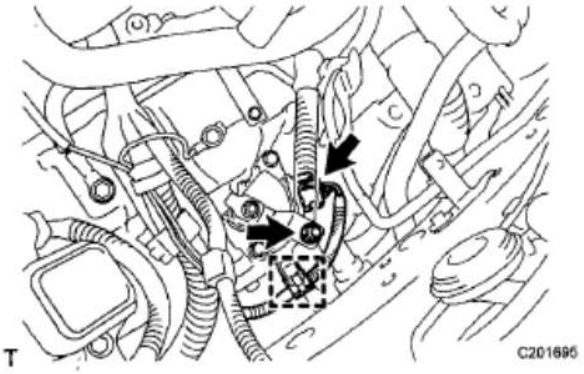


Fig. 139: Locating Park/Neutral Position Switch Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Connect the transmission control cable to the transmission control cable bracket.

NOTE:

- **Make sure that claw A on the clip are securely fit into the bracket holes.**
- **Make sure that the cable is securely installed inside of claw B of the clip.**

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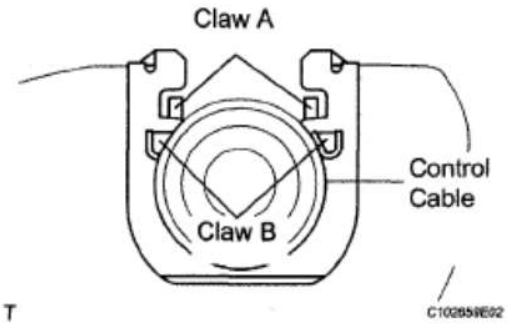


Fig. 140: Identifying Control Cable And Claw
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSTALL AIR CLEANER CASE SUB-ASSEMBLY** (See **INSTALLATION**)
3. **INSTALL AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY** (See **INSTALLATION**)
4. **INSTALL AIR CLEANER CAP SUB-ASSEMBLY** (See **INSTALLATION**)
5. **INSTALL NO. 2 INLET AIR CLEANER** (See **INSTALLATION**)
6. **INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY** (See **INSTALLATION**)
7. **INSTALL OUTER COWL TOP PANEL SUB-ASSEMBLY** (See **INSTALLATION**)
8. **INSTALL EJECTOR TUBE** (See **INSTALLATION**)
9. **INSTALL WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See **INSTALLATION**)
10. **INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See **INSTALLATION**)
11. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See **INSTALLATION**)
12. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See **INSTALLATION**)
13. **INSTALL COOL AIR INTAKE DUCT SEAL** (See **INSTALLATION**)
14. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

NOTE: **When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).**

15. **INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY OPERATION** (See **ON-VEHICLE INSPECTION**)
16. **INSPECT SHIFT LEVER POSITION** (See **ADJUSTMENT**)
17. **ADJUST SHIFT LEVER POSITION** (See **ADJUSTMENT**)

TRANSMISSION WIRE

COMPONENTS

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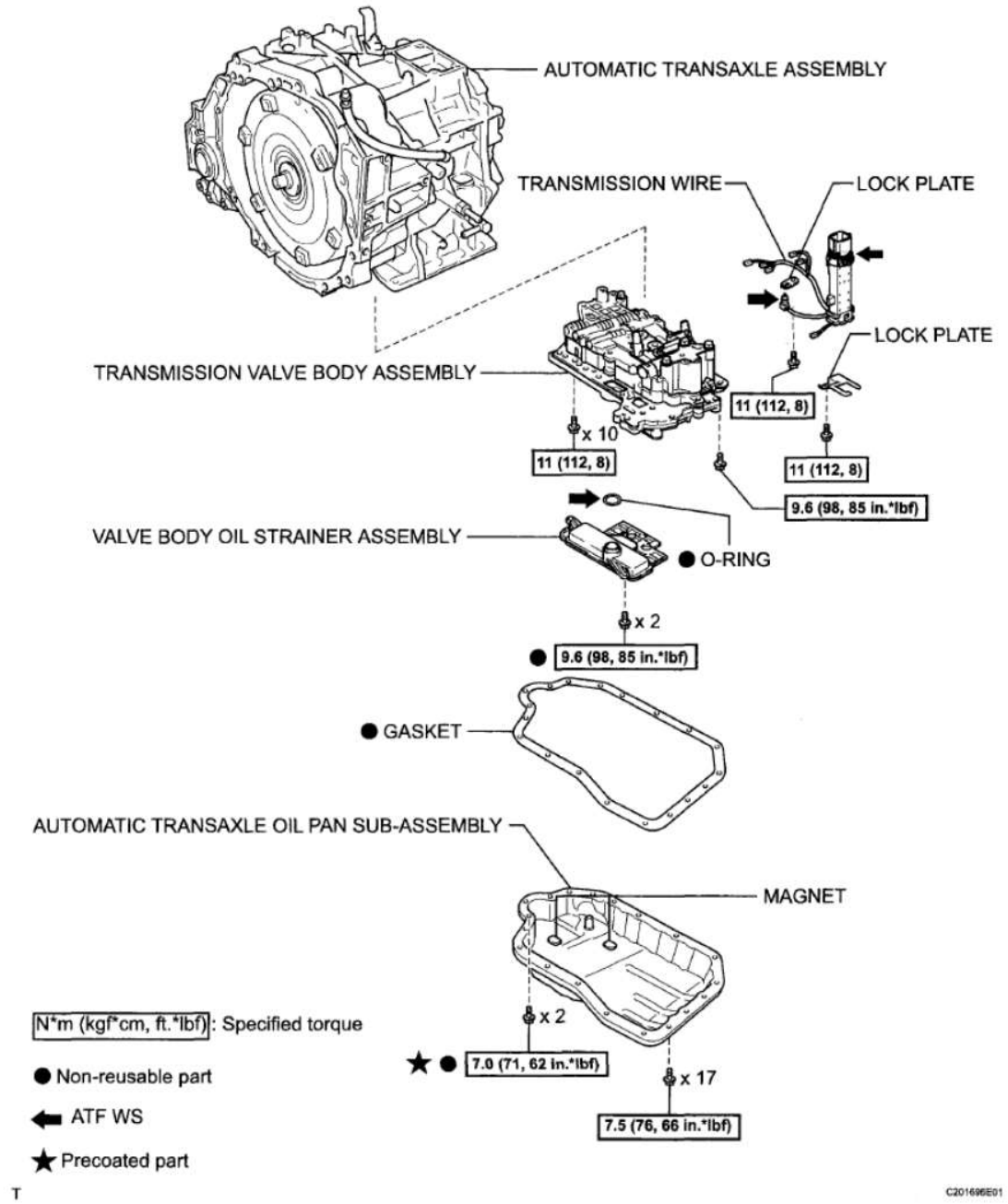


Fig. 141: Identifying Automatic Transaxle Assembly Components With Torque Specification
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **REMOVE AUTOMATIC TRANSAXLE ASSEMBLY**

   HINT:

   See **REMOVAL**

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2. **REMOVE AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY** (See **REMOVAL**)
3. **REMOVE VALVE BODY OIL STRAINER ASSEMBLY** (See **REPLACEMENT**)
4. **REMOVE TRANSMISSION VALVE BODY ASSEMBLY** (See **INSTALLATION**)
5. **REMOVE TRANSMISSION WIRE**
   a. Remove the bolt, lock plate and disconnect the 8 connectors.
   b. Remove the transmission wire from the clamp.

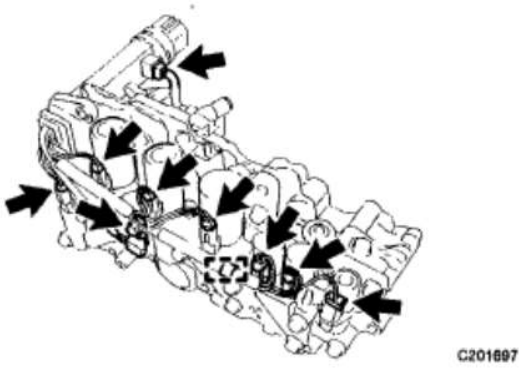


Fig. 142: Locating Transmission Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   c. Remove the bolt, lock plate and transmission wire from the transmission valve body assembly.

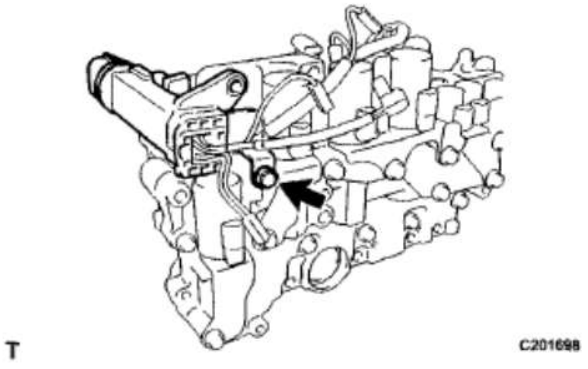


Fig. 143: Locating Transmission Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

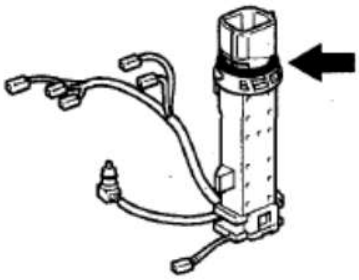
INSTALLATION

1. **INSTALL TRANSMISSION WIRE**
   a. Coat the O-ring with ATF.

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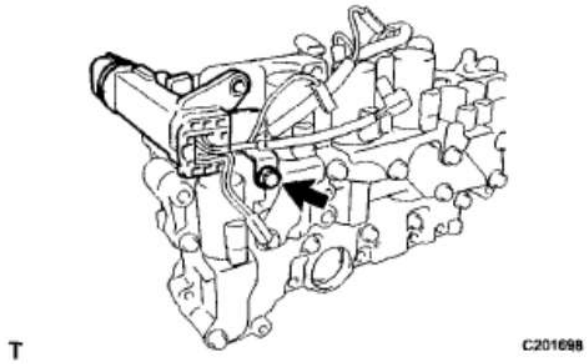


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Fig. 144: Locating O-ring With ATF
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Install the transmission wire and lock plate to the transmission valve body assembly with the bolt.

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



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Fig. 145: Locating Transmission Valve Body Assembly With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Install the transmission wire to the clamp.

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

d. Install the transmission wire and lock plate to the transmission valve body assembly with the bolt.
e. Connect the 8 connectors.

2. **INSTALL TRANSMISSION VALVE BODY ASSEMBLY** (See **INSTALLATION**)
3. **INSTALL VALVE BODY OIL STRAINER ASSEMBLY** (See **AIR COOLED OIL COOLER**)

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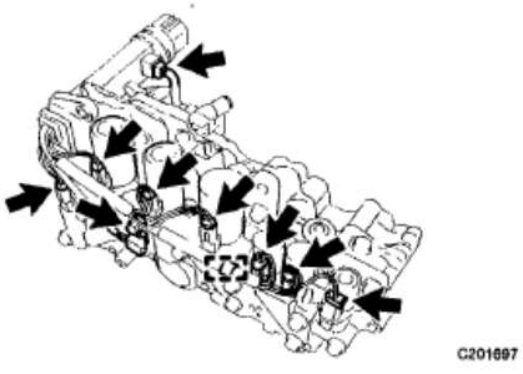


Fig. 146: Locating Transmission Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **INSTALL AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY** (See **AIR COOLED OIL COOLER**)
5. **INSTALL AUTOMATIC TRANSAXLE ASSEMBLY**

HINT:

See **INSTALLATION**

VALVE BODY ASSEMBLY

COMPONENTS

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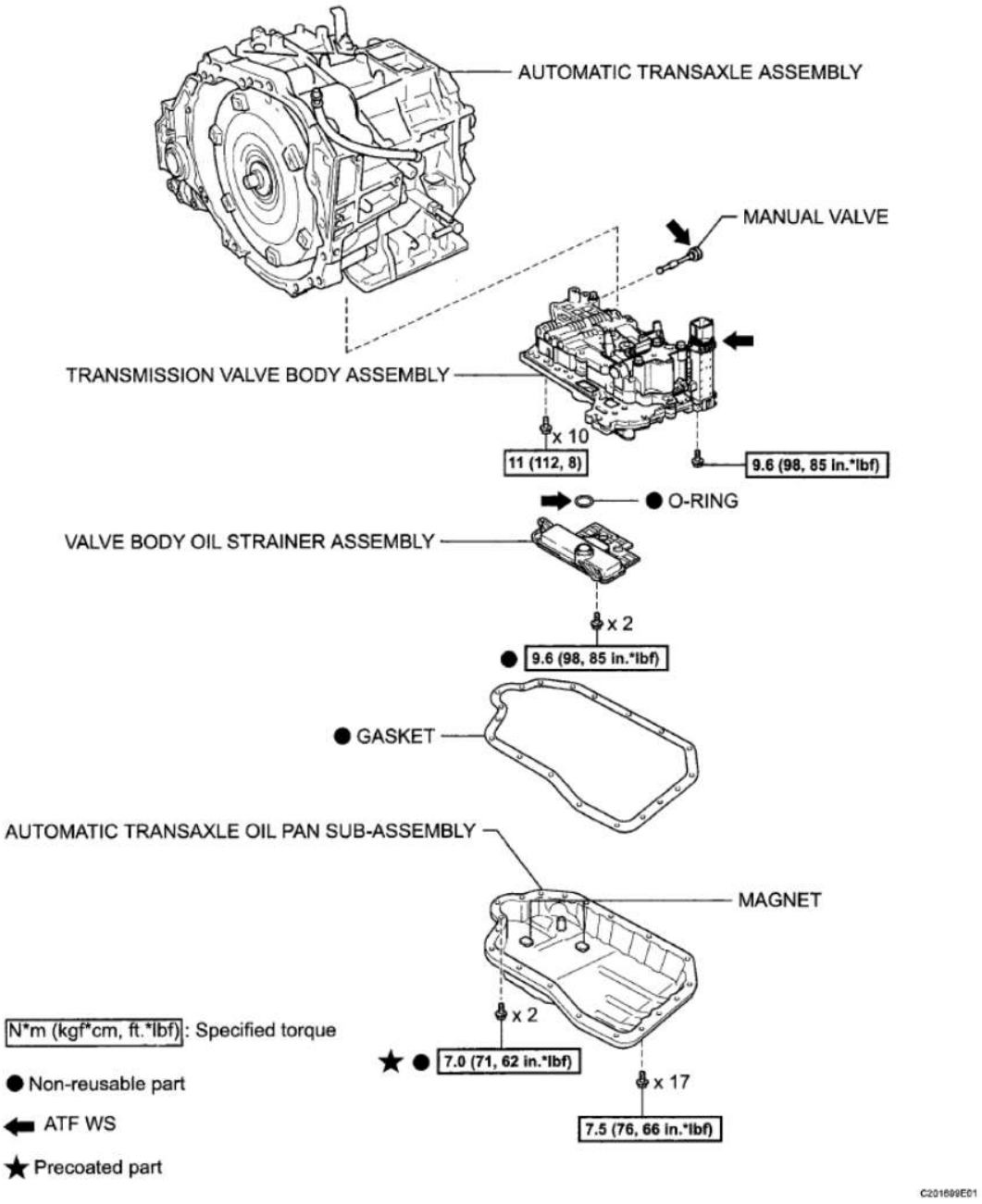


Fig. 147: Identifying Automatic Transaxle Assembly With Torque Specification
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **REMOVE AUTOMATIC TRANSAXLE ASSEMBLY**

   HINT:

   (See **REMOVAL**)

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2. **REMOVE AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY**

a. Remove the 19 bolts and oil pan from the transaxle.

NOTE: Some fluid will remain in the oil pan. Remove all the pan bolts, and carefully remove the oil pan assembly.

b. Remove the gasket from the oil pan.

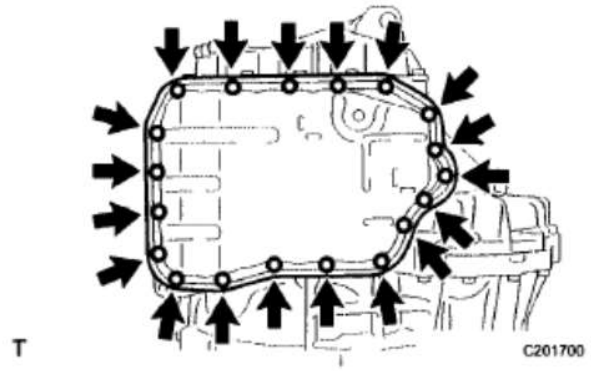


Fig. 148: Locating Oil Pan Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Remove the 2 magnets from the oil pan.

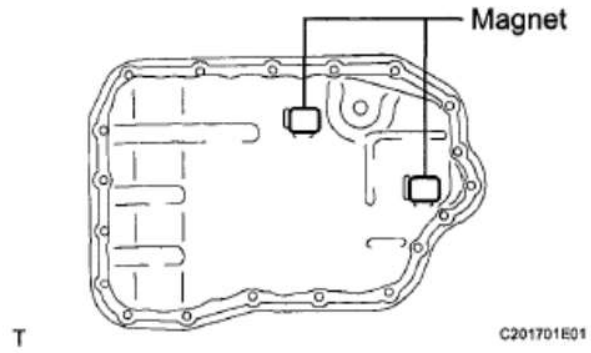


Fig. 149: Identifying Magnets Of Oil Pan
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Examine particles in the oil pan.

1. Collect any steel chips with the removed magnets. Look carefully at the chips and particles in the oil pan and on the magnets to see the type of wear which might be found in the transaxle.

Result:

Steel (magnetic):

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Bearing, gear and plate wear

Brass (non-magnetic):

Bearing wear

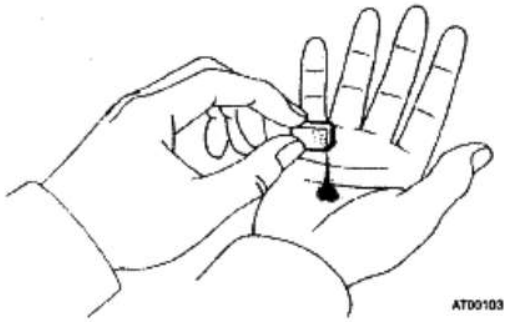


Fig. 150: Inspecting Particles In Oil Pan
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **REMOVE VALVE BODY OIL STRAINER ASSEMBLY**
   a. Remove the 2 bolts and oil strainer from the valve body.

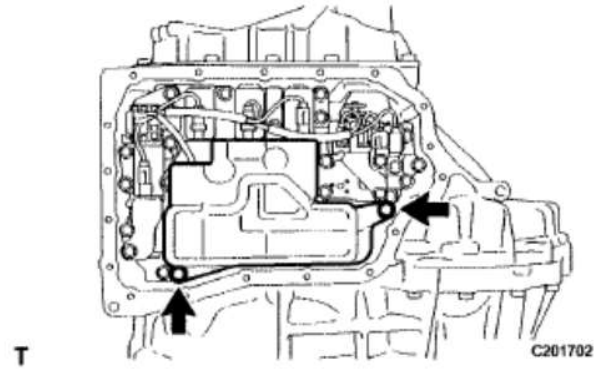


Fig. 151: Locating Valve Body Oil Strainer Assembly Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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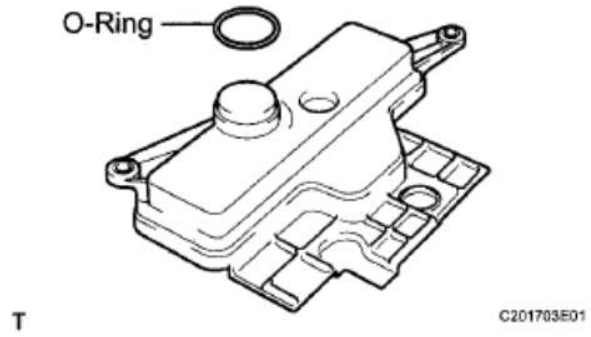


Fig. 152: Identifying O-ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **REMOVE TRANSMISSION VALVE BODY ASSEMBLY**
   a. Remove the 11 bolts and valve body from the transaxle.

NOTE: When removing the transmission valve body assembly, be careful not to allow the speed sensor and the transaxle case to interfere with each other.

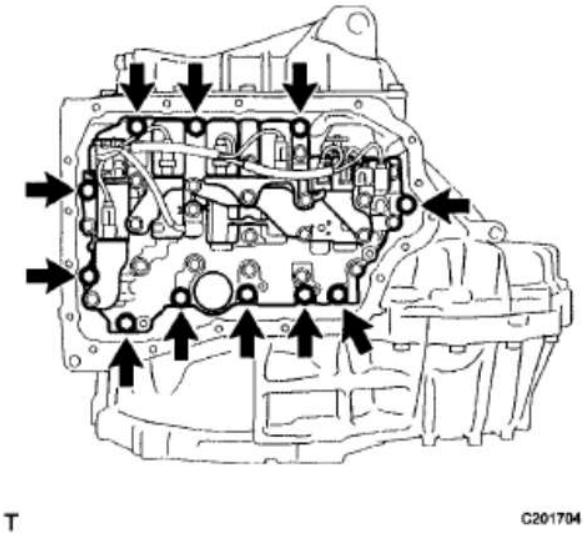


Fig. 153: Locating Transaxle Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **REMOVE MANUAL VALVE**
   a. Remove the manual valve from the valve body.

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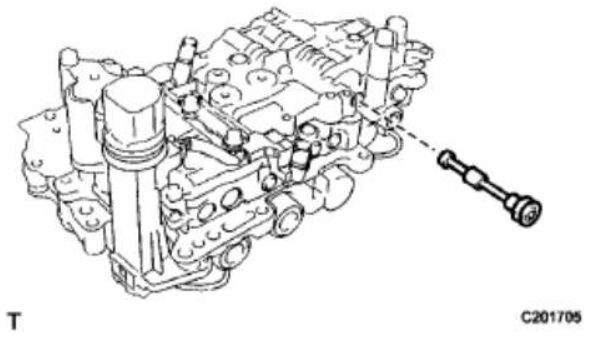


Fig. 154: Identifying Manual Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. **INSTALL MANUAL VALVE**
   a. Coat the manual valve with ATF and install it to the valve body.
2. **INSTALL TRANSMISSION VALVE BODY ASSEMBLY**
   a. Coat the O-ring of the transmission wire with ATF.

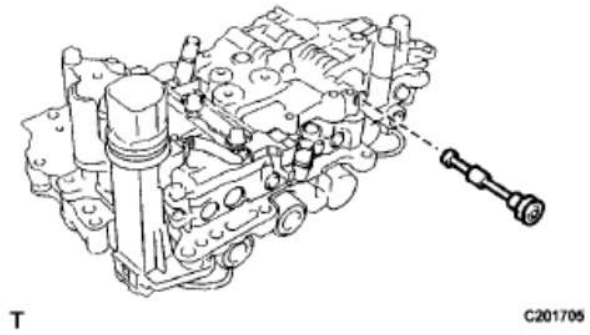


Fig. 155: Identifying Manual Valve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Confirm that the manual valve lever is positioned as shown in the illustration and install the valve body assembly to the transaxle case with the 11 bolts.

Torque: Bolt A, B, C

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

Bolt D

9.6 N*m (98 kgf*cm, 85 in.*lbf)

Bolt length:

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Bolt A:

25 mm (0.984 in.)

Bolt B:

30 mm (1.18 in.)

Bolt C, D:

35 mm (1.38 in.)

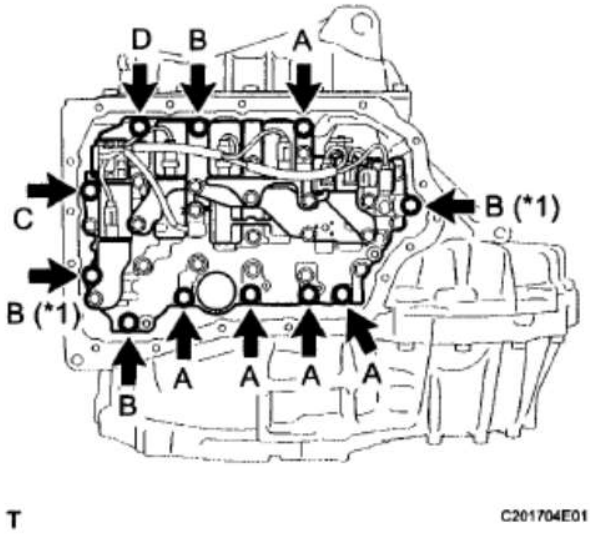


Fig. 156: Locating Transaxle Case Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- **When installing the transmission valve body assembly, be careful not to allow the speed sensor and transaxle case to interfere with each other.**
- **Be sure to insert the pin of the manual valve lever into the groove on the end of the manual valve.**
- **First, temporarily tighten the bolts marked by (*1) in the illustration because they are positioning bolts.**

3. **INSTALL VALVE BODY OIL STRAINER ASSEMBLY**
   a. Coat a new O-ring with ATF and install it to the oil strainer.

NOTE: **Ensure that the O-ring is not twisted or pinched.**

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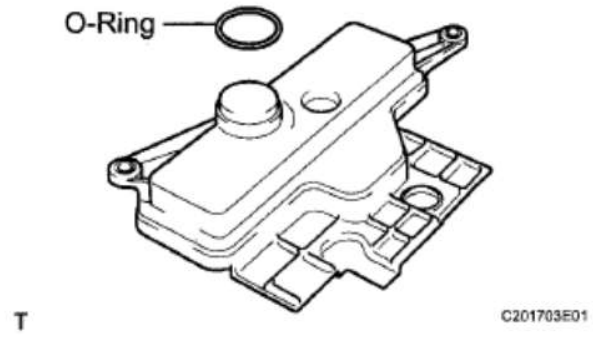


Fig. 157: Identifying O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Install the oil strainer to the valve body with the new 2 bolts.

Torque: 9.6 N*m (98 kgf*cm, 85 in.*lbf)

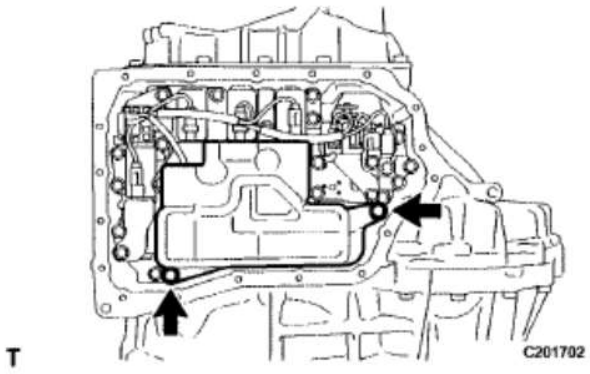
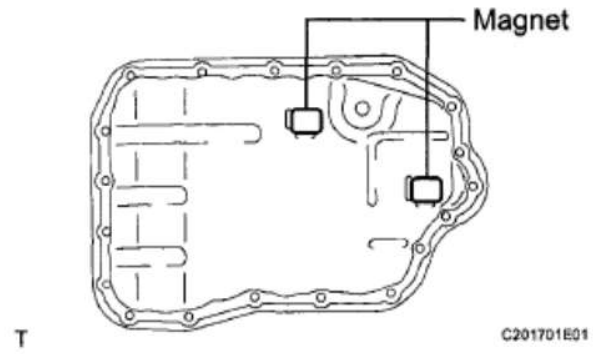


Fig. 158: Locating Valve Body Oil Strainer Assembly Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **INSTALL AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY**
   a. Install the 2 magnets to the oil pan.
   b. Install a new gasket to the oil pan.



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Fig. 159: Identifying Magnets Of Oil Pan
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Install the oil pan to the automatic transaxle with the 17 bolts.

Torque: 7.5 N*m (76 kgf*cm, 66 in.*lbf)

NOTE: Completely remove any oil or grease from the contact surfaces of the transaxle case and oil pan sub-assembly with the gasket before installation.

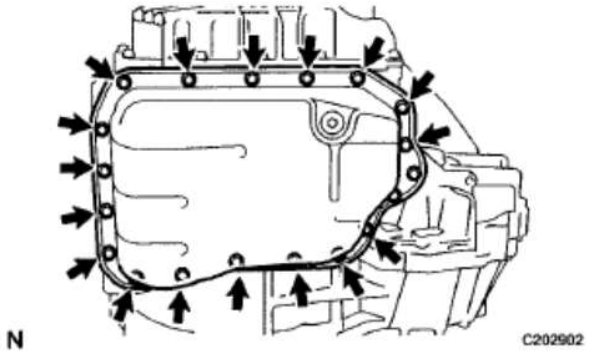


Fig. 160: Locating Oil Pan Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Apply adhesive to the new 2 bolts.

Adhesive:

Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent.

e. Install the oil pan to the automatic transaxle with the 2 bolts.

Torque: 7.0 N*m (71 kgf*cm, 62 in.*lbf)

NOTE: In order to ensure proper sealing of the transmission oil pan bolts, apply sealant to the bolts and install them within 10 minutes of sealant application.

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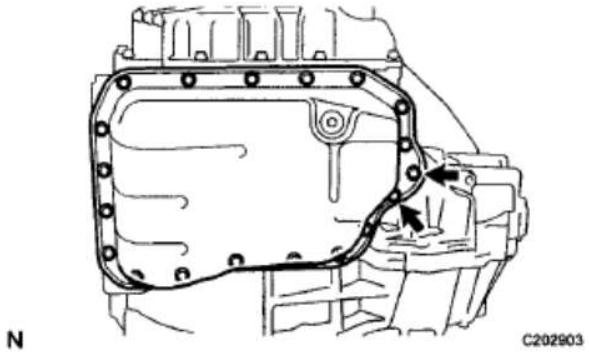


Fig. 161: Locating Automatic Transaxle Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **INSTALL AUTOMATIC TRANSAXLE ASSEMBLY**

HINT:

(See **INSTALLATION**)

AIR COOLED OIL COOLER

COMPONENTS

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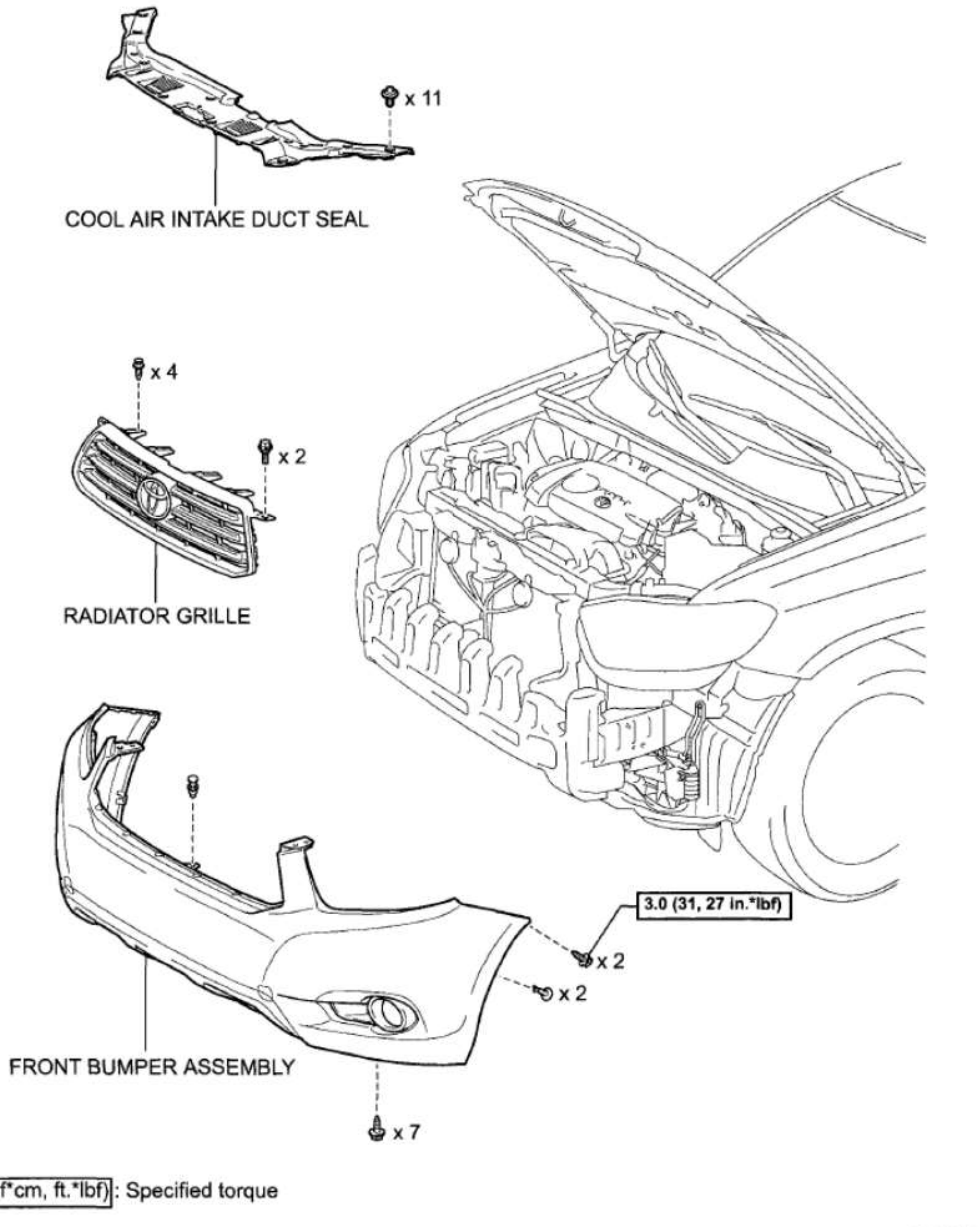


Fig. 162: Identifying Air Cooled Oil Cooler Components (1 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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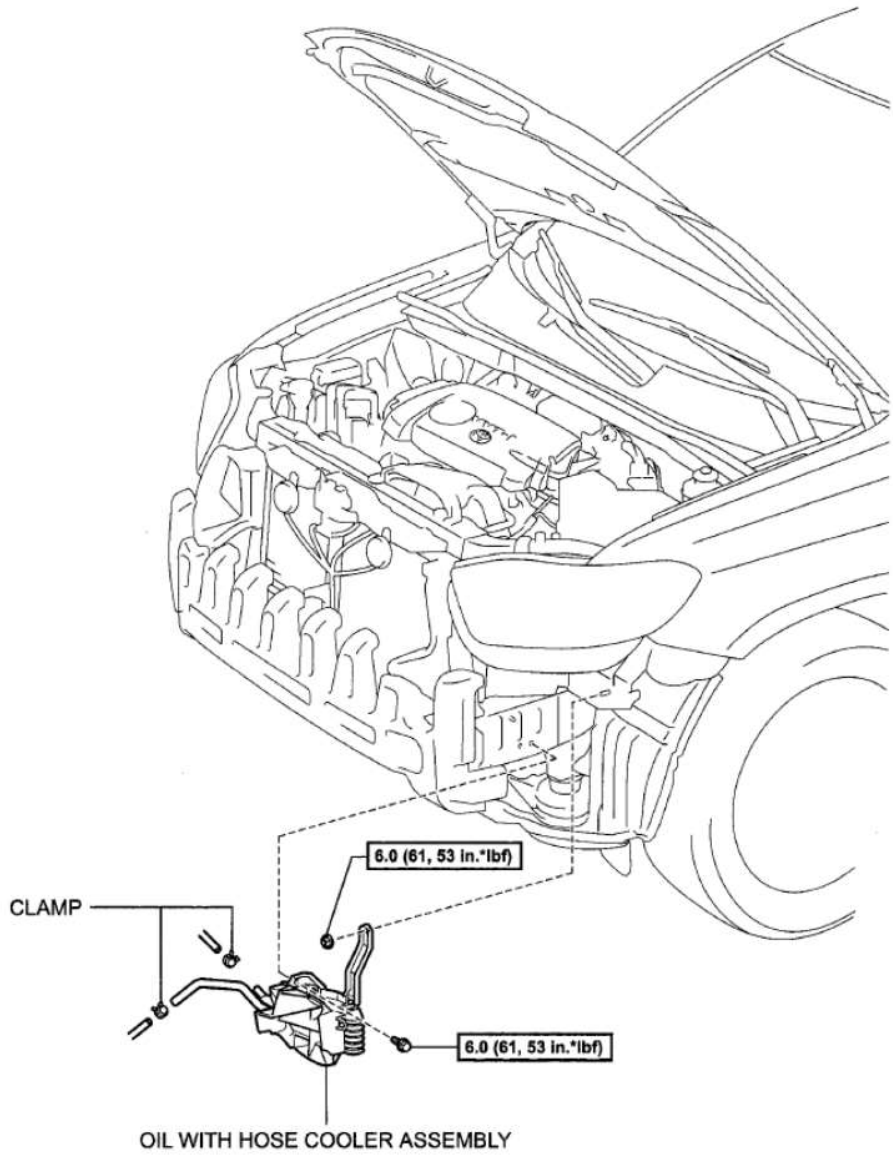


Fig. 163: Identifying Air Cooled Oil Cooler Components (2 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **REMOVE COOL AIR INTAKE DUCT SEAL** (See **REMOVAL**)
2. **REMOVE RADIATOR GRILLE** (See **REMOVAL**)
3. **REMOVE FRONT BUMPER ASSEMBLY (w/o Fog Light)** (See **REMOVAL**)

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4. **REMOVE FRONT BUMPER ASSEMBLY (w/ Fog Light)** (See **DISASSEMBLY**)
5. **DRAIN AUTOMATIC TRANSAXLE FLUID** (See **REPLACEMENT**)
6. **REMOVE OIL WITH HOSE COOLER ASSEMBLY**
   a. Remove the 2 hose clamps and disconnect the 2 oil cooler hoses.

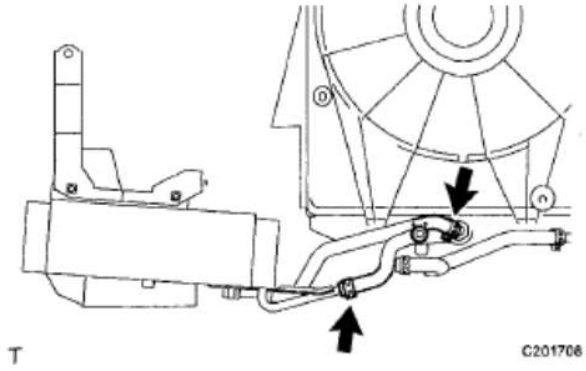


Fig. 164: Locating Oil Cooler Hoses And Hose Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Remove the bolt, nut and oil with hose cooler assembly.

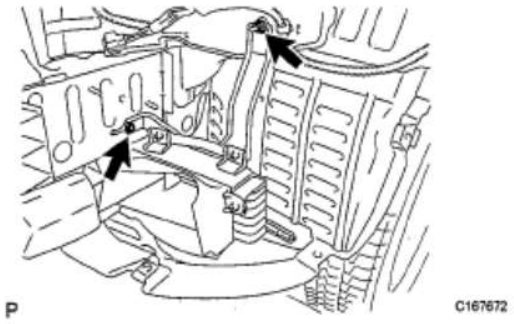


Fig. 165: Locating Hose Cooler Assembly Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. **INSTALL OIL WITH HOSE COOLER ASSEMBLY**
   a. Install the oil with hose cooler assembly with the bolt and nut.

   Torque: 6.0 N*m (61 kgf*cm, 53 in.*lbf)

   HINT:

   After temporarily tightening the bolt, fully tighten the nut and then the bolt.

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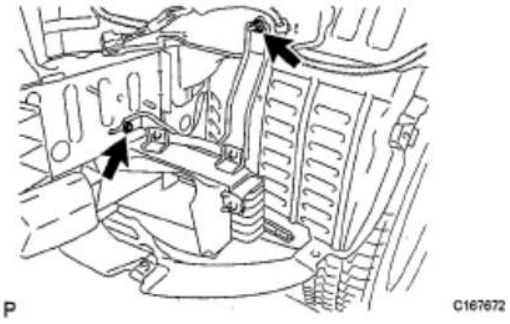


Fig. 166: Locating Hose Cooler Assembly Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Connect the 2 oil cooler hoses and install the 2 hose clamps.

2. **INSTALL FRONT BUMPER ASSEMBLY (w/o Fog Light)** (See **INSTALLATION**)
3. **INSTALL FRONT BUMPER ASSEMBLY (w/ Fog Light)** (See **INSTALLATION**)
4. **INSTALL RADIATOR GRILLE** (See **INSTALLATION**)
5. **INSTALL COOL AIR INTAKE DUCT SEAL** (See **INSTALLATION**)

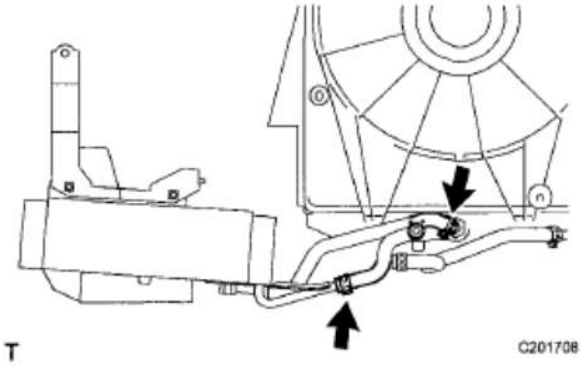


Fig. 167: Locating Oil Cooler Hoses And Hose Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **ADD AUTOMATIC TRANSAXLE FLUID**

HINT:

See **AUTOMATIC TRANSAXLE FLUID**

SHIFT LEVER

COMPONENTS

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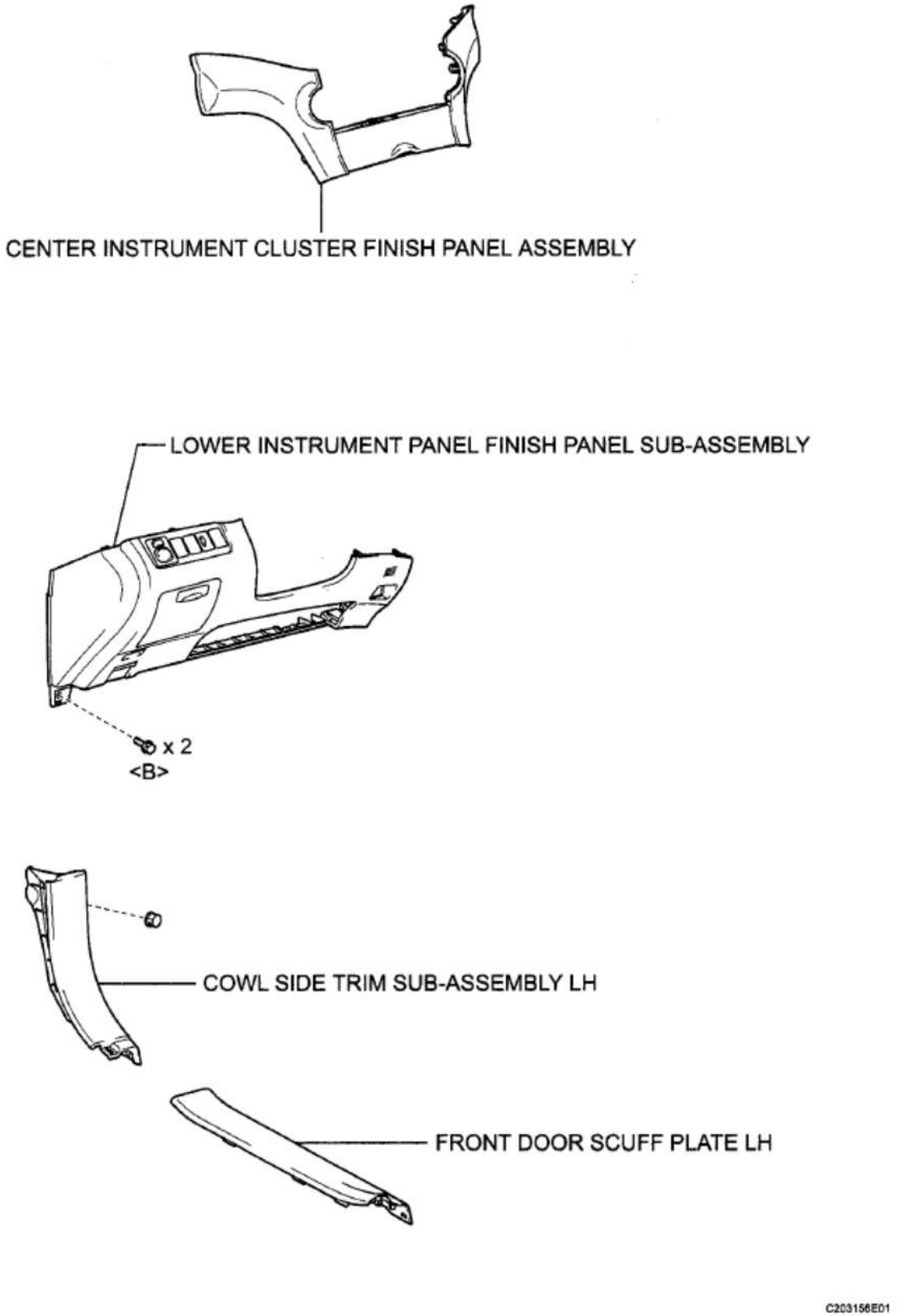


Fig. 168: Identifying Shift Lever Components With Torque Specification (1 Of 5)

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Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

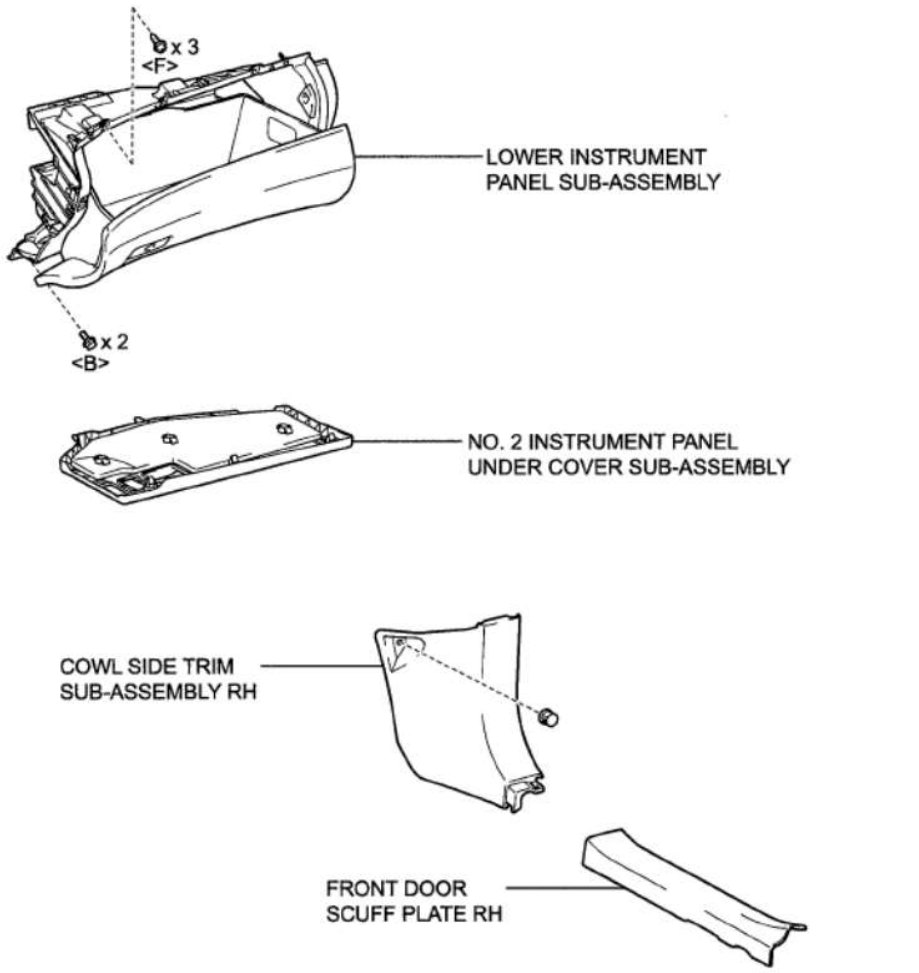


Fig. 169: Identifying Shift Lever Components With Torque Specification (2 Of 5)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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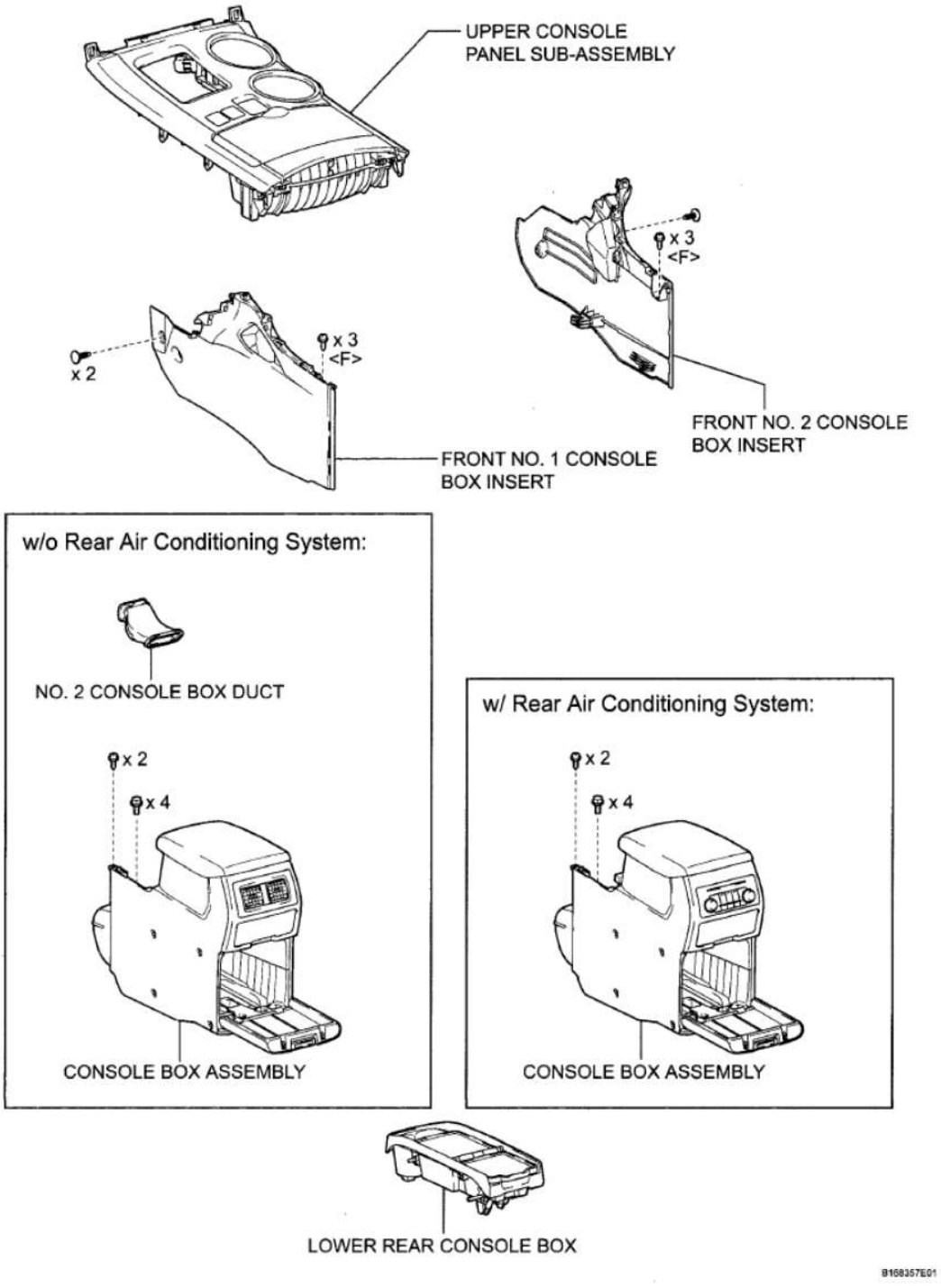


Fig. 170: Identifying Shift Lever Components With Torque Specification (3 Of 5)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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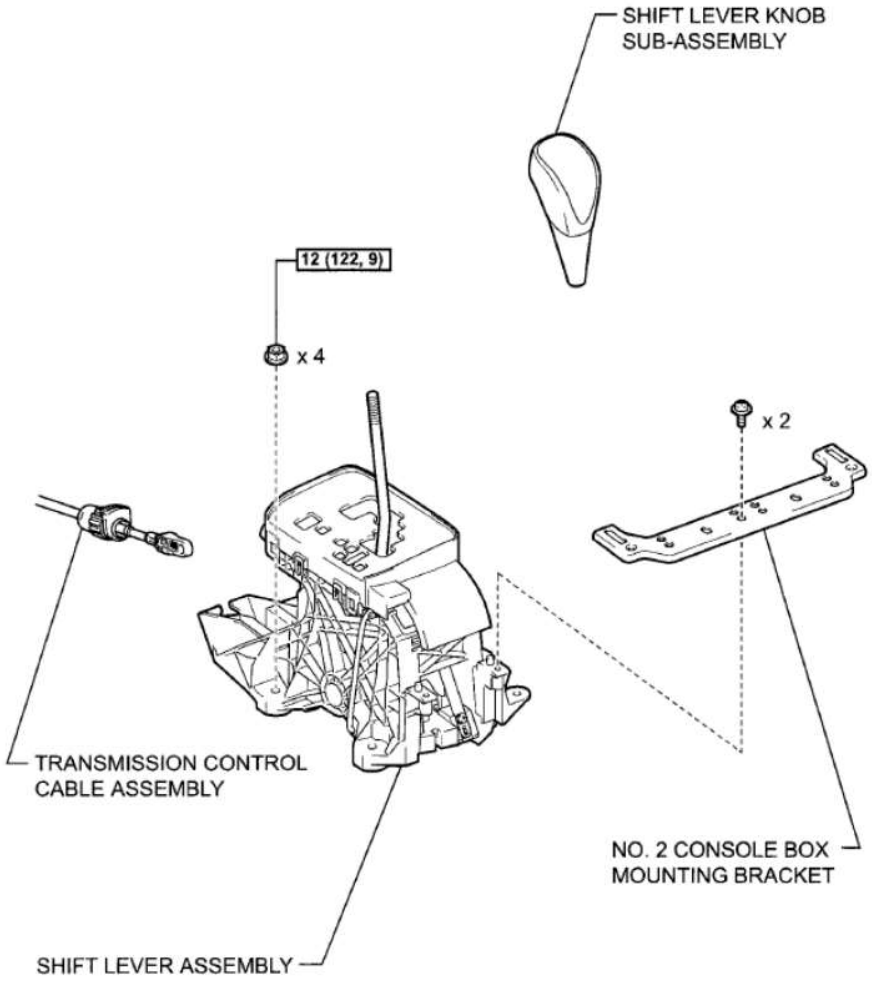


Fig. 171: Identifying Shift Lever Components With Torque Specification (4 Of 5)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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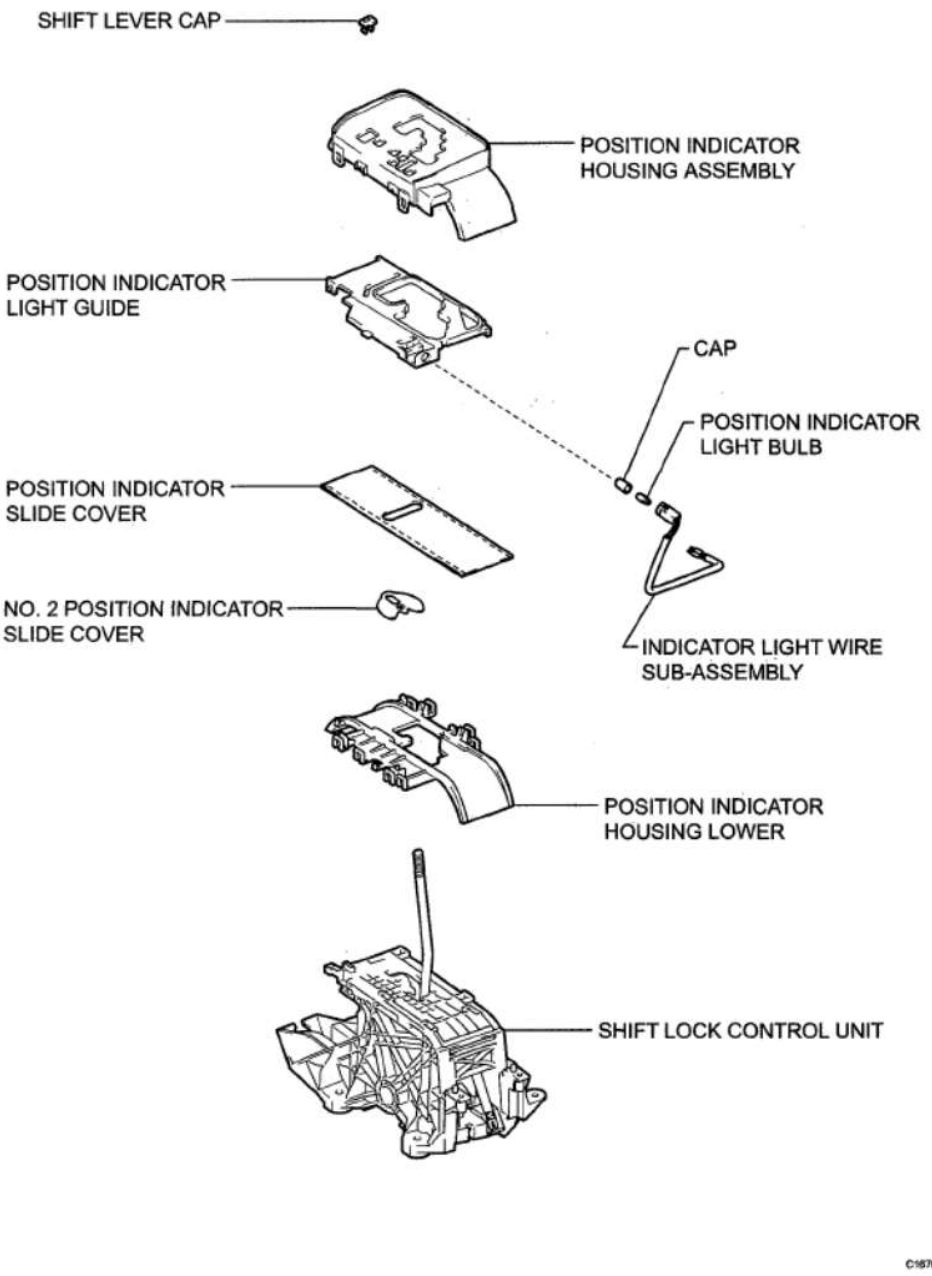


Fig. 172: Identifying Shift Lever Components With Torque Specification (5 Of 5)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ON-VEHICLE INSPECTION

1. **INSPECT SHIFT LEVER POSITION**
   a. When shifting from the P position to the R position with the ignition switch ON and the brake pedal depressed, make sure that the shift lever moves smoothly and correctly into the position.
   b. Start the engine and make sure that the vehicle moves forward when shifting from the N position to the D position and moves rearward when shifting to the R position. If the operation cannot be done

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as specified, inspect the park/neutral position switch assembly and check the shift lever assembly installation condition.

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.

NOTE: When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).

2. **REMOVE CENTER INSTRUMENT CLUSTER FINISH PANEL ASSEMBLY** (See **REMOVAL**)
3. **REMOVE FRONT DOOR SCUFF PLATE LH** (See **REMOVAL**)
4. **REMOVE COWL SIDE TRIM SUB-ASSEMBLY LH** (See **REMOVAL**)
5. **REMOVE LOWER INSTRUMENT PANEL FINISH PANEL SUB-ASSEMBLY** (See **REMOVAL**)
6. **REMOVE FRONT DOOR SCUFF PLATE RH** (See **REMOVAL**)
7. **REMOVE COWL SIDE TRIM SUB-ASSEMBLY RH** (See **REMOVAL**)
8. **REMOVE NO. 2 INSTRUMENT PANEL UNDER COVER SUB-ASSEMBLY** (See **REMOVAL**)
9. **REMOVE LOWER INSTRUMENT PANEL SUB-ASSEMBLY** (See **REMOVAL**)
10. **REMOVE UPPER CONSOLE PANEL SUB-ASSEMBLY** (See **REMOVAL**)
11. **REMOVE NO. 2 CONSOLE BOX DUCT (w/o Rear Air Conditioning System)** (See **REMOVAL**)
12. **REMOVE LOWER REAR CONSOLE BOX** (See **REMOVAL**)
13. **REMOVE CONSOLE BOX ASSEMBLY (w/o Rear Air Conditioning System)** (See **REMOVAL**)
14. **REMOVE CONSOLE BOX ASSEMBLY (w/ Rear Air Conditioning System)** (See **DISASSEMBLY**)
15. **REMOVE FRONT NO. 1 CONSOLE BOX INSERT** (See **REMOVAL**)
16. **REMOVE FRONT NO. 2 CONSOLE BOX INSERT** (See **REMOVAL**)
17. **REMOVE SHIFT LEVER KNOB SUB-ASSEMBLY**
    a. Turn the shift lever knob counterclockwise and remove the shift lever knob sub-assembly.

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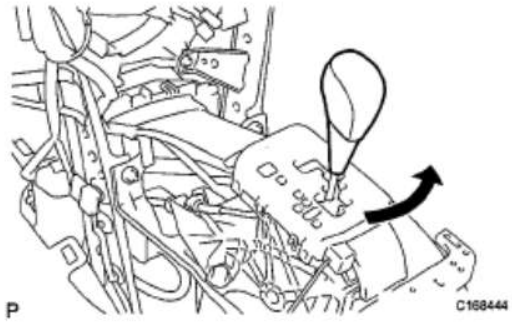


Fig. 173: Turning Shift Lever Knob
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. **DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**
    a. Using a screwdriver, disconnect the cable end from the shift lever assembly.

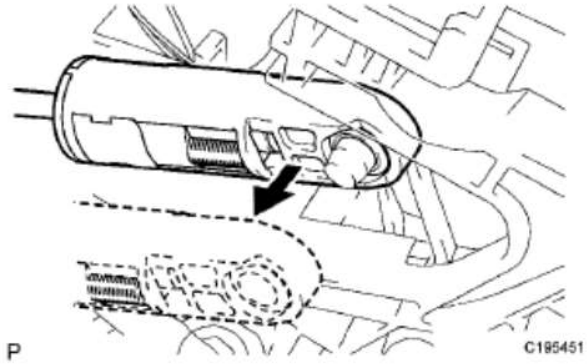


Fig. 174: Disconnecting Cable End And Shift Lever Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

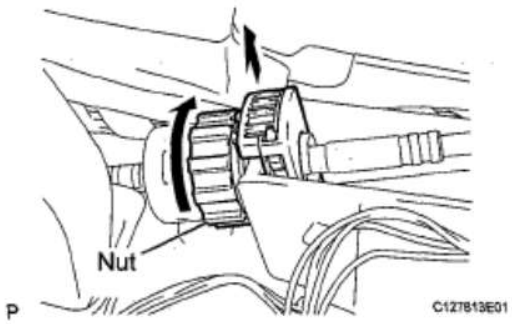


Fig. 175: Disconnecting Control Cable Of Shift Lever Retainer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

19. **REMOVE SHIFT LEVER ASSEMBLY**

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a. Disconnect the 2 connectors from the shift lever assembly.

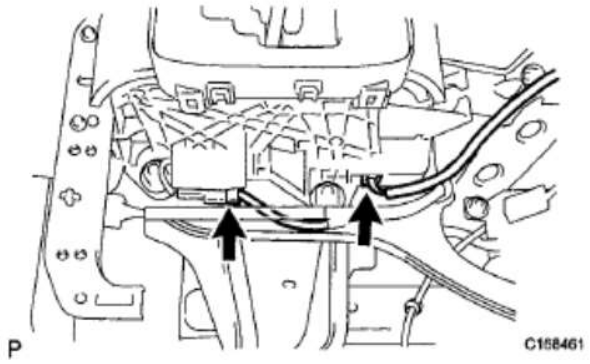


Fig. 176: Locating Shift Lever Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the 4 nuts and disconnect the shift lever assembly from the vehicle.
c. Remove the 2 screws and No. 2 console box mounting bracket.

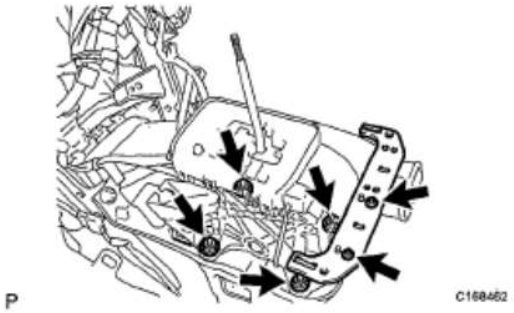
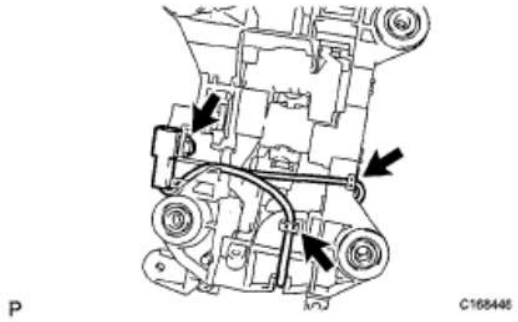


Fig. 177: Locating Shift Lever Assembly Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

1. **REMOVE POSITION INDICATOR HOUSING ASSEMBLY**
   a. Separate the connector and 2 wire harness clamps from the shift lock control unit.



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Fig. 178: Locating Wire Harness Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using a screwdriver, release the stopper.
c. Using a screwdriver, disengage the locking lug of terminals 4 and 8, and pull the terminals out from the rear of the connector.

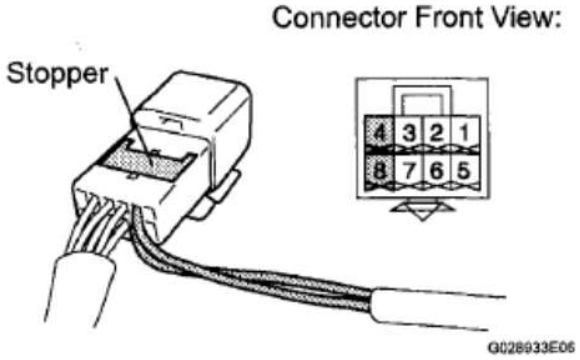


Fig. 179: Identifying Stopper Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Separate the wire harness clamp from the shift lock control unit.
e. Disengage the 4 claws and remove the position indicator housing from the shift lock control unit.

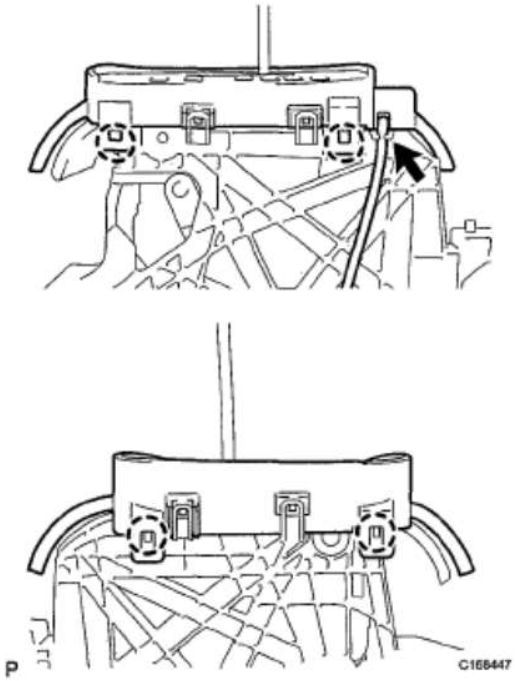


Fig. 180: Identifying Wire Harness Clamp And Shift Lock Control Unit
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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2. **REMOVE POSITION INDICATOR HOUSING LOWER**
   a. Disengage the 4 claws and remove the position indicator housing lower from the position indicator housing.
3. **REMOVE SHIFT LEVER CAP**
   a. Using a screwdriver, remove the shift lever cap from the position indicator housing.

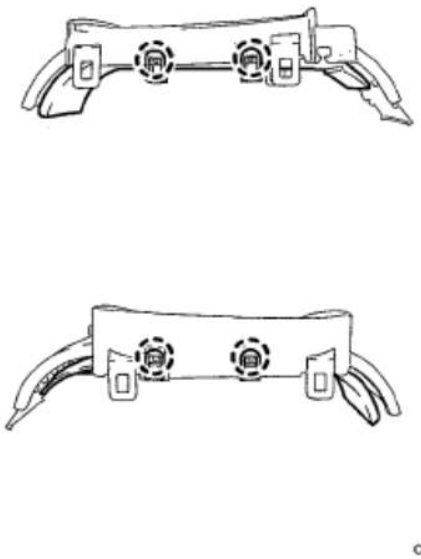


Fig. 181: Identifying Position Indicator Housing And Claws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **REMOVE POSITION INDICATOR LIGHT GUIDE**
   a. Disengage the 4 claws and remove the position indicator light guide from the position indicator housing lower.

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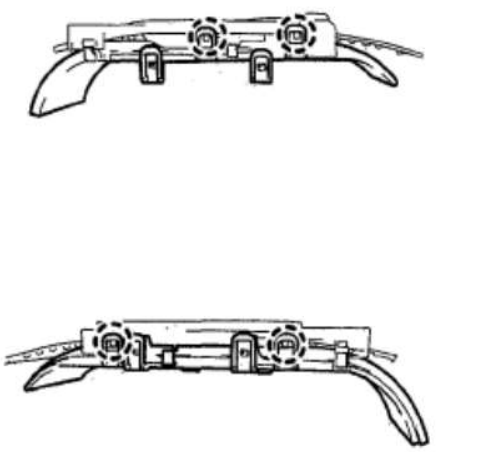


Fig. 182: Identifying Position Indicator Housing Lower And Claws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **REMOVE INDICATOR LIGHT WIRE SUB-ASSEMBLY**
   a. Remove the indicator light wire sub-assembly from the position indictor light guide.
6. **REMOVE POSITION INDICATOR LIGHT BULB**
   a. Remove the bulb and cap from the indicator light wire socket.

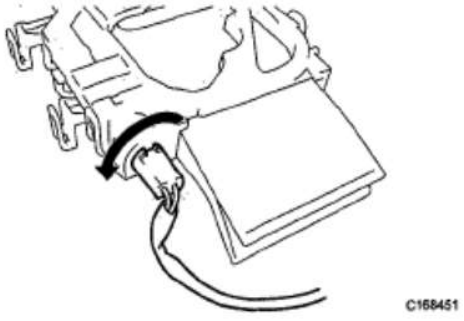


Fig. 183: Removing Position Indicator Light Bulb
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. **REMOVE POSITION INDICATOR SLIDE COVER**
   a. Remove the position indicator slide cover from the position indicator housing lower.

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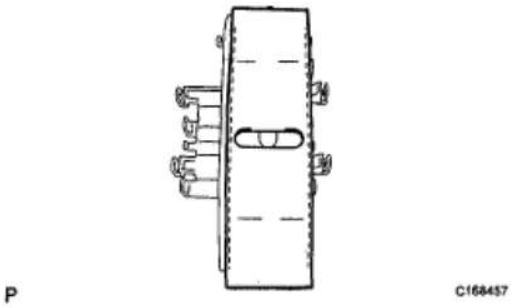


Fig. 184: Identifying Position Indicator Slide Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **REMOVE NO. 2 POSITION INDICATOR SLIDE COVER**
   a. Remove the position indicator slide cover from the No. 2 position indicator slide cover.

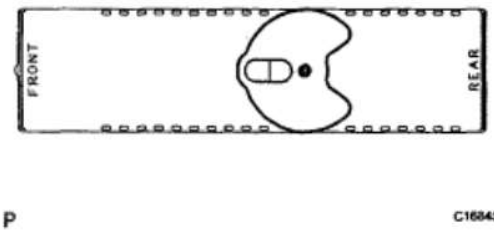


Fig. 185: Identifying No. 2 Position Indicator Slide Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. **INSPECT SHIFT LOCK CONTROL ECU**
   a. Disconnect the shift lock control ECU connector.
   b. Measure the voltage according to the value (s) in the table below.

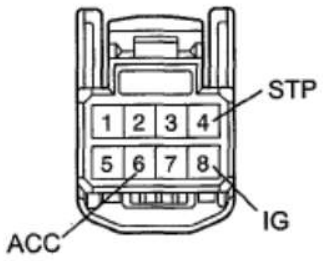
Standard voltage

VOLTAGE SPECIFICATION

Tester Connection	Condition	Specified Condition
6 (ACC) - Body ground	Ignition switch ON	10 to 14 V
6 (ACC) - Body ground	Ignition switch ACC	10 to 14 V
6 (ACC) - Body ground	Ignition switch off	Below 1 V
4 (STP) - Body ground	Brake pedal depressed	10 to 14 V
4 (STP) - Body ground	Brake pedal released	Below 1 V
8 (IG) - Body ground	Ignition switch ON	10 to 14 V
8 (IG) - Body ground	Ignition switch off	Below 1 V

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Front view of wire harness connector:
(to Shift Lock Control ECU)



P C168464E03

Fig. 186: Identifying Shift Lock Control ECU Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Standard resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
1 (E) - Body ground	Always	Below 1 ohms

Front view of wire harness connector:
(to Shift Lock Control ECU)



P C168464E02

Fig. 187: Identifying Shift Lock Control ECU Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Connect the shift lock control ECU connector.
e. Measure the voltage according to the value (s) in the table below.

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NOTE: Do not disconnect the shift lock control ECU connector.

Standard voltage

VOLTAGE SPECIFICATION

Tester Connection	Condition	Specified Condition
5 (KLS+) -1 (E)	Ignition switch ACC and shift lever P position	Below 1 V
	Ignition switch ACC and shift lever except P position ? After approx. 1 second	7.5 to 11 V ? 6 to 9.5 V

Component with harness connected:
(Shift Lock Control ECU)

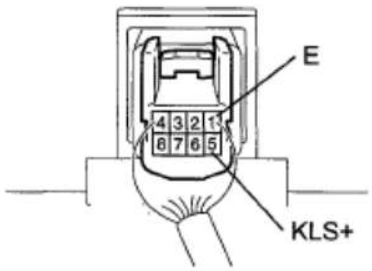


Fig. 188: Identifying ECU Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSPECT TRANSMISSION CONTROL SWITCH**
   a. Disconnect the transmission control switch connector from the shift lock control unit assembly.
   b. Measure the voltage according to the value (s) in the table below.

Standard voltage

VOLTAGE SPECIFICATION

Tester Connection	Switch Condition	Specified Condition
3 - Body ground	Ignition switch ON	10 to 14 V
?	Ignition switch off	Below 1 V

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



P

C110345E33

Fig. 189: Identifying Transmission Control Switch Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Standard resistance

RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
5 - Body ground	Always	Below 1 ohms

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



P

C110345E33

Fig. 190: Identifying Transmission Control Switch Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Measure the resistance according to the value (s) in the table below when the shift lever is moved to each position.

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Standard resistance

RESISTANCE SPECIFICATION

Tester Connection	Shift Position	Specified Condition
3-7	S, "+" or "-"	Below 1 ohms
?	Except S, "+" and "-"	10 kohms or higher
2-5	Press continuously "+" (Up shift)	Below 1 ohms
?	S	10 kohms or higher
1-5	Press continuously (Down shift)	Below 1 ohms
?	S	10 kohms or higher

If the result is not as specified, replace the shift lock control unit.

Component without harness connected:
(Transmission Control Switch)



C110341E26

Fig. 191: Identifying Transmission Control Switch Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **INSPECT SHIFT LOCK SOLENOID**
   a. Disconnect the shift lock solenoid connector.
   b. Measure the resistance according to the value (s) in the table below when the shift lever is moved to each position.

Standard resistance

RESISTANCE SPECIFICATION

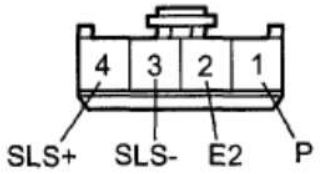
Tester Connection	Shift Position	Specified Condition
1 (P) - 2 (E2)	P	10 kohms or higher
1 (P) - 2 (E2)	Except P	Below 1 ohms

If the result is not as specified, replace the shift lock control unit.

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

Front view of wire harness connector:
(to Shift Lock Solenoid)



C159129E01

Fig. 192: Identifying Shift Lock Solenoid Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard resistance

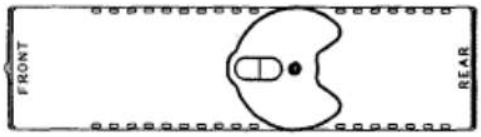
RESISTANCE SPECIFICATION

Tester Connection	Condition	Specified Condition
3 (SLS-) - 4 (SLS+)	Always	112 ohms

If the result is not as specified, replace the shift lock control unit.

REASSEMBLY

1. **INSTALL NO. 2 POSITION INDICATOR SLIDE COVER**
   a. Install the position indicator slide cover to the No. 2 position indicator slide cover.



P C160456

Fig. 193: Identifying No. 2 Position Indicator Slide Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSTALL POSITION INDICATOR SLIDE COVER**
   a. Install the position indicator slide cover to the position indicator housing lower.

NOTE: Install the No. 2 position indicator slide cover with the boss facing the rear of the vehicle.

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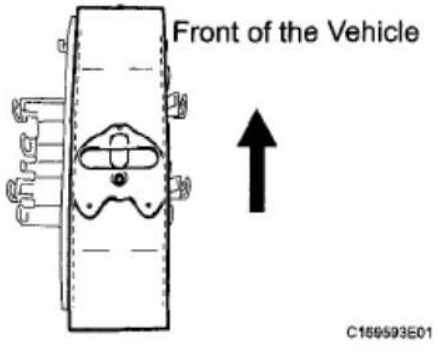


Fig. 194: Installing Position Indicator Slide Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **INSTALL POSITION INDICATOR HOUSING LOWER**
   a. Engage the 4 claws and install the position indicator housing lower to the position indicator housing.

NOTE: Make sure that the claws are firmly engaged.

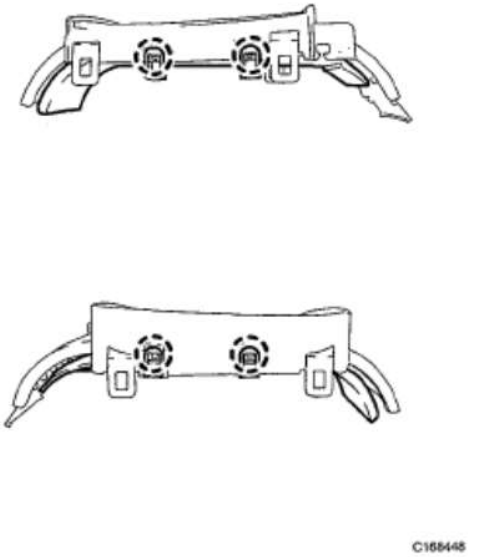


Fig. 195: Identifying Position Indicator Housing And Claws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **INSTALL POSITION INDICATOR LIGHT GUIDE**
   a. Engage the 4 claws and install the position indicator light guide to the position indicator housing lower.

NOTE: Make sure that the claws are firmly engaged.

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5. **INSTALL POSITION INDICATOR LIGHT BULB**
   a. Install the cap to the bulb.
   b. install the bulb to the position indicator light wire socket.

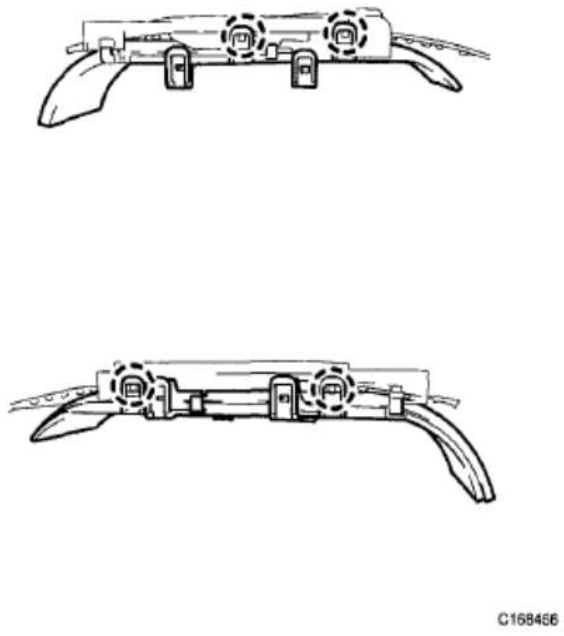


Fig. 196: Identifying Position Indicator Light Bulb Claw
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **INSTALL INDICATOR LIGHT WIRE SUB-ASSEMBLY**
   a. Install the indicator light wire sub-assembly to the position indicator light guide.
7. **INSTALL SHIFT LEVER CAP**
   a. Install the shift lever cap to the position indicator housing.



Fig. 197: Installing Indicator Light Wire Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **INSTALL POSITION INDICATOR HOUSING ASSEMBLY**

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a. Engage the 4 claws and install the position indicator housing to the shift lever assembly.

NOTE: Make sure that the claws are firmly engaged.

b. Connect the wire harness clamp to the shift lock control unit.

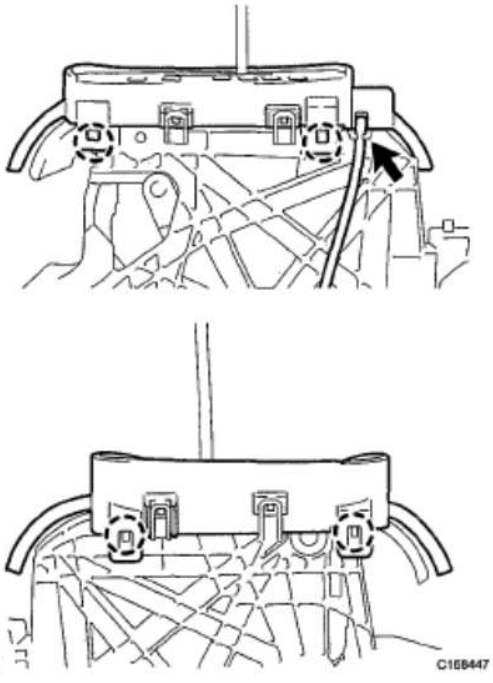


Fig. 198: Identifying Position Indicator Housing Assembly And Claws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Connect terminals 4 and 8 of the indicator light wire.
d. Push the stopper.

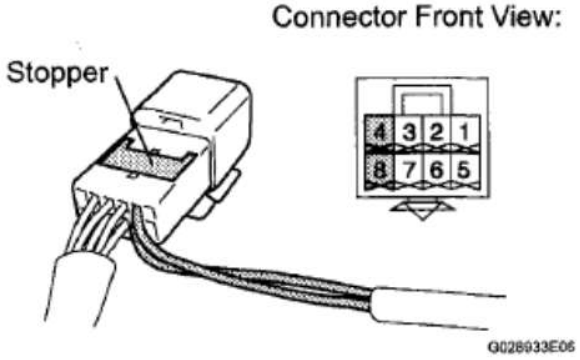


Fig. 199: Identifying Stopper Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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e. Connect the connector and 2 wire harness clamps to the shift lock control unit.

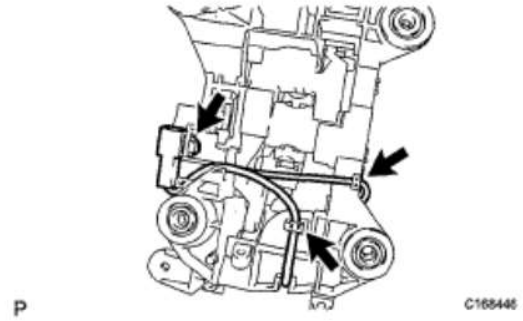


Fig. 200: Locating Wire Harness Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. **INSTALL SHIFT LEVER ASSEMBLY**
   a. Install the shift lever assembly with the 4 nuts.

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

   HINT:

   Tighten the nuts in the order of A, B, C and D.

   NOTE: Be careful not to route the indicator light or shift lock system wiring between the shift lever assembly and the floor while installing the shift lever assembly.

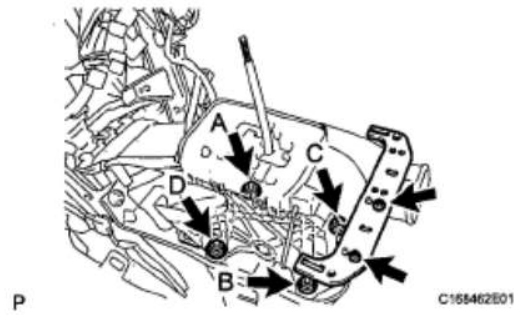


Fig. 201: Locating Shift Lever Assembly With Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Install the No. 2 console box mounting bracket with the 2 screws.
   c. Connect the 2 connectors to the shift lever assembly.

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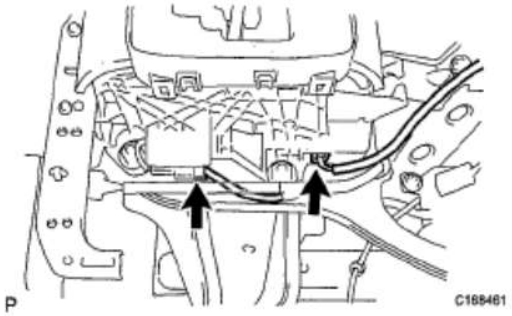


Fig. 202: Locating No. 2 Console Box Mounting Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **CONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**
   a. Rotate the transmission control cable nut counterclockwise and, while holding the nut in that position, press in the stopper.

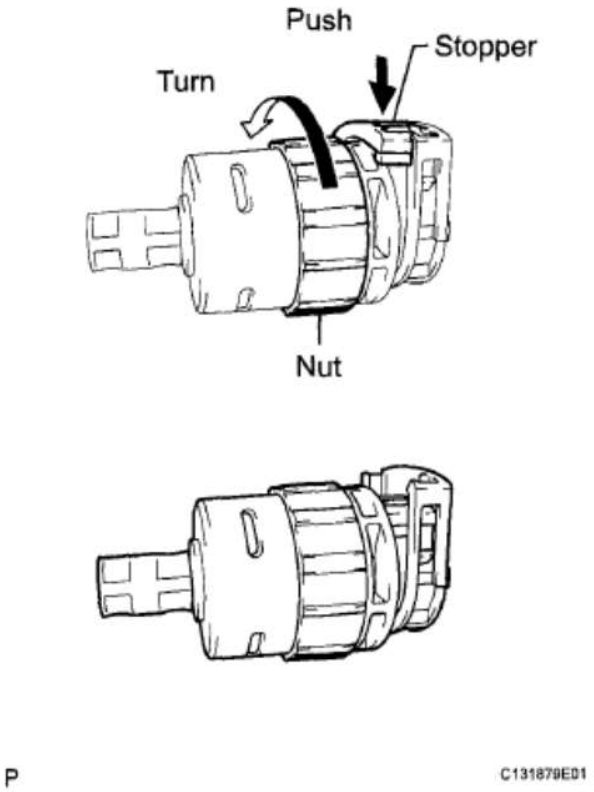


Fig. 203: Rotating Transmission Control Cable Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Connect the outer part of the transmission control cable assembly to the shift lever retainer.

NOTE: After installation, check that the outer part of the cable lock is

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protruding beyond portion A-A as shown in the illustration.

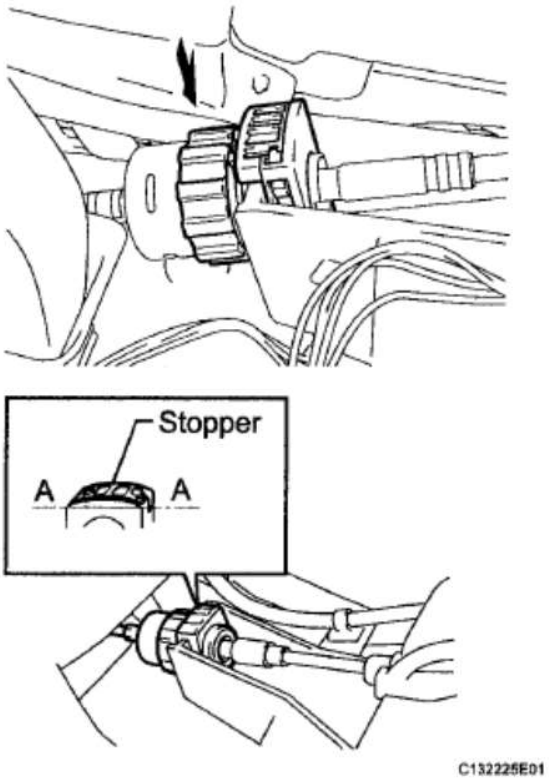


Fig. 204: Identifying Stopper Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Slide the slider in the direction shown in the illustration and pull out the lock piece.

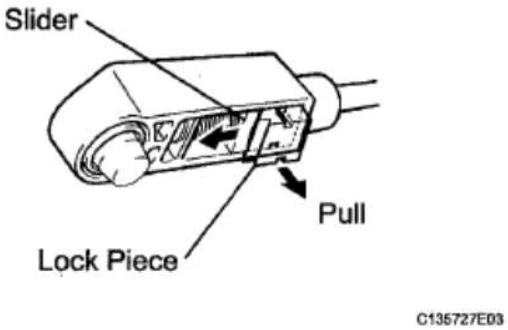


Fig. 205: Pulling Lock Piece
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Install the cable end to the shift control unit.

NOTE:

- **Check that the lock piece is pulled up.**

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- **Install the cable end all the way to the base of the pin.**

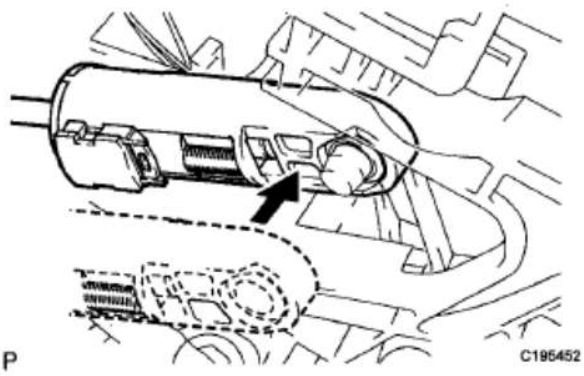


Fig. 206: Installing Cable End To Shift Control Unit
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Push the lock piece into the adjuster case.

NOTE: Firmly push in the lock piece until the slider locks.

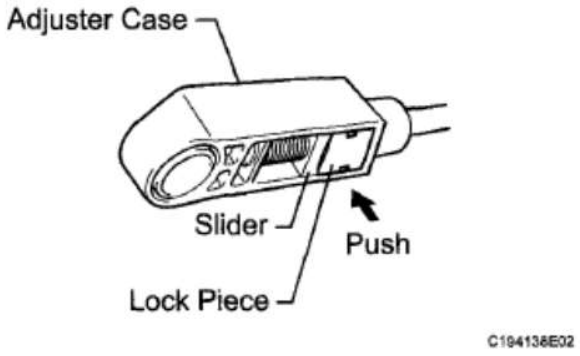


Fig. 207: Pushing Lock Piece Into Adjuster Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **INSTALL SHIFT LEVER KNOB SUB-ASSEMBLY**
   a. Install the shift lever knob sub-assembly.
4. **INSTALL FRONT NO. 2 CONSOLE BOX INSERT** (See **INSTALLATION**)
5. **INSTALL FRONT NO. 1 CONSOLE BOX INSERT** (See **INSTALLATION**)
6. **INSTALL CONSOLE BOX ASSEMBLY (w/o Rear Air Conditioning System)** (See **INSTALLATION**)

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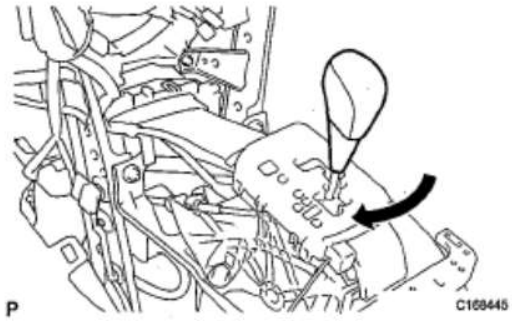


Fig. 208: Installing Shift Lever Knob Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. **INSTALL CONSOLE BOX ASSEMBLY (w/ Rear Air Conditioning System)** (See **INSTALLATION**)
8. **INSTALL LOWER REAR CONSOLE BOX** (See **INSTALLATION**)
9. **INSTALL NO. 2 CONSOLE BOX DUCT (w/o Rear Air Conditioning System)** (See **INSTALLATION**)
10. **INSTALL UPPER CONSOLE PANEL SUB-ASSEMBLY** (See **INSTALLATION**)
11. **INSTALL LOWER INSTRUMENT PANEL SUB-ASSEMBLY** (See **INSTALLATION**)
12. **INSTALL NO. 2 INSTRUMENT PANEL UNDER COVER SUB-ASSEMBLY** (See **INSTALLATION**)
13. **INSTALL COWL SIDE TRIM SUB-ASSEMBLY RH** (See **INSTALLATION**)
14. **INSTALL FRONT DOOR SCUFF PLATE RH** (See **INSTALLATION**)
15. **INSTALL LOWER INSTRUMENT PANEL FINISH PANEL SUB-ASSEMBLY** (See **INSTALLATION**)
16. **INSTALL COWL SIDE TRIM SUB-ASSEMBLY LH** (See **INSTALLATION**)
17. **INSTALL FRONT DOOR SCUFF PLATE LH** (See **INSTALLATION**)
18. **INSTALL CENTER INSTRUMENT CLUSTER FINISH PANEL ASSEMBLY** (See **INSTALLATION**)
19. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

NOTE: **When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).**

20. **ADJUST SHIFT LEVER POSITION** (See **ADJUSTMENT**)
21. **INSPECT SHIFT LEVER POSITION** (See **ON-VEHICLE INSPECTION**)

TRANSMISSION CONTROL CABLE ASSEMBLY

COMPONENTS

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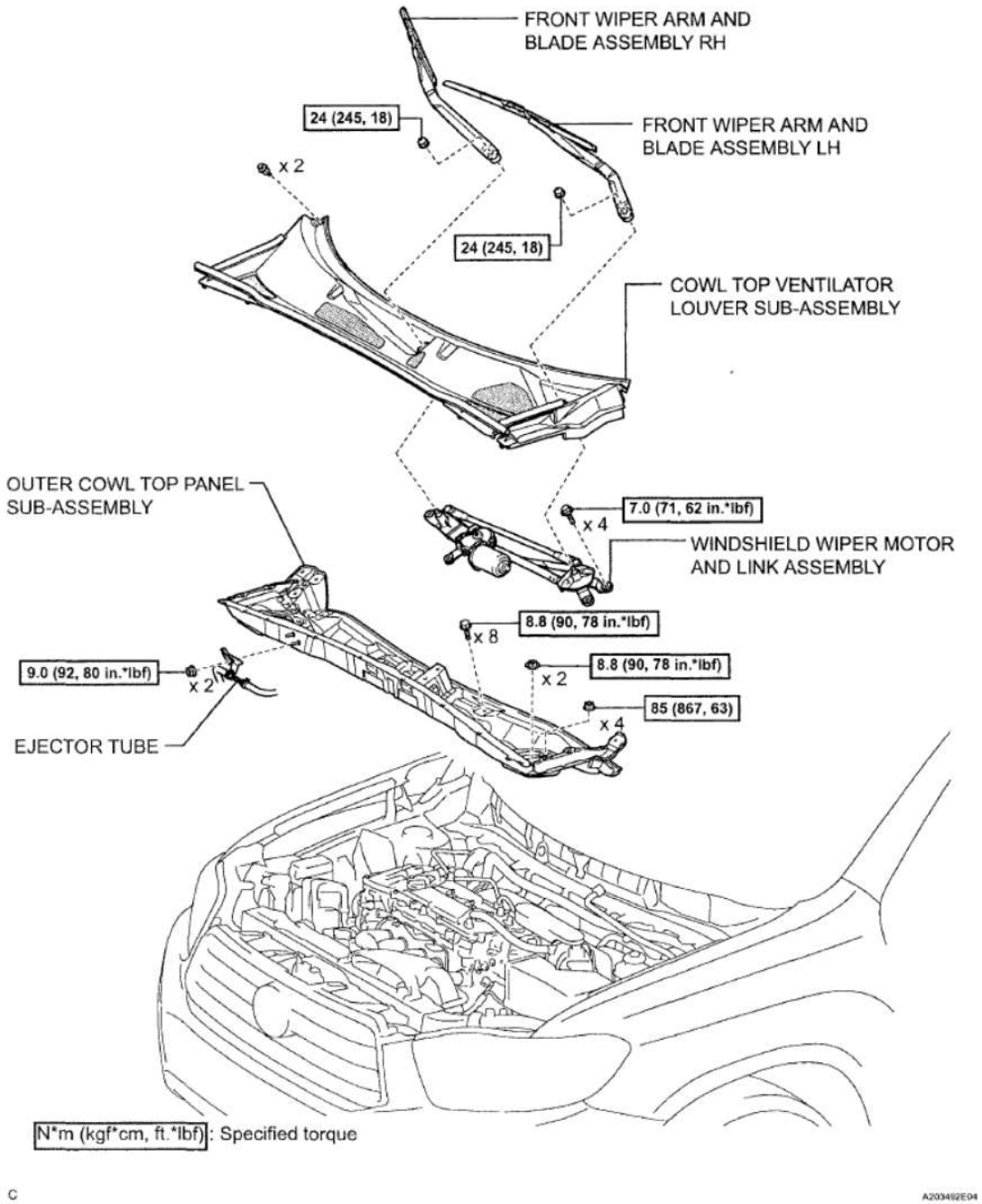


Fig. 209: Identifying Transmission Control Cable Assembly Components (1 Of 4)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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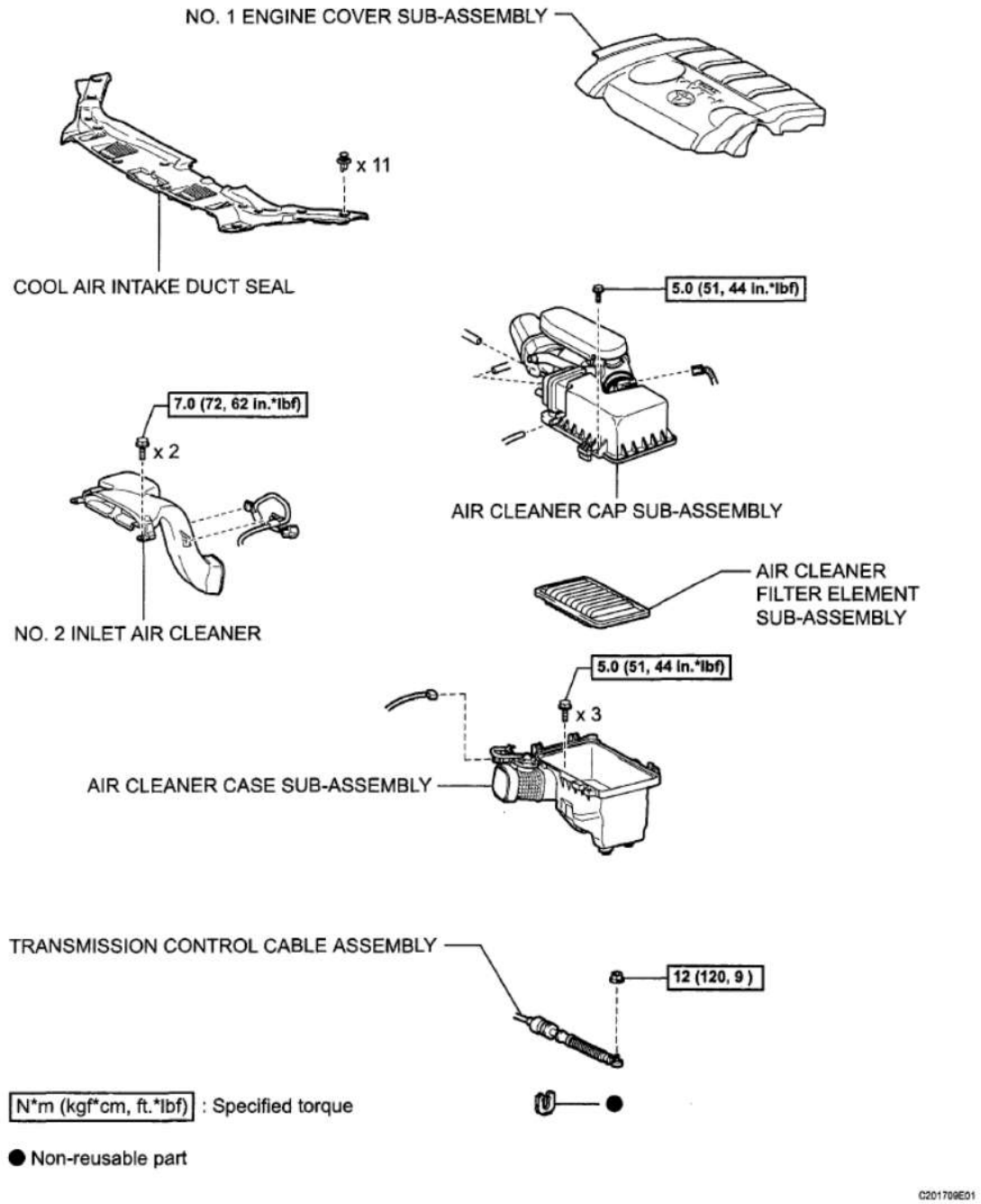
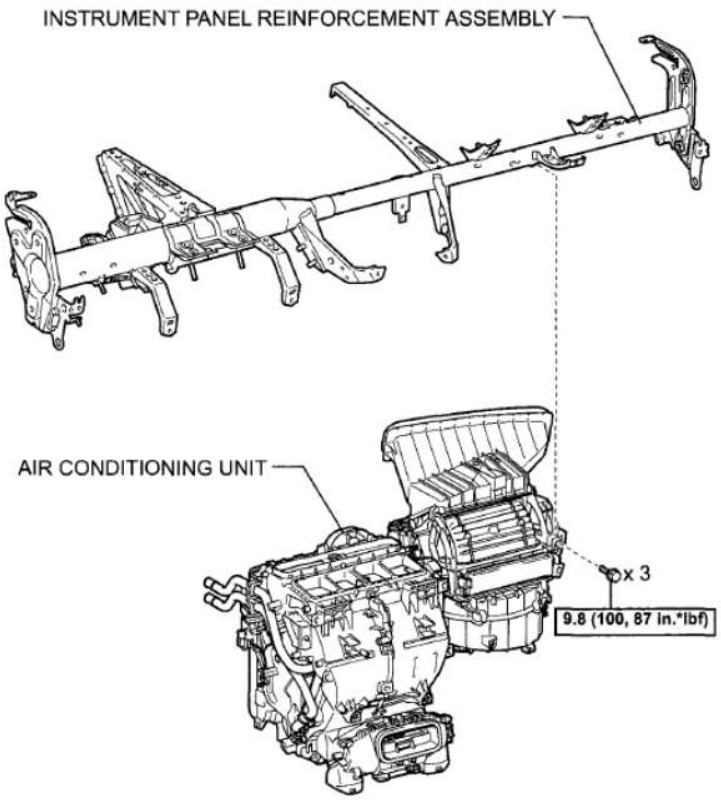


Fig. 210: Identifying Transmission Control Cable Assembly Components (2 Of 4)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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N*m (kgf*cm, ft.*lbf): Specified torque

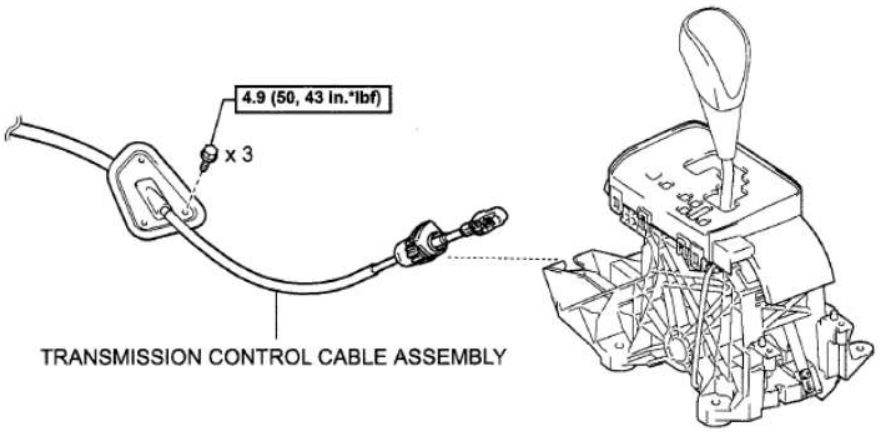
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Fig. 211: Identifying Transmission Control Cable Assembly Components (3 Of 4)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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N*m (kgf*cm, ft.*lbf): Specified torque

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Fig. 212: Identifying Transmission Control Cable Assembly Components (4 Of 4)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

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

   NOTE: When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).

2. **REMOVE COOL AIR INTAKE DUCT SEAL** (See **REMOVAL**)
3. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See **REMOVAL**)
4. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See **REMOVAL**)
5. **REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See **REMOVAL**)
6. **REMOVE WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See **REMOVAL**)
7. **SEPARATE EJECTOR TUBE** (See **REMOVAL**)
8. **REMOVE OUTER COWL TOP PANEL SUB-ASSEMBLY** (See **REMOVAL**)
9. **REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY** (See **REMOVAL**)
10. **REMOVE NO. 2 INLET AIR CLEANER** (See **REMOVAL**)
11. **REMOVE AIR CLEANER CAP SUB-ASSEMBLY** (See **REMOVAL**)
12. **REMOVE AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY** (See **REMOVAL**)
13. **REMOVE AIR CLEANER CASE SUB-ASSEMBLY** (See **REMOVAL**)
14. **REMOVE AIR CONDITIONING UNIT**

    HINT:

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See **REMOVAL**

15. **REMOVE TRANSMISSION CONTROL CABLE ASSEMBLY**
    a. Remove the nut from the control shaft lever.
    b. Disconnect the transmission control cable assembly from the control shaft lever.

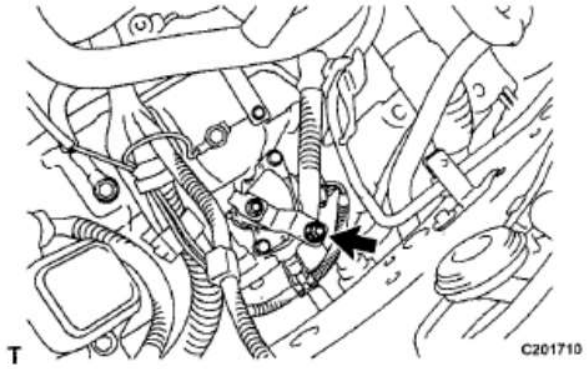


Fig. 213: Locating Control Shaft Lever Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    c. While expanding the claws of the clip, disconnect the transmission control cable assembly and clip from the control cable bracket.
    d. Remove the clip from the transmission control cable assembly.

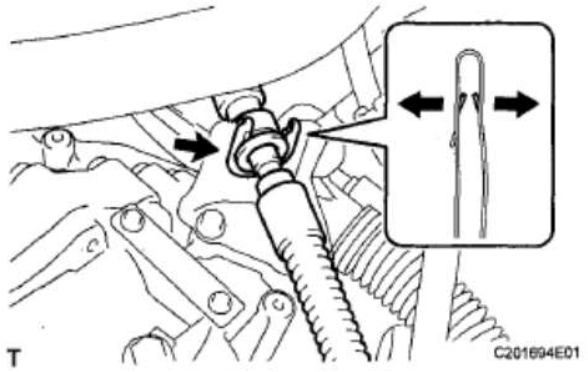


Fig. 214: Locating Control Cable Bracket, Clip And Claws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    e. Remove the 3 bolts and disconnect the transmission control cable assembly from the vehicle.

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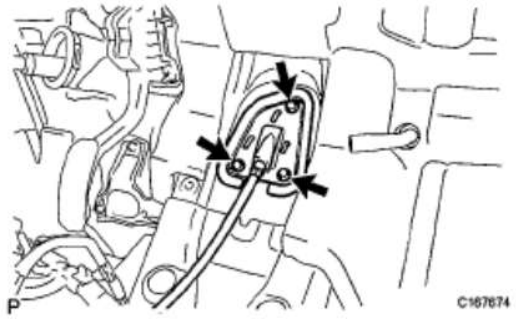


Fig. 215: Locating Transmission Control Cable Assembly And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Using a screwdriver, disconnect the cable end from the shift lever assembly.

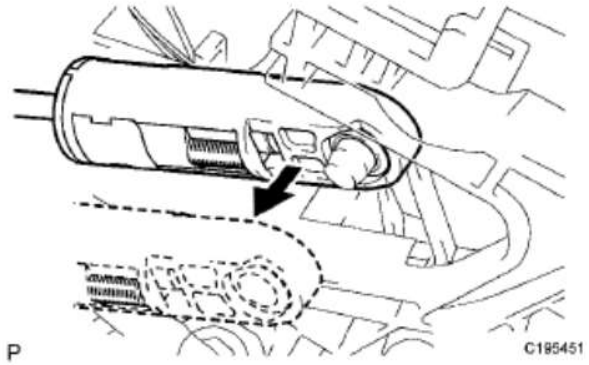


Fig. 216: Disconnecting Shift Lever Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Turn the nut and disconnect the control cable from the shift lever retainer.

ADJUSTMENT

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

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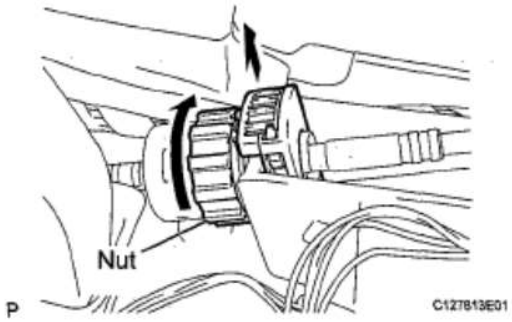


Fig. 217: Disconnecting Control Cable Of Shift Lever Retainer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **ADJUST SHIFT LEVER POSITION**
   a. Move the shift lever to N.
   b. Slide the slider in the direction shown in the illustration and pull out the lock piece.
   c. Push the lock piece into the adjuster case.

   NOTE: Firmly push in the lock piece until the slider locks.

   d. After adjusting the shift lever position, check the operation and function of the shift lever. If there is a problem, adjust the position again.

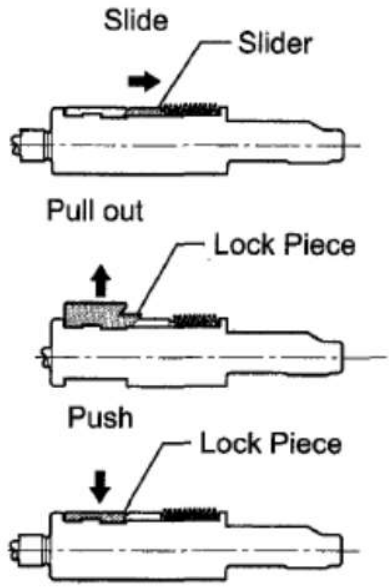


Fig. 218: Adjusting Shift Lever Position

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2009 TRANSMISSION Automatic Transaxle (U760E) - Highlander

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. **INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY**
   a. Rotate the transmission control cable nut counterclockwise and, while holding the nut in that position, press in the stopper.

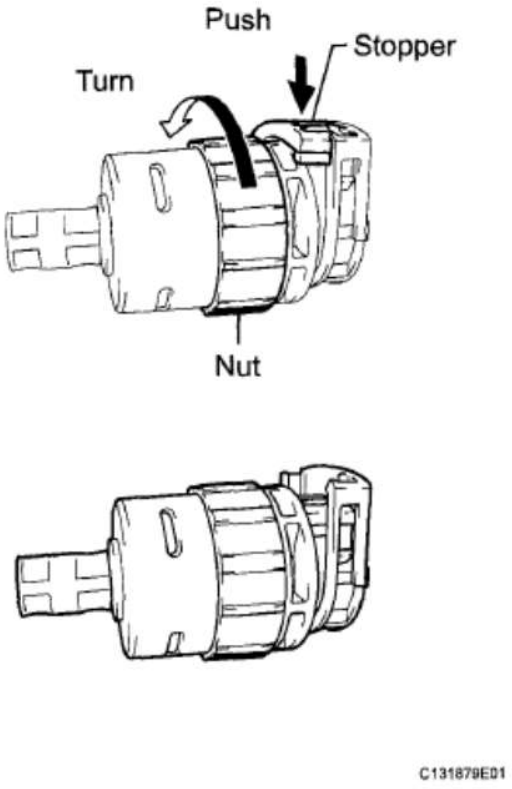


Fig. 219: Rotating Transmission Control Cable Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Install the outer part of the transmission control cable assembly to the shift lever retainer.

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

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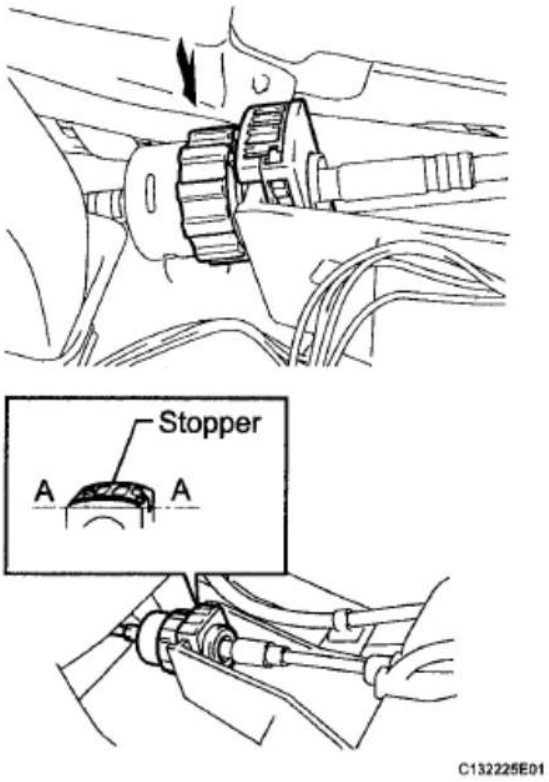


Fig. 220: Identifying Stopper Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Slide the slider in the direction shown in the illustration and pull out the lock piece.

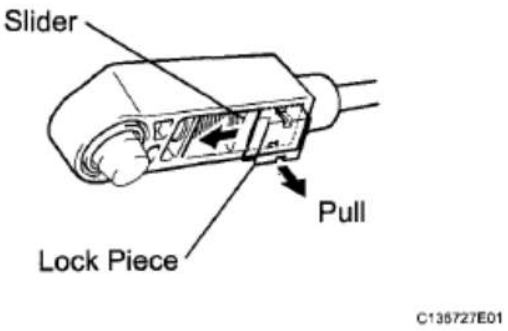


Fig. 221: Pulling Lock Piece
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Install the cable end to the shift control unit.

NOTE:

- **Check that the lock piece is pulled up.**
- **Install the cable end all the way to the base of the pin.**
- **Push in the lock piece after adjusting the shift lever position.**

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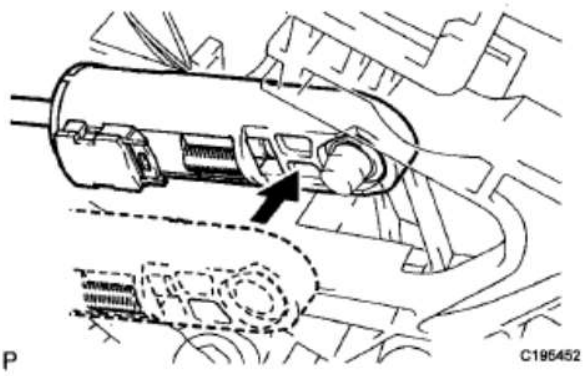


Fig. 222: Installing Cable End To Shift Control Unit
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Install the transmission control cable assembly with the 3 bolts.

Torque: 4.9 N*m (50 kgf*cm, 43 in.*lbf)

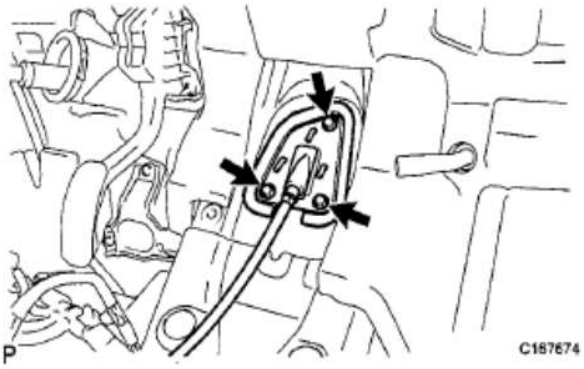


Fig. 223: Locating Transmission Control Cable Assembly With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Install the transmission control cable assembly to the control shaft lever with the nut.

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

g. Install a new clip to the cable bracket.

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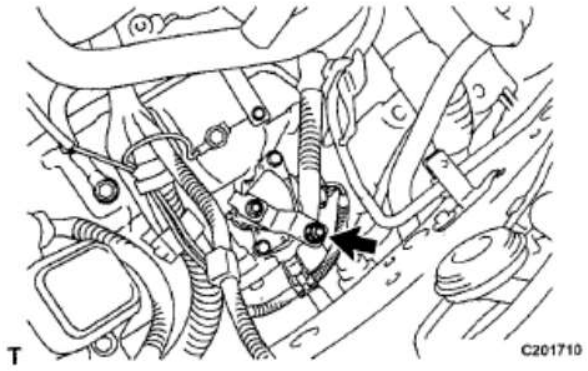


Fig. 224: Locating Cable Bracket And Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

h. Connect the transmission control cable assembly to the cable bracket.

NOTE:

- **Make sure that claw A on the clip are securely fit into the bracket holes.**
- **Make sure that the cable is securely installed inside claw B of the clip.**

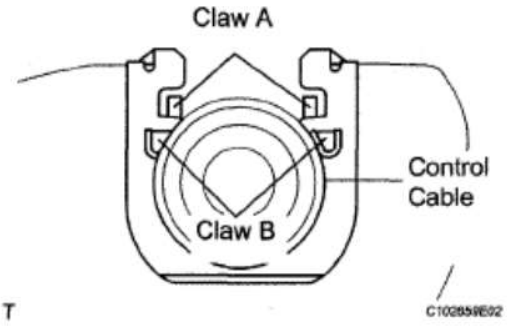


Fig. 225: Identifying Control Cable And Claw
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSTALL AIR CONDITIONING UNIT**

   HINT:

   See **INSTALLATION**

3. **INSTALL AIR CLEANER CASE SUB-ASSEMBLY** (See **INSTALLATION**)
4. **INSTALL AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY** (See **INSTALLATION**)
5. **INSTALL AIR CLEANER CAP SUB-ASSEMBLY** (See **INSTALLATION**)
6. **INSTALL NO. 2 INLET AIR CLEANER** (See **INSTALLATION**)
7. **INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY** (See **INSTALLATION**)

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8. **INSTALL OUTER COWL TOP PANEL SUB-ASSEMBLY** (See **INSTALLATION**)
9. **INSTALL EJECTOR TUBE** (See **INSTALLATION**)
10. **INSTALL WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See **INSTALLATION**)
11. **INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See **INSTALLATION**)
12. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See **INSTALLATION**)
13. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See **INSTALLATION**)
14. **INSTALL COOL AIR INTAKE DUCT SEAL** (See **INSTALLATION**)
15. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

NOTE: **When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).**

16. **ADJUST SHIFT LEVER POSITION** (See **ADJUSTMENT**)
17. **INSPECT SHIFT LEVER POSITION** (See **ON-VEHICLE INSPECTION**)

DIFFERENTIAL OIL SEAL

COMPONENTS

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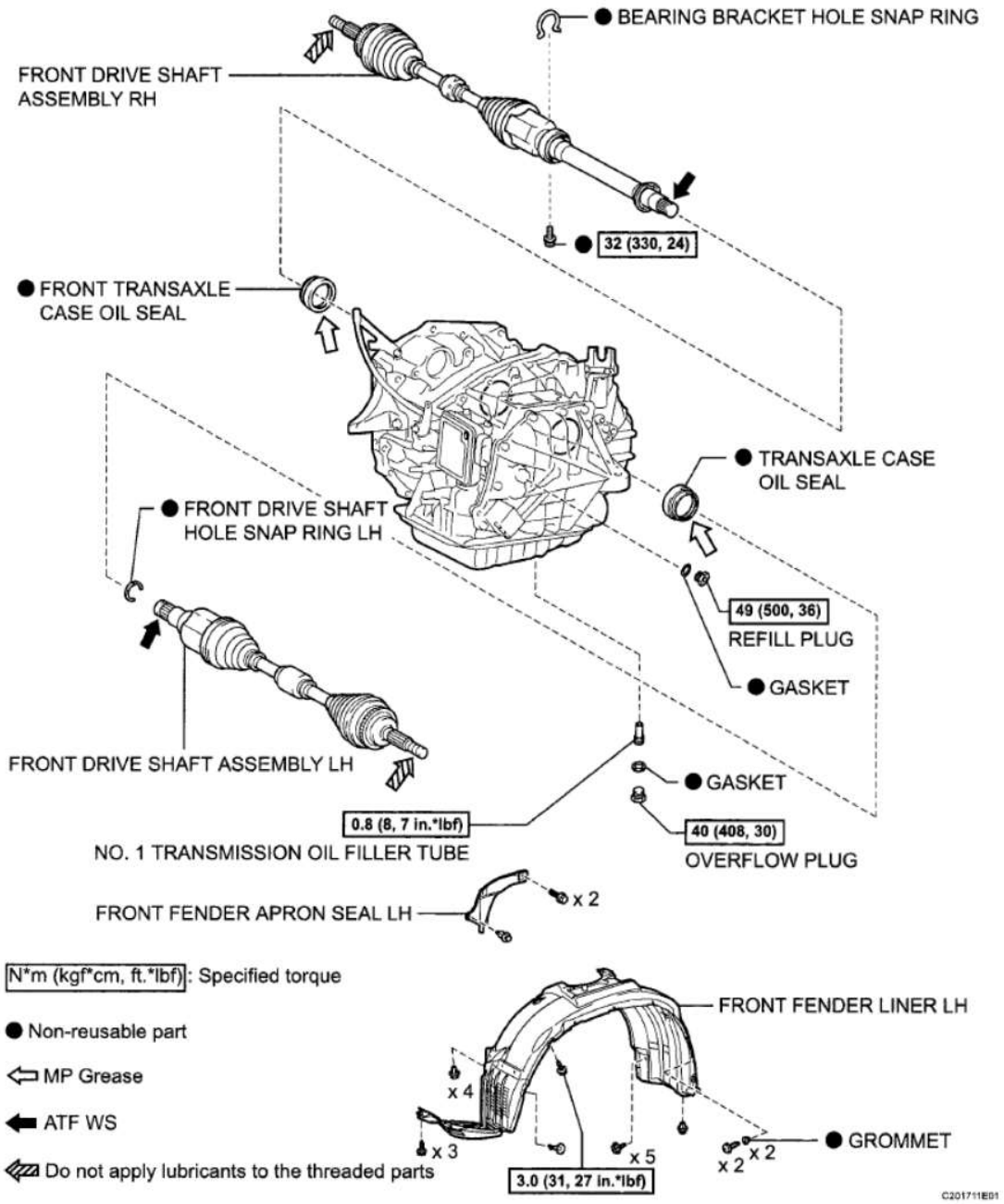


Fig. 226: Identifying Differential Oil Seal Components With Torque Specification
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REPLACEMENT

1. **DRAIN AUTOMATIC TRANSAXLE FLUID**
   a. Remove the front fender liner LH (See **REMOVAL**).
   b. Remove the front fender apron seal LH (See **REMOVAL**).
   c. Using a 6 mm hexagon socket wrench, remove the overflow plug and gasket from the automatic

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transaxle.

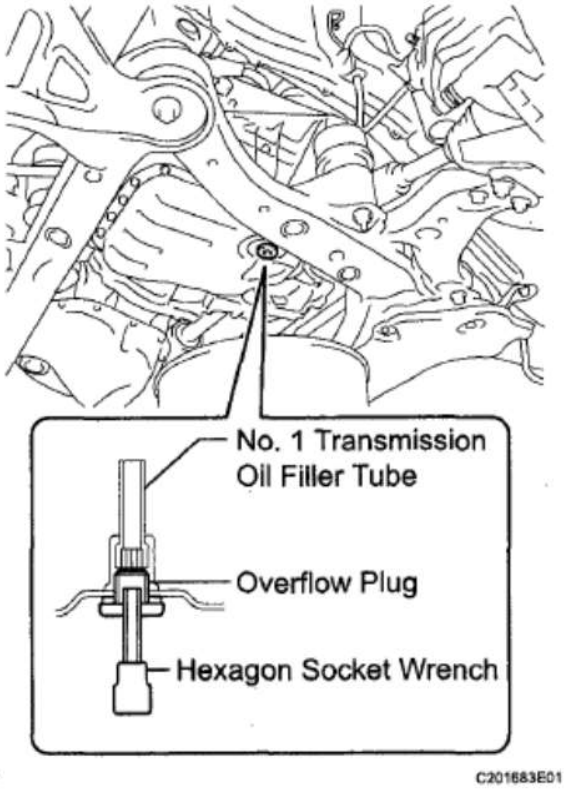


Fig. 227: Identifying No.1 Transmission Oil Filler Tube Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Remove the refill plug and gasket from the automatic transaxle.

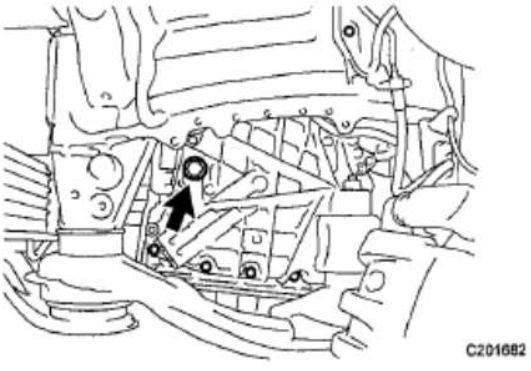


Fig. 228: Locating Refill Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Using a 6 mm hexagon socket wrench, remove the No. 1 transmission oil filler tube from the automatic transaxle.

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f. Drain automatic transaxle fluid from the automatic transaxle.

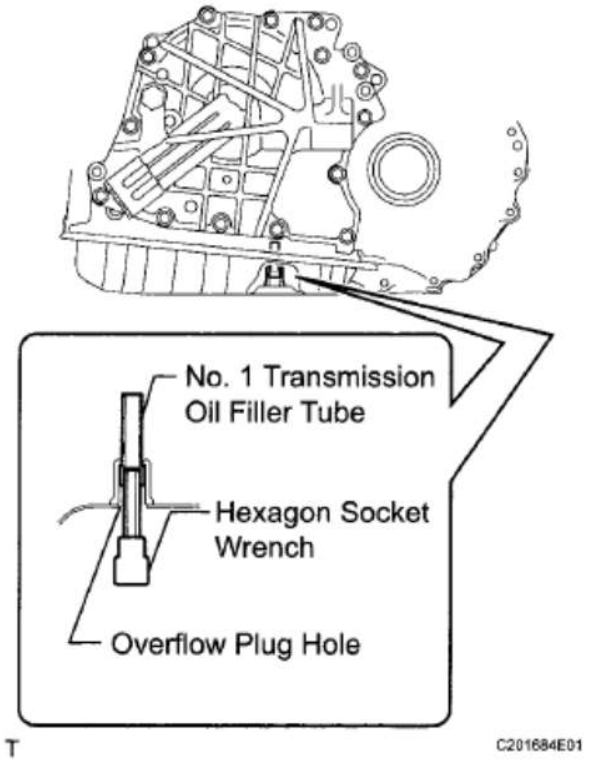


Fig. 229: Identifying No.1 Transmission Oil Filler Tube Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Using a 6 mm hexagon socket wrench, install the No. 1 transmission oil filler tube to the automatic transaxle.

Torque: 0.8 N*m (8 kgf*cm, 7 in.*lbf)

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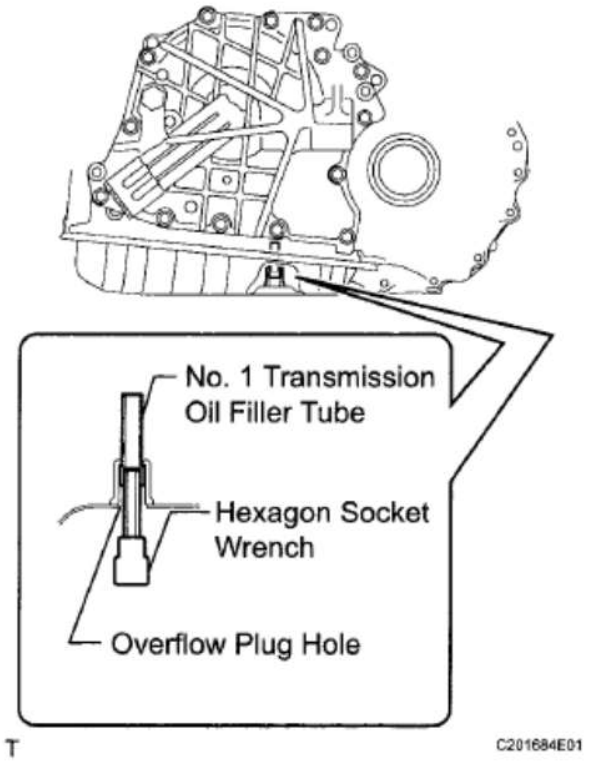


Fig. 230: Identifying No.1 Transmission Oil Filler Tube Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

h. Using a 6 mm hexagon socket wrench, install a new gasket and the overflow plug to the automatic transaxle.

Torque: 40 N*m (408 kgf*cm, 30 ft.*lbf)

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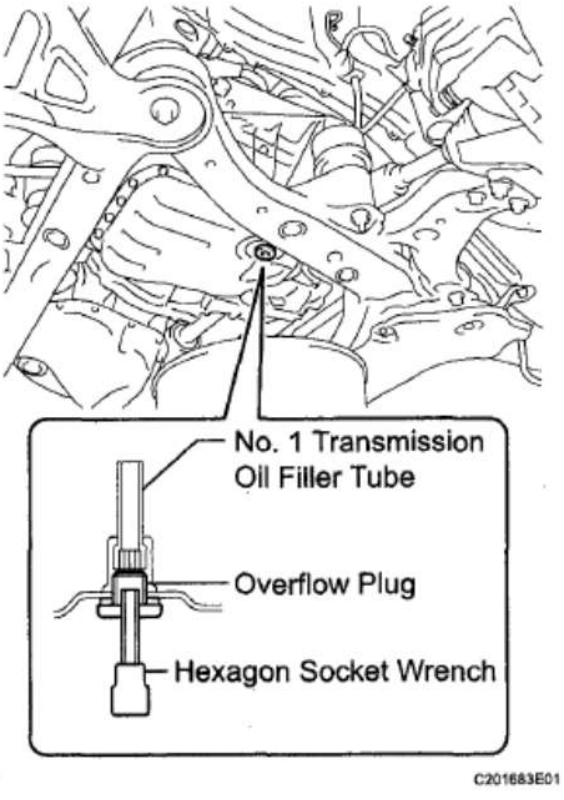


Fig. 231: Identifying No.1 Transmission Oil Filler Tube Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

i. Install a new gasket and the refill plug to the automatic transaxle.

Torque: 49 N*m (500 kgf*cm, 36 ft.*lbf)

j. Install the front fender apron seal LH (See **INSTALLATION**).
k. Install the front fender liner LH (See **INSTALLATION**).

2. **REMOVE FRONT DRIVE SHAFT ASSEMBLY**

HINT:

See **REMOVAL**

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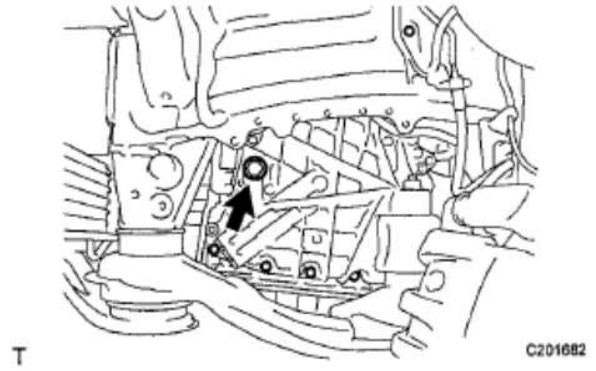


Fig. 232: Locating Refill Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **REMOVE TRANSAXLE CASE OIL SEAL**
   a. Using SST, tap out the transaxle case oil seal.

SST 09308-00010

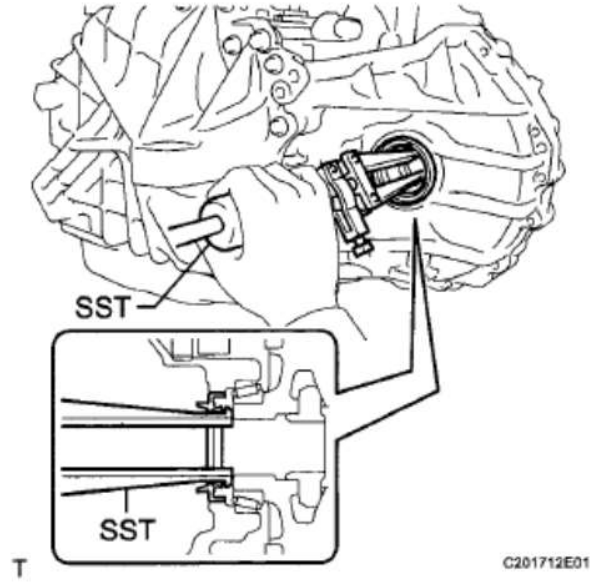


Fig. 233: Tapping Transaxle Case Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **REMOVE FRONT TRANSAXLE CASE OIL SEAL**
   a. Using SST, tap out the front transaxle case oil seal.

SST 09308-00010

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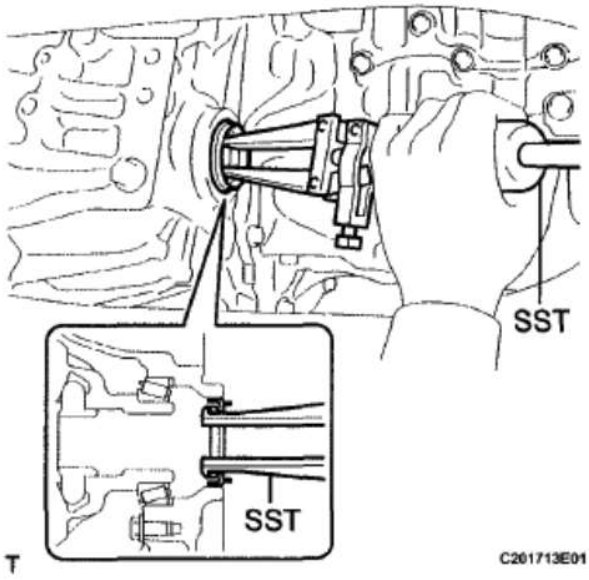


Fig. 234: Tapping Front Transaxle Case Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **INSTALL FRONT TRANSAXLE CASE OIL SEAL**
   a. Using SST and a hammer, tap in a new front transaxle case oil seal.

      SST 09316-60011, 09950-70010 (09951 -07100)

      Oil seal driven in depth:

      -0.5 to 0.5 mm (-0.0197 to 0.0197 in.)

      NOTE: Check that the oil seal is installed in the correct direction.

   b. Coat the lip of the front transaxle case oil seal with MP grease.

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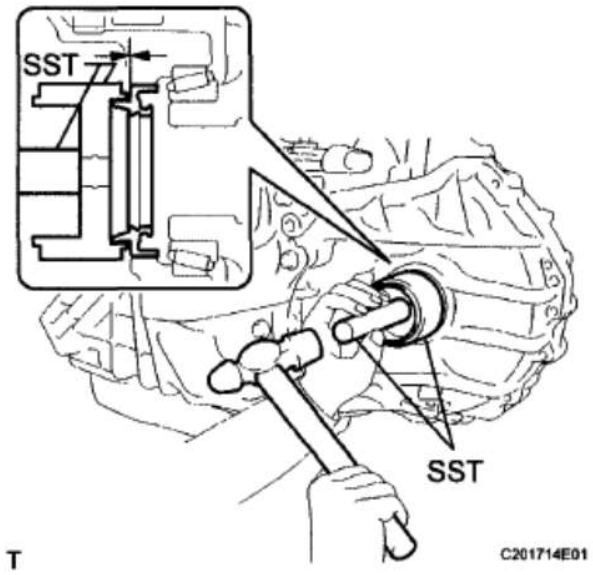


Fig. 235: Tapping Front Transaxle Case Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **INSTALL TRANSAXLE CASE OIL SEAL**
   a. Using SST and a hammer, tap in a new transaxle case oil seal.

      SST 09316-60011 (09316-00011)

      Oil seal driven in depth:

      -0.5 to 0.5 mm (-0.0197 to 0.0197 in.)

      NOTE: Check that the oil seal is installed in the correct direction.

   b. Coat the lip of the transaxle case oil seal with MP grease.
7. **INSTALL FRONT DRIVE SHAFT ASSEMBLY**

   HINT:

   See **INSTALLATION**

8. **ADD AUTOMATIC TRANSAXLE FLUID**

   HINT:

   See **AUTOMATIC TRANSAXLE FLUID**

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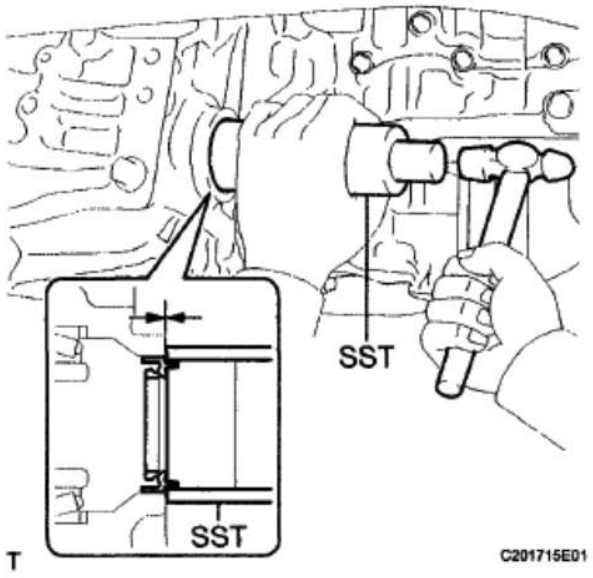


Fig. 236: Tapping Transaxle Case Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

AUTOMATIC TRANSAXLE ASSEMBLY

COMPONENTS

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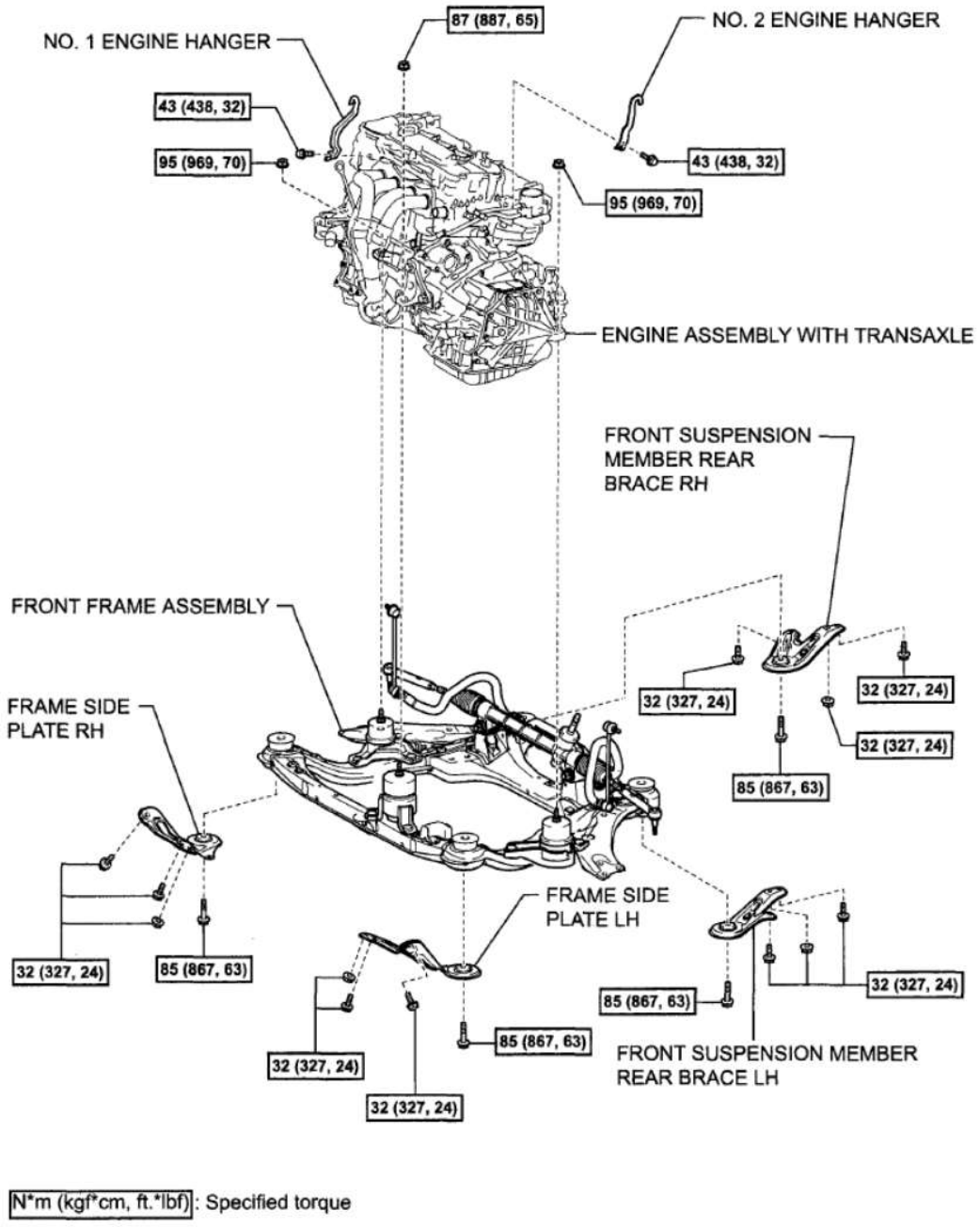


Fig. 237: Identifying Automatic Transaxle Assembly Components With Torque Specification (1 Of 3)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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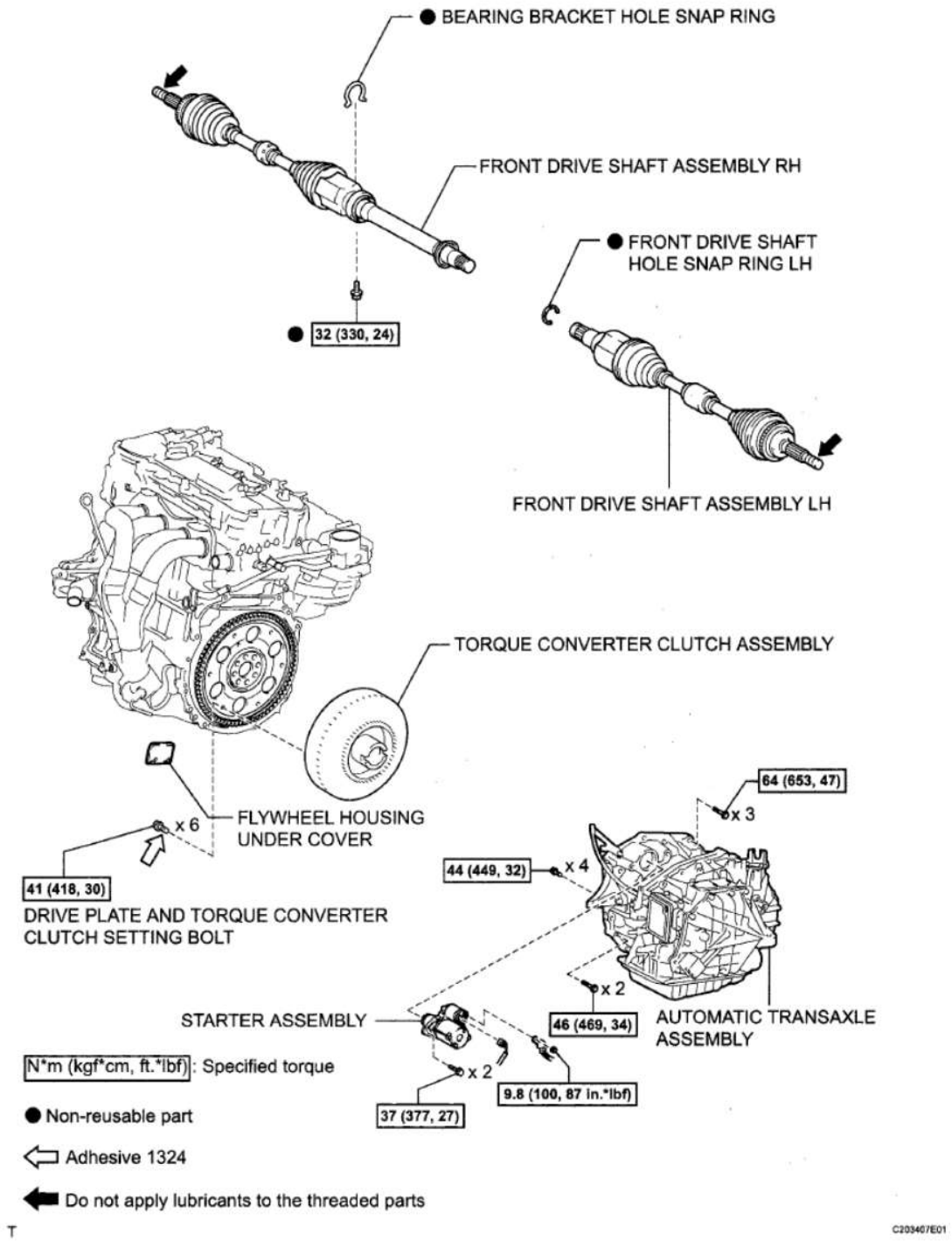


Fig. 238: Identifying Automatic Transaxle Assembly Components With Torque Specification (2 Of 3)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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2009 TRANSMISSION Automatic Transaxle (U760E) - Highlander

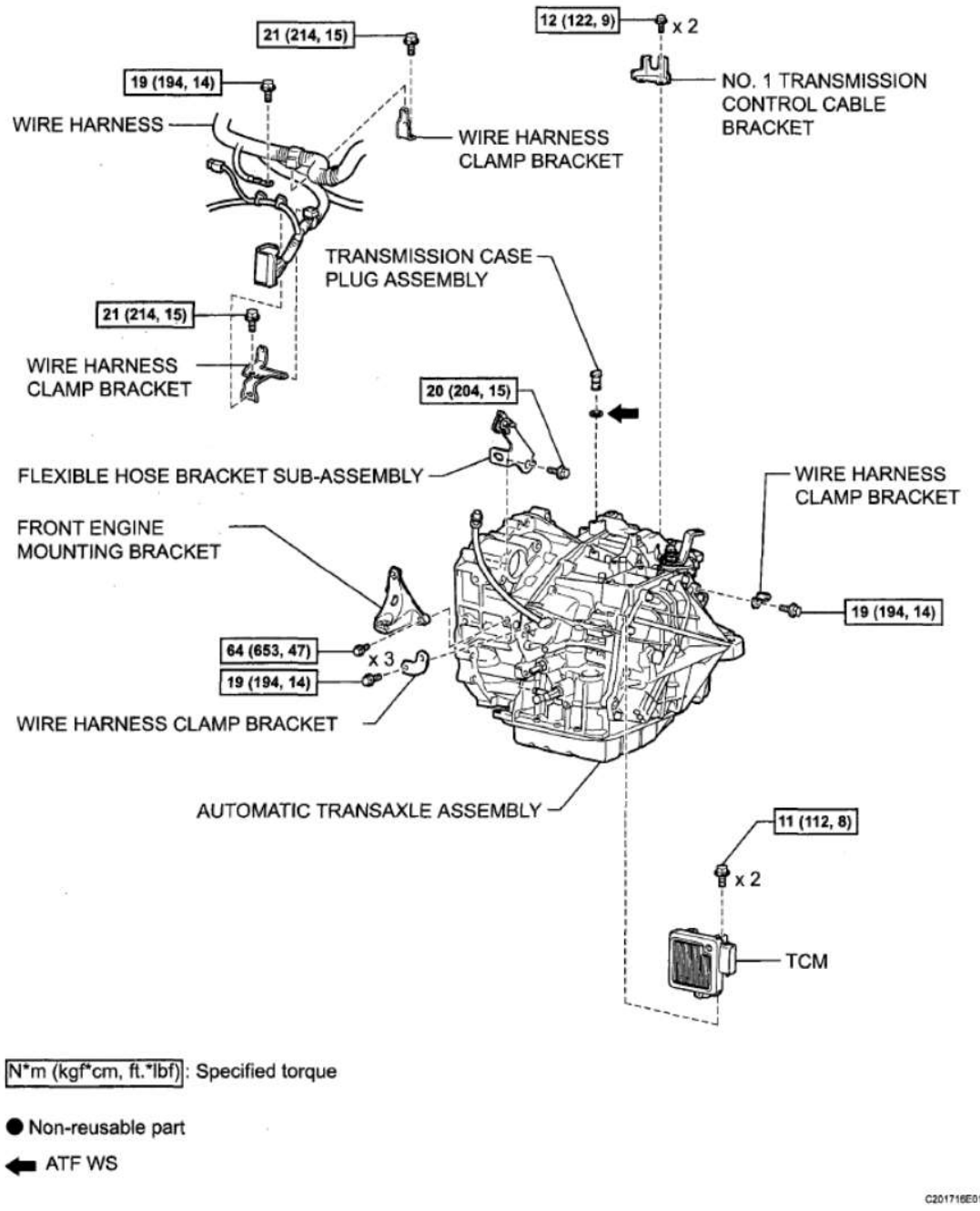


Fig. 239: Identifying Automatic Transaxle Assembly Components With Torque Specification (3 Of 3)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

NOTE: **If automatic transmission parts are replaced, refer to the Parts Replacement Compensation Table to determine if any additional operations are necessary (See AUTOMATIC TRANSAXLE SYSTEM).**

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1. **REMOVE ENGINE ASSEMBLY WITH TRANSAXLE**

   HINT:

   See the steps from "Recover Refrigerant from Refrigeration System" through "Remove Engine Assembly with Transaxle" (See **REMOVAL**).

2. **INSTALL ENGINE HANGERS** (See **REMOVAL**)
3. **REMOVE STARTER ASSEMBLY** (See **REMOVAL**)
4. **REMOVE FRONT DRIVE SHAFT ASSEMBLY LH** (See **REMOVAL**)
5. **REMOVE FRONT DRIVE SHAFT HOLE SNAP RING LH** (See **DISASSEMBLY**)
6. **REMOVE FRONT DRIVE SHAFT ASSEMBLY RH** (See **DISASSEMBLY**)
7. **REMOVE FRONT FRAME ASSEMBLY** (See **REMOVAL**)
8. **REMOVE TCM** (See **INSTALLATION**)
9. **SEPARATE WIRE HARNESS**
   a. Remove the bolt and ground cable.
   b. Separate the park/neutral position switch connector and 6 wire harness clamps.

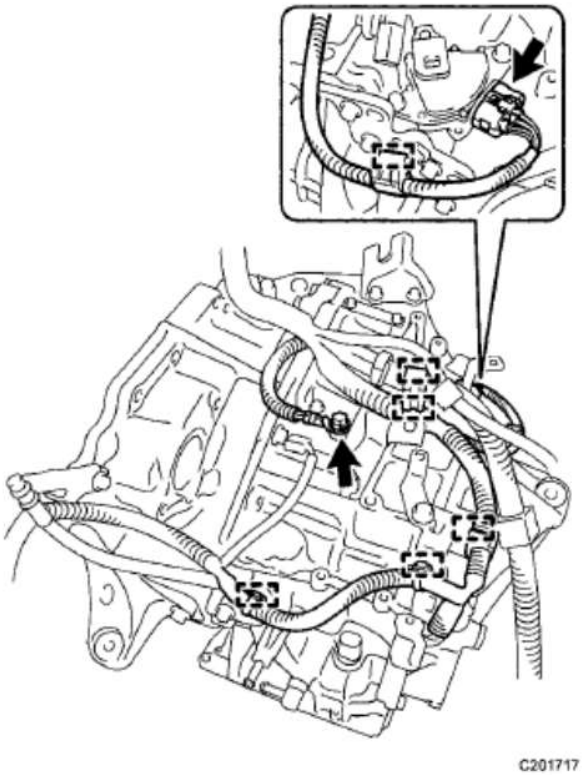


Fig. 240: Locating Park/Neutral Position Switch Connector And Wire Harness Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. **REMOVE AUTOMATIC TRANSAXLE ASSEMBLY**

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a. Remove the 9 bolts and transaxle.

NOTE: To prevent damage to the knock pins, do not pry between the transaxle and engine.

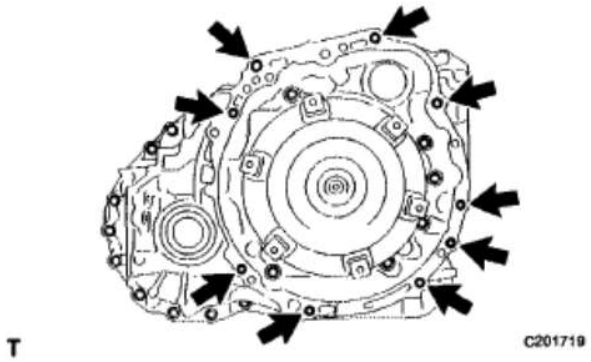


Fig. 241: Locating Transaxle Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. **REMOVE FLEXIBLE HOSE BRACKET SUB-ASSEMBLY**
    a. Slide the clip and disconnect the breather plug hose from the flexible hose bracket sub-assembly.
    b. Remove the bolt and flexible hose bracket sub-assembly from the transaxle.

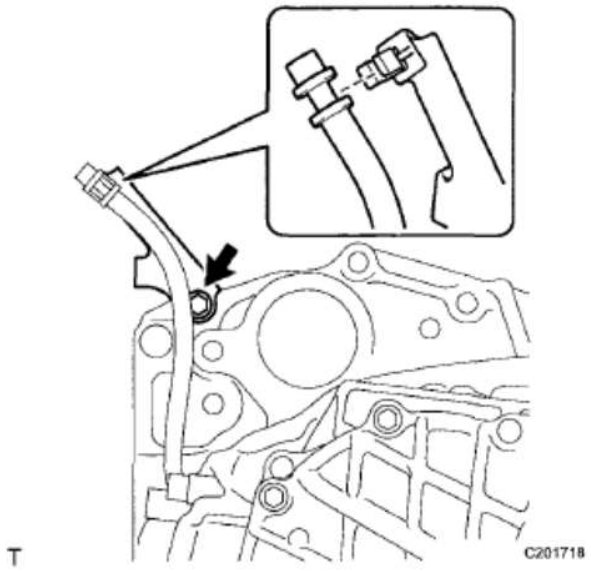


Fig. 242: Locating Breather Plug Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. **REMOVE WIRE HARNESS CLAMP BRACKET**
    a. Remove the 4 bolts and 4 wire harness clamp brackets from the transaxle.

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Fig. 243: Locating Wire Harness Clamp Brackets Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. **REMOVE FRONT ENGINE MOUNTING BRACKET**
    a. Remove the 3 bolts and front engine mounting bracket from the automatic transaxle assembly.

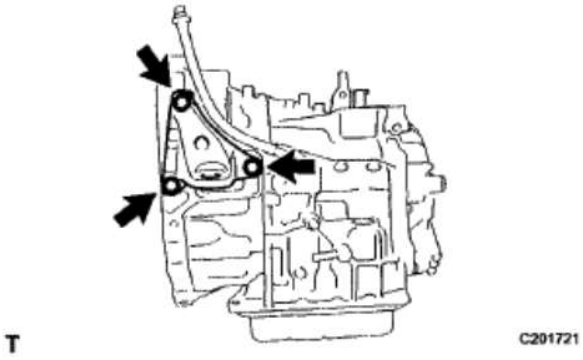


Fig. 244: Locating Front Engine Mounting Bracket Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. **REMOVE NO. 1 TRANSMISSION CONTROL CABLE BRACKET**
    a. Remove the 2 bolts and No. 1 transmission control cable bracket from the automatic transaxle assembly.

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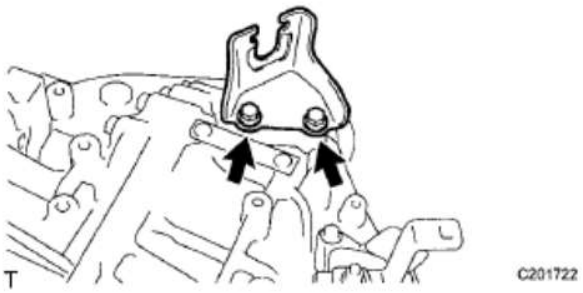


Fig. 245: Locating No. 1 Transmission Control Cable Bracket And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. **REMOVE TRANSMISSION CASE PLUG ASSEMBLY**
    a. Remove the transmission case plug assembly from the automatic transaxle assembly.
    b. Remove the O-ring from the transmission case plug assembly.

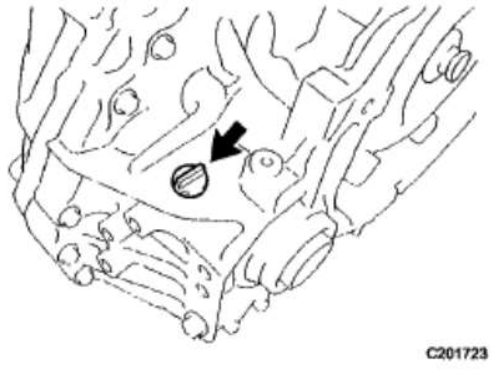


Fig. 246: Locating Transmission Case Plug Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

16. **REMOVE TORQUE CONVERTER CLUTCH ASSEMBLY**
    a. Remove the torque converter clutch assembly from the automatic transaxle assembly.

INSTALLATION

1. **INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY** (See **TORQUE CONVERTER CLUTCH AND DRIVE PLATE**)

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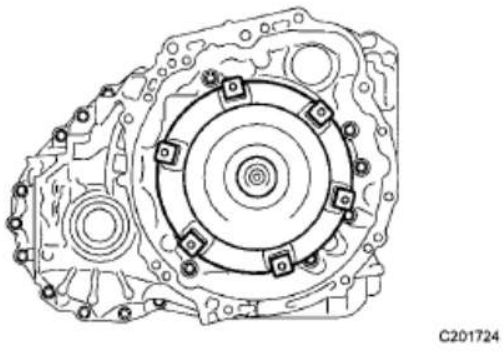


Fig. 247: Identifying Torque Converter Clutch Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSTALL TORQUE CONVERTER CLUTCH ASSEMBLY**
   a. Engage the splines of the input shaft and turbine runner.

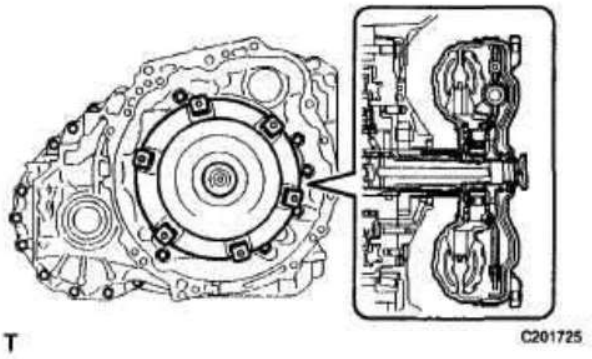


Fig. 248: Identifying Input Shaft And Turbine Runner
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Engage the splines of the stator shaft and the stator while turning the torque converter clutch assembly.

      HINT:

      If the stator shaft splines are difficult to engage with the stator splines, move the torque converter back approximately 10 mm and engage the splines while rotating the torque converter.

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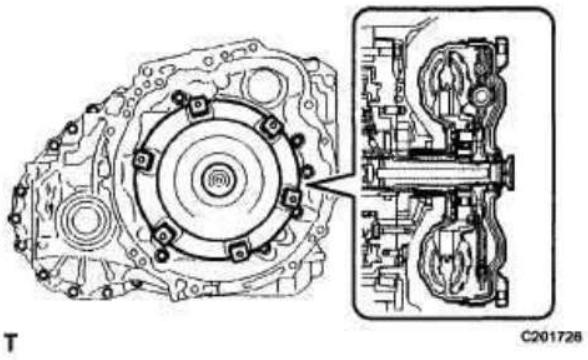


Fig. 249: Identifying Stator Shaft Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Turn the torque converter clutch assembly to engage the key of the oil pump drive gear into the slot on the torque converter clutch assembly.

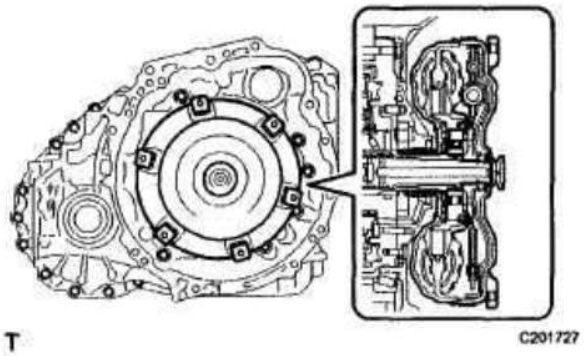


Fig. 250: Identifying Torque Converter Clutch Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Using a vernier caliper and a straightedge, measure dimension "A" between the transaxle fitting surface of the engine *1 and the converter fitting surface of the drive plate *2. (#)

NOTE: Make sure to deduct the thickness of the straightedge.

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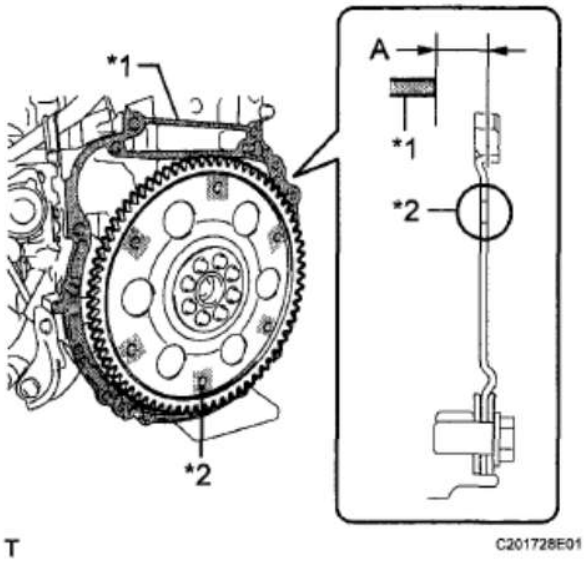


Fig. 251: Measuring Dimension A Between Transaxle Fitting Surface And Converter Fitting Surface
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Using a vernier caliper and a straightedge, measure dimension "B" shown in the illustration and check that "B" is greater than "A" (measured in step (#)).

Standard:

A + 1 mm (0.0394 in.) or more

NOTE:

- **Make sure to deduct the thickness of the straightedge.**
- **If the transaxle is installed to the engine with the torque converter not sufficiently inserted, the torque converter may be damaged.**

HINT:

If a U760E is used with a 1AR-FE, the standard installation depth is 14 mm (0.551 in.) or more.

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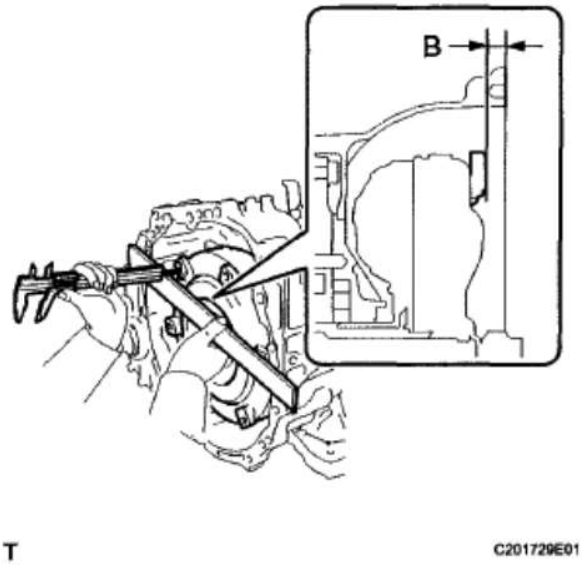


Fig. 252: Checking Torque Converter Thickness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **INSTALL TRANSMISSION CASE PLUG ASSEMBLY**
   a. Apply ATF to a new O-ring and install it to the transmission case plug assembly.
   b. Install the transmission case plug assembly to the automatic transaxle assembly.

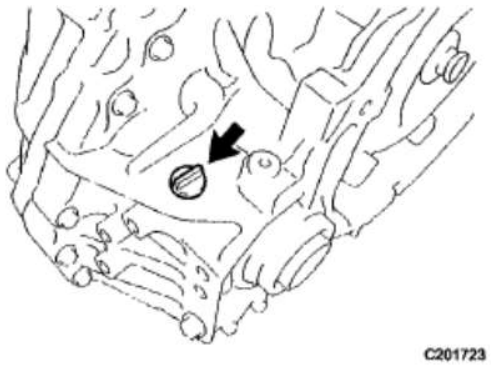


Fig. 253: Locating Transmission Case Plug Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **INSTALL NO. 1 TRANSMISSION CONTROL CABLE BRACKET**
   a. Install the No. 1 transmission control cable bracket to the automatic transaxle assembly with the 2 bolts.

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

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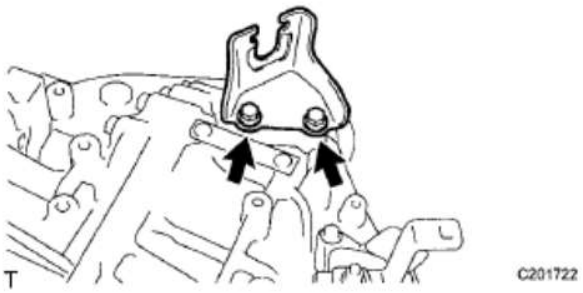


Fig. 254: Locating No. 1 Transmission Control Cable Bracket And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **INSTALL FRONT ENGINE MOUNTING BRACKET**
   a. Install the front engine mounting bracket to the automatic transaxle assembly with the 3 bolts.

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

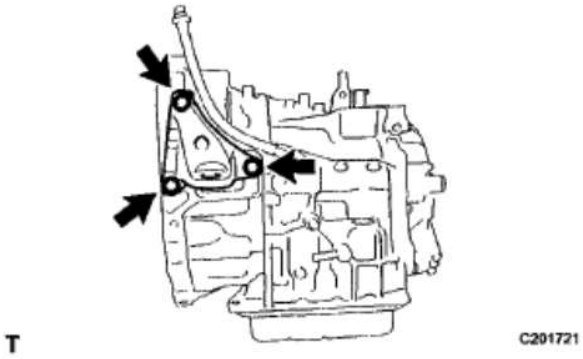


Fig. 255: Locating Front Engine Mounting Bracket Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **INSTALL WIRE HARNESS CLAMP BRACKET**
   a. Install the 4 wire harness clamp brackets to the automatic transaxle assembly with the 4 bolts.

Torque: Bolt A

21 N*m (214 kgf*cm, 15 ft.*lbf)

Bolt B

19 N*m (194 kgf*cm, 14 ft.*lbf)

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Fig. 256: Locating Wire Harness Clamp Brackets
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. **INSTALL FLEXIBLE HOSE BRACKET SUB-ASSEMBLY**
   a. Install the flexible hose bracket sub-assembly to the transaxle with the bolt.

      Torque: 20 N*m (204 kgf*cm, 15 ft.*lbf)

   b. Install the breather plug hose to the flexible hose bracket sub-assembly with the clip.

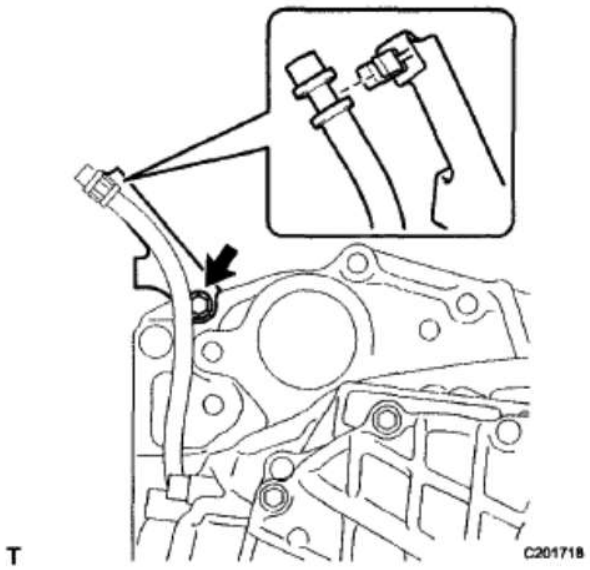


Fig. 257: Locating Flexible Hose Bracket Sub-Assembly With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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8. **INSTALL AUTOMATIC TRANSAXLE ASSEMBLY**

a. Apply clutch spline grease to the round of the crankshaft contact surface with the torque converter centerpiece.

Clutch spline grease:

Toyota Genuine Clutch Spline Grease or equivalent

Maximum spread:

About 1 g (0.0353 oz.)

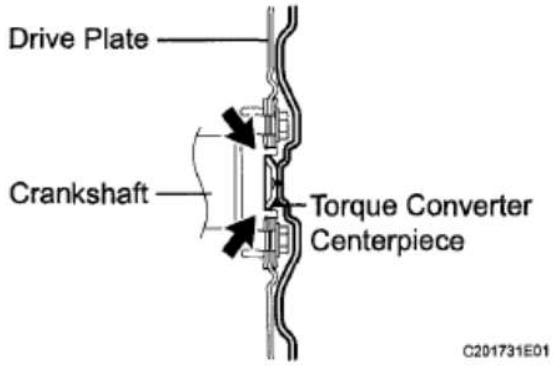


Fig. 258: Locating Drive Plate, Crankshaft And Torque Converter Centerpiece
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Confirm that 2 knock pins are on the transaxle contact surface of the engine block before the transaxle installation.

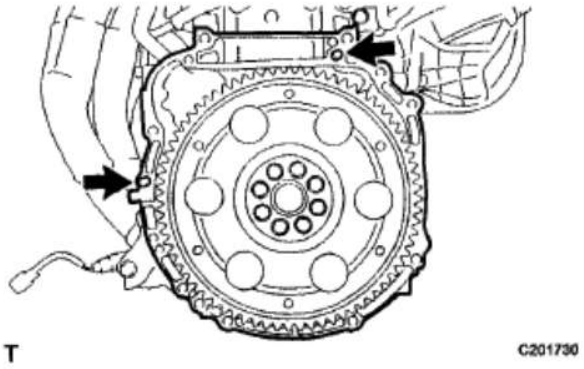


Fig. 259: Locating Knock Pins
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Keeping the engine and automatic transaxle assembly in a horizontal position, align the knock pins with each hole on the automatic transaxle assembly and tighten the 9 bolts shown in the illustration.

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Torque: Bolt A

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

Bolt B

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

Bolt C

44 N*m (449 kgf*cm, 32 ft.*lbf)

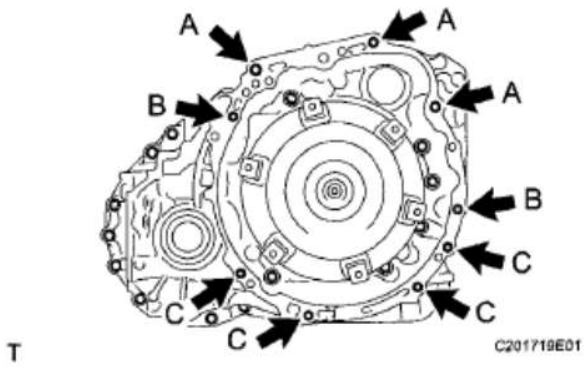


Fig. 260: Locating Automatic Transaxle Assembly Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- **Do not forcibly pry on the automatic transaxle assembly.**
- **Check that the torque converter rotates.**

HINT:

Bolt length:

- Bolt A: 55 mm (2.17 in.)
- Bolt B: 50 mm (1.97 in.)
- Bolt C: 32 or 33 mm (1.26 or 1.30 in.)

9. **INSTALL WIRE HARNESS**
   a. Connect the 6 wire harness clamps and park/neutral position switch connector.
   b. Install the ground cable with the bolt.

Torque: 19 N*m (194 kgf*cm, 14 ft.*lbf)

10. **INSTALL TCM** (See **INSTALLATION**)
11. **INSTALL FRONT FRAME ASSEMBLY** (See **INSTALLATION**)

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12. **INSTALL FRONT DRIVE SHAFT ASSEMBLY RH** (See **INSTALLATION**)
13. **INSTALL FRONT DRIVE SHAFT HOLE SNAP RING LH** (See **REASSEMBLY**)

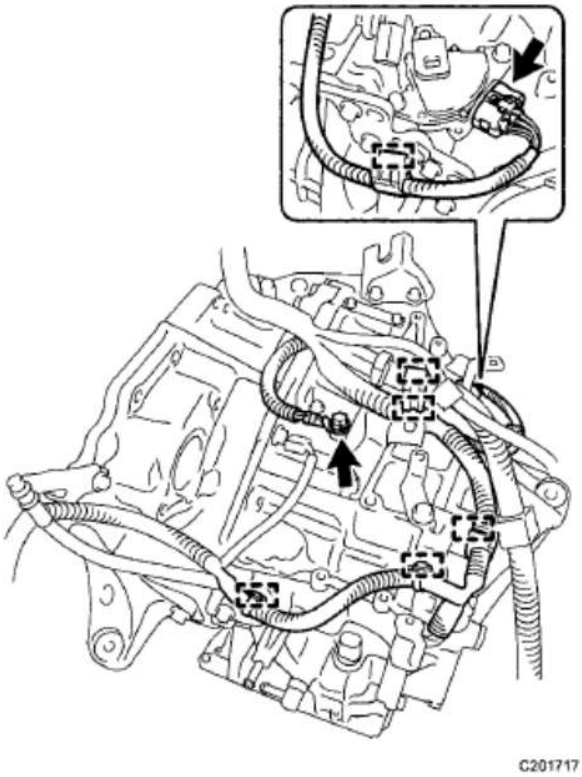


Fig. 261: Locating Park/Neutral Position Switch Connector And Wire Harness Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. **INSTALL FRONT DRIVE SHAFT ASSEMBLY LH** (See **INSTALLATION**)
15. **INSTALL STARTER ASSEMBLY** (See **INSTALLATION**)
16. **REMOVE ENGINE HANGERS** (See **INSTALLATION**)
17. **INSTALL ENGINE ASSEMBLY WITH TRANSAXLE**

HINT:

See the steps from "Install Engine Assembly with Transaxle" through "Inspect Speed Sensor Signal" (See **INSTALLATION**).

18. **CHECK AUTOMATIC TRANSAXLE SYSTEM**

NOTE: **If automatic transmission parts have been replaced, refer to the Parts Replacement Compensation Table to determine if any additional operations are necessary (See AUTOMATIC TRANSAXLE SYSTEM).**

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TORQUE CONVERTER CLUTCH AND DRIVE PLATE

INSPECTION

1. **INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY**
   a. Inspect the one-way clutch.
      1. Press on the serrations of the stator with a finger and rotate it. Check that it rotates smoothly when turned clockwise and locks when turned counterclockwise.

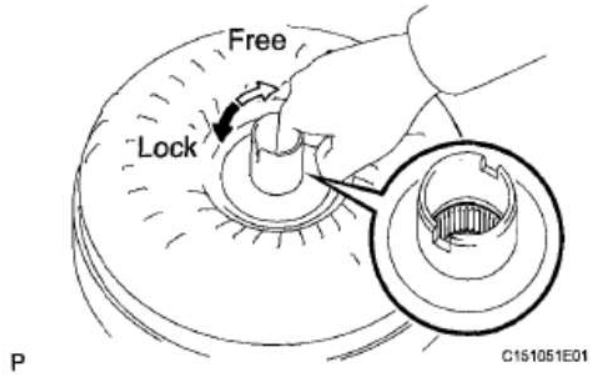


Fig. 262: Inspecting Torque Converter Clutch Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If necessary, clean the converter and recheck the one-way clutch.

Replace the converter if the one-way clutch still fails the check.

   b. Determine the condition of the torque converter clutch assembly.
      1. Check that the following conditions are met:
         - During the stall test or when the shift lever is in N, metallic sounds are not emitted from the torque converter clutch.
         - The one-way clutch turns clockwise and locks when turned counterclockwise.
         - 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 ATF taken from a removed torque converter.

   c. Replace the ATF in the torque converter clutch.
      1. If the ATF is discolored and/or has foul odor, stir the ATF in the torque converter clutch thoroughly and drain it.

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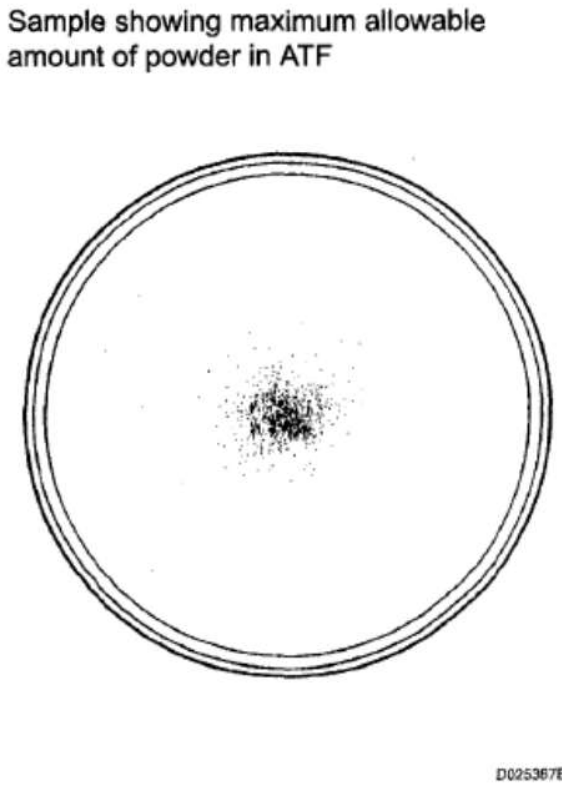


Fig. 263: Identifying Condition Of Torque Converter Clutch Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Clean and check the oil cooler and oil pipe line.
   1. If the torque converter clutch is inspected or the ATF is replaced, clean the oil cooler and oil pipe line.

      HINT:

      - Apply compressed air of 196 kPa (2.0 kgf/cm^2 , 28 psi) into the inlet hose.
      - If a large amount of powder is found in the ATF, add new ATF using a bucket pump and clean the oil cooler and oil pipe line again.

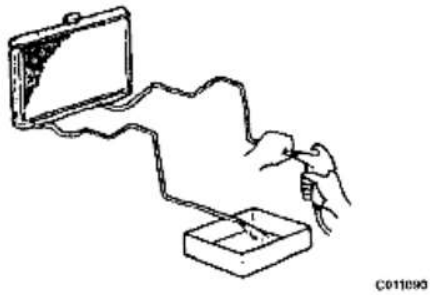


Fig. 264: Checking Oil Cooler And Oil Pipe Line

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2. If the ATF is cloudy, inspect the oil cooler (radiator).

e. Avoid damaging the torque converter clutch and the oil pump gear.
   1. When any marks due to interference are found on the end of a bolt for the torque converter clutch or on the bottom of a bolt hole, replace the bolt and torque converter clutch.
   2. All of the bolts should be the same length.
   3. Make sure that no spring washers are missing.

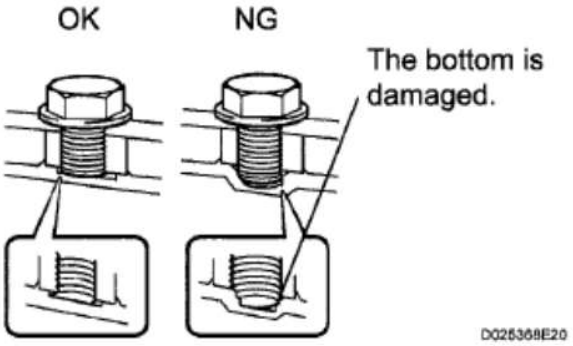


Fig. 265: Identifying Torque Converter Bolt Damaged
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSPECT DRIVE PLATE**
   a. Check the drive plate for damage.
   b. Set up a dial indicator and measure the runout of the 6 portions around the torque converter fitting surfaces.

Maximum runout:

0.30 mm (0.0118 in.)

If the runout is greater than the maximum or if the drive plate is damaged, replace the drive plate. If installing a new drive plate, note the orientation of the spacers and tighten the bolts (See **INSTALLATION**).

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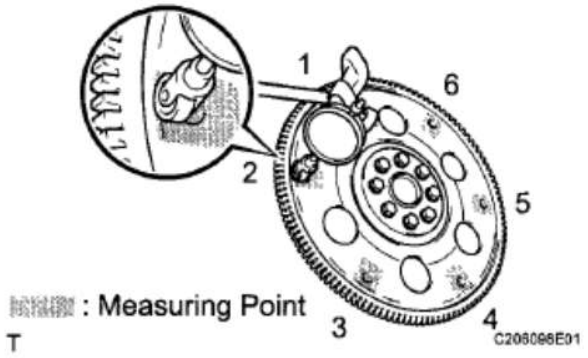


Fig. 266: Identifying Drive Plate Bolt Tighten Sequence
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TCM

COMPONENTS

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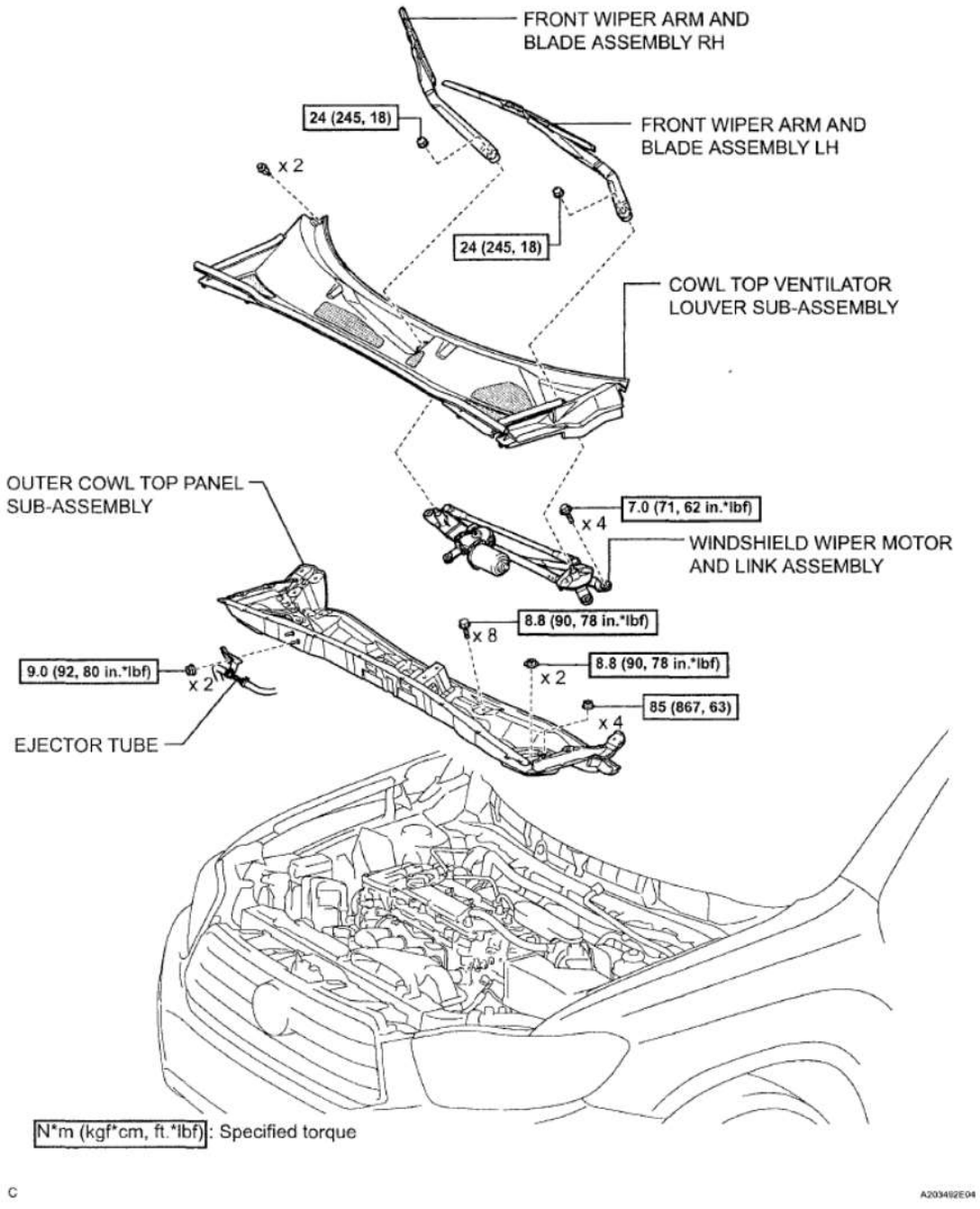


Fig. 267: Identifying TCM Components With Torque Specification (1 Of 2)
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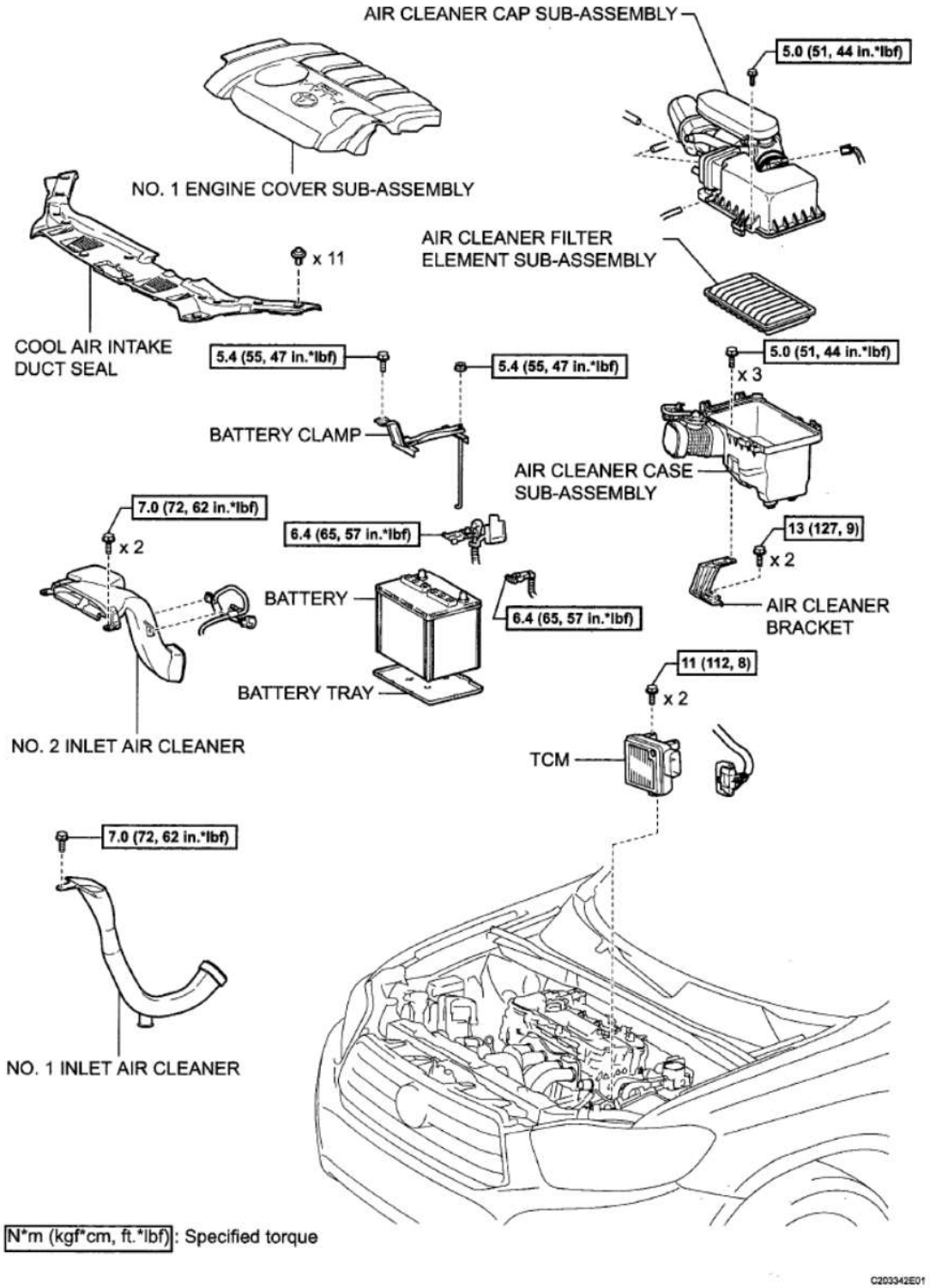


Fig. 268: Identifying TCM Components With Torque Specification (2 Of 2)
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REMOVAL

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NOTE: When the TCM is replaced, the existing transaxle compensation codes must be input into the new TCM (See AUTOMATIC TRANSAXLE SYSTEM).

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

   NOTE: When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).

2. **REMOVE COOL AIR INTAKE DUCT SEAL** (See **REMOVAL**)
3. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See **REMOVAL**)
4. **REMOVE FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See **REMOVAL**)
5. **REMOVE COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See **REMOVAL**)
6. **REMOVE WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See **REMOVAL**)
7. **SEPARATE EJECTOR TUBE** (See **REMOVAL**)
8. **REMOVE OUTER COWL TOP PANEL SUB-ASSEMBLY** (See **REMOVAL**)
9. **REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY** (See **REMOVAL**)
10. **REMOVE BATTERY** (See **REMOVAL**)
11. **REMOVE NO. 2 INLET AIR CLEANER** (See **REMOVAL**)
12. **REMOVE AIR CLEANER CAP SUB-ASSEMBLY** (See **REMOVAL**)
13. **REMOVE AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY** (See **REMOVAL**)
14. **REMOVE AIR CLEANER CASE SUB-ASSEMBLY** (See **REMOVAL**)
15. **REMOVE AIR CLEANER BRACKET** (See **REMOVAL**)
16. **REMOVE NO. 1 INLET AIR CLEANER** (See **REMOVAL**)
17. **REMOVE TCM**
    a. Turn the lock lever and disconnect the connector from the TCM.

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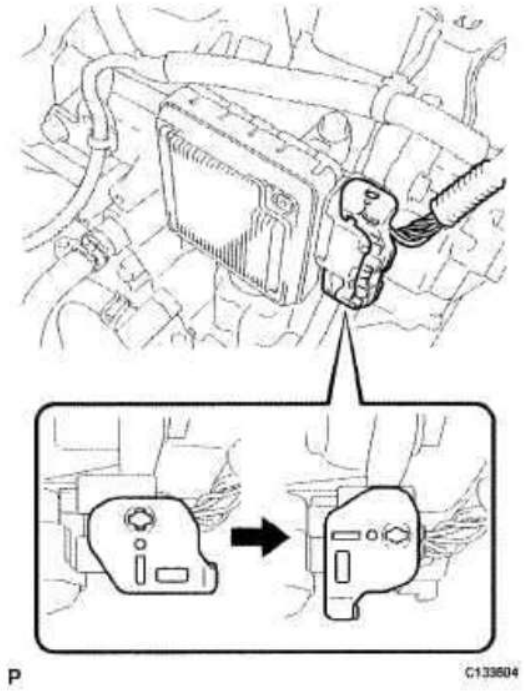


Fig. 269: Disconnecting Connector Of TCM
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the 2 bolts and TCM from the transaxle.

INSTALLATION

1. **INSTALL TCM**
   a. Install the TCM to the transaxle.

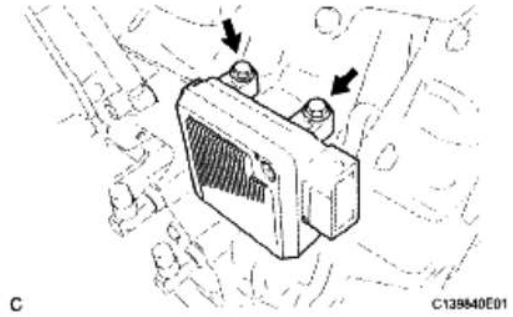


Fig. 270: Locating TCM Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Install and tighten the 2 bolts in the order shown in the illustration.

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

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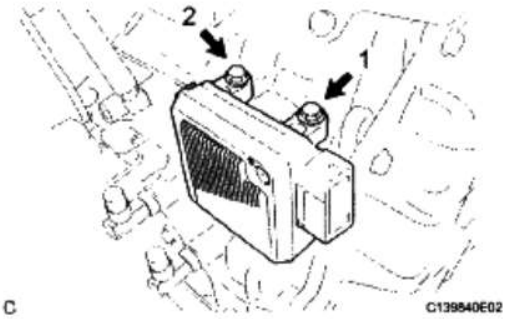


Fig. 271: Locating TCM Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Connect the connector to the TCM.
d. Turn the lock lever and secure the connector with the lock lever.

2. **INSTALL NO. 1 INLET AIR CLEANER** (See **INSTALLATION**)
3. **INSTALL AIR CLEANER BRACKET** (See **INSTALLATION**)
4. **INSTALL AIR CLEANER CASE SUB-ASSEMBLY** (See **INSTALLATION**)
5. **INSTALL AIR CLEANER FILTER ELEMENT SUB-ASSEMBLY** (See **INSTALLATION**)
6. **INSTALL AIR CLEANER CAP SUB-ASSEMBLY** (See **INSTALLATION**)
7. **INSTALL NO. 2 INLET AIR CLEANER** (See **INSTALLATION**)
8. **INSTALL BATTERY** (See **INSTALLATION**)

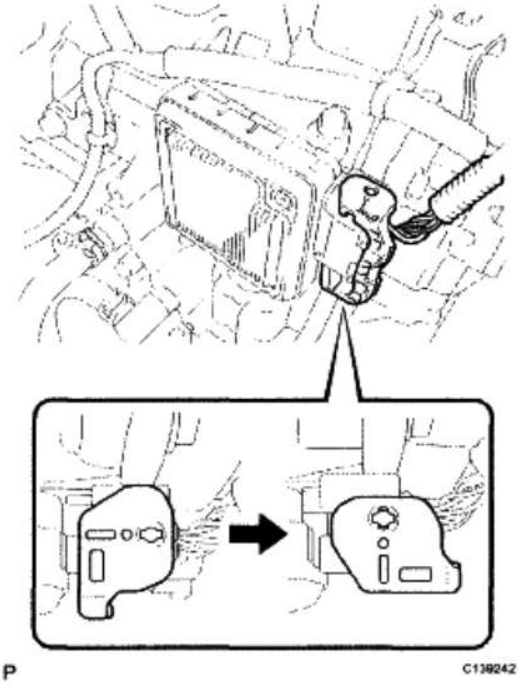


Fig. 272: Connecting Connector To TCM
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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9. **INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY** (See **INSTALLATION**)
10. **INSTALL OUTER COWL TOP PANEL SUB-ASSEMBLY** (See **INSTALLATION**)
11. **INSTALL EJECTOR TUBE** (See **INSTALLATION**)
12. **INSTALL WINDSHIELD WIPER MOTOR AND LINK ASSEMBLY** (See **INSTALLATION**)
13. **INSTALL COWL TOP VENTILATOR LOUVER SUB-ASSEMBLY** (See **INSTALLATION**)
14. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY RH** (See **INSTALLATION**)
15. **INSTALL FRONT WIPER ARM AND BLADE ASSEMBLY LH** (See **INSTALLATION**)
16. **INSTALL COOL AIR INTAKE DUCT SEAL** (See **INSTALLATION**)
17. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

NOTE: **When disconnecting the cable, some systems need to be initialized after the cable is reconnected (See INITIALIZATION).**

18. **PERFORM TCM REGISTRATION**

HINT:

(See **AUTOMATIC TRANSAXLE SYSTEM**)

AUTOMATIC TRANSAXLE UNIT

COMPONENTS

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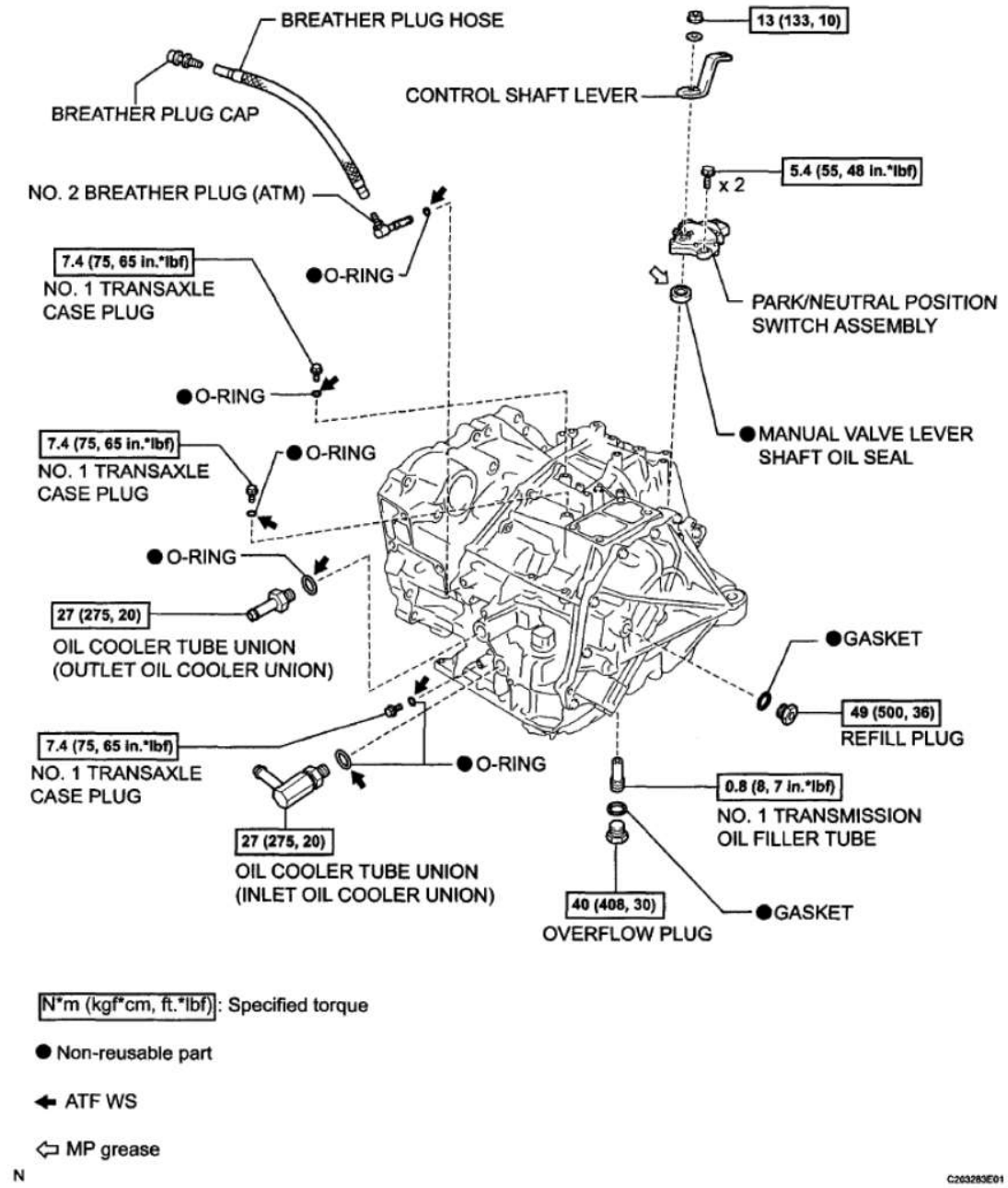


Fig. 273: Identifying Automatic Transaxle Unit Components With Torque Specification (1 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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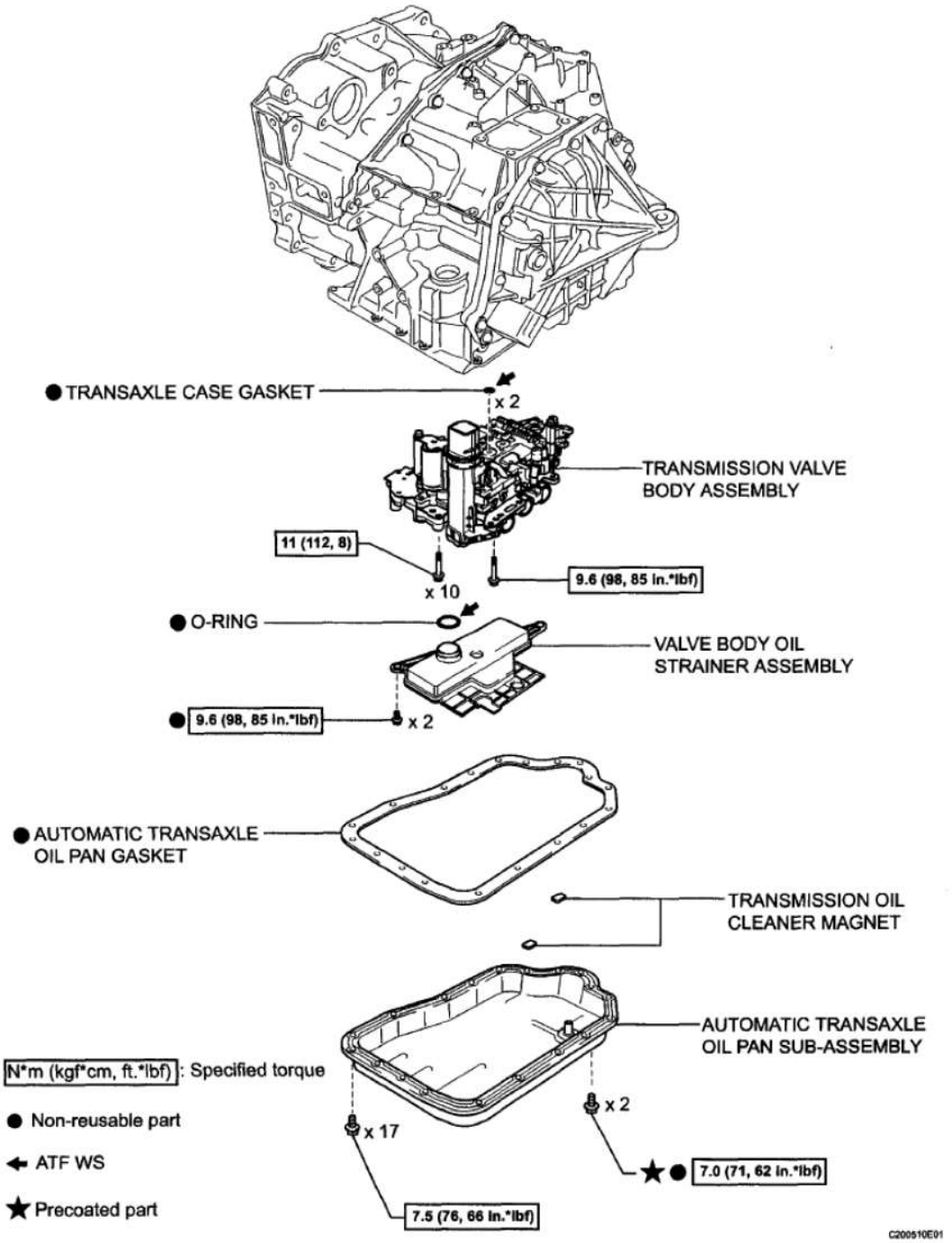


Fig. 274: Identifying Automatic Transaxle Unit Components With Torque Specification (2 Of 7)
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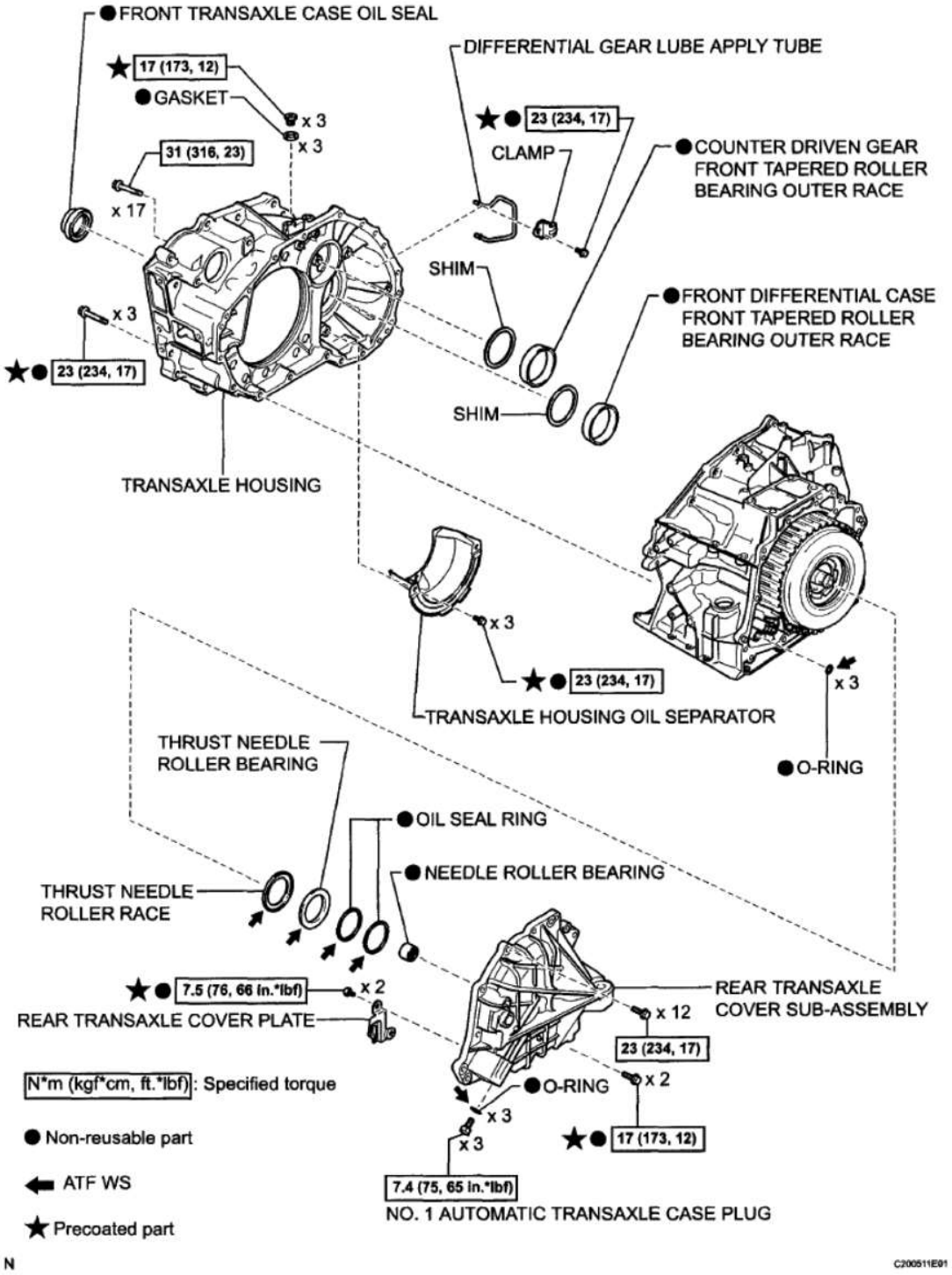


Fig. 275: Identifying Automatic Transaxle Unit Components With Torque Specification (3 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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2009 TRANSMISSION Automatic Transaxle (U760E) - Highlander

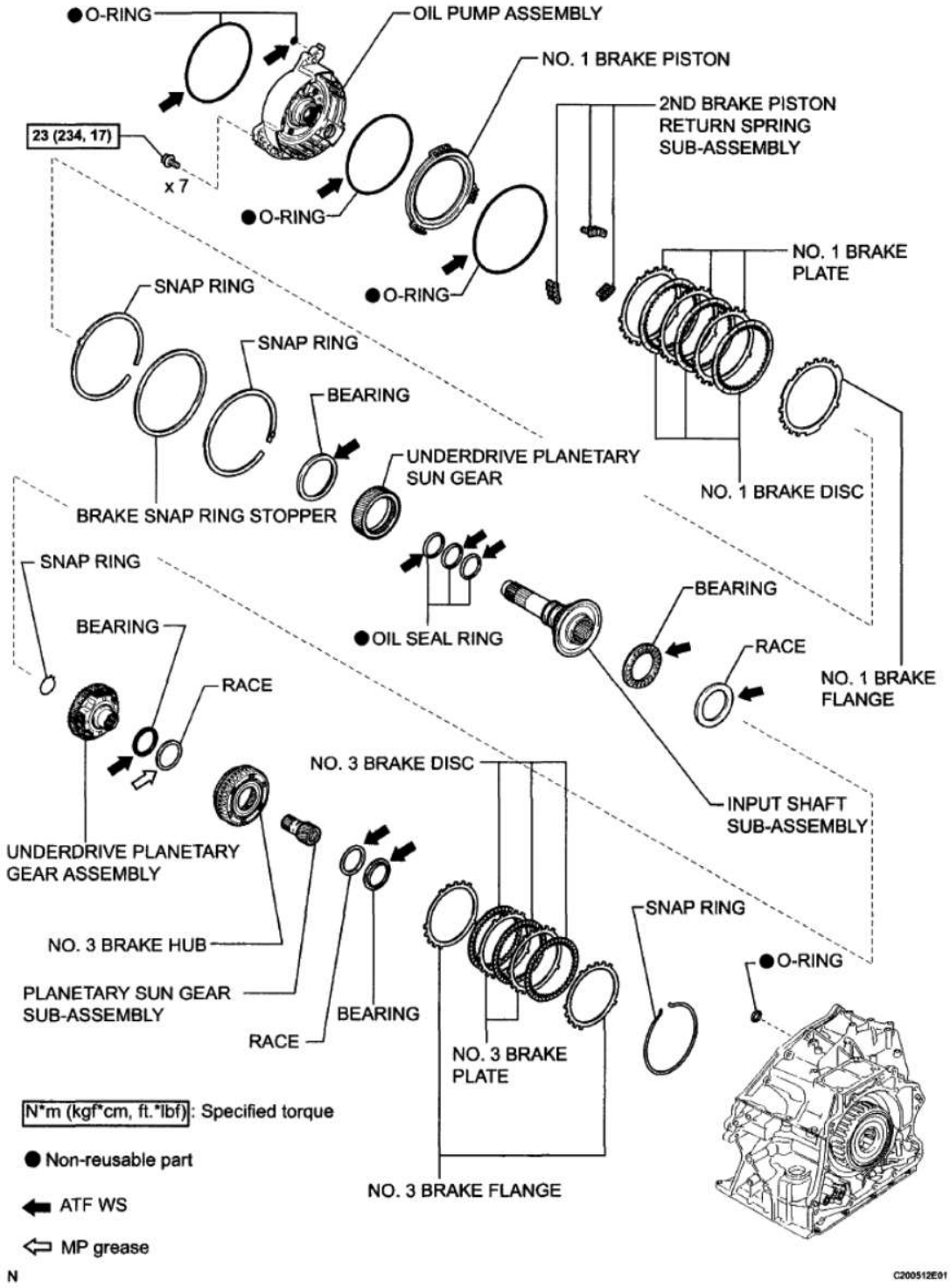


Fig. 276: Identifying Automatic Transaxle Unit Components With Torque Specification (4 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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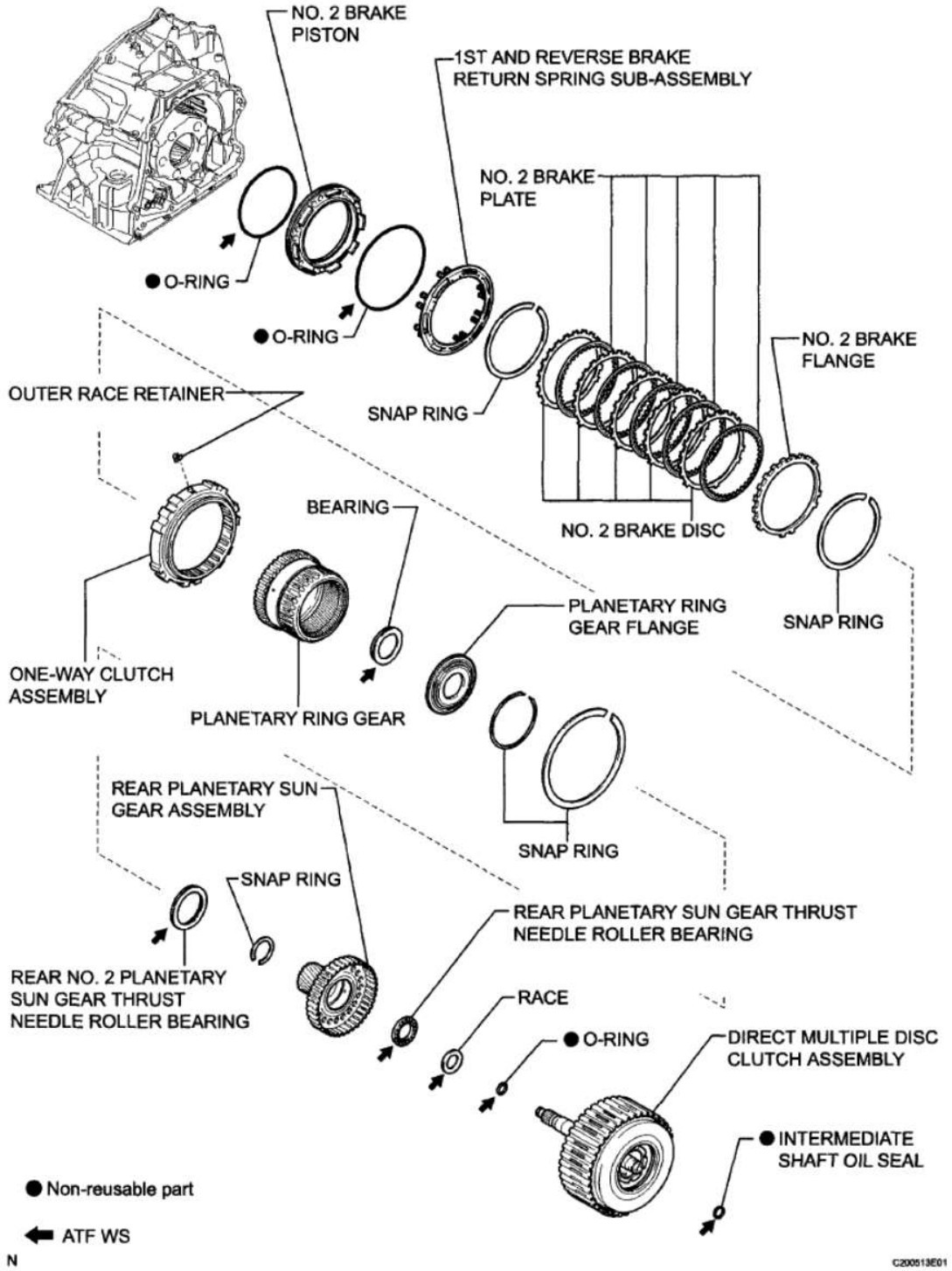


Fig. 277: Identifying Automatic Transaxle Unit Components With Torque Specification (5 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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2009 TRANSMISSION Automatic Transaxle (U760E) - Highlander

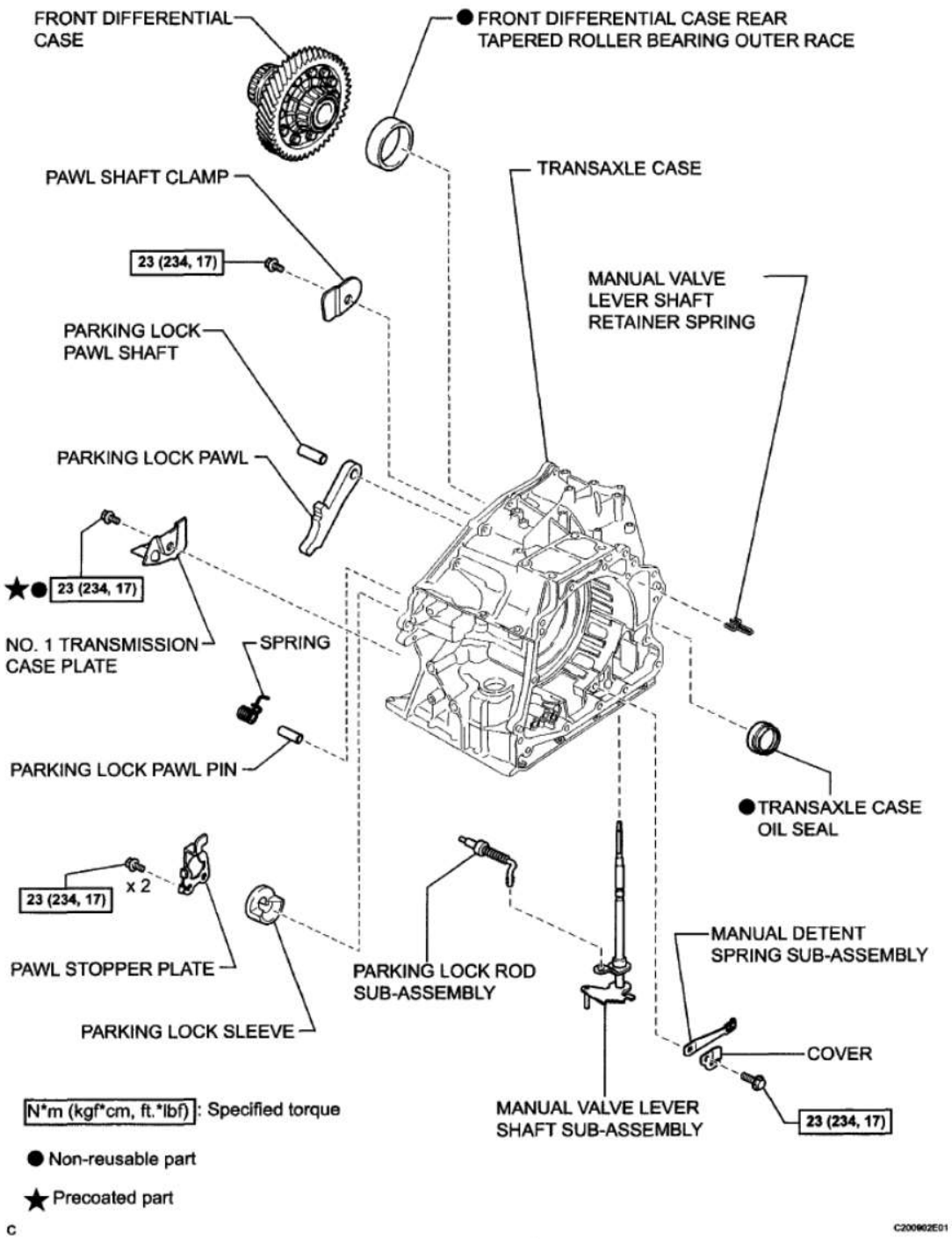


Fig. 278: Identifying Automatic Transaxle Unit Components With Torque Specification (6 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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2009 TRANSMISSION Automatic Transaxle (U760E) - Highlander

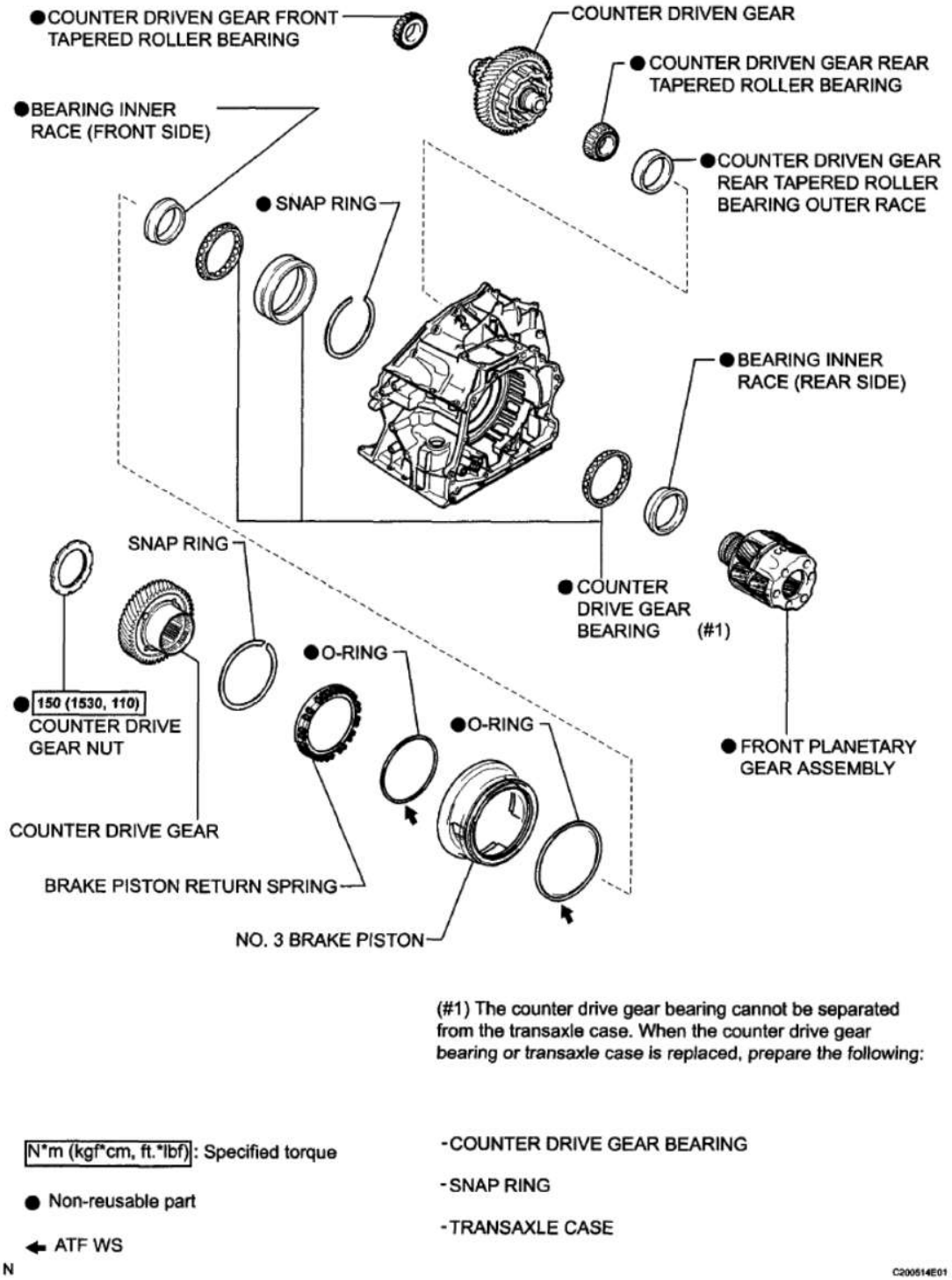


Fig. 279: Identifying Automatic Transaxle Unit Components With Torque Specification (7 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

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1. **REMOVE BREATHER PLUG HOSE**
   a. Using a screwdriver, remove the breather plug hose from the transaxle case.

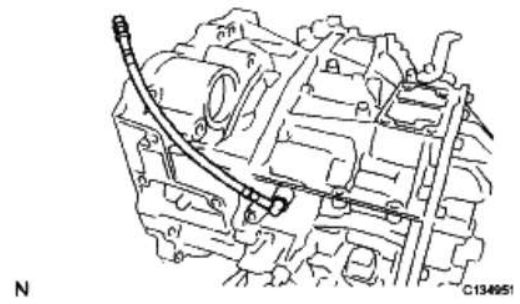


Fig. 280: Identifying Breather Plug Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Using a screwdriver, remove the No. 2 breather plug (ATM) from the breather plug hose.
   c. Using a screwdriver, remove the O-ring from the No. 2 breather plug (ATM).
   d. Using a screwdriver, remove the breather plug cap from the breather plug hose.

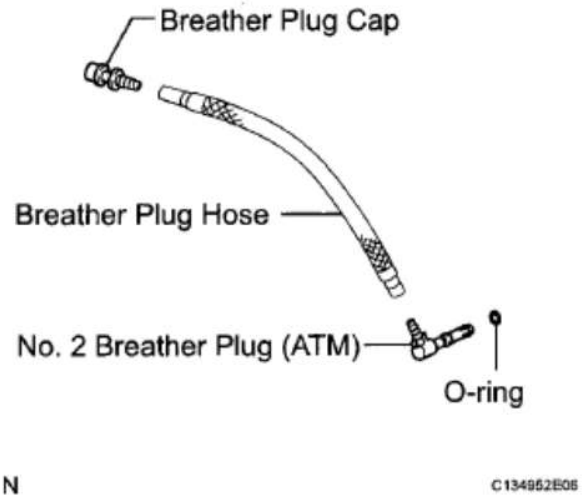


Fig. 281: Identifying No. 2 Breather Plug And Breather Plug Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **REMOVE PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
   a. Remove the nut, washer, and control shaft lever from the control shaft.

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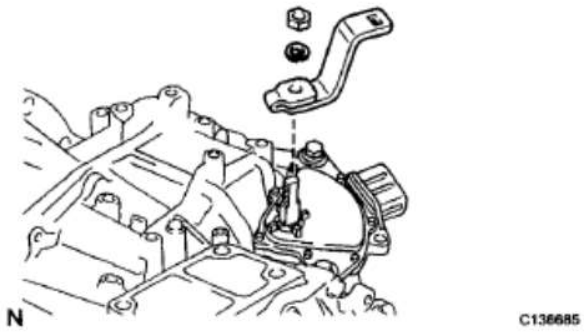


Fig. 282: Identifying Control Shaft Lever, Washer And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the 2 bolts and the park/neutral position switch assembly from the transaxle case.

NOTE: Before removing the park/neutral position switch, remove any dirt or rust on the installation portion of the control shaft. Be sure to remove the switch straight along the shaft while being careful not to deform the plate spring that supports the shaft. If the plate spring is deformed, the park/neutral position switch cannot be reinstalled correctly.

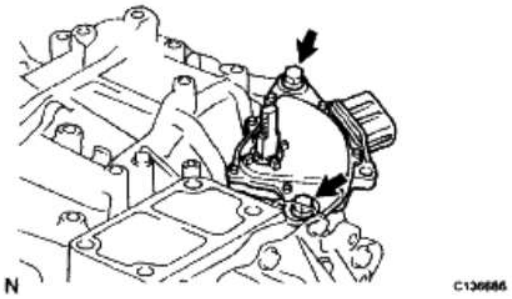


Fig. 283: Locating Park/Neutral Position Switch Assembly Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **REMOVE OIL COOLER TUBE UNION (OUTLET OIL COOLER UNION)**
   a. Loosen the nut while holding the oil cooler tube union (outlet oil cooler union).
   b. Remove the oil cooler tube union (outlet oil cooler union) from the transaxle case.
   c. Remove the O-ring from the oil cooler tube union (outlet oil cooler union).

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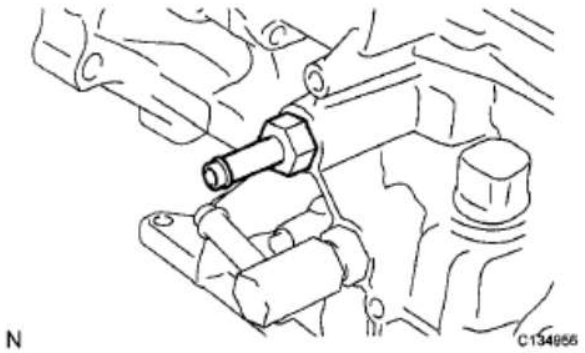


Fig. 284: Identifying Oil Cooler Tube Union (Outlet Oil Cooler Union)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **REMOVE OIL COOLER TUBE UNION (INLET OIL COOLER UNION)**
   a. Loosen the nut while holding the oil cooler tube union (inlet oil cooler union).
   b. Remove the oil cooler tube union (inlet oil cooler union) from the transaxle case.
   c. Remove the O-ring from the oil cooler tube union (inlet oil cooler union).

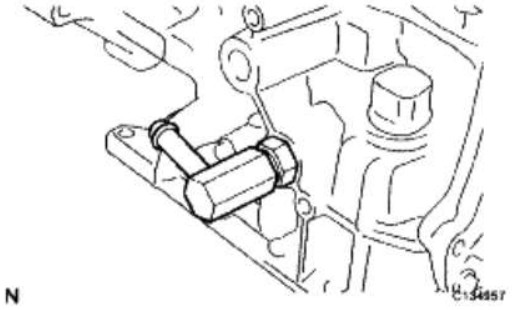
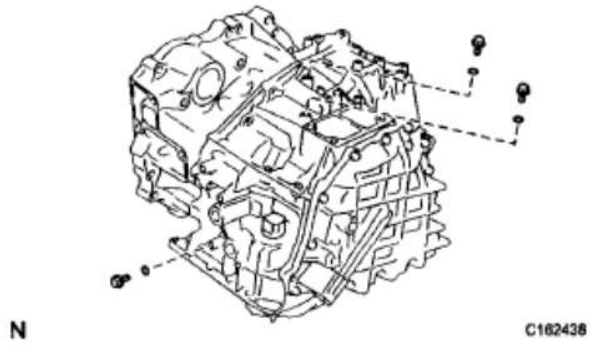


Fig. 285: Identifying Oil Cooler Tube Union (Inlet Oil Cooler Union)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **REMOVE NO. 1 TRANSAXLE CASE PLUG**
   a. Remove the 3 No. 1 transaxle case plugs from the transaxle case.
   b. Using a screwdriver, remove the 3 O-rings from the 3 No. 1 transaxle case plugs.



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Fig. 286: Identifying No. 1 Transaxle Case Plugs
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Using a hexagon wrench (6 mm), remove the 3 hexagon bolts from the transaxle housing.
d. Remove the gasket from each of the 3 hexagon bolts.

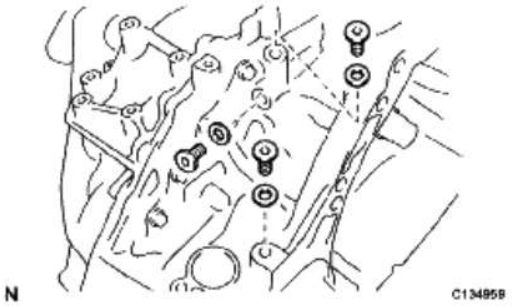


Fig. 287: Identifying Transaxle Housing Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **SUPPORT AUTOMATIC TRANSAXLE ASSEMBLY**
   a. Support the transaxle assembly on wooden blocks.

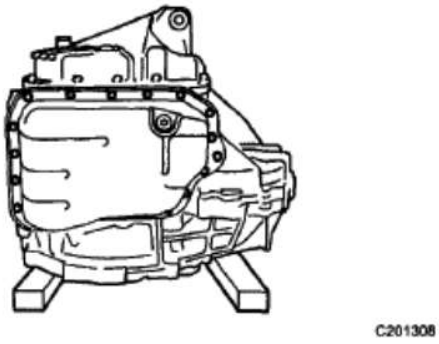


Fig. 288: Identifying Automatic Transaxle Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. **REMOVE AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY**
   a. Using a hexagon wrench (6 mm), remove the overflow plug from the automatic transaxle oil pan sub-assembly.
   b. Remove the gasket from the overflow plug.

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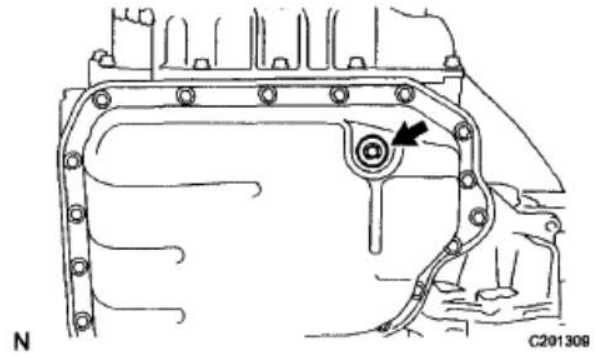


Fig. 289: Locating Automatic Transaxle Oil Pan Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Using a hexagon wrench (6 mm), remove the No. 1 transmission oil filler tube from the automatic transaxle assembly.

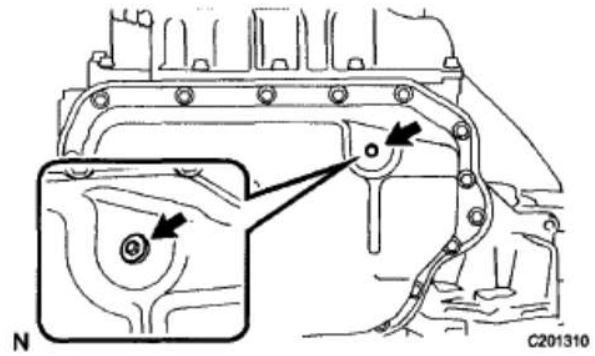


Fig. 290: Locating Oil Filler Tube
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Remove the 19 bolts, automatic transaxle oil pan sub-assembly, and automatic transaxle oil pan gasket from the automatic transaxle assembly.

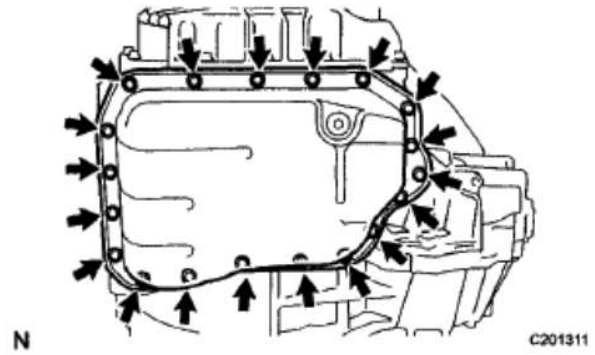


Fig. 291: Locating Automatic Transaxle Oil Pan Sub-Assembly Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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e. Remove the 2 transmission oil cleaner magnets from the automatic transaxle oil pan sub-assembly.

8. **INSPECT TRANSMISSION OIL CLEANER MAGNET** (See **INSPECTION**)

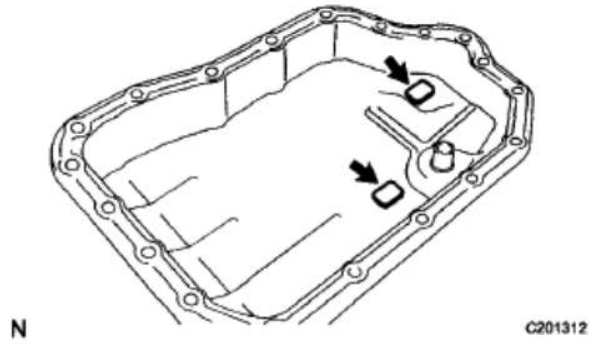


Fig. 292: Locating Transmission Oil Cleaner Magnets
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. **REMOVE VALVE BODY OIL STRAINER ASSEMBLY**
   a. Remove the 2 bolts and oil strainer assembly from the valve body assembly.

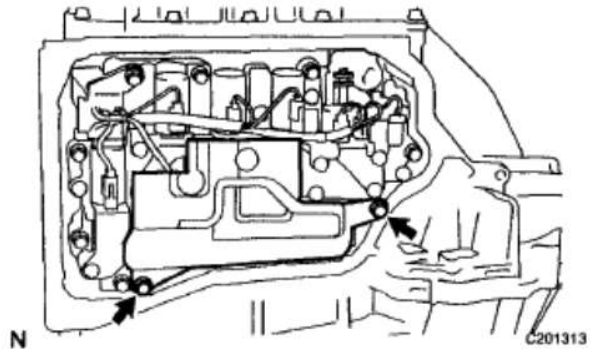


Fig. 293: Locating Oil Strainer Assembly Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Remove the O-ring from the oil strainer assembly.

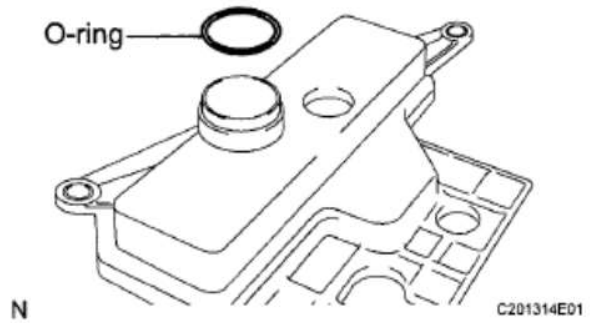


Fig. 294: Identifying O-ring

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Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. **REMOVE TRANSMISSION VALVE BODY ASSEMBLY**
    a. Remove the 11 bolts and valve body assembly from the transaxle case.

NOTE: **When removing the transmission valve body assembly, be careful not to allow the transmission revolution sensor and the transaxle case to interfere with each other.**

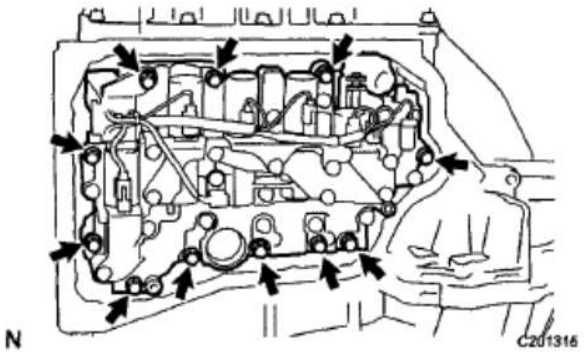


Fig. 295: Locating Transmission Valve Body Assembly Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. **REMOVE TRANSAXLE CASE GASKET**
    a. Remove the 2 gaskets from the transaxle case.
12. **INSPECT INPUT SHAFT SUB-ASSEMBLY** (See **INSPECTION**)

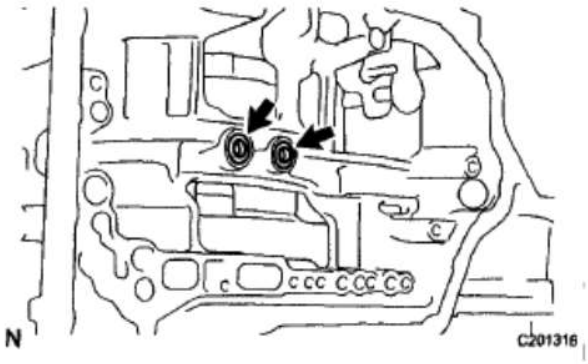


Fig. 296: Locating Transaxle Case Gaskets
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. **REMOVE REAR TRANSAXLE COVER SUB-ASSEMBLY**
    a. Remove the refill plug from the rear transaxle cover sub-assembly.
    b. Remove the gasket from the refill plug.

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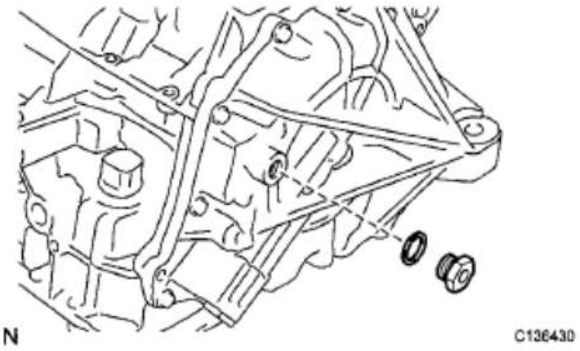


Fig. 297: Identifying Rear Transaxle Cover Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Remove the 3 No. 1 automatic transaxle case plugs from the rear transaxle cover sub-assembly.
d. Using a screwdriver, remove the 3 O-rings from the 3 No. 1 automatic transaxle case plugs.

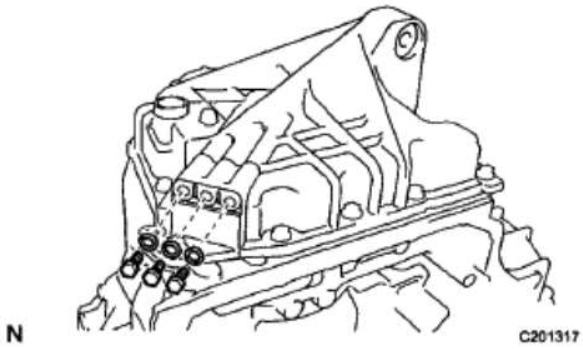


Fig. 298: Locating No. 1 Automatic Transaxle Case Plugs
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Remove the 14 bolts from the rear transaxle cover sub-assembly.
f. Using a brass bar and hammer, tap on the circumference of the rear transaxle cover sub-assembly to remove the rear transaxle cover sub-assembly from the transaxle case.

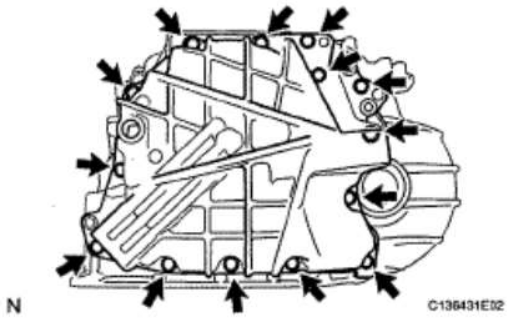


Fig. 299: Locating Rear Transaxle Cover Sub-Assembly Bolts
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g. Using a screwdriver, remove the 3 O-rings from the transaxle case.

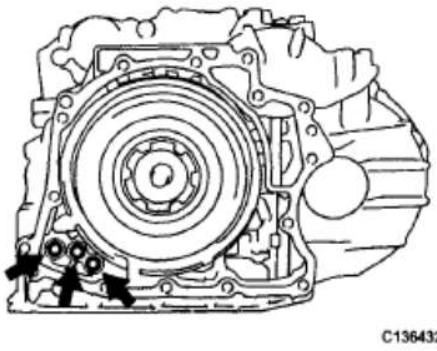


Fig. 300: Locating Transaxle Case Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

h. Using a screwdriver, remove the 2 oil seal rings from the rear transaxle cover sub-assembly.

i. Remove the thrust needle roller bearing and thrust needle roller race from the rear transaxle cover sub-assembly.

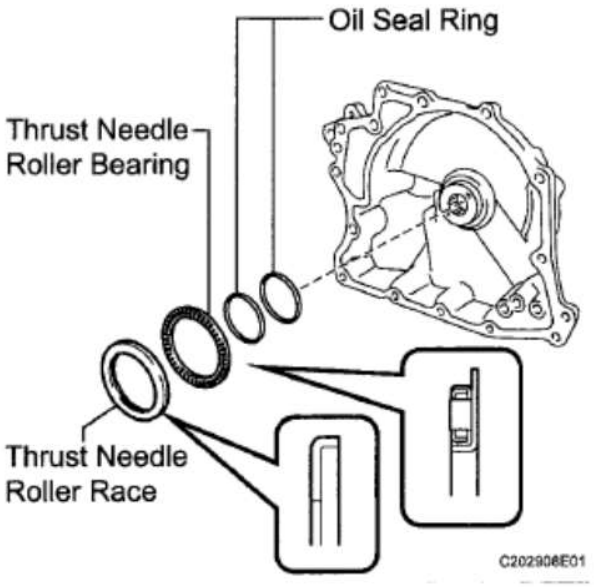


Fig. 301: Identifying Oil Seal Ring, Thrust Needle Roller Bearing And Thrust Needle Roller Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

j. Using a "TORX" wrench (T30), remove the 2 "TORX" screws and rear transaxle cover plate from the rear transaxle cover sub-assembly.

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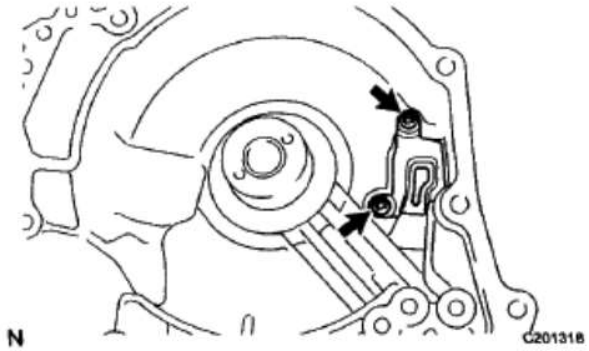


Fig. 302: Locating Rear Transaxle Cover Sub-Assembly And Screw
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

k. Using SST, remove the needle roller bearing from the rear transaxle cover sub-assembly.

SST 09319-60020

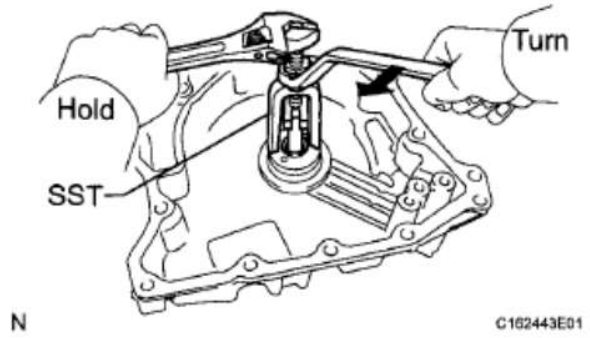


Fig. 303: Removing Needle Roller Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. **REMOVE REAR NO. 2 PLANETARY SUN GEAR THRUST NEEDLE ROLLER BEARING**
    a. Remove the direct multiple disc clutch assembly from the transaxle case.
    b. Remove the rear No. 2 planetary sun gear thrust needle roller bearing from the direct multiple disc clutch assembly.

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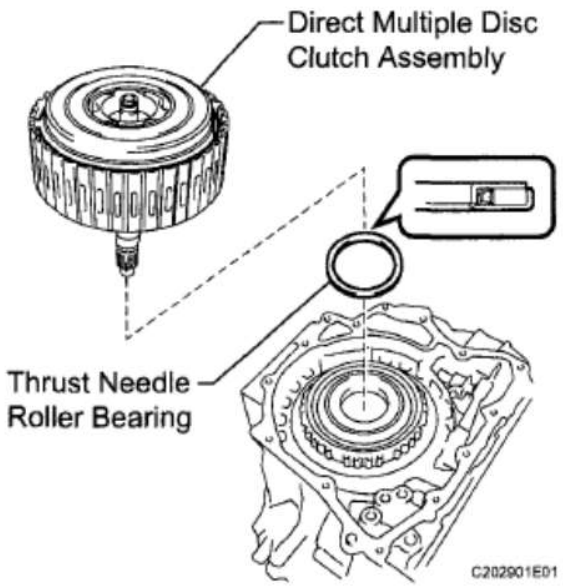


Fig. 304: Identifying Direct Multiple Disc Clutch Assembly And Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. **REMOVE REAR PLANETARY SUN GEAR THRUST NEEDLE ROLLER BEARING**
    a. Using 2 screwdrivers and a hammer, tap out the snap ring from the direct multiple disc clutch assembly.

       HINT:

       Use a piece of cloth to keep the snap ring from flying off.

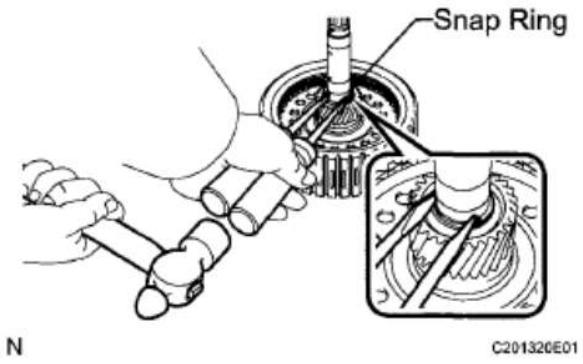


Fig. 305: Removing Rear Planetary Sun Gear Thrust Needle Roller Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Remove the rear planetary sun gear assembly from the direct multiple disc clutch assembly.

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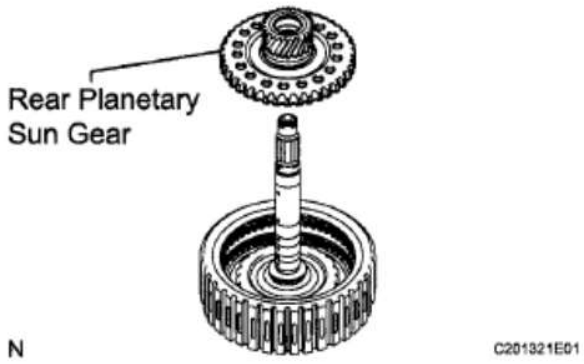


Fig. 306: Identifying Rear Planetary Sun Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Remove the rear planetary sun gear thrust needle roller bearing and thrust needle roller race from the direct multiple disc clutch assembly.

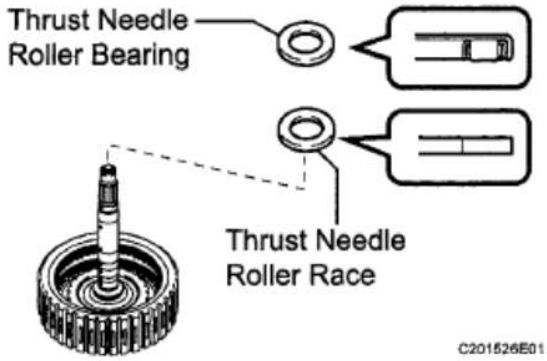


Fig. 307: Identifying Thrust Needle Roller Race And Direct Multiple Disc Clutch Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Using a screwdriver, remove the O-ring from the direct multiple disc clutch assembly.
e. Using a screwdriver, remove the intermediate shaft oil seal from the direct multiple disc clutch assembly.

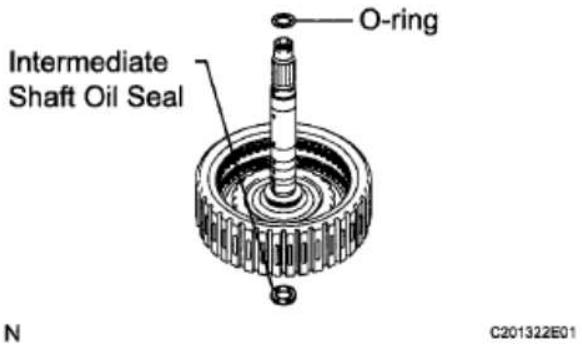


Fig. 308: Identifying O-Ring And Intermediate Shaft Oil Seal

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Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

16. **REMOVE TRANSAXLE HOUSING**
    a. Remove the 20 bolts from the transaxle housing.
    b. Using a brass bar and hammer, tap on the circumference of the transaxle housing to remove the transaxle housing from the transaxle case.

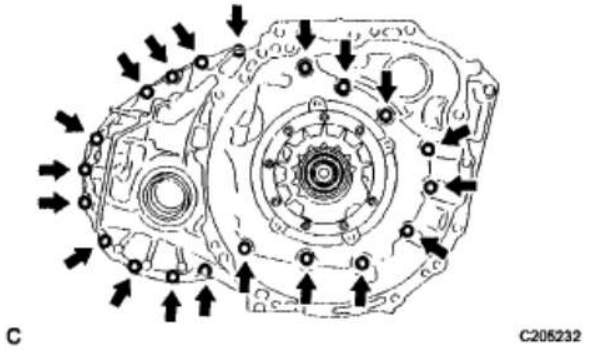


Fig. 309: Locating Transaxle Housing Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. **REMOVE COUNTER DRIVEN GEAR FRONT TAPERED ROLLER BEARING OUTER RACE**
    a. Using SST, remove the counter driven gear front tapered roller bearing outer race and shim from the transaxle housing.

SST 09308-00010

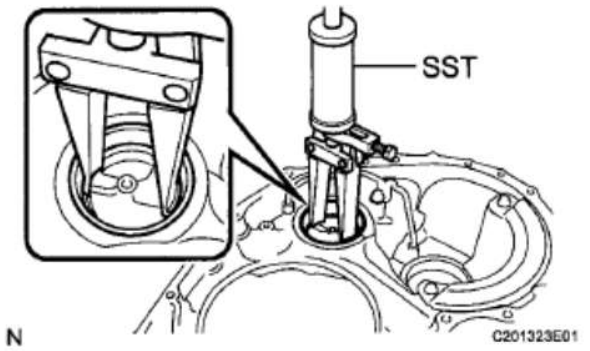


Fig. 310: Removing Counter Driven Gear Front Tapered Roller Bearing Outer Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. **REMOVE FRONT DIFFERENTIAL CASE FRONT TAPERED ROLLER BEARING OUTER RACE** (See **DISASSEMBLY**)
19. **REMOVE FRONT TRANSAXLE CASE OIL SEAL** (See **INSPECTION**)
20. **REMOVE DIFFERENTIAL GEAR LUBE APPLY TUBE**
    a. Remove the bolt, clamp, and differential gear lube apply tube from the transaxle housing.

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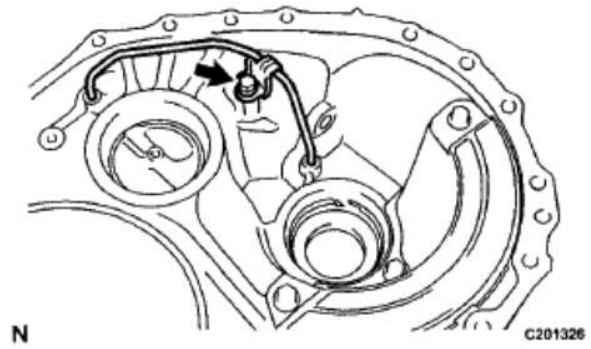


Fig. 311: Locating Front Differential Case Front Tapered Roller Bearing Outer Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

21. **REMOVE TRANSAXLE HOUSING OIL SEPARATOR**
    a. Remove the 3 bolts and transaxle housing oil separator from the transaxle housing.

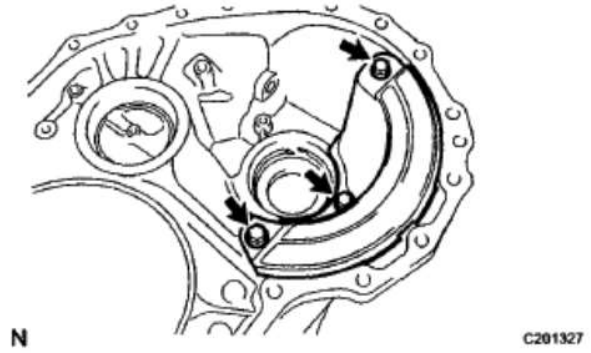


Fig. 312: Locating Transaxle Housing Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

22. **REMOVE OIL PUMP ASSEMBLY**
    a. Remove the O-ring from the oil pump assembly.
    b. Remove the 7 bolts and oil pump from the transaxle case.

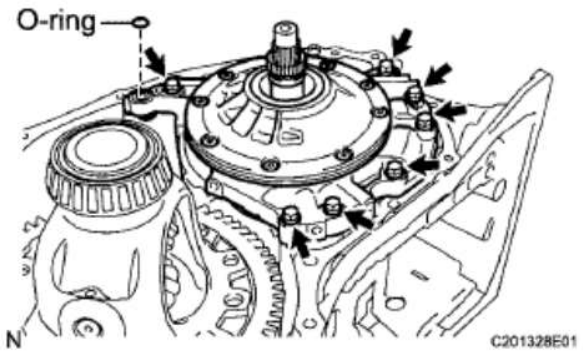


Fig. 313: Locating Oil Pump Assembly

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Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Remove the O-ring.

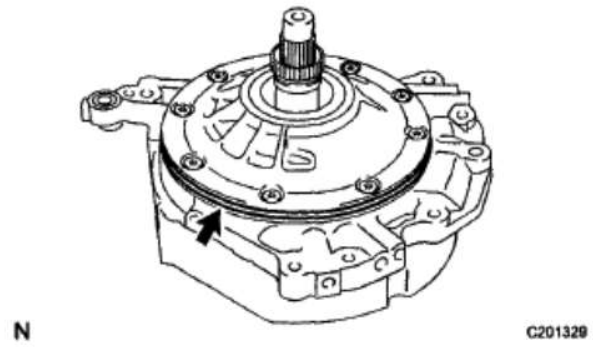


Fig. 314: Locating O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Remove the thrust needle roller bearing and thrust needle roller race from the carrier lock nut.
e. Remove the O-ring from the transaxle case.

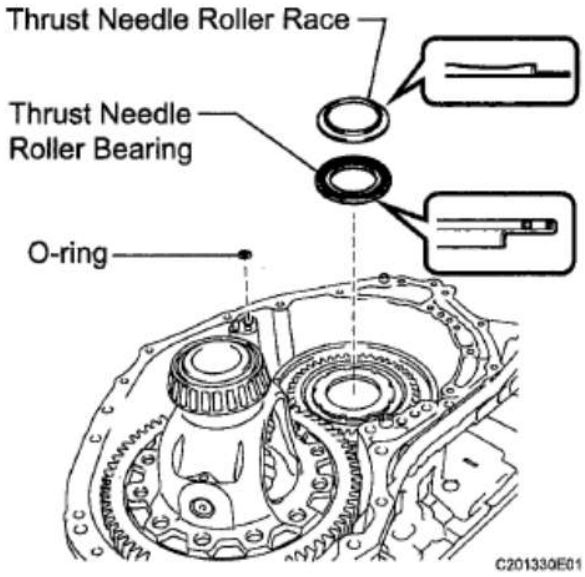


Fig. 315: Identifying Thrust Needle Roller Bearing And Thrust Needle Roller Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

23. **REMOVE NO. 3 BRAKE DISC**
    a. Using a screwdriver, remove the snap ring from the oil pump assembly.

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Fig. 316: Identifying No. 3 Brake Disc
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the 2 brake flanges, 3 brake discs, and 2 brake plates from the oil pump assembly.

24. **INSPECT NO. 3 BRAKE DISC** (See **REASSEMBLY**)

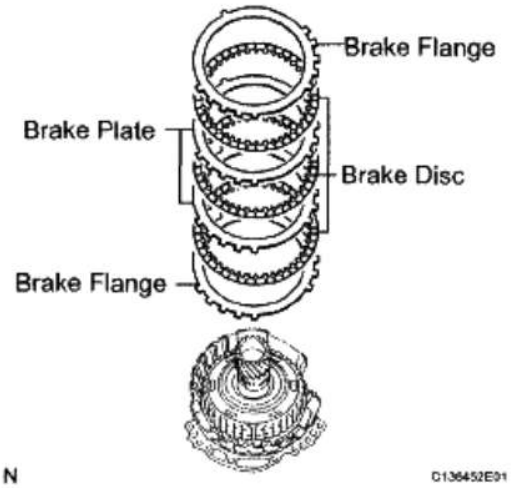


Fig. 317: Identifying No. 3 Brake Disc
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

25. **REMOVE UNDERDRIVE PLANETARY GEAR ASSEMBLY**

a. Remove the underdrive planetary gear assembly from the oil pump assembly.

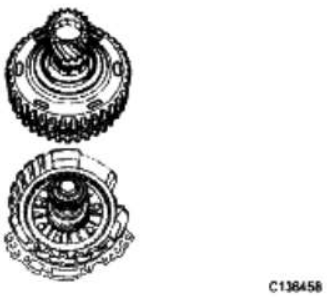


Fig. 318: Identifying Underdrive Planetary Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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26. **REMOVE NO. 3 BRAKE HUB**
    a. Remove the No. 3 brake hub from the underdrive planetary gear assembly.



Fig. 319: Identifying No. 3 Brake Hub And Underdrive Planetary Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Remove the thrust needle roller bearing and thrust needle roller race from the underdrive planetary gear assembly.

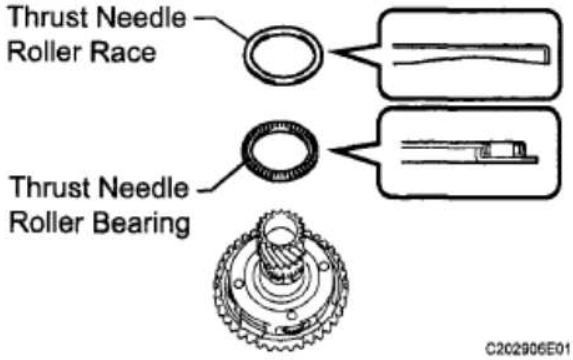


Fig. 320: Identifying Thrust Needle Roller Bearing And Thrust Needle Roller Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

27. **REMOVE PLANETARY SUN GEAR SUB-ASSEMBLY**
    a. While expanding the snap ring with snap ring pliers, remove the planetary sun gear from the underdrive planetary gear assembly.
    b. Remove the snap ring from the underdrive planetary gear assembly.
28. **INSPECT UNDERDRIVE PLANETARY GEAR ASSEMBLY** (See **REASSEMBLY**)
29. **INSPECT PLANETARY SUN GEAR SUB-ASSEMBLY** (See **INSPECTION**)

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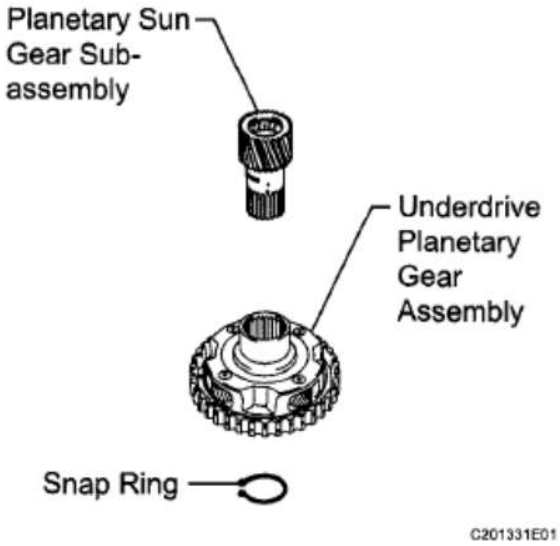


Fig. 321: Identifying Planetary Sun Gear Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

30. **REMOVE INPUT SHAFT SUB-ASSEMBLY**
    a. Remove the input shaft sub-assembly from the oil pump assembly.

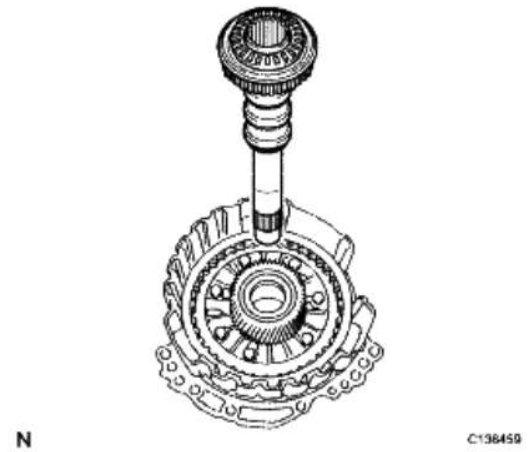


Fig. 322: Identifying Input Shaft Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Remove the thrust needle roller bearing and thrust needle roller race from the input shaft.
    c. Using a screwdriver, remove the 3 input shaft oil seal rings from the input shaft.

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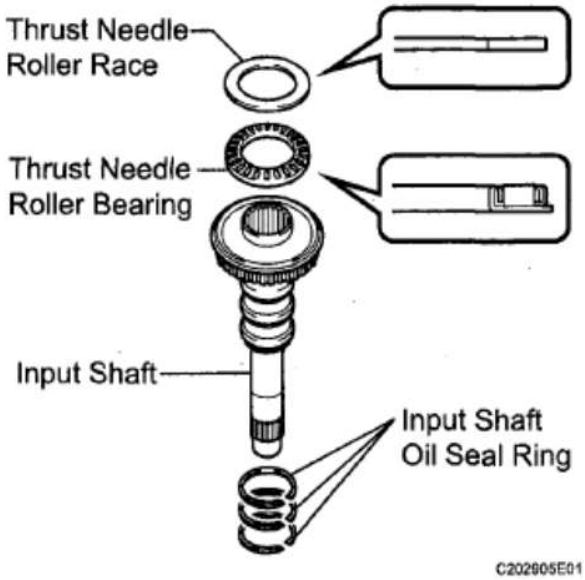


Fig. 323: Identifying Thrust Needle Roller Bearing And Thrust Needle Roller Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

31. **REMOVE UNDERDRIVE PLANETARY SUN GEAR**
    a. Remove the underdrive planetary sun gear from the oil pump assembly.
    b. Remove the thrust needle roller bearing from the oil pump assembly.

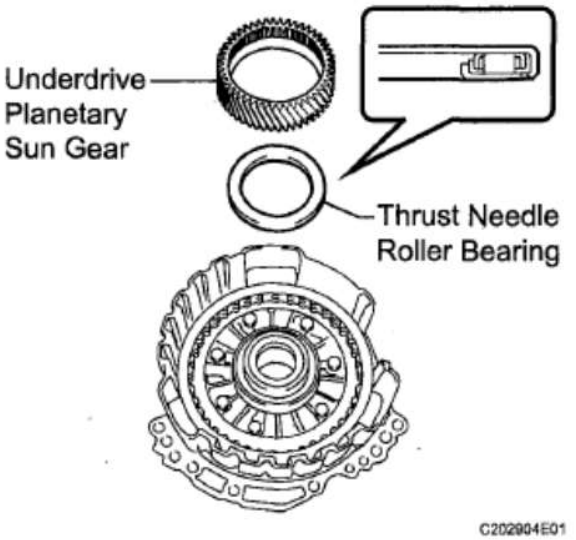


Fig. 324: Identifying Underdrive Planetary Sun Gear And Oil Pump Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

32. **REMOVE NO. 1 BRAKE DISC**
    a. Using a screwdriver, remove the 2 snap rings and brake snap ring stopper from the oil pump assembly.

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2009 TRANSMISSION Automatic Transaxle (U760E) - Highlander

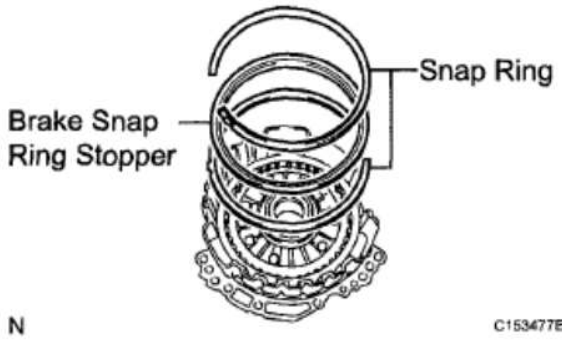


Fig. 325: Identifying Snap Rings And Brake Snap Ring Stopper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the flange, 3 brake discs, and 3 brake plates from the oil pump assembly.

33. **INSPECT NO. 1 BRAKE DISC** (See **REASSEMBLY**)

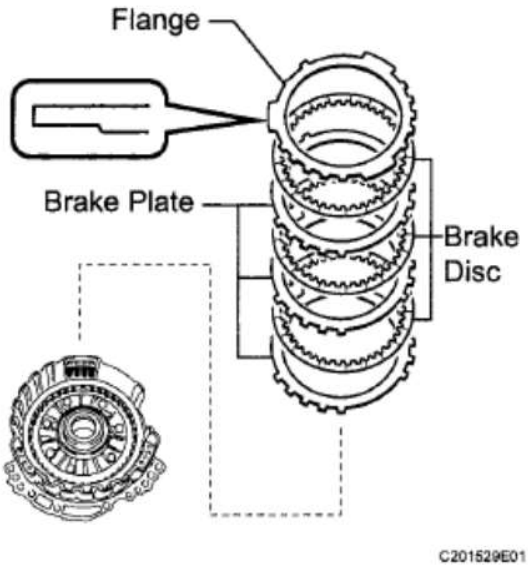


Fig. 326: Identifying No. 1 Brake Disc
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

34. **REMOVE 2ND BRAKE PISTON RETURN SPRING SUB-ASSEMBLY**

a. Remove the 3 2nd brake piston return springs from the oil pump assembly.

35. **INSPECT 2ND BRAKE PISTON RETURN SPRING SUB-ASSEMBLY** (See **REASSEMBLY**)

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Fig. 327: Identifying 2nd Brake Piston Return Spring Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

36. **REMOVE NO. 1 BRAKE PISTON**

a. Holding the oil pump assembly by hand, apply compressed air (392 kPa, 4.0 kgf/cm^2 , 57 psi) to the oil pump assembly to remove the No. 1 brake piston.

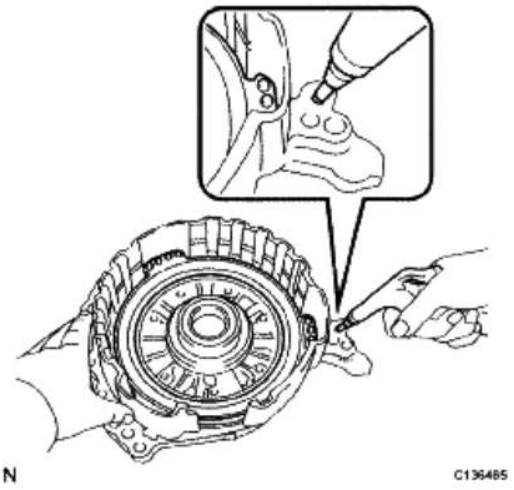


Fig. 328: Applying Compressed Air To Oil Pump Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using a screwdriver, remove the 2 O-rings from the No. 1 brake piston.

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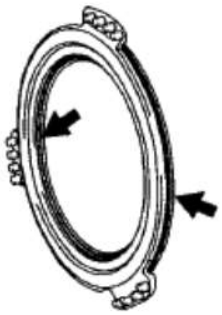


Fig. 329: Identifying O-Rings Of No. 1 Brake Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

37. **REMOVE FRONT DIFFERENTIAL CASE**
    a. Remove the front differential case from the transaxle case.

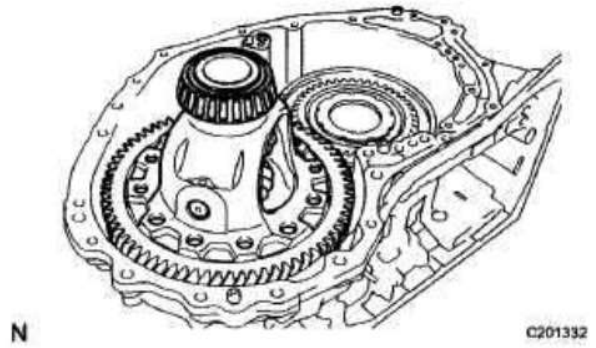
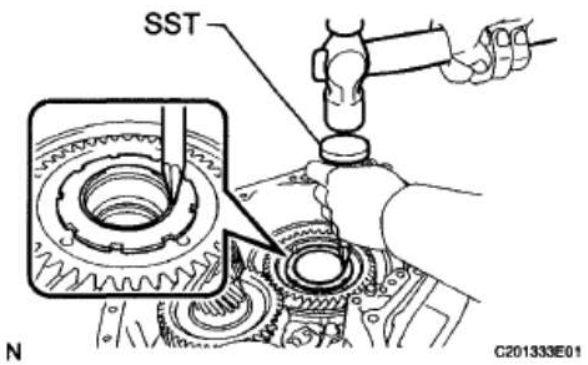


Fig. 330: Identifying Front Differential Case Of Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

38. **REMOVE COUNTER DRIVE GEAR NUT**
    a. Using SST and a hammer, unstake the counter drive gear nut.

    SST 09930-00010



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Fig. 331: Removing Counter Drive Gear Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Turn the manual valve lever shaft counterclockwise to set it to the P position as shown in the illustration.

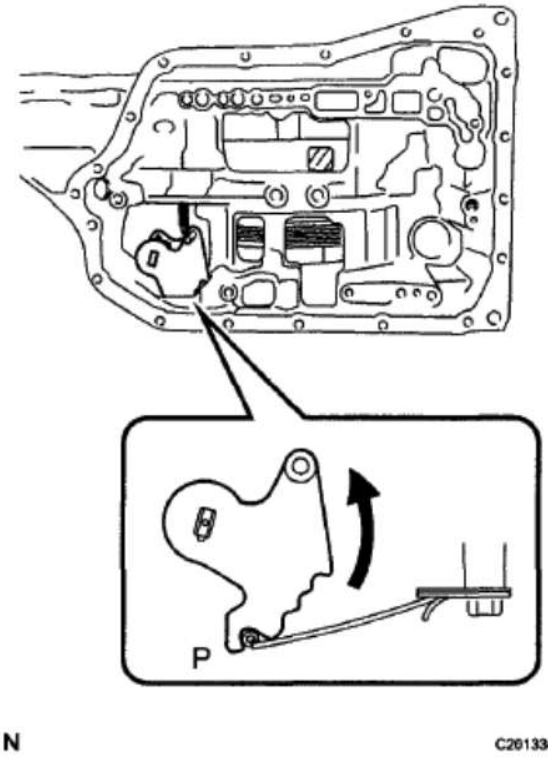
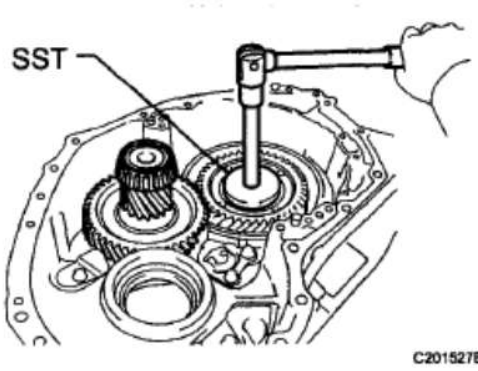


Fig. 332: Turning Manual Valve Lever Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Using SST, remove the counter drive gear nut from the planetary gear assembly.

SST 09387-00130



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Fig. 333: Removing Counter Drive Gear Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

39. **REMOVE COUNTER DRIVEN GEAR**
    a. Turn the manual valve lever shaft 2 notches clockwise to set it to the N position as shown in the illustration.

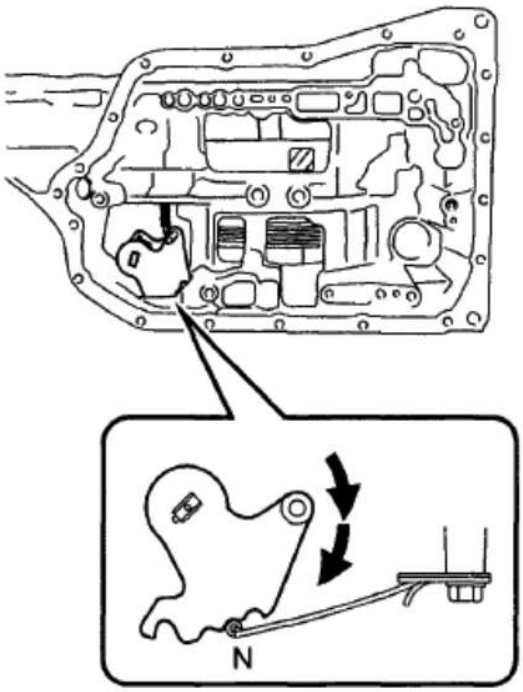


Fig. 334: Turning Manual Valve Lever Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Remove the counter driven gear from the transaxle case.

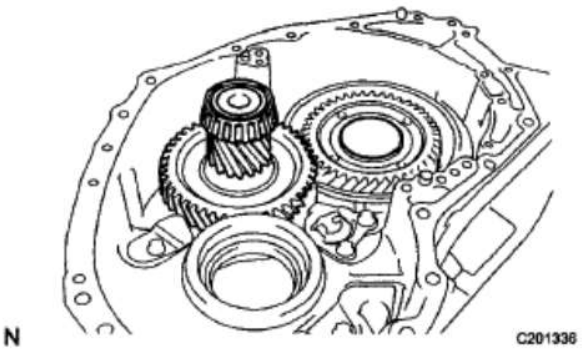


Fig. 335: Identifying Counter Driven Gear Of Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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40. **REMOVE COUNTER DRIVEN GEAR FRONT TAPERED ROLLER BEARING**
    a. Using SST, remove the counter driven gear front tapered roller bearing from the counter driven gear.

SST 09950-00020, 09950-00030, 09950-40011 (09957-04010), 09950-60010 (09951-00320)

41. **REMOVE COUNTER DRIVEN GEAR REAR TAPERED ROLLER BEARING**

HINT:

If removing the counter driven gear rear tapered roller bearing, replace the counter driven gear with a new one.

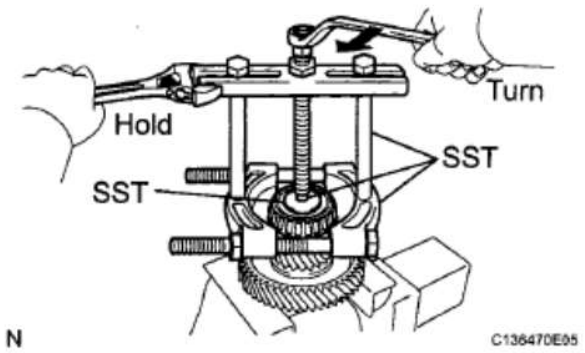


Fig. 336: Removing Counter Driven Gear Rear Tapered Roller Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

42. **REMOVE PAWL SHAFT CLAMP**
    a. Remove the bolt and pawl shaft clamp from the transaxle case.

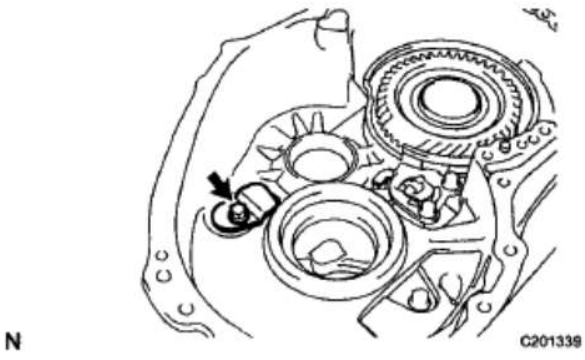


Fig. 337: Locating Pawl Shaft Clamp And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

43. **REMOVE NO. 1 TRANSMISSION CASE PLATE**
    a. Remove the bolt and No. 1 transmission case plate form the transaxle case.

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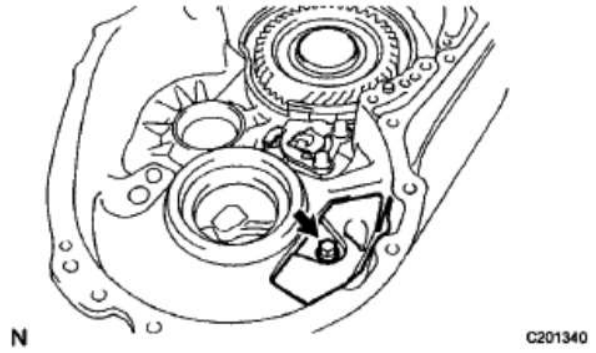


Fig. 338: Locating No. 1 Transmission Case Plate And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

44. **REMOVE PAWL STOPPER PLATE**
    a. Remove the 2 bolts and pawl stopper plate from the transaxle case.

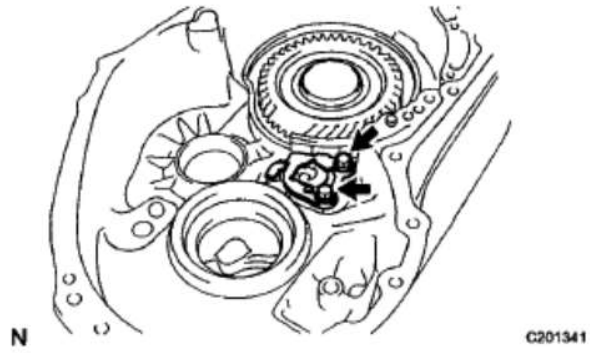


Fig. 339: Locating Pawl Stopper Plate And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

45. **REMOVE PARKING LOCK SLEEVE**
    a. Remove the parking lock sleeve from the transaxle case.

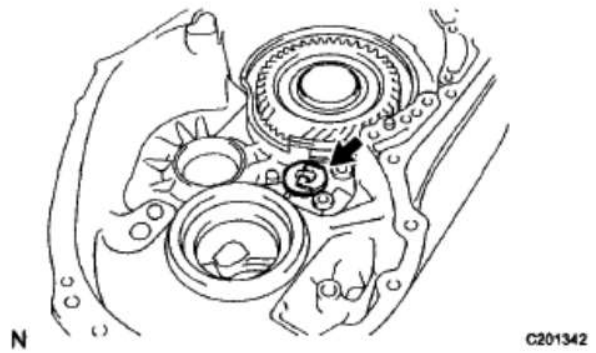


Fig. 340: Locating Parking Lock Sleeve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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46. **REMOVE PARKING LOCK PAWL**
    a. Remove the spring, parking lock pawl pin, parking lock pawl shaft, and parking lock pawl from the transaxle case.

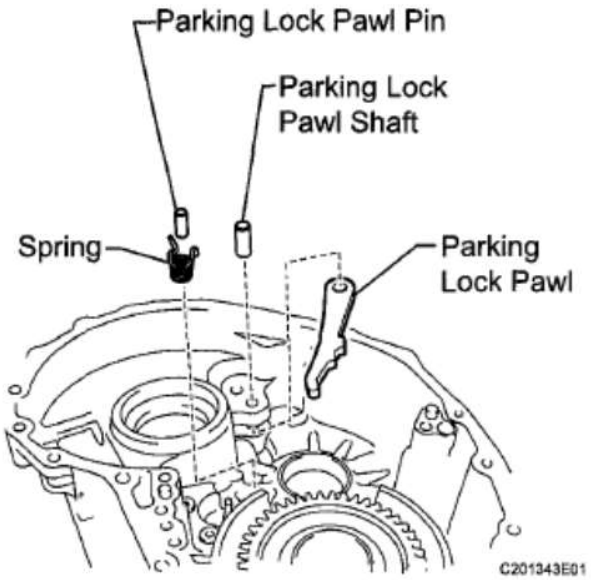


Fig. 341: Identifying Parking Lock Pawl And Parking Lock Pawl Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

47. **REMOVE COUNTER DRIVEN GEAR REAR TAPERED ROLLER BEARING OUTER RACE**
    a. Using SST, remove the counter driven gear rear tapered roller bearing outer race from the transaxle case.

SST 09308-00010

48. **REMOVE FRONT DIFFERENTIAL CASE REAR TAPERED ROLLER BEARING OUTER RACE** (See **INSPECTION**)
49. **REMOVE TRANSAXLE CASE OIL SEAL** (See **INSPECTION**)

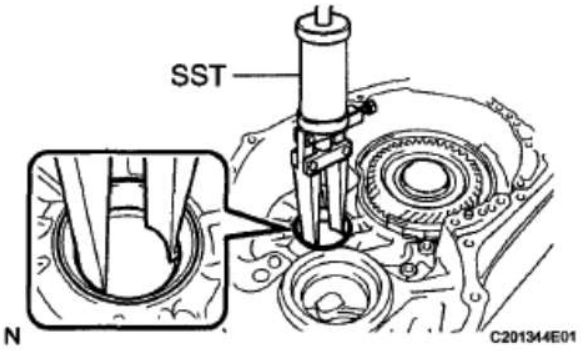


Fig. 342: Removing Counter Driven Gear Rear Tapered Roller Bearing Outer Race

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Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

50. **REMOVE ONE-WAY CLUTCH ASSEMBLY**
    a. Using a screwdriver, remove the snap ring from the transaxle case.

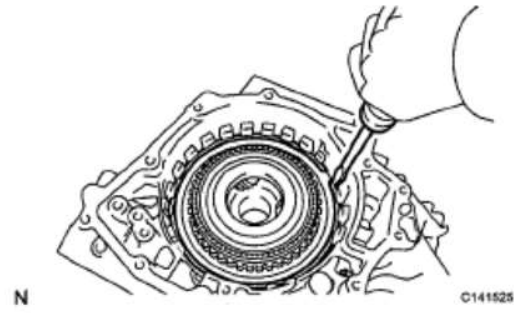


Fig. 343: Removing Snap Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Remove the one-way clutch assembly with the planetary ring gear from the transaxle case.
    c. Remove the thrust needle roller bearing from the planetary gear assembly.

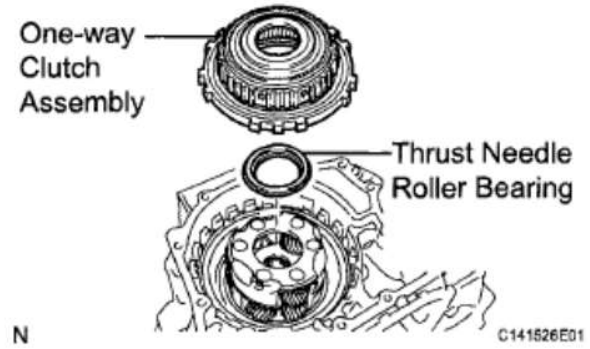


Fig. 344: Identifying Thrust Needle Roller Bearing One-Way Clutch Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    d. Remove the one-way clutch assembly from the planetary ring gear.
    e. Remove the outer race retainer from the one-way clutch assembly.
51. **INSPECT ONE-WAY CLUTCH ASSEMBLY** (See **REASSEMBLY**)

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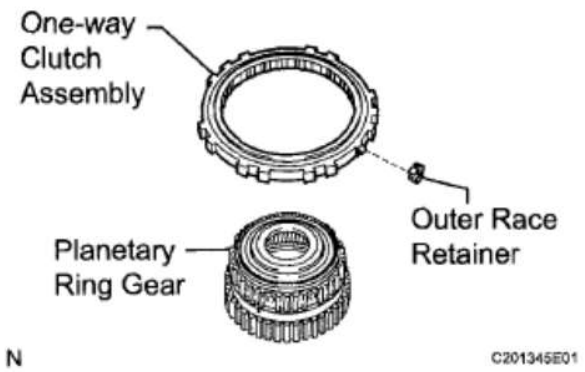


Fig. 345: Identifying One-Way Clutch Assembly And Planetary Ring Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

52. **REMOVE PLANETARY RING GEAR FLANGE**
    a. Using a screwdriver, remove the snap ring from the planetary ring gear.
    b. Remove the planetary ring gear flange from the planetary ring gear.

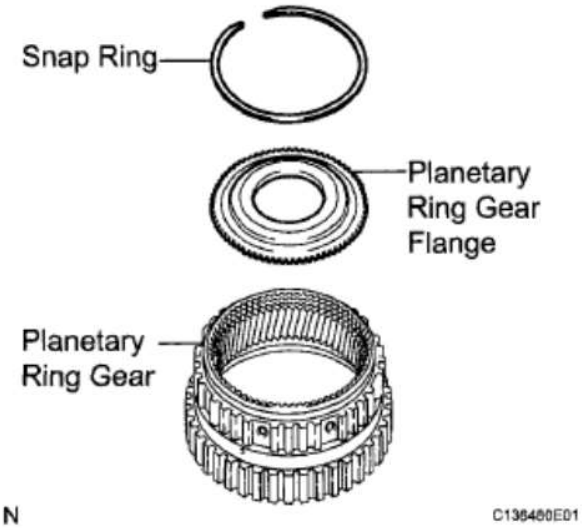


Fig. 346: Identifying Snap Ring And Planetary Ring Gear Flange
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

53. **REMOVE NO. 2 BRAKE DISC**
    a. Using a screwdriver, remove the snap ring from the transaxle case.

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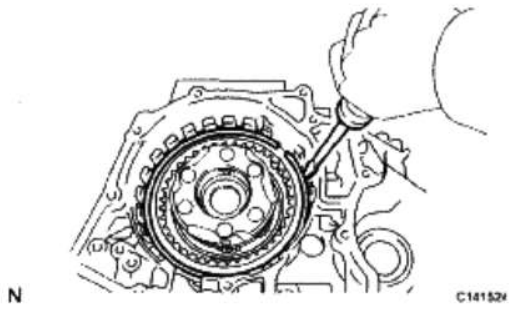


Fig. 347: Removing Snap Ring Of Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the brake flange, 5 brake discs, and 5 brake plates from the transaxle case.

54. **INSPECT NO. 2 BRAKE DISC** (See **REASSEMBLY**)

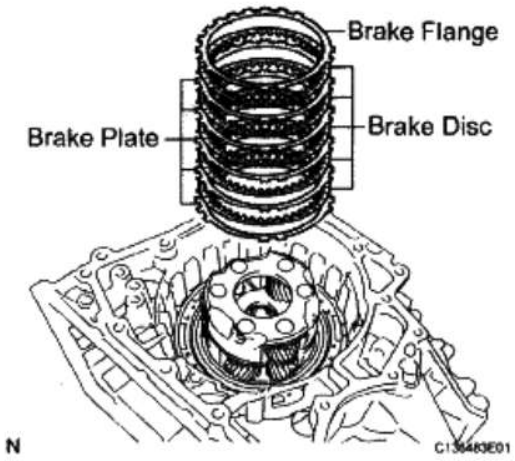
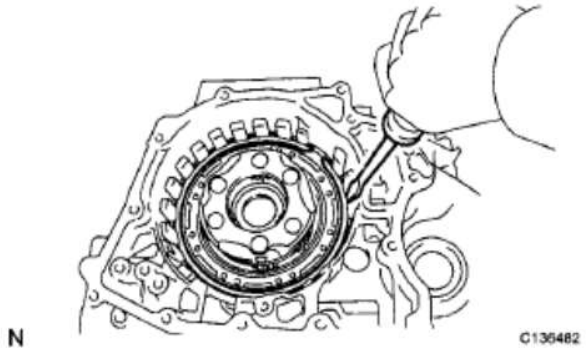


Fig. 348: Identifying Brake Flange, Brake Plate And Brake Disc
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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



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Fig. 349: Removing Snap Ring Of Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the 1st and reverse brake return spring from the transaxle case.

56. **INSPECT 1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY** (See **REASSEMBLY**)

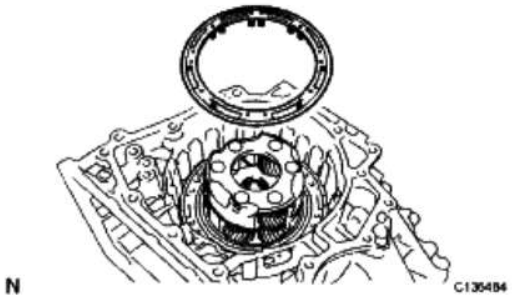


Fig. 350: Identifying Reverse Brake Return Spring And Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

57. **REMOVE NO. 2 BRAKE PISTON**

a. Apply compressed air (392 kPa, 4.0 kgf/cm^2 , 57 psi) to the ATF hole to remove the No. 2 brake piston assembly from the transaxle case.

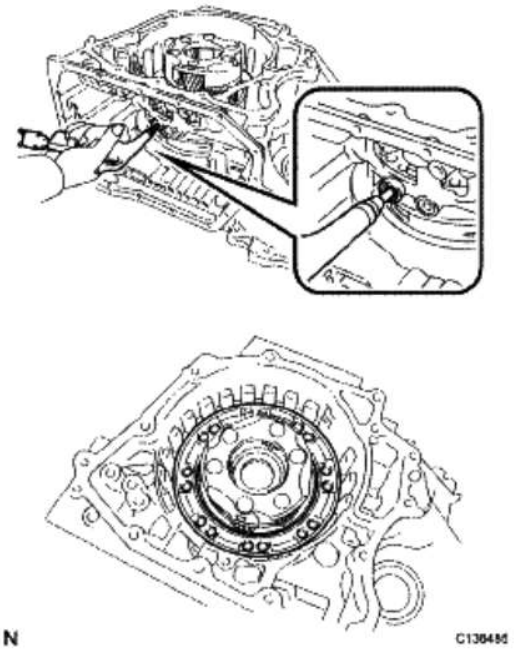


Fig. 351: Applying Compressed Air To ATF Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using a screwdriver, remove the 2 O-rings from the No. 2 brake piston.

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Fig. 352: Locating O-rings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

58. **REMOVE FRONT PLANETARY GEAR ASSEMBLY**
    a. Using SST and a press, remove the planetary gear assembly from the transaxle case.

SST 09950-60010 (09951 -00580), 09950-70010 (09951-07100)

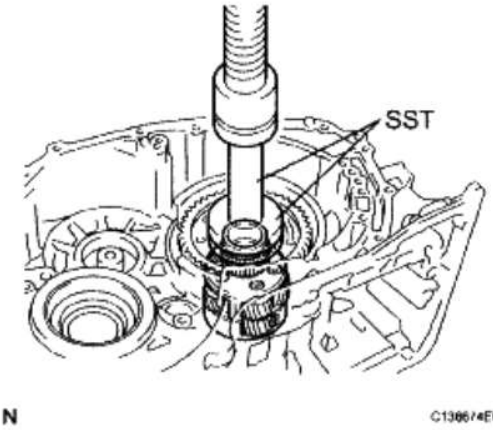


Fig. 353: Removing Planetary Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

59. **REMOVE COUNTER DRIVE GEAR**
    a. Using SST and a press, remove the counter drive gear and bearing inner race (rear side) from the transaxle case.

SST 09950-60020 (09951 -00710), 09950-70010 (09951-07100)

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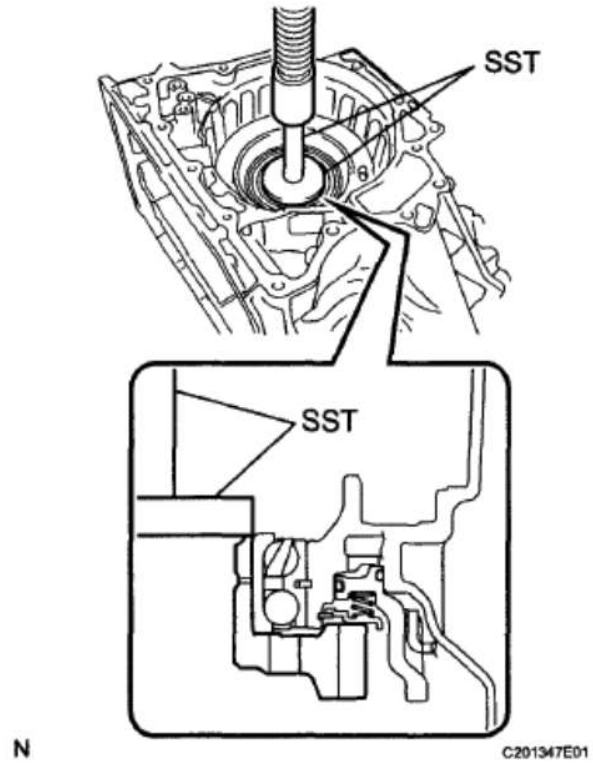


Fig. 354: Removing Counter Drive Gear And Bearing Inner Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. As shown in the illustration, tighten the 2 bolts evenly and leave a clearance of approximately 5.0 mm (0.197 in.) between the counter drive gear and inner race.

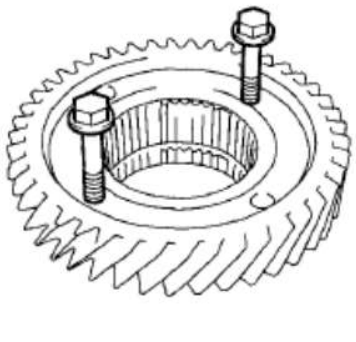


Fig. 355: Locating Pawl Stopper Plate And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Using SST, remove the bearing inner race (front side) from the counter drive gear.

SST 09950-00020, 09950-00030, 09950-40011 (09957-04010), 09950-60020 (09951-00710)

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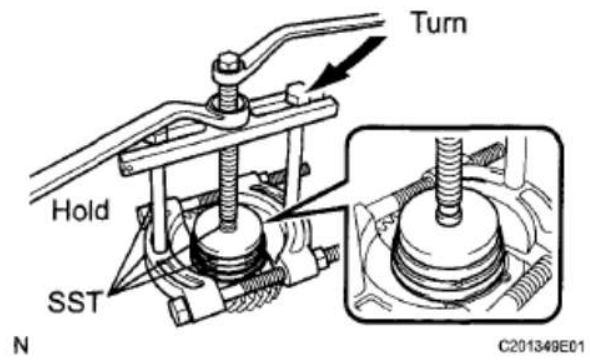


Fig. 356: Removing Bearing Inner Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

60. **REMOVE NO. 3 BRAKE PISTON**
    a. Place SST on the brake piston return spring and compress the brake piston return spring with a press.

       SST 09387-00070

    b. Using a screwdriver, remove the snap ring from the transaxle case.

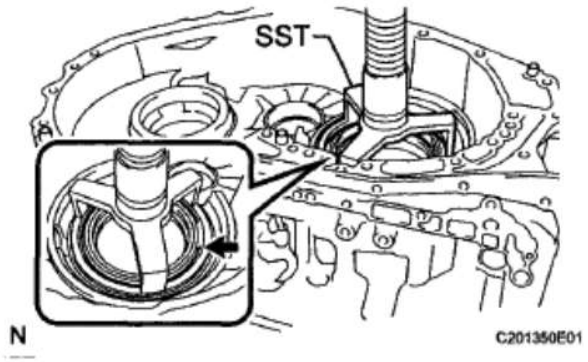


Fig. 357: Compressing Brake Piston Return Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    c. Remove the brake piston return spring from the transaxle case.

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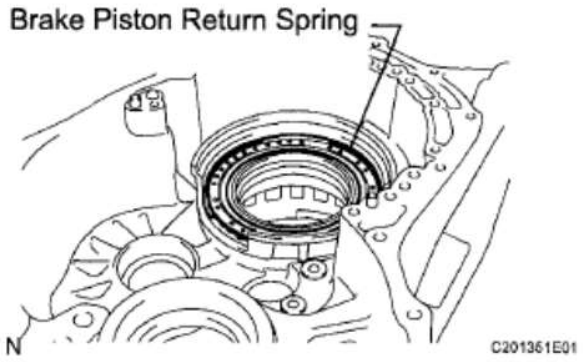


Fig. 358: Identifying Brake Piston Return Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Remove the No. 3 brake piston from the transaxle case.

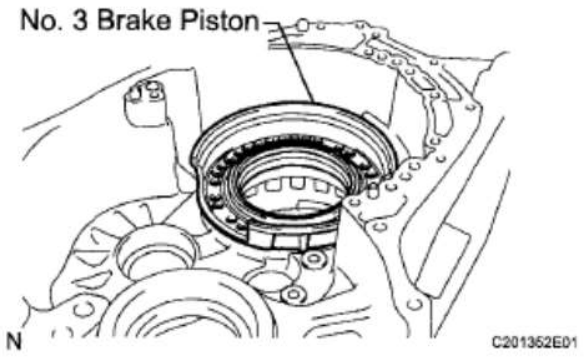


Fig. 359: Identifying No. 3 Brake Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Using a screwdriver, remove the 2 O-rings from the No. 3 brake piston.

61. **INSPECT NO. 3 BRAKE PISTON RETURN SPRING SUB-ASSEMBLY**

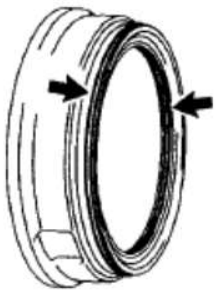


Fig. 360: Locating O-Rings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

62. **REMOVE MANUAL DETENT SPRING SUB-ASSEMBLY**

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a. Remove the bolt, cover, and manual detent spring sub-assembly from the transaxle case.

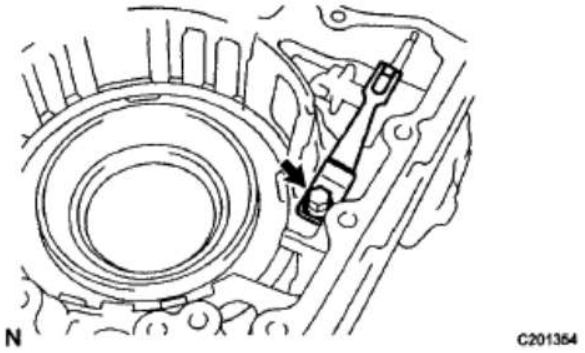


Fig. 361: Locating Manual Detent Spring Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

63. **REMOVE PARKING LOCK ROD SUB-ASSEMBLY**

a. Remove the parking lock rod sub-assembly from the manual valve lever shaft.

HINT:

Align the slot with the notches on the manual valve lever shaft to remove the parking lock rod sub-assembly.

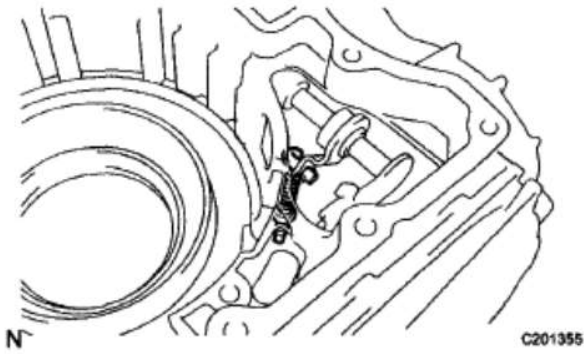


Fig. 362: Identifying Parking Lock Rod Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

64. **REMOVE MANUAL VALVE LEVER SHAFT SUB-ASSEMBLY**

a. Using needle-nose pliers, remove the manual valve lever shaft retainer spring from the transaxle case.

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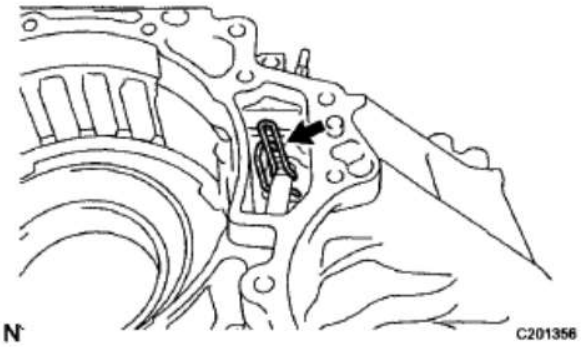


Fig. 363: Locating Manual Valve Lever Shaft Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the manual valve lever shaft sub-assembly from the transaxle case.

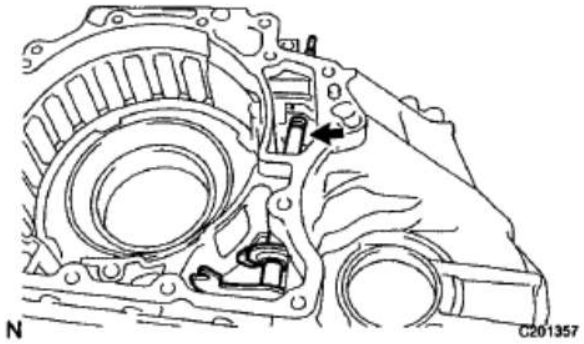


Fig. 364: Locating Manual Valve Lever Shaft Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

65. **REMOVE MANUAL VALVE LEVER SHAFT OIL SEAL**

a. Using a screwdriver, remove the manual valve lever shaft oil seal from the transaxle case.

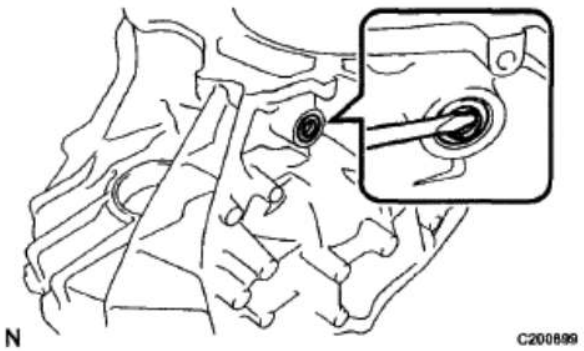


Fig. 365: Removing Manual Valve Lever Shaft Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

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1. **INSPECT TRANSMISSION OIL CLEANER MAGNET**
   a. Use the removed magnets to collect any steel chips. Examine the chips and particles in the pan and on the magnets to determine what type of wear has occurred in the transaxle:

Result:

Steel (magnetic):

Bearing, gear and plate wear

Brass (non-magnetic):

Bushing wear

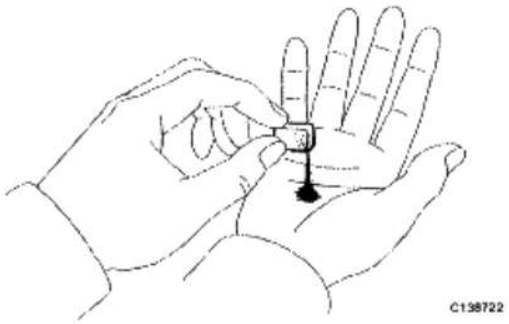


Fig. 366: Inspecting Transmission Oil Cleaner Magnet
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSPECT INPUT SHAFT SUB-ASSEMBLY**
   a. Using a dial indicator, measure the input shaft end play.

End play:

0.020 to 1.242 mm (0.000787 to 0.0489 in.)

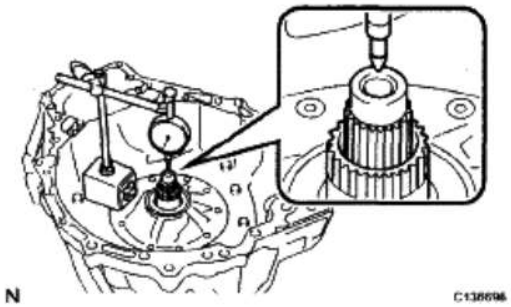


Fig. 367: Measuring Input Shaft End Play
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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3. **INSPECT PLANETARY SUN GEAR SUB-ASSEMBLY**
   a. Using a dial indicator, measure the inside diameter of the bushings of the planetary sun gear.

Standard inside diameter:

25.525 to 25.546 mm (1.0049 to 1.0057 in.)

Maximum inside diameter:

25.546 mm (1.0057 in.)

If the inside diameter is greater than the maximum, replace the planetary sun gear.

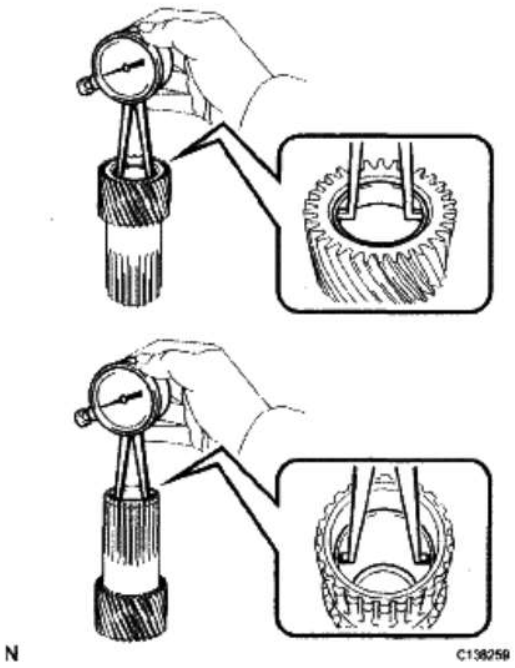


Fig. 368: Measuring Inside Diameter Of Planetary Sun Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **INSPECT NO. 3 BRAKE DISC**
   a. Check if the contact surfaces of the discs, plates and flanges are worn or burnt.

NOTE:

- **If the lining of any disc is peeled off or discolored, or even if part of the groove is damaged, replace all discs.**
- **Before assembling new discs, soak them in ATF for at least 15 minutes.**

If necessary, replace them.

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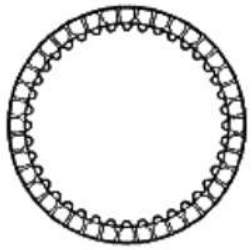


Fig. 369: Identifying No. 3 Brake Disc
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **INSPECT UNDERDRIVE PLANETARY GEAR ASSEMBLY**
   a. Using a feeler gauge, measure the clearance between the underdrive planetary gear and the pinion gear at 4 points.

Standard clearance:

0.18 to 0.54 mm (0.00709 to 0.0213 in.)

If the clearance is greater than the standard clearance, replace the automatic transaxle assembly.

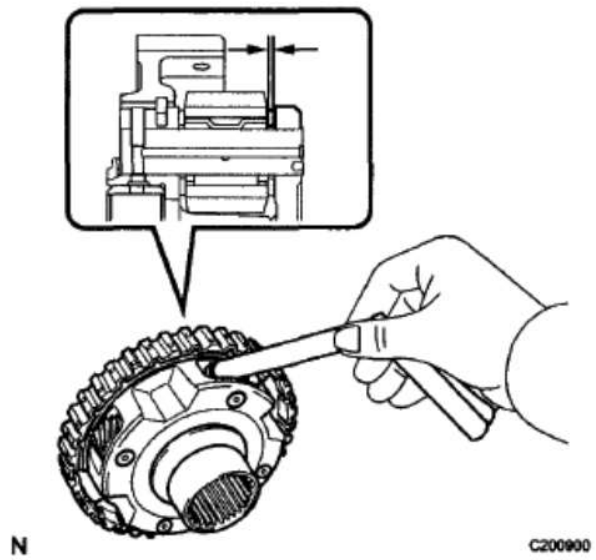


Fig. 370: Measuring Clearance Between Underdrive Planetary Gear And Pinion Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **INSPECT REAR PLANETARY SUN GEAR ASSEMBLY**
   a. Using a dial indicator, measure the inside diameter of the bushing of the rear planetary sun gear sub-assembly.

Standard inside diameter:

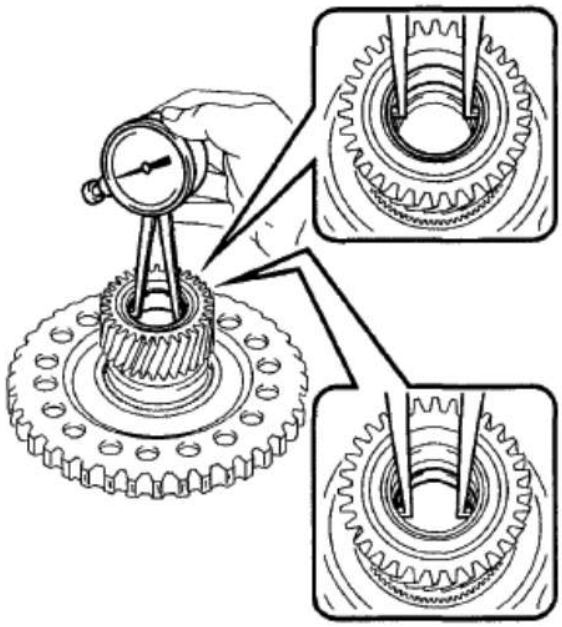
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25.580 to 25.601 mm (1.0071 to 1.0079 in.)

Maximum inside diameter:

25.601 mm (1.0079 in.)

If the inside diameter is greater than the maximum, replace the automatic transaxle assembly.



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Fig. 371: Measuring Inside Diameter Of Rear Planetary Sun Gear Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. **INSPECT NO. 1 BRAKE DISC**
   a. Check if the contact surfaces of the discs, plates and flange are worn or burnt.

NOTE:

- **If the lining of any disc is peeled off or discolored, or even if part of the groove is damaged, replace all discs.**
- **Before assembling new discs, soak them in ATF for at least 15 minutes.**

If necessary, replace them.

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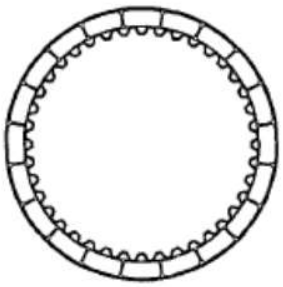


Fig. 372: Identifying No. 1 Brake Disc
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **INSPECT 2ND BRAKE PISTON RETURN SPRING SUB-ASSEMBLY**
   a. Using a vernier caliper, measure the free length of the 3 2nd brake piston return springs including the spring seats.

Standard free length:

23.26 mm (0.916 in.)

If the free length is shorter than the standard free length, replace the 2nd brake piston return spring.

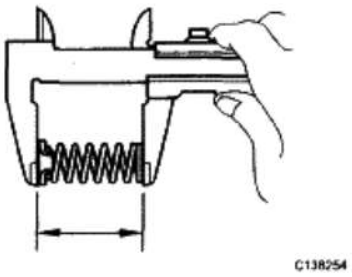


Fig. 373: Measuring Free Length Of 2nd Brake Piston Return Springs
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. **INSPECT ONE-WAY CLUTCH ASSEMBLY**
   a. Temporarily install the one-way clutch assembly to the planetary ring gear.
   b. Make sure that the one-way clutch assembly turns freely counterclockwise and locks when turned clockwise.

If the one-way clutch assembly does not operate normally, replace it.

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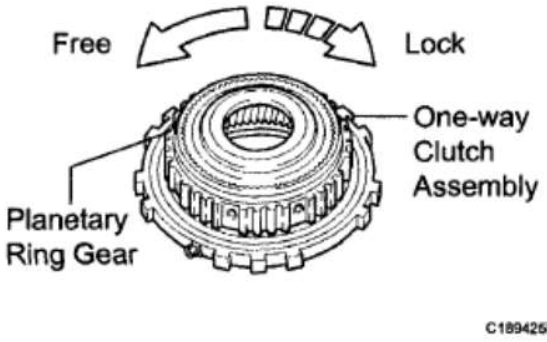


Fig. 374: Inspecting One-Way Clutch Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. **INSPECT NO. 2 BRAKE DISC**
    a. Check if the contact surfaces of the discs, plates and flange are worn or burnt.

NOTE:

- **If the lining of any disc is peeled off or discolored, or even if part of the groove is damaged, replace all discs.**
- **Before assembling new discs, soak them in ATF for at least 15 minutes.**

If necessary, replace them.

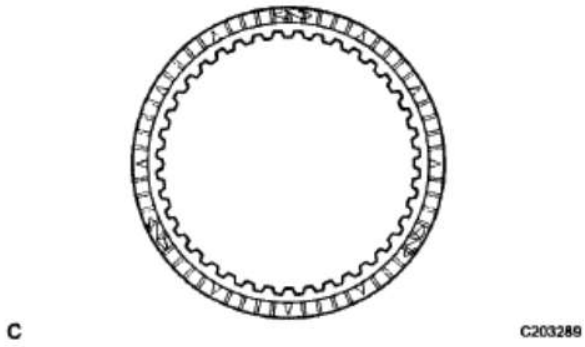


Fig. 375: Identifying No. 2 Brake Disc
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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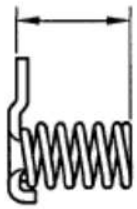


Fig. 376: Identifying Free Length Of 1st And Reverse Brake Return Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Using a vernier caliper, measure the free length of the 1st and reverse brake return spring together with the spring seat.

Standard free length:

15.79 mm (0.621 in.)

If the free length is shorter than the standard free length, replace the 1st and reverse brake return spring.

12. **INSPECT CLEARANCE OF NO. 2 BRAKE**
    a. Using a dial indicator, measure the clearance of the No. 2 brake while applying compressed air (200 kPa, 2.0 kgf/cm^2 , 29 psi).

Standard clearance:

0.884 to 1.196 mm (0.0348 to 0.0471 in.)

HINT:

Measure the clearance at 3 points where the brake piston diameter is approximately 140 mm (5.51 in.) and calculate the average.

If the clearance is not as specified, select an appropriate No. 2 brake flange so that the clearance will be within the specified range.

HINT:

There are 5 flanges of different thicknesses.

No. 2 Brake Flange Thickness: mm (in.)

THICKNESS REFERENCE

Mark	Thickness
40	4.0 (0.157)
41	4.1 (0.161)

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42	4.2 (0.165)
43	4.3 (0.169)
44	4.4 (0.173)

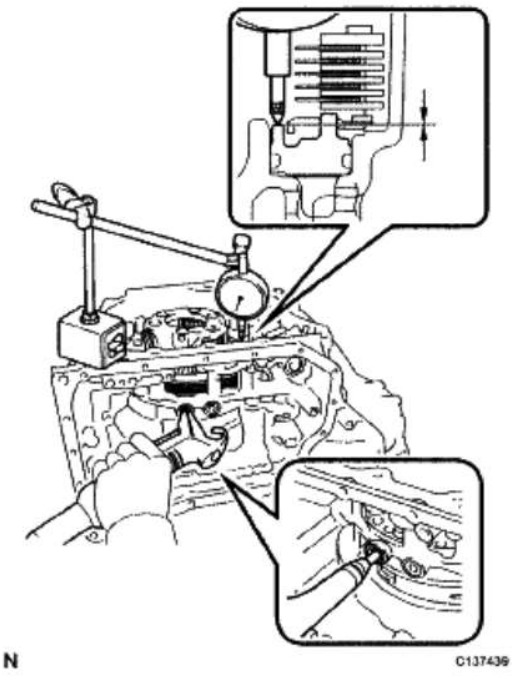


Fig. 377: Inspecting Clearance Of No. 2 Brake
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. **INSPECT CLEARANCE OF NO. 1 BRAKE**
    a. Using a dial indicator, measure the clearance of the No. 1 brake while applying compressed air (200 kPa, 2.0 kgf/cm^2 , 29 psi).

Standard clearance:

0.601 to 0.819 mm (0.0237 to 0.0322 in.)

HINT:

Measure the clearance at 3 points where the brake piston diameter is approximately 140 mm (5.51 in.) and calculate the average.

If the clearance is not as specified, select an appropriate No. 1 brake flange so that the clearance will be within the specified range.

HINT:

There are 6 flanges of different thicknesses.

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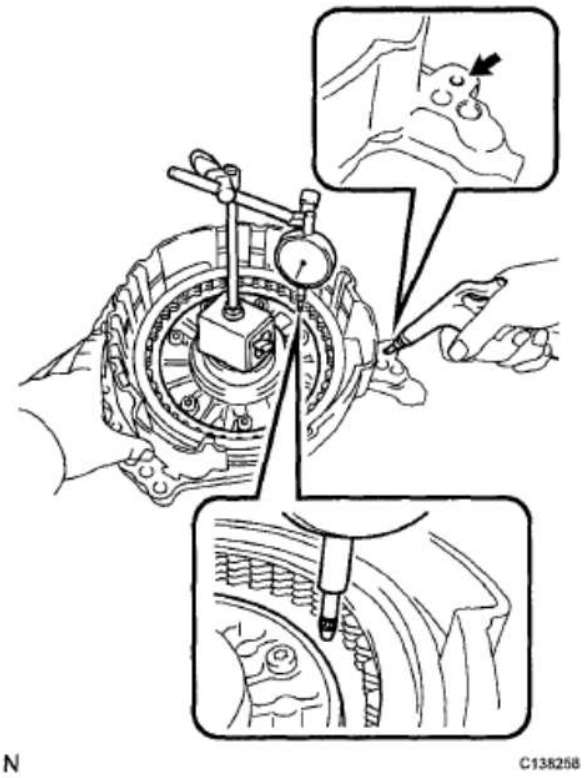


Fig. 378: Inspecting Clearance Of No. 1 Brake
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

No. 1 Brake Flange Thickness: mm (in.)

THICKNESS REFERENCE

Mark	Thickness
30	3.0 (0.118)
31	3.1 (0.122)
32	3.2 (0.126)
33	3.3 (0.130)
34	3.4 (0.134)
35	3.5 (0.138)

14. **INSPECT NO. 3 BRAKE PISTON RETURN SPRING SUB-ASSEMBLY**
    a. Using a vernier caliper, measure the free length of the No. 3 brake piston return spring together with the spring seat.

Standard free length:

9.15 mm (0.360 in.)

If the free length is shorter than the standard free length, replace the No. 3 brake piston return spring.

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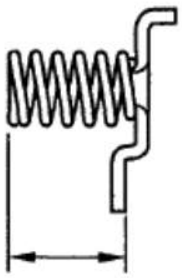


Fig. 379: Identifying Free Length Of No. 3 Brake Piston Return Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. **INSPECT CLEARANCE OF NO. 3 BRAKE**
    a. Using a vernier caliper and a straightedge, measure the distance shown in the illustration (Dimension A) while a load of 500 N (51 kgf, 112 lbf) is being applied to the flange.

       HINT:

       Measure dimension A at 3 points where the flange diameter is approximately 166 mm (6.54 in.) and calculate the average.

    b. Using a vernier caliper and a straightedge, measure the distance shown in the illustration (Dimension B).

       HINT:

       Measure dimension B at 3 points where the No. 3 brake diameter is approximately 166 mm (6.54 in.) and calculate the average.

    c. Calculate the clearance value using the following formula:

Clearance = Dimension B - Dimension A - Flange

Thickness

Standard clearance:

0.599 to 0.799 mm (0.0236 to 0.0315 in.)

If the clearance is not as specified, select an appropriate brake flange so that the clearance will be within the specified range.

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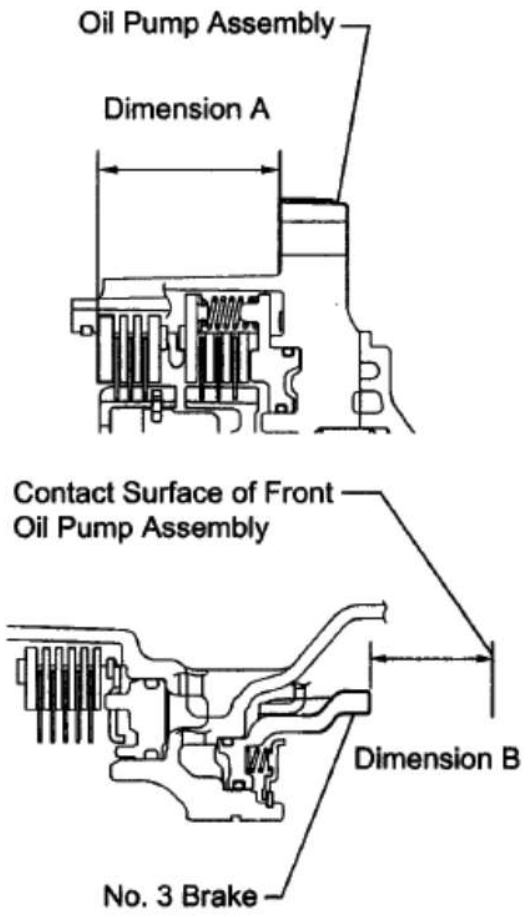


Fig. 380: Identifying Front Oil Pump Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

There are 6 flanges of different thicknesses.

No. 3 Brake Flange Thickness: mm (in.)

THICKNESS REFERENCE

Mark	Thickness
38	3.80 (0.150)
39	3.90 (0.154)
40	4.00 (0.157)
41	4.10 (0.161)
42	4.20 (0.165)
43	4.30 (0.169)

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16. **INSPECT CLEARANCE OF NO. 1 CLUTCH DISC**
    a. Install the direct multiple disc clutch assembly onto the rear transaxle cover sub-assembly.
    b. Check that the piston moves when compressed air (200 kPa, 2.0 kgf/cm^2 , 29 psi) is applied to the oil hole.

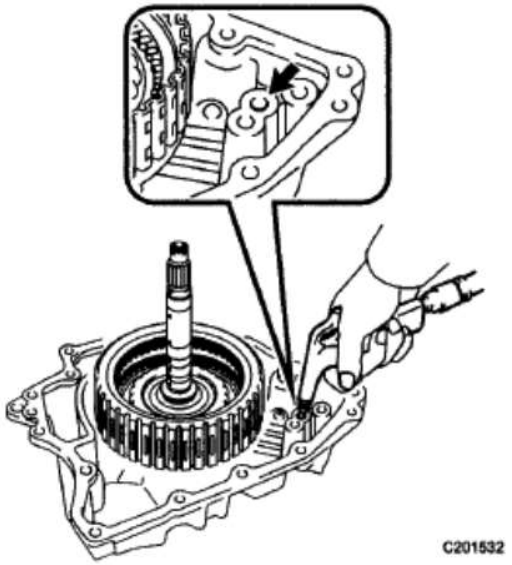


Fig. 381: Inspecting Clearance Of No. 1 Clutch Disc
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    c. Using a feeler gauge, measure the No. 1 clutch pack clearance.

HINT:

Measure the clearance at 3 points where the flange diameter is approximately 152 mm (5.98 in.) and calculate the average.

Pack clearance:

0.601 to 0.819 mm (0.0237 to 0.0322 in.)

If the pack clearance is not as specified, replace the automatic transaxle assembly.

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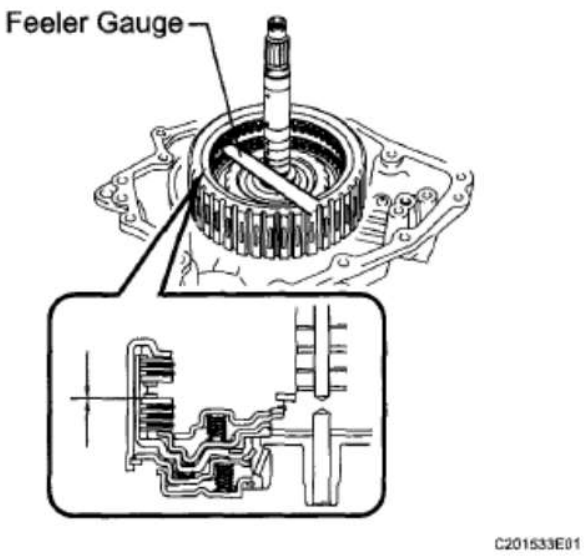


Fig. 382: Measuring No. 1 Clutch Pack Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. **INSPECT CLEARANCE OF NO. 2 CLUTCH DISC**
    a. Install the direct multiple disc clutch assembly onto the rear transaxle cover sub-assembly.
    b. Using a dial indicator, measure the No. 2 clutch pack clearance while applying and releasing compressed air (200 kPa, 2.0 kgf/cm^2 , 29 psi).

HINT:

Measure the clearance at 3 points where the diameter of the No. 2 direct multiple clutch piston is approximately 152 mm (5.98 in.) and calculate the average.

Pack clearance:

0.394 to 0.605 mm (0.0155 to 0.0238 in.)

If the pack clearance is not as specified, replace the automatic transaxle assembly.

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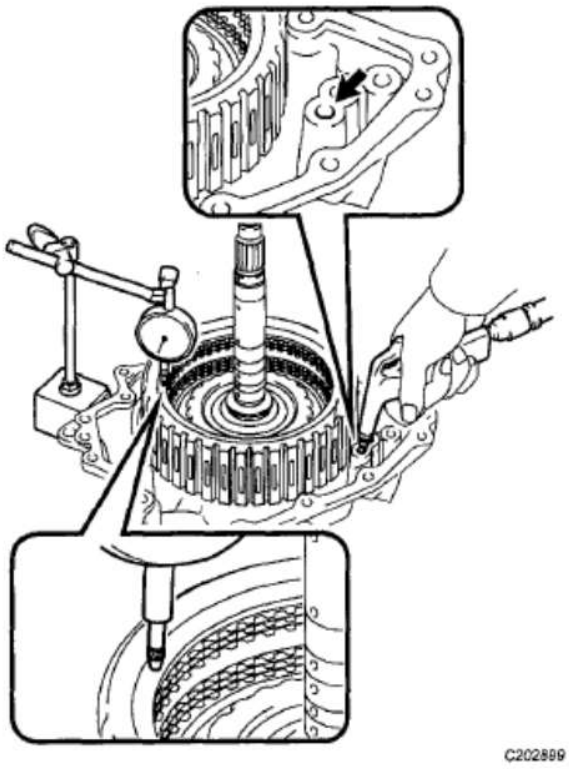


Fig. 383: Measuring No. 2 Clutch Pack Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REASSEMBLY

1. **BEARING POSITION**
   a. Check bearing position and installation direction.

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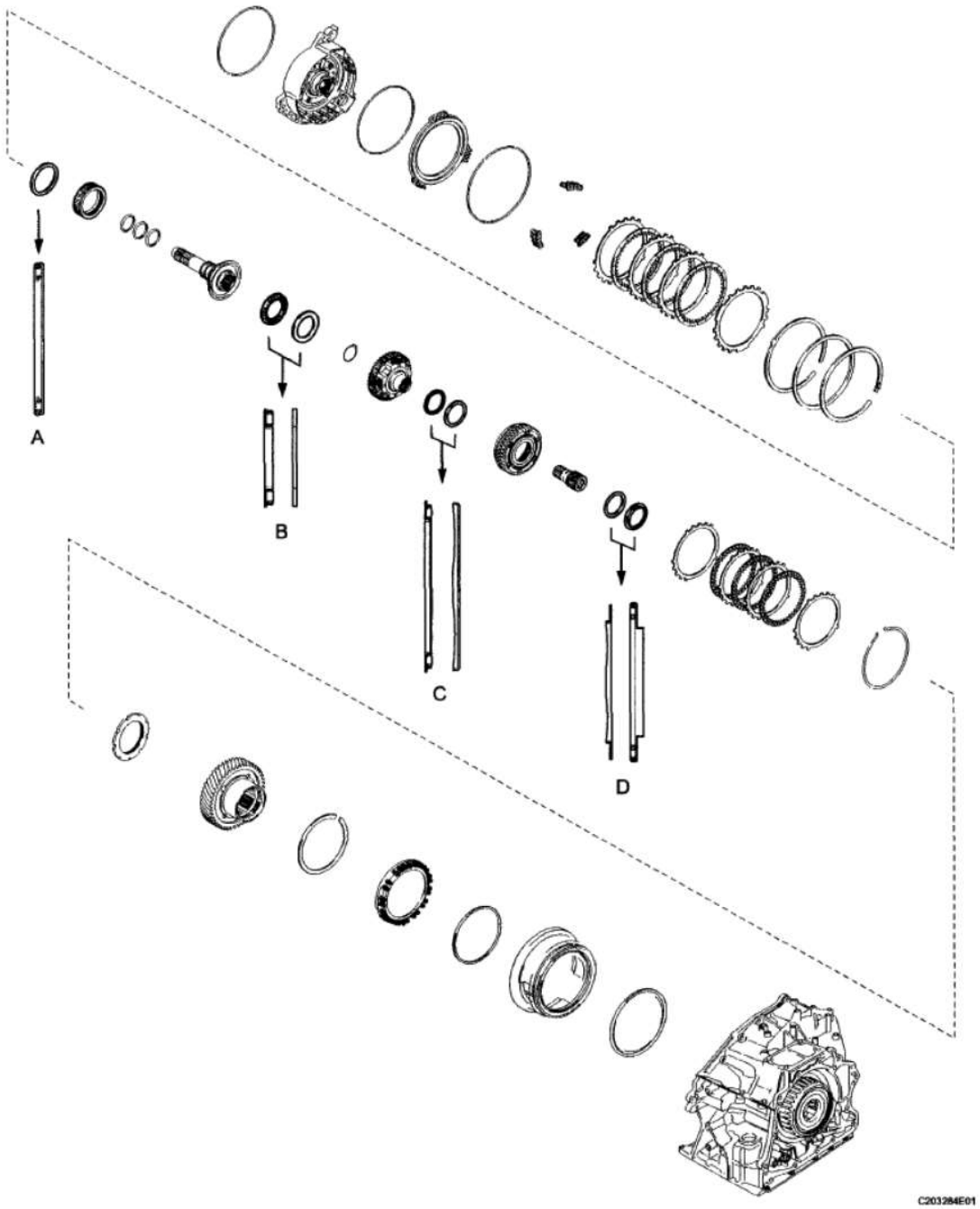


Fig. 384: Identifying Bearing Position (1 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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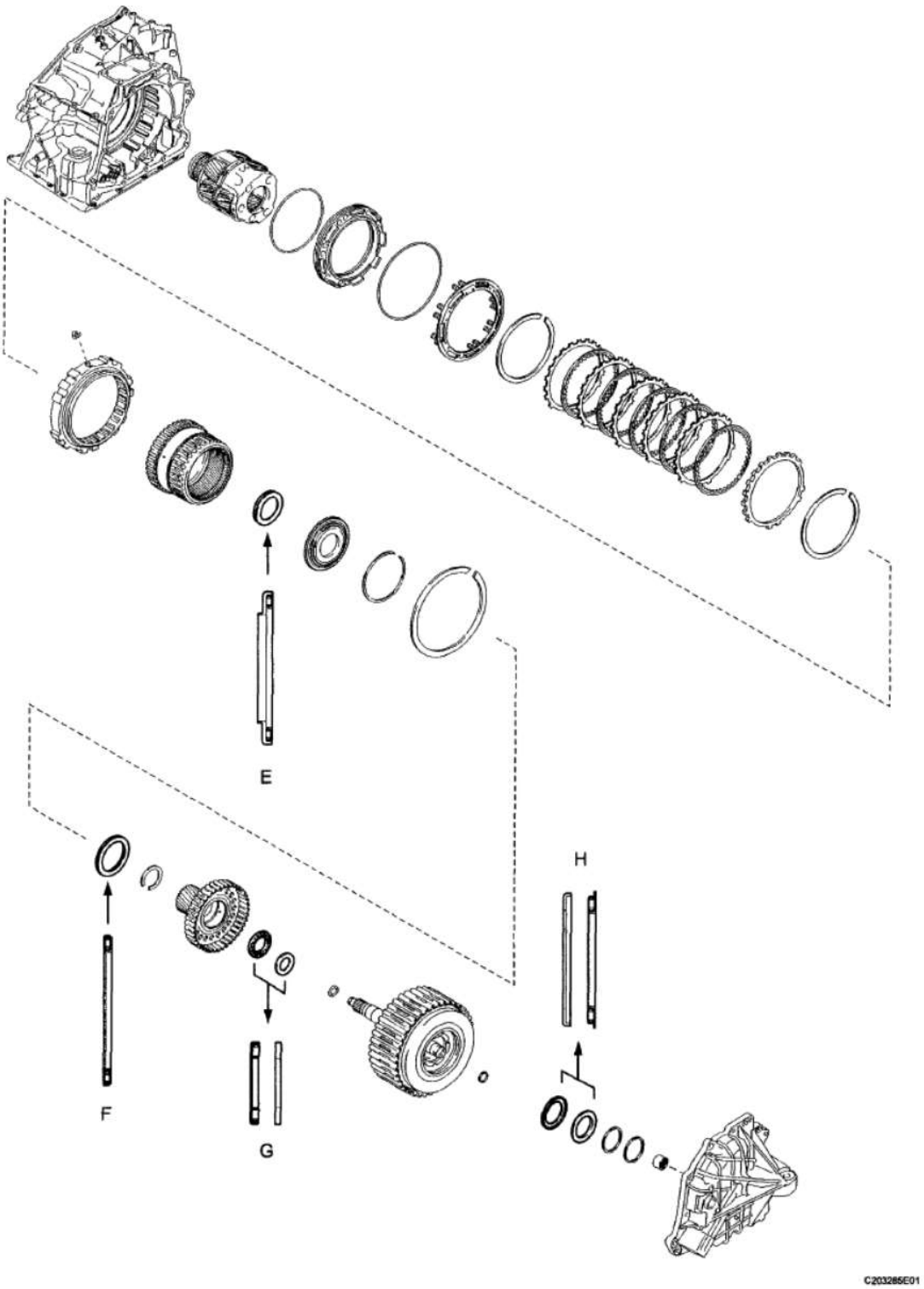


Fig. 385: Identifying Bearing Position (2 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DIAMETER REFERENCE

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Mark	Front Race Diameter Inside/Outside mm (in.)	Thrust Bearing Diameter Inside/Outside mm (in.)	Rear Race Diameter Inside/Outside mm (in.)
A	-	57.7 (2.27)/75.2 (2.96)	-
B	-	29.1 (1.15)/48.6 (1.91)	30.7 (1.21)/48.3 (1.90)
C	65.9 (2.59)/82.3 (3.24)	62.6 (2.47)/82.4 (3.24)	-
D	59.4 (2.34)/76 (2.99)	53.46 (2.10)/79 (3.11)	-
E	-	56.1 (2.21)/81.1 (3.19)	-
F	-	61.2 (2.41)/79 (3.11)	-
G	-	28 (1.10)/47.1 (1.85)	26.1 (1.03)/44 (1.73)
H	52.2 (2.06)/70.4 (2.77)	48.9 (1.93)/72.0 (2.84)	-

2. **INSTALL MANUAL VALVE LEVER SHAFT OIL SEAL**
   a. Coat the lip of a new manual valve lever shaft oil seal with MP grease.
   b. Using SST and a hammer, install the manual valve lever shaft oil seal to the transaxle case.

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

Oil seal driven in depth:

-0.5 to 0.5 mm (-0.0197 to 0.0197 in.)

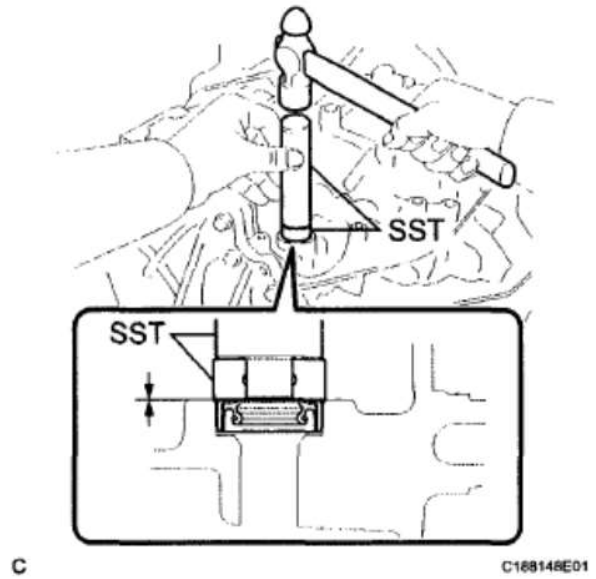


Fig. 386: Installing Manual Valve Lever Shaft Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **INSTALL MANUAL VALVE LEVER SHAFT SUB-ASSEMBLY**
   a. Install the manual valve lever shaft to the transaxle case.

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NOTE: Do not damage the manual valve lever shaft oil seal while installing the manual valve lever shaft to the transaxle case.

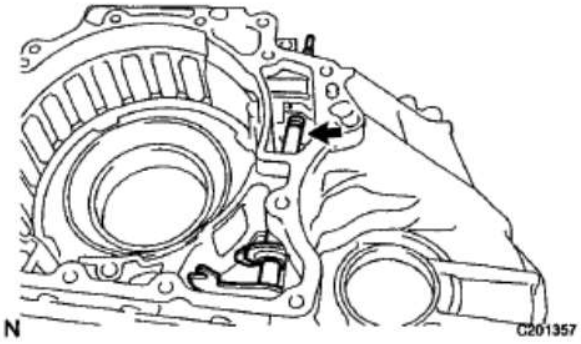


Fig. 387: Locating Manual Valve Lever Shaft Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using needle-nose pliers, install the manual valve shaft retainer spring to the transaxle case.

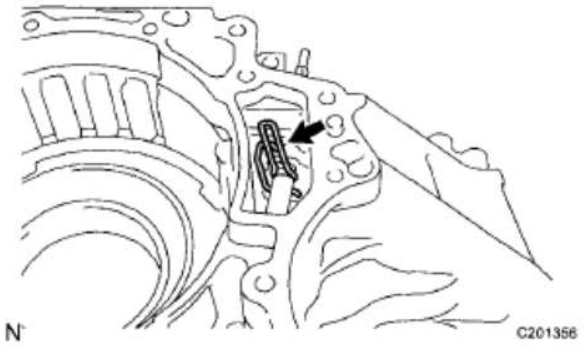
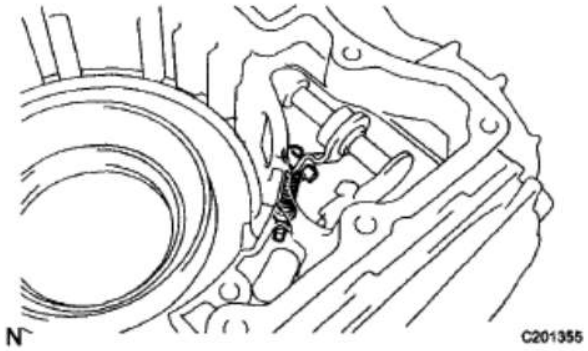


Fig. 388: Identifying Manual Valve Shaft Retainer Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **INSTALL PARKING LOCK ROD SUB-ASSEMBLY**
   a. Align the slot with the notches on the manual valve lever shaft and install the parking lock rod sub-assembly.



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Fig. 389: Identifying Parking Lock Rod Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **INSTALL MANUAL DETENT SPRING SUB-ASSEMBLY**
   a. Install the manual detent spring sub-assembly and cover to the transaxle case with the bolt.

Torque: 23 N*m (234 kgf*cm, 17 ft.*lbf)

NOTE: Make sure to install the manual detent spring first and then the cover.

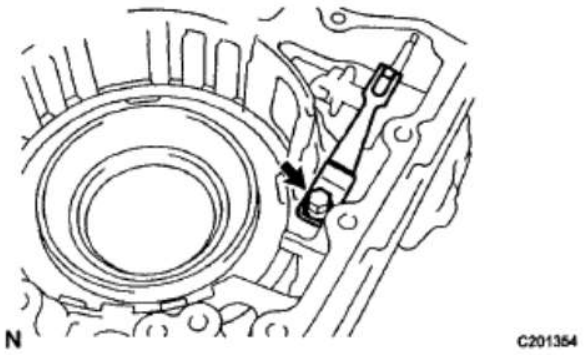


Fig. 390: Locating Manual Detent Spring Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **INSTALL COUNTER DRIVE GEAR BEARING**

NOTE: Perform this procedure only when the counter drive gear bearing or transaxle case is replaced.

   a. Using SST and a press, install a new counter drive gear bearing and snap ring to the transaxle case.

SST 09950-60020 (09951 -01030), 09950-70010 (09951-07100)

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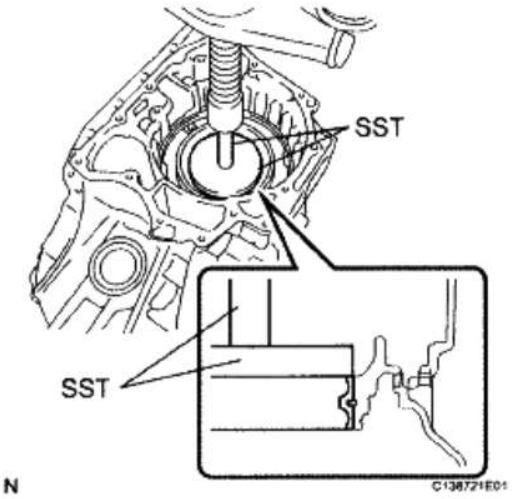


Fig. 391: Installing Counter Drive Gear Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. **INSTALL NO. 3 BRAKE PISTON**
   a. Coat 2 new O-rings with ATF and install them to the No. 3 brake piston.

NOTE: Ensure that the 2 O-rings are not twisted.

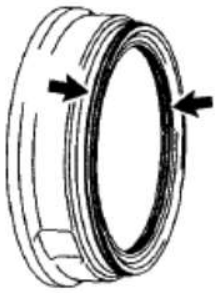


Fig. 392: Locating O-Rings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   b. Temporarily install the No. 3 brake piston to the transaxle case.

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Fig. 393: Identifying No. 3 Brake Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Temporarily install the pawl stopper plate to the transaxle case with the 2 bolts.

NOTE: After installing, make sure that the protrusions on the No. 3 brake piston and the grooves on the pawl stopper plate are aligned.

d. Press the No. 3 brake piston into the transaxle case.

NOTE: Make sure that the lip of the No. 3 brake piston is not twisted and does not get caught in the transaxle case.

HINT:

Use the installation surface of the return spring to press the piston into the transaxle case.

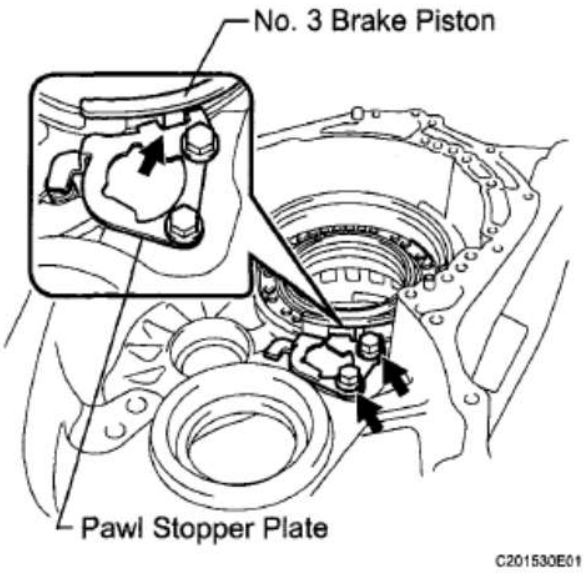


Fig. 394: Locating No. 3 Brake Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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e. Remove the 2 bolts and pawl stopper plate from the transaxle case.

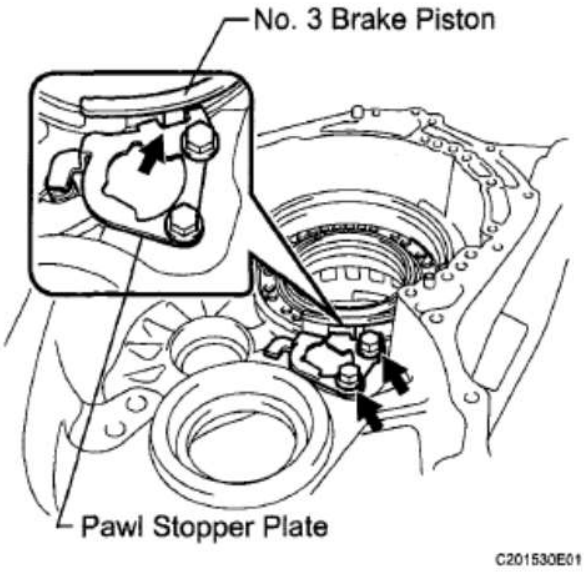


Fig. 395: Locating No. 3 Brake Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Install the brake piston return spring to the transaxle case.

NOTE: Install the brake piston return spring as shown in the illustration.

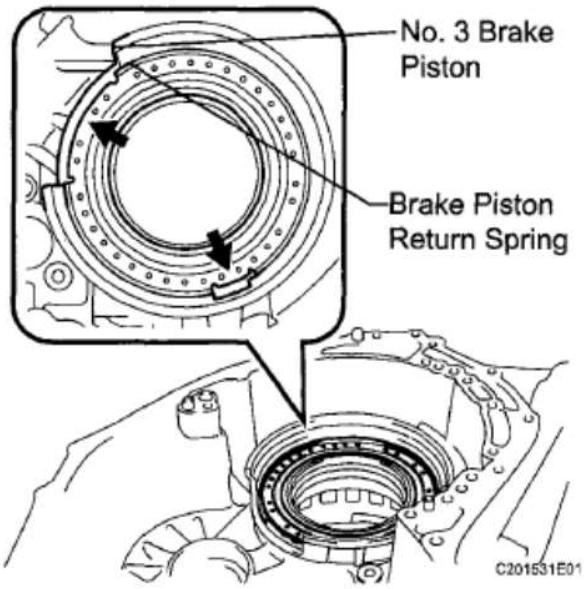


Fig. 396: Identifying Brake Piston Return Spring To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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g. Place SST on the brake piston return spring and compress the brake piston return spring with a press.

SST 09387-00070

NOTE: Stop the press when the brake piston return spring is flush with the snap ring groove. This prevents the brake piston return spring from being deformed.

h. Using a screwdriver, install the snap ring to the transaxle case as shown in the illustration.

NOTE:

- **Confirm that the snap ring is correctly located in the groove of the transaxle case.**
- **Be sure to align the opening of the snap ring with one of the protrusions on the brake piston return spring as shown in the illustration.**

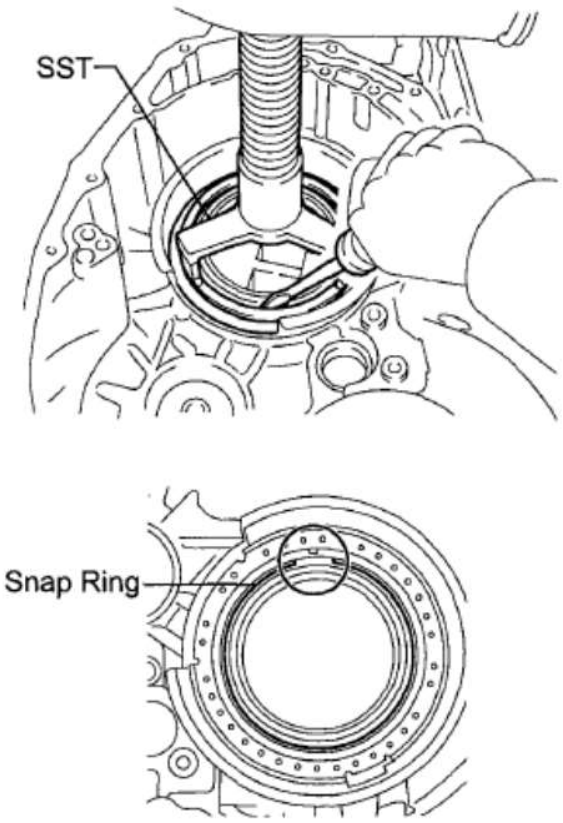


Fig. 397: Installing Snap Ring To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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8. **INSTALL COUNTER DRIVE GEAR**

a. Using SST and a press, install a new bearing inner race (front side) to the counter drive gear.

SST 09387-00020

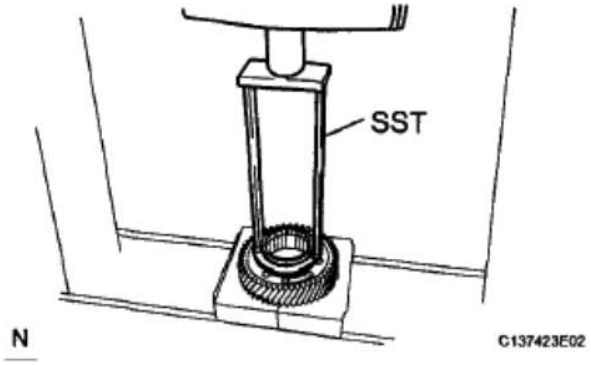


Fig. 398: Installing Counter Drive Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using SST, install a new bearing inner race (rear side) and counter drive gear to the transaxle case.

SST 09223-15030, 09527-17011, 09950-60020 (09951-00810), 09950-70010 (09951-07100)

NOTE: There should not be any clearance between the bearing inner race (front side) and counter drive gear.

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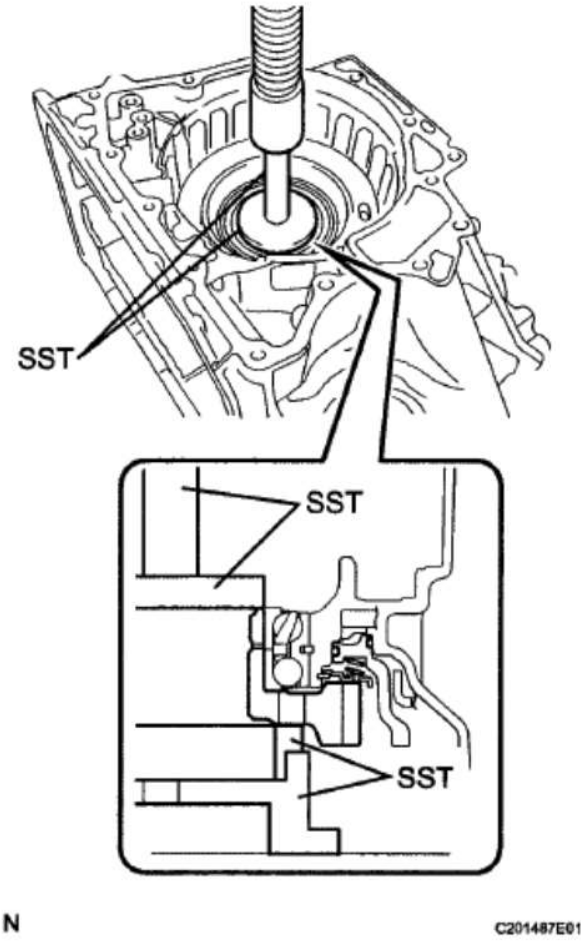


Fig. 399: Installing Bearing Inner Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

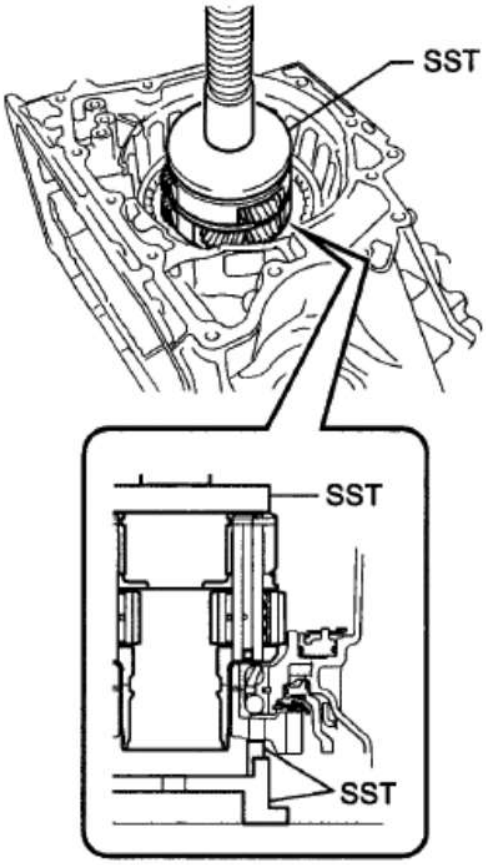
9. **INSTALL FRONT PLANETARY GEAR ASSEMBLY**
   a. Using SST and a press, press in a new front planetary gear assembly to the transaxle case.

SST 09223-15030, 09527-17011, 09951 -01100

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N C201488E01

Fig. 400: Installing Front Planetary Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. **INSTALL NO. 2 BRAKE PISTON**
    a. Coat 2 new O-rings with ATF and install them to the No. 2 brake piston.

NOTE: Ensure that the 2 O-rings are not twisted.



N C201346

Fig. 401: Locating O-rings

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Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Install the No. 2 brake piston to the transaxle case.

NOTE: Be careful not to damage the O-rings.

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

a. Install the 1st and reverse brake return spring to the transaxle case.

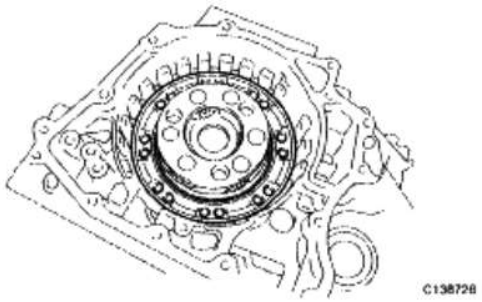


Fig. 402: Identifying No. 2 Brake Piston To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Place SST on the 1st and reverse brake return spring and compress the 1st and reverse brake return spring with a press.

SST 09387-00060

NOTE: Stop the press when the 1st and reverse brake return spring is flush with the snap ring groove. This prevents the 1st and reverse brake return spring from being deformed.

c. Using a screwdriver, install the snap ring to the transaxle case as shown in the illustration.

NOTE:

- **Confirm that the snap ring is correctly located in the groove of the transaxle case.**
- **Be sure to align the opening of the snap ring with one of the protrusions on the transaxle case as shown in the illustration.**

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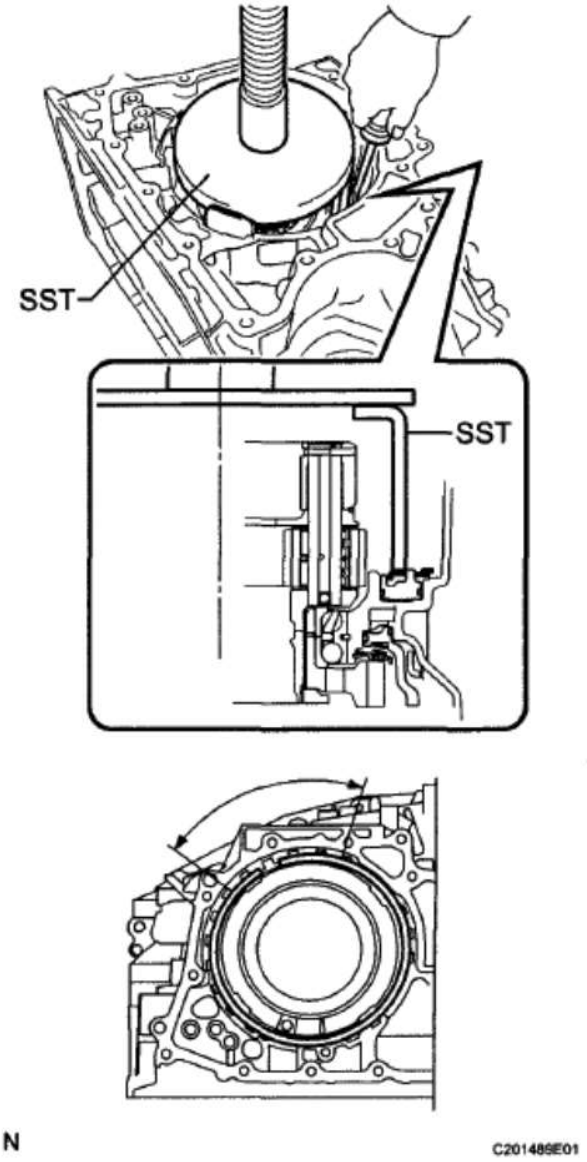


Fig. 403: Installing Snap Ring To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. **INSTALL NO. 2 BRAKE DISC**
    a. Install the 5 brake discs, 5 brake plates, and brake flange to the transaxle case.

NOTE: **Make sure that the discs, plates, and flange are installed in the correct order.**

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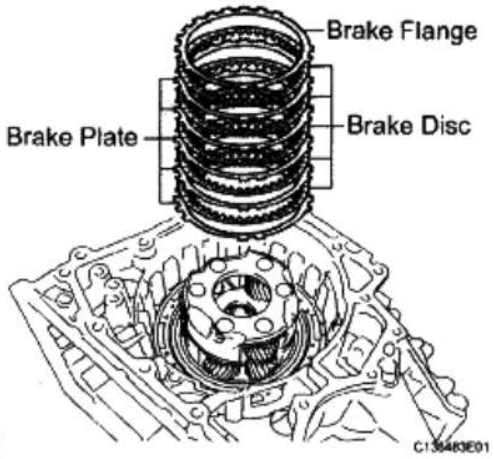


Fig. 404: Identifying Brake Flange, Brake Plate And Brake Disc
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using a screwdriver, install the snap ring to the transaxle case.

NOTE:

- **Confirm that the snap ring is correctly located in the groove of the transaxle case.**
- **Be sure to align the opening of the snap ring with one of the protrusions on the transaxle case as shown in the illustration.**

13. **INSPECT CLEARANCE OF NO. 2 BRAKE** (See **REASSEMBLY**)

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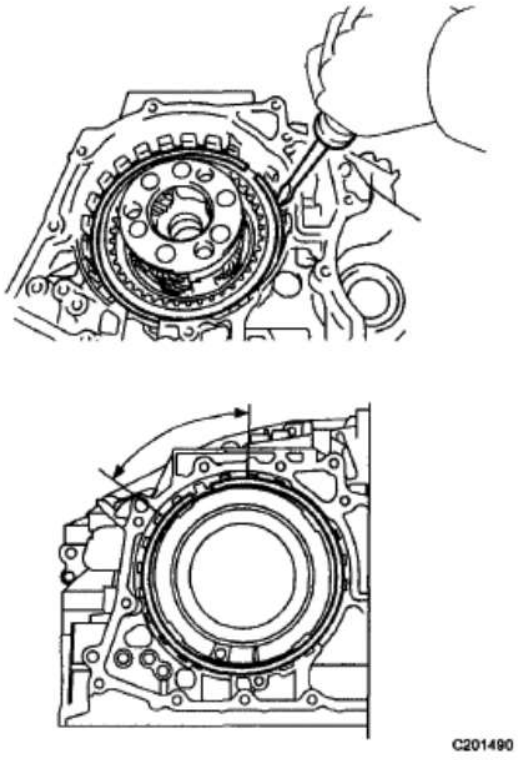


Fig. 405: Installing Snap Ring To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. **INSTALL PLANETARY RING GEAR FLANGE**
    a. Install the planetary ring gear flange to the planetary ring gear.
    b. Using a screwdriver, install the snap ring to the planetary ring gear.

NOTE: Confirm that the snap ring is correctly located in the groove of the planetary ring gear.

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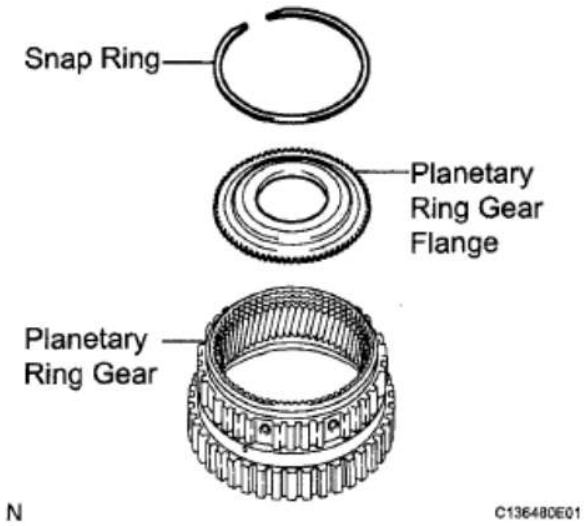


Fig. 406: Identifying Planetary Ring Gear Flange And Snap Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. **INSTALL ONE-WAY CLUTCH ASSEMBLY**
    a. Install the outer race retainer to the one-way clutch assembly.
    b. Install the one-way clutch assembly to the planetary ring gear.

NOTE: Make sure that the one-way clutch assembly is positioned in the correct direction as shown in the illustration.

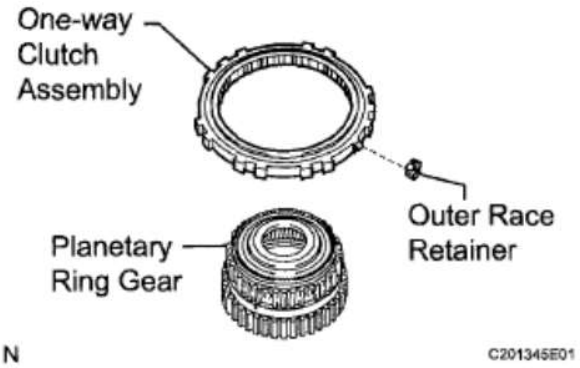


Fig. 407: Identifying One-Way Clutch Assembly And Planetary Ring Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    c. Coat the thrust needle roller bearing with ATF, and install it onto the planetary gear assembly.

Bearing Diameter: mm (in.)

DIAMETER REFERENCE

-	Inside	Outside

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Bearing	56.1 (2.21)	81.1 (3.19)

NOTE: **Be sure to install the thrust needle roller bearing properly so that the temper colored side of the race will be visible.**

d. Install the one-way clutch assembly to the transaxle case.

NOTE: **Make sure that there is no clearance between the retainer and the claw on the one-way clutch assembly. If there is any clearance, the spring of the retainer will be deformed.**

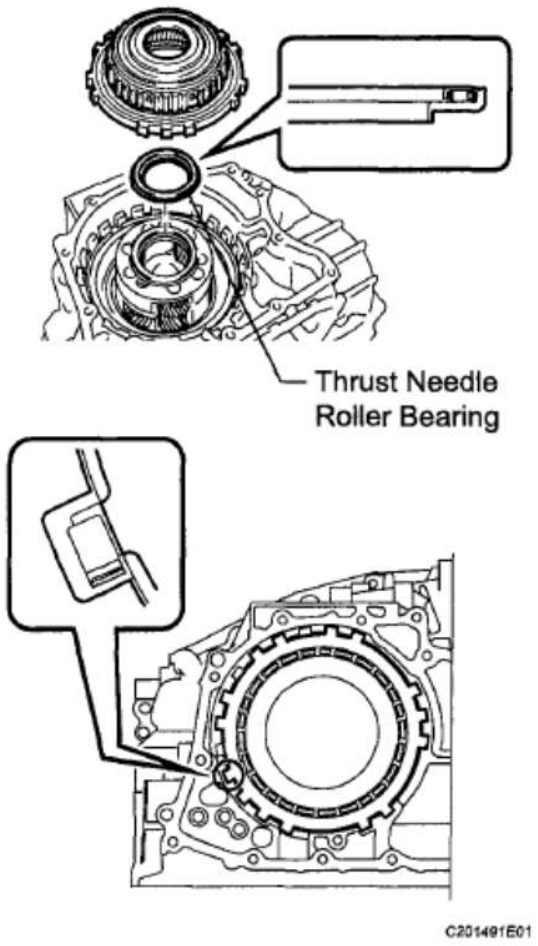


Fig. 408: Identifying Thrust Needle Roller Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Using a screwdriver, install the snap ring to the transaxle case.

NOTE:

- **Confirm that the snap ring is correctly located in the groove of the transaxle case.**

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- **Be sure to align the opening of the snap ring with one of the protrusions on the transaxle case as shown in the illustration.**

16. **INSTALL FRONT DIFFERENTIAL CASE REAR TAPERED ROLLER BEARING OUTER RACE** (See **REASSEMBLY**)
17. **INSTALL TRANSAXLE CASE OIL SEAL** (See **REASSEMBLY**)

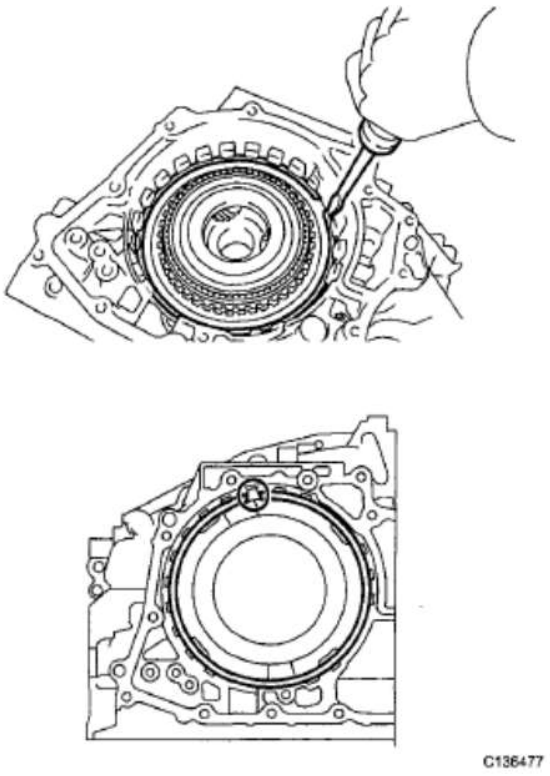


Fig. 409: Installing Snap Ring To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. **INSTALL COUNTER DRIVEN GEAR REAR TAPERED ROLLER BEARING OUTER RACE**
    a. Using SST and a hammer, install a new counter driven gear rear tapered roller bearing outer race to the transaxle case.

SST 09950-60010 (09951 -00630), 09950-70010 (09951-07100)

NOTE: **Be sure to install the counter driven gear rear tapered roller bearing outer race so that there is no clearance between the bearing outer race and the transaxle case. If there is any clearance, the turning torque of the counter drive gear cannot be measured correctly.**

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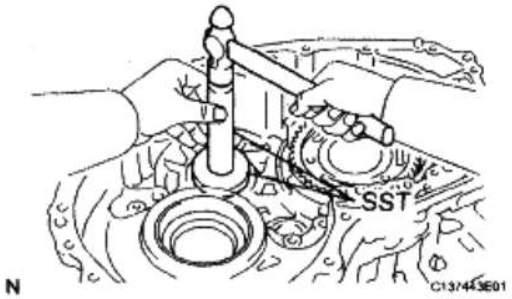


Fig. 410: Installing Counter Driven Gear Rear Tapered Roller Bearing Outer Race To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

19. **INSTALL PARKING LOCK PAWL**
    a. Install the parking lock pawl to the transaxle case with the parking lock pawl shaft.
    b. Install the parking lock pawl pin to the transaxle case.

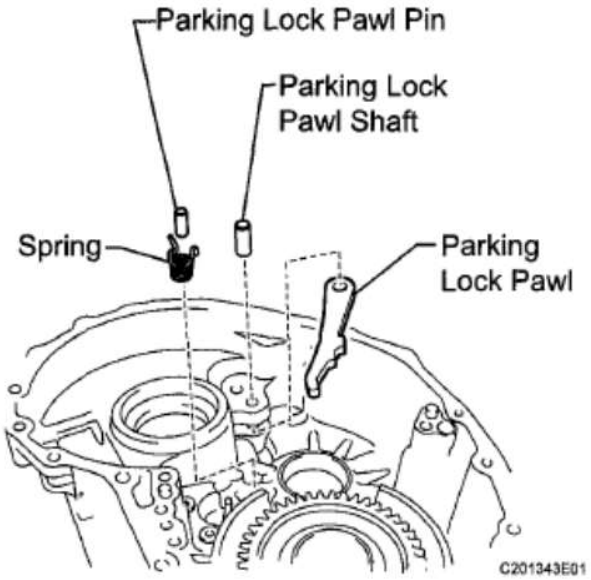


Fig. 411: Identifying Parking Lock Pawl And Parking Lock Pawl Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    c. Install the torsion spring to the parking lock pawl.

NOTE: Make sure that one end of the spring is secured in the hole of the transaxle case and the other end is positioned on the parking lock pawl as shown in the illustration.

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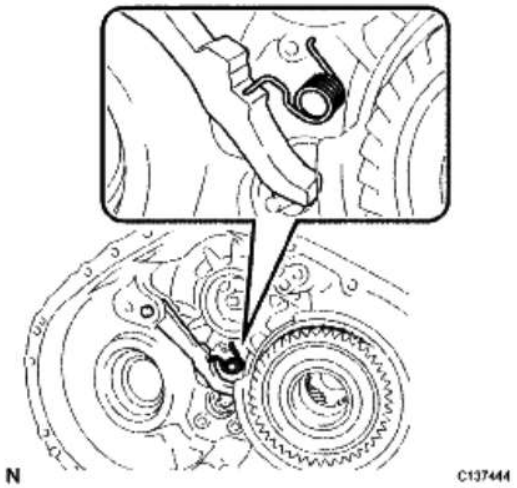


Fig. 412: Installing Torsion Spring To Parking Lock Pawl
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

20. **INSTALL PARKING LOCK SLEEVE**
    a. Install the parking lock sleeve to the transaxle case.

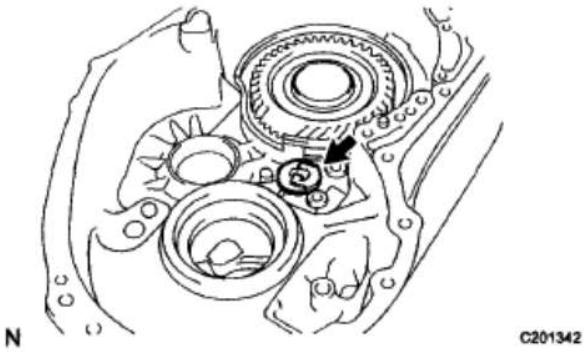


Fig. 413: Locating Parking Lock Sleeve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

21. **INSTALL PAWL STOPPER PLATE**
    a. Install the pawl stopper plate to the transaxle case with the 2 bolts.

Torque: 23 N*m (234 kgf*cm, 17 ft.*lbf)

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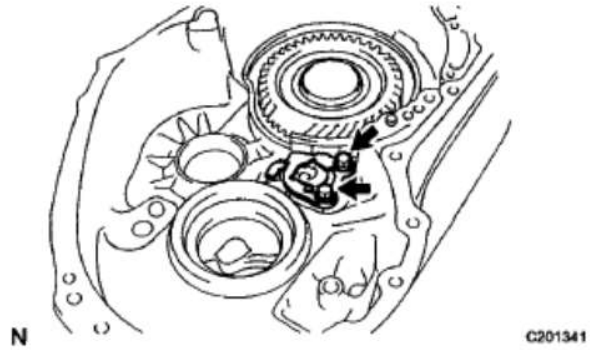


Fig. 414: Locating Pawl Stopper Plate And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

22. **INSTALL NO. 1 TRANSMISSION CASE PLATE**
    a. Install the No. 1 transmission case plate to the transaxle case with a new bolt.

Torque: 23 N*m (234 kgf*cm, 17 ft.*lbf)

HINT:

Tighten the bolt while part A of the No. 1 transmission case plate contacts the transaxle case as shown in the illustration.



Fig. 415: Locating Transaxle Case Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

23. **INSTALL PAWL SHAFT CLAMP**
    a. Install the pawl shaft clamp to the transaxle case with the bolt.

Torque: 23 N*m (234 kgf*cm, 17 ft.*lbf)

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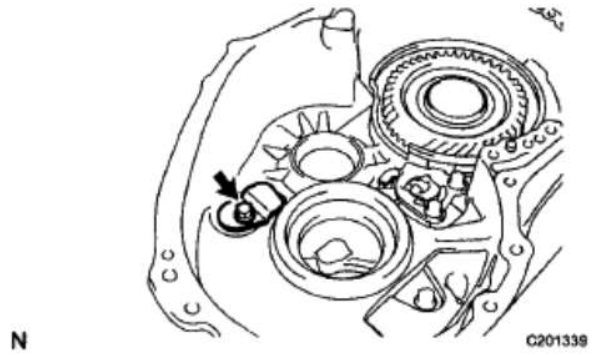


Fig. 416: Locating Pawl Shaft Clamp And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

24. **INSTALL COUNTER DRIVEN GEAR FRONT TAPERED ROLLER BEARING**
    a. Using SST and a press, install a new counter driven gear front tapered roller bearing to the counter driven gear sub-assembly.

SST 09950-60010 (09951-00490)

NOTE: Be sure to install the counter driven gear front tapered roller bearing so that there is no clearance between the bearing and the counter driven gear. If there is any clearance, the turning torque of the counter drive gear cannot be measured correctly.

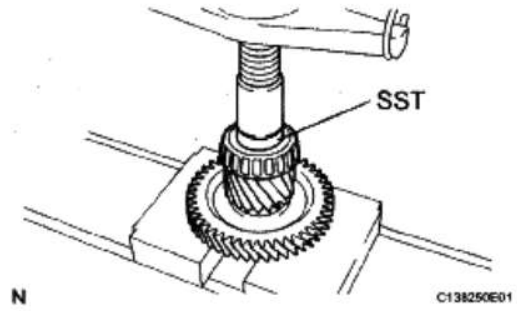


Fig. 417: Installing Counter Driven Gear Front Tapered Roller Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

25. **INSTALL COUNTER DRIVEN GEAR REAR TAPERED ROLLER BEARING**
    a. Using SST and a press, install a new counter driven gear rear tapered roller bearing to the counter driven gear sub-assembly.

SST 09950-60010 (09951-00400)

NOTE: Be sure to install the counter driven gear rear tapered roller bearing and the differential drive pinion so that there is no clearance between each of them and the counter driven gear.

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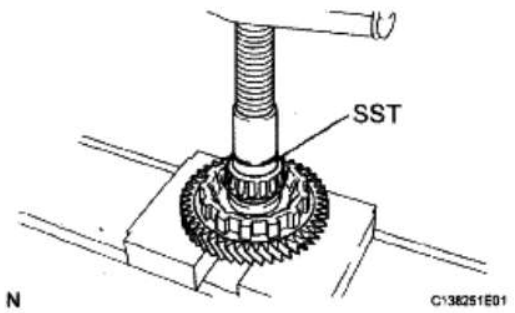


Fig. 418: Identifying Counter Driven Gear Rear Tapered Roller Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

26. **INSTALL COUNTER DRIVEN GEAR**
    a. Install the counter driven gear to the transaxle case.

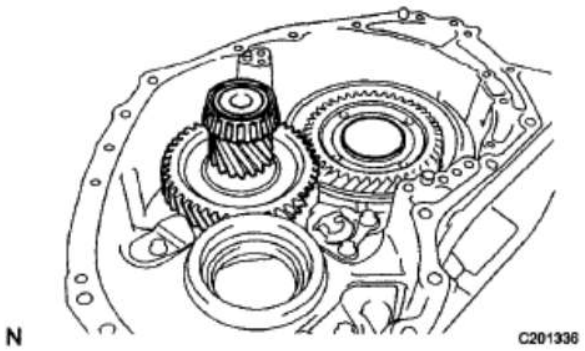


Fig. 419: Identifying Counter Driven Gear Of Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

27. **INSTALL COUNTER DRIVE GEAR NUT**
    a. Turn the manual valve lever shaft counterclockwise to set it to the P position as shown in the illustration.

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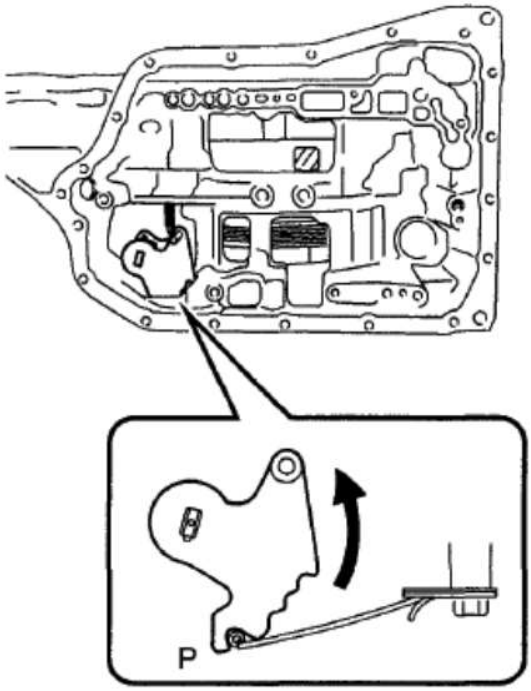


Fig. 420: Turning Manual Valve Lever Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using SST, install a new counter drive gear nut.

SST 09387-00130

Torque: 150 N*m (1530 kgf*cm, 110 ft.*lbf)

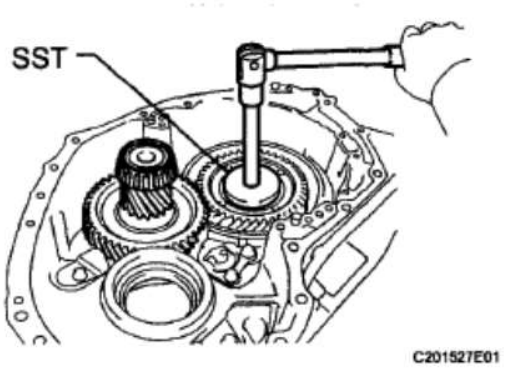


Fig. 421: Installing Counter Drive Gear Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Turn the manual valve lever shaft 2 notches clockwise to set it to the N position as shown in the

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illustration.

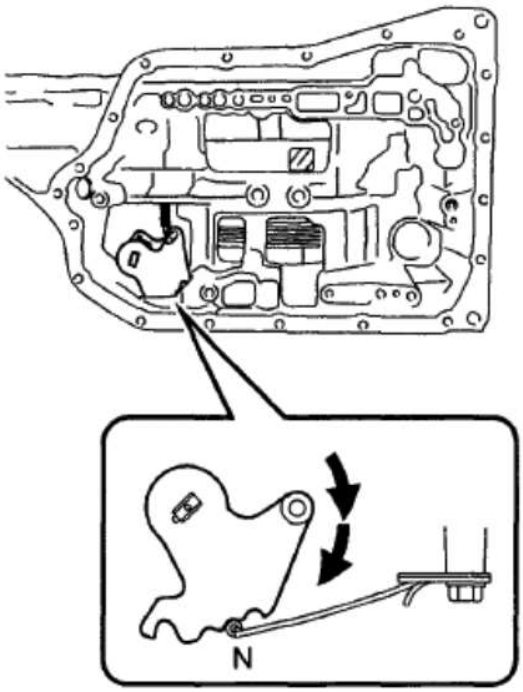


Fig. 422: Turning Manual Valve Lever Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Using SST and a torque wrench, measure the turning torque of the bearing while rotating SST at 60 rpm.

SST 09387-00130

Turning torque:

0.1 to 0.8 N*m (1 to 8 kgf*cm, 1 to 7 in.*lbf)

If the measured value is not within the specified range, gradually tighten the nut until the turning toque falls within the specified range.

Maximum torque:

180 N*m (1835 kgf*cm, 132 ft.*lbf)

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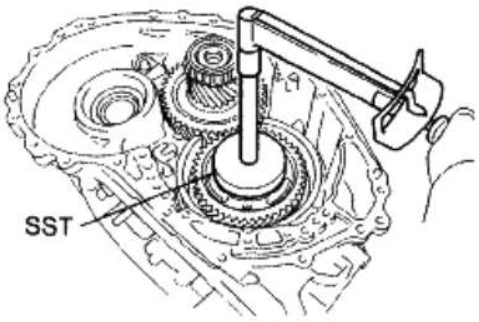


Fig. 423: Measuring Turning Torque Of Bearing Rotating SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Using SST and a hammer, stake the planetary gear assembly.

SST 09930-00010

28. **INSPECT DIFFERENTIAL SIDE GEAR BACKLASH** (See **INSPECTION**)

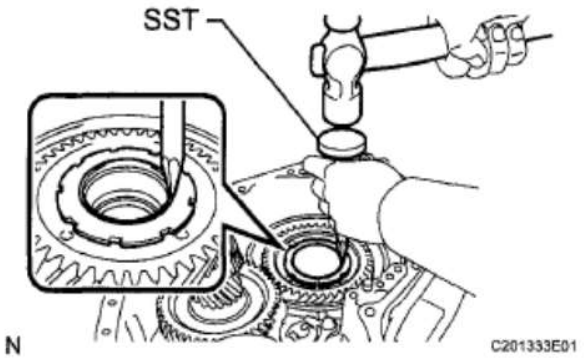


Fig. 424: Turning Manual Valve Lever Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

29. **INSTALL FRONT DIFFERENTIAL CASE**
    a. Install the front differential case to the transaxle case.

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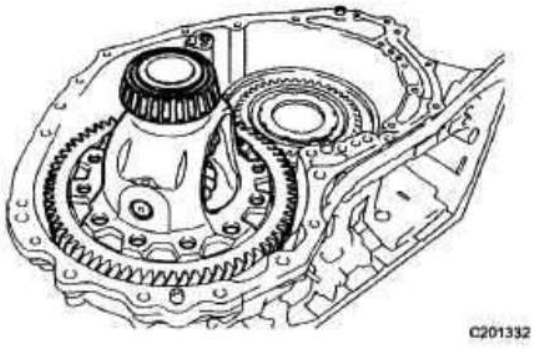


Fig. 425: Identifying Front Differential Case Of Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

30. **INSTALL NO. 1 BRAKE PISTON**
    a. Coat 2 new O-rings with ATF and install them to the No. 1 brake piston.

NOTE: Ensure that the O-rings are not twisted.



Fig. 426: Locating No. 1 Brake Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    b. Install the No. 1 brake piston to the oil pump assembly.

NOTE: Be careful not to damage the O-rings.

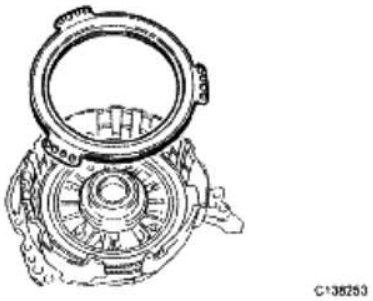


Fig. 427: Identifying No. 1 Brake Piston To Oil Pump Assembly

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Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

31. **INSTALL 2ND BRAKE PISTON RETURN SPRING SUB-ASSEMBLY**
    a. Install the 3 2nd brake piston return springs to the oil pump assembly.

NOTE: Make sure that the 3 2nd brake piston return springs are installed onto the protrusions on the oil pump assembly.



Fig. 428: Identifying 2nd Brake Piston Return Springs To Oil Pump Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

32. **INSTALL NO. 1 BRAKE DISC**
    a. Install the 3 brake discs, 3 brake plates, and brake flange to the oil pump assembly.

NOTE:
- **Make sure that the discs, plates, and flange are installed in the correct order.**
- **Be sure to install the flange in the correct direction.**

    b. Place SST on the flange and compress the flange with a press.

SST 09387-00070,09495-65040

NOTE: Stop the press when the brake piston return spring is flush with the snap ring groove. This prevents the brake piston return spring from being deformed.

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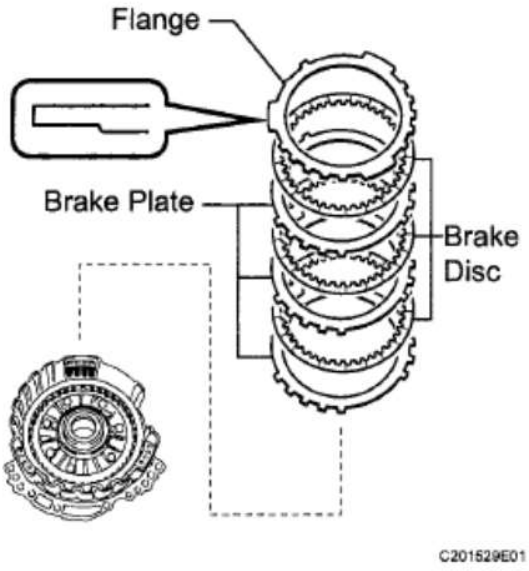


Fig. 429: Identifying No. 1 Brake Disc
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Using a screwdriver, install the snap ring to the oil pump assembly as shown in the illustration (#1).

NOTE:

- **Confirm that the snap ring is correctly located in the groove of the oil pump.**
- **Make sure to align the protruding part of the snap ring with the indented part (#1) of the front oil pump and gear body assembly shown in the illustration to install the snap ring.**

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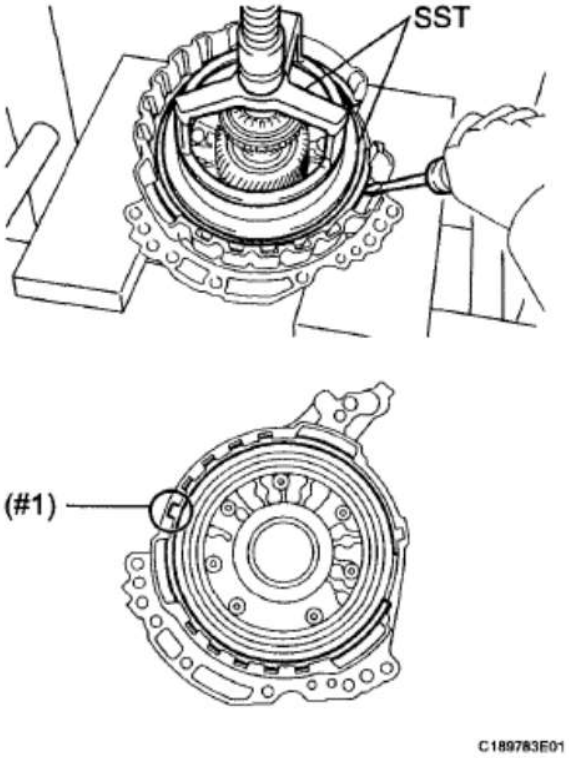


Fig. 430: Installing Snap Ring To Oil Pump
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Install the brake snap ring stopper to the oil pump assembly.

NOTE: Be sure to install the brake snap ring stopper in the correct direction.

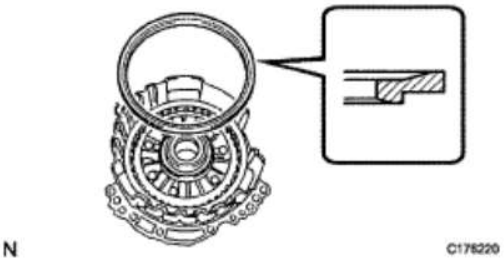


Fig. 431: Identifying Brake Snap Ring Stopper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Using a screwdriver, install the snap ring to the oil pump assembly as shown in the illustration (#2).

NOTE:

- **Confirm that the snap ring is correctly located in the groove of the oil pump.**
- **Make sure to align the protruding part of the snap ring with the**

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indented part (#2) of the front oil pump assembly shown in the illustration to install the snap ring.

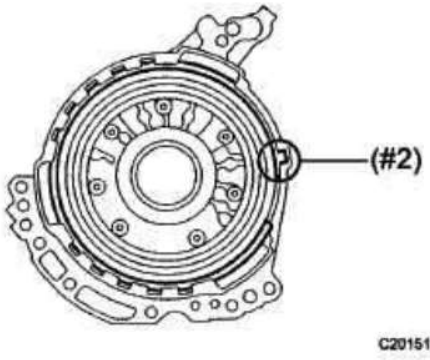


Fig. 432: Identifying Snap Ring To Oil Pump Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Check that the brake snap ring stopper can be turned by hand.

NOTE: If the brake snap ring stopper cannot be turned by hand, the brake snap ring stopper may have been installed upside down, or the snap ring may not have been completely located in the groove on the oil pump. Remove and reinstall the snap ring and the brake snap ring stopper.

33. **INSPECT CLEARANCE OF NO. 1 BRAKE** (See **REASSEMBLY**)

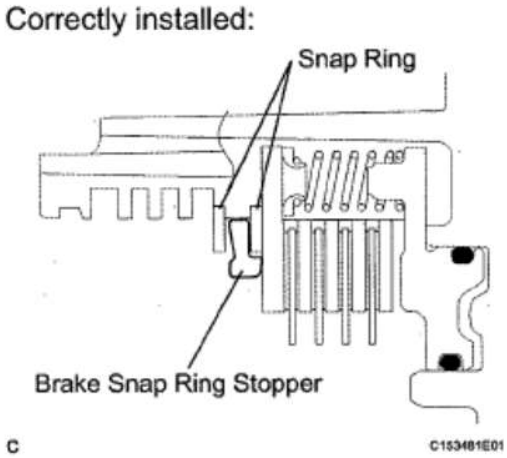


Fig. 433: Identifying Snap Ring And Brake Snap Ring Stopper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

34. **INSTALL UNDERDRIVE PLANETARY SUN GEAR**
    a. Coat the thrust needle roller bearing with ATF, and install it to the oil pump assembly.

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Bearing Diameter: mm (in.)

DIAMETER REFERENCE

-	Inside	Outside
Bearing	57.7 (2.27)	75.2 (2.96)

NOTE: Be sure to install the thrust needle roller bearing properly so that the temper colored side of the race will be visible.

b. Install the underdrive planetary sun gear to the oil pump assembly.

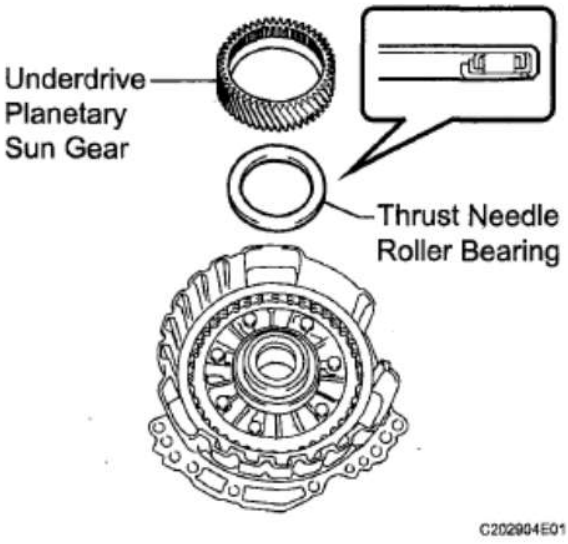


Fig. 434: Identifying Underdrive Planetary Sun Gear And Oil Pump Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

35. **INSTALL INPUT SHAFT SUB-ASSEMBLY**
    a. Coat 3 new input shaft oil seal rings with ATF and install them to the input shaft.

NOTE: Do not expand the gap of the oil seal ring too much.

    b. Coat the thrust needle roller bearing and thrust needle roller race with ATF, and install them on the oil pump assembly.

Bearing and Race Diameter: mm (in.)

BEARING AND RACE DIAMETER REFERENCE

-	Inside	Outside
Bearing	29.1 (1.15)	48.6 (1.91)
Race	30.7 (1.21)	48.3 (1.90)

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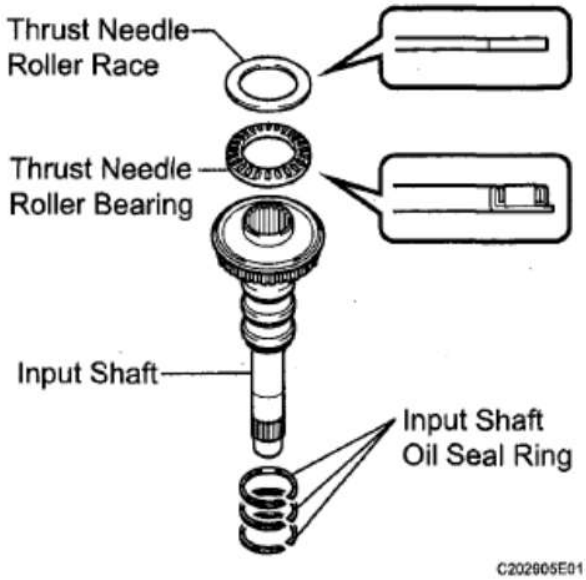


Fig. 435: Identifying Thrust Needle Roller Bearing And Thrust Needle Roller Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Be sure to install the thrust needle roller bearing in the correct direction.

c. Install the input shaft to the oil pump assembly.

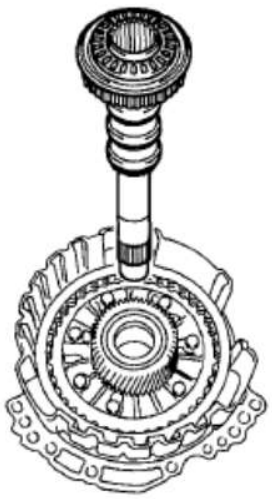


Fig. 436: Identifying Input Shaft To Oil Pump Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

36. **INSTALL PLANETARY SUN GEAR SUB-ASSEMBLY**
    a. Using a snap ring expander, install the snap ring to the underdrive planetary gear assembly.

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b. Using a snap ring expander, install the planetary sun gear sub-assembly to the underdrive planetary gear assembly with the snap ring expanded.

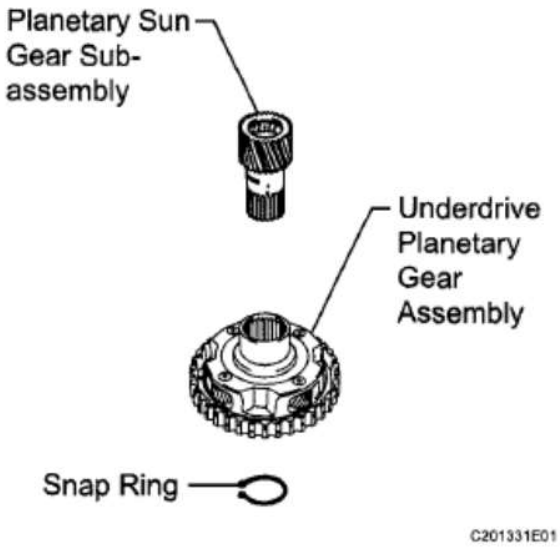


Fig. 437: Identifying Planetary Sun Gear Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

37. **INSTALL NO. 3 BRAKE HUB**

a. Coat the thrust needle roller bearing with ATF and install it on the underdrive planetary gear assembly.

Bearing and Race Diameter: mm (in.)

BEARING AND RACE DIAMETER REFERENCE

-	Inside	Outside
Bearing	62.6 (2.46)	82.9 (3.26)
Race	65.9 (2.59)	80.3 (3.16)

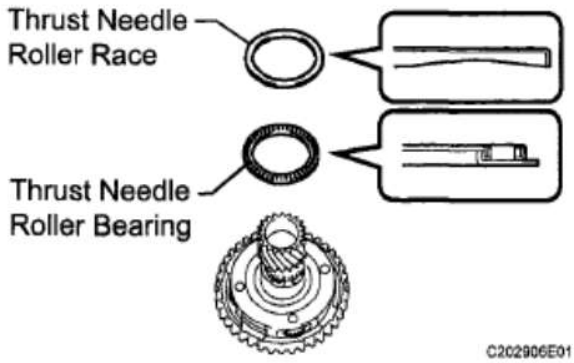


Fig. 438: Identifying Thrust Needle Roller Bearing And Thrust Needle Roller Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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NOTE: **Be sure to install the thrust needle roller bearing properly so that the temper colored side of the race will be visible.**

b. Coat the thrust needle roller race with MP grease and install it to the No. 3 brake hub.
c. Install the No. 3 brake hub to the underdrive planetary gear assembly.

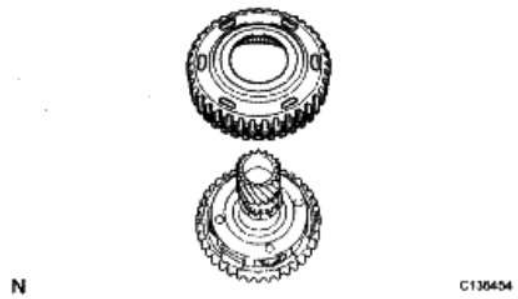


Fig. 439: Identifying 2nd Brake Piston Return Spring Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

38. **INSTALL UNDERDRIVE PLANETARY GEAR ASSEMBLY**
a. Install the underdrive planetary gear assembly to the oil pump assembly.



Fig. 440: Identifying Underdrive Planetary Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

39. **INSTALL NO. 3 BRAKE DISC**
a. Install the 2 brake flanges, 3 brake discs, and 2 brake plates to the oil pump assembly.

NOTE: **Make sure that the discs, plates, and flanges are installed in the correct order.**

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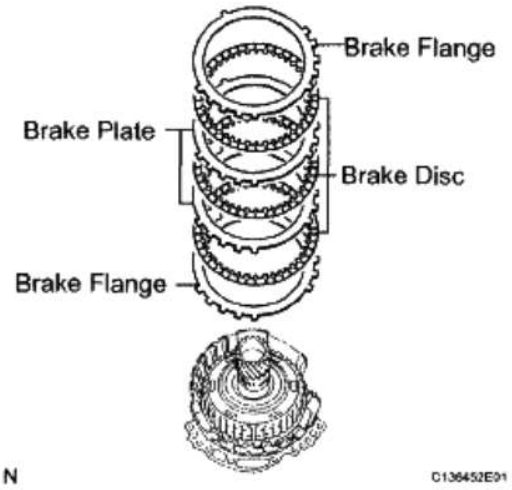


Fig. 441: Identifying No. 3 Brake Disc
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using a screwdriver, install the snap ring to the oil pump assembly.

NOTE:

- **Confirm that the snap ring is correctly located in the groove of the oil pump.**
- **Make sure that the snap ring ends are positioned as shown in the illustration (A).**

40. **INSPECT CLEARANCE OF NO. 3 BRAKE** (See **REASSEMBLY**)

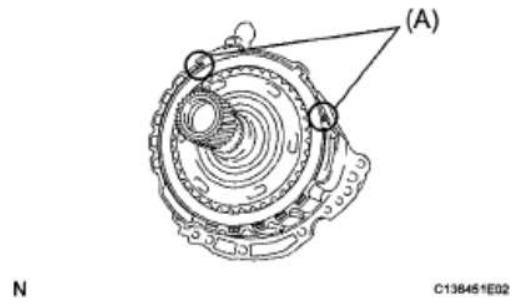


Fig. 442: Identifying Snap Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

41. **INSTALL OIL PUMP ASSEMBLY**
    a. Coat a new O-ring with ATF and install it to the transaxle case.
    b. Coat the thrust needle roller bearing and thrust needle roller race with ATF and install them on the underdrive planetary gear assembly.

Bearing and Race Diameter: mm (in.)

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BEARING AND RACE DIAMETER REFERENCE

-	Inside	Outside
Bearing	53.5 (2.11)	79 (3.11)
Race	59.4 (2.34)	76 (2.99)

NOTE: Be sure to install the thrust needle roller bearing properly so that the temper colored side of the race will be visible.

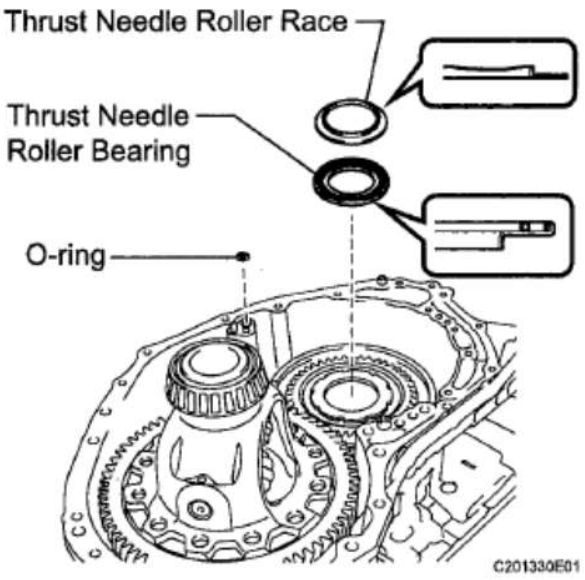


Fig. 443: Identifying Thrust Needle Roller Bearing And Thrust Needle Roller Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Coat a new O-ring with ATF and install it to the oil pump.

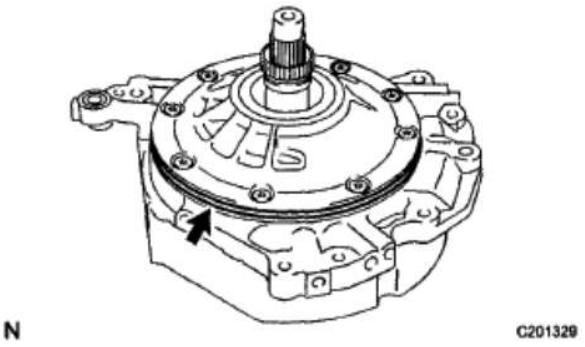


Fig. 444: Locating O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Install the oil pump assembly to the transaxle case with the 7 bolts.

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Torque: 23 N*m (234 kgf*cm, 17 ft.*lbf)

e. Coat a new O-ring with ATF and install it to the oil pump.

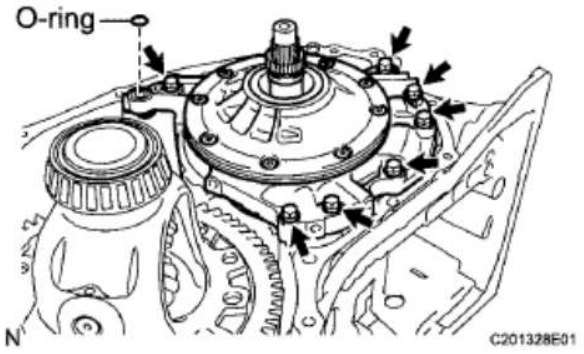


Fig. 445: Locating Oil Pump Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

42. **INSTALL TRANSAXLE HOUSING OIL SEPARATOR**
    a. Install the transaxle housing oil separator to the transaxle case with new 3 bolts.

Torque: 23 N*m (234 kgf*cm, 17 ft.*lbf)

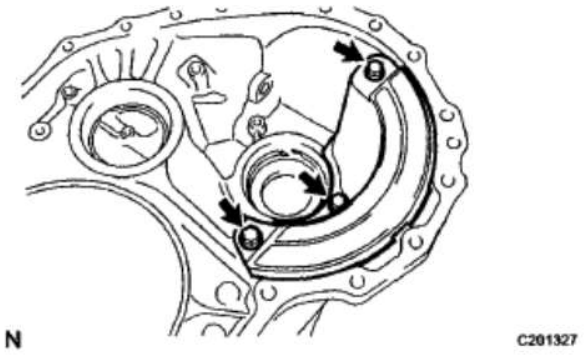


Fig. 446: Locating Transaxle Housing Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

43. **INSTALL DIFFERENTIAL GEAR LUBE APPLY TUBE**
    a. Install the differential gear lube apply tube to the transaxle housing.

NOTE: Insert the differential gear lube apply tube into the transaxle case until it makes contact with the stopper.

    b. Install the apply tube clamp to the differential gear lube apply tube with a new bolt.

Torque: 23 N*m (234 kgf*cm, 17 ft.*lbf)

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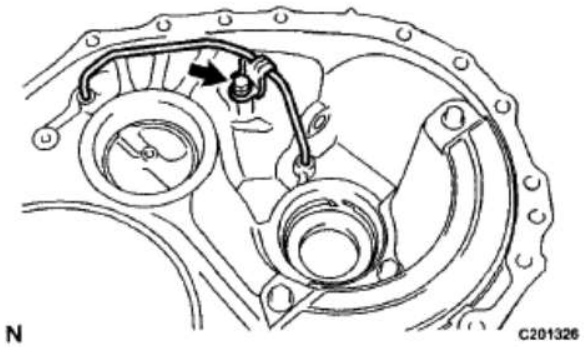


Fig. 447: Locating Front Differential Case Front Tapered Roller Bearing Outer Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: There should be clearance between the differential lube apply tube and apply tube clamp.

44. **INSTALL FRONT DIFFERENTIAL CASE FRONT TAPERED ROLLER BEARING OUTER RACE**
45. **INSTALL TRANSAXLE CASE OIL SEAL**
46. **INSTALL COUNTER DRIVEN GEAR FRONT TAPERED ROLLER BEARING OUTER RACE**
    a. Install the shim to the transaxle housing.
    b. Using SST, install a new counter driven gear front tapered roller bearing outer race to the transaxle housing.

SST 09950-60020 (09951 -00710), 09950-70010 (09951-07100)

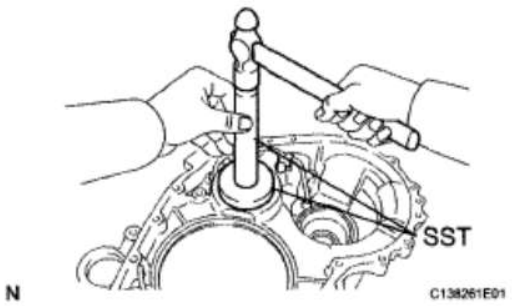


Fig. 448: Installing Counter Driven Gear Front Tapered Roller Bearing Outer Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE: Be sure to install the counter driven gear front tapered roller bearing outer race so that there is no clearance between the shim and the transaxle housing.

47. **INSTALL TRANSAXLE HOUSING**
    a. Remove packing material from the contact surfaces between the transaxle housing and case.

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NOTE: Make sure that there is no ATF on the contact surfaces.

b. Apply FIPG to the transaxle case.

FIPG:

Toyota Genuine Seal Packing 1281, Three Bond 1281 or equivalent

NOTE: Apply FIPG in a continuous line (width 1.2 mm (0.0472 in.)) along the sealing surface.

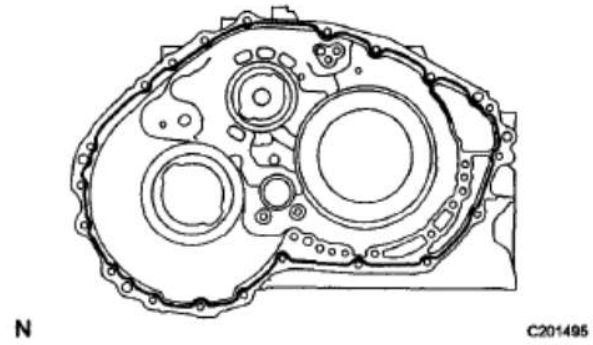


Fig. 449: Applying FIPG To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Install the transaxle housing to the transaxle case with the 17 bolts.

Torque: 31 N*m (316 kgf*cm, 23 ft.*lbf)

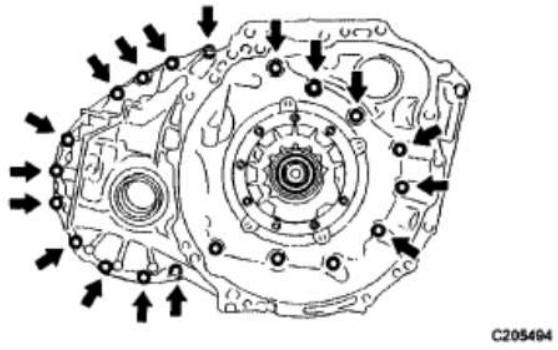


Fig. 450: Locating Transaxle Housing To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Install the transaxle housing to the transaxle case with 3 new bolts.

Torque: 23 N*m (234 kgf*cm, 17 ft.*lbf)

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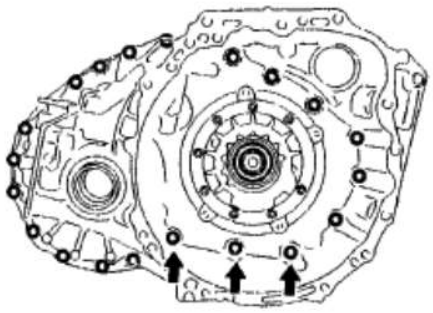


Fig. 451: Locating Transaxle Housing To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

48. **ADJUST COUNTER DRIVEN GEAR PRELOAD**
    a. Using SST and a torque wrench, measure the turning torque of the counter driven gear while rotating SST at 10 rpm.

SST 09564-33010

Turning torque:

Differential side bearing preload + 3.2 to 6.0 N*m (32 to 63 kgf*cm, 28 to 54 in.*lbf)

If the turning torque is not within the specified range, refer to the table below to select a shim of the counter driven gear front tapered roller bearing outer race so that the turning torque is within the specified range.

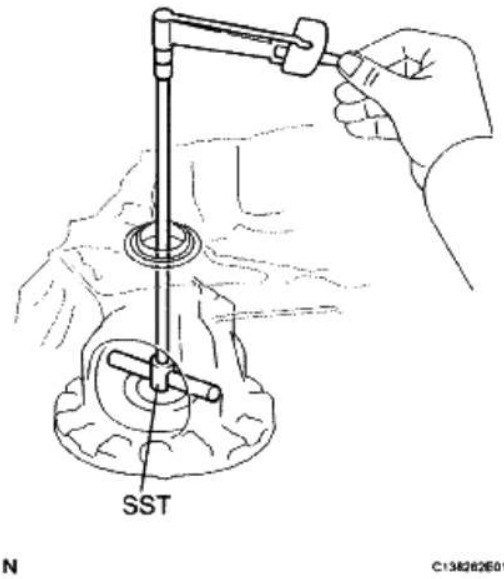


Fig. 452: Adjusting Counter Driven Gear Preload
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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Shim Thickness: mm (in.)

SHIM THICKNESS REFERENCE

Thickness	Thickness	Thickness	Thickness
2.000 (0.0787)	2.275 (0.0896)	2.525 (0.0994)	2.775 (0.109)
2.025 (0.0797)	2.300 (0.0906)	2.550 (0.100)	2.800 (0.110)
2.050 (0.0807)	2.325 (0.0915)	2.575 (0.101)	2.825 (0.111)
2.075 (0.0817)	2.350 (0.0925)	2.600 (0.102)	2.850 (0.112)
2.100 (0.0827)	2.375 (0.0935)	2.625 (0.103)	2.875 (0.113)
2.125 (0.0837)	2.400 (0.0945)	2.650 (0.104)	2.900 (0.114)
2.150 (0.0846)	2.425 (0.0955)	2.675 (0.105)	2.925 (0.115)
2.175 (0.0856)	2.450 (0.0965)	2.700 (0.106)	2.950 (0.116)
2.200 (0.0866)	2.475 (0.0974)	2.725 (0.107)	2.975 (0.117)
2.225 (0.0876)	2.500 (0.0984)	2.750 (0.108)	3.000 (0.118)
2.250 (0.0886)	-	-	-

49. **INSPECT CLEARANCE OF NO. 1 CLUTCH DISC** (See **REASSEMBLY**)
50. **INSTALL REAR PLANETARY SUN GEAR THRUST NEEDLE ROLLER BEARING**
    a. Coat a new O-ring with ATF and install it to the direct multiple disc clutch assembly.
    b. Coat a new intermediate shaft oil seal with ATF and install it to the intermediate shaft.

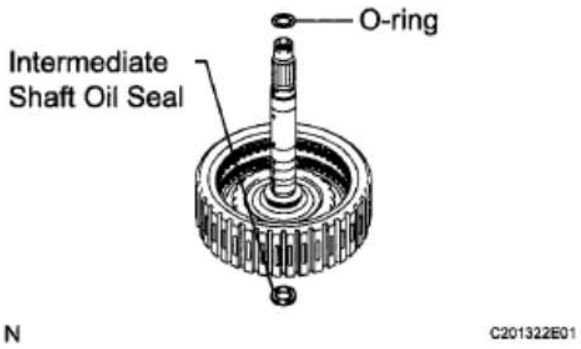


Fig. 453: Identifying O-Ring And Intermediate Shaft Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    c. Coat the rear planetary sun gear thrust needle roller bearing and thrust needle roller race with ATF, and install them to the direct multiple disc clutch assembly.

Bearing and Race Diameter: mm (in.)

BEARING AND RACE DIAMETER REFERENCE

-	Inside	Outside
Bearing	28 (1.10)	47.1 (1.85)
Race	26.1 (1.03)	44 (1.73)

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NOTE: **Install the rear planetary sun gear thrust needle roller bearing properly so that the temper colored side of the race will be visible.**

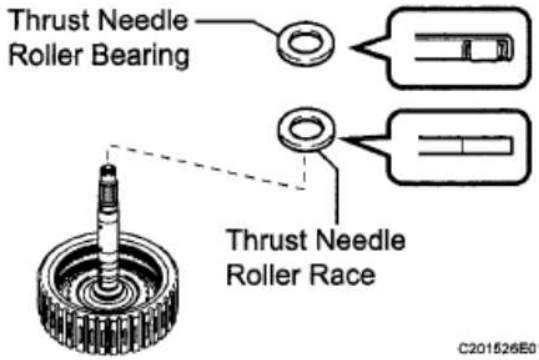


Fig. 454: Identifying Thrust Needle Roller Race And Direct Multiple Disc Clutch Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Install the rear planetary sun gear assembly to the direct multiple disc clutch assembly.

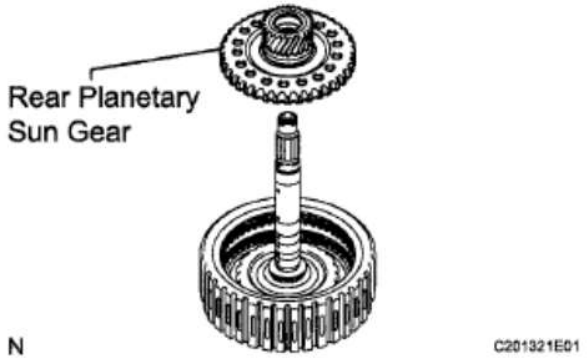


Fig. 455: Identifying Rear Planetary Sun Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Using a snap ring expander, install the snap ring to the direct multiple disc clutch assembly.

51. **INSPECT CLEARANCE OF NO. 2 CLUTCH DISC** (See **REASSEMBLY**)



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Fig. 456: Identifying Snap Ring To Direct Multiple Disc Clutch Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

52. **INSTALL REAR NO. 2 PLANETARY SUN GEAR THRUST NEEDLE ROLLER BEARING**
    a. Coat the rear No. 2 planetary sun gear thrust needle roller bearing with ATF and install it on the transaxle case.

    Bearing Diameter: mm (in.)

    BEARING DIAMETER REFERENCE

-	Inside	Outside
Bearing	61.2 (2.41)	79 (3.11)

    b. Install the direct multiple disc clutch assembly to the transaxle case.
    c. Clean the contact surfaces of the transaxle case and rear transaxle cover sub-assembly.

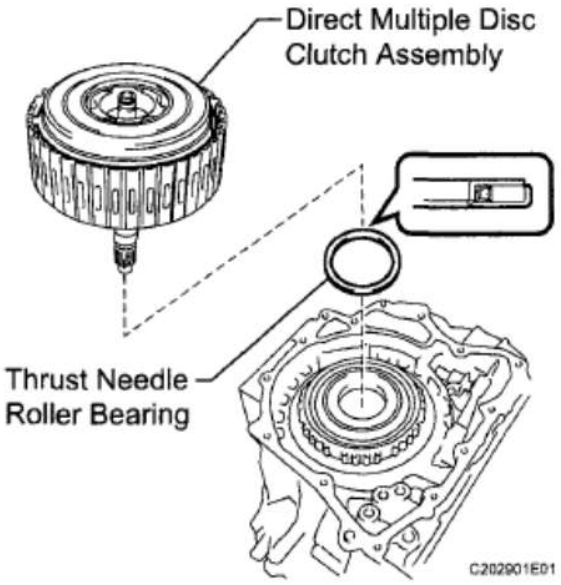


Fig. 457: Identifying Direct Multiple Disc Clutch Assembly And Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    d. As shown in the illustration, place a straightedge on the multiple direct clutch drum and measure the distance between the transaxle case and the straightedge using a vernier caliper (Dimension A).

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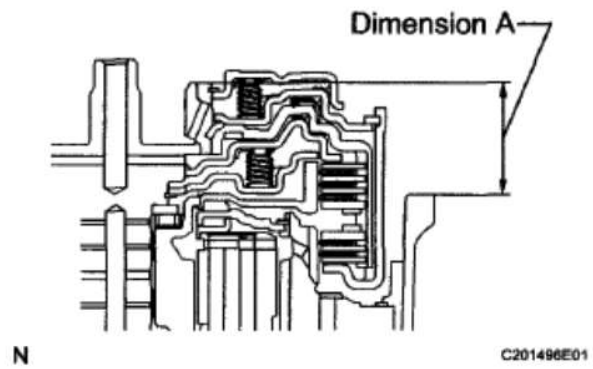


Fig. 458: Measuring Distance Between Transaxle Case And Straightedge
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Using a vernier caliper and a straightedge, measure the distance shown in the illustration. (Dimension B)
f. Calculate the end play value using the following formula:

End play = Dimension B - Dimension A - Bearing Thickness

End play:

0.022 to 1.099 mm (0.000866 to 0.0433 in.)

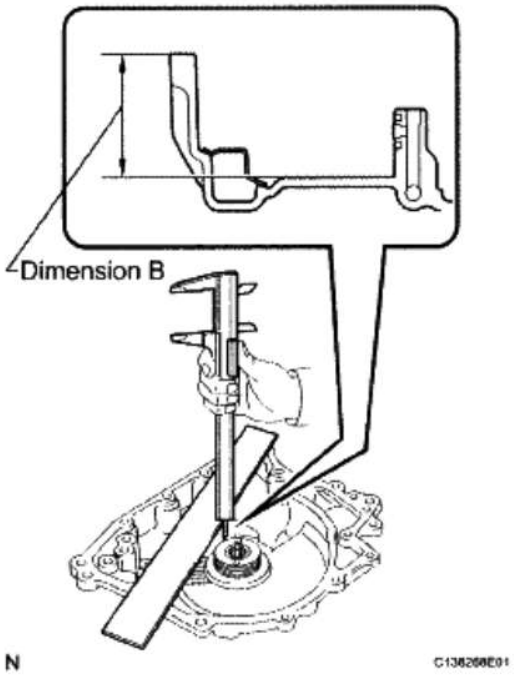


Fig. 459: Measuring Bearing End Play
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

a. Using SST and a hammer, install the needle roller bearing into the rear transaxle cover sub-assembly.

SST 09950-60010 (09951 -00220), 09950-70010 (09951-07100)

Installation depth:

21.5 to 21.9 mm (0.846 to 0862 in.)

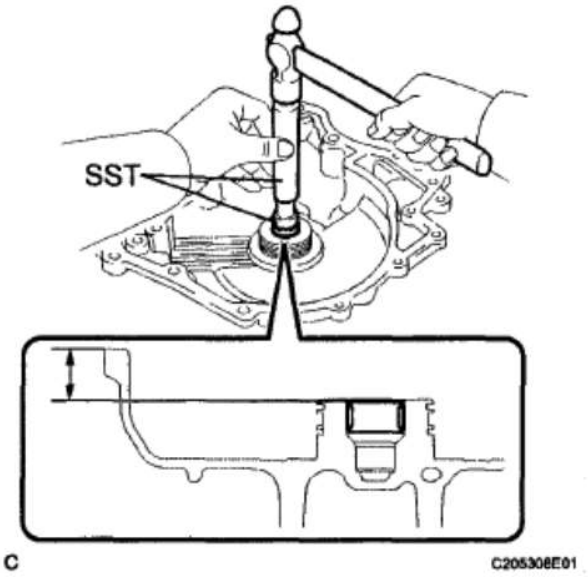


Fig. 460: Installing Needle Roller Bearing Into Rear Transaxle Cover Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using a "TORX" wrench (T30), install the rear transaxle cover plate to the rear transaxle cover sub-assembly with new 2 "TORX" screws.

Torque: 7.5 N*m (76 kgf*cm, 66 in.*lbf)

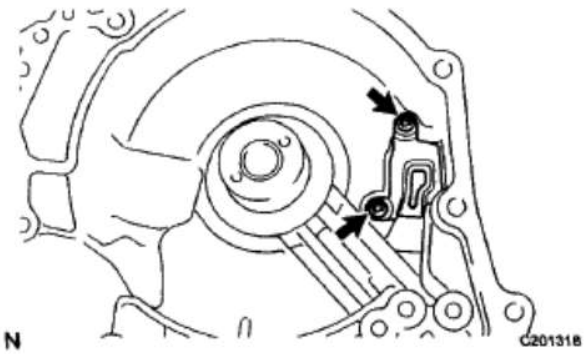


Fig. 461: Locating Rear Transaxle Cover Sub-Assembly And Screw

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Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Coat the thrust needle roller bearing and thrust needle roller race with ATF and install them on the transaxle case.

Bearing and Race Diameter: mm (in.)

BEARING AND RACE DIAMETER REFERENCE

-	Inside	Outside
Bearing	48.9 (1.93)	72.0 (2.84)
Race	52.2 (2.06)	70.4 (2.77)

d. Coat 2 new oil seal rings with ATF and install them to the rear transaxle cover sub-assembly.

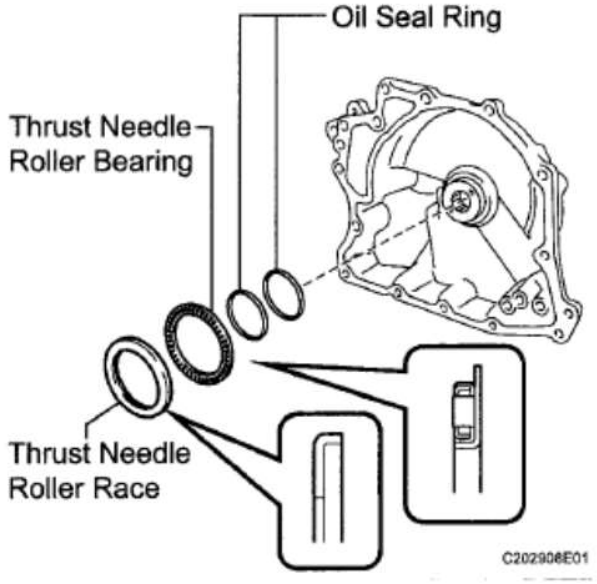


Fig. 462: Identifying Oil Seal Ring, Thrust Needle Roller Bearing And Thrust Needle Roller Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Coat 3 new O-rings with ATF and install them to the transaxle case.

NOTE: Ensure that the O-rings are not twisted.

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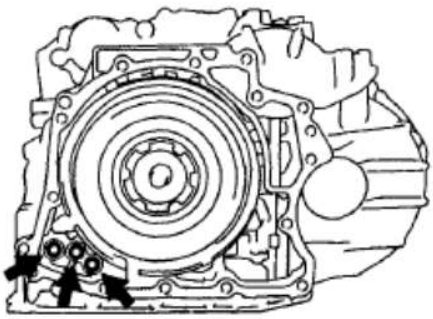


Fig. 463: Locating Transaxle Case Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Remove packing material from the contact surfaces between the rear transaxle cover sub-assembly and transaxle case.

NOTE: Make sure that there is no ATF on the contact surfaces.
FIPG:
Toyota Genuine Seal Packing 1281, Three Bond 1281 or equivalent.

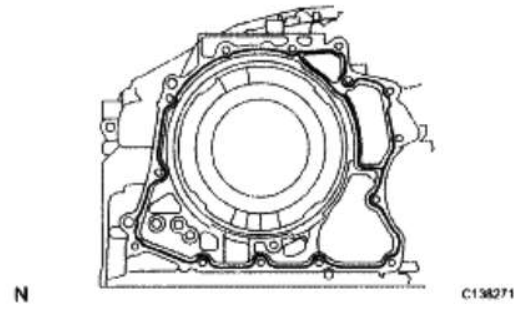


Fig. 464: Identifying Rear Transaxle Cover Sub-Assembly And Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Install the rear transaxle cover sub-assembly to the transaxle case with the 12 bolts.

Torque: 23 N*m (234 kgf*cm, 17 ft.*lbf)

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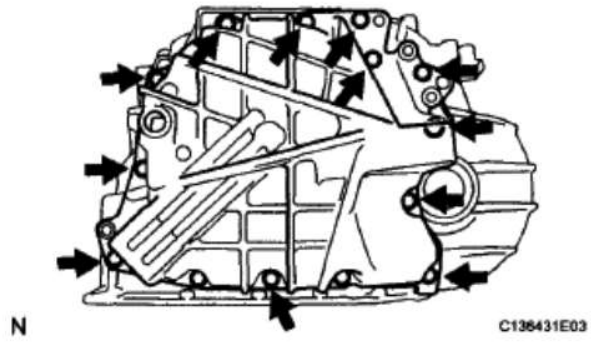


Fig. 465: Locating Rear Transaxle Cover Sub-Assembly And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

h. Install the rear transaxle cover sub-assembly to the transaxle case with new 2 bolts.

Torque: 17 N*m (173 kgf*cm, 12 ft.*lbf)

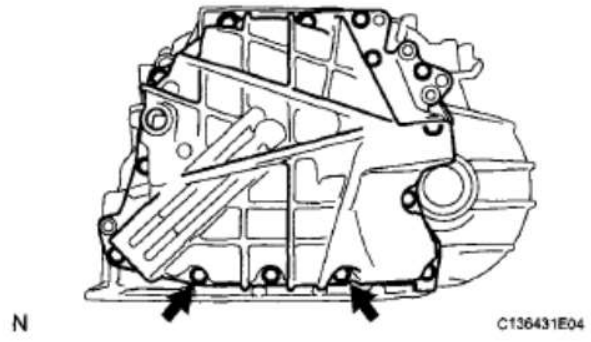
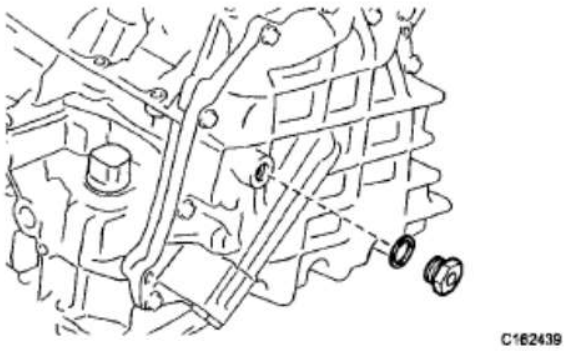


Fig. 466: Locating Transaxle Case And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

i. Install a new gasket to the refill plug.
j. Install the refill plug to the rear transaxle cover sub-assembly.

Torque: 49 N*m (500 kgf*cm, 36 ft.*lbf)



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Fig. 467: Identifying Refill Plug And Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

k. Coat 3 new O-rings with ATF and install them to the 3 No. 1 automatic transaxle case plugs.
l. Install the 3 No. 1 automatic transaxle case plugs to the rear transaxle cover sub-assembly.

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

54. **INSPECT INPUT SHAFT END PLAY** (See **INSPECTION**)

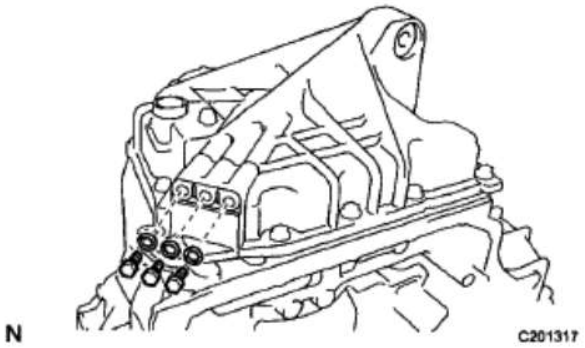


Fig. 468: Locating No. 1 Automatic Transaxle Case Plugs
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

55. **INSTALL TRANSAXLE CASE GASKET**
a. Coat 2 new gaskets with ATF and install them to the transaxle case.

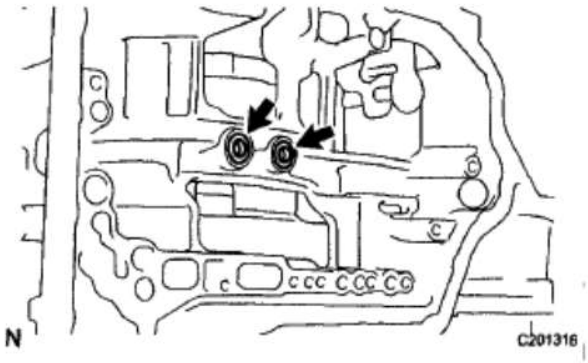


Fig. 469: Locating Transaxle Case Gaskets
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

56. **INSTALL TRANSMISSION VALVE BODY ASSEMBLY**
a. Install the valve body assembly to the transaxle case with the 11 bolts.

Torque: Bolt A, B, C

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

Bolt D

9.6 N*m (98 kgf*cm, 85 in.*lbf)

BOLT SPECIFICATION

-	Bolt Length
Bolt A	25 mm (0.984 in.)
Bolt B	30 mm (1.18 in.)
Bolt C, D	35 mm (1.38 in.)

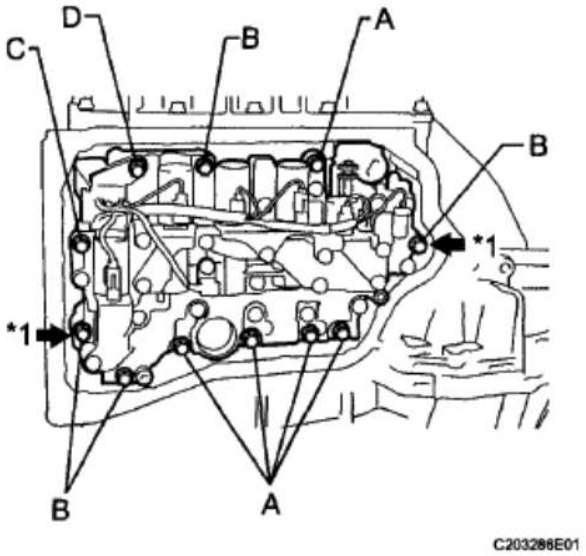


Fig. 470: Identifying Valve Body Assembly To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- **When installing the transmission valve body assembly, be careful not to allow the transmission revolution sensor and transaxle case to interfere with each other.**
- **Be sure to insert the pin of the manual valve lever into the groove on the end of the manual valve.**
- **First, temporarily tighten the bolts marked *1 in the illustration because they are positioning bolts.**

57. **INSTALL VALVE BODY OIL STRAINER ASSEMBLY**
    a. Coat a new O-ring with ATF and install it to the oil strainer assembly.

NOTE: Ensure that the O-ring is not twisted or pinched.

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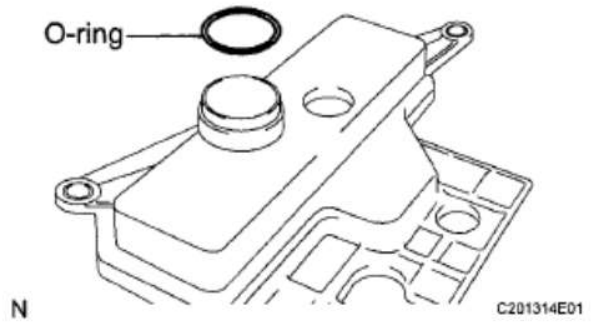


Fig. 471: Identifying O-ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Install the oil strainer assembly to the valve body assembly with 2 new bolts.

Torque: 9.6 N*m (98 kgf*cm, 85 in.*lbf)

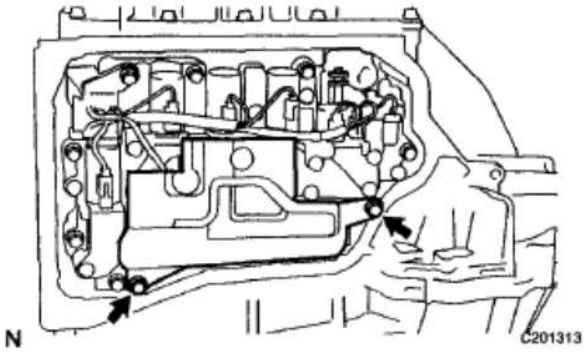


Fig. 472: Locating Oil Strainer Assembly Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

a. Install the 2 magnets in the automatic transaxle oil pan sub-assembly.

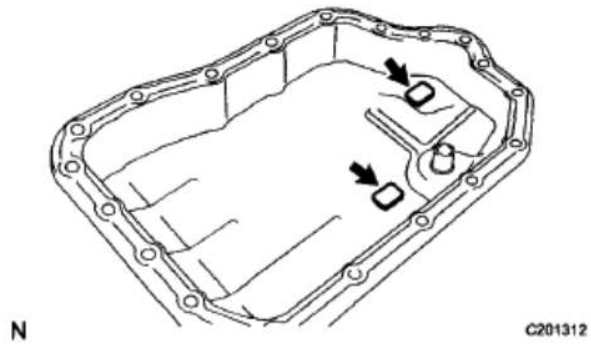


Fig. 473: Locating Transmission Oil Cleaner Magnets
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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b. Install the automatic transaxle oil pan sub-assembly and a new gasket to the transaxle case with the 17 bolts.

Torque: 7.5 N*m (76 kgf*cm, 66 in.*lbf)

NOTE: Completely remove any oil or grease from the contact surfaces of the transaxle case and oil pan sub-assembly with the gasket before installation.

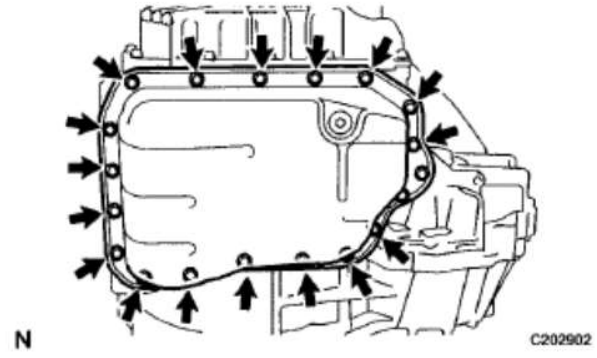


Fig. 474: Locating Oil Pan Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Apply adhesive to 2 new bolts.

Sealant:

Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

d. Install the automatic transaxle oil pan sub-assembly with the 2 bolts.

Torque: 7.0 N*m (71 kgf*cm, 62 in.*lbf)

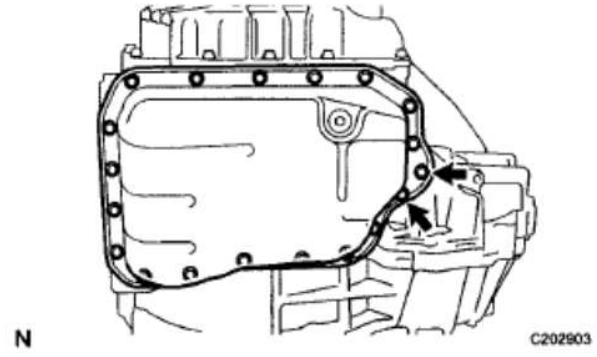


Fig. 475: Locating Automatic Transaxle Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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NOTE: **In order to ensure proper sealing of the transmission pan bolts, apply adhesive to the bolts and install them within 10 minutes of adhesive application.**

e. Using a hexagon wrench (6 mm), install the No. 1 oil filler tube to the automatic transaxle assembly.

Torque: 0.8 N*m (8 kgf*cm, 7 in.*lbf)

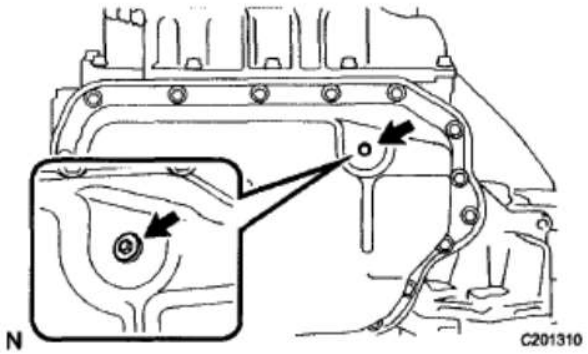


Fig. 476: Locating Oil Filler Tube
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Using a hexagon wrench (6 mm), install the overflow plug and a new gasket to the oil pan sub-assembly.

Torque: 40 N*m (408 kgf*cm, 30 ft.*lbf)

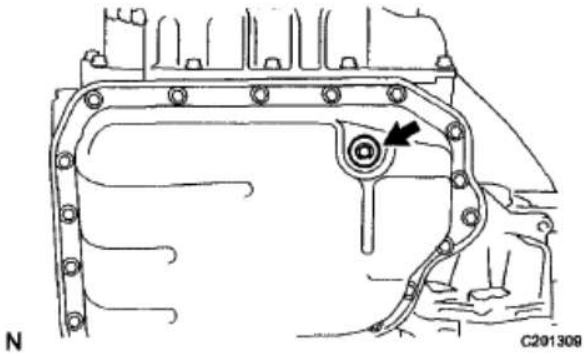


Fig. 477: Locating Automatic Transaxle Oil Pan Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

59. **INSTALL NO. 1 TRANSAXLE CASE PLUG**
    a. Install 3 new gaskets to the 3 hexagon bolts.
    b. Apply adhesive to the 3 hexagon bolts.

Sealant:

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Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

NOTE: In order to ensure proper sealing of the hexagon bolts, apply adhesive to the bolts and install them within 10 minutes of adhesive application.

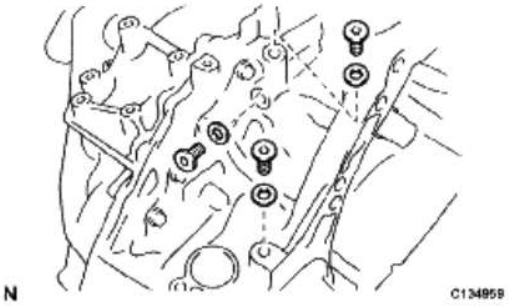


Fig. 478: Identifying Transaxle Housing Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Using a hexagon wrench (6 mm), install the 3 hexagon bolts to the transaxle housing with the gaskets.

Torque: 17 N*m (173 kgf*cm, 12 ft.*lbf)

d. Coat 3 new O-rings with ATF and install them to the 3 No. 1 transaxle case plugs.
e. Install the 3 No. 1 transaxle case plugs to the transaxle case.

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

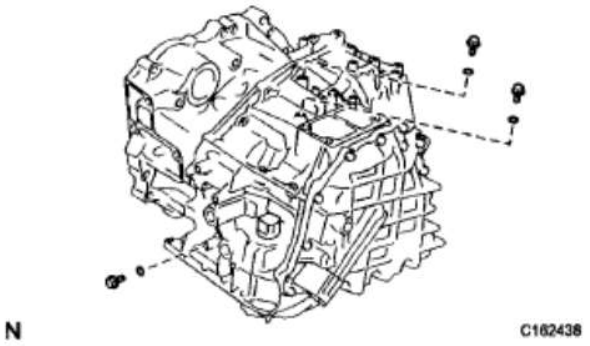


Fig. 479: Identifying No. 1 Transaxle Case Plugs
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

60. **INSTALL OIL COOLER TUBE UNION (INLET OIL COOLER UNION)**
    a. Coat a new O-ring with ATF and install it to the oil cooler tube union (inlet oil cooler union).
    b. Install the oil cooler tube union (inlet oil cooler union) to the transaxle case.

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Torque: 27 N*m (275 kgf*cm, 20 ft.*lbf)

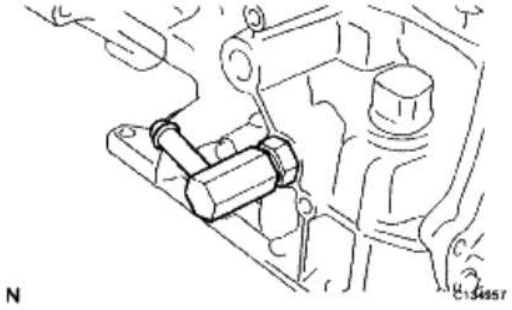


Fig. 480: Identifying Oil Cooler Tube Union (Inlet Oil Cooler Union)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

61. **INSTALL OIL COOLER TUBE UNION (OUTLET OIL COOLER UNION)**
    a. Coat a new O-ring with ATF and install it to the oil cooler tube union (outlet oil cooler union).
    b. Install the oil cooler tube union (outlet oil cooler union) to the transaxle case as shown in the illustration.

Torque: 27 N*m (275 kgf*cm, 20 ft.*lbf)

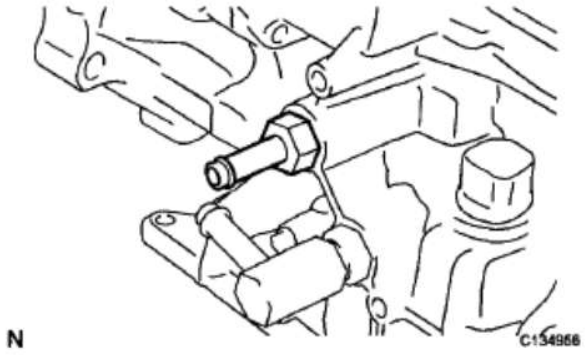


Fig. 481: Identifying Oil Cooler Tube Union (Outlet Oil Cooler Union)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

62. **INSTALL PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
    a. Align the protrusions of the park/neutral position switch.

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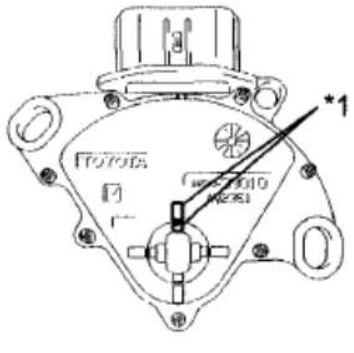


Fig. 482: Aligning Protrusions Of Park/Neutral Position Switch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Install the park/neutral position switch to the control shaft with the 2 bolts.

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

NOTE:

- **Before installing the park/neutral position switch, remove any dirt or rust on the control shaft. Be sure to install the switch straight along the shaft while being careful not to deform the plate spring that supports the shaft. If the plate spring is deformed, the park/ neutral position switch cannot be reinstalled correctly.**
- **After installing the park/neutral position switch, confirm that the 2 protrusions on the switch are aligned.**

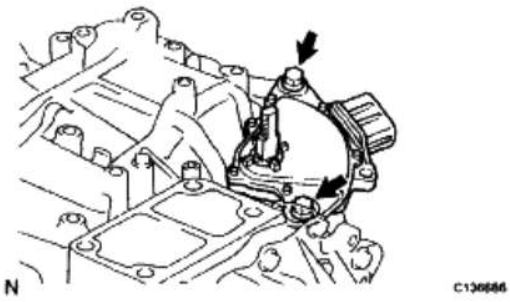


Fig. 483: Locating Park/Neutral Position Switch Assembly Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Install the control shaft lever to the control shaft with the washer and nut.

Torque: 13 N*m (133 kgf*cm, 10 ft.*lbf)

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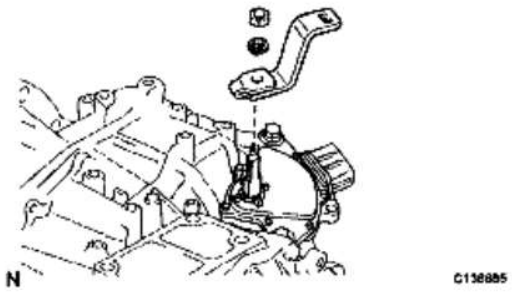


Fig. 484: Identifying Control Shaft Lever
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

63. **INSTALL BREATHER PLUG HOSE**
    a. Coat a new O-ring with ATF and install it to the No. 2 breather plug (ATM).
    b. Install the No. 2 breather plug (ATM) to the breather plug hose.
    c. Install the breather plug cap to the breather plug hose.

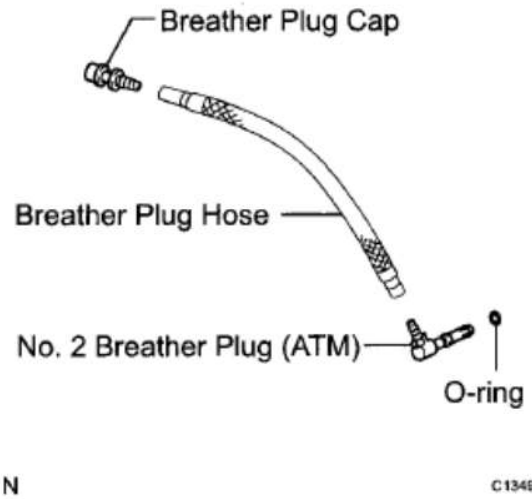
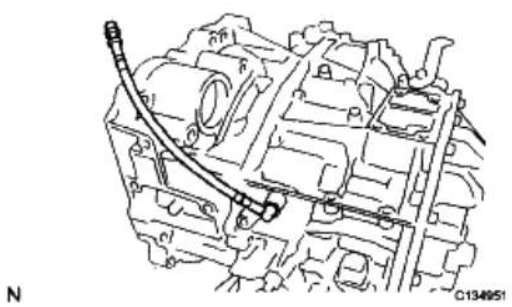


Fig. 485: Identifying No. 2 Breather Plug And Breather Plug Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

    d. Install the breather plug hose to the transaxle case.



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Fig. 486: Identifying Breather Plug Hose
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OIL PUMP

COMPONENTS

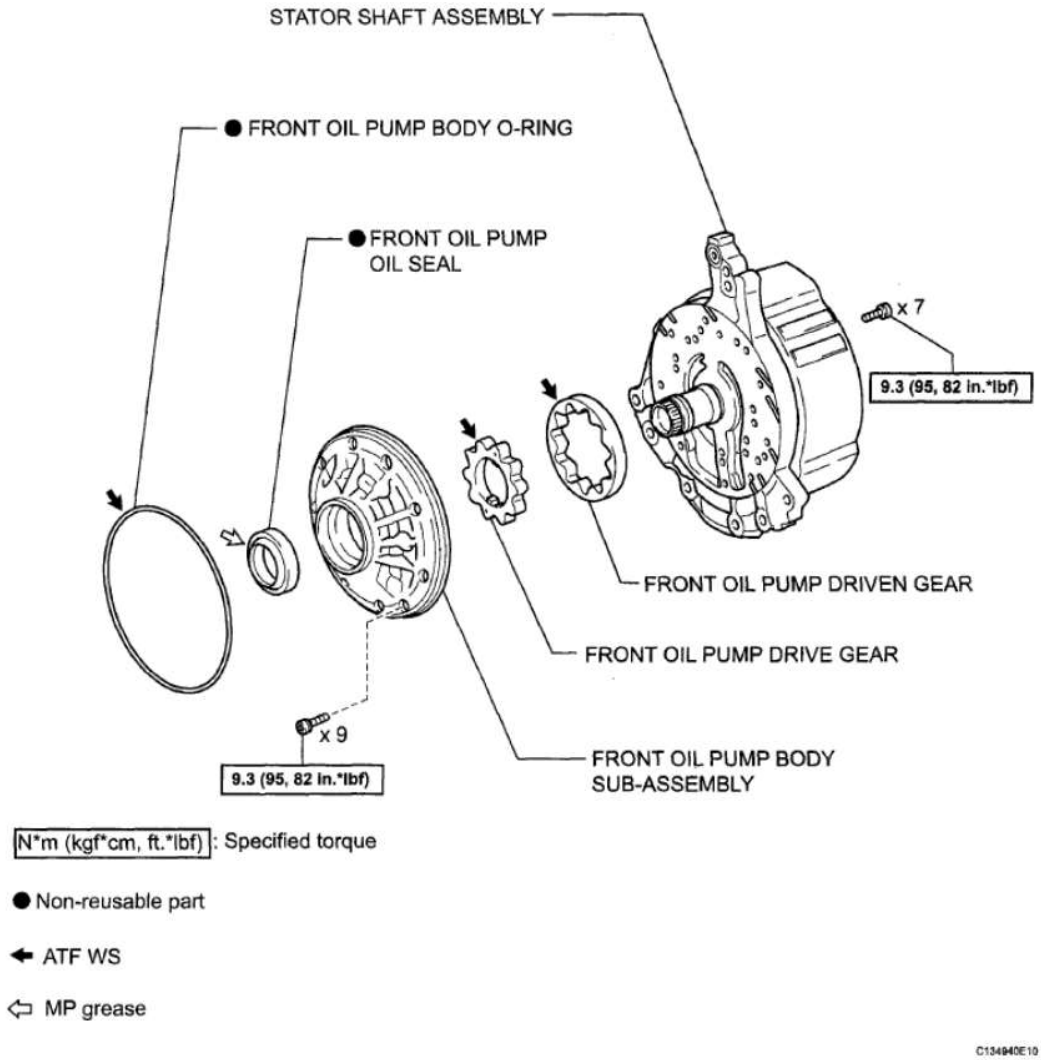


Fig. 487: Identifying Oil Pump Components With Torque Specification
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

1. **INSPECT FRONT OIL PUMP AND GEAR BODY SUB-ASSEMBLY** (See **INSPECTION**)
2. **REMOVE STATOR SHAFT ASSEMBLY**
   a. Using a "TORX" wrench (T30), remove the 16 bolts and stator shaft assembly from the oil pump body.

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NOTE: Keep the gears in the order of installation.

3. **INSPECT CLEARANCE OF FRONT OIL PUMP AND GEAR BODY SUB-ASSEMBLY** (See **INSPECTION**)

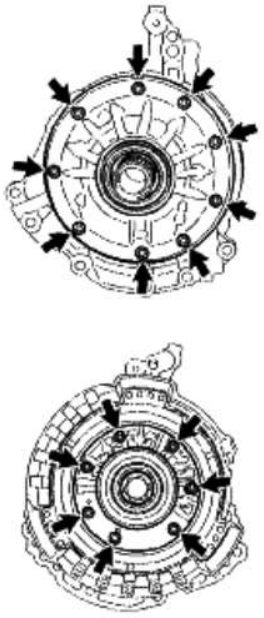


Fig. 488: Locating Stator Shaft Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **REMOVE FRONT OIL PUMP BODY O-RING**
   a. Remove the O-ring from the front oil pump body.



Fig. 489: Identifying Front Oil Pump Body And O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **REMOVE FRONT OIL PUMP DRIVE GEAR**
   a. Remove the front oil pump drive gear from the front oil pump body.

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Fig. 490: Identifying Front Oil Pump Drive Gear And Front Oil Pump Body
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **REMOVE FRONT OIL PUMP DRIVEN GEAR**
   a. Remove the front oil pump driven gear from the front oil pump body.



Fig. 491: Identifying Front Oil Pump Driven Gear And Front Oil Pump Body
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. **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

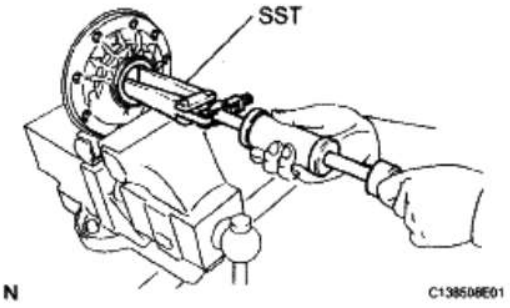


Fig. 492: Removing Oil Seal To Oil Pump Body
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

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1. **INSPECT FRONT OIL PUMP AND GEAR BODY SUB-ASSEMBLY**
   a. Turn the drive gear with 2 screwdrivers and make sure that it rotates smoothly.

NOTE: Be careful not to damage the oil seal lip.

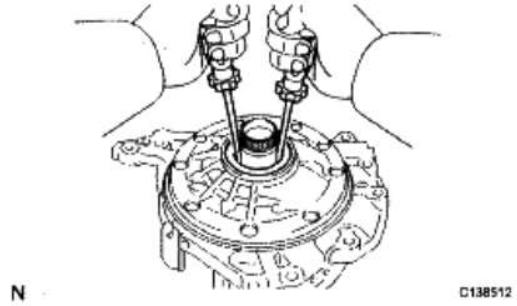


Fig. 493: Turning Drive Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSPECT CLEARANCE OF FRONT OIL PUMP AND GEAR BODY SUB-ASSEMBLY**
   a. Push the driven gear to one side of the body.
   b. Using a feeler gauge, measure the clearance.

Standard clearance:

0.08 to 0.15 mm (0.00315 to 0.00591 in.)

Maximum clearance:

0.15 mm (0.00591 in.)

If the clearance is greater than the maximum, replace the front oil pump body sub-assembly.

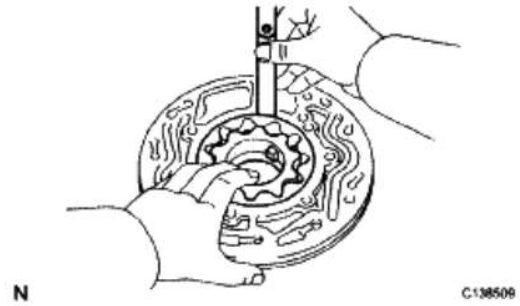


Fig. 494: Measuring Clearance Of Front Oil Pump And Gear Body Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   c. Using a straight edge and feeler gauge, measure the side clearance of both gears.

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Standard side clearance:

0.025 to 0.04 mm (0.000984 to 0.00157 in.)

Maximum side clearance:

0.04 mm (0.00157 in.)

Drive Gear Thickness

DRIVE GEAR THICKNESS REFERENCE

Mark	Thickness
1	11.547 to 11.555 mm (0.4546 to 0.4549 in.)
2	11.555 to 11.563 mm (0.4549 to 0.4552 in.)
3	11.564 to 11.571 mm (0.4553 to 0.4556 in.)
4	11.572 to 11.579 mm (0.4556 to 0.4559 in.)
5	11.580 to 11.587 mm (0.4559 to 0.4562 in.)

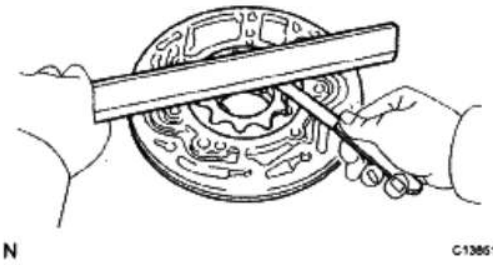


Fig. 495: Measuring Side Clearance Of Both Gears
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Driven Gear Thickness

DRIVEN GEAR THICKNESS REFERENCE

Mark	Thickness
1	11.547 to 11.555 mm (0.4546 to 0.4549 in.)
2	11.555 to 11.563 mm (0.4549 to 0.4552 in.)
3	11.564 to 11.571 mm (0.4553 to 0.4556 in.)
4	11.572 to 11.579 mm (0.4556 to 0.4559 in.)
5	11.580 to 11.587 mm (0.4559 to 0.4562 in.)

3. **INSPECT FRONT OIL PUMP AND GEAR BODY SUB-ASSEMBLY**
   a. Using a dial indicator, measure the inside diameter of the oil pump body bushing.

Standard inside diameter:

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43.122 to 43.138 mm (1.6977 to 1.6983 in.)

Maximum inside diameter:

43.188 mm (1.7003 in.)

If the inside diameter is greater than the maximum, replace the oil pump body sub-assembly.

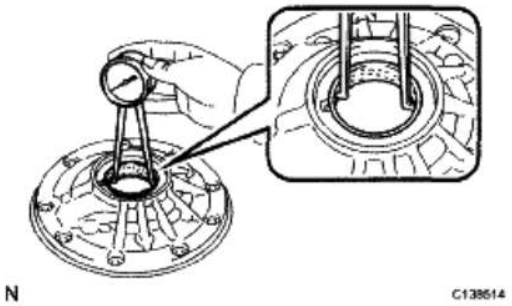


Fig. 496: Measuring Inside Diameter Of Oil Pump Body Bushing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **INSPECT STATOR SHAFT ASSEMBLY**
   a. Using a dial indicator, measure the inside diameter of the oil pump body bushing.

Standard inside diameter:

22.500 to 22.526 mm (0.8858 to 0.8868 in.)

Maximum inside diameter:

22.570 mm (0.8886 in.)

If the inside diameter is greater than the maximum, replace the oil pump body sub-assembly.

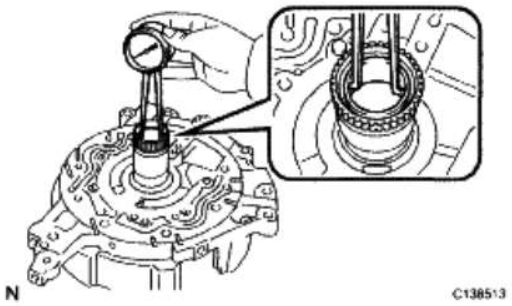


Fig. 497: Measuring Inside Diameter Of Oil Pump Body Bushing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REASSEMBLY

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1. **INSTALL FRONT OIL PUMP OIL SEAL**
   a. Using SST and a hammer, install a new oil seal to the oil pump body.

      SST 09350-32014 (09351 -32140)

      NOTE: The seal end should be level with the outer edge of the oil pump.

   b. Coat the lip of the oil seal with MP grease.

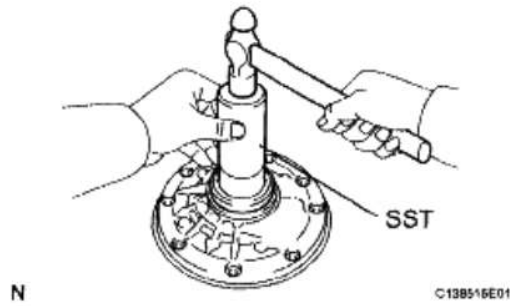


Fig. 498: Installing Oil Seal To Oil Pump Body
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSTALL FRONT OIL PUMP BODY O-RING**
   a. Coat a new O-ring with ATF and install it to the oil pump body.

NOTE: Ensure that the O-ring is not twisted.



Fig. 499: Identifying ATF AND O-ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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 up.

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Fig. 500: Identifying Front Oil Pump Driven Gear And Front Oil Pump Body
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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 up.



Fig. 501: Locating Front Oil Pump Drive Gear With ATF
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **INSTALL STATOR SHAFT ASSEMBLY**
   a. Align each knock pin of the stator shaft with the holes in the oil pump body and install the stator shaft to the oil pump body with the 16 bolts.
   b. Using a "TORX" socket (T30), install the 16 bolts.

Torque: 9.3 N*m (95 kgf*cm, 82 in.*lbf)

BOLT SPECIFICATION

-	Bolt length
Bolt A	14 mm (0.551 in)
Bolt B	26 mm (1.02 in)

6. **INSPECT FRONT OIL PUMP AND GEAR BODY SUB-ASSEMBLY** (See **INSPECTION**)

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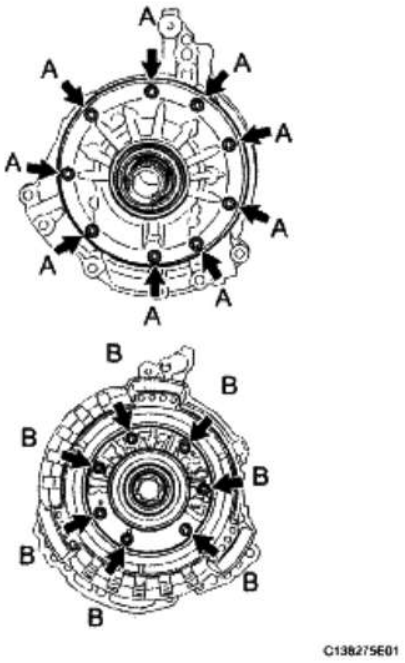


Fig. 502: Locating Oil Pump Body Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SHIFT SOLENOID VALVE

COMPONENTS

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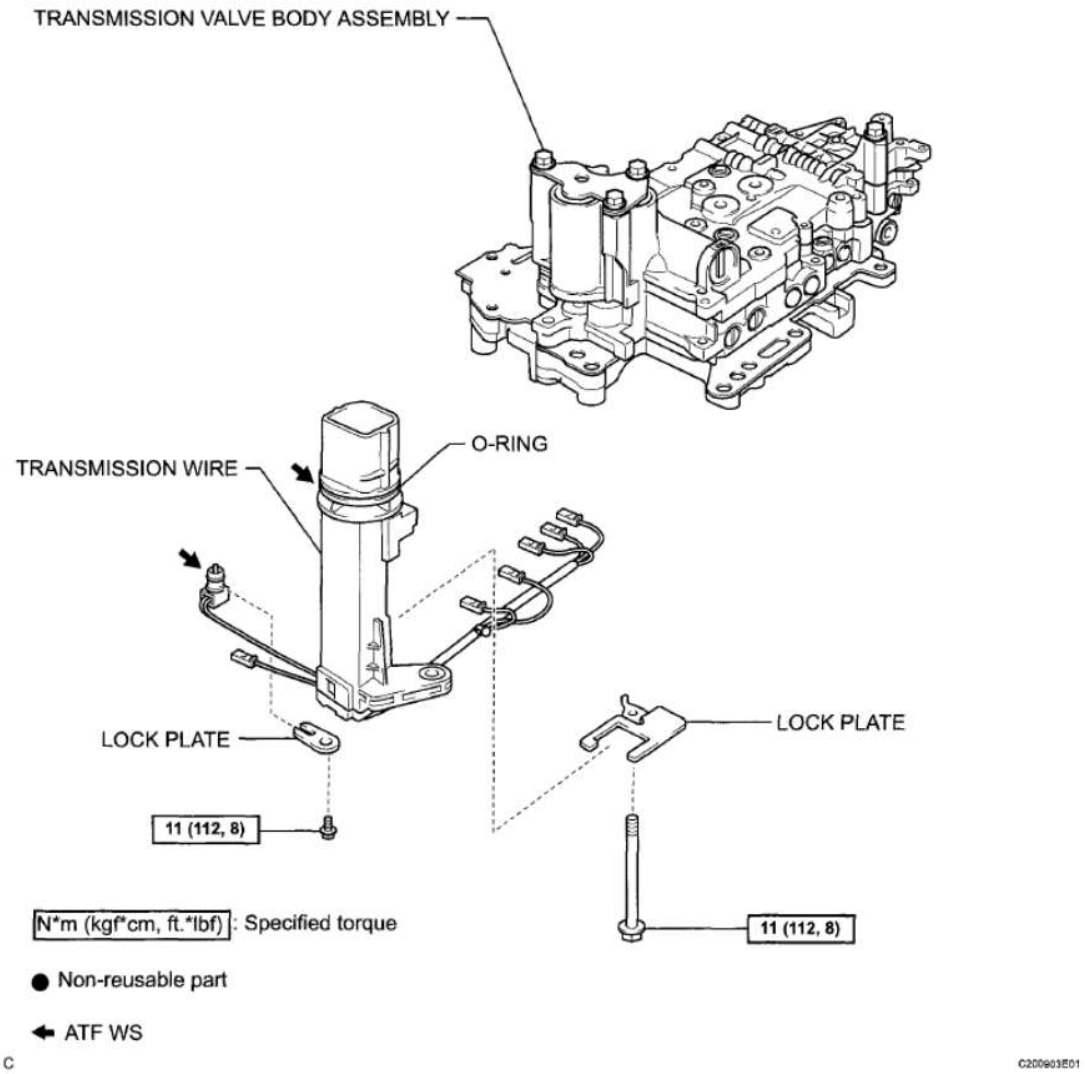


Fig. 503: Identifying Shift Solenoid Valve Components With Torque Specification (1 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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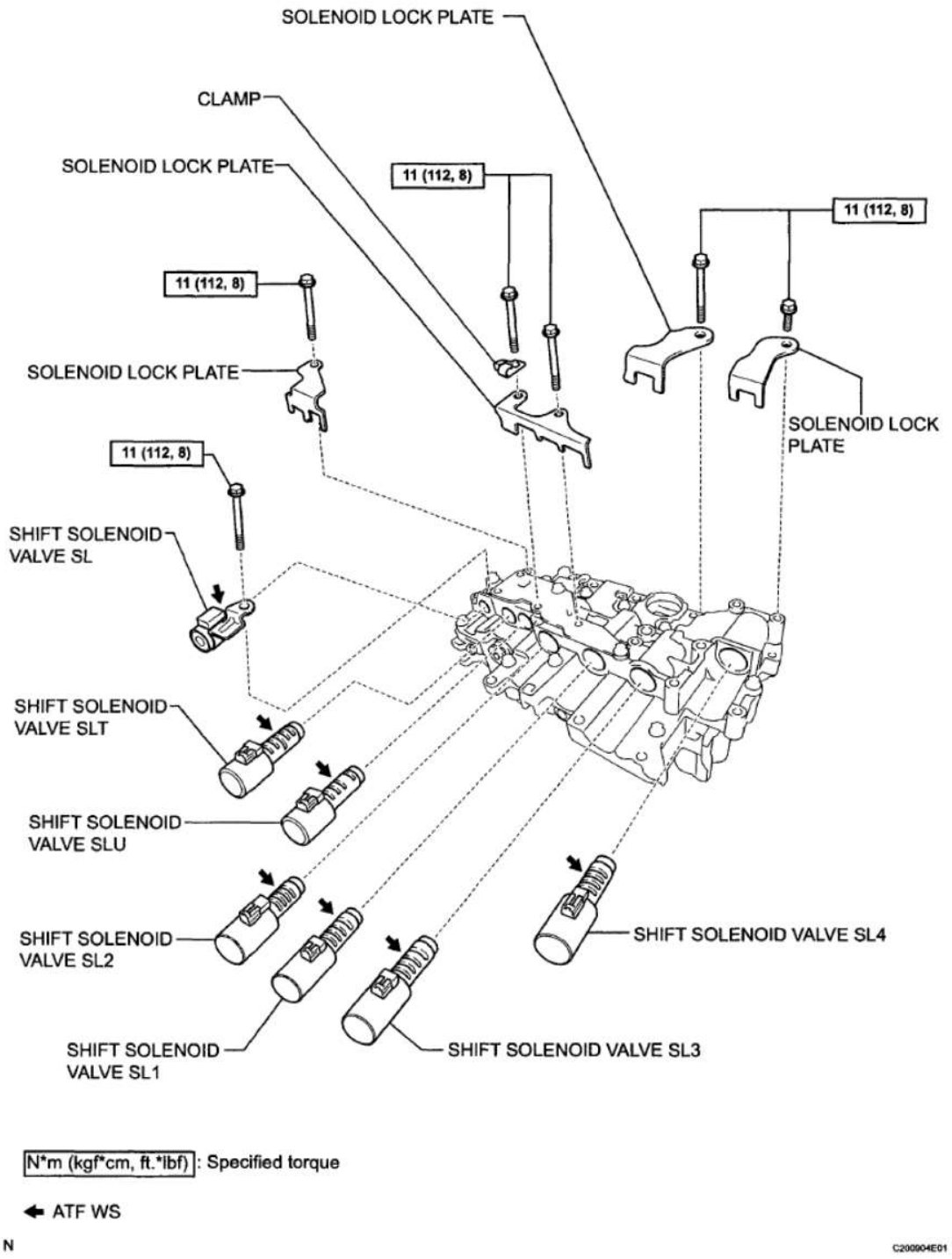


Fig. 504: Identifying Shift Solenoid Valve Components With Torque Specification (2 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **REMOVE AUTOMATIC TRANSAXLE ASSEMBLY** See **REMOVAL**.

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2. **REMOVE AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY** (See **REMOVAL**)
3. **REMOVE VALVE BODY OIL STRAINER ASSEMBLY** (See **REMOVAL**)
4. **REMOVE TRANSMISSION VALVE BODY ASSEMBLY** (See **INSTALLATION**)

DISASSEMBLY

1. **REMOVE SPEED SENSOR** (See **REMOVAL**)
2. **REMOVE TRANSMISSION WIRE** (See **REMOVAL**)
3. **REMOVE SHIFT SOLENOID VALVE SL**
   a. Remove the bolt and shift solenoid valve SL from the valve body assembly.

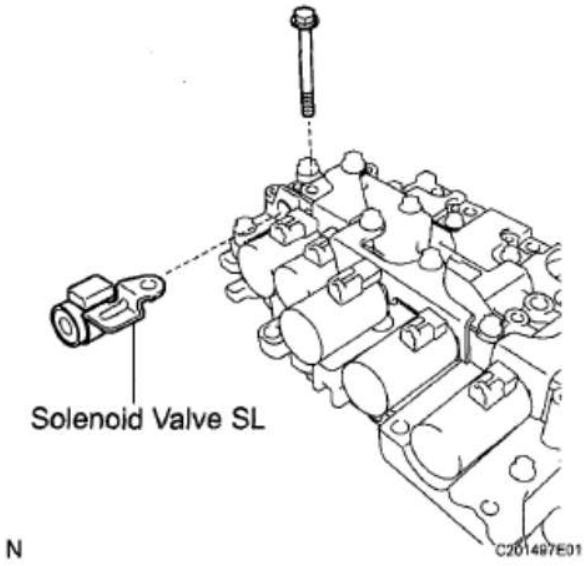


Fig. 505: Identifying Solenoid Valve SL
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **REMOVE SHIFT SOLENOID VALVE SL2**
   a. Remove the 2 bolts, clamp, lock plate and shift solenoid valve SL2 from the valve body assembly.
5. **REMOVE SHIFT SOLENOID VALVE SL1**
   a. Remove the shift solenoid valve SL1 from the valve body assembly.

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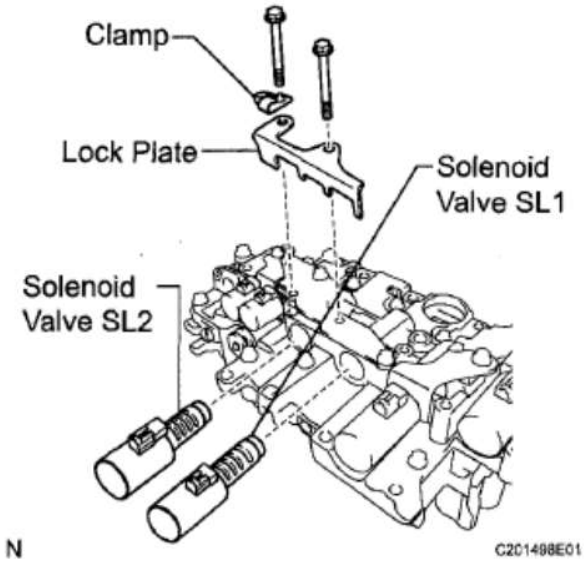


Fig. 506: Identifying Lock Plate, Shift Solenoid Valve SL2 And Valve Body Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **REMOVE SHIFT SOLENOID VALVE SLT**
   a. Remove the bolt, lock plate and shift solenoid valve SLT from the valve body assembly
7. **REMOVE SHIFT SOLENOID VALVE SLU**
   a. Remove the shift solenoid valve SLU from the valve body assembly.

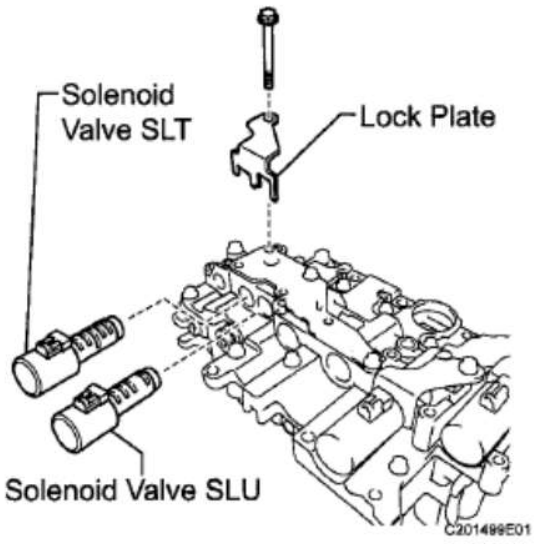


Fig. 507: Identifying Solenoid Valve SLU, Lock Plate And Solenoid Valve SLT
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **REMOVE SHIFT SOLENOID VALVE SL3**
   a. Remove the bolt, lock plate and shift solenoid valve SL3 from the valve body assembly.

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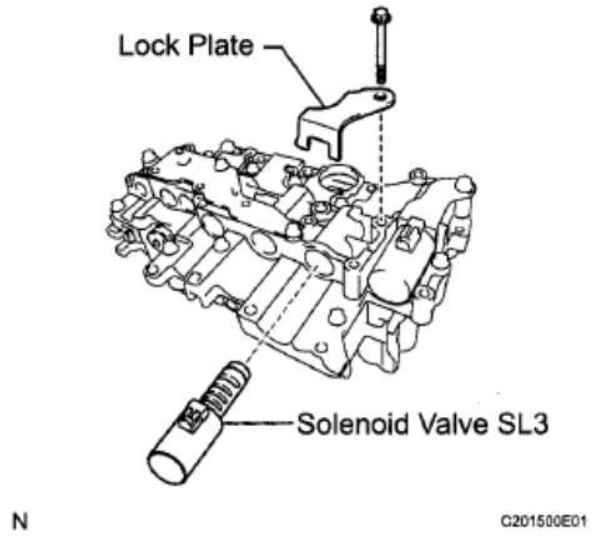


Fig. 508: Identifying Lock Plate And Solenoid Valve SL3
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. **REMOVE SHIFT SOLENOID VALVE SL4**
   a. Remove the bolt, lock plate and shift solenoid valve SL4 from the valve body assembly.

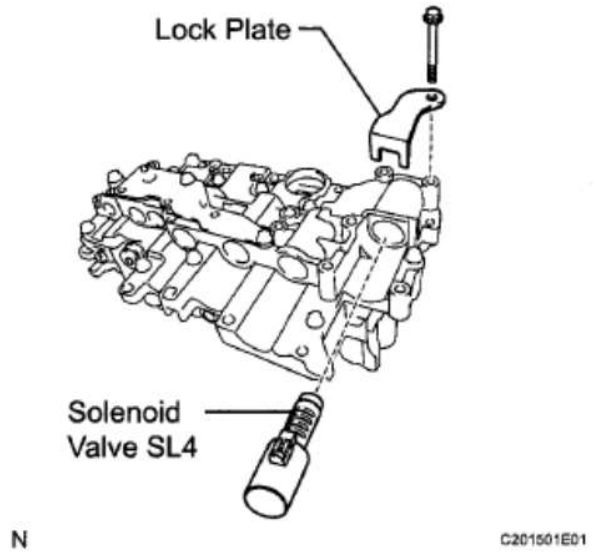


Fig. 509: Identifying Lock Plate And Solenoid Valve SL4
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. **INSPECT SHIFT SOLENOID VALVE SL**
   a. Measure the resistance according to the value (s) in the table below.

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Standard Resistance

RESISTANCE SPECIFICATION

Tester Connection	Specified Condition 20°C (68°F)
Solenoid Connector (SL) - Solenoid Body (SL)	11 to 15 ohms

If the value is not as specified, replace the shift solenoid valve.

b. Connect a positive (+) lead from the battery to terminal 2 and a negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the shift solenoid valve.

OK:

The solenoid makes an operating noise.

If the result is not as specified, replace the shift solenoid valve.

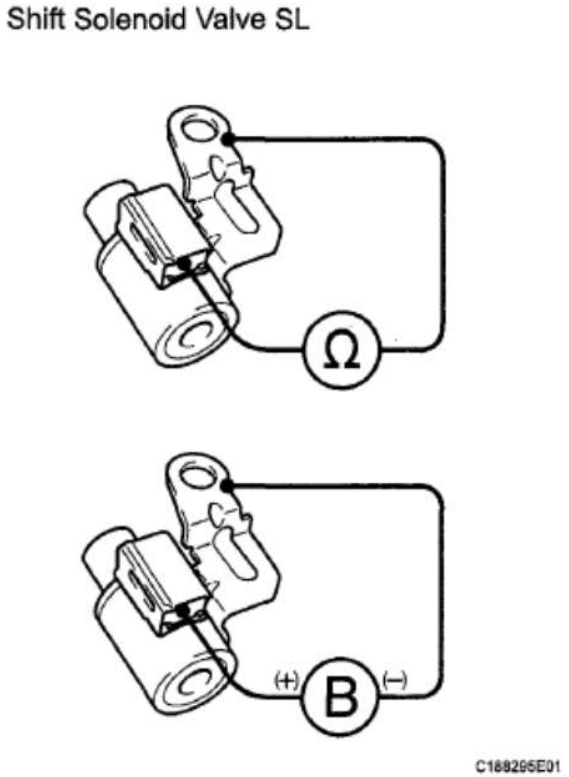


Fig. 510: Inspecting Shift Solenoid Valve SL
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSPECT SHIFT SOLENOID VALVE SLT**
   a. Measure the resistance according to the value (s) in the table below.

Standard Resistance

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RESISTANCE SPECIFICATION

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

If the value is not as specified, replace the shift solenoid valve.

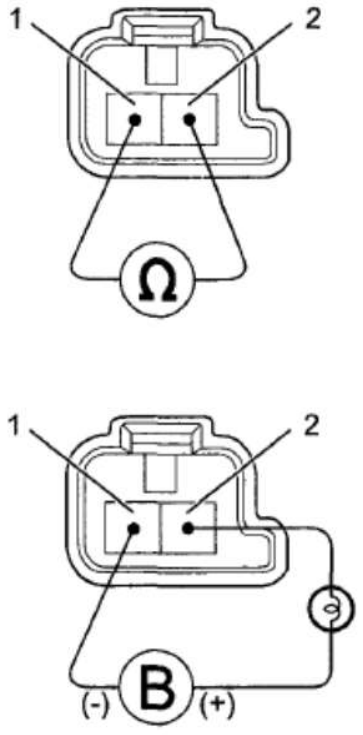
b. Connect a positive (+) lead with a 21 W bulb from the battery to terminal 2 and a negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the shift solenoid valve.

OK:

The solenoid makes an operating noise.

If the result is not as specified, replace the shift solenoid valve.

Component without harness connected:
(Shift Solenoid Valve SLT)



C158063E19

Fig. 511: Inspecting Shift Solenoid Valve SLT
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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3. **INSPECT SHIFT SOLENOID VALVE SLU**

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

Standard Resistance

RESISTANCE SPECIFICATION

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

If the value is not as specified, replace the shift solenoid valve.

b. Connect a positive (+) lead with a 21 W bulb from the battery to terminal 2 and a negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the shift solenoid valve.

OK:

The solenoid makes an operating noise.

If the result is not as specified, replace the shift solenoid valve.

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Component without harness connected:
(Shift Solenoid Valve SLU)

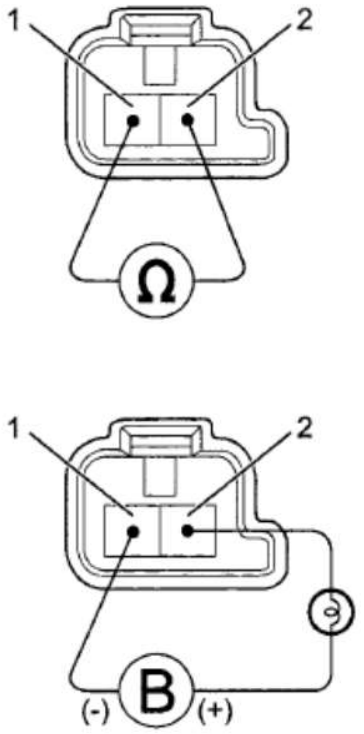


Fig. 512: Inspecting Shift Solenoid Valve SLU
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **INSPECT SHIFT SOLENOID VALVE SL1**
   a. Measure the resistance according to the value (s) in the table below.

   Standard Resistance

   RESISTANCE SPECIFICATION

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

   If the value is not as specified, replace the shift solenoid valve.

   b. Connect a positive (+) lead with a 21 W bulb from the battery to terminal 2 and a negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the shift solenoid valve.

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OK:

The solenoid makes an operating noise.

If the result is not as specified, replace the shift solenoid valve.

Component without harness connected:
(Shift Solenoid Valve SL1)

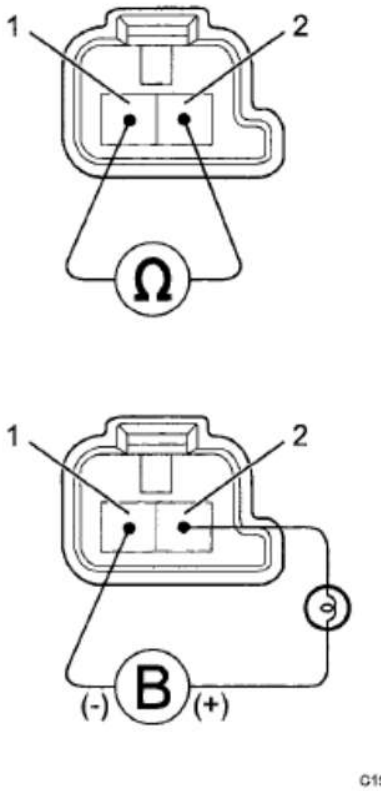


Fig. 513: Inspecting Shift Solenoid Valve SL1
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **INSPECT SHIFT SOLENOID VALVE SL2**
   a. Measure the resistance according to the value (s) in the table below.

Standard Resistance

RESISTANCE SPECIFICATION

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

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If the value is not as specified, replace the shift solenoid valve.

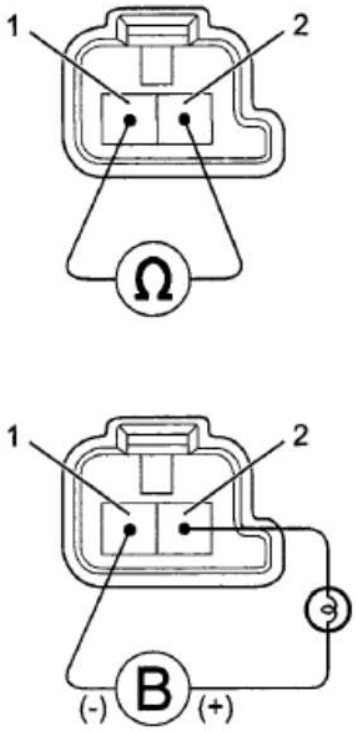
b. Connect a positive (+) lead with a 21 W bulb from the battery to terminal 2 and a negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the shift solenoid valve.

OK:

The solenoid makes an operating noise.

If the result is not as specified, replace the shift solenoid valve.

Component without harness connected:
(Shift Solenoid Valve SL2)



C158063E21

Fig. 514: Inspecting Shift Solenoid Valve SL2
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **INSPECT SHIFT SOLENOID VALVE SL3**
   a. Measure the resistance according to the value (s) in the table below.

Standard Resistance

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RESISTANCE SPECIFICATION

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

If the value is not as specified, replace the shift solenoid valve.

b. Connect a positive (+) lead with a 21 W bulb from the battery to terminal 2 and a negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the shift solenoid valve.

OK:

The solenoid makes an operating noise.

If the result is not as specified, replace the shift solenoid valve.

Component without harness connected:
(Shift Solenoid Valve SL3)

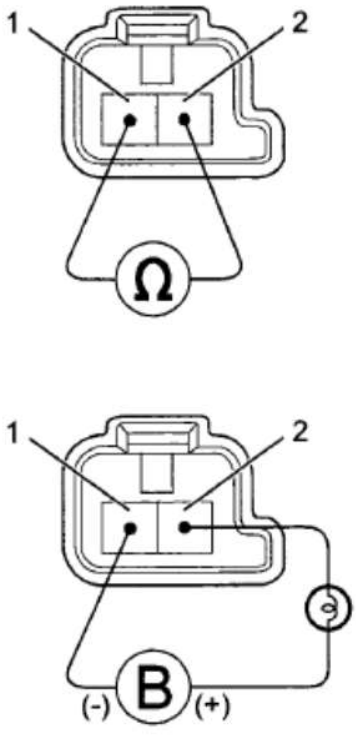


Fig. 515: Inspecting Shift Solenoid Valve SL3
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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7. **INSPECT SHIFT SOLENOID VALVE SL4**

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

   Standard Resistance

   RESISTANCE SPECIFICATION

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

   If the value is not as specified, replace the shift solenoid valve.

   b. Connect a positive (+) lead with a 21 W bulb from the battery to terminal 2 and a negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the shift solenoid valve.

OK:

The solenoid makes an operating noise.

If the result is not as specified, replace the shift solenoid valve.

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Component without harness connected:
(Shift Solenoid Valve SL4)

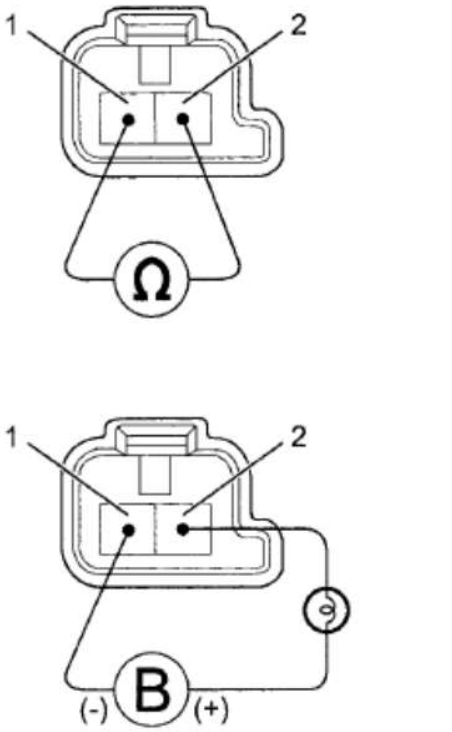


Fig. 516: Inspecting Shift Solenoid Valve Sl4
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REASSEMBLY

1. **INSTALL SHIFT SOLENOID VALVE SL4**
   a. Coat the shift solenoid valve SL4 and bolt with ATF.
   b. Install the shift solenoid valve SL4 and lock plate to the valve body assembly with the bolt.

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

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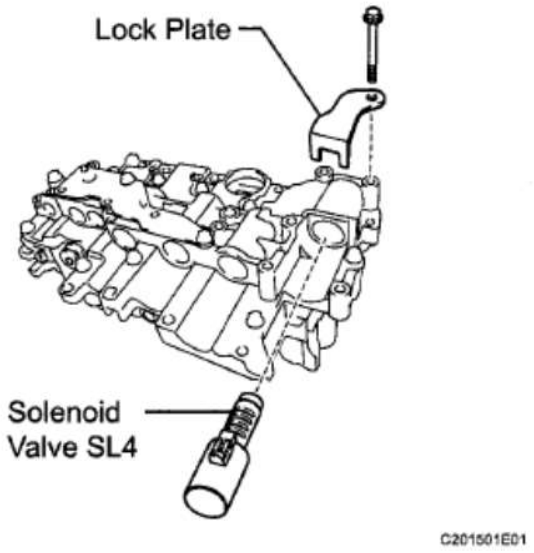


Fig. 517: Identifying Lock Plate And Solenoid Valve SL4
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSTALL SHIFT SOLENOID VALVE SL3**
   a. Coat the shift solenoid valve SL3 and bolt with ATF.
   b. Install the shift solenoid valve SL3 and lock plate to the valve body assembly with the bolt.

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

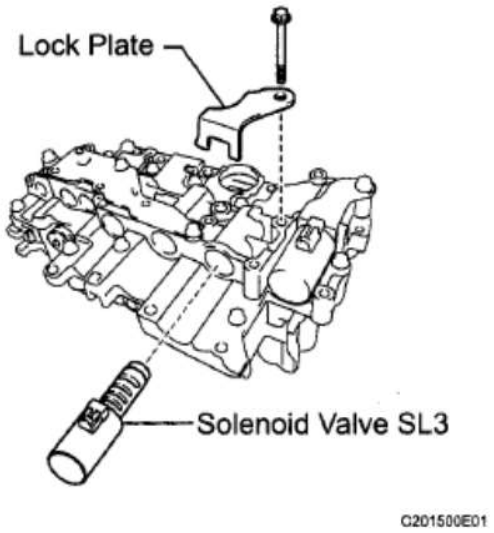


Fig. 518: Identifying Lock Plate And Solenoid Valve SL3
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **INSTALL SHIFT SOLENOID VALVE SLU**
   a. Coat the shift solenoid valve SLU with ATF.

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b. Install the shift solenoid valve SLU to the valve body assembly.

4. **INSTALL SHIFT SOLENOID VALVE SLT**
   a. Coat the shift solenoid valve SLT and bolt with ATF.
   b. Install the shift solenoid valve SLT and lock plate to the valve body assembly with the bolt.

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

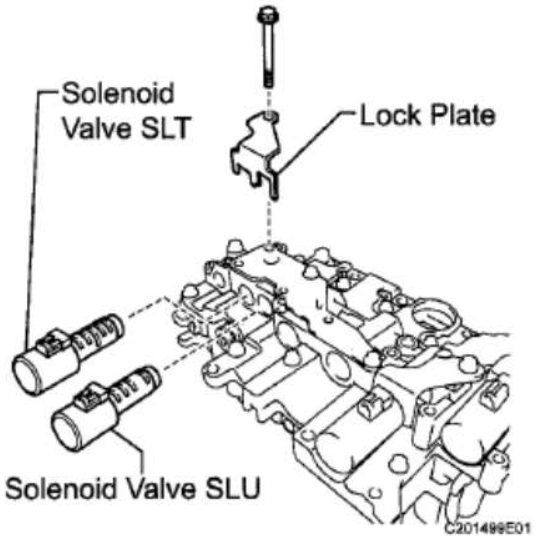


Fig. 519: Identifying Solenoid Valve SLU, Lock Plate And Solenoid Valve SLT
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **INSTALL SHIFT SOLENOID VALVE SL1**
   a. Coat the shift solenoid valve SL1 with ATF.
   b. Install the shift solenoid valve SL1 to the valve body assembly.
6. **INSTALL SHIFT SOLENOID VALVE SL2**
   a. Coat the shift solenoid valve SL2 and 2 bolts with ATF.
   b. Install the shift solenoid valve SL2, clamp and lock plate to the valve body assembly with the 2 bolts.

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

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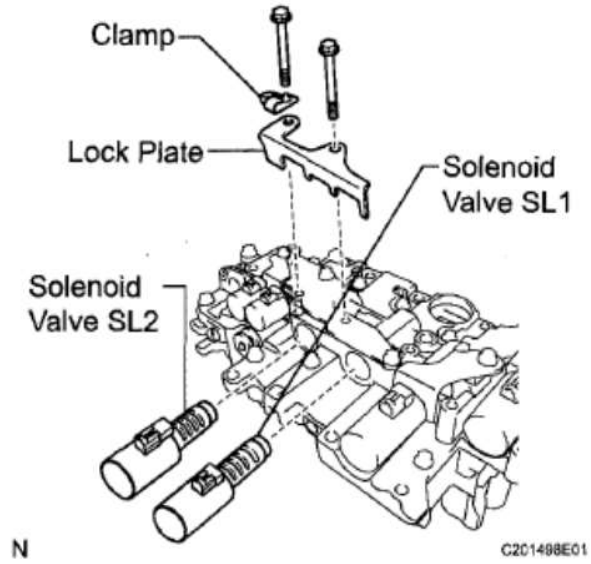


Fig. 520: Identifying Lock Plate, Shift Solenoid Valve SL2 And Valve Body Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. **INSTALL SHIFT SOLENOID VALVE SL,**
   a. Coat the shift solenoid valve SL and bolt with ATF.
   b. Install the shift solenoid valve SL to the valve body assembly with the bolt.

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

8. **INSTALL TRANSMISSION WIRE** (See **REMOVAL**)
9. **INSTALL SPEED SENSOR** (See **REMOVAL**)

INSTALLATION

1. **INSTALL TRANSMISSION VALVE BODY ASSEMBLY** (See **INSTALLATION**)

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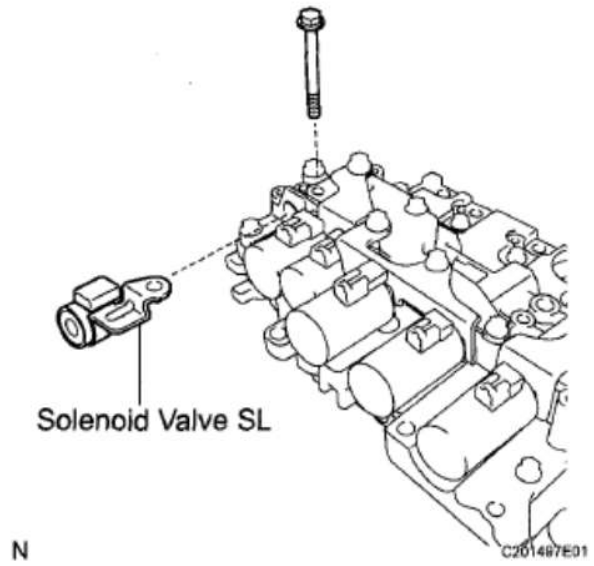


Fig. 521: Identifying Solenoid Valve SL
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSTALL VALVE BODY OIL STRAINER ASSEMBLY** (See **AIR COOLED OIL COOLER**)
3. **INSTALL AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY** (See **AIR COOLED OIL COOLER**)
4. **INSTALL AUTOMATIC TRANSAXLE ASSEMBLY**

   See **INSTALLATION**.

DIFFERENTIAL CASE

COMPONENTS

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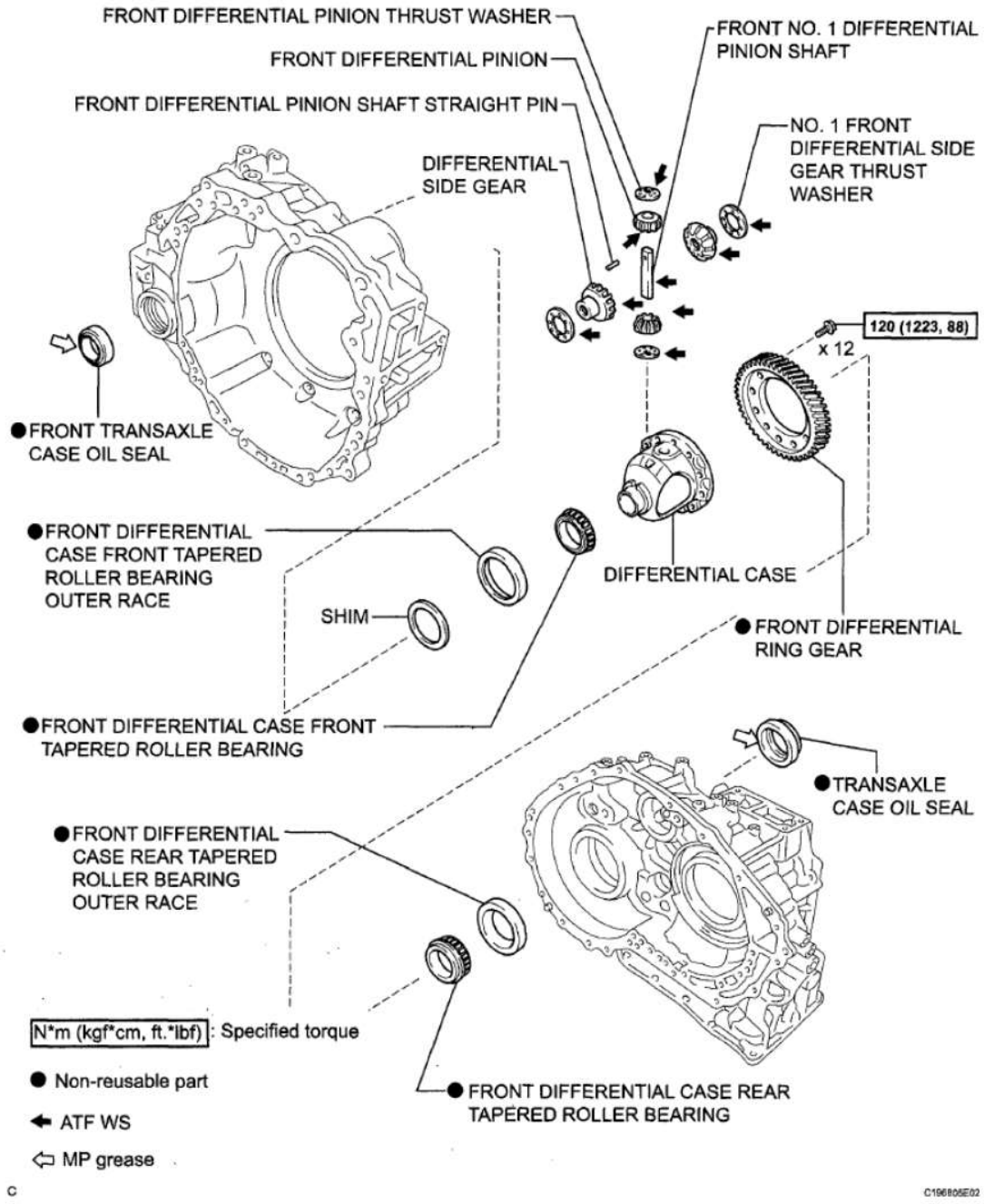


Fig. 522: Identifying Differential Case Components With Torque Specification
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

1. **REMOVE FRONT DIFFERENTIAL RING GEAR**
   a. Put matchmarks on the front differential ring gear and differential case.

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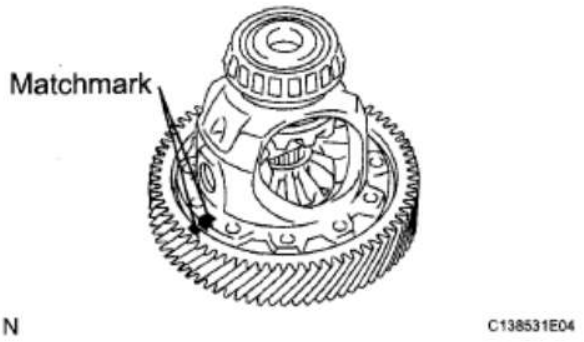


Fig. 523: Identifying Matchmarks On Front Differential Ring Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Remove the 12 bolts.

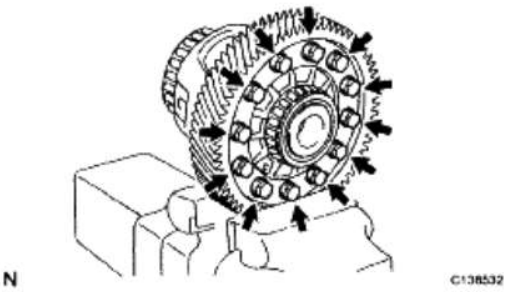


Fig. 524: Locating Differential Case Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Using a plastic hammer, tap on the front differential ring gear to remove it from the case.

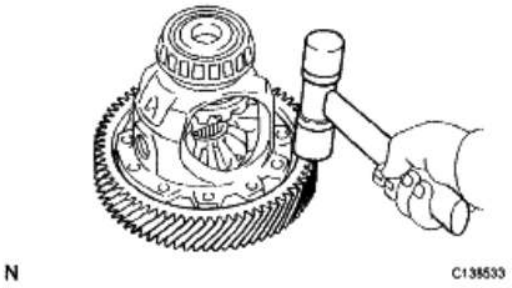


Fig. 525: Tapping On Front Differential Ring Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **REMOVE FRONT DIFFERENTIAL CASE FRONT TAPERED ROLLER BEARING**

a. Using SST, remove the front differential case front tapered roller bearing from the differential case.

SST 09950-00020, 09950-00030, 09950-40011 (09957-04010), 09950-60010 (09951-00480)

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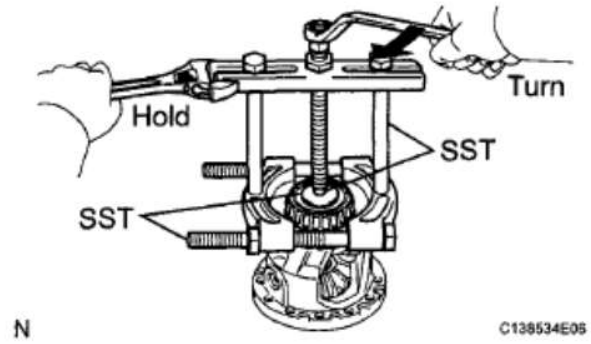


Fig. 526: Removing Front Differential Case Front Tapered Roller Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using SST, remove the front differential case front tapered roller bearing outer race and shim from the transaxle housing.

SST 09308-00010

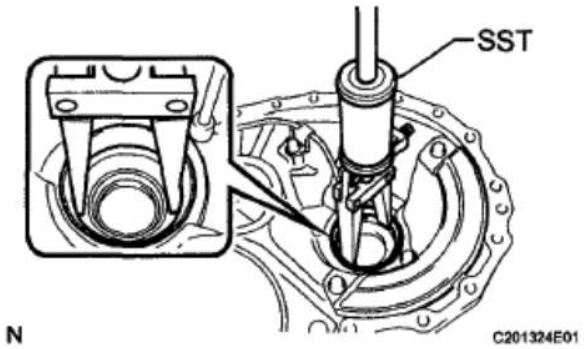


Fig. 527: Removing Front Differential Case Front Tapered Roller Bearing Outer Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. **REMOVE FRONT DIFFERENTIAL CASE REAR TAPERED ROLLER BEARING**
   a. Using SST, remove the front differential case rear tapered roller bearing from the differential case.

   SST 09950-00020, 09950-00030, 09950-40011 (09957-04010), 09950-60010 (09951-00480)

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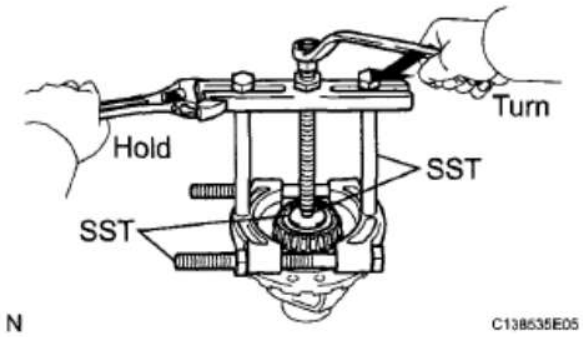


Fig. 528: Removing Front Differential Case Rear Tapered Roller Bearing From
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using SST, remove the front differential case rear tapered roller bearing outer race from the transaxle case.

SST 09308-00010

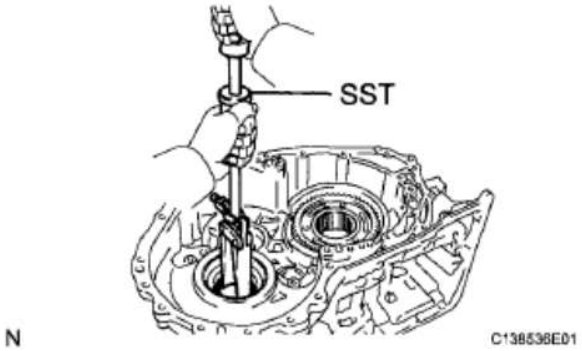


Fig. 529: Removing Front Differential Case Rear Tapered Roller Bearing Outer Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **REMOVE FRONT DIFFERENTIAL PINION SHAFT STRAIGHT PIN**
   a. Using SST and a hammer, loosen the staked part of the front differential case.

   SST 09930-00010

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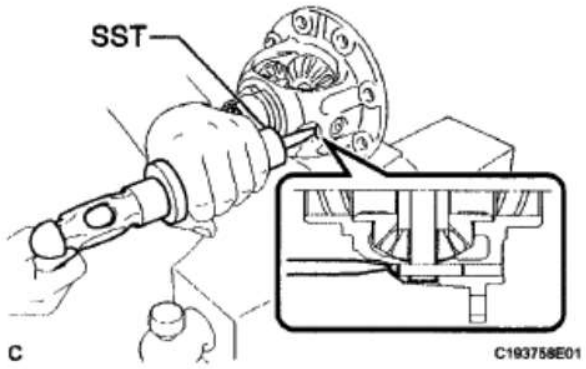


Fig. 530: Loosening Staked Part Of Front Differential Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using a pin punch (5 mm) and hammer, remove the straight pin.

NOTE: Before removing the straight pin, unstake it with a pin punch.

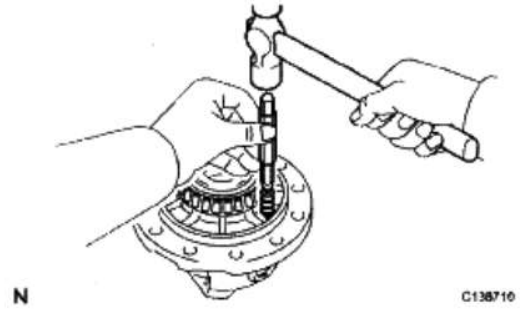


Fig. 531: Removing Straight Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **REMOVE FRONT NO. 1 DIFFERENTIAL PINION SHAFT**
   a. Remove the front No. 1 differential pinion shaft from the differential case.

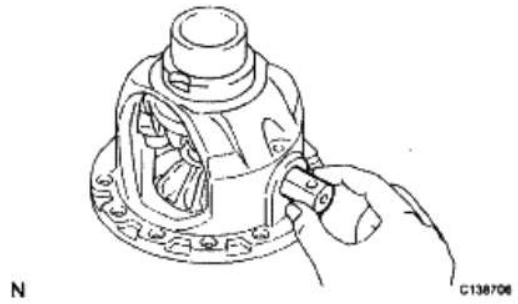


Fig. 532: Removing Front No. 1 Differential Pinion Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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6. **REMOVE 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.

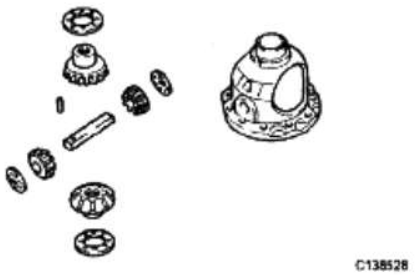


Fig. 533: Identifying Front Differential Pinions, Pinion Thrust Washers And Front Differential Side Gears
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. **REMOVE FRONT TRANSAXLE CASE OIL SEAL**
   a. Using SST and a hammer, remove the front transaxle case oil seal from the transaxle housing.

SST 09950-60010 (09951 -00550), 09950-70010 (09951-07200)

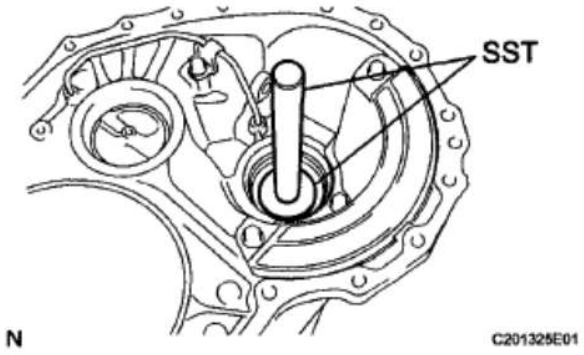


Fig. 534: Removing Front Transaxle Case Oil Seal And Transaxle Housing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **REMOVE TRANSAXLE CASE OIL SEAL**
   a. Using SST and a hammer, remove the transaxle case oil seal from the transaxle case.

SST 09950-60010 (09951 -00650), 09950-70010 (09951-07100)

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2009 TRANSMISSION Automatic Transaxle (U760E) - Highlander

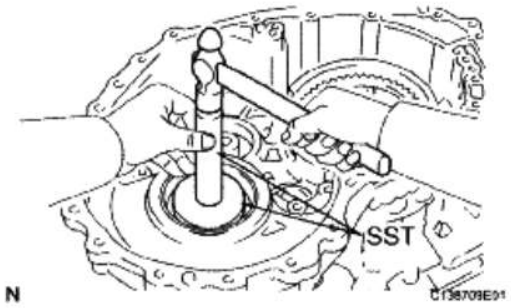


Fig. 535: Removing Transaxle Case Oil Seal And Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. **INSPECT DIFFERENTIAL SIDE GEAR BACKLASH**
   a. Hold the differential case in a vise between aluminum plates.

   NOTE: Do not overtighten the vise.

   b. Place a dial indicator on the tip of the side gear tooth at a right angle.
   c. Hold the pinion gear in the differential case and measure the backlash of the side gear.

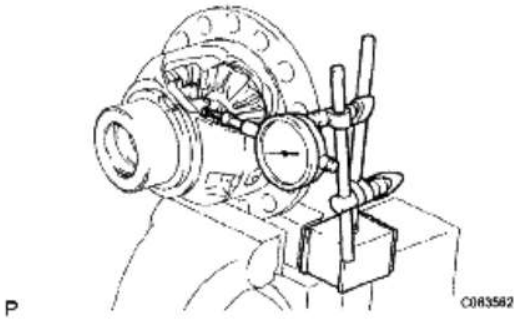


Fig. 536: Inspecting Differential Side Gear Backlash
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard backlash:

0.05 to 0.2 mm (0.00197 to 0.00787 in.)

Thrust Washer Thickness

THRUST WASHER THICKNESS REFERENCE

Thickness
1.00 mm (0.0394 in.)
1.10 mm (0.0433 in.)

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1.20 mm (0.0472 in.)
1.30 mm (0.0512 in.)

If the backlash is greater than the standard range, select another side gear thrust washer.

REASSEMBLY

1. **INSTALL DIFFERENTIAL SIDE GEAR**
   a. Coat the 2 front differential side gears, 2 side gear thrust washers, 2 front differential pinions and 2 pinion thrust washers with ATF and install them to the differential case.

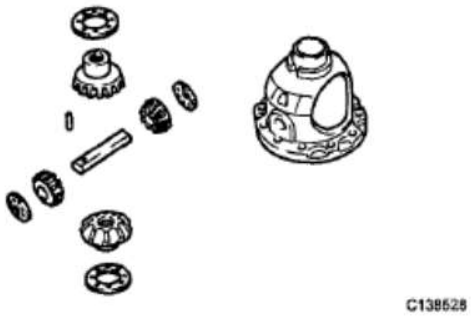


Fig. 537: Identifying Front Differential Side Gears, Side Gear Thrust Washers And Front Differential Pinions
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. **INSTALL FRONT NO. 1 DIFFERENTIAL PINION SHAFT**
   a. Coat the front No. 1 differential pinion shaft with ATF, and install it to the differential case.
3. **INSPECT DIFFERENTIAL SIDE GEAR BACKLASH** (See **INSPECTION**)

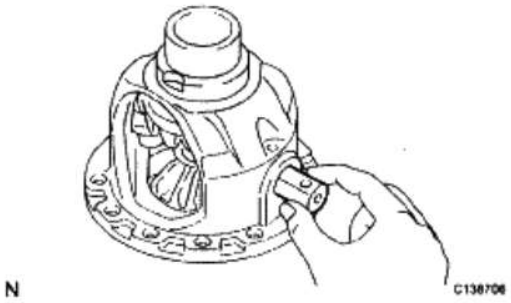


Fig. 538: Installing Front No. 1 Differential Pinion Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. **INSTALL FRONT DIFFERENTIAL PINION SHAFT STRAIGHT PIN**
   a. Using a pin punch (5 mm) and hammer, install the pinion shaft straight pin.

NOTE: Align the holes, and install the pinion shaft straight pin.

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Fig. 539: Installing Pinion Shaft Straight Pin
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Using a chisel and hammer, stake the differential case.

NOTE: Stake the differential case after adjusting the backlash.

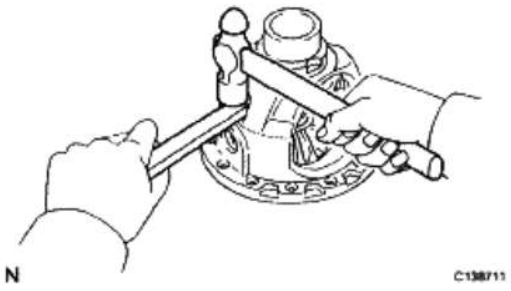


Fig. 540: Staking Differential Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **INSTALL FRONT DIFFERENTIAL CASE REAR TAPERED ROLLER BEARING**

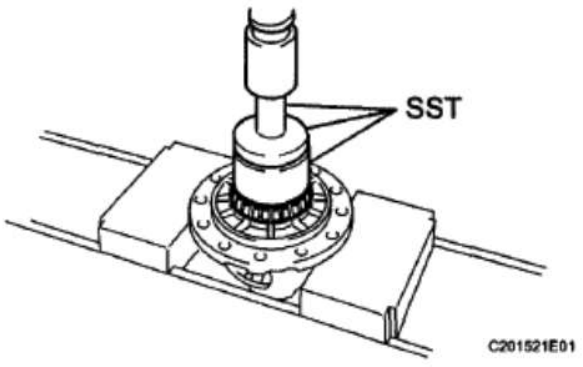


Fig. 541: Installing Front Differential Case Rear Tapered Roller Bearing And Differential Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

a. Using SST and a press, install a new front differential case rear tapered roller bearing to the differential case.

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SST 09710-04081, 09950-60010 (09951 -00480), 09950-70010 (09951-07100)

NOTE: Do not damage the bearing cage during bearing inner race installation.

b. Using SST and a hammer, install a new front differential case rear tapered roller bearing outer race to the transaxle case.

SST 09950-60020 (09951 -00810), 09950-70010 (09951-07150)

NOTE: Ensure that there is no clearance between the bearing and transaxle case.

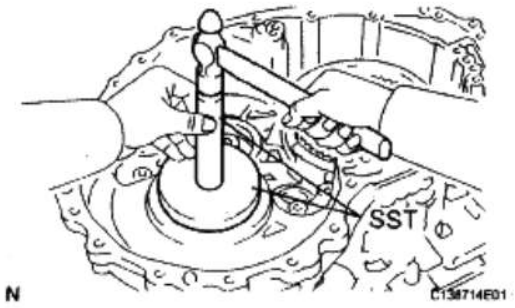


Fig. 542: Installing Front Differential Case Rear Tapered Roller Bearing Outer Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **INSTALL FRONT DIFFERENTIAL CASE FRONT TAPERED ROLLER BEARING**
   a. Using SST and a press, install a new front differential case front tapered roller bearing to the differential case.

SST 09523-36010, 09950-60010 (09951 -00540), 09950-70010 (09951-07100)

NOTE: Do not damage the bearing cage during bearing inner race installation.

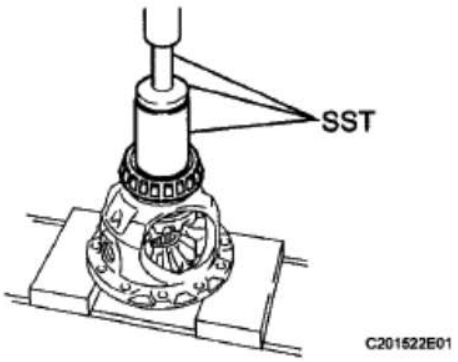


Fig. 543: Installing Front Differential Case Front Tapered Roller Bearing To And

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Differential Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Install the shim to the transaxle housing.
c. Using SST and a hammer, install a new front differential case front tapered roller bearing outer race to the transaxle housing.

SST 09950-60020 (09951 -00790), 09950-70010 (09951-07150)

NOTE: Ensure that there is no clearance between the bearing and transaxle housing.

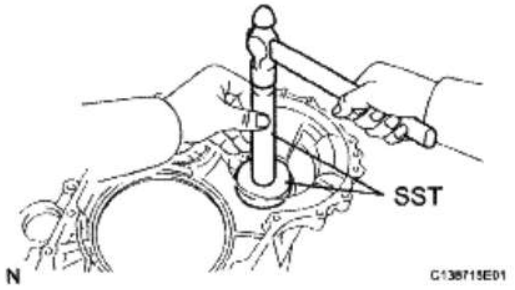


Fig. 544: Installing Front Differential Case Front Tapered Roller Bearing Outer Race And Transaxle Housing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. **ADJUST DIFFERENTIAL SIDE BEARING PRELOAD**
   a. Install the differential assembly to the transaxle case.
   b. Clean the contact surfaces of the transaxle case and transaxle housing.

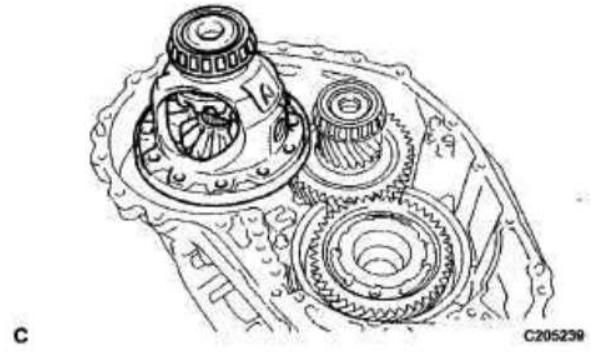


Fig. 545: Identifying Differential Assembly To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Install the transaxle housing to the transaxle case with the 20 bolts.

Torque: Bolt A

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31 N*m (316 kgf*cm, 23 ft.*lbf)

Bolt B

23 N*m (234 kgf*cm, 17 ft.*lbf)

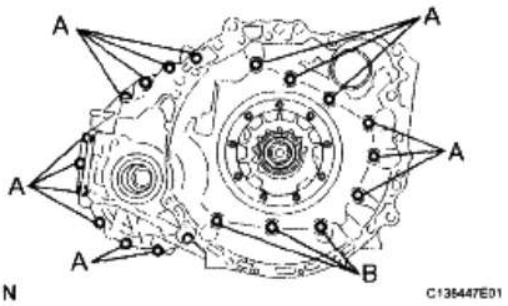


Fig. 546: Identifying Transaxle Case And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Using SST, turn the differential assembly right and left 2 or 3 times to settle the bearing.

SST 09564-33010

e. Using SST and a torque wrench, measure the turning torque of the differential side bearing while rotating SST at 10 rpm.

SST 09564-33010

Turning torque:

0.9 to 1.3 N*m (9 to 13 kgf*cm, 8 to 11 in.*lbf)

If the turning torque is not within the specified range, refer to the table below to select a shim so that the turning torque is within the specified range.

Shim Thickness: mm (in.)

SHIM THICKNESS REFERENCE

Thickness	Thickness	Thickness	Thickness
2.000 (0.0787)	2.225 (0.0876)	2.450 (0.0965)	2.675 (0.105)
2.025 (0.0797)	2.250 (0.0886)	2.475 (0.0974)	2.700 (0.106)
2.050 (0.0807)	2.275 (0.0896)	2.500 (0.0984)	2.725 (0.107)
2.075 (0.0817)	2.300 (0.0906)	2.525 (0.0994)	2.750 (0.108)
2.100 (0.0827)	2.325 (0.0915)	2.550 (0.100)	2.775 (0.109)
2.125 (0.0837)	2.350 (0.0925)	2.575 (0.101)	2.800 (0.110)
2.150 (0.0846)	2.375 (0.0935)	2.600 (0.102)	2.825 (0.111)

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2.175 (0.0856)	2.400 (0.0945)	2.625 (0.103)	2.850 (0.112)
2.200 (0.0866)	2.425 (0.0955)	2.650 (0.104)	2.875 (0.113)

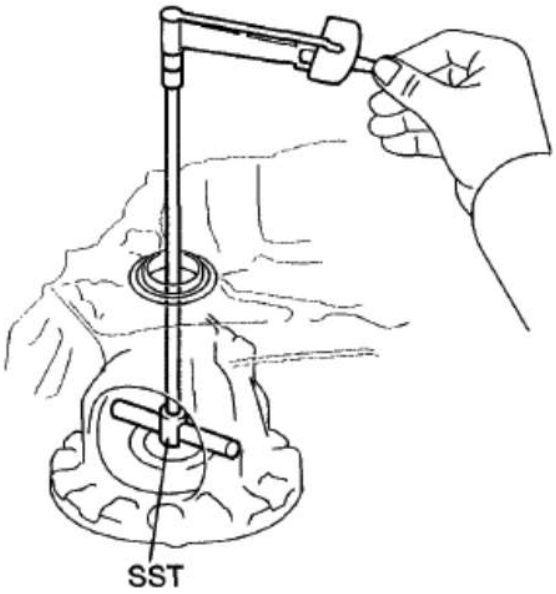


Fig. 547: Measuring Turning Torque Of Differential Side Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Remove the 20 bolts and the transaxle housing from the transaxle case.

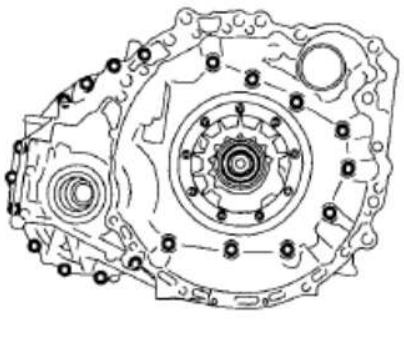


Fig. 548: Identifying Transaxle Case Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Remove the differential assembly from the transaxle case.

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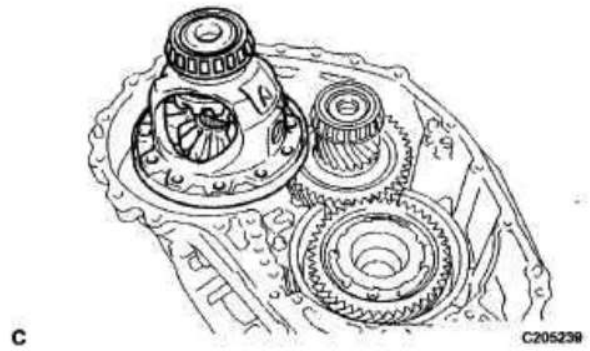


Fig. 549: Identifying Differential Assembly And Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. **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).

NOTE: Do not heat the ring gear to more than 110°C (230°F).

   b. Clean the contact surface of the front differential case.

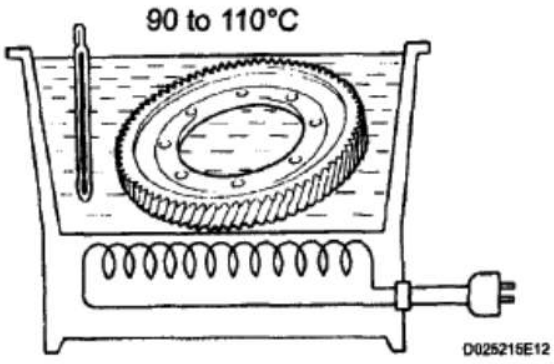


Fig. 550: Heating Front Differential Ring Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

   c. Align the matchmarks, and install the front differential ring gear case quickly.

NOTE: Do not install the bolts while the ring gear is hot.

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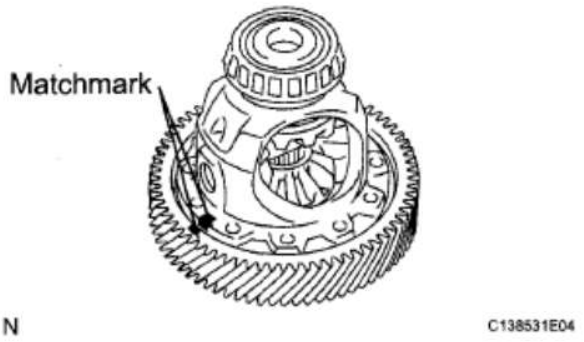


Fig. 551: Identifying Matchmarks Of Front Differential Ring Gear Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Tighten the 12 bolts.

Torque: 120 N*m (1223 kgf*cm, 88 ft.*lbf)

NOTE: Tighten the bolts a little at a time in diagonal order.

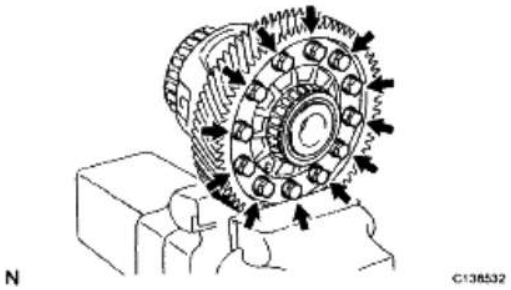


Fig. 552: Locating Differential Case Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. **INSTALL TRANSAXLE CASE OIL SEAL**
   a. Coat the lip of a new oil seal with MP grease.
   b. Using SST and a hammer, install the oil seal.

SST 09316-10010, 09950-70010 (09951 -07100)

Oil seal drive in depth:

-0.5 to 0.5 mm (-0.0197 to 0.0197 in.)

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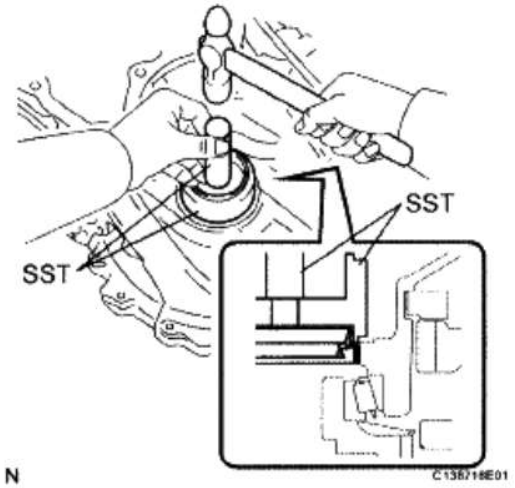


Fig. 553: Installing Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. **INSTALL FRONT TRANSAXLE CASE OIL SEAL**
    a. Coat the lip of a new oil seal with MP grease.
    b. Using SST and a hammer, install the oil seal.

SST 09308-14010

Oil seal drive in depth:

-0.5 to 0.5 mm (-0.0197 to 0.0197 in.)

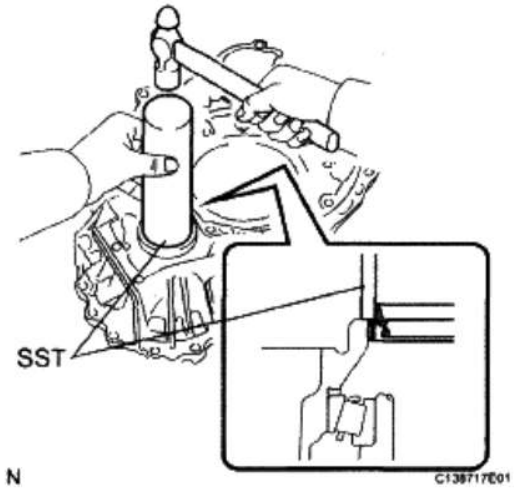


Fig. 554: Installing Oil Seal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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