AUTOMATIC TRANSMISSION SYSTEM

PRECAUTION

1. **INITIALIZATION**
   NOTICE:
   - **Perform the AT initialization when replacing the automatic transmission assembly, engine assembly or ECM.**
   - **Perform the REGISTRATION (VIN registration) when replacing the ECM. (See page ES-16).**

   HINT:
   Initialization can be completed by only disconnecting the battery terminal.
2. **FOR USING INTELLIGENT TESTER**
   CAUTION:
   Observe the following instructions for safety reasons:
   - **Read its instruction books before using the tester.**
   - **Prevent the tester cable from being caught on the pedals, shift lever and steering wheel when driving with the tester connected to the vehicle.**
   - **When driving the vehicle for testing purposes using the tester, two persons are required. One is for driving the vehicle, and the other operates the tester.**
3. **CONNECT BATTERY NEGATIVE TERMINAL**
   (a) Connect the battery negative terminal to the cable and run the engine at no less than 2,000 rpm for 1 minute.
   NOTICE:
   If the engine exceeds 2,000 rpm, the clutch is automatically disengaged by the compressor protection control system.
4. **DISASSEMBLY AND REASSEMBLY**
   CAUTION:
   When using compressed air, always aim away from yourself to prevent Automatic Transmission Fluid (ATF) or kerosene from spraying on your face.
   NOTICE:
   - **The automatic transmission is composed of precision-made parts, necessitating careful inspection before reassembly because even a small nick could cause fluid leakage or affect performance.**
   - **The procedures are organized so that you work on only one component group at a time. This will help avoid confusion with similar-looking parts of different sub-assemblies being on your workbench at the same time.**
   - **The component groups are inspected and repaired from the converter housing side.**

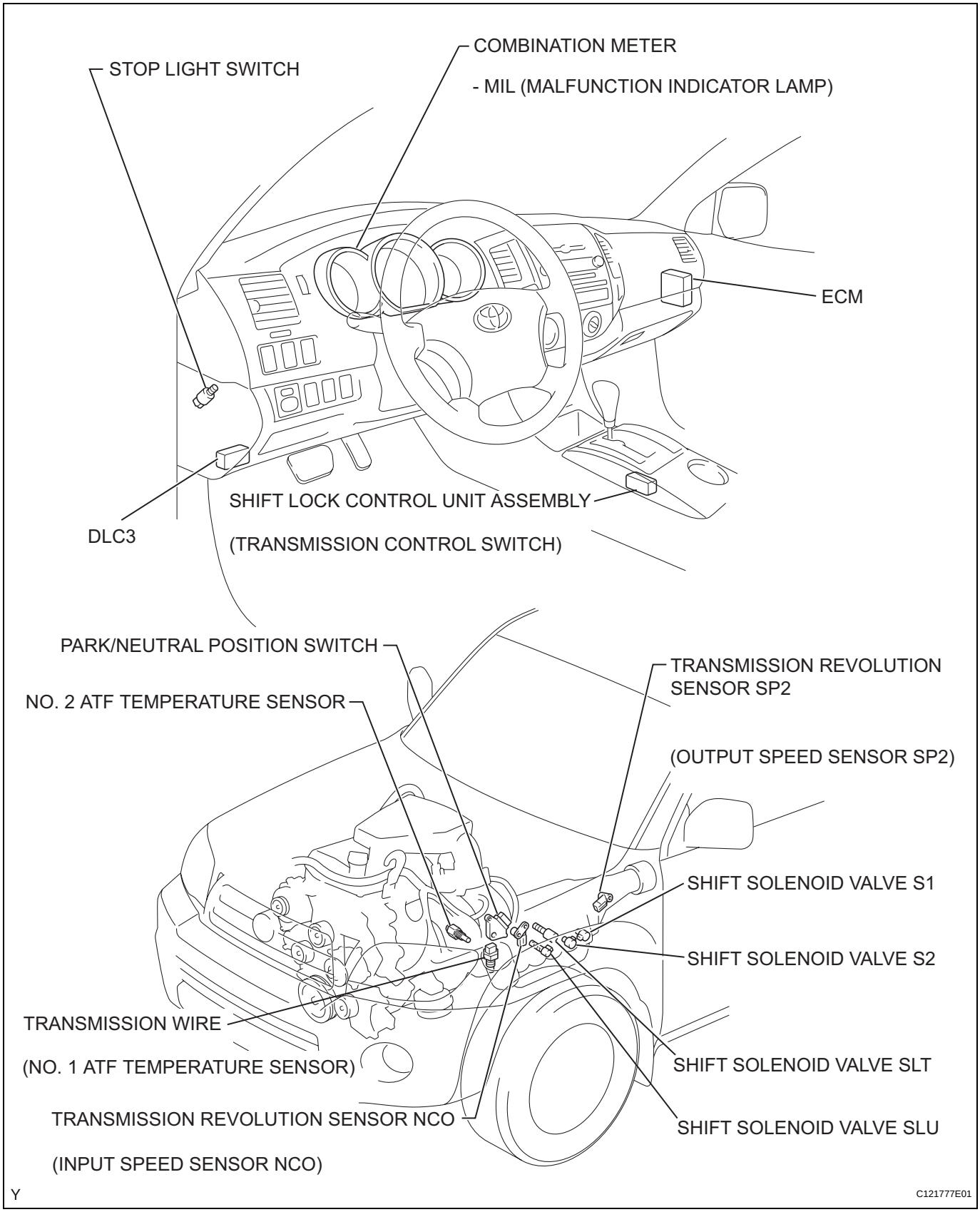
- **Whenever possible, complete the inspection, repair and reassembly before proceeding to the next component group. If a defect is found in a certain component group during reassembly, inspect and repair this group immediately. If a component group cannot be assembled because parts are being ordered, be sure to keep all parts of the group in a separate container while proceeding with disassembly, inspection, repair and reassembly of other component groups.**
- **When changing the automatic transmission fluid, use only "Toyota Genuine ATF Type T- IV" (ATF JWS3309 or NWS6500)**
- **All disassembled parts should be washed clean, and compressed air should be blown through any fluid passages and holes.**
- **Dry all parts with compressed air. Never use cloth.**
- **The recommended ATF or kerosene should be used for cleaning.**
- **After cleaning, the parts should be arranged in the order they were removed for efficient inspection, repairs, and reassembly.**
- **When disassembling a valve body, be sue to match each valve with its corresponding spring.**
- **New discs for the brakes and clutches that will be used for replacement must be soaked in ATF for at least 15 minutes before reassembly.**
- **All oil seal rings, clutch discs, clutch plates, rotating parts, and sliding surfaces should be coated with ATF prior to reassembly.**
- **All old gaskets and rubber O-rings must be replaced.**
- **Do not apply adhesive cement to gaskets and similar parts.**
- **Make sure that the ends of the snap rings are not aligned with any cutouts. Also make sure that snap rings are correctly installed into the grooves.**
- **If a worn bushing is to be replaced, the sub-assembly containing the bushing must also be replaced.**
- **Check the thrust bearings and races for wear or damage. Replace if necessary.**
- **Use petroleum jelly to keep parts in place.**

- **When working with FIPG material, perform the following:**
  Using a razor blade and gasket scraper, remove all old FIPG material from the gasket surface.
  Clean all components thoroughly to remove all foreign matter.
  Clean both sealing surfaces with a non-residue solvent.
  Apply FIPG material in a continuous line approximately 1 mm (0.04 in.) in diameter on the sealing surface.
  Reassemble parts within 10 minutes of applying FIPG material. Failing to do so will require the FIPG material to be removed and reapplied.

DEFINITION OF TERMS

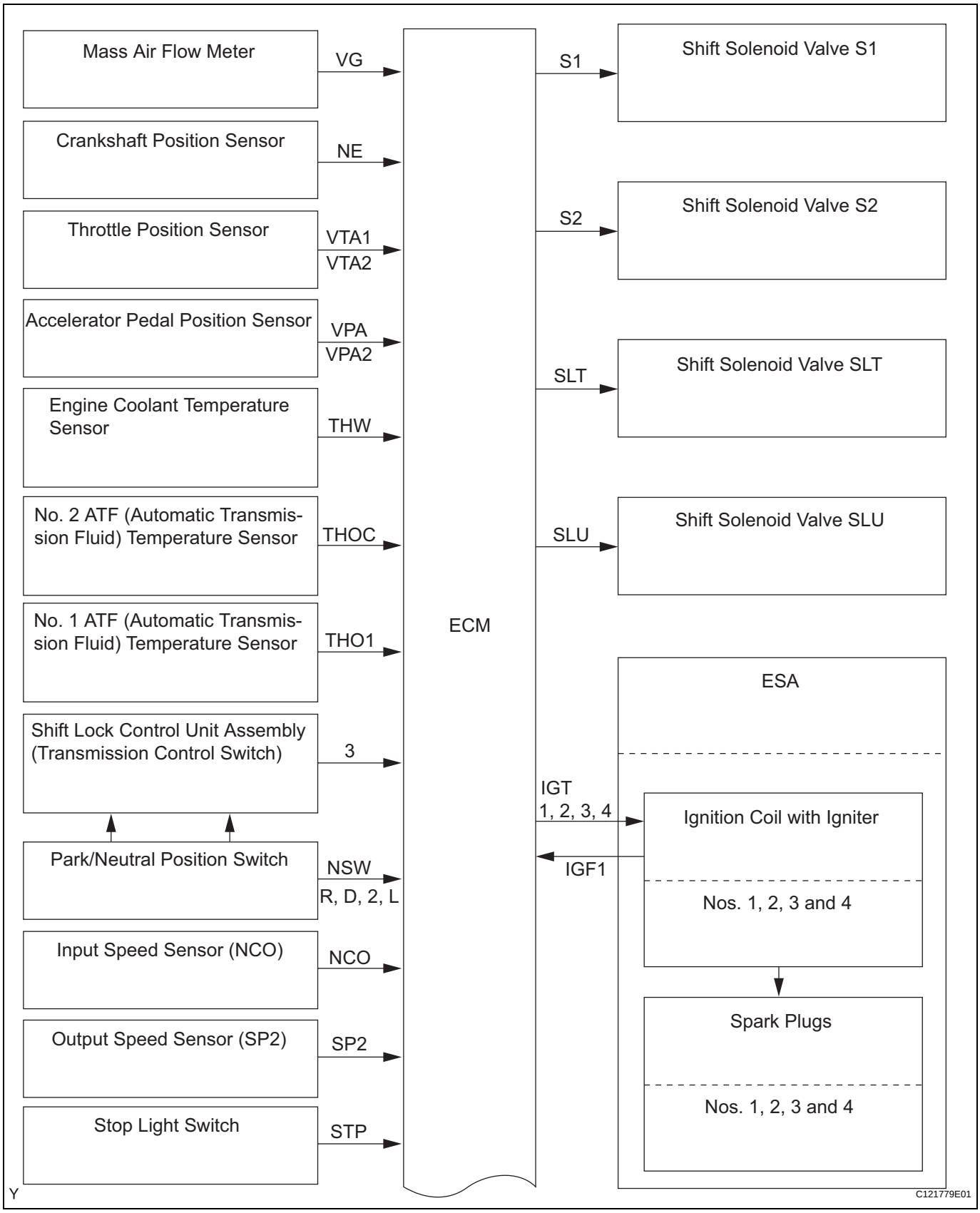
Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	A group of diagnostic trouble code that are output by the ECM based on the same malfunction detection logic.
Typical enabling conditions	Preconditions 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 one sensor is being monitored, the next sensor or component will not be monitored until the previous monitoring has been completed.
Required sensors/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 the malfunction only one time during a single driving cycle. "Continuous" means that the ECM detects the malfunction every time the enabling conditions are met.
Duration	The minimum time that the ECM must detect 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 determines that there is a malfunction and sets a DTC.
MIL operation	MIL illumination timing after a defect is detected. "Immediate" means that the ECM illuminates the MIL the instant the ECM determines that there is a malfunction. "2 driving cycles" means that the ECM illuminates the MIL if the same malfunction is detected again in a 2nd driving cycle.
Component operating range	Normal operation range of sensors and solenoids under normal driving conditions. These ranges are for a reference. They cannot be used to determine whether a sensor or solenoid is defective or not.

PARTS LOCATION

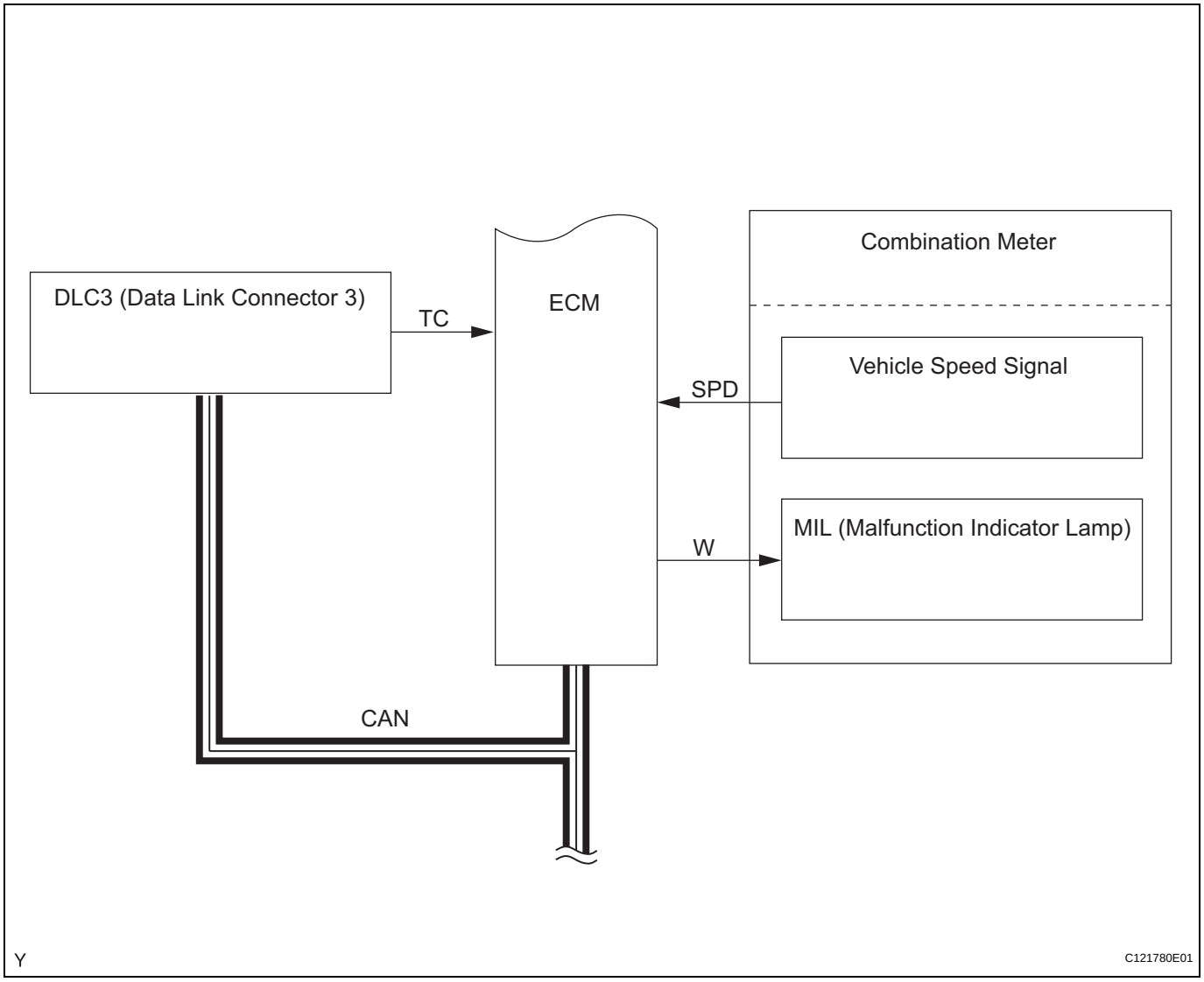


SYSTEM DIAGRAM

The configuration of the electronic control system in the A340E automatic transmission is as shown in the following chart.



AT


Combination Meter
DLC3 (Data Link Connector 3)
TC
ECM
SPD
Vehicle Speed Signal
MIL (Malfunction Indicator Lamp)
W
CAN
Y
C121780E01

SYSTEM DESCRIPTION

1. SYSTEM DESCRIPTION

(a) The ECT (Electronic Controlled automatic Transmission) is an automatic transmission that electronically controls shift timing using the ECM. The ECM detects electrical signals that indicate engine and driving conditions, and controls the shift point, based on driver habits and road conditions. As a result, fuel efficiency and power transmission performance are improved.
Shift shock has been reduced by controlling the engine and transmission simultaneously. In addition, the ECT has features such as follows:

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

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

- The ECM of this system is connected to the CAN and multiplex communication system. Therefore, before starting troubleshooting, make sure that there is no trouble in the CAN and multiplex communication system.
- 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 intelligent tester to DLC3**

NEXT

4 **Check and Clear DTC and Freeze Frame Data (See page AT-25)**

NEXT

5 **Visual Inspection**

NEXT

6 **Setting the Check Mode Diagnosis (See page AT-26)**

NEXT

7 **Problem Symptom Confirmation (See page AT-9)**

Result	Proceed To
Symptom does not occur	A
Symptom occurs	B

B → **Go to step 9**

A

8	Symptom Simulation (See page IN-26)

NEXT

9	DTC Check (See page AT-25)

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

B → Go to step 17

A

10	Basic Inspection (See page AT-85, AT-92 and AT-105)

NG → Go to step 19

OK

11	Mechanical System Test (See page AT-12)

NG → Go to step 16

OK

12	Hydraulic Test (See page AT-14)

NG → Go to step 16

OK

13	Manual Shifting Test (See page AT-15)

NG → Go to step 15

OK

14	Problem Symptoms Table Chapter 1 (See page AT-17)

NG → Go to step 18

OK

15	Problem Symptoms Table Chapter 2 (See page AT-17)

NEXT

16	Part Inspection

NEXT

17	DTC Chart (See page AT-30)

NEXT

18	Circuit Inspection

NEXT

19	Repair or Replace

NEXT

20	Confirmation Test

NEXT

End

ROAD TEST

1. PROBLEM SYMPTOM CONFIRMATION

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

2. ROAD TEST

NOTICE:

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

(a) D position test:

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

(1) Check up-shift operation.

Check that 1 →2, 2 → 3 and 3 → 4 up-shifts take place, and that the shift points conform to the automatic shift schedule. (See page SS-37)

HINT:

4th Gear Up-shift Prohibition Control

- Engine coolant temperature is 55 °C (131 °F) or less and vehicle speed is 49.7 mph (80 km/h) or less.

4th Gear Lock-up Prohibition Control

- Brake pedal is depressed.
- Accelerator pedal is released.
- Engine coolant temperature is 55°C(131 °F) or less.

(2) Check for shift shock and slippage.

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

(3) Check for abnormal noise and vibration.

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

HINT:

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

(4) Check kick-down operation.

While running in the D position, 2nd, 3rd and 4th gears, check that the possible kick-down vehicle speed limits for 2 → 1, 3 → 2 and 4 → 3 kick-downs conform to those indicated on the automatic shift schedule. (See page SS-37)

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

(6) Check the lock-up mechanism.
- Drive in the D position (4th gear), at a steady speed (lock-up ON).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

HINT:
- There is no lock-up function in the 1st and 2nd gears.
- If there is a sudden increase in engine speed, there is no lock-up.

(b) 3 position test:
Shift into the 3 position, fully depress the accelerator pedal and check the following points:
(1) Check up-shift operation.
Check that 1 → 2, 2 → 3 up-shifts take place and that the shift point conforms to the automatic shift schedule (See page SS-37).
HINT:
There is no 4th up-shift and lock-up in the 3 position. 3rd Gear Lock-up Prohibition Control
- Brake pedal is depressed.
- Accelerator pedal is released.
- Engine coolant temperature is 55 °C (131 °F) or less.

(2) Check engine braking.
While running in the 3 position and 3rd gear, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noise during acceleration and deceleration, and for shock at up-shift and down-shift.
(4) Check the lock-up mechanism.
- Drive in the 3 position (3rd gear), at a steady speed (lock-up ON).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

HINT:
- There is no lock-up function in the 1st and 2nd gears.
- If there is a sudden increase in engine speed, there is no lock-up.

(c) 2 position test:
Shift into the 2 position, fully depress the accelerator pedal and check the following points:
(1) Check up-shift operation.
Check that 1 → 2 up-shift takes place and that the shift point conforms to the automatic shift schedule. (See page SS-37).
(2) Check engine braking.
While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.

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

(d) L position test:
Shift into the L position, fully depress the accelerator pedal and check the following points:
(1) Check no up-shift.
While running in the L position, check that there is no up-shift to the 2nd gear.
(2) Check engine braking.
While running in the L position, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noises during acceleration and deceleration.

(e) 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 obstructions.

(f) 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.

MECHANICAL SYSTEM TESTS

1. STALL SPEED TEST

HINT:

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

NOTICE:

- **Do not perform the stall speed test longer than 5 seconds.**
- **To ensure safety, perform this test in an open and level area that provides good traction.**
- **The stall speed test should always be performed with at least 2 people. One person should observe the condition of the wheels and wheel chocks while the other is performing the test.**

(a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.

(b) Run the vehicle until the transmission fluid temperature has reached 50 to 80°C (122 to 176°F).

(c) Allow the engine to idle with the air conditioning OFF.

(d) Chock all 4 wheels.

(e) Set the parking brake and keep the brake pedal depressed firmly with your left foot.

(f) Shift the shift lever into the D position.

(g) Depress the accelerator pedal as much as possible with your right foot.

(h) Read the engine rpm (stall speed) and release the accelerator pedal immediately.

Standard value:

1,850 to 2,150 rpm

Evaluation:

Test Result	Possible Cause
Stall speed is lower than standard value	• Stator one-way clutch is not operating properly • Torque converter is faulty (stall speed is less than standard value by 600 rpm or more) • Engine power may be insufficient
Stall speed is higher than standard value	• Line pressure is low • Forward clutch slipping • No. 2 one-way clutch is not operating properly • O/D one-way clutch is not operating properly • Improper fluid level

2. SHIFT TIME LAG TEST

HINT:

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

(a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.

(b) Run the vehicle until the transmission fluid temperature has reached 50 to 80°C (122 to 176°F).

(c) Allow the engine to idle with the air conditioning OFF.

(d) Set the parking brake and keep the brake pedal depressed firmly.

(e) Check the D range time lag.
(1) Shift the shift lever into the N position and wait for 1 minute.
(2) Shift the shift lever into the D position and measure the time until the shock is felt.
(3) Repeat the 2 procedures above 3 times, and calculate the average time of the 3 tests.

(f) Check the R range time lag.
(1) Shift the shift lever into the N position and wait for 1 minute.
(2) Shift the shift lever into the R position and measure the time until the shock is felt.
(3) Repeat the 2 procedures above 3 times, and calculate the average time of the 3 tests.

Standard value:

D range time lag is less than 1.2 seconds
R range time lag is less than 1.5 seconds

Evaluation:

Test Result	Possible Cause
D range time lag exceeds standard value	• Line pressure is low • Forward clutch is worn • O/D one-way clutch is not operating properly
R range time lag exceeds standard value	• Line pressure is low • Direct clutch is worn • 1st brake and reverse brake is worn • O/D one-way clutch is not operating properly

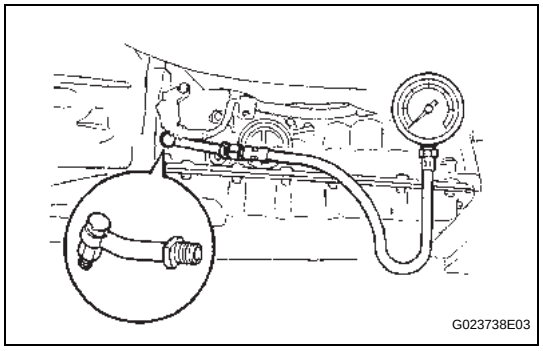
HYDRAULIC TEST

1. PERFORM HYDRAULIC TEST

(a) Measure the line pressure.

NOTICE:

- **Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature of 50° to 80°C (122° to 176°F).**
- **The line pressure test should always be carried out in pairs. One technician should observe the condition of the wheels or wheel stoppers outside the vehicle while the other is doing the test.**
- **Be careful to prevent the SST hose from interfering with the exhaust pipe.**
- **This check must be conducted after checking and adjusting the engine.**
- **Perform the test with A/C OFF.**
- **Do not conduct stall tests for longer than 5 seconds continuously.**


G023738E03

(1) Warm up the ATF.
(2) Lift the vehicle up.
(3) Remove the test plug on the transmission case center right side and connect SST.
SST 09992-00095 (09992-00231, 09992-00271)
(4) Fully apply the parking brake and chock the 4 wheels.
(5) Start the engine and check the idling speed.
(6) Keep your left foot pressing firmly on the brake pedal and shift into the D position.
(7) Measure the line pressure while the engine is idling.
(8) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when the engine speed reaches the stall speed.
(9) In the same manner, do the test in the R position.

Specified line pressure

Condition	D position: kPa (kgf / cm^2, psi)	R position: kPa (kgf / cm^2, psi)
Idling	363 to 422 (3.7 to 4.3, 52.6 to 61.2)	608 to 706 (6.2 to 7.2, 88.2 to 102.4)
Stall test	932 to 1,177 (9.5 to 12.0, 135.2 to 170.7)	1,569 to 1,912 (16.0 to 19.5, 227.6 to 277.3)

Evaluation

Problem	Possible cause
If the measured values at all positions are too high	• Shift solenoid valve (SLT) defective • Regulator valve detective
If the measured values at all positions are too low	• Shift solenoid valve (SLT) defective • Regulator valve detective • Oil pump defective • O/D direct clutch defect
If pressure is low in the D position only	• D position circuit fluid leakage • Forward clutch defective

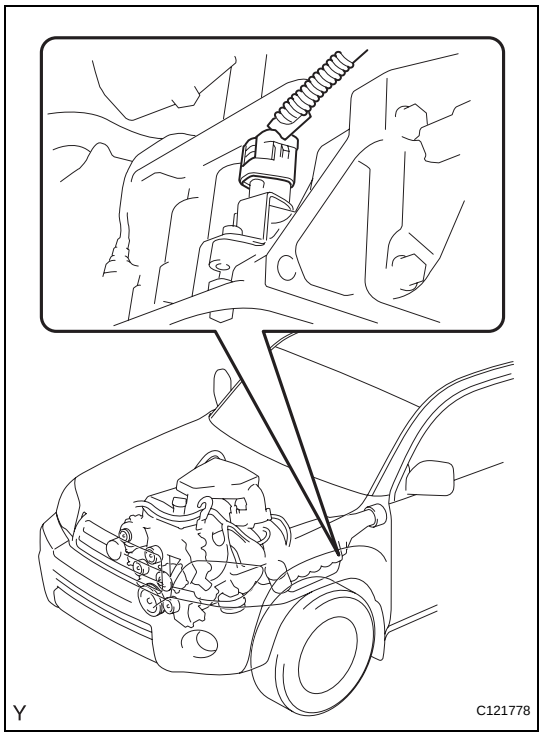
Problem	Possible cause
If pressure is low in the R position only	• **R position circuit fluid leakage** • **Direct clutch defective** • **1st & reverse brake defective**

MANUAL SHIFTING TEST

1. MANUAL SHIFTING TEST

HINT:

- Through this test, it can be determined whether the trouble occurs in the electrical circuit or if it is a mechanical problem in the transmission.
- If any abnormalities are found in the following test, the problem is in the transmission itself.



(a) Disconnect the connector of the transmission wire.
HINT:
It is possible to deactivate the electrical shift control by disconnecting the transmission wire. The gear positions can then be changed mechanically with the shift lever.

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

Shift Lever Position	Gear Position
D	4th
3	4th
2	3rd
L	1st
R	R
P	P

(c) Connect the connector of the transmission wire.

(d) Clear the DTC. (See pageAT-25)

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 (Electronic Controlled automatic Transmission) malfunctions.
(The DTCs may not be detected due to the actual driving conditions. And some DTCs may not be detected through this drive pattern.)
HINT:
Preparation for driving

- Warm up the engine sufficiently. (Engine coolant temperature should be 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))

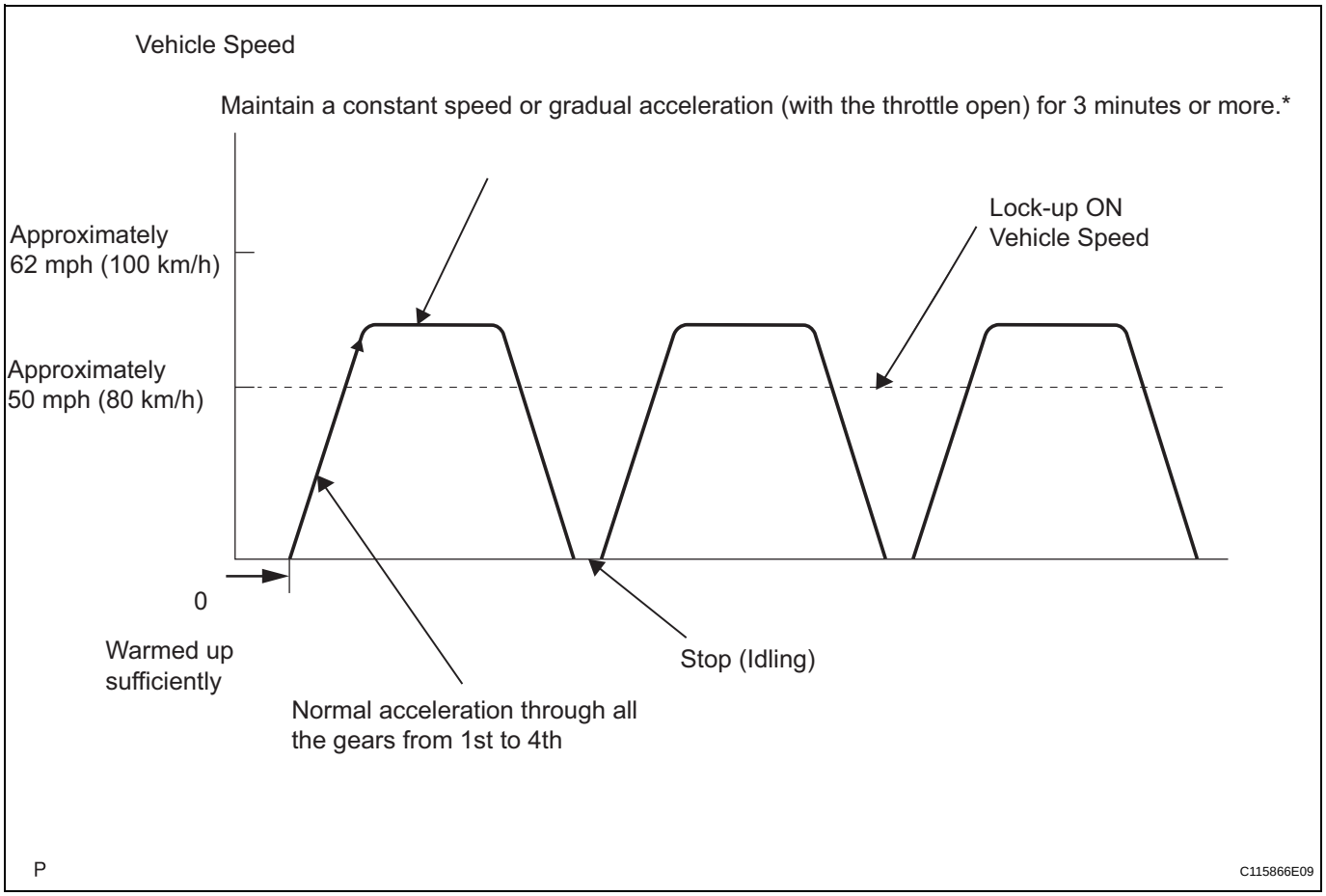
Notice in driving

- Drive the vehicle through all gears.
  Stop → 1st → 2nd → 3rd → 4th → 4th (lock-up ON).
- Repeat the above driving pattern three times or more.

NOTICE:

- **The monitor status can be checked using the 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.**

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



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

PROBLEM SYMPTOMS TABLE

HINT:

- If a normal code is displayed during the DTC 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.

Chapter 1: Electronic Circuit Matrix Chart

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 for 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, then check and replace the ECM.

Symptom	Suspected area	See page
No up-shift (1st to 2nd)	1. Shift solenoid valve (S2) circuit *1	AT-64
	2. Speed sensor SP2 circuit *1	AT-48
	3. ECM	IN-34
No up-shift (2nd to 3rd)	1. Shift solenoid valve (S1) circuit *1	AT-64
	2. ECM	IN-34
No up-shift (3rd to 4th)	1. Park/neutral position switch circuit *1	AT-34
	2. Engine coolant temperature sensor circuit *1	ES-54
	3. Shift solenoid valve (S2) circuit *1	AT-64
	4. ECM	IN-34
No down-shift (4th to 3rd)	1. Park/neutral position switch circuit *1	AT-34
	2. Shift solenoid valve (S2) circuit *1	AT-64
	3. ECM	IN-34
No down-shift (3rd to 2nd)	1. Shift solenoid valve (S1) circuit *1	AT-64
	2. ECM	IN-34
No down-shift (2nd to 1st)	1. Shift solenoid valve (S2) circuit *1	AT-64
	2. ECM	IN-34
No lock-up or no lock-up off	1. Shift solenoid valve (SLU) circuit *1	AT-81
	2. Stop light switch circuit *1	AT-52
	3. ECM	IN-34
No lock-up	1. Shift solenoid valve (SLU) circuit *1	AT-81
	2. Engine coolant temperature sensor circuit *1	ES-54
	3. Stop light switch circuit *1	AT-52
	4. Speed sensor NCO circuit *1	AT-44
	5. ECM	IN-34
No lock-up off	1. Shift solenoid valve (SLU) circuit *1	AT-81
	2. ECM	IN-34
Shift point too high or too low	1. Shift solenoid valve (SLT) circuit *1	AT-68
	2. Speed sensor NCO circuit *1	AT-44
	3. Speed sensor SP2 circuit *1	AT-48
	4. Throttle position sensor circuit *1	ES-54
	5. ATF temperature sensor THOC circuit *1	AT-40
	6. ATF temperature sensor THO1 circuit *1	AT-72
	7. ECM	IN-34
Up-shift to 2nd while in L position	1. Park/neutral position sensor circuit *1	AT-34
	2. ECM	IN-34

Symptom	Suspected area	See page
Up-shift to 3rd while in 2 position	1. Park/neutral position sensor circuit *1	AT-34
	2. ECM	IN-34
Up-shift from 3rd to 4th while engine is cold	1. Engine coolant temperature sensor circuit *1	ES-54
	2. ECM	IN-34
Harsh engagement (N to D)	1. Shift solenoid valve (SLT) circuit *1	AT-68
	2. Speed sensor NCO circuit *1	AT-44
	3. ECM	IN-34
Harsh engagement (Lock-up)	1. Speed sensor NCO circuit *1	AT-44
	2. Speed sensor SP2 circuit *1	AT-48
	3. Shift solenoid valve (SLU) circuit *1	AT-81
	4. ECM	IN-34
Harsh engagement (Any driving position)	1. Throttle position sensor circuit *1	ES-54
	2. Shift solenoid valve (SLU) circuit *1	AT-81
	3. Shift solenoid valve (SLT) circuit *1	AT-68
	4. Speed sensor NCO circuit *1	AT-44
	5. ECM	IN-34
Poor acceleration	1. Shift solenoid valve (SLT) circuit *1	AT-68
	2. ECM	IN-34
No engine braking	ECM	IN-34
No kick-down	ECM	IN-34
Engine stalls when starting off or stopping	1. Shift solenoid valve (SLU) circuit *1	AT-81
	2. ECM	IN-34

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

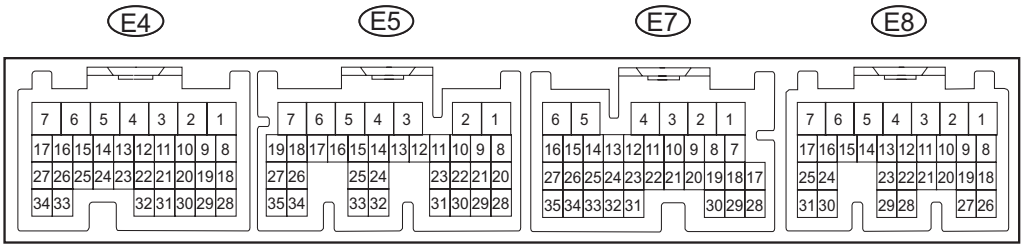
(▲: A340E AUTOMATIC TRANSMISSION Repair Manual Pub. No. RM998U)

Symptom	Suspected area	See page
Vehicle does not move in any forward position or reverse position	1. Shift solenoid valve SLT	AT-68
	2. Transmission control cable	AT-105
	3. Manual valve	▲
	4. Parking lock pawl	▲
	5. O/D one-way clutch (F0)	▲
	6. O/D direct clutch (C0)	▲
	7. O/D brake (B0)	▲
	8. O/D planetary gear unit	▲
	9. Torque converter clutch	AT-117
Vehicle does not move in R position	1. 2nd coast brake (B1)	▲
	2. Front and rear planetary gear unit	▲
	3. Direct clutch (C2)	▲
	4. 1st and reverse brake (B3)	▲
	5. O/D direct clutch (C0)	▲
No up-shift (1st to 2nd)	1. 1-2 shift valve	▲
	2. 2nd brake (B2)	▲
	3. No. 1 one-way clutch (F1)	▲
No up-shift (2nd to 3rd)	1. 2-3 shift valve	▲
	2. Direct clutch (C2)	▲
No up-shift (3rd to 4th)	1. 3-4 shift valve	▲
	2. O/D brake (B0)	▲

Symptom	Suspected area	See page
No down-shift (4th to 3rd)	3-4 shift valve	▲
No down-shift (3rd to 2nd)	2-3 shift valve	▲
No down-shift (2nd to 1st)	1. 1-2 shift valve	▲
	2. 2nd coast brake (B1)	▲
	3. 2nd brake (B2)	▲
No lock-up or no lock-up off	1. Lock-up control valve	▲
	2. Lock-up relay valve	▲
	3. Torque converter clutch	AT-117
Harsh engagement (N to D)	1. Accumulator control valve	▲
	2. Forward clutch (C1)	▲
Harsh engagement (Lock-up)	1. Lock-up control valve	▲
	2. Lock-up relay valve	▲
	3. Torque converter clutch	AT-117
Harsh engagement (N to R)	1. Accumulator control valve	▲
	2. C2 accumulator	▲
	3. Direct clutch (C2)	▲
	4. 1st and reverse brake (B3)	▲
Harsh engagement (N to L)	Low coast modulator valve	▲
Harsh engagement (1st to 2nd, 2nd to 3rd and 3rd to 4th)	1. Accumulator control valve	▲
	2. Throttle valve	▲
Harsh engagement (2nd to 3rd)	1. Accumulator control valve	▲
	2. C2 accumulator	▲
	3. 2nd coast brake (B1)	▲
Harsh engagement (3rd to 4th)	1. Accumulator control valve	▲
	2. Solenoid modulator valve	▲
	3. O/D direct clutch (C0)	▲
	4. O/D brake (B0)	▲
	5. O/D planetary gear unit	▲
Harsh engagement (4th to 3rd)	1. Accumulator control valve	▲
	2. C0 accumulator	▲
	3. O/D brake (B0)	▲
Slippage or shuddering (Forward and reverse: After warm-up)	1. Shift solenoid valve SLT	AT-68
	2. Transmission control cable	AT-105
	3. Oil strainer	▲
	4. Pressure relief valve	▲
	5. Torque converter clutch	▲
	6. O/D one-way clutch (F0)	▲
	7. O/D direct clutch (C0)	▲
Slippage or shuddering (Particular position: Just after engine starts)	1. Shift solenoid valve SLT	AT-68
	2. Transmission control cable	AT-105
	3. Torque converter clutch	AT-117
Slippage or shuddering (R position)	1. Direct clutch (C2)	▲
	2. 1st and reverse brake (B3)	▲

Symptom	Suspected area	See page
Slippage or shuddering (1st position)	1. Forward clutch (C1)	▲
	2. No. 2 one-way clutch (F2)	▲
Slippage or shuddering (2nd position)	1. 2nd brake (B2)	▲
	2. 2nd coast brake (B1)	▲
	3. No. 1 one-way clutch (F1)	▲
Slippage or shuddering (3rd position)	Direct clutch (C2)	▲
Slippage or shuddering (4th position)	O/D brake (B0)	▲
Engine brake does not work only in 1st gear at L position	1. Low coast modulator valve	▲
	2. 1st and reverse brake (B3)	▲
Engine brake does not work only in 2nd gear at 2 position	1. 2nd coast modulator valve	▲
	2. 2nd coast brake (B1)	▲
Engine brake does not work only in 3rd gear at 3 position	O/D direct clutch (C0)	▲
Engine brake does not work only in 1st to 4th gear at D position	O/D direct clutch (C0)	▲
No kick-down	1. 1-2 shift valve	▲
	2. 2-3 shift valve	▲
	3. 3-4 shift valve	▲
Poor acceleration (All position)	Torque converter clutch	AT-117
Poor acceleration (4th)	1. O/D direct clutch (C0)	▲
	2. O/D planetary gear unit	▲
Poor acceleration (other than 4th)	O/D brake (B0)	▲
Poor acceleration (other than 2nd)	1. 2nd coast brake (B1)	▲
	2. 2nd brake (B2)	▲
Poor acceleration (1st and 2nd)	Direct clutch (C2)	▲
Poor acceleration (L and R positions)	1st and reverse brake (B3)	▲
Poor acceleration (R position)	Forward clutch (C1)	▲
Engine stalls when starting off or stopping	Torque converter clutch	AT-117

TERMINALS OF ECM

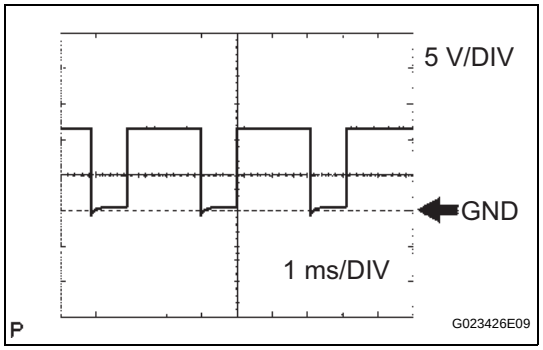


HINT:
The standard voltage of each ECM terminal is shown in the table below.
In the table, first follow the information under "Condition". Look under "Symbols (Terminal No.)" for the terminals to be inspected. The standard voltage between the terminals is shown under "Specified Condition". Use the illustration above as a reference for the ECM terminals.

Standard voltage:

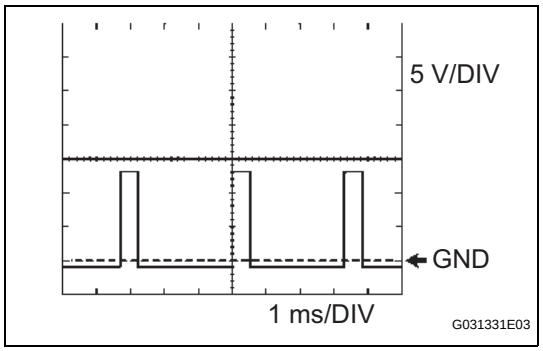
Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	Specified Condition
NSW (E8-30) - E1 (E4-3)	V - BR	Park/neutral switch signal	IG switch ON and shift lever P and N positions	Below 1 V
NSW (E8-30) - E1 (E4-3)	V - BR	Park/neutral switch signal	IG switch ON and shift lever other than P and N positions	10 to 14 V
STP (E7-4) - E1 (E4-3)	L - BR	Stop light switch signal	Brake pedal is depressed	7.5 to 14 V
STP (E7-4) - E1 (E4-3)	L - BR	Stop light switch signal	Brake pedal is released	Below 1.5 V
L (E7-9) - E1 (E4-3)	G-Y - BR	L shift position switch signal	IG switch ON and shift lever L position	10 to 14 V
L (E7-9) - E1 (E4-3)	G-Y - BR	L shift position switch signal	IG switch ON and shift lever other than L position	Below 1 V
2 (E7-10) - E1 (E4-3)	R-Y - BR	2 shift position switch signal	IG switch ON and shift lever 2 position	10 to 14 V
2 (E7-10) - E1 (E4-3)	R-Y - BR	2 shift position switch signal	IG switch ON and shift lever other than 2 position	Below 1 V
R (E7-11) - E1 (E4-3)	R-W - BR	R shift position switch signal	IG switch ON and shift lever R position	10 to 14 V
R (E7-11) - E1 (E4-3)	R-W - BR	R shift position switch signal	IG switch ON and shift lever other than R position	Below 1 V
3 (E7-19) - E1 (E4-3)	Y - BR	3 shift position switch signal	IG switch ON and shift lever 3 position	10 to 14 V
3 (E7-19) - E1 (E4-3)	Y - BR	3 shift position switch signal	IG switch ON and shift lever other than 3 position	Below 1 V
D (E7-21) - E1 (E4-3)	L-B - BR	D shift position switch signal	IG switch ON and shift lever D position	10 to 14 V
D (E7-21) - E1 (E4-3)	L-B - BR	D shift position switch signal	IG switch ON and shift lever other than D position	Below 1 V
S2 (E5-8) - E1 (E4-3)	L-W - BR	S2 solenoid signal	2nd or 3rd gear	10 to 14 V
S2 (E5-8) - E1 (E4-3)	L-W - BR	S2 solenoid signal	1st or 4th gear	Below 1 V
S1 (E5-9) - E1 (E4-3)	W-G - BR	S1 solenoid signal	1st or 2nd gear	10 to 14 V
S1 (E5-9) - E1 (E4-3)	W-G - BR	S1 solenoid signal	3rd and 4th gears	Below 1 V
SLU+ (E5-11) - SLU- (E5-10)	V - LG	SLU solenoid signal	3rd (lock-up) or 4th (lock-up) gear	Pulse generation (See waveform 2)
SLT+ (E5-12) - SLT- (E5-13)	G-B - R-B	SLT solenoid signal	Engine idling speed	Pulse generation (See waveform 1)

Symbols (Terminals No.)	Wiring Color	Terminal Description	Condition	Specified Condition
THO1 (E5-24) - E2 (E4-28)	Y-B - BR	ATF temperature sensor signal	ATF temperature: 115 °C (239 °F) or more	Below 1.5 V
NCO+ (E5-34) - NCO- (E5-26)	Y - L	Speed sensor (NCO) signal	Engine idling speed	Pulse generation (See waveform 3)
SP2+ (E5-35) - SP2- (E5-27)	G - R	Speed sensor (SP2) signal	Vehicle speed 12 mph (20 km/h)	Pulse generation (See waveform 4)
THOC (E4-22) - E2 (E4-28)	GR - BR	ATF temperature sensor signal	ATF temperature: 115 °C (239 °F) or more	Below 1.5 V



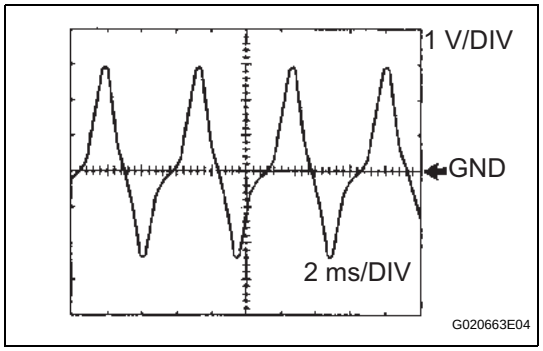
1. Waveform 1

Item	Content
Terminal	SLT+ (E5-12) - SLT- (E5-13)
Tool setting	5V/DIV, 1ms/DIV
Vehicle condition	Engine idling speed



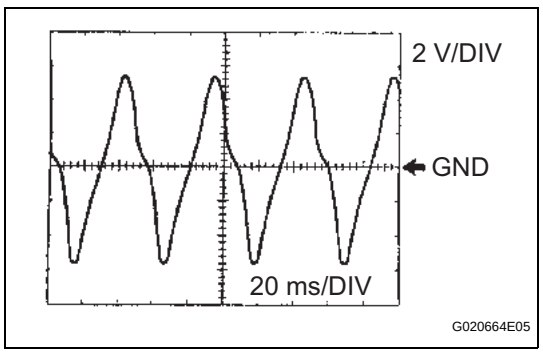
2. Waveform 2

Item	Content
Terminal	SLU+ (E5-11) - SLU- (E5-10)
Tool setting	5V/DIV, 1ms/DIV
Vehicle condition	3rd (lock-up) or 4th (lock-up) gear



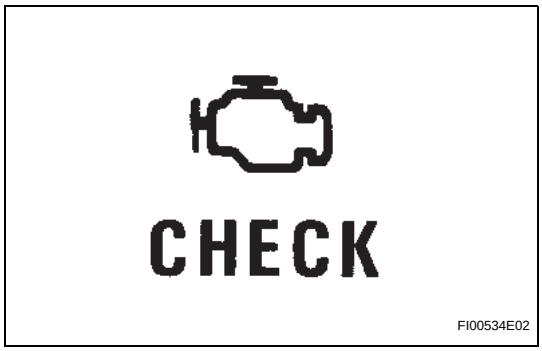
3. Waveform 3

Item	Content
Terminal	NCO+ (E5-34) - NCO- (E5-26)
Tool setting	1V/DIV, 2ms/DIV
Vehicle condition	Engine idling speed (P or N position)



4. Waveform 4

Item	Content
Terminal	SP2+ (E5-35) - SP2- (E5-27)
Tool setting	2V/DIV, 20ms/DIV
Vehicle condition	Vehicle speed 12 mph (20 km/h)



DIAGNOSIS SYSTEM

1. DESCRIPTION

When troubleshooting On-Board Diagnostic (OBD II) vehicles, the vehicle must be connected to the intelligent tester (complying with SAE J1987). Various data output from the vehicle's ECM can then be read.

OBD II regulations require that the vehicle's on-board computer illuminates the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in:

1. The emission control system/components
2. The powertrain control components (which affect vehicle emissions)
3. The computers.

In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the ECM memory. If the malfunction does not reoccur in 3 consecutive trips, the MIL turns off automatically but the DTCs remain recorded in the ECM memory.

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

The DTCs and freeze frame data can be erased with the intelligent tester. (See page AT-25)

In order to enhance OBD functions on vehicles and develop the Off-Board diagnosis system, CAN communication has been introduced in this system (CAN: Controller Area Network). It minimizes the gap between technician skills and vehicle technology. CAN is a network, which uses a pair of data transmission lines, spanning multiple computers and sensors. It allows high speed communication between the systems and simplification of the wire harness connection.

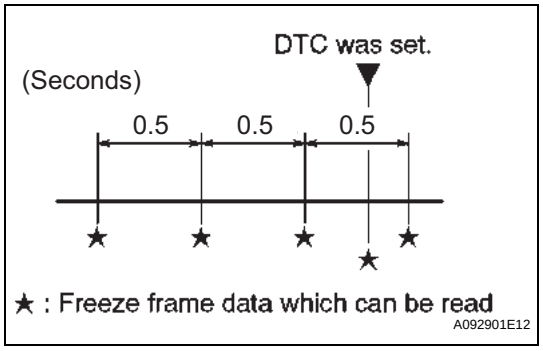
Since this system is equipped with CAN communication, CAN VIM (VIM: Vehicle Interface Module) connecting with an intelligent tester is necessary to display any information from the ECM on the tester. (Also communication between the intelligent tester and the ECM uses a CAN communication signal.) When confirming DTCs and any data of the ECM, connect the CAN VIM between the DLC3 and the intelligent tester.

2. NORMAL MODE AND CHECK MODE

The diagnosis system operates in "normal mode" during normal vehicle use. In normal mode, "2-trip detection logic" is used to ensure accurate detection of malfunctions. "Check mode" is also available to technicians as an option. In check mode, "1-trip detection logic" is used for simulating malfunction symptoms and increasing the system's ability to detect malfunctions, including intermittent malfunctions.

3. 2-TRIP DETECTION LOGIC

When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory (1st trip). If the ignition switch is turned OFF and then ON again, and the same malfunction is detected again, the MIL will illuminate.



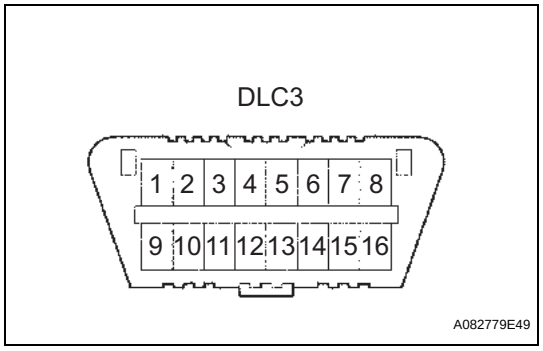
4. FREEZE FRAME DATA

Freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was lean or rich, and other data from the time the malfunction occurred.

The ECM records engine conditions in the form of freeze frame data every 0.5 seconds. Using the intelligent tester, five separate sets of freeze frame data, including the data values at the time when the DTC was set, can be checked.

- 3 data sets before the DTC was set
- 1 data set when the DTC was set
- 1 data set after the DTC was set

These data sets can be used to simulate the condition of the vehicle around the time the occurrence of the malfunction. The data may assist in identifying of the cause of the malfunction, and in judging whether it was temporary or not.



5. DLC3 (Data Link Connector 3)

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

HINT:

Connect the cable of the intelligent tester to the DLC3, turn the ignition switch ON and attempt to use the intelligent tester. If the screen displays UNABLE TO CONNECT TO VEHICLE, a problem exists in the vehicle side or the tester side.

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

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

Symbol	Terminal No.	Name	Reference terminal	Result	Condition
SIL	7	Bus "+" line	5 - Signal ground	Pulse generation	During transmission
CG	4	Chassis ground	Body ground	Below 1 Ω	Always
SG	5	Signal ground	Body ground	Below 1 Ω	Always
BAT	16	Battery positive	Body ground	11 to 14 V	Always
CANH	6	HIGH-level CAN bus line	CANL	54 to 69 Ω	Ignition switch OFF

Symbol	Terminal No.	Name	Reference terminal	Result	Condition
CANH	6	HIGH-level CAN bus line	Battery positive	1 MΩ or higher	Ignition switch OFF
CANH	6	HIGH-level CAN bus line	CG	1 kΩ or higher	Ignition switch OFF
CANL	14	HIGH-level CAN bus line	Battery positive	1 MΩ or higher	Ignition switch OFF
CANL	14	HIGH-level CAN bus line	CG	1 kΩ or higher	Ignition switch OFF

6. CHECK BATTERY VOLTAGE

Standard battery voltage:

11 to 14 V

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

7. CHECK MIL

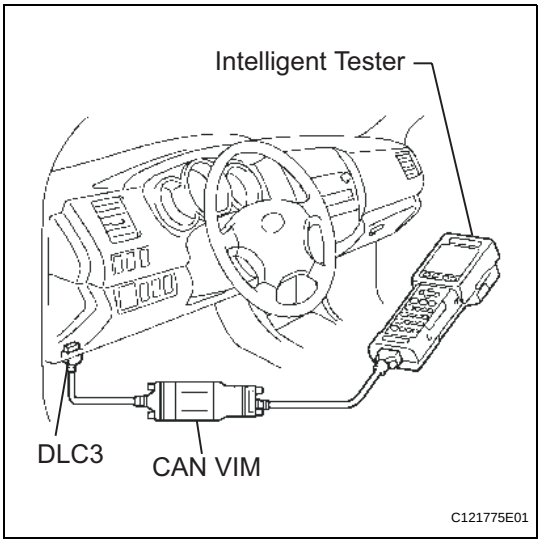
(a) Check that the MIL illuminates when turning the ignition switch ON.
If the MIL does not illuminate, there is a problem in the MIL circuit (refer to MIL CIRCUIT on page ES-439).

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

8. ALL READINESS

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

DTC CHECK / CLEAR



1. CHECK DTC

DTCs which are stored in the ECM can be displayed with the intelligent tester.
The intelligent tester can display pending DTCs and current DTCs.
Some DTC aren't stored if the ECM doesn't detect a malfunction during consecutive driving cycles. However, malfunctions detected during a single driving cycle are stored as pending DTCs.

(a) Connect the intelligent tester to the Controller Area Network Vehicle Interface Module (CAN VIM). Then connect the CAN VIM to the Data Link Connector 3 (DLC3).

(b) Turn the ignition switch to the ON position.

(c) Enter the following menus: DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES (or PENDING CODE).

(d) Confirm the DTCs and freeze frame data and then write them down.

(e) See page AT-30 to confirm the details of the DTCs.

2. CLEAR DTC

(a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.

(b) Turn the ignition switch to the ON position.

Symbol	Terminal No.	Name	Reference terminal	Result	Condition
CANH	6	HIGH-level CAN bus line	Battery positive	1 MΩ or higher	Ignition switch OFF
CANH	6	HIGH-level CAN bus line	CG	1 kΩ or higher	Ignition switch OFF
CANL	14	HIGH-level CAN bus line	Battery positive	1 MΩ or higher	Ignition switch OFF
CANL	14	HIGH-level CAN bus line	CG	1 kΩ or higher	Ignition switch OFF

6. CHECK BATTERY VOLTAGE

Standard battery voltage:

11 to 14 V

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

7. CHECK MIL

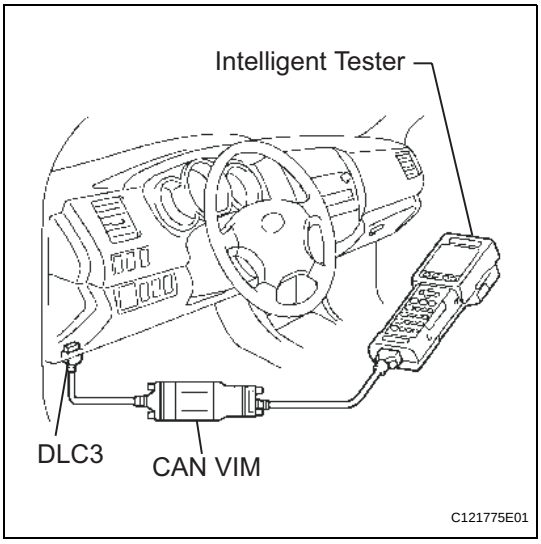
(a) Check that the MIL illuminates when turning the ignition switch ON.
If the MIL does not illuminate, there is a problem in the MIL circuit (refer to MIL CIRCUIT on page ES-439).

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

8. ALL READINESS

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

DTC CHECK / CLEAR



1. CHECK DTC

DTCs which are stored in the ECM can be displayed with the intelligent tester.
The intelligent tester can display pending DTCs and current DTCs.
Some DTC aren't stored if the ECM doesn't detect a malfunction during consecutive driving cycles. However, malfunctions detected during a single driving cycle are stored as pending DTCs.

(a) Connect the intelligent tester to the Controller Area Network Vehicle Interface Module (CAN VIM). Then connect the CAN VIM to the Data Link Connector 3 (DLC3).

(b) Turn the ignition switch to the ON position.

(c) Enter the following menus: DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES (or PENDING CODE).

(d) Confirm the DTCs and freeze frame data and then write them down.

(e) See page AT-30 to confirm the details of the DTCs.

2. CLEAR DTC

(a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.

(b) Turn the ignition switch to the ON position.

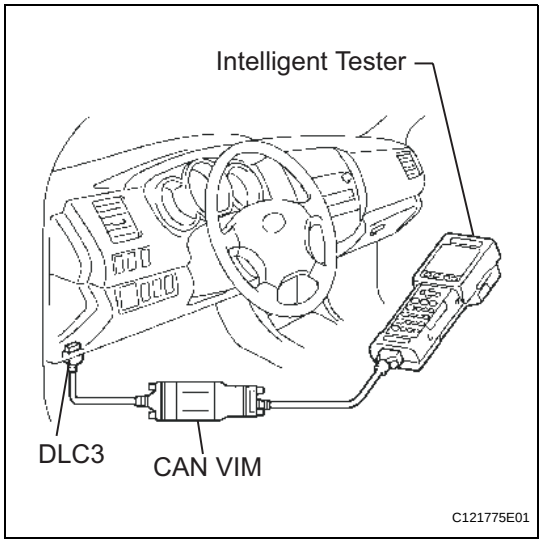
(c) Enter the following menus: DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CLEAR CODES and press YES.

CHECK MODE PROCEDURE

1. DESCRIPTION

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

2. CHECK MODE PROCEDURE



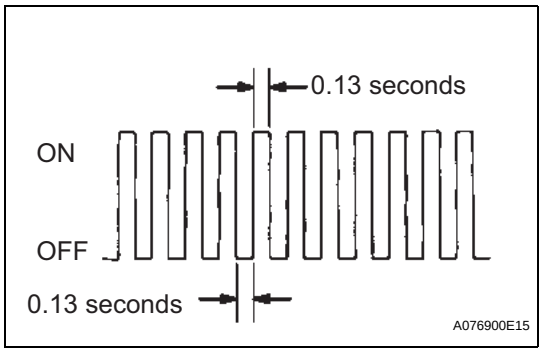
(a) Ensure the following conditions:
  (1) Battery positive voltage 11 V or more
  (2) Throttle valve fully closed
  (3) Transmission in the P or N position
  (4) A/C switched OFF

(b) Turn the ignition switch off.

(c) Connect the intelligent tester together with the Controller Area Network Vehicle Interface Module (CAN VIM) to the DLC3.

(d) Turn the ignition switch to the ON position.

(e) Enter the following menus: DIAGNOSIS/ ENHANCED OBD II/ CHECK MODE.



(f) Change the ECM to check mode. Make sure the MIL flashes as shown in the illustration.

NOTICE:

All recorded DTCs and freeze frame data will be erased if:

1) the intelligent tester is used to change the ECM from normal mode to check mode or vice-versa; or 2) during check mode, the ignition switch is turned from ON to ACC or LOCK. Before entering check mode, make notes of the DTCs and freeze frame data.

(g) Start the engine. The MIL should turn off after the engine starts.

(h) Perform "MONITOR DRIVE PATTERN" for the ECT test. (See page AT-15).
(Or, simulate the conditions of the malfunction described by the customer).

(i) After simulating the malfunction conditions, use the intelligent tester diagnosis selector to check the DTC and freeze frame data.

FAIL-SAFE CHART

1. FAIL-SAFE

This function minimizes the loss of the ECT (Electronic Controlled Automatic Transmission) functions when any malfunction occurs in each sensor or solenoid.

Malfunction Part	Function
Input Speed Sensor (NCO)	During an input speed sensor malfunction, shift control is effected through the output speed sensor signal (SP2). During an input speed sensor malfunction, AI-SHIFT*1 and flex lock-up clutch control are prohibited.
Output Speed Sensor (SP2)	During an output speed sensor malfunction, shift control is effected through the input speed sensor signal (NCO). During an output speed sensor malfunction, AI-SHIFT*1 and flex lock-up clutch control are prohibited.
No. 1 ATF Temperature Sensor	During an No. 1 ATF temperature sensor malfunction, flex lock-up clutch control is prohibited.
Shift Solenoid Valve S1 and S2	The current to the failed solenoid valve is cut off and control is effected by operating the other solenoid valves with normal operation. Shift control is effected depending on the failed solenoid as described in the table on the next page.
Shift Solenoid Valve SLU	During a solenoid valve SLU malfunction, the current to the solenoid valve is stopped. This stops lock-up control and flex lock-up control, and fuel economy decreases.
Shift Solenoid Valve SLT	During a solenoid valve SLT malfunction, the current to the solenoid valve is stopped. This stops line pressure optimal control, and the shift shock increases. However, shifting is effected through normal clutch pressure control.

*1: AI (Artificial Intelligence) -SHIFT control
In addition to switching of the shift pattern through the pattern select switch, the AI-SHIFT control enables the ECM to estimate the road conditions and the driver's intention in order to automatically select the optimal shift pattern. As a result, a comfortable ride has been realized.

2. FAIL-SAFE FUNCTION:

If either of the shift solenoid valve circuits has an open or short failure, the ECM turns the other shift solenoid "ON" and "OFF" in order to shift into the gear positions shown in the table below.
When a short circuit occurs, the ECM cuts the supply of current to the short circuited solenoid.
Even if starting the engine again in fail-safe mode, the gear position remains in the same position.

Position	NORMAL			SHIFT SOLENOID S1 MALFUNCTIONING			SHIFT SOLENOID S2 MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING
	Solenoid valve		Gear	Solenoid valve		Gear	Solenoid valve		Gear	Gear when shift selector is manually operated
	S1	S2		S1	S2		S1	S2		
D	ON	OFF	1st	X	ON	3rd	ON	X	1st	4th
	ON	ON	2nd	X	ON	3rd	OFF	X	4th	4th
	OFF	ON	3rd	X	ON	3rd	OFF	X	4th	4th
	OFF	OFF	4th	X	OFF	4th	OFF	X	4th	4th
3	ON	OFF	1st	X	ON	3rd	ON	X	1st	4th
	ON	ON	2nd	X	ON	3rd	OFF	X	4th	4th
	OFF	ON	3rd	X	ON	3rd	OFF	X	4th	4th

2	ON	OFF	1st	X	ON	3rd	ON	X	1st	3rd
	ON	ON	2nd	X	ON	3rd	OFF	X	3rd	3rd
L	ON	OFF	1st	X	OFF	1st	ON	X	1st	1st

X: Malfunctions

DATA LIST / ACTIVE TEST

1. DATA LIST

HINT:

According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as the first step of troubleshooting is one method of shortening labor time.

NOTICE:

In the table below, the values listed under "Normal Condition" are for reference only. Do not depend solely on these reference values when judging 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) Push the "ON" button of the tester.
(f) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST/ A/T".
(g) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
SPD (NCO)	Input Speed display: 50 rpm	HINT: • 3rd Gear Lock-up ON (After warming up the engine); Input turbine speed (NCO) equal to the engine speed • 4th Gear Lock-up ON (After warming up the engine); Input turbine speed (NCO): 0 rpm • Lock-up OFF (Idling at N position); Input turbine speed (NCO) nearly equal to the engine speed	-
SPD (SP2)	Counter Gear Speed display/ min.: 0 mph (0 km/h) max.: 158 mph (255 km/h)	Vehicle stopped: 0 mph (0 km/h)	-
PNP SW [NSW]	PNP SW Status/ ON or OFF	Shift lever position is; P or 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 AT-34.
STOP LIGHT SW	Stop Lamp Switch Status/ ON or OFF	• Brake Pedal is depressed: ON • Brake Pedal is released: OFF	-
SHIFT	Actual Gear Position/ 1st, 2nd, 3rd or 4th	Shift Lever Position is; • L: 1st • 2: 1st or 2nd • 3: 1st, 2nd or 3rd • D: 1st, 2nd, 3rd or 4th	-

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
REVERSE	PNP SW Status/ ON or OFF	Shift lever position is; R: ON Except R: 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 AT-34.
DRIVE	PNP SW Status/ ON or OFF	Shift lever position is; D and 3: ON Except D and 3: OFF	
3RD	PNP SW Status/ ON or OFF	Shift lever position is; 3: ON Except 3: OFF	
2ND	PNP SW Status/ ON or OFF	Shift lever position is; 2: ON Except 2: OFF	
LOW	PNP SW Status/ ON or OFF	Shift lever position is; L: ON Except L: OFF	
A/T OIL TEMP1	ATF Temperature Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	• After Stall Test; Approximately 80°C (176°F) • Equal to ambient temperature when cold soak	If the value is "-40°C (-40°F)" or "215°C (419°F)", ATF temperature sensor circuit is open or short.
A/T OIL TEMP3	ATF Temperature Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	• After Stall Test; Approximately 80°C (176°F) • Equal to ambient temperature during cold soak	If the value is "-40°C (-40°F)" or "215°C (419°F)", ATF temperature sensor circuit is open or short.
ATF	ATF Condition	ATF Condition NG: ON OK: OFF	Replace ATF when ATF condition is ON.
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	-
SOLENOID (SLU)	Shift Solenoid SLU Status/ ON or OFF	• Lock-up: ON • Except Lock-up: OFF	-

2. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as the first step of troubleshooting is one method of shortening 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 tester.
(f) Select the items "DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST".

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

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position manually. [Vehicle Condition] • IDL: ON • Less than 31 mph (50 km/h) [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 transmission to the lock-up condition. [Vehicle Condition] Vehicle Speed: 37 mph (60 km/h) or more	Possible to check the SLU operation.
LINE PRESS UP *	[Test Details] Operate the shift solenoid SLT to 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)	-

*: "LINE PRESS UP" in the ACTIVE TEST is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the HYDRAULIC TEST (See page AT-14) as well.

HINT:

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

DIAGNOSTIC TROUBLE CODE CHART

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

- *1: "Comes on" means the MIL (Malfunction Indicator Lamp) illuminates.
- *2: "DTC stored" means the ECM stores the malfunction code if the ECM detects the DTC detection condition.
- These DTCs 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	AT-34
P0710	Transmission Fluid Temperature Sensor "A" Circuit	1. Open or short in No. 2 ATF temperature sensor circuit 2. No. 2 ATF temperature sensor 3. ECM	Comes on	DTC stored	AT-40
P0712	Transmission Fluid Temperature Sensor "A" Circuit Low Input	1. Short in No. 2 ATF temperature sensor circuit 2. No. 2 ATF temperature sensor 3. ECM	Comes on	DTC stored	AT-40
P0713	Transmission Fluid Temperature Sensor "A" Circuit High Input	1. Open in No. 2 ATF temperature sensor circuit 2. No. 2 ATF temperature sensor 3. ECM	Comes on	DTC stored	AT-40
P0717	Turbine Speed Sensor Circuit No Signal	1. Open or short in speed sensor (NCO) circuit 2. Speed sensor (NCO) 3. ECM	Comes on	DTC stored	AT-44
P0722	Output Speed Sensor Circuit No Signal	1. Open or short in speed sensor (SP2) circuit 2. Speed sensor (SP2) 3. ECM	Comes on	DTC stored	AT-48
P0724	Brake Switch "B" Circuit High	1. Short in stop light switch signal circuit 2. Stop light switch 3. ECM	Comes on	DTC stored	AT-52

DTC No.	Detection Item	Trouble Area	MIL *1	Memory *2	See page
P0751	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)	1. Shift solenoid valve S1 is stuck open or closed 2. Valve body is blocked 3. Shift solenoid valve S1 4. Automatic transmission (clutch, brake or gear, etc.)	Comes on	DTC stored	AT-55
P0756	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)	1. Shift solenoid valve S2 is stuck open or closed 2. Valve body is blocked 3. Shift solenoid valve S2 4. Automatic transmission (clutch, brake or gear, etc.)	Comes on	DTC stored	AT-59
P0850	Park / Neutral Switch Input Circuit	1. Short in park/ neutral position switch circuit 2. Park/neutral position switch 3. ECM	Comes on	DTC stored	AT-34
P0973	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)	1. Short in shift solenoid valve S1 circuit 2. Shift solenoid valve S1 3. ECM	Comes on	DTC stored	AT-64
P0974	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)	1. Open in shift solenoid valve S1 circuit 2. Shift solenoid valve S1 3. ECM	Comes on	DTC stored	AT-64
P0976	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)	1. Short in shift solenoid valve S2 circuit 2. Shift solenoid valve S2 3. ECM	Comes on	DTC stored	AT-64
P0977	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)	1. Open in shift solenoid valve S2 circuit 2. Shift solenoid valve S2 3. ECM	Comes on	DTC stored	AT-64
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	AT-68
P2740	Transmission Fluid Temperature Sensor "B" Circuit	1. Open or short in No. 1 ATF temperature sensor circuit 2. Transmission wire (No. 1 ATF temperature sensor) 3. ECM	Comes on	DTC stored	AT-72

DTC No.	Detection Item	Trouble Area	MIL *1	Memory *2	See page
P2742	Transmission Fluid Temperature Sensor "B" Circuit Low Input	1. Short in No. 1 ATF temperature sensor circuit 2. Transmission wire (No. 1 ATF temperature sensor) 3. ECM	Comes on	DTC stored	AT-72
P2743	Transmission Fluid Temperature Sensor "B" Circuit High Input	1. Open in No. 1 ATF temperature sensor circuit 2. Transmission wire (No. 1 ATF temperature sensor) 3. ECM	Comes on	DTC stored	AT-72
P2757	Torque Converter Clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU)	1. Shift solenoid valve SLU remains open or closed 2. Valve body is blocked 3. Shift solenoid valve SLU 4. Torque converter clutch 5. Automatic transmission (clutch, brake or gear, etc.) 6. Line pressure is too low	Comes on	DTC stored	AT-76
P2759	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)	1. Open or short in shift solenoid valve SLU circuit 2. Shift solenoid valve SLU 3. ECM	Comes on	DTC stored	AT-81

DTC	P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)

DTC	P0850	Park / Neutral Switch Input Circuit

DESCRIPTION

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

DTC No.	DTC Detection Conditions	Trouble Areas
P0705	Either of the following conditions is met: (a) Any 2 or more of the following signals are ON simultaneously. (2-trip detection logic) • Park/neutral position switch input signal is ON • R input signal is ON • D input signal is ON • 2 input signal is ON (b) Any 2 or more of the following signals are ON simultaneously. (2-trip detection logic) • Park/neutral position switch input signal is ON • R input signal is ON • 3 input signal is ON • L input signal is ON	• Open or short in park/neutral position switch circuit • Park/neutral position switch • ECM
P0850	Park/neutral position switch remains ON (P, N position) while driving under conditions (a) and (b) for 15 seconds. (2-trip detection logic) (a) Vehicle speed: 43.5 mph (70 km/h) or more (b) Engine speed: 1,500 to 2,500 rpm	• 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.

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

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

MONITOR STRATEGY

P0705:

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

P0850:

Related DTCs	P0850: Park/Neutral position switch/Verify switch cycling
Required sensors/Components	Park/Neutral position switch
Frequency of operation	Continuous
Duration	15 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0705:

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

P0850:

The monitor will run whenever the following DTCs are not present.	None
Vehicle speed	43.5 mph (70 km/h) or more
Engine speed	1,500 rpm or more and 2,500 rpm or less
Intake air amount per revolution	0.6 g/rev. or more

TYPICAL MALFUNCTION THRESHOLDS

P0705: One of the following conditions is met: Condition (A) or (B)

Condition (A)

Number of the following signal input at the same time	2 or more
Park/neutral position switch	ON
R switch	ON
D switch	ON
2 switch	ON

Condition (B)

Number of the following signal input at the same time	2 or more
Park/neutral position switch	ON
R switch	ON
3 switch	ON
L switch	ON

P0850:

Park/neutral position switch	ON

COMPONENT OPERATING RANGE

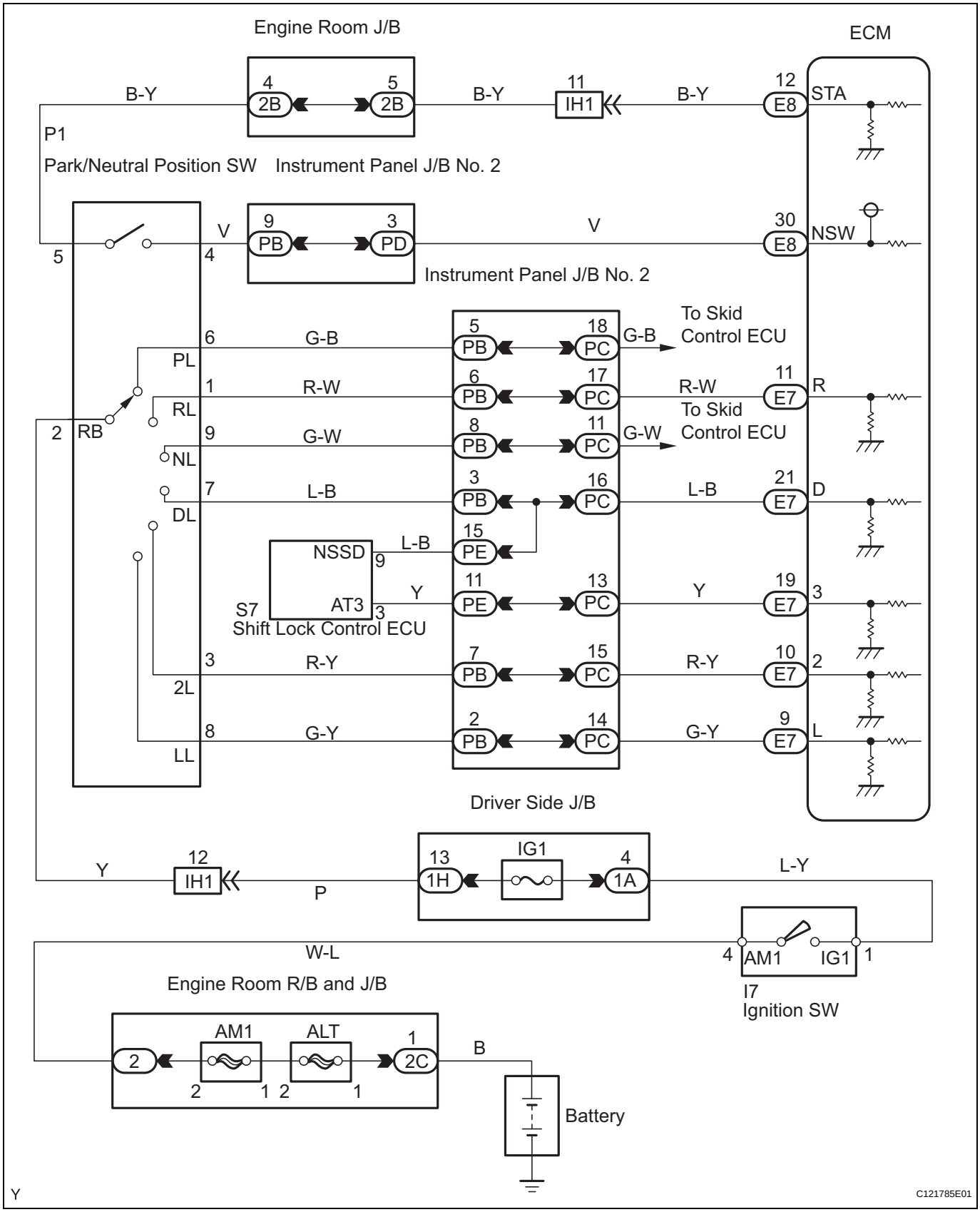
P0705:

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

P0850:

Park/neutral position switch	The park/neutral position switch is OFF when vehicle speed is 43.5 mph (70 km/h) or more and engine speed is between 1,500 rpm and 2,500 rpm.

WIRING DIAGRAM



1. DATA LIST

HINT:

According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as the first step of troubleshooting is one method of shortening labor time.

NOTICE:

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

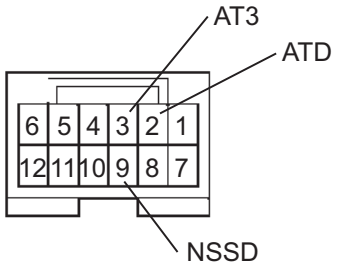
(a) Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
(b) Turn the ignition switch to the ON position.
(c) Push the "ON" button of the tester.
(d) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST/ A/T".
(e) According to the 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 or 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.
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: ON Except D: OFF	
3RD	PNP SW Status/ ON or OFF	Shift lever position is; 3: ON Except 3: OFF	
2ND	PNP SW Status/ ON or OFF	Shift lever position is; 2: ON Except 2: OFF	
LOW	PNP SW Status/ ON or OFF	Shift lever position is; L: ON Except L: OFF	

1	INSPECT SHIFT LOCK CONTROL ECU SUB-ASSEMBLY (TRANSMISSION CONTROL SWITCH)

Component Side:

(Connector Front View): S7



C121789E01

(a) Disconnect the shift lock control ECU connector.
(b) Measure the resistance when the shift lever is moved to each position.

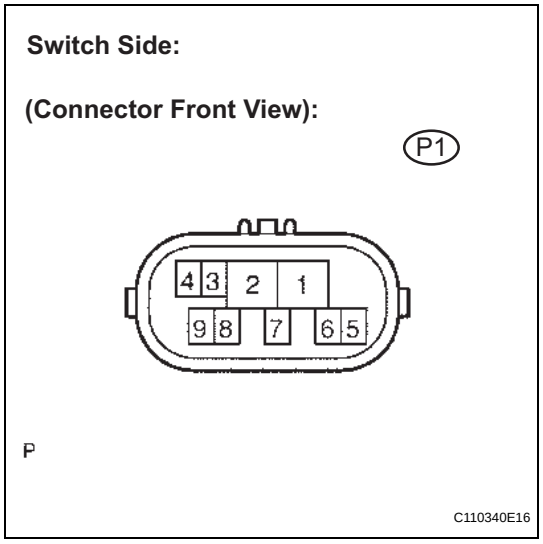
Standard resistance

Shift Position	Tester Connection	Specified Condition
D	9 (NSSD) - 2 (ATD)	Below 1 Ω
3	9 (NSSD) - 2 (ATD)	10 kΩ or higher
D	9 (NSSD) - 3 (AT3)	10 kΩ or higher
3	9 (NSSD) - 3 (AT3)	Below 1 Ω

NG → **REPLACE SHIFT LOCK CONTROL ECU SUB-ASSEMBLY**

OK

2 INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY



(a) Connect the shift lock control ECM connector.
(b) Disconnect the park/neutral position switch connector.
(c) Measure the resistance when the shift lever is moved to each position.

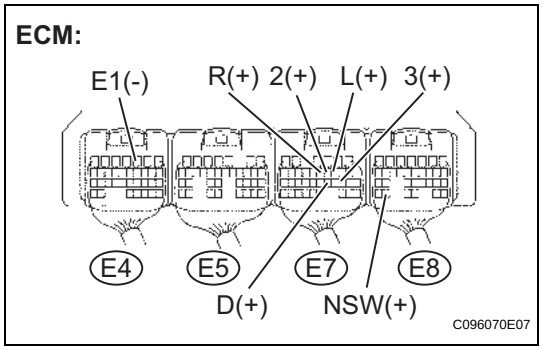
Standard resistance

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

NG → REPLACE PARK/NEUTRAL POSITION SWITCH ASSEMBLY

OK

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



(a) Connect the park/neutral position switch connector.
(b) Turn the ignition switch to the ON position.
(c) Measure the voltage when the shift lever is moved to each position.

Standard voltage

Shift Position	Tester Connection	Specified Condition
P and N	E8-30 (NSW) - E4-3 (E1)	Below 1 V
Except P and N	E8-30 (NSW) - E4-3 (E1)	10 to 14 V
R	E7-11 (R) - E4-3 (E1)	10 to 14 V*
Except R	E7-11 (R) - E4-3 (E1)	Below 1 V
D	E7-21 (D) - E4-3 (E1)	10 to 14 V
Except D	E7-21 (D) - E4-3 (E1)	Below 1 V
3	E7-19 (3) - E4-3 (E1)	10 to 14 V
Except 3	E7-19 (3) - E4-3 (E1)	Below 1 V
2	E7-10 (2) - E4-3 (E1)	10 to 14 V
Except 2	E7-10 (2) - E4-3 (E1)	Below 1 V
L	E7-9 (L) - E4-3 (E1)	10 to 14 V
Except L	E7-9 (L) - E4-3 (E1)	Below 1 V

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

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

OK

REPLACE ECM

DTC	P0710	Transmission Fluid Temperature Sensor "A" Circuit

DTC	P0712	Transmission Fluid Temperature Sensor "A" Circuit Low Input

DTC	P0713	Transmission Fluid Temperature Sensor "A" Circuit High Input

DESCRIPTION

The ATF (Automatic Transmission Fluid) temperature sensor converts the fluid temperature into a resistance value which is input into the ECM. The No. 2 ATF temperature sensor is on the transmission and just before the oil cooler inlet pipeline.

HINT:

- The ATF temperature is liable to increase under conditions such as towing, climbing hills and in traffic.

The symptoms and recovery conditions, when the sensor is normal or there is a short malfunction in the sensor, are as shown in the table below.

No. 2 ATF temperature sensor Status	Detection Condition	Symptom	Recovery Condition
Sensor is normal	• ATF temperature more than 130°C (266°F)	• Shift point too low	• ATF temperature less than 125°C (257°F)
Sensor is normal	When conditions (a) and (b) are satisfied continuously. (a) ATF temperature more than 130°C (266°F) (b) Engine coolant temperature more than 98°C (208.4°F)	• Lock-up in 4th or 3rd gear *1	• ATF temperature less than 110°C (230°F) and engine coolant temperature less than 98°C (208.4°F)
Sensor circuit is short	• Any conditions	• Shift point too low	• Symptom still occurs
Sensor circuit is short	• Engine coolant temperature more than 95°C (203°F)	• Lock-up in 4th or 3rd gear *1	• Symptom still occurs

HINT:

*1: When the ATF temperature is normal, the transmission locks up in 4th gear with the shift lever in the D position and in 3rd gear with the shift lever in the 3rd position.

DTC No.	DTC Detection Conditions	Trouble Areas
P0710	(a) and (b) are detected momentarily within 0.5 seconds when neither P0712 nor P0713 is detected. (1-trip detection logic) (a) No. 2 ATF temperature sensor resistance is less than 79 Ω. (b) No. 2 ATF temperature sensor resistance is more than 156 kΩ. HINT: Within 0.5 seconds the malfunction changes from (a) to (b) or from (b) to (a).	• Open or short in No. 2 ATF temperature sensor circuit • No. 2 ATF temperature sensor • ECM
P0712	No. 2 ATF temperature sensor resistance is less than 79 Ωfor 0.5 seconds or more. (1-trip detection logic)	• Short in No. 2 ATF temperature sensor circuit • No. 2 ATF temperature sensor • ECM
P0713	No. 2 ATF temperature sensor resistance is more than 156 kΩ for 0.5 seconds or more 15 minutes or more after starting engine. (1-trip detection logic)	• Open in No. 2 ATF temperature sensor circuit • No. 2 ATF temperature sensor • ECM

MONITOR DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and detects any open or short malfunctions in the AFT temperature circuit. If the resistance of the ATF temperature is less than 79 Ωor more than 156 kΩ, the ECM interprets this as a fault in the ATF temperature sensor or its wiring. The ECM turns on the MIL and stores a DTC.

MONITOR STRATEGY

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

TYPICAL ENABLING CONDITIONS

P0710: Range check (Fluttering)

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

P0712: Range check (Low resistance)

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

P0713: Range check (High resistance)

The monitor will run whenever the following DTCs are not present.	None
Time after engine start	15 minutes or more

TYPICAL MALFUNCTION THRESHOLDS

P0710: Range check (Fluttering)

TFT Sensor resistance	Less than 79 Ω or more than 156 kΩ

P0712: Range check (Low resistance)

TFT Sensor resistance	Less than 79 Ω

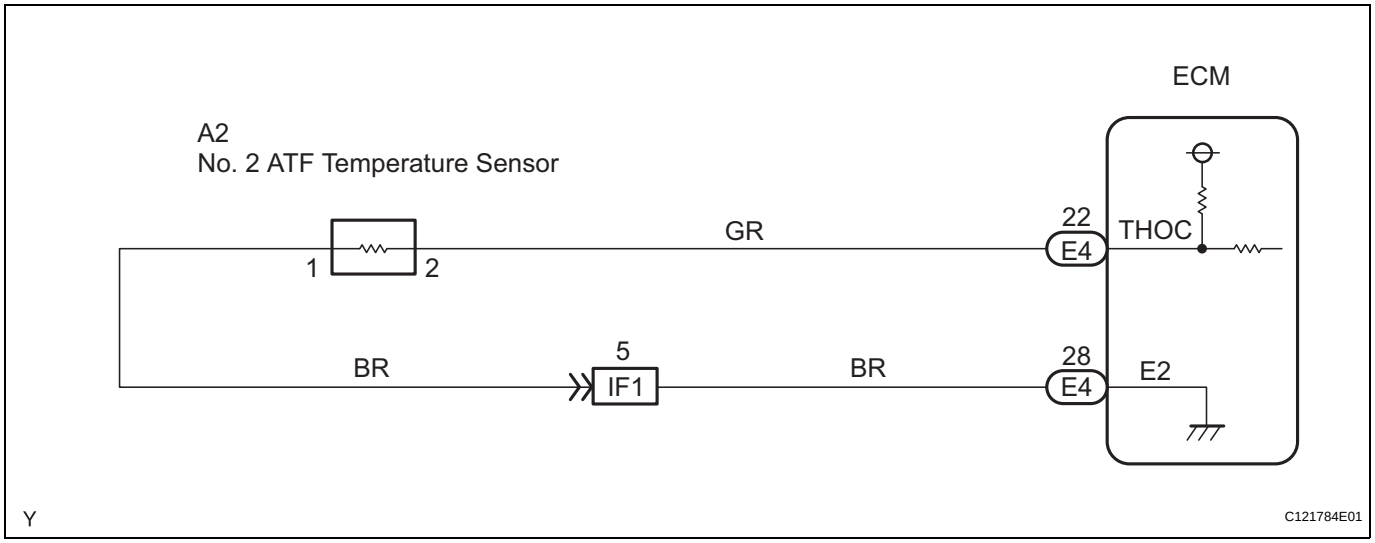
P0713: Range check (High resistance)

TFT Sensor resistance	More than 156 kΩ

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM



1. DATA LIST

HINT:

According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as the first step of troubleshooting is one method of shortening labor time.

NOTICE:

In the table below, the values listed under "Normal Condition" are for reference only. Do not depend solely on these reference values when judging 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) Push the "ON" button of the tester.
(f) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST/ A/T".
(g) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
A/T OIL TEMP3	ATF Temperature Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	• After Stall Test; Approximately 80°C (176°F) • Equal to ambient temperature when cold soak

HINT:

When DTC P0712 is output and the intelligent tester reading is 150°C (302°F) or more, there is an short circuit.

When DTC P0713 is output and the intelligent tester reading is -40°C (-40°F), there is a open circuit.

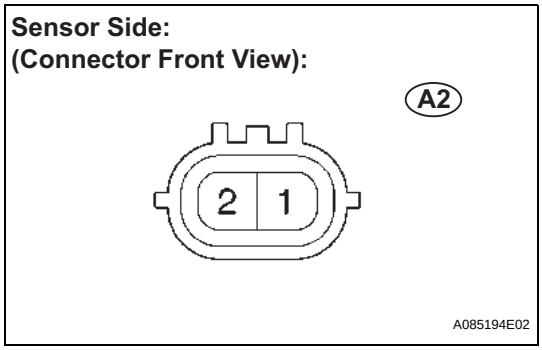
Measure the resistance between terminal THOC and the body ground.

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
160 °C (320°F) or more	Short circuit

HINT:

If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately set (in 0.5 seconds).

1	INSPECT TEMPERATURE SENSOR



(a) Disconnect the ATF temperature sensor connector from the transmission.
(b) Measure the resistance between the sensor connector terminals.

Standard resistance

Tester Connection	Specified Condition
1 - 2	79 Ω to 156 kΩ
1 - Body ground	10 kΩ or higher
2 - Body ground	10 kΩ or higher

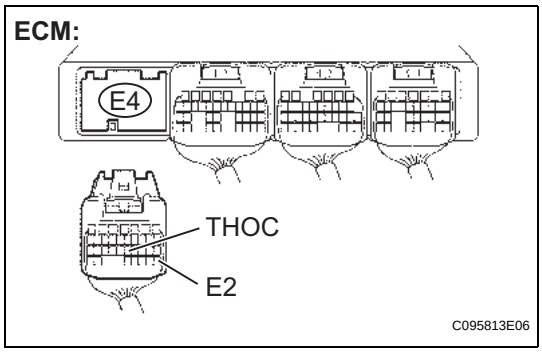
HINT:
If the resistance is outside the specified range at either of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

ATF Temperature:	Resistance:
20 °C (68°F)	10.3 to 13.9 kΩ
110°C (230°F)	0.68 to 0.88 kΩ

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

2	CHECK HARNESS AND CONNECTOR (ATF TEMPERATURE - ECM)



(a) Connect the transmission wire connector.
(b) Disconnect the ECM connector.
(c) Measure the resistance.

Standard resistance

Tester Connection	Specified Condition
E4-22 (THOC) - E4-28 (E2)	79 Ω to 156 kΩ
E4-22 (THOC) - Body ground	10 kΩ or higher
E4-28 (E2) - Body ground	10 kΩ or higher

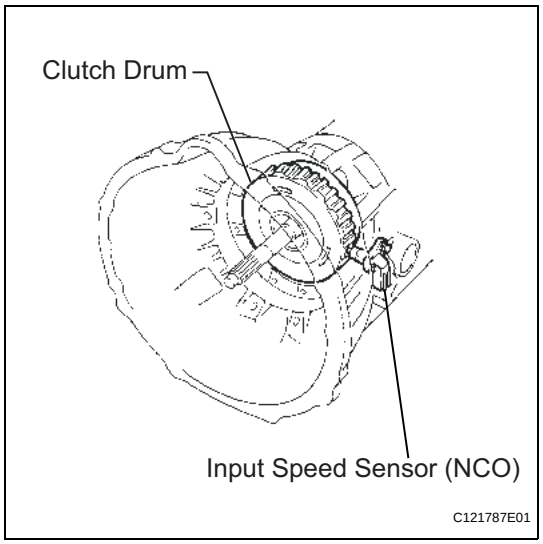
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM

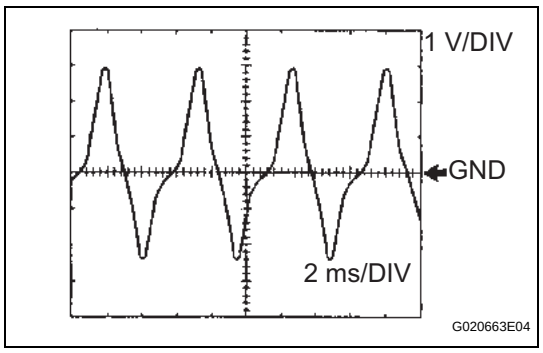
DTC	P0717	Turbine Speed Sensor Circuit No Signal

DESCRIPTION



The sensor detects the rotation speed of the turbine which shows the input revolution of the transmission. By comparing the input turbine speed signal (NCO) with the counter gear speed sensor signal (SP2), 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 Conditions	Trouble Areas
P0717	ECM detects conditions (a), (b) and (c) continuously for 5 seconds or more. (1-trip detection logic) (a) Output shaft speed is 500 rpm or more. (Vehicle speed: 31 mph (50 km/h) or more) (b) Park/neutral position switch: NSW input signal is OFF R input signal is OFF (c) Speed sensor (NCO): Less than 300 rpm	• Open or short in speed sensor (NCO) circuit • Speed sensor (NCO) • ECM



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

Item	Content
Terminal	**NCO+ (E5-34) - NCO- (E5-26)**
Tool setting	**1 V/DIV** **2 ms/DIV**
Vehicle condition	**Engine idling speed (P or N position)**

MONITOR DESCRIPTION

This DTC indicates that a pulse is not output from the speed sensor NCO (Turbine (input) speed sensor) or is weak. The NCO terminal of the ECM detects the revolving signal from speed sensor (NCO) (input RPM). The ECM outputs a gearshift signal comparing the speed sensor (NCO) with the output speed sensor (SP2).

If the input shaft revolution is less than 300 rpm*1 although the output shaft revolution is more than 500 rpm or more*2, the ECM detects the trouble, illuminates the MIL and stores the DTC.

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

AT

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

MONITOR STRATEGY

Related DTCs	P0717: Speed sensor (NCO)/ Verify pulse input
Required sensors/Components	Speed sensor (NCO)
Frequency of operation	Continuous
Duration	5 seconds
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	P0500 (VSS) P0748 - P0798 (Trans solenoid (range))
Shift change	Each shift change is completed before starting next shift change operation
Output shaft rpm	500 rpm or more
Turbine speed sensor malfunction	Not detected
R switch	OFF
Park/neutral position switch	OFF

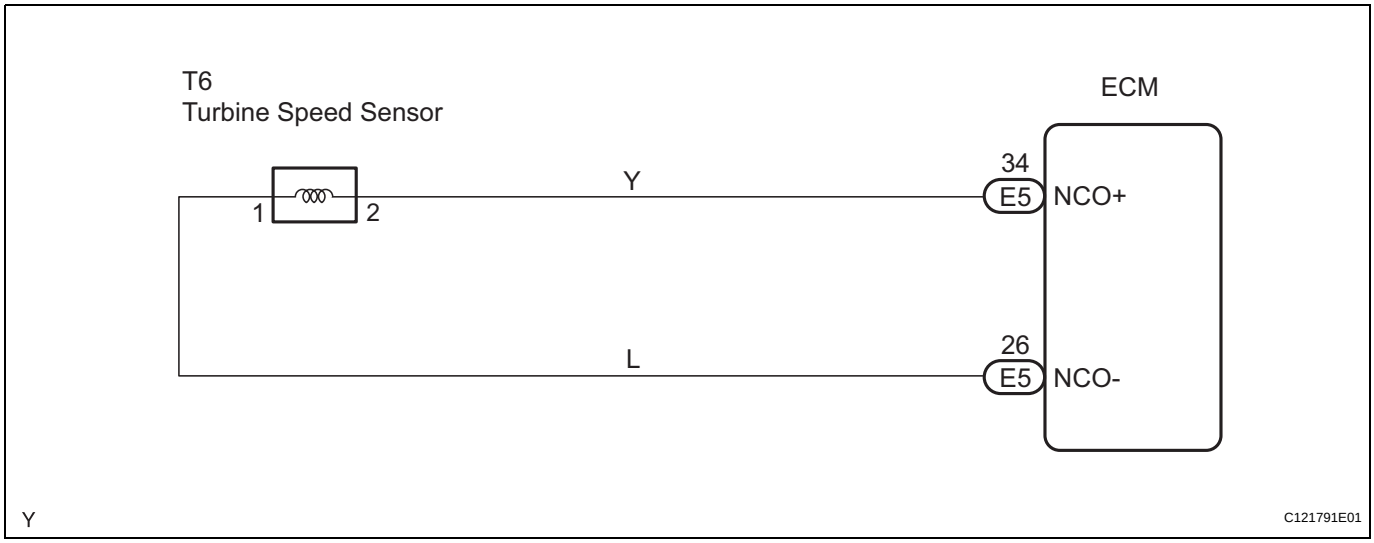
TYPICAL MALFUNCTION THRESHOLDS

Sensor signal rpm	Less than 300 rpm

COMPONENT OPERATING RANGE

Speed sensor (NCO)	Input speed is equal to engine speed when lock-up ON.

WIRING DIAGRAM



AT

1. DATA LIST

HINT:

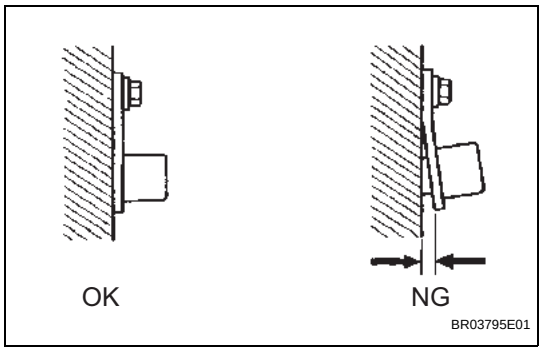
According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as the first step of troubleshooting is one method of shortening labor time.

(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 tester.
(f) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST/ A/T".
(g) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
SPD (NCO)	Input Turbine Speed/ display: 50 rpm	HINT: • 3rd gear lock-up ON (After warming up the engine); Input turbine speed (NCO) equal to the engine speed • 4th gear lock-up ON (After warming up the engine); Input turbine speed (NCO): 0 rpm • Lock-up OFF (Idling at N position); Input turbine speed (NCO) nearly equal to the engine speed

HINT:
- SPD (NCO) is always 0 while driving indicates:
  3rd Gear: Open or short in the sensor or circuit.
  4th Gear: Engine speed 0 rpm
- SPD (NCO) is always less than 300 rpm while driving the vehicle at 31 mph (50 km/h) or more indicates:
  Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

1 INSPECT SPEED SENSOR INSTALLATION

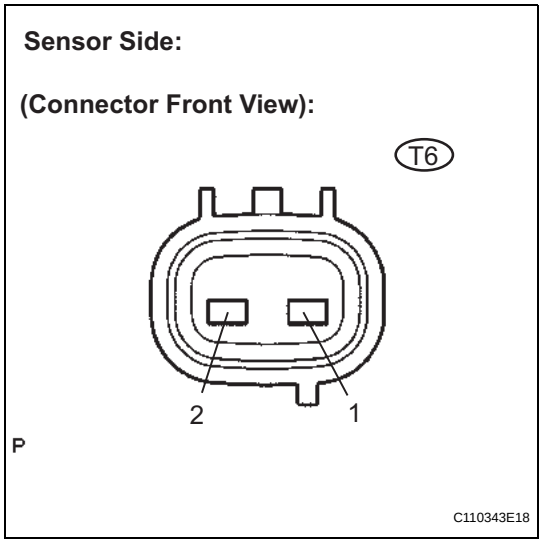


(a) Check the speed sensor (NCO) installation.
OK:
The installation bolt is tightened properly and there is no clearance between the sensor and transmission case.

NG → **REPLACE SPEED SENSOR (NCO)**

OK

2	INSPECT SPEED SENSOR (NCO)



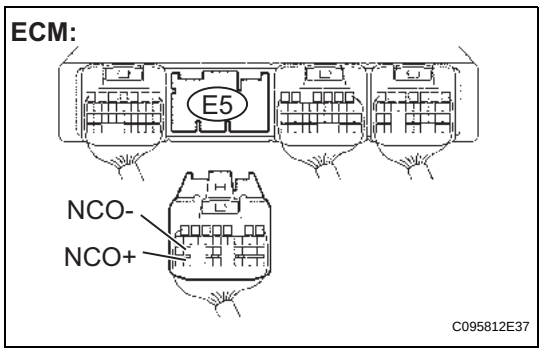
(a) Disconnect the speed sensor connector from the transmission.
(b) Measure the resistance.
Standard resistance

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

NG → **REPLACE SPEED SENSOR (NCO)**

OK

3	CHECK HARNESS AND CONNECTOR (SPEED SENSOR - ECM)



(a) Connect the speed sensor connector.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
E5-34 (NCO+) - E5-26 (NCO-)	560 to 680 Ω at 20 °C (68 °F)
E5-34 (NCO+) - Body ground	10 kΩ or higher
E5-26 (NCO-) - Body ground	10 kΩ or higher

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

OK

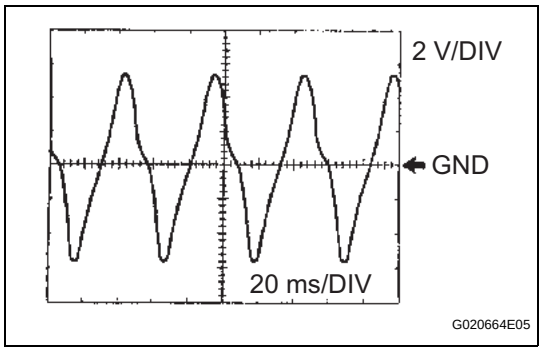
REPLACE ECM

DTC	P0722	Output Speed Sensor Circuit No Signal

DESCRIPTION

The speed sensor SP2 detects the rotation speed of the transmission output shaft and sends signals to the ECM. The ECM determines the vehicle speed based on these signals.
An AC voltage is generated in the speed sensor SP2 coil as the rotor mounted on the output shaft rotates, and this voltage is sent to the ECM.
The gear shift point and lock-up timing are controlled by the ECM based on the signals from the speed sensor and the throttle position sensor.

DTC No.	DTC Detection Conditions	Trouble Areas
P0722	All conditions below are detected 500 times or more continuously. (2-trip detection logic) • No signal from speed sensor (SP2) is input to ECM while 4 pulses of No. 1 vehicle speed sensor signal are sent • Vehicle speed is 5.6 mph (9 km/h) or more for at least 4 seconds • Park/neutral position switch is OFF	• Open or short in speed sensor (SP2) circuit • Speed sensor (SP2) • ECM



1. Reference (Using an oscilloscope):
Check the waveform between terminals SP2+ and SP2- of the ECM connector.
Standard:
Refer to the illustration.

Item	Content
Terminal	**SP2+ (E5-35) - SP2- (E5-27)**
Tool setting	**2 V/DIV** **20 ms/DIV**
Vehicle condition	**Vehicle speed 12 mph (20 km/h)**

MONITOR DESCRIPTION

The output speed sensor monitors the output shaft speed. The ECM controls the gearshift point and the lock up timing based on the signals from the output speed sensor and throttle position sensor.
If the ECM detects no signal from the output speed sensor even while the vehicle is moving, it will conclude that there is a malfunction in the output speed sensor. The ECM will illuminate the MIL and set the DTC.

MONITOR STRATEGY

Related DTCs	P0722: Speed sensor SP2/Verify pulse input
Required sensors/Components	Speed sensor SP2
Frequency of operation	Continuous
Duration	500 output shaft revolutions
MIL operation	2 driving cycles
Sequence of operation	None

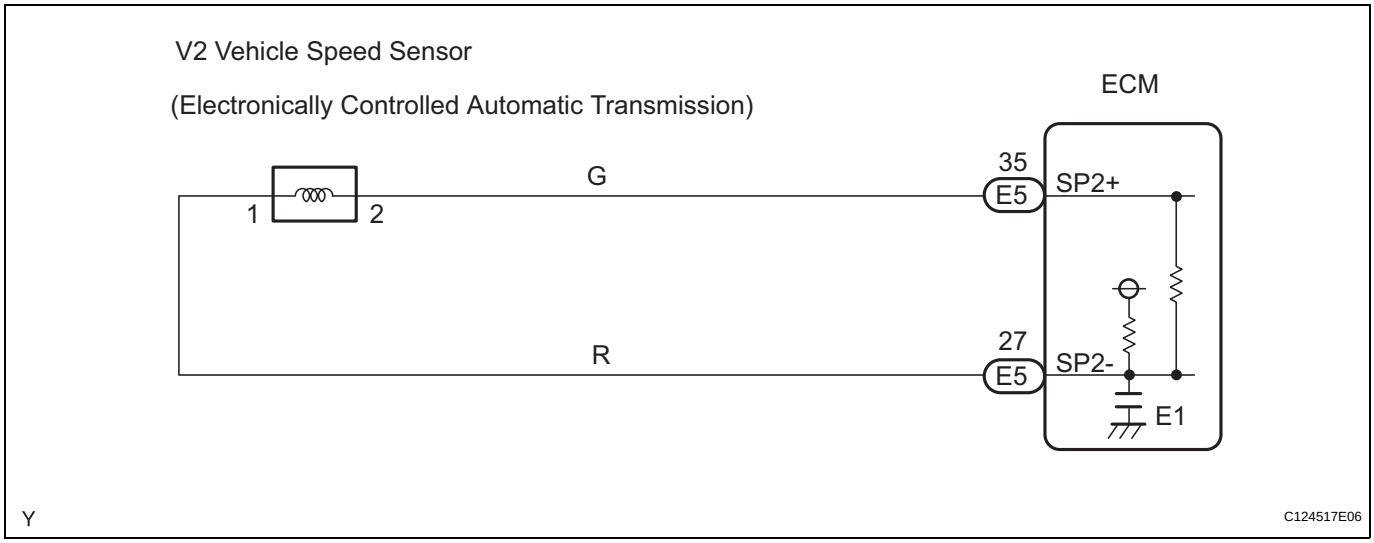
TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	P0500 (VSS) P0748 - P0798 (Trans solenoid (range))
Vehicle speed range (4 seconds or more)	5.6 mph (9 km/h) or more
Park/neutral position switch	OFF

TYPICAL MALFUNCTION THRESHOLDS

No pulse input during 4 vehicle speed sensor pulse inputs	500 times or more

WIRING DIAGRAM

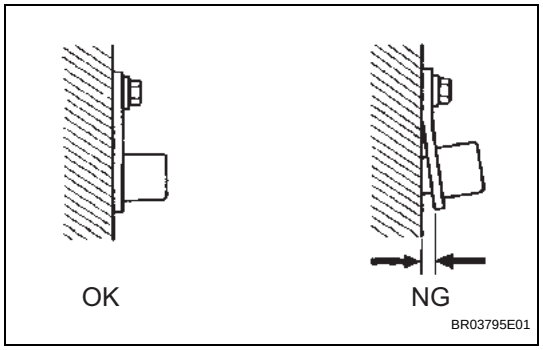


HINT:
According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as the first step of troubleshooting is one method of shortening labor time.
NOTICE:
In the table below, the values listed under "Normal Condition" are for reference only. Do not depend solely on these reference values when judging whether a part is faulty or not.
(a) Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
(b) Turn the ignition switch to the ON position.
(c) Push the "ON" button of the tester.
(d) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST/ A/T".
(e) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
SPD (SP2)	Counter Gear Speed display/ min.: 0 mph (0 km/h) max.: 158 mph (255 km/h)	Vehicle stopped: 0 mph (0 km/h) [HINT] Equal to vehicle speed

HINT:
- SPD (SP2) is always 0 while driving:
  Open or short in the sensor or circuit.
- The SPD (SP2) value displayed on the tester is much lower than the actual vehicle speed:
  Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

1 INSPECT SPEED SENSOR INSTALLATION



(a) Check the speed sensor (SP2) installation.

OK:

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

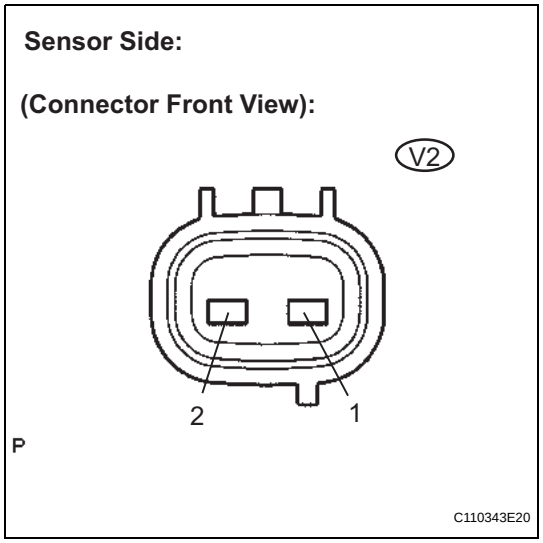
NG → **REPLACE SPEED SENSOR (SP2)**

OK

2 INSPECT SPEED SENSOR (SP2)

Sensor Side:

(Connector Front View):



(a) Disconnect the speed sensor connector from the transmission.

(b) Measure the resistance.

Standard resistance

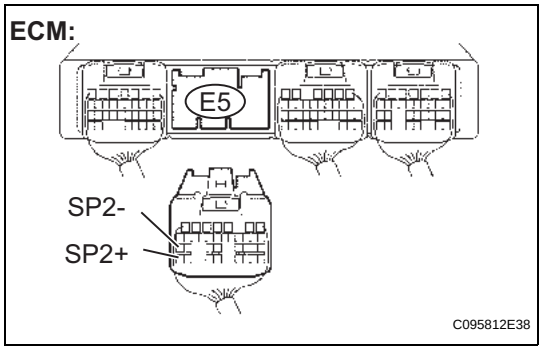
Tester Connection	Specified Condition
1 - 2	560 to 680 Ω at 20 °C (68 °F)

NG → **REPLACE SPEED SENSOR (SP2)**

OK

3 CHECK HARNESS AND CONNECTOR (SPEED SENSOR - ECM)

ECM:



(a) Connect the speed sensor connector.

(b) Disconnect the ECM connector.

(c) Measure the resistance.

Standard resistance

Tester Connection	Specified Condition
E5-35 (SP2+) - E5-27 (SP2-)	560 to 680 Ωat 20 °C (68 °F)
E5-35 (SP2+) - Body ground	10 kΩ or higher
E5-27 (SP2-) - Body ground	10 kΩ or higher

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

AT

OK

REPLACE ECM

DTC	P0724	Brake Switch "B" Circuit High

DESCRIPTION

The purpose of this circuit is to prevent the engine from stalling while driving in lock-up condition, when the brakes are suddenly applied.
When the brake pedal is depressed, this switch sends signals to the ECM. Then the ECM cancels the operation of the lock-up clutch while braking is in progress.

DTC No.	DTC Detection Condition	Trouble Area
P0724	The stop light switch remains ON even when the vehicle is driven in a GO (18.6 mph (30 km/h) or more) and STOP (less than 1.9 mph (3 km/h)) pattern 5 times. (2-trip detection logic)	• Short in stop light switch signal circuit • Stop light switch • ECM

MONITOR DESCRIPTION

This DTC indicates that the stop light switch remains ON. When the stop light switch remains ON during 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 1.9 mph (3 km/h)) and go (18.6 mph (30 km/h) or more) 5 times during 2 driving cycles, in order to detect a malfunction.

MONITOR STRATEGY

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

TYPICAL ENABLING CONDITIONS

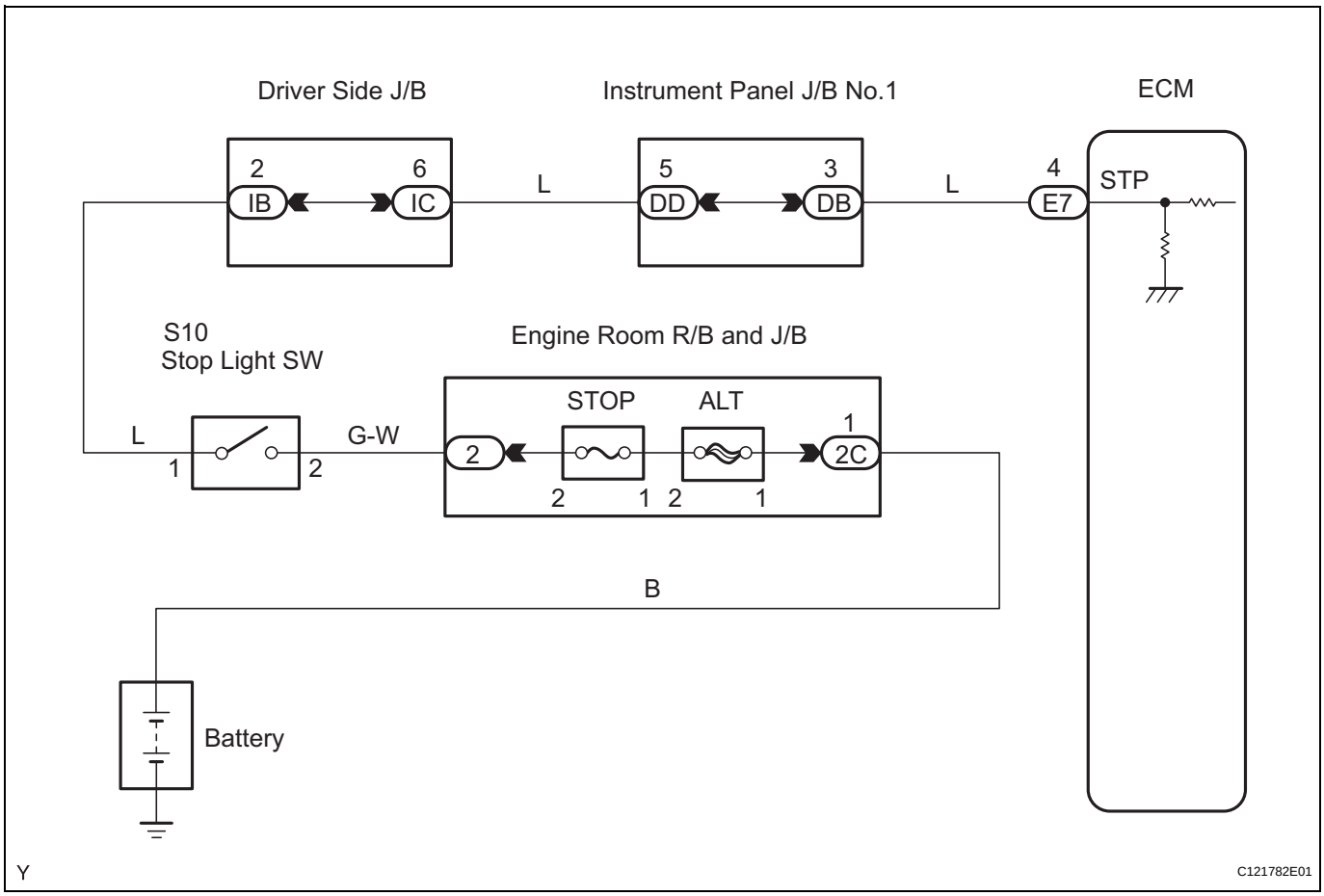
The stop light switch remains ON during GO and STOP 5 times.
GO and STOP are defined as follows;

The monitor will run whenever the following DTCs are not present.	None
GO: Vehicle speed	18.6 mph (30 km/h) or more
STOP: Vehicle speed	Less than 1.9 mph (3 km/h)

TYPICAL MALFUNCTION THRESHOLDS

Stop light switch status	Stuck ON

WIRING DIAGRAM



HINT:
According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as the first step of troubleshooting is one method of shortening labor time.

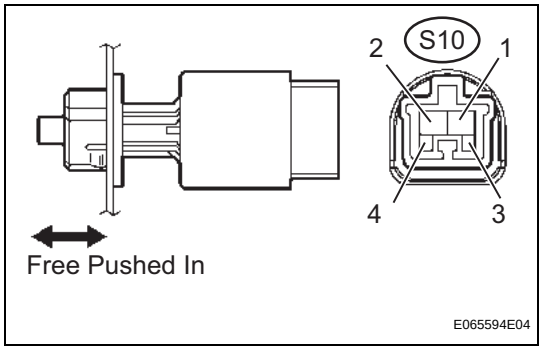
NOTICE:

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

(a) Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
(b) Turn the ignition switch to the ON position.
(c) Push the "ON" button of the tester.
(d) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST/ A/T".
(e) According to the display on the tester, read the "DATA LIST".

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

1 INSPECT STOP LIGHT SWITCH ASSEMBLY



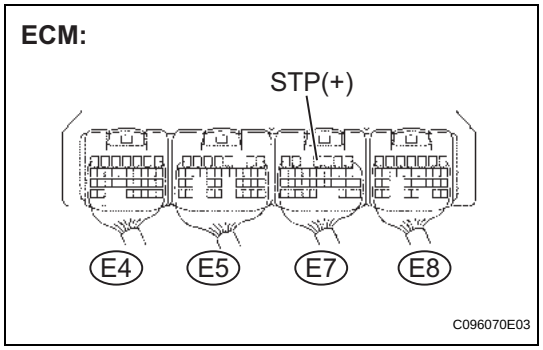
(a) Remove the stop light switch assembly.
(b) Measure the resistance.
Standard resistance

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

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 when the brake pedal is depressed and released.
Standard voltage

Condition	Tester Connection	Specified Condition
Brake pedal is depressed	E7-4 (STP) - Body ground	10 to 14 V
Brake pedal is released	E7-4 (STP) - Body ground	Below 1 V

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

OK

REPLACE ECM

DTC	P0751	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)

SYSTEM DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd or 4th gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC No.	DTC Detection Conditions	Trouble Areas
P0751	S1 stuck ON malfunction*1: The ECM determines that there is a malfunction when the following conditions are met: (a) When the ECM directs the gearshift to switch to 4th gear, the engine overruns (clutch slips). (b) When the ECM directs the gearshift to switch to 4th gear, the actual gear is shifted to 1st.	• Shift solenoid valve S1 is stuck open • Valve body is blocked • Shift solenoid valve S1 • Automatic transmission (clutch, brake or gear, etc.)
P0751	S1 stuck OFF malfunction*2: The ECM determines that there is a malfunction when the following conditions are met: (a) When the ECM directs the gearshift to switch to 1st gear, the actual gear is shifted to 4th. (b) When the ECM directs the gearshift to switch to 4th gear, the actual gear is also shifted to 4th.	• Shift solenoid valve S1 is stuck closed • Valve body is blocked • Shift solenoid valve S1 • Automatic transmission (clutch, brake or gear, etc.)

HINT:

- Gear positions in the event of a solenoid valve mechanical problem:

Gearshift controlled by ECM	1st	2nd	3rd	4th
*1: Actual gear position under S1 stuck ON malfunction	1st	2nd	2nd	1st
*2: Actual gear position under S1 stuck OFF malfunction	4th	3rd	3rd	4th

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve S1.
The ECM controls the gearshifts by turning the shift solenoid valves "ON/OFF". When the gear position directed by the ECM and the actual gear position do not match, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0751: Shift solenoid valve S1/OFF malfunction Shift solenoid valve S1/ON malfunction
Required sensors/Components	Shift solenoid valve S1, Speed sensor (SP2), Speed sensor (NCO), Crankshaft position sensor (NE), Throttle position sensor, MAF
Frequency of operation	Continuous
Duration	OFF malfunction (A): 1.0 second OFF malfunction (B): 0.4 seconds ON malfunction (A): 0.8 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The following conditions are common to all OFF malfunctions (A), (B) and ON malfunctions (A), (B).

The monitor will run whenever the following DTCs are not present.	P0115 - P0118 (ECT sensor) P0125 (Insufficient ECT for closed loop) P0500 (VSS) P0748 - P0798 (Trans solenoid (range))
Shift solenoid "A" (S1) circuit Shift solenoid "B" (S2) circuit ECT (Engine Coolant Temperature) sensor circuit Input speed sensor (NCO) circuit Output speed sensor (SP2) circuit	There is no malfunction in the sensor circuits shown on the left
Transmission shift position	"D"
ECT (Engine Coolant Temperature)	40°C (104°F) or more
Spark advance from max. retard timing by knock control	0° CA or more
Engine	Running

OFF malfunction (A)

ECM selected gear	1st
Vehicle speed	6.2 mph (10 km/h) or more and Less than 24.8 mph (40 km/h)
Throttle valve opening angle	15 % or more and 6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

OFF malfunction (B)

Current ECM selected gear	4th
Last ECM selected gear	3rd
Actual gear when ECM selected 3th gear	3rd

ON malfunction (A)

ECM selected gear	4th
Vehicle speed at current ECM selected gear - Vehicle speed at last ECM selected gear	Less than 6.2 mph (10 km/h)
Throttle valve opening angle at current ECM selected gear - Throttle valve opening angle at last ECM selected gear	Less than 10 %
Throttle valve opening angle	Less than 20 %
Vehicle speed	Less than 52.8 mph (85 km/h)

ON malfunction (B)

Current ECM selected gear	4th
Last ECM selected gear	3rd

TYPICAL MALFUNCTION THRESHOLDS

[OFF malfunction]

Both of the following conditions are met: OFF malfunctions (A) and (B)
2 detections are necessary in 1 driving cycle.
1st detection: Temporary flag ON
2nd detection: Pending fault code ON

OFF malfunctions (A) and (B)

Input speed/Output speed (NC0/SP2)	0.00 or more and 0.22 or less (This means actual gear is 4th)

[ON malfunction]

Both of the following conditions are met: ON malfunctions (A) and (B)

ON malfunction (A)

NE current - NE last NE current: Engine speed at current ECM selected gear NE last: Engine speed at last ECM selected gear	950 rpm or more

ON malfunction (B)

Input speed/Output speed (NC0/SP2)	Not change as follows 0.93 or more and 1.07 or less (This means actual gear is 3rd) ↓ 0.00 or more and 0.22 or less (This means actual gear is 4th)

1. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as the first step of troubleshooting is one method of shortening 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 tester.

(f) Select the items "DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ SHIFT".

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

HINT:

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

Comparing the shift position directed by the ACTIVE TEST with the actual shift position enables you to confirm the problem (See page AT-27).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position by manually. [Vehicle Condition] • IDL: ON • Less than 31 mph (50 km/h) [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 31 mph (50 km/h) or less.
- The 3rd to 4th up-shifting must be performed with the accelerator pedal released.
- The 4th to 3rd down-shifting must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position directed by the ECM is shown in the DATA LIST/ SHIFT display on the intelligent tester.
- The shift solenoid valve S1 is turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th
Shift solenoid valve S1	ON	ON	OFF	OFF

1 CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P0751)

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

Result

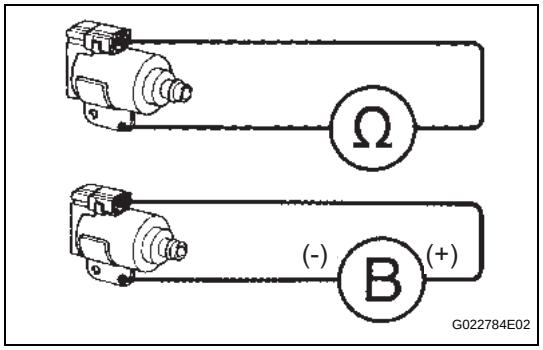
Display (DTC Output)	Proceed to
Only "P0751" is output	A
"P0751" and other DTCs	B

HINT:
If any codes besides "P0751" are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART**

A

2 INSPECT SHIFT SOLENOID VALVE S1



(a) Remove the shift solenoid valve S1.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
Solenoid Connector (S1) - Solenoid Body (S1)	11 to 15 Ω at 20°C (68°F)

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

NG → **REPLACE SHIFT SOLENOID VALVE S1**

OK

3 INSPECT TRANSMISSION VALVE BODY ASSEMBLY

OK:
There are no foreign objects on any valves and they operate smoothly.

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

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY

DTC	P0756	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)

SYSTEM DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd or 4th gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC No.	DTC Detection Conditions	Trouble Areas
P0756	S2 stuck OFF malfunction*2: Shifting to 1st and 4th gears is impossible. The ECM determines that there is a malfunction when the following conditions are met: (a) When the ECM directs the gearshift to switch to 2nd gear, the actual gear is shifted to 1st. (b) When the ECM directs the gearshift to switch to 3rd gear, the actual gear is shifted to 4th.	• Shift solenoid valve S2 is stuck open • Valve body is blocked • Shift solenoid valve S2 • Automatic transmission (clutch, brake or gear, etc.)
P0756	S2 stuck ON malfunction*1: The vehicle starts in 2nd gear and shifting to 3rd gear is impossible. The ECM determines that there is a malfunction when the following conditions are met: (a) When the ECM directs the gearshift to switch to 1st gear, the actual gear is shifted to 2nd. (b) When the ECM directs the gearshift to switch to 4th gear, the actual gear is shifted to 3rd.	• Shift solenoid valve S2 is stuck closed • Valve body is blocked • Shift solenoid valve S2 • Automatic transmission (clutch, brake or gear, etc.)

HINT:

- Gear positions in the event of a solenoid valve mechanical problem:

Gearshift controlled by ECM	1st	2nd	3rd	4th
*1: Actual gear position under S2 stuck ON malfunction	2nd	2nd	3rd	3rd
*2: Actual gear position under S2 stuck OFF malfunction	1st	1st	4th	4th

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve S1.
The ECM controls the gearshifts by turning the shift solenoid valves "ON/OFF". When the gear position directed by the ECM and the actual gear position do not match, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0756: Shift solenoid valve S2/OFF malfunction Shift solenoid valve S2/ON malfunction
Required sensors/Components	Shift solenoid valve S2
Frequency of operation	Continuous
Duration	1.0 second
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The following conditions are common to all OFF malfunctions (A), (B), (C) and ON malfunctions (A), (B), (C).

The monitor will run whenever the following DTCs are not present.	P0115 - P0118 (ECT sensor) P0125 (Insufficient ECT for closed loop) P0500 (VSS) P0748 - P0798 (Trans solenoid (range))
Shift solenoid "A" (S1) circuit Shift solenoid "B" (S2) circuit ECT (Engine Coolant Temperature) sensor circuit Input speed sensor circuit Output speed sensor circuit	There is no malfunction in the sensor circuits shown on the left
Transmission shift position	"D"
ECT (Engine Coolant Temperature)	40°C (104°F) or more
Spark advance from max. retard timing by knock control	0°CA or more
Engine	Running

OFF malfunction (A)

ECM selected gear	2nd
Vehicle speed	6.2 mph (10 km/h) or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

OFF malfunction (B)

ECM selected gear	3rd
Vehicle speed	6.2 mph (10 km/h) or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

OFF malfunction (C)

ECM selected gear	4th
Vehicle speed	6.2 mph (10 km/h) or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

ON malfunction (A)

ECM selected gear	1st
Vehicle speed	6.2 mph (10 km/h) or more and Less than 24.8 mph (40 km/h)
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

ON malfunction (B)

ECM selected gear	3rd
Vehicle speed	6.2 mph (10 km/h) or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

ON malfunction (C)

ECM selected gear	4th
Vehicle speed	6.2 mph (10 km/h) or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

TYPICAL MALFUNCTION THRESHOLDS

[OFF malfunction]

All of the following conditions are met: OFF malfunctions (A), (B) and (C)
2 detections are necessary in 1 driving cycle.
1st detection: Temporary flag ON
2nd detection: Pending fault code ON

OFF malfunction (A)

Input speed/Output speed (NC0/SP2)	2.63 or more and 3.20 or less (This means actual gear is 1st)

OFF malfunction (B)

Input speed/Output speed (NC0/SP2)	0.00 or more and 0.22 or less (This means actual gear is 4th)

OFF malfunction (C)

Input speed/Output speed (NC0/SP2)	0.00 or more and 0.22 or less (This means actual gear is 4th)

[ON malfunction]

All of the following conditions are met: ON malfunctions (A), (B) and (C)

ON malfunction (A)

Input speed/Output speed (NC0/SP2)	1.40 or more and 1.67 or less (This means actual gear is 2nd)

ON malfunction (B)

Input speed/Output speed (NC0/SP2)	0.93 or more and 1.07 or less (This means actual gear is 3rd)

ON malfunction (C)

Input speed/Output speed (NC0/SP2)	0.93 or more and 1.07 or less (This means actual gear is 3rd)

1. ACTIVE TEST

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as the first step of troubleshooting is one method of shortening 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 tester.
(f) Select the items "DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ SHIFT".
(g) According to the display on the tester, perform the "ACTIVE TEST".
HINT:
While driving, the shift position can be changed with the intelligent tester.
Comparing the shift position directed by the ACTIVE TEST with the actual shift position enables you to confirm the problem (See page AT-27).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position by manually. [Vehicle Condition] • IDL: ON • Less than 31 mph (50 km/h) [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 31 mph (50 km/h) or less.
- The 3rd to 4th up-shifting must be performed with the accelerator pedal released.
- The 4th to 3rd down-shifting must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position directed by the ECM is shown in the DATA LIST/ SHIFT display on the intelligent tester.
- The shift solenoid valve S2 is turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th
Shift solenoid valve S2	OFF	ON	ON	OFF

1 CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P0756)

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

Result

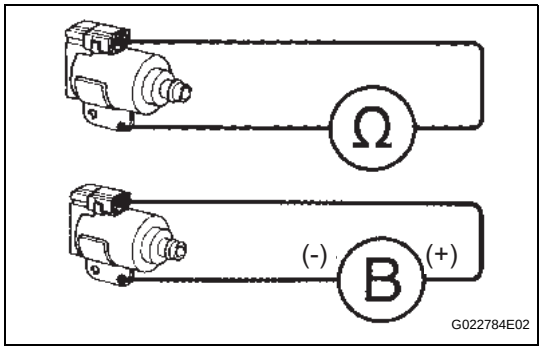
Display (DTC Output)	Proceed to
Only "P0756" is output	**A**
"P0756" and other DTCs	**B**

HINT:
If any codes besides "P0756" are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART**

A

2 INSPECT SHIFT SOLENOID VALVE S2



(a) Remove the shift solenoid valve S2.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
Solenoid Connector (S2) - Solenoid Body (S2)	11 to 15 Ω at 20°C (68°F)

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

NG → **REPLACE SHIFT SOLENOID VALVE S2**

OK

3 INSPECT TRANSMISSION VALVE BODY ASSEMBLY

OK:
There are no foreign objects on any valves and they operate smoothly.

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

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY

DTC	P0973	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)

DTC	P0974	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)

DTC	P0976	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)

DTC	P0977	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)

DESCRIPTION

Shifting from 1st to 4th is performed in combination with the ON and OFF operation of the shift solenoid valves No. 1 and No. 2 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 valve to allow the vehicle to be driven smoothly. (In case of an open or short circuit, the ECM stops sending current to the circuit.)
Fail-safe functions (See page AT-27)

DTC No.	DTC Detection Conditions	Trouble Areas
P0973	ECM detects short in solenoid valve S1 circuit 2 times when solenoid valve S1 is operated. (1-detection logic)	• Short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM
P0974	ECM detects open in solenoid valve S1 circuit 2 times when solenoid valve S1 is not operated. (1-detection logic)	• Open in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM
P0976	ECM detects short in solenoid valve S2 circuit 2 times when solenoid valve S2 is operated. (1-trip detection logic)	• Short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM
P0977	ECM detects open in solenoid valve S2 circuit 2 times when solenoid valve S2 is not operated. (1-trip detection logic)	• Open in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM

MONITOR DESCRIPTION

The ECM controls the gearshift by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in either shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores a DTC. And the ECM performs the fail-safe function and turns the other shift solenoid valves in good condition "ON/OFF". (In case of an open or short circuit, the ECM stops sending current to the circuit.)

MONITOR STRATEGY

P0973, P0974:

Related DTCs	P0973: Shift solenoid valve S1/Range check (Low resistance) P0974: Shift solenoid valve S1/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S1
Frequency of operation	Continuous
Duration	0.1 seconds x 2 (times) or more
MIL operation	Immediate
Sequence of operation	None

P0976, P0977:

Related DTCs	P0976: Shift solenoid valve S2/Range check (Low resistance) P0977: Shift solenoid valve S2/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S2
Frequency of operation	Continuous
Duration	0.1 seconds x 2 (times) or more
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0973: Range check (Low resistance)

Range check (Low resistance)

The monitor will run whenever the following DTCs are not present.	None
Solenoid	ON

P0974: Range check (High resistance)

The monitor will run whenever the following DTCs are not present.	None
Solenoid	OFF

P0976: Range check (Low resistance)

The monitor will run whenever the following DTCs are not present.	None
Solenoid	ON

P0977: Range check (High resistance)

The monitor will run whenever the following DTCs are not present.	None
Solenoid	OFF

TYPICAL MALFUNCTION THRESHOLDS

P0973: Range check (Low resistance)

Intelligent power MOS diagnosis fail signals detected while the solenoid is operated	Fail: Solenoid resistance 8 Ω or less

P0974: Range check (High resistance)

Intelligent power MOS diagnosis fail signals detected while the solenoid is not operated	Fail: Solenoid resistance 100 kΩ or more

P0976: Range check (Low resistance)

Intelligent power MOS diagnosis fail signals detected while the solenoid is operated	Fail: Solenoid resistance 8 Ω or less

P0977: Range check (High resistance)

Intelligent power MOS diagnosis fail signals detected while the solenoid is not operated	Fail: Solenoid resistance 100 kΩ or more

COMPONENT OPERATING RANGE

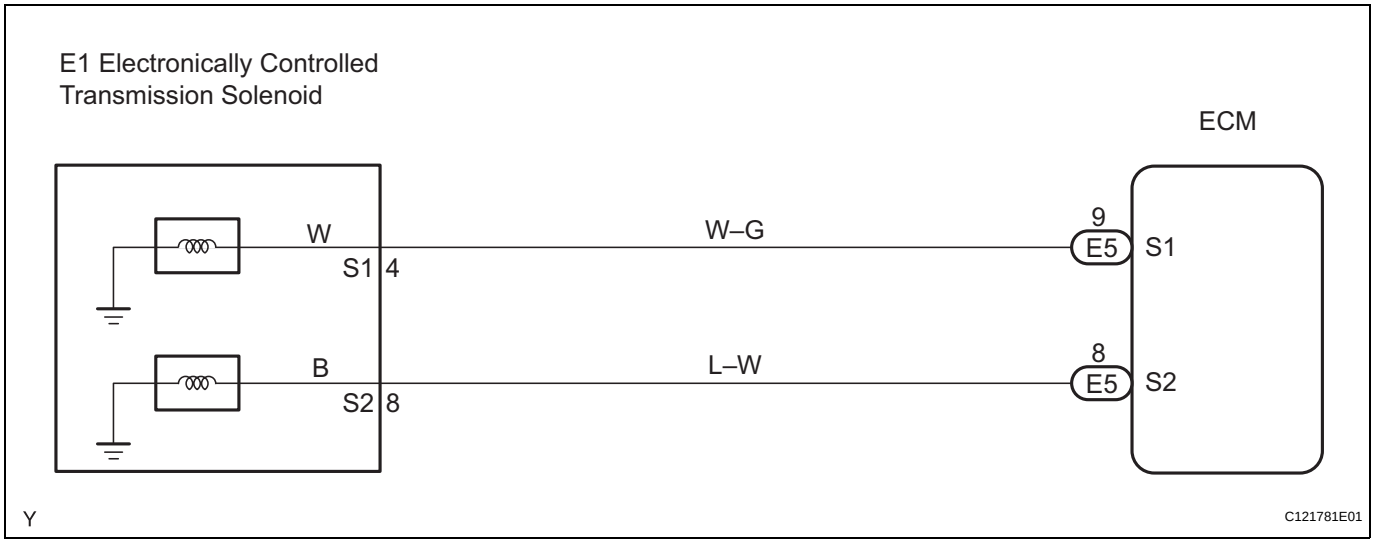
P0973, P0974:

Shift solenoid valve S1 resistance	11 to 15 Ω at 20°C (68°F)

P0976, P0977:

Shift solenoid valve S2 resistance	11 to 15 Ω at 20°C (68°F)

WIRING DIAGRAM

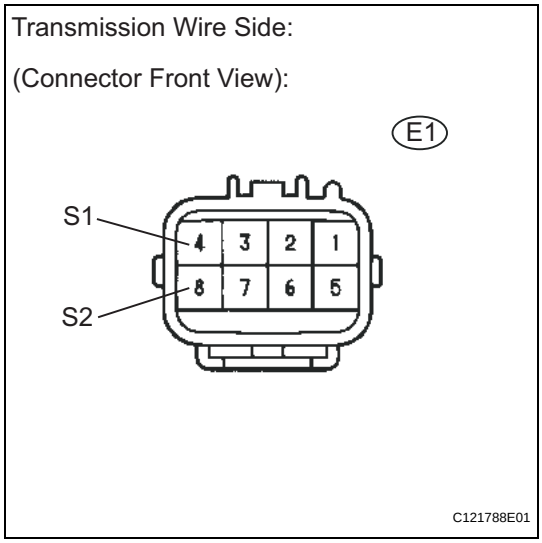


HINT:

- The shift solenoid valve S1 or S2 is turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th
Shift solenoid valve S1	ON	ON	OFF	OFF
Shift solenoid valve S2	OFF	ON	ON	OFF

1	INSPECT TRANSMISSION WIRE (S1/S2)



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

(b) Measure the resistance.

Standard resistance

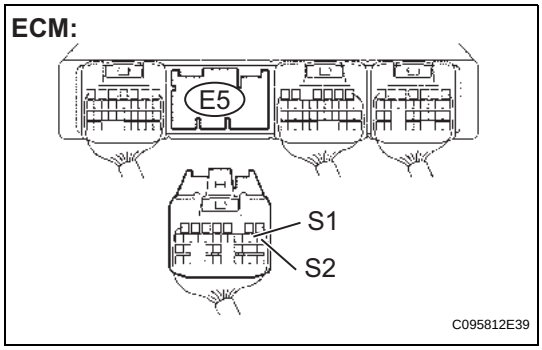
Tester Connection	Specified Condition
4 - Body ground	11 to 15 Ω at 20°C (68°F)
8 - Body ground	11 to 15 Ω at 20°C (68°F)

NG → **Go to step 3**

OK

AT

2	CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
Standard resistance

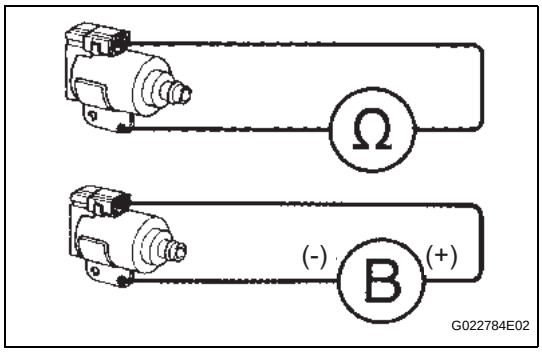
Tester Connection	Specified Condition
E5-9 (S1) - Body ground	11 to 15 Ω at 20°C (68°F)
E5-8 (S2) - Body ground	11 to 15 Ω at 20°C (68°F)

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

OK

REPLACE ECM

3	INSPECT SHIFT SOLENOID VALVE (S1/S2)



(a) Remove the shift solenoid valve S1 or S2.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
Solenoid Connector (S1) - Solenoid Body (S1)	11 to 15 Ω at 20°C (68°F)
Solenoid Connector (S2) - Solenoid Body (S2)	11 to 15 Ω at 20°C (68°F)

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

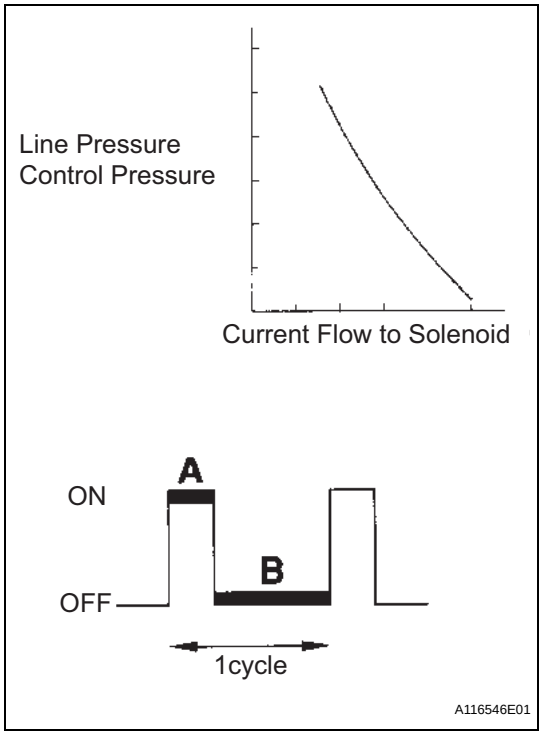
NG → **REPLACE SHIFT SOLENOID VALVE (S1/S2)**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

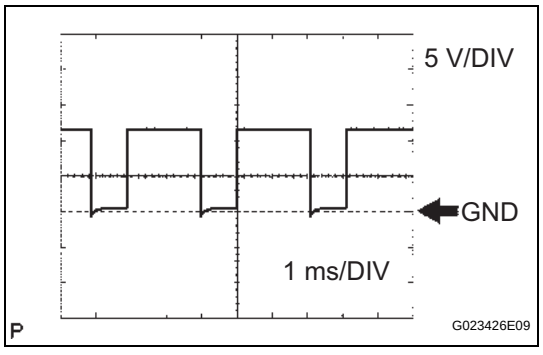
DTC	P2716	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)

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 the 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 Conditions	Trouble Areas
P2716	Open or short is detected in shift solenoid valve SLT circuit for 1 second or more while driving. (1-trip detection logic)	• Open or short in shift solenoid valve SLT circuit • Shift solenoid valve SLT • ECM



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

Item	Content
Terminal	**SLT+ (E5-12) - SLT- (E5-13)**
Tool setting	**5 V/DIV** **1 ms/DIV**
Vehicle condition	**Engine idle speed**

AT

MONITOR DESCRIPTION

When an open or short is detected in the linear solenoid valve (SLT) circuit, the ECM interprets this as a fault. The ECM turns on the MIL and stores 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 second
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	None
Solenoid current cut status	Not cut
Battery voltage	11 V or more
CPU command duty ratio to SLT	19 % or more

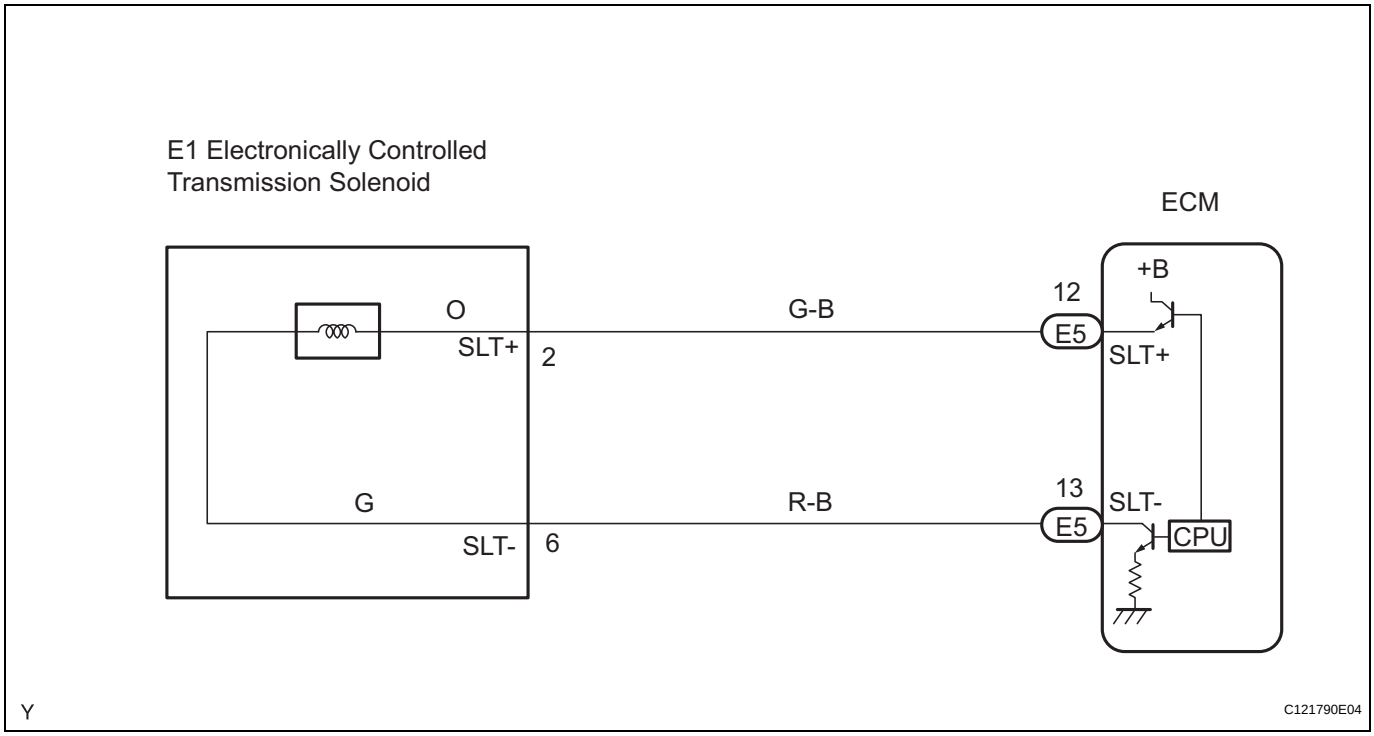
TYPICAL MALFUNCTION THRESHOLDS

Solenoid status (SLT) from IC	Fail (Open or short) (Output signal duty ratio equal to 100 %)

COMPONENT OPERATING RANGE

Output signal duty ratio	Less than 100 %

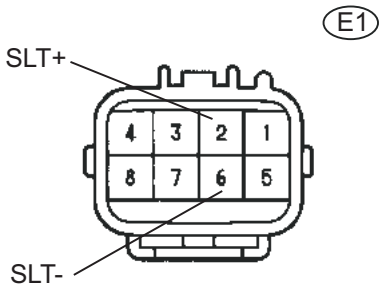
WIRING DIAGRAM



1	INSPECT TRANSMISSION WIRE (SLT)

Transmission Wire Side:

(Connector Front View):



C121788E02

(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
Standard resistance

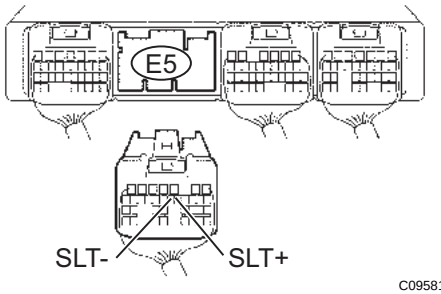
Tester Connection	Specified Condition
2 (SLT+) - 6 (SLT-)	5.0 to 5.6 Ω at 20°C (68°F)
2 (SLT+) - Body ground	10 kΩ or higher
6 (SLT-) - Body ground	10 kΩ or higher

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)

ECM:



C095812E40

(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
Standard resistance

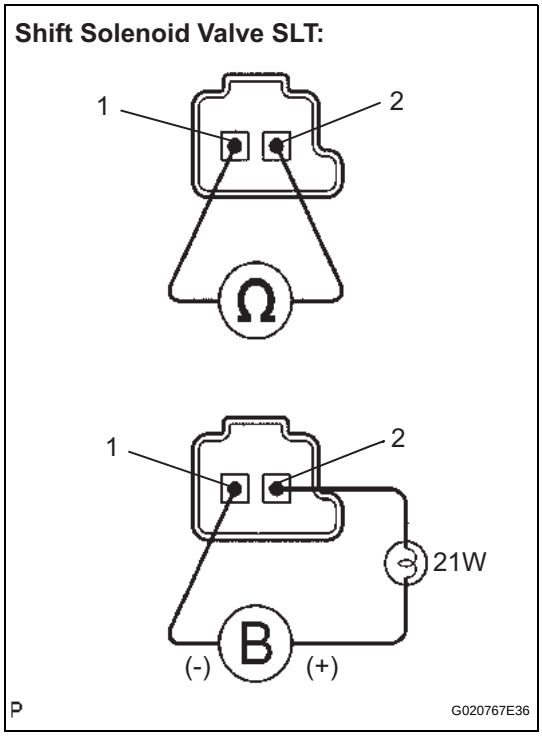
Tester Connection	Specified Condition
E5-12 (SLT+) - E5-13 (SLT-)	5.0 to 5.6 Ω at 20°C (68°F)
E5-12 (SLT+) - Body ground	10 kΩ or higher
E5-13 (SLT-) - Body ground	10 kΩ or higher

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

OK

REPLACE ECM

3	INSPECT SHIFT SOLENOID VALVE (SLT)



(a) Remove the shift solenoid valve (SLT).
(b) Measure the resistance.
Standard resistance

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

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

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

OK

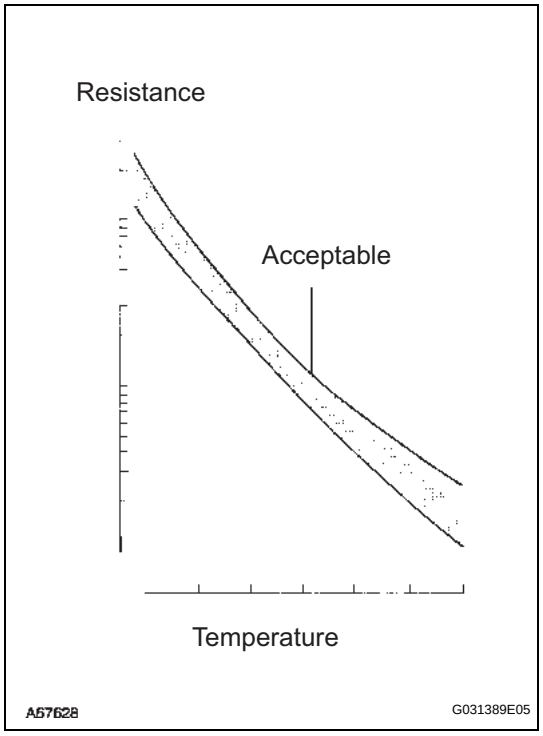
REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P2740	Transmission Fluid Temperature Sensor "B" Circuit

DTC	P2742	Transmission Fluid Temperature Sensor "B" Circuit Low Input

DTC	P2743	Transmission Fluid Temperature Sensor "B" 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 and the voltage decrease as the temperature becomes higher.
The ECM calculates the fluid temperature based on the voltage signal.

DTC No.	DTC Detecting Conditions	Trouble Areas
P2740	Conditions (a) and (b) are detected momentarily within 0.5 seconds when neither P2742 nor P2743 is detected. (1-trip detection logic) (a) No. 1 ATF temperature sensor voltage is less than 0.142 V. (b) No. 1 ATF temperature sensor voltage is more than 4.915 V. HINT: Within 0.5 seconds the malfunction changes from (a) to (b) or (b) to (a).	• Open or short in No. 1 ATF temperature sensor circuit • Transmission wire (No. 1 ATF temperature sensor) • ECM

DTC No.	DTC Detecting Conditions	Trouble Areas
P2742	No. 1 ATF temperature sensor voltage is less than 0.142 V for 0.5 seconds or more. (1-trip detection logic)	• Short in No. 1 ATF temperature sensor circuit • Transmission wire (No. 1 ATF temperature sensor) • ECM
P2743	No. 1 ATF temperature sensor voltage is more than 4.915 V for 0.5 seconds or more 15 minutes or more after starting engine. (1-trip detection logic)	• Open in No. 1 ATF temperature sensor circuit • Transmission wire (No. 1 ATF temperature sensor) • ECM

MONITOR DESCRIPTION

The Automatic Transmission Fluid (ATF) temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and detects any open or short malfunctions in the AFT temperature circuit. If the output voltage of the ATF temperature is less than 0.142 V*1 or more than 4.915 V*2, the ECM interprets this as a fault in the ATF temperature sensor or its wiring. The ECM turns on the MIL and stores a 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 intelligent tester display.

MONITOR STRATEGY

Related DTCs	P2740: ATF temperature sensor/Range check (Fluttering) P2742: ATF temperature sensor/Range check (Low voltage) P2743: ATF temperature sensor/Range check (High voltage)
Required sensors/Components	ATF temperature sensor
Frequency of operation	Continuous
Duration	0.5 seconds
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P2740: Range check (Fluttering)

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

P2742: Range check (Low voltage)

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

P2743: Range check (High voltage)

The monitor will run whenever the following DTCs are not present.	None
Time after engine start	15 minutes or more

TYPICAL MALFUNCTION THRESHOLDS

P2740: Range check (Fluttering)

TFT Sensor voltage	Less than 0.142 V or More than 4.915 V

AT

P2742: Range check (Low voltage)

TFT Sensor voltage	Less than 0.142 V

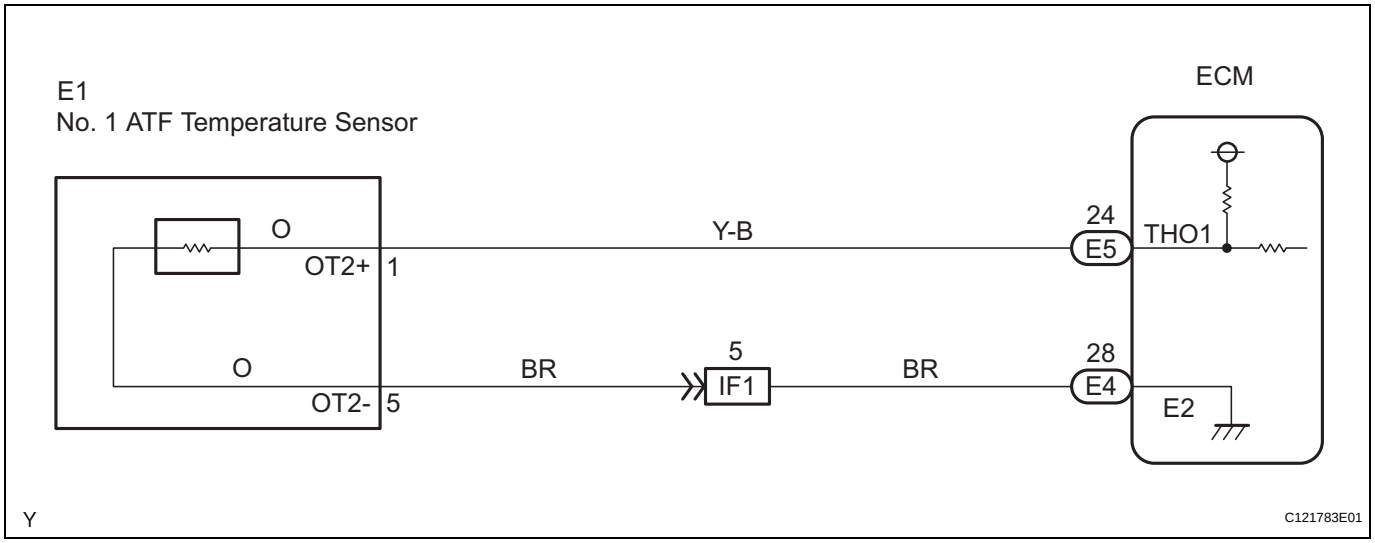
P2743: Range check (High voltage)

TFT Sensor voltage	More than 4.915 V

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM



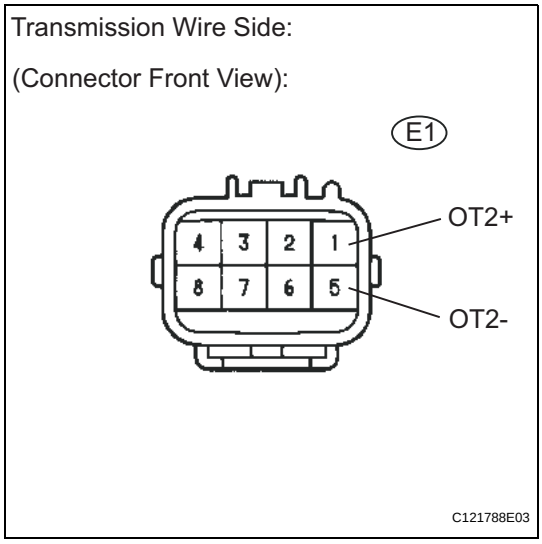
HINT:
According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as the first step of troubleshooting is one method of shortening labor time.
NOTICE:
In the table below, the values listed under "Normal Condition" are for reference only. Do not depend solely on these reference values when judging 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) Push the "ON" button of the tester.
(f) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST/ A/T".
(g) According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
A/T OIL TEMP1	ATF Temperature Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	• After Stall Test: Approximately 80°C (176°F) • Equal to ambient temperature when cold soak

HINT:
When DTC P2742 is output and the intelligent tester reading is 150°C (302°F) or more, there is a short circuit.
When DTC P2743 is output and the intelligent tester reading is -40°C (-40°F), there is an open circuit.
Measure the resistance between terminal THO1 and the 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 transmission.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
1 (OT2+) - 5 (OT2-)	79 Ω to 156 kΩ
1 (OT2+) - Body ground	10 kΩ or higher
5 (OT2-) - Body ground	10 kΩ or higher

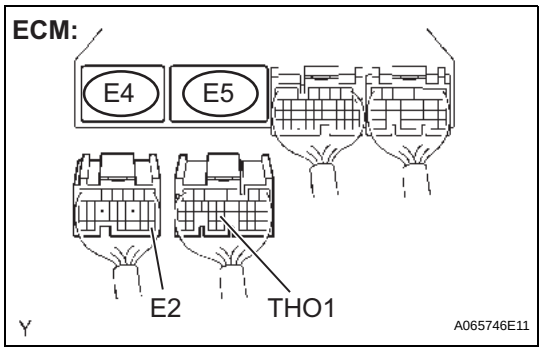
HINT:
If the resistance is outside the specified range at either of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

ATF Temperature:	Resistance:
20 °C (68°F)	3 to 4 kΩ
110 °C (230°F)	0.22 to 0.28 kΩ

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

2	CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connectors.
(c) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
E5-24 (THO1) - E4-28 (E2)	79 Ω to 156 kΩ
E5-24 (THO1) - Body ground	10 kΩ or higher
E4-28 (E2) - Body ground	10 kΩ or higher

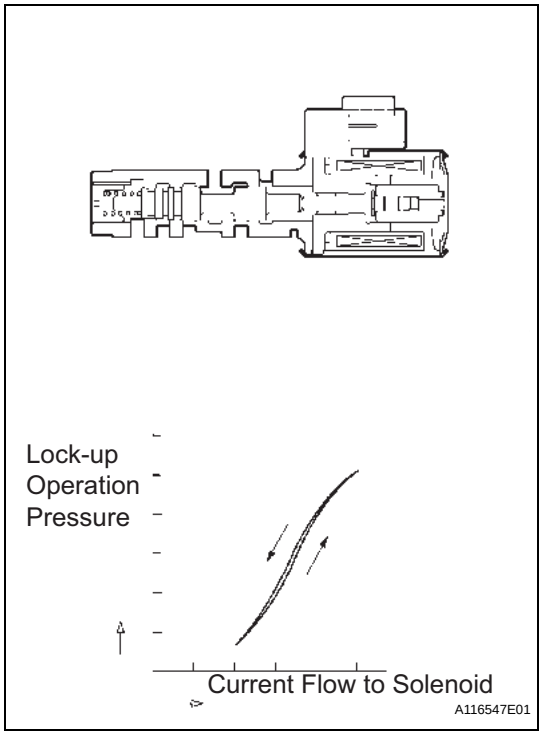
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM

DTC	P2757	Torque Converter Clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU)

SYSTEM DESCRIPTION



The ECM uses the signals from the throttle position sensor, mass air-flow meter, turbine (input) speed sensor, output 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 any mechanical problems with the shift solenoid valve SLU, valve body or torque converter clutch.

DTC No.	DTC Detection Conditions	Trouble Areas
P2757	Lock-up does not occur when driving in the lock-up range (normal driving at 50 mph [80 km/h]), or lock-up remains ON in the lock-up OFF range. (2-trip detection logic)	• Shift solenoid valve SLU remains open or closed • Valve body is blocked • Shift solenoid valve SLU • Torque converter clutch • Automatic transmission (clutch, brake or gear, etc.) • Line pressure is too low

MONITOR DESCRIPTION

Torque converter lock-up is controlled by the ECM based on turbine (input) speed sensor NCO, output speed sensor SP2, engine rpm, engine load, engine coolant temperature, vehicle speed, transmission fluid temperature, and gear selection. The ECM determines the lock-up status of the torque converter by comparing the engine rpm (NE) with the input turbine rpm (NCO). The ECM calculates the actual transmission gear by comparing the input turbine rpm (NCO) with output shaft rpm (SP2). When the conditions are appropriate, the ECM requests "lock-up" by applying the control voltage to the shift solenoid SLU. When the SLU is turned on, the solenoid SLU 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 SLU or lock-up system performance.

The ECM turns on the MIL and stores the DTC.
Example:
When any of the following are met, the ECM interprets it as a malfunction.
(a) There is a difference in rotation between before and after the torque converter even when the ECM requests lock-up.
(Engine speed is at least 70 rpm greater than the input turbine speed.)
(b) There is no difference in rotation between before and after the torque converter even when the ECM requests lock-up off.
(The difference between the engine speed and input turbine speed is less than 35 rpm.)

MONITOR STRATEGY

Related DTCs	P2757: Shift solenoid valve SLU/OFF malfunction Shift solenoid valve SLU/ON malfunction
Required sensors/Components	Shift solenoid valve SLU
Frequency of operation	Continuous
Duration	OFF malfunction: 2 seconds ON malfunction: 1.8 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The following items are common to all conditions below:

OFF malfunction and ON malfunction

The monitor will run whenever the following DTCs are not present.	None
Shift solenoid "A" (S1) circuit Shift solenoid "B" (S2) circuit ECT (Engine Coolant Temperature) sensor circuit Input speed sensor (NCO) circuit Output speed sensor (SP2) circuit	There is no malfunction in the sensor circuits shown on the left
ETCS (Electronic Throttle Control System)	System not down
Transmission shift position	"D"
ECT (Engine Coolant Temperature)	40°C (104°F) or more
Spark advance from max. retard timing by knock control	0°CA or more
Engine	Engine is running
ECM selected gear	3rd or 4th
Vehicle speed	15.5 mph (25 km/h) or more
Transfer neutral position switch	OFF

OFF malfunction

ECM lock-up request	ON (SLU pressure: 90 % or more)
Duration time from lock-up on request	3 seconds or more
Vehicle speed	6.2 mph (10 km/h) or more and Less than 62.2 mph (100 km/h)

ON malfunction

ECM lock-up request	OFF (SLU pressure: less than 10 %)
Throttle valve opening angle	10 % or more
Duration time from lock-up off request	1 second or more
Vehicle speed	Less than 37.3 mph (60 km/h)

TYPICAL MALFUNCTION THRESHOLDS

OFF malfunction

Engine speed - Output speed x 4th gear ratio	70 rpm or more

ON malfunction

2 detections are necessary in 1 driving cycle.
1st detection; temporary flag ON
2nd detection; pending fault code ON
Vehicle speed must be under 6 mph (10 km/h) once before the 2nd detection.

Engine speed - Input speed	Less than 35 rpm

COMPONENT OPERATING RANGE

Speed sensor (NCO)	Input speed is equal to engine speed when lock-up ON.

1. ACTIVE TEST

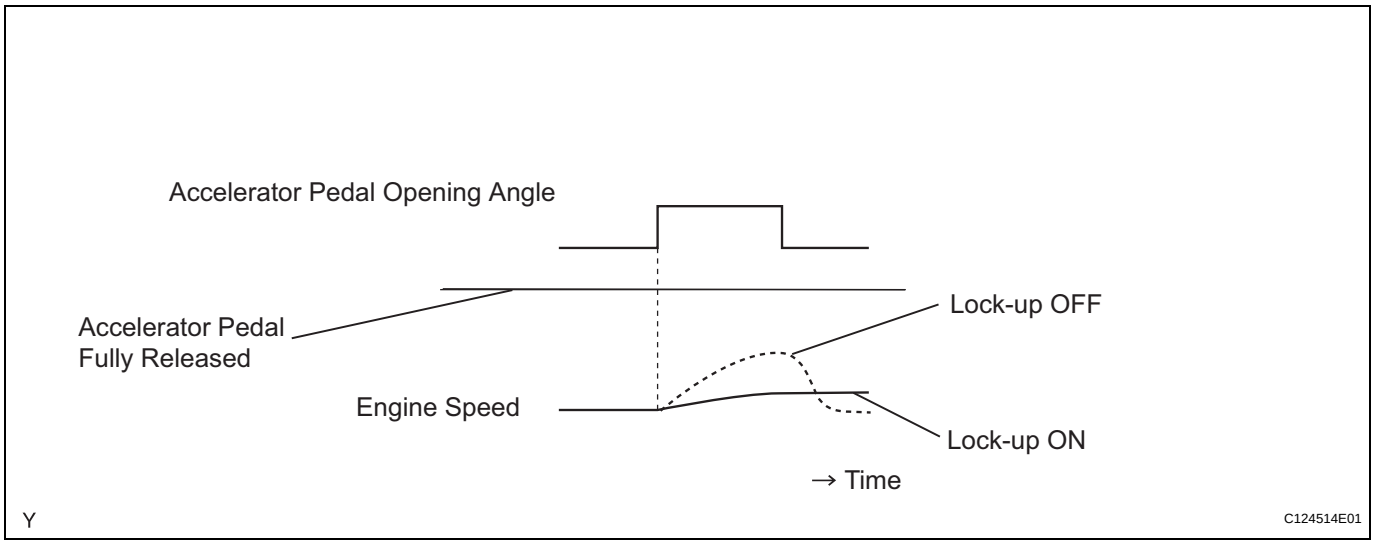
HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as the first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA 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 tester.
(f) Select the items "DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ LOCK UP".
(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 SLU to set the automatic transmission to the lock-up condition. [Vehicle Condition] Vehicle Speed: 37.3 mph (60 km/h) or more	Possible to check the SLU operation.

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

(h) Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.
HINT:
- When changing the accelerator pedal opening angle while driving, if the engine speed does not change, lock-up is on.
- Slowly release, but not fully, the accelerator pedal in order to decelerate. (Fully releasing the pedal causes closure of the throttle valve and lock-up may be turned off automatically.)



1	CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P2757)

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

Result

Display (DTC Output)	Proceed to
Only "P2757" is output	A
"P2757" and other DTCs	B

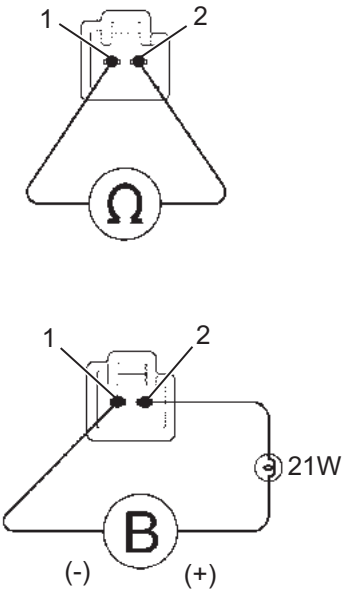
HINT:
If any codes besides "P2757" are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART

A

2 **INSPECT SHIFT SOLENOID VALVE SLU**

Shift Solenoid Valve SLU:



(a) Remove the shift solenoid valve SLU.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
1 - 2	5.1 to 5.5 Ω at 20°C (68°F)

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

NG → **REPLACE SHIFT SOLENOID VALVE SLU**

OK

3 **INSPECT TRANSMISSION VALVE BODY ASSEMBLY**

OK:
There are no foreign objects on any valves 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.

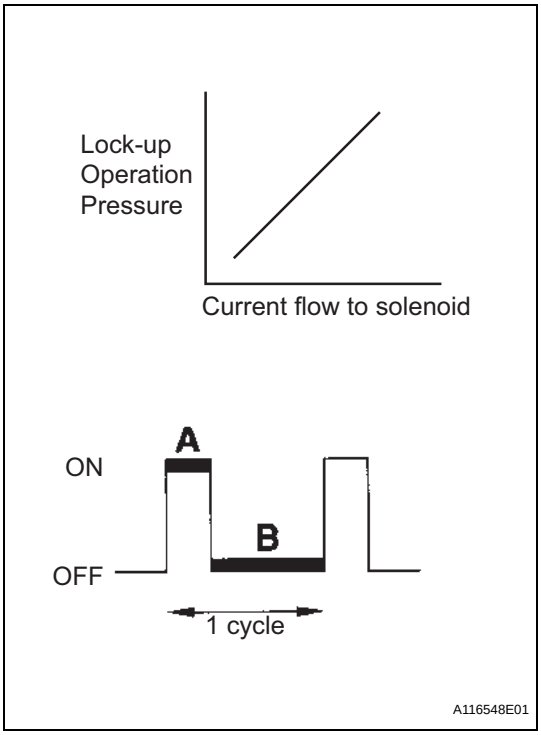
NG → **REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY**

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY

DTC	P2759	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)

DESCRIPTION



The current flow to the solenoid is controlled by the duty ratio* of the ECM output signal. The higher the duty ratio becomes, the higher the lock-up hydraulic pressure becomes during the lock-up operation.

*: 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
P2759	Open or short is detected in shift solenoid valve SLU circuit for 1 second or more while driving. (1-trip detection logic)	• Open or short in shift solenoid valve SLU circuit • Shift solenoid valve SLU • ECM

MONITOR DESCRIPTION

When an open or short is detected in the shift solenoid valve (SLU) circuit, the ECM determines that there is a malfunction. The ECM turns on the MIL and stores this DTC.

MONITOR STRATEGY

Related DTCs	P2759: Shift solenoid valve SLU/Range check
Required sensors/Components	Shift solenoid valve SLU
Frequency of operation	Continuous
Duration	1 second
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	None
Solenoid current cut status	Not cut
Battery voltage	11 V or more
CPU commanded duty ratio to SLU	19 % or more

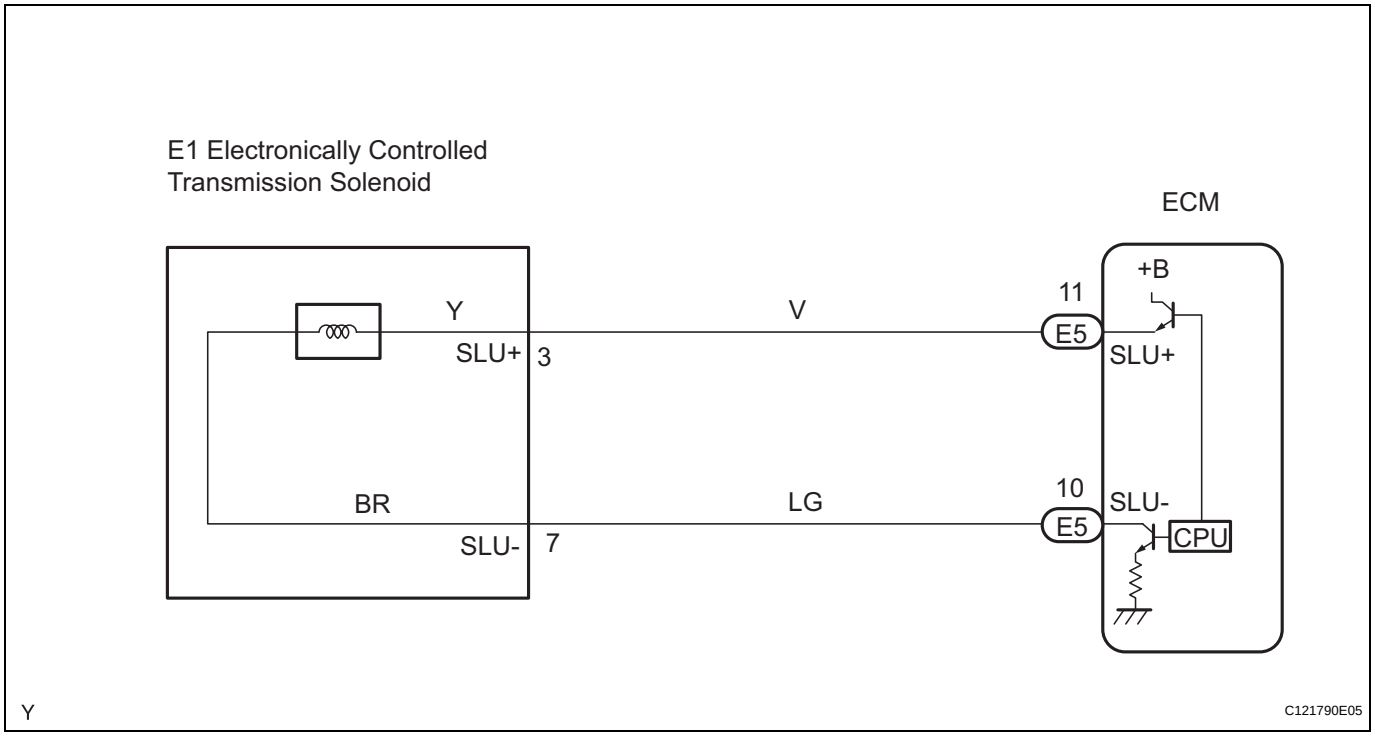
TYPICAL MALFUNCTION THRESHOLDS

Solenoid status (SLU) from IC	Fail (Open or short) (Output signal duty ratio equal to 100 %)

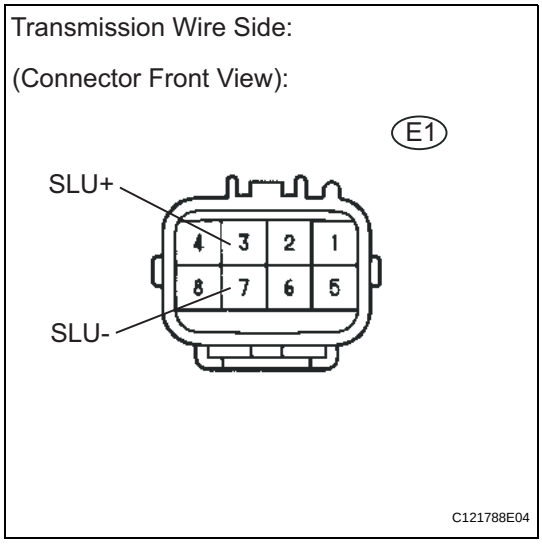
COMPONENT OPERATING RANGE

Output signal duty ratio	Less than 100 %

WIRING DIAGRAM



1	INSPECT TRANSMISSION WIRE (SLU)



(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.

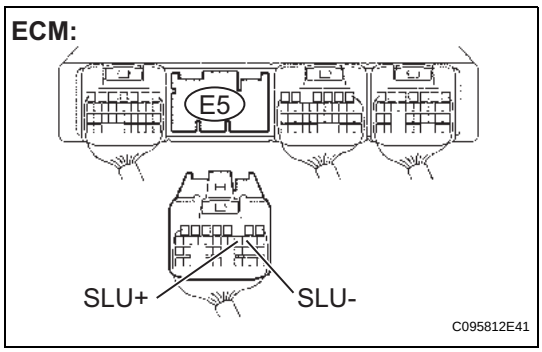
Standard resistance

Tester Connection	Specified Condition
3 (SLU+) - 7 (SLU-)	5.1 to 5.5 Ω at 20°C (68°F)
3 (SLU+) - Body ground	10 kΩ or higher
7 (SLU-) - Body ground	10 kΩ or higher

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.

Standard resistance

Tester Connection	Specified Condition
E5-11 (SLU+) - E5-10 (SLU-)	5.1 to 5.5 Ω at 20°C (68°F)
E5-11 (SLU+) - Body ground	10 kΩ or higher
E5-10 (SLU-) - Body ground	10 kΩ or higher

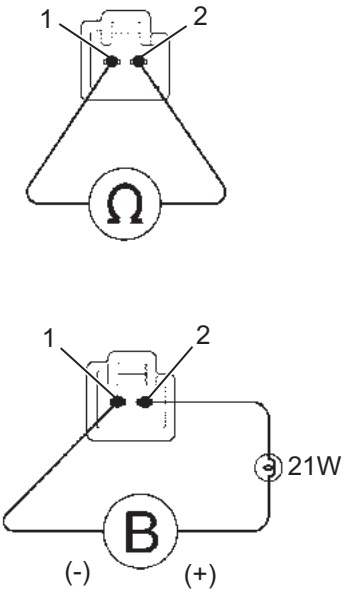
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM

3	INSPECT SHIFT SOLENOID VALVE SLU

Shift Solenoid Valve SLU:



(a) Remove the shift solenoid valve SLU.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
1 - 2	5.1 to 5.5 Ω at 20°C (68°F)

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

NG → **REPLACE SHIFT SOLENOID VALVE SLU**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

AUTOMATIC TRANSMISSION FLUID

ON-VEHICLE INSPECTION

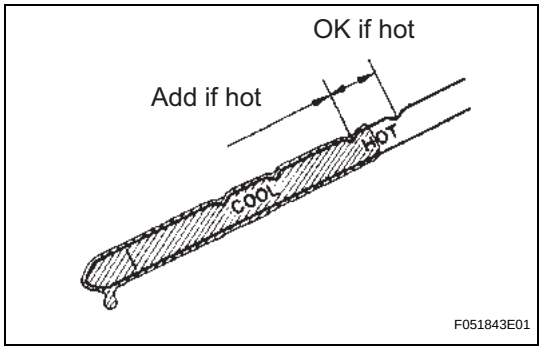
1. CHECK THE FLUID LEVEL

HINT:

Drive the vehicle until the engine and transmission are at normal operating temperature.

Fluid temperature:

70 to 80 °C (158 to 176 °F)



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

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

(c) Pull out the oil level gage and wipe it clean.

(d) Push it back fully into the pipe.

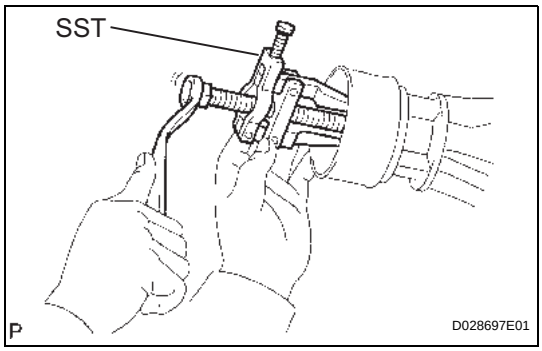
(e) Pull it out and check that the fluid level is within the HOT range.

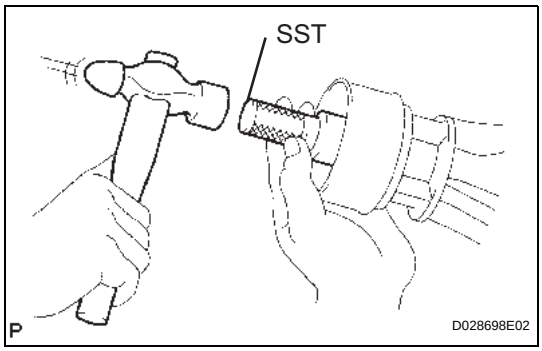
If there is any leakage, repair or replace O-rings, FIPGs, oil seals, plugs or other parts.

EXTENSION HOUSING REAR OIL SEAL

REMOVAL

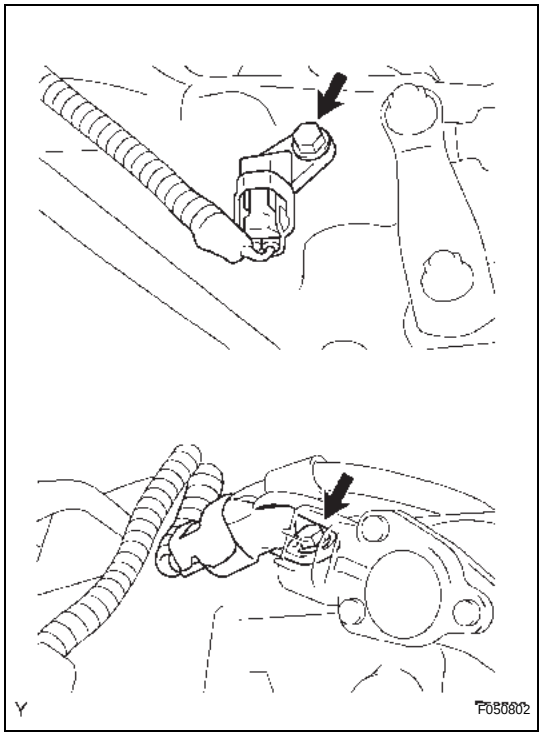
1. **REMOVE PROPELLER SHAFT ASSEMBLY (for Regular Cab) (See page PR-3)**
2. **REMOVE PROPELLER WITH CENTER BEARING SHAFT ASSEMBLY (for Except Regular Cab) (See page PR-27)**
3. **DRAIN AUTOMATIC TRANSMISSION FLUID**
   (a) Remove the drain plug, gasket and drain ATF.
   (b) Install a new gasket and drain plug.
   Torque: 20 N*m (205 kgf*cm, 15 ft.*lbf)
4. **REMOVE AUTOMATIC TRANSMISSION EXTENSION HOUSING OIL SEAL**
   (a) Using SST, remove the oil seal.
   SST 09308-00010





INSTALLATION

1. **INSTALL AUTOMATIC TRANSMISSION EXTENSION HOUSING OIL SEAL**
   (a) Using SST and a hammer, carefully tap a new oil seal in until it is flush with the automatic transmission extension housing oil seal.
   SST 09325-40010
   Oil seal depth from flat end:
   5.8 to 6.2 mm (0.228 to 0.244 in.)
   (b) Coat the oil seal lip with MP grease.
2. **INSTALL PROPELLER WITH CENTER BEARING SHAFT ASSEMBLY (for Except Regular Cab) (See page PR-32)**
3. **INSTALL PROPELLER SHAFT ASSEMBLY (for Regular Cab) (See page PR-6)**
4. **ADD AUTOMATIC TRANSMISSION FLUID**
5. **INSPECT AUTOMATIC TRANSMISSION FLUID (See page AT-85)**

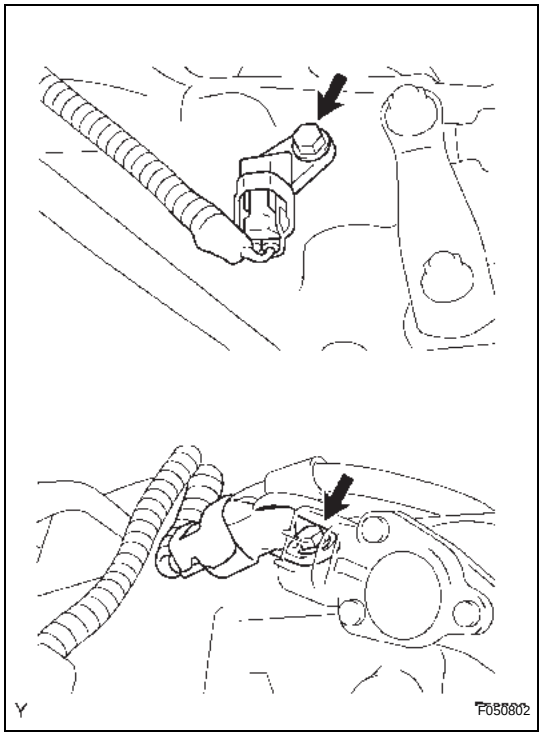


SPEED SENSOR

REMOVAL

1. REMOVE SPEED SENSOR

(a) Disconnect the speed sensor connector.
(b) Remove the bolt and speed sensor.
(c) Remove the O-ring from the speed sensor.



INSTALLATION

1. INSTALL SPEED SENSOR

(a) Coat a new O-ring with ATF.
(b) Install the speed sensor with the bolt.
Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)
(c) Connect the speed sensor connector.

TRANSMISSION WIRE

REMOVAL

CAUTION:
When working with FIPG material, you must observe the following guidelines.

- Using a razor blade and gasket scraper, remove all the old FIPG material from the gasket surfaces.
- Thoroughly clean all components to remove all loose material.
- Clean both sealing surfaces with a non-residue solvent.
- Apply FIPG in an approximately 1 mm (0.04 in.) wide bead along the sealing surface.
- Parts must be assembled within 10 minutes of application. Otherwise, the FIPG material must be removed and reapplied.

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

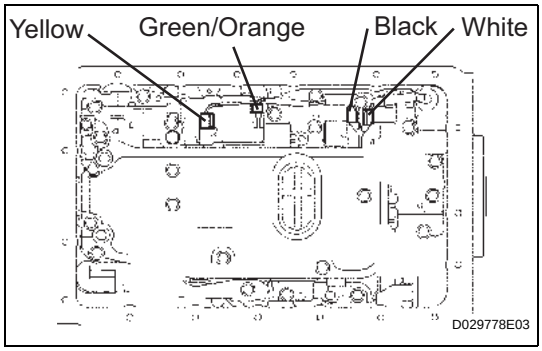
2. **DRAIN AUTOMATIC TRANSMISSION FLUID**
   (a) Remove the drain plug, gasket and drain ATF.
   (b) Install a new gasket and drain plug.
   Torque: 20 N*m (204 kgf*cm, 15 ft.*lbf)

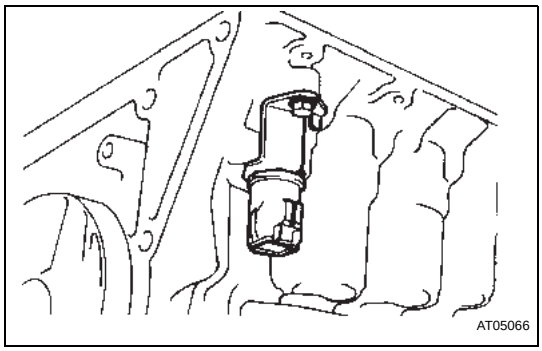
3. **REMOVE TRANSMISSION OIL FILLER TUBE SUB-ASSEMBLY (See page AT-110)**

4. **REMOVE AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY (See page AT-94)**

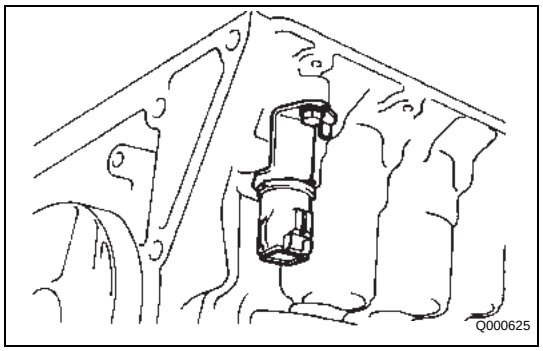
5. **REMOVE VALVE BODY OIL STRAINER ASSEMBLY (See page AT-95)**

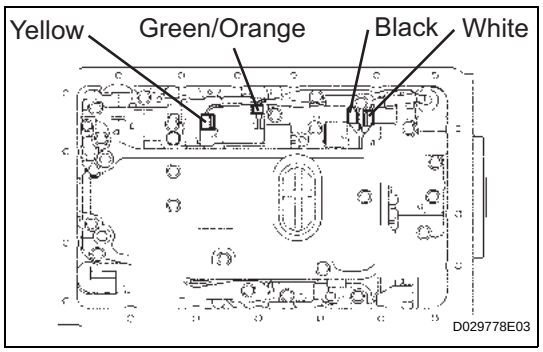
6. **REMOVE TRANSMISSION WIRE**
   (a) Disconnect the 4 connectors from each shift solenoid valve.





   (b) Remove the bolt and the stopper plate from the case.
   (c) Pull the solenoid wiring out of the transmission case.
   (d) Remove the O-ring from the solenoid wiring.



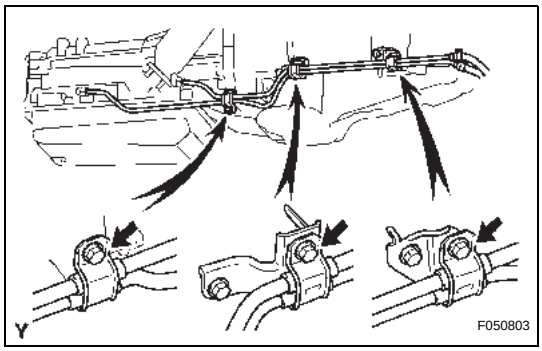


INSTALLATION

1. **INSTALL TRANSMISSION WIRE**
   (a) Coat a new O-ring with ATF, and install it onto the solenoid wiring.
   (b) Install the solenoid wiring onto the case, and install the stopper plate.
   Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)
   (c) Connect the connectors to each shift solenoid valve.
2. **INSTALL VALVE BODY OIL STRAINER ASSEMBLY (See page AT-96)**
3. **INSTALL AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY (See page AT-97)**
4. **INSTALL TRANSMISSION OIL FILLER TUBE SUB-ASSEMBLY (See page AT-116)**
5. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
   Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)
6. **ADD AUTOMATIC TRANSMISSION FLUID**
7. **INSPECT AUTOMATIC TRANSMISSION FLUID (See page AT-85)**

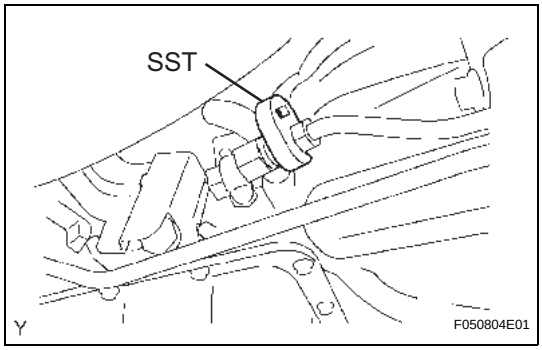
ATF TEMPERATURE SENSOR

REMOVAL



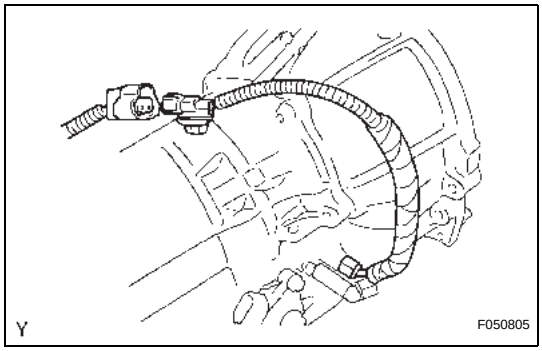
1. DISCONNECT NO. 1 OIL COOLER INLET TUBE

(a) Remove the 3 bolts and 3 clamps.



(b) Using SST, disconnect the oil cooler inlet tube No. 1.

SST 09023-12701



2. REMOVE TEMPERATURE SENSOR

(a) Disconnect the temperature sensor connector.

(b) Remove the temperature sensor.

(c) Remove the O-ring from the temperature sensor.

INSTALLATION

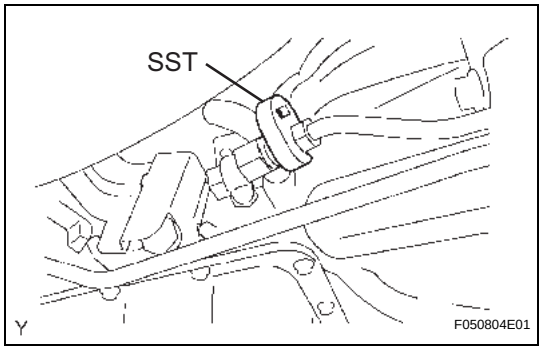
1. INSTALL TEMPERATURE SENSOR

(a) Coat a new O-ring with ATF and install it onto the temperature sensor.

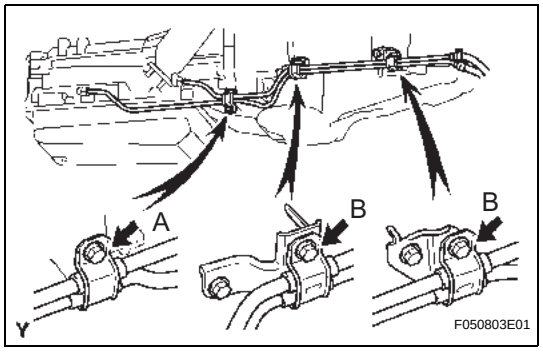
(b) Install the temperature sensor.
Torque: 29 N*m (300 kgf*cm, 22 ft.*lbf)

(c) Connect the temperature sensor connector.

2. CONNECT NO. 1 OIL COOLER INLET TUBE



(a) Using SST, tighten oil cooler inlet tube No. 1.
SST 09023-12701
Torque: 34 N*m (350 kgf*cm, 25 ft.*lbf)



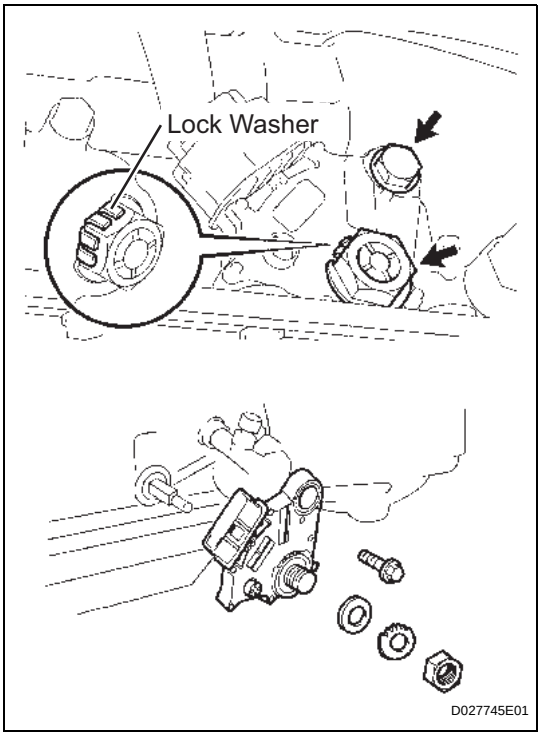
(b) Install the 3 clamps and 3 bolts.
Torque: 12 N*m (122 kgf*cm, 8.9 ft.*lbf) for bolt A
5.0 N*m (51 kgf*cm, 44 in.*lbf) for bolt B

3. INSPECT AUTOMATIC TRANSMISSION FLUID (See page AT-85)

PARK / NEUTRAL POSITION SWITCH

REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
2. **DISCONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR**
3. **REMOVE PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
   (a) Using a screwdriver, unstake the lock washer.
   (b) Remove the nut, lock washer and grommet.
   (c) Remove the bolt and park/neutral position switch.



ADJUSTMENT

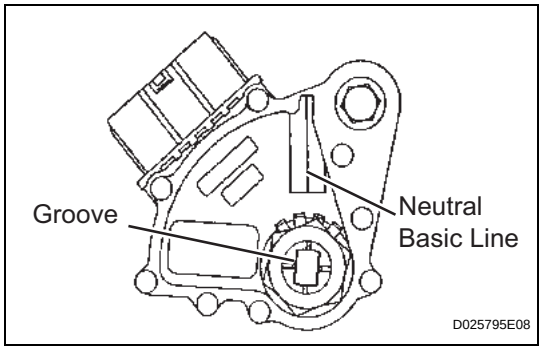
1. INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY

(a) Apply the parking brake and turn the ignition switch to ON.

(b) Depress the brake pedal and check that the engine starts only when the shift lever is set in the N or P position and that it does not start in any other positions.

(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 and not in other positions.

If any failure is found, check the park/neutral position switch for continuity.



2. ADJUST PARK/NEUTRAL POSITION SWITCH ASSEMBLY

(a) Loosen the bolt of the park/neutral position switch and set the shift lever to the N position.

(b) Align the groove and the neutral basic line.

(c) Hold the switch in position and tighten the bolt.

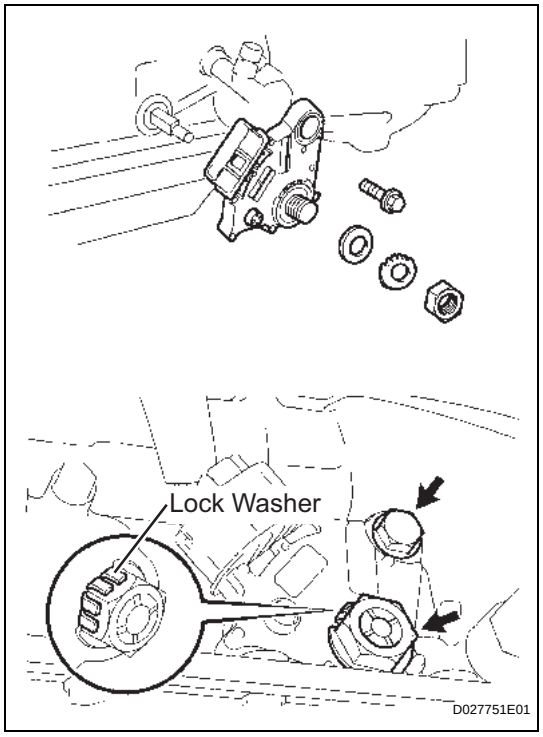
Torque: 13 N*m (130 kgf*cm, 9 ft.*lbf)

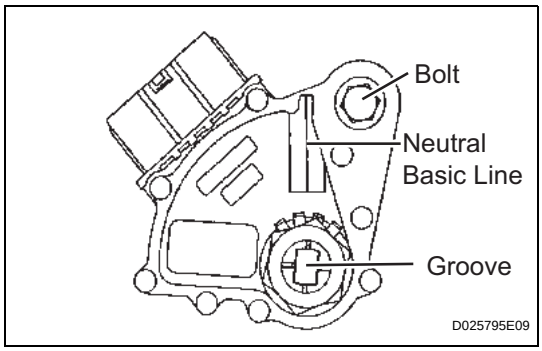
(d) After making an adjustment, perform the inspection described in step 1.

INSTALLATION

1. INSTALL PARK/NEUTRAL POSITION SWITCH ASSEMBLY

(a) Install the park/neutral position switch onto the manual valve lever shaft and provisionally tighten the adjusting bolt.





(b) Install the grommet, a new lock washer and the nut.
Torque: 6.9 N*m (70 kgf*cm, 61 in.*lbf)
(c) Install the manual valve lever shaft onto the groove and turn it 2 notches counterclockwise to the neutral position.
(d) Align the neutral basic line with the switch groove and tighten the adjusting bolt.
Torque: 13 N*m (130 kgf*cm, 9 ft.*lbf)
(e) Bend the tabs of the lock washer.
HINT:
Bend at least 2 of the lock washer tabs.

2. CONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR

3. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)

4. INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY (See page AT-92)

5. ADJUST PARK/NEUTRAL POSITION SWITCH ASSEMBLY (See page AT-92)

6. ADJUST SHIFT LEVER POSITION (See page AT-105)

7. INSPECT SHIFT LEVER POSITION (See page AT-105)

VALVE BODY ASSEMBLY

REMOVAL

CAUTION:
When working with FIPG material, you must observe the following guidelines.

- Using a razor blade and gasket scraper, remove all the old FIPG material from the gasket surfaces.
- Thoroughly clean all components to remove all loose material.
- Clean both sealing surfaces with a non-residue solvent.
- Apply FIPG in an approximately 1 mm (0.04 in.) wide bead along the sealing surface.
- Parts must be assembled within 10 minutes of application. Otherwise, the FIPG material must be removed and reapplied.

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

2. DRAIN AUTOMATIC TRANSMISSION FLUID

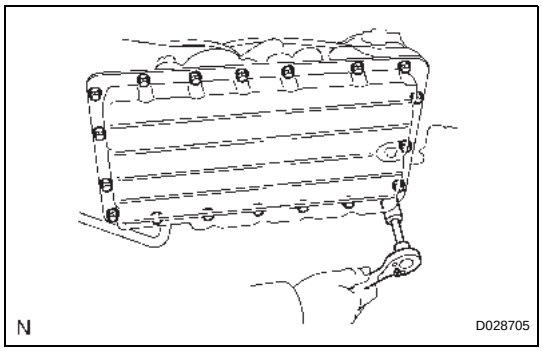
(a) Remove the drain plug, gasket and drain ATF.

(b) Install a new gasket and drain plug.
Torque: 20 N*m (204 kgf*cm, 15 ft.*lbf)

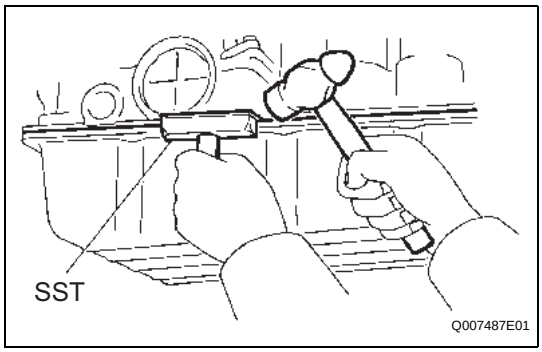
3. REMOVE TRANSMISSION OIL FILLER TUBE SUB-ASSEMBLY (See page AT-110)

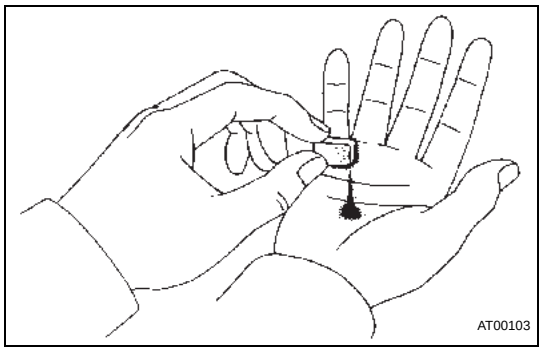
4. REMOVE AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY
NOTICE:
Some fluid will remain in the oil pan.

(a) Remove the 19 bolts and oil pan sub-assembly.

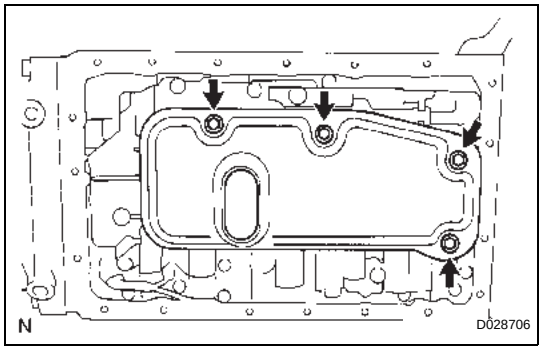


(b) Insert the blade of SST between the transmission case and oil pan, cut off applied sealer and remove the oil pan.
SST 09032-00100
NOTICE:
When removing the oil pan, be careful not to damage the oil pan flange.





(c) Examine the particles in the pan.
  (1) Remove the magnets and use them to collect steel particles. Carefully inspect the foreign matter and particles in the pan and on the magnets to anticipate the type of wear you will find in the transmission.
  Steel (magnetic) ... bearing, gear and clutch plate wear
  Brass (non-magnetic) ... bushing wear

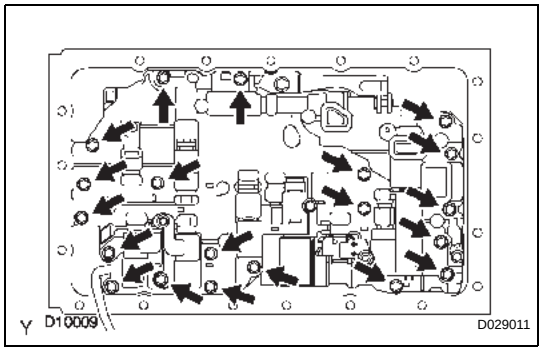


5. REMOVE VALVE BODY OIL STRAINER ASSEMBLY

(a) Remove the 4 bolts and oil strainer.
NOTICE:
Be careful as some fluid will come out of the oil strainer.

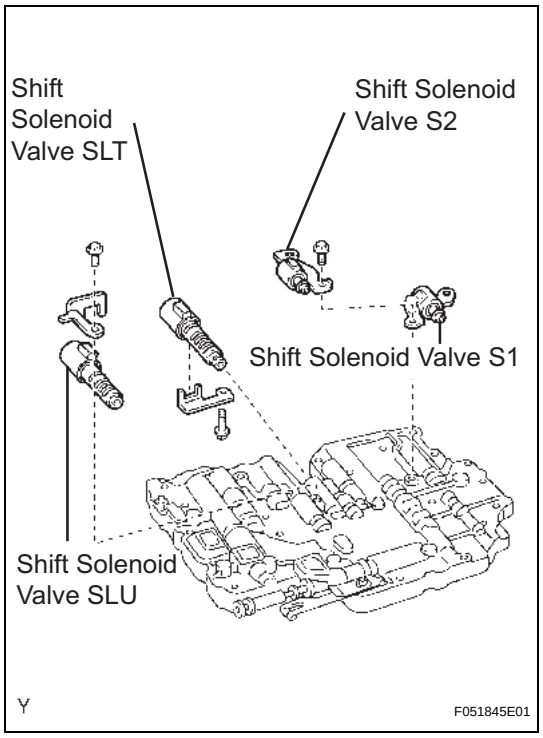
(b) Remove the 5 gaskets from the oil strainer.

6. REMOVE TRANSMISSION WIRE (See page AT-88)



7. REMOVE TRANSMISSION VALVE BODY ASSEMBLY

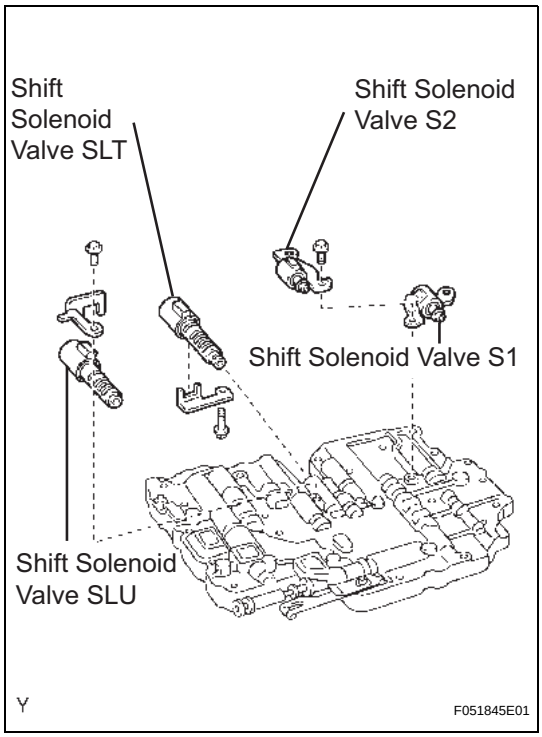
(a) Remove the 20 bolts and valve body assembly.



(b) Remove the bolt and shift solenoid valves S1 and S2.

(c) Remove the bolt and shift solenoid valve SLU.

(d) Remove the bolt and shift solenoid valve SLT.



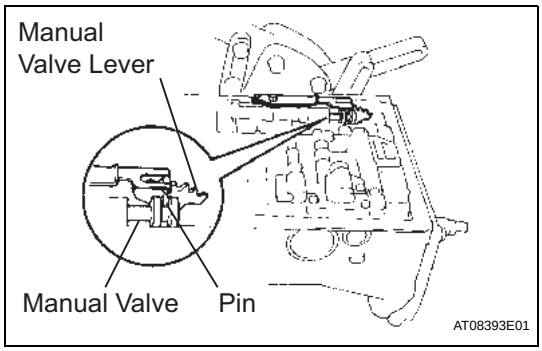
INSTALLATION

1. INSTALL TRANSMISSION VALVE BODY ASSEMBLY

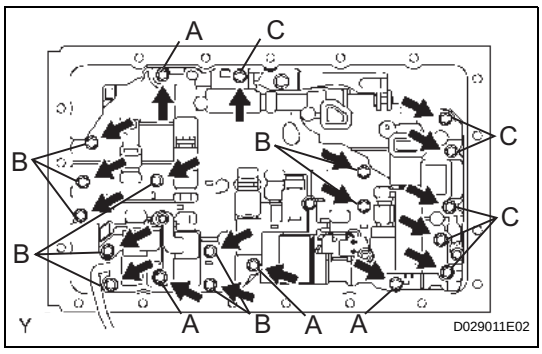
(a) Install the shift solenoid valve SLU with the bolt.
Torque: 6.4 N*m (65 kgf*cm, 56 in.*lbf)

(b) Install the shift solenoid valves S1 and S2 with the bolt.
Torque: 6.4 N*m (65 kgf*cm, 56 in.*lbf)

(c) Install the shift solenoid valve SLT with the bolt.
Torque: 6.4 N*m (65 kgf*cm, 56 in.*lbf)

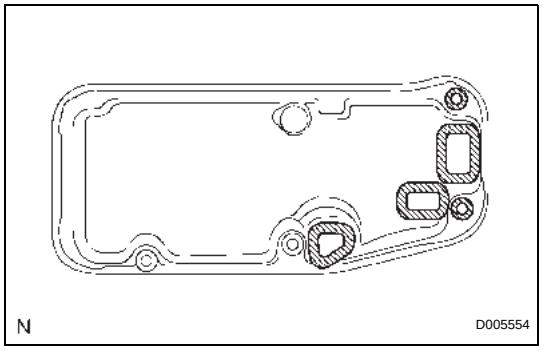


(d) Align the groove of the manual valve with the pin of the lever.



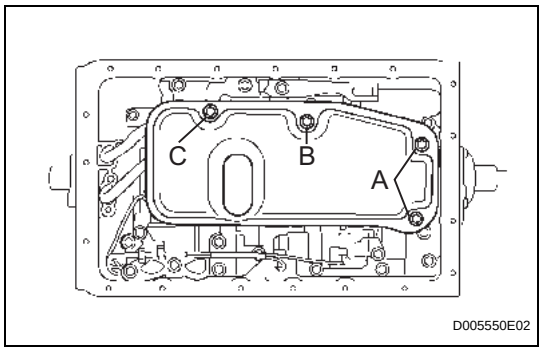
(e) Install the 20 bolts.
Torque: 11 N*m (110 kgf*cm, 8 ft.*lbf)
Bolt length:
Bolt A: 23 mm (0.91 in.)
Bolt B: 28 mm (1.10 in.)
Bolt C: 36 mm (1.42 in.)

2. INSTALL TRANSMISSION WIRE (See page AT-89)

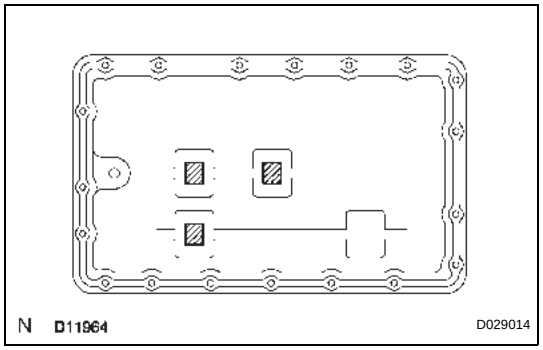


3. INSTALL VALVE BODY OIL STRAINER ASSEMBLY

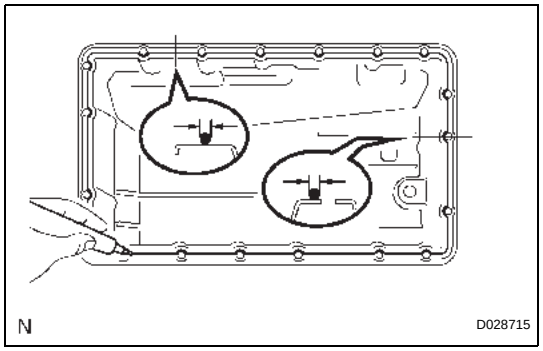
(a) Install 5 new gaskets.



(b) Install the oil strainer with the 4 bolts.
Torque: 10 N*m (100 kgf*cm, 7 ft.*lbf)
Bolt length:
Bolt A: 14 mm (0.55 in.)
Bolt B: 20 mm (0.79 in.)
Bolt C: 23 mm (0.91 in.)



4. INSTALL AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY
HINT:
Remove any packing material and be careful not to drop oil on the contact surfaces of the transmission case and oil pan sub-assembly.
(a) Install the 3 magnets onto the oil pan sub-assembly, in the portions indicated in the illustration.



(b) Apply FIPG to the oil pan, as shown in the illustration.
FIPG:
Part No.08826-00090, THREE BOND 1281 or equivalent
(c) Install the oil pan sub-assembly with the 19 bolts.
Torque: 7.4 N*m (75 kgf*cm, 65 in.*lbf)

5. INSTALL TRANSMISSION OIL FILLER TUBE SUB-ASSEMBLY (See page AT-116)

6. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)

7. ADD AUTOMATIC TRANSMISSION FLUID

8. INSPECT AUTOMATIC TRANSMISSION FLUID (See page AT-85)

SHIFT LOCK SYSTEM

ON-VEHICLE INSPECTION

1. CHECK SHIFT LOCK OPERATION

(a) Shift the shift lever to the P position.
(b) Turn the ignition switch to LOCK.
(c) Check that the shift lever cannot be shifted to any positions other than P.
(d) Turn the ignition switch to ON, depress the brake pedal, and check that the shift lever can be shifted to other positions.

2. CHECK SHIFT LOCK RELEASE LINK OPERATION

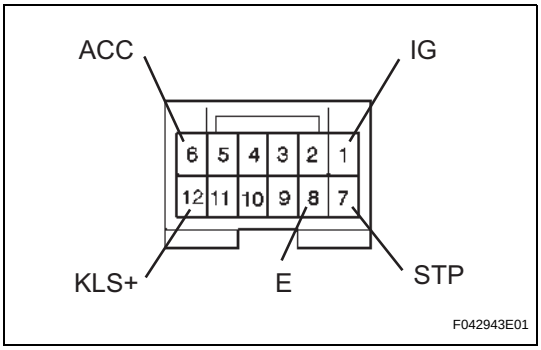
(a) Using a small screwdriver, remove the shift lever cap.
(b) When operating the shift lever with the shift lock release link pressed, check that the lever can be shifted to any positions other than P.

3. CHECK KEY INTERLOCK OPERATION

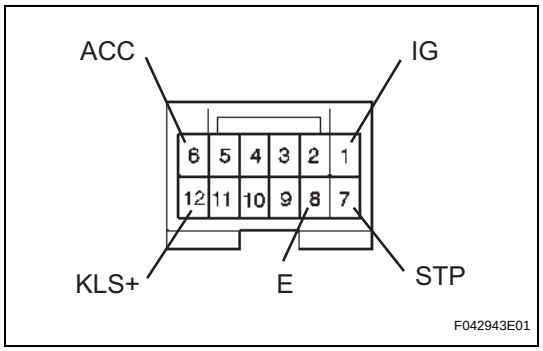
(a) Turn the ignition switch to ON.
(b) Depress the brake pedal and shift the shift lever to any positions other than P.
(c) Check that the ignition key cannot be turned to LOCK.
(d) Shift the shift lever to the P position, turn the ignition key to LOCK, and check that the ignition key can be removed.

4. INSPECT SHIFT LOCK CONTROL ECU SUB-ASSEMBLY

(a) Using a voltmeter, measure the voltage at each terminal.
HINT:
Do not disconnect the shift lock control ECU connector.

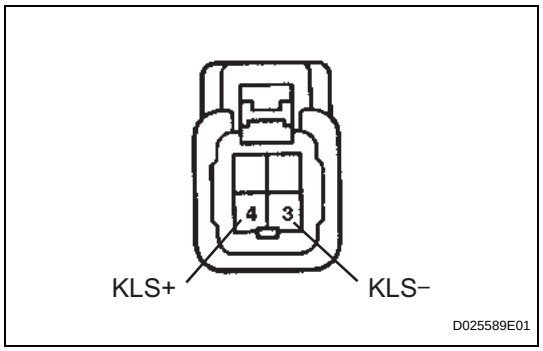


Terminal	Measuring Condition	Voltage (V)
1 (KLS+) - 8 (E)	(1) Ignition switch ACC and P position (2) Ignition switch ACC and except P position (3) Ignition switch ACC and except P position (After approx. 1 second)	0 7.5 to 11 6 to 9
4 (ACC) - 8 (E)	Ignition switch ON	10 to 14
	Ignition switch ACC	10 to 14
	Ignition switch OFF	0
9 (STP) - 8 (E)	Depress brake pedal	10 to 14
	Release brake pedal	0
5 (IG) - 8 (E)	Ignition switch ON	10 to 14
	Ignition switch OFF	0



(b) Using an ohmmeter, measure the resistance at terminal E (8) and body ground.
HINT:
Do not disconnect the shift lock control ECU connector.

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

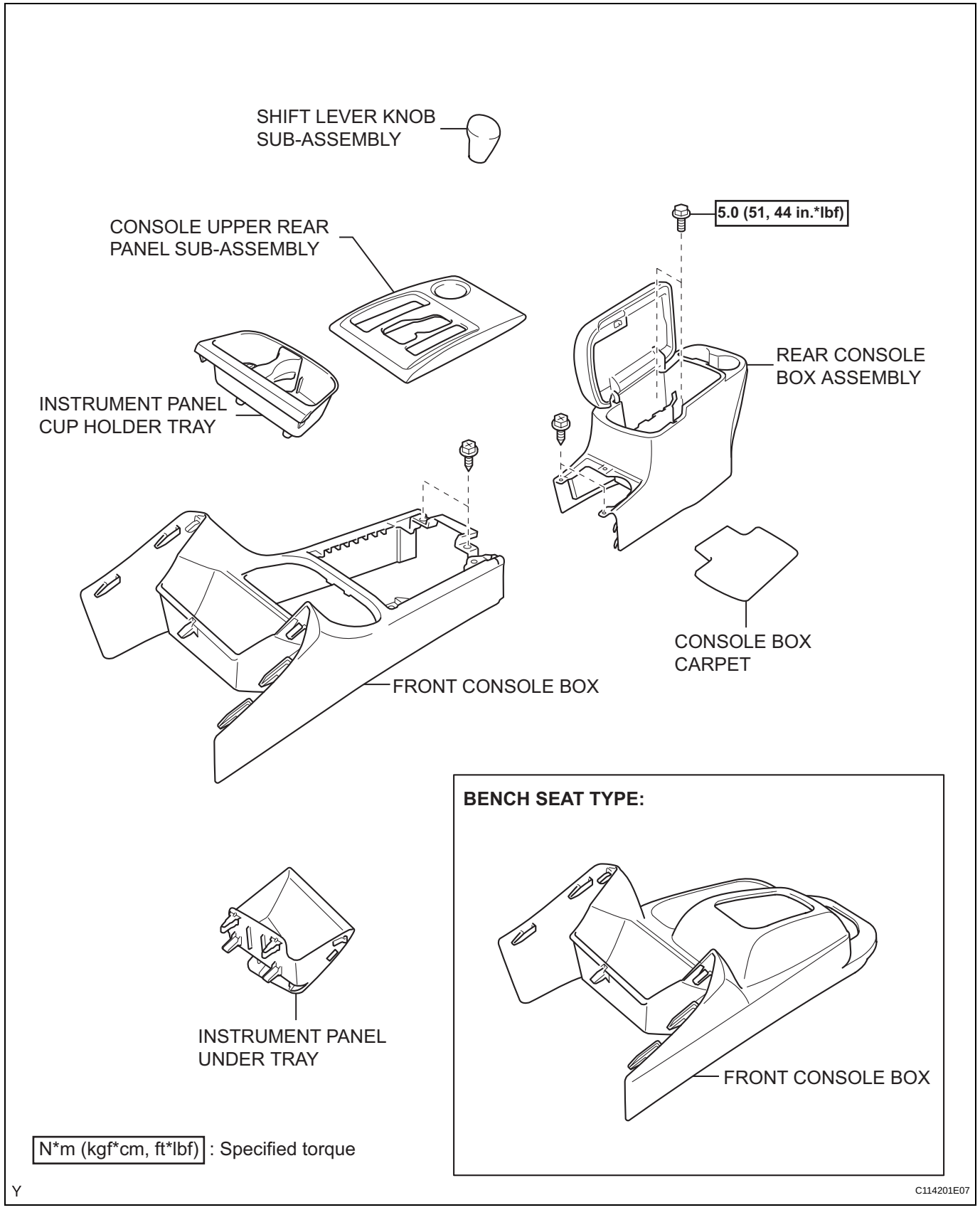


5. INSPECT KEY INTER LOCK SOLENOID

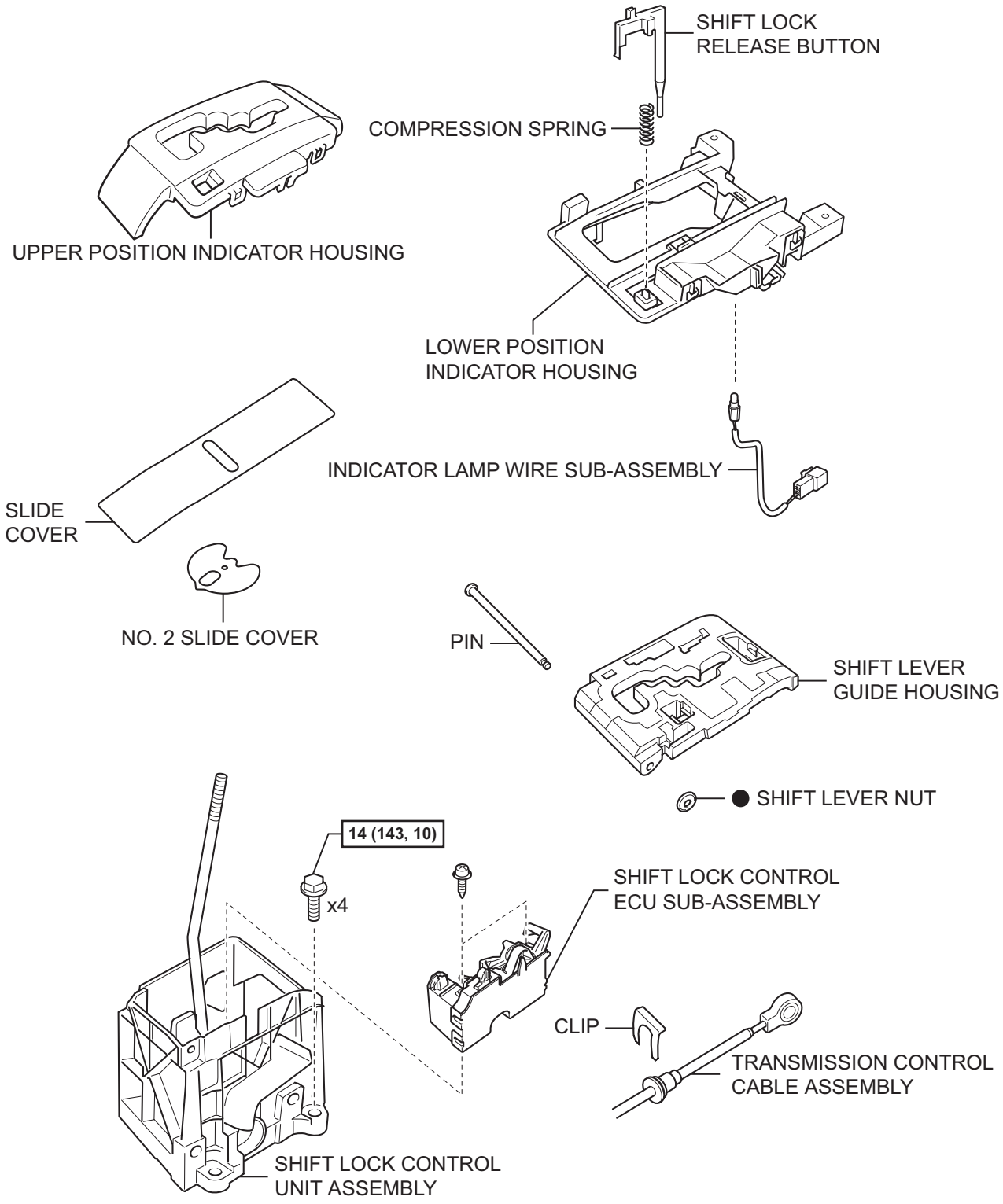
(a) Disconnect the solenoid connector.
(b) Connect KLS+ (4) terminal to the battery positive (+) terminal, and KLS- (3) terminal to the battery negative (-) terminal, and apply about 12V between KLS+ and KLS- terminals.
Check that operation noise can be heard from the solenoid.
If the solenoid does not operate, replace the solenoid.

FLOOR SHIFT ASSEMBLY

COMPONENTS



CABLE TYPE:



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

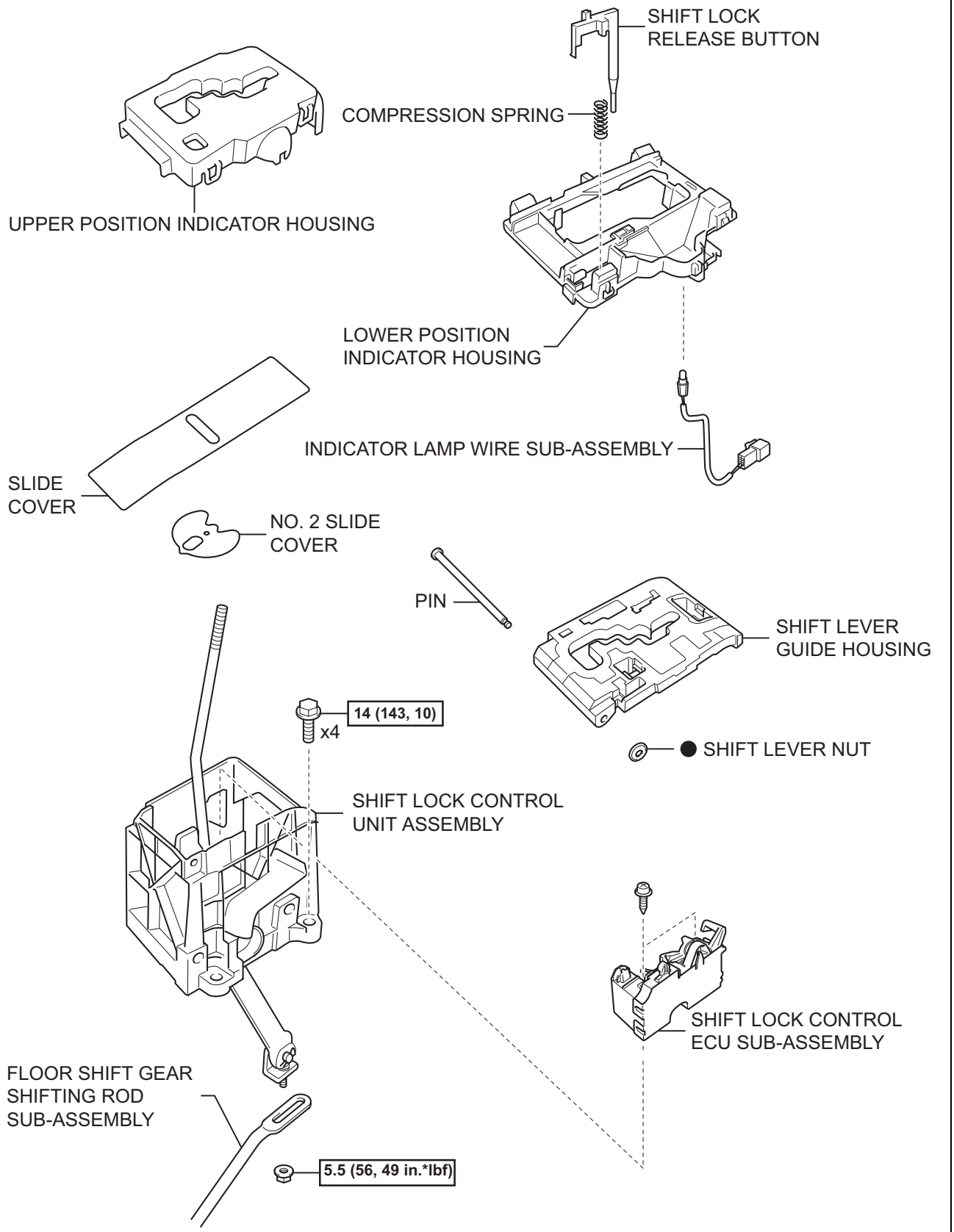
● Non-reusable part

Y

C114202E04

AT

ROD TYPE:



AT

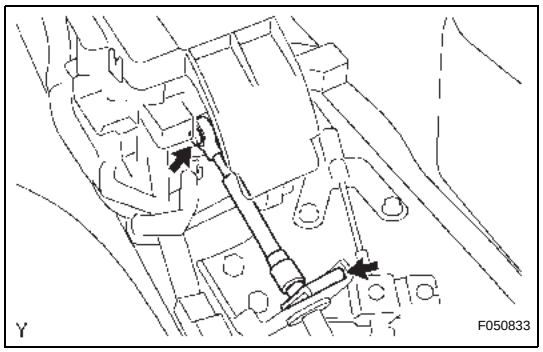
N*m (kgf*cm, ft*lbf) : Specified torque ● Non-reusable part

Y

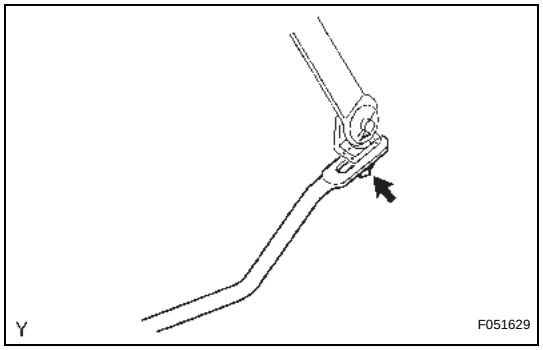
C114203E03

REMOVAL

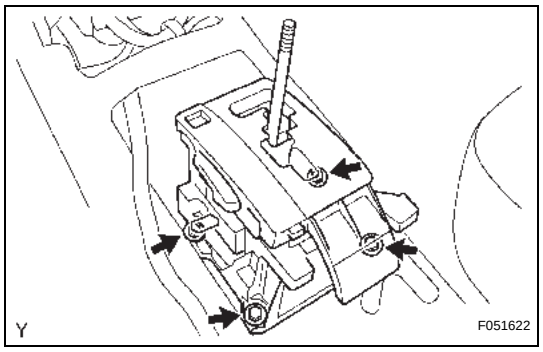
1. **REMOVE CONSOLE UPPER REAR PANEL SUB-ASSEMBLY (for Separate Seat Type) (See page IP-9)**
2. **REMOVE REAR CONSOLE BOX ASSEMBLY (for Separate Seat Type) (See page IP-10)**
3. **REMOVE INSTRUMENT PANEL CUP HOLDER TRAY (for Separate Seat Type) (See page IP-10)**
4. **REMOVE FRONT CONSOLE BOX (for Separate Seat Type) (See page IP-10)**
5. **REMOVE FRONT CONSOLE BOX (for Bench Seat Type) (See page IP-11)**



6. **DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**
   (a) CABLE TYPE:
      (1) Disconnect the transmission control cable assembly from the shift lever assembly.
      (2) Remove the clip and disconnect the transmission control cable.

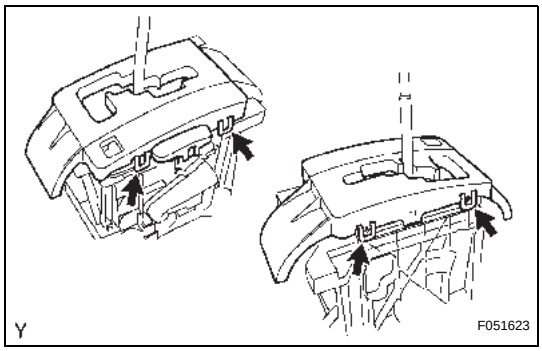


7. **SEPARATE FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY**
   (a) ROD TYPE:
      (1) Remove the nut, then separate the floor shift gear shifting rod.



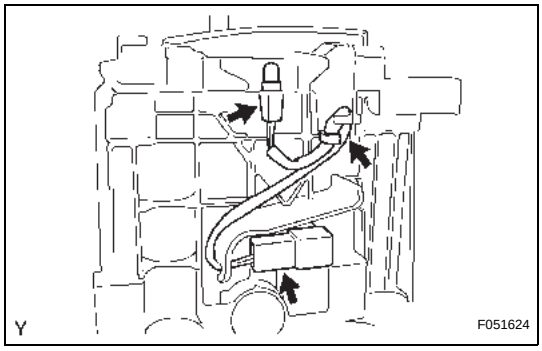
8. **REMOVE FLOOR SHIFT ASSEMBLY**
   (a) Disconnect the 2 connectors and 2 clamps.
   (b) Remove the 4 bolts and floor shift assembly.

DISASSEMBLY



1. REMOVE UPPER POSITION INDICATOR HOUSING

(a) Release the 4 claws with a screwdriver and remove the position indicator housing and slide cover.

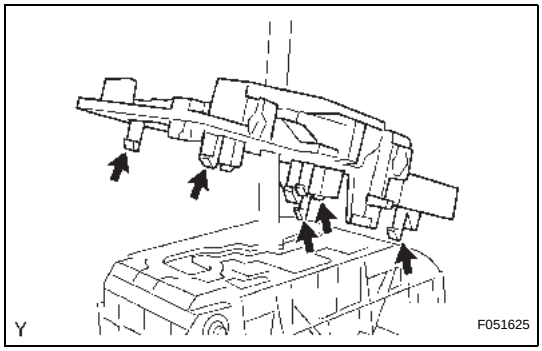


2. REMOVE INDICATOR LAMP WIRE SUB-ASSEMBLY

(a) Remove the indicator lamp wire sub-assembly.

(b) Remove the bulb from the indicator lamp wire sub-assembly.

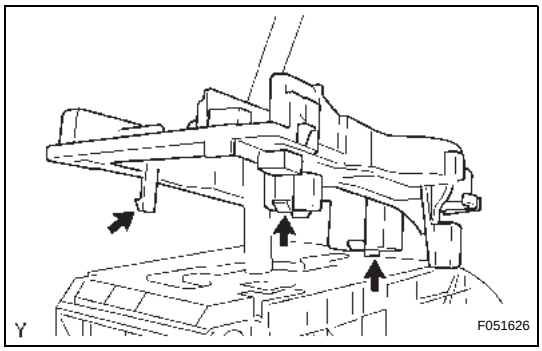
3. REMOVE SHIFT LOCK RELEASE BUTTON



4. REMOVE LOWER POSITION INDICATOR HOUSING

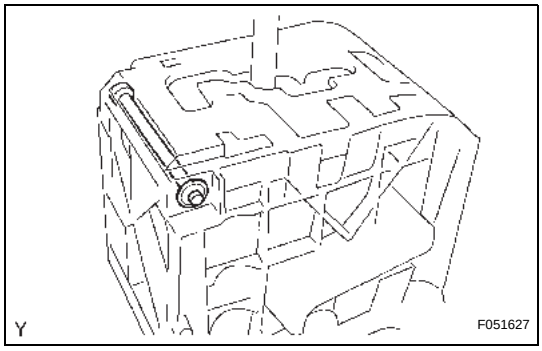
(a) CABLE TYPE:

(1) Release the 5 claws with a screwdriver and remove the position indicator housing lower.



(b) ROD TYPE:

(1) Release the 3 claws with a screwdriver and remove the position indicator housing lower.



5. REMOVE SHIFT LOCK CONTROL ECU SUB-ASSEMBLY

(a) Remove the shift lever nut and shift lever lock pin.

(b) Remove the shift lever guide housing.

(c) Release the 2 claws with a screwdriver and remove the shift lock release link and spring.

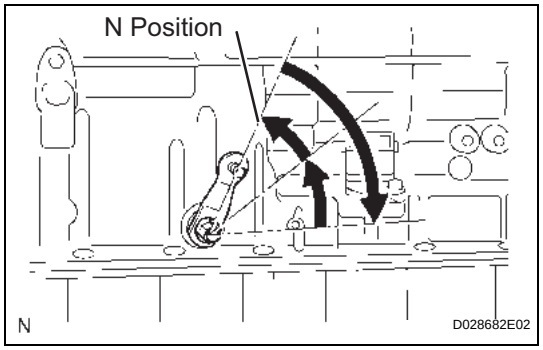
(d) Remove the 2 screws and the shift lock control ECU.

ADJUSTMENT

1. INSPECT SHIFT LEVER POSITION

(a) Check that the shift lever moves smoothly and appropriately from the P to R position, only when the ignition switch is turned to ON and the brake pedal is depressed.

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



2. ADJUST SHIFT LEVER POSITION

(a) Push the control shaft fully rearward.

(b) Turn the control shaft lever 2 notches counterclockwise to the N position.

(c) Set the shift lever to the N position.

REASSEMBLY

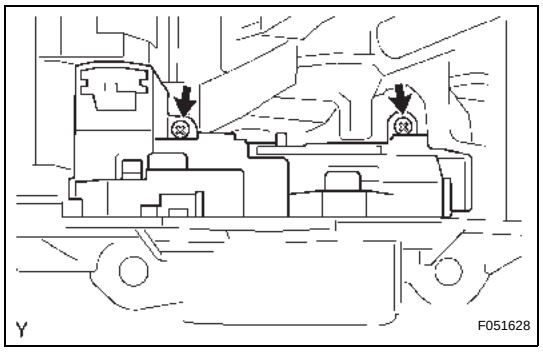
1. INSTALL SHIFT LOCK CONTROL ECU SUB-ASSEMBLY

(a) Install the shift lock control ECU with the 2 screws.

(b) Install the spring and shift lock release link.

(c) Install the shift lever guide housing .

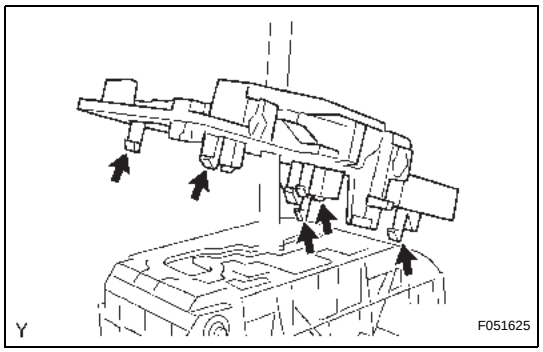
(d) Install the lever lock and new shift lever nut.



2. INSTALL LOWER POSITION INDICATOR HOUSING

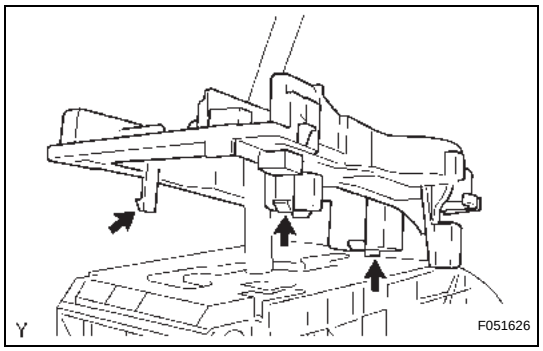
(a) CABLE TYPE:

(1) Install the position indicator housing lower.
HINT:
Firmly make the claws fit.

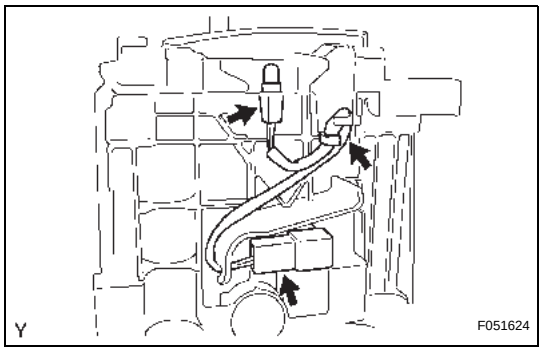


(b) ROD TYPE:

(1) Install the position indicator housing lower.
HINT:
Firmly make the claws fit.



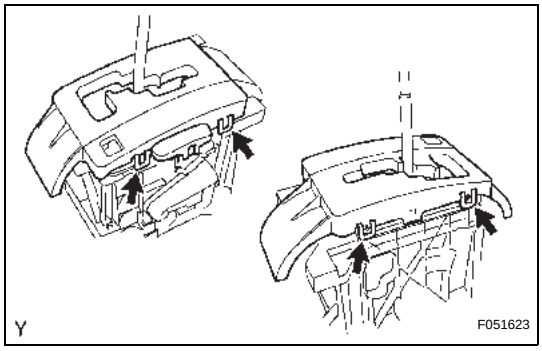
3. INSTALL SHIFT LOCK RELEASE BUTTON



4. INSTALL INDICATOR LAMP WIRE SUB-ASSEMBLY

(a) Install the bulb into the indicator lamp wire sub-assembly.

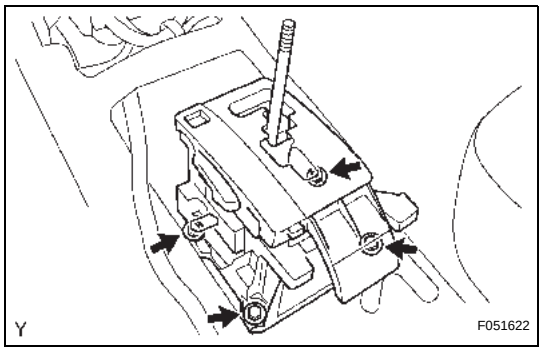
(b) Install the indicator lamp wire sub-assembly.



5. INSTALL UPPER POSITION INDICATOR HOUSING

(a) Install the slide cover and position indicator housing sub-assembly onto the shift lever guide housing.
HINT:
Firmly make the claws fit.

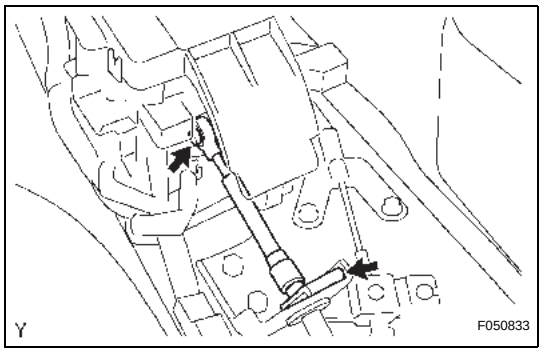
INSTALLATION



1. INSTALL FLOOR SHIFT ASSEMBLY

(a) Install the floor shift with the 4 bolts.
Torque: 14 N*m (143 kgf*cm, 10 ft.*lbf)

(b) Connect the 2 clamps and 2 connectors.

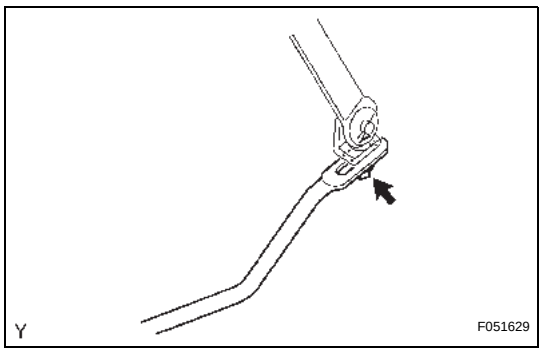


2. CONNECT TRANSMISSION CONTROL CABLE ASSEMBLY

(a) CABLE TYPE:

(1) Connect the transmission control cable with the clip to floor shift assembly.

(2) Install the transmission control cable onto the floor shift assembly.



3. INSTALL FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

(a) ROD TYPE:

(1) Install the floor shift gear shifting rod with nut.
Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf)

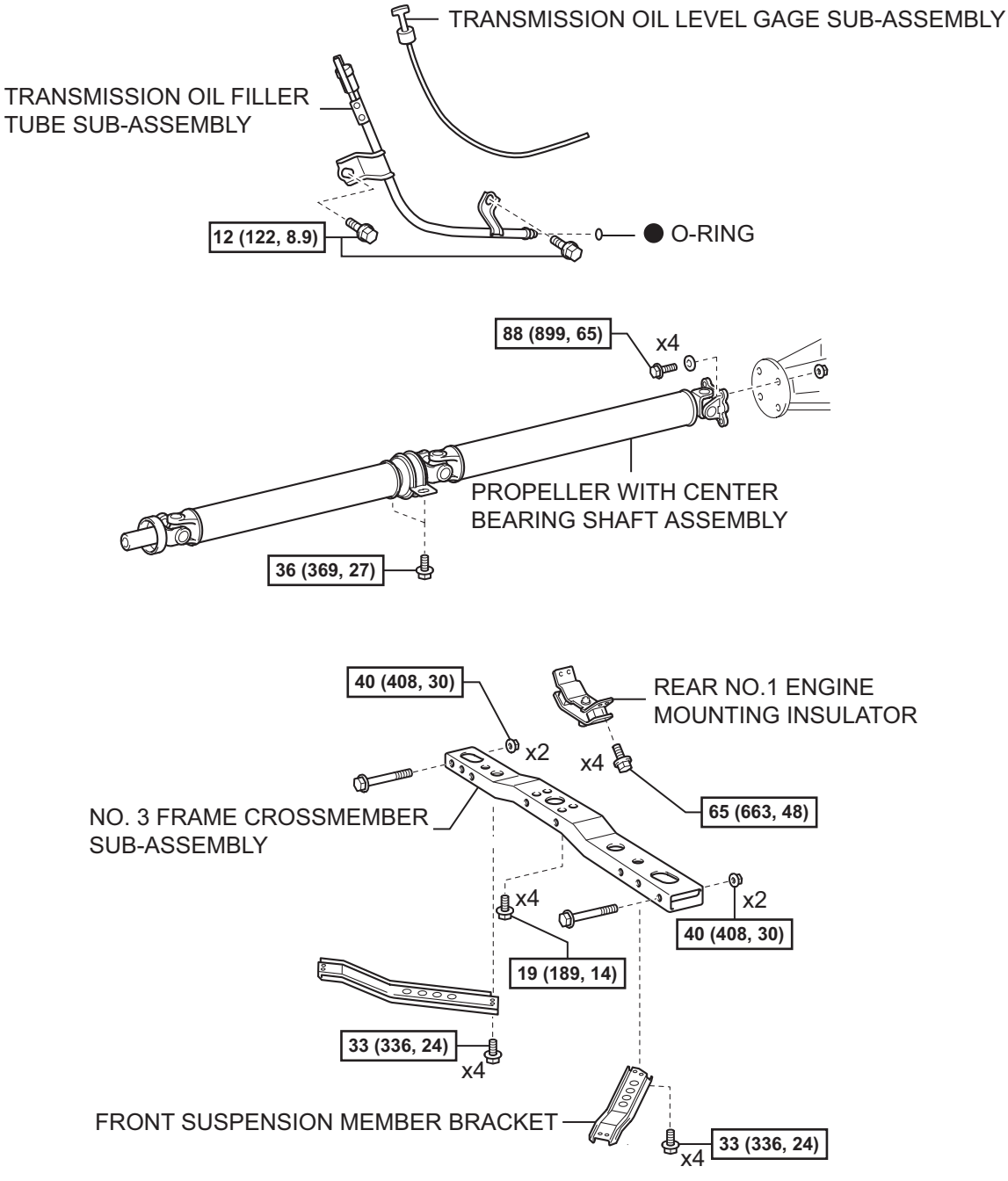
4. INSTALL FRONT CONSOLE BOX (for Bench Seat Type) (See page IP-23)

5. INSTALL FRONT CONSOLE BOX (for Separate Seat Type) (See page IP-24)

6. **INSTALL INSTRUMENT PANEL CUP HOLDER TRAY (for Separate Seat Type) (See page IP-24)**
7. **INSTALL REAR CONSOLE BOX ASSEMBLY (for Separate Seat Type) (See page IP-24)**
8. **INSTALL CONSOLE UPPER REAR PANEL SUB-ASSEMBLY (for Separate Seat Type) (See page IP-25)**
9. **ADJUST SHIFT LEVER POSITION (See page AT-105)**
10. **INSPECT SHIFT LEVER POSITION (See page AT-105)**

AUTOMATIC TRANSMISSION ASSEMBLY

COMPONENTS

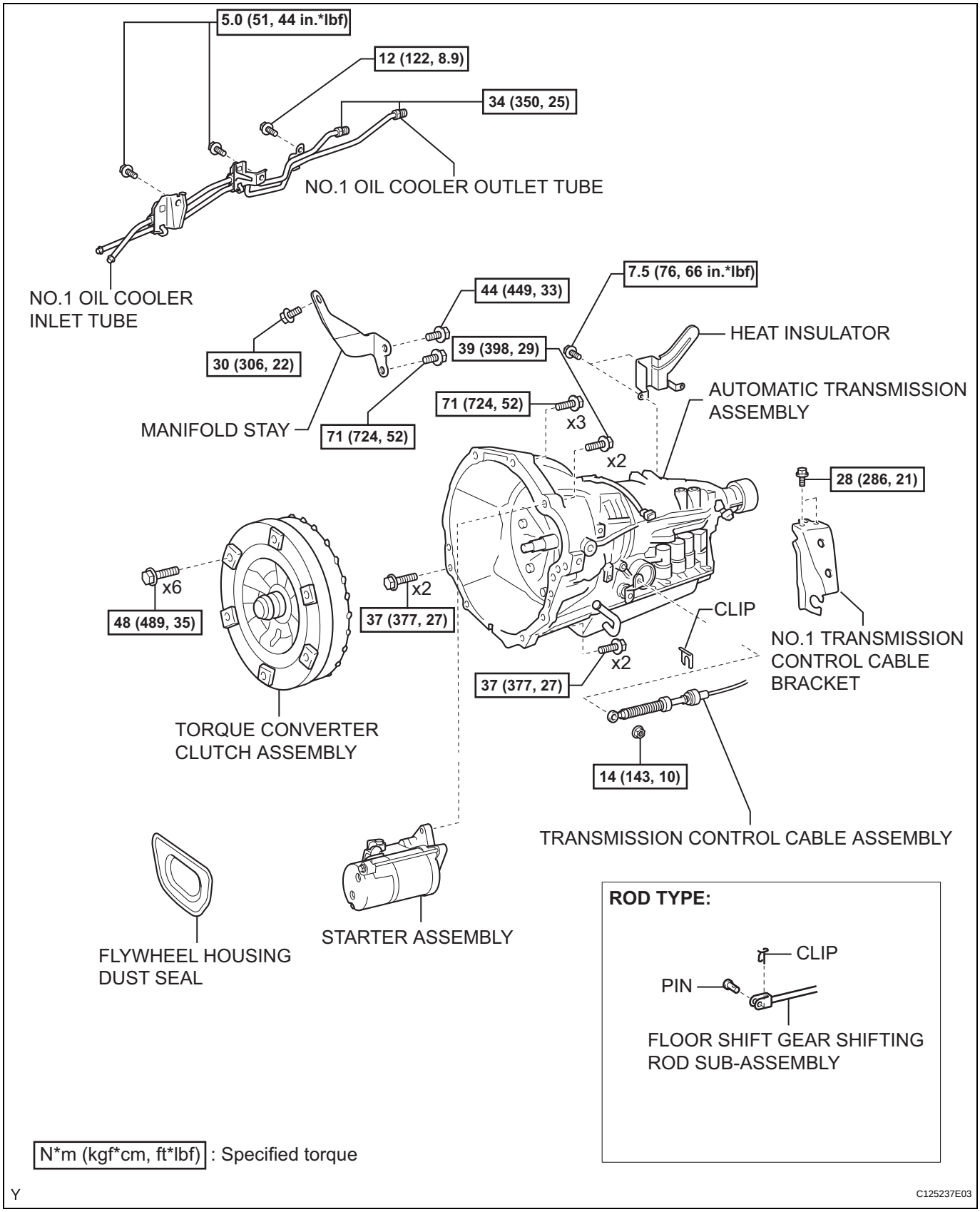


AT

N*m (kgf*cm, ft*lbf) : Specified torque ● Non-reusable part

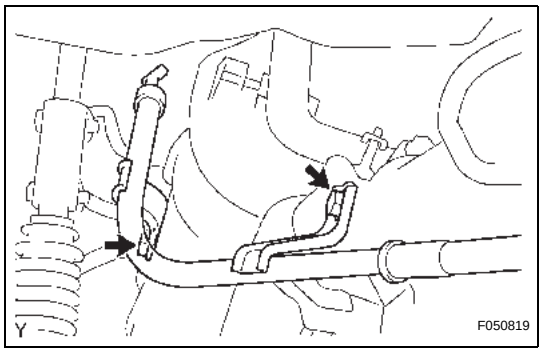
Y

C125236E03

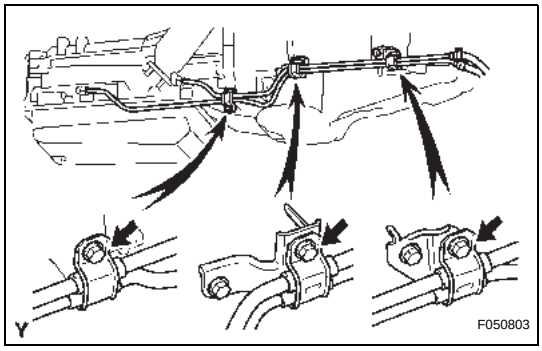

5.0 (51, 44 in.*lbf)
12 (122, 8.9)
34 (350, 25)
NO.1 OIL COOLER OUTLET TUBE
NO.1 OIL COOLER INLET TUBE
44 (449, 33)
7.5 (76, 66 in.*lbf)
HEAT INSULATOR
30 (306, 22)
39 (398, 29)
AUTOMATIC TRANSMISSION ASSEMBLY
71 (724, 52)
x3
MANIFOLD STAY
71 (724, 52)
x2
28 (286, 21)
x6
48 (489, 35)
x2
37 (377, 27)
CLIP
NO.1 TRANSMISSION CONTROL CABLE BRACKET
x2
37 (377, 27)
TORQUE CONVERTER CLUTCH ASSEMBLY
14 (143, 10)
TRANSMISSION CONTROL CABLE ASSEMBLY
FLYWHEEL HOUSING DUST SEAL
STARTER ASSEMBLY
ROD TYPE:
CLIP
PIN
FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY
N*m (kgf*cm, ft*lbf) : Specified torque
Y
C125237E03

REMOVAL

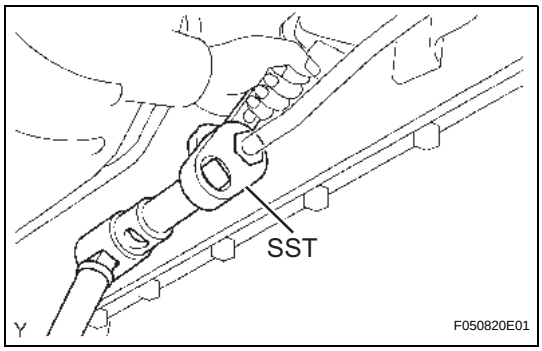
1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
2. **REMOVE PROPELLER SHAFT ASSEMBLY (for Regular Cab) (See page PR-3)**
3. **REMOVE PROPELLER WITH CENTER BEARING SHAFT ASSEMBLY (for Except Regular Cab) (See page PR-27)**
4. **DRAIN AUTOMATIC TRANSMISSION FLUID**
   (a) Remove the drain plug, gasket and drain ATF.
   (b) Install a new gasket and drain plug.
   Torque: 20 N*m (204 kgf*cm, 15 ft.*lbf)
5. **REMOVE TRANSMISSION OIL LEVEL GAGE SUB-ASSEMBLY**
6. **REMOVE TRANSMISSION OIL FILLER TUBE SUB-ASSEMBLY**
   (a) Remove the 2 bolts and oil filler tube.

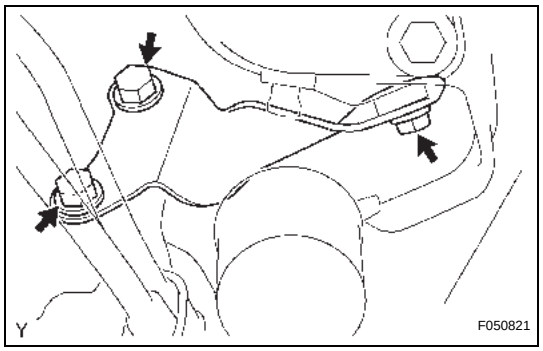


7. **REMOVE NO.1 OIL COOLER OUTLET TUBE**
   (a) Remove the 3 bolts and 3 clamps.



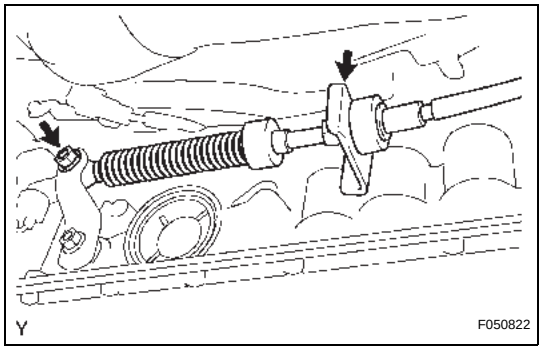
   (b) Using SST, disconnect the oil cooler outlet tube No. 1.
   SST 09023-12701
8. **REMOVE NO.1 OIL COOLER INLET TUBE**
   (a) Using SST, disconnect the oil cooler inlet tube No. 1.
   SST 09023-12701





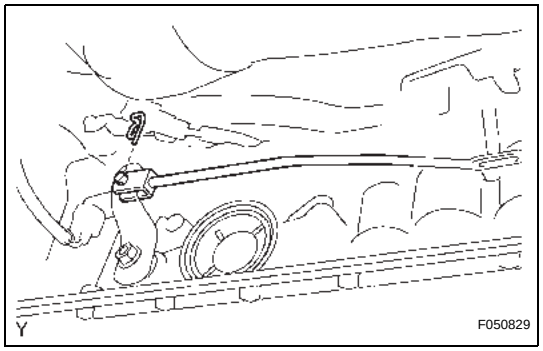
9. REMOVE MANIFOLD STAY

(a) Remove the 3 bolts and manifold stay.



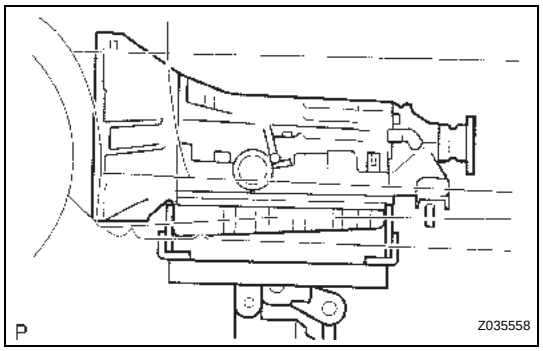
10. DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY

(a) CABLE TYPE:
  (1) Remove the nut and disconnect the transmission control cable.
  (2) Remove the clip and disconnect the transmission control cable.



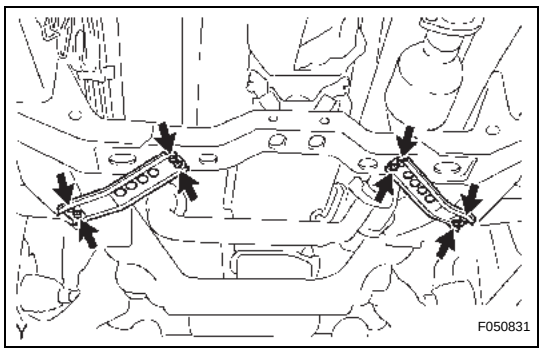
11. SEPARATE FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

(a) ROD TYPE:
  (1) Remove the clip and separate the floor shift gear shifting rod from the automatic transmission.



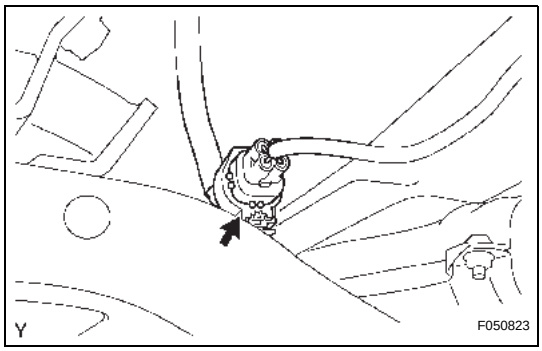
12. SUPPORT AUTOMATIC TRANSMISSION ASSEMBLY

(a) Support the automatic transmission assembly with a transmission jack.



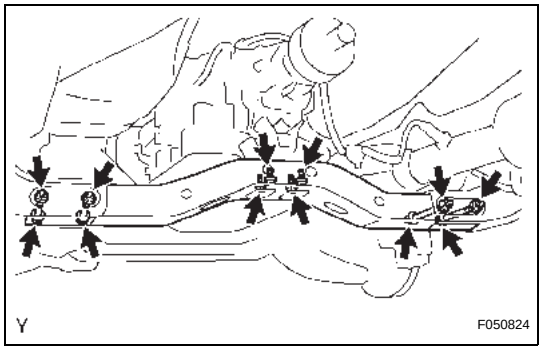
13. REMOVE FRONT SUSPENSION MEMBER BRACKET

(a) Remove the 8 bolts and 2 front suspension member brackets.



14. REMOVE NO.3 FRAME CROSSMEMBER SUB-ASSEMBLY

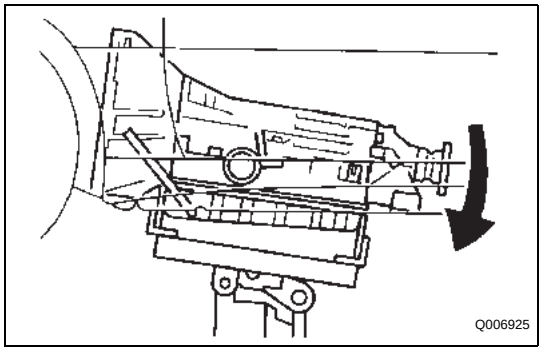
(a) Disconnect the heated oxygen sensor connector.



(b) Remove the 4 bolts from the frame crossmember sub-assembly No. 3.

(c) Remove the 4 nuts, 4 bolts and frame crossmember sub-assembly No. 3.

15. REMOVE STARTER ASSEMBLY (See page ST-5)



16. DISCONNECT CONNECTOR

(a) Tilt down the transmission.
NOTICE:
Take care so that the cooling fan does not come in contact with the fan shroud.

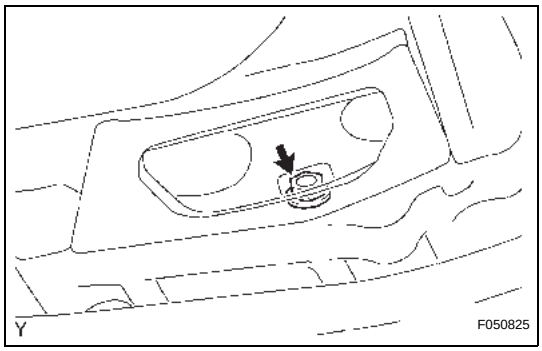
(b) Disconnect the park/neutral position switch connector.

(c) Disconnect the transmission wire connector.

(d) Disconnect the 2 speed sensor connectors.

(e) Disconnect the temperature sensor connector.

17. DISCONNECT WIRE HARNESS

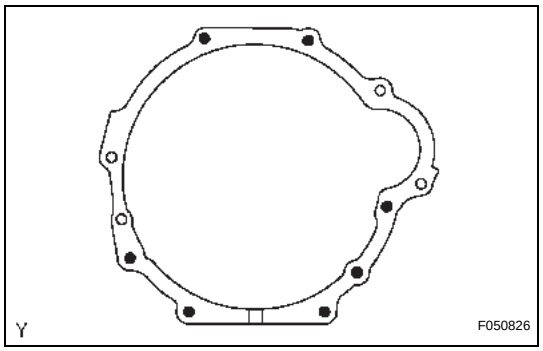


18. REMOVE AUTOMATIC TRANSMISSION ASSEMBLY

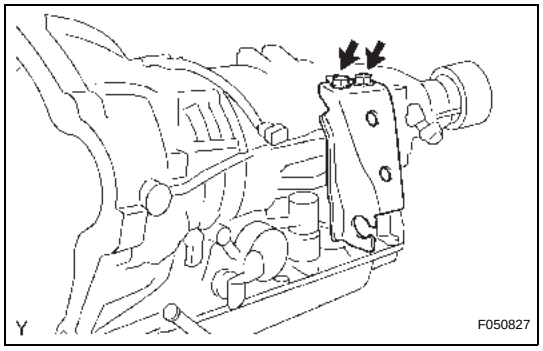
(a) Remove flywheel housing dust seal.

(b) Turn the crankshaft to gain access to each bolt.

(c) Hold the crankshaft pulley bolt with a wrench and remove the 6 bolts.

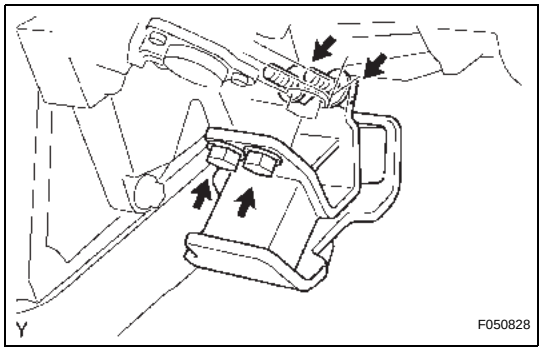


(d) Remove the 7 bolts.
(e) Separate and remove the automatic transmission.



19. REMOVE NO.1 TRANSMISSION CONTROL CABLE BRACKET

(a) Remove the 2 bolts and transmission control cable bracket No. 1.



20. REMOVE REAR NO.1 ENGINE MOUNTING INSULATOR

(a) Remove the 4 bolts and engine mounting insulator rear No. 1.

21. REMOVE TORQUE CONVERTER CLUTCH ASSEMBLY

INSTALLATION

1. INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY (See page AT-117)

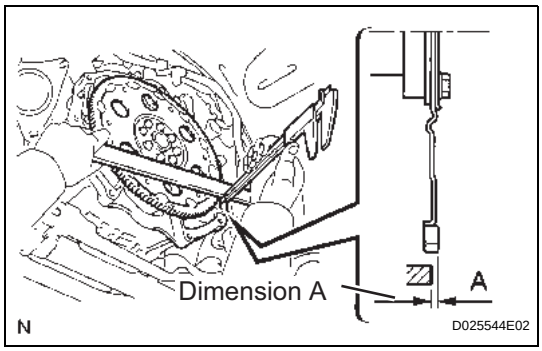
2. INSTALL TORQUE CONVERTER CLUTCH ASSEMBLY

(a) Install the torque converter clutch onto the automatic transmission.

(b) Using calipers and a straight edge, measure dimension A, between the transmission and the end surface of the drive plate, as shown in the illustration.

Standard:

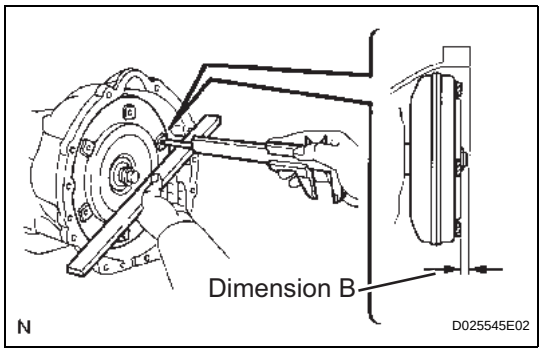
A: 22.28 mm (0.8772 in.)



(c) Using calipers and a straight edge, measure the dimension B shown in the illustration and check that B is greater than A measured in (b).

Standard:

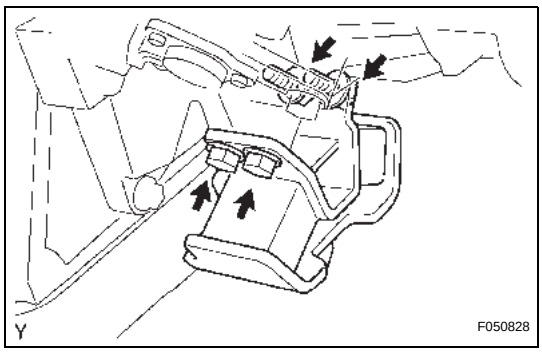
23.28 mm (0.9165 in.) or more



3. INSTALL REAR NO.1 ENGINE MOUNTING INSULATOR

(a) Install the engine mounting insulator with the 4 bolts.

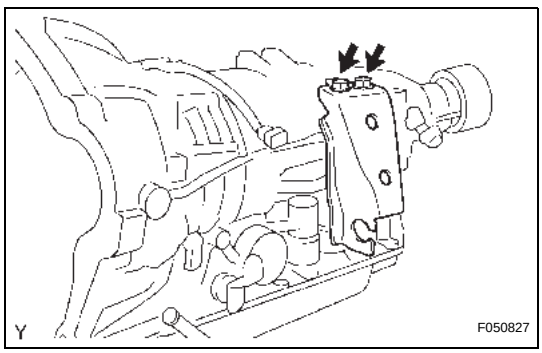
Torque: 65 N*m (663 kgf*cm, 48 ft.*lbf)

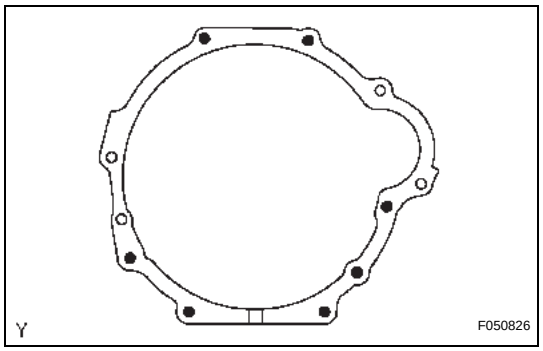


4. INSTALL NO.1 TRANSMISSION CONTROL CABLE BRACKET

(a) Install the transmission control cable bracket No. 1 with the 2 bolts.

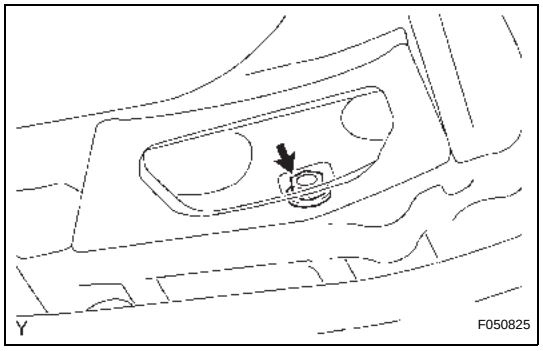
Torque: 28 N*m (286 kgf*cm, 21 ft.*lbf)





5. INSTALL AUTOMATIC TRANSMISSION ASSEMBLY

(a) Install the automatic transmission with the 7 bolts.
Torque: 71 N*m (724 kgf*cm, 52 ft.*lbf) for bolt A
37 N*m (377 kgf*cm, 27 ft.*lbf) for bolt B

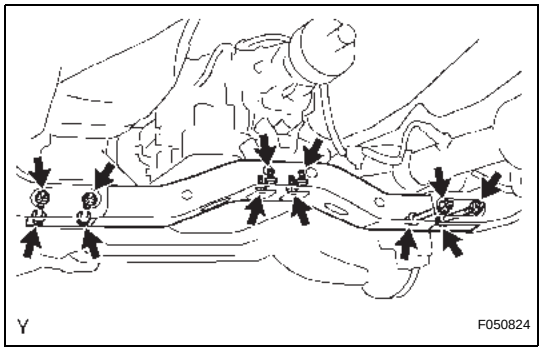


(b) Install the 6 torque converter clutch mounting bolts.
Torque: 48 N*m (489 kgf*cm, 35 ft.*lbf)
HINT:
First install the black bolt and then the other 5 bolts.

(c) Install the flywheel housing under cover.

6. INSTALL WIRE HARNESS

7. INSTALL STARTER ASSEMBLY (See page ST-10)

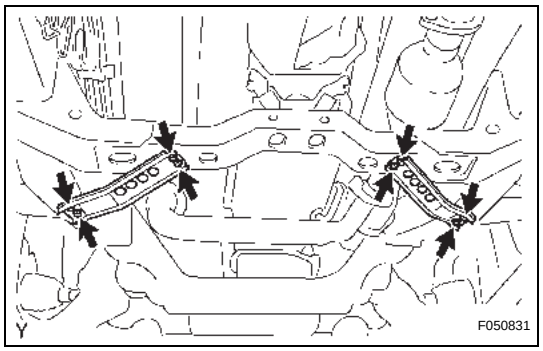


8. INSTALL NO.3 FRAME CROSSMEMBER SUB-ASSEMBLY

(a) Install the frame crossmember sub-assembly No. 3 with the 4 bolts and 4 nuts.
Torque: 40 N*m (408 kgf*cm, 30 ft.*lbf)

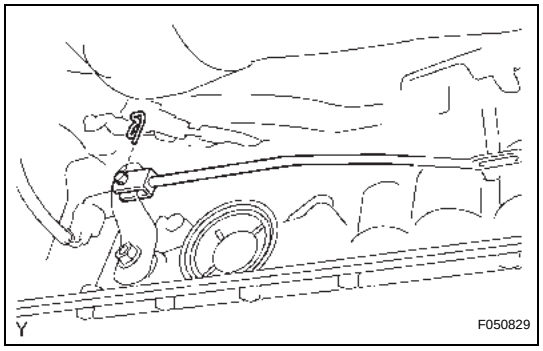
(b) Install the frame crossmember sub-assembly No. 3 with the 4 bolts.
Torque: 19 N*m (189 kgf*cm, 14 ft.*lbf)

(c) Connect the heated oxygen sensor connector.



9. INSTALL FRONT SUSPENSION MEMBER BRACKET

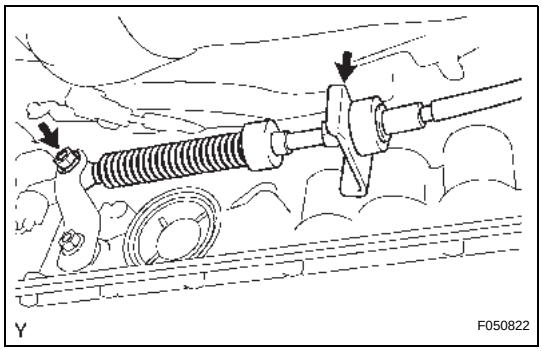
(a) Install the 2 front suspension member brackets with the 8 bolts.
Torque: 33 N*m (336 kgf*cm, 24 ft.*lbf)



10. INSTALL FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

(a) ROD TYPE:

(1) Install the floor shift gear shifting rod, then install the clip.



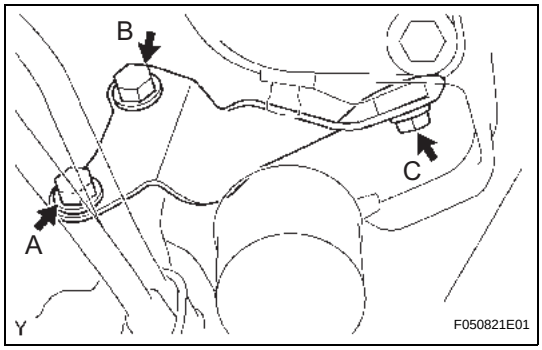
11. CONNECT TRANSMISSION CONTROL CABLE ASSEMBLY

(a) CABLE TYPE:

(1) Connect the transmission control cable with the clip.

(2) Connect the transmission control cable with the nut.

Torque: 14 N*m (143 kgf*cm, 10 ft.*lbf)



12. INSTALL MANIFOLD STAY

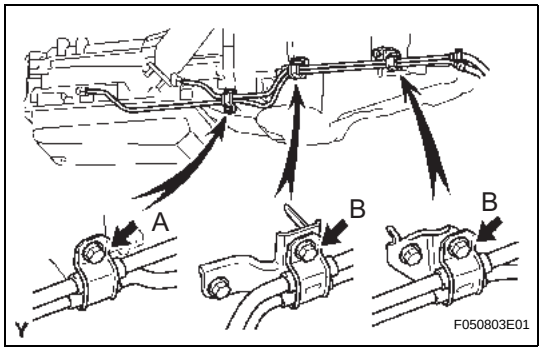
(a) Install the manifold stay with the 3 bolts.

Torque: 71 N*m (724 kgf*cm, 52 ft.*lbf) for bolt A
44 N*m (449 kgf*cm, 33 ft.*lbf) for bolt B
30 N*m (306 kgf*cm, 22 ft.*lbf) for bolt C

13. INSTALL NO.1 OIL COOLER INLET TUBE

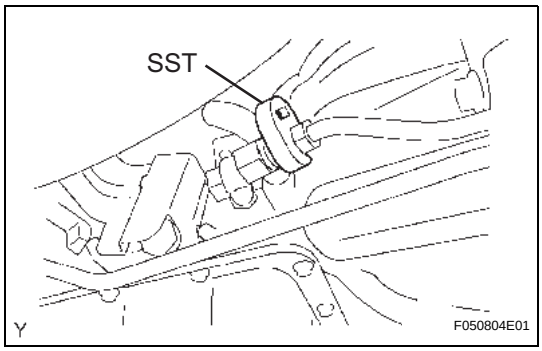
(a) Provisionally install the oil cooler inlet tube No. 1.

(b) Provisionally install the oil cooler outlet tube No. 1.



(c) Install the 3 clamps and 3 bolts.

Torque: 12 N*m (122 kgf*cm, 8.9 ft.*lbf) for bolt A
5.0 N*m (51 kgf*cm, 44 in.*lbf) for bolt B



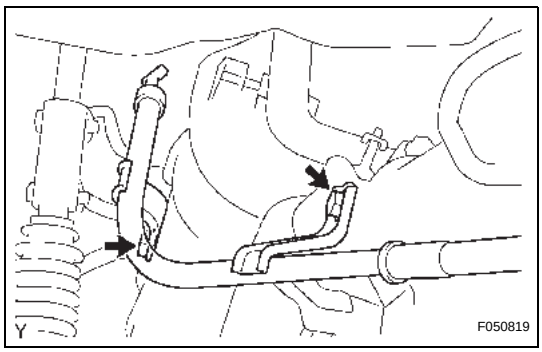
(d) Using SST, tighten the oil cooler inlet tube No. 1.

SST 09023-12701
Torque: 34 N*m (350 kgf*cm, 25 ft.*lbf)

14. INSTALL NO.1 OIL COOLER OUTLET TUBE

(a) Using SST, tighten the oil cooler outlet tube No. 1.

SST 09023-12701
Torque: 34 N*m (350 kgf*cm, 25 ft.*lbf)



15. INSTALL TRANSMISSION OIL FILLER TUBE SUB-ASSEMBLY

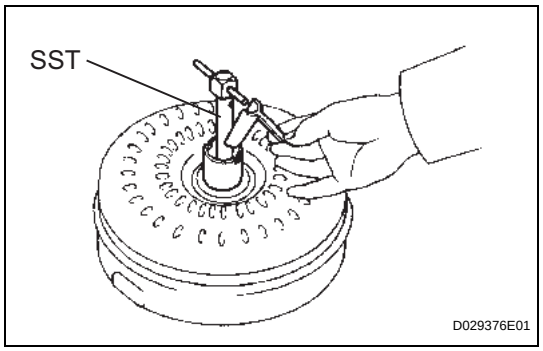
(a) Coat new O-ring with ATF and install it onto the oil filler tube.

(b) Install the oil filler tube with the 2 bolts.

Torque: 12 N*m (122 kgf*cm, 8.9 ft.*lbf)

16. INSTALL TRANSMISSION OIL LEVEL GAGE SUB-ASSEMBLY

17. **INSTALL PROPELLER WITH CENTER BEARING SHAFT ASSEMBLY (for Except Regular Cab) (See page PR-32)**
18. **INSTALL PROPELLER SHAFT ASSEMBLY (for Regular Cab) (See page PR-6)**
19. **ADJUST SHIFT LEVER POSITION (See page AT-105)**
20. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
    Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)
21. **ADD AUTOMATIC TRANSMISSION FLUID**
22. **INSPECT AUTOMATIC TRANSMISSION FLUID (See page AT-85)**
23. **INSPECT SHIFT LEVER POSITION (See page AT-105)**



TORQUE CONVERTER CLUTCH AND DRIVE PLATE

INSPECTION

1. INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

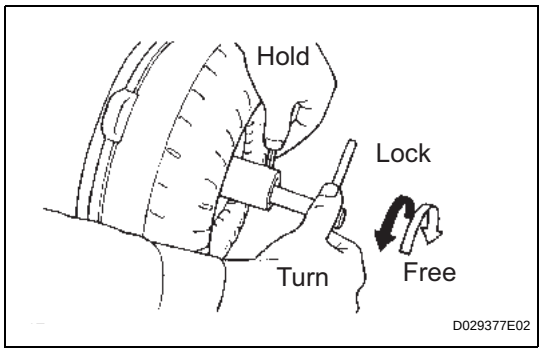
(a) Inspect the one-way clutch.

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

SST 09350-32014 (09351-32010)

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

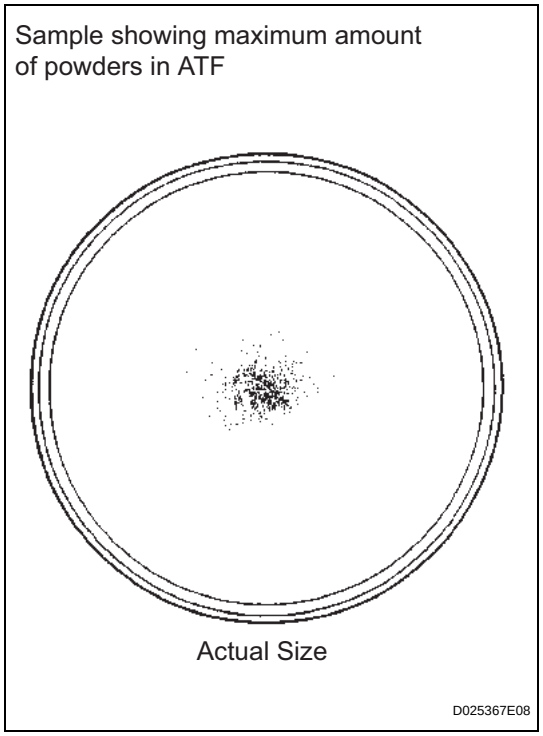
SST 09350-32014 (09351-32020)



(3) With the torque converter standing on its side, check that the clutch locks when turned counterclockwise and rotates freely and smoothly clockwise.

If necessary, clean the converter and check the one-way clutch again.

Replace the converter if the one-way clutch still doesn't operate as specified.



(b) Check the condition of the torque converter clutch assembly.

(1) If the inspection result of the torque converter clutch assembly matches any of the cases mentioned below, replace the torque converter clutch.

Malfunction item:

Any metallic sound is heard from the torque converter clutch during stall test or when the shift lever is in the neutral position.

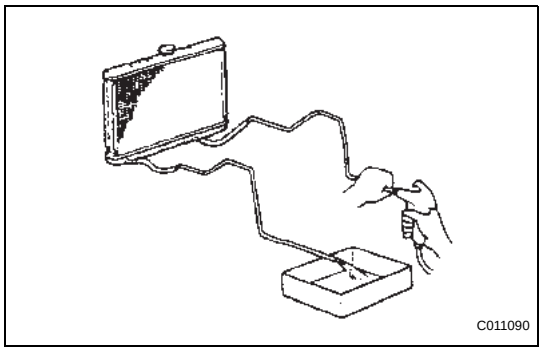
One-way clutch is free or locked in both directions. Fine powders exceeding the sample limit are identified in ATF. (See the sample.)

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.

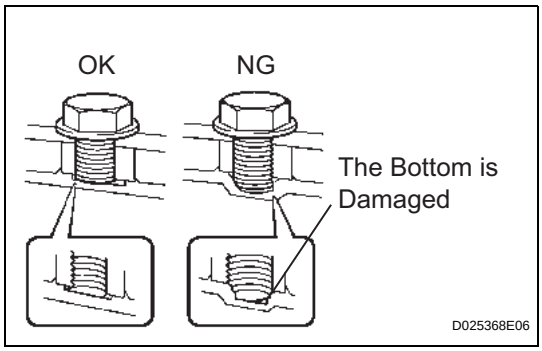
(c) Replace the ATF in the torque converter clutch.

(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 installation surface facing up.


C011090

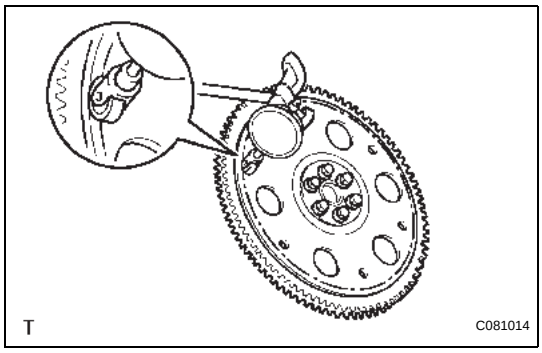
(d) Clean and then check the oil cooler and oil pipe line.
  (1) If inspecting the torque converter clutch or exchanging the ATF, clean the oil cooler and oil pipe line.
  HINT:
  - Apply compressed air of 196 kPa (2 kgf/ cm2, 28 psi) from the inlet hose.
  - If plenty of fine powders are identified in the ATF, add new ATF using a bucket pump and clean the ATF again.

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



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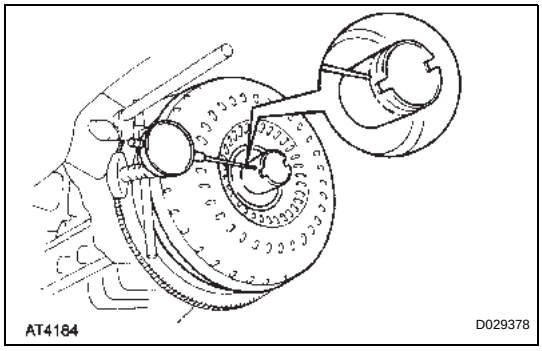
(e) Be careful not to deform the torque converter clutch or damage the oil pump gear.
  (1) When any marks due to interference are found on the end of the bolt on the torque converter clutch and on the bottom of the bolt hole, replace the bolt and the torque the converter clutch.
  (2) All the bolts should be the same length.
  (3) Do not lose any spring washers.


T
C081014

2. INSPECT RUNOUT OF DRIVE PLATE AND RING GEAR SUB-ASSEMBLY

(a) Set up a dial indicator and measure the drive plate runout.

(b) Check the ring gear for damage.
Maximum runout:
0.20 mm (0.0079 in.)
If the runout is not within the specification or the ring gear is damaged, replace the drive plate.


AT4184
D029378

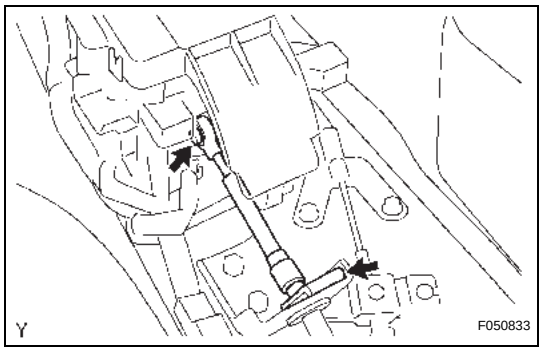
3. INSPECT RUNOUT OF TORQUE CONVERTER CLUTCH ASSEMBLY

(a) Provisionally mount the torque converter onto the drive plate, set up a dial indicator, and measure the torque converter sleeve runout.
Maximum runout:
0.30 mm (0.0118 in.)
If the runout is not within the specification, try to correct it by reinstalling the converter to the correct orientation.
HINT:
Mark the position of the converter to ensure correct installation.

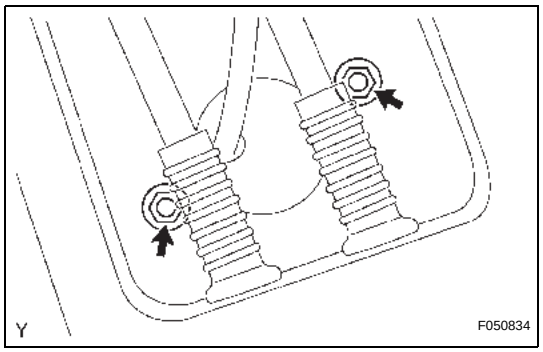
TRANSMISSION CONTROL CABLE

REMOVAL

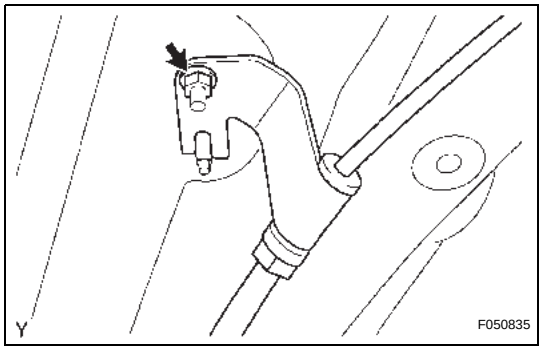
1. **REMOVE CONSOLE UPPER REAR PANEL SUB-ASSEMBLY (See page IP-9)**
2. **REMOVE CONSOLE BOX ASSEMBLY REAR (See page IP-10)**
3. **REMOVE INSTRUMENT PANEL CUP HOLDER TRAY (See page IP-10)**
4. **REMOVE CONSOLE BOX FRONT (See page IP-10)**
5. **REMOVE VOLTAGE INVERTER ASSEMBLY (w/ Voltage Inverter) (See page AV-104)**
6. **REMOVE TRANSMISSION CONTROL CABLE ASSEMBLY**
   (a) Disconnect the transmission control cable assembly from the shift lever assembly.
   (b) Remove the clip and disconnect the transmission control cable.

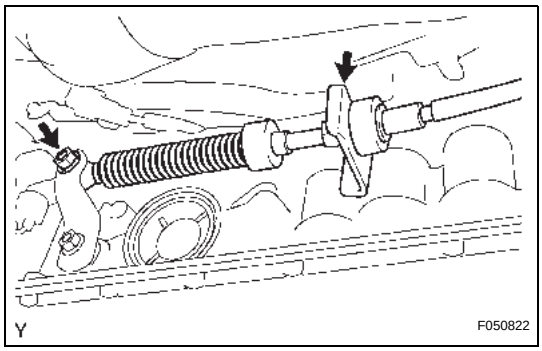


   (c) Remove the 2 nuts and disconnect the transmission control cable assembly from the body.



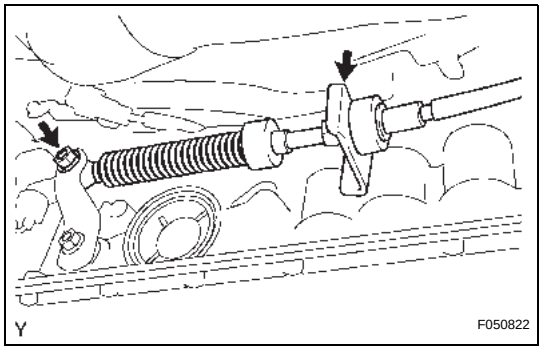
   (d) Remove the nut and disconnect the transmission control cable assembly from the body.





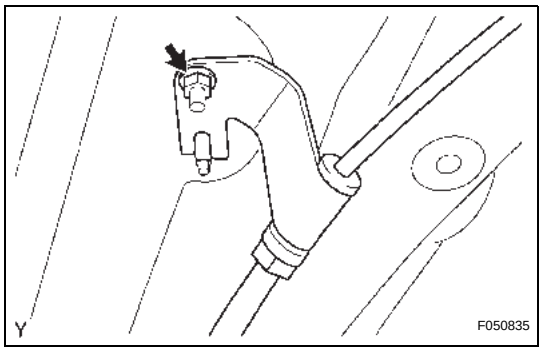
(e) Remove the clip and transmission control cable bracket.
(f) Remove the nut and transmission control cable assembly.

INSTALLATION

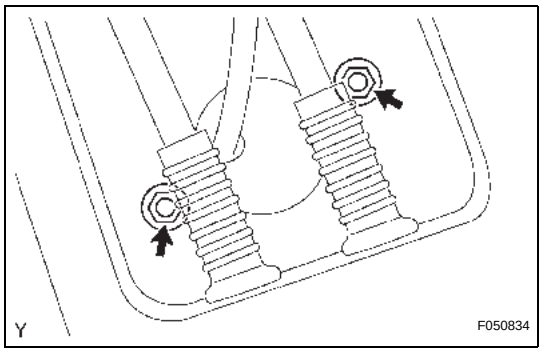


1. INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY

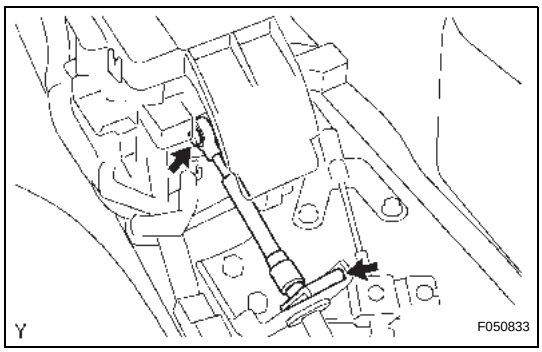
(a) Install the transmission control cable assembly with the nut.
Torque: 14 N*m (143 kgf*cm, 10 ft.*lbf)
(b) Install the transmission control cable bracket and lock plate.



(c) Connect the transmission control cable with the nut to the body.
Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf)



(d) Connect the transmission control cable with the 2 nuts to the body.
Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf)



(e) Connect the transmission control cable with the lock plate to the floor shift assembly.
(f) Install the transmission control cable onto the floor shift assembly.

2. INSTALL VOLTAGE INVERTER ASSEMBLY (w/ Voltage Inverter) (See page AV-105)

3. INSTALL CONSOLE BOX FRONT (See page IP-24)

4. INSTALL INSTRUMENT PANEL CUP HOLDER TRAY (See page IP-24)

5. **INSTALL CONSOLE BOX ASSEMBLY REAR (See page IP-24)**
6. **INSTALL CONSOLE UPPER REAR PANEL SUB-ASSEMBLY (See page IP-25)**
7. **ADJUST SHIFT LEVER POSITION (See page AT-105)**
8. **INSPECT SHIFT LEVER POSITION (See page AT-105)**

AUTOMATIC TRANSMISSION SYSTEM

PRECAUTION

1. **PRECAUTION**
   NOTICE:
   - **Perform the RESET MEMORY (AT initialization) when replacing the automatic transmission assembly, engine assembly or ECM (See page AT-17).**
   - **Perform the REGISTRATION (VIN registration) when replacing the ECM (See page ES-14).**

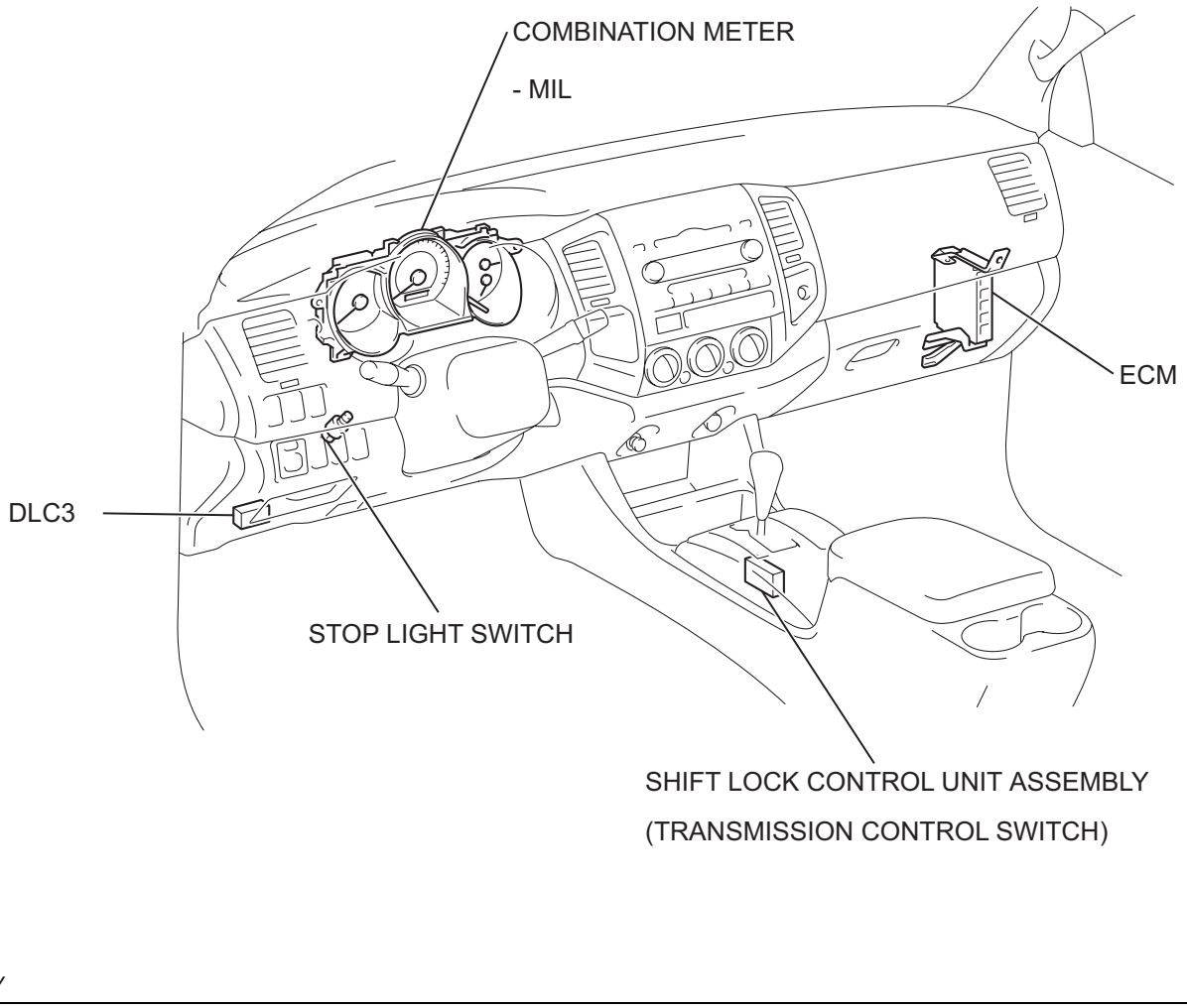
   HINT:
   RESET MEMORY cannot be completed by only disconnecting the negative cable from the battery.
2. **CONNECT BATTERY NEGATIVE TERMINAL**
   (a) Connect the battery negative terminal to the cable and run the engine at no less than 2,000 rpm for 1 minute.
   NOTICE:
   If the engine exceeds 2,000 rpm, the clutch is automatically disengaged by the compressor protection control system.
3. **PRECAUTION FOR DISASSEMBLY AND REASSEMBLY**
   CAUTION:
   When using compressed air, always aim away from yourself to prevent Automatic Transmission Fluid (ATF) or kerosene from spraying on your face.
   NOTICE:
   - **The automatic transaxle is composed of precision-made parts, necessitating careful inspection before reassembly because even a small nick could cause fluid leakage or affect performance.**
   - **The procedures are organized so that you work on only one component group at a time. This will help avoid confusion with similar-looking parts of different sub-assemblies being on your workbench at the same time.**
   - **The component groups are inspected and repaired from the converter housing side.**
   - **Whenever possible, complete the inspection, repair and reassembly before proceeding to the next component group. If a defect is found in a certain component group during reassembly, inspect and repair this group immediately. If a component group cannot be assembled because parts are being ordered, be sure to keep all parts of the group in a separate container while proceeding with disassembly, inspection, repair and reassembly of other component groups.**

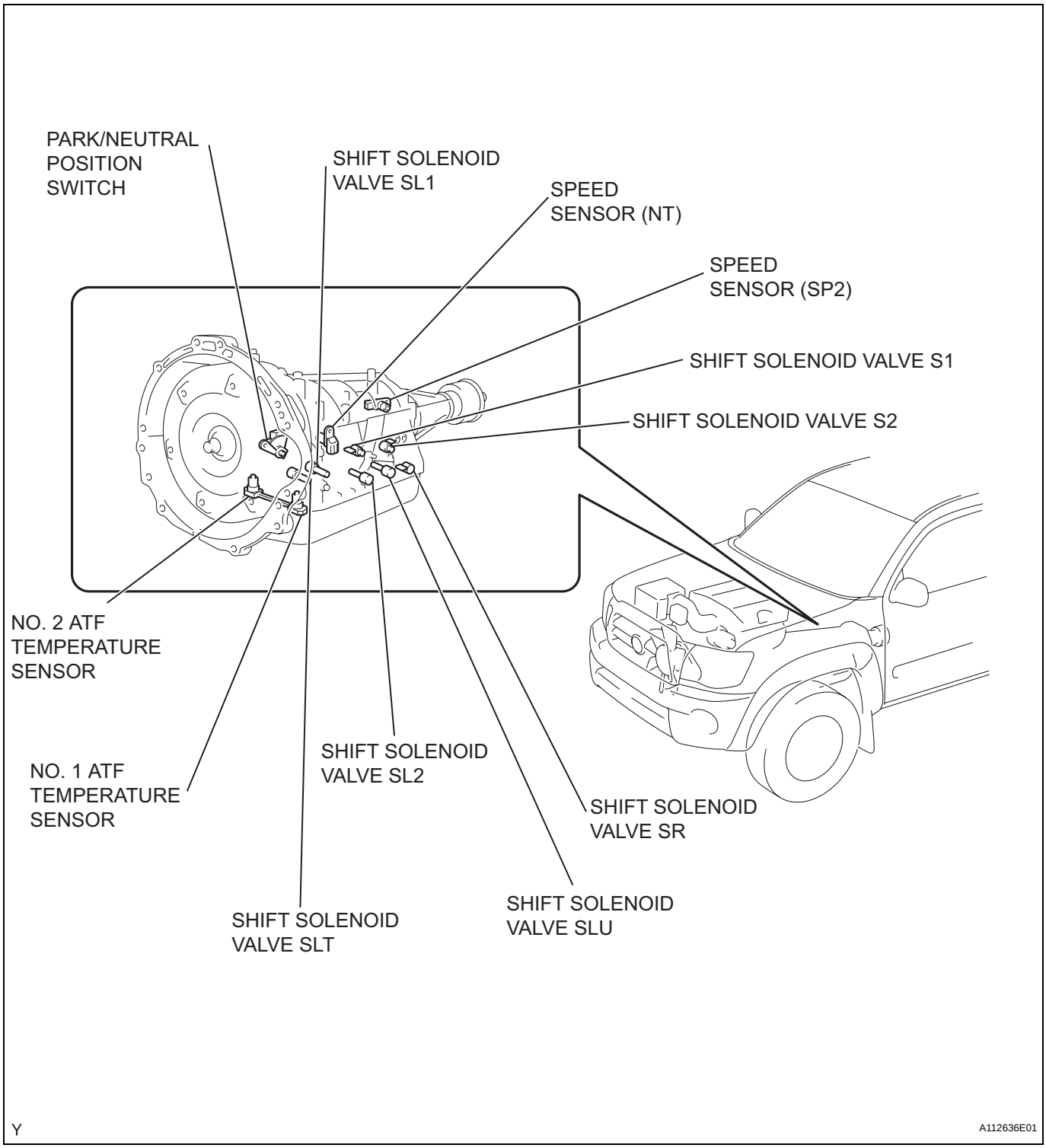
- **When changing the automatic transmission fluid, use only "Toyota Genuine ATF WS" (ATF JWS3324 or NWS9638).**
- **All disassembled parts should be washed clean, and compressed air should be blown through any fluid passages and holes.**
- **Dry all parts with compressed air. Never use cloth.**
- **The recommended ATF or kerosene should be used for cleaning.**
- **After cleaning, the parts should be arranged in the order they were removed for efficient inspection, repairs, and reassembly.**
- **When disassembling a valve body, be sue to match each valve with its corresponding spring.**
- **New discs for the brakes and clutches that will be used for replacement must be soaked in ATF for at least 15 minutes before reassembly.**
- **All oil seal rings, clutch discs, clutch plates, rotating parts, and sliding surfaces should be coated with ATF prior to reassembly.**
- **All old gaskets and rubber O-rings must be replaced.**
- **Do not apply adhesive cement to gaskets and similar parts.**
- **Make sure that the ends of the snap rings are not aligned with any cutouts. Also make sure that snap rings are correctly installed into the grooves.**
- **If a worn bushing is to be replaced, the sub-assembly containing the bushing must also be replaced.**
- **Check the thrust bearings and races for wear or damage. Replace if necessary.**
- **Use petroleum jelly to keep parts in place.**
- **When working with FIPG material, perform the following:**
  Using a razor blade and gasket scraper, remove all old FIPG material from the gasket surface.
  Clean all components thoroughly to remove all foreign matter.
  Clean both sealing surfaces with a non-residue solvent.
  Apply FIPG material in a continuous line approximately 1 mm (0.04 in.) in diameter on the sealing surface.
  Reassemble parts within 10 minutes of applying FIPG material. Failing to do so will require the FIPG material to be removed and reapplied.

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	A group of diagnostic trouble codes that are output by the ECM based on the same malfunction detection logic.
Typical enabling conditions	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 one sensor is being monitored, the next sensor or component will not be monitored until the previous monitoring has been completed.
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 the malfunction only one time during a single driving cycle. "Continuous" means that the ECM detects the malfunction every time the enabling conditions are met.
Duration	The minimum time that the ECM must detect 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 determines that there is a malfunction and sets a DTC.
MIL operation	MIL illumination timing after a defect is detected. "Immediate" means that the ECM illuminates the MIL the instant the ECM determines that there is a malfunction. "2 driving cycles" means that the ECM illuminates the MIL if the same malfunction is detected again in a 2nd driving cycle.
Component operating range	Normal operation range of sensors and solenoids under normal driving conditions. These ranges are for a reference. They cannot be used to determine whether a sensor or solenoid is defective or not.

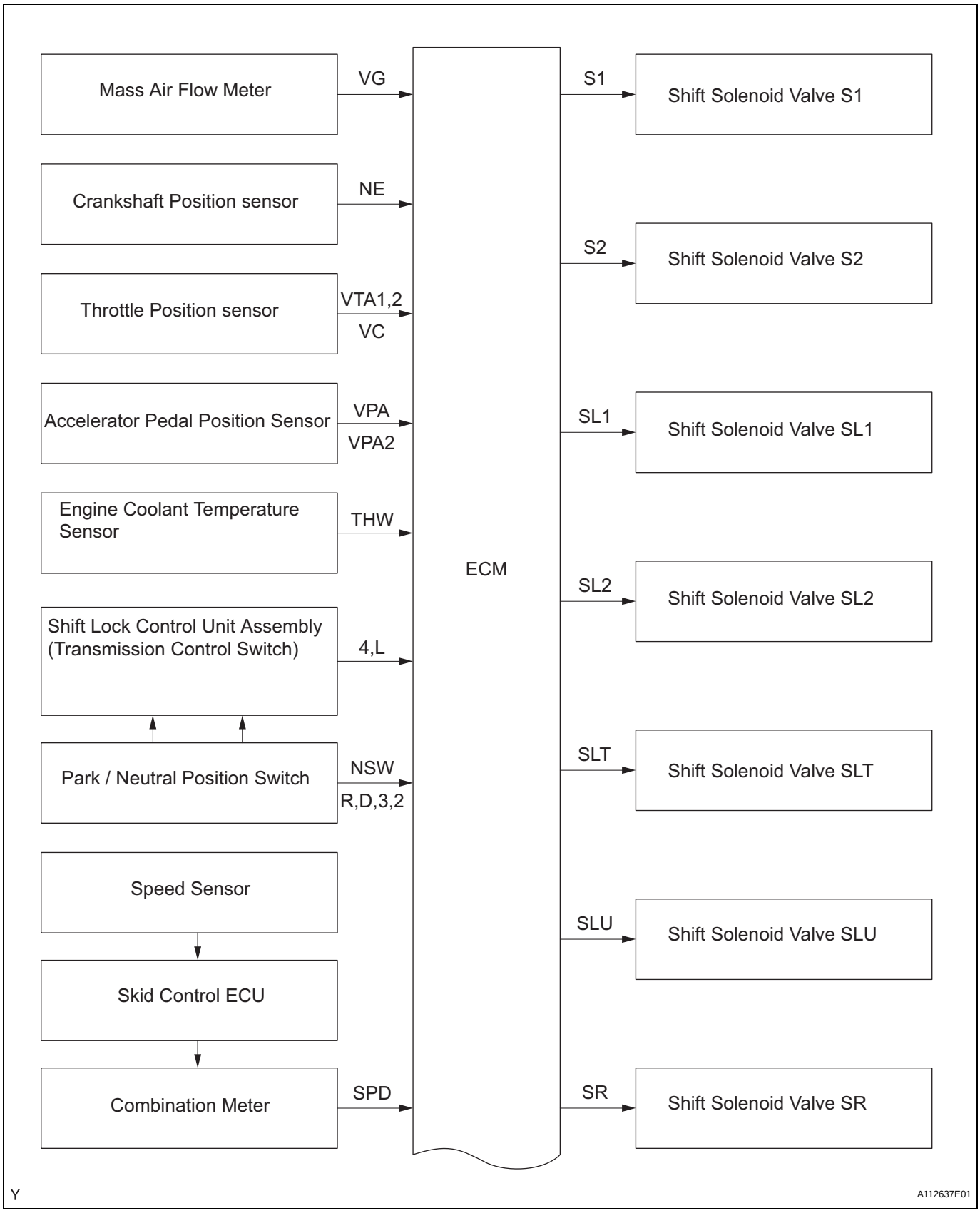
PARTS LOCATION

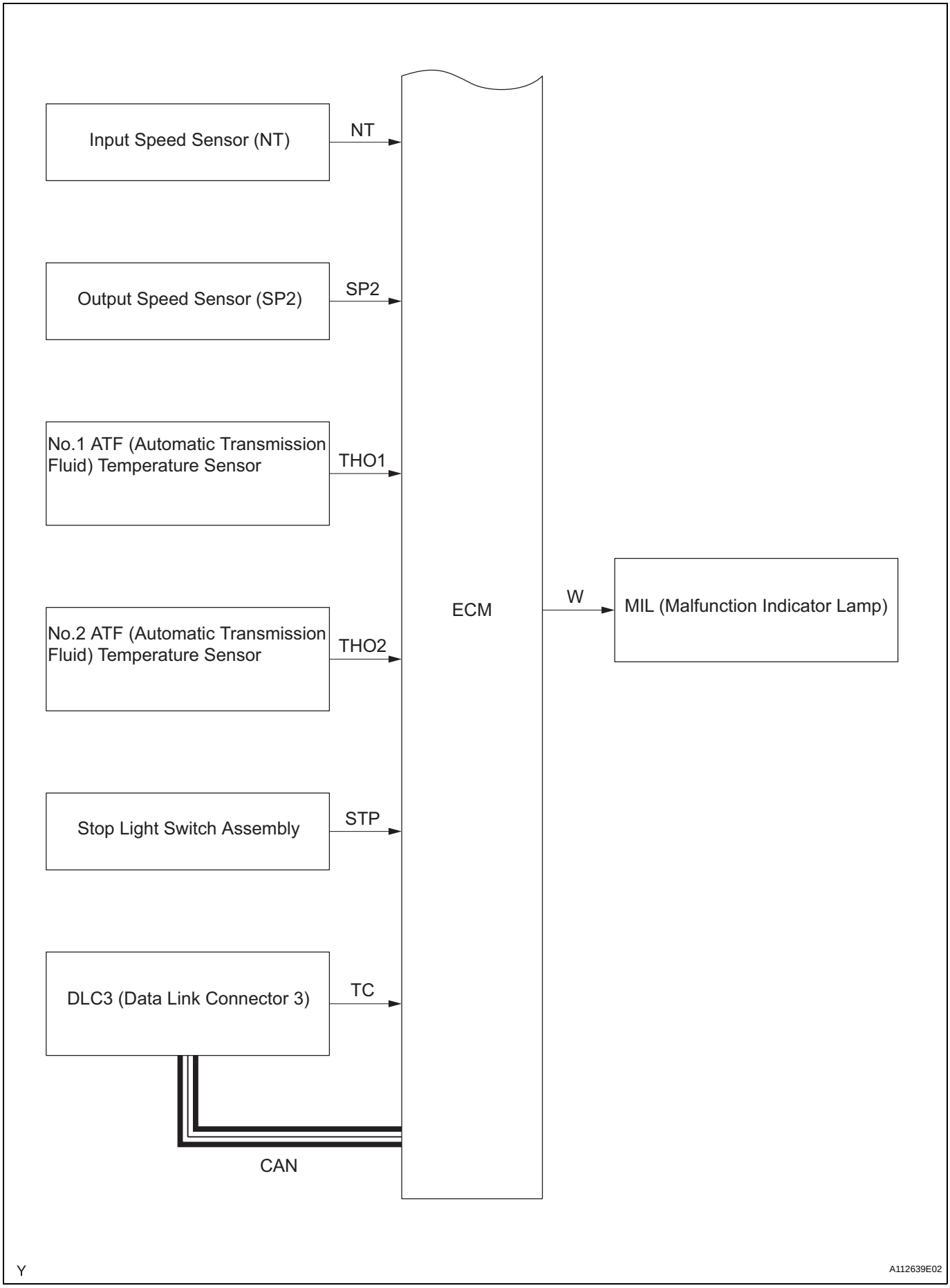



PARK/NEUTRAL POSITION SWITCH
SHIFT SOLENOID VALVE SL1
SPEED SENSOR (NT)
SPEED SENSOR (SP2)
SHIFT SOLENOID VALVE S1
SHIFT SOLENOID VALVE S2
NO. 2 ATF TEMPERATURE SENSOR
NO. 1 ATF TEMPERATURE SENSOR
SHIFT SOLENOID VALVE SL2
SHIFT SOLENOID VALVE SR
SHIFT SOLENOID VALVE SLT
SHIFT SOLENOID VALVE SLU
Y
A112636E01

SYSTEM DIAGRAM

The configuration of the electronic control system in the A750E automatic transmission is as shown in the following chart.




Input Speed Sensor (NT)
NT
Output Speed Sensor (SP2)
SP2
No.1 ATF (Automatic Transmission Fluid) Temperature Sensor
THO1
No.2 ATF (Automatic Transmission Fluid) Temperature Sensor
THO2
Stop Light Switch Assembly
STP
DLC3 (Data Link Connector 3)
TC
CAN
ECM
W
MIL (Malfunction Indicator Lamp)
Y
A112639E02

SYSTEM DESCRIPTION

1. SYSTEM DESCRIPTION

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

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

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

1	VEHICLE BROUGHT TO WORKSHOP

NEXT

2	CUSTOMER PROBLEM ANALYSIS

NEXT

3	CONNECT INTELLIGENT TESTER TO DLC3 *

NEXT

4	CHECK AND CLEAR DTCS AND FREEZE FRAME DATA *

Refer to the DTC CHECK / CLEAR (See page AT-30).

NEXT

5	VISUAL INSPECTION

NEXT

6	SETTING CHECK MODE DIAGNOSIS *

Refer to the CHECK MODE PROCEDURE (See page AT-31).

NEXT

7	PROBLEM SYMPTOM CONFIRMATION

Refer to the ROAD TEST (See page AT-11).

Result

Result	Proceed to
Symptom does not occur	A
Symptom occurs	B

B → GO TO STEP 9

A

8	SYMPTOM SIMULATION

Refer to the ELECTRONIC CIRCUIT INSPECTION PROCEDURE (See page IN-34).

NEXT

9	DTC CHECK *

Refer to the DTC CHECK / CLEAR (See page AT-30).

Result

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

B → GO TO STEP 17

A

10	BASIC INSPECTION

Refer to the AUTOMATIC TRANSMISSION FLUID (See page AT-135).
Refer to the PARK/NEUTRAL POSITION SWITCH (See page AT-142).
Refer to the FLOOR SHIFT ASSEMBLY (See page AT-155).

NG → GO TO STEP 19

OK

11	MECHANICAL SYSTEM TEST

Refer to the MECHANICAL SYSTEM TEST (See page AT-14).

NG → GO TO STEP 16

OK

12	HYDRAULIC TEST

Refer to the HYDRAULIC TEST (See page AT-16).

NG → GO TO STEP 16

OK

13	MANUAL SHIFTING TEST

Refer to the MANUAL SHIFTING TEST (See page AT-17).

NG → GO TO STEP 15

OK

14	PROBLEM SYMPTOMS TABLE CHAPTER 1

Refer to the PROBLEM SYMPTOMS TABLE (See page AT-20).

NG → GO TO STEP 18

OK

15	PROBLEM SYMPTOMS TABLE CHAPTER 2

Refer to the PROBLEM SYMPTOMS TABLE (See page AT-20).

NEXT

16	PART INSPECTION

NEXT → GO TO STEP 19

17	DTC CHART

Refer to the DIAGNOSTIC TROUBLE CODE CHART (See page AT-38).

NEXT

18	CIRCUIT INSPECTION

NEXT

19	REPAIR OR REPLACE

NEXT

20	**CONFIRMATION TEST**

NEXT

END

ROAD TEST

1. PROBLEM SYMPTOM CONFIRMATION

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

2. ROAD TEST

NOTICE:

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

(a) D position test:

Shift into the D position, 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-39).

HINT:

5th Gear Up-shift Prohibition Control

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

4th Gear Up-shift Prohibition Control

- Engine coolant temperature is 47°C (116.6°F) or less and vehicle speed is 30.4 mph (49 km/h) or less.

5th 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 slippage

Check for shock and slippage 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 check while driving in the lock-up condition.

HINT:

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

(4) Check kick-down operation.
Check vehicle speeds when the 2 → 1, 3 → 2, 4 → 3, and 5 → 4 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-39).

(5) Check for abnormal shock and slippage 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:
If there is a sudden increase in engine speed, there is no lock-up.

(b) 4 position test:
Shift into the 4 position, fully depress the accelerator pedal and check the following points.

(1) Check up-shift operation.
Check that the 1 → 2, 2 → 3 and 3 → 4 up-shifts take place and that the shift points conform to the automatic shift schedule (see page SS-39).
HINT:
- There is no 5th up-shift in the 4 position.
- 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 engine braking.
While driving in the 4 position and 4th gear, release the accelerator pedal and check the engine braking effect.

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

(4) Check the lock-up mechanism.
- Drive in the 4 position and 4th gear, at a steady speed (lock-up ON).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

HINT:
If there is a sudden increase in engine speed, there is no lock-up.

(c) 3 position test:
Shift into the 3 position, fully depress the accelerator pedal and check the following points.
(1) Check up-shift operation.
Check that the 1 → 2 and 2 → 3 up-shifts take place and that the shift points conform to the automatic shift schedule (see page SS-39).
HINT:
There is no 4th up-shift and lock-up in the 3 position.
(2) Check engine braking.
While running in the 3 position and 3rd gear, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noises during acceleration and deceleration, and for shock at up-shift and down-shift.

(d) 2 position test:
Shift into the 2 position, fully depress the accelerator pedal and check the following points.
(1) Check up-shift operation.
Check that the 1 → 2 up-shift takes place and that the shift point conforms to the automatic shift schedule (see page SS-39).
HINT:
There is no 3rd up-shift and lock-up in the 2 position.
(2) Check engine braking.
While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noises during acceleration and deceleration, and for shock at up-shift and down-shift.

(e) L position test:
Shift into the L position and fully depress the accelerator pedal and check the following points.
(1) Check no up-shift.
While running in the L position, check that there is no up-shift to 2nd gear.
(2) Check engine braking.
While running in the L position, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noises during acceleration and deceleration.

(f) 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 obstructions.

(g) 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.

MECHANICAL SYSTEM TESTS

1. STALL SPEED TEST

HINT:

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

NOTICE:

- **Do not perform the stall speed test longer than 5 seconds.**
- **To ensure safety, perform this test in an open and level area that provides good traction.**
- **The stall speed test should always be performed with at least 2 people. One person should observe the condition of the wheels and wheel chocks while the other is performing the test.**

(a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.

(b) Run the vehicle until the transmission fluid temperature has reached 50 to 80°C (122 to 176°F).

(c) Allow the engine to idle with the air conditioning OFF.

(d) Chock all 4 wheels.

(e) Set the parking brake and keep the brake pedal depressed firmly with your left foot.

(f) Shift the shift lever into the drive position.

(g) Depress the accelerator pedal as much as possible with your right foot.

(h) Read the engine rpm (stall speed) and release the accelerator pedal immediately.

Standard value:

2,250 to 2,550 rpm

Evaluation:

Test Result	Possible Cause
Stall speed is lower than standard value	• Stator one-way clutch is not operating properly • Torque converter is faulty (stall speed is less than standard value by 600 rpm or more) • Engine power may be insufficient
Stall speed is higher than standard value	• Line pressure is low • No. 1 clutch (C1) slipping • No. 3 one-way clutch (F3) is not operating properly • Improper fluid level

2. SHIFT TIME LAG TEST

HINT:

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

(a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.

(b) Run the vehicle until the transmission fluid temperature has reached 50 to 80°C (122 to 176°F).

(c) Allow the engine to idle with the air conditioning OFF.

(d) Set the parking brake and keep the brake pedal depressed firmly.

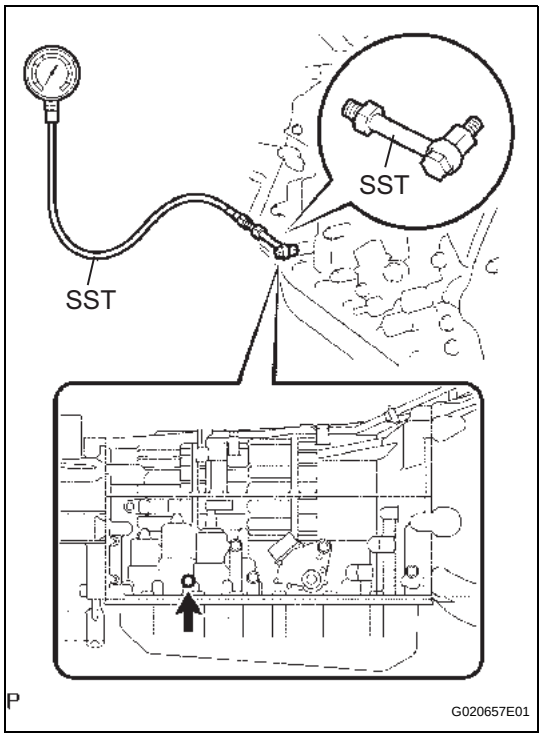
(e) Check the D range time lag.
(1) Shift the shift lever into the N position and wait for 1 minute.
(2) Shift the shift lever into the D position and measure the time until the shock is felt.
(3) Repeat the 2 procedures above 3 times, and calculate the average time of the 3 tests.

(f) Check the R range time lag.
(1) Shift the shift lever into the N position and wait for 1 minute.
(2) Shift the shift lever into the R position and measure the time until the shock is felt.
(3) Repeat the 2 procedures above 3 times, and calculate the average time of the 3 tests.

Standard value:
D range time lag is less than 1.2 seconds
R range time lag is less than 1.5 seconds

Evaluation:

Test Result	Possible Cause
D range time lag exceeds standard value	• Line pressure is low • No. 1 clutch (C1) is worn • No. 3 one-way clutch (F3) is not operating properly
R range time lag exceeds standard value	• Line pressure is low • No. 3 clutch (C3) is worn • No. 4 brake (B4) is worn • No. 1 one-way clutch (F1) is not operating properly



HYDRAULIC TEST

1. PERFORM HYDRAULIC TEST

(a) Measure the line pressure.

NOTICE:

- **Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature of 50° to 80°C (122° to 176°F).**
- **The line pressure test should always be carried out in pairs. One technician should observe the condition of the wheels or wheel stoppers outside the vehicle while the other is doing the test.**
- **Be careful to prevent the SST hose from interfering with the exhaust pipe.**
- **This check must be conducted after checking and adjusting the engine.**
- **Perform with the A/C OFF.**
- **Do not conduct stall tests for longer than 10 seconds continuously.**

(1) Warm up the ATF.
(2) Lift the vehicle up.
(3) Remove the test plug on the transmission case center right side and connect SST.
SST 09992-00095 (09992-00151, 09992-00271)
(4) Fully apply the parking brake and chock the 4 wheels.
(5) Start the engine and check the idling speed.

(6) Keep your left foot pressing firmly on the brake pedal and shift into the D position.
(7) Measure the line pressure while the engine is idling.
(8) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when the engine speed reaches the stall speed.
(9) In the same manner, do the test in the R position.

Specified line pressure

Condition	D position	R position
Idling	**363 to 423 kPa (3.7 to 4.3 kgf/cm^2 , 53 to 61 psi)**	**484 to 564 kPa (4.9 to 5.8 kgf/cm^2, 70 to 82 psi)**
Stall test	**1,282 to 1,381 kPa (13.1 to 14.1 kgf/cm^2, 186 to 200 psi)**	**1,218 to 1,338 kPa (12.4 to 13.6 kgf/cm^2, 177 to 194 psi)**

Evaluation:

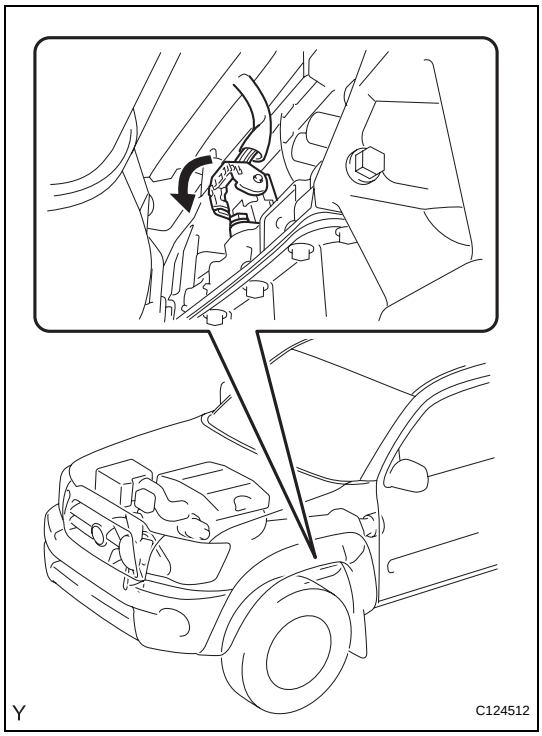
Problem	Possible cause
Measured value are higher than specified in all positions	• Shift solenoid valve SLT defective • Regulator valve defective
Measured value are lower than specified in all positions	• Shift solenoid valve SLT defective • Regulator valve defective • Oil pump defective
Pressure is low in D position only	• D position circuit fluid leakage • No. 1 clutch (C_1) defective
Pressure is low in R position only	• R position circuit fluid leakage • No. 3 clutch (C_3) defective • No. 4 brake (B_4) defective

MANUAL SHIFTING TEST

1. MANUAL SHIFTING TEST

HINT:

- Through this test, it can be determined whether the trouble occurs in the electrical circuit or if it is a mechanical problem in the transmission.
- If any abnormalities are found in the following test, the problem is in the transmission itself.



(a) Disconnect the connector of the transmission wire.
HINT:
It is possible to deactivate the electrical shift control by disconnecting the transmission wire. The gear positions can then be changed mechanically with the shift lever.

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

Shift Lever Position	Gear Position
D	4th
4	4th
3	3rd
2	1st
L	1st
R	R
P	P

(c) Connect the connector of the transmission wire.

(d) Clear the DTC (See page AT-30).

INITIALIZATION

1. RESET MEMORY

CAUTION:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transmission assembly, engine assembly or ECM.

NOTICE:

Intelligent tester only

HINT:

The ECM stores the condition under which the ECT (Electronic Controlled Automatic Transmission) controls the automatic transmission and engine assemblies according to their characteristics. Therefore, when the automatic transmission assembly, engine assembly, or ECM has been replaced, it is necessary to reset the memory so that the ECM can store the new information. Reset procedure is as follows.

(a) Turn the ignition switch off.

(b) Connect the intelligent tester together with the CAN VIN (controller area network vehicle interface module) to the DLC3.

(c) Turn the ignition switch to the ON position and push the intelligent tester main switch on.

(d) Select the items "DIAGNOSIS/ ENHANCED OBD II".

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

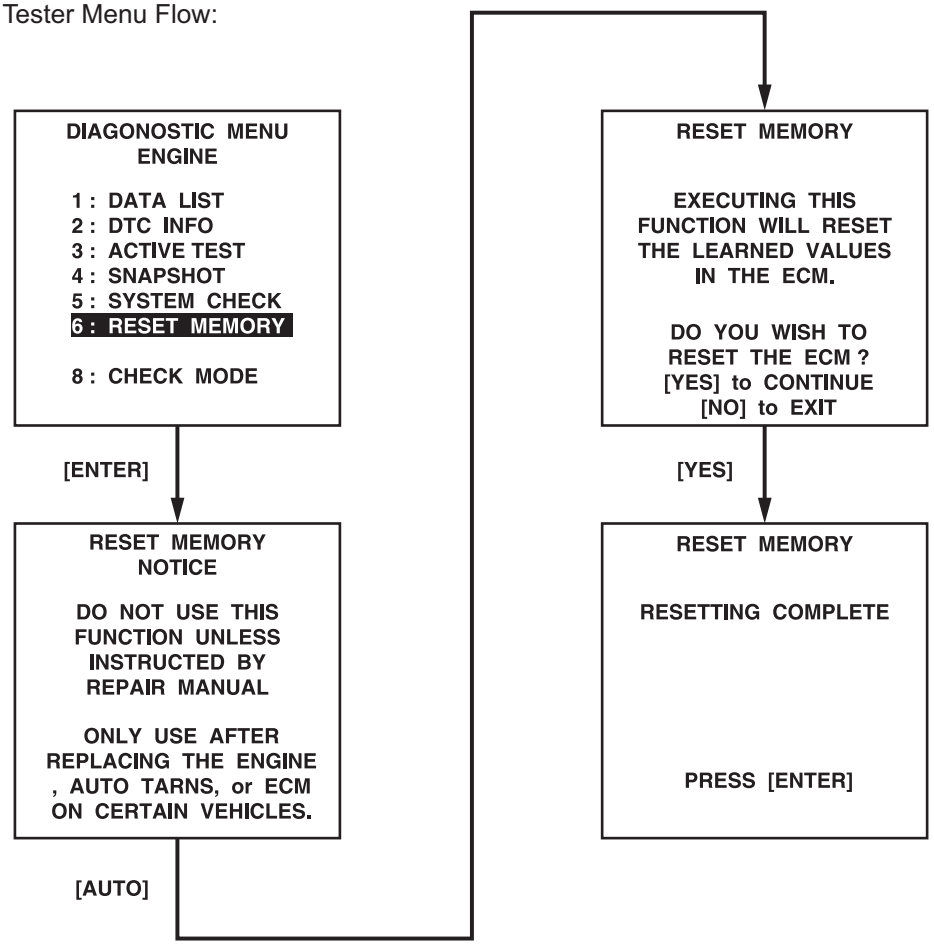
CAUTION:

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

HINT:

The ECM stores the new information during the ROAD TEST.

Tester Menu Flow:



P C115865E01

MONITOR DRIVE PATTERN

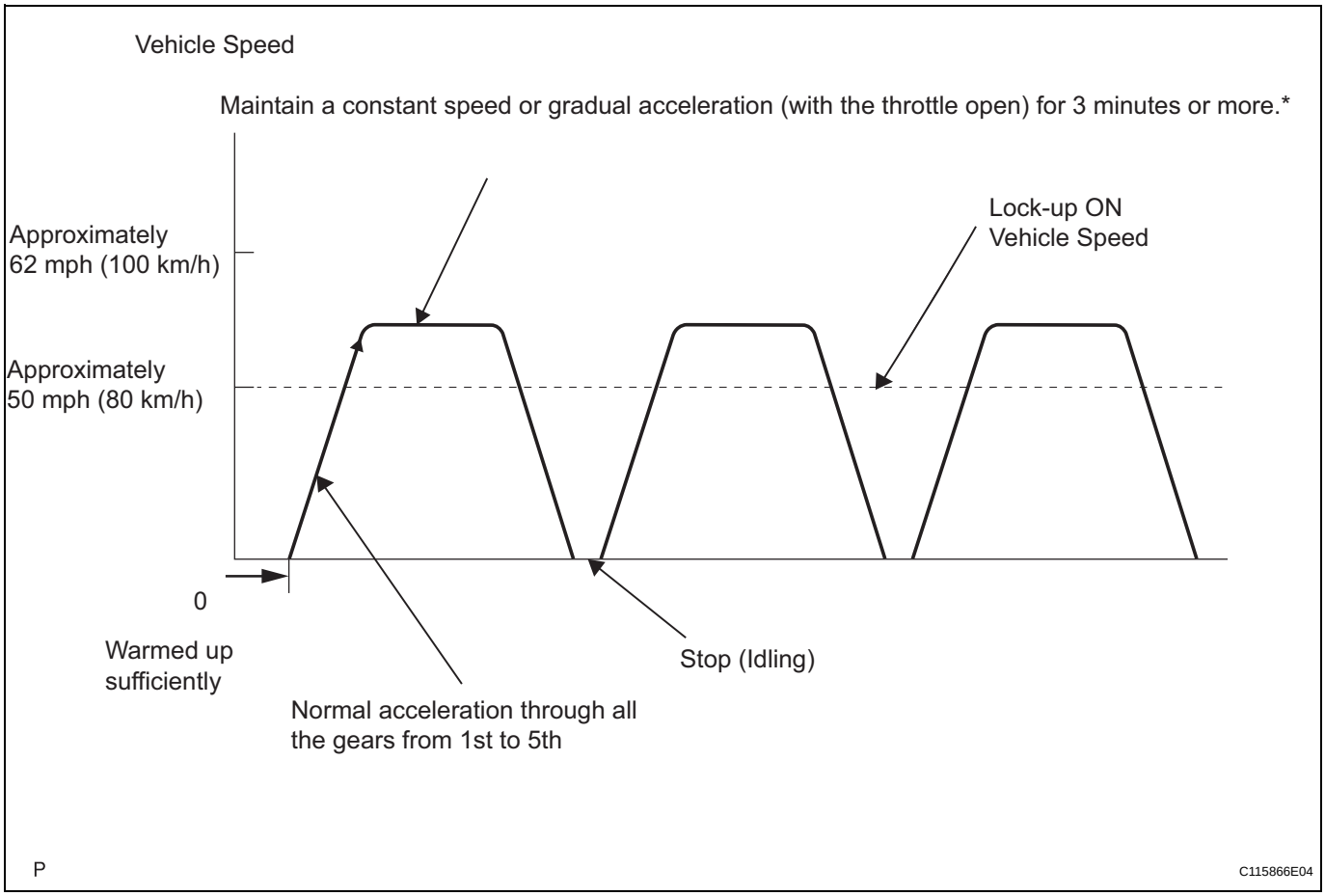
1. MONITOR DRIVE PATTERN FOR ECT TEST

(a) Perform this drive pattern as one method to simulate the detection conditions of the ECT (Electronic Controlled Automatic Transmission) malfunctions.
(The DTCs may not be detected due to the actual driving conditions. And some DTCs may not be detected through this drive pattern.)
HINT:
Preparation for driving
- Warm up the engine sufficiently. (Engine coolant temperature should be 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))

Notice in driving
- Drive the vehicle through all gears. Stop → 1st → 2nd → 3rd → 4th → 5th → 5th (lock-up ON).
- Repeat the above driving pattern three times or more.

NOTICE:
- **The monitor status can be checked using the 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.**

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



HINT:
*: Drive at such a speed in the uppermost gear, as 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:
It is necessary to drive the vehicle for approximately 30 minutes to detect DTC P0711 (ATF temperature sensor malfunction).

PROBLEM SYMPTOMS TABLE

HINT:
If no DTCs are 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.

1. **Chapter 1: Electronic Circuit Matrix Chart**
   - Refer to the table below when the cause of trouble is considered to be electrical.
   - If the trouble still occurs even though there are no abnormalities in any of the other circuits, check and replace the ECM.

   HINT:
   *1: Denotes that when there are malfunctions in the circuit, DTCs may be set.

Symptom	Suspected area	See page
No up-shift (A particular gear, from 1st to 4th gear, is not up-shifted)	1. Shift solenoid valve (S1) circuit *1	AT-100
	2. Shift solenoid valve (S2) circuit *1	AT-103
	3. ECM	IN-34
No up-shift (4th -> 5th)	1. Transmission control switch circuit (D - 4) *1	AT-43
	2. Engine coolant temperature sensor circuit *1	ES-104
	3. Speed sensor NT circuit *1	AT-57
	4. Shift solenoid valve (SL1) circuit *1	AT-66
	5. Shift solenoid valve (SL2) circuit *1	AT-91
	6. Shift solenoid valve (SR) circuit *1	AT-106
	7. ECM	IN-34
No up-shift (3rd -> 4th)	1. Engine coolant temperature sensor circuit *1	ES-104
	2. Shift solenoid valve (S2) circuit *1	AT-103
	3. ECM	IN-34
No up-shift (1st -> 2nd)	1. Transmission control switch circuit (2 - L) *1	AT-43
	2. Shift solenoid valve (S2) circuit *1	AT-103
	3. ECM	IN-34
No down-shift (5th -> 4th)	1. Transmission control switch circuit (D - 4) *1	AT-43
	2. Shift solenoid valve (SL1) circuit *1	AT-66
	3. Shift solenoid valve (SL2) circuit *1	AT-91
	4. Shift solenoid valve (SR) circuit *1	AT-106
	5. ECM	IN-34
No down-shift (2nd -> 1st)	1. Transmission control switch circuit (2 - L) *1	AT-43
	2. Shift solenoid valve (S2) circuit *1	AT-103
	3. ECM	IN-34
No down-shift (A particular gear, from 1st to 4th gear, is not down-shifted)	1. Shift solenoid valve (S1) circuit *1	AT-100
	2. Shift solenoid valve (S2) circuit *1	AT-103
	3. ECM	IN-34

Symptom	Suspected area	See page
No lock-up	1. ATF temperature sensor circuit *1	AT-49
	2. Stop light switch circuit *1	ES-272
	3. Speed sensor NT circuit *1	AT-57
	4. Shift solenoid valve (SLU) circuit *1	AT-131
	5. Engine coolant temperature sensor circuit *1	ES-104
	6. ECM	IN-34
No lock-up off	1. Shift solenoid valve (SLU) circuit *1	AT-131
	2. ECM	IN-34
Shift point too high or too low	1. Shift solenoid valve (SLT) circuit *1	AT-117
	2. Speed sensor NT circuit *1	AT-57
	3. Speed sensor SP2 circuit *1	AT-62
	4. Throttle position sensor circuit *1	ES-112
	5. ATF temperature sensor circuit *1	AT-49
	6. ECM	IN-34
Up-shift from 4th to 5th while shift lever is in 4 position	1. Transmission control switch circuit (D - 4) *1	AT-43
	2. ECM	IN-34
Up-shift from 4th to 5th while engine is cold	1. Engine coolant temperature sensor circuit *1	ES-104
	2. ECM	IN-34
Up-shift from 3rd to 4th while shift lever is in 3 position	1. Park/neutral position switch circuit *1	AT-43
	2. ECM	IN-34
Up-shift from 2nd to 3rd while shift lever is in 2 position	1. Park/neutral position switch circuit *1	AT-43
	2. ECM	IN-34
Up-shift from 1st to 2nd while shift lever is in L position	1. Transmission control switch circuit (2 - L) *1	AT-43
	2. ECM	IN-34
Harsh engagement (N -> D)	1. Speed sensor NT circuit *1	AT-57
	2. Shift solenoid valve (SL1) circuit *1	AT-66
	3. Shift solenoid valve (SLT) circuit *1	AT-117
	4. ECM	IN-34
Harsh engagement (Lock-up)	1. Speed sensor NT circuit *1	AT-57
	2. Speed sensor SP2 circuit *1	AT-62
	3. Shift solenoid valve (SLU) circuit *1	AT-131
	4. ECM	IN-34
Harsh engagement (Any driving position)	ECM	IN-34
Poor acceleration	1. No. 2 ATF temperature sensor circuit *1	AT-121
	2. Engine coolant temperature sensor circuit *1	ES-104
	3. Shift solenoid valve (SLT) circuit *1	AT-117
	4. ECM	IN-34
No engine braking	ECM	IN-34
No kick-down	ECM	IN-34
Engine stalls when starting off or stopping	1. Shift solenoid valve (SLU) circuit *1	AT-131
	2. ECM	IN-34
ATF temperature warning light remains on	1. No. 2 ATF temperature sensor circuit *1	AT-121
	2. Engine coolant temperature sensor circuit *1	ES-104
	3. ECM	IN-34
Lock-up at 3rd gear	1. No. 2 ATF temperature sensor circuit *1	AT-121
	2. Engine coolant temperature sensor circuit *1	ES-104
	3. ECM	IN-34

Symptom	Suspected area	See page
Shift point too high	1. No. 2 ATF temperature sensor circuit *1	AT-121
	2. Engine coolant temperature sensor circuit *1	ES-104
	3. ECM	IN-34

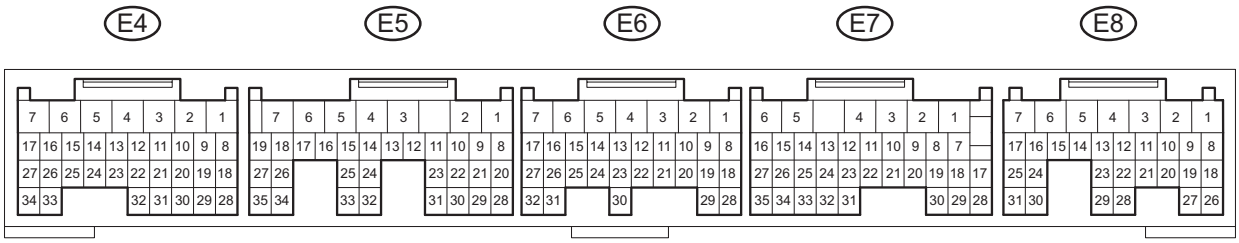
2. Chapter 2: On-Vehicle Repair and Off-Vehicle Repair
(▲: A750E, A750F AUTOMATIC TRANSMISSION Repair Manual Pub. No. RM999U)

Symptom	Suspected area	See page
Vehicle does not move in any forward positions or reverse position	1. Transmission control cable	AT-155
	2. Manual valve	▲
	3. Parking lock pawl	▲
	4. Rear planetary gear unit	▲
	5. Torque converter clutch	AT-166
Vehicle does not move in R position	1. Valve body assembly	AT-144
	2. No. 3 clutch (C3)	▲
	3. No. 4 brake (B4)	▲
	4. No. 1 one-way clutch (F1)	▲
No up-shift (1st -> 2nd)	1. Valve body assembly	AT-144
	2. No. 3 brake (B3)	▲
	3. No. 1 one-way clutch (F1)	▲
	4. No. 2 one-way clutch (F2)	▲
No up-shift (2nd -> 3rd)	1. Valve body assembly	AT-144
	2. No. 3 clutch (C3)	▲
No up-shift (3rd -> 4th)	1. Valve body assembly	AT-144
	2. No. 2 clutch (C2)	▲
No up-shift (4th -> 5th)	1. Valve body assembly	AT-144
	2. No. 1 brake (B1)	▲
	3. No. 1 clutch (C1)	▲
No down-shift (5th -> 4th)	Valve body assembly	AT-144
No down-shift (4th -> 3rd)	Valve body assembly	AT-144
No down-shift (3rd -> 2nd)	Valve body assembly	AT-144
No down-shift (2nd -> 1st)	Valve body assembly	AT-144
No lock-up or No lock-up off	1. Shift solenoid valve (SLU)	AT-126
	2. Valve body assembly	AT-144
	3. Torque converter clutch	AT-166
Harsh engagement (N -> D)	1. Shift solenoid valve (SL1)	AT-81
	2. Valve body assembly	AT-144
	3. C1 accumulator	▲
	4. No. 1 clutch (C1)	▲
	5. No. 3 one-way clutch (F3)	▲
Harsh engagement (Lock-up)	1. Shift solenoid valve (SLU)	AT-126
	2. Valve body assembly	AT-144
	3. Torque converter clutch	AT-166

Symptom	Suspected area	See page
Harsh engagement (N -> R)	1. Shift solenoid valve (SLT)	AT-110
	2. Shift solenoid valve (SLU)	AT-126
	3. Valve body assembly	AT-144
	4. C3 accumulator	▲
	5. No. 3 clutch (C3)	▲
	6. No. 4 brake (B4)	▲
	7. No. 1 one-way clutch (F1)	▲
Harsh engagement (1st -> 2nd -> 3rd -> 4th -> 5th)	1. Shift solenoid valve (SLT)	AT-110
	2. Shift solenoid valve (SL1)	AT-81
	3. Valve body assembly	AT-144
Harsh engagement (1st -> 2nd)	1. Valve body assembly	AT-144
	2. B3 accumulator	▲
	3. No. 3 brake (B3)	▲
	4. No. 1 one-way clutch (F1)	▲
	5. No. 2 one-way clutch (F2)	▲
Harsh engagement (2nd -> 3rd)	1. Valve body assembly	AT-144
	2. C3 accumulator	▲
	3. No. 3 clutch (C3)	▲
Harsh engagement (3rd -> 4th)	1. Valve body assembly	AT-144
	2. C2 accumulator	▲
	3. No. 2 clutch (C2)	▲
Harsh engagement (4th -> 5th)	1. Shift solenoid valve (SL1)	AT-81
	2. Shift solenoid valve (SL2)	AT-86
	3. Valve body assembly	AT-144
	4. No. 1 brake (B1)	▲
	5. No. 1 clutch (C1)	▲
Slippage or shuddering (Forward and reverse: After warm-up)	1. Valve body assembly	AT-144
	2. Oil strainer	AT-144
	3. No. 1 one-way clutch (F1)	▲
	4. No. 3 clutch (C3)	▲
	5. Torque converter clutch	AT-166
Slippage or shuddering (Particular position: Just after engine starts)	Torque converter clutch	AT-166
Slippage or shuddering (R position)	1. No. 4 brake (B4)	▲
	2. No. 1 one-way clutch (F1)	▲
	3. No. 3 clutch (C3)	▲
Slippage or shuddering (1st)	1. No. 1 clutch (C1)	▲
	2. No. 3 one-way clutch (F3)	▲
Slippage or shuddering (2nd)	1. No. 1 clutch (C1)	▲
	2. No. 3 brake (B3)	▲
	3. No. 1 one-way clutch (F1)	▲
	4. No. 2 one-way clutch (F2)	▲

Symptom	Suspected area	See page
Slippage or shuddering (3rd)	1. No. 1 clutch (C1)	▲
	2. No. 3 clutch (C3)	▲
	3. No. 1 one-way clutch (F1)	▲
Slippage or shuddering (4th)	1. No. 1 clutch (C1)	▲
	2. No. 2 clutch (C2)	▲
Slippage or shuddering (5th)	1. No. 2 clutch (C2)	▲
	2. No. 3 clutch (C3)	▲
	3. No. 1 brake (B1)	▲
Engine brake does not work only in 1st to 4th gear at D position	No. 1 clutch (C1)	▲
Engine brake does not work only in 1st gear at L position	1. Valve body assembly	AT-144
	2. No. 4 brake (B4)	▲
Engine brake does not work only in 2nd gear at 2 position	1. Valve body assembly	AT-144
	2. No. 2 brake (B2)	▲
Engine brake does not work only in 3rd gear at 3 position	1. Valve body assembly	AT-144
	2. No. 1 brake (B1)	▲
No kick-down	Valve body assembly	AT-144
Shift point too high or too low	1. Shift solenoid valve (SLT)	AT-110
	2. Shift solenoid valve (SL1)	AT-81
	3. Valve body assembly	AT-144
Poor acceleration (All positions)	1. Shift solenoid valve (SLT)	AT-110
	2. Valve body assembly	AT-144
	3. Torque converter clutch	AT-166
Poor acceleration (5th)	1. No. 1 clutch (C1)	▲
	2. No. 3 clutch (C3)	▲
	3. No. 1 brake (B1)	▲
	4. Front planetary gear unit	▲
Engine stalls when starting off or stopping	1. Shift solenoid valve (SLU)	AT-126
	2. Valve body assembly	AT-144
	3. Torque converter clutch	AT-166

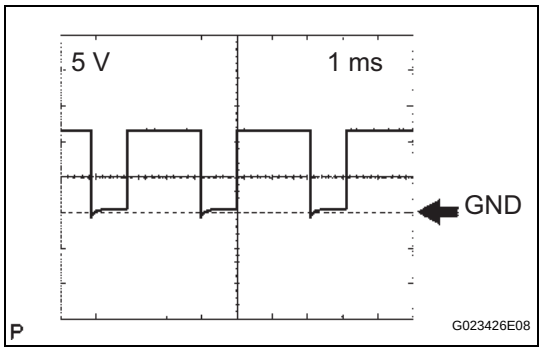
TERMINALS OF ECM



HINT:
The standard voltage of each ECM terminal is shown in the table below.
In the table, first follow the information under "Condition". Look under "Symbols (Terminal No.)" for the terminals to be inspected. The standard voltage between the terminals is shown under "Specified Condition".
Use the illustration above as a reference for the ECM terminals.

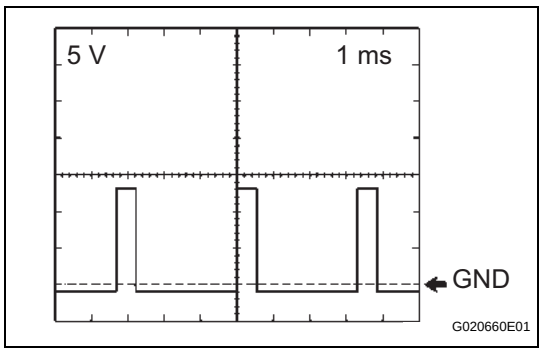
Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
STP (E8-15) - E1 (E6-1)	L - BR	Stop light switch signal	Brake pedal is depressed	7.5 to 14 V
			Brake pedal is released	Below 1.5 V
L (E7-9) - E1 (E6-1)	G-Y - BR	L shift position switch signal	Ignition switch ON and shift lever L position	10 to 14 V
			Ignition switch ON and shift lever other than L position	Below 1 V
2 (E7-10) - E1 (E6-1)	R-Y - BR	2 shift position switch signal	Ignition switch ON and shift lever 2 and L positions	10 to 14 V
			Ignition switch ON and shift lever other than 2 and L positions	Below 1 V
R (E7-11) - E1 (E6-1)	R-W - BR	R shift position switch signal	Ignition switch ON and shift lever R position	10 to 14 V
			Ignition switch ON and shift lever other than R position	Below 1 V
3 (E7-19) - E1 (E6-1)	Y - BR	3 shift position switch signal	Ignition switch ON and shift lever 3 position	10 to 14 V
			Ignition switch ON and shift lever other than 3 position	Below 1 V
4 (E7-20) - E1 (E6-1)	B - BR	4 shift position switch signal	Ignition switch ON and shift lever 4 position	10 to 14 V
			Ignition switch ON and shift lever other than 4 position	Below 1 V
D (E7-21) - E1 (E6-1)	L-B - BR	D shift position switch signal	Ignition switch ON and shift lever D and 4 positions	10 to 14 V
			Ignition switch ON and shift lever other than D and 4 positions	Below 1 V
NSW (E5-8) - E1 (E6-1)	V - BR	Park or neutral shift position switch signal	Ignition switch ON and shift lever P and N positions	Below 2 V
			Ignition switch ON and shift lever other than P and N positions	10 to 14 V

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
SR (E5-9) - E1 (E6-1)	G - BR	SR solenoid signal	5th gear	10 to 14 V
			1st gear	Below 1 V
S2 (E5-10) - E1 (E6-1)	L-W - BR	S2 solenoid signal	2nd or 3rd gear	10 to 14 V
			1st, 4th or 5th gear	Below 1 V
S1 (E5-11) - E1 (E6-1)	W-G - BR	S1 solenoid signal	1st or 2nd gear	10 to 14 V
			3rd, 4th or 5th gear	Below 1 V
SLT+ (E5-13) - SLT- (E5-12)	G-B - R-B	SLT solenoid signal	Engine is idling	Pulse generation (See waveform 1)
SLU+ (E5-15) - SLU- (E5-14)	Y-B - LG	SLU solenoid signal	5th (lock-up) gear	Pulse generation (See waveform 2)
SL2+ (E5-17) - SL2- (E5-16)	W-L - G-R	SL2 solenoid signal	Engine idling speed	Pulse generation (See waveform 3)
SL1+ (E5-19) - SL1- (E5-18)	G-W - P-L	SL1 solenoid signal	Engine idling speed	Pulse generation (See waveform 4)
THO2 (E5-32) - E2 (E4-28)	GR - BR	No. 2 ATF temperature sensor signal	ATF temperature: 115°C (239°F) or more	Below 1.5 V
THO1 (E5-24) - E2 (E4-28)	Y-B - BR	No. 1 ATF temperature sensor signal	ATF temperature: 115°C (239°F) or more	Below 1.5 V
SP2+ (E5-34) - SP2- (E5-26)	L-R - R	Speed sensor (SP2) signal	Vehicle speed 12 mph (20 km/h)	Pulse generation (See waveform 5)
NT+ (E5-35) - NT- (E5-27)	W-R - Y-R	Speed sensor (NT) signal	Engine is idling	Pulse generation (See waveform 6)



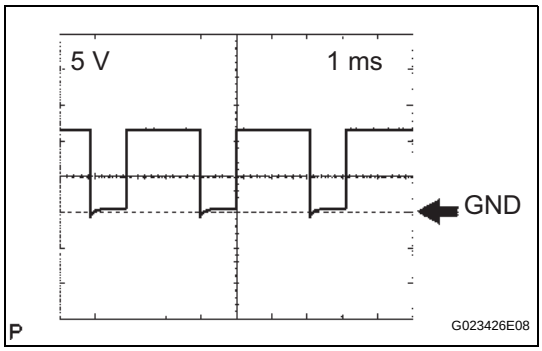
1. Waveform 1

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



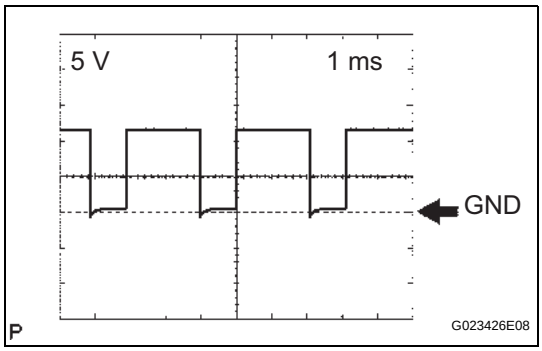
2. Waveform 2

Item	Condition
Terminal	SLU+ - SLU-
Tool setting	5 V/DIV, 1 ms/DIV
Vehicle condition	5th (lock-up) gear



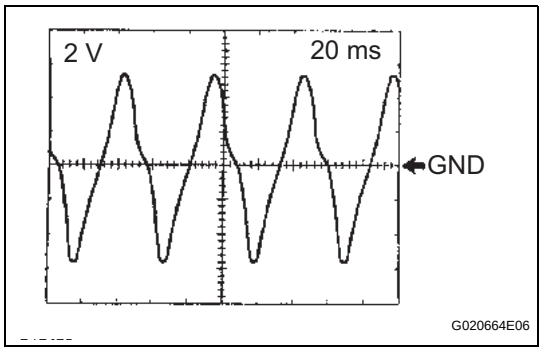
3. Waveform 3

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



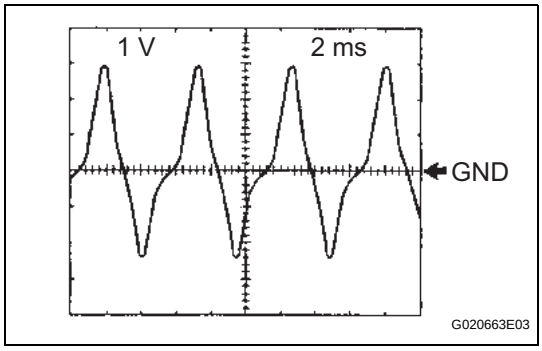
4. Waveform 4

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



5. Waveform 5

Item	Condition
Terminal	SP2+ - SP2-
Tool setting	2 V/DIV, 20 ms/DIV
Vehicle condition	Vehicle speed 12 mph (20 km/h)



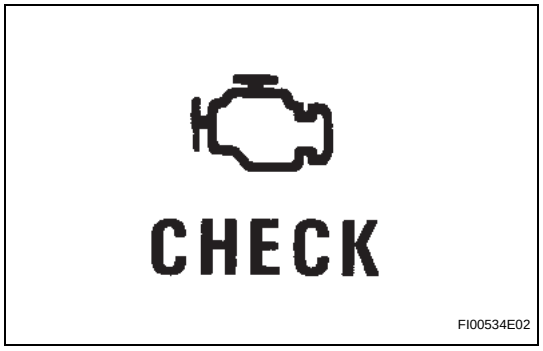
6. Waveform 6

Item	Condition
Terminal	NT+ - NT-
Tool setting	1 V/DIV, 2 ms/DIV
Vehicle condition	Engine idling speed

DIAGNOSIS SYSTEM

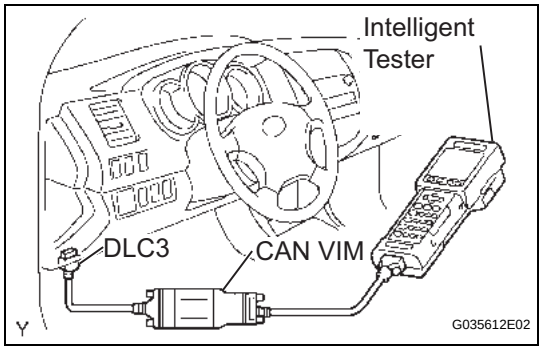
1. DESCRIPTION

(a) When troubleshooting on-Board Diagnostic (OBD II) vehicles, the vehicle must be connected to the intelligent tester (complying with SAE J1987). Various data output from the vehicle's ECM can then be read.



(b) OBD II regulations require that the vehicle's on-board computer illuminate the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in:
1. The emission control system/components
2. The power train control components (which affect vehicle emissions)
3. The computer

In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the ECM memory.
If the malfunction does not reoccur in 3 consecutive trips, the MIL turns off automatically but the DTCs remain recorded in the ECM memory.



(c) To check DTCs, connect the intelligent tester to the Data Link Connector 3 (DLC3) of the vehicle. The intelligent tester displays DTCs, the freeze frame data and a variety of the engine data.
The DTCs and freeze frame data can be erased with the intelligent tester (See page AT-30).

(d) In order to enhance OBD function on vehicles and develop the Off-Board diagnosis system, CAN communication has been introduced in this system (CAN: Controller Area Network). It minimizes the gap between technician skills and vehicle technology. CAN is a network, which uses a pair of data transmission lines, spanning multiple computers and sensors. It allows high speed communication between the systems and simplification of the wire harness connection. Since this system is equipped with CAN communication, CAN VIM (VIM: Vehicle Interface Module) connecting with intelligent tester is necessary to display any information from the ECM on the tester. (Also communication between the intelligent tester and the ECM uses a CAN communication signal.) When confirming DTCs and any data of the ECM, connect the CAN VIM between the DLC3 and the intelligent tester.

2. NORMAL MODE AND CHECK MODE

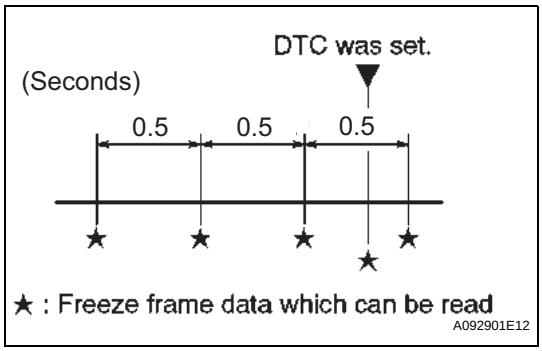
(a) The diagnosis system operates in "normal mode" during normal vehicle use. In normal mode, "2 trip detection logic" is used to ensure accurate detection of malfunctions. "Check mode" is also available to technicians as an option. In check mode, "1 trip detection logic" is used for simulating malfunction symptoms and increasing the system's ability to detect malfunctions, including intermittent malfunctions.

3. 2 TRIP DETECTION LOGIC

(a) When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory (1st trip). If the ignition switch is turned OFF and then ON again, and the same malfunction is detected again, the MIL will illuminate.

4. FREEZE FRAME DATA

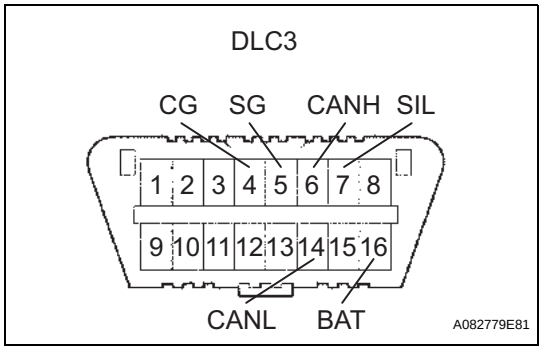
(a) Freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was Lean or Rich, and other data from the time the malfunction occurred.



(b) The ECM records engine conditions in the form of freeze frame data every 0.5 seconds. Using the intelligent tester, five separate sets of freeze frame data, including the data values at the time when the DTC was set, can be checked.
- 3 data sets before the DTC was set
- 1 data set when the DTC was set
- 1 data set after the DTC was set

These data sets can be used to simulate the condition of the vehicle around the time the occurrence of the malfunction. The data may assist in identifying of the cause of the malfunction, and in judging whether it was temporary or not.

5. DATA LINK CONNECTOR 3 (DLC3)



(a) The vehicle's ECM uses the ISO 15765-4 communication protocol. The terminal arrangement of the DLC3 complies with SAE J1962 and matches the ISO 15765-4 format.
HINT:
Connect the cable of the intelligent tester to the DLC3, turn the ignition switch ON and attempt to use the intelligent tester. If the screen displays UNABLE TO CONNECT TO VEHICLE, a problem exists in the vehicle side or the tester side.

If the communication is normal when the tester is connected to another vehicle, inspect the DLC3 on the original vehicle.
If the communication is still impossible when the tester is connected to another vehicle, the problem is probably in the tester itself. Consult the Service Department listed in the tester's instruction manual.

Symbol	Terminal No.	Name	Reference terminal	Result	Condition
SIL	7	Bus "+" line	5 - SG	Pulse generation	During transmission
CG	4	Chassis ground	Body ground	Below 1 Ω	Always
SG	5	Signal ground	Body ground	Below 1 Ω	Always
BAT	16	Battery positive	Body ground	11 to 14 V	Always
CANH	6	HIGH-level CAN bus line	14 - CANL	54 to 69 Ω	Ignition switch OFF
			Battery positive	1 MΩ or higher	Ignition switch OFF
			4 - CG	1 kΩ or higher	Ignition switch OFF
CANL	14	LOW-level CAN bus line	Battery positive	1 MΩ or higher	Ignition switch OFF
			4 - CG	1 kΩ or higher	Ignition switch OFF

6. CHECK BATTERY VOLTAGE

Battery voltage:

11 to 14 V

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

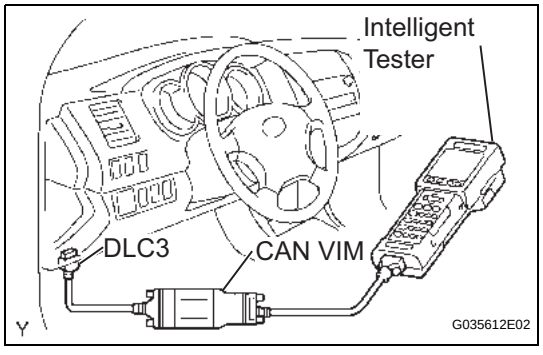
7. CHECK MIL

(a) Check that the MIL illuminates when turning the ignition switch ON.
If the MIL does not illuminate, there is a problem in the MIL circuit (See page ES-402).

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

8. ALL READINESS

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



DTC CHECK / CLEAR

1. CHECK DTC

DTCs which are stored in the ECM can be displayed with the intelligent tester.
The tester can display pending DTCs and current DTCs. Some DTC aren't stored if the ECM doesn't detect a malfunction during consecutive driving cycles. However, malfunctions detected during a single driving cycle are stored as pending DTCs.

(a) Connect the intelligent tester to the Controller Area Network Vehicle Interface Module (CAN VIM). Then connect the CAN VIM to the Data Link Connector 3 (DLC3).

(b) Turn the ignition switch to the ON position.

(c) Enter the following menus: DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES (or PENDING CODE).

If the communication is normal when the tester is connected to another vehicle, inspect the DLC3 on the original vehicle.
If the communication is still impossible when the tester is connected to another vehicle, the problem is probably in the tester itself. Consult the Service Department listed in the tester's instruction manual.

Symbol	Terminal No.	Name	Reference terminal	Result	Condition
SIL	7	Bus "+" line	5 - SG	Pulse generation	During transmission
CG	4	Chassis ground	Body ground	Below 1 Ω	Always
SG	5	Signal ground	Body ground	Below 1 Ω	Always
BAT	16	Battery positive	Body ground	11 to 14 V	Always
CANH	6	HIGH-level CAN bus line	14 - CANL	54 to 69 Ω	Ignition switch OFF
			Battery positive	1 MΩ or higher	Ignition switch OFF
			4 - CG	1 kΩ or higher	Ignition switch OFF
CANL	14	LOW-level CAN bus line	Battery positive	1 MΩ or higher	Ignition switch OFF
			4 - CG	1 kΩ or higher	Ignition switch OFF

6. CHECK BATTERY VOLTAGE

Battery voltage:

11 to 14 V

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

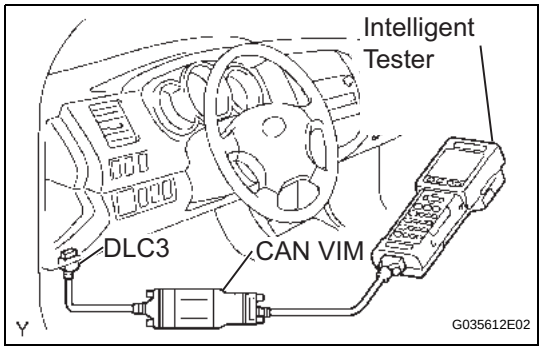
7. CHECK MIL

(a) Check that the MIL illuminates when turning the ignition switch ON.
If the MIL does not illuminate, there is a problem in the MIL circuit (See page ES-402).

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

8. ALL READINESS

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



DTC CHECK / CLEAR

1. CHECK DTC

DTCs which are stored in the ECM can be displayed with the intelligent tester.
The tester can display pending DTCs and current DTCs. Some DTC aren't stored if the ECM doesn't detect a malfunction during consecutive driving cycles. However, malfunctions detected during a single driving cycle are stored as pending DTCs.

(a) Connect the intelligent tester to the Controller Area Network Vehicle Interface Module (CAN VIM). Then connect the CAN VIM to the Data Link Connector 3 (DLC3).

(b) Turn the ignition switch to the ON position.

(c) Enter the following menus: DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES (or PENDING CODE).

(d) Confirm the DTCs and freeze frame data and then write them down.
(e) Confirm the details of the DTCs (See page AT-38).

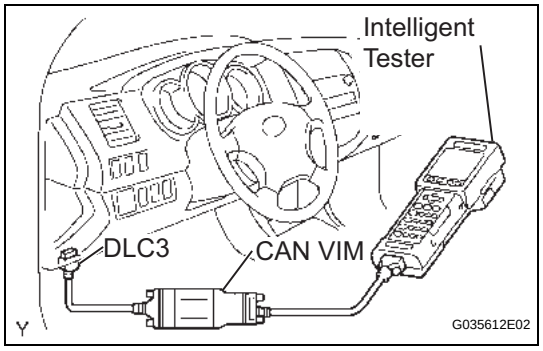
2. CLEAR DTC

(a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
(b) Turn the ignition switch to the ON position.
(c) Enter the following menus: DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CLEAR CODES and press YES.

CHECK MODE PROCEDURE

1. DESCRIPTION

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



2. CHECK MODE PROCEDURE

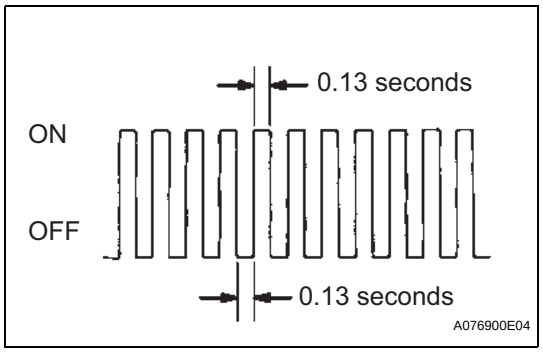
(a) Ensure the following conditions:
  (1) Battery positive voltage 11 V or more
  (2) Throttle valve fully closed
  (3) Transmission in the P or N position
  (4) A/C switched off

(b) Turn the ignition switch off.

(c) Connect the intelligent tester together with the Controller Area Network Vehicle Interface Module (CAN VIM) to the DLC3.

(d) Turn the ignition switch to the ON position.

(e) Enter the following menus: DIAGNOSIS/ ENHANCED OBD II/ CHECK MODE.



(f) Change the ECM to check mode. Make sure the MIL flashes as shown in the illustration.

NOTICE:

All recorded DTCs and freeze frame data will be erased if: 1) the intelligent tester is used to change the ECM from normal mode to check mode or vice-versa; or 2) during check mode, the ignition switch is turned from ON to ACC or LOCK.

Before entering check mode, make notes of the DTCs and freeze frame data.

(g) Start the engine. The MIL should turn off after the engine starts.

(h) Perform "MONITOR DRIVE PATTERN" for the ECT test (See page AT-19).
 (Or, simulate the conditions of the malfunction described by the customer).

(i) After simulating the malfunction conditions, use the intelligent tester diagnosis selector to check the DTC and freeze frame data.

FAIL-SAFE CHART

1. FAIL-SAFE CHART

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

Malfunction Part	Function
DTC P0710, P0712 and P0713: No. 1 ATF Temperature Sensor	During a No. 1 ATF temperature sensor malfunction, up-shift to the 5th gear and flex lock-up clutch control are prohibited.
DTC P0722: Output Speed Sensor (SP2)	During an output speed sensor malfunction, shift control is effected through the input speed sensor signal (NT).
DTC P0751, P0756, P0771, P0973, P0974, P0976, P0977, P0985 and P0986: Shift Solenoid Valve S1, S2 and SR	The current to the failed solenoid valve is cut off and control is effected by operating the other solenoid valves with normal operation. Shift control is effected depending on the failed solenoid as described in the table below.
DTC P0748, P0776 and P0778: Shift Solenoid Valve SL1 and SL2	During a solenoid valve SL1 or SL2 malfunction, up-shift to the 5th gear is prohibited.
DTC P02714 and P2716: Shift Solenoid Valve SLT	During a solenoid valve SLT malfunction, the current to the solenoid valve is stopped. This stops line pressure optimal control, and shift shock increases. However, shifting is effected through normal clutch pressure control.
DTC P2757: Shift Solenoid Valve SLU	During a solenoid valve SLU malfunction, the current to the solenoid valve is stopped. This stops lock-up control and flex lock-up control, and fuel economy decreases.

Fail-safe function:

If either of the shift solenoid valve circuits has an open or short failure, the ECM turns the other shift solenoid ON and OFF in order to shift into the gear positions shown in the table below.

In case of a short circuit, the ECM stops sending current to the short circuit solenoid.

Even if starting the engine again in the fail-safe mode, the gear position remains in the same position.

Position	NORMAL						S1 OFF					
	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2
R	R	ON	OFF	OFF	OFF	ON	R	OFF	OFF	OFF	OFF	ON
D	1st	ON	OFF	OFF	OFF	ON	4th ↓ 3rd	OFF	OFF ↓ ON	OFF	OFF	ON
	2nd	ON	ON	OFF	OFF	ON	3rd	OFF	ON	OFF	OFF	ON
	3rd	OFF	ON	OFF	OFF	ON	3rd	OFF	ON	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON	4th	OFF	OFF	OFF	OFF	ON
	5th	OFF	OFF	ON	ON	OFF	5th	OFF	OFF	ON	ON	OFF
3	1st	ON	OFF	OFF	OFF	ON	3rd ↓ 3rd E/B	OFF	OFF ↓ ON	OFF	OFF	ON ↓ OFF
	2nd	ON	ON	OFF	OFF	ON	3rd ↓ 3rd E/B	OFF	ON	OFF	OFF	ON ↓ OFF
	3rd E/B	OFF	ON	OFF	OFF	OFF	3rd E/B	OFF	ON	OFF	OFF	OFF
	4th	OFF	OFF	ON	OFF	ON	4th	OFF	OFF	ON	OFF	ON
	5th	OFF	OFF	ON	ON	OFF	5th	OFF	OFF	ON	ON	OFF
2	1st	ON	OFF	OFF	OFF	ON	1st	OFF	OFF	OFF	OFF	ON
	2nd E/B	ON	ON	ON	OFF	OFF	3rd E/B	OFF	ON	ON	OFF	OFF
	3rd E/B	OFF	ON	ON	OFF	OFF	3rd E/B	OFF	ON	ON	OFF	OFF
	4th	OFF	OFF	ON	OFF	ON	4th	OFF	OFF	ON	OFF	ON
	5th	OFF	OFF	ON	ON	OFF	5th	OFF	OFF	ON	ON	OFF

Position	NORMAL						S1 OFF					
	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2
L	1st E/B	ON	OFF	OFF	OFF	OFF	1st E/B	OFF	OFF	OFF	OFF	OFF
	2nd E/B	ON	ON	ON	OFF	OFF	3rd E/B	OFF	ON	ON	OFF	OFF
	3rd E/B	OFF	ON	ON	OFF	OFF	3rd E/B	OFF	ON	ON	OFF	OFF
	4th	OFF	OFF	ON	OFF	ON	4th	OFF	OFF	ON	OFF	ON
	5th	OFF	OFF	ON	ON	OFF	5th	OFF	OFF	ON	ON	OFF

Position	S2 OFF						SR OFF					
	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2
R	R	ON	OFF	OFF	OFF	ON	R	ON	OFF	OFF	OFF	ON
D	1st	ON	OFF	OFF	OFF	ON	1st	ON	OFF	OFF	OFF	ON
	1st ↓ 4th	ON ↓ OFF	OFF	OFF	OFF	ON	2nd	ON	ON	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON	3rd	OFF	ON	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON	4th	OFF	OFF	OFF	OFF	ON
	5th	OFF	OFF	ON	ON	OFF	4th	OFF	OFF	OFF	ON	OFF
3	1st	ON	OFF	OFF	OFF	ON	1st	ON	OFF	OFF	OFF	ON
	1st ↓ 3rd E/B	ON ↓ OFF	OFF	OFF	OFF	ON ↓ OFF	2nd	ON	ON	OFF	OFF	ON
	3rd E/B	OFF	OFF	OFF	OFF	OFF	3rd E/B ↓ 3rd	OFF	ON	OFF	OFF	OFF ↓ ON
	4th	OFF	OFF	ON	OFF	ON	3rd	OFF	OFF ↓ ON	OFF	OFF	ON ↓ ON
	5th	OFF	OFF	ON	ON	OFF	3rd E/B ↓ 3rd	OFF	OFF ↓ ON	OFF	ON ↓ OFF	OFF ↓ ON
2	1st	ON	OFF	OFF	OFF	ON	1st	ON	OFF	OFF	OFF	ON
	2nd E/B ↓ 4th	ON ↓ OFF	OFF	ON	OFF	OFF ↓ ON	2nd	ON	ON	OFF	OFF	OFF
	Fail 4th	OFF	OFF	ON	OFF	OFF ↓ ON	2nd	OFF ↓ ON	ON	OFF	OFF	OFF
	4th	OFF	OFF	ON	OFF	ON	1st ↓ 2nd	OFF ↓ ON	OFF ↓ ON	OFF	OFF	ON ↓ OFF
	5th	OFF	OFF	ON	ON	OFF	1st E/B ↓ 2nd	OFF ↓ ON	ON	OFF	ON ↓ OFF	OFF
L	1st E/B	ON	OFF	OFF	OFF	OFF	1st E/B	ON	OFF	OFF	OFF	OFF
	2nd E/B ↓ 4th	ON ↓ OFF	OFF	ON	OFF	OFF ↓ ON	2nd	ON	ON	OFF	OFF	OFF
	Fail 4th	OFF	OFF	ON	OFF	OFF ↓ ON	2nd	OFF ↓ ON	ON	OFF	OFF	OFF
	4th	OFF	OFF	ON	OFF	ON	1st ↓ 2nd	OFF ↓ ON	OFF ↓ ON	OFF	OFF	ON ↓ OFF
	5th	OFF	OFF	ON	ON	OFF	1st E/B ↓ 2nd	OFF ↓ ON	OFF ↓ ON	OFF	ON ↓ OFF	OFF

Position	S1 S2 OFF						S2 SR OFF					
	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2
R	R	OFF	OFF	OFF	OFF	ON	R	ON	OFF	OFF	OFF	ON
D	4th	OFF	OFF	OFF	OFF	ON	1st	ON	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON	1st ↓ 4th	ON ↓ OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON	4th	OFF	OFF	OFF	OFF	ON
	5th	OFF	OFF	ON	ON	OFF	4th	OFF	OFF	OFF	ON ↓ OFF	OFF ↓ ON
3	3rd ↓ 3rd E/B	OFF	OFF	OFF	OFF	ON ↓ OFF	1st	ON	OFF	OFF	OFF	ON
	3rd ↓ 3rd E/B	OFF	OFF	OFF	OFF	ON ↓ OFF	1st ↓ 3rd	ON ↓ OFF	OFF	OFF	OFF	ON ↓ ON
	3rd E/B	OFF	OFF	OFF	OFF	OFF	3rd E/B ↓ 3rd	OFF	OFF	OFF	OFF	OFF ↓ ON
	4th	OFF	OFF	ON	OFF	ON	3rd	OFF	OFF	OFF	OFF	ON ↓ ON
	5th	OFF	OFF	ON	ON	OFF	1st E/B ↓ 3rd	OFF	OFF	OFF	ON ↓ OFF	OFF ↓ ON
2	1st	OFF	OFF	OFF	OFF	ON	1st	ON	OFF	OFF	OFF	ON
	Fail 4th	OFF	OFF	ON	OFF	OFF ↓ ON	1st E/B ↓ 1st	ON	OFF	OFF	OFF	OFF ↓ ON
	Fail 4th	OFF	OFF	ON	OFF	OFF ↓ ON	1st E/B ↓ 1st	OFF ↓ ON	OFF	OFF	OFF	OFF ↓ ON
	4th	OFF	OFF	ON	OFF	ON	1st	OFF ↓ ON	OFF	OFF	OFF	ON
	5th	OFF	OFF	ON	ON	OFF	1st E/B ↓ 1st	OFF ↓ ON	OFF	OFF	ON ↓ OFF	OFF ↓ ON
L	1st E/B	OFF	OFF	OFF	OFF	OFF	1st E/B	ON	OFF	OFF	OFF	OFF
	Fail 4th	OFF	OFF	ON	OFF	OFF ↓ ON	1st E/B ↓ 1st	ON	OFF	OFF	OFF	OFF ↓ ON
	Fail 4th	OFF	OFF	ON	OFF	OFF ↓ ON	1st E/B ↓ 1st	OFF ↓ ON	OFF	OFF	OFF	OFF ↓ ON
	4th	OFF	OFF	ON	OFF	ON	1st	OFF ↓ ON	OFF	OFF	OFF	ON
	5th	OFF	OFF	ON	ON	OFF	1st E/B ↓ 1st	OFF ↓ ON	OFF	OFF	ON ↓ OFF	OFF ↓ ON

Position	S1 SR OFF						S1 S2 SR OFF					
	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2
R	R	OFF	OFF	OFF	OFF	ON	R	OFF	OFF	OFF	OFF	ON

Position	S1 SR OFF						S1 S2 SR OFF					
	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2
D	4th ↓ 3rd	OFF	OFF ↓ ON	OFF	OFF	ON	4th	OFF	OFF	OFF	OFF	ON
	3rd	OFF	ON	OFF	OFF	ON	4th	OFF	OFF	OFF	OFF	ON
	3rd	OFF	ON	OFF	OFF	ON	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	ON ↓ OFF	OFF ↓ ON	4th	OFF	OFF	OFF	ON ↓ OFF	OFF ↓ ON
3	3rd	OFF	OFF ↓ ON	OFF	OFF	ON ↓ ON	3rd	OFF	OFF	OFF	OFF	ON ↓ ON
	3rd	OFF	ON	OFF	OFF	ON ↓ ON	3rd	OFF	OFF	OFF	OFF	ON ↓ ON
	3rd E/B ↓ 3rd	OFF	ON	OFF	OFF	OFF ↓ ON	3rd E/B ↓ 3rd	OFF	OFF	OFF	OFF	OFF ↓ ON
	3rd	OFF	OFF ↓ ON	OFF	OFF	ON ↓ ON	3rd	OFF	OFF	OFF	OFF	ON ↓ ON
	3rd E/B ↓ 3rd	OFF	OFF ↓ ON	OFF	ON ↓ OFF	OFF ↓ ON	3rd E/B ↓ 3rd	OFF	OFF	OFF	ON ↓ OFF	OFF ↓ ON
2	1st	OFF	OFF	OFF	OFF	ON	1st	OFF	OFF	OFF	OFF	ON
	2nd	OFF	ON	OFF	OFF	OFF	1st E/B ↓ 1st	OFF	OFF	OFF	OFF	OFF ↓ ON
	2nd	OFF	ON	OFF	OFF	OFF	1st E/B ↓ 1st	OFF	OFF	OFF	OFF	OFF ↓ ON
	1st ↓ 2nd	OFF	OFF ↓ ON	OFF	OFF	ON ↓ OFF	1st	OFF	OFF	OFF	OFF	ON
	1st E/B ↓ 2nd	OFF	OFF ↓ ON	OFF	ON ↓ OFF	OFF	1st E/B ↓ 1st	OFF	OFF	OFF	ON ↓ OFF	OFF ↓ ON
L	1st E/B	OFF	OFF	OFF	OFF	OFF	1st E/B	OFF	OFF	OFF	OFF	OFF
	2nd	OFF	ON	OFF	OFF	OFF	1st E/B ↓ 1st	OFF	OFF	OFF	OFF	OFF ↓ ON
	2nd	OFF	ON	OFF	OFF	OFF	1st E/B ↓ 1st	OFF	OFF	OFF	OFF	OFF ↓ ON
	1st ↓ 2nd	OFF	OFF ↓ ON	OFF	OFF	ON ↓ OFF	1st	OFF	OFF	OFF	OFF	ON
	1st E/B ↓ 2nd	OFF	OFF ↓ ON	OFF	ON ↓ OFF	OFF	1st E/B ↓ 1st	OFF	OFF	OFF	ON ↓ OFF	OFF ↓ ON

HINT:

- ↓: Condition in the electrical malfunction is shown above "↓".
- ↓: Condition in the fail-safe mode is shown below "↓".
- E/B: Engine brake.

AT

DATA LIST / ACTIVE TEST

1. DATA LIST

HINT:

According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.

NOTICE:

In the table below, the values listed under "Normal Condition" are for reference only. Do not depend solely on these reference values when judging 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) Push the "ON" button of the tester.

(f) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST/ A/T".

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

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
SPD (SP2)	Counter Gear Speed / min.: 0 mph (0 km/h) max.: 158 mph (255 km/h)	Vehicle stopped: 0 mph (0 km/h)	-
SPD (NT)	Input Turbine Speed/ display: 50 rpm	[HINT] • Lock-up ON (After warming up the engine); Input turbine speed (NT) equal to the engine speed. • Lock-up OFF (Idling in N position); Input turbine speed (NT) nearly equal to the engine speed.	-
PNP SW [NSW]	PNP Switch Status/ ON or OFF	Shift lever position is; P or 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. HINT: When the failure still occurs even after adjusting these parts. (See page AT-142)
STOP LIGHT SW	Stop Light Switch Status/ ON or OFF	• Brake Pedal is depressed: ON • Brake Pedal is released: OFF	-
SHIFT	ECM gear shift command/ 1st, 2nd, 3rd, 4th or 5th	Shift Lever Position is; • L: 1st • 2: 1st or 2nd • 3: 1st, 2nd or 3rd • 4: 1st, 2nd, 3rd or 4th • D: 1st, 2nd, 3rd, 4th or 5th	-
REVERSE	PNP Switch Status/ ON or OFF	Shift lever position is; R: ON Except R: OFF	Same as PNP SW [NSW]

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
DRIVE	PNP Switch Status/ ON or OFF	Shift lever position is; D and 4: ON Except D and 4: OFF	Same as PNP SW [NSW]
4th/DRIVE	PNP Switch Status/ ON or OFF	Shift lever position is; 4: ON Except 4: OFF	Same as PNP SW [NSW]
3RD	PNP Switch Status/ ON or OFF	Shift lever position is; 3: ON Except 3: OFF	Same as PNP SW [NSW]
2ND	PNP Switch Status/ ON or OFF	Shift lever position is; 2 and L: ON Except 2 and L: OFF	Same as PNP SW [NSW]
LOW	PNP Switch Status/ ON or OFF	Shift lever position is; L: ON Except L: OFF	Same as PNP SW [NSW]
AT OIL TEMP1	No. 1 ATF Temperature Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	• After Stall Test; Approximately 80°C (176°F) • Equal to ambient temperature during cold soak	If the value is "-40°C (-40°F)" or "150°C (302°F) or more", No. 1 ATF temperature sensor circuit is open or short.
AT OIL TEMP2	No. 2 ATF Temperature Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	• After Stall Test; Approximately 80°C (176°F) • Equal to ambient temperature during cold soak	If the value is "-40°C (-40°F)" or "150°C (302°F) or more", No. 2 ATF temperature sensor circuit is open or short.
LOCK UP SOL	Lock Up Solenoid Status/ ON or OFF	• Lock Up: ON • Except Lock Up: OFF	-
SOLENOID (SLU)	Shift Solenoid SLU Status/ ON or OFF	• Lock Up: ON • Except Lock Up: OFF	-
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	IG SW ON: ON	-

2. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening 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 tester.
(f) Select the items "DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST".

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

Item	Test Details	Diagnostic Note
LINE PRESS UP *	[Test Details] Operate the shift solenoid SLT to 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)	-
LOCK UP	[Test Details] Control the shift solenoid SLU to set the automatic transmission to the lock-up condition. [Vehicle Condition] Vehicle Speed: 36 mph (60 km/h) or more	Possible to check the SLU operation.
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position manually. [Vehicle Condition] Vehicle Speed: Less than 30 mph (50 km/h) [Others] • Press →button: Shift up • Press ←button: Shift down	Possible to check the operation of the shift solenoid valves. HINT: Shifting to the 5th gear is possible only when the vehicle is stationary with the engine idling.

*: "LINE PRESS UP" in the ACTIVE TEST is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the HYDRAULIC TEST (See page AT-16) as well.
HINT:
The pressure values in ACTIVE TEST and HYDRAULIC TEST are different from each other.

DIAGNOSTIC TROUBLE CODE CHART

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

- *1: "Comes on" means that the MIL will illuminate.
- *2: "DTC stored" means that the ECM memorizes the malfunction code if the DTC detection condition(s) are met.
- These DTCs may be output when the clutch, brake and gear components, etc., inside the automatic transmission are damaged.

DTC No.	Detection Item	Trouble Areas	MIL *1	Memory *2	See page
P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	- Open or short in park/neutral position switch circuit - Park/neutral position switch - ECM	Comes on	DTC stored	AT-43
P0710	Transmission Fluid Temperature Sensor "A" Circuit	- Open or short in No. 1 ATF temperature sensor circuit - Transmission wire (No. 1 ATF temperature sensor) - ECM	Comes on	DTC stored	AT-49
P0711	Transmission Fluid Temperature Sensor "A" Performance	- Transmission wire (No. 1 ATF temperature sensor) - ECM	Comes on	DTC stored	AT-54
P0712	Transmission Fluid Temperature Sensor "A" Circuit Low Input	- Short in No. 1 ATF temperature sensor circuit - Transmission wire (No. 1 ATF temperature sensor) - ECM	Comes on	DTC stored	AT-49
P0713	Transmission Fluid Temperature Sensor "A" Circuit High Input	- Open in No. 1 ATF temperature sensor circuit - Transmission wire (No. 1 ATF temperature sensor) - ECM	Comes on	DTC stored	AT-49
P0717	Input Speed Sensor Circuit No Signal	- Open or short in speed sensor (NT) circuit - Speed sensor (NT) - ECM	Comes on	DTC stored	AT-57
P0722	Output Speed Sensor Circuit No Signal	- Open or short in speed sensor (SP2) circuit - Speed sensor (SP2) - ECM	Comes on	DTC stored	AT-62
P0748	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	- Open or short in shift solenoid valve SL1 circuit - Shift solenoid valve SL1 - ECM	Comes on	DTC stored	AT-66

DTC No.	Detection Item	Trouble Areas	MIL *1	Memory *2	See page
P0751	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)	- Shift solenoid valve S1 remains open or closed - Shift solenoid valve SLT remains open or closed - Valve body is blocked - Automatic transmission (clutch, brake or gear, etc.)	Comes on	DTC stored	AT-69
P0756	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)	- Shift solenoid valve S2 remains open or closed - Shift solenoid valve SLT remains open or closed - Valve body is blocked - Automatic transmission (clutch, brake or gear, etc.)	Comes on	DTC stored	AT-75
P0771	Shift Solenoid "E" Performance (Shift Solenoid Valve SR)	- Shift solenoid valve SR remains open or closed - Shift solenoid valve SL1 remains open or closed - Shift solenoid valve SLT remains open or closed - Valve body is blocked - Automatic transmission (clutch, brake or gear, etc.)	Comes on	DTC stored	AT-81
P0776	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)	- Shift solenoid valve SL2 remains open or closed - Shift solenoid valve SLT remains open or closed - Valve body is blocked - Automatic transmission (clutch, brake or gear, etc.)	Comes on	DTC stored	AT-86
P0778	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	- Open or short in shift solenoid valve SL2 circuit - Shift solenoid valve SL2 - ECM	Comes on	DTC stored	AT-91
P0781	1-2 Shift (1-2 Shift Valve)	- Valve body is blocked up or stuck (1-2 shift valve) - Shift solenoid valve SLT remains open or closed - Automatic transmission (clutch, brake or gear, etc.)	Comes on	DTC stored	AT-95

DTC No.	Detection Item	Trouble Areas	MIL *1	Memory *2	See page
P0973	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)	- Short in shift solenoid valve S1 circuit - Shift solenoid valve S1 - ECM	Comes on	DTC stored	AT-100
P0974	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)	- Open in shift solenoid valve S1 circuit - Shift solenoid valve S1 - ECM	Comes on	DTC stored	AT-100
P0976	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)	- Short in shift solenoid valve S2 circuit - Shift solenoid valve S2 - ECM	Comes on	DTC stored	AT-103
P0977	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)	- Open in shift solenoid valve S2 circuit - Shift solenoid valve S2 - ECM	Comes on	DTC stored	AT-103
P0985	Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)	- Short in shift solenoid valve SR circuit - Shift solenoid valve SR - ECM	Comes on	DTC stored	AT-106
P0986	Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)	- Open in shift solenoid valve SR circuit - Shift solenoid valve SR - ECM	Comes on	DTC stored	AT-106
P2714	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)	- Shift solenoid valve SLT remains open or closed - Shift solenoid valve S1, S2, SR, SL1 or SL2 remains open or closed - Valve body is blocked - Automatic transmission (clutch, brake or gear, etc.)	Comes on	DTC stored	AT-110
P2716	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	- Open or short in shift solenoid valve SLT circuit - Shift solenoid valve SLT - ECM	Comes on	DTC stored	AT-117
P2740	Transmission Fluid Temperature Sensor "B" Circuit	- Open or short in No. 2 ATF temperature sensor circuit - No. 2 ATF temperature sensor - ECM	Comes on	DTC stored	AT-121

DTC No.	Detection Item	Trouble Areas	MIL *1	Memory *2	See page
P2742	Transmission Fluid Temperature Sensor "B" Circuit Low Input	- Short in No. 2 ATF temperature sensor circuit - No. 2 ATF temperature sensor - ECM	Comes on	DTC stored	AT-121
P2743	Transmission Fluid Temperature Sensor "B" Circuit High Input	- Open in No. 2 ATF temperature sensor circuit - No. 2 ATF temperature sensor - ECM	Comes on	DTC stored	AT-121
P2757	Torque Converter Clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU)	- Shift solenoid valve SLU remains open or closed - Valve body is blocked - Shift solenoid valve SLU - Torque converter clutch - Automatic transmission (clutch, brake or gear, etc.) - Line pressure is too low	Comes on	DTC stored	AT-126
P2759	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)	- Open or short in shift solenoid valve SLU circuit - Shift solenoid valve SLU - ECM	Comes on	DTC stored	AT-131

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 Conditions	Trouble Areas
P0705	When any one of following conditions (A) to (C) is met (2-trip detection logic): (A) Any 2 or more signals of the following are ON simultaneously • NSW input signal is ON. • R input signal is ON. • D input signal is ON. • 3 input signal is ON. • 2 input signal is ON. (B) All switches are OFF simultaneously for P (NSW), R, N (NSW), D, 3 and 2 positions (C) When NSW or R input signal is ON, 4 or L input signal is ON	• Open or short in park/neutral position switch circuit • Park/neutral position switch • ECM

MONITOR DESCRIPTION

The DTC indicates a problem with the park/neutral position switch and the wire harness in the park/neutral position switch circuit.
For security, the park/neutral position switch detects the shift lever position so that the engine can be started only when the vehicle is in the P or N shift position.
When the park/neutral position switch sends more than one signal at a time from switch positions P, R, N, D, 3 or 2, the ECM interprets this as a fault in the switch. 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	Conditions (A) and (C): 2 seconds Condition (B): 60 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

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

TYPICAL MALFUNCTION THRESHOLDS

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

Condition (A)

Number of the following signals input at the same time	2 or more
Park/neutral position switch	ON
R switch	ON
D switch	ON
3 switch	ON
2 switch	ON

Condition (B)

All of following conditions are met

Park/neutral position switch	OFF
R switch	OFF
D switch	OFF
3 switch	OFF
2 switch	OFF

Condition (C)

Both (i) and (ii) are met

(i) One of following conditions is met

Park/neutral position switch	ON
R switch	ON

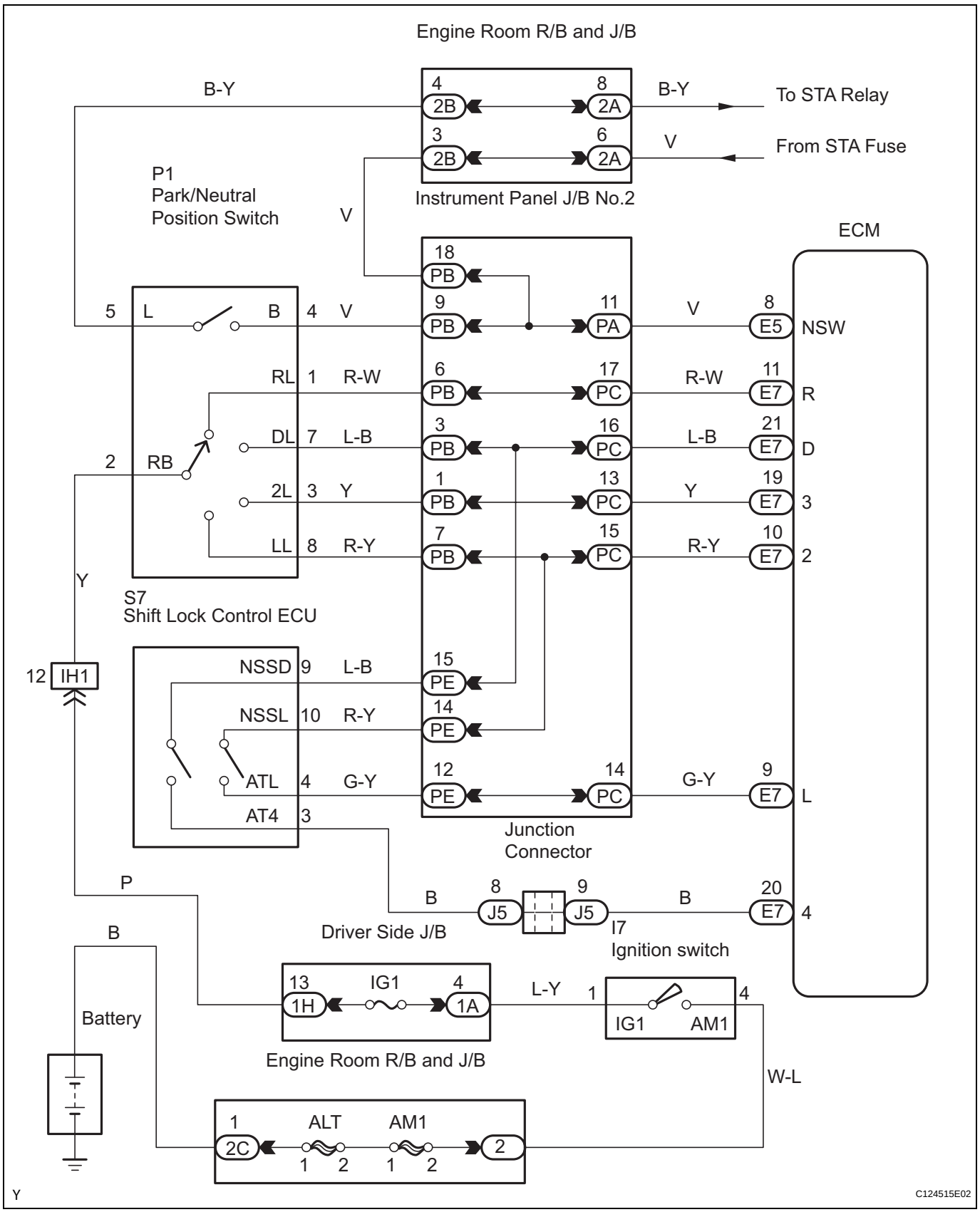
(ii) One of following conditions is met

4 switch	ON
L switch	ON

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM



HINT:
According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.

NOTICE:

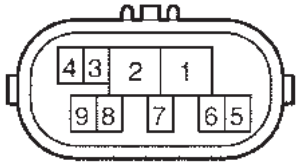
In the table below, the values listed under "Normal Condition" are for reference only. Do not depend solely on these reference values when judging whether a part is faulty or not.

1. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
2. Turn the ignition switch to the ON position.
3. Push the "ON" button of the tester.
4. Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST/ A/T".
5. According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
PNP SW [NSW]	PNP Switch Status/ ON or OFF	Shift lever position is; P or 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 Switch Status/ ON or OFF	Shift lever position is; R: ON Except R: OFF	
DRIVE	PNP Switch Status/ ON or OFF	Shift lever position is; D and 4: ON Except D and 4: OFF	
4th/DRIVE	PNP Switch Status/ ON or OFF	Shift lever position is; 4: ON Except 4: OFF	
3RD	PNP Switch Status/ ON or OFF	Shift lever position is; 3: ON Except 3: OFF	
2ND	PNP Switch Status/ ON or OFF	Shift lever position is; 2 and L: ON Except 2 and L: OFF	
LOW	PNP Switch Status/ ON or OFF	Shift lever position is; L: ON Except L: OFF	

1 INSPECT PARK / NEUTRAL POSITION SWITCH ASSEMBLY

Switch side (Connector Front View):



(a) Disconnect the park/neutral position switch connector.
(b) Measure the resistance when the shift lever is moved to each position.

Standard resistance

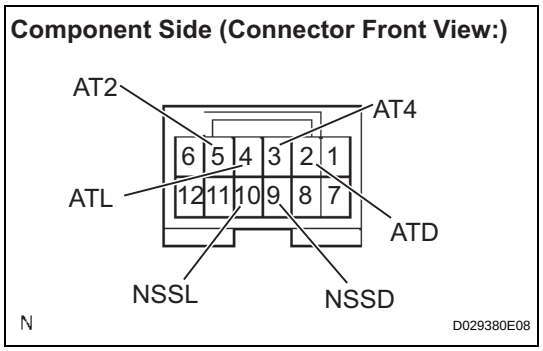
Shift Position	Tester Connection	Specified Condition
P	2 - 6 and 4 - 5	Below 1 Ω
Except P	2 - 6 and 4 - 5	10 kΩ or higher
R	1 - 2	Below 1 Ω
Except R	1 - 2	10 kΩ or higher
N	2 - 9 and 4 - 5	Below 1 Ω
Except N	2 - 9 and 4 - 5	10 kΩ or higher
D, 4	2 - 7	Below 1 Ω
Except D, 4	2 - 7	10 kΩ or higher
3	2 -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

Shift Position	Tester Connection	Specified Condition
Except 2, L	2 - 8	10 kΩ or higher

NG → REPLACE PARK / NEUTRAL POSITION SWITCH ASSEMBLY

OK

2 INSPECT SHIFT LOCK CONTROL ECU SUB-ASSEMBLY



(a) Connect the park/neutral position switch connector.
(b) Disconnect the shift lock control ECU connector.
(c) Measure the resistance when the shift lever is moved to each position.

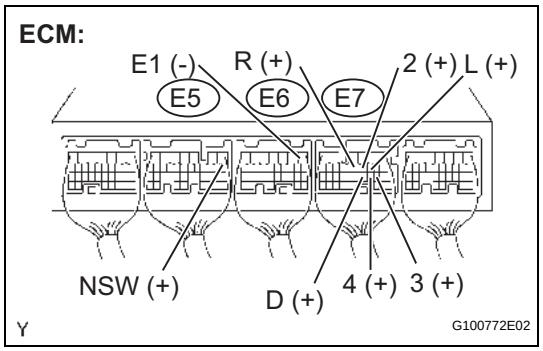
Standard resistance

Shift Position	Tester Connection	Specified Condition
D	9 (NSSD) - 2 (ATD)	Below 1 Ω
4	9 (NSSD) - 2 (ATD)	10 kΩ or higher
D	9 (NSSD) - 3 (AT4)	10 kΩ or higher
4	9 (NSSD) - 3 (AT4)	Below 1 Ω
2	10 (NSSL) - 5 (AT2)	Below 1 Ω
L	10 (NSSL) - 5 (AT2)	10 kΩ or higher
2	10 (NSSL) - 4 (ATL)	10 kΩ or higher
L	10 (NSSL) - 4 (ATL)	Below 1 Ω

NG → REPLACE SHIFT LOCK CONTROL ECU SUB-ASSEMBLY

OK

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



(a) Connect the shift lock control ECU connector.
(b) Turn the ignition switch to the ON position.
(c) Measure the voltage when the shift lever is moved to each position.

Standard voltage

Shift Position	Tester Connection	Specified Condition
P and N	E5-8 (NSW) - E6-1 (E1)	Below 2 V
Except P and N	E5-8 (NSW) - E6-1 (E1)	10 to 14 V
R	E7-11 (R) - E6-1 (E1)	10 to 14 V*
Except R	E7-11 (R) - E6-1 (E1)	Below 1 V
D and 4	E7-21 (D) - E6-1 (E1)	10 to 14 V
Except D and 4	E7-21 (D) - E6-1 (E1)	Below 1 V
4	E7-20 (4) - E6-1 (E1)	10 to 14 V
Except 4	E7-20 (4) - E6-1 (E1)	Below 1 V
3	E7-19 (3) - E6-1 (E1)	10 to 14 V
Except 3	E7-19 (3) - E6-1 (E1)	Below 1 V
2 and L	E7-10 (2) - E6-1 (E1)	10 to 14 V
Except 2 and L	E7-10 (2) - E6-1 (E1)	Below 1 V

Shift Position	Tester Connection	Specified Condition
L	E7-9 (L) - E6-1 (E1)	10 to 14 V
Except L	E7-9 (L) - E6-1 (E1)	Below 1 V

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

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

OK

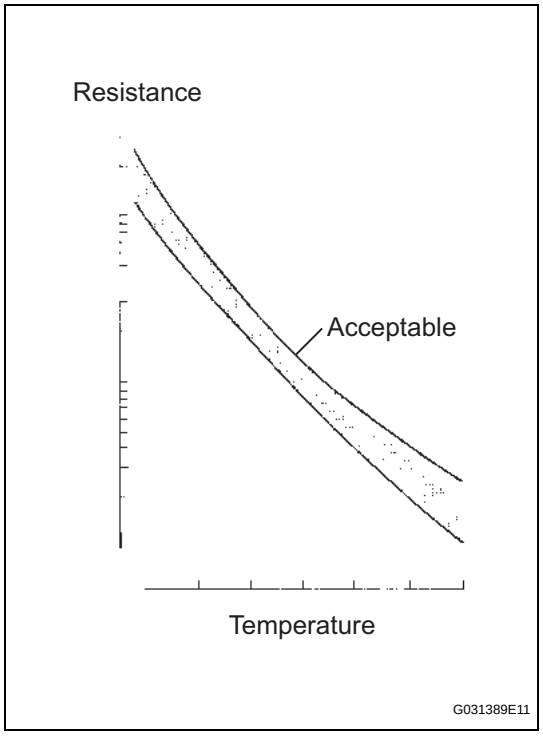
REPLACE ECM

DTC	P0710	Transmission Fluid Temperature Sensor "A" Circuit

DTC	P0712	Transmission Fluid Temperature Sensor "A" Circuit Low Input

DTC	P0713	Transmission Fluid Temperature Sensor "A" Circuit High Input

DESCRIPTION



The ATF (Automatic Transmission Fluid) temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.
The ECM applies a voltage to the temperature sensor through ECM terminal THO1.
The sensor resistance changes with the transmission fluid temperature. As the temperature becomes higher, the sensor resistance decreases.
One terminal of the sensor is grounded so that the sensor resistance and the voltage decrease as the temperature becomes higher.
The ECM calculates the fluid temperature based on the voltage signal.

DTC No.	DTC Detection Conditions	Trouble Areas
P0710	(a) and (b) are detected momentarily within 0.5 seconds when neither P0712 nor P0713 is detected (1-trip detection logic) (a) No. 1 ATF temperature sensor resistance is less than 79 Ω. (b) No. 1 ATF temperature sensor resistance is more than 156 kΩ. HINT: Within 0.5 seconds, the malfunction changes from (a) to (b) or from (b) to (a)	• Open or short in No. 1 ATF temperature sensor circuit • Transmission wire (No. 1 ATF temperature sensor) • ECM

DTC No.	DTC Detection Conditions	Trouble Areas
P0712	No. 1 ATF temperature sensor resistance is less than 79 Ω for 0.5 seconds or more (1-trip detection logic)	• Short in No. 1 ATF temperature sensor circuit • Transmission wire (No. 1 ATF temperature sensor) • ECM
P0713	No. 1 ATF temperature sensor resistance is more than 156 kΩ for 0.5 seconds or more 15 minutes or more after starting engine (1-trip detection logic)	• Open in No. 1 ATF temperature sensor circuit • Transmission wire (No. 1 ATF temperature sensor) • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the Automatic Transmission Fluid (ATF) temperature sensor circuit.
The ATF temperature sensor converts ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and detects any open or short malfunctions in the ATF temperature circuit. If the resistance value of the ATF temperature is less than 79 Ω*1 or more than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or its wiring. The ECM turns on the MIL and stores a 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 intelligent tester display.

MONITOR STRATEGY

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

TYPICAL ENABLING CONDITIONS

P0710: Range check (Fluttering)

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

P0712: Range check (Low resistance)

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

P0713: Range check (High resistance)

The monitor will run whenever the following DTCs are not present.	None
Time after engine start	15 minutes or more

TYPICAL MALFUNCTION THRESHOLDS

P0710: Range check (Fluttering)

ATF temperature sensor resistance	Less than 79 Ω or More than 156 kΩ

AT

P0712: Range check (Low resistance)

ATF temperature sensor resistance	Less than 79 Ω

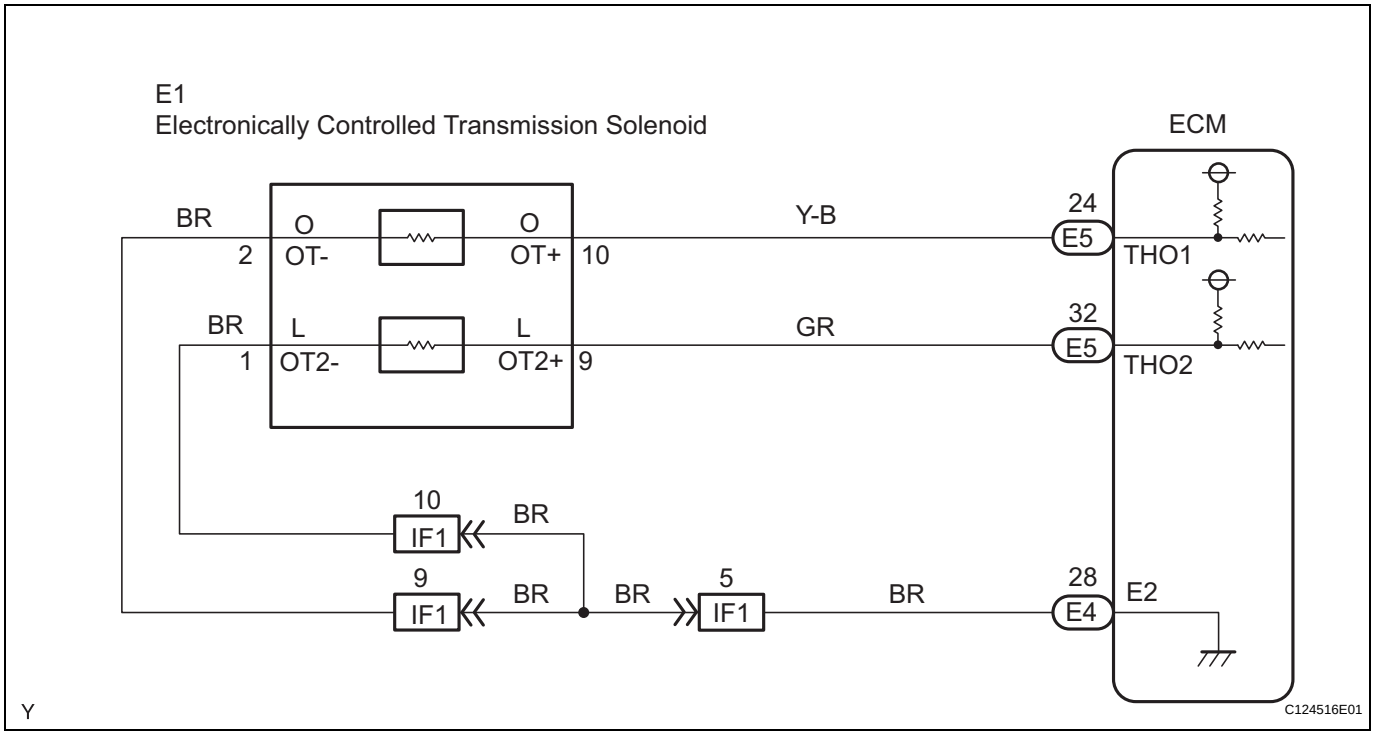
P0713: Range check (High resistance)

ATF temperature sensor resistance	More than 156 kΩ

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM



HINT:
According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.

NOTICE:

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

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST/ A/T".
7. According to the display on the tester, read the "DATA LIST".

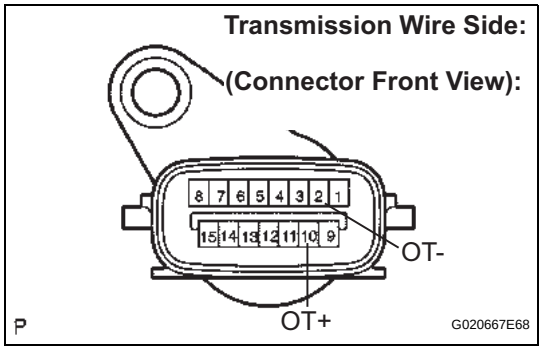
Item	Measurement Item/ Range (display)	Normal Condition
AT OIL TEMP1	No. 1 ATF Temperature Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	• After Stall Test: Approximately 80°C (176°F) • Equal to ambient temperature during cold soak

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

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

HINT:
If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately set (in 0.5 seconds). When P0713 is set, P0711 cannot be detected.
It is not necessary to inspect the circuit when P0711 is set.

1 INSPECT TRANSMISSION WIRE (ATF TEMPERATURE SENSOR)



(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
2 (OT-) - 10 (OT+)	79 Ω to 156 kΩ

(c) Measure the resistance.
Standard resistance (Check for short)

Tester Connection	Specified Condition
2 (OT-) - Body ground	10 kΩ or higher
10 (OT+) - Body ground	10 kΩ or higher

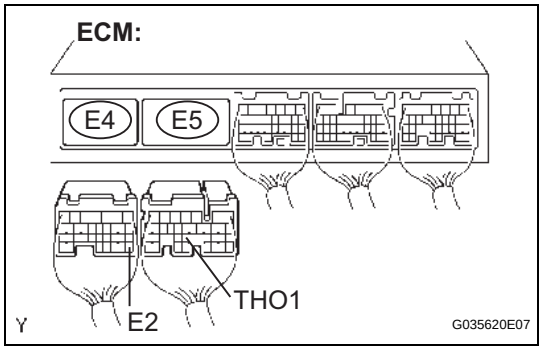
HINT:
If the resistance is outside the specified range at either of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

ATF Temperature	Specified Condition
20°C (68°F)	3 to 4 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

2	CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connectors.
(c) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
E5-24 (THO1) - E4-28 (E2)	79 Ω to 156 kΩ

(d) Measure the resistance.
Standard resistance (Check for short)

Tester Connection	Specified Condition
E5-24 (THO1) - Body ground	10 kΩ or higher
E4-28 (E2) - Body ground	10 kΩ or higher

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

OK

REPLACE ECM

DTC	P0711	Transmission Fluid Temperature Sensor "A" Performance

DESCRIPTION

Refer to DTC P0710 (See page AT-49).

DTC No.	DTC Detection Conditions	Trouble Areas
P0711	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 22 minutes and 5.6 miles (9 km) or more, ATF temperature is less than 20°C (68°F)	• Transmission wire (No. 1 ATF temperature sensor) • ECM

MONITOR DESCRIPTION

This DTC indicates that there is a problem with the output from the automatic transmission fluid (ATF) temperature sensor and that the sensor itself is defective. 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 any open or short malfunctions in the ATF temperature circuit or a fault of the ATF temperature sensor.

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

MONITOR STRATEGY

Related DTCs	P0711: ATF temperature sensor/Rationality check
Required sensors/Components	ATF temperature sensor
Frequency of operation	Continuous
Duration	3 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	None
ATF temperature sensor "A" circuit	Functioning normally
ECT (Engine coolant temperature) sensor circuit	Functioning normally
IAT (Intake air temperature) sensor circuit	Functioning normally
Time after engine start	21 minutes and 40 seconds or more
Driving distance after engine start	5.6 miles (9 km) or more
IAT (12 seconds after engine start)	-10°C (14°F) or more
ECT (12 seconds after engine start)	-10°C (14°F) or more

TYPICAL MALFUNCTION THRESHOLDS

ATF temperature	Less than 20°C (68°F) (Conditions vary with ATF temperature at engine start)

WIRING DIAGRAM

Refer to DTC P0710 (See page AT-51).

HINT:
According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.
NOTICE:
In the table below, the values listed under "Normal Condition" are for reference only. Do not depend solely on these reference values when judging whether a part is faulty or not.
1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST/ A/T".
7. According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
AT OIL TEMP1	No. 1 ATF Temperature Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	• After Stall Test: Approximately 80°C (176°F) • Equal to ambient temperature during cold soak

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

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

HINT:
If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately set (in 0.5 seconds). When P0713 is set, P0711 cannot be detected.
It is not necessary to inspect the circuit when P0711 is set.

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

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

Result:

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

HINT:
If any 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**

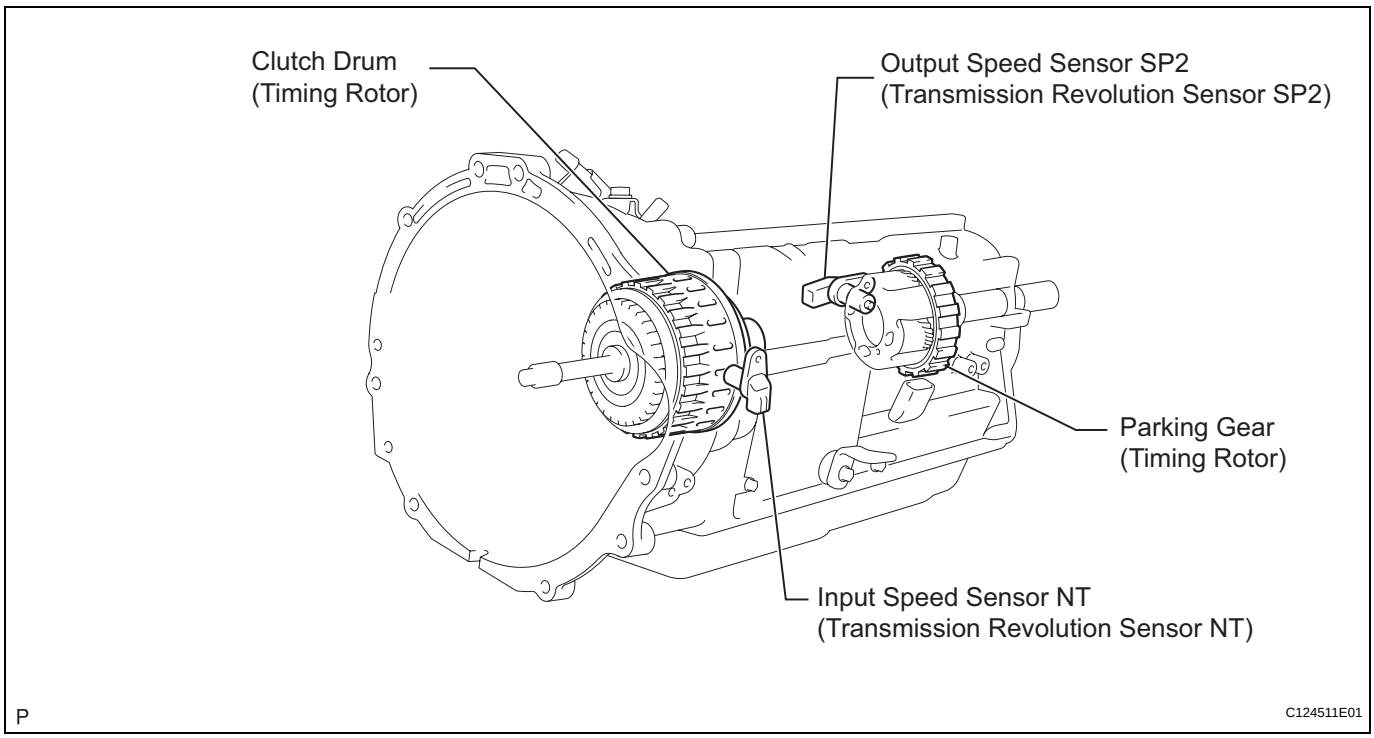
OK

REPLACE TRANSMISSION WIRE (ATF TEMPERATURE SENSOR)

DTC	P0717	Input Speed Sensor Circuit No Signal

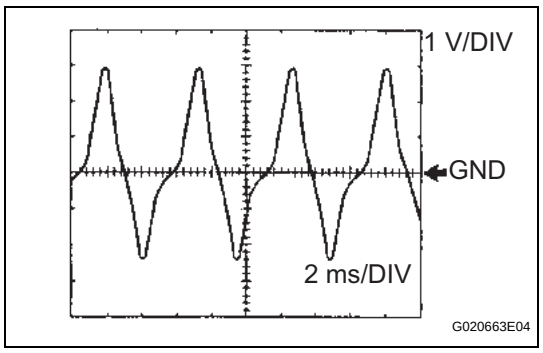
DESCRIPTION

This sensor detects the rotation speed of the turbine which shows the input revolution of the transmission. By comparing the input turbine speed signal (NT) with the counter gear speed sensor signal (SP2), 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 Conditions	Trouble Areas
P0717	All conditions below are detected for 5 seconds or more (1-trip detection logic): (a) Gear change not being performed (b) Gear position: 4th or 5th (c) T/M input shaft rpm: 300 rpm or less (d) T/M output shaft rpm: 1,000 rpm or more (e) Park/neutral position switch: OFF (f) Shift solenoid valves, park/neutral position switch and vehicle speed sensor are in normal operation	• Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM

Reference (Using an oscilloscope):



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

Standard:

Refer to the illustration.

Terminal	NT+ - NT-
Tool setting	1 V/DIV, 2 ms/DIV
Vehicle condition	Engine idling speed (P or N position)

MONITOR DESCRIPTION

This DTC indicates that a pulse is not output from the speed sensor NT (Turbine (input) sped sensor) or is weak. The NT terminal of the ECM detects the revolving signal from speed sensor (NT) (input RPM). The ECM outputs a gearshift signal comparing the input speed sensor (NT) with the output speed sensor (SP2). While the vehicle is operating in the 4th or 5th gear position in the shift position of D, if the input shaft revolution is less than 300 rpm*1 although the output shaft revolution is more than 1,000 rpm or more*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 approximately 31 mph (50 km/h) or more.

MONITOR STRATEGY

Related DTCs	P0717: Speed sensor (NT)/Verify pulse input
Required sensors/Components (Main)	Speed sensor (NT)
Required sensors/Components (Related)	Speed sensor (SP2)
Frequency of operation	Continuous
Duration	5 seconds
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	P0500: VSS P0748 - P0799: Trans solenoid (range)
Shift change	Each shift change is completed before starting next shift change operation
ECM selected gear	4th or 5th
Output shaft rpm	1,000 rpm or more
Park/neutral position switch	OFF
R switch	OFF
L switch	OFF
Engine	Running
Ignition Switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

Sensor signal rpm	Less than 300 rpm

COMPONENT OPERATING RANGE

Speed sensor (NT)	Input speed is equal to engine speed when lock-up ON

WIRING DIAGRAM



HINT:
According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.

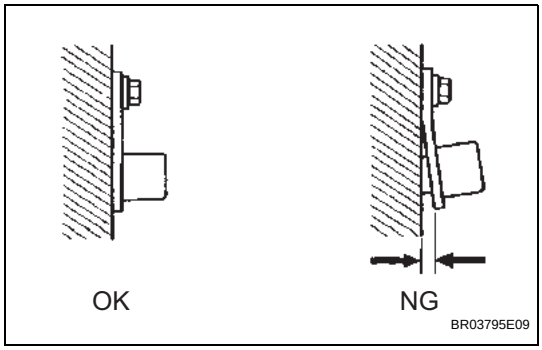
1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST/ A/T".
7. According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
SPD (NT)	Input Turbine Speed/ display: 50 rpm	[HINT] • Lock-up ON (After warming up the engine); Input turbine speed (NT) equal to the engine speed. • Lock-up OFF (Idling at N position); Input turbine speed (NT) nearly equal to the engine speed.

HINT:

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

1 INSPECT SPEED SENSOR INSTALLATION



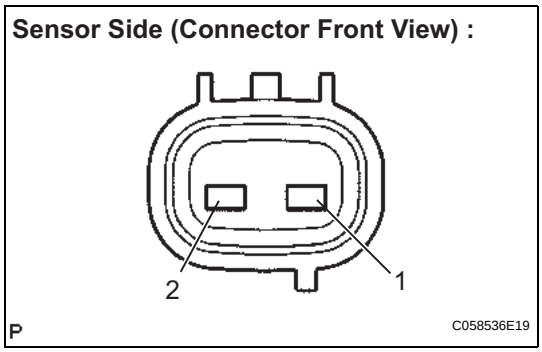
(a) Check the speed sensor (NT) installation.
OK:
The installation bolt is tightened properly and there is no clearance between the sensor and transmission case.

NG → **REPLACE SPEED SENSOR (NT)**

OK

2 INSPECT SPEED SENSOR (NT)

Sensor Side (Connector Front View) :



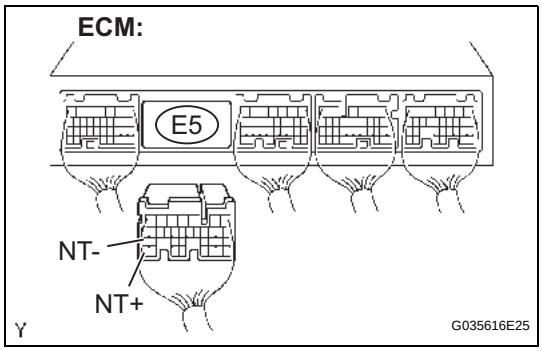
(a) Disconnect the speed sensor (NT) connector from the transmission.
(b) Measure the resistance.
Standard resistance

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

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.
Standard resistance

Tester Connection	Specified Condition
E5-35 (NT+) - E5-27 (NT-)	560 to 680 Ω at 20°C (68°F)

(d) Measure the resistance.
Standard resistance (Check for short)

Tester Connection	Specified Condition
E5-35 (NT+) - Body ground	10 kΩ or higher
E5-27 (NT-) - Body ground	10 kΩ or higher

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

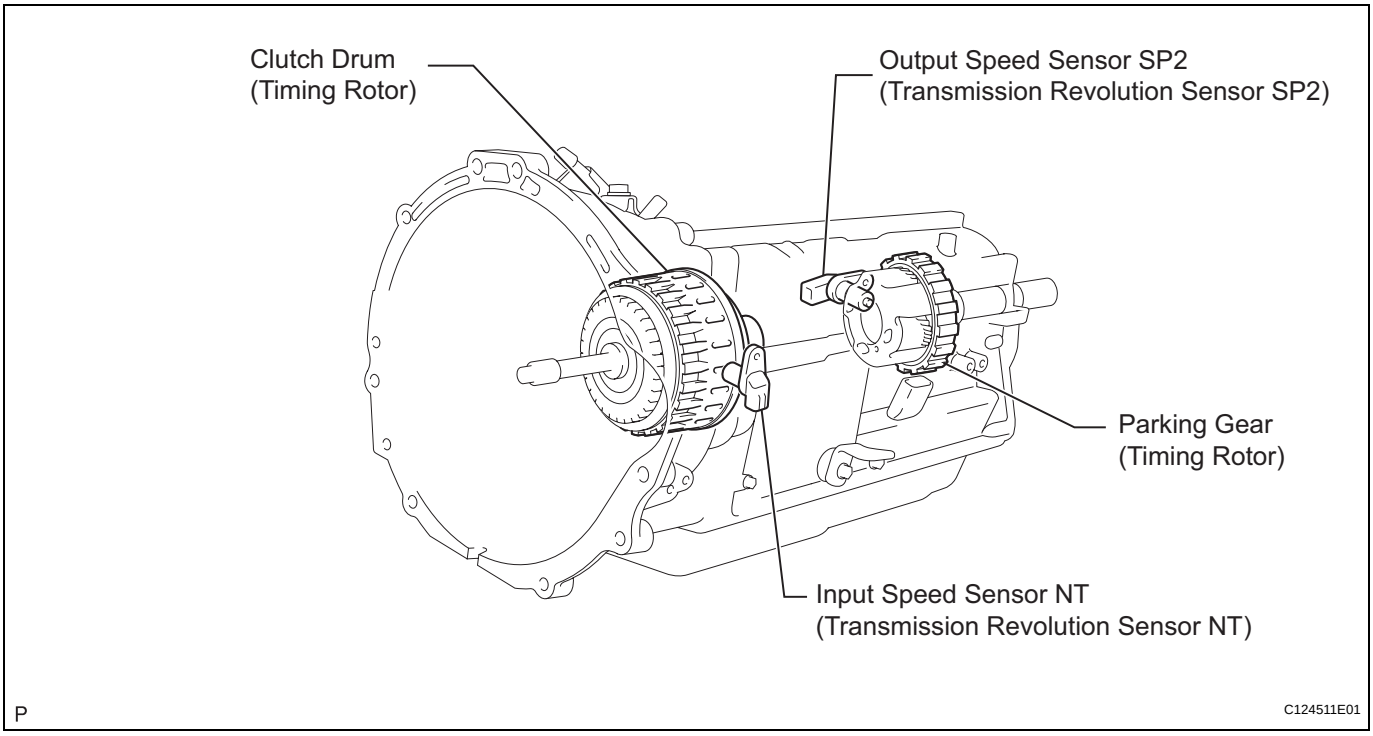
OK

REPLACE ECM

DTC	P0722	Output Speed Sensor Circuit No Signal

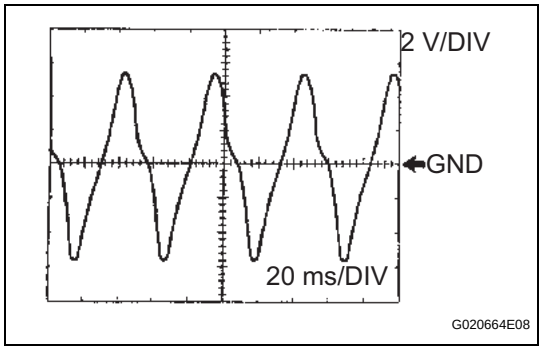
DESCRIPTION

The speed sensor SP2 detects the rotation speed of the transmission output shaft and sends signals to the ECM. The ECM determines the vehicle speed based on these signals. An AC voltage is generated in the speed sensor SP2 coil as the parking gear mounted on the rear planetary gear assembly rotates, and this voltage is sent to the ECM. The parking gear on the rear planetary gear is used as the timing rotor for this sensor. The gear shift point and lock-up timing are controlled by the ECM based on the signals from the vehicle speed sensor and the throttle position sensor.



DTC No.	DTC Detection Conditions	Trouble Areas
P0722	All conditions below are detected 500 times or more continuously (1-trip detection logic) (a) No signal from speed sensor (SP2) is input to ECM while 4 pulses of No. 1 vehicle speed sensor signal are sent (b) Vehicle speed is 5.59 mph (9 km/h) or more for at least 4 seconds (c) Park/neutral position switch is OFF	• Open or short in speed sensor (SP2) circuit • Speed sensor (SP2) • ECM

Reference (Using an oscilloscope):



AT

Check the waveform between terminals SP2+ and SP2- of the ECM connector.

Standard:

Refer to the illustration.

Terminal	SP2+ - SP2-
Tool setting	2 V/DIV, 20 ms/DIV
Vehicle condition	Vehicle speed 12 mph (20 km/h)

MONITOR DESCRIPTION

The output speed sensor monitors the output shaft speed. The ECM controls the gearshift point and the lock up timing based on the signals from the output speed sensor and throttle position sensor.
If the ECM detects no signal from the output shaft speed sensor even while the vehicle is moving, it will conclude that is a malfunction in the output speed sensor. The ECM will illuminate the MIL and set the DTC.

MONITOR STRATEGY

Related DTCs	P0722: Speed sensor SP2/Verify pulse input
Required sensors/Components	Speed sensor SP2
Frequency of operation	Continuous
Duration	500 output shaft revolutions
MIL operation	Immediate
Sequence of operation	None

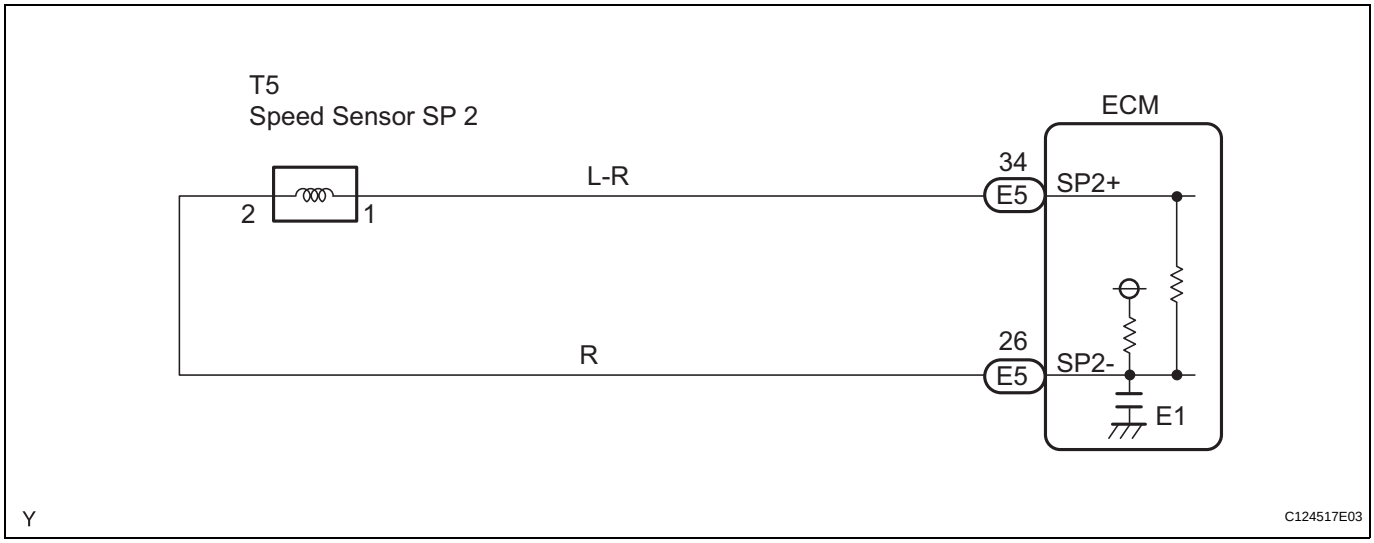
TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	P0500: VSS P0748 - P0799: Trans solenoid (range)
Vehicle speed sensor pulse input	4 times
Vehicle speed range (4 seconds or more)	5.59 mph (9 km/h) or more
Park/neutral position switch	OFF
Battery voltage	8 V or more
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

Output speed sensor pulse input	No input

WIRING DIAGRAM



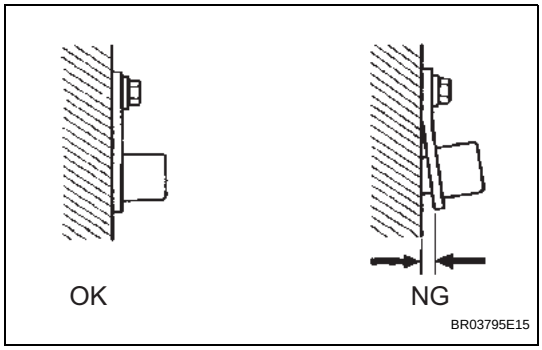
AT

HINT:
According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.
NOTICE:
In the table below, the values listed under "Normal Condition" are for reference only. Do not depend solely on these reference values when judging whether a part is faulty or not.
1. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
2. Turn the ignition switch to the ON position.
3. Push the "ON" button of the tester.
4. Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST/ A/T".
5. According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
SPD (SP2)	Counter Gear Speed display/ min.: 0 mph (0 km/h) max.: 158 mph (255 km/h)	Vehicle stopped: 0 mph (0 km/h) [HINT] Equal to vehicle speed

HINT:
- SPD (SP2) is always 0 while driving:
  Open or short in the sensor or circuit.
- The SPD (SP2) value displayed on the tester is much lower than the actual vehicle speed:
  Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

1 INSPECT SPEED SENSOR INSTALLATION



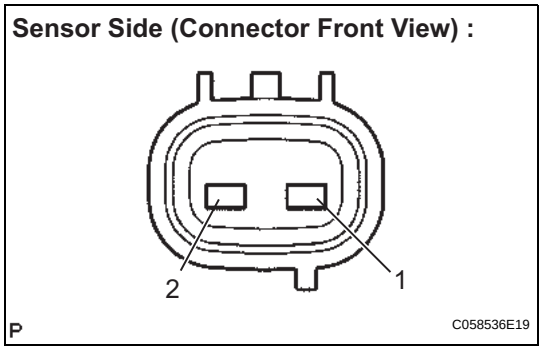
(a) Check the speed sensor (SP2) installation.
OK:
The installation bolt is tightened properly and there is no clearance between the sensor and transmission case.

NG → **REPLACE SPEED SENSOR (SP2)**

OK

2 INSPECT SPEED SENSOR (SP2)

Sensor Side (Connector Front View) :



(a) Disconnect the speed sensor (SP2) connector from the transmission.
(b) Measure the resistance.
Standard resistance

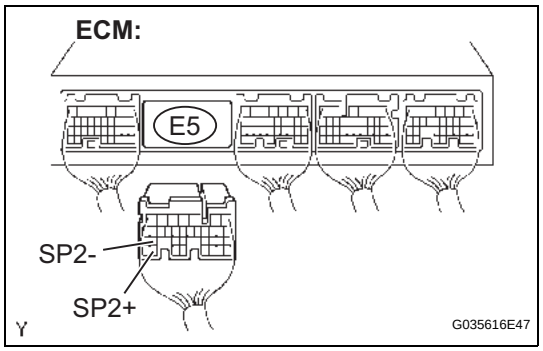
Tester Connection	Specified Condition
1 - 2	560 to 680 Ω at 20°C (68°F)

NG → **REPLACE SPEED SENSOR (SP2)**

AT

OK

3	CHECK HARNESS AND CONNECTOR (SPEED SENSOR - ECM)



(a) Connect the speed sensor connector.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
E5-34 (SP2+) - E5-26 (SP2-)	560 to 680 Ω at 20°C (68°F)

(d) Measure the resistance.
Standard resistance (Check for short)

Tester Connection	Specified Condition
E5-34 (SP2+) - Body ground	10 kΩ or higher
E5-26 (SP2-) - Body ground	10 kΩ or higher

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

OK

REPLACE ECM

DTC	P0748	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)

DESCRIPTION

Shifting from 1st to 5th is performed in combination with the ON and OFF operation of the shift solenoid valves S1, S2, SR, SL1 and SL2 which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be driven smoothly (See page AT-32).

DTC No.	DTC Detection Conditions	Trouble Areas
P0748	The ECM checks for an open or short in the shift solenoid valve SL1 circuit (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

This DTC indicates an open or short in the shift solenoid valve SL1 circuit. The ECM controls the gearshift by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other functioning shift solenoid valves "ON/OFF". (If an open or short circuit is detected, the ECM cuts the current to the circuit.)
If the ECM detects an open or short in the shift solenoid valve SL1 circuit, the ECM determines that there is a malfunction (See page AT-32).

MONITOR STRATEGY

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

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	None
Battery voltage	10 V or more
CPU commanded duty	Less than 75 %
Ignition switch	ON
Starter	OFF

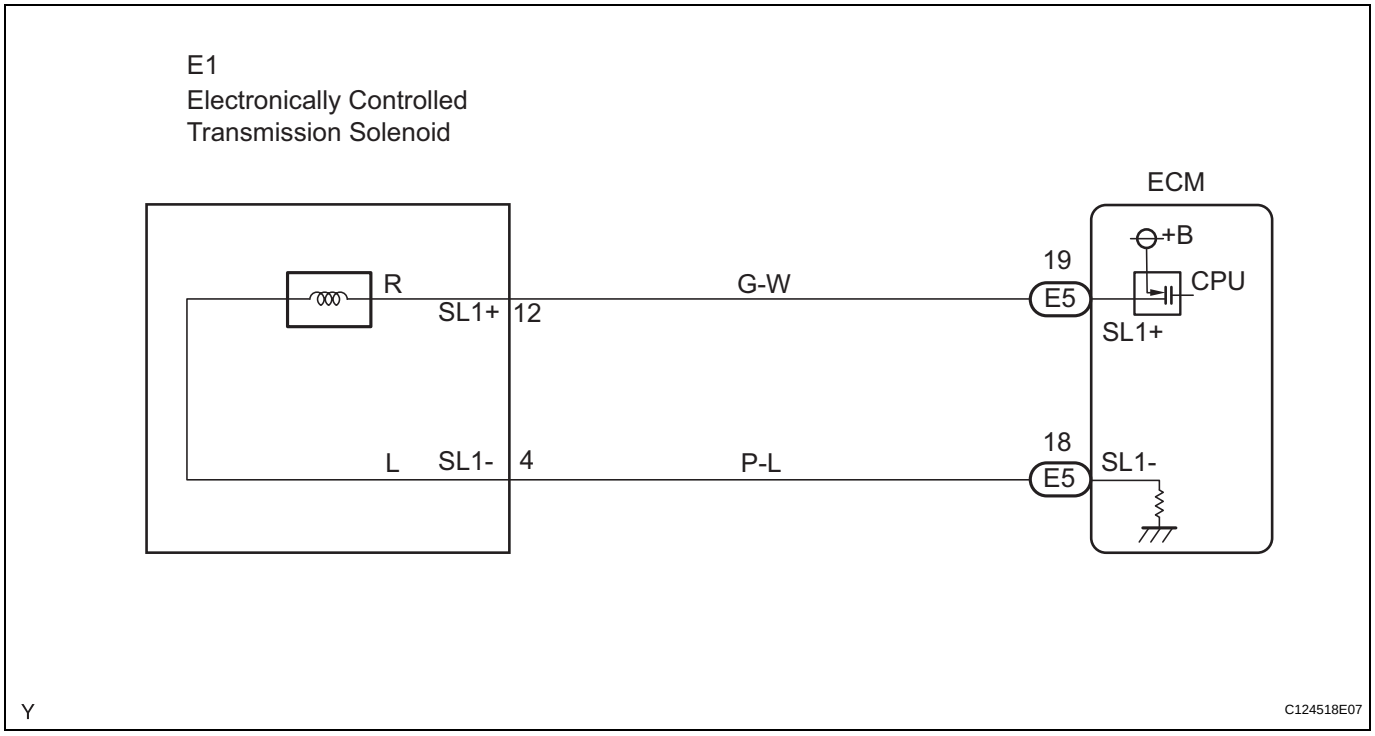
TYPICAL MALFUNCTION THRESHOLDS

Output signal duty	100 %

COMPONENT OPERATING RANGE

Output signal duty	Less than 100 %

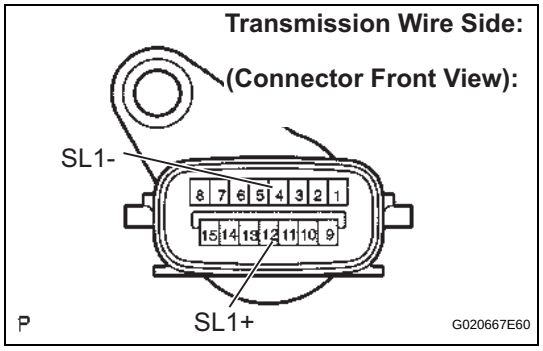
WIRING DIAGRAM



HINT:
The shift solenoid valve SL1 is turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
Shift solenoid valve SL1	OFF	OFF	OFF	OFF	ON

1	INSPECT TRANSMISSION WIRE (SL1)



(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
12 (SL1+) - 4 (SL1-)	5.0 to 5.6 Ωat 20°C (68°F)

(c) Measure the resistance.
Standard resistance (Check for short)

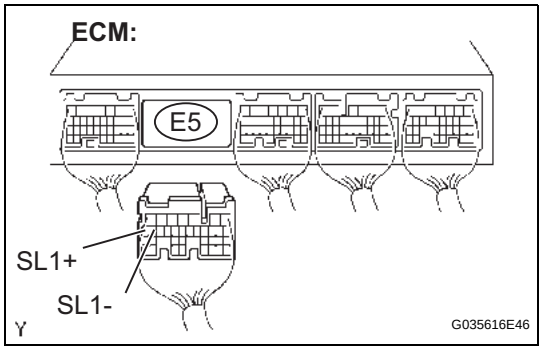
Tester Connection	Specified Condition
12 (SL1+) - Body ground	10 kΩ or higher
4 (SL1-) - Body ground	10 kΩ or higher

NG → **Go to step 3**

OK

AT

2 CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission connector to the transmission.
(b) Disconnect the connector from the ECM.
(c) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
E5-19 (SL1+) - E5-18 (SL1-)	5.0 to 5.6 Ω at 20°C (68°F)

(d) Measure the resistance.
Standard resistance (Check for short)

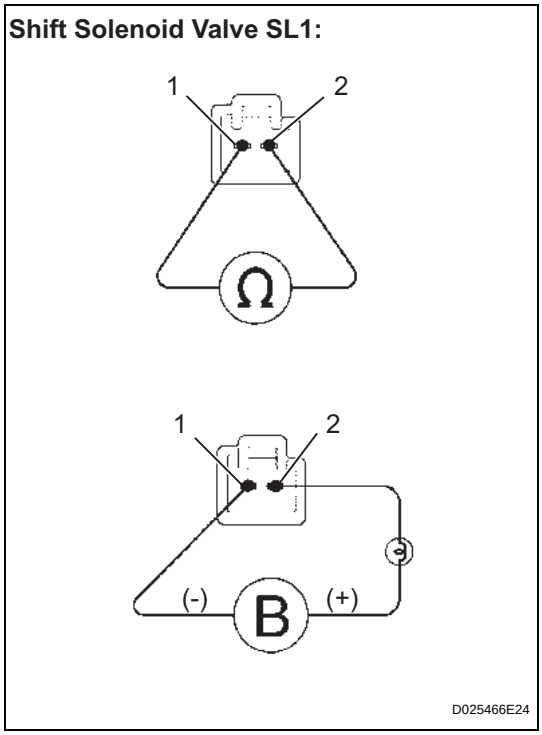
Tester Connection	Specified Condition
E5-19 (SL1+) - Body ground	10 kΩ or higher
E5-18 (SL1-) - Body ground	10 kΩ or higher

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.
Standard resistance

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

(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**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

AT

DTC	P0751	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC No.	DTC Detection Conditions	Trouble Areas
P0751	S1 stuck ON malfunction*1: The ECM determines that there is a malfunction when the following conditions are met (2-trip detection logic): (a) When the ECM directs the gearshift to switch to 4th gear, the actual gear is shifted to 1st. (b) When the ECM directs the gearshift to switch to 1st gear, the actual gear is also shifted to 1st.	• Shift solenoid valve S1 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)
	S1 stuck OFF malfunction*2: The ECM determines that there is a malfunction when the following conditions are met (2-trip detection logic): (a) When the ECM directs the gearshift to switch to 1st gear, the actual gear is shifted to 4th. (b) When the ECM directs the gearshift to switch to 5th gear, the actual gear is also shifted to 5th.	• Shift solenoid valve S1 remains closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

HINT:
Gear positions in the event of a solenoid valve mechanical problem:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
*1: Actual gear position under S1 stuck ON malfunction	1st	2nd	2nd	1st	N*
*2: Actual gear position under S1 stuck OFF malfunction	4th	3rd	3rd	4th	5th

N*: Neutral

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve S1. The ECM controls the gearshifts by turning the shift solenoid valves "ON/OFF". When the gear position directed by the ECM and the actual gear position do not match, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0751: Shift solenoid valve S1/OFF malfunction Shift solenoid valve S1/ON malfunction
Required sensors/Components (Main)	Shift solenoid valve S1
Required sensors/Components (Related)	Vehicle speed sensor, Throttle position sensor, Speed sensor (NT), Speed sensor (SP2)
Frequency of operation	Continuous
Duration	OFF malfunctions (A) and (B): 0.4 seconds OFF malfunction (C): Immediate ON malfunctions (A), (B) and (C): 0.4 seconds ON malfunction (D): 3 seconds ON malfunction (E): 0.5 seconds
MIL operation	2 driving cycles

Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The following conditions are common to all OFF malfunctions (A), (B), (C) and ON malfunctions (A), (B), (C), (D), (E).

The monitor will run whenever the following DTCs are not present.	P0115 - P0118: ECT sensor P0125: Insufficient ECT for Closed Loop P0500: VSS P0748 - P0799: Trans solenoid (range)
Turbine speed sensor (NT) circuit	Functioning normally
Output speed sensor (SP2) circuit	Functioning normally
Shift solenoid "A" (S1) circuit	Functioning normally
Shift solenoid "B" (S2) circuit	Functioning normally
Shift solenoid "E" (SR) circuit	Functioning normally
Pressure control solenoid "A" (SL1) circuit	Functioning normally
Pressure control solenoid "B" (SL2) circuit	Functioning normally
ECT (Engine coolant temperature) sensor circuit	Functioning normally
Knock sensor circuit	Functioning normally
ETCS (Electronic throttle control system)	System not down
Transmission shift position	"D"
ECT	40°C (104°F) or more
Spark advance from max. retard timing by knock sensor control	0° CA or more
Engine	Starting

OFF malfunction (A)

ECM selected gear	1st
Vehicle speed	1.2 to 24.9 mph (2 to 40 km/h)
Throttle valve opening angle	8 % or more and 6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

OFF malfunction (B)

Current ECM selected gear	5th
Last ECM selected gear	4th
Continuous time of ECM selecting 4th gear	2 seconds or more
Actual gear when ECM selected 4th gear	4th

OFF malfunction (C)

Current ECM selected gear	5th
Last ECM selected gear	4th

ON malfunction (A)

ECM selected gear	1st
Vehicle speed	1.2 to 24.9 mph (2 to 40 km/h)
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

ON malfunction (B)

ECM selected gear	4th
Vehicle speed	1.2 mph (2 km/h) or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

ON malfunction (C)

ECM selected gear	3rd
Vehicle speed	1.2 mph (2 km/h) or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

ON malfunction (D)

Current ECM selected gear	5th
Last ECM selected gear	4th
Vehicle speed (During transition from 4th to 5th gear)	Less than 62.2 mph (100 km/h)

ON malfunction (E)

ECM selected gear	5th
Engine speed - Turbine speed (NE - NT) (After transition from 4th to 5th gear)	150 rpm or less
Vehicle speed (After transition from 4th to 5th gear)	Less than 62.2 mph (100 km/h)

TYPICAL MALFUNCTION THRESHOLDS

[OFF malfunction]
All of the following conditions are met: OFF malfunctions (A), (B) and (C)
2 detections are necessary in 1 driving cycle.
1st detection; temporary flag ON
2nd detection; pending fault code ON

OFF malfunction (A)

Turbine speed/Output speed	0.93 to 1.07 (Actual gear is 4th)

OFF malfunction (B)

Turbine speed/Output speed	0.65 to 0.79 (Actual gear is 5th)

OFF malfunction (C)

Output record from ECM for 4th → 5th upshifting	Recorded

[ON malfunction]
Either of the following conditions is met:

- ON malfunctions (A) and (B)
- ON malfunction (B) or (C) and ON malfunction (D) or (E)

ON malfunction (A)

Turbine speed/Output speed	3.30 to 7.50 (Actual gear is 1st)

ON malfunction (B)

Turbine speed/Output speed	3.30 to 7.50 (Actual gear is 1st)

ON malfunction (C)

Turbine speed/Output speed	1.91 to 2.35 (Actual gear is 2nd)

ON malfunction (D)

Turbine speed - Output speed x 4th gear ratio	1,000 rpm or more

ON malfunction (E)

Turbine speed - Output speed x 5th gear ratio	1,000 rpm or more

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.
1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ SHIFT".
8. According to the display on the tester, perform the "ACTIVE TEST".

HINT:
While driving, the shift position can be changed with the intelligent tester.
Comparing the shift position directed by the ACTIVE TEST with the actual shift position enables the problem to be confirmed (See page AT-32).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position manually. [Vehicle Condition] Vehicle Speed: Less than 30 mph (50 km/h) [Others] • Press → button: Shift up • Press ← button: Shift down	Possible to check the operation of the shift solenoid valves. HINT: Shifting to the 5th gear is possible only when the vehicle is stationary with the engine idling.

HINT:
- This test can be conducted when the vehicle speed is 30 mph (50 km/h) or less.
- The 4th to 5th up-shifting must be performed with the accelerator pedal released.
- The 5th to 4th down-shifting must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position directed by the ECM is shown in the DATA LIST/ SHIFT display on the intelligent tester.
- The shift solenoid valve S1 is turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
Shift solenoid valve S1	ON	ON	OFF	OFF	OFF

1	CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P0751)

(a) Connect the the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

Result:

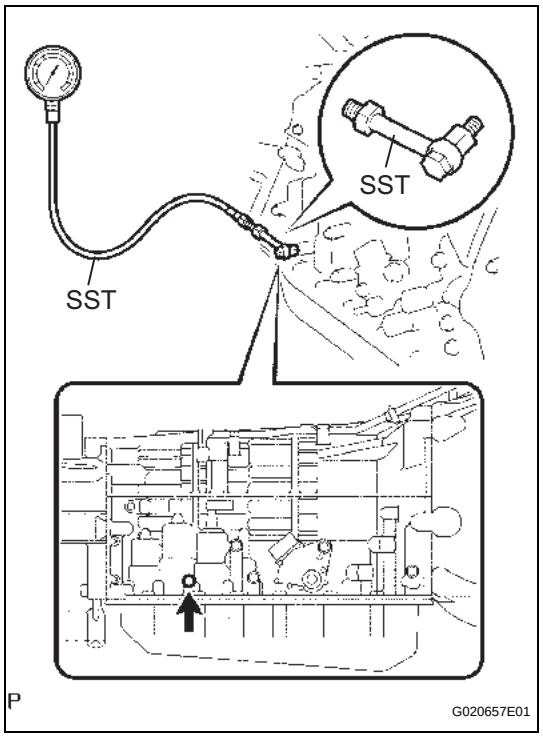
Display (DTC Output)	Proceed to
Only "P0751" is output	A
"P0751" and other DTCs	B

HINT:
If any codes besides "P0751" are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART

A

2 PERFORM ACTIVE TEST USING INTELLIGENT TESTER (LINE PRESS UP)



NOTICE:

- **Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST's hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C OFF.**

HINT:

Performing the intelligent tester's ACTIVE TEST allows relay, VSV, actuator and other items to be operated without removing any parts. Performing the ACTIVE TEST early in troubleshooting is one way to save time.

The DATA LIST can be displayed during the ACTIVE TEST.

(a) Remove the test plug on the transmission case center right side and connect SST.

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

(b) Connect the intelligent tester to the DLC3.

(c) Start the engine and warm it up.

(d) Measure the line pressure with SST.

(e) Turn the intelligent tester ON.

(f) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.

(g) Follow the instructions on the tester and perform the ACTIVE TEST.

(h) Measure the line pressure with SST.

Item	Test Details	Diagnostic Note
LINE PRESS UP*	[Test Details] Operate shift solenoid SLT and raise line pressure. [Vehicle Condition] • Vehicle stopped • IDL: ON HINT: OFF: Line pressure up (when Active Test of "LINE PRESS UP" is performed, ECM commands SLT solenoid to turn OFF) ON: No action (normal operation)	-

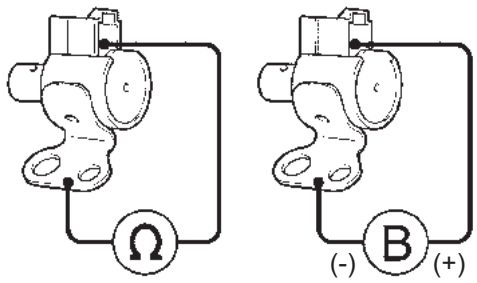
*: "LINE PRESS UP" in the ACTIVE TEST is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the HYDRAULIC TEST (See page AT-16) as well. Please note that the pressure values in the ACTIVE TEST and HYDRAULIC TEST are different.

NG → REPLACE SHIFT SOLENOID VALVE SLT

OK

3	INSPECT SHIFT SOLENOID VALVE S1

Shift Solenoid Valve S1:



A110986E04

(a) Remove the shift solenoid valve S1.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
Solenoid Connector (S1) - Solenoid Body (S1)	11 to 15 Ω at 20°C (68°F)

(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 S1**

OK

4	INSPECT TRANSMISSION VALVE BODY ASSEMBLY (See chapter 2 in the problem symptoms table)

OK:
There are no foreign objects on any valves and they operate smoothly.

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

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY

DTC	P0756	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC No.	DTC Detection Conditions	Trouble Areas
P0756	S2 stuck ON malfunction*1; The ECM determines that there is a malfunction when the following conditions are met (2-trip detection logic): (a) When the ECM directs the gearshift to switch to 1st gear, the actual gear is shifted to 2nd. (b) When the ECM directs the gearshift to switch to 5th gear, the engine overruns (clutch slips)	• Shift solenoid valve S2 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)
	S2 stuck OFF malfunction*2: The ECM determines that there is a malfunction when the following conditions are met (2-trip detection logic): (a) When the ECM directs the gearshift to switch to 1st gear, the actual gear is also shifted to 1st. (b) When the ECM directs the gearshift to switch to 2nd gear, the actual gear is shifted to 1st. (c) When the ECM directs the gearshift to switch to 5th gear, the actual gear is also shifted to 5th.	• Shift solenoid valve S2 remains closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

HINT:
Gear positions in the event of a solenoid valve mechanical problem:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
*1: Actual gear position under S2 stuck ON malfunction	2nd	2nd	3rd	3rd	N*
*2: Actual gear position under S2 stuck OFF malfunction	2nd	1st	4th	4th	5th

N*: Neutral

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve S2. The ECM controls the gearshifts by turning the shift solenoid valves "ON/OFF". When the gear position directed by the ECM and the actual gear position do not match, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0756: Shift solenoid valve S2/OFF malfunction Shift solenoid valve S2/ON malfunction
Required sensors/Components (Main)	Shift solenoid valve S2
Required sensors/Components (Related)	Vehicle speed sensor, Throttle position sensor, Speed sensor (NT), Speed sensor (SP2)
Frequency of operation	Continuous

Duration	OFF malfunctions (A), (B) and (C): 0.4 seconds OFF malfunction (D): Immediate ON malfunctions (A) and (B): 0.4 seconds ON malfunction (C): 3 seconds ON malfunction (D): 0.5 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The following conditions are common to all OFF malfunctions (A), (B), (C), (D) and ON malfunctions (A), (B), (C), (D).

The monitor will run whenever the following DTCs are not present.	P0115 - P0118: ECT sensor P0125: Insufficient ECT for Closed Loop P0500: VSS P0748 - P799: Trans solenoid (range)
Turbine speed sensor (NT) circuit	Functioning normally
Output speed sensor (SP2) circuit	Functioning normally
Shift solenoid "A" (S1) circuit	Functioning normally
Shift solenoid "B" (S2) circuit	Functioning normally
Shift solenoid "E" (SR) circuit	Functioning normally
Pressure control solenoid "A" (SL1) circuit	Functioning normally
Pressure control solenoid "B" (SL2) circuit	Functioning normally
ECT (Engine coolant temperature) sensor circuit	Functioning normally
Knock sensor circuit	Functioning normally
ETCS (Electronic throttle control system)	System not down
Transmission shift position	"D"
ECT	40°C (104°F) or more
Spark advance from max. retard timing by knock sensor control	0° CA or more
Engine	Starting

OFF malfunction (A)

ECM selected gear	1st
Vehicle speed	1.2 to 24.9 mph (2 to 40 km/h)
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

OFF malfunction (B)

ECM selected gear	2nd
Vehicle speed	1.2 mph (2 km/h) or more
Output speed	2nd → 1st down shift point or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

OFF malfunction (C)

Current ECM selected gear	5th
Last ECM selected gear	4th
Continuous time of ECM selecting 4th gear	2 seconds or more
Actual gear when ECM selected 4th gear	4th

OFF malfunction (D)

Current ECM selected gear	5th

Last ECM selected gear	4th

ON malfunction (A)

ECM selected gear	1st
Vehicle speed	1.2 to 24.9 mph (2 to 40 km/h)
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

ON malfunction (B)

ECM selected gear	4th
Vehicle speed	1.2 mph (2 km/h) or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

ON malfunction (C)

Current ECM selected gear	5th
Last ECM selected gear	4th
Vehicle speed (During transition from 4th to 5th gear)	Less than 62.2 mph (100 km/h)

ON malfunction (D)

ECM selected gear	5th
Engine speed - Turbine speed (NE - NT) (After transition from 4th to 5th gear)	150 rpm or less
Vehicle speed (After transition from 4th to 5th gear)	Less than 62.2 mph (100 km/h)

TYPICAL MALFUNCTION THRESHOLDS

[OFF malfunction]
All of the following conditions are met: OFF malfunctions (A), (B), (C) and (D)
2 detections are necessary in 1 driving cycle.
1st detection; temporary flag ON
2nd detection; pending fault code ON

OFF malfunction (A)

Turbine speed/Output speed	3.30 to 7.50 (Actual gear is 1st)

OFF malfunction (B)

Turbine speed/Output speed	3.30 to 7.50 (Actual gear is 1st)

OFF malfunction (C)

Turbine speed/Output speed	0.65 to 0.79 (Actual gear is 5th)

OFF malfunction (D)

Output record from ECM for 4th → 5th upshifting	Recorded

[ON malfunction]
ON malfunction (A) or (B) and ON malfunction (C) or (D) are met:

ON malfunction (A)

Turbine speed/Output speed	1.91 to 2.35 (Actual gear is 2nd)

ON malfunction (B)

Turbine speed/Output speed	1.28 to 1.53 (Actual gear is 3rd)

ON malfunction (C)

Turbine speed - Output speed x 4th gear ratio	1,000 rpm or more

ON malfunction (D)

Turbine speed - Output speed x 5th gear ratio	1,000 rpm or more

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ SHIFT".
8. According to the display on the tester, perform the "ACTIVE TEST".

HINT:
While driving, the shift position can be changed with the intelligent tester.
Comparing the shift position directed by the ACTIVE TEST with the actual shift position enables the problem to be confirmed (See page AT-32).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position manually. [Vehicle Condition] Vehicle Speed: Less than 30 mph (50 km/h) [Others] • Press → button: Shift up • Press ← button: Shift down	Possible to check the operation of the shift solenoid valves. HINT: Shifting to the 5th gear is possible only when the vehicle is stationary with the engine idling.

HINT:

- This test can be conducted when the vehicle speed is 30 mph (50 km/h) or less.
- The 4th to 5th up-shifting must be performed with the accelerator pedal released.
- The 5th to 4th down-shifting must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position directed by the ECM is shown in the DATA LIST/ SHIFT display on the intelligent tester.
- The shift solenoid valve S2 is turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
Shift solenoid valve S2	OFF	ON	ON	OFF	OFF

1	CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P0756)

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES".

(d) Read the DTCs using the intelligent tester.

Result:

Display (DTC Output)	Proceed to
Only "P0756" is output	A
"P0756" and other DTCs	B

HINT:
If any codes besides "P0756" are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART**

A

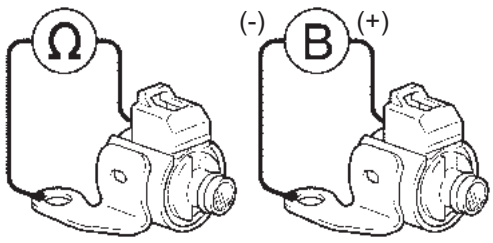
2 **PERFORM ACTIVE TEST USING INTELLIGENT TESTER (LINE PRESS UP) (See page AT-79)**

NG → **REPLACE SHIFT SOLENOID VALVE SLT**

OK

3 **INSPECT SHIFT SOLENOID VALVE S2**

Shift Solenoid Valve S2:



A110987E04

(a) Remove the shift solenoid valve S2.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
Solenoid Connector (S2) - Solenoid Body (S2)	11 to 15 Ωat 20°C (68°F)

(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 S2**

OK

4 **INSPECT TRANSMISSION VALVE BODY ASSEMBLY (See chapter 2 in the problem symptoms table)**

OK:
There are no foreign objects on any valves and they operate smoothly.

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

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY

DTC	P0771	Shift Solenoid "E" Performance (Shift Solenoid Valve SR)

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC No.	DTC Detection Conditions	Trouble Areas
P0771	SR stuck ON malfunction*1: The ECM determines that there is a malfunction when the following condition is met (2-trip detection logic): (a) When the ECM directs the gearshift to switch to 2nd gear, the engine overruns (clutch slips)	• Shift solenoid valve SR remains open • Shift solenoid valve SL1 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)
	SR stuck OFF malfunction*2: The ECM determines that there is a malfunction when the following condition is met (2-trip detection logic): (a) When the ECM directs the gearshift to switch to 5th gear, the actual gear is shifted to 4th.	• Shift solenoid valve SR remains closed • Shift solenoid valve SL1 remains closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

HINT:
Gear positions in the event of a solenoid valve mechanical problem:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
*1: Actual gear position under SR stuck ON malfunction	1st	N*	3rd	4th	5th
*2: Actual gear position under SR stuck OFF malfunction	1st	2nd	3rd	4th	4th

N*: Neutral

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve SR or SL1. The ECM controls the gearshifts by turning the shift solenoid valves "ON/OFF". When the gear position directed by the ECM and the actual gear position do not match, 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 (Main)	Shift solenoid valve SR
Required sensors/Components (Related)	Speed sensor (NT), Speed sensor (SP2), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	OFF malfunction (A): 0.4 seconds OFF malfunctions (B) and (C): Immediate ON malfunction: 0.15 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The following conditions are common to all OFF malfunctions (A), (B), (C) and ON malfunction.

The monitor will run whenever the following DTCs are not present.	P0115 - P0118: ECT sensor P0125: Insufficient ECT for Closed Loop P0500: VSS P0748 - P0799: Trans solenoid (range)
Turbine speed sensor (NT) circuit	Functioning normally
Output speed sensor (SP2) circuit	Functioning normally
Shift solenoid "A" (S1) circuit	Functioning normally
Shift solenoid "B" (S2) circuit	Functioning normally
Shift solenoid "E" (SR) circuit	Functioning normally
Pressure control solenoid "A" (SL1) circuit	Functioning normally
Pressure control solenoid "B" (SL2) circuit	Functioning normally
ECT (Engine coolant temperature) sensor circuit	Functioning normally
Knock sensor circuit	Functioning normally
ETCS (Electronic throttle control system)	System not down
Transmission shift position	"D"
ECT	40°C (104°F) or more
Spark advance from max. retard timing by knock sensor control	0° CA or more
Engine	Starting

OFF malfunction (A)

ECM selected gear	5th
Vehicle speed	1.2 mph (2 km/h) or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

OFF malfunction (B)

Current ECM selected gear	5th
Last ECM selected gear	4th
Continuous time of ECM selecting 4th gear	2 seconds or more

OFF malfunction (C)

Current ECM selected gear	5th
Last ECM selected gear	4th

ON malfunction

Current ECM selected gear	2nd
Last ECM selected gear	1st
Throttle valve opening angle (During transition from 1st to 2nd gear)	5.5 % or more at engine speed of 3,000 rpm (Conditions vary with engine speed)

TYPICAL MALFUNCTION THRESHOLDS

[OFF malfunction]

All of the following conditions are met: OFF malfunctions (A), (B) and (C)

2 detections are necessary in 1 driving cycle.

1st detection; temporary flag ON

2nd detection; pending fault code ON

OFF malfunction (A)

Turbine speed/Output speed	0.93 to 1.07 (Actual gear is 4th)

OFF malfunction (B)

Turbine speed/Output speed	No change as follow: 0.93 to 1.07 (Actual gear is 4th) ↓ 0.65 to 0.79 (Actual gear is 5th)

OFF malfunction (C)

Output record from ECM for 4th → 5th upshifting	Recorded

[ON malfunction]
2 detections are necessary in 1 driving cycle.
1st detection; temporary flag ON
2nd detection; pending fault code ON

Turbine speed - Output speed x 1st gear ratio	150 rpm or more

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ SHIFT".
8. According to the display on the tester, perform the "ACTIVE TEST".

HINT:
While driving, the shift position can be changed with the intelligent tester.
Comparing the shift position directed by the ACTIVE TEST with the actual shift position enables the problem to be confirmed (See page AT-32).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position manually. [Vehicle Condition] Vehicle Speed: Less than 30 mph (50 km/h) [Others] • Press → button: Shift up • Press ← button: Shift down	Possible to check the operation of the shift solenoid valves. HINT: Shifting to the 5th gear is possible only when the vehicle is stationary with the engine idling.

HINT:

- This test can be conducted when the vehicle speed is 30 mph (50 km/h) or less.
- The 4th to 5th up-shifting must be performed with the accelerator pedal released.
- The 5th to 4th down-shifting must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position directed by the ECM is shown in the DATA LIST/ SHIFT display on the intelligent tester.
- The shift solenoid valve SR and S1 are turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
Shift solenoid valve SR	OFF	OFF	OFF	OFF	ON
Shift solenoid valve SL1	OFF	OFF	OFF	OFF	ON

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

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

Result:

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

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

B → GO TO DTC CHART

A

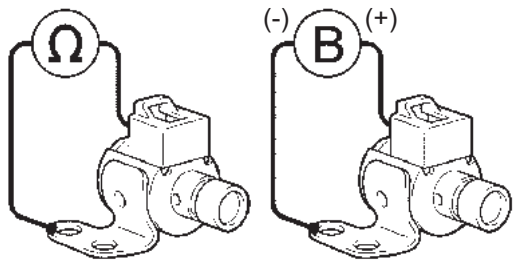
2	PERFORM ACTIVE TEST USING INTELLIGENT TESTER (LINE PRESS UP) (See page AT-79)

NG → REPLACE SHIFT SOLENOID VALVE SLT

OK

3	INSPECT SHIFT SOLENOID VALVE SR

Shift Solenoid Valve SR:



A110988E05

(a) Remove the shift solenoid valve SR.
(b) Measure the resistance.
Standard resistance

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

(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

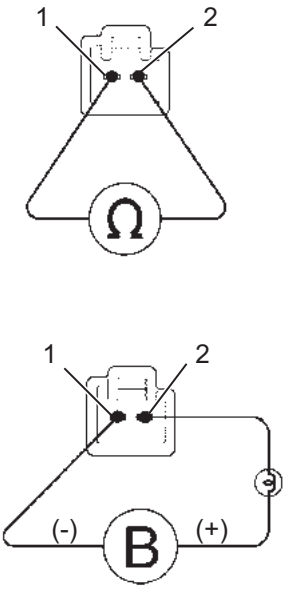
NG → REPLACE SHIFT SOLENOID VALVE SR

OK

AT

4	INSPECT SHIFT SOLENOID VALVE SL1

Shift Solenoid Valve SL1:



(a) Remove the shift solenoid valve SL1.
(b) Measure the resistance.
Standard resistance

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

(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**

OK

5	INSPECT TRANSMISSION VALVE BODY ASSEMBLY (See chapter 2 in the problem symptoms table)

OK:
There are no foreign objects on any valves and they operate smoothly.

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

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY

DTC	P0776	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC No.	DTC Detection Conditions	Trouble Areas
P0776	SL2 stuck ON malfunction*1: The ECM determines that there is a malfunction when the following conditions are met (2-trip detection logic): (a) When the ECM directs the gearshift to switch to 4th gear, the actual gear is also shifted to 4th. (b) When the ECM directs the gearshift to switch to 5th gear, the engine overruns (clutch slips)	• Shift solenoid valve SL2 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

HINT:
Gear positions in the event of a solenoid valve mechanical problem:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
*1: Actual gear position under SL2 stuck ON malfunction	1st	2nd	3rd	4th	N*

N*: Neutral

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" of the shift solenoid valve SL2.
The ECM controls the gearshifts by turning the shift solenoid valves "ON/OFF". When the gear position directed by the ECM and the actual gear position do not match, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0776: Shift solenoid valve SL2/ON malfunction
Required sensors/Components (Main)	Shift solenoid valve SL2
Required sensors/Components (Related)	Speed sensor (NT), Speed sensor (SP2), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	ON malfunctions (A), (B) and (C): 0.4 seconds ON malfunction (D): 3 seconds ON malfunction (E): 0.5 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The following conditions are common to all ON malfunctions (A), (B), (C), (D) and (E).

The monitor will run whenever the following DTCs are not present.	P0115 - P0118: ECT sensor P0125: Insufficient ECT for Closed Loop P0500: VSS P0748 - P0799: Trans solenoid (range)
Turbine speed sensor (NT) circuit	Functioning normally
Output speed sensor (SP2) circuit	Functioning normally
Shift solenoid "A" (S1) circuit	Functioning normally

Shift solenoid "B" (S2) circuit	Functioning normally
Shift solenoid "E" (SR) circuit	Functioning normally
Pressure control solenoid "A" (SL1) circuit	Functioning normally
Pressure control solenoid "B" (SL2) circuit	Functioning normally
ECT (Engine coolant temperature) sensor circuit	Functioning normally
Knock sensor circuit	Functioning normally
ETCS (Electronic throttle control system)	System not down
Transmission shift position	"D"
ECT	40°C (104°F) or more
Spark advance from max. retard timing by knock sensor control	0° CA or more
Engine	Starting

ON malfunction (A)

ECM selected gear	1st
Vehicle speed	1.2 to 24.9 mph (2 to 40 km/h)
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

ON malfunction (B)

ECM selected gear	3rd
Vehicle speed	1.2 mph (2 km/h) or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

ON malfunction (C)

ECM selected gear	4th
Vehicle speed	1.2 mph (2 km/h) or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

ON malfunction (D)

Current ECM selected gear	5th
Last ECM selected gear	4th
Vehicle speed (During transition from 4th to 5th gear)	Less than 62.2 mph (100 km/h)

ON malfunction (E)

ECM selected gear	5th
Engine speed - Turbine speed (NE - NT) (After transition from 4th to 5th gear)	150 rpm or less
Vehicle speed (After transition from 4th to 5th gear)	Less than 62.2 mph (100 km/h)

TYPICAL MALFUNCTION THRESHOLDS

[ON malfunction]

Both of the following conditions are met:

- ON malfunctions (A) and (B), or ON malfunction (C)
- ON malfunction (D) or (E)

ON malfunction (A)

Turbine speed/Output speed	3.30 to 7.50 (Actual gear is 1st)

ON malfunction (B)

Turbine speed/Output speed	1.28 to 1.53 (Actual gear is 3rd)

ON malfunction (C)

Turbine speed/Output speed	0.93 to 1.07 (Actual gear is 4th)

ON malfunction (D)

Turbine speed - Output speed x 4th gear ratio	1,000 rpm or more

ON malfunction (E)

Turbine speed - Output speed x 5th gear ratio	1,000 rpm or more

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ SHIFT".
8. According to the display on the tester, perform the "ACTIVE TEST".

HINT:
While driving, the shift position can be changed with the intelligent tester.
Comparing the shift position directed by the ACTIVE TEST with the actual shift position enables the problem to be confirmed (See page AT-32).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position manually. [Vehicle Condition] Vehicle Speed: Less than 30 mph (50 km/h) [Others] • Press → button: Shift up • Press ← button: Shift down	Possible to check the operation of the shift solenoid valves. HINT: Shifting to the 5th gear is possible only when the vehicle is stationary with the engine idling.

HINT:

- This test can be conducted when the vehicle speed is 30 mph (50 km/h) or less.
- The 4th to 5th up-shifting must be performed with the accelerator pedal released.
- The 5th to 4th down-shifting must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position directed by the ECM is shown in the DATA LIST/ SHIFT display on the intelligent tester.
- The shift solenoid valve SL2 is turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
Shift solenoid valve SL2	ON	ON	ON	ON	OFF

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

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.

(c) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

Result:

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

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

B → **GO TO DTC CHART**

A

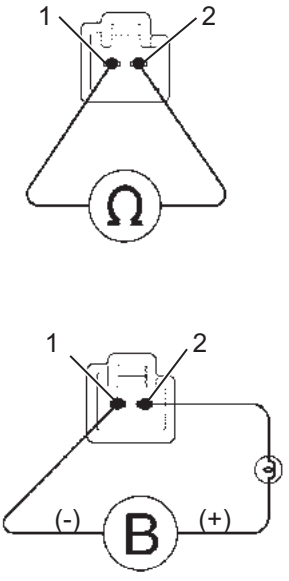
2 **PERFORM ACTIVE TEST USING INTELLIGENT TESTER (LINE PRESS UP) (See page AT-79)**

NG → **REPLACE SHIFT SOLENOID VALVE SLT**

OK

3 **INSPECT SHIFT SOLENOID VALVE SL2**

Shift Solenoid Valve SL2:



D025466E25

(a) Remove the shift solenoid valve SL2.
(b) Measure the resistance.
Standard resistance

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

(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

4	**INSPECT TRANSMISSION VALVE BODY ASSEMBLY (See chapter 2 in the problem symptoms table)**

OK:
There are no foreign objects on any valves and they operate smoothly.

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

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY

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

DESCRIPTION

Shifting from 1st to 5th is performed in combination with the ON and OFF operation of the shift solenoid valves S1, S2, SR, SL1 and SL2 which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be driven smoothly (See page AT-32).

DTC No.	DTC Detection Conditions	Trouble Areas
P0778	The ECM checks for an open or short in the shift solenoid valve SL2 circuit (1-trip detection logic): • Output signal duty equals 100 %. (NOTE: SL2 output signal duty is less than 100 % under normal conditions)	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL2 circuit. The ECM controls the gearshift by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other functioning shift solenoid valves "ON/OFF". (If an open or short circuit is detected, the ECM cuts the current to the circuit.)
If the ECM detects an open or short in the shift solenoid valve SL2 circuit, the ECM determines that there is a malfunction (See page AT-32).

MONITOR STRATEGY

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

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	None
Battery voltage	10 V or more
CPU requested duty ratio to SL2	Less than 75 %
Ignition switch	ON
Starter	OFF

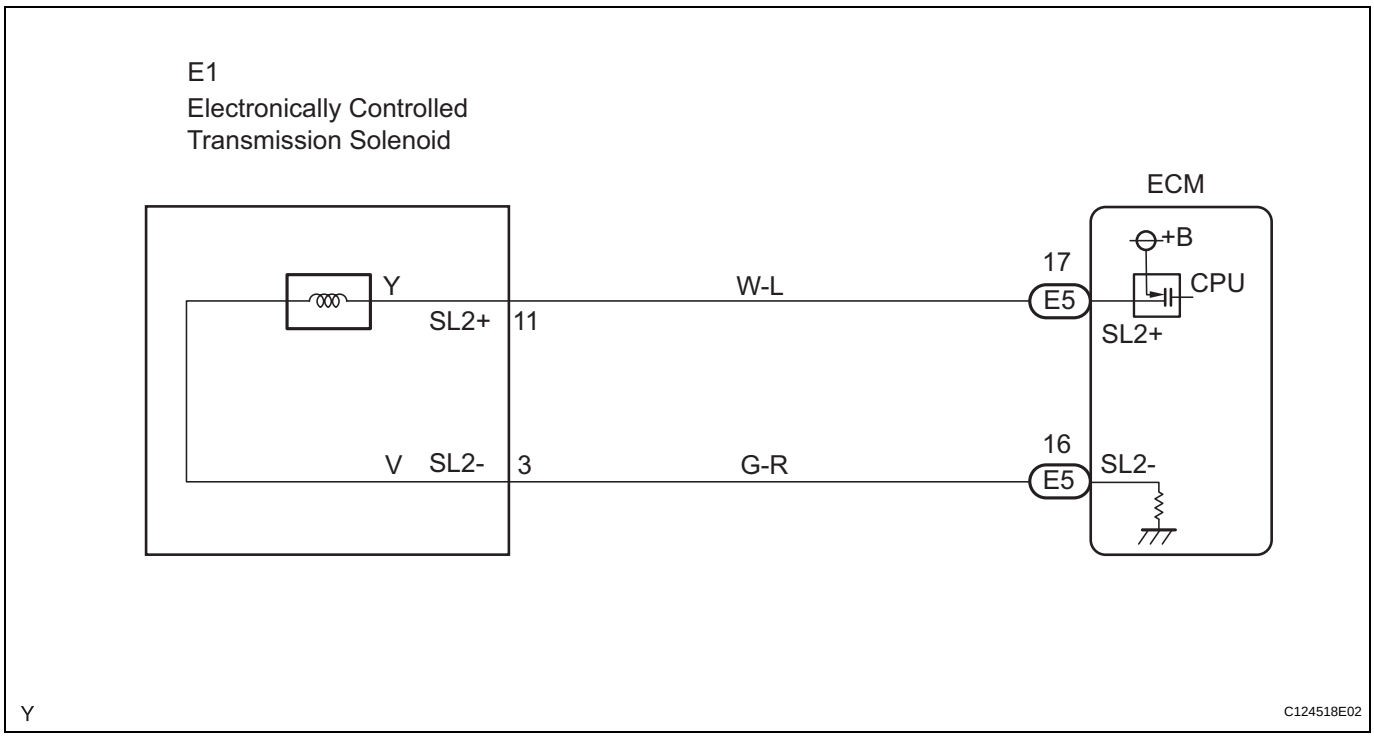
TYPICAL MALFUNCTION THRESHOLDS

Output signal duty	100 %

COMPONENT OPERATING RANGE

Output signal duty	Less than 100 %

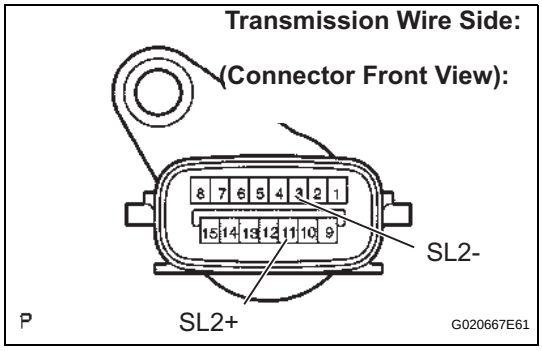
WIRING DIAGRAM



HINT:
The shift solenoid valve SL2 is turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
Shift solenoid valve SL2	ON	ON	ON	ON	OFF

1	INSPECT TRANSMISSION WIRE (SL2)



(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
11 (SL2+) - 3 (SL2-)	5.0 to 5.6 Ωat 20°C (68°F)

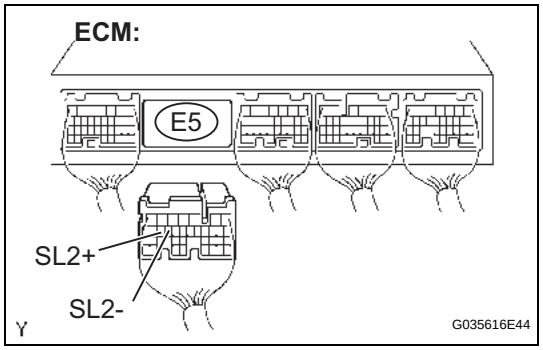
(c) Measure the resistance.
Standard resistance (Check for short):

Tester Connection	Specified Condition
11 (SL2+) - Body ground	10 kΩ or higher
3 (SL2-) - Body ground	10 kΩ or higher

NG → **Go to step 3**

OK

2 CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
E5-17 (SL2+) - E5-16 (SL2-)	5.0 to 5.6 Ω at 20°C (68°F)

(d) Measure the resistance.
Standard resistance (Check for short)

Tester Connection	Specified Condition
E5-17 (SL2+) - Body ground	10 kΩ or higher
E5-16 (SL2-) - Body ground	10 kΩ or higher

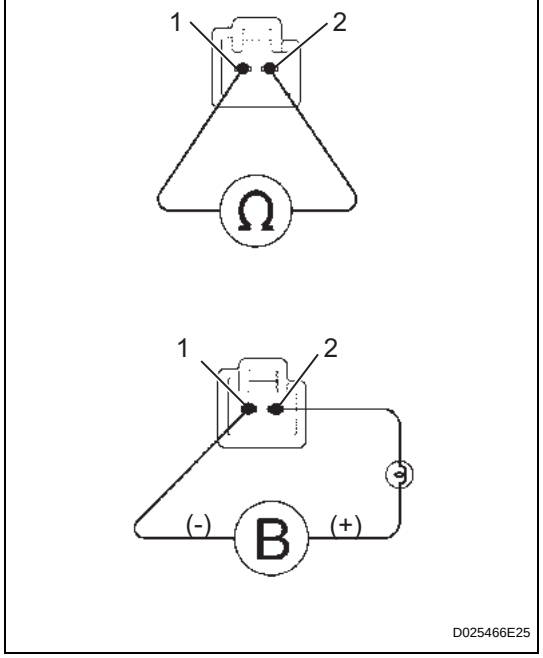
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE SL2

Shift Solenoid Valve SL2:



(a) Remove the shift solenoid valve SL2.
(b) Measure the resistance.
Standard resistance

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

(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.

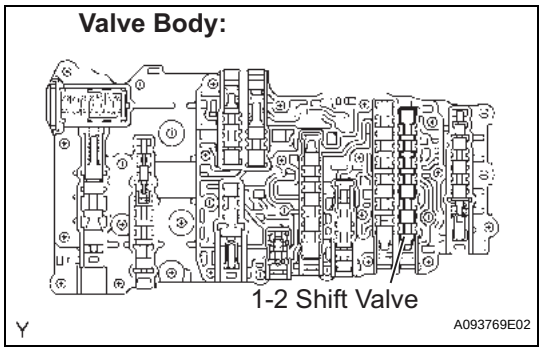
NG → **REPLACE SHIFT SOLENOID VALVE SL2**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P0781	1-2 Shift (1-2 Shift Valve)

DESCRIPTION



The 1-2 shift valve performs shifting to 1st gear and other gears.

DTC No.	DTC Detection Conditions	Trouble Areas
P0781	1-2 shift valve malfunction: The ECM determines that there is a malfunction when the following conditions (a) and (b), or (a) and (c) are met (2-trip detection logic): (a) When the ECM directs the gearshift to switch to 2nd gear, the actual gear is shifted to 1st. (b) When the ECM directs the gearshift to switch to 4th gear, the actual gear is shifted to 3rd. (c) When the ECM directs the gearshift to switch to 5th gear, the engine overruns (clutch slips)	• Valve body is blocked up or stuck (1-2 shift valve) • Shift solenoid valve SLT remains open or closed • Automatic transmission (clutch, brake or gear, etc.)

HINT:
Gear positions in the event of a 1-2 shift valve mechanical problem:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
Actual gear position under malfunction	1st	1st	3rd	3rd	N*

N*: Neutral

MONITOR DESCRIPTION

This DTC indicates that the 1-2 shift valve in the valve body is locked in the direction of the spring compression. The ECM controls the gearshifts by turning the shift solenoid valves "ON/OFF" and switching oil pressure to the valves in the valve body.
The ECM calculates the "actual" transmission gear by comparing the signals from the input speed sensor (NT) and the output speed sensor (SP2). The ECM can detect many mechanical problems in the shift solenoids, valve body, and the transmission clutches, brakes, and gears. If the ECM detects that the actual gear position and the commanded gear position are different, it will illuminate the MIL and store the DTC .

MONITOR STRATEGY

Related DTCs	P0781: Valve body/Rationality check
Required sensors/Components (Main)	Valve body
Required sensors/Components (Related)	Automatic transmission assembly, Speed sensor (NT), Speed sensor (SP2), Vehicle speed sensor, Throttle position sensor
Frequency of operation	Continuous
Duration	Conditions (A) and (B) 0.4 seconds Condition (C) 3 seconds Condition (D) 0.5 seconds
MIL operation	2 driving cycles

Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The following conditions are common to all Conditions (A), (B), (C) and (D).

The monitor will run whenever the following DTCs are not present.	P0115 - P0118: ECT sensor P0125: Insufficient ECT for Closed Loop P0500: VSS P0748 - P0799: Trans Solenoid (range)
Turbine speed sensor (NT) circuit	Functioning normally
Output speed sensor (SP2) circuit	Functioning normally
Shift solenoid "A" (S1) circuit	Functioning normally
Shift solenoid "B" (S2) circuit	Functioning normally
Shift solenoid "E" (SR) circuit	Functioning normally
Pressure control solenoid "A" (SL1) circuit	Functioning normally
Pressure control solenoid "B" (SL2) circuit	Functioning normally
ECT (Engine coolant temperature) sensor circuit	Functioning normally
Knock sensor circuit	Functioning normally
ETCS (Electronic throttle control system)	System not down
Transmission shift position	"D"
ECT	40°C (104°F) or more
Spark advance from max. retard timing by knock sensor control	0°CA or more
Engine	Starting

Condition (A)

ECM selected gear	2nd
Vehicle speed	1.2 mph (2 km/h) or more
Output speed	2nd → 1st down shift point or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

Condition (B)

ECM selected gear	4th
Vehicle speed	1.2 mph (2 km/h) or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

Condition (C)

Current ECM selected gear	5th
Last ECM selected gear	4th
Vehicle speed (During transition from 4th to 5th gear)	Less than 62.2 mph (100 km/h)

Condition (D)

ECM selected gear	5th
Engine speed - Turbine speed (NE - NT) After transition from 4th to 5th gear)	150 rpm or less
Vehicle speed After transition from 4th to 5th gear)	Less than 62.2 mph (100 km/h)

TYPICAL MALFUNCTION THRESHOLDS

Condition (A) and Conditions (B), (C) or (D) are met:

Condition (A)

Turbine speed/Output speed	3.30 to 7.50 (Actual gear is 1st)

Condition (B)

Turbine speed/Output speed	1.28 to 1.53 (Actual gear is 3rd)

Condition (C)

Turbine speed - Output speed x 4th gear ratio	1,000 rpm or more

Condition (D)

Turbine speed - Output speed x 5th gear ratio	1,000 rpm or more

1	CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P0781)

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the main switch ON.
(c) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

Result:

Display (DTC Output)	Proceed to
Only "P0781" is output	A
"P0781" and other DTCs	B

HINT:
If any codes besides "P0781" are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART

A

2	PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT)

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ SHIFT".
8. According to the display on the tester, perform the "ACTIVE TEST".

HINT:
While driving, the shift position can be changed with the intelligent tester.
Comparing the shift position directed by the ACTIVE TEST with the actual shift position enables the problem to be confirmed (See page AT-32).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position manually. [Vehicle Condition] Vehicle Speed: Less than 30 mph (50 km/h) [Others] • Press →button: Shift up • Press ←button: Shift down	Possible to check the operation of the shift solenoid valves. HINT: Shifting to the 5th gear is possible only when the vehicle is stationary with the engine idling.

HINT:
- This test can be conducted when the vehicle speed is 30 mph (50 km/h) or less.
- The 4th to 5th up-shifting must be performed with the accelerator pedal released.
- The 5th to 4th down-shifting must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position directed by the ECM is shown in the DATA LIST/ SHIFT display on the intelligent tester.
- Gear positions in the event of a solenoid valve mechanical problem:

Gearshift operated by tester	1st	2nd	3rd	4th	5th
Actual gear position under malfunction	1st	1st	3rd	3rd	N*

N*: Neutral
OK:
Gear position changes in accordance with the tester operation.

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

OK

3	**PERFORM ACTIVE TEST USING INTELLIGENT TESTER (LINE PRESS UP) (See page AT-79)**

NG → **REPLACE SHIFT SOLENOID VALVE SLT**

OK

4	**CLEAR DTC AND PERFORM RUNNING TEST**

(a) Clear the DTC, and check for the DTC again after conducting the "MONITOR DRIVE PATTERN FOR ECT TEST" (See page AT-19).
OK:
No DTC

AT

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

OK

END

DTC	P0973	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)

DTC	P0974	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)

DESCRIPTION

Shifting from 1st to 5th is performed in combination with the ON and OFF operation of the shift solenoid valves S1, S2, SR, SL1 and SL2 which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valve to allow the vehicle to be driven smoothly (See page AT-32).

DTC No.	DTC Detection Conditions	Trouble Areas
P0973	ECM detects short in solenoid valve S1 circuit 2 times when solenoid valve S1 is operated (1-trip detection logic)	• Short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM
P0974	ECM detects open in solenoid valve S1 circuit 2 times when solenoid valve S1 is not operated (1-trip detection logic)	• Open in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S1 circuit. When there is an open or short circuit in any shift solenoid valve circuits, the ECM detects the problem and illuminates the MIL and stores the DTC. When the shift solenoid valve S1 is on, if the resistance is 8 Ω or less, the ECM determines that there is a short malfunction in the shift solenoid valve S1 circuit.
When the shift solenoid valve S1 is off, if the resistance is 100 kΩ or more, the ECM determines that the shift solenoid valve S1 circuit is open (See page AT-32).

MONITOR STRATEGY

Related DTCs	P0973: Shift solenoid valve S1/Range check (Low resistance) P0974: Shift solenoid valve S1/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S1
Frequency of operation	Continuous
Duration	0.064 seconds
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0973: Range check (Low resistance)

The monitor will run whenever the following DTCs are not present.	None
Shift solenoid valve S1	ON

P0974: Range check (High resistance)

The monitor will run whenever the following DTCs are not present.	None
Shift solenoid valve S1	OFF

TYPICAL MALFUNCTION THRESHOLDS

AT

P0973: Range check (Low resistance)

Shift solenoid valve S1 resistance	8 Ω or less

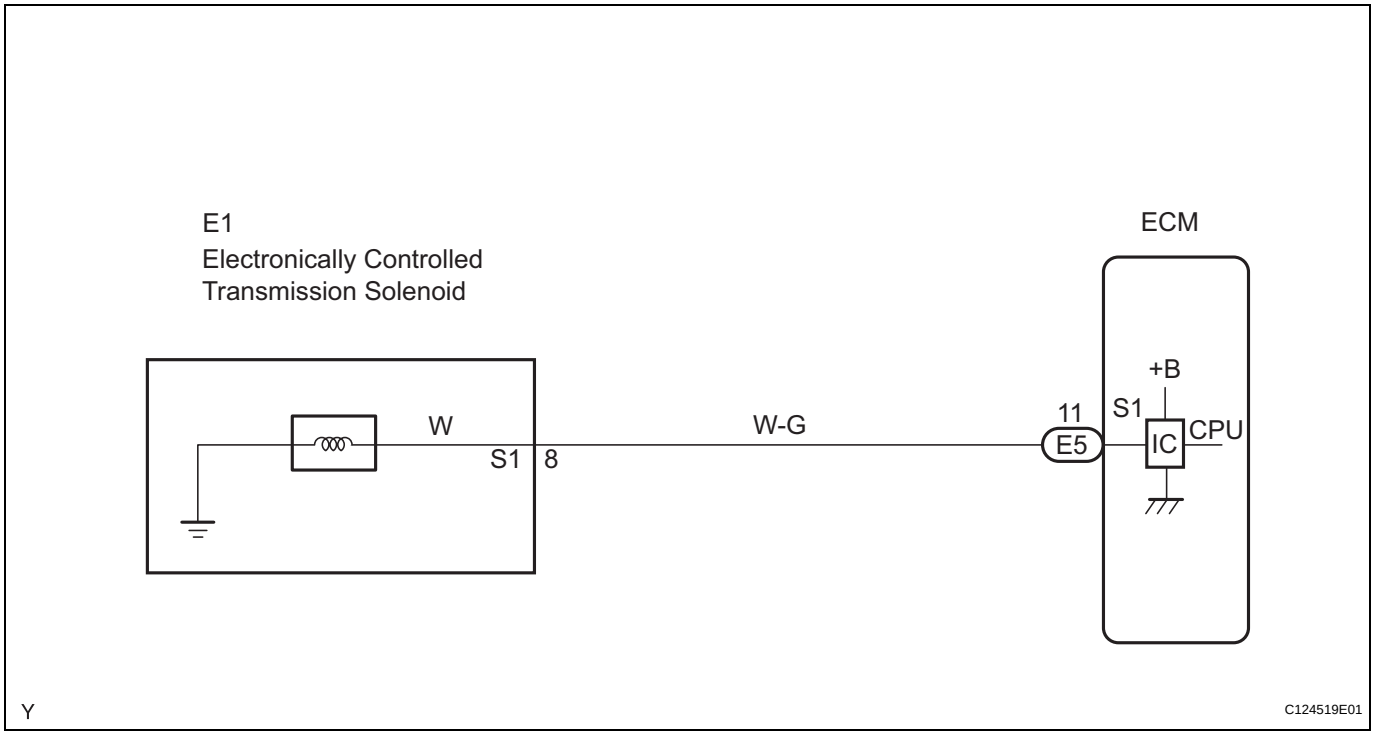
P0974: Range check (High resistance)

Shift solenoid valve S1 resistance	100 kΩ or more

COMPONENT OPERATING RANGE

Shift solenoid valve S1 resistance	11 to 15 Ω at 20°C (68°F)

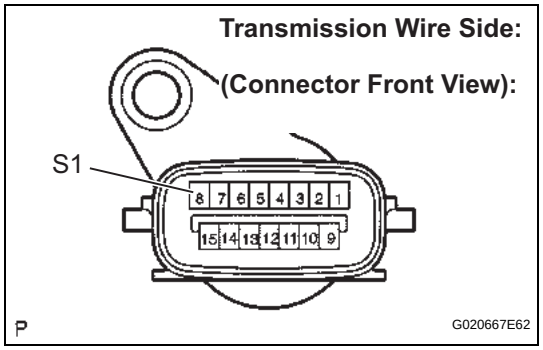
WIRING DIAGRAM



HINT:
The shift solenoid valve S1 is turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
Shift solenoid valve S1	ON	ON	OFF	OFF	OFF

1 INSPECT TRANSMISSION WIRE (S1)



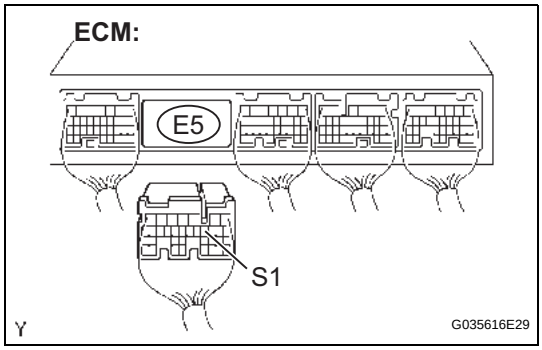
(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
Standard resistance

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

NG → **Go to step 3**

OK

2 CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
Standard resistance

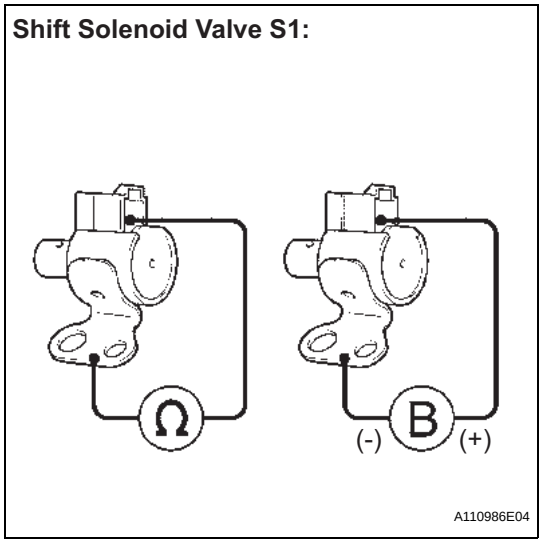
Tester Connection	Specified Condition
E5-11 (S1) - Body ground	11 to 15 Ω at 20°C (68°F)

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

OK

REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE S1



(a) Remove the shift solenoid valve S1.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
Solenoid Connector (S1) - Solenoid Body (S1)	11 to 15 Ω at 20°C (68°F)

(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 S1**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P0976	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)

DTC	P0977	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)

DESCRIPTION

Shifting from 1st to 5th is performed in combination with the ON and OFF operation of the shift solenoid valves S1, S2, SR, SL1 and SL2 which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valve to allow the vehicle to be driven smoothly (See page AT-32).

DTC No.	DTC Detection Conditions	Trouble Areas
P0976	ECM detects short in solenoid valve S2 circuit 2 times when solenoid valve S2 is operated (1-trip detection logic)	• Short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM
P0977	ECM detects open in solenoid valve S2 circuit 2 times when solenoid valve S2 is not operated (1-trip detection logic)	• Open in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S2 circuit. When there is an open or short circuit in any shift solenoid valve circuits, the ECM detects the problem and illuminates the MIL and stores the DTC. When the shift solenoid valve S2 is on, if the resistance is 8 Ω or less, the ECM determines that there is a short malfunction in the shift solenoid valve S2 circuit.
When the shift solenoid valve S2 is off, if the resistance is 100 kΩ or more, the ECM determines that the shift solenoid valve S2 circuit is open (See page AT-32).

MONITOR STRATEGY

Related DTCs	P0976: Shift solenoid valve S2/Range check (Low resistance) P0977: Shift solenoid valve S2/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S2
Frequency of operation	Continuous
Duration	0.064 seconds
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0976: Range check (Low resistance)

The monitor will run whenever the following DTCs are not present.	None
Shift solenoid valve S2	ON

P0977: Range check (High resistance)

The monitor will run whenever the following DTCs are not present.	None
Shift solenoid valve S2	OFF

TYPICAL MALFUNCTION THRESHOLDS

P0976: Range check (Low resistance)

Shift solenoid valve S2 resistance	8 Ω or less

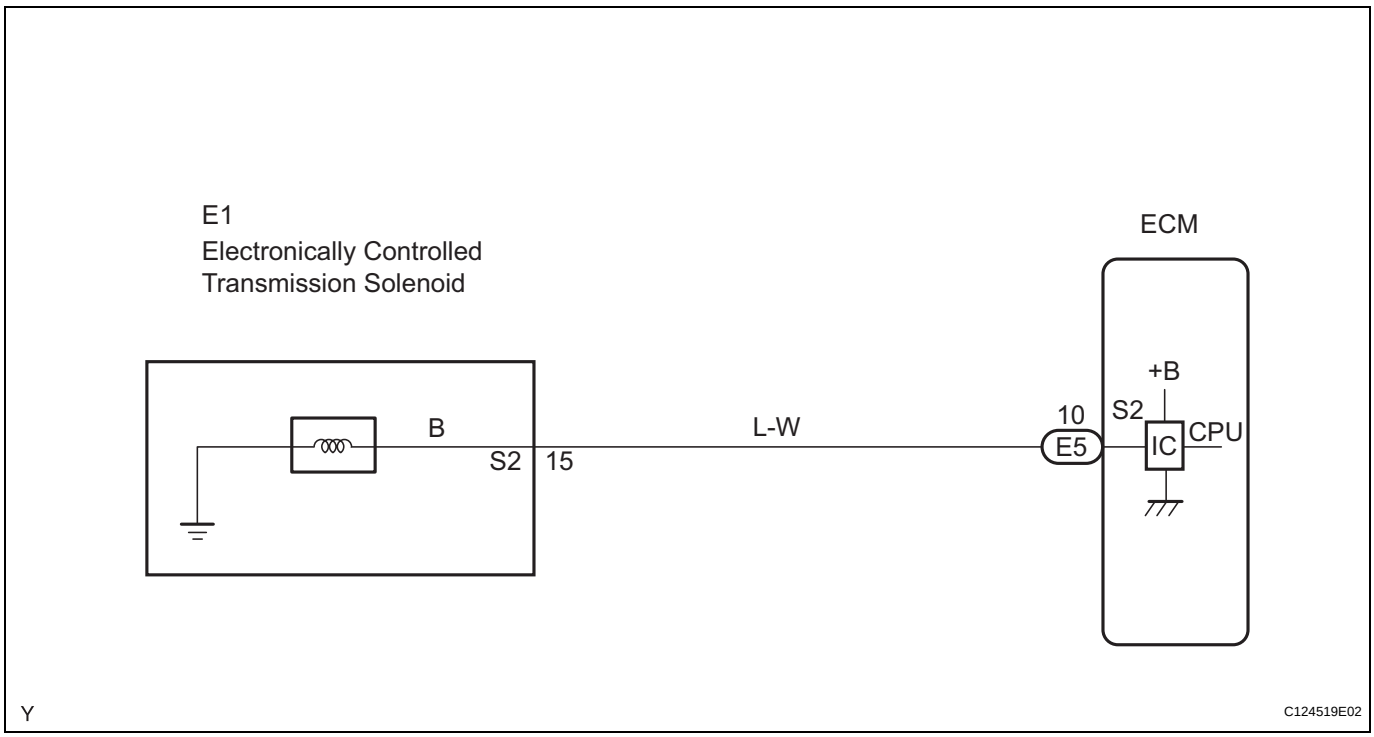
P0977: Range check (High resistance)

Shift solenoid valve S2 resistance	100 kΩ or more

COMPONENT OPERATING RANGE

Shift solenoid valve S2 resistance	11 to 15 Ω at 20°C (68°F)

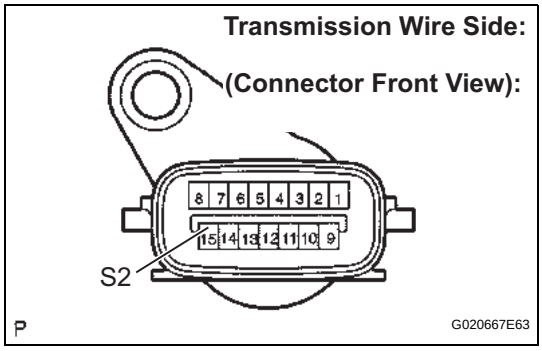
WIRING DIAGRAM



HINT:
The shift solenoid valve S2 is turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
Shift solenoid valve S2	OFF	ON	ON	OFF	OFF

1	INSPECT TRANSMISSION WIRE (S2)



(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
Standard resistance

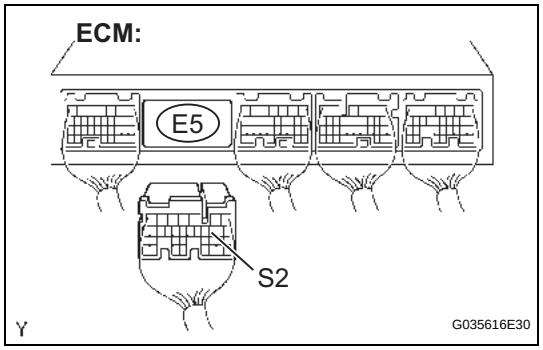
Tester Connection	Specified Condition
15 - Body ground	11 to 15 Ω at 20°C (68°F)

NG → **Go to step 3**

OK

AT

2 CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
Standard resistance

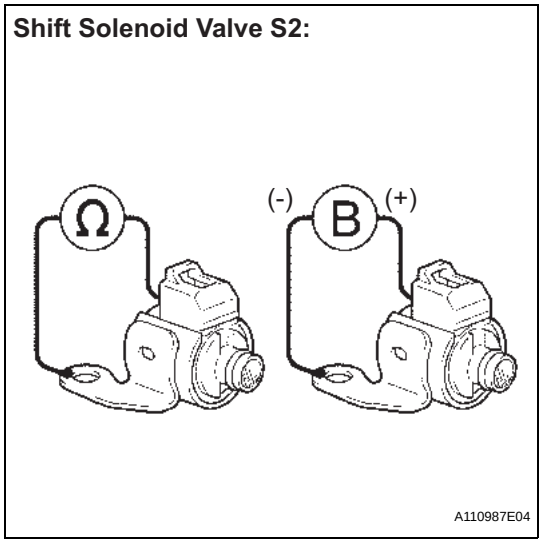
Tester Connection	Specified Condition
E5-10 (S2) - Body ground	11 to 15 Ω at 20°C (68°F)

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

OK

REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE S2



(a) Remove the shift solenoid valve S2.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
Solenoid Connector (S2) - Solenoid Body (S2)	11 to 15 Ω at 20°C (68°F)

(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 S2**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P0985	Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)

DTC	P0986	Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)

DESCRIPTION

Shifting from 1st to 5th is performed in combination with the ON and OFF operation of the shift solenoid valves S1, S2, SR, SL1 and SL2 which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be driven smoothly (See page AT-32).

DTC No.	DTC Detection Conditions	Trouble Areas
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

These DTCs indicate an open or short in the shift solenoid valve SR circuit. When there is an open or short circuit in any shift solenoid valve circuits, the ECM detects the problem and illuminates the MIL and stores the DTC. When the shift solenoid valve SR is on, if the resistance is 8 Ω or less, the ECM determines that there is a short malfunction in the shift solenoid valve SR circuit.
When the shift solenoid valve SR is off, if the resistance is 100 kΩ or more, the ECM determines that the shift solenoid valve SR circuit is open (See page AT-32).

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 seconds
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0985: Range check (Low resistance)

The monitor will run whenever the following DTCs are 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 the following DTCs are not present.	None
Shift solenoid valve SR	OFF
Battery voltage	8 V or more
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

P0985: Range check (Low resistance)

Shift solenoid valve SR resistance	8 Ω or less

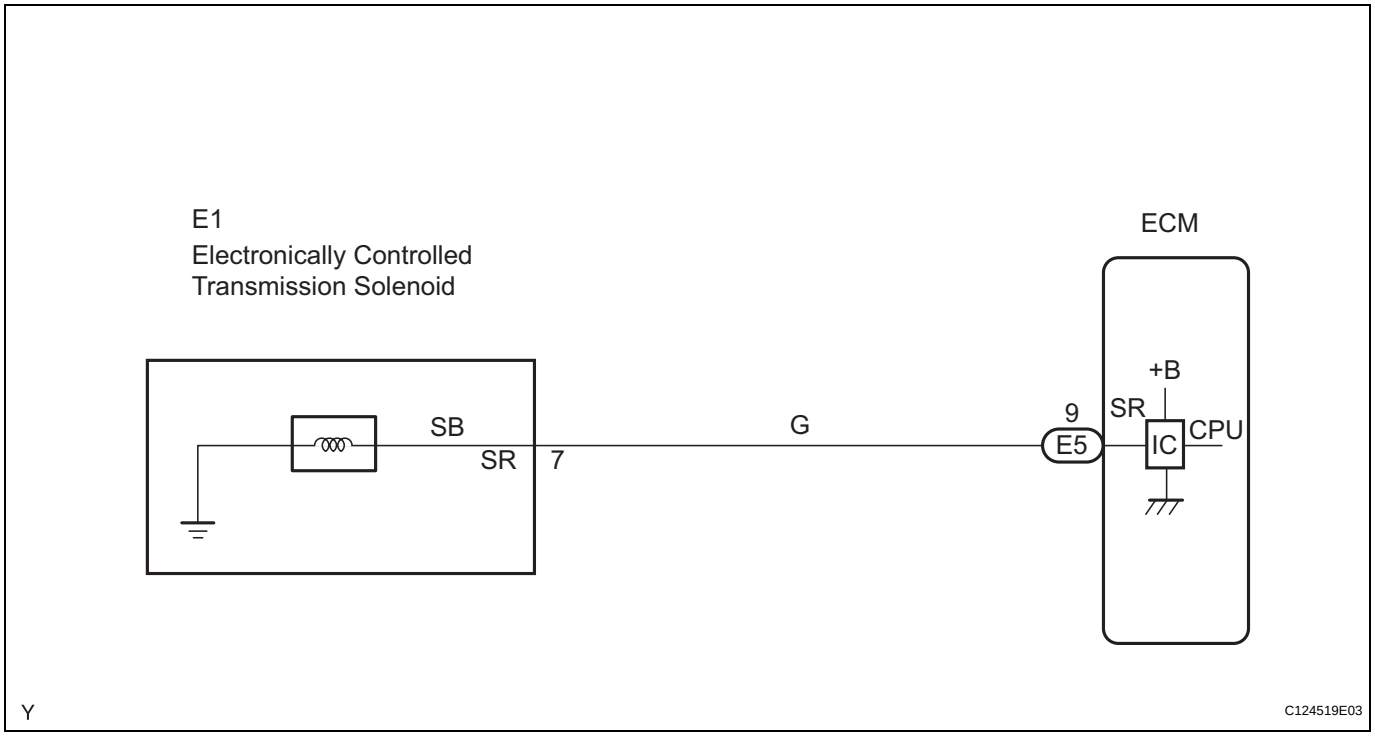
P0986: Range check (High resistance)

Shift solenoid valve SR resistance	100 kΩ or more

COMPONENT OPERATING RANGE

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

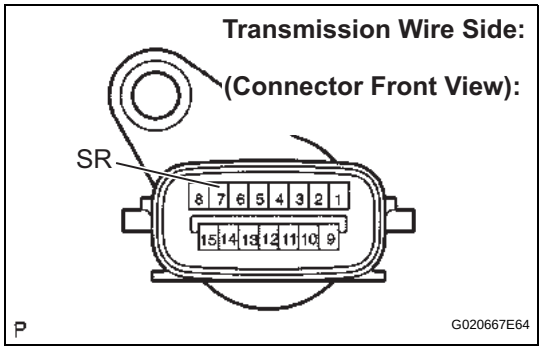
WIRING DIAGRAM



HINT:
The shift solenoid valve SR is turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
Shift solenoid valve SR	OFF	OFF	OFF	OFF	ON

1	INSPECT TRANSMISSION WIRE (SR)



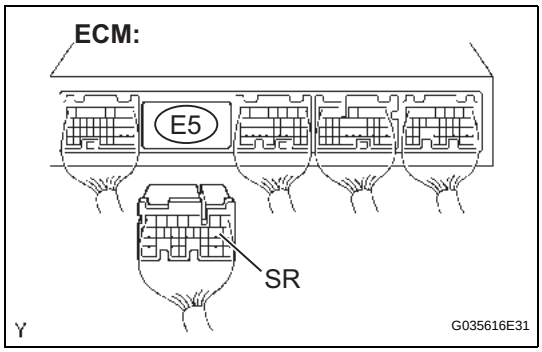
(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
Standard resistance

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

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
E5-9 (SR) - Body ground	11 to 15 Ω at 20°C (68°F)

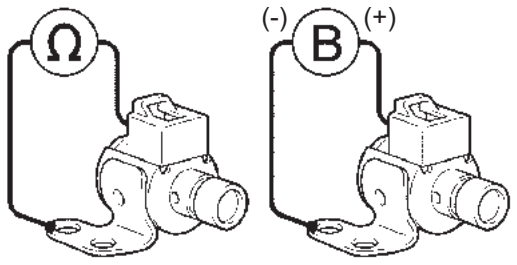
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM

3	INSPECT SHIFT SOLENOID VALVE SR

Shift Solenoid Valve SR:



A110988E05

(a) Remove the shift solenoid valve SR.
(b) Measure the resistance.
Standard resistance

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

(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.

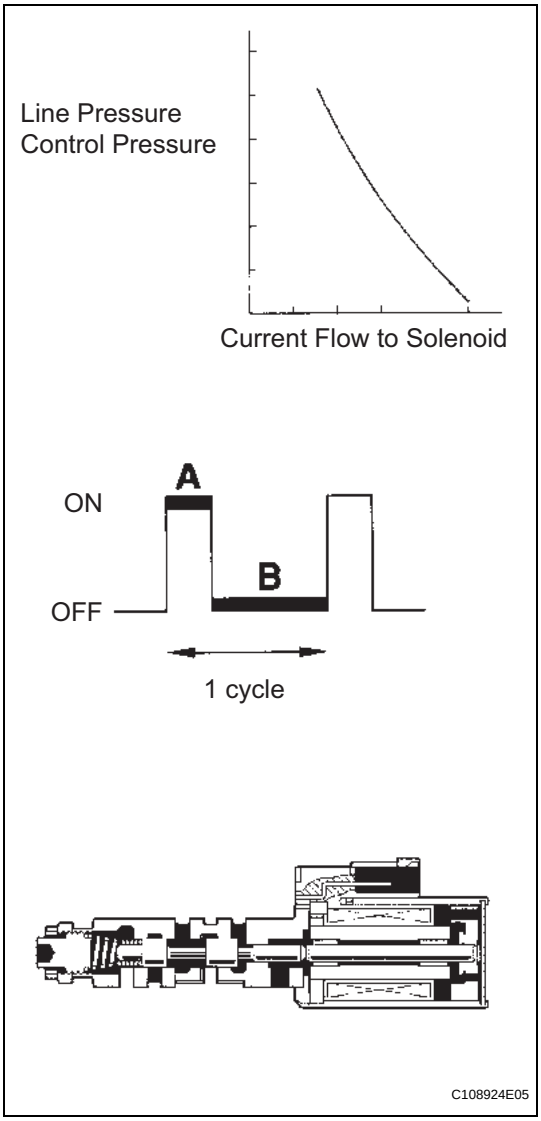
NG → **REPLACE SHIFT SOLENOID VALVE SR**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P2714	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)

DESCRIPTION



The linear solenoid valve (SLT) controls the transmission line pressure for smooth transmission operation based on signals from the throttle position sensor and the vehicle speed sensor. The ECM adjusts the duty ratio* of the SLT solenoid valve output signal to control the hydraulic line pressure coming from the primary regulator valve. Appropriate line pressure assures smooth shifting with varying engine outputs.
*: 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
P2714	ECM detects malfunctions on SLT (ON side) according to the revolution difference between the turbine and the output shaft, and also by monitoring the oil pressure. (2 trip detection logic)	• Shift solenoid valve SLT remains open or closed • Shift solenoid valve S1, S2, SR, SL1 or SL2 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

MONITOR DESCRIPTION

The ECM calculates the amount of heat absorbed by the friction material based on the difference in revolution (clutch slippage) between the turbine and output shaft. The ECM turns on the MIL and outputs this DTC when the amount of heat absorption exceeds the specified value.
When the shift solenoid valve SLT remains on, the oil pressure goes down and the clutch engagement force decreases.
NOTE: If driving continues under these conditions, the clutch will burn out and the vehicle will no longer be drivable.

MONITOR STRATEGY

Related DTCs	P2714 : Shift solenoid valve SLT/ON malfunction
Required sensors/Components (Main)	Shift solenoid valve SLT
Required sensors/Components (Related)	Valve body, ATF temperature sensor, Speed sensor (NT), Speed sensor (SP2)
Frequency of operation	Continuous
Duration	Immediate
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	None
Turbine speed sensor (NT) circuit	Functioning normally
Output speed sensor (SP2) circuit	Functioning normally
Transmission fluid temperature sensor "A" circuit	Functioning normally
Shift solenoid "A" (S1) circuit	Functioning normally
Shift solenoid "B" (S2) circuit	Functioning normally
Shift solenoid "E" (SR) circuit	Functioning normally
Pressure control solenoid "A" (SL1) circuit	Functioning normally
Pressure control solenoid "B" (SL2) circuit	Functioning normally
Pressure control solenoid "D" (SLT) circuit	Functioning normally
ECT (Engine coolant temperature) sensor circuit	Functioning normally
Knock sensor circuit	Functioning normally
ETCS (Electronic throttle control system)	System not down
Transmission shift position	"D"
ECT	40°C (104°F) or more
Spark advance from max. retard timing by knock sensor control	0° CA or more
Engine	Starting
ATF temperature	10°C (50°F) or more

TYPICAL MALFUNCTION THRESHOLDS

Summation of C1 clutch heat generations = SUM (Turbine speed - Output speed x Temporary gear ratio)	Specified value

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.
1. Warm up the engine.

2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ LINE PRESS UP".
8. According to the display on the tester, perform the "ACTIVE TEST".

Item	Test Details	Diagnostic Note
LINE PRESS UP *	[Test Details] Operate the shift solenoid SLT to 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)	-

*: "LINE PRESS UP" in the ACTIVE TEST is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the HYDRAULIC TEST (See page AT-16) as well.

HINT:

- The pressure values in ACTIVE TEST and HYDRAULIC TEST are different from each other.
- Normally, the line pressure detected in the ACTIVE TEST is approximately half of the value detected in the HYDRAULIC TEST's stall test.

1 CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P2714)

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

Result:

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

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

B → **GO TO DTC CHART**

A

2 PERFORM ACTIVE TEST USING INTELLIGENT TESTER (LINE PRESS UP) (See page AT-79)

NG → **Go to step 9**

OK

3	PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT)

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Turn the intelligent tester ON.
(d) Clear the DTC (See page AT-30).
(e) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
(f) Follow the instructions on the tester and perform the ACTIVE TEST.

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

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position. [Vehicle Condition] • IDL: ON • Less than 30 mph (50 km/h) [Other information] • Press "→" button: Shift up • Press "←" button: Shift down	The operation of the shift solenoid valves can be checked.

HINT:
- This test can be conducted when the vehicle speed is 30 mph (50 km/h) or less.
- The 4th to 5th up-shift must be performed with the accelerator pedal released.
- The 5th to 4th down-shift must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position commanded by the ECM is shown in the DATA LIST (SHIFT) display on the intelligent tester.

(g) Compare the ECM gear shift command and the actual gear position.

ECM gear shift command			1st	2nd	3rd	4th	5th	Proceed to
Actual gear position under malfunction	Shift solenoid S1	Stuck ON	1st	2nd	2nd	1st	N*1	A
		Stuck OFF	4th	3rd	3rd	4th	5th	
	Shift solenoid S2	Stuck ON	2nd	2nd	3rd	3rd	N*1	B
		Stuck OFF	1st	1st	4th	4th	5th	
	Shift solenoid SL2	Stuck ON	1st	2nd	3rd	4th	N*1	C
		Stuck OFF	1st	2nd	3rd	4th	5th	
	Shift solenoid SR	Stuck ON*2	1st	2nd	3rd	4th	5th	D
		Stuck OFF	1st	2nd	3rd	4th	4th	

HINT:
- *1: Neutral
- *2: Shift shock increases extremely when a malfunction occurs.
- Gear shift can be determined by paying attention to changes in rpm.

B	Go to step 5
C	Go to step 6
D	Go to step 7
OK	Go to step 9

A

4	INSPECT SHIFT SOLENOID VALVE S1 (See page AT-108)

OK	Go to step 10

NG

REPLACE SHIFT SOLENOID VALVE S1

5	INSPECT SHIFT SOLENOID VALVE S2 (See page AT-111)

OK	Go to step 10

NG

REPLACE SHIFT SOLENOID VALVE S2

6	INSPECT SHIFT SOLENOID VALVE SL2 (See page AT-99)

OK	Go to step 10

NG

REPLACE SHIFT SOLENOID VALVE SL2

7	INSPECT SHIFT SOLENOID VALVE SR (See page AT-115)

NG	REPLACE SHIFT SOLENOID VALVE SR

OK

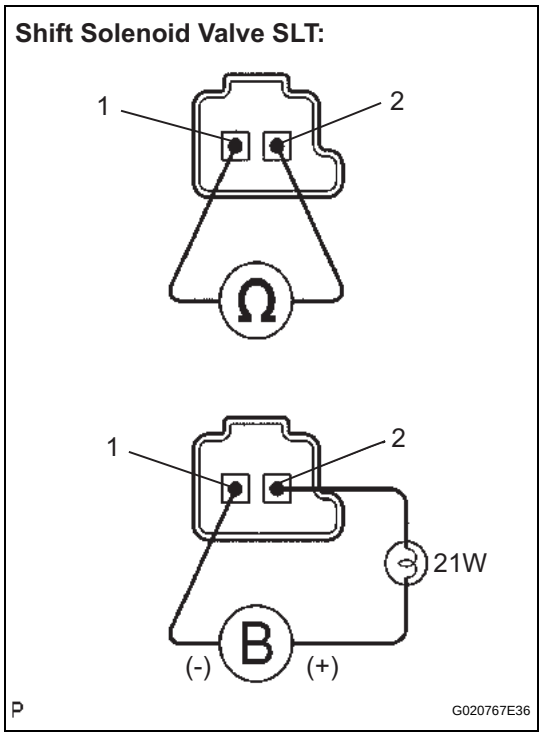
8	INSPECT SHIFT SOLENOID VALVE SL1 (See page AT-74)

OK	Go to step 10

NG

REPLACE SHIFT SOLENOID VALVE SL1

9 INSPECT SHIFT SOLENOID VALVE SLT



(a) Remove the shift solenoid valve SLT.
(b) Measure the resistance.
Standard resistance

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

(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

10 INSPECT TRANSMISSION VALVE BODY ASSEMBLY (See chapter 2 in the problem symptoms table)

OK:
There are no foreign objects on any valves and they operate smoothly.

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

OK

11 INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

(a) Check the torque converter clutch assembly (See page AT-166).
OK:
The torque converter clutch operates normally.

NG → **REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY**

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY

DTC	P2716	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)

DESCRIPTION

Refer to DTC P2714 (See page AT-110).

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

MONITOR DESCRIPTION

When an open or short is detected in the linear solenoid valve (SLT) circuit, the ECM interprets this as a fault.
The ECM turns on the MIL and stores 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 second
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	None
Battery voltage	10 V or more
CPU requested duty ratio to SLT	Less than 75 %
Ignition switch	ON
Starter	OFF

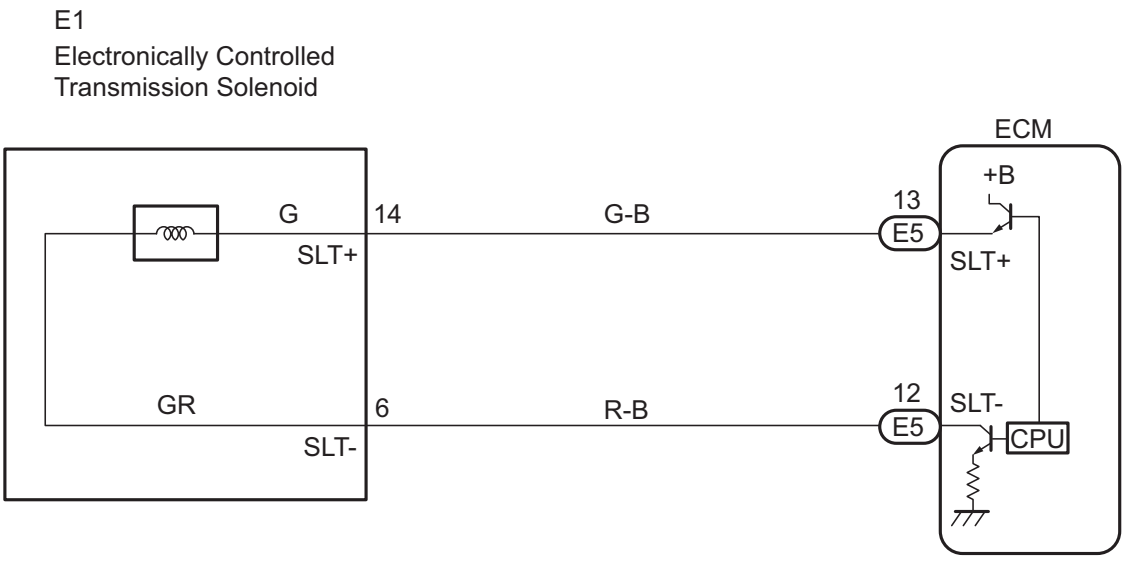
TYPICAL MALFUNCTION THRESHOLDS

Output signal duty	100 %

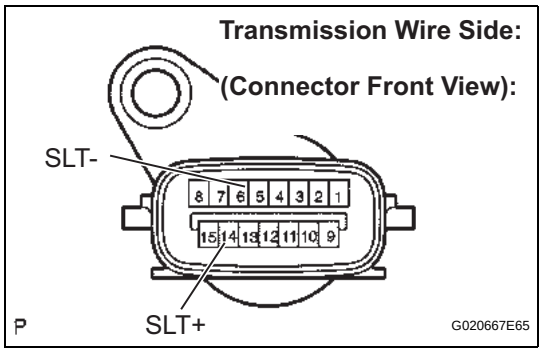
COMPONENT OPERATING RANGE

Output signal duty ratio	Less than 100 %

WIRING DIAGRAM



1	INSPECT TRANSMISSION WIRE (SLT)



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

(b) Measure the resistance.

Standard resistance

Tester Connection	Specified Condition
14 (SLT+) - 6 (SLT-)	5.0 to 5.6 Ω at 20°C (68°F)

(c) Measure the resistance.

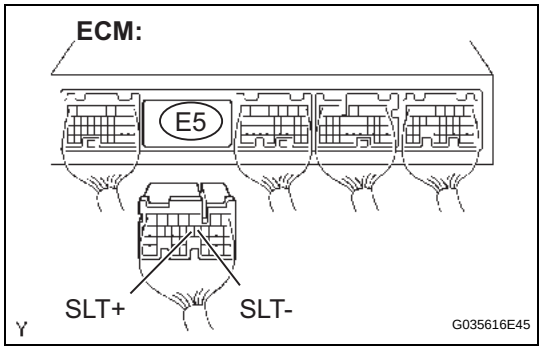
Standard resistance (Check for short)

Tester Connection	Specified Condition
14 (SLT+) - Body ground	10 kΩ or higher
6 (SLT-) - Body ground	10 kΩ or higher

NG → **Go to step 3**

OK

2 CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
E5-13 (SLT+) - E5-12 (SLT-)	5.0 to 5.6 Ω at 20°C (68°F)

(d) Measure the resistance.
Standard resistance (Check for short)

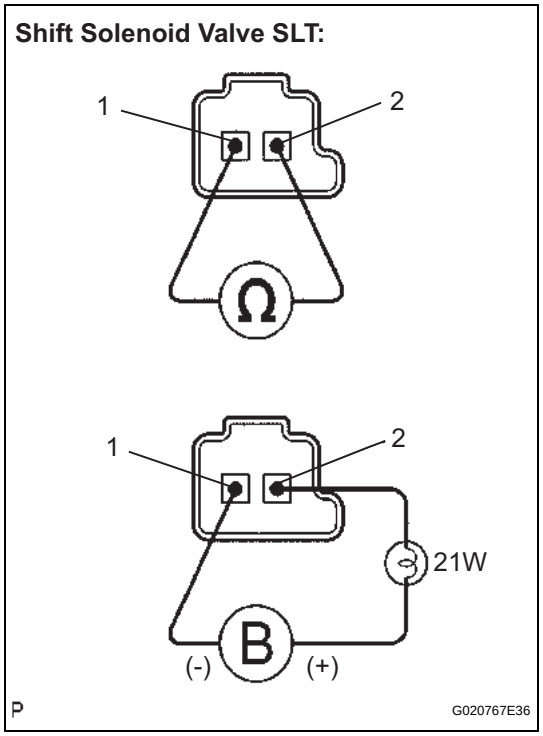
Tester Connection	Specified Condition
E5-13 (SLT+) - Body ground	10 kΩ or higher
E5-12 (SLT-) - Body ground	10 kΩ or higher

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

OK

REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE SLT



(a) Remove the shift solenoid valve SLT.
(b) Measure the resistance.
Standard resistance

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

(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

DTC	P2740	Transmission Fluid Temperature Sensor "B" Circuit

DTC	P2742	Transmission Fluid Temperature Sensor "B" Circuit Low Input

DTC	P2743	Transmission Fluid Temperature Sensor "B" Circuit High Input

DESCRIPTION

The No. 2 Automatic Transmission Fluid (ATF) temperature sensor is on the transmission, just before the oil cooler inlet pipeline.

If the ECM detects an abnormally high ATF temperature through this sensor, it illuminates the warning light to indicate the problem to the driver.

HINT:

- The ATF temperature is liable to increase under vehicle conditions such as towing, climbing hills and in traffic.
- If there is a short malfunction in the No. 2 ATF temperature sensor, the ECM receives signals from the sensor, which indicate that the ATF temperature is 150°C (302°F) or more.

The symptoms and recovery conditions, when the sensor is normal or there is a short malfunction in the sensor, are as shown in the table below.

No.2 ATF Temperature Sensor Status	Detection Condition	Symptom	Recovery Condition
Sensor is normal	• ATF temperature more than 150°C (302°F)	• ATF temperature warning light remains on	• ATF temperature less than 135°C (275°F) *2
	• ATF temperature more than 130°C (266°F)	• Shift point too high	• ATF temperature less than 110°C (230°F)
	When the conditions (a) and (b) are satisfied continually (a) ATF temperature more than130°C (266°F) (b) Engine coolant temperature more than 95°C (203°F)	• Lock-up in 3rd gear *1	• ATF temperature less than 110°C (230°F) *2 and engine coolant temperature less than 95°C (203°F)
Sensor is short	• Any conditions	• ATF temperature warning light remains on • Shift point too high	• Symptoms still occur
	• Engine coolant temperature more than 95°C (203°F)	• Lock-up in 3rd gear *1	• Symptom still occurs

HINT:

*1: When the ATF temperature is normal, the transmission locks up in 5th gear with the shift lever in the D position and in 4th gear with the shift lever in the 4th position.

*2: When the ATF temperature is in the normal range, it decreases to less than 135°C (275°F) within 5 minutes of the shift lever being moved to the P or N position, while idling.

DTC No.	DTC Detection Conditions	Trouble Areas
P2740	Conditions (a) and (b) are detected momentarily within 0.5 seconds when neither P2742 nor P2743 is detected (1-trip detection logic) (a) No. 2 ATF temperature sensor resistance (voltage) is less than 25 Ω (0.046 V) (b) No. 2 ATF temperature sensor resistance (voltage) is more than 156 kΩ (4.915 V) HINT: Within 0.5 seconds the malfunction changes from (a) to (b) or (b) to (a)	• Open or short in No.2 ATF temperature sensor circuit • No.2 ATF temperature sensor • ECM

DTC No.	DTC Detection Conditions	Trouble Areas
P2742	No. 2 ATF temperature sensor resistance (voltage) is less than 25 Ω (0.046 V) for 0.5 seconds or more (1-trip detection logic)	• Short in No.2 ATF temperature sensor circuit • No.2 ATF temperature sensor • ECM
P2743	No. 2 ATF temperature sensor resistance (voltage) is more than 156 kΩ (4.915 V) for 0.5 seconds or more 15 minutes or more after starting engine (1-tip detection logic)	• Open in No.2 ATF temperature sensor circuit • No.2 ATF temperature sensor • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the No. 2 Automatic Transmission Fluid (ATF) temperature sensor circuit. The No. 2 ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and detects any open or short malfunctions in the No. 2 ATF temperature sensor circuit. If the resistance (voltage) of the No. 2 ATF temperature sensor is less than 25 Ω (0.046 V) or more than 156 kΩ (4.915 V), the ECM interprets this as a fault in the No. 2 ATF temperature sensor or its wiring. The ECM turns on the MIL and stores a DTC.

MONITOR STRATEGY

Related DTCs	P2740 : No. 2 ATF temperature sensor/Range check (Fluttering) P2742 : No. 2 ATF temperature sensor/Range check (Low voltage) P2743 : No. 2 ATF temperature sensor/Range check (High voltage)
Required sensors/Components	No. 2 ATF temperature sensor
Frequency of operation	Continuous
Duration	0.5 seconds
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P2740: Range check (Fluttering)

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

P2742: Range check (Low voltage)

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

P2743: Range check (High voltage)

The monitor will run whenever the following DTCs are not present.	None
Time after engine start	15 minutes or more

TYPICAL MALFUNCTION THRESHOLDS

P2740: Range check (Fluttering)

No. 2 ATF temperature sensor voltage	Less than 0.046 V or More than 4.915 V

P2742: Range check (Low voltage)

No. 2 ATF temperature sensor voltage	Less than 0.046 V

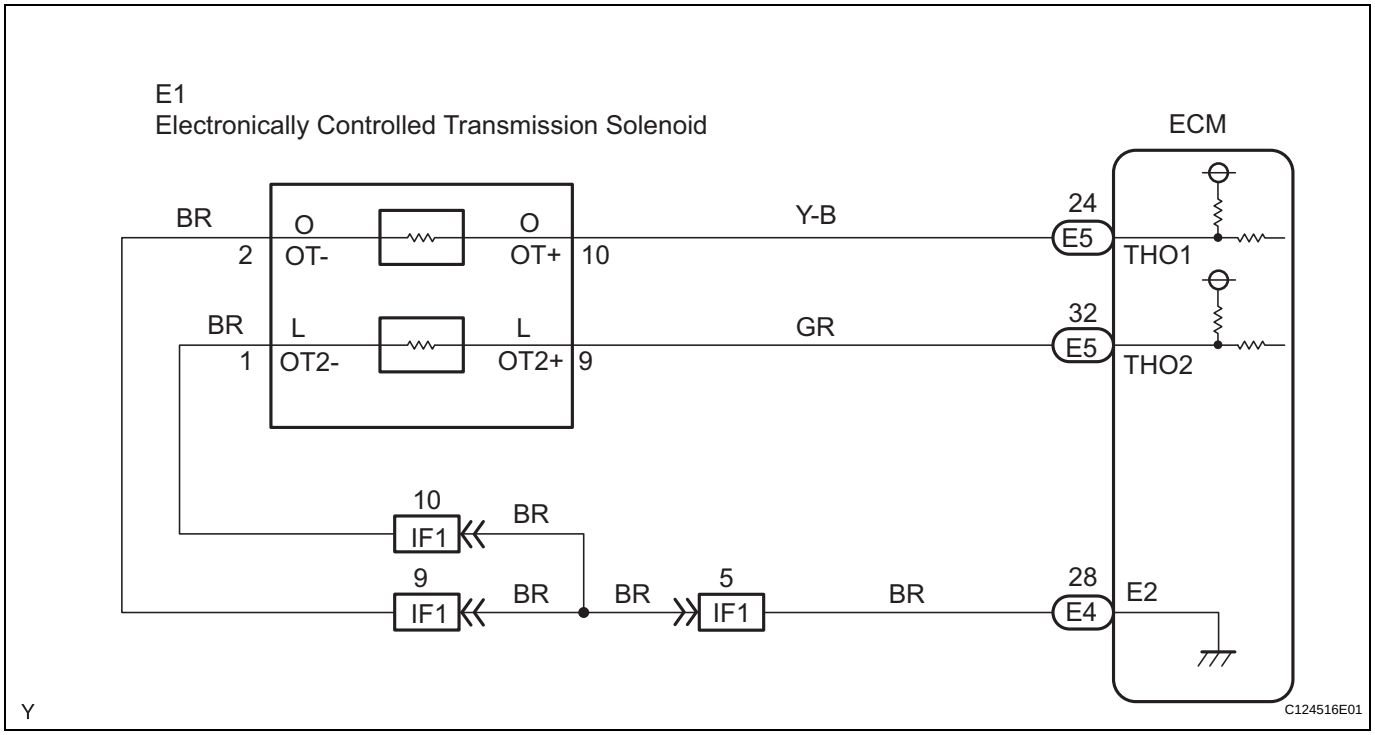
P2743: Range check (High voltage)

No. 2 ATF temperature sensor voltage	More than 4.915 V

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM



HINT:
According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors, actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.
NOTICE:
In the table below, the values listed under "Normal Condition" are for reference only. Do not depend solely on these reference values when judging whether a part is faulty or not.
1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST"/ A/T.
7. According to the display on the tester, read the "DATA LIST".

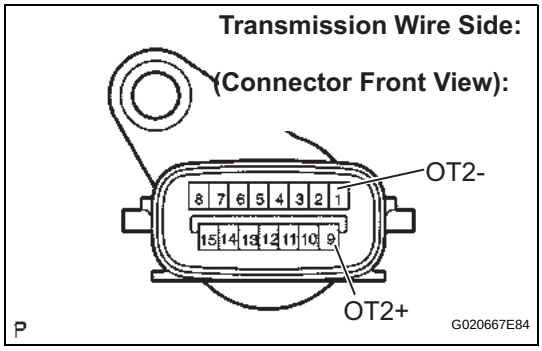
Item	Measurement Item/ Range (display)	Normal Condition
AT OIL TEMP2	No. 2 ATF Temperature Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	• After Stall Test: Approximately 80°C (176°F) • Equal to ambient temperature during cold soak

HINT:
When DTC P2742 is output and intelligent tester reading is 150°C (302°F) or more, there is a short circuit.
When DTC P2743 is output and intelligent tester reading is -40°C (-40°F), there is an open circuit.

Measure the resistance between terminal THO2 (OT2) and the body ground.

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

1 INSPECT TRANSMISSION WIRE (NO.2 ATF TEMPERATURE SENSOR)



(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
1 (OT2-) - 9 (OT2+)	79 Ω to 156 kΩ

(c) Measure the resistance.
Standard resistance (Check for short)

Tester Connection	Specified Condition
1 (OT2-) - Body ground	10 kΩ or higher
9 (OT2+) - Body ground	10 kΩ or higher

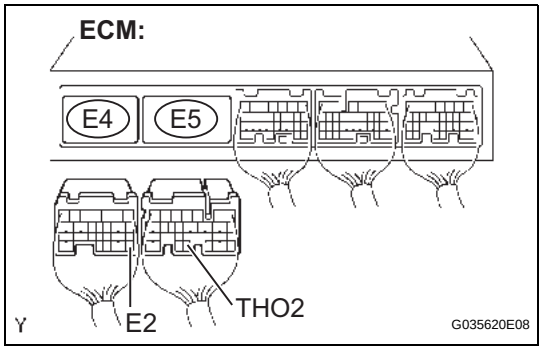
HINT:
If the resistance is out of the specified range with either the ATF temperature shown in the table below, the driveability of the vehicle may decrease.

ATF Temperature	Specified Condition
20°C (68°F)	3 to 4 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

2 CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connectors.
(c) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
E5-32 (THO2) - E4-28 (E2)	79 Ω to 156 kΩ

(d) Measure the resistance.
Standard resistance (Check for short)

Tester Connection	Specified Condition
E5-32 (THO2) - Body ground	10 kΩ or higher
E4-28 (E2) - Body ground	10 kΩ or higher

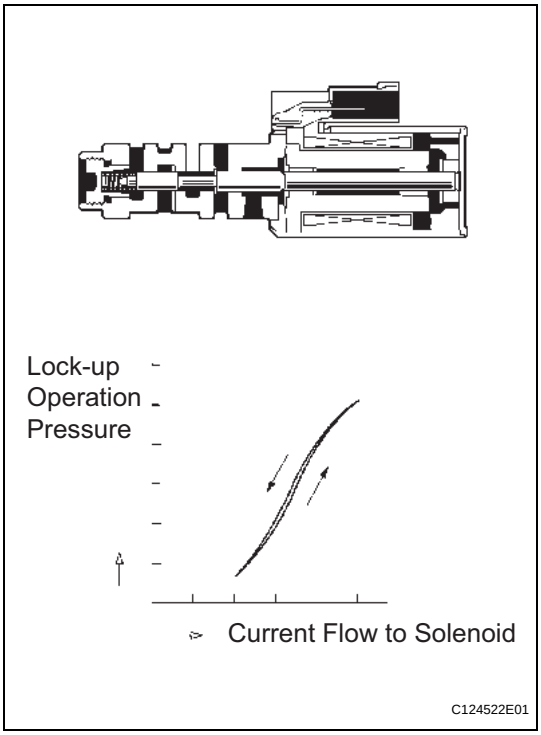
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM

DTC	P2757	Torque Converter Clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU)

DESCRIPTION



The ECM uses the signals from the throttle position sensor, mass air flow meter, turbine (input) speed sensor, output 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 any mechanical problems with the shift solenoid valve SLU, valve body or torque converter clutch.

DTC No.	DTC Detection Conditions	Trouble Areas
P2757	Lock-up does not occur when driving in the lock-up range (normal driving at 50 mph [80 km/h]), or lock-up remains ON in the lock-up OFF range. (2-trip detection logic)	• Shift solenoid valve SLU remains open or closed • Valve body is blocked • Shift solenoid valve SLU • Torque converter clutch • Automatic transmission (clutch, brake or gear, etc.) • Line pressure is too low

MONITOR DESCRIPTION

Torque converter lock-up is controlled by the ECM based on turbine (input) speed sensor NT, output speed sensor SP2, engine rpm, engine load, engine coolant temperature, vehicle speed, transmission fluid temperature, and gear selection. The ECM determines the lock-up status of the torque converter by comparing the engine rpm (NE) with the input turbine rpm (NT). The ECM calculates the actual transmission gear by comparing input turbine rpm (NT) with output shaft rpm (SP2). When the conditions are appropriate, the ECM requests "lock-up" by applying the control voltage to the shift solenoid SLU. When the SLU is turned on, solenoid SLU applies pressure to the lock-up relay valve and locks the torque converter clutch.

AT

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 SLU or lock-up system performance. The ECM turns on the MIL and stores the DTC.

Example:
When any of the following are met, the ECM interprets it as a malfunction.
1. There is a difference in rotation between before and after the torque converter even when the ECM requests lock-up.
   (Engine speed is at least 70 rpm greater than the input turbine speed.)
2. There is no difference in rotation between before and after the torque converter even when the ECM requests lock-up off.
   (The difference between the engine speed and input turbine speed is less than 35 rpm.)

MONITOR STRATEGY

Related DTCs	P2757: Shift solenoid valve SLU/OFF malfunction Shift solenoid valve SLU/ON malfunction
Required sensors/Components (Main)	Shift solenoid valve SLU
Required sensors/Components (Related)	Valve body, Vehicle speed sensor, Throttle position sensor, Speed sensor (NT), Speed sensor (SP2)
Frequency of operation	Continuous
Duration	OFF malfunction (A): 2 seconds OFF malfunction (B): 0.4 seconds ON malfunction: 1.8 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The following conditions are common to all OFF malfunctions (A), (B) and ON malfunction.

The monitor will run whenever the following DTCs are not present.	None
Turbine speed sensor (NT) circuit	Functioning normally
Output speed sensor (SP2) circuit	Functioning normally
Shift solenoid "A" (S1) circuit	Functioning normally
Shift solenoid "B" (S2) circuit	Functioning normally
Shift solenoid "E" (SR) circuit	Functioning normally
Torque converter clutch pressure control solenoid circuit	Functioning normally
Knock sensor circuit	Functioning normally
ETCS (Electronic throttle control system)	System not down
Transmission shift position	"D"
ECT	40°C (104°F) or more
Spark advance from max. retard timing by knock sensor control	0° CA or more
Engine	Starting
ECM selected gear	4th or 5th
Vehicle speed	15.5 mph (25 km/h) or more
Shift solenoid "A" (S1) circuit	Functioning normally
Shift solenoid "B" (S2) circuit	Functioning normally
Pressure control solenoid "B" (SL2) circuit	Functioning normally
1-2 shift valve	Functioning normally

OFF malfunction (A)

ECM lock-up request	ON (SLU pressure: 513 kPa or more)
Vehicle speed	Less than 62.2 mph (100 km/h)

OFF malfunction (B)

ECM selected gear	2nd
Vehicle speed	1.2 mph (2 km/h) or more
Output speed	2nd → 1st down shift point or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

ON malfunction

ECM lock-up request	OFF (SLU pressure: less than 4 kPa)
Throttle valve opening angle	7 % or more
Vehicle speed	Less than 37.3 mph (60 km/h)

TYPICAL MALFUNCTION THRESHOLDS

Both of the following conditions are met: OFF malfunction (A) and (B)

OFF malfunction (A)

Engine speed - Turbine speed	70 rpm or more

OFF malfunction (B)

Turbine speed/Output speed	Not 3.3 to 7.50

ON malfunction
2 detections are necessary in 1 driving cycle.
1st detection; temporary flag ON
2nd detection; pending fault code ON
Vehicle speed must be under 6.2 mph (10 km/h) once before the 2nd detection.

Difference between engine speed and turbine speed	Less than 35 rpm

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as, the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.

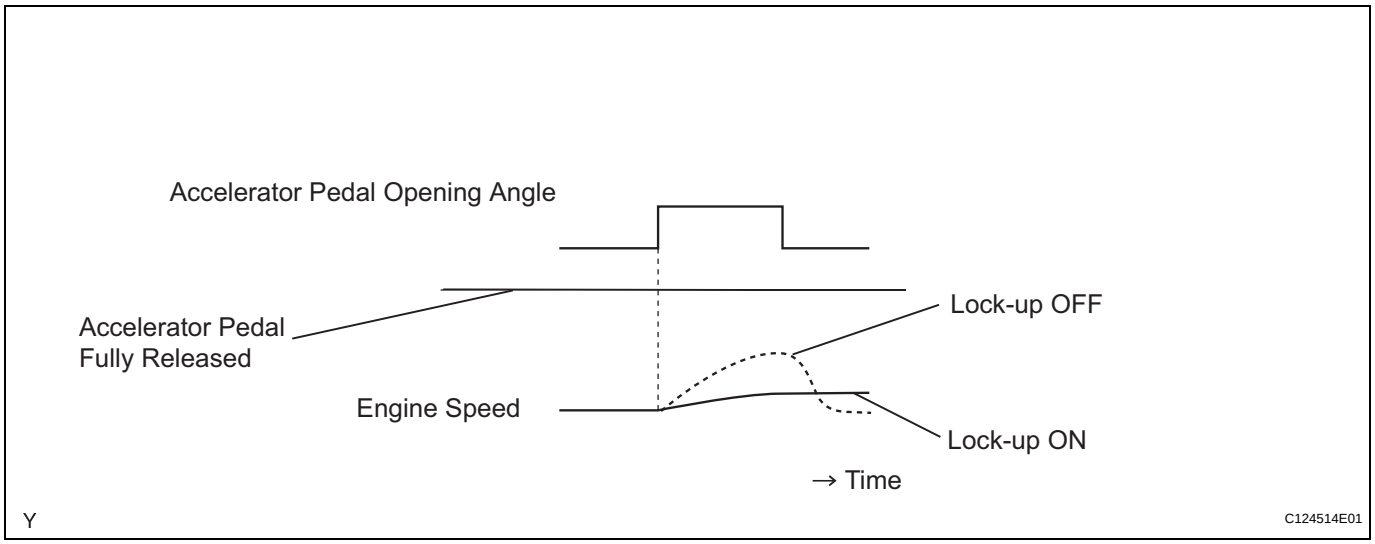
1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ LOCK UP".
8. According to the display on the tester, perform the "ACTIVE TEST".

Item	Test Details	Diagnostic Note
LOCK UP	[Test Details] Control the shift solenoid SLU to set the automatic transmission to the lock-up condition. [Vehicle Condition] Vehicle Speed: 36 mph (60 km/h) or more	Possible to check the SLU operation.

HINT:
This test can be conducted when the vehicle speed is 36 mph (60 km/h) or more.

9. 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 causes closure of the throttle valve and lock-up may be turned off automatically.)



1	CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P2757)

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

Result:

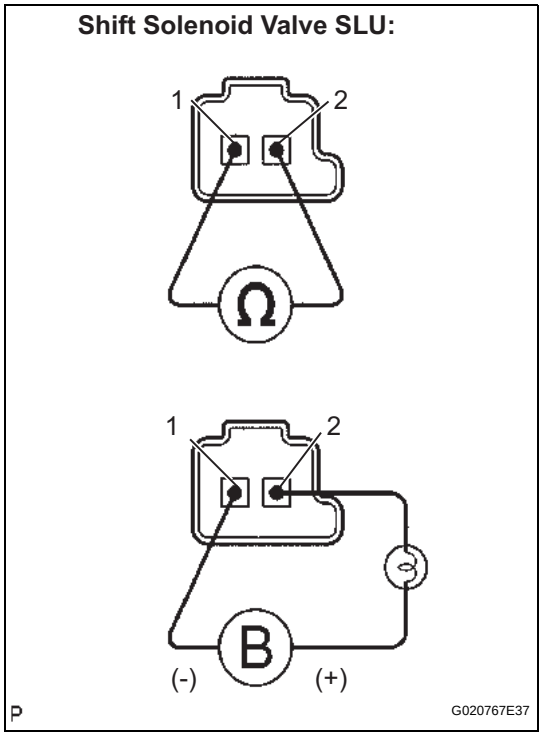
Display (DTC Output)	Proceed to
Only "P2757" is output	A
P2757" and other DTCs	B

HINT:
If any codes besides "P2757" are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART

A

2	INSPECT SHIFT SOLENOID VALVE SLU



(a) Remove the shift solenoid valve SLU.
(b) Measure the resistance.
Standard resistance

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

(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 SLU**

OK

3	INSPECT TRANSMISSION VALVE BODY ASSEMBLY (See chapter 2 in the problem symptoms table)

OK:
There are no foreign objects on any valves and they operate smoothly.

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

OK

4	INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

(a) Inspect the torque converter clutch assembly (See page AT-166).
OK:
The torque converter clutch operates normally.

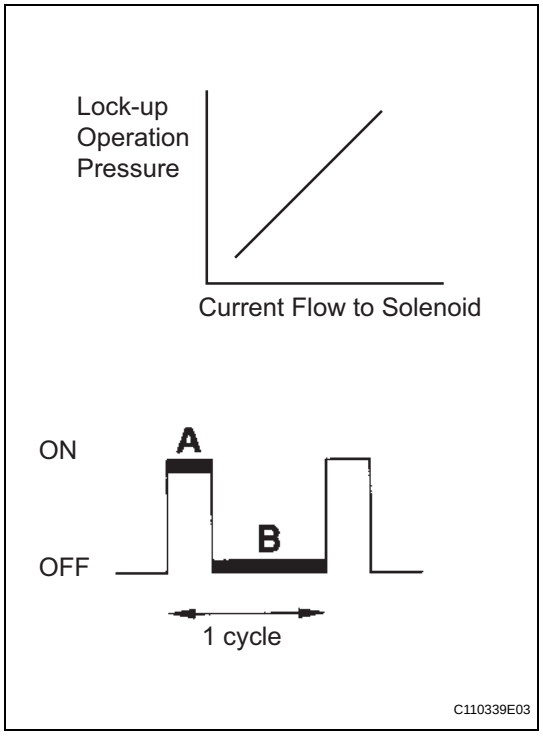
NG → **REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY**

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY

DTC	P2759	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)

DESCRIPTION



The current flow to the solenoid is controlled by the duty ratio* of the ECM output signal. The higher the duty ratio becomes, the higher the lock-up hydraulic pressure becomes during the lock-up operation.
*: 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 Conditions	Trouble Areas
P2759	Open or short is detected in shift solenoid valve SLU circuit for 1 second or more while driving (1-trip detection logic)	• Open or short in shift solenoid valve SLU circuit • Shift solenoid valve SLU • ECM

MONITOR DESCRIPTION

When an open or short is detected in the shift solenoid valve (SLU) circuit, the ECM determines that there is a malfunction. The ECM turns on the MIL and stores this DTC.

MONITOR STRATEGY

Related DTCs	P2759: Shift solenoid valve SLU/Range check
Required sensors/Components	Shift solenoid valve SLU
Frequency of operation	Continuous
Duration	1 second
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	None
Battery voltage	10 V or more
CPU requested duty ratio to SLU	75 % or more
Ignition switch	ON
Starter	OFF

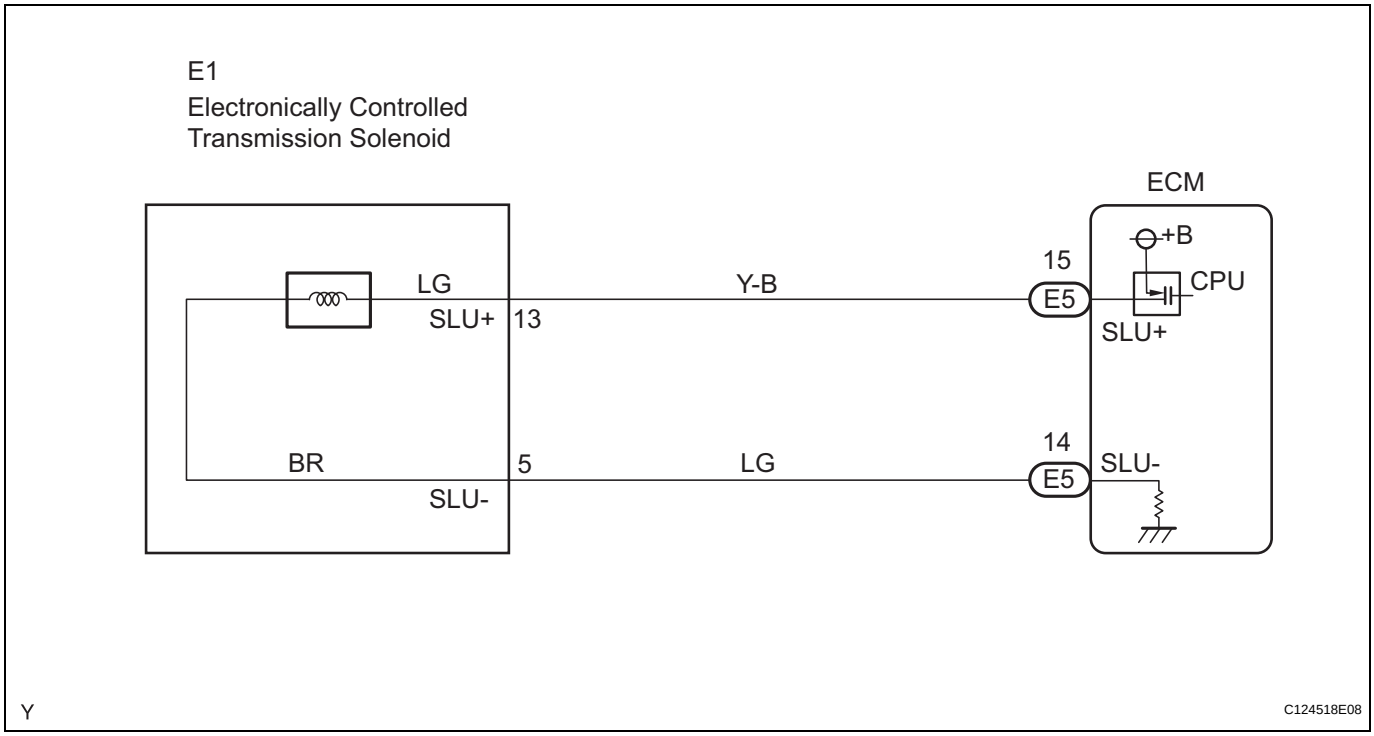
TYPICAL MALFUNCTION THRESHOLDS

Output signal duty	100 %

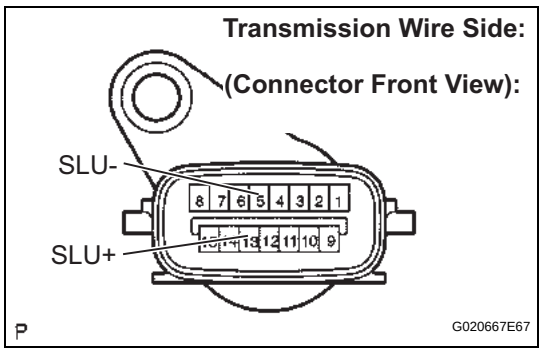
COMPONENT OPERATING RANGE

Output signal duty	Less than 100 %

WIRING DIAGRAM



1	INSPECT TRANSMISSION WIRE (SLU)



(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
13 (SLU+) - 5 (SLU-)	5.0 to 5.6 Ω at 20°C (68°F)

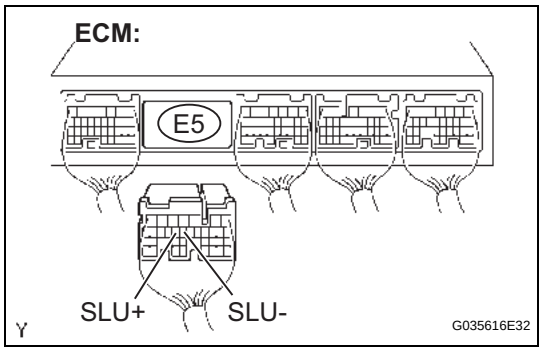
(c) Measure the resistance.
Standard resistance (Check for short)

Tester Connection	Specified Condition
13 (SLU+) - Body ground	10 kΩ or higher
5 (SLU-) - Body ground	10 kΩ or higher

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
E5-15 (SLU+) - E5-14 (SLU-)	5.0 to 5.6 Ω at 20°C (68°F)

(d) Measure the resistance.
Standard resistance (Check for short)

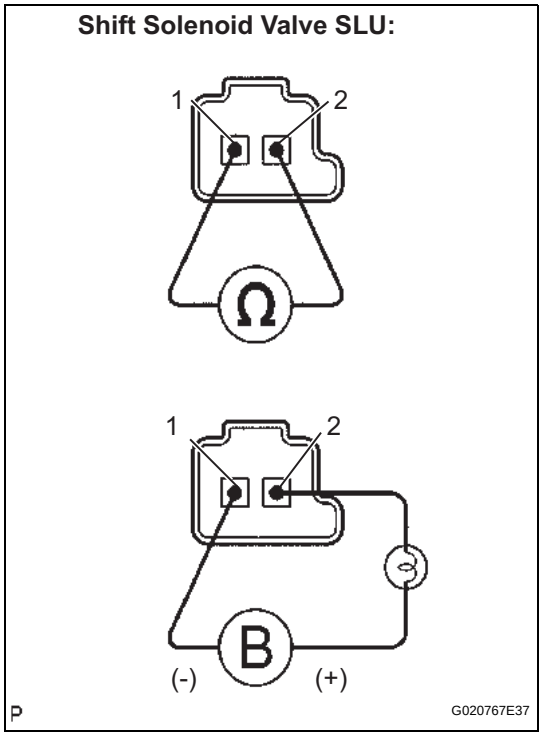
Tester Connection	Specified Condition
E5-15 (SLU+) - Body ground	10 kΩ or higher
E5-14 (SLU-) - Body ground	10 kΩ or higher

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

OK

REPLACE ECM

3	INSPECT SHIFT SOLENOID VALVE SLU



(a) Remove the shift solenoid valve SLU.
(b) Measure the resistance.
Standard resistance

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

(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 SLU**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

AUTOMATIC TRANSMISSION FLUID

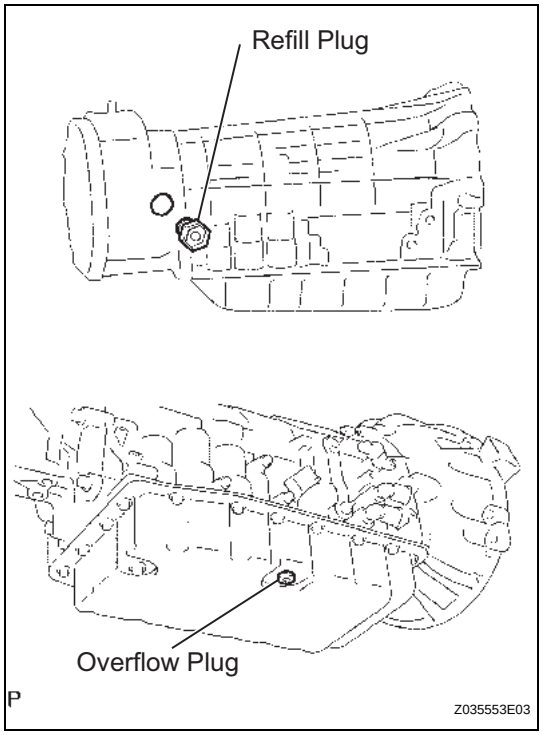
ADJUSTMENT

1. BEFORE FILLING TRANSMISSION

- This transmission requires Toyota Genuine ATF WS.
- It is necessary to refill the transmission with the correct amount of fluid.
- The vehicle must remain level while adjusting the transmission fluid level.
- On vehicles equipped with active suspension, turn the suspension control switch OFF if it is necessary to jack up the vehicle with the engine running.

2. TRANSMISSION PAN FILL

(a) Remove the refill plug and overflow plug.



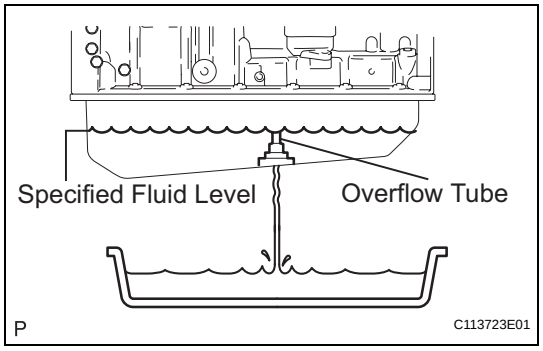
(b) Fill the transmission through the refill hole until fluid begins to trickle out of the overflow tube.

(c) Reinstall the overflow plug.

3. TRANSMISSION FILL

(a) Fill the transmission with the correct amount of fluid as listed in the table below.

(b) Reinstall the refill plug to avoid fluid splash.



Repair	Fill Amount
Transmission pan and drain plug removal	1.3 L (1.37 US qts, 1.14 lmp qts)
Transmission valve body removal	3.9 L (4.12 US qts, 3.43 lmp qts)
Torque converter removal	5.3 L (5.60 US qts, 4.66 lmp qts)
Entire transmission assembly	5.3 L (5.60 US qts, 4.66 lmp qts)

HINT:

If you cannot add the listed amount of fluid, do the following:

- Install the refill plug.
- Allow the engine to idle with the air conditioning OFF.
- Move the shift lever through entire gear range to circulate fluid.
- Wait for 30 seconds with the engine idling.
- Stop the engine.
- Remove the refill plug and add fluid.
- Reinstall the refill plug.

4. FLUID CIRCULATION

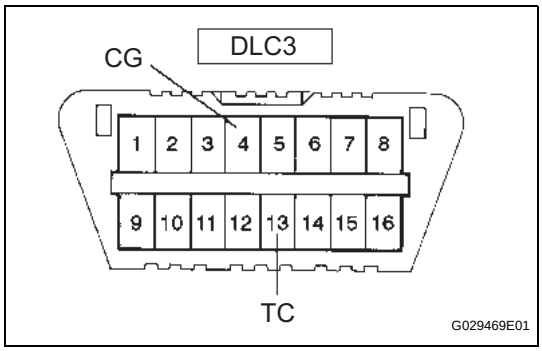
(a) Allow the engine to idle with the air conditioning OFF.

(b) Move the shift lever through entire gear range to circulate fluid.

5. FLUID TEMPERATURE CHECK

NOTICE:

The fluid temperature should be less then 30°C (86°F) before beginning the fluid temperature check.



(a) With intelligent tester

(1) Connect the intelligent tester to the DLC3.

(2) Select the tester menus: OBD/MOBD, ENGINE, DATA LIST and A/T.

(3) Check A/T OIL TEMP.

(4) Allow the engine to idle until the fluid temperature reaches 46°C (115°F).

(b) Without intelligent tester (Using A/T OIL TEMP indicator)

(1) Connect terminals between CG (4) and TC (13) of the DLC3 using SST (09843-18040).

(2) Move the shift lever back and forth between N and D every 1.5 seconds for six seconds.

(3) The D shift indicator on the combination meter comes on for two seconds. This indicates that the fluid temperature check mode has been started.

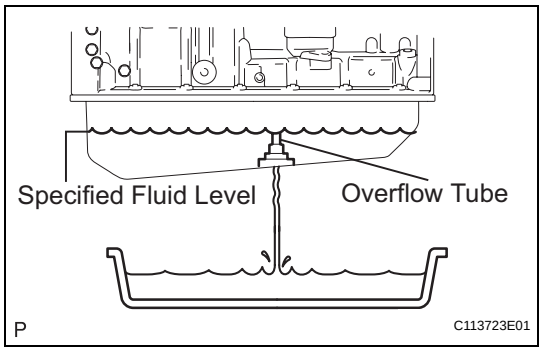
(4) The D shift indicator will come on again when the fluid temperature reaches 46°C (115°F) and will blink when it exceeds 56°C (130°F).

(5) Allow the engine to idle until the fluid temperature reaches 46°C (115°F).

6. FLUID LEVEL CHECK

NOTICE:

The fluid temperature must be between 46°C (115°F) and 56°C (130°F) to accurately check the fluid level.



(a) Remove the overflow plug with the engine idling.
(b) Check that the fluid comes out of the overflow tube.
If fluid does not come out, proceed to step 7.
If fluid comes out, wait until the overflow slows to a trickle and proceed to step 8.

7. TRANSMISSION REFILL

(a) Install the overflow plug.
(b) Stop the engine.
(c) Remove the refill plug.
(d) Add 0.4 liters (0.42 US qts, 0.35 lmp qts) of fluid.
(e) Allow the engine to idle and wait for 10 seconds.
(f) Proceed to step 6.

8. COMPLETE

(a) Install the overflow plug with a new gasket.
(b) Stop the engine.
(c) Install the refill plug with a new gasket.
Torque: 20 N*m (205 kgf*cm, 15 ft.*lbf) for overflow plug
39 N*m (400 kgf*cm, 29 ft.*lbf) for refill plug

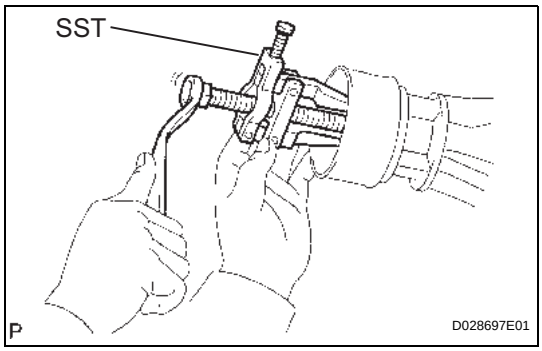
EXTENSION HOUSING REAR OIL SEAL

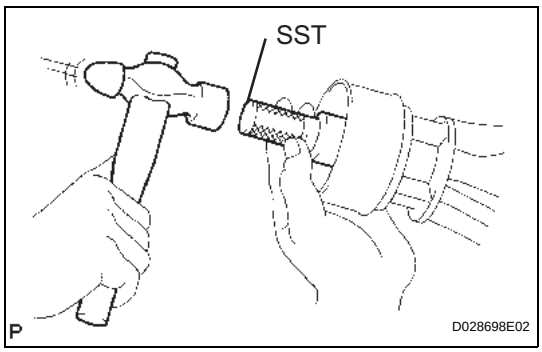
REMOVAL

1. **REMOVE PROPELLER WITH/CENTER BEARING SHAFT ASSEMBLY (See page PR-27)**

2. **DRAIN AUTOMATIC TRANSMISSION FLUID**
   (a) Remove the drain plug, gasket and drain ATF.
   (b) Install a new gasket and drain plug.
   Torque: 28 N*m (285 kgf*cm, 21 ft.*lbf)

3. **REMOVE AUTOMATIC TRANSMISSION EXTENSION HOUSING OIL SEAL**
   (a) Using SST, remove the oil seal.
   SST 09308-00010



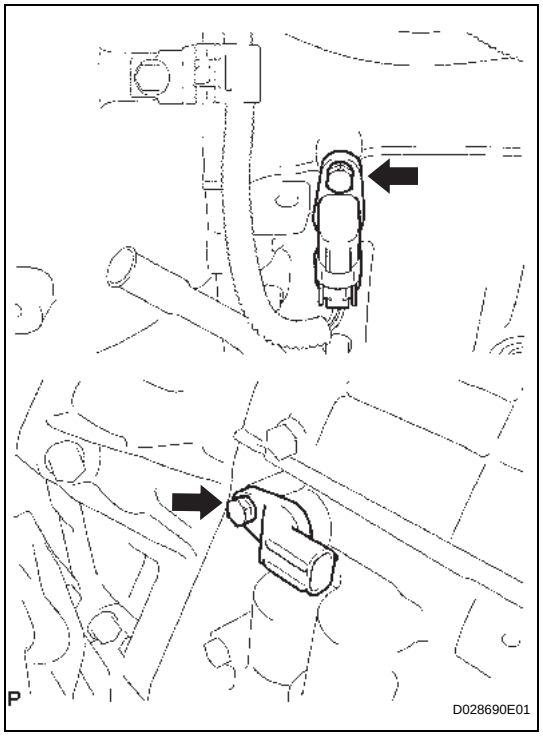


INSTALLATION

1. **INSTALL AUTOMATIC TRANSMISSION EXTENSION HOUSING OIL SEAL**
   (a) Using SST and a hammer, carefully tap in a new oil seal until it is flush with the automatic transmission extension housing.
   SST 09316-60011 (09316-00011, 09316-00051)
   Oil seal depth from flat end:
   5.4 to 5.8 mm (0.213 to 0.228 in.)
   (b) Coat the oil seal lip with MP grease.

2. **INSTALL PROPELLER WITH/CENTER BEARING SHAFT ASSEMBLY (See page PR-32)**

3. **ADD AUTOMATIC TRANSMISSION FLUID**
   (See page AT-135)



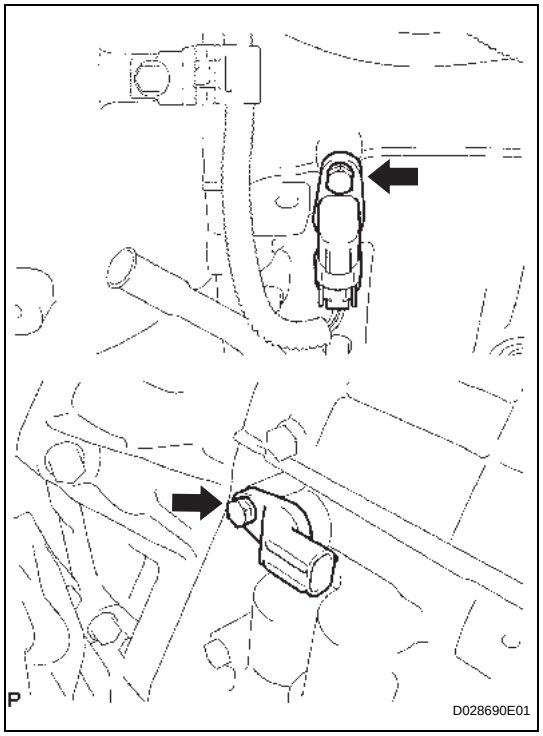
SPEED SENSOR

REMOVAL

1. REMOVE TRANSMISSION REVOLUTION SENSOR

(a) Disconnect the connector.

(b) Remove the bolt and speed sensor.



INSTALLATION

1. INSTALL TRANSMISSION REVOLUTION SENSOR

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

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

(c) Connect the connector.

TRANSMISSION WIRE

REMOVAL

CAUTION:
When working with FIPG material, you must observe the following guidelines.

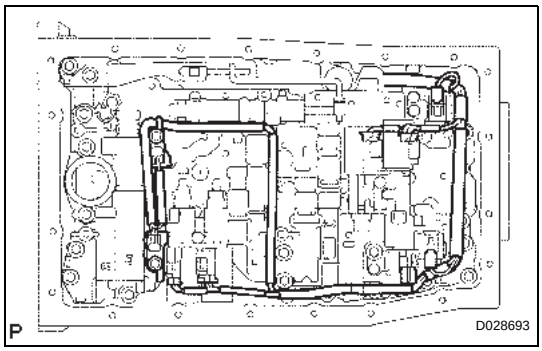
- **Using a razor blade and gasket scraper, remove all the old FIPG material from the gasket surfaces.**
- **Thoroughly clean all components to remove all loose material.**
- **Clean both sealing surfaces with a non-residue solvent.**
- **Apply FIPG in an approximately 1 mm (0.04 in.) wide bead along the sealing surface.**
- **Parts must be assembled within 10 minutes of application. Otherwise, the FIPG material must be removed and reapplied.**

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

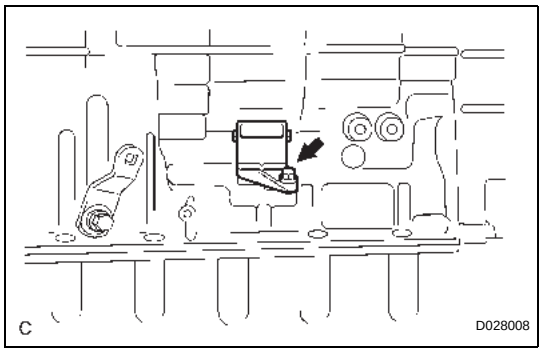
2. **DRAIN AUTOMATIC TRANSMISSION FLUID**
   (a) Remove the drain plug, gasket and drain ATF.
   (b) Install a new gasket and drain plug.
   Torque: 28 N*m (285 kgf*cm, 21 ft.*lbf)

3. **REMOVE AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY (See page AT-144)**

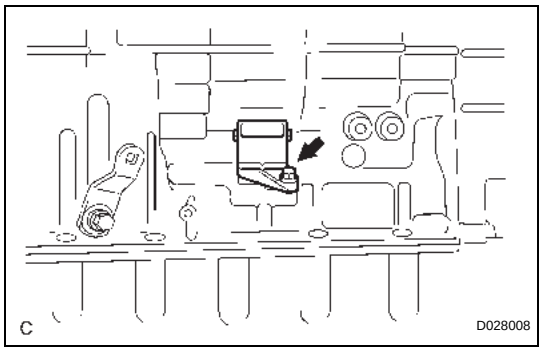
4. **REMOVE VALVE BODY OIL STRAINER ASSEMBLY (See page AT-145)**



5. **SEPARATE TRANSMISSION WIRE**
   (a) Remove the bolt and clamp.
   (b) Disconnect the ATF temperature sensor.
   (c) Disconnect the 7 connectors from the solenoid valves.

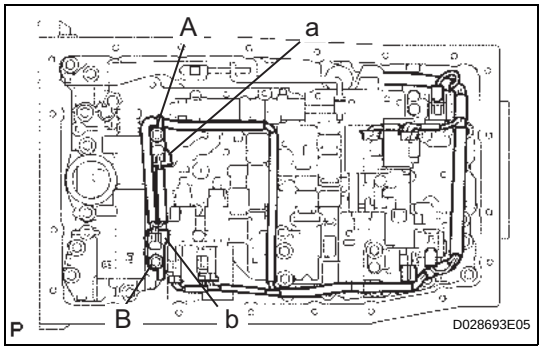


6. **REMOVE TRANSMISSION WIRE**
   (a) Disconnect the transmission wire connector.
   (b) Remove the bolt and pull out the transmission wire.



INSTALLATION

1. **INSTALL TRANSMISSION WIRE**
   (a) Install the transmission wire with the bolt.
   Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)
   (b) Connect the transmission wire connector.



2. **CONNECT TRANSMISSION WIRE**
   (a) Connect the 7 connectors to the solenoid valves.
   (b) Install the clamp with the bolt.
   Torque: A
   10 N*m (100 kgf*cm, 7 in.*lbf)
   B
   11 N*m (110 kgf*cm, 8 in.*lbf)
   (c) Connect the ATF temperature sensor.
   Wiring color:
   a: Orange
   b: Blue

3. **INSTALL VALVE BODY OIL STRAINER ASSEMBLY (See page AT-146)**

4. **INSTALL AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY (See page AT-146)**

5. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
   Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)

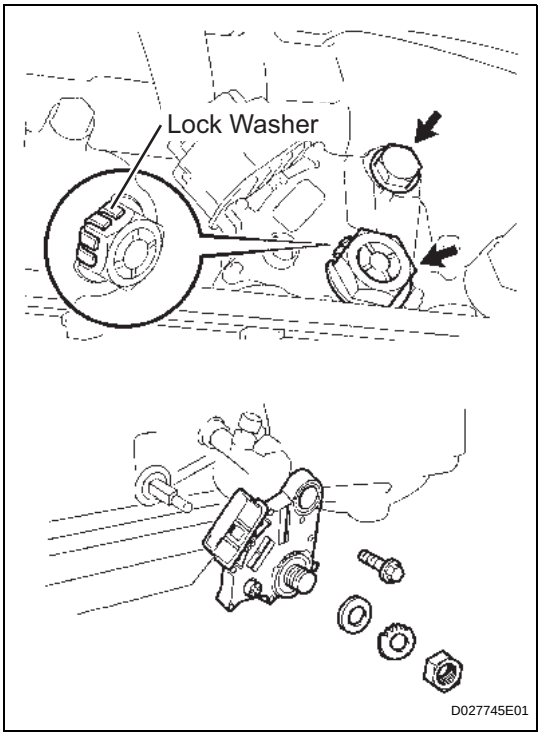
6. **PERFORM INITIALIZATION**
   (See page AT-17)

7. **ADD AUTOMATIC TRANSMISSION FLUID**
   (See page AT-135)

PARK / NEUTRAL POSITION SWITCH

REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
2. **DISCONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR**
3. **REMOVE PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
   (a) Using a screwdriver, unstake the lock washer.
   (b) Remove the nut, lock washer and grommet.
   (c) Remove the bolt and park/neutral position switch.



ADJUSTMENT

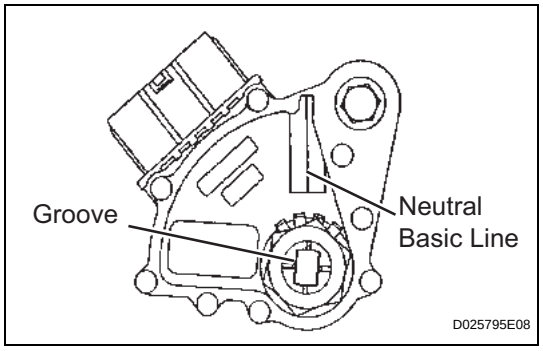
1. INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY

(a) Apply the parking brake and turn the ignition switch to ON.

(b) Depress the brake pedal and check that the engine starts only when the shift lever is set in the N or P position and that it does not start in any other positions.

(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 and not in other positions.

If any failure is found, check the park/neutral position switch for continuity.



2. ADJUST PARK/NEUTRAL POSITION SWITCH ASSEMBLY

(a) Loosen the bolt of the park/neutral position switch and set the shift lever to the N position.

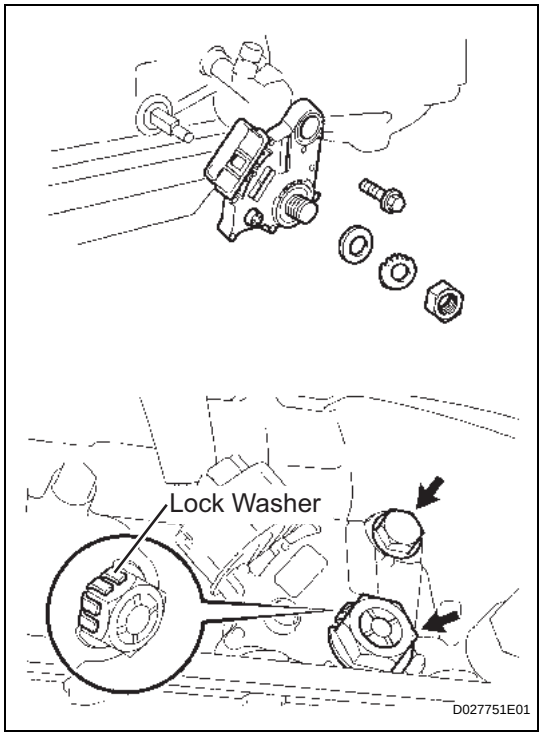
(b) Align the groove and the neutral basic line.

(c) Hold the switch in position and tighten the bolt.

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

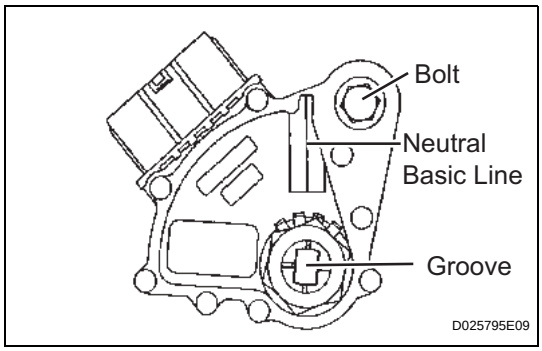
(d) After making an adjustment, perform the inspection described in step 1.

INSTALLATION



1. INSTALL PARK/NEUTRAL POSITION SWITCH ASSEMBLY

(a) Install the park/neutral position switch onto the manual valve lever shaft and provisionally tighten the adjusting bolt.



(b) Install the grommet, a new lock washer and the nut.
Torque: 6.9 N*m (70 kgf*cm, 61 in.*lbf)
(c) Install the manual valve lever shaft onto the groove and turn it 2 notches counterclockwise to the neutral position.
(d) Align the neutral basic line with the switch groove and tighten the adjusting bolt.
Torque: 13 N*m (130 kgf*cm, 9 ft.*lbf)
(e) Bend the tabs of the lock washer.
HINT:
Bend at least 2 of the lock washer tabs.

2. CONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR

3. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)

4. INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY (See page AT-142)

5. ADJUST PARK/NEUTRAL POSITION SWITCH ASSEMBLY (See page AT-142)

6. ADJUST SHIFT LEVER POSITION (See page AT-155)

7. INSPECT SHIFT LEVER POSITION (See page AT-155)

VALVE BODY ASSEMBLY

REMOVAL

CAUTION:
When working with FIPG material, you must observe the following guidelines.

- **Using a razor blade and gasket scraper, remove all the old FIPG material from the gasket surfaces.**
- **Thoroughly clean all components to remove all loose material.**
- **Clean both sealing surfaces with a non-residue solvent.**
- **Apply FIPG in an approximately 1 mm (0.04 in.) wide bead along the sealing surface.**
- **Parts must be assembled within 10 minutes of application. Otherwise, the FIPG material must be removed and reapplied.**

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

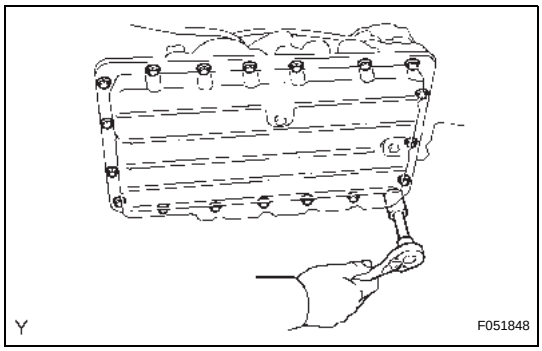
2. DRAIN AUTOMATIC TRANSMISSION FLUID

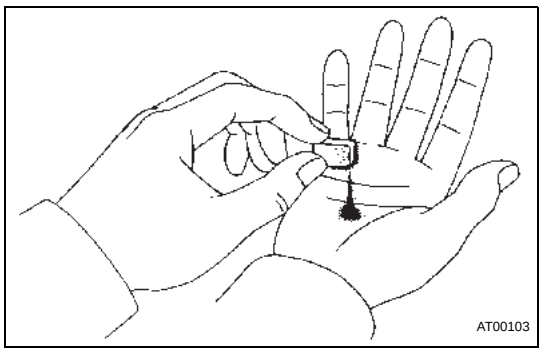
(a) Remove the drain plug, gasket and drain ATF.

(b) Install a new gasket and drain plug.
Torque: 28 N*m (285 kgf*cm, 21 ft.*lbf)

3. REMOVE AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY
NOTICE:
Some fluid will remain in the oil pan.

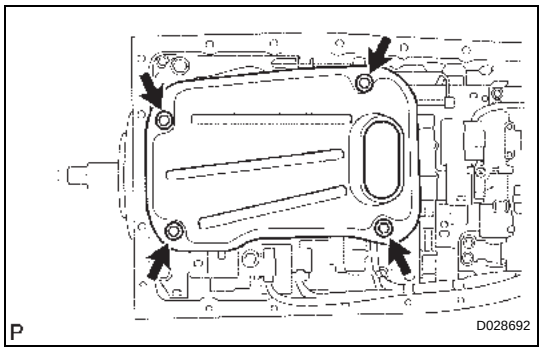
(a) Remove the 20 bolts, gasket and oil pan sub-assembly.





(b) Examine the particles in the pan.

(1) Remove the magnets and use them to collect steel particles. Carefully inspect the foreign matter and particles in the pan and on the magnets to anticipate the type of wear you will find in the transmission.
Steel (magnetic) ... bearing, gear and clutch plate wear
Brass (non-magnetic) ... bushing wear



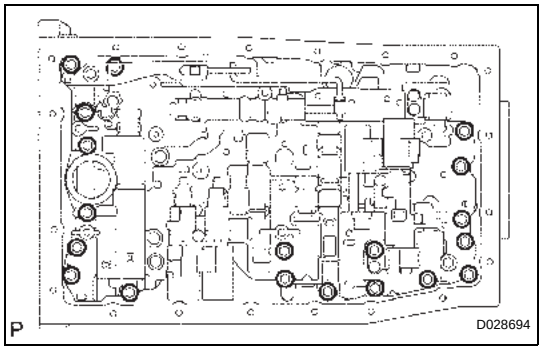
4. REMOVE VALVE BODY OIL STRAINER ASSEMBLY

(a) Remove the 4 bolts, oil strainer and O-ring.

NOTICE:

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

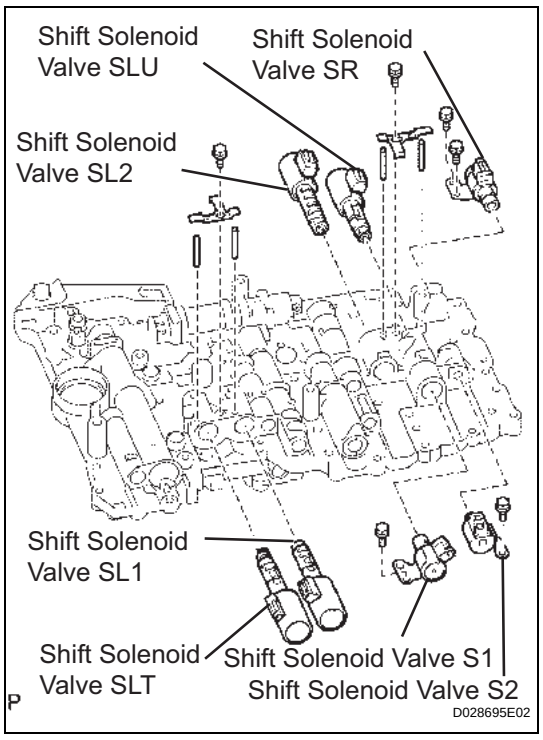
5. SEPARATE TRANSMISSION WIRE (See page AT-140)



6. REMOVE TRANSMISSION VALVE BODY ASSEMBLY

(a) Remove the 19 bolts and valve body.

(b) Remove the 3 drum seal gaskets.



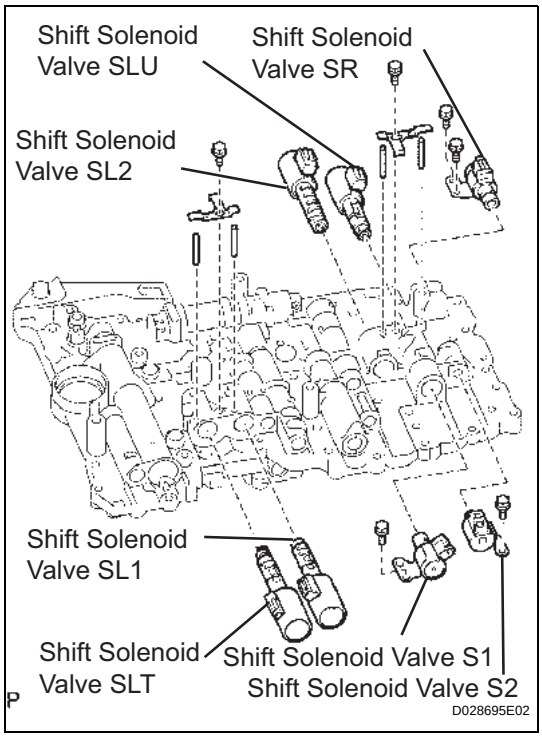
(c) Remove the bolt, lock plate, pin and shift solenoid valves SLT and SL1.

(d) Remove the bolt, lock plate, pin and shift solenoid valves SLU and SL2.

(e) Remove the 2 bolts and shift solenoid valve SR.

(f) Remove the bolt and shift solenoid valve S1.

(g) Remove the bolt and shift solenoid valve S2.



INSTALLATION

1. INSTALL TRANSMISSION VALVE BODY ASSEMBLY

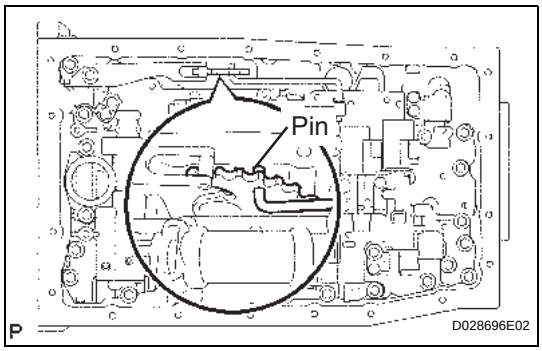
(a) Install the shift solenoid valve S2 with the bolt.
Torque: 10 N*m (102 kgf*cm, 7 ft.*lbf)

(b) Install the shift solenoid valve S1 with the bolt.
Torque: 6.4 N*m (65 kgf*cm, 56 in.*lbf)

(c) Install the shift solenoid valve SR with the 2 bolts.
Torque: 6.4 N*m (65 kgf*cm, 56 in.*lbf)

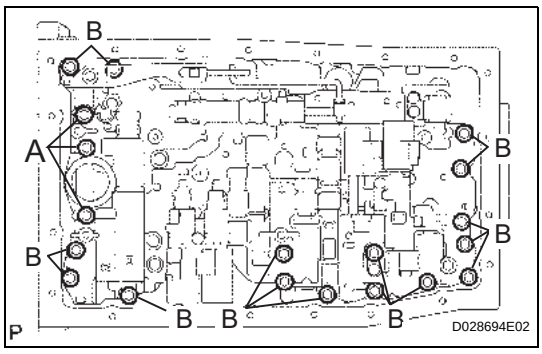
(d) Install the shift solenoid valves SLU and SL2 with the pin, lock plate and bolt.
Torque: 6.4 N*m (65 kgf*cm, 56 in.*lbf)

(e) Install the shift solenoid valves SLT and SL1 with the pin, lock plate and bolt.
Torque: 6.4 N*m (65 kgf*cm, 56 in.*lbf)



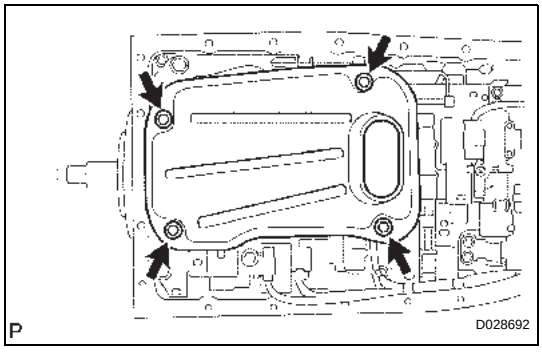
(f) Insert the pin of the lever into the hole of the manual valve.

(g) Install 3 new drum seal gaskets onto the transmission case.



(h) Install the 19 bolts.
Torque: 11 N*m (110 kgf*cm, 8 ft.*lbf)
Bolt length:
Bolt A: 36 mm (1.42 in.)
Bolt B: 25 mm (0.98 in.)

2. INSTALL TRANSMISSION WIRE (See page AT-141)

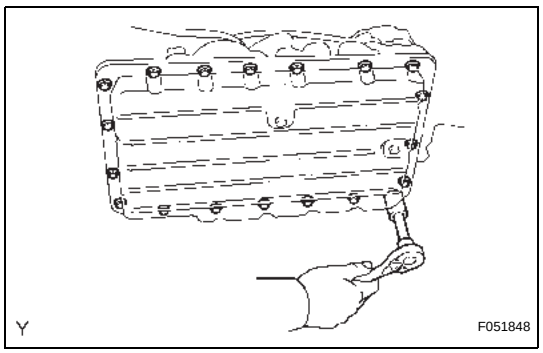


3. INSTALL VALVE BODY OIL STRAINER ASSEMBLY

(a) Install a new O-ring and the oil strainer with the 4 bolts.
Torque: 10 N*m (102 kgf*cm, 7 ft.*lbf)

4. INSTALL AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY

HINT:
Remove all packing material and be careful not to drop oil on the contact surfaces of the transmission case and oil pan.



(a) Install a new gasket and the oil pan sub-assembly.

(b) Install the oil pan with the 20 bolts.
Torque: 4.4 N*m (45 kgf*cm, 39 in.*lbf)

5. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)

6. **PERFORM INITIALIZATION**
(See page AT-17)

7. **ADD AUTOMATIC TRANSMISSION FLUID**
(See page AT-135)

SHIFT LOCK SYSTEM

ON-VEHICLE INSPECTION

1. CHECK SHIFT LOCK OPERATION

(a) Shift the shift lever to the P position.
(b) Turn the ignition switch to LOCK.
(c) Check that the shift lever cannot be shifted to any positions other than P.
(d) Turn the ignition switch to ON, depress the brake pedal, and check that the shift lever can be shifted to other positions.

2. CHECK SHIFT LOCK RELEASE LINK OPERATION

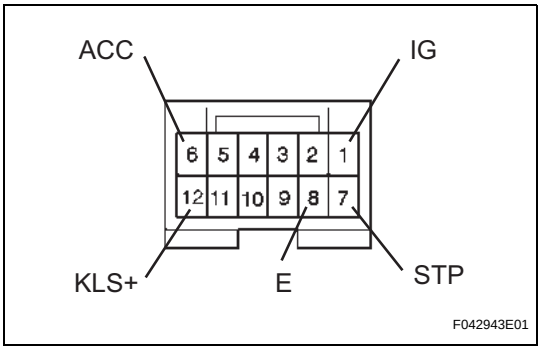
(a) Using a small screwdriver, remove the shift lever cap.
(b) When operating the shift lever with the shift lock release link pressed, check that the lever can be shifted to any positions other than P.

3. CHECK KEY INTERLOCK OPERATION

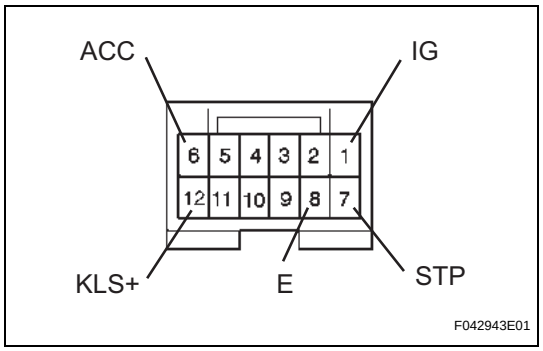
(a) Turn the ignition switch to ON.
(b) Depress the brake pedal and shift the shift lever to any positions other than P.
(c) Check that the ignition key cannot be turned to LOCK.
(d) Shift the shift lever to the P position, turn the ignition key to LOCK, and check that the ignition key can be removed.

4. INSPECT SHIFT LOCK CONTROL ECU SUB-ASSEMBLY

(a) Using a voltmeter, measure the voltage at each terminal.
HINT:
Do not disconnect the shift lock control ECU connector.

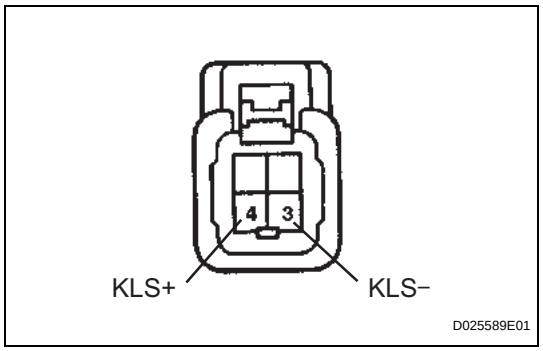


Terminal	Measuring Condition	Voltage (V)
1 (KLS+) - 8 (E)	(1) Ignition switch ACC and P position (2) Ignition switch ACC and except P position (3) Ignition switch ACC and except P position (After approx. 1 second)	0 7.5 to 11 6 to 9
4 (ACC) - 8 (E)	Ignition switch ON	10 to 14
	Ignition switch ACC	10 to 14
	Ignition switch OFF	0
9 (STP) - 8 (E)	Depress brake pedal	10 to 14
	Release brake pedal	0
5 (IG) - 8 (E)	Ignition switch ON	10 to 14
	Ignition switch OFF	0



(b) Using an ohmmeter, measure the resistance at terminal E (8) and body ground.
HINT:
Do not disconnect the shift lock control ECU connector.

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



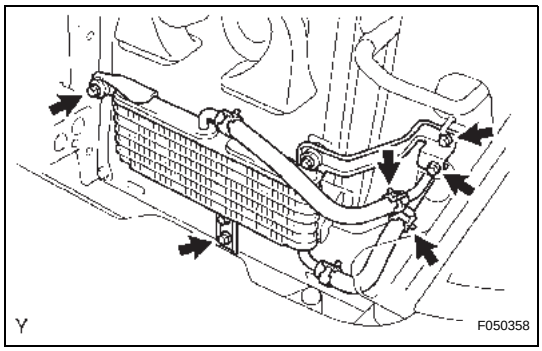
5. INSPECT KEY INTER LOCK SOLENOID

(a) Disconnect the solenoid connector.
(b) Connect KLS+ (4) terminal to the battery positive (+) terminal, and KLS- (3) terminal to the battery negative (-) terminal, and apply about 12V between KLS+ and KLS- terminals.
Check that operation noise can be heard from the solenoid.
If the solenoid does not operate, replace the solenoid.

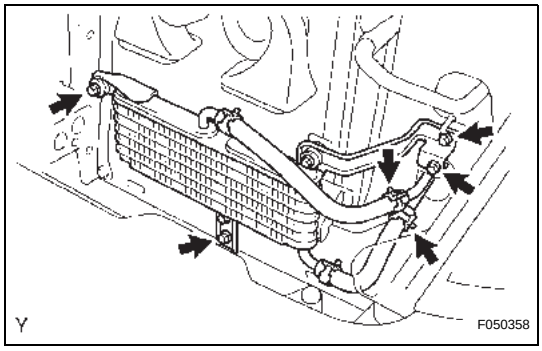
AIR COOLED OIL COOLER

REMOVAL

1. **REMOVE RADIATOR GRILLE (See page ET-4)**
2. **DRAIN AUTOMATIC TRANSMISSION FLUID**
   (a) Remove the drain plug, gasket and drain ATF.
   (b) Install a new gasket and drain plug.
   Torque: 28 N*m (285 kgf*cm, 21 ft.*lbf)
3. **REMOVE OIL COOLER WITH HOSE ASSEMBLY**
   (a) Loosen the 2 clips and disconnect the 2 oil cooler hoses.
   (b) Remove the 4 bolts and the oil cooler with hose assembly.



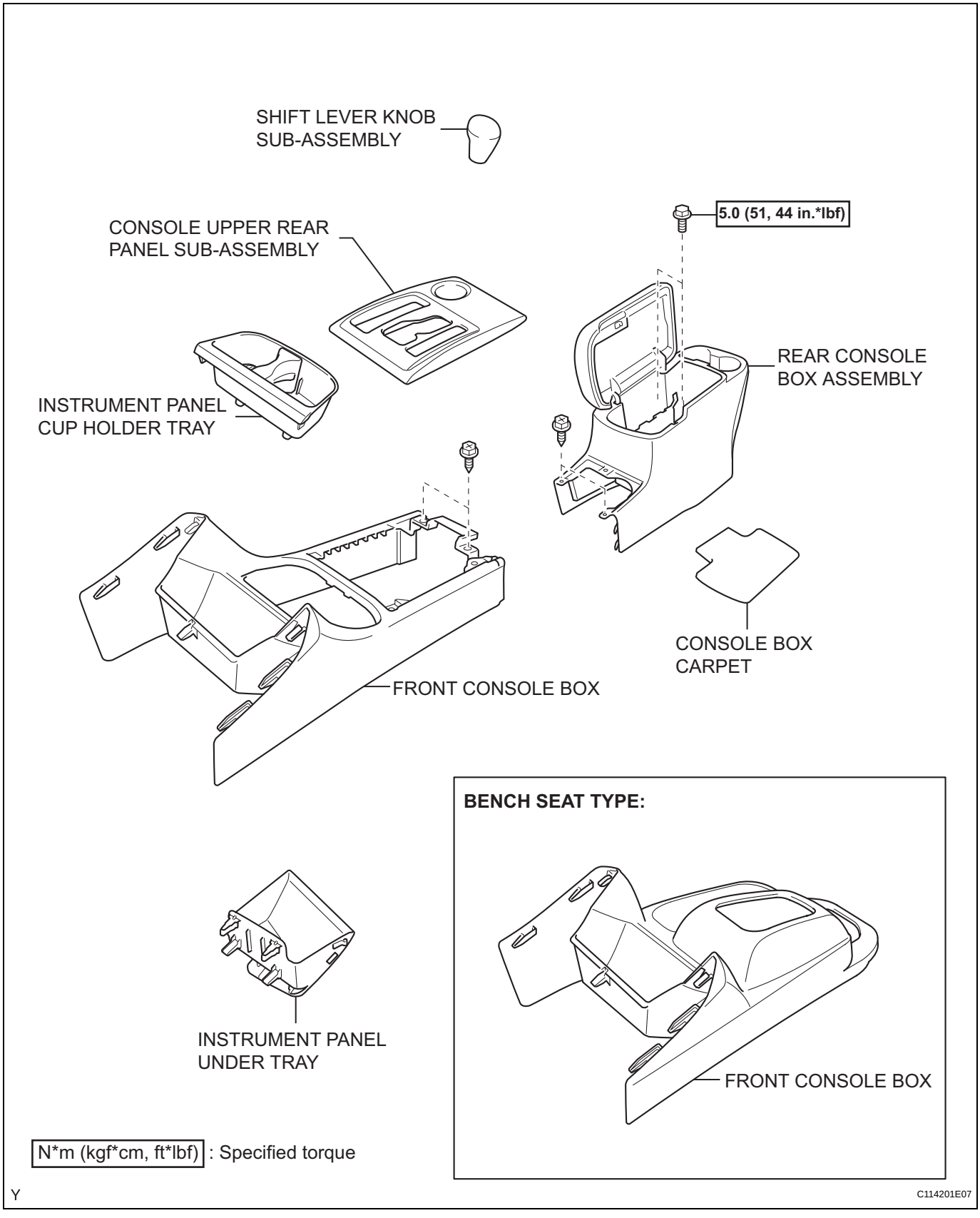
INSTALLATION



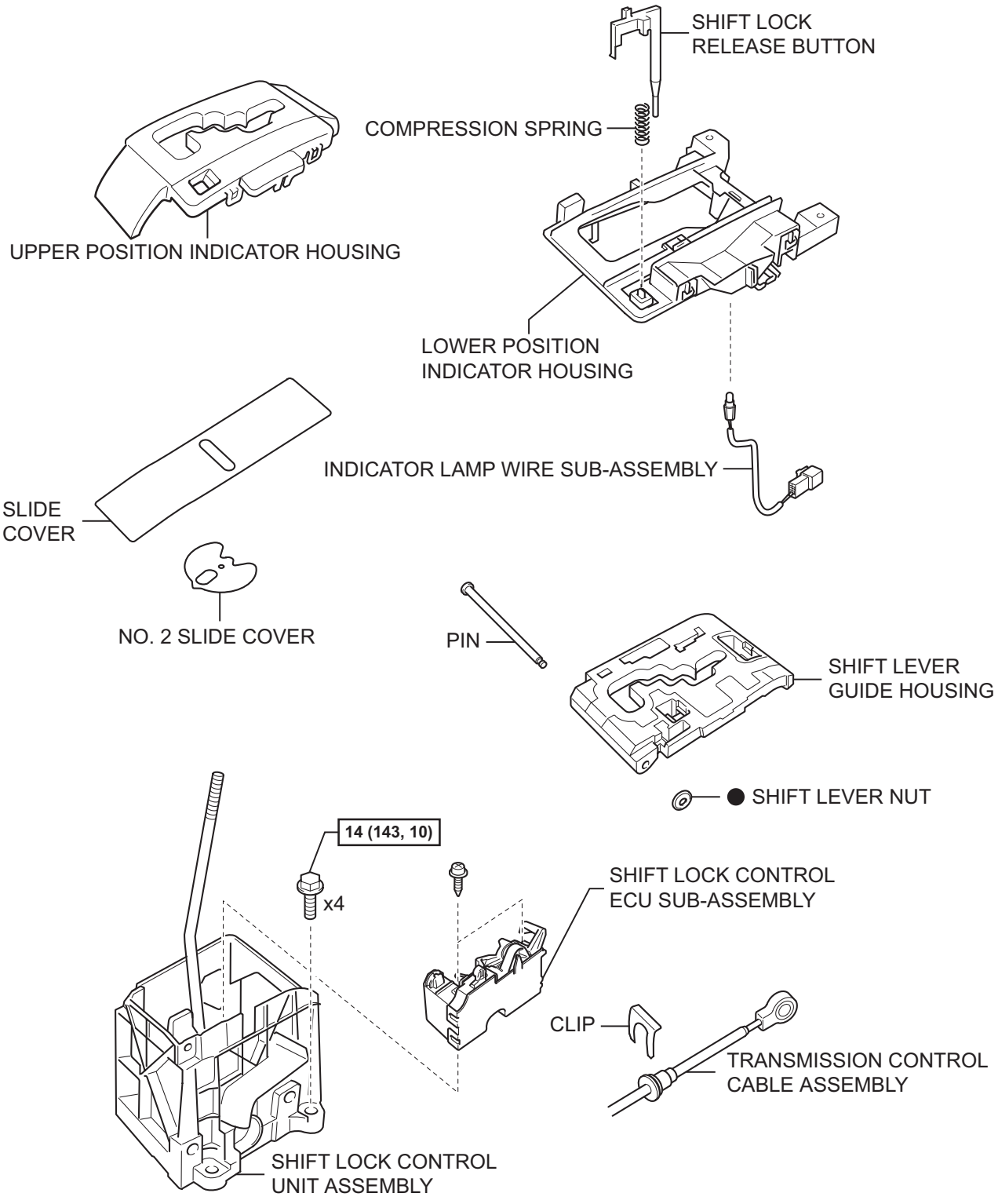
1. **INSTALL OIL COOLER WITH HOSE ASSEMBLY**
   (a) Install the oil cooler with hose assembly with the 4 bolts.
   Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)
   (b) Install the 2 oil cooler hoses and 2 clips.
2. **ADD AUTOMATIC TRANSMISSION FLUID**
   (See page AT-135)
3. **INSTALL RADIATOR GRILLE (See page ET-11)**

FLOOR SHIFT ASSEMBLY

COMPONENTS



CABLE TYPE:



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

● Non-reusable part

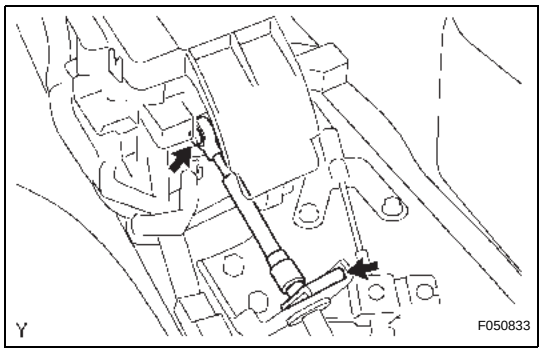
AT

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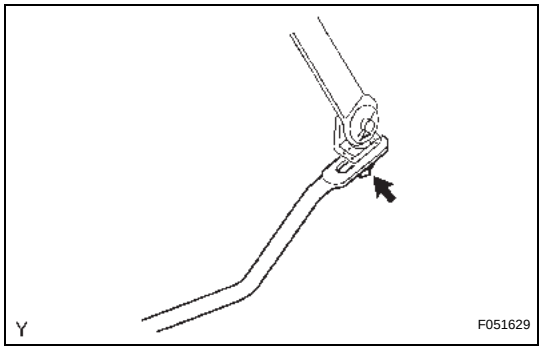
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REMOVAL

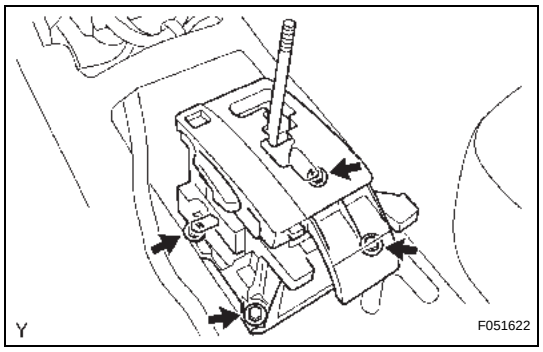
1. **REMOVE CONSOLE UPPER REAR PANEL SUB-ASSEMBLY (for Separate Seat Type) (See page IP-9)**
2. **REMOVE REAR CONSOLE BOX ASSEMBLY (for Separate Seat Type) (See page IP-10)**
3. **REMOVE INSTRUMENT PANEL CUP HOLDER TRAY (for Separate Seat Type) (See page IP-10)**
4. **REMOVE FRONT CONSOLE BOX (for Separate Seat Type) (See page IP-10)**
5. **REMOVE FRONT CONSOLE BOX (for Bench Seat Type) (See page IP-11)**



6. **DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**
   (a) CABLE TYPE:
      (1) Disconnect the transmission control cable assembly from the shift lever assembly.
      (2) Remove the clip and disconnect the transmission control cable.

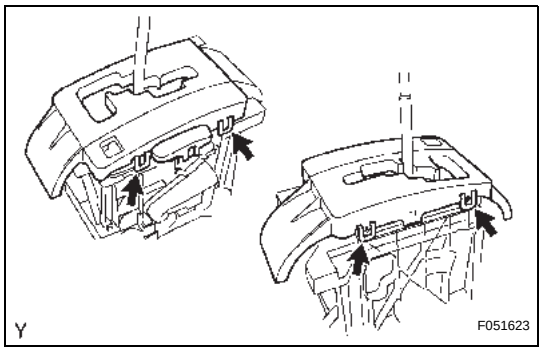


7. **SEPARATE FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY**
   (a) ROD TYPE:
      (1) Remove the nut, then separate the floor shift gear shifting rod.



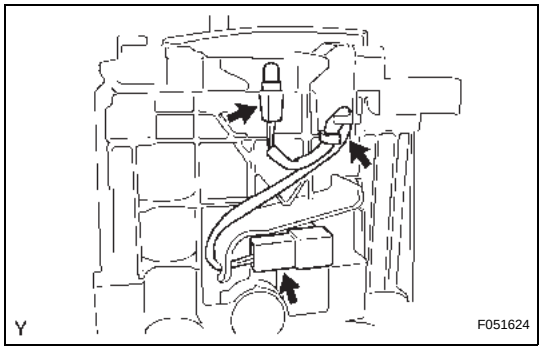
8. **REMOVE FLOOR SHIFT ASSEMBLY**
   (a) Disconnect the 2 connectors and 2 clamps.
   (b) Remove the 4 bolts and floor shift assembly.

DISASSEMBLY



1. REMOVE UPPER POSITION INDICATOR HOUSING

(a) Release the 4 claws with a screwdriver and remove the position indicator housing and slide cover.

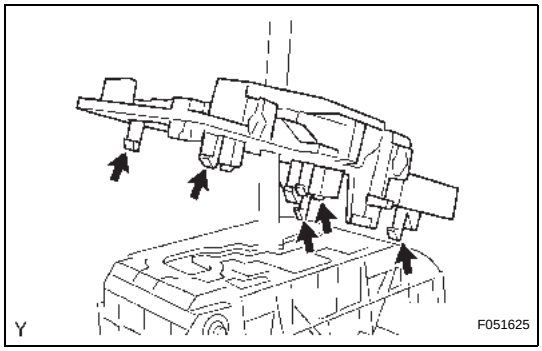


2. REMOVE INDICATOR LAMP WIRE SUB-ASSEMBLY

(a) Remove the indicator lamp wire sub-assembly.

(b) Remove the bulb from the indicator lamp wire sub-assembly.

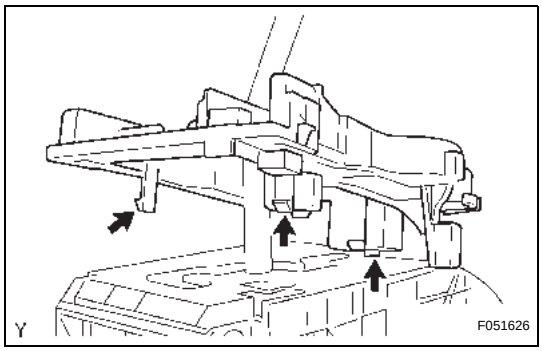
3. REMOVE SHIFT LOCK RELEASE BUTTON



4. REMOVE LOWER POSITION INDICATOR HOUSING

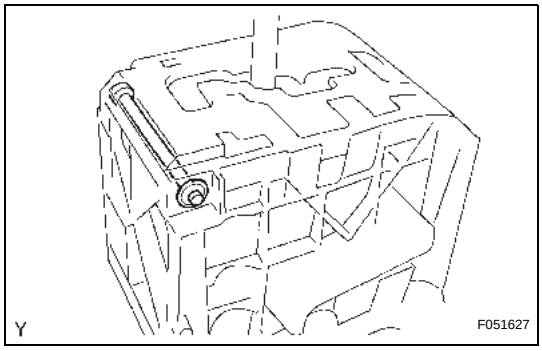
(a) CABLE TYPE:

(1) Release the 5 claws with a screwdriver and remove the position indicator housing lower.



(b) ROD TYPE:

(1) Release the 3 claws with a screwdriver and remove the position indicator housing lower.

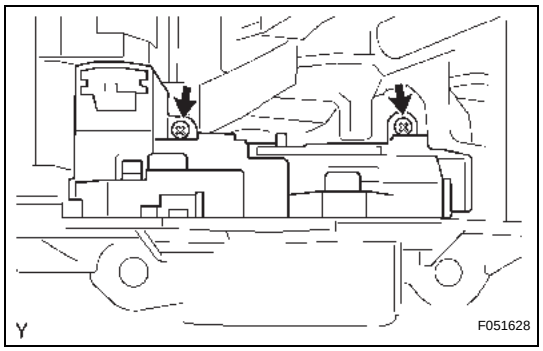


5. REMOVE SHIFT LOCK CONTROL ECU SUB-ASSEMBLY

(a) Remove the shift lever nut and shift lever lock pin.

(b) Remove the shift lever guide housing.

(c) Release the 2 claws with a screwdriver and remove the shift lock release link and spring.



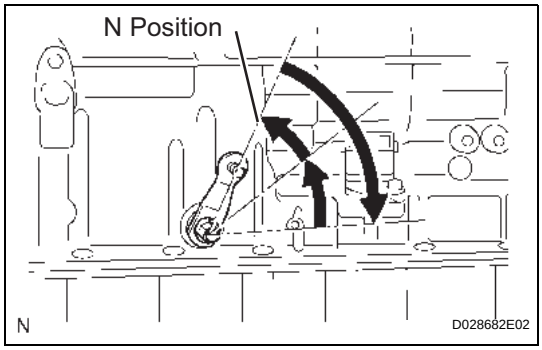
(d) Remove the 2 screws and the shift lock control ECU.

ADJUSTMENT

1. INSPECT SHIFT LEVER POSITION

(a) Check that the shift lever moves smoothly and appropriately from the P to R position, only when the ignition switch is turned to ON and the brake pedal is depressed.

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



2. ADJUST SHIFT LEVER POSITION

(a) Push the control shaft fully rearward.

(b) Turn the control shaft lever 2 notches counterclockwise to the N position.

(c) Set the shift lever to the N position.

REASSEMBLY

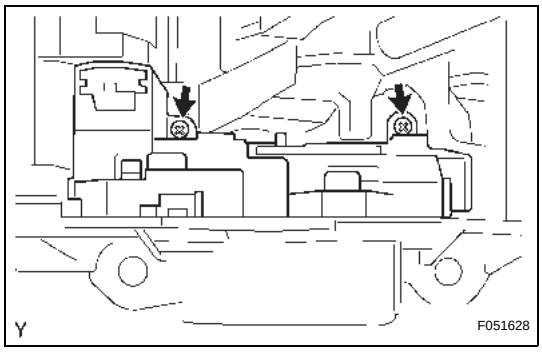
1. INSTALL SHIFT LOCK CONTROL ECU SUB-ASSEMBLY

(a) Install the shift lock control ECU with the 2 screws.

(b) Install the spring and shift lock release link.

(c) Install the shift lever guide housing .

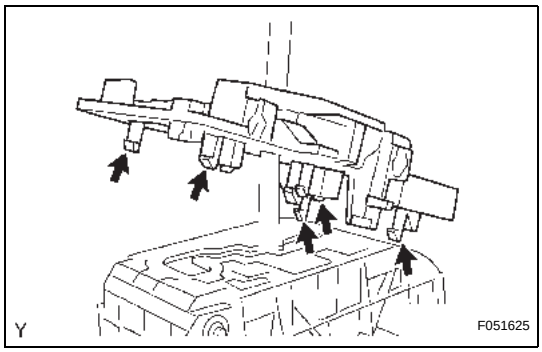
(d) Install the lever lock and new shift lever nut.



2. INSTALL LOWER POSITION INDICATOR HOUSING

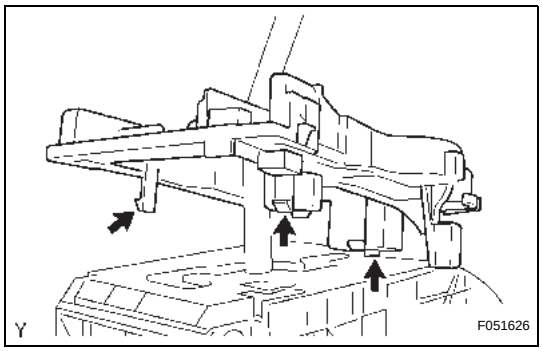
(a) CABLE TYPE:

(1) Install the position indicator housing lower.
HINT:
Firmly make the claws fit.

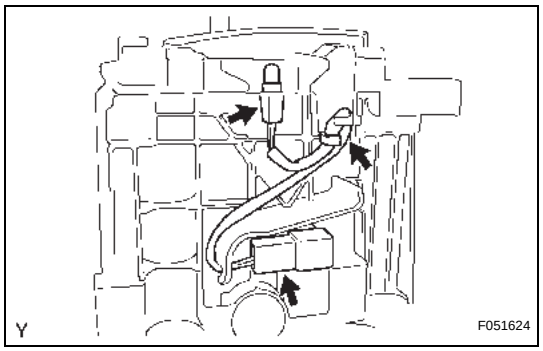


(b) ROD TYPE:

(1) Install the position indicator housing lower.
HINT:
Firmly make the claws fit.



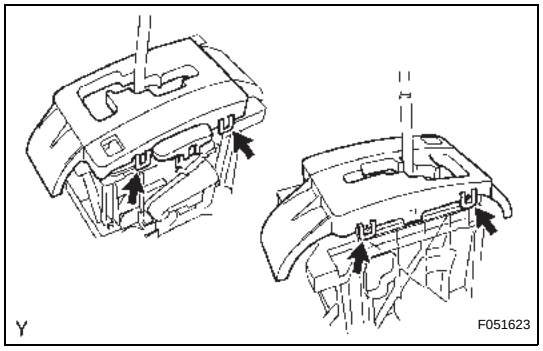
3. INSTALL SHIFT LOCK RELEASE BUTTON



4. INSTALL INDICATOR LAMP WIRE SUB-ASSEMBLY

(a) Install the bulb into the indicator lamp wire sub-assembly.

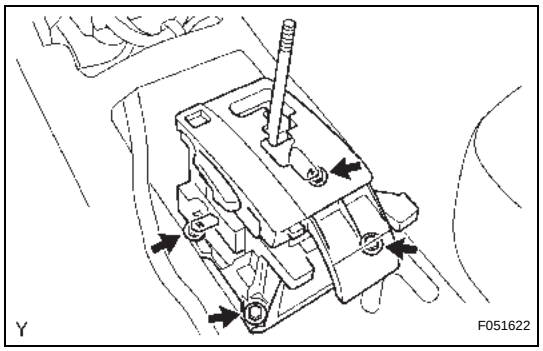
(b) Install the indicator lamp wire sub-assembly.



5. INSTALL UPPER POSITION INDICATOR HOUSING

(a) Install the slide cover and position indicator housing sub-assembly onto the shift lever guide housing.
HINT:
Firmly make the claws fit.

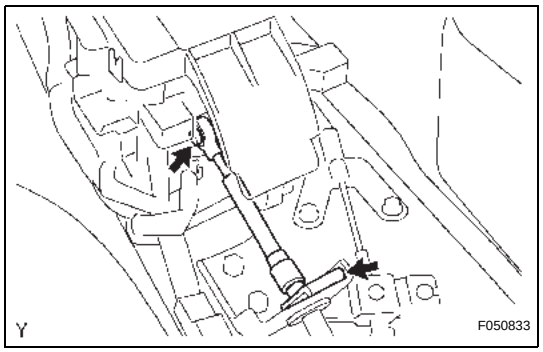
INSTALLATION



1. INSTALL FLOOR SHIFT ASSEMBLY

(a) Install the floor shift with the 4 bolts.
Torque: 14 N*m (143 kgf*cm, 10 ft.*lbf)

(b) Connect the 2 clamps and 2 connectors.

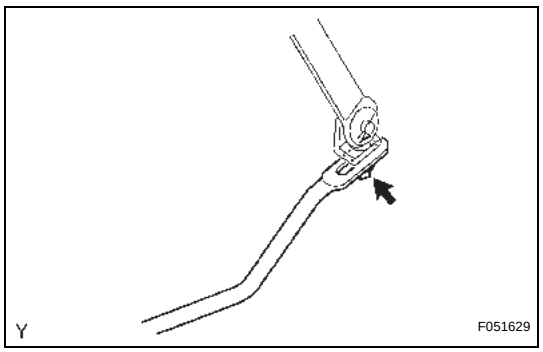


2. CONNECT TRANSMISSION CONTROL CABLE ASSEMBLY

(a) CABLE TYPE:

(1) Connect the transmission control cable with the clip to floor shift assembly.

(2) Install the transmission control cable onto the floor shift assembly.



3. INSTALL FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

(a) ROD TYPE:

(1) Install the floor shift gear shifting rod with nut.
Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf)

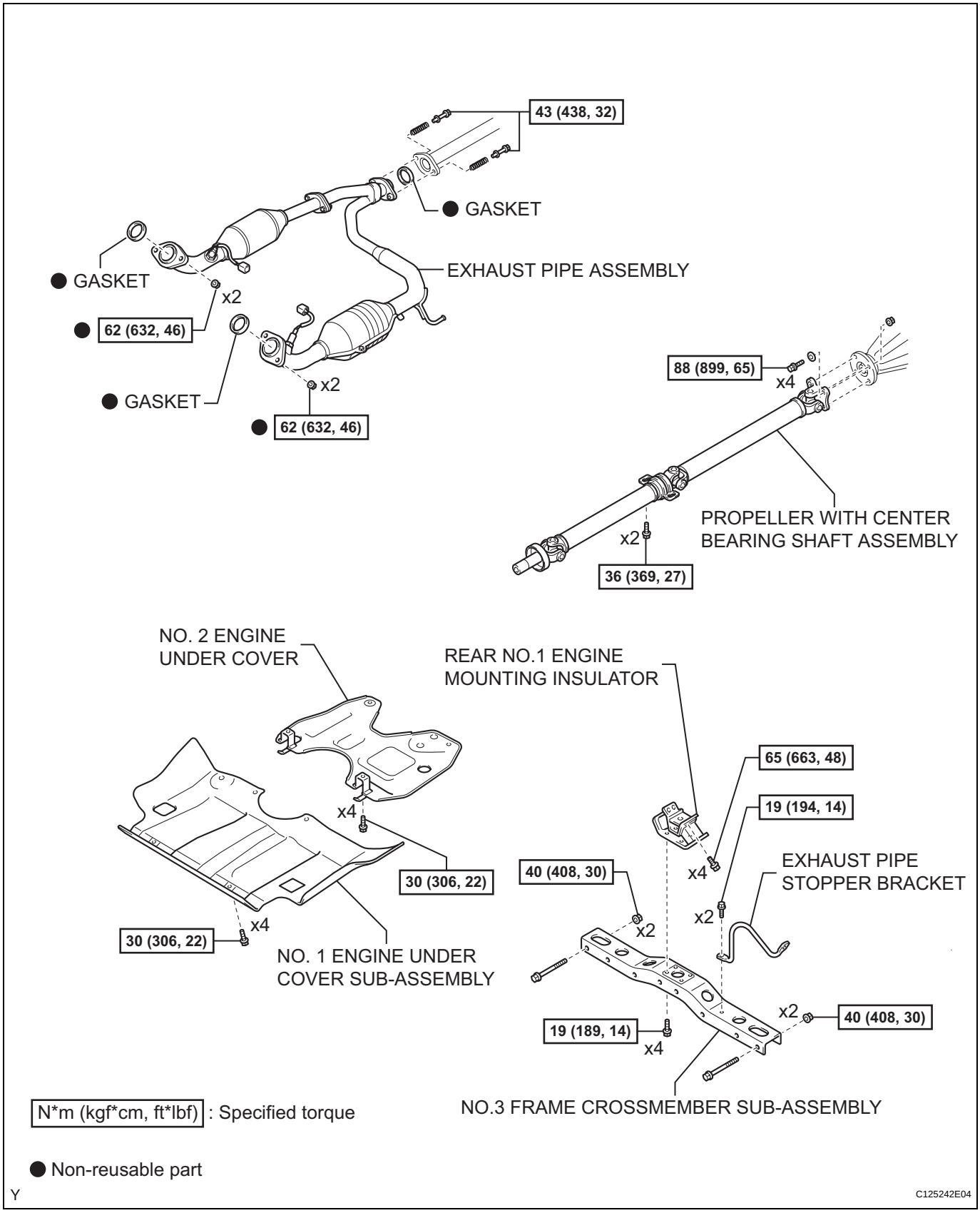
4. INSTALL FRONT CONSOLE BOX (for Bench Seat Type) (See page IP-23)

5. INSTALL FRONT CONSOLE BOX (for Separate Seat Type) (See page IP-24)

6. **INSTALL INSTRUMENT PANEL CUP HOLDER TRAY (for Separate Seat Type) (See page IP-24)**
7. **INSTALL REAR CONSOLE BOX ASSEMBLY (for Separate Seat Type) (See page IP-24)**
8. **INSTALL CONSOLE UPPER REAR PANEL SUB-ASSEMBLY (for Separate Seat Type) (See page IP-25)**
9. **ADJUST SHIFT LEVER POSITION (See page AT-155)**
10. **INSPECT SHIFT LEVER POSITION (See page AT-155)**

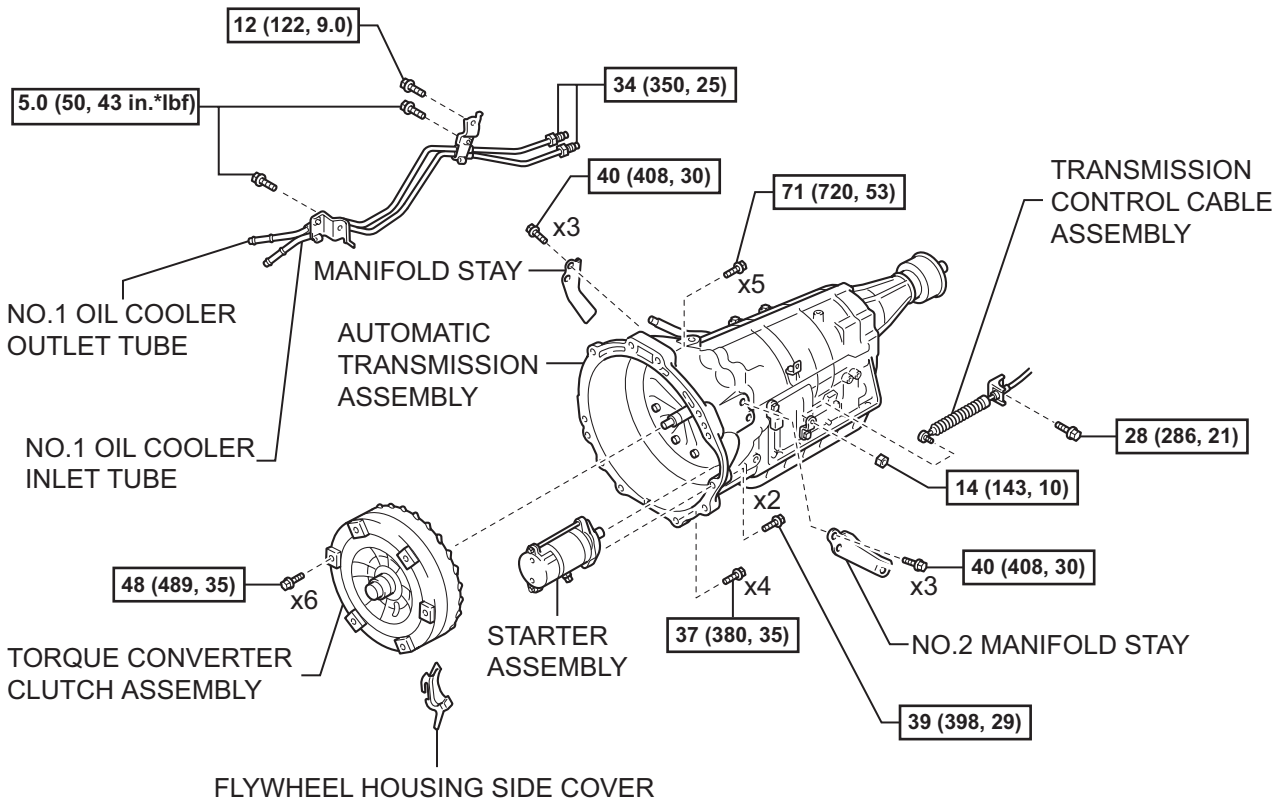
AUTOMATIC TRANSMISSION ASSEMBLY

COMPONENTS



AT

Y



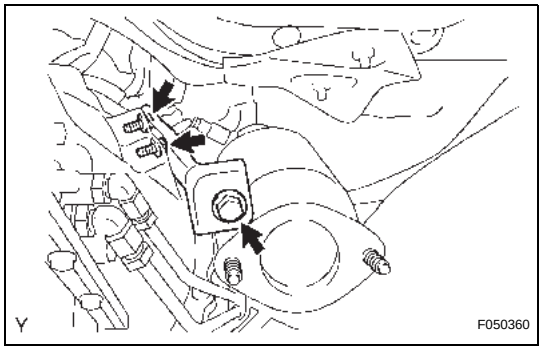
N*m (kgf*cm, ft*lbf) : Specified torque

Y

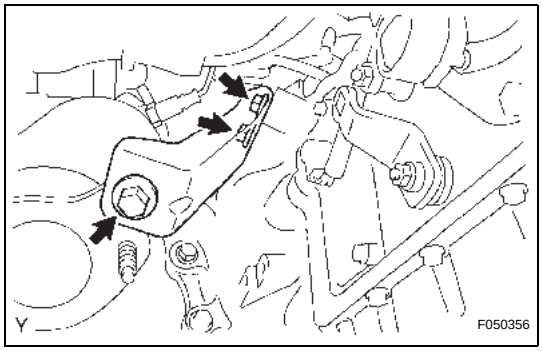
C125234E03

REMOVAL

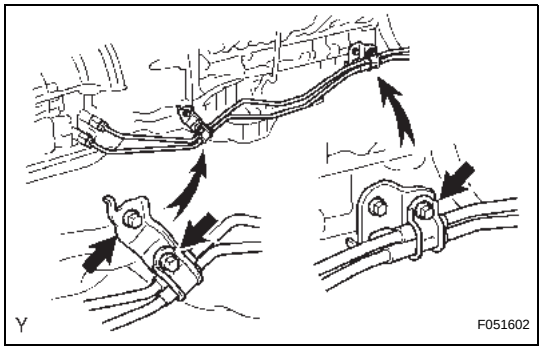
1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
2. **REMOVE NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY**
3. **REMOVE NO. 2 ENGINE UNDER COVER (w/ No. 2 Engine Under Cover)**
4. **DISCONNECT OXYGEN SENSOR**
5. **REMOVE EXHAUST PIPE ASSEMBLY**
   (See page EX-3)
6. **REMOVE PROPELLER WITH CENTER BEARING SHAFT ASSEMBLY (See page PR-27)**
7. **DRAIN AUTOMATIC TRANSMISSION FLUID**
   (a) Remove the drain plug and gasket, and drain ATF.
   (b) Install a new gasket and drain plug.
   Torque: 28 N*m (285 kgf*cm, 21 ft.*lbf)
8. **REMOVE MANIFOLD STAY**
   (a) Remove the 3 bolts and manifold stay.

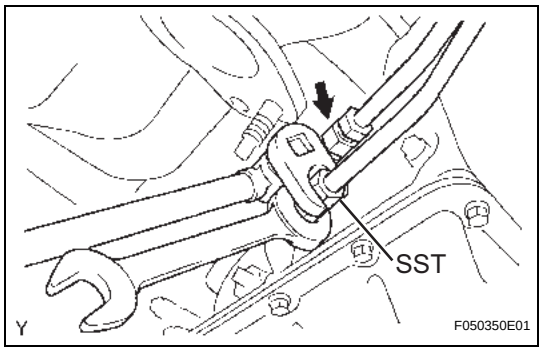


9. **REMOVE NO.2 MANIFOLD STAY**
   (a) Remove the 3 bolts and manifold stay No. 2.



10. **DISCONNECT NO.1 OIL COOLER INLET TUBE**
    (a) Remove the 3 bolts and 2 clamps.

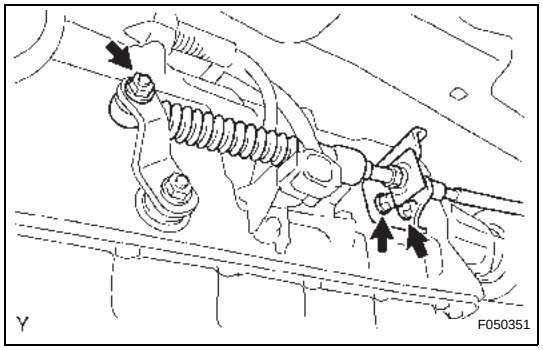




(b) Using SST, disconnect the oil cooler inlet tube No. 1.
SST 09023-12701

11. DISCONNECT NO.1 OIL COOLER OUTLET TUBE

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



12. DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY

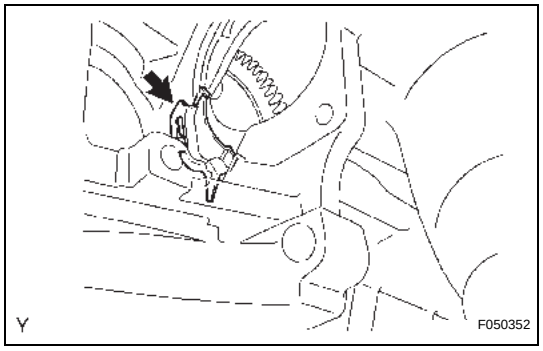
(a) Remove the nut and disconnect the transmission control cable.
(b) Remove the 2 bolts and disconnect the transmission control cable.

13. DISCONNECT CONNECTOR

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

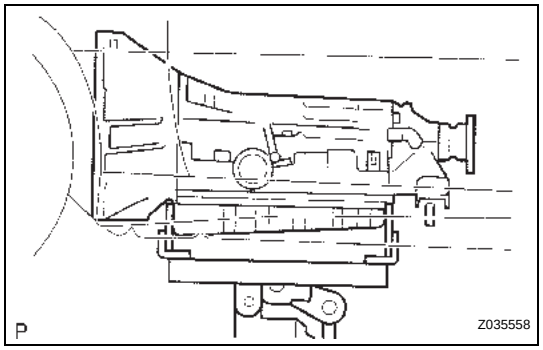
14. DISCONNECT WIRE HARNESS

15. REMOVE STARTER ASSEMBLY (See page ST-5)



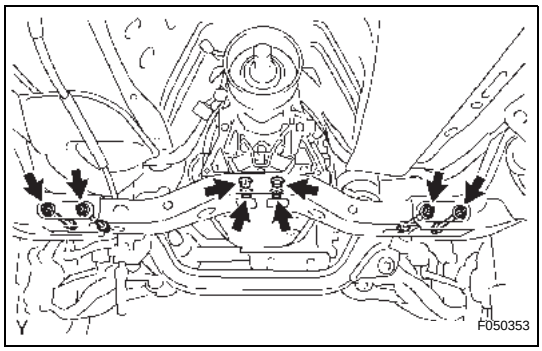
16. REMOVE FLYWHEEL HOUSING SIDE COVER

(a) Remove the flywheel housing side cover from the cylinder block.



17. SUPPORT AUTOMATIC TRANSMISSION ASSEMBLY

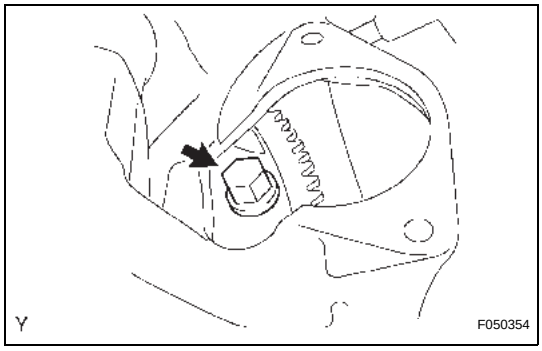
(a) Support the automatic transmission assembly with a transmission jack.



18. REMOVE NO.3 FRAME CROSSMEMBER SUB-ASSEMBLY

(a) Remove the 4 bolts on the frame crossmember sub-assembly No. 3.

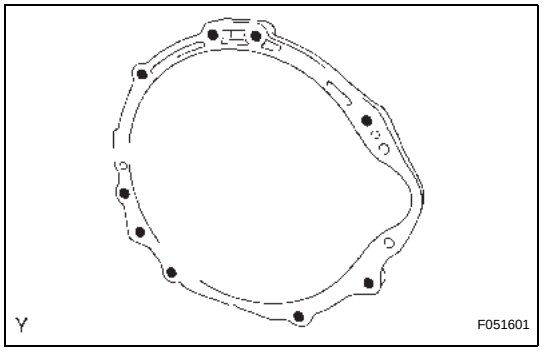
(b) Remove the 4 nuts, 4 bolts and frame crossmember sub-assembly No. 3.



19. REMOVE AUTOMATIC TRANSMISSION ASSEMBLY

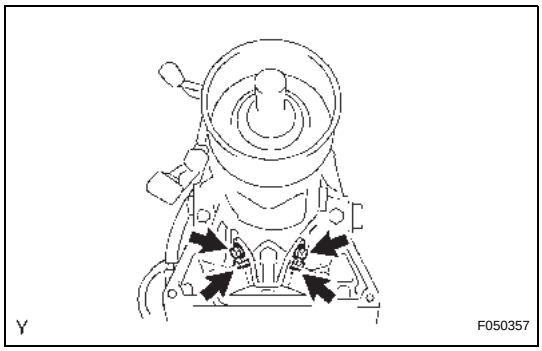
(a) Turn the crankshaft to gain access to each bolt.

(b) Hold the crankshaft pulley nut with a wrench and remove the 6 bolts.



(c) Remove the 9 bolts.

(d) Separate and remove the automatic transmission.



20. REMOVE REAR NO.1 ENGINE MOUNTING INSULATOR

(a) Remove the 4 bolts and engine mounting insulator rear from the automatic transmission.

21. REMOVE TORQUE CONVERTER CLUTCH ASSEMBLY

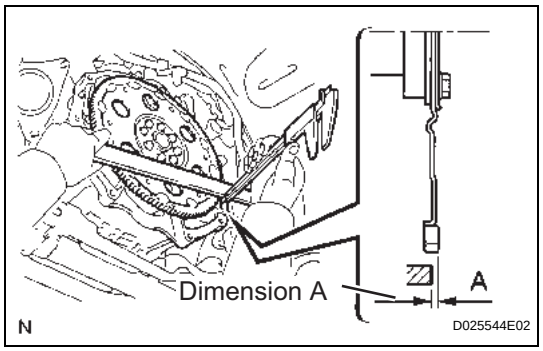
INSTALLATION

1. INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY (See page AT-166)

2. INSTALL TORQUE CONVERTER CLUTCH ASSEMBLY

(a) Install the torque converter clutch onto the automatic transmission.

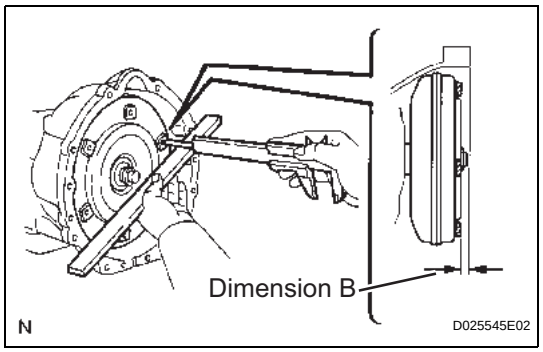
(b) Using calipers and a straight edge, measure dimension A, between the engine and the end surface of the drive plate, as shown in the illustration.



(c) Using calipers and a straight edge, measure dimension B shown in the illustration and check that B is greater than A measured in (b).

Standard:

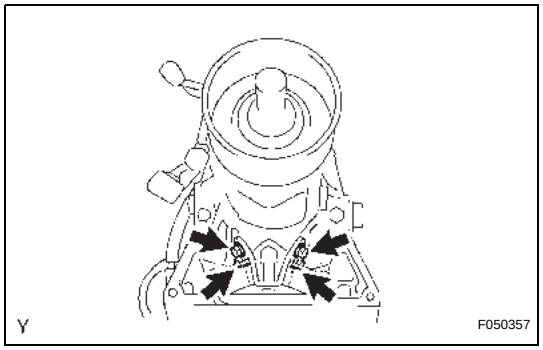
A + 1 mm or more



3. INSTALL REAR NO.1 ENGINE MOUNTING INSULATOR

(a) Install the engine mounting insulator rear onto the automatic transmission with the 4 bolts.

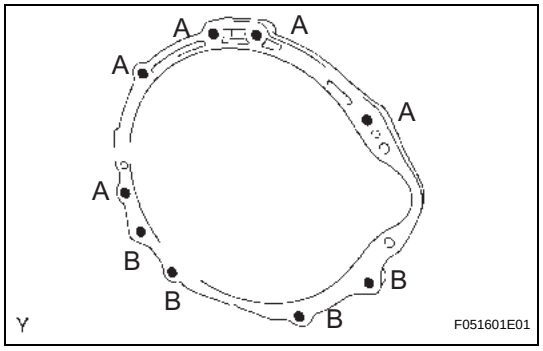
Torque: 65 N*m (663 kgf*cm, 48 ft.*lbf)

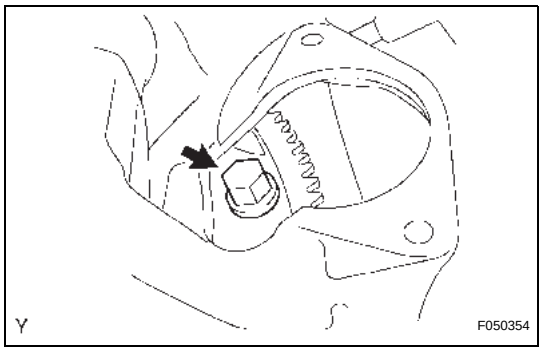


4. INSTALL AUTOMATIC TRANSMISSION ASSEMBLY

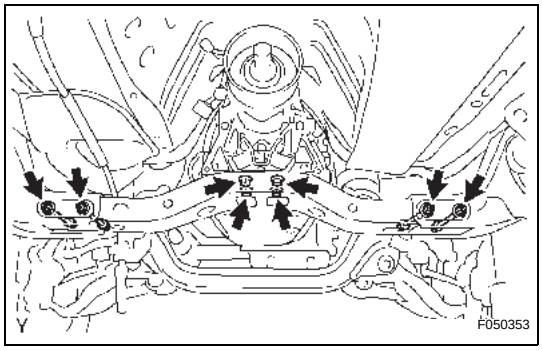
(a) Install the automatic transmission onto the engine with the 9 bolts.

Torque: 71 N*m (720 kgf*cm, 53 ft.*lbf) for bolt A
37 N*m (380 kgf*cm, 27 ft.*lbf) for bolt B





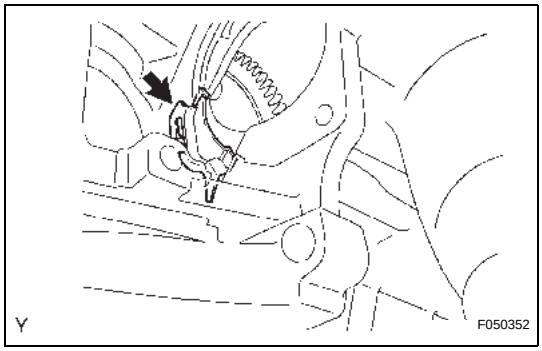
(b) Install the 6 torque converter clutch mounting bolts.
Torque: 48 N*m (489 kgf*cm, 35 ft.*lbf)
HINT:
First install the black bolt and then the other 5 bolts.



5. INSTALL NO.3 FRAME CROSSMEMBER SUB-ASSEMBLY

(a) Install the frame crossmember sub-assembly No. 3 with the 4 bolts and 4 nuts.
Torque: 40 N*m (408 kgf*cm, 30 ft.*lbf)

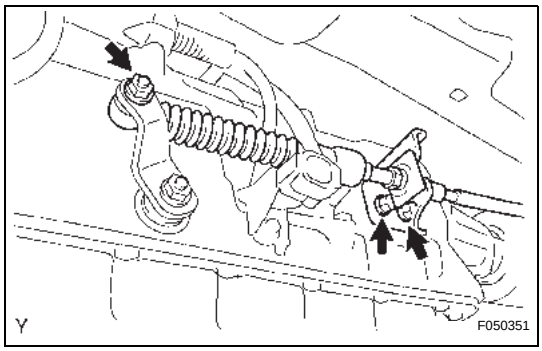
(b) Install the frame crossmember sub-assembly No. 3 with the 4 bolts.
Torque: 19 N*m (189 kgf*cm, 14 ft.*lbf)



6. INSTALL FLYWHEEL HOUSING SIDE COVER

(a) Install the flywheel housing side cover onto the cylinder block.

7. INSTALL STARTER ASSEMBLY (See page ST-11)



8. INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY

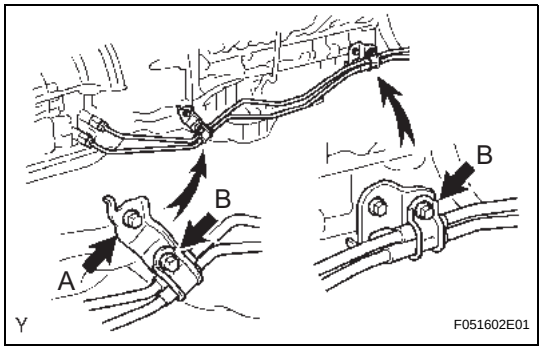
(a) Install the transmission control cable bracket No. 1 with the 2 bolts.
Torque: 28 N*m (286 kgf*cm, 21 ft.*lbf)

(b) Connect the transmission control cable with the nut.
Torque: 14 N*m (143 kgf*cm, 10 ft.*lbf)

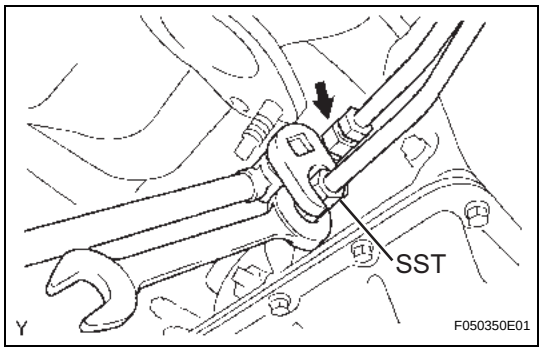
9. INSTALL NO.1 OIL COOLER OUTLET TUBE

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

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



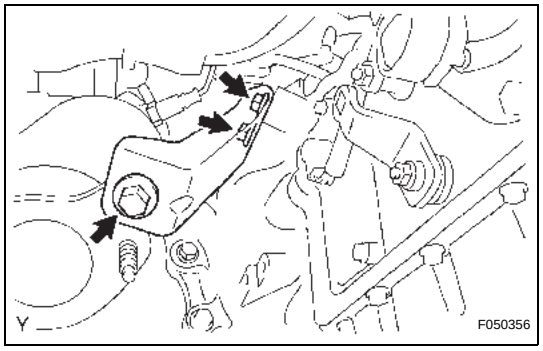
(c) Install the 2 clamps and 3 bolts.
Torque: 12 N*m (122 kgf*cm, 9 ft.*lbf) for bolt A
5.0 N*m (50 kgf*cm, 43 in.*lbf) for bolt B



(d) Using SST, tighten the oil cooler outlet tube No. 1.
SST 09023-12701
Torque: 34 N*m (350 kgf*cm, 25 ft.*lbf)

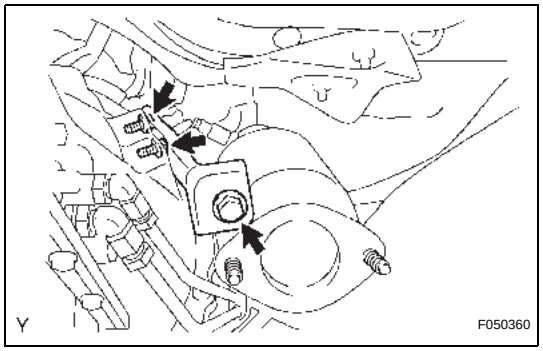
10. INSTALL NO.1 OIL COOLER INLET TUBE

(a) Using SST, tighten the oil cooler inlet tube No. 1.
SST 09023-12701
Torque: 34 N*m (350 kgf*cm, 25 ft.*lbf)



11. INSTALL NO.2 MANIFOLD STAY

(a) Install manifold stay No. 2 with the 3 bolts.
Torque: 40 N*m (408 kgf*cm, 30 ft.*lbf)



12. INSTALL MANIFOLD STAY

(a) Install the manifold stay with the 3 bolts.
Torque: 40 N*m (408 kgf*cm, 30 ft.*lbf)

13. INSTALL PROPELLER WITH CENTER BEARING SHAFT ASSEMBLY (See page PR-32)

14. INSTALL EXHAUST PIPE
(See page EX-3)

15. INSTALL OXYGEN SENSOR

16. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)

17. PERFORM INITIALIZATION
(See page AT-17)

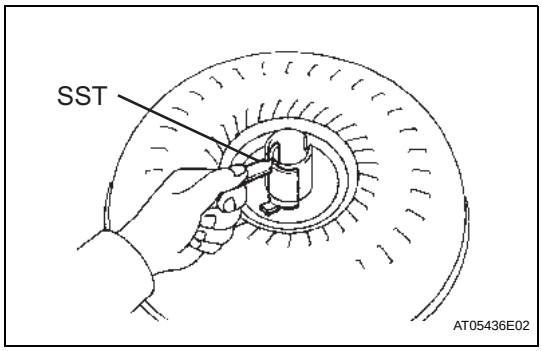
18. ADD AUTOMATIC TRANSMISSION FLUID
(See page AT-135)

19. INSPECT SHIFT LEVER POSITION (See page AT-155)

20. CHECK FOR EXHAUST GAS LEAKAGE

21. INSTALL NO. 2 ENGINE UNDER COVER (w/ No. 2 Engine Under Cover)

22. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY



TORQUE CONVERTER CLUTCH AND DRIVE PLATE

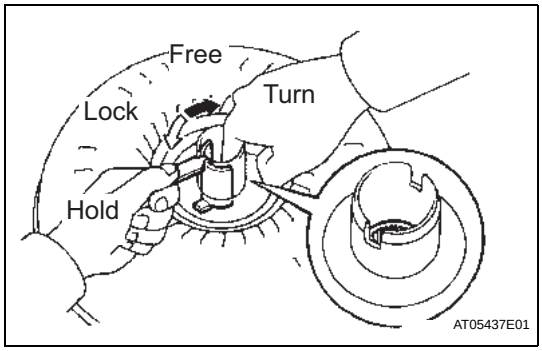
INSPECTION

1. INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

(a) Inspect the one-way clutch.

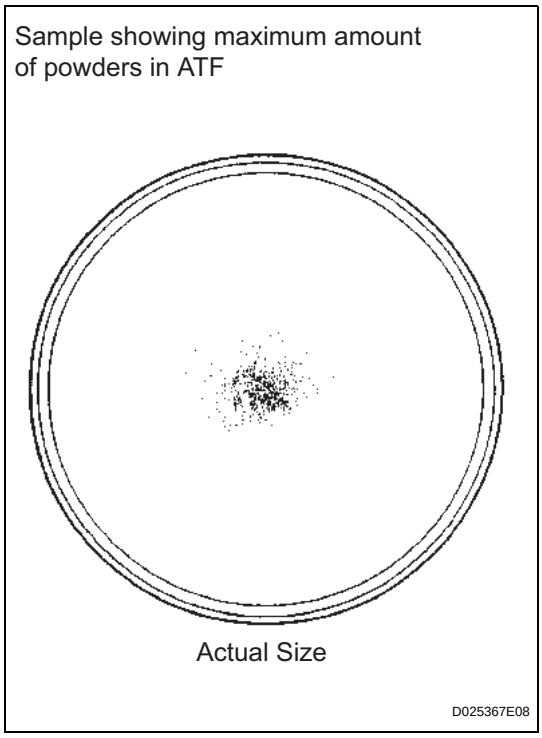
(1) Install SST so that it fits in the notch of the converter hub and outer race of the one-way clutch.
SST 09350-32014 (09351-32020)

(2) Press on the serrations of the starter with a finger and rotate it.
Check if it rotates smoothly when turned clockwise and locks up when turned counterclockwise.
If necessary, clean the converter and check the one-way clutch again.
Replace the converter if the one-way clutch still won't operate as specified.



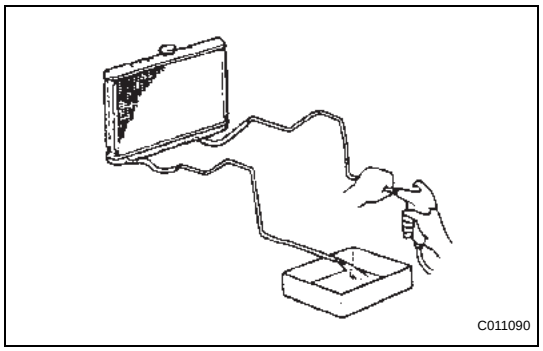
(b) Check the condition of the torque converter clutch assembly.

(1) If the inspection result of the torque converter clutch assembly meets any of the cases mentioned below, replace the torque converter clutch.
Malfunction item:
Any metallic sound is heard from the torque converter clutch during stall test or when the shift lever is in the neutral position.
One-way clutch is free or locked in both directions. Fine powders exceeding the sample limit are identified in ATF. (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.



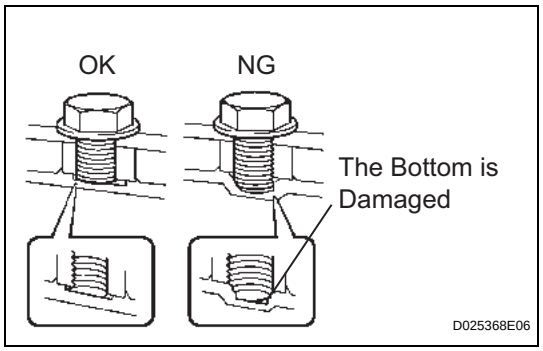
(c) Replace the ATF in the torque converter clutch.

(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 installation surface facing up.

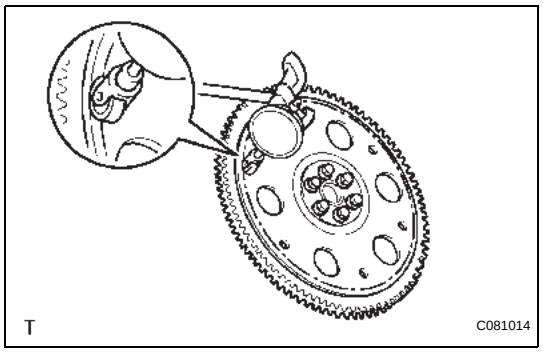


(d) Clean and then check the oil cooler and oil pipe line.
  (1) If inspecting the torque converter clutch or exchanging the ATF, clean the oil cooler and oil pipe line.
  HINT:
  - Apply compressed air of 196 kPa (2 kgf/ cm2, 28 psi) from the inlet hose.
  - If plenty of fine powders are identified in the ATF, add new ATF using a bucket pump and clean the ATF again.

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



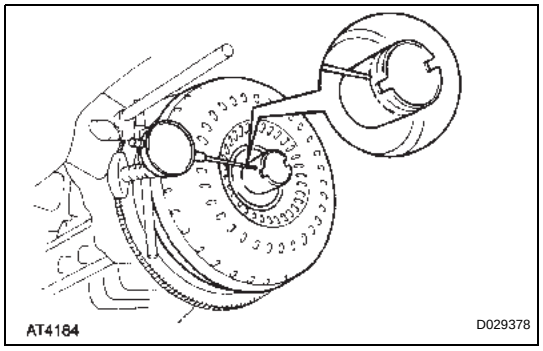
(e) Be careful not to deform the torque converter clutch or damage the oil pump gear.
  (1) When any marks due to interference are found on the end of the bolt to the torque converter clutch or on the bottom of the bolt hole, replace the bolt and the torque converter clutch.
  (2) All the bolts should be the same length.
  (3) Do not lose any spring washers.



2. INSPECT DRIVE PLATE AND RING GEAR SUB-ASSEMBLY

(a) Set up a dial indicator and measure the drive plate runout.
Maximum runout:
0.20 mm (0.0079 in.)

(b) Check the ring gear for damage.
If the runout is not within the specification or the ring gear is damaged, replace the drive plate.



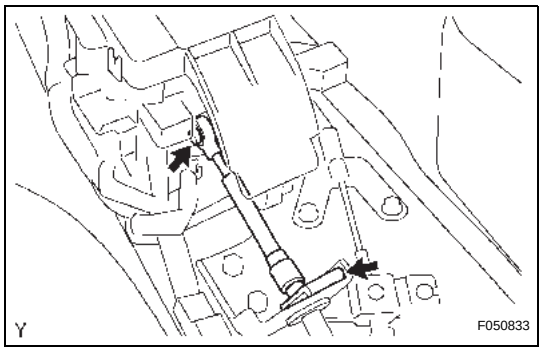
3. INSPECT RUNOUT OF TORQUE CONVERTER CLUTCH ASSEMBLY

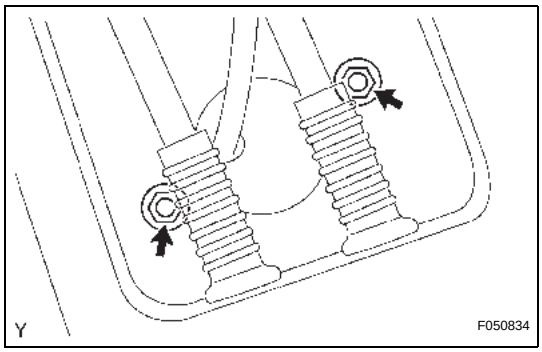
(a) Provisionally mount the torque converter onto the drive plate, set up a dial indicator, and measure the torque converter sleeve runout.
Maximum runout:
0.30 mm (0.0118 in.)
If the runout is not within the specification, try to correct it by reinstalling the converter to the correct orientation.
HINT:
Mark the position of the converter to ensure correct installation.

TRANSMISSION CONTROL CABLE

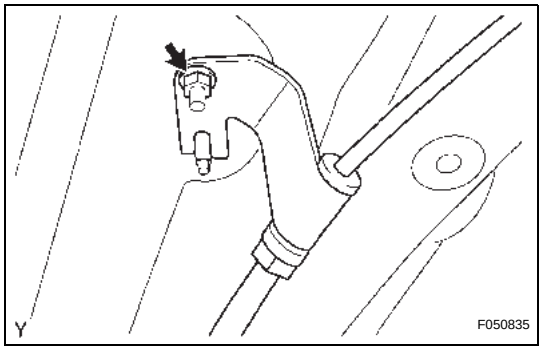
REMOVAL

1. **REMOVE CONSOLE UPPER REAR PANEL SUB-ASSEMBLY (See page IP-9)**
2. **REMOVE CONSOLE BOX ASSEMBLY REAR (See page IP-10)**
3. **REMOVE INSTRUMENT PANEL CUP HOLDER TRAY (See page IP-10)**
4. **REMOVE CONSOLE BOX FRONT (See page IP-10)**
5. **REMOVE VOLTAGE INVERTER ASSEMBLY (w/ Voltage Inverter) (See page AV-104)**
6. **REMOVE TRANSMISSION CONTROL CABLE ASSEMBLY**
   (a) Disconnect the transmission control cable assembly from the shift lever assembly.
   (b) Remove the clip and disconnect the transmission control cable.

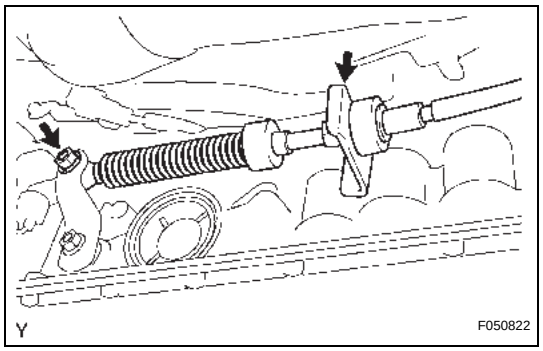




   (c) Remove the 2 nuts and disconnect the transmission control cable assembly from the body.

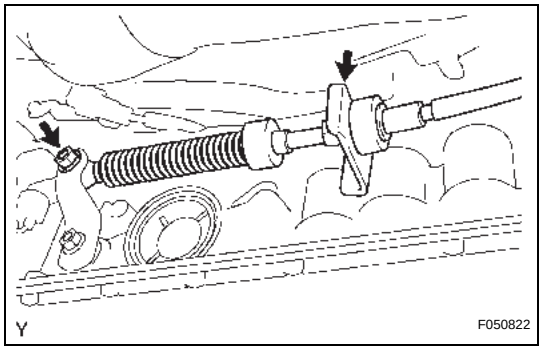


   (d) Remove the nut and disconnect the transmission control cable assembly from the body.



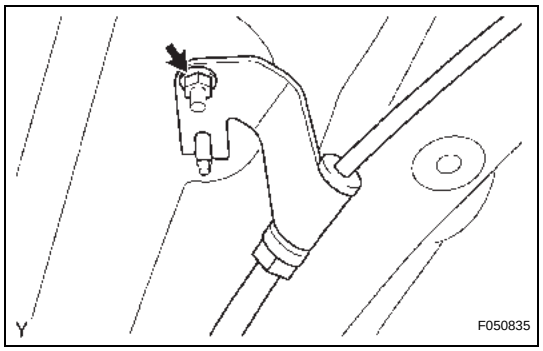
(e) Remove the clip and transmission control cable bracket.
(f) Remove the nut and transmission control cable assembly.

INSTALLATION

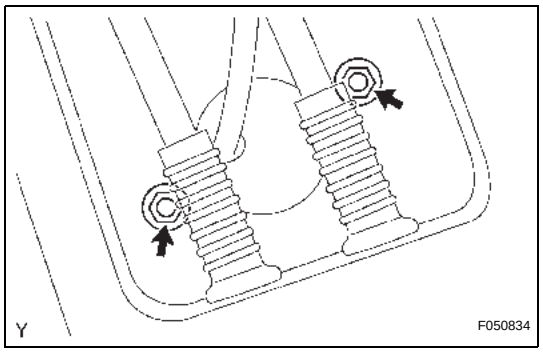


1. INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY

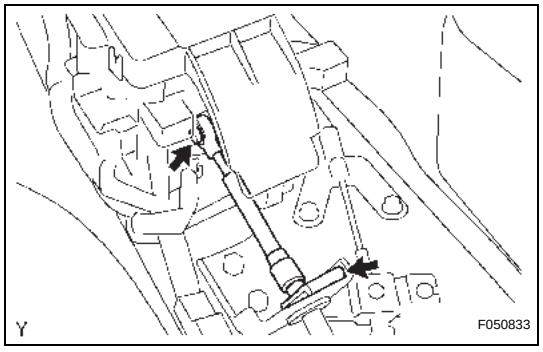
(a) Install the transmission control cable assembly with the nut.
Torque: 14 N*m (143 kgf*cm, 10 ft.*lbf)
(b) Install the transmission control cable bracket and lock plate.



(c) Connect the transmission control cable with the nut to the body.
Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf)



(d) Connect the transmission control cable with the 2 nuts to the body.
Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf)



(e) Connect the transmission control cable with the lock plate to the floor shift assembly.
(f) Install the transmission control cable onto the floor shift assembly.

2. INSTALL VOLTAGE INVERTER ASSEMBLY (w/ Voltage Inverter) (See page AV-105)

3. INSTALL CONSOLE BOX FRONT (See page IP-24)

4. INSTALL INSTRUMENT PANEL CUP HOLDER TRAY (See page IP-24)

5. **INSTALL CONSOLE BOX ASSEMBLY REAR (See page IP-24)**
6. **INSTALL CONSOLE UPPER REAR PANEL SUB-ASSEMBLY (See page IP-25)**
7. **ADJUST SHIFT LEVER POSITION (See page AT-105)**
8. **INSPECT SHIFT LEVER POSITION (See page AT-105)**

AUTOMATIC TRANSMISSION SYSTEM

PRECAUTION

1. **PRECAUTION**

   NOTICE:

   - **Perform the RESET MEMORY (AT initialization) when replacing the automatic transmission assembly, engine assembly or ECM (See page AT-17).**
   - **Perform the REGISTRATION (VIN registration) when replacing the ECM (See page ES-14).**
   - **Re-set the function of the ATF (Automatic Transmission Fluid) temperature warning light, if the ECM has been replaced or RESET MEMORY (AT initialization) has been performed (See page AT-17).**

   HINT:

   RESET MEMORY cannot be completed by only disconnecting the negative cable from the battery.

2. **CONNECT BATTERY NEGATIVE TERMINAL**

   (a) Connect the battery negative terminal to the cable and run the engine at no less than 2,000 rpm for 1 minute.

   NOTICE:

   If the engine exceeds 2,000 rpm, the clutch is automatically disengaged by the compressor protection control system.

3. **PRECAUTION FOR DISASSEMBLY AND REASSEMBLY**

   CAUTION:

   When using compressed air, always aim away from yourself to prevent Automatic Transmission Fluid (ATF) or kerosene from spraying on your face.

   NOTICE:

   - **The automatic transaxle is composed of precision-made parts, necessitating careful inspection before reassembly because even a small nick could cause fluid leakage or affect performance.**
   - **The procedures are organized so that you work on only one component group at a time. This will help avoid confusion with similar-looking parts of different sub-assemblies being on your workbench at the same time.**
   - **The component groups are inspected and repaired from the converter housing side.**

AT

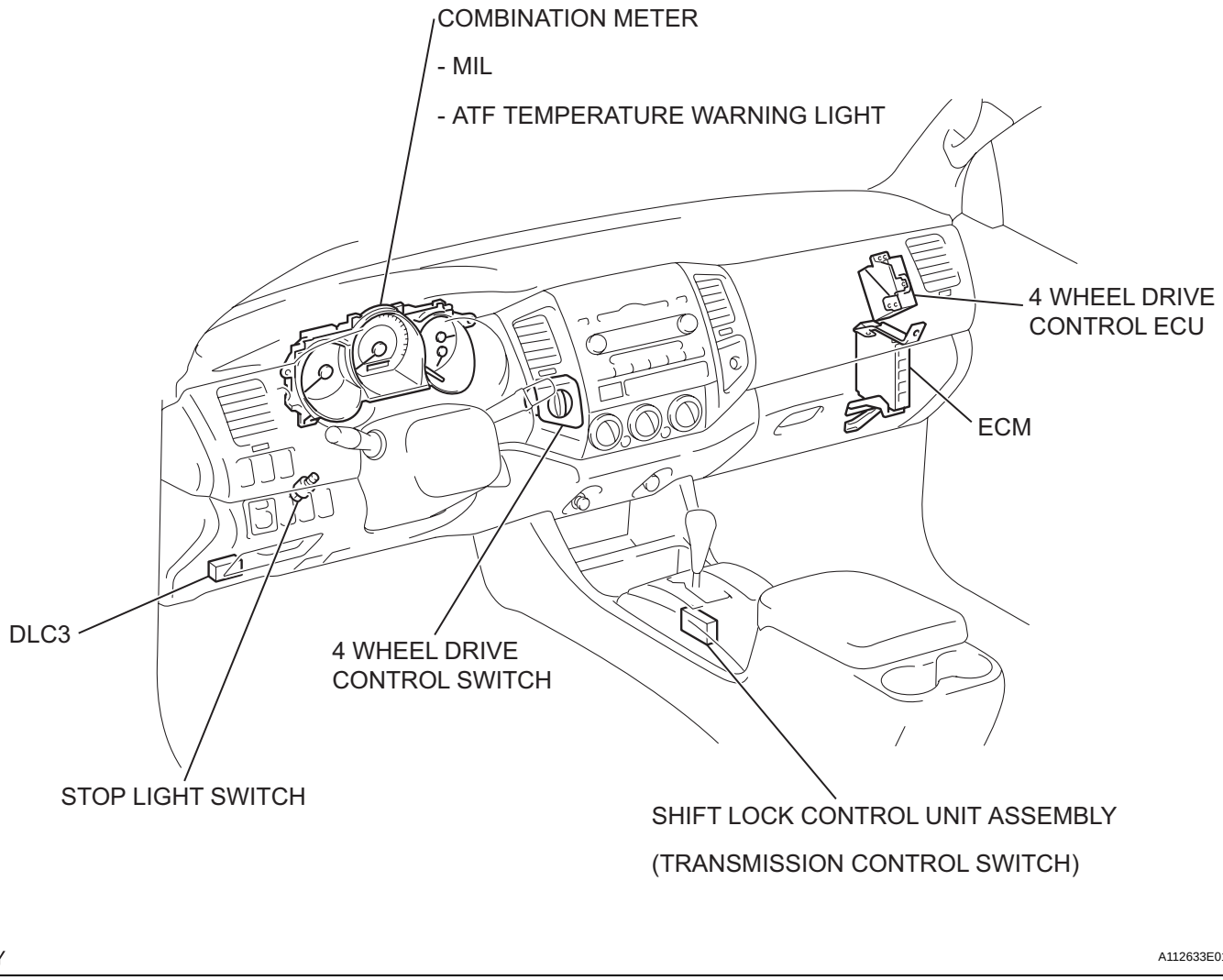
- **Whenever possible, complete the inspection, repair and reassembly before proceeding to the next component group. If a defect is found in a certain component group during reassembly, inspect and repair this group immediately. If a component group cannot be assembled because parts are being ordered, be sure to keep all parts of the group in a separate container while proceeding with disassembly, inspection, repair and reassembly of other component groups.**
- **When changing the automatic transmission fluid, use only "Toyota Genuine ATF WS" (ATF JWS3324 or NWS9638).**
- **All disassembled parts should be washed clean, and compressed air should be blown through any fluid passages and holes.**
- **Dry all parts with compressed air. Never use cloth.**
- **The recommended ATF or kerosene should be used for cleaning.**
- **After cleaning, the parts should be arranged in the order they were removed for efficient inspection, repairs, and reassembly.**
- **When disassembling a valve body, be sue to match each valve with its corresponding spring.**
- **New discs for the brakes and clutches that will be used for replacement must be soaked in ATF for at least 15 minutes before reassembly.**
- **All oil seal rings, clutch discs, clutch plates, rotating parts, and sliding surfaces should be coated with ATF prior to reassembly.**
- **All old gaskets and rubber O-rings must be replaced.**
- **Do not apply adhesive cement to gaskets and similar parts.**
- **Make sure that the ends of the snap rings are not aligned with any cutouts. Also make sure that snap rings are correctly installed into the grooves.**
- **If a worn bushing is to be replaced, the sub-assembly containing the bushing must also be replaced.**
- **Check the thrust bearings and races for wear or damage. Replace if necessary.**
- **Use petroleum jelly to keep parts in place.**

- **When working with FIPG material, perform the following:**
  Using a razor blade and gasket scraper, remove all old FIPG material from the gasket surface.
  Clean all components thoroughly to remove all foreign matter.
  Clean both sealing surfaces with a non-residue solvent.
  Apply FIPG material in a continuous line approximately 1 mm (0.04 in.) in diameter on the sealing surface.
  Reassemble parts within 10 minutes of applying FIPG material. Failing to do so will require the FIPG material to be removed and reapplied.

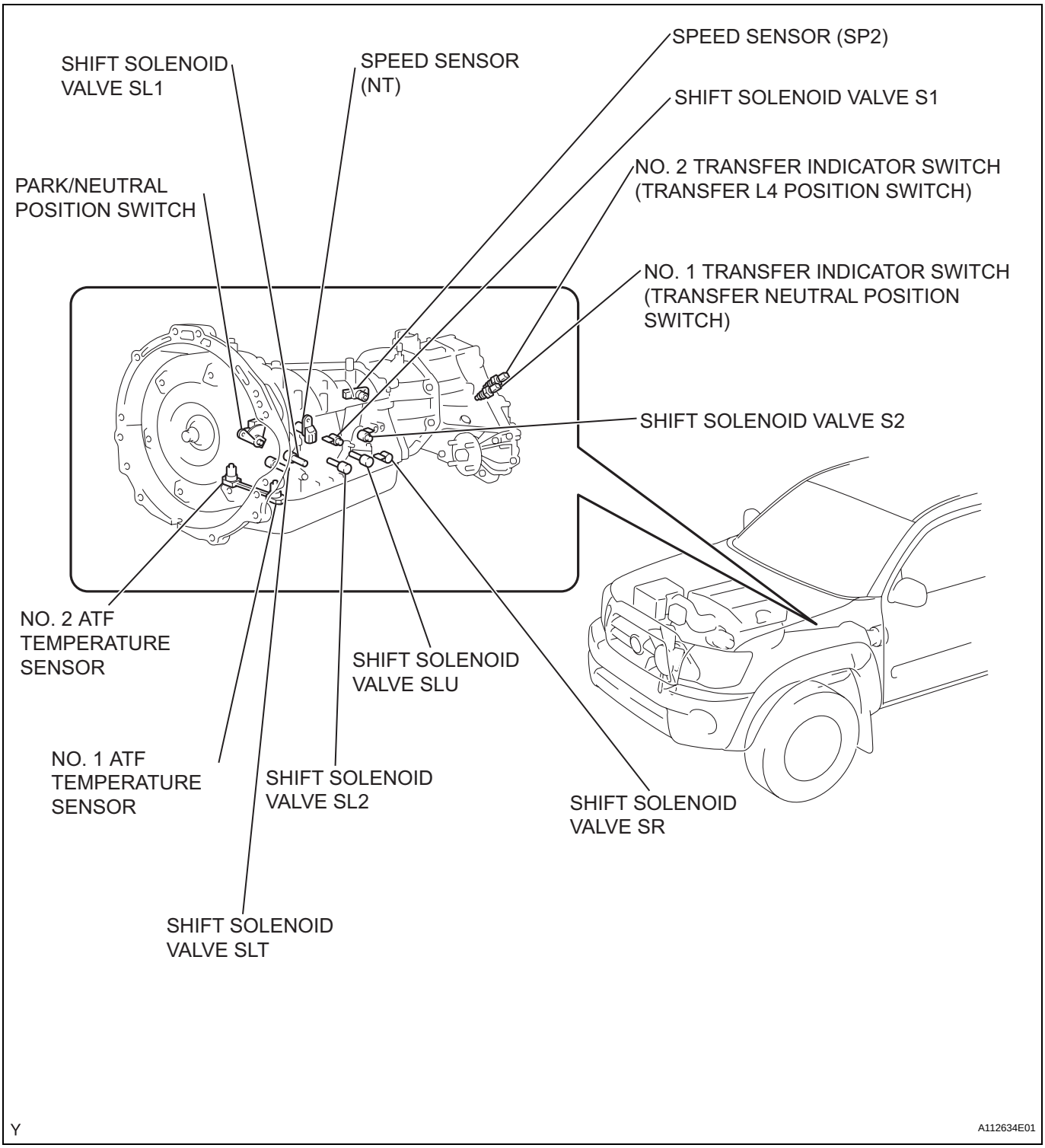
DEFINITION OF TERMS

Term	Definition
Monitor description	Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details).
Related DTCs	A group of diagnostic trouble codes that are output by the ECM based on the same malfunction detection logic.
Typical enabling conditions	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 one sensor is being monitored, the next sensor or component will not be monitored until the previous monitoring has been completed.
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 the malfunction only one time during a single driving cycle. "Continuous" means that the ECM detects the malfunction every time the enabling conditions are met.
Duration	The minimum time that the ECM must detect 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 determines that there is a malfunction and sets a DTC.
MIL operation	MIL illumination timing after a defect is detected. "Immediate" means that the ECM illuminates the MIL the instant the ECM determines that there is a malfunction. "2 driving cycles" means that the ECM illuminates the MIL if the same malfunction is detected again in a 2nd driving cycle.
Component operating range	Normal operation range of sensors and solenoids under normal driving conditions. These ranges are for a reference. They cannot be used to determine whether a sensor or solenoid is defective or not.

PARTS LOCATION

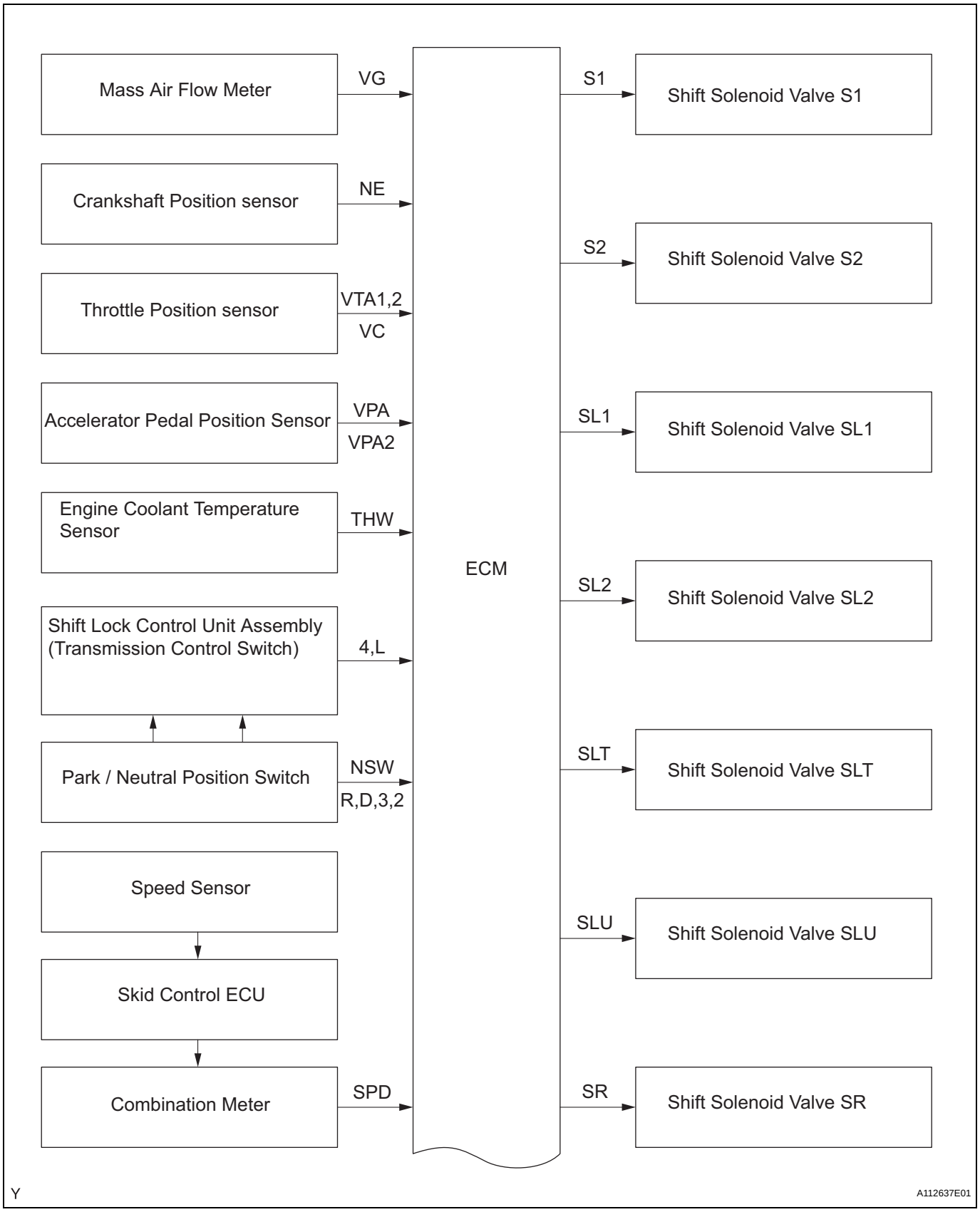


AT

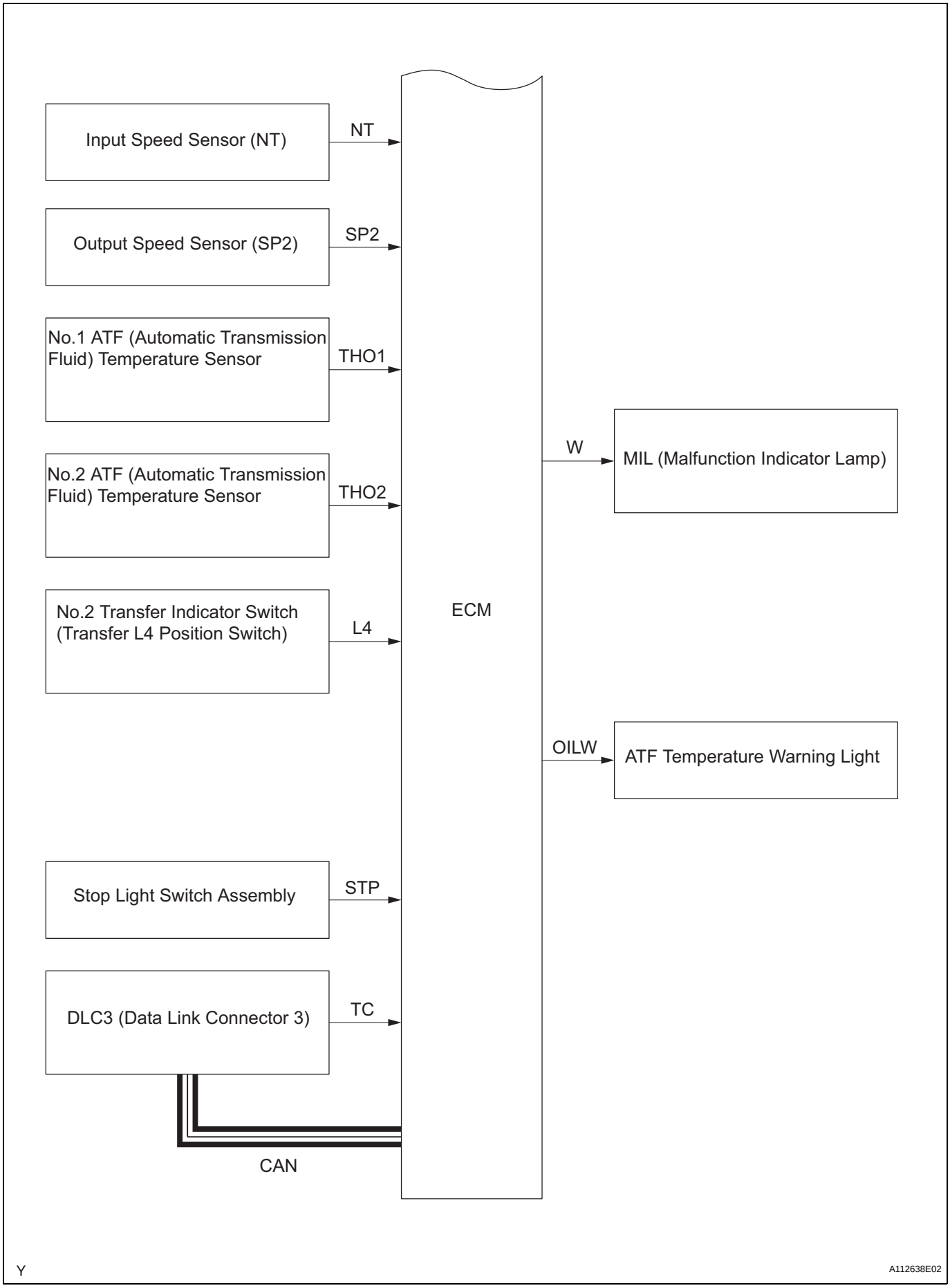

SHIFT SOLENOID VALVE SL1
SPEED SENSOR (NT)
SPEED SENSOR (SP2)
SHIFT SOLENOID VALVE S1
NO. 2 TRANSFER INDICATOR SWITCH (TRANSFER L4 POSITION SWITCH)
PARK/NEUTRAL POSITION SWITCH
NO. 1 TRANSFER INDICATOR SWITCH (TRANSFER NEUTRAL POSITION SWITCH)
SHIFT SOLENOID VALVE S2
NO. 2 ATF TEMPERATURE SENSOR
SHIFT SOLENOID VALVE SLU
NO. 1 ATF TEMPERATURE SENSOR
SHIFT SOLENOID VALVE SL2
SHIFT SOLENOID VALVE SR
SHIFT SOLENOID VALVE SLT
Y
A112634E01

SYSTEM DIAGRAM

The configuration of the electronic control system in the A750F automatic transmission is as shown in the following chart.



AT


Input Speed Sensor (NT)
NT
Output Speed Sensor (SP2)
SP2
No.1 ATF (Automatic Transmission Fluid) Temperature Sensor
THO1
No.2 ATF (Automatic Transmission Fluid) Temperature Sensor
THO2
No.2 Transfer Indicator Switch (Transfer L4 Position Switch)
L4
Stop Light Switch Assembly
STP
DLC3 (Data Link Connector 3)
TC
CAN
ECM
W
MIL (Malfunction Indicator Lamp)
OILW
ATF Temperature Warning Light
Y
A112638E02

SYSTEM DESCRIPTION

1. SYSTEM DESCRIPTION

(a) The ECT (Electronic controlled automatic transmission) is an automatic transmission 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.

AT

HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

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

1	VEHICLE BROUGHT TO WORKSHOP

NEXT

2	CUSTOMER PROBLEM ANALYSIS

NEXT

3	CONNECT INTELLIGENT TESTER TO DLC3 *

NEXT

4	CHECK AND CLEAR DTCS AND FREEZE FRAME DATA *

Refer to the DTC CHECK / CLEAR (See page AT-31).

NEXT

5	VISUAL INSPECTION

NEXT

6	SETTING CHECK MODE DIAGNOSIS *

Refer to the CHECK MODE PROCEDURE (See page AT-31).

NEXT

7	PROBLEM SYMPTOM CONFIRMATION

Refer to the ROAD TEST (See page AT-11).

Result

Result	Proceed to
Symptom does not occur	A
Symptom occurs	B

B → GO TO STEP 9

A

8	SYMPTOM SIMULATION

AT

Refer to the ELECTRONIC CIRCUIT INSPECTION PROCEDURE (See page IN-34).

NEXT

9	DTC CHECK *

Refer to the DTC CHECK / CLEAR (See page AT-31).

Result

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

B → GO TO STEP 17

A

10	BASIC INSPECTION

Refer to the AUTOMATIC TRANSMISSION FLUID (See page AT-139).
Refer to the PARK/NEUTRAL POSITION SWITCH (See page AT-145).
Refer to the FLOOR SHIFT ASSEMBLY (See page AT-158).

NG → GO TO STEP 19

OK

11	MECHANICAL SYSTEM TEST

Refer to the MECHANICAL SYSTEM TEST (See page AT-14).

NG → GO TO STEP 16

OK

12	HYDRAULIC TEST

Refer to the HYDRAULIC TEST (See page AT-16).

NG → GO TO STEP 16

OK

AT

13	MANUAL SHIFTING TEST

Refer to the MANUAL SHIFTING TEST (See page AT-17).

NG → GO TO STEP 15

OK

14	PROBLEM SYMPTOMS TABLE CHAPTER 1

Refer to the PROBLEM SYMPTOMS TABLE (See page AT-21).

NG → GO TO STEP 18

OK

15	PROBLEM SYMPTOMS TABLE CHAPTER 2

Refer to the PROBLEM SYMPTOMS TABLE (See page AT-21).

NEXT

16	PART INSPECTION

NEXT → GO TO STEP 19

17	DTC CHART

Refer to the DIAGNOSTIC TROUBLE CODE CHART (See page AT-39).

NEXT

18	CIRCUIT INSPECTION

NEXT

19	REPAIR OR REPLACE

NEXT

20	CONFIRMATION TEST

NEXT

END

AT

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 while referring to the automatic shift schedule and simulate the problem symptoms.

2. ROAD TEST

NOTICE:

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

(a) D position test:

Shift into the D position, 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-42).

HINT:

5th Gear Up-shift Prohibition Control

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

4th Gear Up-shift Prohibition Control

- Engine coolant temperature is 47°C (116.6°F) or less and vehicle speed is 30.4 mph (49 km/h) or less.

5th 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 slippage

Check for shock and slippage 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 check while driving in the lock-up condition.

HINT:

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

(4) Check kick-down operation.
Check vehicle speeds when the 2 → 1, 3 → 2, 4 → 3, and 5 → 4 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-42).

(5) Check for abnormal shock and slippage 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:
If there is a sudden increase in engine speed, there is no lock-up.

(b) 4 position test:
Shift into the 4 position, fully depress the accelerator pedal and check the following points.

(1) Check up-shift operation.
Check that the 1 → 2, 2 → 3 and 3 → 4 up-shifts take place and that the shift points conform to the automatic shift schedule (see page SS-42).
HINT:
- There is no 5th up-shift in the 4 position.
- 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 engine braking.
While driving in the 4 position and 4th gear, release the accelerator pedal and check the engine braking effect.

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

(4) Check the lock-up mechanism.
- Drive in the 4 position and 4th gear, at a steady speed (lock-up ON).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

HINT:
If there is a sudden increase in engine speed, there is no lock-up.

(c) 3 position test:
Shift into the 3 position, fully depress the accelerator pedal and check the following points.
(1) Check up-shift operation.
Check that the 1 → 2 and 2 → 3 up-shifts take place and that the shift points conform to the automatic shift schedule (see page SS-42).
HINT:
There is no 4th up-shift and lock-up in the 3 position.
(2) Check engine braking.
While running in the 3 position and 3rd gear, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noises during acceleration and deceleration, and for shock at up-shift and down-shift.

(d) 2 position test:
Shift into the 2 position, fully depress the accelerator pedal and check the following points.
(1) Check up-shift operation.
Check that the 1 → 2 up-shift takes place and that the shift point conforms to the automatic shift schedule (see page SS-42).
HINT:
There is no 3rd up-shift and lock-up in the 2 position.
(2) Check engine braking.
While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noises during acceleration and deceleration, and for shock at up-shift and down-shift.

(e) L position test:
Shift into the L position and fully depress the accelerator pedal and check the following points.
(1) Check no up-shift.
While running in the L position, check that there is no up-shift to 2nd gear.
(2) Check engine braking.
While running in the L position, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noises during acceleration and deceleration.

(f) 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 obstructions.

(g) 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.

AT

MECHANICAL SYSTEM TESTS

1. STALL SPEED TEST

HINT:

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

NOTICE:

- **Do not perform the stall speed test longer than 5 seconds.**
- **To ensure safety, perform this test in an open and level area that provides good traction.**
- **The stall speed test should always be performed with at least 2 people. One person should observe the condition of the wheels and wheel chocks while the other is performing the test.**

(a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.

(b) Run the vehicle until the transmission fluid temperature has reached 50 to 80°C (122 to 176°F).

(c) Allow the engine to idle with the air conditioning OFF.

(d) Chock all 4 wheels.

(e) Set the parking brake and keep the brake pedal depressed firmly with your left foot.

(f) Shift the shift lever into the drive position.

(g) Depress the accelerator pedal as much as possible with your right foot.

(h) Read the engine rpm (stall speed) and release the accelerator pedal immediately.

Standard value:

2,250 to 2,550 rpm

Evaluation:

Test Result	Possible Cause
Stall speed is lower than standard value	• Stator one-way clutch is not operating properly • Torque converter is faulty (stall speed is less than standard value by 600 rpm or more) • Engine power may be insufficient
Stall speed is higher than standard value	• Line pressure is low • No. 1 clutch (C1) slipping • No. 3 one-way clutch (F3) is not operating properly • Improper fluid level

2. SHIFT TIME LAG TEST

HINT:

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

(a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.

(b) Run the vehicle until the transmission fluid temperature has reached 50 to 80°C (122 to 176°F).

(c) Allow the engine to idle with the air conditioning OFF.

(d) Set the parking brake and keep the brake pedal depressed firmly.

(e) Check the D range time lag.
(1) Shift the shift lever into the N position and wait for 1 minute.
(2) Shift the shift lever into the D position and measure the time until the shock is felt.
(3) Repeat the 2 procedures above 3 times, and calculate the average time of the 3 tests.

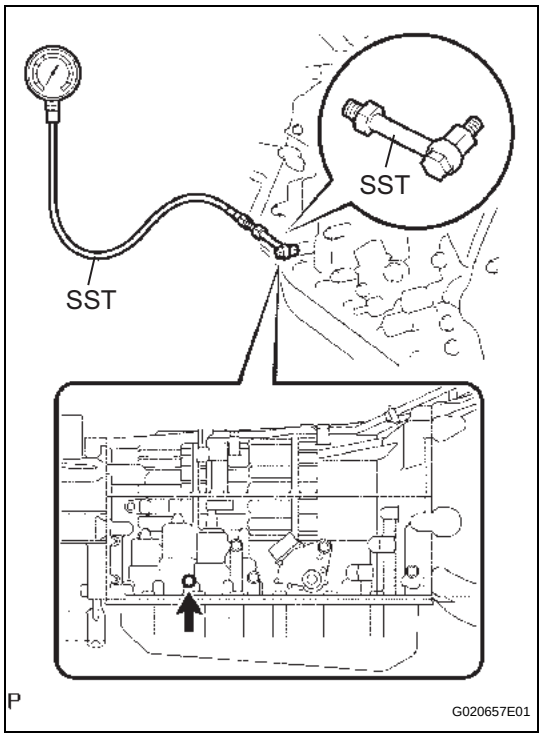
(f) Check the R range time lag.
(1) Shift the shift lever into the N position and wait for 1 minute.
(2) Shift the shift lever into the R position and measure the time until the shock is felt.
(3) Repeat the 2 procedures above 3 times, and calculate the average time of the 3 tests.

Standard value:

D range time lag is less than 1.2 seconds
R range time lag is less than 1.5 seconds

Evaluation:

Test Result	Possible Cause
D range time lag exceeds standard value	• Line pressure is low • No. 1 clutch (C1) is worn • No. 3 one-way clutch (F3) is not operating properly
R range time lag exceeds standard value	• Line pressure is low • No. 3 clutch (C3) is worn • No. 4 brake (B4) is worn • No. 1 one-way clutch (F1) is not operating properly



HYDRAULIC TEST

1. PERFORM HYDRAULIC TEST

(a) Measure the line pressure.

NOTICE:

- **Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature of 50° to 80°C (122° to 176°F).**
- **The line pressure test should always be carried out in pairs. One technician should observe the condition of the wheels or wheel stoppers outside the vehicle while the other is doing the test.**
- **Be careful to prevent the SST hose from interfering with the exhaust pipe.**
- **This check must be conducted after checking and adjusting the engine.**
- **Perform with the A/C OFF.**
- **Do not conduct stall tests for longer than 10 seconds continuously.**

(1) Warm up the ATF.
(2) Lift the vehicle up.
(3) Remove the test plug on the transmission case center right side and connect SST.

SST 09992-00095 (09992-00151, 09992-00271)

(4) Fully apply the parking brake and chock the 4 wheels.
(5) Start the engine and check the idling speed.

(6) Keep your left foot pressing firmly on the brake pedal and shift into the D position.
(7) Measure the line pressure while the engine is idling.
(8) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when the engine speed reaches the stall speed.
(9) In the same manner, do the test in the R position.

Specified line pressure

Condition	D position	R position
Idling	**363 to 423 kPa (3.7 to 4.3 kgf/cm^2 , 53 to 61 psi)**	**484 to 564 kPa (4.9 to 5.8 kgf/cm^2, 70 to 82 psi)**
Stall test	**1,282 to 1,381 kPa (13.1 to 14.1 kgf/cm^2, 186 to 200 psi)**	**1,218 to 1,338 kPa (12.4 to 13.6 kgf/cm^2, 177 to 194 psi)**

Evaluation:

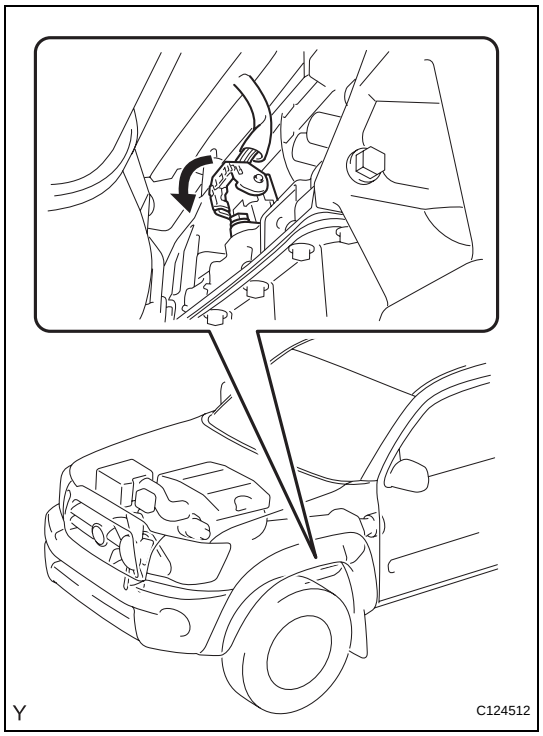
Problem	Possible cause
Measured value are higher than specified in all positions	• Shift solenoid valve SLT defective • Regulator valve defective
Measured value are lower than specified in all positions	• Shift solenoid valve SLT defective • Regulator valve defective • Oil pump defective
Pressure is low in D position only	• D position circuit fluid leakage • No. 1 clutch (C_1) defective
Pressure is low in R position only	• R position circuit fluid leakage • No. 3 clutch (C_3) defective • No. 4 brake (B_4) defective

MANUAL SHIFTING TEST

1. MANUAL SHIFTING TEST

HINT:

- Through this test, it can be determined whether the trouble occurs in the electrical circuit or if it is a mechanical problem in the transmission.
- If any abnormalities are found in the following test, the problem is in the transmission itself.



(a) Disconnect the connector of the transmission wire.
HINT:
It is possible to deactivate the electrical shift control by disconnecting the transmission wire. The gear positions can then be changed mechanically with the shift lever.

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

Shift Lever Position	Gear Position
D	4th
4	4th
3	3rd
2	1st
L	1st
R	R
P	P

(c) Connect the connector of the transmission wire.

(d) Clear the DTC (See page AT-31).

AT

INITIALIZATION

1. RESET MEMORY

CAUTION:

Perform the RESET MEMORY (AT initialization) when replacing the automatic transmission assembly, engine assembly or ECM.

NOTICE:

Intelligent tester only

HINT:

The ECM stores the condition under which the ECT (Electronic Controlled Automatic Transmission) controls the automatic transmission and engine assemblies according to their characteristics. Therefore, when the automatic transmission assembly, engine assembly, or ECM has been replaced, it is necessary to reset the memory so that the ECM can store the new information. Reset procedure is as follows.

(a) Turn the ignition switch off.

(b) Connect the intelligent tester together with the CAN VIN (controller area network vehicle interface module) to the DLC3.

(c) Turn the ignition switch to the ON position and push the intelligent tester main switch on.

(d) Select the items "DIAGNOSIS/ ENHANCED OBD II".

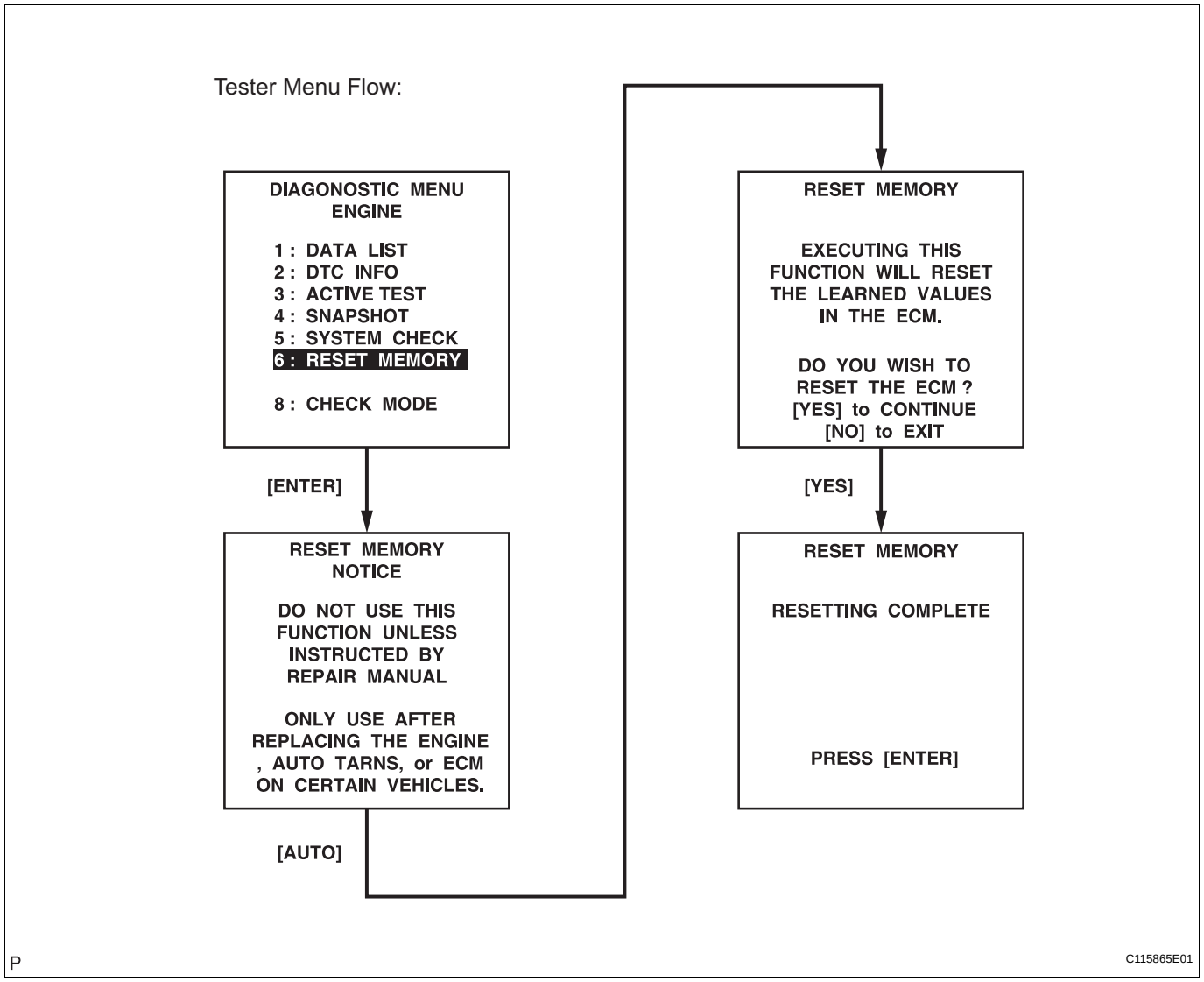
(e) Perform the reset memory procedure from the ENGINE menu.

CAUTION:

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

HINT:

The ECM stores the new information during the ROAD TEST.



2. SET UP FUNCTION OF ATF TEMPERATURE WARNING LIGHT (ONLY 4WD VEHICLE)

CAUTION:

Re-set the function of the ATF (Automatic Transmission Fluid) temperature warning light, if the ECM has been replaced or RESET MEMORY (AT initialization) has been performed.

HINT:

- The ATF temperature warning light is built into the 4WD vehicles. When the ATF temperature is too high, the ATF temperature warning light illuminates to warn the driver. If the ECM has been replaced or RESET MEMORY has been performed, this function does not work unless the following procedure is performed.
- Once the ECM is set up, its memory will not be cleared by only disconnecting the negative cable from the battery.

(a) Start the engine.

(b) Shift the 4 wheel drive control switch to the 4WD position. Check that the 4WD indicator illuminates.

(c) Shift the 4 wheel drive control switch to the 2WD position.
(d) Drive the vehicle at a vehicle speed of 25 mph (40 km/h) or more.

NOTICE:
If the battery is disconnected before driving the vehicle at a vehicle speed of 25 mph (40 km/h) or more, the memory will be cleared. If the battery has been disconnected, perform steps (a) to (d) again.

MONITOR DRIVE PATTERN

1. MONITOR DRIVE PATTERN FOR ECT TEST

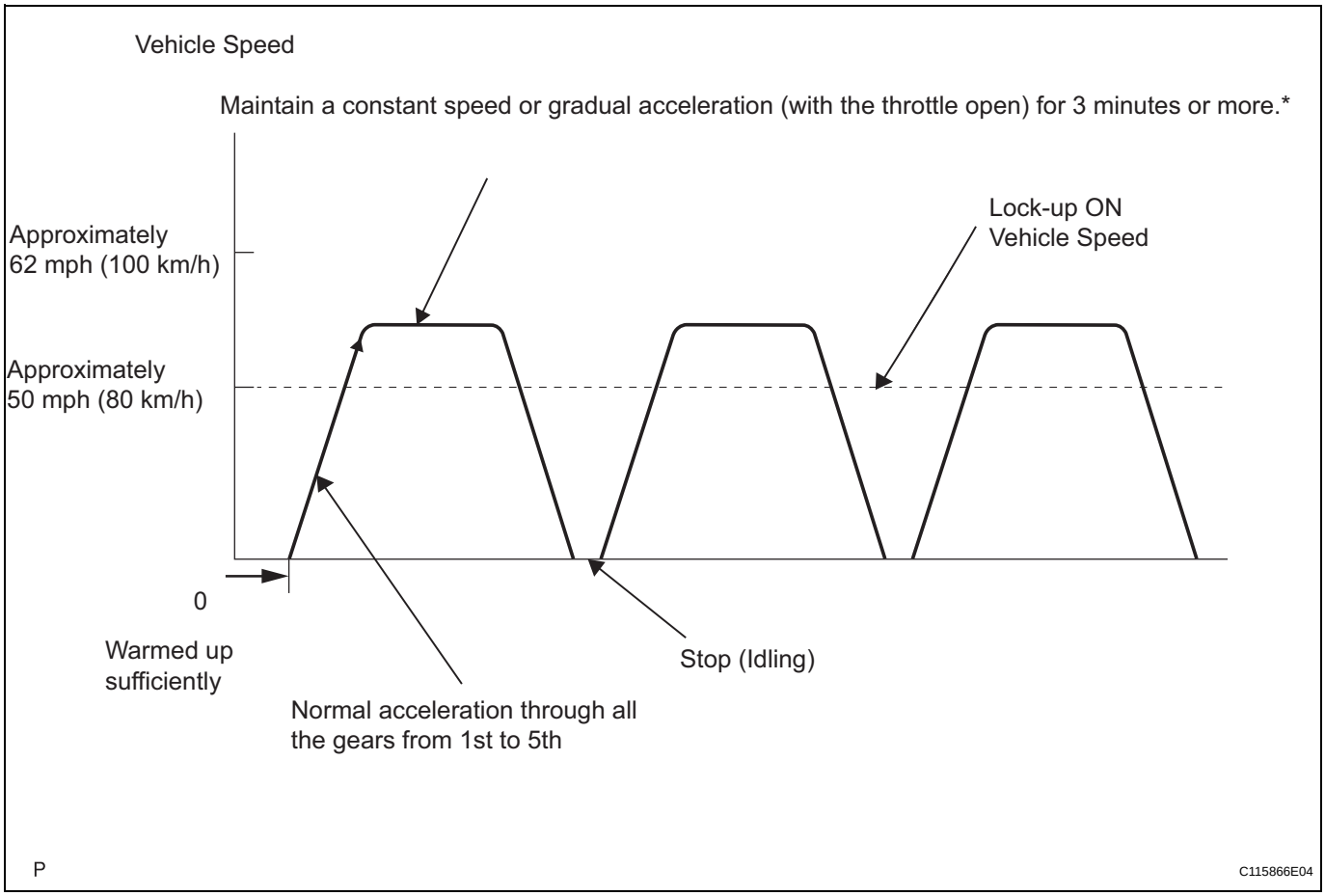
(a) Perform this drive pattern as one method to simulate the detection conditions of the ECT (Electronic Controlled Automatic Transmission) malfunctions.
(The DTCs may not be detected due to the actual driving conditions. And some DTCs may not be detected through this drive pattern.)
HINT:
Preparation for driving
- Warm up the engine sufficiently. (Engine coolant temperature should be 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))

Notice in driving
- Drive the vehicle through all gears. Stop → 1st → 2nd → 3rd → 4th → 5th → 5th (lock-up ON).
- Repeat the above driving pattern three times or more.

NOTICE:
- **The monitor status can be checked using the 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.**

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

AT



HINT:

*: Drive at such a speed in the uppermost gear, as 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:

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

PROBLEM SYMPTOMS TABLE

HINT:
If no DTCs are 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.

1. **Chapter 1: Electronic Circuit Matrix Chart**
   - Refer to the table below when the cause of trouble is considered to be electrical.
   - If the trouble still occurs even though there are no abnormalities in any of the other circuits, check and replace the ECM.

   HINT:
   *1: Denotes that when there are malfunctions in the circuit, DTCs may be set.

Symptom	Suspected area	See page
No up-shift (A particular gear, from 1st to 4th gear, is not up-shifted)	1. Shift solenoid valve (S1) circuit *1	AT-101
	2. Shift solenoid valve (S2) circuit *1	AT-104
	3. ECM	IN-34
No up-shift (4th -> 5th)	1. Transmission control switch circuit (D - 4) *1	AT-43
	2. Engine coolant temperature sensor circuit *1	ES-104
	3. Speed sensor NT circuit *1	AT-57
	4. Shift solenoid valve (SL1) circuit *1	AT-67
	5. Shift solenoid valve (SL2) circuit *1	AT-92
	6. Shift solenoid valve (SR) circuit *1	AT-107
	7. ECM	IN-34
No up-shift (3rd -> 4th)	1. Engine coolant temperature sensor circuit *1	ES-104
	2. Shift solenoid valve (S2) circuit *1	AT-104
	3. ECM	IN-34
No up-shift (1st -> 2nd)	1. Transmission control switch circuit (2 - L) *1	AT-43
	2. Shift solenoid valve (S2) circuit *1	AT-104
	3. ECM	IN-34
No down-shift (5th -> 4th)	1. Transmission control switch circuit (D - 4) *1	AT-43
	2. Shift solenoid valve (SL1) circuit *1	AT-67
	3. Shift solenoid valve (SL2) circuit *1	AT-92
	4. Shift solenoid valve (SR) circuit *1	AT-107
	5. ECM	IN-34
No down-shift (2nd -> 1st)	1. Transmission control switch circuit (2 - L) *1	AT-43
	2. Shift solenoid valve (S2) circuit *1	AT-104
	3. ECM	IN-34
No down-shift (A particular gear, from 1st to 4th gear, is not down-shifted)	1. Shift solenoid valve (S1) circuit *1	AT-101
	2. Shift solenoid valve (S2) circuit *1	AT-104
	3. ECM	IN-34

Symptom	Suspected area	See page
No lock-up	1. ATF temperature sensor circuit *1	AT-49
	2. Transfer L4 position switch circuit *1	AT-136
	3. Stop light switch circuit *1	ES-272
	4. Speed sensor NT circuit *1	AT-57
	5. Shift solenoid valve (SLU) circuit *1	AT-132
	6. Engine coolant temperature sensor circuit *1	ES-104
	7. ECM	IN-34
No lock-up off	1. Shift solenoid valve (SLU) circuit *1	AT-132
	2. ECM	IN-34
Shift point too high or too low	1. Shift solenoid valve (SLT) circuit *1	AT-118
	2. Speed sensor NT circuit *1	AT-57
	3. Speed sensor SP2 circuit *1	AT-62
	4. Throttle position sensor circuit *1	ES-112
	5. ATF temperature sensor circuit *1	AT-49
	6. Transfer L4 position switch circuit *1	AT-136
	7. ECM	IN-34
Up-shift from 4th to 5th while shift lever is in 4 position	1. Transmission control switch circuit (D - 4) *1	AT-43
	2. ECM	IN-34
Up-shift from 4th to 5th while engine is cold	1. Engine coolant temperature sensor circuit *1	ES-104
	2. ECM	IN-34
Up-shift from 3rd to 4th while shift lever is in 3 position	1. Park/neutral position switch circuit *1	AT-43
	2. ECM	IN-34
Up-shift from 2nd to 3rd while shift lever is in 2 position	1. Park/neutral position switch circuit *1	AT-43
	2. ECM	IN-34
Up-shift from 1st to 2nd while shift lever is in L position	1. Transmission control switch circuit (2 - L) *1	AT-43
	2. ECM	IN-34
Harsh engagement (N -> D)	1. Speed sensor NT circuit *1	AT-57
	2. Shift solenoid valve (SL1) circuit *1	AT-67
	3. Shift solenoid valve (SLT) circuit *1	AT-118
	4. ECM	IN-34
Harsh engagement (Lock-up)	1. Speed sensor NT circuit *1	AT-57
	2. Speed sensor SP2 circuit *1	AT-62
	3. Shift solenoid valve (SLU) circuit *1	AT-132
	4. ECM	IN-34
Harsh engagement (Any driving position)	ECM	IN-34
Poor acceleration	1. No. 2 ATF temperature sensor circuit *1	AT-122
	2. Engine coolant temperature sensor circuit *1	ES-104
	3. Shift solenoid valve (SLT) circuit *1	AT-118
	4. ECM	IN-34
No engine braking	ECM	IN-34
No kick-down	ECM	IN-34
Engine stalls when starting off or stopping	1. Shift solenoid valve (SLU) circuit *1	AT-132
	2. ECM	IN-34
ATF temperature warning light remains on	1. No. 2 ATF temperature sensor circuit *1	AT-122
	2. Engine coolant temperature sensor circuit *1	ES-104
	3. ECM	IN-34
Lock-up at 3rd gear	1. No. 2 ATF temperature sensor circuit *1	AT-122
	2. Engine coolant temperature sensor circuit *1	ES-104
	3. ECM	IN-34

Symptom	Suspected area	See page
Shift point too high	1. No. 2 ATF temperature sensor circuit *1	AT-122
	2. Engine coolant temperature sensor circuit *1	ES-104
	3. ECM	IN-34

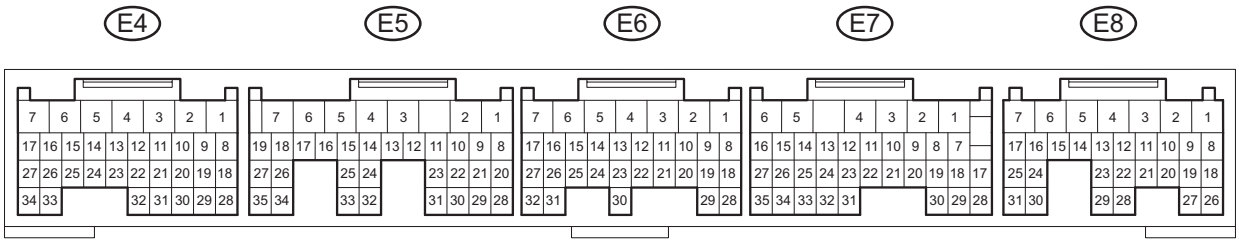
2. Chapter 2: On-Vehicle Repair and Off-Vehicle Repair
(▲: A750E, A750F AUTOMATIC TRANSMISSION Repair Manual Pub. No. RM999U)

Symptom	Suspected area	See page
Vehicle does not move in any forward positions or reverse position	1. Transmission control cable	AT-158
	2. Manual valve	▲
	3. Parking lock pawl	▲
	4. Rear planetary gear unit	▲
	5. Torque converter clutch	AT-169
Vehicle does not move in R position	1. Valve body assembly	AT-147
	2. No. 3 clutch (C3)	▲
	3. No. 4 brake (B4)	▲
	4. No. 1 one-way clutch (F1)	▲
No up-shift (1st -> 2nd)	1. Valve body assembly	AT-147
	2. No. 3 brake (B3)	▲
	3. No. 1 one-way clutch (F1)	▲
	4. No. 2 one-way clutch (F2)	▲
No up-shift (2nd -> 3rd)	1. Valve body assembly	AT-147
	2. No. 3 clutch (C3)	▲
No up-shift (3rd -> 4th)	1. Valve body assembly	AT-147
	2. No. 2 clutch (C2)	▲
No up-shift (4th -> 5th)	1. Valve body assembly	AT-147
	2. No. 1 brake (B1)	▲
	3. No. 1 clutch (C1)	▲
No down-shift (5th -> 4th)	Valve body assembly	AT-147
No down-shift (4th -> 3rd)	Valve body assembly	AT-147
No down-shift (3rd -> 2nd)	Valve body assembly	AT-147
No down-shift (2nd -> 1st)	Valve body assembly	AT-147
No lock-up or No lock-up off	1. Shift solenoid valve (SLU)	AT-127
	2. Valve body assembly	AT-147
	3. Torque converter clutch	AT-169
Harsh engagement (N -> D)	1. Shift solenoid valve (SL1)	AT-82
	2. Valve body assembly	AT-147
	3. C1 accumulator	▲
	4. No. 1 clutch (C1)	▲
	5. No. 3 one-way clutch (F3)	▲
Harsh engagement (Lock-up)	1. Shift solenoid valve (SLU)	AT-127
	2. Valve body assembly	AT-147
	3. Torque converter clutch	AT-169

Symptom	Suspected area	See page
Harsh engagement (N -> R)	1. Shift solenoid valve (SLT)	AT-111
	2. Shift solenoid valve (SLU)	AT-127
	3. Valve body assembly	AT-147
	4. C3 accumulator	▲
	5. No. 3 clutch (C3)	▲
	6. No. 4 brake (B4)	▲
	7. No. 1 one-way clutch (F1)	▲
Harsh engagement (1st -> 2nd -> 3rd -> 4th -> 5th)	1. Shift solenoid valve (SLT)	AT-111
	2. Shift solenoid valve (SL1)	AT-82
	3. Valve body assembly	AT-147
Harsh engagement (1st -> 2nd)	1. Valve body assembly	AT-147
	2. B3 accumulator	▲
	3. No. 3 brake (B3)	▲
	4. No. 1 one-way clutch (F1)	▲
	5. No. 2 one-way clutch (F2)	▲
Harsh engagement (2nd -> 3rd)	1. Valve body assembly	AT-147
	2. C3 accumulator	▲
	3. No. 3 clutch (C3)	▲
Harsh engagement (3rd -> 4th)	1. Valve body assembly	AT-147
	2. C2 accumulator	▲
	3. No. 2 clutch (C2)	▲
Harsh engagement (4th -> 5th)	1. Shift solenoid valve (SL1)	AT-82
	2. Shift solenoid valve (SL2)	AT-87
	3. Valve body assembly	AT-147
	4. No. 1 brake (B1)	▲
	5. No. 1 clutch (C1)	▲
Slippage or shuddering (Forward and reverse: After warm-up)	1. Valve body assembly	AT-147
	2. Oil strainer	AT-147
	3. No. 1 one-way clutch (F1)	▲
	4. No. 3 clutch (C3)	▲
	5. Torque converter clutch	AT-169
Slippage or shuddering (Particular position: Just after engine starts)	Torque converter clutch	AT-169
Slippage or shuddering (R position)	1. No. 4 brake (B4)	▲
	2. No. 1 one-way clutch (F1)	▲
	3. No. 3 clutch (C3)	▲
Slippage or shuddering (1st)	1. No. 1 clutch (C1)	▲
	2. No. 3 one-way clutch (F3)	▲
Slippage or shuddering (2nd)	1. No. 1 clutch (C1)	▲
	2. No. 3 brake (B3)	▲
	3. No. 1 one-way clutch (F1)	▲
	4. No. 2 one-way clutch (F2)	▲

Symptom	Suspected area	See page
Slippage or shuddering (3rd)	1. No. 1 clutch (C1)	▲
	2. No. 3 clutch (C3)	▲
	3. No. 1 one-way clutch (F1)	▲
Slippage or shuddering (4th)	1. No. 1 clutch (C1)	▲
	2. No. 2 clutch (C2)	▲
Slippage or shuddering (5th)	1. No. 2 clutch (C2)	▲
	2. No. 3 clutch (C3)	▲
	3. No. 1 brake (B1)	▲
Engine brake does not work only in 1st to 4th gear at D position	No. 1 clutch (C1)	▲
Engine brake does not work only in 1st gear at L position	1. Valve body assembly	AT-147
	2. No. 4 brake (B4)	▲
Engine brake does not work only in 2nd gear at 2 position	1. Valve body assembly	AT-147
	2. No. 2 brake (B2)	▲
Engine brake does not work only in 3rd gear at 3 position	1. Valve body assembly	AT-147
	2. No. 1 brake (B1)	▲
No kick-down	Valve body assembly	AT-147
Shift point too high or too low	1. Shift solenoid valve (SLT)	AT-111
	2. Shift solenoid valve (SL1)	AT-82
	3. Valve body assembly	AT-147
Poor acceleration (All positions)	1. Shift solenoid valve (SLT)	AT-111
	2. Valve body assembly	AT-147
	3. Torque converter clutch	AT-169
Poor acceleration (5th)	1. No. 1 clutch (C1)	▲
	2. No. 3 clutch (C3)	▲
	3. No. 1 brake (B1)	▲
	4. Front planetary gear unit	▲
Engine stalls when starting off or stopping	1. Shift solenoid valve (SLU)	AT-127
	2. Valve body assembly	AT-147
	3. Torque converter clutch	AT-169

TERMINALS OF ECM



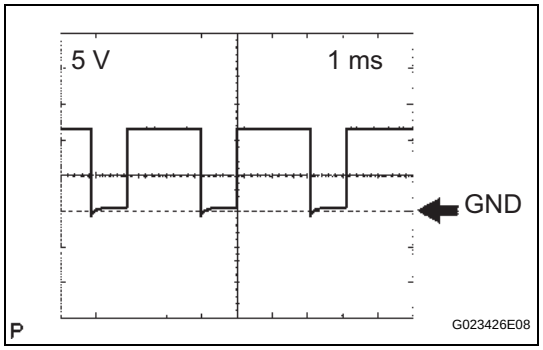
Y

C124513E01

HINT:
The standard voltage of each ECM terminal is shown in the table below.
In the table, first follow the information under "Condition". Look under "Symbols (Terminal No.)" for the terminals to be inspected. The standard voltage between the terminals is shown under "Specified Condition".
Use the illustration above as a reference for the ECM terminals.

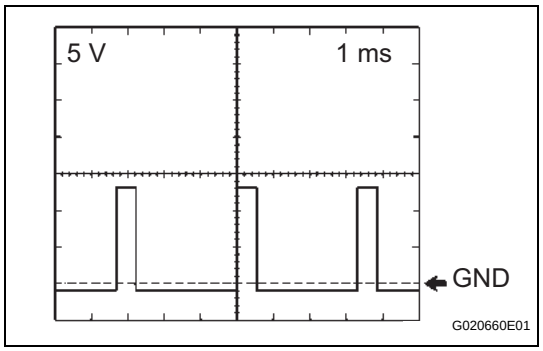
Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
STP (E8-15) - E1 (E6-1)	L - BR	Stop light switch signal	Brake pedal is depressed	7.5 to 14 V
			Brake pedal is released	Below 1.5 V
L (E7-9) - E1 (E6-1)	G-Y - BR	L shift position switch signal	Ignition switch ON and shift lever L position	10 to 14 V
			Ignition switch ON and shift lever other than L position	Below 1 V
2 (E7-10) - E1 (E6-1)	R-Y - BR	2 shift position switch signal	Ignition switch ON and shift lever 2 and L positions	10 to 14 V
			Ignition switch ON and shift lever other than 2 and L positions	Below 1 V
R (E7-11) - E1 (E6-1)	R-W - BR	R shift position switch signal	Ignition switch ON and shift lever R position	10 to 14 V
			Ignition switch ON and shift lever other than R position	Below 1 V
3 (E7-19) - E1 (E6-1)	Y - BR	3 shift position switch signal	Ignition switch ON and shift lever 3 position	10 to 14 V
			Ignition switch ON and shift lever other than 3 position	Below 1 V
4 (E7-20) - E1 (E6-1)	B - BR	4 shift position switch signal	Ignition switch ON and shift lever 4 position	10 to 14 V
			Ignition switch ON and shift lever other than 4 position	Below 1 V
D (E7-21) - E1 (E6-1)	L-B - BR	D shift position switch signal	Ignition switch ON and shift lever D and 4 positions	10 to 14 V
			Ignition switch ON and shift lever other than D and 4 positions	Below 1 V
L4 (E6-13) - E1 (E6-1)	Y-B - BR	Transfer L4 shift position switch signal	Ignition switch ON and transfer shift lever L position	Below 1 V
			Ignition switch ON and transfer shift lever other than L position	10 to 14 V

Symbols (Terminal No.)	Wiring Color	Terminal Description	Condition	Specified Condition
NSW (E5-8) - E1 (E6-1)	V - BR	Park or neutral shift position switch signal	Ignition switch ON and shift lever P and N positions	Below 2 V
			Ignition switch ON and shift lever other than P and N positions	10 to 14 V
SR (E5-9) - E1 (E6-1)	G - BR	SR solenoid signal	5th gear	10 to 14 V
			1st gear	Below 1 V
S2 (E5-10) - E1 (E6-1)	L-W - BR	S2 solenoid signal	2nd or 3rd gear	10 to 14 V
			1st, 4th or 5th gear	Below 1 V
S1 (E5-11) - E1 (E6-1)	W-G - BR	S1 solenoid signal	1st or 2nd gear	10 to 14 V
			3rd, 4th or 5th gear	Below 1 V
SLT+ (E5-13) - SLT- (E5-12)	G-B - R-B	SLT solenoid signal	Engine is idling	Pulse generation (See waveform 1)
SLU+ (E5-15) - SLU- (E5-14)	Y-B - LG	SLU solenoid signal	5th (lock-up) gear	Pulse generation (See waveform 2)
SL2+ (E5-17) - SL2- (E5-16)	W-L - G-R	SL2 solenoid signal	Engine idling speed	Pulse generation (See waveform 3)
SL1+ (E5-19) - SL1- (E5-18)	G-W - P-L	SL1 solenoid signal	Engine idling speed	Pulse generation (See waveform 4)
THO2 (E5-32) - E2 (E4-28)	GR - BR	No. 2 ATF temperature sensor signal	ATF temperature: 115°C (239°F) or more	Below 1.5 V
THO1 (E5-24) - E2 (E4-28)	Y-B - BR	No. 1 ATF temperature sensor signal	ATF temperature: 115°C (239°F) or more	Below 1.5 V
SP2+ (E5-34) - SP2- (E5-26)	L-R - R	Speed sensor (SP2) signal	Vehicle speed 12 mph (20 km/h)	Pulse generation (See waveform 5)
NT+ (E5-35) - NT- (E5-27)	W-R - Y-R	Speed sensor (NT) signal	Engine is idling	Pulse generation (See waveform 6)



1. Waveform 1

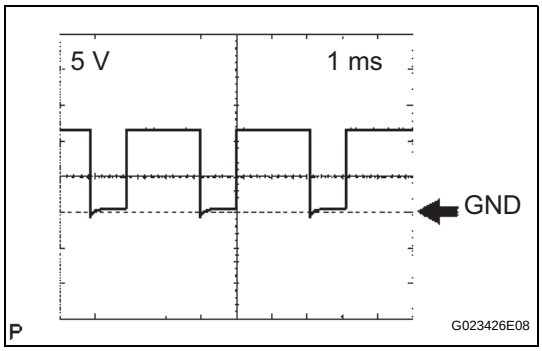
Item	Condition
Terminal	SLT+ - SLT-
Tool setting	5 V/DIV, 1 ms/DIV
Vehicle condition	Engine idling speed



2. Waveform 2

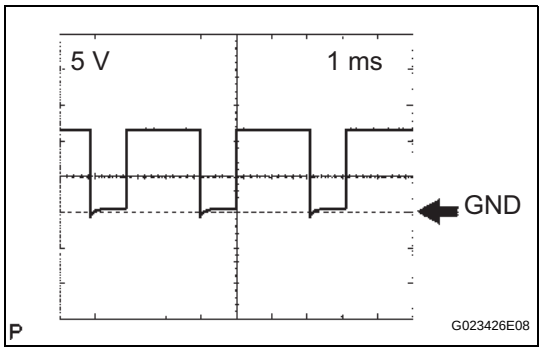
Item	Condition
Terminal	SLU+ - SLU-
Tool setting	5 V/DIV, 1 ms/DIV
Vehicle condition	5th (lock-up) gear

AT



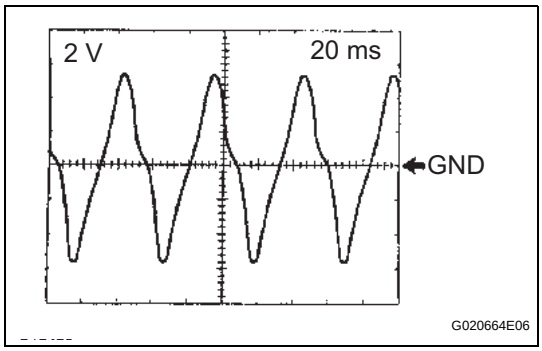
3. Waveform 3

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



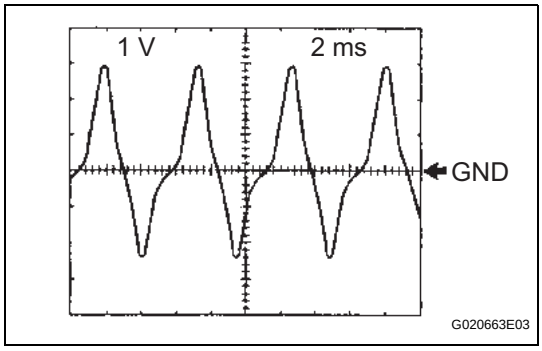
4. Waveform 4

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



5. Waveform 5

Item	Condition
Terminal	SP2+ - SP2-
Tool setting	2 V/DIV, 20 ms/DIV
Vehicle condition	Vehicle speed 12 mph (20 km/h)



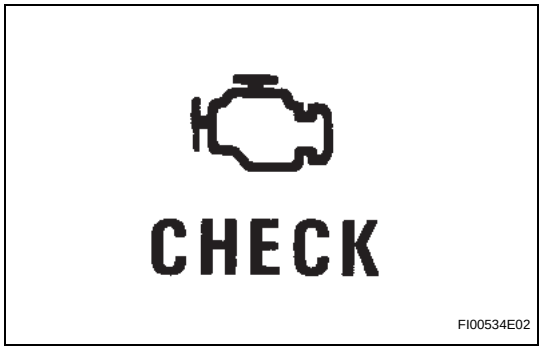
6. Waveform 6

Item	Condition
Terminal	NT+ - NT-
Tool setting	1 V/DIV, 2 ms/DIV
Vehicle condition	Engine idling speed

DIAGNOSIS SYSTEM

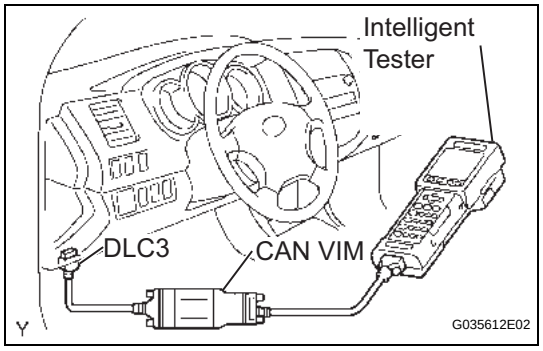
1. DESCRIPTION

(a) When troubleshooting on-Board Diagnostic (OBD II) vehicles, the vehicle must be connected to the intelligent tester (complying with SAE J1987). Various data output from the vehicle's ECM can then be read.



(b) OBD II regulations require that the vehicle's on-board computer illuminate the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in:
1. The emission control system/components
2. The power train control components (which affect vehicle emissions)
3. The computer

In addition, the applicable Diagnostic Trouble Codes (DTCs) prescribed by SAE J2012 are recorded in the ECM memory.
If the malfunction does not reoccur in 3 consecutive trips, the MIL turns off automatically but the DTCs remain recorded in the ECM memory.



(c) To check DTCs, connect the intelligent tester to the Data Link Connector 3 (DLC3) of the vehicle. The intelligent tester displays DTCs, the freeze frame data and a variety of the engine data.
The DTCs and freeze frame data can be erased with the intelligent tester (See page AT-31).

(d) In order to enhance OBD function on vehicles and develop the Off-Board diagnosis system, CAN communication has been introduced in this system (CAN: Controller Area Network). It minimizes the gap between technician skills and vehicle technology. CAN is a network, which uses a pair of data transmission lines, spanning multiple computers and sensors. It allows high speed communication between the systems and simplification of the wire harness connection. Since this system is equipped with CAN communication, CAN VIM (VIM: Vehicle Interface Module) connecting with intelligent tester is necessary to display any information from the ECM on the tester. (Also communication between the intelligent tester and the ECM uses a CAN communication signal.) When confirming DTCs and any data of the ECM, connect the CAN VIM between the DLC3 and the intelligent tester.

AT

2. NORMAL MODE AND CHECK MODE

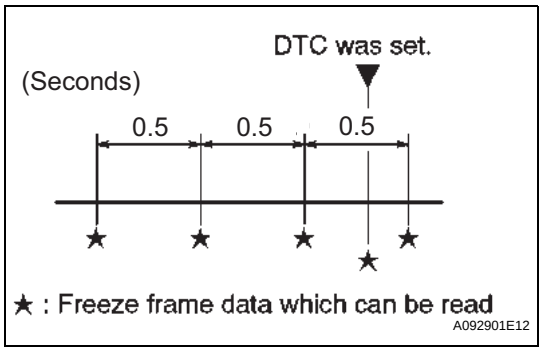
(a) The diagnosis system operates in "normal mode" during normal vehicle use. In normal mode, "2 trip detection logic" is used to ensure accurate detection of malfunctions. "Check mode" is also available to technicians as an option. In check mode, "1 trip detection logic" is used for simulating malfunction symptoms and increasing the system's ability to detect malfunctions, including intermittent malfunctions.

3. 2 TRIP DETECTION LOGIC

(a) When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory (1st trip). If the ignition switch is turned OFF and then ON again, and the same malfunction is detected again, the MIL will illuminate.

4. FREEZE FRAME DATA

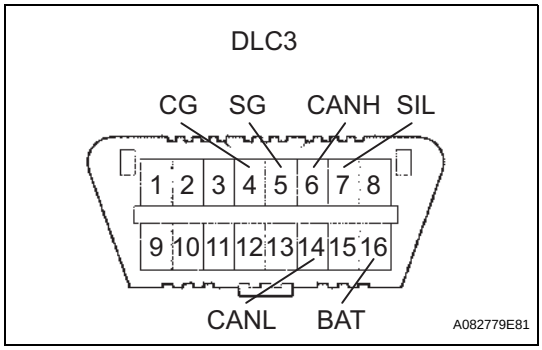
(a) Freeze frame data records the engine conditions (fuel system, calculated load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when a malfunction is detected. When troubleshooting, freeze frame data can help determine if the vehicle was running or stopped, if the engine was warmed up or not, if the air-fuel ratio was Lean or Rich, and other data from the time the malfunction occurred.



(b) The ECM records engine conditions in the form of freeze frame data every 0.5 seconds. Using the intelligent tester, five separate sets of freeze frame data, including the data values at the time when the DTC was set, can be checked.

- 3 data sets before the DTC was set
- 1 data set when the DTC was set
- 1 data set after the DTC was set

These data sets can be used to simulate the condition of the vehicle around the time the occurrence of the malfunction. The data may assist in identifying of the cause of the malfunction, and in judging whether it was temporary or not.



5. DATA LINK CONNECTOR 3 (DLC3)

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

HINT:

Connect the cable of the intelligent tester to the DLC3, turn the ignition switch ON and attempt to use the intelligent tester. If the screen displays UNABLE TO CONNECT TO VEHICLE, a problem exists in the vehicle side or the tester side.

If the communication is normal when the tester is connected to another vehicle, inspect the DLC3 on the original vehicle.
If the communication is still impossible when the tester is connected to another vehicle, the problem is probably in the tester itself. Consult the Service Department listed in the tester's instruction manual.

Symbol	Terminal No.	Name	Reference terminal	Result	Condition
SIL	7	Bus "+" line	5 - SG	Pulse generation	During transmission
CG	4	Chassis ground	Body ground	Below 1 Ω	Always
SG	5	Signal ground	Body ground	Below 1 Ω	Always
BAT	16	Battery positive	Body ground	11 to 14 V	Always
CANH	6	HIGH-level CAN bus line	14 - CANL	54 to 69 Ω	Ignition switch OFF
			Battery positive	1 MΩ or higher	Ignition switch OFF
			4 - CG	1 kΩ or higher	Ignition switch OFF
CANL	14	LOW-level CAN bus line	Battery positive	1 MΩ or higher	Ignition switch OFF
			4 - CG	1 kΩ or higher	Ignition switch OFF

6. CHECK BATTERY VOLTAGE

Battery voltage:

11 to 14 V

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

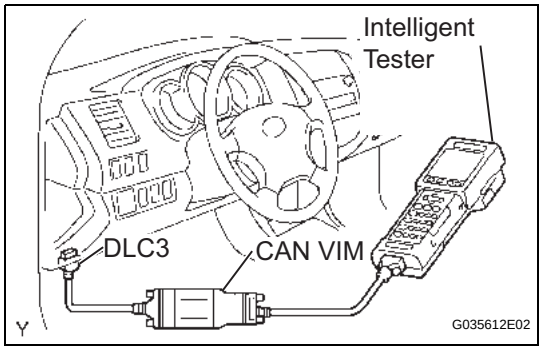
7. CHECK MIL

(a) Check that the MIL illuminates when turning the ignition switch ON.
If the MIL does not illuminate, there is a problem in the MIL circuit (See page ES-402).

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

8. ALL READINESS

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



DTC CHECK / CLEAR

1. CHECK DTC

DTCs which are stored in the ECM can be displayed with the intelligent tester.
The tester can display pending DTCs and current DTCs. Some DTC aren't stored if the ECM doesn't detect a malfunction during consecutive driving cycles. However, malfunctions detected during a single driving cycle are stored as pending DTCs.

(a) Connect the intelligent tester to the Controller Area Network Vehicle Interface Module (CAN VIM). Then connect the CAN VIM to the Data Link Connector 3 (DLC3).

(b) Turn the ignition switch to the ON position.

(c) Enter the following menus: DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES (or PENDING CODE).

If the communication is normal when the tester is connected to another vehicle, inspect the DLC3 on the original vehicle.
If the communication is still impossible when the tester is connected to another vehicle, the problem is probably in the tester itself. Consult the Service Department listed in the tester's instruction manual.

Symbol	Terminal No.	Name	Reference terminal	Result	Condition
SIL	7	Bus "+" line	5 - SG	Pulse generation	During transmission
CG	4	Chassis ground	Body ground	Below 1 Ω	Always
SG	5	Signal ground	Body ground	Below 1 Ω	Always
BAT	16	Battery positive	Body ground	11 to 14 V	Always
CANH	6	HIGH-level CAN bus line	14 - CANL	54 to 69 Ω	Ignition switch OFF
			Battery positive	1 MΩ or higher	Ignition switch OFF
			4 - CG	1 kΩ or higher	Ignition switch OFF
CANL	14	LOW-level CAN bus line	Battery positive	1 MΩ or higher	Ignition switch OFF
			4 - CG	1 kΩ or higher	Ignition switch OFF

6. CHECK BATTERY VOLTAGE

Battery voltage:

11 to 14 V

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

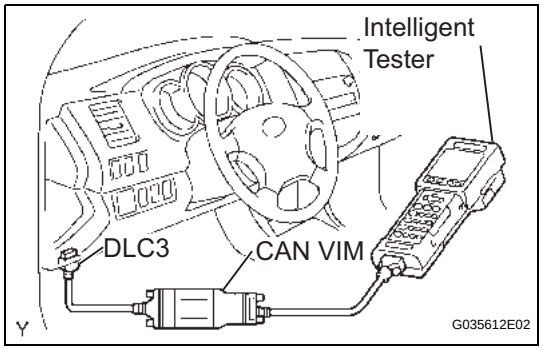
7. CHECK MIL

(a) Check that the MIL illuminates when turning the ignition switch ON.
If the MIL does not illuminate, there is a problem in the MIL circuit (See page ES-402).

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

8. ALL READINESS

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



DTC CHECK / CLEAR

1. CHECK DTC

DTCs which are stored in the ECM can be displayed with the intelligent tester.
The tester can display pending DTCs and current DTCs. Some DTC aren't stored if the ECM doesn't detect a malfunction during consecutive driving cycles. However, malfunctions detected during a single driving cycle are stored as pending DTCs.

(a) Connect the intelligent tester to the Controller Area Network Vehicle Interface Module (CAN VIM). Then connect the CAN VIM to the Data Link Connector 3 (DLC3).

(b) Turn the ignition switch to the ON position.

(c) Enter the following menus: DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES (or PENDING CODE).

(d) Confirm the DTCs and freeze frame data and then write them down.
(e) Confirm the details of the DTCs (See page AT-39).

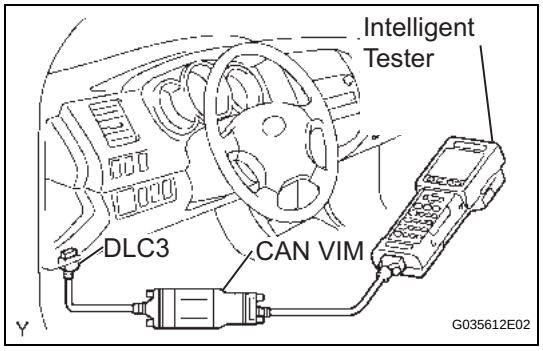
2. CLEAR DTC

(a) Connect the intelligent tester to the CAN VIM. Then connect the CAN VIM to the DLC3.
(b) Turn the ignition switch to the ON position.
(c) Enter the following menus: DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CLEAR CODES and press YES.

CHECK MODE PROCEDURE

1. DESCRIPTION

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



2. CHECK MODE PROCEDURE

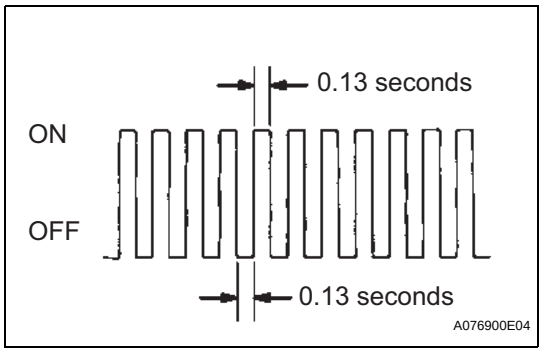
(a) Ensure the following conditions:
  (1) Battery positive voltage 11 V or more
  (2) Throttle valve fully closed
  (3) Transmission in the P or N position
  (4) A/C switched off

(b) Turn the ignition switch off.

(c) Connect the intelligent tester together with the Controller Area Network Vehicle Interface Module (CAN VIM) to the DLC3.

(d) Turn the ignition switch to the ON position.

(e) Enter the following menus: DIAGNOSIS/ ENHANCED OBD II/ CHECK MODE.



(f) Change the ECM to check mode. Make sure the MIL flashes as shown in the illustration.

NOTICE:

All recorded DTCs and freeze frame data will be erased if: 1) the intelligent tester is used to change the ECM from normal mode to check mode or vice-versa; or 2) during check mode, the ignition switch is turned from ON to ACC or LOCK.

Before entering check mode, make notes of the DTCs and freeze frame data.

(g) Start the engine. The MIL should turn off after the engine starts.

(h) Perform "MONITOR DRIVE PATTERN" for the ECT test (See page AT-19).
 (Or, simulate the conditions of the malfunction described by the customer).

(i) After simulating the malfunction conditions, use the intelligent tester diagnosis selector to check the DTC and freeze frame data.

FAIL-SAFE CHART

1. FAIL-SAFE CHART

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

AT

Malfunction Part	Function
DTC P0710, P0712 and P0713: No. 1 ATF Temperature Sensor	During a No. 1 ATF temperature sensor malfunction, up-shift to the 5th gear and flex lock-up clutch control are prohibited.
DTC P0722: Output Speed Sensor (SP2)	During an output speed sensor malfunction, shift control is effected through the input speed sensor signal (NT).
DTC P0751, P0756, P0771, P0973, P0974, P0976, P0977, P0985 and P0986: Shift Solenoid Valve S1, S2 and SR	The current to the failed solenoid valve is cut off and control is effected by operating the other solenoid valves with normal operation. Shift control is effected depending on the failed solenoid as described in the table below.
DTC P0748, P0776 and P0778: Shift Solenoid Valve SL1 and SL2	During a solenoid valve SL1 or SL2 malfunction, up-shift to the 5th gear is prohibited.
DTC P02714 and P2716: Shift Solenoid Valve SLT	During a solenoid valve SLT malfunction, the current to the solenoid valve is stopped. This stops line pressure optimal control, and shift shock increases. However, shifting is effected through normal clutch pressure control.
DTC P2757: Shift Solenoid Valve SLU	During a solenoid valve SLU malfunction, the current to the solenoid valve is stopped. This stops lock-up control and flex lock-up control, and fuel economy decreases.

Fail-safe function:

If either of the shift solenoid valve circuits has an open or short failure, the ECM turns the other shift solenoid ON and OFF in order to shift into the gear positions shown in the table below.

In case of a short circuit, the ECM stops sending current to the short circuit solenoid.

Even if starting the engine again in the fail-safe mode, the gear position remains in the same position.

Position	NORMAL						S1 OFF					
	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2
R	R	ON	OFF	OFF	OFF	ON	R	OFF	OFF	OFF	OFF	ON
D	1st	ON	OFF	OFF	OFF	ON	4th ↓ 3rd	OFF	OFF ↓ ON	OFF	OFF	ON
	2nd	ON	ON	OFF	OFF	ON	3rd	OFF	ON	OFF	OFF	ON
	3rd	OFF	ON	OFF	OFF	ON	3rd	OFF	ON	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON	4th	OFF	OFF	OFF	OFF	ON
	5th	OFF	OFF	ON	ON	OFF	5th	OFF	OFF	ON	ON	OFF
3	1st	ON	OFF	OFF	OFF	ON	3rd ↓ 3rd E/B	OFF	OFF ↓ ON	OFF	OFF	ON ↓ OFF
	2nd	ON	ON	OFF	OFF	ON	3rd ↓ 3rd E/B	OFF	ON	OFF	OFF	ON ↓ OFF
	3rd E/B	OFF	ON	OFF	OFF	OFF	3rd E/B	OFF	ON	OFF	OFF	OFF
	4th	OFF	OFF	ON	OFF	ON	4th	OFF	OFF	ON	OFF	ON
	5th	OFF	OFF	ON	ON	OFF	5th	OFF	OFF	ON	ON	OFF
2	1st	ON	OFF	OFF	OFF	ON	1st	OFF	OFF	OFF	OFF	ON
	2nd E/B	ON	ON	ON	OFF	OFF	3rd E/B	OFF	ON	ON	OFF	OFF
	3rd E/B	OFF	ON	ON	OFF	OFF	3rd E/B	OFF	ON	ON	OFF	OFF
	4th	OFF	OFF	ON	OFF	ON	4th	OFF	OFF	ON	OFF	ON
	5th	OFF	OFF	ON	ON	OFF	5th	OFF	OFF	ON	ON	OFF

Position	NORMAL						S1 OFF					
	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2
L	1st E/B	ON	OFF	OFF	OFF	OFF	1st E/B	OFF	OFF	OFF	OFF	OFF
	2nd E/B	ON	ON	ON	OFF	OFF	3rd E/B	OFF	ON	ON	OFF	OFF
	3rd E/B	OFF	ON	ON	OFF	OFF	3rd E/B	OFF	ON	ON	OFF	OFF
	4th	OFF	OFF	ON	OFF	ON	4th	OFF	OFF	ON	OFF	ON
	5th	OFF	OFF	ON	ON	OFF	5th	OFF	OFF	ON	ON	OFF

AT

Position	S2 OFF						SR OFF					
	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2
R	R	ON	OFF	OFF	OFF	ON	R	ON	OFF	OFF	OFF	ON
D	1st	ON	OFF	OFF	OFF	ON	1st	ON	OFF	OFF	OFF	ON
	1st ↓ 4th	ON ↓ OFF	OFF	OFF	OFF	ON	2nd	ON	ON	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON	3rd	OFF	ON	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON	4th	OFF	OFF	OFF	OFF	ON
	5th	OFF	OFF	ON	ON	OFF	4th	OFF	OFF	OFF	ON	OFF
3	1st	ON	OFF	OFF	OFF	ON	1st	ON	OFF	OFF	OFF	ON
	1st ↓ 3rd E/B	ON ↓ OFF	OFF	OFF	OFF	ON ↓ OFF	2nd	ON	ON	OFF	OFF	ON
	3rd E/B	OFF	OFF	OFF	OFF	OFF	3rd E/B ↓ 3rd	OFF	ON	OFF	OFF	OFF ↓ ON
	4th	OFF	OFF	ON	OFF	ON	3rd	OFF	OFF ↓ ON	OFF	OFF	ON ↓ ON
	5th	OFF	OFF	ON	ON	OFF	3rd E/B ↓ 3rd	OFF	OFF ↓ ON	OFF	ON ↓ OFF	OFF ↓ ON
2	1st	ON	OFF	OFF	OFF	ON	1st	ON	OFF	OFF	OFF	ON
	2nd E/B ↓ 4th	ON ↓ OFF	OFF	ON	OFF	OFF ↓ ON	2nd	ON	ON	OFF	OFF	OFF
	Fail 4th	OFF	OFF	ON	OFF	OFF ↓ ON	2nd	OFF ↓ ON	ON	OFF	OFF	OFF
	4th	OFF	OFF	ON	OFF	ON	1st ↓ 2nd	OFF ↓ ON	OFF ↓ ON	OFF	OFF	ON ↓ OFF
	5th	OFF	OFF	ON	ON	OFF	1st E/B ↓ 2nd	OFF ↓ ON	ON	OFF	ON ↓ OFF	OFF
L	1st E/B	ON	OFF	OFF	OFF	OFF	1st E/B	ON	OFF	OFF	OFF	OFF
	2nd E/B ↓ 4th	ON ↓ OFF	OFF	ON	OFF	OFF ↓ ON	2nd	ON	ON	OFF	OFF	OFF
	Fail 4th	OFF	OFF	ON	OFF	OFF ↓ ON	2nd	OFF ↓ ON	ON	OFF	OFF	OFF
	4th	OFF	OFF	ON	OFF	ON	1st ↓ 2nd	OFF ↓ ON	OFF ↓ ON	OFF	OFF	ON ↓ OFF
	5th	OFF	OFF	ON	ON	OFF	1st E/B ↓ 2nd	OFF ↓ ON	OFF ↓ ON	OFF	ON ↓ OFF	OFF

AT

Position	S1 S2 OFF						S2 SR OFF					
	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2
R	R	OFF	OFF	OFF	OFF	ON	R	ON	OFF	OFF	OFF	ON
D	4th	OFF	OFF	OFF	OFF	ON	1st	ON	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON	1st ↓ 4th	ON ↓ OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON	4th	OFF	OFF	OFF	OFF	ON
	5th	OFF	OFF	ON	ON	OFF	4th	OFF	OFF	OFF	ON ↓ OFF	OFF ↓ ON
3	3rd ↓ 3rd E/B	OFF	OFF	OFF	OFF	ON ↓ OFF	1st	ON	OFF	OFF	OFF	ON
	3rd ↓ 3rd E/B	OFF	OFF	OFF	OFF	ON ↓ OFF	1st ↓ 3rd	ON ↓ OFF	OFF	OFF	OFF	ON ↓ ON
	3rd E/B	OFF	OFF	OFF	OFF	OFF	3rd E/B ↓ 3rd	OFF	OFF	OFF	OFF	OFF ↓ ON
	4th	OFF	OFF	ON	OFF	ON	3rd	OFF	OFF	OFF	OFF	ON ↓ ON
	5th	OFF	OFF	ON	ON	OFF	1st E/B ↓ 3rd	OFF	OFF	OFF	ON ↓ OFF	OFF ↓ ON
2	1st	OFF	OFF	OFF	OFF	ON	1st	ON	OFF	OFF	OFF	ON
	Fail 4th	OFF	OFF	ON	OFF	OFF ↓ ON	1st E/B ↓ 1st	ON	OFF	OFF	OFF	OFF ↓ ON
	Fail 4th	OFF	OFF	ON	OFF	OFF ↓ ON	1st E/B ↓ 1st	OFF ↓ ON	OFF	OFF	OFF	OFF ↓ ON
	4th	OFF	OFF	ON	OFF	ON	1st	OFF ↓ ON	OFF	OFF	OFF	ON
	5th	OFF	OFF	ON	ON	OFF	1st E/B ↓ 1st	OFF ↓ ON	OFF	OFF	ON ↓ OFF	OFF ↓ ON
L	1st E/B	OFF	OFF	OFF	OFF	OFF	1st E/B	ON	OFF	OFF	OFF	OFF
	Fail 4th	OFF	OFF	ON	OFF	OFF ↓ ON	1st E/B ↓ 1st	ON	OFF	OFF	OFF	OFF ↓ ON
	Fail 4th	OFF	OFF	ON	OFF	OFF ↓ ON	1st E/B ↓ 1st	OFF ↓ ON	OFF	OFF	OFF	OFF ↓ ON
	4th	OFF	OFF	ON	OFF	ON	1st	OFF ↓ ON	OFF	OFF	OFF	ON
	5th	OFF	OFF	ON	ON	OFF	1st E/B ↓ 1st	OFF ↓ ON	OFF	OFF	ON ↓ OFF	OFF ↓ ON

Position	S1 SR OFF						S1 S2 SR OFF					
	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2
R	R	OFF	OFF	OFF	OFF	ON	R	OFF	OFF	OFF	OFF	ON

Position	S1 SR OFF						S1 S2 SR OFF					
	Gear	S1	S2	SR	SL1	SL2	Gear	S1	S2	SR	SL1	SL2
D	4th ↓ 3rd	OFF	OFF ↓ ON	OFF	OFF	ON	4th	OFF	OFF	OFF	OFF	ON
	3rd	OFF	ON	OFF	OFF	ON	4th	OFF	OFF	OFF	OFF	ON
	3rd	OFF	ON	OFF	OFF	ON	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	OFF	ON	4th	OFF	OFF	OFF	OFF	ON
	4th	OFF	OFF	OFF	ON ↓ OFF	OFF ↓ ON	4th	OFF	OFF	OFF	ON ↓ OFF	OFF ↓ ON
3	3rd	OFF	OFF ↓ ON	OFF	OFF	ON ↓ ON	3rd	OFF	OFF	OFF	OFF	ON ↓ ON
	3rd	OFF	ON	OFF	OFF	ON ↓ ON	3rd	OFF	OFF	OFF	OFF	ON ↓ ON
	3rd E/B ↓ 3rd	OFF	ON	OFF	OFF	OFF ↓ ON	3rd E/B ↓ 3rd	OFF	OFF	OFF	OFF	OFF ↓ ON
	3rd	OFF	OFF ↓ ON	OFF	OFF	ON ↓ ON	3rd	OFF	OFF	OFF	OFF	ON ↓ ON
	3rd E/B ↓ 3rd	OFF	OFF ↓ ON	OFF	ON ↓ OFF	OFF ↓ ON	3rd E/B ↓ 3rd	OFF	OFF	OFF	ON ↓ OFF	OFF ↓ ON
2	1st	OFF	OFF	OFF	OFF	ON	1st	OFF	OFF	OFF	OFF	ON
	2nd	OFF	ON	OFF	OFF	OFF	1st E/B ↓ 1st	OFF	OFF	OFF	OFF	OFF ↓ ON
	2nd	OFF	ON	OFF	OFF	OFF	1st E/B ↓ 1st	OFF	OFF	OFF	OFF	OFF ↓ ON
	1st ↓ 2nd	OFF	OFF ↓ ON	OFF	OFF	ON ↓ OFF	1st	OFF	OFF	OFF	OFF	ON
	1st E/B ↓ 2nd	OFF	OFF ↓ ON	OFF	ON ↓ OFF	OFF	1st E/B ↓ 1st	OFF	OFF	OFF	ON ↓ OFF	OFF ↓ ON
L	1st E/B	OFF	OFF	OFF	OFF	OFF	1st E/B	OFF	OFF	OFF	OFF	OFF
	2nd	OFF	ON	OFF	OFF	OFF	1st E/B ↓ 1st	OFF	OFF	OFF	OFF	OFF ↓ ON
	2nd	OFF	ON	OFF	OFF	OFF	1st E/B ↓ 1st	OFF	OFF	OFF	OFF	OFF ↓ ON
	1st ↓ 2nd	OFF	OFF ↓ ON	OFF	OFF	ON ↓ OFF	1st	OFF	OFF	OFF	OFF	ON
	1st E/B ↓ 2nd	OFF	OFF ↓ ON	OFF	ON ↓ OFF	OFF	1st E/B ↓ 1st	OFF	OFF	OFF	ON ↓ OFF	OFF ↓ ON

HINT:

- ↓: Condition in the electrical malfunction is shown above "↓".
- ↓: Condition in the fail-safe mode is shown below "↓".
- E/B: Engine brake.

AT

DATA LIST / ACTIVE TEST

1. DATA LIST

HINT:

According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.

NOTICE:

In the table below, the values listed under "Normal Condition" are for reference only. Do not depend solely on these reference values when judging 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) Push the "ON" button of the tester.

(f) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST/ A/T".

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

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
SPD (SP2)	Counter Gear Speed / min.: 0 mph (0 km/h) max.: 158 mph (255 km/h)	Vehicle stopped: 0 mph (0 km/h)	-
SPD (NT)	Input Turbine Speed/ display: 50 rpm	[HINT] • Lock-up ON (After warming up the engine); Input turbine speed (NT) equal to the engine speed. • Lock-up OFF (Idling in N position); Input turbine speed (NT) nearly equal to the engine speed.	-
PNP SW [NSW]	PNP Switch Status/ ON or OFF	Shift lever position is; P or 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. HINT: When the failure still occurs even after adjusting these parts. (See page AT-145)
STOP LIGHT SW	Stop Light Switch Status/ ON or OFF	• Brake Pedal is depressed: ON • Brake Pedal is released: OFF	-
SHIFT	ECM gear shift command/ 1st, 2nd, 3rd, 4th or 5th	Shift Lever Position is; • L: 1st • 2: 1st or 2nd • 3: 1st, 2nd or 3rd • 4: 1st, 2nd, 3rd or 4th • D: 1st, 2nd, 3rd, 4th or 5th	-
REVERSE	PNP Switch Status/ ON or OFF	Shift lever position is; R: ON Except R: OFF	Same as PNP SW [NSW]

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
DRIVE	PNP Switch Status/ ON or OFF	Shift lever position is; D and 4: ON Except D and 4: OFF	Same as PNP SW [NSW]
4th/DRIVE	PNP Switch Status/ ON or OFF	Shift lever position is; 4: ON Except 4: OFF	Same as PNP SW [NSW]
3RD	PNP Switch Status/ ON or OFF	Shift lever position is; 3: ON Except 3: OFF	Same as PNP SW [NSW]
2ND	PNP Switch Status/ ON or OFF	Shift lever position is; 2 and L: ON Except 2 and L: OFF	Same as PNP SW [NSW]
LOW	PNP Switch Status/ ON or OFF	Shift lever position is; L: ON Except L: OFF	Same as PNP SW [NSW]
AT OIL TEMP1	No. 1 ATF Temperature Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	• After Stall Test; Approximately 80°C (176°F) • Equal to ambient temperature during cold soak	If the value is "-40°C (-40°F)" or "150°C (302°F) or more", No. 1 ATF temperature sensor circuit is open or short.
AT OIL TEMP2	No. 2 ATF Temperature Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	• After Stall Test; Approximately 80°C (176°F) • Equal to ambient temperature during cold soak	If the value is "-40°C (-40°F)" or "150°C (302°F) or more", No. 2 ATF temperature sensor circuit is open or short.
LOCK UP SOL	Lock Up Solenoid Status/ ON or OFF	• Lock Up: ON • Except Lock Up: OFF	-
SOLENOID (SLU)	Shift Solenoid SLU Status/ ON or OFF	• Lock Up: ON • Except Lock Up: OFF	-
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	IG SW ON: ON	-

AT

2. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening 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 tester.
(f) Select the items "DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST".

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

Item	Test Details	Diagnostic Note
LINE PRESS UP *	[Test Details] Operate the shift solenoid SLT to 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)	-
LOCK UP	[Test Details] Control the shift solenoid SLU to set the automatic transmission to the lock-up condition. [Vehicle Condition] Vehicle Speed: 36 mph (60 km/h) or more	Possible to check the SLU operation.
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position manually. [Vehicle Condition] Vehicle Speed: Less than 30 mph (50 km/h) [Others] • Press →button: Shift up • Press ←button: Shift down	Possible to check the operation of the shift solenoid valves. HINT: Shifting to the 5th gear is possible only when the vehicle is stationary with the engine idling.

*: "LINE PRESS UP" in the ACTIVE TEST is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the HYDRAULIC TEST (See page AT-16) as well.
HINT:
The pressure values in ACTIVE TEST and HYDRAULIC TEST are different from each other.

DIAGNOSTIC TROUBLE CODE CHART

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

- *1: "Comes on" means that the MIL will illuminate.
- *2: "DTC stored" means that the ECM memorizes the malfunction code if the DTC detection condition(s) are met.
- These DTCs may be output when the clutch, brake and gear components, etc., inside the automatic transmission are damaged.

DTC No.	Detection Item	Trouble Areas	MIL *1	Memory *2	See page
P0705	Transmission Range Sensor Circuit Malfunction (PRNDL Input)	- Open or short in park/neutral position switch circuit - Park/neutral position switch - ECM	Comes on	DTC stored	AT-43
P0710	Transmission Fluid Temperature Sensor "A" Circuit	- Open or short in No. 1 ATF temperature sensor circuit - Transmission wire (No. 1 ATF temperature sensor) - ECM	Comes on	DTC stored	AT-49
P0711	Transmission Fluid Temperature Sensor "A" Performance	- Transmission wire (No. 1 ATF temperature sensor) - ECM	Comes on	DTC stored	AT-54
P0712	Transmission Fluid Temperature Sensor "A" Circuit Low Input	- Short in No. 1 ATF temperature sensor circuit - Transmission wire (No. 1 ATF temperature sensor) - ECM	Comes on	DTC stored	AT-49
P0713	Transmission Fluid Temperature Sensor "A" Circuit High Input	- Open in No. 1 ATF temperature sensor circuit - Transmission wire (No. 1 ATF temperature sensor) - ECM	Comes on	DTC stored	AT-49
P0717	Input Speed Sensor Circuit No Signal	- Open or short in speed sensor (NT) circuit - Speed sensor (NT) - ECM	Comes on	DTC stored	AT-57
P0722	Output Speed Sensor Circuit No Signal	- Open or short in speed sensor (SP2) circuit - Speed sensor (SP2) - ECM	Comes on	DTC stored	AT-62
P0748	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)	- Open or short in shift solenoid valve SL1 circuit - Shift solenoid valve SL1 - ECM	Comes on	DTC stored	AT-67

DTC No.	Detection Item	Trouble Areas	MIL *1	Memory *2	See page
P0751	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)	- Shift solenoid valve S1 remains open or closed - Shift solenoid valve SLT remains open or closed - Valve body is blocked - Automatic transmission (clutch, brake or gear, etc.)	Comes on	DTC stored	AT-70
P0756	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)	- Shift solenoid valve S2 remains open or closed - Shift solenoid valve SLT remains open or closed - Valve body is blocked - Automatic transmission (clutch, brake or gear, etc.)	Comes on	DTC stored	AT-76
P0771	Shift Solenoid "E" Performance (Shift Solenoid Valve SR)	- Shift solenoid valve SR remains open or closed - Shift solenoid valve SL1 remains open or closed - Shift solenoid valve SLT remains open or closed - Valve body is blocked - Automatic transmission (clutch, brake or gear, etc.)	Comes on	DTC stored	AT-82
P0776	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)	- Shift solenoid valve SL2 remains open or closed - Shift solenoid valve SLT remains open or closed - Valve body is blocked - Automatic transmission (clutch, brake or gear, etc.)	Comes on	DTC stored	AT-87
P0778	Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2)	- Open or short in shift solenoid valve SL2 circuit - Shift solenoid valve SL2 - ECM	Comes on	DTC stored	AT-92
P0781	1-2 Shift (1-2 Shift Valve)	- Valve body is blocked up or stuck (1-2 shift valve) - Shift solenoid valve SLT remains open or closed - Automatic transmission (clutch, brake or gear, etc.)	Comes on	DTC stored	AT-96

DTC No.	Detection Item	Trouble Areas	MIL *1	Memory *2	See page
P0973	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)	- Short in shift solenoid valve S1 circuit - Shift solenoid valve S1 - ECM	Comes on	DTC stored	AT-101
P0974	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)	- Open in shift solenoid valve S1 circuit - Shift solenoid valve S1 - ECM	Comes on	DTC stored	AT-101
P0976	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)	- Short in shift solenoid valve S2 circuit - Shift solenoid valve S2 - ECM	Comes on	DTC stored	AT-104
P0977	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)	- Open in shift solenoid valve S2 circuit - Shift solenoid valve S2 - ECM	Comes on	DTC stored	AT-104
P0985	Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)	- Short in shift solenoid valve SR circuit - Shift solenoid valve SR - ECM	Comes on	DTC stored	AT-107
P0986	Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)	- Open in shift solenoid valve SR circuit - Shift solenoid valve SR - ECM	Comes on	DTC stored	AT-107
P2714	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)	- Shift solenoid valve SLT remains open or closed - Shift solenoid valve S1, S2, SR, SL1 or SL2 remains open or closed - Valve body is blocked - Automatic transmission (clutch, brake or gear, etc.)	Comes on	DTC stored	AT-111
P2716	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)	- Open or short in shift solenoid valve SLT circuit - Shift solenoid valve SLT - ECM	Comes on	DTC stored	AT-118
P2740	Transmission Fluid Temperature Sensor "B" Circuit	- Open or short in No. 2 ATF temperature sensor circuit - No. 2 ATF temperature sensor - ECM	Comes on	DTC stored	AT-122

DTC No.	Detection Item	Trouble Areas	MIL *1	Memory *2	See page
P2742	Transmission Fluid Temperature Sensor "B" Circuit Low Input	- Short in No. 2 ATF temperature sensor circuit - No. 2 ATF temperature sensor - ECM	Comes on	DTC stored	AT-122
P2743	Transmission Fluid Temperature Sensor "B" Circuit High Input	- Open in No. 2 ATF temperature sensor circuit - No. 2 ATF temperature sensor - ECM	Comes on	DTC stored	AT-122
P2757	Torque Converter Clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU)	- Shift solenoid valve SLU remains open or closed - Valve body is blocked - Shift solenoid valve SLU - Torque converter clutch - Automatic transmission (clutch, brake or gear, etc.) - Line pressure is too low	Comes on	DTC stored	AT-127
P2759	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)	- Open or short in shift solenoid valve SLU circuit - Shift solenoid valve SLU - ECM	Comes on	DTC stored	AT-132
P2772	Transfer "L4" Switch Circuit	- Short in transfer L4 position switch circuit - Transfer L4 position switch - ECM	Comes on	DTC stored	AT-136

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 Conditions	Trouble Areas
P0705	When any one of following conditions (A) to (C) is met (2-trip detection logic): (A) Any 2 or more signals of the following are ON simultaneously • NSW input signal is ON. • R input signal is ON. • D input signal is ON. • 3 input signal is ON. • 2 input signal is ON. (B) All switches are OFF simultaneously for P (NSW), R, N (NSW), D, 3 and 2 positions (C) When NSW or R input signal is ON, 4 or L input signal is ON	• Open or short in park/neutral position switch circuit • Park/neutral position switch • ECM

MONITOR DESCRIPTION

The DTC indicates a problem with the park/neutral position switch and the wire harness in the park/neutral position switch circuit.
For security, the park/neutral position switch detects the shift lever position so that the engine can be started only when the vehicle is in the P or N shift position.
When the park/neutral position switch sends more than one signal at a time from switch positions P, R, N, D, 3 or 2, the ECM interprets this as a fault in the switch. 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	Conditions (A) and (C): 2 seconds Condition (B): 60 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

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

TYPICAL MALFUNCTION THRESHOLDS

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

Condition (A)

Number of the following signals input at the same time	2 or more
Park/neutral position switch	ON
R switch	ON
D switch	ON
3 switch	ON
2 switch	ON

Condition (B)

All of following conditions are met

Park/neutral position switch	OFF
R switch	OFF
D switch	OFF
3 switch	OFF
2 switch	OFF

Condition (C)

Both (i) and (ii) are met

(i) One of following conditions is met

Park/neutral position switch	ON
R switch	ON

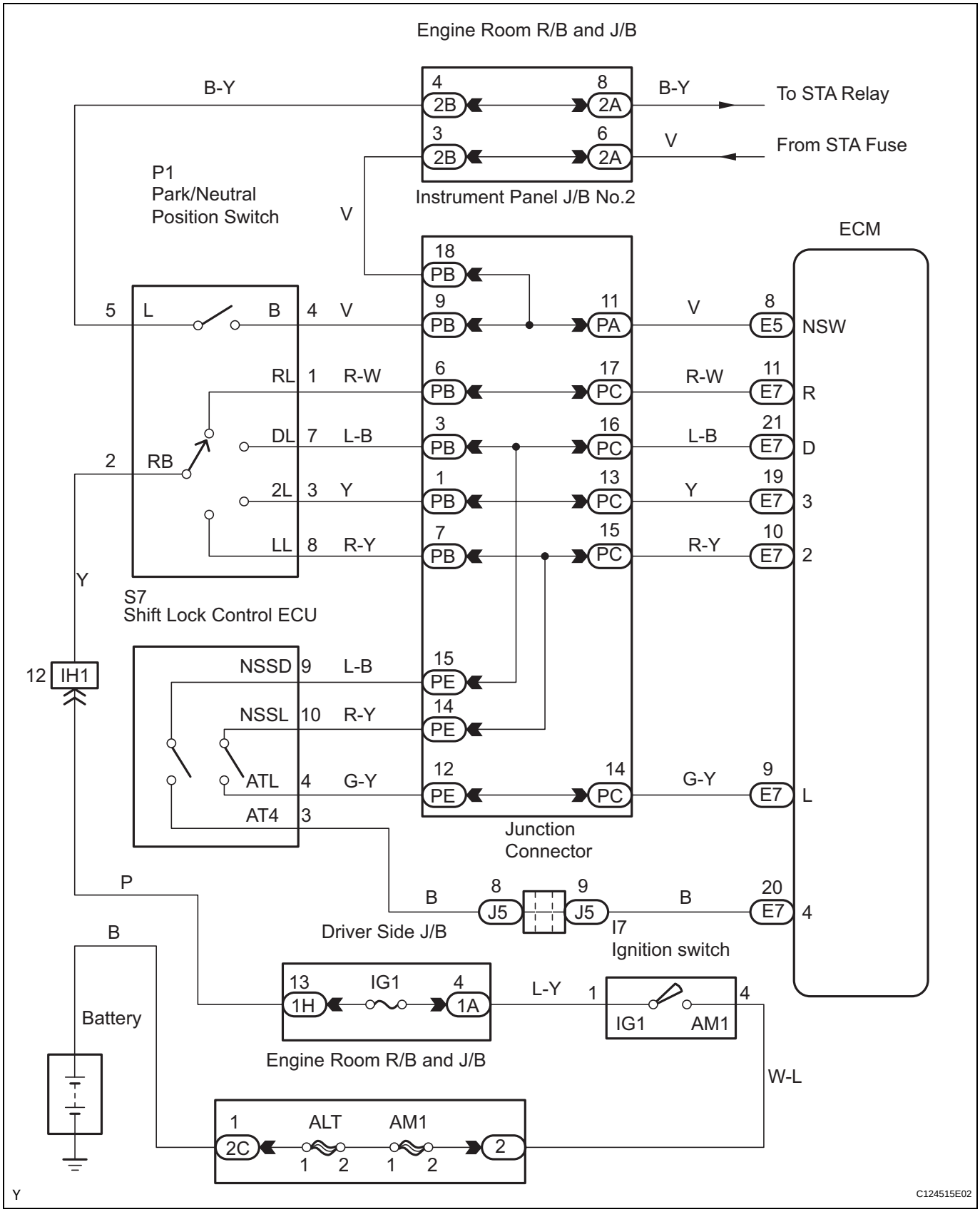
(ii) One of following conditions is met

4 switch	ON
L switch	ON

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM



HINT:
According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.

NOTICE:

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

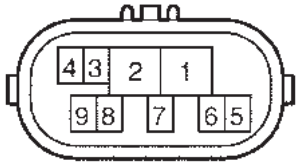
AT

1. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
2. Turn the ignition switch to the ON position.
3. Push the "ON" button of the tester.
4. Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST/ A/T".
5. According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
PNP SW [NSW]	PNP Switch Status/ ON or OFF	Shift lever position is; P or 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 Switch Status/ ON or OFF	Shift lever position is; R: ON Except R: OFF	
DRIVE	PNP Switch Status/ ON or OFF	Shift lever position is; D and 4: ON Except D and 4: OFF	
4th/DRIVE	PNP Switch Status/ ON or OFF	Shift lever position is; 4: ON Except 4: OFF	
3RD	PNP Switch Status/ ON or OFF	Shift lever position is; 3: ON Except 3: OFF	
2ND	PNP Switch Status/ ON or OFF	Shift lever position is; 2 and L: ON Except 2 and L: OFF	
LOW	PNP Switch Status/ ON or OFF	Shift lever position is; L: ON Except L: OFF	

1 INSPECT PARK / NEUTRAL POSITION SWITCH ASSEMBLY

Switch side (Connector Front View):



P G026080E19

(a) Disconnect the park/neutral position switch connector.
(b) Measure the resistance when the shift lever is moved to each position.

Standard resistance

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

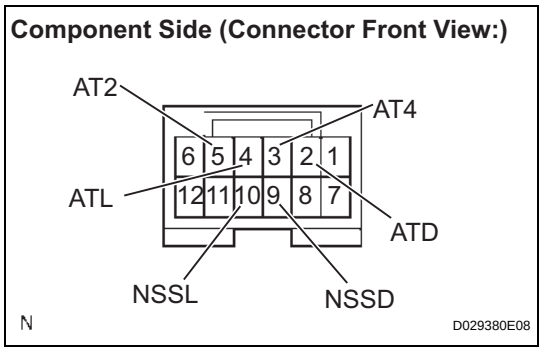
Shift Position	Tester Connection	Specified Condition
Except 2, L	2 - 8	10 kΩ or higher

NG → REPLACE PARK / NEUTRAL POSITION SWITCH ASSEMBLY

OK

AT

2 INSPECT SHIFT LOCK CONTROL ECU SUB-ASSEMBLY



(a) Connect the park/neutral position switch connector.
(b) Disconnect the shift lock control ECU connector.
(c) Measure the resistance when the shift lever is moved to each position.

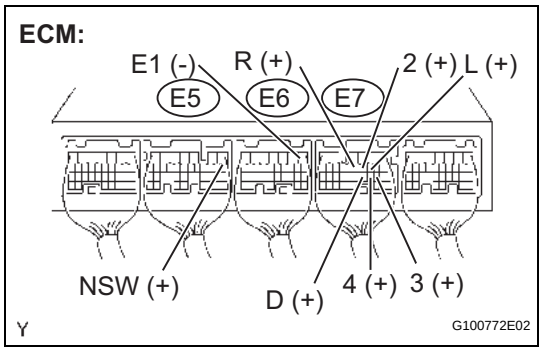
Standard resistance

Shift Position	Tester Connection	Specified Condition
D	9 (NSSD) - 2 (ATD)	Below 1 Ω
4	9 (NSSD) - 2 (ATD)	10 kΩ or higher
D	9 (NSSD) - 3 (AT4)	10 kΩ or higher
4	9 (NSSD) - 3 (AT4)	Below 1 Ω
2	10 (NSSL) - 5 (AT2)	Below 1 Ω
L	10 (NSSL) - 5 (AT2)	10 kΩ or higher
2	10 (NSSL) - 4 (ATL)	10 kΩ or higher
L	10 (NSSL) - 4 (ATL)	Below 1 Ω

NG → REPLACE SHIFT LOCK CONTROL ECU SUB-ASSEMBLY

OK

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



(a) Connect the shift lock control ECU connector.
(b) Turn the ignition switch to the ON position.
(c) Measure the voltage when the shift lever is moved to each position.

Standard voltage

Shift Position	Tester Connection	Specified Condition
P and N	E5-8 (NSW) - E6-1 (E1)	Below 2 V
Except P and N	E5-8 (NSW) - E6-1 (E1)	10 to 14 V
R	E7-11 (R) - E6-1 (E1)	10 to 14 V*
Except R	E7-11 (R) - E6-1 (E1)	Below 1 V
D and 4	E7-21 (D) - E6-1 (E1)	10 to 14 V
Except D and 4	E7-21 (D) - E6-1 (E1)	Below 1 V
4	E7-20 (4) - E6-1 (E1)	10 to 14 V
Except 4	E7-20 (4) - E6-1 (E1)	Below 1 V
3	E7-19 (3) - E6-1 (E1)	10 to 14 V
Except 3	E7-19 (3) - E6-1 (E1)	Below 1 V
2 and L	E7-10 (2) - E6-1 (E1)	10 to 14 V
Except 2 and L	E7-10 (2) - E6-1 (E1)	Below 1 V

Shift Position	Tester Connection	Specified Condition
L	E7-9 (L) - E6-1 (E1)	10 to 14 V
Except L	E7-9 (L) - E6-1 (E1)	Below 1 V

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

AT

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

OK

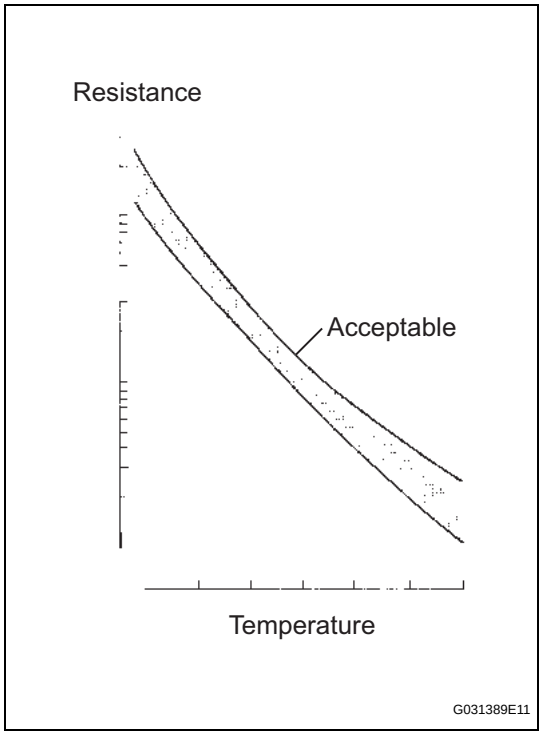
REPLACE ECM

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 and the voltage decrease as the temperature becomes higher.
The ECM calculates the fluid temperature based on the voltage signal.

DTC No.	DTC Detection Conditions	Trouble Areas
P0710	(a) and (b) are detected momentarily within 0.5 seconds when neither P0712 nor P0713 is detected (1-trip detection logic) (a) No. 1 ATF temperature sensor resistance is less than 79 Ω. (b) No. 1 ATF temperature sensor resistance is more than 156 kΩ. HINT: Within 0.5 seconds, the malfunction changes from (a) to (b) or from (b) to (a)	• Open or short in No. 1 ATF temperature sensor circuit • Transmission wire (No. 1 ATF temperature sensor) • ECM

DTC No.	DTC Detection Conditions	Trouble Areas
P0712	No. 1 ATF temperature sensor resistance is less than 79 Ω for 0.5 seconds or more (1-trip detection logic)	• Short in No. 1 ATF temperature sensor circuit • Transmission wire (No. 1 ATF temperature sensor) • ECM
P0713	No. 1 ATF temperature sensor resistance is more than 156 kΩ for 0.5 seconds or more 15 minutes or more after starting engine (1-trip detection logic)	• Open in No. 1 ATF temperature sensor circuit • Transmission wire (No. 1 ATF temperature sensor) • ECM

AT

MONITOR DESCRIPTION

These DTCs indicate an open or short in the Automatic Transmission Fluid (ATF) temperature sensor circuit.
The ATF temperature sensor converts ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and detects any open or short malfunctions in the ATF temperature circuit. If the resistance value of the ATF temperature is less than 79 Ω*1 or more than 156 kΩ*2, the ECM interprets this as a fault in the ATF sensor or its wiring. The ECM turns on the MIL and stores a 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 intelligent tester display.

MONITOR STRATEGY

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

TYPICAL ENABLING CONDITIONS

P0710: Range check (Fluttering)

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

P0712: Range check (Low resistance)

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

P0713: Range check (High resistance)

The monitor will run whenever the following DTCs are not present.	None
Time after engine start	15 minutes or more

TYPICAL MALFUNCTION THRESHOLDS

P0710: Range check (Fluttering)

ATF temperature sensor resistance	Less than 79 Ω or More than 156 kΩ

P0712: Range check (Low resistance)

ATF temperature sensor resistance	Less than 79 Ω

P0713: Range check (High resistance)

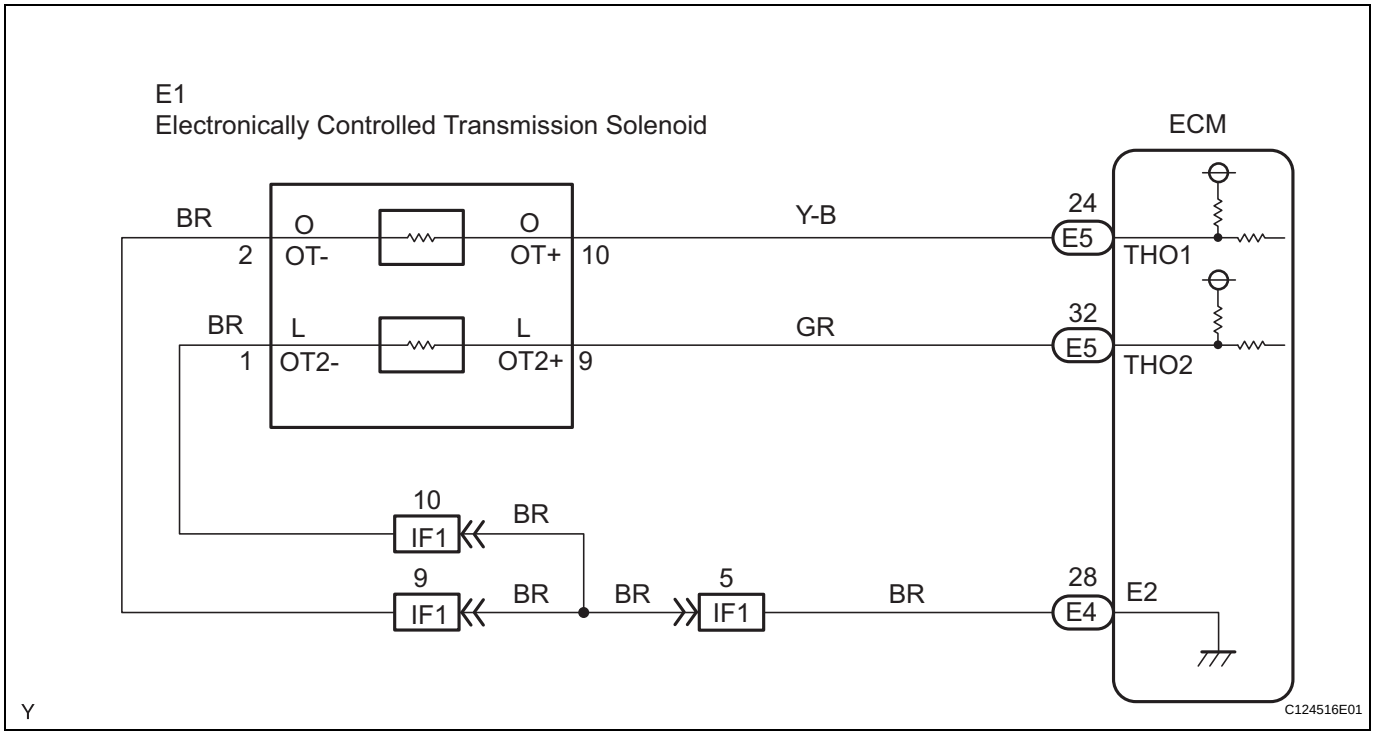
ATF temperature sensor resistance	More than 156 kΩ

COMPONENT OPERATING RANGE

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

AT

WIRING DIAGRAM



HINT:
According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.

NOTICE:

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

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST/ A/T".
7. According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
AT OIL TEMP1	No. 1 ATF Temperature Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	• After Stall Test: Approximately 80°C (176°F) • Equal to ambient temperature during cold soak

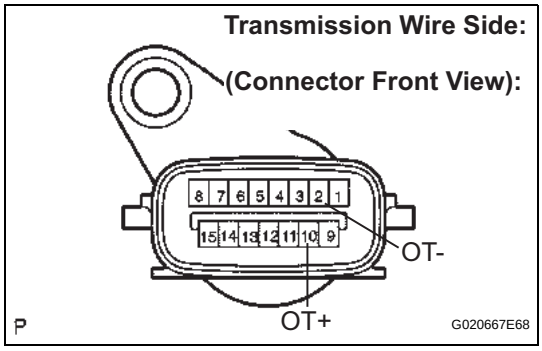
HINT:
When DTC P0712 is output and intelligent tester reading is 150°C (302°F) or more, there is a short circuit.
When DTC P0713 is output and intelligent tester reading is -40°C (-40°F), there is an open circuit.
Measure the resistance between terminal THO1 (OT) and the body ground.

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

AT

HINT:
If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately set (in 0.5 seconds). When P0713 is set, P0711 cannot be detected.
It is not necessary to inspect the circuit when P0711 is set.

1	INSPECT TRANSMISSION WIRE (ATF TEMPERATURE SENSOR)



(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
2 (OT-) - 10 (OT+)	79 Ω to 156 kΩ

(c) Measure the resistance.
Standard resistance (Check for short)

Tester Connection	Specified Condition
2 (OT-) - Body ground	10 kΩ or higher
10 (OT+) - Body ground	10 kΩ or higher

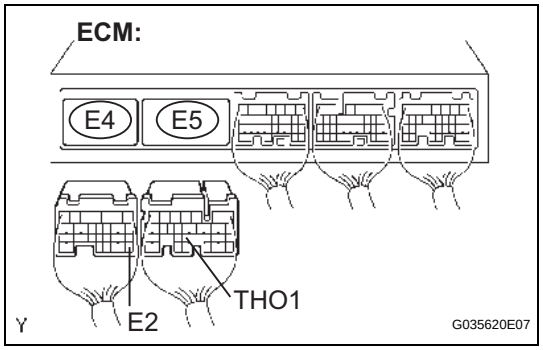
HINT:
If the resistance is outside the specified range at either of the ATF temperatures shown in the table below, the driveability of the vehicle may decrease.

ATF Temperature	Specified Condition
20°C (68°F)	3 to 4 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

2	CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connectors.
(c) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
E5-24 (THO1) - E4-28 (E2)	79 Ω to 156 kΩ

(d) Measure the resistance.
Standard resistance (Check for short)

Tester Connection	Specified Condition
E5-24 (THO1) - Body ground	10 kΩ or higher
E4-28 (E2) - Body ground	10 kΩ or higher

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

OK

REPLACE ECM

AT

DTC	P0711	Transmission Fluid Temperature Sensor "A" Performance

DESCRIPTION

Refer to DTC P0710 (See page AT-49).

DTC No.	DTC Detection Conditions	Trouble Areas
P0711	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 22 minutes and 5.6 miles (9 km) or more, ATF temperature is less than 20°C (68°F)	• Transmission wire (No. 1 ATF temperature sensor) • ECM

MONITOR DESCRIPTION

This DTC indicates that there is a problem with the output from the automatic transmission fluid (ATF) temperature sensor and that the sensor itself is defective. 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 any open or short malfunctions in the ATF temperature circuit or a fault of the ATF temperature sensor.

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

MONITOR STRATEGY

Related DTCs	P0711: ATF temperature sensor/Rationality check
Required sensors/Components	ATF temperature sensor
Frequency of operation	Continuous
Duration	3 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	None
ATF temperature sensor "A" circuit	Functioning normally
ECT (Engine coolant temperature) sensor circuit	Functioning normally
IAT (Intake air temperature) sensor circuit	Functioning normally
Time after engine start	21 minutes and 40 seconds or more
Driving distance after engine start	5.6 miles (9 km) or more
IAT (12 seconds after engine start)	-10°C (14°F) or more
ECT (12 seconds after engine start)	-10°C (14°F) or more

TYPICAL MALFUNCTION THRESHOLDS

ATF temperature	Less than 20°C (68°F) (Conditions vary with ATF temperature at engine start)

WIRING DIAGRAM

Refer to DTC P0710 (See page AT-51).

HINT:
According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.
NOTICE:
In the table below, the values listed under "Normal Condition" are for reference only. Do not depend solely on these reference values when judging whether a part is faulty or not.

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST/ A/T".
7. According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
AT OIL TEMP1	No. 1 ATF Temperature Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	• After Stall Test: Approximately 80°C (176°F) • Equal to ambient temperature during cold soak

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

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

HINT:
If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately set (in 0.5 seconds). When P0713 is set, P0711 cannot be detected.
It is not necessary to inspect the circuit when P0711 is set.

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

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

Result:

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

HINT:
If any codes besides "P0711" are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART

A

2	CHECK TRANSMISSION FLUID LEVEL

AT

OK:
Automatic transmission fluid level is correct.

NG → **ADD FLUID**

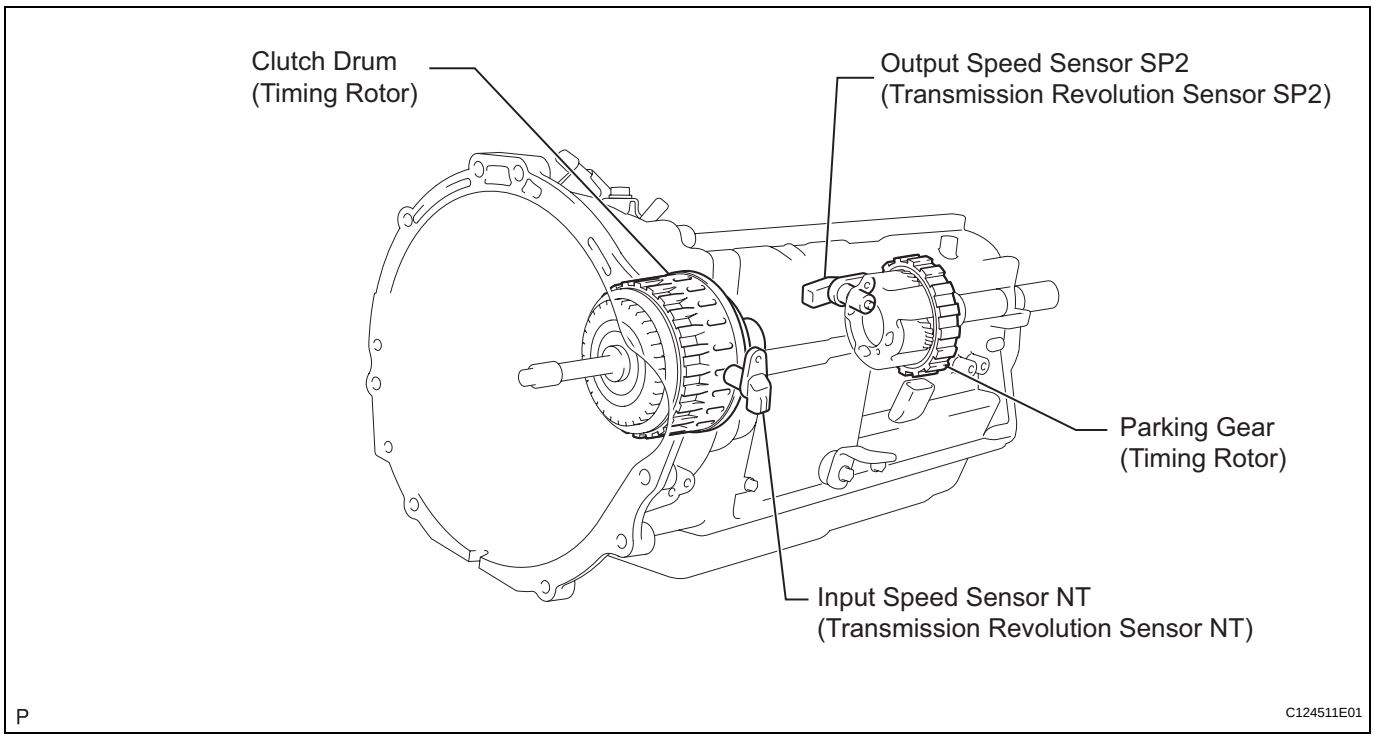
OK

REPLACE TRANSMISSION WIRE (ATF TEMPERATURE SENSOR)

DTC	P0717	Input Speed Sensor Circuit No Signal

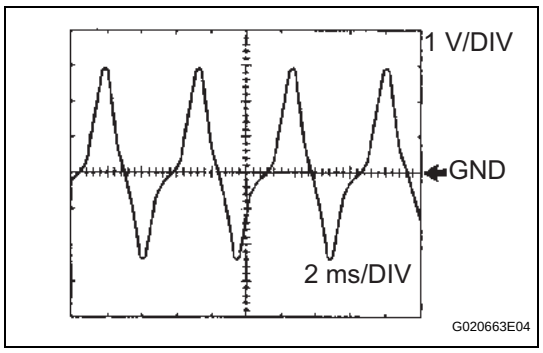
DESCRIPTION

This sensor detects the rotation speed of the turbine which shows the input revolution of the transmission. By comparing the input turbine speed signal (NT) with the counter gear speed sensor signal (SP2), 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 Conditions	Trouble Areas
P0717	All conditions below are detected for 5 seconds or more (1-trip detection logic): (a) Gear change not being performed (b) Gear position: 4th or 5th (c) T/M input shaft rpm: 300 rpm or less (d) T/M output shaft rpm: 1,000 rpm or more (e) Park/neutral position switch: OFF (f) Shift solenoid valves, park/neutral position switch and vehicle speed sensor are in normal operation	• Open or short in speed sensor (NT) circuit • Speed sensor (NT) • ECM

Reference (Using an oscilloscope):



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

Standard:

Refer to the illustration.

Terminal	NT+ - NT-
Tool setting	1 V/DIV, 2 ms/DIV
Vehicle condition	Engine idling speed (P or N position)

MONITOR DESCRIPTION

This DTC indicates that a pulse is not output from the speed sensor NT (Turbine (input) sped sensor) or is weak. The NT terminal of the ECM detects the revolving signal from speed sensor (NT) (input RPM). The ECM outputs a gearshift signal comparing the input speed sensor (NT) with the output speed sensor (SP2). While the vehicle is operating in the 4th or 5th gear position in the shift position of D, if the input shaft revolution is less than 300 rpm*1 although the output shaft revolution is more than 1,000 rpm or more*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 approximately 31 mph (50 km/h) or more.

MONITOR STRATEGY

Related DTCs	P0717: Speed sensor (NT)/Verify pulse input
Required sensors/Components (Main)	Speed sensor (NT)
Required sensors/Components (Related)	Speed sensor (SP2)
Frequency of operation	Continuous
Duration	5 seconds
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	P0500: VSS P0748 - P0799: Trans solenoid (range)
Shift change	Each shift change is completed before starting next shift change operation
ECM selected gear	4th or 5th
Output shaft rpm	1,000 rpm or more
Park/neutral position switch	OFF
R switch	OFF
L switch	OFF
Engine	Running
Ignition Switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

Sensor signal rpm	Less than 300 rpm

COMPONENT OPERATING RANGE

Speed sensor (NT)	Input speed is equal to engine speed when lock-up ON

WIRING DIAGRAM



HINT:
According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST/ A/T".
7. According to the display on the tester, read the "DATA LIST".

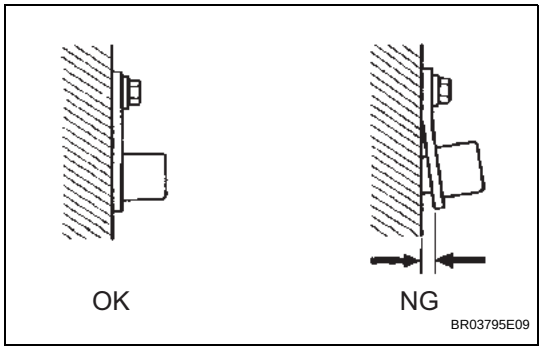
Item	Measurement Item/ Range (display)	Normal Condition
SPD (NT)	Input Turbine Speed/ display: 50 rpm	[HINT] • Lock-up ON (After warming up the engine); Input turbine speed (NT) equal to the engine speed. • Lock-up OFF (Idling at N position); Input turbine speed (NT) nearly equal to the engine speed.

HINT:

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

AT

1 INSPECT SPEED SENSOR INSTALLATION



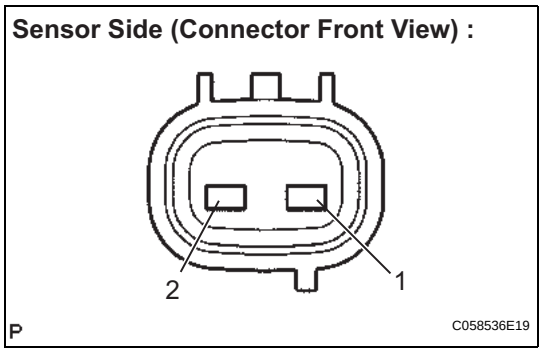
(a) Check the speed sensor (NT) installation.
OK:
The installation bolt is tightened properly and there is no clearance between the sensor and transmission case.

NG → **REPLACE SPEED SENSOR (NT)**

OK

2 INSPECT SPEED SENSOR (NT)

Sensor Side (Connector Front View) :



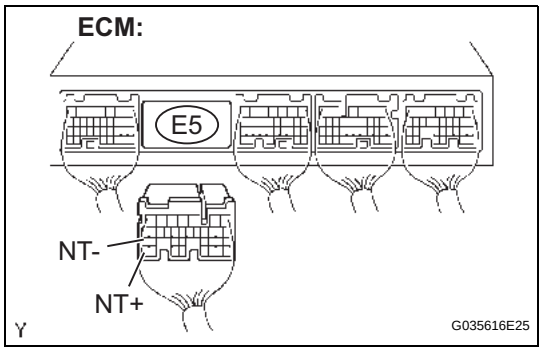
(a) Disconnect the speed sensor (NT) connector from the transmission.
(b) Measure the resistance.
Standard resistance

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

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.
Standard resistance

Tester Connection	Specified Condition
E5-35 (NT+) - E5-27 (NT-)	560 to 680 Ω at 20°C (68°F)

(d) Measure the resistance.
Standard resistance (Check for short)

Tester Connection	Specified Condition
E5-35 (NT+) - Body ground	10 kΩ or higher
E5-27 (NT-) - Body ground	10 kΩ or higher

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

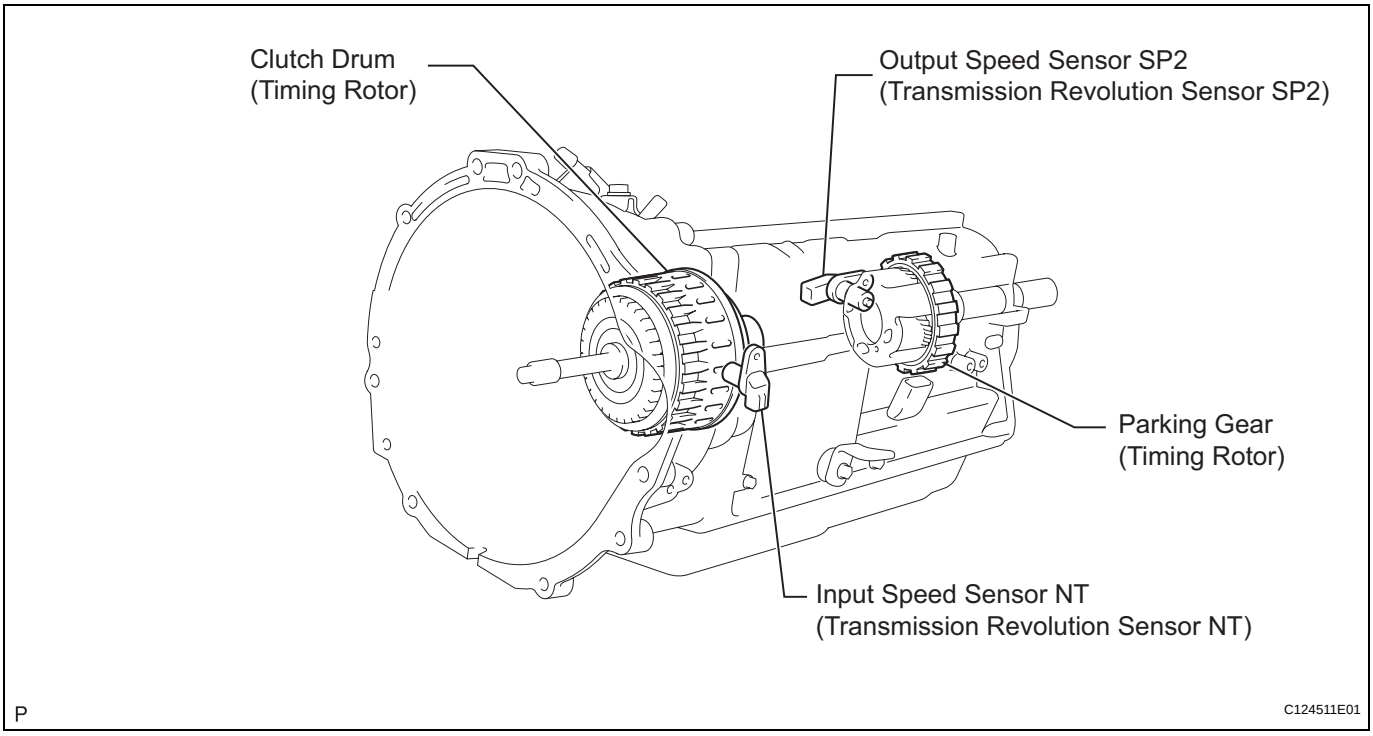
OK

REPLACE ECM

DTC	P0722	Output Speed Sensor Circuit No Signal

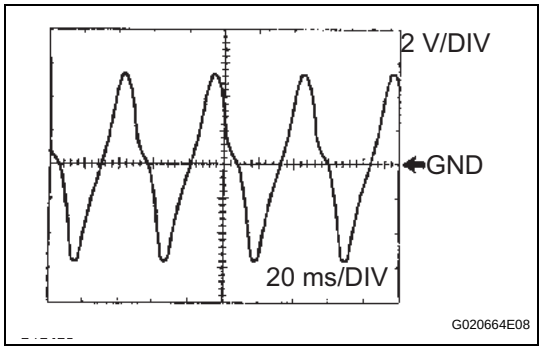
DESCRIPTION

The speed sensor SP2 detects the rotation speed of the transmission output shaft and sends signals to the ECM. The ECM determines the vehicle speed based on these signals. An AC voltage is generated in the speed sensor SP2 coil as the parking gear mounted on the rear planetary gear assembly rotates, and this voltage is sent to the ECM. The parking gear on the rear planetary gear is used as the timing rotor for this sensor. The gear shift point and lock-up timing are controlled by the ECM based on the signals from the vehicle speed sensor and the throttle position sensor.



DTC No.	DTC Detection Conditions	Trouble Areas
P0722	All conditions below are detected 500 times or more continuously (1-trip detection logic) (a) No signal from speed sensor (SP2) is input to ECM while 4 pulses of No. 1 vehicle speed sensor signal are sent (b) Vehicle speed is 5.59 mph (9 km/h) or more for at least 4 seconds (c) Park/neutral position switch is OFF (d) Transfer is in any position other than neutral position	• Open or short in speed sensor (SP2) circuit • Speed sensor (SP2) • ECM

Reference (Using an oscilloscope):



Check the waveform between terminals SP2+ and SP2- of the ECM connector.

Standard:
Refer to the illustration.

Terminal	SP2+ - SP2-
Tool setting	2 V/DIV, 20 ms/DIV
Vehicle condition	Vehicle speed 12 mph (20 km/h)

MONITOR DESCRIPTION

The output speed sensor monitors the output shaft speed. The ECM controls the gearshift point and the lock up timing based on the signals from the output speed sensor and throttle position sensor.
If the ECM detects no signal from the output shaft speed sensor even while the vehicle is moving, it will conclude that is a malfunction in the output speed sensor. The ECM will illuminate the MIL and set the DTC.

MONITOR STRATEGY

Related DTCs	P0722: Speed sensor SP2/Verify pulse input
Required sensors/Components	Speed sensor SP2
Frequency of operation	Continuous
Duration	500 output shaft revolutions
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

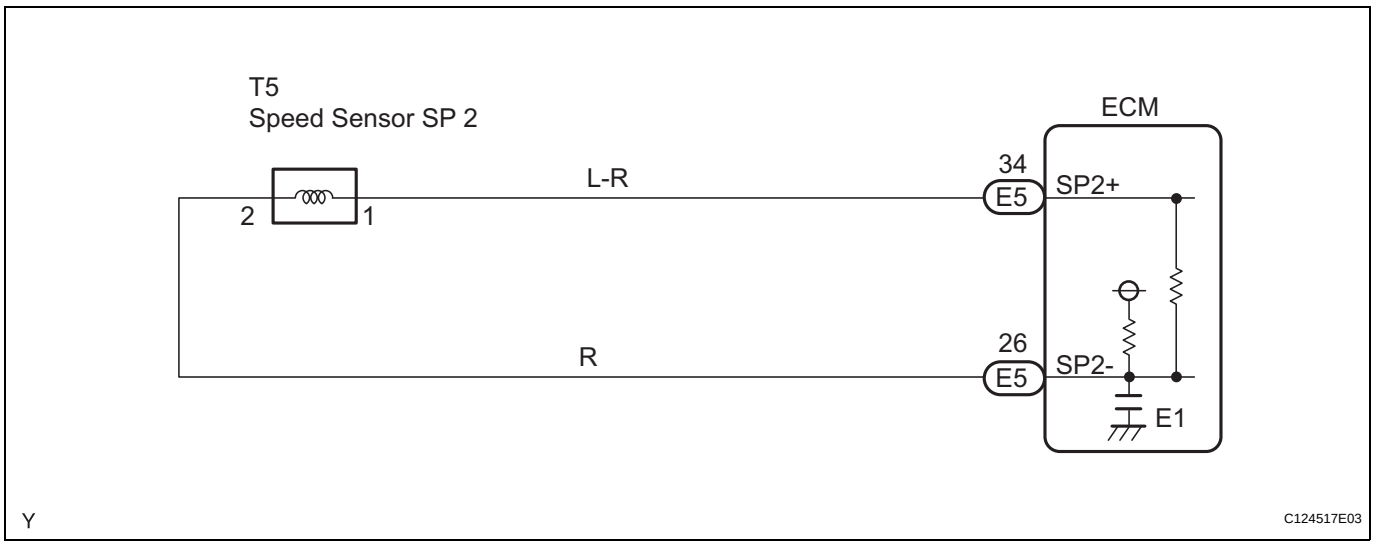
The monitor will run whenever the following DTCs are not present.	P0500: VSS P0748 - P0799: Trans solenoid (range)
Vehicle speed sensor pulse input	4 times
Vehicle speed range (4 seconds or more)	5.59 mph (9 km/h) or more
Park/neutral position switch	OFF
Battery voltage	8 V or more
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

Output speed sensor pulse input	No input

AT

WIRING DIAGRAM



HINT:
According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors and actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.

NOTICE:

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

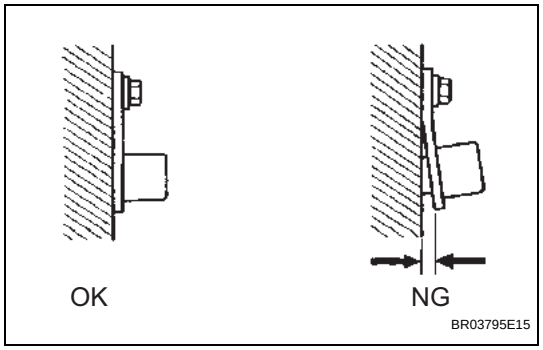
1. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
2. Turn the ignition switch to the ON position.
3. Push the "ON" button of the tester.
4. Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST/ A/T".
5. According to the display on the tester, read the "DATA LIST".

Item	Measurement Item/ Range (display)	Normal Condition
SPD (SP2)	Counter Gear Speed display/ min.: 0 mph (0 km/h) max.: 158 mph (255 km/h)	Vehicle stopped: 0 mph (0 km/h) [HINT] Equal to vehicle speed

HINT:

- SPD (SP2) is always 0 while driving:
  Open or short in the sensor or circuit.
- The SPD (SP2) value displayed on the tester is much lower than the actual vehicle speed:
  Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

1 INSPECT SPEED SENSOR INSTALLATION

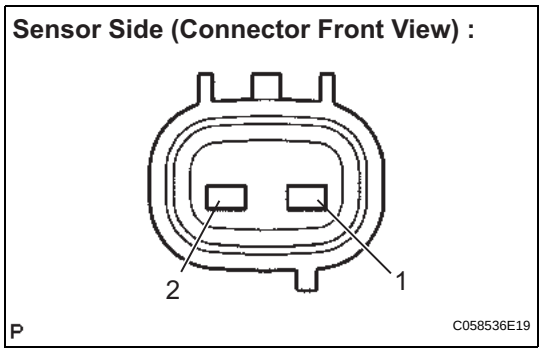


(a) Check the speed sensor (SP2) installation.
OK:
The installation bolt is tightened properly and there is no clearance between the sensor and transmission case.

NG → **REPLACE SPEED SENSOR (SP2)**

OK

2 INSPECT SPEED SENSOR (SP2)



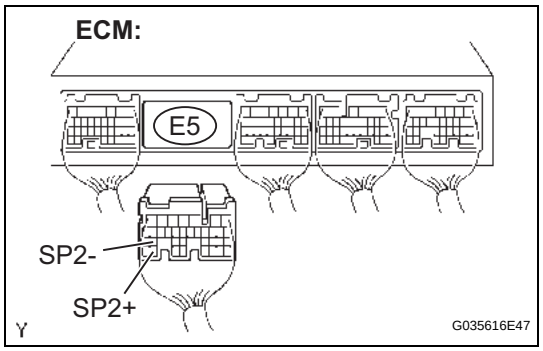
(a) Disconnect the speed sensor (SP2) connector from the transmission.
(b) Measure the resistance.
Standard resistance

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

NG → **REPLACE SPEED SENSOR (SP2)**

OK

3 CHECK HARNESS AND CONNECTOR (SPEED SENSOR - ECM)



(a) Connect the speed sensor connector.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
E5-34 (SP2+) - E5-26 (SP2-)	560 to 680 Ω at 20°C (68°F)

(d) Measure the resistance.
Standard resistance (Check for short)

Tester Connection	Specified Condition
E5-34 (SP2+) - Body ground	10 kΩ or higher
E5-26 (SP2-) - Body ground	10 kΩ or higher

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

OK

REPLACE ECM

DTC	P0748	Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1)

DESCRIPTION

Shifting from 1st to 5th is performed in combination with the ON and OFF operation of the shift solenoid valves S1, S2, SR, SL1 and SL2 which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be driven smoothly (See page AT-32).

DTC No.	DTC Detection Conditions	Trouble Areas
P0748	The ECM checks for an open or short in the shift solenoid valve SL1 circuit (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

This DTC indicates an open or short in the shift solenoid valve SL1 circuit. The ECM controls the gearshift by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other functioning shift solenoid valves "ON/OFF". (If an open or short circuit is detected, the ECM cuts the current to the circuit.)
If the ECM detects an open or short in the shift solenoid valve SL1 circuit, the ECM determines that there is a malfunction (See page AT-32).

MONITOR STRATEGY

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

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	None
Battery voltage	10 V or more
CPU commanded duty	Less than 75 %
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

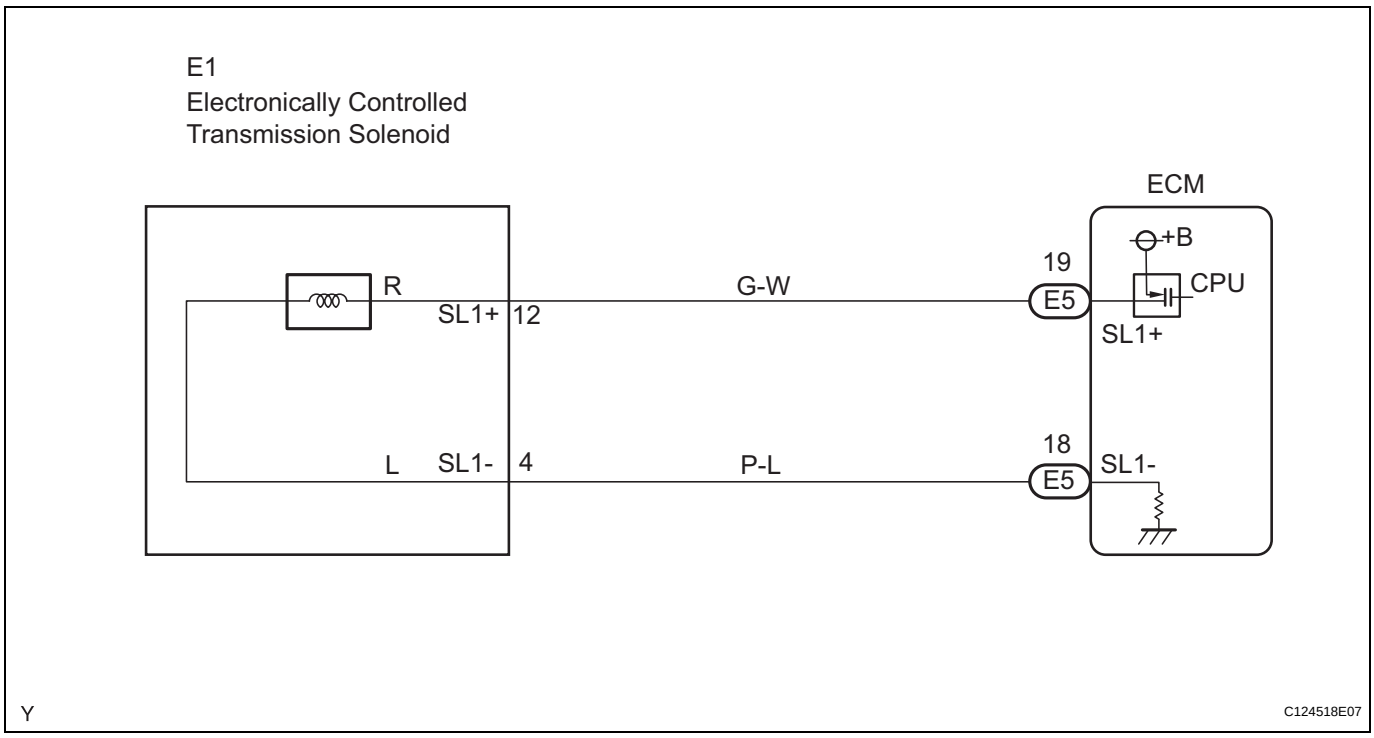
Output signal duty	100 %

COMPONENT OPERATING RANGE

Output signal duty	Less than 100 %

AT

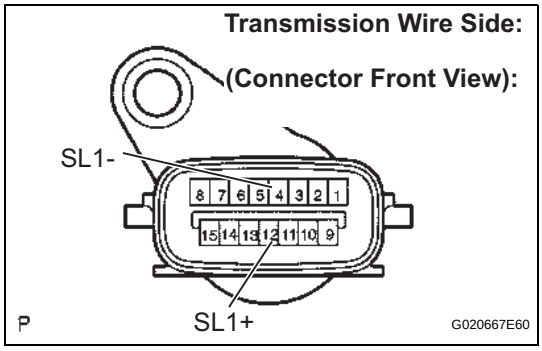
WIRING DIAGRAM



HINT:
The shift solenoid valve SL1 is turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
Shift solenoid valve SL1	OFF	OFF	OFF	OFF	ON

1	INSPECT TRANSMISSION WIRE (SL1)



(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
12 (SL1+) - 4 (SL1-)	5.0 to 5.6 Ωat 20°C (68°F)

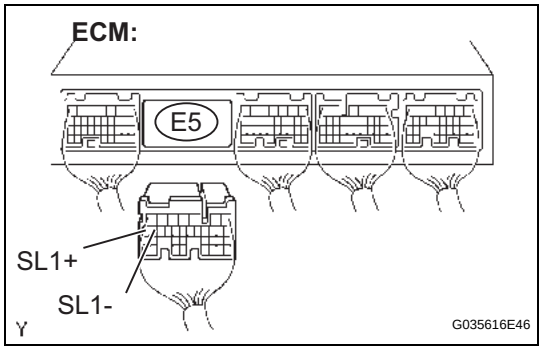
(c) Measure the resistance.
Standard resistance (Check for short)

Tester Connection	Specified Condition
12 (SL1+) - Body ground	10 kΩ or higher
4 (SL1-) - Body ground	10 kΩ or higher

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission connector to the transmission.
(b) Disconnect the connector from the ECM.
(c) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
E5-19 (SL1+) - E5-18 (SL1-)	5.0 to 5.6 Ω at 20°C (68°F)

(d) Measure the resistance.
Standard resistance (Check for short)

Tester Connection	Specified Condition
E5-19 (SL1+) - Body ground	10 kΩ or higher
E5-18 (SL1-) - Body ground	10 kΩ or higher

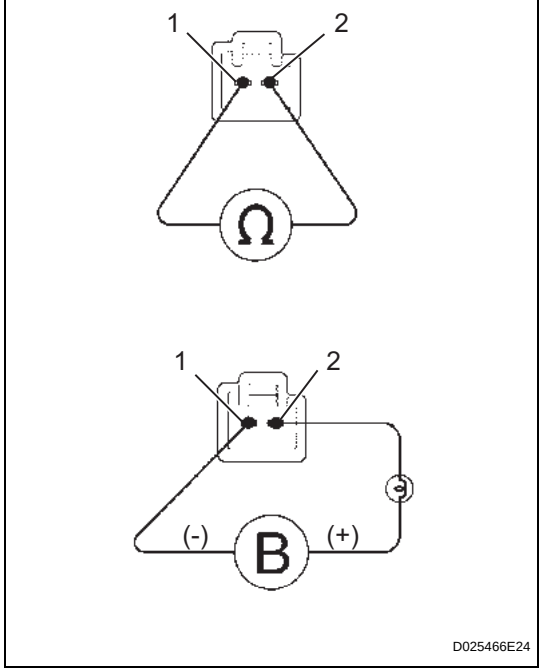
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM

3	INSPECT SHIFT SOLENOID VALVE SL1

Shift Solenoid Valve SL1:



(a) Remove the shift solenoid valve SL1.
(b) Measure the resistance.
Standard resistance

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

(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**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P0751	Shift Solenoid "A" Performance (Shift Solenoid Valve S1)

DESCRIPTION

AT

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC No.	DTC Detection Conditions	Trouble Areas
P0751	S1 stuck ON malfunction*1: The ECM determines that there is a malfunction when the following conditions are met (2-trip detection logic): (a) When the ECM directs the gearshift to switch to 4th gear, the actual gear is shifted to 1st. (b) When the ECM directs the gearshift to switch to 1st gear, the actual gear is also shifted to 1st.	• Shift solenoid valve S1 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)
	S1 stuck OFF malfunction*2: The ECM determines that there is a malfunction when the following conditions are met (2-trip detection logic): (a) When the ECM directs the gearshift to switch to 1st gear, the actual gear is shifted to 4th. (b) When the ECM directs the gearshift to switch to 5th gear, the actual gear is also shifted to 5th.	• Shift solenoid valve S1 remains closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

HINT:
Gear positions in the event of a solenoid valve mechanical problem:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
*1: Actual gear position under S1 stuck ON malfunction	1st	2nd	2nd	1st	N*
*2: Actual gear position under S1 stuck OFF malfunction	4th	3rd	3rd	4th	5th

N*: Neutral

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve S1. The ECM controls the gearshifts by turning the shift solenoid valves "ON/OFF". When the gear position directed by the ECM and the actual gear position do not match, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0751: Shift solenoid valve S1/OFF malfunction Shift solenoid valve S1/ON malfunction
Required sensors/Components (Main)	Shift solenoid valve S1
Required sensors/Components (Related)	Vehicle speed sensor, Throttle position sensor, Speed sensor (NT), Speed sensor (SP2)
Frequency of operation	Continuous
Duration	OFF malfunctions (A) and (B): 0.4 seconds OFF malfunction (C): Immediate ON malfunctions (A), (B) and (C): 0.4 seconds ON malfunction (D): 3 seconds ON malfunction (E): 0.5 seconds
MIL operation	2 driving cycles

Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The following conditions are common to all OFF malfunctions (A), (B), (C) and ON malfunctions (A), (B), (C), (D), (E).

The monitor will run whenever the following DTCs are not present.	P0115 - P0118: ECT sensor P0125: Insufficient ECT for Closed Loop P0500: VSS P0748 - P0799: Trans solenoid (range)
Turbine speed sensor (NT) circuit	Functioning normally
Output speed sensor (SP2) circuit	Functioning normally
Shift solenoid "A" (S1) circuit	Functioning normally
Shift solenoid "B" (S2) circuit	Functioning normally
Shift solenoid "E" (SR) circuit	Functioning normally
Pressure control solenoid "A" (SL1) circuit	Functioning normally
Pressure control solenoid "B" (SL2) circuit	Functioning normally
ECT (Engine coolant temperature) sensor circuit	Functioning normally
Knock sensor circuit	Functioning normally
ETCS (Electronic throttle control system)	System not down
Transmission shift position	"D"
ECT	40°C (104°F) or more
Spark advance from max. retard timing by knock sensor control	0° CA or more
Engine	Starting
Transfer range	"High" *1

*1: Following conditions are met

Vehicle speed sensor "A" circuit	Functioning normally
Output speed sensor circuit	Functioning normally
Transfer output speed	143 rpm or more
Transfer input speed/Transfer output speed	0.9 to 1.1

OFF malfunction (A)

ECM selected gear	1st
Vehicle speed	1.2 to 24.9 mph (2 to 40 km/h)
Throttle valve opening angle	8 % or more and 6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

OFF malfunction (B)

Current ECM selected gear	5th
Last ECM selected gear	4th
Continuous time of ECM selecting 4th gear	2 seconds or more
Actual gear when ECM selected 4th gear	4th

OFF malfunction (C)

Current ECM selected gear	5th
Last ECM selected gear	4th

ON malfunction (A)

ECM selected gear	1st
Vehicle speed	1.2 to 24.9 mph (2 to 40 km/h)
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

ON malfunction (B)

ECM selected gear	4th
Vehicle speed	1.2 mph (2 km/h) or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

AT

ON malfunction (C)

ECM selected gear	3rd
Vehicle speed	1.2 mph (2 km/h) or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

ON malfunction (D)

Current ECM selected gear	5th
Last ECM selected gear	4th
Vehicle speed (During transition from 4th to 5th gear)	Less than 62.2 mph (100 km/h)

ON malfunction (E)

ECM selected gear	5th
Engine speed - Turbine speed (NE - NT) (After transition from 4th to 5th gear)	150 rpm or less
Vehicle speed (After transition from 4th to 5th gear)	Less than 62.2 mph (100 km/h)

TYPICAL MALFUNCTION THRESHOLDS

[OFF malfunction]
All of the following conditions are met: OFF malfunctions (A), (B) and (C)
2 detections are necessary in 1 driving cycle.
1st detection; temporary flag ON
2nd detection; pending fault code ON

OFF malfunction (A)

Turbine speed/Output speed	0.93 to 1.07 (Actual gear is 4th)

OFF malfunction (B)

Turbine speed/Output speed	0.65 to 0.79 (Actual gear is 5th)

OFF malfunction (C)

Output record from ECM for 4th → 5th upshifting	Recorded

[ON malfunction]
Either of the following conditions is met:

- ON malfunctions (A) and (B)
- ON malfunction (B) or (C) and ON malfunction (D) or (E)

ON malfunction (A)

Turbine speed/Output speed	3.30 to 7.50 (Actual gear is 1st)

ON malfunction (B)

Turbine speed/Output speed	3.30 to 7.50 (Actual gear is 1st)

ON malfunction (C)

Turbine speed/Output speed	1.91 to 2.35 (Actual gear is 2nd)

ON malfunction (D)

Turbine speed - Output speed x 4th gear ratio	1,000 rpm or more

ON malfunction (E)

Turbine speed - Output speed x 5th gear ratio	1,000 rpm or more

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.
1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ SHIFT".
8. According to the display on the tester, perform the "ACTIVE TEST".

HINT:
While driving, the shift position can be changed with the intelligent tester.
Comparing the shift position directed by the ACTIVE TEST with the actual shift position enables the problem to be confirmed (See page AT-32).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position manually. [Vehicle Condition] Vehicle Speed: Less than 30 mph (50 km/h) [Others] • Press → button: Shift up • Press ← button: Shift down	Possible to check the operation of the shift solenoid valves. HINT: Shifting to the 5th gear is possible only when the vehicle is stationary with the engine idling.

HINT:
- This test can be conducted when the vehicle speed is 30 mph (50 km/h) or less.
- The 4th to 5th up-shifting must be performed with the accelerator pedal released.
- The 5th to 4th down-shifting must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position directed by the ECM is shown in the DATA LIST/ SHIFT display on the intelligent tester.
- The shift solenoid valve S1 is turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
Shift solenoid valve S1	ON	ON	OFF	OFF	OFF

1	**CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P0751)**

(a) Connect the the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES".

(d) Read the DTCs using the intelligent tester.

Result:

Display (DTC Output)	Proceed to
Only "P0751" is output	A
"P0751" and other DTCs	B

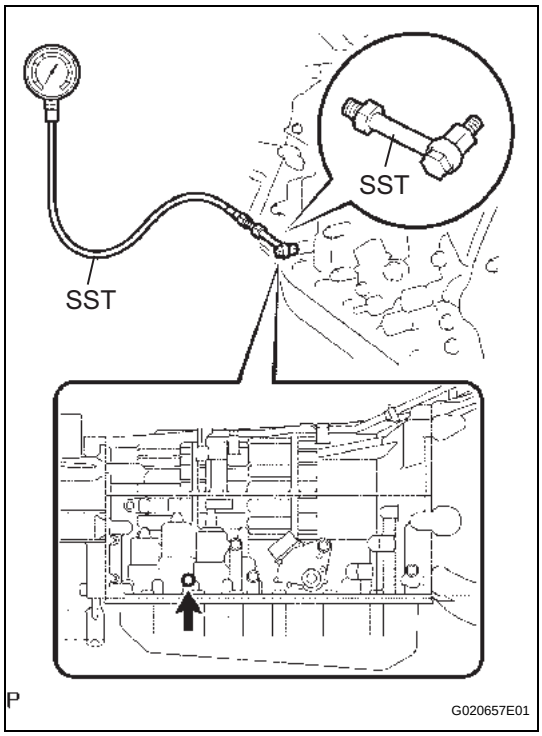
AT

HINT:
If any codes besides "P0751" are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART**

A

2 PERFORM ACTIVE TEST USING INTELLIGENT TESTER (LINE PRESS UP)



NOTICE:
- **Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature: 50 to 80°C (122 to 176°F).**
- **Be careful to prevent SST's hose from interfering with the exhaust pipe.**
- **Perform the test with the A/C OFF.**

HINT:
Performing the intelligent tester's ACTIVE TEST allows relay, VSV, actuator and other items to be operated without removing any parts. Performing the ACTIVE TEST early in troubleshooting is one way to save time.
The DATA LIST can be displayed during the ACTIVE TEST.

(a) Remove the test plug on the transmission case center right side and connect SST.
SST 09992-00095 (09992-00231, 09992-00271)
(b) Connect the intelligent tester to the DLC3.
(c) Start the engine and warm it up.
(d) Measure the line pressure with SST.
(e) Turn the intelligent tester ON.
(f) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
(g) Follow the instructions on the tester and perform the ACTIVE TEST.
(h) Measure the line pressure with SST.

Item	Test Details	Diagnostic Note
LINE PRESS UP*	[Test Details] Operate shift solenoid SLT and raise line pressure. [Vehicle Condition] • Vehicle stopped • IDL: ON HINT: OFF: Line pressure up (when Active Test of "LINE PRESS UP" is performed, ECM commands SLT solenoid to turn OFF) ON: No action (normal operation)	-

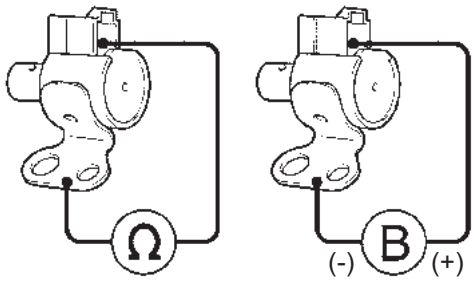
*: "LINE PRESS UP" in the ACTIVE TEST is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the HYDRAULIC TEST (See page AT-16) as well. Please note that the pressure values in the ACTIVE TEST and HYDRAULIC TEST are different.

NG → **REPLACE SHIFT SOLENOID VALVE SLT**

OK

3 INSPECT SHIFT SOLENOID VALVE S1

Shift Solenoid Valve S1:



A110986E04

(a) Remove the shift solenoid valve S1.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
Solenoid Connector (S1) - Solenoid Body (S1)	11 to 15 Ω at 20°C (68°F)

(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 S1**

OK

4 INSPECT TRANSMISSION VALVE BODY ASSEMBLY (See chapter 2 in the problem symptoms table)

OK:
There are no foreign objects on any valves and they operate smoothly.

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

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY

DTC	P0756	Shift Solenoid "B" Performance (Shift Solenoid Valve S2)

DESCRIPTION

AT

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC No.	DTC Detection Conditions	Trouble Areas
P0756	S2 stuck ON malfunction*1; The ECM determines that there is a malfunction when the following conditions are met (2-trip detection logic): (a) When the ECM directs the gearshift to switch to 1st gear, the actual gear is shifted to 2nd. (b) When the ECM directs the gearshift to switch to 5th gear, the engine overruns (clutch slips)	• Shift solenoid valve S2 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)
	S2 stuck OFF malfunction*2: The ECM determines that there is a malfunction when the following conditions are met (2-trip detection logic): (a) When the ECM directs the gearshift to switch to 1st gear, the actual gear is also shifted to 1st. (b) When the ECM directs the gearshift to switch to 2nd gear, the actual gear is shifted to 1st. (c) When the ECM directs the gearshift to switch to 5th gear, the actual gear is also shifted to 5th.	• Shift solenoid valve S2 remains closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

HINT:
Gear positions in the event of a solenoid valve mechanical problem:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
*1: Actual gear position under S2 stuck ON malfunction	2nd	2nd	3rd	3rd	N*
*2: Actual gear position under S2 stuck OFF malfunction	2nd	1st	4th	4th	5th

N*: Neutral

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve S2. The ECM controls the gearshifts by turning the shift solenoid valves "ON/OFF". When the gear position directed by the ECM and the actual gear position do not match, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0756: Shift solenoid valve S2/OFF malfunction Shift solenoid valve S2/ON malfunction
Required sensors/Components (Main)	Shift solenoid valve S2
Required sensors/Components (Related)	Vehicle speed sensor, Throttle position sensor, Speed sensor (NT), Speed sensor (SP2)
Frequency of operation	Continuous

Duration	OFF malfunctions (A), (B) and (C): 0.4 seconds OFF malfunction (D): Immediate ON malfunctions (A) and (B): 0.4 seconds ON malfunction (C): 3 seconds ON malfunction (D): 0.5 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The following conditions are common to all OFF malfunctions (A), (B), (C), (D) and ON malfunctions (A), (B), (C), (D).

The monitor will run whenever the following DTCs are not present.	P0115 - P0118: ECT sensor P0125: Insufficient ECT for Closed Loop P0500: VSS P0748 - P799: Trans solenoid (range)
Turbine speed sensor (NT) circuit	Functioning normally
Output speed sensor (SP2) circuit	Functioning normally
Shift solenoid "A" (S1) circuit	Functioning normally
Shift solenoid "B" (S2) circuit	Functioning normally
Shift solenoid "E" (SR) circuit	Functioning normally
Pressure control solenoid "A" (SL1) circuit	Functioning normally
Pressure control solenoid "B" (SL2) circuit	Functioning normally
ECT (Engine coolant temperature) sensor circuit	Functioning normally
Knock sensor circuit	Functioning normally
ETCS (Electronic throttle control system)	System not down
Transmission shift position	"D"
ECT	40°C (104°F) or more
Spark advance from max. retard timing by knock sensor control	0° CA or more
Engine	Starting
Transfer range	"High" *1

*1: Following conditions are met

Vehicle speed sensor "A" circuit	Functioning normally
Output speed sensor circuit	Functioning normally
Transfer output speed	143 rpm or more
Transfer input speed/Transfer output speed	0.9 to 1.1

OFF malfunction (A)

ECM selected gear	1st
Vehicle speed	1.2 to 24.9 mph (2 to 40 km/h)
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

OFF malfunction (B)

ECM selected gear	2nd
Vehicle speed	1.2 mph (2 km/h) or more
Output speed	2nd → 1st down shift point or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

OFF malfunction (C)

Current ECM selected gear	5th
Last ECM selected gear	4th
Continuous time of ECM selecting 4th gear	2 seconds or more
Actual gear when ECM selected 4th gear	4th

OFF malfunction (D)

Current ECM selected gear	5th
Last ECM selected gear	4th

ON malfunction (A)

ECM selected gear	1st
Vehicle speed	1.2 to 24.9 mph (2 to 40 km/h)
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

ON malfunction (B)

ECM selected gear	4th
Vehicle speed	1.2 mph (2 km/h) or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

ON malfunction (C)

Current ECM selected gear	5th
Last ECM selected gear	4th
Vehicle speed (During transition from 4th to 5th gear)	Less than 62.2 mph (100 km/h)

ON malfunction (D)

ECM selected gear	5th
Engine speed - Turbine speed (NE - NT) (After transition from 4th to 5th gear)	150 rpm or less
Vehicle speed (After transition from 4th to 5th gear)	Less than 62.2 mph (100 km/h)

TYPICAL MALFUNCTION THRESHOLDS

[OFF malfunction]

All of the following conditions are met: OFF malfunctions (A), (B), (C) and (D)

2 detections are necessary in 1 driving cycle.

1st detection; temporary flag ON

2nd detection; pending fault code ON

OFF malfunction (A)

Turbine speed/Output speed	3.30 to 7.50 (Actual gear is 1st)

OFF malfunction (B)

Turbine speed/Output speed	3.30 to 7.50 (Actual gear is 1st)

OFF malfunction (C)

Turbine speed/Output speed	0.65 to 0.79 (Actual gear is 5th)

OFF malfunction (D)

Output record from ECM for 4th → 5th upshifting	Recorded

[ON malfunction]

ON malfunction (A) or (B) and ON malfunction (C) or (D) are met:

ON malfunction (A)

Turbine speed/Output speed	1.91 to 2.35 (Actual gear is 2nd)

ON malfunction (B)

Turbine speed/Output speed	1.28 to 1.53 (Actual gear is 3rd)

ON malfunction (C)

Turbine speed - Output speed x 4th gear ratio	1,000 rpm or more

ON malfunction (D)

Turbine speed - Output speed x 5th gear ratio	1,000 rpm or more

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ SHIFT".
8. According to the display on the tester, perform the "ACTIVE TEST".

HINT:
While driving, the shift position can be changed with the intelligent tester.
Comparing the shift position directed by the ACTIVE TEST with the actual shift position enables the problem to be confirmed (See page AT-32).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position manually. [Vehicle Condition] Vehicle Speed: Less than 30 mph (50 km/h) [Others] • Press → button: Shift up • Press ← button: Shift down	Possible to check the operation of the shift solenoid valves. HINT: Shifting to the 5th gear is possible only when the vehicle is stationary with the engine idling.

HINT:

- This test can be conducted when the vehicle speed is 30 mph (50 km/h) or less.
- The 4th to 5th up-shifting must be performed with the accelerator pedal released.
- The 5th to 4th down-shifting must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position directed by the ECM is shown in the DATA LIST/ SHIFT display on the intelligent tester.
- The shift solenoid valve S2 is turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
Shift solenoid valve S2	OFF	ON	ON	OFF	OFF

AT

1	CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P0756)

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

Result:

Display (DTC Output)	Proceed to
Only "P0756" is output	A
"P0756" and other DTCs	B

HINT:
If any codes besides "P0756" are output, perform troubleshooting for those DTCs first.

B → GO TO DTC CHART

A

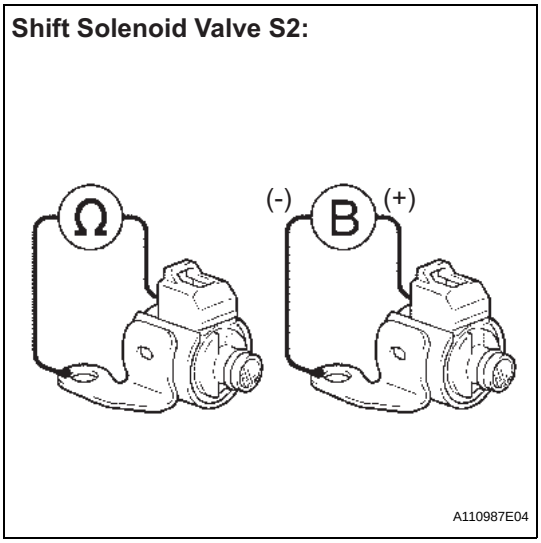
2	PERFORM ACTIVE TEST USING INTELLIGENT TESTER (LINE PRESS UP) (See page AT-82)

NG → REPLACE SHIFT SOLENOID VALVE SLT

OK

3	INSPECT SHIFT SOLENOID VALVE S2

Shift Solenoid Valve S2:



(a) Remove the shift solenoid valve S2.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
Solenoid Connector (S2) - Solenoid Body (S2)	11 to 15 Ωat 20°C (68°F)

(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 S2

OK

4	**INSPECT TRANSMISSION VALVE BODY ASSEMBLY (See chapter 2 in the problem symptoms table)**

OK:
There are no foreign objects on any valves and they operate smoothly.

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

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY

DTC	P0771	Shift Solenoid "E" Performance (Shift Solenoid Valve SR)

DESCRIPTION

AT

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC No.	DTC Detection Conditions	Trouble Areas
P0771	SR stuck ON malfunction*1: The ECM determines that there is a malfunction when the following condition is met (2-trip detection logic): (a) When the ECM directs the gearshift to switch to 2nd gear, the engine overruns (clutch slips)	• Shift solenoid valve SR remains open • Shift solenoid valve SL1 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)
	SR stuck OFF malfunction*2: The ECM determines that there is a malfunction when the following condition is met (2-trip detection logic): (a) When the ECM directs the gearshift to switch to 5th gear, the actual gear is shifted to 4th.	• Shift solenoid valve SR remains closed • Shift solenoid valve SL1 remains closed • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

HINT:
Gear positions in the event of a solenoid valve mechanical problem:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
*1: Actual gear position under SR stuck ON malfunction	1st	N*	3rd	4th	5th
*2: Actual gear position under SR stuck OFF malfunction	1st	2nd	3rd	4th	4th

N*: Neutral

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" or "stuck OFF malfunction" of the shift solenoid valve SR or SL1. The ECM controls the gearshifts by turning the shift solenoid valves "ON/OFF". When the gear position directed by the ECM and the actual gear position do not match, 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 (Main)	Shift solenoid valve SR
Required sensors/Components (Related)	Speed sensor (NT), Speed sensor (SP2), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	OFF malfunction (A): 0.4 seconds OFF malfunctions (B) and (C): Immediate ON malfunction: 0.15 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The following conditions are common to all OFF malfunctions (A), (B), (C) and ON malfunction.

The monitor will run whenever the following DTCs are not present.	P0115 - P0118: ECT sensor P0125: Insufficient ECT for Closed Loop P0500: VSS P0748 - P0799: Trans solenoid (range)
Turbine speed sensor (NT) circuit	Functioning normally
Output speed sensor (SP2) circuit	Functioning normally
Shift solenoid "A" (S1) circuit	Functioning normally
Shift solenoid "B" (S2) circuit	Functioning normally
Shift solenoid "E" (SR) circuit	Functioning normally
Pressure control solenoid "A" (SL1) circuit	Functioning normally
Pressure control solenoid "B" (SL2) circuit	Functioning normally
ECT (Engine coolant temperature) sensor circuit	Functioning normally
Knock sensor circuit	Functioning normally
ETCS (Electronic throttle control system)	System not down
Transmission shift position	"D"
ECT	40°C (104°F) or more
Spark advance from max. retard timing by knock sensor control	0° CA or more
Engine	Starting
Transfer range	"High" *1

*1: Following conditions are met

Vehicle speed sensor "A" circuit	Functioning normally
Output speed sensor circuit	Functioning normally
Transfer output speed	143 rpm or more
Transfer input speed/Transfer output speed	0.9 to 1.1

OFF malfunction (A)

ECM selected gear	5th
Vehicle speed	1.2 mph (2 km/h) or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

OFF malfunction (B)

Current ECM selected gear	5th
Last ECM selected gear	4th
Continuous time of ECM selecting 4th gear	2 seconds or more

OFF malfunction (C)

Current ECM selected gear	5th
Last ECM selected gear	4th

ON malfunction

Current ECM selected gear	2nd
Last ECM selected gear	1st
Throttle valve opening angle (During transition from 1st to 2nd gear)	5.5 % or more at engine speed of 3,000 rpm (Conditions vary with engine speed)

TYPICAL MALFUNCTION THRESHOLDS

[OFF malfunction]

All of the following conditions are met: OFF malfunctions (A), (B) and (C)

2 detections are necessary in 1 driving cycle.

1st detection; temporary flag ON

2nd detection; pending fault code ON

OFF malfunction (A)

Turbine speed/Output speed	0.93 to 1.07 (Actual gear is 4th)

OFF malfunction (B)

Turbine speed/Output speed	No change as follow: 0.93 to 1.07 (Actual gear is 4th) ↓ 0.65 to 0.79 (Actual gear is 5th)

OFF malfunction (C)

Output record from ECM for 4th → 5th upshifting	Recorded

[ON malfunction]
2 detections are necessary in 1 driving cycle.
1st detection; temporary flag ON
2nd detection; pending fault code ON

Turbine speed - Output speed x 1st gear ratio	150 rpm or more

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ SHIFT".
8. According to the display on the tester, perform the "ACTIVE TEST".

HINT:
While driving, the shift position can be changed with the intelligent tester.
Comparing the shift position directed by the ACTIVE TEST with the actual shift position enables the problem to be confirmed (See page AT-32).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position manually. [Vehicle Condition] Vehicle Speed: Less than 30 mph (50 km/h) [Others] • Press → button: Shift up • Press ← button: Shift down	Possible to check the operation of the shift solenoid valves. HINT: Shifting to the 5th gear is possible only when the vehicle is stationary with the engine idling.

HINT:

- This test can be conducted when the vehicle speed is 30 mph (50 km/h) or less.
- The 4th to 5th up-shifting must be performed with the accelerator pedal released.
- The 5th to 4th down-shifting must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position directed by the ECM is shown in the DATA LIST/ SHIFT display on the intelligent tester.
- The shift solenoid valve SR and S1 are turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th

Shift solenoid valve SR	OFF	OFF	OFF	OFF	ON
Shift solenoid valve SL1	OFF	OFF	OFF	OFF	ON

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

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

Result:

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

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

B → **GO TO DTC CHART**

A

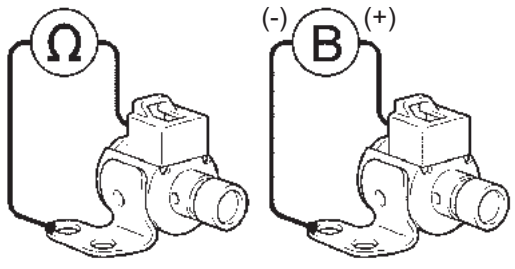
2 PERFORM ACTIVE TEST USING INTELLIGENT TESTER (LINE PRESS UP) (See page AT-82)

NG → **REPLACE SHIFT SOLENOID VALVE SLT**

OK

3 INSPECT SHIFT SOLENOID VALVE SR

Shift Solenoid Valve SR:



A110988E05

(a) Remove the shift solenoid valve SR.
(b) Measure the resistance.
Standard resistance

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

(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

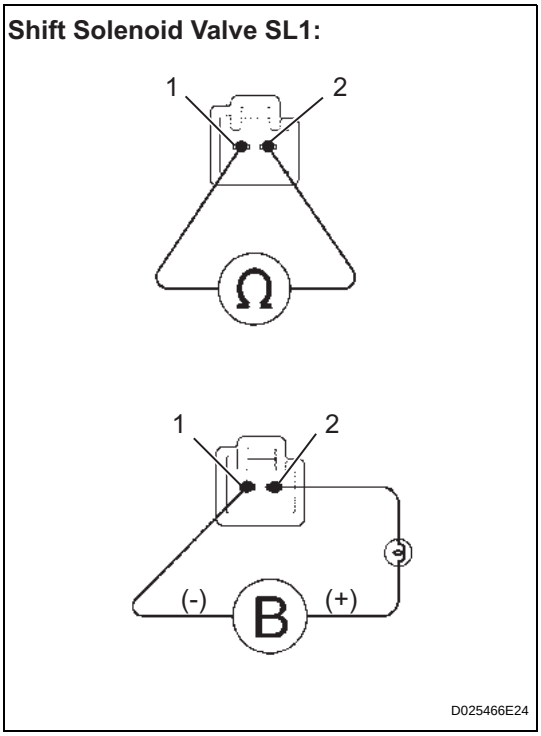
NG → **REPLACE SHIFT SOLENOID VALVE SR**

OK

AT

4	INSPECT SHIFT SOLENOID VALVE SL1

Shift Solenoid Valve SL1:



(a) Remove the shift solenoid valve SL1.
(b) Measure the resistance.
Standard resistance

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

(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**

OK

5	INSPECT TRANSMISSION VALVE BODY ASSEMBLY (See chapter 2 in the problem symptoms table)

OK:
There are no foreign objects on any valves and they operate smoothly.

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

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY

DTC	P0776	Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2)

DESCRIPTION

The ECM uses signals from the output shaft speed sensor and input speed sensor to detect the actual gear position (1st, 2nd, 3rd, 4th or 5th gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical problems of the shift solenoid valves, valve body or automatic transmission (clutch, brake or gear, etc.).

DTC No.	DTC Detection Conditions	Trouble Areas
P0776	SL2 stuck ON malfunction*1: The ECM determines that there is a malfunction when the following conditions are met (2-trip detection logic): (a) When the ECM directs the gearshift to switch to 4th gear, the actual gear is also shifted to 4th. (b) When the ECM directs the gearshift to switch to 5th gear, the engine overruns (clutch slips)	• Shift solenoid valve SL2 remains open • Shift solenoid valve SLT remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

HINT:
Gear positions in the event of a solenoid valve mechanical problem:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
*1: Actual gear position under SL2 stuck ON malfunction	1st	2nd	3rd	4th	N*

N*: Neutral

MONITOR DESCRIPTION

This DTC indicates "stuck ON malfunction" of the shift solenoid valve SL2.
The ECM controls the gearshifts by turning the shift solenoid valves "ON/OFF". When the gear position directed by the ECM and the actual gear position do not match, the ECM illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P0776: Shift solenoid valve SL2/ON malfunction
Required sensors/Components (Main)	Shift solenoid valve SL2
Required sensors/Components (Related)	Speed sensor (NT), Speed sensor (SP2), Crankshaft position sensor (NE)
Frequency of operation	Continuous
Duration	ON malfunctions (A), (B) and (C): 0.4 seconds ON malfunction (D): 3 seconds ON malfunction (E): 0.5 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The following conditions are common to all ON malfunctions (A), (B), (C), (D) and (E).

The monitor will run whenever the following DTCs are not present.	P0115 - P0118: ECT sensor P0125: Insufficient ECT for Closed Loop P0500: VSS P0748 - P0799: Trans solenoid (range)
Turbine speed sensor (NT) circuit	Functioning normally
Output speed sensor (SP2) circuit	Functioning normally
Shift solenoid "A" (S1) circuit	Functioning normally

Shift solenoid "B" (S2) circuit	Functioning normally
Shift solenoid "E" (SR) circuit	Functioning normally
Pressure control solenoid "A" (SL1) circuit	Functioning normally
Pressure control solenoid "B" (SL2) circuit	Functioning normally
ECT (Engine coolant temperature) sensor circuit	Functioning normally
Knock sensor circuit	Functioning normally
ETCS (Electronic throttle control system)	System not down
Transmission shift position	"D"
ECT	40°C (104°F) or more
Spark advance from max. retard timing by knock sensor control	0° CA or more
Engine	Starting
Transfer range	"High" *1

*1: Following conditions are met

Vehicle speed sensor "A" circuit	Functioning normally
Output speed sensor circuit	Functioning normally
Transfer output speed	143 rpm or more
Transfer input speed/Transfer output speed	0.9 to 1.1

ON malfunction (A)

ECM selected gear	1st
Vehicle speed	1.2 to 24.9 mph (2 to 40 km/h)
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

ON malfunction (B)

ECM selected gear	3rd
Vehicle speed	1.2 mph (2 km/h) or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

ON malfunction (C)

ECM selected gear	4th
Vehicle speed	1.2 mph (2 km/h) or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

ON malfunction (D)

Current ECM selected gear	5th
Last ECM selected gear	4th
Vehicle speed (During transition from 4th to 5th gear)	Less than 62.2 mph (100 km/h)

ON malfunction (E)

ECM selected gear	5th
Engine speed - Turbine speed (NE - NT) (After transition from 4th to 5th gear)	150 rpm or less
Vehicle speed (After transition from 4th to 5th gear)	Less than 62.2 mph (100 km/h)

TYPICAL MALFUNCTION THRESHOLDS

[ON malfunction]

Both of the following conditions are met:

- ON malfunctions (A) and (B), or ON malfunction (C)

- ON malfunction (D) or (E)

ON malfunction (A)

Turbine speed/Output speed	3.30 to 7.50 (Actual gear is 1st)

ON malfunction (B)

Turbine speed/Output speed	1.28 to 1.53 (Actual gear is 3rd)

ON malfunction (C)

Turbine speed/Output speed	0.93 to 1.07 (Actual gear is 4th)

ON malfunction (D)

Turbine speed - Output speed x 4th gear ratio	1,000 rpm or more

ON malfunction (E)

Turbine speed - Output speed x 5th gear ratio	1,000 rpm or more

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ SHIFT".
8. According to the display on the tester, perform the "ACTIVE TEST".

HINT:
While driving, the shift position can be changed with the intelligent tester.
Comparing the shift position directed by the ACTIVE TEST with the actual shift position enables the problem to be confirmed (See page AT-32).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position manually. [Vehicle Condition] Vehicle Speed: Less than 30 mph (50 km/h) [Others] • Press → button: Shift up • Press ← button: Shift down	Possible to check the operation of the shift solenoid valves. HINT: Shifting to the 5th gear is possible only when the vehicle is stationary with the engine idling.

HINT:

- This test can be conducted when the vehicle speed is 30 mph (50 km/h) or less.
- The 4th to 5th up-shifting must be performed with the accelerator pedal released.
- The 5th to 4th down-shifting must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position directed by the ECM is shown in the DATA LIST/ SHIFT display on the intelligent tester.
- The shift solenoid valve SL2 is turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
Shift solenoid valve SL2	ON	ON	ON	ON	OFF

AT

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

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

Result:

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

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

B → GO TO DTC CHART

A

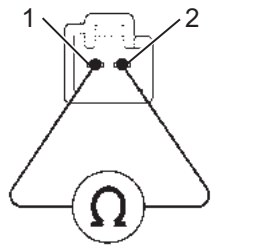
2	PERFORM ACTIVE TEST USING INTELLIGENT TESTER (LINE PRESS UP) (See page AT-82)

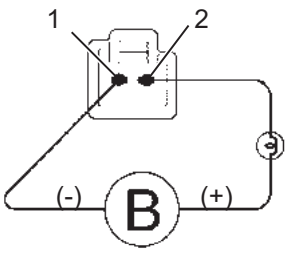
NG → REPLACE SHIFT SOLENOID VALVE SLT

OK

3	INSPECT SHIFT SOLENOID VALVE SL2

Shift Solenoid Valve SL2:





D025466E25

(a) Remove the shift solenoid valve SL2.
(b) Measure the resistance.
Standard resistance

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

(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

4	INSPECT TRANSMISSION VALVE BODY ASSEMBLY (See chapter 2 in the problem symptoms table)

OK:
There are no foreign objects on any valves and they operate smoothly.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY

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

DESCRIPTION

AT

Shifting from 1st to 5th is performed in combination with the ON and OFF operation of the shift solenoid valves S1, S2, SR, SL1 and SL2 which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be driven smoothly (See page AT-32).

DTC No.	DTC Detection Conditions	Trouble Areas
P0778	The ECM checks for an open or short in the shift solenoid valve SL2 circuit (1-trip detection logic): • Output signal duty equals 100 %. (NOTE: SL2 output signal duty is less than 100 % under normal conditions)	• Open or short in shift solenoid valve SL2 circuit • Shift solenoid valve SL2 • ECM

MONITOR DESCRIPTION

This DTC indicates an open or short in the shift solenoid valve SL2 circuit. The ECM controls the gearshift by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem, illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other functioning shift solenoid valves "ON/OFF". (If an open or short circuit is detected, the ECM cuts the current to the circuit.)
If the ECM detects an open or short in the shift solenoid valve SL2 circuit, the ECM determines that there is a malfunction (See page AT-32).

MONITOR STRATEGY

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

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	None
Battery voltage	10 V or more
CPU requested duty ratio to SL2	Less than 75 %
Ignition switch	ON
Starter	OFF

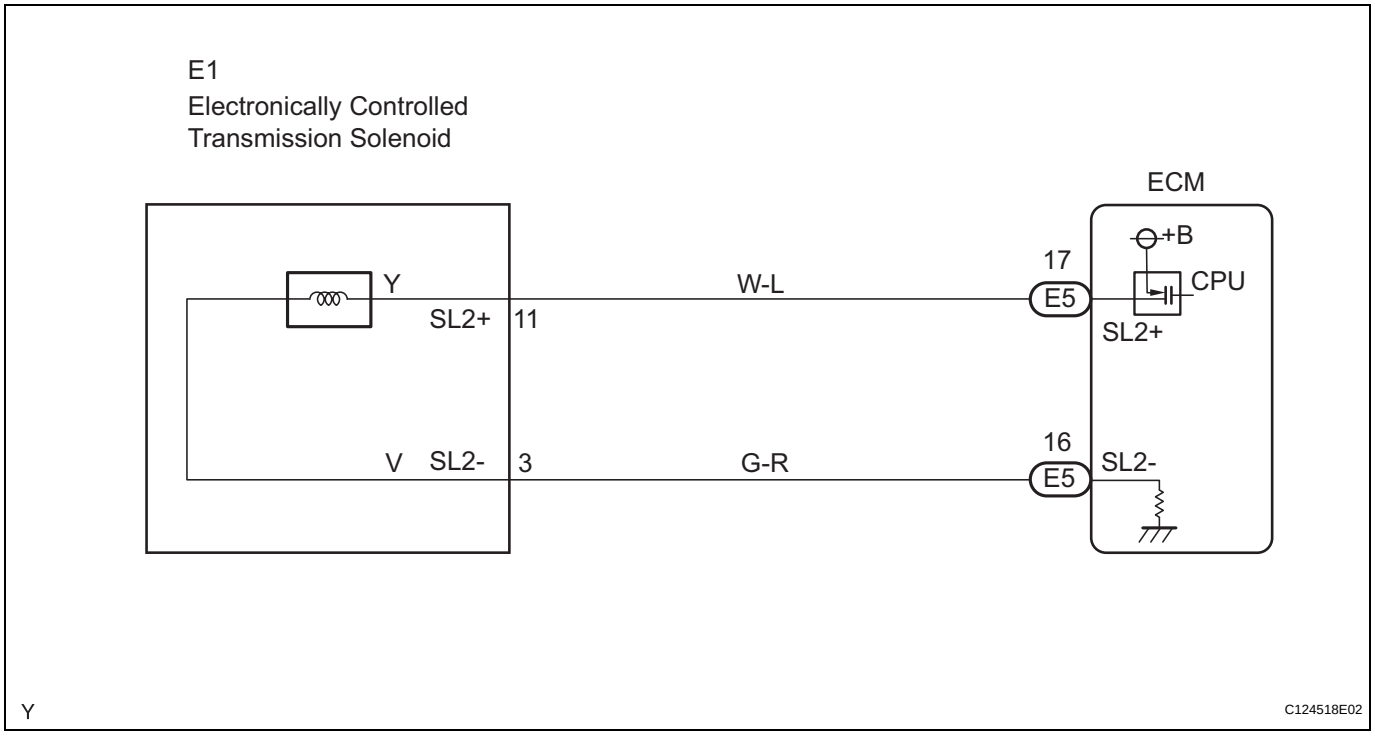
TYPICAL MALFUNCTION THRESHOLDS

Output signal duty	100 %

COMPONENT OPERATING RANGE

Output signal duty	Less than 100 %

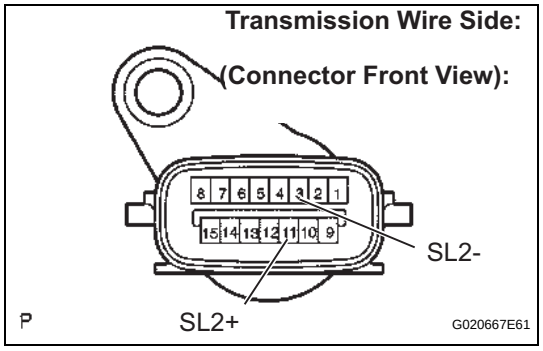
WIRING DIAGRAM



HINT:
The shift solenoid valve SL2 is turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
Shift solenoid valve SL2	ON	ON	ON	ON	OFF

1	INSPECT TRANSMISSION WIRE (SL2)



(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
11 (SL2+) - 3 (SL2-)	5.0 to 5.6 Ωat 20°C (68°F)

(c) Measure the resistance.
Standard resistance (Check for short):

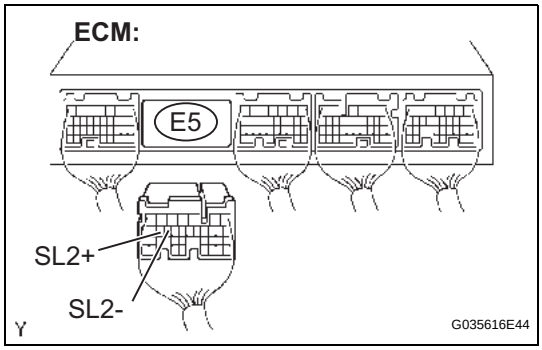
Tester Connection	Specified Condition
11 (SL2+) - Body ground	10 kΩ or higher
3 (SL2-) - Body ground	10 kΩ or higher

NG → **Go to step 3**

OK

AT

2 CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
E5-17 (SL2+) - E5-16 (SL2-)	5.0 to 5.6 Ω at 20°C (68°F)

(d) Measure the resistance.
Standard resistance (Check for short)

Tester Connection	Specified Condition
E5-17 (SL2+) - Body ground	10 kΩ or higher
E5-16 (SL2-) - Body ground	10 kΩ or higher

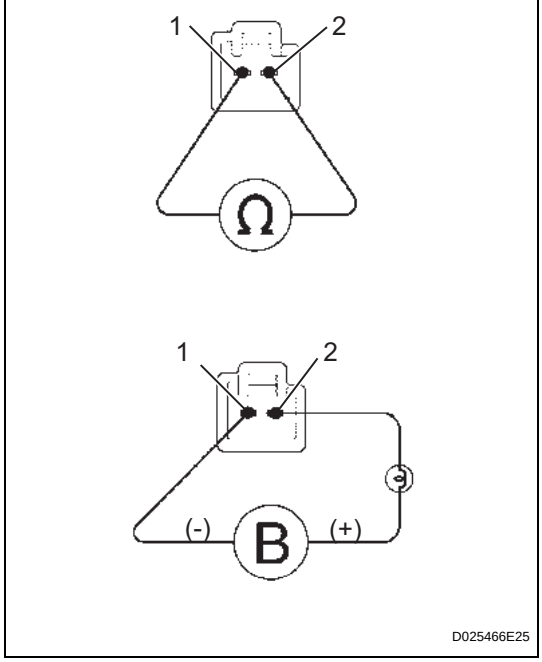
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE SL2

Shift Solenoid Valve SL2:



(a) Remove the shift solenoid valve SL2.
(b) Measure the resistance.
Standard resistance

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

(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.

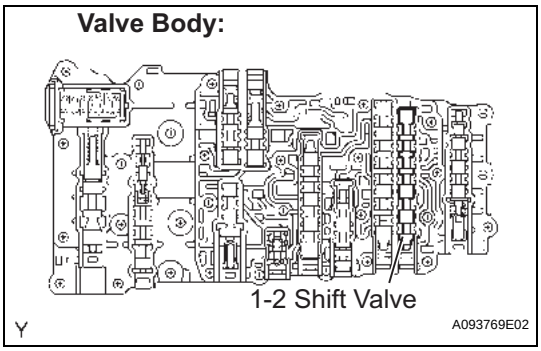
NG → **REPLACE SHIFT SOLENOID VALVE SL2**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P0781	1-2 Shift (1-2 Shift Valve)

DESCRIPTION



The 1-2 shift valve performs shifting to 1st gear and other gears.

DTC No.	DTC Detection Conditions	Trouble Areas
P0781	1-2 shift valve malfunction: The ECM determines that there is a malfunction when the following conditions (a) and (b), or (a) and (c) are met (2-trip detection logic): (a) When the ECM directs the gearshift to switch to 2nd gear, the actual gear is shifted to 1st. (b) When the ECM directs the gearshift to switch to 4th gear, the actual gear is shifted to 3rd. (c) When the ECM directs the gearshift to switch to 5th gear, the engine overruns (clutch slips)	• Valve body is blocked up or stuck (1-2 shift valve) • Shift solenoid valve SLT remains open or closed • Automatic transmission (clutch, brake or gear, etc.)

HINT:
Gear positions in the event of a 1-2 shift valve mechanical problem:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
Actual gear position under malfunction	1st	1st	3rd	3rd	N*

N*: Neutral

MONITOR DESCRIPTION

This DTC indicates that the 1-2 shift valve in the valve body is locked in the direction of the spring compression. The ECM controls the gearshifts by turning the shift solenoid valves "ON/OFF" and switching oil pressure to the valves in the valve body.
The ECM calculates the "actual" transmission gear by comparing the signals from the input speed sensor (NT) and the output speed sensor (SP2). The ECM can detect many mechanical problems in the shift solenoids, valve body, and the transmission clutches, brakes, and gears. If the ECM detects that the actual gear position and the commanded gear position are different, it will illuminate the MIL and store the DTC .

MONITOR STRATEGY

Related DTCs	P0781: Valve body/Rationality check
Required sensors/Components (Main)	Valve body
Required sensors/Components (Related)	Automatic transmission assembly, Speed sensor (NT), Speed sensor (SP2), Vehicle speed sensor, Throttle position sensor
Frequency of operation	Continuous
Duration	Conditions (A) and (B) 0.4 seconds Condition (C) 3 seconds Condition (D) 0.5 seconds
MIL operation	2 driving cycles

Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The following conditions are common to all Conditions (A), (B), (C) and (D).

The monitor will run whenever the following DTCs are not present.	P0115 - P0118: ECT sensor P0125: Insufficient ECT for Closed Loop P0500: VSS P0748 - P0799: Trans Solenoid (range)
Turbine speed sensor (NT) circuit	Functioning normally
Output speed sensor (SP2) circuit	Functioning normally
Shift solenoid "A" (S1) circuit	Functioning normally
Shift solenoid "B" (S2) circuit	Functioning normally
Shift solenoid "E" (SR) circuit	Functioning normally
Pressure control solenoid "A" (SL1) circuit	Functioning normally
Pressure control solenoid "B" (SL2) circuit	Functioning normally
ECT (Engine coolant temperature) sensor circuit	Functioning normally
Knock sensor circuit	Functioning normally
ETCS (Electronic throttle control system)	System not down
Transmission shift position	"D"
ECT	40°C (104°F) or more
Spark advance from max. retard timing by knock sensor control	0°CA or more
Engine	Starting
Transfer range	"High" *1

*1: Following conditions are met

Vehicle speed sensor "A" circuit	Functioning normally
Output speed sensor circuit	Functioning normally
Transfer output speed	143 rpm or more
Transfer input speed/Transfer output speed	0.9 to 1.1

Condition (A)

ECM selected gear	2nd
Vehicle speed	1.2 mph (2 km/h) or more
Output speed	2nd → 1st down shift point or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

Condition (B)

ECM selected gear	4th
Vehicle speed	1.2 mph (2 km/h) or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

Condition (C)

Current ECM selected gear	5th
Last ECM selected gear	4th
Vehicle speed (During transition from 4th to 5th gear)	Less than 62.2 mph (100 km/h)

Condition (D)

ECM selected gear	5th
Engine speed - Turbine speed (NE - NT) After transition from 4th to 5th gear)	150 rpm or less

Vehicle speed After transition from 4th to 5th gear)	Less than 62.2 mph (100 km/h)

TYPICAL MALFUNCTION THRESHOLDS

Condition (A) and Conditions (B), (C) or (D) are met:

AT

Condition (A)

Turbine speed/Output speed	3.30 to 7.50 (Actual gear is 1st)

Condition (B)

Turbine speed/Output speed	1.28 to 1.53 (Actual gear is 3rd)

Condition (C)

Turbine speed - Output speed x 4th gear ratio	1,000 rpm or more

Condition (D)

Turbine speed - Output speed x 5th gear ratio	1,000 rpm or more

1	CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P0781)

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the main switch ON.
(c) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

Result:

Display (DTC Output)	Proceed to
Only "P0781" is output	A
"P0781" and other DTCs	B

HINT:
If any codes besides "P0781" are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART**

A

2	PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT)

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch off.

3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ SHIFT".
8. According to the display on the tester, perform the "ACTIVE TEST".

HINT:
While driving, the shift position can be changed with the intelligent tester.
Comparing the shift position directed by the ACTIVE TEST with the actual shift position enables the problem to be confirmed (See page AT-32).

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position manually. [Vehicle Condition] Vehicle Speed: Less than 30 mph (50 km/h) [Others] • Press →button: Shift up • Press ←button: Shift down	Possible to check the operation of the shift solenoid valves. HINT: Shifting to the 5th gear is possible only when the vehicle is stationary with the engine idling.

HINT:
- This test can be conducted when the vehicle speed is 30 mph (50 km/h) or less.
- The 4th to 5th up-shifting must be performed with the accelerator pedal released.
- The 5th to 4th down-shifting must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position directed by the ECM is shown in the DATA LIST/ SHIFT display on the intelligent tester.
- Gear positions in the event of a solenoid valve mechanical problem:

Gearshift operated by tester	1st	2nd	3rd	4th	5th
Actual gear position under malfunction	1st	1st	3rd	3rd	N*

N*: Neutral

OK:

Gear position changes in accordance with the tester operation.

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

OK ↓

3	**PERFORM ACTIVE TEST USING INTELLIGENT TESTER (LINE PRESS UP) (See page AT-82)**

NG → **REPLACE SHIFT SOLENOID VALVE SLT**

OK

4	CLEAR DTC AND PERFORM RUNNING TEST

AT

(a) Clear the DTC, and check for the DTC again after conducting the "MONITOR DRIVE PATTERN FOR ECT TEST" (See page AT-19).

OK:

No DTC

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

OK

END

DTC	P0973	Shift Solenoid "A" Control Circuit Low (Shift Solenoid Valve S1)

DTC	P0974	Shift Solenoid "A" Control Circuit High (Shift Solenoid Valve S1)

DESCRIPTION

Shifting from 1st to 5th is performed in combination with the ON and OFF operation of the shift solenoid valves S1, S2, SR, SL1 and SL2 which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valve to allow the vehicle to be driven smoothly (See page AT-32).

DTC No.	DTC Detection Conditions	Trouble Areas
P0973	ECM detects short in solenoid valve S1 circuit 2 times when solenoid valve S1 is operated (1-trip detection logic)	• Short in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM
P0974	ECM detects open in solenoid valve S1 circuit 2 times when solenoid valve S1 is not operated (1-trip detection logic)	• Open in shift solenoid valve S1 circuit • Shift solenoid valve S1 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S1 circuit. When there is an open or short circuit in any shift solenoid valve circuits, the ECM detects the problem and illuminates the MIL and stores the DTC. When the shift solenoid valve S1 is on, if the resistance is 8 Ω or less, the ECM determines that there is a short malfunction in the shift solenoid valve S1 circuit.
When the shift solenoid valve S1 is off, if the resistance is 100 kΩ or more, the ECM determines that the shift solenoid valve S1 circuit is open (See page AT-32).

MONITOR STRATEGY

Related DTCs	P0973: Shift solenoid valve S1/Range check (Low resistance) P0974: Shift solenoid valve S1/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S1
Frequency of operation	Continuous
Duration	0.064 seconds
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0973: Range check (Low resistance)

The monitor will run whenever the following DTCs are not present.	None
Shift solenoid valve S1	ON

P0974: Range check (High resistance)

The monitor will run whenever the following DTCs are not present.	None
Shift solenoid valve S1	OFF

TYPICAL MALFUNCTION THRESHOLDS

P0973: Range check (Low resistance)

Shift solenoid valve S1 resistance	8 Ω or less

P0974: Range check (High resistance)

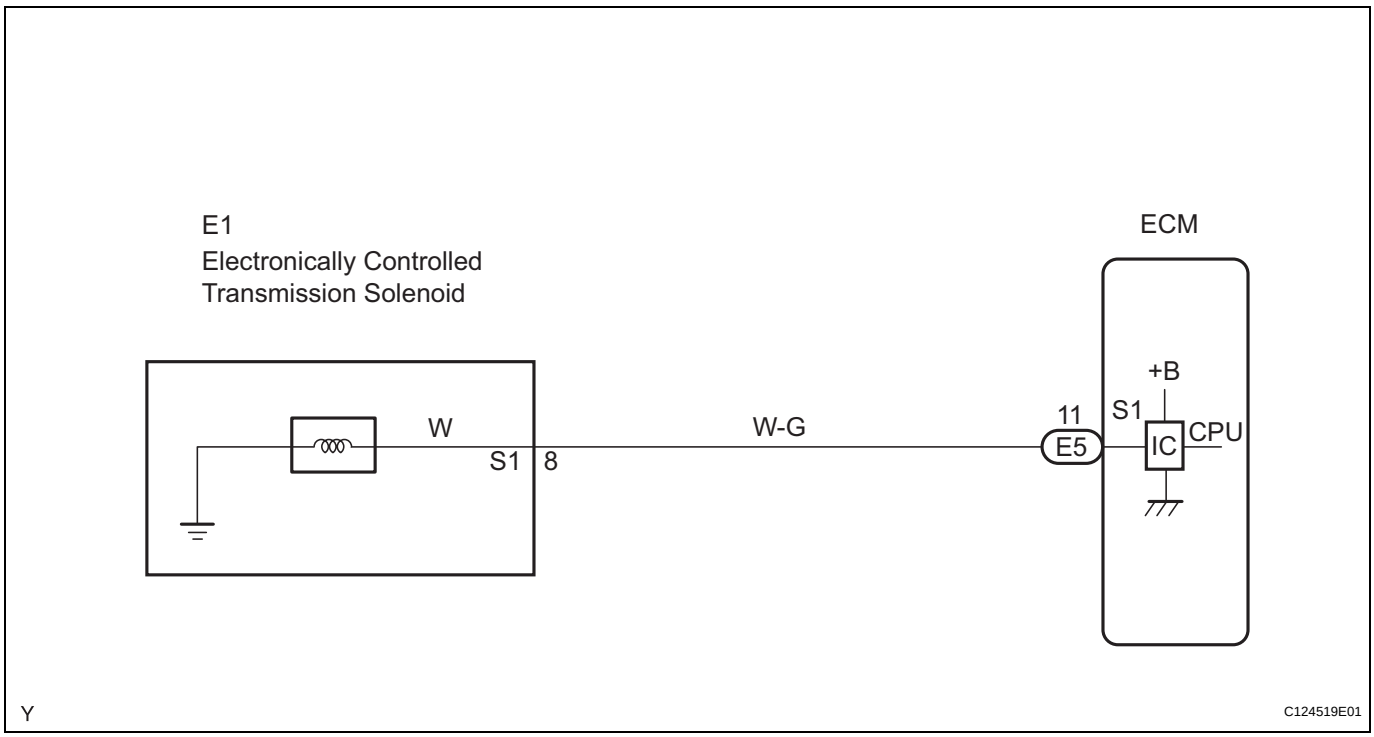
Shift solenoid valve S1 resistance	100 kΩ or more

COMPONENT OPERATING RANGE

Shift solenoid valve S1 resistance	11 to 15 Ω at 20°C (68°F)

AT

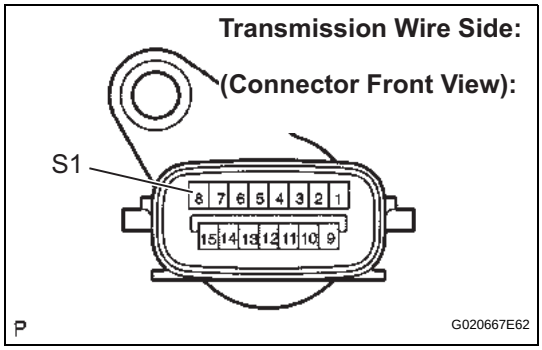
WIRING DIAGRAM



HINT:
The shift solenoid valve S1 is turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
Shift solenoid valve S1	ON	ON	OFF	OFF	OFF

1	INSPECT TRANSMISSION WIRE (S1)



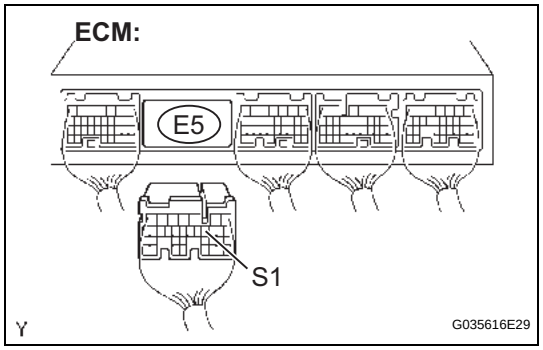
(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
Standard resistance

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

NG → **Go to step 3**

OK

2 CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
Standard resistance

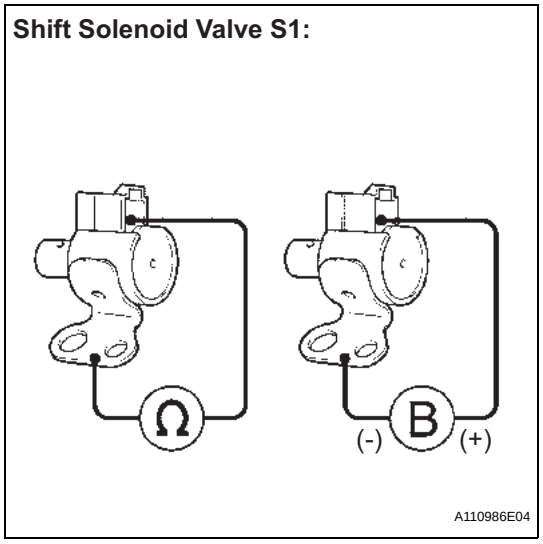
Tester Connection	Specified Condition
E5-11 (S1) - Body ground	11 to 15 Ω at 20°C (68°F)

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

OK

REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE S1



(a) Remove the shift solenoid valve S1.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
Solenoid Connector (S1) - Solenoid Body (S1)	11 to 15 Ω at 20°C (68°F)

(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 S1**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P0976	Shift Solenoid "B" Control Circuit Low (Shift Solenoid Valve S2)

DTC	P0977	Shift Solenoid "B" Control Circuit High (Shift Solenoid Valve S2)

AT

DESCRIPTION

Shifting from 1st to 5th is performed in combination with the ON and OFF operation of the shift solenoid valves S1, S2, SR, SL1 and SL2 which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valve to allow the vehicle to be driven smoothly (See page AT-32).

DTC No.	DTC Detection Conditions	Trouble Areas
P0976	ECM detects short in solenoid valve S2 circuit 2 times when solenoid valve S2 is operated (1-trip detection logic)	• Short in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM
P0977	ECM detects open in solenoid valve S2 circuit 2 times when solenoid valve S2 is not operated (1-trip detection logic)	• Open in shift solenoid valve S2 circuit • Shift solenoid valve S2 • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the shift solenoid valve S2 circuit. When there is an open or short circuit in any shift solenoid valve circuits, the ECM detects the problem and illuminates the MIL and stores the DTC. When the shift solenoid valve S2 is on, if the resistance is 8 Ω or less, the ECM determines that there is a short malfunction in the shift solenoid valve S2 circuit.
When the shift solenoid valve S2 is off, if the resistance is 100 kΩ or more, the ECM determines that the shift solenoid valve S2 circuit is open (See page AT-32).

MONITOR STRATEGY

Related DTCs	P0976: Shift solenoid valve S2/Range check (Low resistance) P0977: Shift solenoid valve S2/Range check (High resistance)
Required sensors/Components	Shift solenoid valve S2
Frequency of operation	Continuous
Duration	0.064 seconds
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0976: Range check (Low resistance)

The monitor will run whenever the following DTCs are not present.	None
Shift solenoid valve S2	ON

P0977: Range check (High resistance)

The monitor will run whenever the following DTCs are not present.	None
Shift solenoid valve S2	OFF

TYPICAL MALFUNCTION THRESHOLDS

P0976: Range check (Low resistance)

Shift solenoid valve S2 resistance	8 Ω or less

P0977: Range check (High resistance)

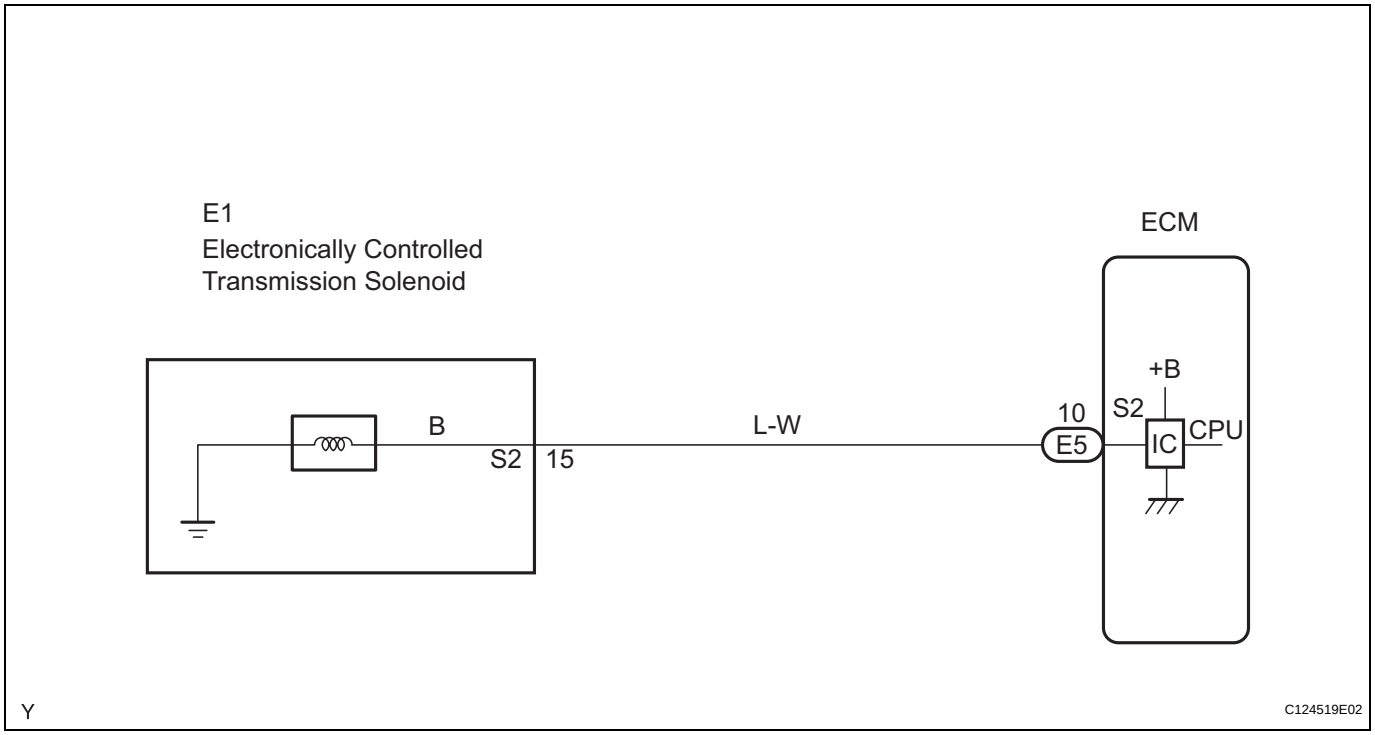
Shift solenoid valve S2 resistance	100 kΩ or more

COMPONENT OPERATING RANGE

Shift solenoid valve S2 resistance	11 to 15 Ω at 20°C (68°F)

AT

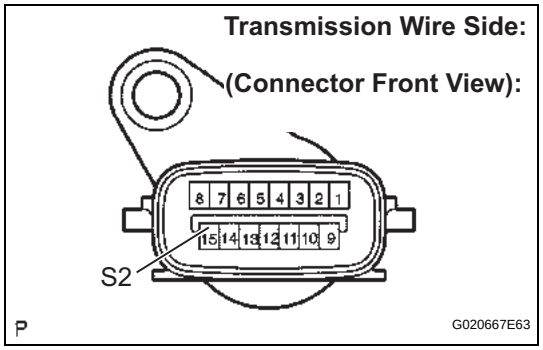
WIRING DIAGRAM



HINT:
The shift solenoid valve S2 is turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
Shift solenoid valve S2	OFF	ON	ON	OFF	OFF

1	INSPECT TRANSMISSION WIRE (S2)



(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
Standard resistance

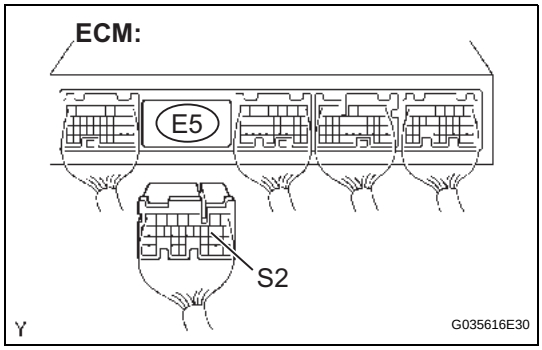
Tester Connection	Specified Condition
15 - Body ground	11 to 15 Ω at 20°C (68°F)

NG → **Go to step 3**

OK

AT

2	CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
Standard resistance

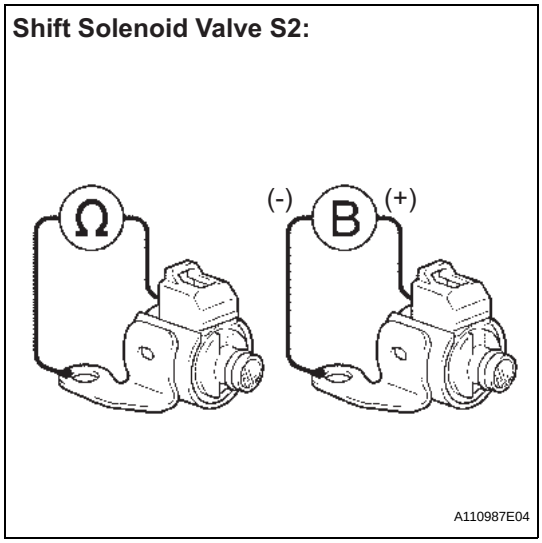
Tester Connection	Specified Condition
E5-10 (S2) - Body ground	11 to 15 Ω at 20°C (68°F)

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

OK

REPLACE ECM

3	INSPECT SHIFT SOLENOID VALVE S2



(a) Remove the shift solenoid valve S2.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
Solenoid Connector (S2) - Solenoid Body (S2)	11 to 15 Ω at 20°C (68°F)

(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 S2**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P0985	Shift Solenoid "E" Control Circuit Low (Shift Solenoid Valve SR)

DTC	P0986	Shift Solenoid "E" Control Circuit High (Shift Solenoid Valve SR)

DESCRIPTION

Shifting from 1st to 5th is performed in combination with the ON and OFF operation of the shift solenoid valves S1, S2, SR, SL1 and SL2 which are controlled by the ECM. If an open or short circuit occurs in any of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valves to allow the vehicle to be driven smoothly (See page AT-32).

DTC No.	DTC Detection Conditions	Trouble Areas
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

These DTCs indicate an open or short in the shift solenoid valve SR circuit. When there is an open or short circuit in any shift solenoid valve circuits, the ECM detects the problem and illuminates the MIL and stores the DTC. When the shift solenoid valve SR is on, if the resistance is 8 Ω or less, the ECM determines that there is a short malfunction in the shift solenoid valve SR circuit.
When the shift solenoid valve SR is off, if the resistance is 100 kΩ or more, the ECM determines that the shift solenoid valve SR circuit is open (See page AT-32).

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 seconds
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P0985: Range check (Low resistance)

The monitor will run whenever the following DTCs are 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 the following DTCs are not present.	None
Shift solenoid valve SR	OFF
Battery voltage	8 V or more
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

P0985: Range check (Low resistance)

Shift solenoid valve SR resistance	8 Ω or less

P0986: Range check (High resistance)

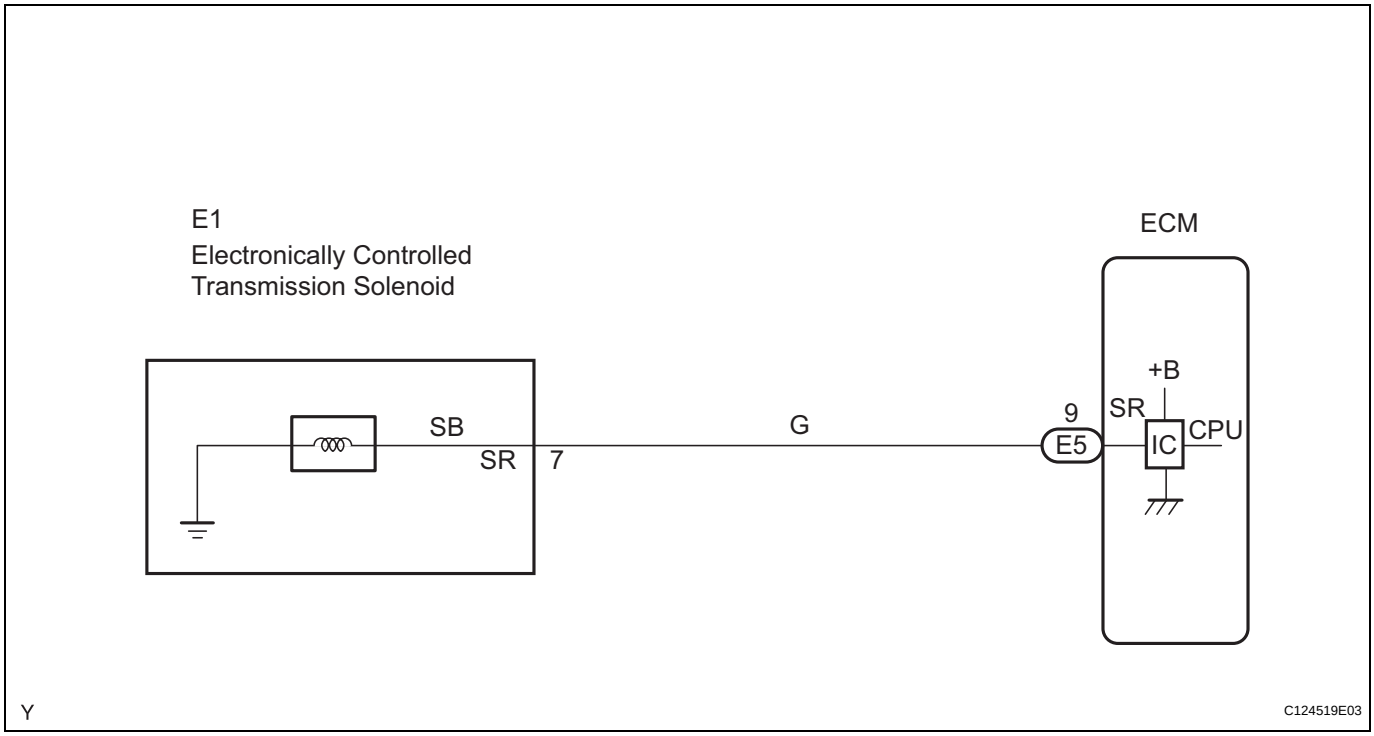
AT

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)

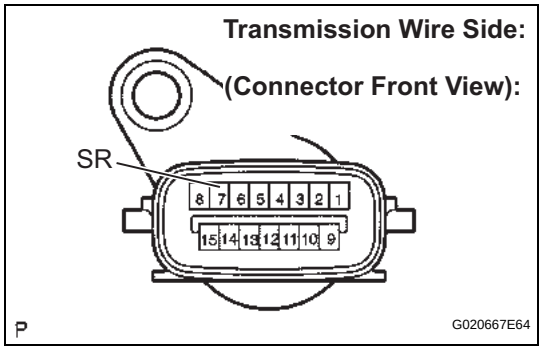
WIRING DIAGRAM



HINT:
The shift solenoid valve SR is turned on/off normally when the shift lever is in the D position:

Gearshift controlled by ECM	1st	2nd	3rd	4th	5th
Shift solenoid valve SR	OFF	OFF	OFF	OFF	ON

1	INSPECT TRANSMISSION WIRE (SR)



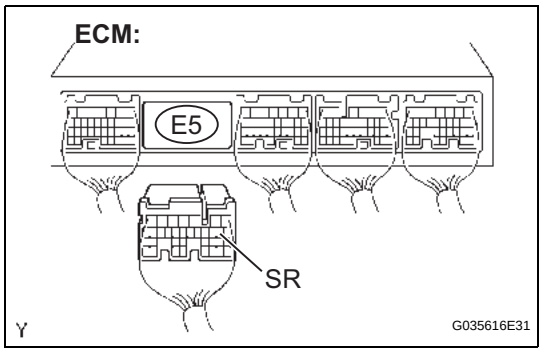
(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
Standard resistance

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

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
E5-9 (SR) - Body ground	11 to 15 Ω at 20°C (68°F)

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

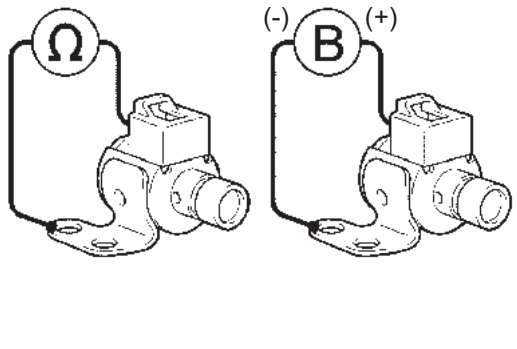
OK

REPLACE ECM

3	INSPECT SHIFT SOLENOID VALVE SR

AT

Shift Solenoid Valve SR:



A110988E05

(a) Remove the shift solenoid valve SR.
(b) Measure the resistance.
Standard resistance

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

(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.

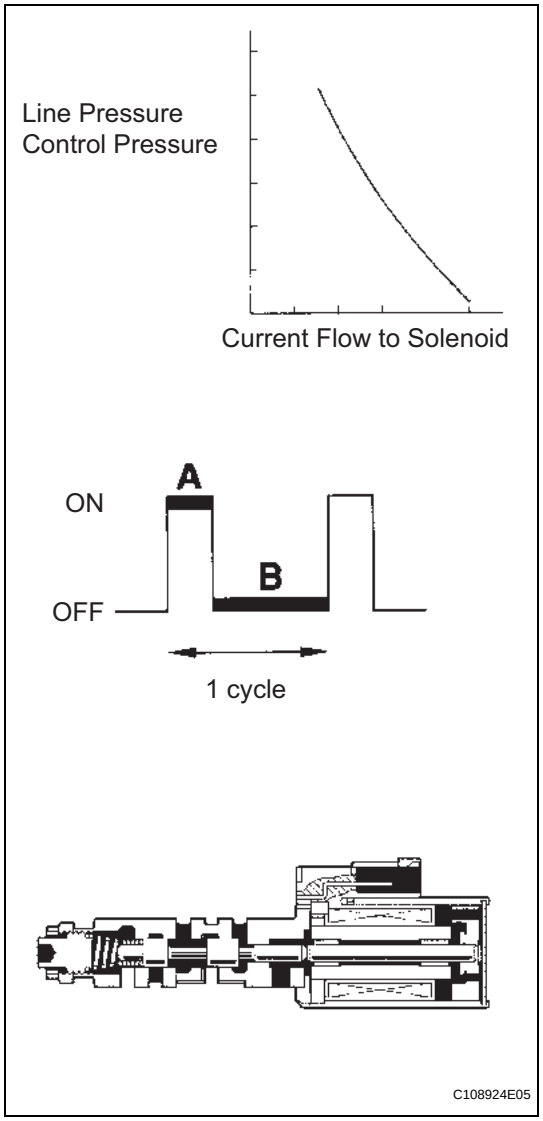
NG → **REPLACE SHIFT SOLENOID VALVE SR**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

DTC	P2714	Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT)

DESCRIPTION



The linear solenoid valve (SLT) controls the transmission line pressure for smooth transmission operation based on signals from the throttle position sensor and the vehicle speed sensor. The ECM adjusts the duty ratio* of the SLT solenoid valve output signal to control the hydraulic line pressure coming from the primary regulator valve. Appropriate line pressure assures smooth shifting with varying engine outputs.
*: 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
P2714	ECM detects malfunctions on SLT (ON side) according to the revolution difference between the turbine and the output shaft, and also by monitoring the oil pressure. (2 trip detection logic)	• Shift solenoid valve SLT remains open or closed • Shift solenoid valve S1, S2, SR, SL1 or SL2 remains open or closed • Valve body is blocked • Automatic transmission (clutch, brake or gear, etc.)

MONITOR DESCRIPTION

The ECM calculates the amount of heat absorbed by the friction material based on the difference in revolution (clutch slippage) between the turbine and output shaft. The ECM turns on the MIL and outputs this DTC when the amount of heat absorption exceeds the specified value.
When the shift solenoid valve SLT remains on, the oil pressure goes down and the clutch engagement force decreases.
NOTE: If driving continues under these conditions, the clutch will burn out and the vehicle will no longer be drivable.

MONITOR STRATEGY

Related DTCs	P2714 : Shift solenoid valve SLT/ON malfunction
Required sensors/Components (Main)	Shift solenoid valve SLT
Required sensors/Components (Related)	Valve body, ATF temperature sensor, Speed sensor (NT), Speed sensor (SP2)
Frequency of operation	Continuous
Duration	Immediate
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	None
Turbine speed sensor (NT) circuit	Functioning normally
Output speed sensor (SP2) circuit	Functioning normally
Transmission fluid temperature sensor "A" circuit	Functioning normally
Shift solenoid "A" (S1) circuit	Functioning normally
Shift solenoid "B" (S2) circuit	Functioning normally
Shift solenoid "E" (SR) circuit	Functioning normally
Pressure control solenoid "A" (SL1) circuit	Functioning normally
Pressure control solenoid "B" (SL2) circuit	Functioning normally
Pressure control solenoid "D" (SLT) circuit	Functioning normally
ECT (Engine coolant temperature) sensor circuit	Functioning normally
Knock sensor circuit	Functioning normally
ETCS (Electronic throttle control system)	System not down
Transmission shift position	"D"
ECT	40°C (104°F) or more
Spark advance from max. retard timing by knock sensor control	0° CA or more
Engine	Starting
Transfer range	"High"*1
ATF temperature	10°C (50°F) or more

*1: Following conditions are met

Vehicle speed sensor "A" circuit	Functioning normally
Output speed sensor circuit	Functioning normally
Transfer output speed	143 rpm or more
Transfer input speed/Transfer output speed	0.9 to 1.1

TYPICAL MALFUNCTION THRESHOLDS

Summation of C1 clutch heat generations = SUM (Turbine speed - Output speed x Temporary gear ratio)	Specified value

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ LINE PRESS UP".
8. According to the display on the tester, perform the "ACTIVE TEST".

Item	Test Details	Diagnostic Note
LINE PRESS UP *	[Test Details] Operate the shift solenoid SLT to 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)	-

*: "LINE PRESS UP" in the ACTIVE TEST is performed to check the line pressure changes by connecting SST to the automatic transmission, which is used in the HYDRAULIC TEST (See page AT-16) as well.

HINT:
- The pressure values in ACTIVE TEST and HYDRAULIC TEST are different from each other.
- Normally, the line pressure detected in the ACTIVE TEST is approximately half of the value detected in the HYDRAULIC TEST's stall test.

1	CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P2714)

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

Result:

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

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

B → GO TO DTC CHART

A

2	PERFORM ACTIVE TEST USING INTELLIGENT TESTER (LINE PRESS UP) (See page AT-82)

NG → Go to step 9

AT

OK

3	PERFORM ACTIVE TEST USING INTELLIGENT TESTER (SHIFT)

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch ON.
(c) Turn the intelligent tester ON.
(d) Clear the DTC (See page AT-31).
(e) Enter the following menus: DIAGNOSIS / ENHANCED OBD II / ACTIVE TEST.
(f) Follow the instructions on the tester and perform the ACTIVE TEST.

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

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set each shift position. [Vehicle Condition] • IDL: ON • Less than 30 mph (50 km/h) [Other information] • Press "→" button: Shift up • Press "←" button: Shift down	The operation of the shift solenoid valves can be checked.

HINT:
- This test can be conducted when the vehicle speed is 30 mph (50 km/h) or less.
- The 4th to 5th up-shift must be performed with the accelerator pedal released.
- The 5th to 4th down-shift must be performed with the accelerator pedal released.
- Do not operate the accelerator pedal for at least 2 seconds after shifting and do not shift successively.
- The shift position commanded by the ECM is shown in the DATA LIST (SHIFT) display on the intelligent tester.

(g) Compare the ECM gear shift command and the actual gear position.

ECM gear shift command			1st	2nd	3rd	4th	5th	Proceed to
Actual gear position under malfunction	Shift solenoid S1	Stuck ON	1st	2nd	2nd	1st	N*1	A
		Stuck OFF	4th	3rd	3rd	4th	5th	
	Shift solenoid S2	Stuck ON	2nd	2nd	3rd	3rd	N*1	B
		Stuck OFF	1st	1st	4th	4th	5th	
	Shift solenoid SL2	Stuck ON	1st	2nd	3rd	4th	N*1	C
		Stuck OFF	1st	2nd	3rd	4th	5th	
	Shift solenoid SR	Stuck ON*2	1st	2nd	3rd	4th	5th	D
		Stuck OFF	1st	2nd	3rd	4th	4th	

HINT:
- *1: Neutral
- *2: Shift shock increases extremely when a malfunction occurs.
- Gear shift can be determined by paying attention to changes in rpm.

B	Go to step 5
C	Go to step 6
D	Go to step 7
OK	Go to step 9

A

4	INSPECT SHIFT SOLENOID VALVE S1 (See page AT-111)

OK	Go to step 10

NG

REPLACE SHIFT SOLENOID VALVE S1

5	INSPECT SHIFT SOLENOID VALVE S2 (See page AT-114)

OK	Go to step 10

NG

REPLACE SHIFT SOLENOID VALVE S2

6	INSPECT SHIFT SOLENOID VALVE SL2 (See page AT-102)

OK	Go to step 10

NG

REPLACE SHIFT SOLENOID VALVE SL2

7	INSPECT SHIFT SOLENOID VALVE SR (See page AT-118)

NG	REPLACE SHIFT SOLENOID VALVE SR

OK

8	INSPECT SHIFT SOLENOID VALVE SL1 (See page AT-77)

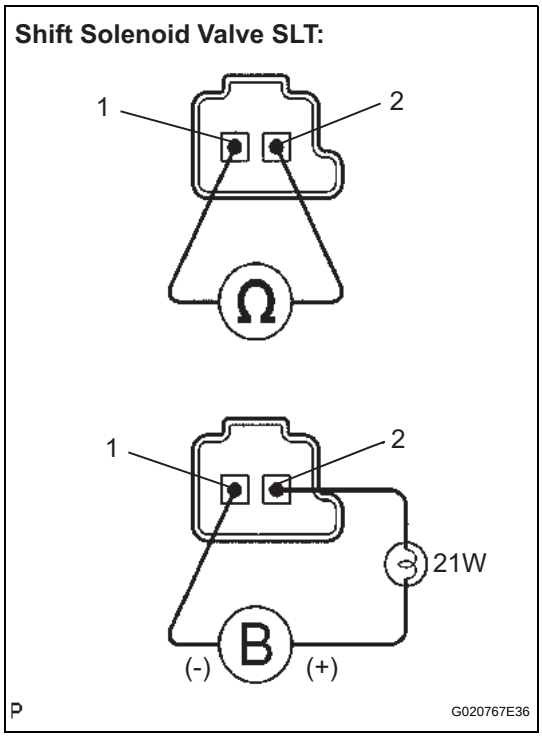
AT

OK → Go to step 10

NG

REPLACE SHIFT SOLENOID VALVE SL1

9	INSPECT SHIFT SOLENOID VALVE SLT



(a) Remove the shift solenoid valve SLT.
(b) Measure the resistance.
Standard resistance

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

(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

10	INSPECT TRANSMISSION VALVE BODY ASSEMBLY (See chapter 2 in the problem symptoms table)

OK:
There are no foreign objects on any valves and they operate smoothly.

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY

OK

11	INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

(a) Check the torque converter clutch assembly (See page AT-169).

OK:

The torque converter clutch operates normally.

NG → **REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY**

OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY

DTC	P2716	Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT)

DESCRIPTION

Refer to DTC P2714 (See page AT-111).

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

MONITOR DESCRIPTION

When an open or short is detected in the linear solenoid valve (SLT) circuit, the ECM interprets this as a fault.
The ECM turns on the MIL and stores 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 second
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	None
Battery voltage	10 V or more
CPU requested duty ratio to SLT	Less than 75 %
Ignition switch	ON
Starter	OFF

TYPICAL MALFUNCTION THRESHOLDS

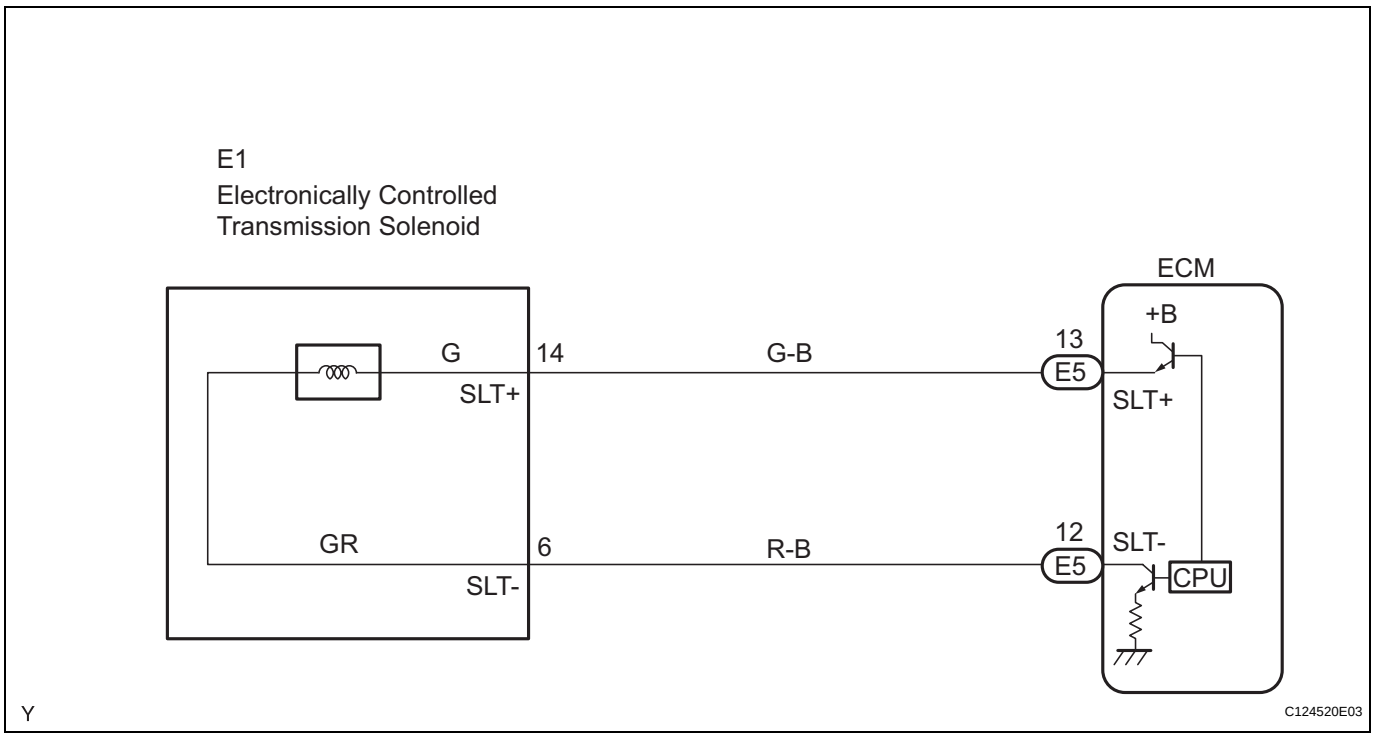
Output signal duty	100 %

COMPONENT OPERATING RANGE

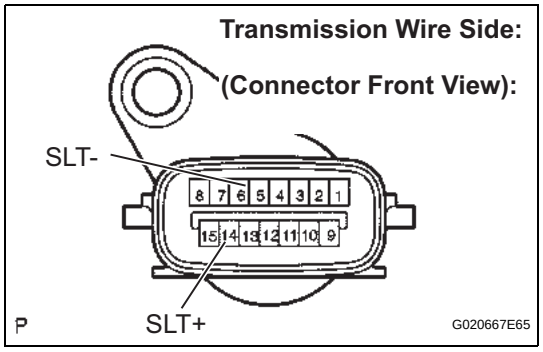
Output signal duty ratio	Less than 100 %

AT

WIRING DIAGRAM



1	INSPECT TRANSMISSION WIRE (SLT)



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

(b) Measure the resistance.

Standard resistance

Tester Connection	Specified Condition
14 (SLT+) - 6 (SLT-)	5.0 to 5.6 Ω at 20°C (68°F)

(c) Measure the resistance.

Standard resistance (Check for short)

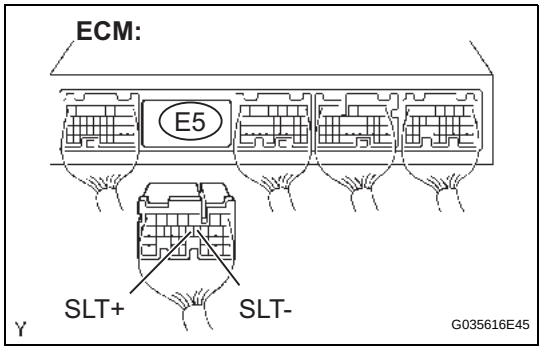
Tester Connection	Specified Condition
14 (SLT+) - Body ground	10 kΩ or higher
6 (SLT-) - Body ground	10 kΩ or higher

NG → **Go to step 3**

OK

AT

2 CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
E5-13 (SLT+) - E5-12 (SLT-)	5.0 to 5.6 Ω at 20°C (68°F)

(d) Measure the resistance.
Standard resistance (Check for short)

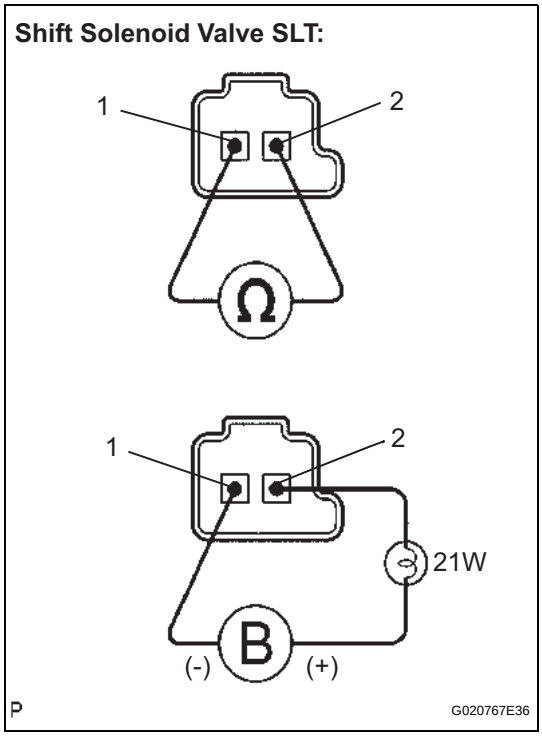
Tester Connection	Specified Condition
E5-13 (SLT+) - Body ground	10 kΩ or higher
E5-12 (SLT-) - Body ground	10 kΩ or higher

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

OK

REPLACE ECM

3 INSPECT SHIFT SOLENOID VALVE SLT



(a) Remove the shift solenoid valve SLT.
(b) Measure the resistance.
Standard resistance

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

(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

DTC	P2740	Transmission Fluid Temperature Sensor "B" Circuit

DTC	P2742	Transmission Fluid Temperature Sensor "B" Circuit Low Input

DTC	P2743	Transmission Fluid Temperature Sensor "B" Circuit High Input

AT

DESCRIPTION

The No. 2 Automatic Transmission Fluid (ATF) temperature sensor is on the transmission, just before the oil cooler inlet pipeline.

If the ECM detects an abnormally high ATF temperature through this sensor, it illuminates the warning light to indicate the problem to the driver.

HINT:

- The ATF temperature is liable to increase under vehicle conditions such as towing, climbing hills and in traffic.
- If there is a short malfunction in the No. 2 ATF temperature sensor, the ECM receives signals from the sensor, which indicate that the ATF temperature is 150°C (302°F) or more.

The symptoms and recovery conditions, when the sensor is normal or there is a short malfunction in the sensor, are as shown in the table below.

No.2 ATF Temperature Sensor Status	Detection Condition	Symptom	Recovery Condition
Sensor is normal	• ATF temperature more than 150°C (302°F)	• ATF temperature warning light remains on	• ATF temperature less than 135°C (275°F) *2
	• ATF temperature more than 130°C (266°F)	• Shift point too high	• ATF temperature less than 110°C (230°F)
	When the conditions (a) and (b) are satisfied continually (a) ATF temperature more than130°C (266°F) (b) Engine coolant temperature more than 95°C (203°F)	• Lock-up in 3rd gear *1	• ATF temperature less than 110°C (230°F) *2 and engine coolant temperature less than 95°C (203°F)
Sensor is short	• Any conditions	• ATF temperature warning light remains on • Shift point too high	• Symptoms still occur
	• Engine coolant temperature more than 95°C (203°F)	• Lock-up in 3rd gear *1	• Symptom still occurs

HINT:

*1: When the ATF temperature is normal, the transmission locks up in 5th gear with the shift lever in the D position and in 4th gear with the shift lever in the 4th position.

*2: When the ATF temperature is in the normal range, it decreases to less than 135°C (275°F) within 5 minutes of the shift lever being moved to the P or N position, while idling.

DTC No.	DTC Detection Conditions	Trouble Areas
P2740	Conditions (a) and (b) are detected momentarily within 0.5 seconds when neither P2742 nor P2743 is detected (1-trip detection logic) (a) No. 2 ATF temperature sensor resistance (voltage) is less than 25 Ω (0.046 V) (b) No. 2 ATF temperature sensor resistance (voltage) is more than 156 kΩ (4.915 V) HINT: Within 0.5 seconds the malfunction changes from (a) to (b) or (b) to (a)	• Open or short in No.2 ATF temperature sensor circuit • No.2 ATF temperature sensor • ECM

DTC No.	DTC Detection Conditions	Trouble Areas
P2742	No. 2 ATF temperature sensor resistance (voltage) is less than 25 Ω (0.046 V) for 0.5 seconds or more (1-trip detection logic)	• Short in No.2 ATF temperature sensor circuit • No.2 ATF temperature sensor • ECM
P2743	No. 2 ATF temperature sensor resistance (voltage) is more than 156 kΩ (4.915 V) for 0.5 seconds or more 15 minutes or more after starting engine (1-tip detection logic)	• Open in No.2 ATF temperature sensor circuit • No.2 ATF temperature sensor • ECM

MONITOR DESCRIPTION

These DTCs indicate an open or short in the No. 2 Automatic Transmission Fluid (ATF) temperature sensor circuit. The No. 2 ATF temperature sensor converts the ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and detects any open or short malfunctions in the No. 2 ATF temperature sensor circuit. If the resistance (voltage) of the No. 2 ATF temperature sensor is less than 25 Ω (0.046 V) or more than 156 kΩ (4.915 V), the ECM interprets this as a fault in the No. 2 ATF temperature sensor or its wiring. The ECM turns on the MIL and stores a DTC.

MONITOR STRATEGY

Related DTCs	P2740 : No. 2 ATF temperature sensor/Range check (Fluttering) P2742 : No. 2 ATF temperature sensor/Range check (Low voltage) P2743 : No. 2 ATF temperature sensor/Range check (High voltage)
Required sensors/Components	No. 2 ATF temperature sensor
Frequency of operation	Continuous
Duration	0.5 seconds
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

P2740: Range check (Fluttering)

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

P2742: Range check (Low voltage)

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

P2743: Range check (High voltage)

The monitor will run whenever the following DTCs are not present.	None
Time after engine start	15 minutes or more

TYPICAL MALFUNCTION THRESHOLDS

P2740: Range check (Fluttering)

No. 2 ATF temperature sensor voltage	Less than 0.046 V or More than 4.915 V

P2742: Range check (Low voltage)

No. 2 ATF temperature sensor voltage	Less than 0.046 V

P2743: Range check (High voltage)

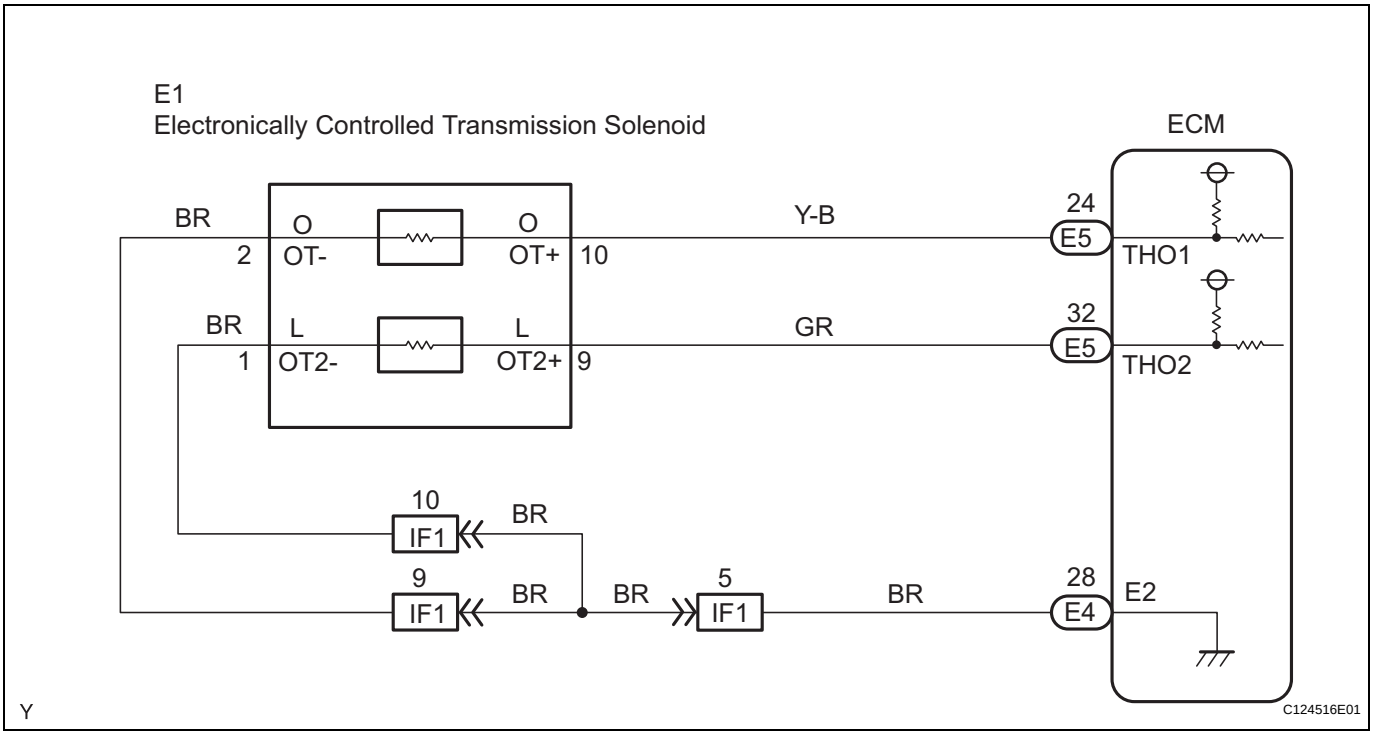
No. 2 ATF temperature sensor voltage	More than 4.915 V

COMPONENT OPERATING RANGE

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

WIRING DIAGRAM

AT



HINT:
According to the DATA LIST displayed on the intelligent tester, you can read the values of components, such as the switches, sensors, actuators, without removing any parts. Reading the DATA LIST as a first step of troubleshooting is one method of shortening labor time.

NOTICE:

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

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Select the items "DIAGNOSIS/ ENHANCED OBD II/ DATA LIST"/ A/T.
7. According to the display on the tester, read the "DATA LIST".

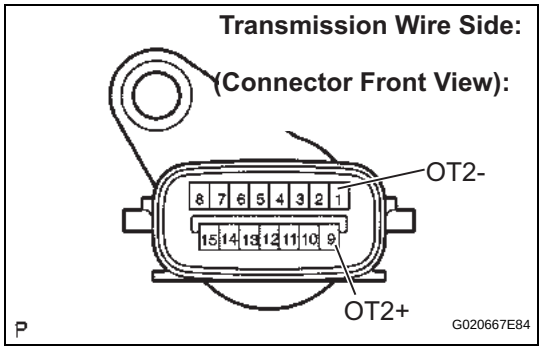
Item	Measurement Item/ Range (display)	Normal Condition
AT OIL TEMP2	No. 2 ATF Temperature Sensor Value/ min.: -40°C (-40°F) max.: 215°C (419°F)	• After Stall Test: Approximately 80°C (176°F) • Equal to ambient temperature during cold soak

HINT:
When DTC P2742 is output and intelligent tester reading is 150°C (302°F) or more, there is a short circuit.
When DTC P2743 is output and intelligent tester reading is -40°C (-40°F), there is an open circuit.

Measure the resistance between terminal THO2 (OT2) and the body ground.

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

1 INSPECT TRANSMISSION WIRE (NO.2 ATF TEMPERATURE SENSOR)



(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
1 (OT2-) - 9 (OT2+)	79 Ω to 156 kΩ

(c) Measure the resistance.
Standard resistance (Check for short)

Tester Connection	Specified Condition
1 (OT2-) - Body ground	10 kΩ or higher
9 (OT2+) - Body ground	10 kΩ or higher

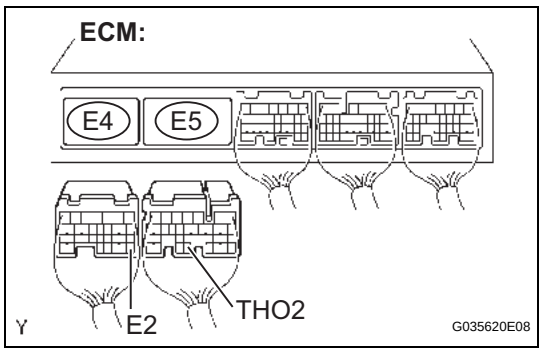
HINT:
If the resistance is out of the specified range with either the ATF temperature shown in the table below, the driveability of the vehicle may decrease.

ATF Temperature	Specified Condition
20°C (68°F)	3 to 4 kΩ
110°C (230°F)	0.22 to 0.28 kΩ

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

OK

2 CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connectors.
(c) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
E5-32 (THO2) - E4-28 (E2)	79 Ω to 156 kΩ

(d) Measure the resistance.
Standard resistance (Check for short)

Tester Connection	Specified Condition
E5-32 (THO2) - Body ground	10 kΩ or higher
E4-28 (E2) - Body ground	10 kΩ or higher

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

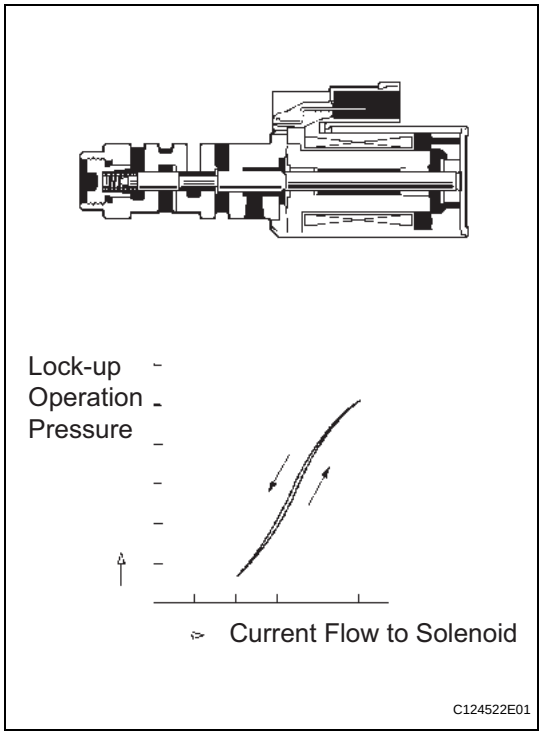
OK

AT

REPLACE ECM

DTC	P2757	Torque Converter Clutch Pressure Control Solenoid Performance (Shift Solenoid Valve SLU)

DESCRIPTION



The ECM uses the signals from the throttle position sensor, mass air flow meter, turbine (input) speed sensor, output 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 any mechanical problems with the shift solenoid valve SLU, valve body or torque converter clutch.

DTC No.	DTC Detection Conditions	Trouble Areas
P2757	Lock-up does not occur when driving in the lock-up range (normal driving at 50 mph [80 km/h]), or lock-up remains ON in the lock-up OFF range. (2-trip detection logic)	• Shift solenoid valve SLU remains open or closed • Valve body is blocked • Shift solenoid valve SLU • Torque converter clutch • Automatic transmission (clutch, brake or gear, etc.) • Line pressure is too low

MONITOR DESCRIPTION

Torque converter lock-up is controlled by the ECM based on turbine (input) speed sensor NT, output speed sensor SP2, engine rpm, engine load, engine coolant temperature, vehicle speed, transmission fluid temperature, and gear selection. The ECM determines the lock-up status of the torque converter by comparing the engine rpm (NE) with the input turbine rpm (NT). The ECM calculates the actual transmission gear by comparing input turbine rpm (NT) with output shaft rpm (SP2). When the conditions are appropriate, the ECM requests "lock-up" by applying the control voltage to the shift solenoid SLU. When the SLU is turned on, solenoid SLU 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 SLU or lock-up system performance. The ECM turns on the MIL and stores the DTC.

Example:
When any of the following are met, the ECM interprets it as a malfunction.
1. There is a difference in rotation between before and after the torque converter even when the ECM requests lock-up.
   (Engine speed is at least 70 rpm greater than the input turbine speed.)
2. There is no difference in rotation between before and after the torque converter even when the ECM requests lock-up off.
   (The difference between the engine speed and input turbine speed is less than 35 rpm.)

MONITOR STRATEGY

Related DTCs	P2757: Shift solenoid valve SLU/OFF malfunction Shift solenoid valve SLU/ON malfunction
Required sensors/Components (Main)	Shift solenoid valve SLU
Required sensors/Components (Related)	Valve body, Vehicle speed sensor, Throttle position sensor, Speed sensor (NT), Speed sensor (SP2)
Frequency of operation	Continuous
Duration	OFF malfunction (A): 2 seconds OFF malfunction (B): 0.4 seconds ON malfunction: 1.8 seconds
MIL operation	2 driving cycles
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The following conditions are common to all OFF malfunctions (A), (B) and ON malfunction.

The monitor will run whenever the following DTCs are not present.	None
Turbine speed sensor (NT) circuit	Functioning normally
Output speed sensor (SP2) circuit	Functioning normally
Shift solenoid "A" (S1) circuit	Functioning normally
Shift solenoid "B" (S2) circuit	Functioning normally
Shift solenoid "E" (SR) circuit	Functioning normally
Torque converter clutch pressure control solenoid circuit	Functioning normally
Knock sensor circuit	Functioning normally
ETCS (Electronic throttle control system)	System not down
Transmission shift position	"D"
ECT	40°C (104°F) or more
Spark advance from max. retard timing by knock sensor control	0° CA or more
Engine	Starting
ECM selected gear	4th or 5th
Vehicle speed	15.5 mph (25 km/h) or more
Shift solenoid "A" (S1) circuit	Functioning normally
Shift solenoid "B" (S2) circuit	Functioning normally
Pressure control solenoid "B" (SL2) circuit	Functioning normally
1-2 shift valve	Functioning normally
Transfer neutral position switch	OFF
Transfer range	"High" *1

*1: Following conditions are met

Vehicle speed sensor "A" circuit	Functioning normally

Output speed sensor circuit	Functioning normally
Transfer output speed	143 rpm or more
Transfer input speed/Transfer output speed	0.9 to 1.1

OFF malfunction (A)

ECM lock-up request	ON (SLU pressure: 513 kPa or more)
Vehicle speed	Less than 62.2 mph (100 km/h)

OFF malfunction (B)

ECM selected gear	2nd
Vehicle speed	1.2 mph (2 km/h) or more
Output speed	2nd → 1st down shift point or more
Throttle valve opening angle	6.5 % or more at engine speed of 2,000 rpm (Conditions vary with engine speed)

ON malfunction

ECM lock-up request	OFF (SLU pressure: less than 4 kPa)
Throttle valve opening angle	7 % or more
Vehicle speed	Less than 37.3 mph (60 km/h)

TYPICAL MALFUNCTION THRESHOLDS

Both of the following conditions are met: OFF malfunction (A) and (B)

OFF malfunction (A)

Engine speed - Turbine speed	70 rpm or more

OFF malfunction (B)

Turbine speed/Output speed	Not 3.3 to 7.50

ON malfunction
2 detections are necessary in 1 driving cycle.
1st detection; temporary flag ON
2nd detection; pending fault code ON
Vehicle speed must be under 6.2 mph (10 km/h) once before the 2nd detection.

Difference between engine speed and turbine speed	Less than 35 rpm

HINT:
Performing the ACTIVE TEST using the intelligent tester allows components, such as, the relay, VSV, and actuator, to be operated without removing any parts. Performing the ACTIVE TEST as a first step of troubleshooting is one method of shortening labor time.
It is possible to display the DATA LIST during the ACTIVE TEST.

1. Warm up the engine.
2. Turn the ignition switch off.
3. Connect the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
4. Turn the ignition switch to the ON position.
5. Push the "ON" button of the tester.
6. Clear the DTC.
7. Select the items "DIAGNOSIS/ ENHANCED OBD II/ ACTIVE TEST/ LOCK UP".

8. According to the display on the tester, perform the "ACTIVE TEST".

Item	Test Details	Diagnostic Note
LOCK UP	[Test Details] Control the shift solenoid SLU to set the automatic transmission to the lock-up condition. [Vehicle Condition] Vehicle Speed: 36 mph (60 km/h) or more	Possible to check the SLU operation.

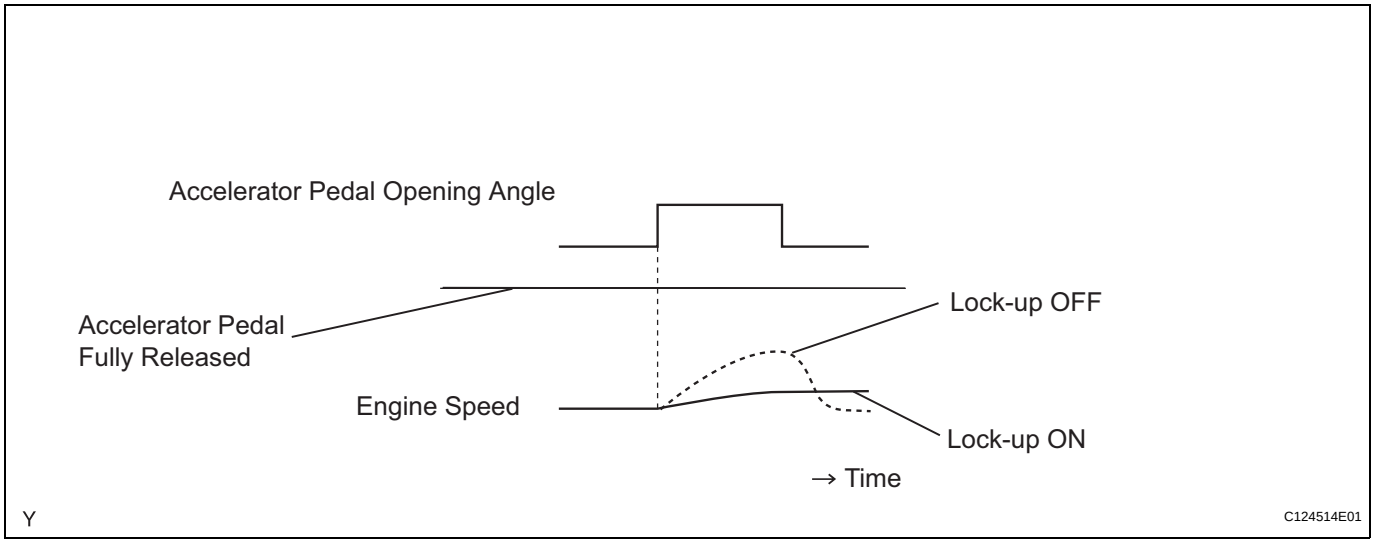
AT

HINT:
This test can be conducted when the vehicle speed is 36 mph (60 km/h) or more.

9. 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 causes closure of the throttle valve and lock-up may be turned off automatically.)



1	CHECK ANY OTHER DTCS OUTPUT (IN ADDITION TO DTC P2757)

(a) Connect the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the intelligent tester main switch ON.
(c) Select the items "DIAGNOSIS/ ENHANCED OBD II/ DTC INFO/ CURRENT CODES".
(d) Read the DTCs using the intelligent tester.

Result:

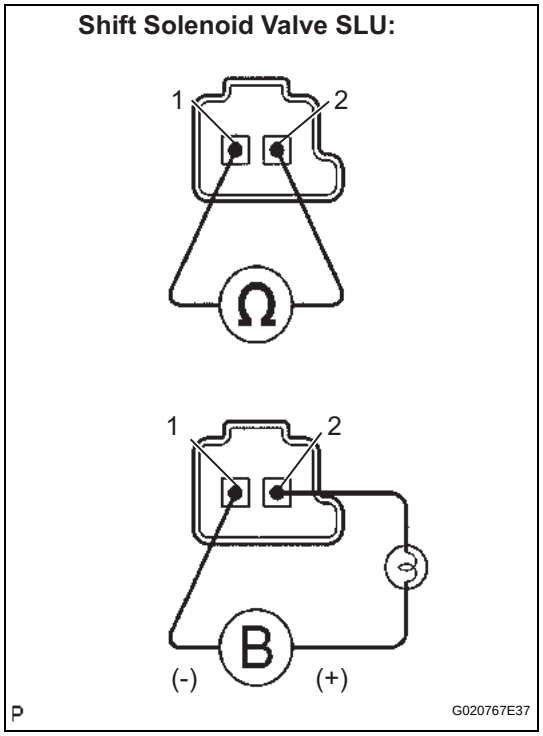
Display (DTC Output)	Proceed to
Only "P2757" is output	A
P2757" and other DTCs	B

HINT:
If any codes besides "P2757" are output, perform troubleshooting for those DTCs first.

B → **GO TO DTC CHART**

A

2	INSPECT SHIFT SOLENOID VALVE SLU



(a) Remove the shift solenoid valve SLU.
(b) Measure the resistance.
Standard resistance

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

(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 SLU**

OK

3	INSPECT TRANSMISSION VALVE BODY ASSEMBLY (See chapter 2 in the problem symptoms table)

OK:
There are no foreign objects on any valves and they operate smoothly.

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

OK

4	INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

(a) Inspect the torque converter clutch assembly (See page AT-169).
OK:
The torque converter clutch operates normally.

NG → **REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY**

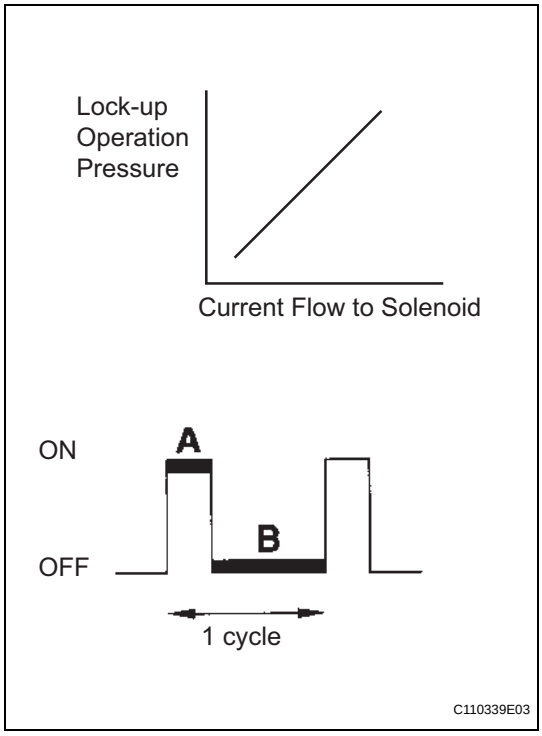
OK

REPAIR OR REPLACE AUTOMATIC TRANSMISSION ASSEMBLY

DTC	P2759	Torque Converter Clutch Pressure Control Solenoid Control Circuit Electrical (Shift Solenoid Valve SLU)

AT

DESCRIPTION



The current flow to the solenoid is controlled by the duty ratio* of the ECM output signal. The higher the duty ratio becomes, the higher the lock-up hydraulic pressure becomes during the lock-up operation.
*: 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 Conditions	Trouble Areas
P2759	Open or short is detected in shift solenoid valve SLU circuit for 1 second or more while driving (1-trip detection logic)	• Open or short in shift solenoid valve SLU circuit • Shift solenoid valve SLU • ECM

MONITOR DESCRIPTION

When an open or short is detected in the shift solenoid valve (SLU) circuit, the ECM determines that there is a malfunction. The ECM turns on the MIL and stores this DTC.

MONITOR STRATEGY

Related DTCs	P2759: Shift solenoid valve SLU/Range check
Required sensors/Components	Shift solenoid valve SLU
Frequency of operation	Continuous
Duration	1 second
MIL operation	Immediate
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The monitor will run whenever the following DTCs are not present.	None
Battery voltage	10 V or more
CPU requested duty ratio to SLU	75 % or more
Ignition switch	ON
Starter	OFF

AT

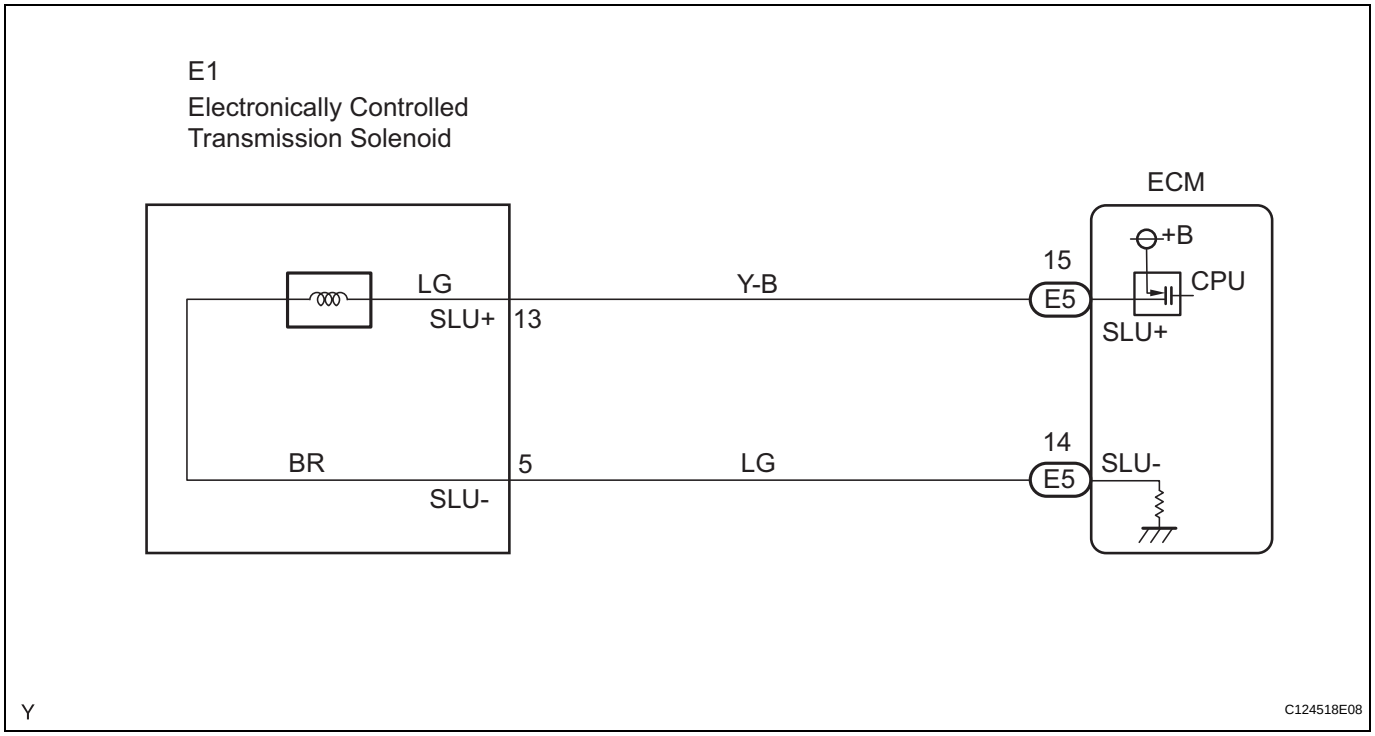
TYPICAL MALFUNCTION THRESHOLDS

Output signal duty	100 %

COMPONENT OPERATING RANGE

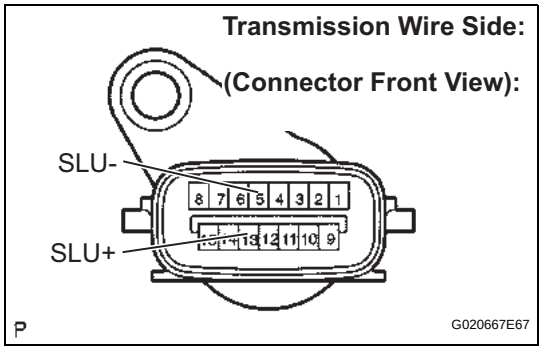
Output signal duty	Less than 100 %

WIRING DIAGRAM



AT

1	INSPECT TRANSMISSION WIRE (SLU)



(a) Disconnect the transmission wire connector from the transmission.
(b) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
13 (SLU+) - 5 (SLU-)	5.0 to 5.6 Ω at 20°C (68°F)

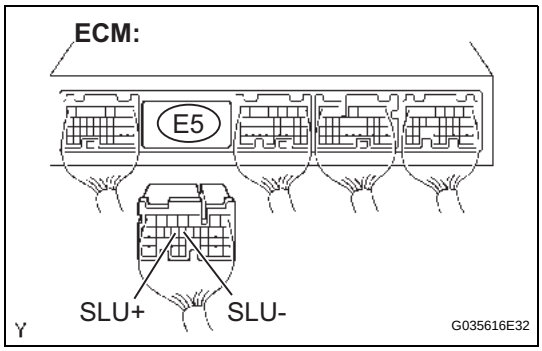
(c) Measure the resistance.
Standard resistance (Check for short)

Tester Connection	Specified Condition
13 (SLU+) - Body ground	10 kΩ or higher
5 (SLU-) - Body ground	10 kΩ or higher

NG → **Go to step 3**

OK

2	CHECK HARNESS AND CONNECTOR (TRANSMISSION WIRE - ECM)



(a) Connect the transmission wire connector to the transmission.
(b) Disconnect the ECM connector.
(c) Measure the resistance.
Standard resistance

Tester Connection	Specified Condition
E5-15 (SLU+) - E5-14 (SLU-)	5.0 to 5.6 Ω at 20°C (68°F)

(d) Measure the resistance.
Standard resistance (Check for short)

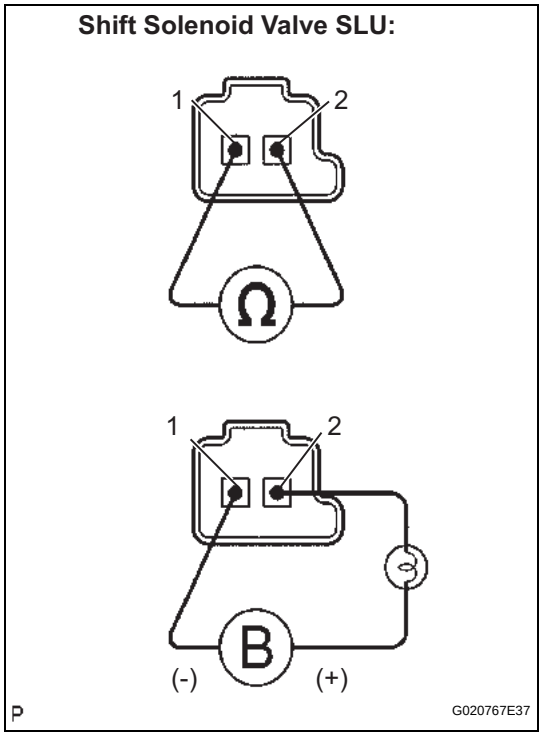
Tester Connection	Specified Condition
E5-15 (SLU+) - Body ground	10 kΩ or higher
E5-14 (SLU-) - Body ground	10 kΩ or higher

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

OK

REPLACE ECM

3	INSPECT SHIFT SOLENOID VALVE SLU



(a) Remove the shift solenoid valve SLU.
(b) Measure the resistance.
Standard resistance

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

(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 SLU**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

AT

DTC P2772 Transfer "L4" Switch Circuit

DESCRIPTION

The ECM detects the signal from the transfer L4 position switch.
This DTC indicates that the transfer L4 position switch remains ON.

AT

DTC No.	DTC Detection Conditions	Trouble Areas
P2772	Transfer L4 position switch remains ON while vehicle running under following conditions for 1.8 seconds or more (1-trip detection logic) (a) Output shaft speed: between 1,000 rpm and 3,000 rpm (b) Transfer shift position: H	• Short in transfer L4 position switch circuit • Transfer L4 position switch • ECM

MONITOR DESCRIPTION

The ECM monitors the transfer-case L4 position switch to determine whether the transfer-case L4 gear is engaged. If the transfer-case L4 gears remain engaged under the following conditions, the ECM determines that there is a malfunction of the L4 position switch:

- L4 switch indicates that the L4 transfer-case gears are engaged.
- Transfer-case shifter is in the "H" position.
- Transfer-case output shaft rpm is between 1,000 and 3,000 rpm.
- The specified time period has elapsed.

If all of the above conditions are met, the ECM determines that there is a malfunction of the L4 switch, illuminates the MIL and stores the DTC.

MONITOR STRATEGY

Related DTCs	P2772 : Transfer L4 position switch/ON malfunction
Required sensors/Components	Transfer L4 position switch
Frequency of operation	Continuous
Duration	ON malfunction (A) 1.8 seconds ON malfunction (B) 0.5 seconds
MIL operation	1 driving cycle
Sequence of operation	None

TYPICAL ENABLING CONDITIONS

The following conditions are common to all ON malfunctions (A) and (B).

The monitor will run whenever the following DTCs are not present.	None
Output speed sensor (SP2) circuit	Functioning normally
Vehicle speed sensor "A" circuit	Functioning normally
Transmission neutral position switch	OFF

ON malfunction (A)

Output speed (Transfer output speed)	1,000 to 3,000 rpm

ON malfunction (B)

Output speed (Transfer output speed)	143 rpm or more

TYPICAL MALFUNCTION THRESHOLDS

Both of the following conditions are met: ON malfunctions (A) and (B)

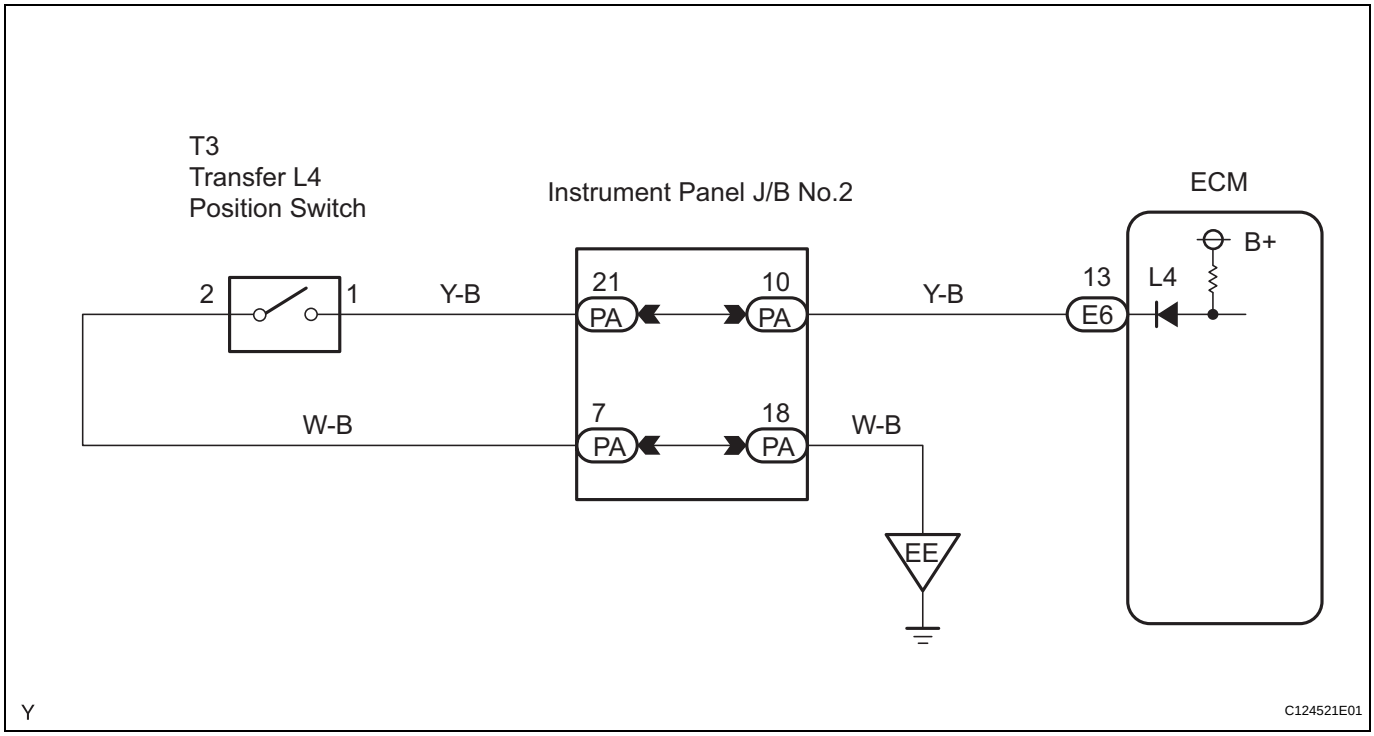
ON malfunction (A)

L4 switch	ON

ON malfunction (B)

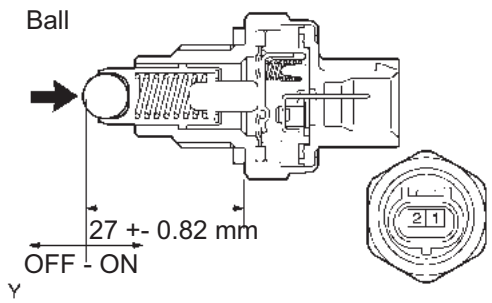
Actual transfer gear ratio Transfer input speed/Transfer output speed	0.9 to 1.1

WIRING DIAGRAM



1	INSPECT NO. 2 TRANSFER INDICATOR SWITCH (TRANSFER L4 POSITION SWITCH)

Transfer L4 Position Switch:



(a) Remove the transfer L4 position switch.
(b) Measure the resistance when pushing the ball at the tip of the switch.

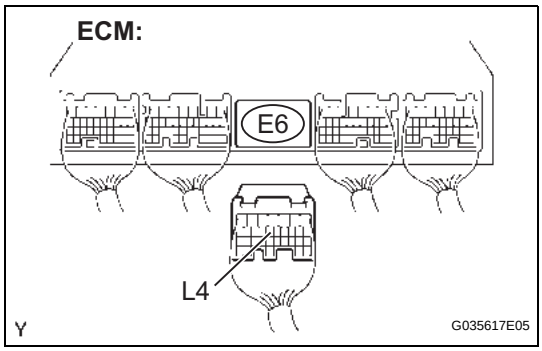
Standard resistance

Switch Ball	Tester Connection	Specified Condition
Push	1 - 2	Below 1 Ω
Free	1 - 2	10 kΩ or higher

NG → **REPLACE NO. 2 TRANSFER INDICATOR SWITCH (TRANSFER L4 POSITION SWITCH)**

OK

2	CHECK HARNESS AND CONNECTOR (ECM - L4 POSITION SWITCH, L4 POSITION SWITCH - BODY GROUND)



(a) Install the transfer L4 position switch.
(b) Disconnect the ECM connector.
(c) Measure the resistance when the transfer shift lever is in any position other than the L position.

Standard resistance

Condition	Tester Connection	Specified Condition
Transfer shift lever other than L position	E6-13 (L4) - Body ground	10 kΩ or higher

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

OK

REPLACE ECM

AUTOMATIC TRANSMISSION FLUID

ADJUSTMENT

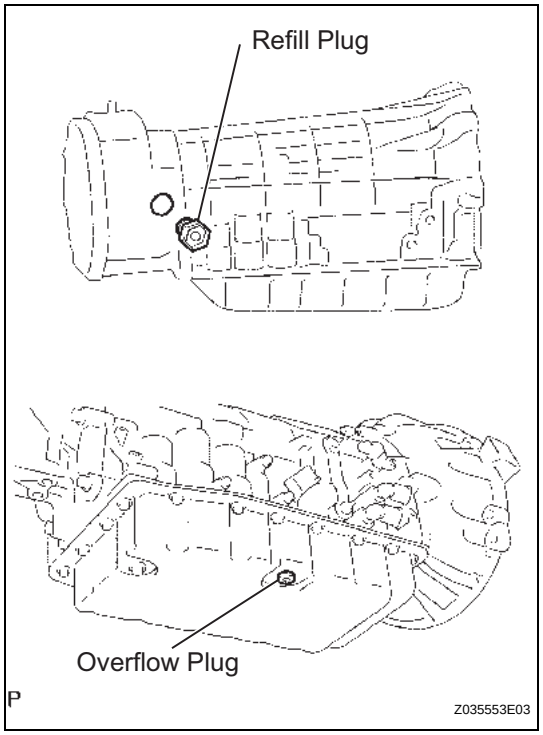
AT

1. BEFORE REFILL TRANSMISSION

- This transmission requires Toyota Genuine ATF WS.
- It is necessary to refill the transmission with the correct amount of fluid.
- The vehicle must remain level while adjusting the transmission fluid level.
- On vehicles equipped with active suspension, turn the suspension control switch OFF if it is necessary to jack up the vehicle with the engine running.

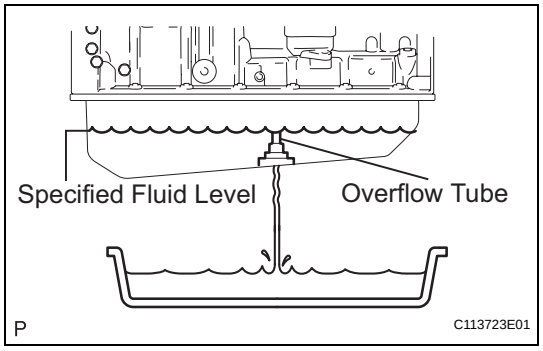
2. TRANSMISSION PAN FILL

(a) Remove the refill plug and overflow plug.



(b) Fill the transmission through the refill hole until fluid begins to trickle out of the overflow tube.

(c) Reinstall the overflow plug.



3. TRANSMISSION FILL

(a) Fill the transmission with the correct amount of fluid as listed in the table below.

(b) Reinstall the refill plug to avoid fluid splash.

Repair	Fill Amount
Transmission pan and drain plug removal	1.3 L (1.37 US qts, 1.14 lmp qts)
Transmission valve body removal	3.9 L (4.12 US qts, 3.43 lmp qts)
Torque converter removal	5.3 L (5.60 US qts, 4.66 lmp qts)
Entire transmission assembly	5.3 L (5.60 US qts, 4.66 lmp qts)

HINT:

If you cannot add the listed amount of fluid, do the following:

AT

- Install the refill plug.
- Allow the engine to idle with the air conditioning OFF.
- Move the shift lever through entire gear range to circulate fluid.
- Wait for 30 seconds with the engine idling.
- Stop the engine.
- Remove the refill plug and add fluid.
- Reinstall the refill plug.

4. FLUID CIRCULATION

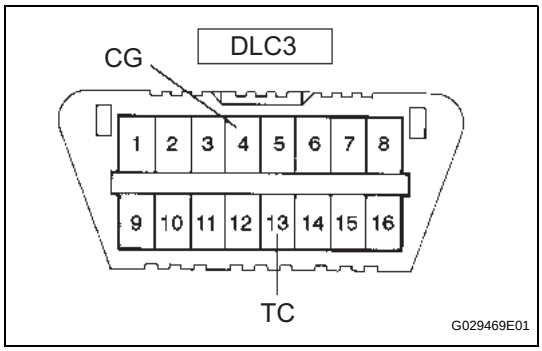
(a) Allow the engine to idle with the air conditioning OFF.

(b) Move the shift lever through entire gear range to circulate fluid.

5. FLUID TEMPERATURE CHECK

NOTICE:

The fluid temperature should be less than 30°C (86°F) before beginning the fluid temperature check.



(a) With intelligent tester

(1) Connect the intelligent tester to the DLC3.

(2) Select the tester menus: OBD/MOBD, ENGINE, DATA LIST and A/T.

(3) Check A/T OIL TEMP.

(4) Allow the engine to idle until the fluid temperature reaches 46°C (115°F).

(b) Without intelligent tester (Using A/T OIL TEMP indicator)

(1) Create a terminals between CG (4) and TC (13) of the DLC3 using SST (09843-18040).

(2) Move the shift lever back and forth between N and D every 1.5 seconds for six seconds.

(3) The D shift indicator on the combination meter comes on for two seconds. This indicates that the fluid temperature check mode has been started.

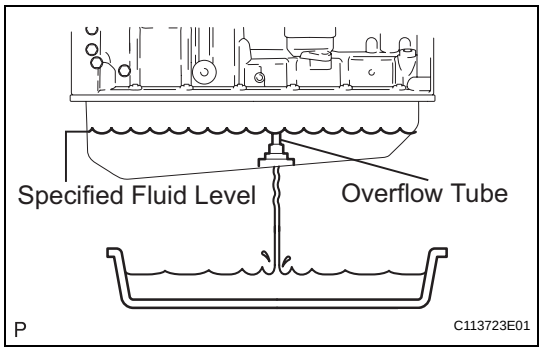
(4) The D shift indicator will come on again when the fluid temperature reaches 46°C (115°F) and will blink when it exceeds 56°C (130°F).

(5) Allow the engine to idle until the fluid temperature reaches 46°C (115°F).

6. FLUID LEVEL CHECK

NOTICE:

The fluid temperature must be between 46°C (115°F) and 56°C (130°F) to accurately check the fluid level.



(a) Remove the overflow plug with the engine idling.
(b) Check that the fluid comes out of the overflow tube.
If fluid does not come out, proceed to step 7.
If fluid comes out, wait until the overflow slows to a trickle and proceed to step 8.

7. TRANSMISSION REFILL

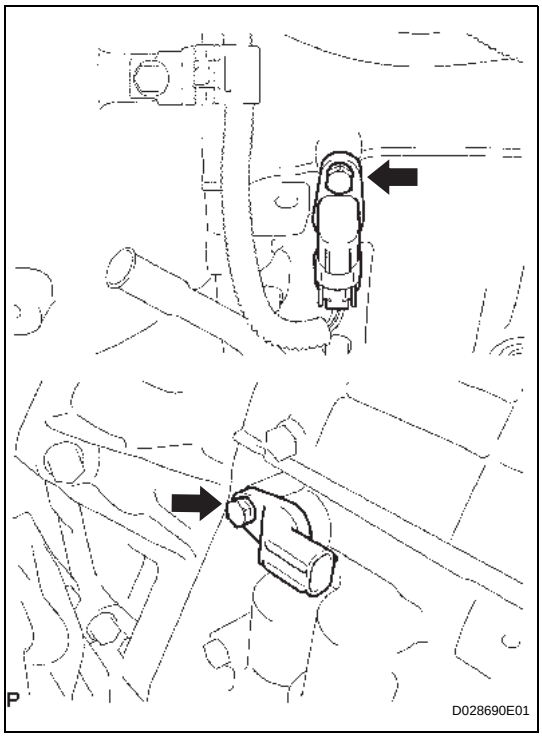
(a) Install the overflow plug.
(b) Stop the engine.
(c) Remove the refill plug.
(d) Add 0.4 liters (0.42 US qts, 0.35 lmp qts) of fluid.
(e) Allow the engine to idle and wait for 10 seconds.
(f) Proceed to step 6.

8. COMPLETE

(a) Install the overflow plug with a new gasket.
(b) Stop the engine.
(c) Install the refill plug with a new gasket.
Torque: 20 N*m (205 kgf*cm, 15 ft.*lbf) for overflow plug
39 N*m (400 kgf*cm, 29 ft.*lbf) for refill plug

AT

AT



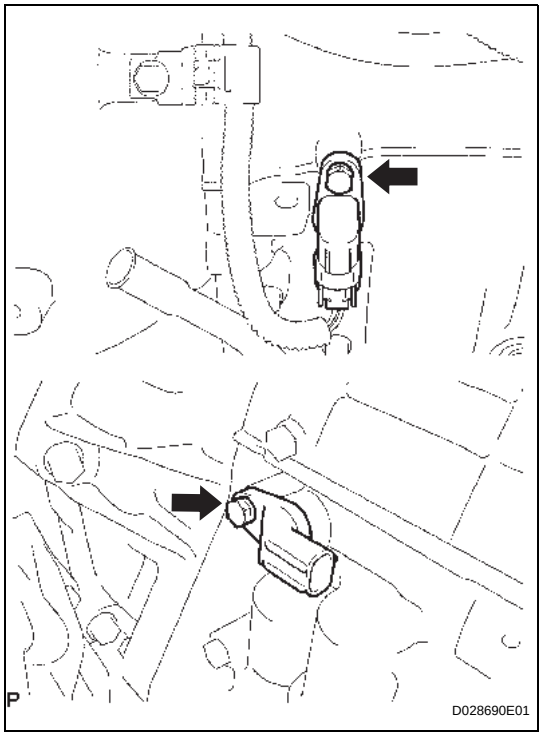
SPEED SENSOR

REMOVAL

1. REMOVE TRANSMISSION REVOLUTION SENSOR

(a) Disconnect the connector.

(b) Remove the bolt and speed sensor.



INSTALLATION

1. INSTALL TRANSMISSION REVOLUTION SENSOR

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

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

(c) Connect the connector.

TRANSMISSION WIRE

REMOVAL

CAUTION:
When working with FIPG material, you must observe the following guidelines.

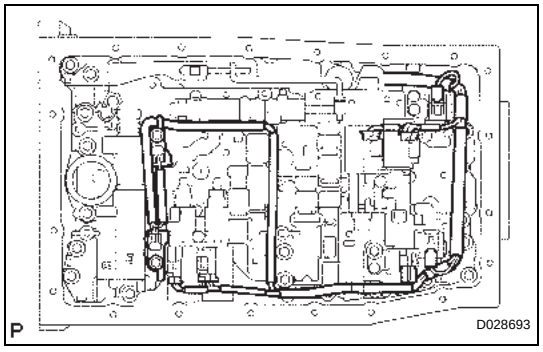
- Using a razor blade and gasket scraper, remove all the old FIPG material from the gasket surfaces.
- Thoroughly clean all components to remove all loose material.
- Clean both sealing surfaces with a non-residue solvent.
- Apply FIPG in an approximately 1 mm (0.04 in.) wide bead along the sealing surface.
- Parts must be assembled within 10 minutes of application. Otherwise, the FIPG material must be removed and reapplied.

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

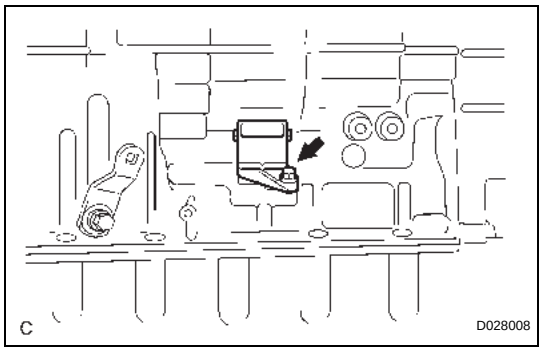
2. DRAIN AUTOMATIC TRANSMISSION FLUID
(a) Remove the drain plug, gasket and drain ATF.
(b) Install a new gasket and drain plug.
Torque: 28 N*m (285 kgf*cm, 21 ft.*lbf)

3. REMOVE AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY (See page AT-147)

4. REMOVE VALVE BODY OIL STRAINER ASSEMBLY (See page AT-148)

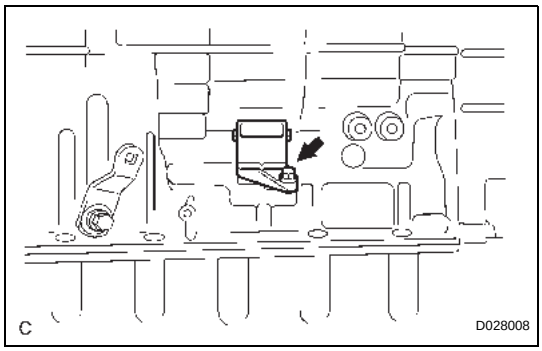


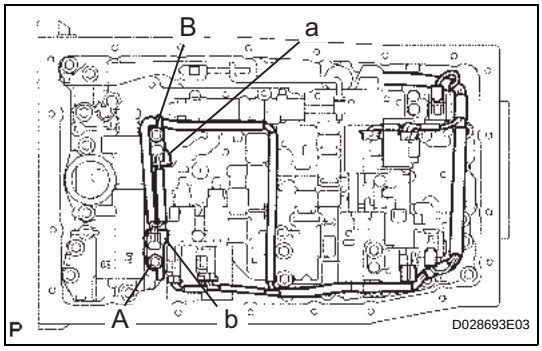
5. SEPARATE TRANSMISSION WIRE
(a) Remove the bolt and clamp.
(b) Disconnect the ATF temperature sensor.
(c) Disconnect the 7 connectors from the solenoid valves.



6. REMOVE TRANSMISSION WIRE
(a) Disconnect the transmission wire connector.
(b) Remove the bolt and pull out the transmission wire.

AT





INSTALLATION

1. **INSTALL TRANSMISSION WIRE**
   (a) Install the transmission wire with the bolt.
   Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)
   (b) Connect the transmission wire connector.

2. **CONNECT TRANSMISSION WIRE**
   (a) Connect the 7 connectors to the solenoid valves.
   (b) Install the clamp with the bolt.
   Torque: A
   10 N*m (100 kgf*cm, 7 in.*lbf)
   B
   11 N*m (110 kgf*cm, 8 in.*lbf)
   (c) Connect the ATF temperature sensor.
   Wiring color:
   a: Orange
   b: Blue

3. **INSTALL VALVE BODY OIL STRAINER ASSEMBLY (See page AT-149)**

4. **INSTALL AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY (See page AT-149)**

5. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
   Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)

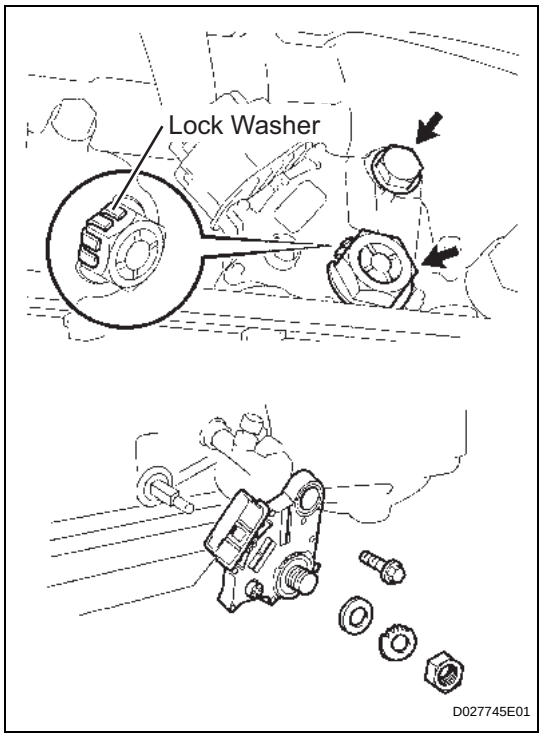
6. **PERFORM INITIALIZATION**
   (See page AT-17)

7. **ADD AUTOMATIC TRANSMISSION FLUID**
   (See page AT-139)

PARK / NEUTRAL POSITION SWITCH

REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
2. **DISCONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR**
3. **REMOVE PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
   (a) Using a screwdriver, unstake the lock washer.
   (b) Remove the nut, lock washer and grommet.
   (c) Remove the bolt and park/neutral position switch.



AT

ADJUSTMENT

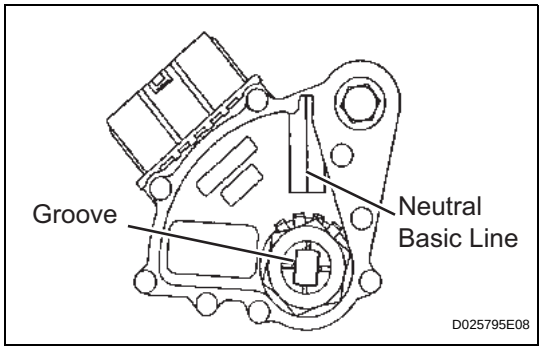
1. INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY

(a) Apply the parking brake and turn the ignition switch to ON.

(b) Depress the brake pedal and check that the engine starts only when the shift lever is set in the N or P position and that it does not start in any other positions.

(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 and not in other positions.

If any failure is found, check the park/neutral position switch for continuity.



2. ADJUST PARK/NEUTRAL POSITION SWITCH ASSEMBLY

(a) Loosen the bolt of the park/neutral position switch and set the shift lever to the N position.

(b) Align the groove and the neutral basic line.

(c) Hold the switch in position and tighten the bolt.

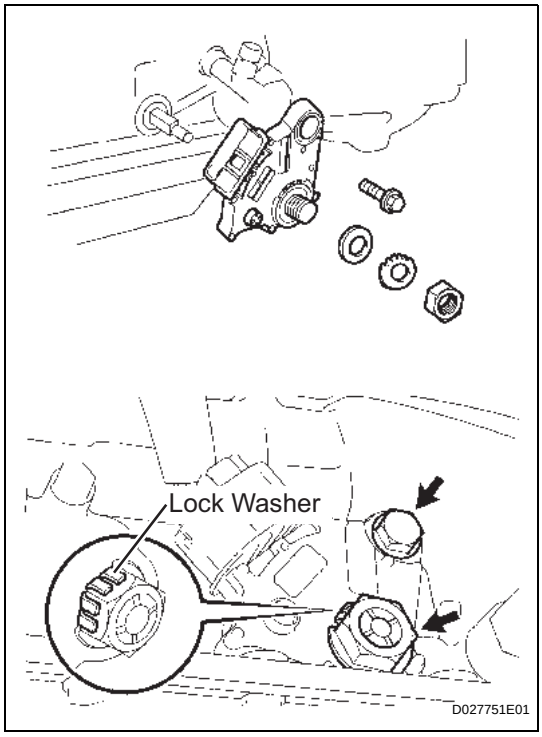
Torque: 13 N*m (130 kgf*cm, 9 ft.*lbf)

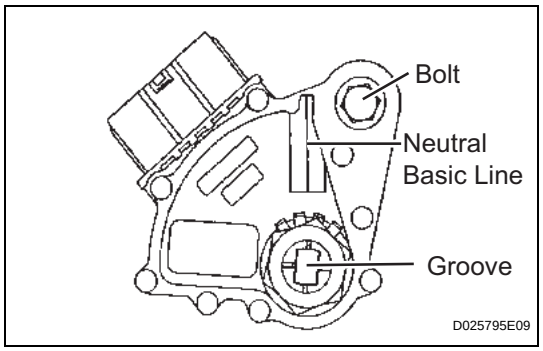
(d) After making an adjustment, perform the inspection described in step 1.

INSTALLATION

1. INSTALL PARK/NEUTRAL POSITION SWITCH ASSEMBLY

(a) Install the park/neutral position switch onto the manual valve lever shaft and provisionally tighten the adjusting bolt.





(b) Install the grommet, a new lock washer and the nut.
Torque: 6.9 N*m (70 kgf*cm, 61 in.*lbf)

(c) Install the manual valve lever shaft onto the groove and turn it 2 notches counterclockwise to the neutral position.

(d) Align the neutral basic line with the switch groove and tighten the adjusting bolt.
Torque: 13 N*m (133 kgf*cm, 10 ft.*lbf)

(e) Bend the tabs of the lock washer.
HINT:
Bend at least 2 of the lock washer tabs.

2. CONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR

3. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)

4. INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY (See page AT-145)

5. ADJUST PARK/NEUTRAL POSITION SWITCH ASSEMBLY (See page AT-145)

6. ADJUST SHIFT LEVER POSITION (See page AT-158)

7. INSPECT SHIFT LEVER POSITION (See page AT-158)

VALVE BODY ASSEMBLY

REMOVAL

CAUTION:
When working with FIPG material, you must observe the following guidelines.

- **Using a razor blade and gasket scraper, remove all the old FIPG material from the gasket surfaces.**
- **Thoroughly clean all components to remove all loose material.**
- **Clean both sealing surfaces with a non-residue solvent.**
- **Apply FIPG in an approximately 1 mm (0.04 in.) wide bead along the sealing surface.**
- **Parts must be assembled within 10 minutes of application. Otherwise, the FIPG material must be removed and reapplied.**

1. DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL

2. DRAIN AUTOMATIC TRANSMISSION FLUID

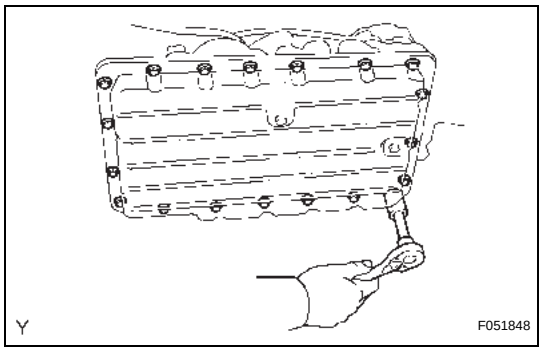
(a) Remove the drain plug, gasket and drain ATF.

(b) Install a new gasket and drain plug.
Torque: 28 N*m (285 kgf*cm, 21 ft.*lbf)

3. REMOVE AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY

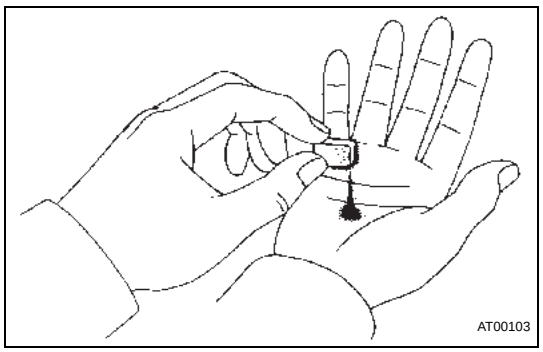
NOTICE:
Some fluid will remain in the oil pan.

(a) Remove the 20 bolts, gasket and oil pan sub-assembly.

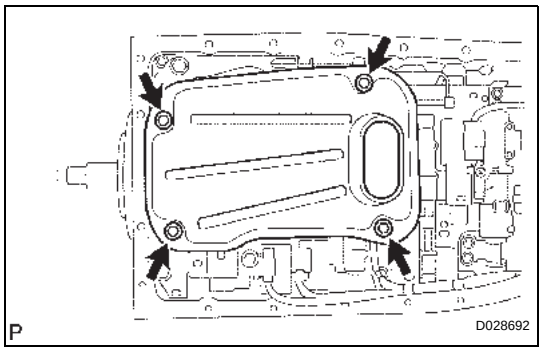


(b) Examine the particles in the pan.

(1) Remove the magnets and use them to collect steel particles. Carefully inspect the foreign matter and particles in the pan and on the magnets to anticipate the type of wear you will find in the transmission.
Steel (magnetic) ... bearing, gear and clutch plate wear
Brass (non-magnetic) ... bushing wear



AT



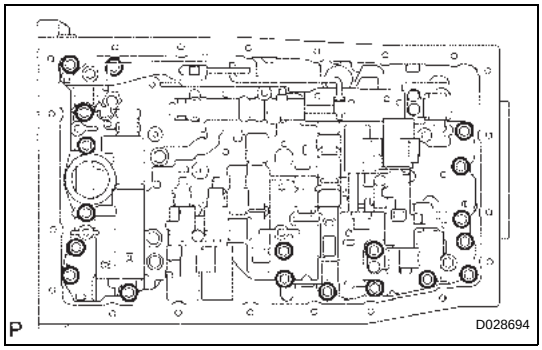
4. REMOVE VALVE BODY OIL STRAINER ASSEMBLY

(a) Remove the 4 bolts, oil strainer and O-ring.

NOTICE:

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

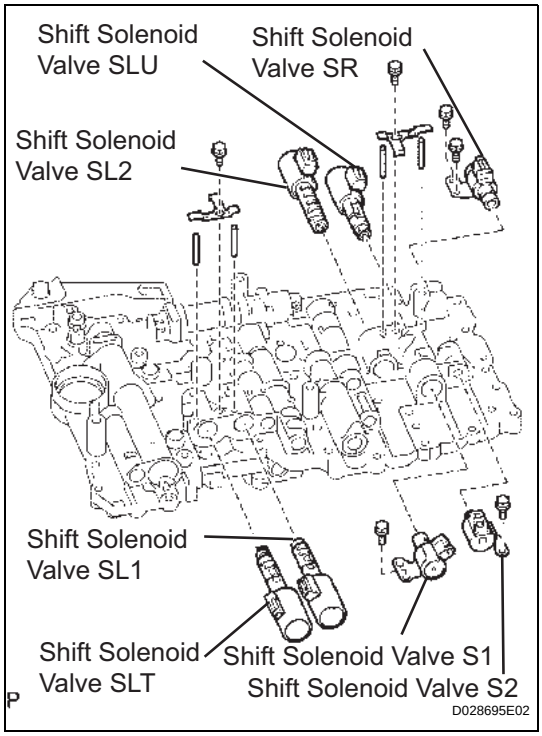
5. SEPARATE TRANSMISSION WIRE (See page AT-143)



6. REMOVE TRANSMISSION VALVE BODY ASSEMBLY

(a) Remove the 19 bolts and valve body.

(b) Remove the 3 drum seal gaskets.



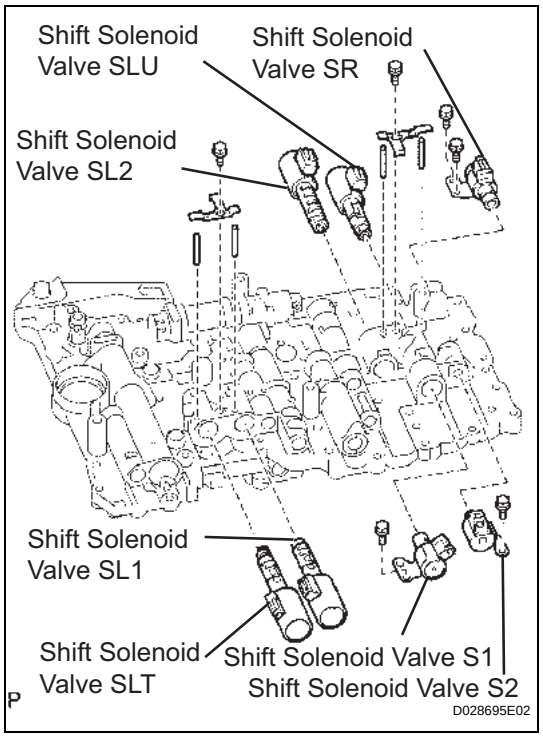
(c) Remove the bolt, lock plate, pin and shift solenoid valves SLT and SL1.

(d) Remove the bolt, lock plate, pin and shift solenoid valves SLU and SL2.

(e) Remove the 2 bolts and shift solenoid valve SR.

(f) Remove the bolt and shift solenoid valve S1.

(g) Remove the bolt and shift solenoid valve S2.



INSTALLATION

1. INSTALL TRANSMISSION VALVE BODY ASSEMBLY

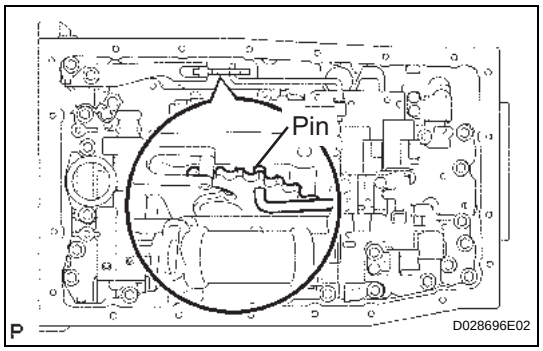
(a) Install the shift solenoid valve S2 with the bolt.
Torque: 10 N*m (100 kgf*cm, 7 ft.*lbf)

(b) Install the shift solenoid valve S1 with the bolt.
Torque: 6.4 N*m (65 kgf*cm, 56 in.*lbf)

(c) Install the shift solenoid valve SR with the 2 bolts.
Torque: 6.4 N*m (65 kgf*cm, 56 in.*lbf)

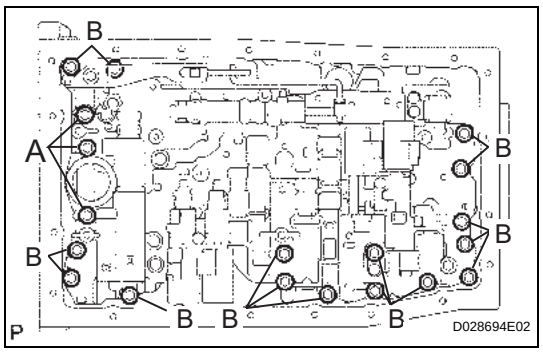
(d) Install the shift solenoid valves SLU and SL2 with the pin, lock plate and bolt.
Torque: 6.4 N*m (65 kgf*cm, 56 in.*lbf)

(e) Install the shift solenoid valves SLT and SL1 with the pin, lock plate and bolt.
Torque: 6.4 N*m (65 kgf*cm, 56 in.*lbf)



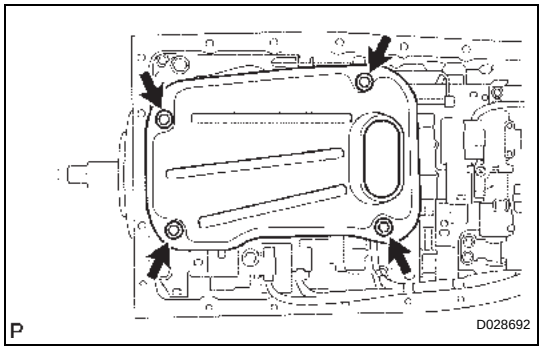
(f) Insert the pin of the lever into the hole of the manual valve.

(g) Install 3 new drum seal gaskets onto the transmission case.



(h) Install the 19 bolts.
Torque: 11 N*m (110 kgf*cm, 8 ft.*lbf)
Bolt length:
Bolt A: 36 mm (1.42 in.)
Bolt B: 25 mm (0.98 in.)

2. INSTALL TRANSMISSION WIRE (See page AT-144)

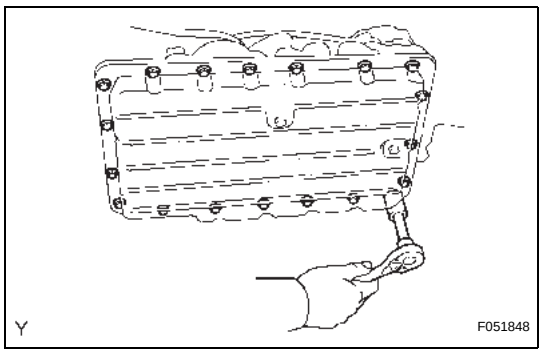


3. INSTALL VALVE BODY OIL STRAINER ASSEMBLY

(a) Install a new O-ring and the oil strainer with the 4 bolts.
Torque: 10 N*m (100 kgf*cm, 7 ft.*lbf)

4. INSTALL AUTOMATIC TRANSMISSION OIL PAN SUB-ASSEMBLY

HINT:
Remove all packing material and be careful not to drop oil on the contact surfaces of the transmission case and oil pan.



(a) Install a new gasket and the oil pan sub-assembly.

(b) Install the oil pan with the 20 bolts.
Torque: 4.4 N*m (45 kgf*cm, 39 in.*lbf)

5. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)

6. **PERFORM INITIALIZATION**
(See page AT-17)

7. **ADD AUTOMATIC TRANSMISSION FLUID**
(See page AT-139)

SHIFT LOCK SYSTEM

ON-VEHICLE INSPECTION

1. CHECK SHIFT LOCK OPERATION

(a) Shift the shift lever to the P position.
(b) Turn the ignition switch to LOCK.
(c) Check that the shift lever cannot be shifted to any positions other than P.
(d) Turn the ignition switch to ON, depress the brake pedal, and check that the shift lever can be shifted to other positions.

2. CHECK SHIFT LOCK RELEASE LINK OPERATION

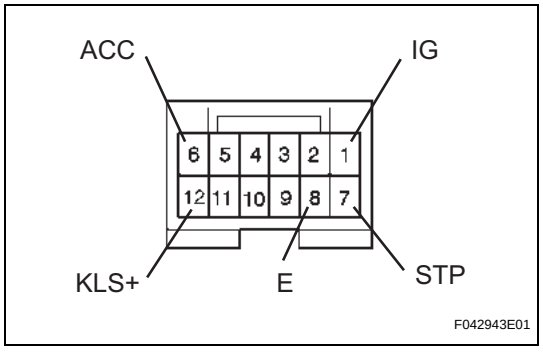
(a) Using a small screwdriver, remove the shift lever cap.
(b) When operating the shift lever with the shift lock release link pressed, check that the lever can be shifted to any positions other than P.

3. CHECK KEY INTERLOCK OPERATION

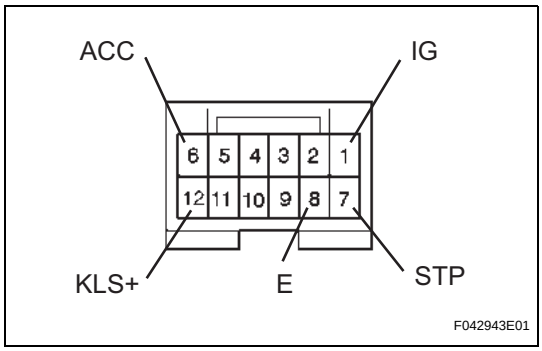
(a) Turn the ignition switch to ON.
(b) Depress the brake pedal and shift the shift lever to any positions other than P.
(c) Check that the ignition key cannot be turned to LOCK.
(d) Shift the shift lever to the P position, turn the ignition key to LOCK, and check that the ignition key can be removed.

4. INSPECT SHIFT LOCK CONTROL ECU SUB-ASSEMBLY

(a) Using a voltmeter, measure the voltage at each terminal.
HINT:
Do not disconnect the shift lock control ECU connector.

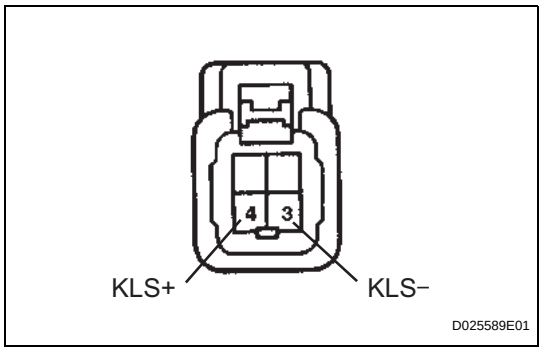


Terminal	Measuring Condition	Voltage (V)
1 (KLS+) - 8 (E)	(1) Ignition switch ACC and P position (2) Ignition switch ACC and except P position (3) Ignition switch ACC and except P position (After approx. 1 second)	0 7.5 to 11 6 to 9
4 (ACC) - 8 (E)	Ignition switch ON	10 to 14
	Ignition switch ACC	10 to 14
	Ignition switch OFF	0
9 (STP) - 8 (E)	Depress brake pedal	10 to 14
	Release brake pedal	0
5 (IG) - 8 (E)	Ignition switch ON	10 to 14
	Ignition switch OFF	0



(b) Using an ohmmeter, measure the resistance at terminal E (8) and body ground.
HINT:
Do not disconnect the shift lock control ECU connector.

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



5. INSPECT KEY INTER LOCK SOLENOID

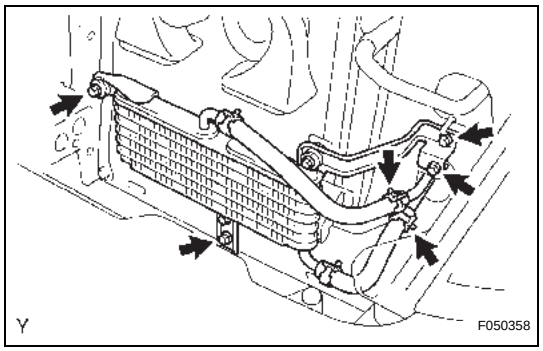
(a) Disconnect the solenoid connector.

(b) Connect KLS+ (4) terminal to the battery positive (+) terminal, and KLS- (3) terminal to the battery negative (-) terminal, and apply about 12V between KLS+ and KLS- terminals.
Check that operation noise can be heard from the solenoid.
If the solenoid does not operate, replace the solenoid.

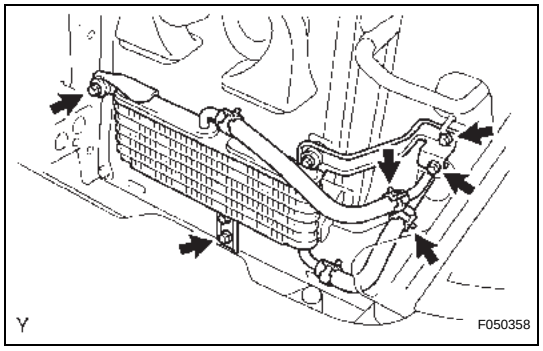
AIR COOLED OIL COOLER

REMOVAL

1. **REMOVE RADIATOR GRILLE (See page ET-4)**
2. **DRAIN AUTOMATIC TRANSMISSION FLUID**
   (a) Remove the drain plug, gasket and drain ATF.
   (b) Install a new gasket and drain plug.
   Torque: 28 N*m (285 kgf*cm, 21 ft.*lbf)
3. **REMOVE OIL COOLER WITH HOSE ASSEMBLY**
   (a) Loosen the 2 clips and disconnect the 2 oil cooler hoses.
   (b) Remove the 4 bolts and the oil cooler with hose assembly.



INSTALLATION

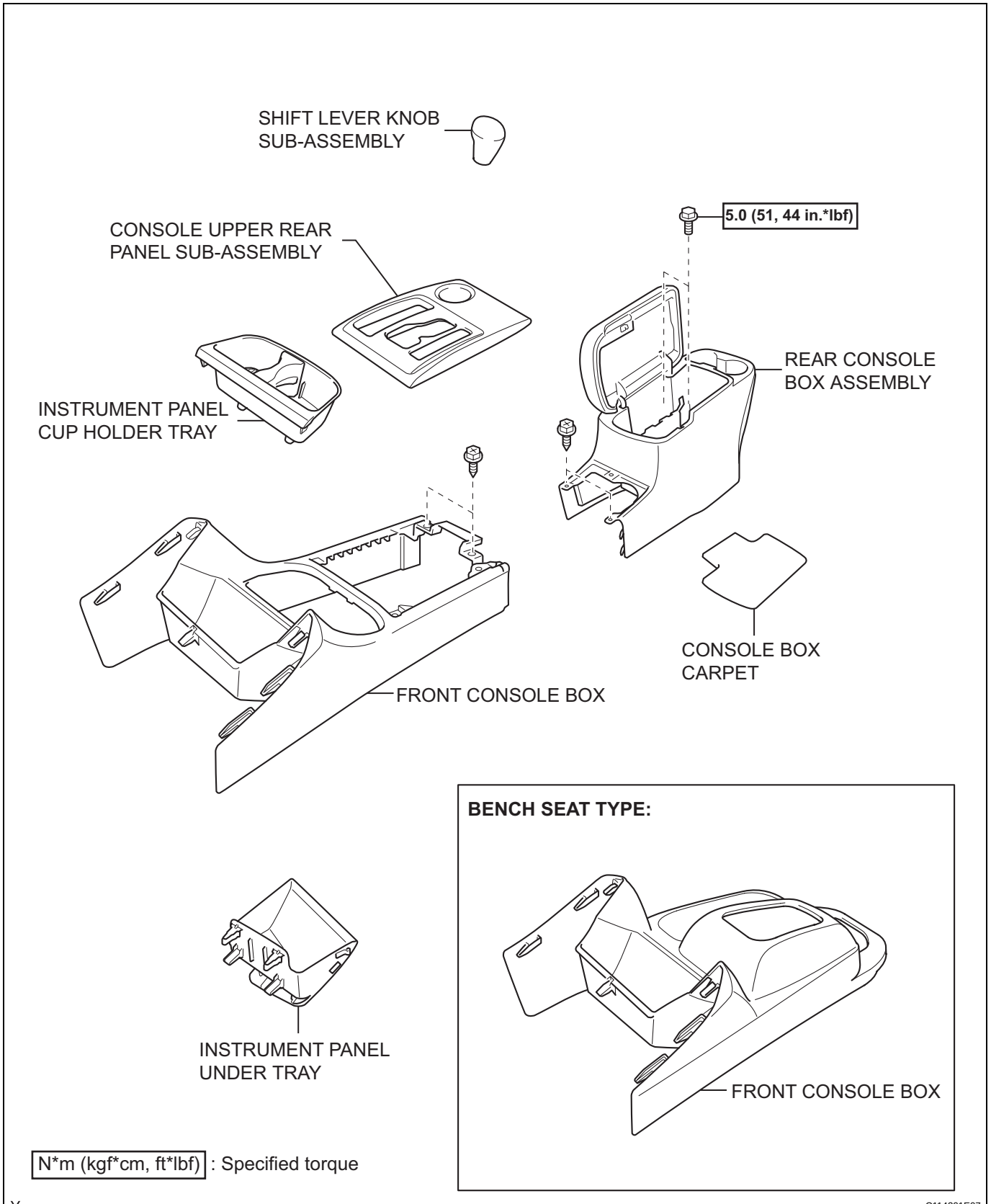


1. **INSTALL OIL COOLER WITH HOSE ASSEMBLY**
   (a) Install the oil cooler with hose assembly with the 4 bolts.
   Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)
   (b) Install the 2 oil cooler hoses and 2 clips.
2. **ADD AUTOMATIC TRANSMISSION FLUID**
   (See page AT-139)
3. **INSTALL RADIATOR GRILLE (See page ET-11)**

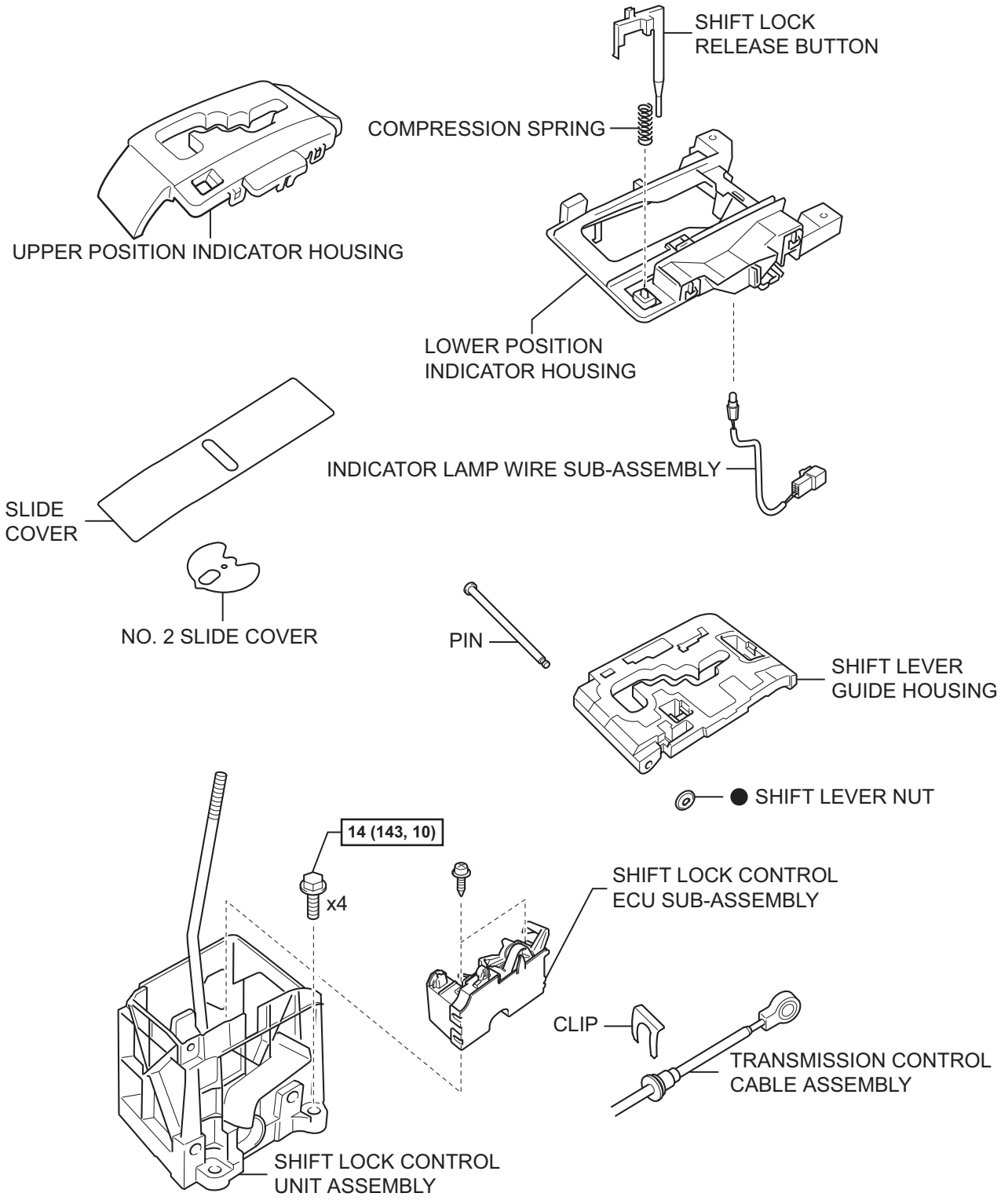
FLOOR SHIFT ASSEMBLY

COMPONENTS

AT



CABLE TYPE:



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

● Non-reusable part

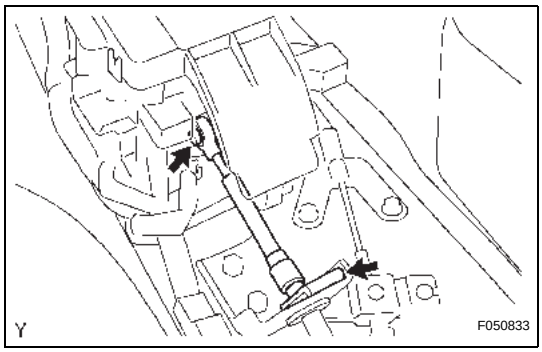
Y

C114202E04

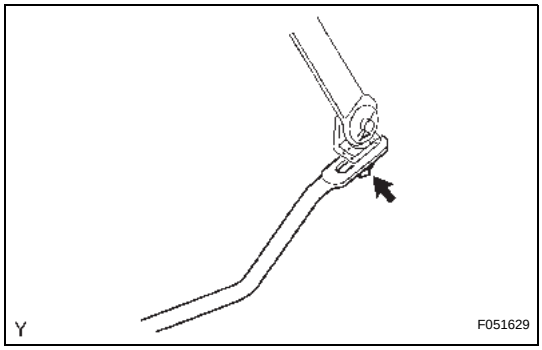
AT

REMOVAL

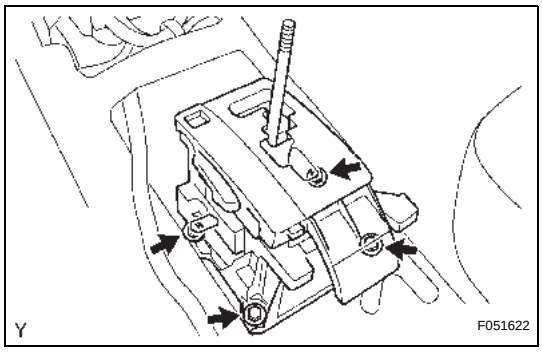
1. **REMOVE CONSOLE UPPER REAR PANEL SUB-ASSEMBLY (for Separate Seat Type) (See page IP-9)**
2. **REMOVE REAR CONSOLE BOX ASSEMBLY (for Separate Seat Type) (See page IP-10)**
3. **REMOVE INSTRUMENT PANEL CUP HOLDER TRAY (for Separate Seat Type) (See page IP-10)**
4. **REMOVE FRONT CONSOLE BOX (for Separate Seat Type) (See page IP-10)**
5. **REMOVE FRONT CONSOLE BOX (for Bench Seat Type) (See page IP-11)**
6. **DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**
   (a) CABLE TYPE:
      (1) Disconnect the transmission control cable assembly from the shift lever assembly.
      (2) Remove the clip and disconnect the transmission control cable.



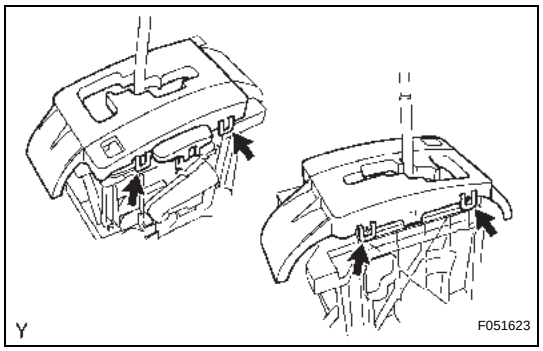
7. **SEPARATE FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY**
   (a) ROD TYPE:
      (1) Remove the nut, then separate the floor shift gear shifting rod.



8. **REMOVE FLOOR SHIFT ASSEMBLY**
   (a) Disconnect the 2 connectors and 2 clamps.
   (b) Remove the 4 bolts and floor shift assembly.

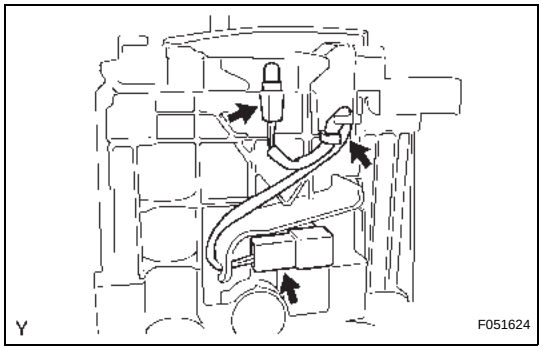


DISASSEMBLY



1. REMOVE UPPER POSITION INDICATOR HOUSING

(a) Release the 4 claws with a screwdriver and remove the position indicator housing and slide cover.

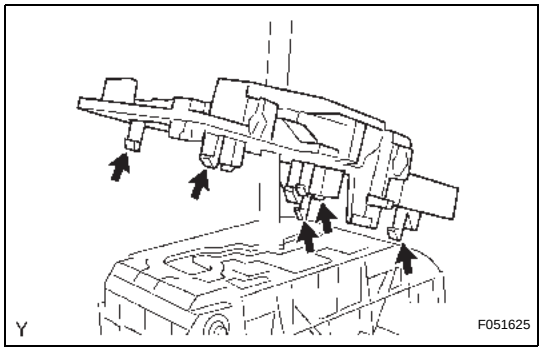


2. REMOVE INDICATOR LAMP WIRE SUB-ASSEMBLY

(a) Remove the indicator lamp wire sub-assembly.

(b) Remove the bulb from the indicator lamp wire sub-assembly.

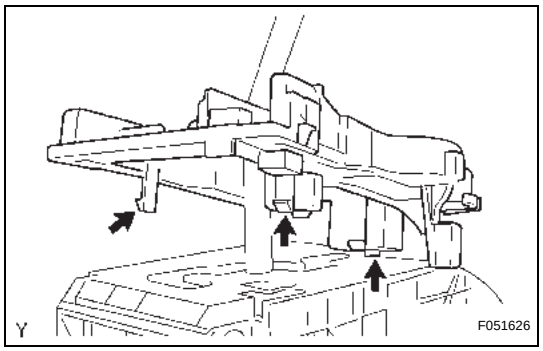
3. REMOVE SHIFT LOCK RELEASE BUTTON



4. REMOVE LOWER POSITION INDICATOR HOUSING

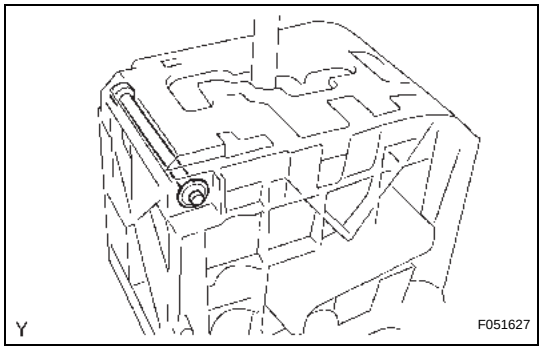
(a) CABLE TYPE:

(1) Release the 5 claws with a screwdriver and remove the position indicator housing lower.



(b) ROD TYPE:

(1) Release the 3 claws with a screwdriver and remove the position indicator housing lower.

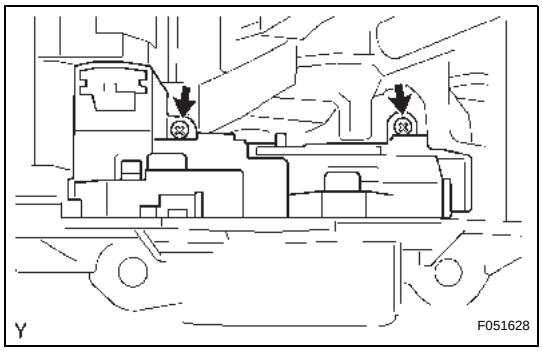


5. REMOVE SHIFT LOCK CONTROL ECU SUB-ASSEMBLY

(a) Remove the shift lever nut and shift lever lock pin.

(b) Remove the shift lever guide housing.

(c) Release the 2 claws with a screwdriver and remove the shift lock release link and spring.



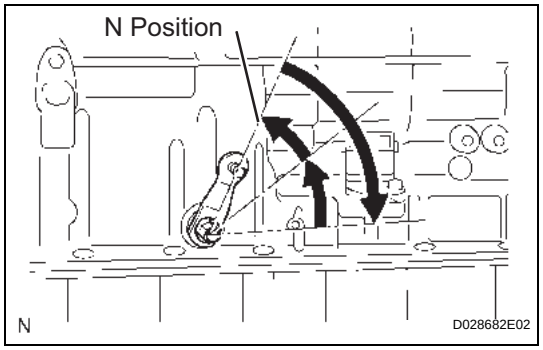
(d) Remove the 2 screws and the shift lock control ECU.

ADJUSTMENT

1. INSPECT SHIFT LEVER POSITION

(a) Check that the shift lever moves smoothly and appropriately from the P to R position, only when the ignition switch is turned to ON and the brake pedal is depressed.

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



2. ADJUST SHIFT LEVER POSITION

(a) Push the control shaft fully rearward.

(b) Turn the control shaft lever 2 notches counterclockwise to the N position.

(c) Set the shift lever to the N position.

REASSEMBLY

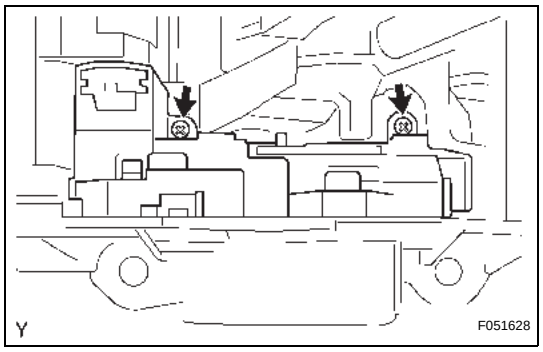
1. INSTALL SHIFT LOCK CONTROL ECU SUB-ASSEMBLY

(a) Install the shift lock control ECU with the 2 screws.

(b) Install the spring and shift lock release link.

(c) Install the shift lever guide housing.

(d) Install the lever lock and new shift lever nut.



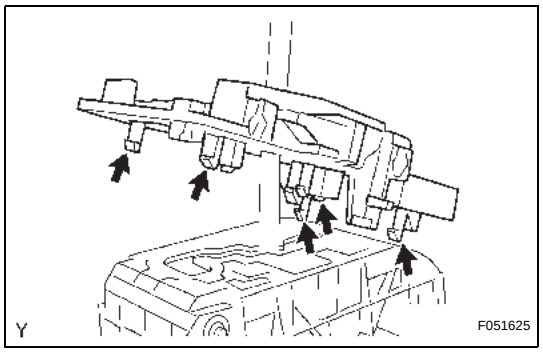
2. INSTALL POSITION INDICATOR HOUSING LOWER

(a) CABLE TYPE:

(1) Install the position indicator housing lower.

HINT:

Firmly make the claws fit.

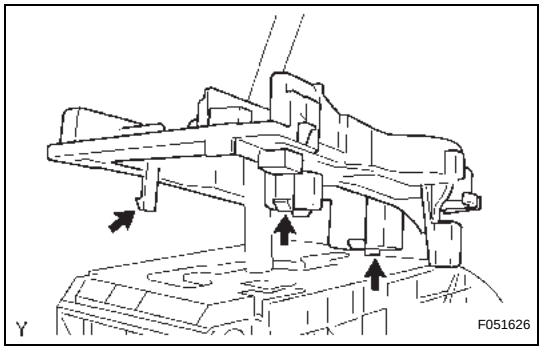


(b) ROD TYPE:

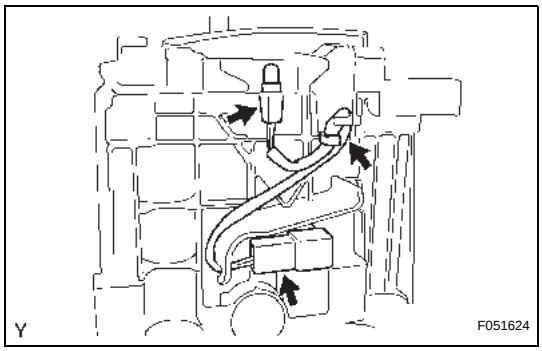
(1) Install the position indicator housing lower.

HINT:

Firmly make the claws fit.



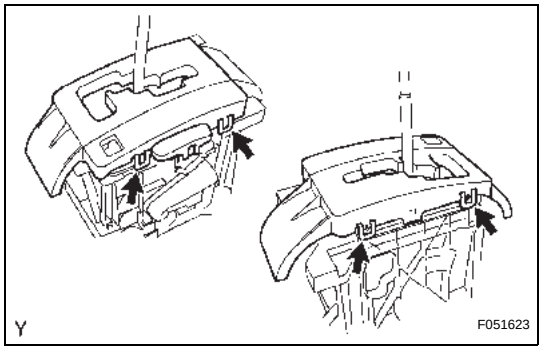
3. INSTALL SHIFT LOCK RELEASE BUTTON



4. INSTALL INDICATOR LAMP WIRE SUB-ASSEMBLY

(a) Install the bulb into the indicator lamp wire sub-assembly.

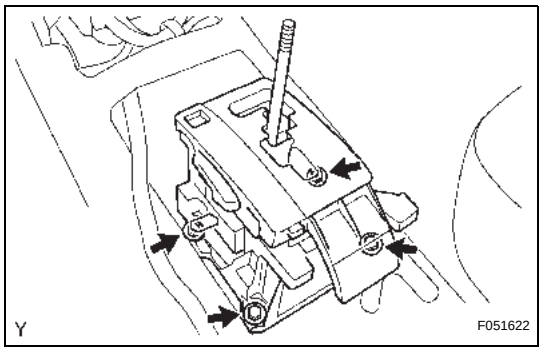
(b) Install the indicator lamp wire sub-assembly.



5. INSTALL POSITION INDICATOR HOUSING UPPER

(a) Install the slide cover and position indicator housing sub-assembly onto the shift lever guide housing.
HINT:
Firmly make the claws fit.

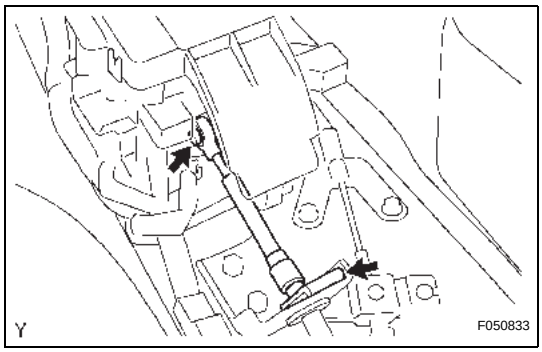
INSTALLATION



1. INSTALL FLOOR SHIFT ASSEMBLY

(a) Install the floor shift with the 4 bolts.
Torque: 14 N*m (143 kgf*cm, 10 ft.*lbf)

(b) Connect the 2 clamps and 2 connectors.

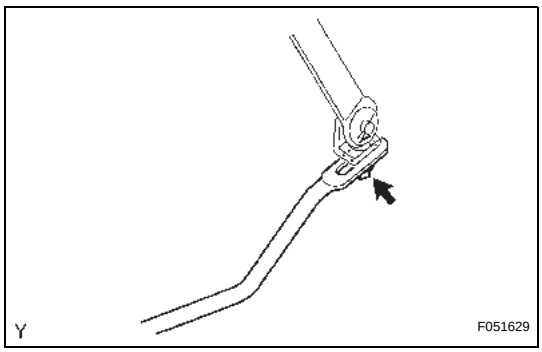


2. INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY

(a) CABLE TYPE:

(1) Connect the transmission control cable with the clip to floor shift assembly.

(2) Install the transmission control cable onto the floor shift assembly.



3. INSTALL FLOOR SHIFT GEAR SHIFTING ROD SUB-ASSEMBLY

(a) ROD TYPE:

(1) Install the floor shift gear shifting rod with nut.
Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf)

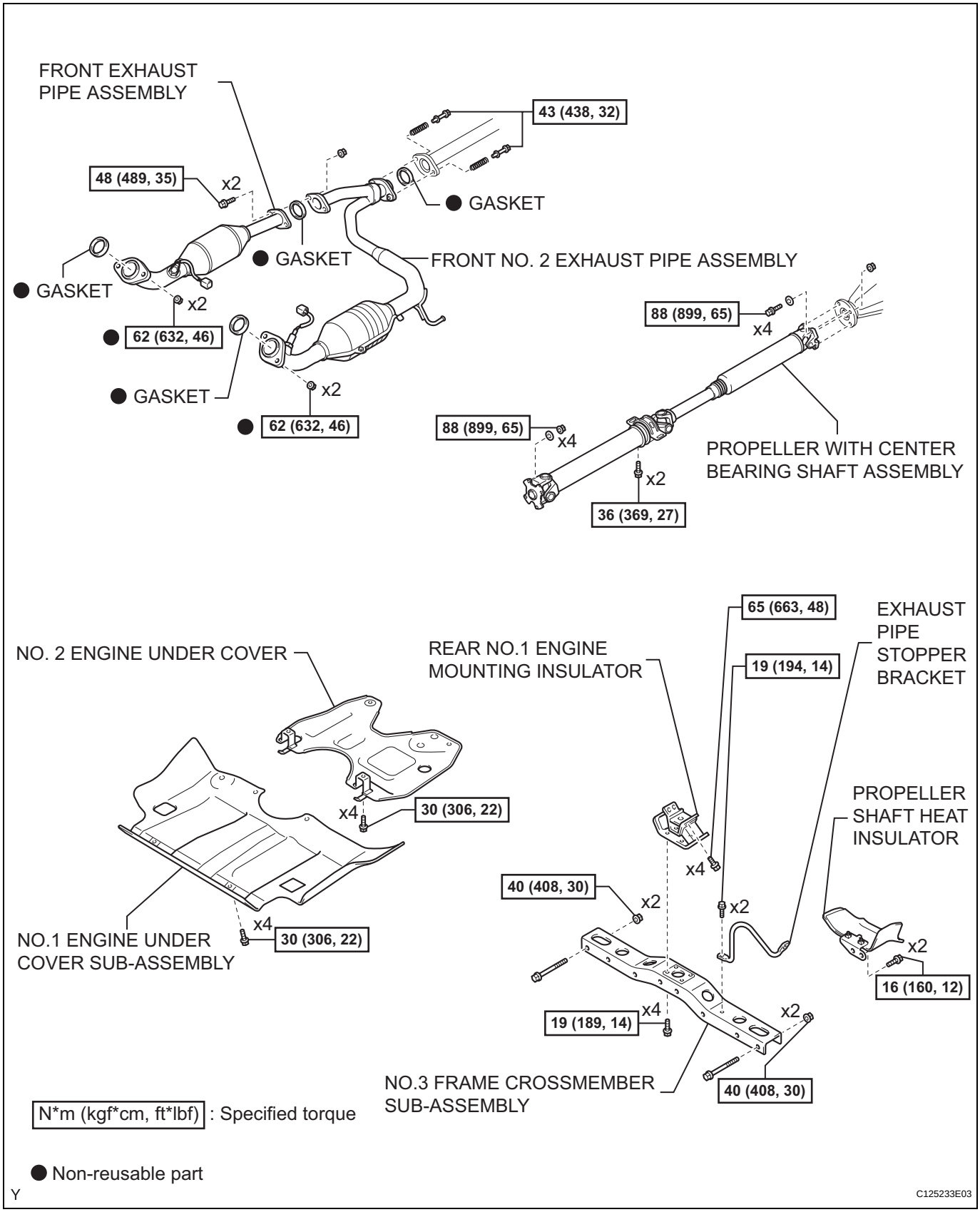
4. REMOVE FRONT CONSOLE BOX (for Bench Seat Type) (See page IP-23)

5. INSTALL FRONT CONSOLE BOX (for Separate Seat Type) (See page IP-24)

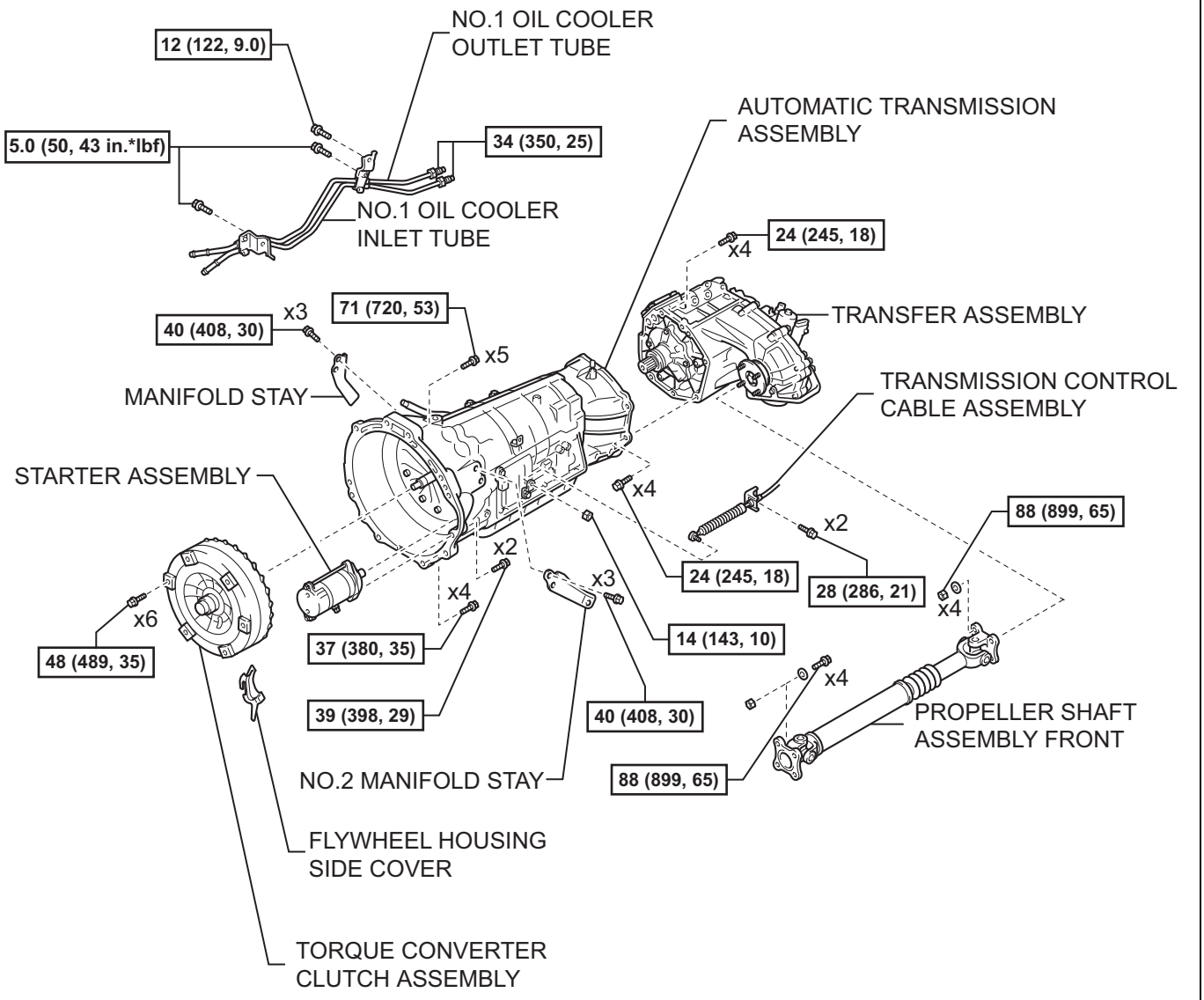
6. **INSTALL INSTRUMENT PANEL CUP HOLDER TRAY (for Separate Seat Type) (See page IP-24)**
7. **INSTALL REAR CONSOLE BOX ASSEMBLY (for Separate Seat Type) (See page IP-24)**
8. **INSTALL CONSOLE UPPER REAR PANEL SUB-ASSEMBLY (for Separate Seat Type) (See page IP-25)**
9. **ADJUST SHIFT LEVER POSITION (See page AT-105)**
10. **INSPECT SHIFT LEVER POSITION (See page AT-105)**

AUTOMATIC TRANSMISSION ASSEMBLY

COMPONENTS



AT



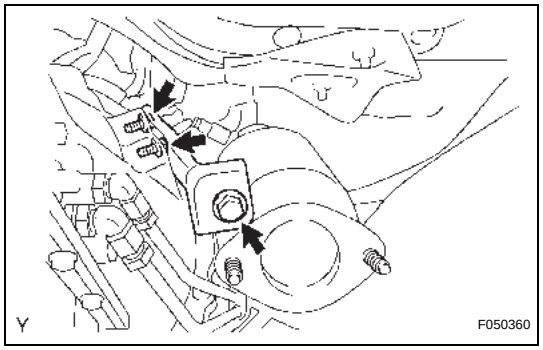
N*m (kgf*cm, ft*lbf) : Specified torque

Y

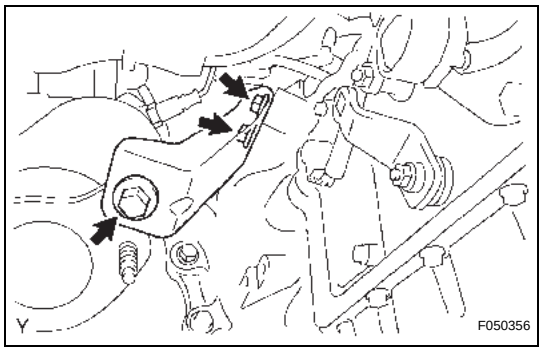
C125235E03

REMOVAL

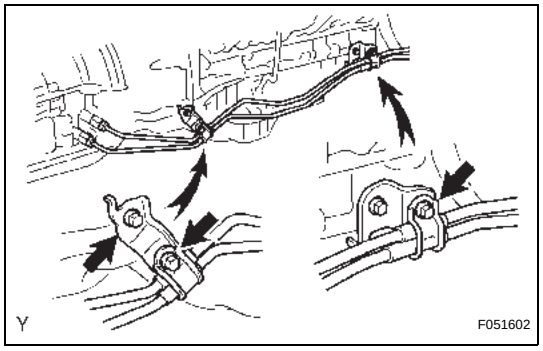
1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
2. **REMOVE NO.1 ENGINE UNDER COVER SUB-ASSEMBLY**
3. **REMOVE NO. 2 ENGINE UNDER COVER (w/ No. 2 Engine Under Cover)**
4. **DISCONNECT OXYGEN SENSOR**
5. **REMOVE EXHAUST PIPE**
   (See page EX-3)
6. **REMOVE PROPELLER SHAFT ASSEMBLY FRONT (See page PR-16)**
7. **REMOVE PROPELLER WITH CENTER BEARING SHAFT ASSEMBLY (See page PR-8)**
8. **DRAIN AUTOMATIC TRANSMISSION FLUID**
   (a) Remove the drain plug and gasket, and drain ATF.
   (b) Install a new gasket and drain plug.
   Torque: 28 N*m (285 kgf*cm, 21 ft.*lbf)
9. **REMOVE MANIFOLD STAY**
   (a) Remove the 3 bolts and manifold stay.

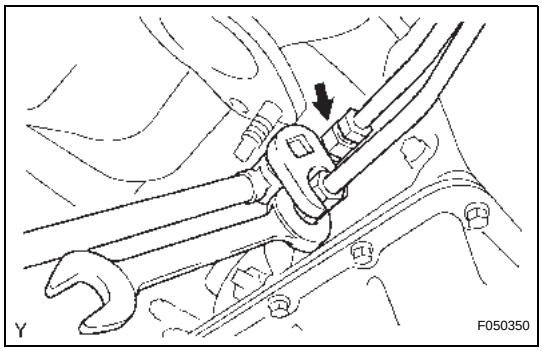


10. **REMOVE NO.2 MANIFOLD STAY**
    (a) Remove the 3 bolts and manifold stay No. 2.



11. **DISCONNECT NO.1 OIL COOLER INLET TUBE**
    (a) Remove the 3 bolts and 2 clamps.

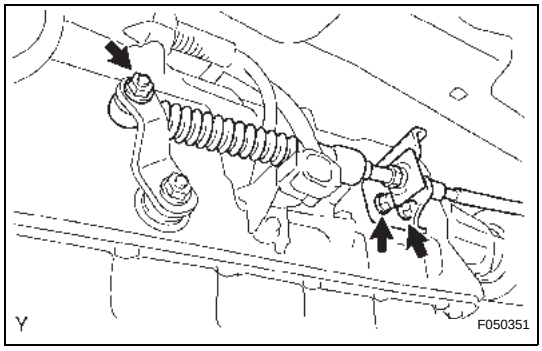




(b) Using SST, disconnect the oil cooler inlet tube No. 1.
SST 09023-12701

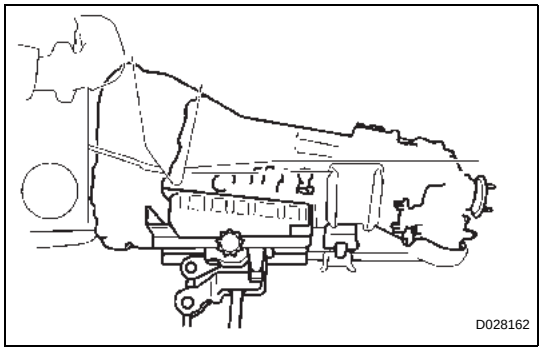
12. DISCONNECT NO.1 OIL COOLER OUTLET TUBE

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



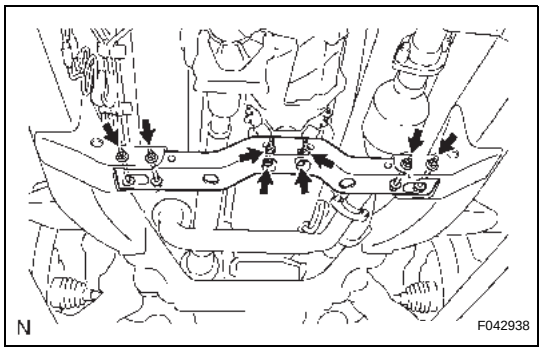
13. DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY

(a) Remove the nut and disconnect the transmission control cable.
(b) Remove the 2 bolts and disconnect the transmission control cable.



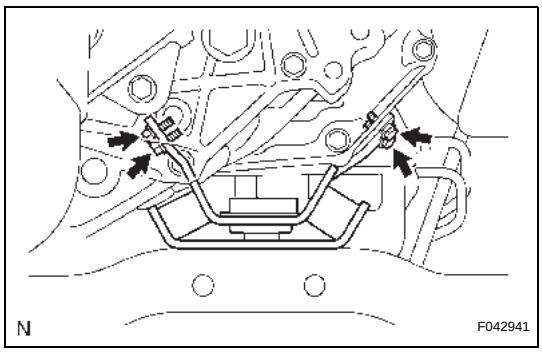
14. SUPPORT AUTOMATIC TRANSMISSION WITH TRANSFER

(a) Support the automatic transmission assembly with a transmission jack.



15. REMOVE NO.3 FRAME CROSSMEMBER SUB-ASSEMBLY

(a) Remove the 4 bolts on the frame crossmember sub-assembly No. 3.
(b) Remove the 4 nuts, 4 bolts and frame crossmember sub-assembly No. 3.



16. REMOVE REAR NO.1 ENGINE MOUNTING INSULATOR

(a) Remove the 4 bolts and engine mounting insulator rear from the automatic transmission.

17. DISCONNECT CONNECTOR

(a) Disconnect the park/neutral position switch connector.
(b) Disconnect the transmission wire connector.
(c) Disconnect the 2 speed sensor connectors.
(d) Disconnect the transfer shift actuator connector.

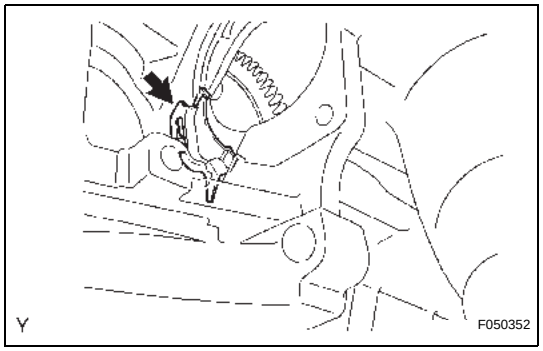
(e) Disconnect the indicator switch No. 1 connector.
(f) Disconnect the indicator switch No. 2 connector.

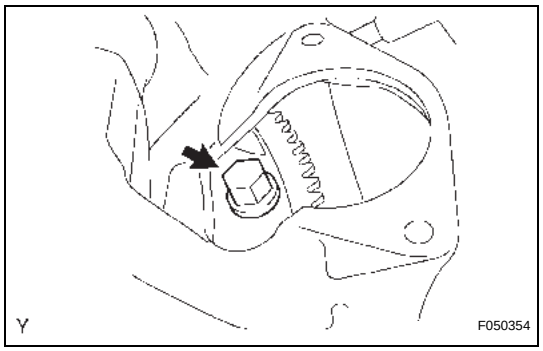
18. DISCONNECT WIRE HARNESS

19. REMOVE STARTER ASSEMBLY (See page ST-13)

20. REMOVE FLYWHEEL HOUSING SIDE COVER

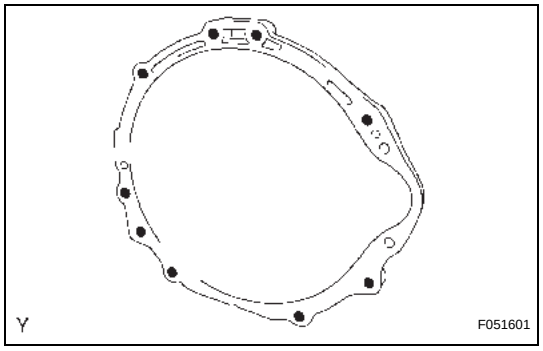
(a) Remove the flywheel housing side cover from the cylinder block.





21. REMOVE AUTOMATIC TRANSMISSION WITH TRANSFER

(a) Turn the crankshaft to gain access to each bolt.
(b) Hold the crankshaft pulley nut with a wrench and remove the 6 bolts.



(c) Remove the 9 bolts.
(d) Separate and remove the automatic transmission.

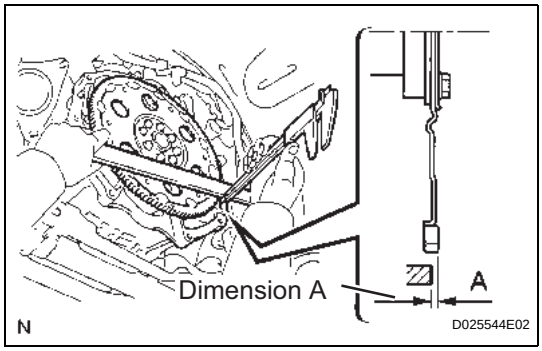
22. REMOVE TORQUE CONVERTER CLUTCH ASSEMBLY

23. REMOVE TRANSFER ASSEMBLY (See page TF-14)

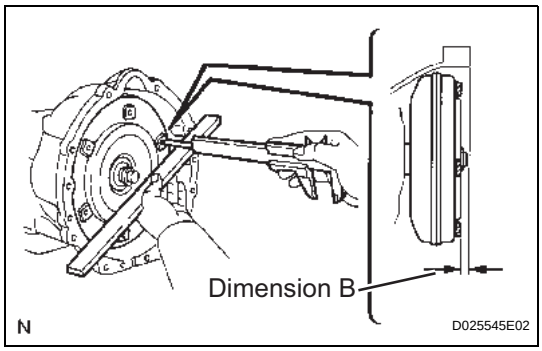
AT

INSTALLATION

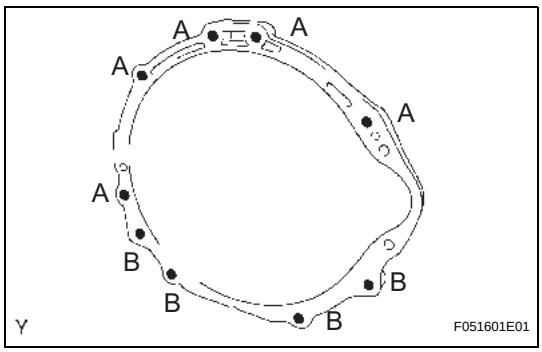
1. **INSTALL TRANSFER ASSEMBLY (See page TF-38)**
2. **INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY (See page AT-169)**
3. **INSTALL TORQUE CONVERTER CLUTCH ASSEMBLY**
   (a) Install the torque converter clutch onto the automatic transmission.
   (b) Using calipers and a straight edge, measure dimension A, between the engine and the end surface of the drive plate, shown in the illustration.



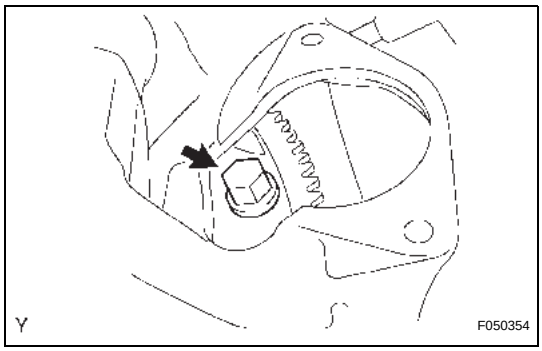
   (c) Using calipers and a straight edge, measure dimension B shown in the illustration and check that B is greater than A measured in (b).
   Standard:
   A+1 mm or more

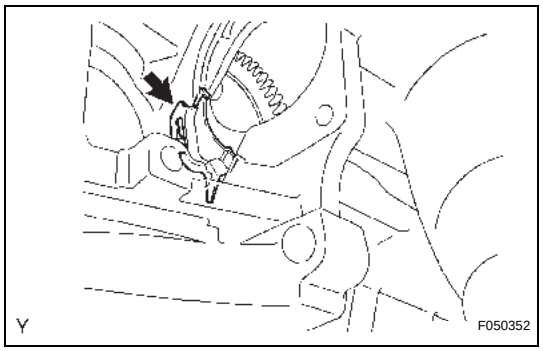


4. **INSTALL AUTOMATIC TRANSMISSION WITH TRANSFER**
   (a) Install the automatic transmission onto the engine with the 9 bolts.
   Torque: 71 N*m (720 kgf*cm, 53 ft.*lbf) for bolt A
   37 N*m (380 kgf*cm, 27 ft.*lbf) for bolt B



   (b) Install the 6 torque converter clutch mounting bolts.
   Torque: 48 N*m (489 kgf*cm, 35 ft.*lbf)
   HINT:
   First install the black bolt and then the other 5 bolts.

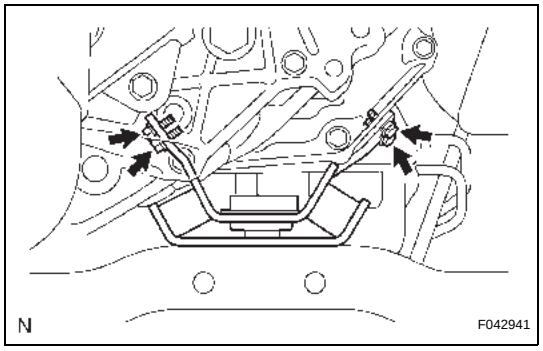




5. INSTALL FLYWHEEL HOUSING SIDE COVER

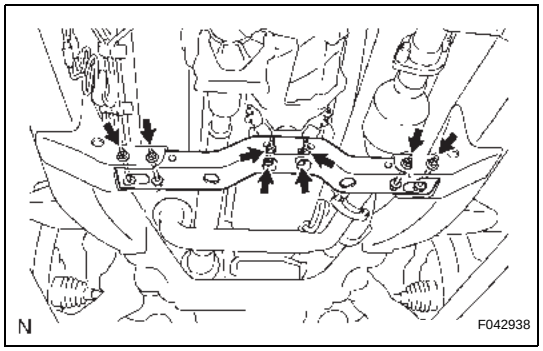
(a) Install the flywheel housing side cover onto the cylinder block.

6. INSTALL STARTER ASSEMBLY (See page ST-19)



7. INSTALL REAR NO.1 ENGINE MOUNTING INSULATOR

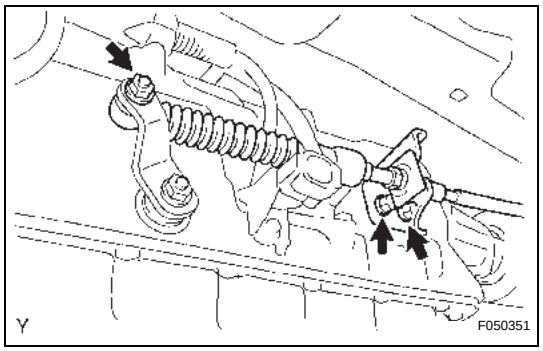
(a) Install the engine mounting insulator rear and 4 bolts onto the automatic transmission.
Torque: 65 N*m (663 kgf*cm, 48 ft.*lbf)



8. INSTALL NO.3 FRAME CROSSMEMBER SUB-ASSEMBLY

(a) Install the frame crossmember sub-assembly No. 3 with the 4 bolts and 4 nuts.
Torque: 40 N*m (408 kgf*cm, 30 ft.*lbf)

(b) Install the frame crossmember sub-assembly No. 3 with the 4 bolts.
Torque: 19 N*m (189 kgf*cm, 14 ft.*lbf)



9. INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY

(a) Install the transmission control cable bracket No. 1 with the 2 bolts.
Torque: 28 N*m (286 kgf*cm, 21 ft.*lbf)

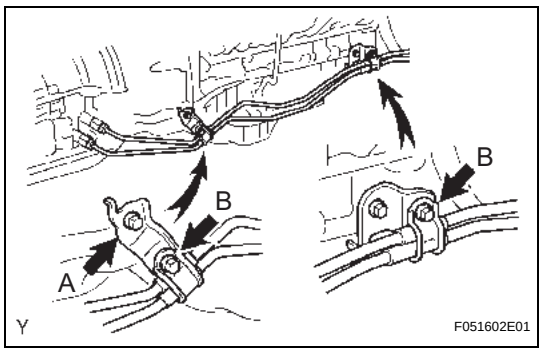
(b) Connect the transmission control cable with the nut.
Torque: 14 N*m (143 kgf*cm, 10 ft.*lbf)

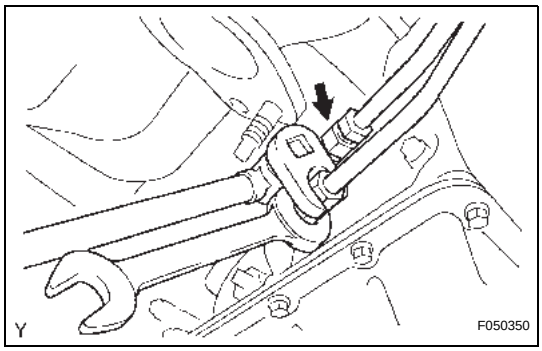
10. INSTALL NO.1 OIL COOLER OUTLET TUBE

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

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

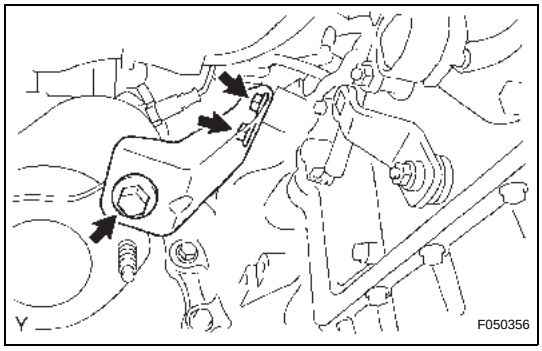
(c) Install the 2 clamps and 2 bolts.
Torque: 12 N*m (122 kgf*cm, 9 ft.*lbf) for bolt A
5.0 N*m (50 kgf*cm, 43 in.*lbf) for bolt B



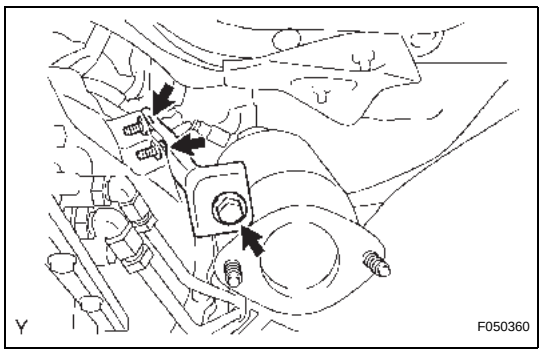


(d) Using SST, tighten the oil cooler outlet tube No. 1.
SST 09023-12701
Torque: 34 N*m (350 kgf*cm, 25 ft.*lbf)

11. INSTALL NO.1 OIL COOLER INLET TUBE
(a) Using SST, tighten the oil cooler inlet tube No. 1.
SST 09023-12701
Torque: 34 N*m (350 kgf*cm, 25 ft.*lbf)



12. INSTALL NO.2 MANIFOLD STAY
(a) Install manifold stay No. 2 with the 3 bolts.
Torque: 40 N*m (408 kgf*cm, 30 ft.*lbf)



13. INSTALL MANIFOLD STAY
(a) Install the manifold stay with the 3 bolts.
Torque: 40 N*m (408 kgf*cm, 30 ft.*lbf)

14. INSTALL PROPELLER WITH CENTER BEARING SHAFT ASSEMBLY (See page PR-8)

15. INSTALL FRONT PROPELLER SHAFT ASSEMBLY (See page PR-19)

16. INSTALL EXHAUST PIPE
(See page EX-3)

17. CONNECT OXYGEN SENSOR

18. CONNECT CABLE TO NEGATIVE BATTERY TERMINAL
Torque: 3.9 N*m (40 kgf*cm, 35 in.*lbf)

19. PERFORM INITIALIZATION
(See pageAT-17)

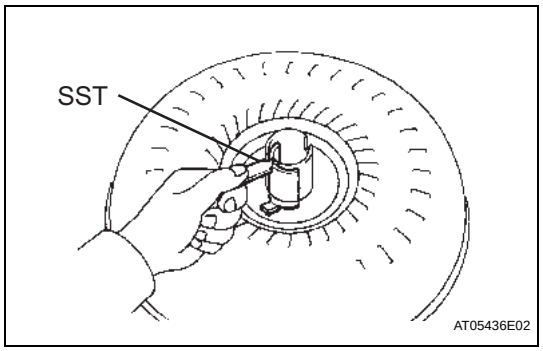
20. ADD AUTOMATIC TRANSMISSION FLUID
(See page AT-139)

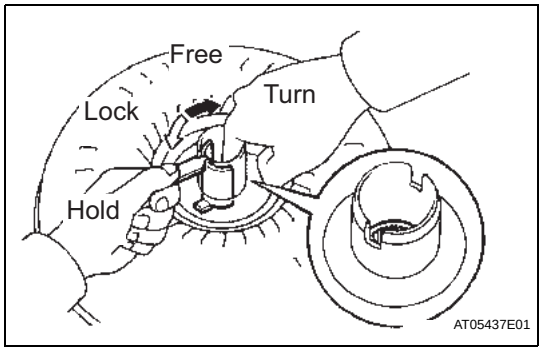
21. INSPECT SHIFT LEVER POSITION (See page AT-158)

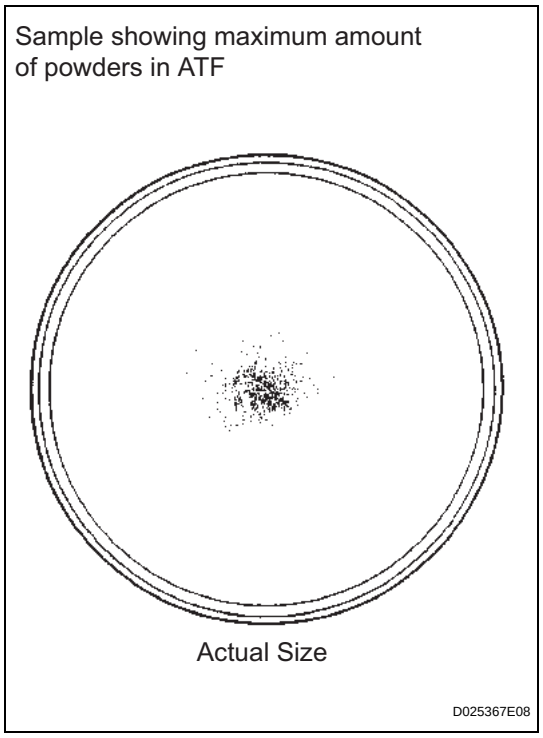
22. CHECK FOR EXHAUST GAS LEAKAGE

23. INSTALL NO. 2 ENGINE UNDER COVER (w/ No. 2 Engine Under Cover)

24. INSTALL NO. 1 ENGINE UNDER COVER SUB-ASSEMBLY







TORQUE CONVERTER CLUTCH AND DRIVE PLATE

INSPECTION

AT

1. INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY

(a) Inspect the one-way clutch.

(1) Install SST so that it fits in the notch of the converter hub and outer race of the one-way clutch.
SST 09350-32014 (09351-32020)

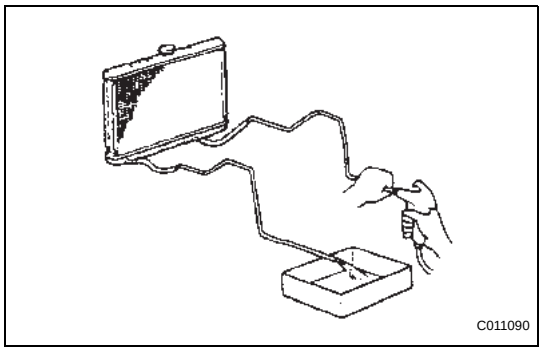
(2) Press on the serrations of the starter with a finger and rotate it.
Check if it rotates smoothly when turned clockwise and locks up when turned counterclockwise.
If necessary, clean the converter and check the one-way clutch again.
Replace the converter if the one-way clutch still won't operate as specified.

(b) Check the condition of the torque converter clutch assembly.

(1) If the inspection result of the torque converter clutch assembly meets any of the cases mentioned below, replace the torque converter clutch.
Malfunction item:
Any metallic sound is heard from the torque converter clutch during stall test or when the shift lever is in the neutral position.
One-way clutch is free or locked in both directions. Fine powders exceeding the sample limit are identified in ATF. (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.

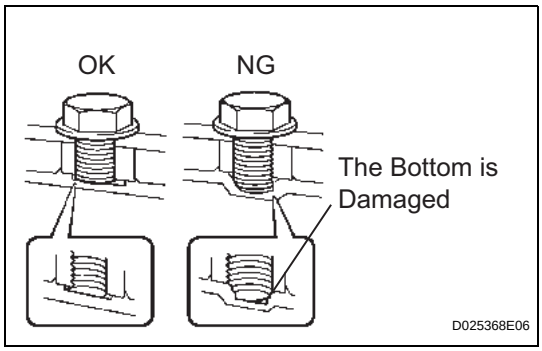
(c) Replace the ATF in the torque converter clutch.

(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 installation surface facing up.

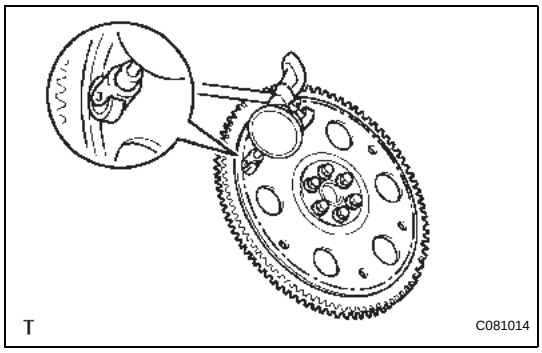


(d) Clean and then check the oil cooler and oil pipe line.
(1) If inspecting the torque converter clutch or exchanging the ATF, clean the oil cooler and oil pipe line.
HINT:
- Apply compressed air of 196 kPa (2 kgf/ cm2, 28 psi) from the inlet hose.
- If plenty of fine powders are identified in the ATF, add new ATF using a bucket pump and clean the ATF again.

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



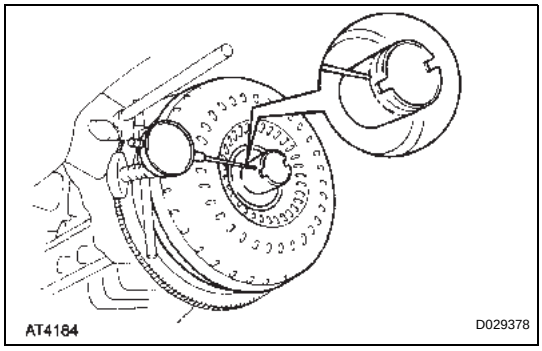
(e) Be careful not to deform the torque converter clutch or damage the oil pump gear.
(1) When any marks due to interference are found on the end of the bolt to the torque converter clutch or on the bottom of the bolt hole, replace the bolt and the torque converter clutch.
(2) All the bolts should be the same length.
(3) Do not lose any spring washers.



2. INSPECT DRIVE PLATE AND RING GEAR SUB-ASSEMBLY

(a) Set up a dial indicator and measure the drive plate runout.
Maximum runout:
0.20 mm (0.0079 in.)

(b) Check the ring gear for damage.
If the runout is not within the specification or the ring gear is damaged, replace the drive plate.



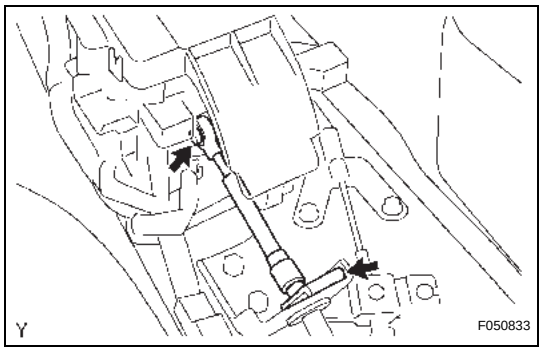
3. INSPECT RUNOUT OF TORQUE CONVERTER CLUTCH ASSEMBLY

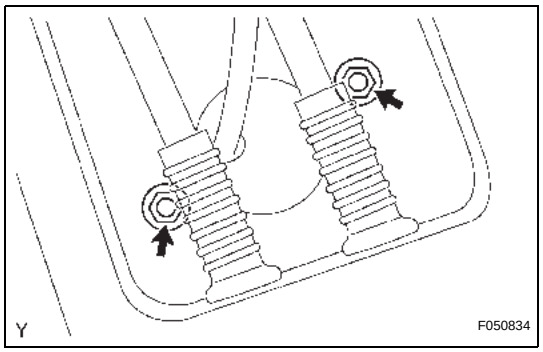
(a) Provisionally mount the torque converter onto the drive plate, set up a dial indicator, and measure the torque converter sleeve runout.
Maximum runout:
0.30 mm (0.0118 in.)
If the runout is not within the specification, try to correct it by reinstalling the converter to the correct orientation.
HINT:
Mark the position of the converter to ensure correct installation.

TRANSMISSION CONTROL CABLE

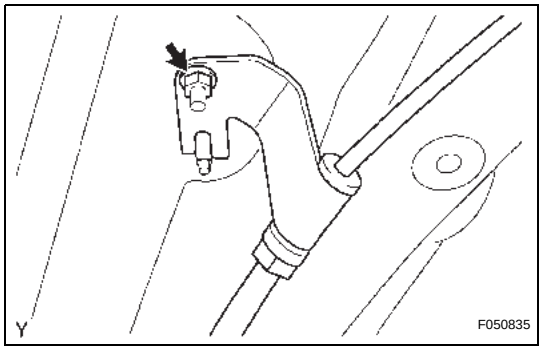
REMOVAL

1. **REMOVE CONSOLE UPPER REAR PANEL SUB-ASSEMBLY (See page IP-9)**
2. **REMOVE CONSOLE BOX ASSEMBLY REAR (See page IP-10)**
3. **REMOVE INSTRUMENT PANEL CUP HOLDER TRAY (See page IP-10)**
4. **REMOVE CONSOLE BOX FRONT (See page IP-10)**
5. **REMOVE VOLTAGE INVERTER ASSEMBLY (w/ Voltage Inverter) (See page AV-104)**
6. **REMOVE TRANSMISSION CONTROL CABLE ASSEMBLY**
   (a) Disconnect the transmission control cable assembly from the shift lever assembly.
   (b) Remove the clip and disconnect the transmission control cable.

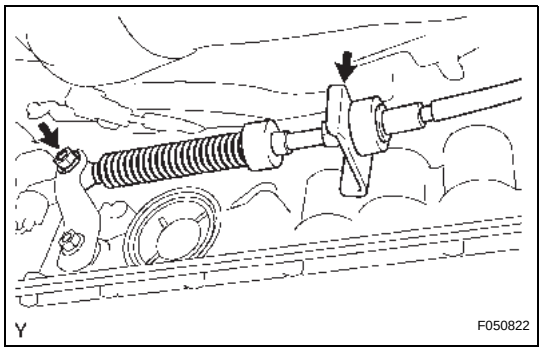




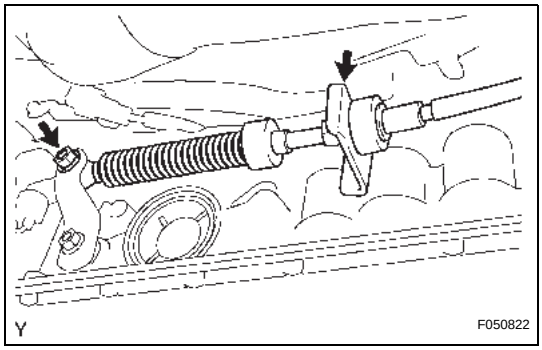
   (c) Remove the 2 nuts and disconnect the transmission control cable assembly from the body.



   (d) Remove the nut and disconnect the transmission control cable assembly from the body.



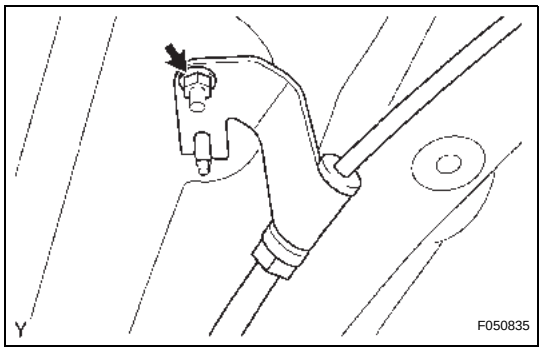
(e) Remove the clip and transmission control cable bracket.
(f) Remove the nut and transmission control cable assembly.



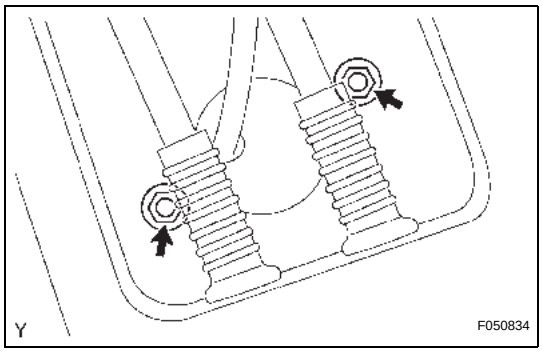
INSTALLATION

1. INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY

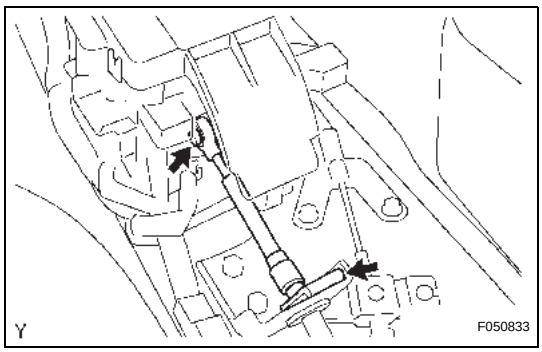
(a) Install the transmission control cable assembly with the nut.
Torque: 14 N*m (143 kgf*cm, 10 ft.*lbf)
(b) Install the transmission control cable bracket and lock plate.



(c) Connect the transmission control cable with the nut to the body.
Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf)



(d) Connect the transmission control cable with the 2 nuts to the body.
Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf)



(e) Connect the transmission control cable with the lock plate to the floor shift assembly.
(f) Install the transmission control cable onto the floor shift assembly.

2. INSTALL VOLTAGE INVERTER ASSEMBLY (w/ Voltage Inverter) (See page AV-105)

3. INSTALL CONSOLE BOX FRONT (See page IP-24)

4. INSTALL INSTRUMENT PANEL CUP HOLDER TRAY (See page IP-24)

5. **INSTALL CONSOLE BOX ASSEMBLY REAR (See page IP-24)**
6. **INSTALL CONSOLE UPPER REAR PANEL SUB-ASSEMBLY (See page IP-25)**
7. **ADJUST SHIFT LEVER POSITION (See page AT-105)**
8. **INSPECT SHIFT LEVER POSITION (See page AT-105)**