2007 TRANSMISSION

U151F Automatic Transmission - Sienna

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 WS**
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 setting a DTC. This timing begins after the "typical enabling conditions" are met.
Malfunction thresholds	Beyond this value, the ECM will conclude that there is a malfunction and set a DTC.
MIL operation	MIL illumination timing after a defect is detected. "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.

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

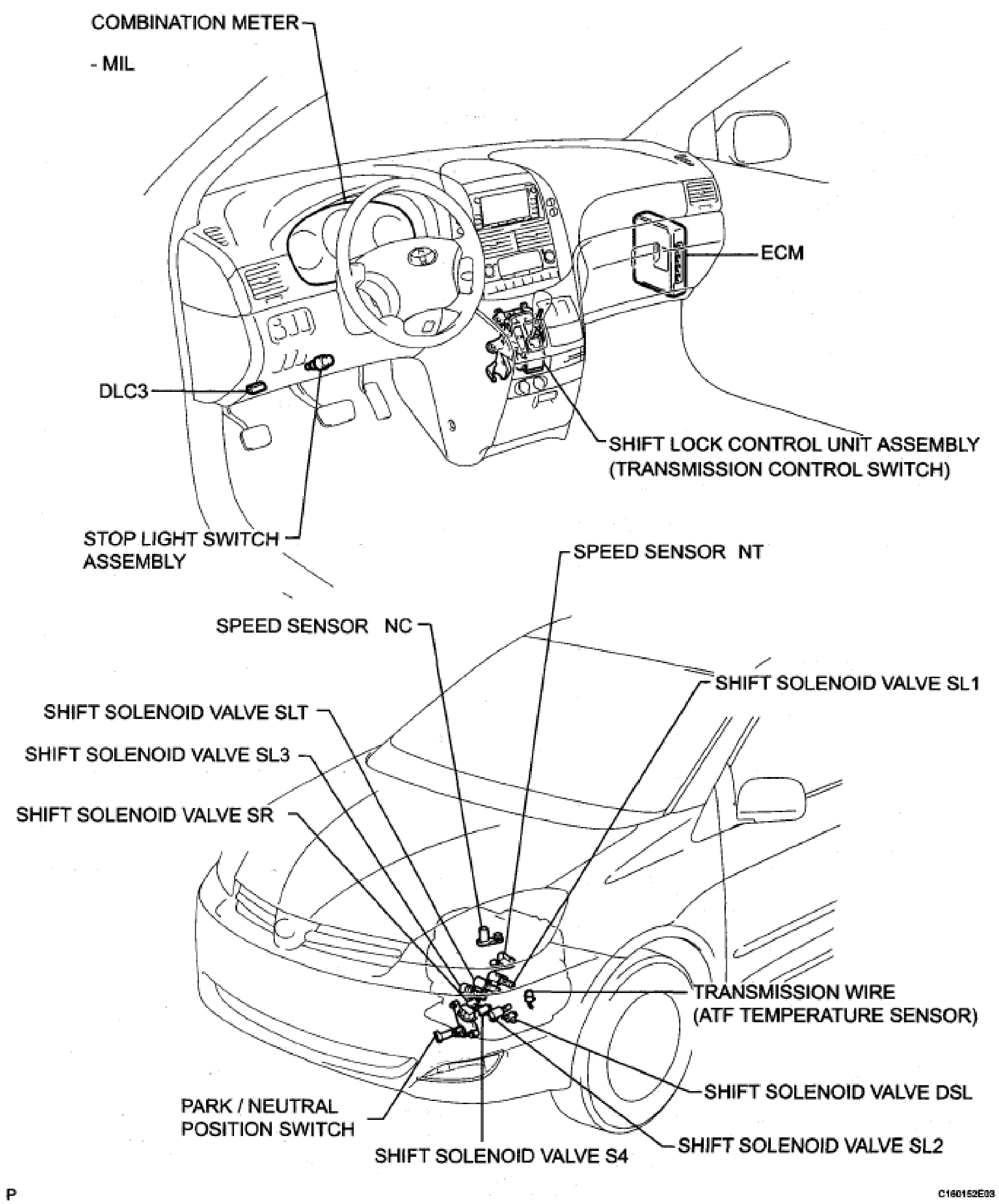

Fig. 1: Identifying Automatic Transaxle System Components Location

SYSTEM DIAGRAM

The configuration of the electronic control system in the U151F automatic transaxles is as shown in the following chart.

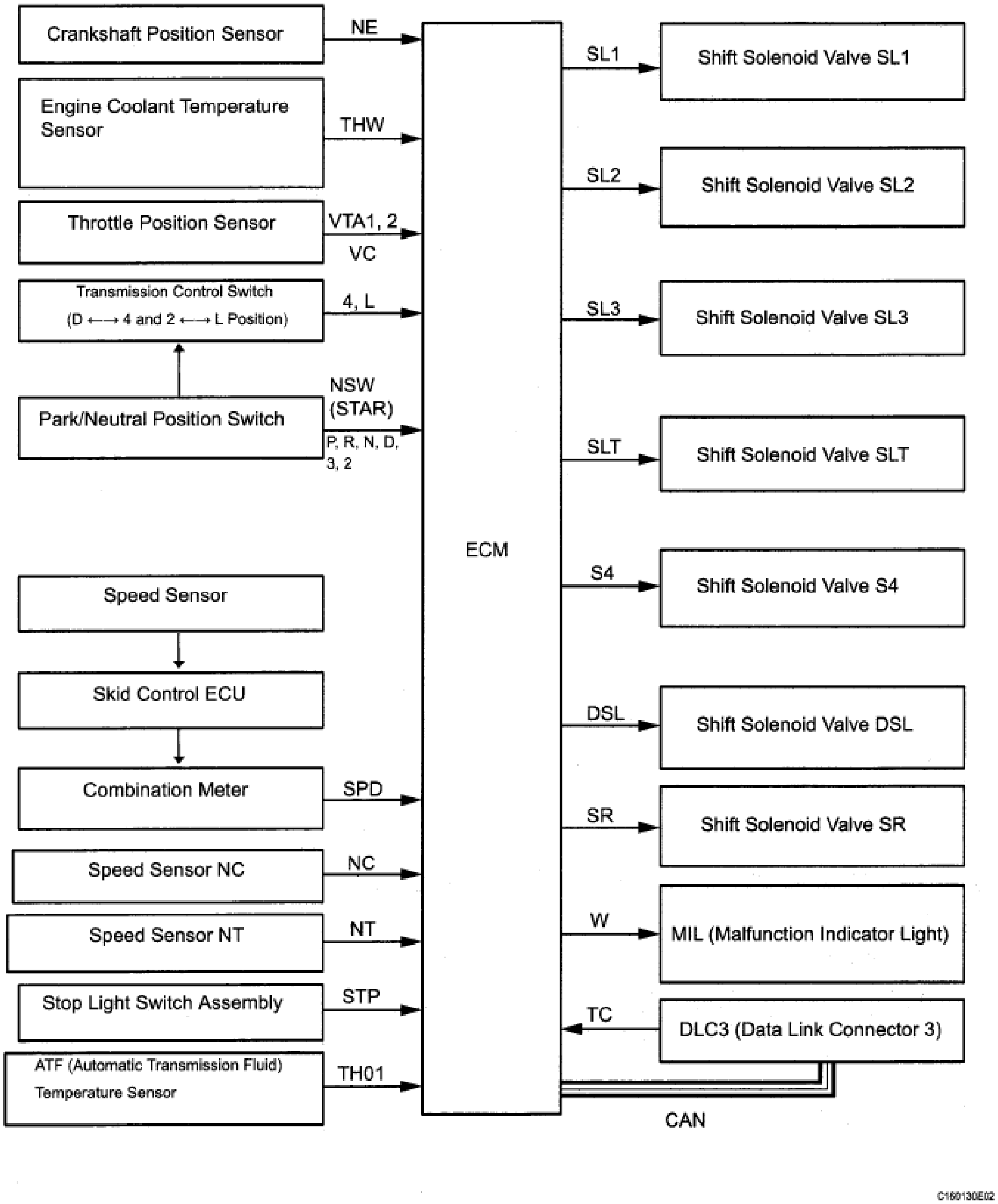

Fig. 2: Automatic Transaxle System Diagram

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 **HOW TO PROCEED WITH TROUBLESHOOTING**).

   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 **INSPECTION** , **ON-VEHICLE 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 **MANUAL SHIFTING TEST**).

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 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, 3 --> 4 and 4 --> 5th upshifts take place, and that the shift points conform to the automatic shift schedule (See **U151F AUTOMATIC TRANSAXLE**).

   HINT:

   5th Gear Up-shift Prohibition Control

   - Engine coolant temperature is 55°C (131 °F) or less and vehicle speed is at 80 km/h (176 mph) or less.
   - ATF temperature is -2°C (28°F) or less.

   4th Gear Up-shift Prohibition Control

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

   5th and 4th Gear Lock up Prohibition Control

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

   Check for shock and slip at the 1 --> 2, 2 --> 3, 3 --> 4 and 4 --> 5th up-shifts.

3. Check for abnormal noise and vibration. Drive in the D position lock-up or 5th gear, and check for abnormal noises and vibration.

   HINT:

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

4. Check kick-down operation.

Check that the possible kick-down vehicle speed limits for 2nd to 1st, 3rd to 2nd, 4th to 3rd, 5th to 4th kick-downs conform to those indicated on the automatic shift schedule while driving through all gears with the shift lever in the D position (See **U151F AUTOMATIC TRANSAXLE**).

5. Check abnormal shock and slip at kick-down.
6. Check the lock-up mechanism.
   - Drive in D position (5th gear), at a steady speed (lock-up ON).
   - Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

   HINT:

   - There is no lock-up in the 1st and 2nd gear.
   - 4th lock-up operates while uphill-downhill control is active in D position.
   - 3rd lock-up operates while uphill-downhill control is active in D position.
   - ATF temperature is 120°C (248°F) or more.
   - If there is a big jump in engine speed, there is no lock-up.

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

Shift into the 4 position and fully depress the accelerator pedal and check the following points.

1. Check up-shift operation.

   Check that the 1 -->2, 2 --> 3 and 3 -->4 up-shift take place and that the shift point conforms to the automatic shift schedule (See **U151F AUTOMATIC TRANSAXLE**).

   HINT:

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

2. Check engine braking.

   While driving in the 4 position and 4th gear, release the accelerator pedal and check the engine braking effect.

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

c. 3 position test:

Shift into the 3 position and fully depress the accelerator pedal and check the following points.

1. Check up-shift operation.

   Check that the 1 -->2 and 2 --> 3 up-shift take place and that the shift point conforms to the automatic shift schedule (See **U151F AUTOMATIC TRANSAXLE**).

HINT:

There is no 4th up-shift and lock-up in the 3 position.

2. Check engine braking.

   While running in the 3 position and 3rd gear, release the accelerator pedal and check the engine braking effect.

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

d. 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 **U151F 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.

e. L position test:

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

1. Check no up-shift.

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

   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.

f. R position test:

Shift into the R position and fully depress the accelerator pedal and check for slipping.

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

g. 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.

h. Uphill/downhill control function test:

1. Check that the gear does not up-shift to the 4th or 5th gear while the vehicle is driving uphill.
2. Check that the gear automatically down-shifts from 5th to 4th or from the 4th to 3rd gear when brake is applied while the vehicle is driving downhill.

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: 2,600+-150 rpm

Evaluation:

EVALUATION CHART

Problem	Possible cause
(a) Stall engine speed is low in D position	• Engine power output may be insufficient • Stator one-way clutch not operating properly HINT: If the value is less than the specified value by 600 rpm or more, the torque converter could be faulty.
(b) Stall engine speed is high in D position	• Line pressure is too low • Forward clutch slipping • U/D (Underdrive) brake slipping • U/D (Underdrive) one-way clutch is not operating properly • No. 1 one-way clutch not operating properly • Improper fluid level

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.**
- **When conducting stall test, do not continue more than 10 seconds.**

   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 N --> R time lag is longer than the specified):

EVALUATION CHART

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 • U/D (Underdrive) brake worn
N --> R time lag is longer	• Line pressure is too low • Reverse clutch worn • 1st and reverse brake worn • U/D (Underdrive) brake worn

HYDRAULIC TEST

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

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 (Automatic Transmission Fluid).
2. Lift the vehicle up.
3. Remove the engine under cover.
4. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.

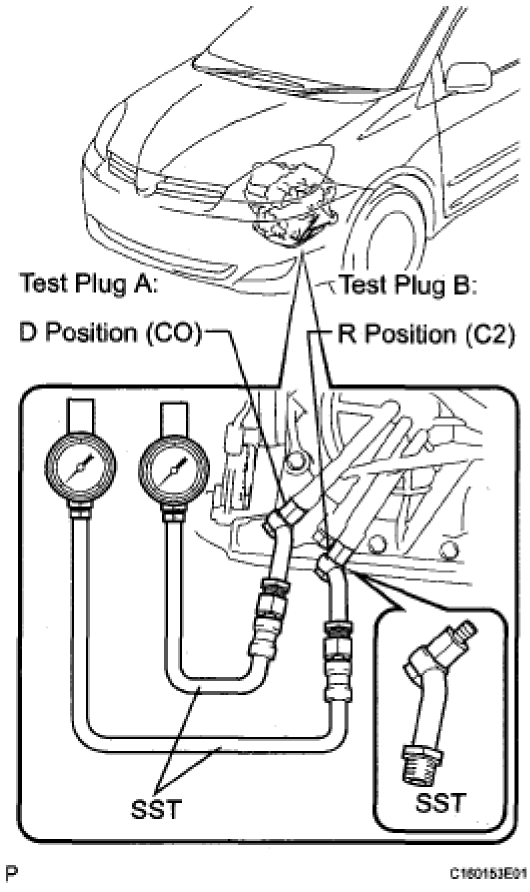

Fig. 3: Measuring Line Pressure

5. Remove the test plug A on the transaxle case front left side and install the SST.

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

NOTE: **There is a difference in installation point between D position and R position.**

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

   Specified line pressure:

   LINE PRESSURE SPECIFICATION

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

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

   HINT:

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

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

    Specified line pressure:

    LINE PRESSURE SPECIFICATION

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

12. Turn the ignition switch off.
13. Remove the SST, install the test plug A.
14. Remove the test plug B, install the SST and start engine.

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

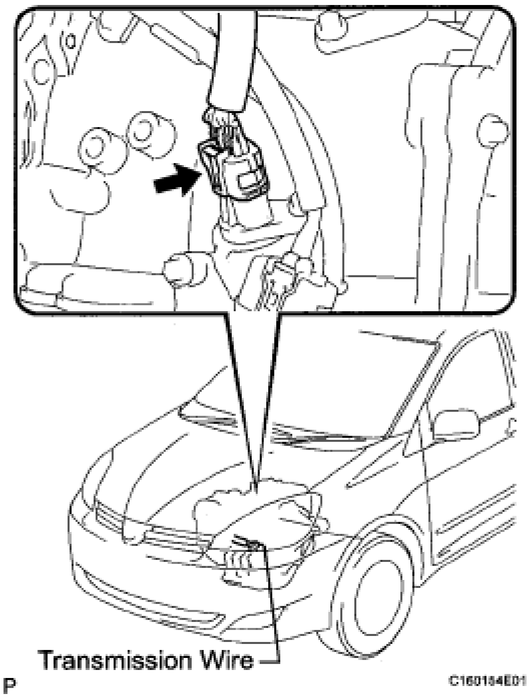

Fig. 4: Locating Transmission Wire Connector

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

    Specified line pressure:

    LINE PRESSURE SPECIFICATION

Condition	R position kPa (kgf / cm^2 , psi)
Idling	672 to 742 kPa (6.9 to 7.6 kgf/cm^2 , 97 to 108 psi)
Stall test	1,768 to 1,968 kPa (18.0 to 20.1 kgf/cm^2 , 256 to 285 psi)

16. Remove the SST, install the test plug B.
17. Clear the DTC.

    Evaluation:

    EVALUATION CHART

Problem	Possible cause
Measured values are higher than specified in all positions	• Shift solenoid valve SLT defective • Regulator valve defective
	• Shift solenoid valve SLT defective

Measured values are lower than specified in all positions	• Regulator valve defective • Oil pump defective • U/D (Underdrive) direct clutch defective
Pressure is low in the D position only	• D position circuit fluid leak • Forward clutch defective
Pressure is low in the R position only	• R position circuit fluid leak • Reverse 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 connector of the transmission wire.

   b. Drive with the transmission wire disconnected. Shifting the shift lever in the order of L, 2, 3, 4 and D position to check whether the shifting condition changes the table below.

   SHIFT POSITION AND SHIFTING CONDITION

Shift Position	Shifting Condition
L<-- -->2	No Shift (Not Change)
2<-- -->3	Down Shift <-- --> Up Shift
3<-- -->4<-- -->D	No Shift (Not Change)

   HINT:

   When driving with the transmission wire disconnected, the shift lever position is in L or 2, the gear position is held in 3rd and the shift lever position is in 3, 4 or D, the gear position is held in 4th. However, when the shift position is in R or P, the operation is same as usual.

   c. Connect the connector of the transmission wire.

   d. Clear the DTC (See **DTC CHECK / CLEAR**).

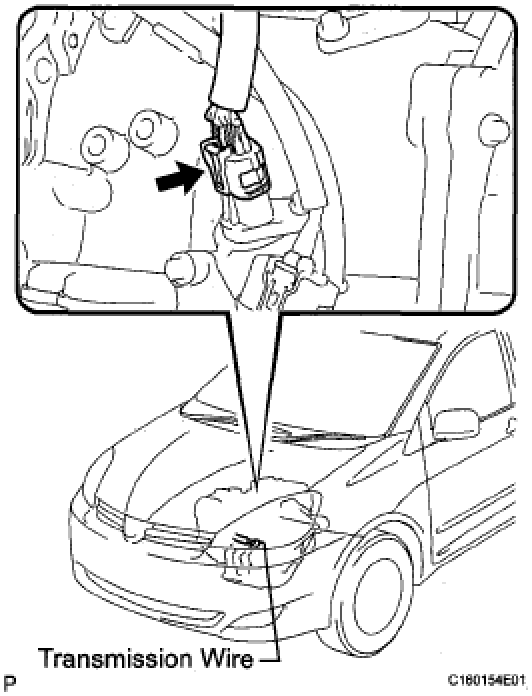

Fig. 5: Locating Transmission Wire Connector

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.

a. Turn the engine switch off.
b. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
c. Turn the ignition switch to the ON position and push the intelligent tester main switch on.
d. Select the item "DIAGNOSIS / ENHANCED OBD
e. 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.

1. Tester menu flow:

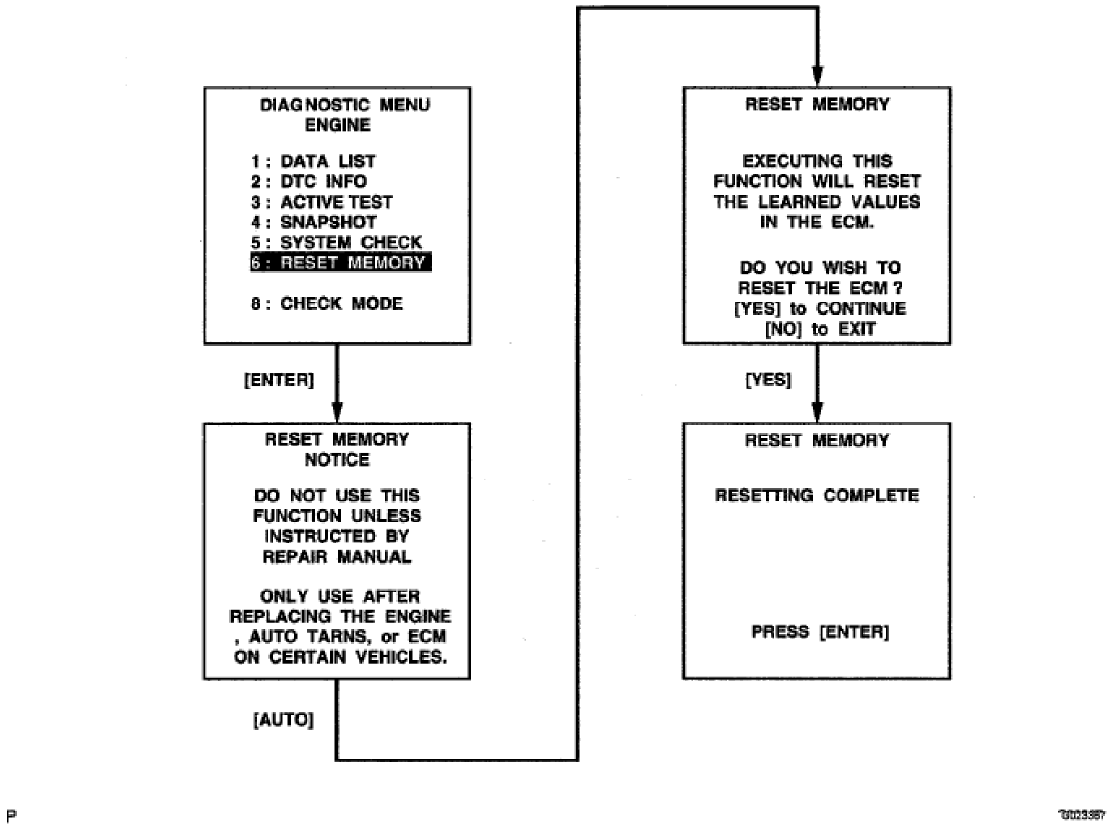

Fig. 6: Reset Memory Procedure Chart

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

Driving note

- Drive the vehicle through all gears.

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

- Repeat the above driving pattern three times or more.

NOTE:

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

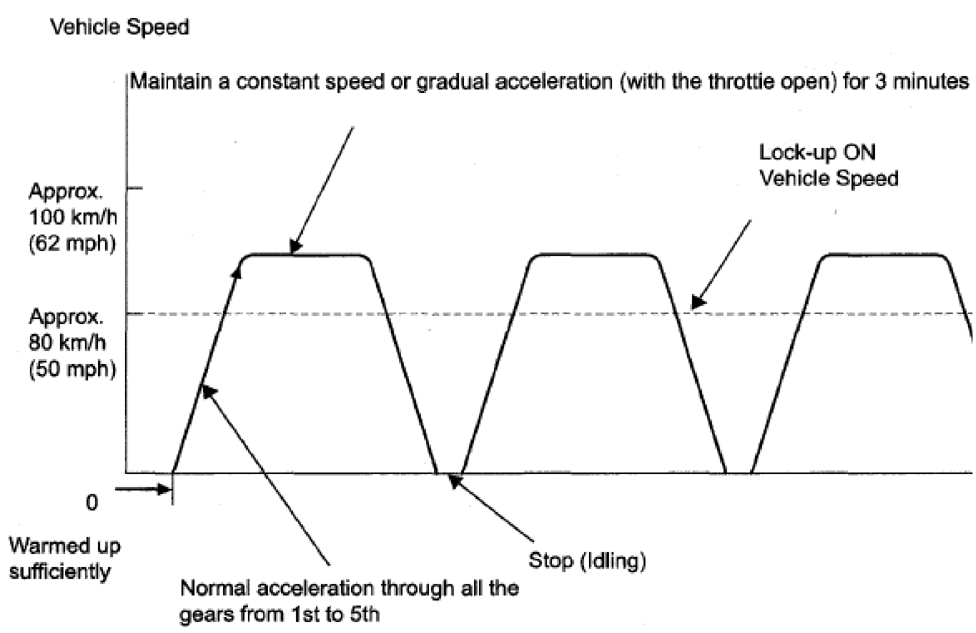

Fig. 7: Vehicle Speed Graph

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. If the instruction PROCEED TO NEXT CIRCUIT INSPECTION SHOWN IN PROBLEM SYMPTOMS TABLE is given in the flowchart of each circuit, inspect the suspected areas in descending order for each symptom. If the trouble still occurs even though there are no abnormalities in the inspections listed for the symptoms, check and replace the ECM.

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

PROBLEM SYMPTOMS TABLE

Symptom	Suspected Area	See
No down-shift (A particular gear, from 1st to 4th gear, is not down-shifted)	ECM	**HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS**
No down-shift (5th -> 4th)	Transmission control switch (D <--> 4 position) circuit	**DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (PRNDL INPUT)**
	Shift solenoid valve S4 circuit *1	**DTC P0982 SHIFT SOLENOID "D" CONTROL CIRCUIT LOW (SHIFT SOLENOID VALVE S4); DTC P0983 SHIFT SOLENOID "D" CONTROL CIRCUIT HIGH (SHIFT SOLENOID VALVE S4)**
	ECM	**HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS**
No up-shift (A particular gear, from 1st to 4th gear, is not up-shifted)	ECM	**HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS**
	Transmission control switch (D <--> 4 position) circuit	**DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (PRNDL**

		INPUT)
No up-shift (4th -> 5th)	Shift solenoid valve S4 circuit *1	**DTC P0982 SHIFT SOLENOID "D" CONTROL CIRCUIT LOW (SHIFT SOLENOID VALVE S4); DTC P0983 SHIFT SOLENOID "D" CONTROL CIRCUIT HIGH (SHIFT SOLENOID VALVE S4)**
	ECM	**HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS**
No lock-up	Stop light switch circuit *1	**DTC P0724 BRAKE SWITCH "B" CIRCUIT HIGH**
	Engine coolant temp, sensor circuit *1	**DIAGNOSTIC TROUBLE CODE CHART**
	ECM	**HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS**
No lock-up off	ECM	**HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS**
Shift point too high or too low	Throttle position sensor circuit *1	**DIAGNOSTIC TROUBLE CODE CHART**
	ECM	**HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS**
Up-shift to 5th from 4th while shift lever is in 4 position	Transmission control switch (D <--> 4 position) circuit	**DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (PRNDL INPUT)**
	ECM	**HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS**
Up-shift to 5th from 4th while engine is cold	Engine coolant temp, sensor circuit *1	**DIAGNOSTIC TROUBLE CODE CHART**
	ECM	**HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS**
Up-shift to 2nd from 1st while shift lever is in L position	Transmission control switch (L <--> 2 position) circuit *1	**DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (PRNDL INPUT)**
	ECM	**HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS**
Harsh engagement (N -> D)	Shift solenoid valve SL1 circuit *1	**DTC P0748 PRESSURE CONTROL SOLENOID "A" ELECTRICAL (SHIFT SOLENOID VALVE SL1)**
	ECM	**HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS**
Harsh engagement (Lock up)	ECM	**HOW TO TROUBLESHOOT**

		ECU CONTROLLED SYSTEMS
Harsh engagement (Any driving position)	ECM	**HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS**
Poor acceleration	ECM	**HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS**
No kick-down	ECM	**HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS**
Engine stalls when starting off or stopping	ECM	**HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS**
Malfunction in shifting	Park/neutral position switch circuit "1	**DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (PRNDL INPUT)**
	Transmission control switch (D <--> 4 position) circuit	**DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (PRNDL INPUT)**
	ECM	**HOW TO TROUBLESHOOT ECU CONTROLLED SYSTEMS**

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

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

Symptom	Suspected Area	See
Vehicle does not move in any forward position and in reverse positions	Valve body assembly	**VALVE BODY ASSEMBLY**
	U/D brake (B3)	**AUTOMATIC TRANSAXLE UNIT**
	Torque converter clutch	**TORQUE CONVERTER CLUTCH AND DRIVE PLATE**
Vehicle does not move in R position	Valve body assembly	**VALVE BODY ASSEMBLY**
	Reverse clutch (C2)	**AUTOMATIC TRANSAXLE UNIT**
	1st and reverse brake (B2)	**AUTOMATIC TRANSAXLE UNIT**
No up-shift (1st -> 2nd)	Valve body assembly	**VALVE BODY ASSEMBLY**
	2nd and O/D brake (B1)	**AUTOMATIC TRANSAXLE UNIT**
No up-shift (2nd -> 3rd)	Valve body assembly	**VALVE BODY ASSEMBLY**
	Direct and O/D clutch (CO)	**AUTOMATIC TRANSAXLE UNIT**
No up-shift (3rd -> 4th)	Valve body assembly	**VALVE BODY ASSEMBLY**
	2nd and O/D brake (B1)	**AUTOMATIC TRANSAXLE UNIT**
	Shift solenoid valve S4	**DTC P0766 SHIFT SOLENOID**

No up-shift (4th -> 5th)		**"D" PERFORMANCE (SHIFT SOLENOID VALVE S4)**
	Valve body assembly	**VALVE BODY ASSEMBLY**
	U/D clutch (C3)	**AUTOMATIC TRANSAXLE UNIT**
No down-shift (5th -> 4th)	Shift solenoid valve S4	**DTC P0766 SHIFT SOLENOID "D" PERFORMANCE (SHIFT SOLENOID VALVE S4)**
	Valve body assembly	**VALVE BODY ASSEMBLY**
No down-shift (4th -> 3rd)	Valve body assembly	**VALVE BODY ASSEMBLY**
No down-shift (3rd -> 2nd)	Valve body assembly	**VALVE BODY ASSEMBLY**
No down-shift (2nd -> 1st)	Valve body assembly	**VALVE BODY ASSEMBLY**
No lock-up or No lock-up off	Shift solenoid valve DSL	**DTC P0741 TORQUE CONVERTER CLUTCH SOLENOID PERFORMANCE (SHIFT SOLENOID VALVE DSL)**
	Valve body assembly	**VALVE BODY ASSEMBLY**
	Torque converter clutch	**TORQUE CONVERTER CLUTCH AND DRIVE PLATE**
Harsh engagement (N -> D)	Shift solenoid valve SL1	**DTC P0746 PRESSURE CONTROL SOLENOID "A" PERFORMANCE (SHIFT SOLENOID VALVE SL1)**
	Valve body assembly	**VALVE BODY ASSEMBLY**
	C1 accumulator	**AUTOMATIC TRANSAXLE UNIT**
	Forward clutch (C1)	**AUTOMATIC TRANSAXLE UNIT**
	No. 1 one-way clutch (F1)	**AUTOMATIC TRANSAXLE UNIT**
	U/D one-way clutch (F2)	**AUTOMATIC TRANSAXLE UNIT**
Harsh engagement (Lock up)	Shift solenoid valve SL2	**DTC P0776 PRESSURE CONTROL SOLENOID "B" PERFORMANCE (SHIFT SOLENOID VALVE SL2)**
	Valve body assembly	**VALVE BODY ASSEMBLY**
	Torque converter clutch	**TORQUE CONVERTER CLUTCH AND DRIVE PLATE**
Harsh engagement (N -> R)	Valve body assembly	**VALVE BODY ASSEMBLY**
	C2 accumulator	**AUTOMATIC TRANSAXLE UNIT**
	Reverse clutch (C2)	**AUTOMATIC TRANSAXLE**

		UNIT
	1st and reverse brake (B2)	**AUTOMATIC TRANSAXLE UNIT**
Harsh engagement (1st -> 2nd -> 3rd -> 4th -> 5th)	Shift solenoid valve SLT	**DTC P2716 PRESSURE CONTROL SOLENOID "D" ELECTRICAL (SHIFT SOLENOID VALVE SLT)**
	Valve body assembly	**VALVE BODY ASSEMBLY**
Harsh engagement (1st -> 2nd)	Valve body assembly	**VALVE BODY ASSEMBLY**
	2nd and O/D brake (B1)	**AUTOMATIC TRANSAXLE UNIT**
Harsh engagement (2nd -> 3rd)	Valve body assembly	**VALVE BODY ASSEMBLY**
	CO accumulator	**AUTOMATIC TRANSAXLE UNIT**
	Direct and O/D clutch (CO)	**AUTOMATIC TRANSAXLE UNIT**
Harsh engagement (3rd -> 4th)	Valve body assembly	**VALVE BODY ASSEMBLY**
	2nd and O/D brake (B1)	**AUTOMATIC TRANSAXLE UNIT**
Harsh engagement (4th -> 5th)	Valve body assembly	**VALVE BODY ASSEMBLY**
	C3 accumulator	**AUTOMATIC TRANSAXLE UNIT**
	U/D clutch (B3)	**AUTOMATIC TRANSAXLE UNIT**
Harsh engagement (5th -> 4th)	Valve body assembly	**VALVE BODY ASSEMBLY**
	B3 accumulator	**AUTOMATIC TRANSAXLE UNIT**
Slip or shudder (Forward and reverse: After warm-up)	Valve body assembly	**VALVE BODY ASSEMBLY**
	Oil strainer	**VALVE BODY ASSEMBLY**
	Direct and O/D clutch (CO)	**AUTOMATIC TRANSAXLE UNIT**
	Forward clutch (C1)	**DIFFERENTIAL OIL SEAL**
	U/D clutch (C3)	**AUTOMATIC TRANSAXLE UNIT**
	2nd and brake (B1)	**AUTOMATIC TRANSAXLE UNIT**
	U/D brake (B3)	**AUTOMATIC TRANSAXLE UNIT**
	No. 1 one-way clutch (F1)	**AUTOMATIC TRANSAXLE UNIT**
	U/D one-way clutch (F2)	**AUTOMATIC TRANSAXLE UNIT**
	Torque converter clutch	**TORQUE CONVERTER CLUTCH AND DRIVE PLATE**

Slip or shudder (Particular position: Just after engine starts)	Torque converter clutch	**TORQUE CONVERTER CLUTCH AND DRIVE PLATE**
Slip or shudder (R position)	Reverse clutch (C2)	**AUTOMATIC TRANSAXLE UNIT**
	1st and reverse brake (B2)	**AUTOMATIC TRANSAXLE UNIT**
Slip or shudder (1st)	Forward clutch (C1)	**AUTOMATIC TRANSAXLE UNIT**
	No. 1 one-way clutch (F1)	**AUTOMATIC TRANSAXLE UNIT**
	U/D one-way clutch (F2)	**AUTOMATIC TRANSAXLE UNIT**
Slip or shudder (2nd)	2nd and O/D brake (B1)	**AUTOMATIC TRANSAXLE UNIT**
Slip or shudder (3rd)	Direct and O/D clutch (CO)	**AUTOMATIC TRANSAXLE UNIT**
Slip or shudder (4th)	2nd and O/D brake (B1)	**AUTOMATIC TRANSAXLE UNIT**
Slip or shudder (5th)	U/D clutch (C3)	**AUTOMATIC TRANSAXLE UNIT**
Shift position too high or too low	Shift solenoid valve SLT	**DTC P2716 PRESSURE CONTROL SOLENOID "D" ELECTRICAL (SHIFT SOLENOID VALVE SLT)**
No engine braking (1st +- 4th: D position)	U/D brake (B3)	**AUTOMATIC TRANSAXLE UNIT**
No engine braking (1st: L (1) position)	Valve body assembly	**VALVE BODY ASSEMBLY**
	1st and reverse brake (B2)	**AUTOMATIC TRANSAXLE UNIT**
No engine braking (2nd: 2 position)	Valve body assembly	**VALVE BODY ASSEMBLY**
	2nd and O/D brake (B1)	**AUTOMATIC TRANSAXLE UNIT**
No engine braking (3rd: 3 position)	U/D brake (B3)	**AUTOMATIC TRANSAXLE UNIT**
No kick-down	Valve body assembly	**VALVE BODY ASSEMBLY**
Poor acceleration (All positions)	Shift solenoid valve SLT	**DTC P2716 PRESSURE CONTROL SOLENOID "D" ELECTRICAL (SHIFT SOLENOID VALVE SLT)**
	Torque converter clutch	**TORQUE CONVERTER CLUTCH AND DRIVE PLATE**
Poor acceleration (5th)	U/D clutch (C3)	**AUTOMATIC TRANSAXLE UNIT**
	U/D planetary gear unit	**AUTOMATIC TRANSAXLE**

		UNIT
Engine stalls when starting off or stopping	Shift solenoid valve DSL	**DTC P0741 TORQUE CONVERTER CLUTCH SOLENOID PERFORMANCE (SHIFT SOLENOID VALVE DSL)**
	Torque converter clutch	**TORQUE CONVERTER CLUTCH AND DRIVE PLATE**

TERMINALS OF ECM

1. **ECM**

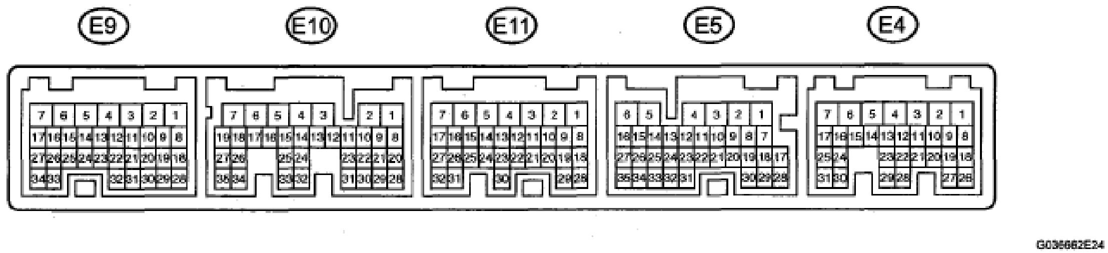

Fig. 8: Identifying ECM Connector Terminals

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.

ECM CONNECTOR TERMINALS VOLTAGE SPECIFICATION

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	Specified Condition
L (E5-9)-E1 (E11-1)	L-BR	L shift position switch signal	IG switch ON and shift lever L position	11 to 14 V
			IG switch ON and shift lever other than L position	Below 1 V
2 (E5-10)-E1 (E11-1)	Y-G - BR	2 shift position switch signal	IG switch ON and shift lever 2 and L position	11 to 14 V
			IG switch ON and shift lever other than 2 and L position	Below 1 V
D (E5-21)-E1 (E11-1)	L-W - BR	D shift position switch signal	IG switch ON and shift lever D and 4 position	11 to 14 V
			IG switch ON and shift lever	

			other than D and 4 position	Below 1 V
R (E5-11)-E1 (E11-1)	R-B - BR	R shift position switch signal	IG switch ON and shift lever R position	11 to 14 V
			IG switch ON and shift lever other than R position	Below 1 V
SPD (E5-8)-E1 (E11-1)	V-W - BR	Speed signal	Vehicle speed 20 km/h (12 mph)	Pulse generation (See hwaveform 8)
STP (E4-15)-E1 (E11-1)	G-W - BR	Stop light switch signal	Brake pedal is depressed	7.5 to 14 V
			Brake pedal is released	Below 1.5 V
3 (E5-19)-E1 (E11-1)	G - BR	3 shift position switch signal	IG switch ON and shift lever 3 position	11 to 14 V
			IG switch ON and shift lever other than 3 position	Below 1 V
4 (E5-20)-E1 (E11-1)	B-W - BR	4 shift position switch signal	IG switch ON and shift lever 4 position	11 to 14 V
			IG switch ON and shift lever other than 4 position	Below 1 V
NSW (STAR) (E10-8) - E1 (E11-1)	B-Y - BR	Park neutral switch signal	IG switch ON and shift lever P and N position	Below 1 V
			IG switch ON and shift lever other than P and N position	11 to 14 V
P (E5-23)-E1 (E11-1)	L-Y - BR	Park position switch signal	IG switch ON and shift lever P position	11 to 14 V
			IG switch ON and shift lever other then P position	Below 1 V
N (E5-22)-E1 (E11-1)	Y-R - BR	Neutral position switch signal	IG switch ON and shift lever N position	11 to 14 V
			IG switch ON and shift lever other then N position	Below 1 V
DSL (E10-11)-E1 (E11-1)	Y-G - BR	DSL solenoid signal	Vehicle speed 65 km/h (40 mph), lock-up (ON to OFF)	Pulse generation (See bwaveform 2)
SR (E10-9)-E1 (E11-1)	L-B - BR	SR solenoid signal	IG switch ON	Below 1 V
			3rd, 4th or 5th gear	11 to 14 V
			1st or 2nd gear	Below 1 V
S4 (E10-10)-E1 (E11-1)	L-W - BR	S4 solenoid signal	IG switch ON	Below 1 V
			5th gear	11 to 14 V
			Except 5th gear	Below 1 V
SL3+ (E10-17)-SL3- (E10-16)	G-B - G-R	SL3 solenoid signal	Engine idle speed	Pulse generation (See cwaveform 3)
SL2+ (E10-15) - SL2- (E10-14)	L-Y - L-R	SL2 solenoid signal	Engine idle speed	Pulse generation (See dwaveform 4)
SL1+ (E10-19)-SL1- (E10-18)	R-B - B-W	SL1 solenoid signal	Engine idle speed	Pulse generation (See ewaveform 5)
			Vehicle speed 30 km/h (19	

NC+ (E10-34)-NC- (E10-26)	R-W-G	Speed sensor (NC) signal	mph): (3rd gear) Engine speed 1,400 rpm	Pulse generation (See fwaveform 6)
NT+ (E10-35)- NT- (E10-27)	W-R-W	Speed sensor (NT) signal	Vehicle speed 20 km/h (12mph)	Pulse generation (See gwaveform 7)
SLT+ (E10-13)- SLT- (E10-12)	Y-R - Y-B	SLT solenoid signal	Engine idle speed	Pulse generation (See awaveform 1)
THO1 (E10-24)-E2 (E9-28)	G-Y - BR	ATF temperature sensor signal	ATF temperature: 115°C (239°F) or more	Below 1.5 V

a. Waveform 1

Reference:

WAVEFORM REFERENCE (WAVEFORM 1)

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

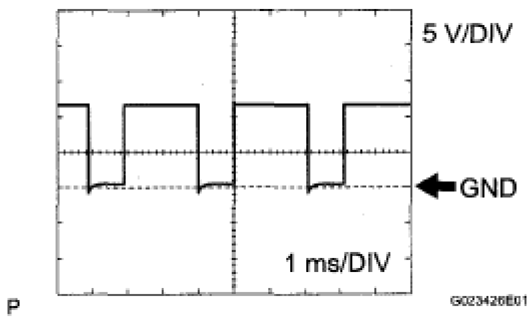

Fig. 9: Waveform Graph (Waveform 1)

b. Waveform 2

Reference:

WAVEFORM REFERENCE (WAVEFORM 2)

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

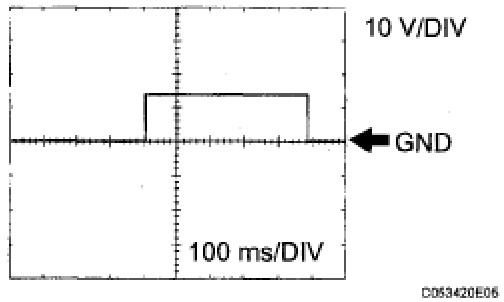

Fig. 10: Waveform Graph (Waveform 2)

c. Waveform 3

Reference:

WAVEFORM REFERENCE (WAVEFORM 3)

Terminal	SL3+ - SL3-
Tool setting	5 V/DIV, 1 ms/DIV
Vehicle condition	Engine idle speed

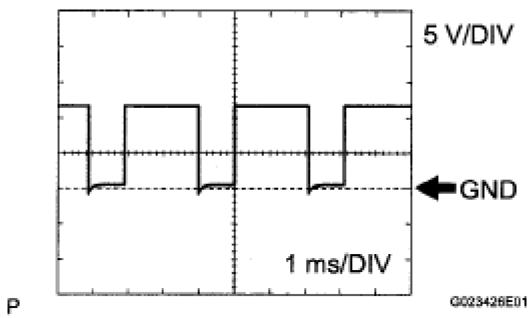

Fig. 11: Waveform Graph (Waveform 3)

d. Waveform 4

Reference:

WAVEFORM REFERENCE (WAVEFORM 4)

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

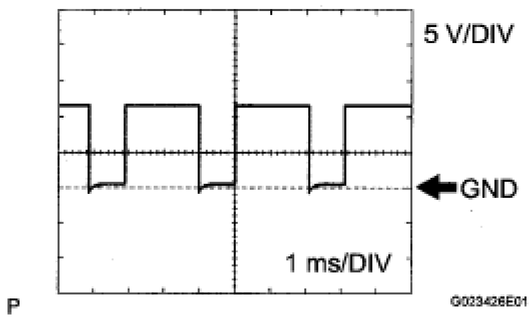

Fig. 12: Waveform Graph (Waveform 4)

e. Waveform 5

Reference:

WAVEFORM REFERENCE (WAVEFORM 5)

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

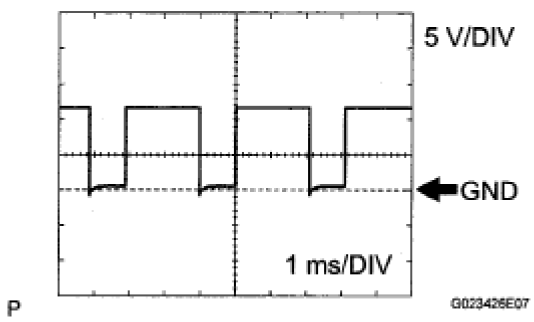

Fig. 13: Waveform Graph (Waveform 5)

f. Waveform 6

Reference:

WAVEFORM REFERENCE (WAVEFORM 6)

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

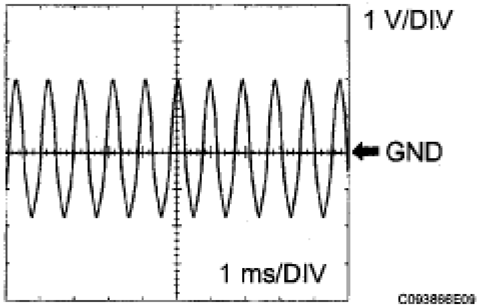

Fig. 14: Waveform Graph (Waveform 6)

g. Waveform 7

Reference:

WAVEFORM REFERENCE (WAVEFORM 7)

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

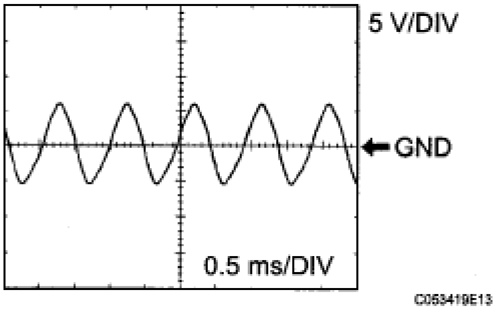

Fig. 15: Waveform Graph (Waveform 7)

h. Waveform 8

Reference:

WAVEFORM REFERENCE (WAVEFORM 8)

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

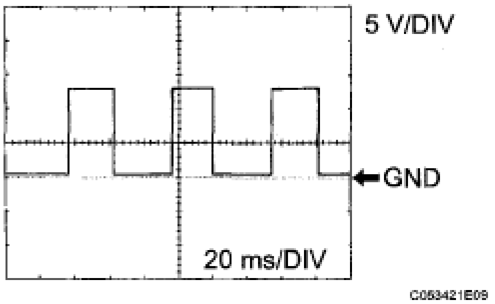

Fig. 16: Waveform Graph (Waveform 8)

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.

Fig. 17: Identifying Malfunction Indicator Lamp

   c. To check the DTCs, connect the OBD II scan tool or intelligent tester 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).
   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**).

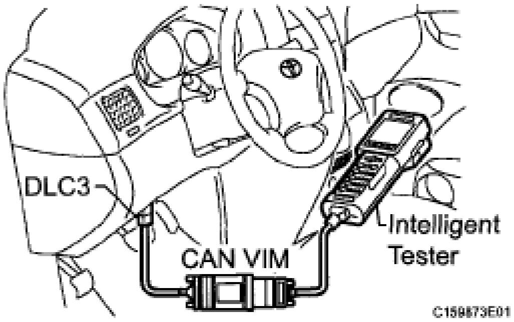

Fig. 18: Connecting Intelligent Tester To DLC3

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.

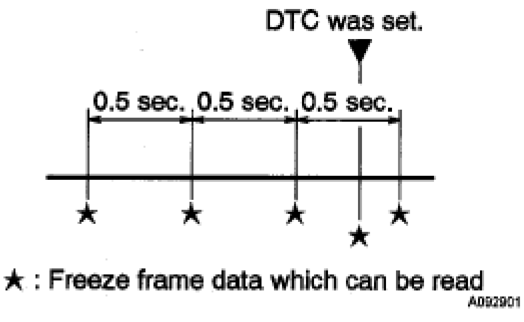

Fig. 19: DTC Timing Chart

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 15765-4 format.

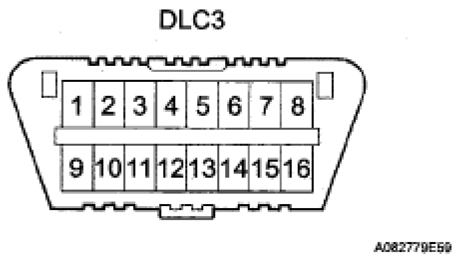

Fig. 20: Identifying DLC3 Connector Terminals

Terminals of DLC3

DLC3 CONNECTOR TERMINALS RESISTANCE SPECIFICATION

Symbol	Terminal No.	Name	Reference Terminal	Result	Condition
SIL	7	Bus "+" line	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	HIGH-level CAN bus line	CANL	54 to 69 ohms	IG switch OFF
CANH	6	HIGH-level CAN bus line	Battery positive	6 kohms or higher	IG switch OFF
CANH	6	HIGH-level CAN bus lineCG	CG	200 ohms or higher	IG switch OFF
CANL	14	LOW-level CAN bus line	Battery positive	6 kohms or higher	IG switch OFF
CANL	14	LOW-level CAN bus line	CG	200 ohms or higher	IG switch OFF

CAUTION: *: 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 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.
        4. Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".

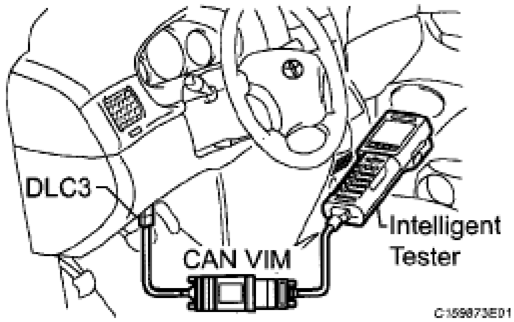

Fig. 21: Connecting Intelligent Tester To DLC3

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 do the "INITIALIZE" 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
      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.

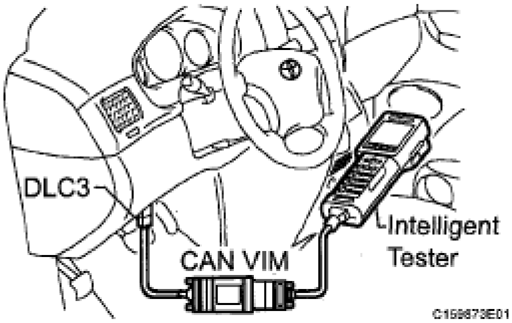

Fig. 22: Connecting Intelligent Tester To DLC3

      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.**

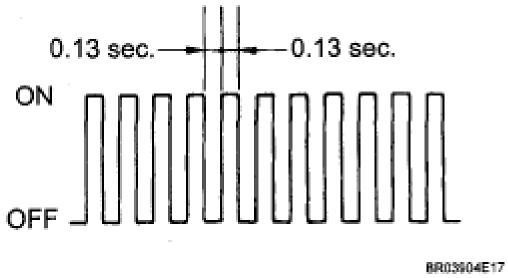

Fig. 23: Identifying MIL Flashes

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 "INITIALIZE" 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, 5th upshift is prohibited.

   b. Counter gear speed sensor NC (Speed sensor NC): When the counter gear speed sensor has a malfunction, 5th 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, SL3 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 circuit solenoid). Even if starting the engine in the fail-safe mode, the gear position remains in the same position.

      HINT:

      FL: Flex Lock up

FAIL-SAFE CHART

<table>
<tr><td rowspan="5">Normal</td><td rowspan="4">Solenoid Valve</td><td>SL1</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>OFF</td></tr>
<tr><td>SL2</td><td>ON</td><td>ON</td><td>OFF</td><td>FL</td><td>FL</td></tr>
<tr><td>SL3</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr>
<tr><td>S4</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td></tr>
<tr><td colspan="2">Gear Position</td><td>1st</td><td>2nd</td><td>3rd</td><td>4th</td><td>5th</td></tr>
<tr><td rowspan="5">SL1 Malfunction (During driving at 1st or 2nd)</td><td rowspan="4">Solenoid Valve</td><td>SL1</td><td colspan="5">OFF</td></tr>
<tr><td>SL2</td><td>ON</td><td>ON</td><td>OFF to ON</td><td>FL to ON</td><td>FL to ON</td></tr>
<tr><td>SL3</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON to OFF</td><td>ON to OFF</td></tr>
<tr><td>S4</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON to OFF</td></tr>
<tr><td colspan="2">Gear Position</td><td>1st to</td><td>2nd</td><td>3rd to</td><td>4th to</td><td>5th to</td></tr>
</table>

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

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

DATA LIST / ACTIVE TEST

1. **DATA LIST**

HINT:

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

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

a. Warm up the engine.
b. Turn the ignition switch off.
c. Connect the 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	-
			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.

PNP SW [NSW]	PNP switch Status/ ON or OFF	Shift lever position is; P and N:ON Except P and N: OFF	HINT: When the failure still occurs even after adjusting these parts, See **DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT MALFUNCTION (PRNDL INPUT)**.
PARKING	PNP switch Status/ ON or OFF	Shift lever position is: P:ON Except P: OFF	?
NEUTRAL	PNP switch Status/ ON or OFF	Shift lever position is: N:ON Except N: OFF	?
REVERSE	PNP switch Status/ ON or OFF	Shift lever position is; R:ON Except R: OFF	?
DRIVE	PNP switch Status/ ON or OFF	Shift lever position is; D and 4: ON Except D and 4: 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	?
4TH/DRIVE	PNP SW Status/ ON or OFF	Shift lever position is; 4: ON Except 4: OFF	?
3RD	PNP SW Status/ ON or OFF	Shift lever position is; 3: ON Except 3: OFF	?
SHIFT	Actual Gear Position/ 1st, 2nd, 3rd, 4th or 5th (O/D)	Shift lever position is; • L: 1st • 2:1st or 2nd • 3: 1st, 2nd or 3rd • 4: 1st, 2nd, 3rd or 4th • D (O/D ON): 1st, 2nd, 3rd, 4th or 5th	-
LOCK UP	Lock Up Status/ ON or	• Lock Up: ON • Except Lock Up:	-

	OFF	OFF	
LOCK UP SOL	Lock Up Solenoid Status/ ON or OFF	• Lock Up: ON • Except Lock Up: OFF	-
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	• Accelerator pedal is depressed: OFF • Accelerator pedal is released: ON	-
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.
SPD (NC)	Counter Gear Speed/ display: 50 r/min	HINT: 3rd when shift lever position is D position (After warming up the engine); • Intermediate shaft speed (NC) becomes close to the engine speed.	-
SPD (NT)	Input Turbine Speed/display: 50 r/ min	HINT: • Lock up ON (After warning up the engine): Input Turbine speed (NT) equal to the engine speed. • Lock up OFF (Idling at N position): Input Turbine speed (NT) nearly equal to the engine speed.	-

2. **ACTIVE TEST**

HINT:

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

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

ACTIVE TEST DETAIL

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/5th	Possible to check the operation of the shift 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: 60 km/h (37 mph) or more, and 5th gear	ON/OFF	Possible to check the DSL operation.
SOLENOID (SL1)	[Test Details] Operate the shift solenoid SL1 [Vehicle Condition] • Vehicle Stopped.	ON/OFF	-

	• Shift lever P or N position		
SOLENOID (SL2)	[Test Details] Operate the shift solenoid SL2 [Vehicle Condition] • Vehicle Stopped. • Shift lever P or N position	ON/OFF	-
SOLENOID (SL3)	[Test Details] Operate the shift solenoid SL3 [Vehicle Condition] • Vehicle Stopped. • Shift lever P or N position	ON/OFF	-
SOLENOID (S4)	[Test Details] Operate the shift solenoid S4 [Vehicle Condition] • Vehicle Stopped. • Shift lever P or N position	ON/OFF	-
SOLENOID (SR)	[Test Details] Operate the shift solenoid SR [Vehicle Condition] • Vehicle Stopped. • Shift lever P or N position	ON/OFF	-
SOLENOID (DSL)	[Test Details] Operate the shift solenoid DSL [Vehicle Condition] • Vehicle Stopped. • Shift lever P or N position	ON/OFF	-
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/OFF	-

	ON: No action (normal operation)		

(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 HYDRAULIC TEST (See **HYDRAULIC TEST**) 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 transmission are damaged.

AUTOMATIC TRANSAXLE SYSTEM:

DIAGNOSTIC TROUBLE CODE CHART

DTC Code	Detection Item	Trouble Area	MIL*1	Memory *2
P0705	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
P0710	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
P0711	Transmission Fluid Temperature Sensor "A" Performance	Transmission wire (ATF temperature sensor)	Comes on	DTC stored
P0712	Transmission Fluid Temperature Sensor "A" Circuit Low Input	1. Short in ATF temperature sensor circuit 2. Transmission wire (ATF temperature sensor) 3. ECM	Comes on	DTC stored

P0713	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
P0717	Turbine Speed Sensor Circuit No Signal	1. Open or short in transmission revolution sensor NT (speed sensor NT) circuit 2. Transmission revolution sensor NT (speed sensor NT) 3. ECM 4. Automatic transaxle assembly	Comes on	DTC stored
P0724	Brake Switch "B" Circuit High	1. Short in stop light switch circuit 2. Stop light switch 3. ECM	Comes on	DTC stored
P0741	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
P0746	Pressure Control Solenoid "A" Performance (Shift Solenoid Valve SL1)	1. Shift solenoid valve SL1 remains open or closed 2. Valve body is blocked 3. Automatic transaxle (clutch, brake or gear etc.)-	Comes on	DTC stored
P0748	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	1. Open or short in shift solenoid valve SL1 circuit 2. Shift solenoid valve SL1 3. ECM	Comes on	DTC stored
P0766	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
P0771	Shift Solenoid "E" Performance (Shift	1. Shift solenoid valve SR remains open or closed	Comes on	DTC stored

	Solenoid Valve SR)	2. Valve body is blocked 3. Automatic transaxle (clutch, brake or gear etc.)		
P0776	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
P0778	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	1. Open or short in shift solenoid valve SL2 circuit 2. Shift solenoid valve SL2 3. ECM	Comes on	DTC stored
P0793	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
P0796	Pressure Control Solenoid "C" Performance (Shift Solenoid Valve SL3)	1. Shift solenoid valve SL3 remains open or closed 2. Valve body is blocked 3. Automatic transaxle (clutch, brake or gear etc.)	Comes on	DTC stored
P0798	Pressure Control Solenoid "C" Electrical (Shift Solenoid Valve SL3)	1. Open or short in shift solenoid valve SL3 circuit 2. Shift solenoid valve SL3 3. ECM	Comes on	DTC stored
P0982	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
P0983	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
P0985	Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)	1. Short in shift solenoid valve SR circuit 2. Shift solenoid valve SR 3. ECM	Comes on	DTC stored

P0986	Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)	1. Open in shift solenoid valve SR circuit 2. Shift solenoid valve SR 3. ECM	Comes on	DTC stored
P2714	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
P2716	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	1. Open or short in shift solenoid valve SLT circuit 2. Shift solenoid valve SLT 3. ECM	Comes on	DTC stored
P2769	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
P2770	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
	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. • 3 input signal is ON. • 2 input signal is ON. B. Any 2 or more signals of the following are ON	

<table>
<tr>
<td>P0705</td>
<td>simultaneously (2-trip detection logic)
NSW (STAR) input signal is ON.
R input signal is ON.
D input signal is ON.
3 input signal is ON.
2 input signal is ON.
C. All switches are OFF simultaneously for NSW (STAR), P, R, N, D, 3, 2 positions (2-trip detection logic).
D. Both 1 and 2 conditions are met (2-trip detection logic)
1. One of the following conditions are met
a. NSW (STAR) input signal is ON.
b. P input signal is ON.
c. N input signal is ON.
d. R input signal is ON.
2. One of the following conditions are met
a. 4 input signal is ON.
b. L input signal is ON.</td>
<td>Short in park/neutral position switch circuit
Park/neutral position switch
ECM</td>
</tr>
</table>

MONITOR DESCRIPTION

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

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

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

The park/neutral position switch sends a signal to the ECM according to the shift position (P, R, N or D).

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

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0705: Park/neutral position switch/Verify switch input
Required sensors/Components	Park/neutral position switch
Frequency of operation	Continuous
Duration	Condition (A), (B), (D) 2 sec. Condition (C) 60 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.	None
Ignition switch	ON
Battery voltage	10.5 V or more

TYPICAL MALFUNCTION THRESHOLDS

1. **One of the following conditions are met: Condition (A), (B), (C) and (D)**

    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
3 switch	ON
2 switch	ON

    Condition (B):

    TYPICAL MALFUNCTION THRESHOLDS

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

    Condition (C):

    TYPICAL MALFUNCTION THRESHOLDS

NSW (STAR) switch	OFF
P switch	OFF
N switch	OFF

R switch	OFF
D switch	OFF
3 switch	OFF
2 switch	OFF

Condition (D):

Both of the following conditions (1) or (2) are met:

TYPICAL MALFUNCTION THRESHOLDS

(1) One of the following conditions are met	-
NSW (STAR) switch	ON
P switch	ON
R switch	ON
N switch	ON
(2) One of the following conditions are met	-
4 shift position switch	ON
L shift position switch	ON

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM

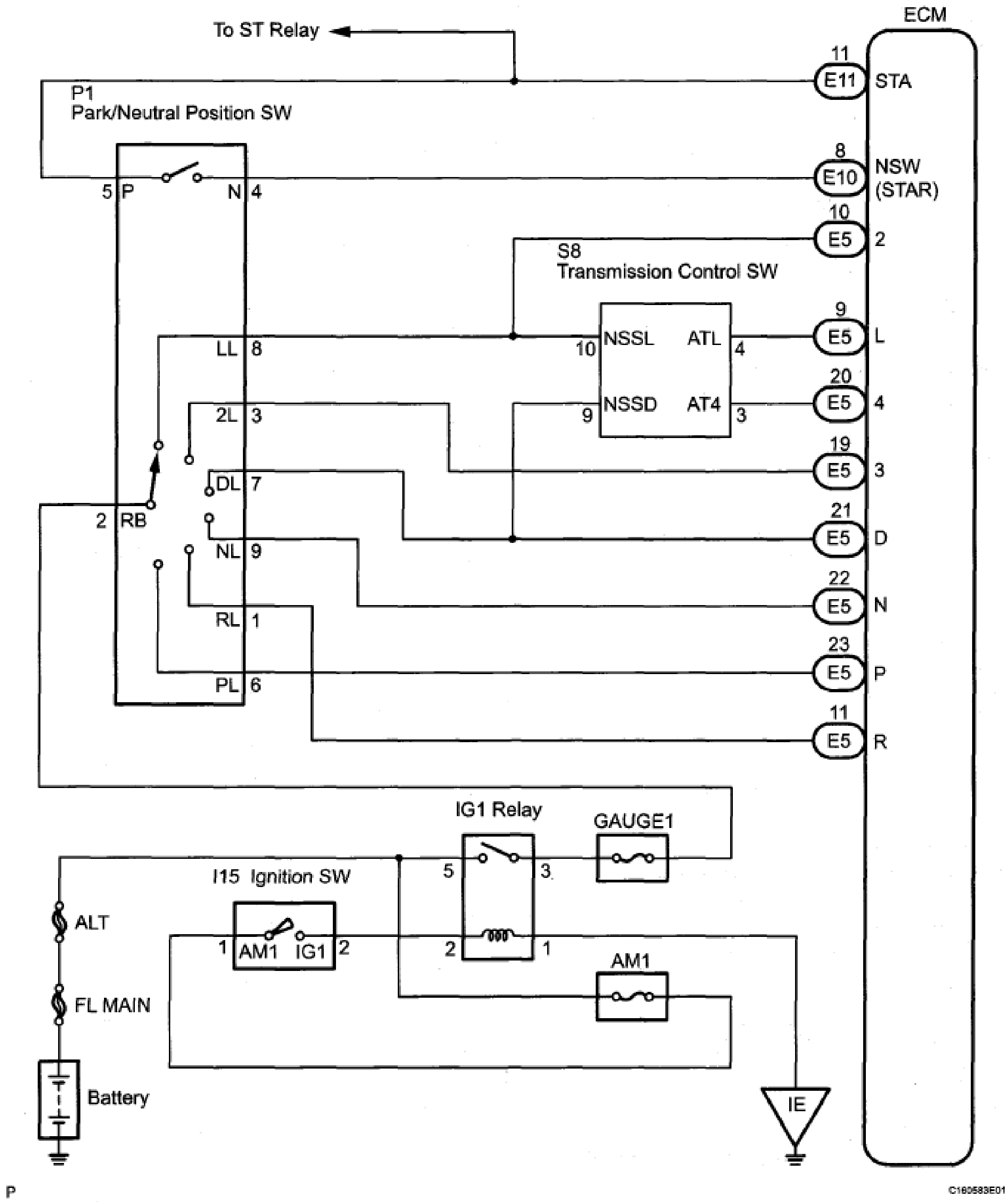

Fig. 24: Park/Neutral Position Switch - Wiring Diagram

INSPECTION PROCEDURE

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

Standard resistance

RESISTANCE SPECIFICATION

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 and 4	2 - 7	Below 1 ohms
Except D and 4		10 kohms or higher
3	2 - 3	Below 1 ohms
Except 3		10 kohms or higher
2 and L	2 - 8	Below 1 ohms
Except 2 and L		10 kohms or higher

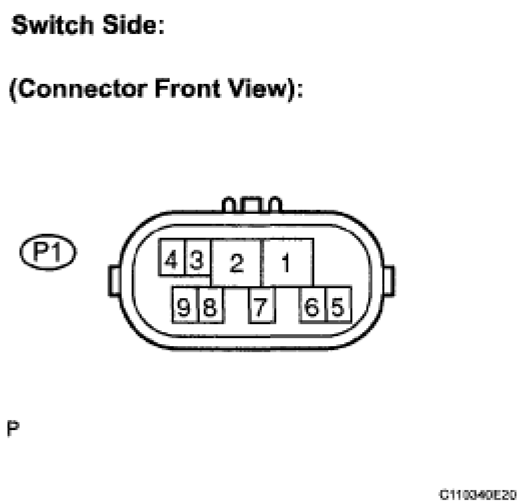

Fig. 25: Identifying Park/Neutral Position Switch Connector Terminals

NG: REPLACE PARK/NEUTRAL POSITION SWITCH ASSEMBLY

OK: Go to Next Step

2. **INSPECT SHIFT LOCK CONTROL UNIT ASSEMBLY**
   a. Connect the park/neutral position switch connector.
   b. Disconnect the transmission control switch connector of shift lock control unit assembly.
   c. Measure resistance according to the value (s) in the table below when the shift lever is moved to each position.

   Standard resistance

RESISTANCE SPECIFICATION

Shift Position	Tester Connection	Specified Condition
D	2 - 9	Below 1 ohms
4	?	10 kohms or higher
D	3 - 9	10 kohms or higher
4	?	Below 1 ohms
2	5 - 10	Below 1 ohms
L	?	10 kohms or higher
2	4 - 10	10 kohms or higher
L	?	Below 1 ohms

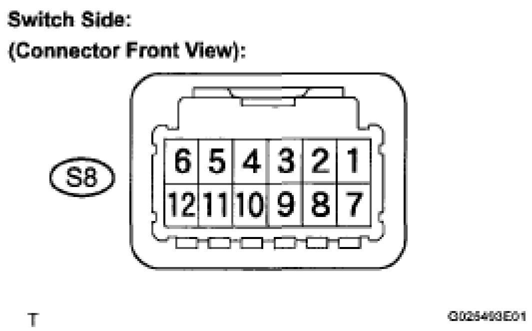

Fig. 26: Identifying Shift Lock Control Unit Connector Terminals

NG: REPLACE SHIFT LOCK CONTROL UNIT ASSEMBLY

OK: Go to Next Step

3. **CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH - ECM)**
   a. Connect the transmission control switch connector of shift lock control unit assembly.
   b. 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.

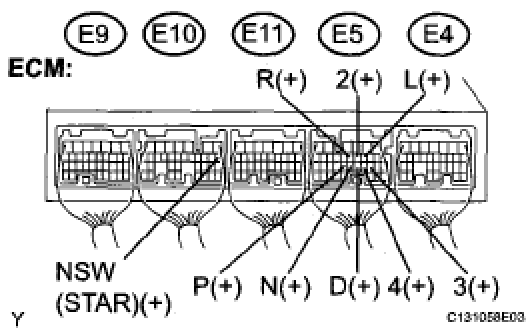

Fig. 27: Identifying ECM Connector Terminals

Standard voltage

VOLTAGE SPECIFICATION

Shift Position	Tester Connection	Specified Condition
P and N	E10-8 (NSW (STAR)) - Body ground	Below 1 V
Except P and N	E10-8 (NSW (STAR)) - Body ground	11 to 14 V
P	E5-23 (P) - Body ground	11 to 14 V
Except P	E5-23 (P) - Body ground	Below 1 V
N	E5-22 (N) - Body ground	11 to 14 V
Except IM	E5-22 (N) - Body ground	Below 1 V
R	ES-11 (R) - Body ground	11 to 14 V*
Except R	ES-11 (R) - Body ground	Below 1 V
D and 4	E5-21 (D) - Body ground	11 to 14 V
Except D and 4	E5-21 (D) - Body ground	Below 1 V
4	ES-20 (4) - Body ground	11 to 14 V
Except 4	ES-20 (4) - Body ground	Below 1 V
3	E5-19 (3) - Body ground	11 to 14 V
Except 3	E5-19 (3) - Body ground	Below 1 V
2 and L	E5-10 (2) - Body ground	11 to 14 V
Except 2 and L	E5-10 (2) - Body ground	Below 1 V
L	E5-9 (L) - Body ground	11 to 14 V
Except L	E5-9 (L) - Body ground	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.

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.

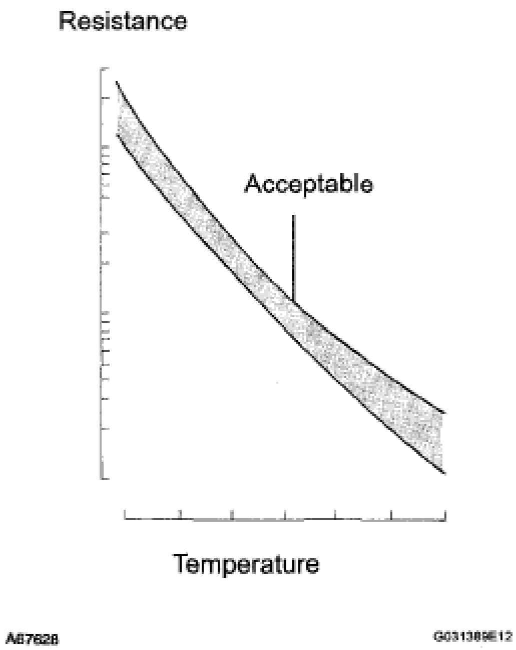

Fig. 28: ATF Temperature Sensor Resistance Graph

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 79ohms b. ATF temperature sensor resistance is more than 156 kohms HINT: Within 0.5 sec, the malfunction switches from (a) to (b) or from (b) to (a)	• Open or short in ATF temperature sensor circuit • Transmission wire (ATF temperature sensor) • ECM
P0712	ATF temperature sensor resistance is less than 79 a 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	• Open in ATF temperature sensor circuit • Transmission wire (ATF

	DTC is detected for 0.5 sec. or more (1-trip detection logic)	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 156 kohms *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

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)

TYPICAL ENABLING CONDITIONS

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)

TYPICAL MALFUNCTION THRESHOLDS

TFT sensor resistance	Less than 79 ohms

P0713: Range check (High resistance)

TYPICAL MALFUNCTION THRESHOLDS

TFT sensor resistance	More than 156 kohms

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM

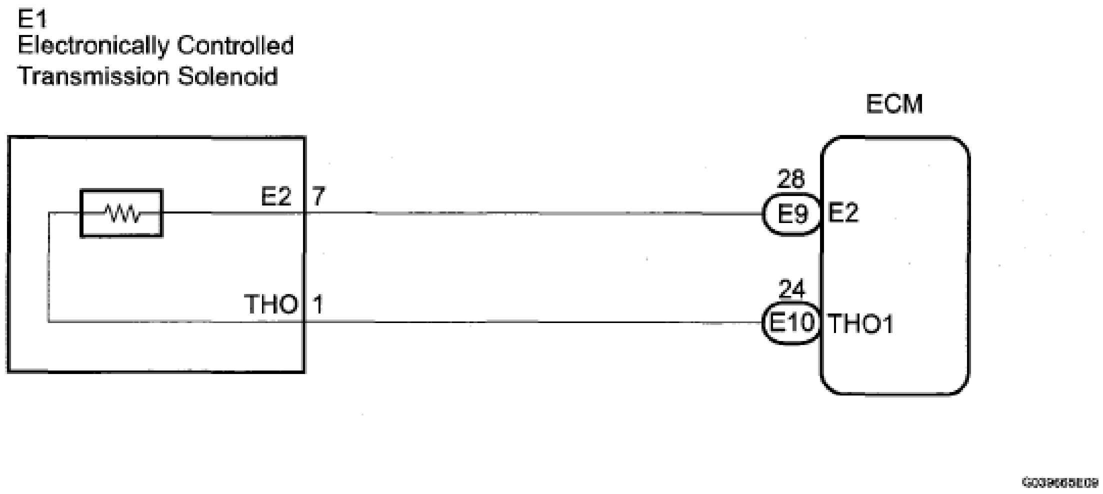

Fig. 29: Electronically Controlled Transmission Solenoid - Wiring Diagram

INSPECTION PROCEDURE

HINT:

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

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
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.

TEMPERATURE SPECIFICATION

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

Standard resistance

RESISTANCE SPECIFICATION

Tester Connection	Specified Condition
1 (THO) - 7 (E2)	79 ohms to 156 kohms
1 (THO) - Body ground	10 kohms or higher
7 (E2) - Body ground	?

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.

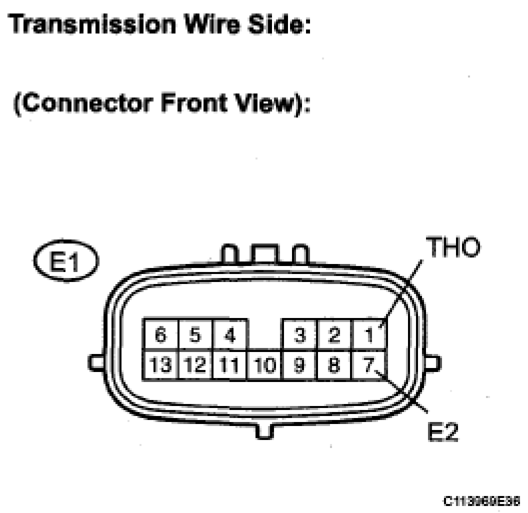

Fig. 30: Identifying Transmission Wire Connector Terminals

ATF TEMPERATURE AND RESISTANCE SPECIFICATION

ATF Temperature	Specified Condition
10°C (50°F)	5to8kohms
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)**
    a. Connect the transmission wire connector to the transaxle.
    b. Disconnect the ECM connectors.
    c. Measure the resistance according to the value (s) in the table below.

    Standard resistance

    RESISTANCE SPECIFICATION

Tester Connection	Specified Condition
E10-24 (THO1) - E9-28 (E2)	79 ohms to 156 kohms

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

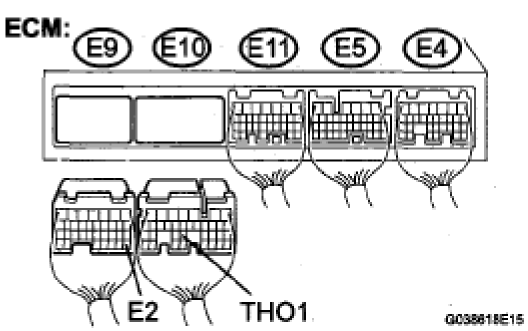

Fig. 31: Disconnecting ECM Connectors

Standard resistance (Check for short)

RESISTANCE SPECIFICATION

Tester Connection	Specified Condition
E10-24 (THO1) - Body ground	10 kohms or higher
E9-28 (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	A. Both (a) and (b) are detected: (2-trip detection logic) a. Intake air and engine coolant temperatures are more than -10°C (14°F) at engine start b. After normal driving for over 19 min. and 9 km (6 mile) or more, ATF temp, is less than 20°C (68°F) B. When engine coolant temp, is less than 35°C (95°F) at engine start, the ATF temp, is 110°C (230°F) or more after 17 min. of engine start (2-trip detection logic).	Transmission wire (ATF temperature sensor)

MONITOR DESCRIPTION

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

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

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

MONITOR STRATEGY

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 (A), (B), (C) Continuous: Condition (D)
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
TFT sensor circuit	Not circuit malfunction
ECT sensor circuit	Not circuit malfunction
IAT sensor circuit	Not circuit malfunction
ETCS	Not circuit malfunction

Condition (A):

TYPICAL ENABLING CONDITIONS

Time after engine start	18 min. and 20 sec.
Driving distance after engine start	9 km (5.6 mile) or more
IAT (Intake air temperature) (12 sec. after starting engine)	-10°C (14°F)or more
ECT (12 sec. after starting engine)	-10°C (14°F)or more

Condition (B):

TYPICAL ENABLING CONDITIONS

Time after engine start	30 min.
Driving distance after engine start	15 km (9.3 mile) or more
IAT (Intake air temperature) (12 sec. after starting engine)	-15°C (5°F)or more
ECT (12 sec. after starting engine)	-15°C (5°F)or more

Condition (C):

TYPICAL ENABLING CONDITIONS

Time after engine start	40 min.
Driving distance after engine start	20 km (124 mile) or more

Condition (D):

TYPICAL ENABLING CONDITIONS

ECT (12 sec. after engine start)	Less than 35°C (95°F)

TYPICAL MALFUNCTION THRESHOLDS

Condition (A), (B), (C):

TYPICAL MALFUNCTION THRESHOLDS

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

Condition (D):

TYPICAL MALFUNCTION THRESHOLDS

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

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM

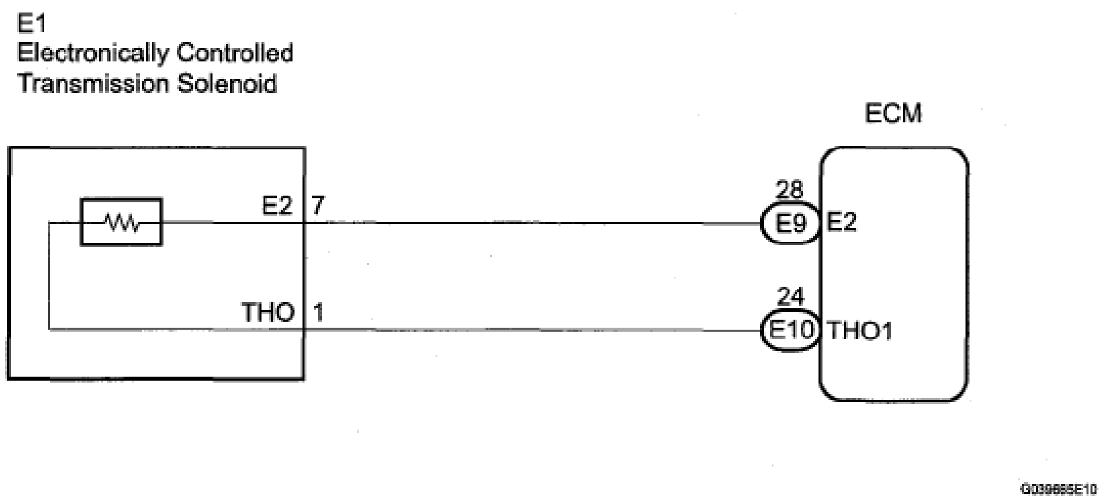

Fig. 32: Electronically Controlled Transmission Solenoid - Wiring Diagram

INSPECTION PROCEDURE

HINT:

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

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
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.

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.

TEMPERATURE SPECIFICATION

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)**
   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 push 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

RESULT REFERENCE

Result	Proceed to
P0711	A
P0711 and other DTCs	B

HINT:

If any other codes besides "P0711" 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 (STAR) and R) is OFF	• Open or short in transmission revolution sensor NT (speed sensor NT) circuit • Transmission revolution sensor NT (speed sensor NT) • ECM

	c. Speed sensor (NT): less than 300 rpm	• Automatic transaxle assembly

Reference (Using an oscilloscope):

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

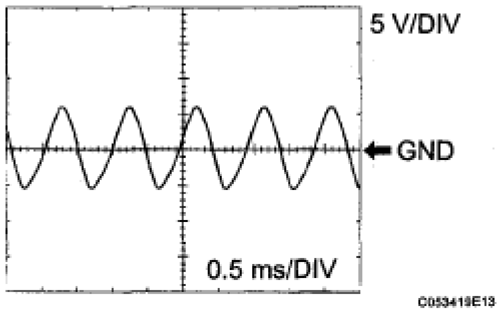

Fig. 33: Waveform Graph

Standard: Refer to the illustration.

WAVEFORM REFERENCE

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

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	3rd, 4th
Output shaft rpm	1,000 rpm or more
NSW (STAR) switch	OFF
R switch	OFF
L switch	OFF
Engine	Running
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

TYPICAL MALFUNCTION THRESHOLDS

Sensor signal rpm	Less than 300 rpm

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM

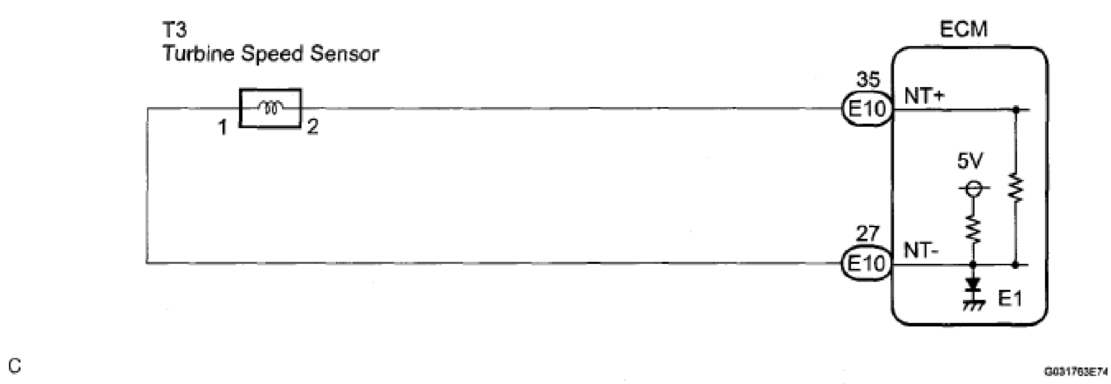

Fig. 34: Turbine Speed Sensor - Wiring Diagram

INSPECTION PROCEDURE

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.

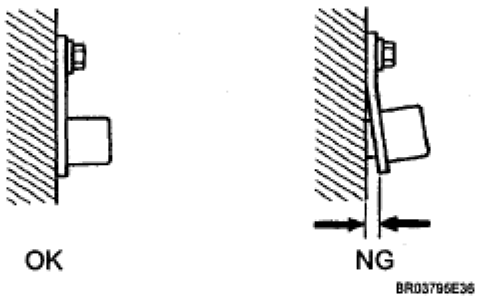

Fig. 35: Identifying Proper Installation Position Of Speed Sensor

NG: REPLACE SPEED SENSOR (NT)

OK: Go to Next Step

2. **INSPECT SPEED SENSOR (NT)**
    a. Disconnect the speed sensor connector from the transaxle.

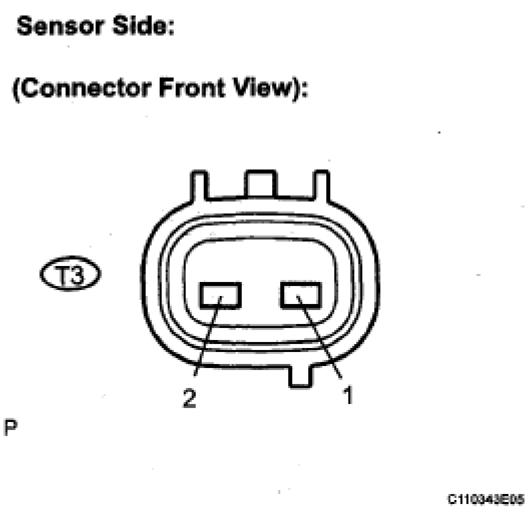

Fig. 36: Identifying Speed Sensor Connector Terminals

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

Standard resistance

RESISTANCE SPECIFICATION

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

NG: REPLACE SPEED SENSOR (NT)

OK: Go to Next Step

3. **CHECK HARNESS AND CONNECTOR (SPEED SENSOR - ECM)**
    a. Connect the speed sensor connector.
    b. Disconnect the ECM connector.
    c. Measure the resistance according to the value (s) in the table below.

    Standard resistance

    RESISTANCE SPECIFICATION

Tester Connection	Specified Condition 20°C (68°F)
E10-35 (NT+) - E10-27 (NT-)	560 to 680 ohms

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

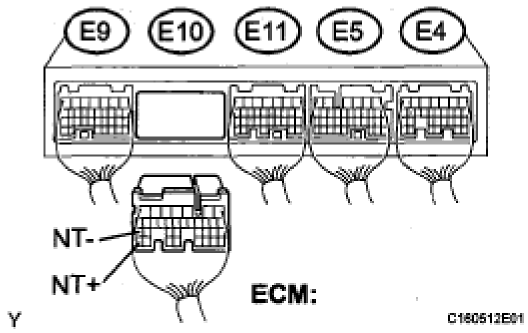

Fig. 37: Disconnecting ECM Connector

Standard resistance (Check for short)

RESISTANCE SPECIFICATION

Tester Connection	Specified Condition
E10-35 (NT+) - Body ground	10 kohms or higher
E10-27 (NT-) - Body ground	

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

OK: REPLACE ECM

DTC P0724 BRAKE SWITCH "B" CIRCUIT HIGH

DESCRIPTION

The purpose of this circuit is to prevent the engine from stalling while driving in 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

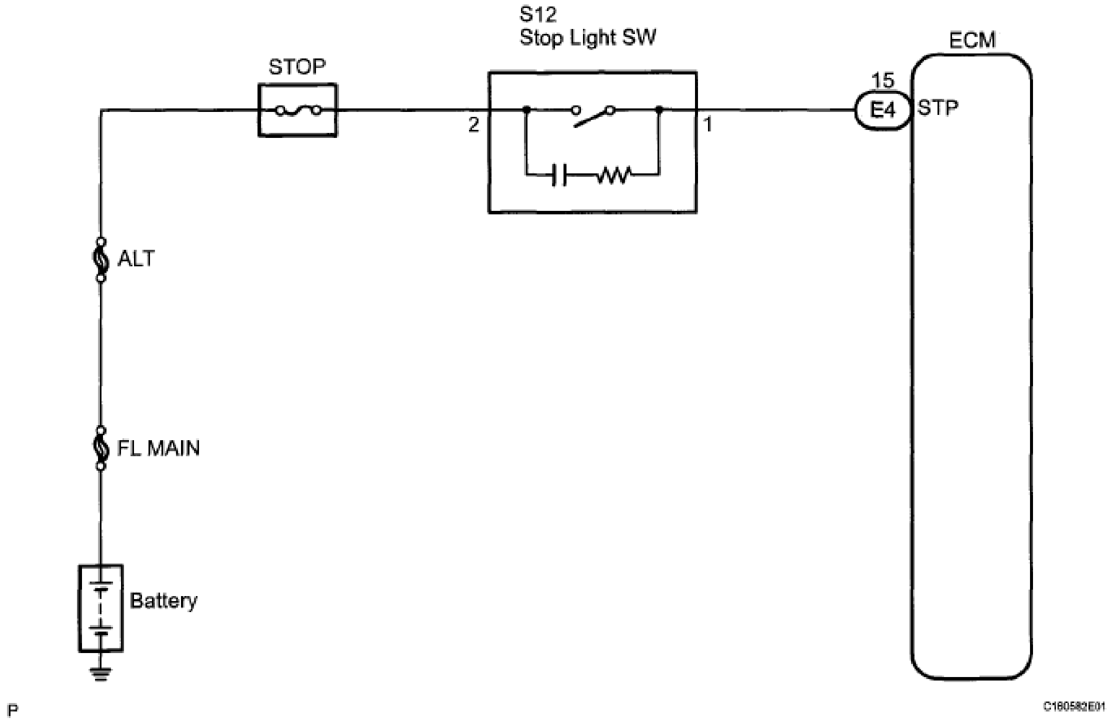

Fig. 38: Stop Light Switch - Wiring Diagram

INSPECTION PROCEDURE

1. **READ VALUE OF DATA LIST**

   HINT:

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

   a. Warm up the engine.
   b. Turn the ignition switch off.
   c. 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 apart is faulty or not.

Result

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

RESISTANCE SPECIFICATION

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

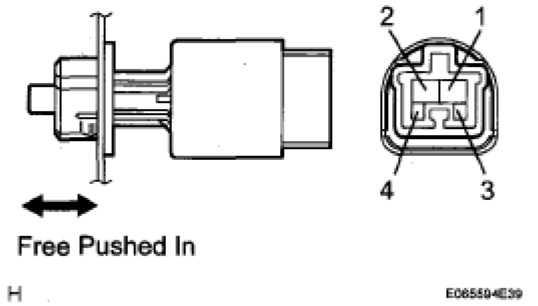

Fig. 39: Inspecting Stop Light Switch Assembly

NG: REPLACE STOP LIGHT SWITCH ASSEMBLY

OK: Go to Next Step

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

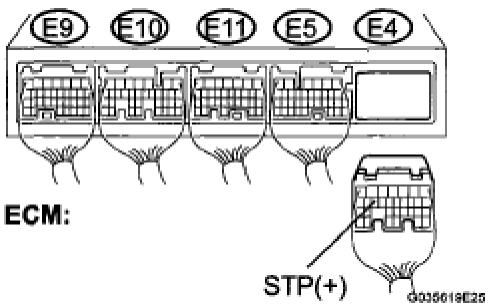

Fig. 40: Disconnecting ECM Connector

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

Standard voltage

VOLTAGE SPECIFICATION

Condition	Tester Connection	Specified Condition
Brake pedal is depressed	E4-15 (STP) - Body ground	11 to 14 V
Brake pedal is released		Below 1 V

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

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 the lock-up range (normal driving at 80 km/h [50 mph]), or lock up remains ON in the lock-up OFF range. (2-trip detection logic)	• Shift solenoid valve DSL remains open or closed • Valve body is blocked • 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.

(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) Continuous. OFF malfunction (B) 1 sec. OFF malfunction (C) 3.5 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)	10°C (50°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 SL3 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve SR circuit	Not circuit malfunction
Shift solenoid valve DSL circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction (A):

TYPICAL ENABLING CONDITIONS

ECM selected gear	3rd
Throttle valve opening angle	4.5% or more at engine speed gear 1,900 rpm (varies with engine speed)

OFF malfunction (B):

TYPICAL ENABLING CONDITIONS

ECM selected gear	5th
Vehicle speed	10 km/h (6.2 mph) or more

OFF malfunction (C):

TYPICAL ENABLING CONDITIONS

ECM lock-up command	ON
ECM selected gear	3rd, 4th or 5th
Vehicle speed	25 km/h (15.5 mph) or more

ON malfunction:

TYPICAL ENABLING CONDITIONS

ECM lock-up command	OFF
ECM selected gear	3rd, 4th or 5th
Throttle valve opening angle	7% or more
Vehicle speed	25 to 60 km/h (15.5 to 37.3 mph)

TYPICAL MALFUNCTION THRESHOLDS

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

TYPICAL MALFUNCTION THRESHOLDS

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

ON malfunction:

TYPICAL MALFUNCTION THRESHOLDS

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

INSPECTION PROCEDURE

HINT:

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

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

   ACTIVE TEST DETAIL

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: 60 km/h (37 mph) or more, and 5th gear	ON/OFF	Possible to check the DSL operation.

   HINT:

   - This test can be conducted when the vehicle speed is 60 km/h (37 mph) or more.
   - This test can be conducted in the 5th gear.

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

   HINT:

- When changing the accelerator pedal opening angle while driving, if the engine speed does not change, lock-up is on.
- Slowly release, 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.)

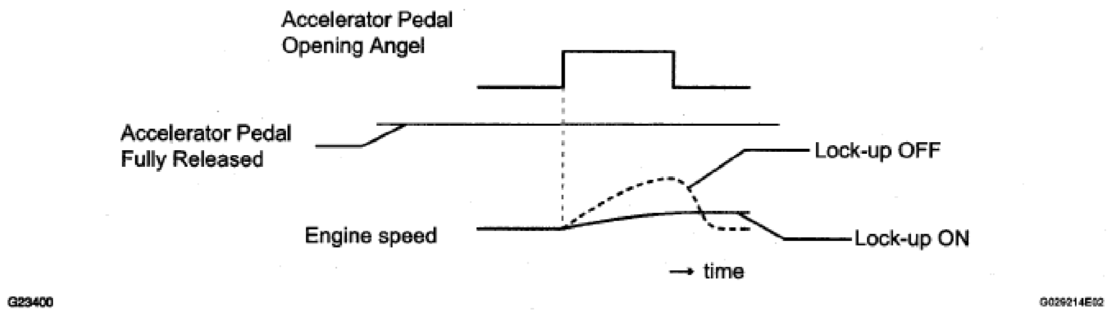

Fig. 41: Accelerator Pedal Opening Angle Graph

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

      RESULT REFERENCE

Result	Proceed to
P0741	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)**
   a. Disconnect the transmission wire connector from the transaxle.
   b. Measure the resistance according to the value (s) in the table below.

Standard resistance

RESISTANCE SPECIFICATION

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

NG: Go to step 4

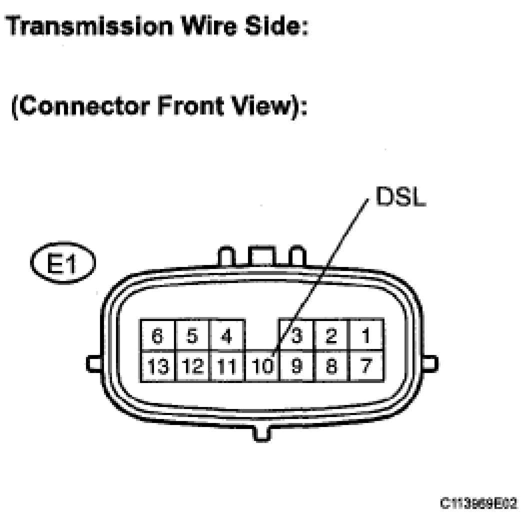

Fig. 42: Identifying Transmission Wire Connector Terminals (DSL)

OK: Go to Next Step

3. **CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)**
    a. Connect the transmission wire connector.
    b. Disconnect the ECM connector.

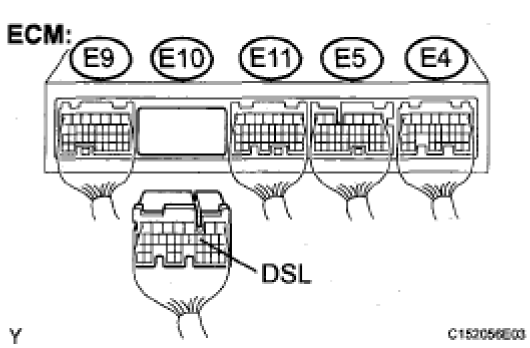

Fig. 43: Disconnecting ECM Connector

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

Standard resistance

RESISTANCE SPECIFICATION

Tester Connection	Specified Condition 20°C (68°F)
E10-11 (DSL) - Body ground	11 to 13 ohms

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

OK: Go to Next Step

4. **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.

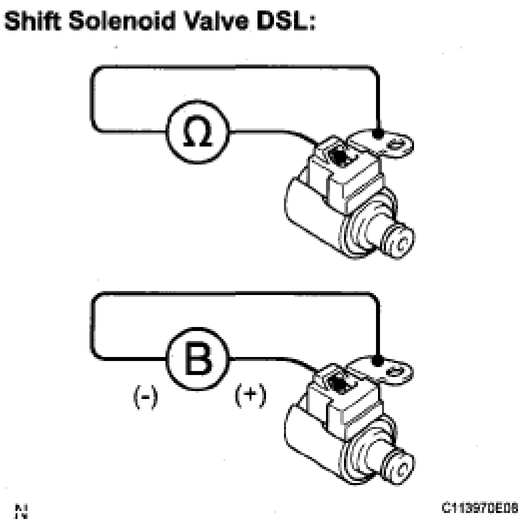

Fig. 44: Measuring Resistance Between Shift Solenoid Valve DSL Terminals And Solenoid Body

Standard resistance

RESISTANCE SPECIFICATION

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

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, 4th or 5th gear).

Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transaxle (clutch, brake 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, 4th or 5th gear position). When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL.

HINT:

Example:

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

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

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0746: Shift solenoid valve SL1/OFF malfunction Shift solenoid valve SL1/ON malfunction
Required sensors/Components	Shift solenoid valve SL1, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	0.8 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

ALL:

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)	10°C (50°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 SL3 circuit	Not circuit malfunction

Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve SR circuit	Not circuit malfunction
Shift solenoid valve DSL circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction:

TYPICAL ENABLING CONDITIONS

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:

TYPICAL ENABLING CONDITIONS

ECM selected gear	2nd
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (Varies with engine speed)

TYPICAL MALFUNCTION THRESHOLDS

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

OFF malfunction:

2 detections are necessary per driving cycle:

1st detection; temporary flag ON

2nd detection; pending fault code ON

TYPICAL MALFUNCTION THRESHOLDS

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

ON malfunction:

TYPICAL MALFUNCTION THRESHOLDS

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

INSPECTION PROCEDURE

HINT:

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

1. **PERFORM ACTIVE TEST**
    a. Warm up the engine.
    b. Turn the ignition switch off.
    c. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
    d. Turn the ignition switch to the ON position.
    e. 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**).

ACTIVE TEST DETAIL

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/5th	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

    RESULT REFERENCE

Result	Proceed to
P0746	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**
    a. Remove the shift solenoid valve SL1.
    b. Measure the resistance according to the value (s) in the table below.

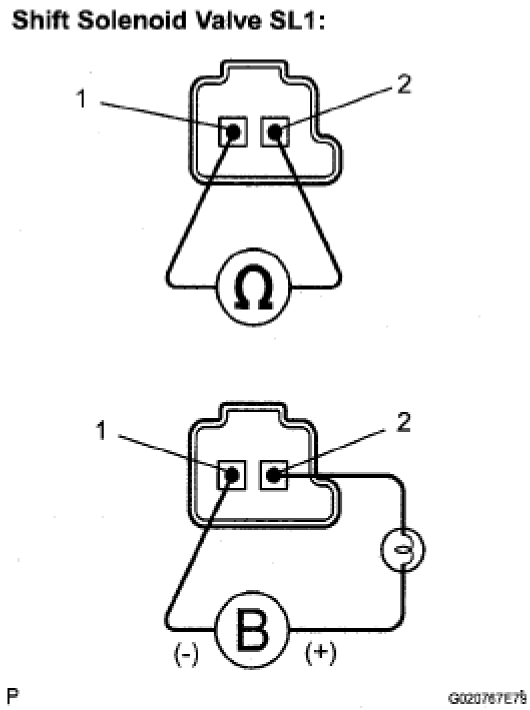

Fig. 45: Measuring Resistance Between Shift Solenoid Valve SL1 Terminals

Standard resistance

RESISTANCE SPECIFICATION

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

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)

DESCRIPTION

Shifting from 1st to 5th is performed in combination with "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, SL3, S4 and SR which are controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves 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

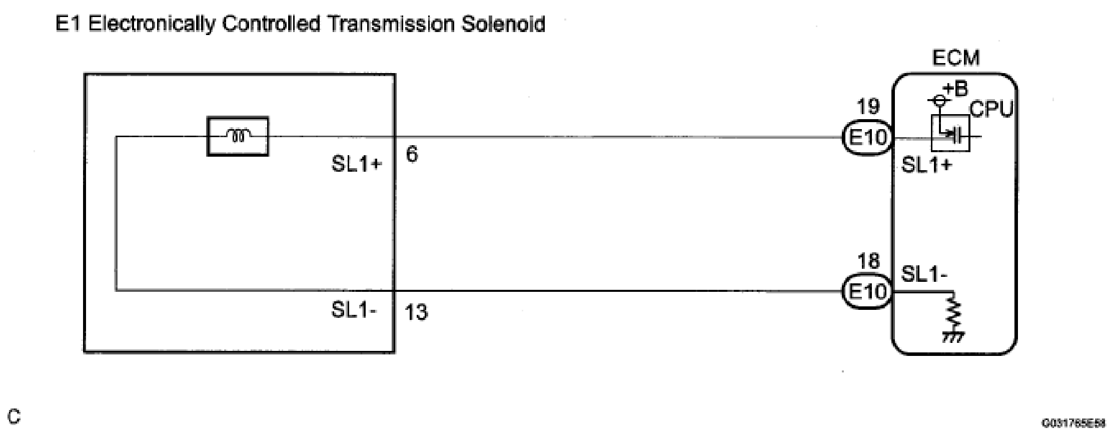

Fig. 46: Electronically Controlled Transmission Solenoid - Wiring Diagram

INSPECTION PROCEDURE

1. **INSPECT TRANSMISSION WIRE (SL1)**
   a. Disconnect the transmission wire connector from the transaxle.
   b. Measure the resistance according to the value (s) in the table below.

   Standard resistance

   RESISTANCE SPECIFICATION

Tester Connection	Specified Condition 20°C (68°F)
6 (SL1+)-13 (SL1-)	5.0 to 5.6 ohms

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

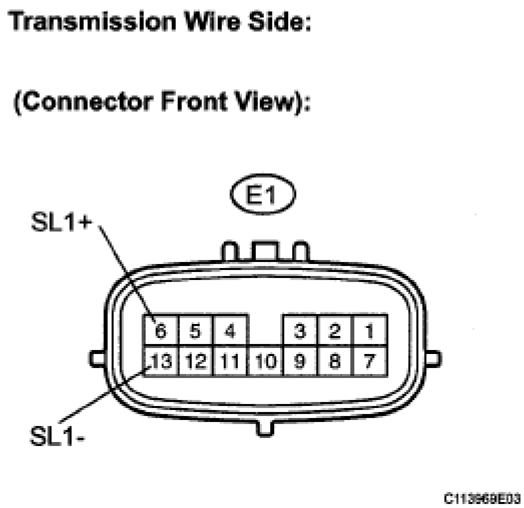

Fig. 47: Identifying Transmission Wire Connector Terminals

Standard resistance (Check for short)

RESISTANCE SPECIFICATION

Tester Connection	Specified Condition
6 (SL1+) - Body ground	10 kohms or higher
13 (SL1-) - Body ground	?

NG: Go to step 3

OK: Go to Next Step

2. **CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)**
    a. Connect the transmission wire connector to the transaxle.
    b. Disconnect the connector from the ECM.
    c. Measure the resistance according to the value (s) in the table below.

    Standard resistance

    RESISTANCE SPECIFICATION

Tester Connection	Specified Condition 20°C (68°F)
E10-19 (SL1+)-E10-18 (SL1-)	5.0 to 5.6 ohms

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

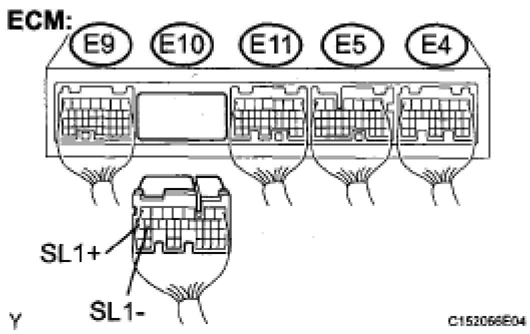

Fig. 48: Disconnecting ECM Connector

Standard resistance (Check for short)

RESISTANCE SPECIFICATION

Tester Connection	Specified Condition
E10-19 (SL1+) - Body ground	10 kohms or higher
E10-18 (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.

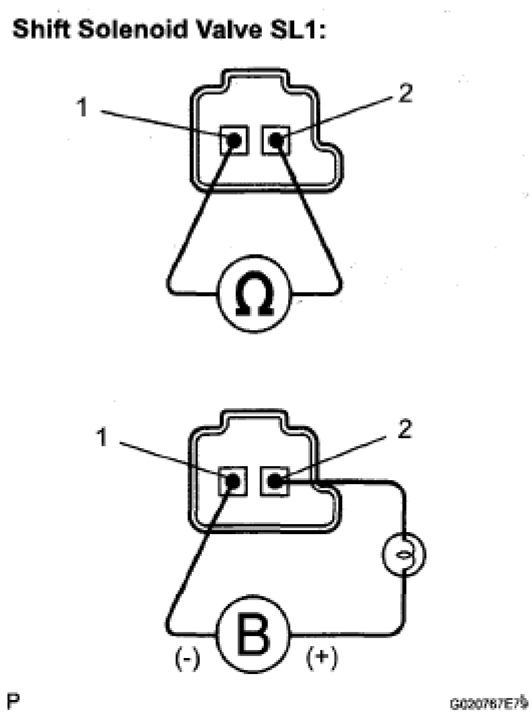

Fig. 49: Measuring Resistance Between Shift Solenoid Valve SL1 Terminals

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

Standard resistance

RESISTANCE SPECIFICATION

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

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

OK: REPAIR OR REPLACE TRANSMISSION WIRE

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

SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear).

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

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

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0766: Shift solenoid valve S4/OFF malfunction Shift solenoid valve S4/ON malfunction
Required sensors/Components	Shift solenoid valve S4, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	OFF malfunction (A) and ON malfunction (B) 1 sec. OFF malfunction (B) 1.2 sec. ON malfunction (A) 0.8 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

All:

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)	10°C (50°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 SL3 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve SR circuit	Not circuit malfunction
Shift solenoid valve DSL circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction (A):

TYPICAL ENABLING CONDITIONS

ECM selected gear	5th

Throttle valve opening angle	5% or more
Vehicle speed	10 km/h (6.2 mph) or more

OFF malfunction (B):

TYPICAL ENABLING CONDITIONS

ECM lock-up command	ON
ECM selected gear	3rd, 4th or 5th
Throttle valve opening angle	10% or more
Vehicle speed	25 to 100 km/h (15.5 to 62.1 mph)

ON malfunction (A):

TYPICAL ENABLING CONDITIONS

ECM selected gear	4th or 5th
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (Varies with engine speed)

ON malfunction (B):

TYPICAL ENABLING CONDITIONS

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

TYPICAL MALFUNCTION THRESHOLDS

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

2 detections are necessary per driving cycle:

1st detection; temporary flag ON

2nd detection; pending fault code ON

OFF malfunction (A):

TYPICAL MALFUNCTION THRESHOLDS

Intermediate shaft speed/Output speed	1.44 to 1.58

OFF malfunction (B):

TYPICAL MALFUNCTION THRESHOLDS

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

ON malfunction (A):

TYPICAL MALFUNCTION THRESHOLDS

Input (turbine) speed/Intermediate shaft speed	0.64 to 0.74

ON malfunction (B):

TYPICAL MALFUNCTION THRESHOLDS

Intermediate shaft speed/Output speed	1.02 to 1.16

INSPECTION PROCEDURE

HINT:

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

1. **PERFORM ACTIVE TEST**
   a. Warm up the engine.
   b. Turn the ignition switch off.
   c. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
   d. Turn the ignition switch to the ON position.
   e. 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**).

ACTIVE TEST DETAIL

Tester Display	Test Part	Control Range	Diagnostic Note
	[Test Details] Operate the shift solenoid valve and set the each shift position by yourself. [Vehicle Condition]		

SHIFT	• IDL: ON • Less than 50 km/h (31 mph) [Others] • Press "-->" button: Shift up • Press "<--" button: Shift down	1st/2nd/3rd/4th/5th	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)**
   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. 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

   RESULT REFERENCE

Result	Proceed to
P0766	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.

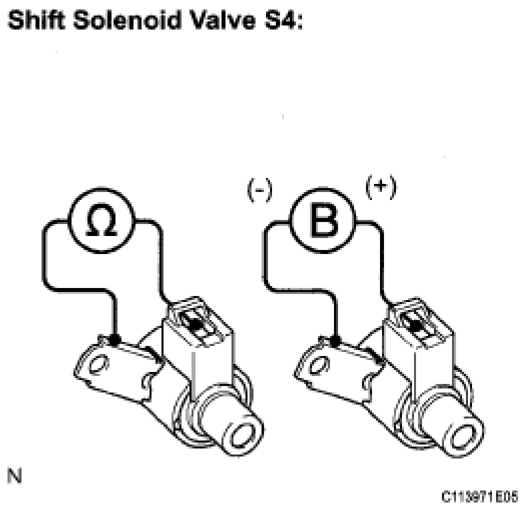

Fig. 50: Measuring Resistance Between Shift Solenoid Valve S4 Terminals And Solenoid Body

Standard resistance

RESISTANCE SPECIFICATION

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

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 P0771 SHIFT SOLENOID "E" PERFORMANCE (SHIFT SOLENOID VALVE SR)

SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear).

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

DTC DETECTION CONDITION AND TROUBLE AREA

DTC No.	DTC Detection Condition	Trouble Area
P0771	The gear required by the ECM does not match the actual gear when driving (2-trip detection logic)	• Shift solenoid valve SR remains open or closed • Valve body is blocked • 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, 4th or 5th gear position). When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0771: Shift solenoid valve SR/Rationality check
Required sensors/Components	Shift solenoid valve SR, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	OFF malfunction (A) 1 sec. OFF malfunction (B) 3.5 sec. ON malfunction (A) Continuous ON malfunction (B) and (C) 0.8 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

All:

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)	10°C (50°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 SL3 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve SR circuit	Not circuit malfunction
Shift solenoid valve DSL circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction (A):

TYPICAL ENABLING CONDITIONS

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

OFF malfunction (B):

TYPICAL ENABLING CONDITIONS

ECM lock-up command	ON
ECM selected gear	3rd, 4th or 5th
Vehicle speed	25 km/h (15.5 mph) or more

ON malfunction (A):

TYPICAL ENABLING CONDITIONS

ECM lock-up command	OFF

ON malfunction (B):

TYPICAL ENABLING CONDITIONS

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

ON malfunction (C):

TYPICAL ENABLING CONDITIONS

ECM selected gear	3rd
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (Varies with engine speed)

ON malfunction (D):

TYPICAL ENABLING CONDITIONS

Duration time from shift command of ECM	15 sec. or more
ECM selected gear	4th or 5th

TYPICAL MALFUNCTION THRESHOLDS

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

OFF malfunction (A):

TYPICAL MALFUNCTION THRESHOLDS

Intermediate shaft speed/Output speed	1.44 to 1.58

OFF malfunction (B):

TYPICAL MALFUNCTION THRESHOLDS

Engine speed - Input (turbine) speed	75 rpm or more

ON malfunction (A):

TYPICAL MALFUNCTION THRESHOLDS

Difference between engine speed and input (turbine) speed	150 rpm or more

ON malfunction (B):

TYPICAL MALFUNCTION THRESHOLDS

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

ON malfunction (C):

TYPICAL MALFUNCTION THRESHOLDS

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

ON malfunction (D):

TYPICAL MALFUNCTION THRESHOLDS

Input (turbine) speed/Intermediate shaft speed	0.64 to 0.74

INSPECTION PROCEDURE

HINT:

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

1. **PERFORM ACTIVE TEST**
   a. Warm up the engine.
   b. Turn the ignition switch off.
   c. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
   d. Turn the ignition switch to the ON position.
   e. 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**).

ACTIVE TEST DETAIL

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	1st/2nd/3rd/4th/5th	Possible to check the operation of the shift solenoid

	• Less than 50 km/h (31 mph) [Others] • Press "-->" button: Shift up • Press "<--" button: Shift down		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 P0771)**
   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

      RESULT REFERENCE

Result	Proceed to
P0771	A
P0771 and other DTCs	B

HINT:

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

B: Go to **DTC CHART**

A: Go to next step

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

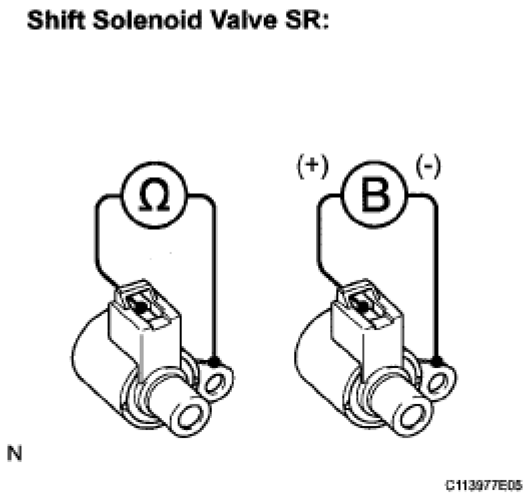

Fig. 51: Measuring Resistance Between Shift Solenoid Valve SR Terminals And Solenoid Body

Standard resistance

RESISTANCE SPECIFICATION

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

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

OK:

The solenoid makes an operating sound.

NG: REPLACE SHIFT SOLENOID VALVE SR

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 TRANSMISSION 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, 4th or 5th gear).

Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transaxle (clutch, brake 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 position (1st, 2nd, 3rd, 4th or 5th gear position). When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

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
	OFF malfunction (A) 1.8 sec.

Duration	OFF malfunction (B) and (C) 0.8 sec. ON malfunction (A) and (B) 0.8 sec. ON malfunction (C) 0.4 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

All:

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)	10°C (50°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 SL3 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve SR circuit	Not circuit malfunction
Shift solenoid valve DSL circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction (A):

TYPICAL ENABLING CONDITIONS

ECM lock-up command	OFF
Vehicle speed	Less than 60 km/h (37.3 mph)
Throttle valve opening angle	10% or more

OFF malfunction (B):

TYPICAL ENABLING CONDITIONS

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

OFF malfunction (C):

TYPICAL ENABLING CONDITIONS

ECM selected gear	3rd
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (Varies with engine speed)

OFF malfunction (D):

TYPICAL ENABLING CONDITIONS

ECM selected gear	4th or 5th
Duration time from shift command of ECM	15 sec. or more

ON malfunction (A):

TYPICAL ENABLING CONDITIONS

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

ON malfunction (B):

TYPICAL ENABLING CONDITIONS

ECM selected gear	3rd
Throttle valve opening angle	5.0% or more at output speed 1,400 rpm (Varies with engine speed)
Malfunction of pressure control solenoid "B" (SL2) and "C" (SL3)	Not detected

ON malfunction (C):

TYPICAL ENABLING CONDITIONS

Throttle valve opening angle	7.0% or more at output speed 1,050 rpm (Varies with engine speed)
Malfunction of pressure control solenoid "B" (SL2)	Not detected

TYPICAL MALFUNCTION THRESHOLDS

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

(B) and (C)

OFF malfunction (A):

TYPICAL MALFUNCTION THRESHOLDS

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

OFF malfunction (B) and (C):

TYPICAL MALFUNCTION THRESHOLDS

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

OFF malfunction (D):

TYPICAL MALFUNCTION THRESHOLDS

Input (turbine) speed/Intermediate shaft speed	0.64 to 0.74

ON malfunction (A):

TYPICAL MALFUNCTION THRESHOLDS

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

ON malfunction (B):

TYPICAL MALFUNCTION THRESHOLDS

Input (turbine) speed - Intermediate shaft speed	700 rpm or more

ON malfunction (C):

TYPICAL MALFUNCTION THRESHOLDS

Input (turbine) speed - Intermediate shaft speed	Less than -500 rpm or 700 rpm or more

INSPECTION PROCEDURE

HINT:

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

1. **PERFORM ACTIVE TEST**
    a. Warm up the engine.
    b. Turn the ignition switch off.

c. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
d. Turn the ignition switch to the ON position.
e. 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**).

ACTIVE TEST DETAIL

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/5th	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

RESULT REFERENCE

Result	Proceed to
P0776	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**
   a. Remove the shift solenoid valve SL2.
   b. Measure the resistance according to the value (s) in the table below.

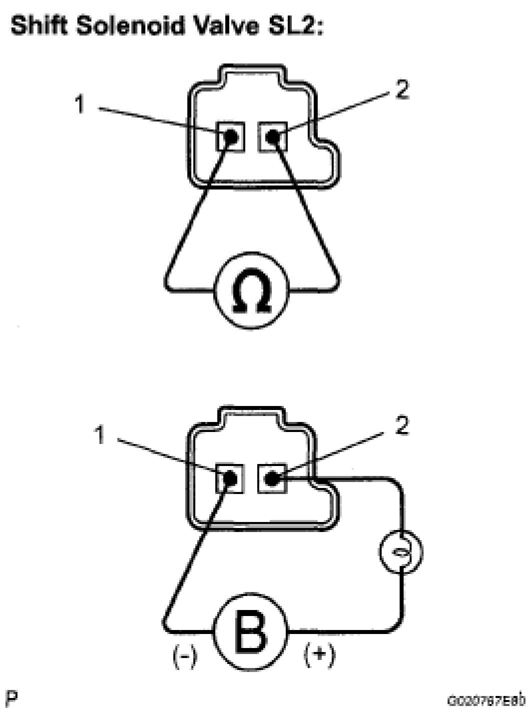

Fig. 52: Measuring Resistance Between Shift Solenoid Valve SL2 Terminals

Standard resistance

RESISTANCE SPECIFICATION

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

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 TRANSMISSION ASSEMBLY

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

DESCRIPTION

Shifting from 1st to 5th is performed in combination with "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, SL3, S4 and SR which are controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves 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	ECM checks for an open or short circuit in shift solenoid valves SL2 (1-trip detection logic) Hybrid IC for solenoid indicates fail.	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other normal shift solenoid valves "ON/OFF" (In case of an open or short circuit, the ECM stops sending current to the circuit.) (See **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	11V or more
Ignition switch	ON
Starter	OFF
CPU commanded duty ratio to SL2	19% or more

TYPICAL MALFUNCTION THRESHOLDS

TYPICAL MALFUNCTION THRESHOLDS

Solenoid status from IC	Fail (Open or short)

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

Output signal duty	Less than 100%

WIRING DIAGRAM

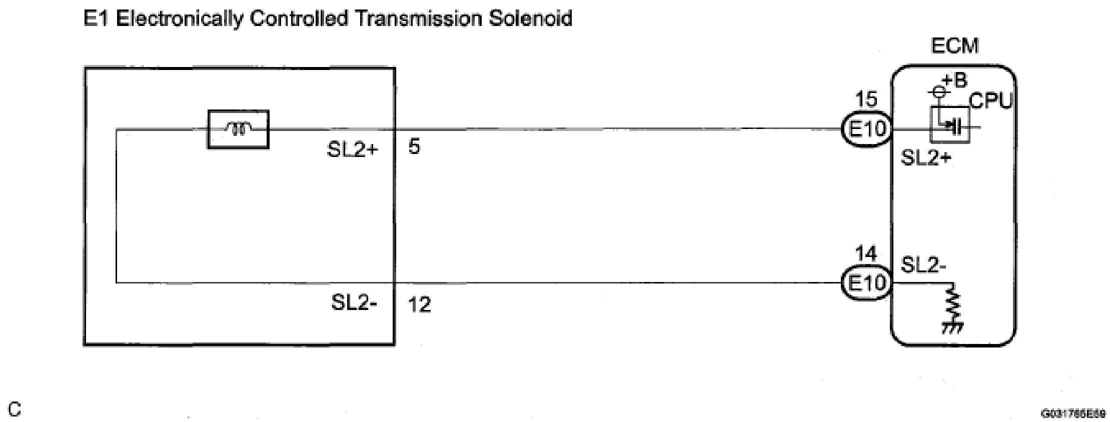

Fig. 53: Electronically Controlled Transmission Solenoid - Wiring Diagram

INSPECTION PROCEDURE

1. **INSPECT TRANSMISSION WIRE (SL2)**
   a. Disconnect the transmission wire connector from the transaxle.
   b. Measure the resistance according to the value (s) in the table below.

   Standard resistance

   RESISTANCE SPECIFICATION

Tester Connection	Specified Condition 20°C (68°F)
5 (SL2+) - 12 (SL2-)	5.0 to 5.6 ohms

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

   OK:

   Standard resistance (Check for short)

   RESISTANCE SPECIFICATION

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

NG: Go to step 3

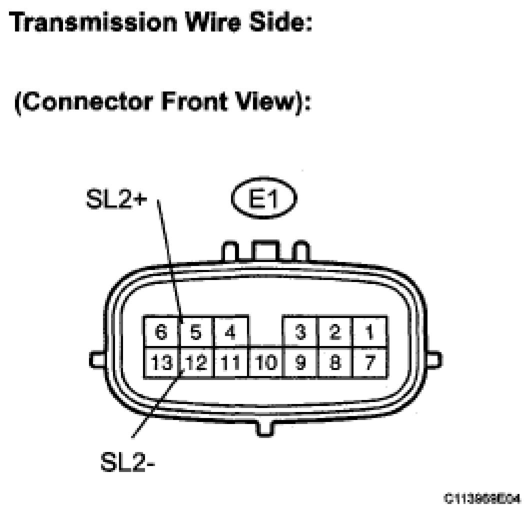

Fig. 54: Identifying Transmission Wire Connector Terminals (SL2)

OK: Go to next step

2. **CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)**
    a. Connect the transmission wire connector to the transaxle.
    b. Disconnect the connector from the ECM.

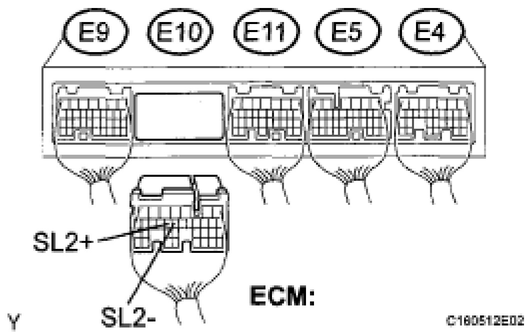

Fig. 55: Disconnecting ECM Connector

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

Standard resistance

RESISTANCE SPECIFICATION

Tester Connection	Specified Condition 20°C (68°F)
E10-15 (SL2+) - E10-14 (SL2-)	5.0 to 5.6 ohms

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

OK:

Standard resistance (Check for short)

RESISTANCE SPECIFICATION

Tester Connection	Specified Condition
E10-15 (SL2+) - Body ground	10 kohms or higher
E10-14 (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.

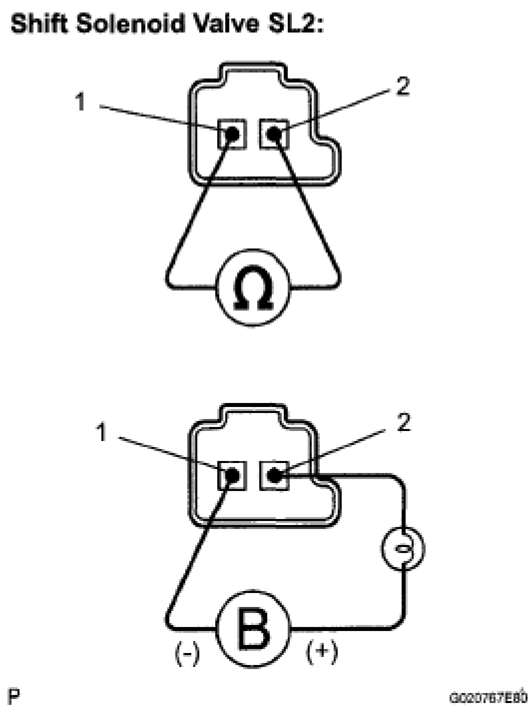

Fig. 56: Measuring Resistance Between Shift Solenoid Valve SL2 Terminals

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

Standard resistance

RESISTANCE SPECIFICATION

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

   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

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 (STAR)) 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.

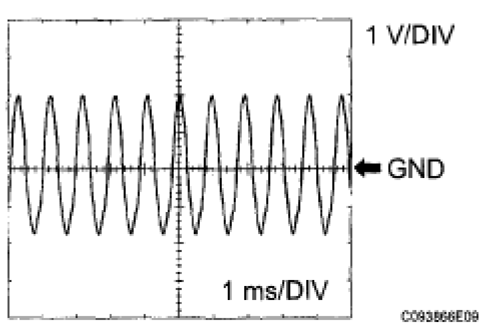

Fig. 57: Waveform Graph

Standard: Refer to the illustration.

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, 4th or 5th 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

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 (STAR) switch	OFF
Output shaft rpm	1,000 rpm or more
Battery voltage	8 V or more
Ignition switch	ON
Starter	OFF

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

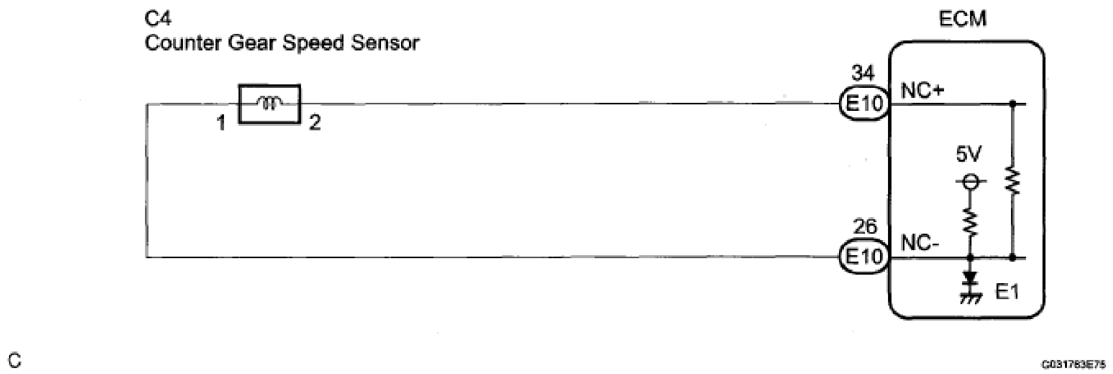

Fig. 58: Counter Gear Speed Sensor - Wiring Diagram

INSPECTION PROCEDURE

HINT:

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

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	Measurement	Normal Condition	Diagnostic

Display	Item/Range		Note
SPD (NC)	Counter Gear Speed/ display: 50 r/min	HINT: 3rd 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.

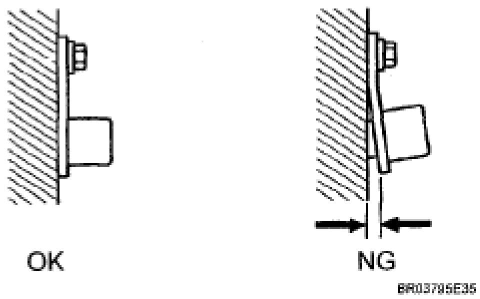

Fig. 59: Identifying Proper Installation Position Of Speed Sensor (NC)

NG: REPLACE SPEED SENSOR (NC)

OK: Go to next step

2. **INSPECT SPEED SENSOR (NC)**

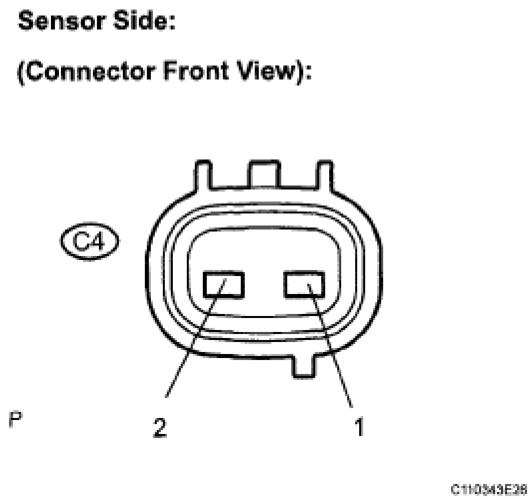

Fig. 60: Identifying Speed Sensor Connector Terminals (NC)

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

Standard resistance

RESISTANCE SPECIFICATION

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

NG: REPLACE SPEED SENSOR (NC)

OK: Go to next step

3. **CHECK HARNESS AND CONNECTOR (SPEED SENSOR - ECM)**
   a. Connect the speed sensor connector.
   b. Disconnect the ECM connector.

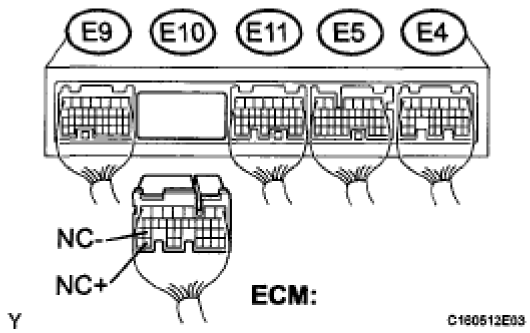

Fig. 61: Disconnecting ECM Connector

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

Standard resistance

RESISTANCE SPECIFICATION

Tester Connection	Specified Condition 20 °C (68 °F)
E10-34 (NC+) - E10-26 (NC-)	560 to 680 ohms

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

Standard resistance (Check for short)

RESISTANCE SPECIFICATION

Tester Connection	Specified Condition
E10-34 (NC+) - Body ground	10 kohms or higher
E10-26 (NC-) - Body ground	

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

OK: REPLACE ECM

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

SYSTEM DESCRIPTION

The ECM uses signals from the vehicle speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear).

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

DTC DETECTION CONDITION AND TROUBLE AREA

DTC No.	DTC Detection Condition	Trouble Area
P0796	The gear required by the ECM does not match the actual gear when driving (2-trip detection logic)	• Shift solenoid valve SL3 remains open or closed • Valve body is blocked • Automatic transaxle (clutch, brake 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, 4th or 5th gear position). When the gear position commanded by the ECM and the actual gear position are not the same, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0796: Shift solenoid valve SL3/OFF malfunction Shift solenoid valve SL3/ON malfunction
Required sensors/Components	Shift solenoid valve SL3, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	OFF malfunction (A) 0.8 sec. OFF malfunction (B) 1 sec. ON malfunction (A) and (B) 0.8 sec. ON malfunction (C) 0.4 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

All:

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)	10°C (50°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 SL3 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction

Shift solenoid valve SR circuit	Not circuit malfunction
Shift solenoid valve DSL circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction (A):

TYPICAL ENABLING CONDITIONS

ECM selected gear	4th or 5th
Throttle valve opening angle	4.5% or more at engine speed 1,900 rpm (Varies with engine speed)

OFF malfunction (B):

TYPICAL ENABLING CONDITIONS

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

ON malfunction (A):

TYPICAL ENABLING CONDITIONS

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

ON malfunction (B):

TYPICAL ENABLING CONDITIONS

ECM selected gear	3rd
Throttle valve opening angle	5.0% or more at output speed 1,400 rpm (Varies with engine speed)
Malfunction of pressure control solenoid "B" (SL2) and "C" (SL3)	Not detected

ON malfunction (C):

TYPICAL ENABLING CONDITIONS

Throttle valve opening angle	5.0% or more at output speed 1,050 rpm (Varies with engine speed)
Malfunction of pressure control solenoid "B" (SL2)	Not detected

TYPICAL MALFUNCTION THRESHOLDS

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

(C)

2 detections are necessary per driving cycle:

1st detection; temporary flag ON

2nd detection; pending fault code ON

OFF malfunction (A):

TYPICAL MALFUNCTION THRESHOLDS

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

OFF malfunction (B):

TYPICAL MALFUNCTION THRESHOLDS

Intermediate shaft speed/Output speed	1.02 to 1.16

ON malfunction (A):

TYPICAL MALFUNCTION THRESHOLDS

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

ON malfunction (B):

TYPICAL MALFUNCTION THRESHOLDS

Input (turbine) speed - Intermediate shaft speed	700 rpm or more

ON malfunction (C):

TYPICAL MALFUNCTION THRESHOLDS

Input (turbine) speed - Intermediate shaft speed	Less than -500 rpm or 700 rpm or more

INSPECTION PROCEDURE

HINT:

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

1. **PERFORM ACTIVE TEST**
    a. Warm up the engine.

b. Turn the ignition switch off.
c. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
d. Turn the ignition switch to the ON position.
e. 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).

ACTIVE TEST DETAIL

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/5th	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 P0796)**

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

   RESULT REFERENCE

Result	Proceed to
P0796	A
P0796 and other DTCs	B

   HINT:

   If any other codes besides "P0796" are output, perform the troubleshooting for those DTCs first.

B: Go to **DTC CHART**

A: Go to next step

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

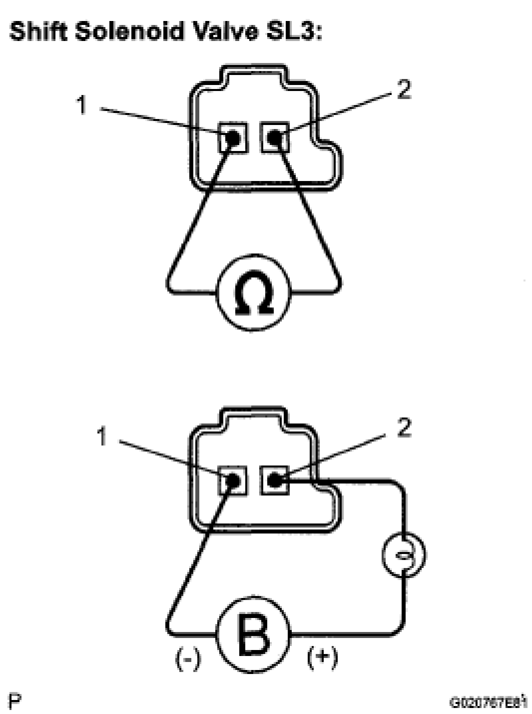

Fig. 62: Measuring Resistance Between Shift Solenoid Valve SL3 Terminals

Standard resistance

RESISTANCE SPECIFICATION

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 SL3

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

DESCRIPTION

Shifting from 1st to 5th is performed in combination with "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, SL3, S4 and SR which are controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated smoothly (Fail safe function).

DTC DETECTION CONDITION AND TROUBLE AREA

DTC No.	DTC Detection Condition	Trouble Area
P0798	The ECM checks for an open or short in the shift solenoid valve SL3 circuit while driving and shifting gears. (1-trip detection logic) ◦ Output signal duty equals to 100 %. (NOTE: SL3 output signal duty is less than 100 % under normal condition.)	• Open or short in shift solenoid valve SL3 circuit • Shift solenoid valve SL3 • 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	P0798: Shift solenoid valve SL3/Range check
Required sensors/Components	Shift solenoid valve SL3
Frequency of operation	Continuous
Duration	1 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

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

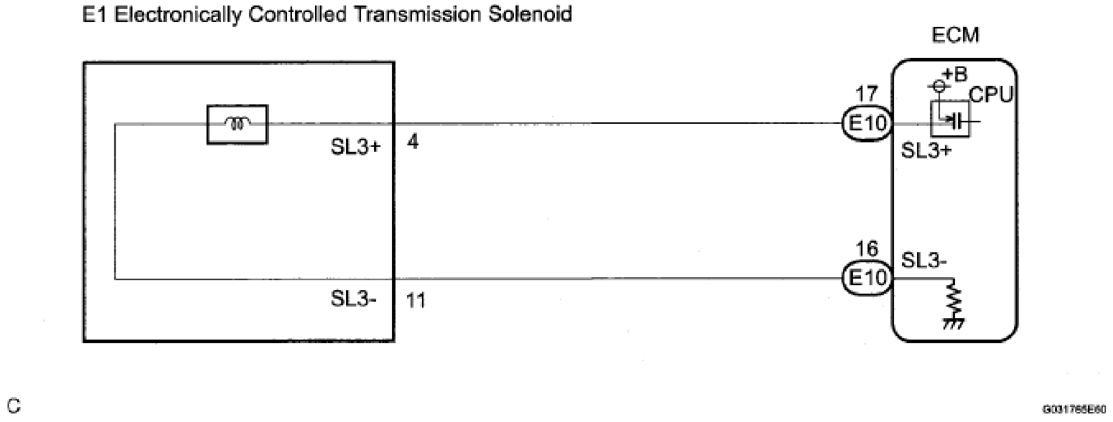

Fig. 63: Shift Solenoid Valve SL3 - Wiring Diagram

INSPECTION PROCEDURE

1. **INSPECT TRANSMISSION WIRE (SL3)**
   a. Disconnect the transmission wire connector from the transaxle.
   b. Measure the resistance according to the value (s) in the table below.

   Standard resistance

   RESISTANCE SPECIFICATION

Tester Connection	Specified Condition 20°C (68°F)
4 (SL3+) -11 (SL3-)	5.0 to 5.6 ohms

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

   Standard resistance (Check for short)

   RESISTANCE SPECIFICATION

Tester Connection	Specified Condition
4 (SL3+) - Body ground	10 kohms or higher
11 (SL3-) - Body ground	?

NG: Go to step 3

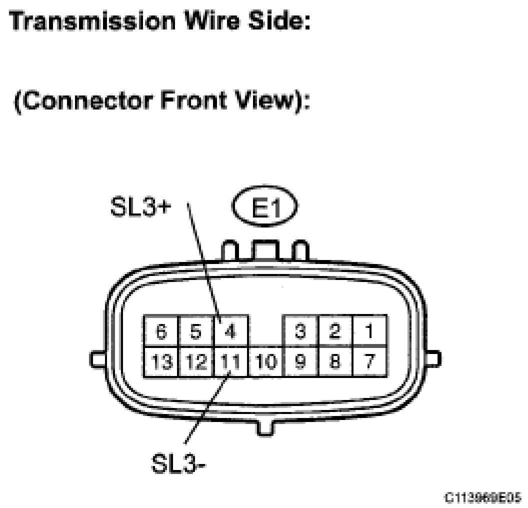

Fig. 64: Identifying Transmission Wire Connector Terminals (SL3)

OK: Go to next step

2. **CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)**
    a. Connect the transmission wire connector to the transaxle.
    b. Disconnect the connector from the ECM.

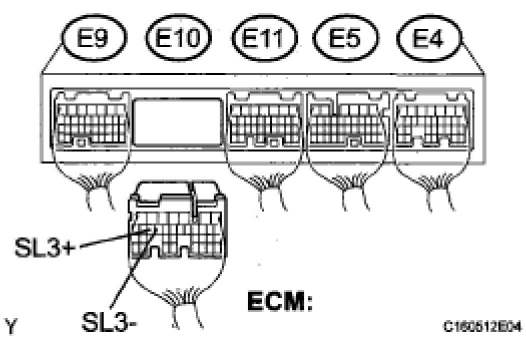

Fig. 65: Disconnecting ECM Connector

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

Standard resistance

RESISTANCE SPECIFICATION

Tester Connection	Specified Condition 20°C (68°F)
E10-17 (SL3+) - E10-16 (SL3-)	5.0 to 5.6 ohms

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

Standard resistance (Check for short)

RESISTANCE SPECIFICATION

Tester Connection	Specified Condition
E10-17 (SL3+) - Body ground	10 kohms or higher
E10-16 (SL3-) - Body ground	

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

OK: REPLACE ECM

3. **INSPECT SHIFT SOLENOID VALVE SL3**
   a. Remove the shift solenoid valve SL3.

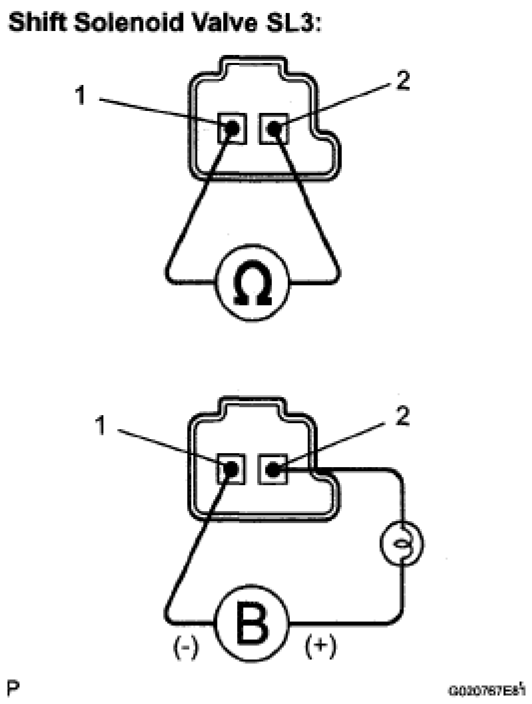

Fig. 66: Measuring Resistance Between Shift Solenoid Valve SL3 Terminals

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

Standard resistance

RESISTANCE SPECIFICATION

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

   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 SL3

OK: REPAIR OR REPLACE TRANSMISSION WIRE

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

DESCRIPTION

Shifting from 1st to 5th is performed in combination with "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, SL3, S4 and SR which are controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves 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

Related DTCs	P0982: Shift solenoid valve S4/Range check (Low resistance) P0983: Shift solenoid valve S4/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S4
Frequency of operation	Continuous
Duration	0.064 sec.
MIL operation	Immediate

Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0982: Range check (Low resistance):

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):

TYPICAL ENABLING CONDITIONS

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):

TYPICAL MALFUNCTION THRESHOLDS

Shift solenoid valve S4 resistance	100 kohms or more

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

Shift solenoid valve S4	Resistance: 11 to 15 ohms at20°C (68°F)

WIRING DIAGRAM

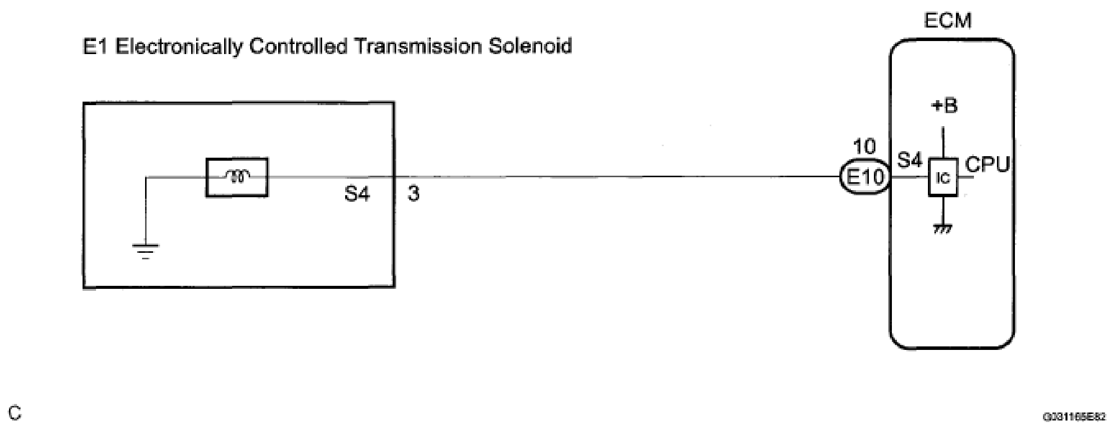

Fig. 67: Shift Solenoid Valve S4 - Wiring Diagram

INSPECTION PROCEDURE

1. **INSPECT TRANSMISSION WIRE (S4)**
   a. Disconnect the transmission wire connector from the transaxle.
   b. Measure the resistance according to the value (s) in the table below.

   Standard resistance

   RESISTANCE SPECIFICATION

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

NG: Go to step 3

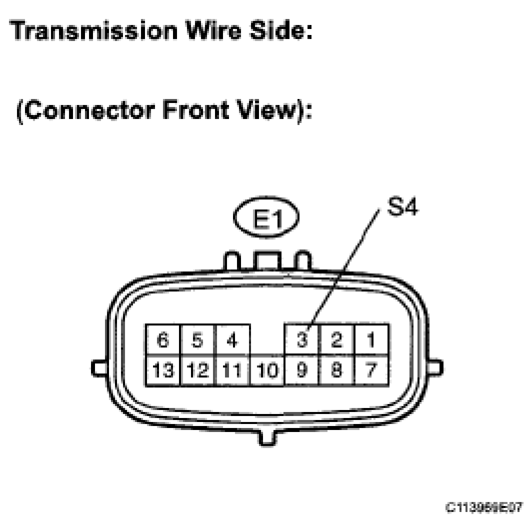

Fig. 68: Identifying Transmission Wire Connector Terminals (S4)

OK: Go to next step

2. **CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)**
   a. Connect the transmission wire connector to the transaxle.
   b. Disconnect the connector from the ECM.

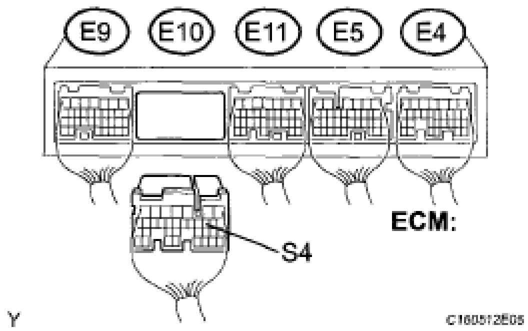

Fig. 69: Disconnecting ECM Connector

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

Standard resistance

RESISTANCE SPECIFICATION

Tester Connection	Specified Condition 20°C (68°F)
E10-10 (S4) - Body ground	11 to 15 ohms

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

OK: REPLACE ECM

3. **INSPECT SHIFT SOLENOID VALVE S4**
   a. Remove the shift solenoid valve S4.

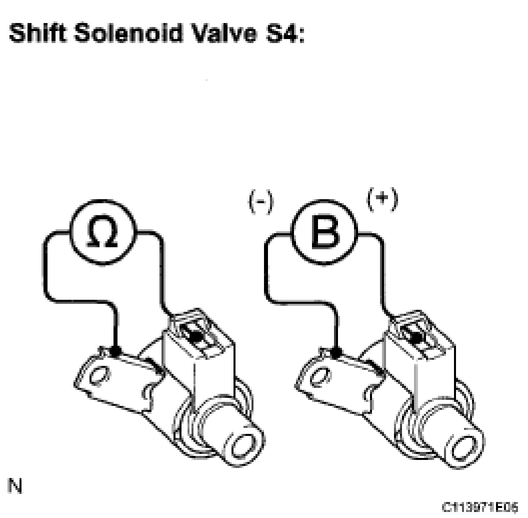

Fig. 70: Measuring Resistance Between Shift Solenoid Valve S4 Terminals And Solenoid Body

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

Standard resistance

RESISTANCE SPECIFICATION

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

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: REPAIR OR REPLACE TRANSMISSION WIRE

DTC P0985 SHIFT SOLENOID "E" CONTROL CIRCUIT LOW (SHIFT SOLENOID VALVE SR); DTC P0986 SHIFT SOLENOID "E" CONTROL CIRCUIT HIGH (SHIFT SOLENOID VALVE SR)

DESCRIPTION

Shifting from 1st to 5th is performed in combination with "ON" and "OFF" operation of the shift solenoid valves SL1, SL2, SL3, S4 and SR which are controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be operated smoothly (Fail safe function).

DTC DETECTION CONDITION AND TROUBLE AREA

DTC No.	DTC Detection Condition	Trouble Area
P0985	ECM detects short in solenoid valve SR circuit 2 times when solenoid valve SR is operated (1-trip detection logic)	• Short in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM
P0986	ECM detects open in solenoid valve SR circuit 2 times when solenoid valve SR is not operated (1-trip detection logic)	• Open in shift solenoid valve SR circuit • Shift solenoid valve SR • ECM

MONITOR DESCRIPTION

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

MONITOR STRATEGY

MONITOR STRATEGY

Related DTCs	P0985: Shift solenoid valve SR/Range check (Low resistance) P0986: Shift solenoid valve SR/Range check (High resistance)
Required sensors/Components	Shift solenoid valve SR
Frequency of operation	Continuous
Duration	0.064 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0985: Range check (Low resistance):

TYPICAL ENABLING CONDITIONS

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

P0986: Range check (High resistance):

TYPICAL ENABLING CONDITIONS

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

TYPICAL MALFUNCTION THRESHOLDS

P0985: Range check (Low resistance):

TYPICAL MALFUNCTION THRESHOLDS

Shift solenoid valve SR resistance	8 ohms or less

P0986: Range check (High resistance):

TYPICAL MALFUNCTION THRESHOLDS

Shift solenoid valve SR resistance	100 kohms or more

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM

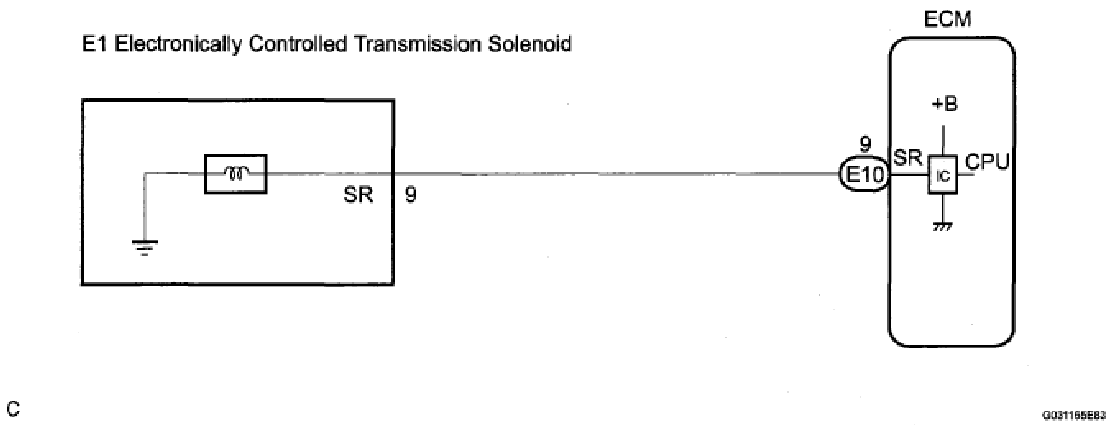

Fig. 71: Shift Solenoid Valve SR - Wiring Diagram

INSPECTION PROCEDURE

1. **INSPECT TRANSMISSION WIRE (SR)**
    a. Disconnect the transmission wire connector from the transaxle.
    b. Measure the resistance according to the value (s) in the table below.

    Standard resistance

    RESISTANCE SPECIFICATION

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

NG: Go to step 3

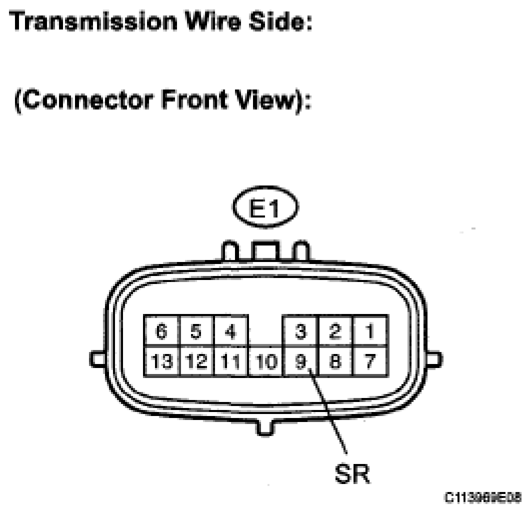

Fig. 72: Identifying Transmission Wire Connector Terminals (SR)

OK: Go to next step

2. **CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)**
    a. Connect the transmission wire connector to the transaxle.
    b. Disconnect the connector from the ECM.

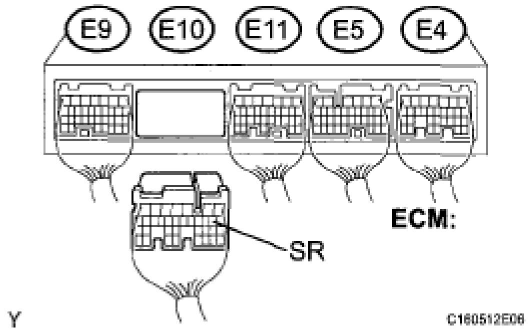

Fig. 73: Disconnecting ECM Connector

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

Standard resistance

RESISTANCE SPECIFICATION

Tester Connection	Specified Condition 20°C (68°F)
E10-9 (SR) - Body ground	11 to 15 ohms

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

OK: REPLACE ECM

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

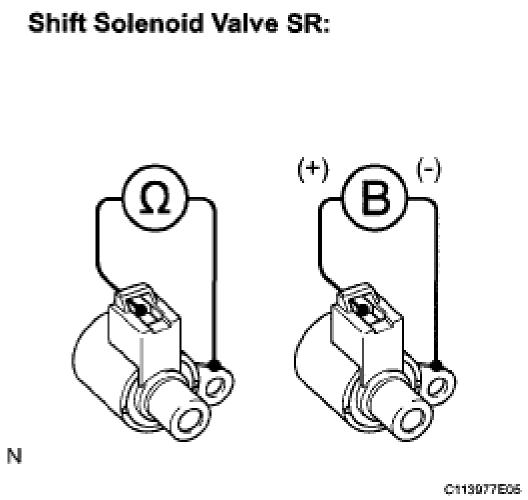

Fig. 74: Measuring Resistance Between Shift Solenoid Valve SR Terminals And Solenoid Body

Standard resistance

RESISTANCE SPECIFICATION

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

    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 SR

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

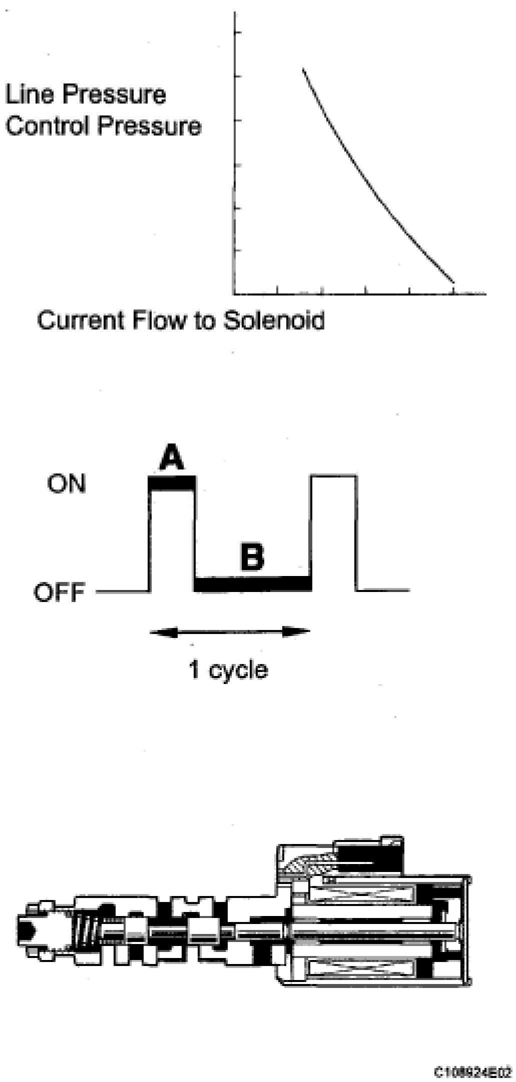

Fig. 75: Line Pressure Graph

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	• Shift solenoid valve SLT remains closed • Valve body is blocked

	shaft, and also by the oil pressure. (2-trip detection logic)	• Automatic transaxle (clutch, brake or gear, etc.)

MONITOR DESCRIPTION

In any forward position, when the difference between the revolutions of the turbine, Intermediate and output shaft exceeds the specified value (varies with Intermediate, output speed) determined by the ECM, the ECM illuminates the MIL and 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	0.5 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"
TFT (Transmission fluid temperature)	-20°C (-4°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 SL3 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve SR circuit	Not circuit malfunction

Shift solenoid valve DSL circuit	Not circuit malfunction
Shift solenoid valve SLT circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

ON malfunction (A):

TYPICAL ENABLING CONDITIONS

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	100 rpm or more at Intermediate shaft speed 1,000 rpm
Temporary U/D gear	Low
NC - NO x Temporary U/D gear ratio NO: Output speed	300 rpm or more at Output speed 1,000 rpm
TT TT: Turbine Torque	900 Nm or more
NT	250 rpm or more
NC	250 rpm or more
NO	250 rpm or more

ON malfunction (B):

TYPICAL ENABLING CONDITIONS

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	100 rpm or more at Intermediate shaft speed 1,000 rpm
Temporary U/D gear	Low
NC - NO x Temporary U/D gear ratio NO: Output speed	300 rpm or more at Output speed 1,000 rpm
TT TT: Turbine Torque	192 Nm or more
NT	250 rpm or more
NC	250 rpm or more
NO	250 rpm or more

ON malfunction (C):

TYPICAL ENABLING CONDITIONS

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	100 rpm or more at Intermediate shaft speed 1,000 rpm
Temporary U/D gear	Low
NC - NO x Temporary U/D gear ratio NO: Output speed	300 rpm or more at Output speed 1,000 rpm
TT TT: Turbine Torque	900 Nm or more
NT	250 rpm or more
NC	250 rpm or more
NO	250 rpm or more

ON malfunction (D):

TYPICAL ENABLING CONDITIONS

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	100 rpm or more at Intermediate shaft speed 1,000 rpm
Temporary U/D gear	Low
NC - NO x Temporary U/D gear ratio NO: Output speed	300 rpm or more at Output speed 1,000 rpm
TT TT: Turbine Torque	189 Nm or more
NT	250 rpm or more
NC	250 rpm or more
NO	250 rpm or more

ON malfunction (E):

TYPICAL ENABLING CONDITIONS

ECM selected gear	5th
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	100 rpm or more at Intermediate shaft speed 1,000 rpm
Temporary U/D gear	High
NC - NO x Temporary U/D gear ratio NO: Output speed	300 rpm or more at Output speed 1,000 rpm
TT TT: Turbine Torque	189 Nm or more
NT	250 rpm or more
NC	250 rpm or more

NO	250 rpm or more

TYPICAL MALFUNCTION THRESHOLDS

[ON malfunction]

Detection condition: Total accumulated time of ON malfunctions (a), (b), (c), (d) and (e) is 0.5 second or more

ON malfunction (A):

TYPICAL MALFUNCTION THRESHOLDS

NT - NC x 1st gear ratio	100 rpm or more at Intermediate shaft speed 1,000 rpm
NC - NO x Low gear ratio	300 rpm or more at Output speed 1,000 rpm
Duration	1 sec. or more
Shift Solenoid valve SL1 Performance	Not performance malfunction

ON malfunction (B):

TYPICAL MALFUNCTION THRESHOLDS

NT - NC x 2nd gear ratio	100 rpm or more at Intermediate shaft speed 1,000 rpm
NC - NO x Low gear ratio	300 rpm or more at Output speed 1,000 rpm
Duration	1 sec. or more
Shift Solenoid valve SL1 Performance	Not performance malfunction

ON malfunction (C):

TYPICAL MALFUNCTION THRESHOLDS

NT - NC x 3rd gear ratio	100 rpm or more at Intermediate shaft speed 1,000 rpm
NC - NO x Low gear ratio	300 rpm or more at Output speed 1,000 rpm
Duration	1 sec. or more
Shift Solenoid valve SL1 Performance	Not performance malfunction

ON malfunction (D):

TYPICAL MALFUNCTION THRESHOLDS

NT - NC x 4th gear ratio	100 rpm or more at Intermediate shaft speed 1,000 rpm
NC - NO x Low gear ratio	300 rpm or more at Output speed 1,000 rpm
Duration	1 sec. or more
Shift Solenoid valve SL1 Performance	Not performance malfunction

ON malfunction (E):

TYPICAL MALFUNCTION THRESHOLDS

NT - NC x 4th gear ratio	100 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	1 sec. or more
Shift Solenoid valve SL1 Performance	Not performance malfunction

INSPECTION PROCEDURE

1. **CHECK OTHER DTCS OUT PUT (IN ADDITION TO DTC P2714)**
   a. Connect the OBD II scan tool or 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

      RESULT REFERENCE

Result	Proceed to
P2714	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**
   a. Remove the shift solenoid valve SLT.

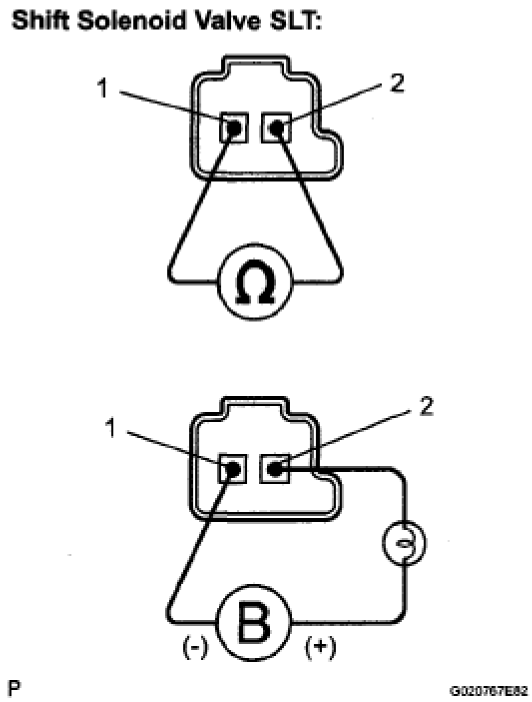

Fig. 76: Measuring Resistance Between Shift Solenoid Valve SLT Terminals

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

Standard resistance

RESISTANCE SPECIFICATION

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

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

OK: Go to next step

3. **INSPECT TRANSMISSION VALVE BODY ASSEMBLY**

OK:

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 Duty Ratio = A/ (A + B) x 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

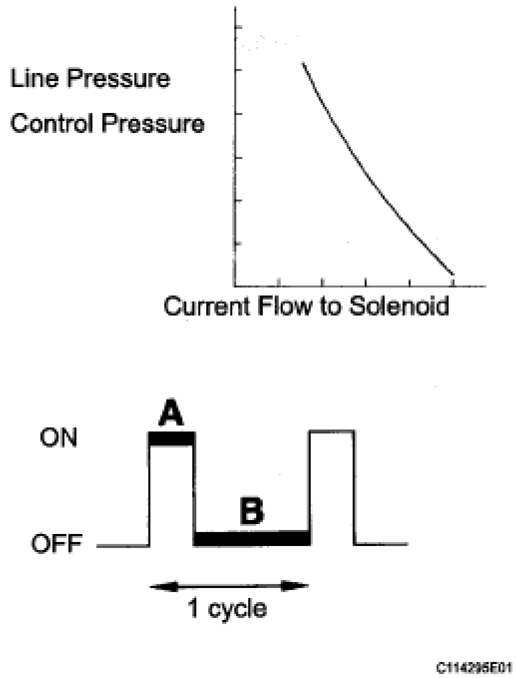

Fig. 77: Duty Ratio Cycle And Line Pressure Graph

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
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 ohms at 20°C (68°F)

WIRING DIAGRAM

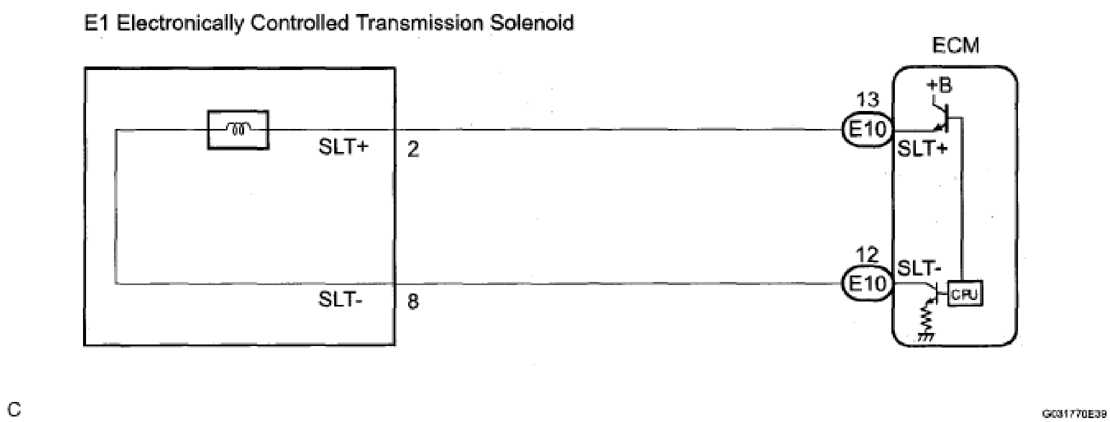

Fig. 78: Shift Solenoid Valve SLT - Wiring Diagram

INSPECTION PROCEDURE

1. **INSPECT TRANSMISSION WIRE (SLT)**
    a. Disconnect the transmission wire connector from the transaxle.
    b. Measure the resistance according to the value (s) in the table below.

    Standard resistance

    RESISTANCE SPECIFICATION

Tester Connection	Specified Condition 20°C (68°F)
2 (SLT+) - 8 (SLT-)	5.0 to 5.6 ohms

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

    Standard resistance (Check for short)

    RESISTANCE SPECIFICATION

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

8 (SLT-) - Body ground	?

NG: Go to step 3

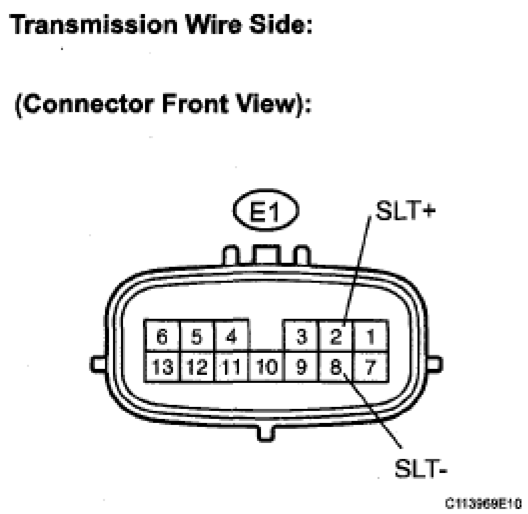

Fig. 79: Identifying Transmission Wire Connector Terminals (SLT)

OK: Go to next step

2. **CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)**
    a. Connect the transmission wire connector to the transaxle.
    b. Disconnect the ECM connector.

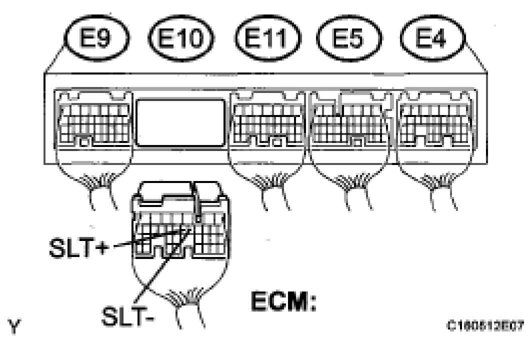

Fig. 80: Disconnecting ECM Connector

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

Standard resistance

RESISTANCE SPECIFICATION

Tester Connection	Specified Condition 20°C (68°F)
E10-13 (SLT+) - E10-12 (SLT-)	5.0 to 5.6 ohms

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

Standard resistance (Check for short)

RESISTANCE SPECIFICATION

Tester Connection	Specified Condition
E10-13 (SLT+) - Body ground	10 kohms or higher
E10-12 (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).

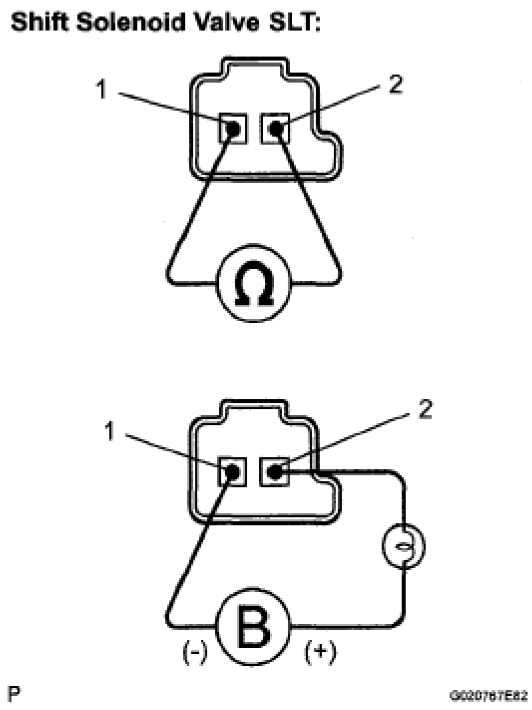

Fig. 81: Measuring Resistance Between Shift Solenoid Valve SLT Terminals

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

Standard resistance

RESISTANCE SPECIFICATION

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

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

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 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):

TYPICAL ENABLING CONDITIONS

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
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

P2769: Range check (Low resistance):

TYPICAL MALFUNCTION THRESHOLDS

Shift solenoid valve DSL resistance	8 ohms or less

P2770: Range check (High resistance):

TYPICAL MALFUNCTION THRESHOLDS

Shift solenoid valve DSL resistance	100 kohms or more

COMPONENT OPERATING RANGE

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM

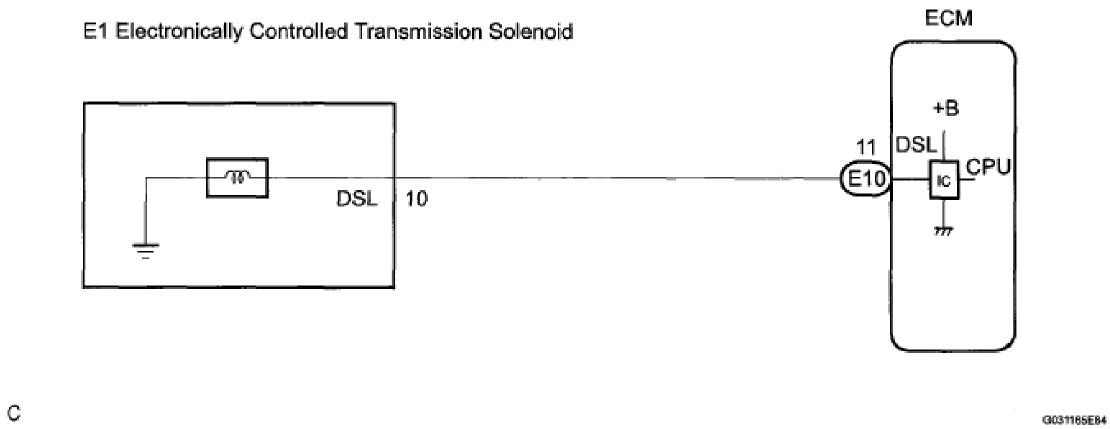

Fig. 82: Shift Solenoid Valve DSL - Wiring Diagram

INSPECTION PROCEDURE

1. **INSPECT TRANSMISSION WIRE (DSL)**
   a. Disconnect the transmission wire connector from the transaxle.
   b. Measure the resistance according to the value (s) in the table below.

   Standard resistance

   RESISTANCE SPECIFICATION

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

NG: Go to step 3

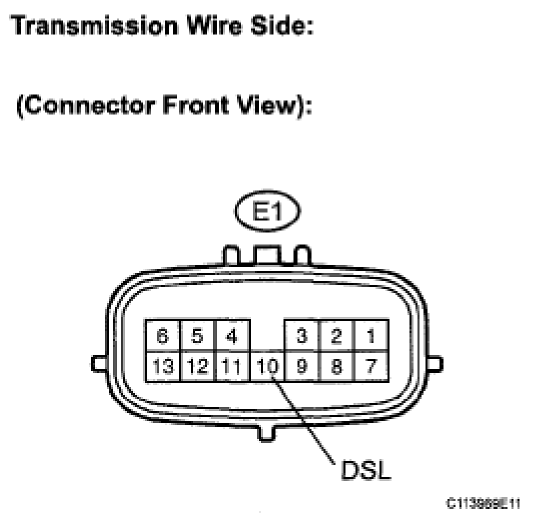

Fig. 83: Identifying Transmission Wire Connector Terminals (DSL)

OK: Go to next step

2. **CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)**
    a. Connect the transmission wire connector.
    b. Disconnect the ECM connector.

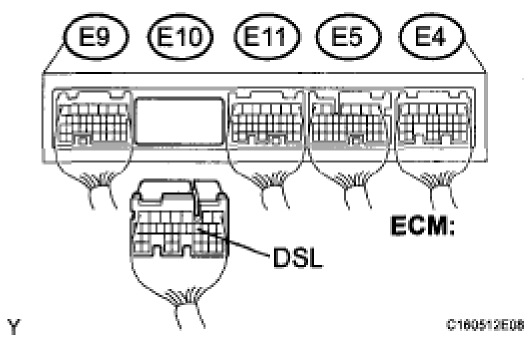

Fig. 84: Disconnecting ECM Connector

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

Standard resistance

RESISTANCE SPECIFICATION

Tester Connection	Specified Condition 20°C (68°F)
E10-11 (DSL) - Body ground	11 to 13 ohms

NG: REPAIR OR REPLACE HARNESS OR CONNECTOR

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.

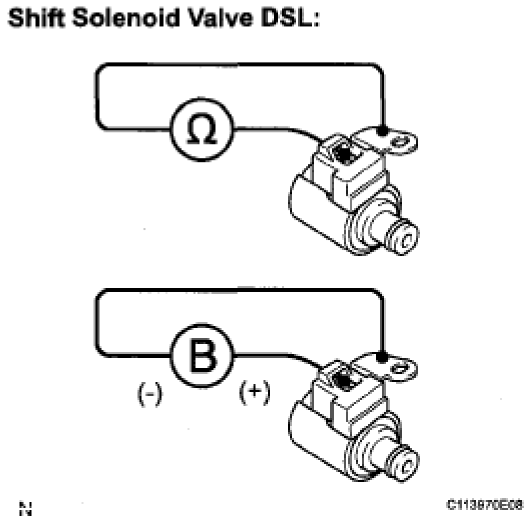

Fig. 85: Measuring Resistance Between Shift Solenoid Valve DSL Terminals And Solenoid Body

Standard resistance

RESISTANCE SPECIFICATION

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

OK: REPAIR OR REPLACE TRANSMISSION WIRE

AUTOMATIC TRANSAXLE FLUID

ON-VEHICLE INSPECTION

1. **CHECK FLUID LEVEL**

HINT:

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

Fluid temperature:

70 to 80°C (158 to 176°F)

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

   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.

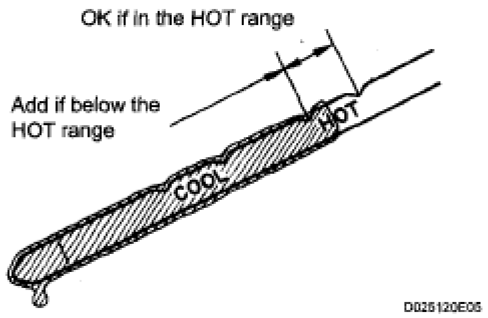

Fig. 86: Identifying Fluid Level On Dipstick

PARK / NEUTRAL POSITION SWITCH

COMPONENTS

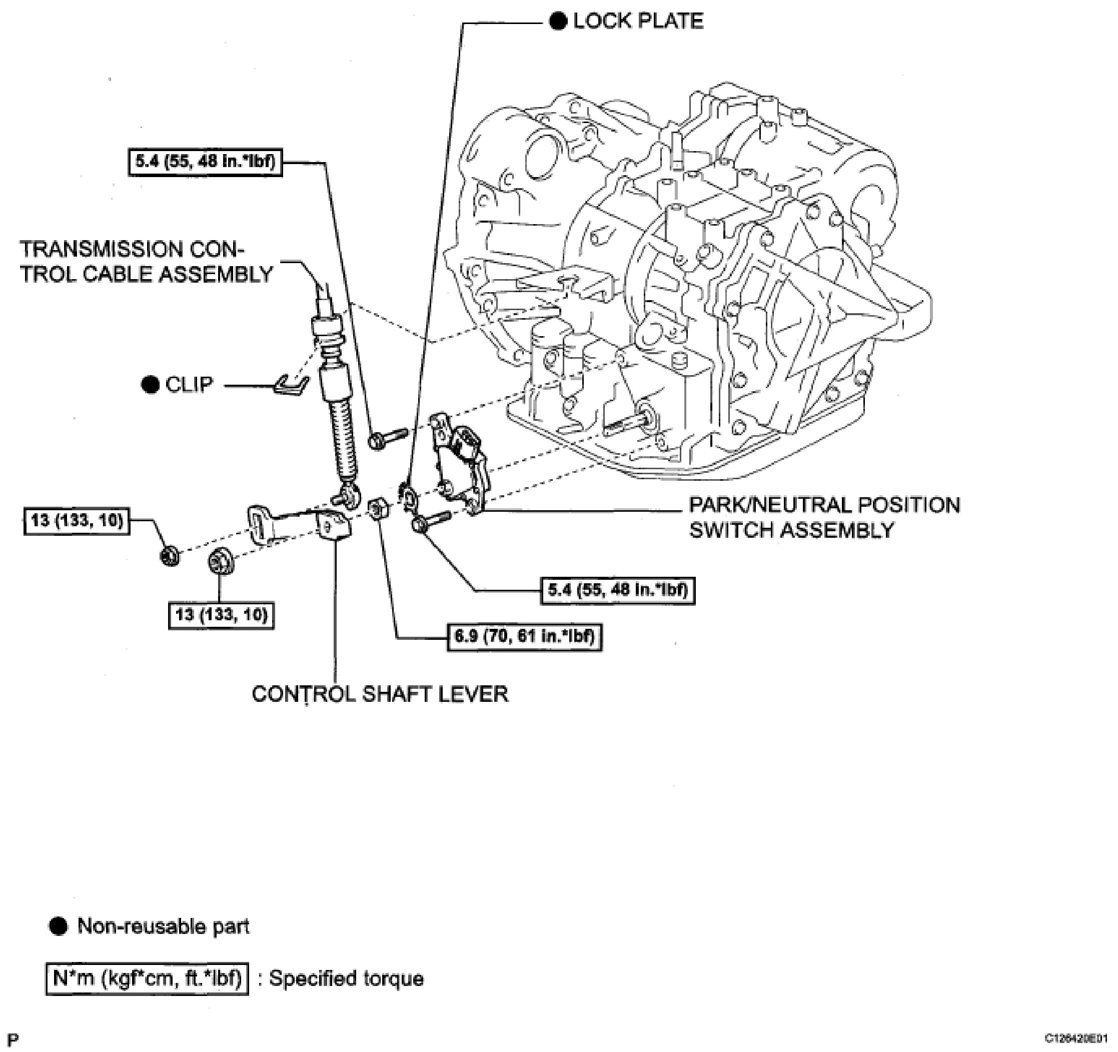

Fig. 87: Identifying Park/Neutral Position Switch Components With Torque Specifications

REMOVAL

1. **REMOVE BATTERY**
2. **REMOVE AIR CLEANER ASSEMBLY**

   HINT:

   (See **REMOVAL**)

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

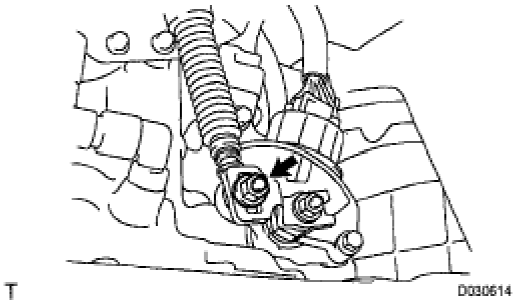

Fig. 88: Locating Control Shaft Lever Nut

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

NOTE: Do not hold the resin guide pipe.

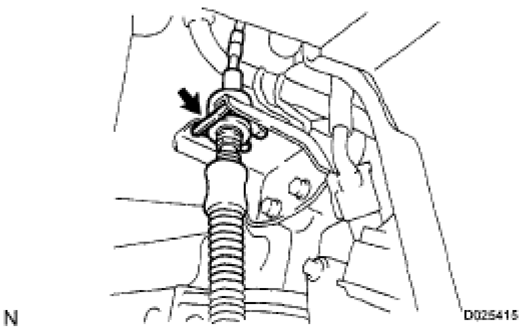

Fig. 89: Locating Control Cable Clip

4. **REMOVE PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
   a. Disconnect the park/neutral position switch connector.

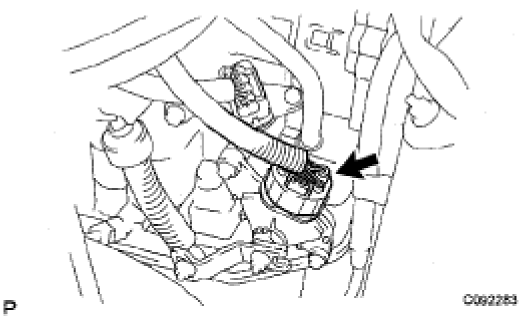

Fig. 90: Locating Park/Neutral Position Switch Connector

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

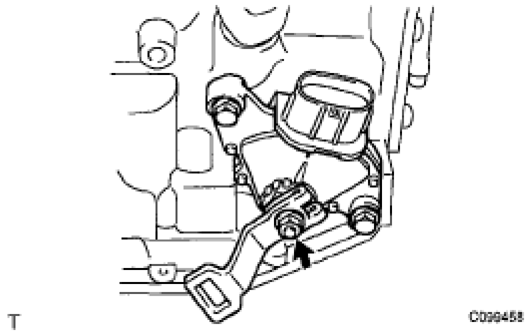

Fig. 91: Locating Control Shaft Lever Nut

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

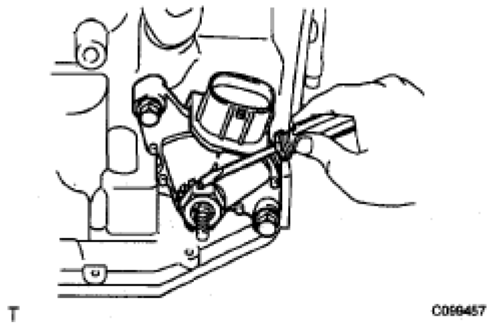

Fig. 92: Prying Up Lock Plate

d. Remove the lock nut and the lock plate.

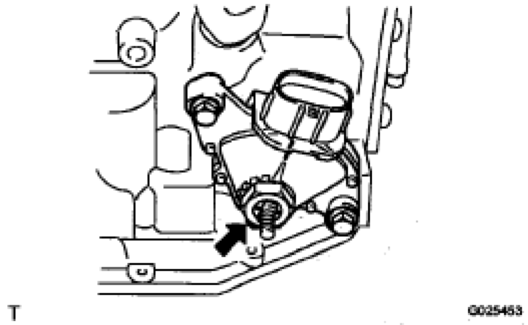

Fig. 93: Locating Lock Plate Nut

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

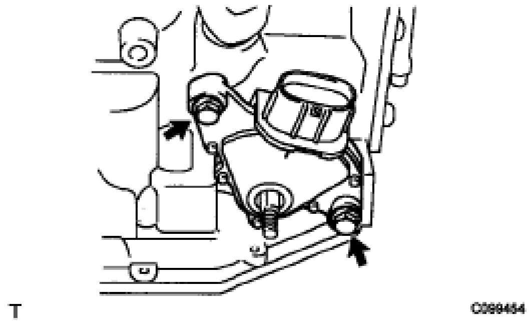

Fig. 94: Locating Park/Neutral Position Switch Bolts

INSPECTION

1. **INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY OPERATION**
    a. Apply the parking brake and turn the ignition switch to the ON position.
    b. 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.
    c. 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.
    d. If a failure is found, check the park/neutral position switch for continuity.
2. **INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
    a. Jack up the vehicle.
    b. Disconnect the park/neutral position switch connector.
    c. Measure the resistance according to the value (s) in the table below when the shift lever is moved to each position.

    Resistance

    RESISTANCE SPECIFICATION

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 and 4	2 - 7	Below 1 ohms
Except D and 4		10 kohms or higher
3	2 - 3	Below 1
Except 3		10 kohms or higher
2 and L	2 - 8	Below 1 ohms

Except 2 and L		10 kohms or higher

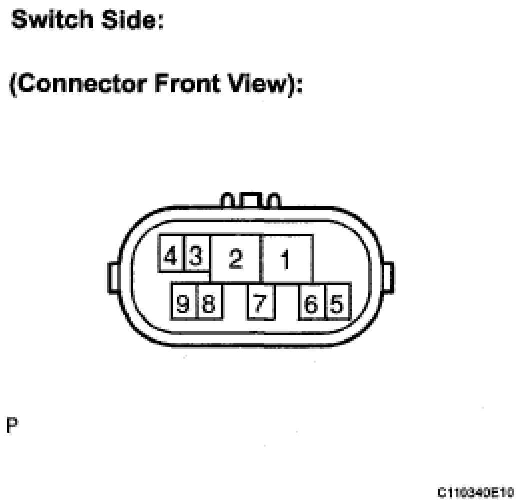

Fig. 95: Identifying Park/Neutral Position Switch Connector Terminals

ADJUSTMENT

1. **ADJUST PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
   a. Loosen the 2 bolts of the park/neutral position switch and move the shift lever to the N position.
   b. Align the groove with the neutral basic line.
   c. Hold the switch in position and tighten the 2 bolts.

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

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

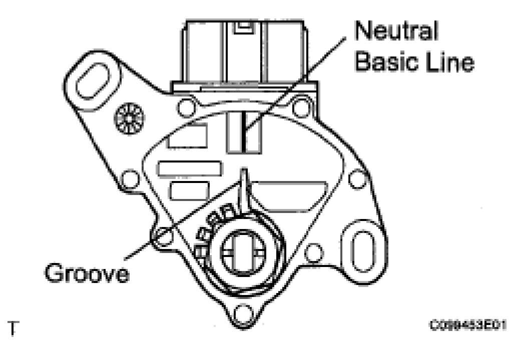

Fig. 96: Identifying Park/Neutral Position Switch Groove And Neutral Basic Line

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.

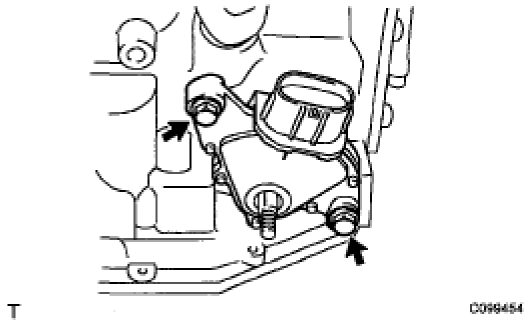

Fig. 97: Locating Park/Neutral Position Switch Bolts

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.

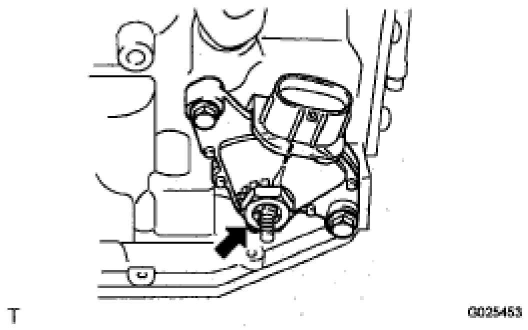

Fig. 98: Locating Lock Plate Nut

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

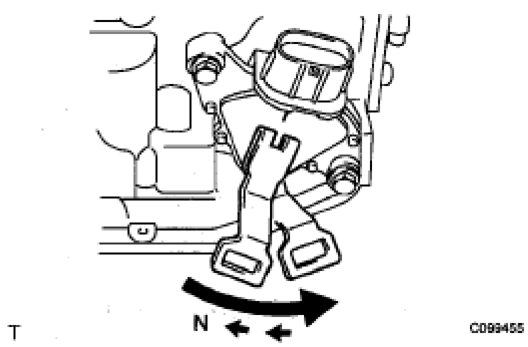

Fig. 99: Turning Lever Counterclockwise

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)

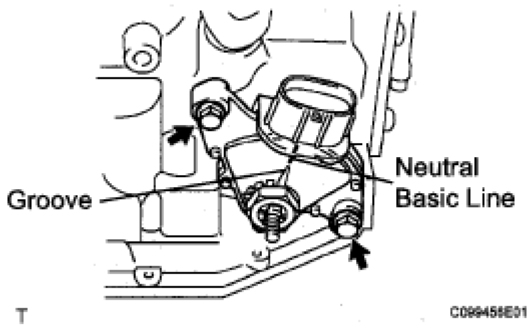

Fig. 100: Identifying Park/Neutral Position Switch Groove And Neutral Basic Line

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

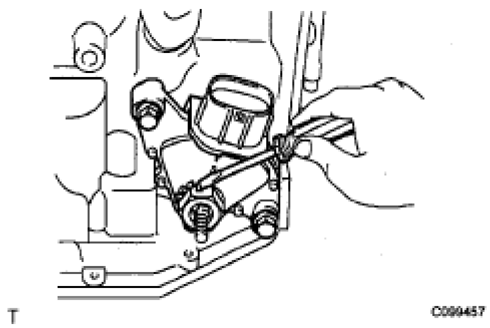

Fig. 101: Bending Tabs Of Lock Plate

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

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

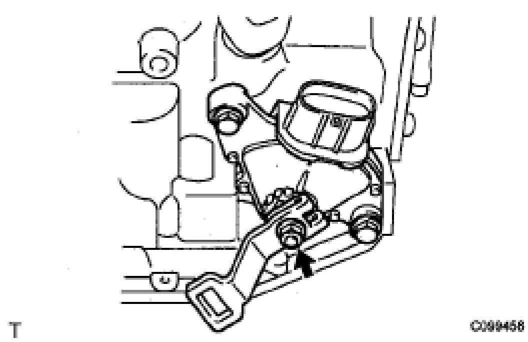

Fig. 102: Locating Control Shaft Lever Nut

k. Connect the park/neutral position switch connector.

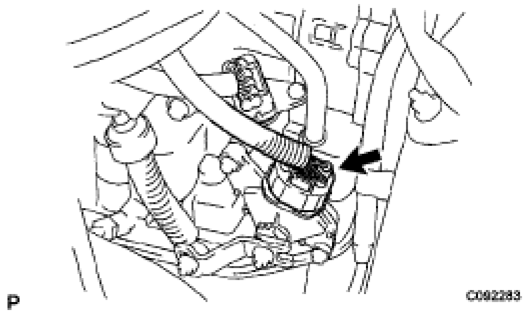

Fig. 103: Locating Park/Neutral Position Switch Connector

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)

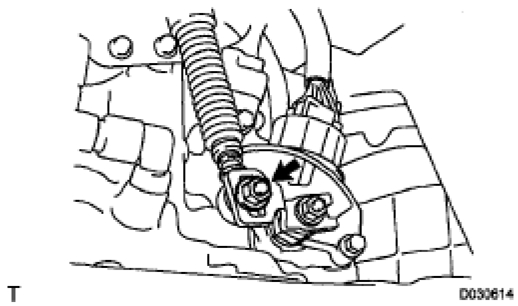

Fig. 104: Locating Control Shaft Lever Nut

   b. Install the control cable with a new clip to the bracket.

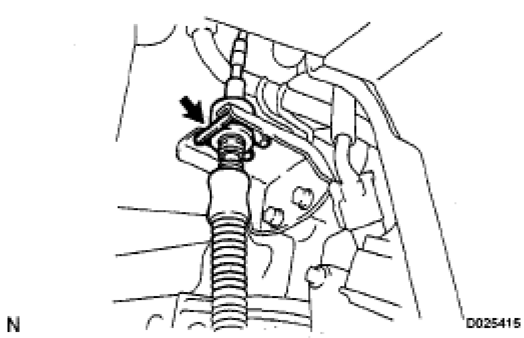

Fig. 105: Locating Control Cable Clip

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

   HINT:

   (See **INSTALLATION**)

8. **INSTALL BATTERY**

TRANSMISSION WIRE

COMPONENTS

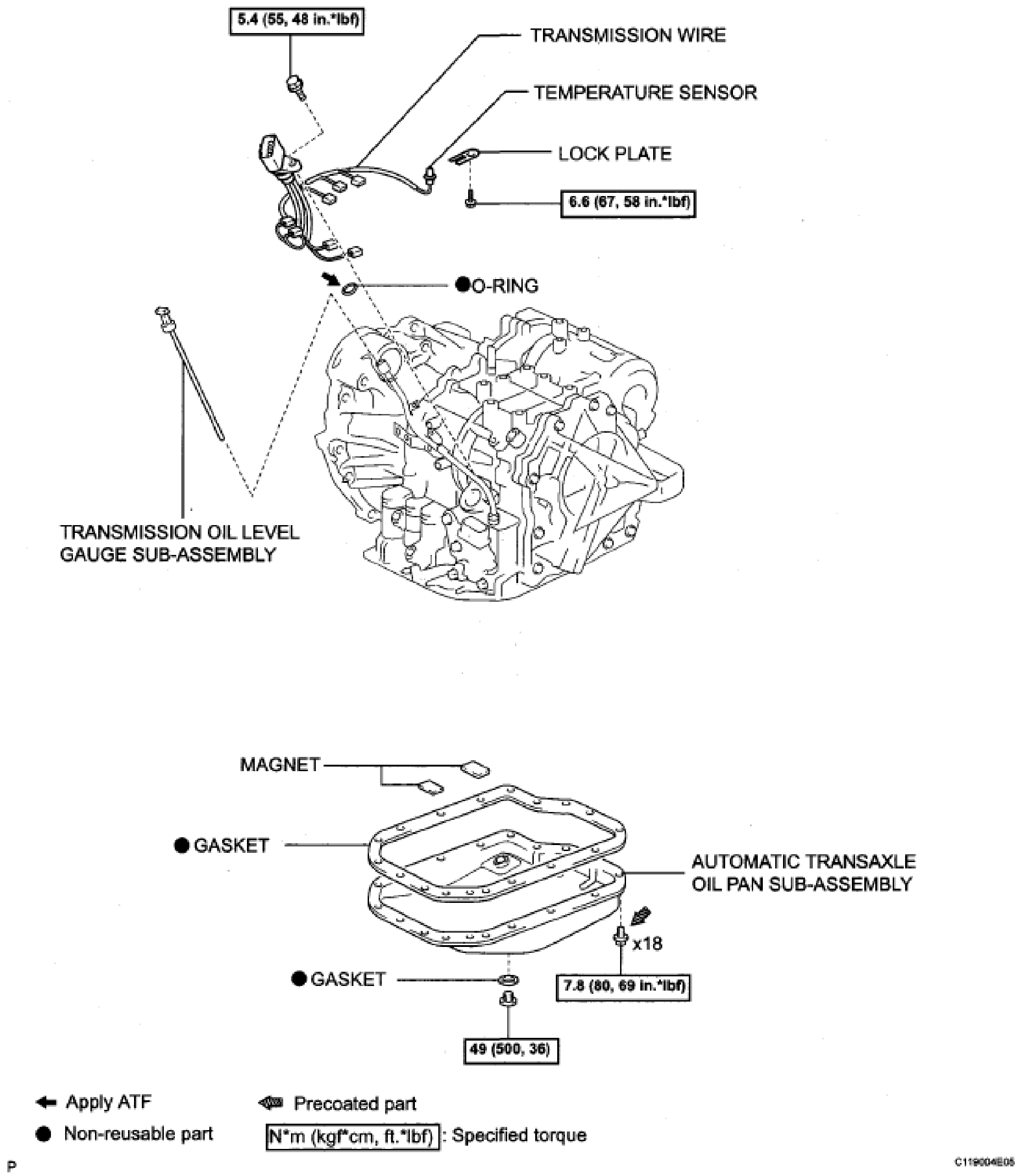

Fig. 106: Identifying Transmission Wire Components With Torque Specifications

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.**

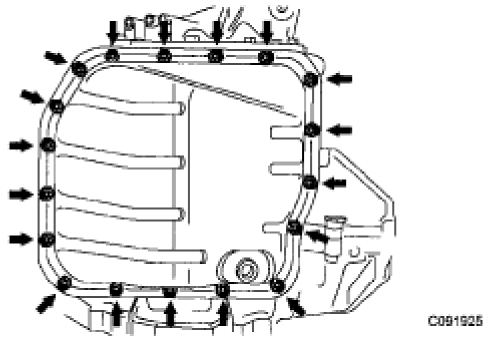

Fig. 107: Locating Oil Pan Assembly Bolts

   b. Remove the 2 magnets from the oil pan.

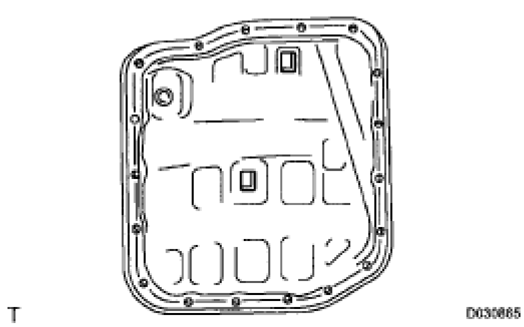

Fig. 108: Identifying Magnets

   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

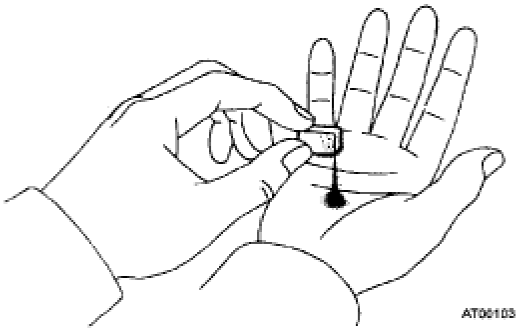

Fig. 109: Collecting Steel Chips Using Magnet

5. **DISCONNECT TRANSMISSION WIRE**
    a. Disconnect the 7 shift solenoid valve connectors.
    b. Remove the bolt and lock plate, and disconnect the ATF temperature sensor.

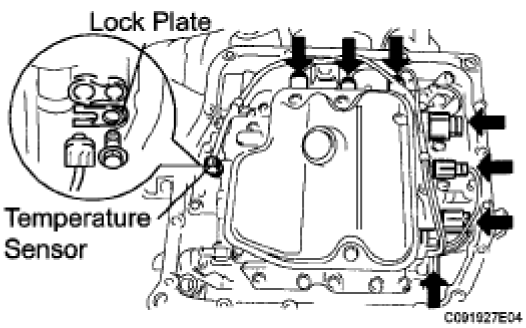

Fig. 110: Locating Shift Solenoid Valve Connectors

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.

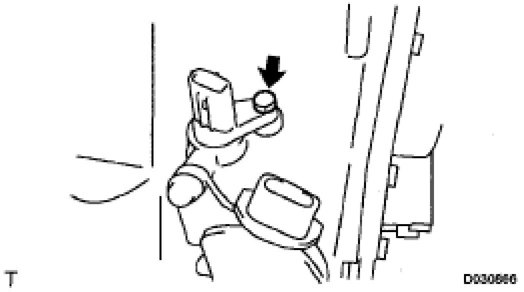

Fig. 111: Locating Transmission Wire Bolt

INSTALLATION

1. **INSTALL TRANSMISSION WIRE**
    a. Coat the O-ring of the transmission wire connector with ATF and install it.

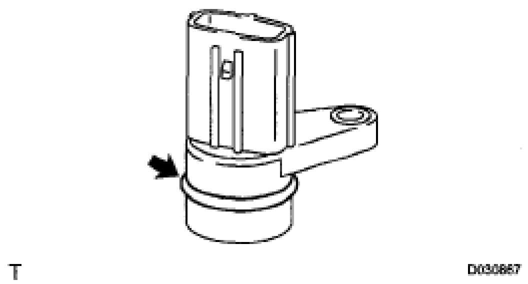

Fig. 112: Locating O-Ring Of Transmission Wire Connector

    b. Install the transmission wire with the bolt.

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

Fig. 113: Locating Transmission Wire Bolt

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 ft.*lbf)

    c. Connect the 7 shift solenoid valve connectors.

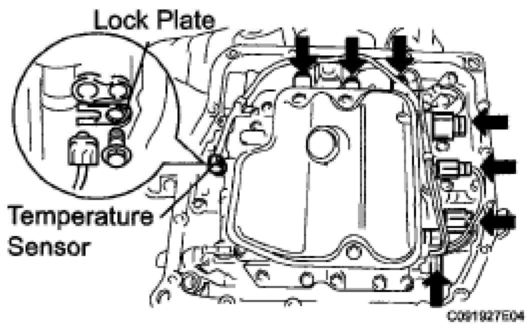

Fig. 114: Locating Shift Solenoid Valve Connectors

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.

    Seal packing:

    THREE BOND 2430 or equivalent

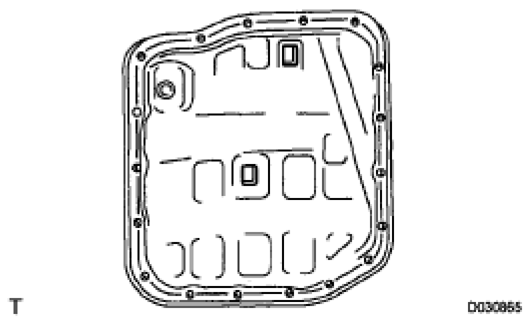

Fig. 115: Identifying Magnets

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

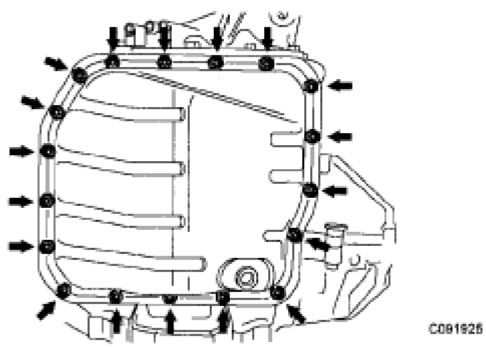

Fig. 116: Locating Oil Pan Assembly Bolts

Torque: 7.8 N*m (80 kgf*cm, 69 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**
6. **INSPECT AUTOMATIC TRANSAXLE FLUID** (See **AUTOMATIC TRANSAXLE FLUID**)
7. **INSTALL ENGINE UNDER COVER NO.1**
8. **RESET MEMORY**

   HINT:

   (See **INITIALIZATION**)

VALVE BODY ASSEMBLY

COMPONENTS

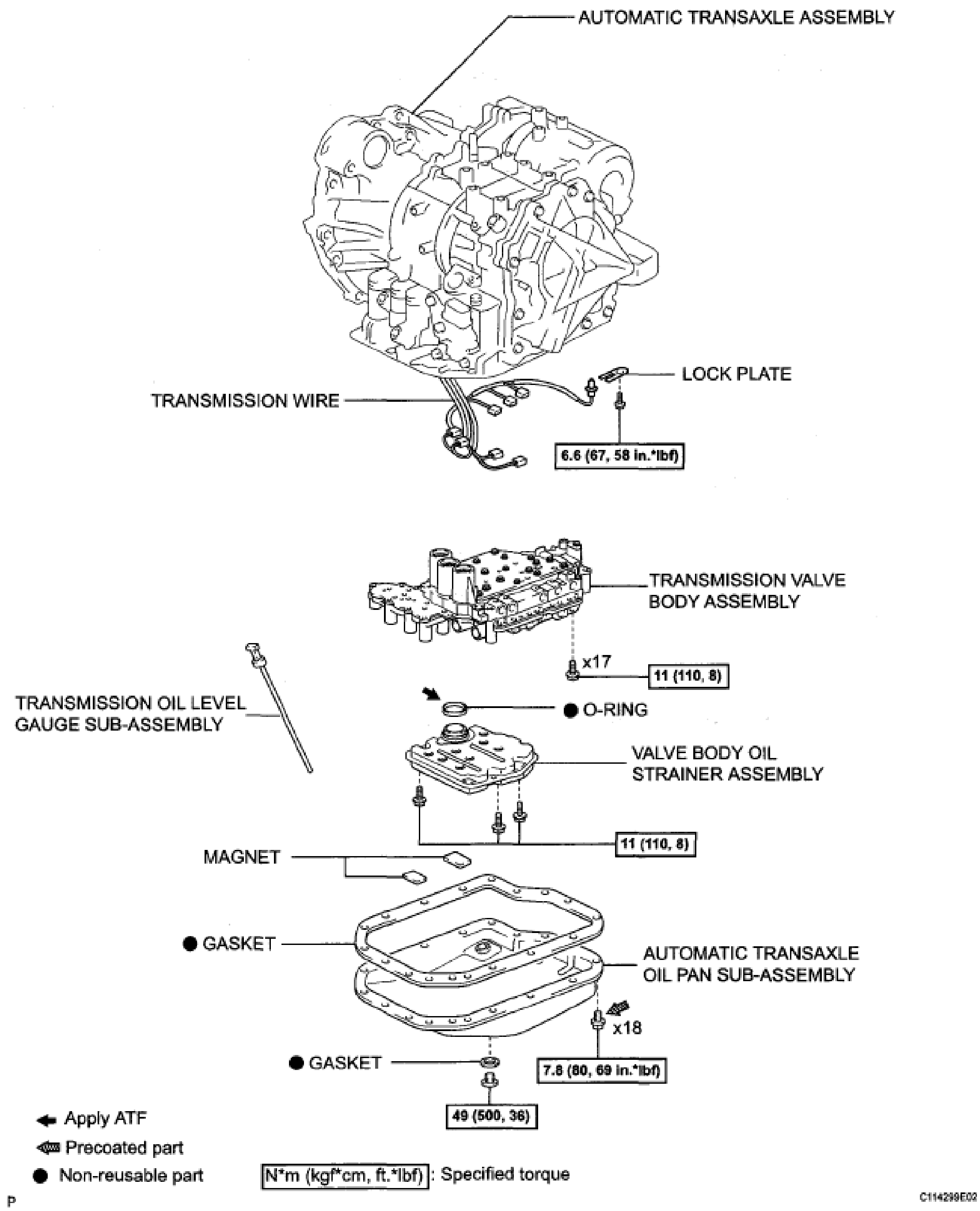

Fig. 117: Identifying Valve Body Assembly Components With Torque Specifications (1 Of 2)

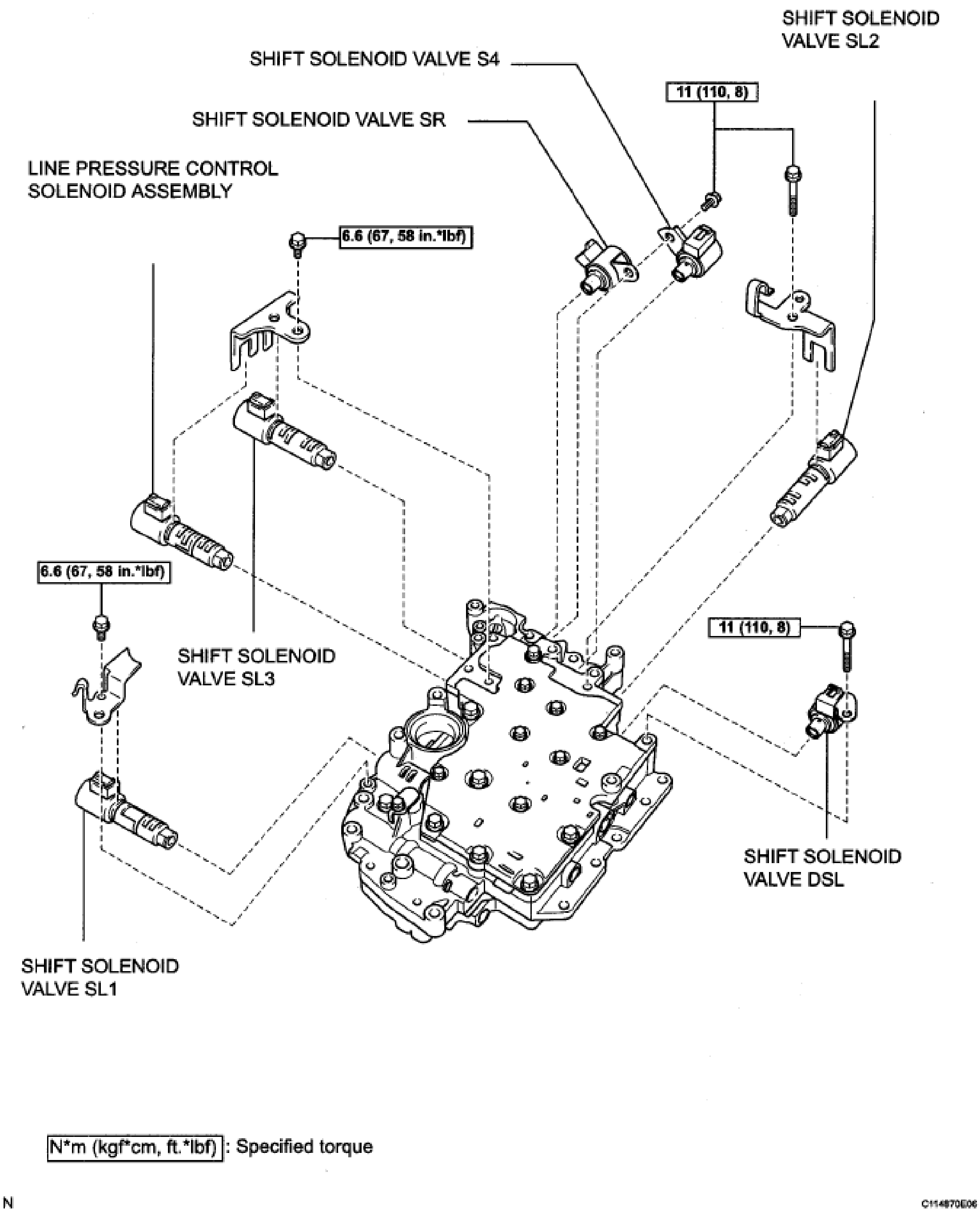

Fig. 118: Identifying Valve Body Assembly Components With Torque Specifications (2 Of 2)

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.

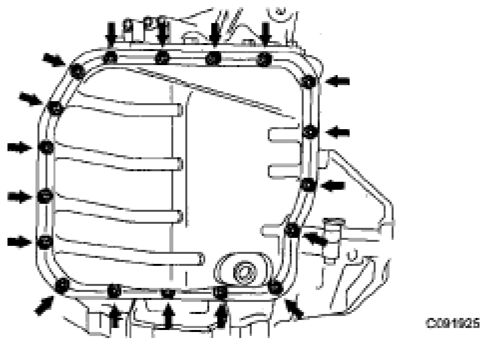

Fig. 119: Locating Oil Pan Assembly Bolts

b. Remove the 2 magnets from the oil pan.

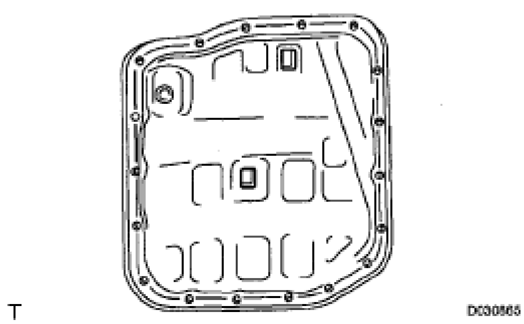

Fig. 120: Identifying Magnets

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

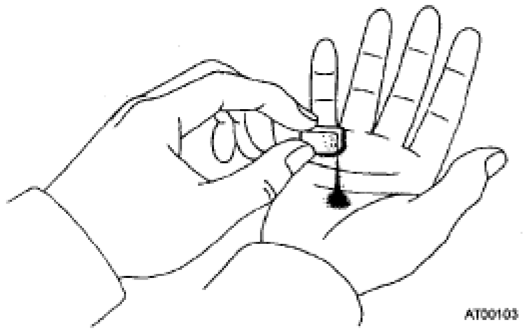

Fig. 121: Collecting Steel Chips Using Magnet

5. **DISCONNECT TRANSMISSION WIRE**
    a. Disconnect the 7 shift solenoid valve connectors.
    b. Remove the bolt and lock plate, and disconnect the ATF temperature sensor.

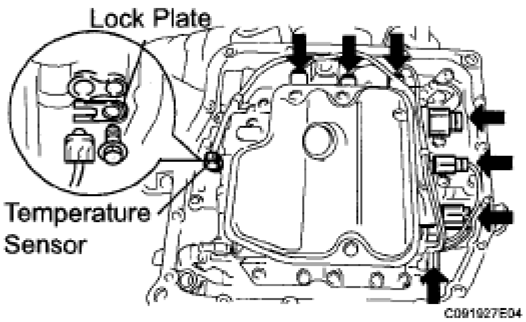

Fig. 122: Locating Shift Solenoid Valve Connectors

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.

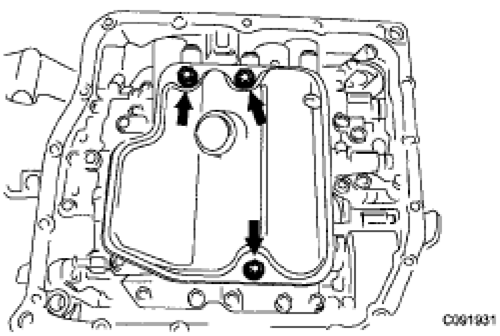

Fig. 123: Locating Oil Strainer Bolts

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

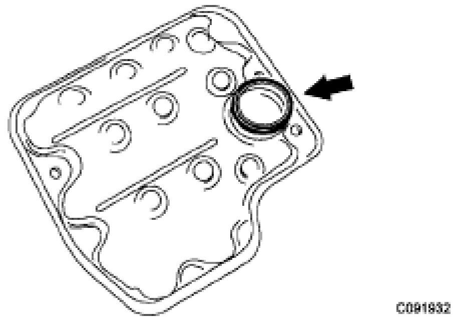

Fig. 124: Locating Valve Body Oil Strainer O-Ring

7. **REMOVE TRANSMISSION VALVE BODY ASSEMBLY**
   a. Support the valve body assembly and remove the 17 bolts and the transmission valve body assembly.

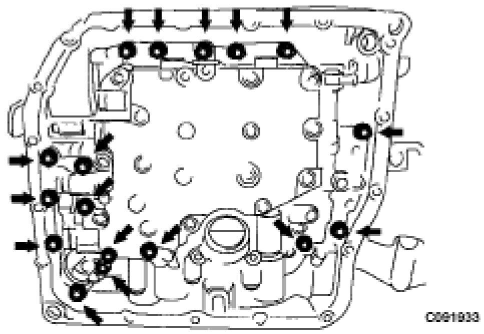

Fig. 125: Locating Valve Body Assembly Bolts

   b. Remove the check ball body and the spring.

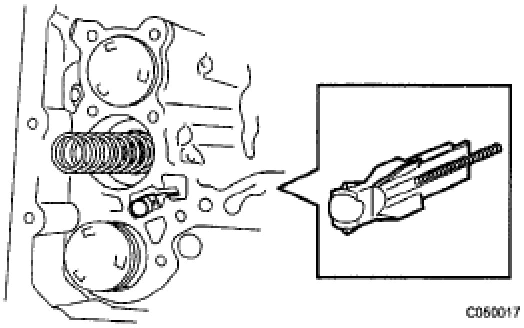

Fig. 126: Identifying Check Ball Body And Spring

   c. Remove the bolt and lock plate from the valve body assembly.
   d. Remove the shift solenoid valve SL3 and SLT from the valve body assembly.

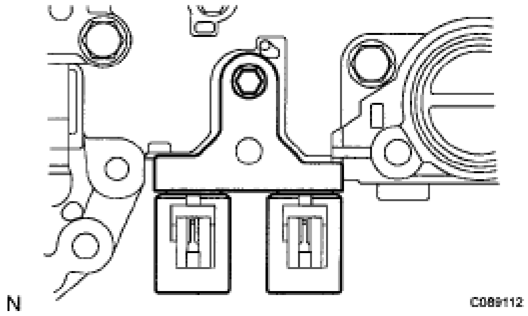

Fig. 127: Identifying Lock Plate Bolt

e. Remove the bolt and shift solenoid valve S4 from the valve body assembly.

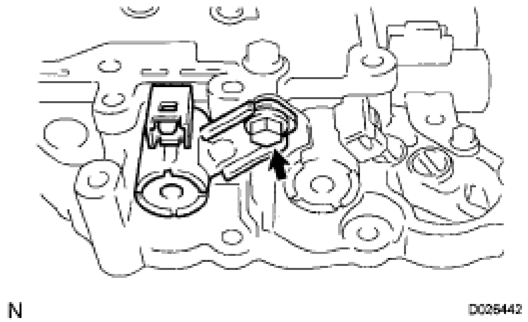

Fig. 128: Locating Shift Solenoid Valve S4 Bolt

f. Remove the shift solenoid valve SR from the valve body assembly.

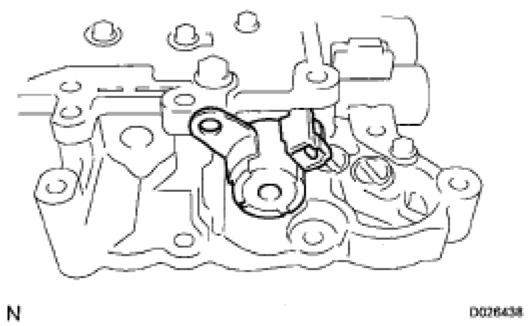

Fig. 129: Identifying Shift Solenoid Valve SR

g. Remove the bolt and shift solenoid valve DSL from the valve body assembly.

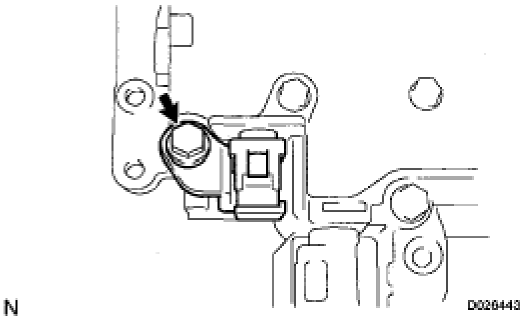

Fig. 130: Locating Shift Solenoid Valve DSL Bolt

h. Remove the bolt and shift solenoid valve SL2 from the valve body assembly.

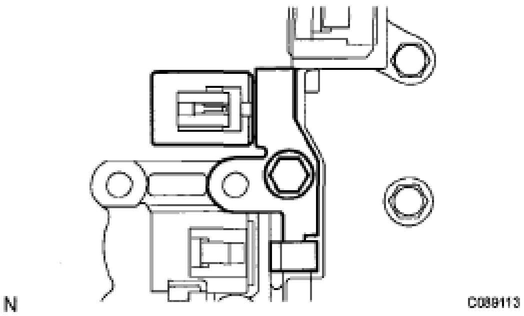

Fig. 131: Identifying Shift Solenoid Valve SL2 Bolt

i. Remove the bolt and shift solenoid valve SL1 from the valve body assembly.

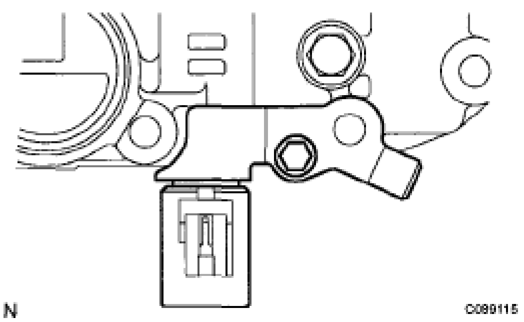

Fig. 132: Identifying Shift Solenoid Valve SL1 Bolt

INSTALLATION

1. **INSTALL TRANSMISSION VALVE BODY ASSEMBLY**
   a. Install the shift solenoid valve SL1 to the valve body assembly with the bolt.

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

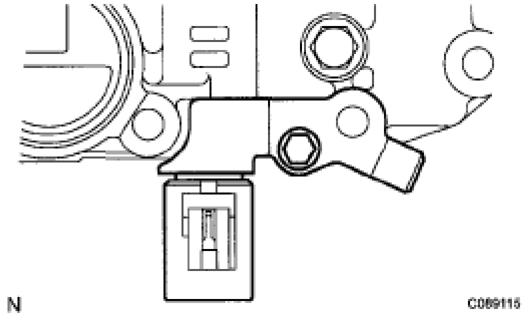

Fig. 133: Identifying Shift Solenoid Valve SL1 Bolt

b. Install the shift solenoid valve SL2 to the valve body assembly with the bolt.

Torque: 11 N*m (110 kgf*cm, 8 ft.*lbf)

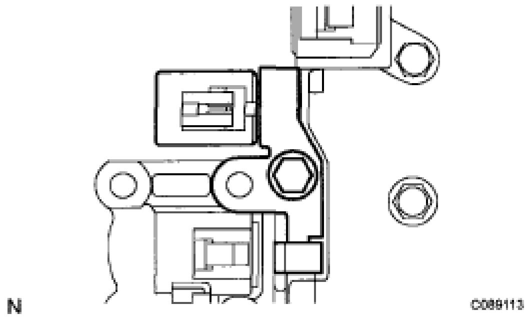

Fig. 134: Identifying Shift Solenoid Valve SL2 Bolt

c. Install the shift solenoid valve DSL to the valve body assembly with the bolt.

Torque: 11 N*m (110 kgf*cm, 8 ft.*lbf)

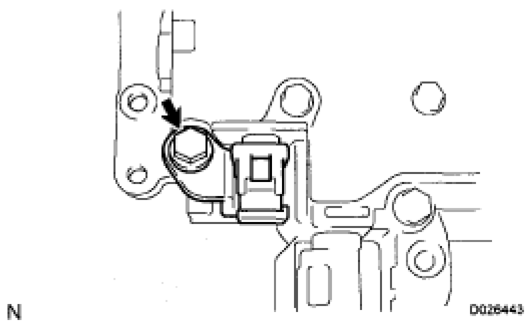

Fig. 135: Locating Shift Solenoid Valve DSL Bolt

d. Install the shift solenoid valve SR to the valve body assembly.

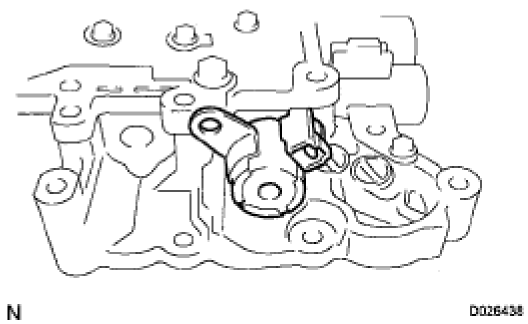

Fig. 136: Identifying Shift Solenoid Valve SR

e. Install the shift solenoid valve S4 to the valve body assembly with the bolt.

Torque: 11 N*m (110 kgf*cm, 8 ft.*lbf)

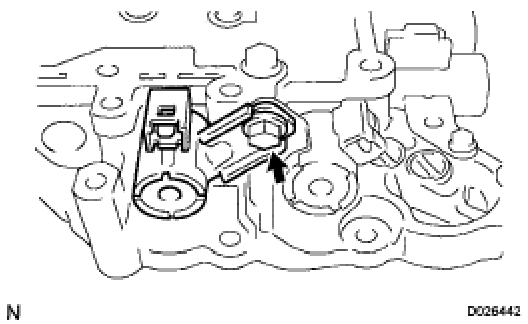

Fig. 137: Locating Shift Solenoid Valve S4 Bolt

f. Install the shift solenoid valve SL3 and SLT to the valve body assembly.
g. Install the lock plate to the valve body assembly with the bolt.

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

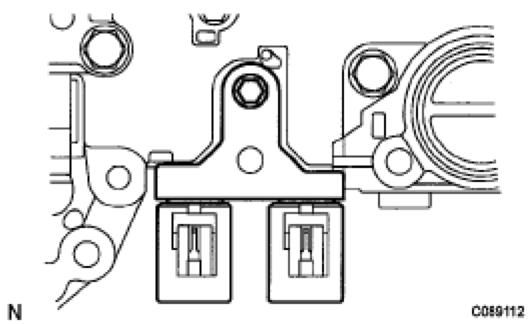

Fig. 138: Identifying Lock Plate Bolt

h. Install the spring and check ball body.

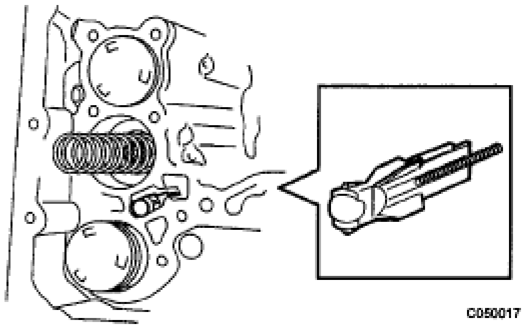

Fig. 139: Identifying Check Ball Body And Spring

i. Align the groove of the manual valve with the pin of the lever.
j. Install the 17 bolts.

Torque: 11 N*m (110 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.**

Bolt length:

Bolt A:

41 mm (1.614 in.)

Bolt B:

57 mm (2.244 in.)

Bolt C:

25 mm (0.984 in.)

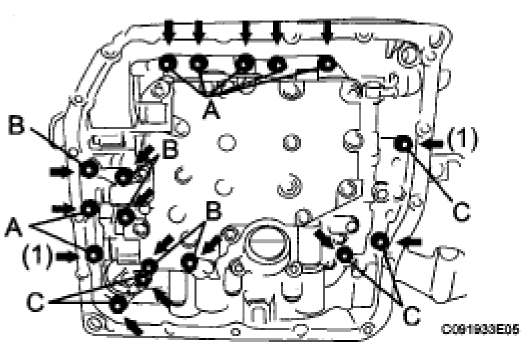

Fig. 140: Locating Transmission Valve Body Assembly Bolts

2. **INSTALL VALVE BODY OIL STRAINER ASSEMBLY**
   a. Coat a new O-ring with ATF.
   b. Install the O-ring to the oil strainer.

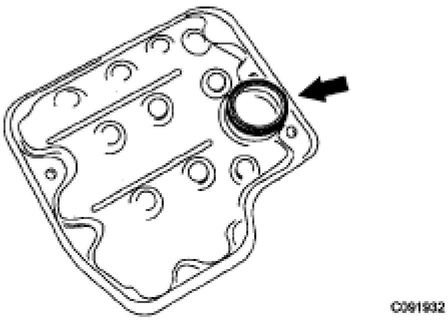

Fig. 141: Locating Valve Body Oil Strainer O-Ring

   c. Install the oil strainer with the 3 bolts.

   Torque: 11 N*m (110 kgf*cm, 8 ft.*lbf)

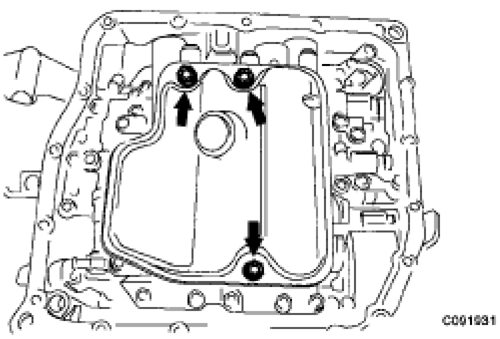

Fig. 142: Locating Oil Strainer Bolts

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 7 shift solenoid valve connectors.

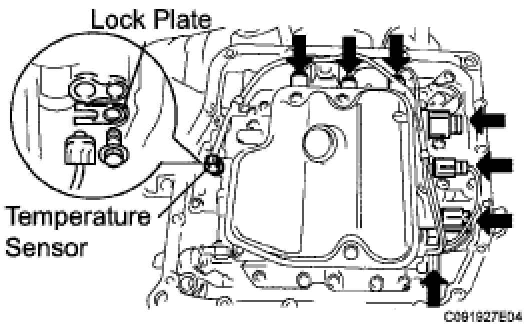

Fig. 143: Locating Shift Solenoid Valve Connectors

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.

    Seal packing:

    THREE BOND 2430 or equivalent

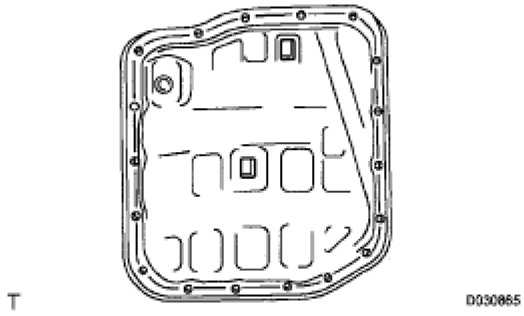

Fig. 144: Identifying Magnets

    c. Install the oil pan and new gasket with the 18 bolts to the transaxle case.

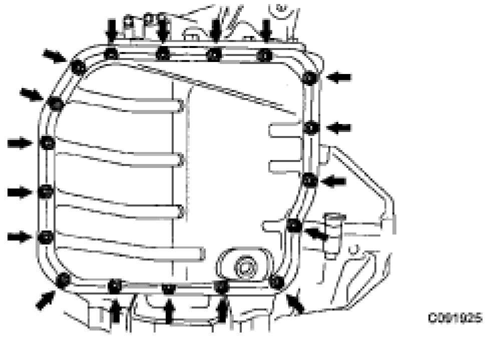

Fig. 145: Locating Oil Pan Assembly Bolts

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

NOTE: Tighten the bolts within 10 minutes of sealant application.

5. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
6. **ADD AUTOMATIC TRANSAXLE FLUID**
7. **CHECK FLUID LEVEL IN AUTOMATIC TRANSAXLE** (See **AUTOMATIC TRANSAXLE FLUID**)
8. **INSTALL ENGINE UNDER COVER NO.1**
9. **RESET MEMORY**

   HINT:

   (See **INITIALIZATION**)

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.

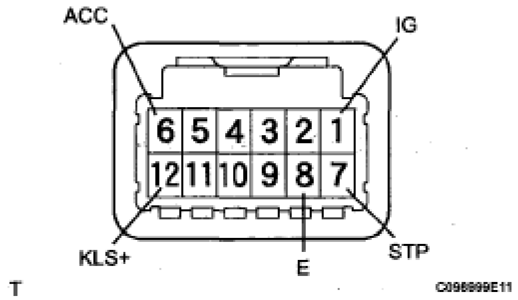

Fig. 146: Identifying Shift Lock Control Unit Assembly Connector Terminals

Voltage

VOLTAGE SPECIFICATION

Terminal	Measuring Condition	Voltage (V)
6 (ACC) - 8 (E)	Ignition switch ACC	10 to 14
6 (ACC)- 8 (E)	Ignition switch OFF	Below 1
7 (STP)-8 (E)	Depress brake pedal	10 to 14
7 (STP)-8 (E)	Release brake pedal	Below 1
12 (KLS+) - 8 (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
1 (IG)-8 (E)	Ignition switch ON	10 to 14
1 (IG) - 8 (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.

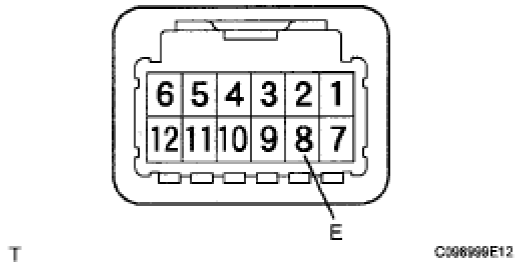

Fig. 147: Identifying Shift Lock Control Unit Assembly Connector Terminals

Resistance

RESISTANCE SPECIFICATION

Terminal	Measuring Condition	Specified Value
8 (E) - Body ground	Always	Below 1 ohms

5. **INSPECT KEY INTER LOCK SOLENOID**
   a. Disconnect the solenoid connector.
   b. Connect KLS+ (4) terminal to the batteries' positive (+) terminal and KLS (3) terminal to the battery negative (-) terminal, and apply about 12V between KLS+ - KLS- terminals.
   c. Check that operation noise can be heard from the solenoid.

   If the solenoid does not operate, replace the solenoid.

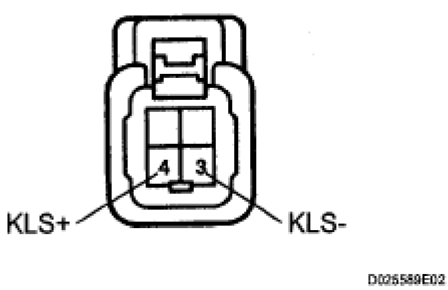

Fig. 148: Identifying Key Inter Lock Solenoid Connector Terminals

6. **INSPECT SHIFT LOCK SOLENOID**
   a. Disconnect the solenoid connector.
   b. Connect SSL+ (2) terminal to the batteries' positive (+) terminal, and SLS- (1) terminal to the battery negative (-) terminal, and apply about 12 V between SLL+-SLS- terminals.
   c. Check that operation noise can be heard from the solenoid.

   If the solenoid does not operate, replace the solenoid.

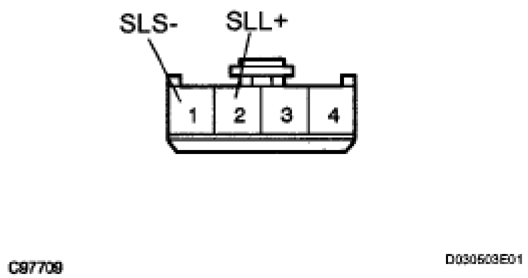

Fig. 149: Identifying Shift Lock Solenoid Connector Terminals

SHIFT LEVER

COMPONENTS

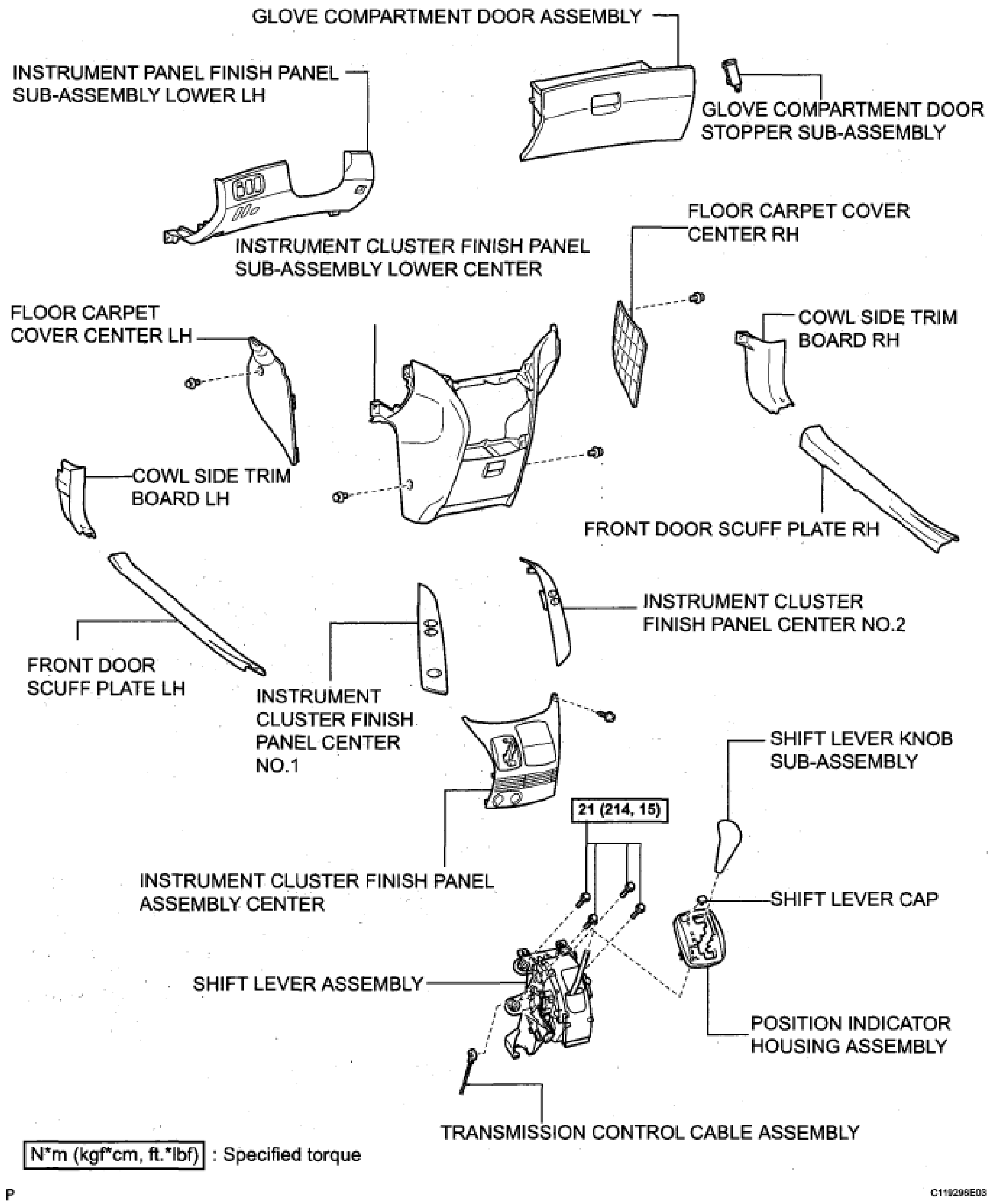

Fig. 150: Identifying Shift Lever Components With Torque Specification (1 Of 2)

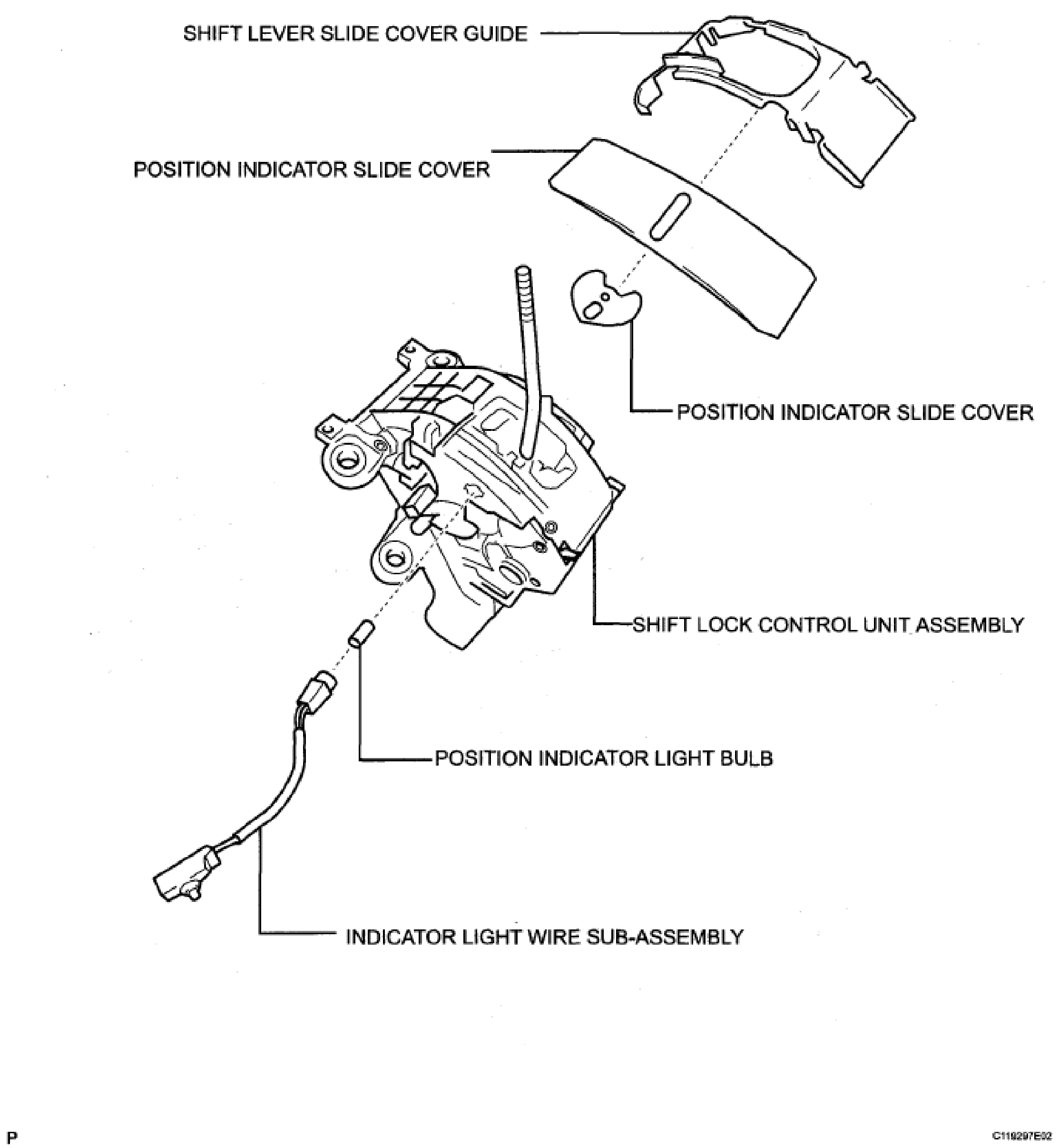

Fig. 151: Identifying Shift Lever Components (2 Of 2)

REMOVAL

1. **DISCONNECT BATTERY NEGATIVE TERMINAL**
2. **REMOVE FRONT DOOR SCUFF PLATE LH**

   HINT:

   (See **REMOVAL**)

3. **REMOVE FRONT DOOR SCUFF PLATE RH**

HINT:

(See **REMOVAL**)

4. **REMOVE COWL SIDE TRIM BOARD LH**

HINT:

(See **REMOVAL**)

5. **REMOVE COWL SIDE TRIM BOARD RH**

HINT:

(See **REMOVAL**)

6. **REMOVE INSTRUMENT PANEL FINISH PANEL SUB-ASSEMBLY LOWER LH**

HINT:

(See **REMOVAL**)

7. **REMOVE GLOVE COMPARTMENT DOOR STOPPER SUB-ASSEMBLY**

HINT:

(See **REMOVAL**)

8. **REMOVE GLOVE COMPARTMENT DOOR ASSEMBLY**

HINT:

(See **REMOVAL**)

9. **REMOVE FLOOR CARPET COVER CENTER LH**

HINT:

(See **REMOVAL**)

10. **REMOVE FLOOR CARPET COVER CENTER RH**

HINT:

(See **REMOVAL**)

11. **REMOVE INSTRUMENT CLUSTER FINISH PANEL CENTER NO.1**

HINT:

(See **REMOVAL**)

12. **REMOVE INSTRUMENT CLUSTER FINISH PANEL CENTER NO.2**

HINT:

(See **REMOVAL**)

13. **REMOVE SHIFT LEVER KNOB SUB-ASSEMBLY**
    a. Remove the floor shift lever knob sub-assembly.

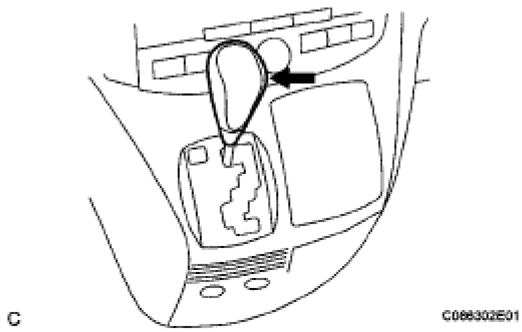

Fig. 152: Locating Floor Shift Lever Knob Sub-Assembly

14. **REMOVE POSITION INDICATOR HOUSING ASSEMBLY**
    a. Using a screwdriver, remove the position indicator housing assembly from the instrument cluster finish panel assembly center.

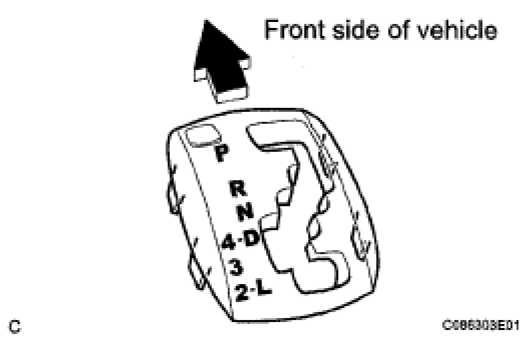

Fig. 153: Removing Position Indicator Housing Assembly

15. **REMOVE INSTRUMENT CLUSTER FINISH PANEL ASSEMBLY CENTER**

HINT:

(See **REMOVAL**)

16. **REMOVE SHIFT LEVER CAP**
    a. Using a small screwdriver, remove the shift lever cap from the position indicator housing assembly.

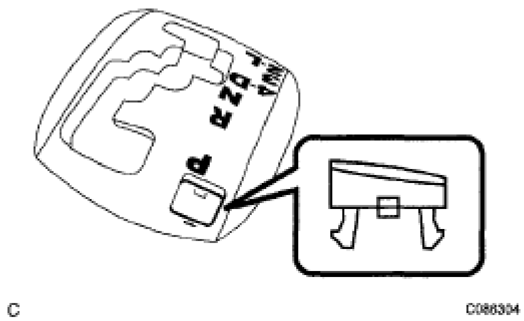

Fig. 154: Identifying Shift Lever Cap

17. **REMOVE INSTRUMENT CLUSTER FINISH PANEL SUB-ASSEMBLY LOWER CENTER**

    HINT:

    (See **REMOVAL**)

18. **DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**
    a. Using a screwdriver, disconnect the cable end from the shift lever assembly.
    b. Using a small screwdriver, disconnect the outer of transmission control cable assembly from the shift lever assembly.

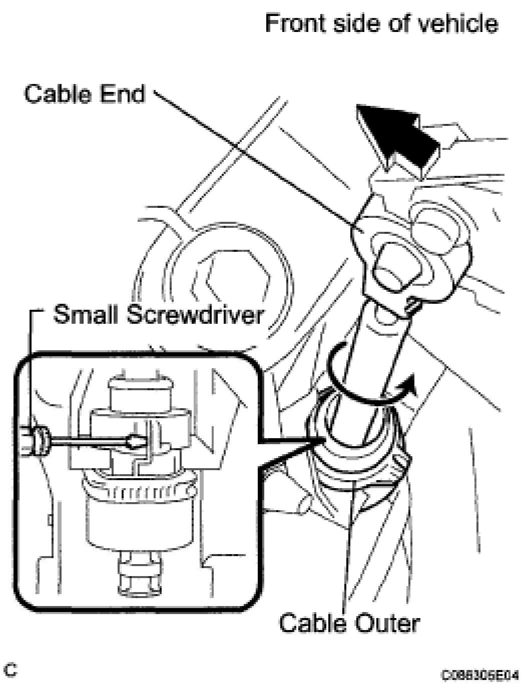

Fig. 155: Disconnecting Outer Of Transmission Control Cable Assembly From Shift Lever

Assembly

19. **REMOVE SHIFT LEVER ASSEMBLY**
    a. Disconnect the 2 connectors.
    b. Remove the 4 bolts and disconnect the shift lever assembly from the vehicle.

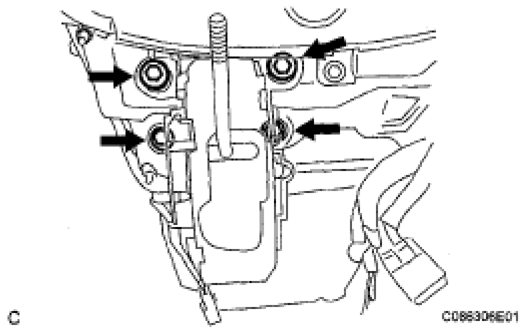

Fig. 156: Locating Shift Lever Assembly Bolts

DISASSEMBLY

1. **REMOVE INDICATOR LIGHT WIRE SUB-ASSEMBLY**
    a. Remove the indicator light wire sub assembly from the position indicator light guide.
2. **REMOVE POSITION INDICATOR LIGHT BULB**
    a. Remove the shift position indicator light bulb from the indicator light wire sub-assembly

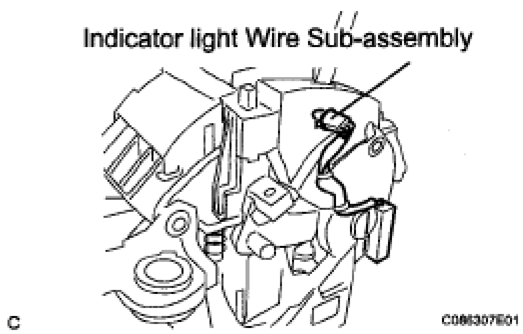

Fig. 157: Identifying Indicator Light Wire Sub Assembly

3. **REMOVE POSITION INDICATOR SLIDE COVER**
    a. Remove the shift lever slide cover guide from the shift lever assembly.

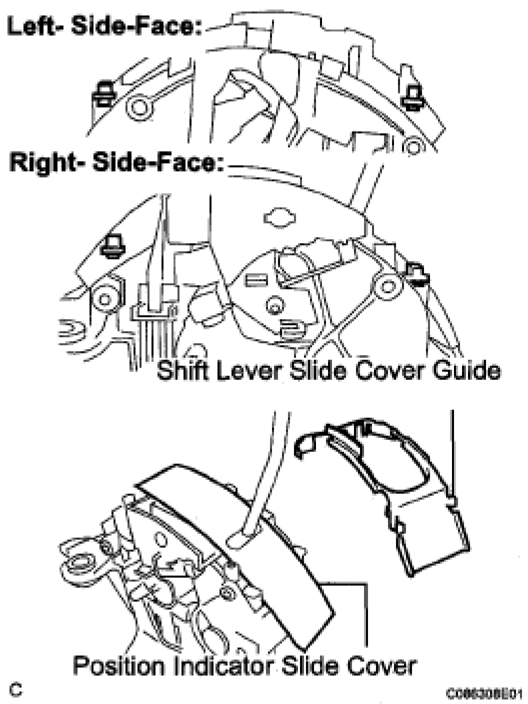

Fig. 158: Identifying Shift Lever Slide Cover Guide And Position Indicator Slide Cover

b. Remove the position indicator slide cover from the shift lever assembly.

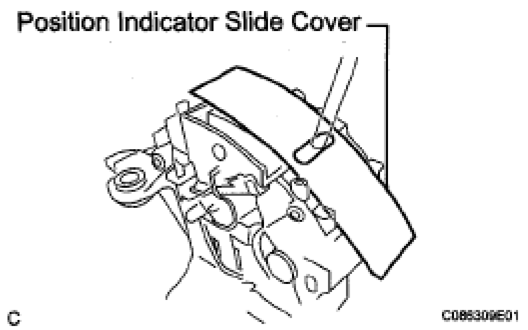

Fig. 159: Identifying Position Indicator Slide Cover

4. **REMOVE POSITION INDICATOR SLIDE COVER**
   a. Remove the position indicator slide cover No.2 from the position indicator slide cover.

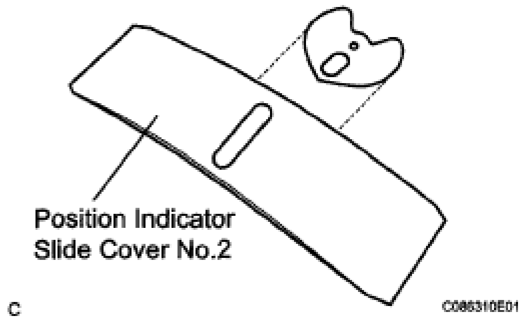

Fig. 160: Removing Position Indicator Slide Cover No. 2

ADJUSTMENT

1. **INSPECT SHIFT LEVER POSITION**
   a. When shifting from P to R position only with ignition switch ON and brake pedal, make sure that the shifting lever moves smoothly and can be moderately operated.
   b. When starting engine, make sure that the vehicle moves forward when shifting from N to D position and moves rearward when shifting to R position.
2. **ADJUST SHIFT LEVER POSITION**
   a. Loosen the nut on the control shaft lever.

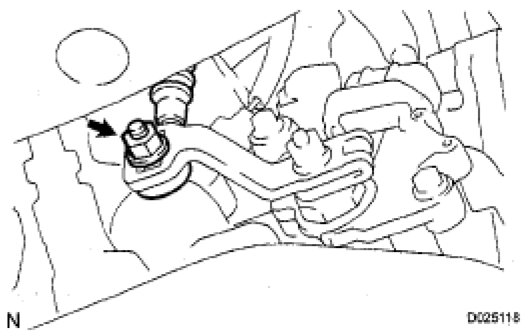

Fig. 161: Locating Control Shaft Lever Nut

   b. Push the control shaft fully downward.
   c. Return the control shaft lever 2 notches to the N position.

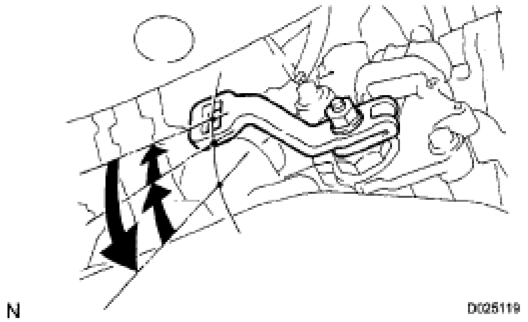

Fig. 162: Returning Control Shaft Lever Notches To N Position

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: 13 N*m (132.6 kgf*cm, 9.5 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.

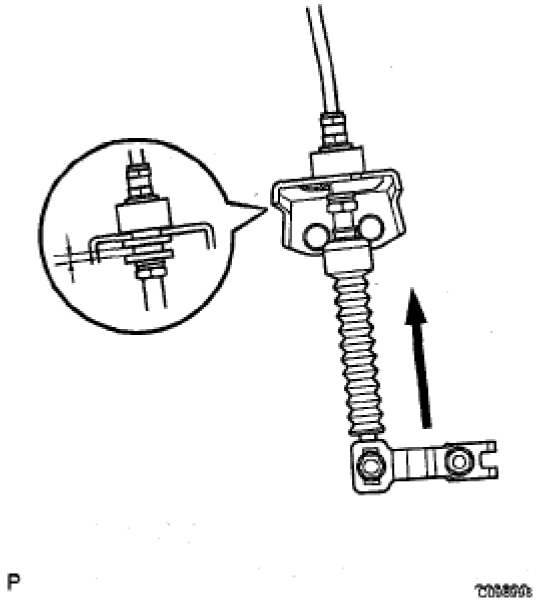

Fig. 163: Installing Control Cable End To Control Shaft Lever

REASSEMBLY

1. **INSTALL POSITION INDICATOR SLIDE COVER**
    a. Install the position indicator slide cover No.2 to the position indicator slide cover.

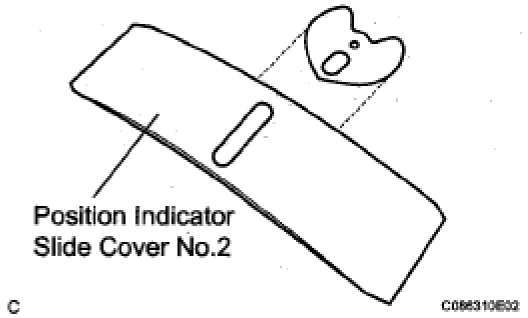

Fig. 164: Installing Position Indicator Slide Cover No. 2

2. **INSTALL POSITION INDICATOR SLIDE COVER**
    a. Install the position indicator slide cover to the shift lever assembly.
    b. Install the shift lever slide cover guide to the shift lever assembly.
3. **INSTALL POSITION INDICATOR LIGHT BULB**
    a. Install the shift position indicator light bulb to the indicator light wire sub-assembly.

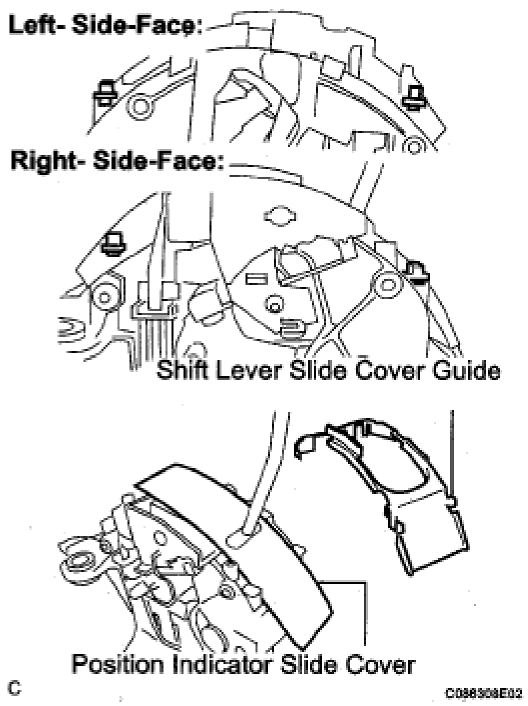

Fig. 165: Identifying Position Indicator Slide Cover And Shift Lever Slide Cover Guide

4. **INSTALL INDICATOR LIGHT WIRE SUB-ASSEMBLY**
    a. Install the indicator light wire sub-assembly to the shift lever assembly.

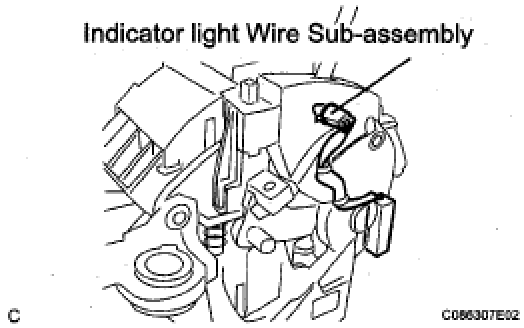

Fig. 166: Identifying Indicator Light Wire Sub-Assembly

INSTALLATION

1. **INSTALL SHIFT LEVER ASSEMBLY**
    a. Install shift lever assembly to the vehicle with the 4 bolts.

    Torque: 21 N*m (214 kgf*cm, 15 ft.*lbf)

    NOTE: Into datum hole of shift lever into datum pin of instrument lower.

    b. Connect the 2 connectors to the shift lever assembly.

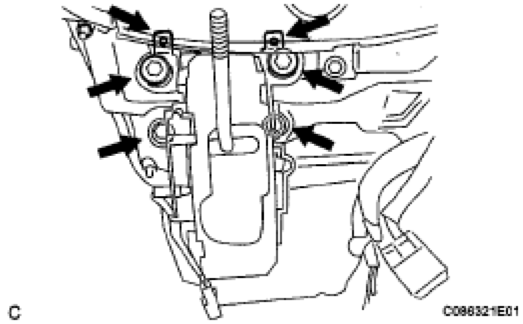

Fig. 167: Locating Shift Lever Assembly Bolts

2. **INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY**
    a. Install the cable outer to the shift lever plate

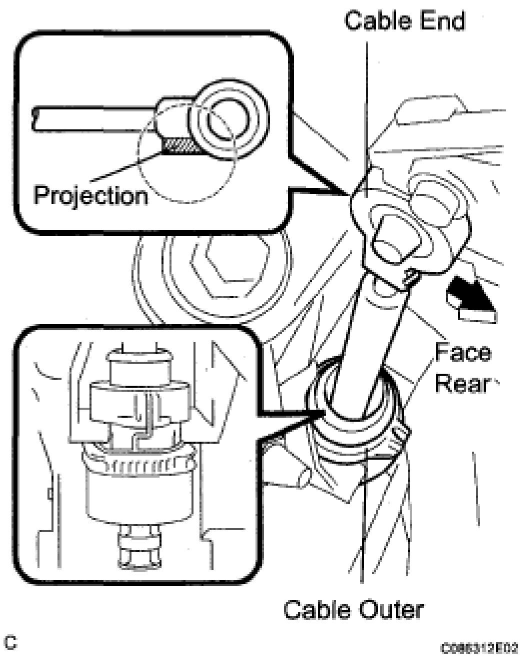

Fig. 168: Installing Cable Outer To Shift Lever Plate

b. When installing the transmission control cable assembly on the shift lever plate, place the projection to the shift lever plate (**Fig. 169**). Confirm that the spring in the shift cable outer has moved to the position (**Fig. 169**) shown in the illustration.

Confirm that the shift cable is installed on the shift lever plate properly.

NOTE:

- **To prevent torsion of the inner cable, the projection on the eye end should face rear.**
- **Push the cable end to the bottom of the pin.**

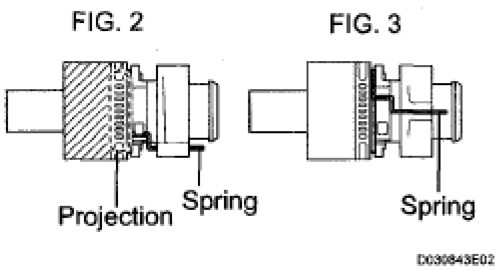

Fig. 169: Identifying Shift Cable Outer Spring Position

3. **INSTALL INSTRUMENT CLUSTER FINISH PANEL SUB-ASSEMBLY LOWER CENTER**

HINT:

(See **INSTALLATION**)

4. **INSTALL SHIFT LEVER CAP**
    a. Install the shift lever cap to the floor shift position indicator housing assembly.

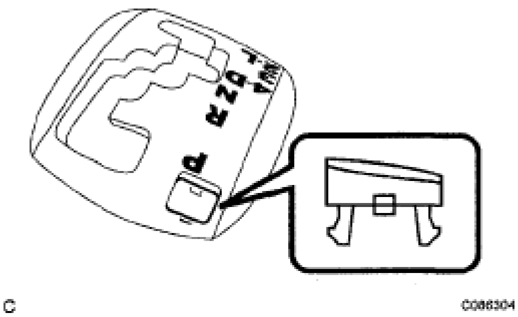

Fig. 170: Identifying Shift Lever Cap

5. **INSTALL POSITION INDICATOR HOUSING ASSEMBLY**
    a. install the position indicator housing assembly to the instrument cluster finish panel assembly center.

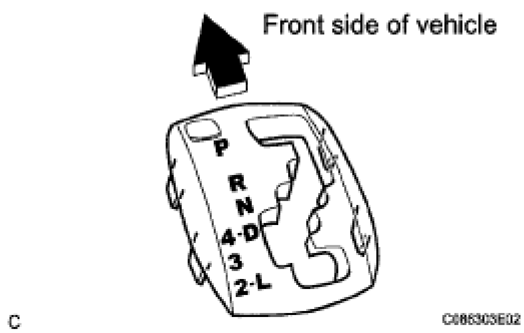

Fig. 171: Identifying Position Indicator Housing Assembly

6. **INSTALL SHIFT LEVER KNOB SUB-ASSEMBLY**
    a. install the shift lever knob sub-assembly.

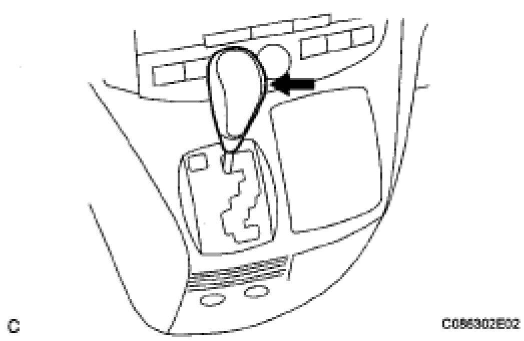

Fig. 172: Identifying Shift Lever Knob Sub-Assembly

7. **ADJUST SHIFT LEVER POSITION**

   HINT:

   (See **ADJUSTMENT**)

8. **INSPECT SHIFT LEVER POSITION**

   HINT:

   (See **ADJUSTMENT**)

9. **INSPECT KEY INTER LOCK OPERATION**

   HINT:

   (See **ON-VEHICLE INSPECTION**)

10. **INSPECT SHIFT LOCK OPERATION**

    HINT:

    (See **ON-VEHICLE INSPECTION**)

11. **INSPECT SHIFT LOCK RELEASE BUTTON OPERATION**

    HINT:

    (See **ON-VEHICLE INSPECTION**)

TRANSMISSION CONTROL CABLE ASSEMBLY

COMPONENTS

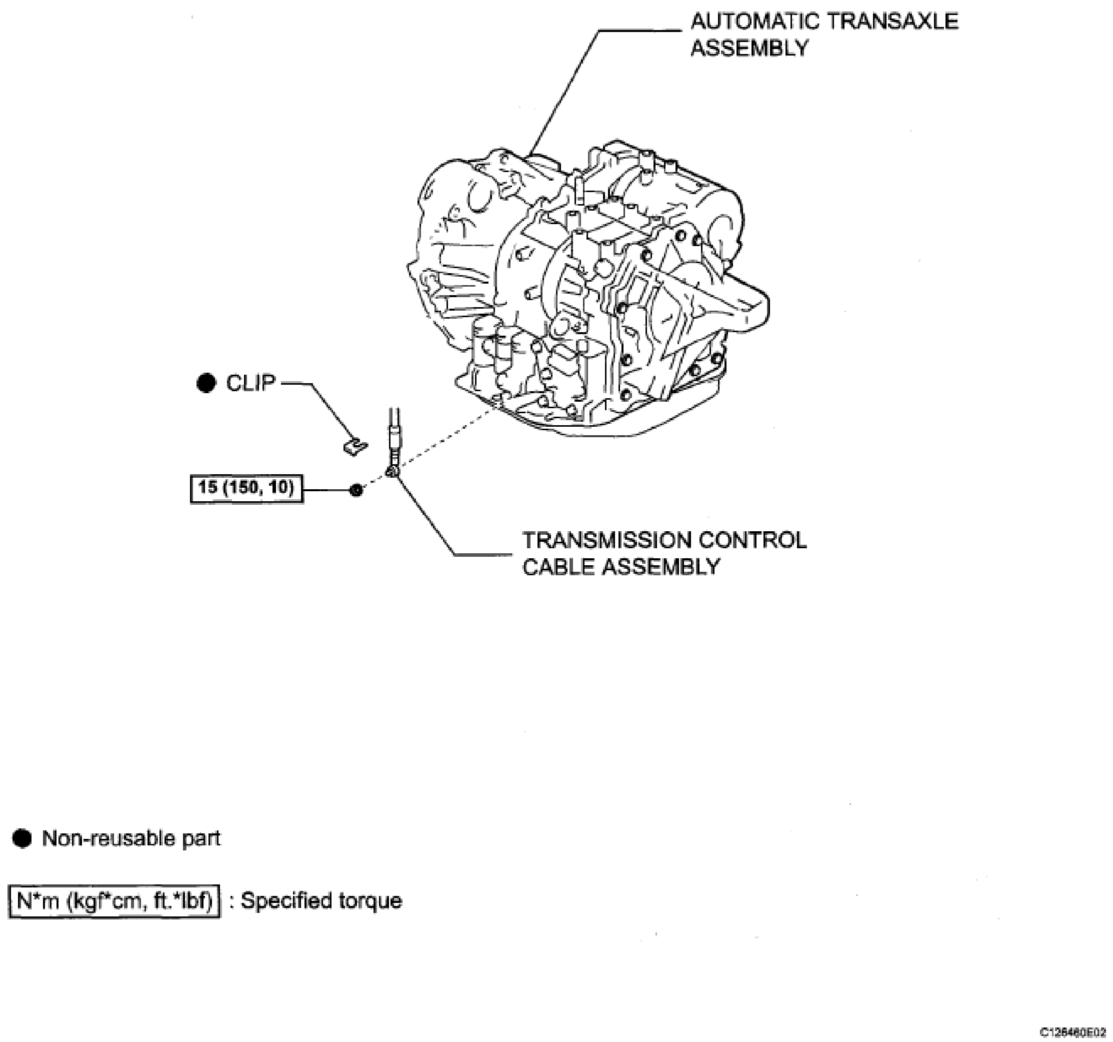

Fig. 173: Identifying Transmission Control Cable Assembly Components With Torque Specification

REMOVAL

1. **DISCONNECT BATTERY NEGATIVE TERMINAL**
2. **REMOVE INSTRUMENT CLUSTER FINISH PANEL SUB-ASSEMBLY CENTER**

   HINT:

   (See **REMOVAL**)

3. **REMOVE TRANSMISSION CONTROL CABLE ASSEMBLY**
   a. Remove the nut from the control shaft lever.
   b. Disconnect the transmission control cable assembly from the control shaft lever.

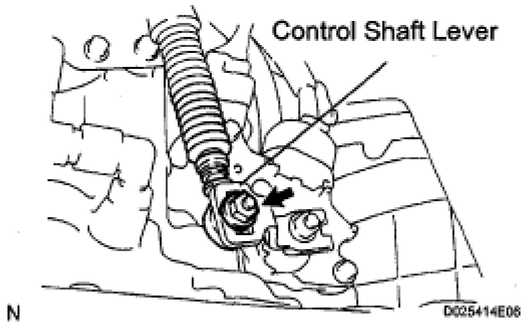

Fig. 174: Locating Control Shaft Lever Nut

c. Remove the clip and disconnect the transmission control cable assembly from the control cable bracket.

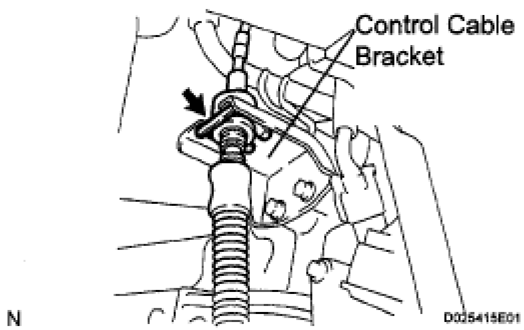

Fig. 175: Identifying Control Cable Bracket

d. Disconnect the transmission control cable assembly from the transmission control cable bracket No.2.

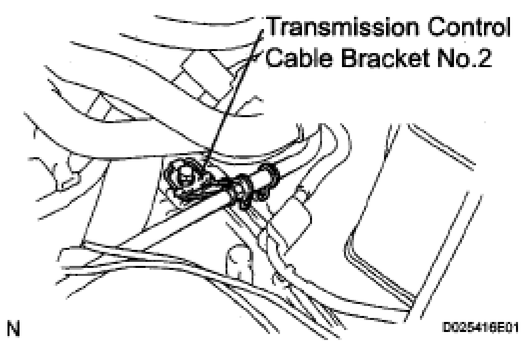

Fig. 176: Identifying Transmission Control Cable Bracket No. 2

e. Remove the 2 nuts and disconnect the transmission control cable assembly from the vehicle.

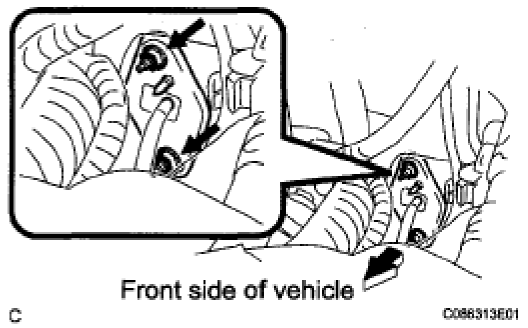

Fig. 177: Locating Transmission Control Cable Assembly Nuts

f. Using a screwdriver, disconnect the cable end from the shift lever assembly
g. Using a small screwdriver, disconnect the cable outer of transmission control cable assembly from the shift lever assembly.
h. Pull out the control cable from the vehicle.

ADJUSTMENT

1. **INSPECT SHIFT LEVER POSITION**
    a. When shifting from P to R position only with ignition switch ON and brake pedal, make sure that the shifting lever moves smoothly and can be moderately operated.
    b. When starting engine, make sure that the vehicle moves forward when shifting from N to D position and moves rearward when shifting to R position.

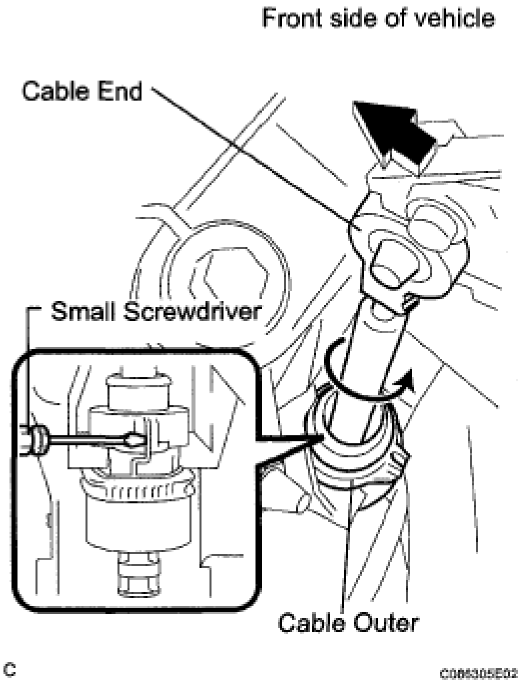

Fig. 178: Disconnecting Cable Outer Of Transmission Control Cable Assembly

2. **ADJUST SHIFT LEVER POSITION**
    a. Loosen the nut on the control shaft lever.

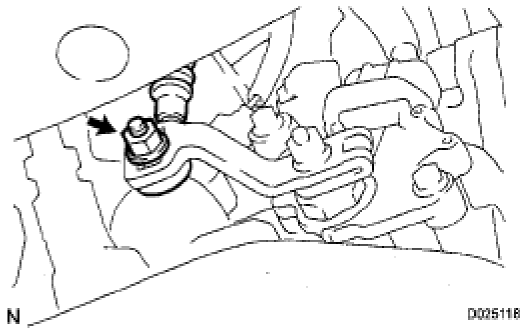

Fig. 179: Locating Control Shaft Lever Nut

    b. Push the control shaft fully downward.
    c. Return the control shaft lever 2 notches to the N position.

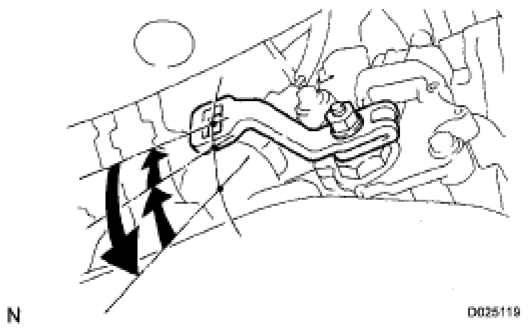

Fig. 180: Returning Control Shaft Lever Notches To N Position

    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: 13 N*m (132.6 kgf*cm, 9.5 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.

INSTALLATION

1. **INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY**

a. Pull in the control cable to the body.

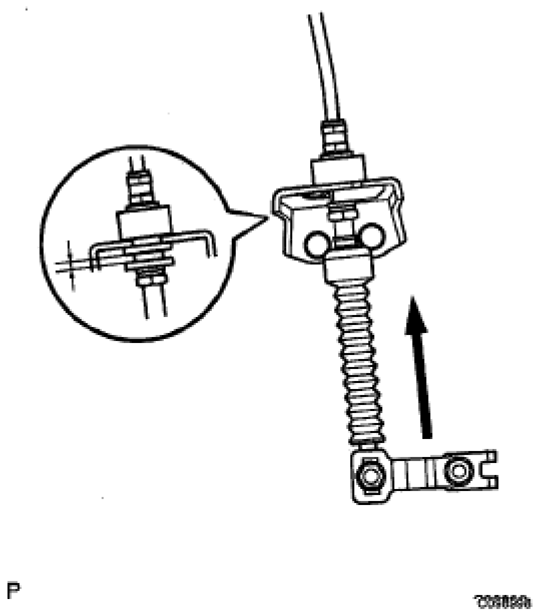

Fig. 181: Installing Control Cable End To Control Shaft Lever

b. Install the cable end, as shown in the illustration.

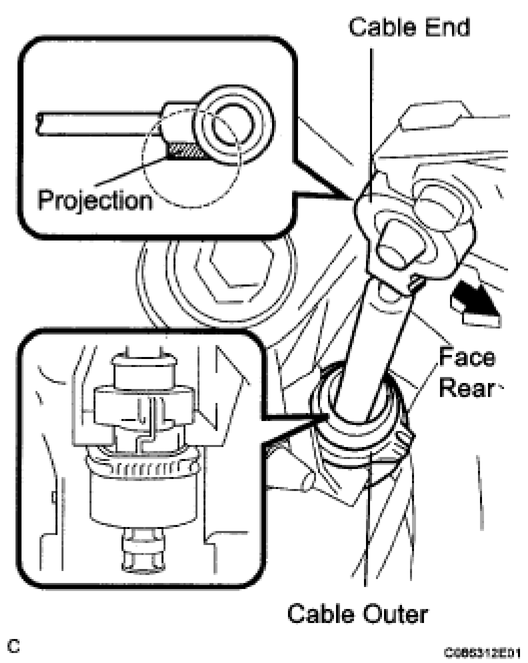

Fig. 182: Installing Cable End

c. When installing the transmission control cable assembly on the shift lever plate, place the projection of the shift cable downward to fit in the groove of the shift lever plate (FIG.2) Confirm that the spring in the shift cable outer has moved to the position (FIG.3) shown in the illustration.

Confirm that the shift cable is installed on the shift lever plate properly.

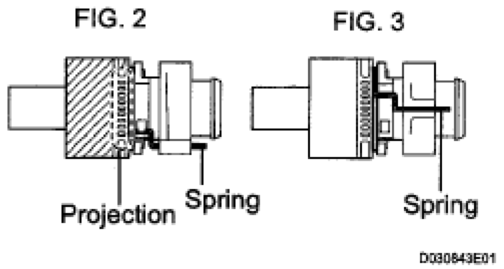

Fig. 183: Identifying Projection Of Shift Cable

NOTE:

- **To prevent torsion of the inner cable, the projection on the eye end should face rear.**
- **Push the cable end to the bottom of the pin.**

d. Install the transmission control cable assembly and 2 nuts.

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

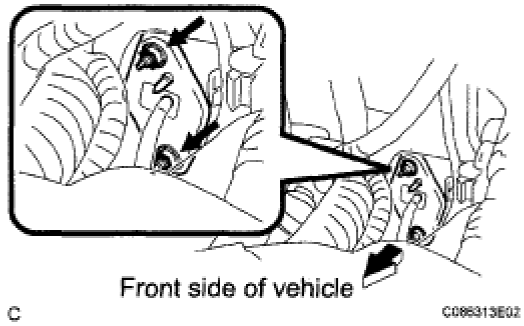

Fig. 184: Locating Transmission Control Cable Assembly Nuts

e. Connect the transmission control cable assembly to the transmission control cable bracket No.2.

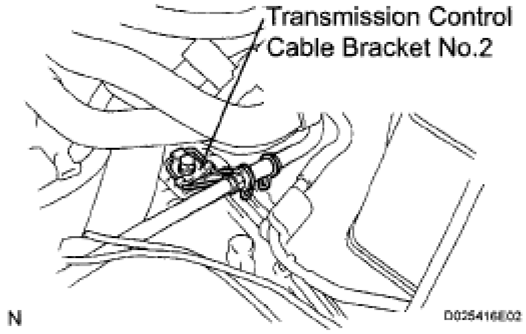

Fig. 185: Identifying Transmission Control Cable Bracket No. 2

f. Temporarily install the transmission control cable assembly to the control shaft lever with the nut.

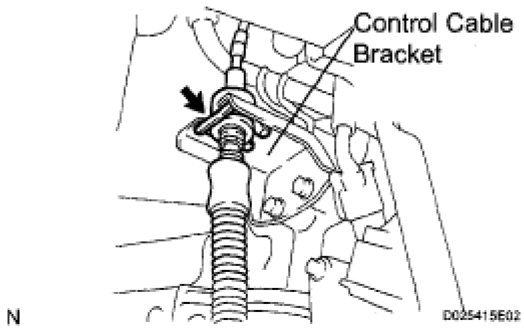

Fig. 186: Identifying Control Cable Bracket

g. Install the transmission control cable assembly and clip to the bracket.

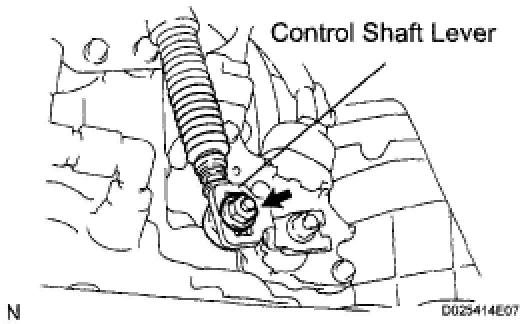

Fig. 187: Locating Control Shaft Lever Nut

2. **INSTALL INSTRUMENT CLUSTER FINISH PANEL SUB-ASSEMBLY CENTER**

   HINT:

   (See **INSTALLATION**)

3. **ADJUST SHIFT LEVER POSITION**

   HINT:

   (See **ADJUSTMENT**)

4. **INSPECT SHIFT LEVER POSITION**

   HINT:

   (See **ADJUSTMENT**)

DIFFERENTIAL OIL SEAL

COMPONENTS

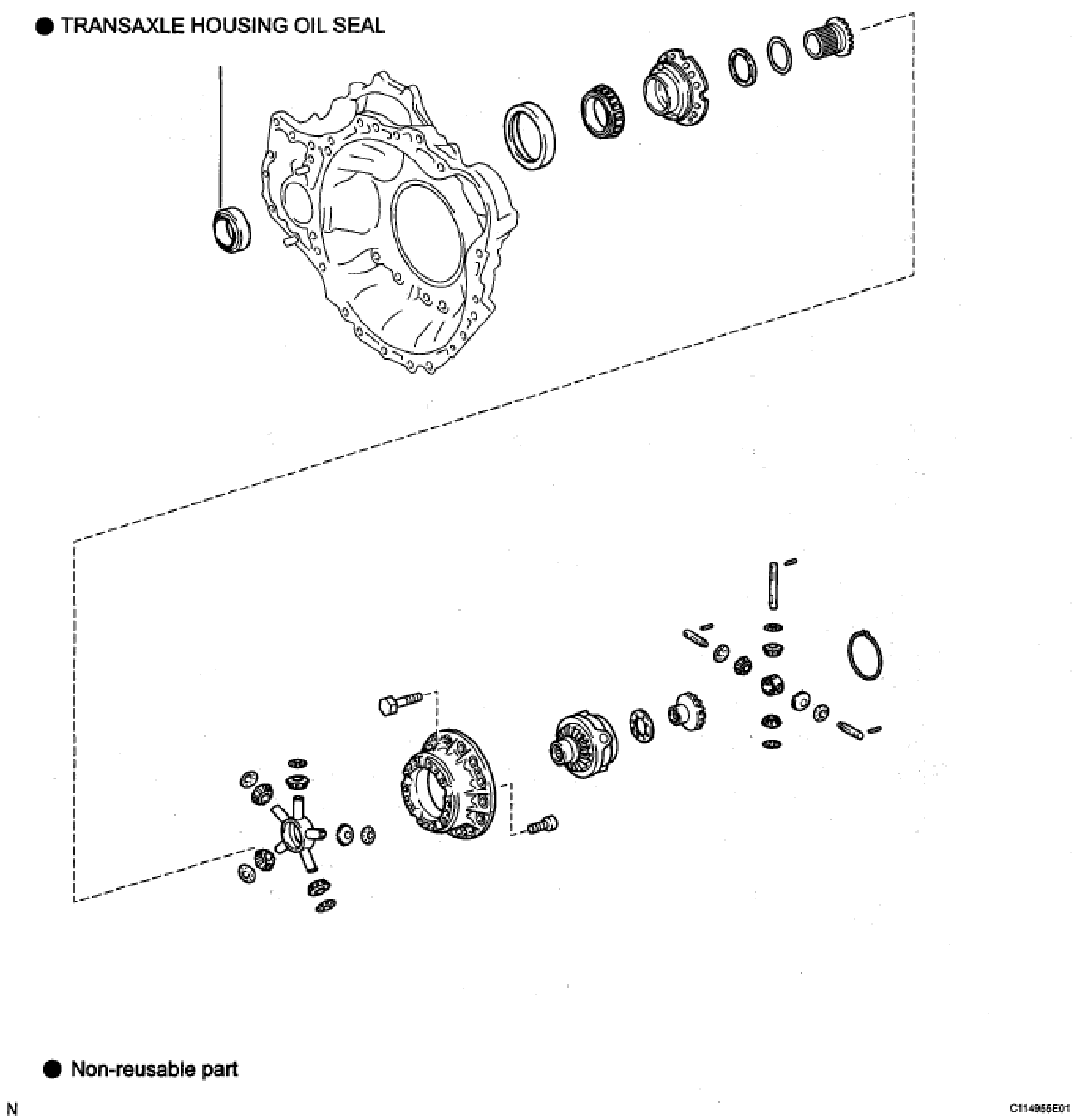

Fig. 188: Identifying Differential Oil Seal Components (1 Of 2)

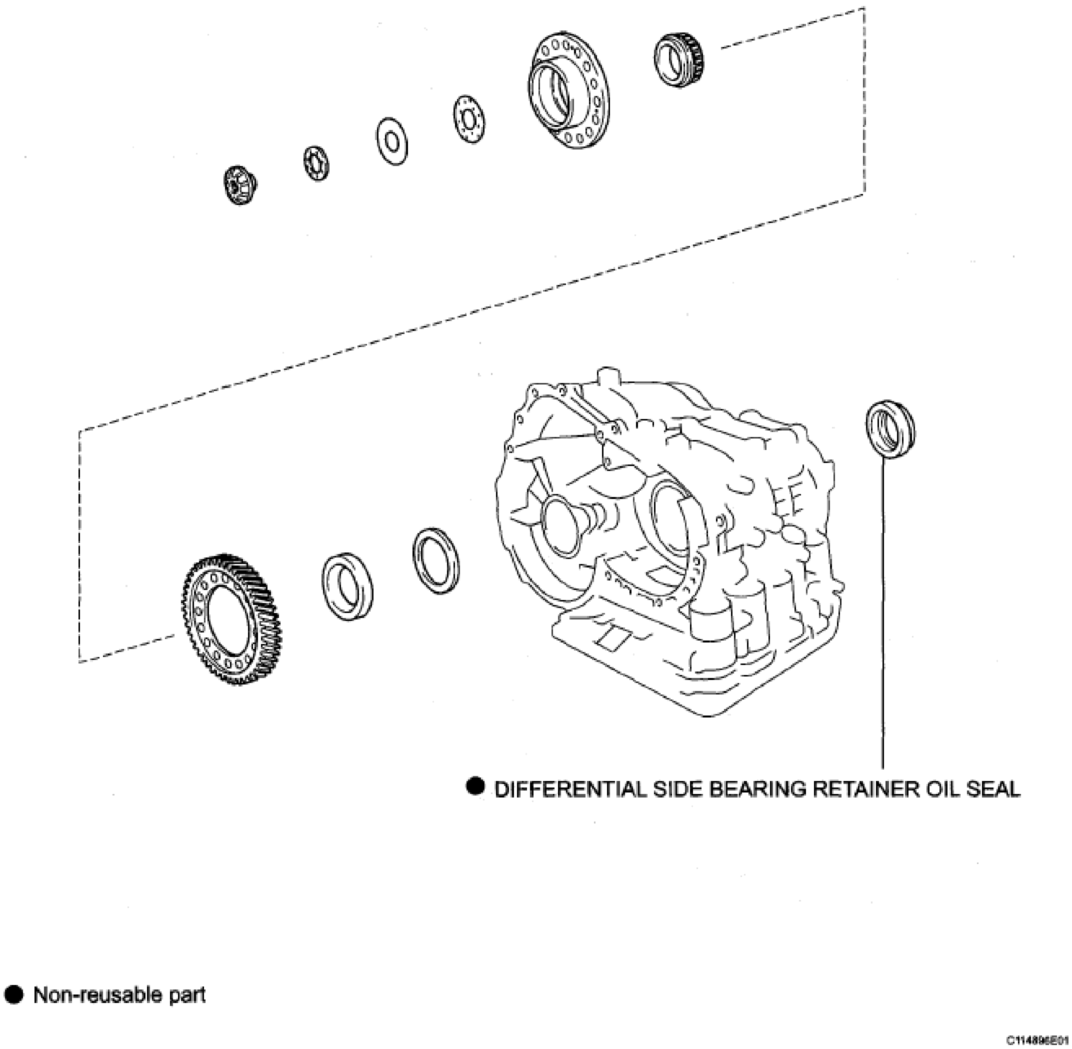

Fig. 189: Identifying Differential Oil Seal Components (1 Of 2)

REMOVAL

1. **REMOVE FRONT WHEELS**

   HINT:

   When replacing the front differential oil seal (LH) or (RH), perform step 1 to 5 or 6 to 11 respectively.

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 DIFFERENTIAL SIDE BEARING RETAINER OIL SEAL**
   a. Using SST, pull out the oil seal.

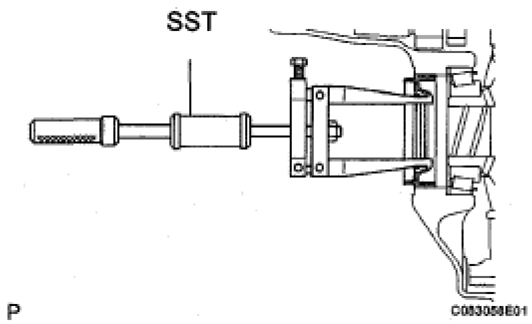

Fig. 190: Pulling Out Differential Side Bearing Retainer Oil Seal

SST 09308-00010

6. **REMOVE ENGINE ASSEMBLY WITH TRANSAXLE**

   HINT:

   (See **REMOVAL**)

7. **REMOVE FRONT DRIVE SHAFT ASSEMBLY RH (for 4WD)**

   HINT:

   (See **REMOVAL**)

8. **REMOVE TRANSFER STIFFENER PLATE RH**

   HINT:

   (See **REMOVAL**)

9. **REMOVE AUTOMATIC TRANSAXLE W/TRANSFER**

   HINT:

(See **REMOVAL**)

10. **REMOVE TRANSFER ASSEMBLY**

    HINT:

    (See **REMOVAL**)

11. **REMOVE TRANSAXLE HOUSING OIL SEAL**
    a. Using a screw driver with vinyl tape wrapped around its tip, remove the oil seal.

    NOTE: Be careful not to damage the housing.

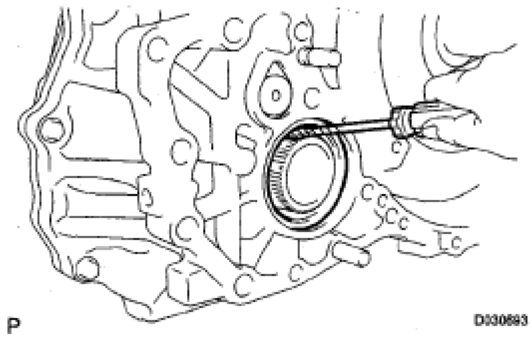

Fig. 191: Removing Transaxle Housing Oil Seal

INSTALLATION

1. **INSTALL DIFFERENTIAL SIDE BEARING RETAINER OIL SEAL**
   a. Using SST and a hammer, install a new oil seal.

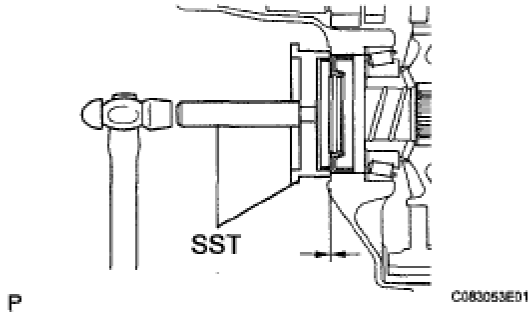

Fig. 192: Installing Differential Side Bearing Retainer Oil Seal

SST 09223-15020, 09950-70010 (09951-07200)

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.

2. **INSTALL FRONT DRIVE SHAFT ASSEMBLY LH**

   HINT:

   (See **INSTALLATION**)

3. **INSTALL FRONT WHEELS**

   Torque: 103 N*m (1,050 kgf*cm, 76 ft.*lbf)

4. **ADD AUTOMATIC TRANSAXLE FLUID**
5. **INSPECT AUTOMATIC TRANSAXLE FLUID** (See **AUTOMATIC TRANSAXLE FLUID**)
6. **INSTALL ENGINE UNDER COVER NO.1**
7. **CHECK ABS SPEED SENSOR SIGNAL**

   HINT:

   (See **DTC CHECK / CLEAR**)

8. **INSTALL TRANSAXLE HOUSING OIL SEAL**
   a. Using SST and a hammer, install a new oil seal.

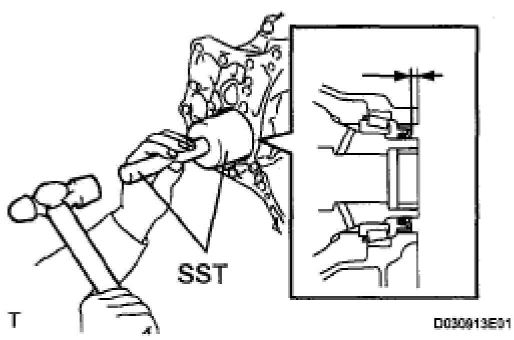

Fig. 193: Installing Transaxle Housing Oil Seal

SST 09649-17010, 09950-70010 (09951-07200)

Oil seal installation depth:

5.5 to 6.5 mm (0.217 to 0.256 in.)

   b. Coat the lip of the oil seal with MP grease.

9. **INSTALL TRANSFER ASSEMBLY**

HINT:

(See **INSTALLATION**)

10. **INSTALL AUTOMATIC TRANSAXLE W/TRANSFER**

HINT:

(See **INSTALLATION**)

11. **INSTALL FRONT DRIVE SHAFT ASSEMBLY RH (for 4WD)**

HINT:

(See **INSTALLATION**)

12. **INSTALL TRANSFER STIFFENER PLATE RH**

HINT:

(See **INSTALLATION**)

13. **INSTALL ENGINE ASSEMBLY WITH TRANSAXLE**

HINT:

(See **INSTALLATION**)

AUTOMATIC TRANSAXLE ASSEMBLY

COMPONENTS

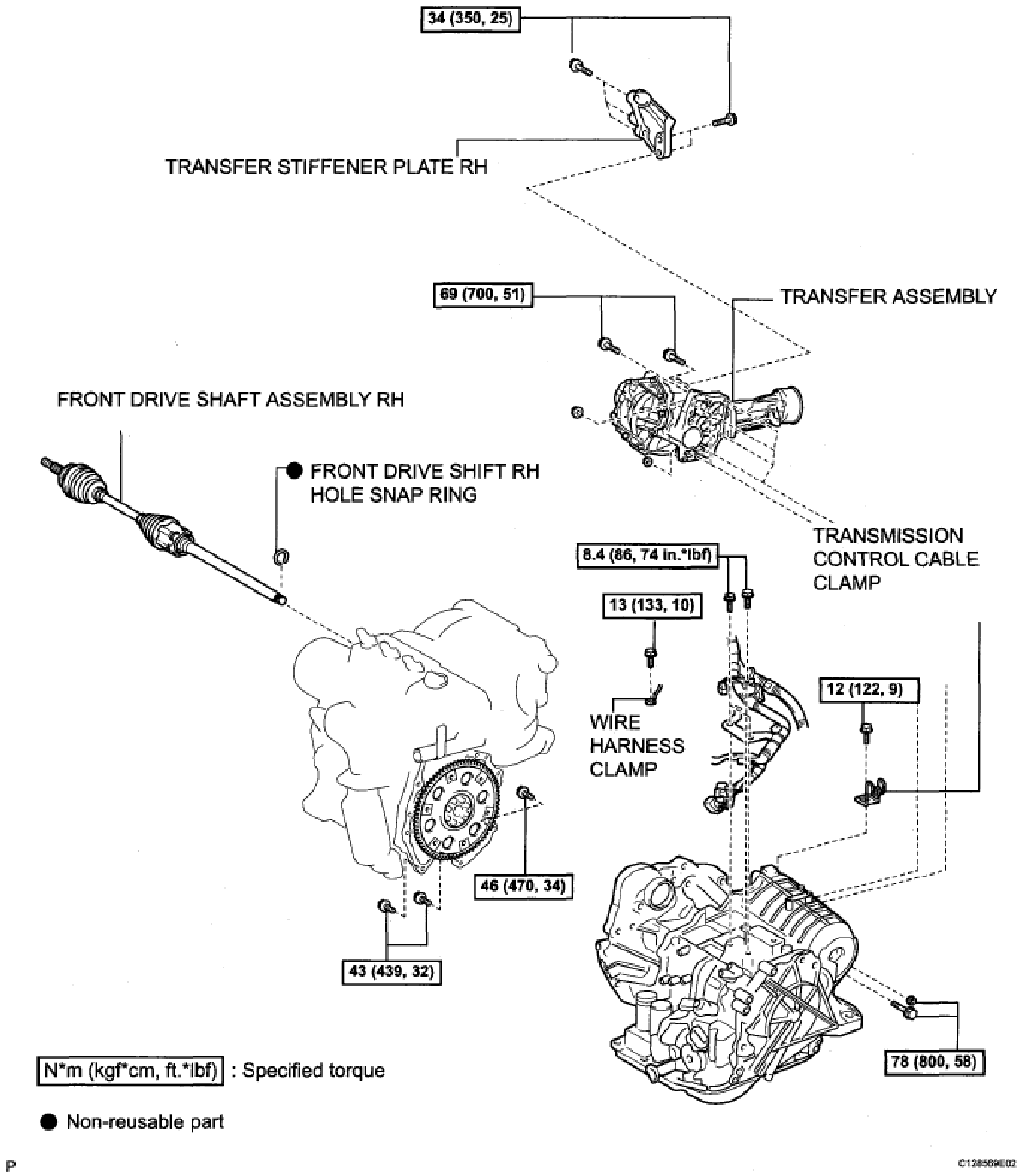

Fig. 194: Identifying Automatic Transaxle Assembly Components With Torque Specifications (1 Of 2)

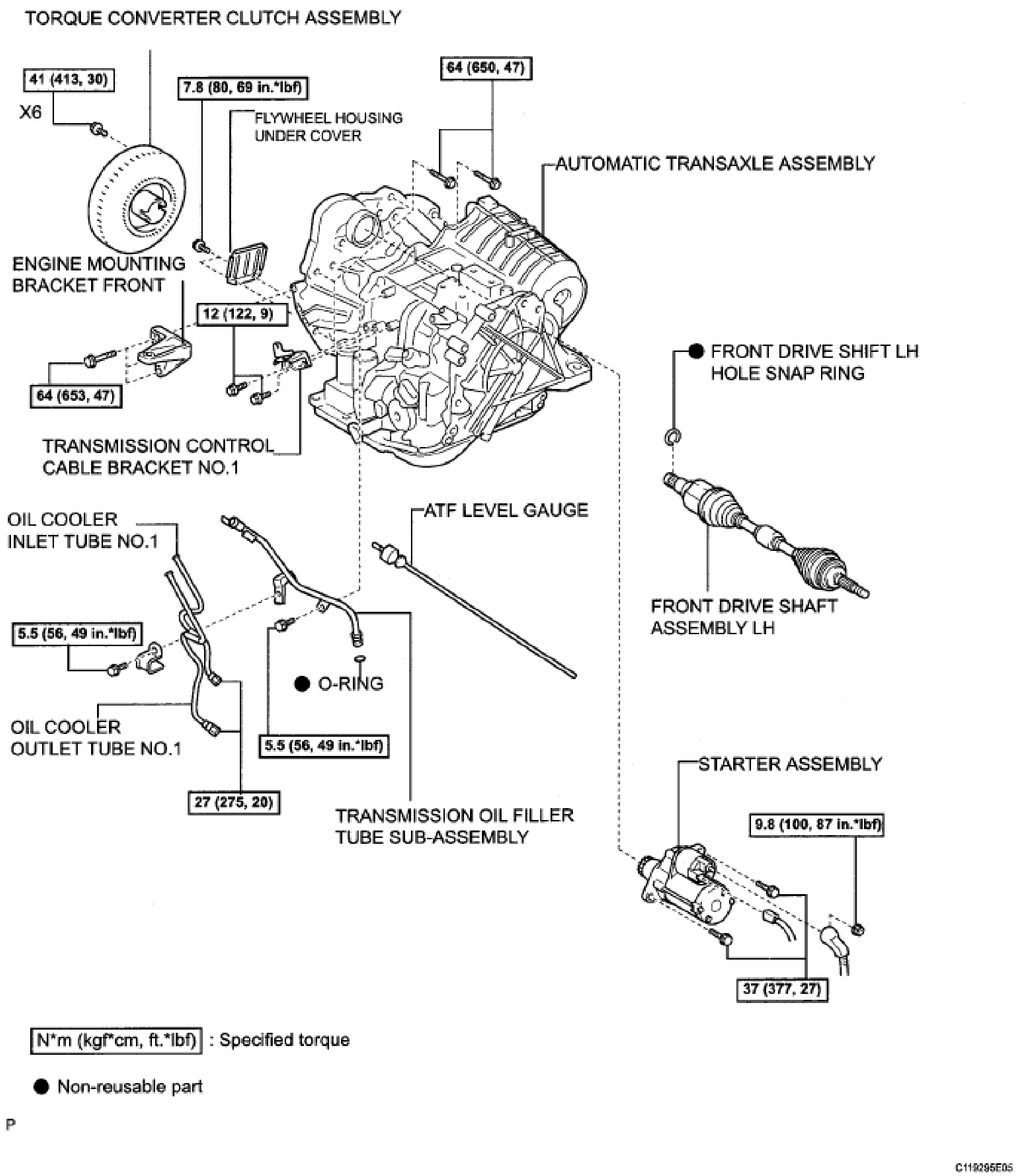

Fig. 195: Identifying Automatic Transaxle Assembly Components With Torque Specifications (2 Of 2)

REMOVAL

1. **REMOVE ENGINE ASSEMBLY WITH TRANSAXLE**

   HINT:

   (See **REMOVAL**)

2. **REMOVE FRONT DRIVE SHAFT ASSEMBLY LH**

HINT:

(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 clamp.

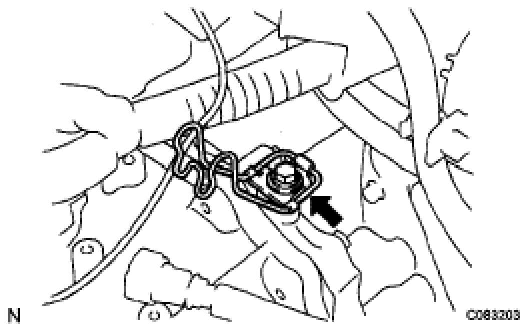

Fig. 196: Locating Transmission Control Cable Clamp Bolt

5. **REMOVE WIRE HARNESS CLAMP**
   a. Disconnect the wire harnesses from the clamp.
   b. Remove the 3 bolts and 2 clamps.

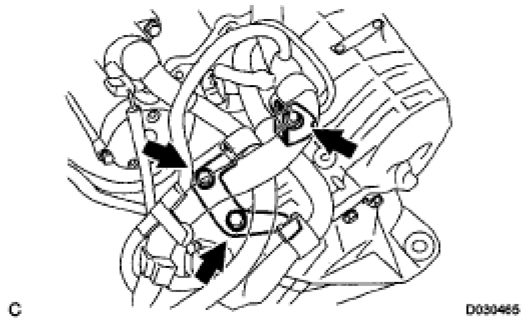

Fig. 197: Locating Wire Harness Clamps Bolts

6. **DISCONNECT WIRE HARNESS**
   a. Remove the bolt and disconnect the wire harness.

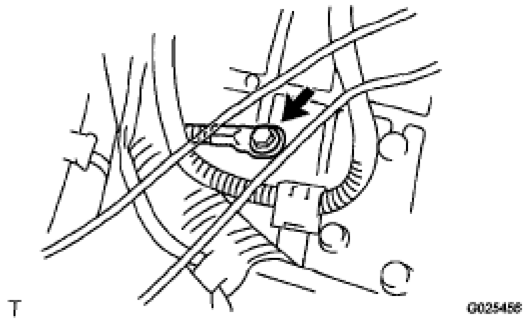

Fig. 198: Locating Wire Harness Bolt

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.

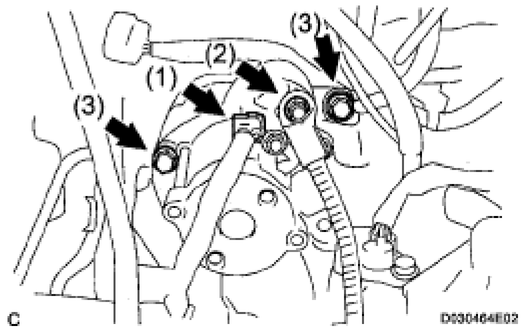

Fig. 199: Locating Starter Assembly Bolts

8. **DISCONNECT CONNECTORS**
    a. Disconnect the transmission wire connector.
    b. Disconnect the park/neutral position switch connector.
    c. Disconnect the 2 speed sensor connectors.

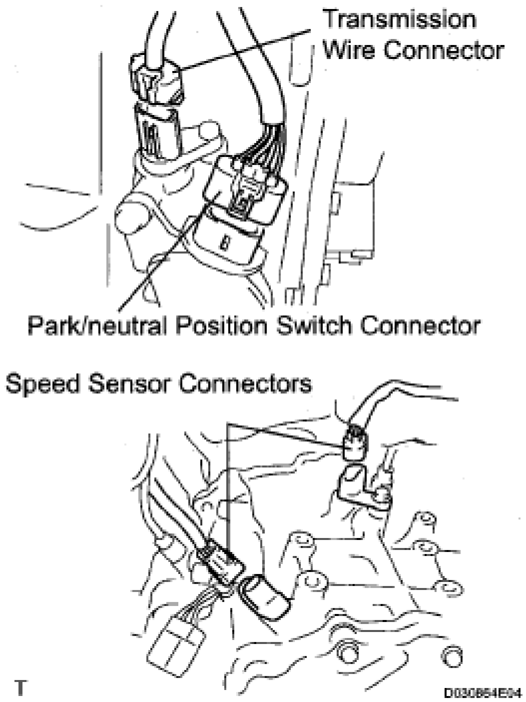

Fig. 200: Identifying Transmission Wire Connector And Speed Sensor Connectors

9. **REMOVE TRANSMISSION CONTROL CABLE BRACKET NO.1**
    a. Remove the bolt and automatic transmission oil cooler tube clamp.
    b. Remove the 2 bolts and transmission control cable bracket No.1.

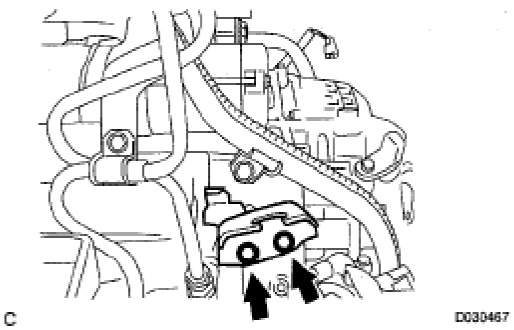

Fig. 201: Locating Transmission Control Cable Bracket Bolts

10. **REMOVE TRANSMISSION OIL FILLER TUBE SUB-ASSEMBLY**
    a. Remove the ATF level gauge.
    b. Disconnect the wire harnesses 2 clamps from the oil filler tube.
    c. Remove the 2 bolts and oil filler tube.
    d. Remove the O-ring from the oil filler tube.

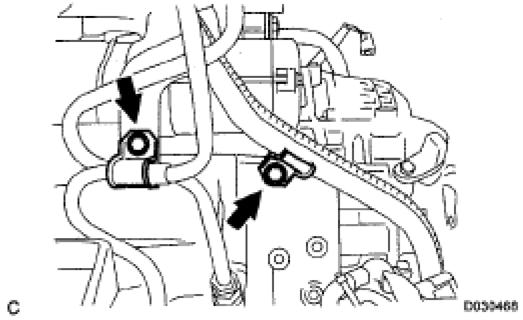

Fig. 202: Locating Oil Filler Tube Clamp Bolts

11. **REMOVE OIL COOLER INLET TUBE NO.1**
    a. Using SST and a wrench, disconnect the oil cooler inlet tube No.1.

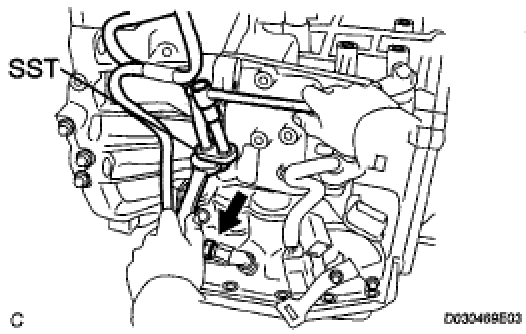

Fig. 203: Removing Oil Cooler Inlet Tube

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

13. **REMOVE ENGINE MOUNTING BRACKET FRONT**
    a. Remove the 3 bolts and engine mounting bracket front.

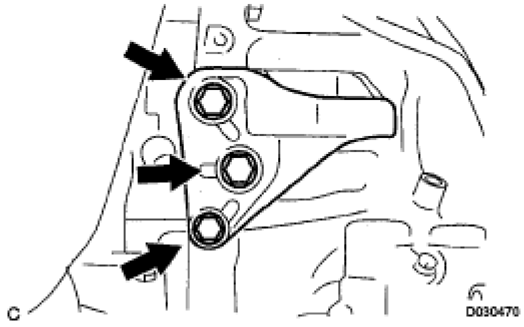

Fig. 204: Locating Engine Mounting Bracket Bolts (Front)

14. **REMOVE TRANSFER STIFFENER PLATE RH**
    a. Remove the 5 bolts and transfer stiffener plate RH.

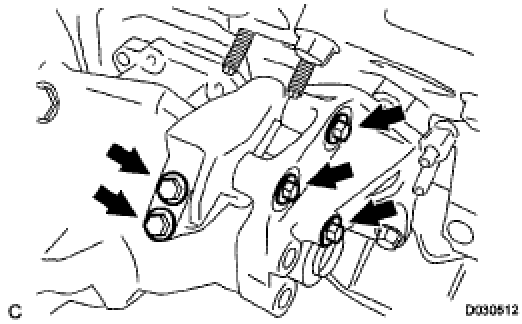

Fig. 205: Locating Transfer Stiffener Plate RH Bolts

15. **REMOVE AUTOMATIC TRANSAXLE W/TRANSFER**
    a. Remove the 2 bolts and flywheel housing under cover.

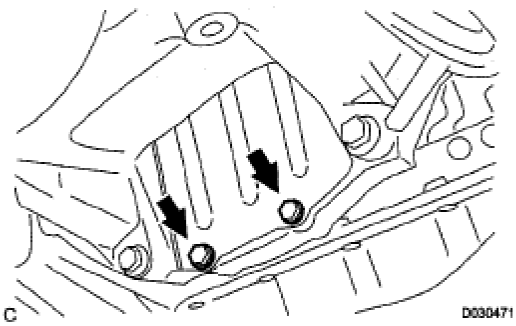

Fig. 206: Locating Flywheel Housing Under Cover Bolts

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.

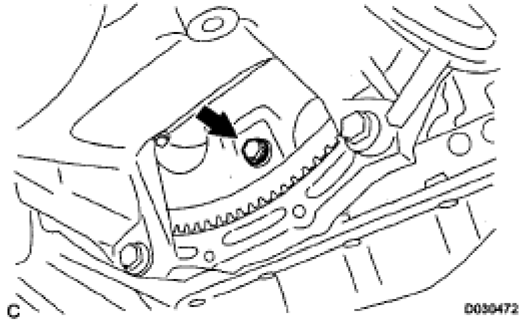

Fig. 207: Locating Torque Converter Clutch Mounting Bolts

c. Remove the 10 bolts.
d. Separate and remove the automatic transaxle w/ transfer.

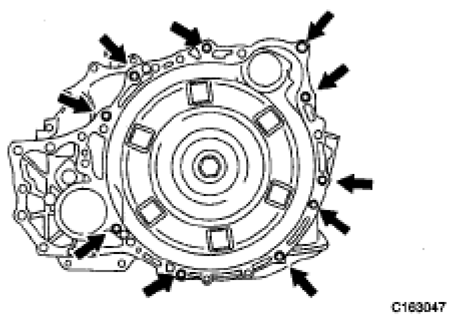

Fig. 208: Locating Automatic Transaxle Assembly Bolts

16. **REMOVE TRANSFER ASSEMBLY**

    HINT:

    (See **REMOVAL**)

17. **REMOVE TORQUE CONVERTER CLUTCH ASSEMBLY**
18. **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.
    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).

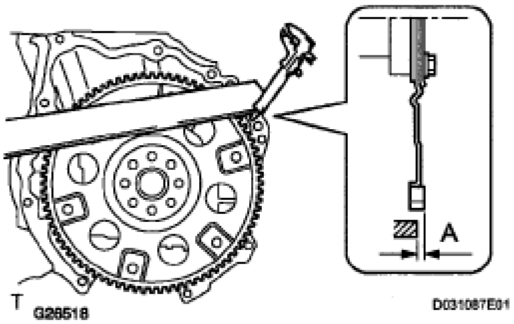

Fig. 209: Measuring Dimension Between Transaxle Fitting Part Of Engine And Converter Fitting Part Of Drive Plate

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 minus the thickness of the straight edge.**

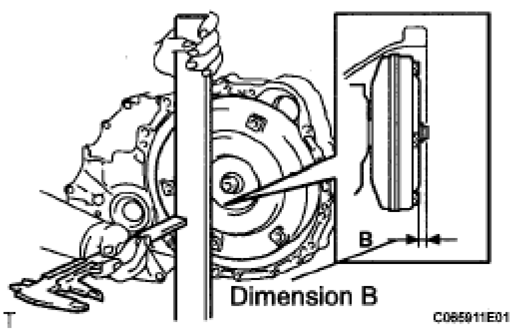

Fig. 210: Measuring Dimension B

2. **INSTALL TRANSFER ASSEMBLY**

   HINT:

   (See **INSTALLATION**)

3. **INSTALL AUTOMATIC TRANSAXLE W/TRANSFER**
   a. Install the automatic transaxle w/transfer with the 10 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

43 N*m (439 kgf*cm, 32 ft.*lbf)

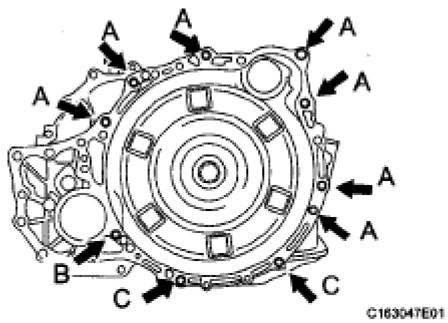

Fig. 211: Locating Automatic Transaxle Assembly Bolts

b. Apply a few drops of adhesive to each of 2 threads on the tip of the 6 torque converter clutch mounting bolts.

Adhesive:

Part No. 08833-00070, THREE BOND 1324 or equivalent

c. Install the 6 torque converter clutch mounting bolts.

Torque: 41 N*m (413 kgf*cm, 30 ft.*lbf)

NOTE: **First install the black colored bolt, and then the remaining 5 bolts.**

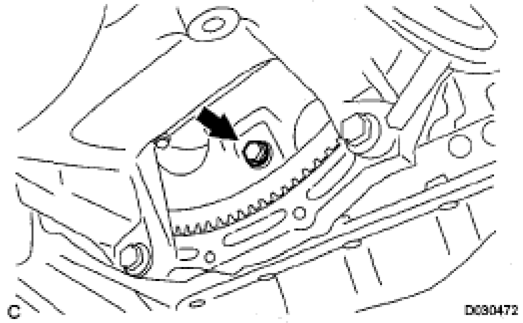

Fig. 212: Locating Torque Converter Clutch Mounting Bolts

d. Install the flywheel housing under cover to the automatic transaxle with the 2 bolt.

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

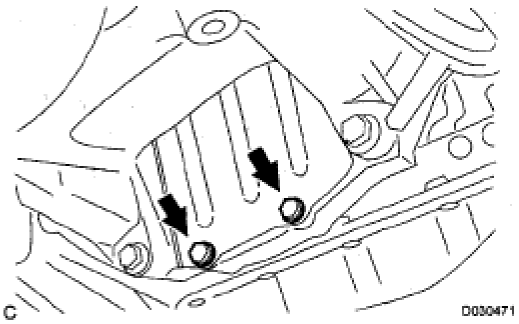

Fig. 213: Locating Flywheel Housing Under Cover Bolts

4. **INSTALL TRANSFER STIFFENER PLATE RH**
   a. Install the transfer stiffener plate RH with 5 bolts to the transfer and engine mounting bracket RR.

   Torque: 34 N*m (350 kgf*cm, 25 ft.*lbf)

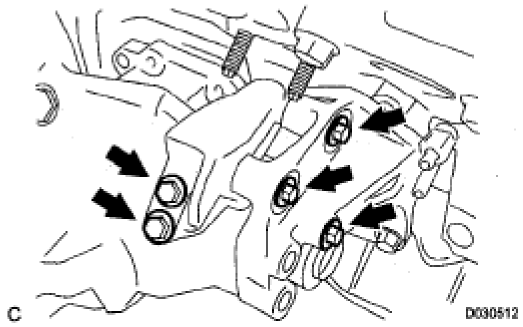

Fig. 214: Locating Transfer Stiffener Plate RH Bolts

5. **INSTALL ENGINE MOUNTING BRACKET FRONT**
   a. Install the engine mounting bracket front to the automatic transaxle with the 3 bolts.

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

6. **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.

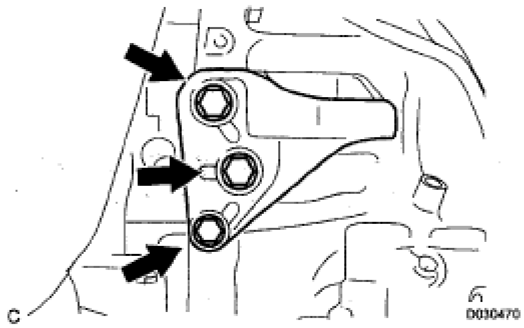

Fig. 215: Locating Engine Mounting Bracket Bolts (Front)

b. Install the transmission oil filler tube sub-assembly and bolt to the automatic transaxle.

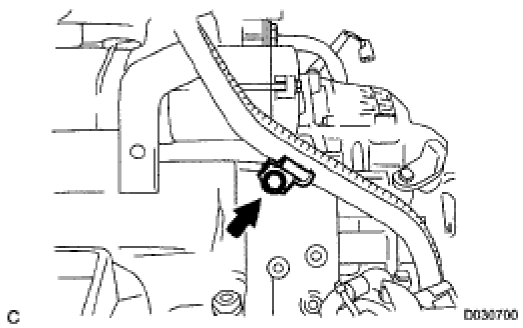

Fig. 216: Locating Transmission Oil Filler Tube Clamp Bolt

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

c. Connect the 2 clamps to the oil filler tube.
d. Install the ATF level gauge.

7. **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.
   c. Install the oil cooler tube clamp and bolt.

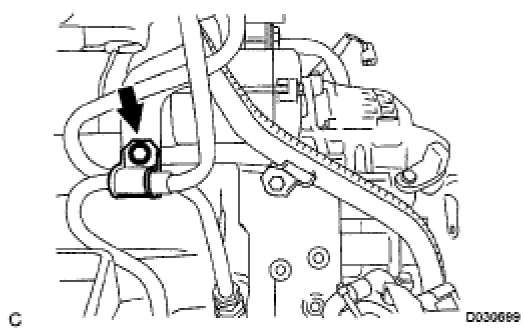

Fig. 217: Locating Oil Cooler Tube Clamp Bolt

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

d. Using SST and a wrench, tighten the oil cooler inlet tube No.1.

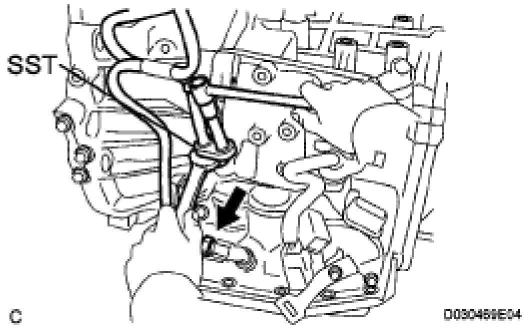

Fig. 218: Tightening Oil Cooler Inlet Tube

SST 09023-12701

Torque: 34 N*m (347 kgf*cm, 25 ft.*lbf)

8. **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)

9. **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)

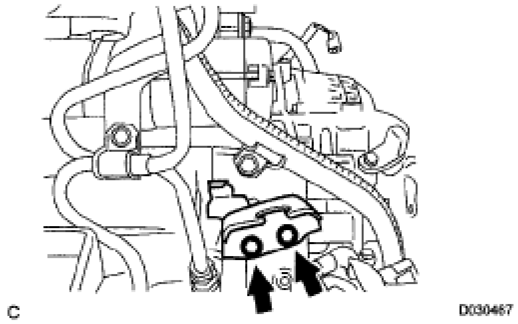

Fig. 219: Locating Control Cable Bracket Bolts

10. **CONNECT CONNECTORS**
    a. Connect the transmission wire connector.

b. Connect the park/neutral position switch connector.
c. Connect the 2 speed sensor connectors.

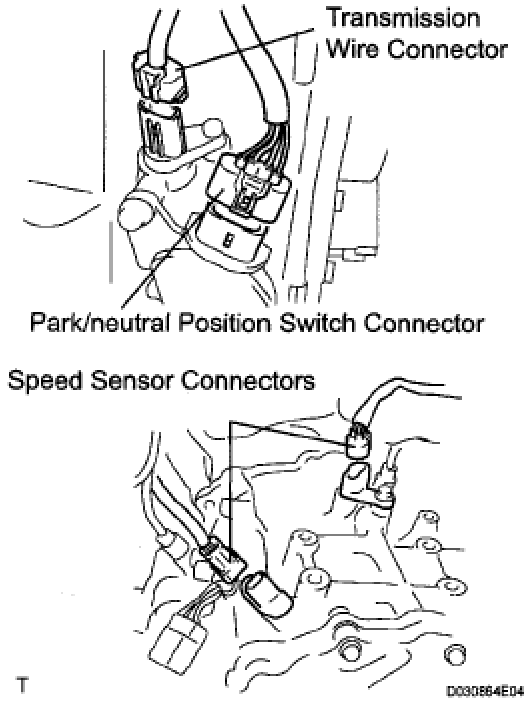

Fig. 220: Identifying Transmission Wire Connector And Speed Sensor Connectors

11. **INSTALL STARTER ASSEMBLY**
    a. Install the starter assembly with the 2 bolts (1).

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

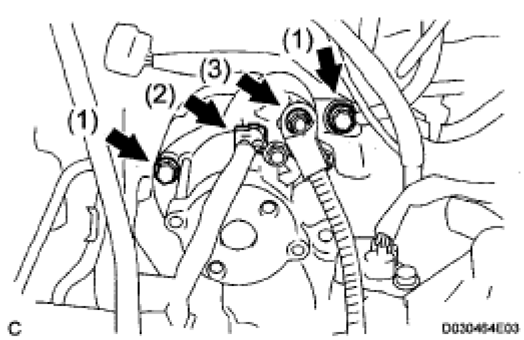

Fig. 221: Locating Starter Assembly Bolts

12. **CONNECT WIRE HARNESS**
    a. Connect the wire harness with the bolt.

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

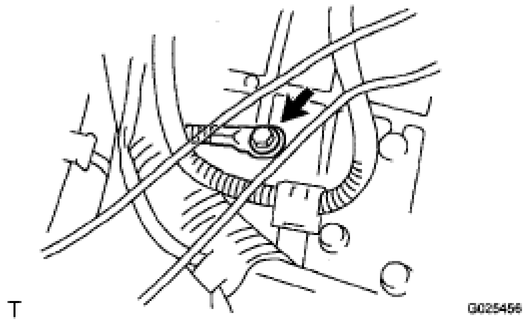

Fig. 222: Locating Wire Harness Bolt

13. **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 clamps.

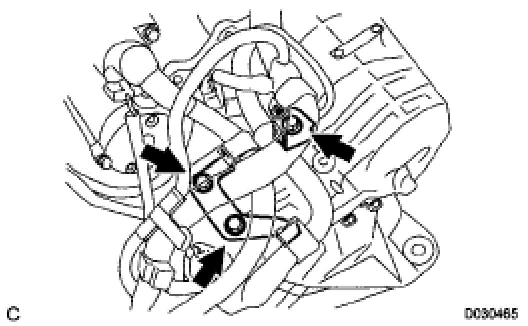

Fig. 223: Locating Wire Harness Clamps Bolts

14. **INSTALL TRANSMISSION CONTROL CABLE CLAMP**
    a. Install the transmission control cable clamp with the bolt.

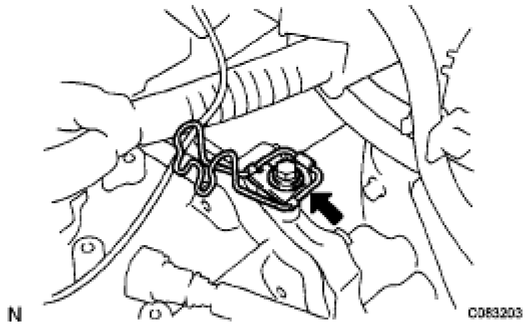

Fig. 224: Locating Transmission Control Cable Clamp Bolt

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

15. **INSTALL FRONT DRIVE SHAFT ASSEMBLY LH**

    HINT:

    (See **INSTALLATION**)

16. **INSTALL FRONT DRIVE SHAFT ASSEMBLY RH**

    HINT:

    (See **INSTALLATION**)

17. **INSTALL ENGINE ASSEMBLY WITH TRANSAXLE**

    HINT:

    (See **INSTALLATION**)

18. **RESET MEMORY**

    HINT:

    (See **INITIALIZATION**)

TORQUE CONVERTER CLUTCH AND DRIVE PLATE

INSPECTION

1. **INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY**

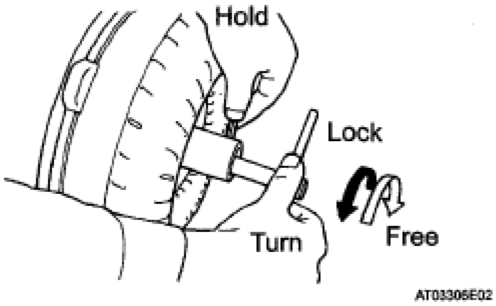

Fig. 225: Inspecting Torque Converter Clutch Assembly

a. Inspect the one-way clutch.
    1. Set SST into the inner race of the one-way clutch.

       SST 09350-32014 (09351 -32010)

    2. Install SST so that it fits in the notch of the converter hub and outer race of the one-way clutch.

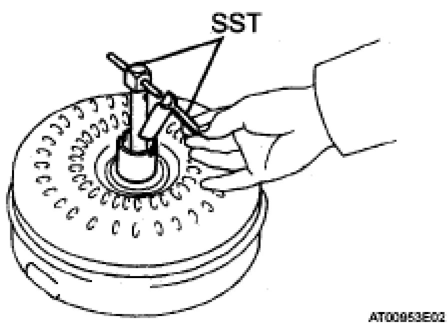

Fig. 226: Setting SST Into Inner Race Of One-Way Clutch

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.

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 sample).

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.

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.

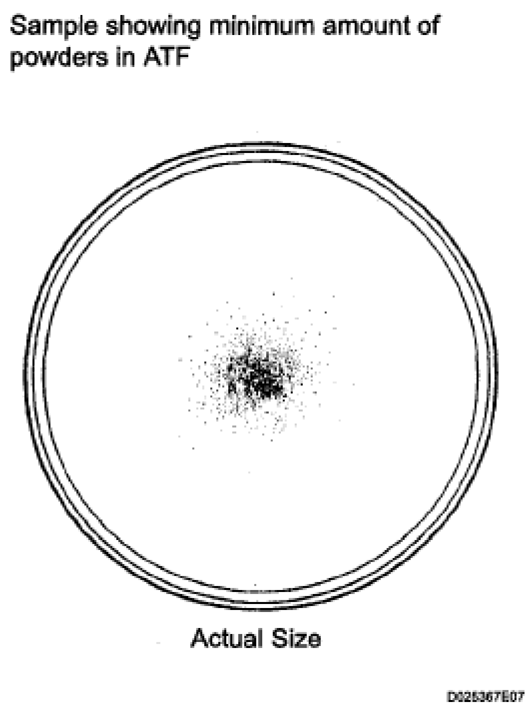

Fig. 227: Identifying Minimum Amount Of Powders In ATF

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/cm 2, 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.

2. If the ATF is cloudy, inspect the oil cooler (radiator).

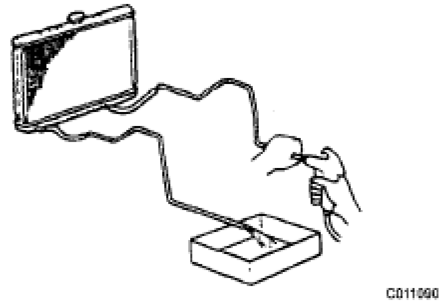

Fig. 228: Checking Oil Pipe Line

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.

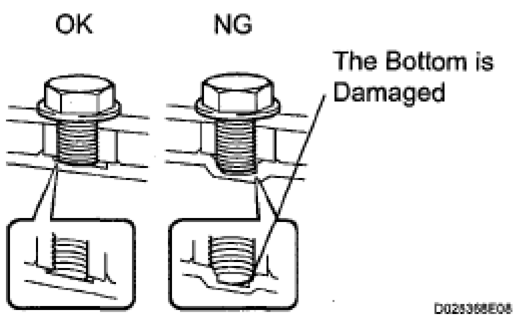

Fig. 229: Identifying Proper Installation Of Bolts

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.

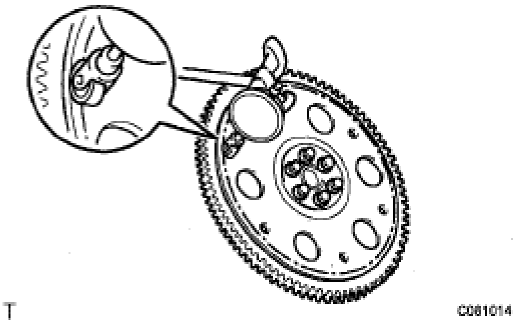

Fig. 230: Measuring Drive Plate Runout

AUTOMATIC TRANSAXLE UNIT

COMPONENTS

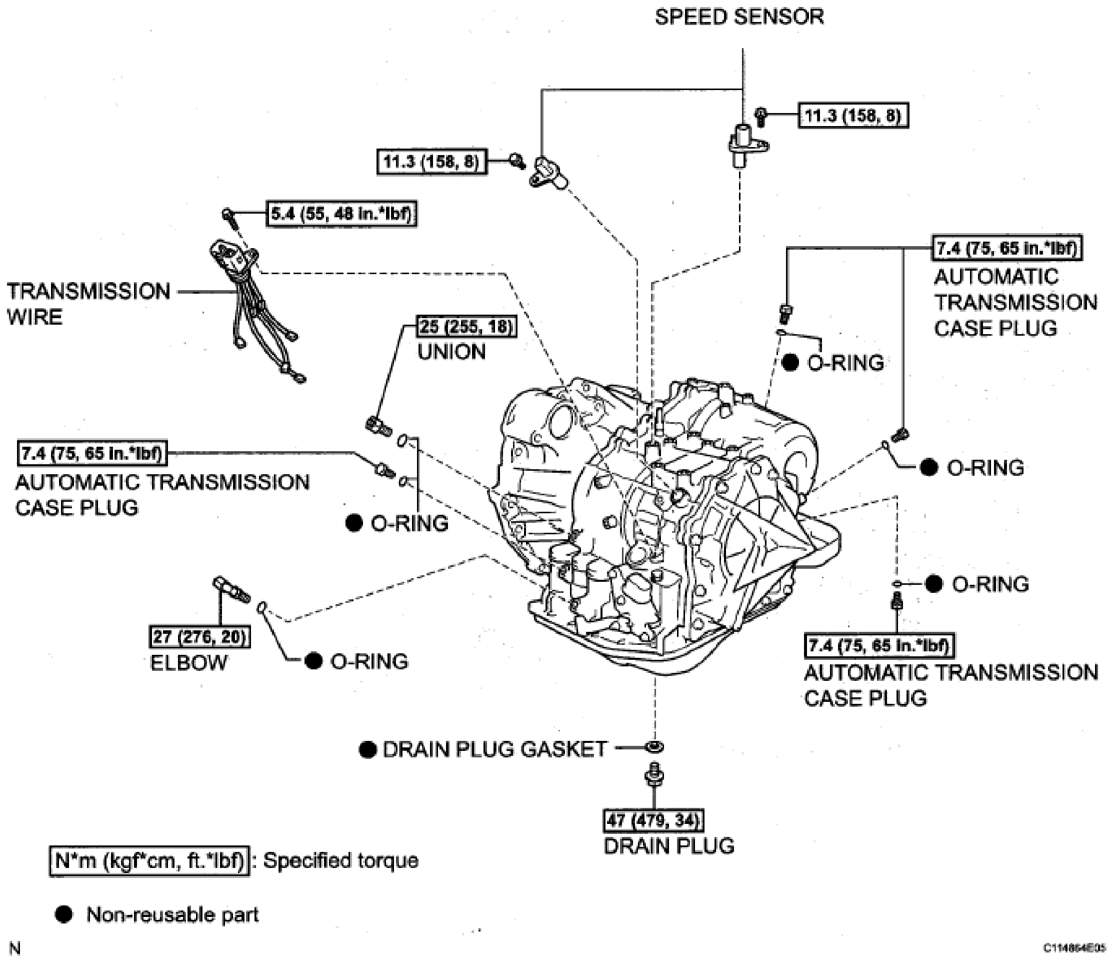

Fig. 231: Identifying Automatic Transaxle Unit Components With Torque Specifications (1 Of 7)

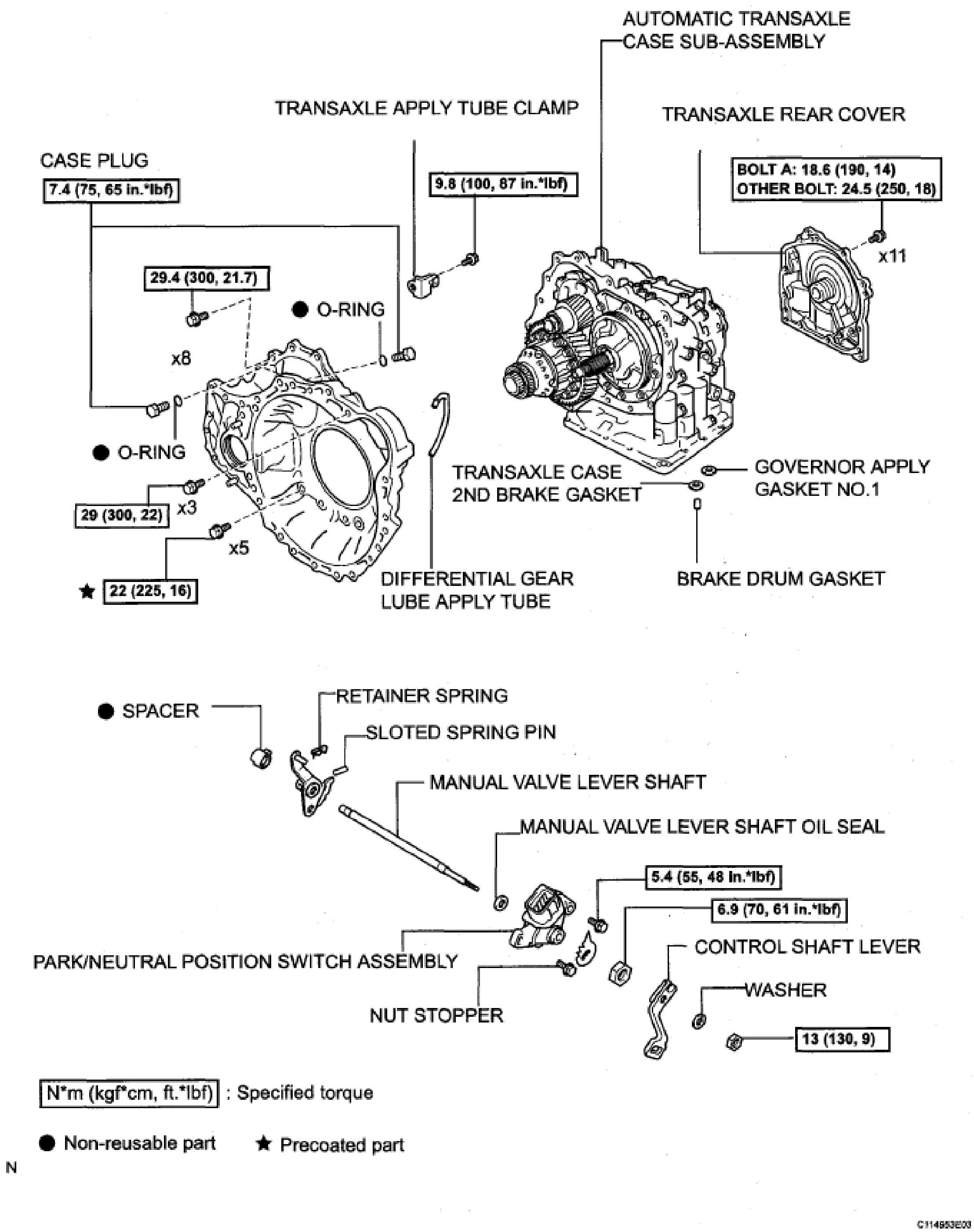

Fig. 232: Identifying Automatic Transaxle Unit Components With Torque Specifications (2 Of 7)

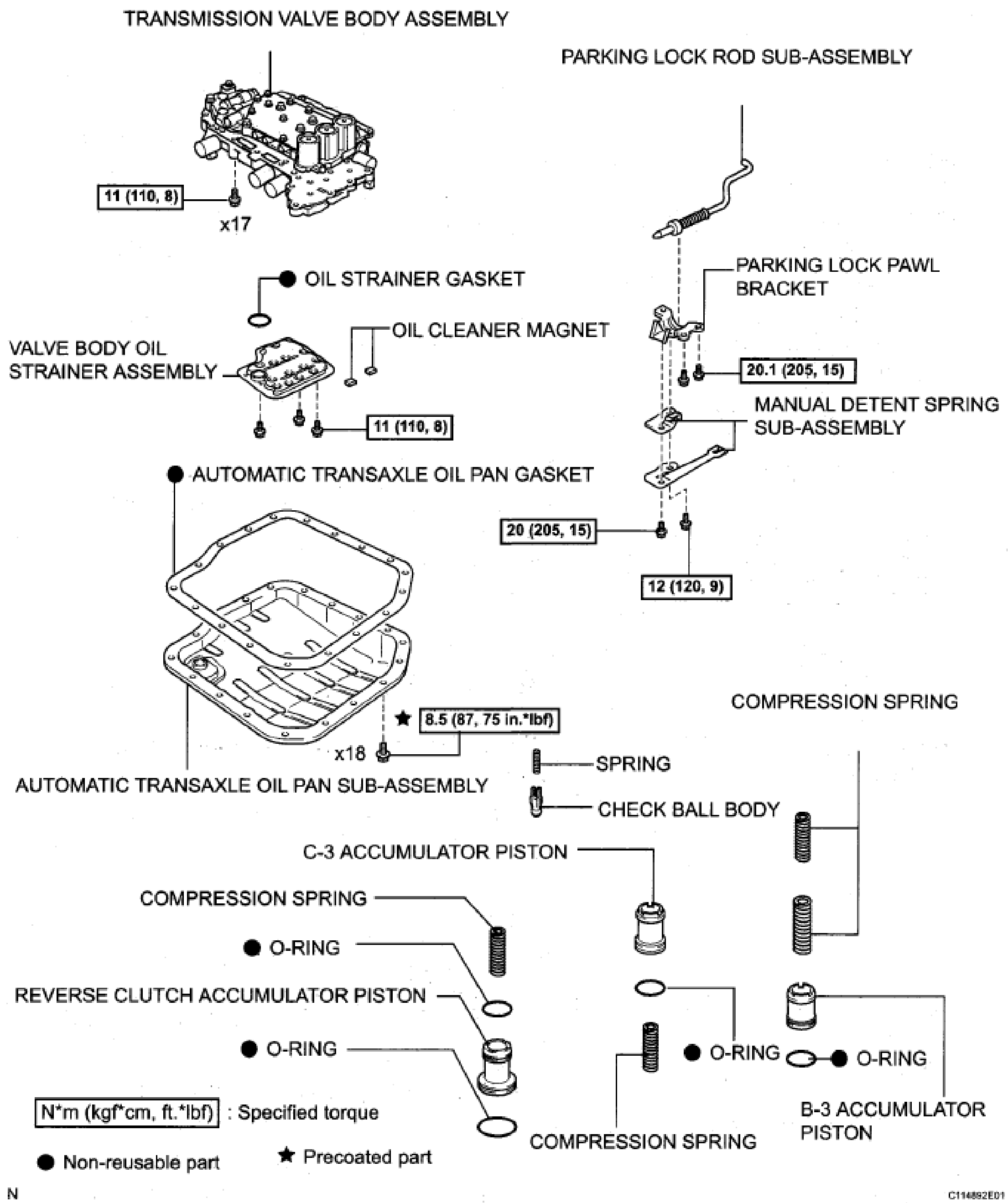

Fig. 233: Identifying Automatic Transaxle Unit Components With Torque Specifications (3 Of 7)

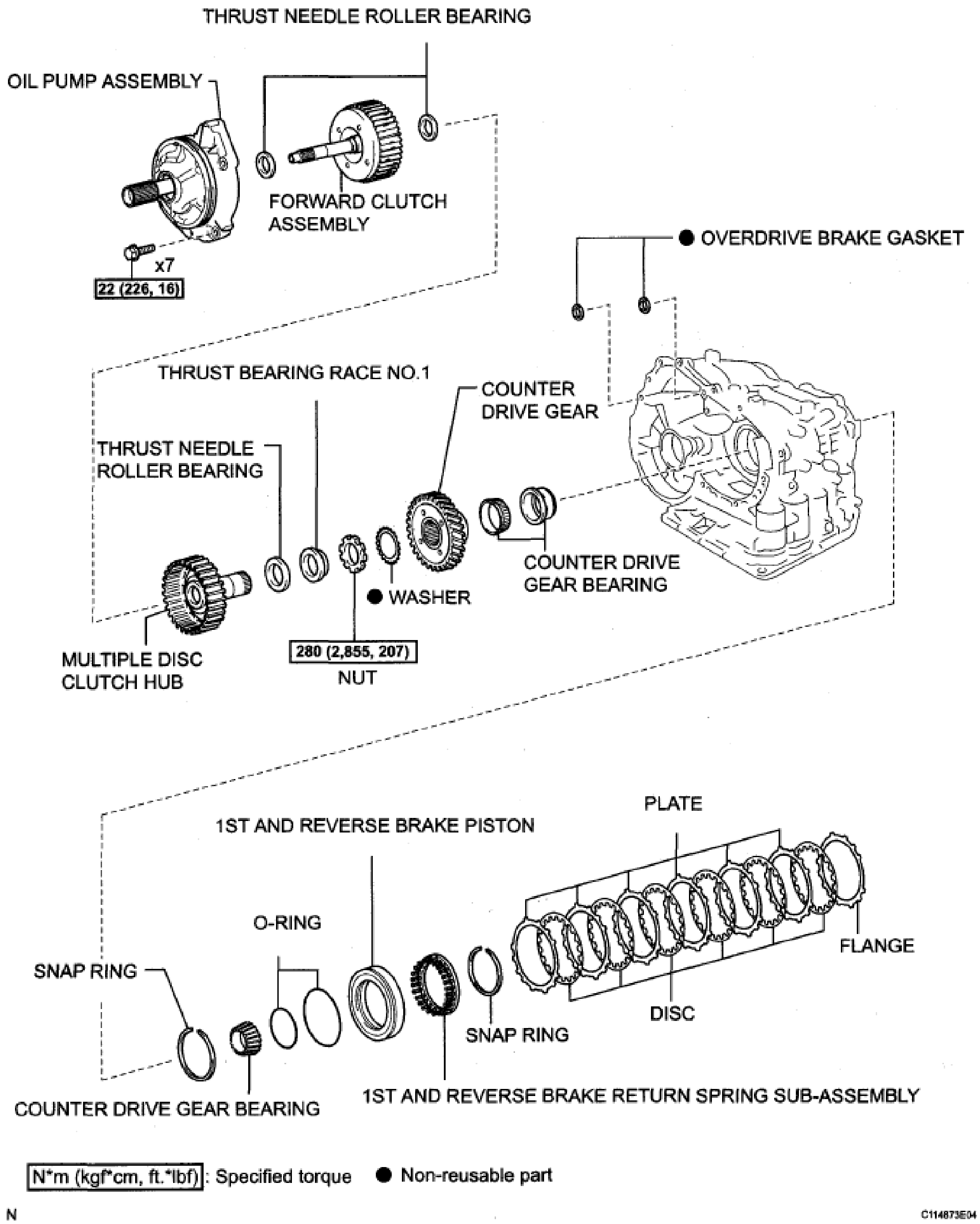

Fig. 234: Identifying Automatic Transaxle Unit Components With Torque Specifications (4 Of 7)

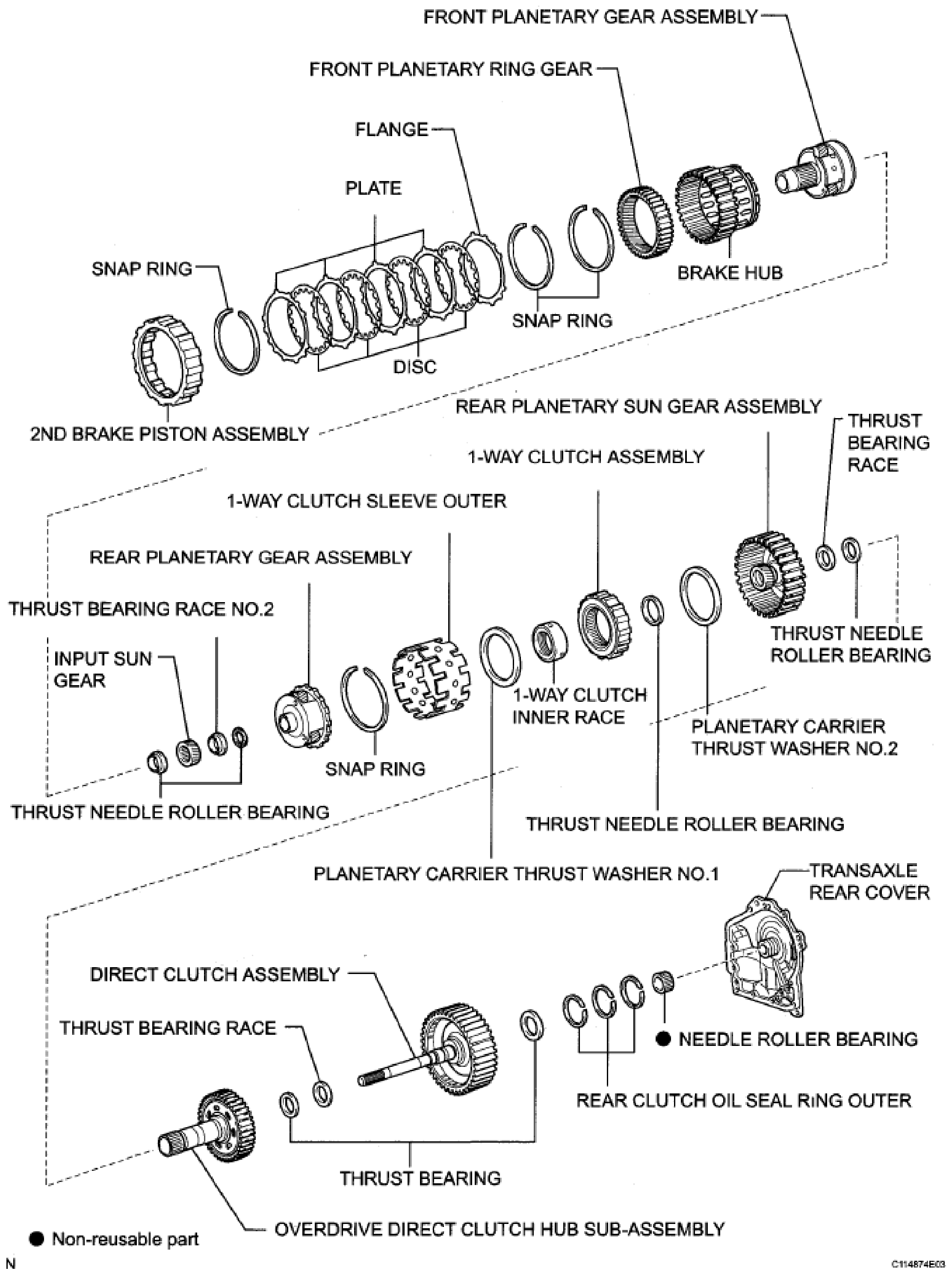

Fig. 235: Identifying Automatic Transaxle Unit Components (5 Of 7)

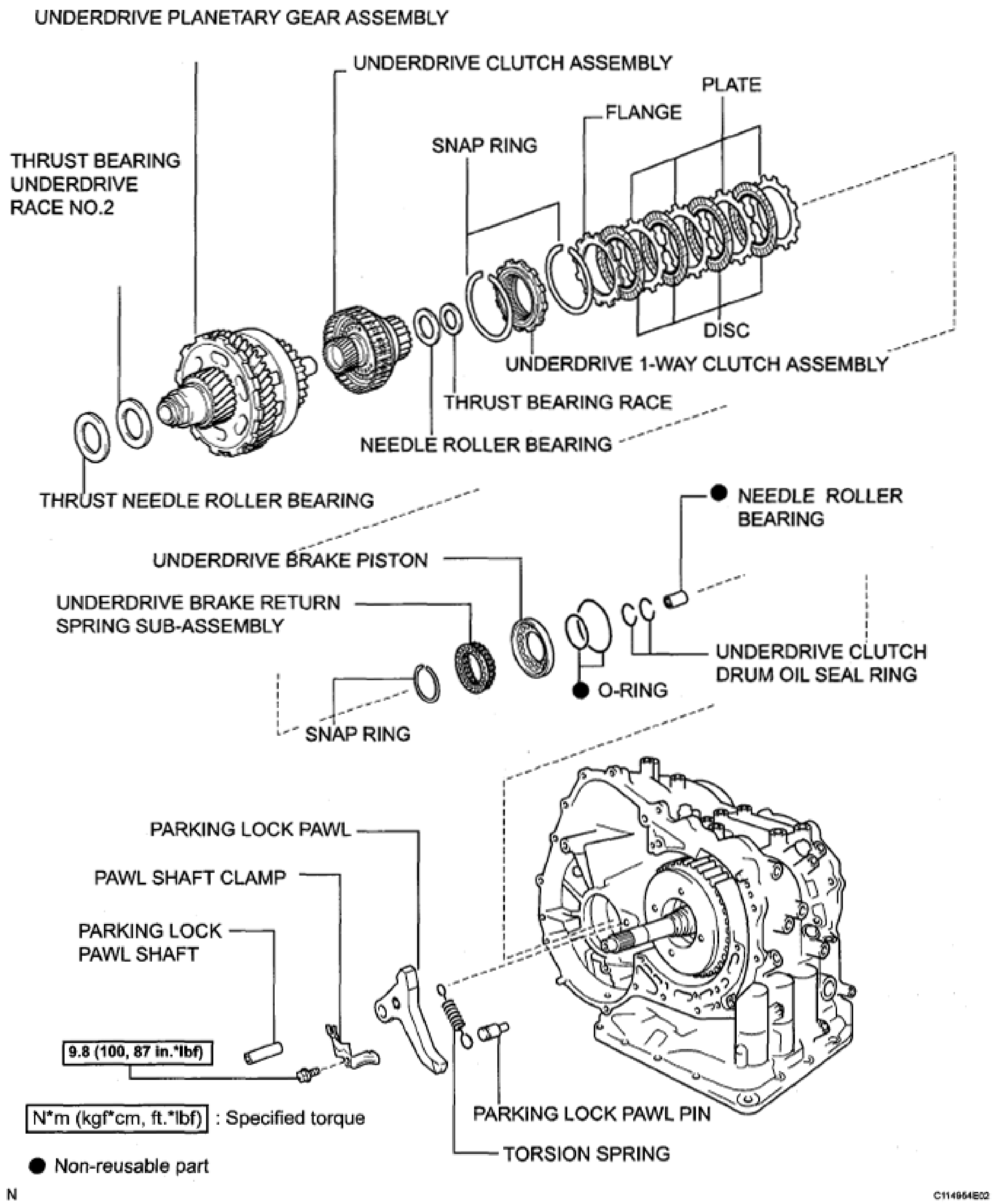

Fig. 236: Identifying Automatic Transaxle Unit Components With Torque Specification (6 Of 7)

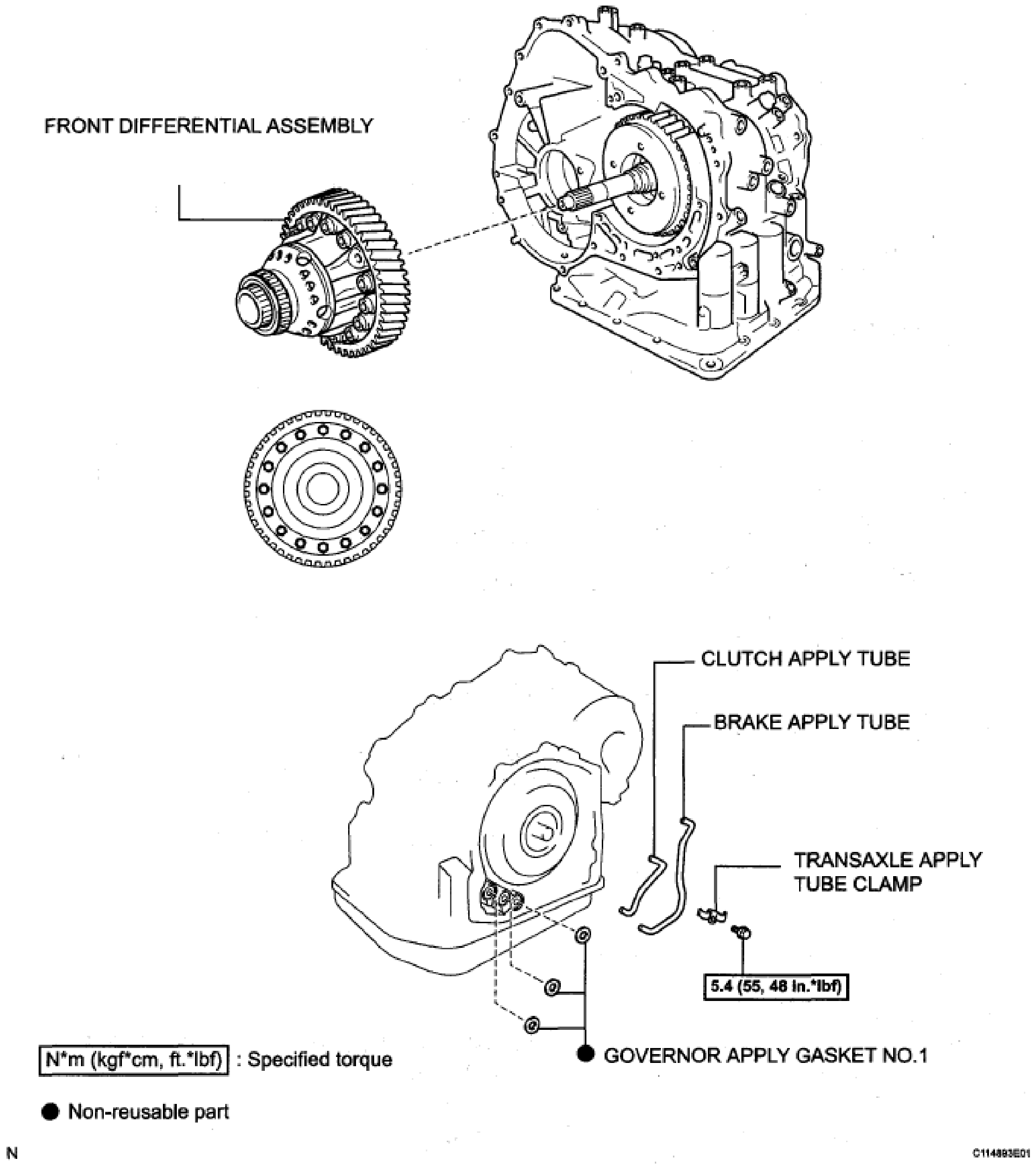

Fig. 237: Identifying Automatic Transaxle Unit Components With Torque Specification (7 Of 7)

DISASSEMBLY

1. **REMOVE PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
   a. Remove the nut, washer and control shaft lever.

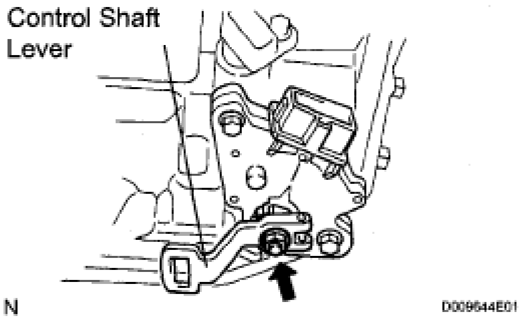

Fig. 238: Locating Control Shaft Lever Nut

b. Using a screwdriver, unstake the nut stopper, and remove the lock nut and nut stopper.

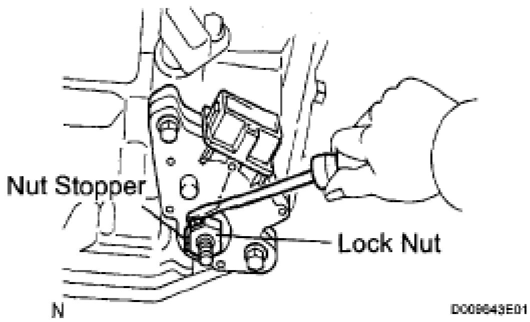

Fig. 239: Unstaking Nut Stopper Using Screwdriver

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

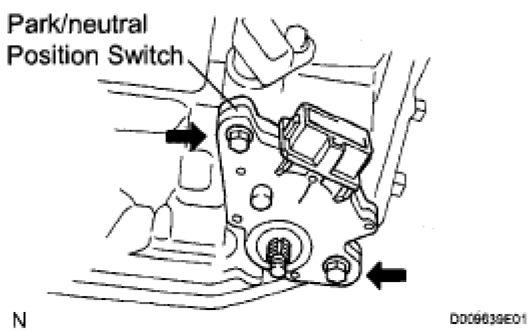

Fig. 240: Locating Park/Neutral Position Switch Bolts

2. **REMOVE BREATHER PLUG HOSE**
   a. Remove the breather plug hose from the transaxle case.
3. **REMOVE OIL COOLER TUBE UNION (INLET OIL COOLER UNION)**
   a. Remove the union.
   b. Remove the O-ring from the union.

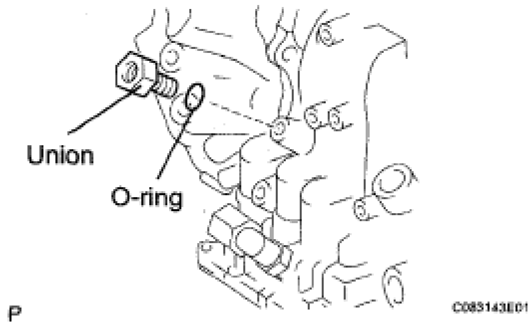

Fig. 241: Removing Oil Cooler Tube Union (Inlet Oil Cooler Union)

4. **REMOVE OIL COOLER TUBE UNION (OUTLET OIL COOLER UNION)**
   a. Remove the elbow.
   b. Remove the O-ring from the elbow.

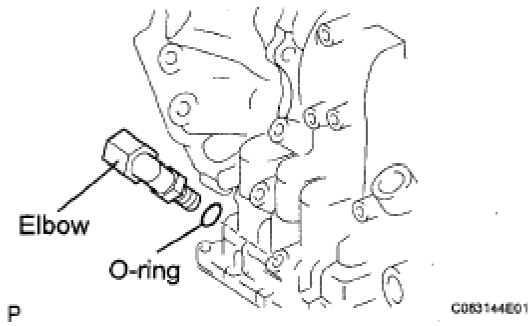

Fig. 242: Removing Elbow

5. **REMOVE SPEED SENSOR**
   a. Remove the 2 bolts and the 2 speed sensors from the transaxle assembly.

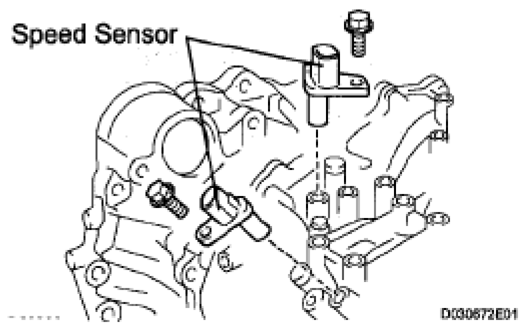

Fig. 243: Removing Speed Sensors

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.

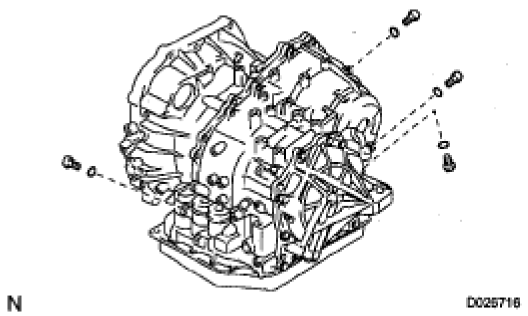

Fig. 244: Removing Transaxle Case Plugs

7. **FIX AUTOMATIC TRANSAXLE ASSEMBLY**
   a. Fix the transaxle assembly.

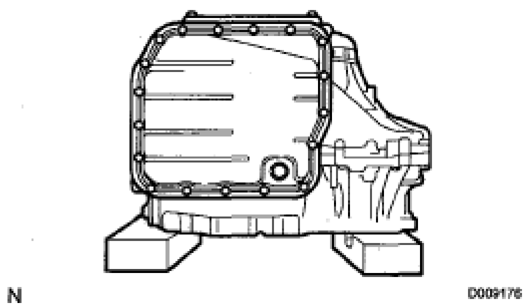

Fig. 245: Fixing Automatic Transaxle Assembly

8. **REMOVE AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY**
   a. Remove the 18 bolts, oil pan and gasket.

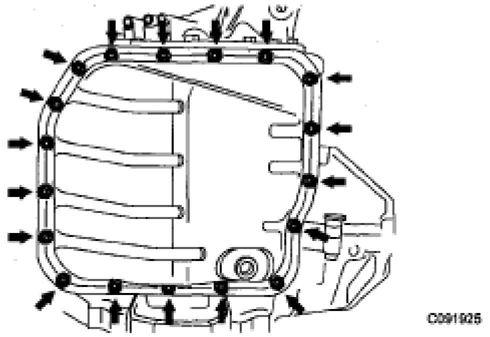

Fig. 246: Locating Oil Pan Assembly Bolts

   b. Remove the 2 magnets from the oil pan.

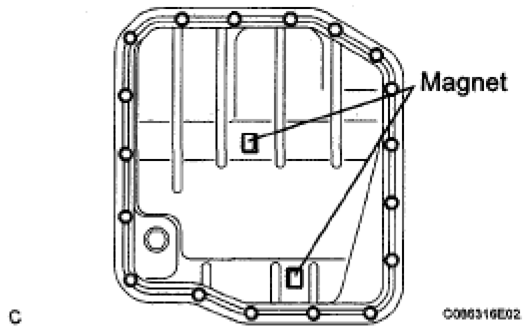

Fig. 247: Identifying Magnets

9. **INSPECT TRANSMISSION OIL CLEANER MAGNET**
   a. Remove the magnets and use them to collect any steel chips. Examine the chips and particles in the pan and on the magnet to determine what type of wear has occurred in the transaxle:

      Result:

      Steel (magnetic):

      Wear of the bearing, gear and plate

      Brass (non-magnetic):

      Wear of the bushing

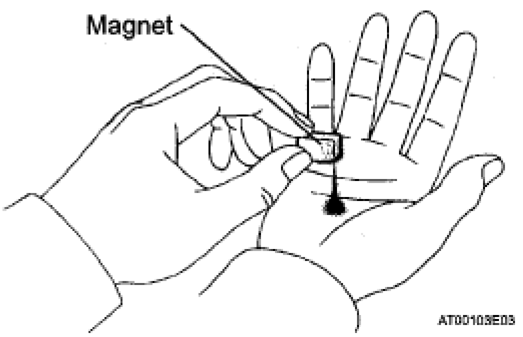

Fig. 248: Collecting Steel Chips Using Magnet

10. **DISCONNECT TRANSMISSION WIRE**
    a. Remove the 7 connectors from the shift solenoid valves.
    b. Remove the bolt, lock plate and temperature sensor.

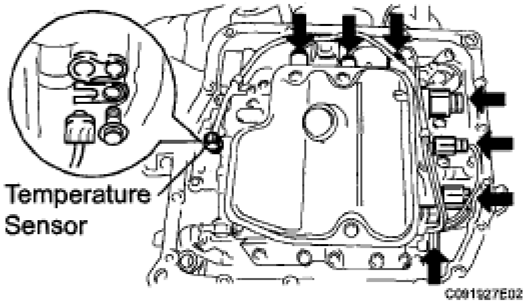

Fig. 249: Locating Shift Solenoid Valves Connectors

11. **REMOVE TRANSMISSION WIRE**
    a. Remove the bolt and transmission wire from the transaxle case.

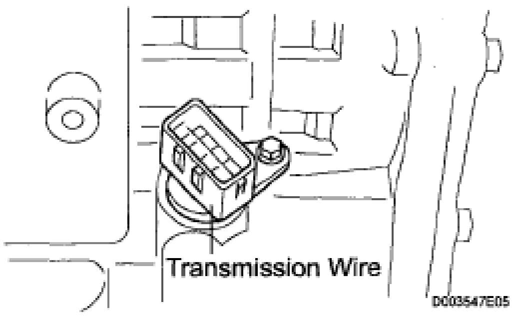

Fig. 250: Identifying Transmission Wire

12. **REMOVE VALVE BODY OIL STRAINER ASSEMBLY**
    a. Remove the 3 bolts and oil strainer.

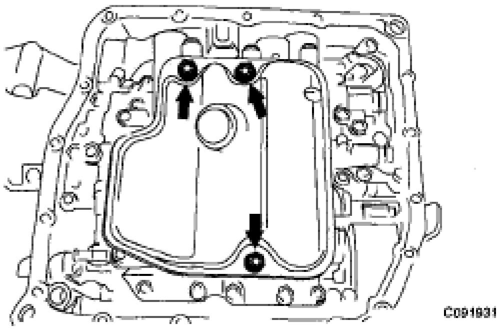

Fig. 251: Locating Oil Strainer Bolts

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

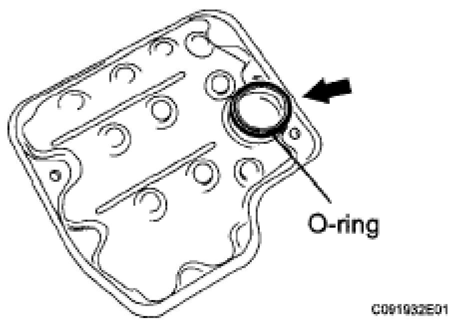

Fig. 252: Locating Valve Body Oil Strainer O-Ring

13. **REMOVE TRANSMISSION VALVE BODY ASSEMBLY**
    a. Support the valve body assembly and remove the 17 bolts and valve body assembly.

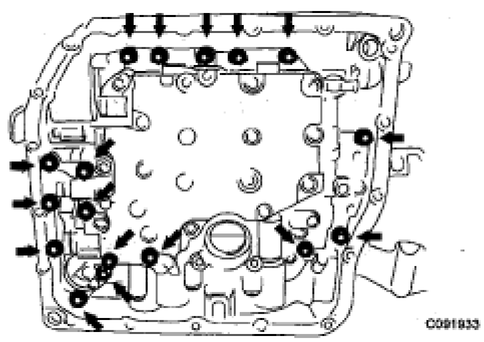

Fig. 253: Locating Valve Body Assembly Bolts

14. **REMOVE GOVERNOR APPLY GASKET NO.1**
    a. Remove the governor apply gasket No.1 from the transaxle case.

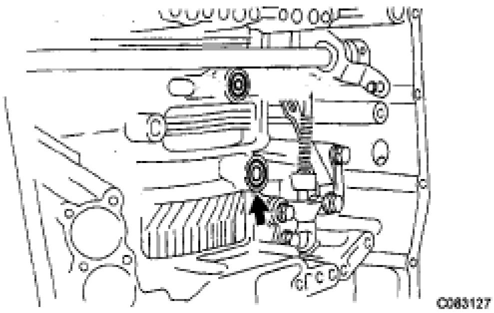

Fig. 254: Locating Governor Apply Gasket

15. **REMOVE TRANSAXLE CASE 2ND BRAKE GASKET**
    a. Remove the transaxle case 2nd brake gasket from the transaxle case.

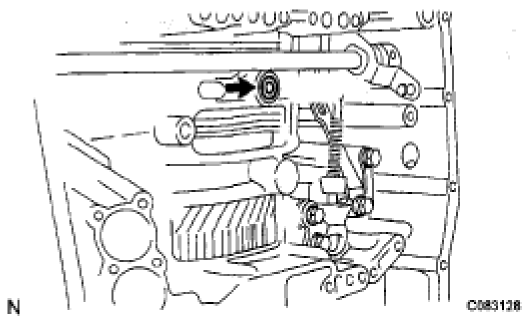

Fig. 255: Locating Transaxle Case 2nd Brake Gasket

16. **REMOVE BRAKE DRUM GASKET**
    a. Remove the brake drum gasket from the transaxle case.

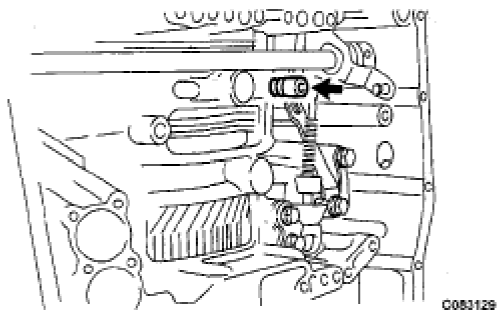

Fig. 256: Locating Brake Drum Gasket

17. **REMOVE CHECK BALL BODY**
    a. Remove the check ball body and spring from the transaxle case.

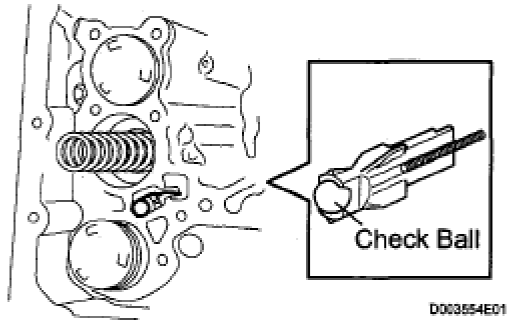

Fig. 257: Identifying Check Ball Body And Spring

18. **REMOVE C-3 ACCUMULATOR PISTON**
    a. Remove the spring from the C-3 accumulator piston.

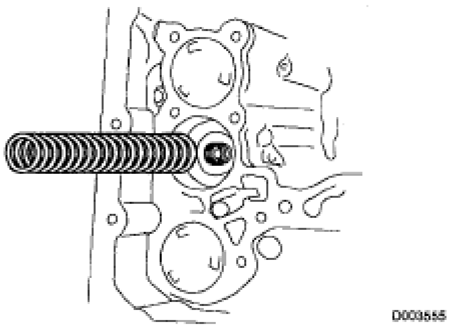

Fig. 258: Identifying C-3 Accumulator Piston Spring

b. Apply compressed air (392 kPa, 4.0 kgf/cm^2 , 57 psi) to the oil hole and remove the C-3 accumulator piston.

NOTE:

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

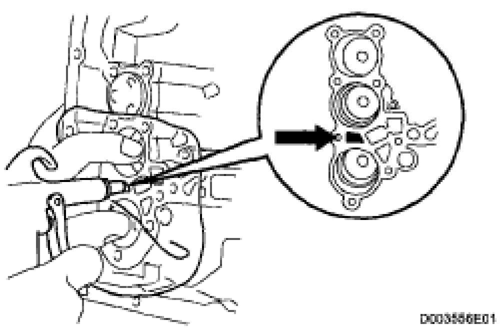

Fig. 259: Removing C-3 Accumulator Piston

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

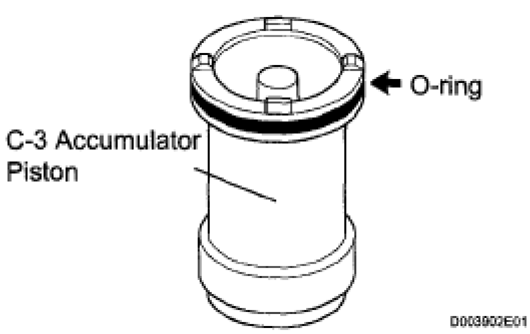

Fig. 260: Locating C-3 Accumulator Piston O-Ring

19. **REMOVE REVERSE CLUTCH ACCUMULATOR PISTON**

a. Apply compressed air (392 kPa, 4.0 kgf/cm^2 , 57 psi) to the oil hole and remove the reverse accumulator piston and spring.

NOTE:

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

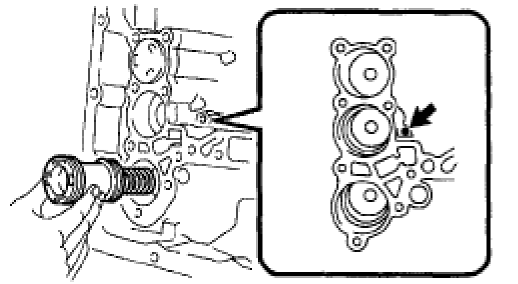

Fig. 261: Removing Reverse Clutch Accumulator Piston

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

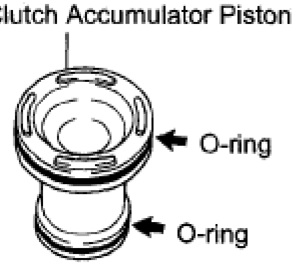

Fig. 262: Locating Reverse Clutch Accumulator Piston O-Rings

20. **REMOVE B-3 ACCUMULATOR PISTON**

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

NOTE:

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

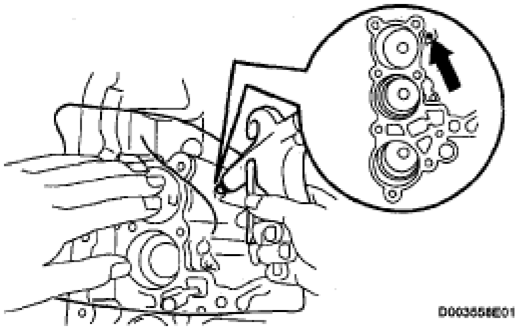

Fig. 263: Removing B-3 Accumulator Piston

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

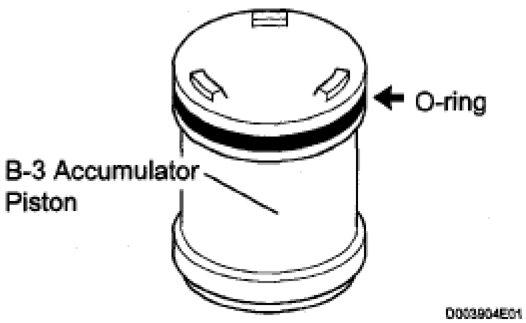

Fig. 264: Locating B-3 Accumulator Piston O-Ring

21. **REMOVE MANUAL VALVE LEVER SHAFT RETAINER SPRING**
    a. Using needle-nose pliers, remove the manual valve lever shaft retainer spring.

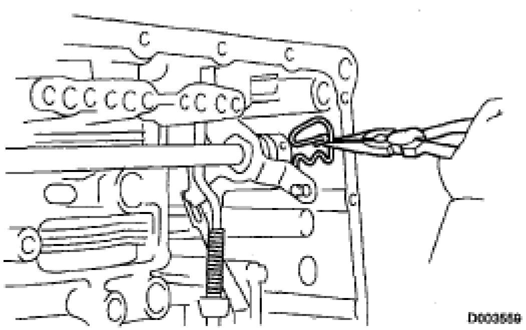

Fig. 265: Removing Manual Valve Lever Shaft Retainer Spring

22. **REMOVE MANUAL DETENT SPRING SUB-ASSEMBLY**
    a. Remove the 2 bolts, the manual detent spring sub-assembly and cover.

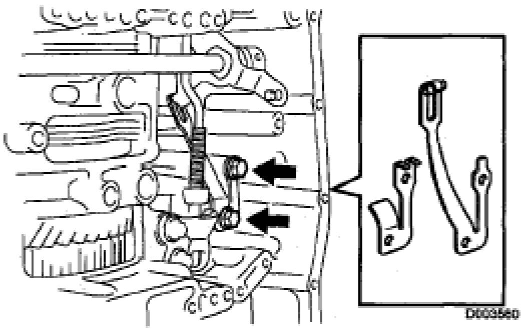

Fig. 266: Locating Manual Detent Spring Sub-Assembly Bolts

23. **REMOVE PARKING LOCK PAWL BRACKET**
    a. Remove the 2 bolts and parking lock pawl bracket.

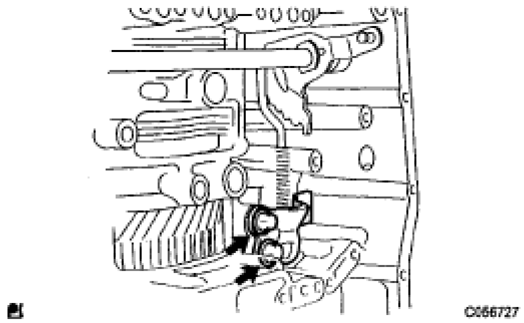

Fig. 267: Locating Parking Lock Pawl Bracket Bolts

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

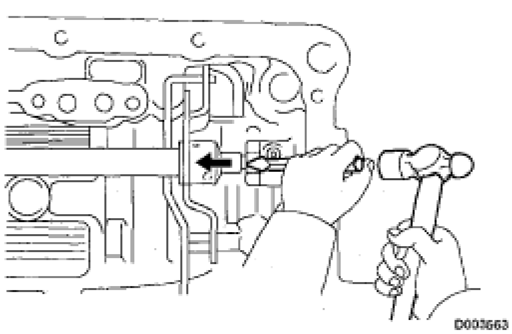

Fig. 268: Removing Spacer

b. Using a pin punch (ø35 mm) and hammer, drive out the pin.

HINT:

Slowly drive out the pin so that it will not fall into the transaxle case.

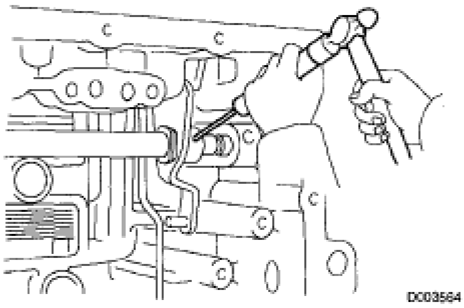

Fig. 269: Driving Out Pin

c. Remove the manual valve lever shaft and manual valve lever.

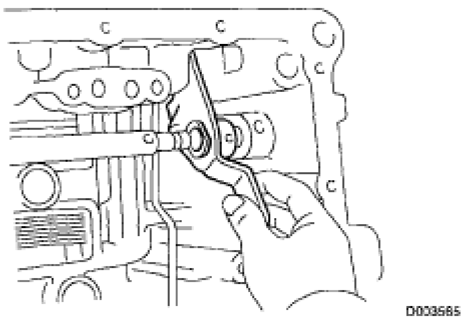

Fig. 270: Removing Manual Valve Lever Shaft And Manual Valve Lever

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

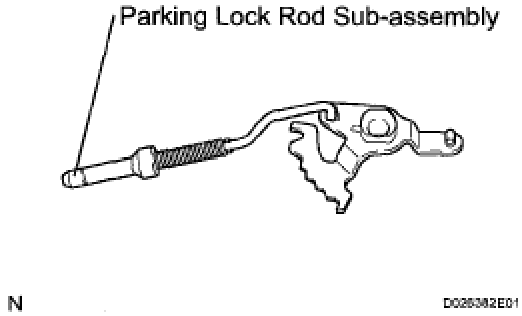

Fig. 271: Identifying Parking Lock Rod Sub-Assembly

26. **REMOVE MANUAL VALVE LEVER SHAFT OIL SEAL**
    a. Using a screwdriver, remove the oil seal from the transaxle case.

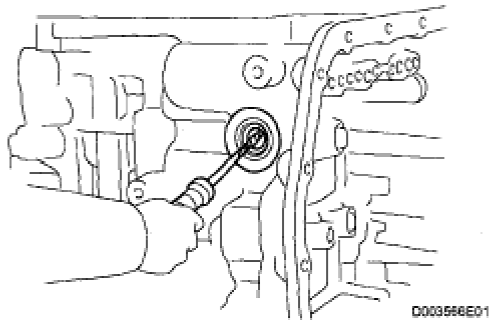

Fig. 272: Removing Manual Valve Lever Shaft Oil Seal

NOTE: Do not apply excessive force when removing the oil seal.

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**)

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

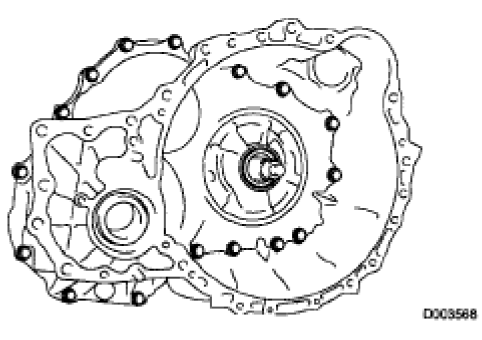

Fig. 273: Identifying Transaxle Housing Bolts

30. **REMOVE OIL PUMP ASSEMBLY**
    a. Remove the 7 bolts and oil pump from the transaxle case.

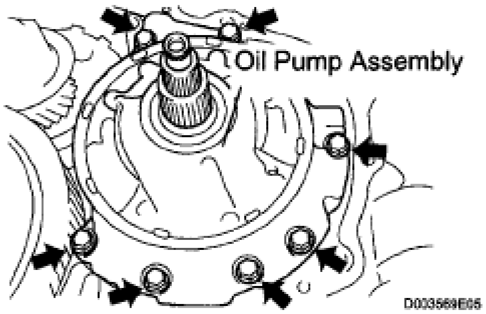

Fig. 274: Locating Oil Pump Assembly Bolts

31. **REMOVE THRUST NEEDLE ROLLER BEARING**
    a. Remove the thrust needle roller bearing from the underdrive planetary gear assembly.

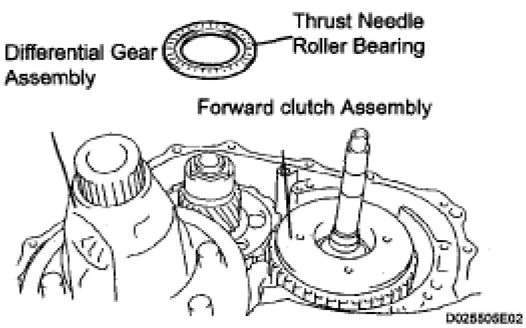

Fig. 275: Identifying Thrust Needle Roller Bearing And Differential Gear Assembly

32. **REMOVE THRUST BEARING UNDERDRIVE RACE NO.2**
    a. Remove the thrust bearing underdrive race No.2 from the underdrive planetary gear assembly.

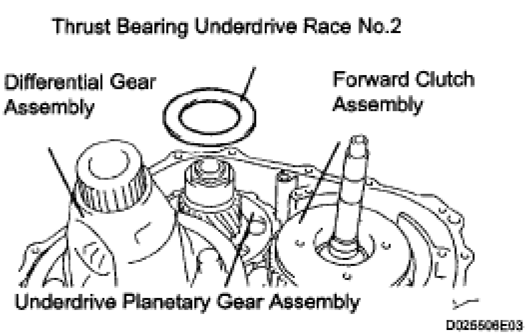

Fig. 276: Identifying Differential Gear Assembly, Forward Clutch Assembly And Underdrive Planetary Gear Assembly

33. **REMOVE DIFFERENTIAL GEAR ASSEMBLY**
    a. Remove the differential gear assembly from the transaxle case.

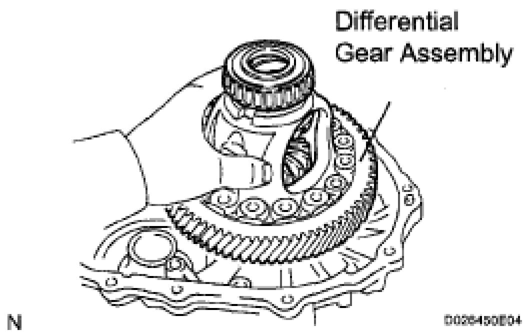

Fig. 277: Removing Differential Gear Assembly From Transaxle Case

34. **REMOVE OVERDRIVE BRAKE GASKET**
    a. Remove the 2 overdrive brake gaskets from the transaxle case.

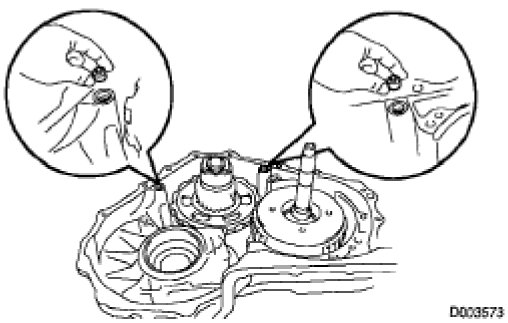

Fig. 278: Removing Overdrive Brake Gaskets From Transaxle Case

35. **REMOVE FORWARD CLUTCH ASSEMBLY**
    a. Remove the forward clutch assembly from the transaxle case.

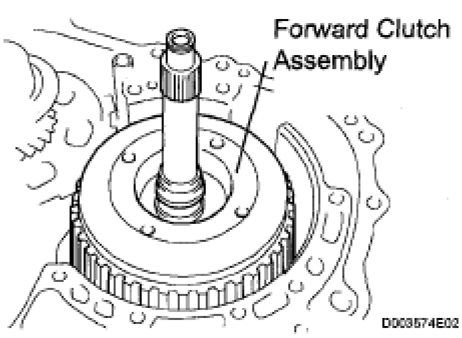

Fig. 279: Identifying Forward Clutch Assembly

    b. Remove the thrust needle roller bearing from the forward clutch.

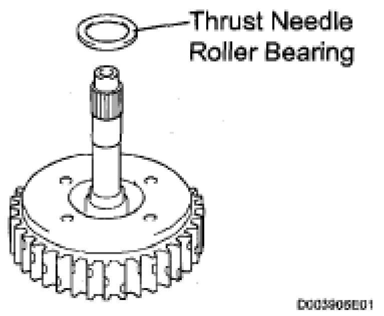

Fig. 280: Identifying Thrust Needle Roller Bearing

36. **REMOVE MULTIPLE DISC CLUTCH HUB**
    a. Remove the thrust needle roller bearing, multiple disc clutch hub, thrust needle roller bearing and thrust bearing race No.1 from the transaxle case.

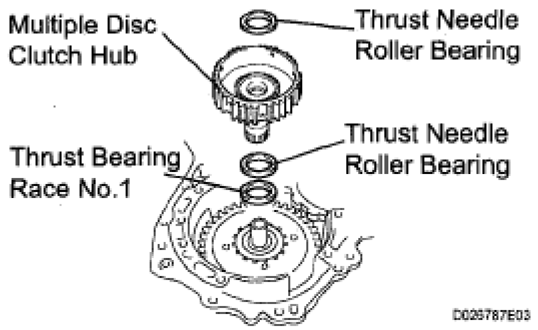

Fig. 281: Identifying Thrust Needle Roller Bearing, Multiple Disc Clutch Hub And Thrust Bearing Race

37. **INSPECT MULTIPLE DISC CLUTCH HUB**

    HINT:

    (See **INSPECTION**)

38. **REMOVE UNDERDRIVE PLANETARY GEAR ASSEMBLY**
    a. Remove the bolt and pawl shaft clamp.

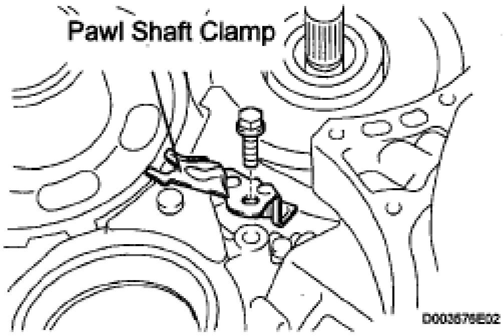

Fig. 282: Removing Pawl Shaft Clamp Bolt

b. Remove the parking lock pawl shaft.

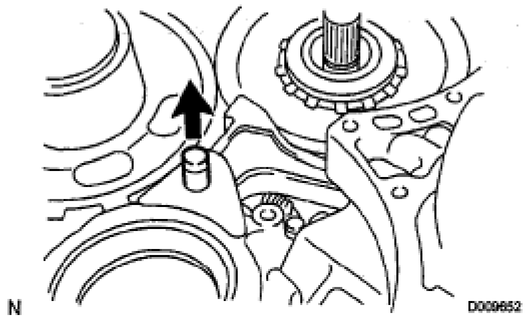

Fig. 283: Removing Parking Lock Pawl Shaft

c. Push the parking lock pawl.

HINT:

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

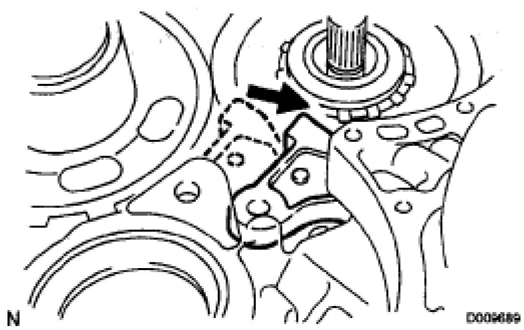

Fig. 284: Pushing Parking Lock Pawl

d. Remove the underdrive planetary gear assembly from the transaxle case.

NOTE: Be careful so that the underdrive planetary gear assembly will not fall

out.

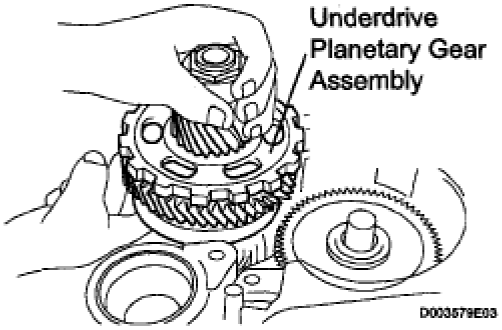

Fig. 285: Removing Underdrive Planetary Gear Assembly

39. **REMOVE PARKING LOCK PAWL**
    a. Remove the spring, pawl pin and parking lock pawl.

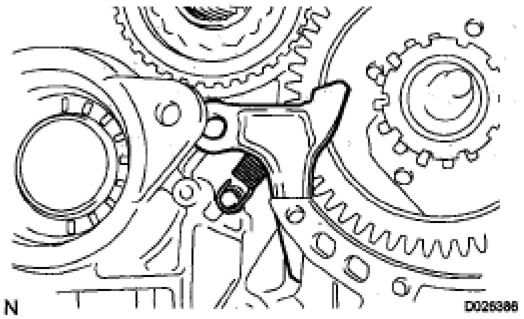

Fig. 286: Identifying Spring, Pawl Pin And Parking Lock Pawl

40. **REMOVE UNDERDRIVE CLUTCH ASSEMBLY**
    a. Remove the underdrive clutch assembly, thrust bearing and bearing race from the transaxle case.

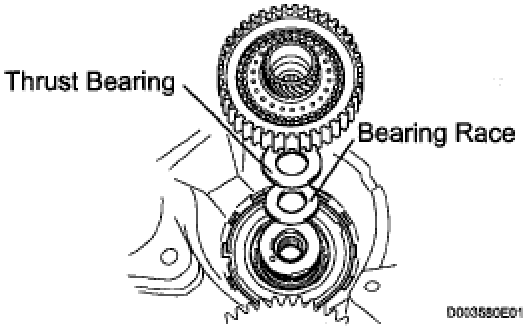

Fig. 287: Identifying Thrust Bearing And Bearing Race

41. **REMOVE UNDERDRIVE 1-WAY CLUTCH ASSEMBLY**
    a. Using a screwdriver, remove the snap ring from the transaxle case.

NOTE: Do not apply excessive force when removing the snap ring.

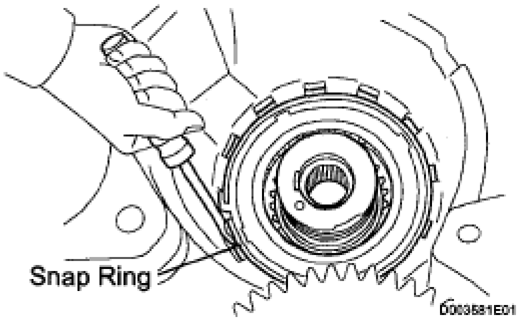

Fig. 288: Removing Snap Ring From Transaxle Case

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

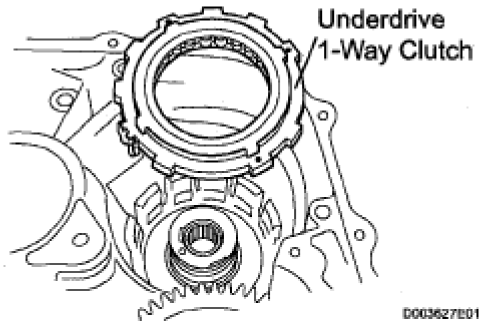

Fig. 289: Identifying Underdrive 1-Way Clutch

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

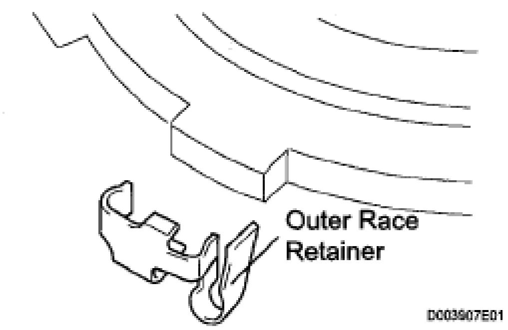

Fig. 290: Identifying Outer Race Retainer

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

a. Using a screwdriver, remove the snap ring.

NOTE: Do not apply excessive force when removing the snap ring.

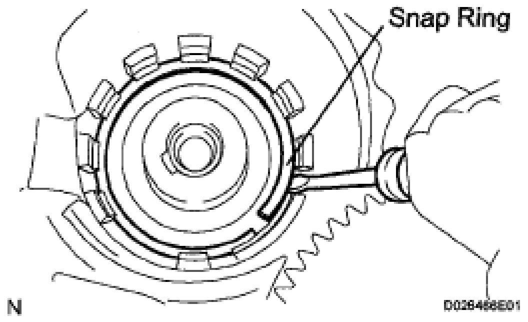

Fig. 291: Removing Snap Ring

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

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

HINT:

(See **INSPECTION**)

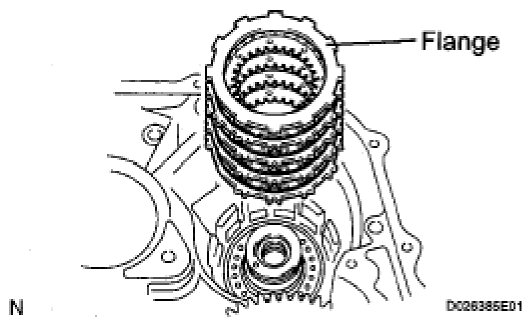

Fig. 292: Identifying Flange

44. **REMOVE TRANSAXLE REAR COVER SUB-ASSEMBLY**
    a. Remove the 11 bolts.
    b. Tap on the circumference of the rear cover with a plastic hammer to remove the transaxle rear cover from the transaxle case.

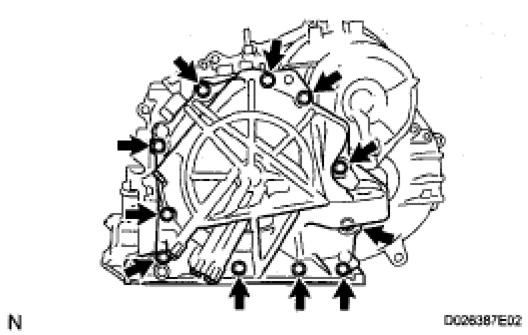

Fig. 293: Locating Transaxle Rear Cover Bolts

45. **REMOVE TRANSAXLE CASE NO.1 PLUG**
    a. Remove the 4 transaxle case No.1 plugs from the transaxle rear cover.
    b. Remove the 4 O-rings from the 4 transaxle case No.1 plugs.

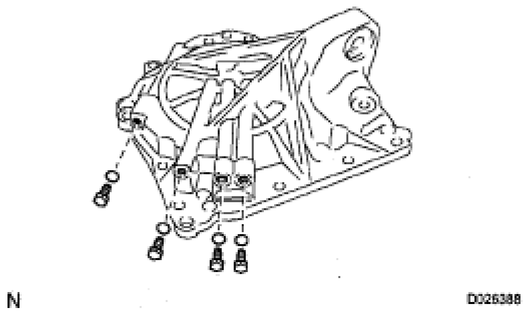

Fig. 294: Removing Transaxle Case Plugs

46. **REMOVE REAR CLUTCH OIL SEAL RING OUTER**
    a. Remove the 3 rear clutch oil seal rings from the transaxle rear cover.

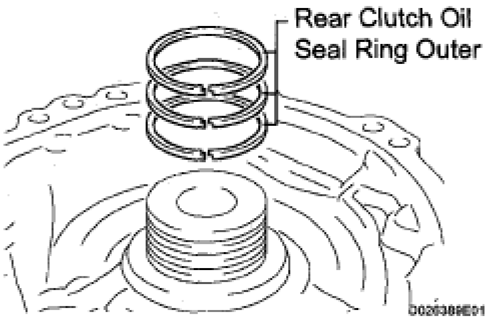

Fig. 295: Identifying Rear Clutch Oil Seal Ring Outer

47. **REMOVE NEEDLE-ROLLER BEARING**
    a. Using SST, remove the needle-roller bearing from the transaxle rear cover.

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

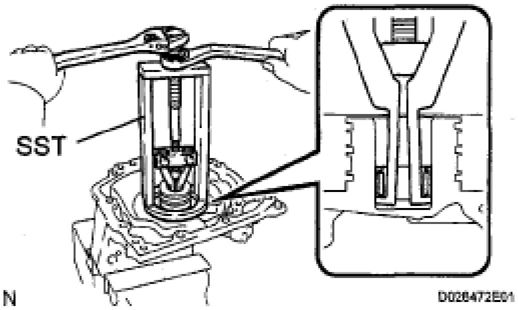

Fig. 296: Removing Needle-Roller Bearing From Transaxle Rear Cover

48. **REMOVE GOVERNOR APPLY GASKET NO.1**
    a. Using a screwdriver, remove the 3 apply gaskets.

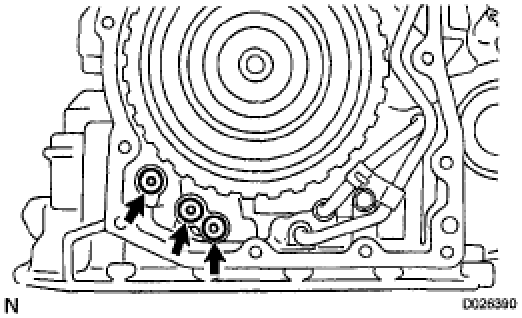

Fig. 297: Locating Governor Apply Gaskets

49. **REMOVE BRAKE APPLY TUBE**
    a. Remove the bolt, clamp and brake apply tube.
    b. Remove the clutch apply tube.
    c. Remove the brake apply tube from the clamp.

NOTE: Do not bend the tubes.

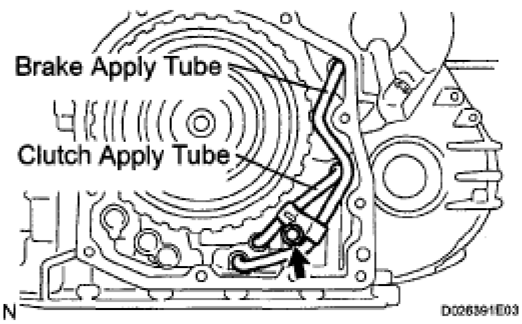

Fig. 298: Identifying Brake Apply Tube And Clutch Apply Tube

50. **REMOVE DIRECT CLUTCH ASSEMBLY**
    a. Remove the thrust bearing and the direct clutch assembly from the transaxle case.

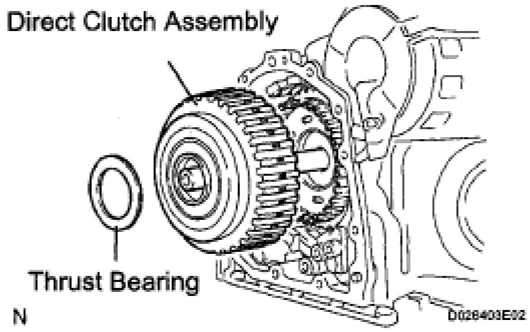

Fig. 299: Identifying Thrust Bearing And Direct Clutch Assembly

51. **REMOVE OVERDRIVE DIRECT CLUTCH HUB SUB-ASSEMBLY**
    a. Remove the thrust bearing race, thrust bearing and overdrive direct clutch hub from the planetary gear assembly.

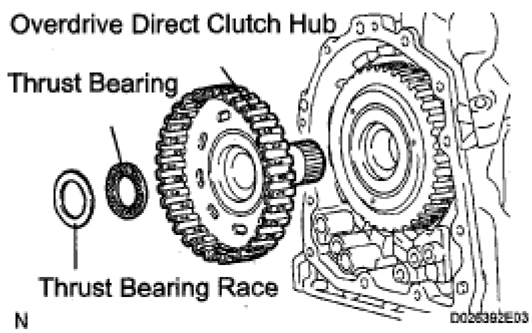

Fig. 300: Identifying Thrust Bearing Race, Thrust Bearing And Overdrive Direct Clutch Hub

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

    HINT:

    (See **INSPECTION**)

53. **REMOVE REAR PLANETARY SUN GEAR ASSEMBLY**
    a. Remove the rear planetary sun gear assembly from the transaxle case.

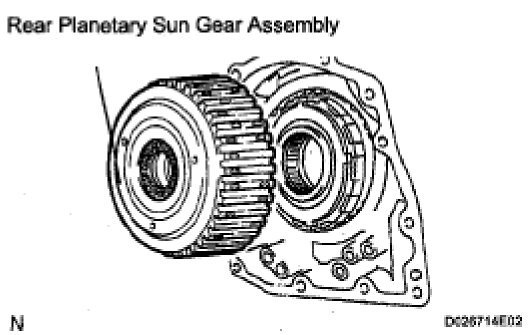

Fig. 301: Identifying Rear Planetary Sun Gear Assembly

b. Remove the thrust needle roller bearing and thrust bearing race from the rear planetary sun gear assembly.

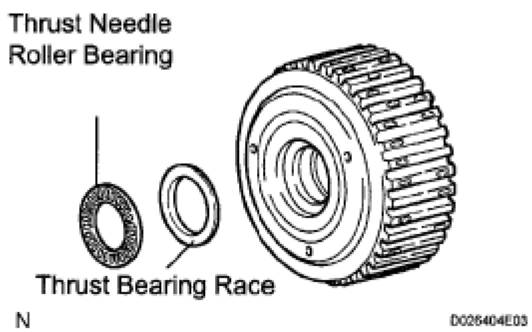

Fig. 302: Identifying Thrust Needle Roller Bearing And Thrust Bearing Race

c. Remove the planetary carrier thrust washer No.2 from the rear planetary sun gear assembly.

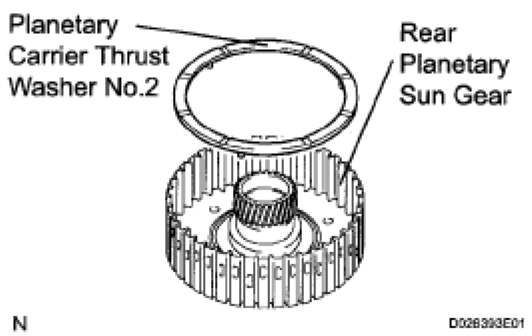

Fig. 303: Identifying Planetary Carrier Thrust Washer And Rear Planetary Sun Gear

54. **REMOVE 1-WAY CLUTCH ASSEMBLY**
    a. Remove the 1-way clutch assembly and the thrust needle roller bearing from the transaxle case.

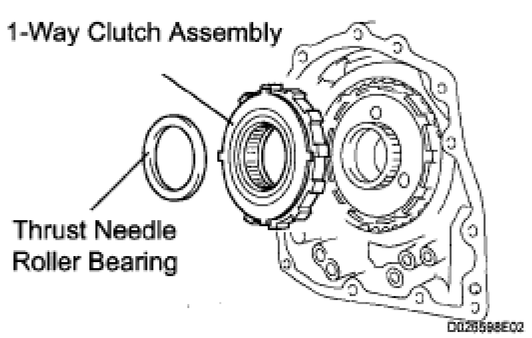

Fig. 304: Identifying 1-Way Clutch Assembly And Thrust Needle Roller Bearing

b. Remove the 1-way clutch inner race from the 1-way clutch assembly.

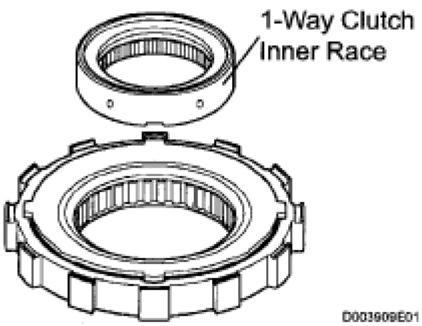

Fig. 305: Identifying 1-Way Clutch Inner Race

55. **REMOVE 1-WAY CLUTCH SLEEVE OUTER**
    a. Remove the 1-way clutch sleeve outer from the transaxle case.

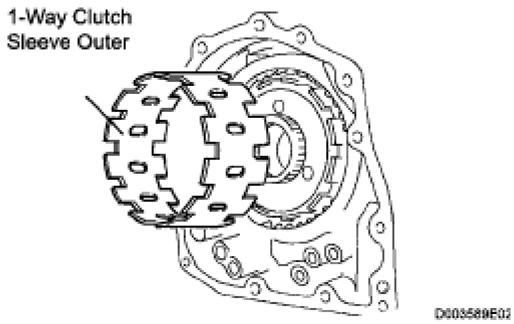

Fig. 306: Identifying 1-Way Clutch Sleeve Outer

56. **REMOVE PLANETARY CARRIER THRUST WASHER NO.1**
    a. Remove the planetary carrier thrust washer No. 1 from the planetary gear assembly.

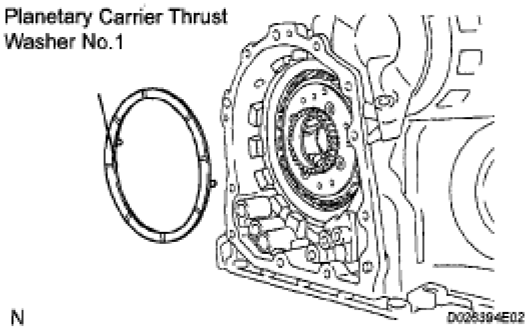

Fig. 307: Identifying Planetary Carrier Thrust Washer

57. **REMOVE 2ND BRAKE CLUTCH DISC**
    a. Using a screwdriver, remove the snap ring.

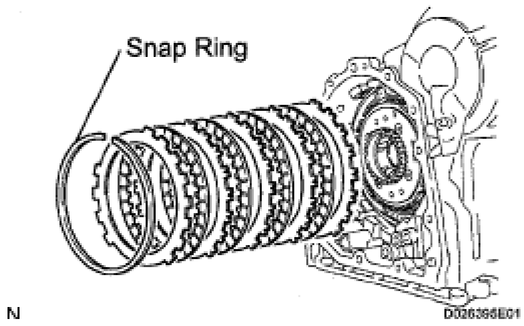

Fig. 308: Identifying Snap Ring

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

58. **INSPECT 2ND BRAKE CLUTCH DISC**

HINT:

(See **INSPECTION**)

59. **REMOVE 2ND BRAKE PISTON ASSEMBLY**

a. Using a screwdriver, remove the snap ring.

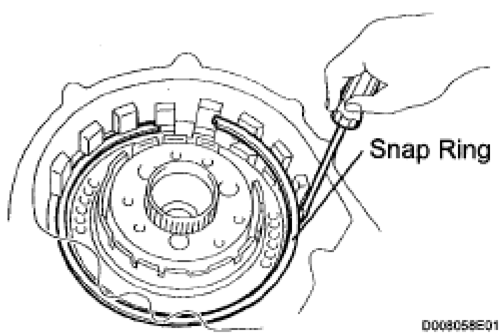

Fig. 309: Removing Snap Ring

b. Remove the 2ND brake piston assembly from the transaxle case.

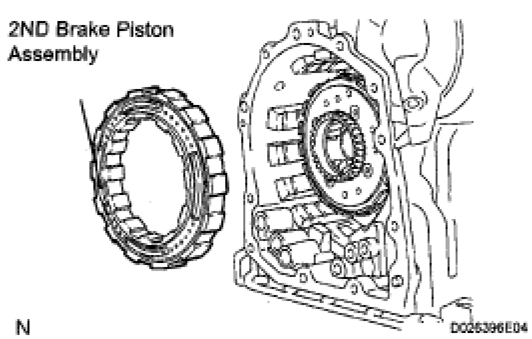

Fig. 310: Identifying 2nd Brake Piston Assembly

60. **REMOVE REAR PLANETARY GEAR ASSEMBLY**
    a. Using a screwdriver, remove the snap ring.

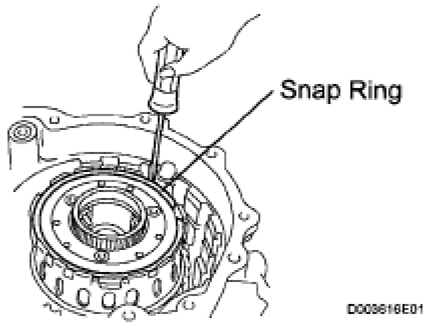

Fig. 311: Removing Snap Ring

    b. Remove the rear planetary gear assembly from the transaxle case.

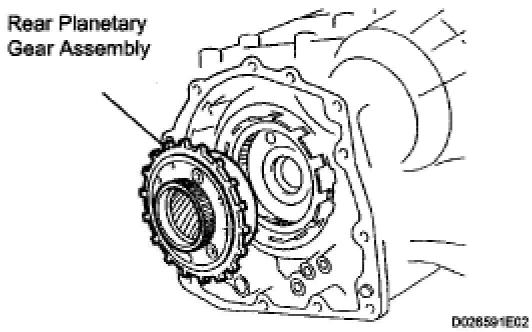

Fig. 312: Identifying Rear Planetary Gear Assembly

61. **REMOVE INPUT SUN GEAR**
    a. Remove the 2 thrust needle roller bearings, thrust bearing race No.2 and the input sun gear from the transaxle case.

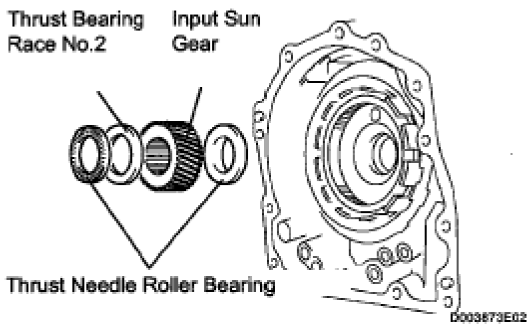

Fig. 313: Identifying Thrust Needle Roller Bearings, Thrust Bearing Race And Input Sun Gear

62. **REMOVE 1ST AND REVERSE BRAKE CLUTCH DISC**

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

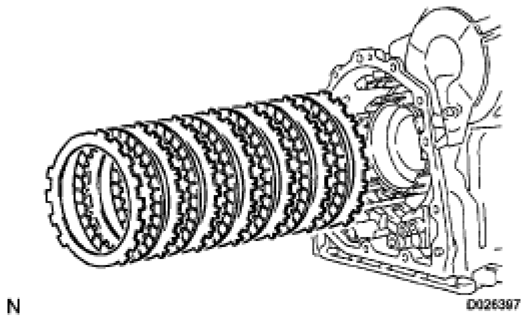

Fig. 314: Identifying Flange, Discs And Plates

63. **INSPECT 1ST AND REVERSE BRAKE CLUTCH DISC**

HINT:

(See **INSPECTION**)

64. **REMOVE FRONT PLANETARY GEAR ASSEMBLY**

a. Using a chisel and hammer, unstake the lock washer.

NOTE: Push down all claws of the washer. Otherwise the SST cannot be fully pressed against the nut, and cannot loosen the nut.

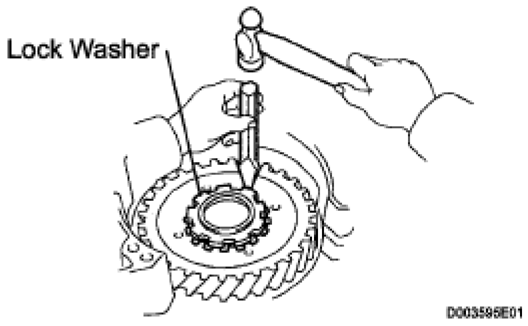

Fig. 315: Unstaking Lock Washer

b. Using SST, remove the nut.

SST 09387-00030,09387-00080

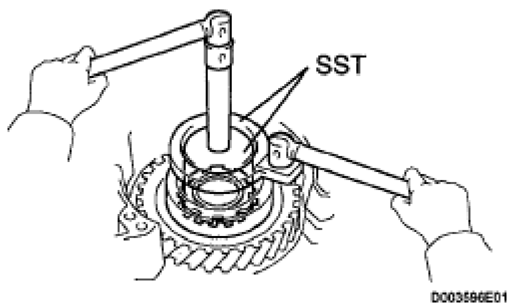

Fig. 316: Removing Front Planetary Gear Nut

c. Using SST and a press, remove the front planetary gear assembly from the counter drive gear.

SST 09950-60010 (09951-00450), 09950-70010 (09951-07100)

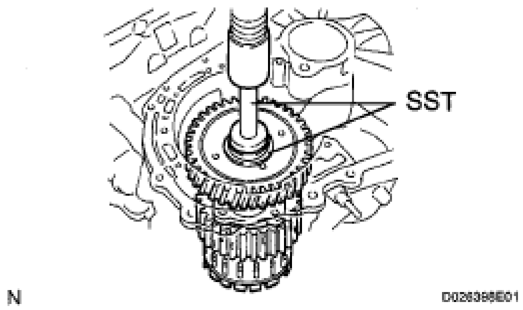

Fig. 317: Removing Front Planetary Gear Assembly From Counter Drive Gear

d. Remove the front planetary gear assembly from the brake hub.

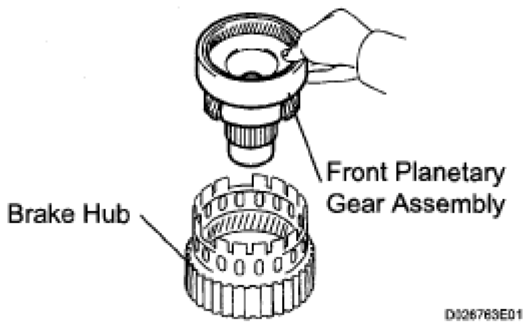

Fig. 318: Removing Front Planetary Gear Assembly From Brake Hub

65. **REMOVE FRONT PLANETARY RING GEAR**

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

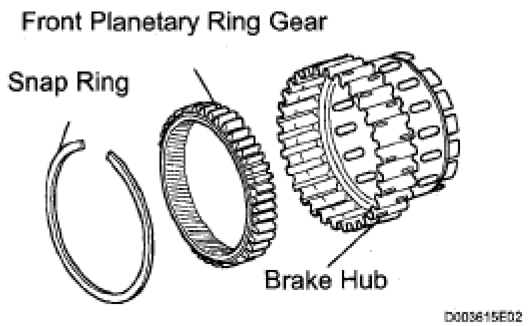

Fig. 319: Identifying Snap Ring, Brake Hub And Front Planetary Ring Gear

66. **REMOVE 1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY**
    a. Place SST on the return spring, and compress the return spring with a press.

    SST 09387-00070

    b. Using a snap ring expander, remove the snap ring.

NOTE:
- **Stop the press when the spring seat is lowered 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove, to prevent the spring seat from being deformed.**
- **Do not expand the snap ring excessively.**

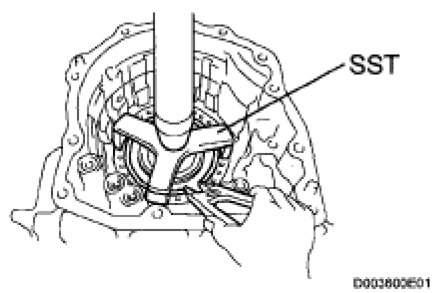

Fig. 320: Compressing Return Spring

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

    HINT:

    (See **INSPECTION**)

68. **REMOVE 1ST AND REVERSE BRAKE PISTON**
    a. Apply compressed air (392 kPa, 4.0 kgf/cm^2 , 57 psi) to the transaxle case to remove the 1st and reverse brake piston.

NOTE:

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

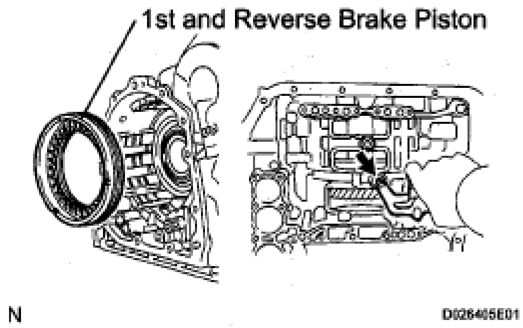

Fig. 321: Removing 1st And Reverse Brake Piston

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

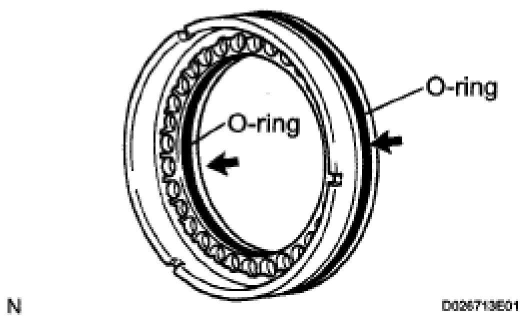

Fig. 322: Locating 1st And Reverse Brake Piston O-Rings

69. **REMOVE COUNTER DRIVE GEAR**

a. Using SST and a press, remove the counter drive gear from the transaxle case.

SST 09950-60010 (09951-00590), 09950-70010 (09951-07100)

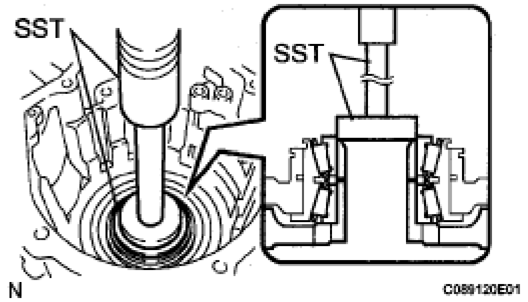

Fig. 323: Removing Counter Drive Gear From Transaxle Case

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

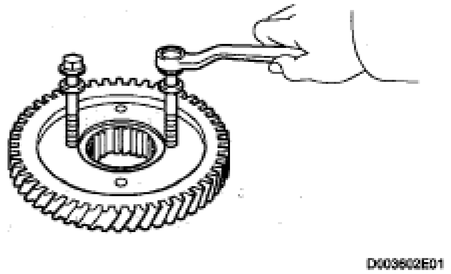

Fig. 324: Tightening Bolts

c. Using SST, remove the tapered roller bearing.

SST 09950-60010 (09951-00590), 09950-00020, 09950-00030, 09950-40011 (09957-04010)

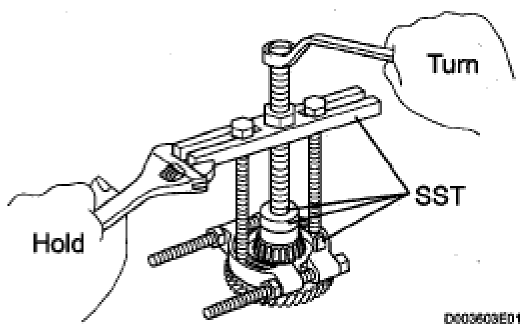

Fig. 325: Removing Tapered Roller Bearing

70. **REMOVE TRANSFER DRIVEN PINION FRONT BEARING**

a. Using a snap ring expander, remove the snap ring.

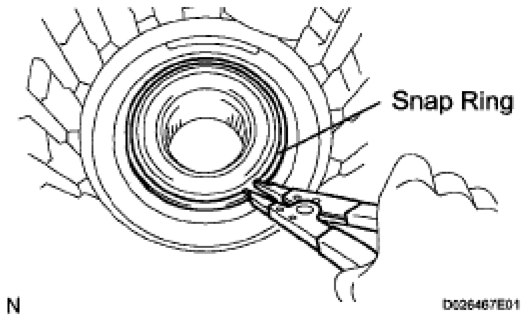

Fig. 326: Removing Snap Ring

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

SST 09950-60020 (09951 -00910)

71. **REMOVE BREATHER PLUG NO.2 (ATM)**

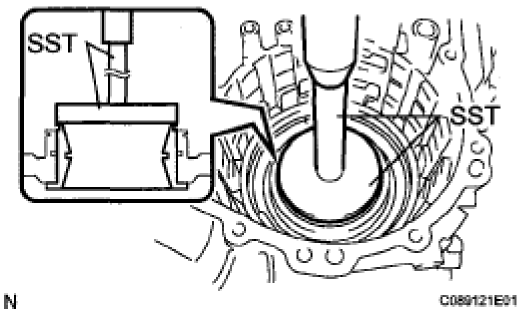

Fig. 327: Removing Bearing Outer Race

72. **REMOVE UNDERDRIVE BRAKE RETURN SPRING SUB-ASSEMBLY**
    a. Place SST on the return spring, and compress the return spring with a press.

    SST 09387-00020

    b. Using a snap ring expander, remove the snap ring.

NOTE:	• Stop the press when the spring seat is lowered 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove, to prevent the spring seat from being deformed. • Do not expand the snap ring excessively.

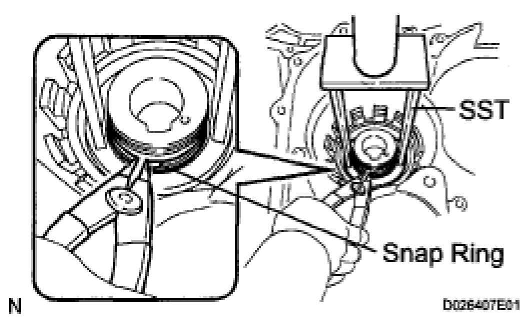

Fig. 328: Compressing Return Spring

73. **INSPECT UNDERDRIVE BRAKE RETURN SPRING SUB-ASSEMBLY**

HINT:

(See **INSPECTION**)

74. **REMOVE UNDERDRIVE BRAKE PISTON**
    a. Apply compressed air (392 kPa, 4.0 kgf/cm^2 , 57 psi) to the transaxle case to remove the

underdrive brake piston.

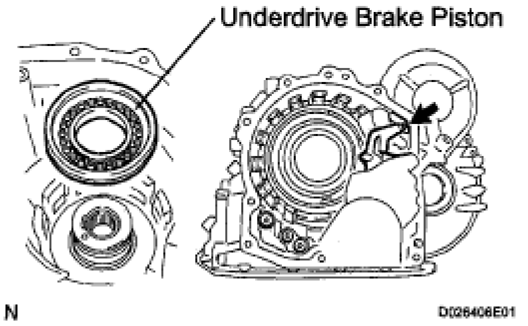

Fig. 329: Removing Underdrive Brake Piston

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

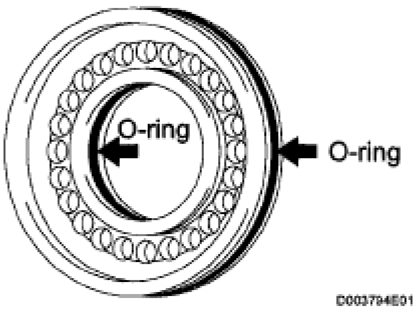

Fig. 330: Locating Underdrive Brake Piston O-Rings

75. **REMOVE NEEDLE ROLLER BEARING**

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

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

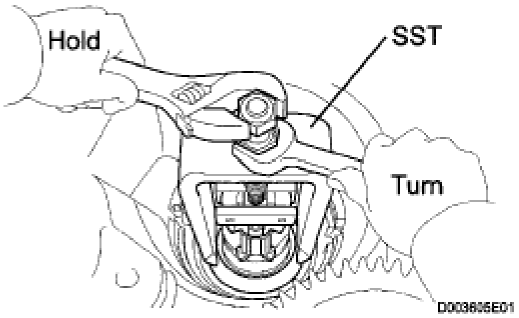

Fig. 331: Removing Needle Roller Bearing

76. **REMOVE UNDERDRIVE CLUTCH DRUM OIL SEAL RING**

a. Remove the 2 oil seal rings from the transaxle case.

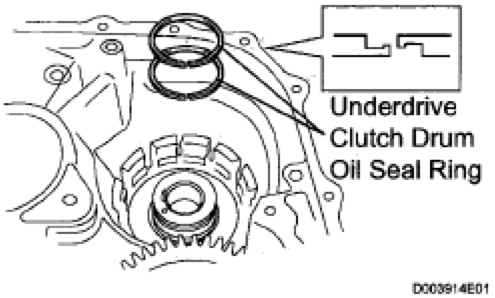

Fig. 332: Identifying Underdrive Clutch Drum Oil Seal Ring

77. **REMOVE TRANSAXLE CASE NO.1 PLUG**
    a. Remove the 2 transaxle case No.1 plugs.
    b. Remove the 2 O-rings from the 2 transaxle case No.1 plugs.

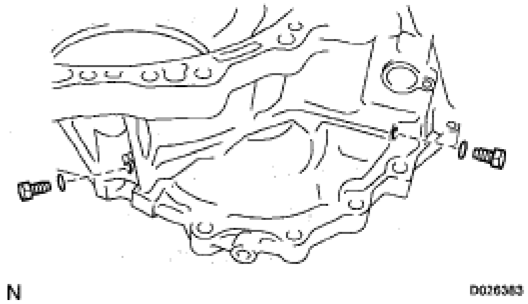

Fig. 333: Removing Transaxle Case Plugs

78. **REMOVE UNDERDRIVE CYLINDRICAL ROLLER BEARING**
    a. Using SST, remove the underdrive cylindrical roller bearing from the transaxle case.

    SST 09514-35011

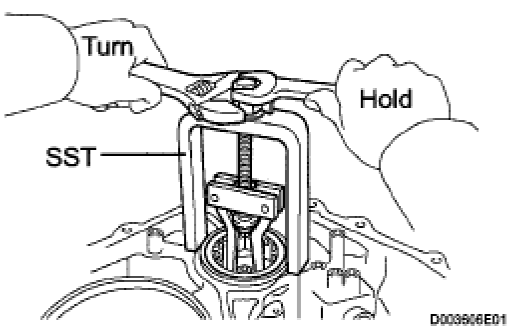

Fig. 334: Removing Underdrive Cylindrical Roller Bearing

79. **REMOVE UNDERDRIVE OUTPUT SHAFT OIL SEAL RING**
    a. Remove the oil seal ring from the transaxle housing.

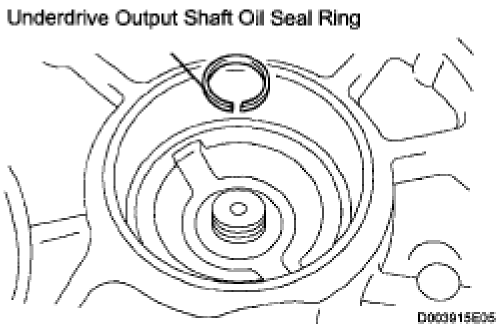

Fig. 335: Identifying Underdrive Output Shaft Oil Seal Ring

80. **REMOVE DIFFERENTIAL GEAR LUBE APPLY TUBE**
    a. Remove the bolt, transaxle apply tube clamp and differential gear lube apply tube from the transaxle housing.

NOTE: **Do not bend the tubes.**

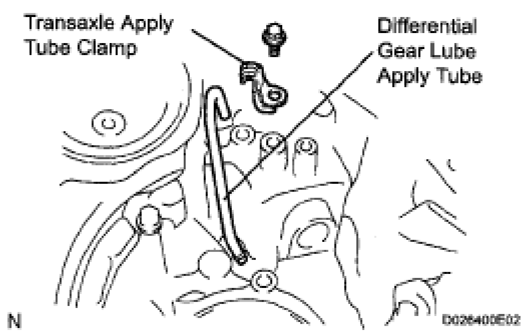

Fig. 336: Identifying Transaxle Apply Tube Clamp And Differential Gear Lube Apply Tube

INSPECTION

1. **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 23.046 mm (0.9065 to 0.9073 in.)

Maximum inside diameter: 23.09 mm (0.9091 in.)

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

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

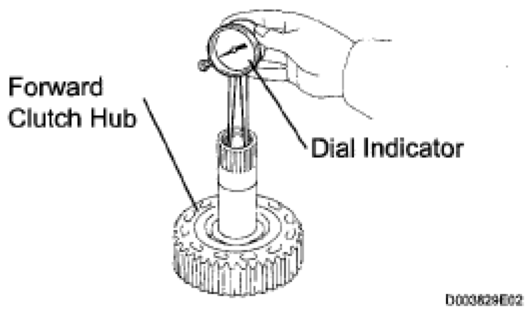

Fig. 337: Measuring Inside Diameter Of Forward Clutch Hub Bushing

2. **INSPECT UNDERDRIVE CLUTCH DISC NO.2**
   a. Check if the sliding surfaces of the disc, plate and flange are worn or burnt. If necessary, replace them.

NOTE:
- **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.**

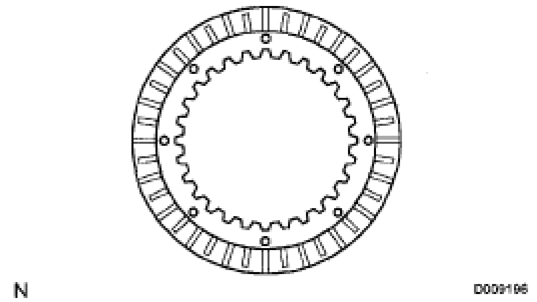

Fig. 338: Identifying Underdrive Clutch Disc

3. **INSPECT OVERDRIVE DIRECT CLUTCH DRUM SUB-ASSEMBLY**
   a. Using a dial indicator, measure the inside diameter of the forward clutch hub bushing.

Standard inside diameter: 23.025 to 23.046 mm (0.9065 to 0.9073 in.)

Maximum inside diameter: 23.09 mm (0.9091 in.)

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

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

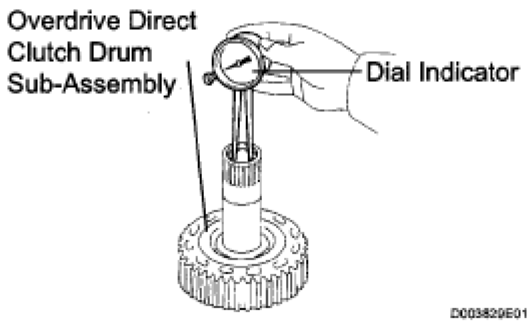

Fig. 339: Measuring Inside Diameter Of Forward Clutch Hub Bushing

4. **INSPECT 2ND BRAKE CLUTCH DISC**
   a. Check if the sliding surface of the disc, plate and flange are worn or burnt. If necessary, replace them.

NOTE:
- **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.**

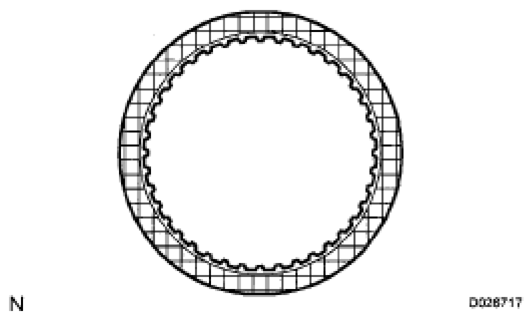

Fig. 340: Identifying 2nd Brake Clutch Disc

5. **INSPECT 1ST AND REVERSE BRAKE CLUTCH DISC**
   a. Check if the sliding surface of the disc, plate and flange are worn or burnt. If necessary, replace them.

NOTE:
- **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.**

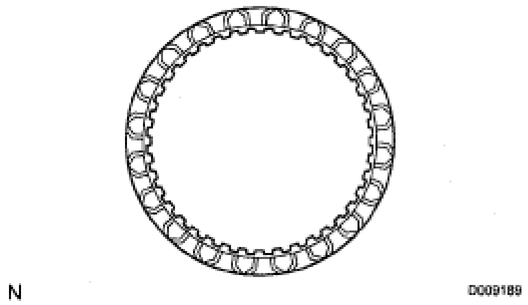

Fig. 341: Identifying 1st And Reverse Brake Clutch Disc

6. **INSPECT 1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY**
   a. Using a vernier calipers, measure the free length of the spring together with the spring seat.

      Standard free length: 17.61 mm (0.6933 in.)

      HINT:

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

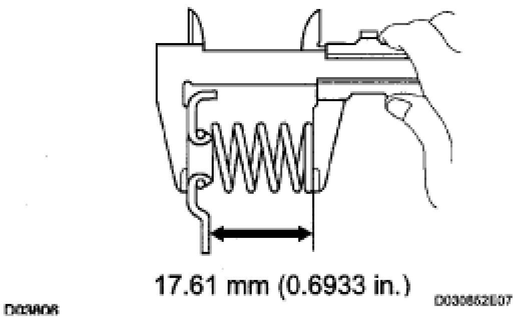

Fig. 342: Measuring Free Length Of 1st And Reverse Brake Return Spring

7. **INSPECT UNDERDRIVE BRAKE RETURN SPRING SUB-ASSEMBLY**
   a. Using a vernier calipers, measure the free length of the spring together with the spring seat.

      Standard free length: 13.24 mm (0.5213 in.)

      HINT:

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

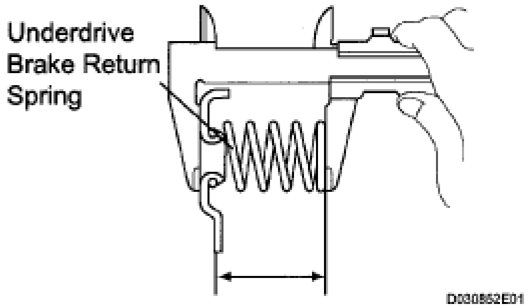

Fig. 343: Measuring Free Length Of Underdrive Brake Return Spring

8. **INSPECT PACK CLEARANCE OF 1ST AND REVERSE BRAKE**
   a. Using vernier calipers, measure the distance between the disc surface and the contact surface of the 2nd brake cylinder and transaxle case (Dimension A).
   b. Select an appropriate flange so that the pack clearance will meet the specified value.

   Pack clearance: 1.16 to 1.35 mm (0.0457 to 0.0531 in.)

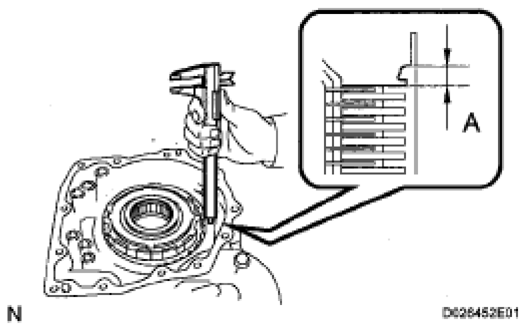

Fig. 344: Measuring Distance Between Disc/Contact Surface Of 2nd Brake Cylinder And Transaxle Case

HINT:

Piston stroke = Dimension A - Flange thickness

Flange thickness: mm (in.)

FLANGE THICKNESS SPECIFICATION

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)

   c. Install the flange.

9. **INSPECT PACK CLEARANCE OF 2ND BRAKE**
    a. Using a vernier calipers, measure the distance between the disc surface and snap ring surface (Dimension B).
    b. Select an appropriate flange so that the pack clearance will meet the specified value.

Pack clearance: 0.62 to 0.91 mm (0.0244 to 0.0358 in.)

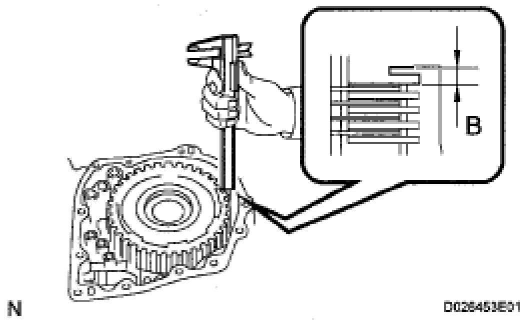

Fig. 345: Measuring Distance Between Disc Surface And Snap Ring Surface

HINT:

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

Flange thickness: mm (in.)

FLANGE THICKNESS SPECIFICATION

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	-

10. **INSPECT PACK CLEARANCE OF UNDERDRIVE BRAKE**
    a. Using a dial indicator, measure the underdrive brake pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm^2 , 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.

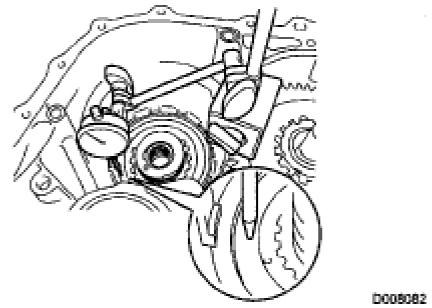

Fig. 346: Measuring Underdrive Brake Pack Clearance

Flange thickness: mm (in.)

FLANGE THICKNESS SPECIFICATION

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

b. Temporarily remove the snap ring and attach it to the flange.
c. Reinstall the snap ring.

11. **INSPECT UNDERDRIVE 1-WAY CLUTCH ASSEMBLY**
    a. Install the underdrive clutch assembly to the 1-way clutch.
    b. Rotate the underdrive 1-way clutch assembly to check the rotating direction for the lock or free operation.

    HINT:

    If the result is not as specified, replace the underdrive 1-way clutch.

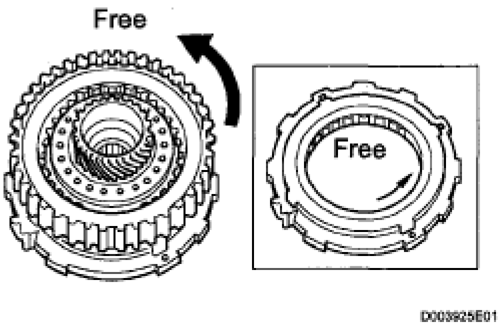

Fig. 347: Inspecting Underdrive 1-Way Clutch Assembly

12. **INSPECT INPUT SHAFT END PLAY**
    a. Using a dial indicator, measure the input shaft end play.

End play: 0.262 to 1.244 mm (0.01 to 0.049 in.)

HINT:

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

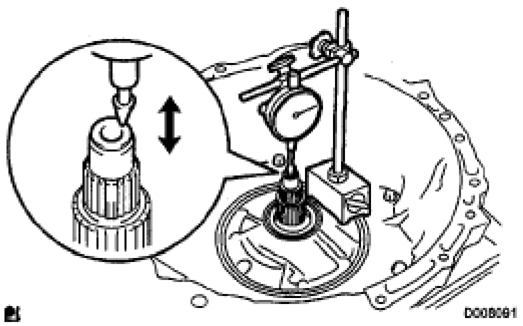

Fig. 348: Measuring Input Shaft End Play

REASSEMBLY

1. **BEARING POSITION**

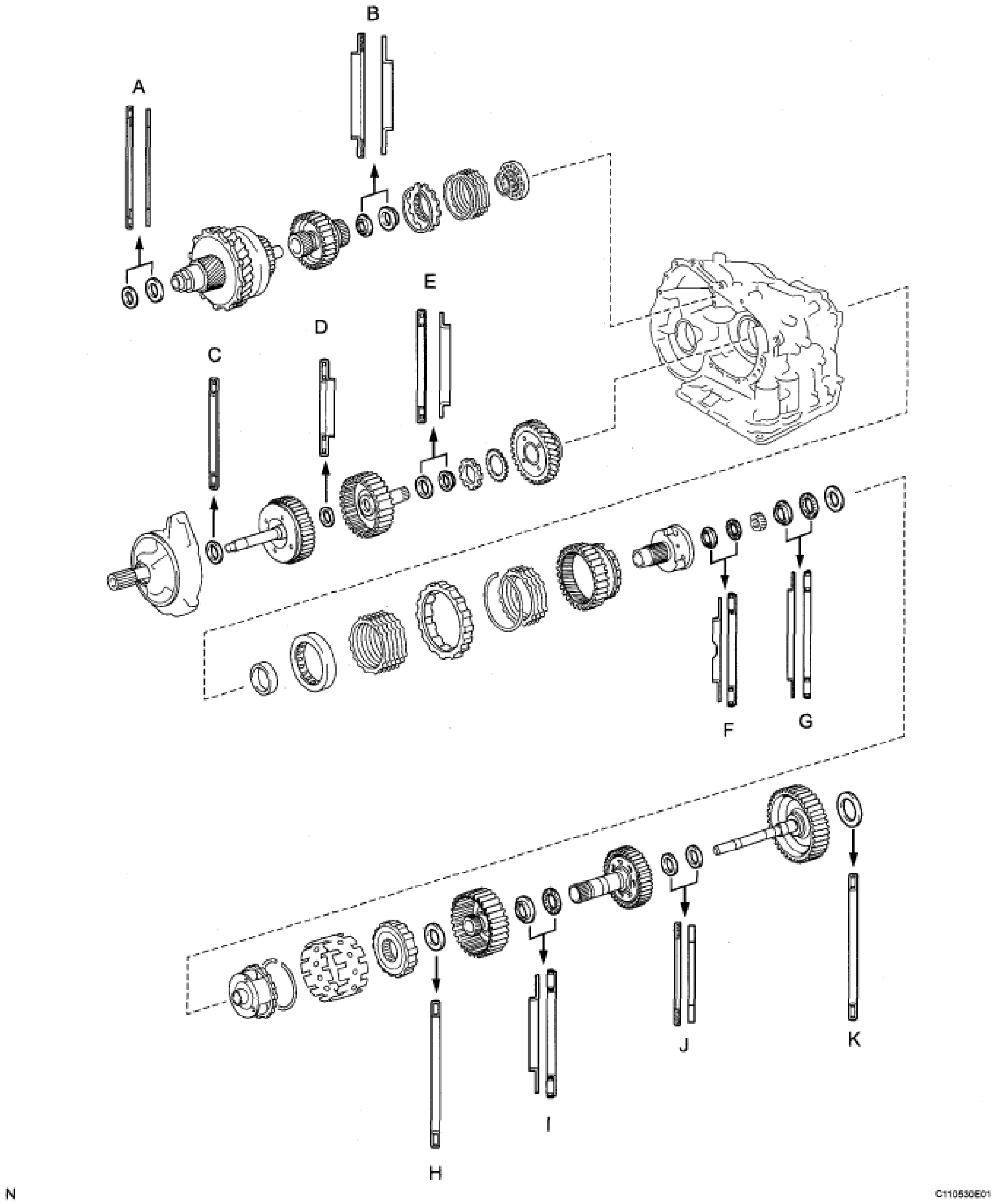

Fig. 349: Installing Bearings

FRONT/REAR RACE AND THRUST BEARING DIAMETER SPECIFICATION

Mark	Front Race Diameter Inside / Outside mm (in.)	Thrust Bearing Diameter Inside / Outside mm (in.)	Rear Race Diameter Inside / Outside mm (in.)
A	-	57.2 (2.252) / 84.96 (3.3449)	56.4 (2.220) / 83.0 (3.268)
B	-	37.73 (1.4854)/58.0 (2.283)	-
C	-	33.85 (1.3327)/52.2 (2.055)	-
D	24.94 (0.982)	23.5 (0.925) / 44.0 (1.732)	-

E	-	36.3 (1.429)/51.93 (2.044)	34.5 (1.358)/48.35 (1.904)
F	34.35 (1.352)/56.57 (2.227)	32.45 (1.278)/56.48 (2.223)	-
G	40.15 (1.581)/59.25 (2.333)	38.65 (1.522)/59.79 (2.354)	38.65 (1.522)/59.25 (2.332)
H	-	53.6 (2.110)/69.6 (2.740)	-
I	33.02 (1.3)/45.8 (1.803)	31.85 (1.254)/57.3 (2.256)	-
J	-	24.79 (0.976)/39.5 (1.555)	23.6 (0.929)/37.95 (1.494)
K	-	56.3 (2.216)/75.96 (2.991)	-

2. **INSTALL DIFFERENTIAL GEAR LUBE APPLY TUBE**
   a. Install the differential gear lube apply tube and transaxle apply tube 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.

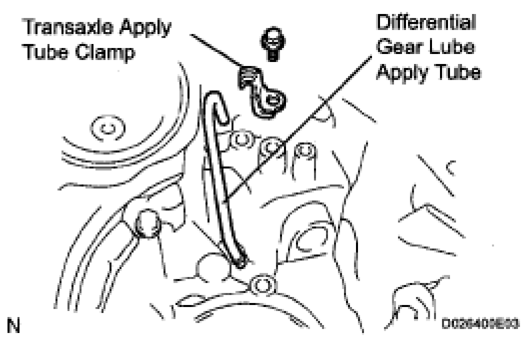

Fig. 350: Identifying Differential Gear Lube Apply Tube And Transaxle Apply Tube Clamp

3. **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 rear cover.

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

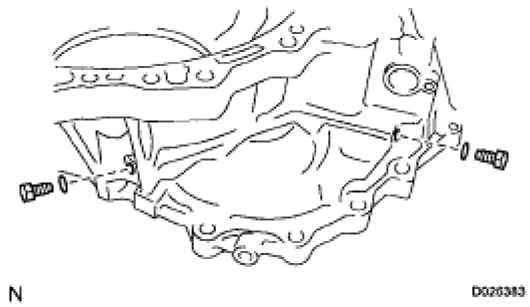

Fig. 351: Installing Transaxle Case Plugs

4. **INSTALL UNDERDRIVE OUTPUT SHAFT OIL SEAL RING**
   a. Coat a new oil seal ring with ATF and install it to the transaxle housing.

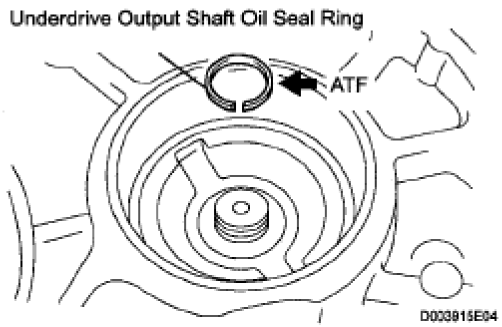

Fig. 352: Identifying Underdrive Output Shaft Oil Seal Ring

5. **INSTALL UNDERDRIVE CYLINDRICAL ROLLER BEARING**
   a. Coat the underdrive cylindrical roller bearing with ATF.
   b. Using SST and a press, install the underdrive cylindrical roller bearing.

   SST 09950-60020 (09951 -00810), 09950-70010 (09951-07100)

   NOTE: **Do not apply excessive pressure to the bearing.**

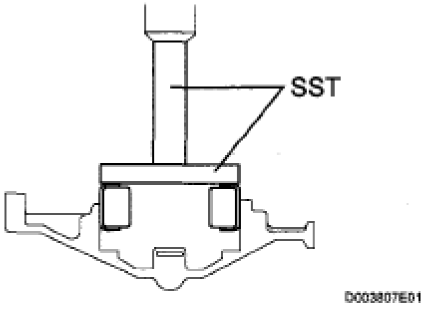

Fig. 353: Installing Underdrive Cylindrical Roller Bearing

6. **INSTALL UNDERDRIVE CLUTCH DRUM OIL SEAL RING**
   a. Coat 2 new oil seal rings with ATF, and install them to the transaxle rear cover.

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

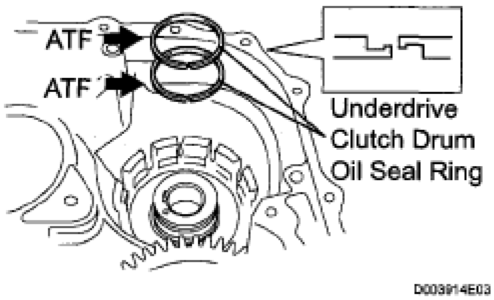

Fig. 354: Identifying Underdrive Clutch Drum Oil Seal Ring

7. **INSTALL NEEDLE ROLLER BEARING**
   a. Wrap vinyl tape around the SST 4.0 mm (0.157 in.) from the bottom of the SST until the thickness of the tape is about 5.0 mm (0.197 in.).

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

      NOTE: Clean SST to remove deposited oil, before wrapping vinyl tape.

   b. Coat the needle roller bearing with ATF.

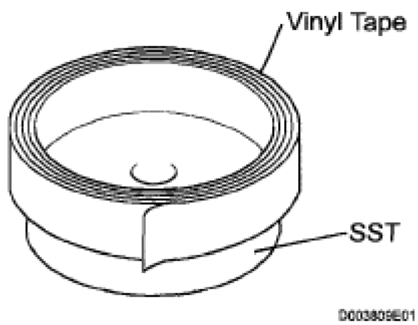

Fig. 355: Wrapping Vinyl Tape Around SST

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

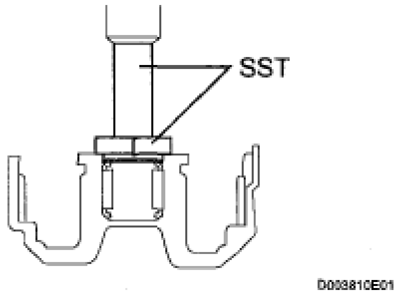

Fig. 356: Installing Needle-Roller Bearing To Transaxle Case

8. **INSTALL UNDERDRIVE BRAKE PISTON**
   a. Coat 2 new O-rings with ATF, and install them to the underdrive brake piston.

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

   b. Coat the underdrive brake piston with ATF.

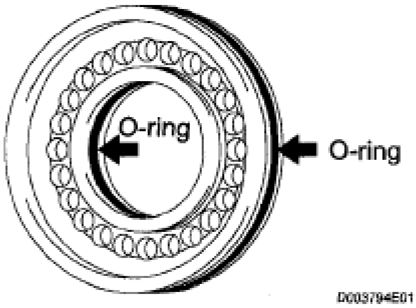

Fig. 357: Locating Underdrive Brake Piston O-Rings

   c. Install the underdrive brake piston to the transaxle case.

NOTE: **Be careful not to damage the O-ring.**

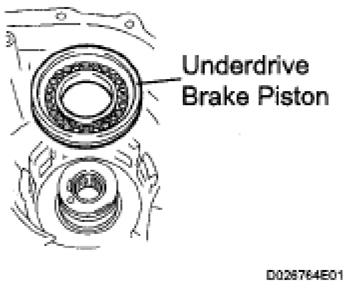

Fig. 358: Identifying Underdrive Brake Piston

9. **INSTALL UNDERDRIVE BRAKE RETURN SPRING SUB-ASSEMBLY**
   a. Place SST on the return spring and compress the return spring with a press.

      SST 09387-00020

   b. Using a snap ring expander, install the snap ring to the transaxle case.

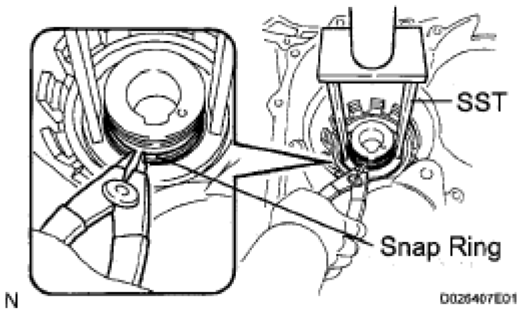

Fig. 359: Compressing Return Spring

NOTE:

- **Stop the press when the spring seat is lowered 1 to 2 mm (0.039 to 0.078 in.) from the snap ring groove, to prevent the spring seat from being deformed.**
- **Do not expand the snap ring excessively.**
- **Installing the spring sub-assembly, check that all of the springs are fit in the piston correctly.**
- **The snap ring should be fully engaged in the groove of the transaxle case.**

10. **INSTALL BREATHER PLUG NO.2 (ATM)**
11. **INSTALL COUNTER DRIVE GEAR BEARING**
    a. Coat the counter drive gear bearing with ATF.
    b. Using SST and a press, install the bearing outer race.

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

NOTE:

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

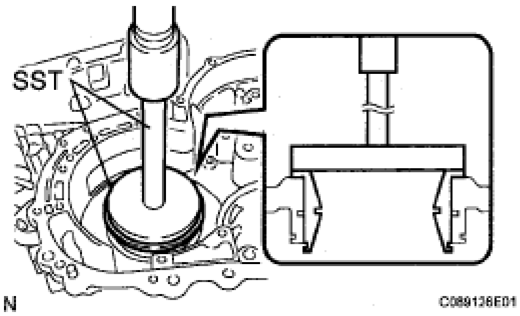

Fig. 360: Installing Bearing Outer Race

c. Using a snap ring expander, install the snap ring.

NOTE: The white mark side of the snap ring should face upward.

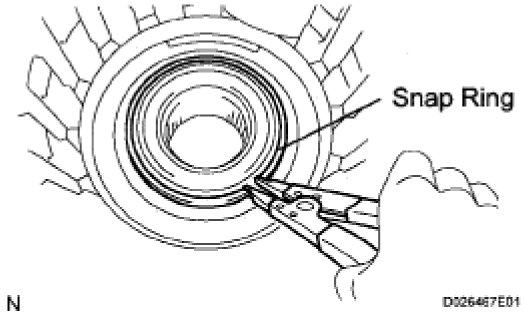

Fig. 361: Installing Snap Ring

12. **INSTALL COUNTER DRIVE GEAR**
    a. Coat the counter drive gear with ATF.
    b. Using SST and a press, install the tapered roller bearing to the counter drive gear.

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

    NOTE: Do not apply excessive pressure to the bearing.

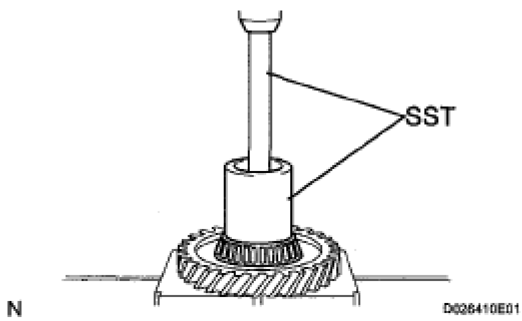

Fig. 362: Installing Tapered Roller Bearing To Counter Drive Gear

c. Using SST and a press, install the counter drive gear and bearing to the transaxle case.

SST 09950-70010 (09951 -07150), 09223-15030, 09527-17011, 09950-60020 (09951-00750)

NOTE: Do not apply excessive pressure to the counter drive gear.

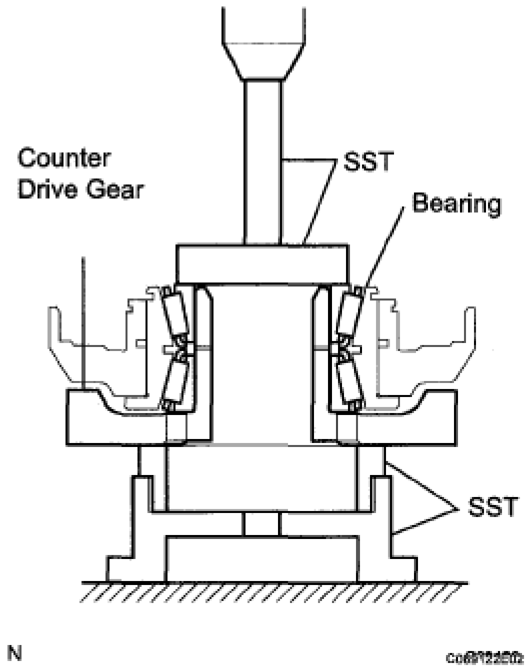

Fig. 363: Installing Counter Drive Gear And Bearing To Transaxle Case

13. **INSTALL 1ST AND REVERSE BRAKE PISTON**
    a. Coat 2 new O-rings with ATF.
    b. Install the 2 O-rings to the 1st and reverse brake piston.

NOTE:

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

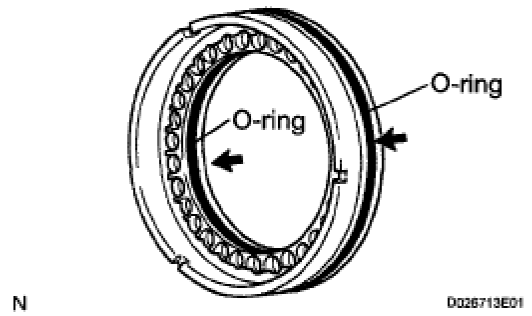

Fig. 364: Locating 1st And Reverse Brake Piston O-Rings

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

NOTE: **Be careful not to damage the O-ring.**

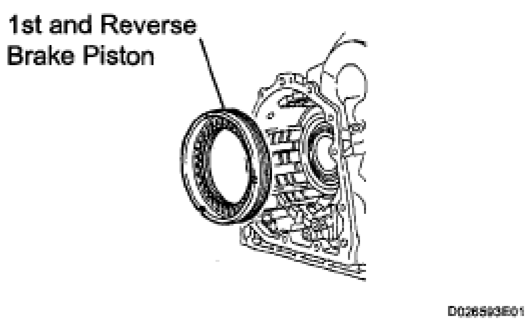

Fig. 365: Identifying 1st And Reverse Brake Piston

14. **INSTALL 1ST AND REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY**
    a. Place SST on the return spring and compress the return spring with a press.

    SST 09387-00070

    b. Using a snap ring expander, install the snap ring to the transaxle case.

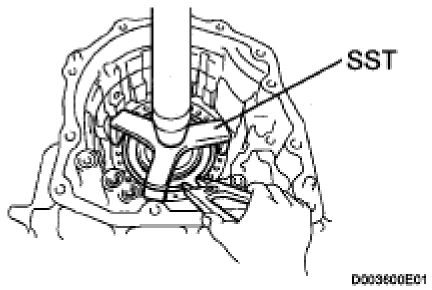

Fig. 366: Installing Snap Ring

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.**
- **Installing the spring sub-assembly, check that all of the springs are fit in the piston correctly.**
- **The snap ring should be fully engaged in the groove of the cylinder.**
- **Fix the snap ring to the inside of the claw of the spring seat firmly.**

15. **INSTALL FRONT PLANETARY RING GEAR**
    a. Using a screwdriver, install the front planetary ring gear and snap ring to the brake hub.

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

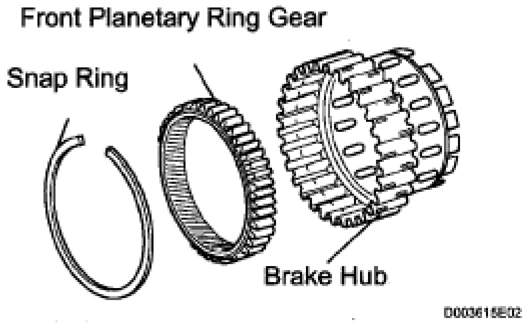

Fig. 367: Identifying Snap Ring, Brake Hub And Front Planetary Ring Gear

16. **INSTALL FRONT PLANETARY GEAR ASSEMBLY**
    a. Install the front planetary gear assembly to the brake hub.

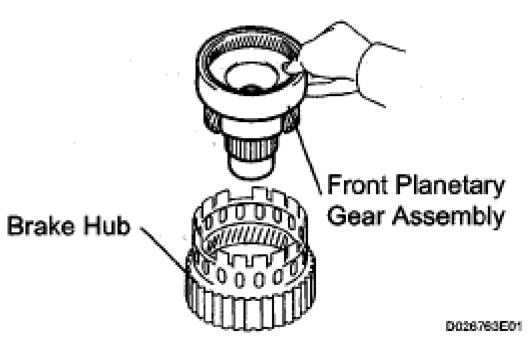

Fig. 368: Installing Front Planetary Gear Assembly

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 the planetary gear assembly.**
- **Press the inner race of LH tapered roller bearing, counter gear and front planetary gear assembly to the position where no preload should be applied to one pair of tapered roller bearings (left and right).**

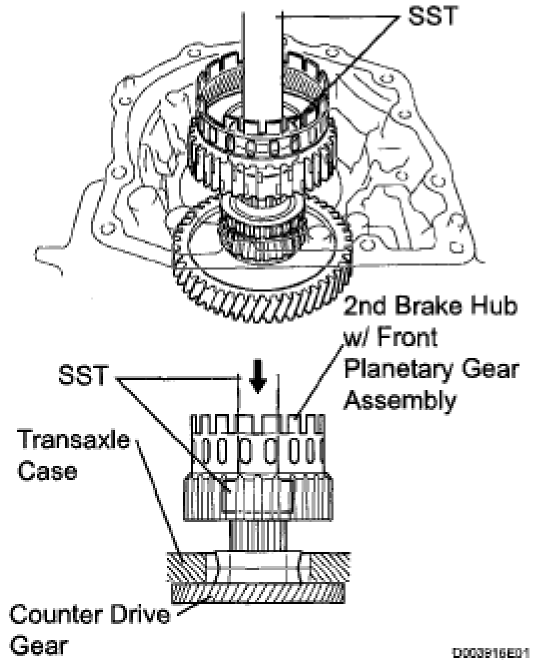

Fig. 369: Pressing Front Planetary Gear Assembly

c. Install a new washer as shown in the illustration.

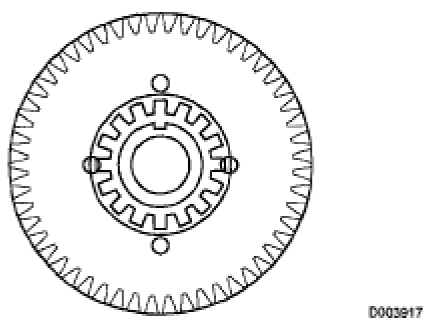

Fig. 370: Identifying Washer

d. Using SST, install the nut.

SST 09387-00030,09387-00080

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

NOTE:	**Assemble the washer after pressing each part, then tighten the nut to the minimum tightening torque.**

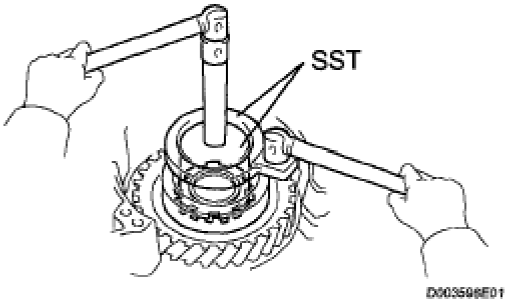

Fig. 371: Identifying Front Planetary Gear Nut

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

SST 09387-00080

Standard: Turning torque at 60 rpm

Bearing: New Bearing:

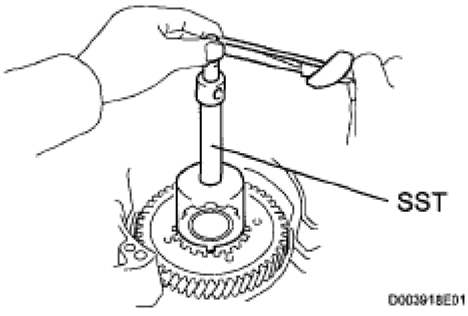

Fig. 372: Measuring Turning Torque Of Bearing

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

Used Bearing: 0.26 to 0.51 N*m (2.7 to 5.2 kgf*cm, 2.3 to 4.5 in.*lbf)

HINT:

Use a torque wrench with a fulcrum length of 160 mm (6.3 in.).

f. Tighten the nut gradually until the specified turning torque of tapered roller bearing is measured.

Torque: 350 N*m (3,569 kgf*cm, 258 ft.*lbf)

g. Using a chisel and hammer, stake the front lock washer.

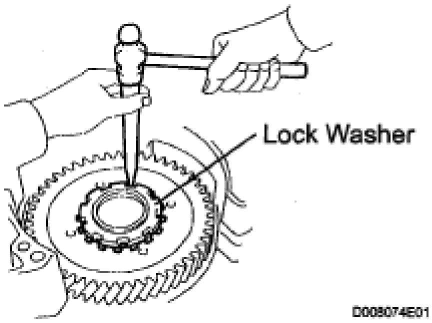

Fig. 373: Staking Front Lock Washer

17. **INSTALL INPUT SUN GEAR**
   a. Coat the 2 thrust bearings with ATF.
   b. Install the 2 thrust bearings, the bearing race and the input sun gear to the front planetary gear assembly.

NOTE:

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

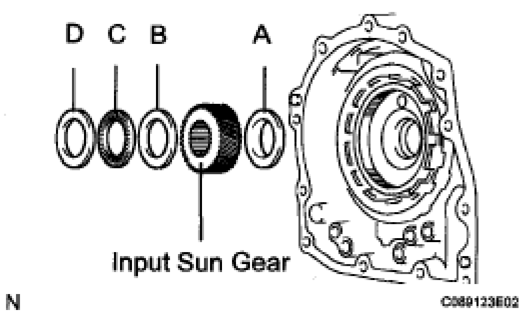

Fig. 374: Identifying Thrust Bearings, Bearing Race And Input Sun Gear

Thrust bearing and bearing race diameter: mm (in.)

THRUST BEARING AND BEARING RACE DIAMETER SPECIFICATION

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

18. **INSTALL REAR PLANETARY GEAR ASSEMBLY**
    a. install the rear planetary gear assembly to the rear planetary ring gear.

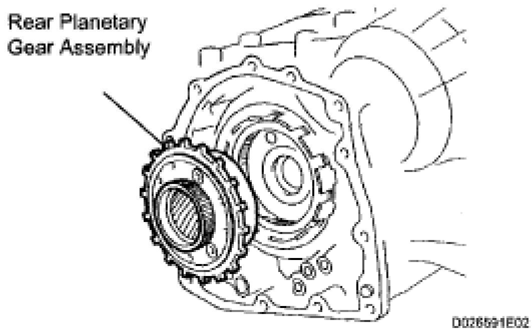

Fig. 375: Identifying Rear Planetary Gear Assembly

    b. Using a screwdriver, install the snap ring.

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

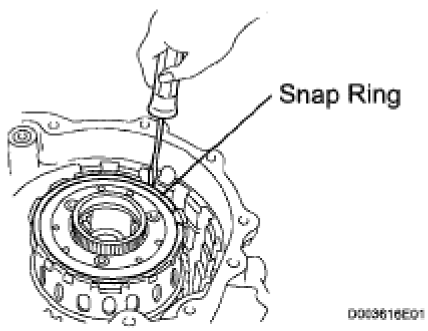

Fig. 376: Installing Snap Ring

19. **INSTALL 1ST AND REVERSE BRAKE CLUTCH DISC**
    a. Coat the 6 discs with ATF.
    b. Install the 7 plates and 6 discs.

NOTE: Make sure that the plates, discs, and flange are installed as shown in the illustration.

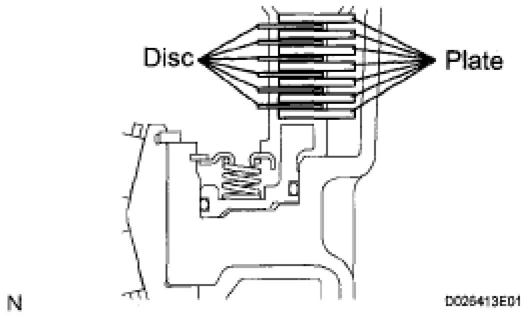

Fig. 377: Identifying Discs And Plates

20. **INSPECT PACK CLEARANCE OF FIRST AND REVERSE BRAKE**
    a. Using vernier calipers, measure the distance between the disc surface and the contact surface of the 2nd brake cylinder and transaxle case (Dimension A).
    b. Select an appropriate flange so that the pack clearance will meet the specified value.

    Pack clearance: 1.16 to 1.35 mm (0.0457 to 0.0531 in.)

    HINT:

    Piston stroke = Dimension A - Flange thickness

    Flange thickness: mm (in.)

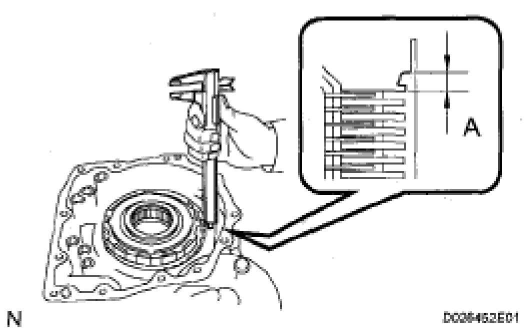

Fig. 378: Measuring Distance Between Disc/Contact Surface Of 2nd Brake Cylinder And Transaxle Case

FLANGE THICKNESS SPECIFICATION

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)

c. Install the flange.

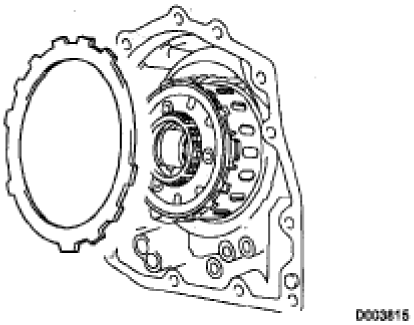

Fig. 379: Identifying Flange

21. **INSTALL SECOND BRAKE PISTON ASSEMBLY**
    a. Install the second brake piston assembly to the transaxle case.

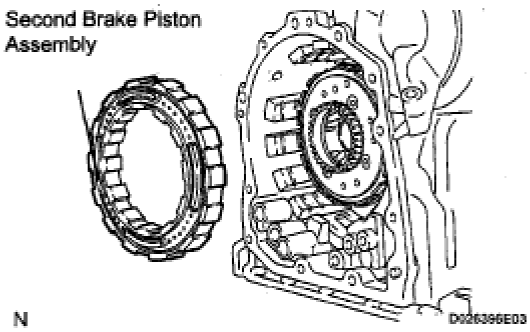

Fig. 380: Identifying Second Brake Piston Assembly

b. Install the snap ring and measure the inside diameter.

Inside diameter: Greater than 167 mm (6.57 in.)

NOTE:

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

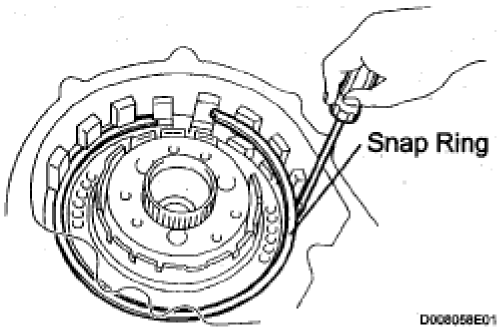

Fig. 381: Installing Snap Ring

22. **INSTALL 1-WAY CLUTCH SLEEVE OUTER**
    a. Install the 1 -way clutch sleeve outer to the 2nd brake cylinder assembly.

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

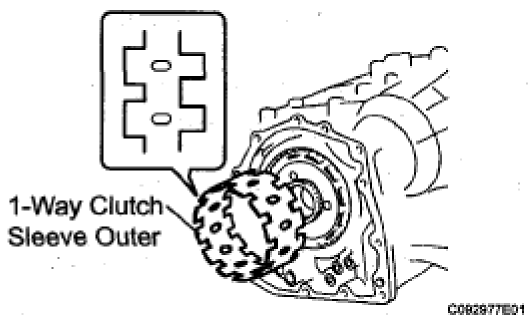

Fig. 382: Identifying 1-Way Clutch Sleeve Outer

23. **INSTALL 1-WAY CLUTCH ASSEMBLY**
    a. Install the 1-way clutch inner race to the 1-way clutch.

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

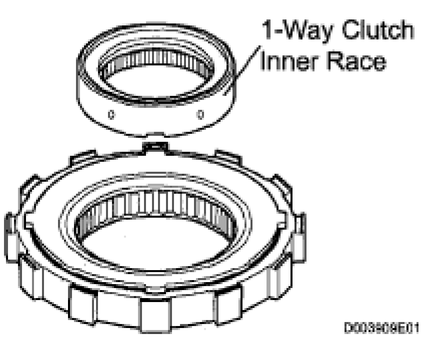

Fig. 383: Identifying 1-Way Clutch Inner Race

b. Check the rotating direction of 1-way clutch for the lock or free operation as shown in the illustration.

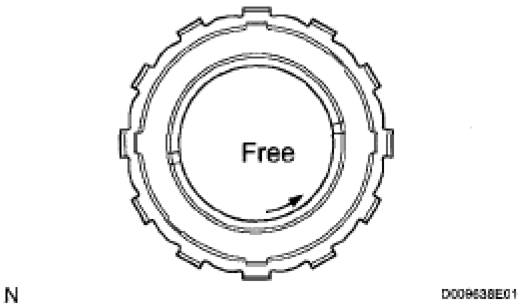

Fig. 384: Checking Rotating Direction Of 1-Way Clutch

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

Bearing diameter: mm (in.)

BEARING DIAMETER SPECIFICATION

	Inside	Outside
Bearing	53.6 (2.110)	69.4 (2.732)

NOTE: **Install the thrust bearing properly so that no-colored race will be visible.**

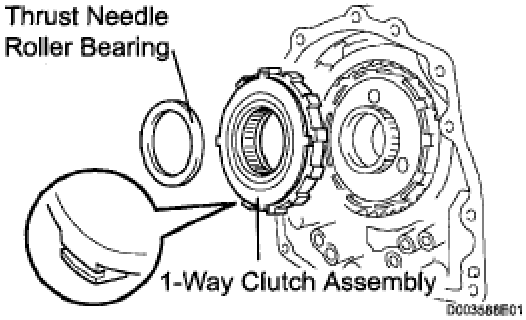

Fig. 385: Identifying Thrust Needle Roller Bearing And 1-Way Clutch Assembly

24. **INSTALL PLANETARY CARRIER THRUST WASHER NO.1**

a. Coat the planetary carrier thrust washer No. 1 with yellow petrolatum, and install the washer onto the planetary sun gear assembly.

NOTE: **After installing, confirm that the projection should be fixed firmly in the hole of the planetary sun gear assembly.**

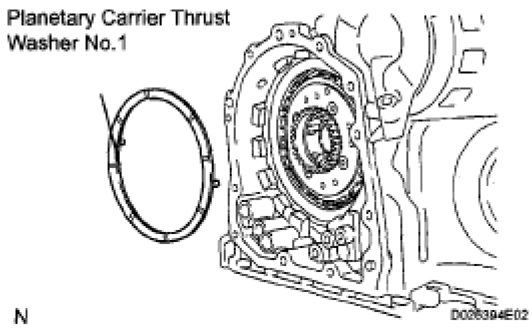

Fig. 386: Identifying Planetary Carrier Thrust Washer

25. **REMOVE REAR PLANETARY SUN GEAR ASSEMBLY**
    a. Coat the planetary carrier thrust washer No.2 with yellow petrolatum, and install the washer onto the rear planetary sun gear.

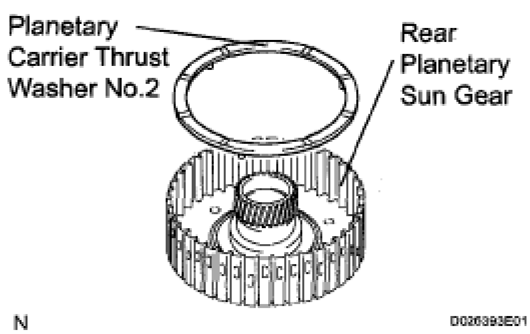

Fig. 387: Identifying Planetary Carrier Thrust Washer And Rear Planetary Sun Gear Assembly

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

Bearing diameter: mm (in.)

BEARING DIAMETER SPECIFICATION

	Inside	Outside
Race, A	33.0 (1.299)	45.4 (1.787)
Bearing, B	31.85 (1.254)	45.2 (1.78)

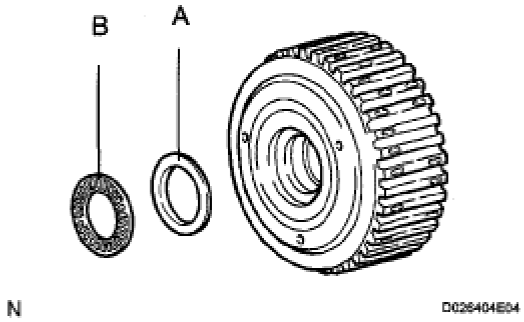

Fig. 388: Identifying Bearing And Bearing Race

c. Install the rear planetary sun gear assembly to the rear planetary gear.

NOTE: **Installing the rear planetary sun gear assembly, make sure that the B1 discs are engaged.**

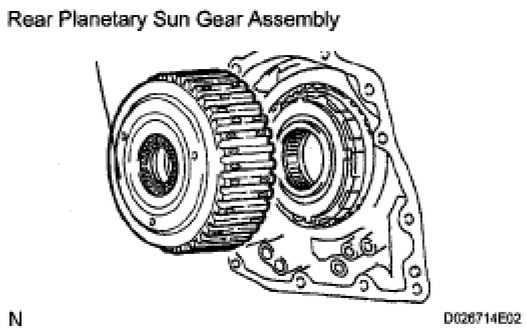

Fig. 389: Identifying Rear Planetary Sun Gear Assembly

26. **INSTALL 2ND BRAKE CLUTCH DISC**
    a. Coat the 4 discs with ATF.
    b. Install the 4 discs and 5 plates to the transaxle case.
    c. Temporarily install the snap ring.

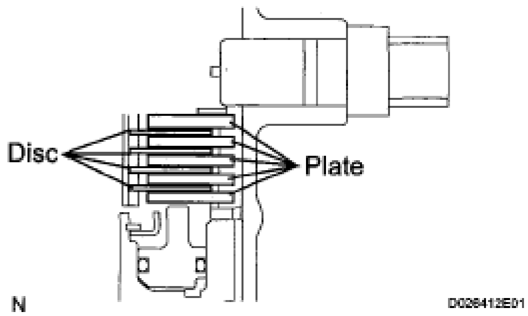

Fig. 390: Identifying Discs And Plates

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

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

Clearance: 0.62 to 0.91 mm (0.0244 to 0.0358 in.)

HINT:

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

Flange thickness: mm (in.)

FLANGE THICKNESS SPECIFICATION

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	-

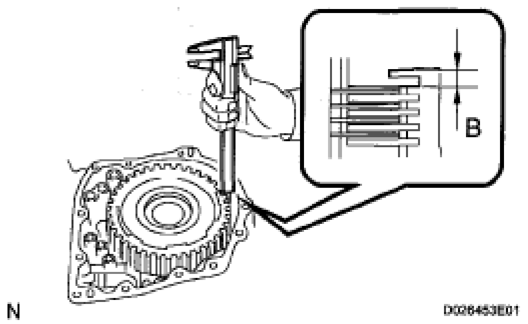

Fig. 391: Measuring Distance Between Disc Surface And Snap Ring Surface

c. Temporarily remove the snap ring, attach the selected flange and reinstall the snap ring.

NOTE: Secure the snap ring so that the ends visible through the groove of the transaxle case.

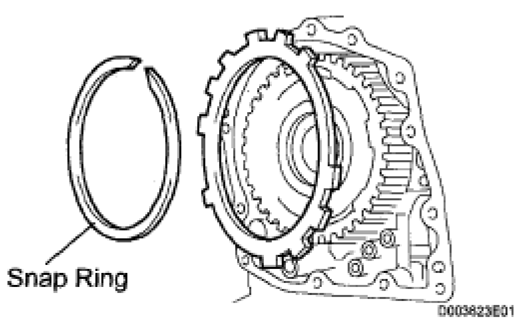

Fig. 392: Identifying Snap Ring

28. **INSTALL OVERDRIVE DIRECT CLUTCH HUB SUB-ASSEMBLY**
    a. Install the direct clutch hub to the planetary gear assembly.

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

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

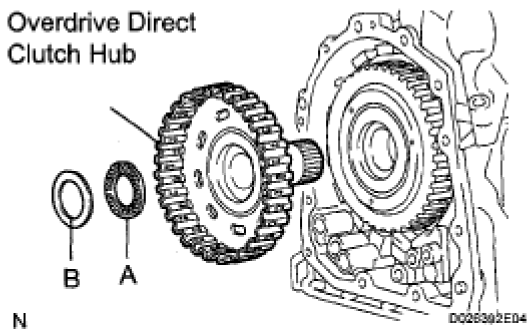

Fig. 393: Identifying Direct Clutch Hub

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

Bearing and race diameter: mm (in.)

BEARING AND RACE DIAMETER SPECIFICATION

	Inside	Outside
Bearing, A	24.7 (0.972)	39.5 (1.555)
Race, B	23.6 (0.929)	38.0 (1.496)

29. **INSTALL DIRECT CLUTCH ASSEMBLY**
    a. Coat the thrust bearing with ATF.
    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 match with the hub attached outside the rear planetary sun gear. Otherwise, the rear cover cannot be installed.

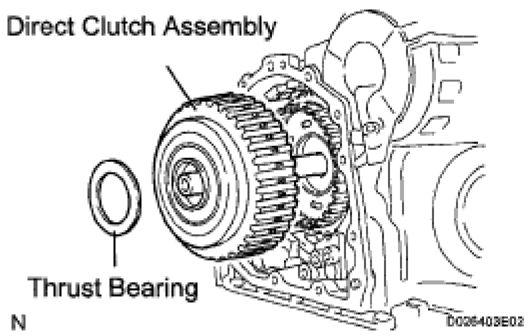

Fig. 394: Identifying Thrust Bearing And Direct Clutch Assembly

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

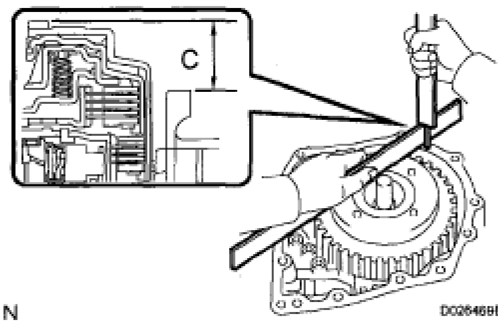

Fig. 395: Measuring Distance Between Transaxle Case And Straightedge

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

End play: 0.244 to 0.901 mm (0.0096 to 0.0355 in.)

NOTE: **Make sure that the no-colored race side is facing the direct clutch assembly.**

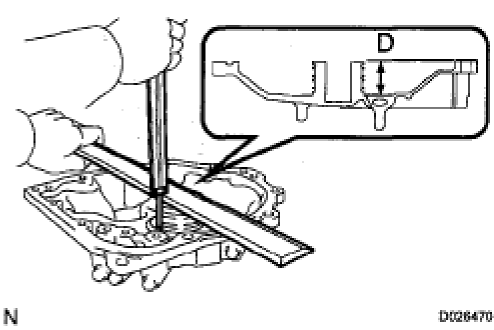

Fig. 396: Measuring Dimension

HINT:

End play = Dimension D - Dimension C

Bearing thickness and diameter: mm (in.)

BEARING THICKNESS AND DIAMETER SPECIFICATION

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

30. **INSTALL GOVERNOR APPLY GASKET NO.1**
    a. Install 3 new governor apply gaskets No.1 to the transaxle case.

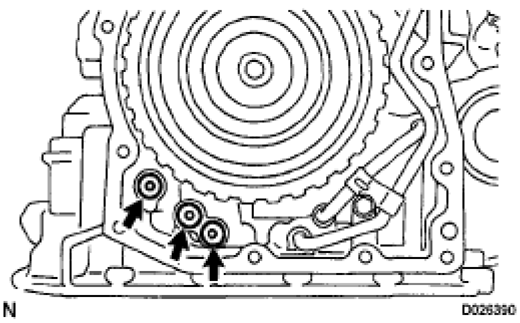

Fig. 397: Locating Governor Apply Gaskets

31. **INSTALL BRAKE APPLY TUBE**
    a. Install the clamp to the brake apply tube.

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

    b. Install the clutch apply tube.

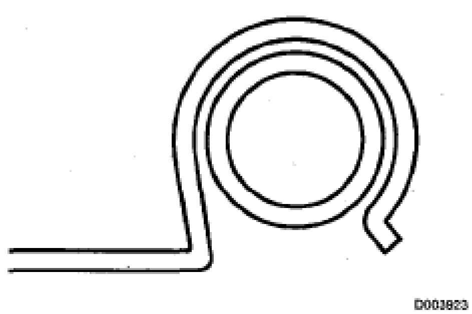

Fig. 398: Identifying Brake Apply Tube

c. Install the brake apply tube and a bolt to the transaxle case.

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

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

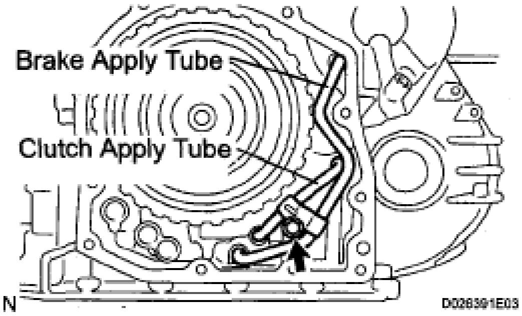

Fig. 399: Identifying Brake Apply Tube And Clutch Apply Tube

32. **INSTALL NEEDLE ROLLER BEARING**
    a. Using SST and a press, press the needle roller bearing into the transaxle rear cover.

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

Press fit depth: 20.55 to 21.25 mm (0.8091 to 0.8366 in.)

NOTE:
- **The engraved mark side of the bearing should face upward.**
- **Repeat the press fit until the specified value is obtained.**

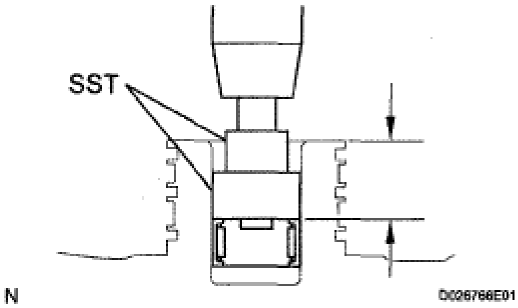

Fig. 400: Pressing Needle Roller Bearing Into Transaxle Rear Cover

b. Coat a needle roller bearing with ATF.

33. **INSTALL REAR CLUTCH OIL SEAL RING OUTER**
    a. Coat 3 new rear clutch oil seal rings with ATF, install them to the transaxle rear cover.

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

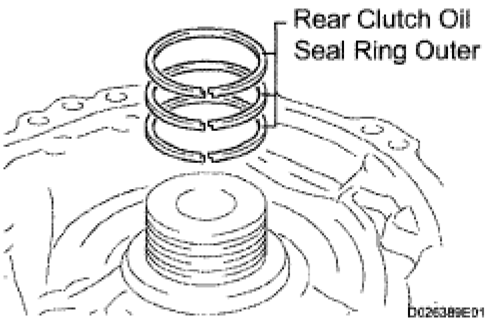

Fig. 401: Identifying Rear Clutch Oil Seal Ring Outer

34. **INSTALL TRANSAXLE CASE NO.1 PLUG**
    a. Coat 4 new O-rings with ATF.
    b. Install the 4 O-rings to the 4 transaxle case No.1 plugs.
    c. Install the 4 transaxle case No. 1 plugs to the transaxle rear cover.

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

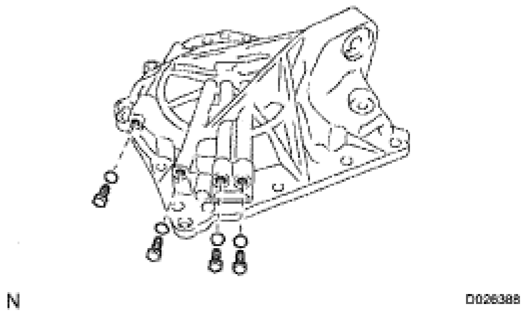

Fig. 402: Identifying O-Ring And Transaxle Case No. 1 Plugs

35. **INSTALL TRANSAXLE REAR COVER SUB-ASSEMBLY**
    a. Remove any packing material and be careful not to spill oil on the contact surfaces of the transaxle rear cover or the transaxle case.
    b. Apply FIPG to the cover.

    FIPG:

    Part No. 08826-00090, THREE BOND 1281 or equivalent.

NOTE: Make sure that the FIPG is applied in a bead (section diameter: ø 1.2) so that the entire sealing surface will be evenly sealed. The FIPG should also protrude slightly from the flange after the assembly of the parts has been completed.

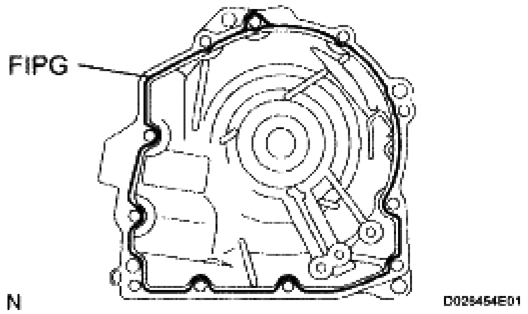

Fig. 403: Applying FIPG To Cover

c. Apply liquid sealer to the "A" bolt threads.

Sealant: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent.

d. Install the 11 bolts.

Torque: Bolt A

19 N*m (190 kgf*cm, 14 ft.*lbf)

Other bolts:

25 N*m (250 kgf*cm, 18 ft.*lbf)

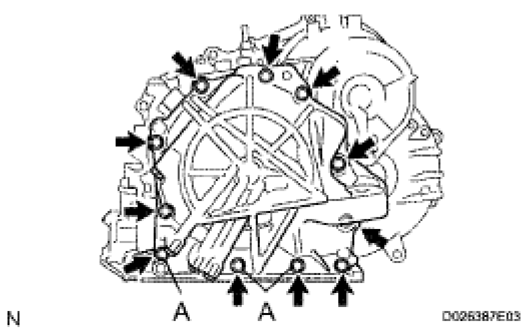

Fig. 404: Locating Transaxle Rear Cover Bolts

36. **INSTALL UNDERDRIVE CLUTCH DISC NO.2**
    a. Coat the 4 discs with ATF.
    b. Install the 4 discs, 4 plates and flange to the transaxle case.

NOTE: Be careful about the order of discs, plate and flange assembly.

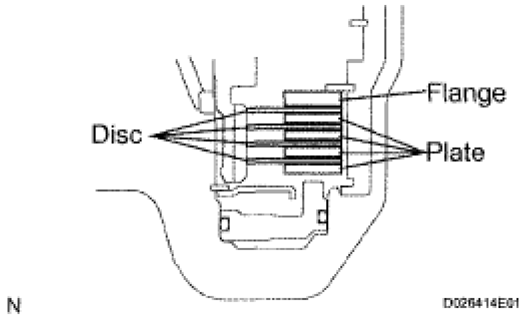

Fig. 405: Identifying Discs, Plates And Flange

c. Using a screwdriver, install the snap ring.

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

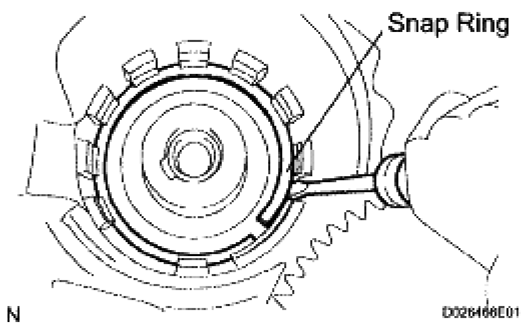

Fig. 406: Removing Snap Ring

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

a. Using a dial indicator, measure the underdrive brake pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm^2 , 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.

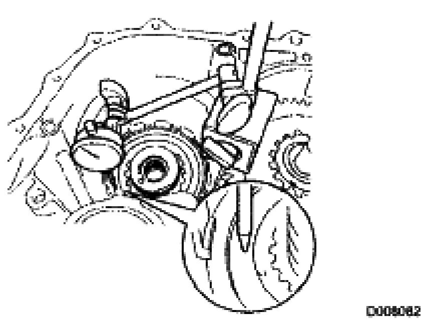

Fig. 407: Measuring Underdrive Brake Pack Clearance

Flange thickness: mm (in.)

FLANGE THICKNESS SPECIFICATION

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

b. Temporarily remove the snap ring and attach it to the flange.
c. Reinstall the snap ring.

38. **INSPECT UNDERDRIVE 1-WAY CLUTCH ASSEMBLY**
   a. Install the underdrive clutch assembly to the 1-way clutch.
   b. Rotate the underdrive clutch assembly to check the rotating direction for the lock or free operation.

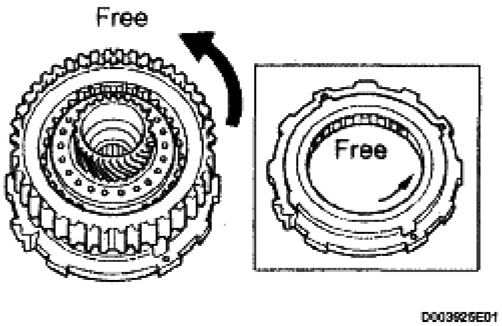

Fig. 408: Checking Free Operation

39. **INSTALL UNDERDRIVE 1-WAY CLUTCH ASSEMBLY**
   a. Install the outer race retainer to the 1-way clutch.

NOTE: **Fix the outer race retainer to the external tooth of the 1-way clutch firmly.**

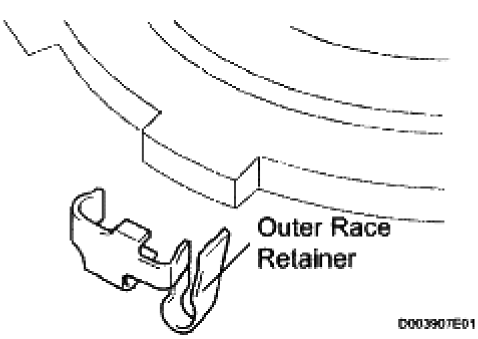

Fig. 409: Identifying Outer Race Retainer

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

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

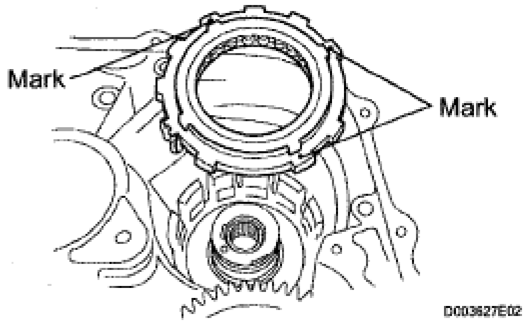

Fig. 410: Identifying Mark On 1-Way Clutch Outer Race

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

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

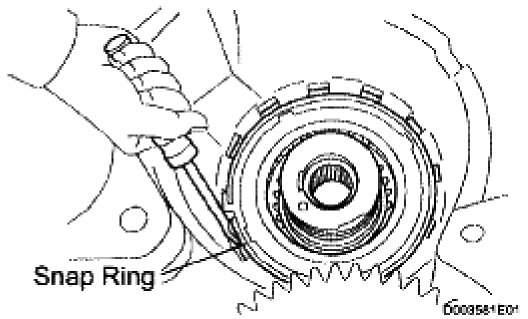

Fig. 411: Removing Snap Ring From Transaxle Case

40. **INSTALL UNDERDRIVE CLUTCH ASSEMBLY**

a. Coat the bearing and bearing race with petroleum jelly, install them onto the underdrive clutch.

Bearing and bearing race diameter: mm (in.)

BEARING AND BEARING RACE DIAMETER SPECIFICATION

	Inside	Outside
Bearing	37.73 (1.4854)	58.0 (2.2835)
Race	29.9 (1.1772)	55.5 (2.185)

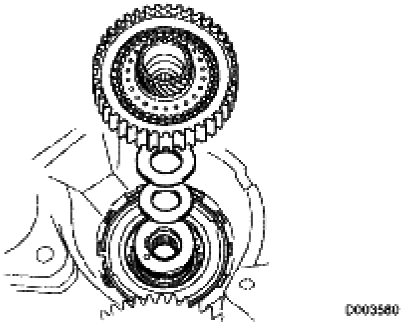

Fig. 412: Identifying Bearing And Bearing Race

b. Install the underdrive clutch assembly to the transaxle case.

NOTE: **Do not damage the oil seal when installing the underdrive clutch drum sub-assembly.**

41. **INSTALL PARKING LOCK PAWL**

a. Install the pawl pin and spring to the parking lock pawl.

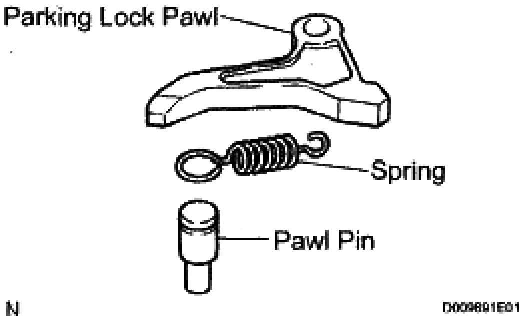

Fig. 413: Identifying Pawl Pin, Spring And Parking Lock Pawl

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

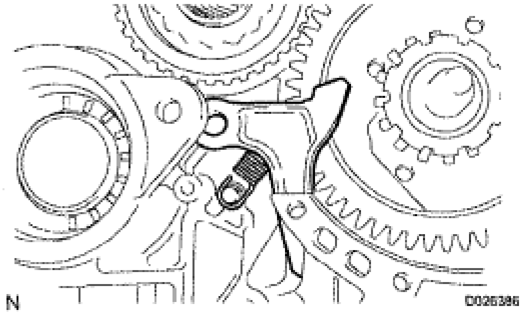

Fig. 414: Identifying Spring, Pawl Pin And Parking Lock Pawl

42. **INSTALL UNDERDRIVE PLANETARY GEAR ASSEMBLY**
   a. Install the underdrive planetary gear assembly to the transaxle case.

   NOTE: Fully engage all the discs of underdrive clutch and hub splines of the underdrive planetary gear assembly and install them securely.

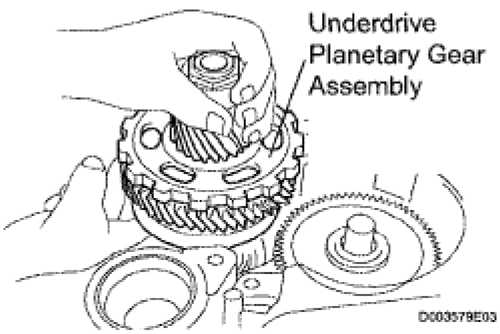

Fig. 415: Installing Underdrive Planetary Gear Assembly

   b. Install the parking lock pawl shaft.

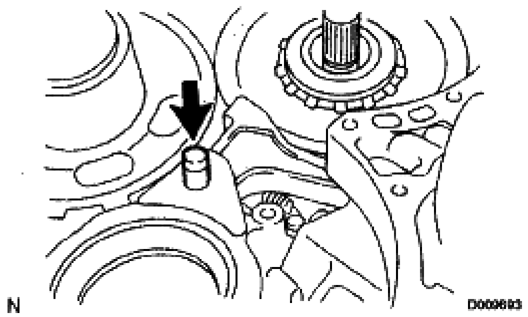

Fig. 416: Installing Parking Lock Pawl Shaft

   c. Install the pawl shaft clamp with the bolt.

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

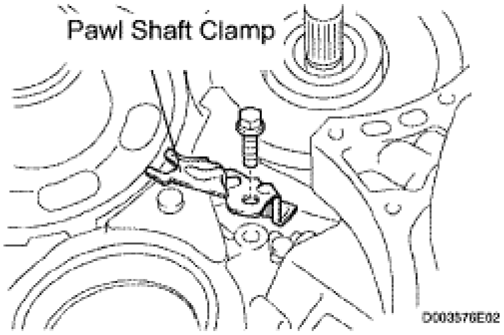

Fig. 417: Installing Pawl Shaft Clamp Bolt

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

NOTE: Record dimension E for the following process.

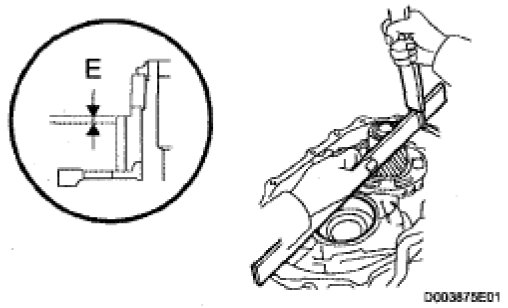

Fig. 418: Measuring Gap Between Top Of Differential Drive Pinion

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

NOTE: Record dimension F for the following process.

HINT:

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

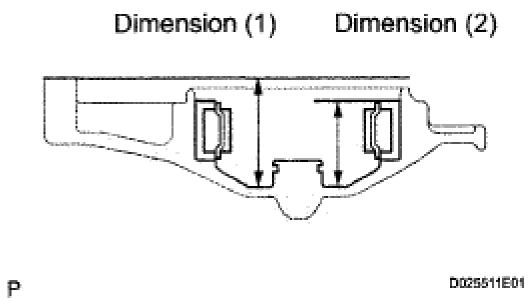

Fig. 419: Identifying Dimension (1) And Dimension (2)

43. **INSTALL MULTIPLE DISC CLUTCH HUB**

a. Install the thrust bearing race No.1 to the transaxle case while checking its direction.

Bearing race diameter: mm (in.)

BEARING RACE DIAMETER SPECIFICATION

	Inside	Outside
Bearing race	39.5 (1.555)	45.8 (1.803)

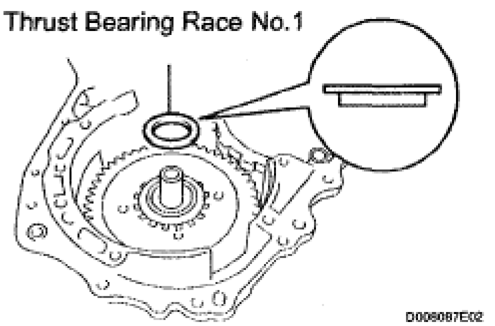

Fig. 420: Identifying Thrust Bearing Race

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

Thrust bearing and race diameter: mm (in.)

THRUST BEARING AND RACE DIAMETER SPECIFICATION

	Inside	Outside
Thrust Bearing	36.4 (1.433)	52.2 (2.055)

c. Coat the needle roller bearing with ATF.

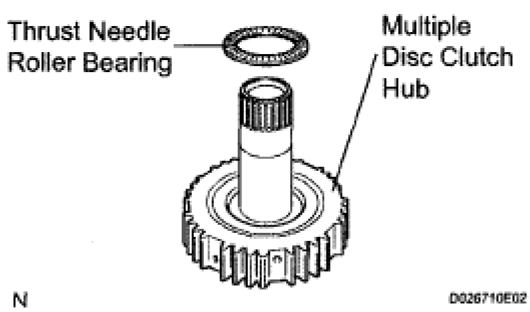

Fig. 421: Identifying Thrust Needle Roller Bearing And Multiple Disc Clutch Hub

d. Install the needle roller bearing to the multiple clutch hub.

Bearing diameter: mm (in.)

BEARING DIAMETER SPECIFICATION

	Inside	Outside
Bearing	23.6 (0.929)	44 (1.732)

e. Install the multiple clutch hub to the transaxle case.

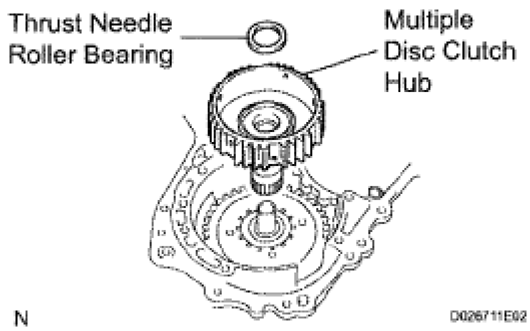

Fig. 422: Identifying Thrust Needle Roller Bearing And Multiple Disc Clutch Hub

44. **INSTALL FORWARD CLUTCH ASSEMBLY**
    a. Coat the thrust needle roller bearing with ATF.
    b. Install the thrust needle roller bearing to the forward clutch.

Thrust bearing diameter: mm (in.)

THRUST BEARING DIAMETER SPECIFICATION

	Inside	Outside
Thrust Bearing	33.58 (1.3220)	51.9 (2.043)

NOTE: **Install the thrust bearing properly so that the no-colored race or blue ink jet race will be visible.**

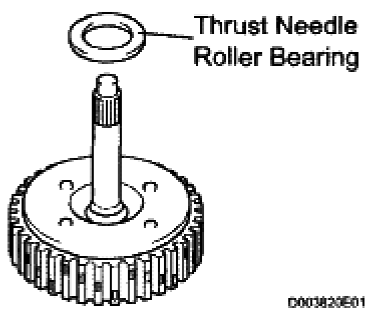

Fig. 423: Identifying Thrust Needle Roller Bearing

c. Install the forward clutch to the forward clutch assembly.

NOTE:

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

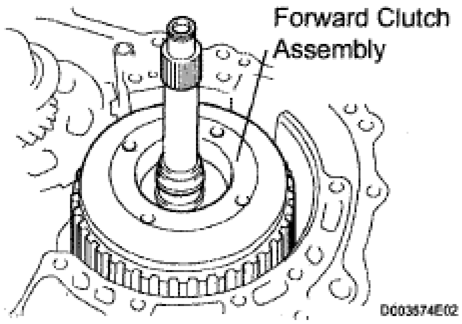

Fig. 424: Identifying Forward Clutch Assembly

45. **INSTALL OVERDRIVE BRAKE GASKET**
    a. Install 2 new overdrive brake gaskets.

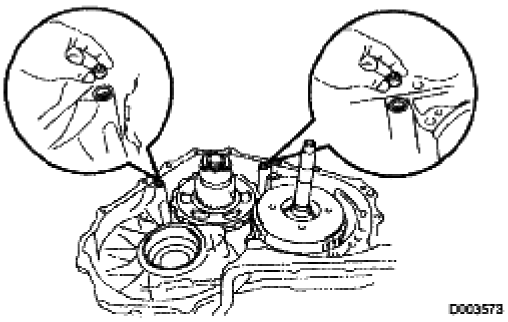

Fig. 425: Identifying Overdrive Brake Gaskets

46. **INSTALL DIFFERENTIAL GEAR ASSEMBLY**
    a. Install the differential gear assembly to the transaxle case.

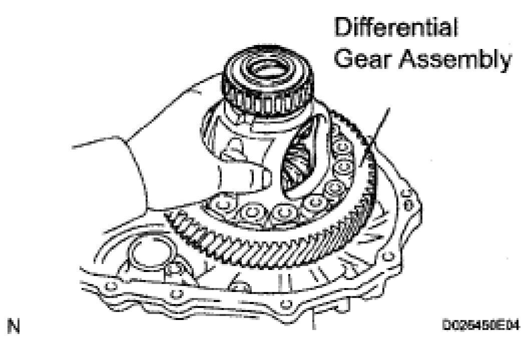

Fig. 426: Installing Differential Gear Assembly To Transaxle Case

47. **INSTALL THRUST BEARING UNDERDRIVE RACE NO.2**
    a. Install the thrust bearing underdrive race No.2 to the underdrive planetary gear assembly.

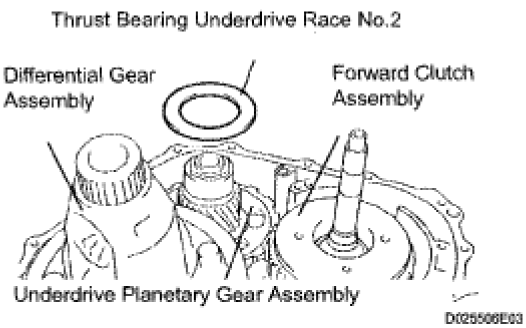

Fig. 427: Identifying Differential Gear Assembly, Forward Clutch Assembly And Underdrive Planetary Gear Assembly

48. **INSTALL THRUST NEEDLE ROLLER BEARING**
    a. Coat the thrust needle roller bearing with ATF.
    b. Calculate the end play value using the following formula and values of Dimension E and F that are measured when installing the cylindrical roller bearing and underdrive planetary gear. Select an appropriate underdrive planetary gear thrust bearing race No.2 which satisfies the specified end play value, and install the selected bearing race.

End play: 0.498 to 0.993 mm (0.01961 to 0.03909 in.)

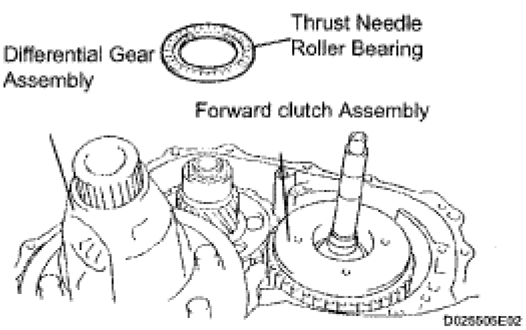

Fig. 428: Identifying Forward Clutch Assembly And Differential Gear Assembly

HINT:

End play = Dimension F - Dimension E - thrust bearing thickness 2.5 mm (0.0984 in.) - underdrive thrust bearing race No.2 thickness.

Race thickness: mm (in.)

RACE THICKNESS SPECIFICATION

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

Bearing and bearing race diameter: mm (in.)

BEARING AND BEARING RACE DIAMETER SPECIFICATION

	Inside	Outside
Bearing	57.2 (2.252)	84.96 (3.345)
Bearing race	56.4 (2.22)	83 (3.268)

49. **INSTALL OIL PUMP ASSEMBLY**
    a. Install the oil pump to the transaxle case with the 7 bolts.

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

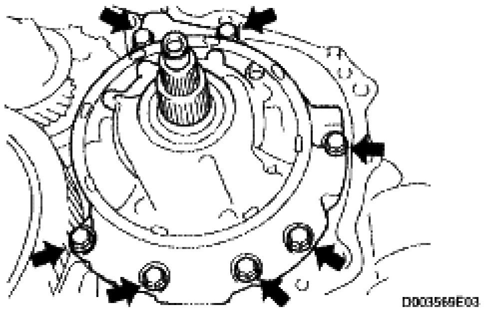

Fig. 429: Locating Transaxle Case Bolts

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

NOTE: **Confirm that the input shaft rotates smoothly with the manual operation after installing the oil pump.**

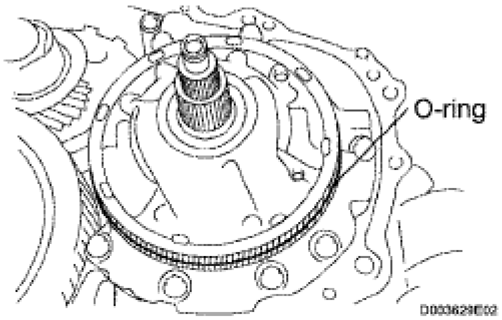

Fig. 430: Identifying O-Ring

50. **INSTALL TRANSAXLE HOUSING**
    a. Remove any packing material and be careful not to spill oil on the contact surface of the transaxle case or transaxle housing.
    b. Apply FIPG to the transaxle case.

FIPG: Part No. 08826-00090, THREE BOND 1281 or equivalent

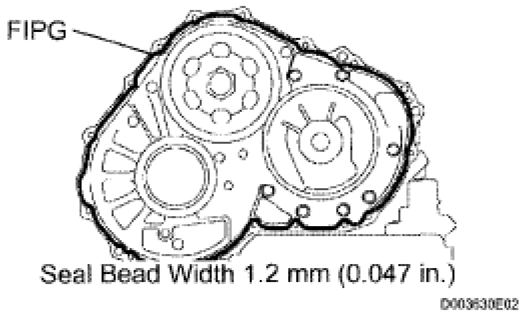

Fig. 431: Identifying FIPG On Transaxle Housing

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

Torque: Bolt A

22 N*m (225 kgf*cm, 16 ft.*lbf) Bolt B

29 N*m (300 kgf*cm, 22 ft.*lbf) Bolt C

29 N*m (295 kgf*cm, 21 ft.*lbf) Bolt D

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

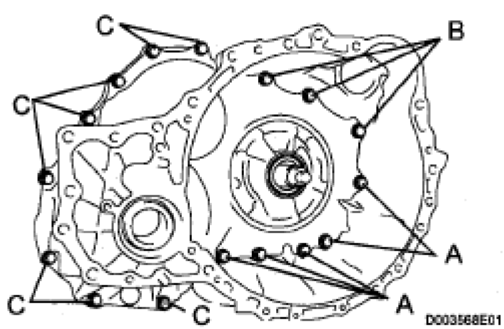

Fig. 432: Identifying Transaxle Housing Bolts

HINT:

Apply seal packing or equivalent to bolts A and D.

Seal packing: THREE BOND 2403 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.)

Bolt D: 72 mm (2.835 in.)

NOTE: Tighten the bolts within 10 minutes of sealant application.

51. **INSPECT INPUT SHAFT END PLAY**
    a. Using a dial indicator, measure the input shaft end play.

    End play: 0.262 to 1.249 mm (0.0100 to 0.0494 in.)

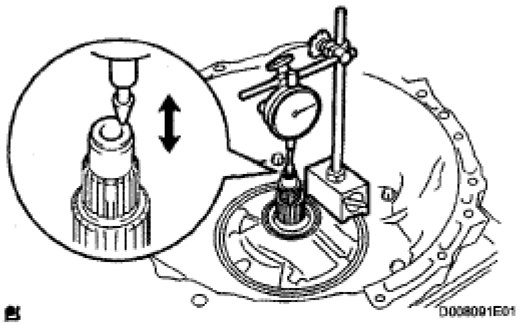

Fig. 433: Measuring Input Shaft End Play

52. **FIX AUTOMATIC TRANSAXLE ASSEMBLY**
    a. Fix the transaxle assembly.

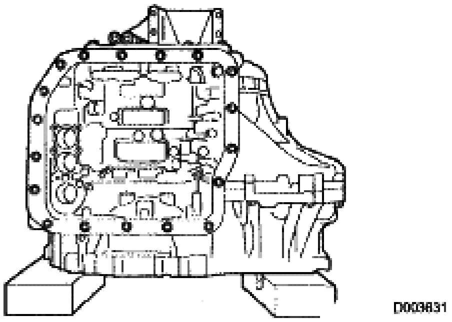

Fig. 434: Identifying Automatic Transaxle Assembly

53. **INSTALL MANUAL VALVE LEVER SHAFT OIL SEAL**
    a. Coat a new oil seal with MP grease.
    b. Install the oil seal to the transaxle case.

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

Oil seal installation depth: 0 +- 0.5 mm (0 +- 0.197 in.)

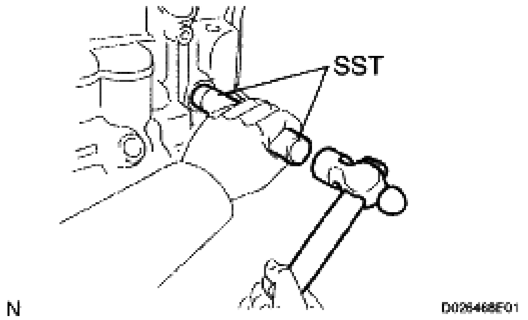

Fig. 435: Tapping Oil Seal To Transaxle Case

54. **INSTALL PARKING LOCK ROD SUB-ASSEMBLY**
    a. Install the parking lock rod to the manual valve lever.

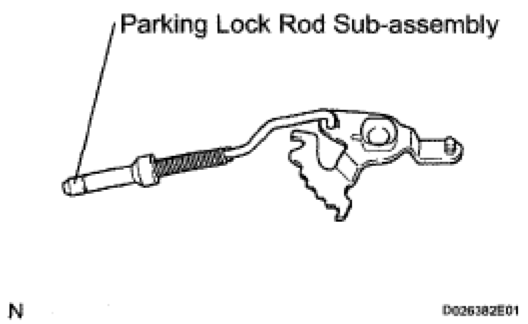

Fig. 436: Identifying Parking Lock Rod Sub-Assembly

55. **INSTALL MANUAL VALVE LEVER SUB-ASSEMBLY**
    a. Install a new spacer and manual valve lever shaft to the transaxle case.

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

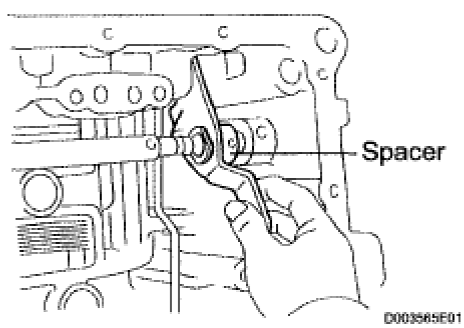

Fig. 437: Installing Manual Valve Lever Sub-Assembly

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

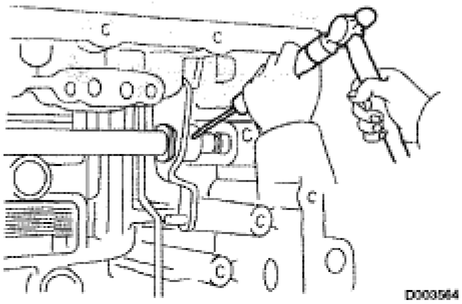

Fig. 438: Tapping Pin

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

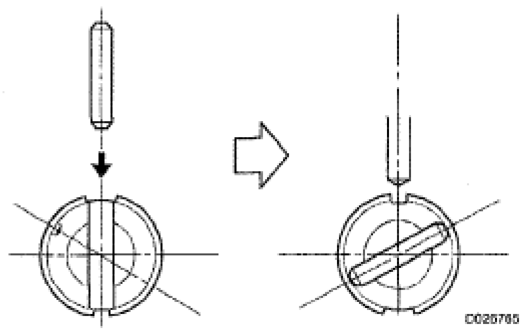

Fig. 439: Turning Spacer And Lever Shaft

56. **INSTALL MANUAL VALVE LEVER SHAFT RETAINER SPRING**
    a. Using needle-nose pliers, install the retainer spring.

NOTE: Hang the spring on the shaft firmly.

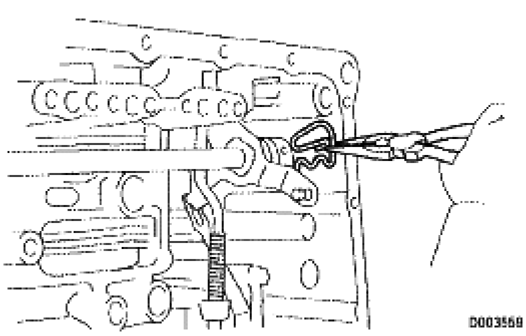

Fig. 440: Removing Manual Valve Lever Shaft Retainer Spring

57. **INSTALL PARKING LOCK PAWL BRACKET**

a. Install the parking lock pawl bracket with the 2 bolts.

Torque: 20 N*m (205 kgf*cm, 15 ft.*lbf)

Bolt length: 25 mm (0.984 in.)

NOTE: **Make sure that the parking rod is placed between the parking pawl and the guide of the parking bracket when the parking bracket is installed.**

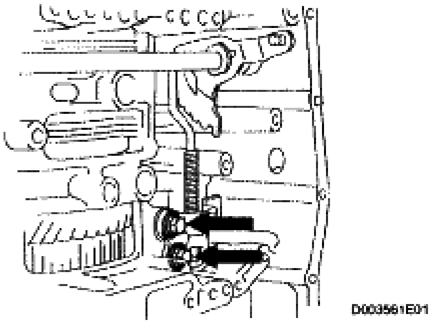

Fig. 441: Locating Parking Lock Pawl Bracket And Bolts

58. **INSTALL MANUAL DETENT SPRING SUB-ASSEMBLY**

a. Install the manual detent spring and cover with the 2 bolts.

NOTE: **Make sure to install the manual detent spring and cover in this order.**

HINT:

Tighten bolt A first, and then bolt B.

Torque: Bolt A

20 N*m (205 kgf*cm, 15 ft.*lbf)

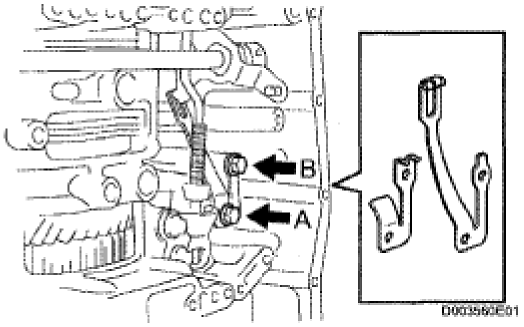

Fig. 442: Locating Manual Detent Spring And Cover Bolts

Bolt B 12 N*m (120 kgf*cm, 9 ft.*lbf)

Bolt length:

Bolt A: 27 mm (1.063 in.)

Bolt B: 16 mm (0.630 in.)

59. **INSTALL B-3 ACCUMULATOR PISTON**
    a. Coat a new O-ring with ATF, install it to the B-3 accumulator piston.

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

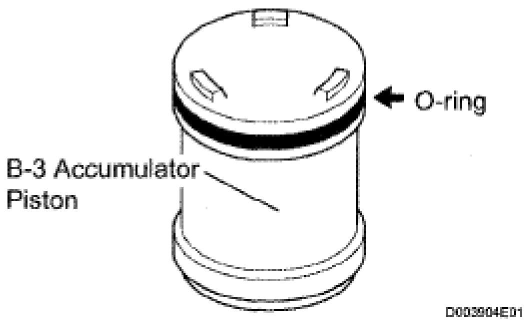

Fig. 443: Locating O-Ring And B-3 Accumulator Piston

    b. Coat the piston with ATF, install it to the transaxle case.

NOTE: **Install the springs to each accumulator piston, checking the identification color or each spring.**

Accumulator spring:

B-3 ACCUMULATOR SPRING FREE LENGTH OUTER DIAMETER SPECIFICATION

Free length Outer diameter mm (in.)	Color
Inner 62.00 (2.4409)/ 15.50 (0.610)	Purple
Outer 74.23 (2.9224) / 21.70 (0.854)	Purple

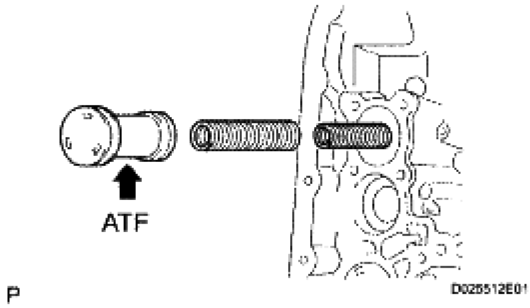

Fig. 444: Locating Piston With ATF

60. **INSTALL REVERSE CLUTCH ACCUMULATOR PISTON**

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

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

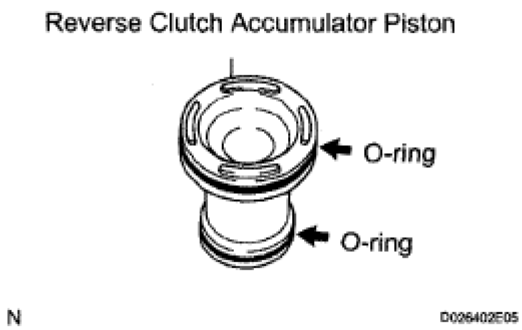

Fig. 445: Locating Reverse Clutch Accumulator Piston O-Rings

b. Coat the piston with ATF, install it to the transaxle case.

NOTE: **Install the springs to each accumulator piston, checking the identification color or each spring.**

Accumulator spring:

REVERSE CLUTCH ACCUMULATOR SPRING FREE LENGTH OUTER DIAMETER SPECIFICATION

Free length Outer diameter mm (in.)	Color
60.96 (2.3999)/ 14.10 (0.555)	Yellow

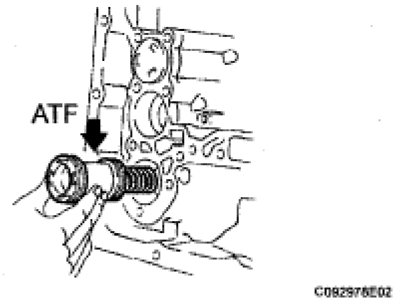

Fig. 446: Installing Reverse Clutch Accumulator Piston

61. **INSTALL C-3 ACCUMULATOR PISTON**
    a. Coat a new O-ring with ATF, install it to the C-3 accumulator piston.

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

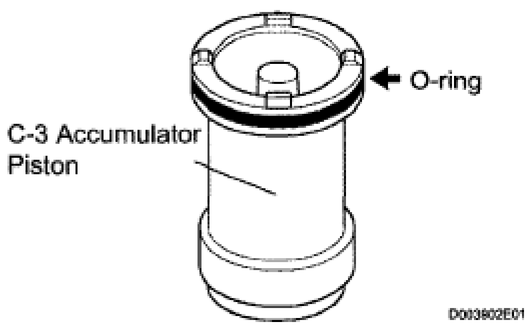

Fig. 447: Locating O-Ring And C-3 Accumulator Piston

b. Coat the piston with ATF, install it to the transaxle case.

NOTE: **Install the springs to each accumulator piston, checking the identification color or each spring.**

Accumulator spring:

C-3 ACCUMULATOR SPRING FREE LENGTH OUTER DIAMETER SPECIFICATION

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

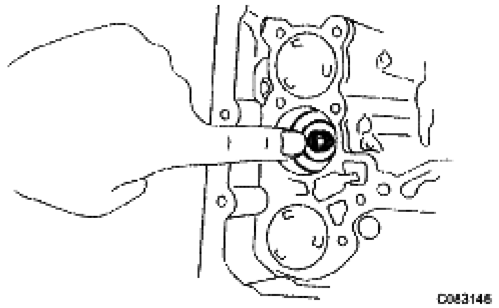

Fig. 448: Installing C-3 Accumulator Piston To Transaxle Case

c. Install the spring to the C-3 accumulator piston.

NOTE: Install the springs to each accumulator piston, checking the identification color or each spring.

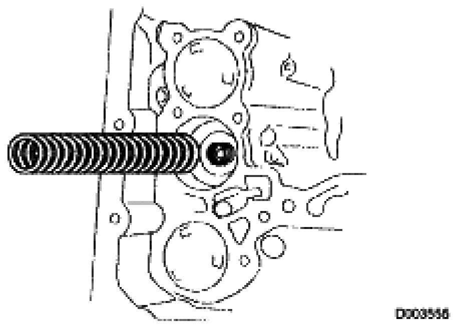

Fig. 449: Identifying Spring And C-3 Accumulator Piston

62. **INSTALL CHECK BALL BODY**
    a. Coat the check ball body with ATF.
    b. Install the check ball body and spring.

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

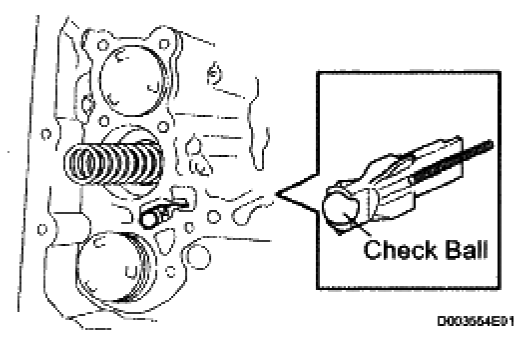

Fig. 450: Identifying Check Ball Body And Spring

63. **INSTALL BRAKE DRUM GASKET**
   a. Coat a new brake drum gasket with ATF, install it to the transaxle case.

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

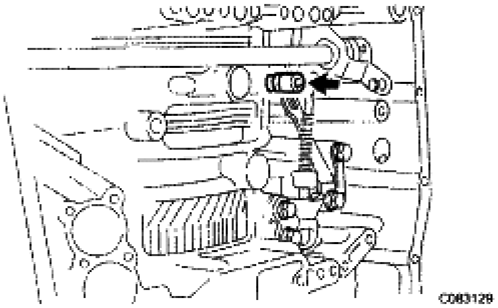

Fig. 451: Locating Brake Drum Gasket

64. **INSTALL TRANSAXLE CASE 2ND BRAKE GASKET**
   a. Coat a new transaxle case 2nd brake gasket with ATF, and install it to the transaxle case.

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

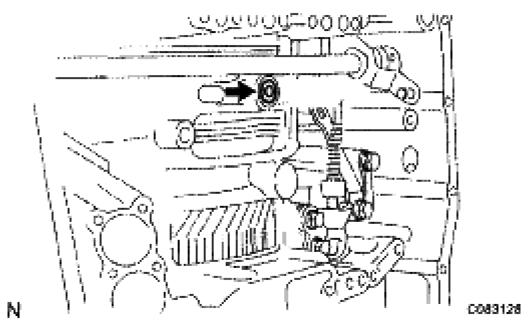

Fig. 452: Locating Transaxle Case 2nd Brake Gasket

65. **INSTALL GOVERNOR APPLY GASKET NO.1**
   a. Coat a new governor apply gasket No.1 with ATF, and install it to the transaxle case.

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

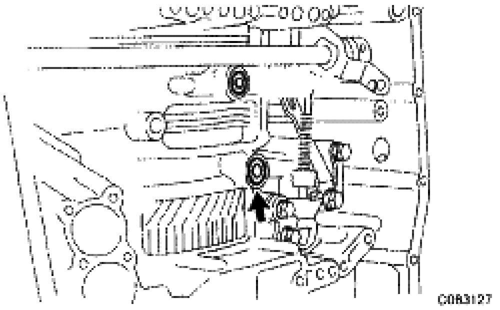

Fig. 453: Locating Governor Apply Gasket No.1

66. **INSTALL TRANSMISSION WIRE**
   a. Coat a new O-ring with ATF, and install it to the transmission wire.

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

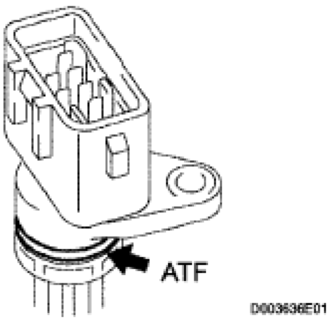

Fig. 454: Locating O-Ring With ATF

   b. Install the transmission wire retaining bolt.

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

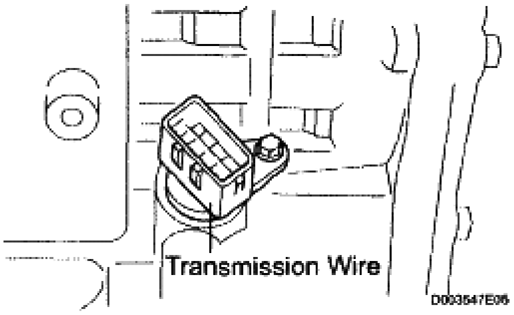

Fig. 455: Locating Transmission Wire Retaining Bolt

67. **CONNECT TRANSMISSION WIRE**

a. Coat an 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 7 solenoid connectors.

NOTE:

- **Connect the connectors A, B, C, D, E, F, G, in the order from shortest to longest.**
- **Apply ATF to the bolt.**

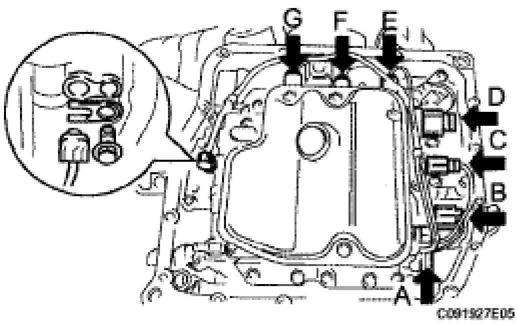

Fig. 456: Locating Solenoid Connectors

68. **INSTALL TRANSMISSION VALVE BODY ASSEMBLY**

a. While positioning the manual valve lever position, install the valve body to the transaxle case with the 17 bolts.

Torque: 11 N*m (110 kgf*cm, 8 ft.*lbf)

Bolt length:

Bolt A: 41 mm (1.614 in.)

Bolt B: 57 mm (2.244 in.)

Bolt C: 25 mm (0.984 in.)

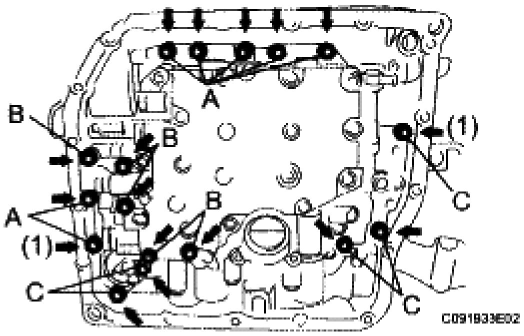

Fig. 457: Locating Transaxle Case Bolts

NOTE:

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

69. **INSTALL VALVE BODY OIL STRAINER ASSEMBLY**
    a. Coat a new O-ring with ATF and install it to the oil strainer.

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

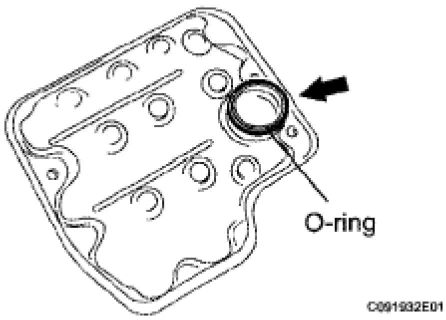

Fig. 458: Locating O-Ring

b. Install the oil strainer and 3 bolts to the valve body.

Torque: 11 N*m (110 kgf*cm, 8 ft.*lbf)

NOTE: **Apply ATF to the bolts.**

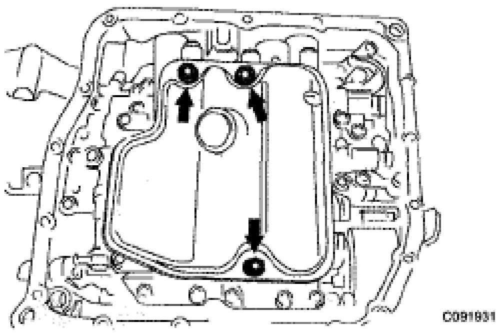

Fig. 459: Locating Oil Strainer Bolts

70. **INSTALL AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY**
   a. Install the 2 magnets to the oil pan.
   b. Apply seal packing or equivalent to new 18 bolts.

   Seal packing: THREE BOND 2430 or equivalent

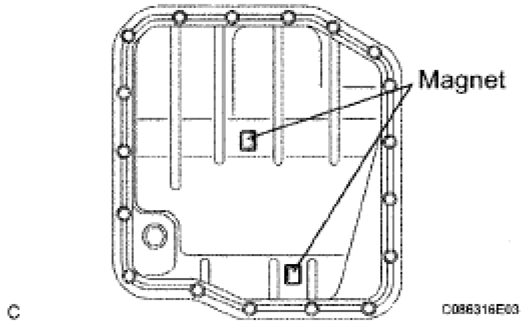

Fig. 460: Identifying Magnets In Oil Pan

   c. Install the oil pan and new oil pan gasket to the transaxle case with the 18 bolts.

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

NOTE:

- **Tighten the bolts within 10 minutes of sealant application.**
- **Completely remove any oil or grease from the contact surface of the transaxle case and the oil pan with the gasket before installing the oil pan to the case.**

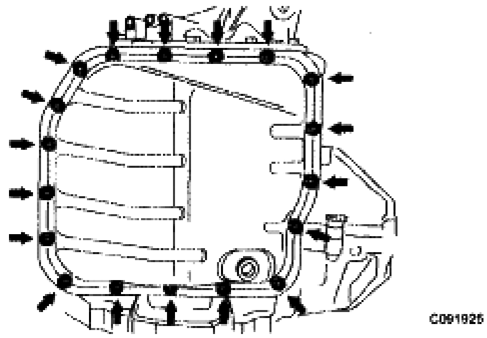

Fig. 461: Locating Oil Pan Bolts

71. **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)

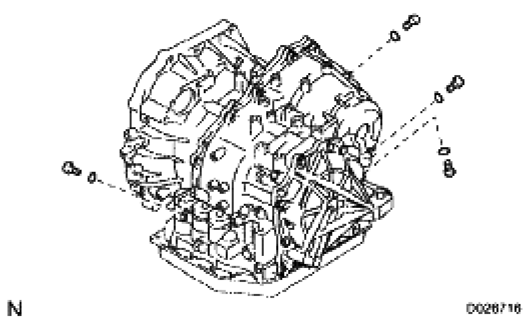

Fig. 462: Identifying O-Rings And Transaxle Case No.1 Plugs

72. **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: 11.0 N*m (115 kgf*cm, 8 ft.*lbf)

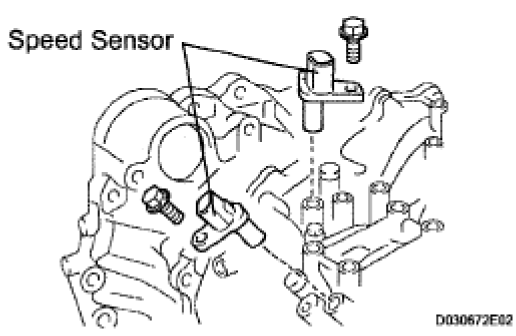

Fig. 463: Identifying Speed Sensor

73. **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)

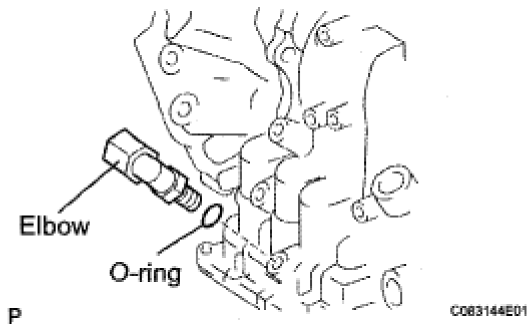

Fig. 464: Identifying O-Ring And Elbow

74. **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: 25 N*m (255 kgf*cm, 18 ft.*lbf)

75. **INSTALL BREATHER PLUG HOSE**
    a. Install the breather plug hose to the transaxle case firmly.

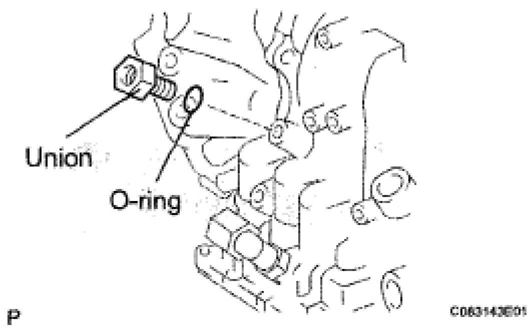

Fig. 465: Identifying O-Ring And Union

76. **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)

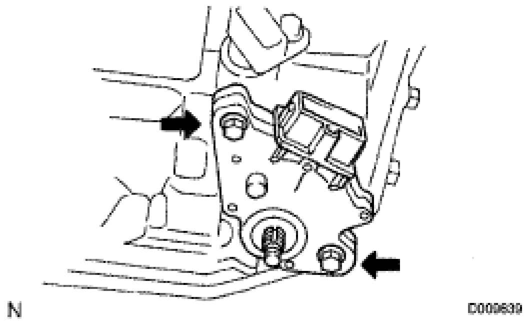

Fig. 466: Locating Park/Neutral Position Switch Bolts

c. Temporarily install the control shaft lever.

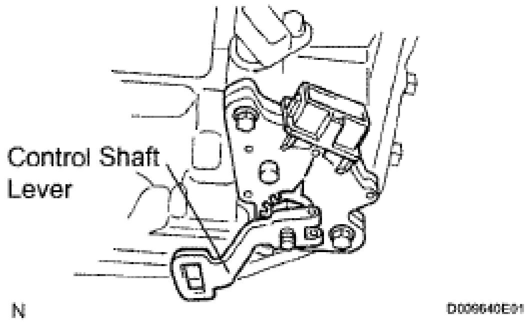

Fig. 467: Identifying Control Shaft Lever

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

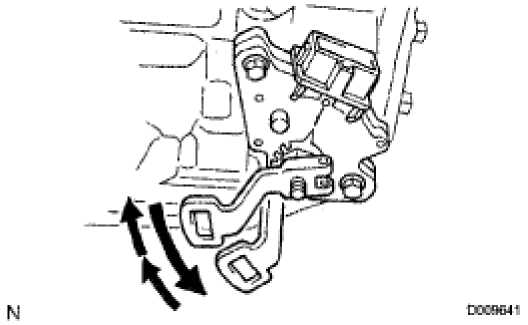

Fig. 468: Turning Lever Counterclockwise

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)

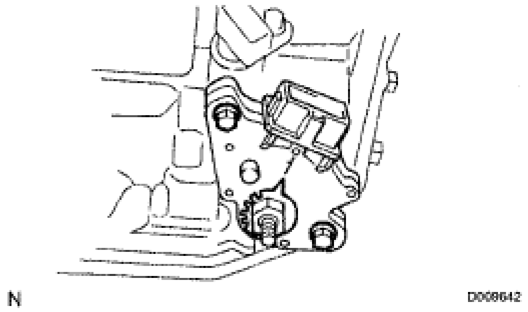

Fig. 469: Aligning Groove With Neutral Basic Line

h. Using a screwdriver, stake the nut with the nut stopper.

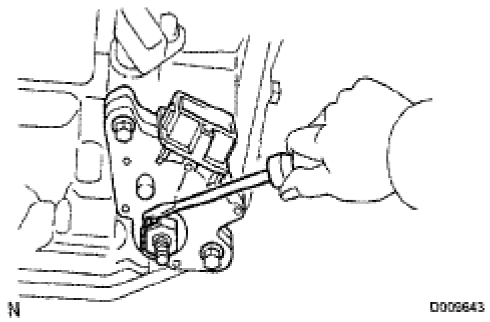

Fig. 470: Tapping Lock Nut

i. Install the control shaft lever, washer and nut.

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

77. **INSTALL SPEEDOMETER DRIVEN HOLE (ATM) COVER SUB-ASSEMBLY**
    a. Coat a new O-ring with ATF and install it to the speedometer driven hole cover.
    b. Install the bolt and speedometer driven hole cover sub assembly to the transaxle assembly.

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

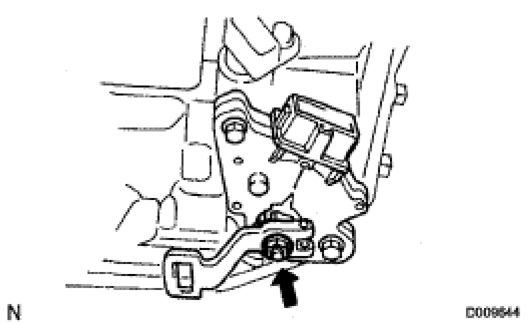

Fig. 471: Locating Control Shaft Lever With Bolt

OIL PUMP

COMPONENTS

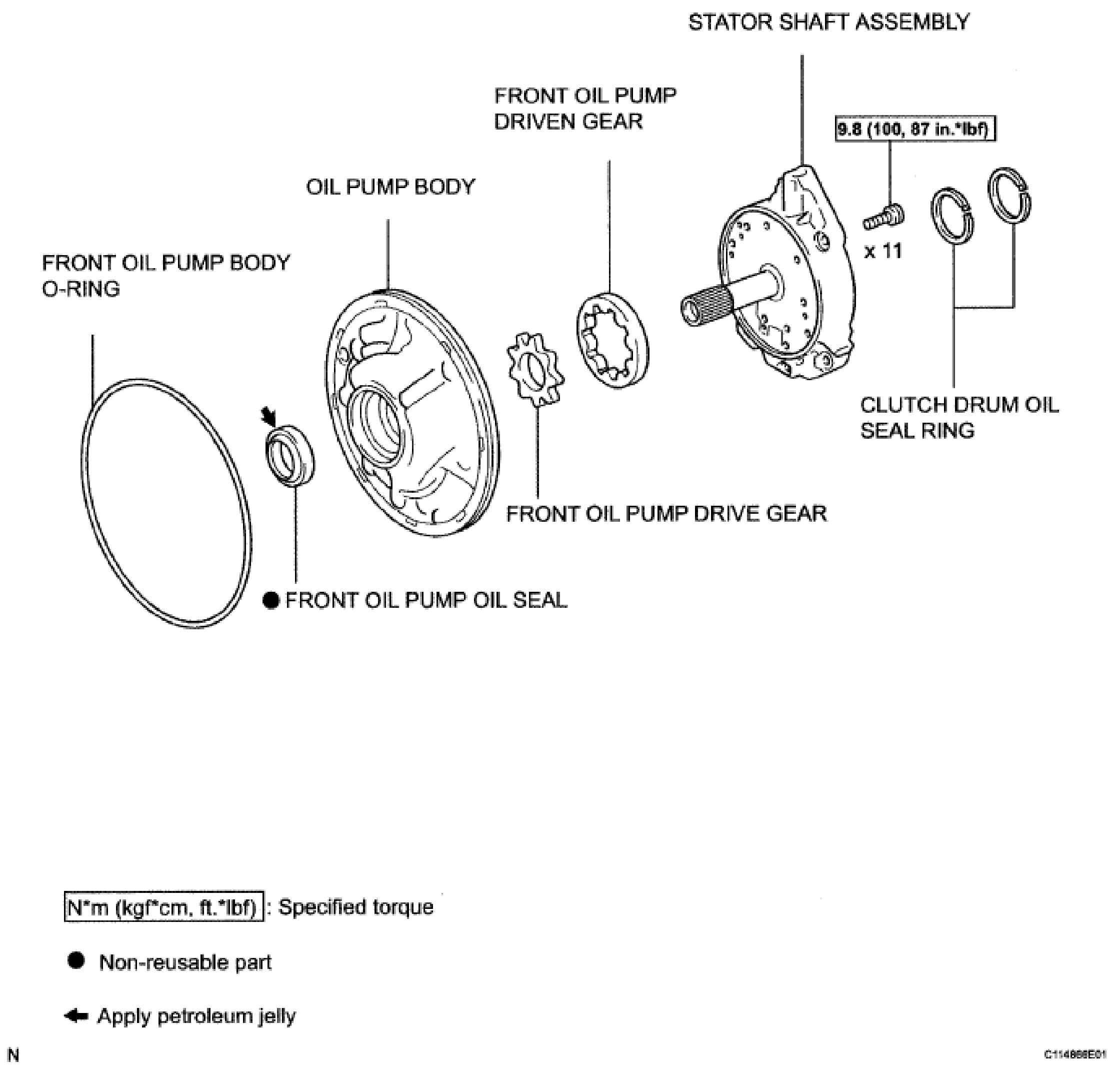

Fig. 472: Exploded View Of Oil Pump Components With Torque Specification

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.

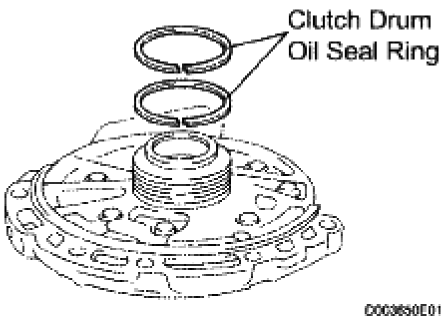

Fig. 473: Identifying Clutch Drum Oil Seal Rings

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**)

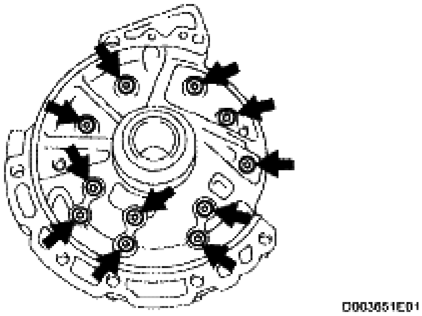

Fig. 474: Locating Stator Shaft With Bolts

5. **REMOVE FRONT OIL PUMP DRIVE GEAR**
   a. Remove the front oil pump drive gear.

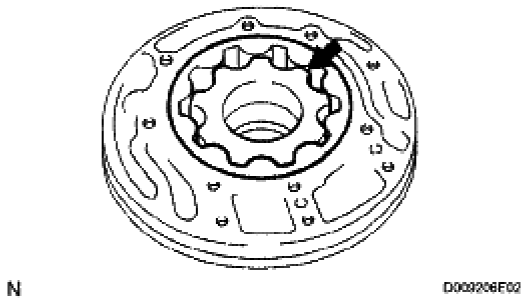

Fig. 475: Locating Front Oil Pump Drive Gear

6. **REMOVE FRONT OIL PUMP DRIVEN GEAR**

a. Remove the front oil pump driven gear.

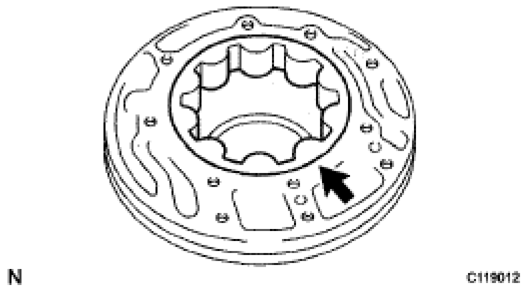

Fig. 476: Locating Front Oil Pump Driven Gear

7. **REMOVE FRONT OIL PUMP BODY O-RING**
    a. Using a screwdriver, remove the O-ring.

    HINT:

    Tape the screwdriver before use.

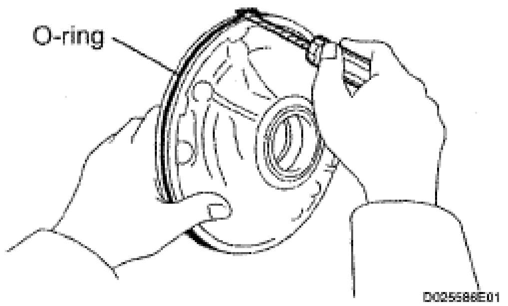

Fig. 477: Removing O-Ring

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

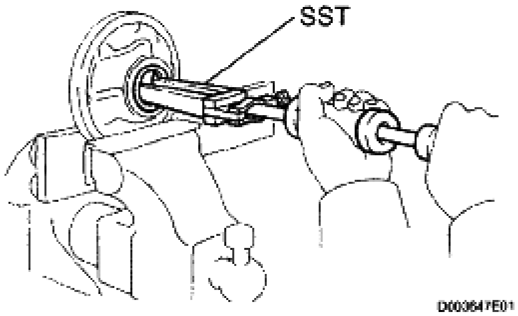

Fig. 478: Removing Oil Seal From Oil Pump Body

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.

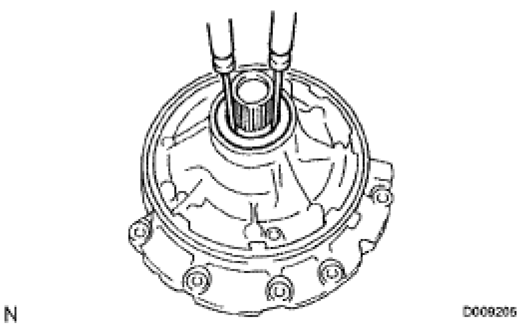

Fig. 479: Turning Drive Gear With Screwdrivers

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.)

   If the body clearance is greater than the maximum, replace the oil pump body sub-assembly.

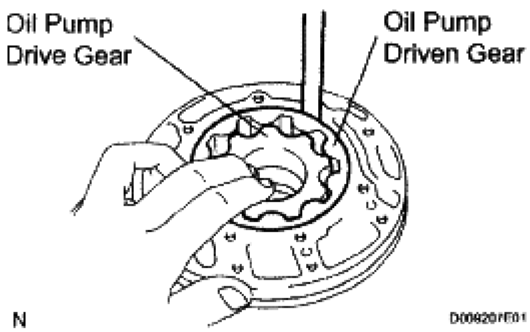

Fig. 480: Inspecting Clearance Of Oil Pump Assembly

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.

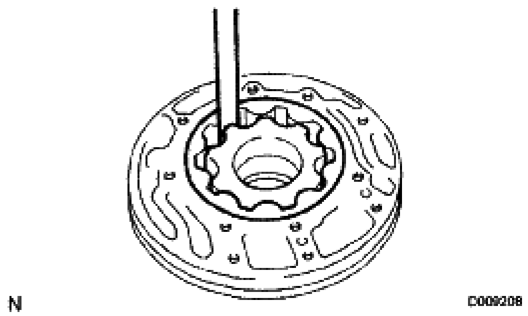

Fig. 481: Measuring Tip Clearance Between Driven Gear Teeth And Drive Gear Teeth

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.)

Drive gear thickness: mm (in.)

DRIVE GEAR THICKNESS SPECIFICATION

Mark	Thickness
A	11.690 to 11.699 (0.4602 to 0.4606)
B	11.700 to 11.709 (0.4606 to 0.4610)
C	11.710 to 11.720 (0.4610 to 0.4614)
D	11.721 to 11.730 (0.4615 to 0.4618)
E	11.731 to 11.740 (0.4619 to 0.4622)

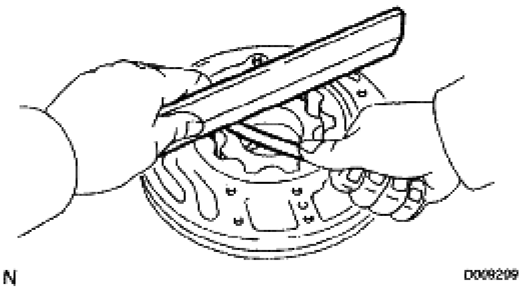

Fig. 482: Measuring Side Clearance Of Both Gears

Driven gear thickness: mm (in.)

DRIVEN GEAR THICKNESS SPECIFICATION

Mark	Thickness
A	11.690 to 11.699 (0.4602 to 0.4606)
B	11.700 to 11.709 (0.4606 to 0.4610)
C	11.710 to 11.720 (0.4610 to 0.4614)
D	11.721 to 11.730 (0.4615 to 0.4618)
E	11.731 to 11.740 (0.4619 to 0.4622)

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.

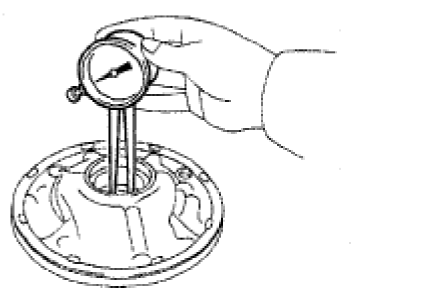

Fig. 483: Measuring Inside Diameter Of Oil Pump Body Bushing

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.

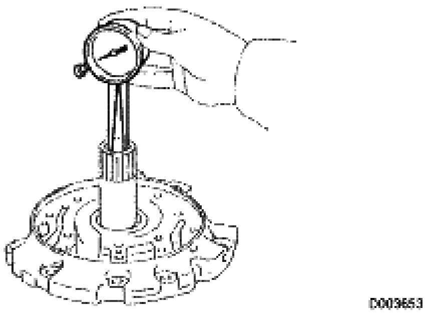

Fig. 484: Measuring Inside Diameter Of Stator Shaft

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.

   b. Coat the lip of the oil seal with MP grease.

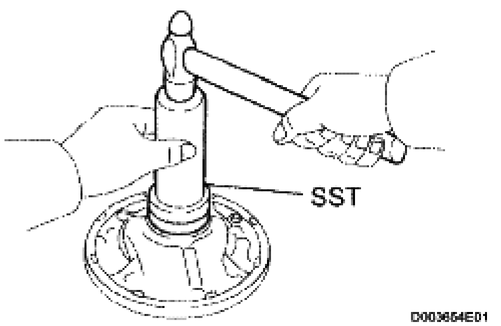

Fig. 485: Tapping Oil Seal To Oil Pump Body

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.**

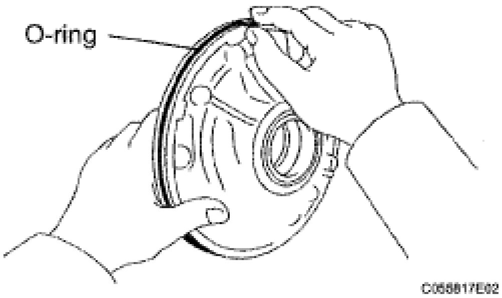

Fig. 486: Identifying O-Ring With ATF

3. **INSTALL FRONT OIL PUMP DRIVEN GEAR**
   a. Goat the front oil pump driven gear with ATF, and install it to the oil pump body with the marked side facing upward.

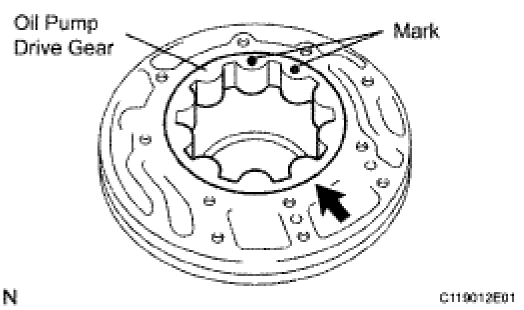

Fig. 487: Identifying Mark On Front Oil Pump Driven Gear

4. **INSTALL FRONT OIL PUMP DRIVE GEAR**
   a. Coat the front oil pump drive gear with ATF, and install it to the oil pump body with the marked side facing upward.

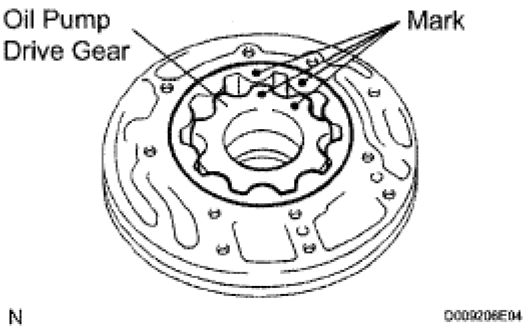

Fig. 488: Identifying Oil Pump Drive Gear Marks

5. **INSTALL STATOR SHAFT ASSEMBLY**
   a. Set the stator shaft and align it with each bolt hole.
   b. Using a "Torx" socket (T30), install the 11 bolts.

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

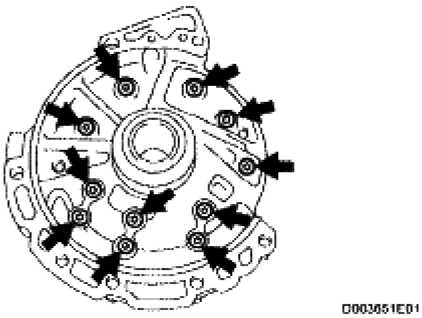

Fig. 489: Locating Stator Shaft With Bolts

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**)

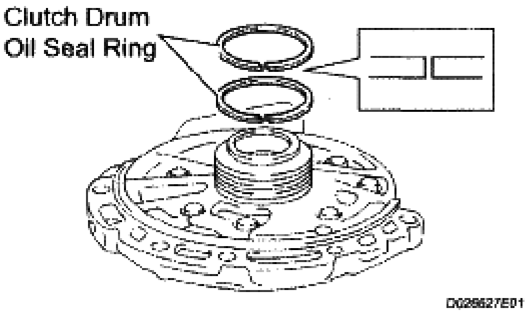

Fig. 490: Identifying Clutch Drum Oil Seal Rings

SECOND BRAKE PISTON

COMPONENTS

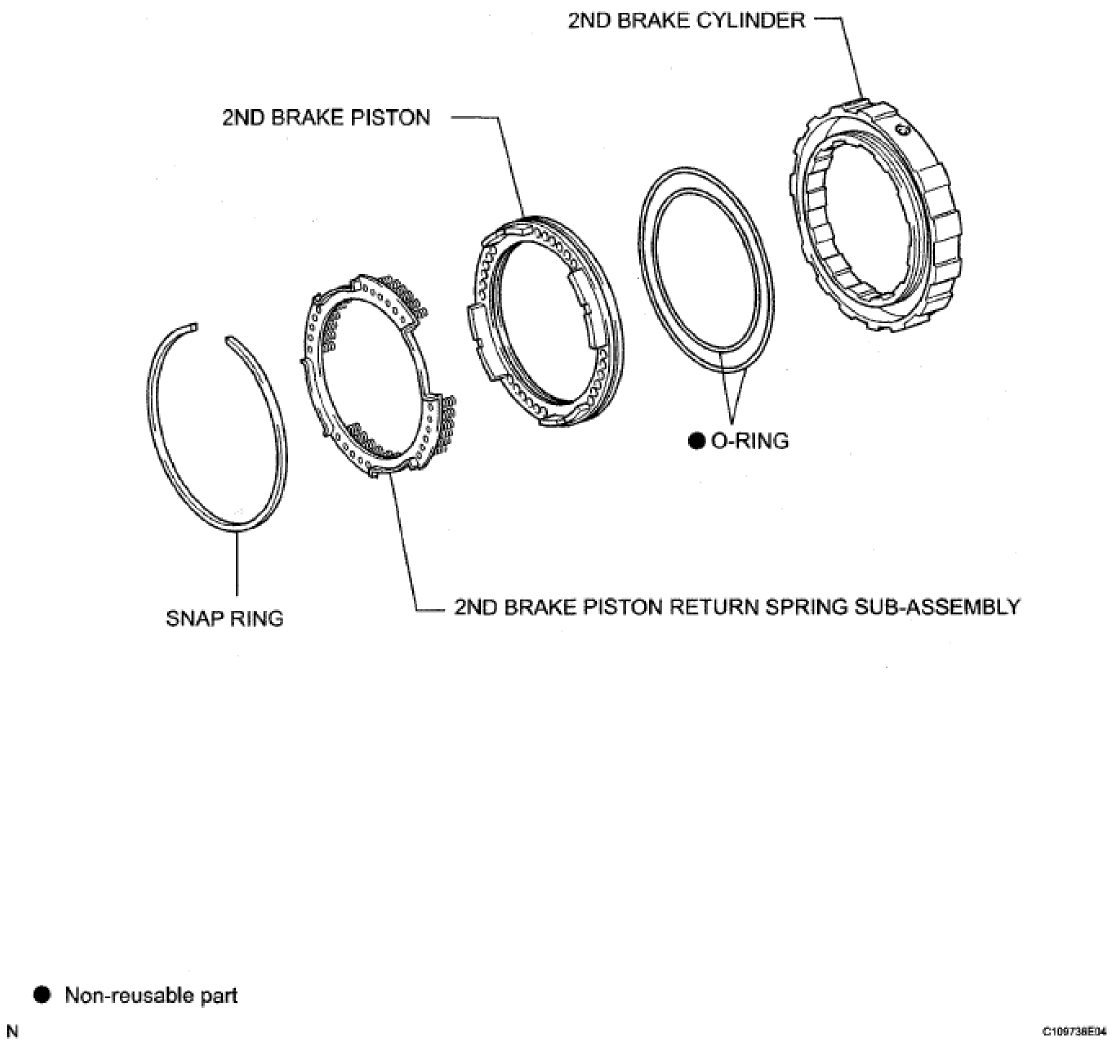

Fig. 491: Identifying Second Brake Piston Components

DISASSEMBLY

1. **REMOVE 2ND BRAKE PISTON RETURN SPRING SUB-ASSEMBLY**
    a. Place SST on the return spring and compress the return spring with a press.

    SST 09387-00060

    b. Using a screwdriver, remove the snap ring.

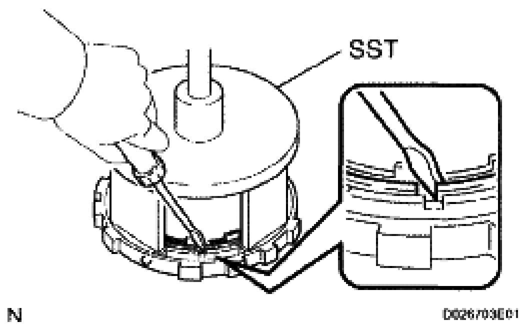

Fig. 492: Removing Snap Ring

c. Remove the 2nd brake piston return spring.

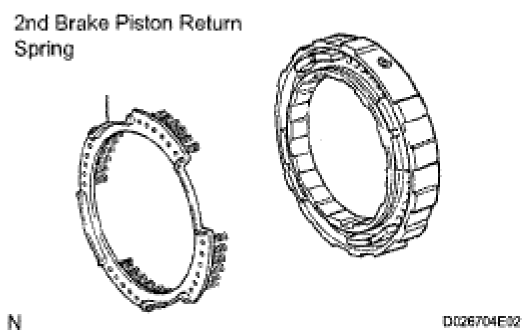

Fig. 493: Identifying 2nd Brake Piston Return Spring

2. **REMOVE 2ND BRAKE PISTON**

a. Hold the 2nd brake piston and apply compressed air (392 kPa, 4.0 kgf/cm^2 , 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.**

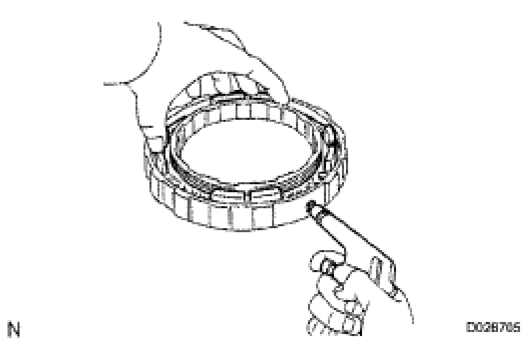

Fig. 494: Removing 2nd Brake Piston

3. **REMOVE 2ND BRAKE PISTON O-RING**

a. Remove the 2 O-rings from the 2nd brake piston.

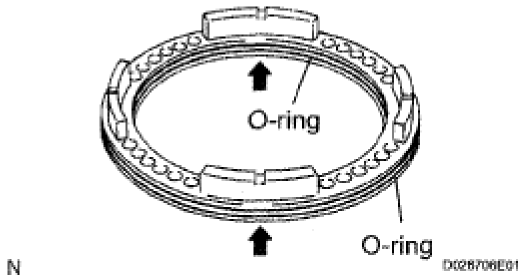

Fig. 495: Locating 2nd Brake Piston O-Rings

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.)

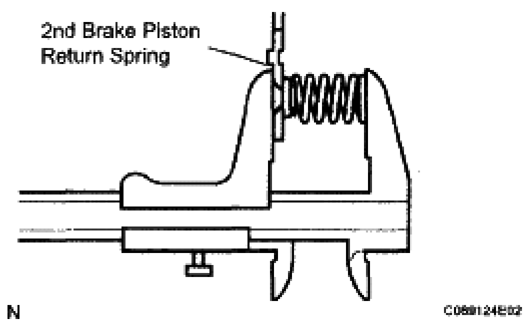

Fig. 496: Measuring Free Length Of 2nd Brake Piston Return Spring

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-ring is not twisted or pinched.

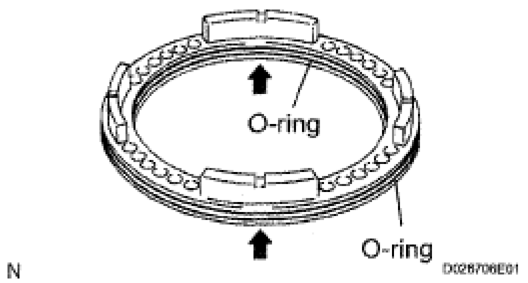

Fig. 497: Locating 2nd Brake Piston O-Rings

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.

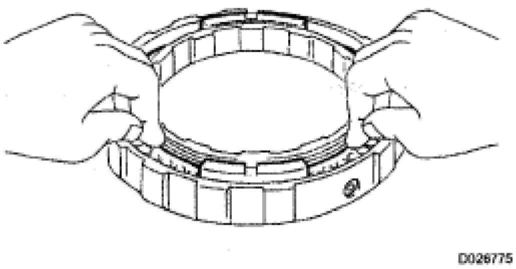

Fig. 498: Installing 2nd Brake Piston

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.

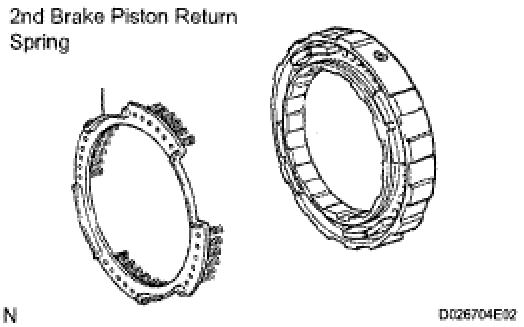

Fig. 499: Identifying 2nd Brake Piston Return Spring

    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:

- **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.**

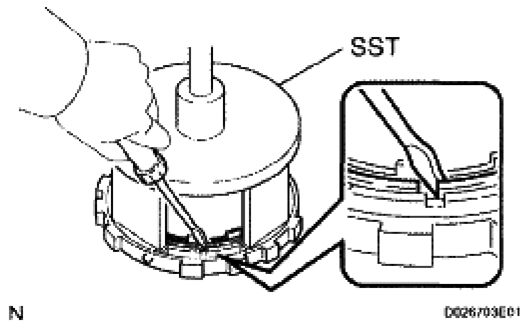

Fig. 500: Removing Snap Ring

FORWARD CLUTCH

COMPONENTS

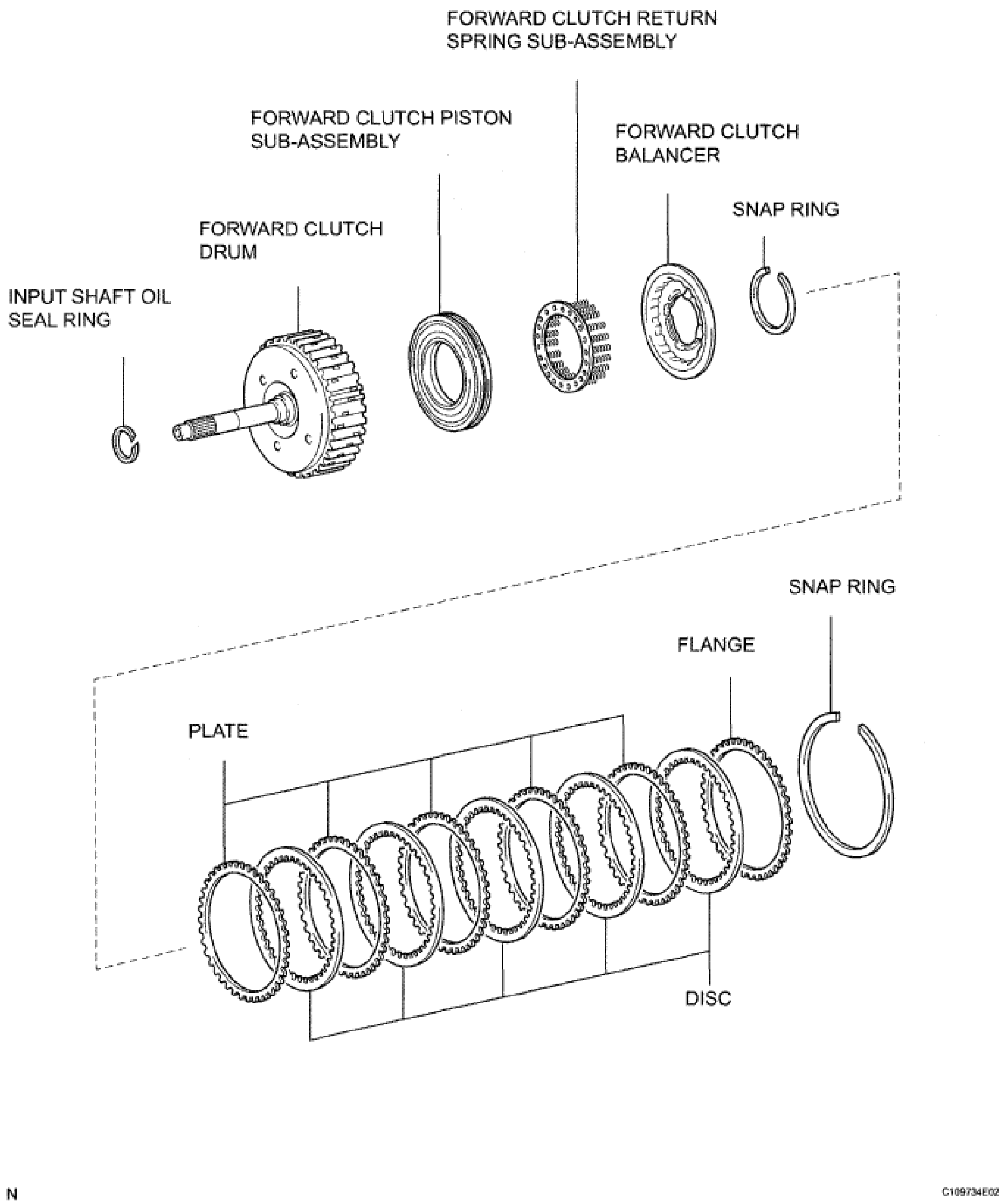

Fig. 501: Identifying Forward Clutch Components

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.

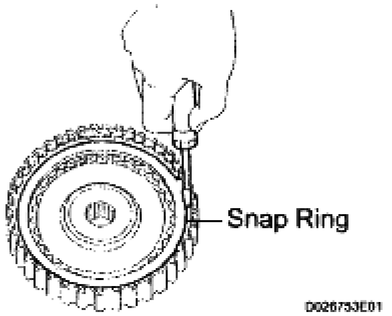

Fig. 502: Removing Snap Ring

   b. Remove the flange, 5 discs and 5 plates from the input shaft assembly.

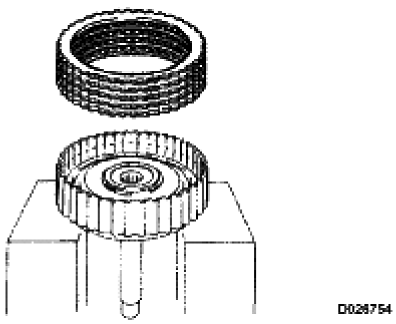

Fig. 503: Identifying Flange, Discs And Plates

3. **REMOVE FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY**
   a. Place SST on the spring retainer and compress the return spring with a press.
   b. Using a snap ring expander, remove the snap ring.

NOTE:	• **Stop the press when the spring seat is lowered 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.**

   c. Remove the clutch balancer from the input shaft.

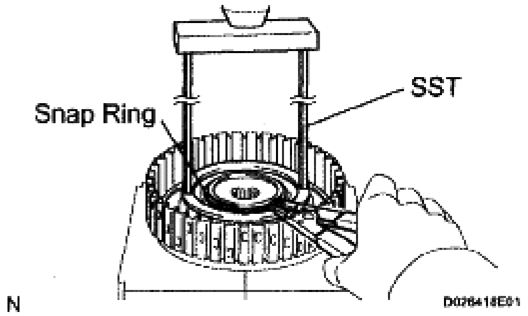

Fig. 504: Removing Snap Ring

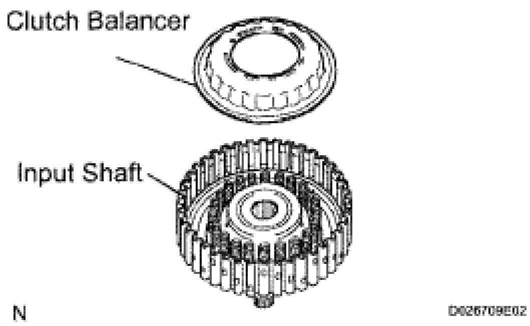

Fig. 505: Identifying Clutch Balancer And Input Shaft

d. Remove the forward clutch return spring from the input shaft.

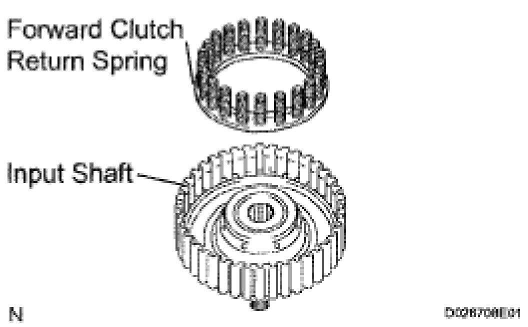

Fig. 506: Identifying Forward Clutch Return Spring And Input Shaft

4. **REMOVE FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY**
   a. Place the forward clutch drum onto the oil pump.
   b. Holding the forward clutch piston by hand, apply compressed air (392 kPa, 4.0 kgf/cm^2 , 57 psi) to the oil pump to remove the forward clutch piston.

      HINT:

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

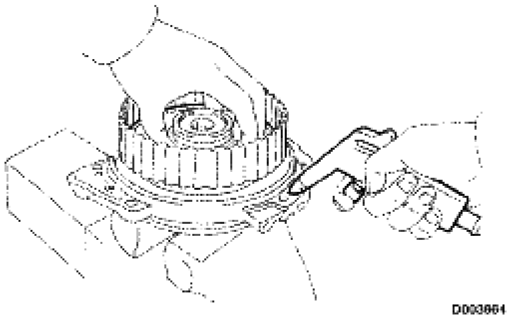

Fig. 507: Applying Compressed Air To Oil Pump

5. **REMOVE INPUT SHAFT OIL SEAL RING**
   a. Remove the input shaft oil seal ring from the input shaft.

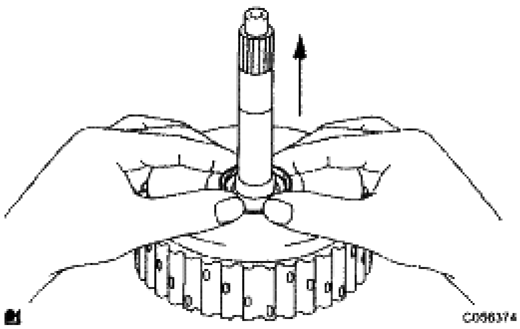

Fig. 508: Removing Input Shaft Oil Seal Ring

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 pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm^2 , 57 psi).

   Pack clearance: 1.00 to 1.25 mm (0.0394 to 0.4921 in.)

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

   HINT:

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

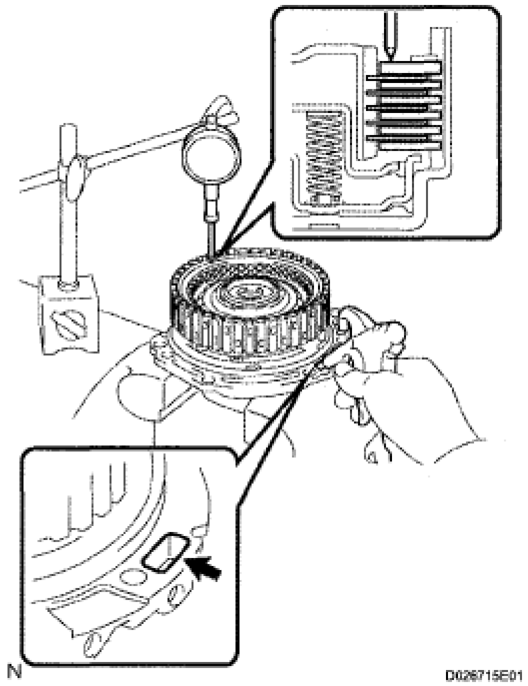

Fig. 509: Measuring Forward Clutch Pack Clearance

2. **INSPECT FORWARD MULTIPLE DISC CLUTCH DISC**
    a. Check if the sliding surface of the disc, plate and flange are worn or burnt. If necessary, replace them.

    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.

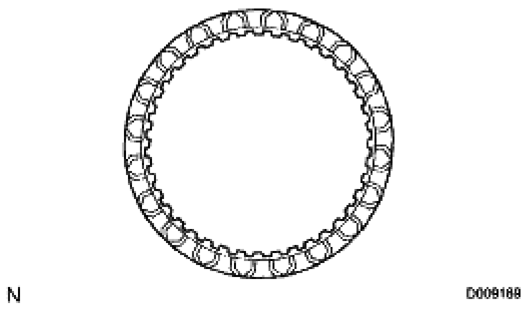

Fig. 510: Identifying Reverse Brake Clutch Disc

3. **INSPECT FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY**
    a. Using vernier calipers, measure the free length of the spring together with the spring seat.

Standard free length: 26.74 mm (1.0528 in.)

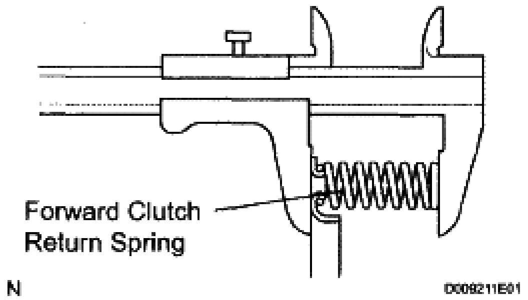

Fig. 511: Measuring Free Length Of Spring

4. **INSPECT PACK CLEARANCE OF FORWARD CLUTCH**
   a. Using a dial indicator, measure the forward clutch pack clearance while applying and releasing compressed air (392 kgf/cm^2 , 4.0 kPa, 57 psi).

Pack clearance: 1.00 to 1.25 mm (0.0394 to 0.4921 in.)

If the piston stroke is less than the minimum, parts may be assembled incorrectly. Check and reassemble the parts again.

If the clearance is not as specified, select another flange.

HINT:

There are 5 different thicknesses of flanges available.

Flange thickness: mm (in.)

FLANGE THICKNESS SPECIFICATION

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)	-	-

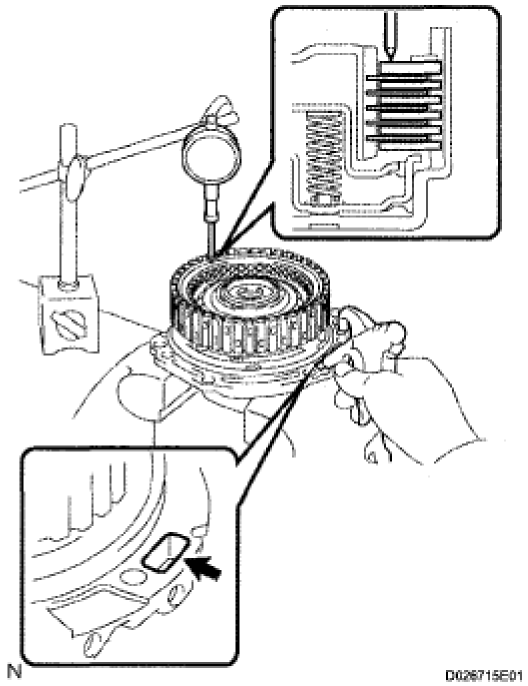

Fig. 512: Measuring Forward Clutch Pack Clearance

5. **INSPECT FORWARD MULTIPLE DISC CLUTCH DISC**
   a. Check if 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.

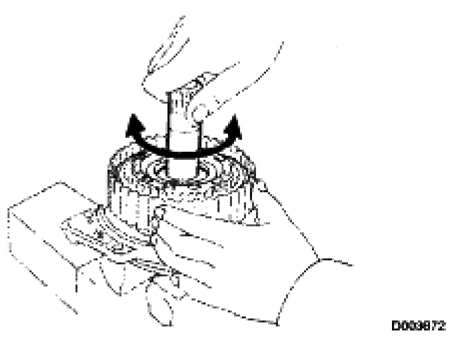

Fig. 513: Checking Forward Clutch Assembly Rotation

REASSEMBLY

1. **INSTALL INPUT SHAFT OIL SEAL RING**
   a. Compress a new input shaft oil seal ring from both sides to reduce dimension A.

   Dimension A: 5 mm (0.197 in.)

b. Coat the oil seal ring with ATF and install it to the input shaft.

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

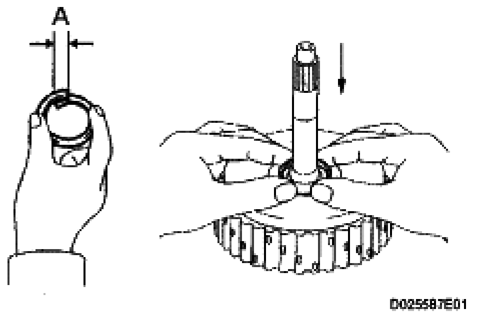

Fig. 514: Compressing Input Shaft Oil Seal Ring From Both Sides To Reduce Dimension

2. **INSTALL FORWARD CLUTCH PISTON SUB-ASSEMBLY**
   a. Coat the forward clutch piston with ATF, and install it to the input shaft.

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

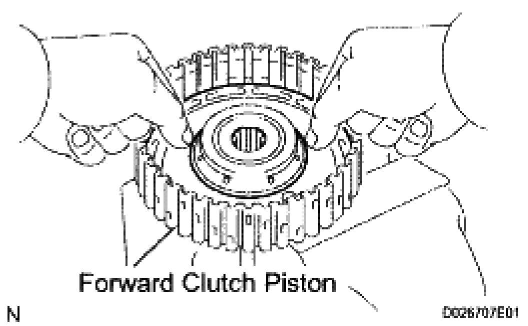

Fig. 515: Identifying Forward Clutch Piston Sub-Assembly

3. **INSTALL FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY**
   a. Install the return spring to the input shaft.

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.

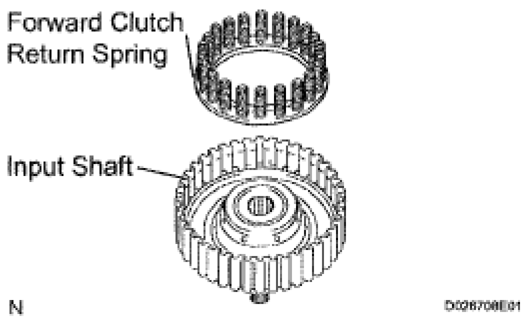

Fig. 516: Identifying Forward Clutch Return Spring And Input Shaft

c. Install the clutch balancer to the input shaft.

NOTE:

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

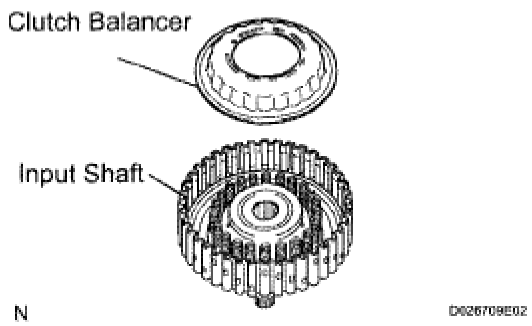

Fig. 517: Identifying Clutch Balancer And Input Shaft

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

SST 09387-00020

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

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.**

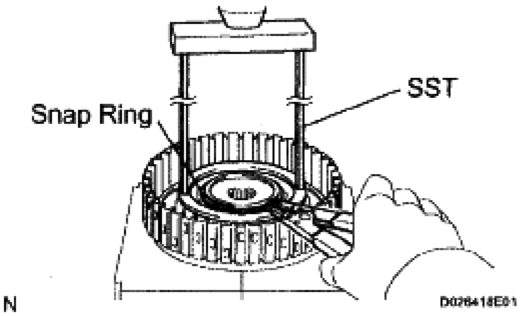

Fig. 518: Removing Snap Ring

g. Set the end gap of the snap ring in the piston as shown in the illustration.

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

4. **INSTALL FORWARD MULTIPLE DISC CLUTCH DISC**

a. Coat the 5 discs with ATF.

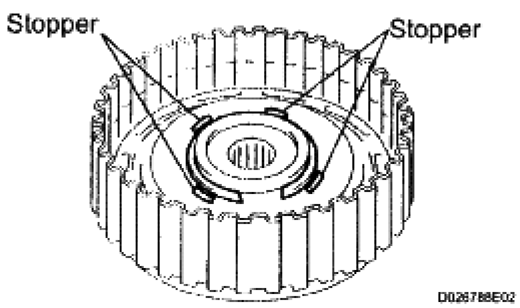

Fig. 519: Identifying Stoppers

b. Install the 5 plates, 5 discs and flange input shaft.

NOTE: Make sure that the plates, discs, and flange are installed as shown in the illustration.

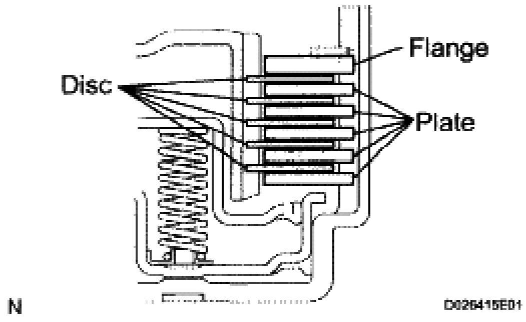

Fig. 520: Identifying Plates, Discs And Flange Input Shaft

c. Using a screwdriver, install the snap ring.
d. Check that the end gap of the snap ring is not aligned with one of the cutouts.

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

5. **INSPECT PACK CLEARANCE OF FORWARD CLUTCH**

HINT:

(See **INSPECTION**)

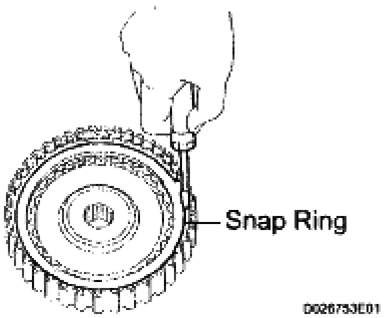

Fig. 521: Removing Snap Ring

6. **INSPECT FORWARD MULTIPLE DISC CLUTCH DISC**

HINT:

(See **INSPECTION**)

DIRECT CLUTCH

COMPONENTS

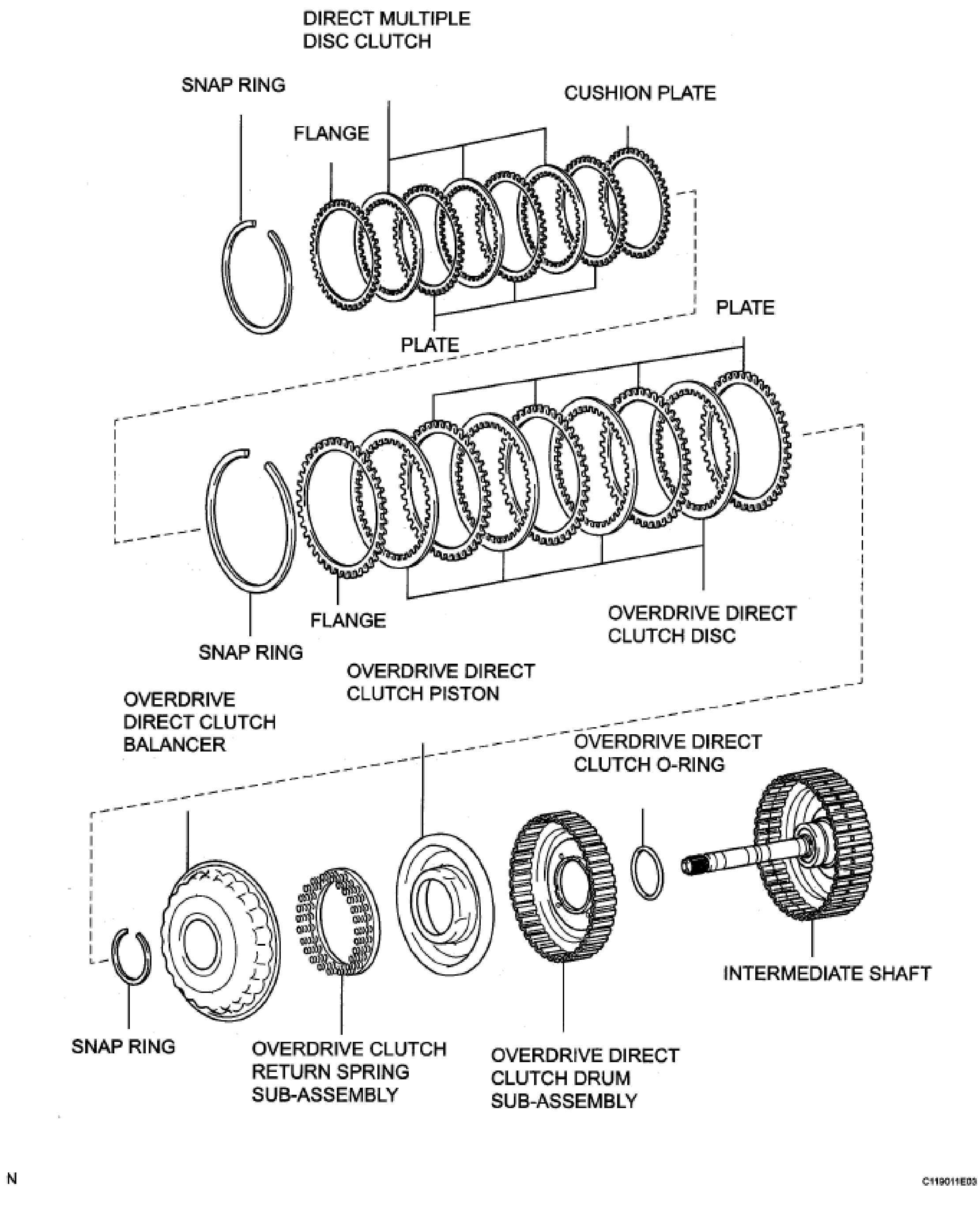

Fig. 522: Identifying Direct Clutch Components

DISASSEMBLY

1. **INSPECT PACK CLEARANCE OF REVERSE CLUTCH**

   HINT:

   (See **INSPECTION**)

2. **INSPECT PACK CLEARANCE OF DIRECT CLUTCH AND OVERDRIVE CLUTCH**

   HINT:

   (See **INSPECTION**)

3. **REMOVE DIRECT MULTIPLE DISC CLUTCH**
   a. Using a screwdriver, remove the snap ring from the intermediate shaft.

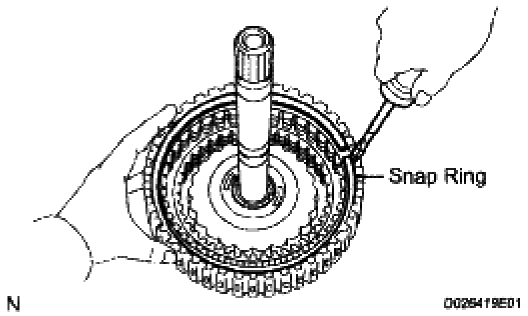

Fig. 523: Removing Snap Ring From Intermediate Shaft

   b. Remove the flange, 3 discs, 3 plates and cushion plate from the intermediate shaft.

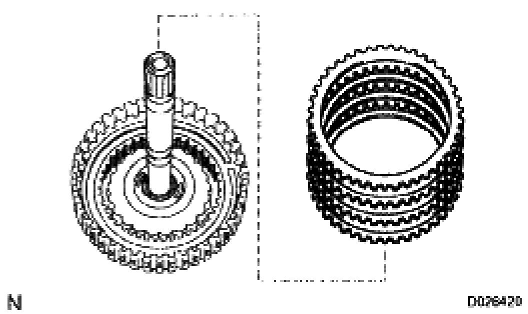

Fig. 524: Removing Flange, Discs, Plates And Cushion Plate From Intermediate Shaft

4. **REMOVE OVERDRIVE DIRECT CLUTCH DISC**
   a. Using a screwdriver, remove the snap ring from the intermediate shaft.
   b. Remove the flange, 4 discs and 4 plates from the intermediate shaft.

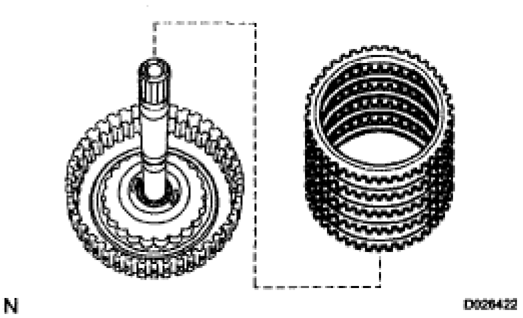

Fig. 525: Removing Flange, Discs And Plates From Intermediate Shaft

5. **REMOVE OVERDRIVE CLUTCH RETURN SPRING SUB-ASSEMBLY**
   a. Place SST on the clutch balancer and compress the spring with a press.

      SST 09387-00020

   b. Using a snap ring expander, remove the snap ring from the direct clutch drum.

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.**

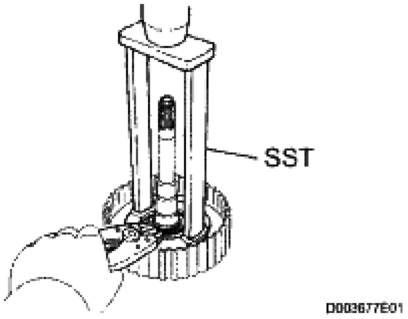

Fig. 526: Removing Snap Ring

- **This prevents the spring seat from being deformed.**
- **Do not expand the snap ring excessively.**

   c. Remove the clutch balancer from the direct clutch drum.

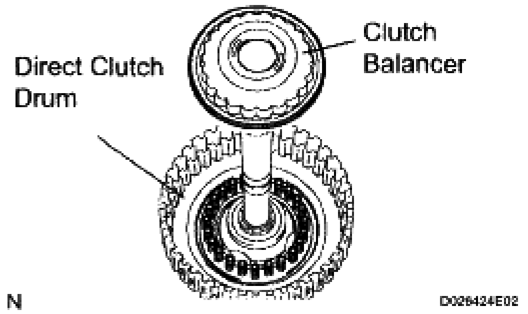

Fig. 527: Identifying Clutch Balancer And Direct Clutch Drum

d. Remove the overdrive clutch return spring from the direct clutch drum.

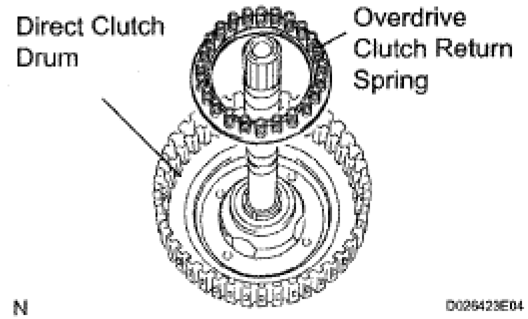

Fig. 528: Identifying Overdrive Clutch Return Spring And Direct Clutch Drum

6. **REMOVE OVERDRIVE DIRECT CLUTCH PISTON**
   a. Install the intermediate shaft on the transaxle rear cover.
   b. Holding the direct clutch piston with your hand, apply compressed air (392 kPa, 4.0 kgf/cm^2 , 57 psi) to the transaxle rear cover to remove the direct clutch piston.

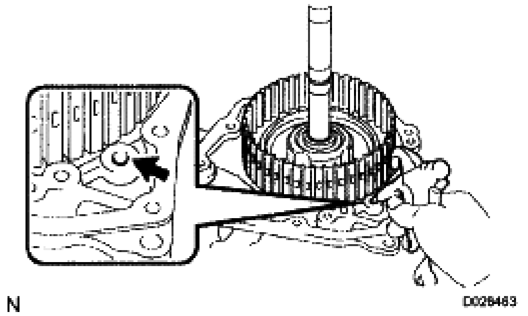

Fig. 529: Removing Overdrive Direct Clutch Piston

7. **REMOVE OVERDRIVE DIRECT CLUTCH DRUM SUB-ASSEMBLY**
   a. Holding the direct clutch drum by hand, apply compressed air (392 kPa, 4.0 kgf/cm^2 , 57 psi) to the transaxle rear cover to remove the direct clutch drum.

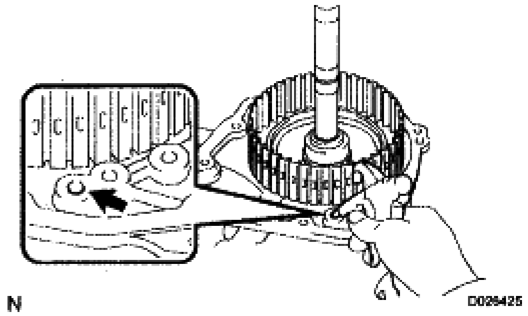

Fig. 530: Removing Overdrive Direct Clutch Drum Sub-Assembly

8. **REMOVE OVERDRIVE DIRECT CLUTCH O-RING**
   a. Using a screwdriver, remove the O-ring from the direct clutch drum.

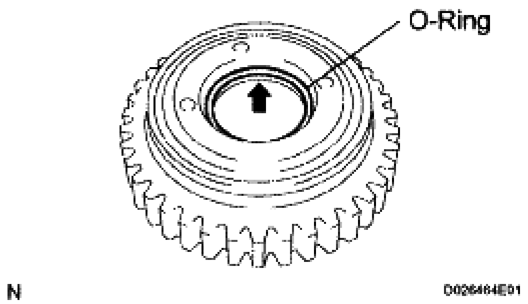

Fig. 531: Locating Overdrive Direct Clutch O-Ring

INSPECTION

1. **INSPECT PACK CLEARANCE OF REVERSE CLUTCH**
   a. Install the intermediate shaft and needle roller bearing onto the transaxle rear cover.
   b. Using a dial indicator, measure the reverse clutch pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm^2 , 57 psi).

   Pack clearance: 0.60 to 0.82 mm (0.02362 to 0.03228 in.)

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

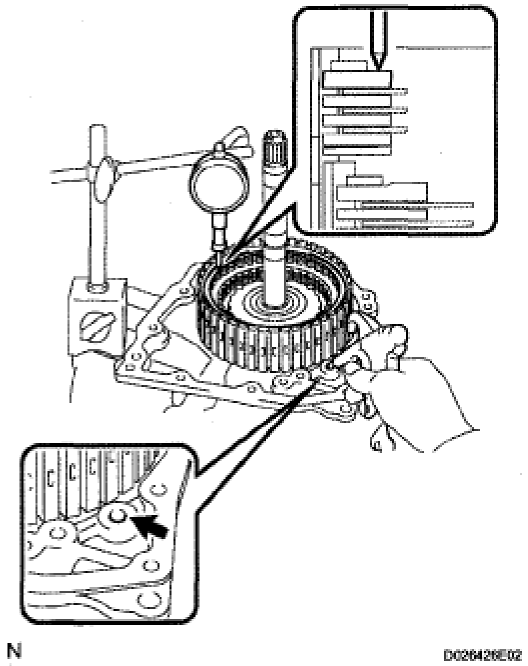

Fig. 532: Measuring Reverse Clutch Pack Clearance

2. **INSPECT PACK CLEARANCE OF DIRECT CLUTCH AND OVERDRIVE CLUTCH**
   a. Using a dial indicator, measure the direct clutch and overdrive clutch pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm^2 , 57 psi).

      Pack clearance: 0.61 to 0.83 mm (0.02401 to 0.03268 in.)

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

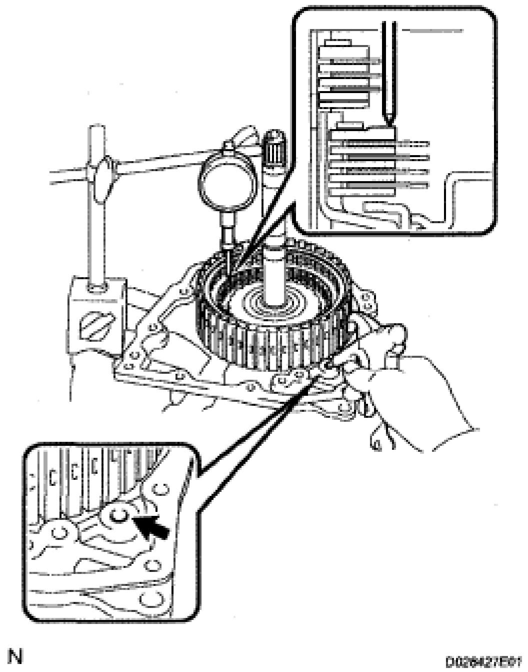

Fig. 533: Measuring Direct Clutch And Overdrive Clutch Pack Clearance

3. **INSPECT DIRECT MULTIPLE DISC CLUTCH DISC**
   a. Check if the sliding surfaces 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.

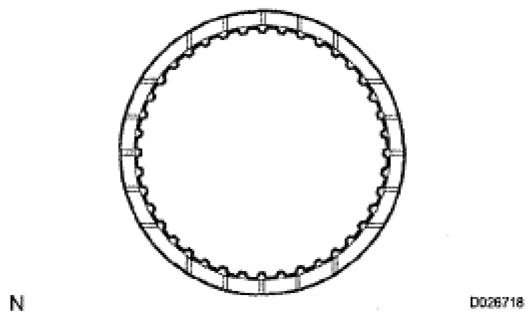

Fig. 534: Identifying Direct Multiple Disc Clutch Disc

4. **INSPECT OVERDRIVE DIRECT CLUTCH DISC**
   a. Check if the sliding surface of the disc, plate and flange are worn or burnt. If necessary, replace them.

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.

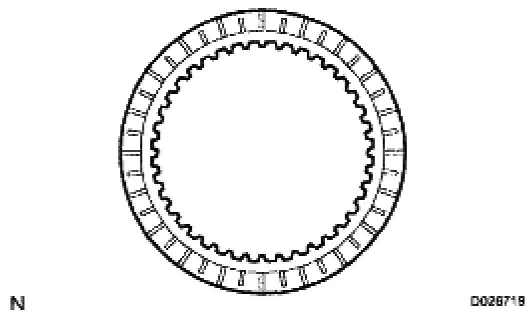

Fig. 535: Identifying Overdrive Direct Clutch Disc

5. **INSPECT OVERDRIVE CLUTCH RETURN SPRING SUB-ASSEMBLY**
    a. Using vernier calipers, measure the free length of the spring together with the spring seat.

    Standard free length: 25.91 mm (1.0201 in.)

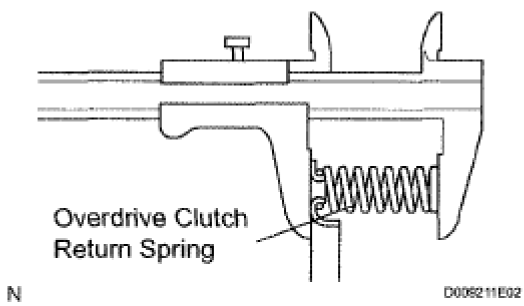

Fig. 536: Measuring Free Length Of Overdrive Clutch Return Spring

6. **INSPECT PACK CLEARANCE OF REVERSE CLUTCH**
    a. Install the intermediate shaft onto the transaxle rear cover.
    b. Using a dial indicator, measure the direct clutch pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm^2 , 57 psi).

    Clearance: 0.60 to 0.82 mm (0.02362 to 0.03228 in.)

    If the pack clearance is less than the minimum, parts may have been assembled incorrectly, so check and reassemble again. If the clearance is not as specified, select another flange.

    HINT:

There are 7 flanges of different thickness.

Flange thickness: mm (in.)

FLANGE THICKNESS SPECIFICATION

No.	Thickness	No.	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)	-	-

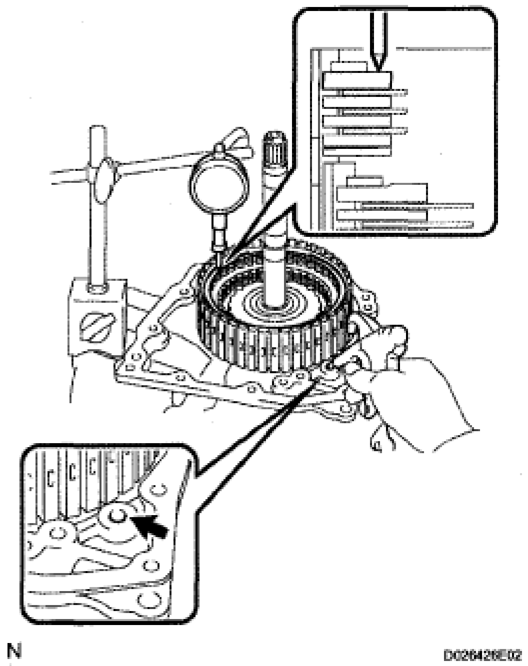

Fig. 537: Measuring Reverse Clutch Pack Clearance

7. **INSPECT PACK CLEARANCE OF DIRECT CLUTCH AND OVERDRIVE CLUTCH**
   a. Using a dial indicator, measure the direct clutch & overdrive clutch pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm^2 , 57 psi).

   Clearance: 0.61 to 0.83 mm (0.02401 to 0.03268 in.)

   If the pack clearance is less than the minimum, parts may have been assembled incorrectly, so check and reassemble again. If the clearance is not as specified, select another flange.

   HINT:

   There are 7 different thicknesses of flanges available.

Flange thickness: mm (in.)

FLANGE THICKNESS SPECIFICATION

No.	Thickness	No.	Thickness
0	2.5 (0.098)	4	2.9 (0.114)
1	2.6 (0.102)	5	3.0 (0.118)
2	2.7 (0.106)	6	3.1 (0.122)
3	2.8 (0.110)	-	-

b. 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.

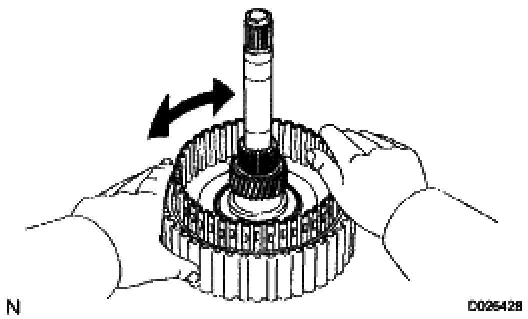

Fig. 538: Checking Disc Rotation

REASSEMBLY

1. **INSTALL OVERDRIVE DIRECT CLUTCH O-RING**
   a. Coat an O-ring with ATF, and install it to the direct clutch drum.

NOTE: Make sure that the O-ring is not twisted or pinched when it is installed.

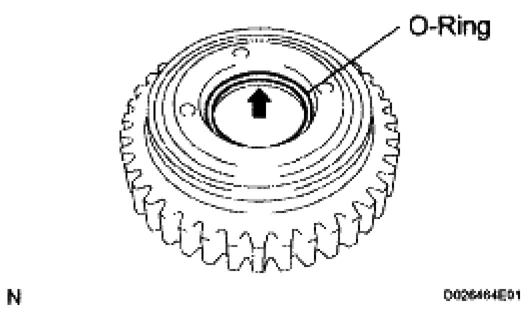

Fig. 539: Locating Overdrive Direct Clutch O-Ring

2. **INSTALL OVERDRIVE DIRECT CLUTCH DRUM SUB-ASSEMBLY**

a. Coat the direct clutch drum with ATF, and install it to the intermediate shaft.

NOTE:
- **Be careful not to damage the O-ring.**
- **Be careful not to damage the lip of the direct clutch drum.**

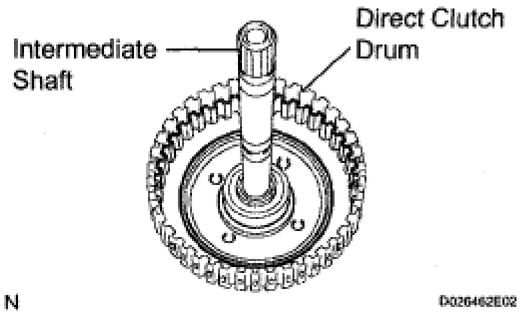

Fig. 540: Identifying Direct Clutch Drum And Intermediate Shaft

3. **INSTALL OVERDRIVE DIRECT CLUTCH PISTON**
   a. Coat the overdrive direct clutch piston with ATF, and install it to the direct clutch drum.

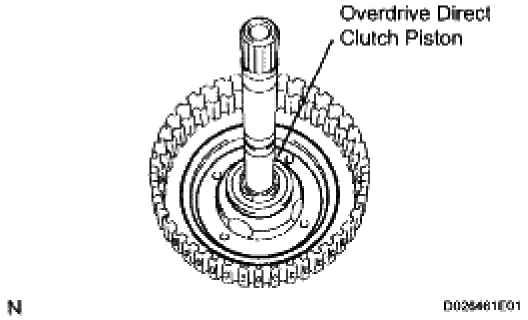

Fig. 541: Identifying Overdrive Direct Clutch Piston

4. **INSTALL OVERDRIVE CLUTCH RETURN SPRING SUB-ASSEMBLY**
   a. Install the overdrive clutch return spring to the direct clutch drum.

NOTE: **Installing the spring sub-assembly, check that all of the springs are fit in piston correctly.**

   b. Coat the clutch balancer with ATF.

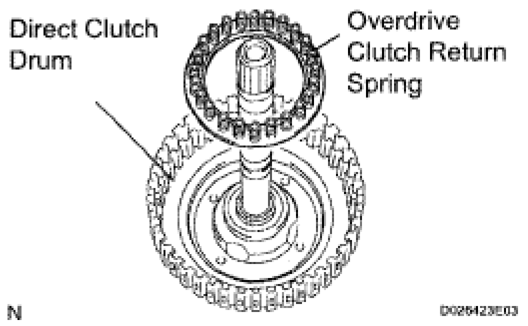

Fig. 542: Identifying Overdrive Clutch Return Spring And Direct Clutch Drum

c. Install the clutch balancer to the direct clutch drum.

NOTE:

- **Be careful not to damage the lip of the direct clutch balancer.**
- **Make sure that the lip of the seal is not pinched and that it has no other defects.**
- **Apply sufficient ATF to the sealing lip before installing the clutch balancer.**

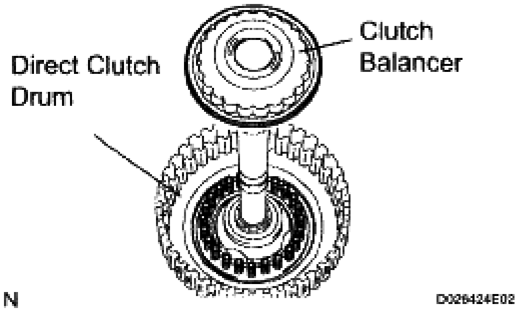

Fig. 543: Identifying Clutch Balancer And Direct Clutch Drum

d. Place SST on the clutch balancer and compress the overdrive clutch return spring with a press.

SST 09387-00020

e. Using a snap ring expander, install the snap ring to the direct clutch drum.
f. Be sure that the end gap of the snap ring is not aligned with the spring retainer claw.

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.**

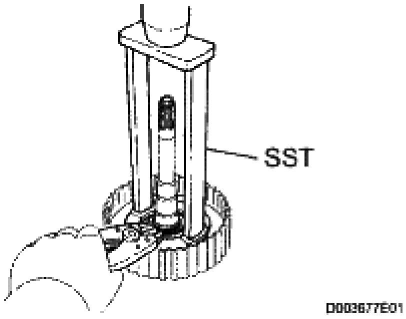

Fig. 544: Removing Snap Ring

g. Set the end gap of the snap ring in the piston shown in the illustration.

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

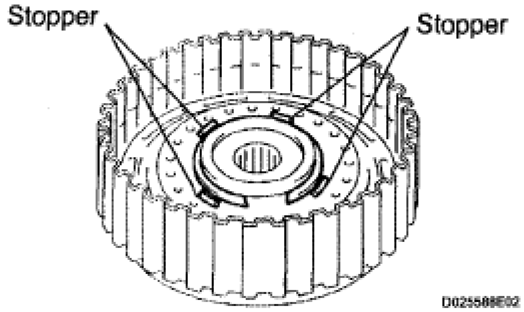

Fig. 545: Identifying Stoppers

5. **INSTALL OVERDRIVE DIRECT CLUTCH DISC**
   a. Coat the 4 discs with ATF.
   b. Install the 4 plates, 4 discs and flange to the intermediate shaft.

NOTE: **Make sure that the plates, discs, and flange are installed as shown in the illustration.**

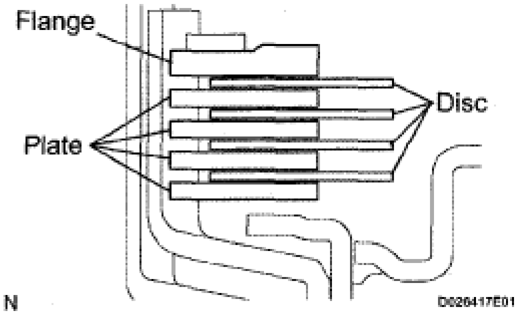

Fig. 546: Identifying Plates, Discs And Flange

c. Using a screwdriver, install the snap ring.
d. Check that the end gap of the snap ring is not aligned with one of the cutouts.

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

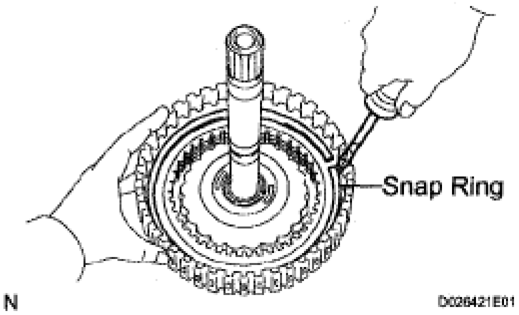

Fig. 547: Installing Snap Ring

6. **INSTALL DIRECT MULTIPLE DISC CLUTCH DISC**
   a. Coat the 3 disc with ATF.
   b. Install the cushion plate, 3 plates, 3 disc and flange to the intermediate shaft.

NOTE:

- **Install the cushion plate with the mark on the white surface facing to plate.**
- **Be careful about the order of discs, plate and flange assembly.**

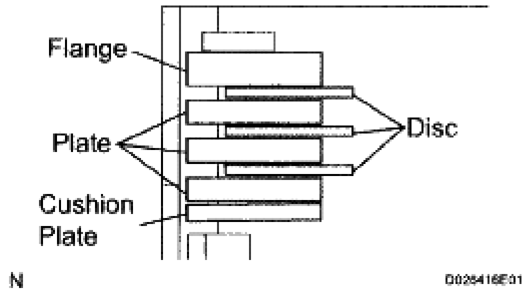

Fig. 548: Identifying Cushion Plate, Plates, Discs And Flange

c. Using a screwdriver, install the snap ling.
d. Check that the end gap of the snap ling is not aligned with one of the cutouts.

NOTE: **The slap ring should be fixed certainly in the groove of the drum.**

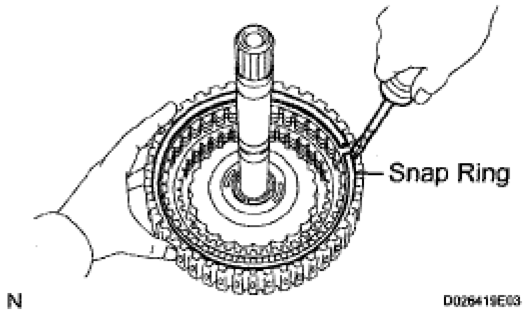

Fig. 549: Installing Snap Ring

UNDERDRIVE PLANETARY GEAR

COMPONENTS

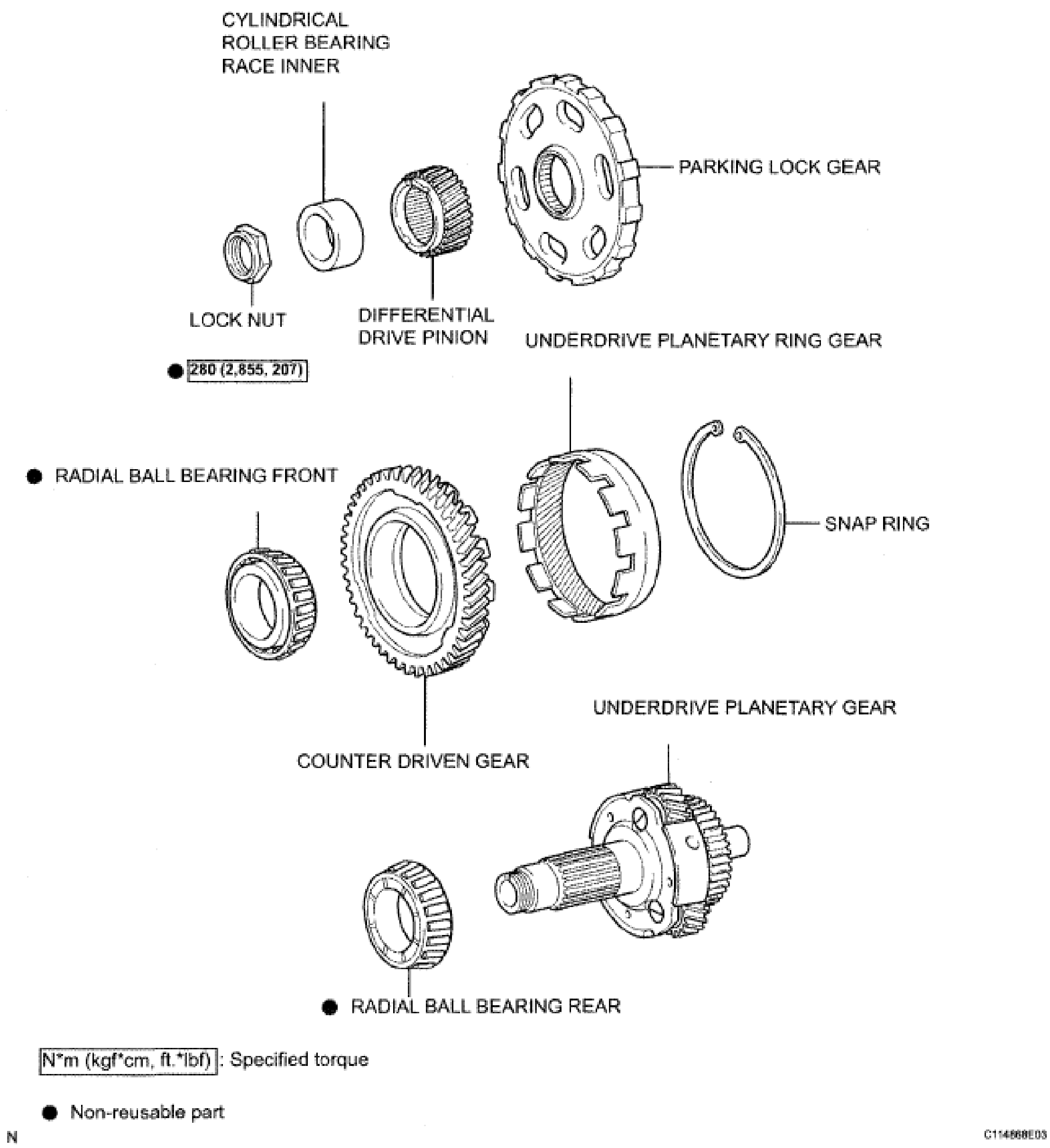

Fig. 550: Identifying Underdrive Planetary Gear Components With Torque Specification

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

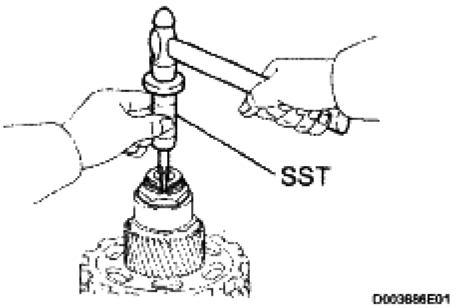

Fig. 551: Tapping Lock Nut

b. Place the underdrive planetary gear in a soft jaw vise.

NOTE: Be careful not to damage the differential drive pinion.

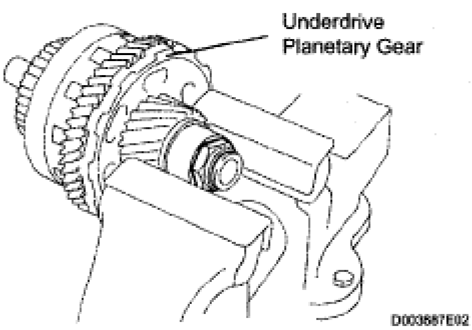

Fig. 552: Placing Underdrive Planetary Gear In Soft Jaw Vise

c. Using a socket wrench, remove the lock nut.

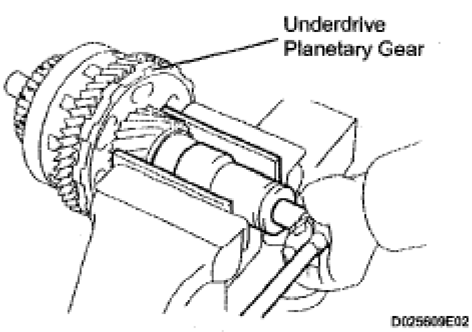

Fig. 553: Removing Lock Nut

3. **REMOVE CYLINDRICAL ROLLER BEARING RACE INNER**
    a. Using SST, remove the cylindrical roller bearing race inner.

SST 09950-00020, 09950-00030, 09950-60010 (09951-00320, 09957-04010)

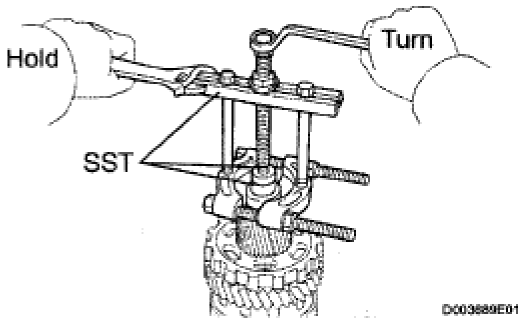

Fig. 554: Removing Cylindrical Roller Bearing Race Inner

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 09950-60010 (09951 -00320), 09387-00050, 09950-00020, 09950-00030, 09950-40011 (09957-04010)

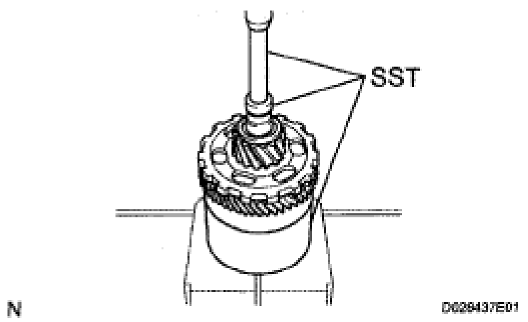

Fig. 555: Identifying SST

    b. Place the underdrive planetary gear in a soft jaw vise.
    c. Using SST, remove the radial ball bearing rear from the underdrive planetary gear.

    SST 09950-60010 (09951 -00320), 09950-00030, 09950-40011 (09957-04010)

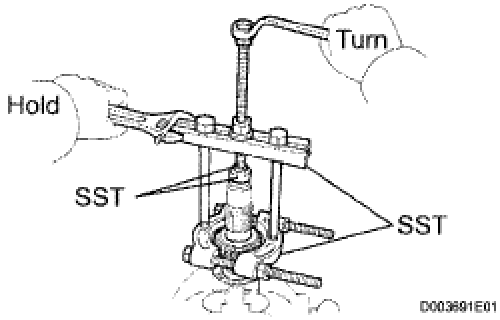

Fig. 556: Removing Radial Ball Bearing Rear

5. **REMOVE UNDERDRIVE PLANETARY RING GEAR**
   a. Using a snap ring pliers, remove the snap ring.

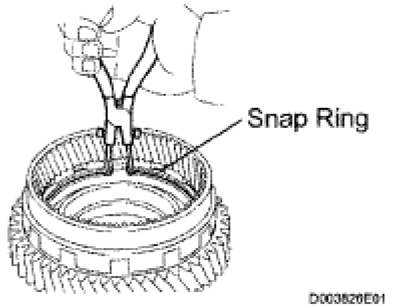

Fig. 557: Removing Snap Ring

   b. Remove the underdrive planetary ring gear from the counter driven gear.

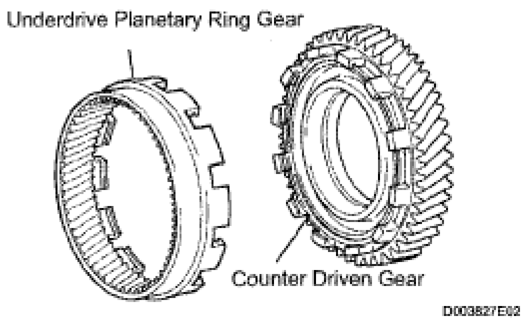

Fig. 558: Identifying Underdrive Planetary Ring Gear And Counter Driven Gear

INSPECTION

1. **INSPECT UNDERDRIVE PLANETARY GEAR PRELOAD**
   a. Using SST, fix the underdrive planetary gear assembly.

   SST 09387-00050

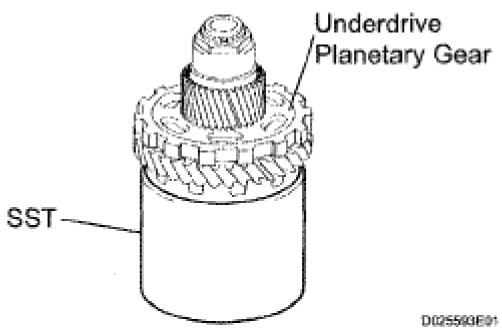

Fig. 559: Identifying Underdrive Planetary Gear Assembly

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

Turning torque at 60 rpm.: 0.50 to 1.42 N*m (5.1 to 14.5 kgf*cm, 4.4 to 12.6 in.*lbf)

HINT:

Use a torque wrench with a fulcrum length of 160 mm (6.3 in.).

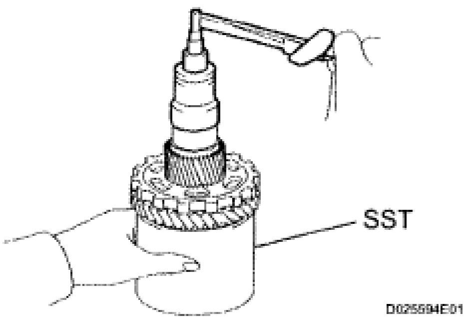

Fig. 560: Measuring Turning Torque Of Underdrive Planetary Gear

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.

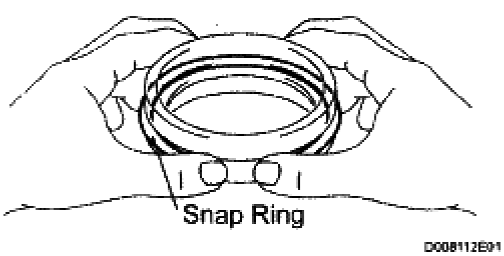

Fig. 561: Installing Snap Ring To Outer Race

   b. Using a piston ring compressor, squeeze the snap ring.

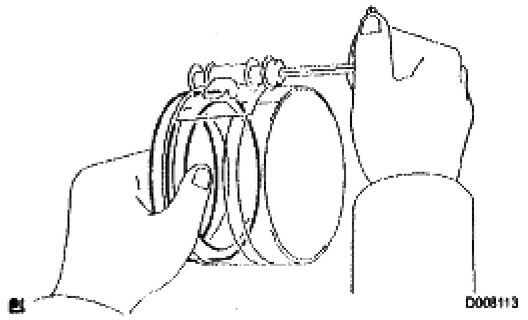

Fig. 562: Squeezing Snap Ring

c. Using SST and a press, press in the outer race of the radial ball bearing rear.

SST 09950-60020 (09951-00890), 09950-70010 (09951-07100)

NOTE: Be sure not to damage the snap ring during outer race installation.

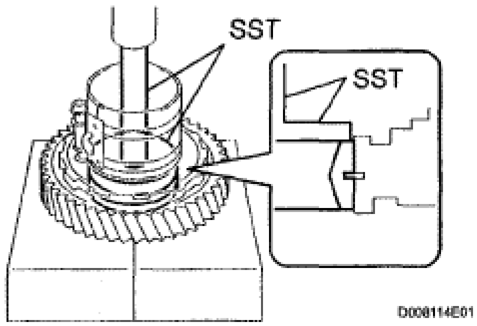

Fig. 563: Pressing In Outer Race Of Radial Ball Bearing Rear

d. Install the underdrive planetary ring gear to the counter driven gear.

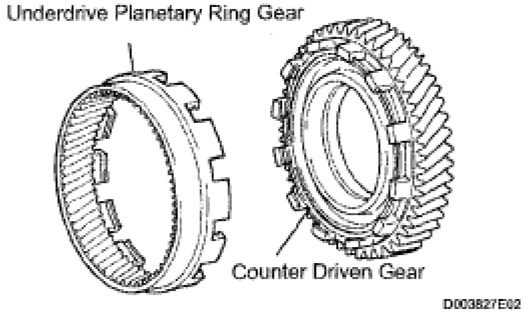

Fig. 564: Identifying Underdrive Planetary Ring Gear And Counter Driven Gear

e. Using a snap ring pliers, install the snap ring.

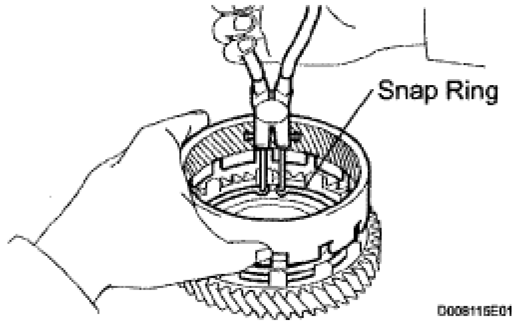

Fig. 565: Identifying Snap Ring

2. **INSTALL UNDERDRIVE PLANETARY GEAR ASSEMBLY**
   a. Using SST and a press, press the radial ball bearing rear in the underdrive planetary gear.

      SST 09502-12010, 09950-60010 (09951 -00260), 09950-70010 (09951-07100)

      NOTE: Press the bearing until it becomes flat at the bottom.

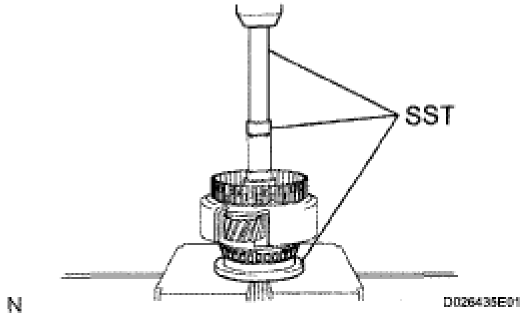

Fig. 566: Pressing Radial Ball Bearing Rear In Underdrive Planetary Gear

   b. Install the counter driven gear with planetary ring gear to the underdrive planetary gear.

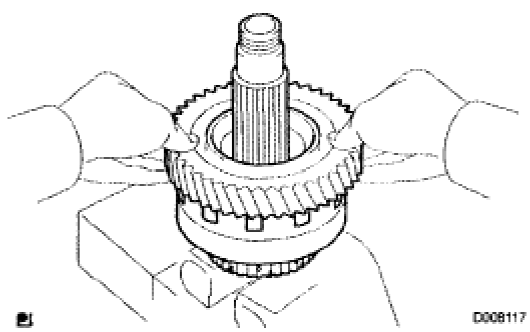

Fig. 567: Identifying Counter Driven Gear With Planetary Ring Gear

   c. Using SST and a press, press in the radial ball bearing front.

SST 09502-12010, 09950-60010 (09951-00260), 09950-70010 (09951-07100)

NOTE: Press the counter driven gear while rotating it.

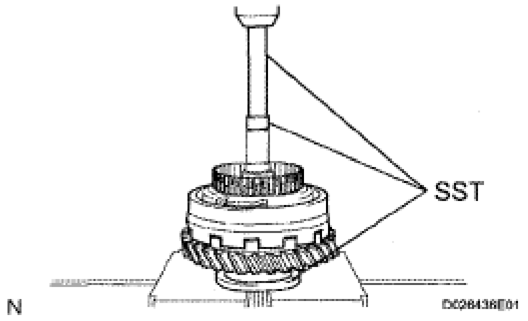

Fig. 568: Pressing Radial Ball Bearing Front

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.

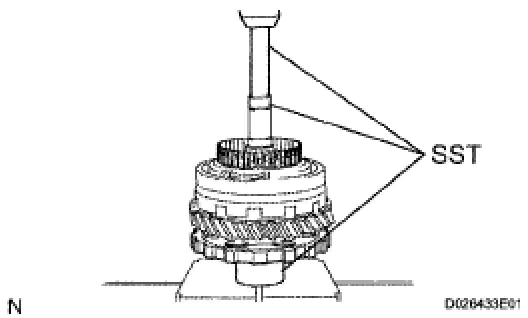

Fig. 569: Pressing Parking Lock Gear

3. **INSTALL DIFFERENTIAL DRIVE PINION**
    a. Using SST and a press, press the differential drive pinion.

SST 09726-40010, 09950-60010 (09951 -00260), 09950-70010 (09951-07100)

NOTE: Press the counter driven gear while rotating it.

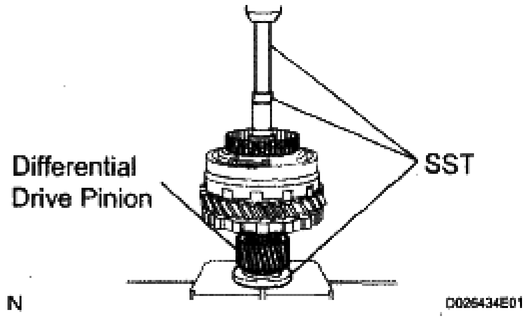

Fig. 570: Pressing Differential Drive Pinion

4. **INSTALL CYLINDRICAL ROLLER BEARING RACE INNER**
   a. Using SST and a press, press the cylindrical roller bearing race inner.

   SST 09506-35010, 09950-60010 (09951 -00260), 09950-70010 (09951-07100)

   NOTE: Press the counter driven gear while rotating it.

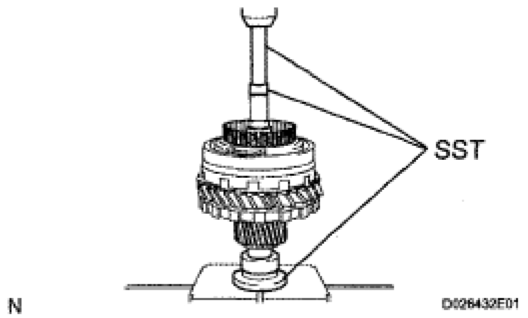

Fig. 571: Pressing Cylindrical Roller Bearing Race Inner

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 a socket wrench, install a new lock nut.

   Torque: 280 N*m (2,885 kgf*cm, 207 ft.*lbf)

   HINT:

   Use a torque wrench with a fulcrum length of 750 mm (29.53 in.).

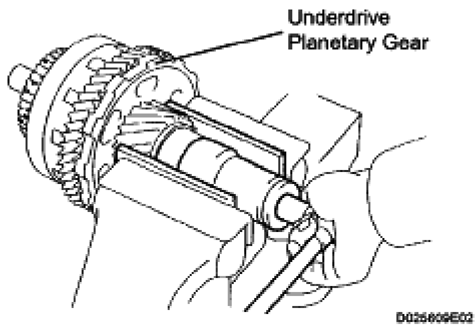

Fig. 572: Tightening Lock Nut

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**)

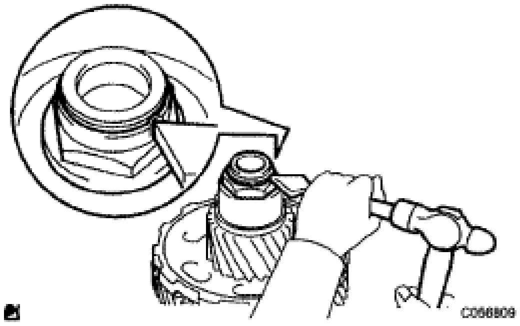

Fig. 573: Staking Lock Nut

UNDERDRIVE CLUTCH

COMPONENTS

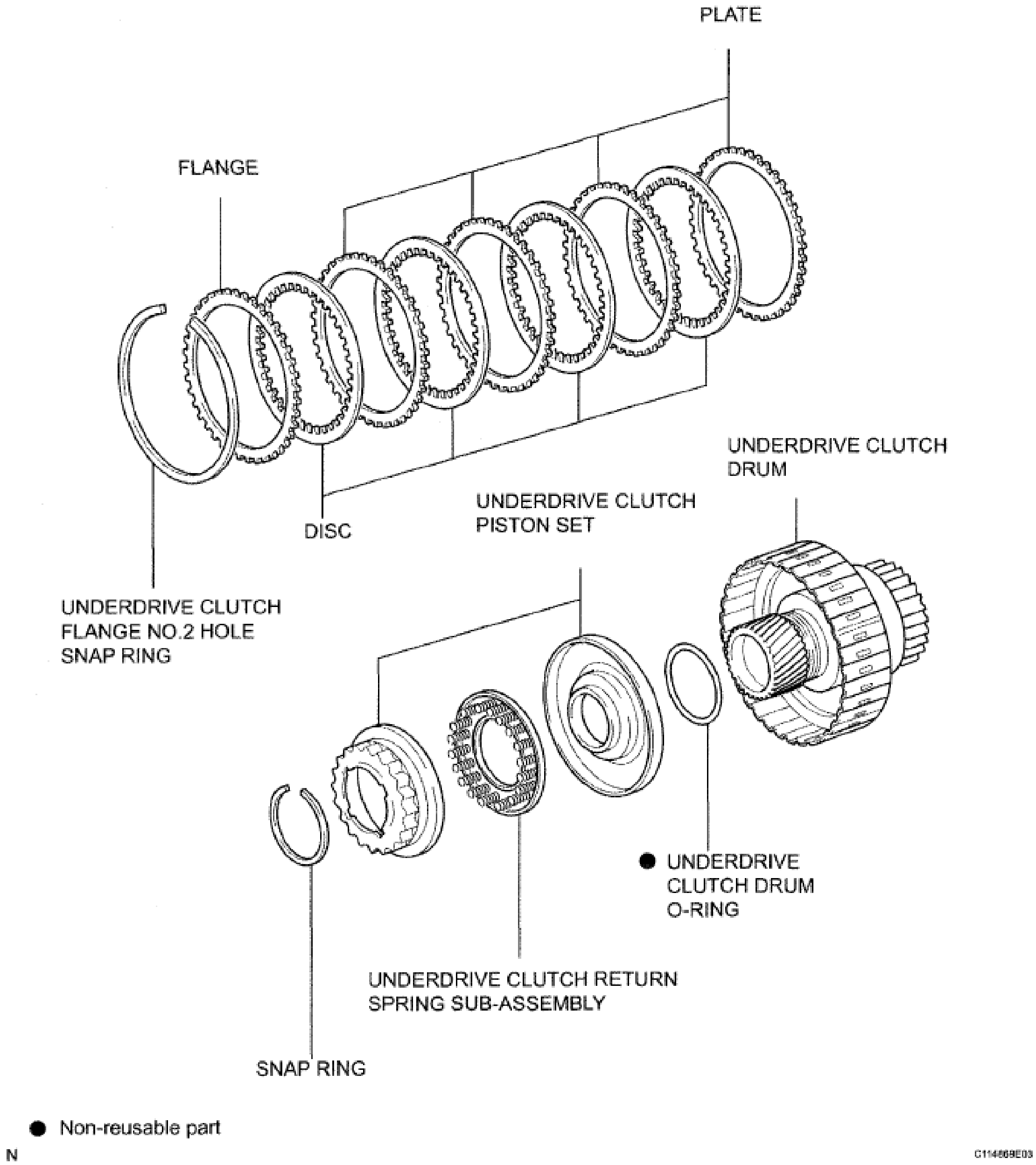

Fig. 574: Identifying Underdrive Clutch Components

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.

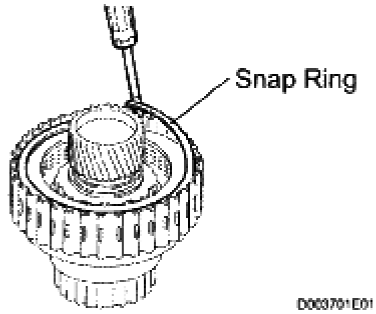

Fig. 575: Removing Snap Ring

3. **REMOVE UNDERDRIVE CLUTCH DISC NO.1**
   a. Remove the flange, 4 discs and 4 plates from the underdrive clutch drum.

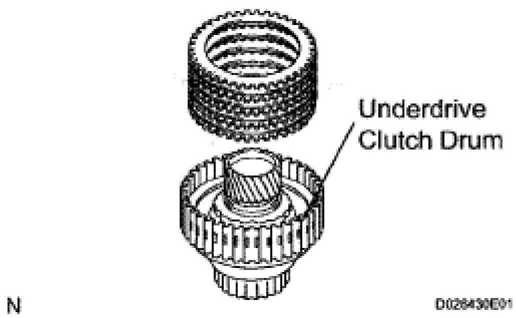

Fig. 576: Identifying Underdrive Clutch Drum

4. **REMOVE UNDERDRIVE CLUTCH RETURN SPRING SUB-ASSEMBLY**
   a. Place SST on the clutch balancer and compress the spring with a press.

      SST 09350-32014

   b. Using a snap ring expander, remove the snap ring.

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.**

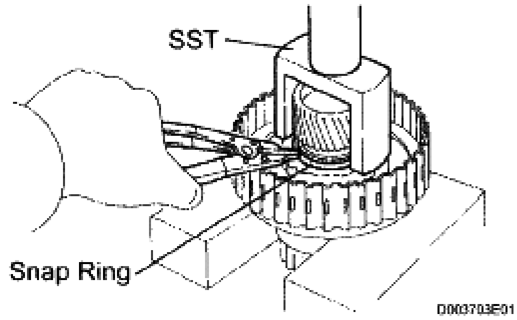

Fig. 577: Compressing Spring

c. Remove the clutch balancer from the underdrive clutch drum.

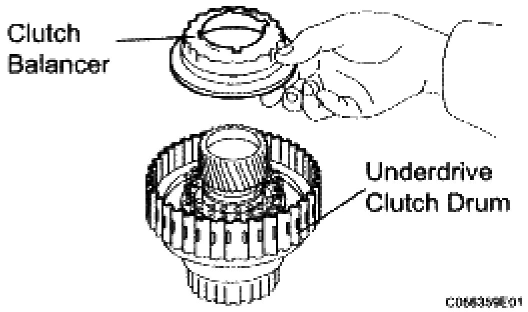

Fig. 578: Removing Clutch Balancer From Underdrive Clutch Drum

d. Remove the return spring from the underdrive clutch drum.

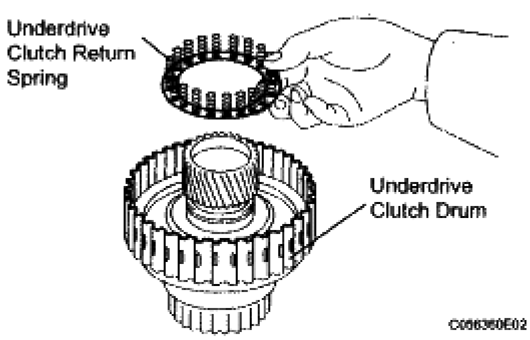

Fig. 579: Removing Return Spring From Underdrive Clutch Drum

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.

   b. Holding the underdrive clutch piston by hand, apply compressed air (392 kPa, 4.0 kgf/cm^2 , 57 psi) to the transaxle case to remove the underdrive clutch piston.

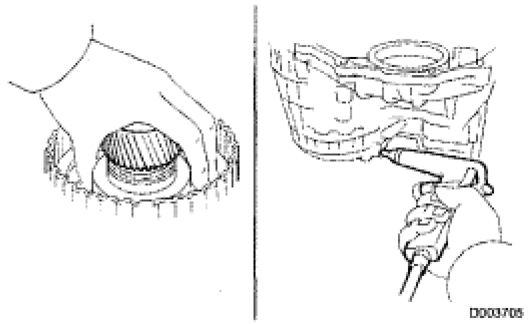

Fig. 580: Applying Compressed Air To Transaxle Case

6. **REMOVE UNDERDRIVE CLUTCH DRUM O-RING**
   a. Using a screwdriver, remove the O-ring from the underdrive clutch drum.

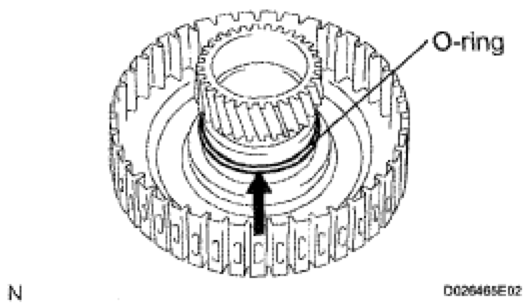

Fig. 581: Locating O-Ring

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.

   b. Install a dial indicator as shown in the illustration.
   c. Measure the underdrive clutch pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm^2 , 57 psi).

   Pack clearance: 1.51 to 1.71 mm (0.0594 to 0.0673 in.)

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

   HINT:

   There are 5 flanges in different thickness.

   Flange thickness: mm (in.)

FLANGE THICKNESS SPECIFICATION

Mark	Thickness	Mark	Thickness
1	3.0 (0.118)	4	3.6 (0.122)
2	3.2 (0.126)	5	3.8 (0.130)
3	3.4 (0.134)	-	-

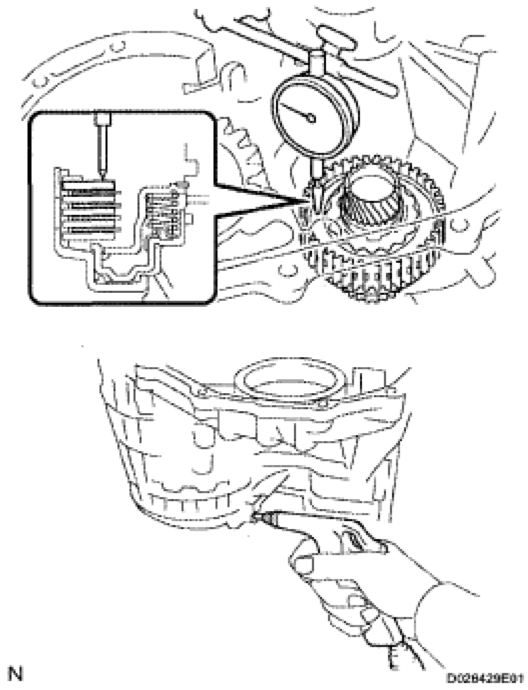

Fig. 582: Measuring Underdrive Clutch Pack Clearance

2. **INSPECT UNDERDRIVE CLUTCH DISC NO.1**
   a. 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.

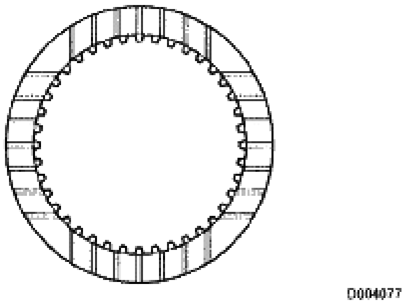

Fig. 583: Identifying Underdrive Clutch Disc No.1

3. **INSPECT UNDERDRIVE CLUTCH DRUM SUB-ASSEMBLY**
   a. Using a dial indicator, measure the inside diameter of the underdrive clutch drum bushing.

      Standard drum bushing: 37.06 to 37.08 mm (1.4591 to 1.4598 in.)

      Maximum drum bushing: 37.13 mm (1.4618 in.)

      If the inside diameter is greater than the maximum, replace the underdrive clutch drum.

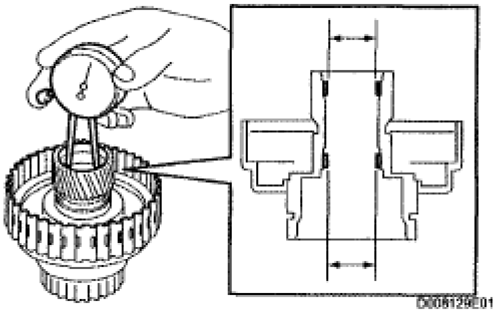

Fig. 584: Measuring Inside Diameter Of Underdrive Clutch Drum Bushing

4. **INSPECT UNDERDRIVE CLUTCH RETURN SPRING SUB-ASSEMBLY**
   a. Using a vernier calipers, measure the free length of the spring together with the spring seat.

      Standard free length: 17.14 mm (0.6752 in.)

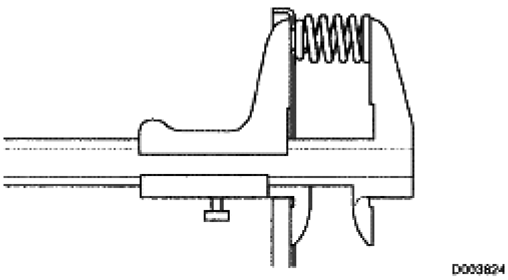

Fig. 585: Measuring Free Length Of Spring

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.**

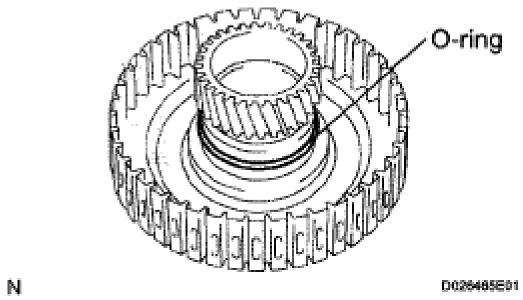

Fig. 586: Identifying O-Ring

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.**

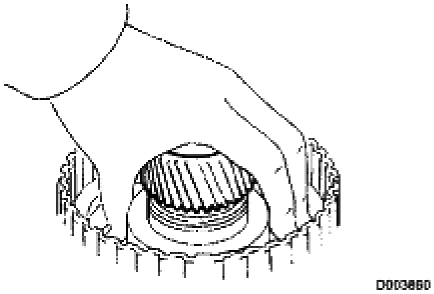

Fig. 587: Installing Underdrive Clutch Piston

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.

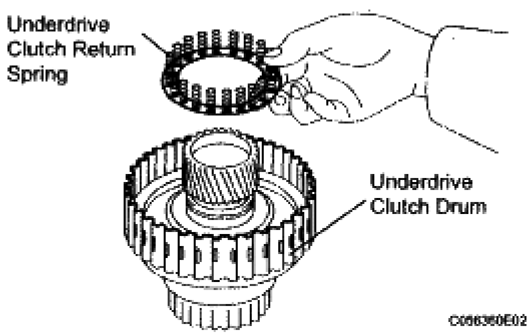

Fig. 588: Removing Return Spring From Underdrive Clutch Drum

c. Install the clutch balancer to the underdrive clutch drum.

NOTE: Be careful not to damage the lip of the clutch balancer.

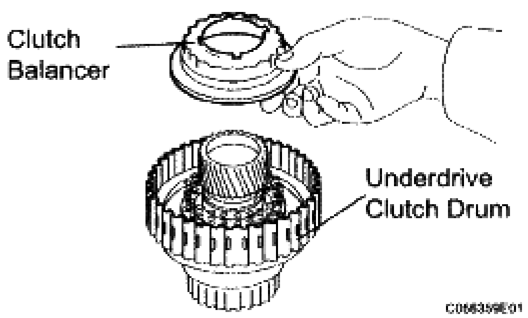

Fig. 589: Removing Clutch Balancer From Underdrive Clutch Drum

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.**
- **This prevents the spring seat from being deformed.**
- **Do not expand the snap ring excessively.**

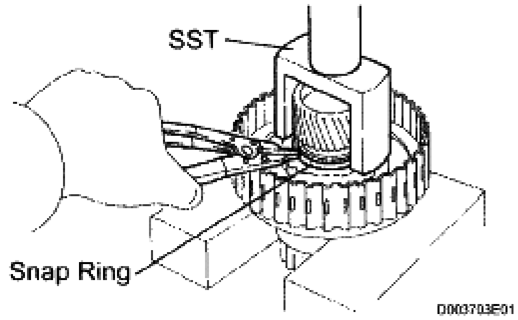

Fig. 590: Compressing Spring

g. Set the end gap of the snap ring in the underdrive clutch drum as shown in the illustration.

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

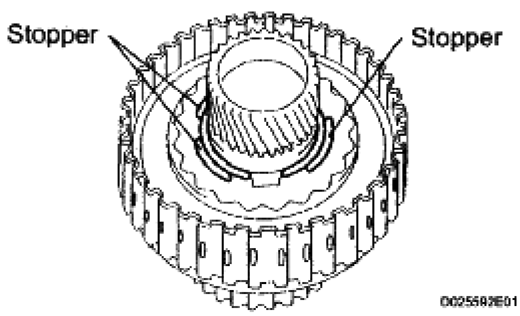

Fig. 591: Identifying Stoppers Location

4. **INSTALL UNDERDRIVE CLUTCH DISC NO.1**
   a. Coat the 4 discs with ATF.
   b. Install the 4 plates, 4 discs and flange to the underdrive clutch drum.

NOTE: **Make sure that the plates, discs, and flange are installed as shown in the illustration.**

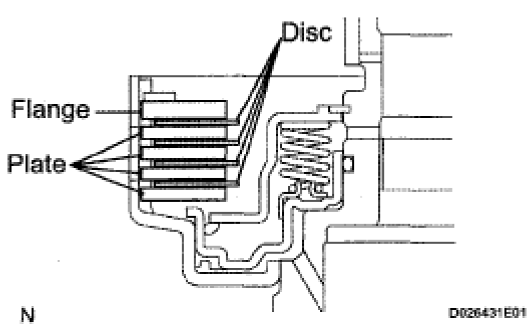

Fig. 592: Identifying Plates, Discs And Flange

5. **INSTALL 1ST & REVERSE BRAKE RETURN SPRING SHAFT SNAP RING**
   a. Using a screwdriver, install the underdrive clutch flange No.2 hole snap ring.

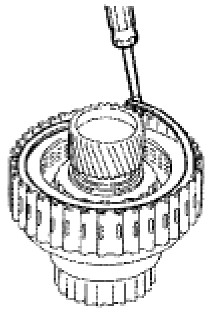

Fig. 593: Removing Snap Ring

   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.

6. **INSPECT UNDERDRIVE PACK CLEARANCE**

HINT:

(See **INSPECTION**)

DIFFERENTIAL CASE

COMPONENTS

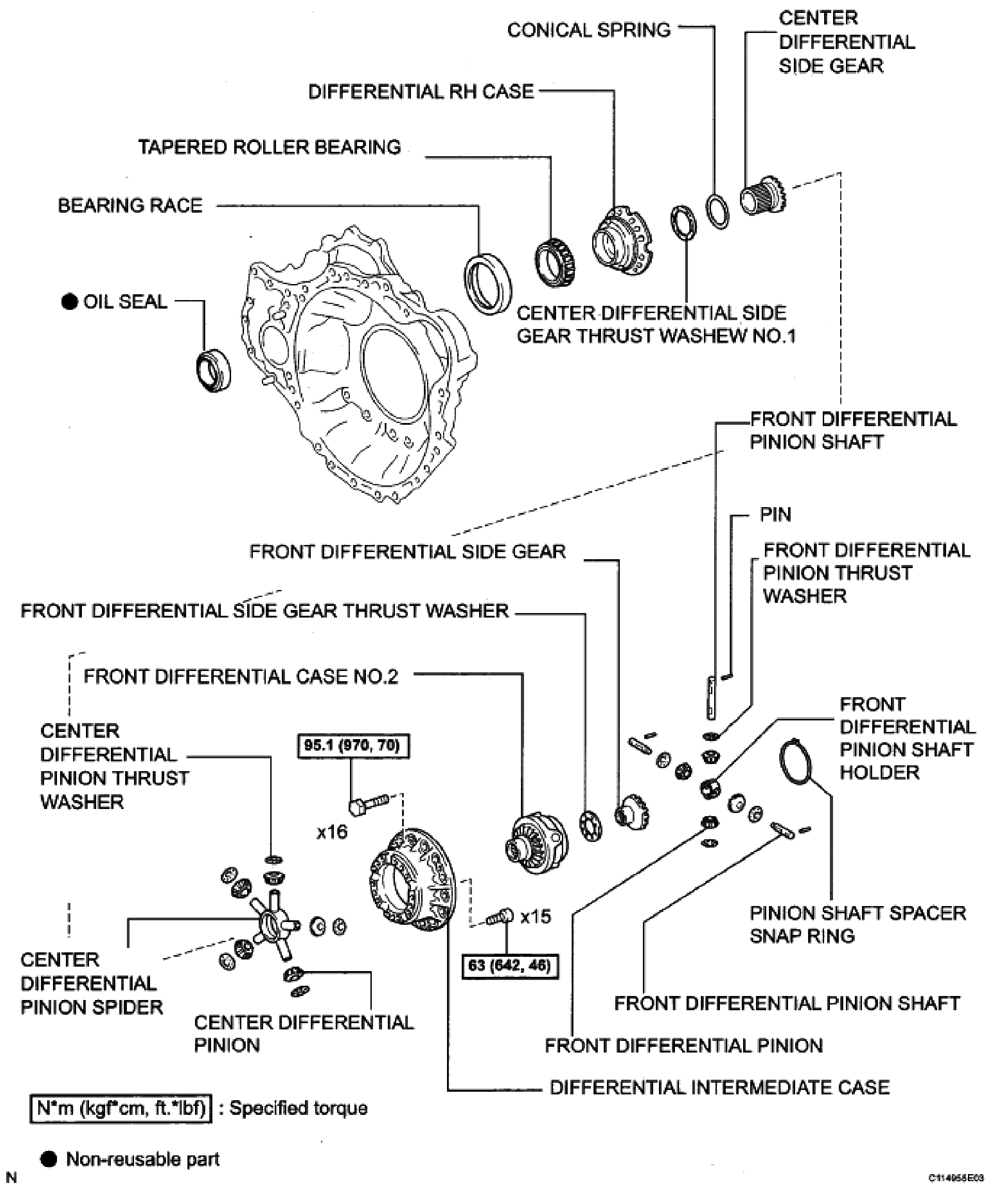

Fig. 594: Identifying Differential Case Components With Torque Specifications (1 Of 2)

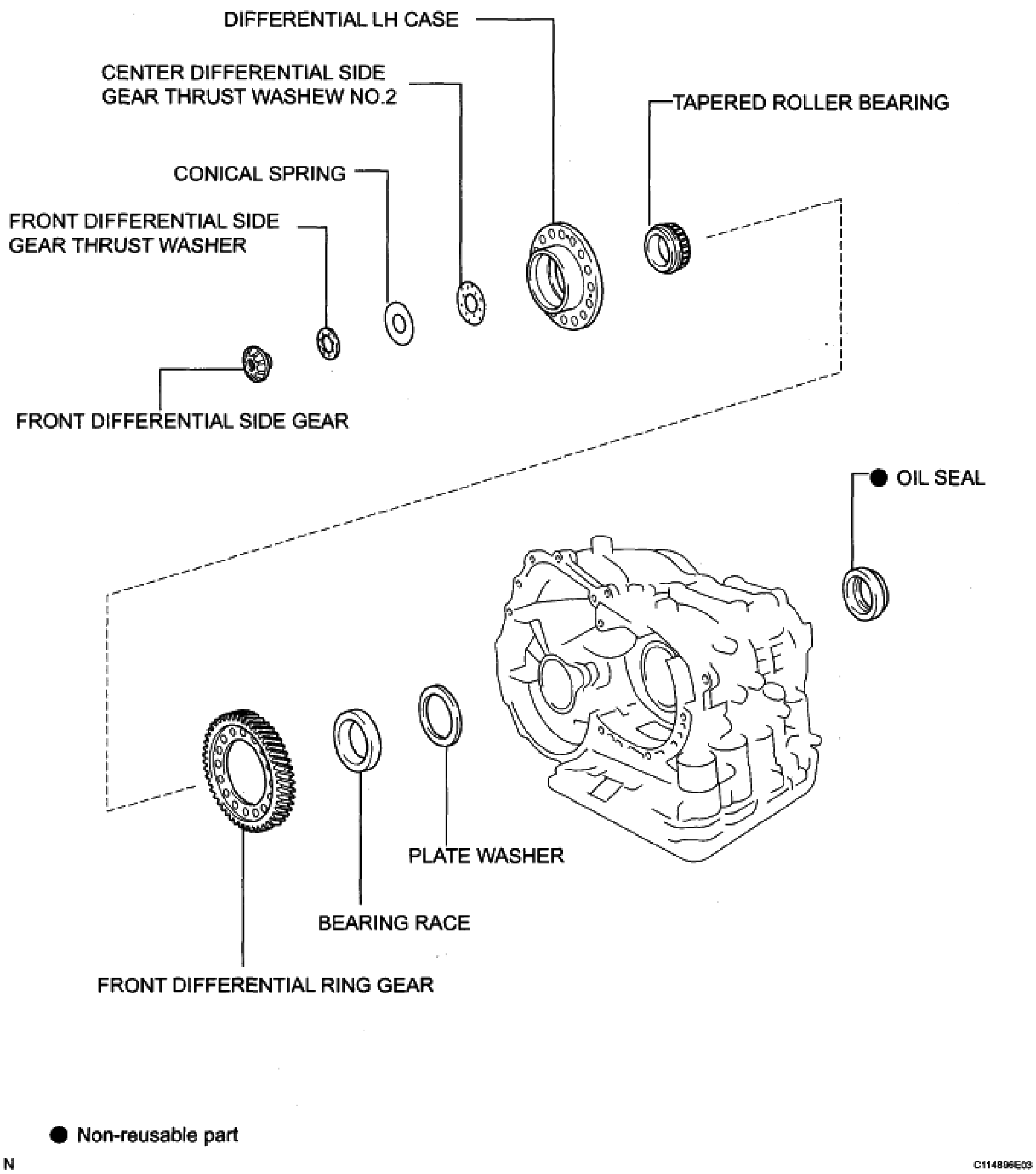

Fig. 595: Identifying Differential Case Components (2 Of 2)

DISASSEMBLY

1. **REMOVE FRONT DIFFERENTIAL RING GEAR**
   a. Place the match-marks on the ring gear and differential case.

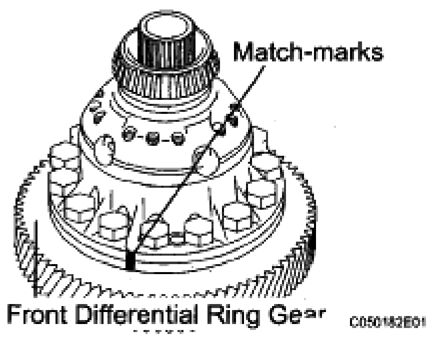

Fig. 596: Identifying Match-Marks On Ring Gear And Differential Case

b. Remove the 16 bolts.

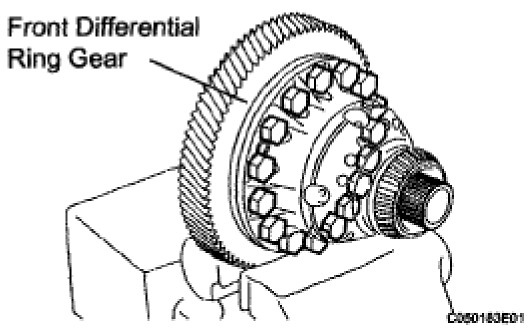

Fig. 597: Identifying Front Differential Ring Gear

c. Using a plastic hammer, tap ring gear to remove it from the case.

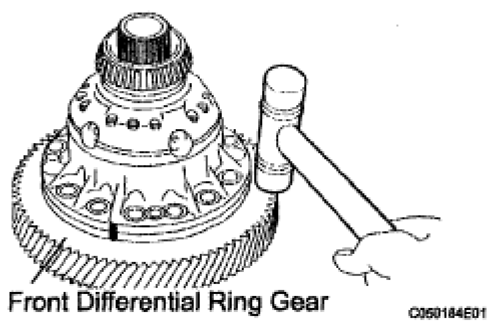

Fig. 598: Tapping Front Differential Ring Gear

2. **REMOVE FRONT DIFFERENTIAL SIDE GEAR**
   a. Remove the differential LH case from the differential case assembly.

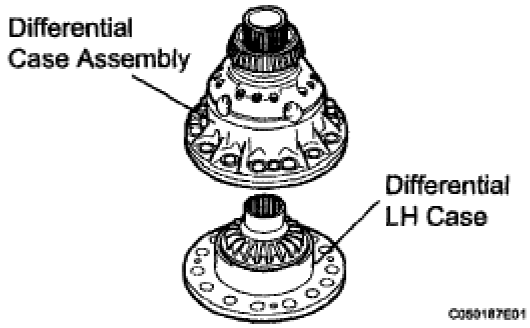

Fig. 599: Identifying Differential LH Case And Differential Case Assembly

b. Remove the differential case No.2 from the differential case LH.

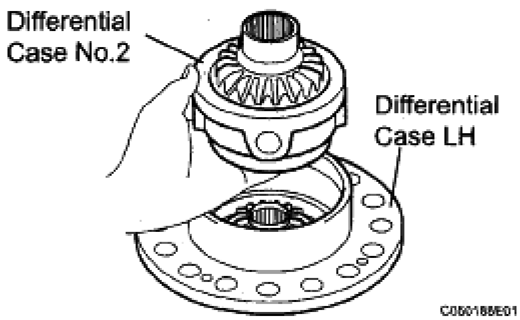

Fig. 600: Removing Differential Case No. 2 From Differential Case LH

c. Remove the front differential side gear, front differential side gear thrust washer, conical spring and center differential side gear thrust washer No.2 from the differential case LH.

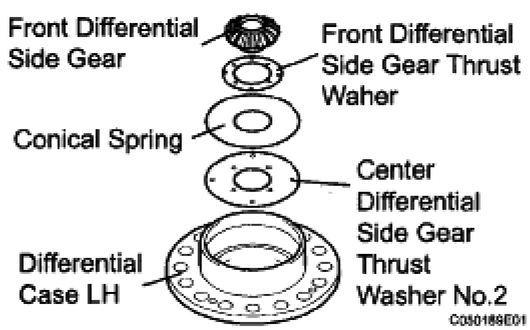

Fig. 601: Identifying Front Differential Side Gear And Front/Center Differential Side Gear Thrust Washer

d. Using a snap ring expander, remove the pinion shaft spacer snap ring.

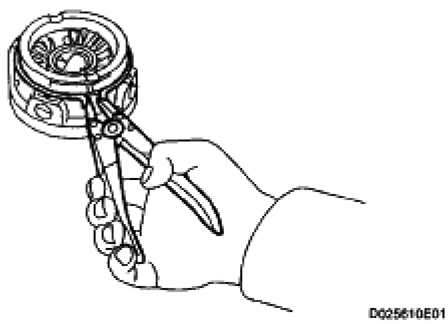

Fig. 602: Removing Pinion Shaft Spacer Snap Ring

e. Using a pin punch and hammer, remove 3 straight pins.

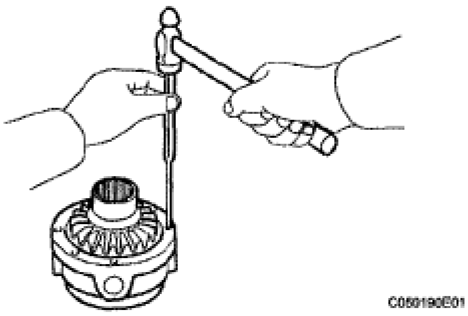

Fig. 603: Removing Straight Pins

f. Remove the center differential pinion shaft and 2 differential pinion shafts.

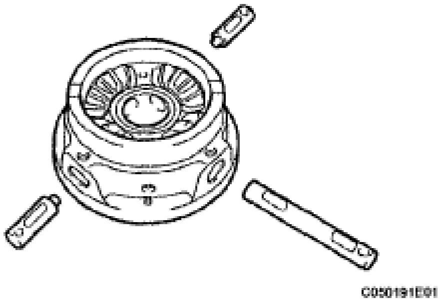

Fig. 604: Identifying Center Differential Pinion Shaft And Differential Pinion Shafts

g. Remove 4 front differential pinions, 4 front differential pinion thrust washers, front differential pinion shaft holder, front differential planetary ring and differential side gear thrust washer No.1.

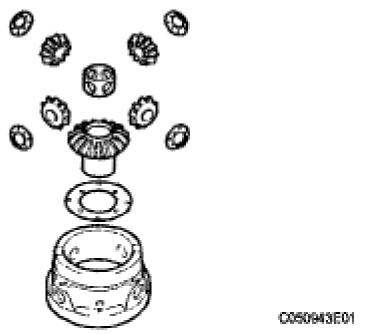

Fig. 605: Identifying Front Differential Pinions And Front Differential Pinion Thrust Washers

3. **REMOVE FRONT DIFFERENTIAL CASE REAR TAPERED ROLLER BEARING**
   a. Using SST, remove the front differential case rear tapered roller bearing from the differential case.

   SST 09950-00020, 09950-00030, 09950-60010 (09951-00480)

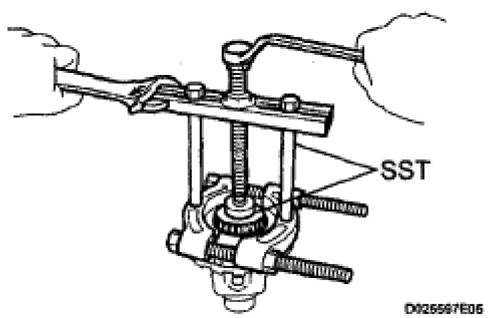

Fig. 606: Removing Front Differential Case Rear Tapered Roller Bearing From Differential Case

   b. Using SST, remove the front differential case rear tapered roller bearing outer race and differential case washer.

   SST 09308-00010

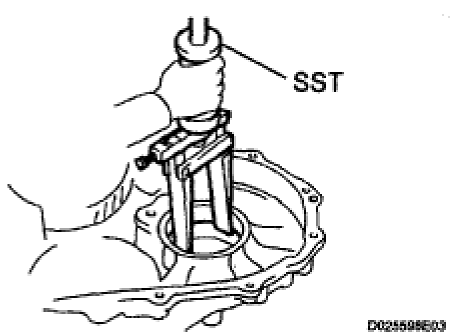

Fig. 607: Removing Front Differential Case Rear Tapered Roller Bearing Outer Race And

Differential Case Washer

4. **REMOVE CENTER DIFFERENTIAL PINION**
   a. Using Torx socket (T50), remove the 15 bolts.

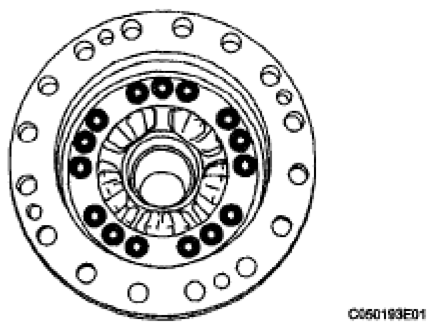

Fig. 608: Identifying Bolts

   b. Place the matchmarks on the differential intermediate case and differential case.
   c. Remove the differential intermediate case from the differential case RH.

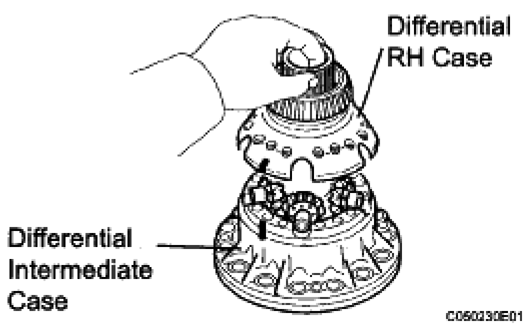

Fig. 609: Removing Differential Intermediate Case From Differential Case RH

   d. Remove the center differential side gear, conical spring washer and center differential side gear thrust washer No.1 RH from the differential case RH.

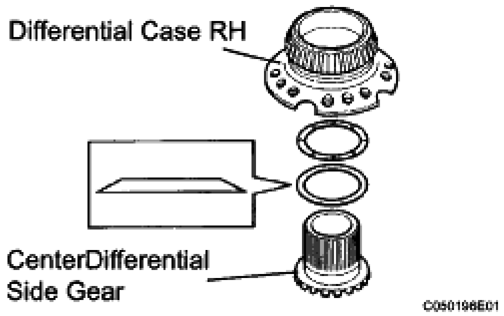

Fig. 610: Identifying Differential Case RH And Center Differential Side Gear

e. Remove the differential spider, 5 center differential pinions and 5 center differential pinion thrust washers from the differential intermediate case.

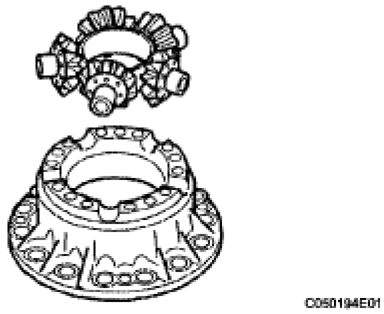

Fig. 611: Identifying Differential Spider And Center Differential Pinions

5. **REMOVE FRONT DIFFERENTIAL CASE FRONT TAPERED ROLLER BEARING**
   a. Using SST, remove the front differential case front tapered roller bearing from the differential case.

   SST 09950-00020, 09950-00030

   SST 09950-60010 (09951-00600)

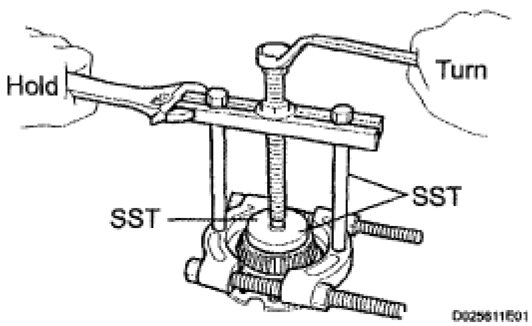

Fig. 612: Removing Front Differential Case Front Tapered Roller Bearing From Differential Case

   b. Using SST, remove the front differential case front tapered roller bearing outer race and differential case washer.

   SST 09308-00010

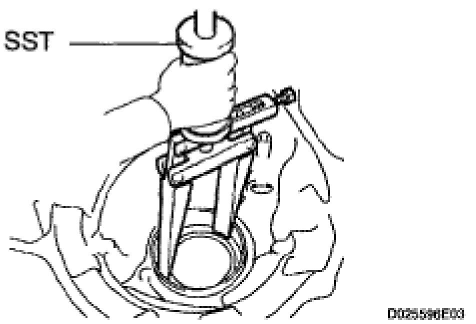

Fig. 613: Removing Front Differential Case Front Tapered Roller Bearing Outer Race And Differential Case Washer

6. **REMOVE TRANSAXLE HOUSING OIL SEAL**
   a. Using SST, remove the oil seal.

   SST 09950-70010 (09951-07100)

   SST 09649-17010

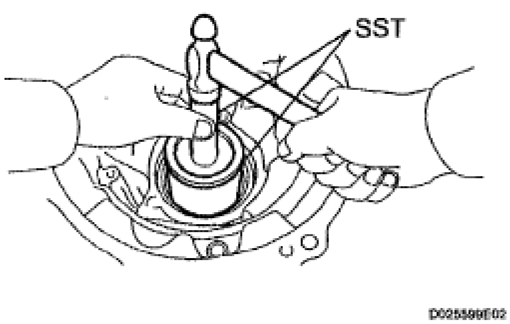

Fig. 614: Removing Transaxle Housing Oil Seal

7. **REMOVE DIFFERENTIAL SIDE BEARING RETAINER OIL SEAL**
   a. Using SST, remove the oil seal.

   SST 09950-70010 (09951 -07100), 09608-10010

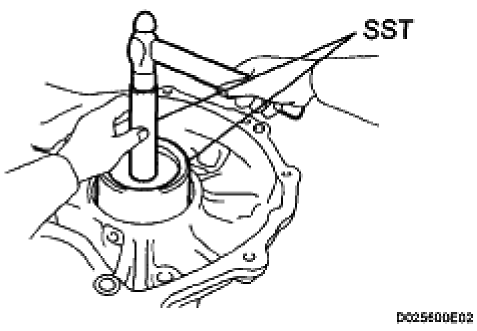

Fig. 615: Removing Differential Side Bearing Retainer Oil Seal

INSPECTION

1. **INSPECT FRONT DIFFERENTIAL**
   a. Using a dial indicator, measure the backlash of one pinion gear while holding the front differential side gear toward the case.

   Standard backlash: 0.05 - 0.20 mm (0.0020 - 0.0079 in.)

   NOTE: Do not mount the surface of front differential case which contacts with bushing in a vise.

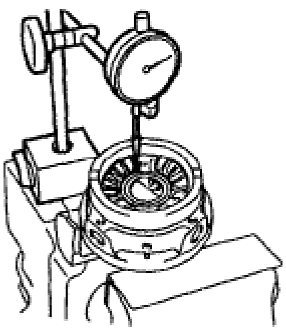

Fig. 616: Measuring Backlash Of Pinion Gear

If the backlash is not within the specified value, refer to the table below and select a thrust washer which will ensure that the backlash is within the specified value.

Thrust washer thickness: mm (in.)

THRUST WASHER THICKNESS SPECIFICATION

Mark	Thickness	Mark	Thickness
A	0.95 (0.0373)	F	1.20 (0.0472)
B	1.00 (0.0393)	G	1.25 (0.0492)
C	1.05 (0.0413)	H	1.30 (0.0512)
D	1.10 (0.0433)	J	1.35 (0.0532)
E	1.15 (0.0453)	K	1.40 (0.0552)

   b. Engage the front differential side to the above mentioned front differential case.
   c. Install the differential case LH to the front differential case and measure its center.
   d. After that, remove the differential case LH.

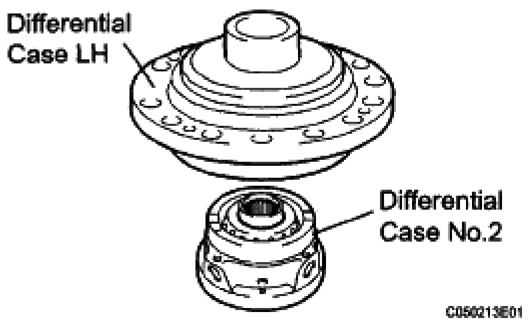

Fig. 617: Identifying Differential Case LH And Differential Case No. 2

e. Using a straight edge and feeler gauge, measure the clearance between the front differential case and the front differential side gear.

HINT:

- t= Thrust washer thickness
- L= Clearance
- t= L-0.162 - 0.265 mm (0.0064 - 0.0104 in.)

If the clearance is not within the specified value, refer to the table below and select a thrust washer which will ensure that the clearance is within the specified value.

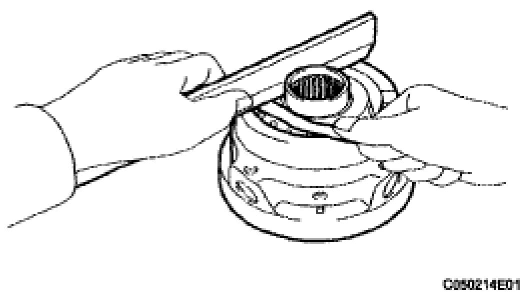

Fig. 618: Measuring Clearance Between Front Differential Case And Front Differential Side Gear

Thrust washer thickness: mm (in.)

THRUST WASHER THICKNESS SPECIFICATION

Mark	Thickness	Mark	Thickness
A	0.95 (0.0373)	F	1.20 (0.0472)
B	1.00 (0.0393)	G	1.25 (0.0492)
C	1.05 (0.0413)	H	1.30 (0.0512)
D	1.10 (0.0433)	J	1.35 (0.0532)
E	1.15 (0.0453)	K	1.40 (0.0552)

If the clearance is not within the specified value, parts may have been assembled incorrectly, so check and reassemble it.

2. **INSPECT CENTER DIFFERENTIAL**
   a. Pressing and holding the differential spider toward the differential case RH, measure the pinion's backlash with a dial indicator as illustrated.

   Standard backlash: 0.05 - 0.20 mm (0.0020 - 0.0079 in.)

   If the backlash is not within the specified value, refer to the table below and select a thrust washer which will ensure that the backlash is within the specified value.

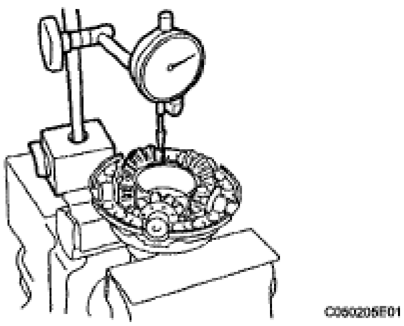

Fig. 619: Measuring Pinion Backlash

Thrust washer thickness: mm (in.)

THRUST WASHER THICKNESS SPECIFICATION

Mark	Thickness	Mark	Thickness
MA	0.80 (0.0313)	MH	1.15 (0.0453)
MB	0.85 (0.0333)	MJ	1.20 (0.0472)
MC	0.90 (0.0353)	MK	1.25 (0.0492)
MD	0.95 (0.0373)	ML	1.30 (0.0512)
ME	1.00 (0.0393)	MM	1.35 (0.0532)
MF	1.05 (0.0413)	MN	1.40 (0.0552)
MG	1.10 (0.0433)	-	-

   b. Temporarily install the differential side gear thrust washer No.2 LH, center differential side gear conical spring washer and differential case No.2 to the differential case LH.

   HINT:

   Ensure that the conical washers is installed correctly.

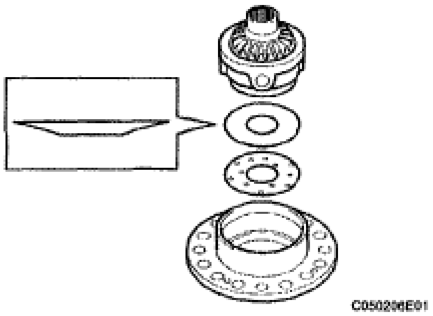

Fig. 620: Identifying Differential Side Gear Thrust Washer And Differential Case LH

c. Install the differential intermediate case to the above and fix them with 4 bolts.

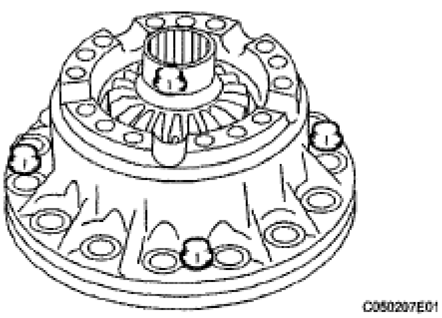

Fig. 621: Identifying Differential Intermediate Case

d. remove the differential spider, 5 center differential pinions and 5 center differential pinion thrust washers from the differential case RH. Put them in the differential intermediate case and fix the case.

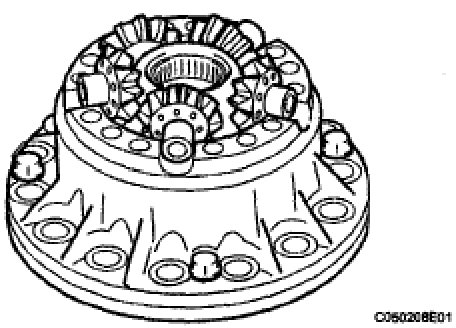

Fig. 622: Identifying Differential Spider And Center Differential Pinions

e. Pressing and holding the differential spider toward the differential intermediate case, measure the pinion's backlash with a dial indicator.

Standard backlash: 0.05 - 0.20 mm (0.0020 - 0.0079 in.)

If the backlash is not within the specified value, refer to the table below and select a thrust washer which will ensure that the backlash is within the specified value.

Thrust washer thickness: mm (in.)

THRUST WASHER THICKNESS SPECIFICATION

Mark	Thickness	Mark	Thickness
MA	0.80 (0.0313)	MH	1.15 (0.0453)
MB	0.85 (0.0333)	MJ	1.20 (0.0472)
MC	0.90 (0.0353)	MK	1.25 (0.0492)
MD	0.95 (0.0373)	ML	1.30 (0.0512)
ME	1.00 (0.0393)	MM	1.35 (0.0532)
MF	1.05 (0.0413)	MN	1.40 (0.0552)
MG	1.10 (0.0433)	-	-

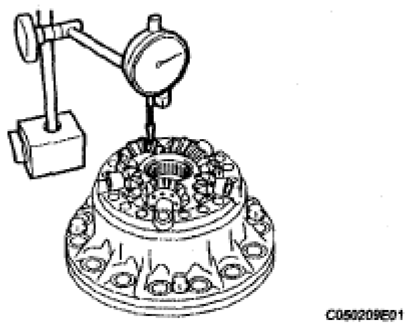

Fig. 623: Measuring Pinion Backlash

f. Remove the 4 bolts and disconnect the differential case LH from the differential intermediate case.

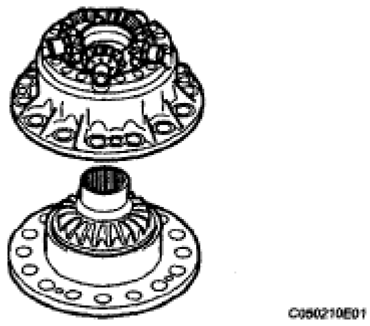

Fig. 624: Identifying Differential Case LH And Differential Intermediate Case

g. Remove the differential case No.2 from the differential case LH.

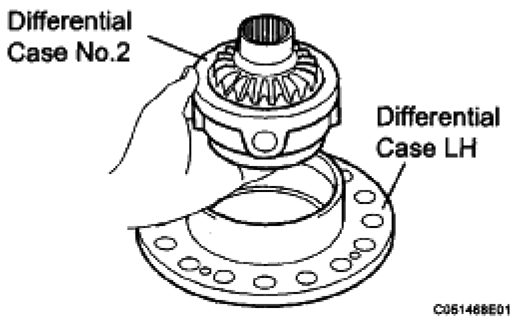

Fig. 625: Removing Differential Case No. 2 From Differential Case LH

3. **ADJUST TAPERED ROLLER BEARING PRELOAD**
   a. Install the intermediate case to the differential case LH and fix them with 4 bolts.
   b. Install the differential assembly to the transaxle case.

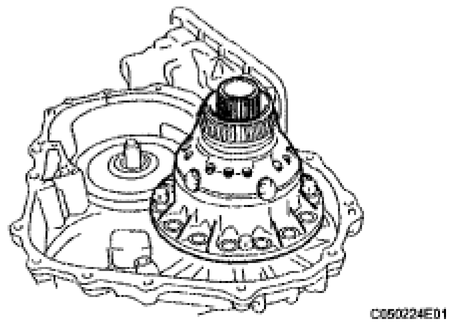

Fig. 626: Identifying Intermediate Case

   c. Clean the matching surfaces of the transaxle case and transaxle housing.
   d. Install the transaxle housing to the transaxle case and tighten them with the 16 bolts.

Torque: Bolt A

25 N*m (255 kgf*cm, 18 ft.*lbf) Bolt B

33 N*m (337 kgf*cm, 24 ft.*lbf) Bolt C

29 N*m (295 kgf*cm, 21 ft.*lbf)

Bolt length:

Bolt A: 50 mm (1.969 in.)

Bolt B: 50 mm (1.969 in.)

Bolt C: 42 mm (1.654 in.)

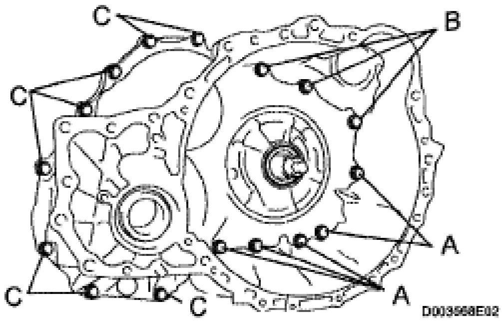

Fig. 627: Identifying Transaxle Housing Bolts

HINT:

Usually, bolt A is a non-reusable bolt. In the case, however, it can be used after cleaning it.

e. Using SST, turn the differential assembly right and left 2 or 3 times to allow the bearing settle.

SST 09564-32011

f. Using SST and a torque wrench, measure the turning torque of the differential case assembly.

SST 09564-32011

Torque: New bearing (*)

0.2 to 0.69 N*m (2.0 to 7.0 kgf*cm, 1.8 to 601 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)

HINT:

- (*): Turning torque at 60 rpm
- If the turning torque is not within the specified value, refer to the table below and select a thrust washer which turning torque is within the specified value.

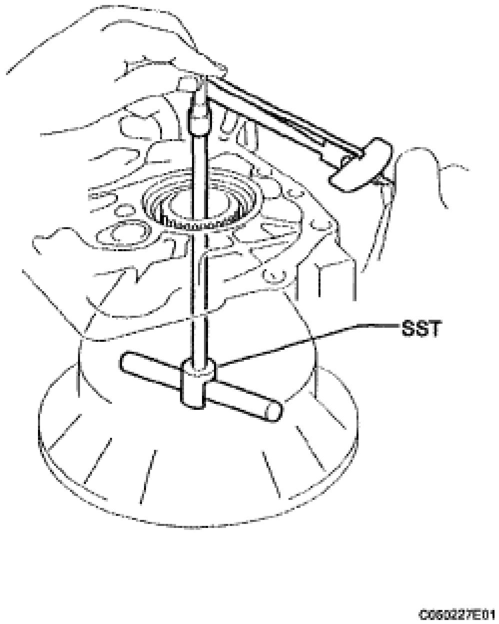

Fig. 628: Measuring Turning Torque Of Differential Case Assembly

Flange thickness: mm (in.)

FLANGE THICKNESS SPECIFICATION

Mark	Thickness	Mark	Thickness
0	2.00 (0.0787)	9	2.45 (0.0965)
1	2.05 (0.0807)	A	2.50 (0.0984)
2	2.10 (0.0827)	B	2.55 (0.1004)
3	2.15 (0.0846)	C	2.60 (0.1024)
4	2.20 (0.0866)	D	2.65 (0.1043)
5	2.25 (0.0886)	E	2.70 (0.1063)
6	2.30 (0.0906)	F	2.75 (0.1083)
7	2.35 (0.0925)	G	2.80 (0.1102)
8	2.40 (0.0945)	H	2.00 (0.1122)

g. Remove the 16 bolts and the transaxle housing.

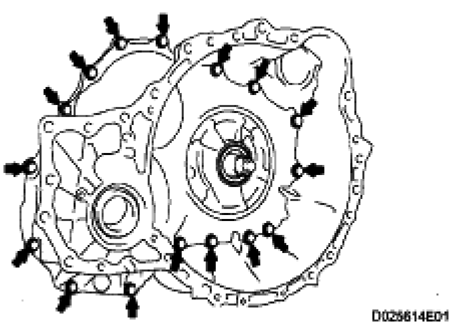

Fig. 629: Locating Transaxle Housing Bolts

h. Remove the differential assembly.

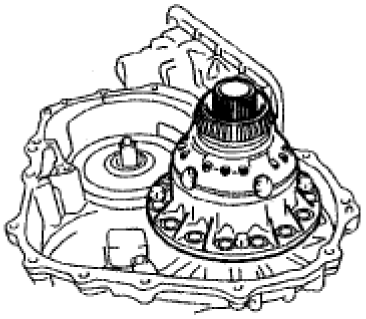

Fig. 630: Identifying Differential Assembly

REASSEMBLY

1. **INSTALL DIFFERENTIAL CASE SUB-ASSEMBLY NO.2**
   a. Coat the front differential side gear thrust washer No.1, front differential planetary ring gear, front differential pinion No.2, front differential pinion thrust washer No.2, front differential pinion shaft holder, front differential pinion shaft and 2 differential pinion shafts with ATF, install them to the differential case No.2.

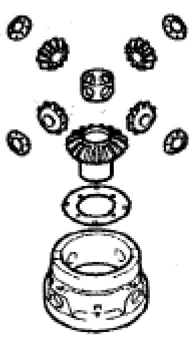

Fig. 631: Identifying Front Differential Side Gear Thrust Washer And Front Differential Pinion

   b. Using a pin punch and a hammer, install 3 straight pins.

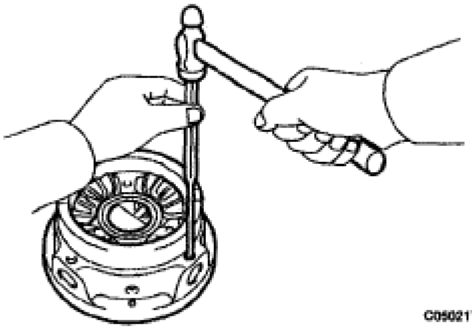

Fig. 632: Installing Straight Pins

c. Using a snap ring expander, install the pinion shaft spacer snap ring.

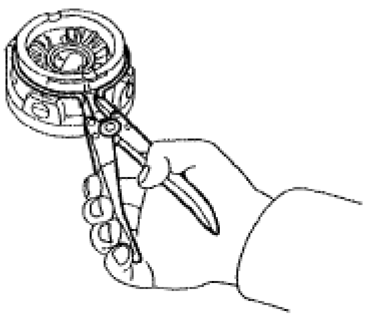

Fig. 633: Installing Pinion Shaft Spacer Snap Ring

2. **INSPECT FRONT DIFFERENTIAL**

   HINT:

   (See **INSPECTION**)

3. **INSTALL CTR DIFFERENTIAL PLANETARY GEAR ASSEMBLY**
   a. Install the center differential side gear, conical spring washer and center differential side gear thrust washer No.2 RH from the differential case RH.

      HINT:

      Ensure that the conical washers is installed correctly.

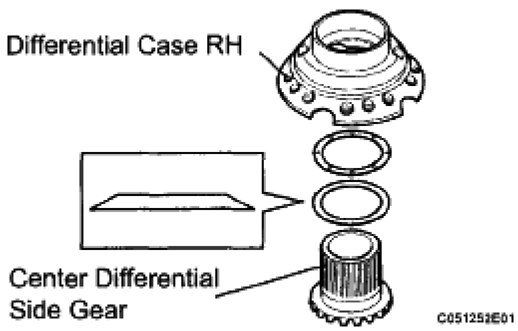

Fig. 634: Identifying Center Differential Side Gear And Differential Case RH

b. Hold the differential case RH by vice. Install the center differential pinion and pinion thrust washer to the differential spider and install them to the differential case RH.

NOTE: When holding the differential case RH by vise, be sure to place an aluminum sheet between them and use a minimum force

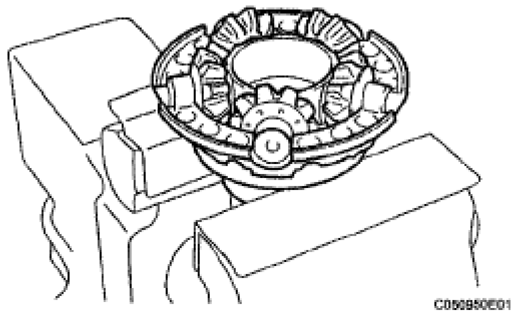

Fig. 635: Holding Differential Case RH By Vice

c. Pressing and holding the differential spider toward the differential case RH, measure the pinion's backlash with a dial indicator as illustrated.

Standard backlash: 0.05 - 0.20 mm (0.0020 - 0.0079 in.)

If the backlash is not within the specified value, refer to the table below and select a thrust washer which will ensure that the backlash is within the specified value.

Thrust washer thickness: mm (in.)

THRUST WASHER THICKNESS SPECIFICATION

Mark	Thickness	Mark	Thickness
MA	0.80 (0.0313)	MH	1.15 (0.0453)
MB	0.85 (0.0333)	MJ	1.20 (0.0472)
MC	0.90 (0.0353)	MK	1.25 (0.0492)
MD	0.95 (0.0373)	ML	1.30 (0.0512)

ME	1.00 (0.0393)	MM	1.35 (0.0532)
MF	1.05 (0.0413)	MN	1.40 (0.0552)
MG	1.10 (0.0433)	-	-

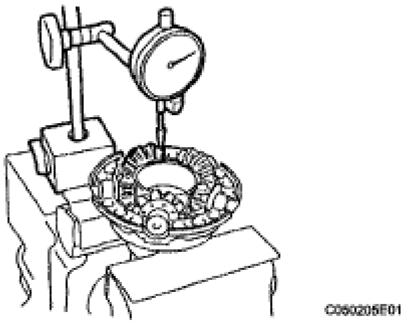

Fig. 636: Measuring Pinion Backlash

d. Temporarily install the differential side gear thrust washer No.2 LH, center differential side gear conical spring washer and differential case No.2 to the differential case LH.

HINT:

Ensure that the conical washers is installed correctly.

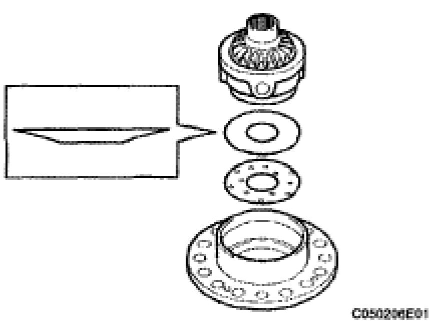

Fig. 637: Identifying Differential Side Gear Thrust Washer And Differential Case LH

e. Install the differential intermediate case to the above and fix them with 4 bolts.

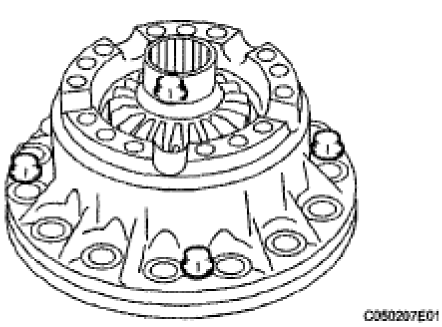

Fig. 638: Identifying Differential Intermediate Case

f. remove the differential spider, 5 center differential pinions and 5 center differential pinion thrust washers from the differential case RH. Put them in the differential intermediate case and fix the case.

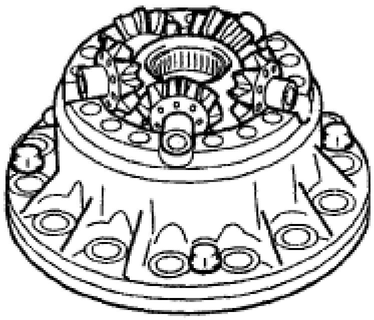

Fig. 639: Identifying Differential Spider And Center Differential Pinions

g. Pressing and holding the differential spider toward the differential intermediate case, measure the pinion's backlash with a dial indicator.

Standard backlash: 0.05 - 0.20 mm (0.0020 - 0.0079 in.)

If the backlash is not within the specified value, refer to the table below and select a thrust washer which will ensure that the backlash is within the specified value.

Thrust washer thickness: mm (in.)

THRUST WASHER THICKNESS SPECIFICATION

Mark	Thickness	Mark	Thickness
MA	0.80 (0.0313)	MH	1.15 (0.0453)
MB	0.85 (0.0333)	MJ	1.20 (0.0472)
MC	0.90 (0.0353)	MK	1.25 (0.0492)
MD	0.95 (0.0373)	ML	1.30 (0.0512)
ME	1.00 (0.0393)	MM	1.35 (0.0532)
MF	1.05 (0.0413)	MN	1.40 (0.0552)
MG	1.10 (0.0433)	-	-

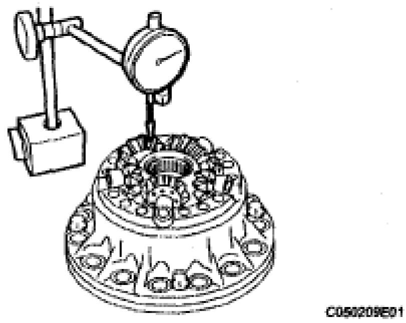

Fig. 640: Measuring Pinion Backlash

h. Remove the 4 bolts and disconnect the differential case LH from the differential intermediate case.

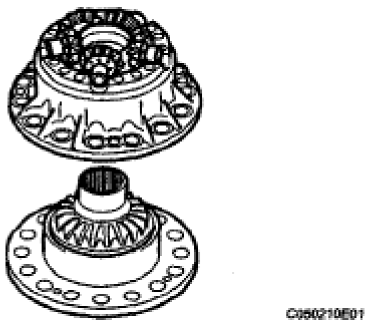

Fig. 641: Identifying Differential Case LH And Differential Intermediate Case

i. Remove the differential case No.2 from the differential case LH.

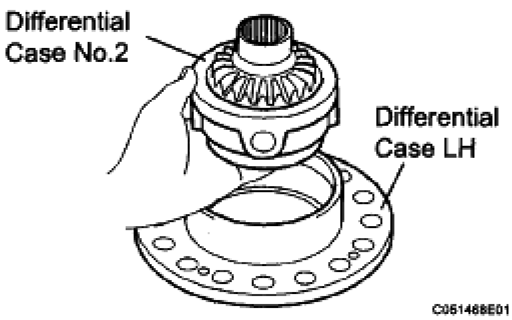

Fig. 642: Removing Differential Case No. 2 From Differential Case LH

j. Install the selected differential side gear thrust washer No.2 LH and center differential planetary gear to the differential case LH.

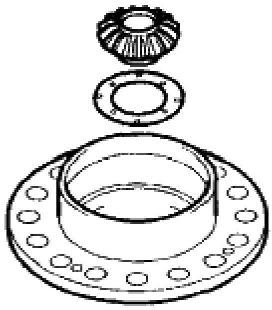

Fig. 643: Identifying Differential Side Gear Thrust Washer And Center Differential Planetary Gear

k. Install the differential case No.2 to the differential case LH again.

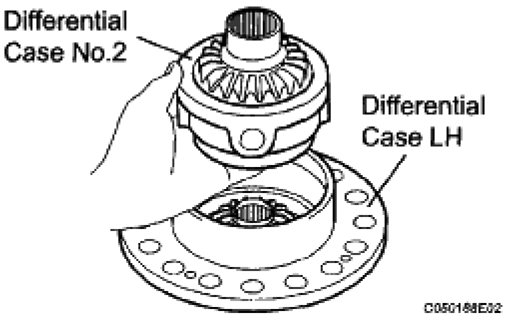

Fig. 644: Installing Differential Case No. 2 To Differential Case LH

l. install the adjusted differential case RH to the intermediate case and tighten the 15 bolts using a Torx socket wrench (T50).

Torque: 63 N*m (642 kgf*cm, 46 ft.*lbf)

NOTE: Align the matchmarks.

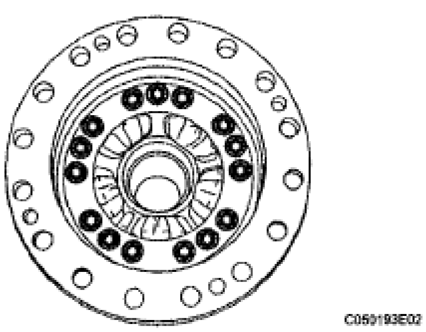

Fig. 645: Identifying Differential Case RH Bolts

4. **INSTALL FRONT DIFFERENTIAL CASE FRONT TAPERED ROLLER BEARING**
   a. Using SST and a press, install the front differential case tapered roller bearing FR to the differential

case.

SST 09950-70010 (09951-07100), 09649-17010

NOTE: **Do not make a damage on the bearing cage during the bearing inner race installation.**

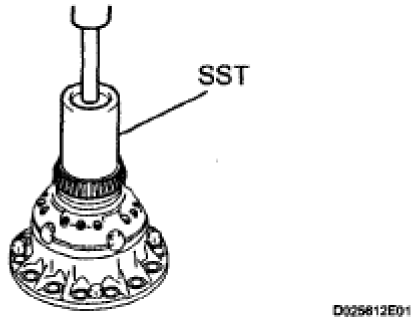

Fig. 646: Installing Front Differential Case Tapered Roller Bearing FR To Differential Case

b. Using SST, install the outer race of the tapered roller bearing FR.

SST 09527-17011, 09950-60020 (09951-01030)

NOTE: **Clearance is not allowed between the plate washer and transaxle housing.**

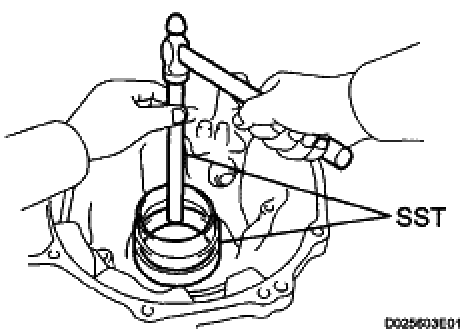

Fig. 647: Installing Outer Race Of Tapered Roller Bearing FR

5. **INSTALL FRONT DIFFERENTIAL SIDE GEAR**

a. Using SST and a press, install the front differential case tapered roller bearing RR to the differential case.

SST 09316-20011, 09214-76011

NOTE: **Do not make a damage on the bearing cage during the bearing inner race installation.**

b. Install the front differential case shim RR to the transaxle case.

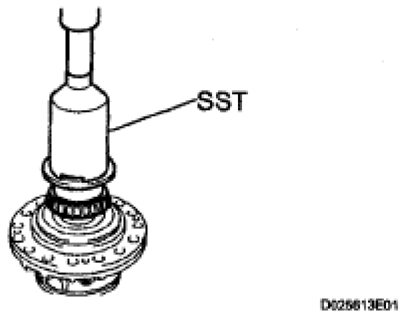

Fig. 648: Installing Front Differential Case Tapered Roller Bearing RR To Differential Case

If the bearing is new, check to select a front differential case shim RR of proper thickness starting from the thinner ones. If the bearing is reused, check to select a front differential case shim RR starting from the same thickness as one installed before disassembly.

c. Using SST, install the outer race of the front differential case tapered roller bearing RR.

SST 09950-60020 (09951 -00890), 09950-70010 (09951-07100)

NOTE:	**Clearance is not allowed between the differential case shim and transaxle case.**

6. **ADJUST TAPERED ROLLER BEARING PRELOAD**

HINT:

(See **INSPECTION**)

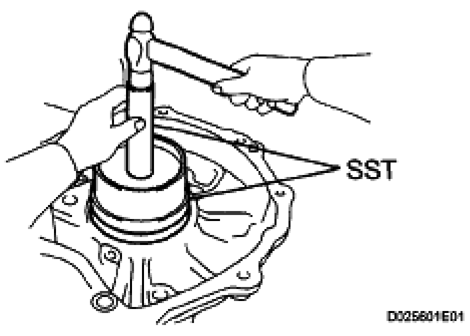

Fig. 649: Installing Outer Race Of Front Differential Case Tapered Roller Bearing RR

7. **INSTALL FRONT DIFFERENTIAL RING GEAR**
   a. Using ATF and heater, heat the front differential ring gear to 90 to 110°C (194.0 to 230.0°F).

NOTE: Do not heat the ring gear to more than 110°C (230.0°F).

b. Clean the contact surface of the front differential case.

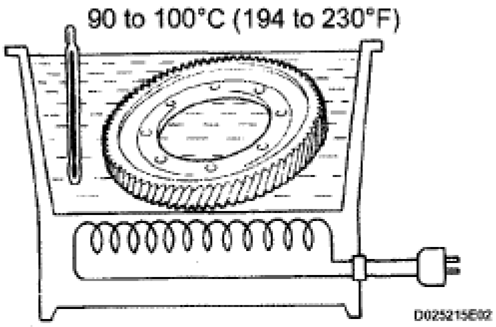

Fig. 650: Heating Front Differential Ring Gear

c. Set the match-marks, install the front differential ring gear case quickly.

NOTE: Do not install the bolts while the ring gear is hot.

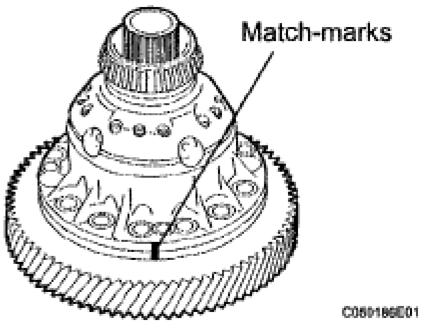

Fig. 651: Identifying Matching Marks On Front Differential Ring Gear

d. Temporarily install the 8 bolts as shown in the illustration.

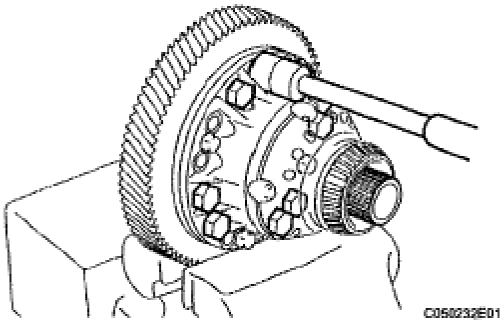

Fig. 652: Installing Front Differential Ring Gear Bolts

e. Remove the 4 bolts shown in the illustration.

f. Temporarily install the remaining 8 set bolts.
g. Fully tighten the set bolts.

Torque: 95.1 N*m (970 kgf*cm, 70 ft.*lbf)

NOTE: Tighten the bolts a little at a time in diagonal order.

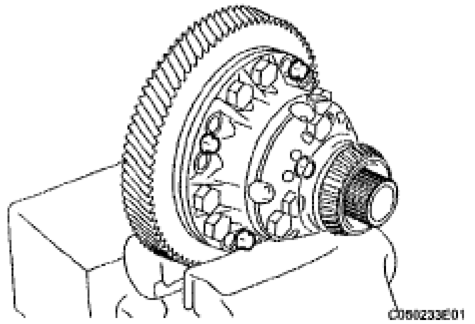

Fig. 653: Identifying Front Differential Ring Gear

8. **INSTALL DIFFERENTIAL SIDE BEARING RETAINER OIL SEAL**
   a. Using SST and a hammer, install a new oil seal.

   SST 09223-15020, 09950-70010 (09951 -07100)

   b. Coat the rip of oil seal with a little MP grease.

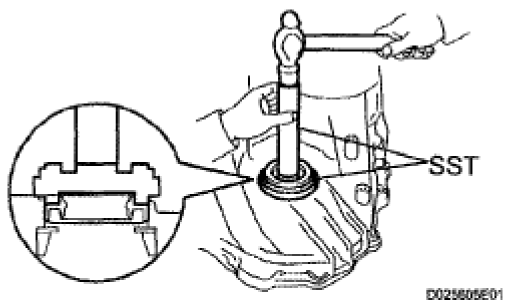

Fig. 654: Installing Differential Side Bearing Retainer Oil Seal

9. **INSTALL TRANSAXLE HOUSING OIL SEAL**
   a. Wind a vinyl tape around SST at the place 6.0 mm (0.236 in.) above from the bottom end until the thickness of the wound tape is about 5.0 mm (0.197 in.).

   SST 09950-60020 (09951-00730)

NOTE: Remove foreign matter such as grease on the SST before winding the tape.

b. Coat the rip of oil seal with a little MP grease.

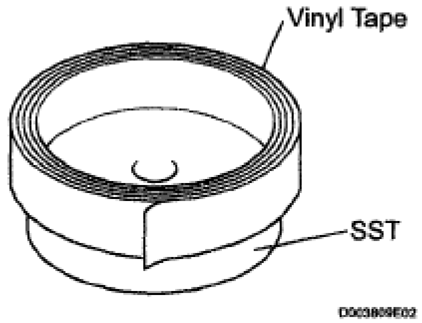

Fig. 655: Winding Vinyl Tape Around SST

c. Using SST, install a new oil seal.

SST 09950-60020 (09951 -00730), 09950-70010 (09951-07150)

Standard press in depth: 5.5 - 6.5 mm (0.217 - 0.256 in.)

NOTE: Stop pressing when the would vinyl tape is contact with the transaxle housing.

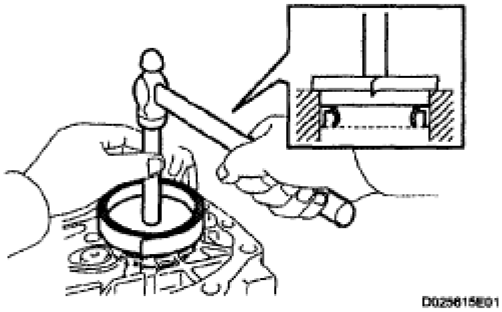

Fig. 656: Installing Transaxle Housing Oil Seal

SPEED SENSOR

COMPONENTS

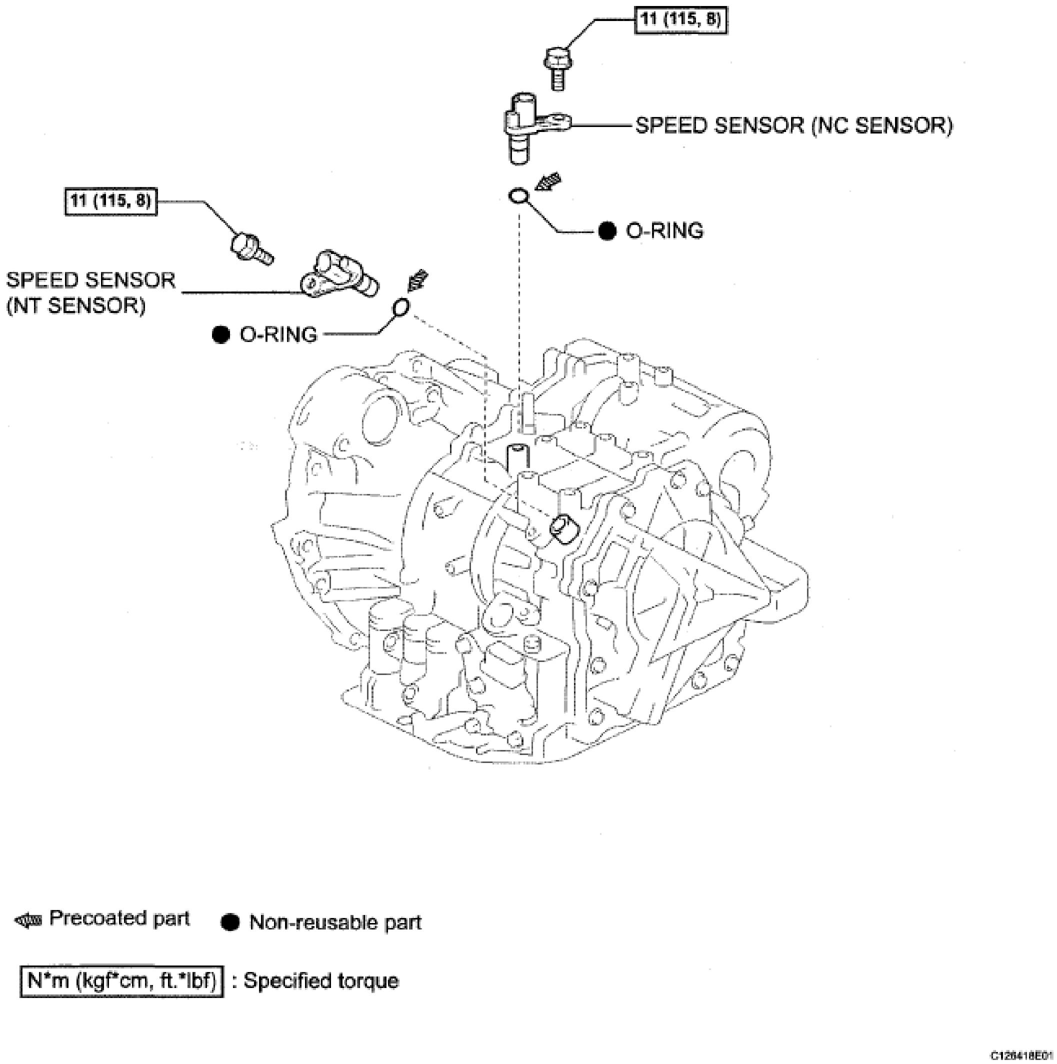

Fig. 657: Identifying Speed Sensor Components With Torque Specifications

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.

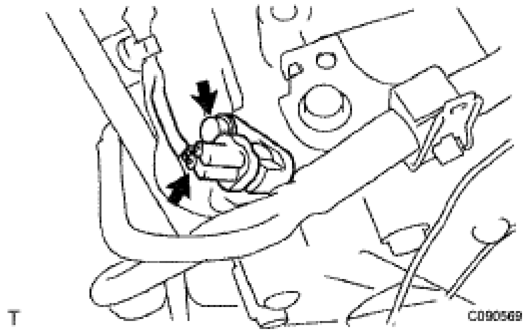

Fig. 658: Locating Speed Sensor Bolt And Speed Sensor Connector (NT)

4. **REMOVE SPEED SENSOR (NC SENSOR)**
   a. Disconnect the speed sensor connector.
   b. Remove the bolt and speed sensor.

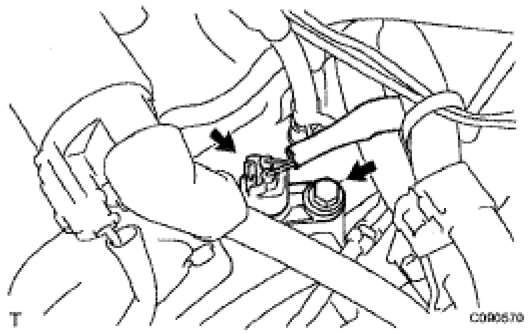

Fig. 659: Locating Speed Sensor Bolt And Speed Sensor Connector (NC)

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.

   AISIN made:

   Resistance:

   RESISTANCE SPECIFICATION

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

   TOYOTA made:

   Resistance:

RESISTANCE SPECIFICATION

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

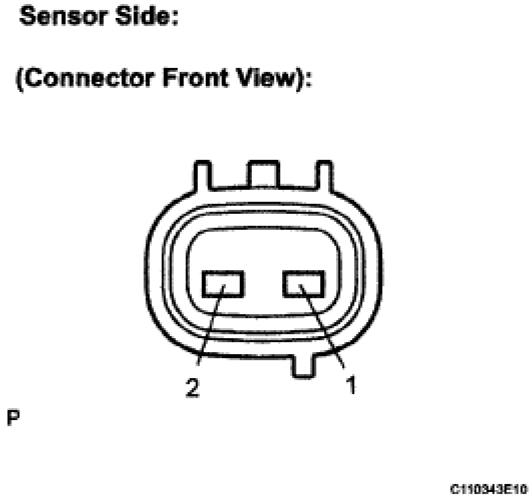

Fig. 660: Identifying Speed Sensor Connector Terminals (NT)

2. **INSPECT SPEED SENSOR (NC SENSOR)**
   a. Disconnect the speed sensor connector from the transaxle.
   b. Measure the resistance according to the value (s) in the table below.

AISIN made:

Resistance:

RESISTANCE SPECIFICATION

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

TOYOTA made:

Resistance:

RESISTANCE SPECIFICATION

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

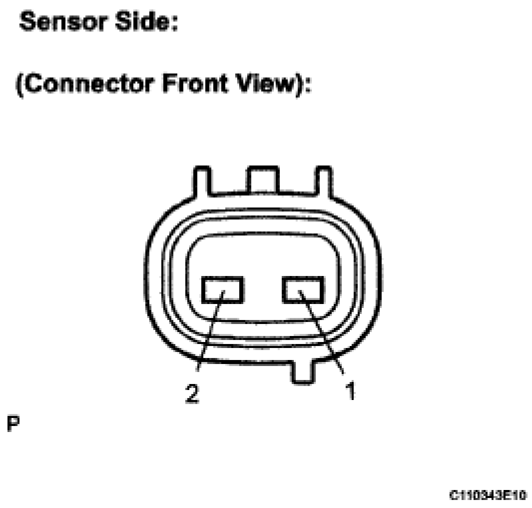

Fig. 661: Identifying Speed Sensor Connector Terminals (NT)

INSTALLATION

1. **INSTALL SPEED SENSOR (NC SENSOR)**
   a. Coat the O-ring with ATF.
   b. Install the speed sensor with the bolt.

   Torque: 11 N*m (115 kgf*cm, 8 ft.*lbf)

   HINT:

   Make sure to install the same manufacturer's sensor.

   c. Connect the speed sensor connector.

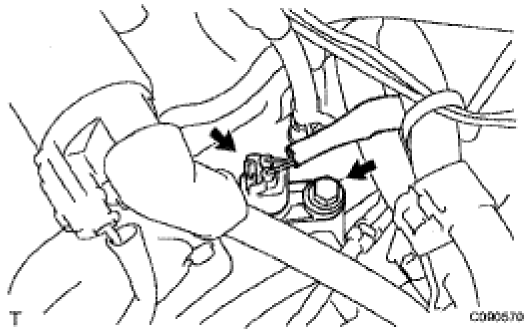

Fig. 662: Locating Speed Sensor Bolt And Speed Sensor Connector (NC)

2. **INSTALL SPEED SENSOR (NT SENSOR)**

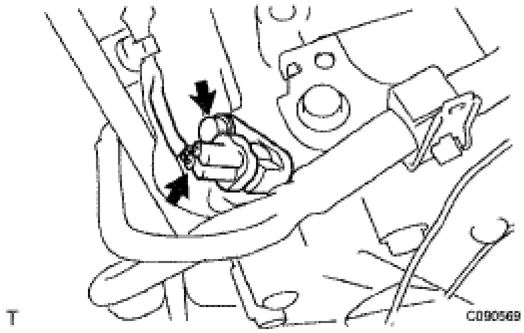

Fig. 663: Locating Speed Sensor Bolt And Speed Sensor Connector (NT)

a. Coat the O-ring with ATF.
b. Install the speed sensor with the bolt.

   Torque: 11 N*m (115 kgf*cm, 8 ft.*lbf)

   HINT:

   Make sure to install the same manufacturer's sensor.

c. Connect the speed sensor connector.

3. **INSTALL AIR CLEANER ASSEMBLY**

   HINT:

   (See **INSTALLATION**)

4. **INSTALL BATTERY**

