

2007 TRANSMISSION**U241E Automatic Transaxle - Highlander****AUTOMATIC TRANSAXLE SYSTEM****PRECAUTION****NOTE:**

- Perform the **RESET MEMORY** (AT initialization) when replacing the automatic transaxle assembly, engine assembly or ECM (See **INITIALIZATION**).
- Perform the **REGISTRATION** (VIN registration) when replacing the ECM (See **REGISTRATION**).

HINT:

RESET MEMORY can not be completed by only disconnecting the battery cable.

1. The automatic transaxle is composed of highly precision-finished parts which need careful inspection before reassembly. Even a small nick could cause fluid leakage or affect the performance. The instructions here are organized so that you work on only one component group at a time. This will help avoid confusion caused by 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. Complete the inspection, repair and reassembly before proceeding to the next component group as much as possible. 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 some 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. Recommended: Toyota Genuine ATF Type T-IV
2. All disassembled parts should be washed clean and any fluid passages and holes should be blown through with compressed air.
3. Dry all parts with compressed air. Never use a shop rag or a piece of cloth to dry them.
4. When using compressed air, always aim away from yourself to prevent accidentally spraying ATF or kerosene in your face.
5. Only recommended automatic transaxle fluid or kerosene should be used for cleaning.
6. After cleaning, the parts should be arranged in the correct order for efficient inspection, repair, and reassembly.
7. When disassembling a valve body, be sure to match each valve together with the corresponding spring.
8. New discs for the brakes and clutches that are to be used for replacement must be soaked in ATF for at least 15 minutes before reassembly.
9. All oil seal rings, clutch discs, clutch plates, rotating parts, and sliding surfaces should be coated with ATF prior to reassembly.
10. All gaskets and rubber O-rings should be replaced with new ones.

11. **Do not apply adhesive cements to gaskets and similar parts.**
12. **Make sure that the ends of a snap ring are not aligned with one of the cutouts and are installed in the groove correctly.**
13. **When replacing a worn bushing, the sub-assembly containing the bushing must also be replaced.**
14. **Check thrust bearings and races for wear or damage. Replace them as necessary.**
15. **When working with FIPG material, you must observe the following:**
 - 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

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Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	Diagnostic code
Typical enabling condition	Preconditions that allow the ECM to detect malfunctions. With all preconditions satisfied, the ECM sets the DTC when the monitored value (s) exceeds the malfunction threshold(s).
Sequence of operation	The priority order that is applied to monitoring, if multiple sensors and components are used to detect the malfunction. While another sensor is being monitored, the next sensor or component will not be monitored until the previous monitoring has concluded.
Required sensor/components	The sensors and components that are used by the ECM to detect malfunctions.
Frequency of operation	The number of times that the ECM checks for malfunctions per driving cycle. "Once per driving cycle" means that the ECM detects malfunction only one time during a single driving cycle. "Continuous" means that the ECM detects malfunction every time when enabling condition is met.
Duration	The minimum time that the ECM must sense a continuous deviation in the monitored value(s) before settings DTC. This timing begins after the "typical enabling conditions" are met.
Malfunction thresholds	Beyond this value, the ECM will conclude that there is a malfunction and set a DTC.
MIL operation	MIL illumination timing after a defect is detected. "Immediately" means that the ECM illuminates MIL the instant the ECM determines that there is a malfunction. "2 driving cycle" means that the ECM illuminates MIL if the same malfunction is detected again in the 2nd driving cycle.

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

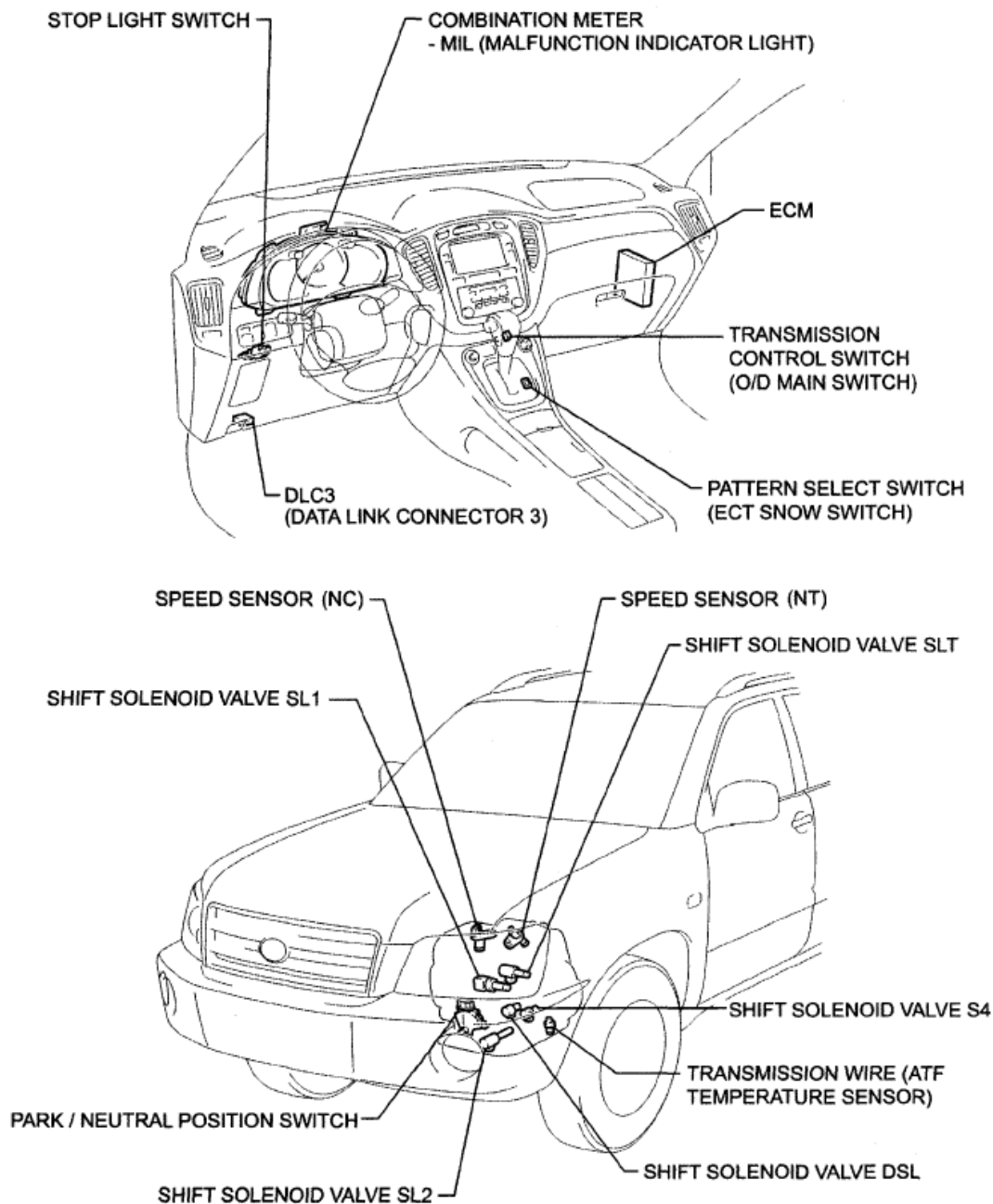
Component operating
range

Normal operation range of sensors and solenoids under normal driving conditions.

Use these ranges as a reference.

They cannot be used to judge if a sensor or solenoid is defective or not.

PARTS LOCATION



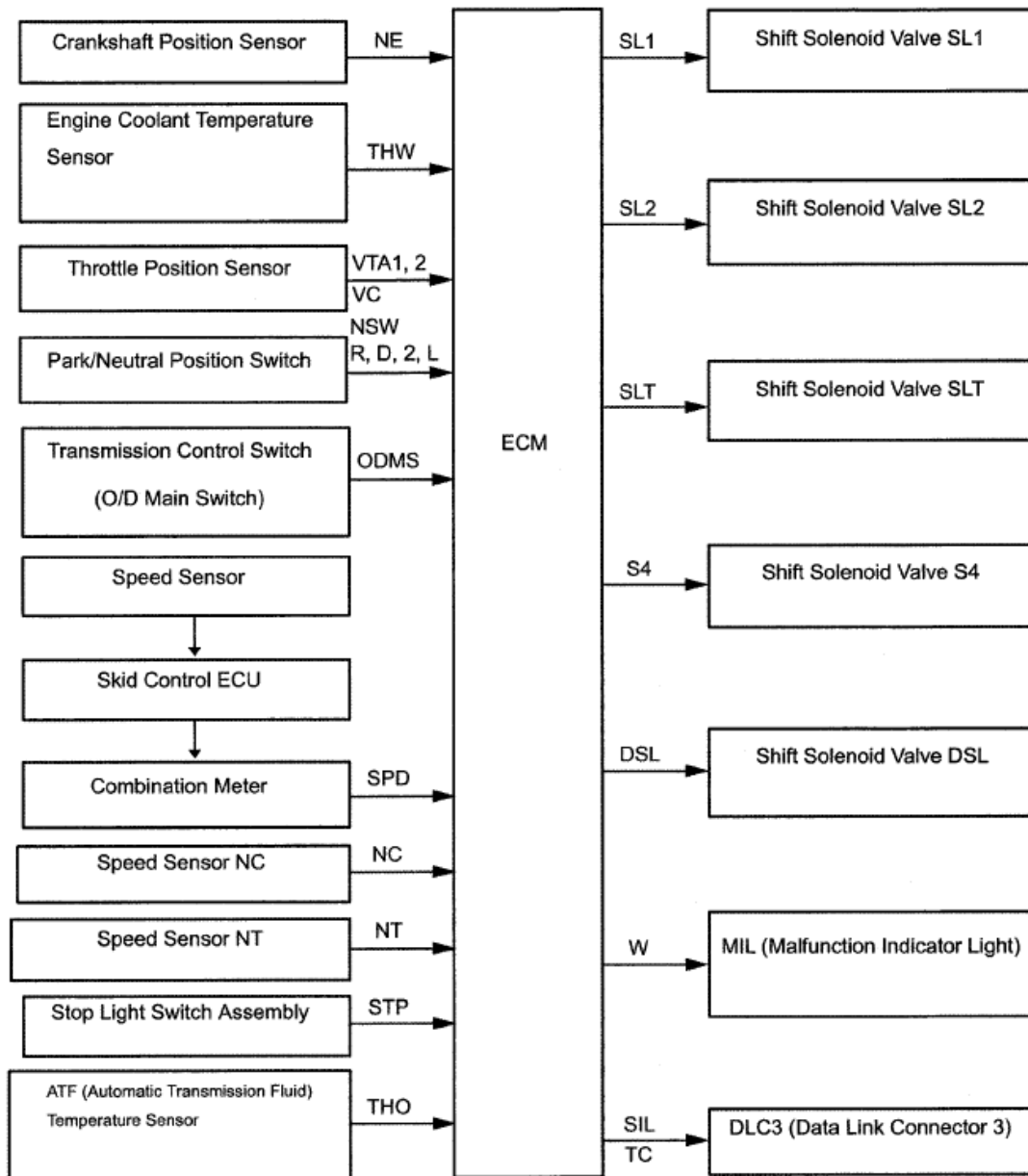
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Fig. 1: Identifying Automatic Transaxle Components Location
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SYSTEM DIAGRAM

The configuration of the electronic control system in the U140F automatic transaxles is as shown in the following chart.



C127518E03

Fig. 2: Automatic Transaxle System Diagram

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SYSTEM DESCRIPTION

1. SYSTEM DESCRIPTION

- a. The ECT (Electronic controlled automatic transmission/transaxle) is an automatic transmission/transaxle that electronically controls shift timing using the ECM. The ECM detects electrical signals that indicate engine and driving conditions, and controls the shift point, based on driver habits and road conditions. As a result, fuel efficiency and power transmission performance are improved.

Shift shock has been reduced by controlling the engine and transmission simultaneously.

In addition, the ECT has features such as follows:

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

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

- The ECM of this system is connected to the CAN and multiplex communication system. Therefore, before starting troubleshooting, make sure to check that there is no trouble in the CAN and multiplex communication systems.
- The intelligent tester can be used at steps 3, 4, 6, and 9.

1. **Vehicle Brought to Workshop**
2. **Customer Problem Analysis**
3. **Connect the OBD II scan tool or intelligent tester to DLC3**
4. **Check and Clear DTCs and Freeze Frame Data**

HINT:

(See **DTC CHECK / CLEAR**).

5. **Visual Inspection**
6. **Setting the Check Mode Diagnosis**

HINT:

(See **CHECK MODE PROCEDURE**).

7. **Problem Symptom Confirmation**

HINT:

(See **ROAD TEST**).

Symptom does not occur: Go to step 8

Symptom occurs: Go to step 9

8. Symptom Simulation

HINT:

(See **HOW TO PROCEED WITH TROUBLESHOOTING**).

9. DTC Check

HINT:

(See **DTC CHECK / CLEAR**).

DTC is not output: Go to step 10

DTC is output: Go to step 17

10. Basic Inspection

HINT:

(See **ON-VEHICLE INSPECTION** , **INSPECTION** and **ADJUSTMENT**).

NG: Go to step 19

OK: Go to Next Step

11. Mechanical System Test

HINT:

(See **MECHANICAL SYSTEM TESTS**).

NG: Go to step 16

OK: Go to Next Step

12. Hydraulic Test

HINT:

(See **HYDRAULIC TEST**).

NG: Go to step 16

OK: Go to Next Step

13. Manual Shifting Test

HINT:

(See INITIALIZATION).

NG: Go to step 15

OK: Go to Next Step

14. Problem Symptoms Table Chapter 1

HINT:

(See PROBLEM SYMPTOMS TABLE).

NG: Go to step 18

OK: Go to Next Step

15. Problem Symptoms Table Chapter 2

HINT:

(See PROBLEM SYMPTOMS TABLE).

16. Part Inspection

Go to step 19

17. DTC Chart

HINT:

(See DIAGNOSTIC TROUBLE CODE CHART).

18. Circuit Inspection

19. Repair or Replace

20. Confirmation Test

NEXT: End

ROAD TEST

1. PROBLEM SYMPTOM CONFIRMATION

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

2. ROAD TEST

NOTE: Perform the test at the ATF (Automatic Transmission Fluid) temperature 50 to 80°C (122 to 176°F) in the normal operation.

- a. D position test:

Shift into the D position and fully depress the accelerator pedal and check the following points.

1. Check up-shift operation.

Check that 1 --> 2, 2 --> 3 and 3 --> O/D up-shifts take place, and that the shift points conform to the automatic shift schedule (See **U140F AUTOMATIC TRANSAXLE**).

HINT:

O/D Gear Up-shift Prohibition Control

- Engine coolant temperature is 60°C (140°F) or less and vehicle speed is at 70 km/h (43 mph) or less.
- ATF temperature is 10°C (50°F) or less.

O/D Gear Lock up Prohibition Control

- Brake pedal is depressed.
- Accelerator pedal is released.
- Engine coolant temperature is 60°C (140°F) or less.

2. Check for shift shock and slip.

Check for shock and slip at the 1 --> 2, 2 --> 3 and 3 --> O/D up-shifts.

3. Check for abnormal noise and vibration.

Check for abnormal noise and vibration when up-shifting from 1 --> 2, 2 --> 3 and 3 --> O/D while driving with the shift lever in the D position, and check while driving in the lock up condition.

HINT:

The check for the cause of abnormal noise and vibration must be done thoroughly as it could also be due to loss of balance in the differential, torque converter clutch, etc.

4. Check kick-down operation.

Check vehicle speeds when the 2nd to 1st, 3rd to 2nd and O/D to 3rd kick-downs take place while driving with the shift lever in the D position. Confirm that each speed is within the applicable vehicle speed range indicated in the automatic shift schedule (See **U140F AUTOMATIC TRANSAXLE**).

5. Check abnormal shock and slip at kick-down.

6. Check the lock up mechanism.

- Drive in D position (O/D 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 the 1st and 2nd gear.
- If there is a big jump in engine speed, there is no lock up.

b. 2 position test:

Shift into the 2 position and fully depress the accelerator pedal and check the following points.

1. Check up-shift operation.

Check that the 1 --> 2 up-shift takes place and that the shift point conforms to the automatic shift schedule (See **U140F AUTOMATIC TRANSAXLE**).

HINT:

There is no 3rd up-shift and lock up in the 2 position.

2. Check engine braking.

While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.

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

c. L position test:

Shift into the L position and fully depress the accelerator pedal and check the following points.

1. Check no up-shift.

While running in the L position, check that there is no up-shift to 2nd gear.

HINT:

There is no lock up in the L position.

2. Check engine braking.

While running in the L position, release the accelerator pedal and check the engine braking effect.

3. Check for abnormal noise during acceleration and deceleration.**d. R position test:**

Shift into the R position, lightly depress the accelerator pedal, and check that the vehicle moves backward without any abnormal noise or vibration.

CAUTION: Before conducting this test ensure that the test area is free from people and obstruction.

e. P position test:

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

MECHANICAL SYSTEM TESTS**1. PERFORM MECHANICAL SYSTEM TESTS****a. Measure the stall speed.**

The object of this test is to check the overall performance of the transaxle and engine by measuring the stall speeds in the D position.

NOTE:

- **Driving test should be done on a paved road (a nonskid road).**
- **Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature 50 to 80°C (122 to 176°F).**
- **Do not continuously run this test for longer than 10 seconds.**
- **To ensure safety, do this test in a wide, clear level area which provides good traction.**
- **The stall test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**

1. Chock the 4 wheels.**2. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.**

3. Fully apply the parking brake.
4. Keep your left foot pressed firmly on the brake pedal.
5. Start the engine.
6. Shift into the D position. Press all the way down on the accelerator pedal with your right foot.
7. Quickly read the stall speed at this time.

Stall speed:

2,250 +- 150 rpm

Evaluation:

PROBLEM AND POSSIBLE CAUSE

Problem	Possible cause
(a) Stall engine speed is low in D position	• Engine power output may be insufficient • Stator one-way clutch not operating property HINT: If the value is less than the specified value by 600 rpm or more, the torque converter could be faulty.
(b) Stall engine speed is high in D position	• Line pressure is too low • Forward clutch slipping • U/D (Underdrive) clutch slipping • U/D (Underdrive) one-way clutch is not operating properly • No. 2 one-way clutch not operating properly • Improper fluid level

b. Measure the time lag.

1. When the shift lever is shifted 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.

NOTE:

- Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature: 50 to 80°C (122 to 176°F).
- Be sure to allow 1 minute interval between tests.
- Perform the test three times, and measure the time lags. Calculate the average value of the three time lags.

2. Connect the intelligent tester together with the CAN VIM (controller area network vehicle

interface module) to the DLC3.

3. Fully apply the parking brake.
4. Start and warm up the engine and check idle speed.

Idle speed:

approx. 700 rpm (In N position and A/C OFF)

5. Shift the lever from N to D position. Using a stop watch, measure the time from when the lever is shifted until the shock is felt.

Time lag:

N --> D less than 1.2 seconds

6. In the same way, measure the time lag for N --> R.

Time lag:

N --> R less than 1.5 seconds

Evaluation (If N --> D or M --> R time lag is longer than the specified):

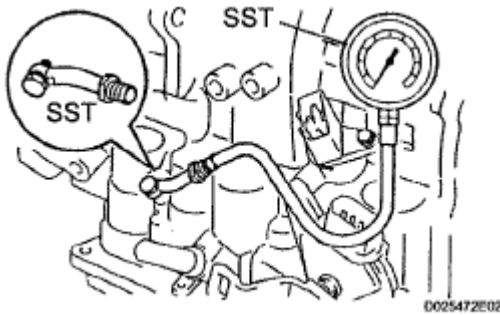
PROBLEM AND POSSIBLE CAUSE

Problem	Possible cause
N --> D time lag is longer	• Line pressure is too low • Forward clutch worn • No.1 one-way clutch is not operating properly • U/D (Underdrive) one-way clutch is not operating
N --> R time lag is longer	• Line pressure is too low • Direct clutch worn • 1st and reverse brake worn • U/D (Underdrive) one-way clutch not operating properly

HYDRAULIC TEST

1. PERFORM HYDRAULIC TEST

- a. Measure the line pressure.

**Fig. 3: Measuring Line Pressure**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature: 50 to 80°C (122 to 176°F).
- The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.
- Be careful to prevent SST hose from interfering with the exhaust pipe.
- This Check must be conducted after checking and adjusting engine.
- Perform under condition that A/C is OFF.
- When conducting stall test, do not continue more than 10 seconds.

1. Warm up the ATF:
2. Remove the test plug on the front side of the transaxle case and connect SST.

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

3. Fully apply the parking brake and chock the 4 wheels.
4. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
5. Start the engine and check idling speed.
6. Keep your left foot pressing firmly on the brake pedal and shift into D position.
7. Measure the line pressure when the engine is idling.
8. Depress the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.
9. In the same way, do the test in R position.

Specified line pressure:

SPECIFIED LINE PRESSURE

Condition	D position kPa (kgf/cm ² , psi)	R position kPa (kgf/cm ² , psi)
Idling	372 to 412 kPa (3.8 to 4.2 kgf/cm ² , 54 to 60 psi)	672 to 742 kPa (6.9 to 7.6 kgf/cm ² , 97 to 108 psi)
Stall test	931 to 1,031 kPa (9.5 to 10.5 kgf/cm ² , 135 to 150 psi)	1,768 to 1,968 kPa (18.0 to 20.0 kgf/cm ² , 256 to 285 psi)

Evaluation:
PROBLEM AND POSSIBLE CAUSE

Problem	Possible cause
If the measured values at all positions are higher	• Line pressure control solenoid (SLT) defective • Regulator valve defective
If the measured values at all positions are lower	• Line pressure control solenoid (SLT) defective • Regulator valve defective • Oil pump defective • U/D (Underdrive) direct clutch defective
If pressure is low in the D position only	• D position circuit fluid leak • Forward clutch defective
If pressure is low in the R position only	• R position circuit fluid leak • Direct clutch defective • 1st and reverse brake defective

MANUAL SHIFTING TEST
1. PERFORM MANUAL SHIFTING TEST
HINT:

- With this test, it can be determined whether the trouble occurs in the electrical circuit or 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 transmission wire connector.
 - b. Inspect the manual driving operation.

Check that the shift and gear positions correspond to the table below.

Check that the gear change corresponds to the shift position.

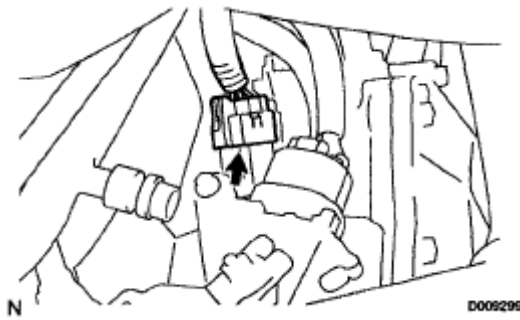


Fig. 4: Locating Transmission Wire Connector

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SHIFT POSITION AND GEAR POSITION

Shift Position	Gear Position
D	3rd
2	3rd
L	3rd
R	Reverse
P	Pawl Lock

HINT:

If the gear positions of the L, 2 and D are difficult to distinguish, do the following **ROAD TEST** .

If any abnormality is found in the above test, the problem is in the transaxle itself.

- c. Connect the transmission wire connector.
- d. Clear the DTC (See **DTC CHECK / CLEAR**).

INITIALIZATION

1. RESET MEMORY

NOTE:

- Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assembly, engine assembly or ECM.
- The RESET MEMORY can be performed only with the Intelligent tester.

HINT:

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

Reset procedure is as follows.

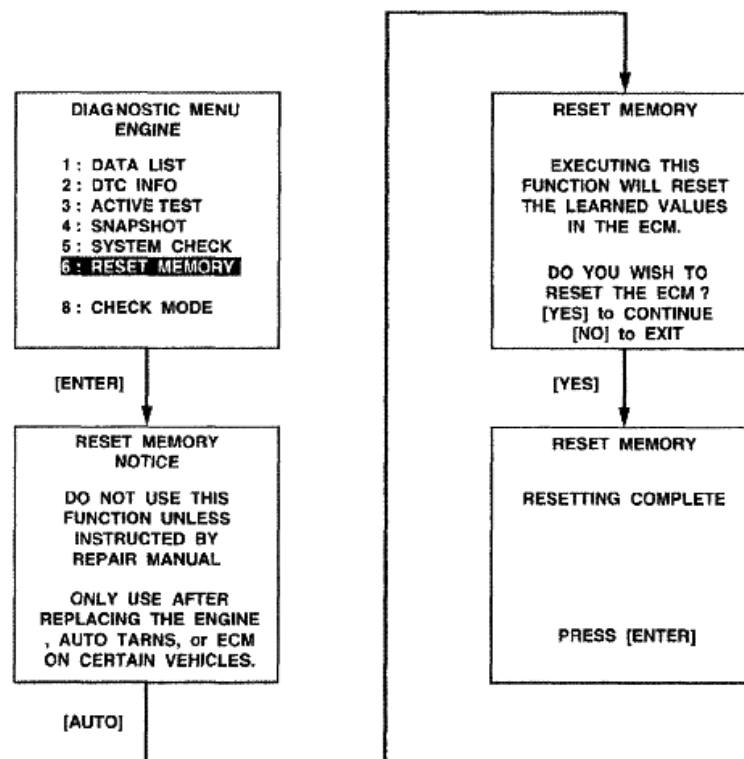
- Turn the ignition switch off.
- Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
- Turn the ignition switch to the ON position and push the intelligent tester main switch on.
- Select the item "DIAGNOSIS / ENHANCED OBD II".
- Perform the reset memory procedure from the ENGINE menu.

CAUTION: After performing the RESET MEMORY, be sure to perform the ROAD TEST described earlier.

HINT:

The ECM is learned by performing the ROAD TEST.

- Tester menu flow:



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Fig. 5: Tester Menu Flow Chart

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

MONITOR DRIVE PATTERN

1. MONITOR DRIVE PATTERN FOR ECT TEST

- a. Perform this drive pattern as one method to simulate the detection conditions of the ECT malfunctions. (The DTCs may not be detected due the actual driving conditions. And some codes may not be detected through this drive pattern.)

HINT:**Preparation for driving**

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

Driving note

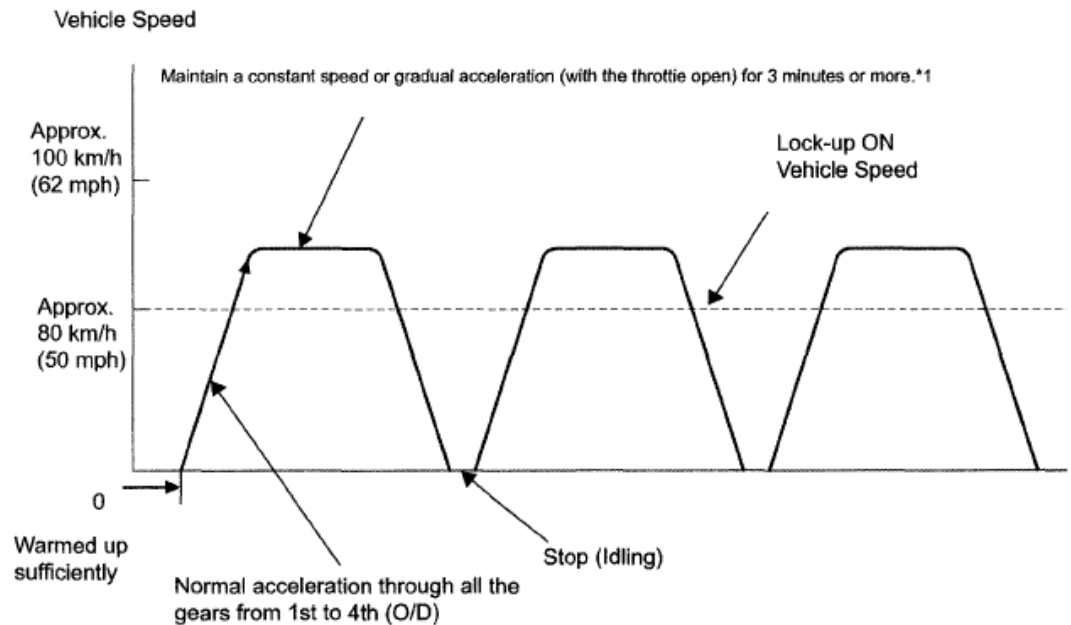
- Drive the vehicle through all gears.

Stop --> 1st --> 2nd --> 3rd --> 4th (O/D) --> 4th (lock up ON).

- Repeat the above driving pattern three times or more.

NOTE:

- **The monitor status can be checked using the OBD II scan tool or intelligent tester. When using the intelligent tester, monitor status can be found in the "ENHANCED OBD II / DATA LIST" or under "CARB OBD II"**
- **In the event that the drive pattern must be interrupted (possibly due to traffic conditions or other factors), the drive pattern can be resumed and in most cases, the monitor can be completed.**
- **Perform this drive pattern on a level road as much as possible and strictly observe the posted speed limits and traffic laws while driving.**



G0315

Fig. 6: ECT Test - Monitor Drive Pattern
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

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

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

PROBLEM SYMPTOMS TABLE

HINT:

- If a normal code is displayed during the diagnostic trouble code check although the trouble still occurs, check the electrical circuits for each symptom in the order given in the charts on the following pages and proceed to the page given for troubleshooting.
- The Matrix Chart is divided into 2 chapters.
- When the circuit on which mark *1 is attached is a malfunction, DTC could be output.

Refer to the table below when the trouble cause is considered to be electrical the instruction "Proceed to next circuit inspection shown on matrix chart" is given in the flow chart of each circuit, proceed to the circuit with the next highest number in the table to continue the check. If the trouble still occurs even though there are no abnormalities in any of the other circuits, check and replace the ECM.

1. Chapter 1: Electronic Circuit Matrix Chart
ELECTRONIC CIRCUIT MATRIX CHART

Symptom	Suspected area	See
No up-shift(1st -> 2nd)	ECM	<u>ELECTRONIC CIRCUIT INSPECTION PROCEDURE</u>
No up-shift (2nd -> 3rd)	ECM	<u>ELECTRONIC CIRCUIT INSPECTION PROCEDURE</u>
No up-shift (3rd -> O/D)	1. Transmission control switch (O/D OFF) circuit	<u>O/D MAIN SWITCH CIRCUIT</u>
	2. ECM	<u>ELECTRONIC CIRCUIT INSPECTION PROCEDURE</u>
No down-shift (O/D -> 3rd)	ECM	<u>ELECTRONIC CIRCUIT INSPECTION PROCEDURE</u>
No down-shift (3rd -> 2nd)	ECM	<u>ELECTRONIC CIRCUIT INSPECTION PROCEDURE</u>
No down-shift (2nd -> 1st)	ECM	<u>ELECTRONIC CIRCUIT INSPECTION PROCEDURE</u>
No lock up or No lock up off	ECM	<u>ELECTRONIC CIRCUIT INSPECTION PROCEDURE</u>
Shift point too high or too low	ECM	<u>ELECTRONIC CIRCUIT INSPECTION PROCEDURE</u>
Up-shift to O/D from 3rd (While O/D main switch is OFF)	1. Transmission control switch (O/D OFF) circuit	<u>O/D MAIN SWITCH CIRCUIT</u>
	2. ECM	<u>ELECTRONIC CIRCUIT INSPECTION PROCEDURE</u>
Up-shift to O/D from 3rd while engine is cold	1. Engine coolant temp, sensor circuit *1	<u>DIAGNOSTIC TROUBLE CODE CHART</u>
	2. ECM	<u>ELECTRONIC CIRCUIT INSPECTION PROCEDURE</u>
Harsh engagement (N -> D)	ECM	<u>ELECTRONIC CIRCUIT INSPECTION PROCEDURE</u>
Harsh engagement (Lock up)	ECM	<u>ELECTRONIC CIRCUIT INSPECTION PROCEDURE</u>
Harsh engagement (Any driving position)	ECM	<u>ELECTRONIC CIRCUIT INSPECTION PROCEDURE</u>
Poor acceleration	ECM	<u>ELECTRONIC CIRCUIT INSPECTION PROCEDURE</u>
Engine stalls when starting off or stopping	ECM	<u>ELECTRONIC CIRCUIT INSPECTION PROCEDURE</u>
Malfunction in shifting	1. Park/neutral position switch circuit *1	<u>DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (PRNDL INPUT)</u>

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

2. ECM

**ELECTRONIC CIRCUIT
INSPECTION PROCEDURE****HINT:**

*1: When the circuit on which mark *1 is detective, a DTC may be output.

2. Chapter 2: On-Vehicle Repair and Off-Vehicle Repair**ON-VEHICLE REPAIR AND OFF-VEHICLE REPAIR REFERENCE**

Symptom	Suspected area	See
Vehicle does not move in any forward positions and reverse positions	1. Manual valve	<u>AUTOMATIC TRANSAXLE UNIT</u>
	2. Primary regulator valve	<u>AUTOMATIC TRANSAXLE UNIT</u>
	3. Front and rear planetary gear	<u>AUTOMATIC TRANSAXLE UNIT</u>
	4. U/D planetary gear	<u>AUTOMATIC TRANSAXLE UNIT</u>
	5. U/D one-way clutch (F2)	<u>AUTOMATIC TRANSAXLE UNIT</u>
	6. Forward clutch (C1)	<u>AUTOMATIC TRANSAXLE UNIT</u>
	7. U/D brake (B3)	<u>AUTOMATIC TRANSAXLE UNIT</u>
Vehicle does not move in R position	1. Front and rear planetary gear unit	<u>AUTOMATIC TRANSAXLE UNIT</u>
	2. U/D planetary gear unit	<u>AUTOMATIC TRANSAXLE UNIT</u>
	3. Direct clutch (C2)	<u>AUTOMATIC TRANSAXLE UNIT</u>
	4. U/D brake (C3)	<u>AUTOMATIC TRANSAXLE UNIT</u>
	5. 1st and reverse brake (B2)	<u>AUTOMATIC TRANSAXLE UNIT</u>
No up-shift (1st -> 2nd)	1. Valve body assembly	<u>VALVE BODY ASSEMBLY</u>
	2. No. 1 one-way clutch (F1)	<u>AUTOMATIC TRANSAXLE UNIT</u>
	3. 2nd brake (B1)	<u>AUTOMATIC TRANSAXLE UNIT</u>
No up-shift (2nd -> 3rd)	1. Valve body assembly	<u>VALVE BODY ASSEMBLY</u>
	2. Direct clutch (C2)	<u>AUTOMATIC TRANSAXLE UNIT</u>
No up-shift (3rd -> O/D)	1. Valve body assembly	<u>VALVE BODY ASSEMBLY</u>
	2. U/D clutch (C3)	<u>AUTOMATIC TRANSAXLE UNIT</u>

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

No down-shift (O/D -> 3rd)	Valve body assembly	<u>VALVE BODY ASSEMBLY</u>
No down-shift (3rd -> 2nd)	Valve body assembly	<u>VALVE BODY ASSEMBLY</u>
No down-shift (2nd -> 1st)	Valve body assembly	<u>VALVE BODY ASSEMBLY</u>
No lock up or No lock up off	1. Lock up relay valve	<u>AUTOMATIC TRANSAXLE UNIT</u>
	2. Torque converter clutch	<u>AUTOMATIC TRANSAXLE UNIT</u>
Harsh engagement (N -> D)	1. C1 accumulator	<u>AUTOMATIC TRANSAXLE UNIT</u>
	2. Valve body assembly	<u>VALVE BODY ASSEMBLY</u>
	3. Forward clutch (C1)	<u>AUTOMATIC TRANSAXLE UNIT</u>
	4. U/D one-way clutch (F2)	<u>AUTOMATIC TRANSAXLE UNIT</u>
	5. No. 1 one-way clutch (F1)	<u>AUTOMATIC TRANSAXLE UNIT</u>
Harsh engagement (N -> R)	1. Valve body assembly	<u>VALVE BODY ASSEMBLY</u>
	2. Direct clutch (C2)	<u>AUTOMATIC TRANSAXLE UNIT</u>
	3. 1st and reverse brake (B2)	<u>AUTOMATIC TRANSAXLE UNIT</u>
Harsh engagement (Lock up)	1. Lock up relay valve	<u>AUTOMATIC TRANSAXLE UNIT</u>
	2. Torque converter clutch	<u>AUTOMATIC TRANSAXLE UNIT</u>
Harsh engagement (2nd -> 3rd)	Valve body assembly	<u>VALVE BODY ASSEMBLY</u>
Harsh engagement (3rd -> O/D)	Valve body assembly	<u>VALVE BODY ASSEMBLY</u>
Harsh engagement (O/D -> 3rd)	Valve body assembly	<u>VALVE BODY ASSEMBLY</u>
Slip or shudder (Forward position: After warm-up)	1. Oil strainer	<u>AUTOMATIC TRANSAXLE UNIT</u>
	2. Torque converter clutch	<u>AUTOMATIC TRANSAXLE UNIT</u>
	3. Forward clutch (C1)	<u>AUTOMATIC TRANSAXLE UNIT</u>
	4. Direct clutch (C2)	<u>AUTOMATIC TRANSAXLE UNIT</u>
	5. U/D brake (C3)	<u>AUTOMATIC TRANSAXLE UNIT</u>
	6. No. 1 one-way clutch (F1)	<u>AUTOMATIC TRANSAXLE UNIT</u>
	7. U/D one-way clutch (F2)	<u>AUTOMATIC TRANSAXLE UNIT</u>
	1. Oil strainer	<u>AUTOMATIC TRANSAXLE UNIT</u>

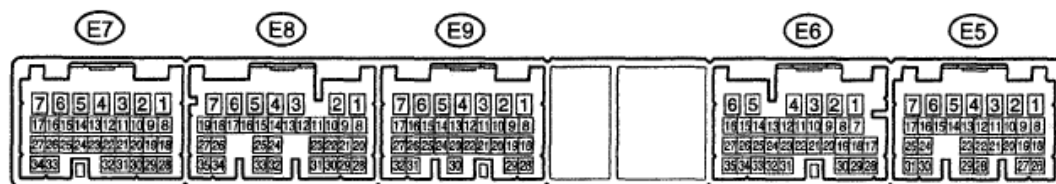
2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

Slip or shudder (R position)	2. Direct clutch (C2)	<u>AUTOMATIC TRANSAXLE UNIT</u>
	3. 1st and reverse brake (B2)	<u>AUTOMATIC TRANSAXLE UNIT</u>
Slip or shudder (1st)	No. 1 one-way clutch (F1)	<u>AUTOMATIC TRANSAXLE UNIT</u>
Slip or shudder (2nd)	1. U/D one-way clutch (F2)	<u>AUTOMATIC TRANSAXLE UNIT</u>
	2. 2nd brake (B1)	<u>AUTOMATIC TRANSAXLE UNIT</u>
Slip or shudder (3rd)	Direct clutch (C2)	<u>AUTOMATIC TRANSAXLE UNIT</u>
Slip or shudder (O/D)	U/D clutch (C3)	<u>AUTOMATIC TRANSAXLE UNIT</u>
No engine braking (1st to 3rd: D position)	U/D brake (B3)	<u>AUTOMATIC TRANSAXLE UNIT</u>
No engine braking (1st: L position)	1st and reverse brake (B2)	<u>AUTOMATIC TRANSAXLE UNIT</u>
No engine braking (2nd: 2 position)	2nd brake (B1)	<u>AUTOMATIC TRANSAXLE UNIT</u>
Poor acceleration (All position)	1. Torque converter clutch	<u>AUTOMATIC TRANSAXLE UNIT</u>
	2. U/D planetary gear	<u>AUTOMATIC TRANSAXLE UNIT</u>
Poor acceleration (O/D)	1. U/D clutch (C3)	<u>AUTOMATIC TRANSAXLE UNIT</u>
	2. U/D planetary gear	<u>AUTOMATIC TRANSAXLE UNIT</u>
Large shift shock or engine stalls when starting off or stopping	Torque converter clutch	<u>AUTOMATIC TRANSAXLE UNIT</u>
No kick-down	Valve body assembly	<u>VALVE BODY ASSEMBLY</u>

TERMINALS OF ECM

1. ECM



CO91968E07

Fig. 7: Identifying ECM Connector Terminals

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

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

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

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

REFERENCE FOR ECM TERMINALS

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
P (E5-6) - E1 (E9-1)	V - BR	P shift position switch signal	IG switch ON and shift lever P: position	10 to 14 V
?	?	?	IG switch ON and shift lever except P position	Below 1 V
N (E5-7) - E1 (E9-1)	GR-BR	N shift position switch signal	IG switch ON and shift lever N position	10 to 14 V
?	?	?	IG switch ON and shift lever except N position	Below 1 V
NSW (E7-16)-E1 (E9-1)	B-R - BR	Park neutral switch signal	IG switch ON and shift lever P and N position	Below 1V
?	?	?	IG switch ON and shift lever except P and N position	10 to 14 V
DSL (E8-9) - E1 (E9-1)	Y-G - BR	DSL solenoid signal	Vehicle speed 65 km/h (40 mph), lock up (ON to OFF)	Pulse generation (See bwaveform 2)
S4 (E8-11) - E1 (E9-1)	L - BR	S4 solenoid signal	IG switch ON	Below 1 V
?	?	?	O/D gear	10 to 14 V
?	?	?	Except O/D gear	Below 1 V
SL2+ (E8-15) - SL2- (E8-14)	L-Y - L- R	SL2 solenoid signal	Engine idle speed	Pulse generation (See cwaveform 3)
?	?	?	IG switch ON	Below 1 V
?	?	?	1st or 2nd gear	10 to 14 V
?	?	?	3rd or O/D gear	Below 1
SL1+ (E8-19) - SL1- (E8-18)	R-B - B- W	SL1 solenoid signal	Engine idle speed	Pulse generation (See dwaveform 4)
?	?	?	IG switch ON	10 to 14 V
?	?	?	1st gear	10 to 14 V
?	?	?	Except 1st gear	Below 1
NC+ (E8-26) - NC- (E8-34)	Y - W-G	Speed sensor (NC) signal	Vehicle speed 30 km/h (19 mph): (3rd gear) Engine speed 1,400	Pulse generation (See ewaveform 5)

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

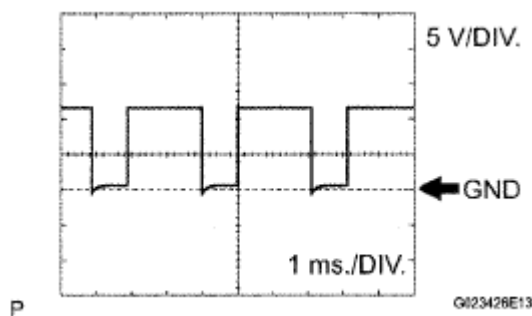
			rpm	
NT+ (E8-27) - NT- (E8-35)	W - R-W	Speed sensor (NT) signal	Vehicle speed 20 km/h (12 mph)	Pulse generation (See fwaveform 6)
SLT+ (E8-13) - SLT- (E8-12)	Y-R - B-Y	SLT solenoid signal	Engine idle speed	Pulse generation (See awaveform 1)
THO (E8-32) - E2 (E7-28)	G-Y - BR	ATF temperature sensor signal	ATF temperature: 115°C (239°F) or more	Below 1.5 V
L (E6-8) - E1 (E9-1)	R-BR	L shift position switch signal	IG switch ON and shift lever L position	10 to 14 V
?	?	?	IG switch ON and shift lever except L position	Below 1 V
2 (E6-9) - E1 (E9-1)	P-BR	2 shift position switch signal	IG switch ON and shift lever 2 position	10 to 14 V
?	?	?	IG switch ON and shift lever except 2 position	Below 1 V
D (E6-10) - E1 (E9-1)	Y - BR	D shift position switch signal	IG switch ON and shift lever D position	10 to 14 V
?	?	?	IG switch ON and shift lever except D position	Below 1 V
R (E6-11) - E1 (E9-1)	L-BR	R shift position switch signal	IG switch ON and shift lever R position	10 to 14 V
?	?	?	IG switch ON and shift lever except R position	Below 1 V
SPD (E6-17) - E1 (E9-1)	Y-BR	Speed signal	Vehicle speed 20 km/h (12 mph)	Pulse generation (See gwaveform 7)
STP (E6-19) - E1 (E9-1)	BR-BR	Stop light switch signal	Brake pedal is depressed	7.5 to 14 V
?	?	?	Brake pedal is released	Below 1.5 V
ODMS (E5-16) - E1 (E9-1)	GR-BR	O/D main switch	IG switch ON	10 to 14 V
?	?	?	IG switch ON and press continuously O/D main switch	Below 1 V

a. Waveform 1

Reference:

WAVEFORM REFERENCE

Terminal	SLT+-SLT-
Tool setting	5 V/DIV., 1 ms./DIV.
Vehicle condition	Engine idle speed

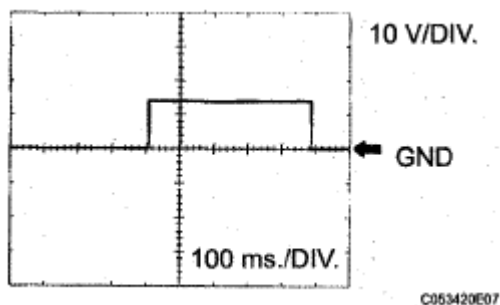
**Fig. 8: Identifying Waveform 1**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

b. Waveform 2

Reference:**WAVEFORM REFERENCE**

Terminal	DSL-E1
Tool setting	10 V/DIV., 100 ms./DIV.
Vehicle condition	Vehicle speed 65 km/h (40 mph), lock up (ON to OFF)

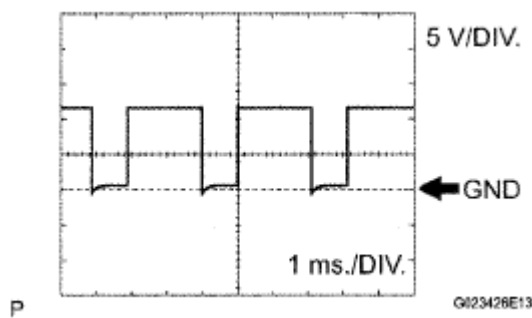
**Fig. 9: Identifying Waveform 2**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

c. Waveform 3

Reference:**WAVEFORM REFERENCE**

Terminal	SL2+ - SL2-
Tool setting	5 V/DIV., 1 ms./DIV.
Vehicle condition	Engine idle speed

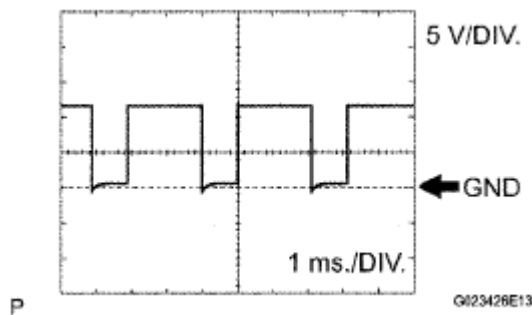
**Fig. 10: Identifying Waveform 3**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Waveform 4

Reference:**WAVEFORM REFERENCE**

Terminal	SL1 +- SL1-
Tool setting	5 V/DIV., 1 ms./DIV.
Vehicle condition	Engine idle speed

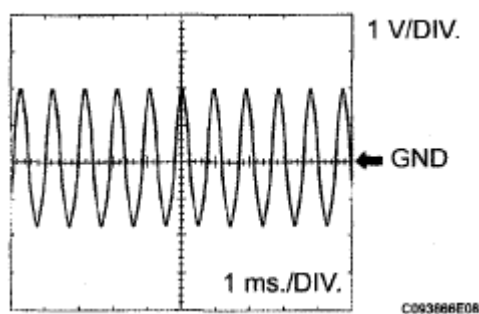
**Fig. 11: Identifying Waveform 4**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

e. Waveform 5

Reference:**WAVEFORM REFERENCE**

Terminal	NC+ - NC-
Tool setting	1 V/DIV., 1 ms./DIV.
Vehicle condition	Vehicle speed 30 km/h (19 mph): (3rd gear) Engine speed 1.400 rpm

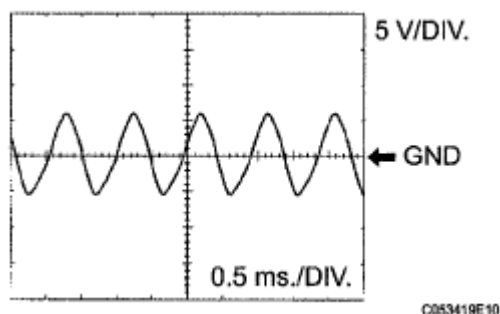
**Fig. 12: Identifying Waveform 5**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

f. Waveform 6

Reference:**WAVEFORM REFERENCE**

Terminal	NT+ - NT-
Tool setting	5 V/DIV., 0.5 ms./DIV.
Vehicle condition	Vehicle speed 20 km/h (12 mph)

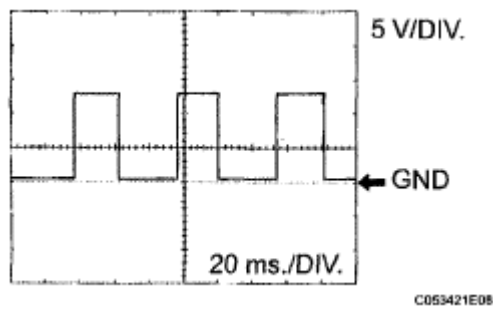
**Fig. 13: Identifying Waveform 6**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

g. Waveform 7

Reference:**WAVEFORM REFERENCE**

Terminal	SPD - E1
Tool setting	5 V/DIV, 20 ms./DIV.
Vehicle condition	Vehicle speed 20 km/h (12 mph)

**Fig. 14: Identifying Waveform 7**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DIAGNOSIS SYSTEM**1. DESCRIPTION**

- a. When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is to connect an OBD II scan tool complying with SAE J1987 or a intelligent tester to the vehicle, and read off various data output from the vehicle's ECM.
- b. OBD II regulations require that the vehicle's on board computer illuminate the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in the computer itself or in the drive system components which affect the vehicle emissions. In addition to illuminating the MIL when a malfunction is detected, the applicable DTCs prescribed by SAE J2012 are recorded in the ECM memory (See **DIAGNOSTIC TROUBLE CODE CHART**).

If the malfunction does not occur in 3 consecutive trips, the MIL goes off but the DTCs remain in the ECM memory.



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Fig. 15: Identifying (Mil) Malfunction Indicator Lamp

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- c. To check the DTCs, connect the OBD II scan tool or intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3 of the vehicle. The OBD II scan tool or intelligent tester also enables you to erase the DTCs and check freeze frame data and various forms of engine data (For operating instructions, see the instruction book).
- d. The DTCs include SAE controlled codes and Manufacturer controlled codes. SAE controlled codes must be set as prescribed by the SAE, while Manufacturer controlled codes can be set freely by a manufacturer within the prescribed limits (See **DIAGNOSTIC TROUBLE CODE CHART**).

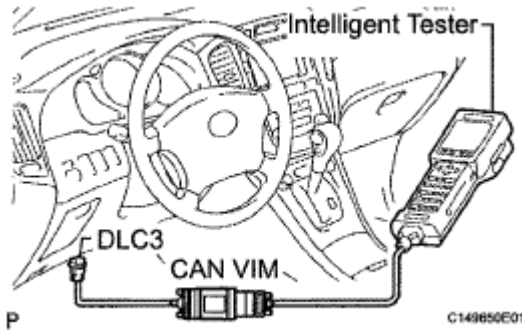


Fig. 16: Connecting Intelligent Tester To DLC3

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. The diagnosis system operates in "normal mode" during the normal vehicle use. In normal mode, "2-trip detection logic" is used to ensure accurate detection of malfunction. "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 malfunction.
- f. *2 trip detection logic: When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory (1st trip). If the ignition switch is turned off and then turned to the ON position again, and same malfunction is detected again, the MIL will illuminate.
- g. Freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air/fuel ratio was Lean or Rich, and other data from the time the malfunction occurred.
- h. The intelligent tester records freeze frame data in five different instance: 1) 3 times before the DTC is set, 2) once when the DTC is set, and 3) once after the DTC is set. These data can be used to simulate the vehicle's condition around the time when the malfunction occurred. The data may help find the cause of the malfunction, or judge if the DTC is being caused by temporary malfunction or not.

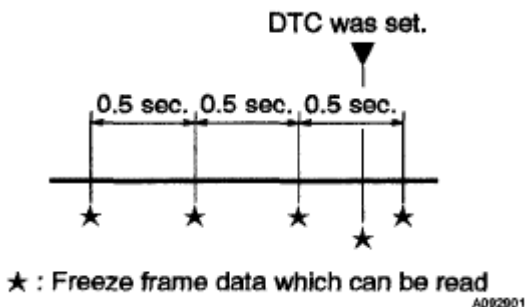


Fig. 17: DTC Blinking Timing Steps

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2. INSPECT THE DLC3

- a. The vehicle's ECM uses ISO 15765-4 for communication. The terminal arrangement of the DLC3

complies with SAE J1962 and matches the ISO 15765-14 format.

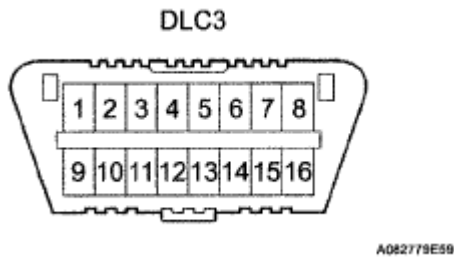


Fig. 18: Identifying DLC3 Connector Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Terminals of DLC3:

DLC3 CONNECTOR TERMINALS REFERENCE

Symbol	Terminal No.	Name	Reference Terminal	Result	Condition
SIL	7	Bus "+" fine	5 - Signal ground	Pulse generation	During transmission
CG	4	Chassis ground	Body ground	Below 1 ohms	Always
SG	5	Signal ground	Body ground	Below 1 ohms	Always
BAT	16	Battery positive	Body ground	11 to 14 V	Always
CANH	6	CAN bus line	CANL	56 to 69 ohms	IG switch OFF ⁽¹⁾
CANH	6	HIGH-level CAN bus line	Battery positive	6 kohms or higher	IG switch OFF ⁽¹⁾
CANH	6	HIGH-level CAN bus line	CG	200 ohms or higher	IG switch OFF ⁽¹⁾
CANL	14	LOW-level CAN bus line	Battery positive	6 kohms or higher	IG switch OFF ⁽¹⁾
CANL	14	LOW-level CAN bus line	CG	200 ohms or higher	IG switch OFF ⁽¹⁾

CAUTION:

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

HINT:

If your display shows UNABLE TO CONNECT TO VEHICLE when you have connected the cable of the OBD II scan tool or intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3, turned the ignition switch to the ON position and operated the scan tool, there is a problem on the vehicle side or tool side.

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

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

3. CHECK BATTERY VOLTAGE

- a. Measure the battery voltage.

Battery voltage:

11 to 14 V

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

4. CHECK MIL

- a. The MIL comes on when the ignition switch is turned to the on position and the engine is not running.

HINT:

If the MIL does not light up, troubleshoot the combination meter.

- b. When the engine is started, the MIL should go off. If the lamp remains on, it means that the diagnosis system has detected a malfunction or abnormality in the system.

DTC CHECK / CLEAR

1. DTC CHECK (NORMAL MODE)

NOTE: When the diagnostic system is switched from the normal mode to the check mode, all the DTCs and freeze frame data recorded in the normal mode will be erased. So before switching modes, always check the DTCs and freeze frame data, and note them down.

- a. Checking DTCs using the OBD II scan tool or intelligent tester.
 1. Turn the ignition switch off.
 2. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
 3. Turn the ignition switch to the on position and turn the OBD II scan tool or the intelligent tester main switch on.

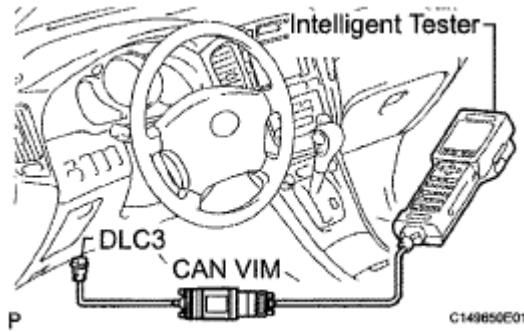


Fig. 19: Connecting Intelligent Tester To DLC3
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".
5. Use the OBD II scan tool or intelligent tester to check the DTCs and freeze frame data and note them down (For operating instructions, see the OBD II scan tool's instruction book).

NOTE: When simulating symptoms with an OBD II scan tool (excluding intelligent tester) to check the DTCs, use the normal mode. For codes on the DTCs chart which are subject to "2 trip detection logic",

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

2. DTC CLEAR

- a. When using the OBD II scan tool or intelligent tester: Clearing the DTCs.
 1. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
 2. Turn the ignition switch to the on position and turn the OBD II scan tool or the intelligent tester main switch on.
 3. Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CLEAR CODES [YES] button".

HINT:

When operating the OBD II scan tool (complying with SAE J1978) or intelligent tester to erase the codes, the DTCs and freeze frame data will be erased. (See the OBD II scan tool's instruction book for operating instructions.)

- b. When not using the OBD II scan tool or intelligent tester: Clearing the DTCs.
 1. Disconnect the battery terminal or remove the EFI and ETCS fuses from the engine room J/B for 60 seconds or more. However, if you disconnect the battery terminal, perform the **INITIALIZATION** procedure.

CHECK MODE PROCEDURE

HINT:

Check mode has a higher sensitivity to malfunctions and can detect malfunction 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.

1. DTC CHECK (CHECK MODE)

HINT:

Intelligent tester only: Compared to the normal mode, the check mode is more sensitive for detecting malfunctions. Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode.

a. Procedure for Check Mode using the intelligent tester.

1. Check the initial conditions.

- Battery positive voltage 11 V or more
- Throttle valve fully closed
- Transaxle in the P or N position
- A/C switch is off

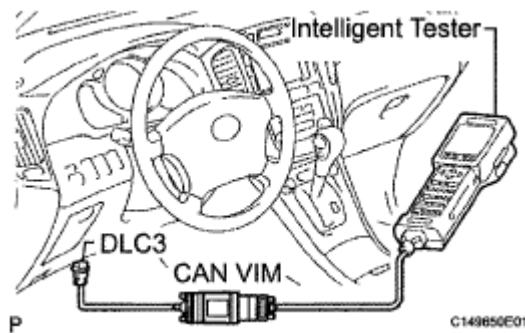


Fig. 20: Connecting Intelligent Tester To DLC3
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to on position and turn the intelligent tester main switch on.
5. Select the item "DIAGNOSIS/ENHANCED OBD II/CHECK MODE" (Check that the MIL flashes).

NOTE: All DTCs and freeze frame data recorded will be erased if: 1) the intelligent tester is used to change the ECM from normal mode

to check mode or vice-versa; or 2) during check mode, the ignition switch is turned from the ON to ACC position or turned OFF.

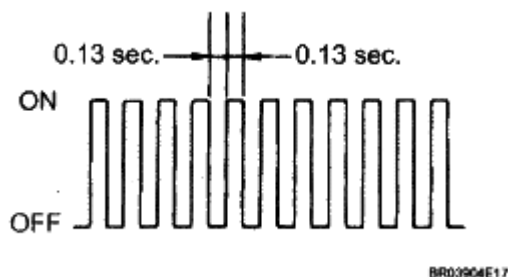


Fig. 21: Identifying Blinking Pattern

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6. Start the engine (the MIL goes off after the engine starts).
7. Perform "MONITOR DRIVE PATTERN" for the ECT test (See **MONITOR DRIVE PATTERN**). (Or, simulate the conditions of the malfunction described by the customer).

NOTE: Leave the ignition switch in the ON position until you have checked the DTCs, etc.

8. After simulating malfunction conditions, use the intelligent tester diagnosis selector to check the DTCs and freeze frame data, etc.
9. When you use intelligent tester: Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".
10. After checking the DTC, inspect the applicable circuit.
11. (See **DIAGNOSTIC TROUBLE CODE CHART**) to confirm the details of the DTCs.

2. DTC CLEAR

- a. When using the OBD II scan tool or intelligent tester: Clearing the DTCs.
 1. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
 2. Turn the ignition switch to the ON position and turn the OBD II scan tool or the intelligent tester main switch on.
 3. When you use intelligent tester: Select the item "DIAGNOSIS/ENHANCED OBD II/DTC INFO/ CLEAR CODES [YES] button".

HINT:

When operating the OBD II scan tool (complying with SAE J1978) or intelligent tester to erase the codes, the DTCs and freeze frame data will be erased. (See the OBD II scan tool's instruction book for operating instructions.)

- b. When not using the OBD II scan tool or intelligent tester: Clearing the DTCs.

1. Disconnect the battery cable or remove the EFI and ETCS fuses from the engine room J/B for 60 seconds or more. However, if you disconnect the battery cable, perform do the **INITIALIZATION** procedure.

FAIL-SAFE CHART

1. FAIL-SAFE

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

- a. ATF (Automatic Transmission Fluid) temperature sensor:

When the ATF temperature sensor has a malfunction, O/D upshift is prohibited.

- b. Counter gear speed sensor NC (Speed sensor NC): When the counter gear speed sensor has a malfunction, O/D upshift is prohibited.
- c. Shift solenoid valve DSL:

When the solenoid valve DSL has a malfunction, the current to the solenoid valve is stopped. This stops lock up control, then fuel economy decreases.

- d. Shift solenoid valve SL1, SL2 and S4:

Fail safe function:

If either of the shift solenoid valve circuits develops an open or short, the ECM turns the other shift solenoid "ON" and "OFF" in order to shift into the gear positions shown in the table below. Manual shifting as shown in the following table must be done (In case of a short circuit, the ECM stops sending the current to the short circuited solenoid). Even if starting the engine in the fail-safe mode, the gear position remains in the same position.

HINT:

- *1: Actual gear shift (gear position) under fail-safe operation.
- OFF: OFF (the ECM stops sending current to a malfunctioning solenoid valve)
- -->: Condition in the electrical malfunction is shown on the left of "-->".

Condition in the fail-safe mode is shown on the right of "-->".

FAIL-SAFE MODE

Normal	Solenoid Valve	SL1	ON	OFF	OFF	OFF
		SL2	ON	ON	OFF	OFF
		S4	OFF	OFF	OFF	ON
	Gear Position		1st	2nd	3rd	4th (O/D)

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

SL1 Malfunction	Solenoid Valve	SL1	OFF			
		SL2	ON	ON	OFF --> ON	OFF --> ON
		S4	OFF	OFF	OFF --> ON	ON
	Gear Position *1		2nd	2nd	3rd	3rd
SL2 Malfunction	Solenoid Valve	SL1	ON --> OFF			
		SL2	OFF			
		S4	OFF	OFF	OFF	ON
	Gear Position *1		3rd	3rd	3rd	4th (O/D)
S4 Malfunction	Solenoid Valve	SL1	ON			
		SL2	ON	ON	OFF	OFF
		SL4	OFF			
	Gear Position *1		1st	2nd	3rd	3rd
SL1 and SL2 Malfunction	Solenoid Valve	SL1	OFF			
		SL2	OFF			
		S4	OFF	OFF	OFF	ON
	Gear Position *1		3rd	3rd	3rd	4th (O/D)
SL1 and S4 Malfunction	Solenoid Valve	SL1	OFF			
		SL2	ON	ON	OFF --> ON	OFF --> ON
		S4	OFF			
	Gear Position *1		2nd	2nd	2nd	2nd
SL2 and S4 Malfunction	Solenoid Valve	SL1	ON --> OFF			
		SL2	OFF			
		S4	OFF			
	Gear Position *1		3rd	3rd	3rd	3rd
SL1, SL2 and S4 Malfunction	Solenoid Valve	SL1	OFF			
		SL2	OFF			
		S4	OFF			
	Gear Position *1		3rd	3rd	3rd	3rd

DATA LIST / ACTIVE TEST

1. DATA LIST

HINT:

According to the DATA LIST displayed by the intelligent tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor 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.

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

- a. Warm up the engine.
- b. Turn the ignition switch off.
- c. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
- d. Turn the ignition switch to the on position.
- e. Turn on the tester.
- f. Select the item "DIAGNOSIS / ENHANCED OBD-II / DATA LIST".
- g. According to the display on the tester, read the "DATA LIST".

DATA LIST

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
STOP LIGHT SW	Stop light switch Status/ ON or OFF	- Brake Pedal is depressed: ON - Brake Pedal is released: OFF	-
PNP SW [NSW]	PNP switch Status/ ON or OFF	Shift lever position is: P and N: ON Except P and N: OFF	When the shift lever position displayed on the Intelligent tester differs from the actual position, adjustment of the PNP switch or the shift cable may be incorrect. HINT: When the failure still occurs even after adjusting these parts, See <u>DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (PRNDL INPUT)</u> .
REVERSE	PNP switch Status/ON or OFF	Shift lever position is: R: ON Except R: OFF	?
4TH/DRIVE	PNP switch Status/ON or OFF	Shift lever position is: D: ON Except D: OFF	?
2ND	PNP SW Status/ON or OFF	Shift lever position is: 2 and L: ON Except 2 and L: OFF	?
LOW	PNP SW Status/ ON or OFF	Shift lever position is: L: ON Except L: OFF	?
		IG SW ON: ON ?	

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

OVERDRV CUT SW1	O/D SW Status/ON or OFF	• O/D SW Push: OFF ? • O/D SW Push: ON	-
SHIFT	Actual Gear Position/ 1st, 2nd, 3rd or 4th (O/D)	Shift lever position is: • L: 1st 2: 1st or 2nd • 3: 1st, 2nd or 3rd • D (O/D ON): 1st, 2nd, 3rd or 4th (O/D)	-
LOCK UP	Lock Up Status/ON or OFF	• Lock Up: ON • Except Lock Up: OFF	-
LOCK UP SOL	Lock Up Solenoid Status/ ON or OFF	• Lock Up Solenoid: ON • Except Lock Up Solenoid: OFF	-
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	• Accelerator pedal is depressed: OFF • Accelerator pedal is released: ON	-
A/TOIL TEMPI	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 opened or shorted.
SPD (NC)	Counter Gear Speed/ display: 50 r/min	HINT: 4th (O/D) when shift lever position is D position (After warming up the engine): • Intermediate shaft speed (NC) becomes close to the engine speed.	-
		HINT: • Lock up ON (After warning up the	

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

SPD (NT)	Input Turbine Speed/display: 50 r/ min	engine): Input Turbine speed (NT) equal to the engine sped. • Lock up OFF (Idling at N position): Input Turbine speed (NT) nearly equal to the engine speed.	-
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2. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the intelligent tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

- Warm up the engine.
- Turn the ignition switch off.
- Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
- Turn the ignition switch to the ON position.
- Push the "ON" button of the intelligent tester.
- Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST".
- According to the display on tester, perform the "ACTIVE TEST".

ACTIVE TEST REFERENCE

Tester Display	Test Part	Control Range	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set the each shift position by yourself. [Vehicle Condition] - IDL : ON - Less than 50 km/h (31 mph)	1st/2nd/3rd/4th	Possible to check the operation of the shift

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

	[Others] • Press "-->" button: Shift up • Press "<--" button: Shift down		solenoid valves.
LOCK UP	[Test Details] Control the shift solenoid DSL to set the automatic transaxle to the lock up condition. [Vehicle Condition] • Throttle valve opening angle: Less than 35% • Vehicle Speed: 58 km/h (36 mph) or more, and 4th gear	ON/OFF	Possible to check the DSL operation.
SOLENOID (SLT) ⁽¹⁾	[Test Details] Operate the shift solenoid SLT and raise the line pressure. [Vehicle Condition] • Vehicle Stopped. • IDL : ON HINT: OFF: Line pressure up (When the active test of "SOLENOID (SLT)" is performed, the ECM commands the SLT solenoid to turn off). ON: No action (normal operation)	ON/OFF	-
(1) "SOLENOID (SLT)" in the ACTIVE TEST is performed to check the line pressure changes by connecting the SST to the automatic transaxle, which is used in the <u>HYDRAULIC TEST</u> as well.			

HINT:

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

DIAGNOSTIC TROUBLE CODE CHART

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

HINT:

- *1: Comes on MIL (Malfunction Indicator Lamp) light up
- *2: "DTC stored" mark means ECM memorizes the malfunction code if the ECM detects the DTC detection condition.
- This DTC may be output when the clutch, brake and gear components etc. inside the automatic transaxle are damaged.

AUTOMATIC TRANSAXLE SYSTEM:

AUTOMATIC TRANSAXLE SYSTEM REFERENCE

DTC Code	Detection Item	Trouble Ana	MIL *1	Memory *2
<u>P0705</u>	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	1. Open or short in park/neutral position switch circuit 2. Park/neutral position switch 3. ECM	Comes on	DTC stored
<u>P0710</u>	Transmission Fluid Temperature Sensor "A" Circuit	1. Open or short in ATF temperature sensor circuit 2. Transmission wire (ATF temperature sensor) 3. ECM	Comes on	DTC stored
<u>P0711</u>	Transmission Fluid Temperature Sensor "A" Performance	1. Transmission wire (ATF temperature sensor)	Comes on	DTC stored
<u>P0712</u>	Transmission Fluid Temperature Sensor "A" Circuit Low Input	1. Short in ATF temperature sensor circuit 2. Transmission wire (ATF temperature sensor) 3. ECM	Comes on	DTC stored
<u>P0713</u>	Transmission Fluid Temperature Sensor "A" Circuit High Input	1. Open in ATF temperature sensor circuit 2. Transmission wire (ATF temperature sensor) 3. ECM	Comes on	DTC stored
<u>P0717</u>	Turbine Speed Sensor Circuit No	1. Open or short in transmission	Comes on	DTC stored

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

	Signal	- revolution sensor NT (speed sensor NT) circuit 2. Transmission revolution sensor NT (speed sensor NT) 3. ECM 4. Automatic transaxle assembly		
<u>P0724</u>	Brake Switch "B" Circuit High	1. Short in stop light switch circuit 2. Stop light switch 3. ECM	Comes on	DTC stored
<u>P0741</u>	Torque Converter Clutch Solenoid Performance (Shift Solenoid Valve DSL)	1. Shift solenoid valve DSL remains open or 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
<u>P0746</u>	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
<u>P0748</u>	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. ECM	Comes on	DTC stored
<u>P0766</u>	Shift Solenoid "D" Performance (Shift Solenoid Valve S4)	1. Shift solenoid valve S4 remains open or closed 2. Valve body is blocked (Brake control valve) 3. Automatic transaxle (clutch, brake or gear, etc.)	Comes on	DTC stored
<u>P0776</u>	Pressure Control 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.)	Comes on	DTC stored
<u>P0778</u>	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	1. Open or short in shift solenoid valve SL2 circuit 2. Shift solenoid valve SL2	Comes on	DTC stored

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

		3. ECM		
<u>P0793</u>	Intermediate Shaft Speed Sensor "A"	1. Open or short in transmission revolution sensor NC (speed sensor NC) : circuit 2. Transmission revolution sensor NC (speed sensor NC) 3. ECM	Comes on	DTC stored
<u>P0982</u>	Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4)	1. Short in shift solenoid valve S4 circuit 2. Shift solenoid valve S4 3. ECM	Comes on	DTC stored
<u>P0983</u>	Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4)	1. Open in shift solenoid valve S4 circuit 2. Shift solenoid valve S4 3. ECM	Comes on	DTC stored
<u>P2714</u>	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)	1. Shift solenoid valve SLT remains closed 2. Valve body is blocked 3. Automatic transaxle (clutch, brake or gear, etc.)	Comes on	DTC stored
<u>P2716</u>	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. ECM	Comes on	DTC stored
<u>P2769</u>	Torque Converter Clutch Solenoid Circuit Low (Shift Solenoid Valve DSL)	1. Short in shift solenoid valve DSL circuit 2. Shift solenoid valve DSL 3. ECM	Comes on	DTC stored
<u>P2770</u>	Torque Converter Clutch Solenoid Circuit High (Shift Solenoid Valve DSL)	1. Open in shift solenoid valve DSL circuit 2. Shift solenoid valve DSL 3. ECM	Comes on	DTC stored

DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (PRNDL INPUT)**DESCRIPTION**

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

DTC DETECTION CONDITION AND TROUBLE AREA

DTC No.	DTC Detection Condition	Trouble Area
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2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

P0705	(A) Any 2 or more signals of the following are ON simultaneously (2-trip detection logic) • P input signal is ON. • N input signal is ON. • R input signal is ON. • D input signal is ON. • 2 input signal is ON. • L input signal is ON.	• Open or short in park/neutral position switch circuit • Park/neutral position switch • ECM
	(B) 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. • 2 input signal is ON. • L input signal is ON.	
	(C) All switches are OFF simultaneously for NSW, P, R, N, D, 2 and L positions (2-trip detection logic).	

MONITOR DESCRIPTION

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

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

When the park/neutral position switch sends more than one signal at a time from switch positions P, R, N, D or 2, the ECM interprets this as a fault in the switch. The ECM will turn on the MIL.

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	2 sec.
MIL operation	2 driving cycles
Sequence of operation	None

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

TYPICAL ENABLING CONDITIONS

All:

TYPICAL ENABLING CONDITIONS

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

TYPICAL MALFUNCTION THRESHOLDS

1. Either of the following conditions is met: Condition (A), (B), (C)

Condition (A):

TYPICAL MALFUNCTION THRESHOLDS

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

Condition (B):

DIAGNOSTIC PROCEDURE

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

Condition (C):

DIAGNOSTIC PROCEDURE

Number of the following signal input at the same time	ALL
NSW switch	OFF
P switch	OFF
N switch	OFF
R switch	OFF
D switch	OFF

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

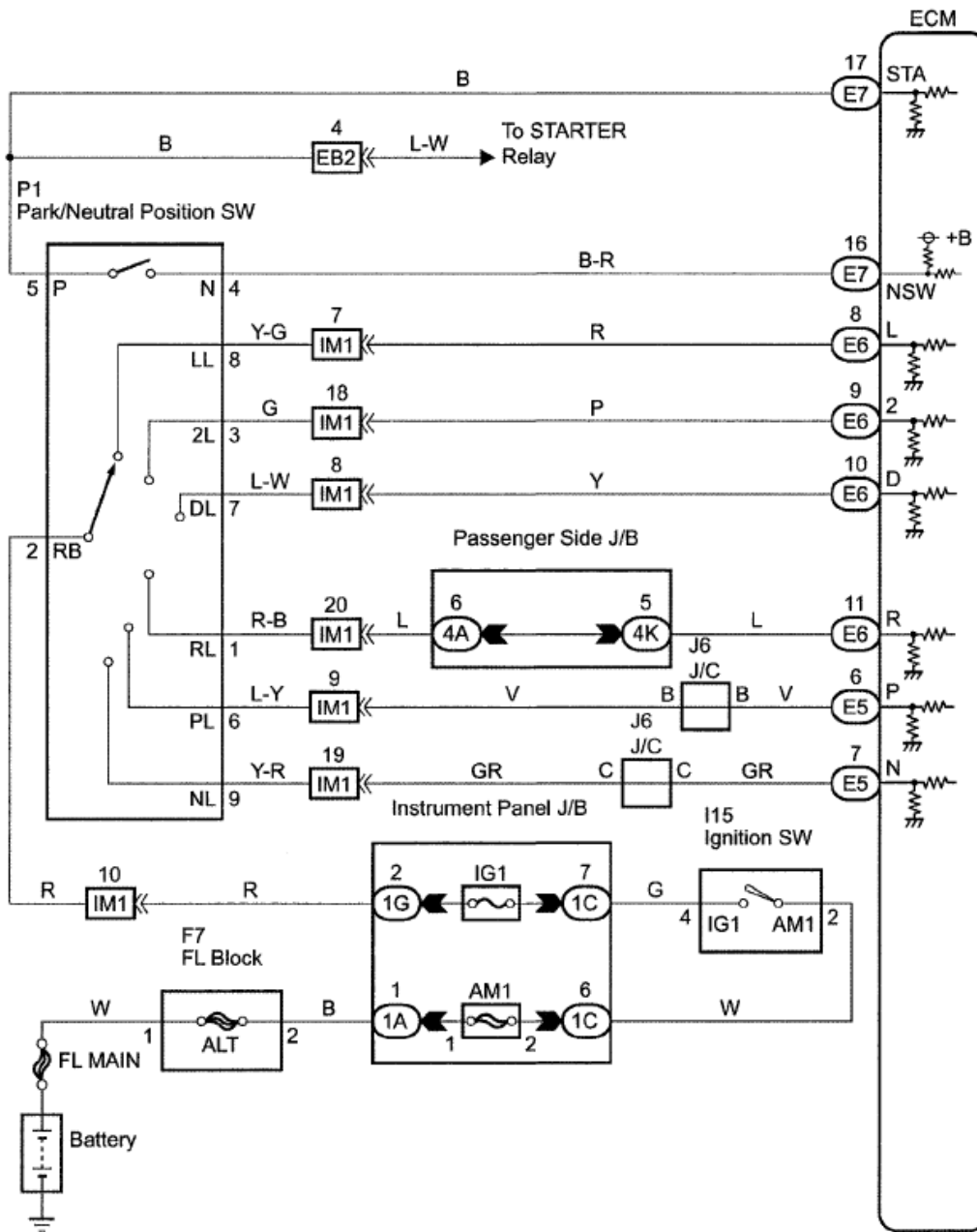
2 switch	OFF
L switch	OFF

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

Park/neutral Position switch	The park/neutral position switch sends only one signal to the ECM.
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WIRING DIAGRAM



G032478E01

Fig. 22: Automatic Transaxle System - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

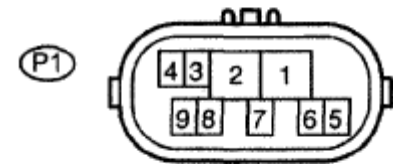
1. INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY

- Disconnect the park/neutral position switch connector.
- Gate shift lever type:

Measure resistance according to the value(s) in the table below when the shift lever is moved to each position.

Switch Side:

(Connector Front View):



P

C110345E20

Fig. 23: Identifying Park/Neutral Position Switch Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard resistance

STANDARD RESISTANCE SPECIFICATIONS

Shift Position	Tester Connection	Specified Condition
P	2 - 6 and 4 - 5	Below 1 ohms
Except P		10 kohms or higher
R	2-1	Below 1 ohms
Except R		10 kohms or higher
N	2 - 9 and 4 - 5	Below 1 ohms
Except N		10 kohms or higher
D	2-7	Below 1 ohms
Except D		10 kohms or higher
2	2-3	Below 1 ohms
Except 2		10 kohms or higher
L	2-8	Below 1 ohms
Except L		10 kohms or higher

NG: REPLACE PARK/NEUTRAL POSITION SWITCH ASSEMBLY

OK: Go to Next Step

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

- Connect the park/neutral position switch connector.
- Turn the ignition switch to the ON position, and measure the voltage according to the value(s) in

the table below when the shift lever is moved to each position.

Standard voltage

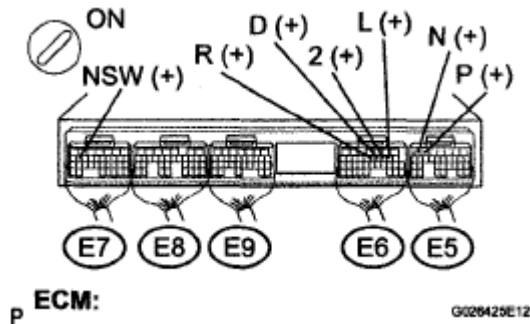


Fig. 24: Identifying Harness And Connector (Park/Neutral Position Switch - ECM)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TESTER CONNECTION AND SPECIFIED CONDITION

Shift Position	Tester Connection	Specified Condition
P and N	E7-16 (NSW) - Body ground	Below 1 V
Except P and N	?	10 to 14 V
P	E5-6 (P) - Body ground	10 to 14 V
Except P	?	Below 1 V
N	E5-7 (N) - Body ground	10 to 14 V
Except N	?	Below 1 V
R	E6-11 (R) - Body ground	10 to 14 V*
Except R	?	Below 1 V
D	E6-10 (D) - Body ground	10 to 14 V
Except D	?	Below 1 V
2	E6-9 (2) - Body ground	10 to 14 V
Except 2	?	Below 1 V
L	E6-8 (L) - Body ground	10 to 14 V
Except L	?	Below 1 V
HINT:		
*: The voltage will drop slightly due to lighting up of the back up light.		

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

OK: REPLACE ECM

DTC P0710 TRANSMISSION FLUID TEMPERATURE SENSOR "A" CIRCUIT; DTC P0712 TRANSMISSION FLUID TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT; DTC P0713 TRANSMISSION FLUID TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT

DESCRIPTION

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

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

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

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

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

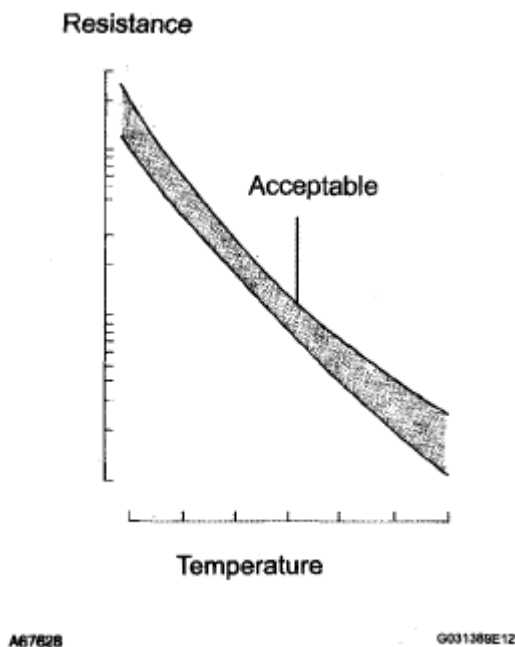


Fig. 25: Resistance And Temperature Graph
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DTC DETECTION CONDITION AND TROUBLE AREA

DTC No.	DTC Detection Condition	Trouble Area
P0710	(a) and (b) are detected momentarily within 0.5 sec. when neither P0712 nor P0713 is detected (1 -trip detection logic) a. ATF temperature sensor resistance is less than 79 ohms. b. ATF temperature sensor resistance is more than 156 kohms. HINT:	• Open or short in ATF temperature sensor circuit • Transmission wire (ATF temperature sensor) • ECM

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

	Within 0.5 sec, the malfunction switches from (a) to (b) or from (b) to (a)	
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) • ECM
P0713	ATF temperature sensor resistance is more than 156 kohms when 15 minutes or more have elapsed after the engine start DTC is detected for 0.5 sec. or more (1-trip detection logic)	• Open in ATF temperature sensor circuit • Transmission wire (ATF temperature sensor) • ECM

MONITOR DESCRIPTION

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

*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 OBD II scan tool or intelligent tester display.

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0710: ATF temperature sensor/Range check (Chattering) P0712: ATF temperature sensor/Range check (Low resistance) P0713: ATF temperature sensor/Range check (High resistance)
Required sensors/Components	ATF temperature sensor (TFT sensor)
Frequency of operation	Continuous
Duration	0.5 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

P0710: Range check (Chattering):

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):

RESISTANCE SPECIFICATIONS

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

TYPICAL MALFUNCTION THRESHOLDS

P0710: Range check (Chattering):

TYPICAL MALFUNCTION THRESHOLDS

TFT (Transmission fluid temperature) sensor resistance	Less; than 79 ohms or More than 156 kohms
--	---

P0712: Range check (Low resistance):

RESISTANCE SPECIFICATIONS

TFT sensor resistance	Less than 79 ohms
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P0713: Range check (High resistance):

RESISTANCE SPECIFICATIONS

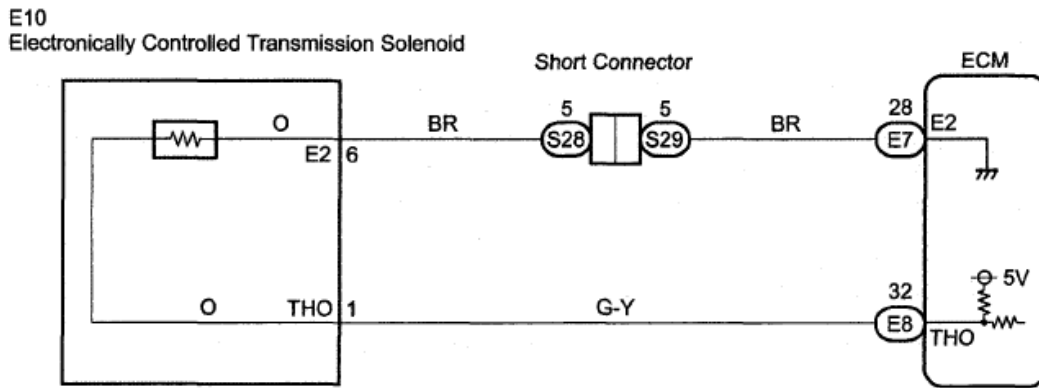
TFT sensor resistance	More than 156 kohms
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COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

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



C

G032447E01

Fig. 26: Electronically Controlled Transmission Solenoid - Wiring Diagram

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE**HINT:**

According to the DATA LIST displayed by the OBD II scan tool or intelligent tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

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

1. READ DATA LIST

- a. Warm up the engine.
- b. Turn the ignition switch off.
- c. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
- d. Turn the ignition switch to the on position.
- e. Turn on the tester.
- f. Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
- g. According to the display on the tester, read the "DATA LIST".

DATA LIST

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
		After Stall Test:	

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

A/T OIL TEMP 1	ATF Temp. Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	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 opened or shorted.
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HINT:

When DTC P0712 is output and OBD II scan tool or intelligent tester output is 150°C (302°F), there is a short circuit.

When DTC P0713 is output and OBD II scan tool or intelligent tester output is -40°C (-40°F), there is an open circuit.

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

RESISTANCE SPECIFICATIONS

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 become open, P0713 is immediately set (in 0.5 second).

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)

- Disconnect the transmission wire connector from the transaxle.
- Measure the resistance according to the value(s) in the table below.

Standard resistance

STANDARD RESISTANCE SPECIFICATIONS

Tester Connection	Specified Condition
1 (THO) - 6 (E2)	79 ohms to 156 kohms
1 (THO) - Body ground	10 kohms or higher
6 (E2) - Body ground	?

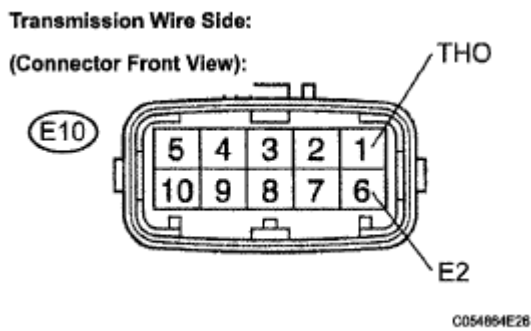


Fig. 27: Identifying Transmission Wire (ATF Temperature Sensor) Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

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

ATF TEMPERATURE SPECIFICATIONS

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: REPAIR OR REPLACE TRANSMISSION WIRE

OK: Go to Next Step

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

- Connect the transmission wire connector to the transaxle.
- Disconnect the ECM connectors.
- Measure the resistance according to the value(s) in the table below.

Standard resistance

STANDARD RESISTANCE SPECIFICATIONS

Tester Connection	Specified Condition
E8-32 (THO) - E7-28 (E2)	79 ohms to 156 kohms

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

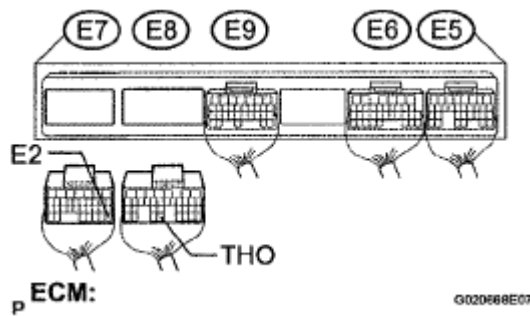


Fig. 28: Identifying ECM Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard resistance:

Check for short

RESISTANCE SPECIFICATIONS

Tester Connection	Specified Condition
E8-32 (THO) - Body ground	10 kohms or higher
E7-28 (E2) - Body ground	?

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

OK: REPLACE ECM

DTC P0711 TRANSMISSION FLUID TEMPERATURE SENSOR "A" PERFORMANCE

DESCRIPTION

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

DTC DETECTION CONDITION AND TROUBLE AREA

DTC No.	DTC Detection Condition	Trouble Area
P0711	Both (a) and (b) are detected: (2-trip detection logic) a. After 12 sec. of engine start, temp, of atmosphere and that of engine coolant is more than -10°C b. After normal driving for over 18 min. and 9 km (6 mile), ATF temp, is less than 10°C (50°F)	• Open or short in ATF temperature sensor circuit • Transmission wire (ATF temperature sensor) • ECM

MONITOR DESCRIPTION

The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature and detects an opens or shorts in the ATF temperature

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

circuit.

After running the vehicle for a certain period, the ATF temperature should increase. When the ATF temperature is below 10°C (50°F), the ECM interprets this as a fault, turns on the MIL.

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0711: ATF temperature sensor/Rationality check
Required sensors/Components	ATF temperature sensor (TFT sensor)
Frequency of operation	Continuous
Duration	3 sec: Condition
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.	None
Time after engine start	16 min. and 40 sec. or more
ECT (Engine coolant temperature)	-15°C (5°F) or more
TFT (transmission fluid temperature) sensor circuit	Not circuit malfunction
ECT sensor circuit	Not circuit malfunction
IAT (Intake air temperature) sensor circuit	Not circuit malfunction

Condition (A):

DIAGNOSTIC PROCEDURE

Time after engine start	18 min. and 20 sec.
Accumulated driving time 1	4 min. and 10 sec. or more
Driving distance after engine start	9 km (5.6 mile) 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

Condition (B):

DIAGNOSTIC PROCEDURE

Time after engine start	30 min.
Accumulated driving time 1	6 min. and 40 sec. or more
Driving distance after engine start	15 km (9.3 mile) or more
IAT (12 sec after engine start)	-15°C (5°F) or more
ECT (12 sec after engine start)	-15°C (5°F) or more

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

Condition (C):

DIAGNOSTIC PROCEDURE

Time after engine start	40 min. or more
Accumulated driving time *1	9 min. and 10 sec. or more
Driving distance after engine start	20 km (12.4 mile) or more
HINT: *1 All the following conditions are met	

ENGINE SPEED SPECIFICATIONS

Engine speed - input (turbine) speed	50 rpm or more
Output speed	400 rpm or more
Throttle valve opening angle	3 % or more
Shift position is not "N" and "P"	
Engine speed	300 rpm or more

TYPICAL MALFUNCTION THRESHOLDS

TYPICAL MALFUNCTION THRESHOLDS

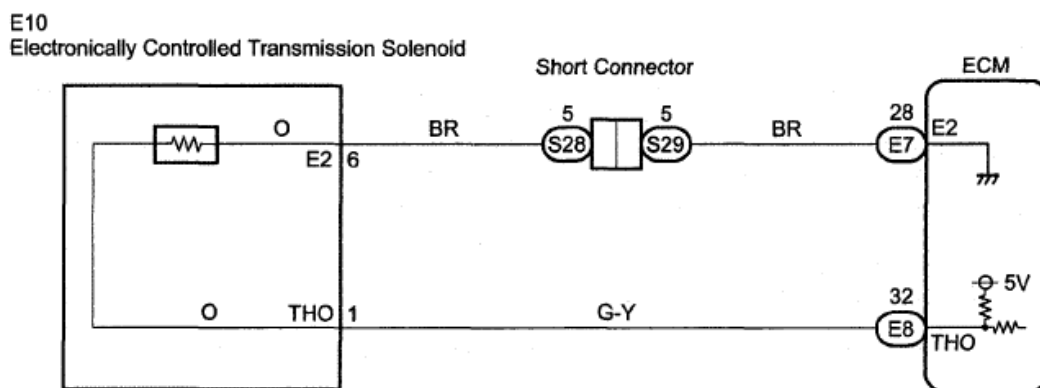
TFT (transmission fluid temperature)	Less than 10°C (50°F)
--------------------------------------	-----------------------

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM



C

G032447E01

Fig. 29: Electronically Controlled Transmission Solenoid - Wiring Diagram

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE**HINT:**

According to the DATA LIST displayed by the OBD II scan tool or intelligent tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

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

1. READ DATA LIST

- a. Warm up the engine.
- b. Turn the ignition switch off.
- c. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DTC3.
- d. Turn the ignition switch to the on position.
- e. Turn on the tester.
- f. Select the item "DIAGNOSIS / ENHANCED OBD II/DATA LIST".
- g. According to the display on the tester, read the "DATA LIST".

DATA LIST

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
A/T OIL TEMP 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 opened or shorted.

HINT:

When DTC P0712 is output and OBD II scan tool or intelligent tester output is 150°C (302°F), there is a short circuit.

When DTC P0713 is output and OBD II scan tool or intelligent tester output is -40°C (-40°F), there is an open circuit.

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

RESISTANCE SPECIFICATIONS

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 second).

When P0713 is set, P0711 cannot be detected.

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

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

- Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
- Turn the ignition switch to the on position and push the OBD II scan tool or the intelligent tester main switch ON.
- When you use intelligent tester:

Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

- Read the DTCs using the OBD II scan tool or the intelligent tester.

Result

DTC RESULT REFERENCE

Display (DTC output)	Proceed to
Only "P0711" Is output	A
"P0711" and other DTCs	B

HINT:

If any other codes besides "POT 11" are output, perform troubleshooting for those DTCs first.

B: GO TO DTC CHART

A: Go to Next Step

2. CHECK TRANSMISSION FLUID LEVEL

OK:

Automatic transmission fluid level is correct.

NG: ADD FLUID

OK: REPLACE TRANSMISSION WIRE (ATF TEMPERATURE SENSOR)**DTC P0717 TURBINE SPEED SENSOR CIRCUIT NO SIGNAL****DESCRIPTION**

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

DTC DETECTION CONDITION AND TROUBLE AREA

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

Reference (Using an oscilloscope):

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

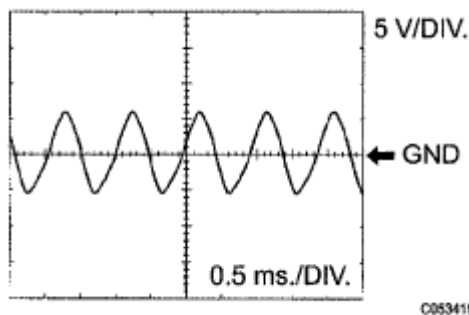


Fig. 30: Identifying ECM Connector Waveform reference
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard: Refer to the illustration.

CONNECTOR WAVEFORM REFERENCE

Terminal	NT+ - NT-
Tool setting	5V/DIV., 0.5 ms./DIV.
Vehicle condition	Vehicle speed 20 km/h (12 mph)

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

MONITOR DESCRIPTION

The NT terminal of the ECM detects a revolution signal from the speed sensor (NT) (input RPM). The ECM calculates a gearshift comparing the speed sensor (NT) with the speed sensor (NC).

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

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

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

MONITOR STRATEGY

MONITOR STRATEGY

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

TYPICAL ENABLING CONDITIONS

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 and before starting next shift change operation
ECM selected gear	2nd, 3rd or 4th
Output shaft rpm	1,000 rpm or more
NSW switch	OFF
R switch	OFF
L switch	OFF
Engine	Running

TYPICAL MALFUNCTION THRESHOLDS

TYPICAL MALFUNCTION THRESHOLDS

Sensor signal rpm	Less than 300 rpm
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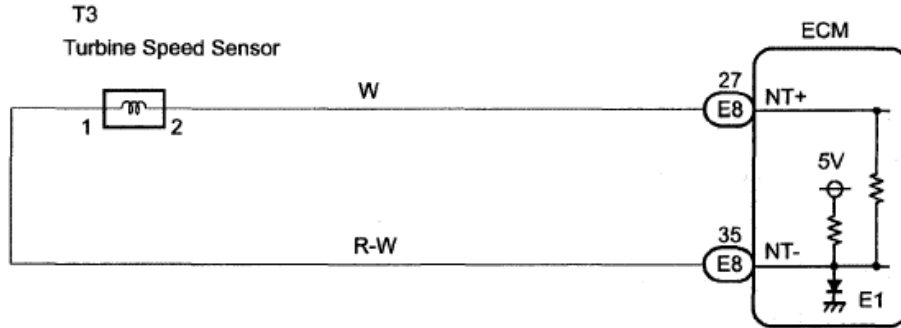
COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

Speed sensor (NT)

Turbine speed is equal to engine speed with lock up ON

WIRING DIAGRAM



G031763E24

Fig. 31: Turbine Speed Sensor - Wiring Diagram

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

1. INSPECT SPEED SENSOR INSTALLATION

- Check the speed sensor installation.

OK:

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

NG: REPLACE SPEED SENSOR (NT)

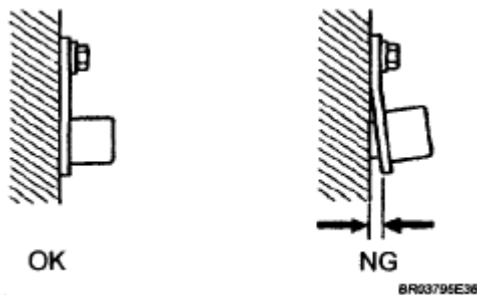


Fig. 32: Checking Speed Sensor

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to Next Step

2. INSPECT SPEED SENSOR (NT)

- Disconnect the speed sensor connector from the transaxle.

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

Standard resistance:

TOYOTA made

TESTER CONNECTION AND SPECIFIED CONDITION

Tester Connection	Specified Condition 20°C (68°F)
1-2	500 to 620 ohms

Standard resistance:

AISIN made

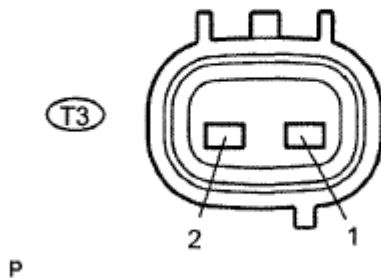
TESTER CONNECTION AND SPECIFIED CONDITION

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

NG: REPLACE SPEED SENSOR (fit)

Sensor Side:

(Connector Front View):



G110343E05

Fig. 33: Identifying Connector Terminals Speed Sensor (NT)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to Next Step

3. CHECK HARNESS AND CONNECTOR (SPEED SENSOR

- Connect the speed sensor connector.
- Disconnect the ECM connector.
- Measure the resistance according to the value(s) in the table below.

Standard resistance:

TOYOTA made

TESTER CONNECTION AND SPECIFIED CONDITION

Tester Connection	Specified Condition 20°C (68°F)
E8-27 (NT+) - E8-35 (NT-)	500 to 620 ohms

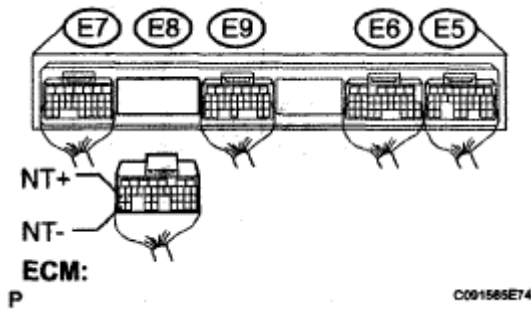


Fig. 34: Identifying ECM Connector

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard resistance:

AISIN made

TESTER CONNECTION AND SPECIFIED CONDITION

Tester Connection	Specified Condition 20°C (68°F)
E8-27 (NT+) - E8-35 (NT-)	560 to 680 ohms

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

Standard resistance:

Check for short

TESTER CONNECTION AND SPECIFIED CONDITION

Tester Connection	Specified Condition
E8-27 (NT+) - Body ground	10 kohms or higher
E8-35 (NT-) - Body ground	?

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

OK: REPLACE ECM

DTC P0724 BRAKE SWITCH "B" CIRCUIT HIGH

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

DESCRIPTION

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

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

DTC DETECTION CONDITION AND TROUBLE AREA

DTC No.	DTC Detection Condition	Trouble Area
P0724	The stop light switch remains ON even when the vehicle is driven in a STOP (less than 3 km/h (2 mph) and GO (30 km/h (19 mph) or more) fashion 5 times. (2-trip detection logic).	• Short in stop light switch circuit • Stop light switch • ECM

MONITOR DESCRIPTION

This DTC indicates that the stop light switch remains on. When the stop light switch remains ON during "stop and go" driving, the ECM interprets this as a fault in the stop light switch and the MIL comes on and the ECM stores the DTC. The vehicle must stop (less than 3 km/h (2 mph)) and go (30 km/h (19 mph) or more) 5 times for two driving cycles in order to detect a malfunction.

MONITOR STRATEGY

MONITOR STRATEGY

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

TYPICAL ENABLING CONDITIONS

TYPICAL ENABLING CONDITIONS

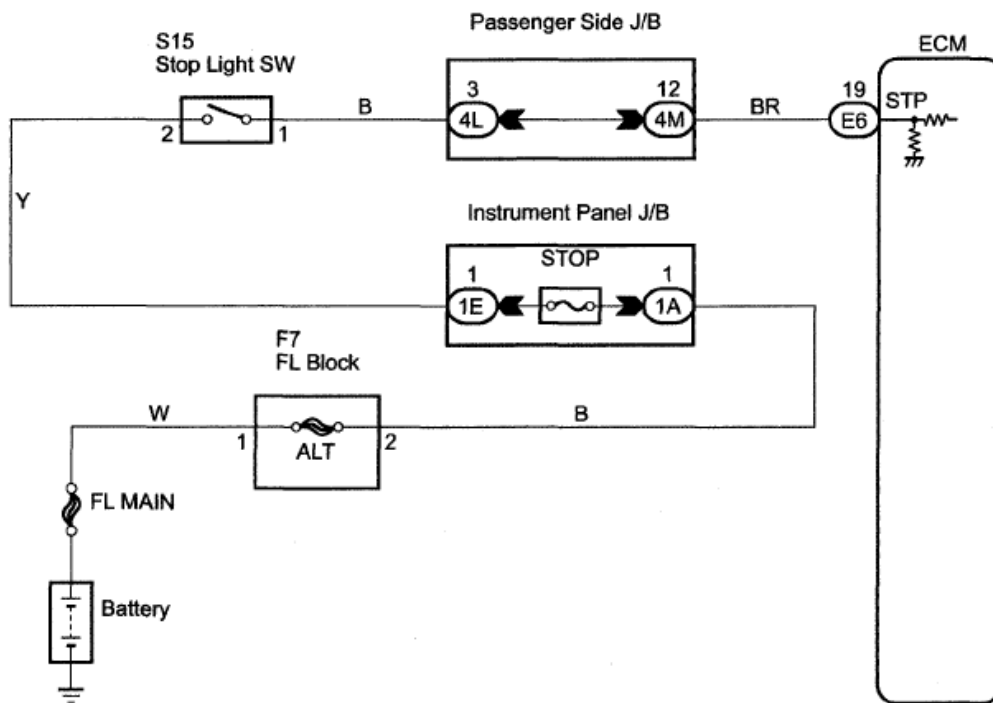
The monitor will run whenever this DTC is not present.	None
Ignition switch	ON
Starter	OFF
Battery voltage	8 V or more
GO (Vehicle speed is 30 km/h (18.63 mph) or more)	Once
STOP (Vehicle speed is less than 3 km/h (1.86 mph))	Once

TYPICAL MALFUNCTION THRESHOLDS

TYPICAL MALFUNCTION THRESHOLDS

Brake switch	Remain ON during GO and STOP 5 times
--------------	--------------------------------------

WIRING DIAGRAM



0032448E01

Fig. 35: Brake Switch B Circuit High - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

1. READ VALUE OF DATA LIST

HINT:

According to the DATA LIST displayed by the OBD II scan tool or intelligent tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

- Warm up the engine.
- Turn the ignition switch off.
- Connect the OBD II scan tool or intelligent tester together with the CAN VIM (controller area

network vehicle interface module) to the DLC3.

- d. Turn the ignition switch to the on position.
- e. Turn on the tester.
- f. Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
- g. According to the display on the tester, read the "DATA LIST".

DATA LIST

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
STOP LIGHT SW	Stop light switch Status/ ON or OFF	- Brake Pedal is depressed: ON - Brake Pedal is released: OFF	-

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

Result

DTC RESULT REFERENCE

Result	Proceed to
NG	A
OK	B

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

STANDARD RESISTANCE SPECIFICATIONS

Switch position	Tester Connection	Specified Condition
Switch pin free	1-2	Below 1 ohms
Switch pin pushed In	?	10 kohms or higher
Switch pin free	3-4	10 kohms or higher
Switch pin pushed in	?	Below 1 ohms

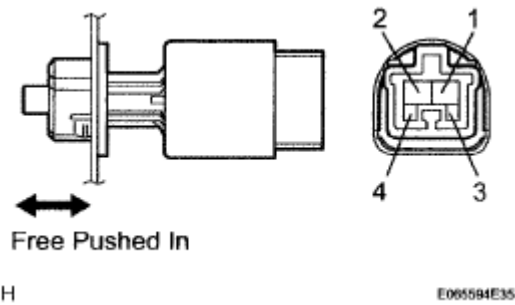


Fig. 36: Inspecting Stop Light Switch Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NG: REPLACE STOP LIGHT SWITCH ASSEMBLY

OK: Go to Next Step

3. CHECK HARNESS AND CONNECTOR (STOP LIGHT SWITCH ASSEMBLY - ECM)

- Install the stop light switch assembly.
- Measure the voltage according to the value(s) in the table below when the brake pedal is depressed and released.

Standard voltage

TESTER CONNECTION AND SPECIFIED CONDITION

Condition	Tester Connection	Specified Condition
Brake pedal is depressed	E6-19 (STP) - Body ground	10 to 14 V
Brake pedal is released	?	Below 1 V

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

ECM:

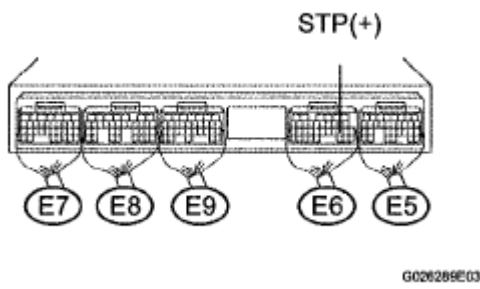


Fig. 37: Identifying Harness And Connector (Stop Light Switch Assembly - ECM)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPLACE ECM

DTC P0741 TORQUE CONVERTER CLUTCH SOLENOID PERFORMANCE (SHIFT SOLENOID

VALVE DSL)**SYSTEM DESCRIPTION**

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

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

DTC DETECTION CONDITION AND TROUBLE AREA

DTC No.	DTC Detection Condition	Trouble Area
P0741	Lock up does not occur when driving in lock up range Lock up remains ON in lock up OFF range (2-trip detection logic)	• Shift solenoid valve DSL 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 ECM based on the speed sensor (NT), speed sensor (NC), engine rpm, engine load, engine temperature, vehicle speed, transmission temperature, and gear selection. The ECM determines the lock up status of the torque converter by comparing the engine rpm (NE) to the input turbine rpm (NT). The ECM calculates the actual transmission gear by comparing input turbine rpm (NT) to counter gear rpm (NC). When conditions are appropriate, the ECM requests "lock up" by applying control voltage to the shift solenoid DSL. When the DSL is turned on, it applies pressure to the lock up relay valve and locks the torque converter clutch.

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

HINT:**Example:**

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

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

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

(Engine speed is at least 100 rpm greater than input turbine speed.)

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

(The difference between engine speed and input turbine speed is less than 35 rpm.)

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0741: Shift solenoid valve DSL/OFF malfunction Shift solenoid valve DSL/ON malfunction
Required sensors/Components	Shift solenoid valve DSL, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE), Throttle position sensor (VPA1), Mass air flow sensor (MAF), Transmission temperature sensor (THO1), Engine coolant temperature sensor (ECT)
Frequency of operation	Continuous
Duration	OFF malfunction (A) 3.5 sec. OFF malfunction (B) 0.8 sec. ON malfunction 1.8 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.	P0115 - P0118 (ECT sensor) P0125 (Insufficient ECT for closed loop) P0500 (VSS) P0748, P0778, P0798 (Shift solenoid valve (range))
ECT (Engine coolant temperature)	60°C (140°F) or more
Transmission range	"D"
TFT (Transmission fluid temperature)	-20°C (-4°F) or more
TFT sensor circuit	Not circuit malfunction
ECT sensor circuit	Not circuit malfunction
Turbine speed sensor circuit	Not circuit malfunction
Intermediate shaft speed sensor circuit	Not circuit malfunction
Output speed sensor circuit	Not circuit malfunction

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

Shift solenoid valve SL1 circuit	Not circuit malfunction
Shift solenoid valve SL2 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve DSL circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction (A):**DIAGNOSTIC PROCEDURE**

ECM lock up command	ON
ECM selected gear	3rd or 4th
Vehicle speed	25 km/h (15.5 mph) or more

OFF malfunction (B):**DIAGNOSTIC PROCEDURE**

ECM selected gear	2nd
Vehicle speed	10 km/h (6.2 mph)
Throttle valve opening angle	4.5 % or more at engine speed 1,900 rpm (varies with engine speed)

ON malfunction:**DIAGNOSTIC PROCEDURE**

ECM lock up command	OFF
ECM selected gear	3rd or 4th
Throttle valve opening angle	8% or more
Vehicle speed	25 to 60 km/h (15.5 to 37.3 mph)

TYPICAL MALFUNCTION THRESHOLDS**Either of the following conditions is met: OFF malfunction or ON malfunction OFF malfunction:****TYPICAL MALFUNCTION THRESHOLDS**

Engine Speed - Input (turbine) speed	100 rpm or more
--------------------------------------	-----------------

ON malfunction:

2 detections are necessary per driving cycle:

1st detection; temporary flag ON

2nd detection; pending fault code ON

Vehicle speed must be under 10 km/h (6.2 mph) once before 2nd detection

ENGINE SPEED AND INPUT (TURBINE) SPEED

Difference between engine speed and input (turbine) speed	Less than 35 rpm
---	------------------

INSPECTION PROCEDURE

HINT:

Performing the ACTIVE TEST using the intelligent tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

1. PERFORM ACTIVE TEST

- Warm up the engine.
- Turn the ignition switch off.
- Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
- Turn the ignition switch to the on position.
- Turn on the tester.
- Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST".
- According to the display on the tester, perform the "ACTIVE TEST".

ACTIVE TEST REFERENCE

Tester Display	Test Part	Control Range	Diagnostic Note
LOCK UP	[Test Details] Control the shift solenoid DSL to set the automatic transaxle to the lock up condition. [Vehicle Condition] - Throttle valve opening angle: Less than 35% - Vehicle Speed: 58 km/h (36 mph) or more, and 4th gear	ON/OFF	Possible to check the DSL operation.

HINT:

- This test can be conducted when the vehicle speed is 58 km/h (36 mph) or more.
 - This test can be conducted in the 3rd or O/D gear.
- 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.)

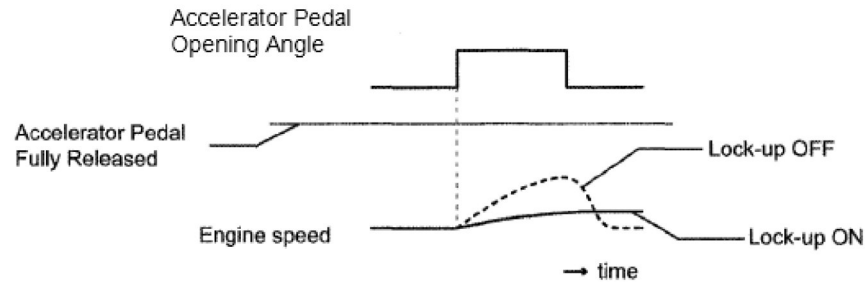


Fig. 38: Accelerator Pedal Graph

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

1. CHECK OTHER DTCS OUTPUT (IN ADDITION TO DTC P0741)

- Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
- Turn the ignition switch to the on position and turn the OBD II scan tool or the intelligent tester main switch ON.
- When you use intelligent tester:

Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

- Read the DTCs using the OBD II scan tool or the intelligent tester.

Result

DTC RESULT REFERENCE

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

HINT:

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

B: GO TO DTC CHART

A: Go to Next Step

2. INSPECT TRANSMISSION WIRE (DSL)

- Disconnect the transmission wire connector from the transaxle.

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

Standard resistance

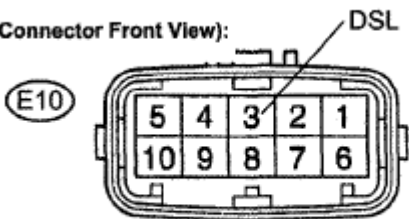
STANDARD RESISTANCE SPECIFICATIONS

Tester Connection	Specified Condition 20°C (68°F)
3 - Body ground	11 to 13 ohms

NG: Go to step 4

Transmission Wire Side:

(Connector Front View):



C054864E27

Fig. 39: Identifying E10 ECM Connector

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to Next Step

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

- Connect the transmission wire connector.
- Disconnect the ECM connector.
- Measure the resistance according to the value(s) in the table below.

Standard resistance

STANDARD RESISTANCE SPECIFICATIONS

Tester Connection	Specified Condition 20°C (68°F)
E8-9 (DSL) - Body ground	11 to 13 ohms

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

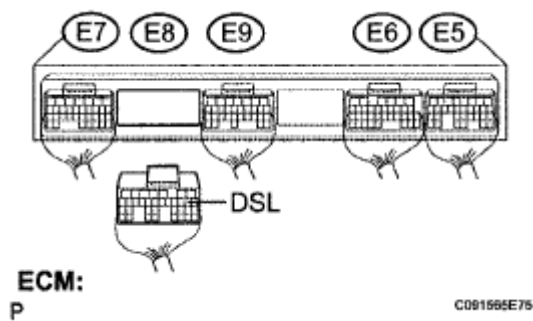


Fig. 40: Identifying E8 ECM Connector

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to Next Step

4. INSPECT SHIFT SOLENOID VALVE (DSL)

- Remove the shift solenoid valve DSL.
- Measure the resistance according to the value(s) in the table below.

Standard resistance

STANDARD RESISTANCE SPECIFICATIONS

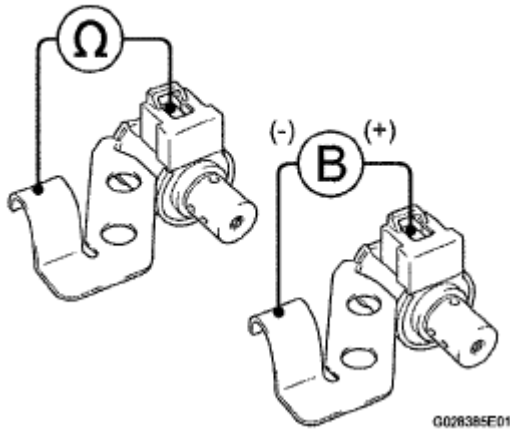
Tester Connection	Specified Condition 20°C (68°F)
Solenoid Connector (DSL) - Solenoid; Body (DSL)	11 to 13 ohms

- Connect the positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.

OK:

The solenoid valve makes an operating sound.

NG: REPLACE SHIFT SOLENOID VALVE (DSL)

Shift Solenoid Valve DSL:**Fig. 41: Identifying Shift Solenoid Valve (DSL)****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.****OK: Go to Next Step****5. CHECK TRANSMISSION WIRE****OK:****The connectors and pins are securely installed. There is no open or short on the wire harness.****NG: REPAIR OR REPLACE TRANSMISSION WIRE****OK: Go to Next Step****6. INSPECT TRANSMISSION VALVE BODY ASSEMBLY****OK:****There are no foreign objects on each valve and they operate smoothly.****NG: REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY****OK: Go to Next Step****7. INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY****OK:****The torque converter clutch operates normally.****NG: REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY**

OK: REPAIR AUTOMATIC TRANSAXLE ASSEMBLY**DTC P0746 PRESSURE CONTROL SOLENOID "A" PERFORMANCE (SHIFT SOLENOID VALVE SL1)****SYSTEM DESCRIPTION**

The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 2nd, 3rd or 4th gear).

Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transaxle (clutch, brake or gear etc.).

DTC DETECTION CONDITION AND TROUBLE AREA

DTC No.	DTC Detection Condition	Trouble Area
P0746	The gear required by the ECM does not match the actual gear when driving (2-trip detection logic)	- Shift solenoid valve SL1 remains open or closed - Valve body is blocked - Automatic transaxle (clutch, brake or gear etc.)

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". According to the input shaft revolution, intermediate (counter) shaft revolution and output shaft revolution, the ECM detects the actual gear position (1st, 2nd, 3rd or 4th gear position). When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL.

HINT:

Example:

When either condition (a) or (b) is met, the ECM detects a malfunction.

- The ECM commands the 1st gear, but the actual gear is 2nd.
- The ECM commands the 2nd gear, but the actual gear is 1st.

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)

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

Frequency of operation	Continuous
Duration	OFF malfunction, ON malfunction (A) 0.8 sec. ON malfunction (B) 1 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.	P0115 - P0118 (ECT sensor) P0125 (Insufficient ECT for closed loop) P0500 (VSS) P0748, P0778, P0798 (Shift solenoid valve (range))
ECT (Engine coolant temperature)	60°C (140°F) or more
Transmission range	"D"
TFT (Transmission fluid temperature)	-20°C (-4°F) or more
TFT sensor circuit	Not circuit malfunction
ECT sensor circuit	Not circuit malfunction
Turbine speed sensor circuit	Not circuit malfunction
Intermediate shaft speed sensor circuit	Not circuit malfunction
Output speed sensor circuit	Not circuit malfunction
Shift solenoid valve SL1 circuit	Not circuit malfunction
Shift solenoid valve SL2 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction:**DIAGNOSTIC PROCEDURE**

ECM selected gear	1st
Vehicle speed	Less than 40 km/h (24.9 mph)
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (Varies with engine speed)

ON malfunction (A):**DIAGNOSTIC PROCEDURE**

ECM selected gear	2nd
Vehicle speed	10 km/h (6.2 mph) or more

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (Varies with engine speed)
------------------------------	---

ON malfunction (B):

DIAGNOSTIC PROCEDURE

ECM lock up command	OFF
ECM selected gear	3rd or 4th

TYPICAL MALFUNCTION THRESHOLDS

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

2 detections are necessary per driving cycle:

1st detection; temporary flag ON

2nd detection; pending fault code ON

OFF malfunction:

TYPICAL MALFUNCTION THRESHOLDS

Input (turbine) speed/Intermediate shaft speed	1.49 to 1.63
--	--------------

ON malfunction (A):

DIAGNOSTIC PROCEDURE

Input (turbine) speed/Intermediate shaft speed	2.72 to 2.86
--	--------------

ON malfunction (B):

DIAGNOSTIC PROCEDURE

Engine speed - Input (turbine) speed	250 rpm or more
--------------------------------------	-----------------

INSPECTION PROCEDURE

HINT:

Performing the ACTIVE TEST using the intelligent tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

1. PERFORM ACTIVE TEST

- Warm up the engine.

- b. Turn the ignition switch off.
- c. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
- d. Turn the ignition switch to the on position.
- e. Turn on the tester.
- f. Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / SHIFT".
- g. According to the display on the tester, perform the "ACTIVE TEST".

HINT:

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

Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (See **DATA LIST / ACTIVE TEST**).

DATA LIST / ACTIVE TEST REFERENCE

Tester Display	Test Part	Control Range	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set the each shift position by yourself. [Vehicle Condition] • IDL: ON • Less than 50 km/h (31 mph) [Others] • Press "-->" button: Shift up • Press "<--" button: Shift down	1st/2nd/3rd/4th	Possible to check the operation of the shift solenoid valves.

HINT:

- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.
- The shift position commanded by the ECM is shown in the DATA LIST/SHIFT display on the intelligent tester.

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

- a. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
- b. Turn the ignition switch to the on position and turn the OBD II scan tool or the intelligent tester main switch ON.
- c. When you use intelligent tester:

Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

- d. Read the DTCs using the OBD II scan tool or the intelligent tester.

Result**DTC RESULT REFERENCE**

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

HINT:

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

B: GO TO DTC CHART**A: Go to Next Step****2. INSPECT SHIFT SOLENOID VALVE SL1**

- Remove the shift solenoid valve SL1.
- Measure the resistance according to the value(s) in the table below.

Standard resistance**STANDARD RESISTANCE SPECIFICATIONS**

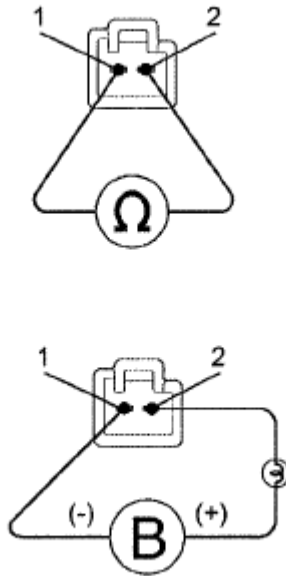
Tester Connection	Specified Condition 20°C (68°F)
1-2	5.0 to 5.6 ohms

- Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating sound.

NG: REPLACE SHIFT SOLENOID VALVE SL1

Shift Solenoid Valve SL1:

D025406E26

Fig. 42: Identifying Shift Solenoid Valve SL1

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to Next Step**3. INSPECT TRANSMISSION VALVE BODY ASSEMBLY****OK:****There are no foreign objects on each valve and they operate smoothly.****NG: REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY****OK: Go to Next Step****4. INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY****OK:****The torque converter clutch operates normally.****NG: REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY****OK: REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSEMBLY****DTC P0748 PRESSURE CONTROL SOLENOID "A" ELECTRICAL (SHIFT SOLENOID VALVE SL1)**

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

DESCRIPTION

Shifting from 1st to O/D is performed in combination with "ON" and "OFF" operation of the shift solenoid valves SL1 and SL2 which is controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valve to allow the vehicle to be operated smoothly (Fail safe function).

DTC DETECTION CONDITION AND TROUBLE AREA

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

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other normal shift solenoid valves "ON/OFF" (In case of an open or short circuit, the ECM stops sending current to the circuit.) (See **DATA LIST / ACTIVE TEST**).

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

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present.	None
Battery voltage	10 V or more
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

TYPICAL MALFUNCTION THRESHOLDS

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

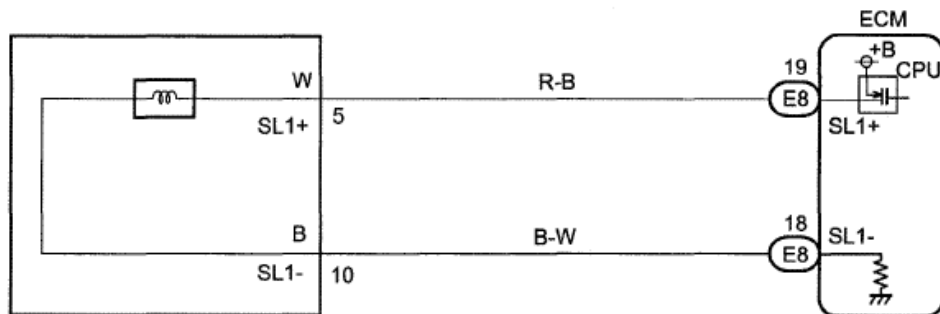
COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM

E10 Electronically Controlled Transmission Solenoid



C

G031785E21

Fig. 43: Electronically Controlled Transmission Solenoid - Wiring Diagram

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

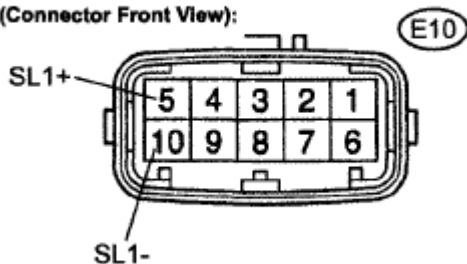
INSPECTION PROCEDURE

1. INSPECT TRANSMISSION WIRE (SL1)

- Disconnect the transmission wire connector from the transaxle.
- Measure the resistance according to the value(s) in the table below.

Transmission Wire Side:

(Connector Front View):



D025234E09

Fig. 44: Identifying Transmission Wire Connector Terminals

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard resistance

STANDARD RESISTANCE SPECIFICATIONS

Tester Connection	Specified Condition 20°C (68°F)
5 (SL1+) - 10 (SL1-)	5.0 to 5.6 ohms

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

Standard resistance:

Check for short

TESTER CONNECTION AND SPECIFIED CONDITION

Tester Connection	Specified Condition
SL1+- Body ground	10 kohms or higher
SL1- - Body ground	?

NG: Go to step 3

OK: Go to Next Step

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

- Connect the transmission connector to the transaxle.
- Disconnect the connector from the ECM.
- Measure the resistance according to the value(s) in the table below.

Standard resistance

STANDARD RESISTANCE SPECIFICATIONS

Tester Connection	Specified Condition 20°C (68°F)
E8-19 (SL1+) - E8-18 (SL1-)	5.0 to 5.6 ohms

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

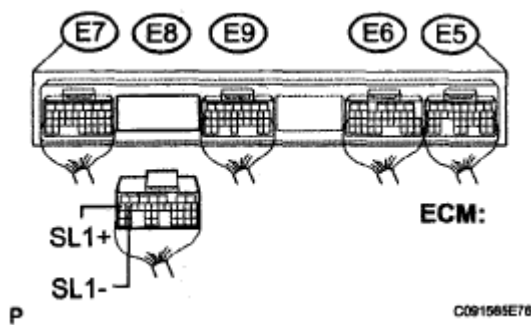


Fig. 45: Identifying Transmission Connector To Transaxle
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard resistance:

Check for short

TESTER CONNECTION AND SPECIFIED CONDITION

Tester Connection	Specified Condition
E8-19 (SL1+) - Body ground	10 kohms or higher
E8-18 (SL1 -) - Body ground	?

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

OK: REPLACE ECM

3. INSPECT SHIFT SOLENOID VALVE SL1

- a. Remove the shift solenoid valve SL1.
- b. Measure the resistance according to the value(s) in the table below.

Standard resistance

STANDARD RESISTANCE SPECIFICATIONS

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

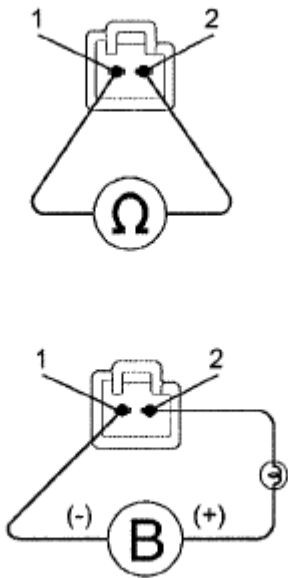
- c. Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating sound.

NG: REPLACE SHIFT SOLENOID VALVE SL1

Shift Solenoid Valve SL1:



D025406E26

Fig. 46: Identifying Shift Solenoid Valve S11 Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPAIR OR REPLACE TRANSMISSION WIRE

DTC P0766 SHIFT SOLENOID "D" PERFORMANCE (SHIFT SOLENOID VALVE S4)

SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 2nd, 3rd or 4th (O/D) gear).

Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transaxle (clutch, brake or gear etc.).

DTC DETECTION CONDITION AND TROUBLE AREA

DTC No.	DTC Detection Condition	Trouble Area
P0766	The gear required by the ECM does not match the actual gear when driving (2-trip detection logic)	• Shift solenoid valve S4 remains open or closed • Valve body is blocked • Automatic transaxle (clutch, brake or gear etc.)

MONITOR DESCRIPTION

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". According to the input shaft revolution, intermediate (counter) shaft revolution and output shaft revolution, the ECM detects the actual gear position (1st, 2nd, 3rd or 4th (O/D) gear position). When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0766: Shift solenoid valve S4/OFF malfunction Shift solenoid valve S4/ON malfunction
Required sensors/Components	Shift solenoid valve S4, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	1 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.	P0115 - P0118 (ECT sensor) P0125 (Insufficient ECT for closed loop) P0500 (VSS) P0748, P0778, P0798 (Shift solenoid valve (range))
ECT (Engine coolant temperature)	60°C (140°F) or more
Transmission range	"D"
TFT (Transmission fluid temperature)	-20°C (-4°F) or more
TFT sensor circuit	Not circuit malfunction
ECT sensor circuit	Not circuit malfunction
Turbine speed sensor circuit	Not circuit malfunction
Intermediate shaft speed sensor circuit	Not circuit malfunction
Output speed sensor circuit	Not circuit malfunction
Shift solenoid valve SL1 circuit	Not circuit malfunction
Shift solenoid valve SL2 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction:

DIAGNOSTIC PROCEDURE

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

ECM selected gear	4th
Throttle valve opening angle	5% or more
Vehicle speed	10 km/h (6.2 mph) or more

ON malfunction:

DIAGNOSTIC PROCEDURE

ECM selected gear	3rd
Throttle valve opening angle	5% or more
Vehicle speed	10 km/h (6.2 mph) or more

TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met: OFF malfunction or ON malfunction

2 detections are necessary per driving cycle:

1st detection; temporary flag ON

2nd detection; pending fault code ON

OFF malfunction:

TYPICAL MALFUNCTION THRESHOLDS

Intermediate shaft speed/Output speed	1.34 to 1.48
---------------------------------------	--------------

ON malfunction:

DIAGNOSTIC PROCEDURE

Intermediate shaft speed/Output speed	0.95 to 1.09
---------------------------------------	--------------

INSPECTION PROCEDURE

HINT:

Performing the ACTIVE TEST using the intelligent tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

1. PERFORM ACTIVE TEST

- Warm up the engine.
- Turn the ignition switch off.
- Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface

- module) to the DLC3.
- Turn the ignition switch to the on position.
 - Turn on the tester.
 - Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / SHIFT".
 - According to the display on the tester, perform the "ACTIVE TEST".

HINT:

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

Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (See **DATA LIST / ACTIVE TEST**).

DATA LIST / ACTIVE TEST REFERENCE

Tester Display	Test Part	Control Range	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set the each shift position by yourself. [Vehicle Condition] - IDL: ON - Less than 50 km/h (31 mph) [Others] - Press "-->" button: Shift up - Press "<--" button: Shift down	1st/2nd/3rd/4th	Possible to check the operation of the shift solenoid valves.

HINT:

- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.
- The shift position commanded by the ECM is shown in the DATA LIST/SHIFT display on the intelligent tester.

1. CHECK OTHER DTCS OUTPUT (IN ADDITION TO DTC P0766)

- Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
- Turn the ignition switch to the on position and turn the OBD II scan tool or the intelligent tester main switch ON.
- Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT COPES".
- Read the DTCs using the OBD II scan tool or the intelligent tester.

Result**DTC RESULT REFERENCE**

Display (DTC output)	Proceed to
Only "P0766" Is output	A
"P0766" and other DTCs	B

HINT:

If any other codes besides "P0766" are output, perform the troubleshooting for those DTCs first.

B: GO TO DTC CHART**A: Go to Next Step****2. INSPECT SHIFT SOLENOID VALVE S4**

- a. Remove the shift solenoid valve S4.
- b. Measure the resistance according to the value(s) in the table below.

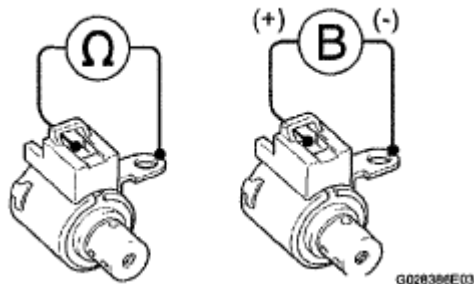
Shift Solenoid Valve S4:

Fig. 47: Identifying Shift Solenoid Valve S4 Terminal
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard resistance**STANDARD RESISTANCE SPECIFICATIONS**

Tester Connection	Specified Condition 20°C (68°F)
Solenoid Connector (S4) - Solenoid Body (S4)	11 to 15ohms

- c. Connect the positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.

OK:

The solenoid makes an operating sound.

NG: REPLACE SHIFT SOLENOID VALVE S4

OK: Go to Next Step

3. INSPECT TRANSMISSION VALVE BODY ASSEMBLY

OK:

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

NG: REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY

OK: Go to Next Step

4. INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

OK:

The torque converter clutch operates normally.

NG: REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY

OK: REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSEMBLY

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

SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 2nd, 3rd or 4th (O/D) gear).

Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transaxle (clutch, brake or gear etc.).

DTC DETECTION CONDITION AND TROUBLE AREA

DTC No.	DTC Detection Condition	Trouble Area
P0776	The gear required by the ECM does not match the actual gear when driving (2-trip detection logic)	• Shift solenoid valve SL2 remains open or closed • Valve body is blocked • Automatic transaxle (clutch, brake or gear etc.)

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". According to the input shaft revolution, intermediate (counter) shaft revolution and output shaft revolution, the ECM detects the actual gear

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

position (1st, 2nd, 3rd or 4th (O/D) gear position). When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

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	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.	P0115 - P0118 (ECT sensor) P0125 (Insufficient ECT for closed loop) P0500 (VSS) P0748, P0778, P0798 (Shift solenoid valve (range))
ECT (Engine coolant temperature)	60°C (140°F) or more
Transmission range	"D"
TFT (Transmission fluid temperature)	-20°C (-4°F) or more
TFT sensor circuit	Not circuit malfunction
ECT sensor circuit	Not circuit malfunction
Turbine speed sensor circuit	Not circuit malfunction
Intermediate shaft speed sensor circuit	Not circuit malfunction
Output speed sensor circuit	Not circuit malfunction
Shift solenoid valve SL1 circuit	Not circuit malfunction
Shift solenoid valve SL2 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction:

DIAGNOSTIC PROCEDURE

ECM selected gear	1st
Vehicle speed	10 to 40 km/h (6.2 to 24.9 mph) or more

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

Throttle valve opening angle	15% or more 4.5% or more at engine speed 1,900 rpm (vary with engine speed)
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ON malfunction:

DIAGNOSTIC PROCEDURE

ECM selected gear	3rd or 4th
Vehicle speed	10 km/h (6.2 mph) or more
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (Varies with engine speed)

TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met: OFF malfunction or ON malfunction

2 detections are necessary per driving cycle:

1st detection; temporary flag ON

2nd detection; pending fault code ON

OFF malfunction:

TYPICAL MALFUNCTION THRESHOLDS

Input (turbine) speed/Intermediate shaft speed	0.93 to 1.07
--	--------------

ON malfunction:

DIAGNOSTIC PROCEDURE

Input (turbine) speed/Intermediate shaft speed	1.49 to 1.63
--	--------------

INSPECTION PROCEDURE

HINT:

Performing the ACTIVE TEST using the intelligent tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as the first step of troubleshooting is one method to shorten labor time.

It is possible to display the DATA LIST during the ACTIVE TEST.

1. PERFORM ACTIVE TEST

- Warm up the engine.
- Turn the ignition switch off.
- Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.

- d. Turn the ignition switch to the on position.
- e. Turn on the tester.
- f. Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / SHIFT".
- g. According to the display on the tester, perform the "ACTIVE TEST".

HINT:

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

Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (See **DATA LIST / ACTIVE TEST**).

DATA LIST / ACTIVE TEST REFERENCE

Tester Display	Test Part	Control Range	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set the each shift position by yourself. [Vehicle Condition] • IDL: ON • Less than 50 km/h (31 mph) [Others] • Press "-->" button: Shift up • Press "<--" button: Shift down	1st/2nd/3rd/4th	Possible to check the operation of the shift solenoid valves.

HINT:

- This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.
- The shift position commanded by the ECM is shown in the DATA LIST/SHIFT display on the intelligent tester.

1. CHECK OTHER DTCS OUTPUT (IN ADDITION TO DTC P0776)

- a. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
- b. Turn the ignition switch to the on position and turn the OBD II scan tool or the intelligent tester main switch ON.
- c. When you use intelligent tester:

Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO/CURRENT CODES".

- d. Read the DTCs using the OBD II scan tool or the intelligent tester.

Result**DTC RESULT REFERENCE**

Display (DTC output)	Proceed to
Only "P0776" Is output	A
"P0776" and other DTCs	B

HINT:

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

B: GO TO DTC CHART**A: Go to Next Step****2. INSPECT SHIFT SOLENOID VALVE SL2**

- Remove the shift solenoid valve SL2.
- Measure the resistance according to the value(s) in the table below.

Standard resistance**STANDARD RESISTANCE SPECIFICATIONS**

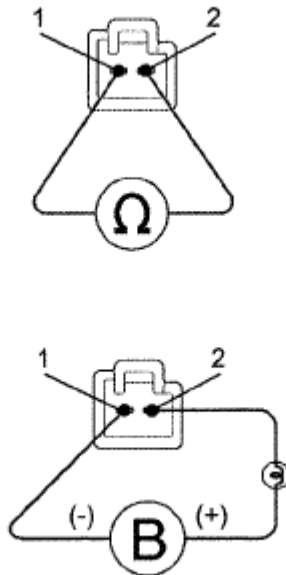
Tester Connection	Specified Condition 20°C (68°F)
1-2	5.0 to 5.6 ohms

- Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating sound.

NG: REPLACE SHIFT SOLENOID VALVE SL2

Shift Solenoid Valve SL2:

D025406E27

Fig. 48: Identifying Shift Solenoid Valve SL2 Terminal

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to Next Step**3. INSPECT TRANSMISSION VALVE BODY ASSEMBLY****OK:****There are no foreign objects on each valve and they operate smoothly.****NG: REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY****OK: Go to Next Step****4. INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY****OK:****The torque converter clutch operates normally.****NG: REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY****OK: REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSEMBLY****DTC P0778 PRESSURE CONTROL SOLENOID "B" ELECTRICAL (SHIFT SOLENOID VALVE SL2)**

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

DESCRIPTION

Shifting from 1st to O/D is performed in combination with "ON" and "OFF" operation of the shift solenoid valves SL1 and SL2 which is controlled by the EGM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valve to allow the vehicle to be operated smoothly (Fail safe function).

DTC DETECTION CONDITION AND TROUBLE AREA

DTC No.	DTC Detection Condition	Trouble Area
P0778	EGM checks for an open or short circuit in shift solenoid valves SL2 (1-trip detection logic) Hybrid IC for solenoid indicates fail.	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other normal shift solenoid valves "ON/OFF" (In case of an open or short circuit, the ECM stops sending current to the circuit.) (See **DATA LIST / ACTIVE TEST**).

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

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present.	None
Solenoid current cut status	Not cut
Battery voltage	10 V or more
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

TYPICAL MALFUNCTION THRESHOLDS

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

Output signal duty	100%
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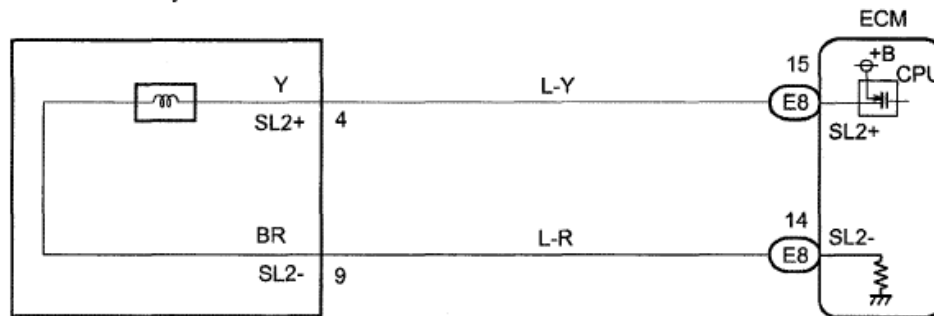
COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM

E10 Electronically Controlled Transmission Solenoid



C

0031785E22

Fig. 49: Pressure Control Solenoid "B" Electrical Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

1. INSPECT TRANSMISSION WIRE (SL2)

- Disconnect the transmission wire connector from the transaxle.
- Measure the resistance according to the value(s) in the table below.

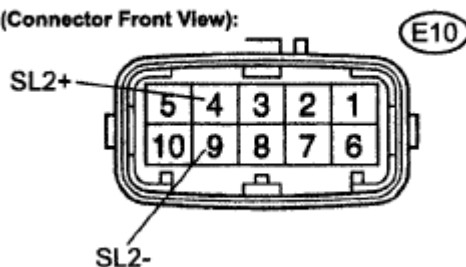
Standard resistance

STANDARD RESISTANCE SPECIFICATIONS

Tester Connection	Specified Condition 20°C (68°F)
4 (SL2+) - 9 (SL2-)	5.0 to 5.6 ohms

Transmission Wire Side:

(Connector Front View):



D025234E10

Fig. 50: Identifying Transmission Wire Connector (SL2)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

OK:**Standard resistance (Check for short)****TESTER CONNECTION AND SPECIFIED CONDITION**

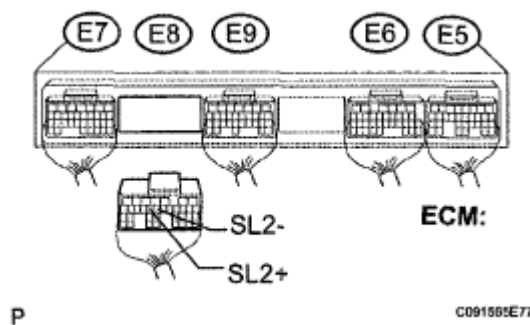
Tester Connection	Specified Condition
4 (SL2+) - Body ground	10 kohms or higher
9 (SL2-) - Body ground	?

NG: Go to step 3**OK:** Go to Next Step**2. CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)**

- Connect the transmission connector to the transaxle.
- Disconnect the connector from the ECM.
- Measure the resistance according to the value(s) in the table below.

Standard resistance**STANDARD RESISTANCE SPECIFICATIONS**

Tester Connection	Specified Condition 20°C (68°F)
E8-15 (SL2+) - E8-14 (SL2-)	5.0 to 5.6 ohms

**Fig. 51: Identifying Connector From ECM**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

OK:

Standard resistance (Check for short)

TESTER CONNECTION AND SPECIFIED CONDITION

Tester Connection	Specified Condition
E8-15 (SL2+) - Body ground	10 kohms or higher
E8-14 (SL2-) - Body ground	?

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

OK: REPLACE ECM

3. INSPECT SHIFT SOLENOID VALVE SL2

- a. Remove the shift solenoid valve SL2.
- b. Measure the resistance according to the value(s) in the table below.

Standard resistance

STANDARD RESISTANCE SPECIFICATIONS

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

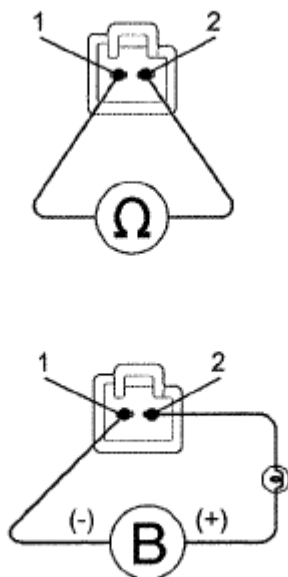
- c. Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating sound.

NG: REPLACE SHIFT SOLENOID VALVE SL2

Shift Solenoid Valve SL2:



D02540E27

Fig. 52: Identifying Shift Solenoid Valve SL2 Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPAIR OR REPLACE TRANSMISSION WIRE

DTC P0793 INTERMEDIATE SHAFT SPEED SENSOR "A"

DESCRIPTION

This sensor detects the rotation speed of the counter gear. By comparing the counter gear speed signal (NC) with the direct clutch speed sensor signal (NT), the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure according to various conditions. Thus smooth gear shifting is performed.

DTC DETECTION CONDITION AND TROUBLE AREA

DTC No.	DTC Detection Condition	Trouble Area
P0793	ECM detects conditions (a), (b) and (c) continuously for 5 sec. or more: (1-trip detection logic) a. Vehicle speed: 50 km/h (31 mph) or more b. Park/neutral position switch (NSW) is OFF c. Speed sensor (NC): less than 300 rpm	• Open or short in transmission revolution sensor NC (speed sensor NC) circuit • Transmission revolution sensor NC (speed sensor NC) • ECM

Reference (Using an oscilloscope):

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

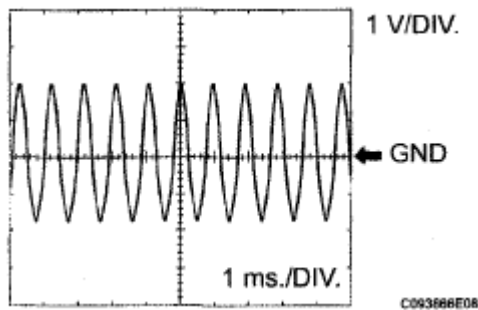


Fig. 53: Identifying ECM Connector Waveform Reference
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard: Refer to the illustration.

CONNECTOR WAVEFORM REFERENCE

Terminal	NC+ - NC-
Tool setting	1 V/DIV., 1 ms./DIV.
Vehicle condition	Vehicle speed 30 km/h (19 mph): (3rd gear) Engine speed 1,400 rpm

MONITOR DESCRIPTION

The NC terminal of the ECM detects a revolution signal from the speed sensor (NC) (counter gear rpm). The ECM calculates a gearshift comparing the speed sensor (NT) with the speed sensor (NC). While the vehicle is operating in 2nd, 3rd or 4th (O/D) gear in the shift position of D, if the counter gear revolution is less than 300 rpm *¹ although the output shaft revolution is more than 1,000 rpm *², the ECM detects the trouble, illuminates the MIL and stores the DTC.

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

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

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0793: Speed sensor (NC)/Verify pulse input
Required sensors/Components	Speed sensor (NC), Speed sensor (NT), Park/neutral position switch
Frequency of operation	Continuous
Duration	5 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present.	P0500 (VSS) P0748, P0778, P0798 (Shift solenoid valve(range))
Engine	Running
NSW switch	OFF
Output shaft rpm	1,000 rpm or more

TYPICAL MALFUNCTION THRESHOLDS

TYPICAL MALFUNCTION THRESHOLDS

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

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

Counter gear speed sensor (NC)	HINT: 3rd when shift lever position is D position (After warming up the engine); Intermediate shaft speed (NC) becomes close to the engine speed.
--------------------------------	--

WIRING DIAGRAM

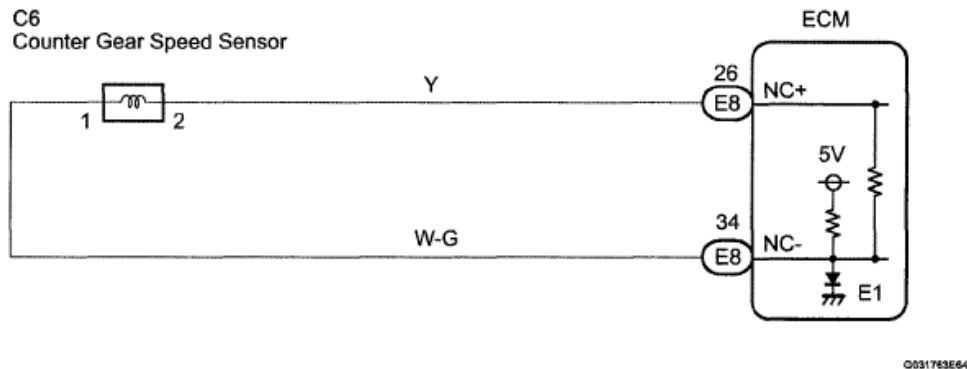


Fig. 54: Intermediate Shaft Speed Sensor Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

HINT:

According to the DATA LIST displayed by the OBD II scan tool or intelligent tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

1. READ DATA LIST

- a. Warm up the engine.
- b. Turn the ignition switch off.
- c. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
- d. Turn the ignition switch to the on position.
- e. Turn on the tester.
- f. Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
- g. According to the display on the tester, read the "DATA LIST".

DATA LIST

Tester Display	Measurement Item/Range	Normal Condition	Diagnostic Note
SPD (NC)	Counter Gear Speed/display: 50 r/min	HINT: 4th (O/D) when shift lever position is D position (After warming up the engine): Intermediate shaft speed (NC) becomes close to the engine speed.	-

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.

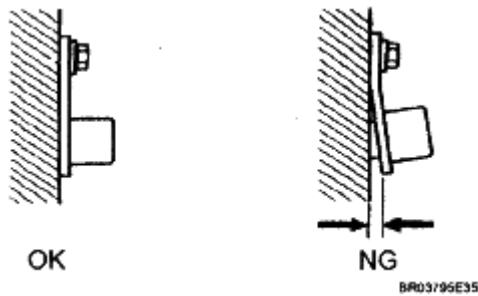
1. INSPECT SPEED SENSOR INSTALLATION

- a. Check the speed sensor installation.

OK:

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

NG: REPLACE SPEED SENSOR (NC)

**Fig. 55: Identifying Speed Sensor Clearance**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to Next Step

2. INSPECT SPEED SENSOR (NC)

- Disconnect the speed sensor connector from the transaxle.
- Measure the resistance according to the value(s) in the table below.

Standard resistance:

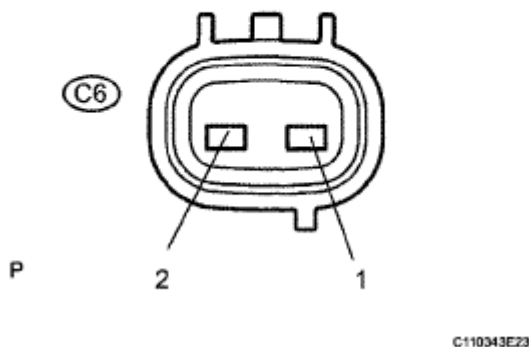
TOYOTA made

TESTER CONNECTION AND SPECIFIED CONDITION

Tester Connection	Specified Condition 20°C (68°F)
1-2	500 to 620 ohms

Sensor Side:

(Connector Front View):

**Fig. 56: Identifying Speed Sensor Connectors**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard resistance:

AISIN made

TESTER CONNECTION AND SPECIFIED CONDITION

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

NG: REPLACE SPEED SENSOR (NC)

OK: Go to Next Step

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

- Connect the speed sensor connector.
- Disconnect the ECM connector.
- Measure the resistance according to the value(s) in the table below.

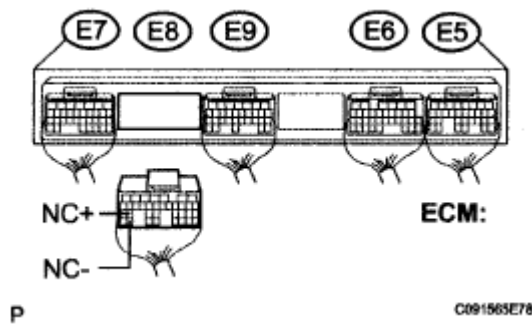


Fig. 57: Identifying Speed Sensor ECM Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard resistance:

TOYOTA made

TESTER CONNECTION AND SPECIFIED CONDITION

Tester Connection	Specified Condition 20°C (68°F)
E8-26 (NC+) - E8-34 (NC-)	500 to 620 ohms

Standard resistance:

AISIN made

TESTER CONNECTION AND SPECIFIED CONDITION

Tester Connection	Specified Condition 20°C (68°F)
E8-26 (NC+) - E8-34 (NC-)	560 to 680 ohms

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

Standard resistance:

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

Check for short

TESTER CONNECTION AND SPECIFIED CONDITION

Tester Connection	Specified Condition
E8-26 (NC+) - Body ground	10 kohms or higher
E8-34 (NC-) - Body ground	?

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

OK: REPLACE ECM

**DTC P0982 SHIFT SOLENOID "D" CONTROL CIRCUIT LOW (SHIFT SOLENOID VALVE S4);
DTC P0983 SHIFT SOLENOID "D" CONTROL CIRCUIT HIGH (SHIFT SOLENOID VALVE S4)**

DESCRIPTION

Shifting from 1st to O/D is performed in combination with "ON" and "OFF" operation of the shift solenoid valves SL1 and SL2 which is controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valve to allow the vehicle to be operated smoothly (Fail safe function).

DTC DETECTION CONDITION AND TROUBLE AREA

DTC No.	DTC Detection Condition	Trouble Area
P0982	ECM detects short in solenoid valve S4 circuit 2 times when solenoid valve S4 is operated (1-trip detection logic)	• Short in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM
P0983	ECM detects open in solenoid valve S4 circuit 2 times when solenoid valve S4 is not operated (1-trip detection logic)	• Open in shift solenoid valve S4 circuit • Shift solenoid valve S4 • ECM

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other normal shift solenoid valves "ON/OFF" (In case of an open or short circuit, the ECM stops sending current to the circuit.) (See **DATA LIST / ACTIVE TEST**).

MONITOR STRATEGY

MONITOR STRATEGY

	P0982: Shift solenoid valve S4/Range check (Low resistance)
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2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

Related DTCs	P0983: Shift solenoid valve S4/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S4
Frequency of operation	Continuous
Duration	0.064 sec. or more
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS**P0982: Range check (Low resistance):****TYPICAL ENABLING CONDITIONS**

The monitor will run whenever this DTC is not present.	None
Shift solenoid valve S4	ON
Battery voltage	8 V or more
Ignition switch	ON
Starter	OFF

P0983: Range check (High resistance):**RESISTANCE SPECIFICATIONS**

The monitor will run whenever this DTC is not present.	None
Shift solenoid valve S4	OFF
Battery voltage	8 V or more
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS**P0982: Range check (Low resistance):****TYPICAL MALFUNCTION THRESHOLDS**

Shift solenoid valve S4 resistance	8 ohms or less
------------------------------------	----------------

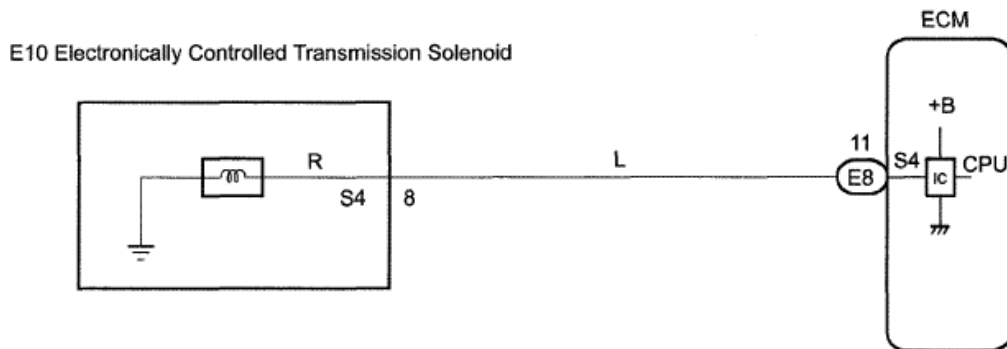
P0983: Range check (High resistance):**RESISTANCE SPECIFICATIONS**

Shift solenoid valve S4 resistance	100 kohms or more
------------------------------------	-------------------

COMPONENT OPERATING RANGE**COMPONENT OPERATING RANGE**

Shift solenoid valve S4	Resistance: 11 to 15 ohms at 20°C (68°F)
-------------------------	--

WIRING DIAGRAM



C

G031166E36

Fig. 58: Shift Solenoid "D" Control Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

1. INSPECT TRANSMISSION WIRE (S4)

- Disconnect the transmission wire connector from the transaxle.
- Measure the resistance according to the value(s) in the table below.

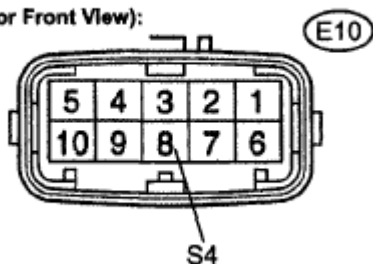
Standard resistance

STANDARD RESISTANCE SPECIFICATIONS

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

Transmission Wire Side:

(Connector Front View):



D025234E11

Fig. 59: Identifying Transmission Wire Connector (S4)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NG: Go to step 3

OK: Go to Next Step

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

- Connect the transmission connector to the transaxle.
- Disconnect the connector from the ECM.
- Measure the resistance according to the value(s) in the table below.

Standard resistance

STANDARD RESISTANCE SPECIFICATIONS

Tester Connection	Specified Condition 20°C (68°F)
E8-11 (S4) - Body ground	11 to 15 ohms

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

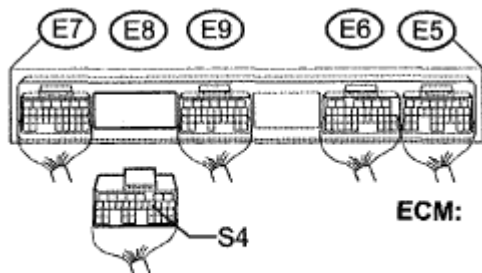


Fig. 60: Identifying Connector From ECM

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPLACE ECM

3. INSPECT SHIFT SOLENOID VALVE S4

- Remove the shift solenoid valve S4.
- Measure the resistance according to the value(s) in the table below.

Standard resistance

STANDARD RESISTANCE SPECIFICATIONS

Tester Connection	Specified Condition 20°C (68°F)
Solenoid Connector (S4) - Solenoid Body(S4)	11 to 15 ohms

- Connect the positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.

OK:

The solenoid makes an operating sound.

Shift Solenoid Valve S4:

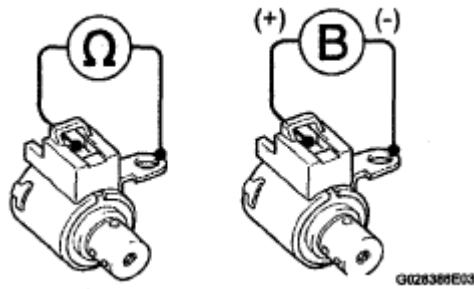


Fig. 61: Identifying Shift Solenoid Valve S4 Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NG: REPLACE SHIFT SOLENOID VALVE S4

OK: REPAIR OR REPLACE TRANSMISSION WIRE

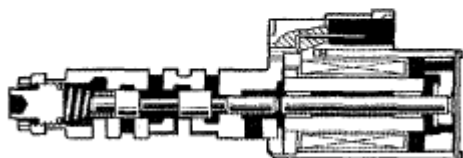
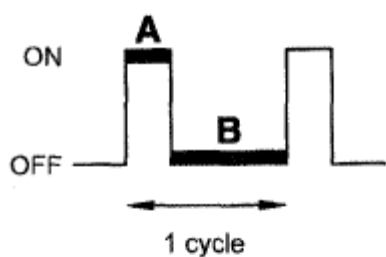
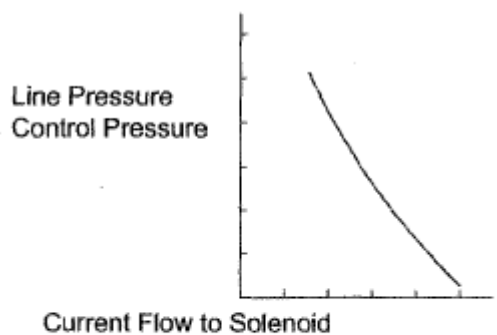
DTC P2714 PRESSURE CONTROL SOLENOID "D" PERFORMANCE (SHIFT SOLENOID VALVE SLT)

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 ECM adjusts the duty ratio (*) of the SLT solenoid valve to control hydraulic line pressure coming from the primary regulator valve. Appropriate line pressure assures smooth shifting with varying engine outputs.

(*): Duty Ratio

The duty ratio is the ratio of the period of continuity in one cycle. For example, if A is the period of continuity in one cycle, and B is the period of non-continuity, then $\text{Duty Ratio} = A / (A + B) \times 100(\%)$



C108924E02

Fig. 62: Line Pressure Control Pressure Graph
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DTC DETECTION CONDITION AND TROUBLE AREA

DTC No.	DTC Detection Condition	Trouble Area
P2714	ECM detects a malfunction on SLT (ON side) according to the revolution difference of the turbine, intermediate and the output shaft, and also by the oil pressure. (2-trip detection logic)	- Shift solenoid valve SLT remains closed - Valve body is blocked - Automatic transaxle (clutch, brake or gear, etc.)

MONITOR DESCRIPTION

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

In any forward position, when the difference between the revolutions of the turbine, Intermediate and output shaft exceeds the specified value (varies with Intermediate, output speed) determined by the ECM, the ECM illuminates the MIL and store the DTC.

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

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

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P2714: Shift solenoid valve SLT/ON malfunction
Required sensors/Components	Shift solenoid valve SLT, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	1 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.	None
Transmission range	"D"
Time after shifting "N" to "D"	4.5 sec. or more
TFT (Transmission fluid temperature)	-10°C (14°F) or more
TFT sensor circuit	Not circuit malfunction
Turbine speed sensor circuit	Not circuit malfunction
Intermediate shaft speed sensor circuit	Not circuit malfunction
Output speed sensor circuit	Not circuit malfunction
Shift solenoid valve SL1 circuit	Not circuit malfunction
Shift solenoid valve SL2 circuit	Not circuit malfunction
Shift solenoid valve SLT circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve DSL circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

ON malfunction (A):

DIAGNOSTIC PROCEDURE

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

ECM selected gear	1st
Temporary MAIN gear	1st or 2nd or 3rd or 4th
NT - NC x Temporary MAIN gear ratio NT: Input (turbine) speed NC: Intermediate shaft speed	300 rpm or more at Intermediate shaft speed 1,000 rpm
Temporary U/D gear	Low or High
NC - NO x Temporary U/D gear ratio NO: Output speed	300 rpm or more at Output speed 1,000 rpm
TT TT: Input turbine Torque	300 Nm or more
NT	300 rpm or more
NC	300 rpm or more
NO	300 rpm or more

ON malfunction (B):**DIAGNOSTIC PROCEDURE**

ECM selected gear	2nd
Temporary MAIN gear	1st or 2nd or 3rd or 4th
NT - NC x Temporary MAIN gear ratio NT: Input (turbine) speed NC: Intermediate shaft speed	300 rpm or more at Intermediate shaft speed 1,000 rpm
Temporary U/D gear	Low or High
NC - NO x Temporary U/D gear ratio NO: Output speed	300 rpm or more at Output speed 1,000 rpm
TT TT: Input turbine Torque	300 Nm or more
NT	300 rpm or more
NC	300 rpm or more
NO	300 rpm or more

ON malfunction (C):**DIAGNOSTIC PROCEDURE**

ECM selected gear	3rd
Temporary MAIN gear	1st or 2nd or 3rd or 4th
NT - NC x Temporary MAIN gear ratio NT: Input (turbine) speed NC: Intermediate shaft speed	300 rpm or more at Intermediate shaft speed 1,000 rpm
Temporary U/D gear	Low or High
NC - NO x Temporary U/D gear ratio NO: Output speed	300 rpm or more at Output speed 1,000 rpm
TT TT: Input turbine Torque	300 Nm or more

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

NT	300 rpm or more
NC	300 rpm or more
NO	300 rpm or more

ON malfunction (D):**DIAGNOSTIC PROCEDURE**

ECM selected gear	4th
Temporary MAIN gear	1st or 2nd or 3rd or 4th
NT - NC x Temporary MAIN gear ratio NT: Input (turbine) speed NC: Intermediate shaft speed	300 rpm or more at Intermediate shaft speed 1,000 rpm
Temporary U/D gear	Low or High
NC - NO x Temporary U/D gear ratio NO: Output speed	300 rpm or more at Output speed 1,000 rpm
TT TT: Input turbine Torque	164 Nm or more
NT	300 rpm or more
NC	300 rpm or more
NO	300 rpm or more

TYPICAL MALFUNCTION THRESHOLDS

[ON malfunction]

Detection condition: Total accumulated time of ON malfunctions (a), (b), (c) and (d) is 1 second or more

ON malfunction (A):**TYPICAL MALFUNCTION THRESHOLDS**

NT - NC x 1st gear ratio	300 rpm or more at Intermediate shaft speed 1,000 rpm
NC - NO x Low gear ratio	300 rpm or more at Output speed 1,000 rpm
Duration	0.85 sec. or more
Shift Solenoid valve SL1 Performance	Not performance malfunction

ON malfunction (B):**DIAGNOSTIC PROCEDURE**

NT - NC x 2nd gear ratio	300 rpm or more at Intermediate shaft speed 1,000 rpm
NC - NO x Low gear ratio	300 rpm or more at Output speed 1,000 rpm
Duration	0.85 sec. or more
Shift Solenoid valve SL1 Performance	Not performance malfunction

ON malfunction (C):

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

DIAGNOSTIC PROCEDURE

NT - NC x 3rd gear ratio	300 rpm or more at Intermediate shaft speed 1,000 rpm
NC - NO x Low gear ratio	300 rpm or more at Output speed 1,000 rpm
Duration	0.85 sec. or more
Shift Solenoid valve SL1 Performance	Not performance malfunction

ON malfunction (D):

DIAGNOSTIC PROCEDURE

NT - NC x 3rd gear ratio	300 rpm or more at Intermediate shaft speed 1,000 rpm
NC-NO x High gear ratio	300 rpm or more at Output speed 1,000 rpm
Duration	0.85 sec. or more
Shift Solenoid valve SL1 Performance	Not performance malfunction

INSPECTION PROCEDURE

1. CHECK OTHER DTCS OUT PUT (IN ADDITION TO DTC P2714)

- Connect the OBD II scan tool or intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
- Turn the ignition switch to the ON position and turn the OBD II scan tool or the intelligent tester main switch ON.
- When you use intelligent tester:

Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES"

- Read the DTCs using the OBD II scan tool or the intelligent tester.

Result

DTC RESULT REFERENCE

Display (DTC output)	Proceed to
Only P2714 is output	A
P2714 and Other DTCs	B

HINT:

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

B: GO TO DTC CHART

A: Go to Next Step

2. INSPECT SHIFT SOLENOID VALVE SLT

- Remove the shift solenoid valve SLT.

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

Standard resistance

STANDARD RESISTANCE SPECIFICATIONS

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

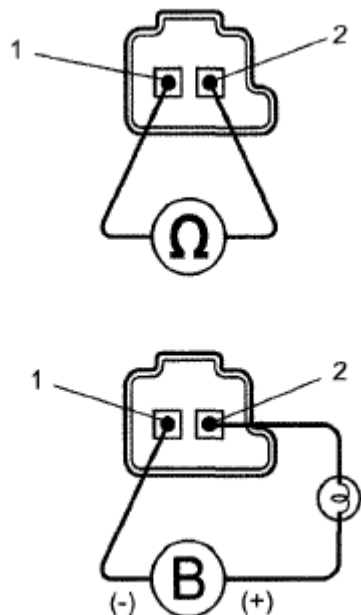
- c. Connect the positive (+) lead with a 21 W bulb to terminal 2 and the negative (-) lead to terminal 1 of the solenoid valve connector, then check the movement of the valve.

OK:

The solenoid makes an operating sound.

NG: REPLACE SHIFT SOLENOID VALVE SLT

Shift Solenoid Valve SLT:



P

G020767E43

Fig. 63: Identifying Shift Solenoid Valve SLT Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to Next Step

3. INSPECT TRANSMISSION VALVE BODY ASSEMBLY

There are no foreign objects on each valve.

NG: REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY

OK: Go to Next Step

4. INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

OK:

The torque converter clutch operates normally.

NG: REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY

OK: REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSEMBLY

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

DESCRIPTION

The linear solenoid valve (SLT) controls the transmission line pressure for smooth transmission operation based on signals from the throttle position sensor and the vehicle speed sensor, the ECM adjusts the duty cycle 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

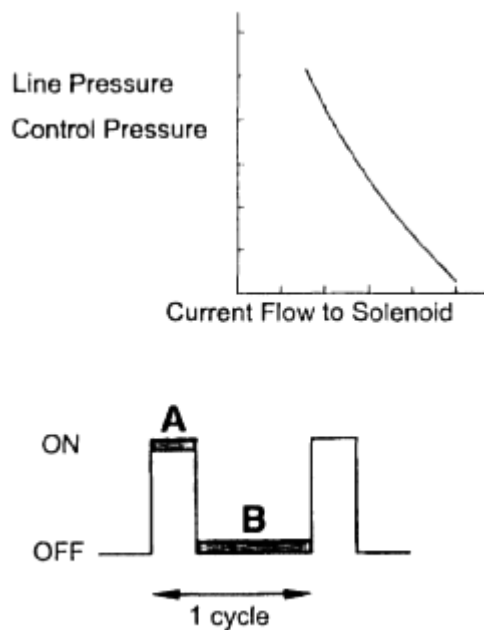
The duty ratio is the ratio of the period of continuity in one cycle.

For example, if A is the period of continuity in one cycle, and B is the period of non-continuity, then

$$\text{Duty Ratio} = A / (A + B) \times 100(\%)$$

DTC DETECTION CONDITION AND TROUBLE AREA

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 detecting logic).	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM



C114295E01

Fig. 64: Duty Ratio Cycle Pattern

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

MONITOR DESCRIPTION

When an open or short in the linear solenoid valve (SLT) circuit is detected, the ECM interprets this as a fault. The ECM 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**TYPICAL ENABLING CONDITIONS**

The monitor will run whenever this DTC is not present.	None
Solenoid current cut status	Not cut
Battery voltage	11 V or more
Ignition switch	ON
Starter	OFF

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

CPU commanded duty ratio to SLT

19% or more

TYPICAL MALFUNCTION THRESHOLDS

TYPICAL MALFUNCTION THRESHOLDS

Solenoid status from IC

Fail (Open or short)

COMPONENT OPERATING RANGE

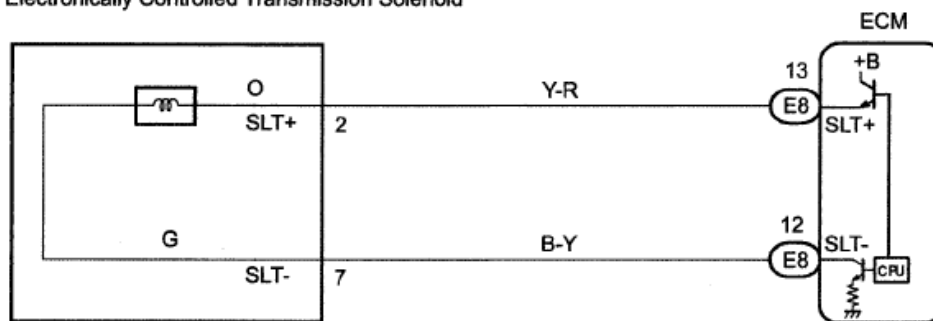
COMPONENT OPERATING RANGE

Shift solenoid valve SLT

Resistance: 5.0 to 5.6 a at 20°C (68°F)

WIRING DIAGRAM

E10 Electronically Controlled Transmission Solenoid



C

G031770E19

Fig. 65: Pressure Control Solenoid "D" Electrical Wiring Diagram

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

1. INSPECT TRANSMISSION WIRE (SLT)

- Disconnect the transmission wire connector from the transaxle.
- Measure the resistance according to the value(s) in the table below.

Standard resistance

STANDARD RESISTANCE SPECIFICATIONS

Tester Connection	Specified Condition 20°C (68°F)
2 (SLT+) - 7 (SLT-)	5.0 to 5.6 ohms

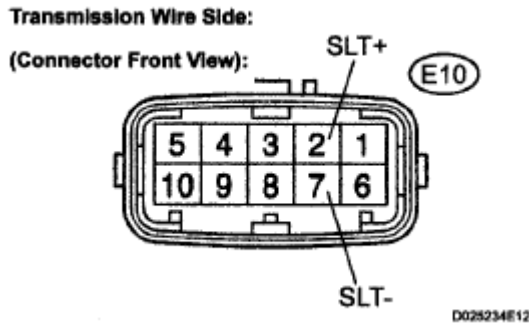


Fig. 66: Identifying Transmission Wire (SLT) Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Standard resistance:

Check for short

TESTER CONNECTION AND SPECIFIED CONDITION

Tester Connection	Specified Condition
2 (SLT+) - Body ground	10 kohms or higher
7 (SLT-) - Body ground	?

NG: Go to step 3

OK: Go to Next Step

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

- Connect the transmission wire connector to the transaxle.
- Disconnect the ECM corrector.
- Measure the resistance according to the value(s) in the table below.

Standard resistance

STANDARD RESISTANCE SPECIFICATIONS

Tester Connection	Specified Condition 2d°C (68°F)
E8-13 (SLT+) - E8-12 (SLT-)	5.0 to 5.6 ohms

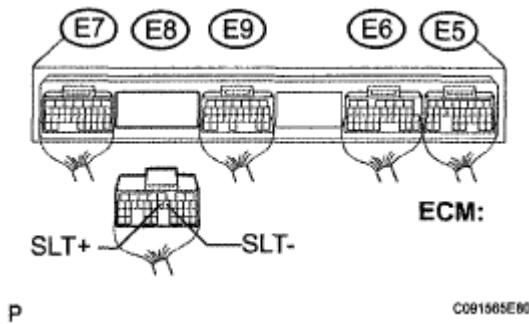


Fig. 67: Identifying ECM Connector Terminal
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Standard resistance:

Check for short

TESTER CONNECTION AND SPECIFIED CONDITION

Tester Connection	Specified Condition
E8-13 (SLT+) - Body ground	10 kohms or higher
E8-12 (SLT-) - Body ground	?

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

OK: REPLACE ECM

3. INSPECT SHIFT SOLENOID VALVE SLT

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

Standard resistance

STANDARD RESISTANCE SPECIFICATIONS

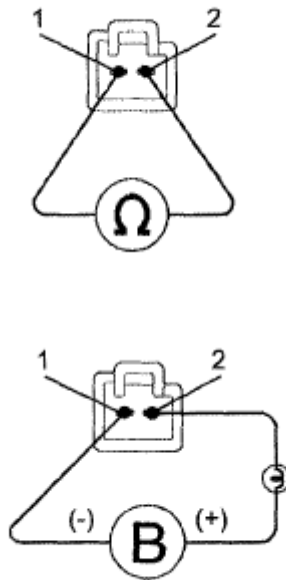
Tester Connection	Specified Condition 20°C (68°F)
1-2	5.0 to 5.6 ohms

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

OK:

The solenoid makes an operating sound.

NG: REPLACE SHIFT SOLENOID VALVE SLT

Shift Solenoid Valve SLT:

D025466E28

Fig. 68: Identifying Shift Solenoid Valve SLT Terminals
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPAIR OR REPLACE TRANSMISSION WIRE

DTC P2769 TORQUE CONVERTER CLUTCH SOLENOID CIRCUIT LOW (SHIFT SOLENOID VALVE DSL); DTC P2770 TORQUE CONVERTER CLUTCH SOLENOID CIRCUIT HIGH (SHIFT SOLENOID VALVE DSL)

DESCRIPTION

The shift solenoid valve DSL is turned "ON" and "OFF" by signals from the ECM in order to control the hydraulic pressure operation, the lock up relay valve, which then controls operation of the lock up clutch.

DTC DETECTION CONDITION AND TROUBLE AREA

DTC No.	DTC Detection Condition	Trouble Area
P2769	ECM detects short in solenoid valve DSL circuit (0.1 sec.) when solenoid valve DSL is operated (2-trip detection logic)	• Short in shift solenoid valve DSL circuit • Shift solenoid valve DSL • ECM
P2770	ECM detects open in solenoid valve DSL circuit (0.1 sec.) when solenoid valve DSL is not operated (2-trip detection logic)	• Open in shift solenoid valve DSL circuit • Shift solenoid valve

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

DSL

- ECM

MONITOR DESCRIPTION

Torque converter lock up is controlled by the ECM based on engine rpm, engine load, engine temperature, vehicle speed, transmission temperature, and shift range selection. The ECM determines the lock up status of the torque converter by comparing the engine rpm (NE) to the input turbine rpm (NT). The ECM calculates the actual transmission gear by comparing input turbine rpm (NT) to counter gear rpm (NC). When conditions are appropriate, the ECM requests "lock up" by applying control voltage to the shift solenoid DSL. When the DSL is opened, it applies pressure to the lock up relay valve and locks the torque converter clutch. If the ECM detects an open or short in the DSL solenoid circuit, the ECM interprets this as a fault in the DSL solenoid or circuit. The ECM will turn on the MIL and store the DTC.

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P2769: Shift solenoid valve DSL/Range check (Low resistance) P2770: Shift solenoid valve DSL/Range check (High resistance)
Required sensors/Components	Shift solenoid valve DSL
Frequency of operation	Continuous
Duration	0.064 sec. or more
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 this DTC is not present.	None
Shift solenoid valve DSL	ON
Solenoid current cut status	Not cut
Battery voltage	8 V or more
Ignition switch	ON
Starter	OFF

P2770: Range check (High resistance):

RESISTANCE SPECIFICATIONS

The monitor will run whenever this DTC is not present.	None
Shift solenoid valve DSL	ON
Battery voltage	8 V or more
Ignition switch	ON

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

Starter

OFF

TYPICAL MALFUNCTION THRESHOLDS

P2769: Range check (Low resistance):

TYPICAL MALFUNCTION THRESHOLDS

Shift solenoid valve DSL resistance	8 ohms or less
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P2770: Range check (High resistance):

RESISTANCE SPECIFICATIONS

Shift solenoid valve DSL resistance	100 kohms or more
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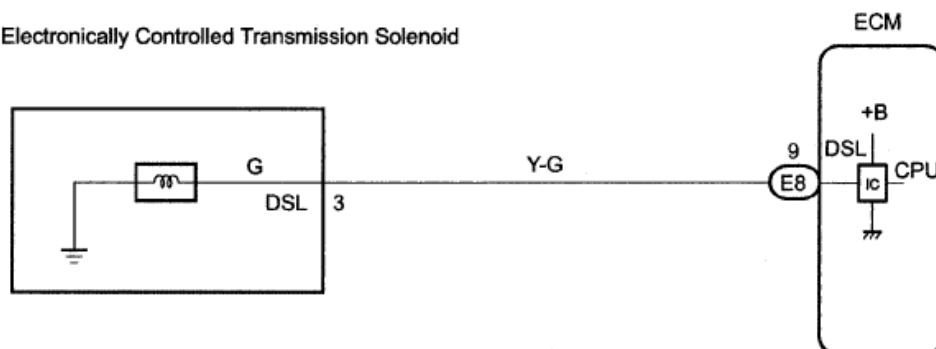
COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

Shift solenoid valve DSL	Resistance: 11 to 13 ohms at 20°C (68°F)
--------------------------	--

WIRING DIAGRAM

E10 Electronically Controlled Transmission Solenoid



C

G031195E37

Fig. 69: Torque Converter Clutch Solenoid Circuit Low (Shift Solenoid Valve DSL) - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

1. INSPECT TRANSMISSION WIRE (DSL)

- Disconnect the transmission wire connector from the transaxle.
- Measure the resistance according to the value(s) in the table below.

Standard resistance

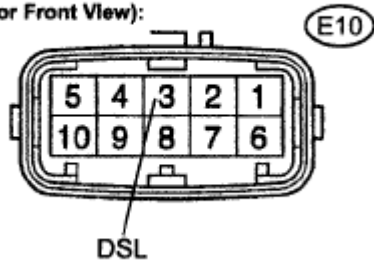
STANDARD RESISTANCE SPECIFICATIONS

Tester Connection	Specified Condition 20°C (68°F)
3 - Body ground	11 to 13 ohms

NG: Go to step 3

Transmission Wire Side:

(Connector Front View):



D025234E13

Fig. 70: Identifying Transmission Wire Connector (DSL)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to Next Step

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

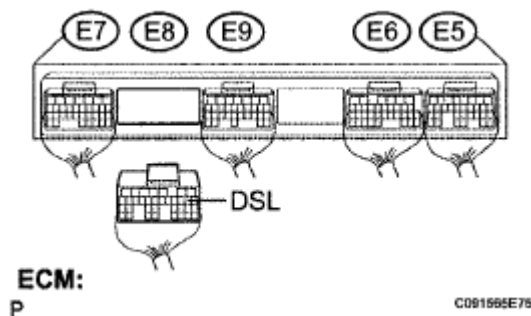
- Connect the transmission wire connector.
- Disconnect the ECM connector.
- Measure the resistance according to the value(s) in the table below.

Standard resistance

STANDARD RESISTANCE SPECIFICATIONS

Tester Connection	Specified Condition 20°C (68°F)
E8-9 (DSL) - Body ground	11 to 13 ohms

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR



C081585E75

Fig. 71: Identifying ECM Connector

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPLACE ECM**3. INSPECT SHIFT SOLENOID VALVE DSL**

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

Standard resistance**STANDARD RESISTANCE SPECIFICATIONS**

Tester Connection	Specified Condition 20°C (68°F)
Solenoid Connector (DSL) - Solenoid Body (DSL)	11 to 13 ohms

- c. Connect the positive (+) lead to the terminal of the solenoid connector, and the negative (-) lead to the solenoid body.

OK:

The solenoid valve makes an operating sound.

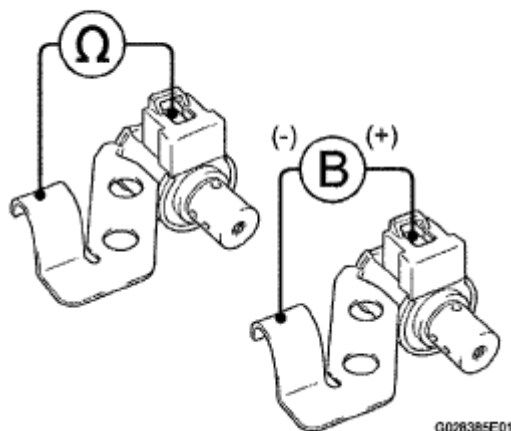
NG: REPLACE SHIFT SOLENOID VALVE DSL**Shift Solenoid Valve DSL:**

Fig. 72: Identifying Shift Solenoid Valve (DSL) Terminals
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: REPAIR OR REPLACE TRANSMISSION WIRE**O/D MAIN SWITCH CIRCUIT****DESCRIPTION**

The O/D main switch (transmission control switch) is a momentary type switch. When pressing the O/D main

switch, the O/D OFF indicator light lights up and the ECM prohibits shifting into O/D, and when pressing it once again, the O/D OFF indicator light goes off and the ECM allows shifting into O/D. Turning the IG switch OFF will reset the O/D OFF indicator light.

WIRING DIAGRAM

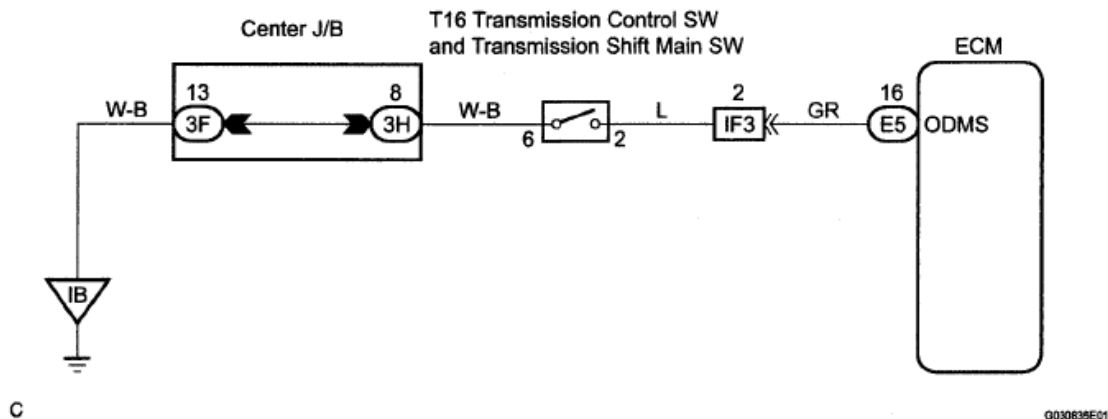


Fig. 73: Main Switch Circuit - Wiring Diagram
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE

1. **CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL SWITCH - BODY GROUND)**
 - a. Disconnect the transmission control switch connector.
 - b. Measure the resistance according to the value(s) in the table below.

Standard resistance

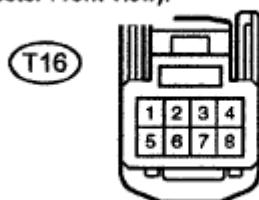
STANDARD RESISTANCE SPECIFICATIONS

Tester Connection	Specified Condition
6 - Body ground	Below 1 ohms

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

Wire Harness Side:

(Connector Front View):



P

G02319E09

Fig. 74: Identifying T16 Connector Terminal

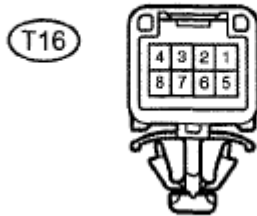
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to Next Step**2. INSPECT TRANSMISSION CONTROL SWITCH**

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

Standard resistance**STANDARD RESISTANCE SPECIFICATIONS**

Switch Condition	Tester Connection	Specified Condition
Press continuously transmission control switch	2-6	Below 1 ohms
Release transmission control switch	?	10 kohms or higher

NG: REPLACE TRANSMISSION CONTROL SWITCH**Switch Side:****(Connector Front View):****Fig. 75: Identifying Transmission Control Switch Connector**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to Next Step**3. CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL SWITCH - ECM)**

- a. Connect the transmission control switch connector.
- b. Disconnect the ECM connector.
- c. Measure the resistance according to the value(s) in the table below.

Standard resistance**STANDARD RESISTANCE SPECIFICATIONS**

Switch Condition	Tester Connection	Specified Condition
Press continuously transmission control switch	E5-16 (ODMS) - Body ground	Below 1 ohms
Release transmission control switch	?	10 kohms or higher

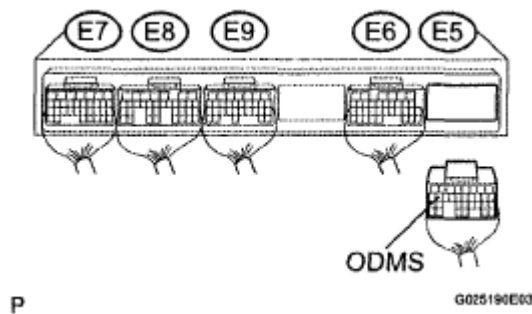


Fig. 76: Identifying ECM Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

OK: PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE

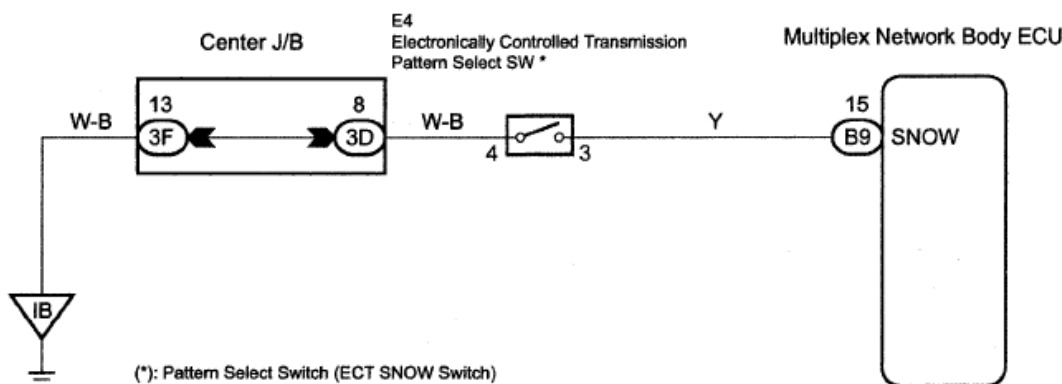
PATTERN SELECT SWITCH CIRCUIT

DESCRIPTION

Multiplex network body ECU receives pattern select switch information, and sends it through the multiplex communication system to the ECM.

ECT SNOW is the system that operates the throttle motor to control engine output to reduce skidding of the driving wheels, guarantee takeoff acceleration, driving straightness and turning stability.

WIRING DIAGRAM



When the ECT SNOW switch is pushed, the switch contact is made and the ECT SNOW mode is selected. To cancel the ECT SNOW mode, push the ECT SNOW switch once again. The ECT SNOW mode is automatically cancelled when the ignition switch is turned "OFF".

G032449E01

Fig. 77: Pattern Select Switch Circuit - Wiring Diagram

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION PROCEDURE**1. DRIVING TEST**

- a. Start the engine.
- b. Turn the ECT SNOW switch "OFF" (Normal drive mode).
- c. Confirm vehicle response by driving from a parked position to fully depressing the accelerator pedal (*1).
- d. Turn the ECT SNOW switch "ON" and perform the same check as (*1).

Confirm that there is a difference between ECT SNOW switch "ON" and "OFF".

HINT:

- Driving test should be done on a paved road (a nonskid road).
- Make sure not to use the TRAC system when testing a vehicle equipped with one.

Standard:

There is a difference in acceleration between "ON" and "OFF".

NG: Go to step 2

OK: PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE

2. CHECK HARNESS AND CONNECTOR (PATTERN SELECT SWITCH ASSEMBLY NO.1 BODY GROUND)

- a. Disconnect the connector of pattern select switch (ECT SNOW switch).
- b. Measure the resistance according to the value(s) in the table below.

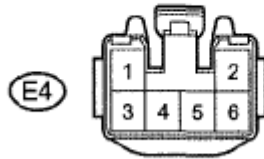
Standard resistance**STANDARD RESISTANCE SPECIFICATIONS**

Tester Connection	Specified Condition
4 - Body ground	Below 1 ohms

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

Wire Harness Side:

(Connector Front View):



C149739E01

Fig. 78: Identifying E4 Connector Of Pattern Select Switch

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to Next Step

3. INSPECT PATTERN SELECT SWITCH ASSEMBLY NO.1

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

Standard resistance

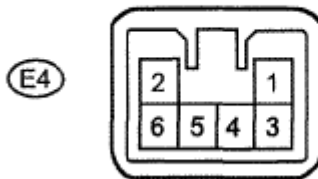
STANDARD RESISTANCE SPECIFICATIONS

Switch Condition	Tester Connection	Specified Condition
Press continuously Pattern select switch	3-4	Below 1 ohms
Release Pattern select switch	?	10 kohms or higher

NG: REPLACE PATTERN SELECT SWITCH ASSEMBLY NO.1

Switch Side:

(Connector Front View):



C152794E01

Fig. 79: Identifying E4 Connector Of Pattern Select Switch

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OK: Go to Next Step

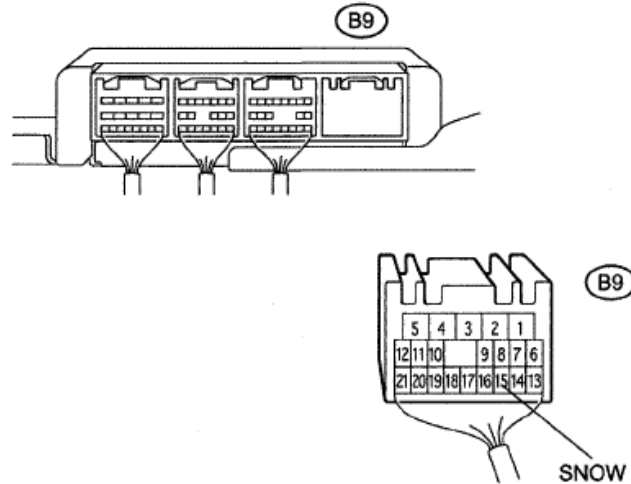
4. CHECK HARNESS AND CONNECTOR (PATTERN SELECT SWITCH ASSEMBLY NO.1 - MULTIPLEX NETWORK BODY)

- Connect the connector of pattern select switch (ECT SNOW switch).
- Disconnect the multiplex network body ECU connector.

- c. Measure the resistance between terminals SNOW of multiplex network body ECU and body ground.

Multiplex Network Body ECU:

Back Side:



G032072E01

Fig. 80: Identifying Multiplex Network Body ECU Connector Terminal
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Standard resistance

STANDARD RESISTANCE SPECIFICATIONS

Switch Condition	Tester Connection	Specified Condition
Press continuously Pattern select switch	B9-15 (SNOW) - Body ground	Below 1 ohms
Release Pattern select switch	?	10 kohms or higher

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

OK: PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE

AUTOMATIC TRANSAXLE FLUID

ON-VEHICLE INSPECTION

1. CHECK FLUID LEVEL

HINT:

Drive the vehicle so that the engine and transaxle are at normal operating temperature.

Fluid temperature:

70 to 80°C (158 to 176°F)

- Park the vehicle on a level surface and set the parking brake.
- With the engine idling and the brake pedal depressed, move the shift lever to all positions from P to L and return to the P position.
- Take out the dipstick and wipe it clean.
- Put the dipstick back all the way.
- Take out the dipstick again and check that the fluid level is within the HOT range.

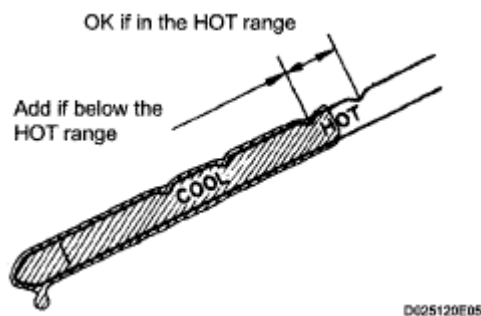


Fig. 81: Identifying Dipstick Fluid Level
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

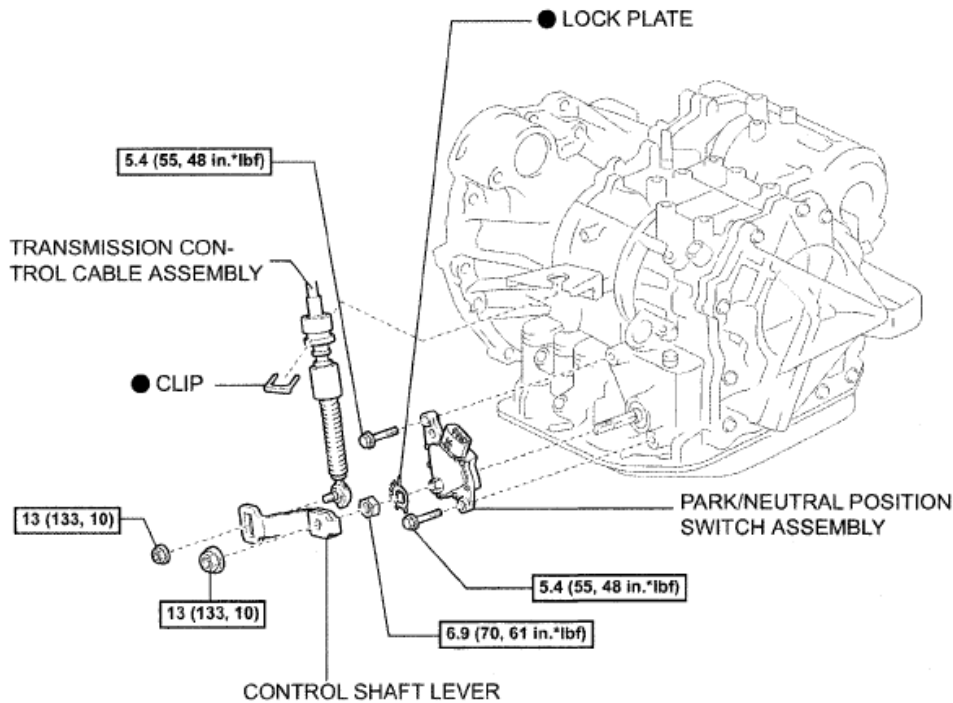
If the fluid level is below the HOT range, add new fluid and recheck the fluid level.

If the fluid level exceeds the HOT range, drain the fluid once, add the proper amount of new fluid and recheck the fluid level.

If there are leaks, it is necessary to repair or replace O-rings, FIPGs, oil seals, plugs and/or other parts.

PARK / NEUTRAL POSITION SWITCH

COMPONENTS



● Non-reusable part

N*m (kgf*cm, ft.*lbf) : Specified torque

P

C126420E01

Fig. 82: Identifying Park / Neutral Position Switch Components And Torque Specifications
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **REMOVE BATTERY**
2. **REMOVE ENGINE UNDER COVER NO. 1**
3. **REMOVE AIR CLEANER ASSEMBLY**

HINT:

(See **REMOVAL**)

4. **SEPARATE TRANSMISSION CONTROL CABLE ASSEMBLY**
 - a. Remove the nut from the control shaft lever.
 - b. Disconnect the control cable from the control shaft lever.

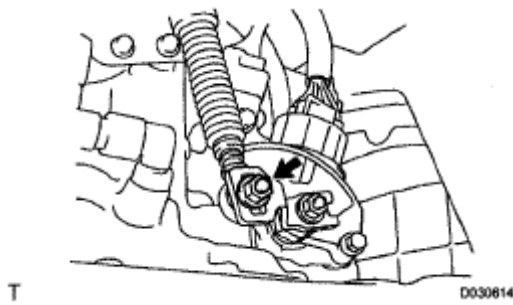


Fig. 83: Locating Nut And Control Shaft Lever

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the clip and disconnect the control cable from the control cable bracket.

NOTE: Do not hold the resin guide pipe.

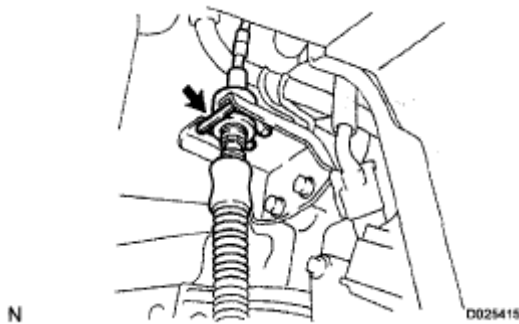


Fig. 84: Locating Control Cable Clip

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. REMOVE PARK/NEUTRAL POSITION SWITCH ASSEMBLY

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

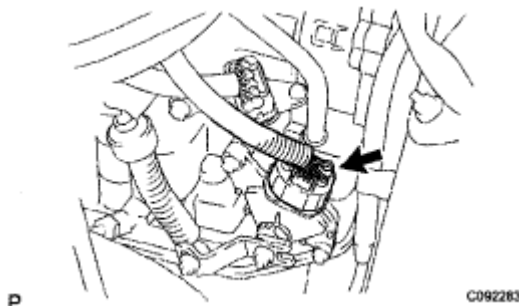


Fig. 85: Locating Park/Neutral Position Switch Connector

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the nut, washer and control shaft lever.

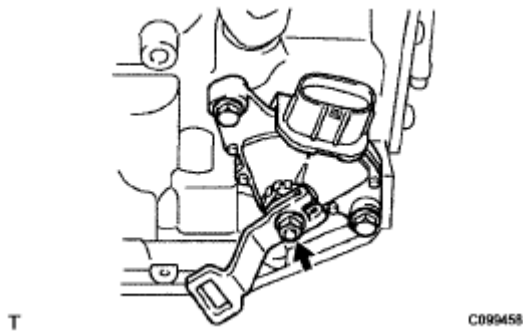


Fig. 86: Locating Nut, Washer And Control Shaft Lever
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using a screwdriver, pry up the lock plate.

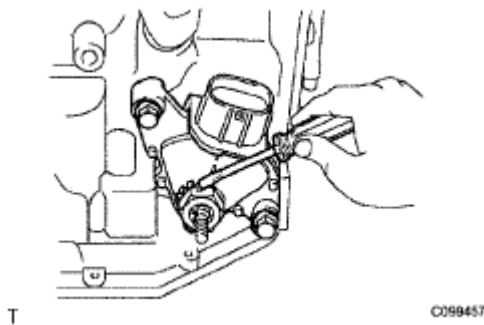


Fig. 87: Prying Up Lock Plate
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Remove the lock nut and the lock plate.

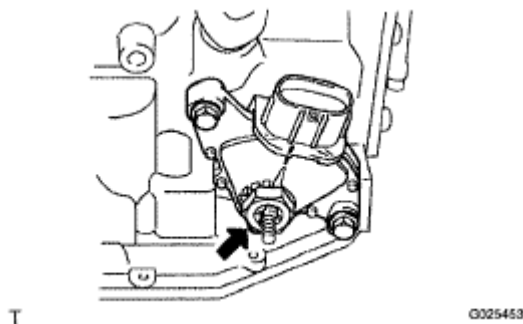


Fig. 88: Locating Lock Nut And Lock Plate
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Remove the 2 bolts and pull out the park/neutral position switch.

INSPECTION

1. INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY OPERATION

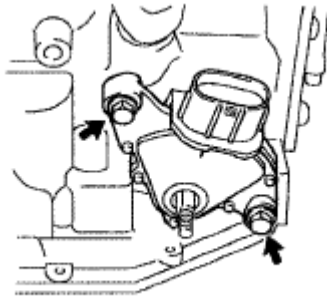


Fig. 89: Locating Bolts And Park/Neutral Position Switch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Apply the parking brake and turn the ignition switch to the ON position.
- Depress the brake pedal and check that the engine starts only when the shift lever is in the N or P position and the engine does not start when the shift lever is in other positions.
- Check that the back up light comes on and the reverse warning buzzer sounds only when the shift lever is in the R position and the light and buzzer do not operate when the shift lever is in other positions.
- If a failure is found, check the park/neutral position switch for continuity.

2. INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY

- Jack up the vehicle.
- Disconnect the park/neutral position switch connector.
- Measure the resistance according to the value(s) in the table below when the shift lever is moved to each position.

Switch Side:

(Connector Front View):

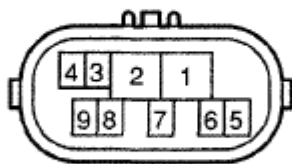


Fig. 90: Identifying Park/Neutral Position Switch Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Resistance**TESTER CONNECTION AND SPECIFIED CONDITION**

Shift Position	Tester Connection	Specified Condition
P	2-6 and 4-5	Below 1 ohms
Except P		10 kohms or higher
R	2-1	Below 1 ohms
Except R		10 kohms or higher
N	2-9 and 4-5	Below 1 ohms
Except N		10 kohms or higher
D	2-7	Below 1 ohms
Except D		10 kohms or higher
2	2-3	Below 1 ohms
Except 2		10 kohms or higher
L	2-8	Below 1 ohms
Except L		10 kohms or higher

ADJUSTMENT**1. ADJUST PARK/NEUTRAL POSITION SWITCH ASSEMBLY**

- Loosen the 2 bolts of the park/neutral position switch and move the shift lever to the N position.
- Align the groove with the neutral basic line.
- Hold the switch in position and tighten the 2 bolts.

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

- After adjustment, perform the inspection described in park/neutral position switch assembly operation.

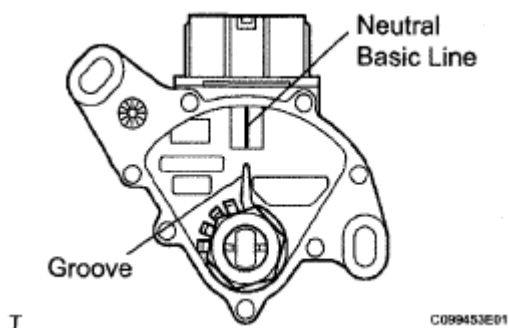


Fig. 91: Aligning Groove With Neutral Basic Line
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. INSTALL PARK/NEUTRAL POSITION SWITCH ASSEMBLY

- a. Install the park/neutral position switch to the manual valve shaft.
- b. Temporarily install the 2 bolts.



Fig. 92: Locating Bolts And Park/Neutral Position Switch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Place a new lock plate and tighten the nut.

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

- d. Temporarily install the control shaft lever.



Fig. 93: Locating Lock Nut And Lock Plate
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

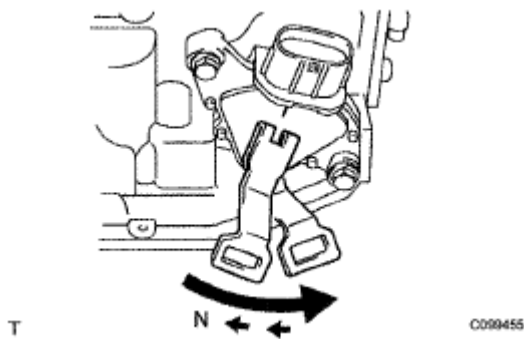


Fig. 94: Turning Lever Counterclockwise
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

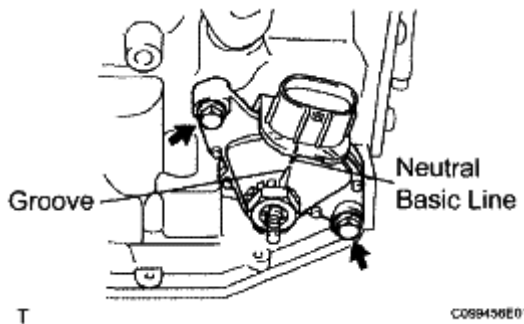


Fig. 95: Locating Groove With Neutral Basic Line
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- i. Using a screwdriver, bend the tabs of the lock plate.

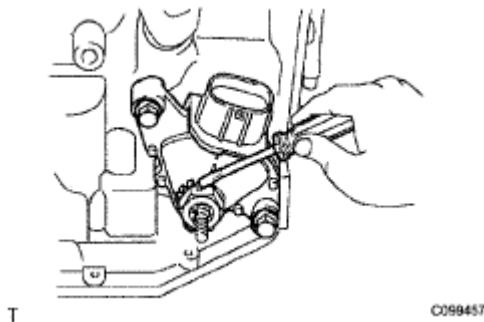


Fig. 96: Bending Tabs Of Lock Plate
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- j. Install the control shaft lever, washer and the nut.

Torque: 13 N*m (133 kgf*cm, 9 ft.*lbf)

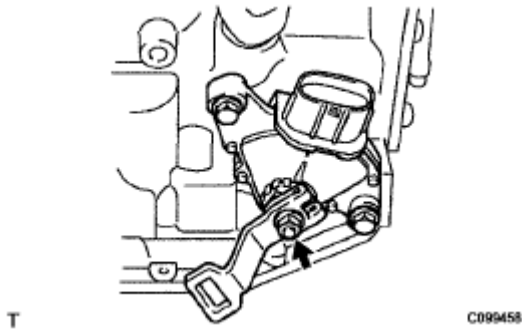


Fig. 97: Locating Nut, Washer And Control Shaft Lever
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- k. Connect the park/neutral position switch connector.

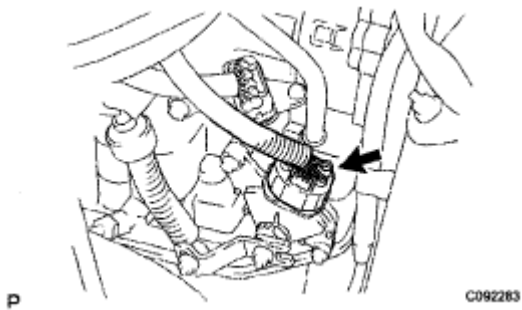


Fig. 98: Locating Park/Neutral Position Switch Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. CONNECT TRANSMISSION CONTROL CABLE ASSEMBLY

- a. Connect the control cable to the control shaft lever with the nut.

Torque: 13 N*m (133 kgf*cm, 10 ft.*lbf)

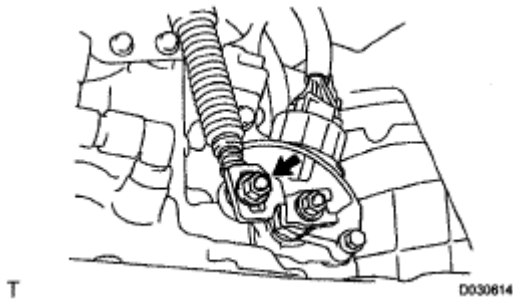


Fig. 99: Locating Nut And Control Shaft Lever
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the control cable with a new clip to the bracket.
3. **ADJUST PARK/NEUTRAL POSITION SWITCH ASSEMBLY** (See ADJUSTMENT)
4. **INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY OPERATION** (See INSPECTION)
5. **INSPECT SHIFT LEVER POSITION** (See ADJUSTMENT)

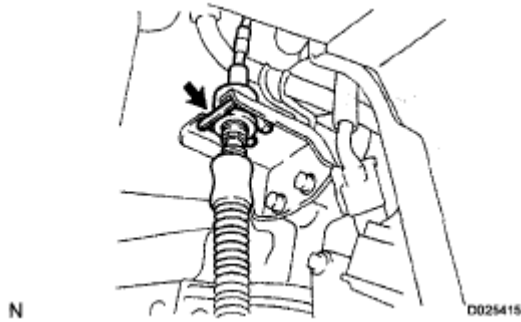


Fig. 100: Locating Control Cable Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. **ADJUST SHIFT LEVER POSITION** (See ADJUSTMENT)
7. **INSTALL AIR CLEANER ASSEMBLY**

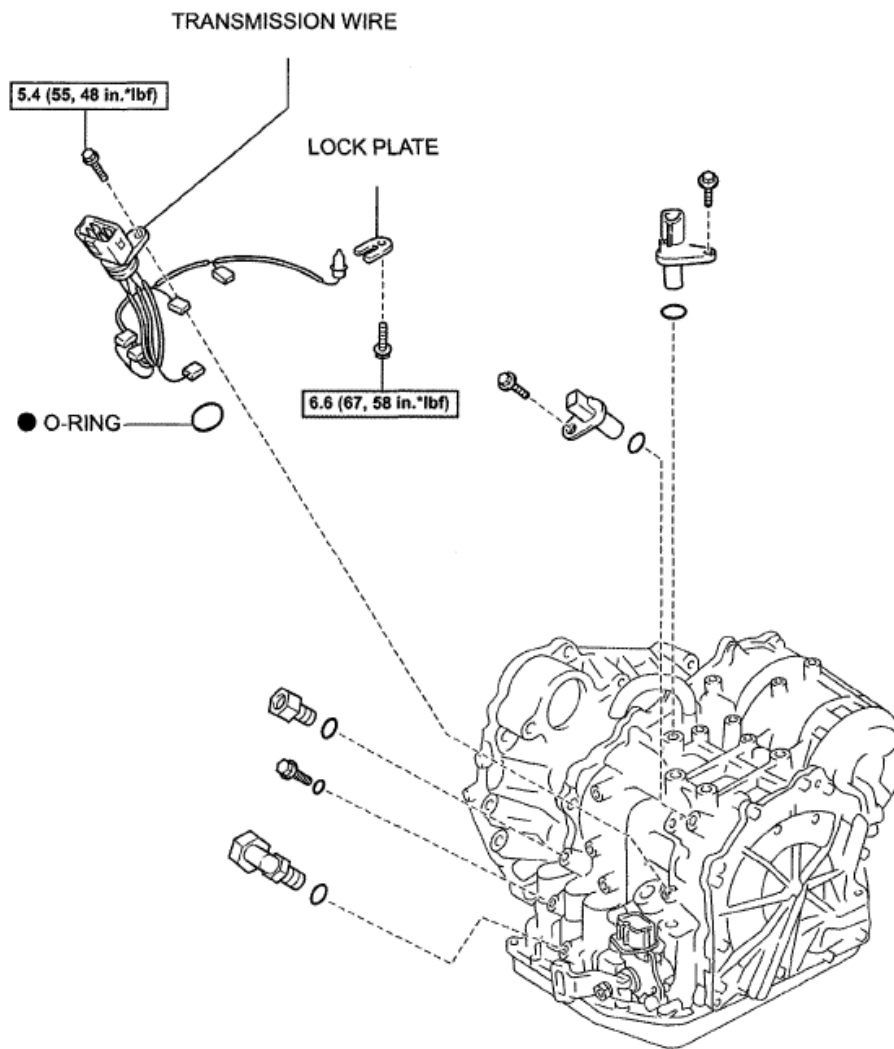
HINT:

(See INSTALLATION)

8. **INSTALL ENGINE UNDER COVER NO. 1**
9. **INSTALL BATTERY**

TRANSMISSION WIRE

COMPONENTS



N*m (kgf*cm, ft.*lbf) : Specified torque

● Non-reusable part

N

C119448E05

Fig. 101: Identifying Transmission Wire Components With Torque Specifications
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
2. **REMOVE ENGINE UNDER COVER NO. 1**
3. **DRAIN AUTOMATIC TRANSAXLE FLUID**
 - a. Remove the drain plug and gasket, and drain the ATF.
 - b. Install a new gasket and the drain plug.

Torque: 49 N*m (500 kgf*cm, 36 ft.*lbf)

4. REMOVE AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY

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

NOTE: Some fluid will remain in the oil pan. Carefully remove the oil pan so that fluid remaining in the pan does not spill out.

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

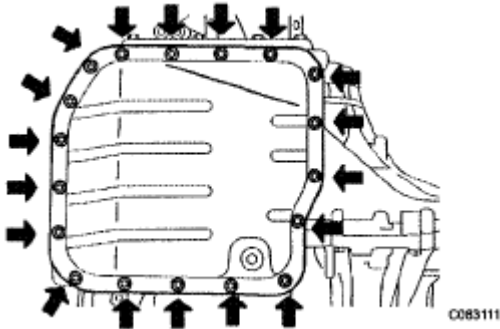


Fig. 102: Locating Oil Pan And Gasket With 18 Bolts To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Examine particles in the pan.
1. Collect any steel chips using the removed magnets. Look carefully at the chips and particles in the pan and on the magnets to see the type of wear which might be found in the transaxle.

Result:

Steel (magnetic):

Wear of the bearing, gear or plate

Brass (non-magnetic):

Wear of the bearing

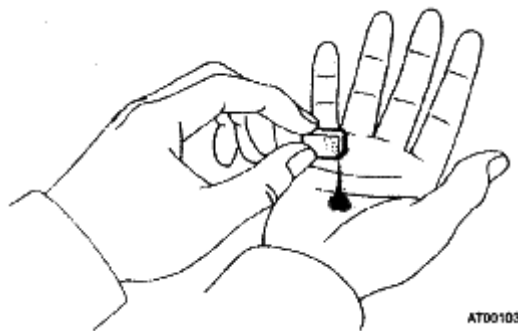


Fig. 103: Checking Particles In Pan

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. DISCONNECT TRANSMISSION WIRE

- a. Disconnect the 5 shift solenoid valve connectors.
- b. Remove the bolt and lock plate, and disconnect the ATF temperature sensor.

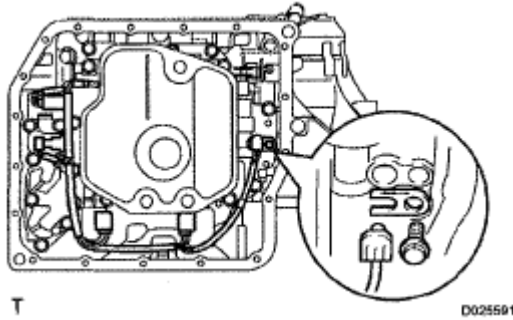


Fig. 104: Identifying ATF Temperature Sensor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. REMOVE TRANSMISSION WIRE

- a. Disconnect the transmission wire connector.
- b. Remove the bolt and transmission wire.
- c. Remove the O-ring from the transmission wire.

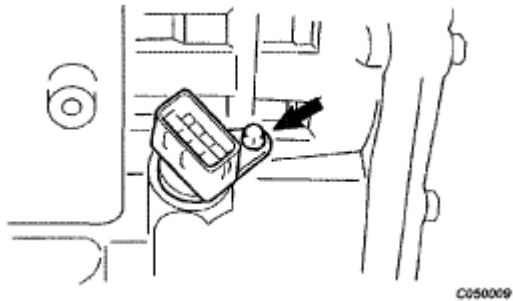


Fig. 105: Locating Transmission Wire With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. INSTALL TRANSMISSION WIRE

- a. Coat the O-ring of the transmission wire connector with ATF and install it.

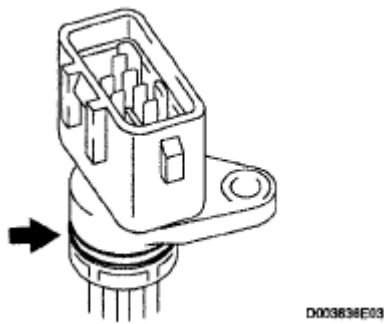


Fig. 106: Locating O-Ring Of Transmission Wire Connector With ATF
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the transmission wire with the bolt.

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

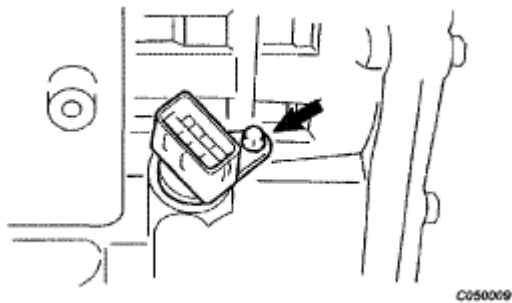


Fig. 107: Locating Transmission Wire With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. CONNECT TRANSMISSION WIRE

- a. Coat the O-ring of the ATF temperature sensor with ATF.
- b. Install the ATF temperature sensor with the lock plate and bolt.

Torque: 6.6 N*m (67 kgf*cm, 58 in.*lbf)

- c. Connect the 5 shift solenoid valve connectors.

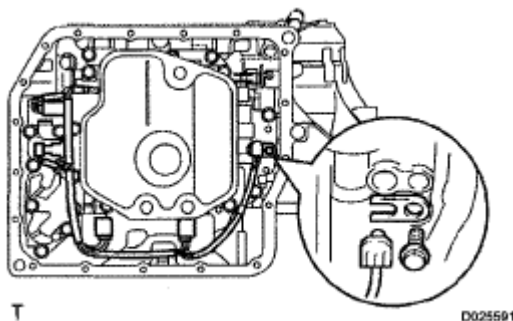


Fig. 108: Identifying ATF Temperature Sensor

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY

- a. Install the 2 magnets in the oil pan.
- b. Apply seal packing to the 18 bolts.

Adhesive:

Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

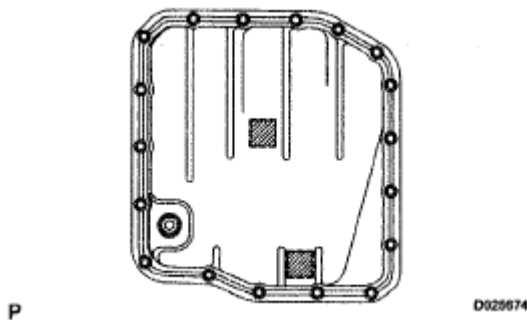


Fig. 109: Identifying Seal Packing Or Equivalent To 18 Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using a new gasket, install the oil pan to the transaxle case with the 18 bolts.

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

NOTE: Apply seal packing to the bolts and tighten them within 10 minutes of application.

4. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

5. ADD AUTOMATIC TRANSAXLE FLUID

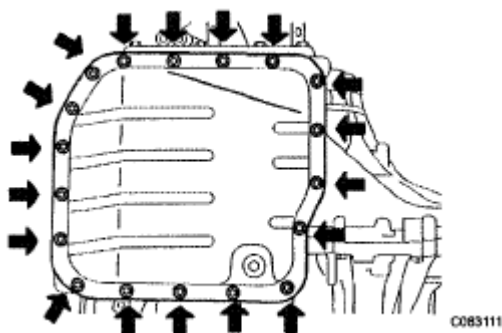


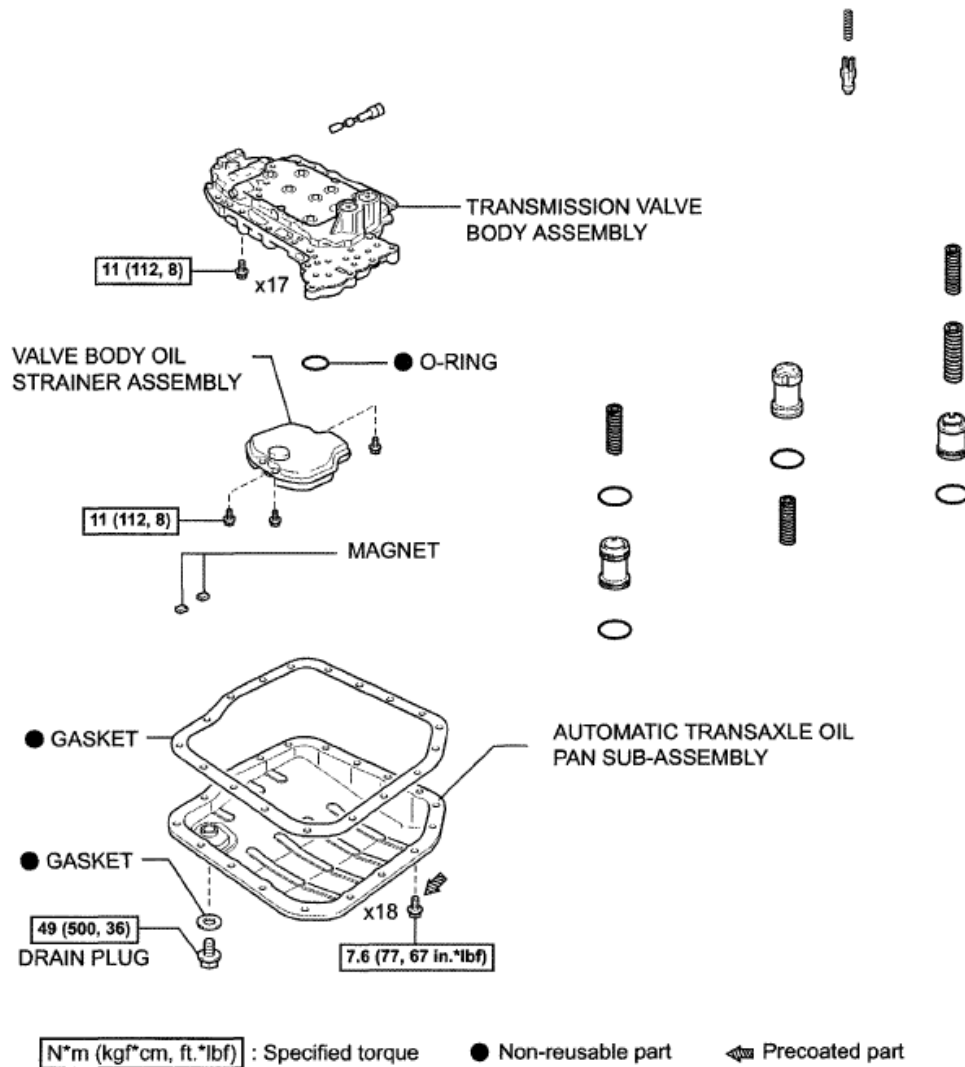
Fig. 110: Locating Oil Pan And Gasket With 18 Bolts To Transaxle Case

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSPECT AUTOMATIC TRANSAXLE FLUID (See ON-VEHICLE INSPECTION)
7. INSTALL ENGINE UNDER COVER NO. 1

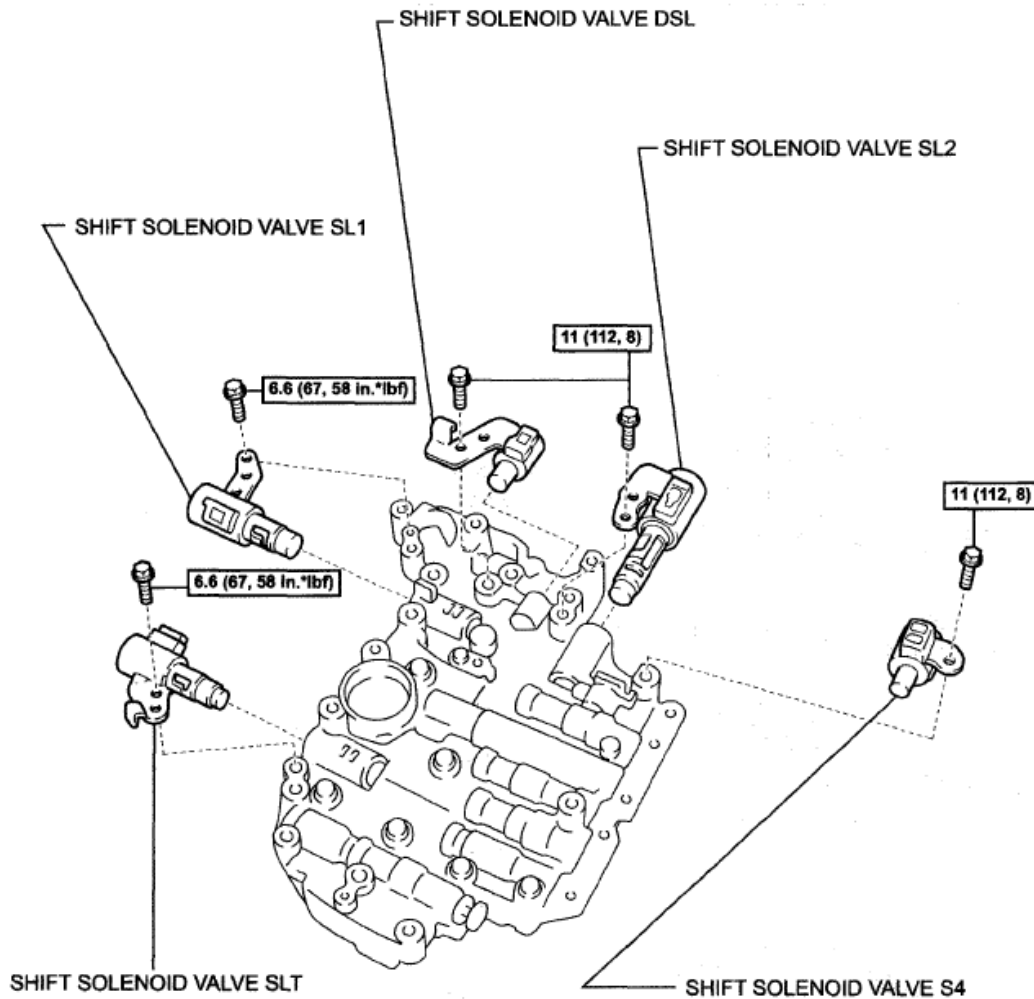
VALVE BODY ASSEMBLY

COMPONENTS



C119448E08

Fig. 111: Identifying Valve Body Assembly Components With Torque Specifications (1 Of 2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



N*m (kgf*cm, ft.*lbf) : Specified torque

P

C119458ED4

Fig. 112: Identifying Valve Body Assembly Components With Torque Specifications (2 Of 2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. REMOVE ENGINE UNDER COVER NO. 1
2. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

3. **DRAIN AUTOMATIC TRANSAXLE FLUID** (See **REMOVAL**)
4. **REMOVE AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY**
 - a. Remove the 18 bolts, oil pan and gasket.

NOTE: **Some fluid will remain in the oil pan. Carefully remove the oil pan so that the fluid remaining in the pan does not spill out.**

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

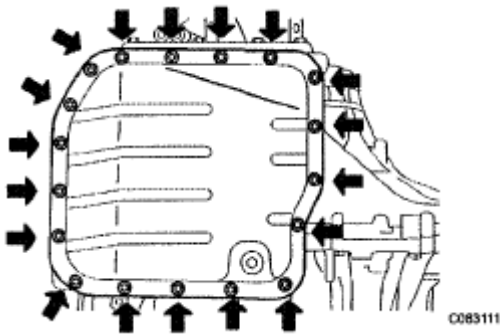


Fig. 113: Locating Oil Pan And Gasket With 18 Bolts To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Examine particles in the pan.
 1. Collect any steel chips using the removed magnets. Look carefully at the chips and particles in the pan and on the magnets to see the type of wear which might be found in the transaxle.

Result:

Steel (magnetic):

Wear of the bearing, gear or plate Brass (non-magnetic):

Wear of the bearing

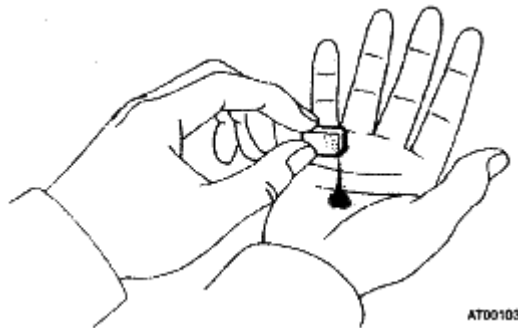


Fig. 114: Identifying Particles In Pan
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. DISCONNECT TRANSMISSION WIRE

- a. Disconnect the 5 shift solenoid valve connectors.
- b. Remove the bolt and lock plate, and disconnect the ATF temperature sensor.

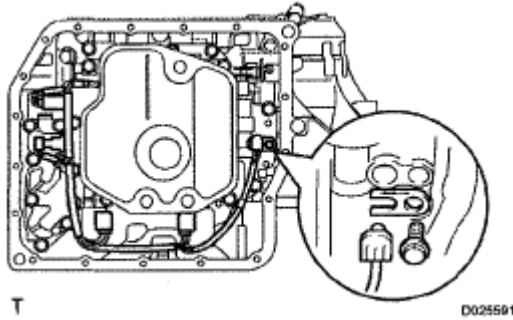


Fig. 115: Identifying ATF Temperature Sensor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. REMOVE VALVE BODY OIL STRAINER ASSEMBLY

- a. Remove the 3 bolts and oil strainer.

NOTE: Be careful when removing the oil strainer as fluid will come out.

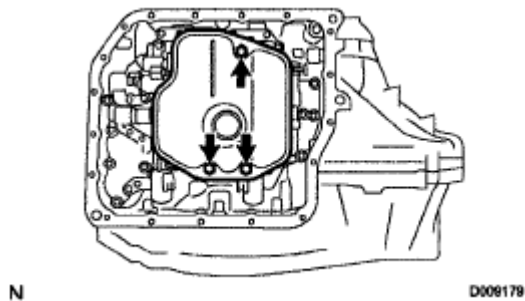


Fig. 116: Identifying Oil Pan Gasket To Oil Pan
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the O-ring from the valve body oil strainer assembly.

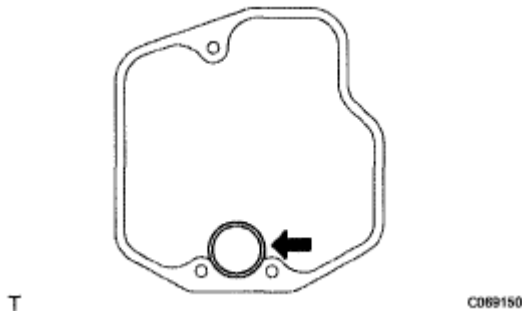


Fig. 117: Locating O-Ring

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. REMOVE TRANSMISSION VALVE BODY ASSEMBLY

- a. Support the valve body assembly and remove the 17 bolts and the transmission valve body assembly.

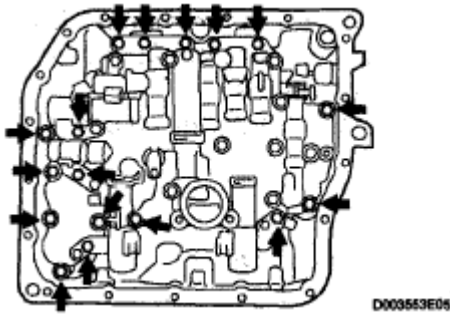


Fig. 118: Locating Bolts Of Transmission Valve Body Assembly

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the check ball body and the spring.

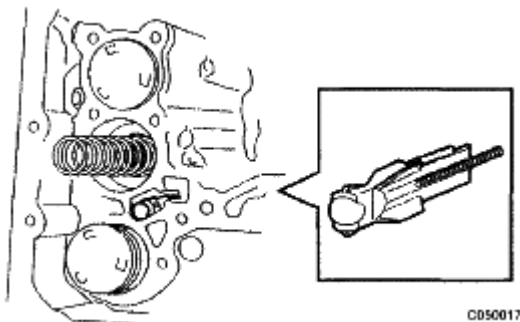


Fig. 119: Identifying Check Ball Body And Spring

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the 5 bolts and 5 shift solenoid valves.

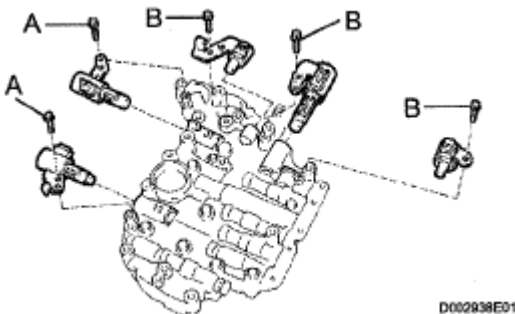


Fig. 120: Identifying Shift Solenoid Valves With 5 Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. INSTALL TRANSMISSION VALVE BODY ASSEMBLY

- a. Install the 5 shift solenoid valves with the 5 bolts.

Torque: Bolt A

6.6 N*m (67 kgf*cm, 58 in.*lbf)

Bolt B

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

Bolt length:

Bolt A:

12 mm (0.47 in.)

Bolt B:

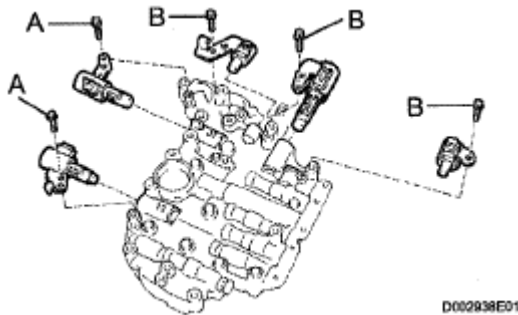


Fig. 121: Identifying Shift Solenoid Valves With 5 Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

45 mm (1.77 in.)

- b. Install the spring and check ball body.

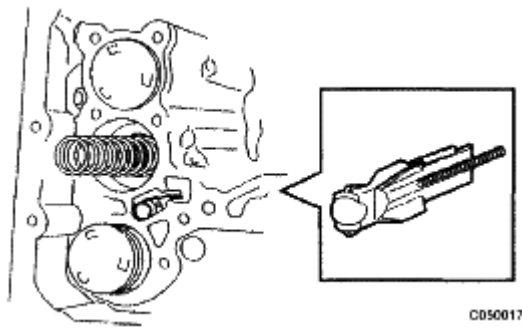


Fig. 122: Identifying Check Ball Body And Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Align the groove of the manual valve with the pin of the lever.
- d. Install the 17 bolts.

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

NOTE:

- Push the valve body against the accumulator piston springs and check ball body to install the valve body.
- First, temporarily tighten the bolts marked with (1) in the illustration because they are positioning bolts.

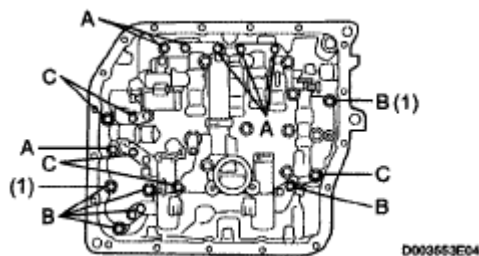


Fig. 123: Identifying Manual Valve With Pin Of Lever
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Bolt length:

Bolt A:

25 mm (0.984 in.)

Bolt B:

41 mm (1.614 in.)

Bolt C:

45 mm (1.771 in.)

2. INSTALL VALVE BODY OIL STRAINER ASSEMBLY

- a. Coat a new O-ring with ATF.
- b. Install the O-ring to the oil strainer.

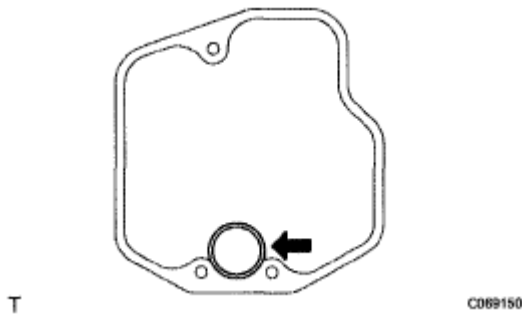


Fig. 124: Locating O-Ring

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the oil strainer with the 3 bolts.

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

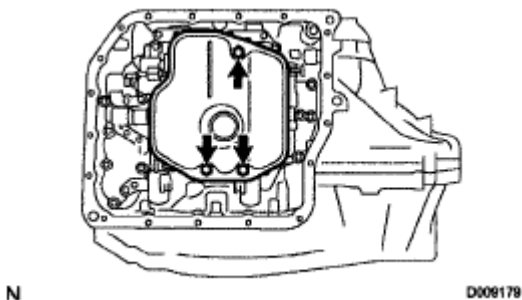


Fig. 125: Locating Oil Pan Gasket To Oil Pan

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL TRANSMISSION WIRE

- a. Coat the O-ring with ATF.
- b. Install the ATF temperature sensor with the lock plate and bolt.

Torque: 6.6 N*m (67 kgf*cm, 58 in.*lbf)

- c. Connect the 5 shift solenoid valve connectors.

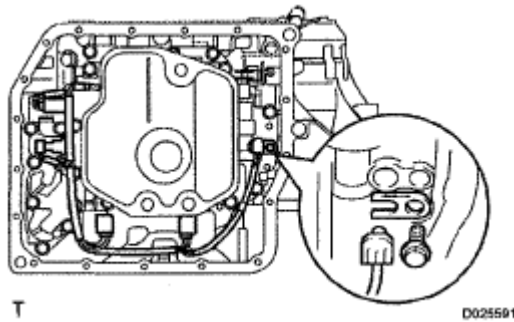


Fig. 126: Identifying ATF Temperature Sensor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSTALL AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY

- a. Install the 2 magnets in the oil pan.
- b. Apply seal packing or equivalent to the 18 bolts.

Adhesive:

Toyota Genuine Adhesive 4344, Three Bond 1344 or equivalent

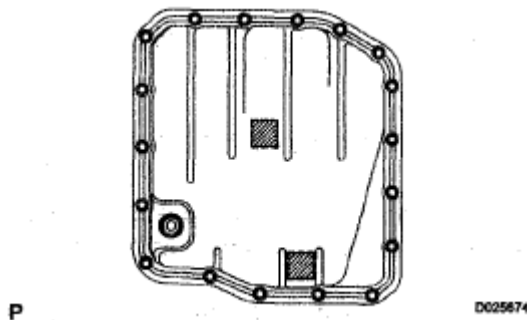


Fig. 127: Identifying Automatic Transaxle Oil Pan Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the oil pan and new gasket with the 18 bolts to the transaxle case.

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

NOTE: Tighten the bolts within 10 minutes of sealant application.

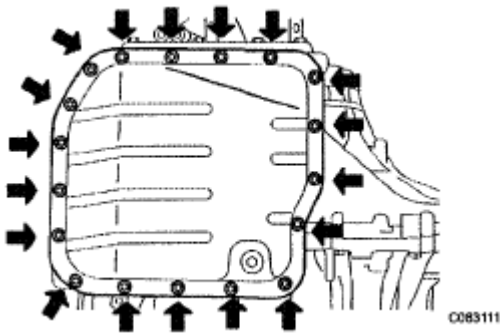


Fig. 128: Locating Oil Pan And Gasket With 18 Bolts To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
6. **ADD AUTOMATIC TRANSAXLE FLUID**
7. **CHECK FLUID LEVEL IN AUTOMATIC TRANSAXLE** (See ON-VEHICLE INSPECTION)
8. **INSTALL ENGINE UNDER COVER NO. 1**

SHIFT LOCK SYSTEM

ON-VEHICLE INSPECTION

1. **CHECK SHIFT LOCK OPERATION**
 - a. Move the shift lever to the P position.
 - b. Turn the ignition switch to the LOCK position.
 - c. Check that the shift lever cannot be moved to any position other than P.
 - d. Turn the ignition switch to the on position, depress the brake pedal and check that the shift lever can be moved to another position. If operation can not be done as specified, inspect the shift lock control unit.
2. **CHECK SHIFT LOCK RELEASE BUTTON OPERATION**
 - a. Using a small screwdriver, remove the shift lock release cover.
 - b. When operating the shift lever with the shift lock release button pressed, check that the lever can be moved to any position other than P.

If operation can not be done as specified, check the shift lever assembly installation condition.

3. **CHECK KEY INTERLOCK OPERATION**
 - a. Turn the ignition switch to the ON position.
 - b. Depress the brake pedal and move the shift lever to any position other than P.
 - c. Check that the ignition key cannot be turned to the LOCK position.
 - d. Move the shift lever to the P position, turn the ignition key to the LOCK position and check that the ignition key can be removed.

If operation cannot be done as specified, inspect the shift lock control unit.

4. INSPECT SHIFT LOCK CONTROL UNIT ASSEMBLY

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

HINT:

Do not disconnect the shift lock control unit assembly connector.

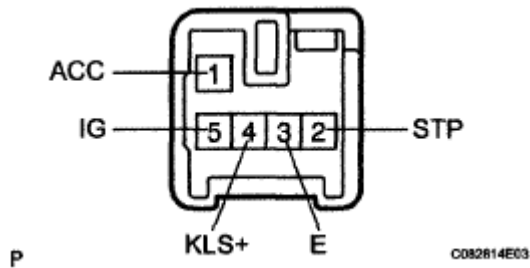


Fig. 129: Identifying Terminals Of Shift Lock Control Unit
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Voltage

VOLTAGE SPECIFICATIONS

Terminal	Measuring Condition	Voltage (V)
1 (ACC) - 3 (E)	Ignition switch ACC	10 to 14
1 (ACC) - 3 (E)	Ignition switch OFF	Below 1
2 (STP) - 3 (E)	Depress brake pedal	10 to 14
2 (STP) - 3 (E)	Release brake pedal	Below 1
4 (KLS+) - 3 (E)	1. Ignition switch ACC and shift lever P position 2. Ignition switch ACC and shift lever except P position 3. Ignition switch ACC and shift lever except P position (After approx. 1 second)	Below 1 7.5 to 11 6 to 9
5 (IG) - 3 (E)	Ignition switch ON	10 to 14
5 (IG) - 3 (E)	Ignition switch OFF	Below 1

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

HINT:

Do not disconnect the shift lock control unit assembly connector.

If operation cannot be done as specified, replace the shift lever assembly.

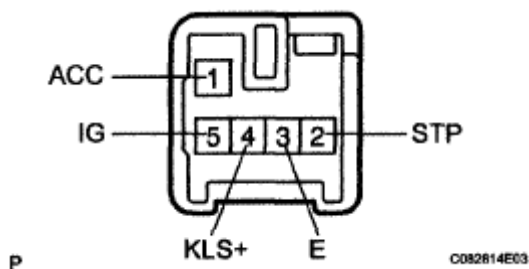


Fig. 130: Identifying Terminals Of Shift Lock Control Unit
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Resistance

RESISTANCE SPECIFICATIONS

Terminal	Measuring Condition	Specified Value
3 (E) - Body ground	Always	Below 1 ohms

5. INSPECT KEY INTER LOCK SOLENOID

- Disconnect the solenoid connector.
- Connect KLS+ (4) terminal to the positive (+) battery terminal and KLS (3) terminal to the negative (-) battery terminal, and apply about 12 V between KLS+- KLS- terminals.
- Check that operation noise can be heard from the solenoid.

If the solenoid does not operate, replace the solenoid.

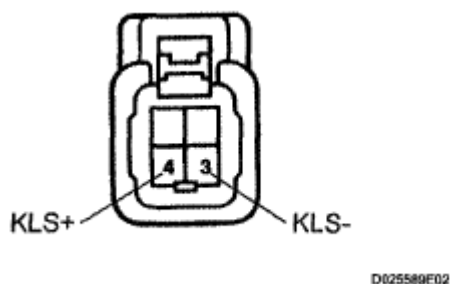


Fig. 131: Identifying Terminals Of Key Inter Lock Solenoid Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

AIR COOLED OIL COOLER

COMPONENTS

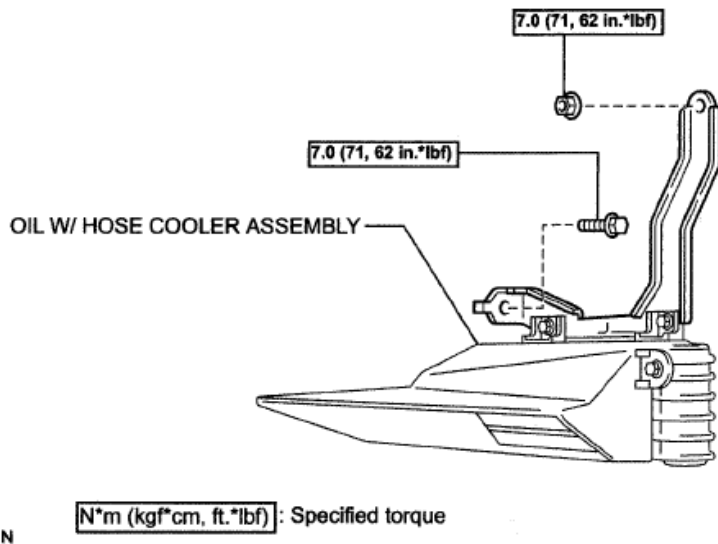


Fig. 132: Identifying Air Cooled Oil Cooler Components With Torque Specifications
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. REMOVE FRONT BUMPER COVER

HINT:

(See **REMOVAL**)

2. DRAIN AUTOMATIC TRANSAXLE FLUID

- Remove a drain plug and the gasket, and drain ATF.
- Install the new gasket and drain plug.

Torque: 49 N*m (500 kgf*cm, 36 ft.*lbf)

3. REMOVE OIL W/ HOSE COOLER ASSEMBLY

- Disconnect the 2 oil cooler hoses.
- Remove the bolt, nut and the oil w/ hose cooler assembly.

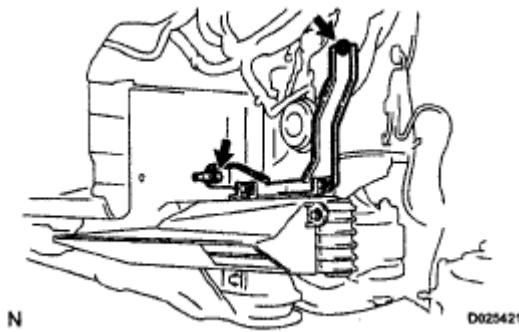


Fig. 133: Identifying Air-cooled Oil Cooler Components With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. INSTALL OIL W/ HOSE COOLER ASSEMBLY

- Install the oil w/ hose cooler assembly with the bolt and the nut.

Torque: 7.0 N*m (71 kgf*cm, 62 in.*lbf)

HINT:

After temporarily tightening the bolt, fully tighten in order of the nut, bolt.

- Connect the 2 oil cooler hoses.

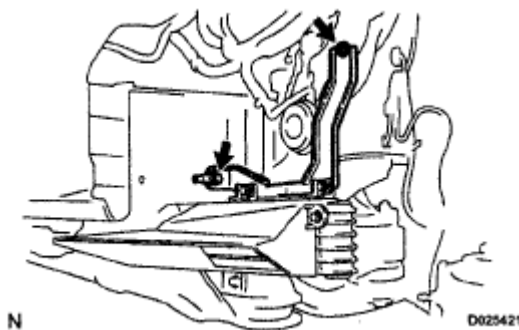


Fig. 134: Locating Oil Cooler Hoses
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL FRONT BUMPER COVER

HINT:

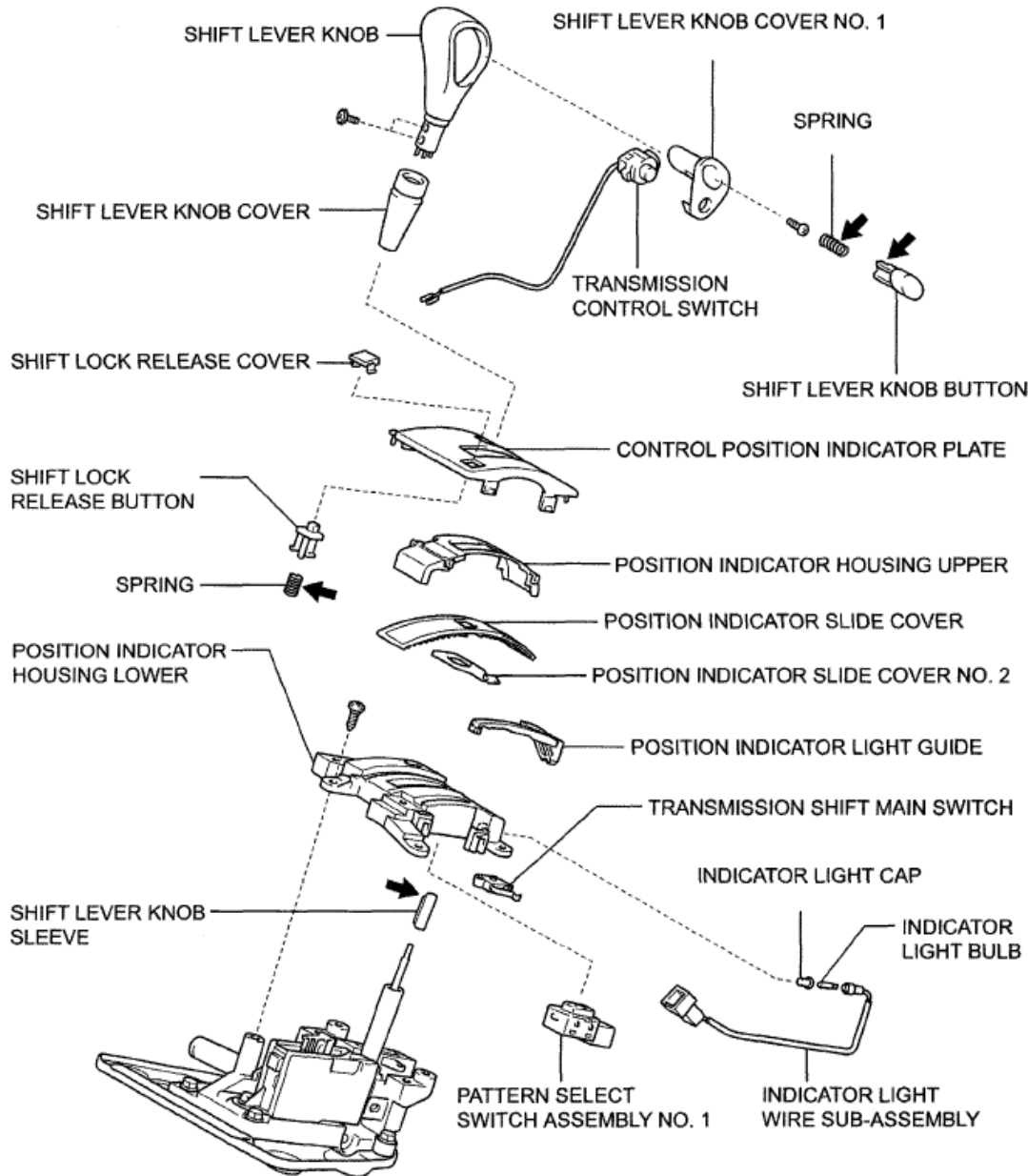
(See **INSTALLATION**)

3. ADD AUTOMATIC TRANSAXLE FLUID

4. INSPECT AUTOMATIC TRANSAXLE FLUID (See ON-VEHICLE INSPECTION)

SHIFT LEVER

COMPONENTS



➔ Apply MP grease

C119893E02

Fig. 135: Identifying Shift Lever Components

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL**1. REMOVE INSTRUMENT CLUSTER FINISH PANEL ASSEMBLY CENTER**

HINT:

(See **REMOVAL**)

2. REMOVE FLOOR CARPET COVER CENTER RH

HINT:

(See **REMOVAL**)

3. REMOVE FLOOR CARPET COVER CENTER LH

HINT:

(See **REMOVAL**)

4. REMOVE CONSOLE BOX ASSEMBLY

HINT:

(See **REMOVAL**)

5. DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY

- a. Disconnect the floor shift transmission control cable assembly end from the floor shift assembly.

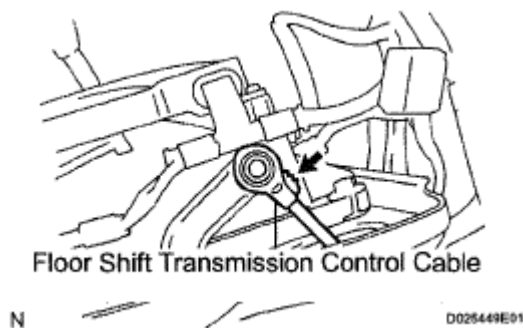


Fig. 136: Locating Floor Shift Transmission Control Cable End To Floor Shift Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. REMOVE FLOOR SHIFT ASSEMBLY

- a. Disconnect the 3 connectors.
- b. Remove the 4 nuts and dismount the floor shift assembly from the vehicle.

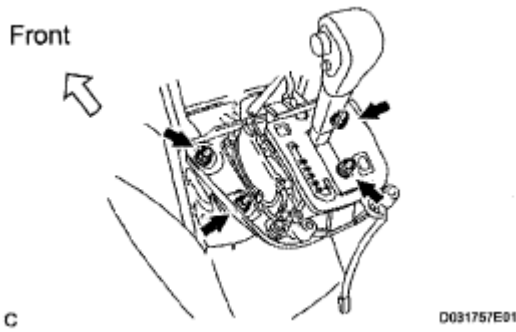


Fig. 137: Locating Connectors Nuts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

1. REMOVE SHIFT LEVER KNOB SUB-ASSEMBLY

- a. Releasing the lock by pressing the click, disconnect the indicator light wire connector from the shift lever plate.

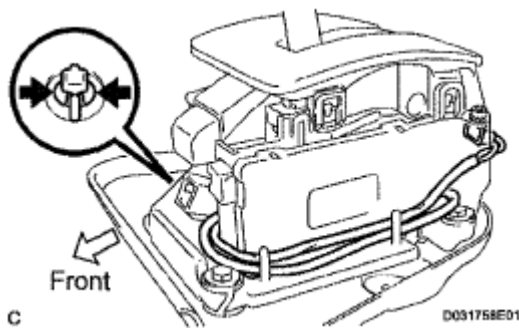


Fig. 138: Removing Indicator Light Wire Connector From Shift Lever Plate

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a screwdriver, release the stopper of the connector.
- c. Using a small screwdriver, disengage the locking lug of the terminals 2 and 6, and pull the terminals out from the rear.
- d. Disconnect the 2 wire harnesses of the transmission control switch from the clamp.

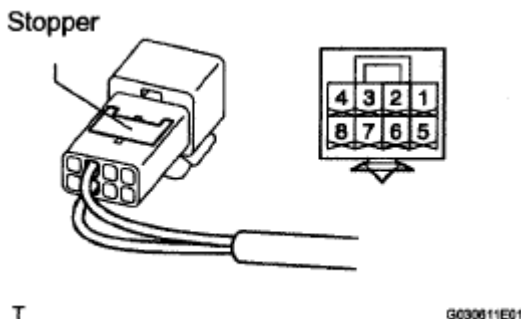
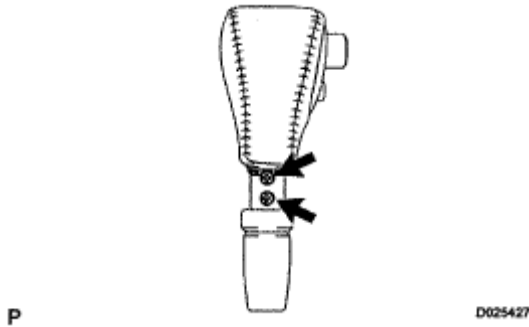


Fig. 139: Identifying Stopper**Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

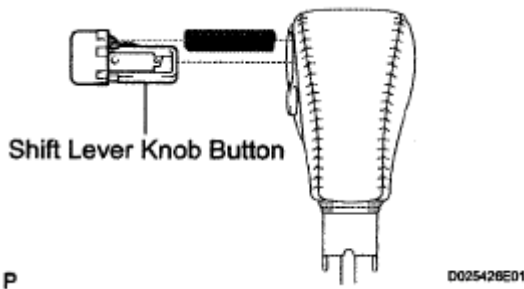
- e. Lower the shift lever knob cover.
- f. Remove the 2 screws and shift lever knob from the shift lever.

2. REMOVE SHIFT LEVER KNOB COVER

- a. Remove the shift lever knob cover from the shift lever.

**Fig. 140: Locating Shift Lever Knob Cover And Screw****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.****3. REMOVE SHIFT LEVER KNOB BUTTON**

- a. Using a screwdriver, release the claw and remove the shift lever knob button and spring from the shift lever knob.

**Fig. 141: Identifying Shift Lever Knob Button And Spring From Shift Lever Knob****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.****4. REMOVE TRANSMISSION CONTROL SWITCH**

- a. Remove the screw from the shift lever knob, detach the transmission control switch together with the shift lever knob cover No. 1.

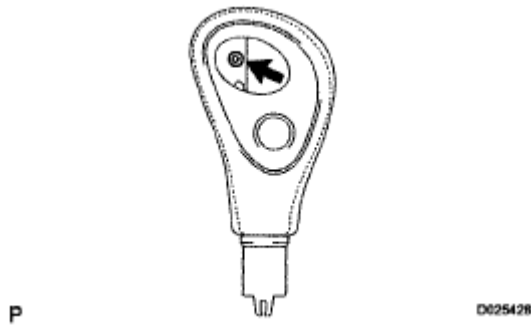


Fig. 142: Locating Transmission Control Switch Together With Shift Lever Knob Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a screwdriver, release the 2 claws and remove the transmission control switch from the shift lever knob cover No. 1.

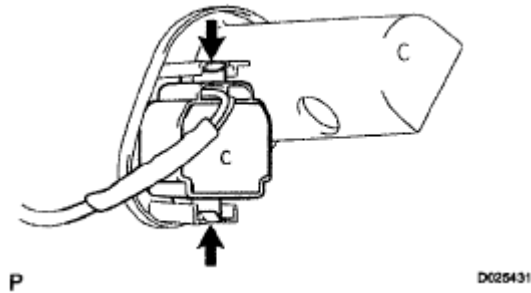


Fig. 143: Locating Transmission Control Switch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. REMOVE INDICATOR LIGHT WIRE SUB-ASSEMBLY

- a. Using a screwdriver, release the stopper of the connector.
- b. Using a small screwdriver, disengage the locking lug of the terminals 3 and 7, and pull the terminals out from the rear.

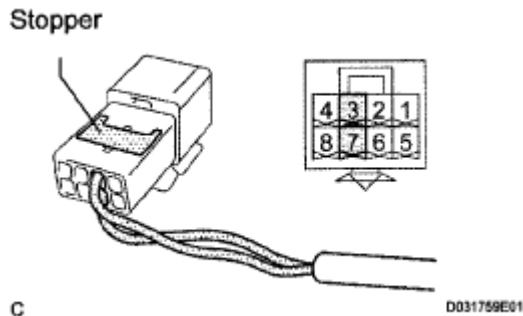


Fig. 144: Identifying Stopper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the indicator light wire from the position indicator housing lower.

- d. Remove the indicator light cap and indicator light bulb from the indicator light wire.

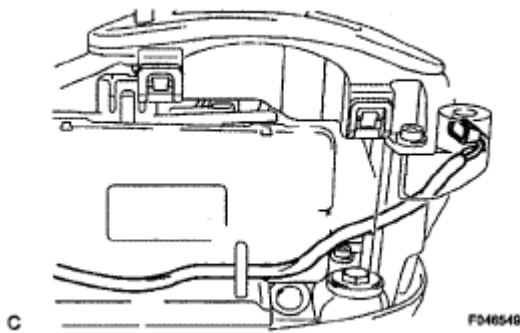


Fig. 145: Identifying Indicator Light Bulb And Indicator Light Cap To Indicator Light Wire
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. REMOVE SHIFT LOCK RELEASE BUTTON COVER

- a. Using a small screwdriver, remove the shift lock release cover from the control position indicator plate.

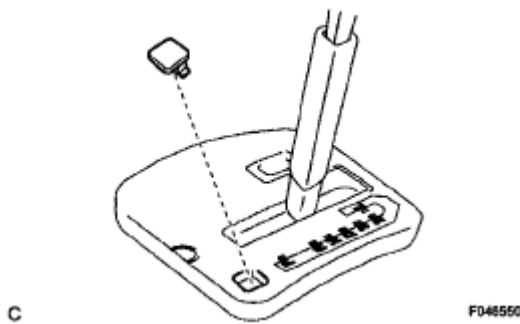


Fig. 146: Identifying Shift Lock Release Button Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. REMOVE CONTROL POSITION INDICATOR PLATE

- a. Using a screwdriver, release the 4 claws and remove the control position indicator plate from the position indicator housing lower.

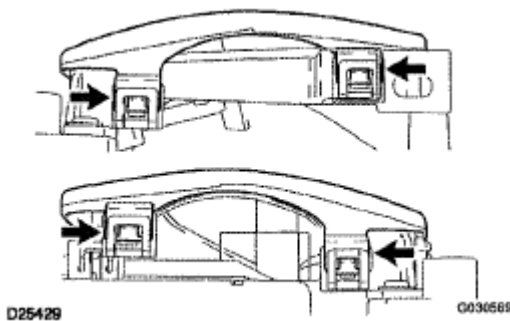


Fig. 147: Locating Control Position Indicator Plate

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. REMOVE POSITION INDICATOR HOUSING LOWER

- a. Remove the 4 screws, detach the position indicator housing lower from the shift lever plate.

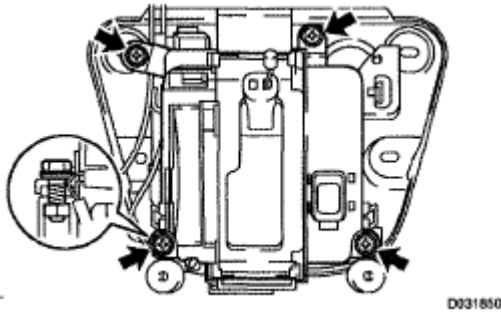


Fig. 148: Locating Position Indicator Housing Lower
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. REMOVE SHIFT LOCK RELEASE BUTTON

- a. While pressing the 2 claws, remove the shift lock release button and spring from the position indicator housing lower.

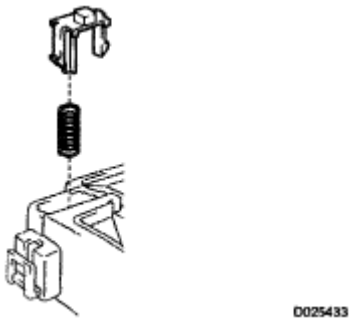


Fig. 149: Identifying Shift Lock Release Button
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. REMOVE PATTERN SELECT SWITCH ASSEMBLY NO. 1

- a. Using a screwdriver, release the 4 claws and remove the pattern select switch assembly No. 1 from the position indicator housing lower.

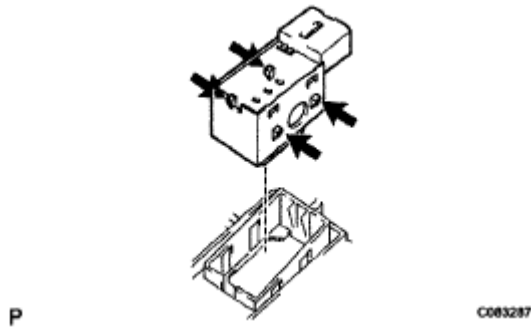


Fig. 150: Locating Pattern Select Switch Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. REMOVE POSITION INDICATOR HOUSING UPPER

- Using a screwdriver, release the 4 claws and remove the position indicator housing upper from the position indicator housing lower.

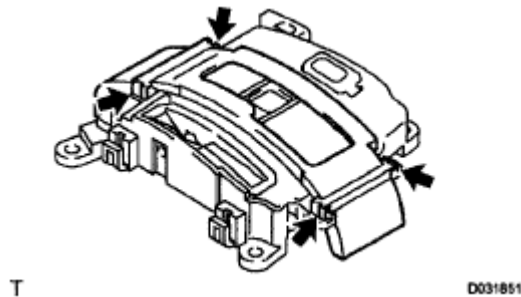


Fig. 151: Locating Position Indicator Housing Upper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. REMOVE POSITION INDICATOR SLIDE COVER

- Remove the position indicator slide cover from the position indicator housing lower.
- Remove the position indicator light guide from the position indicator lower.

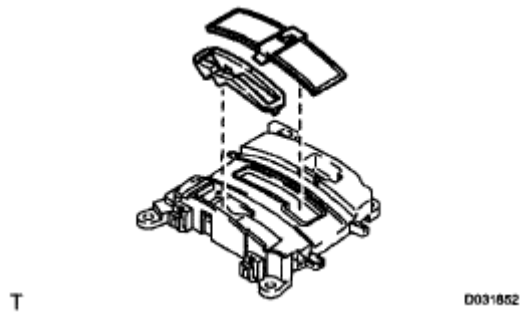


Fig. 152: Identifying Position Indicator Slide Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. REMOVE POSITION INDICATOR SLIDE COVER

- a. Remove the position indicator slide cover No. 2 from the position indicator slide cover.

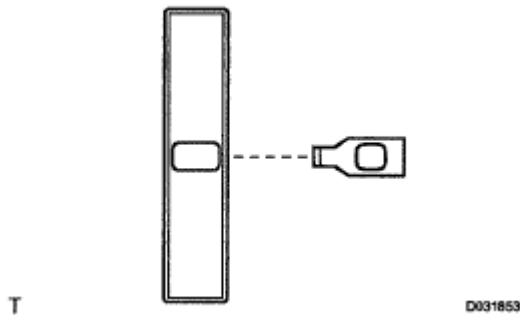


Fig. 153: Identifying Position Indicator Slide Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. REMOVE TRANSMISSION SHIFT MAIN SWITCH

- a. Remove the screw and transmission shift main switch from the position indicator housing lower.

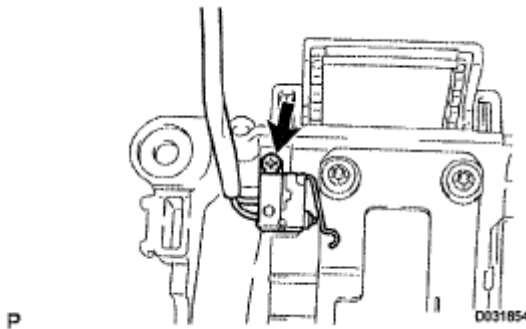


Fig. 154: Locating Transmission Shift Main Switch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. REMOVE SHIFT LEVER KNOB SLEEVE

- a. Remove the shift lever knob sleeve from the shift lever.

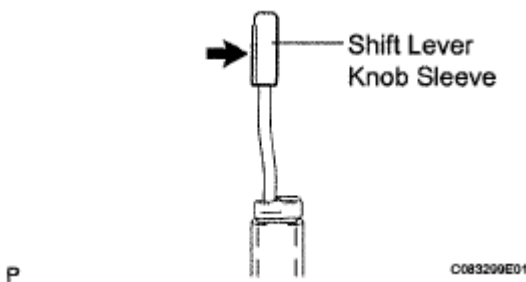


Fig. 155: Locating Shift Lever Knob Sleeve
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ADJUSTMENT

1. INSPECT SHIFT LEVER POSITION

- When shifting it to each position, make sure that the shifting lever moves smoothly, can be moderately operated and the position indicator displays correctly.

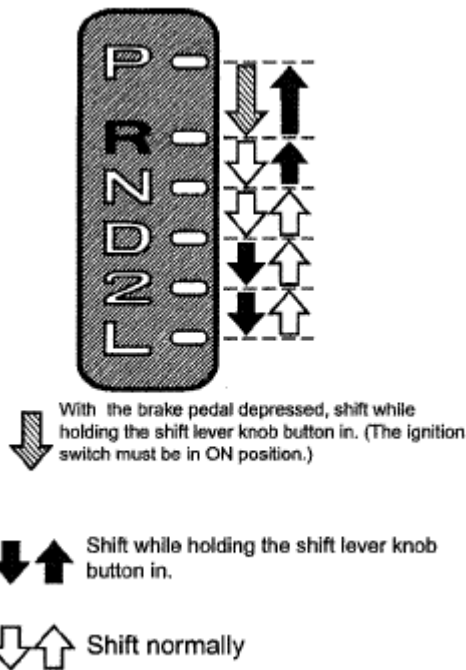
Positions which can be operated without pressing the shift lever knob button:

R --> N --> D, L --> 2 --> D --> N Positions which can be operated only while pressing the shift lever knob button:

D --> 2 --> L, N --> R --> P Positions which can be operated only while pressing the shift lever knob button, ignition switch ON and brake pedal depressed:

P --> R

- When starting the engine, make sure that the vehicle moves forward when shifting from N to D position, and moves rearward when shifting to R position.



F000693E02

Fig. 156: Identifying Shift Lever Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. ADJUST SHIFT LEVER POSITION

- Loosen the nut on the control shaft lever.



Fig. 157: Locating Nut And Control Shaft Lever
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Push the control shaft fully downward.
- c. Return the control shaft lever 2 notches to the N position.



Fig. 158: Pushing Control Shaft Fully Downward
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

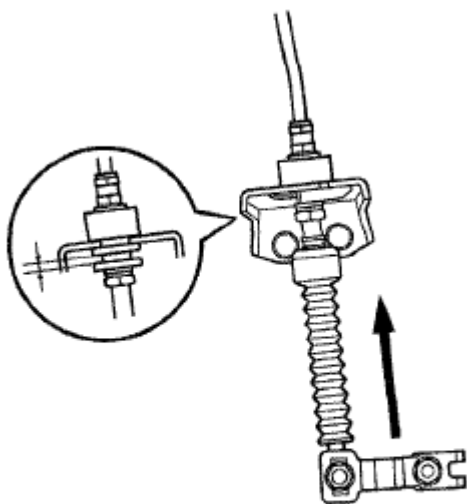
- d. While pushing the control cable end up with the shift lever in the N position, install it to the control shaft lever with the nut.

Torque: 15 N*m (150 kgf*cm, 10 ft.*lbf)

NOTE:

- If the control cable end is excessively pushed up, the shift lever can not be adjusted.
- When tightening the nut, confirm that the control cable is properly stretched.

- e. Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and moves rearward when shifting it to the R position.



P

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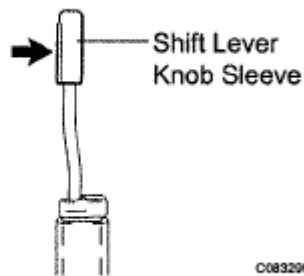
Fig. 159: Pushing Control Cable

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REASSEMBLY

1. INSTALL SHIFT LEVER KNOB SLEEVE

- Apply MP grease to the shown part of the shift lever knob sleeve and install it to the shift lever.



P

C083299E01

Fig. 160: Locating Shift Lever Knob Sleeve

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL TRANSMISSION SHIFT MAIN SWITCH

- Install the transmission shift main switch to the position indicator housing lower with the screw.

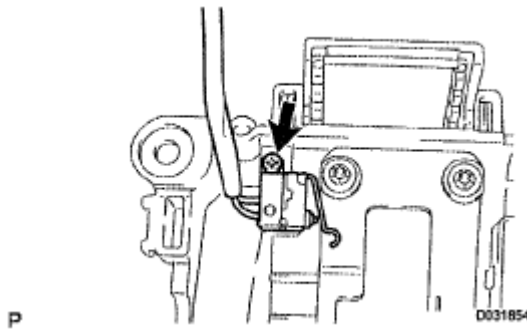


Fig. 161: Locating Transmission Shift Main Switch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL POSITION INDICATOR SLIDE COVER

- a. Install the position indicator slide cover No. 2 to the position indicator slide cover.

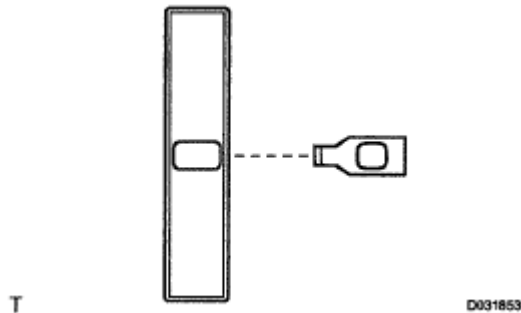


Fig. 162: Identifying Position Indicator Slide Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSTALL POSITION INDICATOR SLIDE COVER

- a. Install the position indicator slide cover to the position indicator housing lower.
- b. Install the position indicator light guide to the position indicator housing lower.

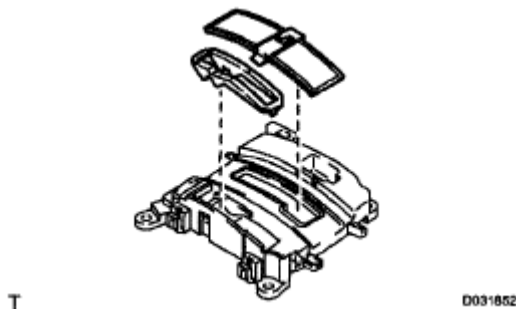


Fig. 163: Identifying Position Indicator Slide Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. INSTALL POSITION INDICATOR HOUSING UPPER

- a. Install the position indicator housing upper to the position indicator housing lower.

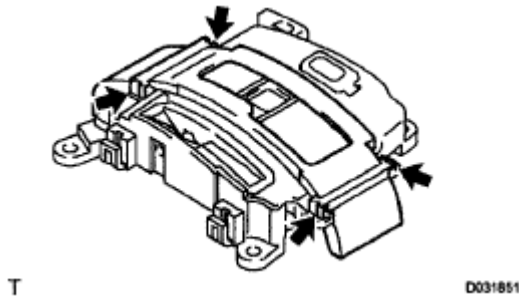


Fig. 164: Locating Position Indicator Housing Upper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSTALL PATTERN SELECT SWITCH ASSEMBLY NO. 1

- a. Install the pattern select switch assembly No. 1 to the position indicator housing lower.

HINT:

Fit the claws securely.

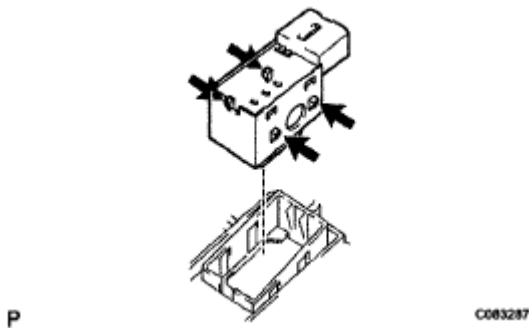


Fig. 165: Locating Pattern Select Switch Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. INSTALL SHIFT LOCK RELEASE BUTTON

- a. Install the shift lock release button and greased spring the position indicator housing lower.

HINT:

Fit the claws securely.

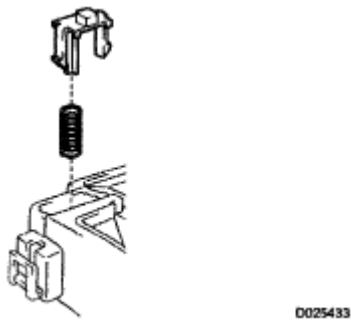


Fig. 166: Identifying Shift Lock Release Button
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. INSTALL POSITION INDICATOR HOUSING LOWER

- a. Install the position indicator housing lower to the shift lever plate with the 4 screws.

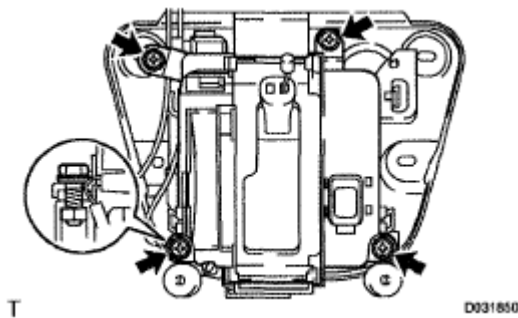


Fig. 167: Locating Position Indicator Housing Lower
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. INSTALL CONTROL POSITION INDICATOR PLATE

- a. Install the control position indicator plate to the position indicator housing lower.

HINT:

Fit the claws securely.

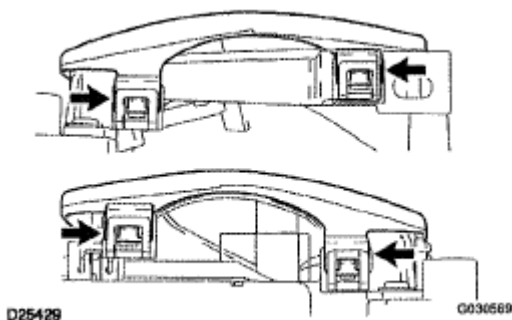


Fig. 168: Locating Control Position Indicator Plate

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. INSTALL SHIFT LOCK RELEASE BUTTON COVER

- a. Install the shift lock release cover to the control position indicator plate.

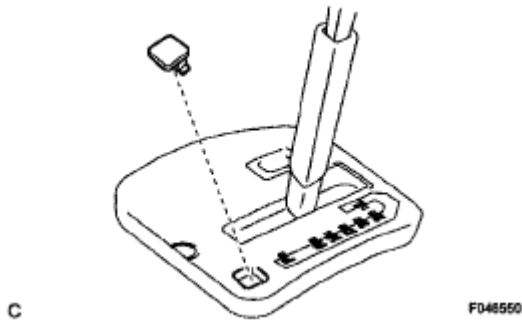


Fig. 169: Identifying Shift Lock Release Button Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. INSTALL INDICATOR LIGHT WIRE SUB-ASSEMBLY

- a. Install the indicator light bulb and indicator light cap to the indicator light wire.
- b. Install the indicator light wire to the position indicator housing lower.

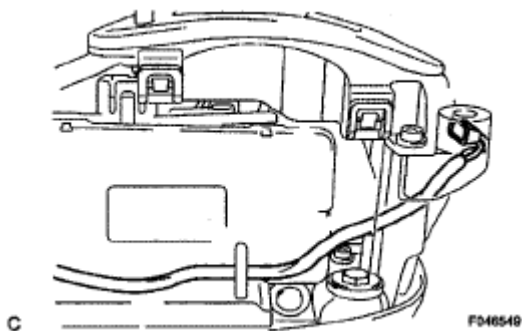


Fig. 170: Identifying Indicator Light Bulb And Indicator Light Cap To Indicator Light Wire
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. INSTALL TRANSMISSION CONTROL SWITCH

- a. Install the transmission control switch to the shift lever knob cover No. 1.

HINT:

Fit the claws securely.

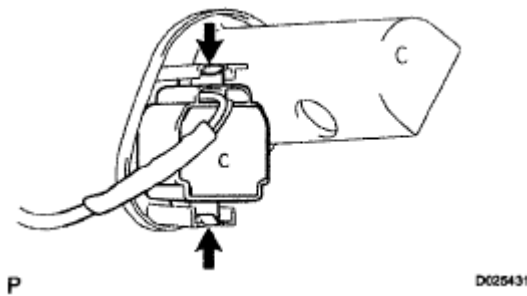


Fig. 171: Locating Transmission Control Switch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the shift lever knob cover No. 1 to the shift lever knob with a screw.

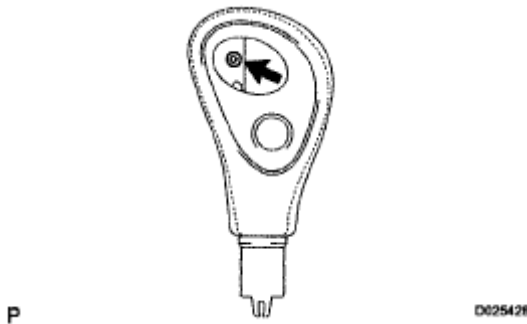


Fig. 172: Locating Transmission Control Switch Together With Shift Lever Knob Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. INSTALL SHIFT LEVER KNOB BUTTON

- a. Apply MP grease to the shift lever knob button and spring and install them to the shift lever knob.

14. INSTALL SHIFT LEVER KNOB COVER

- a. Install the shift lever knob cover to the shift lever.

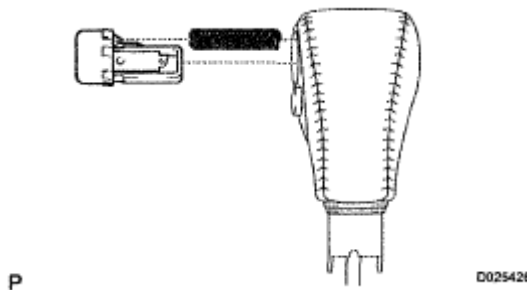


Fig. 173: Identifying Shift Lever Knob
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. INSTALL SHIFT LEVER KNOB SUB-ASSEMBLY

- a. Install the wire harness of the transmission control switch as shown in the illustration.

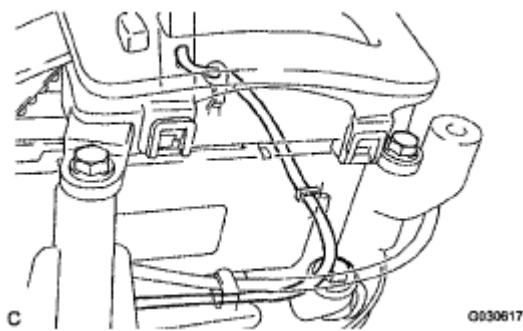


Fig. 174: Identifying Wire Harness Of Transmission Control Switch
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the shift lever knob to the shift lever with 2 screws.
- c. Install the shift lever knob cover to shift lever knob.
- d. Install the 2 wire harnesses of the transmission control switch.

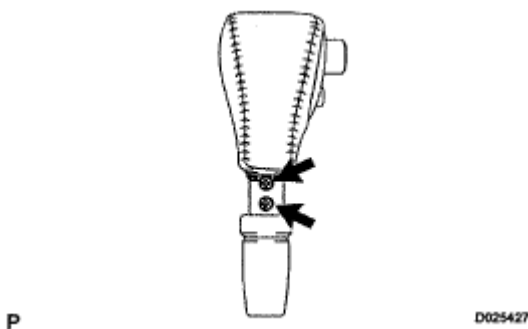


Fig. 175: Locating Wire Harnesses Of Transmission Control Switch
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Install the indicator light wire harness and connector as shown in the illustration.

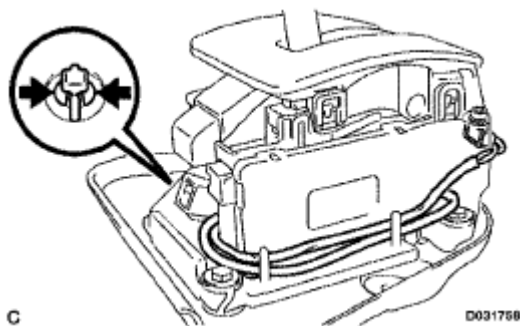


Fig. 176: Locating Indicator Light Wire Harness And Connector
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. INSTALL FLOOR SHIFT ASSEMBLY

- a. Install the floor shift assembly to the vehicle with the 4 nuts.

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

HINT:

Tighten them in the order, A, B, C and D.

- b. Connect the 3 connectors.

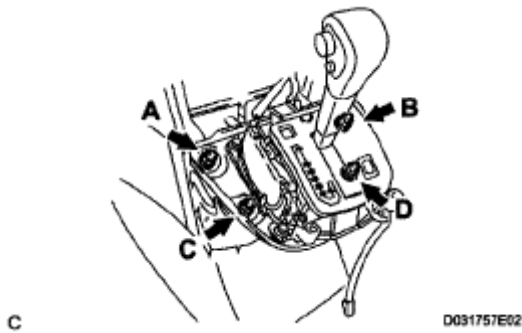


Fig. 177: Locating Floor Shift Assembly

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY

- a. Connect the floor shift transmission control cable end to the floor shift assembly.

HINT:

Install it with the uneven surface facing up.

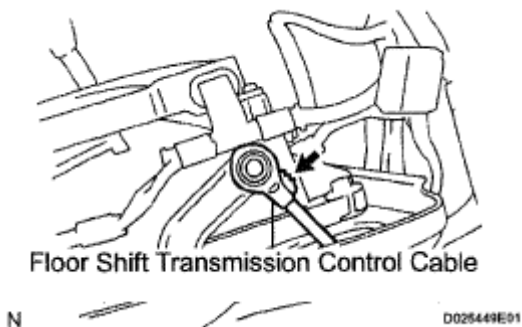


Fig. 178: Locating Floor Shift Transmission Control Cable End To Floor Shift Assembly

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL INSTRUMENT CLUSTER FINISH PANEL ASSEMBLY CENTER

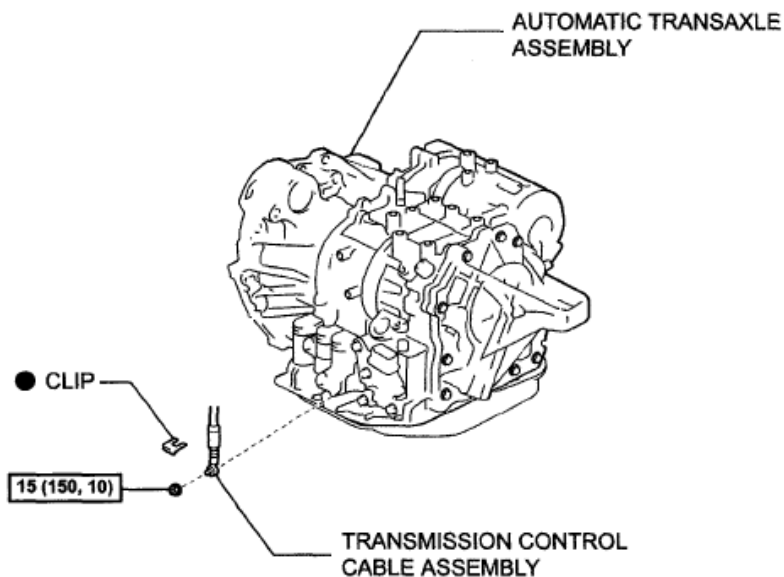
HINT:

(See INSTALLATION)

4. **INSPECT SHIFT LEVER POSITION** (See ADJUSTMENT)
5. **ADJUST SHIFT LEVER POSITION** (See ADJUSTMENT)

TRANSMISSION CONTROL CABLE ASSEMBLY

COMPONENTS



● Non-reusable part

N*m (kgf*cm, ft.*lbf) : Specified torque

C126480E02

Fig. 179: Identifying Transmission Control Cable Assembly With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

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

2. REMOVE INSTRUMENT PANEL SAFETY PAD SUB-ASSEMBLY W/ PASSENGER AIR BAG ASSEMBLY

HINT:

(See **REMOVAL**)

3. REMOVE TRANSMISSION CONTROL CABLE ASSEMBLY

- a. Remove the nut from the control shaft lever.
- b. Disconnect the control cable from the control shaft lever.

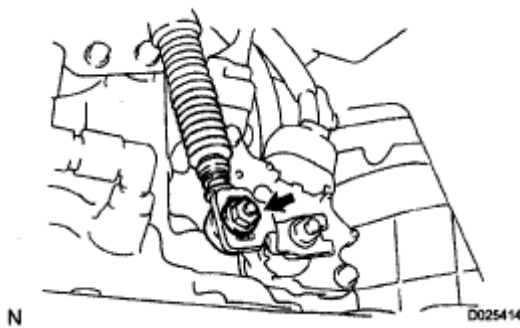


Fig. 180: Locating Control Cable To Control Shaft Lever With Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the clip and disconnect the control cable from the control cable bracket.

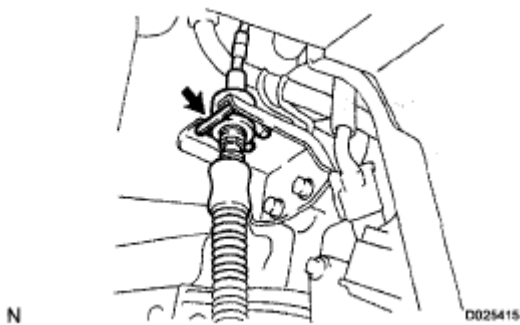


Fig. 181: Locating Control Cable Clip
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Disconnect the control cable from the control cable clamp.

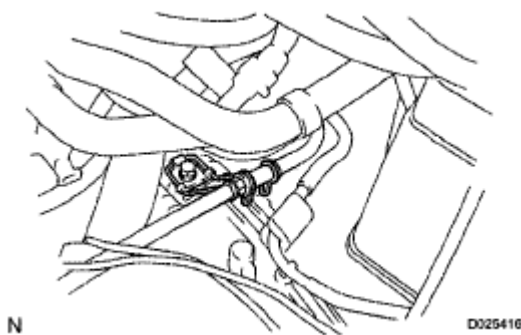


Fig. 182: Identifying Control Cable To Control Cable Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Disconnect the cable end from the rod of the floor shift assembly.

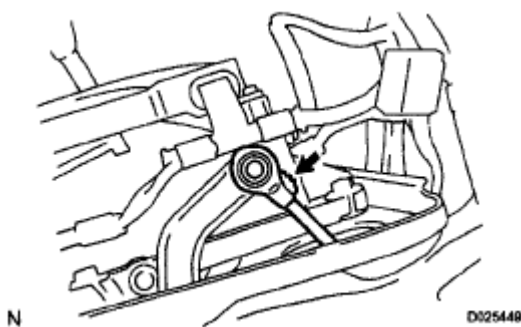


Fig. 183: Locating Cable End From Rod Of Floor Shift Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Remove the 2 nuts.

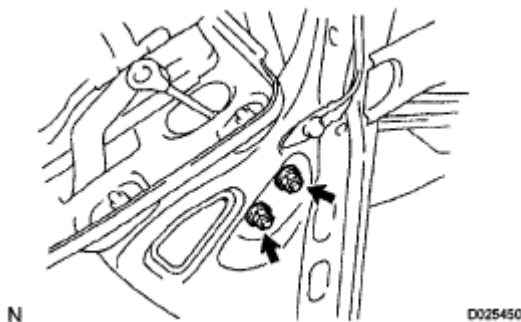


Fig. 184: Locating Control Cable And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Remove the 3 bolts.
h. Pull out the control cable from the body.

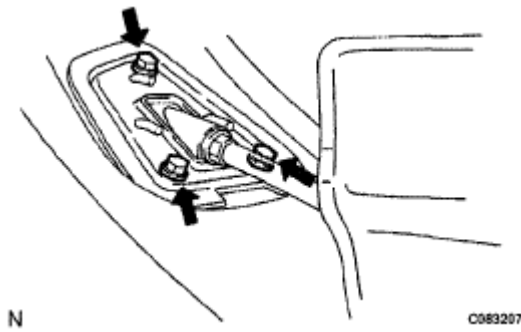


Fig. 185: Locating Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

ADJUSTMENT

1. INSPECT SHIFT LEVER POSITION

- a. When shifting it to each position, make sure that the shifting lever moves smoothly, can be moderately operated and the position indicator displays correctly.

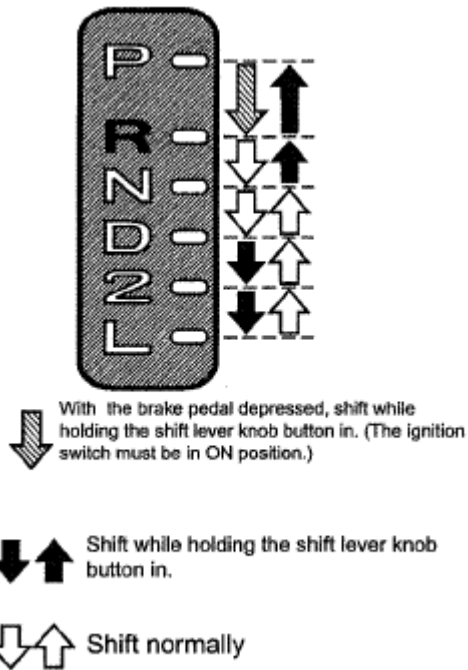
Positions which can be operated without pressing the shift lever knob button:

R --> N --> D, L --> 2 --> D --> N Positions which can be operated only while pressing the shift lever knob button:

D --> 2 --> L, N --> R --> P Positions which can be operated only while pressing the shift lever knob button, ignition switch ON and brake pedal depressed:

P --> R

- b. When starting the engine, make sure that the vehicle moves forward when shifting from N to D position, and moves rearward when shifting to R position.



F000893E02

Fig. 186: Identifying Shift Lever Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. ADJUST SHIFT LEVER POSITION

- Loosen the nut on the control shaft lever.



Fig. 187: Locating Nut And Control Shaft Lever
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- Push the control shaft fully downward.
- Return the control shaft lever 2 notches to the N position.

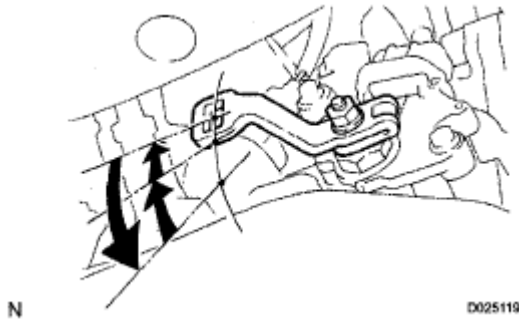


Fig. 188: Pushing Control Shaft Fully Downward
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. While pushing the control cable end up with the shift lever in the N position, install it to the control shaft lever with the nut.

Torque: 15 N*m (150 kgf*cm, 10 ft.*lbf)

NOTE:

- If the control cable end is excessively pushed up, the shift lever can not be adjusted.
 - When tightening the nut, confirm that the control cable is properly stretched.
- e. Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and moves rearward when shifting it to the R position.

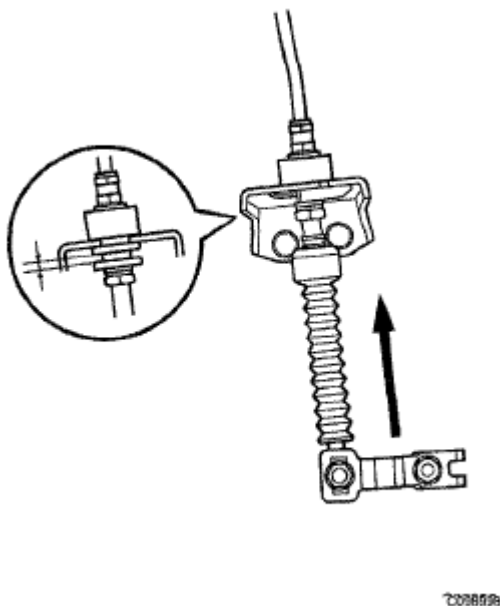


Fig. 189: Pushing Control Cable
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY

- a. Pull in the control cable to the body.
- b. Install the 3 bolts.

Torque: 4.9 N*m (50 kgf*cm, 43 in.*lbf)

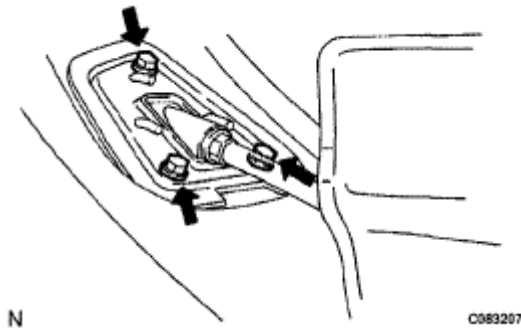


Fig. 190: Locating Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the cable end, as shown in the illustration.

HINT:

Install it with the uneven surface facing up.

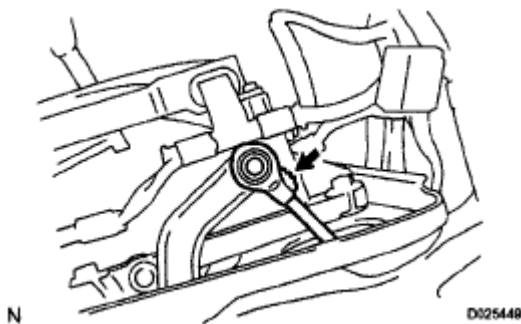


Fig. 191: Locating Cable End From Rod Of Floor Shift Assembly

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the control cable and 2 nuts.

Torque: 11.8 N*m (122 kgf*cm, 9 ft.*lbf)

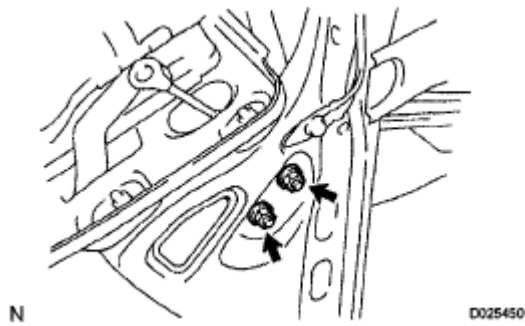


Fig. 192: Locating Control Cable And Nuts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Connect the control cable to the control cable clamp.

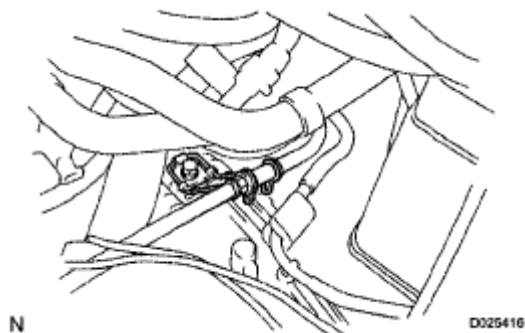


Fig. 193: Identifying Control Cable To Control Cable Clamp
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Temporarily install control cable to the control shaft lever with the nut.

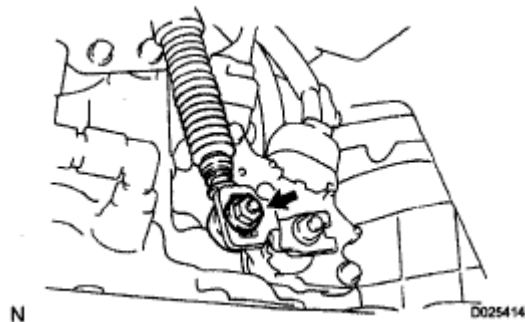


Fig. 194: Locating Control Cable To Control Shaft Lever With Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Install the control cable and clip to the bracket.

2. INSTALL INSTRUMENT PANEL SAFETY PAD SUB-ASSEMBLY W/ PASSENGER AIR BAG ASSEMBLY

HINT:

(See INSTALLATION)

3. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL

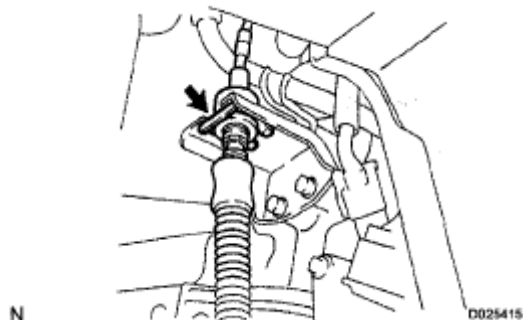


Fig. 195: Locating Control Cable Clip

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

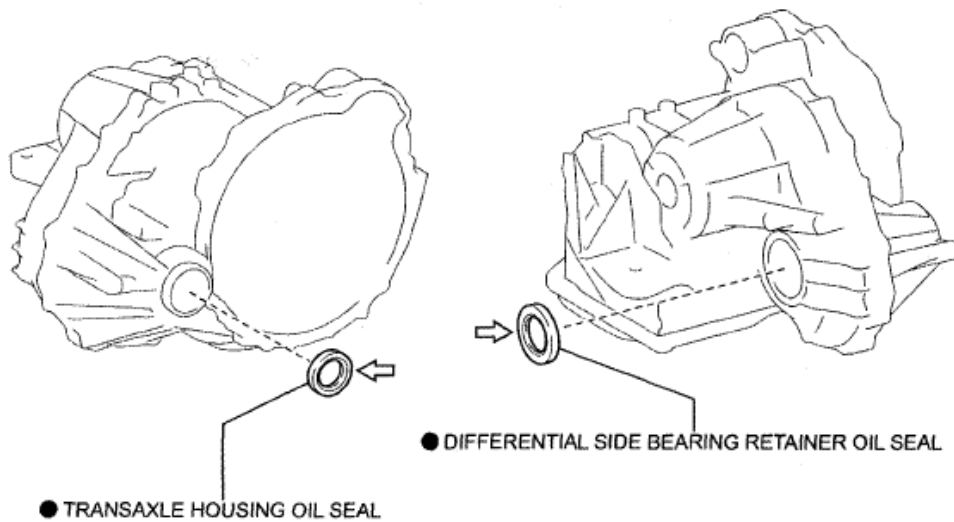
4. **INSPECT SHIFT LEVER POSITION** (See ADJUSTMENT)
5. **ADJUST SHIFT LEVER POSITION** (See ADJUSTMENT)
6. **CLEAR DTC**
7. **INSPECT SRS WARNING LIGHT**

HINT:

(See DIAGNOSIS SYSTEM)

DIFFERENTIAL OIL SEAL

COMPONENTS



↔ Apply MP grease

● Non-reusable part

T

C126455E01

Fig. 196: Identifying Differential Oil Seal Components
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. REMOVE FRONT WHEELS
2. REMOVE ENGINE UNDER COVER NO. 1
3. DRAIN AUTOMATIC TRANSAXLE FLUID
 - a. Remove the drain plug, gasket and drain ATF.
 - b. Install a new gasket and the drain plug.

Torque: 49 N*m (500 kgf*cm, 36 ft.*lbf)

4. REMOVE FRONT DRIVE SHAFT ASSEMBLY LH

HINT:

(See **REMOVAL**)

SST 09520-01010, 09520-24010 (09520-32040)

5. REMOVE FRONT DRIVE SHAFT ASSEMBLY RH

HINT:

(See **REMOVAL**)

6. REMOVE TRANSAXLE HOUSING OIL SEAL

- a. Using SST, pull out the oil seal.

SST 09308-00010

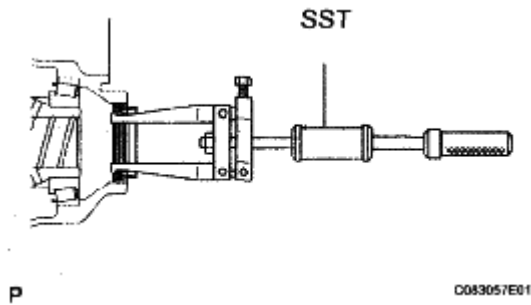


Fig. 197: Identifying Oil Seal With SST

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. REMOVE DIFFERENTIAL SIDE BEARING RETAINER OIL SEAL

- a. Using SST, pull out the oil seal.

SST 09308-00010

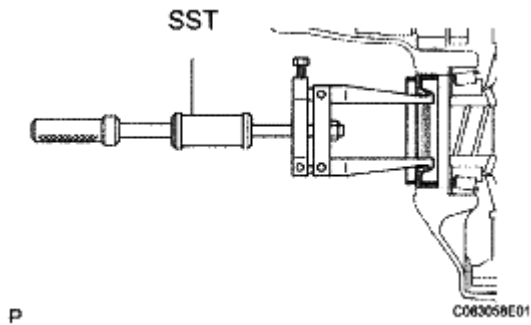


Fig. 198: Identifying Oil Seal With SST

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. INSTALL TRANSAXLE HOUSING OIL SEAL

- a. Using SST and a hammer, install a new oil seal.

SST 09316-60011 (09316-00011)

Oil seal installation depth:

-0.5 to 0.5 mm (-0.020 to 0.020 in.)

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

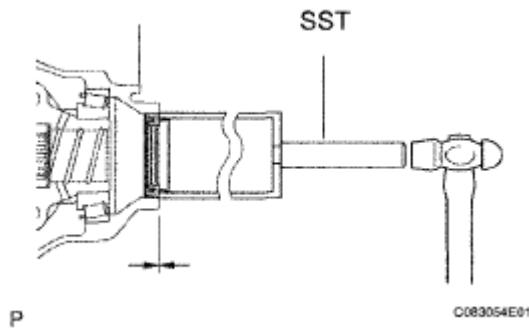


Fig. 199: Identifying Transaxle Housing Oil Seal With SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL DIFFERENTIAL SIDE BEARING RETAINER OIL SEAL

- a. Using SST and a hammer, install a new oil seal.

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

Oil seal installation depth:

-0.5 to 0.5 mm (-0.020 to 0.020 in.)

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

3. INSTALL FRONT DRIVE SHAFT ASSEMBLY LH

HINT:

(See **INSTALLATION**)

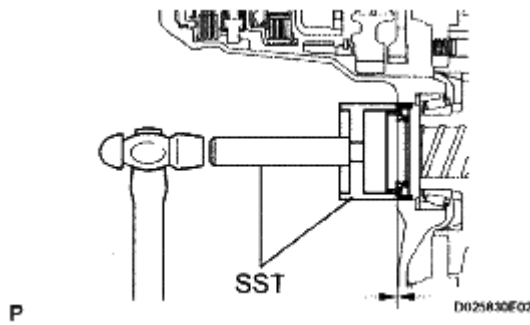


Fig. 200: Identifying Differential Side Bearing Oil Seal Using Hammer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSTALL FRONT DRIVE SHAFT ASSEMBLY RH

HINT:

(See INSTALLATION)

5. INSTALL FRONT WHEELS

Torque: 103 N*m (1,050 kgf*cm, 76 ft.*lbf)

6. ADD AUTOMATIC TRANSAXLE FLUID

7. INSPECT AUTOMATIC TRANSAXLE FLUID (See ON-VEHICLE INSPECTION)

8. INSTALL ENGINE UNDER COVER NO. 1

9. CHECK ABS SPEED SENSOR SIGNAL

HINT:

(See DTC CHECK / CLEAR)

AUTOMATIC TRANSAXLE ASSEMBLY

COMPONENTS



Fig. 201: Identifying Automatic Transaxle Assembly Components
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

(See **REMOVAL**)

3. REMOVE FRONT DRIVE SHAFT ASSEMBLY RH

HINT:

(See **REMOVAL**)

4. REMOVE TRANSMISSION CONTROL CABLE CLAMP

- a. Remove the bolt and the transmission control cable bracket No. 2.

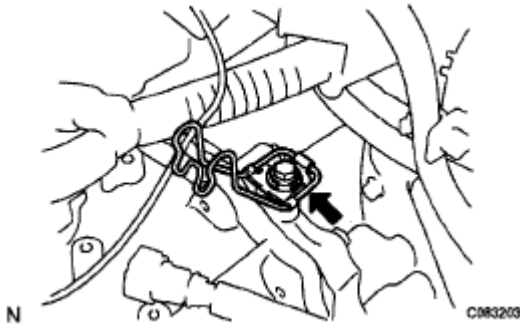


Fig. 202: Locating Transmission Control Cable Bracket No.2 With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. REMOVE WIRE HARNESS CLAMP

- a. Disconnect the wire harnesses from the clamp.
- b. Remove the 3 bolts and 2 clamps.

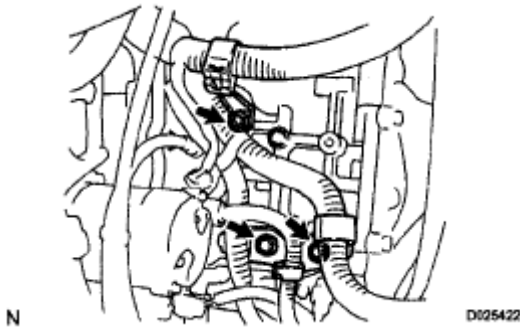


Fig. 203: Locating Wire Harnesses To Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. DISCONNECT WIRE HARNESS

- a. Remove the bolt and disconnect the wire harness.

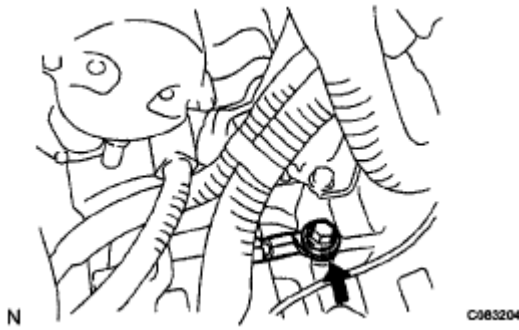


Fig. 204: Locating Bolt To Disconnect Wire Harness
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. REMOVE STARTER ASSEMBLY

- a. Disconnect the connector (1).
- b. Remove the nut (2) and disconnect the starter wire.
- c. Remove the 2 bolts (3) and starter assembly.

8. DISCONNECT CONNECTORS

- a. Disconnect the transmission wire connector.
- b. Disconnect the park/neutral position switch connector.
- c. Disconnect the 2 speed sensor connectors.

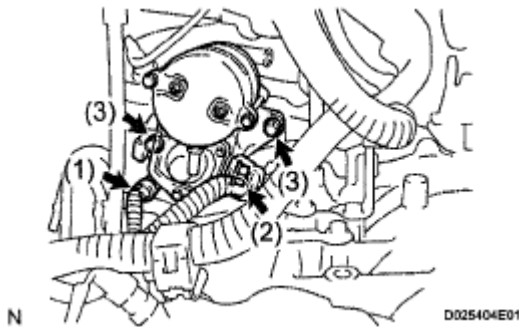


Fig. 205: Locating Starter Assembly With 2 Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. REMOVE TRANSMISSION CONTROL CABLE BRACKET NO. 1

- a. Remove the bolt and oil cooler tube clamp.
- b. Remove the 2 bolts and transmission control cable bracket No. 1.

10. REMOVE TRANSMISSION OIL FILLER TUBE SUB-ASSEMBLY

- a. Remove the ATF level gauge.
- b. Remove the bolt and transmission oil filler tube sub-assembly.
- c. Remove the O-ring from the oil filler tube sub-assembly.

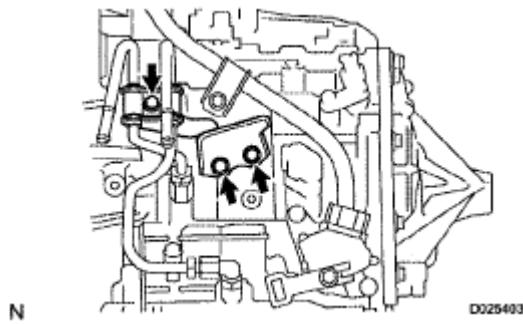


Fig. 206: Locating Bolts And Transmission Control Cable Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. REMOVE OIL COOLER INLET TUBE NO. 1

- a. Using SST and a wrench, disconnect the oil cooler inlet tube No. 1.

SST 09023-12701

12. REMOVE OIL COOLER OUTLET TUBE NO. 1

- a. Using SST and a wrench, disconnect the oil cooler outlet tube No. 1.

SST 09023-12701

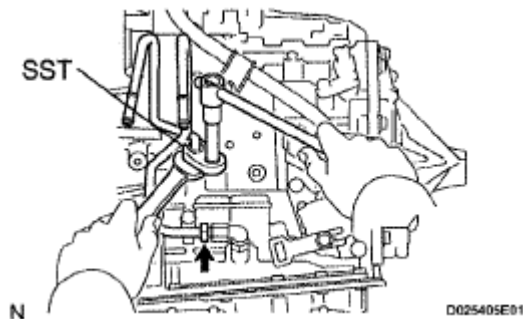


Fig. 207: Locating Oil Cooler Outlet Tube No.1
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. REMOVE ENGINE MOUNTING BRACKET FRONT

- a. Remove the 2 bolts and engine mounting bracket front.

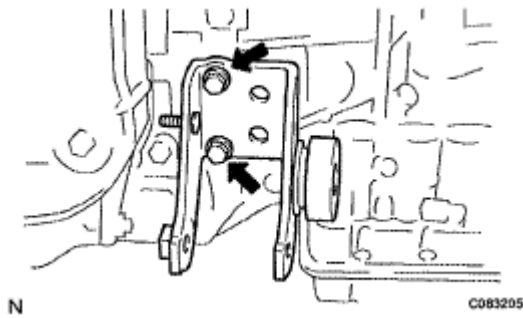


Fig. 208: Locating Engine Mounting Bracket Front
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. REMOVE AUTOMATIC TRANSAXLE ASSEMBLY

- a. Remove the flywheel housing under cover.

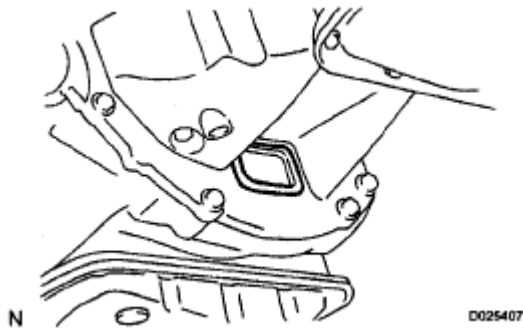


Fig. 209: Identifying Flywheel Housing Under Cover To Automatic Transaxle
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Turn the crankshaft to gain access and remove the 6 bolts while holding the crankshaft pulley bolt with a wrench.

HINT:

There will be one green colored bolt.



Fig. 210: Locating Torque Converter Clutch Mounting Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

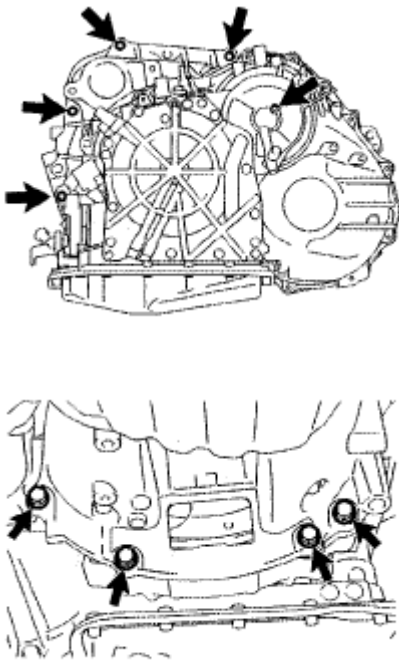
- c. Remove the 9 bolts.
 - d. Separate and remove the automatic transaxle w/ transfer.
15. **REMOVE TORQUE CONVERTER CLUTCH ASSEMBLY**
16. **INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY**

HINT:

(See INSPECTION)

INSTALLATION

1. **INSTALL TORQUE CONVERTER CLUTCH ASSEMBLY**
- a. Install the torque converter clutch to the automatic transaxle.



C153468

Fig. 211: Locating Torque Converter Clutch Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using vernier calipers and a straight edge, measure the dimension "A" between the transaxle fitting part of the engine and the converter fitting part of the drive plate (*1).

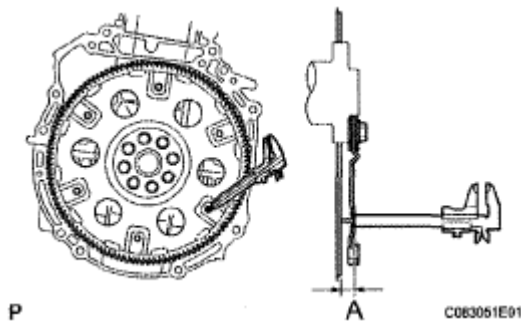


Fig. 212: Measuring Dimension "A" Between Transaxle Fitting Part Of Engine
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using vernier calipers and a straight edge, measure the dimension "B" shown in the illustration and check that "B" is greater than "A" (measured in step (*1)).

Standard:

A + 1 mm (0.03937 in.) or more

NOTE: Remember to subtract the thickness of the straight edge.

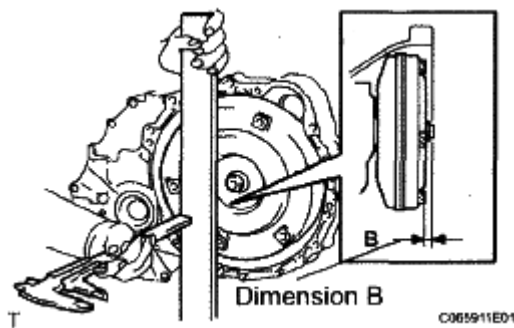


Fig. 213: Measuring Dimension "B"
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL AUTOMATIC TRANSAXLE ASSEMBLY

- a. Install the automatic transaxle w/ transfer with the 9 bolts to the engine.

Torque: Bolt A

64 N*m (650 kgf*cm, 47 ft.*lbf)

Bolt B

46 N*m (470 kgf*cm, 34 ft.*lbf)

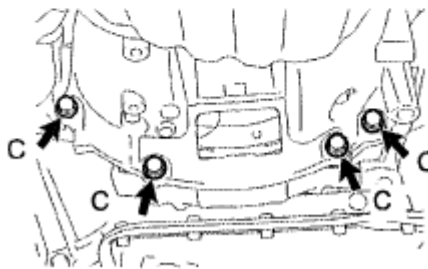
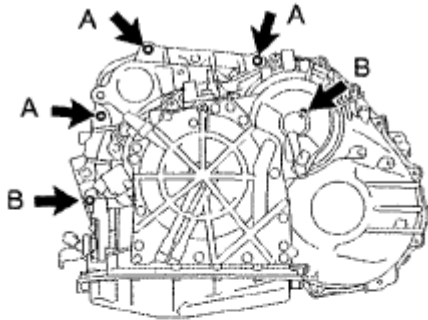
Bolt C

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

- b. Apply a few drops of adhesive to each of 2 threads on the tip of the 6 torque converter clutch mounting bolts.

Adhesive:

Toyota Genuine Adhesive 1324, Three Bond 1324 or equivalent



C153468E01

Fig. 214: Locating Automatic Transaxle Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

NOTE: First install the green colored bolt, and then the remaining 5 bolts.

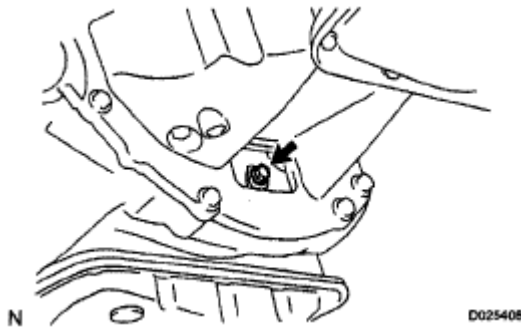


Fig. 215: Locating Torque Converter Clutch Mounting Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the flywheel housing under cover to the automatic transaxle.

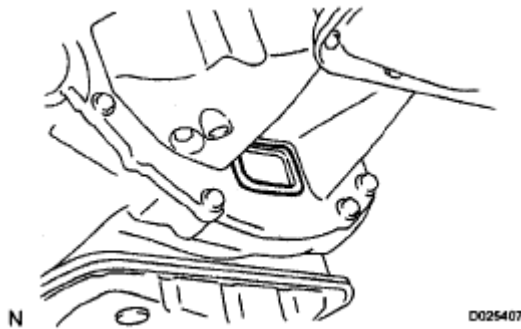


Fig. 216: Identifying Flywheel Housing Under Cover To Automatic Transaxle
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL ENGINE MOUNTING BRACKET FRONT

- a. Install the engine mounting bracket front to the automatic transaxle with the 2 bolts.

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

4. INSTALL TRANSMISSION OIL FILLER TUBE SUB-ASSEMBLY

- a. Coat a new O-ring with ATF, and install it to the transmission oil filler tube sub-assembly.
- b. Install the transmission oil filler tube sub-assembly to the automatic transaxle with the bolt.

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

- c. Install the ATF level gauge.

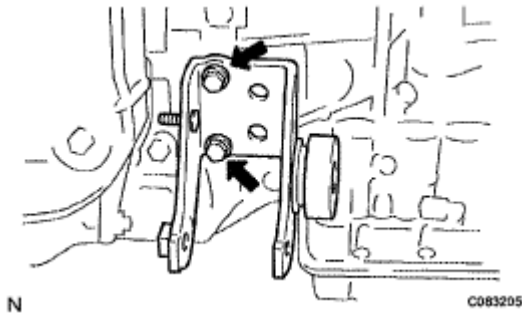


Fig. 217: Locating Engine Mounting Bracket Front
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. INSTALL TRANSMISSION CONTROL CABLE BRACKET NO. 1

- a. Install the control cable bracket No. 1 with the 2 bolts.

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

6. INSTALL OIL COOLER INLET TUBE NO. 1

- a. Temporarily install the oil cooler outlet tube No. 1.
- b. Temporarily install the oil cooler inlet tube No. 1.

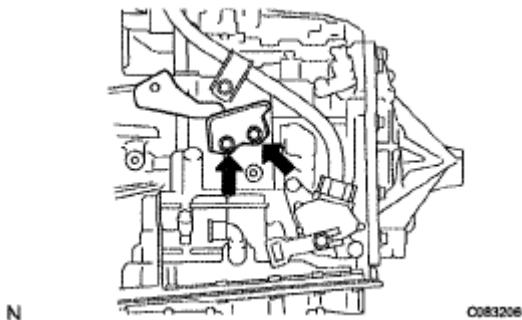


Fig. 218: Locating Control Cable Bracket No. 1 With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the oil cooler tube clamp and bolt.

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

HINT:

Install them so that the oil cooler tube cushion is positioned as shown in the illustration.

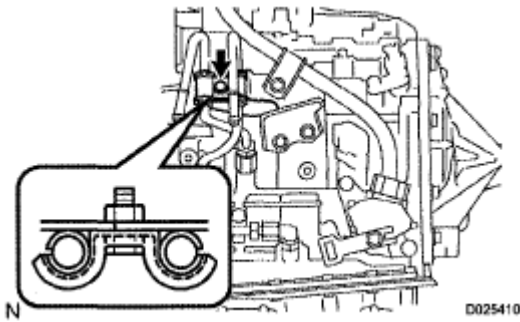


Fig. 219: Locating Oil Cooler Tube Clamp And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Using SST and a wrench, tighten the oil cooler inlet tube No. 1.

SST 09023-12701

Torque: 34 N*m (347 kgf*cm, 25 ft.*lbf)

7. INSTALL OIL COOLER OUTLET TUBE NO. 1

- a. Using SST and a wrench, tighten the oil cooler outlet tube No. 1.

SST 09023-12701

Torque: 34 N*m (347 kgf*cm, 25 ft.*lbf)

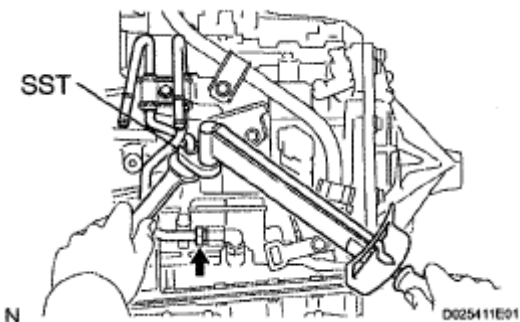


Fig. 220: Locating Oil Cooler Outlet Tube No.1
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. CONNECT CONNECTORS

- a. Connect the transmission wire connector.
- b. Connect the park/neutral position switch connector.
- c. Connect the 2 transmission speed sensor connectors.

9. INSTALL STARTER ASSEMBLY

- a. Install the starter assembly with the 2 bolts (1).

Torque: 39 N*m (398 kgf*cm, 29 ft.*lbf)

- b. Connect the connector (2).
- c. Connect the starter wire with the nut (3).

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

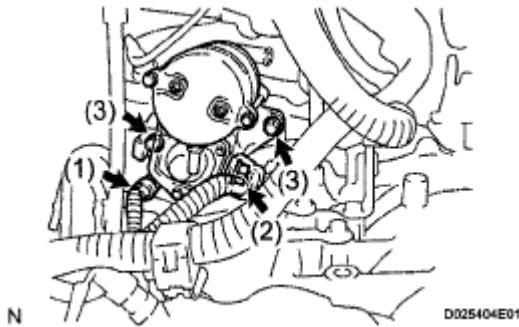


Fig. 221: Locating Starter Assembly With 2 Bolts
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. CONNECT WIRE HARNESS

- a. Connect the wire harness with the bolt.

Torque: 25.5 N*m (260 kgf*cm, 19 ft.*lbf)

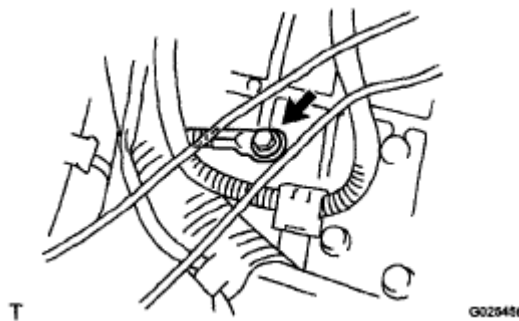


Fig. 222: Locating Wire Harness
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. INSTALL WIRE HARNESS CLAMP

- a. Install the 2 clamps and 3 bolts.

Torque: 8.4 N*m (86 kgf*cm, 74 in.*lbf)

- b. Connect the wire harnesses to the clamp.

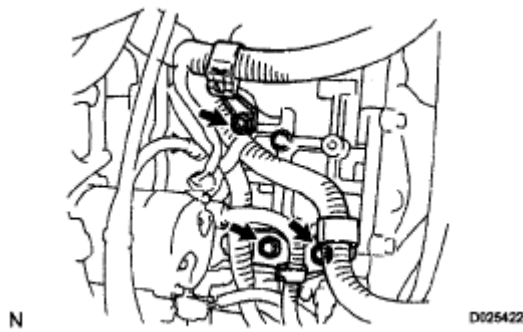


Fig. 223: Locating Wire Harnesses To Clamps
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. INSTALL TRANSMISSION CONTROL CABLE CLAMP

- a. Install the transmission control cable bracket No. 2 with the bolt.

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

13. INSTALL FRONT DRIVE SHAFT ASSEMBLY LH

HINT:

(See INSTALLATION)

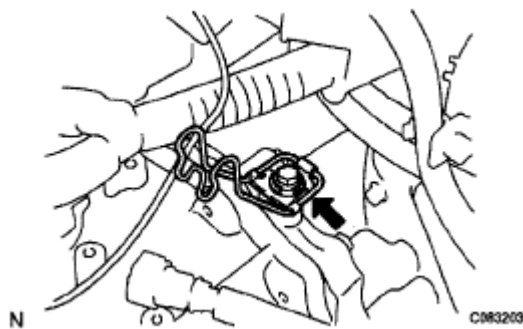


Fig. 224: Locating Transmission Control Cable Bracket No.2 With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. INSTALL FRONT DRIVE SHAFT ASSEMBLY RH

HINT:

(See INSTALLATION)

15. INSTALL ENGINE ASSEMBLY WITH TRANSAXLE

HINT:

(See **INSTALLATION**)

16. RESET MEMORY

HINT:

(See **INITIALIZATION**)

TORQUE CONVERTER CLUTCH AND DRIVE PLATE

INSPECTION

1. INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

a. Inspect the one-way clutch.

1. Set SST into the inner race of the one-way clutch.

SST 09350-32014 (09351 -32010)

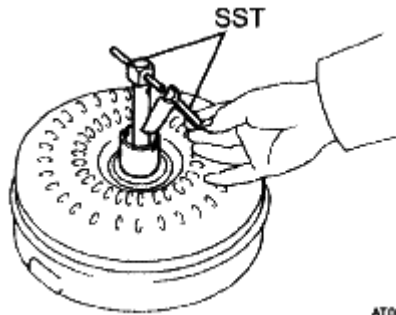


Fig. 225: Setting SST Into Inner Race Of One-Way Clutch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. Install SST so that it fits in the notch of the converter hub and outer race of the one-way clutch.

SST 09350-32014 (09351-32010, 09351-32020)

3. Stand the torque converter up and turn the SST.

Standard:

If the one-way clutch is turned clockwise, it rotates freely and if turned counterclockwise, it locks.

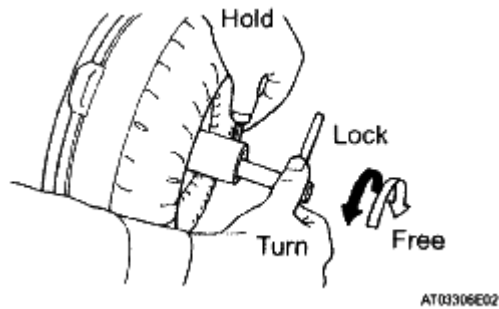


Fig. 226: Turning SST

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Determine the condition of the torque converter clutch assembly.
 1. If the inspection result of the torque converter clutch assembly satisfies the following conditions, replace the torque converter clutch assembly.

Malfunction item:

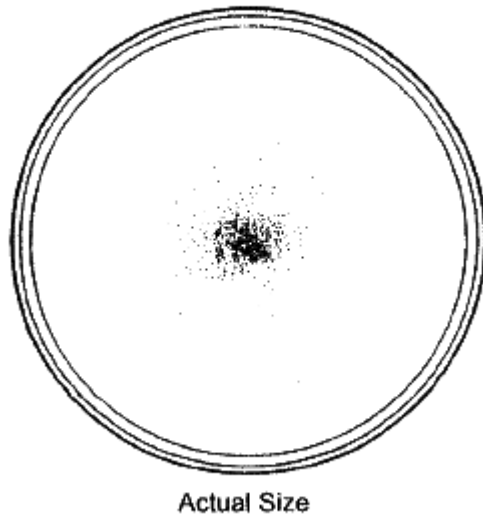
A metallic sound is emitted from the torque converter clutch assembly during the stall test or when the shift lever is moved to the N position. The one-way clutch is free or locked in both directions.

The amount of powder in the ATF is greater than the sample shown on the illustration (see the).

HINT:

The sample shows the auto fluid of approximately 0.25 liters (0.26 US qts, 0.22 Imp. qts) that is taken out from the removed torque converter clutch.

Sample showing minimum amount of
powders in ATF



Actual Size

D026367E07

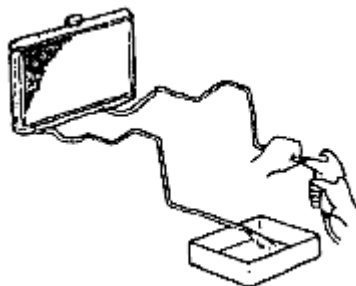
Fig. 227: Identifying Determine Condition Of Torque Converter Clutch Assembly (Actual Size)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Exchange the ATF in the torque converter clutch.
 1. If the ATF is discolored and/or has a foul odor, completely stir the ATF in the torque converter clutch and drain it with the torque converter facing up.
- d. Clean and check the oil cooler and oil pipe line.
 1. If the torque converter clutch is inspected or the ATF is exchanged, clean the oil cooler and oil pipe line.

HINT:

- Spray compressed air of 196 kPa (2 kgf/cm² , 28 psi) from the inlet hose.
- If plenty of fine powders are identified in the ATF, add new ATF using a bucket pump and clean it again.



C011090

Fig. 228: Spraying Compressed Air

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. If the ATF is cloudy, inspect the oil cooler (radiator).
- e. Prevent deformation of the torque converter clutch and damage to the oil pump gear.
 1. When there is any damage on the end of the bolt for the torque converter clutch and on the bottom of the bolt hole, replace the bolt and the torque converter clutch.
 2. All of the bolts must be same length.
 3. Bolts with washers must be used.

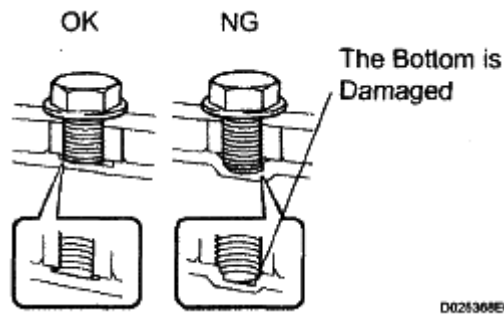


Fig. 229: Identifying Bottom Damage Of Bolt

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSPECT DRIVE PLATE & RING GEAR SUB-ASSEMBLY

- a. Set up a dial indicator with a roller instrument and measure the drive plate runout.
- b. Check for damage of the ring gear.

Maximum runout:

0.20 mm (0.0079 in.)

If runout is not within specification or ring gear is damaged, replace the drive plate.

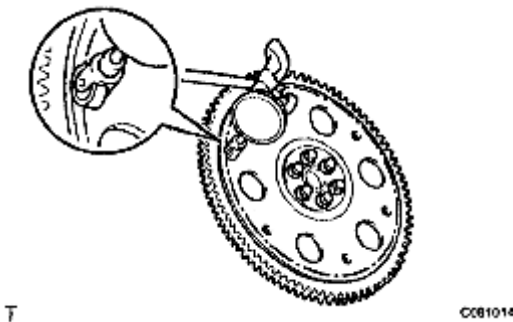
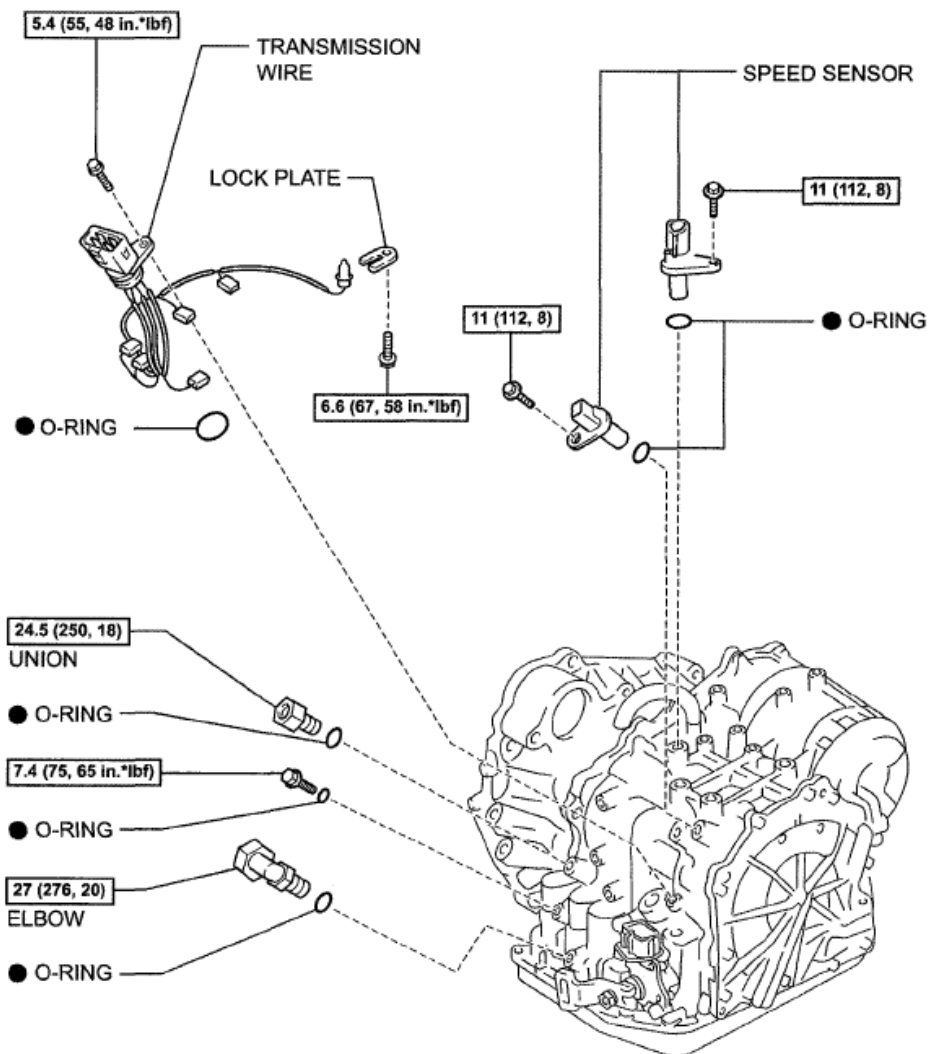


Fig. 230: Measuring Drive Plate Runout

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

AUTOMATIC TRANSAXLE UNIT

COMPONENTS



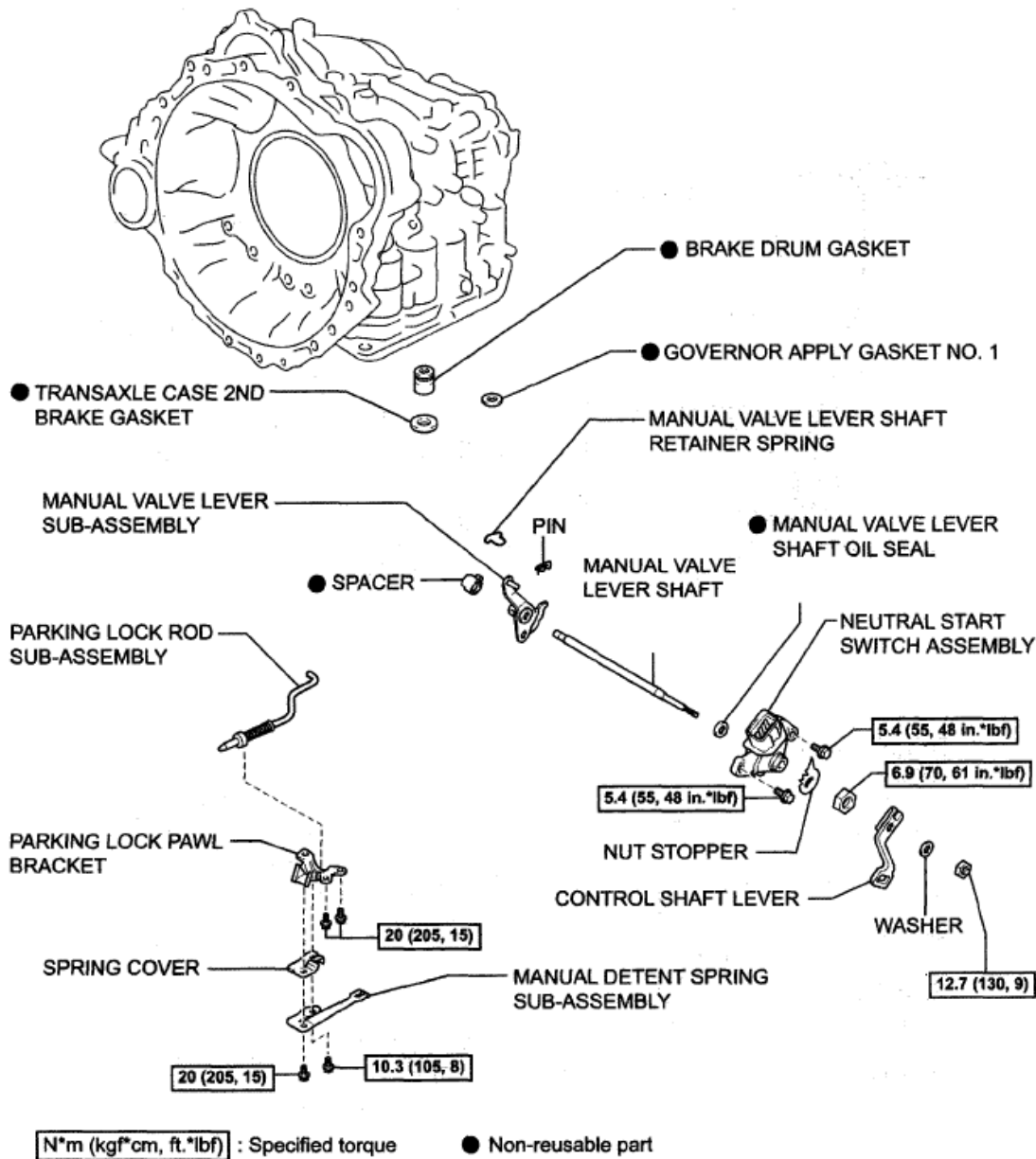
N*m (kgf*cm, ft.*lbf) : Specified torque

● Non-reusable part

N

C119448E04

Fig. 231: Identifying Automatic Transaxle Components With Torque Specifications (1 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



N

C119447E05

Fig. 232: Identifying Automatic Transaxle Components With Torque Specifications (2 Of 7)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

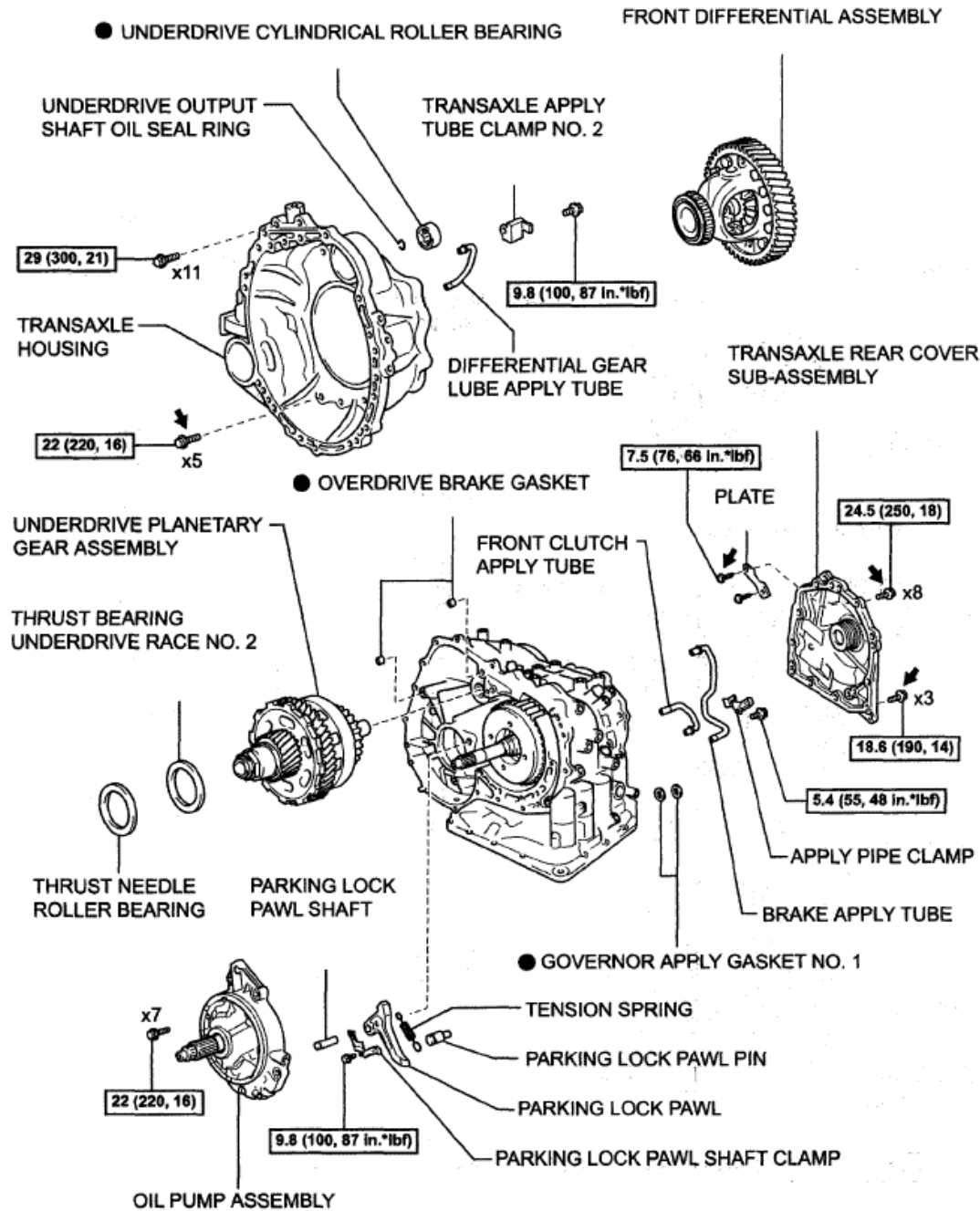
2007 TRANSMISSION U241E Automatic Transaxle - Highlander



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2007 Toyota Highlander Sport

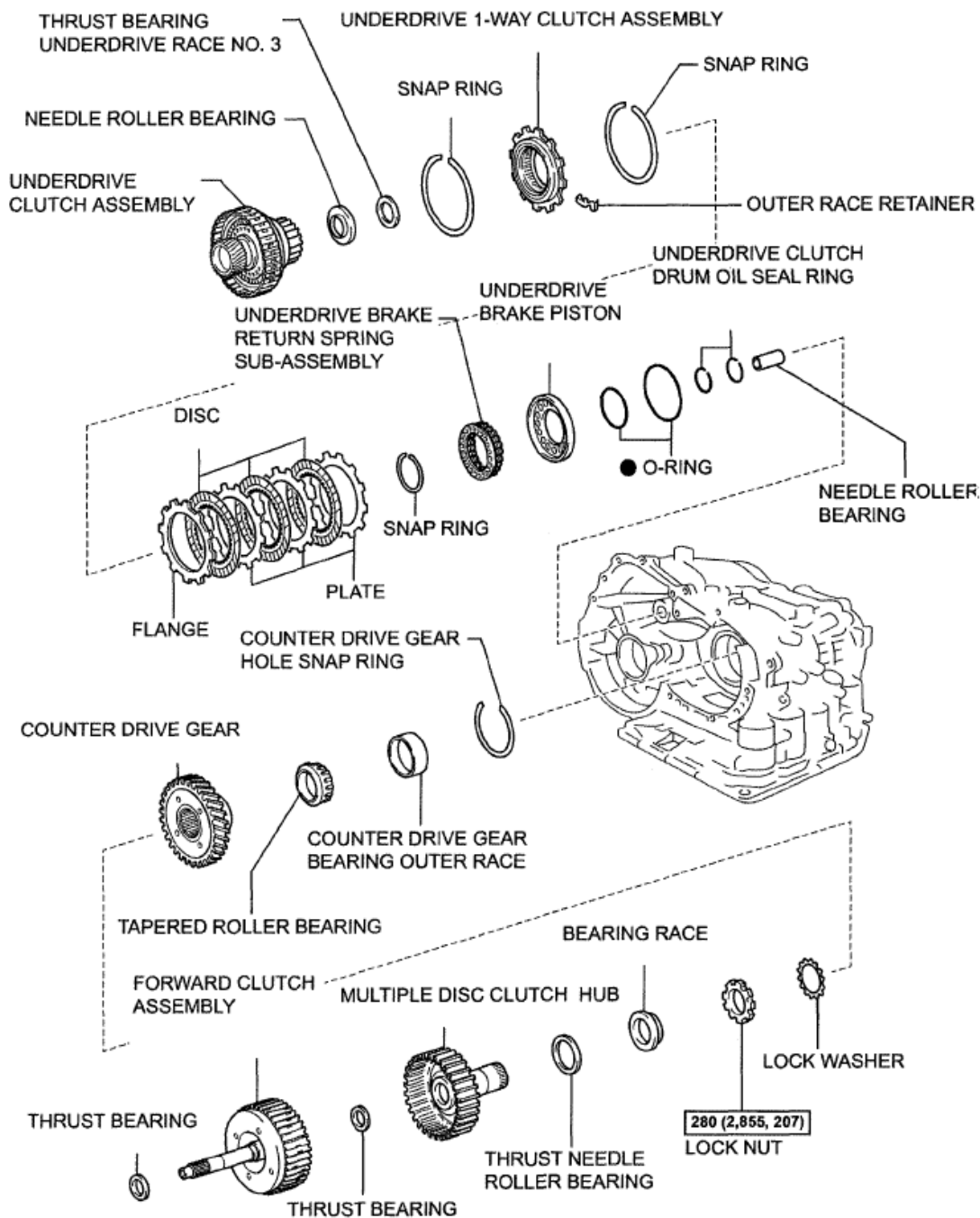
2007 TRANSMISSION U241E Automatic Transaxle - Highlander



N*m (kgf*cm, ft.*lbf) : Specified torque ● Non-reusable part ← Precoated part

C119449E05

Fig. 234: Identifying Automatic Transaxle Components With Torque Specifications (4 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



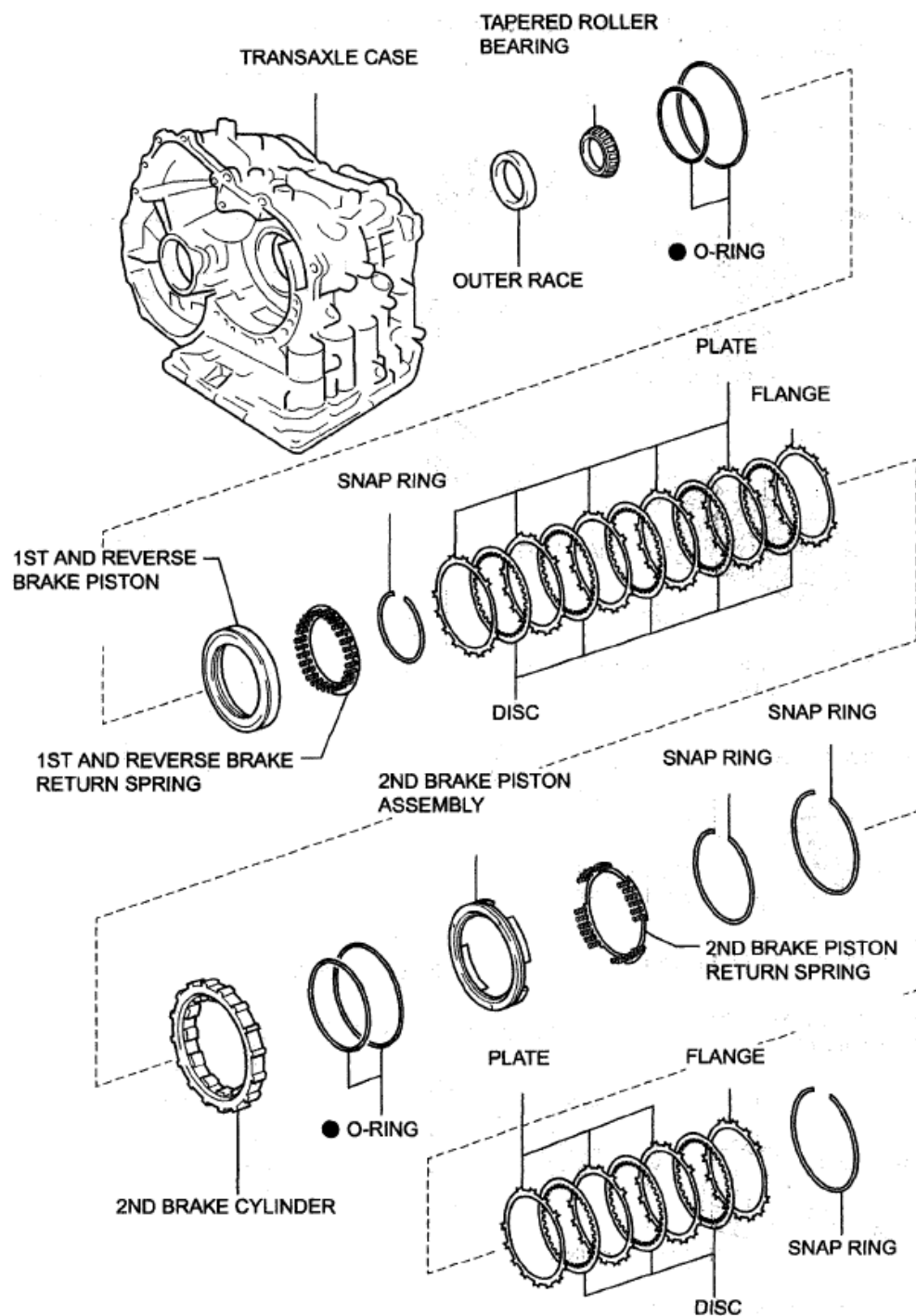
N*m (kgf*cm, ft.*lbf) : Specified torque

● Non-reusable part

N

C119450105

Fig. 235: Identifying Automatic Transaxle Components With Torque Specifications (5 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



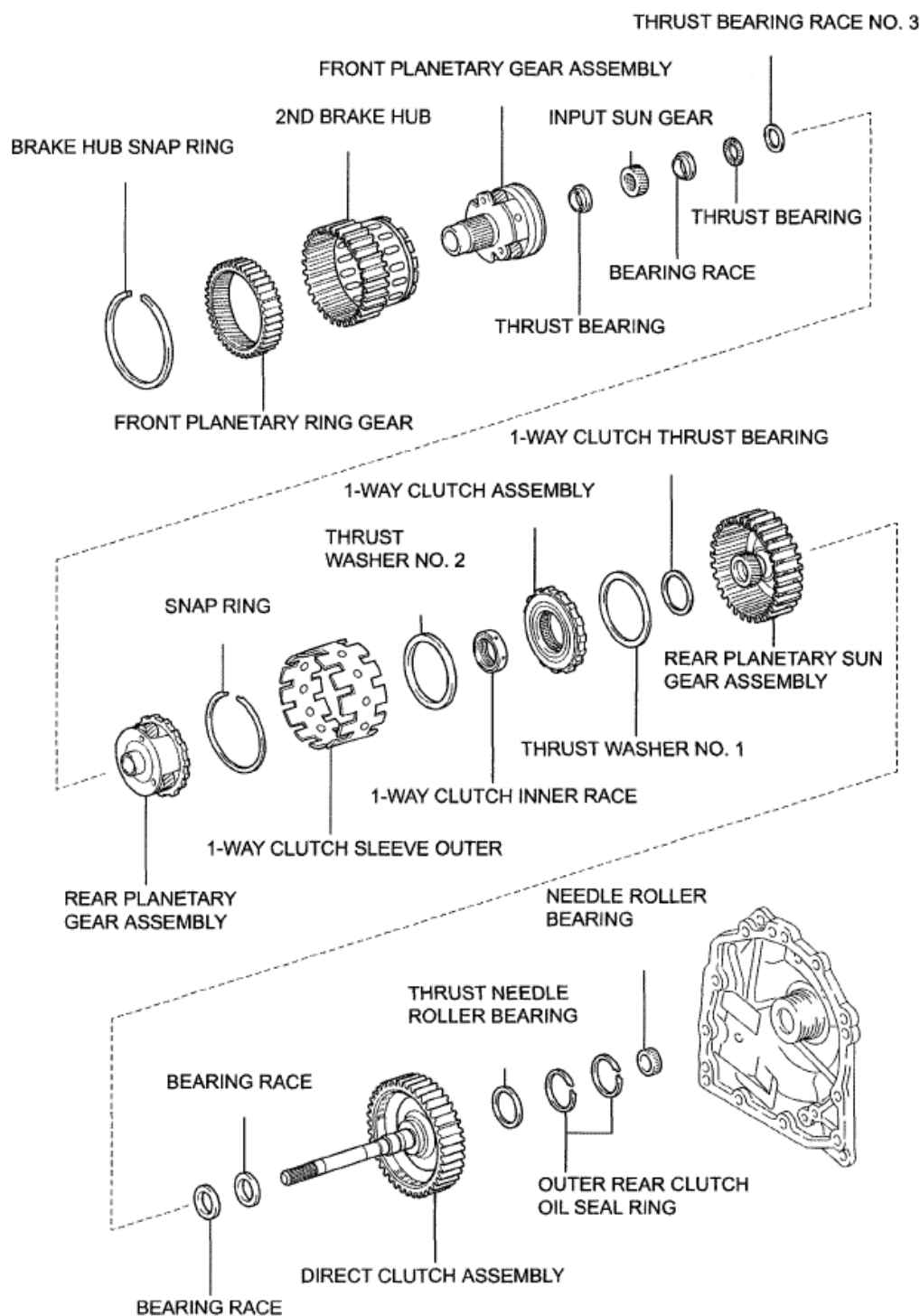
● Non-reusable part

N

C119451E01

Fig. 236: Identifying Automatic Transaxle Components (6 Of 7)

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.



C119452E04

Fig. 237: Identifying Automatic Transaxle Components (7 Of 7)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

1. REMOVE PARK/NEUTRAL POSITION SWITCH ASSEMBLY

- a. Remove the nut, washer and control shaft lever.

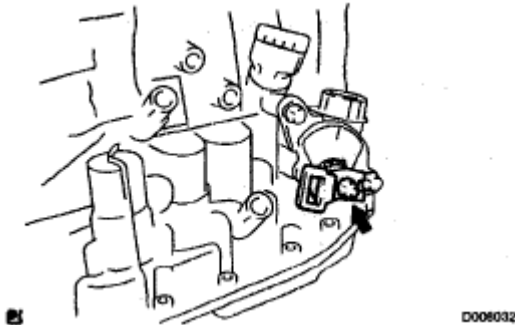


Fig. 238: Locating Control Shaft Lever, Washer And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a screwdriver, unstake the nut stopper remove the lock nut and stopper.

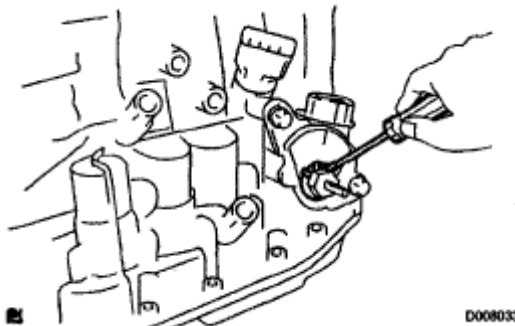


Fig. 239: Removing Lock Nut And Stopper Using Screwdriver
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the 2 bolts and pull out the park/neutral position switch.

2. REMOVE BREATHER PLUG HOSE

- a. Remove the breather plug hose from the breather No. 2 plug.

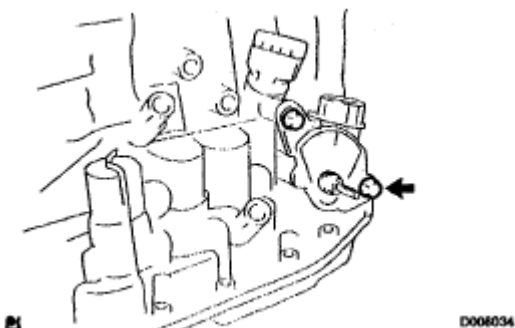


Fig. 240: Locating Breather Plug Hose Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. REMOVE OIL COOLER TUBE UNION (INLET OIL COOLER UNION)

- a. Remove the union.
- b. Remove the O-ring from the union.

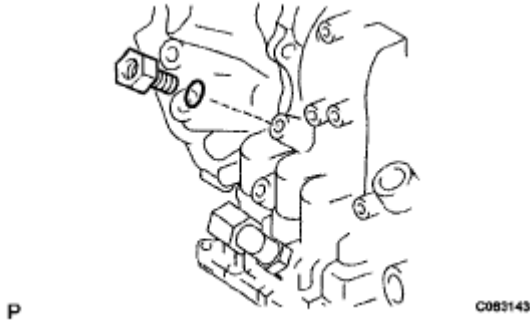


Fig. 241: Identifying Oil Cooler Tube Union (Inlet Oil Cooler Union)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. REMOVE OIL COOLER TUBE UNION (OUTLET OIL COOLER UNION)

- a. Remove the elbow.
- b. Remove the O-ring from the elbow.

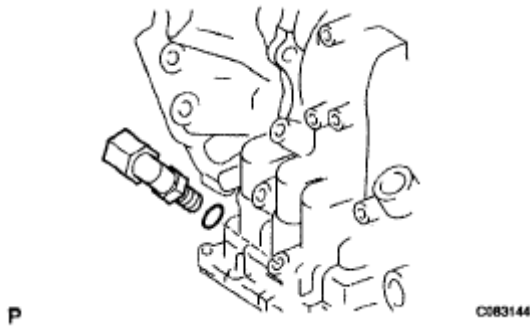


Fig. 242: Identifying Elbow To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. REMOVE SPEED SENSOR

- a. Remove the 2 bolts and the 2 speed sensors from the transaxle assembly.
- b. Remove the 2 O-rings from the sensors.

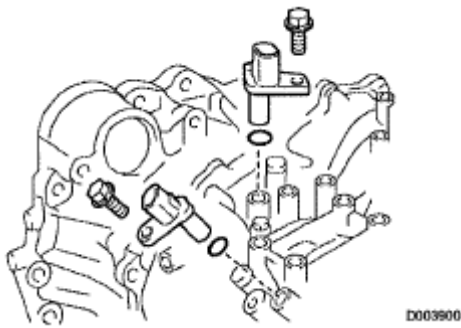


Fig. 243: Identifying Sensors With Bolts To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. REMOVE TRANSAXLE CASE NO. 1 PLUG

- a. Remove the 4 transaxle case No. 1 plugs from the transaxle case.
- b. Remove the 4 O-rings from the 4 transaxle case No. 1 plugs.

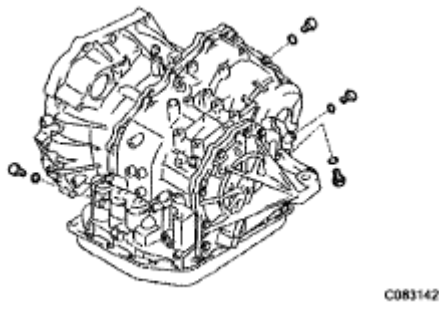


Fig. 244: Identifying Transaxle Case No.1 Plug
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. FIX AUTOMATIC TRANSAXLE ASSEMBLY

- a. Fix the transaxle assembly.

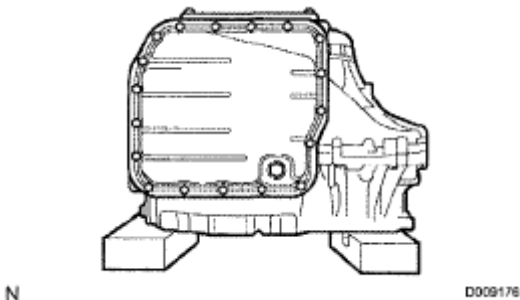


Fig. 245: Identifying Automatic Transaxle Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. REMOVE AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY

- a. Remove the 18 bolts.
- b. Remove the oil pan and 2 magnets.

9. REMOVE AUTOMATIC TRANSAXLE OIL PAN GASKET

- a. Remove the gasket from the oil pan.

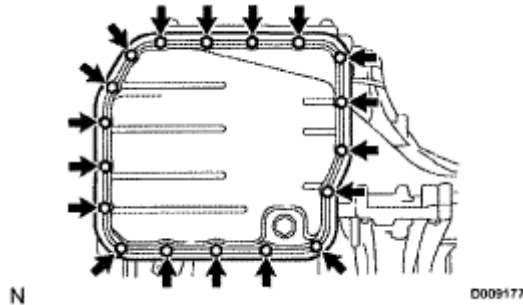


Fig. 246: Locating Automatic Transaxle Oil Pan Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. INSPECT TRANSMISSION OIL CLEANER MAGNET

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

Result:

Steel (magnetic):

bearing, gear and plate wear

Brass (non-magnetic):

bushing wear

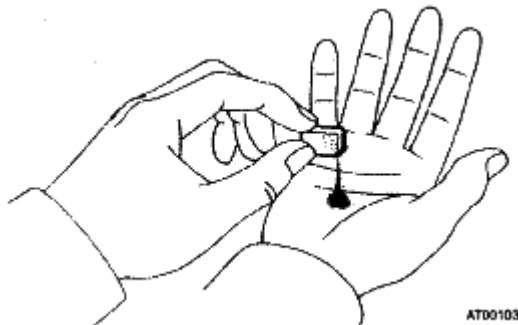


Fig. 247: Checking Particles In Pan

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

11. REMOVE TRANSMISSION WIRE

- a. Remove the 5 connectors from the shift solenoid valves.
- b. Remove the bolt, clamp and the ATF temperature sensor.

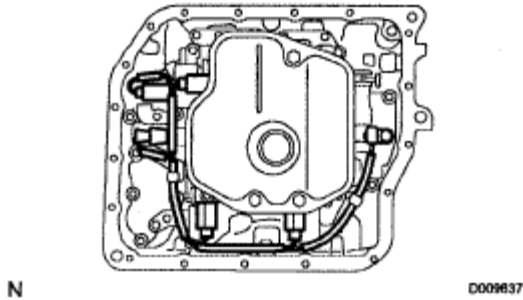


Fig. 248: Identifying Clamp, ATF Temperature Sensor And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the bolt and transaxle solenoid wire from the transaxle case.

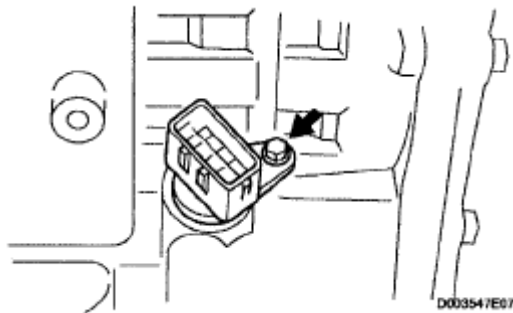


Fig. 249: Locating Solenoid Wire Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Remove the O-ring from the transaxle solenoid wire.

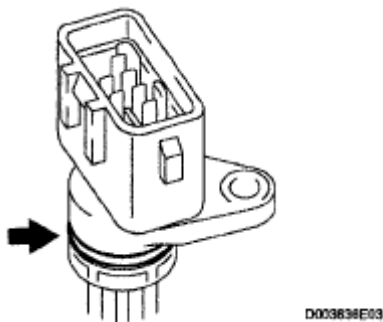
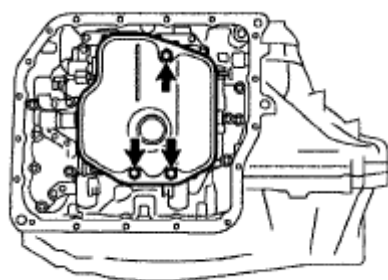


Fig. 250: Locating O-Ring Of Transmission Wire Connector With ATF
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

12. REMOVE VALVE BODY OIL STRAINER ASSEMBLY

- a. Remove the 3 bolts and oil strainer.



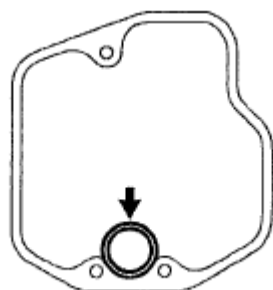
N

D006179

Fig. 251: Locating Oil Pan Gasket To Oil Pan

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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



N

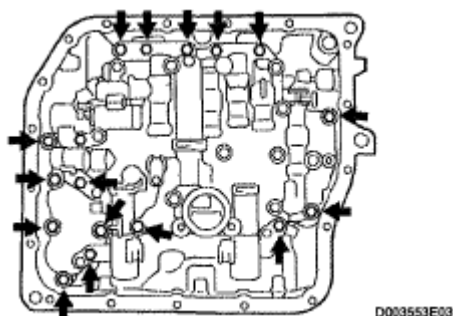
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Fig. 252: Locating O-Ring With ATF To Oil Strainer

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

13. REMOVE TRANSMISSION VALVE BODY ASSEMBLY

- a. Support the valve body assembly and remove the 17 bolts and the valve body assembly.



D003553E03

Fig. 253: Locating Bolts And Valve Body Assembly

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

14. REMOVE GOVERNOR APPLY GASKET NO. 1

- a. Remove the governor apply gasket No. 1 from the transaxle case.

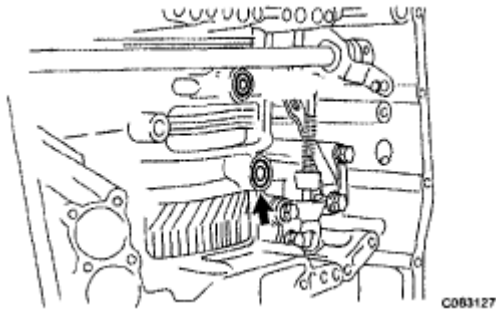


Fig. 254: Locating Governor Apply Gasket No. 1 And Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

15. REMOVE TRANSAXLE CASE 2ND BRAKE GASKET

- a. Remove the transaxle case 2nd brake gasket from the transaxle case.

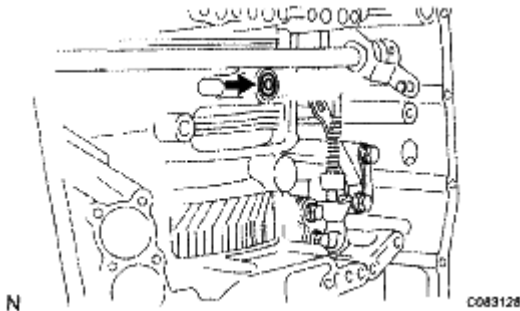


Fig. 255: Locating Transaxle Case 2nd Brake Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

16. REMOVE BRAKE DRUM GASKET

- a. Remove the brake drum gasket from the transaxle case.

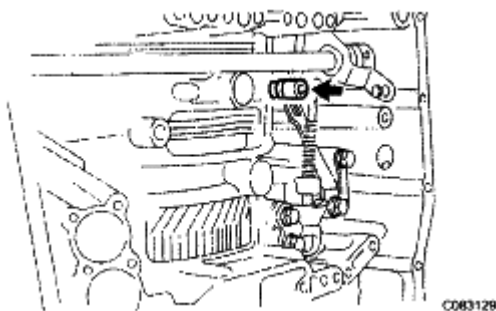


Fig. 256: Locating Brake Drum Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. REMOVE CHECK BALL BODY

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

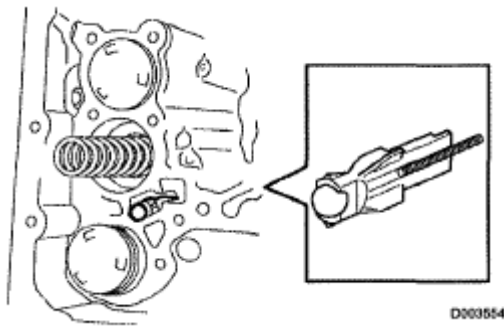


Fig. 257: Identifying Check Ball Body And Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. REMOVE C-3 ACCUMULATOR PISTON

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

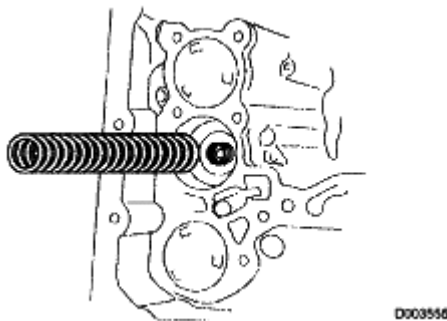


Fig. 258: Identifying Spring And C-3 Accumulator Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

NOTE:

- Blowing off the air may cause the piston's jump-out. When removing the piston, hold it with your hand using a waste cloth.
- Take care not to splash ATF when air-blowing.

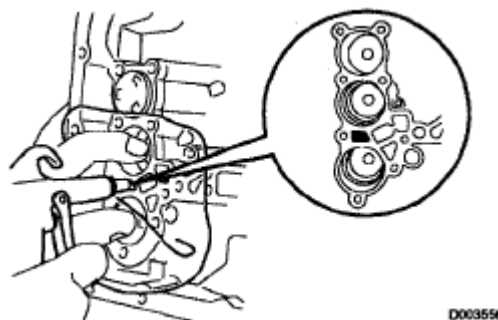


Fig. 259: Applying Compressed Air To Oil Hole
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

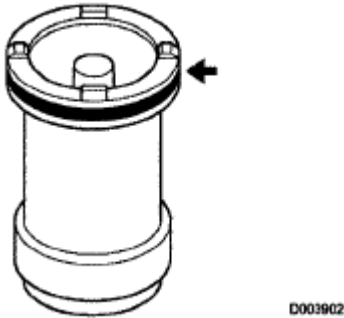


Fig. 260: Locating O-Ring With ATF
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

19. REMOVE C-1 ACCUMULATOR PISTON

- a. Apply compressed air (392 kPa, 4.0 kgf/cm², 57 psi) to the oil hole and remove the C-1 accumulator piston and spring.

NOTE:

- Blowing off the air may cause the piston's jump-out. When removing the piston, hold it with your hand using a waste cloth.
- Take care not to splash ATF when air-blowing.

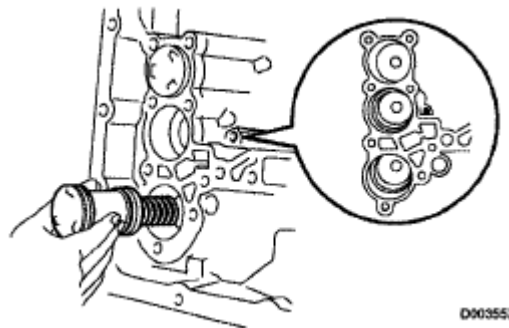


Fig. 261: Removing C Accumulator Piston And Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 2 O-rings from the C-1 accumulator piston.

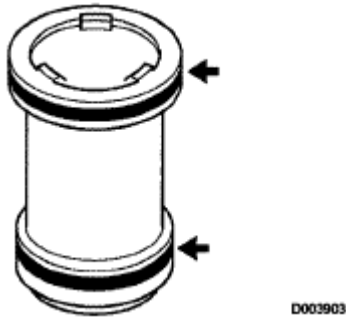


Fig. 262: Coating O-Rings With ATF
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

20. REMOVE B-3 ACCUMULATOR PISTON

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

NOTE:

- Blowing off the air may cause the piston's jump-out. When removing the piston, hold it with your hand using a waste cloth.
- Take care not to splash ATF when air-blowing.

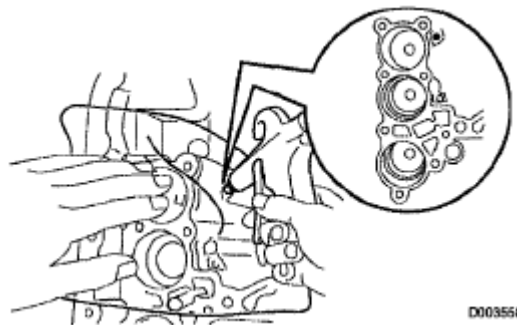


Fig. 263: Applying Compressed Air To Oil Hole
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

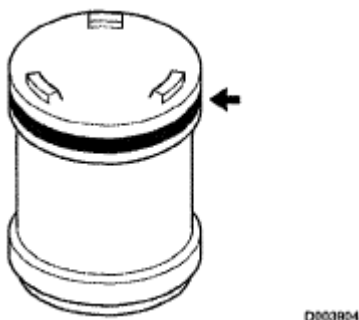
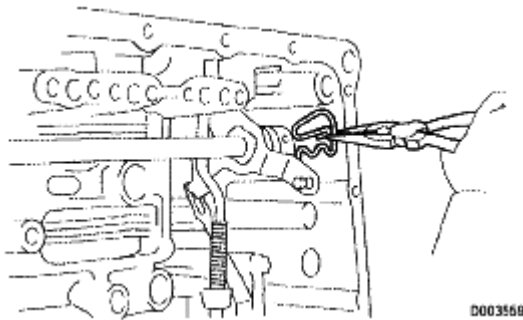
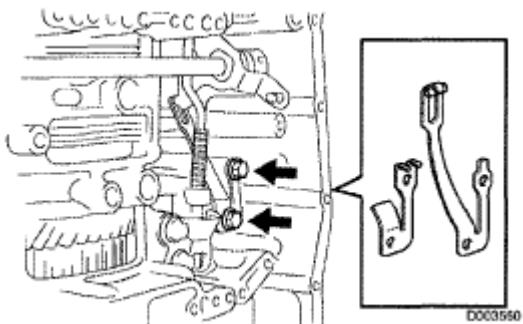


Fig. 264: Coating O-Ring With ATF**Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.****21. REMOVE MANUAL VALVE LEVER SHAFT RETAINER SPRING**

- a. Using needle-nose pliers, remove the retainer spring.

**Fig. 265: Removing Manual Valve Lever Shaft Retainer Spring****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.****22. REMOVE MANUAL DETENT SPRING SUB-ASSEMBLY**

- a. Remove the 2 bolts, the manual detent spring sub-assembly and cover.

**Fig. 266: Locating Bolts And Manual Detent Spring Sub-Assembly****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.****23. REMOVE PARKING LOCK PAWL BRACKET**

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

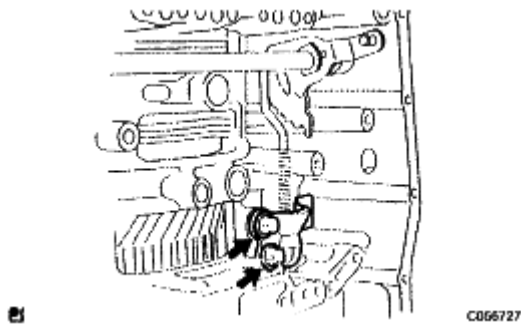


Fig. 267: Locating Bolts And Parking Lock Pawl Bracket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

24. REMOVE MANUAL VALVE LEVER SUB-ASSEMBLY

- a. Using a chisel and hammer, cut off and remove the spacer.

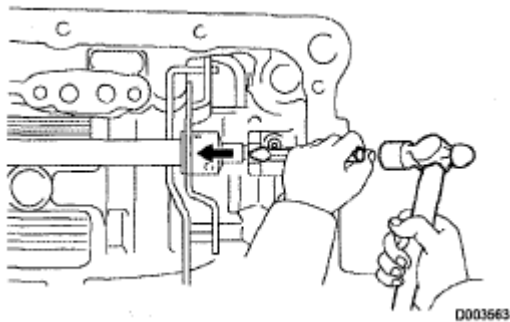


Fig. 268: Removing Spacer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a pin punch and hammer, drive out the pin.

HINT:

Slowly drive out the pin so that it will not fall into the transaxle case.

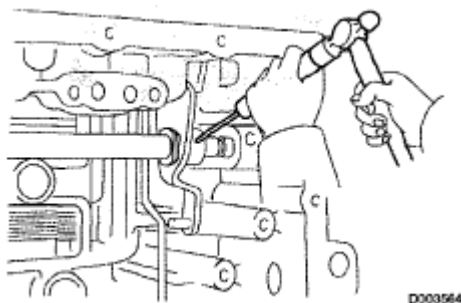


Fig. 269: Driving Out Pin Using Pin Punch And Hammer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

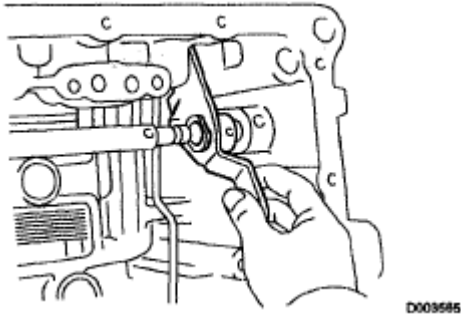


Fig. 270: Installing Direct Clutch Assembly And Thrust Bearing To Rear Planetary Sun Gear Assembly

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

25. REMOVE PARKING LOCK ROD SUB-ASSEMBLY

- a. Remove the parking lock rod from the manual valve lever.

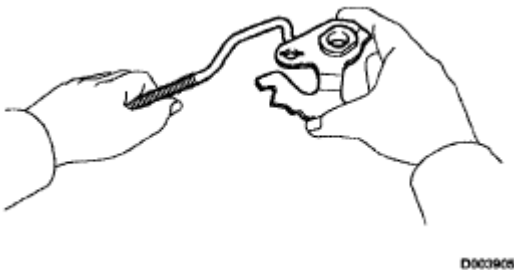


Fig. 271: Installing Parking Lock Rod To Manual Valve Lever

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

26. REMOVE MANUAL VALVE LEVER SHAFT OIL SEAL

- a. Using a screwdriver, remove the oil seal from the transaxle case.

27. FIX AUTOMATIC TRANSAXLE ASSEMBLY

- a. Fix the transaxle case with the oil pump side facing up.

28. INSPECT INPUT SHAFT ENDPLAY

HINT:

(See **INSPECTION**)

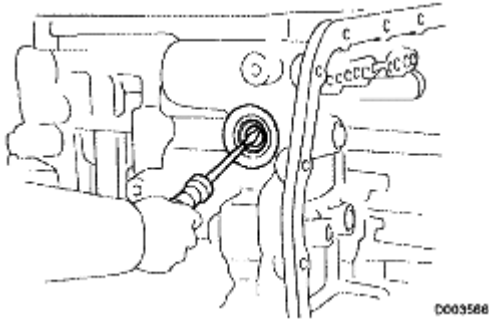


Fig. 272: Removing Oil Seal From Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

29. REMOVE TRANSAXLE HOUSING

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

NOTE: Differential may be accidentally removed when the transaxle housing is removed.

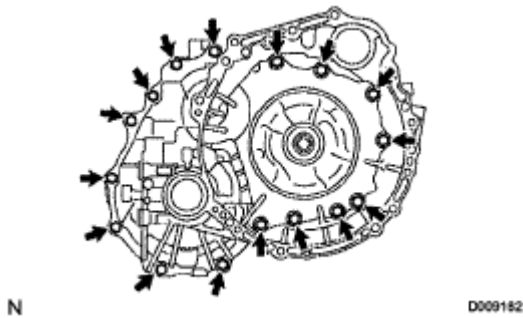


Fig. 273: Removing Bolts And Transaxle Housing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

30. REMOVE OIL PUMP ASSEMBLY

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

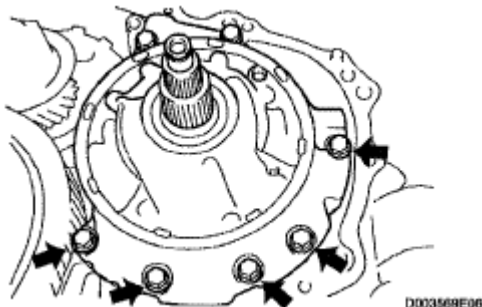


Fig. 274: Removing Bolts And Oil Pump From Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

31. REMOVE THRUST NEEDLE ROLLER BEARING

- a. Remove thrust needle roller bearing from the U/D planetary gear assembly.

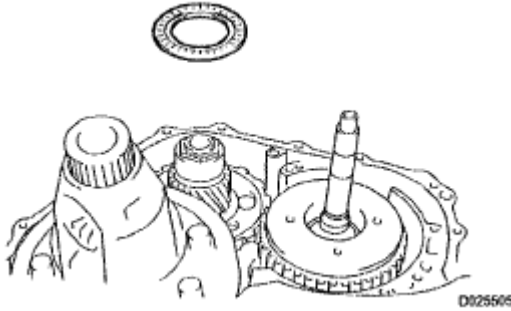


Fig. 275: Installing Thrust Needle Roller Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

32. REMOVE THRUST BEARING UNDERDRIVE RACE NO. 2

- a. Remove thrust bearing U/D race No. 2 from the U/D planetary gear assembly.

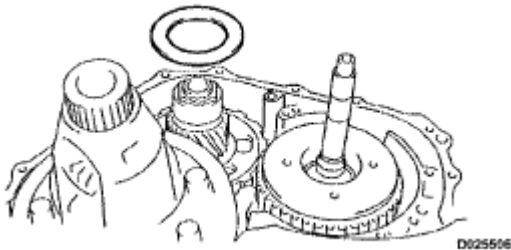


Fig. 276: Installing Thrust Bearing Race To U/D Planetary Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

33. REMOVE DIFFERENTIAL GEAR ASSEMBLY

- a. Remove the differential gear assembly from the transaxle case.

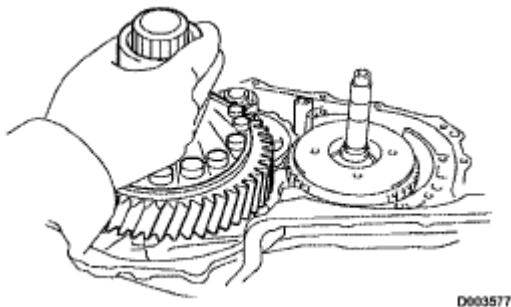


Fig. 277: Installing Differential Gear Assembly To Transaxle Case

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

34. REMOVE OVERDRIVE BRAKE GASKET

- a. Remove 2 O/D brake gaskets from the transaxle case.

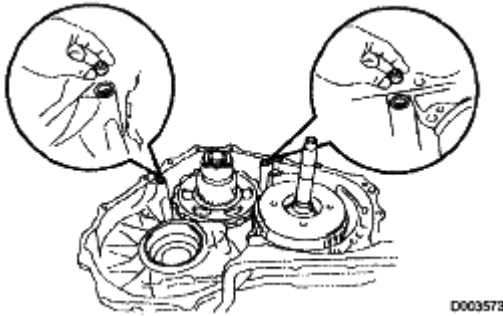


Fig. 278: Removing Overdrive Brake Gaskets

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

35. REMOVE FORWARD CLUTCH ASSEMBLY

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

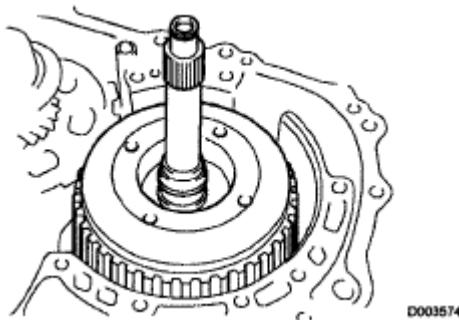


Fig. 279: Installing Forward Clutch To Multiple Clutch Hub

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the thrust bearing from the forward clutch.

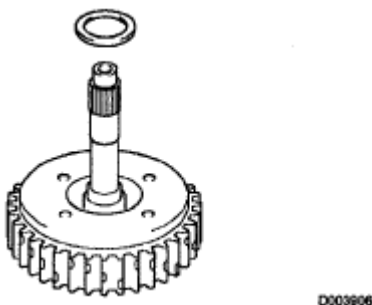


Fig. 280: Removing Thrust Bearing From Forward Clutch

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

36. REMOVE MULTIPLE DISC CLUTCH HUB

- a. Remove the thrust bearing, multiple clutch hub, needle roller bearing and bearing race from the transaxle case.

37. INSPECT MULTIPLE DISC CLUTCH HUB

HINT:

(See INSPECTION)

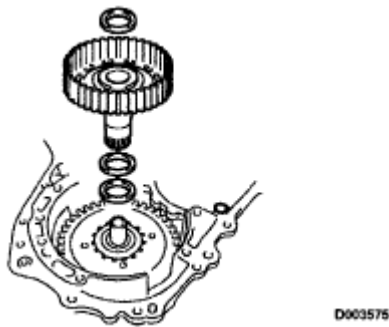


Fig. 281: Removing Multiple Disc Clutch Hub
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

38. REMOVE UNDERDRIVE PLANETARY GEAR ASSEMBLY

- a. Remove the bolt and parking pawl shaft clamp.

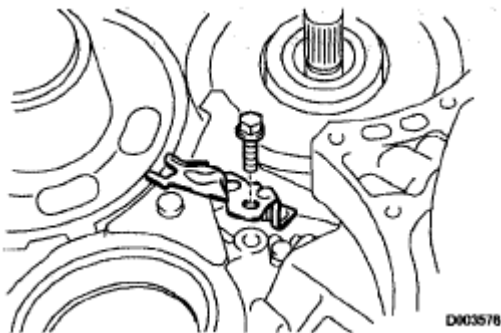


Fig. 282: Installing Pawl Shaft Clamp With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the parking lock pawl shaft.

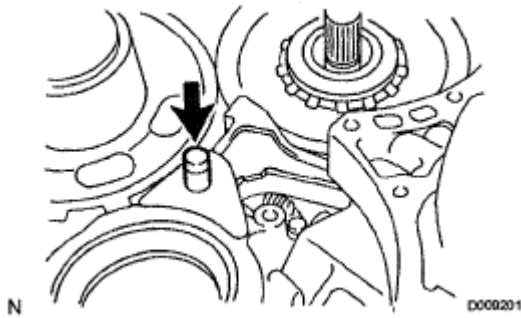


Fig. 283: Removing Parking Lock Pawl Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Push the parking lock pawn.

HINT:

Failure to do so will cause interference when the U7 D planetary gear is removed.

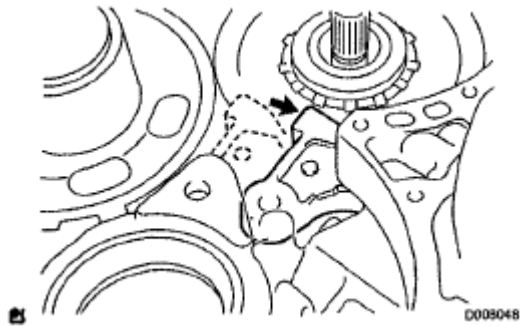


Fig. 284: Pushing Parking Lock Pawn
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Remove the U/D planetary gear assembly from the transaxle case.

NOTE: Be careful so that the U/D planetary gear assembly will not fall out.

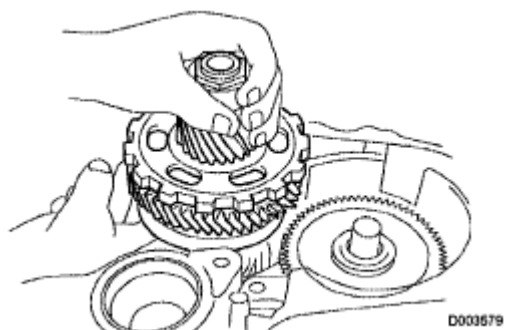


Fig. 285: Installing U/D Planetary Gear Assembly To Transaxle Case

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Remove the spring, pawl pin and parking lock pawl.

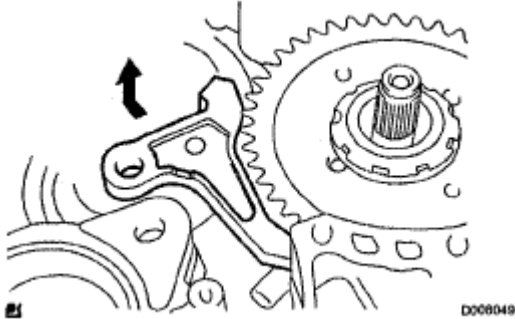


Fig. 286: Removing Spring, Pawl Pin And Parking Lock Pawl
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

39. REMOVE UNDERDRIVE CLUTCH ASSEMBLY

- a. Remove the U/D clutch assembly, thrust bearing and bearing race from the transaxle case.

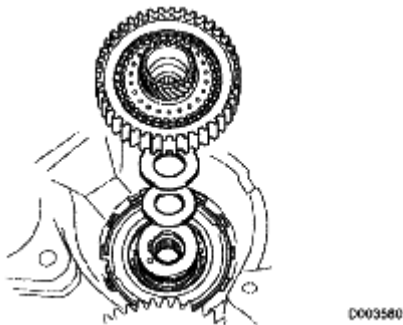


Fig. 287: Identifying Bearing And Bearing Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

40. REMOVE UNDERDRIVE 1-WAY CLUTCH ASSEMBLY

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

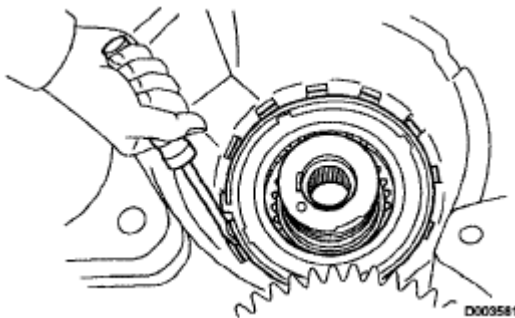


Fig. 288: Installing Snap Ring To Transaxle Case

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 1-way clutch from the transaxle case.

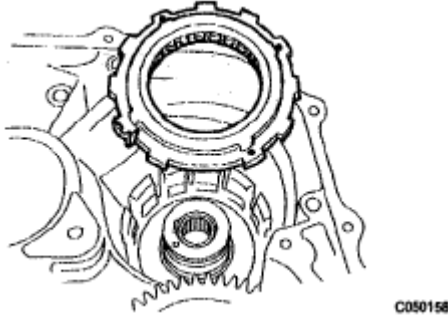


Fig. 289: Installing 1-Way Clutch To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

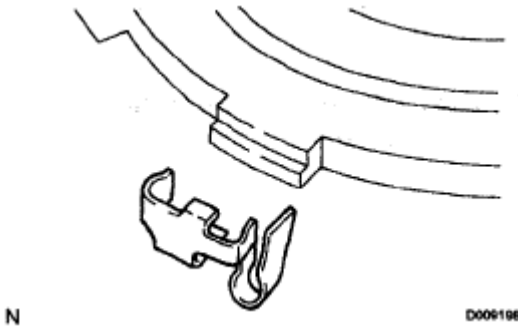


Fig. 290: Installing Outer Race To 1-Way Clutch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

41. REMOVE UNDERDRIVE CLUTCH DISC NO. 2

- a. Using a screwdriver* remove the snap ring.
b. Remove the flange, 3 discs and 3 plates from the transaxle case.

42. INSPECT UNDERDRIVE CLUTCH DISC NO. 2

HINT:

(See **INSPECTION**)

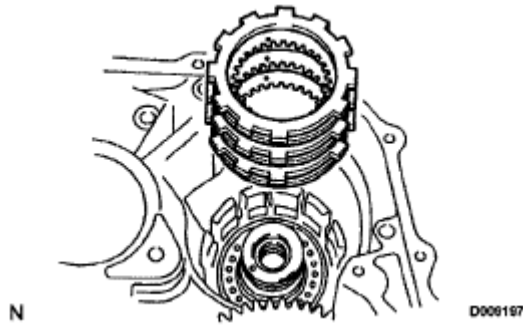


Fig. 291: Installing 4 Discs And 4 Plates To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

43. REMOVE UNDERDRIVE BRAKE RETURN SPRING SUB-ASSEMBLY

- a. Using SST, a snap ring expander and a press, remove the snap ring and piston return spring.

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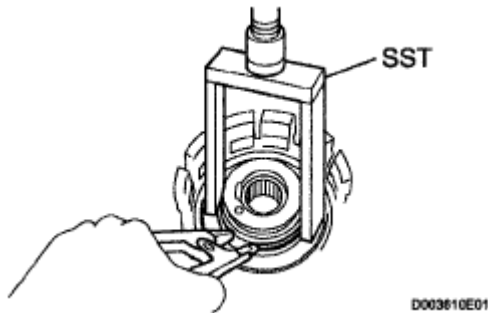


Fig. 292: Inspecting Underdrive Brake Return Spring Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

44. INSPECT UNDERDRIVE BRAKE RETURN SPRING SUB-ASSEMBLY

- a. Using vernier calipers, measure the free length of the spring together with the spring seat.

Standard free length: 14.04 mm (0.5528 in.)

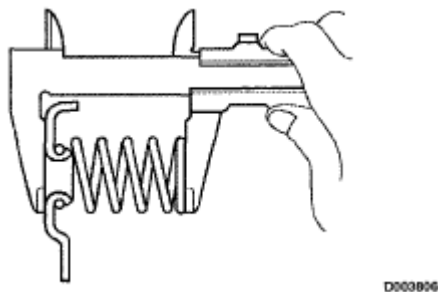


Fig. 293: Measuring Free Length Of Spring Together With Spring Seat Using Vernier Calipers

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

45. REMOVE TRANSAXLE CASE NO. 1 PLUG

- a. Remove 2 transaxle case No. 1 plugs from the transaxle rear cover.
- b. Remove 2 O-rings from the 2 transaxle case No. 1 plugs.

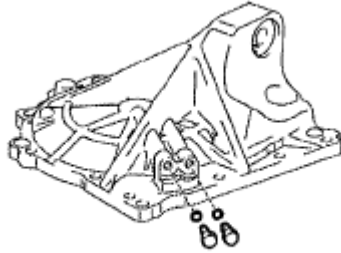


Fig. 294: Installing O-Rings To Transaxle Case Plugs

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

46. REMOVE TRANSAXLE REAR COVER SUB-ASSEMBLY

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

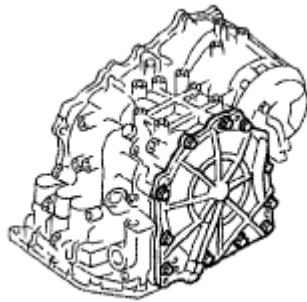


Fig. 295: Removing 11 Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the 2 oil seal rings from the transaxle rear cover.

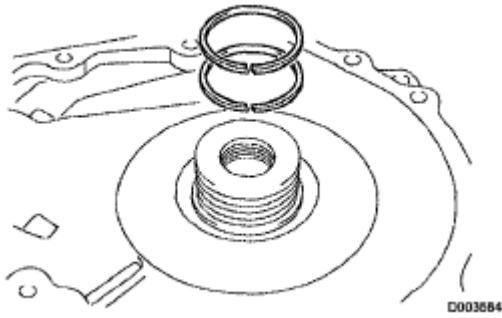


Fig. 296: Removing 2 Oil Seal Rings From Transaxle Rear Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Using a "TORX" socket wrench (T30), remove the 2 screws and transaxle rear cover plate.

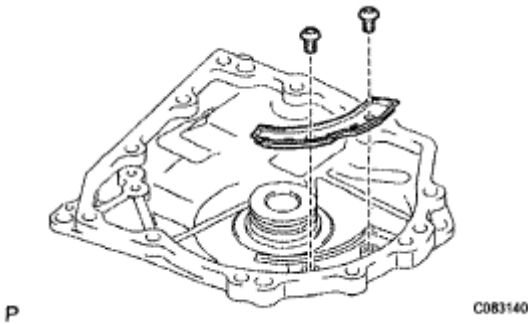


Fig. 297: Installing Transaxle Rear Cover Plate With 2 Screws
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Using SST, remove the needle-roller bearing from the transaxle rear cover.

SST 09387-00041 (09387-01010, 09387-01030, 093874)1040)

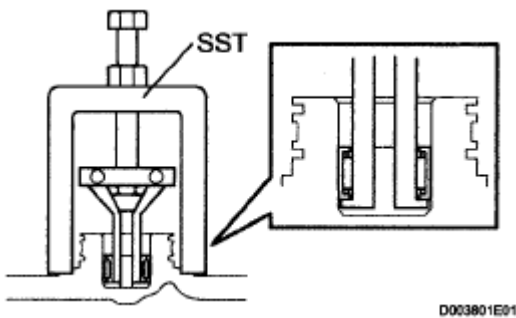


Fig. 298: Removing Needle-Roller Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

47. REMOVE BRAKE APPLY TUBE

- Remove a bolt, clamp and 2 brake apply tubes.
- Remove the brake apply tube from the clamp.

48. REMOVE FRONT CLUTCH APPLY TUBE

- a. Remove the front clutch apply tube from the clamp.

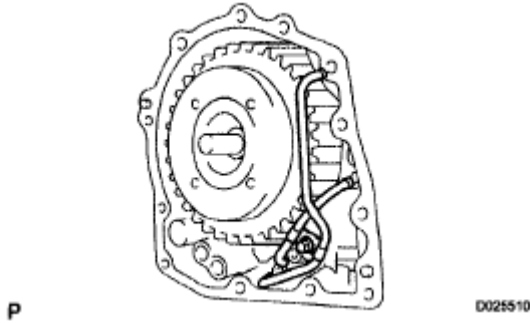


Fig. 299: Installing 2 Apply Tubes And A Bolt To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

49. REMOVE GOVERNOR APPLY GASKET NO. 1

- a. Using a screwdriver, remove the 2 apply gaskets.

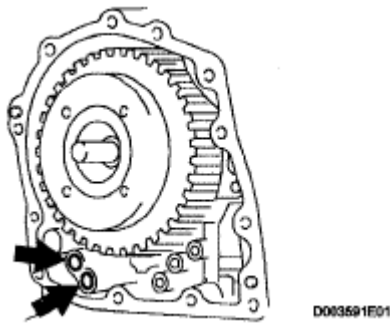


Fig. 300: Installing Apply Gaskets To Transaxle
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

50. REMOVE DIRECT CLUTCH ASSEMBLY

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

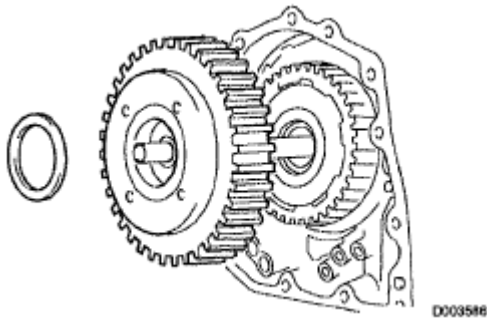


Fig. 301: Installing Direct Clutch Assembly And Thrust Bearing To Rear Planetary Sun Gear Assembly

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the bearing race from the direct clutch.

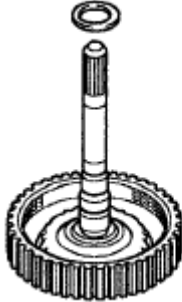


Fig. 302: Installing Bearing Race To Direct Clutch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

51. REMOVE REAR PLANETARY SUN GEAR ASSEMBLY

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

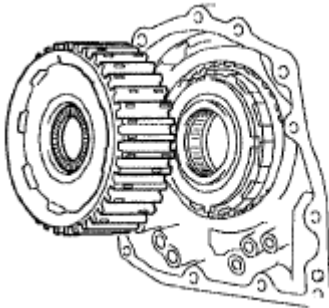


Fig. 303: Installing Rear Planetary Sun Gear Assembly To Rear Planetary Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the thrust bearing from the rear planetary sun gear.

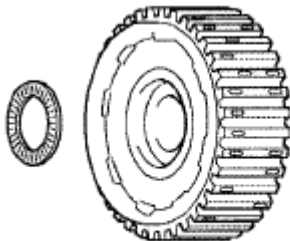


Fig. 304: Coating Bearing With Petroleum Jelly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the thrust washer No. 1 from the rear planetary sun gear.

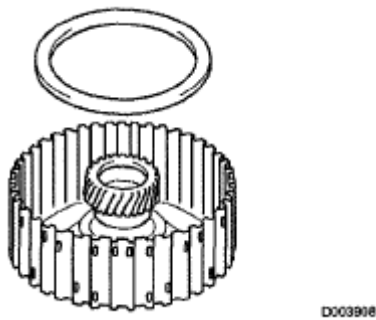


Fig. 305: Coating Thrust Washer

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

52. REMOVE 1-WAY CLUTCH ASSEMBLY

- a. Remove the 1-way clutch and the thrust bearing from the transaxle case.

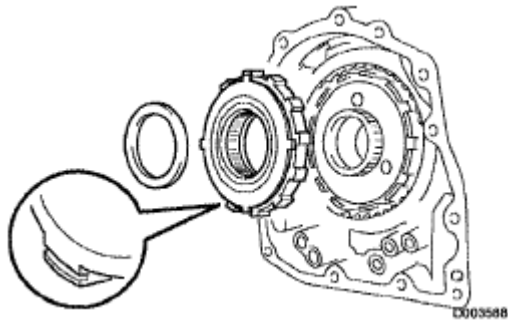


Fig. 306: Installing 1-Way Clutch And Bearing To 1-Way Clutch Sleeve Outer

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

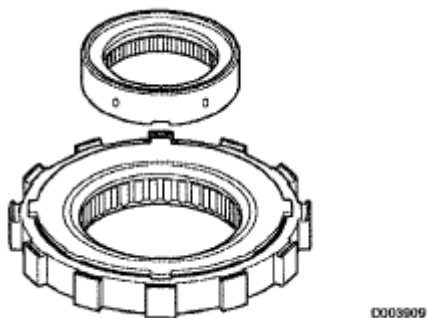


Fig. 307: Installing Inner Race To 1-Way Clutch

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

53. REMOVE 1-WAY CLUTCH SLEEVE OUTER

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

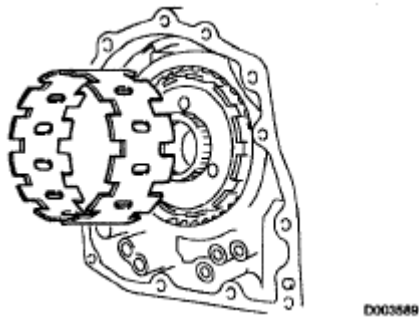


Fig. 308: Removing 1-Way Clutch Sleeve Outer From Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

54. REMOVE 2ND BRAKE CLUTCH DISC

- a. Using a screwdriver, remove the snap ring.
- b. Remove the flange, 3 discs and 3 plates from the transaxle case.

55. INSPECT 2ND BRAKE CLUTCH DISC

HINT:

(See INSPECTION)

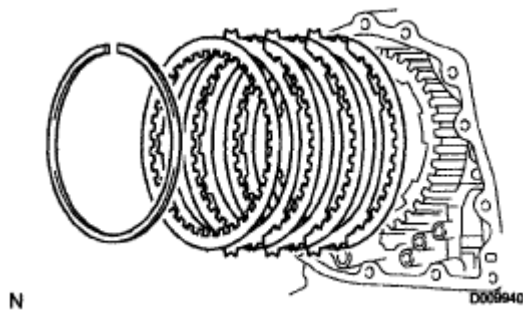
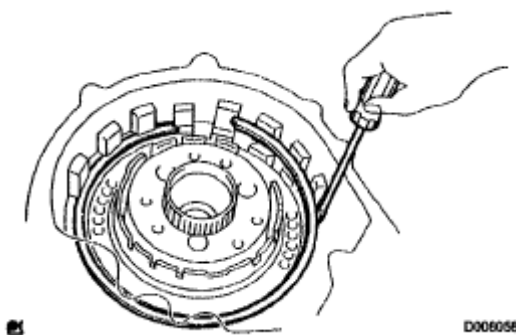


Fig. 309: Removing 2nd Brake Clutch Disc
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

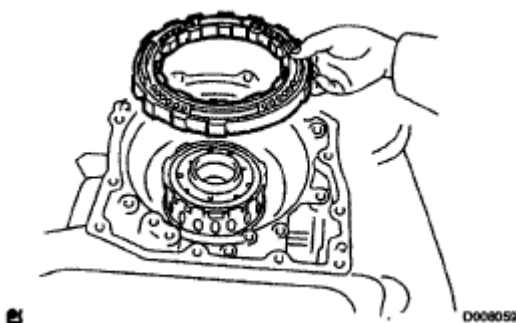
56. REMOVE 2ND BRAKE PISTON ASSEMBLY

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

**Fig. 310: Removing Snap Ring**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

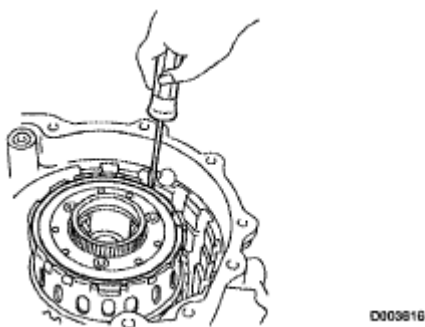
- b. Remove the 2nd brake piston assembly from the transaxle case.

**Fig. 311: Removing 2nd Brake Piston Assembly From Transaxle Case**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

57. REMOVE REAR PLANETARY GEAR ASSEMBLY

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

**Fig. 312: Installing Snap Ring**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

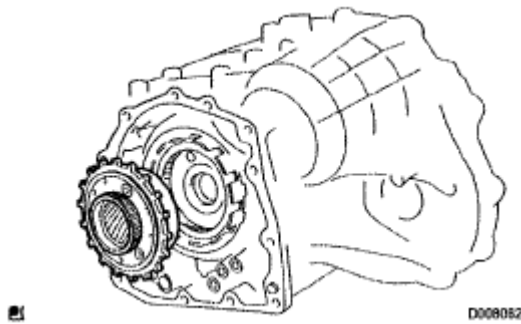


Fig. 313: Installing Rear Planetary Gear To Rear Planetary Ring Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the planetary carrier thrust washer No. 1 from the rear planetary gear.

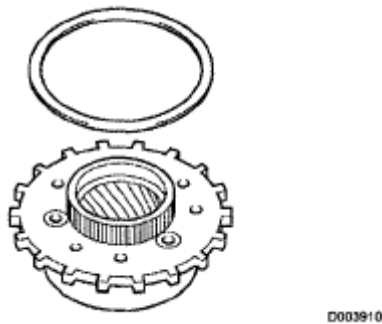


Fig. 314: Installing Thrust Washer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Remove the bearing race from the rear planetary gear.

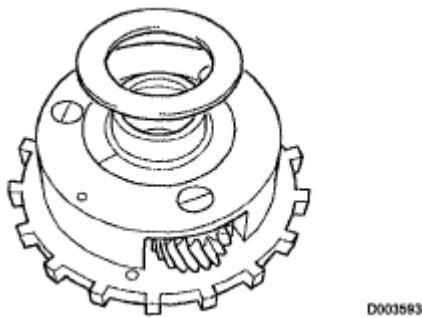


Fig. 315: Installing Bearing Race To Rear Planetary Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

58. REMOVE INPUT SUN GEAR

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

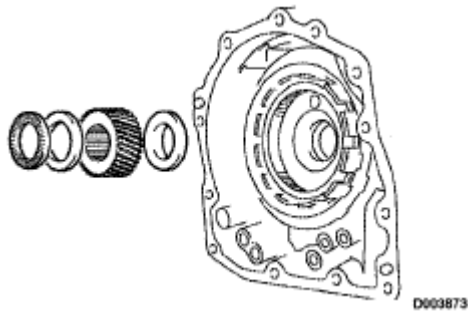


Fig. 316: Installing Input Sun Gear

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

59. REMOVE FRONT PLANETARY GEAR ASSEMBLY

- a. Using a chisel and a hammer, unstake the lock washer.

NOTE: Push down all claws of the washer. Otherwise SST can not be fully pressed against the nut and can not loosen the nut.

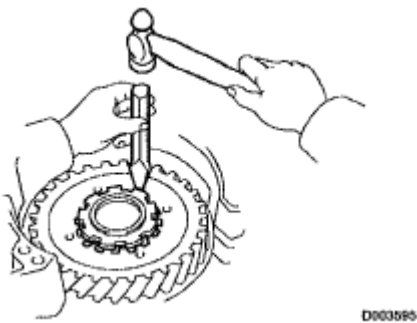


Fig. 317: Unstaking Lock Washer

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using SST, remove the nut.

SST 09387-00030,09387-00080

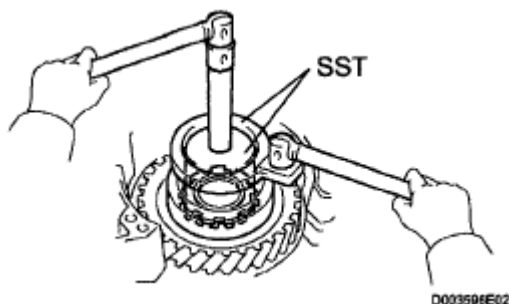


Fig. 318: Installing Nut

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using SST and a press, remove the front planetary gear assembly from the counter drive gear.

SST 09950-60010 (09951-00450)

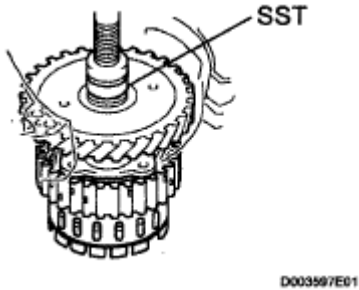


Fig. 319: Removing Front Planetary Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Remove front planetary gear assembly from the brake hub.

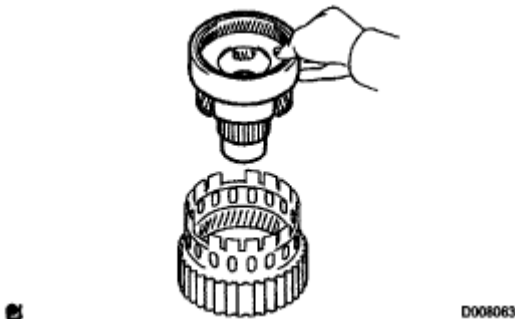


Fig. 320: Installing Front Planetary Gear Assembly To Brake Hub
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

60. REMOVE FRONT PLANETARY RING GEAR

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

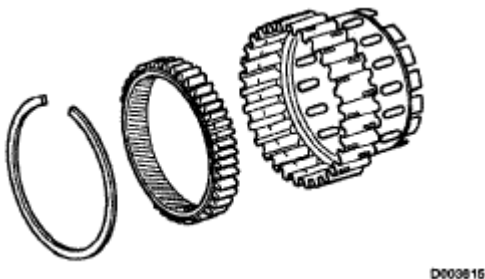


Fig. 321: Installing Front Planetary Ring Gear And Snap Ring To Brake Hub
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

61. REMOVE 1ST AND REVERSE BRAKE CLUTCH DISC

- a. Remove the flange, 5 discs and 5 plates from the transaxle case.

62. INSPECT 1ST AND REVERSE BRAKE CLUTCH DISC

HINT:

(See INSPECTION)

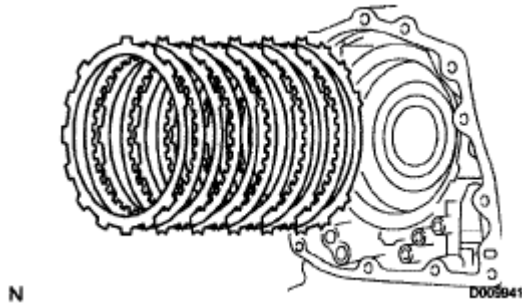


Fig. 322: Removing 1st And Reverse Brake Clutch Disc
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

- a. Using SST, a press and a snap ring expander, remove snap ring and the piston return spring.

SST 09387-00070

NOTE:

- Stop the press when the spring sheet is lowered 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove, preventing the spring sheet from deforming.
- Do not expand the snap ring excessively.

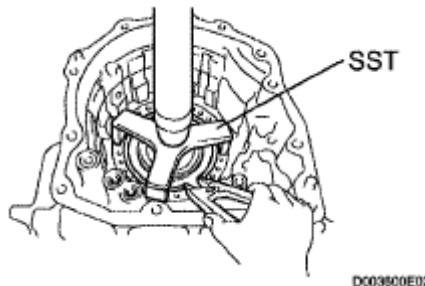


Fig. 323: Installing Piston Return Spring And Snap Ring To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

HINT:

(See **INSPECTION**)

65. REMOVE 1ST AND REVERSE BRAKE PISTON

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

NOTE:

- Blowing off the air may cause the piston jump-out. When removing the piston, hold it with your hand using a waste cloth.
- Take care not to splash ATF when air-blowing.

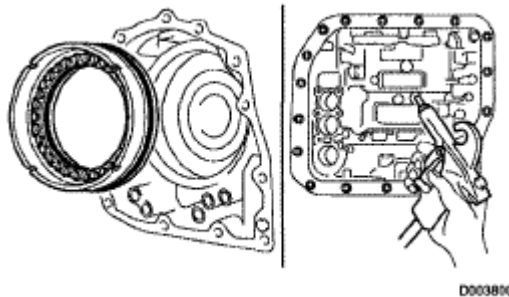


Fig. 324: Applying Compressed Air To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove 2 O-rings from the 1st & reverse brake piston.

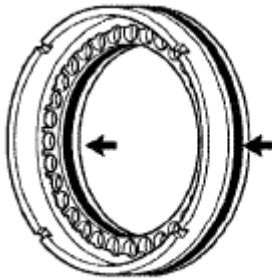
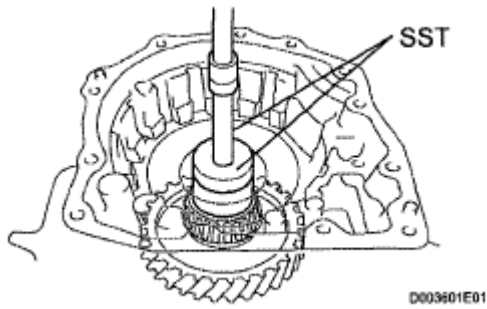


Fig. 325: Coating O-Rings With ATF
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

66. REMOVE COUNTER DRIVE GEAR

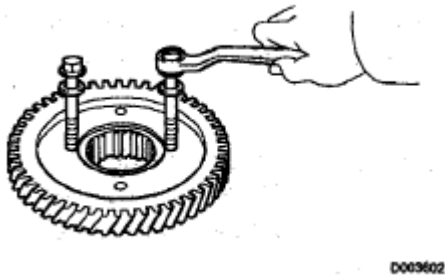
- a. Using SST and a press, remove the counter drive gear from the transaxle case.

SST 09950-60010 (09951-00580), 09950-70010 (09951-07100)

**Fig. 326: Pressing Out Counter Drive Gear**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

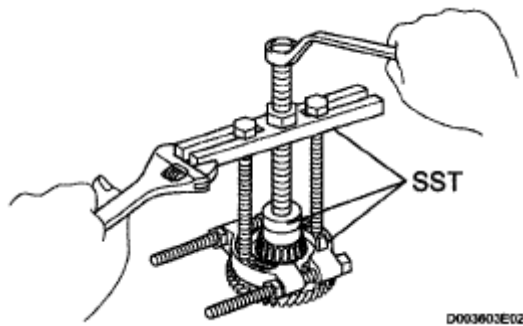
- b. As shown in the illustration, tighten 2 bolts evenly and make clearance of approx. 20.0 mm (0.797 in.) between the counter drive gear and the inner race.

**Fig. 327: Tightening Bolts**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

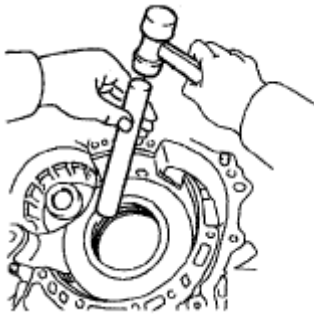
- c. Using SST, remove the tapered roller bearing.

SST 09950-60010 (09951-00580), 09950-00020, 09950-00030

**Fig. 328: Removing Tapered Roller Bearing**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Using a brass bar and a hammer, remove the 2 bearing outer races.



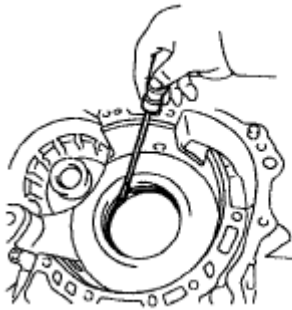
D003798

Fig. 329: Removing 2 Bearing Outer Races

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

67. REMOVE COUNTER DRIVE GEAR HOLE SNAP RING

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

68. REMOVE BREATHER PLUG NO. 2 (ATM)

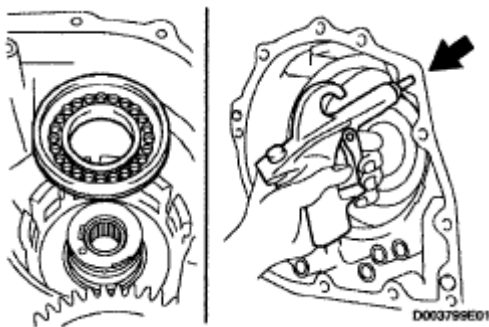
D003804

Fig. 330: Installing Snap Ring To Transaxle Case

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

69. REMOVE UNDERDRIVE BRAKE PISTON

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

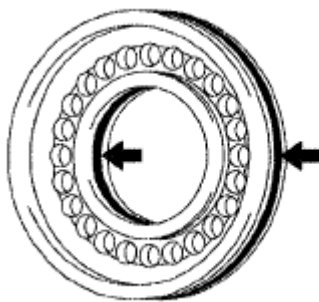


D003799E01

Fig. 331: Applying Compressed Air

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 2 O-rings from the U/D brake piston.

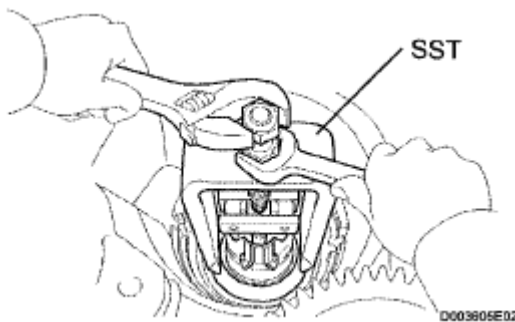


D003794

Fig. 332: Coating O-Rings With ATF
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using SST, remove the needle-roller bearing from the transaxle case.

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

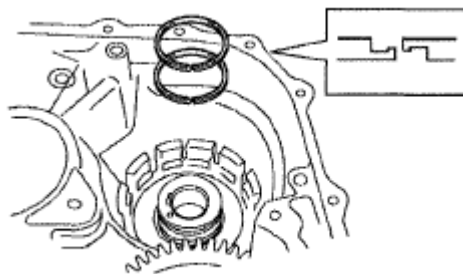


D003805E02

Fig. 333: Removing Needle-Roller Bearing
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

70. REMOVE UNDERDRIVE CLUTCH DRUM OIL SEAL RING

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



D003914

Fig. 334: Installing Oil Seal Rings To Transaxle Case
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

71. REMOVE UNDERDRIVE CYLINDRICAL ROLLER BEARING

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

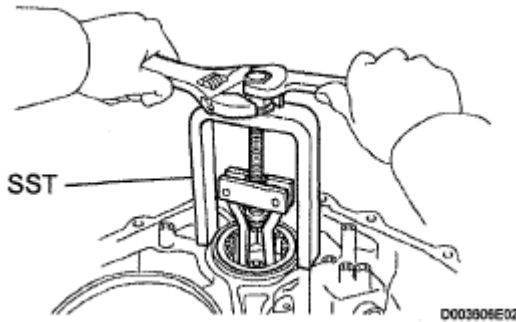
SST 09514-35011

Fig. 335: Removing Cylindrical Roller Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

72. REMOVE UNDERDRIVE OUTPUT SHAFT OIL SEAL RING

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

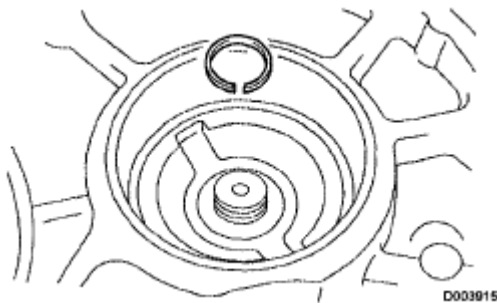


Fig. 336: Installing Oil Seal Ring To Transaxle Housing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

73. REMOVE DIFFERENTIAL GEAR LUBE APPLY TUBE

- a. Remove the bolt, the clamp and the apply tube from the transaxle case.



Fig. 337: Installing Differential Gear Lube Apply Tube

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. INSPECT INPUT SHAFT END PLAY

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

End play::

0.262 to 1.249 mm (0.0103 to 0.0492 in.)

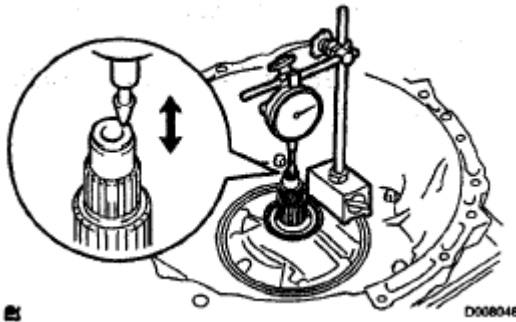


Fig. 338: Pushing Parking Lock Pawn

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSPECT MULTIPLE DISC CLUTCH HUB

- a. Using a dial indicator, measure the inside diameter of the forward clutch hub bushing

Standard inside diameter:

23.025 to 23.045 mm (0.9065 to 0.9073 in.)

Maximum inside diameter:

23.09 mm (0.9091 in.)

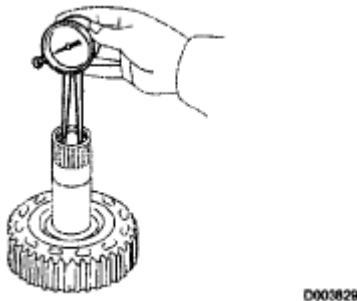


Fig. 339: Measuring Inside Diameter Of Forward Clutch Hub Bushing

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

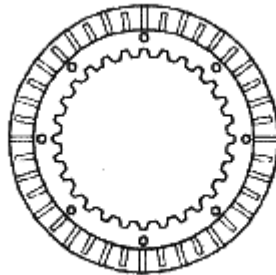
- When the diameter is over the maximum, replace the multiple disc clutch hub with new one.
- Check the contact surface of the bush in the direct clutch shaft. If any scratch or discolor is identified, replace the direct clutch sub-assembly with a new one.

If the inside diameter is greater than the maximum, replace the forward clutch hub.

3. INSPECT UNDERDRIVE CLUTCH DISC NO. 2

- Check to see if the sliding surface of the disc, plate and flange are worn or burnt.

If necessary, replace them.



N

0009196

Fig. 340: Identifying Sliding Surface Of Disc

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- If the lining of the disc is peeling off or discolored, or even if a part of the groove is defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least 15 minutes.

4. INSPECT UNDERDRIVE BRAKE RETURN SPRING SUB-ASSEMBLY

- Using vernier calipers, measure the free length of the spring together with the spring seat.

Standard free length:

14.04 mm (0.5528 in.)

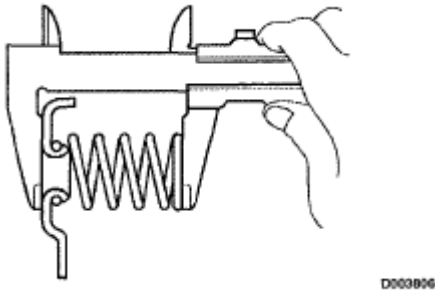


Fig. 341: Measuring Free Length Of Spring Together With Spring Seat Using Vernier Calipers

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. INSPECT 2ND BRAKE CLUTCH DISC

- a. Check to see if the sliding surface of the disc, plate and flange are worn or burnt.

If necessary, replace them.

NOTE:

- If the lining of the disc is peeling off or discolored, or even if a part of the printed number is defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least 15 minutes.

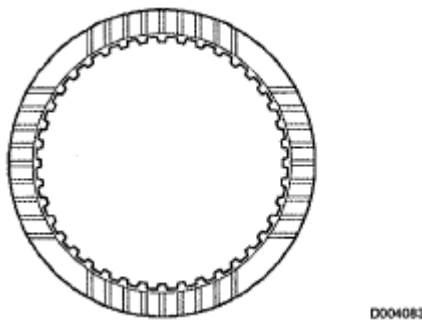


Fig. 342: Checking Sliding Surface Of Disc, Plate And Flange

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

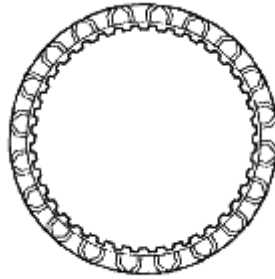
6. INSPECT 1ST AND REVERSE BRAKE CLUTCH DISC

- a. Check to see if the sliding surface of the disc, plate and flange are worn or burnt.

If necessary, replace them.

NOTE:

- If the lining of the disc is peeling off or discolored, or even if a part of the groove is defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least 15 minutes.



N

D009188

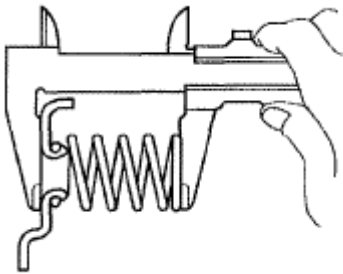
Fig. 343: Identifying Reverse Brake Clutch Disc
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

- a. Using vernier calipers, measure the free length of the spring together with the spring seat.

Standard free length:

15.51 mm (0.6106 in.)

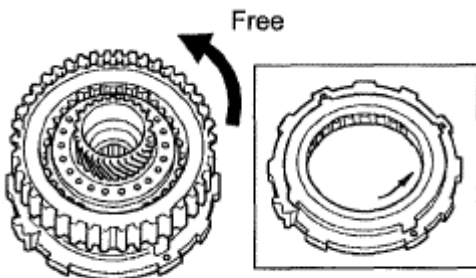


D003811

Fig. 344: Measuring Free Length Of Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. INSPECT UNDERDRIVE 1-WAY CLUTCH ASSEMBLY

- a. Install the U/D clutch assembly to the 1-way clutch. Rotate the U/D clutch assembly to check the rotating direction for the lock or free operation.



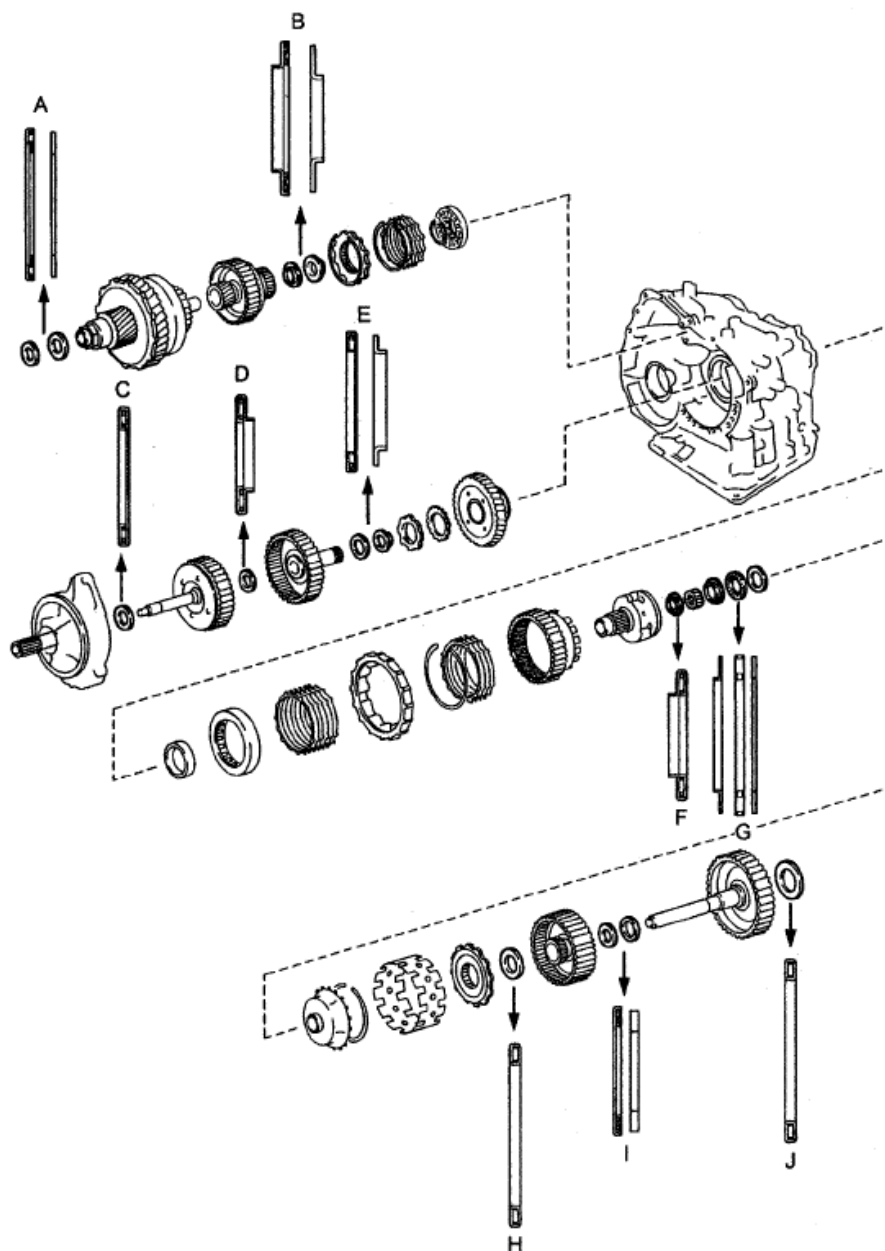
D003925E02

Fig. 345: Inspecting Underdrive 1-Way Clutch Assembly

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REASSEMBLY

1. BEARING POSITION



N

D009942ED1

Fig. 346: Assembling Bearing Position
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DIAGNOSTIC PROCEDURE

2007 Toyota Highlander Sport

2007 TRANSMISSION U241E Automatic Transaxle - Highlander

Mark	Front Race Diameter Inside / Outside mm (in.)	Thrust Bearing Diameter Inside / Outside mm (in.)	Rear Race Diameter Inside / Outside mm (in.)
A	-	53.0 (2.087) / 78.2 (3.079)	52.1 (2.051) / 75.5 (2.972)
B	-	37.73 (1.4854) / 58.0 (2.283)	29.9 (1.177) / 55.5 (2.185)
C	-	33.85 (1.3327) / 52.2 (2.055)	-
D	-	23.5 (0.925) / 44.0 (1.732)	-
E	-	36.3 (1.429) / 52.2 (2.055)	34.5 (1.358) / 48.5 (1.909)
F	-	34.6 (1.362) / 52.2 (2.055)	-
G	40.3 (1.587) / 58.0 (2.283)	38.6 (1.520) / 60.0 (2.362)	38.6 (1.520) / 58.0 (2.283)
H	-	53.6 (2.110) / 69.6 (2.740)	-
I	-	33.7 (1.327) / 48.2 (1.898)	30.3 (1.193) / 46.0 (1.811)
J	-	53.6 (2.110) / 70.18 (2.763) or 69.6 (2.740)	-

2. INSTALL DIFFERENTIAL GEAR LUBE APPLY TUBE

- Install the apply tube, and clamp with the bolt to the transaxle housing.

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

NOTE: Make sure to insert the pipe to the stopper.



Fig. 347: Installing Differential Gear Lube Apply Tube
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL UNDERDRIVE OUTPUT SHAFT OIL SEAL RING

- Install a new oil seal ring to the transaxle housing.

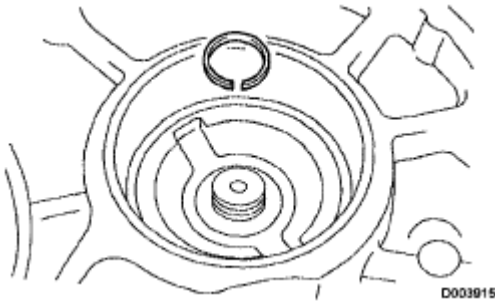


Fig. 348: Installing Oil Seal Ring To Transaxle Housing

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSTALL UNDERDRIVE CYLINDRICAL ROLLER BEARING

- a. Using SST and a press, install the U/D cylindrical roller bearing.

SST 09950-60020 (09951-00810), 09950-70010 (09951-07100)

NOTE: Do not apply excessive pressure to it.

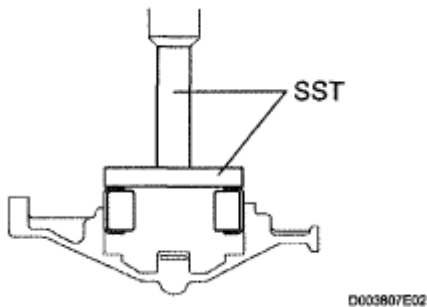


Fig. 349: Installing U/D Cylindrical Roller Bearing

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. INSTALL UNDERDRIVE CLUTCH DRUM OIL SEAL RING

- a. Install 2 new oil seal rings to the transaxle case.

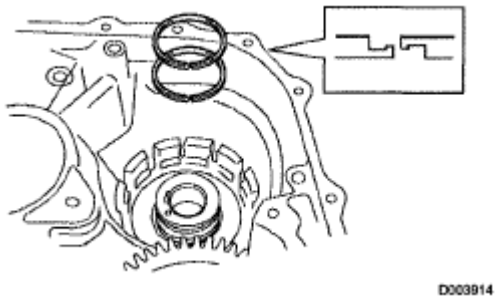


Fig. 350: Installing Oil Seal Rings To Transaxle Case

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSTALL UNDERDRIVE BRAKE PISTON

- a. Wind vinyl tape around SST at the place 4.0 mm (0.157 in.) above from the bottom end until the thickness of the wound tape is about 5.0 mm (0.197 in.).

SST 09950-60010 (09951-00320)

NOTE: **Clean SST to remove deposited oil, before winding vinyl tape.**

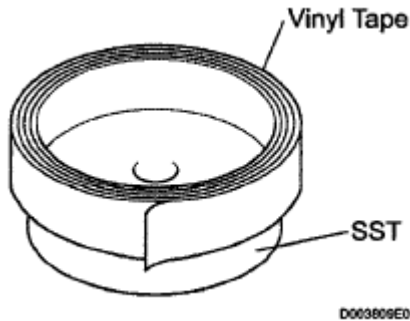


Fig. 351: Installing Underdrive Brake Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using SST and a press, install the needle-roller bearing to the transaxle case.

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

NOTE: **When the wound vinyl tape contacts the transaxle case, stop press-fitting.**

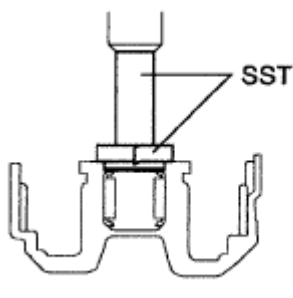
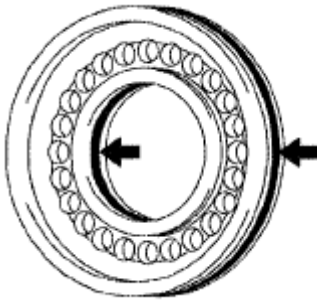


Fig. 352: Installing Needle-Roller Bearing To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

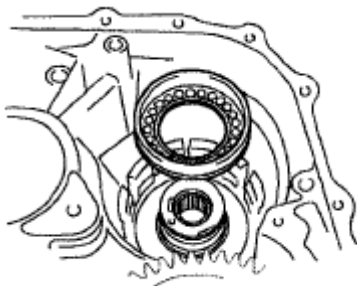
- c. Coat 2 new O-rings with ATF, and install them to the U/D brake piston.



D003794

Fig. 353: Coating O-Rings With ATF
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the U/D brake piston to the transaxle case.



D003609

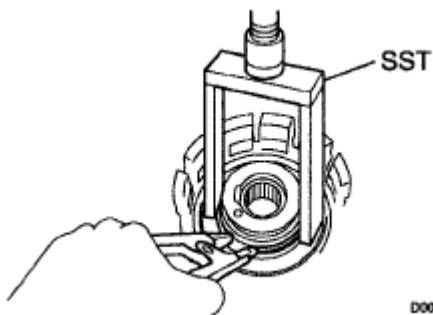
Fig. 354: Installing U/D Brake Piston To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Using SST, a snap ring expander and a press, install the piston return spring and snap ring to the transaxle case.

SST 09387-00020

NOTE: Do not apply excessive pressure to it.

7. INSTALL BREATHER PLUG NO. 2 (ATM)



D003610E01

Fig. 355: Installing Piston Return Spring And Snap Ring To Transaxle Case

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. INSTALL COUNTER DRIVE GEAR HOLE SNAP RING

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

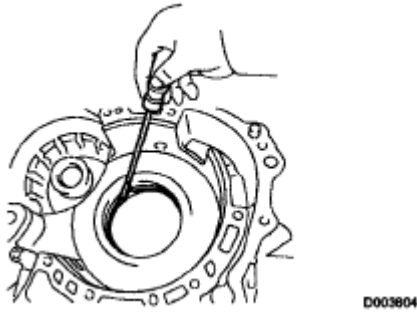


Fig. 356: Installing Snap Ring To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. INSTALL COUNTER DRIVE GEAR

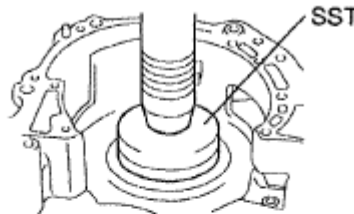
- a. Using SST and a press, instal the 2 bearings outer races to the transaxle case.

SST 09950-60020 (09951-00890), 09950-70010 (09951-07150)

NOTE:

- Press-fit the bearing race until it contacts the snap ring.
- Do not apply excessive pressure to it.

Counter Drive Gear Side:



Front Planetary Gear Side:

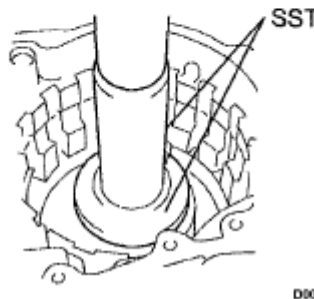


Fig. 357: Installing Bearings Outer Races To Transaxle Case

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using SST and a press, install the tapered roller bearing to the counter drive gear.

SST 09649-17010

NOTE:

- Press-fit the bearing inner race until it contacts the counter drive gear.
- Do not apply excessive pressure to it.

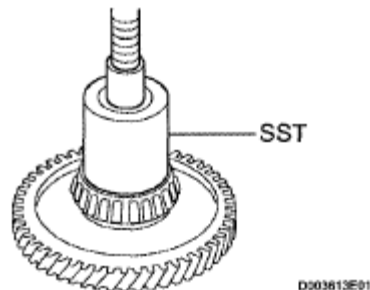


Fig. 358: Installing Tapered Roller Bearing To Counter Drive Gear

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using SST and a press, install the counter drive gear and bearing to the transaxle case.

SST 09950-70010 (09951-07150), 09950-60020 (09951-00750)

NOTE:

Do not apply excessive pressure to it.

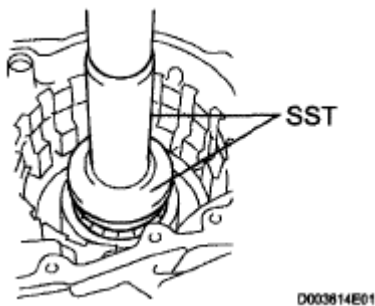
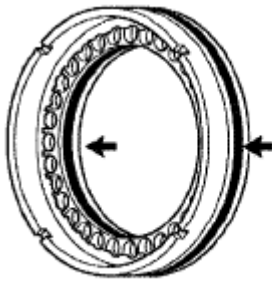


Fig. 359: Installing Counter Drive Gear And Bearing To Transaxle
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. INSTALL 1ST AND REVERSE BRAKE PISTON

- Coat 2 new O-rings with ATF.
- Install the 2 O-rings to the 1st & reverse brake piston.

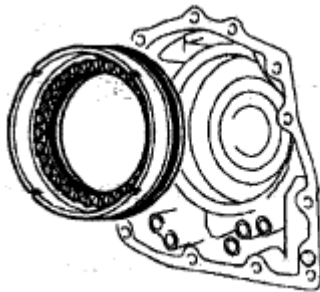


D003913

Fig. 360: Coating O-Rings With ATF

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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



D003813

Fig. 361: Coating 1st And Reverse Brake Piston With ATF

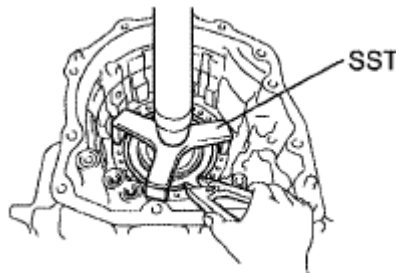
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

- a. Using SST, a press and snap ring expander, install the piston return spring and snap ring to the transaxle case.

SST 09387-00070**NOTE:**

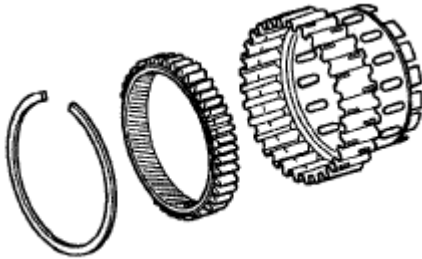
- Stop the press when the spring seat is lowered to the place 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove, preventing the spring seat from being deformed.
- Do not expand the snap ring excessively.



D003900E02

Fig. 362: Installing Piston Return Spring And Snap Ring To Transaxle Case**Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.****12. INSTALL FRONT PLANETARY RING GEAR**

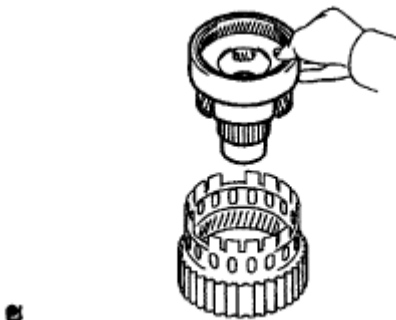
- a. Using a screwdriver, install the front planetary ring gear and snap ring to the brake hub.



D003815

Fig. 363: Installing Front Planetary Ring Gear And Snap Ring To Brake Hub**Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.****13. INSTALL FRONT PLANETARY GEAR ASSEMBLY**

- a. Install the front planetary gear assembly to the brake hub.



D008063

Fig. 364: Installing Front Planetary Gear Assembly To Brake Hub**Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

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

SST 09950-60010 (09951-00500), 09950-70010 (09951-07100)**NOTE: Do not apply excessive pressure to it.**

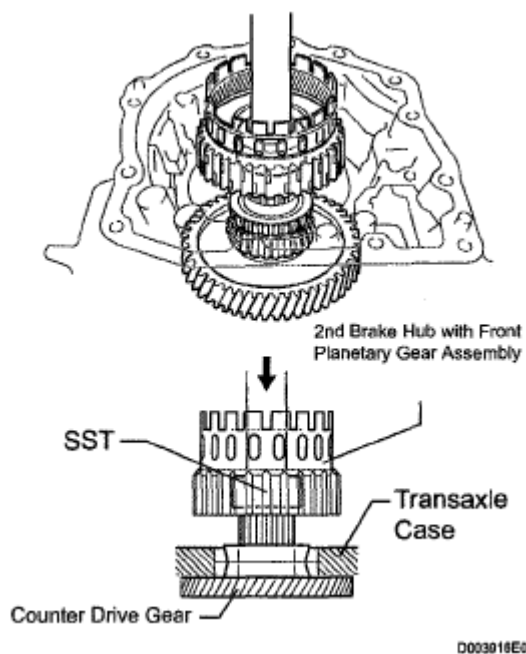


Fig. 365: Fitting Front Planetary Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the washer, as shown in the illustration.

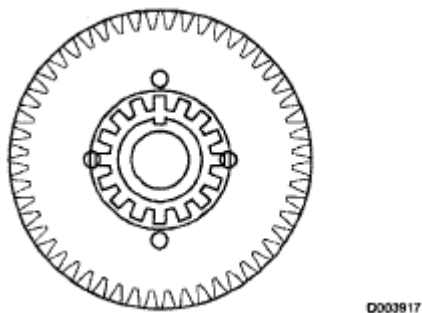


Fig. 366: Identifying Washer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Using SST, install the nut.

SST 09387-00030, 09387-00080

Torque: 268 N*m (2,732 kgf*cm, 198 ft.*lbf)

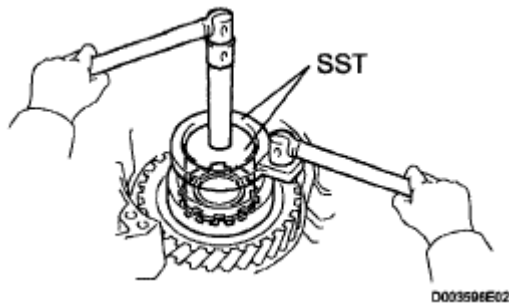


Fig. 367: Installing Nut

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

SST 09387-00080

Torque: New Bearing

0.51 to 1.02 N*m (5.1 to 10.0 kgf*cm, 4.4 to 9.0 in.*lbf)

Used Bearing (*)

0.3 to 0.5 N*m (3.1 to 5.1 kgf*cm, 2.7 to 4.4 in.*lbf)

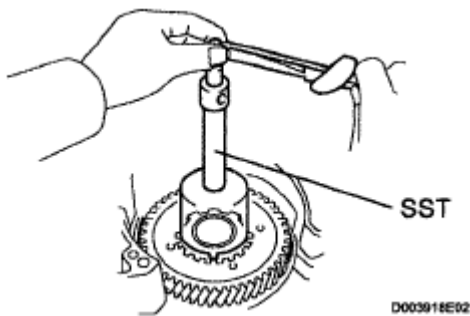


Fig. 368: Measuring Turning Torque Of Bearing

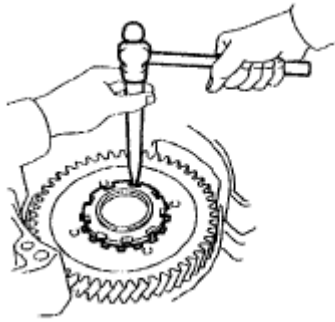
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

- *: Turning torque at 60 rpm:

Use a torque wrench with a fulcrum length of 160 mm (6.3 in.).

- f. Using a chisel and hammer, stake the front planetary gear washer.



D008074

Fig. 369: Staking Front Planetary Gear Washer
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

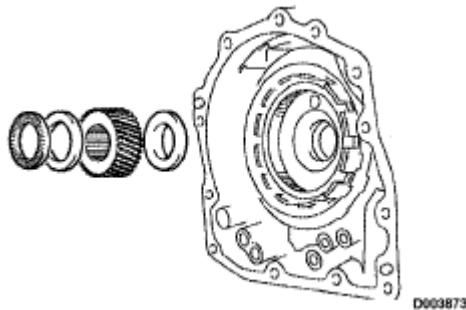
14. INSTALL INPUT SUN GEAR

- a. Install the 2 thrust bearings, the bearing race and the front planetary sun gear to the front planetary gear assembly.

Bearing and race diameter: mm (in.)

BEARING AND RACE DIAMETER

	Inside	Outside
Bearing	34.6 (1.362)	52.2 (2.055)
Race	40.3 (1.587)	58.0 (2.283)
Bearing	38.6 (1.520)	60.0 (2.362)



D003873

Fig. 370: Installing Input Sun Gear
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

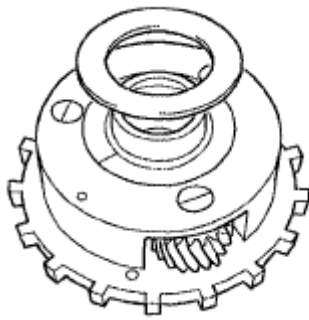
15. INSTALL REAR PLANETARY GEAR ASSEMBLY

- a. Coat the bearing race with ATF, and install it to the rear planetary gear assembly.

Bearing race diameter: mm (in.)

BEARING RACE DIAMETER

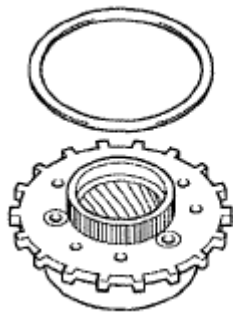
	Inside	Outside
Race	38.6 (1.520)	58.0 (2.283)



D003563

Fig. 371: Installing Bearing Race To Rear Planetary Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

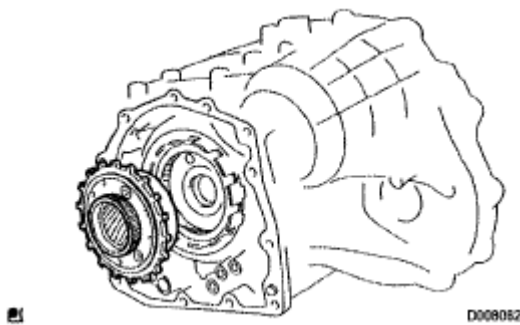
- b. Install the thrust washer No. 2.



D003910

Fig. 372: Installing Thrust Washer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the rear planetary gear to the rear planetary ring gear.



D008082

Fig. 373: Installing Rear Planetary Gear To Rear Planetary Ring Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Using a screwdriver, install the snap ring.

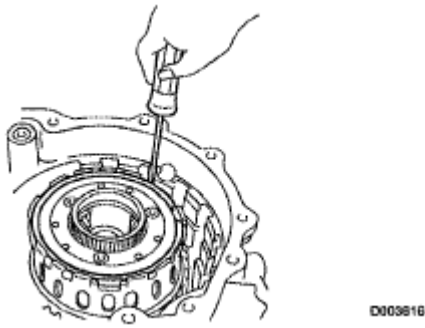


Fig. 374: Installing Snap Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

16. INSTALL 1ST AND REVERSE BRAKE CLUTCH DISC

- a. Install the 5 plates and 5 discs.

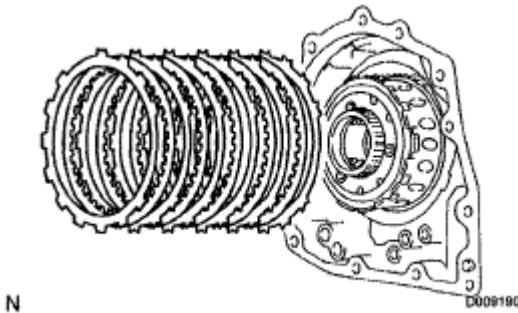


Fig. 375: Installing 1st And Reverse Brake Clutch Disc
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

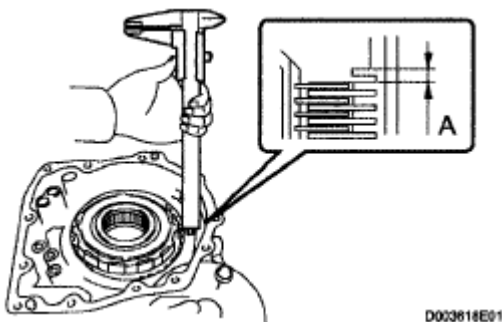


Fig. 376: Measuring Distance Between Disc Surface And Contact Surface Of 2Nd Brake Cylinder And Transaxle
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Pack clearance:

1.02 to 1.21 mm (0.0402 to 0.0476 in.)

HINT:

Piston stroke = Dimension A - Flange thickness

Flange thickness: mm (in.)

FLANGE THICKNESS

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

- d. Install the flange.

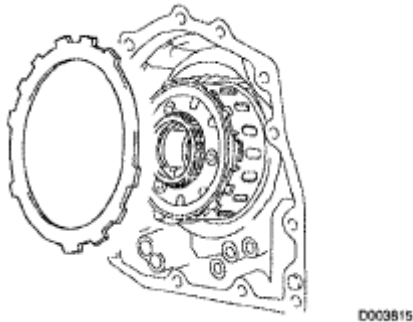


Fig. 377: Identifying Flange

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

17. INSTALL 2ND BRAKE PISTON ASSEMBLY

- Install the 2nd brake piston assembly to the transaxle case.
- Install the snap ring and measure the inside diameter.

NOTE:

- Because the taper snap ring has the positioning direction, check it when installing.
- When the diameter does not satisfy the specified value, replace the snap ring with a new one.

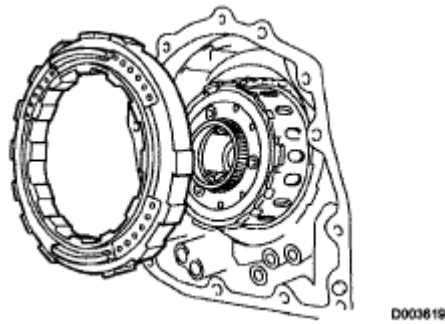


Fig. 378: Installing Brake Piston Assembly To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

18. INSTALL 1-WAY CLUTCH SLEEVE OUTER

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

NOTE: Check the positioning direction of the outer sleeve.

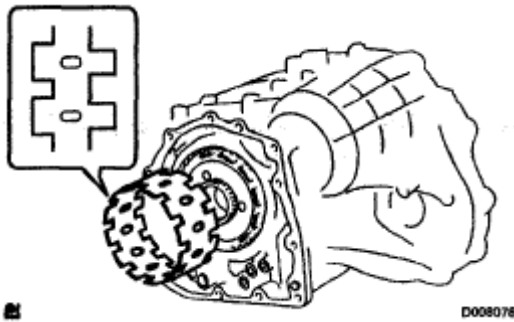


Fig. 379: Installing 1-Way Clutch Outer Sleeve To 2nd Brake Cylinder Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

19. INSTALL 1-WAY CLUTCH ASSEMBLY

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

NOTE: Check the direction of the inner race.

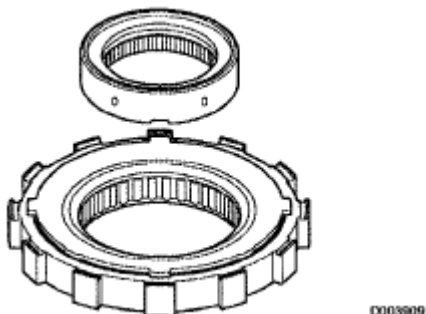
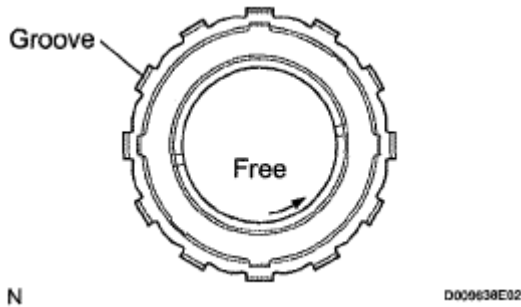


Fig. 380: Installing Inner Race To 1-Way Clutch

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Check the rotating direction of the 1-way clutch for the lock or free operation, as shown in the illustration.

**Fig. 381: Checking Rotating Direction Of 1-Way Clutch**

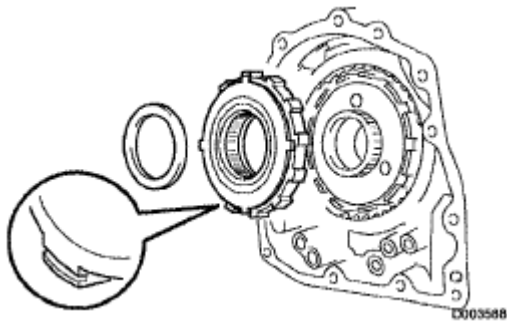
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the 1-way clutch and bearing to the 1-way clutch sleeve outer.

Bearing diameter: mm (in.)**BEARING DIAMETER**

	Inside	Outside
Bearing	53.6 (2.110)	69.6 (2.740)

NOTE: Install the thrust bearing properly so that no-colored race will be visible.

**Fig. 382: Installing 1-Way Clutch And Bearing To 1-Way Clutch Sleeve Outer**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

20. INSTALL REAR PLANETARY SUN GEAR ASSEMBLY

- a. Coat the thrust washer No. 1 with petroleum jelly, and install it onto the rear planetary sun gear.

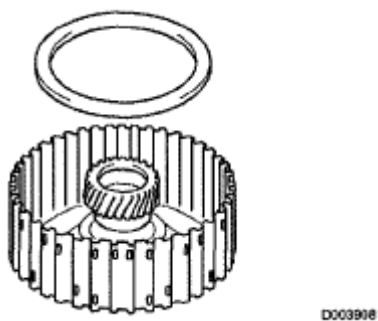


Fig. 383: Coating Thrust Washer

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Coat the bearing with petroleum jelly, and install it onto the rear planetary sun gear.

Bearing diameter: mm (in.)

BEARING DIAMETER

	Inside	Outside
Bearing	33.8 (1.331)	48.2 (1.898)

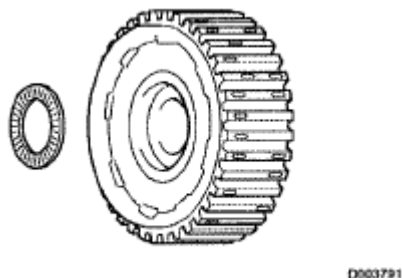


Fig. 384: Coating Bearing With Petroleum Jelly

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the rear planetary sun gear assembly to the rear planetary gear.

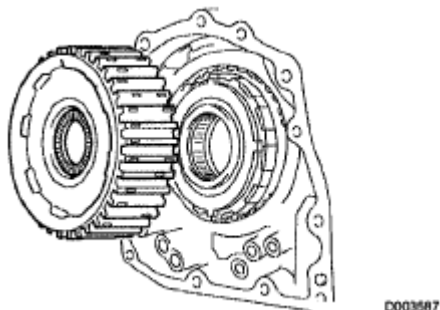


Fig. 385: Installing Rear Planetary Sun Gear Assembly To Rear Planetary Gear

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

21. INSTALL 2ND BRAKE CLUTCH DISC

- a. Install the 3 discs and 3 plates to the transaxle case.
- b. Temporarily install the snap ring.

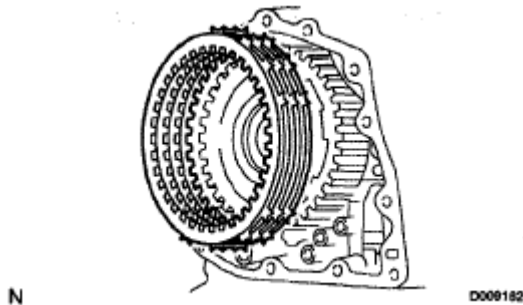


Fig. 386: Installing 2nd Brake Clutch Disc
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using vernier calipers, measure the distance between the disc surface and snap ring surface.
- d. Select an appropriate flange so that the pack clearance will meet the specified value.

Pack clearance:

0.62 to 0.91 mm (0.0244 to 0.0358 in.)

HINT:

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

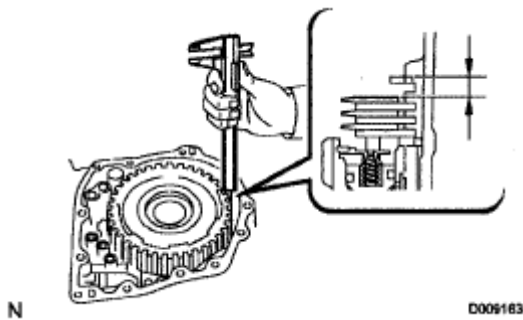


Fig. 387: Measuring Distance Between Disc Surface And Snap Ring Surface
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Flange thickness: mm (in.)

FLANGE THICKNESS

Mark	Thickness	Mark	Thickness
1	3.0 (0.118)	5	3.4 (0.134)

2	3.1 (0.122)	6	3.5 (0.138)
3	3.2 (0.126)	7	3.6 (0.142)
4	3.3 (0.130)	8	-

- e. Temporarily remove the snap ring, attach the selected flange and restore the snap ring.

NOTE: Secure the snap ring so that its gap is visible through the groove of the transaxle case.

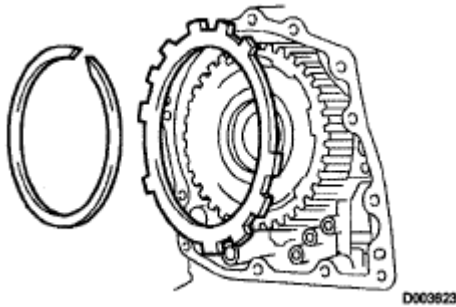


Fig. 388: Removing Snap Ring

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

22. INSTALL DIRECT CLUTCH ASSEMBLY

- a. Install the bearing race to the direct clutch.

Bearing race diameter : mm (in.)

BEARING RACE DIAMETER

	Inside	Outside
Bearing race	30.3 (1.193)	46.0 (1.811)

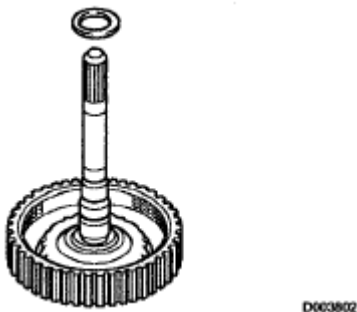


Fig. 389: Installing Bearing Race To Direct Clutch

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the direct clutch assembly and thrust bearing to the rear planetary sun gear assembly.

NOTE: The disc in the direct clutch should completely mate with the hub attached outside the rear planetary sun gear. Otherwise, the rear cover can not be installed.

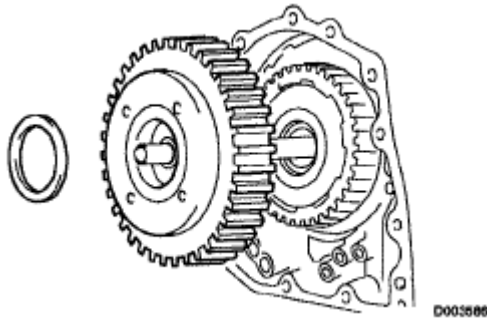


Fig. 390: Installing Direct Clutch Assembly And Thrust Bearing To Rear Planetary Sun Gear Assembly

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Clean the connector part of the transaxle case and rear cover.
- d. As shown in the illustration, place a straight edge on the direct clutch drum and measure the distance between the transaxle case and the straight edge using vernier calipers. (Dimension B)

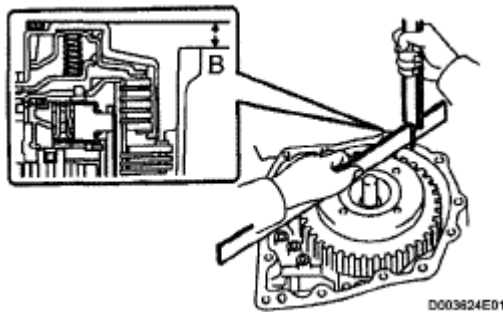


Fig. 391: Measuring Distance Between Transaxle Case And Straight Edge Using Vernier Calipers

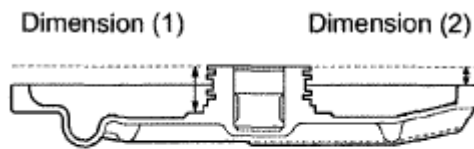
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Measure the 2 places of the rear cover as shown in the illustration and calculate a dimension C using the following formula.

HINT:

Dimension C = Dimension (1) - Dimension (2)

- f. Calculate the end play value using the following formula. Select a thrust bearing which satisfies the end play value and install it.



D003822E01

Fig. 392: Identifying Dimension (1) And Dimension (2)
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

End play:

0.198 to 0.936 mm (0.00780 to 0.03685 in.)

NOTE: Make sure that the colored race side is facing the direct clutch assembly.

HINT:

End play = Dimension C - Dimension B

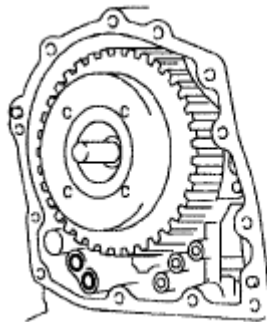
Bearing thickness and diameter : mm (in.)

BEARING THICKNESS AND DIAMETER

Thickness	Inside	Outside
3.55 (0.1397)	53.6 (2.110)	69.6 (2.740)
3.85 (0.1515)	53.6 (2.110)	70.18 (2.763)

23. INSTALL GOVERNOR APPLY GASKET NO. 1

- a. Install 2 new governor apply gaskets No. 1.



D003581

Fig. 393: Identifying Governor
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

24. INSTALL FRONT CLUTCH APPLY TUBE

- a. Install the clamp to the front clutch apply tube.

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

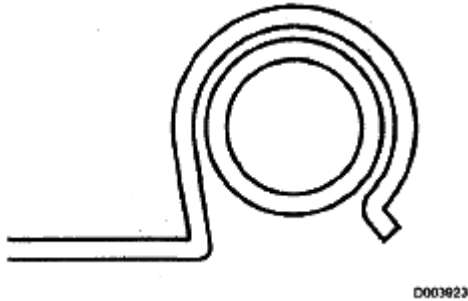


Fig. 394: Identifying Front Clutch Apply Tube
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

25. INSTALL BRAKE APPLY TUBE

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

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

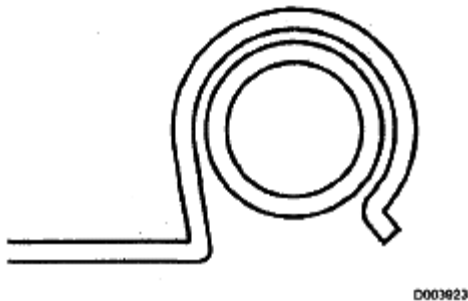


Fig. 395: Identifying Brake Apply Tube
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the 2 apply tubes and a bolt to the transaxle case.

NOTE: Each pipe should be securely inserted until it reaches the stopper.

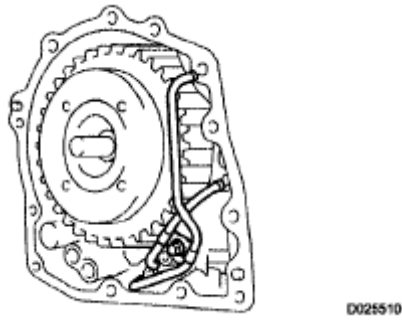


Fig. 396: Installing Apply Tubes And Bolt To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

26. INSTALL TRANSAXLE CASE NO. 1 PLUG

- a. Install 2 new O-rings to the 2 transaxle case No. 1 plugs.
- b. Install 2 transaxle case No. 1 plugs to the transaxle rear cover.

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

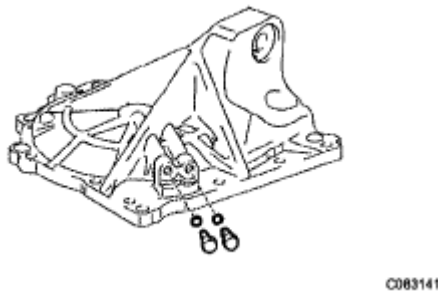


Fig. 397: Installing O-Rings To Transaxle Case Plugs
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

27. INSTALL TRANSAXLE REAR COVER SUB-ASSEMBLY

- a. Using SST and a press, install the bearing.

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

Press fit depth:

12.05 to 12.75 mm (0.4744 to 0.5020 in.)

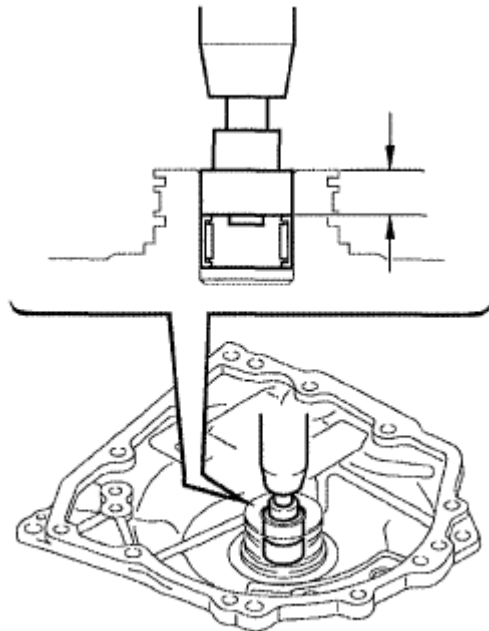
NOTE:

- Face the inscribed mark side of the bearing race up.
- Repeat the press fit until the specified value is obtained.

- b. Apply adhesive to the 2 screws.

Adhesive:

Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent.



N

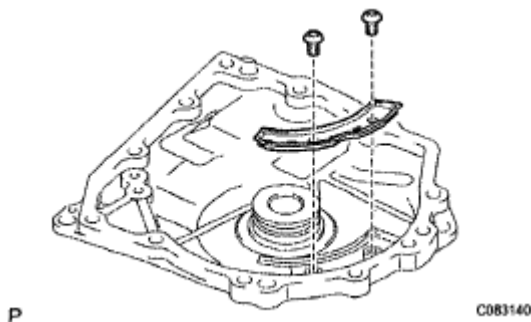
7D06193

Fig. 398: Installing Bearing

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using a "TORX" socket wrench (T30), install the transaxle rear cover plate with the 2 screws.

Torque: 7.5 N*m (76 kgf*cm, 66 in.*lbf)



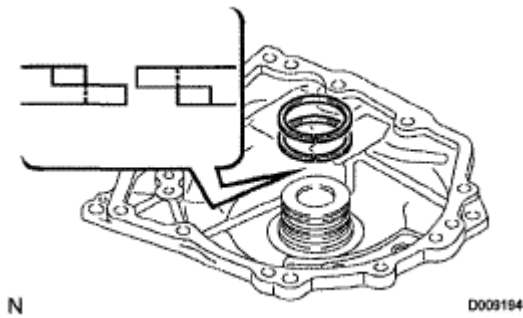
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Fig. 399: Installing Transaxle Rear Cover Plate With Screws

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

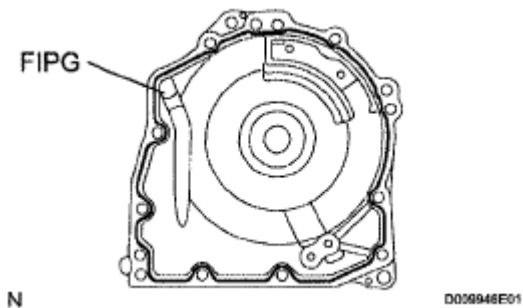
- d. Coat 2 new oil seal rings with ATF, and install them to the transaxle rear cover.

**Fig. 400: Coating Oil Seal Rings With ATF****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- e. Remove any packing material and be careful not to get oil on the contacting surfaces of the transaxle rear cover or the transaxle case.
- f. Apply FIPG to the cover.

Seal Packing:**Toyota Genuine Seal Packing 1281, Three Bond 1281 or equivalent.**

- g. Coat a needle roller bearing with ATF.

**Fig. 401: Applying FIPG To Cover****Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.**

- h. Apply liquid sealer to the "A" bolt threads.

Adhesive:**Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent.**

- i. Install the 11 bolts.

Torque: Bolt A**18.6 N*m (190 kgf*cm, 14 ft.*lbf)**

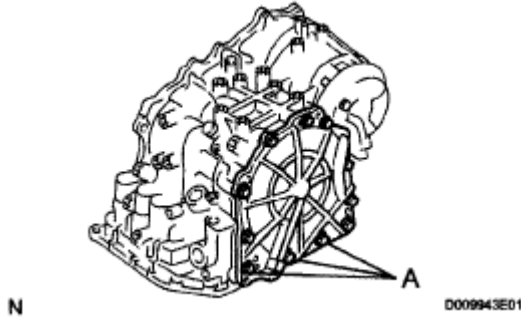
Other bolt**24.5 N*m (250 kgf*cm, 18 ft.*lbf)**

Fig. 402: Applying Adhesive To Threads Of Bolts Labeled A
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

28. INSTALL UNDERDRIVE CLUTCH DISC NO. 2

- a. Install the 3 discs and 3 plates to the transaxle case. Using a screwdriver, install the snap ring.
- b. Using a screwdriver, install the snap ring.

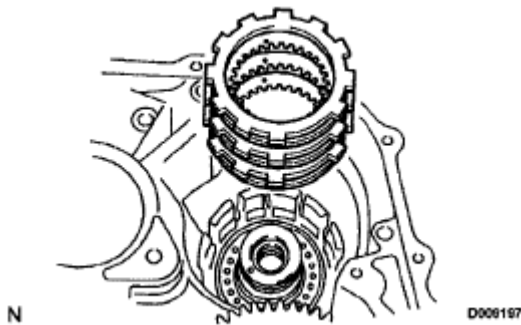
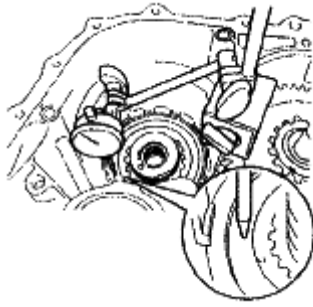


Fig. 403: Installing Discs And Plates To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Pack clearance:**1.81 to 2.20 mm (0.0713 to 0.0866 in.)****HINT:**

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



D008082

Fig. 404: Measuring Underdrive Brake Pack Clearance
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Flange thickness: mm (in.)

FLANGE THICKNESS

Mark	Thickness	Mark	Thickness
1	3.0 (0.118)	3	3.4 (0.134)
2	3.2 (0.126)	-	-

- d. Temporarily remove the snap ring and attach the flange. Restore the snap ring.

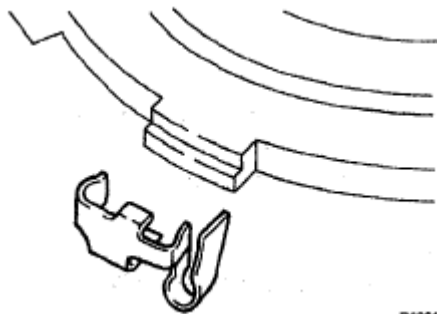
29. INSPECT UNDERDRIVE 1-WAY CLUTCH ASSEMBLY

HINT:

(See **INSPECTION**)

30. INSTALL UNDERDRIVE 1 -WAY CLUTCH ASSEMBLY

- a. Install the outer race retainer to the 1-way clutch.



N

D009198

Fig. 405: Identifying Sliding Surface Of Disc
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the underdrive clutch assembly to the 1-way clutch. Rotate the underdrive clutch assembly to check the rotating direction for the lock or free operation.

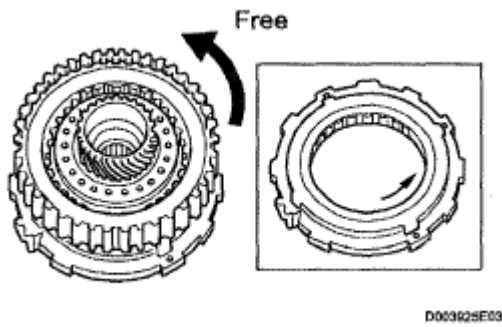


Fig. 406: Installing Underdrive Clutch Assembly To 1-Way Clutch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the 1-way clutch to the transaxle case.

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

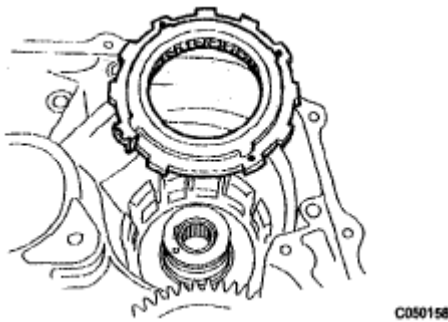


Fig. 407: Installing 1-Way Clutch To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Using a screwdriver, install the snap ring to the transaxle case.

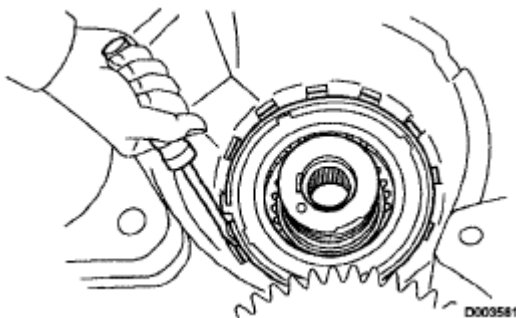


Fig. 408: Installing Snap Ring To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

31. INSTALL UNDERDRIVE CLUTCH ASSEMBLY

- a. Coat the bearing and bearing race with petroleum jelly, and install them onto the U/D clutch.

Race diameter: mm (in.)

RACE DIAMETER

	Inside	Outside
Bearing	37.73 (1.4854)	58.0 (2.283)
Race	29.9 (1.177)	55.5 (2.185)

- b. Install the U/D clutch assembly to the transaxle case.

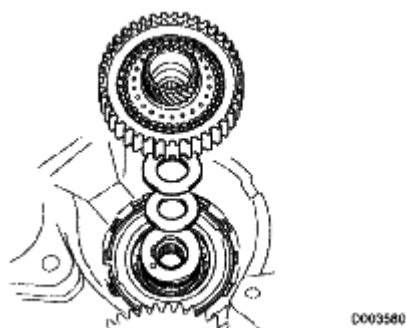


Fig. 409: Identifying Bearing And Bearing Race
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

32. INSTALL UNDERDRIVE PLANETARY GEAR ASSEMBLY

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

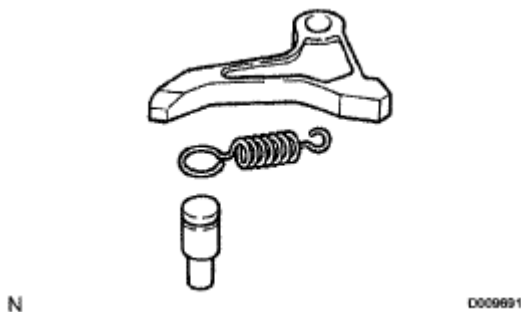


Fig. 410: Installing Pawl Pin And Spring To Parking Lock Pawl
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

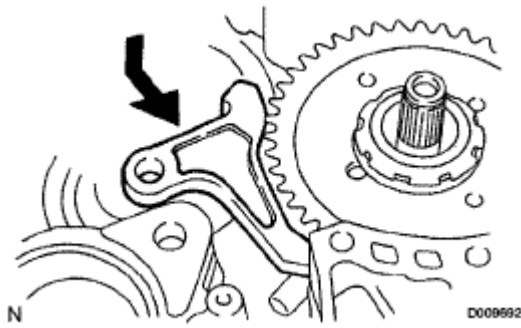


Fig. 411: Installing Parking Lock Pawl, Shaft And Spring To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the U/D planetary gear assembly to the transaxle case.

NOTE: Engage all the discs of the U/D clutch and hub splines of the U/D planetary gear assembly firmly and assemble them securely.

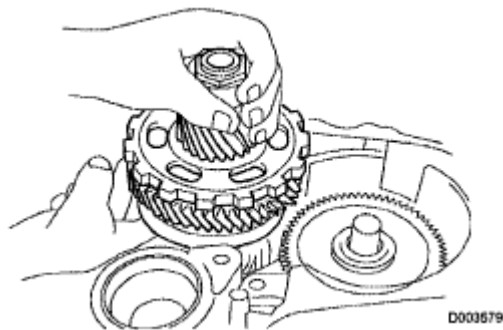


Fig. 412: Installing U/D Planetary Gear Assembly To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the parking lock pawl shaft.

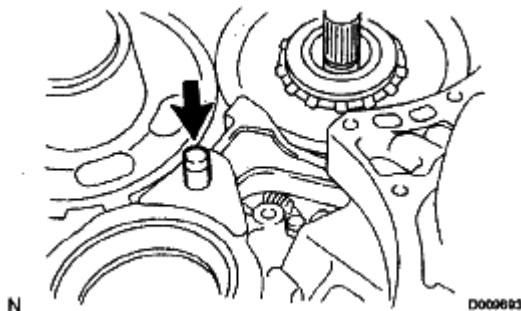


Fig. 413: Installing Parking Lock Pawl Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Install the pawl shaft clamp with the bolt.

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

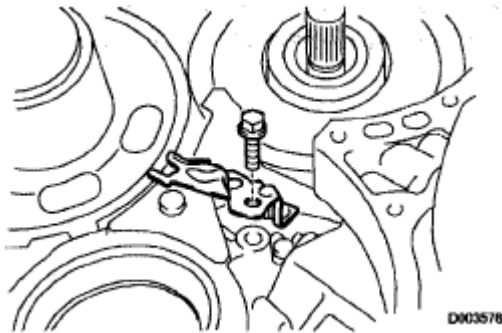


Fig. 414: Installing Pawl Shaft Clamp With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Using a straight edge and vernier calipers as shown in the illustration, measure the gap between the top of the differential drive pinion in the U/D planetary gear and contact surface of the transaxle case and housing. (Dimension D)

NOTE: Note down the dimension D as it is necessary for the following process.

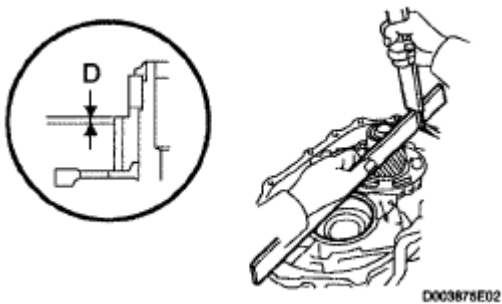


Fig. 415: Measuring Gap Between Top Of Differential Drive Pinion
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. As shown in the illustration, measure the 2 places of the transaxle housing, and calculate the dimension E using the formula.

NOTE: Note down the dimension E as it is necessary for the following process.

HINT:

Dimension E = Dimension (1) - Dimension (2)

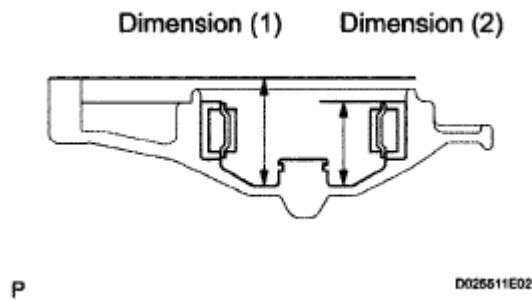


Fig. 416: Identifying Dimension (1) And Dimension (2)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

33. INSTALL MULTIPLE DISC CLUTCH HUB

- a. Install the bearing race to the transaxle while checking its direction.

Bearing race diameter: mm (in.)

BEARING RACE DIAMETER

	Inside	Outside
Bearing race	34.5 (1.358)	48.5 (1.909)

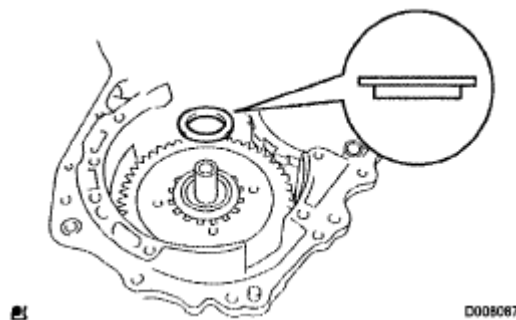


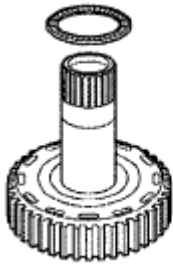
Fig. 417: Installing Bearing Race To Transaxle
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Coat the thrust bearing and race with petroleum jelly, and install them onto the multiple disc clutch hub.

Thrust bearing and race diameter: mm (in.)

THRUST BEARING AND RACE DIAMETER

	Inside	Outside
Bearing	36.3 (1.429)	52.2 (2.055)



D003628

Fig. 418: Installing Thrust Bearing And Race Onto Multiple Disc Clutch Hub
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

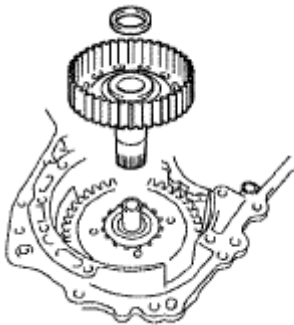
- c. Install the bearing to the multiple clutch hub.

Bearing diameter: mm (in.)

BEARING DIAMETER

	Inside	Outside
Bearing	23.5 (0.925)	44.0 (1.732)

- d. Install the forward clutch hub to the transaxle case.



D003929

Fig. 419: Installing Forward Clutch Hub To Transaxle Case
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

34. INSTALL FORWARD CLUTCH ASSEMBLY

- a. Install the thrust bearing to the forward clutch.

Bearing diameter: mm (in.)

BEARING DIAMETER

	Inside	Outside
Bearing	33.85 (1.3327)	52.2 (2.055)

NOTE: Install the thrust bearing properly so that the race "B" will be visible.

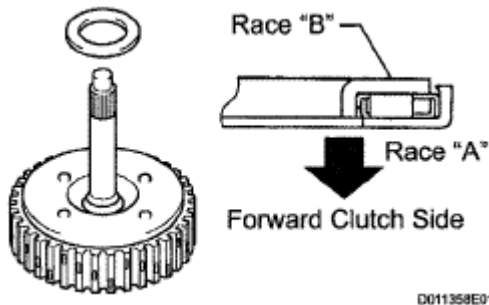


Fig. 420: Installing Thrust Bearing

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the forward clutch to the multiple clutch hub.

NOTE: Align the splines of all discs in the forward clutch with those of the multiple clutch hub to assemble them securely.

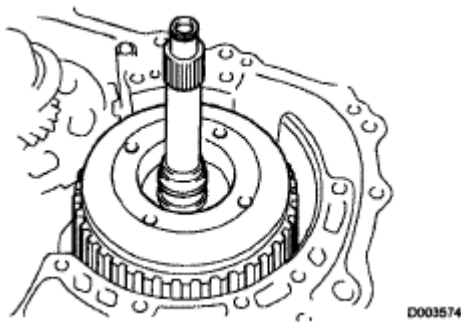


Fig. 421: Installing Forward Clutch To Multiple Clutch Hub

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

35. INSTALL OVERDRIVE BRAKE GASKET

- a. Install 2 new 0/0 brake gaskets.

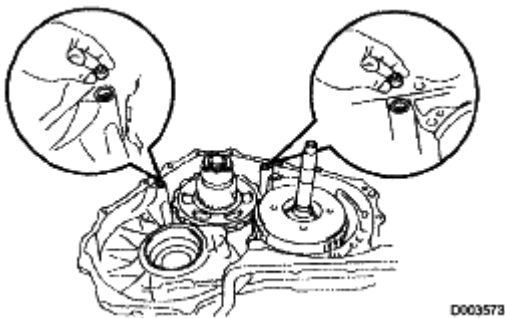


Fig. 422: Installing Overdrive Brake Gaskets

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

36. INSTALL DIFFERENTIAL GEAR ASSEMBLY

- a. Install the differential gear assembly to the transaxle case.

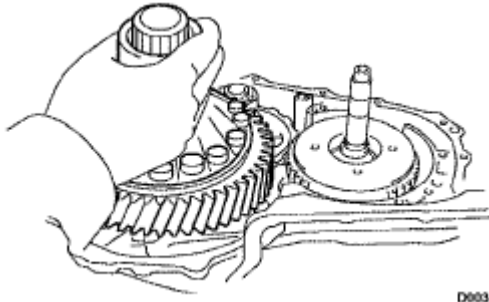


Fig. 423: Installing Differential Gear Assembly To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

37. INSTALL THRUST BEARING UNDERDRIVE RACE NO. 2

- a. Install the thrust bearing race to the U/D planetary gear assembly.

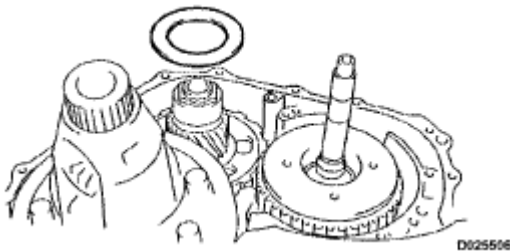


Fig. 424: Installing Thrust Bearing Race To U/D Planetary Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

38. INSTALL THRUST NEEDLE ROLLER BEARING

- a. Calculate the end play value using the following formula and values of Dimension D and E that were measured when installing the cylindrical roller bearing and U/D planetary gear. Select an appropriate U/D planetary gear thrust bearing race No. 2 which satisfies the specified end play value, and install it.

End play:

0.20 to 0.69 mm (0.0079 to 0.0272 in.)

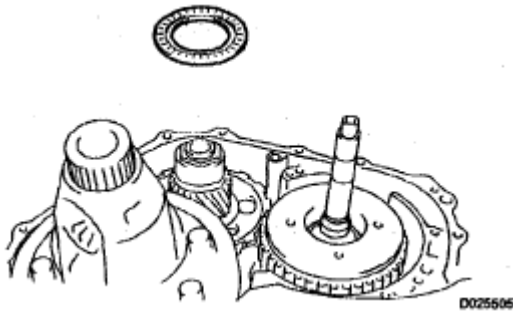


Fig. 425: Installing Thrust Needle Roller Bearing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

End play = Dimension E - Dimension D-thrust bearing thickness 3.28 mm (0.1291 in.) - U/D thrust bearing race No. 2 thickness.

Race thickness: mm (in.)

RACE THICKNESS

E - D	Thickness
Less than 7.34 (0.2890)	3.5 (0.138)
7.34 (0.2890)	3.8 (0.150)

Bearing and bearing race diameter: mm (in.)

BEARING AND BEARING RACE DIAMETER

	Inside	Outside
Bearing	53.0 (2.087)	78.2 (3.079)
Bearing race	52.1 (2.051)	75.5 (2.972)

39. INSTALL OIL PUMP ASSEMBLY

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

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

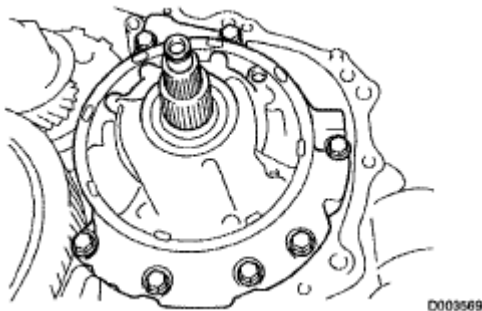


Fig. 426: Installing Oil Pump And Bolts To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

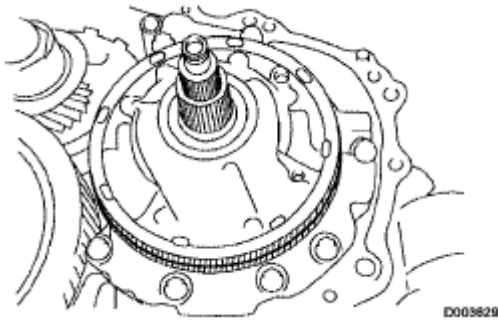


Fig. 427: Identifying Oil Pump
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

40. INSTALL TRANSAXLE HOUSING

- a. Remove any packing material and be careful not to get oil on the contacting surfaces of the transaxle case or transaxle housing.
- b. Apply FIPG to the transaxle case.

Seal Packing:

Toyota Genuine Seal Packing 1281, Three Bond 1281 or equivalent

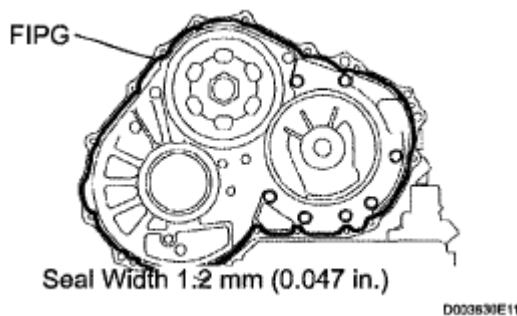


Fig. 428: Identifying Seal Packing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

Torque: Bolt A

22 N*m (220 kgf*cm, 16 ft.*lbf)

Bolt B and C

29 N*m (300 kgf*cm, 21 ft.*lbf)

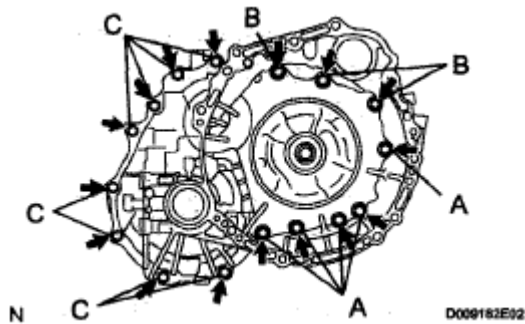


Fig. 429: Installing Transaxle Housing And Bolts To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Apply seal packing or equivalent to the bolt A.

Adhesive:

Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

Bolt length:

Bolt A:

50 mm (1.969 in.)

Bolt B:

50 mm (1.969 in.)

Bolt C:

42 mm (1.654 in.)

NOTE: Because the bolt A is a seal bolt, apply the seal packing to new bolts and tighten them within 10 minutes after application.

41. INSTALL TRANSAXLE CASE NO. 1 PLUG

- a. Install 2 new O-rings to the 2 transaxle case No. 1 plugs.
- b. Install the 2 transaxle case No. 1 plugs to the transaxle housing.

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

42. INSPECT INPUT SHAFT END PLAY

HINT:

(See INSPECTION)

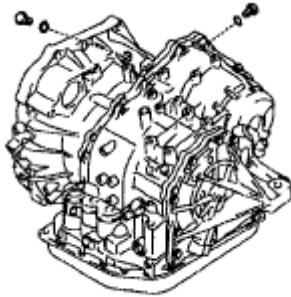


Fig. 430: Installing O-Rings To Transaxle Case Plugs
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

43. FIX AUTOMATIC TRANSAXLE ASSEMBLY

- a. Fix the automatic transaxle assembly.

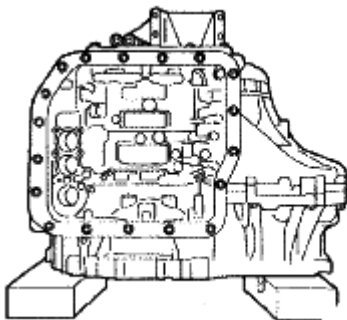


Fig. 431: Fixing Automatic Transaxle Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

44. INSTALL MANUAL VALVE LEVER SHAFT OIL SEAL

- a. Coat a new oil seal with ATF.
- b. Install the oil seal to the transaxle case.

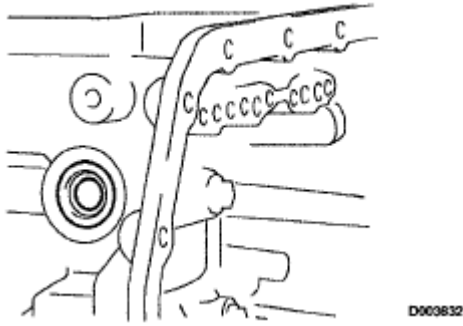


Fig. 432: Installing Oil Seal To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

45. INSTALL PARKING LOCK ROD SUB-ASSEMBLY

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

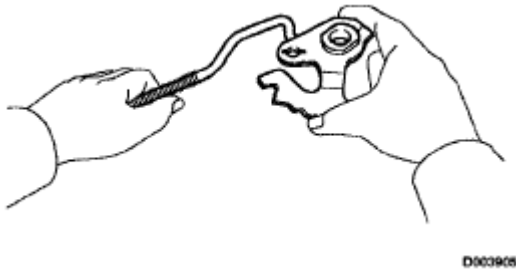


Fig. 433: Installing Parking Lock Rod To Manual Valve Lever
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

46. INSTALL MANUAL VALVE LEVER SUB-ASSEMBLY

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

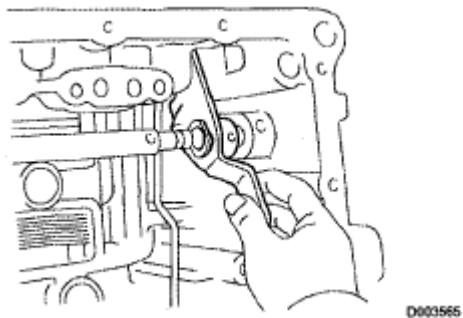
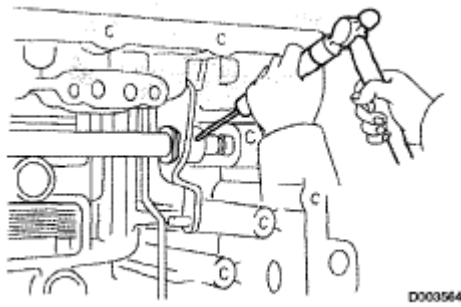


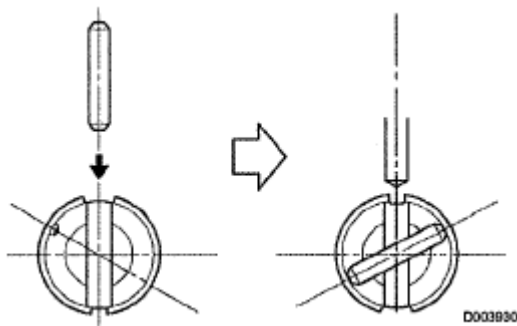
Fig. 434: Installing Spacer And Manual Valve Lever Shaft To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

**Fig. 435: Driving Out Pin Using Pin Punch And Hammer**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

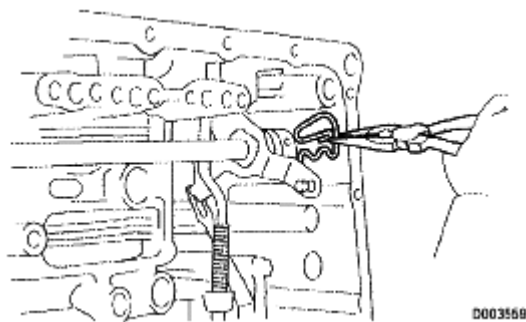
- c. Turn the spacer and the lever shaft to align the small hole for locating the staking position in the spacer with the staking position mark on the lever shaft.
- d. Using a pin punch, stake the spacer through the small hole.
- e. Check that the spacer does not turn.

**Fig. 436: Staking Spacer Through Small Hole**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

47. INSTALL MANUAL VALVE LEVER SHAFT RETAINER SPRING

- a. Using needle-nose pliers, install the retainer spring.

**Fig. 437: Removing Manual Valve Lever Shaft Retainer Spring**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

48. INSTALL PARKING LOCK PAWL BRACKET

- a. Install the parking lock pawl bracket with the 2 bolts.

Torque: 20 N*m (205 kgf*cm, 15 ft.*lbf)

Bolt length:

25 mm (0.984 in.)

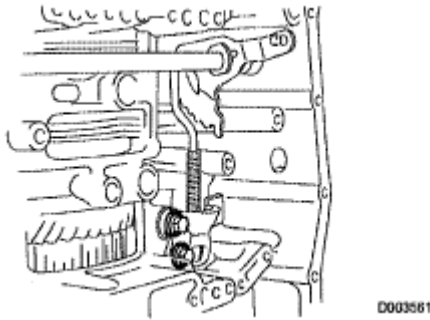


Fig. 438: Installing Parking Lock Pawl Bracket With Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

49. INSTALL MANUAL DETENT SPRING SUB-ASSEMBLY

- a. Install the manual detent spring with the 2 bolts.

NOTE: Make sure to install the manual detent spring and cover in this order.

Torque: Bolt A

20 N*m (205 kgf*cm, 15 ft.*lbf)

Bolt B

12 N*m (120 kgf*cm, 9 ft.*lbf)

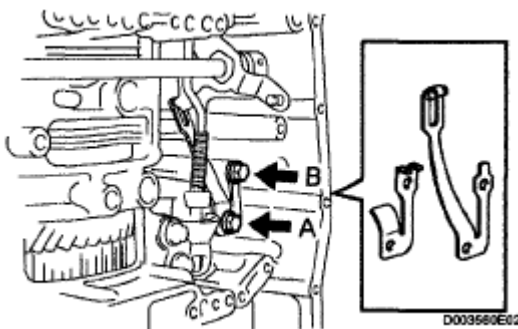


Fig. 439: Installing Manual Detent Spring With Bolts

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Bolt length:

Bolt A:

27 mm (1.063 in.)

Bolt B:

16 mm (0.630 in.)

50. INSTALL B-3 ACCUMULATOR PISTON

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

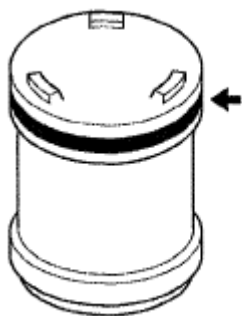


Fig. 440: Identifying O-Ring On B-3 Accumulator Piston

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Coat the piston with ATF, and install it to the transaxle case.

Accumulator spring:

ACCUMULATOR SPRING SPECIFICATIONS

Free Length	Outer Diameter mm (in.)	Color
Inner 60.24 (2.3716)	15.9 (0.626)	Yellowish green
Outer 74.61 (2.9374)	21.7 (0.854)	Blue

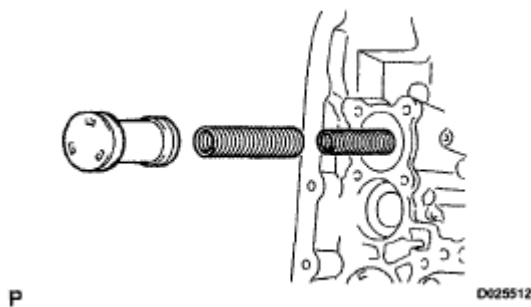
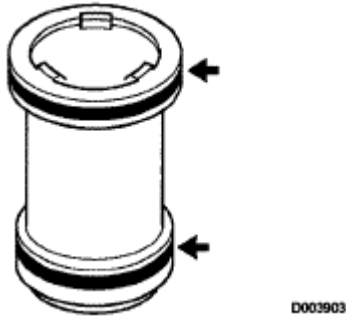


Fig. 441: Installing Piston To Transaxle Case

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

51. INSTALL C-1 ACCUMULATOR PISTON

- a. Coat 2 new O-rings with ATF, and install them to the C-1 accumulator piston.

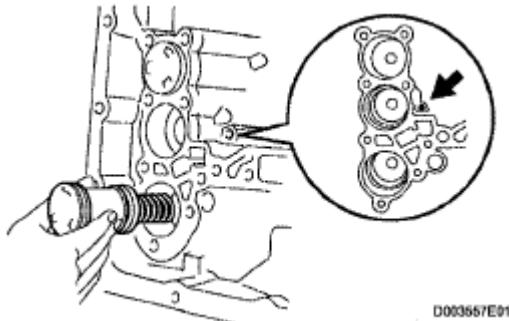
**Fig. 442: Locating O-Rings**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Coat the piston with ATF, and install it to the transaxle case.

Accumulator spring :**ACCUMULATOR SPRING SPECIFICATIONS**

Free Length	Outer Diameter mm (in.)	Color
81.53 (3.2098)	18.5 (0.728)	Pink

**Fig. 443: Installing Piston To Transaxle Case**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

52. INSTALL C-3 ACCUMULATOR PISTON

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

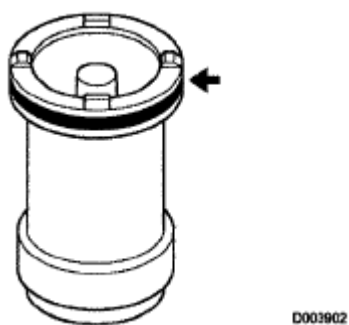


Fig. 444: Coating O-Ring With ATF

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Coat the piston with ATF, and install it to the transaxle case.

Accumulator spring :

ACCUMULATOR SPRING SPECIFICATIONS

Free Length	Outer Diameter mm (in.)	Color
90.49 (3.5626)	19.2 (0.756)	White

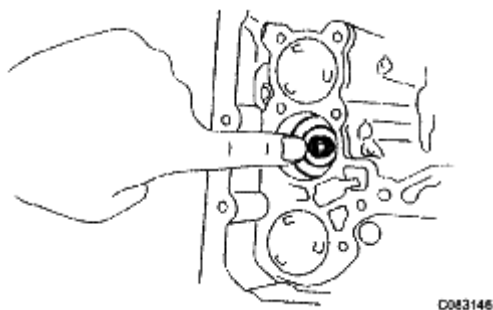


Fig. 445: Installing Piston To Transaxle Case

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the spring from the C-3 accumulator piston.

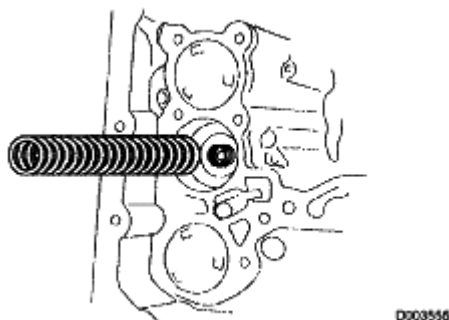


Fig. 446: Identifying Spring And C-3 Accumulator Piston

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

53. INSTALL CHECK BALL BODY

- a. Install the check ball body and spring.

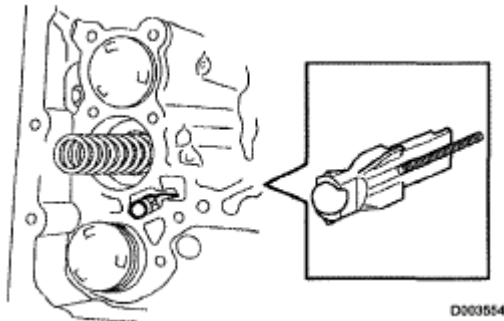


Fig. 447: Installing Check Ball Body And Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

54. INSTALL BRAKE DRUM GASKET

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

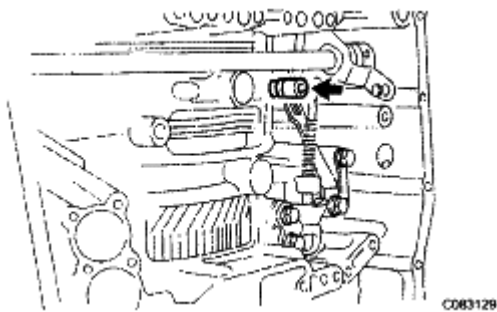


Fig. 448: Locating Brake Drum Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

55. INSTALL TRANSAXLE CASE 2ND BRAKE GASKET

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

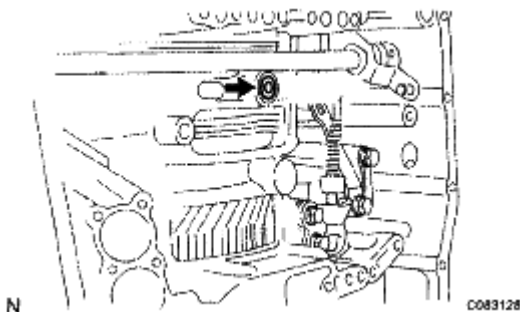


Fig. 449: Locating Transaxle Case 2nd Brake Gasket
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

56. INSTALL GOVERNOR APPLY GASKET NO. 1

- a. Coat a new governor apply gasket No. 1 with ATF, and install it to the transaxle case.

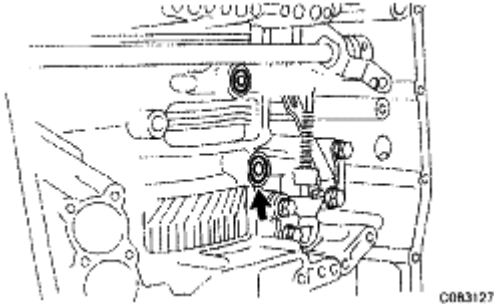


Fig. 450: Locating Governor Apply Gasket No.1
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

57. INSTALL TRANSMISSION WIRE

- a. Coat a new O-ring with ATF, and install it to the transaxle solenoid wire.

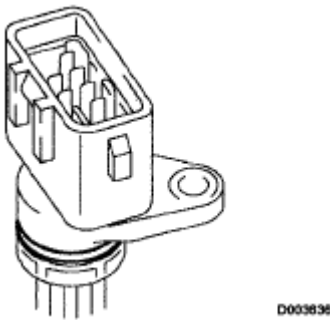


Fig. 451: Installing Transmission Wire
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the solenoid wire retaining bolt.

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

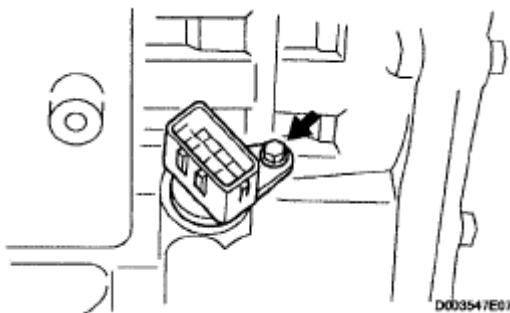


Fig. 452: Installing Solenoid Wire Bolt

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

58. INSTALL TRANSMISSION VALVE BODY ASSEMBLY

- a. Make sure that the manual valve lever position, and install the valve body with the 17 bolts to the transaxle case.

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

Bolt length:

Bolt A:

25 mm (0.984 in.)

Bolt B:

41 mm (1.614 in.)

Bolt C:

45 mm (1.771 in.)

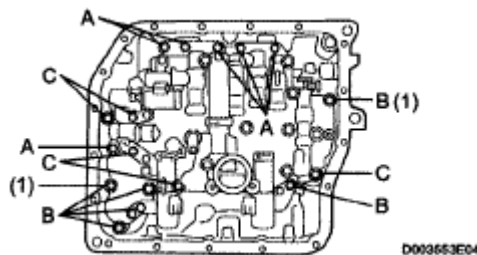


Fig. 453: Installing Valve Body With Bolts To Transaxle Case

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

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

- b. Connect the 5 solenoid connectors.
- c. Install the ATF temperature sensor, clamp and bolt.

Torque: 6.6 N*m (67 kgf*cm, 58 in.*lbf)

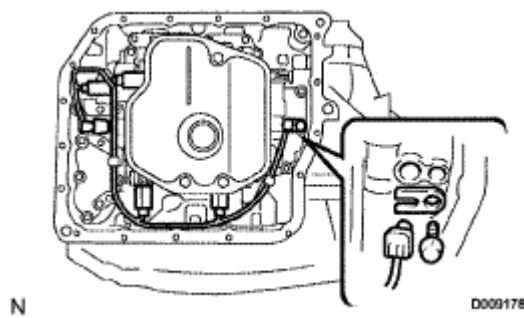


Fig. 454: Installing ATF Temperature Sensor, Clamp And Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

59. INSTALL VALVE BODY OIL STRAINER ASSEMBLY

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

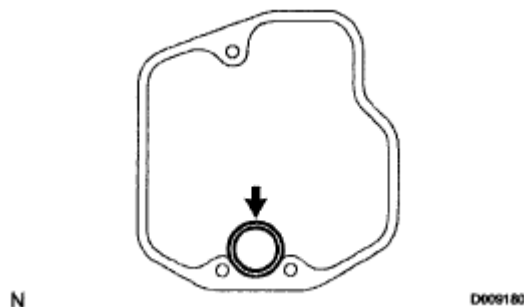


Fig. 455: Locating O-Ring On Oil Strainer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the oil strainer and 3 bolts to the valve body.

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

60. INSTALL AUTOMATIC TRANSAXLE OIL PAN GASKET

- a. Install a new oil pan gasket to the oil pan.

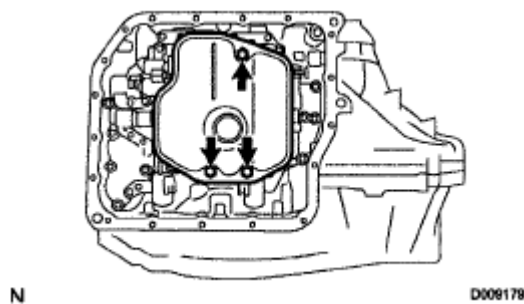


Fig. 456: Installing Oil Pan Gasket To Oil Pan
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

61. INSTALL AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY

- a. Install the 2 magnets in the oil pan.
- b. Apply seal packing or equivalent to new 18 bolts.

Adhesive:

Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

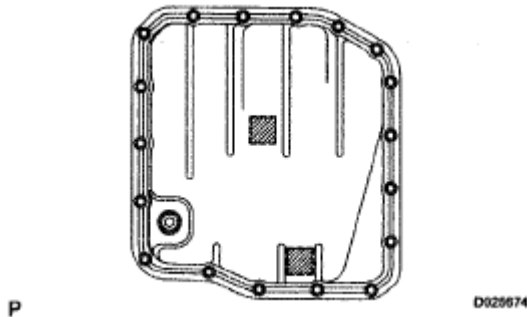


Fig. 457: Identifying Seal Packing

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the oil pan and 18 bolts to the transaxle case.

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

NOTE: Because the bolts should be seal bolts, apply seal packing to new bolts and tighten them within 10 minutes after application.

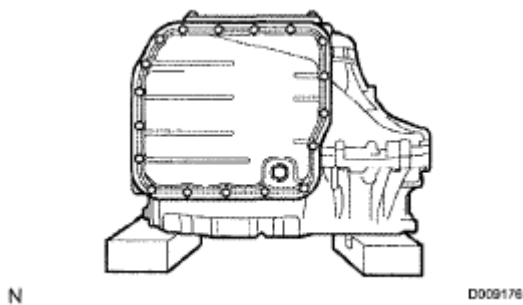


Fig. 458: Fixing Automatic Transaxle Assembly

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

62. INSTALL TRANSAXLE CASE NO. 1 PLUG

- a. Coat 4 new O-rings with ATF, and install them to the 4 transaxle case No. 1 plugs.
- b. Install the 4 transaxle case No. 1 plugs to the transaxle case.

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

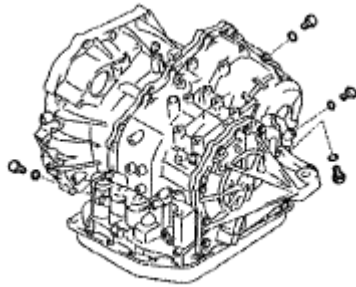


Fig. 459: Installing Transaxle Case No.1 Plug

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

63. INSTALL SPEED SENSOR

- a. Coat 2 new O-rings with ATF, and install them to the 2 sensors.
- b. Install the 2 sensors to the transaxle case with the 2 bolts.

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

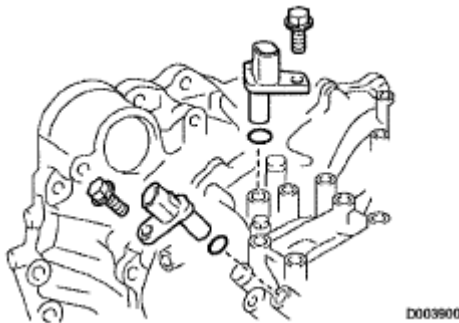


Fig. 460: Installing Sensors With Bolts To Transaxle Case

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

64. INSTALL OIL COOLER TUBE UNION (OUTLET OIL COOLER UNION)

- a. Coat a new O-ring with ATF, and install it to the elbow.
- b. Install the elbow to the transaxle case.

Torque: 27 N*m (276 kgf*cm, 20 ft.*lbf)

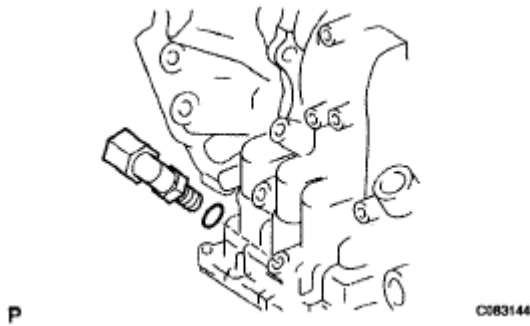


Fig. 461: Installing Elbow To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

65. INSTALL OIL COOLER TUBE UNION (INLET OIL COOLER UNION)

- a. Coat a new O-ring with ATF, and install it to the union.
- b. Install the union to the transaxle case.

Torque: 27 N*m (276 kgf*cm, 20 ft.*lbf)

66. INSTALL BREATHER PLUG HOSE

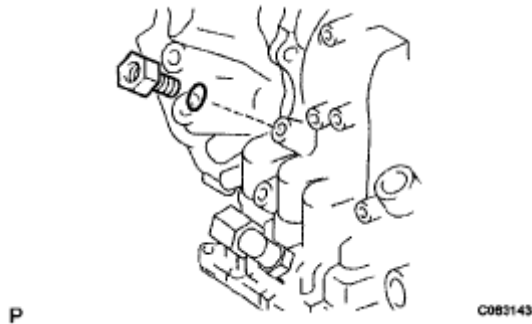


Fig. 462: Installing Oil Cooler Tube Union (Inlet Oil Cooler Union)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

67. INSTALL PARK/NEUTRAL POSITION SWITCH ASSEMBLY

- a. Install the park/neutral position switch onto the manual valve lever shaft and temporarily install the 2 adjusting bolts.
- b. Install a new nut stopper and nut.

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

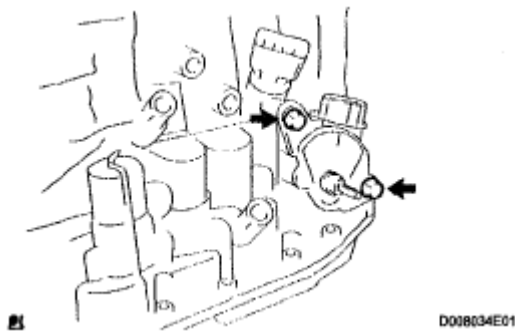


Fig. 463: Installing Park/Neutral Position Switch Onto Manual Valve Lever Shaft And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Temporarily install the control shaft lever.

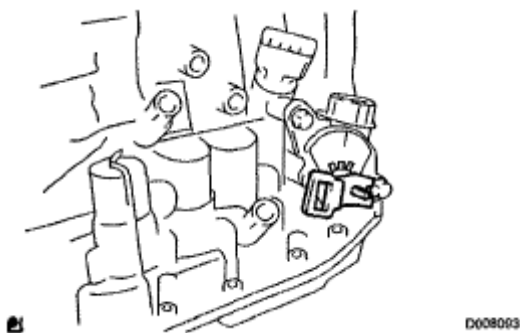


Fig. 464: Installing Control Shaft Lever
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

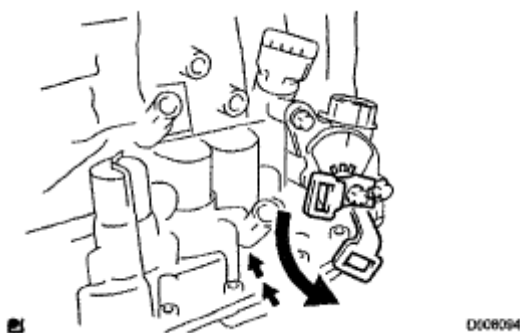


Fig. 465: Turning Lever Counterclockwise
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- f. Align the groove with the neutral basic line.
- g. Tighten the 2 bolts.

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

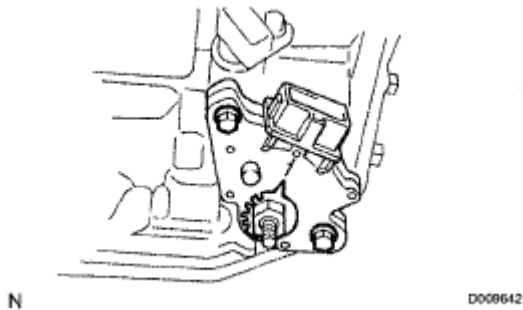


Fig. 466: Aligning Groove With Neutral Basic Line
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- h. Using a screwdriver, stake the nut with the nut stopper.

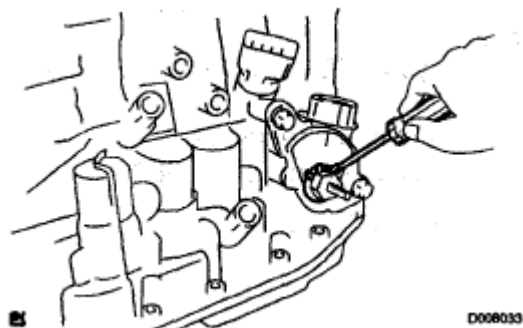


Fig. 467: Staking Nut With Nut Stopper
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- i. Install the control shaft lever, washer and nut.

Torque: 13 N*m (133 kgf*cm, 10 ft.*lbf)

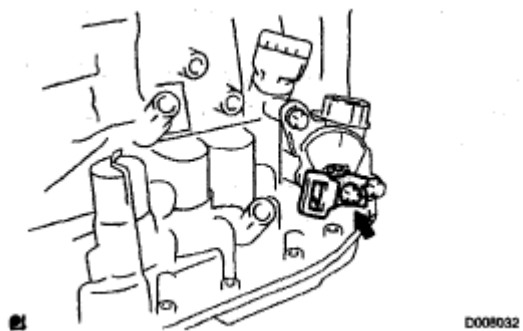
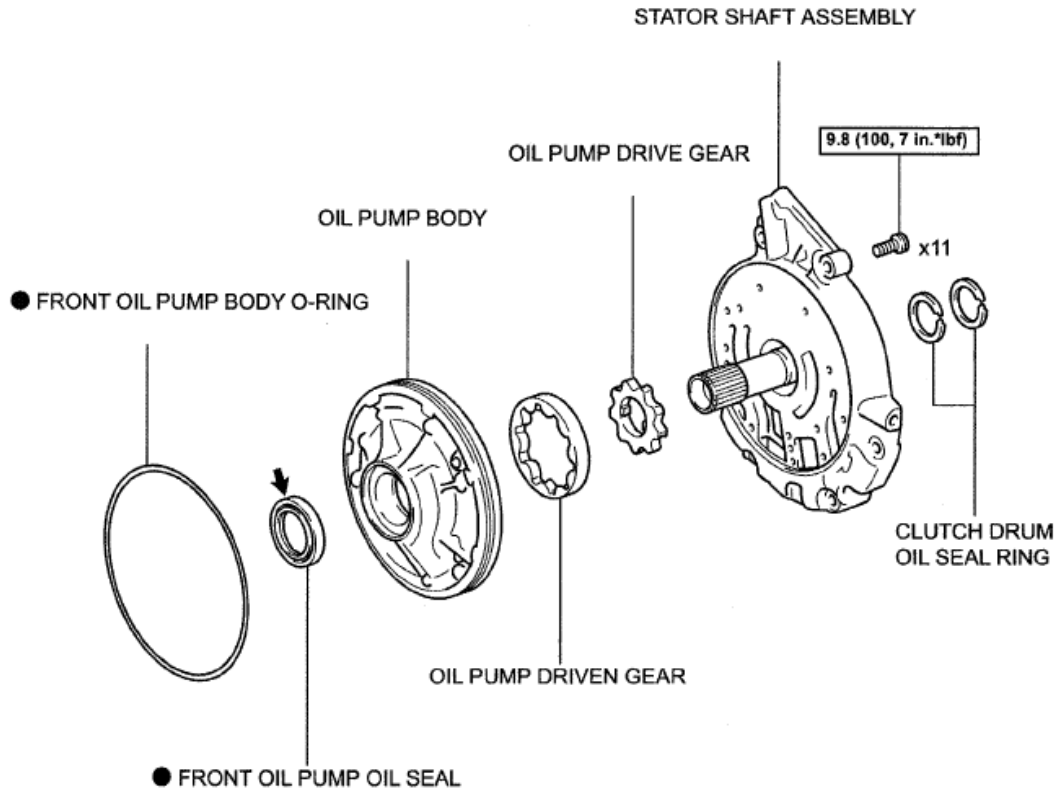


Fig. 468: Installing Control Shaft Lever, Washer And Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

OIL PUMP

COMPONENTS



$\boxed{\text{N}\cdot\text{m (kgf}\cdot\text{cm, ft.}\cdot\text{lbf)}}$: Specified torque

● Non-reusable part

← Apply petroleum jelly

C119453E01

Fig. 469: Identifying Oil Pump Components And Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

1. INSPECT OIL PUMP ASSEMBLY

HINT:

(See **INSPECTION**)

2. REMOVE CLUTCH DRUM OIL SEAL RING

- a. Remove the 2 clutch drum oil seal rings.

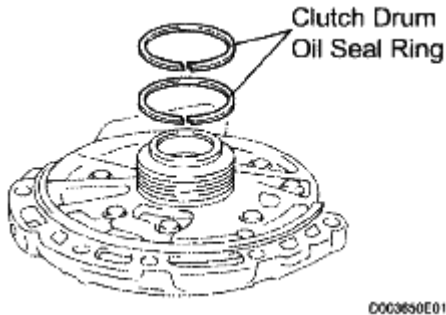


Fig. 470: Identifying Clutch Drum Oil Seal Rings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. REMOVE STATOR SHAFT ASSEMBLY

- a. Using a "TORX" socket (T30), remove the 11 bolts and stator shaft.

4. INSPECT CLEARANCE OF OIL PUMP ASSEMBLY

HINT:

(See INSPECTION)

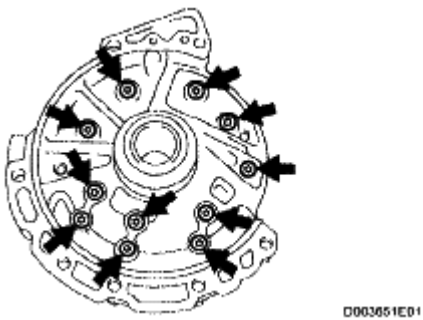
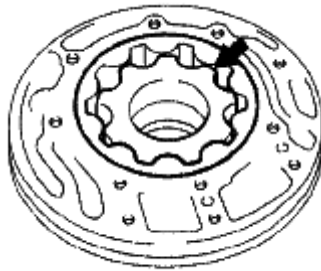


Fig. 471: Locating Bolts And Stator Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. REMOVE FRONT OIL PUMP DRIVE GEAR

- a. Remove the front oil pump drive gear.



N

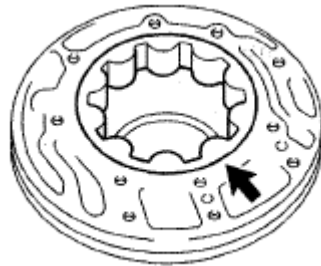
D009206F02

Fig. 472: Locating Front Oil Pump Drive Gear

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. REMOVE FRONT OIL PUMP DRIVEN GEAR

- a. Remove the front oil pump driven gear.



N

C119012

Fig. 473: Locating Front Oil Pump Driven Gear

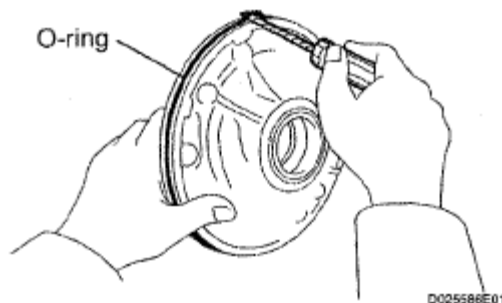
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. REMOVE FRONT OIL PUMP BODY O-RING

- a. Using a screwdriver, remove the O-ring.

HINT:

Tape the screwdriver before use.



D025588E01

Fig. 474: Removing O-Ring

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. REMOVE FRONT OIL PUMP OIL SEAL

- a. Mount the oil pump in a soft jaw vise.
- b. Using SST, remove the oil seal from the oil pump body.

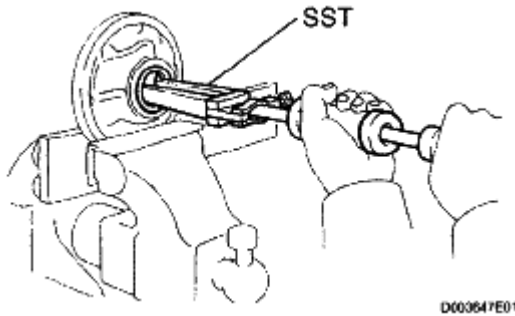
SST 09308-00010

Fig. 475: Removing Oil Seal From Oil Pump Body
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION**1. INSPECT OIL PUMP ASSEMBLY**

- a. Turn the drive gear with the 2 screwdrivers and make sure that it rotates smoothly.

NOTE: Be careful not to damage the oil seal lip.

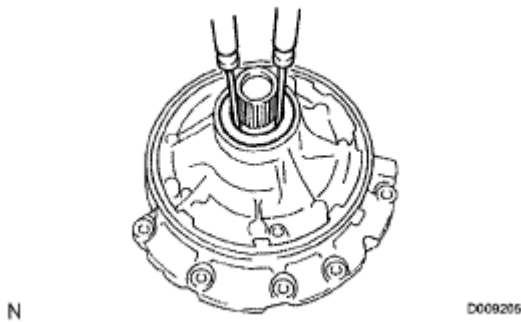


Fig. 476: Turning Drive Gear With Screwdrivers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSPECT CLEARANCE OF OIL PUMP ASSEMBLY

- a. Push the driven gear to one side of the body.
- b. Using a feeler gauge, measure the clearance.

Standard body clearance:

0.10 to 0.17 mm (0.0039 to 0.0067 in.)

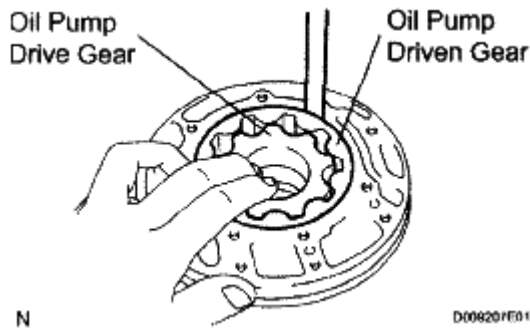
Side clearance:**0.02 to 0.05 mm (0.001 to 0.002 in.)****Maximum body clearance:****0.17 mm (0.0067 in.)**

Fig. 477: Pushing Driven Gear To One Side Of Body
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

If the body clearance is greater than the maximum, replace the oil pump body sub-assembly.

- c. Using a feeler gauge, measure the tip clearance between the driven gear teeth and drive gear teeth.

Standard tip clearance:**0.07 to 0.15 mm (0.0028 to 0.0059 in.)****Maximum tip clearance:****0.15 mm (0.0059 in.)**

If the tip clearance is greater than the maximum, replace the oil pump body sub-assembly.

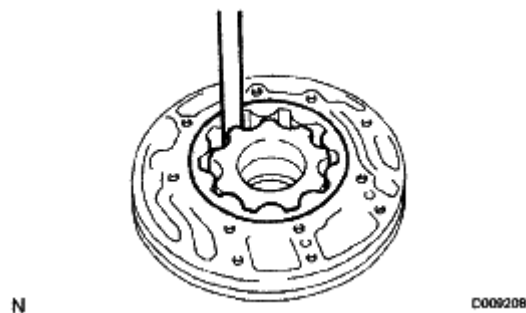


Fig. 478: Measuring Tip Clearance Between Driven Gear Teeth And Drive Gear Teeth
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Using a straightedge and feeler gauge, measure the side clearance of both gears.

Standard side clearance:

0.02 to 0.05 mm (0.0008 to 0.0020 in.)

Maximum side clearance:

0.05 mm (0.0020 in.)

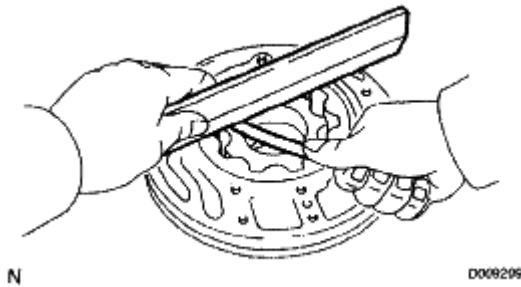


Fig. 479: Measuring Side Clearance

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

Drive gear thickness: mm (in.)

DRIVE GEAR THICKNESS

Mark	Thickness
1	10.690 to 10.699 (0.4209 to 0.4212)
2	10.700 to 10.709 (0.4213 to 0.4216)
3	10.710 to 10.720 (0.4217 to 0.4220)
4	10.721 to 10.730 (0.4221 to 0.4224)
5	10.731 to 10.740 (0.4225 to 0.4228)

Driven gear thickness: mm (in.)

DRIVEN GEAR THICKNESS

Mark	Thickness
1	10.690 to 10.699 (0.4209 to 0.4212)
2	10.700 to 10.709 (0.4213 to 0.4216)
3	10.710 to 10.720 (0.4217 to 0.4220)
4	10.721 to 10.730 (0.4221 to 0.4224)
5	10.731 to 10.740 (0.4225 to 0.4228)

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:

38.113 to 38.138 mm (1.50051 to 1.50149 in.)

Maximum inside diameter:

38.188 mm (1.50346 in.)

If the inside diameter is greater than the maximum, replace the oil pump body sub-assembly.

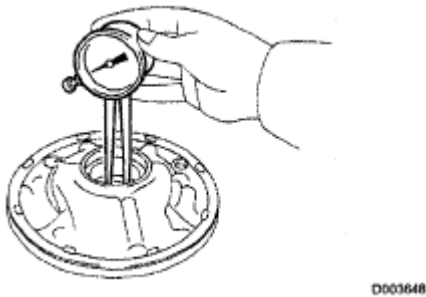


Fig. 480: Measuring Inside Diameter Of Oil Pump Body Bushing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSPECT STATOR SHAFT ASSEMBLY

- a. Using a dial indicator, measure the inside diameter of the stator shaft.

Standard inside diameter:

21.500 to 21.526 mm (0.84646 to 0.84748 in.)

Maximum inside diameter:

21.57 mm (0.8492 in.)

If the inside diameter is greater than the maximum, replace the stator shaft.

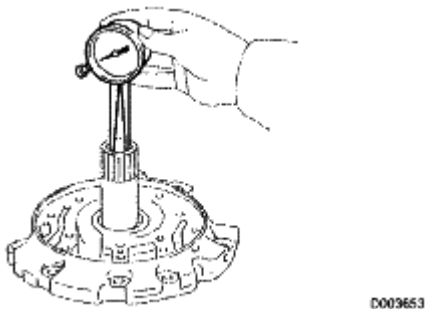


Fig. 481: Measuring Inside Diameter Of Stator Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REASSEMBLY

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)

HINT:

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

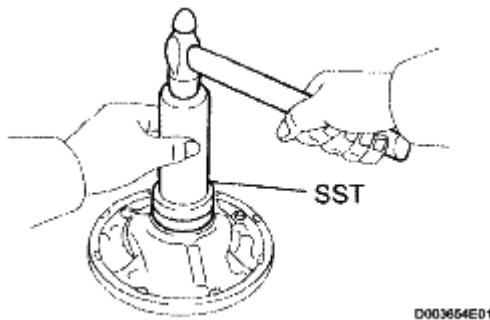


Fig. 482: Installing Oil Seal To Oil Pump Body
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

2. INSTALL FRONT OIL PUMP BODY O-RING

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

NOTE: Make sure that the O-ring is not twisted or pinched. Moreover, apply enough ATF to the O-ring before installation.

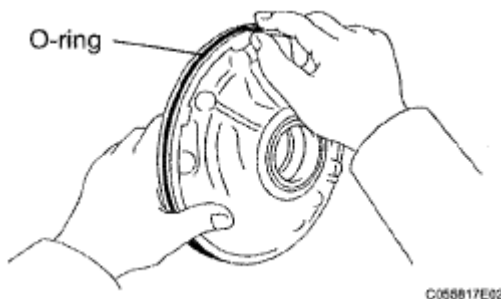


Fig. 483: Installing Front Oil Pump Body O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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 facing upward.

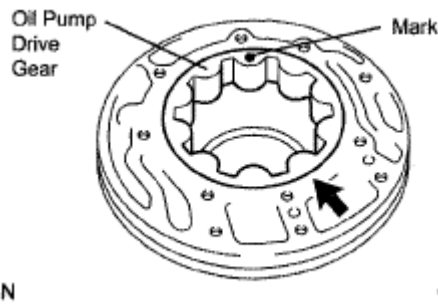


Fig. 484: Installing Front Oil Pump Driven Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSTALL FRONT OIL PUMP DRIVE GEAR

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

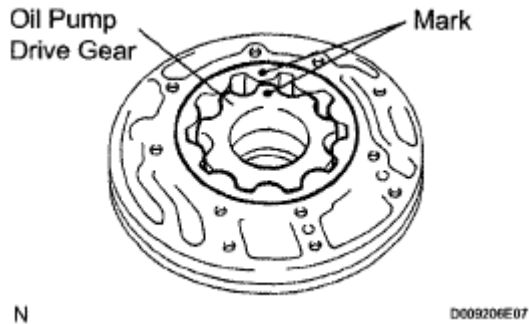


Fig. 485: Coating Front Oil Pump Drive Gear With ATF To Oil Pump
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. INSTALL STATOR SHAFT ASSEMBLY

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

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

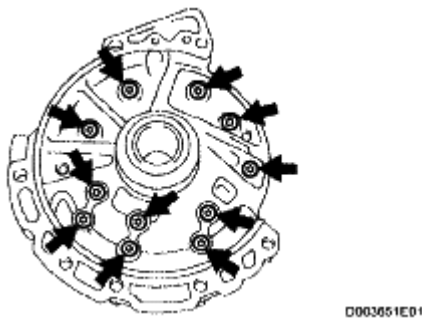


Fig. 486: Locating Bolts And Stator Shaft
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSTALL CLUTCH DRUM OIL SEAL RING

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

NOTE: Do not expand the ring ends excessively.

7. INSPECT OIL PUMP ASSEMBLY

HINT:

(See INSPECTION)

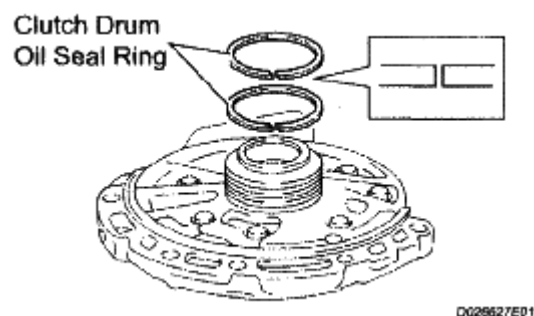
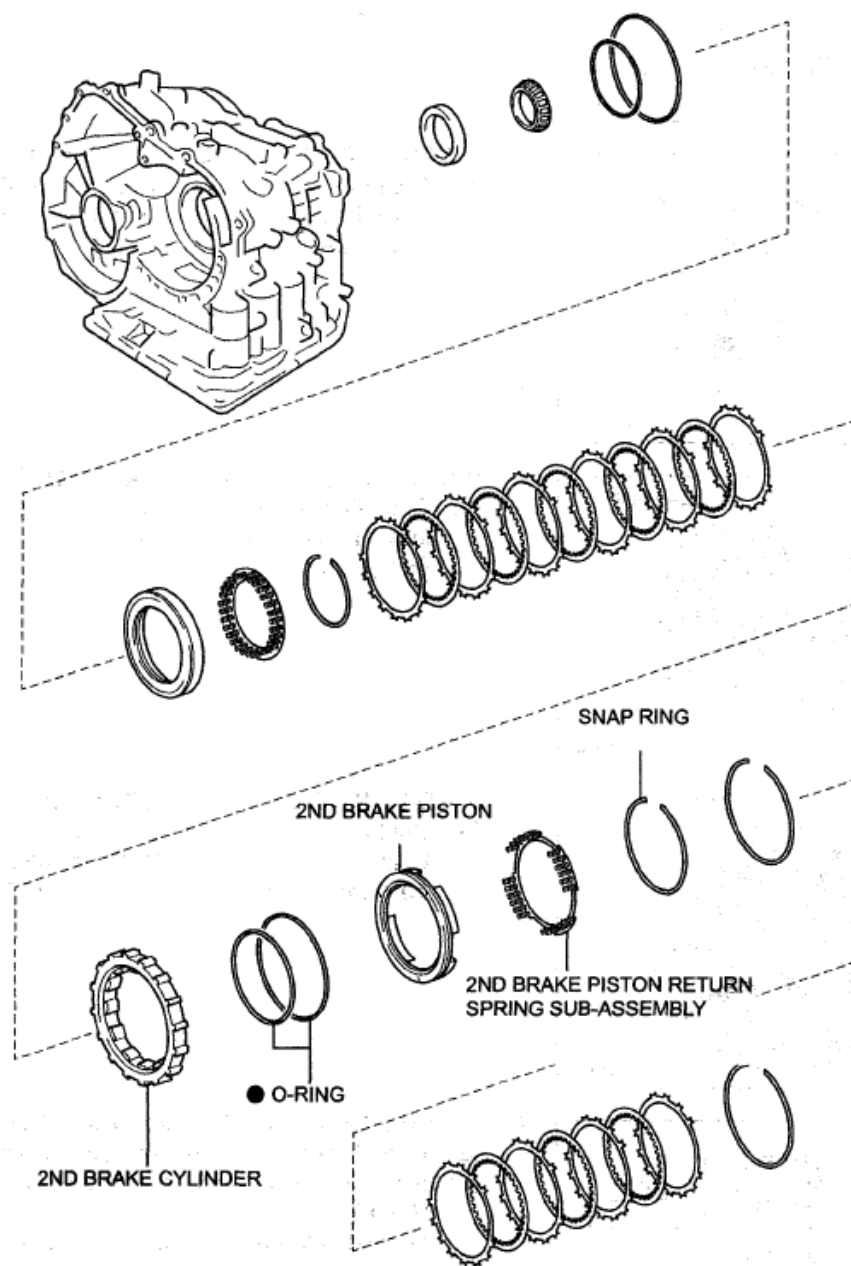


Fig. 487: Identifying Clutch Drum Oil Seal Rings
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SECOND BRAKE PISTON**COMPONENTS**



C119451E02

Fig. 488: Identifying Second Brake Piston Components
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

1. REMOVE 2ND BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

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

SST 09387-00060

- b. Using a screwdriver, remove the snap ring.

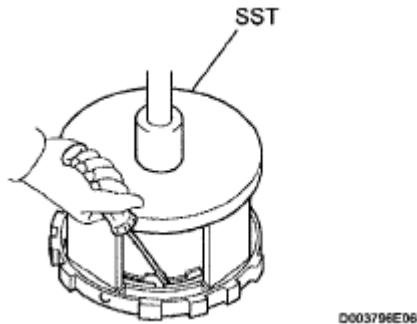


Fig. 489: Removing Snap Ring

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the 2nd brake piston return spring.

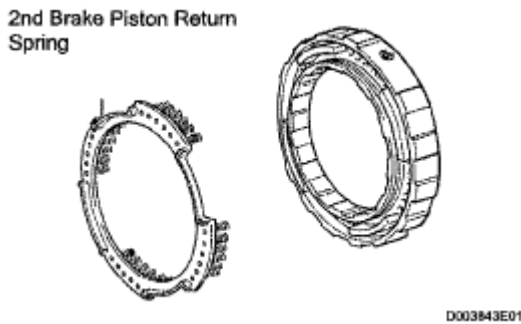


Fig. 490: Removing 2nd Brake Piston Return Spring

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. REMOVE 2ND BRAKE PISTON

- a. Hold the 2nd brake piston and apply compressed air (392 kPa, 4.0 kgf/cm², 57 psi) to the 2nd brake cylinder to remove the 2nd brake piston.

NOTE: Hold the piston with a shop rag or a piece of cloth when removing the piston. Failure to do so may result in the piston jumping out from the cylinder.

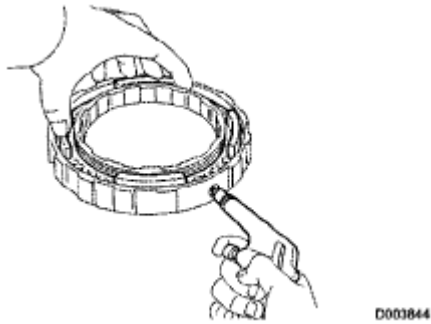


Fig. 491: Applying Compressed Air To 2nd Brake Cylinder
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. REMOVE 2ND BRAKE PISTON O-RING

- a. Remove the 2 O-rings from the 2nd brake piston.

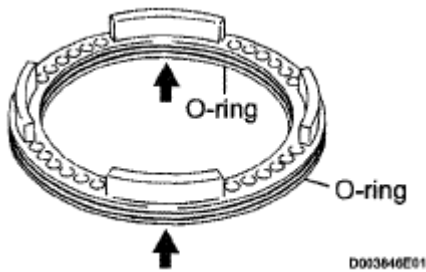


Fig. 492: Removing 2nd Brake Piston O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. INSPECT 2ND BRAKE PISTON RETURN SPRING SUB-ASSEMBLY

- a. Using vernier calipers, measure the free length of the spring together with the spring seat.

Standard free length:

16.61 mm (0.6539 in.)

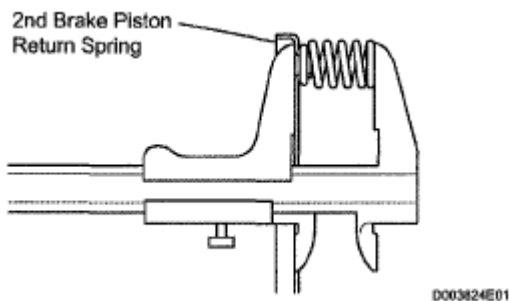


Fig. 493: Measuring Free Length Of Spring Together With Spring Seat

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REASSEMBLY

1. INSTALL 2ND BRAKE PISTON O-RING

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

NOTE: Make sure that the O-rings are not twisted or pinched.

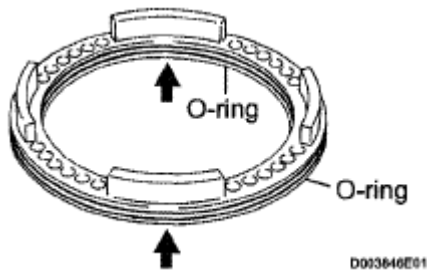


Fig. 494: Installing 2nd Brake Piston O-Ring

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL 2ND BRAKE PISTON

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

NOTE: Be careful not to damage the O-ring.

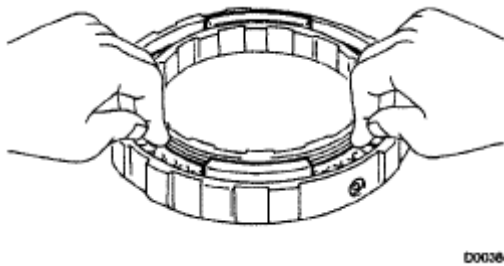


Fig. 495: Installing 2nd Brake Piston

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

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

NOTE: Installing the spring sub- assembly, check that all of the springs are fit in the piston correctly.

2nd Brake Piston Return Spring



D003843E01

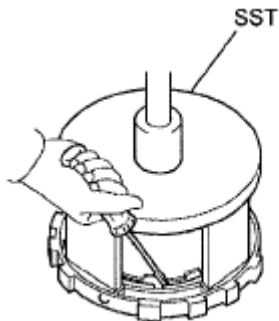
Fig. 496: Installing 2nd Brake Piston Return Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

SST 09387-00060

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

NOTE: Be sure the end gap of the snap ring is not aligned with the piston return spring claw.

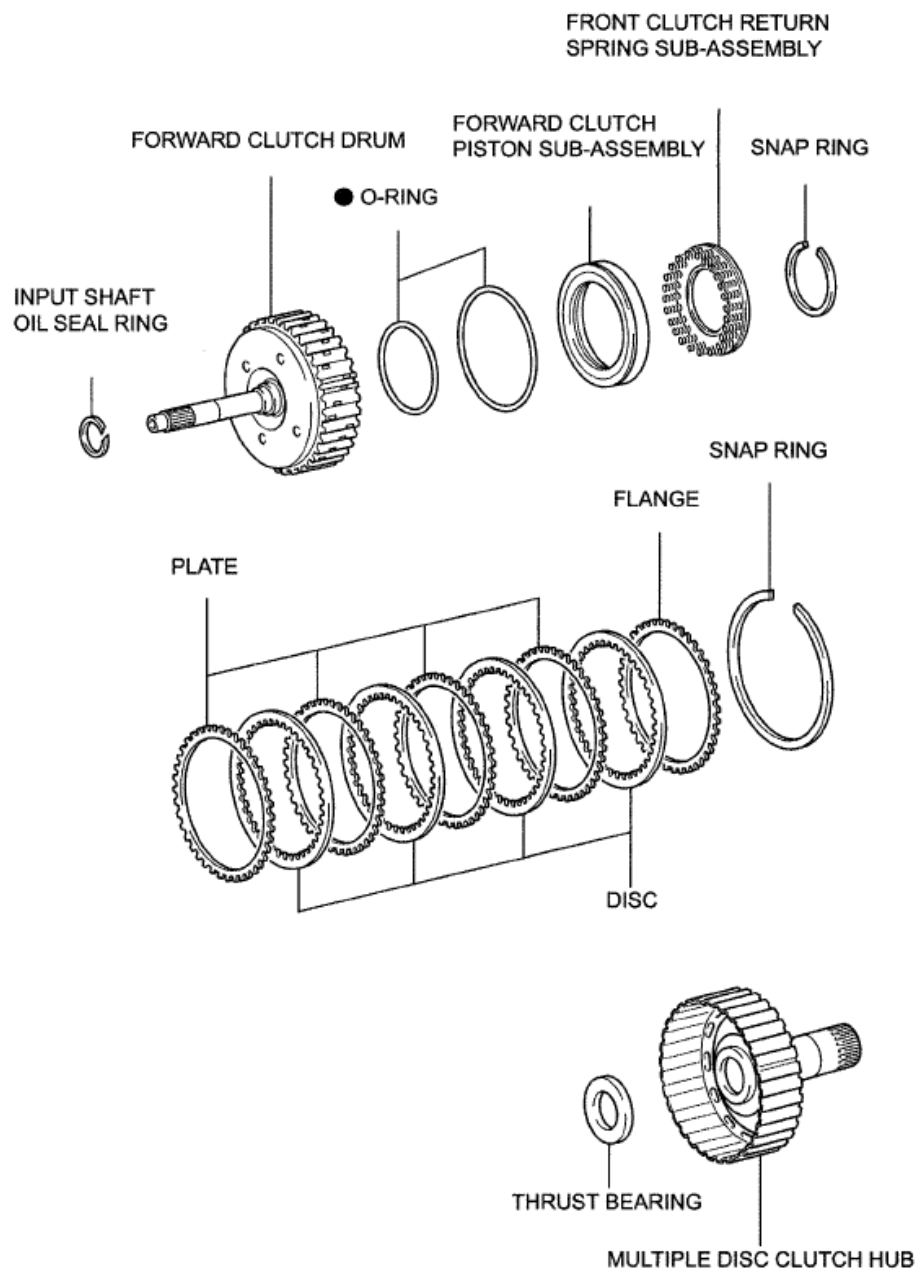


D003796E06

Fig. 497: Compressing Piston Return Spring With Press
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

FORWARD CLUTCH

COMPONENTS



● Non-reusable part

N

C119454E01

Fig. 498: Identifying Forward Clutch Components
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

1. INSPECT PACK CLEARANCE OF FORWARD CLUTCH

HINT:

(See **INSPECTION**)

2. REMOVE FORWARD MULTIPLE DISC CLUTCH DISC

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

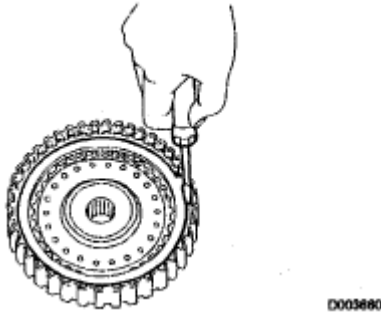


Fig. 499: Removing Snap Ring

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the flange, 5 discs and 5 plates from the input shaft assembly.

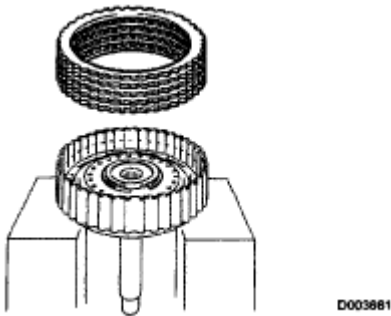


Fig. 500: Removing Plates, Discs And Flange

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. REMOVE FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY

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

SST 09350-32014 (09351-32070)

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

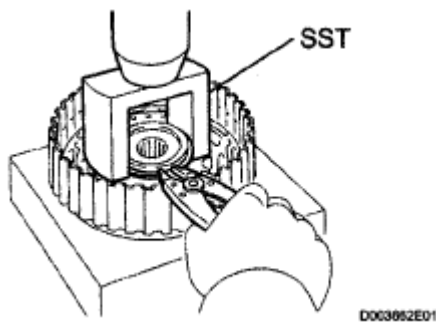


Fig. 501: Removing Snap Ring With Snap Ring Expander
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Remove the piston return spring.

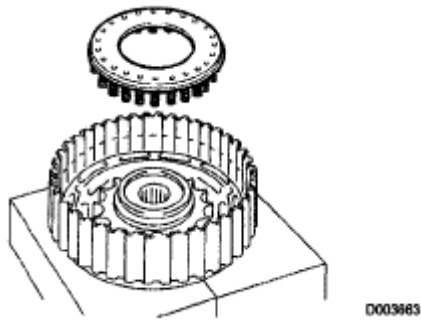


Fig. 502: Removing Piston Return Spring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. REMOVE FORWARD CLUTCH PISTON SUB-ASSEMBLY

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

HINT:

When the piston can not be removed as it is slanted, either blow the air again with the protruding side pushed or remove the piston using the needle nose plier with vinyl tape on the tip.

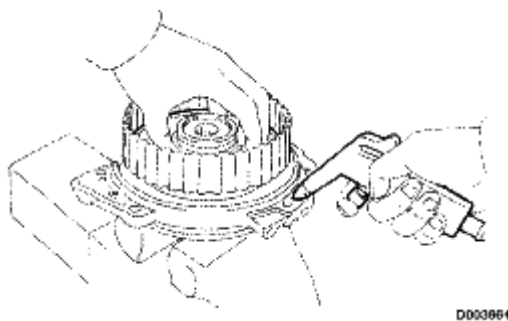


Fig. 503: Applying Compressed Air To Oil Pump
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using a screwdriver, remove the 2 O-rings.

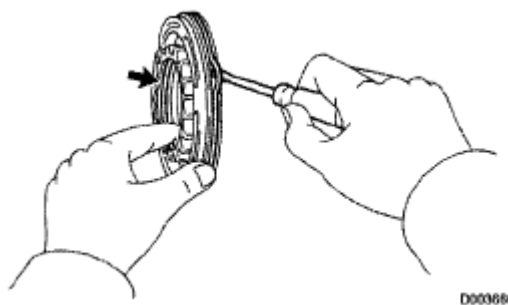


Fig. 504: Removing O-Rings
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. REMOVE INPUT SHAFT OIL SEAL RING

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

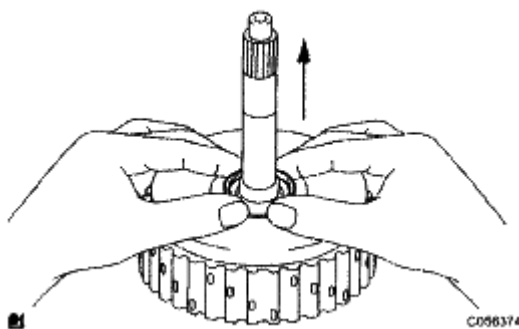


Fig. 505: Removing Input Shaft Oil Seal Ring
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. INSPECT PACK CLEARANCE OF FORWARD CLUTCH

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

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

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

Piston stroke:

1.74 to 2.08 mm (0.0685 to 0.0819 in.)

If the clearance is non-standard, inspect the discs, plates and flange.

HINT:

As the opening is big, cover it with a shop rug to prevent the compressed air from being discharged.

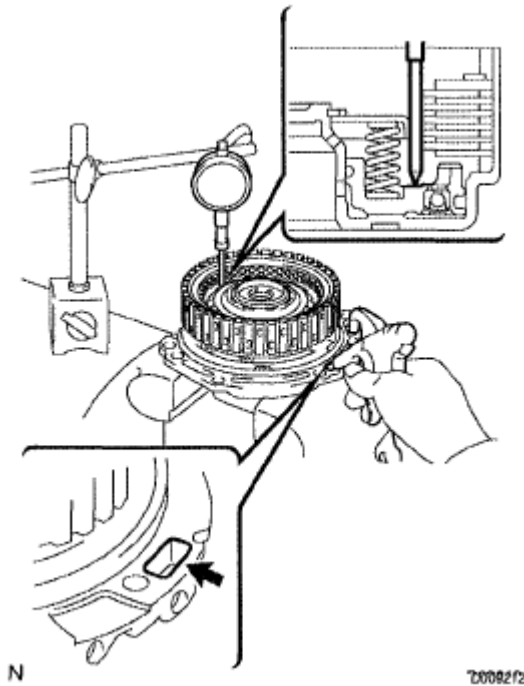


Fig. 506: Inspecting Pack Clearance Of Forward Clutch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSPECT FORWARD MULTIPLE DISC CLUTCH DISC

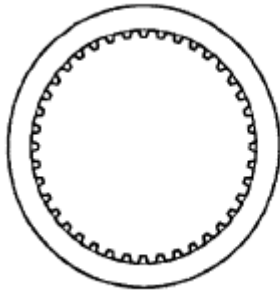
- a. Check to see if the sliding surface of the disc, plate; and flange are worn or burnt.

If necessary, replace them.

HINT:

- If the lining of the disc is peeling off or discolored, replace all discs.

- Before assembling new discs, soak them in ATF for at least 15 minutes.



D004080

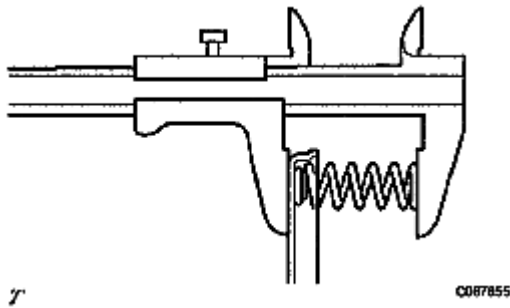
Fig. 507: Checking Sliding Surface Of Disc, Plate And Flange
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSPECT FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY

- Using vernier calipers, measure the free length of the spring together with the spring seat.

Standard free length:

28.23 mm (1.1102 in.)

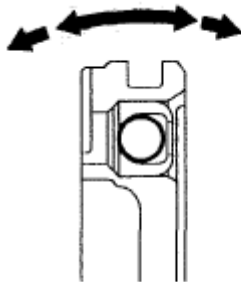


C087855

Fig. 508: Inspecting Forward Clutch Return Spring Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSPECT FORWARD CLUTCH PISTON SUB-ASSEMBLY

- Shake the piston to check that the check ball is not stuck.



D003867

Fig. 509: Inspecting Forward Clutch Piston Subassembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Check that air does not leak from the valve when applying low compressed air (392 kPa, 4.0 kgf/cm² , 57 psi).

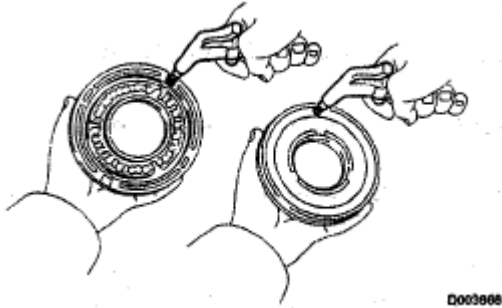


Fig. 510: Applying Low Compressed Air
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. INSPECT PACK CLEARANCE OF FORWARD CLUTCH

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

Piston stroke:

1.74 to 2.08 mm (0.0685 to 0.0819 in.)

If the piston stroke is less than the minimum, parts may have been assembled incorrectly. Check and reassemble again. If the clearance is non-standard, select another flange.

HINT:

There are 5 different flanges in thickness.

Flange thickness: mm (in.)

FLANGE THICKNESS

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

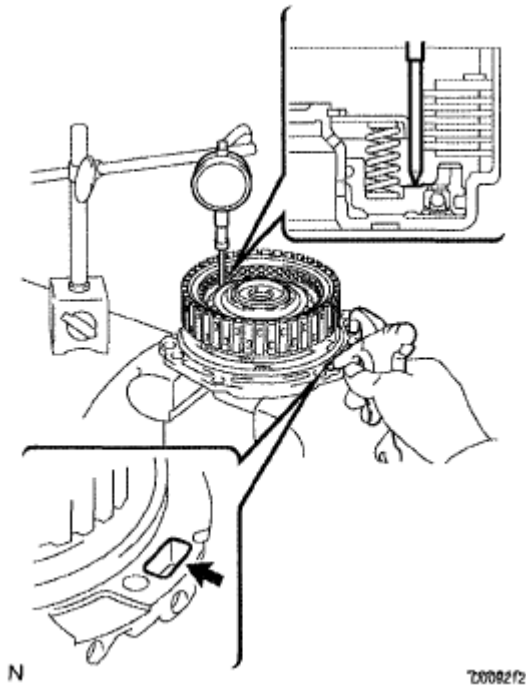


Fig. 511: Inspecting Pack Clearance Of Forward Clutch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSPECT FORWARD MULTIPLE DISC CLUTCH DISC

- a. Check that the disc lightly rotates when rotating the forward clutch assembly after inserting the multiple disc clutch into it.

NOTE: **Do not place the forward clutch assembly in a vise.**

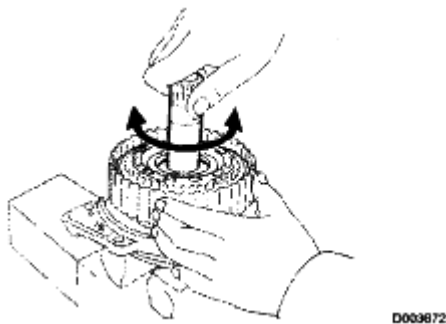


Fig. 512: Checking Forward Clutch Assembly Rotation
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REASSEMBLY

1. INSTALL INPUT SHAFT OIL SEAL RING

- a. Compress the oil seal ring from both sides to reduce dimension A.

Dimension A:

5 mm (0.197 in.)

- b. Coat the oil seal ring with ATF and install it to the input shaft.

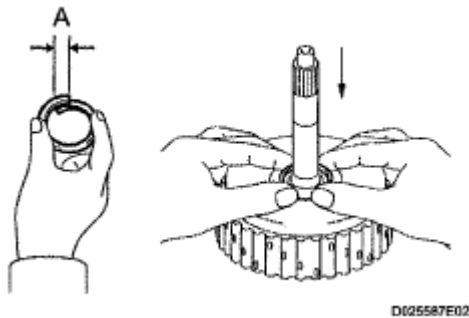


Fig. 513: Compressing Oil Seal Ring

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL FORWARD CLUTCH PISTON SUB-ASSEMBLY

- a. Coat 2 new O-rings with ATF, install them to the forward clutch piston.

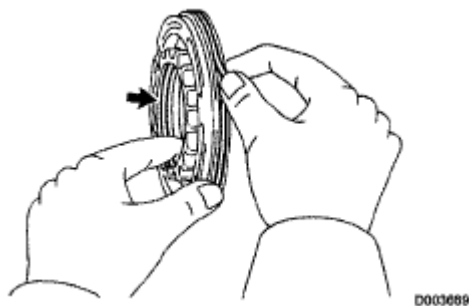


Fig. 514: Installing Forward Clutch Piston Sub-Assembly

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the forward clutch piston to the forward clutch drum.

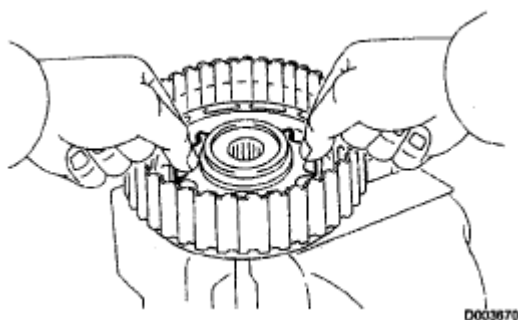


Fig. 515: Installing Forward Clutch Piston To Clutch Drum

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY

- a. Place the return spring onto the piston.

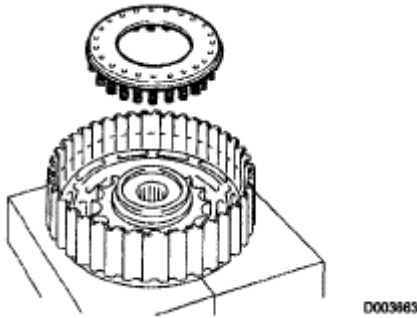


Fig. 516: Placing Return Spring Onto Piston

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

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

SST 09350-32014 (09351-32070)

- c. Install the snap ring with a snap ring expander. Be sure the end gap of the snap ring is not aligned with the spring retainer claw.

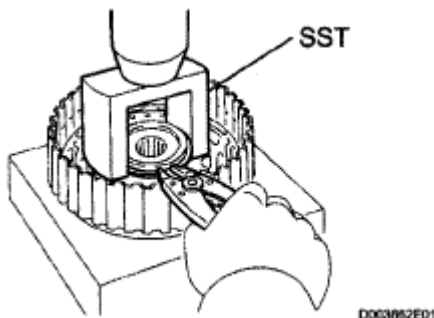


Fig. 517: Installing Snap Ring With Snap Ring Expander

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Stop the press when the spring sheet is lowered to the place 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove.
- This prevents the spring sheet from being deformed.
- Do not expand the snap ring excessively.

4. INSTALL FORWARD MULTIPLE DISC CLUTCH DISC

- a. Install the 5 plates, 5 discs and flange.

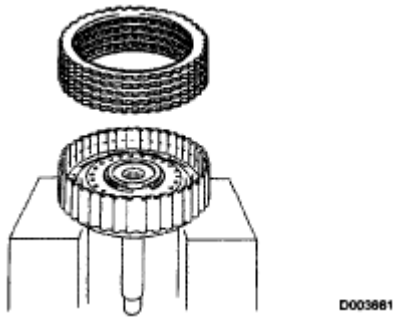


Fig. 518: Installing Plates, Discs And Flange
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a screwdriver, install the snap ring.
- c. Check that the end gap of the snap ring is not aligned with one of the cutouts.

5. INSPECT PACK CLEARANCE OF FORWARD CLUTCH

HINT:

(See INSPECTION)

6. INSPECT FORWARD MULTIPLE DISC CLUTCH DISC

HINT:

(See INSPECTION)

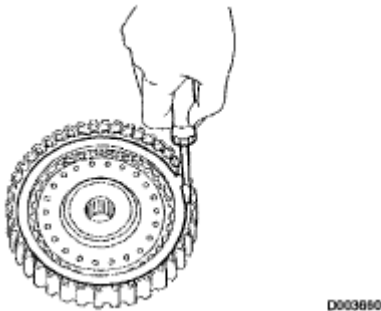
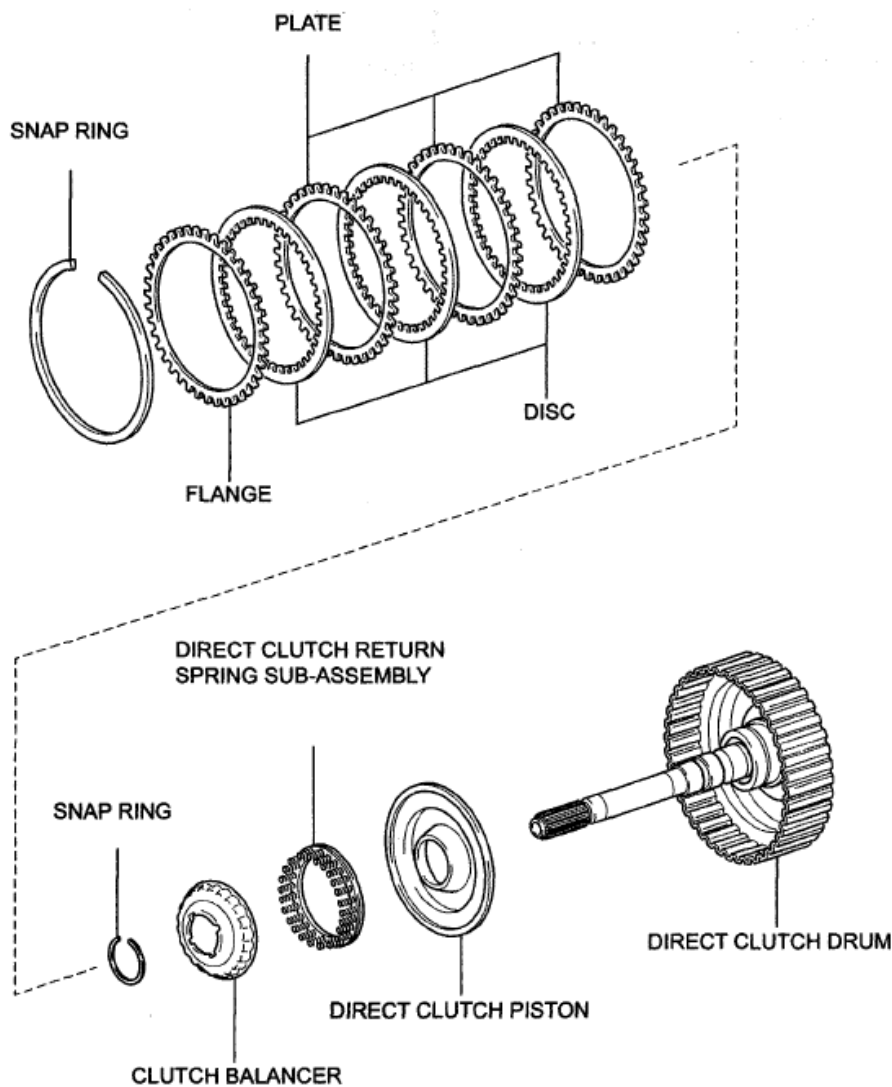


Fig. 519: Locating Manual Detent Spring Sub-Assembly And Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DIRECT CLUTCH

COMPONENTS



N

C119465E01

Fig. 520: Identifying Direct Clutch Components
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

1. INSPECT PACK CLEARANCE OF DIRECT CLUTCH

HINT:

(See INSPECTION)

2. REMOVE DIRECT MULTIPLE DISC CLUTCH DISC

- a. Using a screwdriver, remove the snap ring from the direct clutch drum.

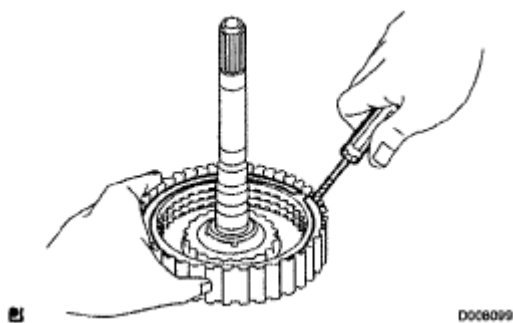


Fig. 521: Removing Snap Ring From Direct Clutch Drum
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the flange, 3 discs and 3 plates from the direct clutch drum.

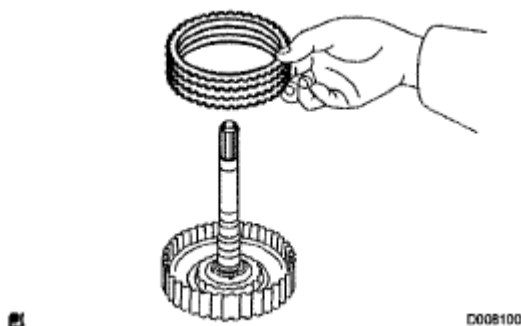


Fig. 522: Removing Flange, Discs And Plates From Direct Clutch Drum
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. REMOVE DIRECT CLUTCH RETURN SPRING SUB-ASSEMBLY

- a. Place SST on the clutch balancer and compress the spring with a press.

SST 09387-00020

- b. Using a snap ring expander, remove the snap ring from the direct clutch drum.

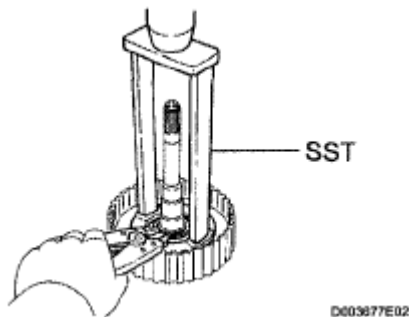


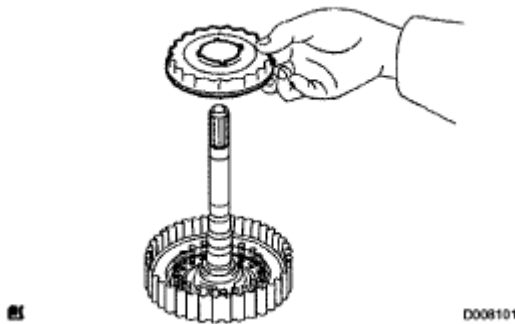
Fig. 523: Removing Snap Ring From Direct Clutch Drum

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

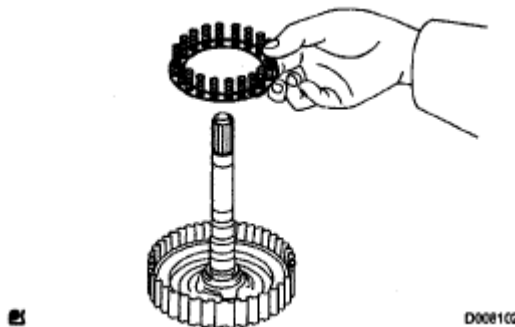
- Stop the press when the spring sheet is lowered to the place 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove.
- This prevents the spring sheet from being deformed.
- Do not expand the snap ring excessively.

- c. Remove the clutch balancer from the direct clutch drum.

**Fig. 524: Removing Clutch Balancer From Direct Clutch Drum**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Remove the piston return spring from the direct clutch drum.

**Fig. 525: Removing Piston Return Spring From Direct Clutch Drum**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Install direct clutch drum on the transaxle rear cover.
- f. Holding the direct clutch piston with your hand, apply compressed air (392 kPa, 4.0 kgf/cm² , 57 psi) to the transaxle rear cover to remove the direct clutch piston.

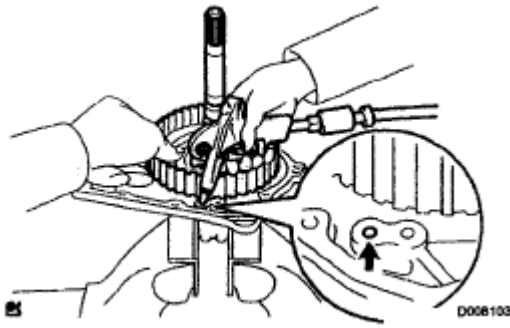


Fig. 526: Applying Compressed Air To Transaxle Rear Cover
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. INSPECT PACK CLEARANCE OF DIRECT CLUTCH

- Install the direct clutch and needle roller bearing on the transaxle rear cover.
- Using a dial indicator, measure the forward clutch pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm², 57 psi).

Pack clearance:

0.605 to 0.825 mm (0.02382 to 0.03248 in.)

If the pack clearance is non-standard, inspect the discs, plates and flange.

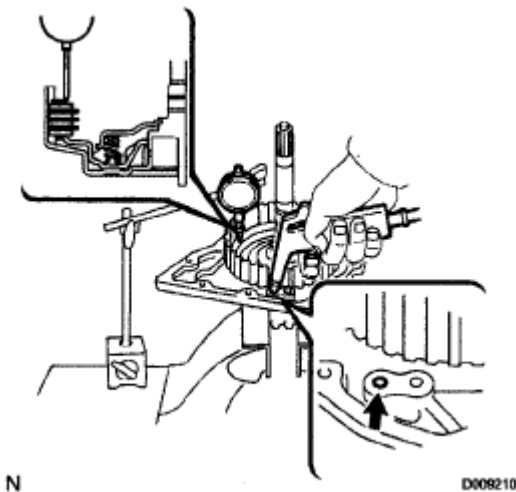


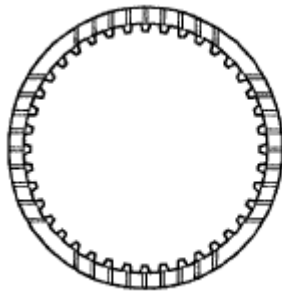
Fig. 527: Inspecting Pack Clearance Of Direct Clutch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSPECT DIRECT MULTIPLE DISC CLUTCH DISC

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

HINT:

- If the lining of the disc is peeling off or discolored, or even if a part of the printed mark is defaced, replace all discs.
- Before assembling new disc, soak them in ATF for at least 15 minutes.

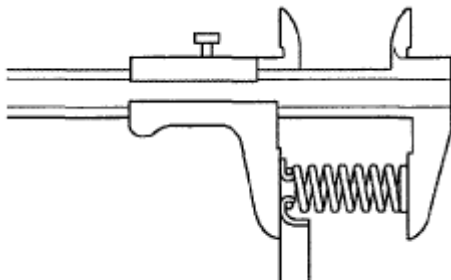


D004079

Fig. 528: Inspecting Direct Multiple Disc Clutch Disc
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSPECT DIRECT CLUTCH RETURN SPRING SUB-ASSEMBLY

- Using vernier calipers, measure the free length of the spring together with the spring seat.

Standard free length:**22.58 mm (0.8890 in.)**

N

D009211

Fig. 529: Measuring Free Length Of Spring Together With Spring Seat
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSPECT PACK CLEARANCE OF DIRECT CLUTCH

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

Pack clearance:**0.605 to 0.825 mm (0.02382 to 0.03248 in.)**

If the pack clearance is less than the minimum, parts may have been assembled incorrectly, so check and reassemble again.

If the stroke is non-standard, select another flange.

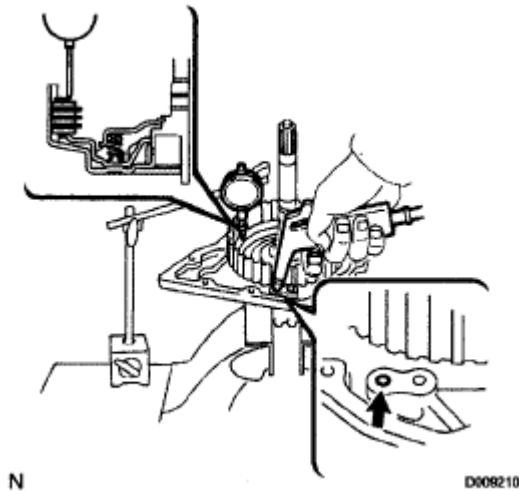


Fig. 530: Inspecting Pack Clearance Of Direct Clutch
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

There are 6 flanges in different thickness.

Flange thickness: mm (in.)

FLANGE THICKNESS

Mark	Thickness	Mark	Thickness
1	3.0 (0.118)	4	3.3 (0.130)
2	3.1 (0.122)	5	3.4 (0.134)
3	3.2 (0.126)	6	3.5 (0.138)

5. INSPECT DIRECT MULTIPLE DISC CLUTCH DISC

- Check that the disc rotates when rotating the disc after inserting the rear planetary sun gear.

NOTE: Do not place the rear planetary sun gear in a vise.

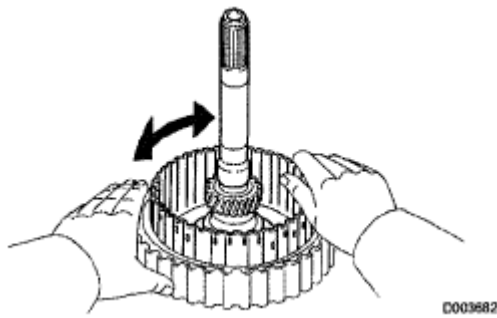


Fig. 531: Inspecting Direct Multiple Disc Clutch Disc
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REASSEMBLY

1. INSTALL DIRECT CLUTCH RETURN SPRING SUB-ASSEMBLY

- a. Coat the direct clutch piston with ATF, and install it to the direct clutch drum.

NOTE: Be careful not to damage the lip seal of the direct clutch piston.

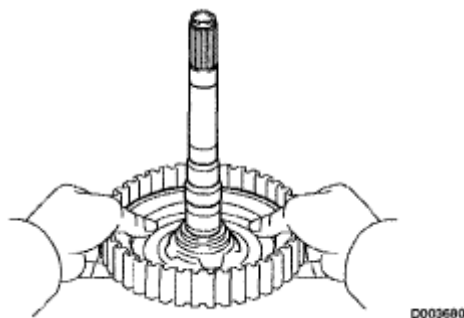


Fig. 532: Installing Direct Clutch Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the piston return spring to the direct clutch drum.

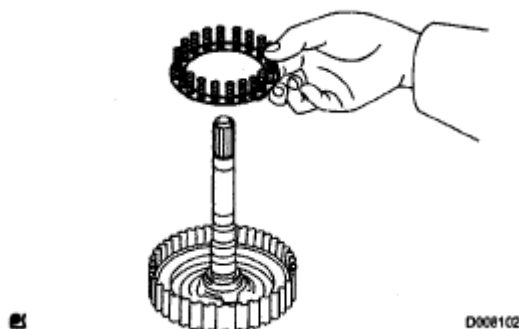


Fig. 533: Installing Piston Return Spring To Direct Clutch Drum
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the clutch balancer to the direct clutch drum.

NOTE: Be careful not to damage the lip seal of the direct clutch balancer.

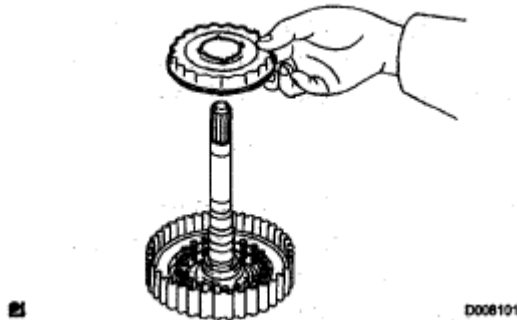


Fig. 534: Installing Clutch Balancer To Direct Clutch Drum
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Place SST on the clutch balancer and compress the piston return spring with a press.

SST 09387-00020

- e. Using a snap ring expander, install the snap ring to the direct clutch drum.

NOTE:

- Be sure the end gap of the snap ring is not aligned with the clutch balancer claw.
- Stop the press when the spring sheet is lowered to the place 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove.
- This prevents the spring sheet from being deformed.
- Do not expand the snap ring excessively.

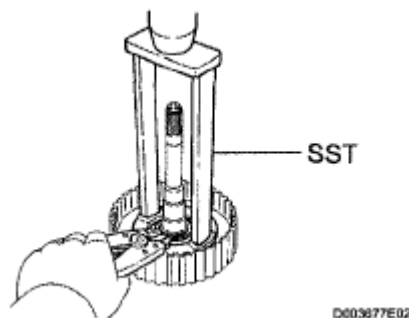


Fig. 535: Installing Snap Ring To Direct Clutch Drum
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL DIRECT MULTIPLE DISC CLUTCH DISC

- a. Install the 3 plates, 3 discs and flange to the direct clutch drum.

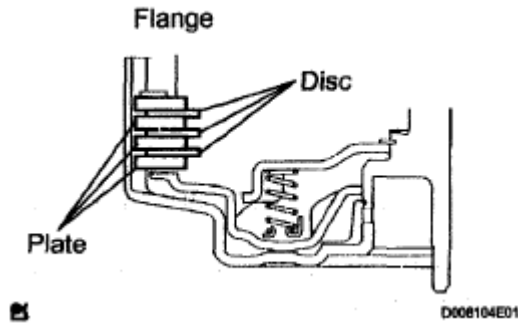


Fig. 536: Installing Plates, Discs And Flange To Direct Clutch Drum
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a screwdriver, install the snap ring.
- c. Check that the end gap of the snap ring is not aligned with one of the cutouts.

3. INSPECT PACK CLEARANCE OF DIRECT CLUTCH

HINT:

(See INSPECTION)

4. INSPECT DIRECT MULTIPLE DISC CLUTCH DISC

HINT:

(See INSPECTION)

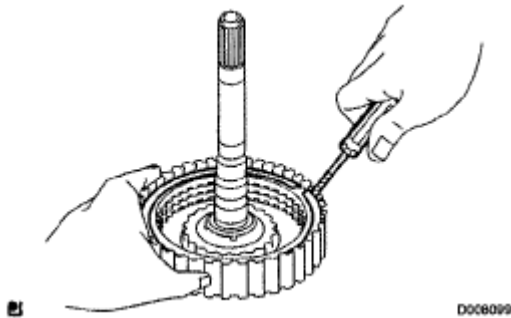
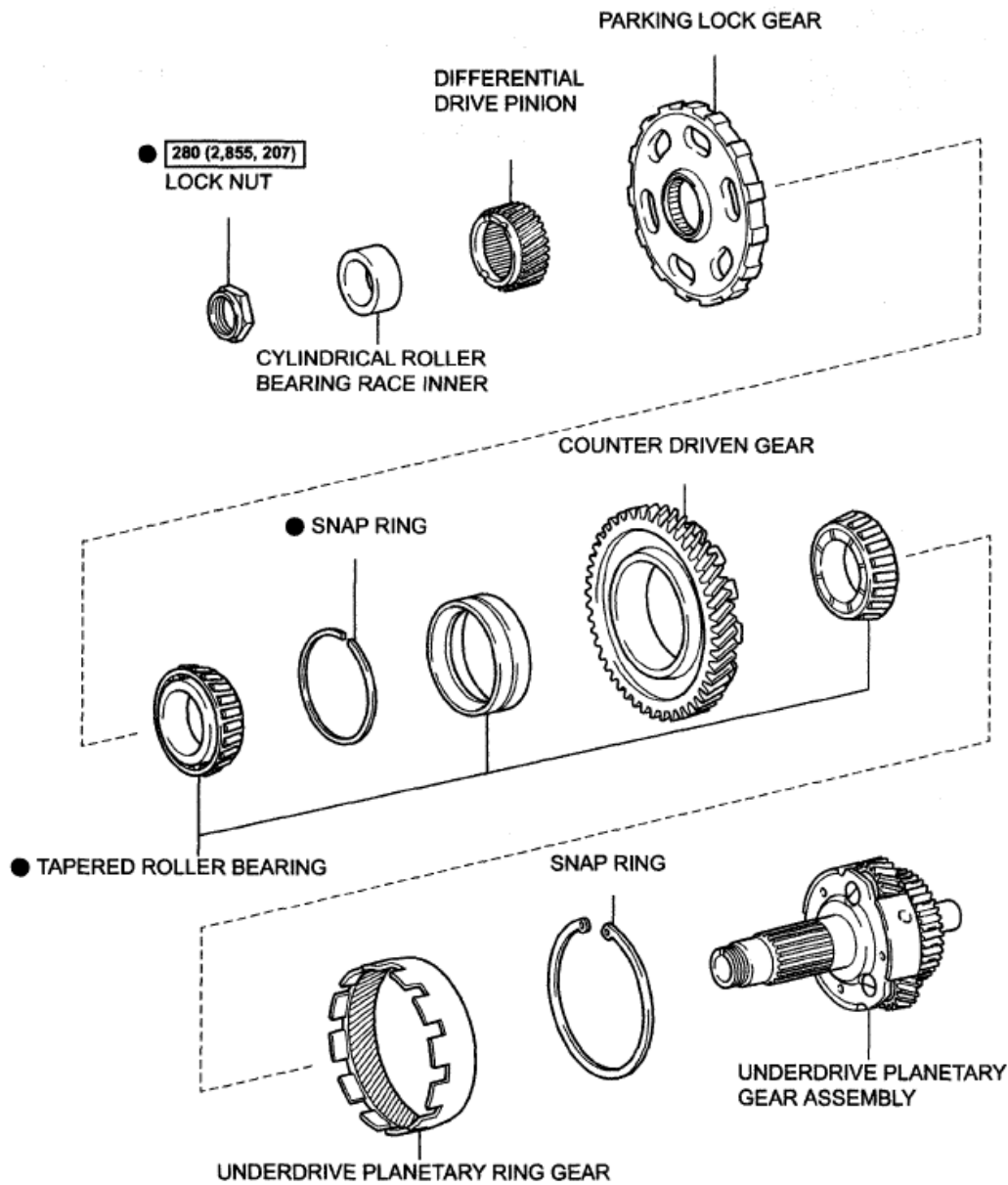


Fig. 537: Installing Snap Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

UNDERDRIVE PLANETARY GEAR

COMPONENTS



N*m (kgf*cm, ft.*lbf) : Specified torque

● Non-reusable part

N

C119457E01

Fig. 538: Identifying Underdrive Planetary Gear Components With Torque Specifications
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

1. INSPECT UNDERDRIVE PLANETARY GEAR PRELOAD

HINT:

(See **INSPECTION**)

2. REMOVE FRONT PLANETARY GEAR NUT

- a. Using SST, loosen the staked part of the lock nut.

SST 09930-00010 (09931-00010, 09931-00020), 09387-00050

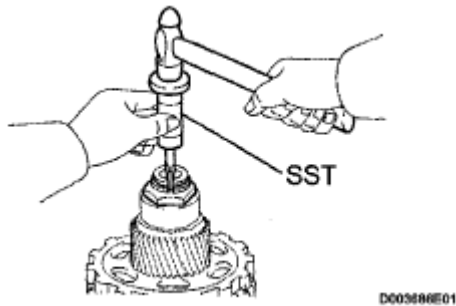


Fig. 539: Staking Lock Nut Using SST

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Place the underdrive planetary gear in a soft jaw vise.

NOTE: Be careful not to damage the differential drive pinion.

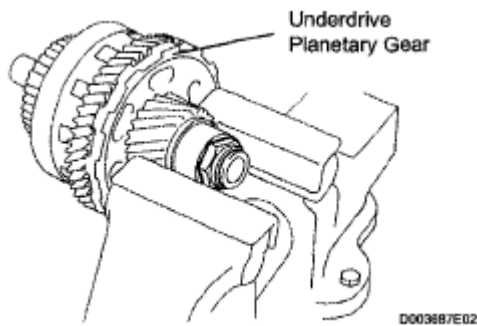


Fig. 540: Placing Underdrive Planetary Gear In Soft Jaw Vise

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using SST, remove the lock nut.

SST 09564-16020

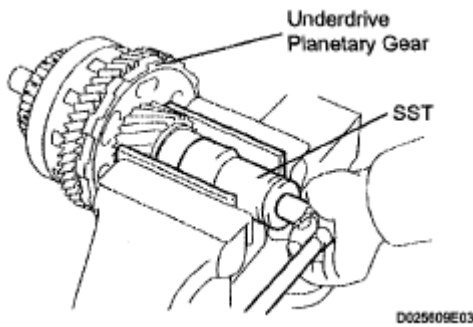


Fig. 541: Removing Lock Nut Using SST
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. REMOVE CYLINDRICAL ROLLER BEARING RACE INNER

- a. Using SST, remove the cylindrical roller bearing race inner.

SST 09950-00020, 09950-00030, 09950-60010 (09951-00340)

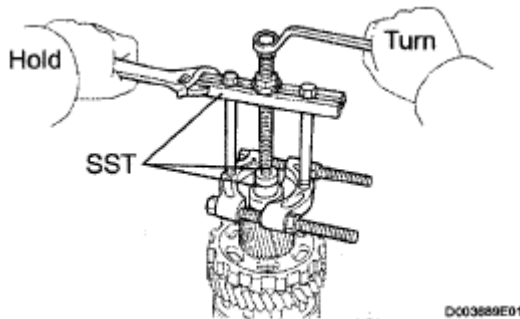


Fig. 542: Removing Cylindrical Roller Bearing Race Inner
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. REMOVE UNDERDRIVE PLANETARY GEAR ASSEMBLY

- a. Using SST and a press, remove the differential drive pinion, parking lock gear, counter driven gear with underdrive planetary ring gear and radial ball bearing front.

SST 09387-00050

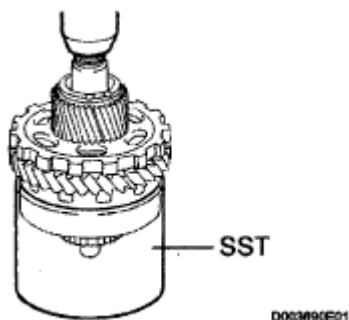
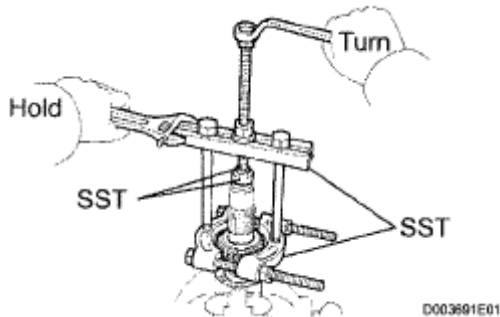


Fig. 543: Removing Differential Drive Pinion

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Place the underdrive planetary gear in a soft jaw vise.
- c. Using SST, remove the radial ball bearing rear from the underdrive planetary gear.

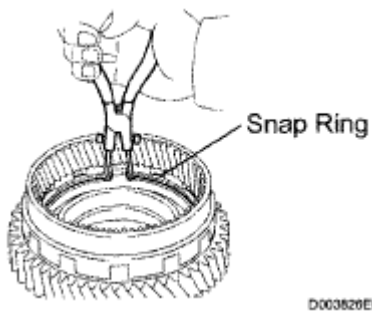
SST 09950-00020, 09950-00030, 09950-60010 (09951-00320)

**Fig. 544: Removing Radial Ball Bearing Rear From Underdrive Planetary Gear**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. REMOVE UNDERDRIVE PLANETARY RING GEAR

- a. Using snap ring pliers, remove the snap ring.

**Fig. 545: Removing Snap Ring**

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the underdrive planetary ring gear from the counter driven gear.

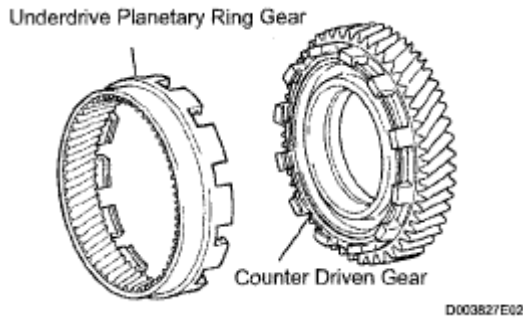


Fig. 546: Removing Underdrive Planetary Ring Gear From Counter Driven Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. INSPECT UNDERDRIVE PLANETARY GEAR PRELOAD

- a. Using SST, fix the underdrive planetary gear assembly.

SST 09387-00050

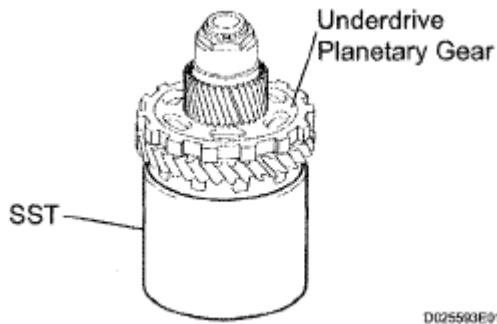


Fig. 547: Identifying Underdrive Planetary Gear Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using SST and a torque wrench, measure the turning torque of the underdrive planetary gear assembly while rotating the torque wrench at 60 rpm.

SST 09387-00050,09564-16020

Turning torque at 60 rpm.:

0.23 to 5.01 N*m (2.3 to 51 kgf*cm, 2.0 to 44.3 in.*lbf)

HINT:

Use a torque wrench with a fulcrum length of 160 mm (6.3 in.).

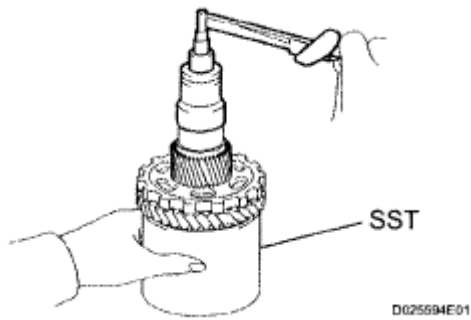


Fig. 548: Measuring Turning Torque Of Underdrive Planetary Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REASSEMBLY

1. INSTALL UNDERDRIVE PLANETARY RING GEAR

- a. Install a new snap ring to the outer race of the radial ball bearing rear.

HINT:

When replacing the bearing, also replace the counter driven gear with a new one.

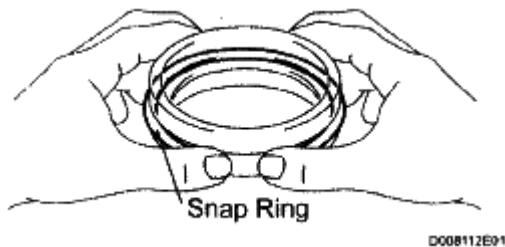


Fig. 549: Installing Snap Ring To Outer Race Of Radial Ball Bearing Rear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a piston ring compressor, squeeze the snap ring.

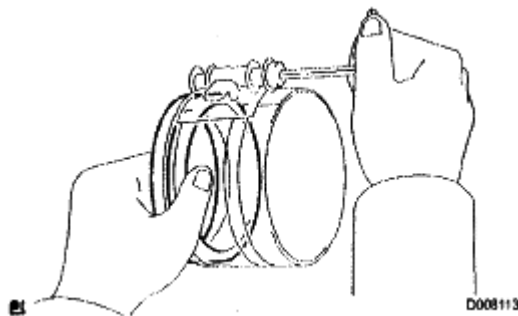


Fig. 550: Squeezing Snap Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using SST and a press, press in the outer race of the radial ball bearing rear.

SST 09950-60020 (09951-00890), 09950-70010 (09951-07100)

NOTE: Be sure not to damage the snap ring during outer race installation.

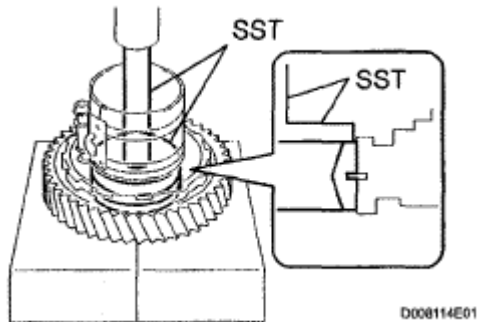


Fig. 551: Pressing Outer Race Of Radial Ball Bearing Rear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Install the underdrive planetary ring gear to the counter driven gear.

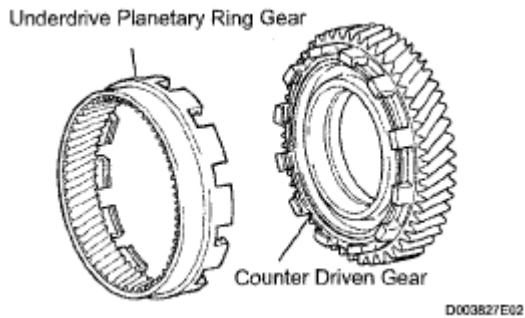


Fig. 552: Identifying Underdrive Planetary Ring Gear And Counter Driven Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- e. Using snap ring pliers, install the snap ring.

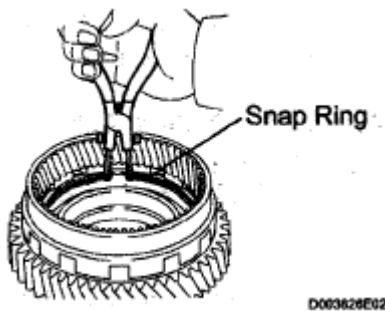


Fig. 553: Installing Snap Ring Using Snap Ring Pliers

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL UNDERDRIVE PLANETARY GEAR ASSEMBLY

- a. Using a press, press the radial ball bearing rear in the underdrive planetary gear.

NOTE: Press the bearing until it becomes flat at the bottom.

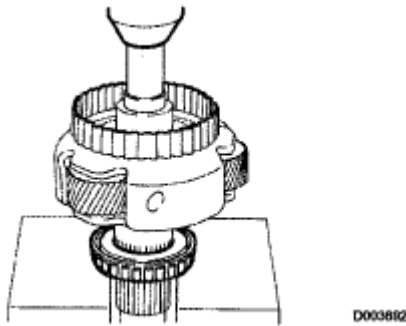


Fig. 554: Pressing Radial Ball Bearing Rear In Underdrive Planetary Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install the counter driven gear with planetary ring gear to the underdrive planetary gear.

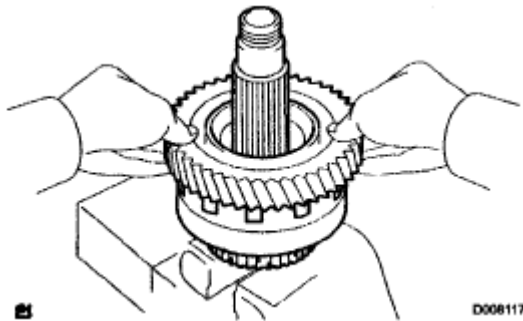


Fig. 555: Installing Counter Driven Gear With Planetary Ring Gear To Underdrive Planetary Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using SST and a press, press in the radial ball bearing front.

SST 09316-60011(09316-00011)

NOTE: Press the counter driven gear while rotating it.

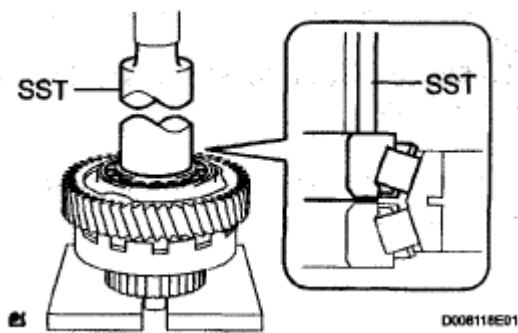


Fig. 556: Pressing In Radial Ball Bearing Front
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Using SST and a press, press in the parking lock gear.

SST 09502-12010, 09950-60010 (09951-00260), 09950-70010 (09951-07100)

NOTE: Press the counter driven gear while rotating it.

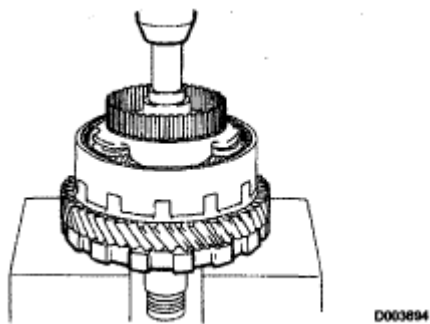


Fig. 557: Pressing In Parking Lock Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL DIFFERENTIAL DRIVE PINION

- a. Using a press, press the differential drive pinion.

NOTE: Press the counter driven gear while rotating it.

SST 09506-35010, 09950-60010 (09951 -00250)

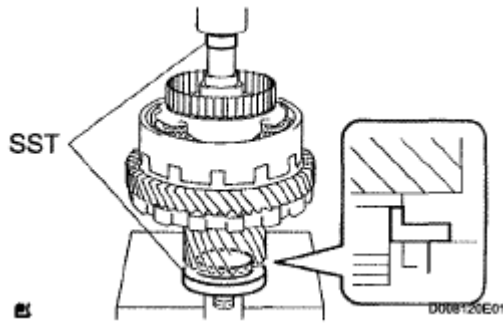


Fig. 558: Pressing Differential Drive Pinion
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSTALL CYLINDRICAL ROLLER BEARING RACE INNER

- a. Using a press, press the cylindrical roller bearing race inner.

NOTE: Press the counter driven gear while rotating it.

SST 09506-35010, 09950-60010 (09951-00250)

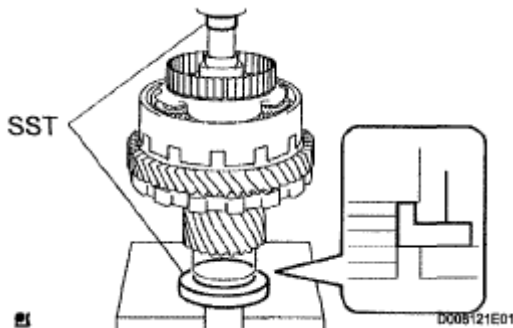


Fig. 559: Pressing Cylindrical Roller Bearing Race Inner
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. INSTALL FRONT PLANETARY GEAR NUT

- a. Place the underdrive planetary gear in a soft jaw vise.

NOTE: Be careful not to damage the differential drive pinion.

- b. Using SST, install a new lock nut.

Torque: 280 N*m (2,885 kgf*cm, 207 ft.*lbf)

SST 09564-16020

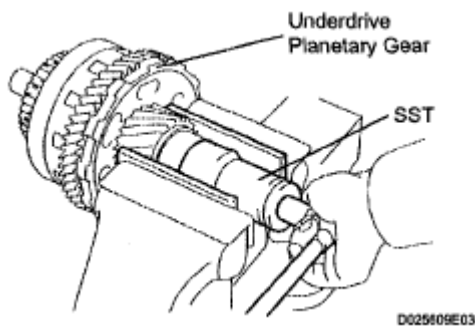


Fig. 560: Placing Underdrive Planetary Gear In Soft Jaw Vise
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Use a torque wrench with a fulcrum length of 750 mm (29.53 in.).

- c. Using a pin punch and hammer, stake the lock nut.

CAUTION: Be sure that there are no cracks on the nut.

6. INSPECT UNDERDRIVE PLANETARY GEAR PRELOAD

HINT:

(See INSPECTION)

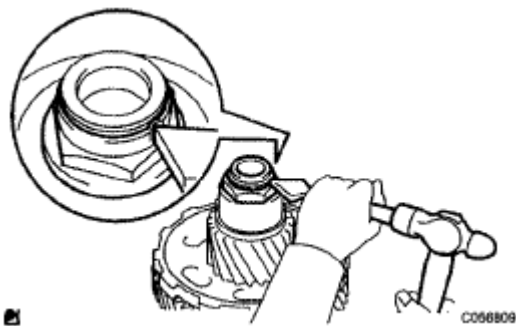
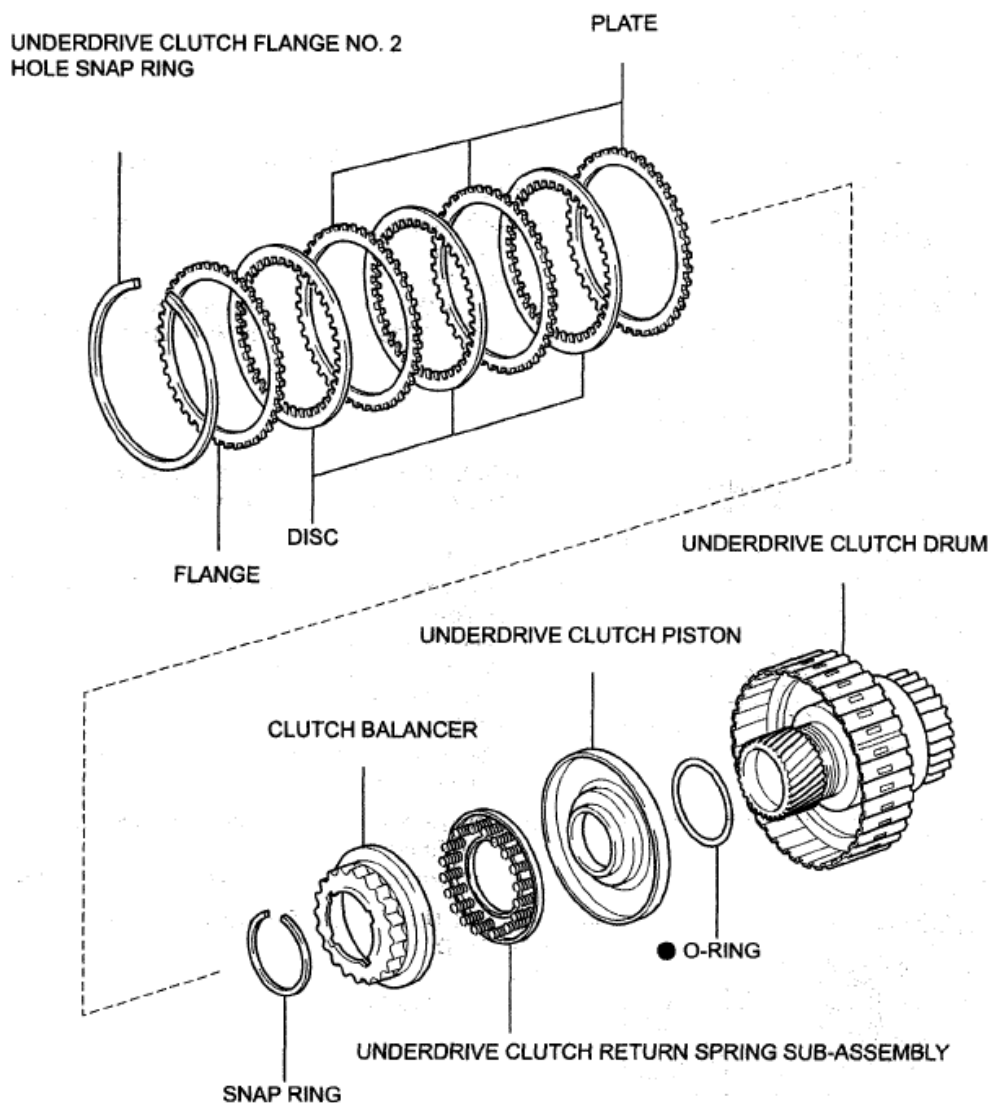


Fig. 561: Staking Lock Nut
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

UNDERDRIVE CLUTCH

COMPONENTS



● Non-reusable part

N

C119456E02

Fig. 562: Identifying Underdrive Clutch Components
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

1. INSPECT UNDERDRIVE PACK CLEARANCE

HINT:

(See **INSPECTION**)

2. REMOVE UNDERDRIVE CLUTCH FLANGE NO. 2 HOLE SNAP RING

- a. Using a screwdriver, remove the underdrive clutch flange No. 2 snap ring.

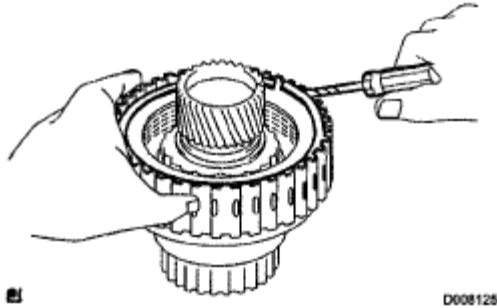


Fig. 563: Removing Underdrive Clutch Flange NO.2 Snap Ring Using Screwdriver
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. REMOVE UNDERDRIVE CLUTCH DISC NO. 1

- a. Remove the flange, 3 discs and 3 plates from the U7 D clutch drum.

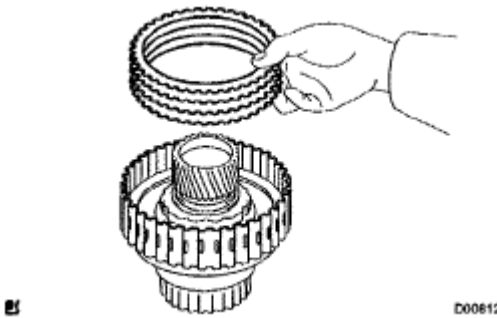


Fig. 564: Removing Flange, Discs And Plates From U/ D Clutch Drum
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. REMOVE UNDERDRIVE CLUTCH RETURN SPRING SUB-ASSEMBLY

- a. Place SST on the clutch balancer and compress the spring with a press.

SST 09350-32014 (09351-32070)

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

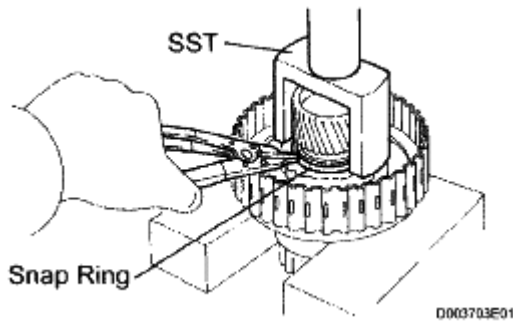


Fig. 565: Compressing Spring With Press
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

NOTE:

- Stop the press when the spring seat is lowered to the place 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove.
- This prevents the spring seat from being deformed.
- Do not expand the snap ring excessively.

c. Remove the clutch balancer from the underdrive clutch drum.

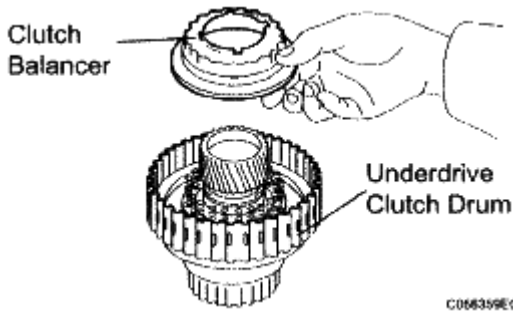


Fig. 566: Removing Clutch Balancer From Underdrive Clutch Drum
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

d. Remove the return spring from the underdrive clutch drum.

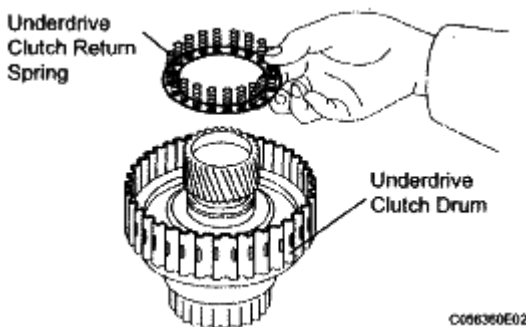


Fig. 567: Removing Return Spring From Underdrive Clutch Drum
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. REMOVE UNDERDRIVE CLUTCH PISTON SET

- a. Install the underdrive clutch to the transaxle case.

NOTE: Be careful not to damage the oil seal ring.

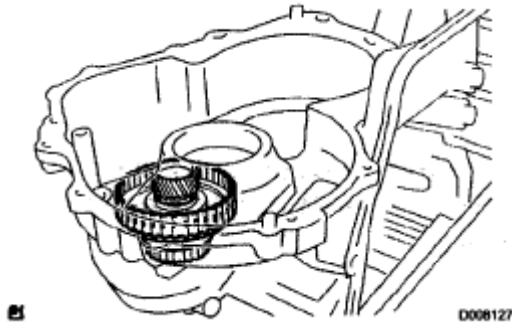


Fig. 568: Installing Underdrive Clutch To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Holding the underdrive clutch piston by hand, apply compressed air (392 kPa, 4.0 kgf/cm², 57 psi) to the transaxle case to remove the underdrive clutch piston.

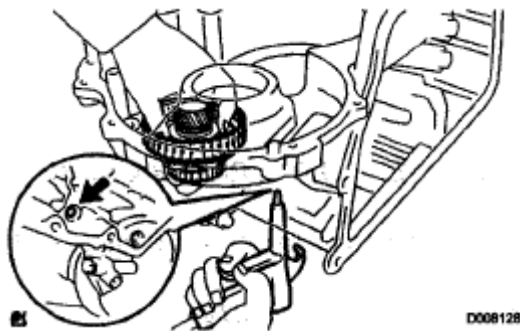


Fig. 569: Applying Compressed Air To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. REMOVE UNDERDRIVE CLUTCH DRUM O-RING

- a. Using a screwdriver, remove the O-ring from the underdrive clutch drum.

INSPECTION**1. INSPECT UNDERDRIVE PACK CLEARANCE**

- a. Install the underdrive clutch to the transaxle case.

NOTE: Be careful not to damage the oil seal rings.

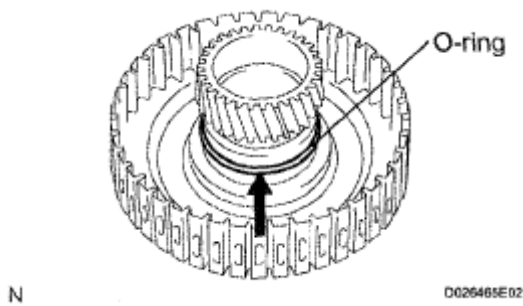


Fig. 570: Locating O-Ring

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Install a dial indicator as shown in the illustration.

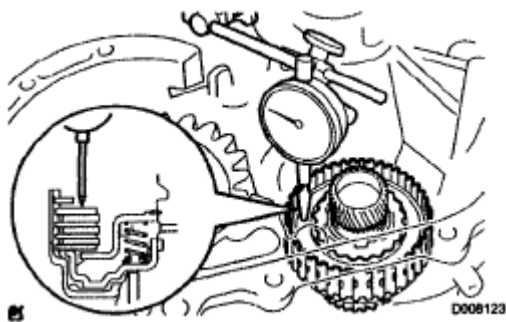


Fig. 571: Installing Dial Indicator

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Measure the underdrive clutch pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm², 57 psi).

Pack clearance:

1.51 to 1.90 mm (0.0594 to 0.0748 in.)

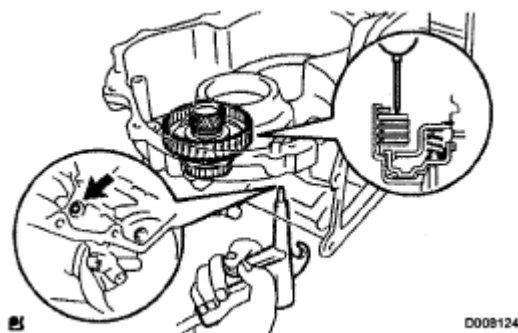


Fig. 572: Measuring Underdrive Clutch Pack Clearance

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- If the pack clearance is not as specified, inspect the discs, plates and flange.
- If the clearance is less than the minimum, parts may have been assembled incorrectly, so check and reassemble again.
- If the park clearance is non-standard, select another flange.

HINT:

There are 3 flanges in different thickness.

Flange thickness: mm (in.)

FLANGE THICKNESS SPECIFICATIONS

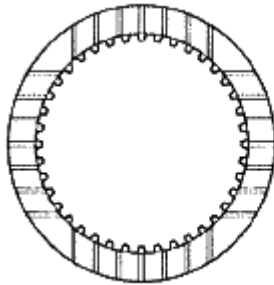
Mark	Thickness	Mark	Thickness
1	3.0 (0.118)	3	3.4 (0.134)
2	3.2 (0.126)	-	-

2. INSPECT UNDERDRIVE CLUTCH DISC NO. 1

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

HINT:

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



D004077

Fig. 573: Identifying Underdrive Clutch Disc No.1
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSPECT UNDERDRIVE CLUTCH DRUM SUB-ASSEMBLY

- Using a dial indicator, measure the inside diameter of the underdrive clutch drum bushing.

Standard drum bushing:

32.56 to 32.58 mm (1.2818 to 1.2826 in.)

Maximum drum bushing:

32.63 mm (1.2846 in.)

If the inside diameter is greater than the maximum, replace the underdrive clutch drum.

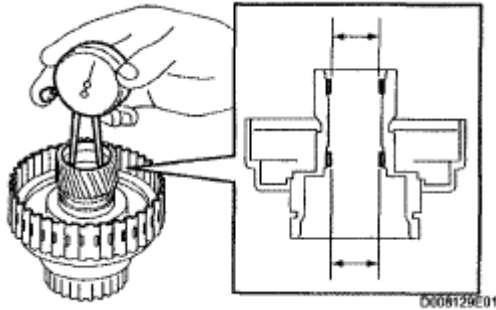


Fig. 574: Inspecting Underdrive Clutch Drum Sub-Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSPECT UNDERDRIVE CLUTCH RETURN SPRING SUB-ASSEMBLY

- a. Using vernier calipers, measure the free length of the spring together with the spring seat.

Standard free length:

17.14 mm (0.6748 in.)

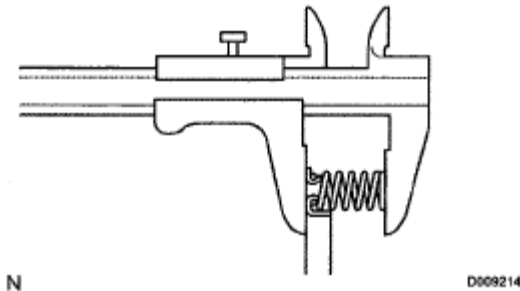


Fig. 575: Measuring Free Length Of Spring Together With Spring Seat Using Vernier Calipers
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REASSEMBLY

1. INSTALL UNDERDRIVE: CLUTCH DRUM O-RING

- a. Coat a new O-ring with ATF, and install it to the underdrive clutch drum.

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

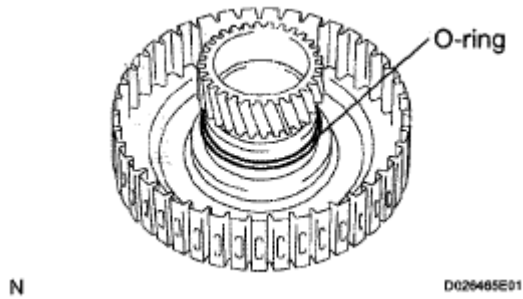


Fig. 576: Identifying O-Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL UNDERDRIVE CLUTCH PISTON SET

- a. Coat the underdrive clutch piston with ATF, and install it to the underdrive clutch piston drum.

NOTE:

- Be careful not to damage the O-ring.
- Be careful not to damage the lip of the piston.

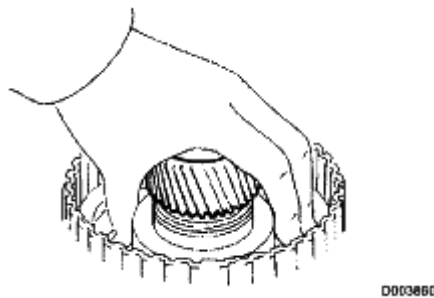


Fig. 577: Installing Underdrive Clutch Piston
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL UNDERDRIVE CLUTCH RETURN SPRING SUB-ASSEMBLY

- a. Install the return spring to the underdrive clutch drum.

NOTE:

Installing the spring sub-assembly, check that all of the springs are fit in the piston correctly.

- b. Coat the clutch balancer with ATF.

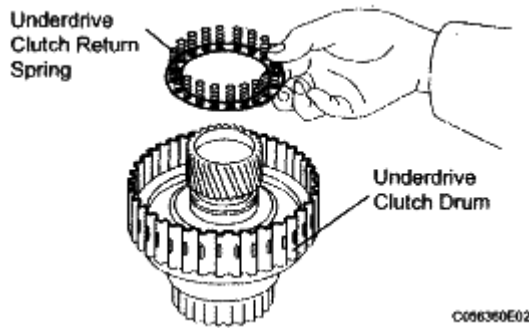


Fig. 578: Installing Return Spring To Underdrive Clutch Drum
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Install the clutch balancer to the underdrive clutch drum.

NOTE: Be careful not to damage the lip of the clutch balancer.

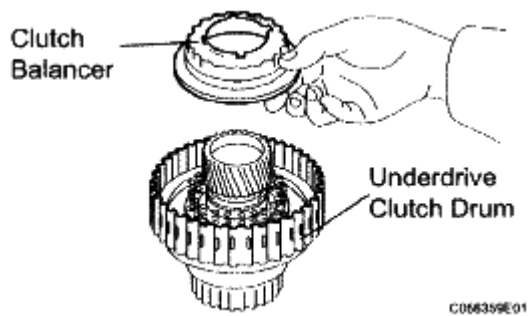


Fig. 579: Installing Clutch Balancer To Underdrive Clutch Drum
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Place SST on the clutch balancer and compress the piston return spring with a press.

SST 09350-32014 (09351-32070)

- e. Using a snap ring expander, install the snap ring to the underdrive clutch drum.
f. Be sure that the end gap of the snap ring is not aligned with the spring retainer claw.

NOTE:

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

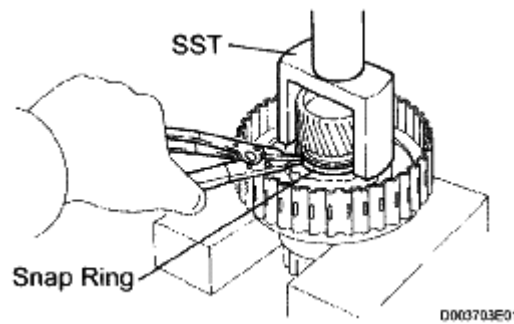


Fig. 580: Installing Snap Ring To Underdrive Clutch Drum
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- This prevents the spring seat from being deformed.
- Do not expand the snap ring excessively.

4. INSTALL UNDERDRIVE CLUTCH DISC NO. 1

- a. Coat the 3 discs with ATF.
- b. Install the 3 plates, 3 discs and flange to the U/D clutch drum.

NOTE: Make sure that the plates, discs, and flange are installed as shown in the illustration.

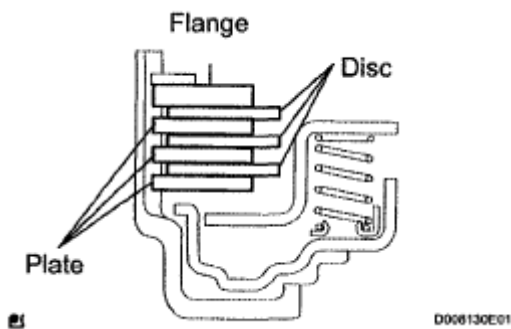
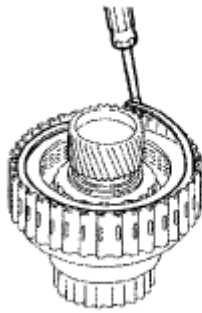


Fig. 581: Installing Underdrive Clutch Disc No.1
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. INSTALL 1ST & REVERSE BRAKE RETURN SPRING SHAFT SNAP RING

- a. Using a screwdriver, install the underdrive clutch flange No. 2 hole snap ring.
- b. Check that the end gap of snap ring is not aligned with one of the cutouts.

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



D003701

Fig. 582: Installing Underdrive Clutch Flange Hole Snap Ring
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSPECT UNDERDRIVE PACK CLEARANCE

HINT:

(See INSPECTION)

DIFFERENTIAL CASE

COMPONENTS

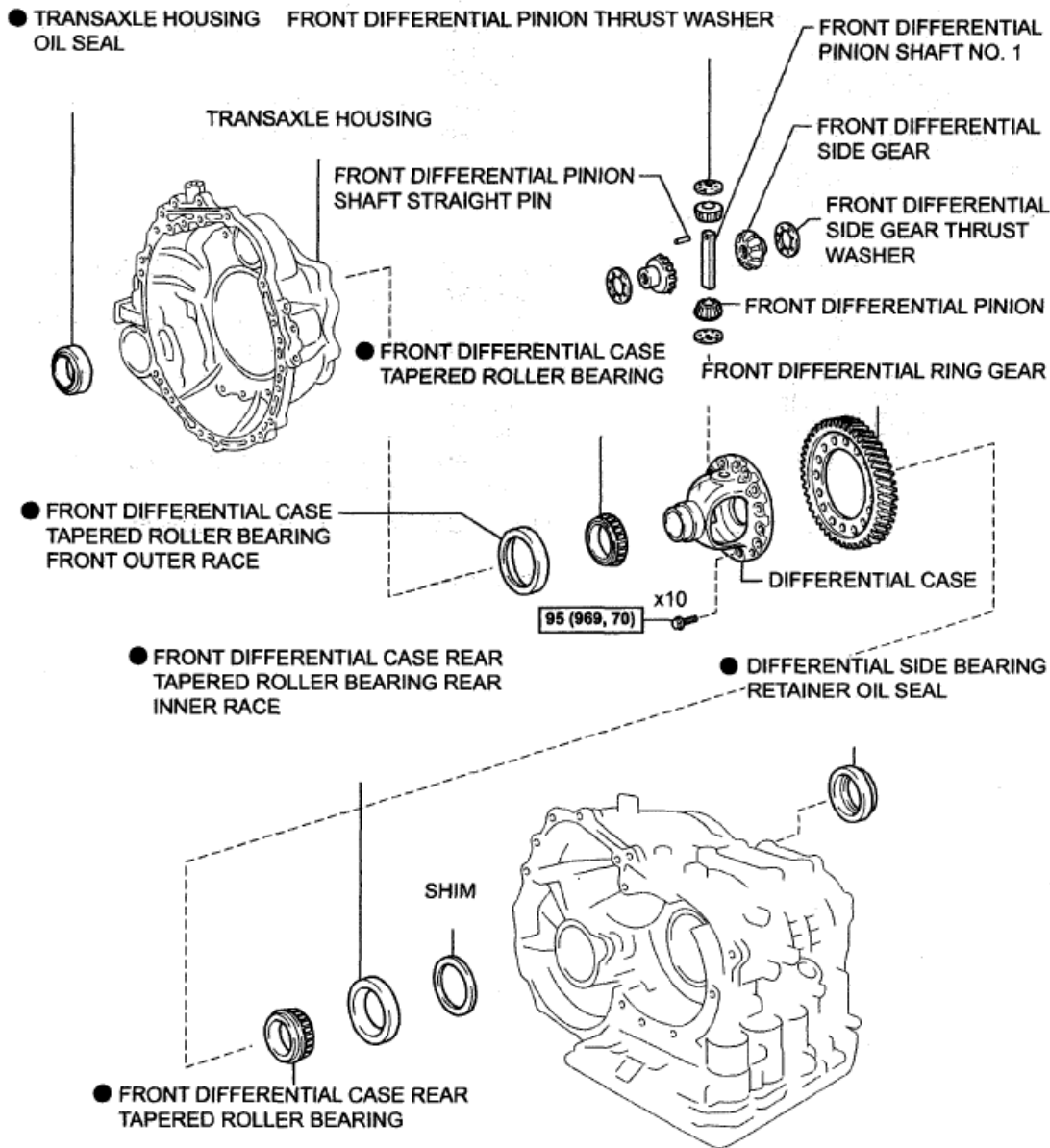


Fig. 583: Identifying Differential Case Components With Torque Specifications
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

DISASSEMBLY

1. REMOVE FRONT DIFFERENTIAL RING GEAR

- Place matchmarks on the front differential ring gear and differential case.

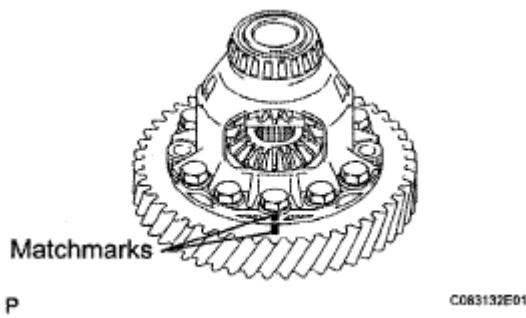


Fig. 584: Identifying Matchmarks On Front Differential Ring Gear Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Remove the 10 bolts.

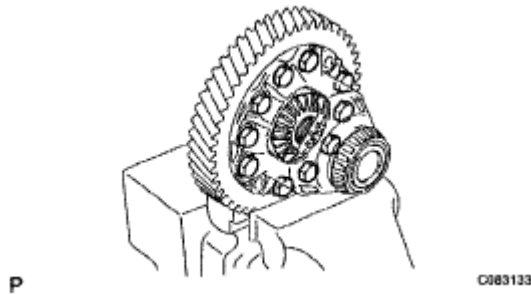


Fig. 585: Removing Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- c. Using a plastic hammer, tap on the front differential ring gear to remove it from the case.

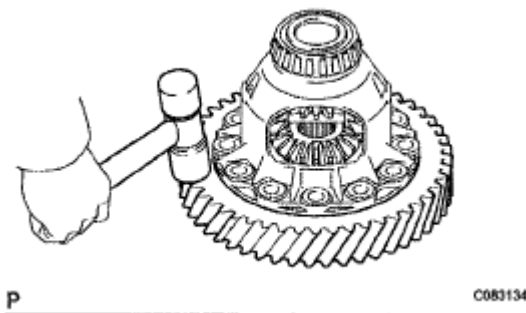


Fig. 586: Tapping On Front Differential Ring Gear Using Plastic Hammer
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. REMOVE FRONT DIFFERENTIAL CASE FRONT TAPERED ROLLER BEARING

- a. Using SST, remove the front differential case front differential tapered roller bearing from the differential case.

SST 09950-40011 (09951-04020, 09952-04010, 09953-04020, 09954-04010, 09955-04061, 09957-04010, 09958-04011), 09950-60010 (09951-00340)

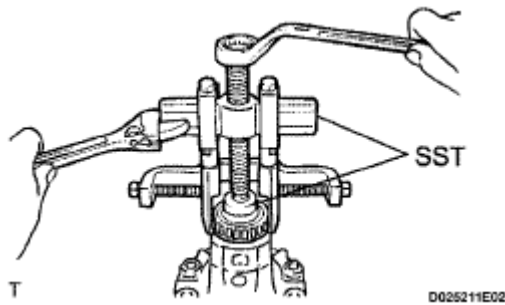


Fig. 587: Removing Front Differential Case Front Differential Tapered Roller Bearing From Differential Case

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using SST, remove the front differential case tapered roller bearing front outer race and differential case washer.

SST 09387-00041 (09387-01030, 09387-01040, 09387-02010, 09387-02020)

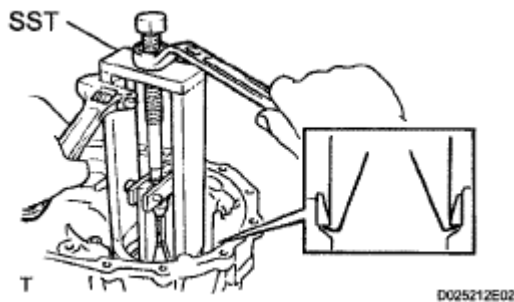


Fig. 588: Removing Front Differential Case Tapered Roller Bearing Front Outer Race And Differential Case Washer

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 tapered roller bearing rear inner race from the differential case.

SST 09950-40011 (09951-04020, 09952-04010, 09953-04020, 09954-04010, 09955-04061, 09957-04010, 09958-04011), 09950-60010 (09951-00340)

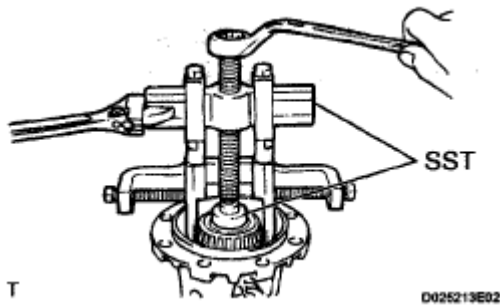


Fig. 589: Removing Front Differential Case Tapered Roller Bearing Rear Inner Race From Differential Case

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using SST, remove the front differential case rear tapered roller bearing outer race.

SST 09387-00041 (09387-01030, 09387-01040, 09387-02010, 09387-02020)

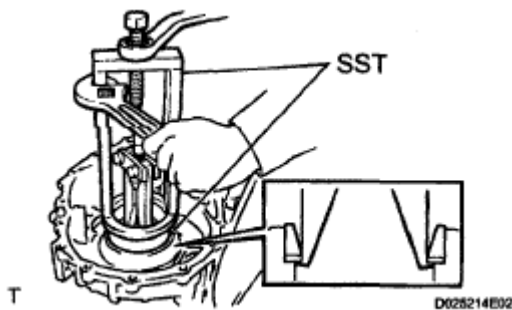


Fig. 590: Removing Front Differential Case Rear Tapered Roller Bearing Outer Race

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. REMOVE FRONT DIFFERENTIAL PINION SHAFT STRAIGHT PIN

- a. Using a punch and a hammer, loosen the staked part of the differential case.

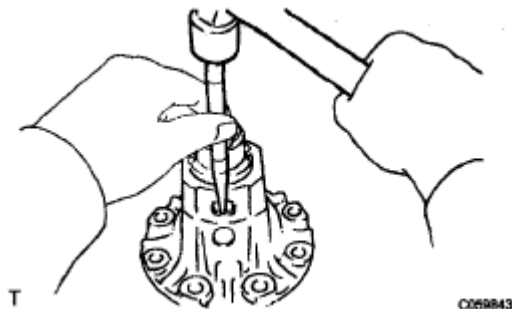


Fig. 591: Staking Differential Case

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a pin punch (5 mm), drive out the pin from ring gear side.

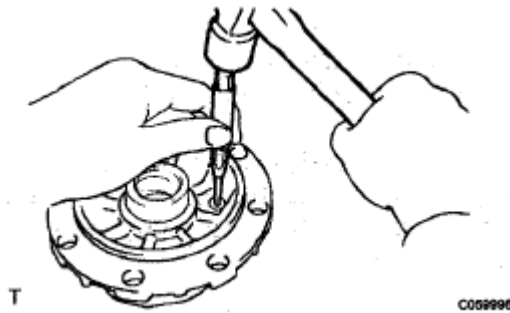


Fig. 592: Driving Out Pin From Ring Gear Side
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. REMOVE FRONT DIFFERENTIAL PINION SHAFT NO. 1

- a. Remove the front differential pinion shaft No. 1 from the differential case.

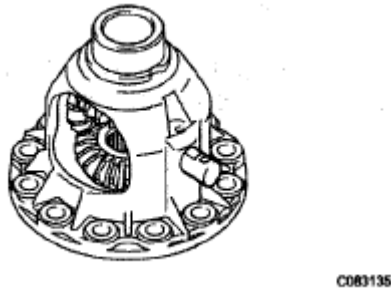


Fig. 593: Removing Front Differential Pinion Shaft No.1
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. REMOVE FRONT DIFFERENTIAL SIDE GEAR

- a. Remove the 2 front differential pinions, 2 pinion thrust washers, 2 front differential side gears and 2 side gear thrust washers from the differential case.

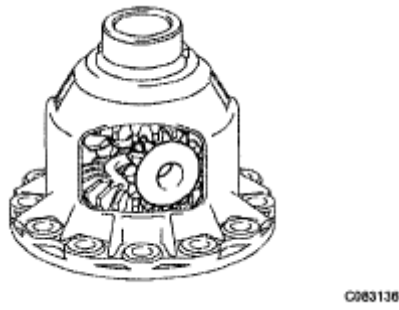
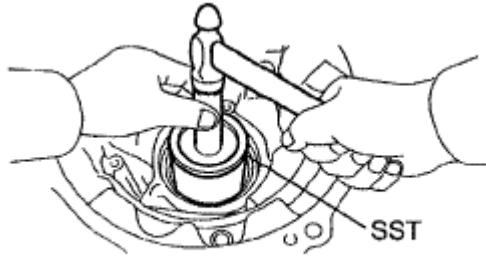


Fig. 594: Removing Front Differential Pinions, Pinion Thrust Washers From Differential Case
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. REMOVE TRANSAXLE HOUSING OIL SEAL

- a. Using SST and a hammer, remove the oil seal.

SST 09308-00010



D025500E03

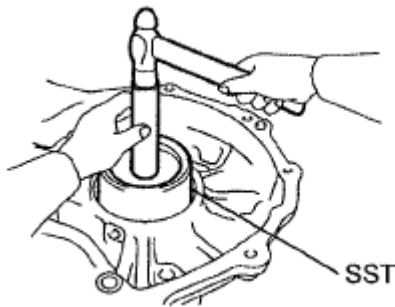
Fig. 595: Removing Oil Seal

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. REMOVE DIFFERENTIAL SIDE BEARING RETAINER OIL SEAL

- a. Using SST, remove the oil seal.

SST 09308-00010



D025800E03

Fig. 596: Removing Differential Side Bearing Retainer Oil Seal

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. INSPECT BACKLASH

- a. Using a dial indicator, inspect the backlash of the side gear.

Standard backlash:

0.05 to 0.20 mm (0.0020 to 0.0079 in.)

Thrust washer thickness

THRUST WASHER THICKNESS

Mark	Thickness
-	1.0 mm (0.0394 in.)
-	1.1 mm (0.0433 in.)
-	1.2 mm (0.0472 in.)
-	1.3 mm (0.0512 in.)

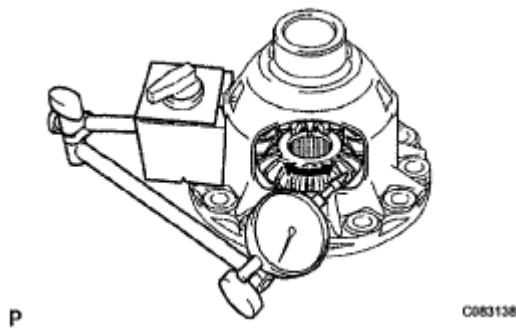


Fig. 597: Inspecting Backlash Of Side Gear Using Dial Indicator
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REASSEMBLY

1. INSTALL FRONT DIFFERENTIAL SIDE GEAR

- Apply ATF to the 2 front differential side gears, 2 side gear thrust washers, 2 front differential pinions and 2 pinion thrust washers and install them to the differential case.

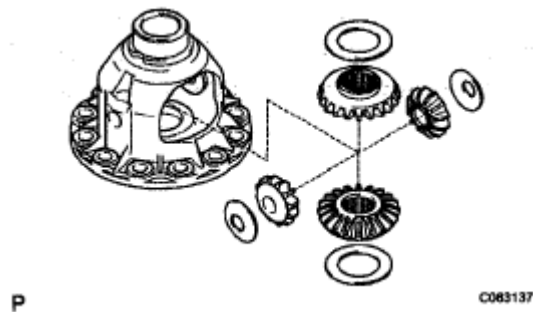


Fig. 598: Installing Front Differential Side Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

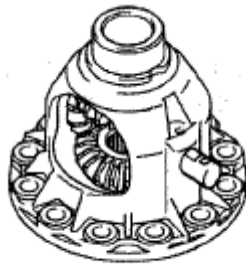
2. INSTALL FRONT DIFFERENTIAL PINION SHAFT NO. 1

- Coat the front differential pinion shaft No. 1 with ATF, and install it to the differential case.

3. INSPECT BACKLASH

HINT:

(See **INSPECTION**)



P

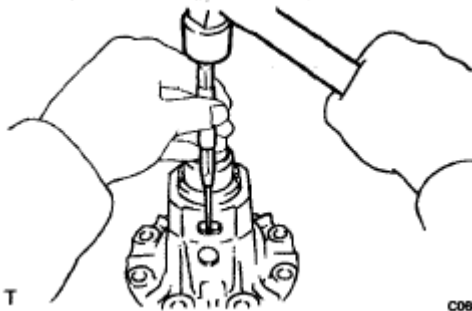
C083135

Fig. 599: Installing Front Differential Pinion Shaft No.1

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. INSTALL FRONT DIFFERENTIAL PINION SHAFT STRAIGHT PIN

- a. Using a pin punch and a hammer, install the pinion shaft straight pin.



T

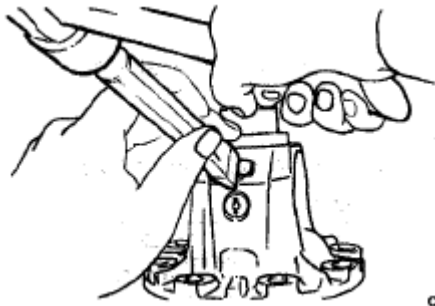
C080005

Fig. 600: Installing Pinion Shaft Straight Pin

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using a chisel and a hammer, stake the differential case.

NOTE: Stake the differential case after adjusting the backlash.



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C080006

Fig. 601: Staking Differential Case Using Chisel And Hammer

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

5. INSTALL FRONT DIFFERENTIAL CASE FRONT TAPERED ROLLER BEARING

- a. Using SST and a press, install the front differential case front tapered roller bearing to the

differential case.

SST 09608-06041

NOTE: Do not damage the bearing cage when installing the bearing inner race.

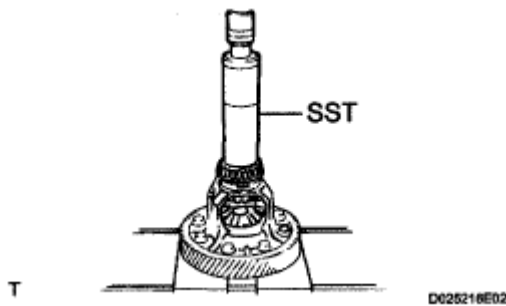


Fig. 602: Installing Front Differential Case Front Tapered Roller Bearing To Differential Case

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using SST and a hammer, install the front differential case tapered roller bearing front outer race to the transaxle housing.

SST 09950-60020 (09951-00680), 09950-70010 (09951-07100), 09950-60010 (09951-00340)

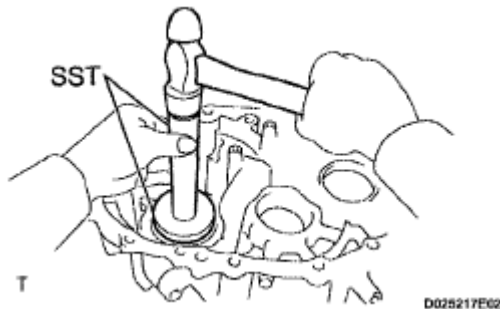


Fig. 603: Installing Front Differential Case Tapered Roller Bearing Front Outer Race To Transaxle Housing

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

6. INSTALL FRONT DIFFERENTIAL CASE REAR TAPERED ROLLER BEARING

- a. Using SST and a press, install the front differential case front tapered roller bearing to the differential case.

SST 09608-06041

NOTE: Do not damage the bearing cage when installing the bearing inner

race.

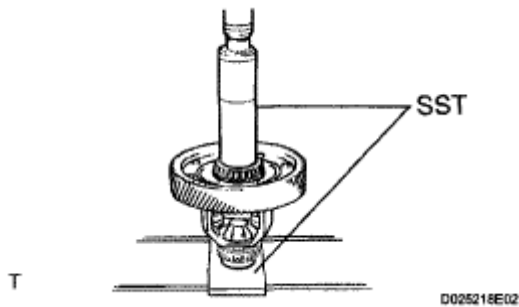


Fig. 604: Installing Front Differential Case Front Tapered Roller Bearing To Differential Case

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Using SST and a hammer, install the case washer and front differential case tapered roller bearing rear outer race to the transaxle case.

SST 09950-60020 (09951-00710), 09950-70010 (09951-07100)

NOTE: No clearance is allowed between the bearing and transaxle housing.

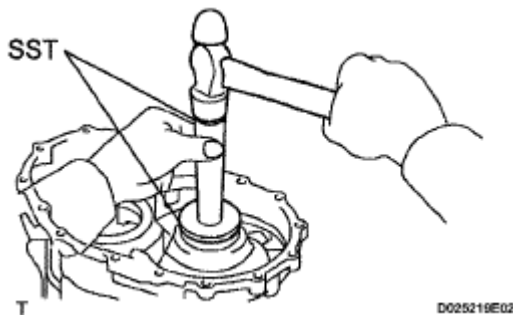


Fig. 605: Installing Case Washer And Front Differential Case Tapered Roller Bearing Rear Outer Race To Transaxle Case

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

7. ADJUST DIFFERENTIAL SIDE BEARING PRELOAD

- a. Install the differential assembly to the transaxle case.

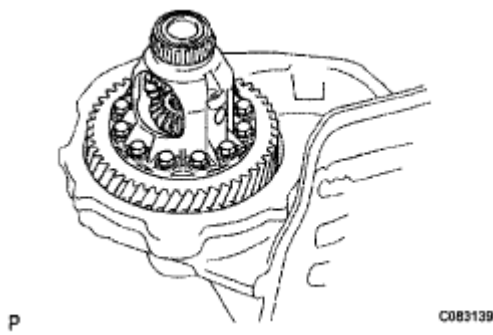


Fig. 606: Installing Differential Assembly To Transaxle Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- b. Clean the mating surfaces of the transaxle case and transaxle housing.
- c. Install the transaxle housing to the transaxle case and tighten them with the 16 bolts.

Torque: Bolt A

29.4 N*m (300 kgf*cm, 21.7 ft.*lbf)

Bolt B

29.4 N*m (300 kgf*cm, 21.7 ft.*lbf)

Bolt C

22.1 N*m (225 kgf*cm, 16.3 ft.*lbf)

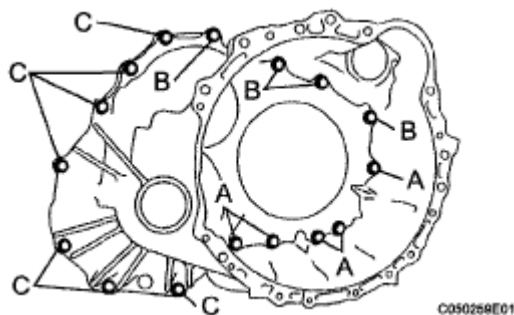


Fig. 607: Installing Bolts
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

Apply seal packing or equivalent to bolts A and C.

Adhesive:

Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent

Bolt length:

Bolt A:

42 mm (1.654 in.)

Bolt B:

42 mm (1.654 in.)

Bolt C:

50 mm (1.969 in.)

- d. Using SST, turn the differential assembly to the right and left 2 or 3 times to settle the bearing.

SST 09564-32011

- e. Using SST and a torque wrench, measure the turning torque of the differential.

SST 09564-32011

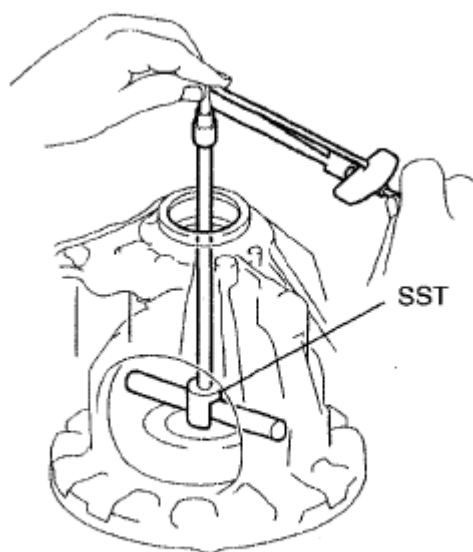
Turning torque at 60 rpm:

New bearing:

0.20 to 0.69 N*m (2.0 to 7.0 kgf*cm, 1.8 to 6.1 in.*lbf)

Used bearing:

0.10 to 0.35 N*m (1.0 to 3.6 kgf*cm, 0.9 to 3.1 in.*lbf)



D025804E01

Fig. 608: Measuring Turning Torque Of Differential
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HINT:

If the turning torque is not as specified, refer to the table below to select a thrust washer so that the specified value is achieved.

Adjusting shim thickness: mm (in.)

ADJUSTING SHIM THICKNESS

Mark	Thickness	Mark	Thickness
0	1.90 (0.074)	A	2.40 (0.094)
1	1.95 (0.077)	B	2.45 (0.096)
2	2.00 (0.079)	C	2.50 (0.098)
3	2.05 (0.081)	D	2.55 (0.100)
4	2.10 (0.083)	E	2.60 (0.102)
5	2.15 (0.085)	F	2.65 (0.104)
6	2.20 (0.087)	G	2.70 (0.106)
7	2.25 (0.089)	H	2.75 (0.108)
8	2.30 (0.091)	J	2.80 (0.110)
9	2.35 (0.093)		

- f. Remove the 16 bolts and the transaxle housing.

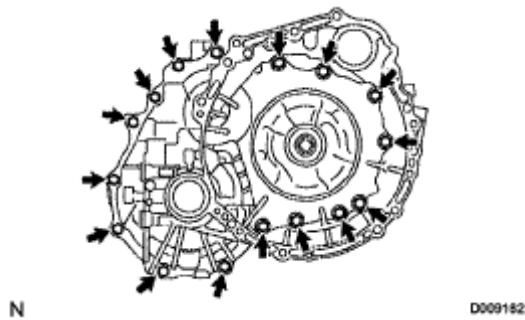


Fig. 609: Removing Bolts And Transaxle Housing
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- g. Remove the differential assembly.

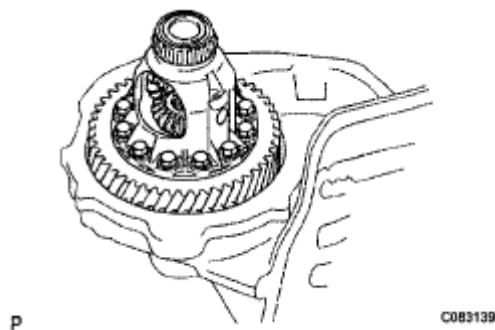


Fig. 610: Removing Differential Assembly
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

8. INSTALL FRONT DIFFERENTIAL RING GEAR

- a. Using ATF and 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.

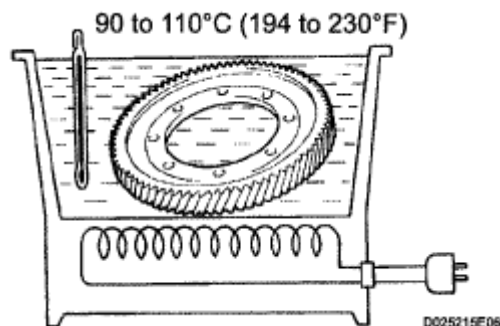


Fig. 611: Heating Front Differential Ring Gear
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- 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.

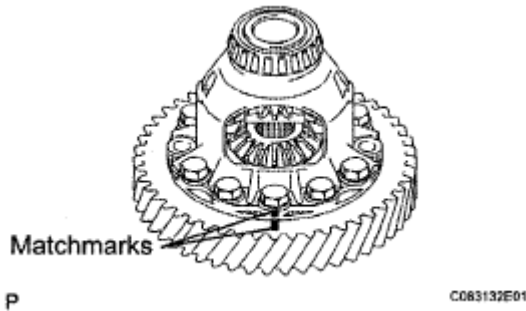


Fig. 612: Identifying Matchmarks On Front Differential Ring Gear Case
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

- d. Tighten the 10 bolts.

Torque: 95.0 N*m (970 kgf*cm, 70 ft.*lbf)

NOTE: Tighten the bolts a little at a time in a diagonal pattern.

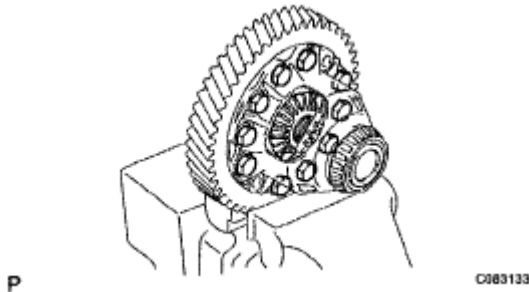


Fig. 613: Gripping Differential
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

9. INSTALL TRANSAXLE HOUSING OIL SEAL

- a. Using SST and a hammer, install a new oil seal.

SST 09350-32014 (09351-32150), 09950-70010 (09951-07150)

- b. Coat the lip of oil seal with a little MP grease.

Oil seal installation depth:

0 +- 0.5 mm (0 +- 0.0197 in.)

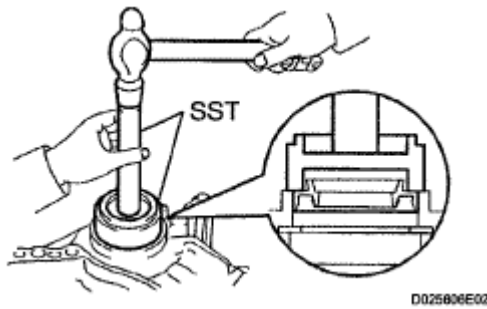


Fig. 614: Installing Oil Seal Using Hammer

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

10. INSTALL DIFFERENTIAL SIDE BEARING RETAINER OIL SEAL

- a. Using SST and a hammer, install a new oil seal.

SST 09350-32014 (09351-32150), 09950-70010 (09951-07150)

- b. Coat the lip of the oil seal with a little MP grease.

Oil seal installation depth:

0 +/- 0.5 mm (0 +/- 0.0197 in.)

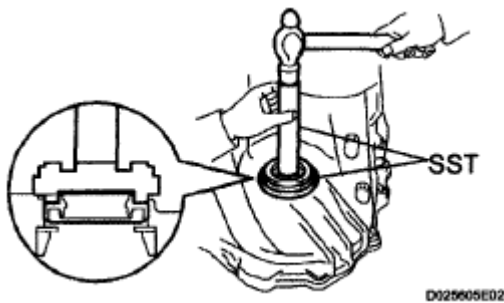
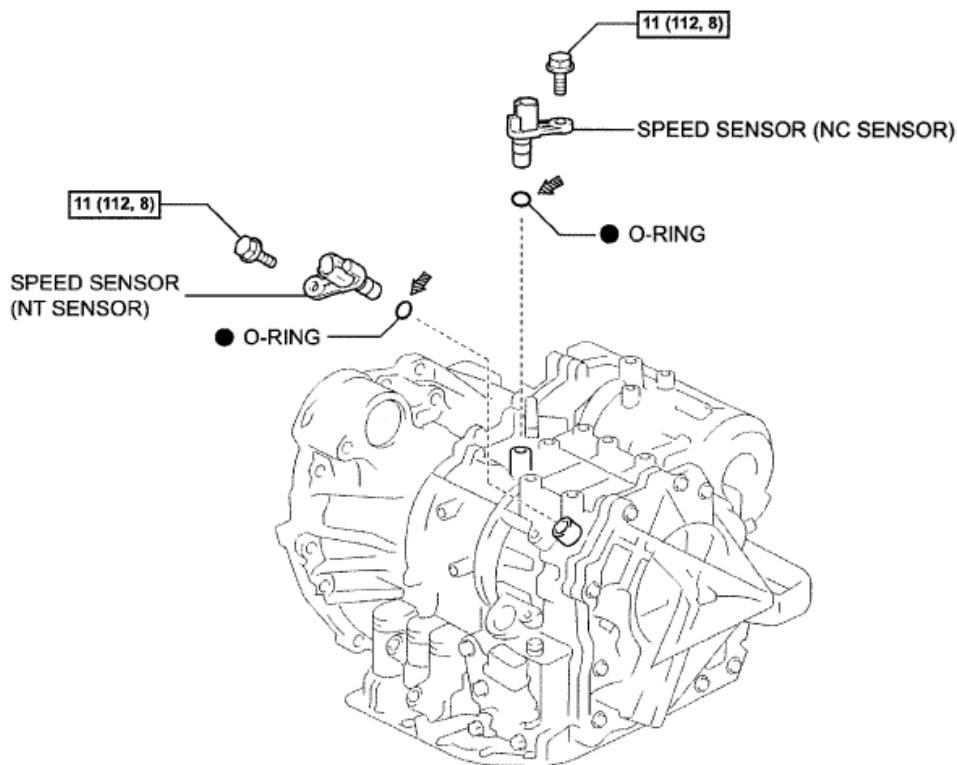


Fig. 615: Installing Differential Side Bearing Retainer Oil Seal Using Hammer

Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SPEED SENSOR

COMPONENTS



◄◄ Precoated part ● Non-reusable part

11 (112, 8) : Specified torque

P

C126418E02

Fig. 616: Identifying Speed Sensor Components With Torque Specifications
 Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

REMOVAL

1. **REMOVE BATTERY**
2. **REMOVE AIR CLEANER ASSEMBLY**

HINT:

(See **REMOVAL**)

3. **REMOVE SPEED SENSOR (NT SENSOR)**
 - a. Disconnect the speed sensor connector.
 - b. Remove the bolt and speed sensor.

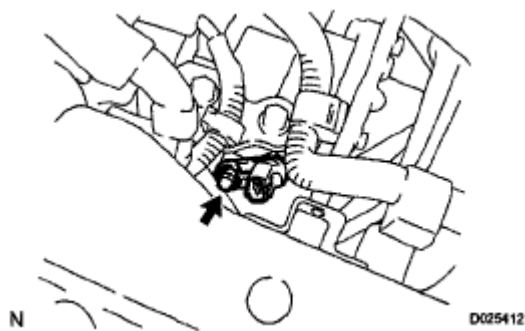


Fig. 617: Removing Bolt And Speed Sensor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

4. REMOVE SPEED SENSOR (NC SENSOR)

- a. Disconnect the speed sensor connector.
- b. Remove the bolt and speed sensor.

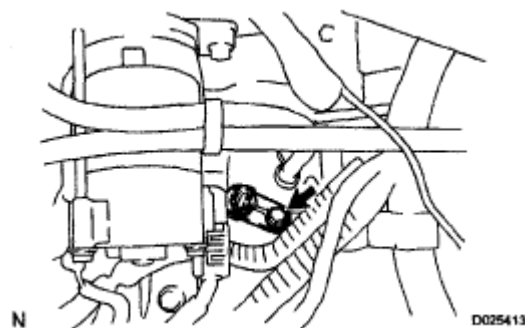


Fig. 618: Removing Speed Sensor (NC Sensor)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSPECTION

1. INSPECT SPEED SENSOR (NT SENSOR)

- a. Disconnect the speed sensor connector from the transaxle.
- b. Measure the resistance according to the value(s) in the table below.

Resistance:

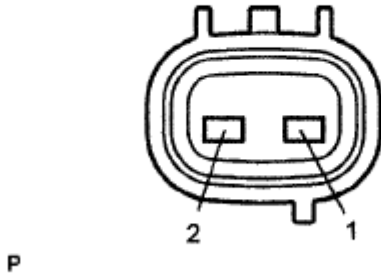
AISIN made

TESTER CONNECTION AND SPECIFIED CONDITION

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

Sensor Side:

(Connector Front View):



C110343E10

Fig. 619: Identifying Terminals Of Speed Sensor Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

TOYOTA made

TESTER CONNECTION AND SPECIFIED CONDITION

Tester Connection	Specified Condition 20°C (68°F)
1-2	500 to 620 ohms

2. INSPECT SPEED SENSOR (NC SENSOR)

- Disconnect the speed sensor connector from the transaxle.
- Measure the resistance according to the value(s) in the table below.

Resistance:

AISIN made

TESTER CONNECTION AND SPECIFIED CONDITION

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

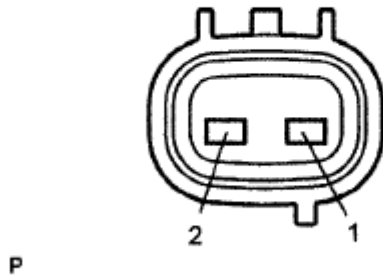
TOYOTA made

TESTER CONNECTION AND SPECIFIED CONDITION

Tester Connection	Specified Condition 20°C (68°F)
1-2	500 to 620 ohms

Sensor Side:

(Connector Front View):



C110343E10

Fig. 620: Identifying Terminals Of Speed Sensor Connector
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

INSTALLATION

1. INSTALL SPEED SENSOR (NC SENSOR)

- Coat the O-ring with ATF.
- Install the speed sensor with the bolt.

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

HINT:

Make sure to install the same manufacturer's sensor.

- Connect the speed sensor connector.

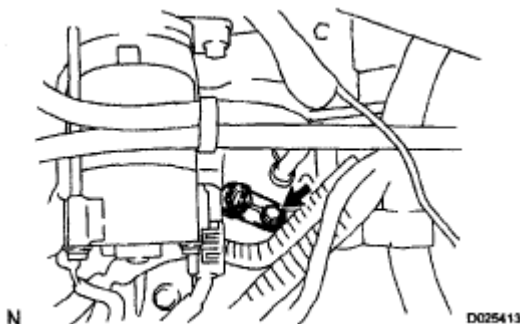


Fig. 621: Installing Speed Sensor With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

2. INSTALL SPEED SENSOR (NT SENSOR)

- Coat the O-ring with ATF.

- b. Install the speed sensor with the bolt.

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

HINT:

Make sure to install the same manufacturer's sensor.

- c. Connect the speed sensor connector.

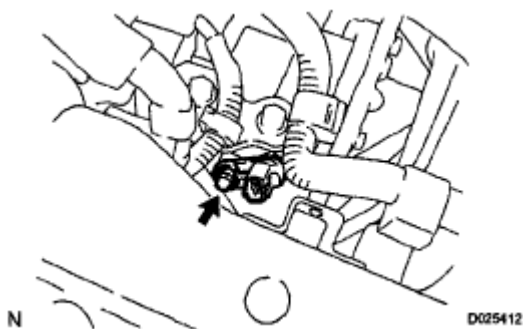


Fig. 622: Installing Speed Sensor With Bolt
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

3. INSTALL AIR CLEANER ASSEMBLY

HINT:

(See INSTALLATION)

4. INSTALL BATTERY