DEFINITION OF TERMS

Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	Diagnostic code
Typical enabling condition	Preconditions that allow the ECM to detect malfunctions. With all preconditions satisfied, the ECM sets the DTC when the monitored value(s) exceeds the malfunction threshold(s).
Sequence of operation	The priority order that is applied to monitoring, if multiple sensors and components are used to detect the malfunction. While another sensor is being monitored, the next sensor or component will not be monitored 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.

AX

PART AND SYSTEM NAME LIST

This reference list indicates the part names used in this manual along with their definitions.

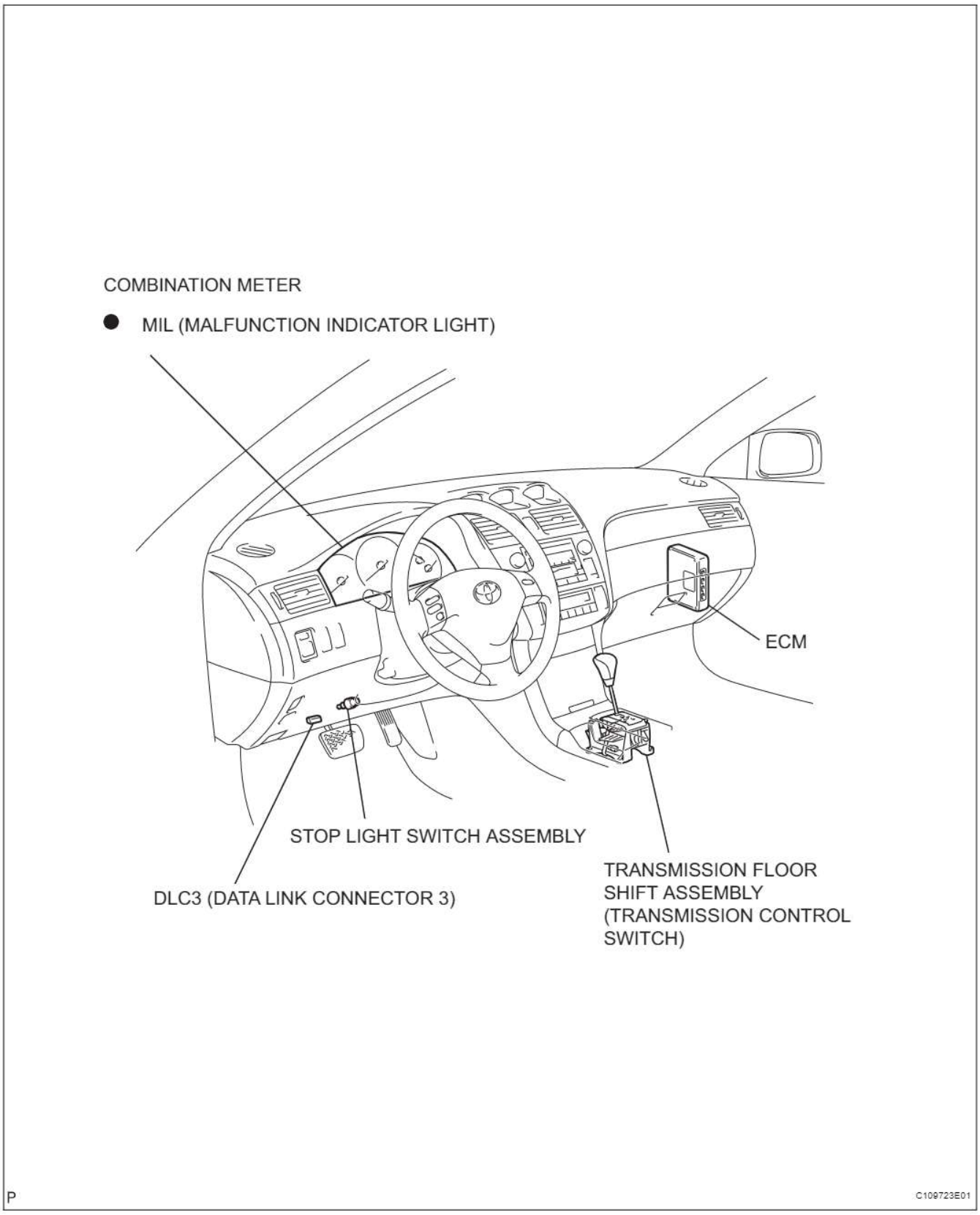
Part and system name	Definition
Toyota HCAC system, Hydrocarbon adsorptive Catalyst (HCAC) system, HC adsorptive three-way catalyst	HC adsorptive three-way catalytic converter
Variable Valve Timing sensor, VVT sensor	Camshaft position sensor
Variable valve timing system, VVT system	Camshaft timing control system
Camshaft timing oil control valve, Oil control valve OCV, VVT, VSV	Camshaft timing oil control valve
Variable timing and lift, VVTL	Camshaft timing and lift control
Crankshaft position sensor "A"	Crankshaft position sensor
Engine speed sensor	Crankshaft position sensor
THA	Intake air temperature
Knock control module	Engine knock control module
Knock sensor	Engine knock sensor
Mass or volume air flow circuit	Mass air flow sensor circuit
Vacuum sensor	Manifold air pressure sensor
Internal control module, Control module, Engine control ECU, PCM	Power train control module
FC idle	Deceleration fuel cut
Idle air control valve	Idle speed control
VSV for CCV, Canister close valve VSV for canister control	Evaporative emissions canister vent valve
VSV for EVAP, Vacuum switching valve assembly No.1, EVAP VAV, Purge VSV	Evaporative emissions canister purge valve
VSV for pressure switching valve, Bypass VSV	Evaporative emission pressure switching valve
Vapor pressure sensor, EVAP pressure sensor, Evaporative emission control system pressure sensor	Fuel tank pressure sensor
Charcoal canister	Evaporative emissions canister
ORVR system	On-board refueling vapor recovery system
Intake manifold runner control	Intake manifold tuning system
Intake manifold runner valve, IMRV, IACV (runner valve)	Intake manifold tuning valve
Intake control VSV	Intake manifold tuning solenoid valve
AFS	Air fuel ratio sensor
O2 sensor	Heater oxygen sensor
Oxygen sensor pumping current circuit	Oxygen sensor output signal
Oxygen sensor reference ground circuit	Oxygen sensor signal ground
Accel position sensor	Accelerator pedal position sensor
Throttle actuator control motor, Actuator control motor, Electronic throttle motor, Throttle control motor	Electronic throttle actuator
Electronic throttle control system, Throttle actuator control system	Electronic throttle control system
Throttle/pedal position sensor, Throttle/pedal position switch, Throttle position sensor/switch	Throttle position sensor
Turbo press sensor	Turbocharger pressure sensor
Turbo VSV	Turbocharger pressure control solenoid valve
P/S pressure switch	Power-steering pressure switch
VSV for ACM	Active control engine mount
Speed sensor, Vehicle speed sensor "A", Speed sensor for skid control ECU	Vehicle speed sensor
ATF temperature sensor, Trans. fluid temp. sensor, ATF temperature sensor "A"	Transmission fluid temperature sensor
Electronic controlled automatic transmission, ECT	Electronically controlled automatic
Intermediate shaft speed sensor "A"	Counter gear speed sensor
Output speed sensor	Output shaft speed sensor

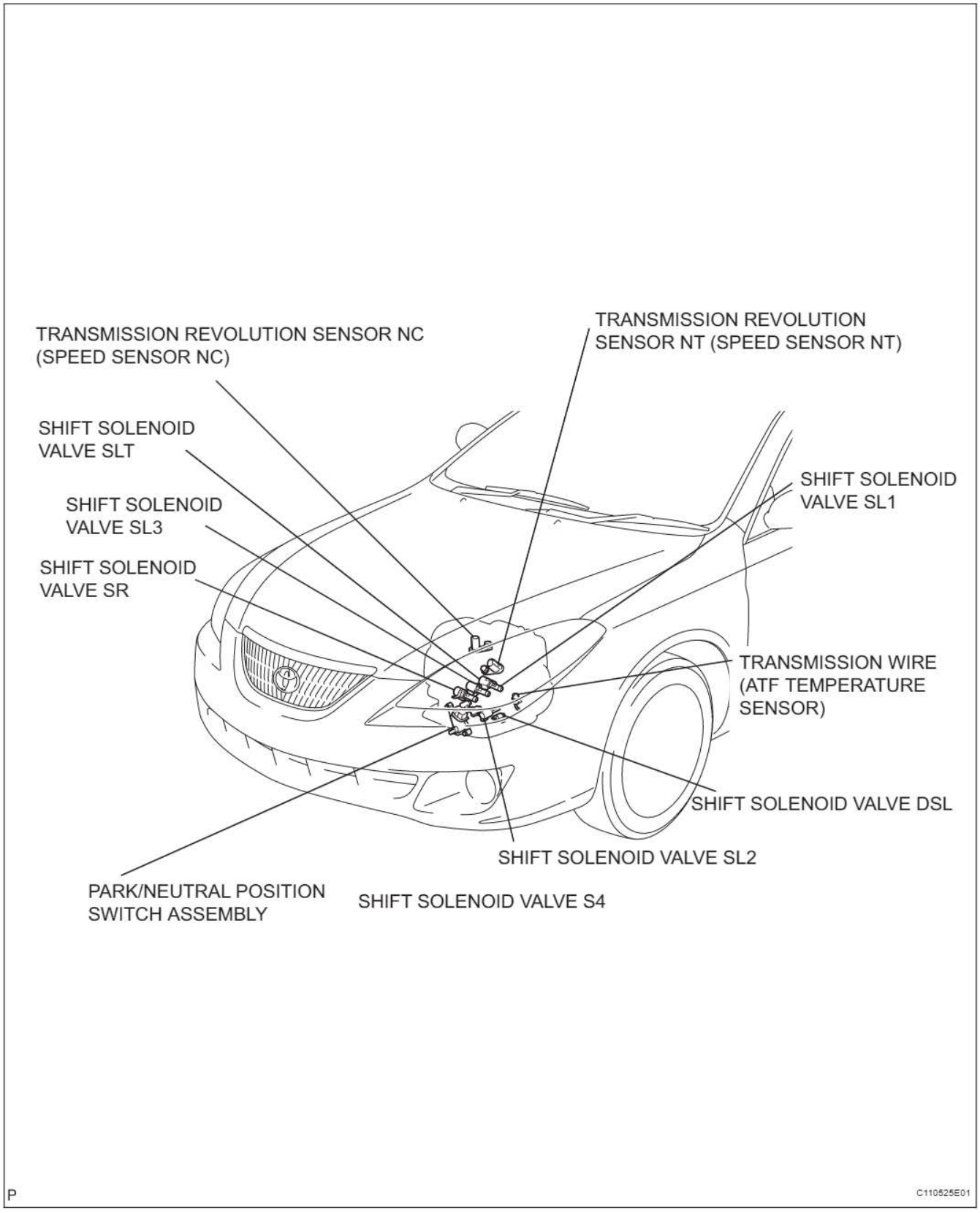
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Part and system name	Definition
Input speed sensor, Input turbine speed sensor "A", Speed sensor (NT), Turbine speed sensor	Input turbine speed sensor
PNP switch, NSW	Park/neutral position switch
Pressure control solenoid	Transmission pressure control solenoid
Shift solenoid	Transmission shift solenoid valve
Transmission control switch, Shift lock control unit	Shift lock control module
Engine immobilizer system, Immobilizer system	Vehicle anti-theft system

AX

PARTS LOCATION

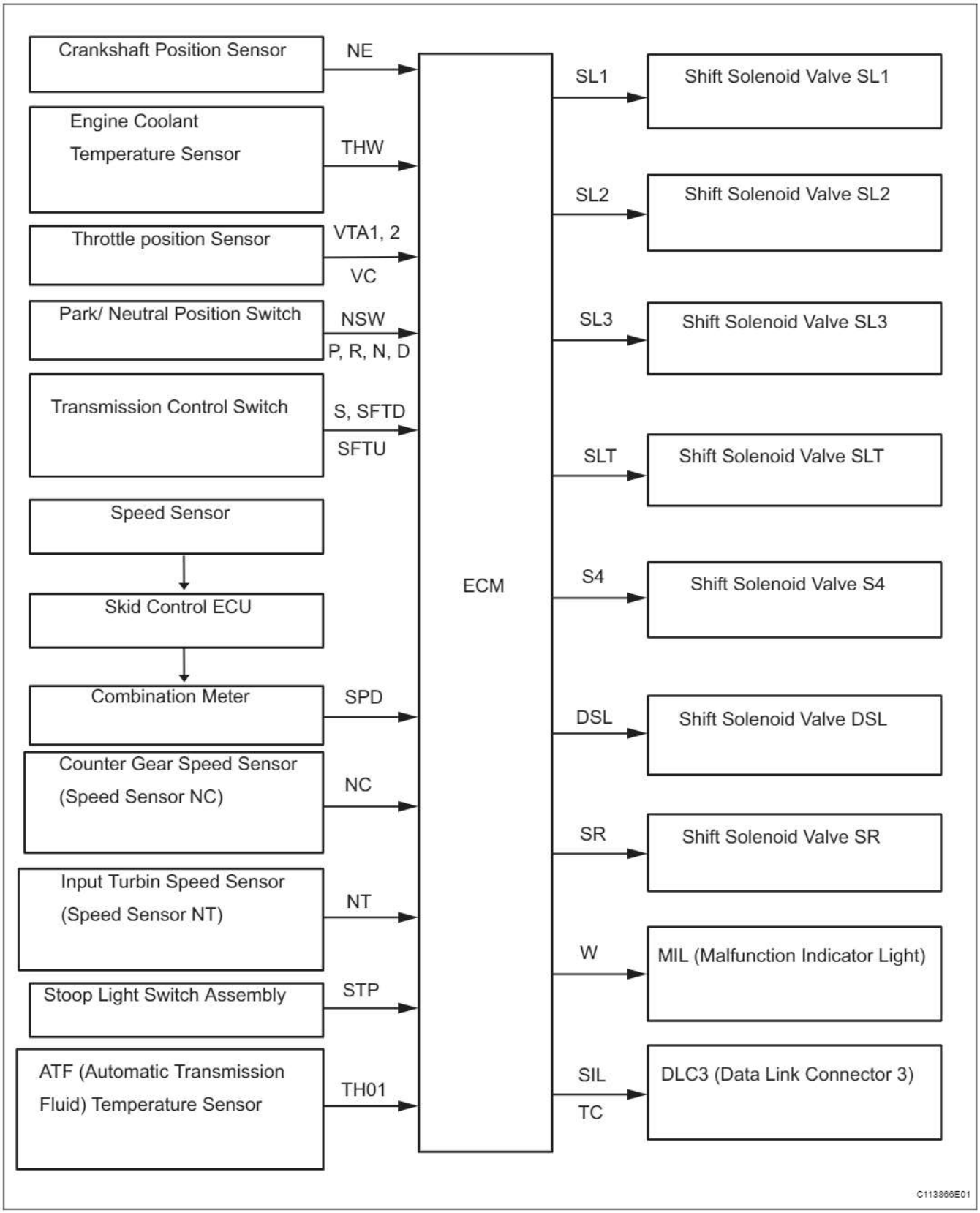



TRANSMISSION REVOLUTION SENSOR NC (SPEED SENSOR NC)
TRANSMISSION REVOLUTION SENSOR NT (SPEED SENSOR NT)
SHIFT SOLENOID VALVE SLT
SHIFT SOLENOID VALVE SL3
SHIFT SOLENOID VALVE SR
SHIFT SOLENOID VALVE SL1
TRANSMISSION WIRE (ATF TEMPERATURE SENSOR)
SHIFT SOLENOID VALVE DSL
SHIFT SOLENOID VALVE SL2
PARK/NEUTRAL POSITION SWITCH ASSEMBLY
SHIFT SOLENOID VALVE S4
P
C110525E01

AX

SYSTEM DIAGRAM

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



AX

SYSTEM DESCRIPTION

1. SYSTEM DESCRIPTION

(a) The ECT (Electronic controlled automatic transmission/transxle) 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.

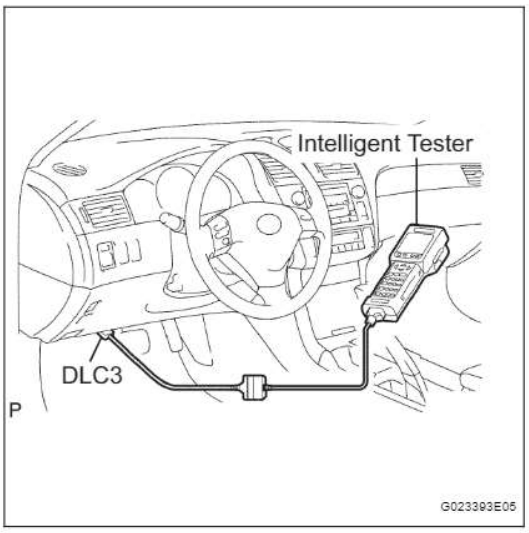
AX

DTC CHECK / CLEAR

1. DTC CHECK (NORMAL MODE)

NOTICE:

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

NOTICE:

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 on the instrument panel and DTCs are recorded in the ECM.

Turn the engine 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 OBD II scan tool or intelligent tester 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.

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(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 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 (See page IN-24)" procedure.

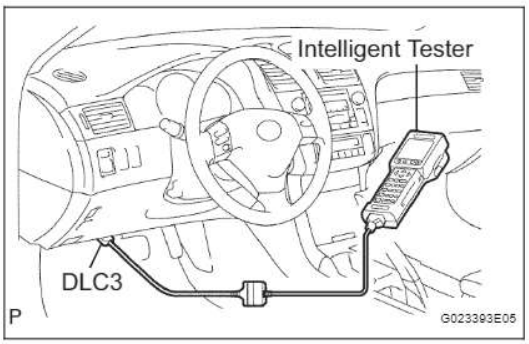
AX

CHECK MODE PROCEDURE

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.

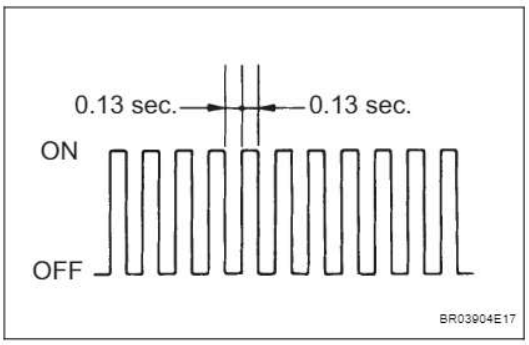


(a) Procedure for Check Mode using the intelligent tester.

(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 to the DLC3.



(4) Turn the ignition switch to the ON position and turn the intelligent tester main switch on.

(5) When you use intelligent tester: Select the item "DIAGNOSIS/ENHANCED OBD II/CHECK MODE" (Check that the MIL flashes).

NOTICE:

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.

(6) Start the engine (the MIL goes off after the engine starts).

(7) Perform "MONITOR DRIVE PATTERN" for the ECT test (See page AX-18). (Or, simulate the conditions of the malfunction described by the customer).

NOTICE:

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 page AX-35) to confirm the details of the DTCs.

AX

2. DTC CLEAR

(a) When using the OBD II scan tool or intelligent tester: Clearing the DTCs.
  (1) Connect the OBD II scan tool or intelligent tester 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 (See page IN-24)" procedure.

AX

AUTOMATIC TRANSAXLE SYSTEM

PRECAUTION

NOTICE:
When the negative (-) battery cable is disconnected, initialize the following systems after the cable is reconnected.

System Name	See procedure
Power Window Control System	IN-24
Sliding Roof System	IN-24

NOTICE:

- **Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assembly, engine assembly or ECM (See page AX-17).**
- **Perform the REGISTRATION (VIN registration) when replacing the ECM (See page ES-10).**

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: 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.**

AX

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.

AX

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 circuited solenoid).
Even if starting the engine in the fail-safe mode, the gear position remains in the same position.
HINT:
FL: Flex Lock-up

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

AX

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

AX

DATA LIST / ACTIVE TEST

1. DATA LIST

HINT:

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

NOTICE:

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

(a) Warm up the engine.

(b) Turn the ignition switch off.

(c) Connect the intelligent tester 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".

Item	Measurement Item/ Range (display)	Normal Condition	Diagnostic Note
STOP LIGHT SW	Stop light switch Status/ ON or OFF	• Brake Pedal is depressed: ON • Brake Pedal is released: OFF	-
PNP SW [NSW]	PNP switch Status/ ON or OFF	Shift lever position is; P and N: ON Except P and N: OFF	When the shift lever position displayed on the Intelligent tester differs from the actual position, adjustment of the PNP switch or the shift cable may be incorrect. HINT: When the failure still occurs even after adjusting these parts, See page AX-39.
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 S: ON Except D and S: OFF	↑
SHIFT	Actual Gear Position/ 1st, 2nd, 3rd, 4th or 5th	Shift lever position is; • D: 1st, 2nd, 3rd, 4th or 5th • S: 1st, 2nd, 3rd, 4th or 5th	-
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	-
AT FLUID TEMP	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.

AX

Item	Measurement Item/ Range (display)	Normal Condition	Diagnostic 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.	-

2. ACTIVE TEST

HINT:

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

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

(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".

Item	Test Details	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	Possible to check the operation of the shift solenoid valves.
LOCK UP	[Test Details] Control the shift solenoid SLU 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 6th gear	Possible to check the DSL operation.
LINE PRESS UP *	[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 "LINE PRESS UP" is performed, the ECM commands the SLT solenoid to turn off). ON: No action (normal operation)	-

AX

*: "LINE PRESS UP" 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 page AX-15) as well.
HINT:
The pressure values in ACTIVE TEST and HYDRAULIC TEST are different from each other.

AX

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 TRANSMISSION SYSTEM

DTC No.	Detection Item	Trouble Area	MIL *1	Memory *2	See page
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	AX-39
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	AX-45
P0711	Transmission Fluid Temperature Sensor "A" Performance	1. Transmission wire (ATF temperature sensor)	Comes on	DTC stored	AX-49
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	AX-45
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	AX-45
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	AX-53
P0724	Brake Switch "B" Circuit High	1. Short in stop light switch circuit 2. Stop light switch 3. ECM	Comes on	DTC stored	AX-56

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DTC No.	Detection Item	Trouble Area	MIL *1	Memory *2	See page
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	AX-59
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	AX-65
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	AX-69
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 transmission (clutch, brake or gear, etc.)	Comes on	DTC stored	AX-73
P0771	Shift Solenoid "E" Performance (Shift Solenoid Valve SR)	1. Shift solenoid valve SR remains open or closed 2. Valve body is blocked 3. Automatic transaxle (clutch, brake or gear etc.)	Comes on	DTC stored	AX-77
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	AX-81
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	AX-86
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	AX-90

AX

DTC No.	Detection Item	Trouble Area	MIL *1	Memory *2	See page
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	AX-94
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	AX-98
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	AX-102
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	AX-102
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	AX-105
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	AX-105
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	AX-108
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	AX-112
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	AX-112

DTC	P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)

DESCRIPTION

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

DTC No.	DTC Detection Condition	Trouble Area
P0705	(A) Any 2 or more signals of the following are ON simultaneously (2-trip detection logic) • P input signal is ON. • N input signal is ON. • R input signal is ON. • D input signal is ON. (B) Any 2 or more signals of the following are ON simultaneously (2-trip detection logic) • NSW input signal is ON. • R input signal is ON. • D input signal is ON (C) When any of following conditions is met for 2.0 sec. or more in the S position (2-trip detection logic) • NSW input signal is ON. • P input signal is ON. • N input signal is ON. • R input signal is ON.	• Open or short in park/neutral position switch circuit • Park/neutral position switch • ECM

MONITOR DESCRIPTION

These DTCs indicate a problem with the park/neutral position switch and the wire harness in the park/neutral position switch circuit.
The park/neutral position switch detects the shift lever position and sends a signal to the ECM.
For security, the park/neutral position switch detects the shift lever position so that 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 it receives more than 1 position signal simultaneously. The ECM will turn on the MIL and store the DTC.

MONITOR STRATEGY

Related DTCs	P0705: Park/neutral position switch/Verify switch input
Required sensors/Components	Park/neutral position switch
Frequency of operation	Continuous
Duration	2 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

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

AX

TYPICAL MALFUNCTION THRESHOLDS

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

Condition (A)

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

Condition (B)

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

Condition (C)When shift lever is in the S position, one of the following conditions is met.

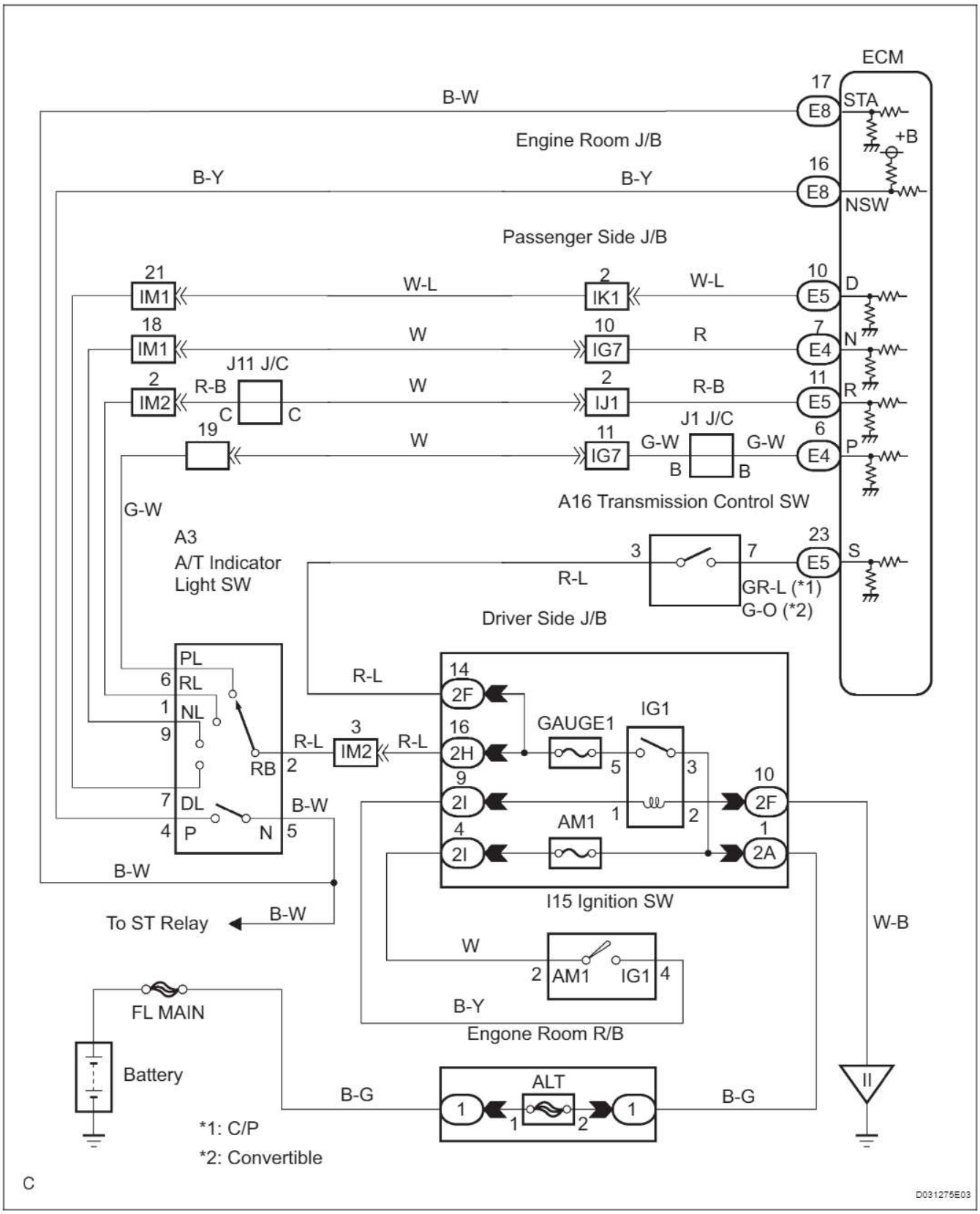
NSW switch	ON
P switch	ON
N switch	ON
R switch	ON

COMPONENT OPERATING RANGE

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

AX

WIRING DIAGRAM



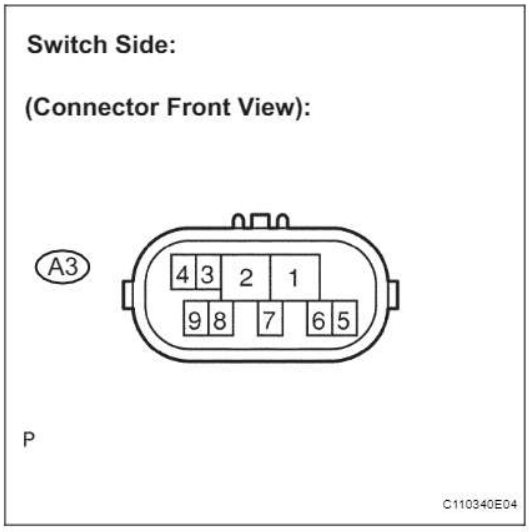
HINT:
According to the DATA LIST displayed by the OBD II scan tool or intelligent tester, you can read the value of the switch, sensor, actuator and so on without parts removal. Reading the DATA LIST as the first step of troubleshooting is one method to shorten labor time.

1. READ DATA LIST

(a) Turn the ignition switch off.
(b) Connect the OBD II scan tool or intelligent tester to the DLC3.
(c) Turn the ignition switch to the on position.
(d) Push the "ON" button of the OBD II scan tool or the intelligent tester.
(e) When you use intelligent tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
(f) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition	Diagnostic Note
PNP SW [NSW]	PNP SW Status/ ON or OFF	Shift lever position is; P and N: ON Except P or N: OFF	When the shift lever position displayed on the intelligent tester differs from the actual position, adjustment of the PNP switch or the shift cable may be incorrect.
REVERSE	PNP SW Status/ ON or OFF	Shift lever position is; R: ON Except R: OFF	↑
DRIVE	PNP SW Status/ ON or OFF	Shift lever position is; D and S: ON Except D and S: OFF	↑

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.

Resistance

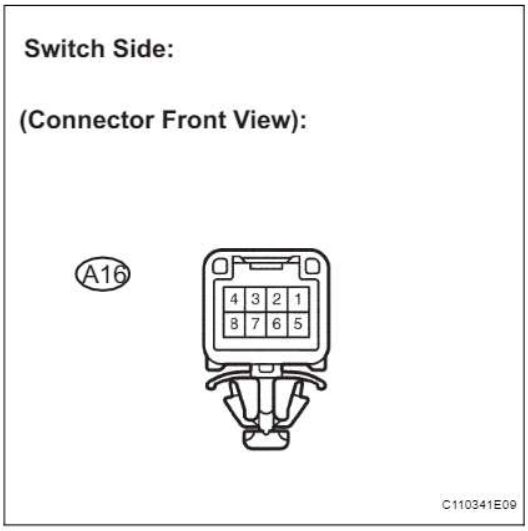
Shift Position	Tester Connection	Specified Condition
P	2 - 6 and 4 - 5	Below 1 Ω
Except P	↑	10 Ω or higher
R	2 - 1	Below 1 Ω
Except R	↑	10 Ω or higher
N	2 - 9 and 4 - 5	Below 1 Ω
Except N	↑	10 Ω or higher
D, S, "+" and "-"	2 - 7	Below 1 Ω
Except D, S, "+" and "-"	↑	10 Ω or higher

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

OK

AX

2 INSPECT TRANSMISSION FLOOR SHIFT ASSEMBLY



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

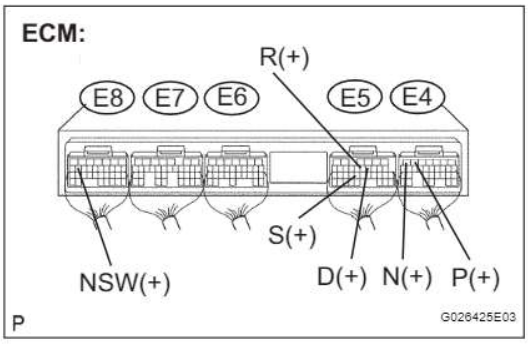
Resistance

Shift Position	Tester Connection	Specified Condition
S, "+" and "-"	3 - 7	Below 1 Ω
Except S, "+" and "-"	↑	10 Ω or higher

NG → **REPLACE TRANSMISSION FLOOR SHIFT ASSEMBLY**

OK

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



(a) Connect the transmission control switch connector of the 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.

Voltage

Shift Position	Tester connection	Specified condition
P and N	E8 - 16 (NSW) - Body ground	Below 1 V
Except P and N	↑	10 to 14 V
P	E4 - 6 (P) - Body ground	10 to 14 V
Except P	↑	Below 1 V
N	E4 - 7 (N) - Body ground	10 to 14 V
Except N	↑	Below 1 V
R	E5 - 11 (R) - Body ground	10 to 14 V *
Except R	↑	Below 1 V
D and S	E5 - 10 (D) - Body ground	10 to 14 V
Except D and S	↑	Below 1 V
S, "+" and "-"	E5 - 23 (S) - Body ground	10 to 14 V
Except S, "+" and "-"	↑	Below 1 V

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

AX

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.

DTC No.	DTC Detection Condition	Trouble Area
P0710	(a) and (b) are detected momentarily within 0.5 sec. when neither P0712 nor P0713 is detected (1-trip detection logic) (a) ATF temperature sensor resistance is less than 79 Ω. (b) ATF temperature sensor resistance is more than 156 kΩ. 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 Ω 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 kΩ when 15 minutes or more have elapsed after the engine start DTC is detected for 0.5 sec. or more (1-trip detection logic)	• Open in ATF temperature sensor circuit • Transmission wire (ATF temperature sensor) • ECM

MONITOR DESCRIPTION

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 Ω *1or more than 156 kΩ *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

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.

AX

MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

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

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

P0713: Range check (High resistance)

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

TYPICAL MALFUNCTION THRESHOLDS

P0710: Range check (Chattering)

TFT (Transmission fluid temperature) sensor resistance	Less than 79 Ω or More than 156 kΩ

P0712: Range check (Low resistance)

TFT sensor resistance	Less than 79 Ω

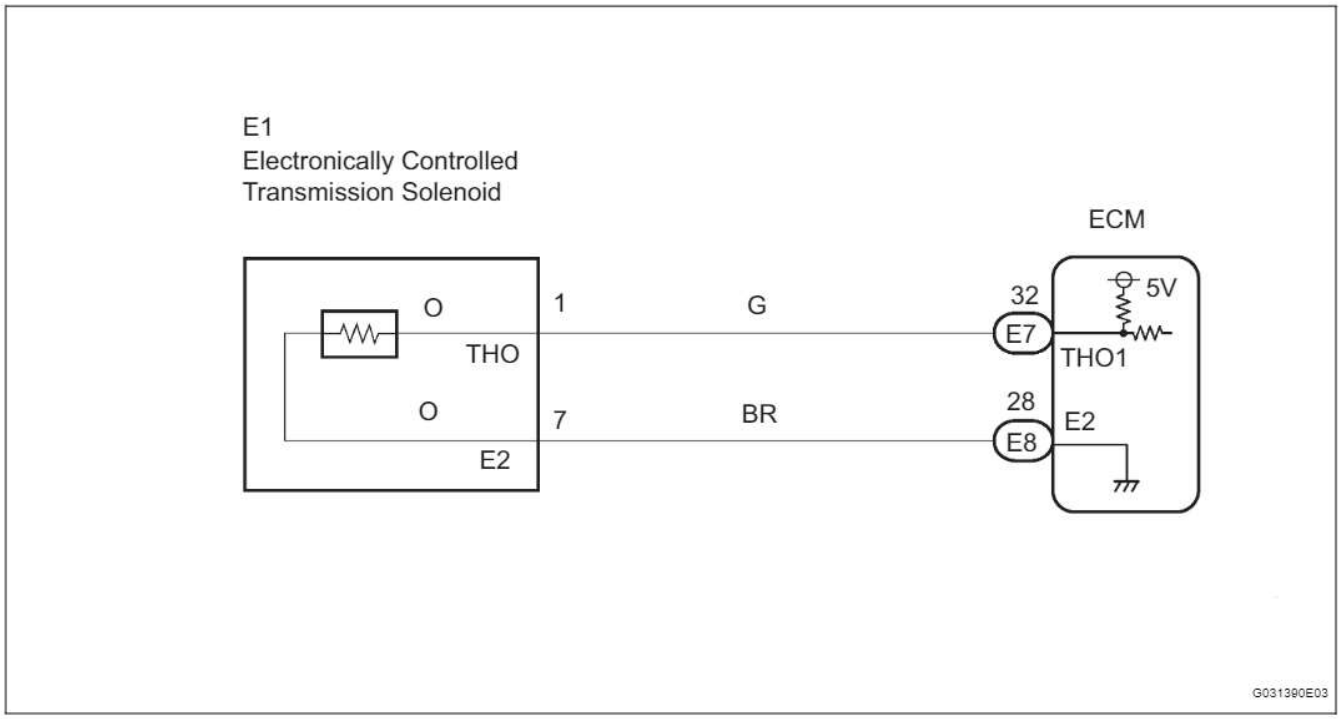
P0713: Range check (High resistance)

TFT sensor resistance	More than 156 kΩ

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM



AX

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

1. READ DATA LIST

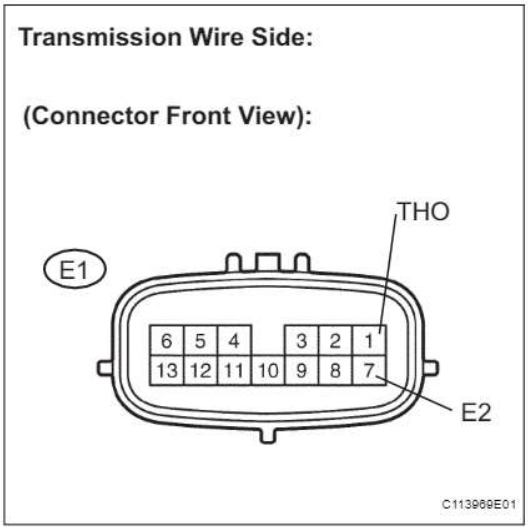
(a) Warm up the engine.
(b) Turn the ignition switch off.
(c) Connect the OBD II scan tool or intelligent tester to the DLC3.
(d) Turn the ignition switch to the on position.
(e) Push the "ON" button of the OBD II scan tool or the intelligent tester.
(f) When you use intelligent tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
(g) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
AT FLUID TEMP	ATF Temp. Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	Approx. 80°C (176°F) (After Stall Test)

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

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.
Resistance

Tester Connection	Specified Condition
1 (THO) - 7 (E2)	79 Ω to 156 kΩ

(c) Measure the resistance according to the value(s) in the table below.
Resistance (Check for short)

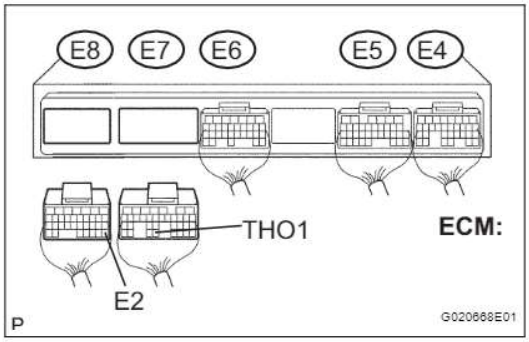
Tester Connection	Specified Condition
1 (THO) - Body ground	10 kΩ or higher
7 (E2) - Body ground	↑

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

AX

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.

Resistance

Tester Connection	Specified Condition
E7 - 32 (THO1) - E8 - 28 (E2)	79 Ω to 156 kΩ

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

Resistance (Check for short)

Tester Connection	Specified Condition
E7 - 32 (THO1) - Body ground	10 kΩ or higher
E8 - 28 (E2) - Body ground	↑

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM

AX

DTC	P0711	Transmission Fluid Temperature Sensor "A" Performance

DESCRIPTION

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

DTC No.	DTC Detection Condition	Trouble Area
P0711	(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).	• Open or short in ATF temperature sensor circuit • Transmission wire (ATF temperature sensor) • ECM

MONITOR DESCRIPTION

The ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature and detects an open or short in the ATF temperature circuit or a fault in the ATF temperature sensor.
After running the vehicle for a certain period, the ATF temperature should increase. If the ATF temperature is below 20°C (68°F) after running the vehicle for a certain period, the ECM interprets this as a fault, and turns on the MIL.
When the ATF temperature is 110°C (230°F) or more after 17 minutes of engine cold start, the ECM also determines this as a fault, turns on the MIL, and stores the DTC.

MONITOR STRATEGY

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

TYPICAL ENABLING CONDITIONS

All:

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

Condition (A):

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

AX

Condition (B):

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

TYPICAL MALFUNCTION THRESHOLDS

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

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

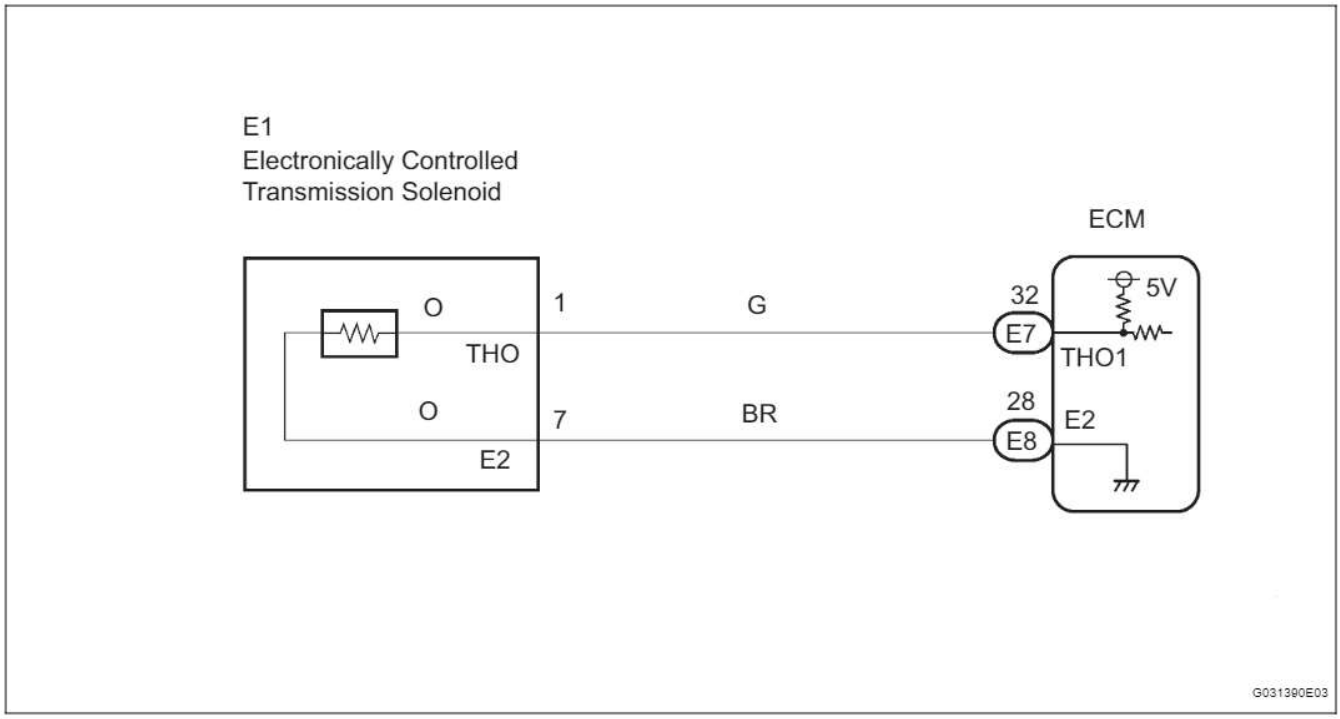
Condition (B):

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

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM



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

1. READ DATA LIST

(a) Warm up the engine.
(b) Turn the ignition switch off.
(c) Connect the OBD II scan tool or intelligent tester to the DLC3.
(d) Turn the ignition switch to the on position.
(e) Push the "ON" button of the OBD II scan tool or the intelligent tester.
(f) When you use intelligent tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".

AX

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

Item	Measurement Item/ Range (display)	Normal Condition
AT FLUID TEMP	ATF Temp. Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	Approx. 80°C (176°F) (After Stall Test)

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 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 OBD II scan tool or the intelligent tester 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

Display (DTC output)	Proceed to
Only "P0711" is output	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

2 CHECK TRANSMISSION FLUID LEVEL

OK:
Automatic transmission fluid level is correct.

NG → ADD FLUID

AX

OK

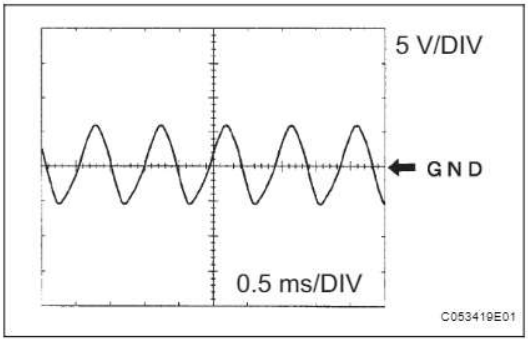
REPLACE TRANSMISSION WIRE

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 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 and R) is OFF (c) Speed sensor (NT): less than 300 rpm	• Open or short in transmission revolution sensor NT (speed sensor NT) circuit • Transmission revolution sensor NT (speed sensor NT) • ECM • Automatic transaxle assembly



Reference (Using an oscilloscope):
Check the waveform between terminals NT+ and NT- of the ECM connector.
Standard: Refer to the illustration.

Terminal	Tool setting	Vehicle condition
NT+ - NT-	5 V/DIV, 0.5ms/DIV	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 *1although the output shaft revolution is more than 1,000 rpm *2, the ECM detects the trouble, illuminates the MIL and stores the DTC.
*1: Pulse is not output or is irregularly output.
*2: The vehicle speed is 50 km/h (31 mph) or more.

MONITOR STRATEGY

Related DTCs	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

AX

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present.	P0500 (VSS) P0748, P0778, P0798 (Shift solenoid valve (range))

Shift change	Shift change is completed and before starting next shift change operation
ECM selected gear	2nd, 3rd, 4th or 5th
Output shaft rpm	1,000 rpm or more
NSW switch	OFF
R switch	OFF
Engine	Running
Ignition switch	ON
Starter	OFF

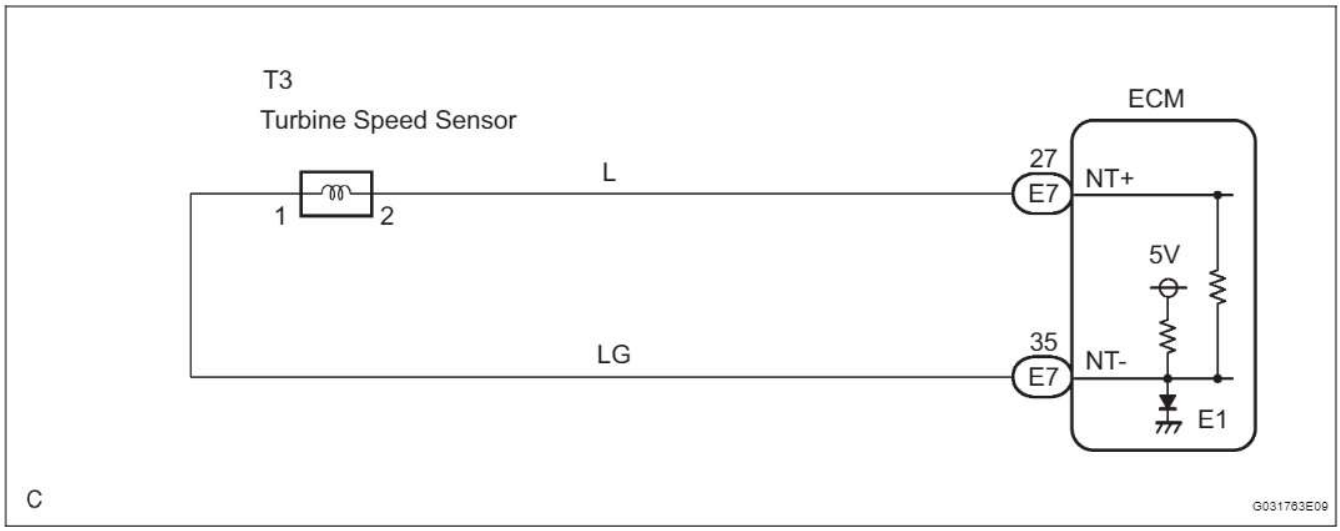
TYPICAL MALFUNCTION THRESHOLDS

Sensor signal rpm	Less than 300 rpm

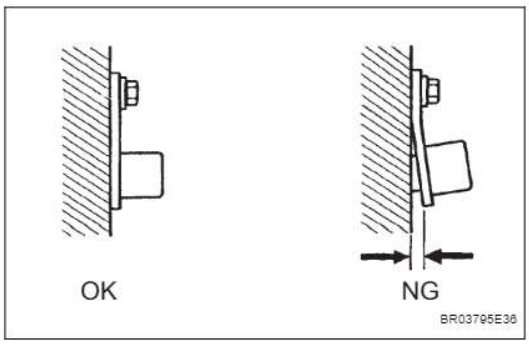
COMPONENT OPERATING RANGE

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

WIRING DIAGRAM



1	INSPECT SPEED SENSOR INSTALLATION



(a) Check the speed sensor installation.

OK:

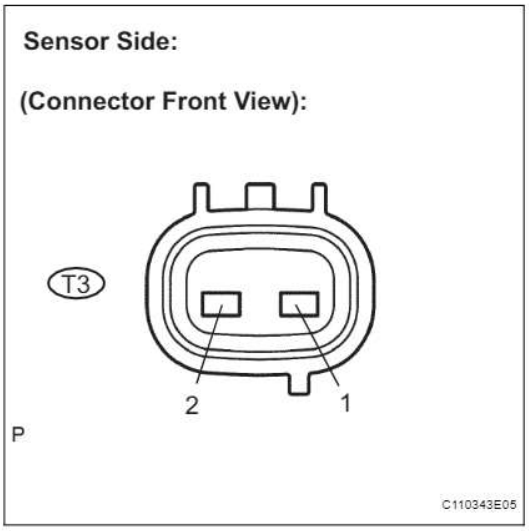
The installation bolt is tightened properly and there is no clearance between the sensor and transaxle case.

NG → **REPLACE SPEED SENSOR (NT)**

OK

AX

2 INSPECT SPEED SENSOR (NT)



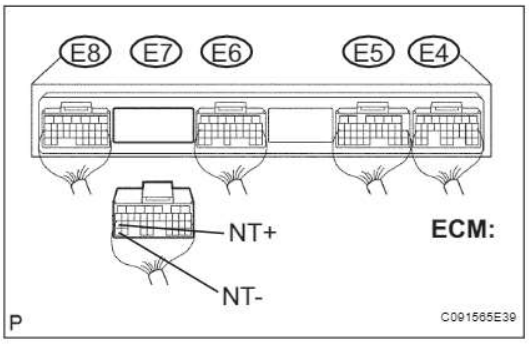
(a) Disconnect the speed sensor connector from the transaxle.
(b) Measure the resistance according to the value(s) in the table below.
Resistance

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

NG → **REPLACE SPEED SENSOR (NT)**

OK

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.
Resistance

Tester Connection	Specified Condition 20°C (68°F)
E7 - 27 (NT+) - E7 - 35 (NT-)	560 to 680 Ω

(d) Measure the resistance according to the value(s) in the table below.
Resistance (Check for short)

Tester Connection	Specified Condition
E7 - 27 (NT+) - Body ground	10 kΩ or higher
E7 - 35 (NT-) - Body ground	↑

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

OK

REPLACE ECM

AX

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 No.	DTC Detecting 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

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

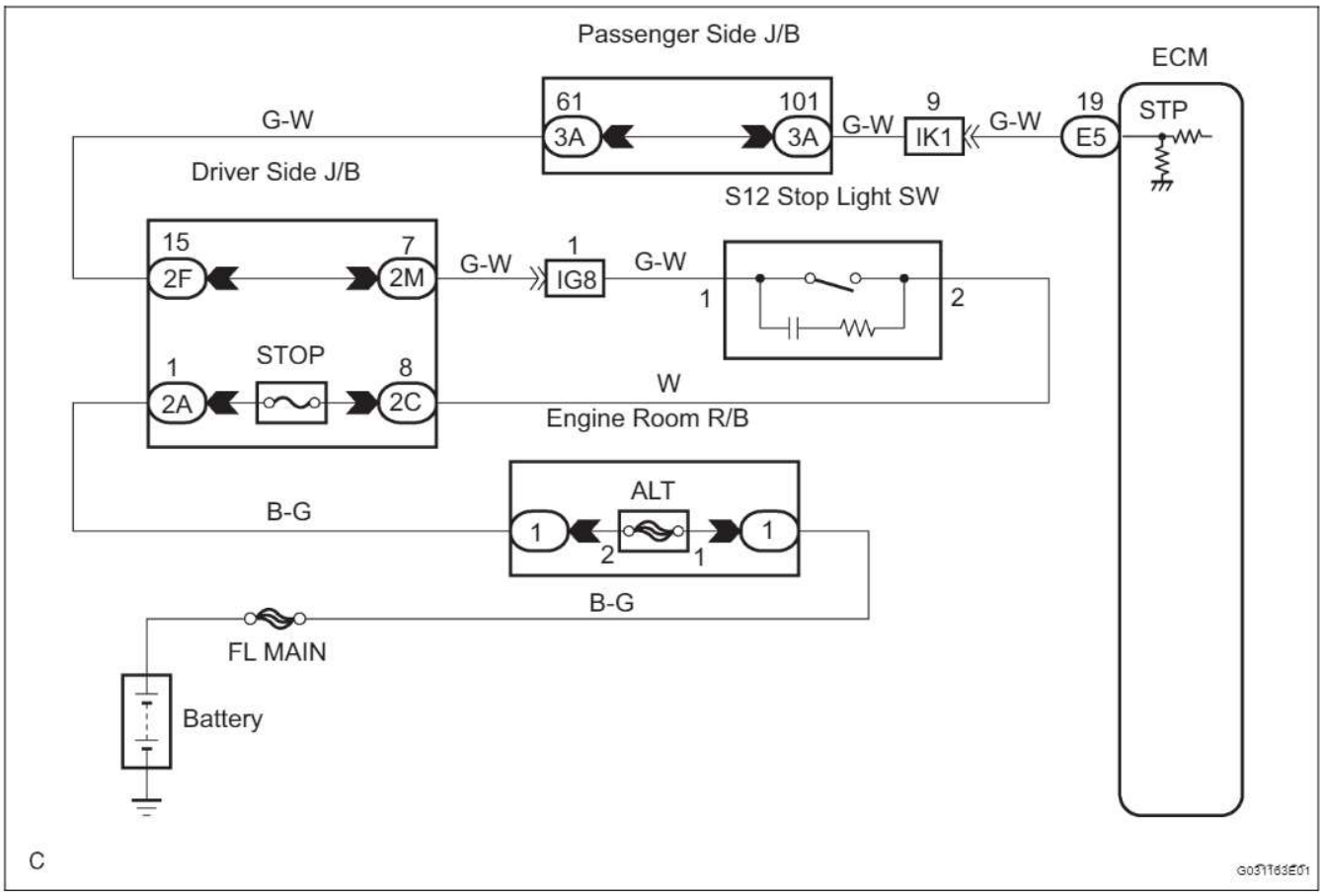
The monitor will run whenever this DTC is not present.	None
Ignition switch	ON
Starter	OFF
Battery voltage	8 V or more
GO (Vehicle speed is 30 km/h (18.63 mph) or more)	Once
STOP (Vehicle speed is less than 3 km/h (1.86 mph))	Once

TYPICAL MALFUNCTION THRESHOLDS

Brake switch	Remain ON during GO and STOP 5 times

AX

WIRING DIAGRAM



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

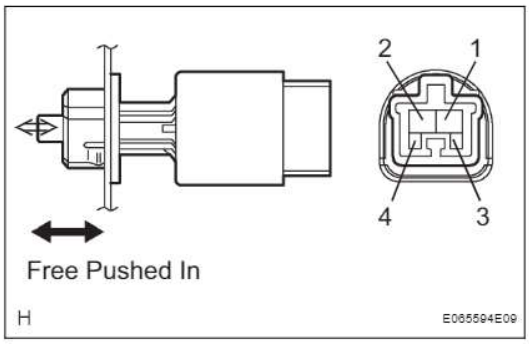
1. READ DATA LIST

(a) Turn the ignition switch off.
(b) Connect the OBD II scan tool or intelligent tester to the DLC3.
(c) Turn the ignition switch to the on position.
(d) Push the "ON" button of the OBD II scan tool or the intelligent tester.
(e) When you use intelligent tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
(f) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
STOP LIGHT SW	Stop light SW Status/ ON or OFF	• Brake pedal is depressed: ON • Brake pedal is released: OFF

AX

1 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.

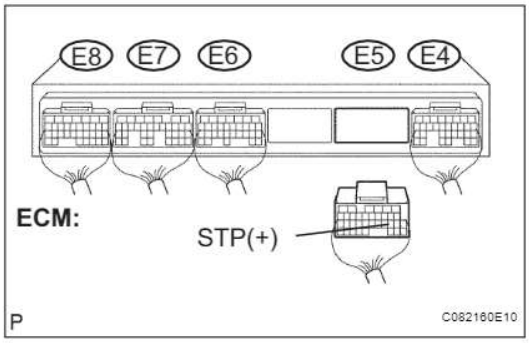
Resistance

Switch position	Tester Connection	Specified Condition
Switch pin free	1 - 2	10 kΩ or higher
Switch pin pushed in	↑	Below 1 Ω
Switch pin free	3 - 4	Below 1 Ω
Switch pin pushed in	↑	10 kΩ or higher

NG → REPLACE STOP LIGHT SWITCH ASSEMBLY

OK

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



(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.

Voltage

Condition	Tester Connection	Specified Condition
Brake pedal is depressed	E5 - 19 (STP) - Body ground	10 to 14 V
Brake pedal is released	↑	Below 1 V

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM

AX

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

MONITOR DESCRIPTION

Torque converter lock-up is controlled by the ECM based on the speed sensor (NT), speed sensor (NC), engine rpm, engine load, engine temperature, vehicle speed, transmission temperature, and gear selection. The ECM determines the lock-up status of the torque converter by comparing the engine rpm (NE) to the input turbine rpm (NT). The ECM calculates the actual transmission gear by comparing input turbine rpm (NT) to counter gear rpm (NC). When conditions are appropriate, the ECM requests "lock-up" by applying control voltage to the shift solenoid DSL. When the DSL is turned on, it applies pressure to the lock-up relay valve and locks the torque converter clutch.
If the ECM detects no lock-up after lock-up has been requested or if it detects lock-up when it is not requested, the ECM interprets this as a fault in the shift solenoid valve DSL or lock-up system performance. The ECM will turn on the MIL and store the DTC.
HINT:
Example:
When any of the following is met, the system judges it as a malfunction.

- There is a difference in rotation between the input side (engine speed) and output side (input turbine speed) of the torque converter when the ECM commands lock-up.
  (Engine speed is at least 75 rpm greater than input turbine speed.)
- There is no difference in rotation between the input side (engine speed) and output side (input turbine speed) of the torque converter when the ECM commands lock-up off.
  (The difference between engine speed and input turbine speed is less than 35 rpm.)

MONITOR STRATEGY

Related DTCs	P0741: Shift solenoid valve DSL/OFF malfunction Shift solenoid valve DSL/ON malfunction
Required sensors/Components	Shift solenoid valve DSL, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE), Throttle position sensor (VPA1), Mass air flow sensor (MAF), Transmission temperature sensor (THO1), Engine coolant temperature sensor (ECT)
Frequency of operation	Continuous
Duration	OFF malfunction 3.5 sec. ON malfunction 1.8 sec.
MIL operation	2 driving cycles
Sequence of operation	None

AX

TYPICAL ENABLING CONDITIONS

ALL:

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:

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

ON malfunction:

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

TYPICAL MALFUNCTION THRESHOLDS

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

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

ON malfunction:

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

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

1. PERFORM ACTIVE TEST

(a) Warm up the engine.
(b) Turn the ignition switch off.
(c) Connect the intelligent tester to the DLC3.
(d) Turn the ignition switch to the on position.
(e) Push the "ON" button of the intelligent tester.

AX

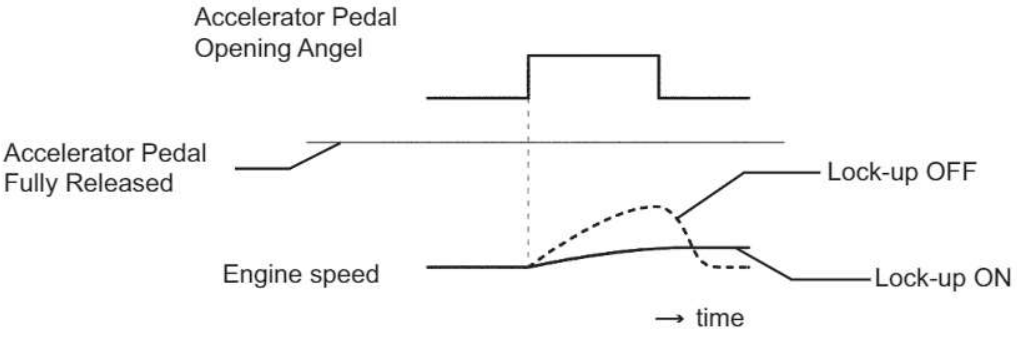
(f) When you use intelligent tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST".

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

Item	Test Details	Diagnostic Note
LOCK UP	[Test Details] Control the shift solenoid DSL to set the automatic transaxle to the lock-up condition. [Vehicle Condition] Vehicle Speed: 60 km/h (37 mph) or more	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.)



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

(a) Connect the OBD II scan tool or the intelligent tester 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:

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

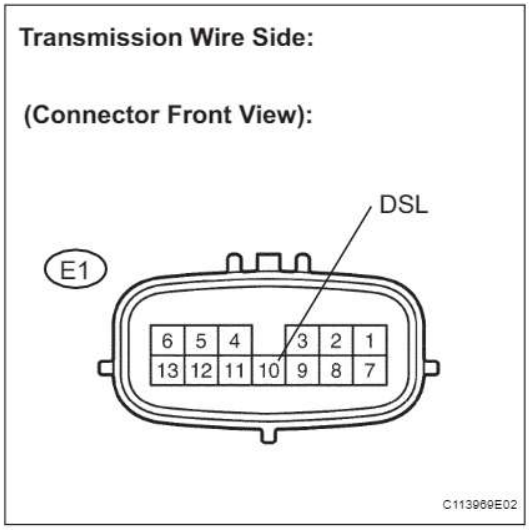
AX

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

B → GO TO DTC CHART

A

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.

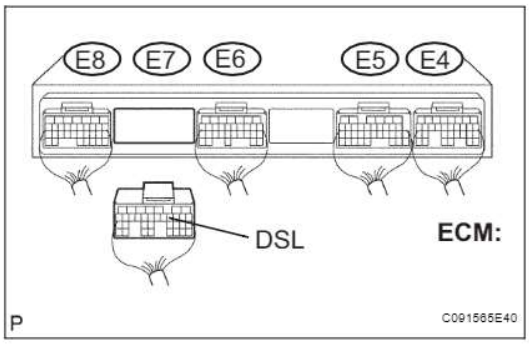
Resistance

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

NG → Go to step 4

OK

3 CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



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

Resistance

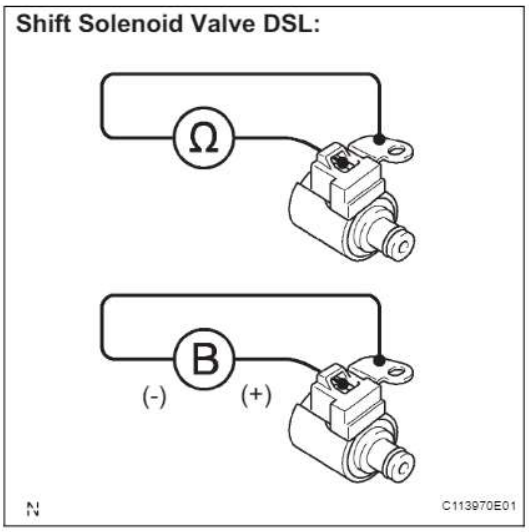
Tester Connection	Specified Condition 20°C (68°F)
E7 - 11 (DSL) - Body ground	11 to 13 Ω

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

AX

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.

Resistance

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

(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 noise.

NG → **REPLACE SHIFT SOLENOID VALVE (DSL)**

OK ↓

5	CHECK TRANSMISSION WIRE

OK:

The connectors and pins are securely installed.
There is no open or short on the wire harness.

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK ↓

6	INSPECT TRANSMISSION VALVE BODY ASSEMBLY

OK:

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

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

OK ↓

7	INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

OK:

The torque converter clutch operates normally.

NG → **REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY**

AX

OK

REPAIR AUTOMATIC TRANSAXLE ASSEMBLY

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:
The intelligent tester can be used at steps 3, 4, 6, and 9.

1	Vehicle Brought to Workshop

NEXT

2	Customer Problem Analysis

NEXT

3	Connect the OBD II scan tool or intelligent tester to DLC3

NEXT

4	Check and Clear DTCs and Freeze Frame Data

HINT:
(See page AX-28).

NEXT

5	Visual Inspection

NEXT

6	Setting the Check Mode Diagnosis

HINT:
(See page AX-30).

NEXT

7	Problem Symptom Confirmation

HINT:
(See page AX-11).

	Symptom does not occur: Go to step 8
	Symptom occurs: Go to step 9

AX

8	Symptom Simulation

HINT:
(See page IN-26).

NEXT

9	DTC Check

HINT:
(See page AX-28).

DTC is not output: Go to step 10

DTC is output: Go to step 17

10	Basic Inspection

HINT:
(See page AX-119, AX-121 and AX-139).

NG → Go to step 19

OK

11	Mechanical System Test

HINT:
(See page AX-13).

NG → Go to step 16

OK

12	Hydraulic Test

HINT:
(See page AX-15).

NG → Go to step 16

OK

13	Manual Shifting Test

HINT:
(See page AX-17).

NG → Go to step 15

OK

AX

14	Problem Symptoms Table Chapter 1

HINT:
(See page AX-20).

NG → Go to step 18

OK

15	Problem Symptoms Table Chapter 2

HINT:
(See page AX-20).

NEXT

16	Part Inspection

→ Go to step 19

17	DTC Chart

HINT:
(See page AX-35).

NEXT

18	Circuit Inspection

NEXT

19	Repair or Replace

NEXT

20	Confirmation Test

NEXT

End

AX

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 and valve body.

DTC No.	DTC Detecting 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

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

TYPICAL ENABLING CONDITIONS

ALL:

The monitor will run whenever 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

AX

Shift solenoid valve SL3 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve SR circuit	Not circuit malfunction
Shift solenoid valve DSL circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction:

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

ON malfunction:

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

TYPICAL MALFUNCTION THRESHOLDS

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

2 detections are necessary per driving cycle:
1st detection; temporary flag ON
2nd detection; pending fault code ON

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

ON malfunction:

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

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

1. **PERFORM ACTIVE TEST**
   (a) Turn the ignition switch off.
   (b) Connect the intelligent tester to the DLC3.
   (c) Turn the ignition switch to the on position.
   (d) Push the "ON" button of the intelligent tester.
   (e) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / SHIFT".
   (f) 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 page AX-31).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press "←" button: Shift up • Press "→" button: Shift down	Possible to check the operation of the shift solenoid valves.

AX

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 OBD II scan tool or the intelligent tester 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:

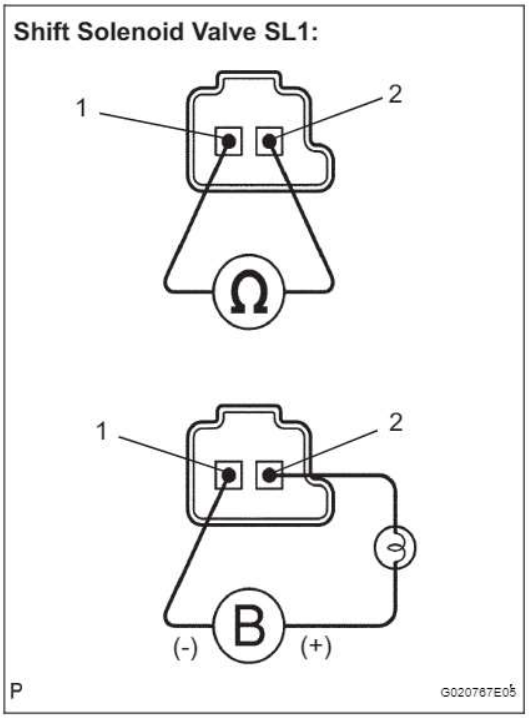
Display (DTC output)	Proceed to
Only "P0746" is output	A
"P0746" and other DTCs	B

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

B → GO TO DTC CHART

A

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.
Resistance

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

(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 noise.

NG → REPLACE SHIFT SOLENOID VALVE (SL1)

AX

OK

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 ↓

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

AX

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 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 page AX-31).

MONITOR STRATEGY

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

TYPICAL ENABLING CONDITIONS

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

TYPICAL MALFUNCTION THRESHOLDS

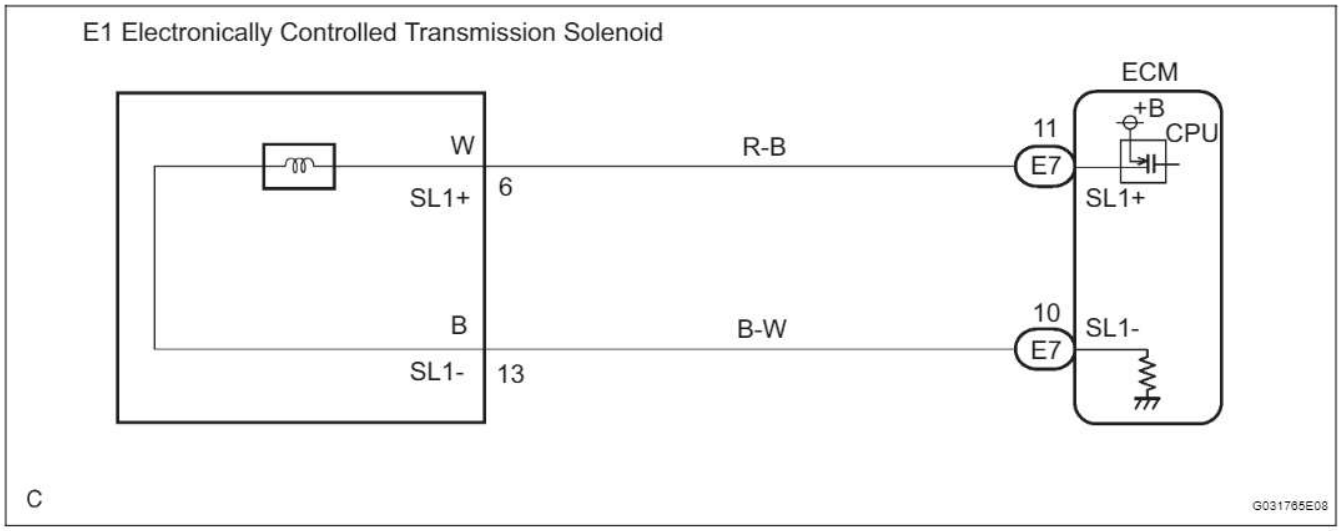
Output signal duty	100%

COMPONENT OPERATING RANGE

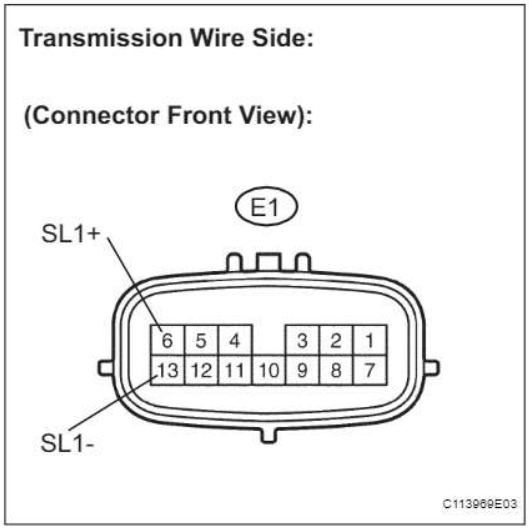
Output signal duty	Less than 100%

AX

WIRING DIAGRAM



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.

Resistance

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

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

Resistance (Check for short)

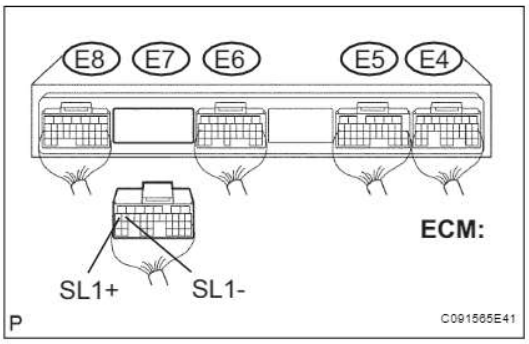
Tester Connection	Specified Condition
SL1+ - Body ground	10 kΩ or higher
SL1- - Body ground	↑

NG → Go to step 3

OK

AX

2 CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



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

Resistance

Tester Connection	Specified Condition 20°C (68°F)
E7 - 19 (SL1+) - E7 - 18 (SL1-)	5.0 to 5.6 Ω

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

Resistance (Check for short)

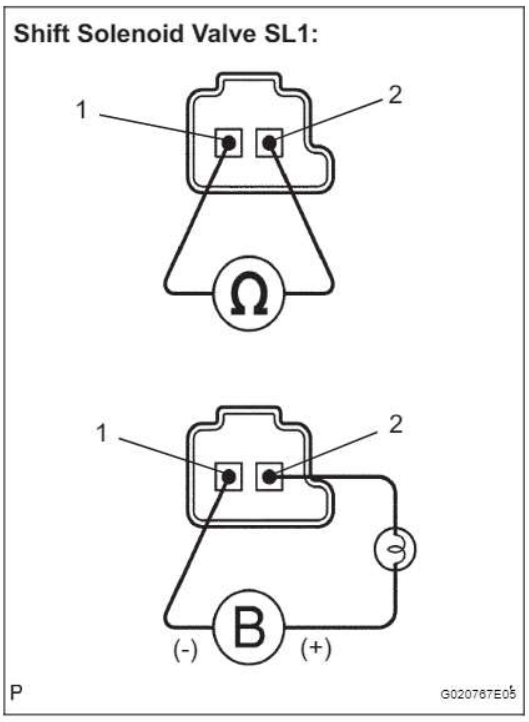
Tester Connection	Specified Condition
E7 - 19 (SL1+) - Body ground	10 kΩ or higher
E7 - 18 (SL1-) - Body ground	↑

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

OK →

REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE (SL1)



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

Resistance

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

(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 noise.

NG → **REPLACE SHIFT SOLENOID VALVE (SL1)**

AX

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 and valve body.

DTC No.	DTC Detecting 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

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

TYPICAL ENABLING CONDITIONS

All:

The monitor will run whenever 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

AX

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

OFF malfunction (A):

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

OFF malfunction (B):

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

ON malfunction (A):

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

ON malfunction (B):

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

TYPICAL MALFUNCTION THRESHOLDS

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

2 detections are necessary per driving cycle:
1st detection; temporary flag ON
2nd detection; pending fault code ON

OFF malfunction (A):

Intermediate shaft speed/Output speed	1.44 to 1.58

OFF malfunction (B):

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

ON malfunction (A):

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

ON malfunction (B):

Intermediate shaft speed/Output speed	1.02 to 1.16

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

1. **PERFORM ACTIVE TEST**
   (a) Turn the ignition switch off.
   (b) Connect the intelligent tester to the DLC3.
   (c) Turn the ignition switch to the on position.
   (d) Push the "ON" button of the intelligent tester.

AX

(e) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / SHIFT".
(f) 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 page AX-31).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves.

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

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

(a) Connect the OBD II scan tool or the intelligent tester 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:

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

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

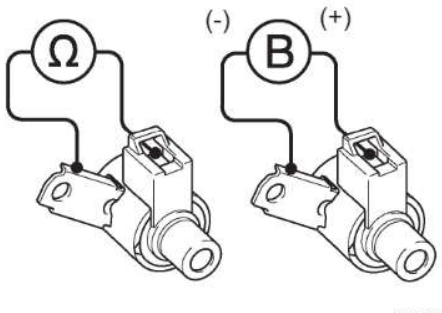
B → GO TO DTC CHART

A

AX

2	INSPECT SHIFT SOLENOID VALVE S4

Shift Solenoid Valve S4:



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

Resistance

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

(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 noise.

NG → **REPLACE SHIFT SOLENOID VALVE (S4)**

OK

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

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

AX

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 and valve body.

DTC No.	DTC Detecting 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

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

TYPICAL ENABLING CONDITIONS

All:

The monitor will run whenever 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

AX

Shift solenoid valve SL3 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve SR circuit	Not circuit malfunction
Shift solenoid valve DSL circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction (A):

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

OFF malfunction (B):

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

ON malfunction (A):

ECM lock-up command	OFF

ON malfunction (B):

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

ON malfunction (C):

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

ON malfunction (D):

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

TYPICAL MALFUNCTION THRESHOLDS

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

OFF malfunction (A):

Intermediate shaft speed/Output speed	1.44 to 1.58

OFF malfunction (B):

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

ON malfunction (A):

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

ON malfunction (B):

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

ON malfunction (C):

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

ON malfunction (D):

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

AX

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

1. PERFORM ACTIVE TEST

(a) Turn the ignition switch off.
(b) Connect the intelligent tester to the DLC3.
(c) Turn the ignition switch to the on position.
(d) Push the "ON" button of the intelligent tester.
(e) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / SHIFT".
(f) 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 page AX-31).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves.

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

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

(a) Connect the OBD II scan tool or the intelligent tester 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:

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

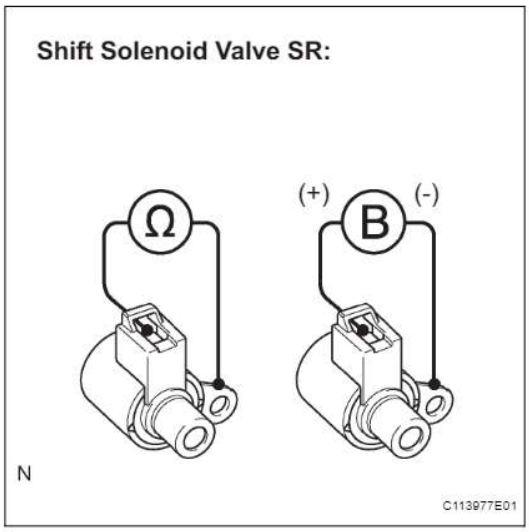
HINT:
If any other codes besides "P0771" are output, perform the troubleshooting for those DTCs first.

B → GO TO DTC CHART

AX

A

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.
Resistance

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

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

NG → **REPLACE SHIFT SOLENOID VALVE (SR)**

OK

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

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

AX

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 and valve body.

DTC No.	DTC Detecting 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

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), Crannkshaft position sensor (NE)
Frequency of operation	Continuous
Duration	OFF malfunction (A) 1.8 sec. OFF malfunction (B) and (C) 0.8 sec. ON malfunction (A) and (B) 0.8 sec. ON malfunction (C) 0.4 sec.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

All:

The monitor will run whenever 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

AX

Shift solenoid valve SL3 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve SR circuit	Not circuit malfunction
Shift solenoid valve DSL circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction (A):

ECM lock-up command	OFF
Vehicle speed	Less than 60 km/h (37.3 mph)
Throttle valve opening angle	7% or more

OFF malfunction (B):

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

OFF malfunction (C):

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

OFF malfunction (D):

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

ON malfunction (A):

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

ON malfunction (B):

ECM selected gear	3rd
Throttle valve opening angle	7.0% or more at output speed 1,400 rpm (Varies with engine speed)
Malfunction of pressure control solenoid "B" (SL2) and "C" (SL3)	Not detected

ON malfunction (C):

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

TYPICAL MALFUNCTION THRESHOLDS

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

OFF malfunction (A):

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

OFF malfunction (B) and (C):

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

OFF malfunction (D):

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

AX

ON malfunction (A):

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

ON malfunction (B):

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

ON malfunction (C):

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

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

1. PERFORM ACTIVE TEST

(a) Turn the ignition switch off.
(b) Connect the intelligent tester to the DLC3.
(c) Turn the ignition switch to the on position.
(d) Push the "ON" button of the intelligent tester.
(e) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / SHIFT".
(f) 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 page AX-31).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set the each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves.

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

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

(a) Connect the OBD II scan tool or the intelligent tester 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.

AX

Result:

Display (DTC output)	Proceed to
Only "P0776" is output	A

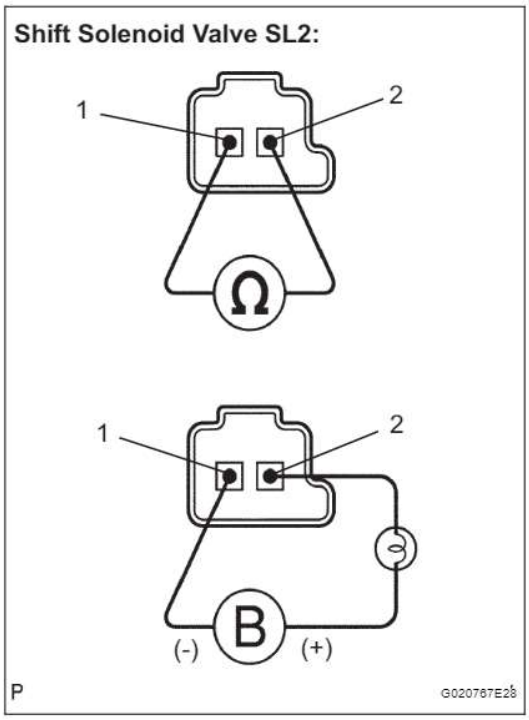
Display (DTC output)	Proceed to
"P0776" and other DTCs	B

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

B → GO TO DTC CHART

A

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.

Resistance

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

(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 noise.

NG → REPLACE SHIFT SOLENOID VALVE (SL2)

OK

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

4 INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

AX

OK:
The torque converter clutch operates normally.

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY

OK

REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSEMBLY

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

DESCRIPTION

Shifting from 1st to 5th is performed in combination with "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 No.	DTC Detection Condition	Trouble Area
P0778	ECM checks for an open or short circuit in shift solenoid valves SL2 (1-trip detection logic) Hybrid IC for solenoid indicates fail.	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other normal shift solenoid valves "ON/OFF" (In case of an open or short circuit, the ECM stops sending current to the circuit.)
(See page AX-31).

MONITOR STRATEGY

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

TYPICAL ENABLING CONDITIONS

The monitor will run whenever this DTC is not present.	None
Solenoid current cut status	Not cut
Battery voltage	11 V or more
Ignition switch	ON
Starter	OFF
CPU commanded duty ratio to SL2	19% or more

TYPICAL MALFUNCTION THRESHOLDS

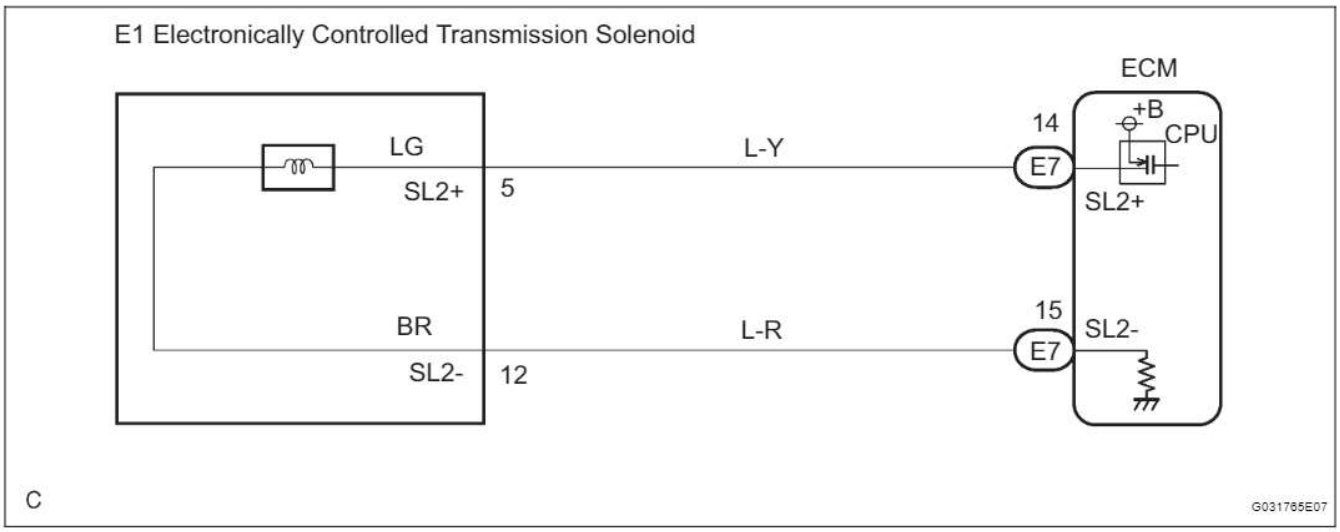
Solenoid status from IC	Fail (Open or short)

COMPONENT OPERATING RANGE

Output signal duty	Less than 100%

AX

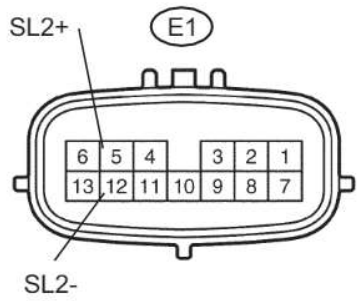
WIRING DIAGRAM



1	INSPECT TRANSMISSION WIRE (SL2)

Transmission Wire Side:

(Connector Front View):



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

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

Resistance

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

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

OK

Resistance (Check for short):

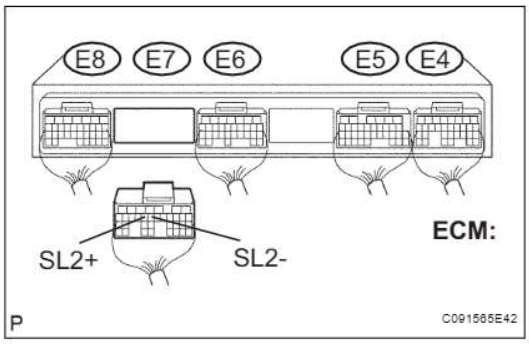
Tester Connection	Specified Condition
5 (SL2+) - Body ground	10 kΩ or higher
12 (SL2-) - Body ground	↑

NG → Go to step 3

OK

AX

2 CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



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

Resistance

Tester Connection	Specified Condition 20°C (68°F)
E7 - 15 (SL2+) - E7 - 14 (SL2-)	5.0 to 5.6 Ω

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

Resistance (Check for short)

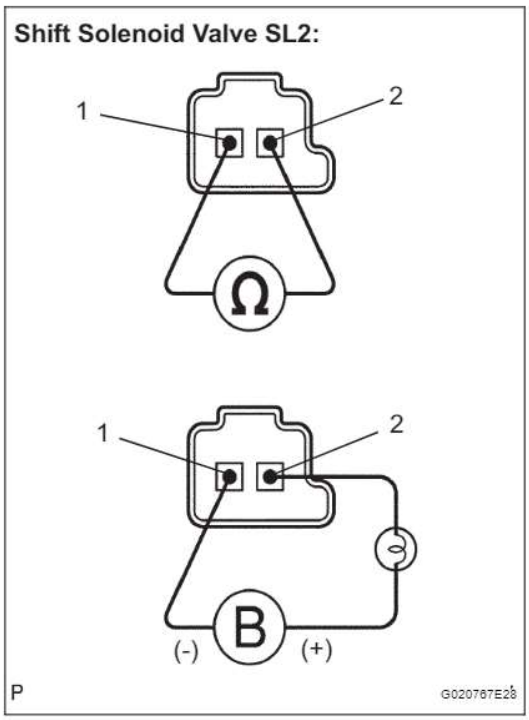
Tester Connection	Specified Condition
E7 - 15 (SL2+) - Body ground	10 kΩ or higher
E7 - 14 (SL2-) - Body ground	↑

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

OK →

REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE (SL2)



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

Resistance

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

(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 noise.

NG → **REPLACE SHIFT SOLENOID VALVE (SL2)**

AX

OK

REPAIR OR REPLACE TRANSMISSION WIRE

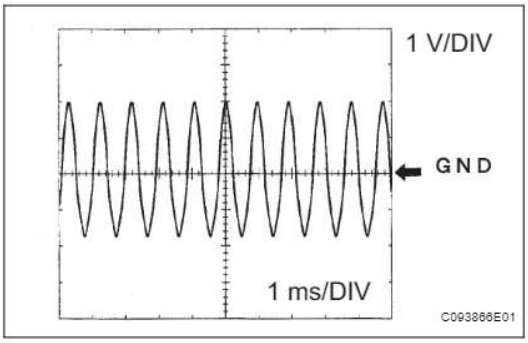
DTC	P0793	Intermediate Shaft Speed Sensor "A"

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

Reference (Using an oscilloscope):
Check the waveform between terminals NC+ and NC- of the ECM connector.



Standard: Refer to the illustration.

Terminal	NC+ - NC-
Tool setting	1 V/DIV, 1ms/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 *1although the output shaft revolution is more than 1,000 rpm *2, the ECM detects the trouble, illuminates the MIL and stores the DTC.
*1: Pulse is not output or is irregularly output.
*2: The vehicle speed is 50 km/h (31 mph) or more.

MONITOR STRATEGY

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

AX

TYPICAL ENABLING CONDITIONS

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

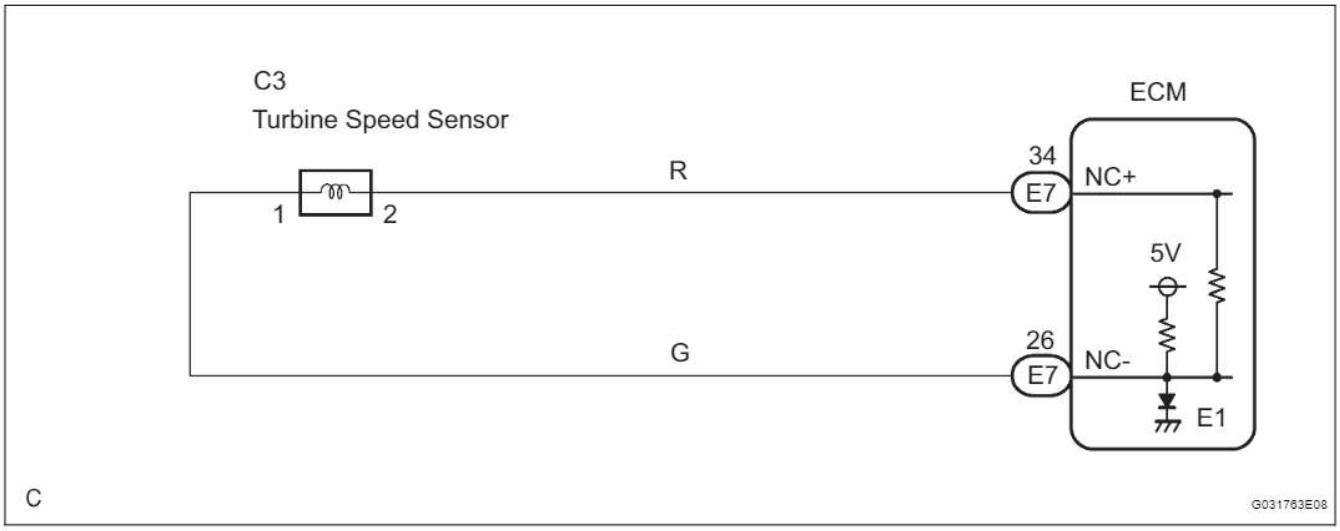
TYPICAL MALFUNCTION THRESHOLDS

Sensor signal rpm	Less than 300 rpm

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



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

1. READ DATA LIST

(a) Warm up the engine.
(b) Turn the ignition switch off.
(c) Connect the OBD II scan tool or intelligent tester to the DLC3.
(d) Turn the ignition switch to the on position.
(e) Push the "ON" button of the OBD II scan tool or the intelligent tester.
(f) When you use intelligent tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DATA LIST".
(g) According to the display on the tester, read the "DATA LIST".

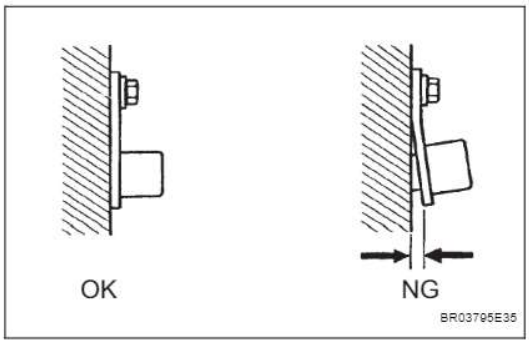
AX

Item	Measurement Item/ Range (display)	Normal Condition

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

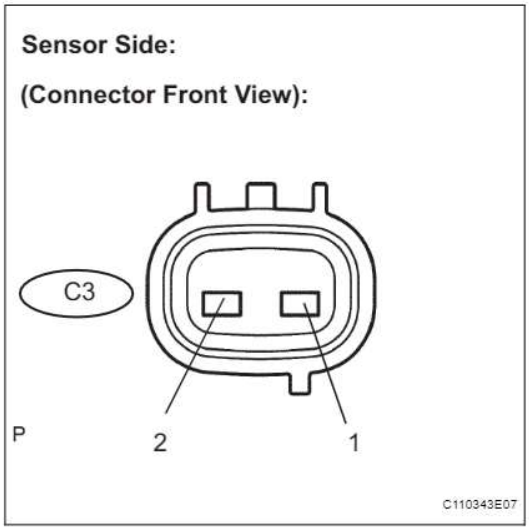


(a) Check the speed sensor installation.
OK:
The installation bolt is tightened properly and there is no clearance between the sensor and transaxle case.

NG → **REPLACE SPEED SENSOR (NC)**

OK

2 INSPECT SPEED SENSOR (NC)



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

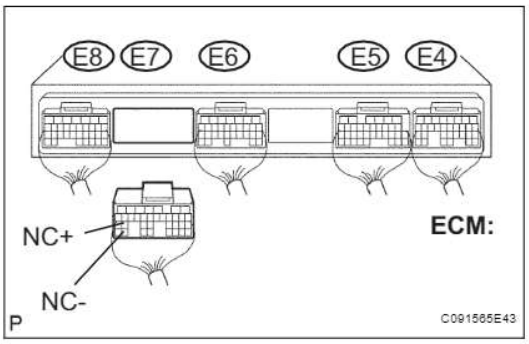
Tester Connection	Specified Condition 20 °C (68 °F)
1 - 2	560 to 680 Ω

NG → **REPLACE SPEED SENSOR (NC)**

OK

AX

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.

Resistance

Tester Connection	Specified Condition 20 °C (68 °F)
E7 - 26 (NC+) - E7 - 34 (NC-)	560 to 680 Ω

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

Resistance (Check for short)

Tester Connection	Specified Condition
E7 - 26 (NC+) - Body ground	10 kΩ or higher
E7 - 34 (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 No.	DTC Detecting 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

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

TYPICAL ENABLING CONDITIONS

All:

The monitor will run whenever 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

AX

Shift solenoid valve SL3 circuit	Not circuit malfunction
Shift solenoid valve S4 circuit	Not circuit malfunction
Shift solenoid valve SR circuit	Not circuit malfunction
Shift solenoid valve DSL circuit	Not circuit malfunction
Electronic throttle system	Not circuit malfunction

OFF malfunction (A):

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

OFF malfunction (B):

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

ON malfunction (A):

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

ON malfunction (B):

ECM selected gear	3rd
Throttle valve opening angle	7.0% or more at output speed 1,400 rpm (Varies with engine speed)
Malfunction of pressure control solenoid "B" (SL2) and "C" (SL3)	Not detected

ON malfunction (C):

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

TYPICAL MALFUNCTION THRESHOLDS

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

2 detections are necessary per driving cycle:

1st detection; temporary flag ON

2nd detection; pending fault code ON

OFF malfunction (A):

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

OFF malfunction (B):

Intermediate shaft speed/Output speed	1.02 to 1.16

ON malfunction (A):

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

ON malfunction (B):

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

AX

ON malfunction (C):

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

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

1. PERFORM ACTIVE TEST

(a) Turn the ignition switch off.
(b) Connect the intelligent tester to the DLC3.
(c) Turn the ignition switch to the on position.
(d) Push the "ON" button of the intelligent tester
(e) Select the item "DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST / SHIFT".
(f) 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 page AX-31).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press "→" button: Shift up • Press "←" button: Shift down	Possible to check the operation of the shift solenoid valves.

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

1	CHECK OTHER DTCS OUTPUT (IN ADDITION TO DTC P0796)

(a) Connect the OBD II scan tool or the intelligent tester 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:

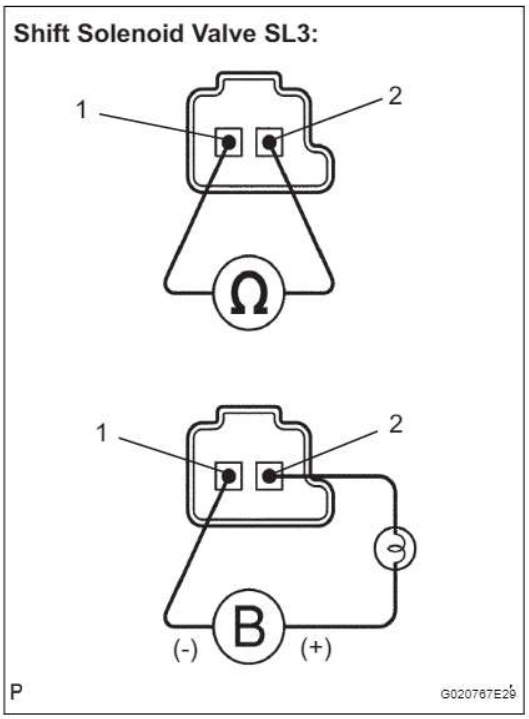
Display (DTC output)	Proceed to
Only "P0796" is output	A
"P0796" and other DTCs	B

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

B → GO TO DTC CHART

A

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.

Resistance

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

(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 noise.

NG → **REPLACE SHIFT SOLENOID VALVE (SL3)**

OK

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

4	INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

OK:

The torque converter clutch operates normally.

NG → **REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY**

OK

AX

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 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 page AX-31).

MONITOR STRATEGY

Related DTCs	P0798: Shift solenoid valve SL3/Range check
Required sensors/Components	Shift solenoid valve SL3
Frequency of operation	Continuous
Duration	1 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

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

TYPICAL MALFUNCTION THRESHOLDS

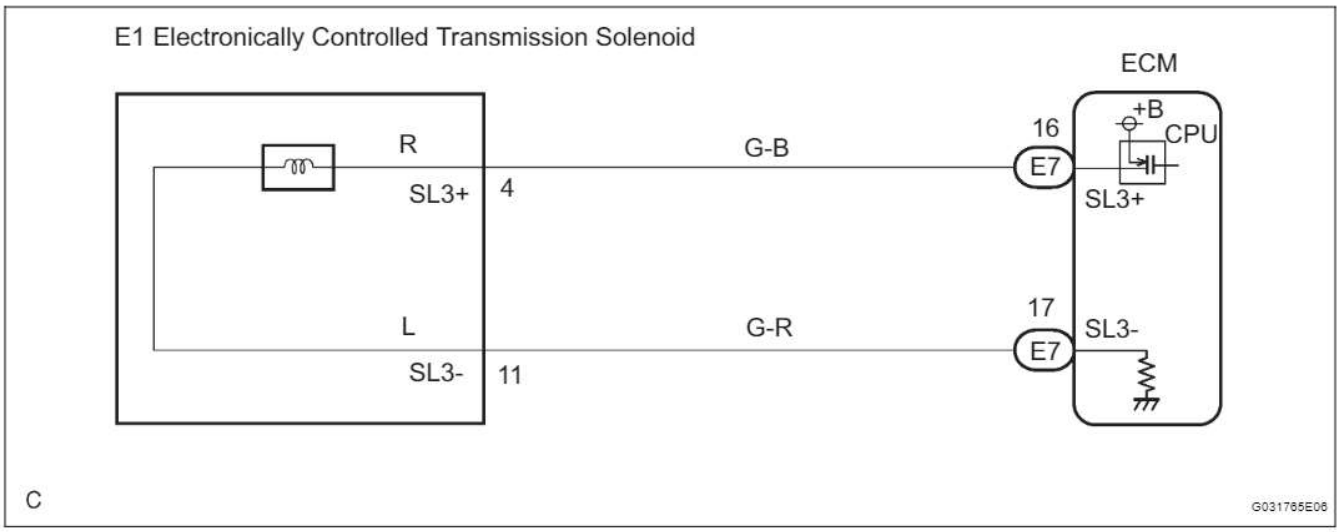
Output signal duty	100%

COMPONENT OPERATING RANGE

Output signal duty	Less than 100%

AX

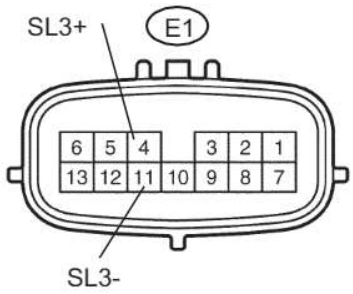
WIRING DIAGRAM



1	INSPECT TRANSMISSION WIRE (SL3)

Transmission Wire Side:

(Connector Front View):



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

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

Resistance

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

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

Resistance (Check for short)

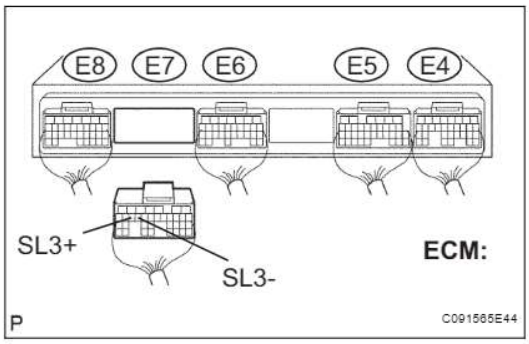
Tester Connection	Specified Condition
4 (SL3+) - Body ground	10 kΩ or higher
11 (SL3-) - Body ground	↑

NG → Go to step 3

OK

AX

2 CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



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

Resistance

Tester Connection	Specified Condition 20°C (68°F)
E7 - 17 (SL3+) - E7 - 16 (SL3-)	5.0 to 5.6 Ω

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

Resistance (Check for short)

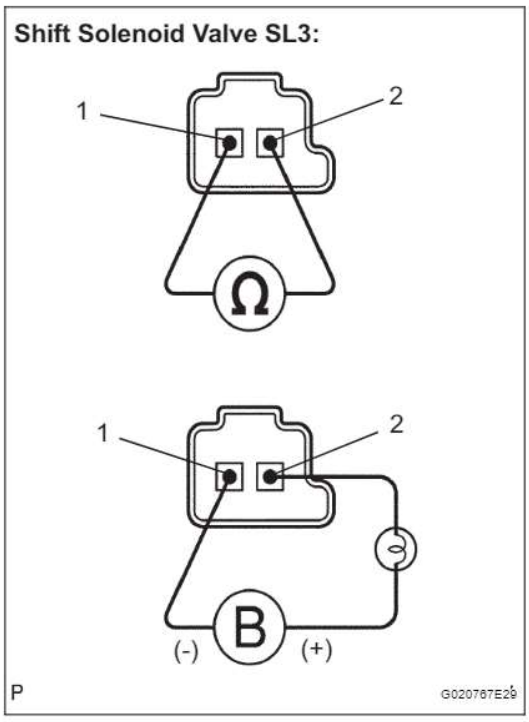
Tester Connection	Specified Condition
E7 - 17 (SL3+) - Body ground	10 kΩ or higher
E7 - 16 (SL3-) - Body ground	↑

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

OK

REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE (SL3)



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

Resistance

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

(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 noise.

NG → **REPLACE SHIFT SOLENOID VALVE (SL3)**

AX

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 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 page AX-31).

MONITOR STRATEGY

Related DTCs	P0982: Shift solenoid valve S4/Range check (Low resistance) P0983: Shift solenoid valve S4/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S4
Frequency of operation	Continuous
Duration	0.064 sec.
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0982: Range check (Low resistance):

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

P0983: Range check (High resistance):

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

AX

TYPICAL MALFUNCTION THRESHOLDS

P0982: Range check (Low resistance):

Shift solenoid valve S4 resistance	8 Ω or less

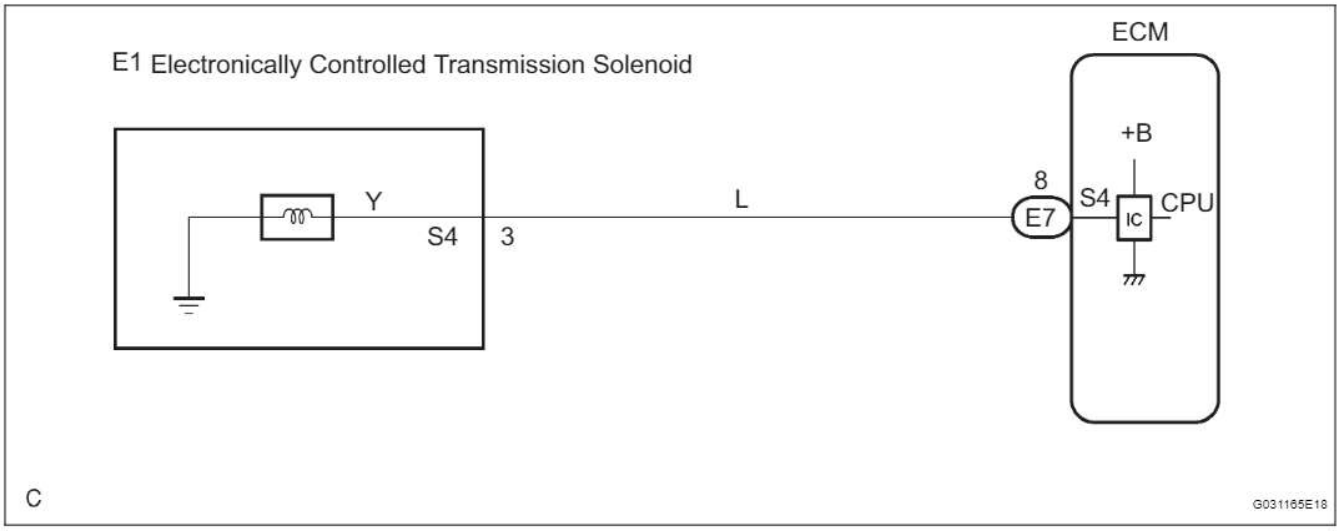
P0983: Range check (High resistance):

Shift solenoid valve S4 resistance	100 kΩ or more

COMPONENT OPERATING RANGE

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

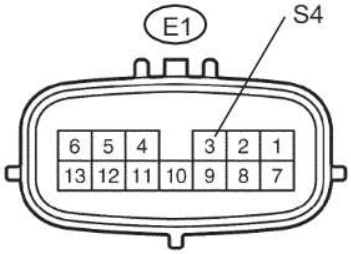
WIRING DIAGRAM



1 INSPECT TRANSMISSION WIRE (S4)

Transmission Wire Side:

(Connector Front View):



C113969E07

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

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

Resistance

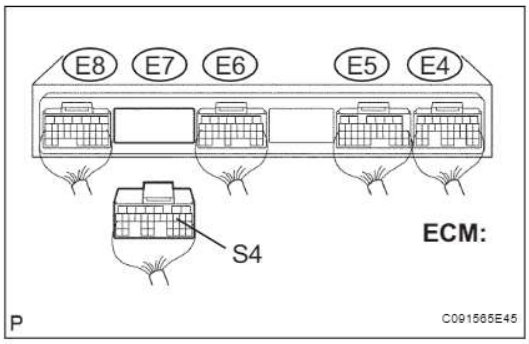
Tester Connection	Specified Condition 20°C (68°F)
3 - Body ground	11 to 15 Ω

NG → **Go to step 3**

OK

AX

2	CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



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

Resistance

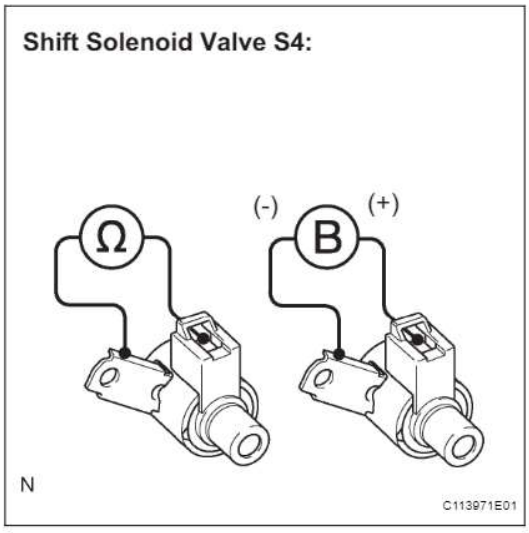
Tester Connection	Specified Condition 20°C (68°F)
E7 - 10 (S4) - Body ground	11 to 15 Ω

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

OK →

REPLACE ECM

3	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.

Resistance

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

(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 noise.

NG → **REPLACE SHIFT SOLENOID VALVE (S4)**

OK →

REPAIR OR REPLACE TRANSMISSION WIRE

AX

ROAD TEST

1. PROBLEM SYMPTOM CONFIRMATION

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

2. ROAD TEST

NOTICE:

Preform the test at the AFT (Automatic Transmission Fluid) temperature 50 to 80 °C (122 to 176 °F) in the normal operation.

(a) D position test:

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

(1) Check up-shift operation.

Check that 1 → 2, 2 → 3, 3 → 4 and 4 → 5th up-shifts take place, and that the shift points conform to the automatic shift schedule (See page SS-35).

HINT:

5th Gear Up-shift Prohibition Control

- Engine coolant temperature is 68°C (154°F) or less and vehicle speed is at 70km/h (43 mph) or less.
- ATF temperature is -2°C (28°F) or less.

4th Gear Up-shift Prohibition Control

- Engine coolant temperature is 65°C (149°F) or less and vehicle speed is at 55km/h (34 mph) or less.

5th and 4th Gear Lock-up Prohibition Control

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

(2) Check for shift shock and slip.

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

(3) Check for abnormal noise and vibration.

Check for abnormal noise and vibration when up-shifting from 1 → 2, 2 → 3, 3 → 4, and 4→ 5 while driving with the shift lever in the D position, and also check while driving in the lock-up condition.

HINT:

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

AX

(4) Check kick-down operation.
Check vehicle speeds when the 2nd to 1st, 3rd to 2nd, 4th to 3rd, and 5th to 4th kick-downs take place while driving with the shift lever in the D position. Confirm that each speed is within the applicable vehicle speed range indicated in the automatic shift schedule (See page SS-35).
(5) Check for abnormal shock and slip at kick-down.
(6) Check the lock-up mechanism.
- Drive in the D position (5th gear), at a steady speed (lock-up ON).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

HINT:
- There is no lock-up function in the 1st, 2nd and 3rd gears.
- 4th lock-up operates while uphill-downhill control is active in the D position.
- If there is a big jump in engine speed, there is no lock-up.

(b) S position test
Shift to the S position, depress the accelerator pedal and check the following points:
(1) Check shift operation.
- While driving in the D position and 5th gear, shift into the S position and back to the D position. Check that the gear change 5 → 4down-shift and 4 → 5up-shift can be performed.
- With the shift lever in the S position (while the vehicle is stopped), shift into the "+" position to check that the shift position on the combination meter changes as follows: 1 → 2, 2 → 3, 3 → 4, and 4 → 5.
- While driving in the 4(S) position and 3rd gear (at a vehicle speed of approximately 40 to 50 km/h (25 to 31mph)), shift into the "-" position and check if the 3th gear down-shift occurs and the engine brake performs properly.
- While driving in the 3(S) position and 3rd gear (at a vehicle speed of approximately 30 to 40 km/h (19 to 25 mph)), shift into the "-" position and check if the 2nd gear down-shift occurs and the engine brake performs properly.
- While driving in the 2(S) position and 2nd gear (at a vehicle speed of approximately 20 to 30 km/h (12 to 19 mph)), shift into the "-" position and check if the 1st gear down-shift occurs and the engine brake performs properly.

HINT:
Manual shift (S position) is prohibited under either of the following conditions:

AX

- Down-shifting may cause engine overrun.
- The driver continuously down-shifts. (Down-shifting to 1st gear may not be performed.)

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

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

(e) Uphill/downhill control function:
(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 the 5th to 4th or from the 4th to 3rd gear when brake is applied while the vehicle is driving downhill.

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

MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other normal shift solenoid valves "ON/OFF" (In case of an open or short circuit, the ECM stops sending current to the circuit.)
(See page AX-31).

MONITOR STRATEGY

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

TYPICAL ENABLING CONDITIONS

P0985: Range check (Low resistance):

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

P0986: Range check (High resistance):

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

AX

TYPICAL MALFUNCTION THRESHOLDS

P0985: Range check (Low resistance):

Shift solenoid valve SR resistance	8 Ω or less

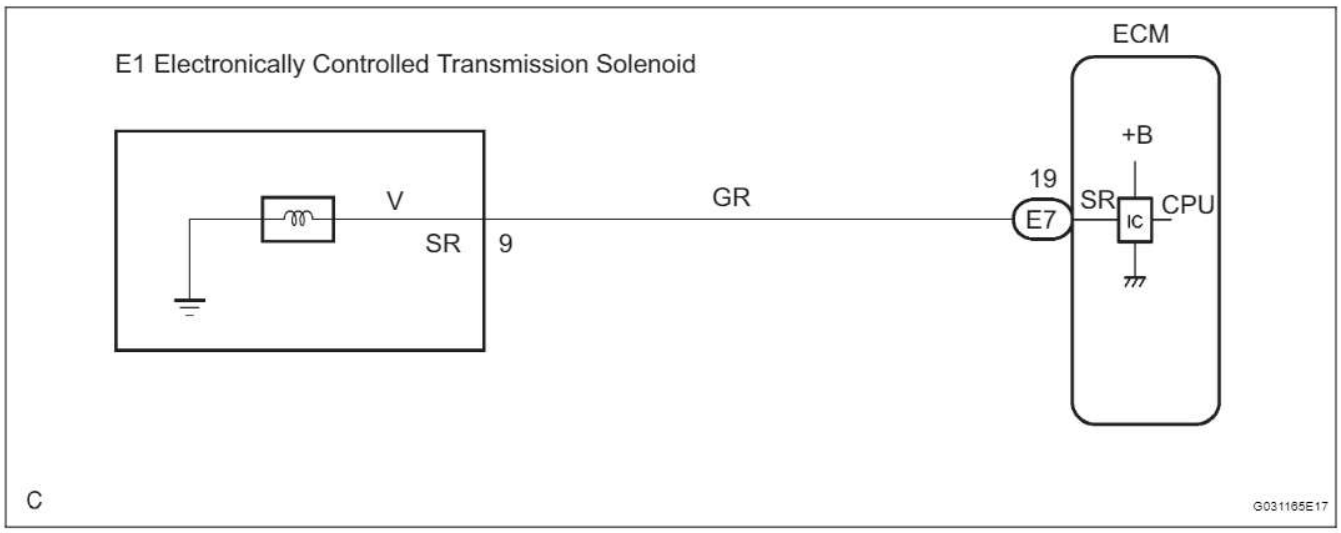
P0986: Range check (High resistance):

Shift solenoid valve SR resistance	100 kΩ or more

COMPONENT OPERATING RANGE

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

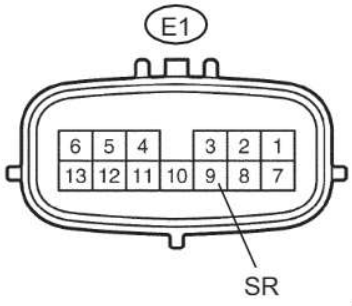
WIRING DIAGRAM



1 INSPECT TRANSMISSION WIRE (SR)

Transmission Wire Side:

(Connector Front View):



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

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

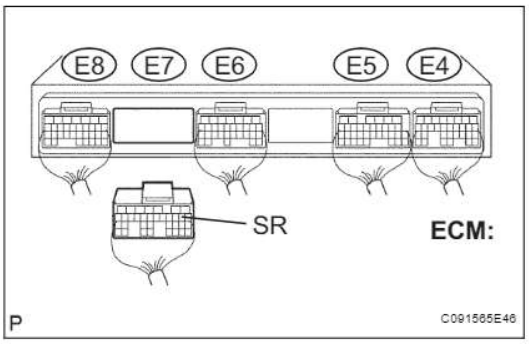
Resistance

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

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR (TRANSMISSION - ECM)



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

Resistance

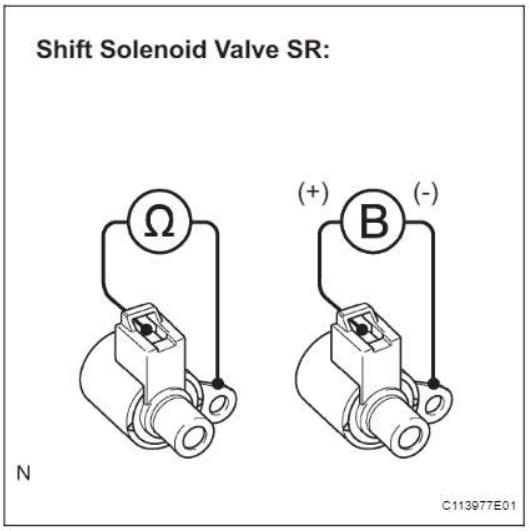
Tester Connection	Specified Condition 20°C (68°F)
E7 - 9 (SR) - Body ground	11 to 15 Ω

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.

Resistance

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

(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 noise.

NG → **REPLACE SHIFT SOLENOID VALVE (SR)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

AX

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.

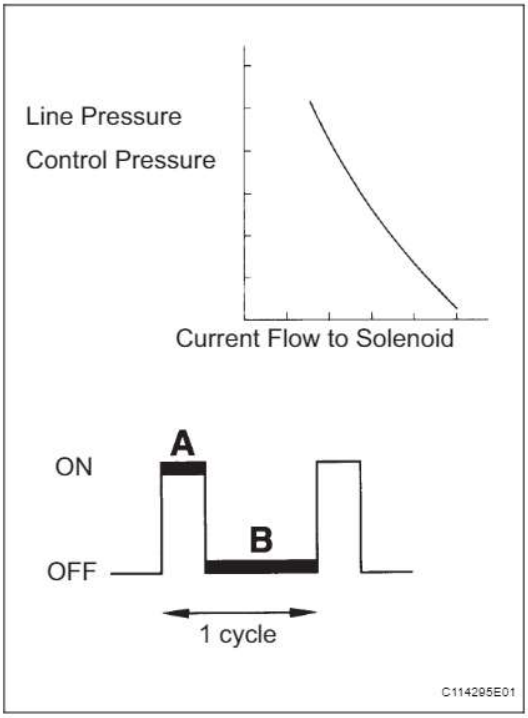
(*): Duty Ratio

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 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



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

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

AX

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

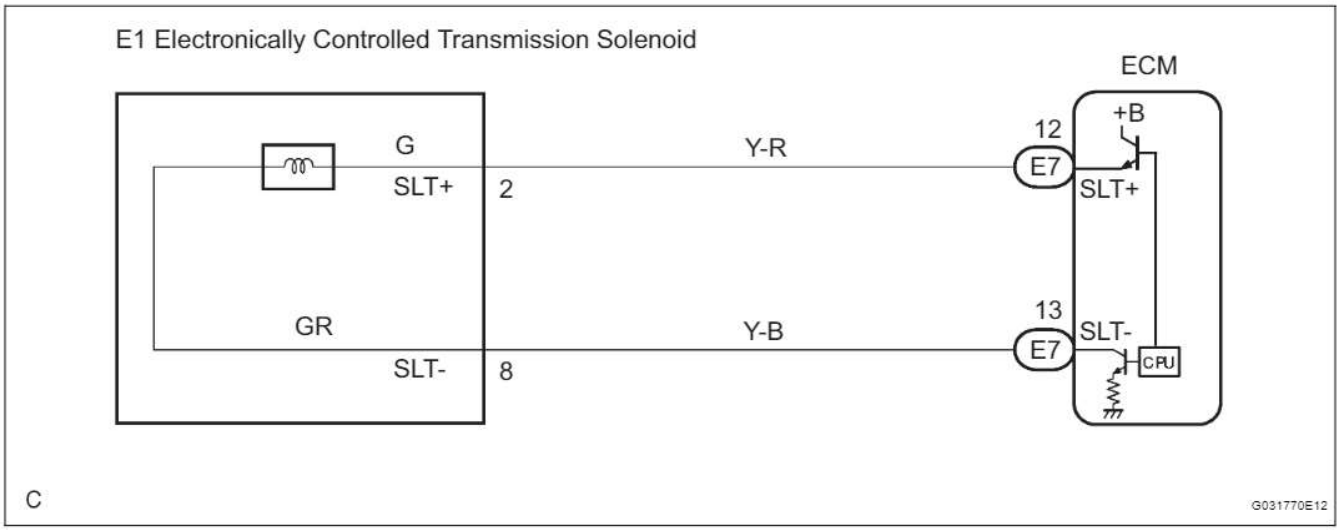
TYPICAL MALFUNCTION THRESHOLDS

Solenoid status from IC	Fail (Open or short)

COMPONENT OPERATING RANGE

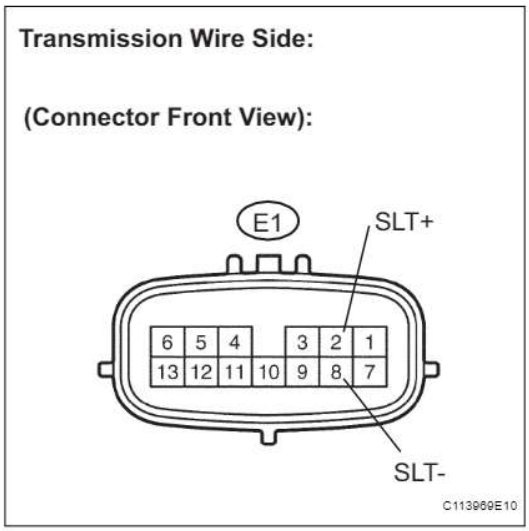
Shift solenoid valve SLT	Resistance: 5.0 to 5.6 Ω at 20°C (68°F)

WIRING DIAGRAM



AX

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.
Resistance

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

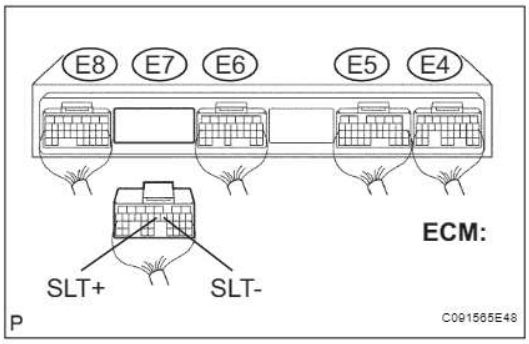
(c) Measure the resistance according to the value(s) in the table below.
Resistance (Check for short)

Tester Connection	Specified Condition
2 (SLT+) - Body ground	10 kΩ or higher
8 (SLT-) - Body ground	↑

NG → Go to step 3

OK

2 CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission wire connector to the transaxle.
(b) Disconnect the ECM connector.
(c) Measure the resistance according to the value(s) in the table below.
Resistance

Tester Connection	Specified Condition 20°C (68°F)
E7 - 13 (SLT+) - E7 - 12 (SLT-)	5.0 to 5.6 Ω

(d) Measure the resistance according to the value(s) in the table below.
Resistance (Check for short)

Tester Connection	Specified Condition
E7 - 13 (SLT+) - Body ground	10 kΩ or higher
E7 - 12 (SLT-) - Body ground	↑

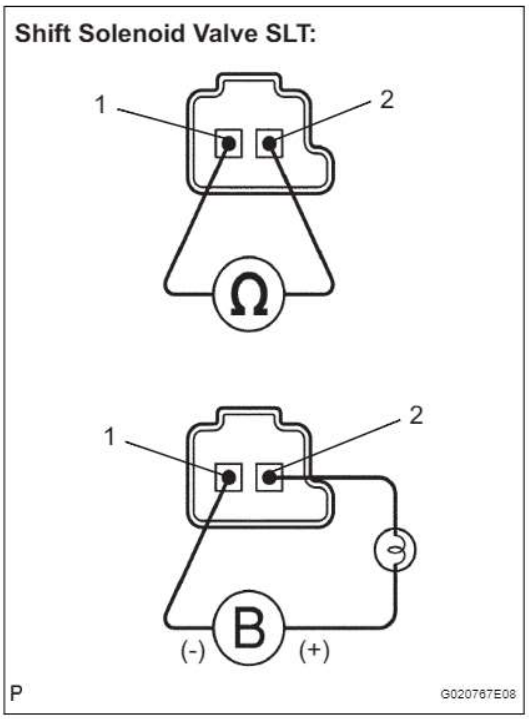
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM

AX

3	INSPECT SHIFT SOLENOID VALVE (SLT)



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

Resistance

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

(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 noise.

NG → **REPLACE SHIFT SOLENOID VALVE (SLT)**

OK →

REPAIR OR REPLACE TRANSMISSION WIRE

AX

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 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

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.
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P2769: Range check (Low resistance):

The monitor will run whenever this DTC is not present.	None
Shift solenoid valve DSL	ON
Solenoid current cut status	Not cut
Battery voltage	8 V or more
Ignition switch	ON
Starter	OFF

P2770: Range check (High resistance):

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

AX

Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

P2769: Range check (Low resistance):

Shift solenoid valve DSL resistance	8 Ω or less

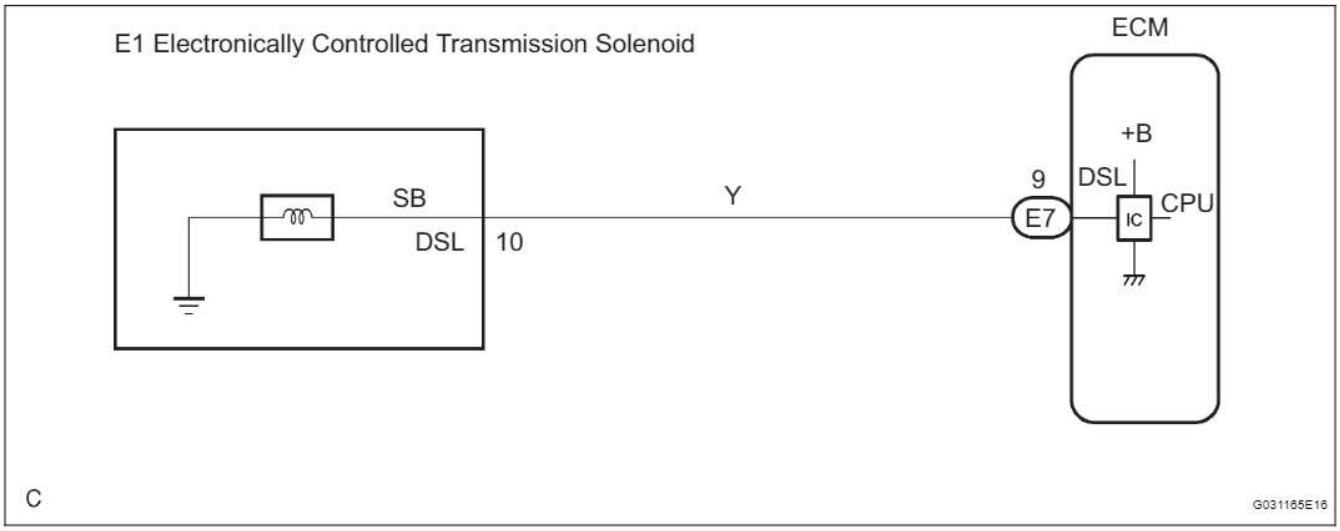
P2770: Range check (High resistance):

Shift solenoid valve DSL resistance	100 kΩ or more

COMPONENT OPERATING RANGE

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

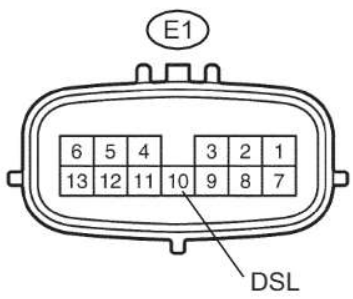
WIRING DIAGRAM



1	INSPECT TRANSMISSION WIRE (DSL)

Transmission Wire Side:

(Connector Front View):



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

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

Resistance

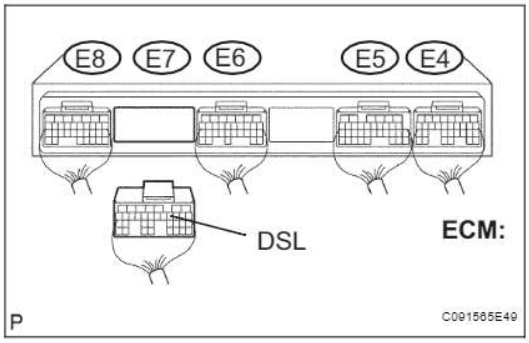
Tester Connection	Specified Condition 20°C (68°F)
10 - Body ground	11 to 13 Ω

NG	Go to step 3

AX

OK

2	CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



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

Resistance

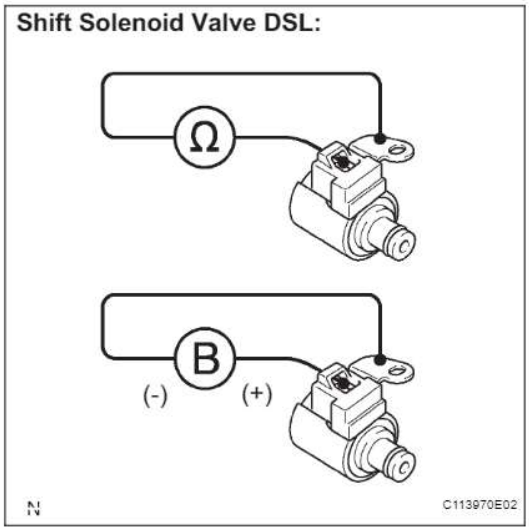
Tester Connection	Specified Condition 20°C (68°F)
E7 - 11 (DSL) - Body ground	11 to 13 Ω

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.

Resistance

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

(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 noise.

NG → REPLACE SHIFT SOLENOID VALVE (DSL)

OK

REPAIR OR REPLACE TRANSMISSION WIRE

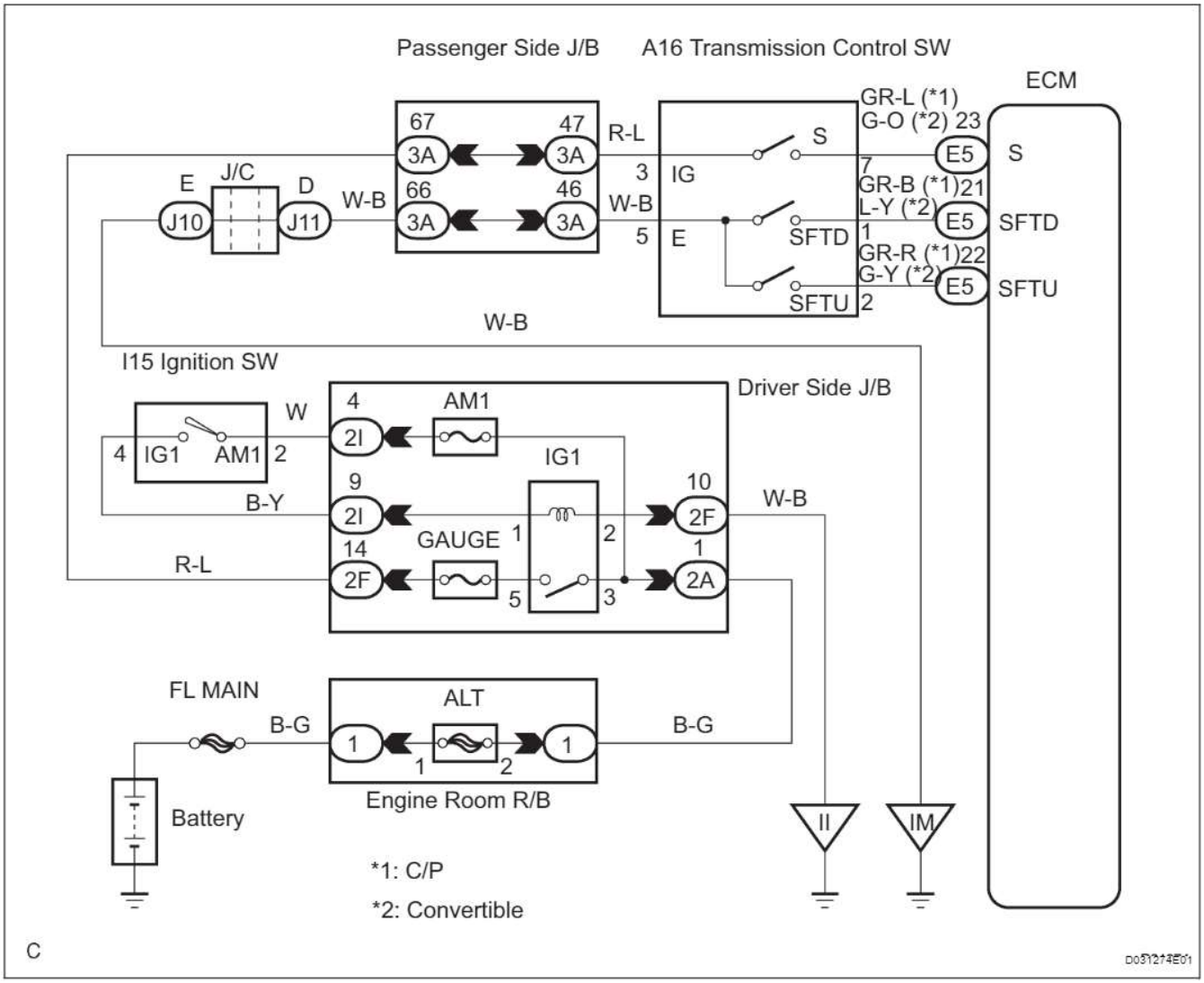
AX

Transmission Control Switch Circuit

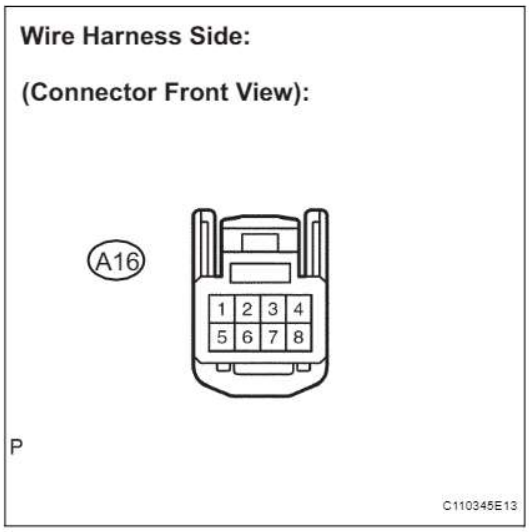
DESCRIPTION

When moving the shift lever into the S position using the transmission control switch, it is possible to switch the shift range position between "1" (first range) and "5" (fifth range).
Shifting up "+" once raises one shift range position, and shifting down "-" lowers one shift range position.

WIRING DIAGRAM



1	CHECK HARNESS AND CONNECTOR (BATTERY - TRANSMISSION CONTROL SWITCH)



(a) Disconnect the transmission control switch connector of shift lock control unit assembly.
(b) Measure the voltage according to the value(s) in the table below.

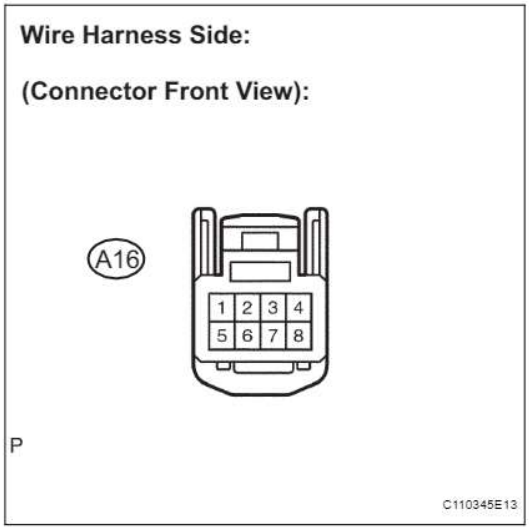
Voltage

Switch Condition	Tester Connection	Specified Condition
IG switch ON	3 - Body ground	10 to 14 V
IG switch OFF	↑	Below 1 V

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

2	CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL SWITCH - BODY GROUND)



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

Resistance

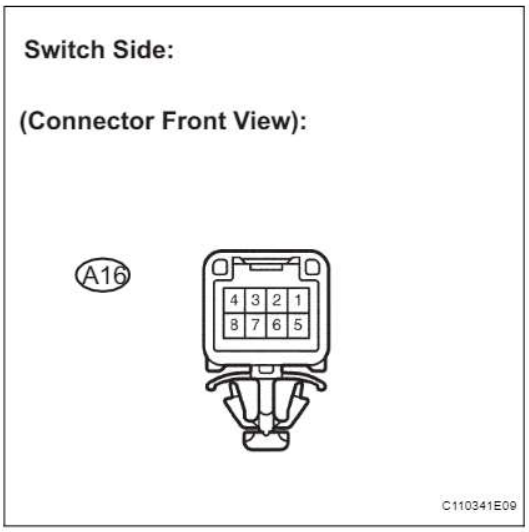
Tester Connection	Specified Condition
5 - Body ground	Below 1 Ω

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

AX

3 INSPECT TRANSMISSION FLOOR SHIFT ASSEMBLY



(a) Measure resistance between each terminal of shift lock control unit assembly when the shift lever is moved to each position.

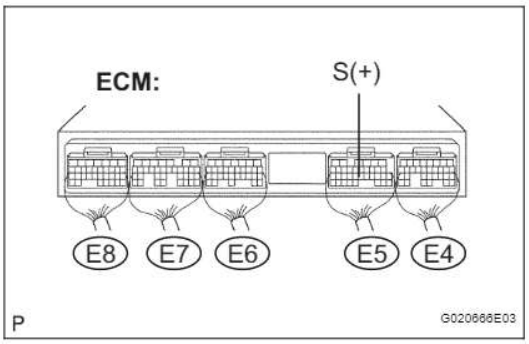
Resistance (Check for short)

Shift Position	Tester Connection	Specified Condition
S, "+" and "-"	3 - 7	Below 1 Ω
Except S, "+" and "-"	↑	10 kΩ or higher
Press continuously "+" (Up shift)	2 - 5	Below 1 Ω
S	↑	10 kΩ or higher
Press continuously "-" (Down shift)	1 - 5	Below 1 Ω
S	↑	10 kΩ or higher

NG → REPLACE TRANSMISSION FLOOR SHIFT ASSEMBLY

OK

4 CHECK HARNESS AND CONNECTOR (TRANSMISSION CONTROL SWITCH - ECM)



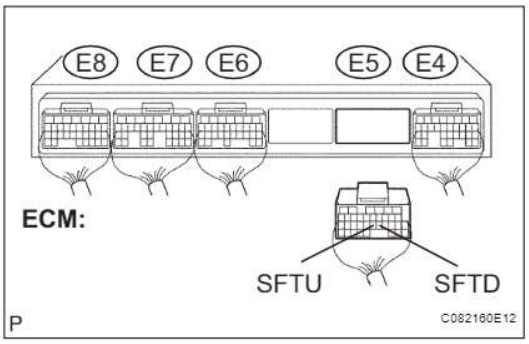
(a) Connect the transmission control switch connector of shift lock control unit assembly.

(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.

Voltage

Shift Position	Tester Connection	Specified Condition
S, "+" and "-"	E5 - 23 (S) - Body ground	10 to 14 V
Except S, "+" and "-"	↑	Below 1 V

(c) Turn the ignition switch to the LOCK position.



(d) Disconnect the ECM connector.

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

Resistance (Check for short)

Shift Position	Tester Connection	Specified Condition
Press continuously "+" (Up shift)	E5 - 22 (SFTU) - Body ground	Below 1 Ω
S	↑	10 kΩ or higher
Press continuously "-" (Down shift)	E5 - 21 (SFTD) - Body ground	Below 1 Ω
S	↑	10 kΩ or higher

AX

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

PROCEED TO NEXT CIRCUIT INSPECTION SHOWN ON PROBLEM SYMPTOMS TABLE

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.

NOTICE:

- **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 an OBD II scan tool or intelligent tester 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:

2,240 +- 150 rpm

Evaluation:

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

AX

(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 direct clutch, forward clutch, and 1st and reverse brake.

NOTICE:

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

(2) Connect an OBD II scan tool or intelligent tester 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.

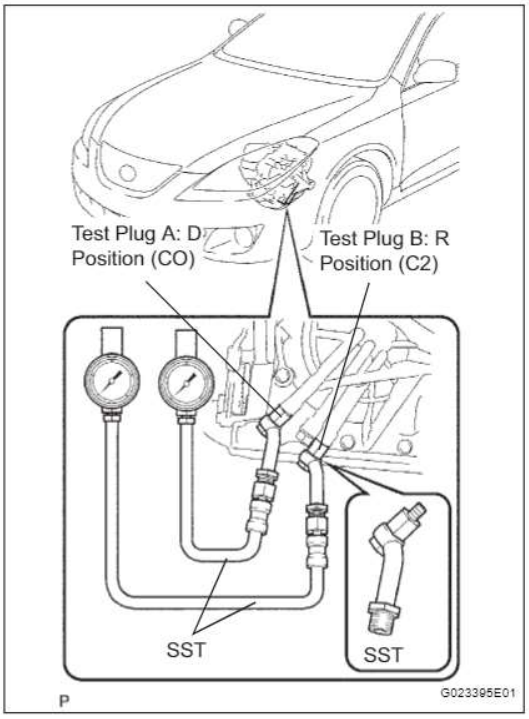
Time lag:

N → R less than 1.5 seconds

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

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

AX



HYDRAULIC TEST

1. PERFORM HYDRAULIC TEST

(a) Measure the line pressure.

NOTICE:

- **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 intelligent tester to DLC3.

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

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

NOTICE:

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

(6) Start the engine.

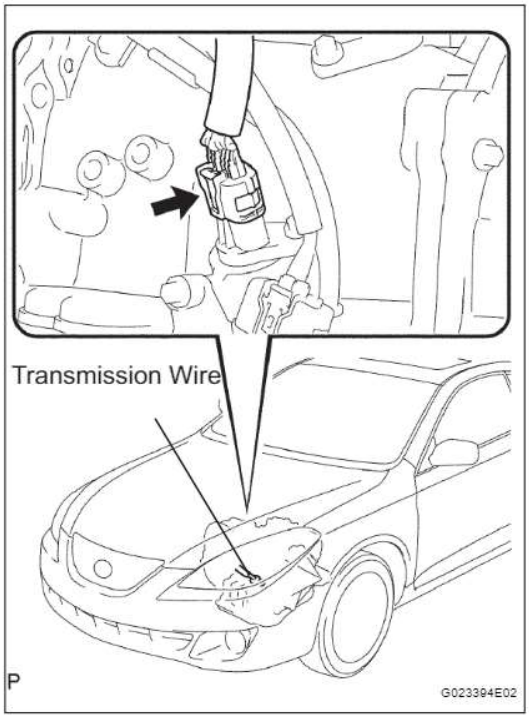
(7) Using intelligent tester, shift to D position and hold 3rd gear by active test, and measure the line pressure in idling.

Specified line pressure:

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.

AX



(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:

Condition	R 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)
(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:

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:

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

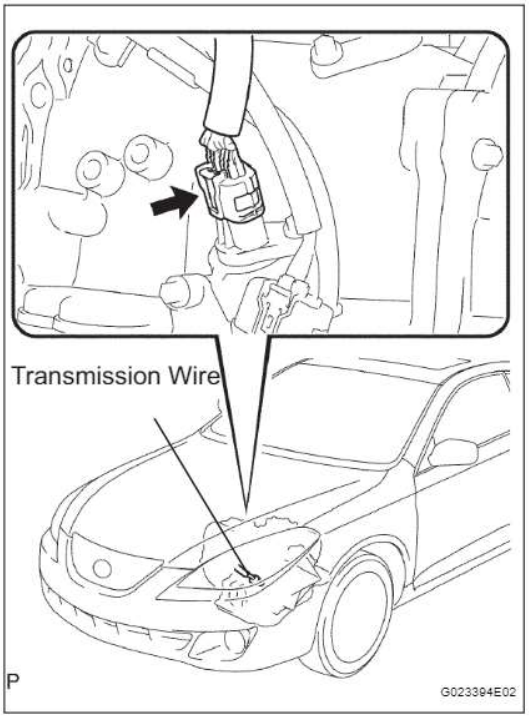
AX

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 to the D position to check whether the shifting condition changes the table below.

Shift Position	Shifting Condition
D	No Shift (Not Change)

HINT:

When driving with the transmission wire disconnected, the gear position will be as follows:

- When the shift lever is in the D position, the gear is held in the 4th position.
- When the shift lever is in the R or the P position, the gear is also in the R or the P position respectively.

(c) Connect the connector of the transmission wire.

(d) Clear the DTC (See page AX-28).

AX

INITIALIZATION

1. RESET MEMORY

NOTICE:

- **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 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 II".

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

CAUTION:

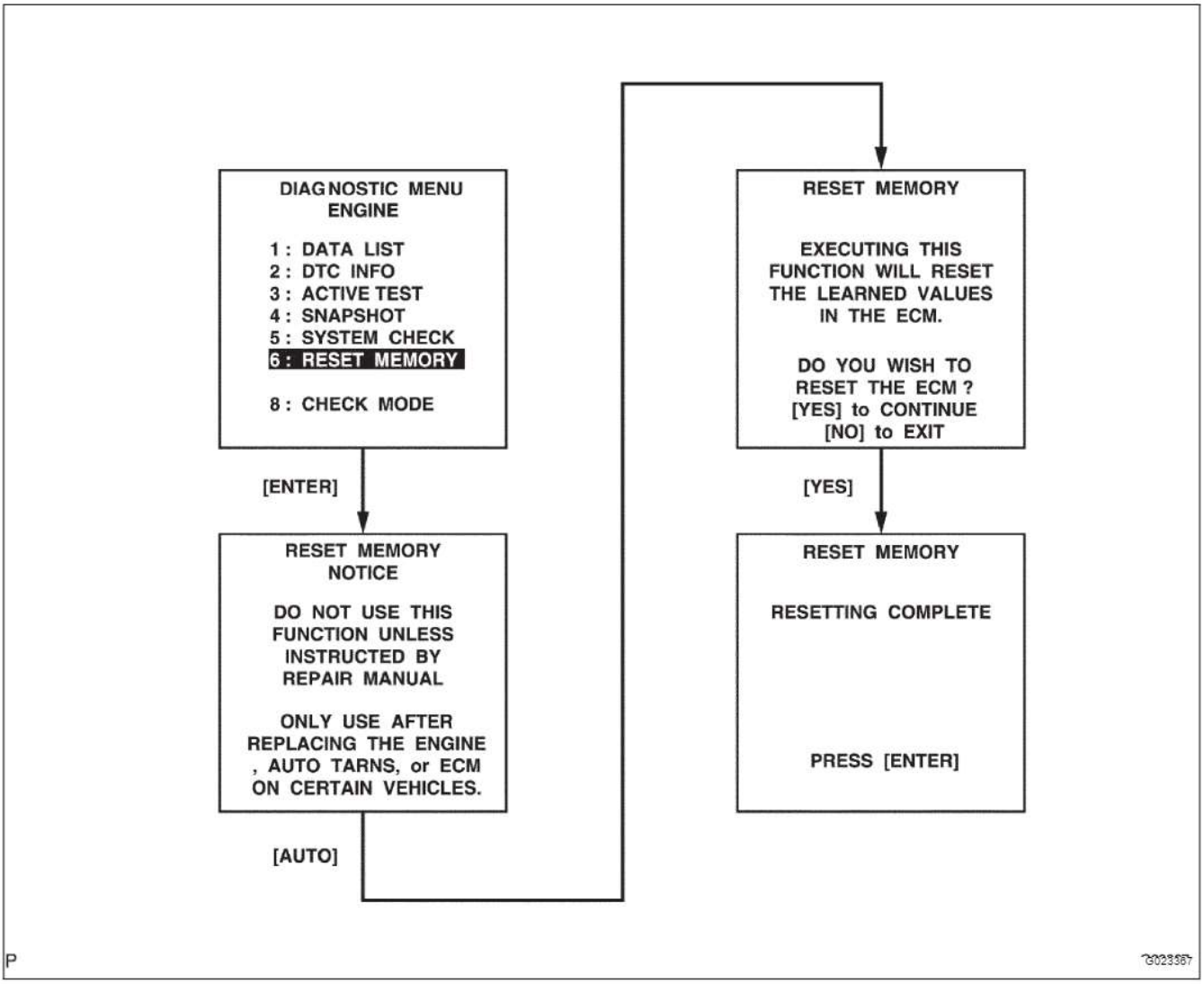
After performing the RESET MEMORY, be sure to perform the ROAD TEST (See page AX-11) described earlier.

HINT:

The ECM is learned by performing the ROAD TEST.

(1) Tester menu flow:

AX


DIAGNOSTIC MENU
ENGINE
1 : DATA LIST
2 : DTC INFO
3 : ACTIVE TEST
4 : SNAPSHOT
5 : SYSTEM CHECK
6 : RESET MEMORY
8 : CHECK MODE
[ENTER]
RESET MEMORY
NOTICE
DO NOT USE THIS FUNCTION UNLESS INSTRUCTED BY REPAIR MANUAL
ONLY USE AFTER REPLACING THE ENGINE , AUTO TARNS, or ECM ON CERTAIN VEHICLES.
[AUTO]
RESET MEMORY
EXECUTING THIS FUNCTION WILL RESET THE LEARNED VALUES IN THE ECM.
DO YOU WISH TO RESET THE ECM ?
[YES] to CONTINUE
[NO] to EXIT
[YES]
RESET MEMORY
RESETTING COMPLETE
PRESS [ENTER]
P
G023367

AX

MONITOR DRIVE PATTERN

1. MONITOR DRIVE PATTERN FOR ECT TEST

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

HINT:

Preparation for driving

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

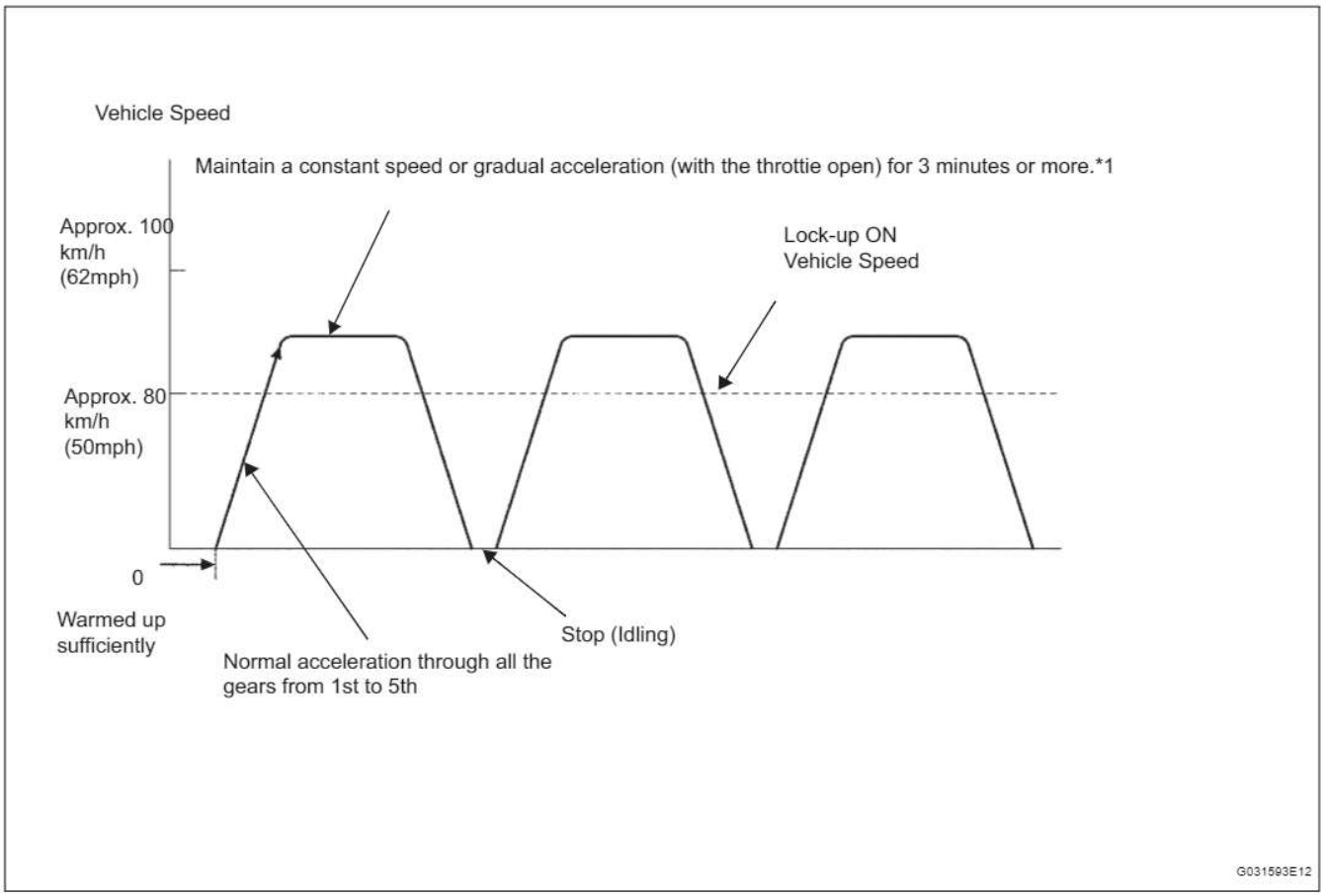
Driving note

- Drive the vehicle through all gears. Stop → 1st → 2nd → 3rd → 4th → 5th → 5th (lock-up ON).
- Perform engine brake test in the S position. While driving in the 5(S) position and 5th gear lock-up, shift into the "-" position and down-shift from 5th to 4th, 4th to 3rd, 3rd to 2nd, 2nd to 1st. Check that the engine brake performs properly whenever down-shift takes place.
- Repeat the above driving pattern three times or more.

NOTICE:

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

AX



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.

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

AX

PROBLEM SYMPTOMS TABLE

HINT:

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

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

1. Chapter 1: Electronic Circuit Matrix Chart

Symptom	Suspected area	See page
No down-shift (A particular gear, from 1st to 4th gear, is not down-shifted)	ECM	IN-34
No down-shift (5th -> 4th)	1. Park/neutral position switch circuit *1	AX-39
	2. Shift solenoid valve (S4) circuit *1	AX-102
	3. ECM	IN-34
No up-shift (A particular gear, from 1st to 4th gear, is not up-shifted)	ECM	IN-34
No up-shift (4th -> 5th)	ECM	IN-34
No lock-up	1. Engine coolant temp. sensor circuit *1	ES-92
	2. ECM	IN-34
No lock-up off	ECM	IN-34
Shift point too high or too low	1. Throttle position sensor circuit *1	ES-99
	2. ECM	IN-34
Up-shift to 5th from 4th while engine is cold	1. Engine coolant temp. sensor circuit *1	ES-92
	2. ECM	IN-34
No gear change by shifting into "+" or "-" while the shifting lever is in the S position	1. Transmission control switch circuit	AX-115
	2. ECM	IN-34
Harsh engagement (N -> D)	1. Shift solenoid valve (SL1) circuit *1	AX-69
	2. ECM	IN-34
Harsh engagement (Lock-up)	ECM	IN-34
Harsh engagement (Any driving position)	ECM	IN-34
Poor acceleration	ECM	IN-34
No kick-down	ECM	IN-34
Engine stalls when starting off or stopping	ECM	IN-34
Malfunction in shifting	1. Transmission control switch circuit	AX-115
	2. ECM	IN-34

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

Symptom	Suspected area	See page
Vehicle does not move in any forward position and in reverse positions	1. Valve body assembly	AX-128
	2. U/D brake (B3)	AX-153
	3. Torque converter clutch	AX-163

AX

Symptom	Suspected area	See page
Vehicle does not move in R position	1. Valve body assembly	AX-128
	2. Reverse clutch (C2)	AX-153
	3. 1st and reverse brake (B2)	AX-153
No up-shift (1st -> 2nd)	1. Valve body assembly	AX-128
	2. 2nd and O/D brake (B1)	AX-153
No up-shift (2nd -> 3rd)	1. Valve body assembly	AX-128
	2. Direct and O/D clutch (C0)	AX-153
No up-shift (3rd -> 4th)	1. Valve body assembly	AX-128
	2. 2nd and O/D brake (B1)	AX-153
No up-shift (4th -> 5th)	1. Shift solenoid valve (S4)	AX-102
	2. Valve body assembly	AX-128
	3. U/D clutch (C3)	AX-153
No down-shift (5th -> 4th)	1. Shift solenoid (S4)	AX-102
	2. Valve body assembly	AX-128
No down-shift (4th -> 3rd)	Valve body assembly	AX-128
No down-shift (3rd -> 2nd)	Valve body assembly	AX-128
No down-shift (2nd -> 1st)	Valve body assembly	AX-128
No lock-up or No lock-up off	1. Shift solenoid valve (DSL)	AX-112
	2. Valve body assembly	AX-128
	3. Torque converter clutch	AX-163
Harsh engagement (N -> D)	1. Shift solenoid valve (SL1)	AX-69
	2. Valve body assembly	AX-128
	3. C1 accumulator	AX-153
	4. Forward clutch (C1)	AX-153
	5. One-way clutch No.1 (F1)	AX-153
	6. U/D one-way clutch (F2)	AX-153
Harsh engagement (Lock-up)	1.Shift solenoid valve (SL2)	AX-86
	2. Valve body assembly	AX-128
	3. Torque converter clutch	AX-163
Harsh engagement (N -> R)	1. Valve body assembly	AX-128
	2. C2 accumulator	AX-153
	3. Reverse clutch (C2)	AX-153
	4. 1st and reverse brake (B2)	AX-153
Harsh engagement (1st -> 2nd -> 3rd -> 4th -> 5th)	1. Shift solenoid valve (SLT)	AX-108
	2. Valve body assembly	AX-128
Harsh engagement (1st -> 2nd)	1. Valve body assembly	AX-128
	2. 2nd and O/D brake (B1)	AX-153
Harsh engagement (2nd -> 3rd)	1. Valve body assembly	AX-128
	2. C0 accumulator	AX-153
	3. Direct and O/D clutch (C0)	AX-153
Harsh engagement (3rd -> 4th)	1. Valve body assembly	AX-128
	2. 2nd and O/D brake (B1)	AX-153
Harsh engagement (4th -> 5th)	1. Valve body assembly	AX-128
	2. C3 accumulator	AX-153
	3. U/D clutch (B3)	AX-153
Harsh engagement (5th -> 4th)	1. Valve body assembly	AX-128
	2. B3 accumulator	AX-153

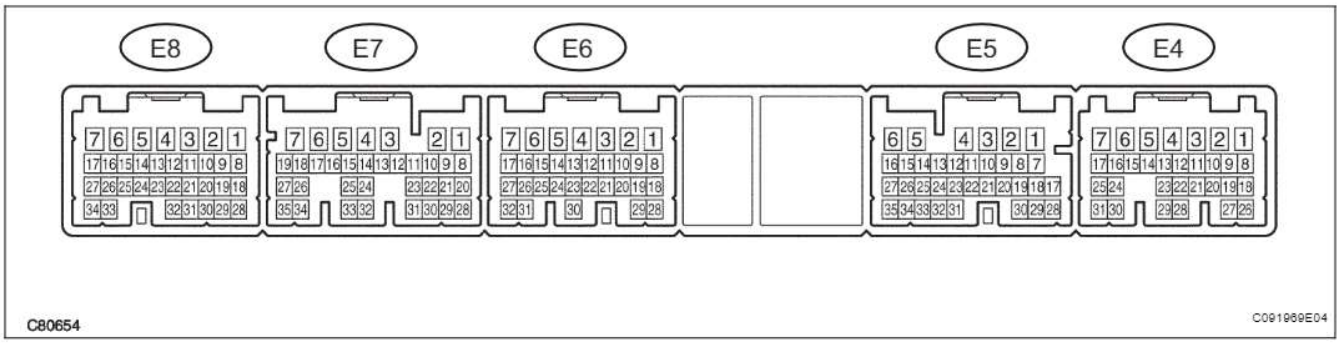
AX

Symptom	Suspected area	See page
Slip or shudder (Forward and reverse: After warm-up)	1. Valve body assembly	AX-128
	2. Oil strainer	AX-153
	3. Direct and O/D clutch (C0)	AX-153
	4. Forward clutch (C1)	AX-153
	5. U/D clutch (C3)	AX-153
	6. 2nd and brake (B1)	AX-153
	7. U/D brake (B3)	AX-153
	8. One-way clutch No.1 (F1)	AX-153
	9. U/D one-way clutch (F2)	AX-153
	10. Torque converter clutch	AX-163
Slip or shudder (Particular position: Just after engine starts)	Torque converter clutch	AX-163
Slip or shudder (R position)	1. Reverse clutch (C2)	AX-153
	2. 1st and reverse brake (B2)	AX-153
Slip or shudder (1st)	1. Forward clutch (C1)	AX-153
	2. One-way clutch No.1 (F1)	AX-153
	3. U/D one-way clutch (F2)	AX-153
Slip or shudder (2nd)	2nd and O/D brake (B1)	AX-153
Slip or shudder (3rd)	Direct and O/D clutch (C0)	AX-153
Slip or shudder (4th)	2nd and O/D brake (B1)	AX-153
Slip or shudder (5th)	U/D clutch (C3)	AX-153
Shift position too high or too low	Shift solenoid valve (SLT)	AX-108
No engine braking (1st +- 4th: D position)	U/D brake (B3)	AX-153
No engine braking (1st: L (1) position)	1. Valve body assembly	AX-128
	2. 1st and reverse brake (B2)	AX-153
No engine braking (2nd: 2 position)	1. Valve body assembly	AX-163
	2. 2nd and O/D brake (B1)	AX-153
No engine braking (3rd: 3 position)	U/D brake (B3)	AX-153
No kick-down	Valve body assembly	AX-128
Poor acceleration (All positions)	1. Shift solenoid valve (SLT)	AX-108
	2. Torque converter clutch	AX-163
Poor acceleration (5th)	1. U/D clutch (C3)	AX-153
	2. U/D planetary gear unit	AX-153
Engine stalls when starting off or stopping	1. Shift solenoid valve DSL)	AX-112
	2. Torque converter clutch	AX-163

AX

TERMINALS OF ECM

1. ECM



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.

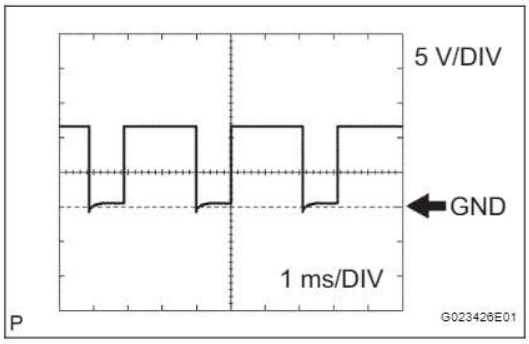
Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	Specified Condition
D (E5-10) - E1 (E6-1)	W-L - BR	D shift position switch signal	IG switch ON and shift lever D and S position	10 to 14 V
↑	↑	↑	IG switch ON and shift lever except D and S position	Below 1 V
R (E5-11) - E1 (E6-1)	R-B - BR	R shift position switch signal	IG switch ON and shift lever R position	10 to 14 V
↑	↑	↑	IG switch ON and shift lever except R position	Below 1 V
SPD (E5-17) - E1 (E6-1)	V-W - BR	Speed signal	Vehicle speed 20 km/h (12 mph)	Pulse generation (See waveform 8)
STP (E5-19) - E1 (E6-1)	G-W - BR	Stop light switch signal	Brake pedal is depressed	7.5 to 14 V
↑	↑	↑	Brake pedal is released	Below 1.5 V
SFTD (E5-21) - E1 (E6-1)	GR-B*1 - BR L-Y*2 -BR	Down shift switch signal	IG switch ON and shift lever S position	10 to 14 V
↑	↑	↑	IG switch ON and shift lever "-" position (Down shift)	Below 1 V
SFTU (E5-22) - E1 (E6-1)	GR-R*1 - BR G-Y*2 -BR	Up shift switch signal	IG switch ON and shift lever S position	10 to 14 V
↑	↑	↑	IG switch ON and shift lever "+" position (Up shift)	Below 1 V
S (E5-23) - E1 (E6-1)	GR-L*1 - BR G-O*2 -BR	S shift position switch signal	IG switch ON and shift lever S position	10 to 14 V
↑	↑	↑	IG switch ON and shift lever except S position	Below 1 V
P (E4-6) - E1 (E6-1)	G-W - BR	Park position switch signal	IG switch ON and shift lever P position	10 to 14 V
↑	↑	↑	IG switch ON and shift lever except P position	Below 1 V
N (E4-7) - E1 (E6-1)	R - BR	Neutral position switch signal	IG switch ON and shift lever N position	10 to 14 V

AX

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	Specified Condition
↑	↑	↑	IG switch ON and shift lever except N position	Below 1 V
NSW (E8-16) - E1 (E6-1)	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 except P and N position	10 to 14 V
DSL (E7-11) - E1 (E6-1)	Y - BR	DSL solenoid signal	Vehicle speed 65 km/h (40 mph), lock-up (ON to OFF)	Pulse generation (See waveform 2)
SR (E7-9) - E1 (E6-1)	GR - BR	SR solenoid signal	IG switch ON	Below 1 V
↑	↑	↑	3rd, 4th or 5th gear	10 to 14 V
↑	↑	↑	1st or 2nd gear	Below 1 V
S4 (E7-10) - E1 (E6-1)	L - BR	S4 solenoid signal	IG switch ON	Below 1 V
↑	↑	↑	5th gear	10 to 14 V
↑	↑	↑	Except 5th gear	Below 1 V
SL3+ (E7-17) - SL3- (E7-16)	G-B - G-R	SL3 solenoid signal	Engine idle speed	Pulse generation (See waveform 3)
SL2+ (E7-15) - SL2- (E7-14)	L-Y - L-R	SL2 solenoid signal	Engine idle speed	Pulse generation (See waveform 4)
SL1+ (E7-19) - SL1-(E7-18)	R-B - B-W	SL1 solenoid signal	Engine idle speed	Pulse generation (See waveform 5)
NC+ (E7-26) - NC- (E7-34)	R - G	Speed sensor (NC) signal	Vehicle speed 30 km/h (19 mph): (3rd gear) Engine speed 1,400 rpm	Pulse generation (See waveform 6)
NT+ (E7-27) - NT- (E7-35)	L -LG	Speed sensor (NT) signal	Vehicle speed 20 km/h (12 mph)	Pulse generation (See waveform 7)
SLT+ (E7-15) - SLT- (E7-12)	Y-R - Y-B	SLT solenoid signal	Engine idle speed	Pulse generation (See waveform 1)
THO1 (E7-32) - E2 (E8-28)	G - BR	ATF temperature sensor signal	ATF temperature: 115°C (239°F) or more	Below 1.5 V

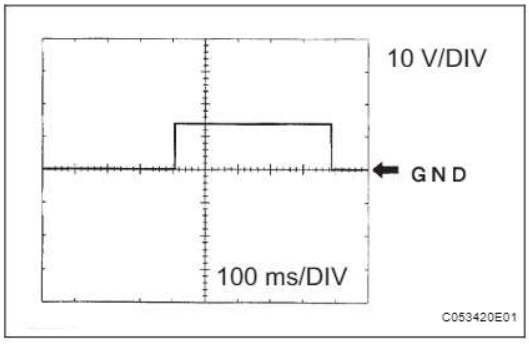
HINT:
*1: C/P
*2: Convertible

(a) Waveform 1
Reference:



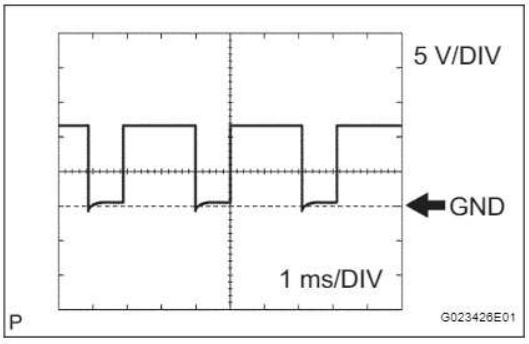
Terminal	SLT+ - SLT-
Tool setting	5 V/DIV, 1ms/DIV
Vehicle condition	Engine idle speed

(b) Waveform 2
Reference:



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

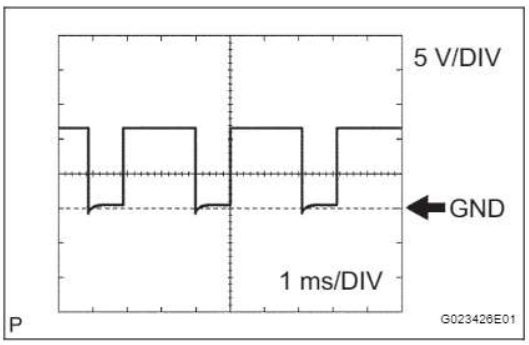
AX



(c) Waveform 3

Reference:

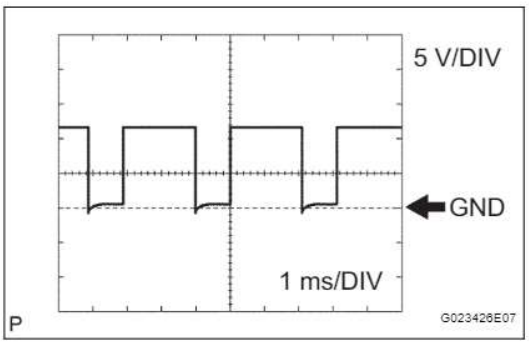
Terminal	SL3+ - SL3-
Tool setting	5 V/DIV, 1ms/DIV
Vehicle condition	Engine idle speed



(d) Waveform 4

Reference:

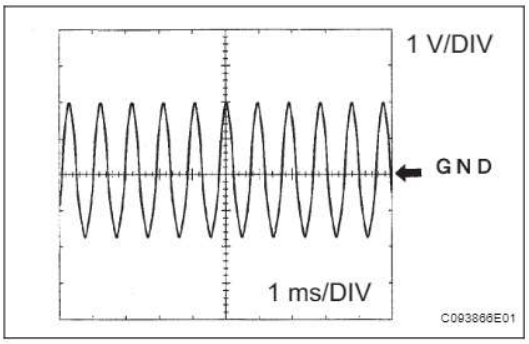
Terminal	SL2+ - SL2-
Tool setting	5 V/DIV, 1ms/DIV
Vehicle condition	5th or 6th gear



(e) Waveform 5

Reference:

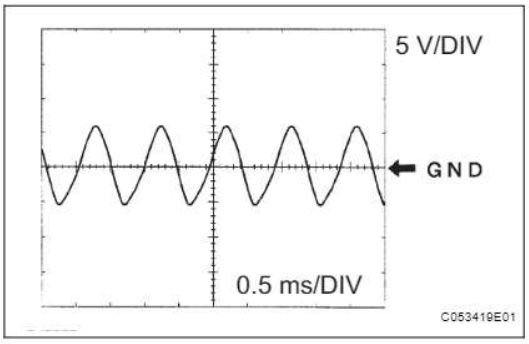
Terminal	SL1+ - SL1-
Tool setting	5 V/DIV, 1ms/DIV
Vehicle condition	Engine idle speed



(f) Waveform 6

Reference:

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

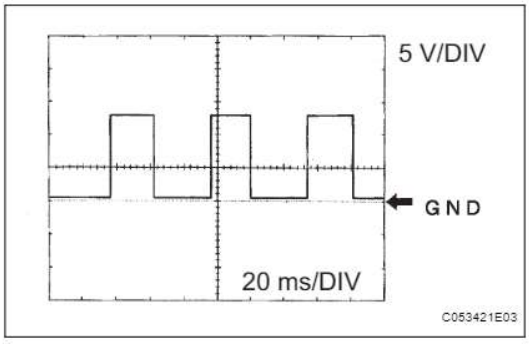


(g) Waveform 7

Reference:

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

AX



(h) Waveform 8

Reference:

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

AX

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 page AX-35).
If the malfunction does not occur in 3 consecutive trips, the MIL goes off but the DTCs remain in the ECM memory.

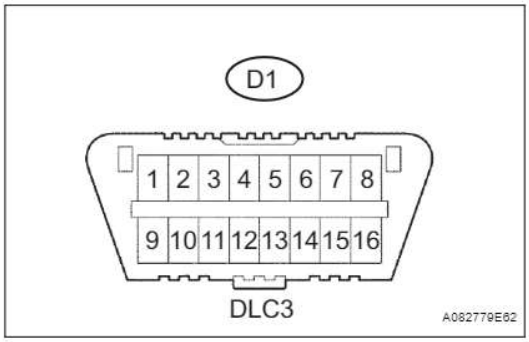
(c) To check the DTCs, connect the OBD II scan tool or intelligent tester to the DLC3 of the vehicle. The OBD II scan tool or intelligent tester also enables you to erase the DTCs and check freeze frame data and various forms of engine data (For operating instructions, see the instruction book).

(d) The DTCs include SAE controlled codes and Manufacturer controlled codes. SAE controlled codes must be set as prescribed by the SAE, while Manufacturer controlled codes can be set freely by a manufacturer within the prescribed limits (See page AX-35).

(e) The diagnosis system operates in the normal mode during the normal vehicle use, and also has a check mode for technicians to simulate malfunction symptoms and perform troubleshooting. Most DTCs use 2 trip detection logic(*) to prevent erroneous detection. By switching the ECM to the check mode when troubleshooting, the technician can cause the MIL to illuminate for a malfunction that is only detected once or momentarily (intelligent tester).

(f) *2 trip detection logic: When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same malfunction is detected again during the second test drive, this second detection causes the MIL to illuminate.

AX



2. INSPECT THE DLC3

(a) The vehicle's ECM uses ISO 9141-2 for communication. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 9141-2 format.

Tester connection	Condition	Condition
7 (Bus Line) - 5 (Signal ground)	During communication	Pulse generation
4 (Chassis Ground) - Body	Always	1 or less
5 (Signal Ground) - Body	Always	1 or less
16 (B+) - Body	Always	9 to 14 V

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 11 V, 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.

AX

AUTOMATIC TRANSAXLE FLUID

ON-VEHICLE INSPECTION

1. CHECK FLUID LEVEL

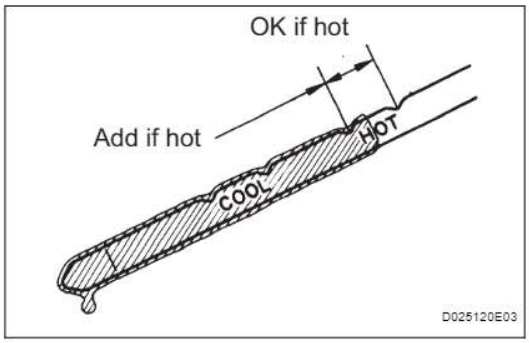
(a) Shift lever with multi-mode automatic transaxle

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)



(1) Park the vehicle on a level surface and set the parking brake.

(2) With the engine idling and the brake pedal depressed, move shift the lever into all positions from P to L (S 1) and return to the P position.

(3) Take out the dipstick and wipe it clean.

(4) Put it back all the way.

(5) Take it out 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.

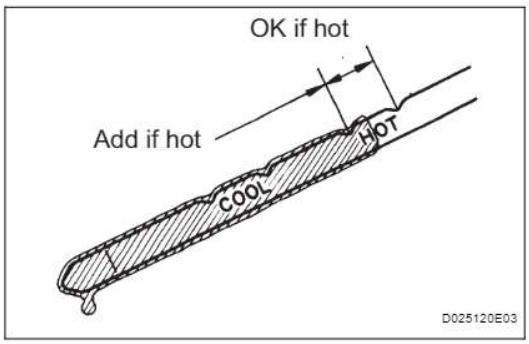
(b) Gate shift lever

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)



(1) Park the vehicle on a level surface and set the parking brake.

(2) With the engine idling and the brake pedal depressed, move the shift lever into all positions from P to L and return to the P position.

(3) Take out the dipstick and wipe it clean.

(4) Put it back all the way.

(5) Take it out again and check that the fluid level is within the HOT range.

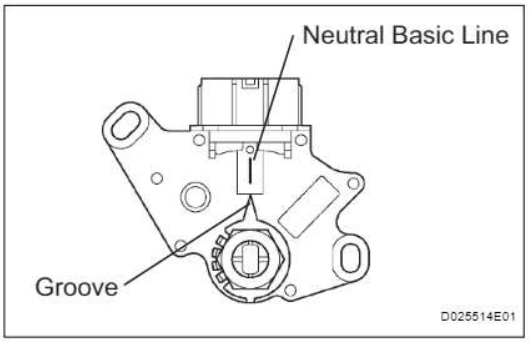
If the fluid level is below the HOT range, add new fluid and recheck the fluid level.

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

AX

INSPECTION

1. **INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
   (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 set in the N or P position.
   (c) Check that the back-up light comes on and the reverse warning buzzer sounds only when the shift lever is set in the R position.
   If a failure is found, check the park/neutral position switch for continuity.

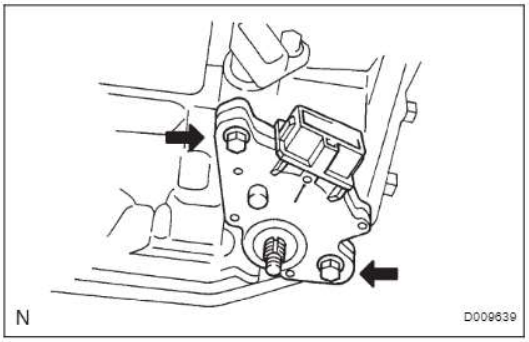


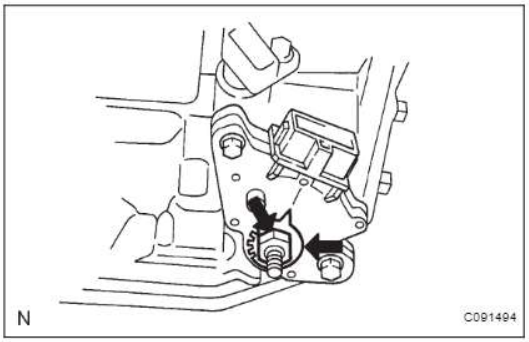
ADJUSTMENT

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 (See page AX-121).

INSTALLATION

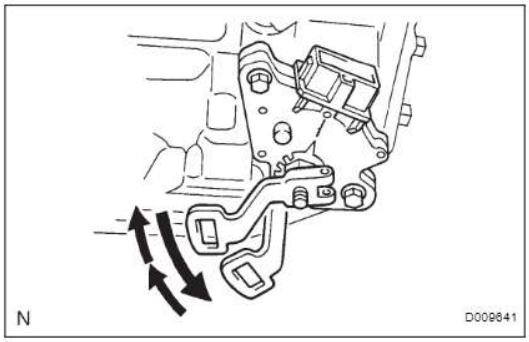
1. **INSTALL PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
   (a) Install the park/neutral position switch to the manual valve shaft.
   (b) Temporarily install the 2 bolts.



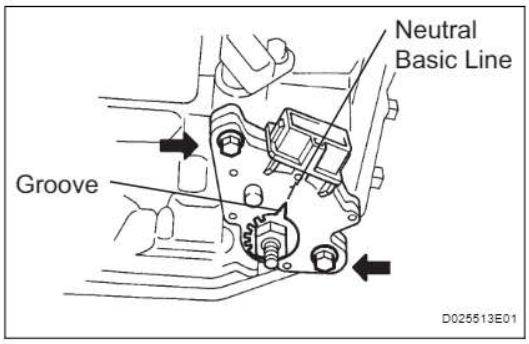


   (c) Place a new lock plate and tighten the nut.
   Torque: 6.9 N*m (70 kgf*cm, 61 in.*lbf)
   (d) Temporarily install the control shaft lever.

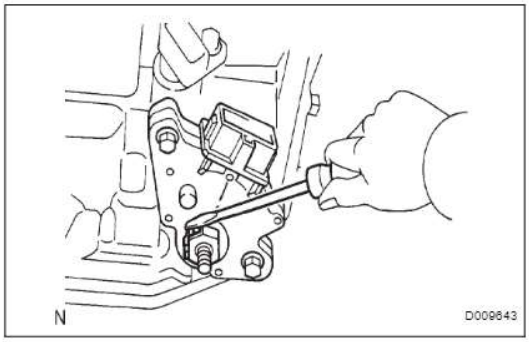
AX



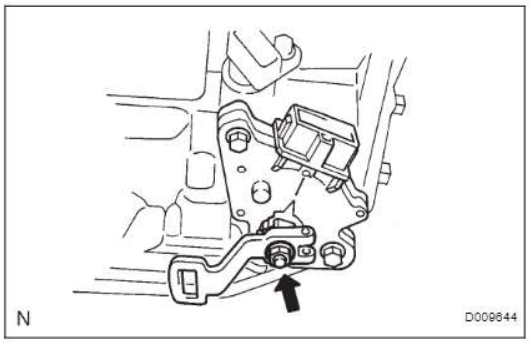
(e) Turn the lever counterclockwise until it stops, then turn it clockwise 2 notches.
(f) Remove the control shaft lever.



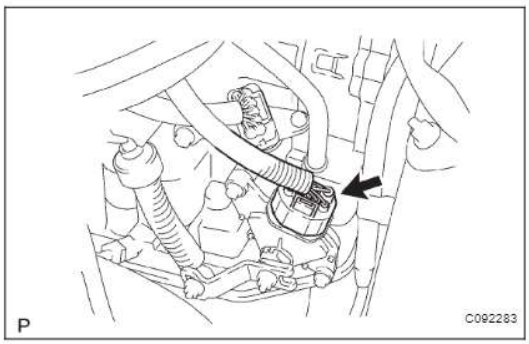
(g) Align the groove with the neutral basic line.
(h) Hold the switch in position and tighten the 2 bolts.
Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)



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

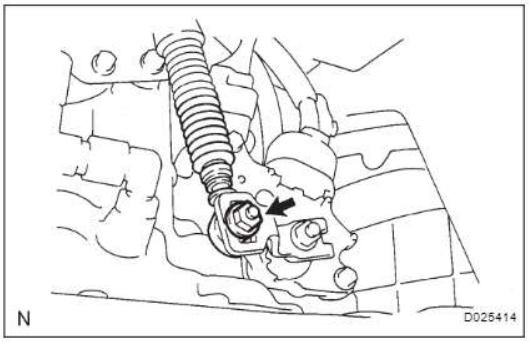


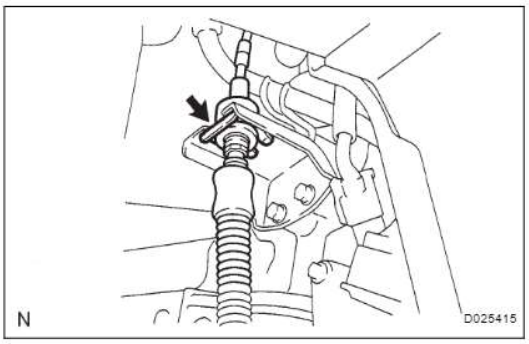
(j) Install the control shaft lever, washer and nut.
Torque: 13 N*m (130 kgf*cm, 9 ft.*lbf)



(k) Connect the park/neutral position switch connector.

AX





2. **CONNECT FLOOR SHIFT CABLE TRANSMISSION CONTROL SHIFT**
   (a) Connect the control cable to the control shaft lever with the nut.
   Torque: 15 N*m (153 kgf*cm, 11 ft.*lbf)

   (b) Connect the control cable with a new clip to the bracket.

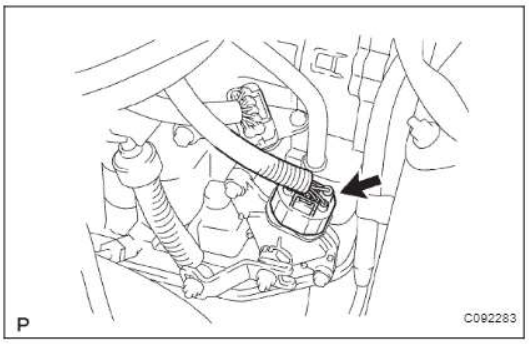
3. **INSTALL ENGINE UNDER COVER LH**
4. **INSTALL INTAKE AIR RESONATOR SUB-ASSEMBLY**
5. **INSTALL AIR CLEANER HOSE NO.1**
6. **INSTALL AIR CLEANER ASSEMBLY**
   HINT:
   See page EM-81.
7. **INSTALL ENGINE COVER NO.1 SUB-ASSEMBLY**
8. **INSTALL BATTERY**
9. **ADJUST SHIFT LEVER POSITION**
   HINT:
   See page AX-148.
10. **INSPECT SHIFT LEVER POSITION**
    HINT:
    See page AX-148.
11. **INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
    HINT:
    See page AX-121.
12. **PERFORM INITIALIZATION**
    HINT:
    See page AX-17.

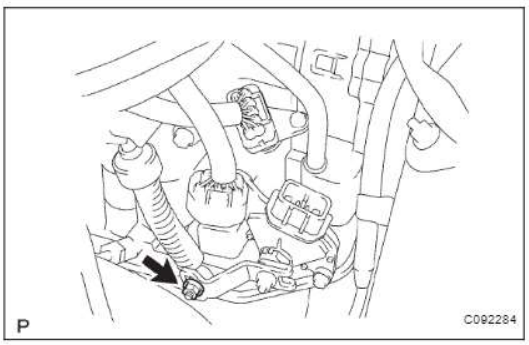
AX

PARK / NEUTRAL POSITION SWITCH

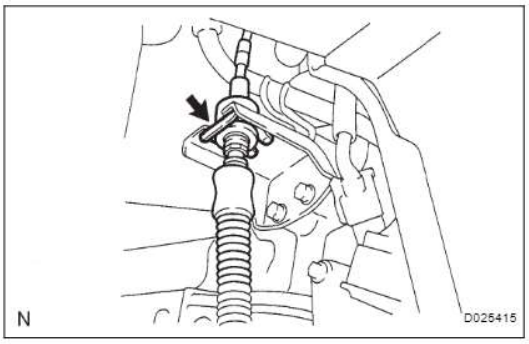
REMOVAL

1. REMOVE BATTERY
2. REMOVE ENGINE COVER NO.1 SUB-ASSEMBLY
3. REMOVE AIR CLEANER ASSEMBLY
4. REMOVE AIR CLEANER HOSE NO.1
5. REMOVE INTAKE AIR RESONATOR SUB-ASSEMBLY
6. REMOVE ENGINE UNDER COVER LH
7. DISCONNECT FLOOR SHIFT CABLE TRANSMISSION CONTROL SHIFT
   (a) Disconnect the park/neutral position switch connector.



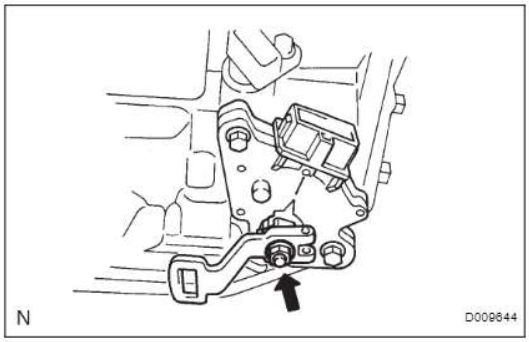


   (b) Remove the nut from the control shift lever.
   (c) Disconnect the control cable from the control shaft lever.



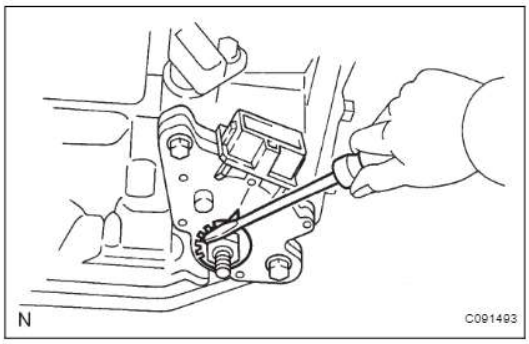
   (d) Remove the clip and disconnect the control cable from the control cable bracket.

AX

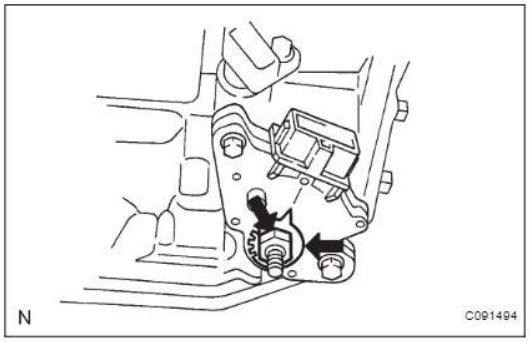


8. REMOVE PARK/NEUTRAL POSITION SWITCH ASSEMBLY

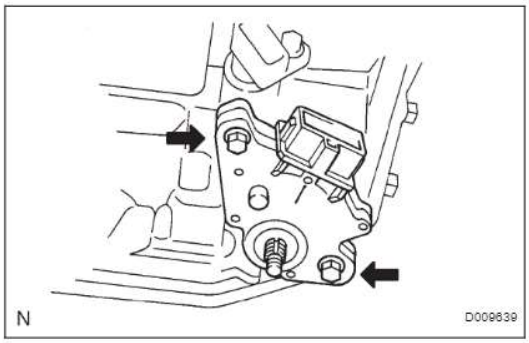
(a) Remove the nut, washer and control shaft lever.



(b) Pry up the lock plate.



(c) Remove the lock nut and lock plate.



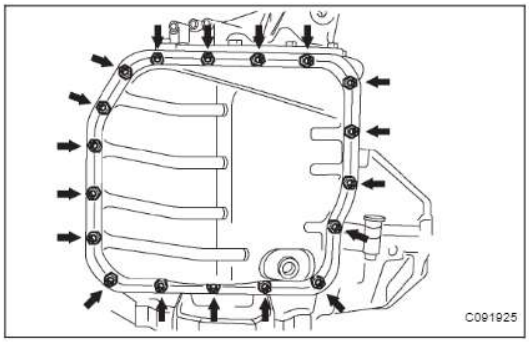
(d) Remove the 2 bolts and pull out the park/neutral position switch.

AX

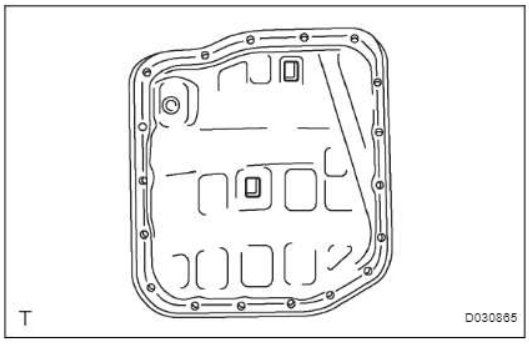
TRANSMISSION WIRE

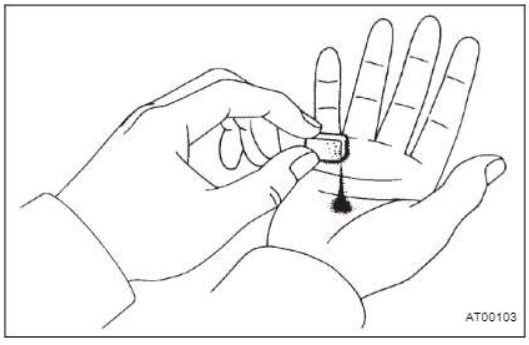
REMOVAL

1. **REMOVE ENGINE UNDER COVER LH**
2. **DRAIN AUTOMATIC TRANSAXLE FLUID**
   (a) Remove the drain plug and gasket, and drain the ATF.
   (b) Install a new gasket and the drain plug.
   Torque: 49 N*m (500 kgf*cm, 36 ft.*lbf)
3. **REMOVE AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY**
   (a) Remove the 18 bolts, oil pan and gasket.
   NOTICE:
   Some fluid will remain in the oil pan. Remove all the pan bolts, and carefully remove the oil pan assembly.



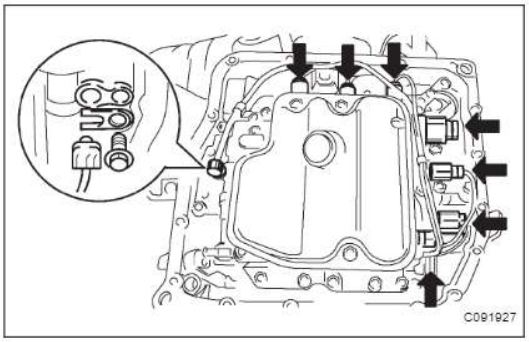
(b) Remove the 2 magnets from the oil pan.





(c) Examine particles in the pan.
   (1) Collect any steel chips with 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.
   Steel (magnetic): bearing, gear and plate wear
   Brass (non-magnetic): bearing wear
   Result:
   Steel (magnetic):
   bearing, gear and plate wear
   Brass (non-magnetic):
   bearing wear

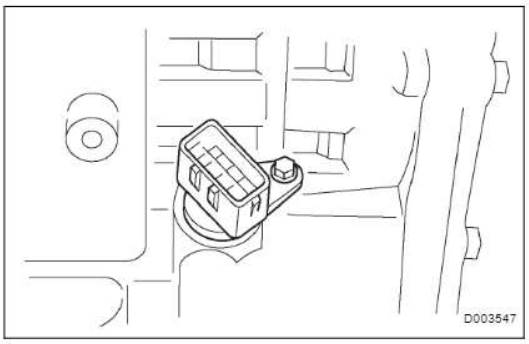
AX



4. DISCONNECT TRANSMISSION WIRE

(a) Disconnect the 7 shift solenoid valve connectors.

(b) Remove the bolt and lock plate, and disconnect the ATF temperature sensor.

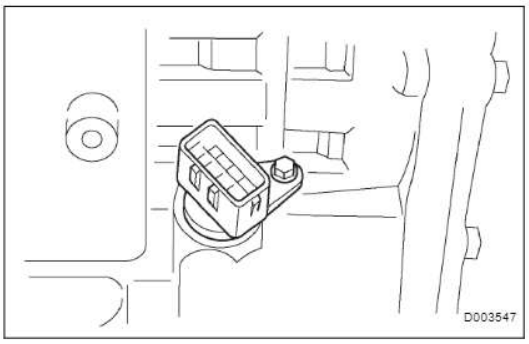


5. REMOVE TRANSMISSION WIRE

(a) Disconnect the transmission wire connectors.

(b) Remove the bolt and transmission wire.

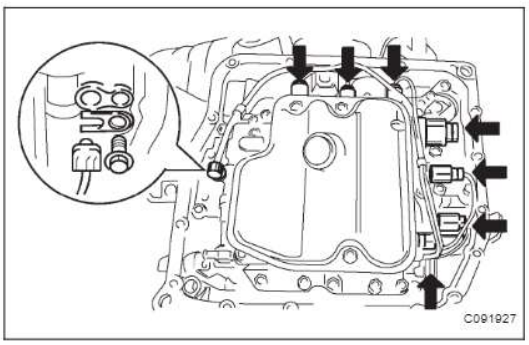
INSTALLATION



1. INSTALL TRANSMISSION WIRE

(a) Coat an O-ring of the transmission wire connector with ATF.

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

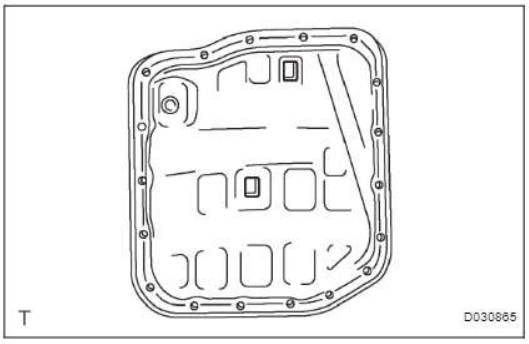


2. CONNECT TRANSMISSION WIRE

(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 shift solenoid valve connectors.

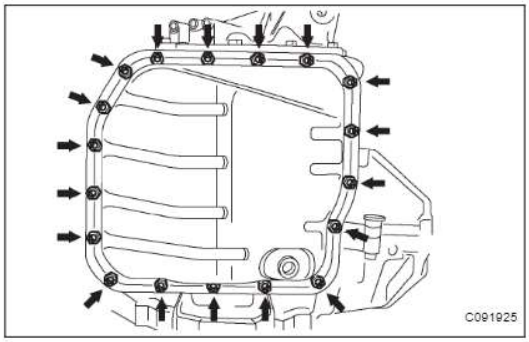


3. INSTALL AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY

(a) Install the 2 magnets in the oil pan.

(b) Apply seal packing or equivalent to the 18 bolts.
Seal packing:
THREE BOND 2430 or equivalent

AX



(c) Using a new gasket, install the oil pan with the 18 bolts to the transaxle case.
Torque: 7.8 N*m (80 kgf*cm, 69 in.*lbf)
NOTICE:
Apply seal packing to the bolts and tighten them within 10 minutes of application.

4. **ADD AUTOMATIC TRANSAXLE FLUID**
Fluid type:
ATF type T-IV
Capacity:
3.5 liters (3.7 US qts, 3.1 Imp. qts)

5. **INSPECT AUTOMATIC TRANSAXLE FLUID**
HINT:
See page AX-119.

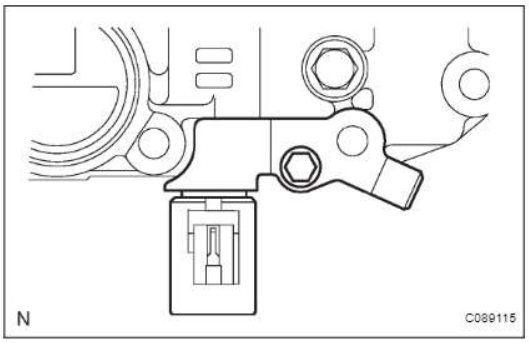
6. **INSTALL ENGINE UNDER COVER LH**

7. **RESET MEMORY**
HINT:
See page AX-17.

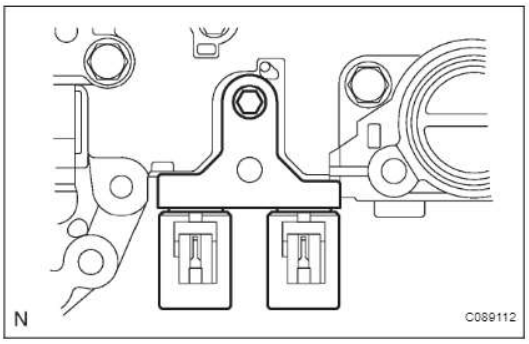
AX

REASSEMBLY

1. **INSTALL MANUAL VALVE**
   (a) Install the manual valve to the valve body assembly.

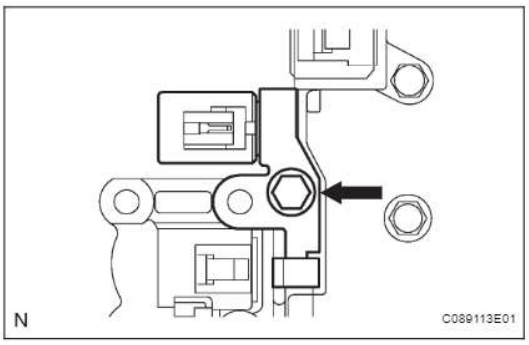


2. **INSTALL SHIFT SOLENOID VALVE SL1**
   (a) Install the shift solenoid valve SL1 to the valve body assembly with the bolt.
   Torque:
   6.6 N*m (67 kgf*cm, 58 in.*lbf)

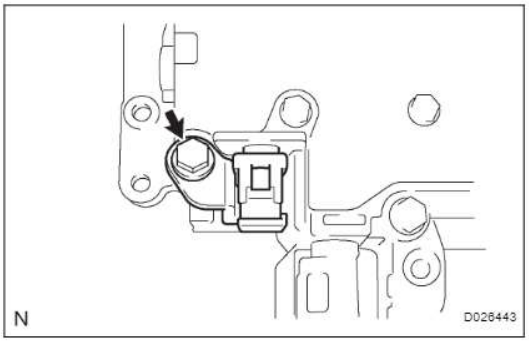


3. **INSTALL LINE PRESSURE CONTROL SOLENOID ASSEMBLY**
   (a) Install the shift solenoid valve SLT to the valve body assembly with the bolt.
   Torque:
   6.6 N*m (67 kgf*cm, 58 in.*lbf)

4. **INSTALL SHIFT SOLENOID VALVE SL3**
   (a) Install the shift solenoid valve SL3 to the valve body assembly with the bolt.
   Torque:
   6.6 N*m (67 kgf*cm, 58 in.*lbf)

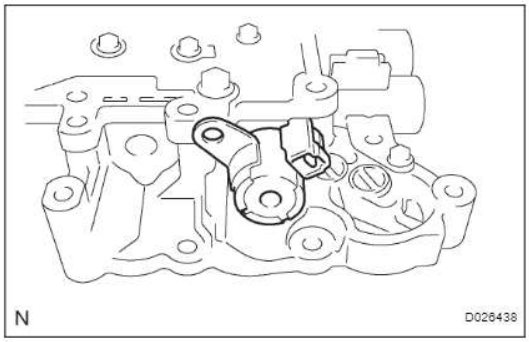


5. **INSTALL SHIFT SOLENOID VALVE SL2**
   (a) Install the shift solenoid valve SL2 to the valve body assembly with the bolt.
   Torque:
   10.8N*m (110kgf*cm, 8 ft.*lbf)



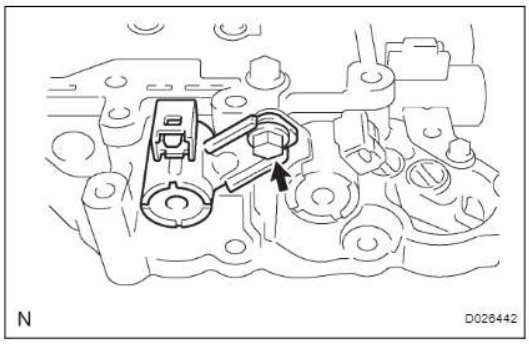
6. **INSTALL SHIFT SOLENOID VALVE DSL**
   (a) Install the shift solenoid valve DSL to the valve body assembly with the bolt.
   Torque:
   10.8N*m (110kgf*cm, 8 ft.*lbf)

AX



7. INSTALL SHIFT SOLENOID VALVE SR

(a) Install the shift solenoid valve SR to the valve body assembly.



8. INSTALL SHIFT SOLENOID VALVE S4

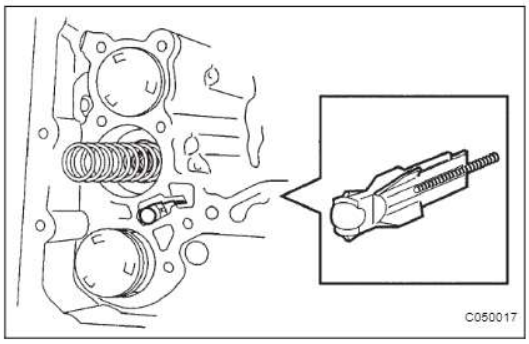
(a) Install the shift solenoid valve S4 to the valve body assembly with the bolt.

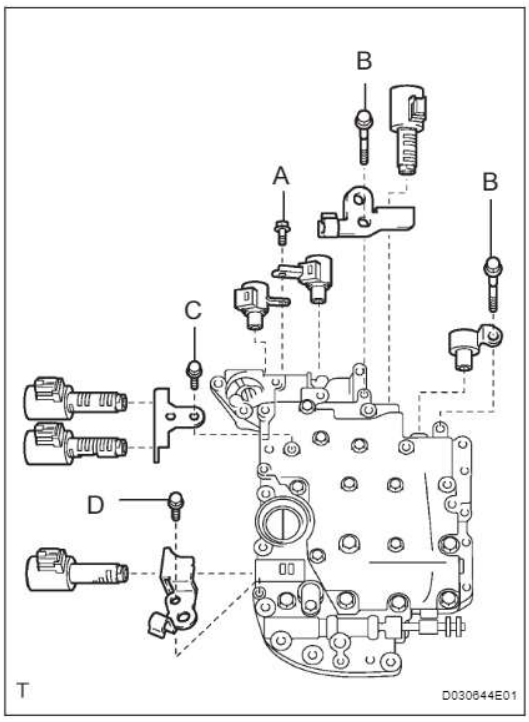
Torque:
10.8N*m (110kgf*cm, 8 ft.*lbf)

INSTALLATION

1. INSTALL TRANSMISSION VALVE BODY ASSEMBLY

(a) Install the spring and check ball body.



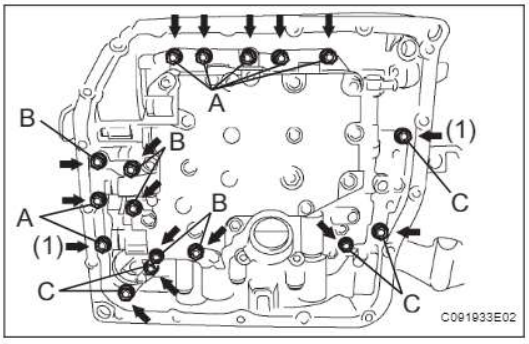


(b) Install the 7 shift solenoid valves with the 5 bolts.

Torque: Bolts A, B
11 N*m (110 kgf*cm, 8 ft.*lbf)
Bolts C, D:
6.6 N*m (67 kgf*cm, 58 in.*lbf)

Bolt length:
Bolt A:
16 mm (0.63 in.)
Bolt B:
57 mm (2.2 in.)
Bolt C:
23 mm (0.9 in.)
Bolt D:
12 mm (0.47 in.)

AX



(c) Align the groove of the manual valve with the pin of the lever.

(d) Install the 17 bolts.

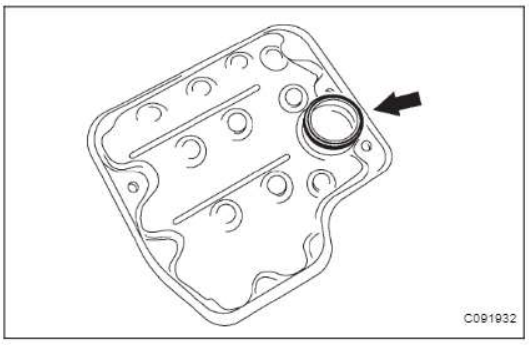
Torque: 11 N*m (110 kgf*cm, 8 ft.*lbf)

NOTICE:

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

Bolt length:

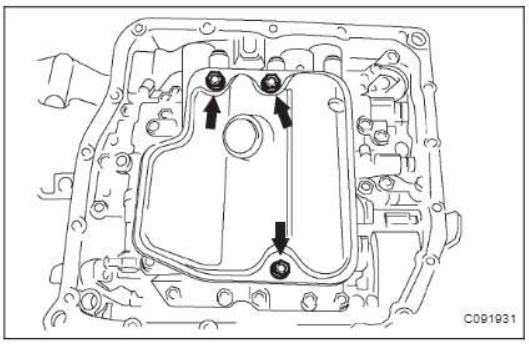
Bolt A: 25 mm (0.984 in.)
Bolt B: 57 mm (2.244 in.)
Bolt C: 41 mm (1.614 in.)



2. INSTALL VALVE BODY OIL STRAINER ASSEMBLY

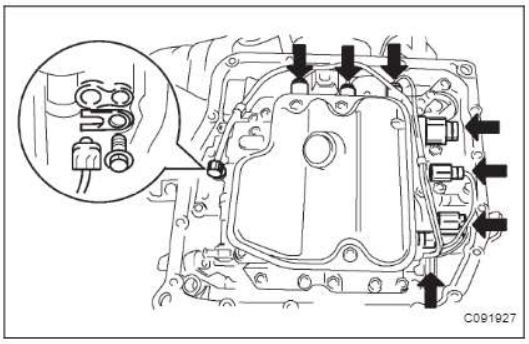
(a) Coat a new O-ring with ATF.

(b) Install the O-ring to the oil strainer.



(c) Install the oil strainer with the 3 bolts.

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



3. INSTALL TRANSMISSION WIRE

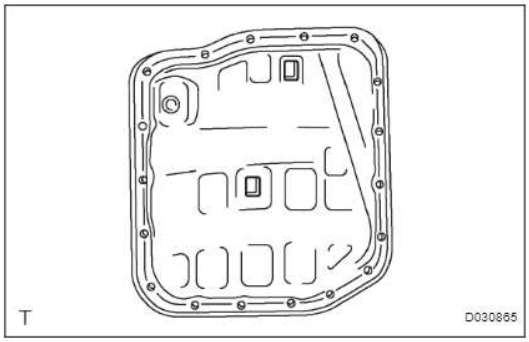
(a) Coat an O-ring with ATF.

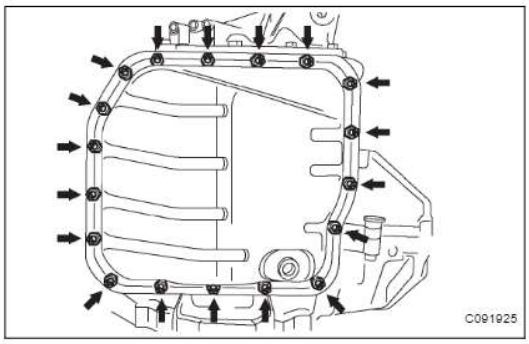
(b) Install the ATF temperature sensor with the lock plate and bolt.

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

(c) Connect the 7 shift solenoid valve connectors.

AX





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

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

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

NOTICE:
Since the bolts should be seal bolts, apply seal packing to the bolts and tighten them within 10 minutes of application.

5. ADD AUTOMATIC TRANSAXLE FLUID

Fluid type:
ATF type T-IV

Capacity:
3.5 liters (3.7 US qts, 3.1 Imp. qts)

6. INSPECT AUTOMATIC TRANSAXLE FLUID

HINT:
See page AX-119.

7. INSTALL ENGINE UNDER COVER RH

8. RESET MEMORY

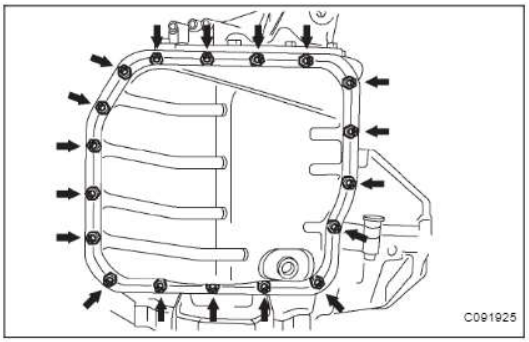
HINT:
See page AX-17.

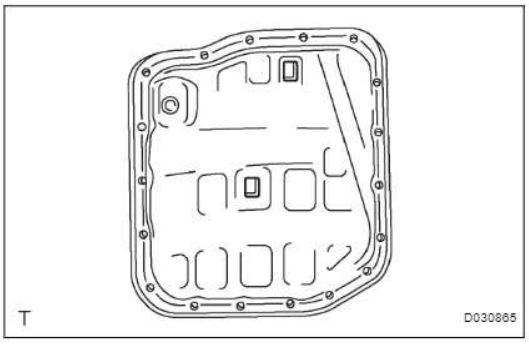
AX

VALVE BODY ASSEMBLY

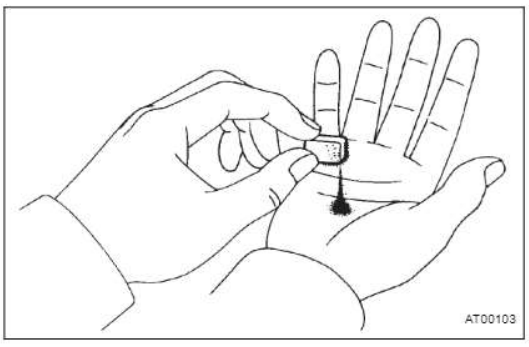
REMOVAL

1. **REMOVE ENGINE UNDER COVER RH**
2. **DRAIN AUTOMATIC TRANSAXLE FLUID**
   (a) Remove the drain plug and gasket, and drain the ATF.
   (b) Install a new gasket and the drain plug.
   Torque: 49 N*m (500 kgf*cm, 36 ft.*lbf)
3. **REMOVE AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY**
   (a) Remove the 18 bolts, oil pan and gasket.
   NOTICE:
   Some fluid will remain in the oil pan. Remove all the pan bolts, and carefully remove the oil pan assembly.



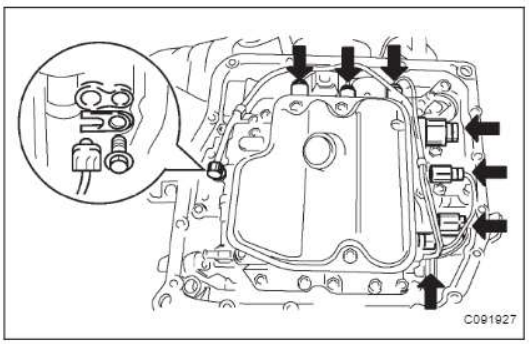


(b) Remove the 2 magnets from the oil pan.

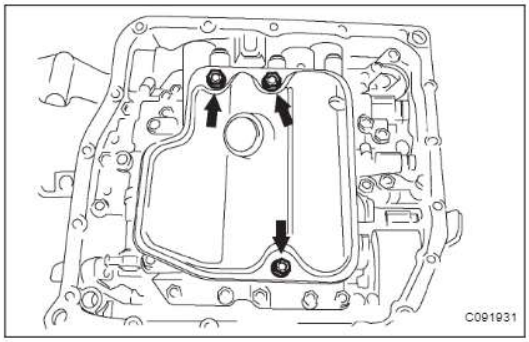


(c) Examine particles in the pan.
   (1) Collect any steel chips with the removed magnets. Look carefully at the chips and particles in the pan and on the magnets to see the type of wear which might be found in the transaxle.
   Result:
   Steel (magnetic):
   bearing, gear and plate wear
   Brass (non-magnetic):
   bearing wear

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



AX

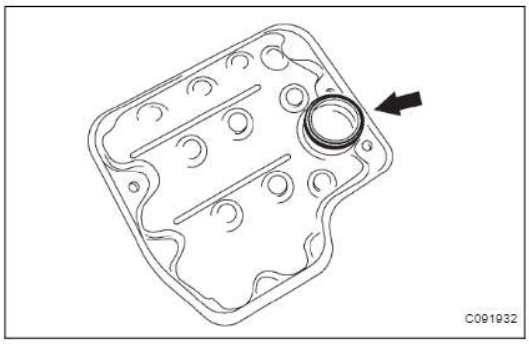


5. REMOVE VALVE BODY OIL STRAINER ASSEMBLY

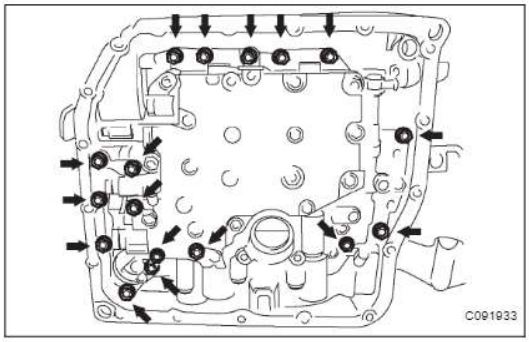
(a) Remove the 3 bolts and oil strainer.

NOTICE:

Be careful that some fluid will come out of the oil strainer.



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

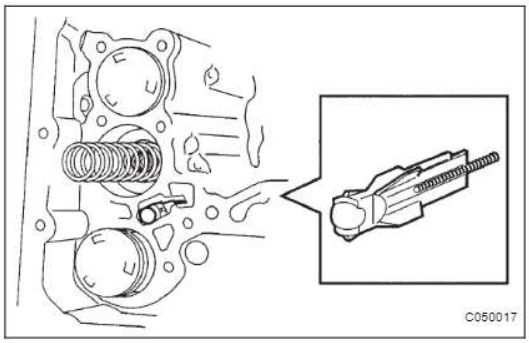


6. REMOVE TRANSMISSION VALVE BODY ASSEMBLY

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

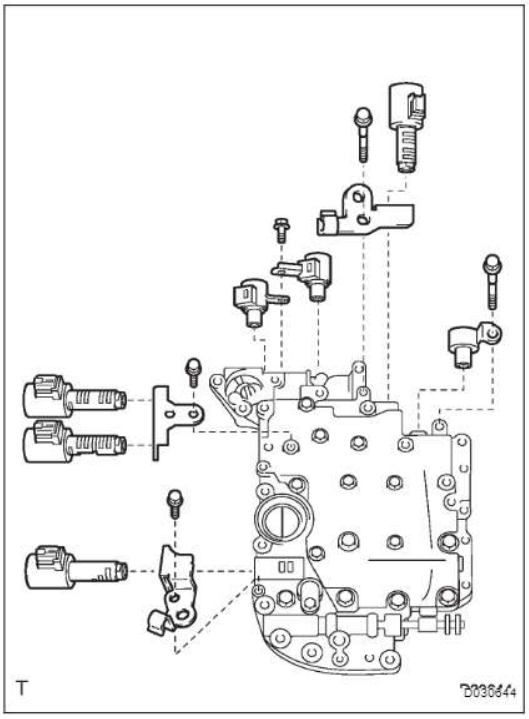
NOTICE:

Be careful not to drop the check ball, spring and accumulator piston.

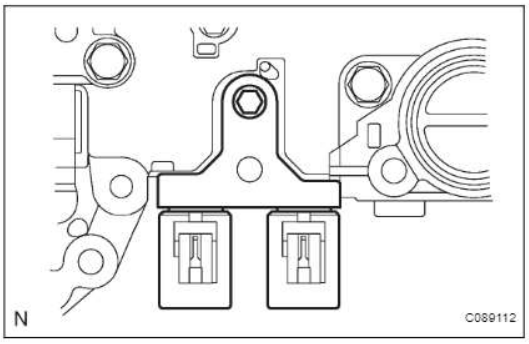


(b) Remove the check ball body and spring.

AX



(c) Remove the 5 bolts and 7 shift solenoid valves.



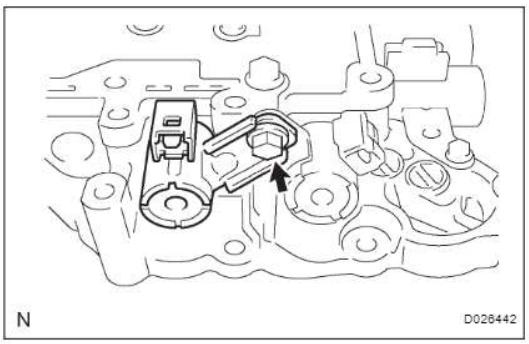
DISASSEMBLY

1. REMOVE SHIFT SOLENOID VALVE SL3

(a) Remove the bolt and shift solenoid valve SL3 from the valve body assembly.

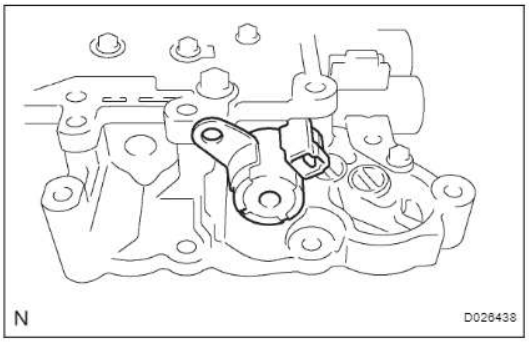
2. REMOVE LINE PRESSURE CONTROL SOLENOID ASSEMBLY

(a) Remove the shift solenoid valve SLT from the valve body assembly.



3. REMOVE SHIFT SOLENOID VALVE S4

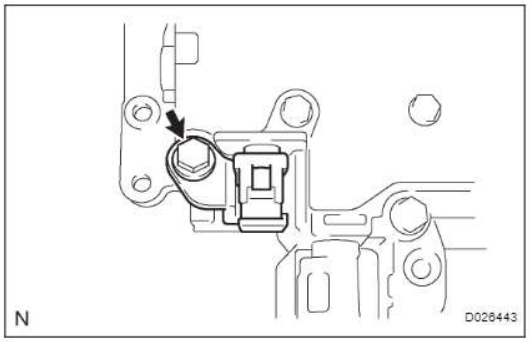
(a) Remove the bolt and shift solenoid valve S4 from the valve body assembly.



4. REMOVE SHIFT SOLENOID VALVE SR

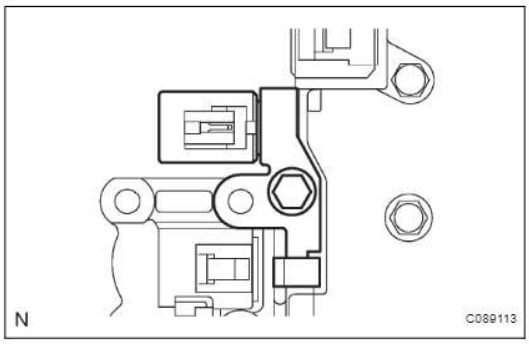
(a) Remove the shift solenoid valve SR from the valve body assembly.

AX



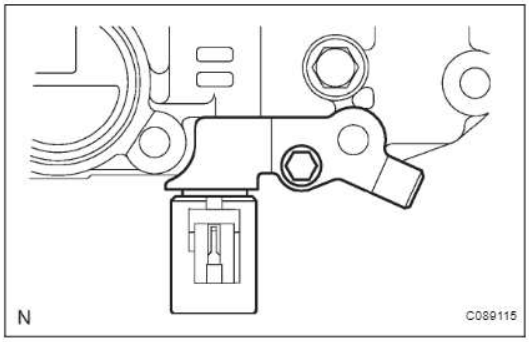
5. REMOVE SHIFT SOLENOID VALVE DSL

(a) Remove the bolt and shift solenoid valve DSL from the valve body assembly.



6. REMOVE SHIFT SOLENOID VALVE SL2

(a) Remove the bolt and shift solenoid valve SL2 from the valve body assembly.



7. REMOVE SHIFT SOLENOID VALVE SL1

(a) Remove the bolt and shift solenoid valve SL1 from the valve body assembly.

8. REMOVE MANUAL VALVE

(a) Remove the manual valve from the valve body assembly.

AX

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

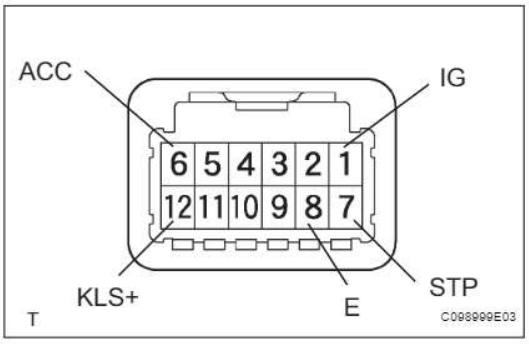
(a) Using a small screwdriver, remove the shift lock release cover.
(b) When operating the shift lever with the shift lock release button pressed, check that the lever can be moved to any position other than P.
If operation can not be done as specified, check the shift lever assembly installation condition.

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.

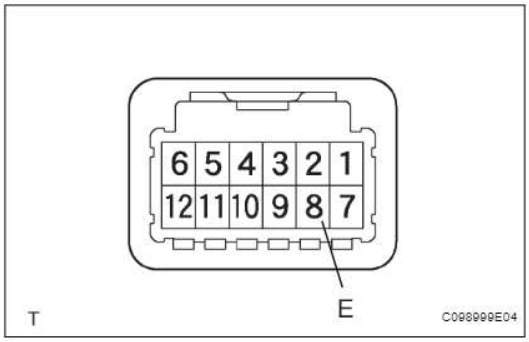


Voltage

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

AX

Terminal	Measuring Condition	Voltage (V)
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.

Resistance

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

AX

ADJUSTMENT

1. INSPECT SHIFT LEVER POSITION

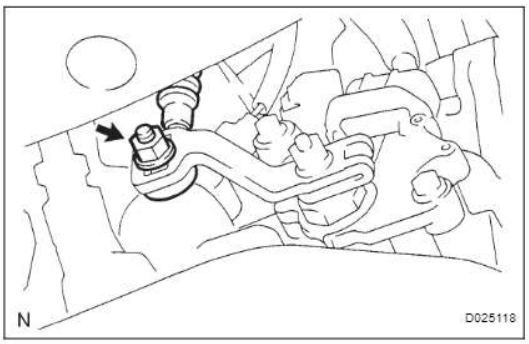
(a) When shifting from the P to R position only with the ignition switch on and brake pedal depressed, make sure that the shift lever moves smoothly and moves correctly into position.

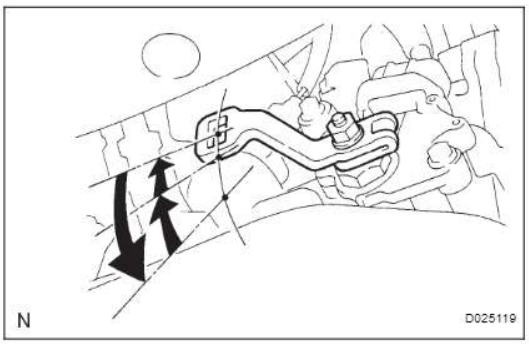
(b) Start the engine and make sure that the vehicle moves forward when shifting from the N to D position and moves rearward when shifting to the R position.

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

2. ADJUST SHIFT LEVER POSITION

(a) Loosen the nut on the control shaft lever.





(b) Push the control shaft fully downward.

(c) Return the control shaft lever 2 notches to the 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 (Procedure "A").

Torque:
15 N*m (150 kgf*cm, 10 ft.*lbf)

NOTICE:

- **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 moving the lever from the N to D position and moves rearward when moving it to the R position.

If it becomes hard to move the shift lever, perform again (See procedure "A").

INSTALLATION

1. INSTALL FLOOR SHIFT CABLE TRANSMISSION CONTROL SHIFT

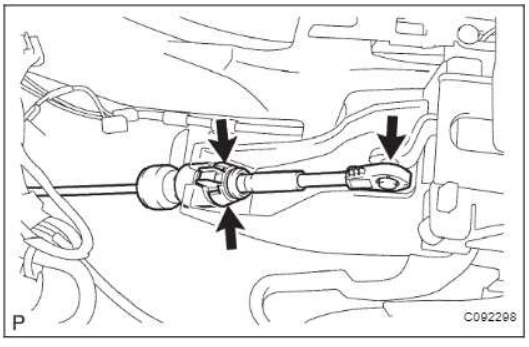
(a) Put in the control cable to the body.

(b) Install the shift cable grommet retainer No.2 to the floor shift cable.

(c) Install the floor shift cable as shown in the illustration.

HINT:

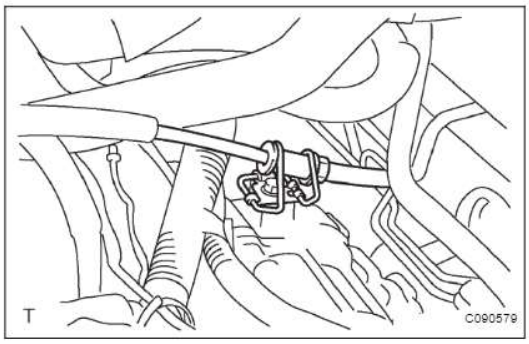
- Install it with the uneven surface facing up.



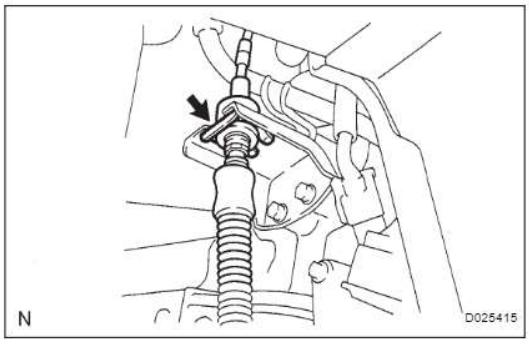
AX

- Securely engage the claws.

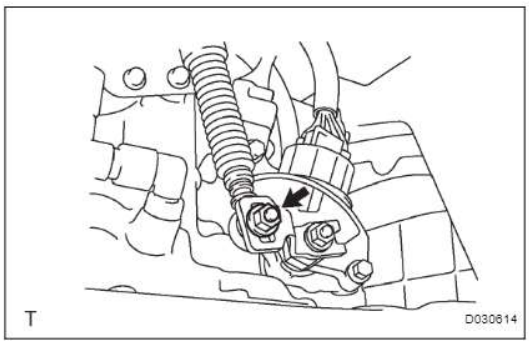
(d) Connect the control cable to the control cable clamp.

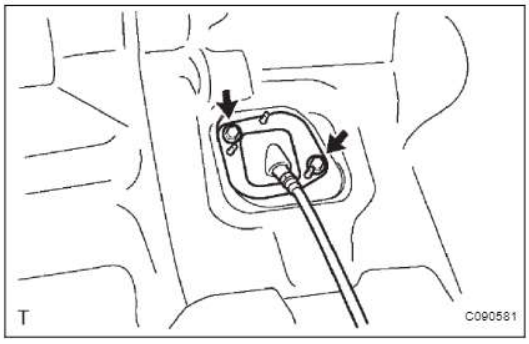


(e) Connect the control cable with a new clip to the bracket.



(f) Temporarily install the control cable to the control shaft lever with the nut.





2. **INSTALL SHIFT CABLE GROMMET RETAINER NO.2**
   (a) Install the shift cable grommet retainer No.2 with the 2 bolts.
   Torque: 5.0 N*m (50 kgf*cm, 43 in.*lbf)
3. **INSTALL CENTER AIRBAG SENSOR ASSEMBLY**
   HINT:
   See page RS-301.
4. **INSTALL AIR CONDITIONING RADIATOR ASSEMBLY**
   HINT:
   See page AC-175.
5. **ADJUST SHIFT LEVER POSITION**
   HINT:
   See page AX-148.
6. **INSPECT SHIFT LEVER POSITION**
   HINT:
   See page AX-148.
7. **INSTALL INTAKE AIR RESONATOR SUB-ASSEMBLY**

AX

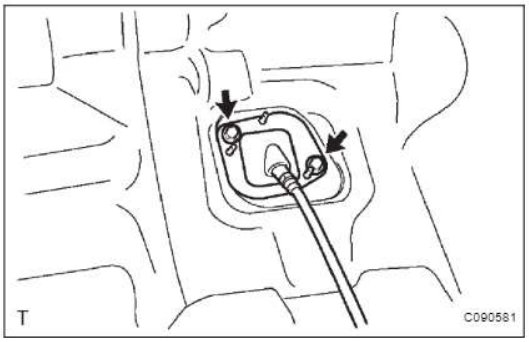
8. **INSTALL AIR CLEANER ASSEMBLY**
   HINT:
   See page EM-81.
9. **INSTALL BATTERY NEGATIVE TERMINAL**
10. **PERFORM INITIALIZATION**
    HINT:
    See page AX-17.

AX

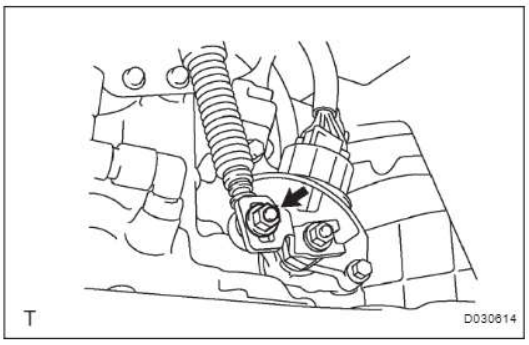
TRANSMISSION CONTROL CABLE ASSEMBLY

REMOVAL

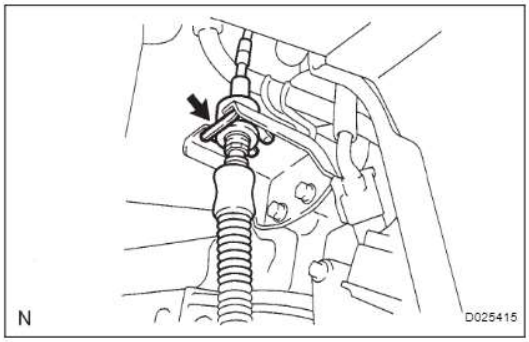
1. **DISCONNECT BATTERY NEGATIVE TERMINAL**
2. **REMOVE INSTRUMENT PANEL SAFETY PAD SUB-ASSEMBLY**
   HINT:
   See page IP-12.
3. **REMOVE AIR CONDITIONING RADIATOR ASSEMBLY**
   HINT:
   See page AC-130.
4. **REMOVE CENTER AIRBAG SENSOR ASSEMBLY**
   HINT:
   See page RS-300.
5. **REMOVE AIR CLEANER ASSEMBLY**
   HINT:
   See page ES-358.
6. **REMOVE INTAKE AIR RESONATOR SUB-ASSEMBLY**
7. **DISCONNECT SHIFT CABLE GROMMET RETAINER NO.2**
   (a) Remove the 2 bolts and disconnect the shift cable grommet retainer No.2.



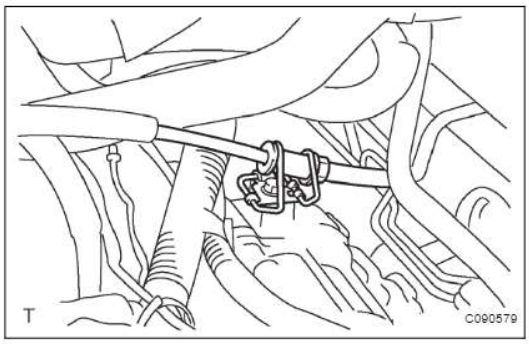
8. **REMOVE FLOOR SHIFT CABLE TRANSMISSION CONTROL SHIFT**
   (a) Remove the nut from the control shift lever.
   (b) Disconnect the control cable from the control shift lever.



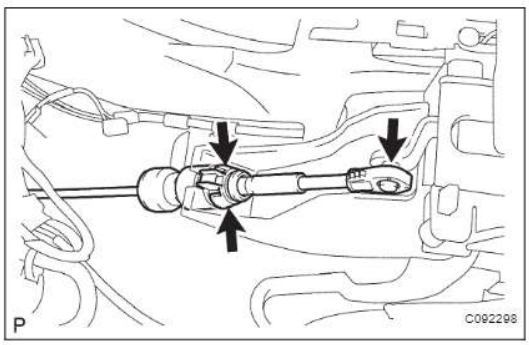
AX



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



(d) Disconnect the control cable from the control cable clamp.



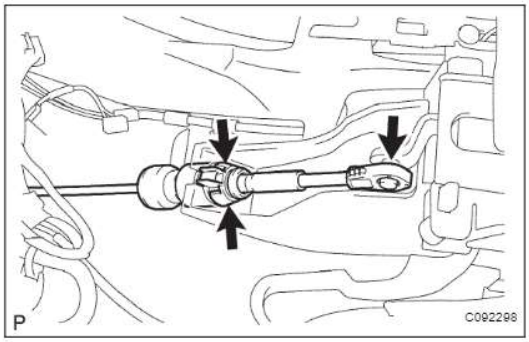
(e) Disconnect the floor shift cable from the transmission floor shift assembly.
(f) Pull out the control cable from the body.
(g) Remove the shift cable grommet retainer No. 2.

AX

DISASSEMBLY

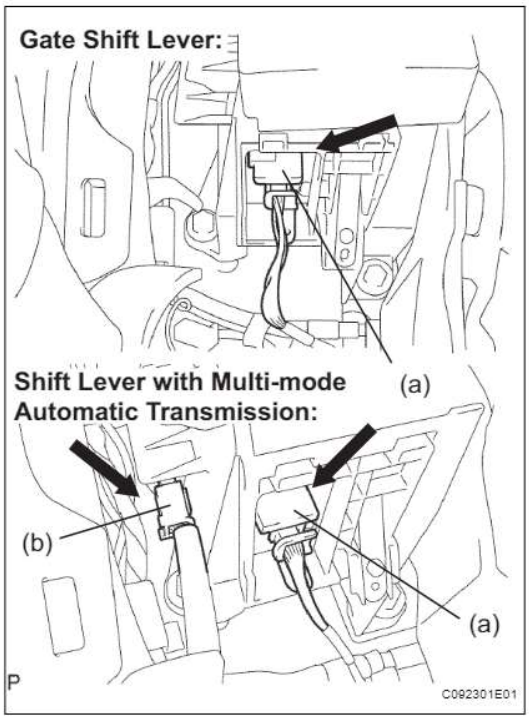
1. **REMOVE CONSOLE UPPER REAR PANEL SUB-ASSEMBLY**
   HINT:
   See page IP-9.
2. **REMOVE REAR CONSOLE BOX ASSEMBLY**
   HINT:
   See page IP-10.
3. **REMOVE UPPER CONSOLE PANEL SUB-ASSEMBLY**
   HINT:
   See page IP-10.
4. **REMOVE FRONT DOOR SCUFF PLATE LH**
   HINT:
   See page IP-7.
5. **REMOVE FRONT DOOR SCUFF PLATE RH**
   HINT:
   See page IP-7.
6. **REMOVE COWL SIDE TRIM LH SUB-ASSEMBLY**
   HINT:
   See page IP-7.
7. **REMOVE COWL SIDE TRIM RH SUB-ASSEMBLY**
   HINT:
   See page IP-7.
8. **REMOVE INSTRUMENT PANEL NO.1 UNDER COVER SUB-ASSEMBLY**
   HINT:
   See page IP-11.
9. **REMOVE INSTRUMENT PANEL FINISH LOWER PANEL RH**
   HINT:
   See page IP-11.
10. **REMOVE INSTRUMENT PANEL FINISH LOWER PANEL LH**
    HINT:
    See page IP-8.
11. **REMOVE CONSOLE BOX FRONT**
    HINT:
    See page IP-11.
12. **REMOVE CONSOLE BOX MOUNTING BRACKET NO.1**

AX



13. DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY

(a) Disconnect the transmission control cable assembly from the transmission floor shift assembly.

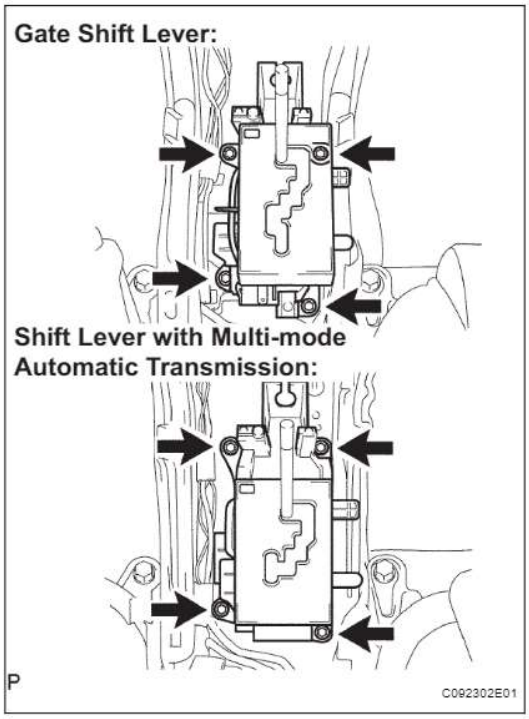


14. REMOVE TRANSMISSION FLOOR SHIFT ASSEMBLY

(a) Disconnect the shift lock control computer connector.

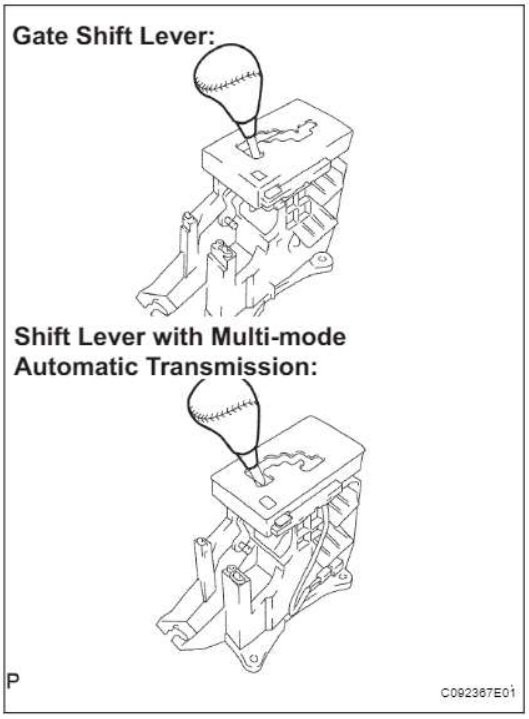
(b) Shift lever with multi-mode automatic transmission:

(1) Disconnect the transmission control switch connector.



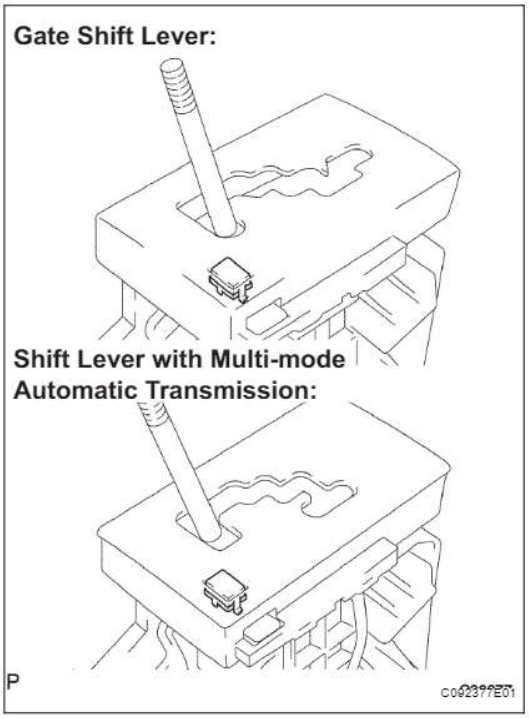
(c) Remove the 4 bolts and transmission floor shift assembly.

AX



15. REMOVE SHIFT LEVER KNOB SUB-ASSEMBLY

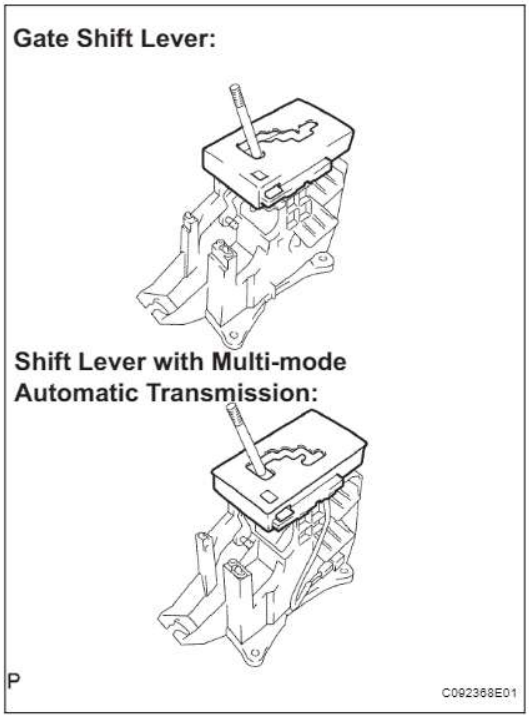
(a) Remove the shift lever knob sub-assembly.



16. REMOVE SHIFT LOCK RELEASE BUTTON COVER

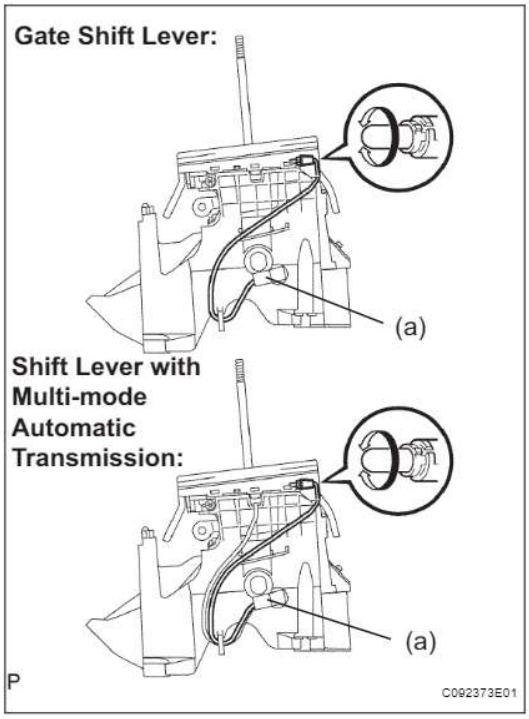
(a) Using a small screwdriver, remove the shift lock release button cover from the position indicator housing assembly.

AX



17. REMOVE POSITION INDICATOR HOUSING ASSEMBLY

(a) Using a screwdriver, remove the position indicator housing from the shift lever assembly.



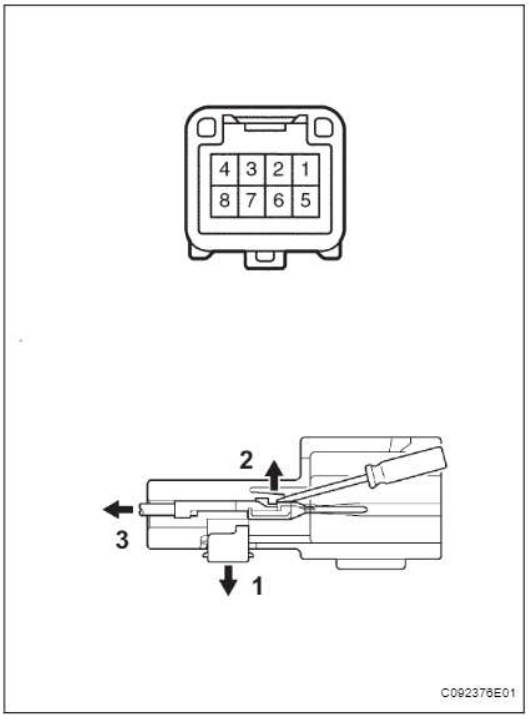
18. REMOVE INDICATOR LIGHT WIRE SUB-ASSEMBLY

(a) Remove the connector from the transmission floor shift assembly.

(b) Using a screwdriver, release the stopper of the connector.

(c) Remove the position indicator lamp bulb from the indicator lamp wire.

AX



(d) Using a small screwdriver, disengage the locking lug of terminals (4) and (8), and pull the terminals out from the rear.

AX

INSPECTION

1. INSPECT SHIFT LEVER POSITION

(a) When shifting from the P to R position only with the ignition switch on and brake pedal depressed, make sure that the shift lever moves smoothly and moves correctly into position.

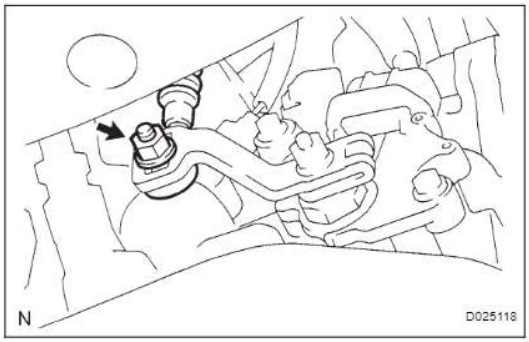
(b) Start the engine and make sure that the vehicle moves forward when shifting from the N to D position and moves rearward when shifting to the R position.

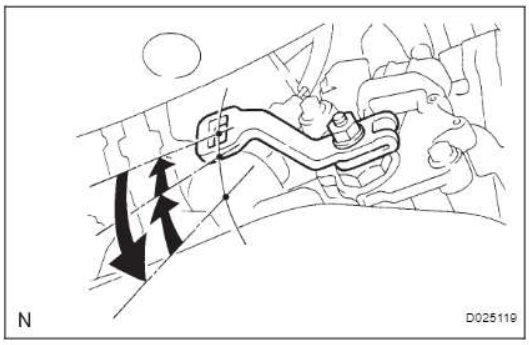
If operation cannot be as specified, inspect the park/neutral position switch assembly and check the shift lever assembly installation condition.

ADJUSTMENT

1. ADJUST SHIFT LEVER POSITION

(a) Loosen the nut on the control shaft lever.





(b) Push the control shaft fully downward.

(c) Return the control shaft lever 2 notches to the 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 (Procedure "A").

Torque: 15 N*m (150 kgf*cm, 10 in.*lbf)

NOTICE:

- **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 moving the lever from the N to D position and moves rearward when moving it to the R position.

If it becomes hard to move the shift lever, perform again (See procedure "A").

AX

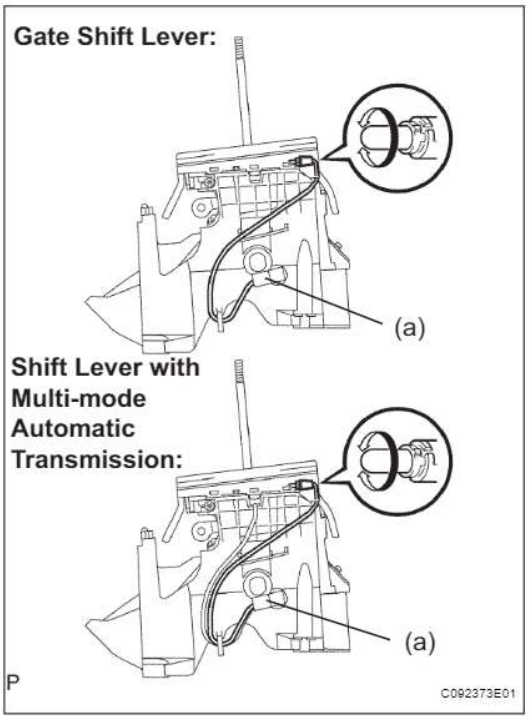
REASSEMBLY

1. INSTALL INDICATOR LIGHT WIRE SUB-ASSEMBLY

(a) Connect the 2 terminals of the indicator light wire harness to the transmission control switch connector.

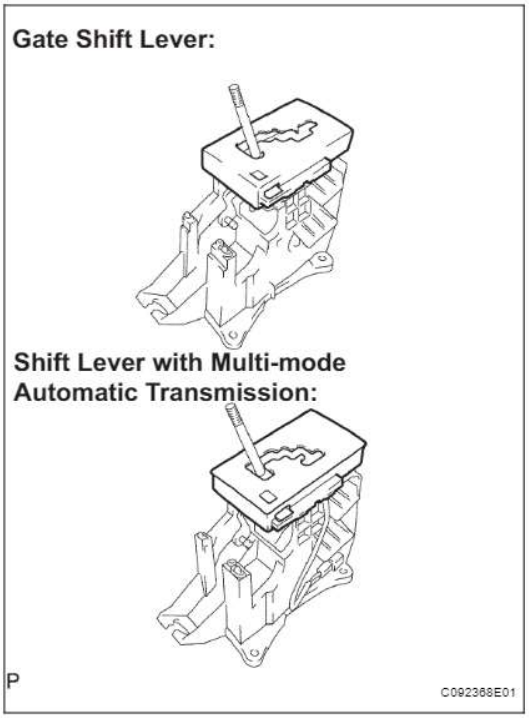
(b) Install the position indicator light bulb to the indicator light wire.

(c) Connect the connector to the transmission floor shift assembly.

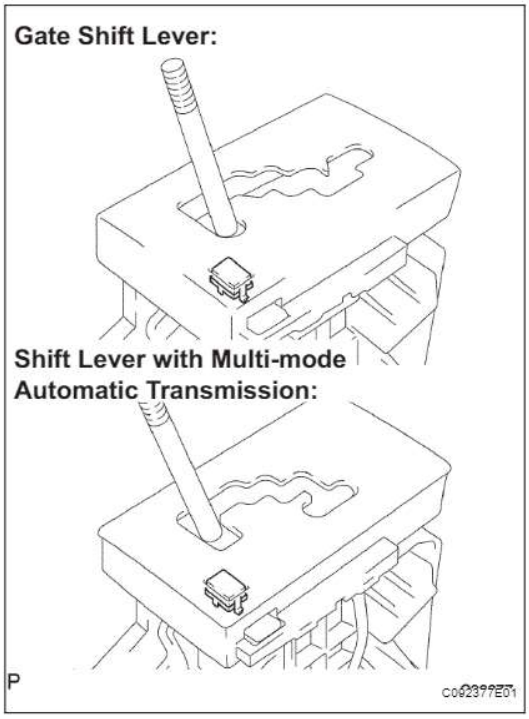


2. INSTALL POSITION INDICATOR HOUSING ASSEMBLY

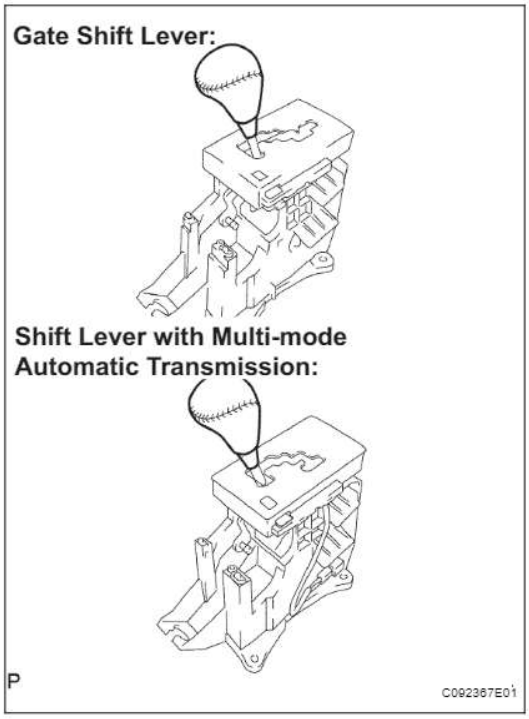
(a) Install the position indicator housing to the transmission floor shift assembly.
HINT:
Securely engage the claws.



AX

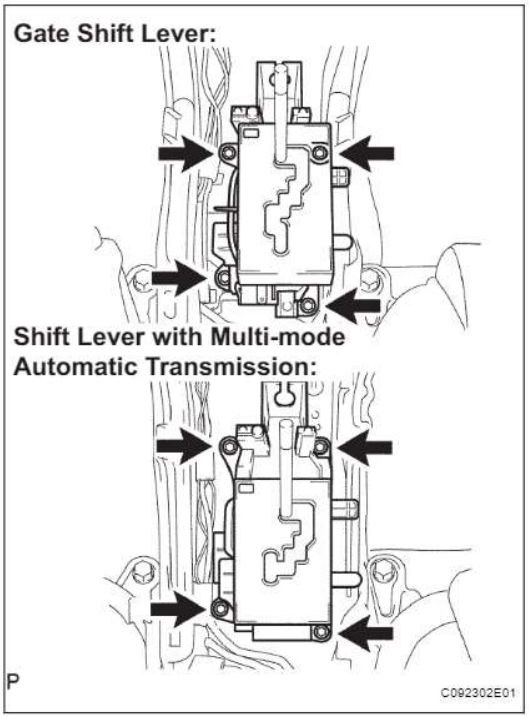


3. **INSTALL SHIFT LOCK RELEASE BUTTON COVER**
   (a) Install the shift lock release button cover to the position indicator housing assembly.



4. **INSTALL SHIFT LEVER KNOB SUB-ASSEMBLY**
   (a) Install the shift lever knob sub-assembly.

AX



5. INSTALL TRANSMISSION FLOOR SHIFT ASSEMBLY

(a) Install the transmission floor shift assembly with the 4 nuts.

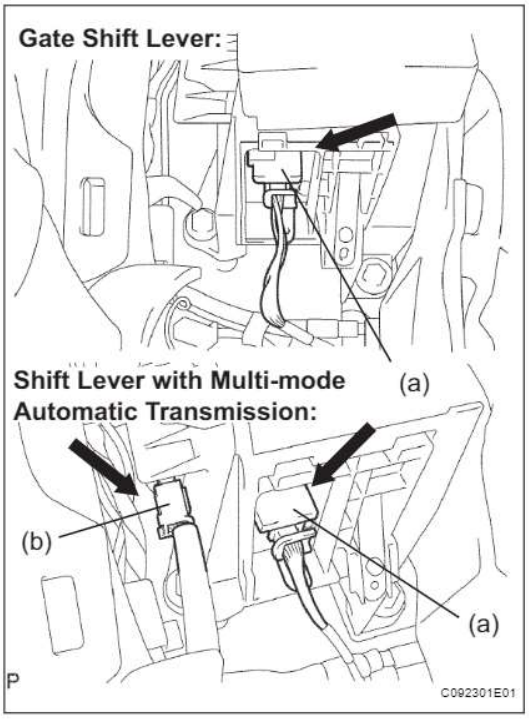
Torque: 12 N*m (122 kgf*cm, 9 in.*lbf)

HINT:

Tighten them in order: A, B, C and D.

NOTICE:

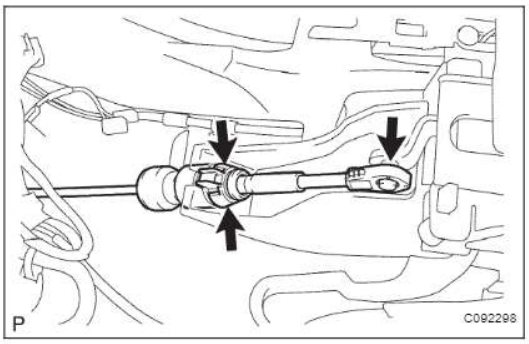
Be careful not to put the wires of the indicator light of the shift lock system between the floor shift assembly and the floor while installing the transmission floor shift assembly.



(b) Connect the shift lock control computer connector.

(c) Shift lever with multi-mode automatic transmission:

(1) Connect the transmission control switch connector.



6. CONNECT TRANSMISSION CONTROL CABLE ASSEMBLY

(a) Connect the transmission control cable assembly to the transmission floor shift assembly.

HINT:

- Install it with the uneven surface facing up.
- Securely engage the claws.

7. INSPECT SHIFT LEVER POSITION

HINT:

See page AX-148.

AX

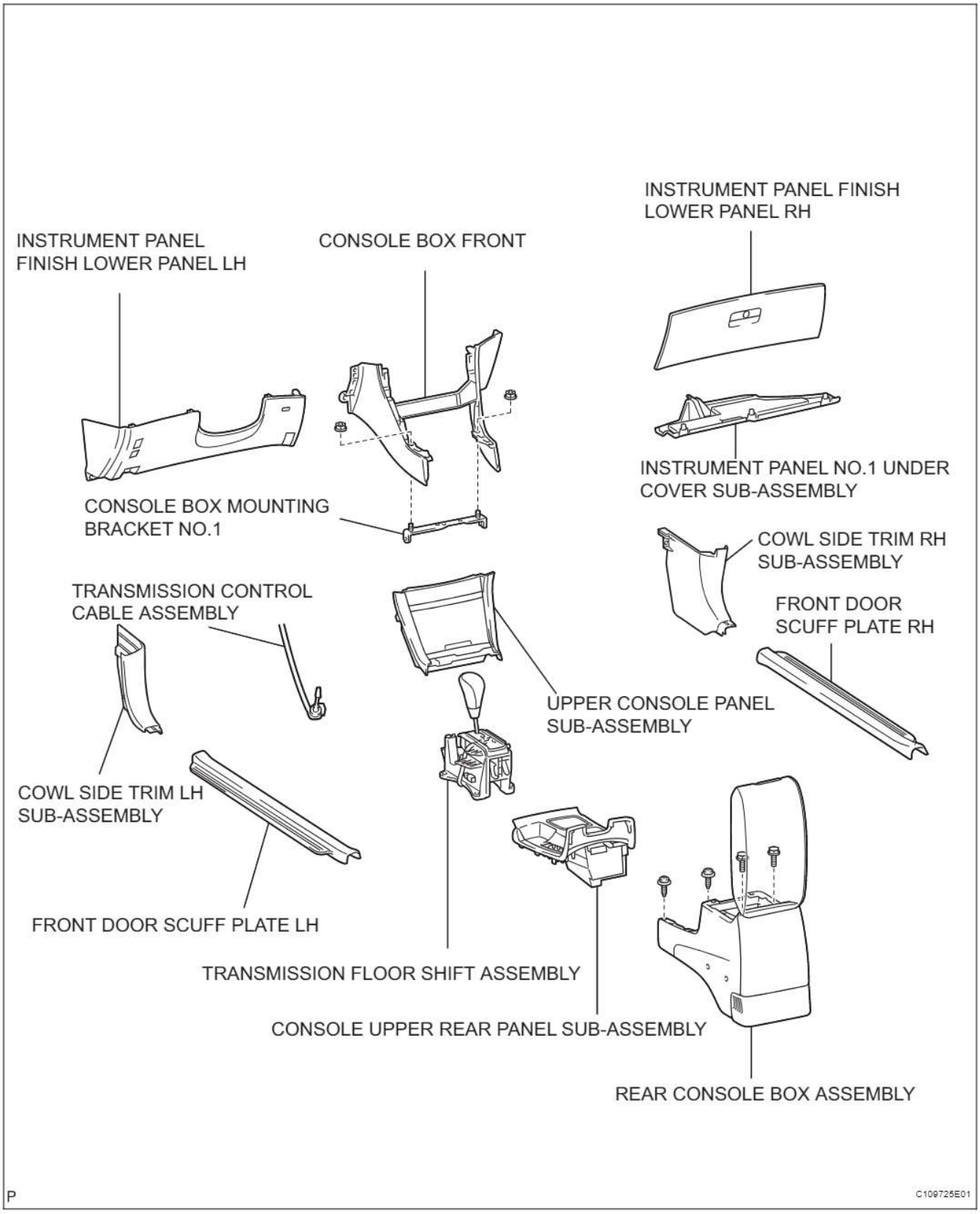
8. ADJUST SHIFT LEVER POSITION

HINT:

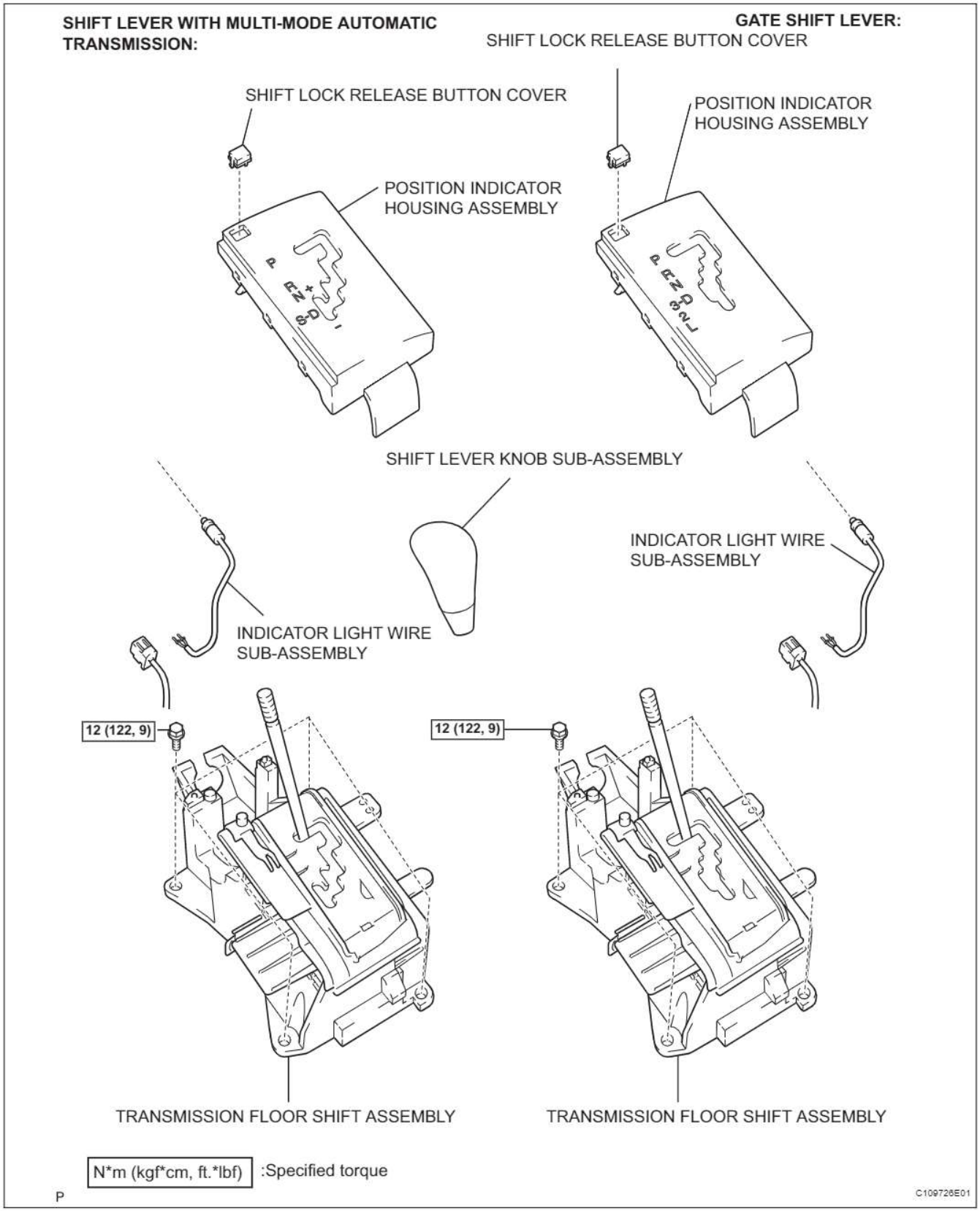
See page AX-148.

FLOOR SHIFT ASSEMBLY

COMPONENTS



AX


SHIFT LEVER WITH MULTI-MODE AUTOMATIC TRANSMISSION:
GATE SHIFT LEVER:
SHIFT LOCK RELEASE BUTTON COVER
SHIFT LOCK RELEASE BUTTON COVER
POSITION INDICATOR HOUSING ASSEMBLY
POSITION INDICATOR HOUSING ASSEMBLY
SHIFT LEVER KNOB SUB-ASSEMBLY
INDICATOR LIGHT WIRE SUB-ASSEMBLY
INDICATOR LIGHT WIRE SUB-ASSEMBLY
12 (122, 9)
12 (122, 9)
TRANSMISSION FLOOR SHIFT ASSEMBLY
TRANSMISSION FLOOR SHIFT ASSEMBLY
N*m (kgf*cm, ft.*lbf) :Specified torque
P
C109726E01

AX

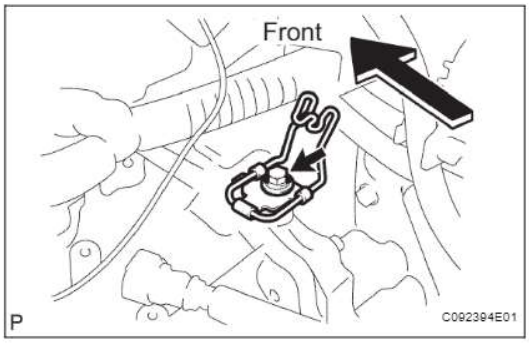
REMOVAL

1. **REMOVE ENGINE ASSEMBLY**
   HINT:
   See page EM-64.

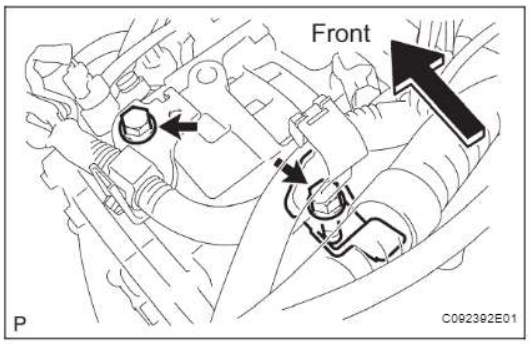
2. **REMOVE RH FRONT DRIVE SHAFT ASSEMBLY**
   HINT:
   See page DS-6.

3. **REMOVE LH FRONT DRIVE SHAFT ASSEMBLY**
   HINT:
   See page DS-5.

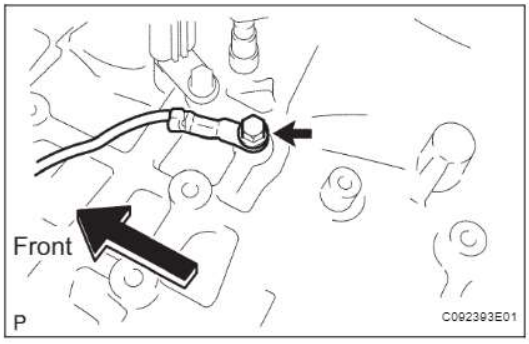
4. **REMOVE TRANSMISSION CONTROL CABLE BRACKET NO.2**
   (a) Remove the bolt and transmission control cable bracket No.2.



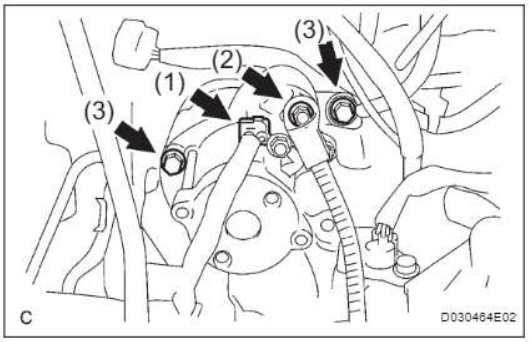
5. **REMOVE WIRE HARNESS CLAMP**
   (a) Disconnect the wire harnesses from the 2 clamps.
   (b) Remove the 2 bolts and 2 clamps.



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

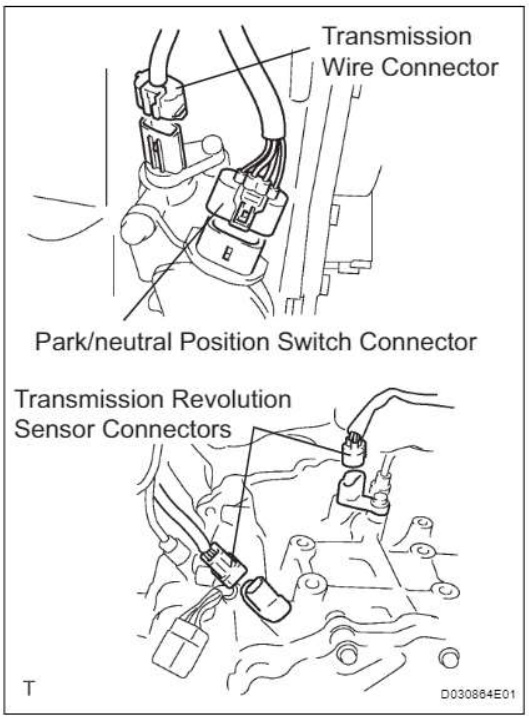


AX



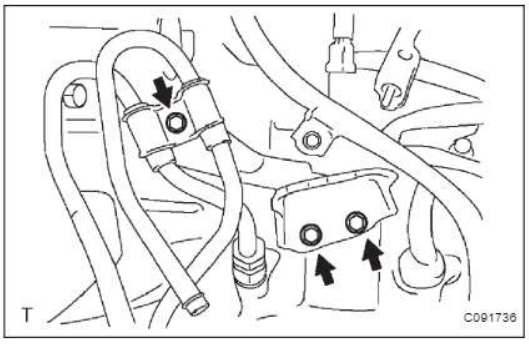
7. REMOVE STARTER ASSEMBLY

(a) Disconnect the connector (1).
(b) Remove the nut and disconnect the starter wire (2).
(c) Remove the 2 bolts and starter assembly (3).



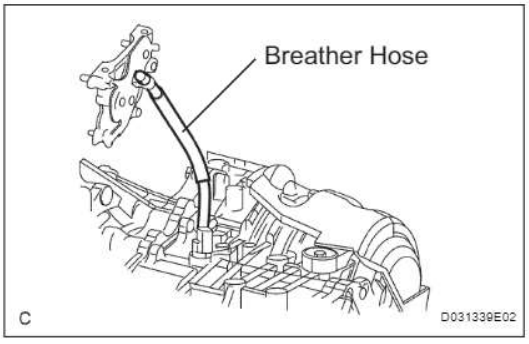
8. DISCONNECT CONNECTORS

(a) Disconnect the transmission wire connector.
(b) Disconnect the park/neutral position switch connector.
(c) Disconnect the 2 transmission revolution sensor connectors.



9. REMOVE TRANSMISSION CONTROL CABLE BRACKET NO.1

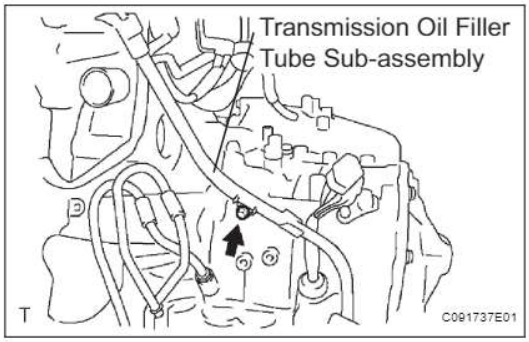
(a) Remove the bolt and oil cooler tube clamp.
(b) Remove the 2 bolts and transmission control cable bracket No.1.



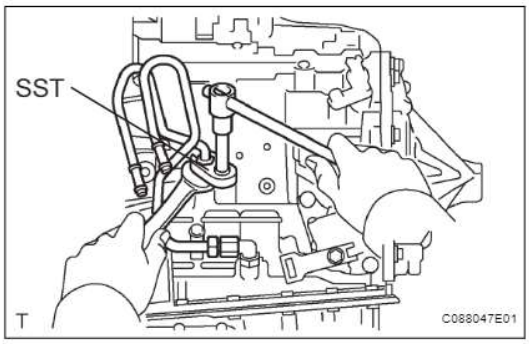
10. REMOVE TRANSMISSION OIL FILLER TUBE SUB-ASSEMBLY

(a) Remove the ATF level gauge.
(b) Disconnect the breather hose from the wire harness bracket.

AX



(c) Remove the bolt and transmission oil filler tube sub-assembly.
(d) Remove the O-ring from the oil filler tube sub-assembly.

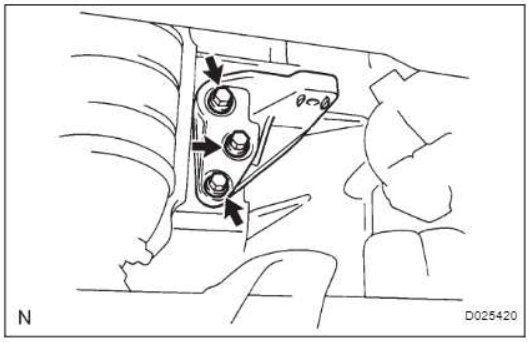


11. REMOVE OIL COOLER INLET TUBE NO.1

(a) Using SST and a wrench, disconnect the oil cooler inlet tube No.1.
SST 09023-12701

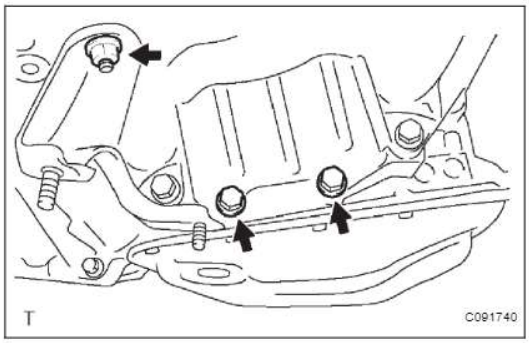
12. REMOVE OIL COOLER OUTLET TUBE NO.1

(a) Using SST and a wrench, disconnect the oil cooler outlet tube No.1.
SST 09023-12701



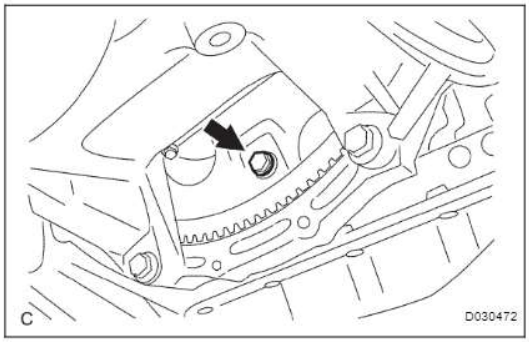
13. REMOVE TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

(a) Remove the 3 bolts and engine mounting bracket FR.



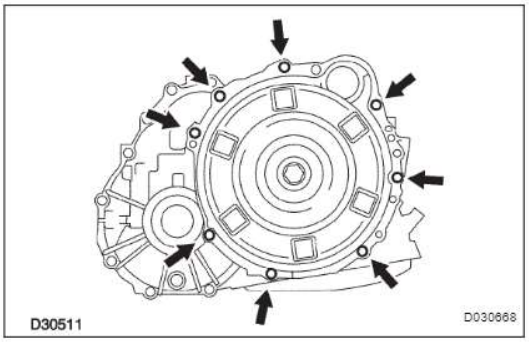
14. REMOVE AUTOMATIC TRANSAXLE ASSEMBLY

(a) Remove the 2 bolts and nut.
(b) Remove the exhaust pipe support bracket and exhaust pipe support bracket No.1 from the automatic transaxle.



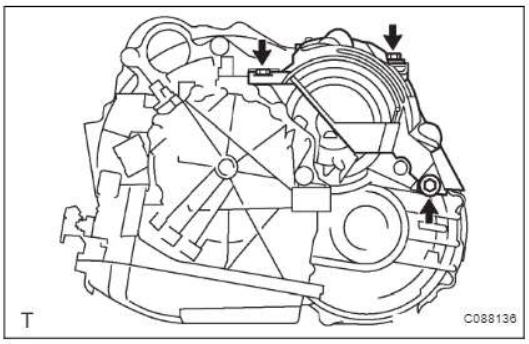
(c) Turn the crankshaft to gain access and remove the 6 bolts while holding the crankshaft pulley bolt with a wrench.
HINT:
There will be one green colored bolt.

AX



(d) Remove the 8 bolts.
(e) Separate and remove the automatic transaxle.

15. REMOVE TORQUE CONVERTER CLUTCH ASSEMBLY



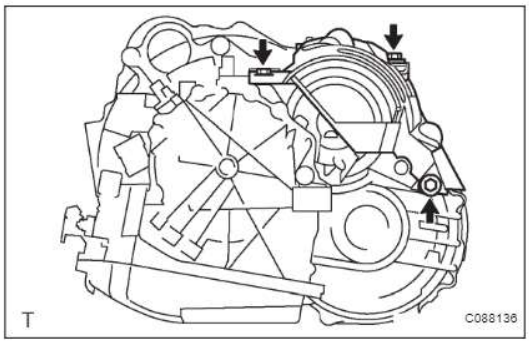
16. REMOVE TRANSAXLE CASE COVER UPPER

(a) Remove the 3 bolts and transaxle case cover upper.

AX

INSPECTION

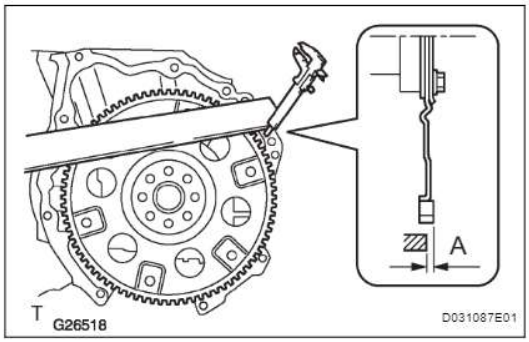
1. **INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY**
   SST 09350-32014 (09351-32010, 09351-32020)



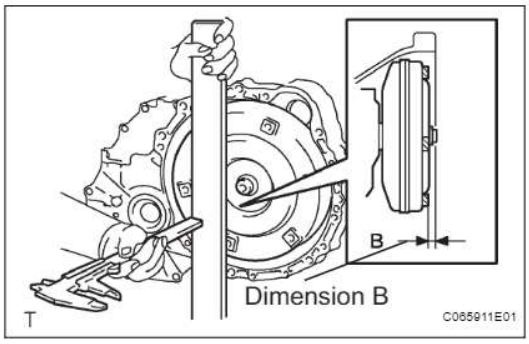
INSTALLATION

1. **INSTALL TRANSAXLE CASE COVER UPPER**
   (a) Install the transmission case cover upper with the 3 bolts.
   Torque: 12 N*m (122 kgf*cm, 9 ft.*lbf)

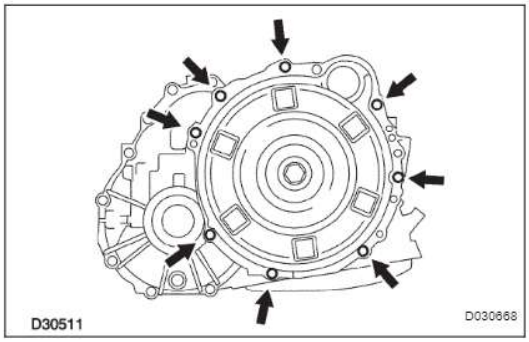
2. **INSTALL TORQUE CONVERTER CLUTCH ASSEMBLY**
   (a) Install the torque converter clutch to the automatic transaxle.



   (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.

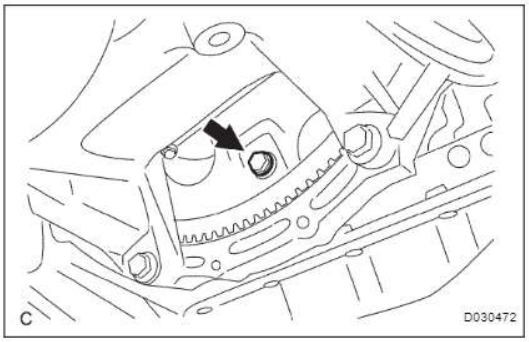


   (c) Using vernier calipers and a straight edge, measure the dimension "B" shown in the illustration and check that "B" is greater than "A" (measured in step (b)).
   Standard:
   A + 1 (0.03937 in.) mm or more
   NOTICE:
   Remember to minus the thickness of the straight edge.

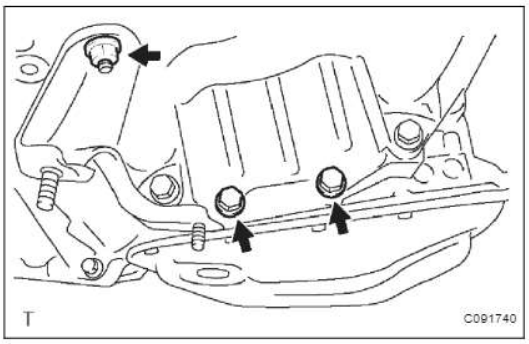


3. **INSTALL AUTOMATIC TRANSAXLE ASSEMBLY**
   (a) Install the automatic transaxle to the engine with the 8 bolts.
   Torque: Bolt A
   64 N*m (53 kgf*cm, 47 ft.*lbf)
   Bolt B
   46 N*m (470 kgf*cm, 34 ft.*lbf)
   Bolt C
   37 N*m (377 kgf*cm, 27 ft.*lbf)
   (b) Apply a few drops of adhesive to 2 threads on the tip of the 6 torque converter clutch mounting bolts.
   Adhesive:
   Part No. 08833-00070, THREE BOND 1324 or equivalent

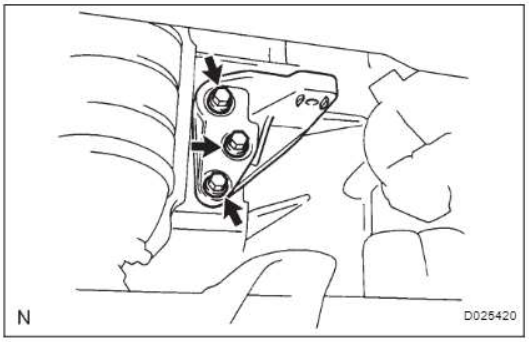
AX



(c) Install the 6 torque converter clutch mounting bolts.
Torque: 41 N*m (418 kgf*cm, 30 ft.*lbf)
NOTICE:
First install the green colored bolt, and then the remaining 5 bolts.



(d) Install the exhaust pipe support bracket and exhaust pipe support bracket No.1 to the automatic transaxle with the 2 bolts and nut.
Torque: Bolt
7.8 N*m (80 kgf*cm, 69 in.*lbf)
Nut
21 N*m (214 kgf*cm, 16 ft.*lbf)

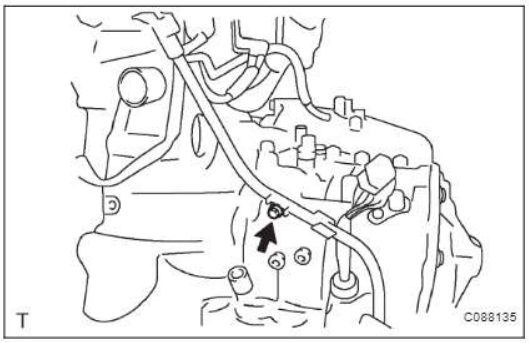


4. INSTALL TRANSVERSE ENGINE ENGINE MOUNTING BRACKET

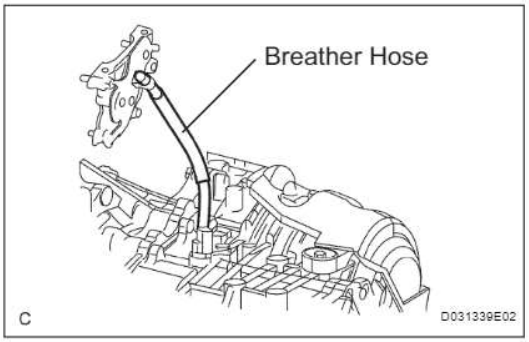
(a) Install the engine mounting bracket FR with the 3 bolts to the automatic transaxle.
Torque: 64 N*m (653 kgf*cm, 47 ft.*lbf)

5. INSTALL TRANSMISSION OIL FILLER TUBE SUB-ASSEMBLY

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



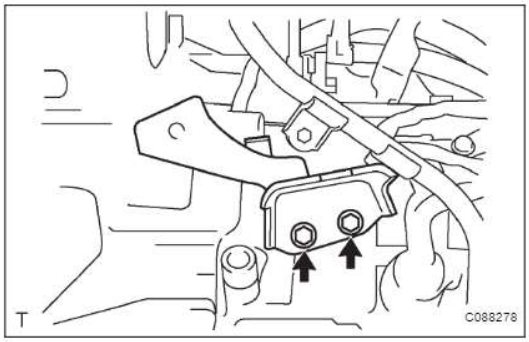
(b) Install the oil filler tube to the automatic transaxle with the bolt.
Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf)



(c) Connect the breather hose to the wire harness bracket.
NOTICE:
The breather hose should be on the left side of the vehicle.

(d) Install the ATF level gauge.

AX



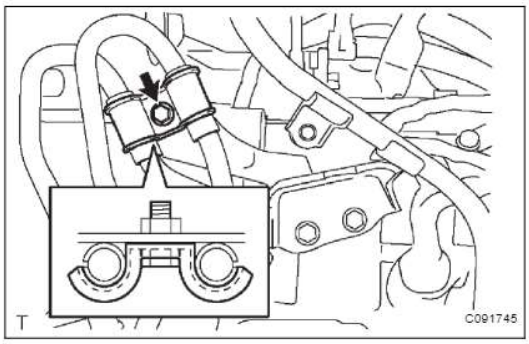
6. INSTALL TRANSMISSION CONTROL CABLE BRACKET NO.1

(a) Install the control cable bracket No.1 with the 2 bolts.
Torque: 12 N*m (122 kgf*cm, 9 ft.*lbf)

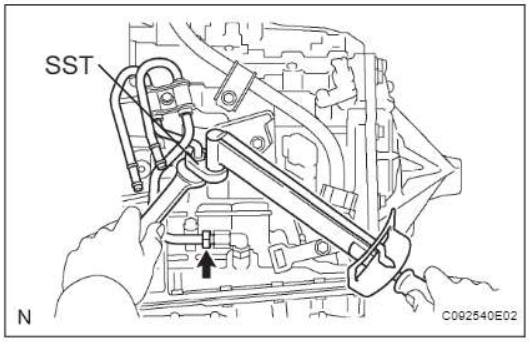
7. INSTALL OIL COOLER INLET TUBE NO.1

(a) Temporarily install the oil cooler outlet tube No.1.

(b) Temporarily install the oil cooler inlet tube No.1.



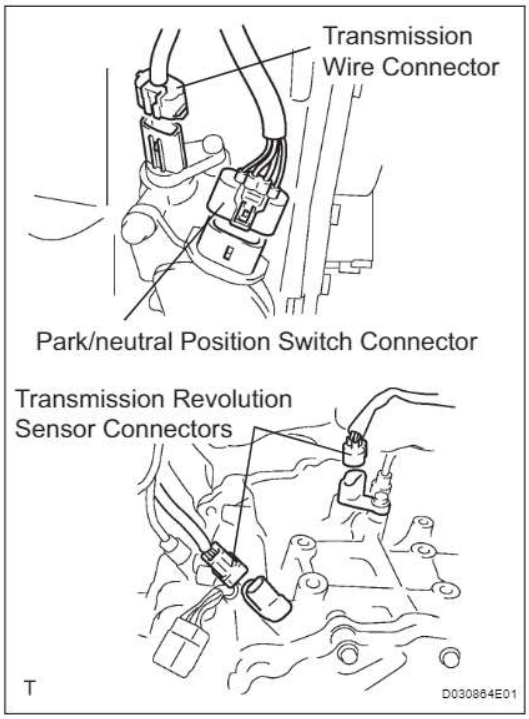
(c) Install the oil cooler tube clamp and bolt.
Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)
HINT:
Install them so that the oil cooler tube cushion is positioned as shown in the illustration.



(d) Using SST and a wrench, tighten the oil cooler inlet tube No.1.
Torque: 34 N*m (350 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



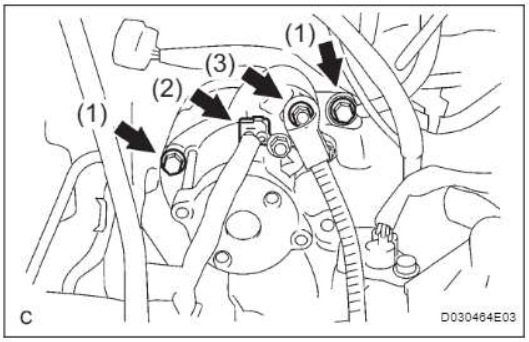
9. CONNECT CONNECTORS

(a) Connect the transmission wire connector.

(b) Connect the park/neutral position switch connector.

(c) Connect the 2 transmission revolution sensor connectors.

AX

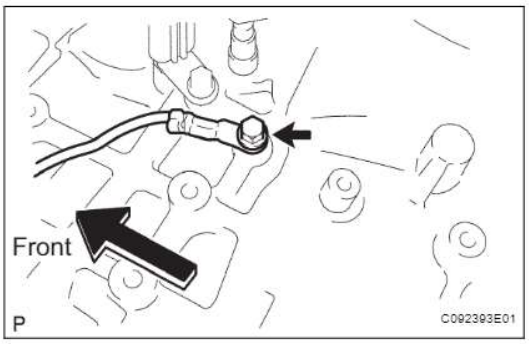


10. INSTALL STARTER ASSEMBLY

(a) Install the starter assembly with the 2 bolts (1).
Torque: 37 N*m (377 kgf*cm, 27 ft.*lbf)

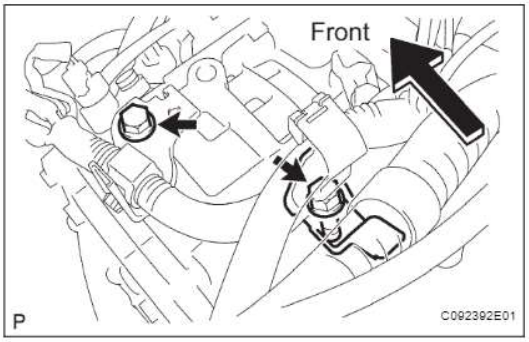
(b) Connect the connecter (2).

(c) Connect the starter wire with the nut (3).
Torque: 9.8 N*m (100 kgf*cm, 87 in.*lbf)



11. CONNECT WIRE HARNESS

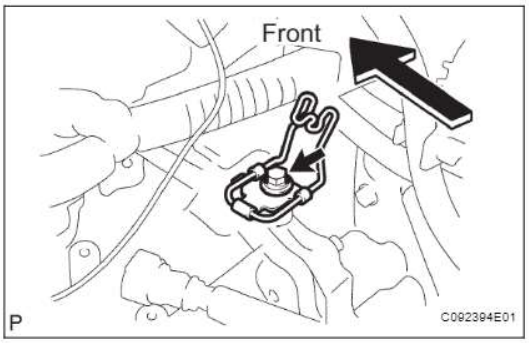
(a) Connect the wire harness with the bolt.
Torque: 13 N*m (139 kgf*cm, 9 ft.*lbf)



12. INSTALL WIRE HARNESS CLAMP

(a) Install the 2 clamps and 2 bolts.
Torque: 8.4 N*m (86 kgf*cm, 74 in.*lbf)

(b) Connect the wire harnesses to the clamps.



13. INSTALL TRANSMISSION CONTROL CABLE BRACKET NO.2

(a) Install the transmission control cable bracket No.2 with the bolt.
Torque: 12 N*m (122 kgf*cm, 9 ft.*lbf)

14. INSTALL LH FRONT DRIVE SHAFT ASSEMBLY

HINT:
See page DS-14.

15. INSTALL RH FRONT DRIVE SHAFT ASSEMBLY

HINT:
See page DS-15.

16. INSTALL ENGINE ASSEMBLY

HINT:
See page EM-75.

17. RESET MEMORY

HINT:
See page AX-17.

AX

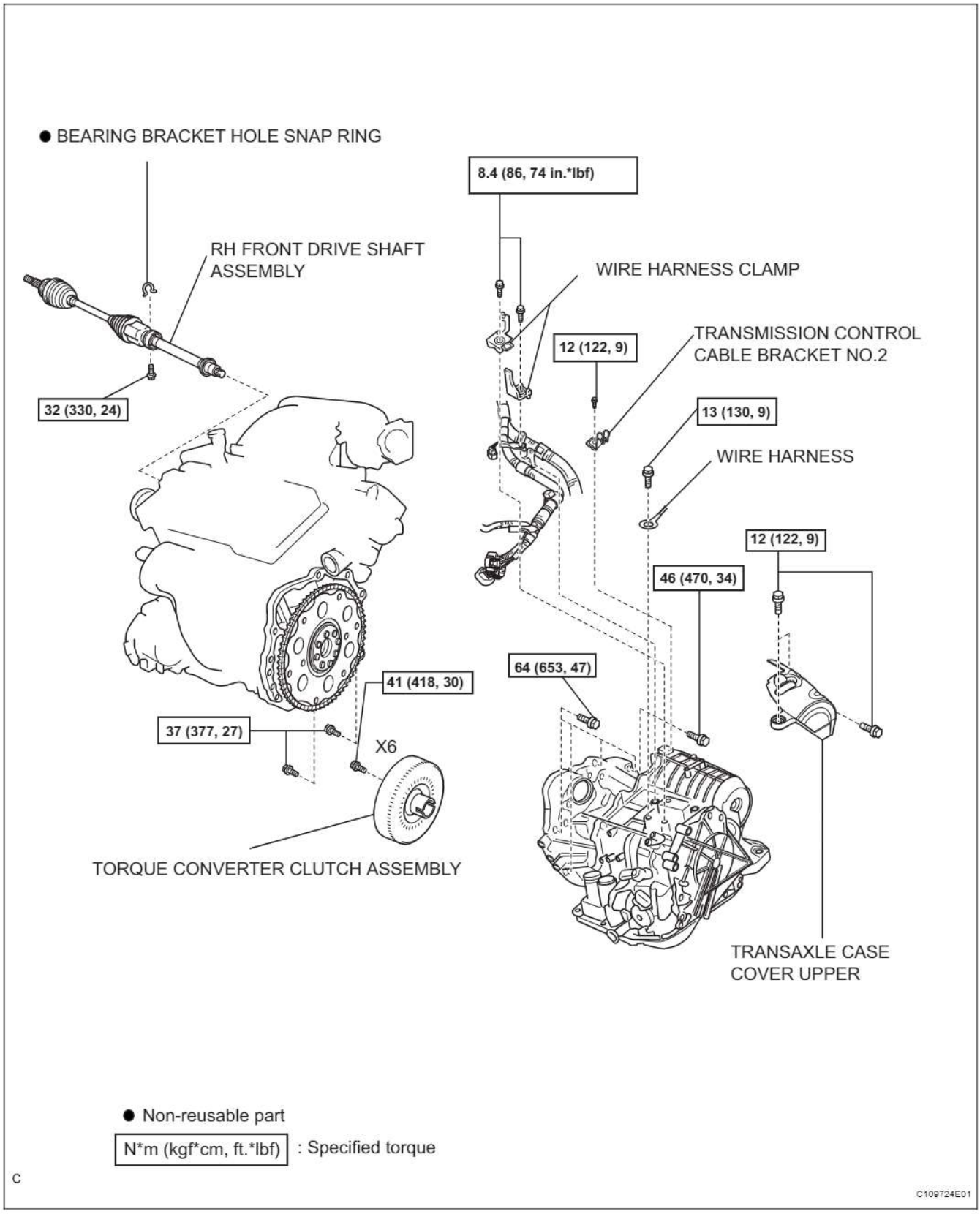
18. PERFORM INITIALIZATION

HINT:

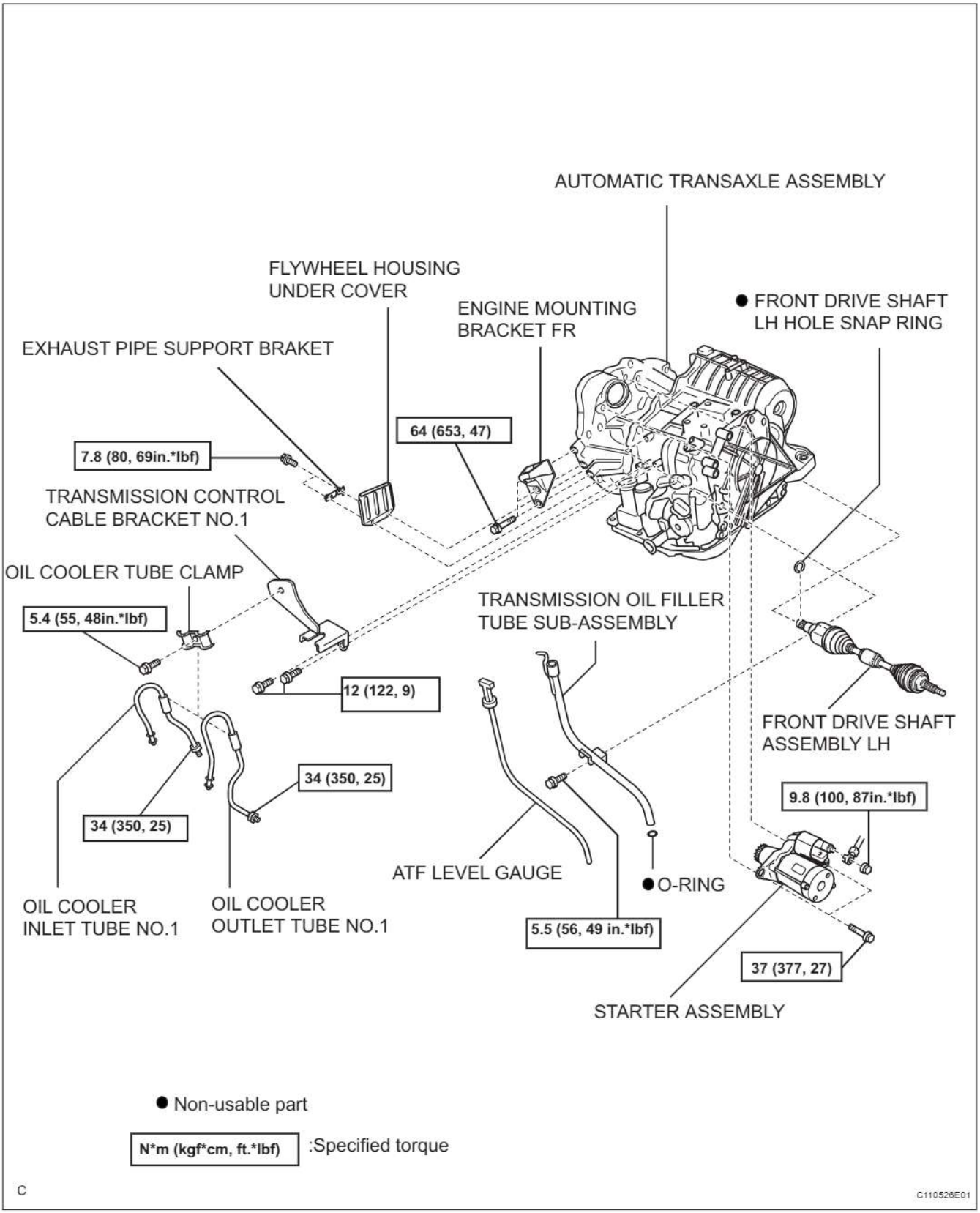
See page AX-17.

AUTOMATIC TRANSAXLE ASSEMBLY

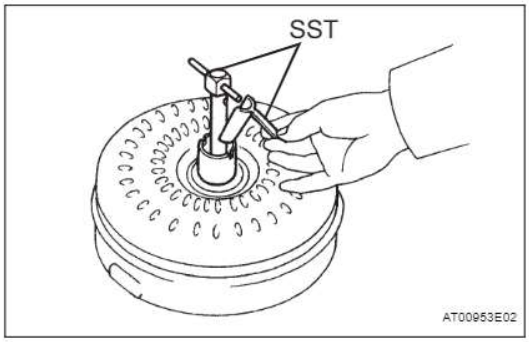
COMPONENTS



AX


AUTOMATIC TRANSAXLE ASSEMBLY
FLYWHEEL HOUSING UNDER COVER
ENGINE MOUNTING BRACKET FR
● FRONT DRIVE SHAFT LH HOLE SNAP RING
EXHAUST PIPE SUPPORT BRAKET
64 (653, 47)
7.8 (80, 69in.*lbf)
TRANSMISSION CONTROL CABLE BRACKET NO.1
OIL COOLER TUBE CLAMP
5.4 (55, 48in.*lbf)
TRANSMISSION OIL FILLER TUBE SUB-ASSEMBLY
12 (122, 9)
FRONT DRIVE SHAFT ASSEMBLY LH
34 (350, 25)
34 (350, 25)
9.8 (100, 87in.*lbf)
ATF LEVEL GAUGE
● O-RING
OIL COOLER INLET TUBE NO.1
OIL COOLER OUTLET TUBE NO.1
5.5 (56, 49 in.*lbf)
37 (377, 27)
STARTER ASSEMBLY
● Non-usable part
N*m (kgf*cm, ft.*lbf) :Specified torque
C
C110526E01

AX



TORQUE CONVERTER CLUTCH AND DRIVE PLATE

INSPECTION

1. INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

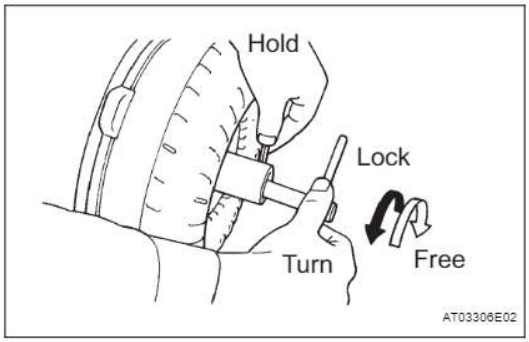
(a) Inspect the one-way clutch.

(1) Set SST into the inner race of the one-way clutch.

SST 09350-32014 (09351-32010)

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

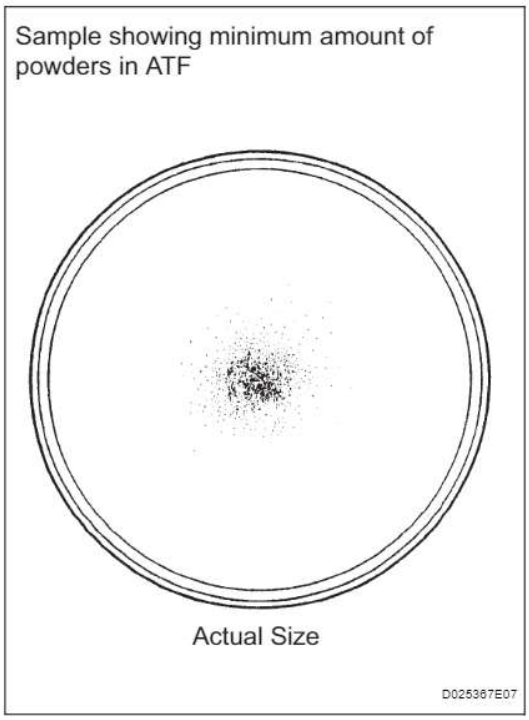
SST 09350-32014 (09351-32010, 09351-32020)



(3) Stand the torque converter up and turn the SST.

Standard:

If the one-way clutch is turned clockwise, it rotates freely and if turned counterclockwise, it locks.



(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).

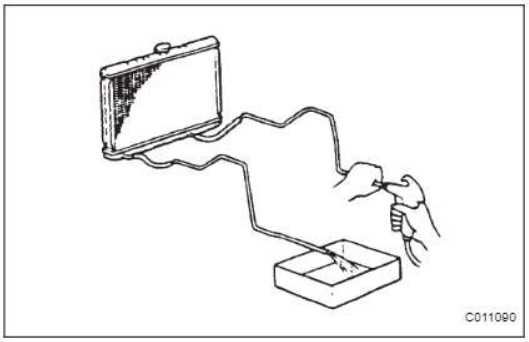
HINT:

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.

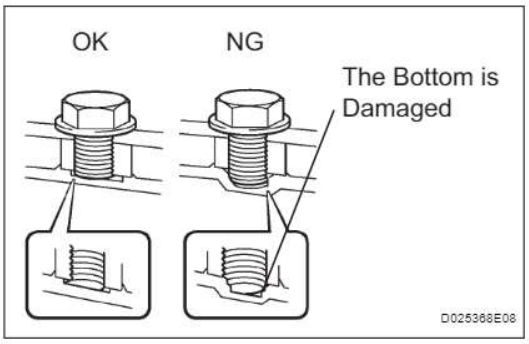
(1) If the ATF is discolored and/or has a foul odor, completely stir the ATF in the torque converter clutch and drain it with the torque converter facing up.

AX

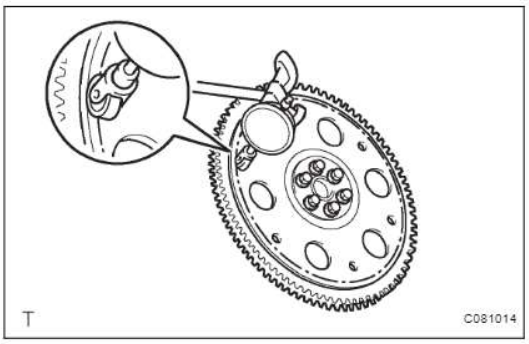


(d) Clean and check the oil cooler and oil pipe line.
(1) If the torque converter clutch is inspected or the ATF is exchanged, clean the oil cooler and oil pipe line.
HINT:
- Spray compressed air of 196 kPa (2 kgf/cm 2, 28 psi) from the inlet hose.
- If plenty of fine powders are identified in the ATF, add new ATF using a bucket pump and clean it again.

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



(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.



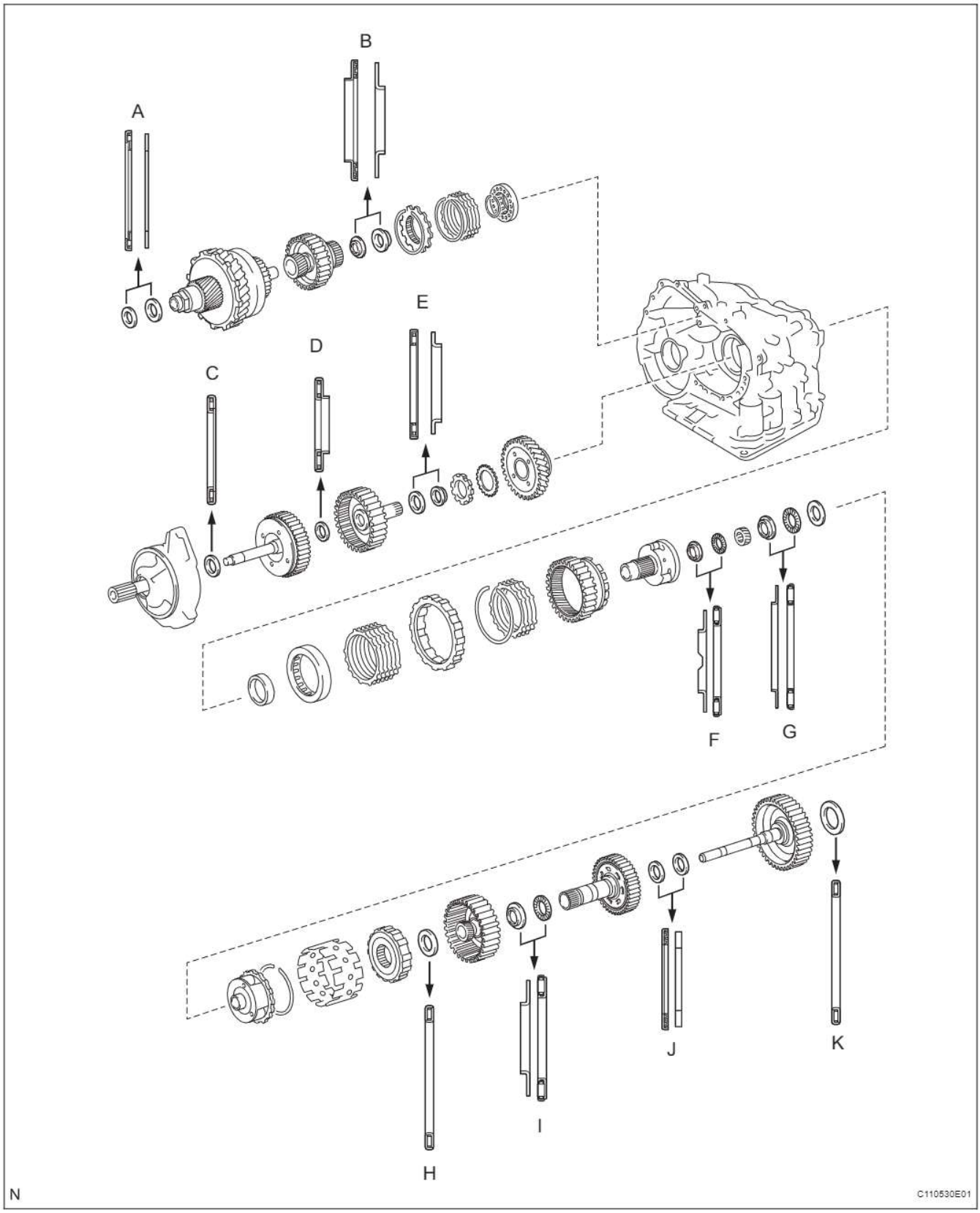
2. INSPECT DRIVE PLATE & RING GEAR SUB-ASSEMBLY

(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.

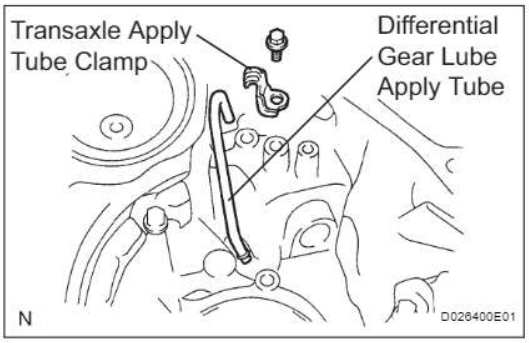
AX

REASSEMBLY

1. BEARING POSITION

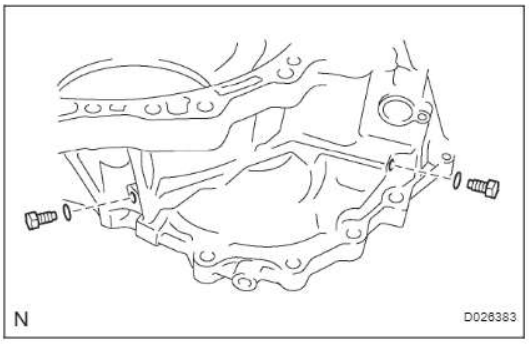


Mark	Front Race Diameter Inside / Outside mm (in.)	Thrust Bearing Diameter Inside / Outside mm (in.)	Rear Race Diameter Inside / Outside mm (in.)
A	-	57.2 (2.252) / 84.96 (3.3449)	56.4 (2.220) / 83.0 (3.268)
B	-	37.73 (1.4854) / 58.0 (2.283)	-
C	-	33.85 (1.3327) / 52.2 (2.055)	-
D	24.94 (0.982)	23.5 (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)	-



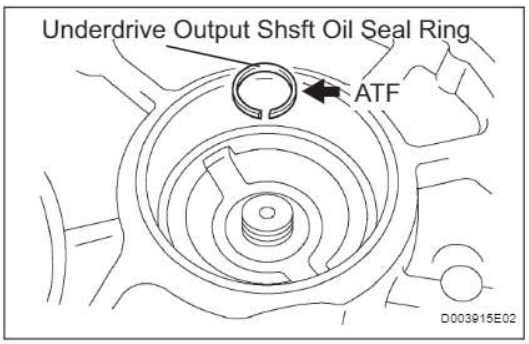
2. INSTALL DIFFERENTIAL GEAR LUBE APPLY TUBE

(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)
NOTICE:
Make sure to insert the pipe to the stopper.



3. INSTALL TRANSAXLE CASE NO.1 PLUG

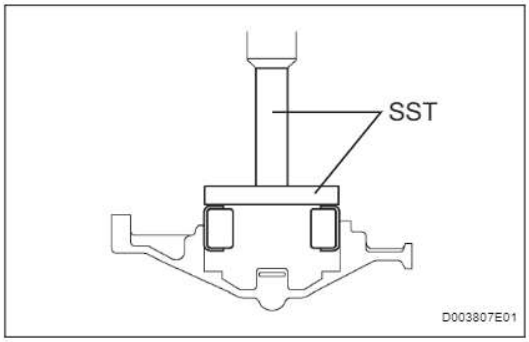
(a) Install the 2 new O-rings to the 2 transaxle case No.1 plugs.
(b) Install the 2 transaxle case No.1 plugs to the transaxle rear cover.
Torque: 7.4 N*m (75 kgf*cm, 65 in.*lbf)



4. INSTALL UNDERDRIVE OUTPUT SHAFT OIL SEAL RING

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

AX



5. INSTALL UNDERDRIVE CYLINDRICAL ROLLER BEARING

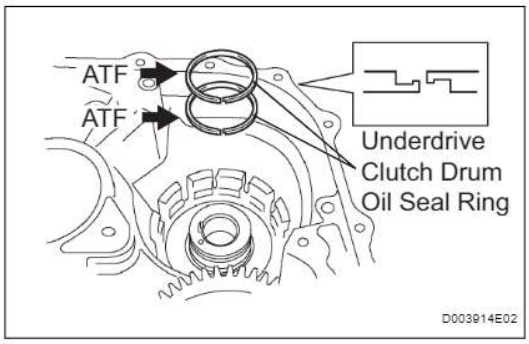
(a) Coat the underdrive cylindrical roller bearing with ATF.

(b) Using SST and a press, install the underdrive cylindrical roller bearing.

SST 09950-60020 (09951-00810), 09950-70010 (09951-07100)

NOTICE:

Do not apply excessive pressure to it.

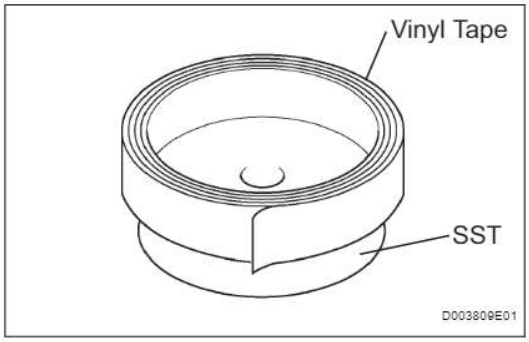


6. INSTALL UNDERDRIVE CLUTCH DRUM OIL SEAL RING

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

NOTICE:

- **Do not expand the gap of the oil seal ring too much.**
- **Fix the hooks certainly. Confirm the smooth rotation.**



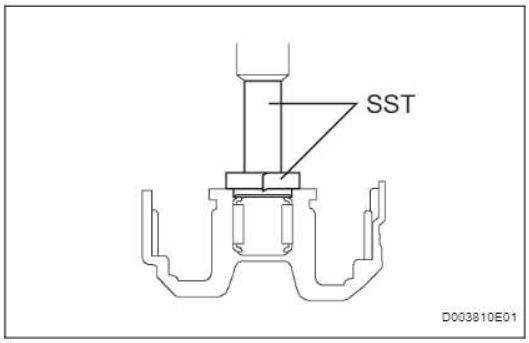
7. INSTALL NEEDLE ROLLER BEARING

(a) Wind a vinyl tape around SST at the place 4.0 mm (0.157 in.) above from the bottom end until the thickness of the wound tape is about 5.0 mm (0.197 in.).

NOTICE:

Clean SST to remove deposited oil, before winding a vinyl tape.

(b) Coat the needle roller bearing with ATF.

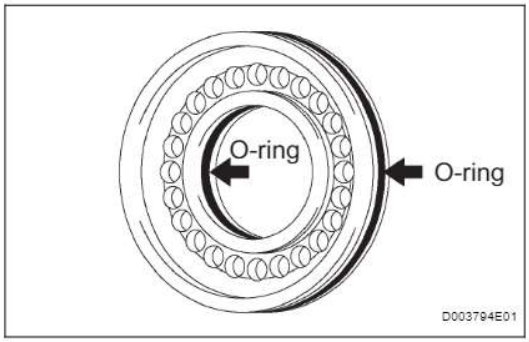


(c) Using SST and a press, install the needle-roller bearing to the transaxle case.

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

NOTICE:

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



8. INSTALL UNDERDRIVE BRAKE PISTON

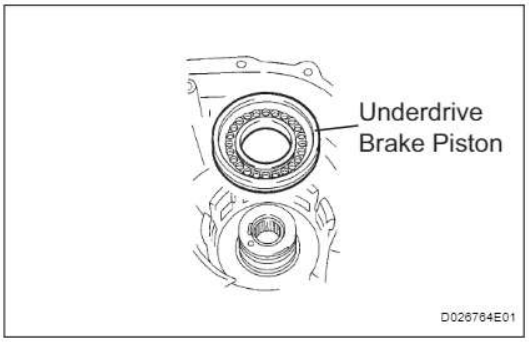
(a) Coat the 2 new O-rings with ATF, install them to the underdrive brake piston.

NOTICE:

- **Assemble the O-ring carefully not to have a twist and a pinching.**
- **Apply enough ATF to the O-ring prior to assembling.**

(b) Coat the underdrive brake piston with ATF.

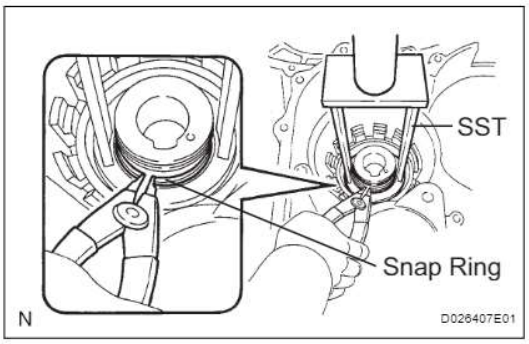
AX



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

NOTICE:

Be careful not to damage the O-ring.



9. INSTALL UNDERDRIVE BRAKE RETURN SPRING SUB-ASSEMBLY

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

(b) Using a snap ring expander, install the snap ring to the transaxle case.

NOTICE:

- **Stop the press when the spring sheet is lowered 1 - 2 mm (0.039 - 0.078 in.) from the snap ring groove, to prevent the spring sheet from deforming.**
- **Do not expand the snap ring excessively.**
- **Installing the spring sub-assembly, check all of the springs are fit in the piston correctly.**
- **The snap ring should be fixed surely in the groove of the transaxle case.**

10. INSTALL BREATHER PLUG NO.2 (ATM)

11. INSTALL COUNTER DRIVE GEAR BEARING

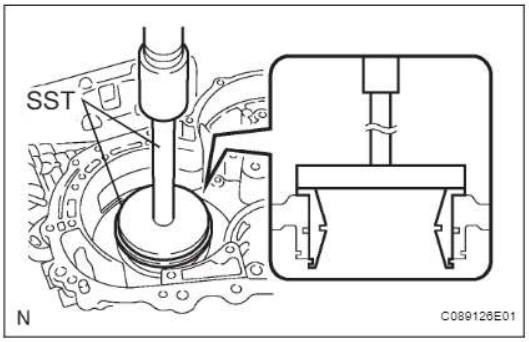
(a) Coat the counterdrive gear bearing with ATF.

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

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

NOTICE:

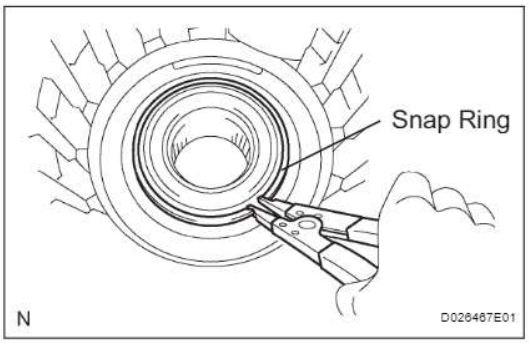
- **Do not apply excessive pressure to it.**
- **Press-fit the bearing outer race until it contacts the transaxle case.**



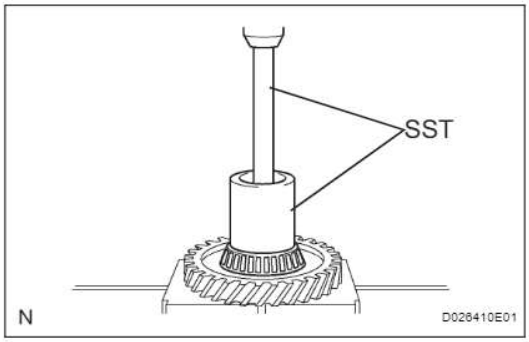
(c) Using a snap ring expander, install the snap ring.

NOTICE:

Face the white mark side of the snap ring up.



AX



12. INSTALL COUNTER DRIVE GEAR

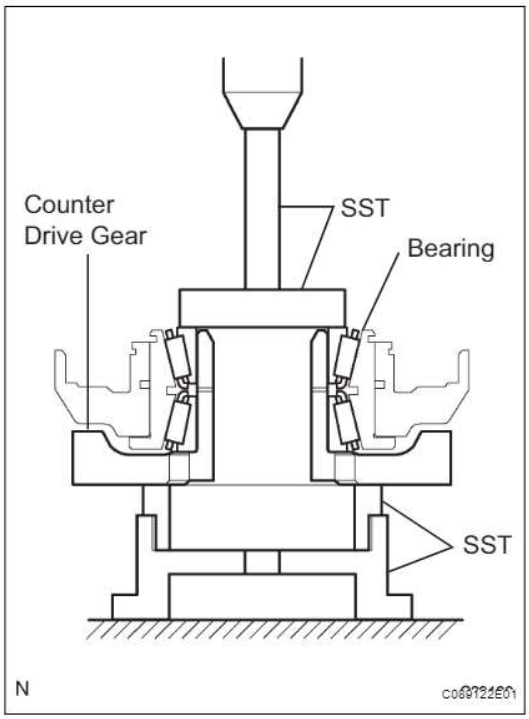
(a) Coat the couterdrive gear with ATF.

(b) Using SST and a press, install the tapered roller bearing to the counter drive gear.

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

NOTICE:

Do not apply excessive pressure to it.

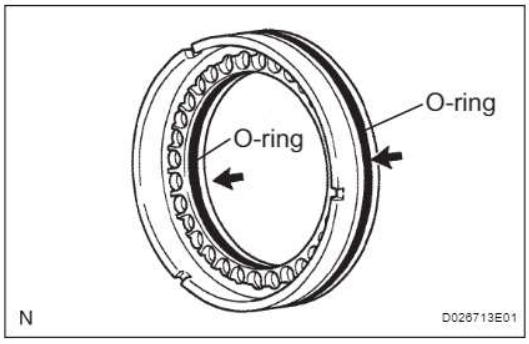


(c) Using SST and a press, install the counter drive gear and bearing to the transaxle case.

SST 09223-15030

NOTICE:

Do not apply excessive pressure to it.



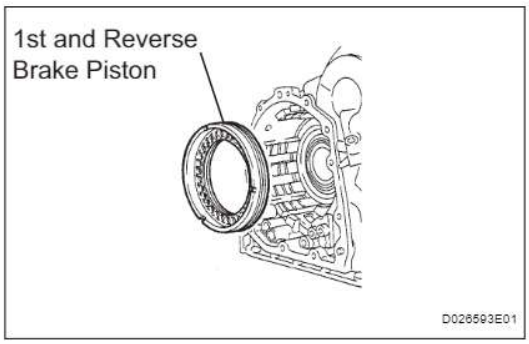
13. INSTALL 1ST & REVERSE BRAKE PISTON

(a) Coat the 2 new O-rings with ATF.

(b) Install the 2 O-rings to the 1st & reverse brake piston.

NOTICE:

- **Assemble the O-ring carefully not to have a twist and a pinching.**
- **Apply enough ATF to the O-ring prior to assembling.**

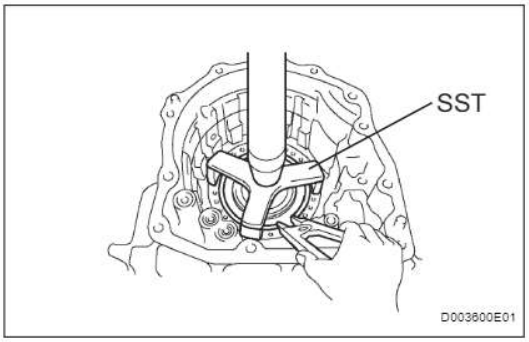


(c) Coat a 1st & reverse brake piston with ATF, install it to the transaxle case.

NOTICE:

Be careful not to damage the O-ring.

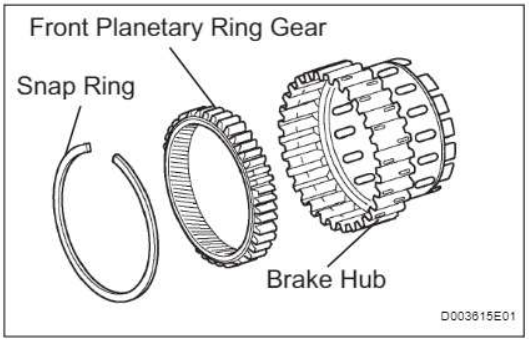
AX



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

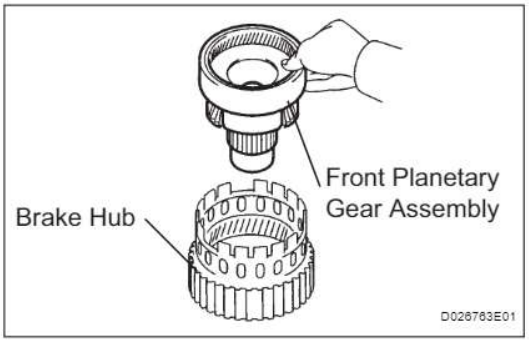
(a) Place SST on the return spring and compress the return spring with a press.
SST 09387-00070

(b) Using a snap ring expander, install the snap ring to the transaxle case.
NOTICE:
- **Stop the press when the spring sheet is lowered to the place 1 - 2 mm (0.039 - 0.078 in.) from the snap ring groove, preventing the spring sheet from being deformed.**
- **Do not expand the snap ring excessively.**
- **Installing the spring sub-assembly, check all of the springs are fit in the piston correctly.**
- **The snap ring should be fixed surely in the groove of the cylinder.**
- **Fix the snap ring to the inside of the claw of the spring seat surely.**



15. INSTALL FRONT PLANETARY RING GEAR

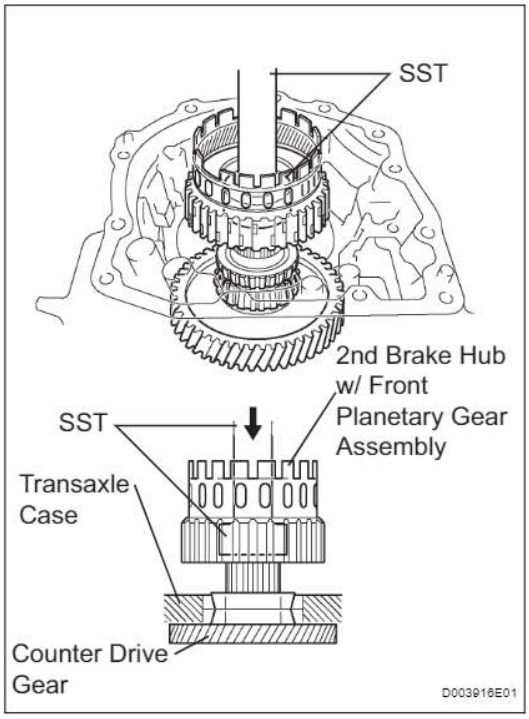
(a) Using a screwdriver, install the front planetary ring gear and snap ring to the brake hub.
NOTICE:
Confirm the snap ring is fixed in the groove of the brake hub correctly.



16. INSTALL FRONT PLANETARY GEAR ASSEMBLY

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

AX

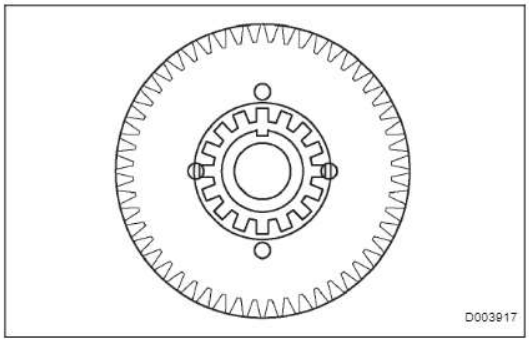


(b) Using SST and a press, press-fit the front planetary gear assembly.

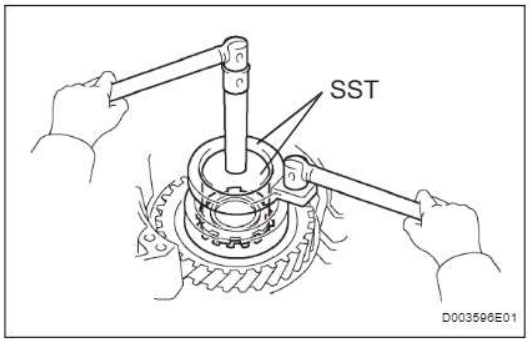
SST 09950-60010 (09951-00500), 09950-70010 (09951-07100)

NOTICE:

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



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



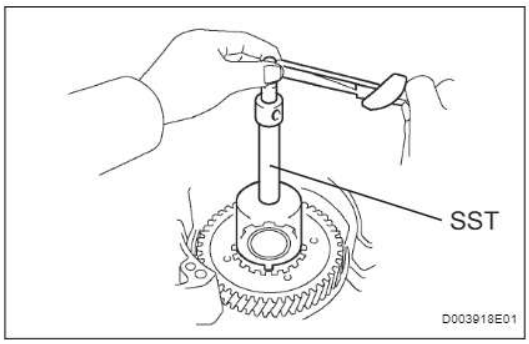
(d) Using SST, install the nut.

SST 09387-00030, 09387-00080

Torque: 210 - 350 N*m (3,141 - 3569 kgf*cm, 155 - 258 ft.*lbf)

NOTICE:

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



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

SST 09387-00080

OK:

Turning torque at 60 rpm

Bearing:

New Bearing:

AX

0.51 - 1.02 N*m(5.1 - 10.0 kgf*cm, 4.4 - 8.7 in.*lbf)

Used Bearing:

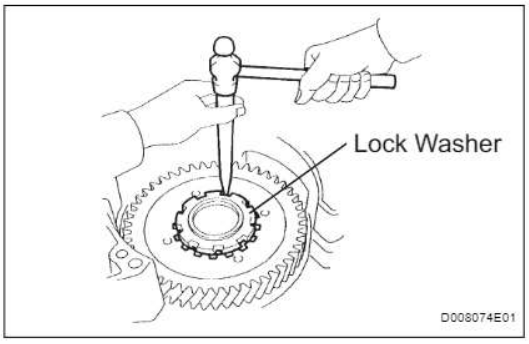
0.26 -0.51 N*m(2.7 - 5.2 kgf*cm, 2.3 - 4.5 in.*lbf)

HINT:

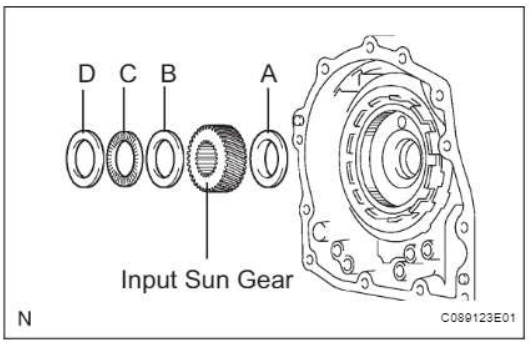
Use a torque wrench with a fulcrum length of 160 mm (6.3 in.).

(f) Tighten the nut gradually until the specified rotation 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.



17. INSTALL INPUT SUN GEAR

(a) Coat the 2 thrust bearings with ATF.

(b) Install the 2 thrust bearings, the bearing race and the front planetary sun gear to the front planetary gear assembly.

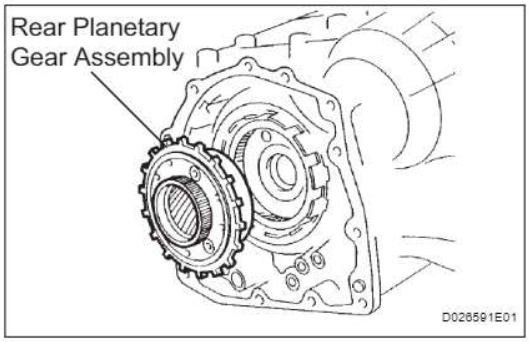
NOTICE:

- **Install the bearing race on the side of the front planetary carrier. Be careful about the orientation of the race.**
- **Installing thrust bearing and front sun gears, be careful about the orientation of the parts.**
- **Install the bearing race on the side of the front sun gear. Be careful about the orientation of the race.**
- **Install the thrust bearing and the race after holding the parts on the rear planetary carrier by applying grease. Be sure the assembling order.**

Thrust bearing and bearing race diameter: mm (in.)

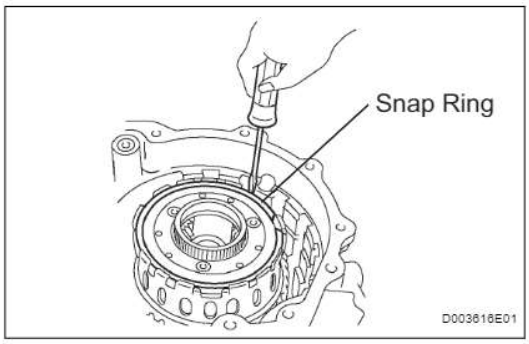
	inside	outside
Thrust Bearing, A	32.5 (1.28)	56.5 (2.224)
Bearing Race, B	40.2 (1.583)	59.3 (2.335)
Thrust Bearing, C	38.6 (1.520)	59.7 (2.35)
Bearing Race, D	38.6 (1.520)	59.3 (2.335)

AX



18. INSTALL REAR PLANETARY GEAR ASSEMBLY

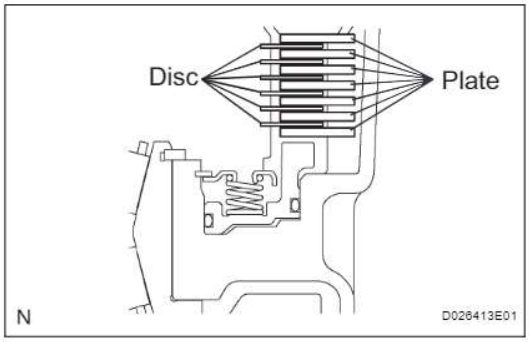
(a) Install the rear planetary gear assembly to the rear planetary ring gear.



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

NOTICE:

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



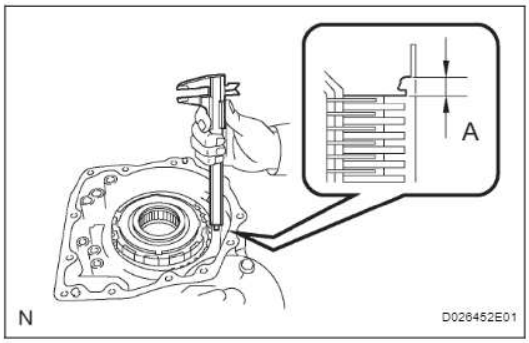
19. INSTALL 1ST & REVERSE BRAKE CLUTCH DISC

(a) Coat the 6 discs with ATF.

(b) Install the 6 plates and 6 discs.

NOTICE:

Be careful about the order of discs, plates and flange assembly.



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 - 1.35 mm (0.0457 - 0.0531 in.)

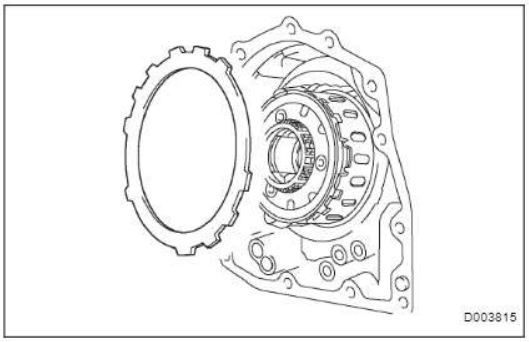
HINT:

Piston stroke = Dimension A -Flange thickness

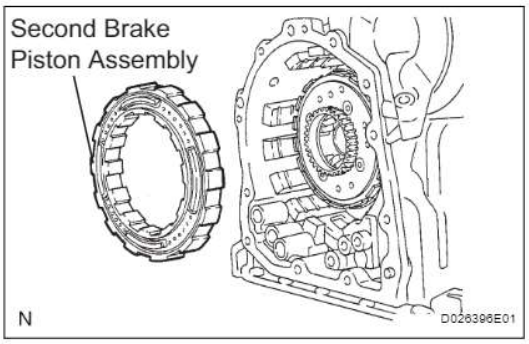
Flange thickness: mm (in.)

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)

AX

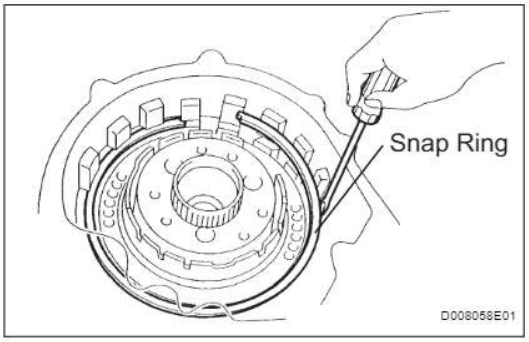


(c) Install the flange.



21. INSTALL SECOND BRAKE PISTON ASSEMBLY

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



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

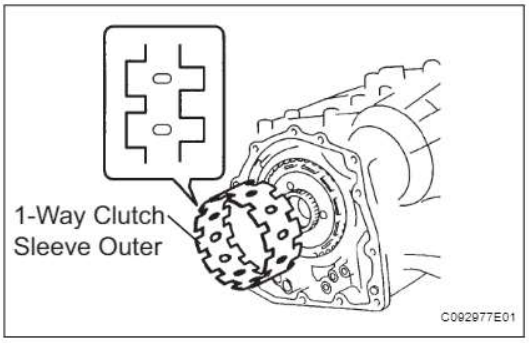
Inside diameter:

More than 167 mm (6.57 in.)

NOTICE:

- **Because the taper snap ring has the positioning direction, check it when installing.**
- **When the diameter does not meet the specified value, replace the snap ring with new one.**
- **After assembling, confirm that there is no clearance between the second brake cylinder and the fitting surface of the cylinder in the transaxle case.**

22. INSTALL ONE-WAY CLUTCH SLEEVE OUTER

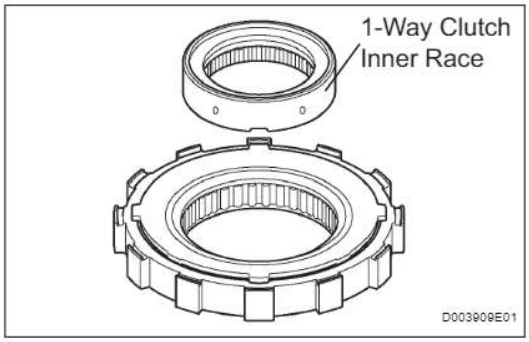


(a) Install the 1-way clutch sleeve outer to the 2nd brake cylinder assembly.

NOTICE:

Check the positioning direction of the outer sleeve.

AX

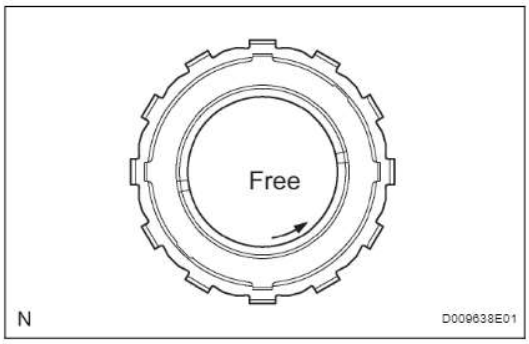


23. INSTALL ONE-WAY CLUTCH ASSEMBLY

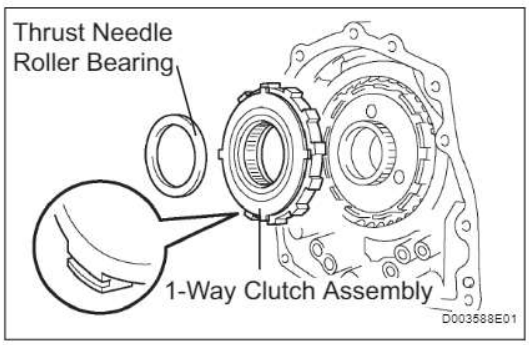
(a) Install the 1-way clutch inner race to the 1-way clutch.

NOTICE:

- **Check the direction of the inner race.**
- **Confirm that the discrimination mark can be seen by the worker.**



(b) Check the rotating direction of 1-way clutch for the lock or free operation, as shown in the illustration.



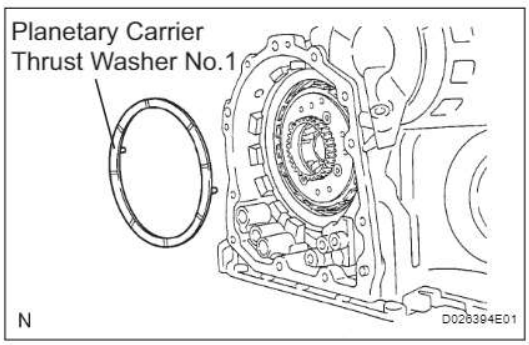
(c) Install the 1-way clutch and thrust needle roller bearing to the 1-way clutch sleeve outer.

Bearing diameter: mm (in.)

	Inside	Outside
Bearing	53.6 (2.110)	69.4 (2.732)

NOTICE:

Install the thrust bearing properly so that no-colored race will be visible.

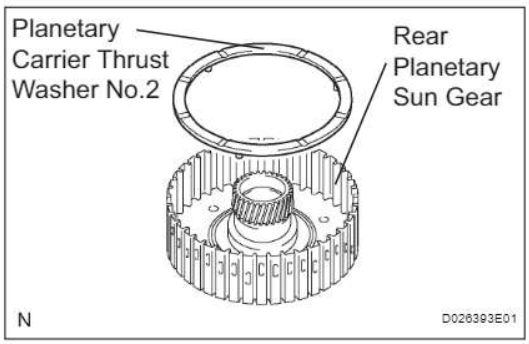


24. INSTALL PLANETARY CARRIER THRUST WASHER NO.1

(a) Coat the planetary carrier thrust washer No. 1 with yellow petrolatum, install it onto the planetary sun gear assembly.

NOTICE:

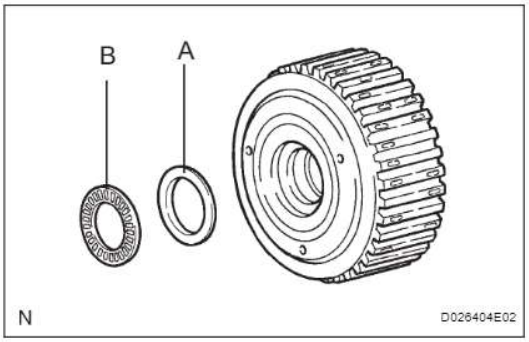
After assembling, confirm that the projection should be fixed surely in the hole of the planetary sun gear assembly.



25. REMOVE REAR PLANETARY SUN GEAR ASSEMBLY

(a) Coat the planetary carrier thrust washer No. 2 with yellow petrolatum, install it onto the rear planetary sun gear.

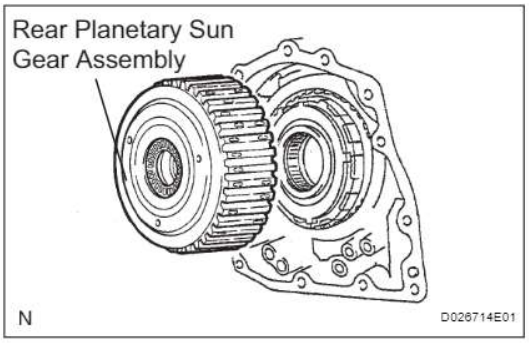
AX



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

Bearing diameter: mm (in.)

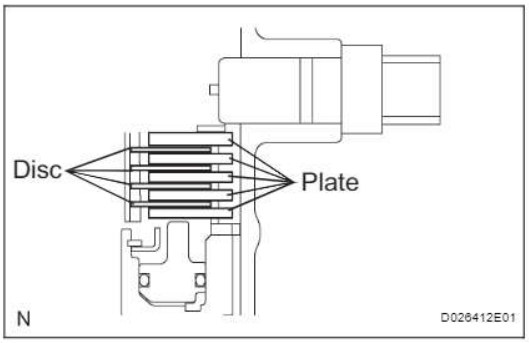
	Inside	Outside
Race, A	33.0 (1.299)	45.4 (1.787)
Bearing, B	31.85 (1.254)	45.2 (1.78)



(c) Install the rear planetary sun gear assembly to the rear planetary gear.

NOTICE:

Installing the rear planetary sun gear assembly, confirm that the B1 discs engage.

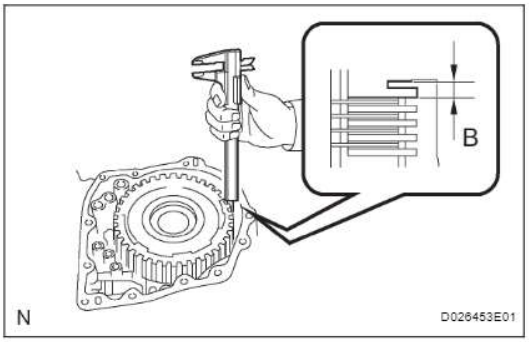


26. INSTALL 2ND BRAKE CLUTCH DISC

(a) Coat the 4 discs with ATF.

(b) Install the 4 discs and 4 plates to the transaxle case.

(c) Temporarily install the snap ring.



27. INSPECT PACK CLEARANCE OF SECOND 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 - 0.91 mm (0.0244 - 0.0358 in.)

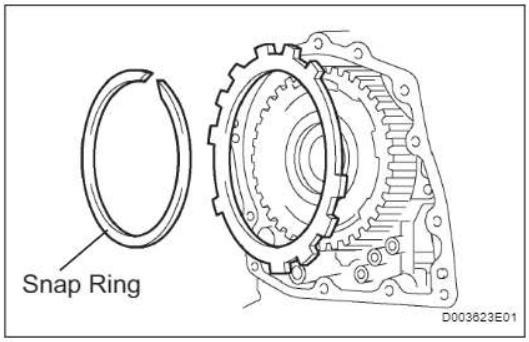
HINT:

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

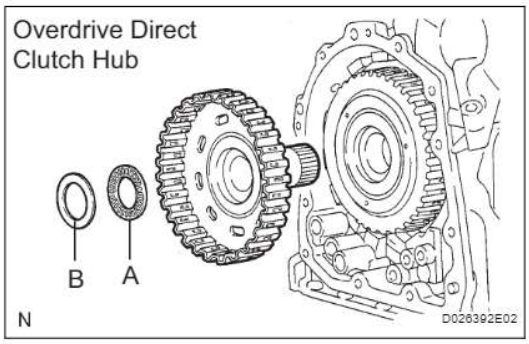
Flange thickness: mm (in.)

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	-

AX



(c) Temporarily remove the snap ring, attach the selected flange and restore the snap ring.
NOTICE:
Secure the snap ring so that its gap is visible through the groove of the transaxle case.



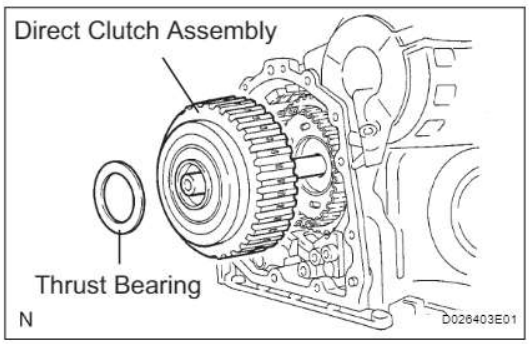
28. INSTALL OVERDRIVE DIRECT CLUTCH HUB SUB-ASSEMBLY

(a) Install the direct clutch hub to the planetary gear assembly.
NOTICE:
Be careful not to damage the bush inside of the overdrive clutch hub during instaling.

(b) Coat the thrust bearing with ATF.

(c) Install the bearing race and the thrust bearing to the direct clutch hub.
NOTICE:
Installing the bearing, hold the part on the side of the overdrive clutch hub.
Bearing and race diameter: mm (in.)

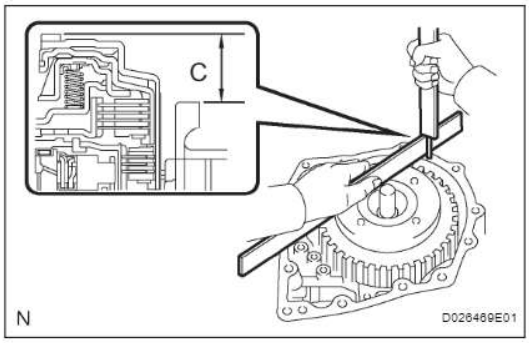
	Inside	Outside
Bearing, A	24.7 (0.972)	39.5 (1.555)
Race, B	23.6 (0.929)	38.0 (1.496)



29. INSTALL DIRECT CLUTCH ASSEMBLY

(a) Coat the thrust bearing with ATF.

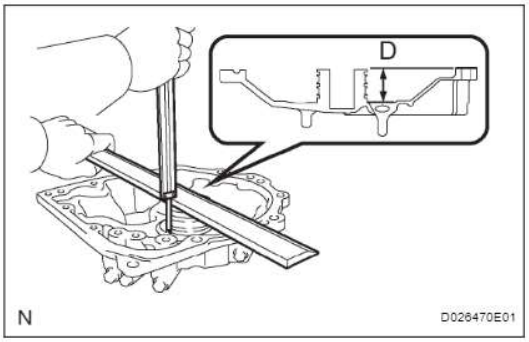
(b) Install the direct clutch assembly and thrust bearing to the rear planetary sun gear assembly.
NOTICE:
The disc in the direct clutch should completely match with the hub attached outside the rear planetary sun gear. Otherwise, the rear cover can not be installed.



(c) Clean the connecter part of the transaxle case and the rear cover.

(d) As shown in the illustration, place a straight edge on the direct clutch drum and measure the distance between transaxle case and the straight edge using vernier calipers (Dimension C).

AX



(e) Using vernier calipers and a simple straightedge, measure the position 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 it.

End play:

0.244 - 0.901 mm (0.0096 - 0.0355 in.)

NOTICE:

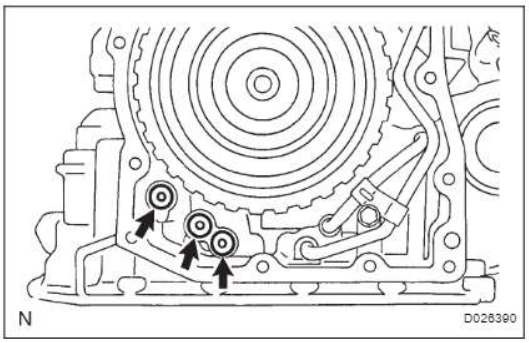
Make sure that the no colored race side is facing the direct clutch assembly.

HINT:

End play = Dimension D - Dimension C

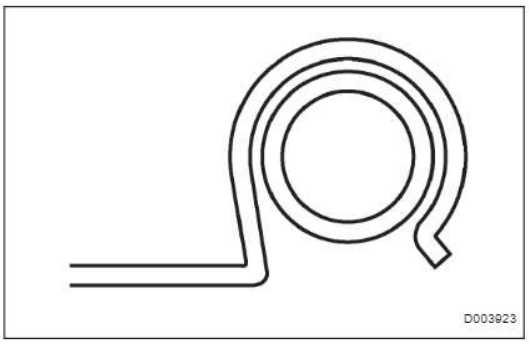
Bearing thickness and diameter : mm (in.)

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 the 3 new governor apply gaskets No. 1 to the transaxle case.



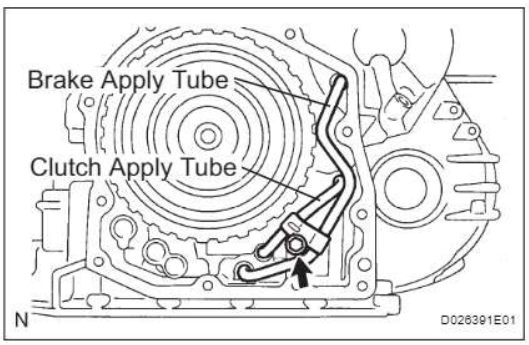
31. INSTALL BRAKE APPLY TUBE

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

NOTICE:

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

(b) Install the clutch apply tube.



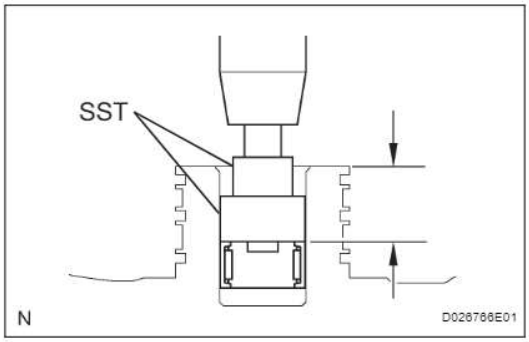
(c) Install the brake apply tube and a bolt to the transaxle case.

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

NOTICE:

Each pipe should be securely inserted until it reaches the stopper.

AX



32. INSTALL NEEDLE ROLLER BEARING

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

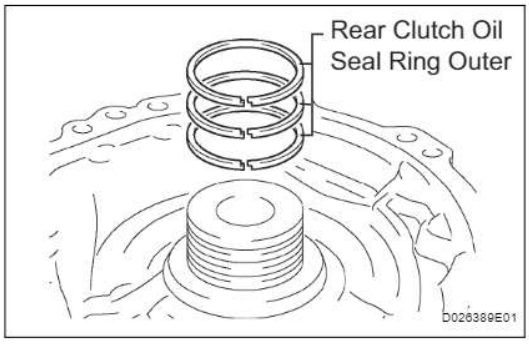
Press fit depth:

20.55 - 21.25 mm (0.8091 - 0.8366 in.)

NOTICE:

- **Face the inscribed mark side of the bearing race up.**
- **Repeat the press fit until the specified value is obtained.**

(b) Coat a needle roller bearing with ATF.

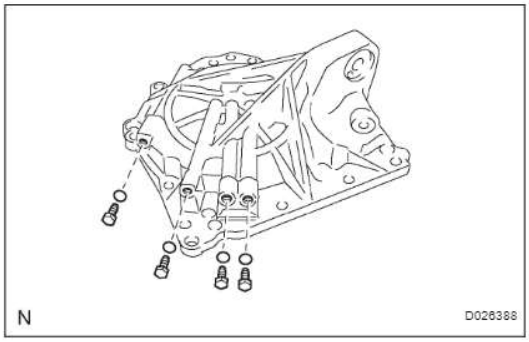


33. INSTALL REAR CLUTCH OIL SEAL RING OUTER

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

NOTICE:

The snap ring should be fixed certainly in the groove of the drum.

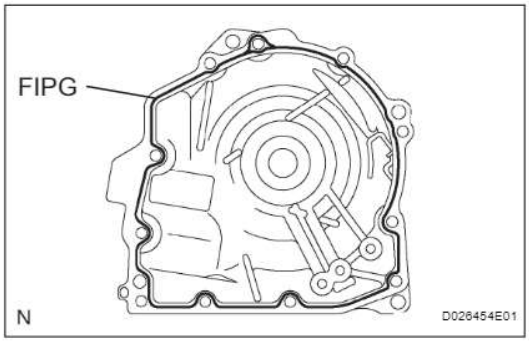


34. INSTALL TRANSAXLE CASE NO.1 PLUG

(a) Install the 4 new O-ring to the 4 transaxle case No. 1 plugs.

(b) Install the 4 transaxle case No. 1 plugs to the transaxle rear cover.

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



35. INSTALL TRANSAXLE REAR COVER SUB-ASSEMBLY

(a) Remove any packing material and be careful not to get oil on the contacting surfaces of the transaxle rear cover or the transaxle case.

(b) Apply FIPG to the cover.

FIPG:

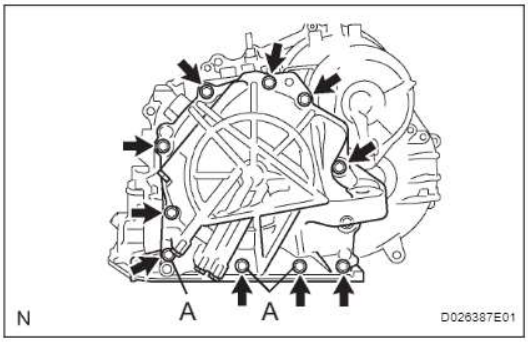
Part No. 08826-00090, THREE BOND 1281 or equivalent.

NOTICE:

Concerning about the amount of the FIPG application, the amount should be controlled to from even sealing film on entire flange surface and have slight protrusion of the FIPG all around of the connecting area. The FIPG shall be applied continuously on the flange.

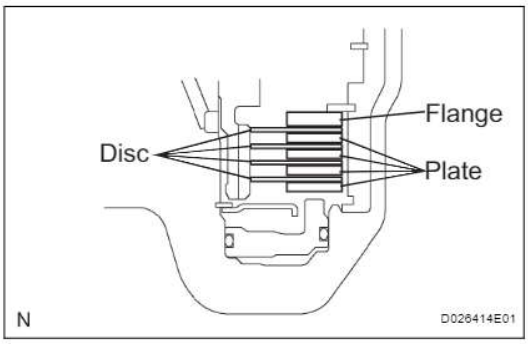
(Reference value of the section diameter: ϕ1.2)

AX



(c) Apply liquid sealer to the "A" bolt threads.
Sealant:
Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent.

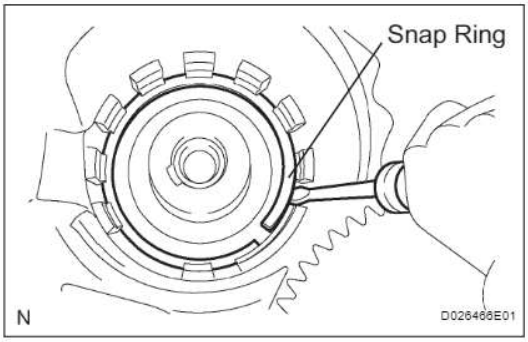
(d) Install the 11 bolts.
Torque: Bolt A
19.0 N*m (190 kgf*cm, 14 ft.*lbf)
Other bolt:
25.0 N*m (250 kgf*cm, 18 ft.*lbf)



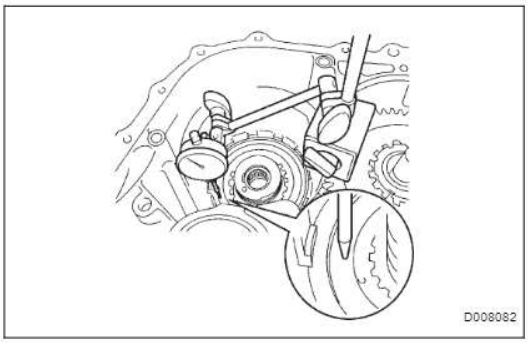
36. INSTALL UNDERDRIVE CLUTCH DISC NO.2

(a) Coat the 4 discs with ATF.

(b) Install the 4 discs, 4 plates and flange to the transaxle case.
NOTICE:
Be careful about the order of discs, plate and flange assembly.



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



37. INSPECT PACK CLEARANCE OF UNDERDRIVE BRAKE

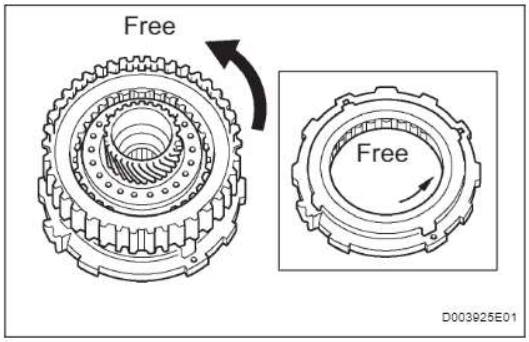
(a) Using a dial indicator, measure the underdrive brake pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm ^{2}, 57 psi).
Pack clearance:
1.81 - 2.20 mm (0.0713 - 0.0866 in.)
HINT:
Select an appropriate flange from the table below so that it will meet the specified value.
Flange thickness: mm (in.)

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) Temporally remove the snap ring and attach to the flange.

(c) Restore the snap ring.

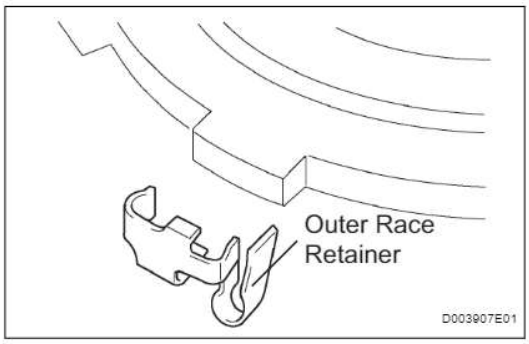
AX



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.

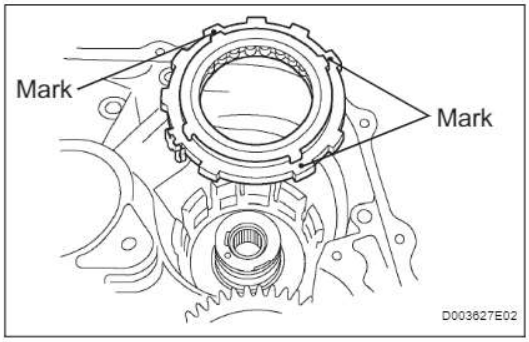


39. INSTALL UNDERDRIVE 1 WAY CLUTCH ASSEMBLY

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

NOTICE:

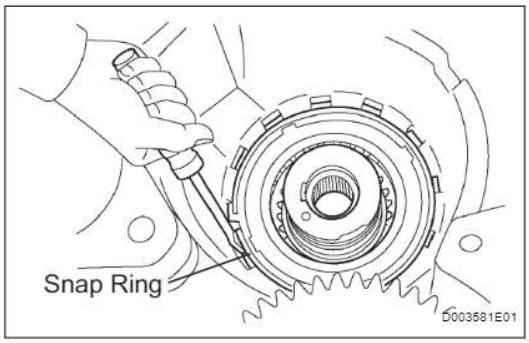
Fix the outer race retainer to the external tooth of the one way clutch surely.



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

NOTICE:

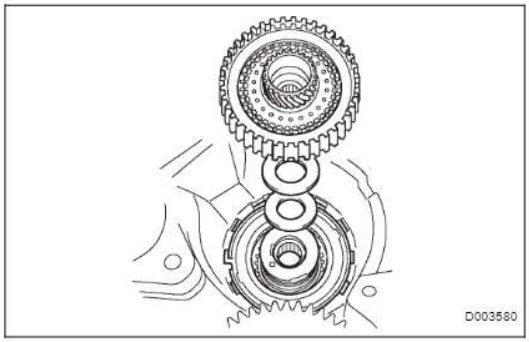
Make sure that the mark on the 1-way clutch outer race is visible.



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

NOTICE:

The snap ring should be fixed certainly in the groove of the transaxle case as the gap exists except in the lock of teeth.



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.)

	Inside	Outside
Bearing	37.73 (1.4854)	58.0 (2.2835)
Race	29.9 (1.1772)	55.5 (2.185)

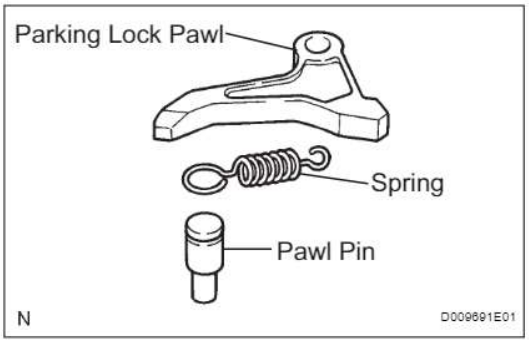
AX

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

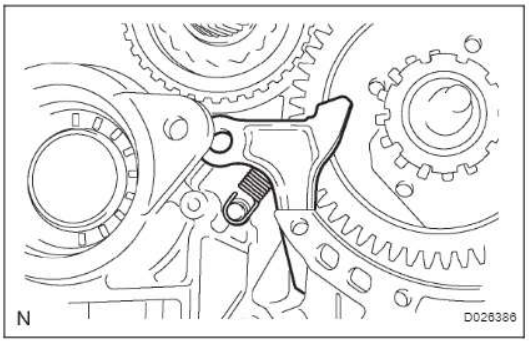
NOTICE:
Installing the underdrive clutch drum sub-assembly, be sure not to damage the oil seal ring.

41. INSTALL PARKING LOCK PAWL

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



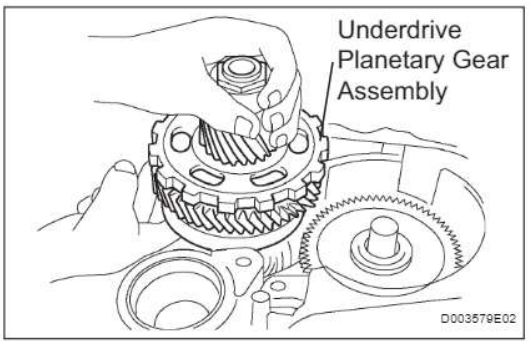
(b) Temporarily install the parking lock pawl, shaft and spring to the transaxle case, as shown in the illustration.



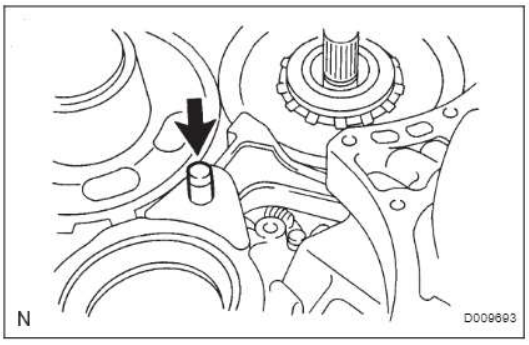
42. INSTALL UNDERDRIVE PLANETARY GEAR ASSEMBLY

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

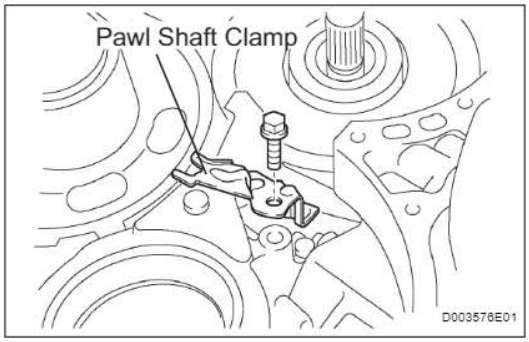
NOTICE:
Engage all the discs of underdrive clutch and hub splines of the underdrive planetary gear assembly firmly and assemble them securely.



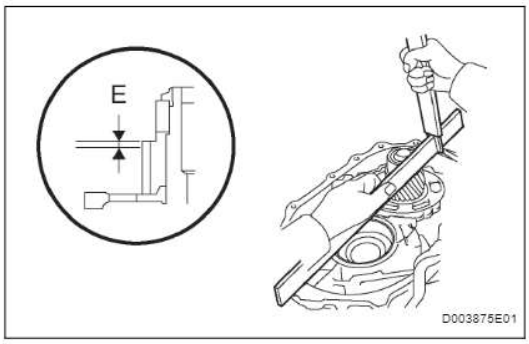
(b) Install the parking lock pawl shaft.



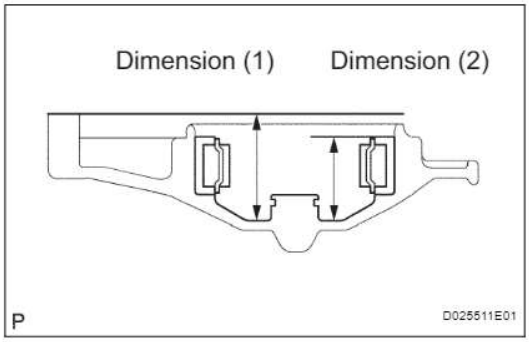
AX



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

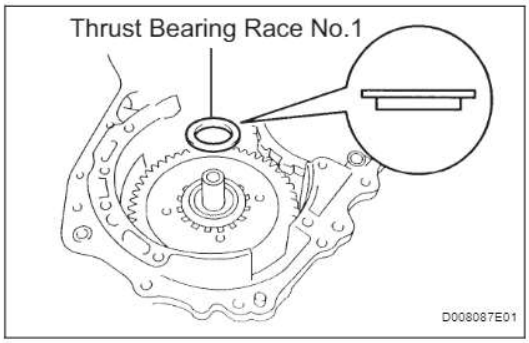


(d) Using a straight edge and vernier calipers as shown in the illustration, measure the gap between the top of the differential drive pinion in the underdrive planetary gear and contact surface of the transaxle case and housing (Dimension E).
NOTICE:
Note down the dimension E as it is necessary for the following process.



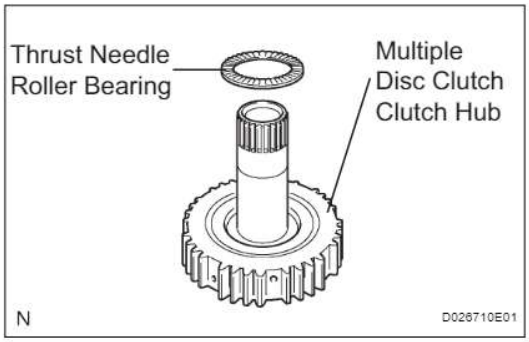
(e) As shown in the illustration, measure the 2 places of the transaxle housing, calculate the dimension F using the formula.
NOTICE:
Note down the dimension F as it is necessary for the following process.
HINT:
Dimension F = Dimension (1) - Dimension (2)

43. INSTALL MULTIPLE DISC CLUTCH CLUTCH HUB



(a) Install the thrust bearing race No.1 to the transaxle case while checking its direction.
Bearing race diameter: mm (in.)

	Inside	Outside
Bearing race	39.5 (1.555)	45.8 (1.803)

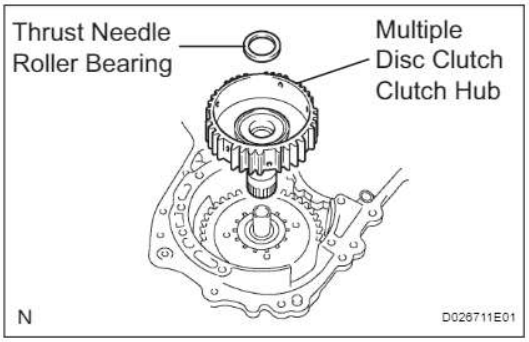


(b) Coat the thrust needle roller bearing and race with yellow petrolatum, install them onto the multiple disc clutch hub.
Thrust bearing and race diameter: mm (in.)

	Inside	Outside
Thrust Bearing	36.4 (1.433)	52.2 (2.055)

(c) Coat the needle roller bearing with ATF.

AX

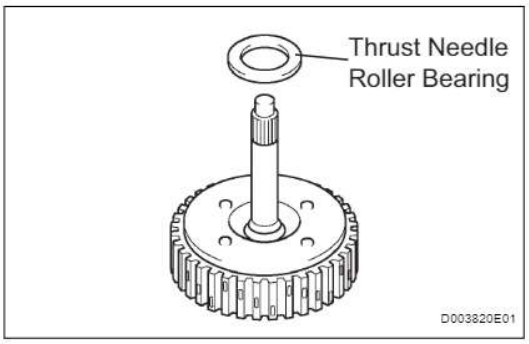


(d) Install the needle roller bearing to the multiple clutch hub.

Bearing diameter: mm (in.)

	Inside	Outside
Bearing	23.6 (0.929)	44 (1.732)

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



44. INSTALL FORWARD CLUTCH ASSEMBLY

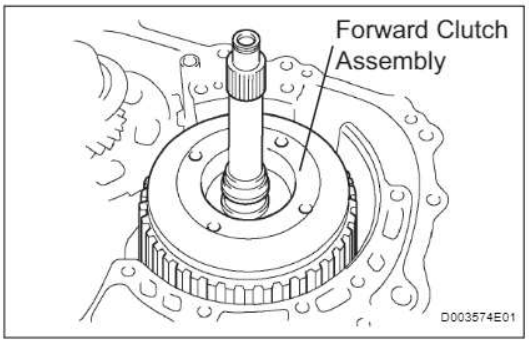
(a) Coat the thrust needle roller bearing with ATF.

(b) Install the thrust needle roller bearing to the forward clutch.

Thrust bearing diameter: mm (in.)

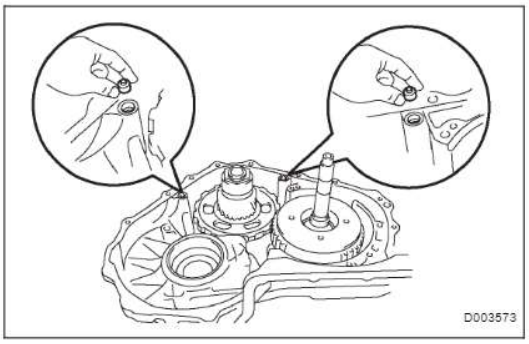
	Inside	Outside
Thrust Bearing	33.58 (1.3220)	51.9 (2.043)

NOTICE:
Install the thrust bearing properly so that the no colored race or blue ink jet race will be visible.



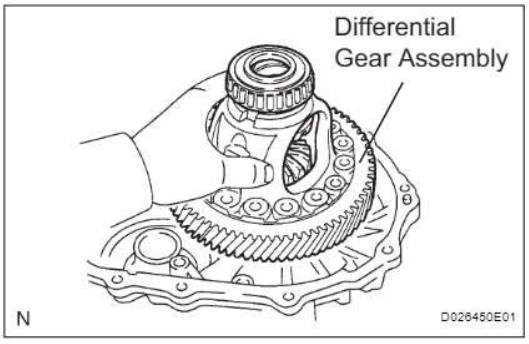
(c) Install the forward clutch to the forward clutch assembly.

NOTICE:
- **Align the splines of all discs in the forward clutch with those of multiple clutch hub to assemble them securely.**
- **Be careful not to damage the bush inside of the forward clutch hub during installing.**



45. INSTALL OVERDRIVE BRAKE GASKET

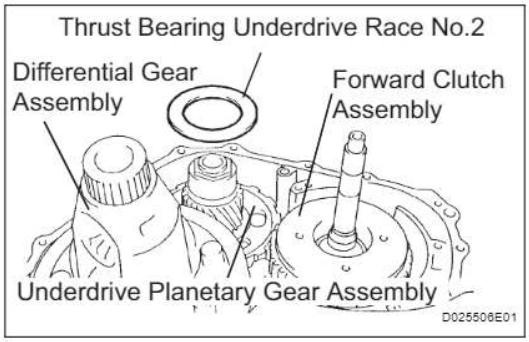
(a) Install the 2 new overdrive brake gaskets.



46. INSTALL DIFFERENTIAL GEAR ASSEMBLY

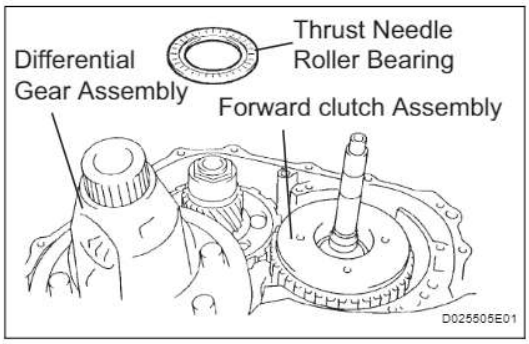
(a) Install the differential gear assembly to the transaxle case.

AX



47. INSTALL THRUST BEARING UNDERDRIVE RACE NO.2

(a) Install the thrust bearing underdrive race No.2 to the 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 ware measured when installing 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 it.

End play:

0.498 - 0.993 mm (0.01961 - 0.03909 in.)

HINT:

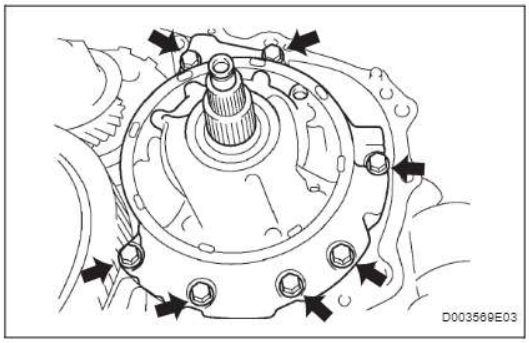
End play = Dimension F - Dimension E - thrust bearing thickness 2.5 mm (0.0984 in.) - underdrive thrust bearing race No. 2 thickness.

Race thickness: mm (in.)

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.)

	Inside	Outside
Bearing	57.2 (2.252)	84.96 (3.345)
Bearing race	56.4 (2.22)	83 (3.268)

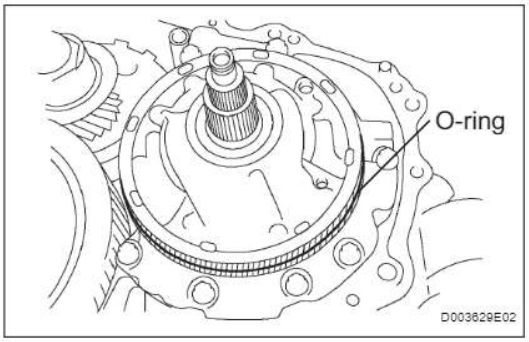


49. INSTALL OIL PUMP ASSEMBLY

(a) Install the oil pump to the transaxle case with the 7 bolts.

Torque: 22.0 N*m (226 kgf*cm, 16 ft.*lbf)

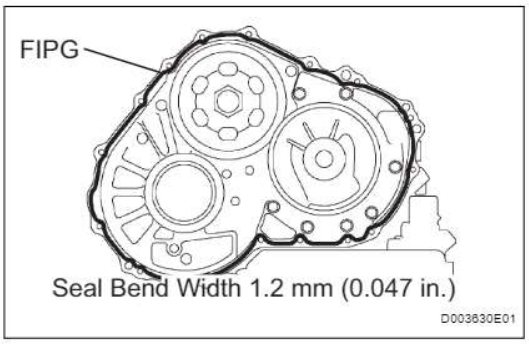
AX



(b) Coat the O-ring of oil pump with ATF.

NOTICE:

Confirm the input shaft rotates smoothly with the manual operation after assembling the oil pump.



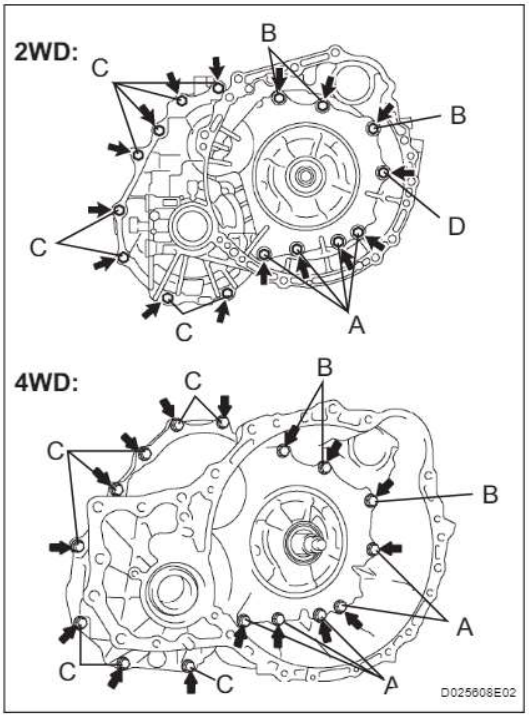
50. INSTALL TRANSAXLE HOUSING

(a) Remove any parking material and be careful not to get oil on the contacting 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



(c) Install the transaxle housing and 16 bolts to the transaxle case.

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 D

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

HINT:

Apply seal packing or equivalent to the bolt 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.)

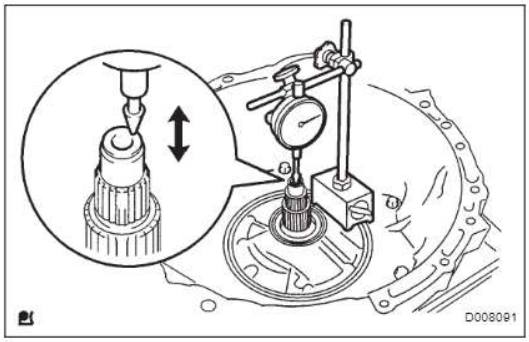
Bolt D:

72 mm (2.835 in.)

NOTICE:

Because the bolt A is a seal bolt, apply the seal packing to new bolts and tighten them within 10 minutes after application.

AX

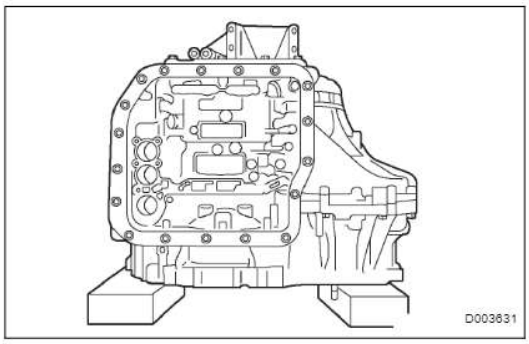


51. INSPECT INPUT SHAFT ENDPLAY

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

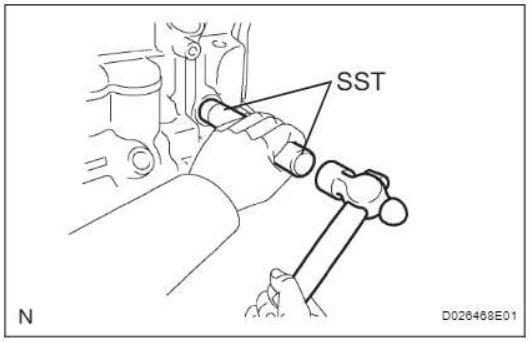
End play:

0.262 - 1.249 mm (0.0100 - 0.0494 in.)



52. FIX AUTOMATIC TRANSAXLE ASSEMBLY

(a) Fix the transaxle assembly.



53. INSTALL MANUAL VALVE LEVER SHAFT OIL SEAL

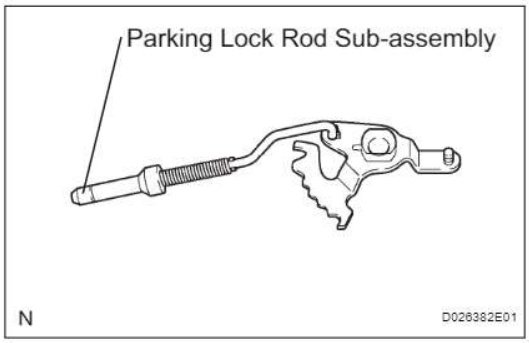
(a) Coat a new oil seal with MP grease.

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

(b) Install the oil seal to the transaxle case.

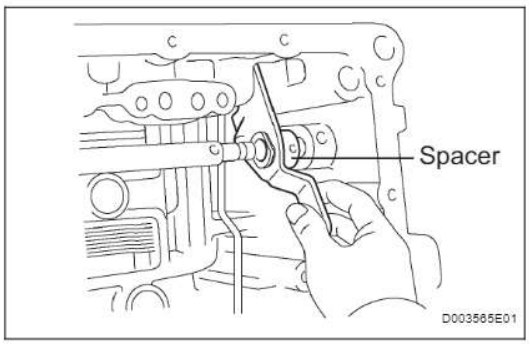
Oil seal drive in depth:

0 +- 0.5 mm (0 +- 0.197 in.)



54. INSTALL PARKING LOCK ROD SUB-ASSEMBLY

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



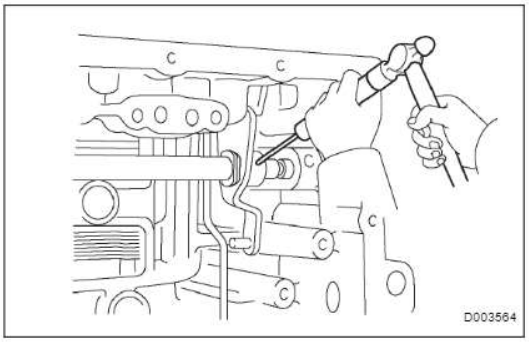
55. INSTALL MANUAL VALVE LEVER SUB-ASSEMBLY

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

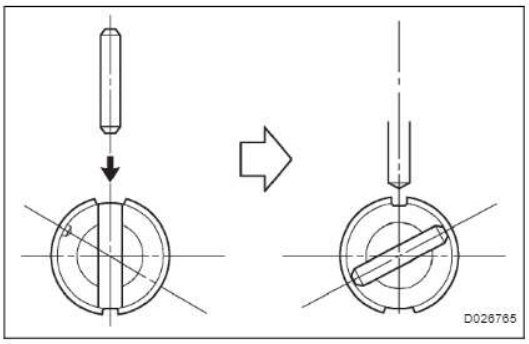
NOTICE:

Do not damage on the oil seal during assembling the shaft to the transaxle case.

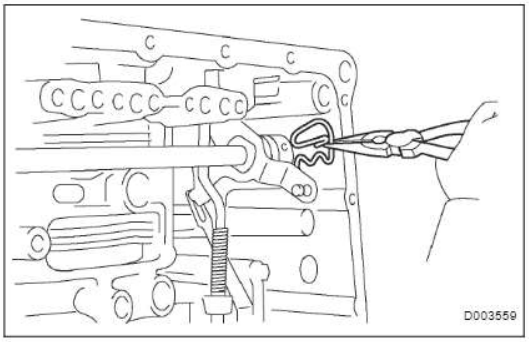
AX



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

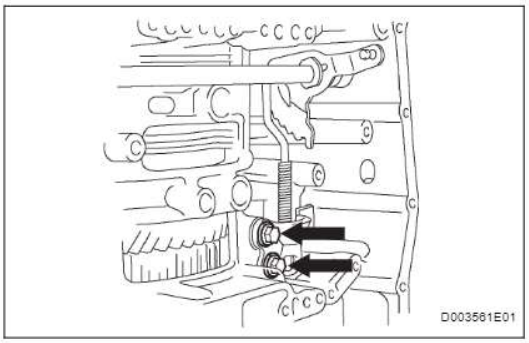


(c) Turn the spacer and the lever shaft to align the small hole for locating the staking position in the spacer with the staking position mark on the lever shaft.
(d) Using a pin punch, stake the spacer through the small hole.
(e) Check that the spacer does not turn.



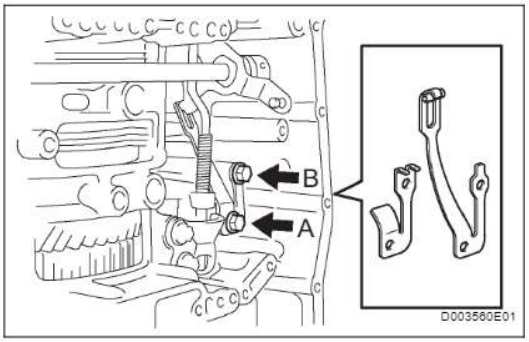
56. INSTALL MANUAL VALVE LEVER SHAFT RETAINER SPRING

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



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.)
NOTICE:
Be sure the parking rod is placed between the parking pawl and the guide of the parking bracket when the parking bracket is assembled.

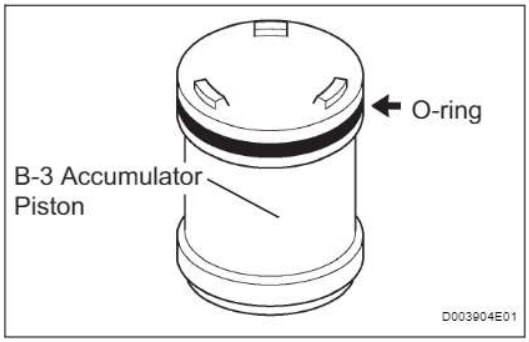


58. INSTALL MANUAL DETENT SPRING SUB-ASSEMBLY

(a) Install the manual detent spring with the 2 bolts.
NOTICE:
Make sure to install the manual detent spring and cover in this order.
HINT:
Tighten them in the order, A and B.
Torque: Bolt A
20 N*m (205 kgf*cm, 15 ft.*lbf)

AX

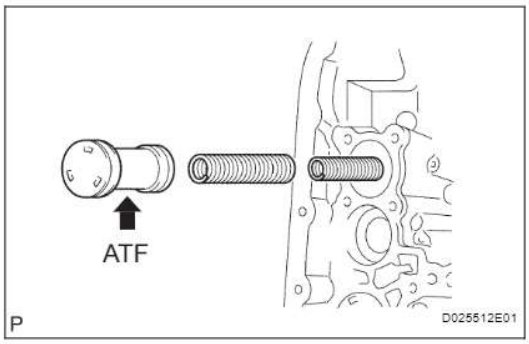
Bolt B
12 N*m (120 kgf*cm, 9 ft.*lbf)
Bolt length:
Bolt A:
27 mm (1.063 in.)
Bolt B:
16 mm (0.630 in.)



59. INSTALL B-3 ACCUMULATOR PISTON

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

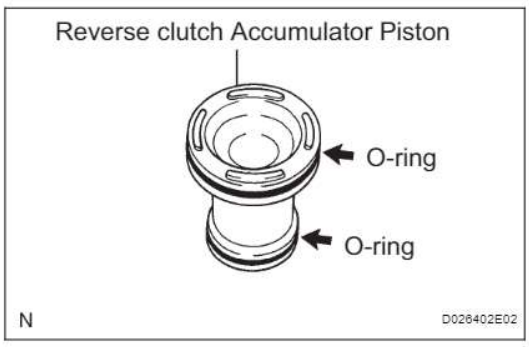
NOTICE:
Install the O-ring to the accumulator piston and the accumulator sleeve not to have a twist and a protrusion. Moreover, apply enough ATF prior to assembling. Be sure to the installed position.



(b) Coat the piston with ATF, install it to the transaxle case.

NOTICE:
Install the springs to each accumulator piston with checking of the identification color or each spring.
Accumulator spring:

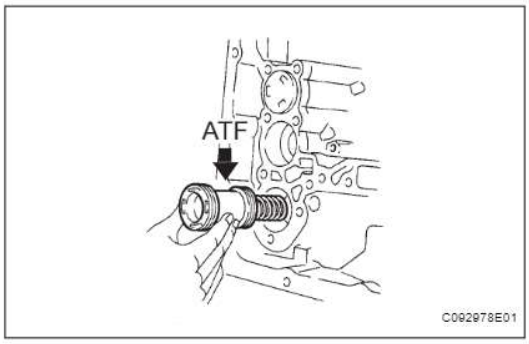
Free length Outer diameter mm (in.)	Color
Inner 62.00 (2.4409) / 15.50 (0.610)	Purple
Outer 74.23 (2.9224) / 21.70 (0.854)	Purple



60. INSTALL REVERSE CLUTCH ACCUMULATOR PISTON

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

NOTICE:
Install the O-ring to the accumulator piston and the accumulator sleeve not to have a twist and a protrusion. Moreover, apply enough ATF prior to assembling. Be sure to the installed position.

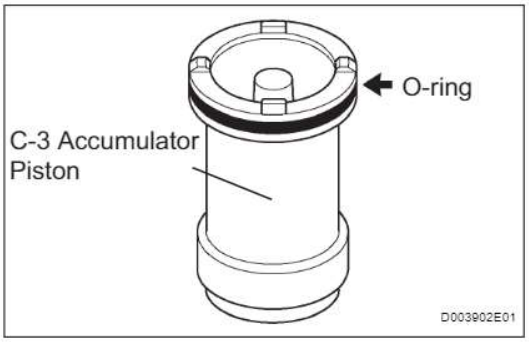


(b) Coat the piston with ATF, install it to the transaxle case.

NOTICE:
Install the springs to each accumulator piston with checking of the identification color or each spring.
Accumulator spring:

Free length Outer diameter mm (in.)	Color
60.96 (2.3999) / 14.10 (0.555)	Yellow

AX

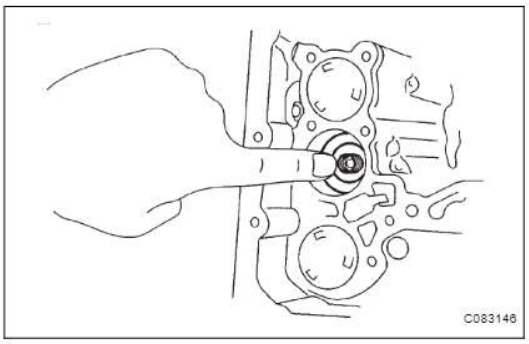


61. INSTALL C-3 ACCUMULATOR PISTON

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

NOTICE:

Install the O-ring to the accumulator piston and the accumulator sleeve not to have a twist and a protrusion. Moreover, apply enough ATF prior to assembling. Be sure to the installed position.



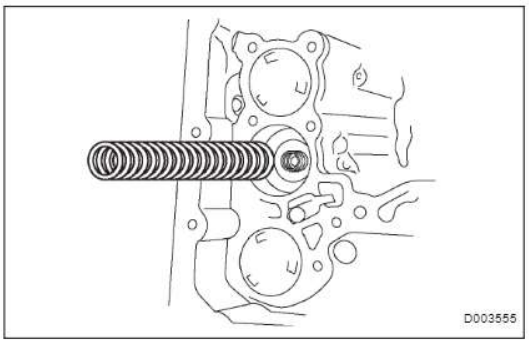
(b) Coat the piston with ATF, install it to the transaxle case.

NOTICE:

Install the springs to each accumulator piston with checking of the identification color or each spring.

Accumulator spring:

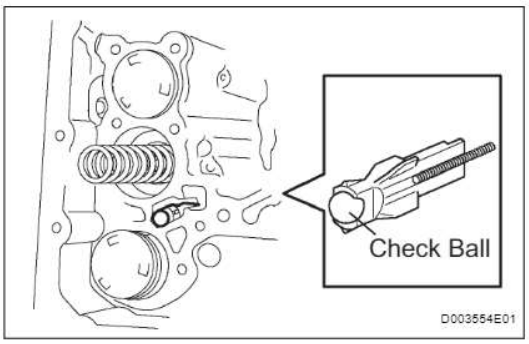
Free length Outer diameter mm (in.)	Color
72.20 (2.8425) / 19.0 (0.748)	Colorless



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

NOTICE:

Install the springs to each accumulator piston with checking of the identification color or each spring.



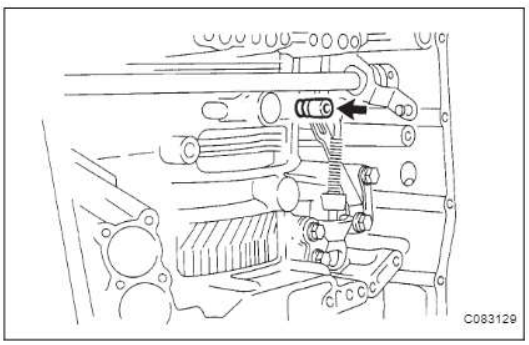
62. INSTALL CHECK BALL BODY

(a) Coat the check ball body with ATF.

(b) Install the check ball body and spring.

NOTICE:

Regarding the installation of the spring for the check ball body, be sure to place the spring in the hole in the ball body. Be careful about the parts orientation.



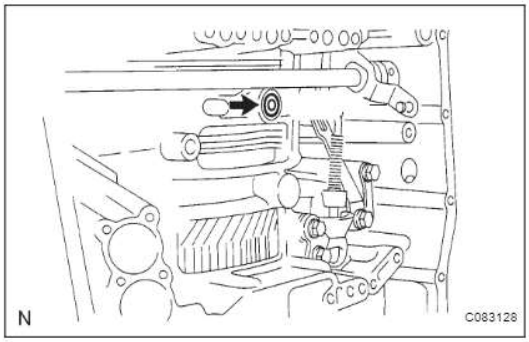
63. INSTALL BRAKE DRUM GASKET

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

NOTICE:

Be sure not to damage the lip portion of the transaxle case brake gasket when inserting the gasket to the case. Moreover, apply enough ATF to the gasket prior to assembling. Also, be careful about the parts orientation.

AX

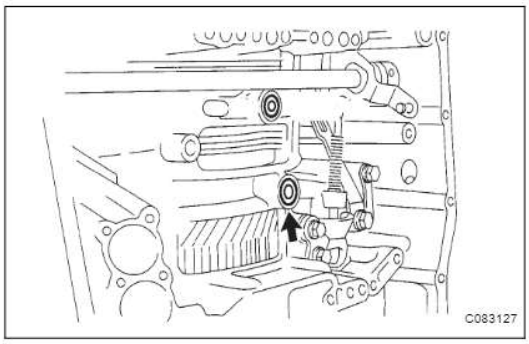


64. INSTALL TRANSAXLE CASE 2ND BRAKE GASKET

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

NOTICE:

Be sure not to damage the lip portion of the transaxle case brake gasket when inserting the gasket to the case. Moreover, apply enough ATF to the gasket prior to assembling. Also, be careful about the parts orientation.

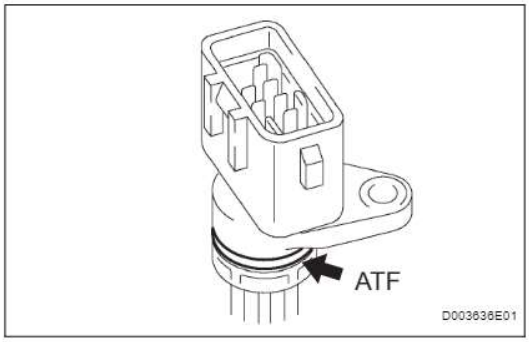


65. INSTALL GOVERNOR APPLY GASKET NO.1

(a) Coat a new governor apply gasket No. 1 with ATF, install it to the transaxle case.

NOTICE:

Be sure not to damage the lip portion of the transaxle case brake gasket when inserting the gasket to the case. Moreover, apply enough ATF to the gasket prior to assembling. Also, be careful about the parts orientation.

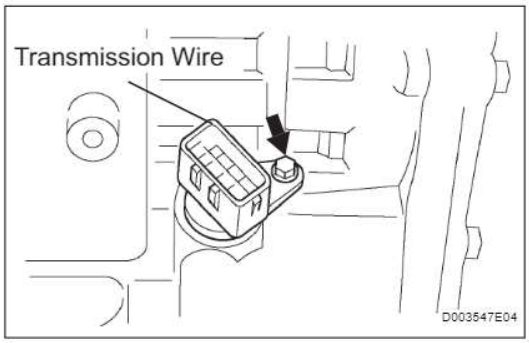


66. INSTALL TRANSMISSION WIRE

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

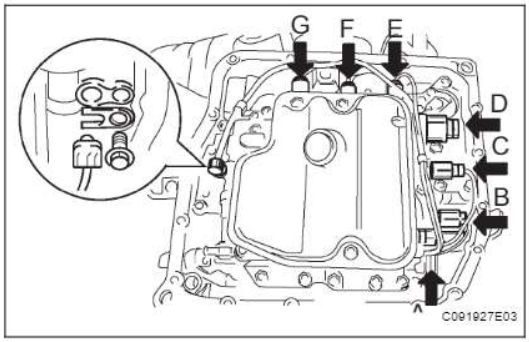
NOTICE:

Be careful about the O-ring not to have a twist, a protrusion and a pinching during installing the wire transmission to the transaxle case. Moreover, apply enough ATF to the O-ring prior to assembling.



(b) Install the transmission wire retaining bolt.

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



67. CONNECT TRANSMISSION WIRE

(a) Coat a O-ring of the ATF temperature sensor with ATF.

(b) Install the ATF temperature sensor, with the lock plate and bolt.

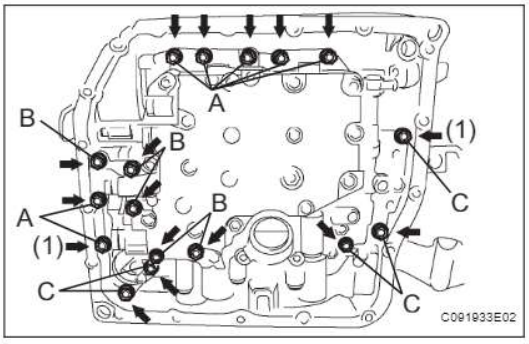
Torque: 6.6 N*m (67 kgf*cm, 58 in.*lbf)

(c) Connect the 7 solenoid connectors.

NOTICE:

- **Connect the connector to A, B, C, D, E, F, G, from shorter one.**
- **Apply ATF to the bolt.**

AX

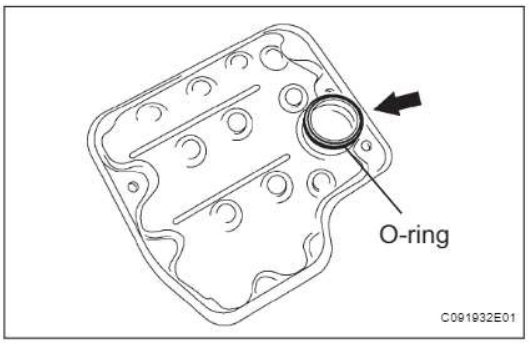


68. INSTALL TRANSMISSION VALVE BODY ASSEMBLY

(a) Make sure that the manual valve lever position, install the valve body with 17 bolts to the transaxle case.

Torque: 11 N*m (110 kgf*cm, 8 in.*lbf)
Bolt length:
Bolt A:
41 mm (1.614 in.)
Bolt B:
57 mm (2.244 in.)
Bolt C:
25 mm (0.984 in.)
NOTICE:

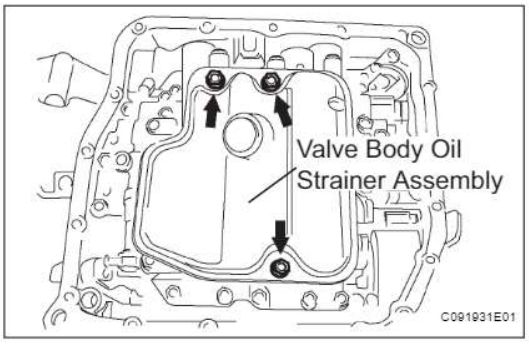
- **Push the valve body against the accumulator piston spring and the check ball body to install it.**
- **When installing the valve body to the transaxle case, do not hold the solenoids.**
- **Tighten temporarily those bolts marked by (1) in the illustration first because they are positioning bolts.**



69. INSTALL VALVE BODY OIL STRAINER ASSEMBLY

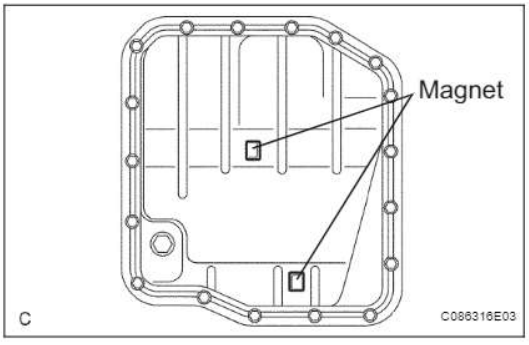
(a) Coat a new O-ring with ATF, install it to the oil strainer.

NOTICE:
Assemble the O-ring carefully not to have a twist and a pinching. Moreover, apply enough ATF to the O-ring prior to assembling.



(b) Install the oil strainer and 3 bolts to the valve body.

Torque: 11 N*m (110 kgf*cm, 8 ft.*lbf)
NOTICE:
Apply ATF to the bolts.



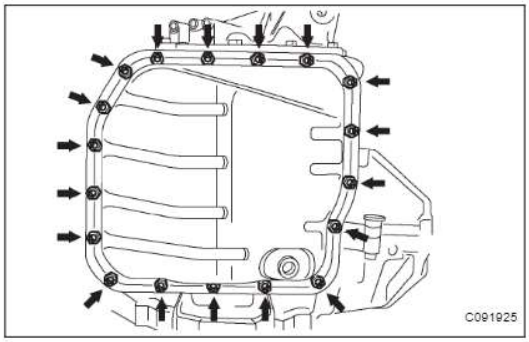
70. INSTALL AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY

(a) Install the 2 magnets in the oil pan.

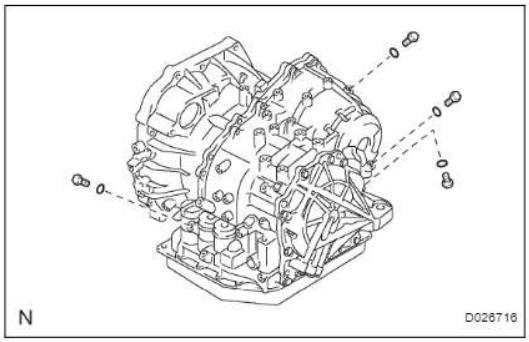
(b) Apply seal packing or equivalent to new 18 bolts.

Seal packing:
THREE BOND 2430 or equivalent

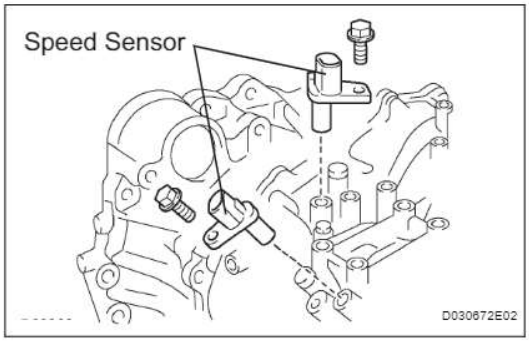
AX



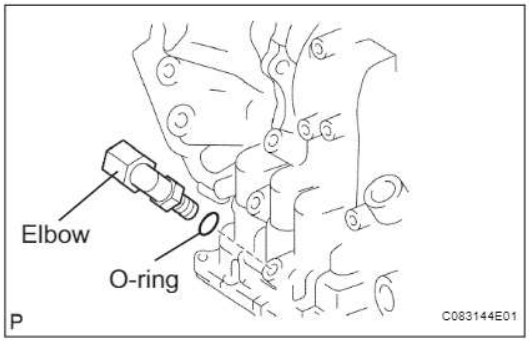
(c) Install the new oil pan gasket with the 18 bolts to the transaxle case.
Torque: 7.8 N*m (80 kgf*cm, 69 in.*lbf)
NOTICE:
- **Because the bolts should be seal bolts, apply seal packing to new bolts and tighten them within 10 minutes after application.**
- **Remove any oil or grease from the contacting surface of the transaxle case and the oil pan with the gasket completely before the oil pan to the case.**



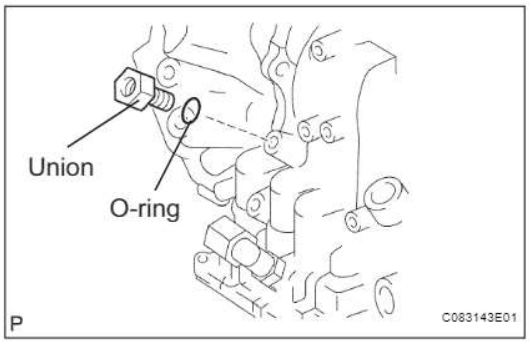
71. INSTALL TRANSAXLE CASE NO.1 PLUG
(a) Coat the 4 new O-rings with ATF, install them to the 4 transaxle case No. 1 plugs.
(b) Install the 4 transaxle case No. 1 plugs to the transaxle case.
Torque: 7.4 N*m (75 kgf*cm, 65 in.*lbf)



72. INSTALL SPEED SENSOR
(a) 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)



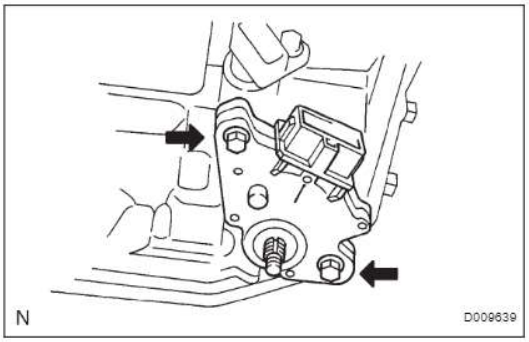
73. INSTALL OIL COOLER TUBE UNION (OUTLET OIL COOLER UNION)
(a) Coat a new O-ring with ATF, install it to the elbow.
(b) Install the elbow to the transaxle case.
Torque: 27 N*m (276 kgf*cm, 20 ft.*lbf)



74. INSTALL OIL COOLER TUBE UNION (INLET OIL COOLER UNION)
(a) Coat a new O-ring with ATF, 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 into the transaxle case certainly.

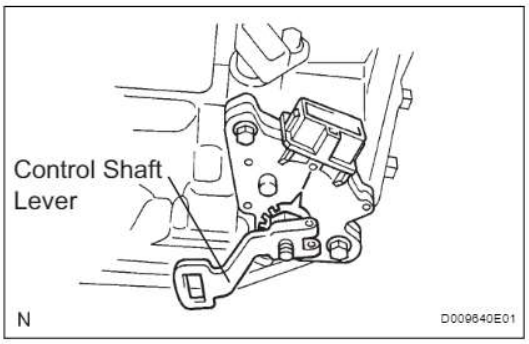
AX



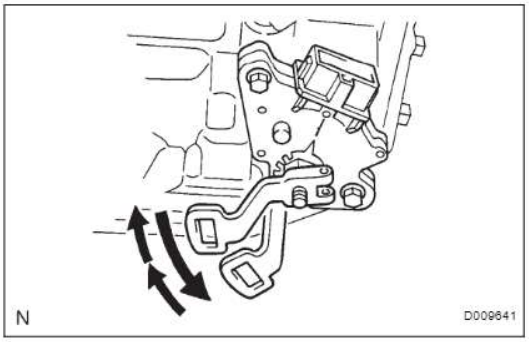
76. INSTALL PARK/NEUTRAL POSITION SWITCH ASSEMBLY

(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)

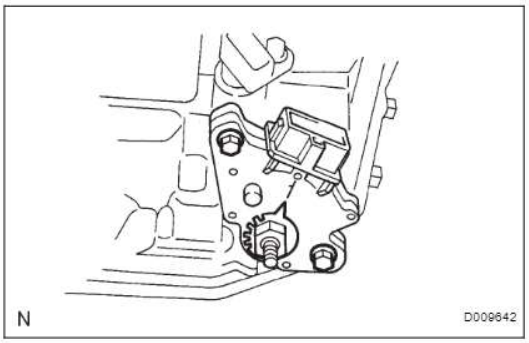


(c) Temporarily install control shaft lever.



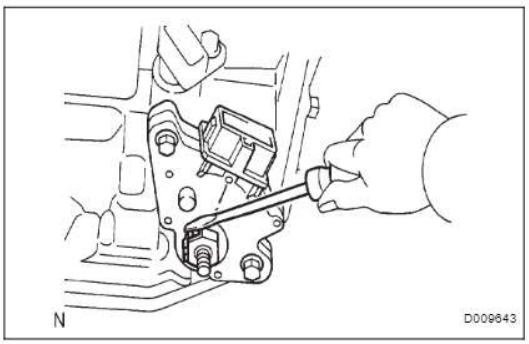
(d) Turn the lever counterclockwise until it stops, and then turn it clockwise 2 notches.

(e) Remove the control shaft lever.



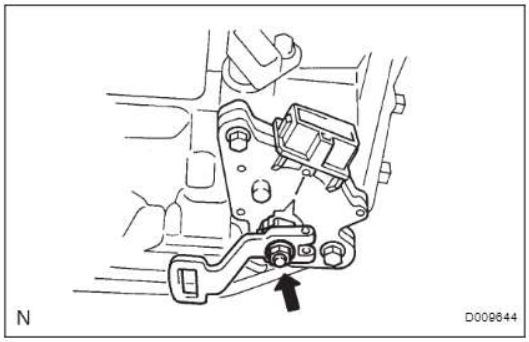
(f) Align the groove with neutral basic line.

(g) Tighten the 2 bolts.
Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)



(h) Using a screwdriver, stake the nut with the nut stopper.

AX



(i) Install the control shaft lever, washer and nut.
Torque: 13 N*m (130 kgf*cm, 9 ft.*lbf)

77. INSTALL SPEEDOMETER DRIVE 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)

AX

AUTOMATIC TRANSAXLE UNIT

DISASSEMBLY

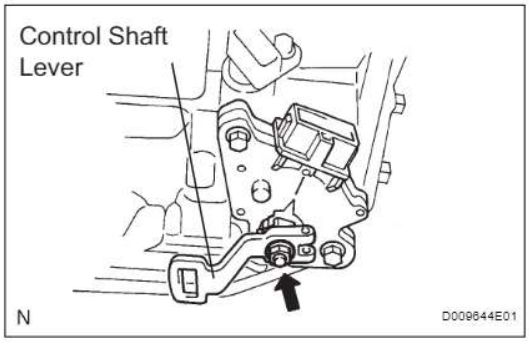
1. REMOVE SPEEDOMETER DRIVEN HOLE (ATM) COVER SUB-ASSEMBLY

(a) Remove the bolt and speedometer driven hole cover sub-assembly from the transaxle assembly.

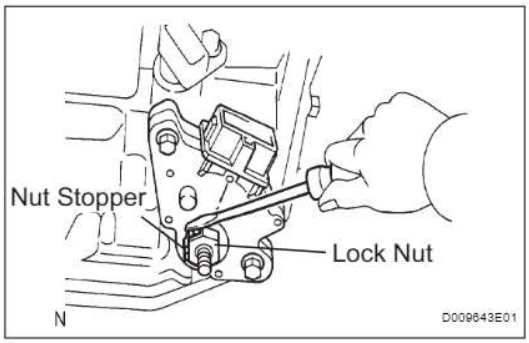
(b) Remove the O-ring from the speedometer driven hole cover.

2. REMOVE PARK/NEUTRAL POSITION SWITCH ASSEMBLY

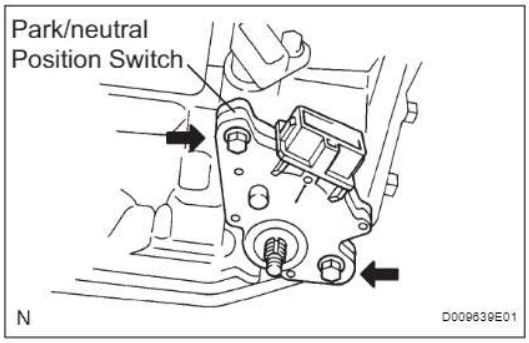
(a) Remove the nut, washer and control shaft lever.



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



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



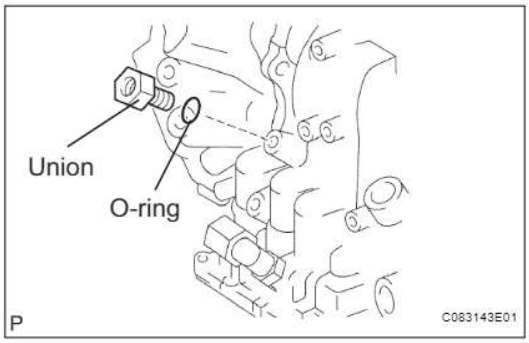
3. REMOVE BREATHER PLUG HOSE

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

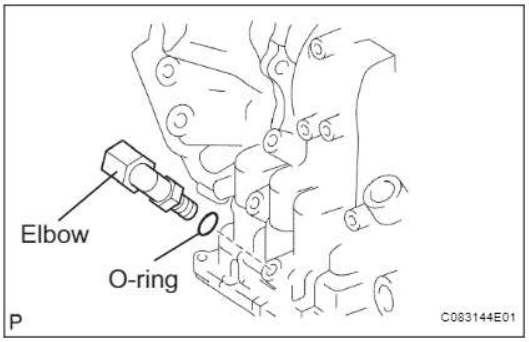
4. REMOVE OIL COOLER TUBE UNION (INLET OIL COOLER UNION)

(a) Remove the union.

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



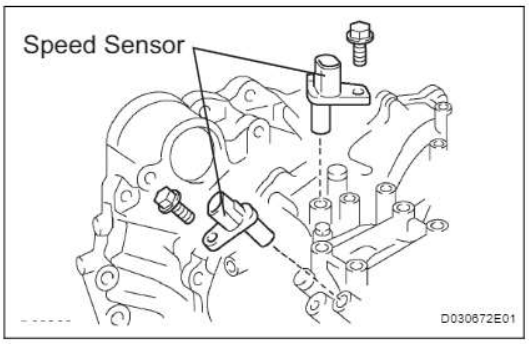
AX



5. REMOVE OIL COOLER TUBE UNION (OUTLET OIL COOLER UNION)

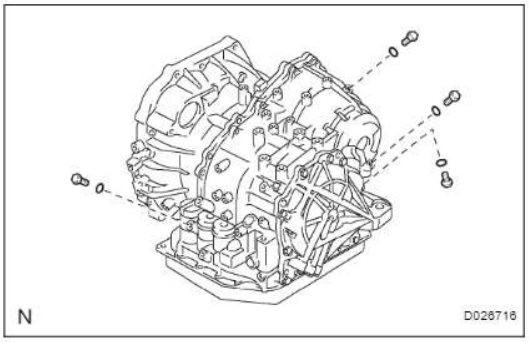
(a) Remove the elbow.

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



6. REMOVE SPEED SENSOR

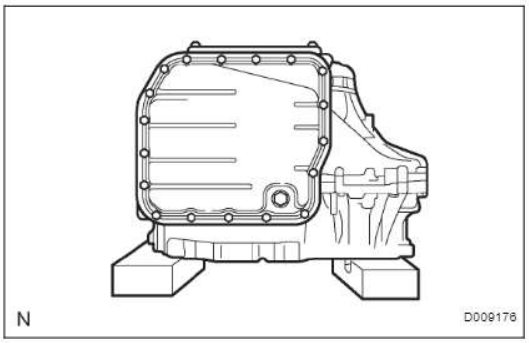
(a) Remove the 2 bolts and the 2 speed sensors from the transaxle assembly.



7. REMOVE TRANSAXLE CASE NO.1 PLUG

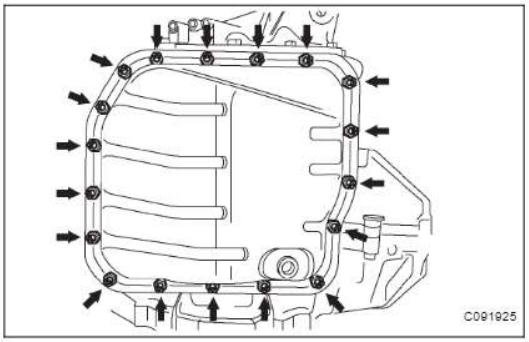
(a) Remove the 4 transaxle case No. 1 plugs from the transaxle case.

(b) Remove the 4 O-rings from the 4 transaxle case No.1 plugs.



8. FIX AUTOMATIC TRANSAXLE ASSEMBLY

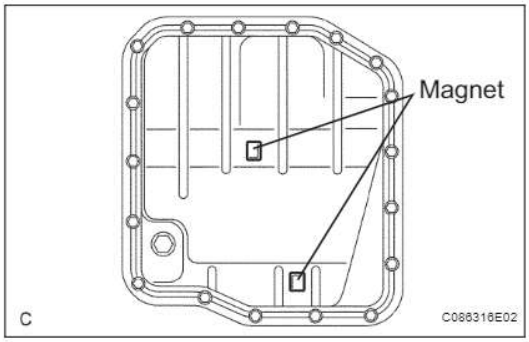
(a) Fix the transaxle assembly.



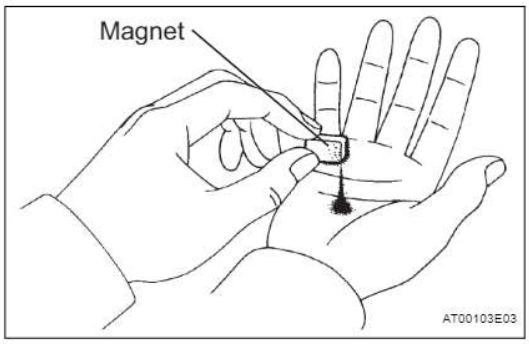
9. REMOVE AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY

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

AX



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

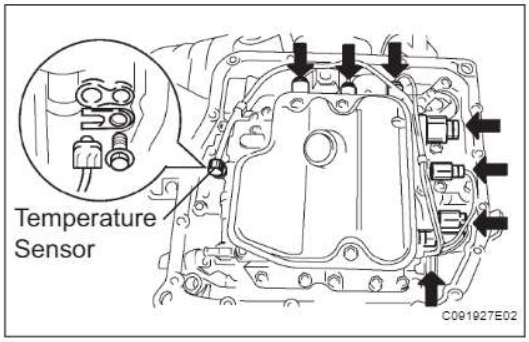


10. INSPECT TRANSMISSION OIL CLEANER MAGNET

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

Result:

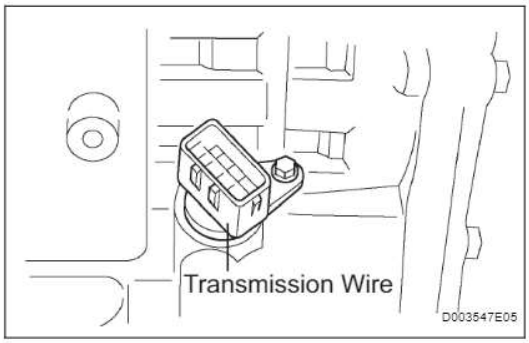
Steel (magnetic:
bearing, gear and plate wear
Brass (non-magnetic):
bushing wear



11. DISCONNECT TRANSMISSION WIRE

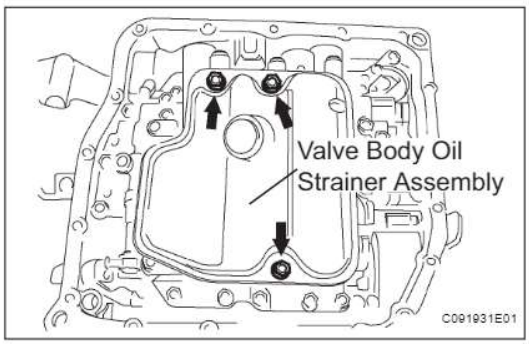
(a) Remove the 7 connectors from the shift solenoid valves.

(b) Remove the bolt, lock plate and ATF temperature sensor.



12. REMOVE TRANSMISSION WIRE

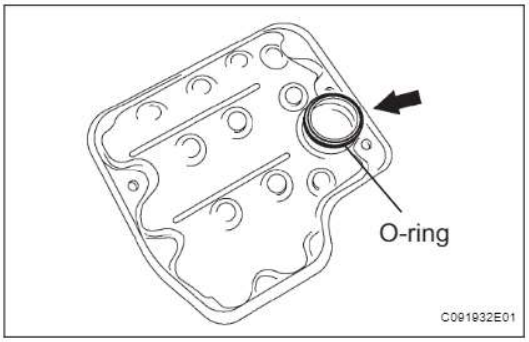
(a) Remove the bolt and transmission wire from the transaxle case.



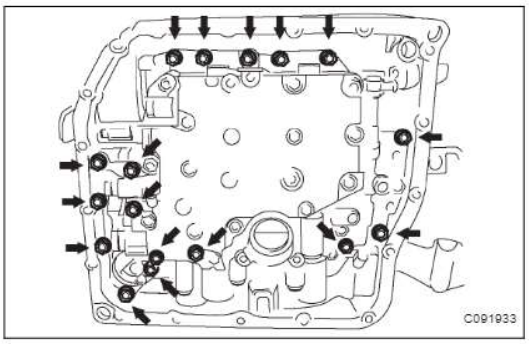
13. REMOVE VALVE BODY OIL STRAINER ASSEMBLY

(a) Remove the 3 bolts and oil strainer.

AX

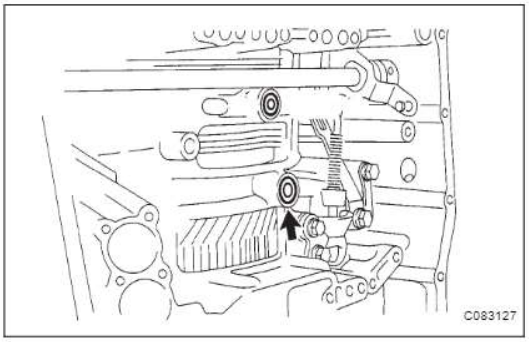


(b) Remove the O-ring from the oil strainer.



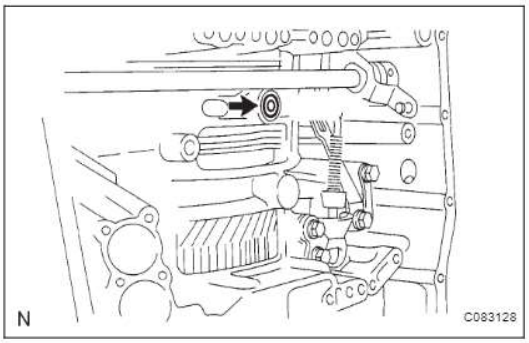
14. REMOVE TRANSMISSION VALVE BODY ASSEMBLY

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



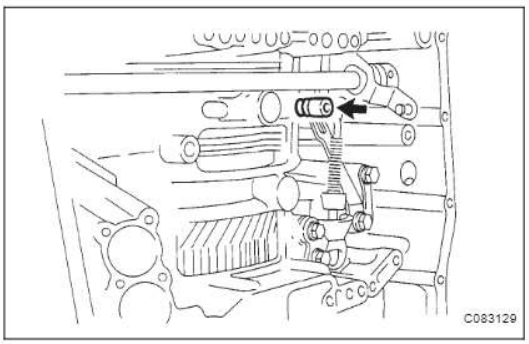
15. REMOVE GOVERNOR APPLY GASKET NO.1

(a) Remove the governor apply gasket No.1 from the transaxle case.



16. REMOVE TRANSAXLE CASE 2ND BRAKE GASKET

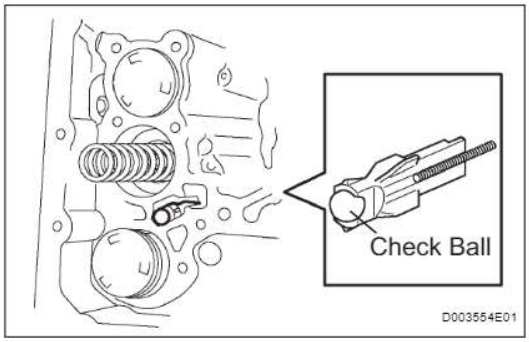
(a) Remove the transaxle case 2nd brake gasket from the transaxle case.



17. REMOVE BRAKE DRUM GASKET

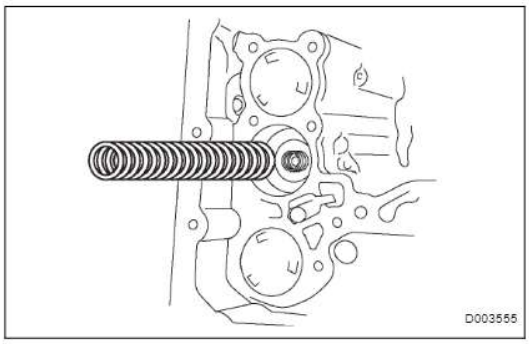
(a) Remove the transaxle case 2nd brake gasket from the transaxle case.

AX



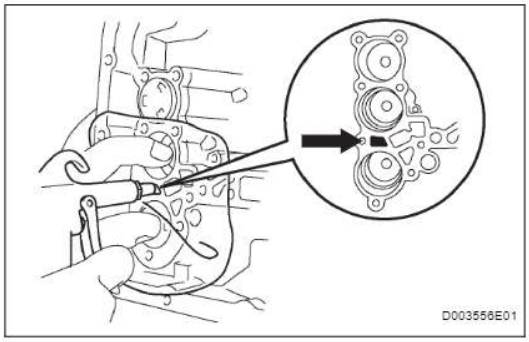
18. REMOVE CHECK BALL BODY

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



19. REMOVE C-3 ACCUMULATOR PISTON

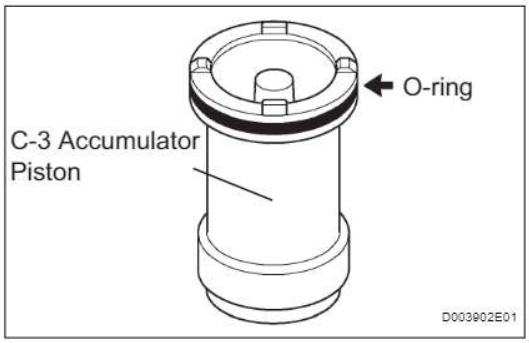
(a) Remove the spring from the C-3 accumulator piston.



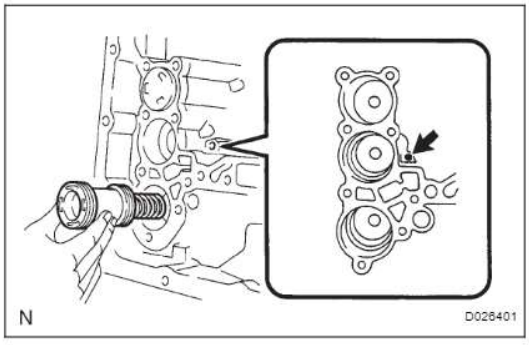
(b) Apply compressed air (392 kPa, 4.0 kgf/cm ^{2}, 57 psi) to the oil hole and remove the C-3 accumulator piston.

NOTICE:

- **Blowing off the air may cause the piston to jump-out. When removing the piston, hold it by your hand using a waste cloth.**
- **Take care not to splash ATF when air-blowing.**



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



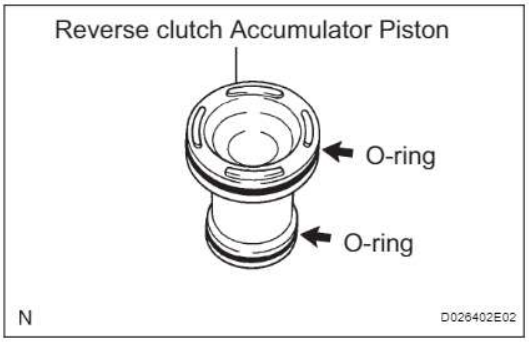
20. REMOVE REVERSE CLUTCH ACCUMULATOR PISTON

(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.

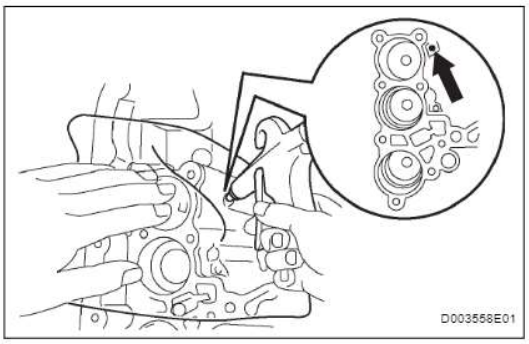
NOTICE:

- **Blowing off the air may cause the piston to jump-out. When removing the piston, hold it by your hand using a waste cloth.**
- **Take care not to splash ATF when air-blowing.**

AX



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

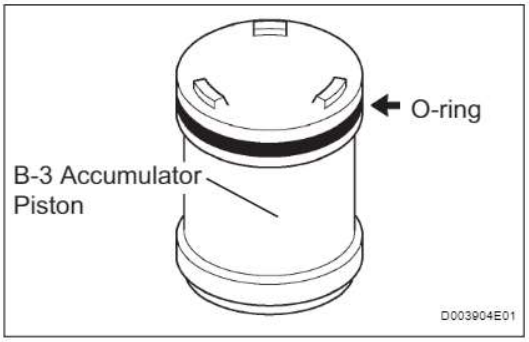


21. REMOVE B-3 ACCUMULATOR PISTON

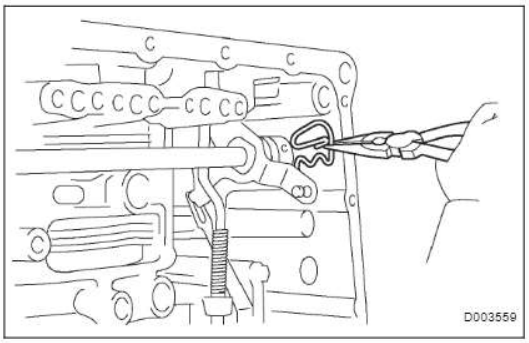
(a) Apply compressed air (392 kPa, 4.0 kgf/cm ^{2}, 57 psi) to the oil hole and remove the B-3 accumulator piston and 2 springs.

NOTICE:

- **Blowing off the air may cause the piston to jump-out. When removing the piston, hold it by your hand using a waste cloth.**
- **Take care not to splash ATF when air-blowing.**

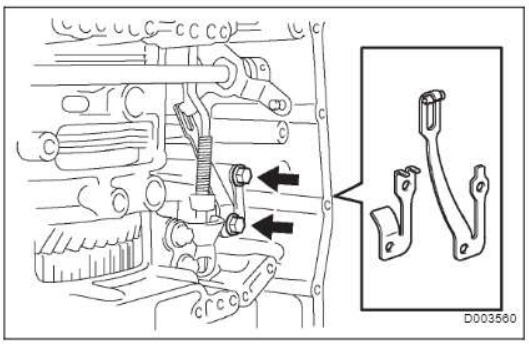


(b) Remove the O-ring from the B-3 accumulator piston.



22. REMOVE MANUAL VALVE LEVER SHAFT RETAINER SPRING

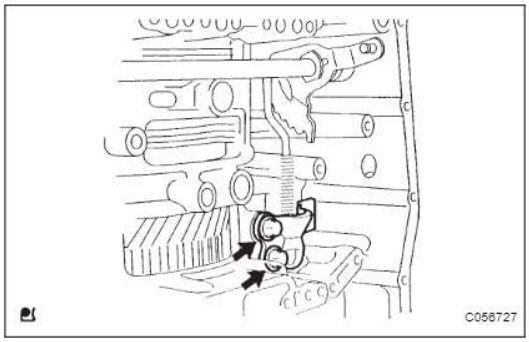
(a) Using a needle-nose pliers, remove the manual valve lever shaft retainer spring.



23. REMOVE MANUAL DETENT SPRING SUB-ASSEMBLY

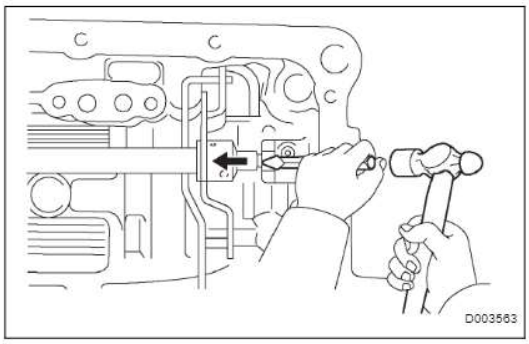
(a) Remove the 2 bolts, the manual detent spring sub-assembly and cover.

AX



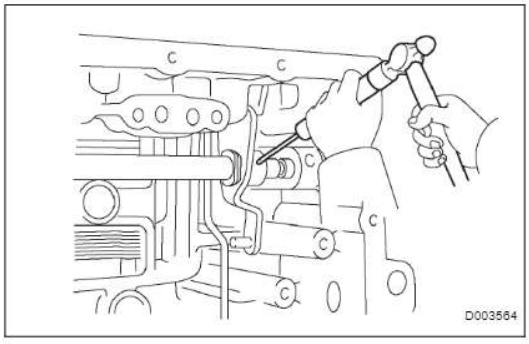
24. REMOVE PARKING LOCK PAWL BRACKET

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

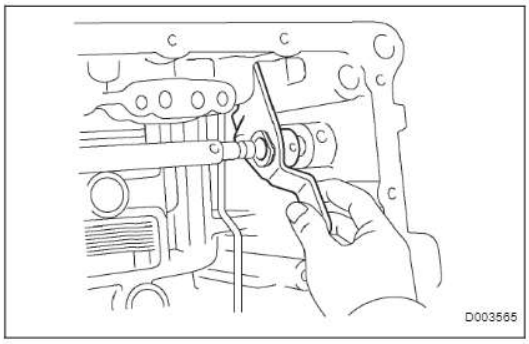


25. REMOVE MANUAL VALVE LEVER SUB-ASSEMBLY

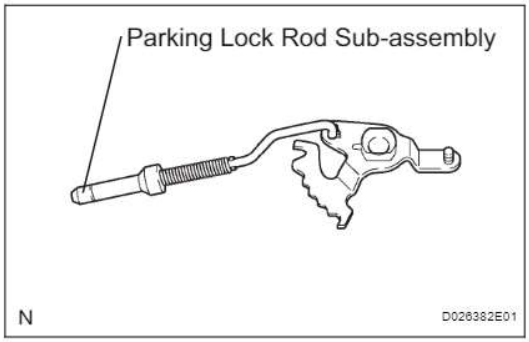
(a) Using a chisel and hammer, cut off and remove the spacer.



(b) Using a pin punch (ϕ35 mm) and hammer, drive out the pin.
HINT:
Slowly drive out the pin so that it will not fall into the transaxle case.



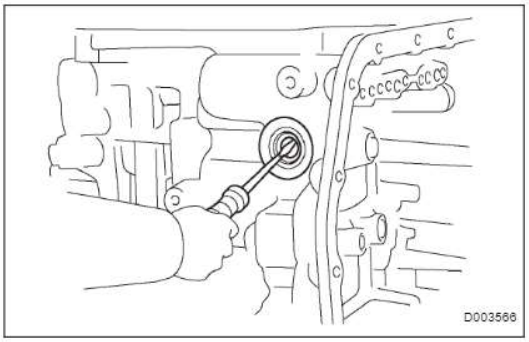
(c) Remove the manual valve lever shaft and manual valve lever.



26. REMOVE PARKING LOCK ROD SUB-ASSEMBLY

(a) Remove the parking lock rod from the manual valve lever.

AX

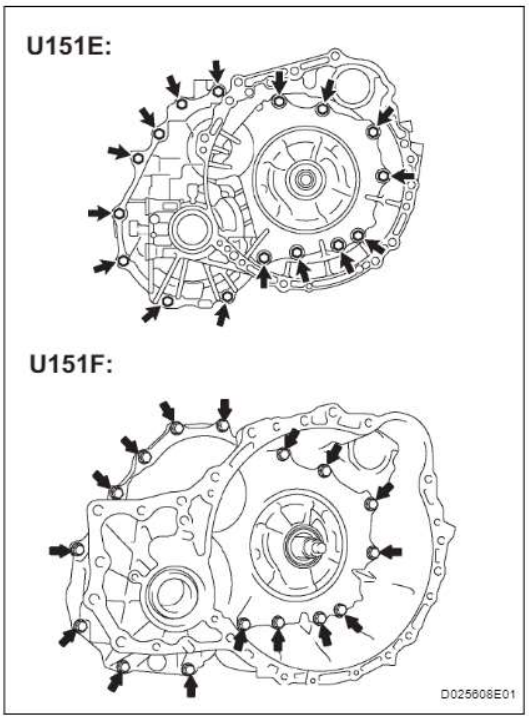


27. REMOVE MANUAL VALVE LEVER SHAFT OIL SEAL

(a) Using a screwdriver, remove the oil seal from the transaxle case.

28. FIX AUTOMATIC TRANSAXLE ASSEMBLY

(a) Fix the transaxle case with the oil pump side facing up.



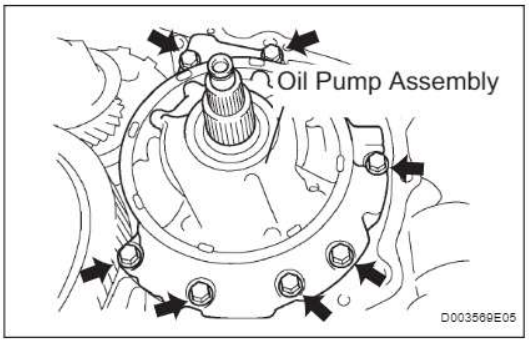
29. REMOVE TRANSAXLE HOUSING

(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.

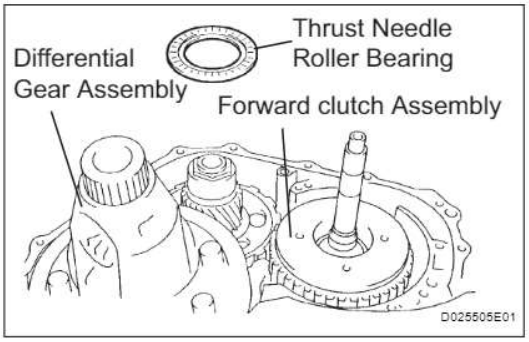
NOTICE:

Differential may be accidentally removed when the transaxle housing is removed.



30. REMOVE OIL PUMP ASSEMBLY

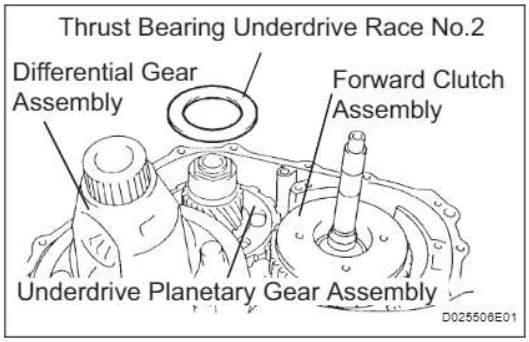
(a) Remove the 7 bolts and oil pump from the transaxle case.



31. REMOVE THRUST NEEDLE ROLLER BEARING

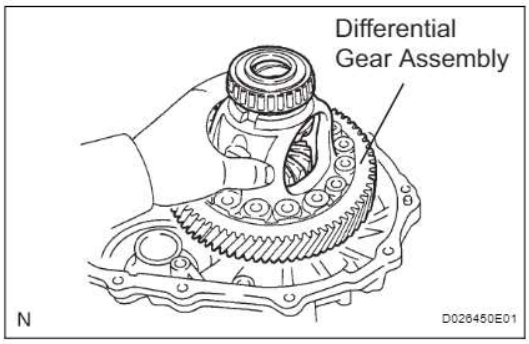
(a) Remove the thrust needle roller bearing from the underdrive planetary gear assembly.

AX



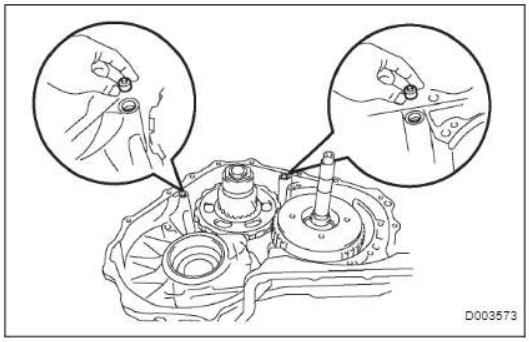
32. REMOVE THRUST BEARING UNDERDRIVE RACE NO.2

(a) Remove the thrust bearing underdrive race No. 2 from the underdrive planetary gear assembly.



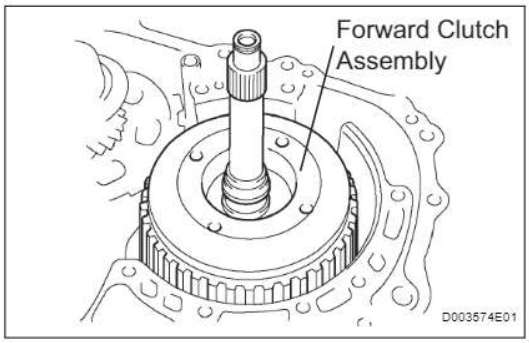
33. REMOVE DIFFERENTIAL GEAR ASSEMBLY

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



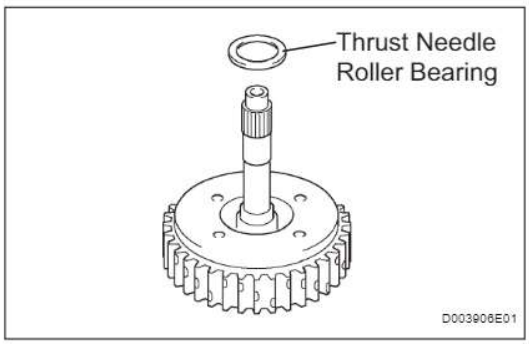
34. REMOVE OVERDRIVE BRAKE GASKET

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



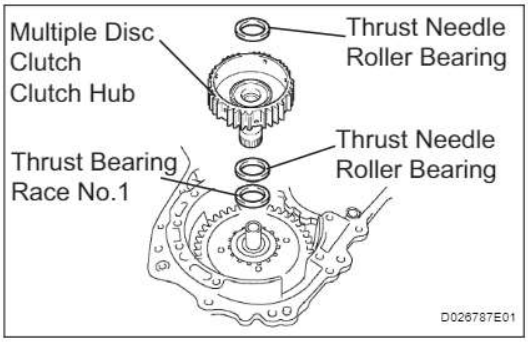
35. REMOVE FORWARD CLUTCH ASSEMBLY

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



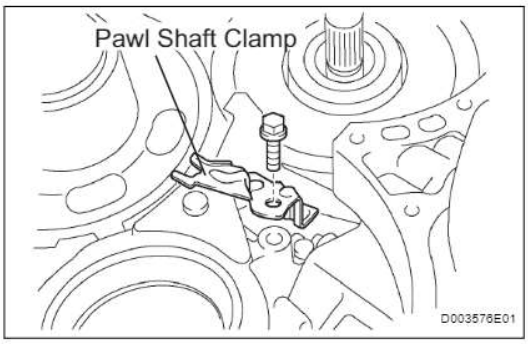
(b) Remove the thrust needle roller bearing from the forward clutch.

AX



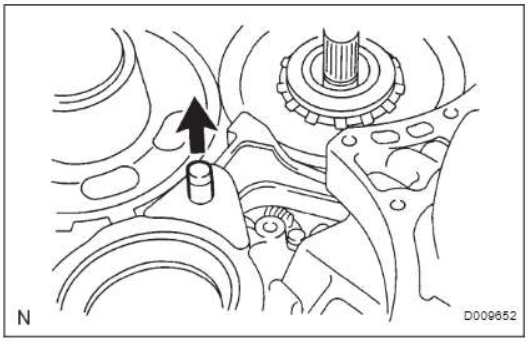
36. REMOVE MULTIPLE DISC CLUTCH CLUTCH HUB

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

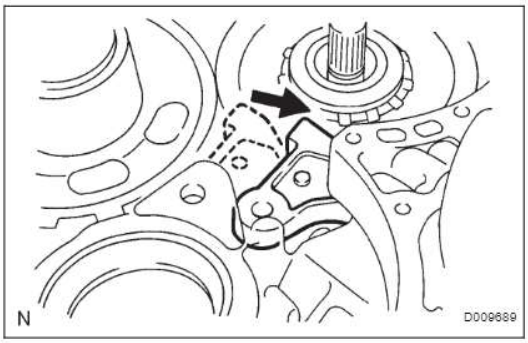


37. REMOVE UNDERDRIVE PLANETARY GEAR ASSEMBLY

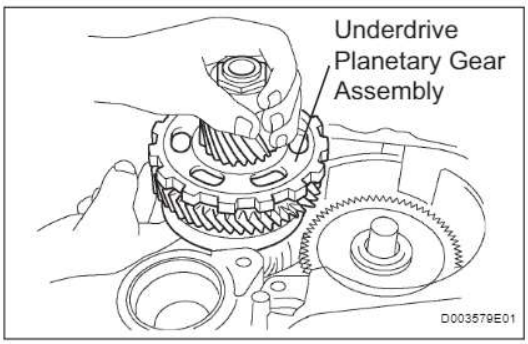
(a) Remove the bolt and pawl shaft clamp.



(b) Remove the parking lock pawl shaft.

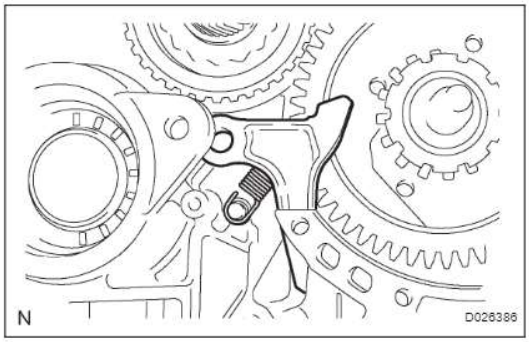


(c) Push the parking lock pawl.
HINT:
Failure to do so will cause interference when the underdrive planetary gear is removed.



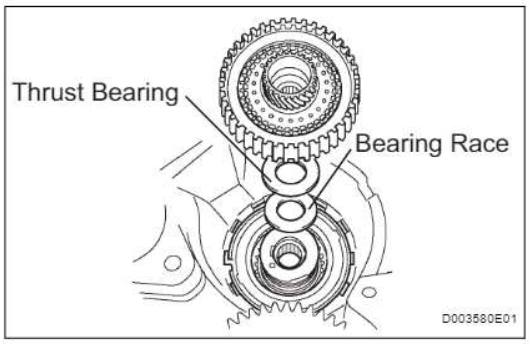
(d) Remove the underdrive planetary gear assembly from the transaxle case.
NOTICE:
Be careful so that the underdrive planetary gear assembly will not fall out.

AX



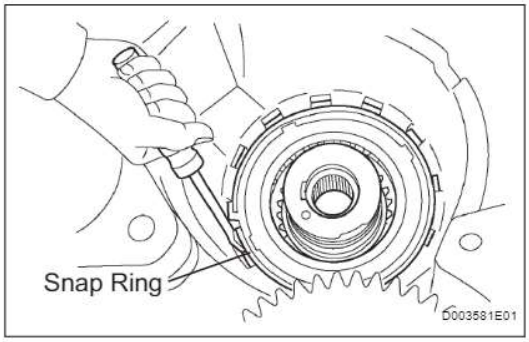
38. REMOVE PARKING LOCK PAWL

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



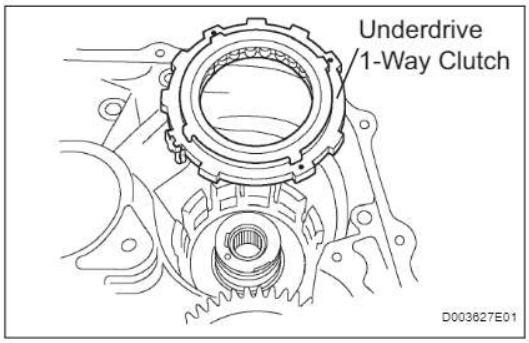
39. REMOVE UNDERDRIVE CLUTCH ASSEMBLY

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

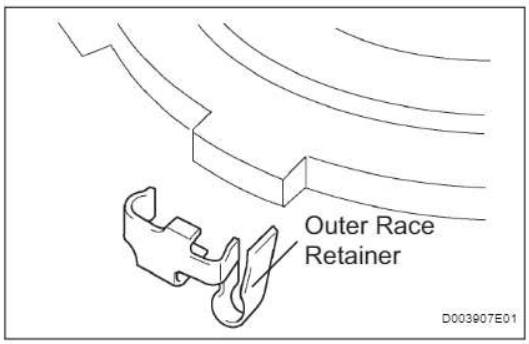


40. REMOVE UNDERDRIVE 1 WAY CLUTCH ASSEMBLY

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

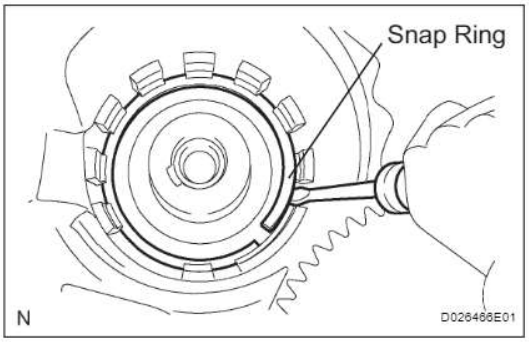


(b) Remove the underdrive 1-way clutch from the transaxle case.



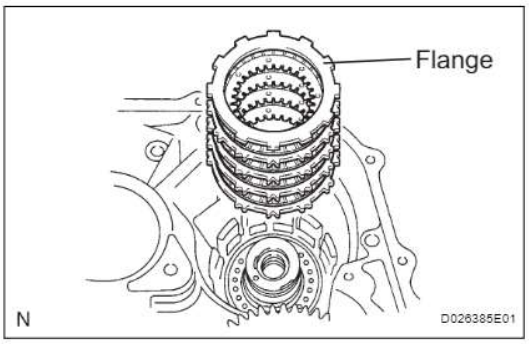
(c) Remove the outer race retainer from the 1-way clutch.

AX

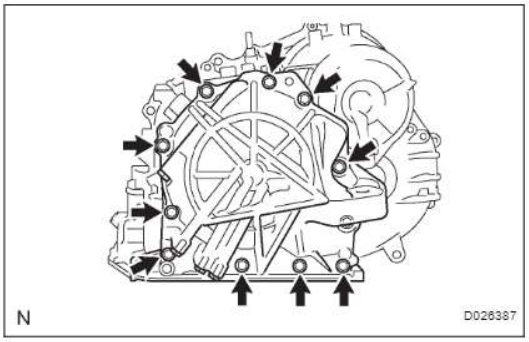


41. REMOVE UNDERDRIVE CLUTCH DISC NO.2

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



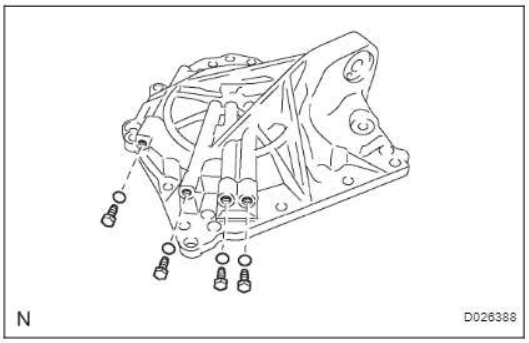
(b) Remove the flange, 4 discs and 4 plates from the transaxle case.



42. REMOVE TRANSAXLE REAR COVER SUB-ASSEMBLY

(a) Remove the 11 bolts.

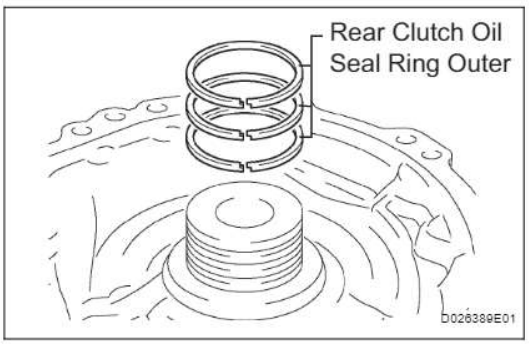
(b) Tap in the circumference of the rear cover with a plastic hammer to remove the transaxle rear cover from the transaxle case.



43. REMOVE TRANSAXLE CASE NO.1 PLUG

(a) Remove the 4 transaxle case No.1 plugs from the transaxle rear cover.

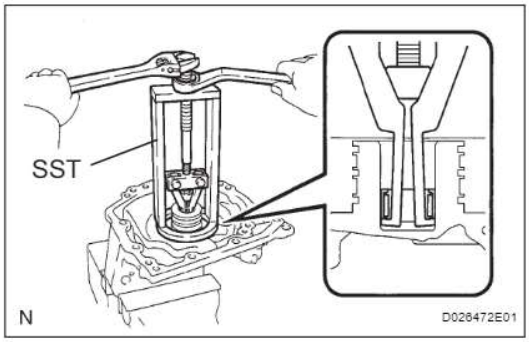
(b) Remove the 4 O-rings from the 4 transaxle case No.1 plugs.



44. REMOVE REAR CLUTCH OIL SEAL RING OUTER

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

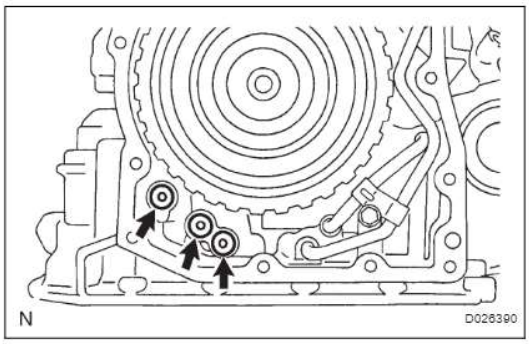
AX



45. REMOVE NEEDLE ROLLER BEARING

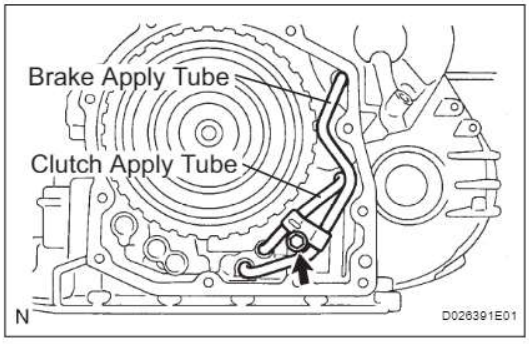
(a) Using SST, remove the needle-roller bearing from the transaxle rear cover.

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



46. REMOVE GOVERNOR APPLY GASKET NO.1

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

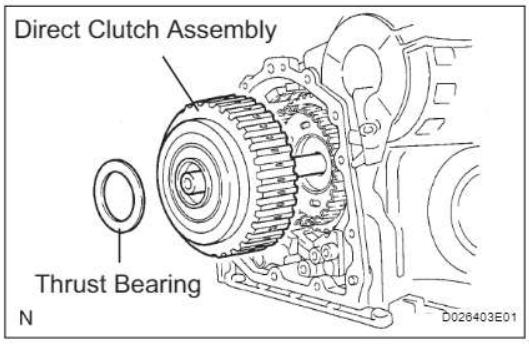


47. REMOVE BRAKE APPLY TUBE

(a) Remove the bolt, clamp and brake apply tube.

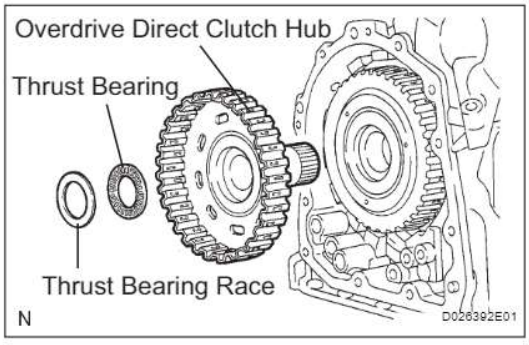
(b) Remove the clutch apply tube.

(c) Remove the brake apply tube from the clamp.



48. REMOVE DIRECT CLUTCH ASSEMBLY

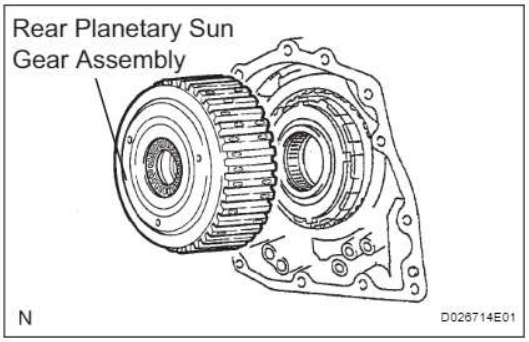
(a) Remove the thrust bearing and the direct clutch assembly from the transaxle case.



49. REMOVE OVERDRIVE DIRECT CLUTCH HUB SUB-ASSEMBLY

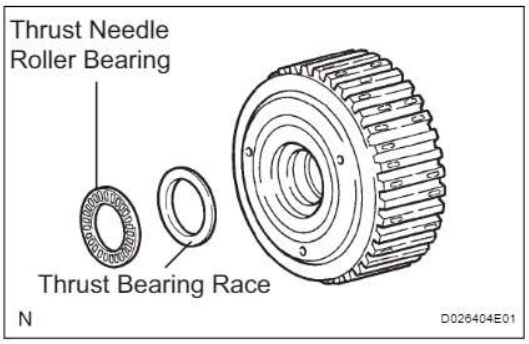
(a) Remove the thrust bearing race, thrust bearing and overdrive direct clutch hub from the planetary gear assembly.

AX

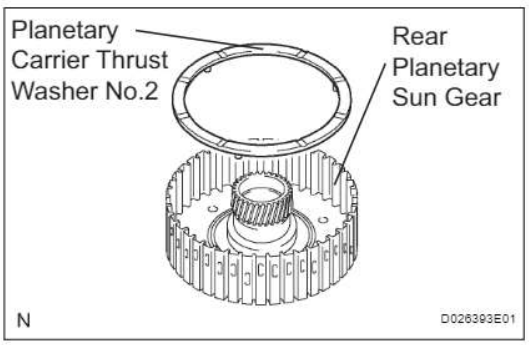


50. REMOVE REAR PLANETARY SUN GEAR ASSEMBLY

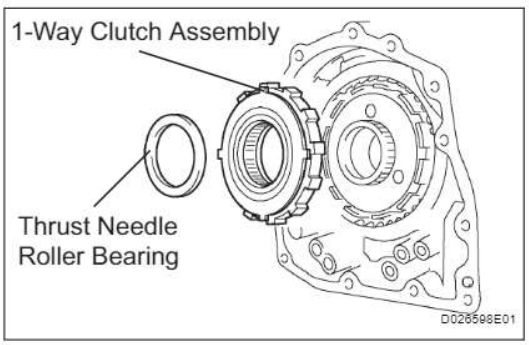
(a) Remove the rear planetary sun gear assembly from the transaxle case.



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

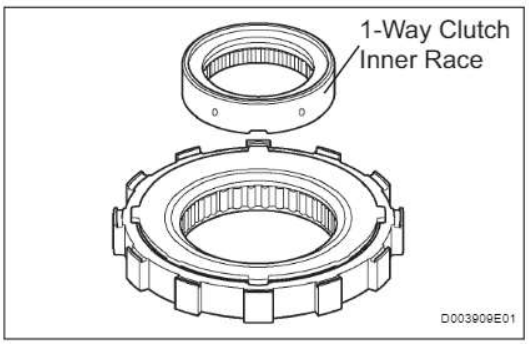


(c) Remove the planetary carrier thrust washer No.2 from the rear planetary sun gear assembly.



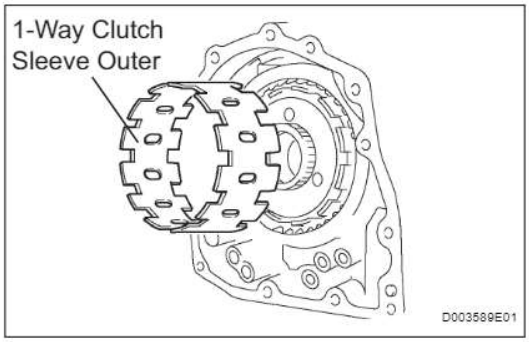
51. REMOVE ONE-WAY CLUTCH ASSEMBLY

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



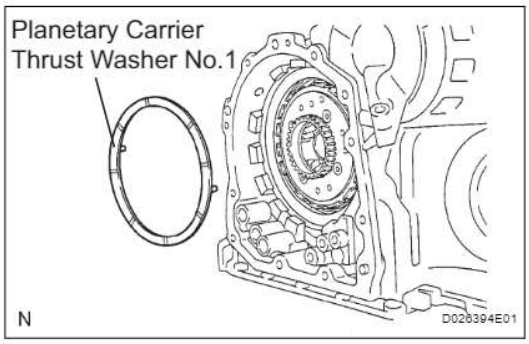
(b) Remove the 1-way clutch inner race from the 1-way clutch assembly.

AX



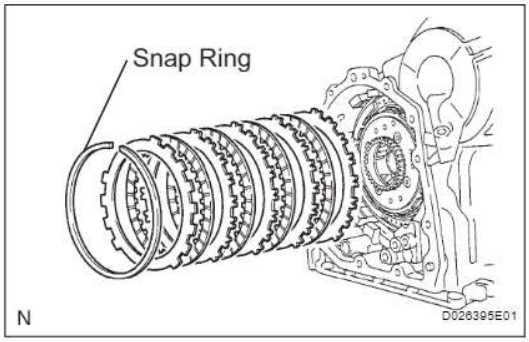
52. REMOVE ONE-WAY CLUTCH SLEEVE OUTER

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



53. REMOVE PLANETARY CARRIER THRUST WASHER NO.1

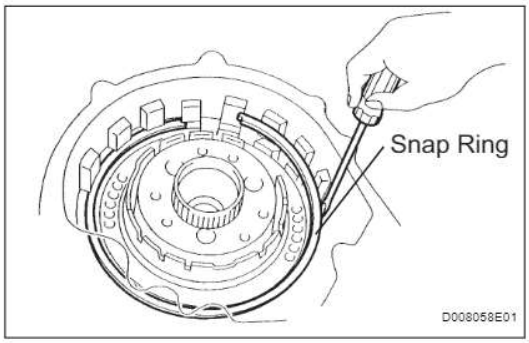
(a) Remove the planetary carrier thrust washer No.1 from the planetary gear assembly.



54. REMOVE 2ND BRAKE CLUTCH DISC

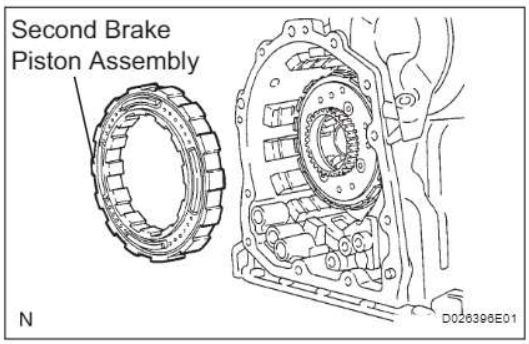
(a) Using a screwdriver, remove the snap ring.

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



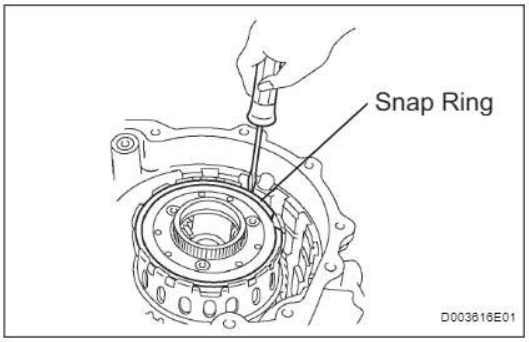
55. REMOVE SECOND BRAKE PISTON ASSEMBLY

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



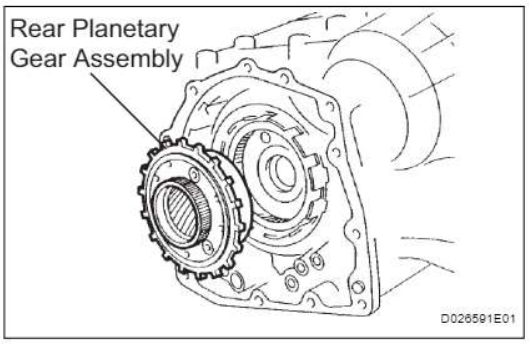
(b) Remove the second brake piston assembly from the transaxle case.

AX

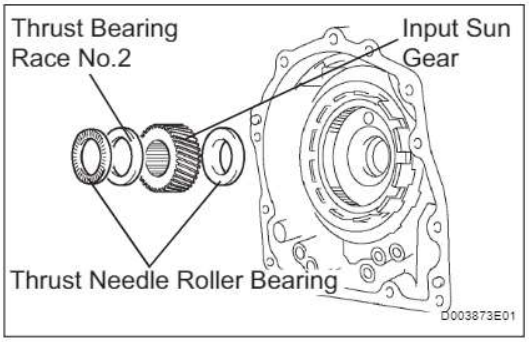


56. REMOVE REAR PLANETARY GEAR ASSEMBLY

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

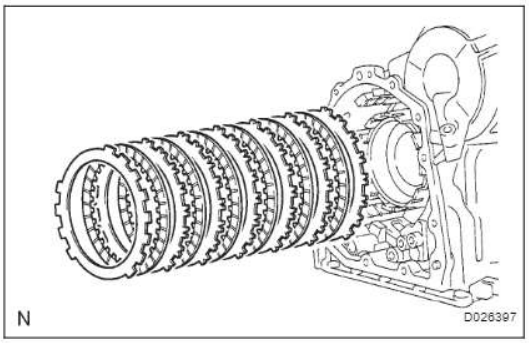


(b) Remove the rear planetary gear assembly from the transaxle case.



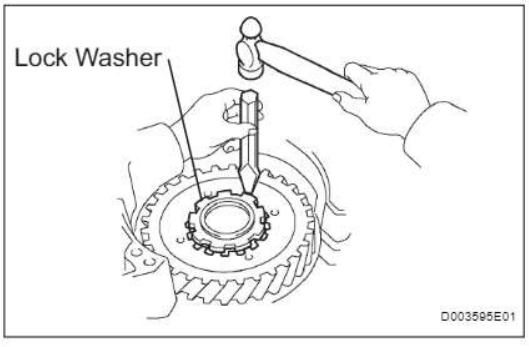
57. REMOVE INPUT SUN GEAR

(a) Remove the 2 thrust needle roller bearings, thrust bearing race No.2 and input sun gear from the transaxle case.



58. REMOVE 1ST & REVERSE BRAKE CLUTCH DISC

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



59. REMOVE FRONT PLANETARY GEAR ASSEMBLY

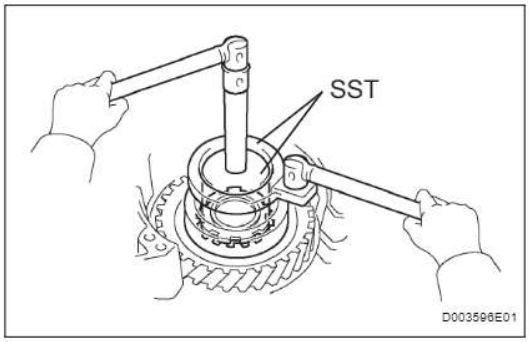
(a) Using a chisel and hammer, unstake the lock washer.

SST 09387-00030, 09387-00080

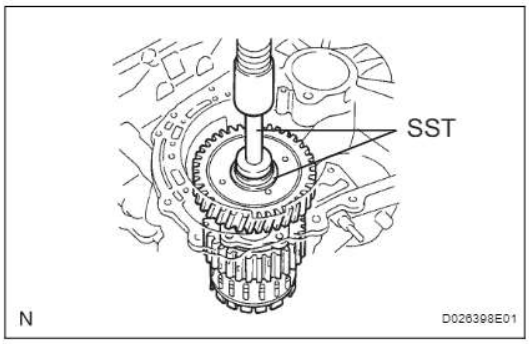
NOTICE:

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

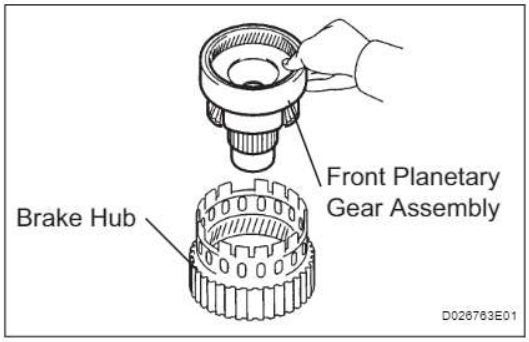
AX



(b) Using SST, remove the nut.

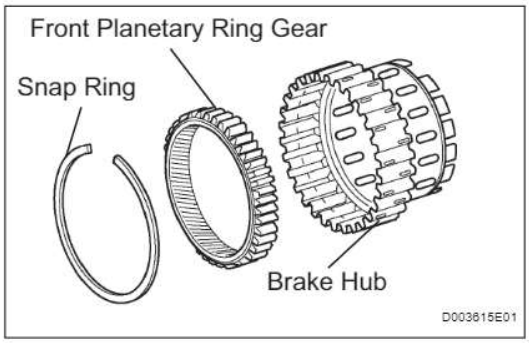


(c) Using SST and a press, remove the front planetary gear assembly from the counter drive gear.
SST 09950-60010 (09951-00450), 09950-70010 (09951-07100)



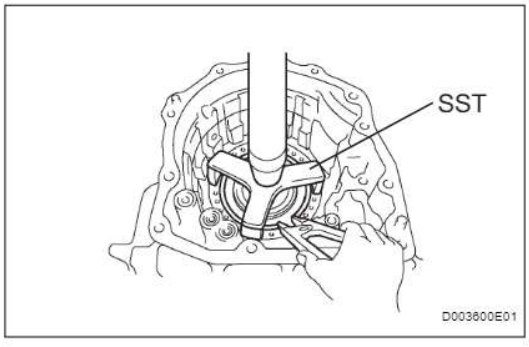
(d) Remove the front planetary gear assembly from the brake hub.

60. REMOVE FRONT PLANETARY RING GEAR



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

61. REMOVE 1ST & REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY

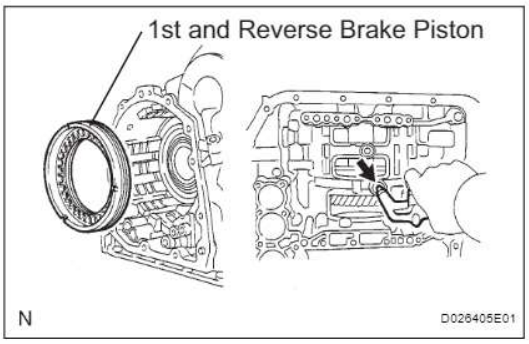


(a) Place SST on the return spring, and compress the return spring with a press.
SST 09387-00070

(b) Using a snap ring expander, remove the snap ring.
NOTICE:
- **Stop the press when the spring sheet is lowered 1 - 2 mm (0.039 - 0.078 in.) from the snap ring groove, to prevent the spring sheet from deforming.**

AX

- **Do not expand the snap ring excessively.**

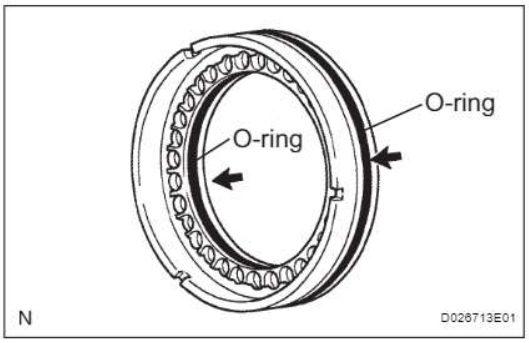


62. REMOVE 1ST & REVERSE BRAKE PISTON

(a) Apply compressed air (392 kPa, 4.0 kgf/cm ^{2}, 57 psi) to the transaxle case to remove 1st & reverse brake piston.

NOTICE:

- **Blowing off the air may cause the piston to jump-out. When removing the piston, hold it by your hand using a waste cloth.**
- **Take care not to splash ATF when air-blowing.**

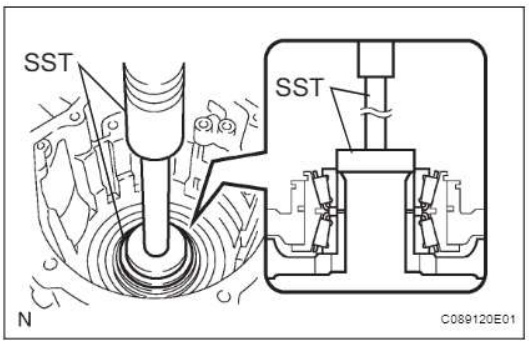


(b) Remove the 2 O-rings from the 1st & reverse brake piston.

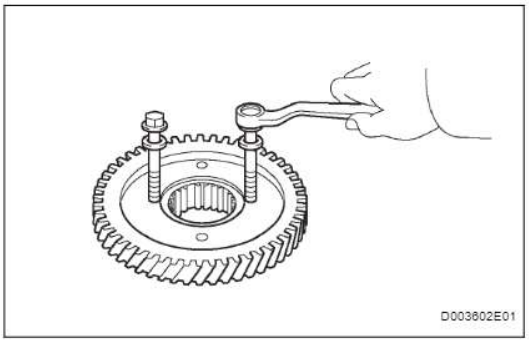
63. REMOVE COUNTER DRIVE GEAR

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

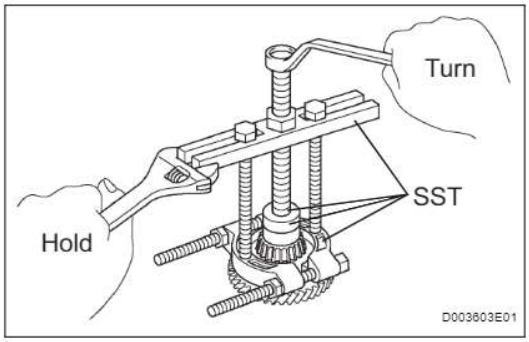
SST 09950-60010 (09951-00590), 09950-70010 (09951-07100)



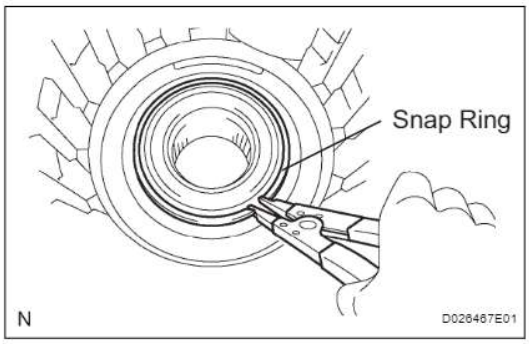
(b) As shown in the illustration, tighten 2 bolts evenly and make clearance of approx. 20.0 mm (0.797 in.) between the counter drive gear and the inner race.



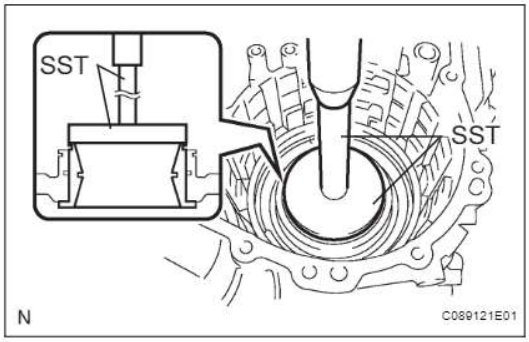
AX



(c) Using SST, remove the tapered roller bearing.
SST 09950-60010 (09951-00590), 09950-70010 (09951-07100), 09950-00020, 09950-00030, 09950-40011 (09957-04010)

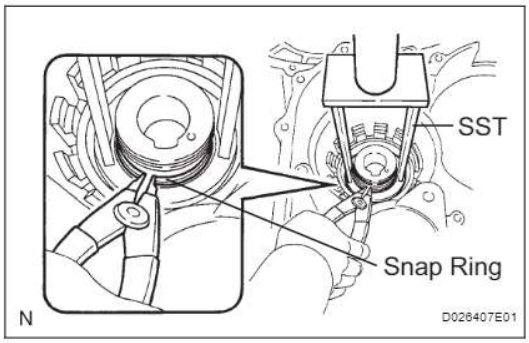


64. REMOVE COUNTER DRIVE GEAR BEARING
(a) Using a snap ring expander, remove the snap ring.



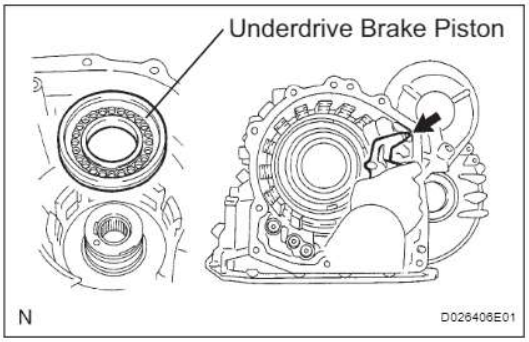
(b) Using SST and a press, remove the bearing outer race.
SST 09950-60020 (09951-00910), 09950-70010 (09951-07100)

65. REMOVE BREATHER PLUG NO.2 (ATM)



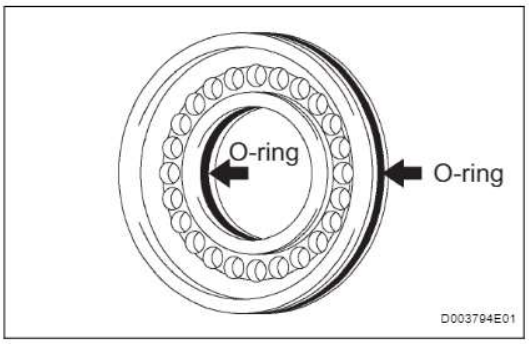
66. REMOVE UNDERDRIVE BRAKE RETURN SPRING SUB-ASSEMBLY
(a) Place SST on the return spring, and compress the return spring with a press.
SST 09387-00020
(b) Using a snap ring expander, remove the snap ring.
NOTICE:
- **Stop the press when the spring sheet is lowered 1 - 2 mm (0.039 - 0.078 in.) from the snap ring groove, to prevent the spring sheet from deforming.**
- **Do not expand the snap ring excessively.**

AX

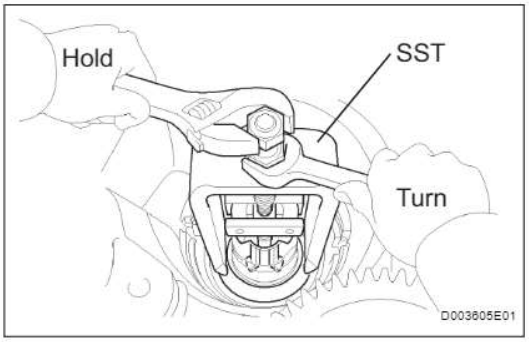


67. REMOVE UNDERDRIVE BRAKE PISTON

(a) Apply compressed air (392 kPa, 4.0 kgf/cm ^{2}, 57 psi) to the transaxle case to remove the underdrive brake piston.



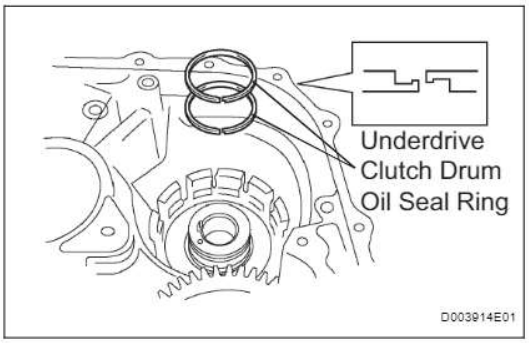
(b) Remove the 2 O-rings from the underdrive brake piston.



68. REMOVE NEEDLE ROLLER BEARING

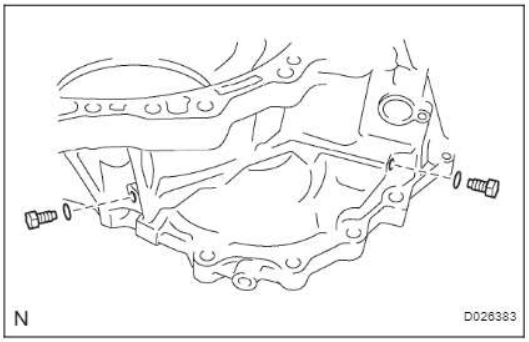
(a) Using SST, remove the needle-roller bearing from the transaxle case.

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



69. REMOVE UNDERDRIVE CLUTCH DRUM OIL SEAL RING

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

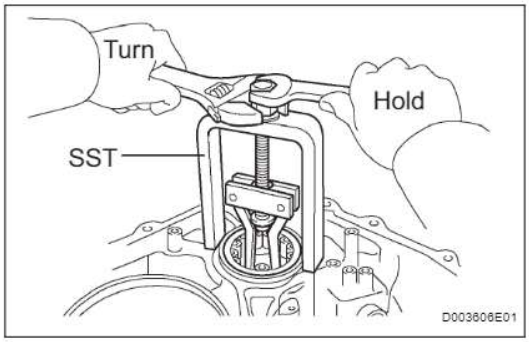


70. REMOVE TRANSAXLE CASE NO.1 PLUG

(a) Remove the 2 transaxle case No. 1 plugs.

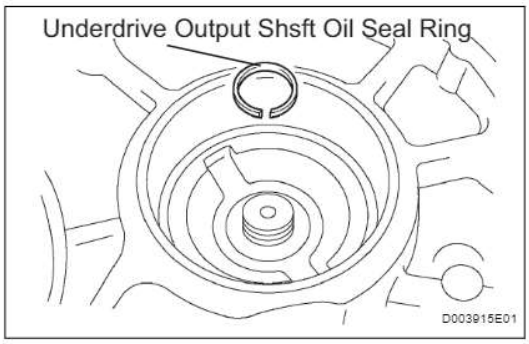
(b) Remove the 2 O-rings from the 2 transaxle case No. 1 plugs.

AX



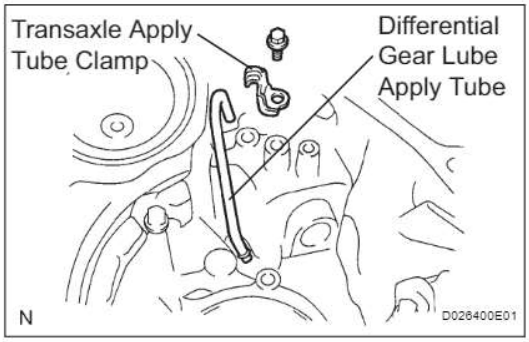
71. REMOVE UNDERDRIVE CYLINDRICAL ROLLER BEARING

(a) Using SST, remove the underdrive cylindrical roller bearing from the transaxle case.
SST 09514-35011



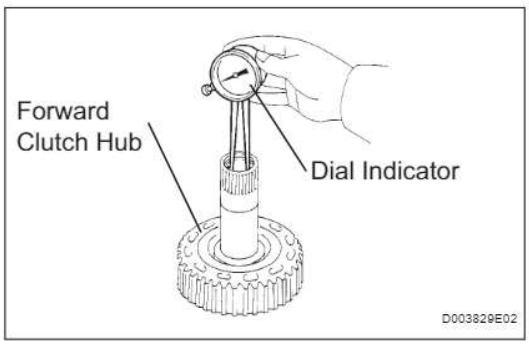
72. REMOVE UNDERDRIVE OUTPUT SHAFT OIL SEAL RING

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



73. REMOVE DIFFERENTIAL GEAR LUBE APPLY TUBE

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



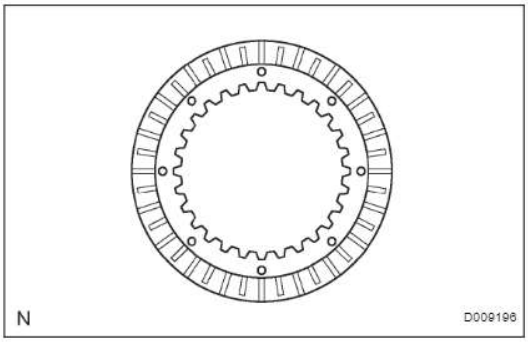
INSPECTION

1. INSPECT MULTIPLE DISC CLUTCH CLUTCH HUB

(a) Using a dial indicator, measure the inside diameter of the forward clutch hub bushing
Standard inside diameter:
23.025 - 23.046 mm (0.9065 - 0.9073 in.)
Maximum inside diameter:
23.09 mm (0.9091 in.)
NOTICE:
- **When the diameter is over the maximum, replace the multiple disc clutch hub with new one.**
- **Check the contact surface of the bush in the direct clutch shaft. If any scratch or discolor is identified, replace the direct clutch sub-assembly with new one.**

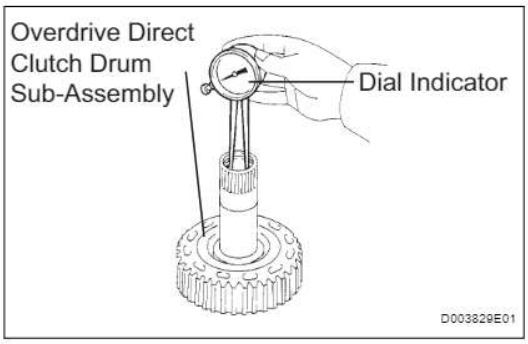
If the inside diameter is greater than the maximum, replace the forward clutch hub.

AX



2. INSPECT UNDERDRIVE CLUTCH DISC NO.2

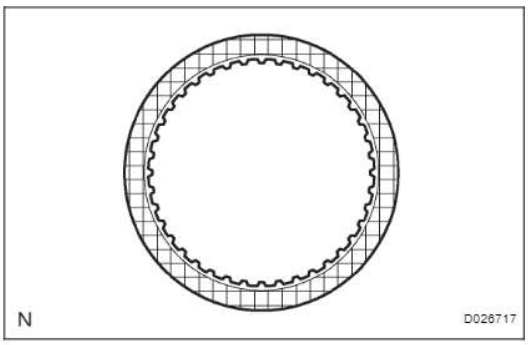
(a) Check to see if the sliding surface of the disc, plate and flange are worn or burnt.
If necessary, replace them.
NOTICE:
- **If the lining of the disc comes off or discolors, or even if a part of the groove is defaced, replace all discs.**
- **Before assembling new discs, soak them in ATF for at least 15 minutes.**



3. INSPECT OVERDRIVE DIRECT CLUTCH DRUM SUB-ASSEMBLY

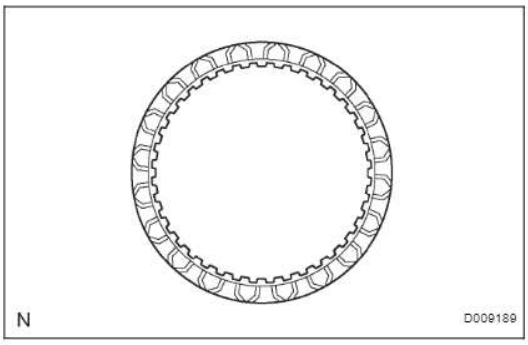
(a) Using a dial indicator, measure the inside diameter of the forward clutch hub bushing.
Standard inside diameter:
23.025 - 23.046 mm (0.9065 - 0.9073 in.)
Maximum inside diameter:
23.09 mm (0.9091 in.)
NOTICE:
- **When the diameter is over the maximum, replace the multiple disc clutch hub with new one.**
- **Check the contact surface of the bush in the direct clutch shaft. If any scratch or discolor is identified, replace the direct clutch sub-assembly with new one.**

If the inside diameter is greater than the maximum, replace the forward clutch hub.



4. INSPECT 2ND BRAKE CLUTCH DISC

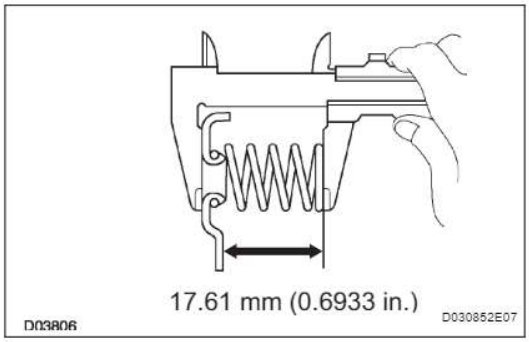
(a) Check to see if the sliding surface of the disc, plate and flange are worn or burnt.
If necessary, replace them.
NOTICE:
- **If the lining of the disc comes off or discolors, or even if a part of the groove is defaced, replace all discs.**
- **Before assembling new discs, soak them in ATF for at least 15 minutes.**



5. INSPECT 1ST & REVERSE BRAKE CLUTCH DISC

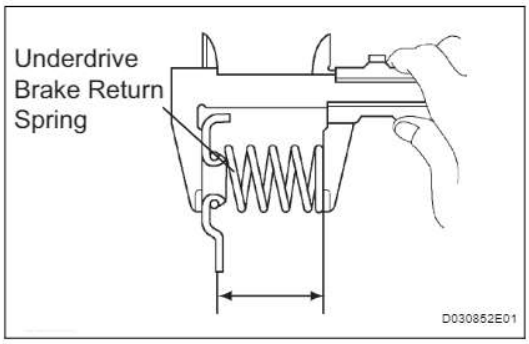
(a) Check to see if the sliding surface of the disc, plate and flange are worn or burnt.
If necessary, replace them.
NOTICE:
- **If the lining of the disc comes off or discolors, or even if a part of the groove is defaced, replace all discs.**
- **Before assembling new discs, soak them in ATF for at least 15 minutes.**

AX



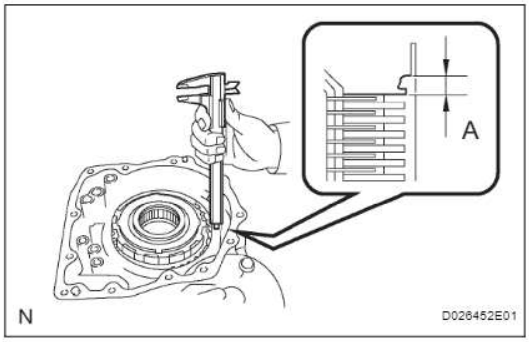
6. INSPECT 1ST & REVERSE BRAKE RETURN SPRING SUB-ASSEMBLY

(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.)



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.)



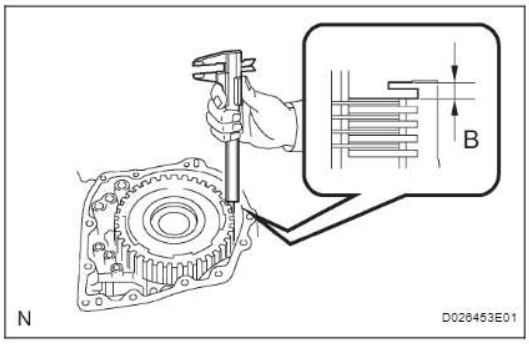
8. INSPECT PACK CLEARANCE OF FIRST & REVERSE BRAKE

(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 - 1.35 mm (0.0457 - 0.0531 in.)
HINT:
Piston stroke = Dimension A -Flange thickness
Flange thickness: mm (in.)

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 SECOND BRAKE

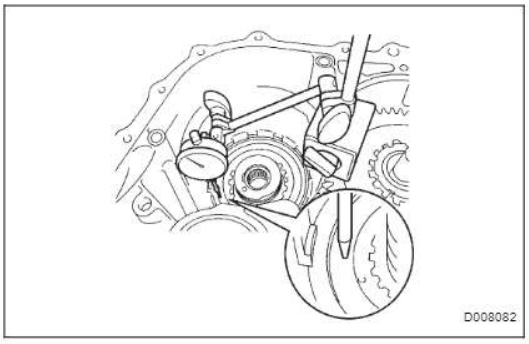
(a) Using a vernier calipers, measure the distance between the disc surface and snap ring surface (Dimension B).

(b) Select an appropriate flange so that the pack clearance will meet the specified value.
Pack clearance:
0.62 - 0.91 mm (0.0244 - 0.0358 in.)
HINT:
Piston stroke = Dimension B - Flange thickness - Snap ring thickness 1.6 mm (0.063 in.)

AX

Flange thickness: mm (in.)

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 - 2.20 mm (0.0713 - 0.0866 in.)

HINT:

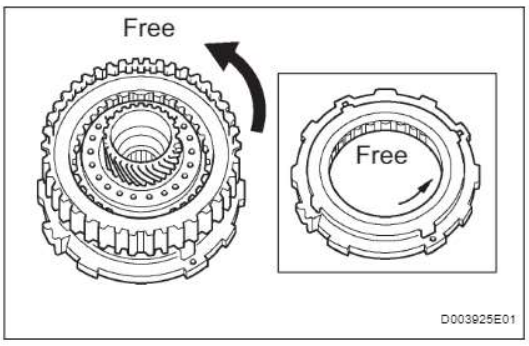
Select an appropriate flange from the table below so that it will meet the specified value.

Flange thickness: mm (in.)

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) Temporally remove the snap ring and attach to the flange.

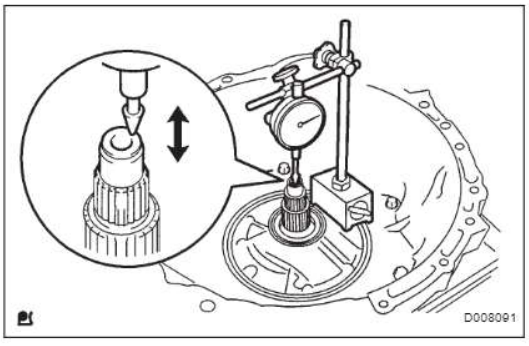
(c) Restore the snap ring.



11. INSPECT UNDERDRIVE 1 WAY CLUTCH ASSEMBLY

(a) Install the underdrive clutch assembly to the 1-way clutch.

(b) Rotate the underdrive clutch assembly to check the rotating direction for the lock or free operation.



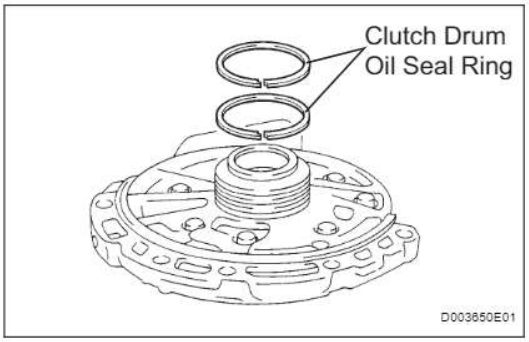
12. INSPECT INPUT SHAFT ENDPLAY

(a) Using a dial indicator, measure the input shaft endplay.

Endplay:

0.262 - 1.244 mm (0.01 - 0.049 in.)

AX

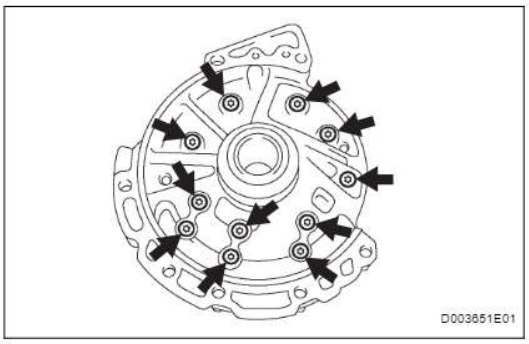


OIL PUMP

DISASSEMBLY

1. REMOVE CLUTCH DRUM OIL SEAL RING

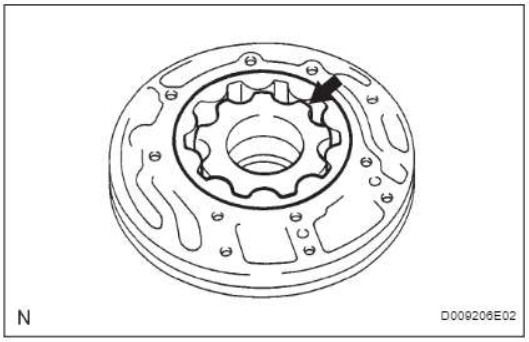
(a) Remove the 2 clutch drum oil seal rings.



2. REMOVE STATOR SHAFT ASSEMBLY

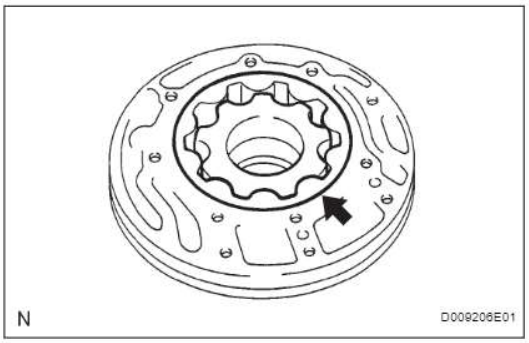
(a) Using a torx socket (T30), remove the 11 bolts and stator shaft.

(b) Keep the gears in assembling order.



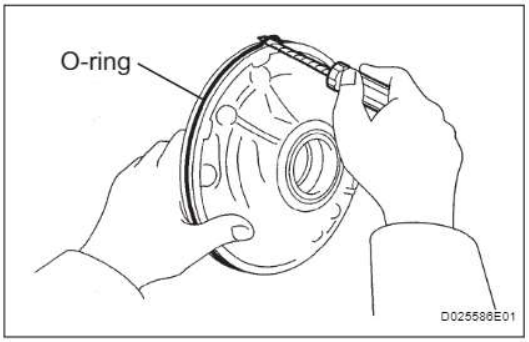
3. REMOVE FRONT OIL PUMP DRIVE GEAR

(a) Remove the front oil pump drive gear.



4. REMOVE FRONT OIL PUMP DRIVEN GEAR

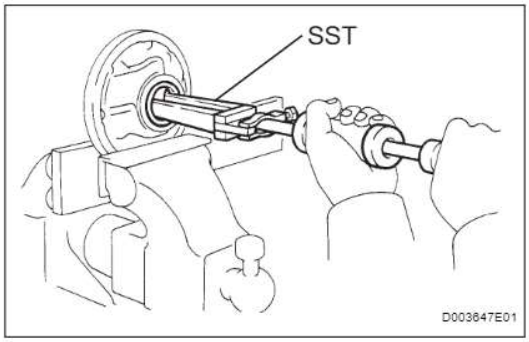
(a) Remove the front oil pump driven gear.



5. REMOVE FRONT OIL PUMP BODY O-RING

(a) Using a screwdriver, remove the O-ring.
HINT:
Tape the screwdriver before use.

AX



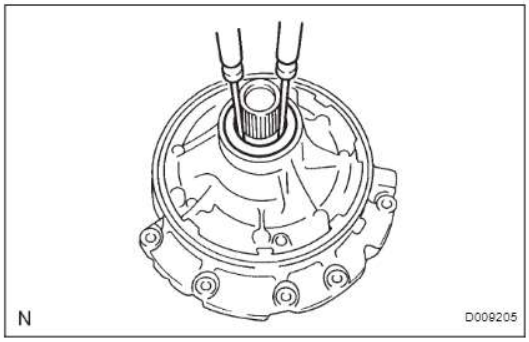
6. REMOVE FRONT OIL PUMP OIL SEAL

(a) Mount oil pump in a soft jaw vise.

(b) Using SST, remove the oil seal from the oil pump body.

SST 09308-00010

INSPECTION

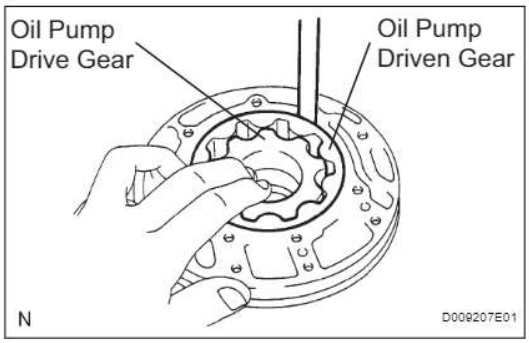


1. INSPECT OIL PUMP ASSEMBLY

(a) Turn the drive gear with 2 screwdrivers and make sure it rotates smoothly.

NOTICE:

Be careful not to damage the oil seal lip.



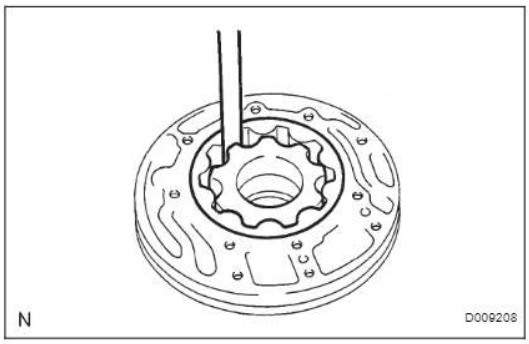
2. INSPECT CLEARANCE OF OIL PUMP ASSEMBLY

(a) Push the driven gear to one side of the body.

(b) Using a feeler gauge, measure the clearance.

Standard body clearance:
0.10 - 0.17 mm (0.0039 - 0.0067 in.)
Side clearance:
0.02 - 0.05 mm (0.001 - 0.02 in.)
Maximum body clearance:
0.17 mm (0.0067 in.)

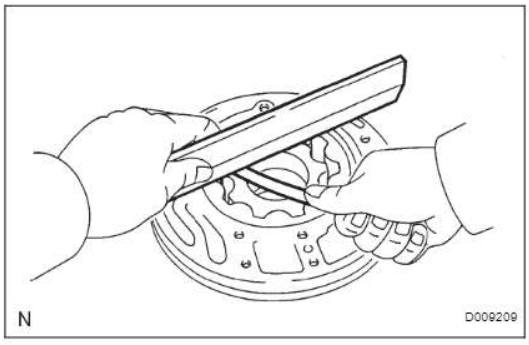
If the body clearance is greater than the maximum, replace the oil pump body sub-assembly.



(c) Using a feeler gauge measure the tip clearance between the driven gear teeth and drive gear teeth.

Standard tip clearance:
0.07 - 0.15 mm (0.0028 - 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.



(d) Using a straight edge and feeler gauge, measure the side clearance of both gears.

Standard side clearance:
0.02 - 0.05 mm (0.0008 - 0.0020 in.)
Maximum side clearance:
0.05 mm (0.0020 in.)

Drive gear thickness: mm (in.)

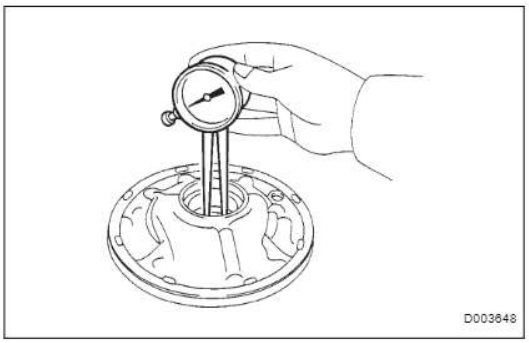
Mark	Thickness
A	11.690 - 11.699 (0.4602 - 0.4606)
B	11.700 - 11.709 (0.4606 - 0.4610)

AX

Mark	Thickness
C	11.710 - 11.720 (0.4610 - 0.4614)
D	11.721 - 11.730 (0.4615 - 0.4618)
E	11.731 - 11.740 (0.4619 - 0.4622)

Driven gear thickness: mm (in.)

Mark	Thickness
A	11.690 - 11.699 (0.4602 - 0.4606)
B	11.700 - 11.709 (0.4606 - 0.4610)
C	11.710 - 11.720 (0.4610 - 0.4614)
D	11.721 - 11.730 (0.4615 - 0.4618)
E	11.731 - 11.740 (0.4619 - 0.4622)

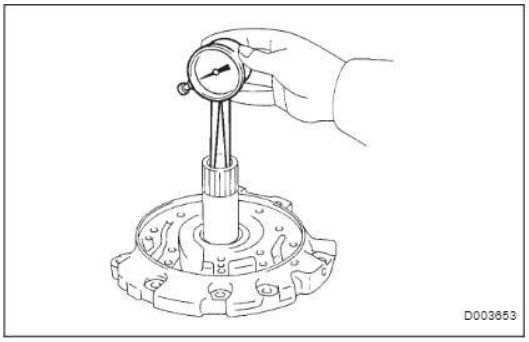


3. INSPECT FRONT OIL PUMP AND GEAR BODY SUB-ASSEMBLY

(a) Using a dial indicator, measure the inside diameter of the oil pump body bushing.

Standard inside diameter:
38.113 - 38.138 mm (1.50051 - 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.

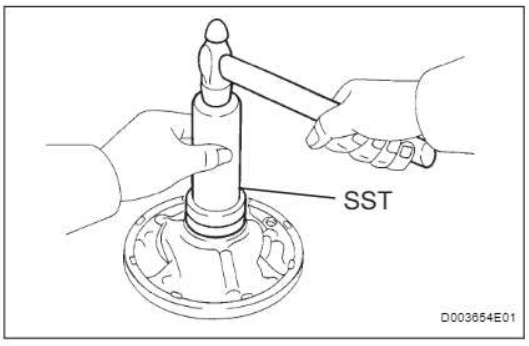


4. INSPECT STATOR SHAFT ASSEMBLY

(a) Using a dial indicator, measure the inside diameter of the stator shaft.

Standard inside diameter:
21.500 - 21.526 mm (0.84646 - 0.84748 in.)
Maximum inside diameter:
21.57 mm (0.8492 in.)

If the indicator diameter is greater than maximum, replace the stator shaft.



REASSEMBLY

1. INSTALL FRONT OIL PUMP OIL SEAL

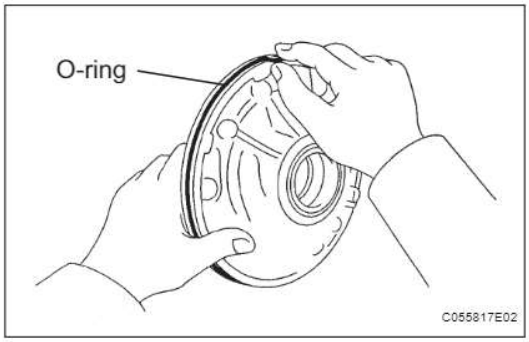
(a) Using SST and a hammer, install a new oil seal to the oil pump body.

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.

AX

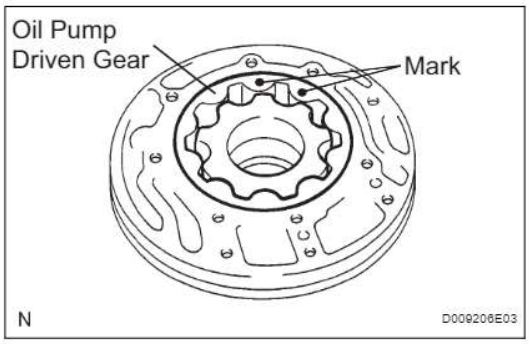


2. INSTALL FRONT OIL PUMP BODY O-RING

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

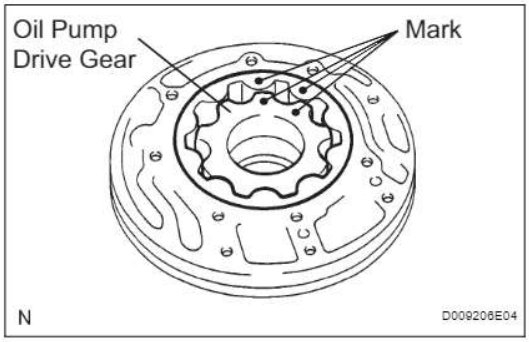
NOTICE:

Assemble the O-ring carefully not to have a twist and a pinching. Moreover, apply enough ATF to the O-ring prior to assembling.



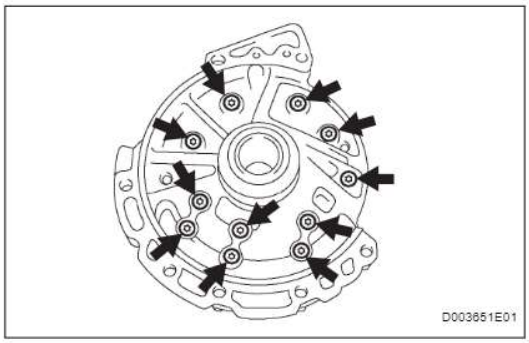
3. INSTALL FRONT OIL PUMP DRIVEN GEAR

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



4. INSTALL FRONT OIL PUMP DRIVE GEAR

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

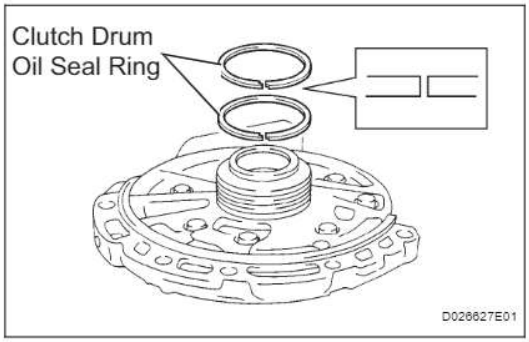


5. INSTALL STATOR SHAFT ASSEMBLY

(a) Set the stator shaft aligned 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)



6. INSTALL CLUTCH DRUM OIL SEAL RING

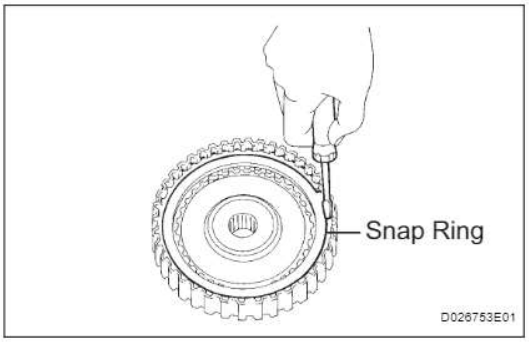
(a) Coat the 2 new clutch drum oil seal rings with ATF.

(b) Install the 2 new clutch drum oil seal rings.

NOTICE:

Do not expand the ring ends excessively.

AX

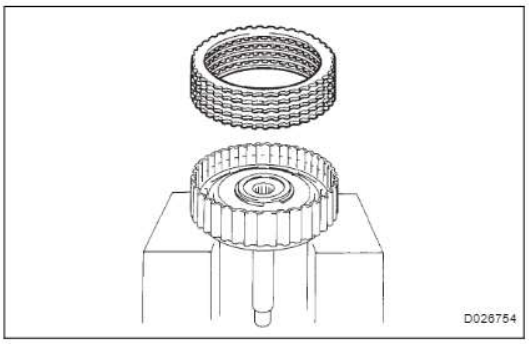


FORWARD AND REVERSE CLUTCH

DISASSEMBLY

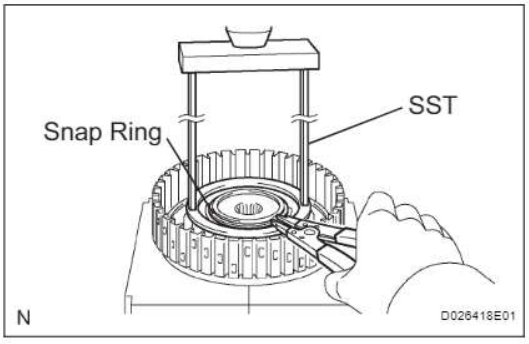
1. REMOVE FORWARD MULTIPLE DISC CLUTCH CLUTCH DISC

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



(b) Remove the flange, 5 discs and 5 plates from the input shaft assembly.

2. REMOVE FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY

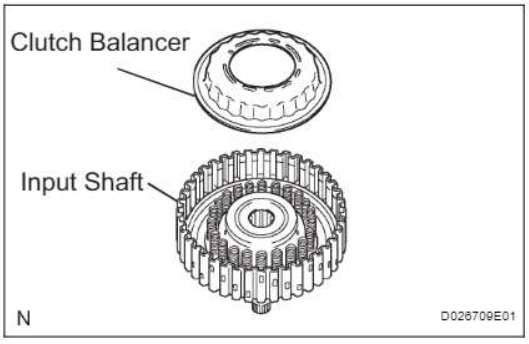


(a) Place SST on the spring retainer and compress the return spring with a press.

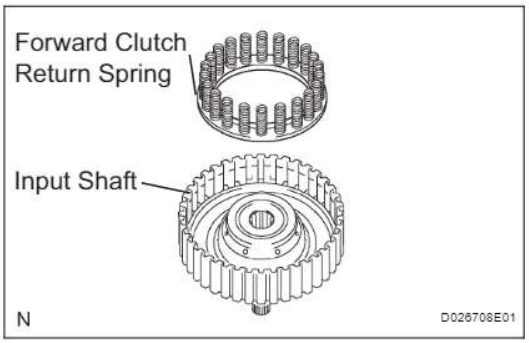
(b) Using a snap ring expander, remove the snap ring.

NOTICE:

- **Stop the press when the spring sheet is lowered 1 - 2 mm (0.039 - 0.078 in.) from the snap ring groove, preventing the spring sheet from deforming.**
- **Do not expand the snap ring excessively.**

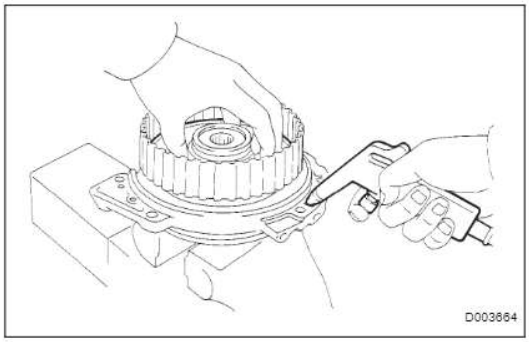


(c) Remove the clutch balancer from the input shaft.



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

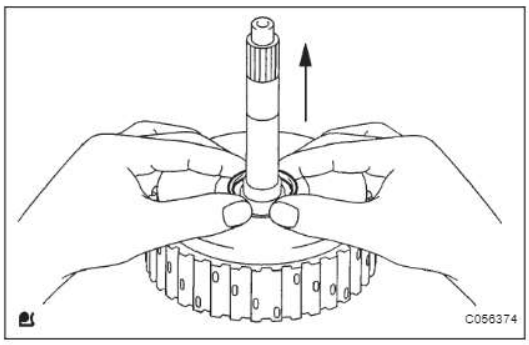
AX



3. REMOVE FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY

(a) Place the forward clutch drum onto the oil pump.

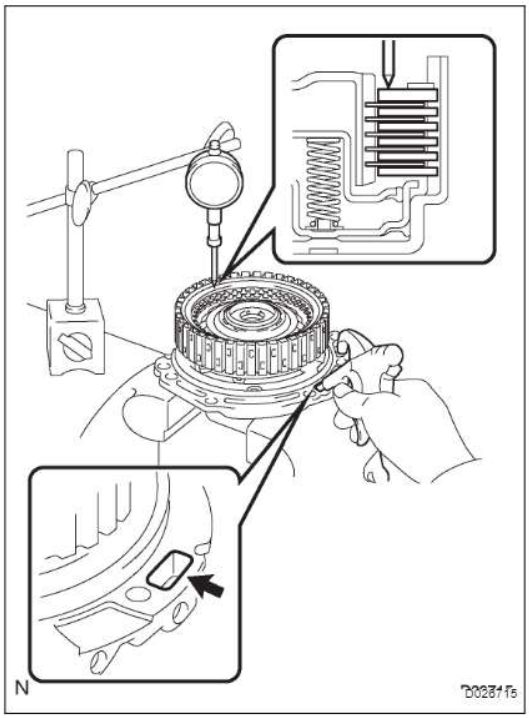
(b) Holding the forward clutch piston by hand, apply compressed air (392 kPa, 4.0 kgf/cm ^{2}, 57 psi) to the oil pump to remove the forward clutch piston.
HINT:
When the piston cannot be removed as it is slanted, either blow the air again with the protruding side pushed, or remove the piston using the needle nose plier with vinyl tape on the tip.



4. REMOVE INPUT SHAFT OIL SEAL RING

(a) Remove the input shaft oil seal ring to the input shaft.

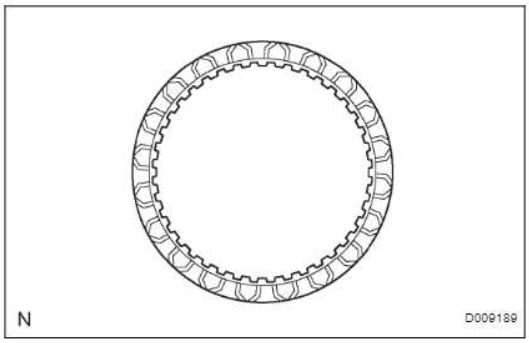
INSPECTION



1. INSPECT PACK CLEARANCE OF FORWARD CLUTCH

(a) Install the forward clutch on the oil pump.
NOTICE:
Be careful not to damage the oil seal ring of oil pump.

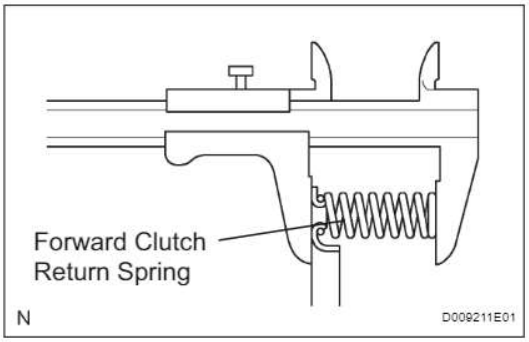
(b) Using a dial indicator, measure the forward clutch pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm ^{2}, 57 psi).
Pack clearance:
1.00 - 1.25 mm (0.0394 - 0.4921 in.)
If the clearance is not within standard, inspect the discs, plates and flange.
HINT:
As the opening is large, cover it with a shop rug to prevent the compressed air from being released.



2. INSPECT FORWARD MULTIPLE DISC CLUTCH CLUTCH DISC

(a) Check to see if the sliding surface of the disc, plate and flange are worn or burnt.
If necessary, replace them.
HINT:
- If the lining of the disc comes off or discolors, or even if replace all discs.
- Before assembling new discs, soak them in ATF for at least 15 minutes.

AX

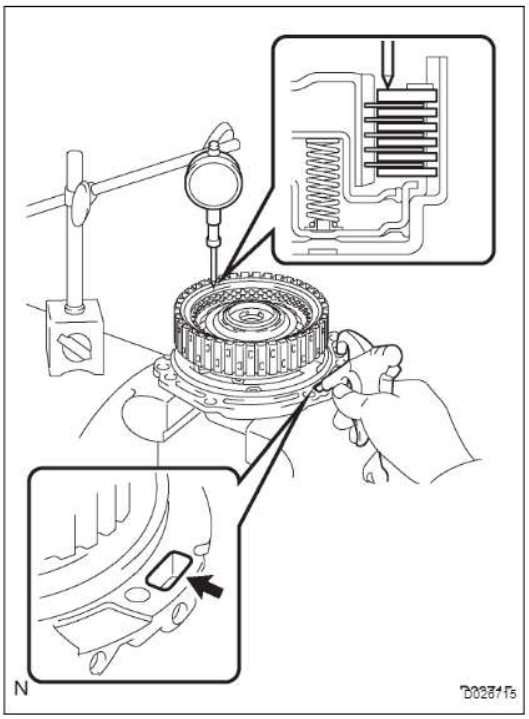


3. INSPECT FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY

(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.)



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 - 1.25 mm (0.0394 - 0.4921 in.)

If the piston stroke is less than the minimum, parts may have been assembled incorrectly. Check and reassemble again.

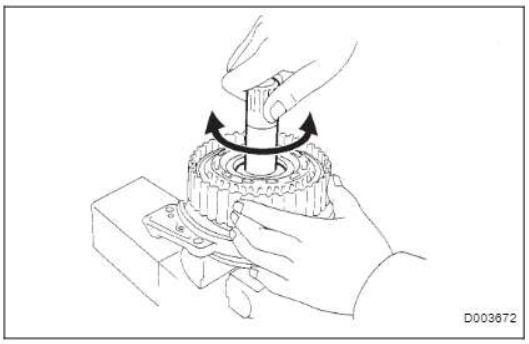
If the clearance is not standard, select another flange.

HINT:

There are 5 different flanges in thickness.

Flange thickness: mm (in.)

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)	-	-

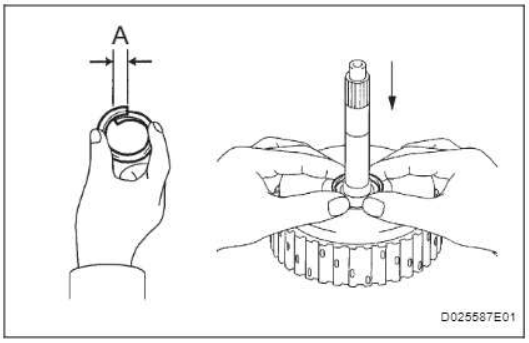


5. INSPECT FORWARD MULTIPLE DISC CLUTCH CLUTCH DISC

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

NOTICE:

Do not place the forward clutch assembly in a vise.



REASSEMBLY

1. INSTALL INPUT SHAFT OIL SEAL RING

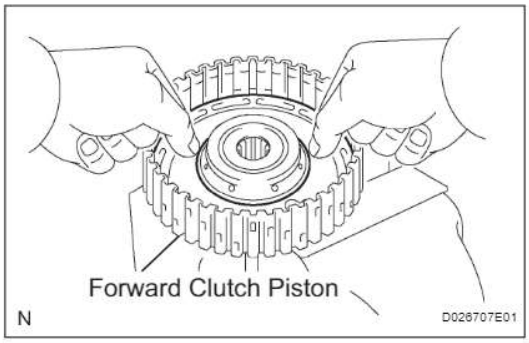
(a) Compress the new input shaft oil seal ring from both sides to reduce dimension A.

Dimension A:

5 mm (0.197 in.)

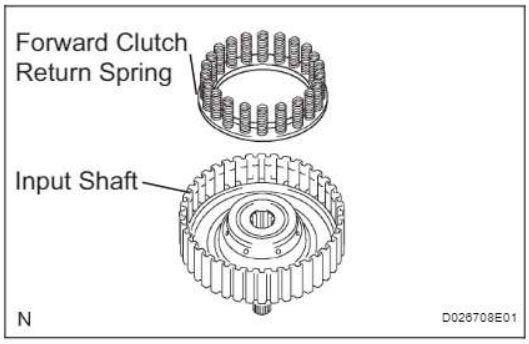
AX

(b) Coat the oil seal ring with ATF and install it to the input shaft.
NOTICE:
Do not expand the gap of the oil seal ring too much. Fix the hooks certainly.



2. INSTALL FORWARD CLUTCH PISTON SUB-ASSEMBLY

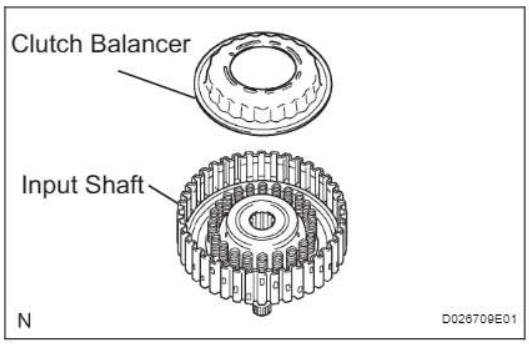
(a) Coat the forward clutch piston with ATF, and install it to the input shaft.
NOTICE:
Be careful not to damage the lip seal of the forward clutch piston.



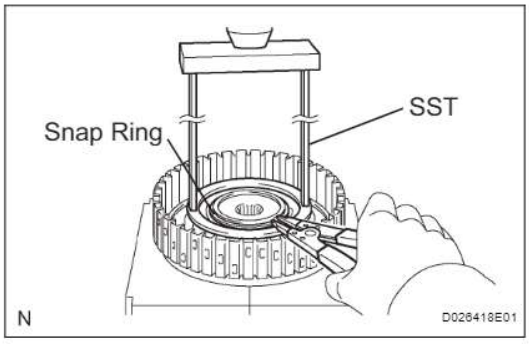
3. INSTALL FORWARD CLUTCH RETURN SPRING SUB-ASSEMBLY

(a) Install the return spring to the input shaft.
NOTICE:
Installing the spring sub-assembly, check all of the springs are fit in the piston correctly.

(b) Coat the clutch balancer with ATF.



(c) Install the clutch balancer to the input shaft.
NOTICE:
- **Be careful not to damage the lip seal of the forward clutch balancer.**
- **Install the clutch balancer carefully not to have a pinching and any other defects at the sealing lip.**
- **Apply enough ATF to the sealing lip prior to assembling.**

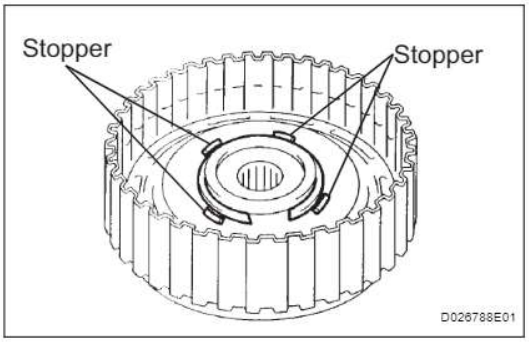


(d) Place SST on the clutch balancer, and compress the clutch balancer with a press.
SST 09387-00020

(e) Install the snap ring with a snap ring expander.

(f) Be sure the end gap of the snap ring is not aligned with the spring retainer claw.
NOTICE:
- **Stop the press when the spring sheet is lowered to the place 1 - 2 mm (0.039 - 0.078 in.) from the snap ring groove.**
- **This prevents the spring sheet from being deformed.**
- **Do not expand the snap ring excessively.**

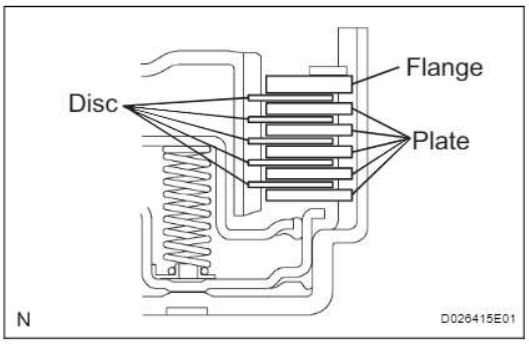
AX



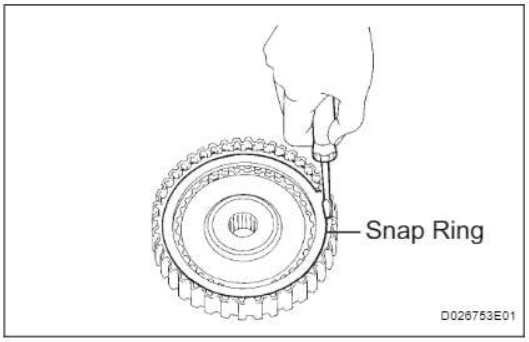
(g) Set the end gap of the snap ring in the piston shown in the illustration.
NOTICE:
The end gap of the snap ring should not coincide with any of the stoppers.

4. INSTALL FORWARD MULTIPLE DISC CLUTCH CLUTCH DISC

(a) Coat the 5 discs with ATF.

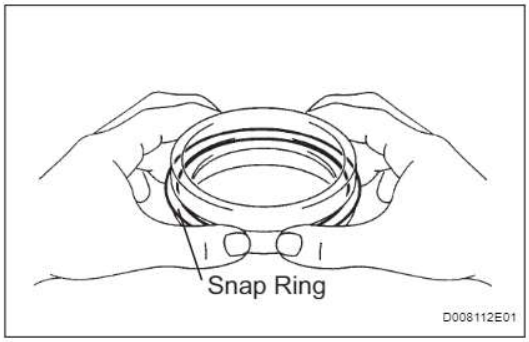


(b) Install the 5 plates, 5 discs and flange input shaft.
NOTICE:
Be careful about the order of discs, plates and flange assembly.



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

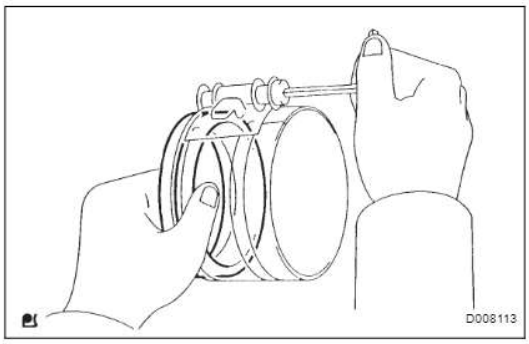
AX



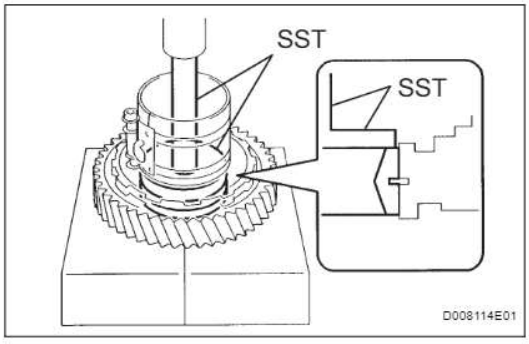
REASSEMBLY

1. INSTALL UNDERDRIVE PLANETARY RING GEAR

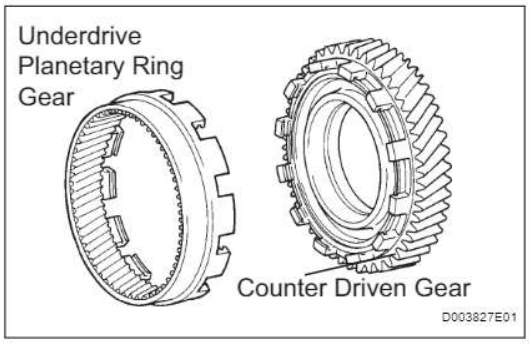
(a) Install a new snap ring to the outer race of the tapered roller bearing.
HINT:
When replacing the bearing, also replace the counter driven gear with a new one.



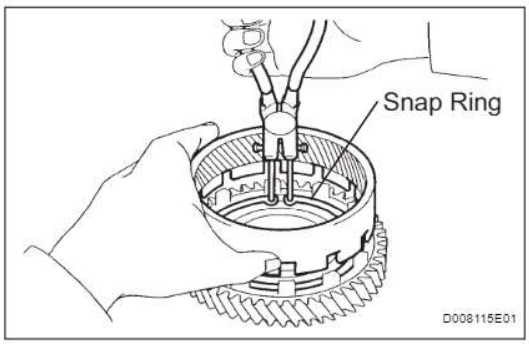
(b) Using a piston ring compressor, squeeze the snap ring.



(c) Using SST and a press, press in the outer race of the tapered roller bearing.
SST 09950-60020 (09951-00890), 09950-70010 (09951-07100)
NOTICE:
Be sure not to damage on the snap ring during the outer race installation.

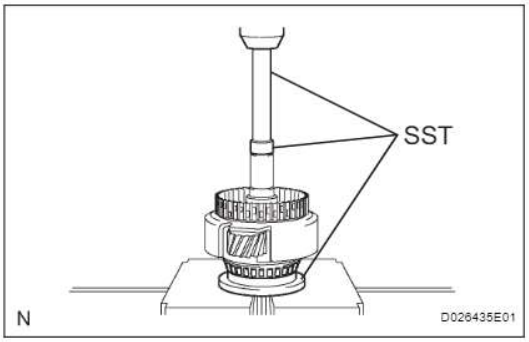


(d) Install the underdrive planetary ring gear to the counter driven gear.



(e) Using a snap ring pliers, install the snap ring.

AX



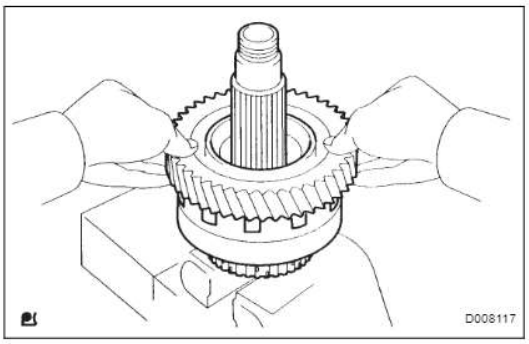
2. INSTALL UNDERDRIVE PLANETARY GEAR ASSEMBLY

(a) Using a press, press the rear tapered roller bearing to the underdrive planetary gear.

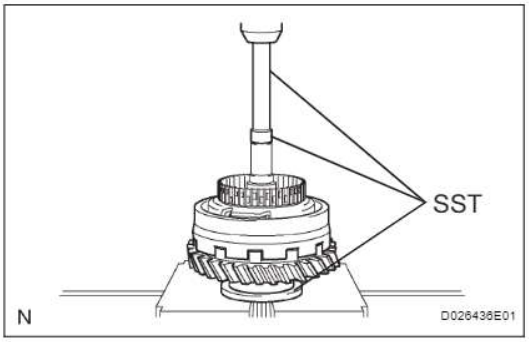
SST 09502-12010, 09950-60010 (09951-00260), 09950-70010 (09951-07100), 09316-20011

NOTICE:

Press the bearing until it becomes flat at the bottom.



(b) Install the counter driven gear with planetary ring gear to the underdrive planetary gear.

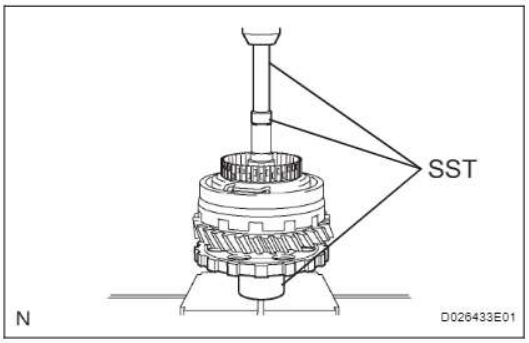


(c) Using SST and a press, press in the front tapered roller bearing.

SST 09502-12010, 09950-60010 (09951-00260), 09950-70010 (09951-07100), 09316-20011

NOTICE:

Press the counter driven gear while rotating it.

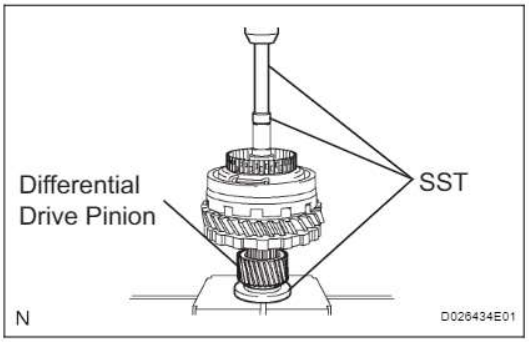


(d) Using a press, press in the parking lock gear.

SST 09502-12010, 09950-60010 (09951-00260), 09950-70010 (09951-07100), 09316-20011

NOTICE:

Press the counter driven gear while rotating it.



3. INSTALL DIFFERENTIAL DRIVE PINION

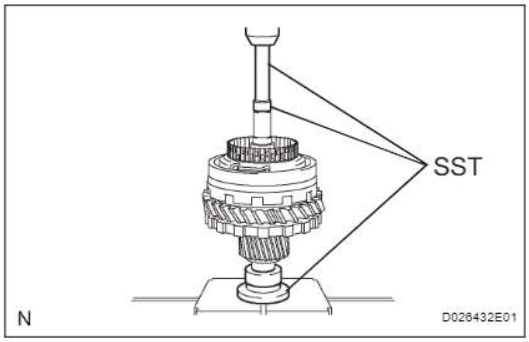
(a) Using a press, press the differential drive pinion.

SST 09726-40010, 09950-60010 (09951-00260), 09950-70010 (09951-07100)

NOTICE:

Press the counter driven gear while rotating it.

AX



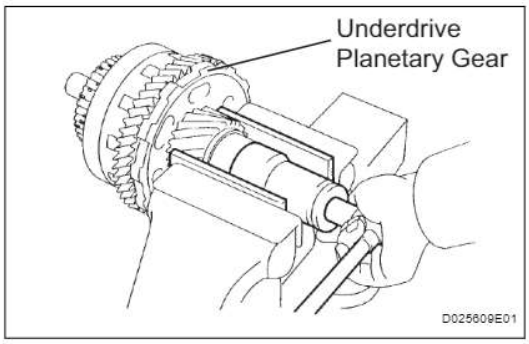
4. INSTALL CYLINDRICAL ROLLER BEARING RACE INNER

(a) Using a press, press the cylindrical roller bearing race inner.

SST 09506-35010, 09950-60010 (09951-00260), 09950-70010 (09951-07100)

NOTICE:

Press the counter driven gear while rotating it.



5. INSTALL FRONT PLANETARY GEAR NUT

(a) Clamp the underdrive planetary gear in soft jaw vise.

NOTICE:

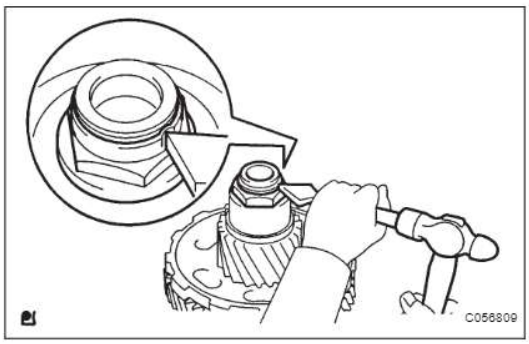
Be careful not to damage the differential drive pinion.

(b) Using a socket wrench, install a new lock nut.

Torque: 280 N*m (2,855 kgf*cm, 207 in.*lbf)

HINT:

Use a torque wrench with a fulcrum length of 750 mm (29.53 in.).

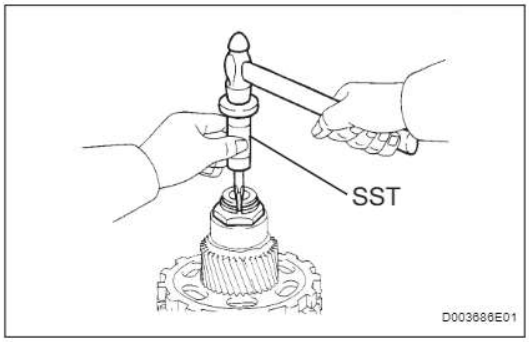


(c) Using a pin punch and hammer, stake the lock nut.

CAUTION:

Be sure that there are no cracks on the nut.

AX



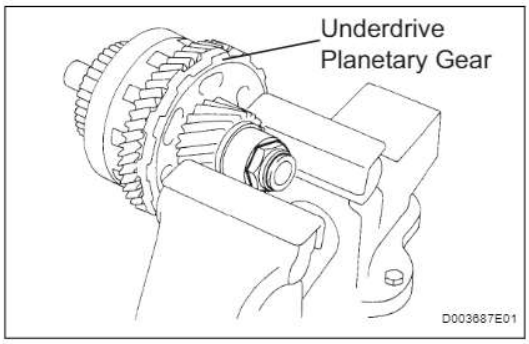
UNDERDRIVE PLANETARY GEAR

DISASSEMBLY

1. REMOVE FRONT PLANETARY GEAR NUT

(a) Using SST, loosen the staked part of the lock nut.

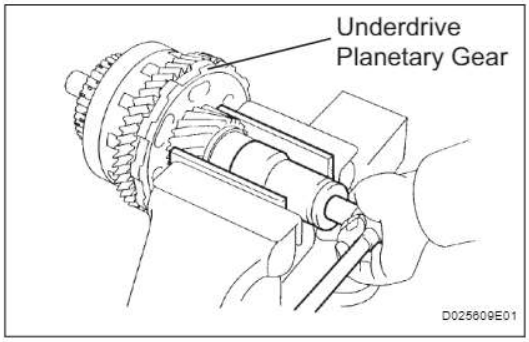
SST 09930-00010 (09931-00010, 09931-00020), 09387-00050



(b) Clamp the underdrive planetary gear in soft jaw vise.

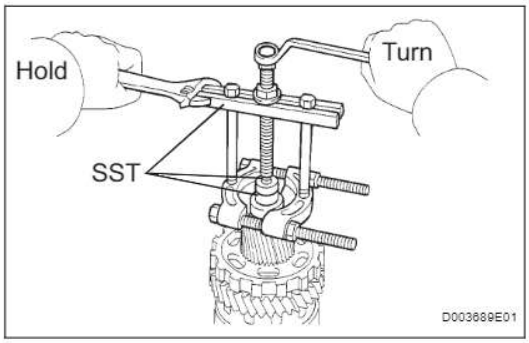
NOTICE:

Be careful not to damage the differential drive pinion.



(c) Using a socket wrench, remove the lock nut.

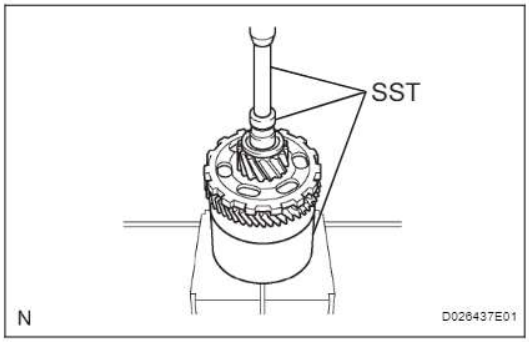
2. REMOVE CYLINDRICAL ROLLER BEARING RACE INNER



(a) Using SST, remove the cylindrical roller bearing race inner.

SST 09950-00020, 09950-00030, 09950-60010 (09951-00320, 09957-04010)

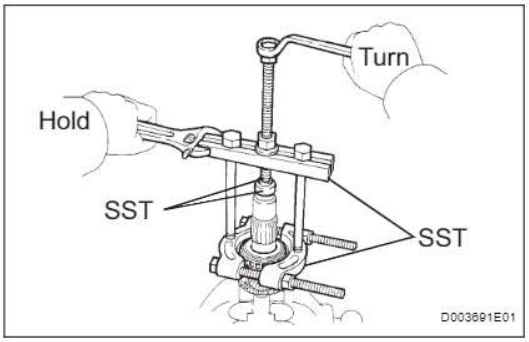
3. REMOVE UNDERDRIVE PLANETARY GEAR ASSEMBLY



(a) Using SST and a press, remove the differential drive pinion, parking lock gear, counter driven gear with underdrive planetary ring gear and front tapered roller bearing.

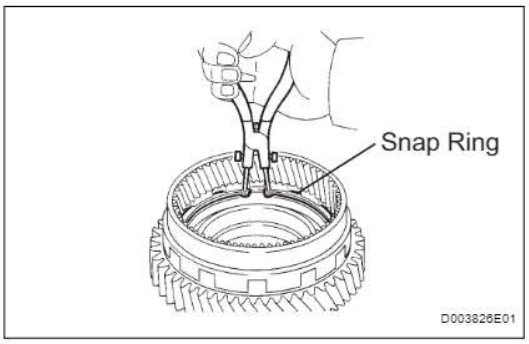
SST 09950-60010 (09951-00320), 09387-00050

AX



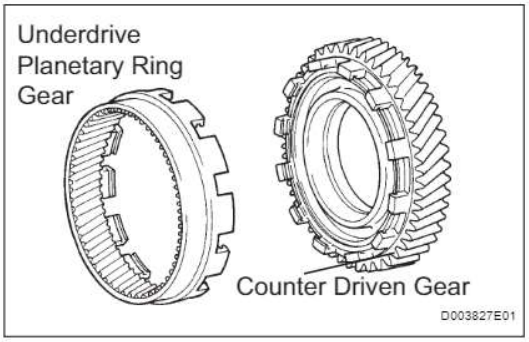
(b) Clamp the underdrive planetary gear in soft jaw vise.
SST 09950-60010 (09951-00320), 09950-00020, 09950-00030, 09950-40011 (09957-04010)

(c) Using SST, remove the rear tapered roller bearing form the underdrive planetary gear.



4. REMOVE UNDERDRIVE PLANETARY RING GEAR

(a) Using a snap ring pliers, remove the snap ring.

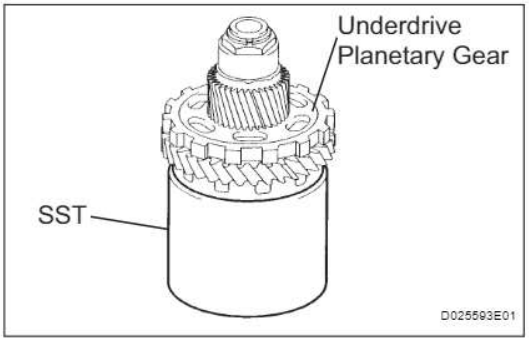


(b) Remove the underdrive planetary ring gear from the counter driven gear.

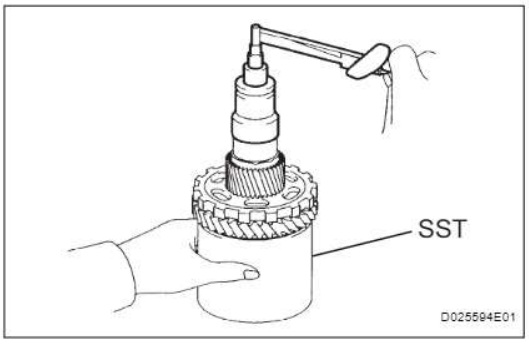
INSPECTION

1. INSPECT UNDERDRIVE PLANETARY GEAR PRELOAD

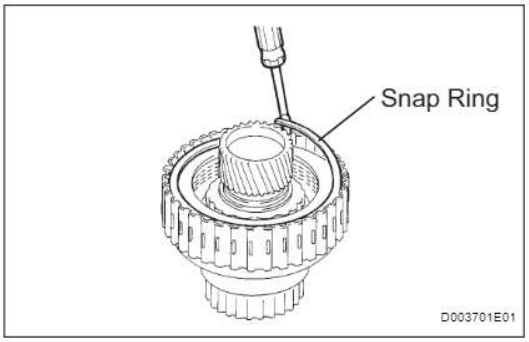
(a) Using SST, fix the underdrive planetary gear assembly.
SST 09387-00050



(b) Using SST and a torque wrench, measure the turning torque of underdrive planetary gear assembly while rotating the torque wrench at 60 rpm.
SST 09387-00050
Turning torque at 60 rpm.:
0.50 - 1.42 N*m(5.1 - 14.5 kgf*cm, 0.06 - 0.17 in.*lbf)
HINT:
Use a torque wrench with a fulcrum length of 160 mm (6.3 in.).



AX

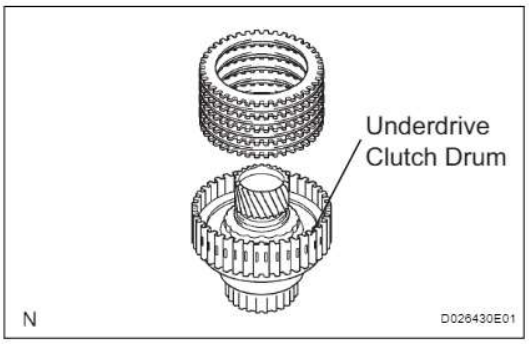


UNDERDRIVE CLUTCH

DISASSEMBLY

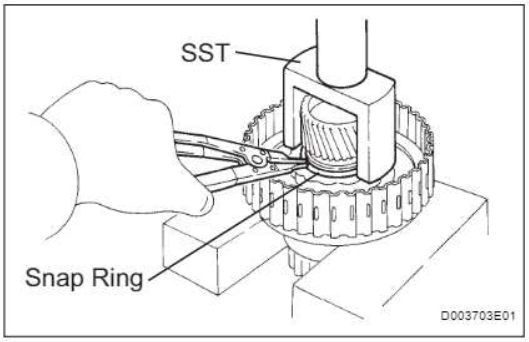
1. REMOVE UNDERDRIVE CLUTCH FLANGE NO.2 HOLE SNAP RING

(a) Using a screwdriver, remove the underdrive clutch flange No.2 snap ring.



2. REMOVE UNDERDRIVE CLUTCH DISC NO.1

(a) Remove the flange, 4 discs and 4 plates from the underdrive clutch drum.

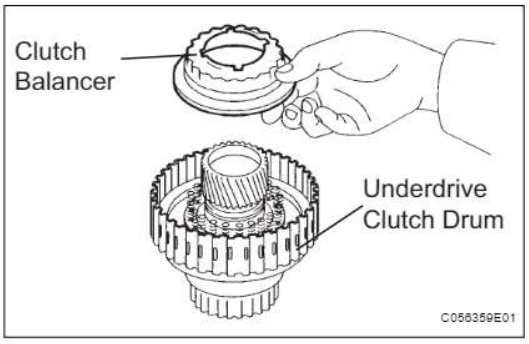


3. REMOVE UNDERDRIVE CLUTCH RETURN SPRING SUB-ASSEMBLY

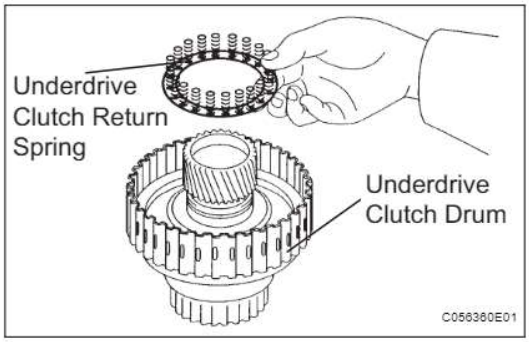
(a) Place SST on the clutch balancer and compress the spring with a press.
SST 09350-32014

(b) Using a snap ring expander, remove the snap ring.
NOTICE:
- **Stop the press when the spring sheet is lowered to the place 1 - 2 mm (0.039 - 0.078 in.) from the snap ring groove.**
- **This prevents the spring sheet from being deformed.**
- **Do not expand the snap ring excessively.**

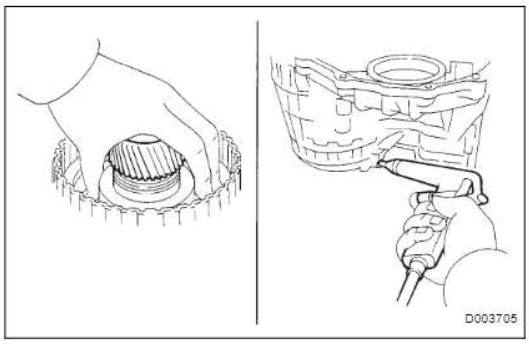
(c) Remove the clutch balancer from the underdrive clutch drum.



AX



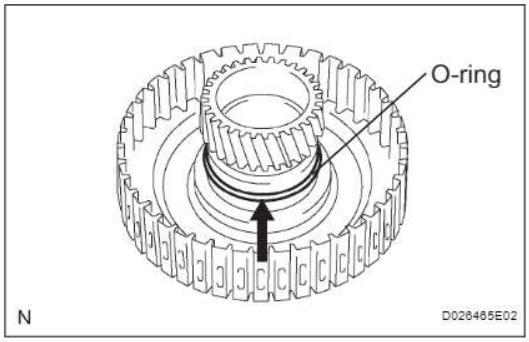
(d) Remove the return spring from the underdrive clutch drum.



4. REMOVE UNDERDRIVE CLUTCH PISTON SET

(a) Install the underdrive clutch to the transaxle case.
NOTICE:
Be careful not to damage the oil seal ring.

(b) Holding the underdrive clutch piston by hand, apply compressed air (392 kPa, 4.0 kgf/cm ^{2}, 57 psi) to the transaxle case to remove the underdrive clutch piston.



5. REMOVE UNDERDRIVE CLUTCH DRUM O-RING

(a) Using a screwdriver, remove the O-ring from the underdrive clutch drum.

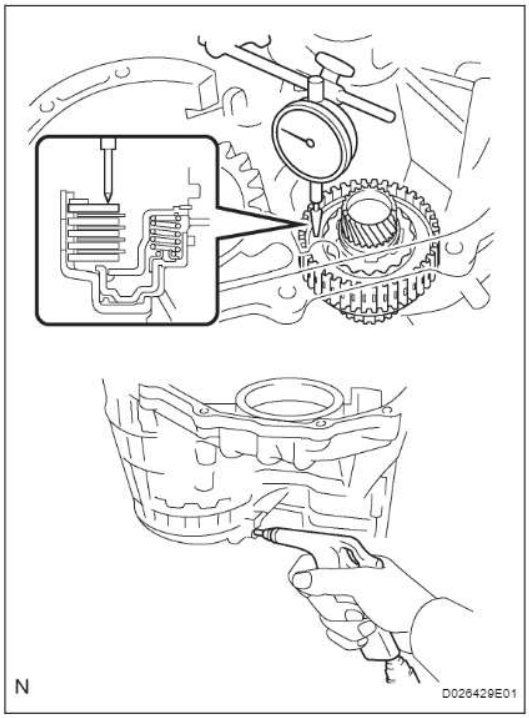
INSPECTION

1. INSPECT UNDERDRIVE PACK CLEARANCE

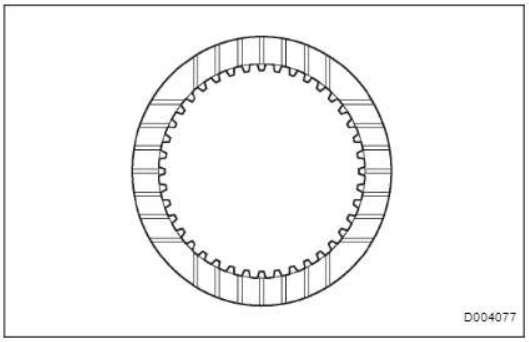
(a) Install the underdrive clutch to the transaxle case.
NOTICE:
Be careful not to damage the oil seal rings.

(b) Install a dial indicator as shown in the illustration.

(c) Measure the underdrive clutch pack clearance while applying and releasing compressed air (392 kPa, 4.0 kgf/cm ^{2}, 57 psi).
Pack clearance:
1.51 - 1.71 mm (0.0594 - 0.0673 in.)
If the pack clearance is not within standard, inspect the discs, plates and flange.



AX

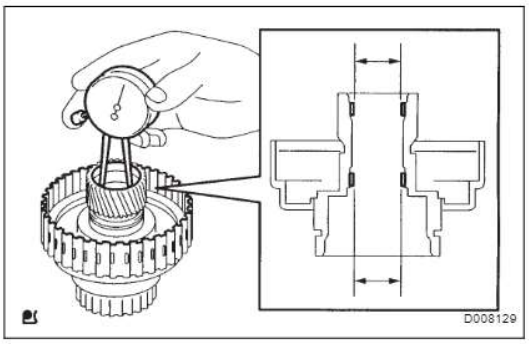


2. INSPECT UNDERDRIVE CLUTCH DISC NO.1

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

HINT:

- If the lining of the disc comes off or discolors, or even if a part of the groove is defaced, replace all discs.
- Before assembling new discs, soak them in ATF for at least 15 minutes.

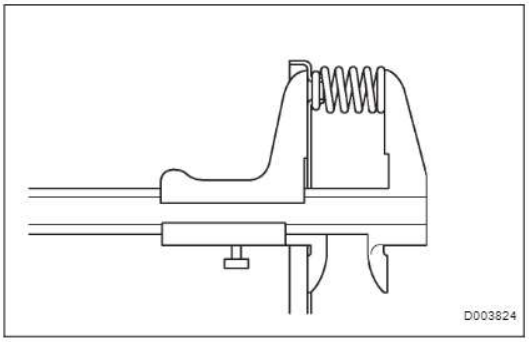


3. INSPECT UNDERDRIVE CLUTCH DRUM SUB-ASSEMBLY

(a) Using a dial indicator, measure the inside diameter of the underdrive clutch drum bushing.

Standard drum bushing:
37.06 - 37.08 mm (1.4591 - 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.

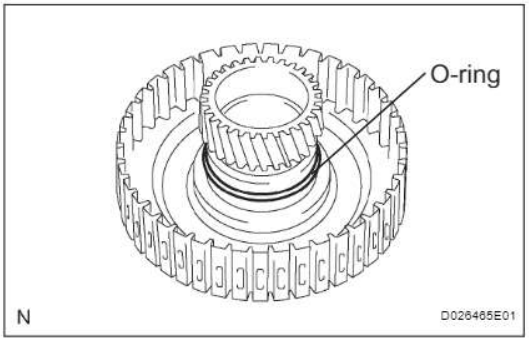


4. INSPECT UNDERDRIVE CLUTCH RETURN SPRING SUB-ASSEMBLY

(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.)

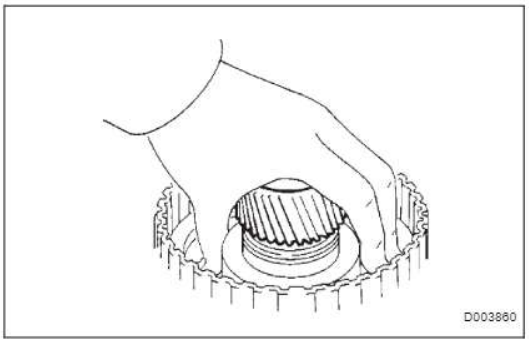
REASSEMBLY



1. INSTALL UNDERDRIVE CLUTCH DRUM O-RING

(a) Apply the new O-ring with ATF, install it to the underdrive clutch drum.

NOTICE:
Assemble the O-ring carefully not to have a twist and a pinching.



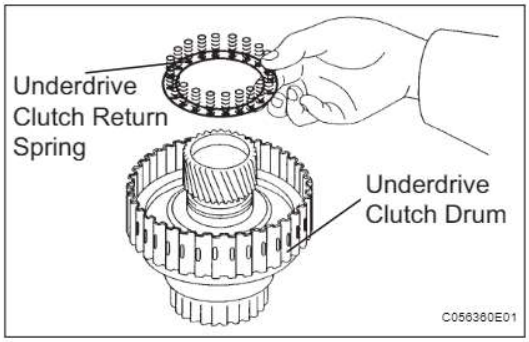
2. INSTALL UNDERDRIVE CLUTCH PISTON SET

(a) Coat the underdrive clutch piston with ATF, install it to the underdrive clutch piston drum.

NOTICE:

- **Be careful not to damage the O-ring.**
- **Be careful not to damage the lip seal of the piston.**

AX



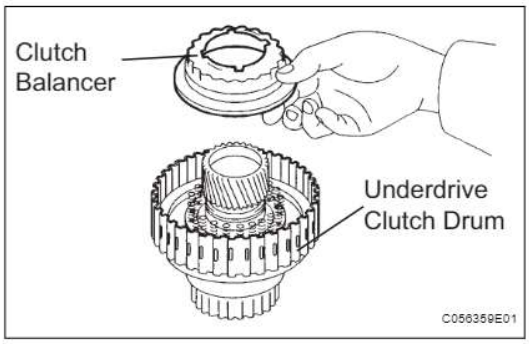
3. INSTALL UNDERDRIVE CLUTCH RETURN SPRING SUB-ASSEMBLY

(a) Install the return spring to the underdrive clutch drum.

NOTICE:

Installing the spring sub-assembly, check all of the springs are fit in the piston correctly.

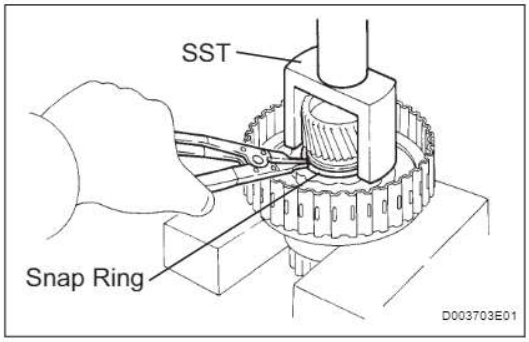
(b) Coat the clutch balancer with ATF.



(c) Install the clutch balancer to the underdrive clutch drum.

NOTICE:

Be careful not to damage the lip seal of the clutch balancer.



(d) Place SST on the clutch balancer and compress the piston return spring with a press.

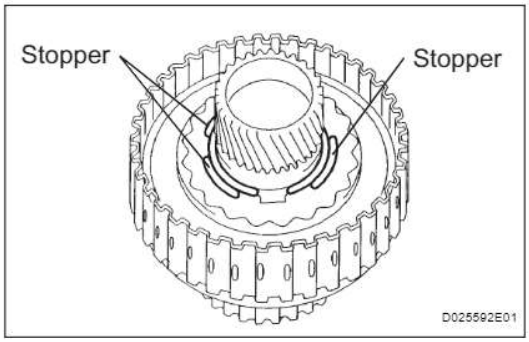
SST 09350-32014 (09351-32070)

(e) Using a snap ring expander, install the snap ring to the underdrive clutch drum.

(f) Be sure the end gap of the snap ring is not aligned with the spring retainer claw.

NOTICE:

- **Stop the press when the spring sheet is lowered to the place 1 - 2 mm (0.039 - 0.078 in.) from the snap ring grove.**
- **This prevents the spring sheet from being deformed.**
- **Do not expand the snap ring excessively.**

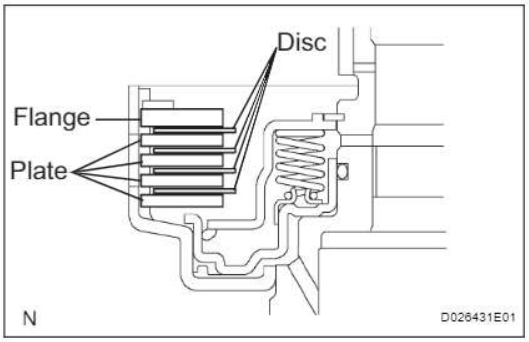


(g) Set the end gap of the snap ring in the underdrive clutch drum shown in the illustration.

NOTICE:

The end gap of the snap ring should not coincide with any of the stopper.

AX



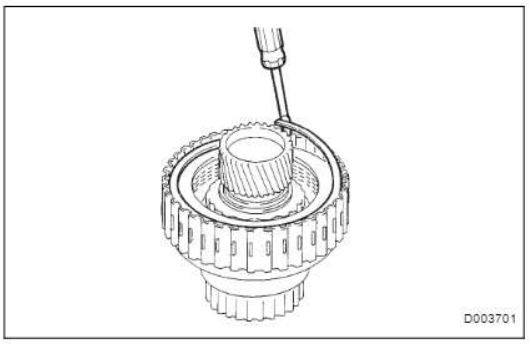
4. INSTALL UNDERDRIVE CLUTCH DISC NO.1

(a) Apply the 4 discs with ATF.

(b) Install the 4 plates, 4 discs and flange to the underdrive clutch drum.

NOTICE:

Be careful about the order of discs, plates and flange assembly.



5. INSTALL UNDERDRIVE CLUTCH FLANGE NO.2 HOLE SNAP RING

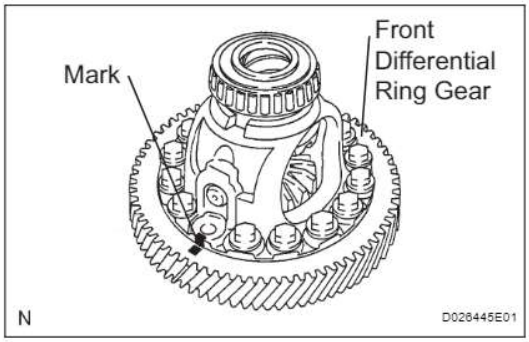
(a) Using a screwdriver, install the underdrive clutch flange No.2 hole snap ring.

(b) Check that the end gap of snap ring is not aligned with one of the cutouts.

NOTICE:

The snap ring should be fixed certainly in the groove of the drum.

AX

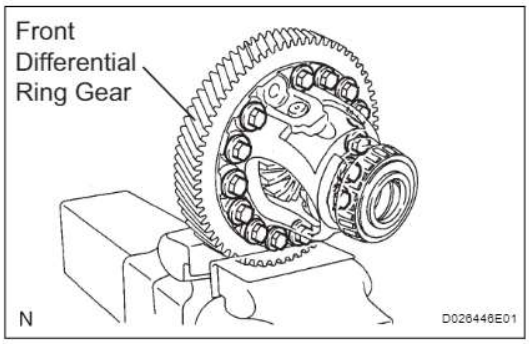


DIFFERENTIAL CASE

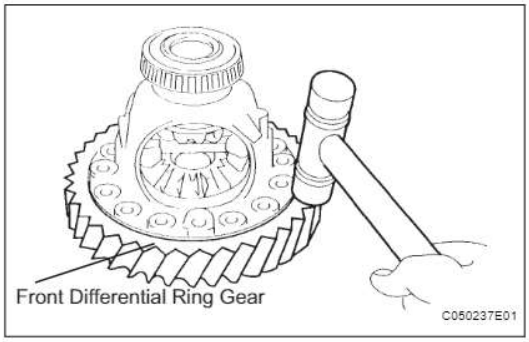
DISASSEMBLY

1. REMOVE FRONT DIFFERENTIAL RING GEAR

(a) Place the match-marks on the front differential ring gear and differential case.

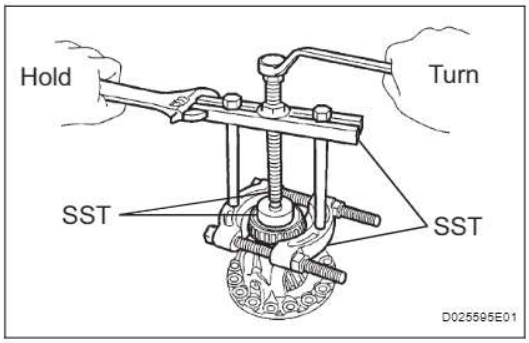


(b) Remove the 14 bolts.



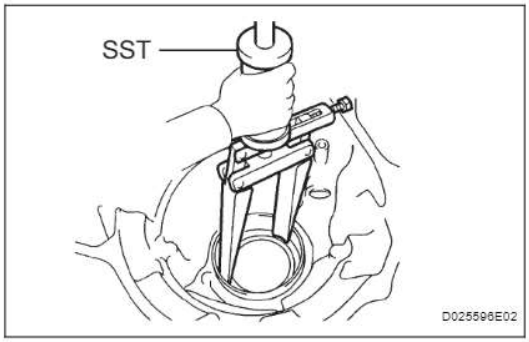
(c) Using a plastic hammer, tap on the front differential ring gear to remove it from the case.

2. REMOVE FR DIFFERENTIAL CASE FRONT TAPERED ROLLER BEARING



(a) Using SST, remove the front differential case front differential tapered roller bearing from the differential case.

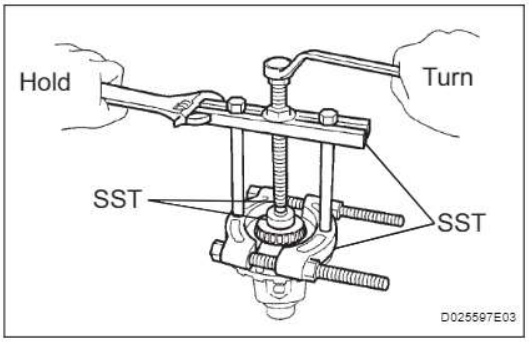
SST 09950-00020, 09950-00030, 09950-60010 (09951-00490), 09950-40011 (09957-04010)



(b) Using SST, remove the front differential case front tapered roller bearing outer race.

SST 09308-00010

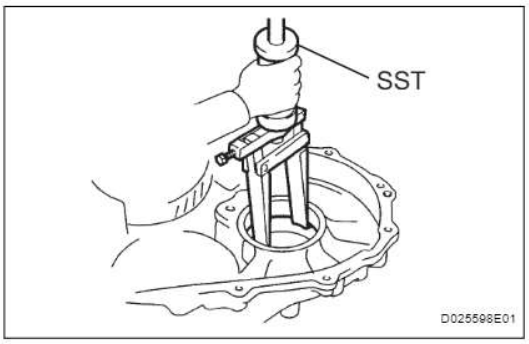
AX



3. REMOVE FR DIFFERENTIAL CASE REAR TAPERED ROLLER BEARING

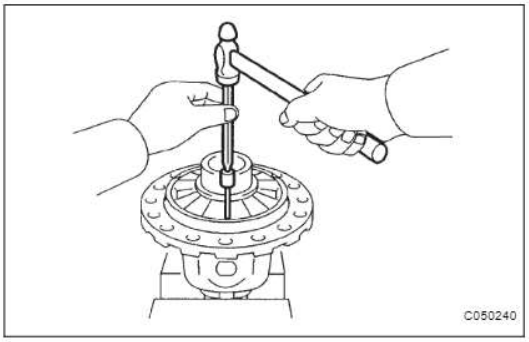
(a) Using SST, remove the front differential case rear tapered roller bearing from the differential case.

SST 09950-00020, 09950-00030, 09950-60010 (09951-00490), 09950-40011 (09957-04010), 09308-00010



(b) Using SST, remove the front differential case rear tapered roller bearing outer race.

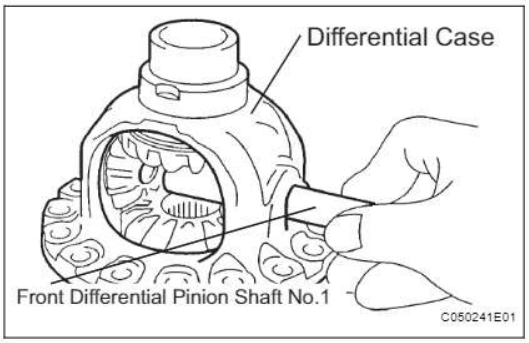
SST 09308-00010



4. REMOVE FRONT DIFFERENTIAL PINION SHAFT STRAIGHT PIN

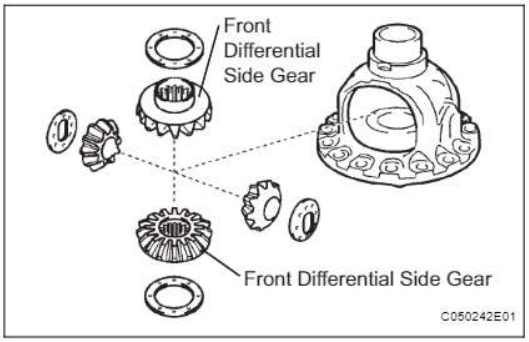
(a) Using a pin punch and hammer, install the straight pin.

NOTICE:
Before removing the straight pin, unstake it with a pin punch.



5. REMOVE FRONT DIFFERENTIAL PINION SHAFT NO.1

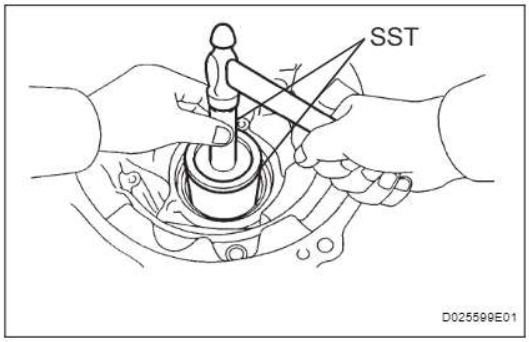
(a) Remove the front differential pinion shaft No.1 from the differential case.



6. REMOVE FRONT DIFFERENTIAL SIDE GEAR

(a) Remove the 2 front differential pinions, 2 pinion thrust washers, 2 front differential side gears and 2 side gear thrust washers from the differential case.

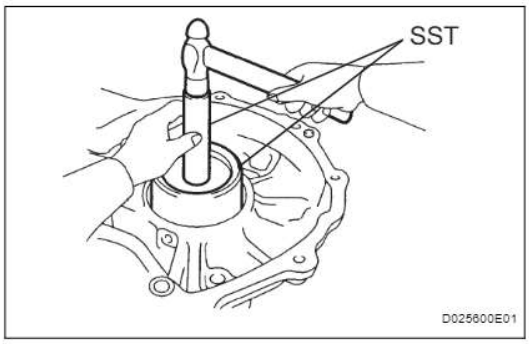
AX



7. REMOVE TRANSAXLE HOUSING OIL SEAL

(a) Using SST, remove the oil seal.

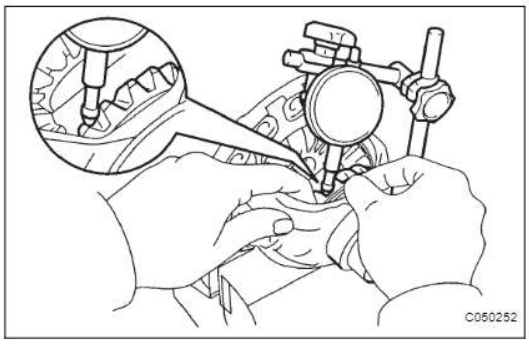
SST 09950-70010 (09951-07100), 09215-00013 (09215-00471)



8. REMOVE DIFFERENTIAL SIDE BEARING RETAINER OIL SEAL

(a) Using SST, remove the oil seal.

SST 09950-70010 (09951-07100), 09608-10010



INSPECTION

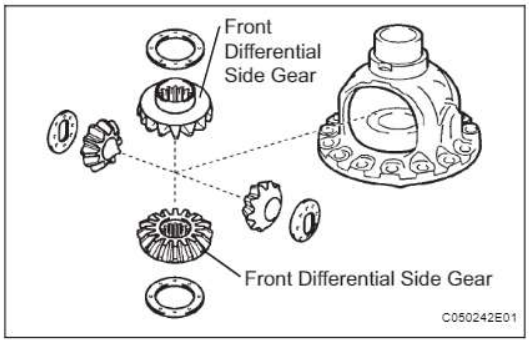
1. INSPECT BACKLASH

(a) Using a dial indicator, inspect the backlash of the side gear.

Standard backlash:
0.05 - 0.20 mm (0.0020 - 0.0079 in.)

Thrust washer thickness

Mark	Thickness
-	1.625 mm (0.0640 in.)
-	1.725 mm (0.0679 in.)
-	1.825 mm (0.0719 in.)

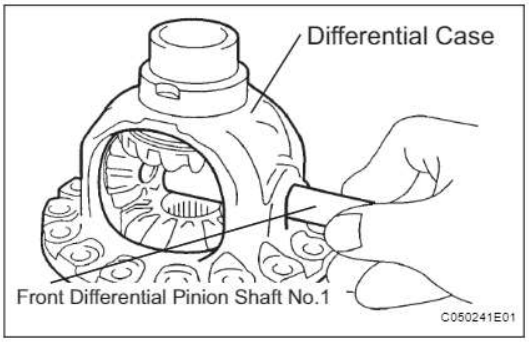


REASSEMBLY

1. INSTALL FRONT DIFFERENTIAL SIDE GEAR

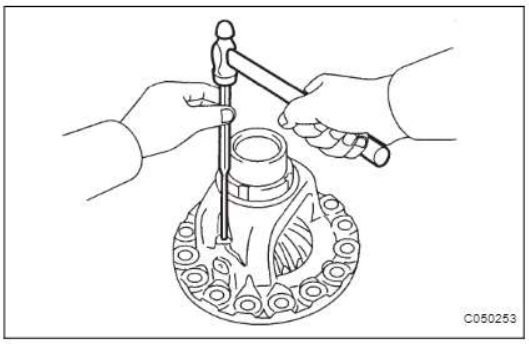
(a) Apply the 2 front differential side gears, 2 side gear thrust washers, 2 front differential pinions and 2 pinion thrust washers with ATF and install them to the differential case.

AX



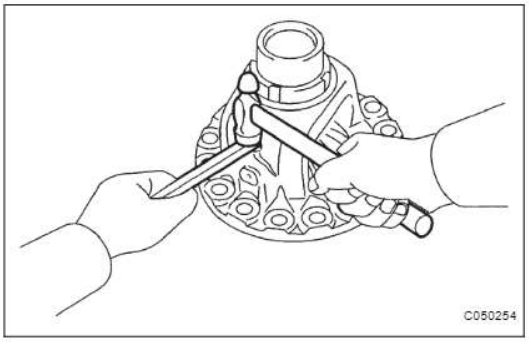
2. INSTALL FRONT DIFFERENTIAL PINION SHAFT NO.1

(a) Apply the front differential pinion shaft No.1 with ATF, install it to the differential case.



3. INSTALL FRONT DIFFERENTIAL PINION SHAFT STRAIGHT PIN

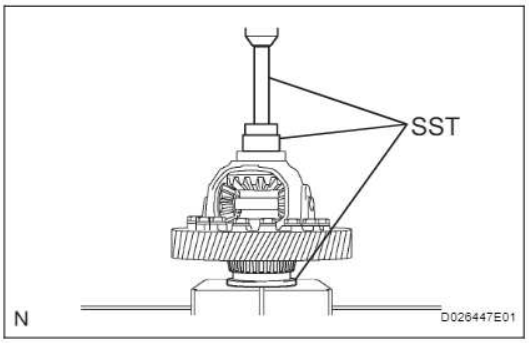
(a) Using a pin punch and hammer, install the pinion shaft straight pin.



(b) Using a chisel and hammer, stake the differential case.

NOTICE:

Stake it after adjusting the backlash.



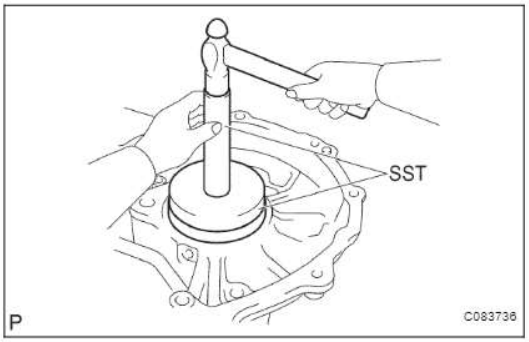
4. INSTALL FR DIFFERENTIAL CASE FRONT TAPERED ROLLER BEARING

(a) Using SST and a press, install the front differential case rear tapered roller bearing to the differential case.

SST 09316-12010, 09550-60010 (09951-00490), 09950-70010 (09951-07100)

NOTICE:

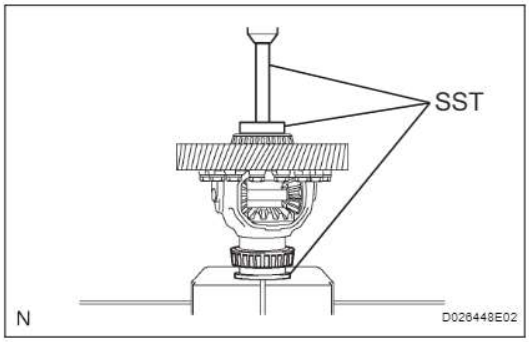
Do not make a damage on the bearing cage during the bearing inner race installation.



(b) Using SST and a hammer, install the front differential case tapered roller bearing front outer race to the transaxle housing.

SST 09550-60010 (09951-00490), 09950-60020 (09951-00910)

AX



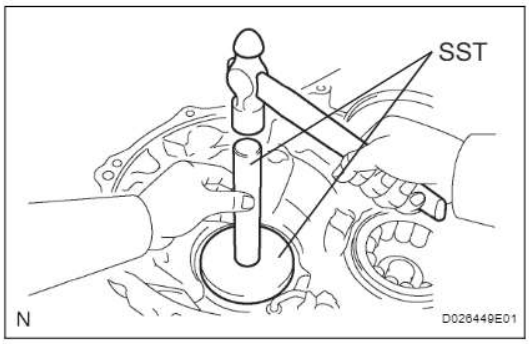
5. INSTALL FR DIFFERENTIAL CASE REAR TAPERED ROLLER BEARING

(a) Using SST and a press, install the front differential case front tapered roller bearing to the differential case.

SST 09316-12010, 09550-60010 (09951-00490), 09950-70010 (09951-07100, 09951-07150)

NOTICE:

Do not make a damage on the bearing cage during the bearing inner race installation.

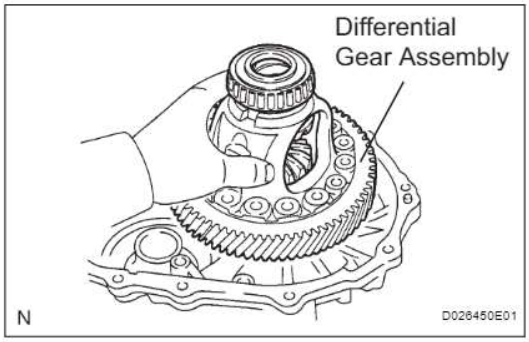


(b) Using SST and a hammer, install the front differential case tapered roller bearing front outer race to the transaxle housing.

SST 09950-70010 (09951-07100, 09951-07150), 09950-60020 (09951-00890)

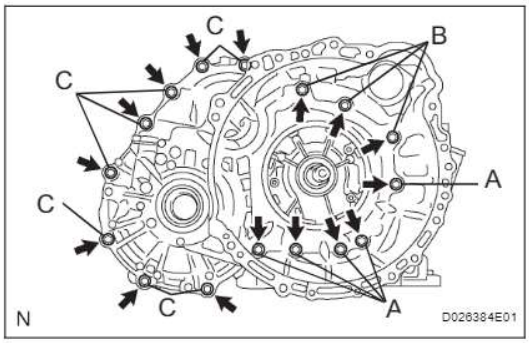
NOTICE:

Clearance is not allowed between the bearing and transaxle housing.



6. ADJUST DIFFERENTIAL SIDE BEARING PRELOAD

(a) Install the differential assy to the transaxle case.



(b) Clean the matching surfaces of the transaxle case and transaxle housing.

(c) Install the transaxle housing to the transaxle case and tighten them with the 16 bolts.

Torque: Bolt A
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 D
22 N*m (226 kgf*cm, 16.0 ft.*lbf)

HINT:

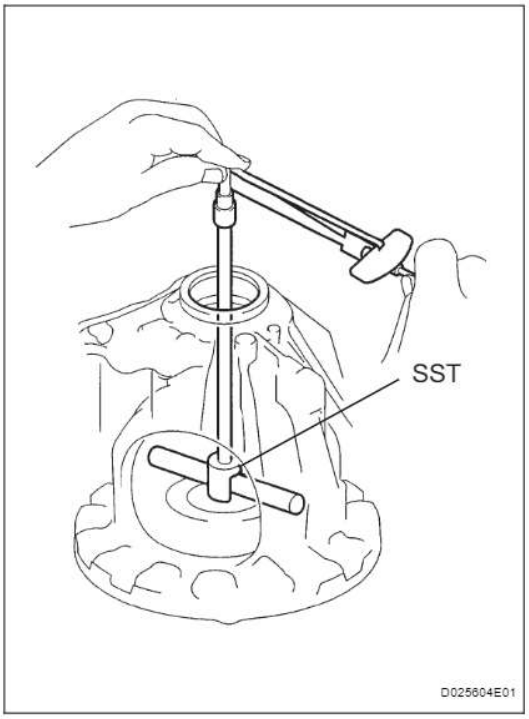
Apply seal packing or equivalent to the A and D.

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:

AX

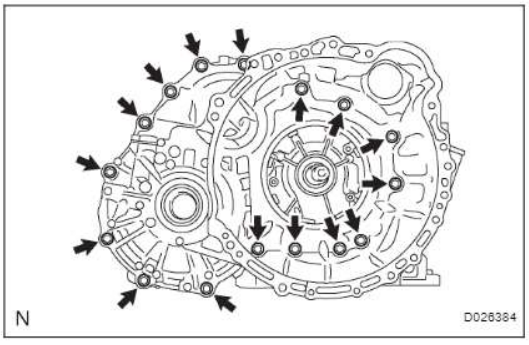
42 mm (1.654 in.)
Bolt D:
72 mm (2.835 in.)
HINT:
Usually, bolt A is a non-reusable bolt. In this case, however, it can be used after cleaning it.



(d) Using SST, turn the differential assy right and left 2 or 3 times to settle the bearing.
SST 09564-32011

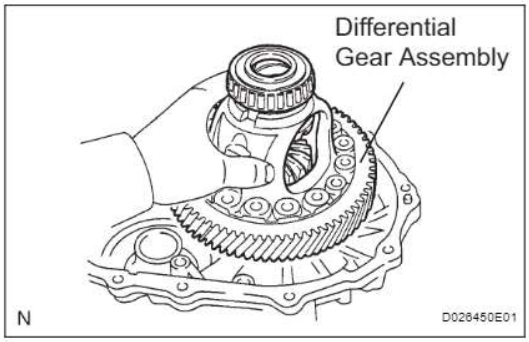
(e) Using SST and a torque wrench, measure the turning torque of the differential.
SST 09564-32011
Turning torque at 60 rpm:
New bearing:
0.20 - 0.69 N*m(2.0 - 7.0 kgf*cm, 1.8 - 6.1 in.*lbf)
Used bearing:
0.10 - 0.35 N*m(1.0 - 3.6 kgf*cm, 0.9 - 3.1 in.*lbf)
HINT:
If the turning torque is not within the specified value, refer to the table below to select a thrust washer which turning torque is within the specified value.
Flange thickness: mm (in.)

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	2.85 (0.1122)

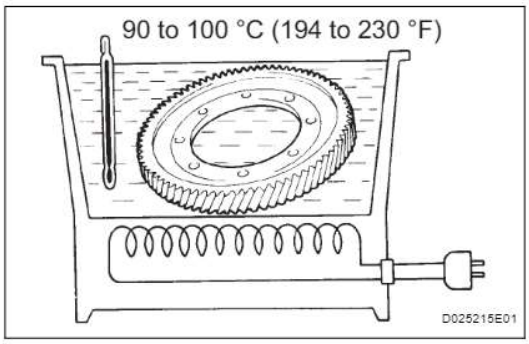


(f) Remove the 16 bolts and the transaxle housing.

AX



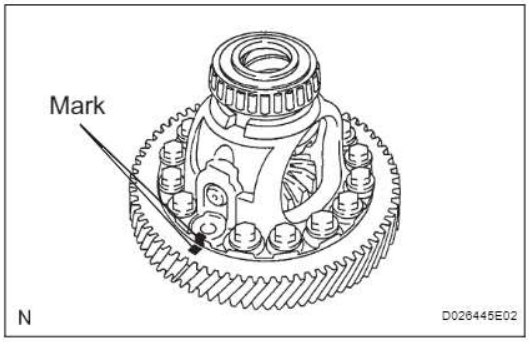
(g) Remove the differential assembly.



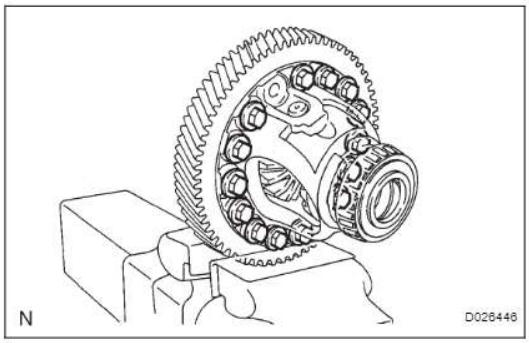
7. INSTALL FRONT DIFFERENTIAL RING GEAR

(a) Using ATF and heater, heat the front differential ring gear to 90 - 110 °C (194.0 - 230.0 °F).
NOTICE:
Do not overheat the ring gear to 110 °C (230.0 °F) or more.

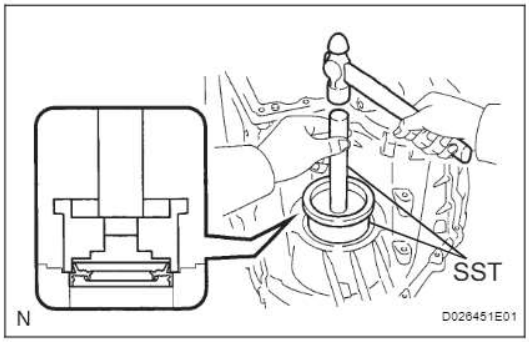
(b) Clean the contact surface of the front differential case.



(c) Align the match-marks, install the front differential ring gear case quickly.
NOTICE:
Do not install the bolts while the ring gear is hot.



(d) Tighten the 14 bolts.
Torque: 95.0 N*m (970 kgf*cm, 70 ft.*lbf)
NOTICE:
Tighten the bolts a little at a time in diagonal order.

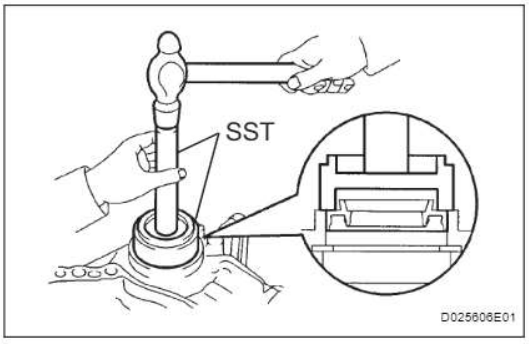


8. INSTALL TRANSAXLE HOUSING OIL SEAL

(a) Using SST and a hammer, install a new oil seal.
SST 09223-15020, 09950-70010 (09951-07150)

(b) Apply the rip of oil seal with a little MP grease.
Oil seal drive in depth:
0 +- 0.5 mm (0 +- 0.0197 in.)

AX



9. INSTALL DIFFERENTIAL SIDE BEARING RETAINER OIL SEAL

(a) Using SST and a hammer, drive into a new oil seal.
SST 09710-30050, 09950-70010 (09951-07150)

(b) Apply the lip of the oil seal with a little MP grease.
Oil seal drive in depth:
0 +- 0.5 mm (0 +- 0.0197 in.)