# AUTOMATIC TRANSAXLE SYSTEM

## PRECAUTION

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

| System Name | See procedure |
|---|---|
| Power Window Control System (with Jam Protection Function) | IN-23 |
| Sliding Roof System | IN-23 |

**NOTICE:**
**Perform the RESET MEMORY (AT initialization) when replacing the automatic transaxle assembly, engine assembly or ECM (See page AX-15).**
HINT:
RESET MEMORY can not be completed by only disconnecting the battery cable.

1. **The automatic transaxle is composed of highly precision-finished parts which need careful inspection before reassembly. Even a small nick could cause fluid leakage or affect the performance. The instructions here are organized so that you work on only one component group at a time. This will help avoid confusion caused by similar-looking parts of different sub-assemblies being on your workbench at the same time. The component groups are inspected and repaired from the converter housing side. Complete the inspection, repair and reassembly before proceeding to the next component group as much as possible. If a defect is found in a certain component group during reassembly, inspect and repair this group immediately. If a component group cannot be assembled because some parts are being ordered, be sure to keep all parts of the group in a separate container while proceeding with disassembly, inspection, repair and reassembly of other component groups. Recommended: Toyota Genuine ATF WS**
2. **All disassembled parts should be washed clean and any fluid passages and holes should be blown through with compressed air.**
3. **Dry all parts with compressed air. Never use a shop rag or a piece of cloth to dry them.**
4. **When using compressed air, always aim away from yourself to prevent accidentally spraying ATF or kerosene in your face.**
5. **Only recommended automatic transaxle fluid or kerosene should be used for cleaning.**

AX

6. **After cleaning, the parts should be arranged in the correct order for efficient inspection, repair, and reassembly.**
7. **When disassembling a valve body, be sure to match each valve together with the corresponding spring.**
8. **New discs for the brakes and clutches that are to be used for replacement must be soaked in ATF for at least 15 minutes before reassembly.**
9. **All oil seal rings, clutch discs, clutch plates, rotating parts, and sliding surfaces should be coated with ATF prior to reassembly.**
10. **All gaskets and rubber O-rings should be replaced with new ones.**
11. **Do not apply adhesive cements to gaskets and similar parts.**
12. **Make sure that the ends of a snap ring are not aligned with one of the cutouts and are installed in the groove correctly.**
13. **When replacing a worn bushing, the sub-assembly containing the bushing must also be replaced.**
14. **Check thrust bearings and races for wear or damage. Replace them as necessary.**
15. **When working with FIPG material, you must observe the following:**
    - Using a razor blade and a gasket scraper, remove all the old packing (FIPG) material from the gasket surface.
    - Thoroughly clean all components to remove any loose material.
    - Clean both sealing surfaces with a non-residue solvent.
    - Parts must be reassembled within 10 minutes of application. Otherwise, the packing (FIPG) material must be removed and reapplied.

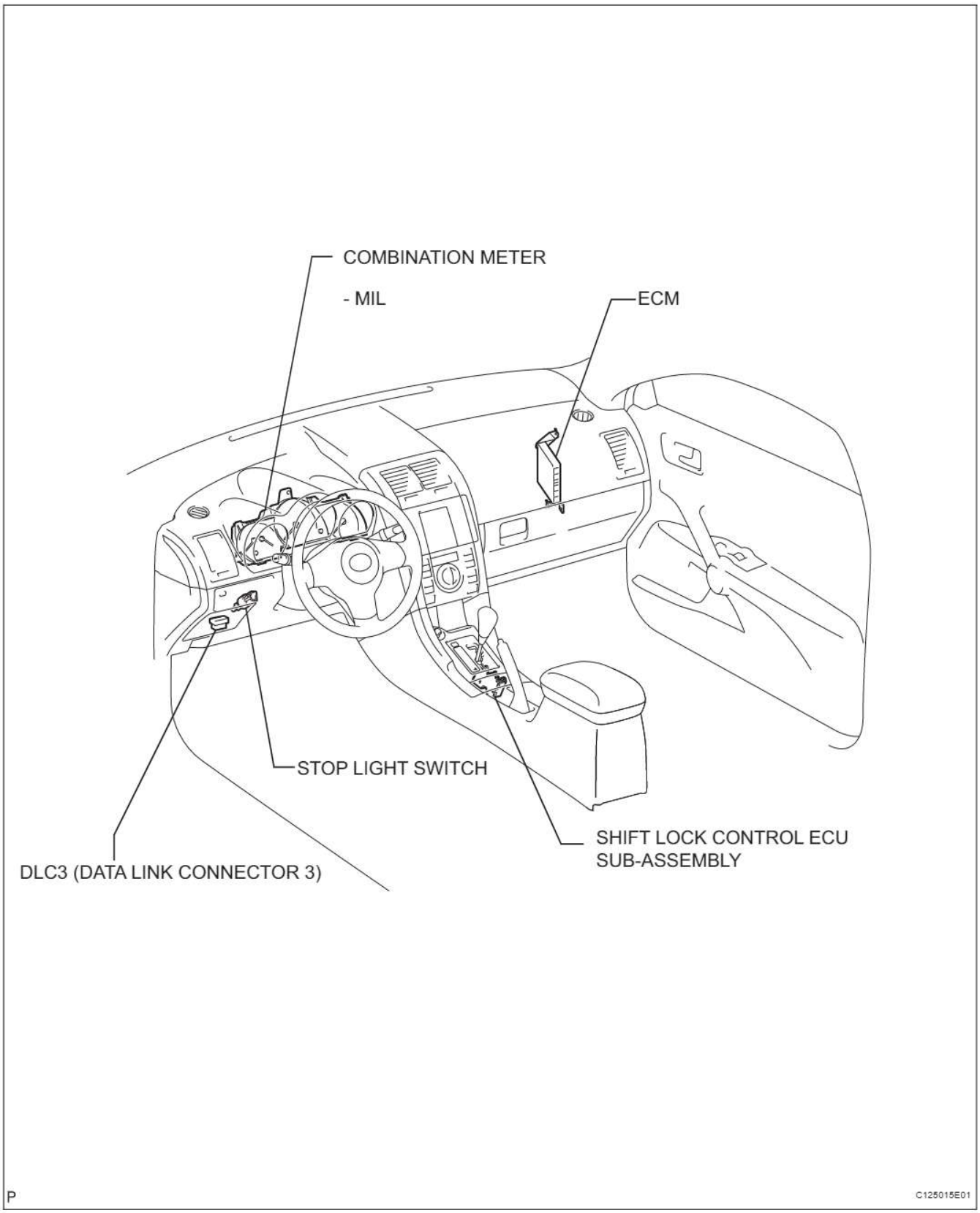
AX

# DEFINITION OF TERMS

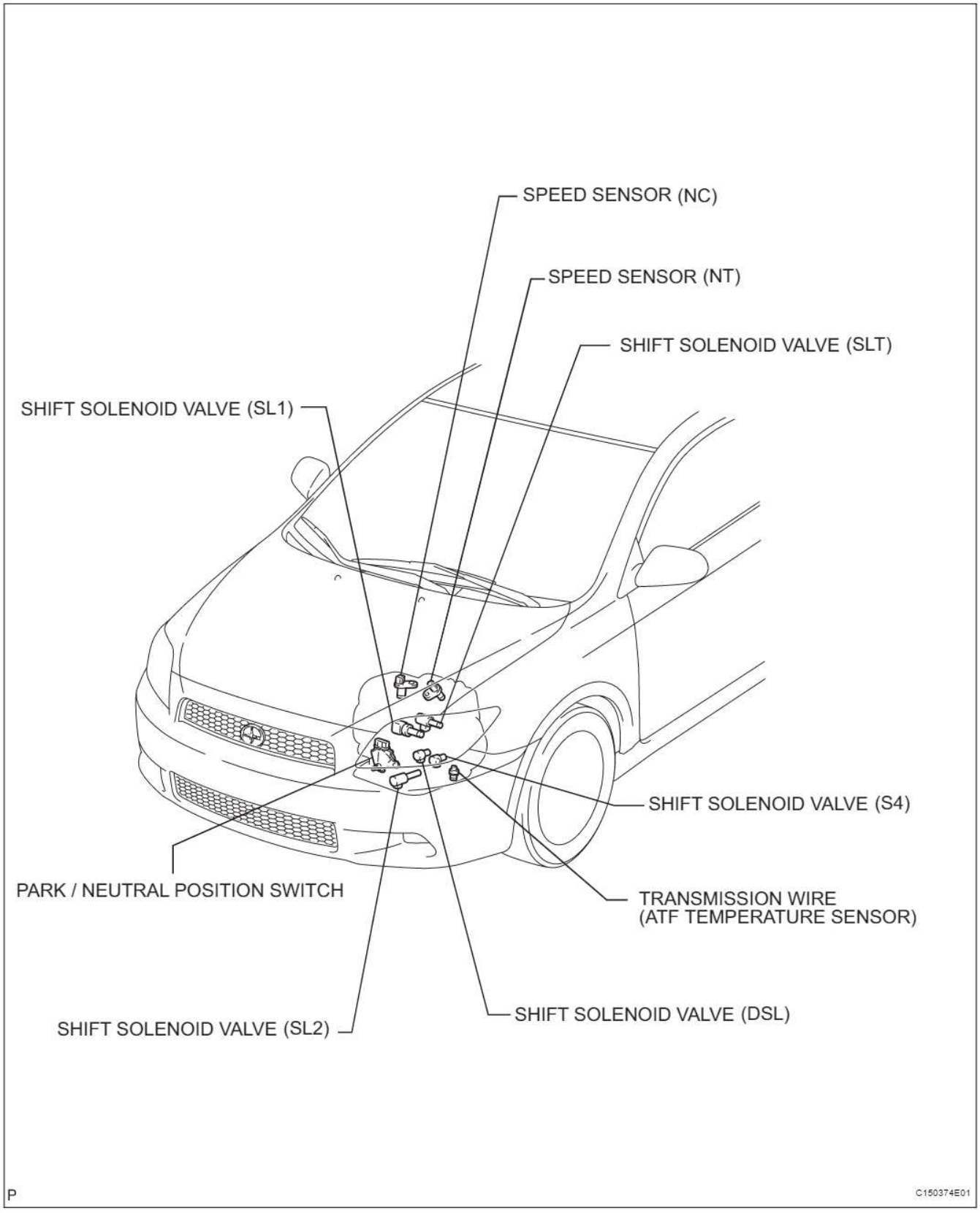
| Term | Definition |
|---|---|
| Monitor description | Description of what the ECM monitors and how it detects malfunctions (monitoring purpose and its details). |
| Related DTCs | Diagnostic code |
| Typical enabling condition | Preconditions that allow the ECM to detect malfunctions.<br>With all preconditions 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.<br>While another sensor is being monitored, the next sensor or component will not be monitored until the previous monitoring has concluded. |
| Required sensor/components | The sensors and components that are used by the ECM to detect malfunctions. |
| Frequency of operation | The number of times that the ECM checks for malfunctions per driving cycle.<br>"Once per driving cycle" means that the ECM detects malfunction only one time during a single driving cycle.<br>"Continuous" means that the ECM detects malfunction every time when enabling condition is met. |
| Duration | The minimum time that the ECM must sense a continuous deviation in the monitored value(s) before setting a DTC. This timing begins after the "typical enabling conditions" are met. |
| Malfunction thresholds | Beyond this value, the ECM will conclude that there is a malfunction and set a DTC. |
| MIL operation | MIL illumination timing after a defect is detected.<br>"Immediately" means that the ECM illuminates MIL the instant the ECM determines that there is a malfunction.<br>"2 driving cycle" means that the ECM illuminates MIL if the same malfunction is detected again in the 2nd driving cycle. |
| Component operating range | Normal operation range of sensors and solenoids under normal driving conditions.<br>Use these ranges as a reference.<br>They cannot be used to judge if a sensor or solenoid is defective or not. |

AX

# PARTS LOCATION



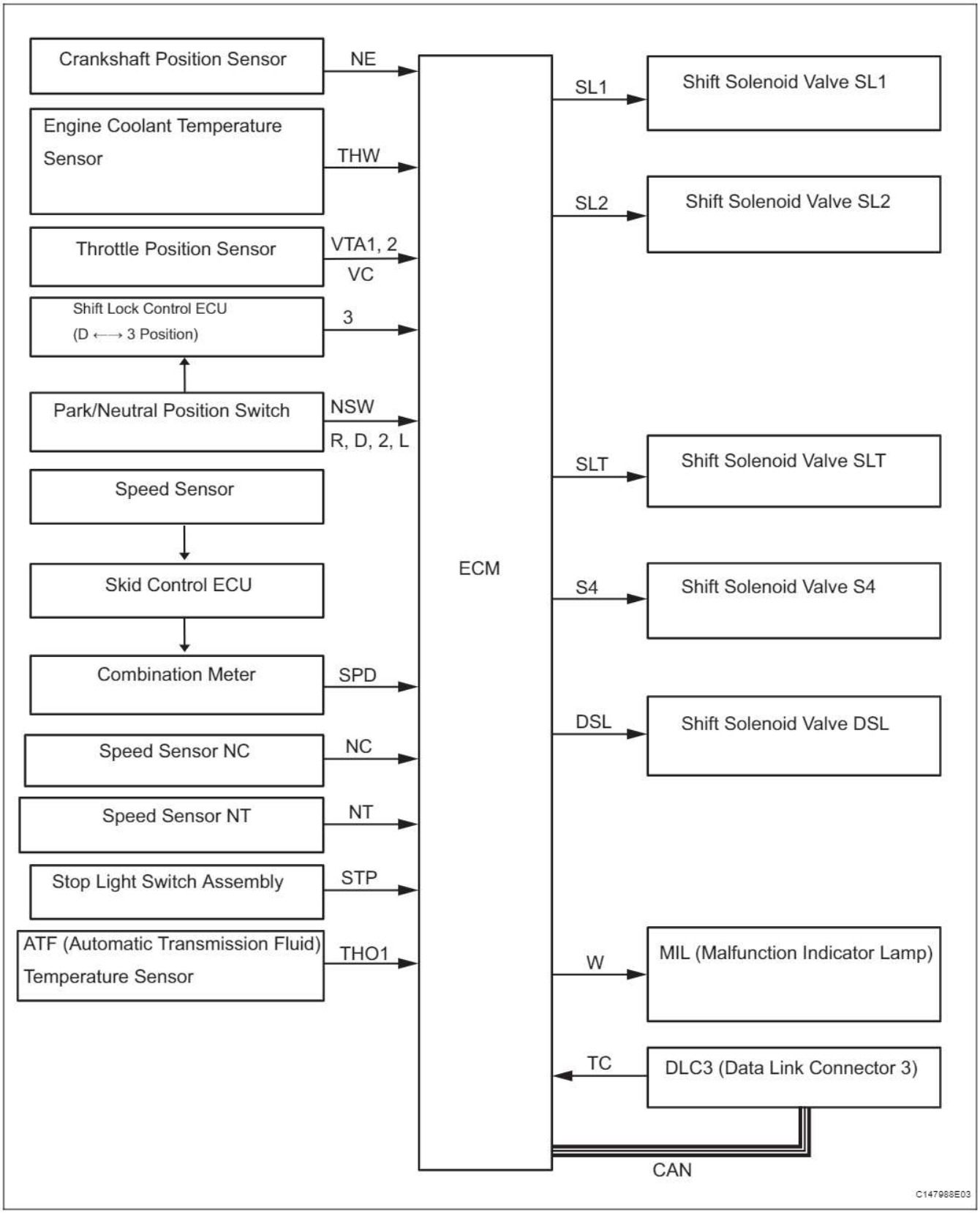

AX


SPEED SENSOR (NC)
SPEED SENSOR (NT)
SHIFT SOLENOID VALVE (SLT)
SHIFT SOLENOID VALVE (SL1)
SHIFT SOLENOID VALVE (S4)
PARK / NEUTRAL POSITION SWITCH
TRANSMISSION WIRE
(ATF TEMPERATURE SENSOR)
SHIFT SOLENOID VALVE (DSL)
SHIFT SOLENOID VALVE (SL2)
P
C150374E01

AX

# SYSTEM DIAGRAM

The configuration of the electronic control system in the U241E automatic transaxles is as shown in the following chart.




AX

# SYSTEM DESCRIPTION

## 1. SYSTEM DESCRIPTION

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

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

In addition, the ECT has features such as follows:

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

# HOW TO PROCEED WITH TROUBLESHOOTING

HINT:

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

| | |
|---|---|
| 1 | Vehicle Brought to Workshop |

NEXT

| | |
|---|---|
| 2 | Customer Problem Analysis |

NEXT

| | |
|---|---|
| 3 | Connect the intelligent tester to DLC3 |

NEXT

| | |
|---|---|
| 4 | Check and Clear DTCs and Freeze Frame Data |

AX

HINT:
(See page AX-26).

NEXT

| | |
|---|---|
| 5 | Visual Inspection |

NEXT

| | |
|---|---|
| 6 | Setting the Check Mode Diagnosis |

HINT:
(See page AX-27).

NEXT

| | |
|---|---|
| 7 | Problem Symptom Confirmation |

HINT:
(See page AX-10).

| | |
|---|---|
| | Symptom does not occur: Go to step 8 |

Symptom occurs: Go to step 9

| 8 | Symptom Simulation |
|---|---|

HINT:
(See page IN-26).

NEXT

| 9 | DTC Check |
|---|---|

HINT:
(See page AX-26).

DTC is not output: Go to step 10

DTC is output: Go to step 17

| 10 | Basic Inspection |
|---|---|

HINT:
(See page AX-104, AX-110 and AX-133).

NG → Go to step 19

OK

| 11 | Mechanical System Test |
|---|---|

HINT:
(See page AX-12).

NG → Go to step 16

OK

| 12 | Hydraulic Test |
|---|---|

HINT:
(See page AX-14).

NG → Go to step 16

OK

| 13 | Manual Shifting Test |
|---|---|

HINT:
(See page AX-15).

NG → Go to step 15

AX

OK

| | |
|---|---|
| 14 | Problem Symptoms Table Chapter 1 |

HINT:
(See page AX-19).

NG → Go to step 18

OK

| | |
|---|---|
| 15 | Problem Symptoms Table Chapter 2 |

HINT:
(See page AX-19).

NEXT

| | |
|---|---|
| 16 | Part Inspection |

→ Go to step 19

| | |
|---|---|
| 17 | DTC Chart |

HINT:
(See page AX-33).

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 referring to the automatic shift schedule and simulate the problem symptoms.

**2. ROAD TEST**

**NOTICE:**

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

(a) D position test:

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

(1) Check up-shift operation.

Check that 1 → 2, 2 → 3 and 3 → 4th(O/D) up-shifts take place, and that the shift points conform to the automatic shift schedule (See page SS-20).

HINT:

4th(O/D) Gear Up-shift Prohibition Control

- Engine coolant temperature is 55°C (131°F) or less and vehicle speed is at 70 km/h (43 mph) or less.
- ATF temperature is 5°C (41°F) or less.

Lock-up Prohibition Control

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

3rd Gear Lock-up Prohibit Control

- There is no 3rd gear lock-up function in the 4 position.

(2) Check for shift shock and slip.

Check for shock and slip at the 1 → 2, 2 → 3 and 3 → 4th(O/D) up-shifts.

(3) Check for abnormal noise and vibration.

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

HINT:

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

AX

(4) Check kick-down operation.
Check vehicle speeds when the 2nd to 1st, 3rd to 2nd and 4th(O/D) to 3rd kick-downs take place while driving with the shift lever in the D position. Confirm that each speed is within the applicable vehicle speed range indicated in the automatic shift schedule (See page SS-20).
(5) Check abnormal shock and slip at kick-down.
(6) Check the lock-up mechanism.
- Drive in D position (4th(O/D) gear), at a steady speed (lock-up ON).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

HINT:
- There is no lock-up function in the 1st and 2nd gear.
- If there is a big jump in engine speed, there is no lock-up.

(b) 2 position test:
Shift into the 2 position and fully depress the accelerator pedal and check the following points.
(1) Check up-shift operation.
Check that the 1 → 2 up-shift takes place and that the shift point conforms to the automatic shift schedule (See page SS-20).
HINT:
There is no 3rd up-shift and lock-up in the 2 position.
(2) Check engine braking.
While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.
(3) Check for abnormal noise during acceleration and deceleration, and for shock at up-shift and down-shift.

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

AX

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

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

# MECHANICAL SYSTEM TESTS

## 1. PERFORM MECHANICAL SYSTEM TESTS

(a) Measure the stall speed.

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

**NOTICE:**

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

(1) Chock the 4 wheels.

(2) Connect the intelligent tester to the DLC3.

(3) Fully apply the parking brake.

(4) Keep your left foot pressed firmly on the brake pedal.

(5) Start the engine.

(6) Shift into the D position. Press all the way down on the accelerator pedal with your right foot.

(7) Quickly read the stall speed at this time.

**Stall speed:**
**2570 +- 150 rpm**

AX

**Evaluation:**

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

(b) Measure the time lag.

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

**NOTICE:**

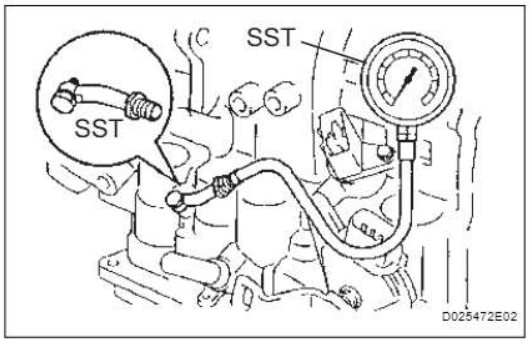
- **Perform the test at the normal operating ATF (Automatic Transmission Fluid) temperature: 50 to 80°C (122 to 176°F).**

- **Be sure to allow 1 minute interval between tests.**
- **Perform the test three times, and measure the time lags. Calculate the average value of the three time lags.**

(2) Connect the intelligent tester to the DLC3.
(3) Fully apply the parking brake.
(4) Start and warm up the engine and check idle speed.
**Idle speed:**
**approx. 700 rpm (In N position and A/C OFF)**
(5) Shift the lever from N to D position. Using a stop watch, measure the time from when the lever is shifted until the shock is felt.
**Time lag:**
**N → D less than 1.2 seconds**
(6) In the same way, measure the time lag for N → R.
**Time lag:**
**N → R less than 1.5 seconds**

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

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




# HYDRAULIC TEST

AX

**1. PERFORM HYDRAULIC TEST**

(a) Measure the line pressure.
**NOTICE:**

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

(1) Warm up the ATF:

(2) Remove the test plug on the front side of the transaxle case and connect SST.
**SST 09992-00095 (09992-00231, 09992-00271)**
(3) Fully apply the parking brake and chock the 4 wheels.
(4) Connect the intelligent tester to the DLC3.
(5) Start the engine and check idling speed.
(6) Keep your left foot pressing firmly on the brake pedal and shift into D position.
(7) Measure the line pressure when the engine is idling.
(8) Depress the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.
(9) In the same way, do the test in R position.

**Specified line pressure:**

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

**Evaluation:**

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

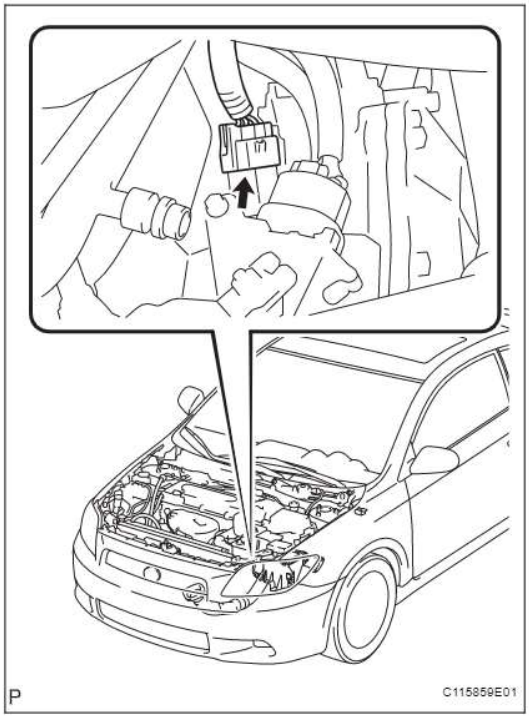
AX

# MANUAL SHIFTING TEST

## 1. PERFORM MANUAL SHIFTING TEST

HINT:

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




(a) Disconnect the transmission wire connector.

(b) Inspect the manual driving operation.
Check that the shift and gear positions correspond to the table below.
Check that the gear change corresponds to the shift position.

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

HINT:
If the gear positions of the L, 2 and D are difficult to distinguish, do the following road test (See page AX-10).
If any abnormality is found in the above test, the problem is in the transaxle itself.

(c) Connect the transmission wire connector.

(d) Clear the DTC (See page AX-26).

AX

# INITIALIZATION

1. **RESET MEMORY**

**NOTICE:**

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

HINT:

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

Reset procedure is as follows.

(a) Turn the ignition switch off.

(b) Connect the intelligent tester to the DLC3.

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

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

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

**CAUTION:**

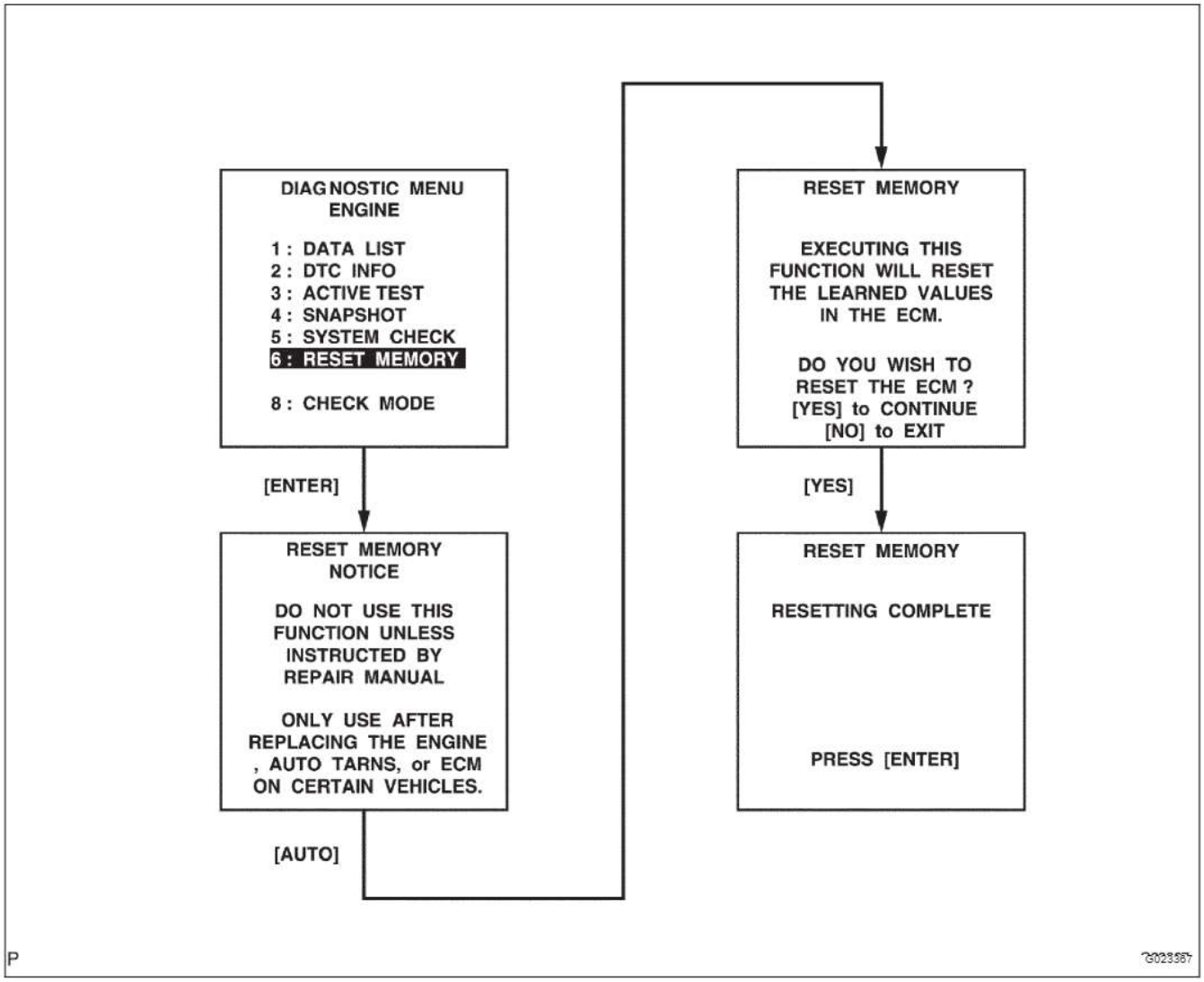
**After performing the RESET MEMORY, be sure to perform the ROAD TEST (See page AX-10) described earlier.**

HINT:

The ECM is learned by performing the ROAD TEST.

(1) Tester menu flow:

AX


DIAGNOSTIC MENU
ENGINE
1 : DATA LIST
2 : DTC INFO
3 : ACTIVE TEST
4 : SNAPSHOT
5 : SYSTEM CHECK
6 : RESET MEMORY
8 : CHECK MODE
[ENTER]
RESET MEMORY
NOTICE
DO NOT USE THIS FUNCTION UNLESS INSTRUCTED BY REPAIR MANUAL
ONLY USE AFTER REPLACING THE ENGINE , AUTO TARNS, or ECM ON CERTAIN VEHICLES.
[AUTO]
RESET MEMORY
EXECUTING THIS FUNCTION WILL RESET THE LEARNED VALUES IN THE ECM.
DO YOU WISH TO RESET THE ECM ?
[YES] to CONTINUE
[NO] to EXIT
[YES]
RESET MEMORY
RESETTING COMPLETE
PRESS [ENTER]
P
G023387

AX

# MONITOR DRIVE PATTERN

## 1. MONITOR DRIVE PATTERN FOR ECT TEST

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

HINT:

Preparation for driving

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

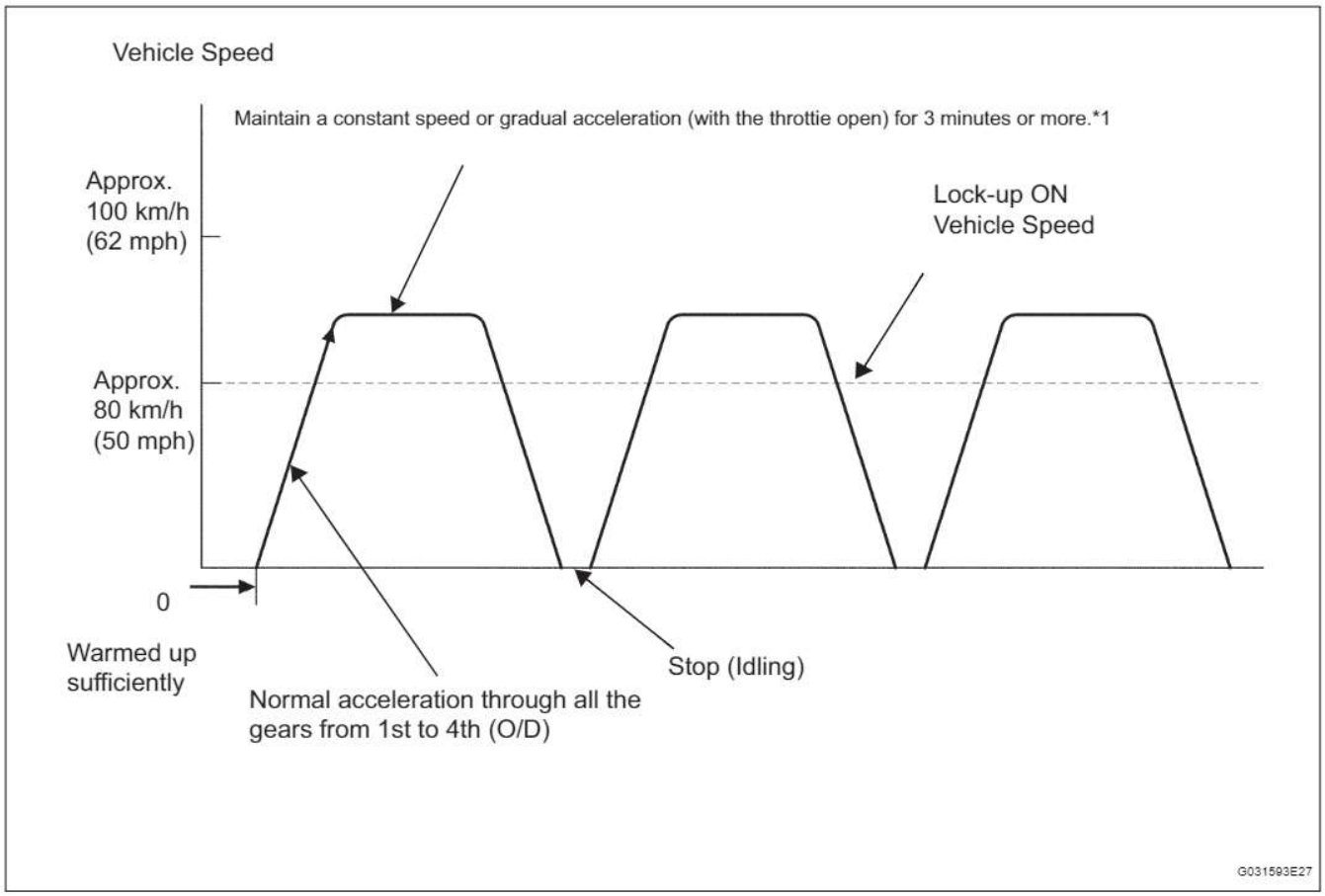
Driving note

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

**NOTICE:**

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

AX




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

AX

# PROBLEM SYMPTOMS TABLE

HINT:

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

Chapter 1:

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

## 1. Chapter 1: Electronic Circuit Matrix Chart

| Symptom | Suspected Area | See page |
|---|---|---|
| No up-shift (1st -> 2nd) | ECM | IN-34 |
| No up-shift (2nd -> 3rd) | ECM | IN-34 |
| No up-shift (3rd -> 4th) | 1. Park/neutral position switch circuit *1 | AX-36 |
| | 2. ECM | IN-34 |
| No down-shift (4th -> 3rd) | ECM | IN-34 |
| No down-shift (3rd -> 2nd) | ECM | IN-34 |
| No down-shift (2nd -> 1st) | ECM | IN-34 |
| No lock-up or No lock-up off | ECM | IN-34 |
| Shift point too high or too low | ECM | IN-34 |
| Up-shift to 4th from 3rd while shift lever is 3 position | 1. Park/neutral position switch circuit *1 | AX-36 |
| | 2. ECM | IN-34 |
| Up-shift to 4th from 3rd while engine is cold | 1. Engine coolant temp. sensor circuit *1 | ES-47 |
| | 2. ECM | IN-34 |
| Harsh engagement (N -> D) | ECM | IN-34 |
| Harsh engagement (Lock-up) | ECM | IN-34 |
| Harsh engagement (Any driving position) | ECM | IN-34 |
| Poor acceleration | ECM | IN-34 |
| Engine stalls when starting off or stopping | ECM | IN-34 |
| Malfunction in shifting | 1. Park/neutral position switch circuit *1 | AX-36 |
| | 2. ECM | IN-34 |

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

| Symptom | Suspected Area | See page |
|---|---|---|
| Vehicle does not move in any forward positions and reverse positions | 1. Manual valve | AX-118 |
| | 2. Valve body assembly | AX-118 |
| | 3. Front and rear planetary gear *2 | - |
| | 4. U/D planetary gear *2 | - |
| | 5. U/D one-way clutch (F2) *2 | - |
| | 6. Forward clutch (C1) *2 | - |
| | 7. U/D brake (B3) *2 | - |

| Symptom | Suspected Area | See page |
|---|---|---|
| Vehicle does not move in R position | 1. Front and rear planetary gear unit *2 | - |
| | 2. U/D planetary gear unit *2 | - |
| | 3. Direct clutch (C2) *2 | - |
| | 4. U/D brake (C3) *2 | - |
| | 5. 1st and reverse brake (B2) *2 | - |
| No up-shift (1st -> 2nd) | 1. Valve body assembly | AX-118 |
| | 2. No. 1 one-way clutch (F1) *2 | - |
| | 3. 2nd brake (B1) *2 | - |
| No up-shift (2nd -> 3rd) | 1. Valve body assembly | AX-118 |
| | 2. Direct clutch (C2) *2 | - |
| No up-shift (3rd -> 4th) | 1. Valve body assembly | AX-118 |
| | 2. U/D clutch (C3) *2 | - |
| No down-shift (4th -> 3rd) | Valve body assembly | AX-118 |
| No down-shift (3rd -> 2nd) | Valve body assembly | AX-118 |
| No down-shift (2nd -> 1st) | Valve body assembly | AX-118 |
| No lock-up or No lock-up off | 1. Valve body assembly | AX-118 |
| | 2. Torque converter clutch | AX-152 |
| Harsh engagement (N -> D) | 1. C1 accumulator *2 | - |
| | 2. Valve body assembly | AX-118 |
| | 3. Forward clutch (C1) *2 | - |
| | 4. U/D one-way clutch (F2) *2 | - |
| | 5. No. 1 one-way clutch (F1) *2 | - |
| Harsh engagement (N -> R) | 1. Valve body assembly | AX-118 |
| | 2. Direct clutch (C2) *2 | - |
| | 3. 1st and reverse brake (B2) *2 | - |
| Harsh engagement (Lock-up) | 1. Valve body assembly | AX-118 |
| | 2. Torque converter clutch | AX-152 |
| Harsh engagement (2nd -> 3rd) | Valve body assembly | AX-118 |
| Harsh engagement (3rd -> 4th) | Valve body assembly | AX-118 |
| Harsh engagement (4th -> 3rd) | Valve body assembly | AX-118 |
| Slip or shudder (Forward position: After warm-up) | 1. Oil strainer | AX-118 |
| | 2. Torque converter clutch | AX-152 |
| | 3. Forward clutch (C1) *2 | - |
| | 4. Direct clutch (C2) *2 | - |
| | 5. U/D brake (C3) *2 | - |
| | 6. No. 1 one-way clutch (F1) *2 | - |
| | 7. U/D one-way clutch (F2) *2 | - |
| Slip or shudder (R position) | 1. Oil strainer | AX-118 |
| | 2. Direct clutch (C2) *2 | - |
| | 3. 1st and reverse brake (B2) *2 | - |
| Slip or shudder (1st) | No. 1 one-way clutch (F1) *2 | - |
| Slip or shudder (2nd) | 1. U/D one-way clutch (F2) *2 | - |
| | 2. 2nd brake (B1) *2 | - |
| Slip or shudder (3rd) | Direct clutch (C2) *2 | - |
| Slip or shudder (4th) | U/D clutch (C3) *2 | - |
| No engine braking (1st to 3rd: D position) | U/D brake (B3) *2 | - |
| No engine braking (1st: L position) | 1st and reverse brake (B2) *2 | - |
| No engine braking (2nd: 2 position) | 2nd brake (B1) *2 | - |

AX

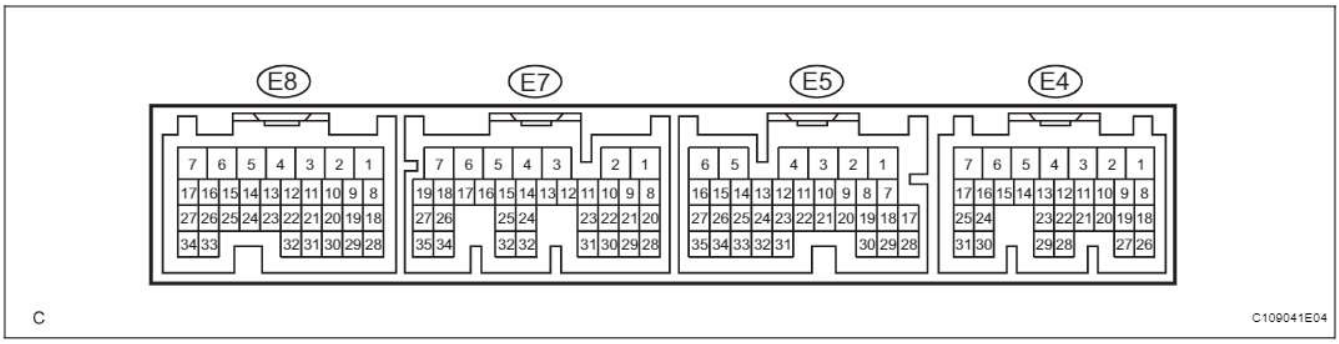
| Symptom | Suspected Area | See page |
|---|---|---|
| Poor acceleration (All position) | 1. Torque converter clutch | AX-152 |
| | 2. U/D planetary gear *2 | - |
| Poor acceleration (4th) | 1. U/D clutch (C3) *2 | - |
| | 2. U/D planetary gear *2 | - |
| Large shift shock or engine stalls when starting off or stopping | Torque converter clutch | AX-152 |
| No kick-down | Valve body assembly | AX-118 |

HINT:
*2: U241E AUTOMATIC TRANSAXLE Repair Manual Pub. No. RM840U.

AX

# TERMINALS OF ECM

## 1. ECM

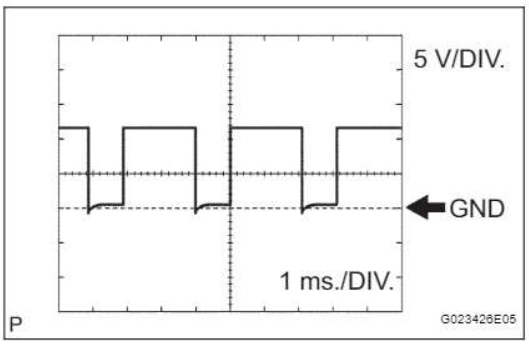



HINT:
Each ECM terminal's standard voltage is shown in the table below.
In the table, first follow the information under "Condition". Look under "Symbols (Terminal No.)" for the terminals to inspected. The standard voltage between the terminals is shown under "Specific Condition".
Use the illustration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

| Symbols (Terminals No.) | Wiring Color | Terminal Description | Condition | Specified Condition |
|---|---|---|---|---|
| D (E5-21) - E1 (E8-3) | W - L | D shift position switch signal | Ignition switch to the ON position and shift lever D and 3 position | 10 to 14 V |
| | | | Ignition switch to the ON position and shift lever except D and 3 position | Below 1 V |
| R (E5-11) - E1 (E8-3) | P - L | R shift position switch signal | Ignition switch to the ON position and shift lever R position | 10 to 14 V |
| | | | Ignition switch to the ON position and shift lever except R position | Below 1 V |
| SPD (E5-8) - E1 (E8-3) | V - L | Speed signal | Vehicle speed 20 km/h (12mph) | Pulse generation (See waveform 7) |
| STP (E5-4) - E1 (E8-3) | L - L | Stop light switch signal | Brake pedal is depressed | 7.5 to 14 V |
| | | | Brake pedal is released | Below 1.5 V |
| 3 (E5-19) - E1 (E8-3) | G - L | 3 shift position switch signal | Ignition switch to the ON position and shift lever 3 position | 10 to 14 V |
| | | | Ignition switch to the ON position and shift lever except 3 position | Below 1 V |
| 2 (E5-10) - E1 (E8-3) | R - L | 2 shift position switch signal | Ignition switch to the ON position and shift lever 2 position | 10 to 14 V |
| | | | Ignition switch to the ON position and shift lever except 2 position | Below 1 V |
| L (E5-9) - E1 (E8-3) | LG - L | L shift position switch signal | Ignition switch to the ON position and shift lever L position | 10 to 14 V |
| | | | Ignition switch to the ON position and shift lever except L position | Below 1 V |
| NSW (E4-30) - E1 (E8-3) | Y - L | Park neutral switch signal | Ignition switch to the ON position and shift lever P and N position | Below 2 V |
| | | | Ignition switch to the ON position and shift lever except P and N position | 10 to 14 V |
| DSL (E7-9) - E1 (E8-3) | Y - L | DSL solenoid signal | Vehicle speed 65 km/h (40mph), lock-up (ON to OFF) | Pulse generation (See waveform 2) |

AX

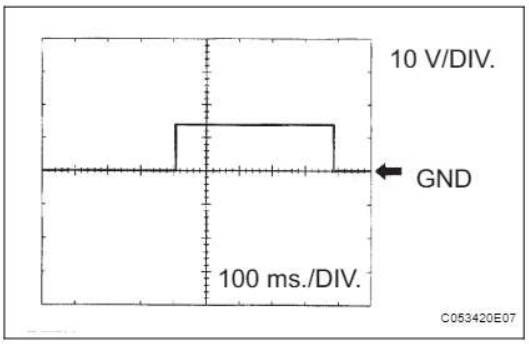
| Symbols (Terminals No.) | Wiring Color | Terminal Description | Condition | Specified Condition |
|---|---|---|---|---|
| S4 (E7-8) - E1 (E8-3) | V - L | S4 solenoid signal | Ignition switch to the ON position | Below 1 V |
| | | | 4th gear | 10 to 14 V |
| | | | Except 4th gear | Below 1 V |
| SL2+ (E7-14) - SL2- (E7-15) | LG - V | SL2 solenoid signal | Engine idle speed | Pulse generation (See waveform 3) |
| | | | Ignition switch to the ON position | Below 1 V |
| | | | 1st or 2nd gear | 10 to 14 V |
| | | | 3rd or O/D gear | Below 1 V |
| SL1+ (E7-11) - SL1- (E7-10) | B - P | SL1 solenoid signal | Engine idle speed | Pulse generation (See waveform 4) |
| | | | Ignition switch to the ON position | 10 to 14 V |
| | | | 1st gear | 10 to 14 V |
| | | | Except 1st gear | Below 1 V |
| NC+ (E7-34) - NC- (E7-26) | R - G | Speed sensor (NC) signal | Vehicle speed 30 km/h (19mph): (3rd gear) Engine speed 1,400 rpm | Pulse generation (See waveform 5) |
| NT+ (E7-35) - NT- (E7-27) | L - LG | Speed sensor (NT) signal | Vehicle speed 20 km/h (12mph) | Pulse generation (See waveform 6) |
| SLT+ (E7-12) - SLT- (E7-13) | BR - GR | SLT solenoid signal | Engine idle speed | Pulse generation (See waveform 1) |
| THO1 (E7-24) - E2 (E8-28) | G - R | ATF temperature sensor signal | ATF temperature: 115°C (239°F) or more | Below 1.5 V |




(a) Waveform 1

**Reference:**

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

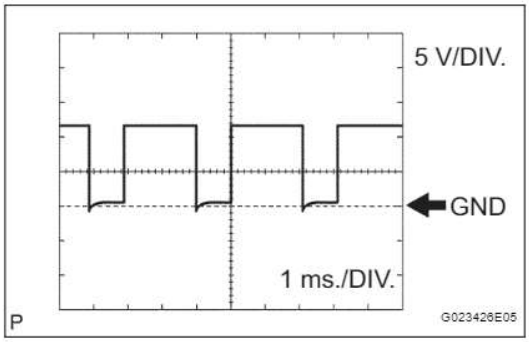



(b) Waveform 2

**Reference:**

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

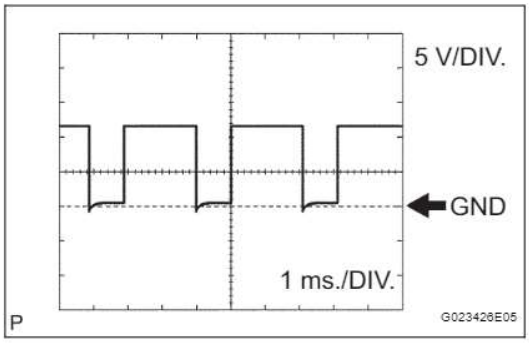
AX




(c) Waveform 3

**Reference:**

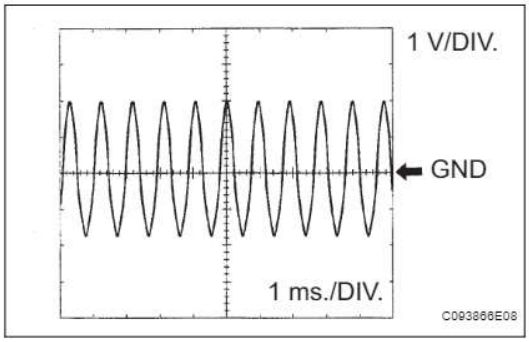
| | |
|---|---|
| Terminal | SL2+ - SL2- |
| Tool setting | 5 V/DIV., 1ms./DIV. |
| Vehicle condition | Engine idle speed |




(d) Waveform 4

**Reference:**

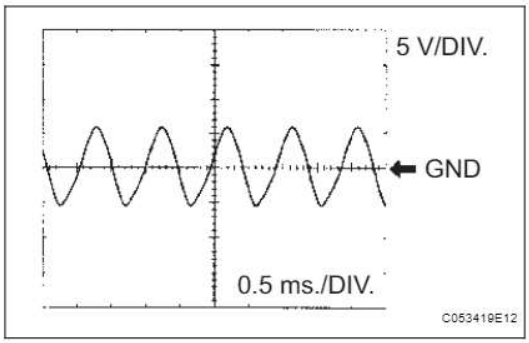
| | |
|---|---|
| Terminal | SL1+ - SL1- |
| Tool setting | 5 V/DIV., 1ms./DIV. |
| Vehicle condition | Engine idle speed |




(e) Waveform 5

**Reference:**

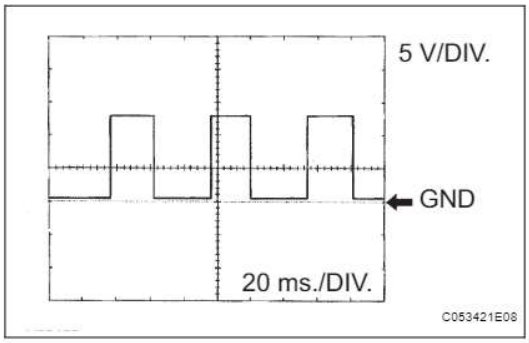
| | |
|---|---|
| Terminal | NC+ - NC- |
| Tool setting | 1 V/DIV., 1ms./DIV. |
| Vehicle condition | Vehicle speed 30 km/h (19 mph): (3rd gear)<br>Engine speed 1.400 rpm |




(f) Waveform 6

**Reference:**

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




(g) Waveform 7

**Reference:**

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

AX

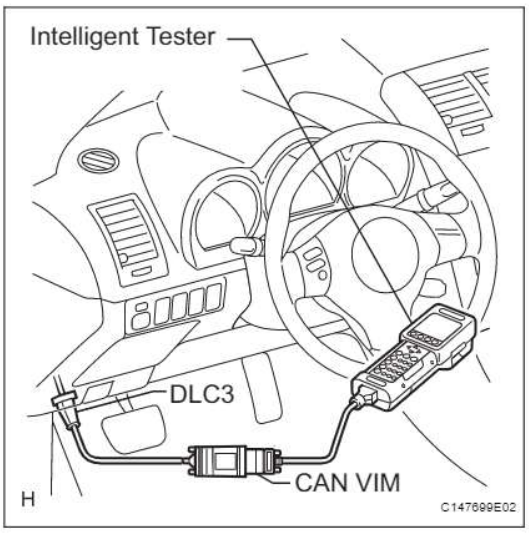
# DIAGNOSIS SYSTEM

## 1. DESCRIPTION

(a) When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is to connect an OBD II scan tool complying with SAE J1987 or a intelligent tester to the vehicle, and read off various data output from the vehicle's ECM.




(b) OBD II regulations require that the vehicle's on-board computer illuminate the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in the computer itself or in the drive system components which affect the vehicle emissions. In addition to illuminating the MIL when a malfunction is detected, the applicable DTCs prescribed by SAE J2012 are recorded in the ECM memory (See page AX-33).
If the malfunction does not occur in 3 consecutive trips, the MIL goes off but the DTCs remain in the ECM memory.




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

(d) The DTCs include SAE controlled codes and Manufacturer controlled codes. SAE controlled codes must be set as prescribed by the SAE, while Manufacturer controlled codes can be set freely by a manufacturer within the prescribed limits (See page AX-33).

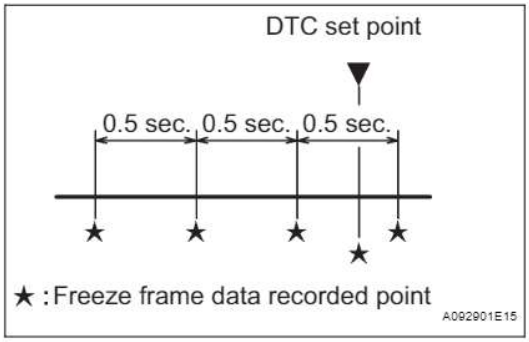
(e) The diagnosis system operates in "normal mode" during the normal vehicle use. In normal mode, "2-trip detection logic" is used to ensure accurate detection of malfunction. "Check mode" is also available to technicians as an option. In check mode, "1-trip detection logic" is used for simulating malfunction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

(f) *2 trip detection logic: When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory (1st trip). IF the ignition switch is turned off and then turned on again, and same malfunction is detected again, the MIL will illuminate.

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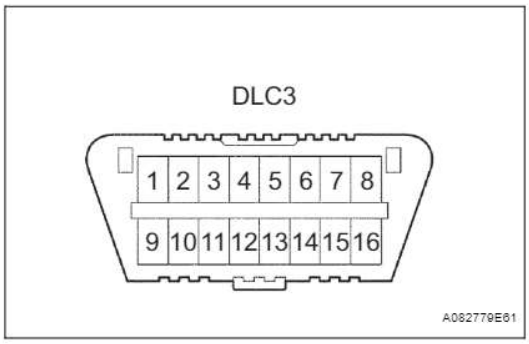
(g) The ECM records vehicle and driving condition information as freeze frame data the moment a DTC is stored. When troubleshooting, freeze frame data can be helpful in determining whether the vehicle was running or stopped, whether the engine was warmed up or not, whether the air/fuel ratio was lean or rich, as well as other data recorded at the time of a malfunction.

(h) The intelligent tester displays freeze frame data recorded at five different points: 1) 3 times before the DTC is set, 2) once when the DTC is set, and 3) once after the DTC is set. The data can be used to simulate the vehicle's condition around the time of the malfunction. The data may be helpful in determining the cause of a malfunction. It may also be helpful in determining whether a DTC is being caused by a temporary malfunction.




## 2. INSPECT THE DLC3

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




**Terminals of DLC 3**

| 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 | CAN bus line | CANL | 54 to 69 Ω | IG switch OFF* |
| CANH | 6 | HIGH-level CAN bus line | Battery positive | 6 kΩ or higher | IG switch OFF* |
| CANH | 6 | HIGH-level CAN bus line | CG | 200 Ω or higher | IG switch OFF* |
| CANL | 14 | LOW-level CAN bus line | Battery positive | 6 kΩ or higher | IG switch OFF* |
| CANL | 14 | LOW-level CAN bus line | CG | 200 Ω or higher | IG switch OFF* |

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

AX

If the result is not as specified, the DLC3 may have a malfunction. Repair or replace the harness and connector.

HINT:

The DLC3 is the interface prepared for reading various data from the vehicle's ECM. After connecting the cable of the intelligent tester to the CAN VIM, turn the ignition switch ON and turn the tester ON. If a communication failure message is displayed on the tester screen (on the tester: UNABLE TO CONNECT TO VEHICLE), a problem exists in either the vehicle or tester. In order to identify the location of the problem, connect the tester to another vehicle.

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

**3. CHECK BATTERY VOLTAGE**

(a) Measure the battery voltage.

**Battery voltage:**
**11 to 14 V**

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

**4. CHECK MIL**

(a) Check that the MIL illuminates when turning the ignition switch to the ON position.

HINT:

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

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

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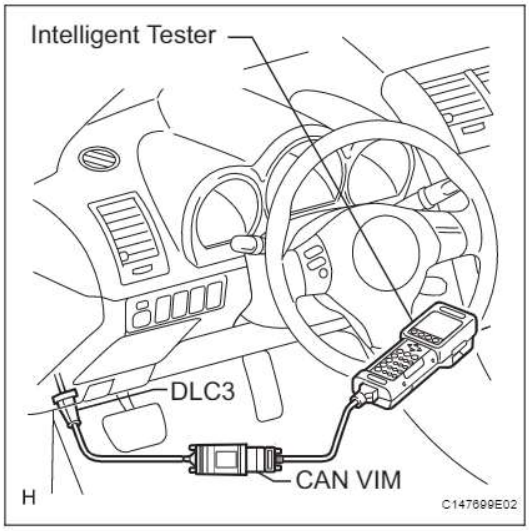
# DTC CHECK / CLEAR

## 1. DTC CHECK (NORMAL MODE)

**NOTICE:**

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

**DTCs which are stored in the ECM can be displayed with the intelligent tester or generic OBD II scan tool. These scan tools can display pending DTCs and current DTCs. Some DTC aren't stored if the ECM doesn't detect a malfunction during consecutive driving. However, the detected malfunction during once driving is stored as pending DTC.**




(a) Checking DTCs using the OBD II scan tool or intelligent tester.

(1) 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).

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

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

(4) Use the OBD II scan tool or intelligent tester to check the DTCs and freeze frame data and note them down (For operating instructions, see the OBD II scan tool's instruction book).

**NOTICE:**

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

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

## 2. DTC CLEAR

(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.

AX

# CHECK MODE PROCEDURE

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

**1. DTC CHECK (CHECK MODE)**

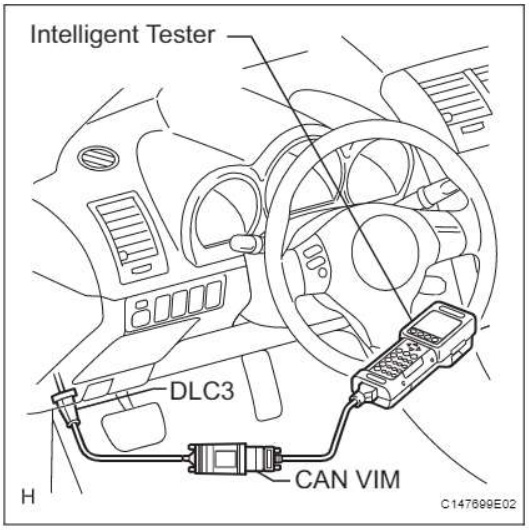
HINT:
Intelligent tester only: Compared to the normal mode, the check mode is more sensitive for detecting malfunctions. Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode.

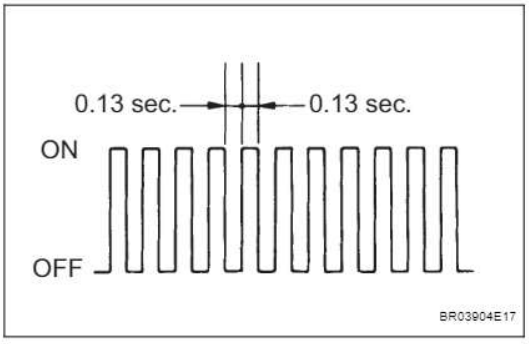
(a) Procedure for Check Mode using the intelligent tester.

(1) Check the initial conditions.
- Battery positive voltage 11 V or more
- Throttle valve fully closed
- Transaxle in the P or N position
- A/C switch is off

(2) Turn the ignition switch off.

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




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

(5) Select the item "DIAGNOSIS / ENHANCED OBD II / CHECK MODE" (Check that the MIL flashes).

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

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

(7) Perform "MONITOR DRIVE PATTERN" for the ECT test (See page AX-17). (Or, simulate the conditions of the malfunction described by the customer).

**NOTICE:**
**Leave the ignition switch to the ON position until you have checked the DTCs, etc.**

(8) After simulating malfunction conditions, use the intelligent tester diagnosis selector to check the DTCs and freeze frame data, etc.
(9) When you use intelligent tester: Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".
(10) After checking the DTC, inspect the applicable circuit.
(11) (See page AX-33) to confirm the details of the DTCs.

**2. DTC CLEAR**

(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.

AX

# FAIL-SAFE CHART

## 1. FAIL-SAFE

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

(a) ATF (Automatic Transmission Fluid) temperature sensor:
When the ATF temperature sensor has a malfunction, O/D upshift is prohibited.

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

(c) Shift solenoid valve DSL:
When the solenoid valve DSL has a malfunction, the current to the solenoid valve is stopped.
This stops lock-up control, then fuel economy decreases.

(d) Shift solenoid valve SL1, SL2 and S4:
Fail safe function:
If either of the shift solenoid valve circuits develops an open or short, the ECM turns the other shift solenoid "ON" and "OFF" in order to shift into the gear positions shown in the table below.
Manual shifting as shown in the following table must be done (In case of a short circuit, the ECM stops sending the current to the short circuited solenoid).
Even if starting the engine in the fail-safe mode, the gear position remains in the same position.
HINT:

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

AX

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

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

AX

# DATA LIST / ACTIVE TEST

## 1. DATA LIST

HINT:

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

**NOTICE:**

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

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

| Tester Display | Measurement Item/Range | Normal Condition | Diagnostic Note |
|---|---|---|---|
| STOP LIGHT SW | Stop Light Switch Status/ON or OFF | • Brake Pedal is depressed: ON<br>• Brake Pedal is released: OFF | - |
| PNP SW (NSW) | PNP Switch Status/ON or OFF | Shift lever position is;<br>P and N: ON<br>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.<br>HINT:<br>When the failure still occurs even after adjusting these parts (See page AX-36). |
| REVERSE | PNP Switch Status/ON or OFF | Shift lever position is;<br>R: ON<br>Except R: OFF | ↑ |
| DRIVE | PNP Switch Status/ON or OFF | Shift lever position is;<br>D and 3: ON<br>Except D and 3: OFF | ↑ |
| 3RD | PNP Switch Status/ON or OFF | Shift lever position is;<br>3: ON<br>Except 3: OFF | ↑ |
| 2ND | PNP Switch Status/ON or OFF | Shift lever position is;<br>2: ON<br>Except 2: OFF | ↑ |
| LOW | PNP Switch Status/ON or OFF | Shift lever position is;<br>L: ON<br>Except L: OFF | ↑ |
| SHIFT | Actual Gear Position/1st, 2nd, 3rd or 4th (O/D) | Shift lever position is;<br>• L: 1st<br>• 2: 1st or 2nd<br>• 3: 1st, 2nd or 3rd<br>• D (O/D ON): 1st, 2nd, 3rd or 4th (O/D) | - |
| LOCK UP | Lock Up Status/ON or OFF | • Lock Up: ON<br>• Except Lock Up: OFF | - |

| Tester Display | Measurement Item/Range | Normal Condition | Diagnostic Note |
|---|---|---|---|
| LOCK UP SOL | Lock Up Solenoid Status/ON or OFF | • Lock Up: ON<br>• Except Lock Up: OFF | - |
| SOLENOID (SLT) | Shift Solenoid SLT Status/ON or OFF | • Accelerator pedal is depressed: OFF<br>• Accelerator pedal is released: ON | - |
| AT OIL TEMP1 | ATF Temp. Sensor Value/min.: -40°C (-40°F), max.: 215°C (419°F) | • After Stall Test; Approx. 80°C (176°F)<br>• Equal to ambient temperature when cold soak | If the value is "-40°C (-40°F)" or "215°C (419°F)", ATF temp. sensor circuit is opened or shorted. |
| SPD (NC) | Counter Gear Speed/display: 50 r/min | HINT:<br>4th (O/D) when shift lever position is D position (After warming up the engine);<br>• Intermediate shaft speed (NC) becomes close to the engine speed. | - |
| SPD (NT) | Input Turbine Speed/display: 50 r/min | HINT:<br>• Lock-up ON (After warning up the engine):<br>Input Turbine speed (NT) equal to the engine sped.<br>• Lock-up OFF (Idling at N position):<br>Input Turbine speed (NT) nearly equal to the engine speed. | - |

## 2. ACTIVE TEST

HINT:

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

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

(a) Warm up the engine.

(b) Turn the ignition switch off.

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

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

(e) Push the "ON" button of the intelligent tester.

(f) Select the item "DIAGNOSIS / OBD/MOBD / ENGINE AND ECT / ACTIVE TEST".

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

AX

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

| Tester Display | Test Part | Control Range | Diagnostic Note |
|---|---|---|---|
| LOCK UP | [Test Details]<br>Control the shift solenoid DSL to set the automatic transaxle to the lock-up condition.<br>[Vehicle Condition]<br>• Throttle valve opening angle: Less than 35%<br>• Vehicle Speed: 58 km/h (36 mph) or more | ON / OFF | Possible to check the DSL operation. |
| SOLENOID (SL1) | [Test Details]<br>Operate the shift solenoid SL1<br>[Vehicle Condition]<br>• Vehicle Stopped.<br>• Shift lever P or N position | ON / OFF | - |
| SOLENOID (SL2) | [Test Details]<br>Operate the shift solenoid SL2<br>[Vehicle Condition]<br>• Vehicle Stopped.<br>• Shift lever P or N position | ON / OFF | - |
| SOLENOID (S4) | [Test Details]<br>Operate the shift solenoid S4<br>[Vehicle Condition]<br>• Vehicle Stopped.<br>• Shift lever P or N position | ON / OFF | - |
| SOLENOID (DSL) | [Test Details]<br>Operate the shift solenoid DSL<br>[Vehicle Condition]<br>• Vehicle Stopped.<br>• Shift lever P or N position | ON / OFF | - |
| SOLENOID (SLT)* | [Test Details]<br>Operate the shift solenoid SLT and raise the line pressure.<br>[Vehicle Condition]<br>• Vehicle Stopped.<br>• IDL: ON<br>HINT:<br>OFF: Line pressure up (When the active test of "SOLENOID (SLT)" is performed, the ECM commands the SLT solenoid to turn off).<br>ON: No action (normal operation) | ON / OFF | - |

AX

*: "SOLENOID (SLT)" in the ACTIVE TEST is performed to check the line pressure changes by connecting the SST to the automatic transaxle, which is used in the HYDRAULIC TEST (See page AX-14) as well.
HINT:
The pressure values in ACTIVE TEST and HYDRAULIC TEST are different from each other.

# DIAGNOSTIC TROUBLE CODE CHART

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

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

## AUTOMATIC TRANSAXLE SYSTEM

| DTC Code | 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<br>2. Park/neutral position switch<br>3. ECM | Comes on | DTC stored | AX-36 |
| P0710 | Transmission Fluid Temperature Sensor "A" Circuit | 1. Open or short in ATF temperature sensor circuit<br>2. Transmission wire (ATF temperature sensor)<br>3. ECM | Comes on | DTC stored | AX-44 |
| P0711 | Transmission Fluid Temperature Sensor "A" Performance | 1. Transmission wire (ATF temperature sensor) | Comes on | DTC stored | AX-49 |
| P0712 | Transmission Fluid Temperature Sensor "A" Circuit Low Input | 1. Short in ATF temperature sensor circuit<br>2. Transmission wire (ATF temperature sensor)<br>3. ECM | Comes on | DTC stored | AX-44 |
| P0713 | Transmission Fluid Temperature Sensor "A" Circuit High Input | 1. Open in ATF temperature sensor circuit<br>2. Transmission wire (ATF temperature sensor)<br>3. ECM | Comes on | DTC stored | AX-44 |
| P0717 | Turbine Speed Sensor Circuit No Signal | 1. Open or short in transmission revolution sensor NT (speed sensor NT) circuit<br>2. Transmission revolution sensor NT (speed sensor NT)<br>3. ECM<br>4. Automatic transaxle assembly | Comes on | DTC stored | AX-53 |
| P0724 | Brake Switch "B" Circuit High | 1. Short in stop light switch circuit<br>2. Stop light switch<br>3. ECM | Comes on | DTC stored | AX-57 |

AX

| DTC Code | Detection Item | Trouble Area | MIL *1 | Memory *2 | See page |
|---|---|---|---|---|---|
| P0741 | Torque Converter Clutch Solenoid Performance (Shift Solenoid Valve DSL) | 1. Shift solenoid valve DSL remains open or closed<br>2. Valve body is blocked<br>3. Torque converter clutch<br>4. Automatic transaxle (clutch, brake or gear etc.)<br>5. Line pressure is too low | Comes on | DTC stored | AX-60 |
| P0746 | Pressure Control Solenoid "A" Performance (Shift Solenoid Valve SL1) | 1. Shift solenoid valve SL1 remains open or closed<br>2. Valve body is blocked<br>3. Automatic transaxle (clutch, brake or gear etc.) | Comes on | DTC stored | AX-66 |
| P0748 | Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1) | 1. Open or short in shift solenoid valve SL1 circuit<br>2. Shift solenoid valve SL1<br>3. ECM | Comes on | DTC stored | AX-70 |
| P0766 | Shift Solenoid "D" Performance (Shift Solenoid Valve S4) | 1. Shift solenoid valve S4 remains open or closed<br>2. Valve body is blocked<br>3. Automatic transaxle (clutch, brake or gear, etc.) | Comes on | DTC stored | AX-74 |
| P0776 | Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2) | 1. Shift solenoid valve SL2 remains open or closed<br>2. Valve body is blocked<br>3. Automatic transaxle (clutch, brake or gear etc.) | Comes on | DTC stored | AX-78 |
| P0778 | Pressure Control Solenoid "B" Electrical (Shift Solenoid Valve SL2) | 1. Open or short in shift solenoid valve SL2 circuit<br>2. Shift solenoid valve SL2<br>3. ECM | Comes on | DTC stored | AX-82 |
| P0793 | Intermediate Shaft Speed Sensor "A" | 1. Open or short in transmission revolution sensor NC (speed sensor NC) circuit<br>2. Transmission revolution sensor NC (speed sensor NC)<br>3. ECM | Comes on | DTC stored | AX-86 |
| P0982 | Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4) | 1. Short in shift solenoid valve S4 circuit<br>2. Shift solenoid valve S4<br>3. ECM | Comes on | DTC stored | AX-90 |

AX

| DTC Code | Detection Item | Trouble Area | MIL *1 | Memory *2 | See page |
|---|---|---|---|---|---|
| P0983 | Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4) | 1. Open in shift solenoid valve S4 circuit<br>2. Shift solenoid valve S4<br>3. ECM | Comes on | DTC stored | AX-90 |
| P2714 | Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT) | 1. Shift solenoid valve SLT remains closed<br>2. Valve body is blocked<br>3. Automatic transaxle (clutch, brake or gear etc.) | Comes on | DTC stored | AX-93 |
| P2716 | Pressure Control Solenoid "D" Electrical (Shift Solenoid Valve SLT) | 1. Open or short in shift solenoid valve SLT circuit<br>2. Shift solenoid valve SLT<br>3. ECM | Comes on | DTC stored | AX-97 |
| P2769 | Torque Converter Clutch Solenoid Circuit Low (Shift Solenoid Valve DSL) | 1. Short in shift solenoid valve DSL circuit<br>2. Shift solenoid valve DSL<br>3. ECM | Comes on | DTC stored | AX-101 |
| P2770 | Torque Converter Clutch Solenoid Circuit High (Shift Solenoid Valve DSL) | 1. Open in shift solenoid valve DSL circuit<br>2. Shift solenoid valve DSL<br>3. ECM | Comes on | DTC stored | AX-101 |

AX

| DTC | P0705 | Transmission Range Sensor Circuit Malfunction (PRNDL Input) |
|---|---|---|

## DESCRIPTION

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

| DTC No. | DTC Detection Condition | Trouble Area |
|---|---|---|
| P0705 | (A) Any 2 or more signals of the following are ON simultaneously (2-trip detection logic)<br>• NSW input signal is ON.<br>• R input signal is ON.<br>• D input signal is ON.<br>• 2 input signal is ON.<br>• L input signal is ON.<br>(B) All switches are OFF simultaneously for NSW, R, D, 2 and L positions (2-trip detection logic).<br>(C) Both 1 and 2 are met (2-trip detection logic)<br>1. One of the following is met<br>(a) NSW input signal is ON.<br>(b) R input signal is ON<br>2. One of the following is met<br>(a) 3 input signal is ON.<br>(b) L input signal is ON. | • Open or short in park/neutral position switch circuit<br>• Park/neutral position switch<br>• ECM |

## MONITOR DESCRIPTION

These DTCs indicate a problem with the park/neutral position switch and the wire harness in the park/neutral position switch circuit.
The park/neutral position switch detects the shift lever position and sends a signal to the ECM.
For security, the park/neutral position switch detects the shift lever position so that engine can be started only when the shift lever is in the P or N position
The park/neutral position switch sends a signal to the ECM according to the shift position (R, D, 2 or L).
The ECM determines that there is a problem with the switch or related parts if in receives more than 1 position signal simultaneously. The ECM will turn on the MIL and store the DTC.

AX

## MONITOR STRATEGY

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

## TYPICAL ENABLING CONDITIONS

**All:**

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

## TYPICAL MALFUNCTION THRESHOLDS

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

**Condition (A):**

If 2 or more of the following signal outputs exist at the same time

| | |
|---|---|
| NSW switch | ON |

| | |
|---|---|
| R switch | ON |
| D switch | ON |
| 2 switch | ON |
| L switch | ON |

**Condition (B):**

All of following conditions are met

| | |
|---|---|
| NSW switch | OFF |
| R switch | OFF |
| D switch | OFF |
| 2 switch | OFF |
| L switch | OFF |

**Condition (C):**

Both (i) and (ii) are met

(i) One of the following is met

| | |
|---|---|
| NSW switch | ON |
| R switch | ON |

(ii) One of the following is met

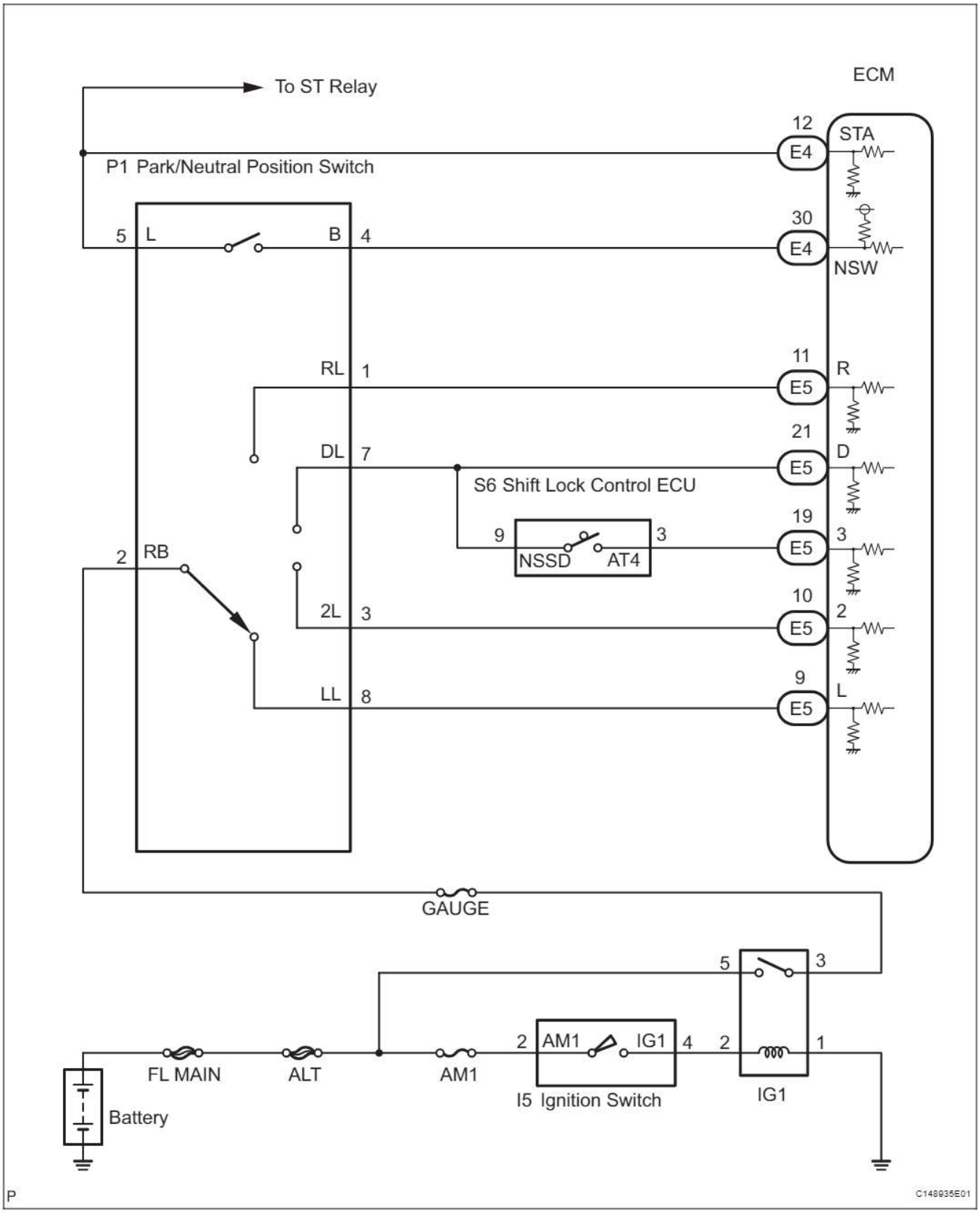
| | |
|---|---|
| 3 switch | ON |
| L switch | ON |

## COMPONENT OPERATING RANGE

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

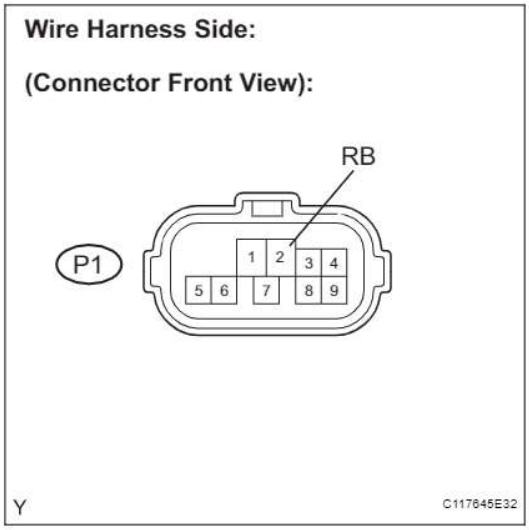
AX

## WIRING DIAGRAM



## INSPECTION PROCEDURE

### 1 CHECK HARNESS AND CONNECTOR (BATTERY - PARK/NEUTRAL POSITION)




(a) Disconnect the park/neutral position switch connector.
(b) Turn the ignition switch to the ON position.
(c) Measure voltage according to the value(s) in the table below.

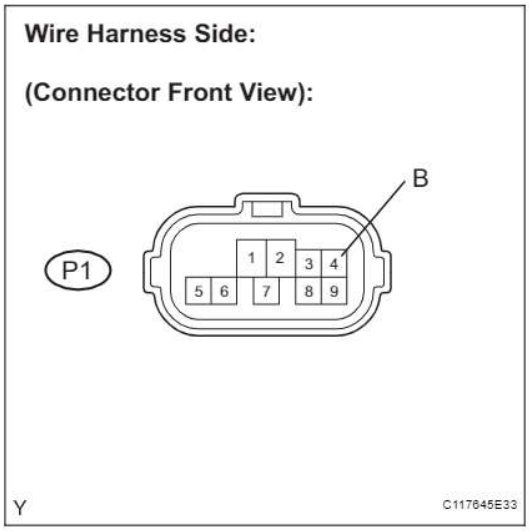
**Standard voltage**

| Tester Connection | Specified Condition |
|---|---|
| 2 - Body ground | 10 to 14 V |

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

### 2 CHECK HARNESS AND CONNECTOR (OUTPUT SIGNAL)




(a) Turn the ignition switch to the ON position.
(b) Measure voltage according to the value(s) in the table below.

**Standard voltage**

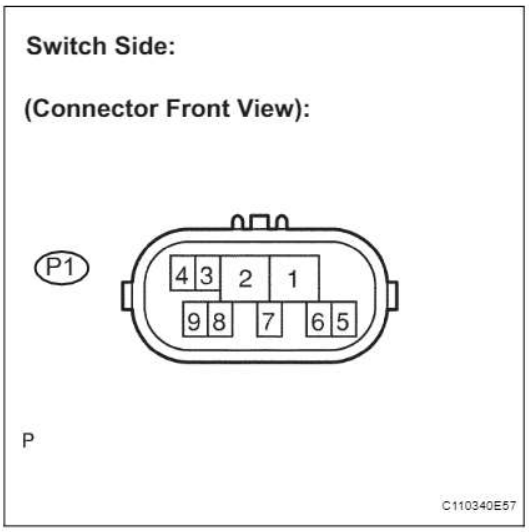
| Tester Connection | Specified Condition |
|---|---|
| 4 - Body ground | 10 to 14 V |

NG → Go to step 8

OK

AX

## 3 INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY




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

**Standard resistance**

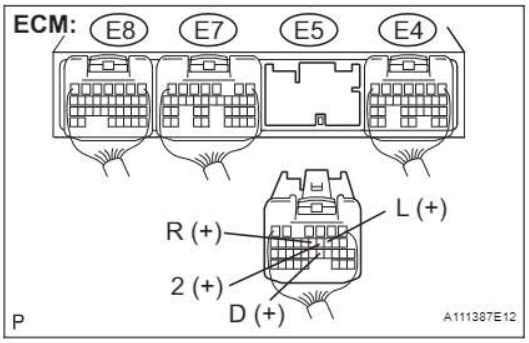
| Shift Position | Tester Connection | Specified Condition |
|---|---|---|
| P | 2 - 6 and 4 - 5 | Below 1 Ω |
| Except P | | 10 kΩ or higher |
| R | 2 - 1 | Below 1 Ω |
| Except R | | 10 kΩ or higher |
| N | 2 - 9 and 4 - 5 | Below 1 Ω |
| Except N | | 10 kΩ or higher |
| D and 3 | 2 - 7 | Below 1 Ω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

NG → REPLACE PARK/NEUTRAL POSITION SWITCH ASSEMBLY

OK

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

AX




(a) Connect the park/neutral position switch connector.
(b) Disconnect the ECM connectors.
(c) Turn the ignition switch to the ON position, and measure the voltage according to the value(s) in the table below when the shift lever is moved to each position.

**Standard voltage**

| Shift Position | Tester Connection | Specified Condition |
|---|---|---|
| R | E5-11 (R) - Body ground | 10 to 14 V* |
| Except R | | Below 1 V |
| D and 3 | E5-21 (D) - Body ground | 10 to 14 V |
| Except D and 3 | | Below 1 V |
| 2 | E5-10 (2) - Body ground | 10 to 14 V |
| Except 2 | | Below 1 V |
| L | E5-9 (L) - Body ground | 10 to 14 V |
| Except L | | Below 1 V |

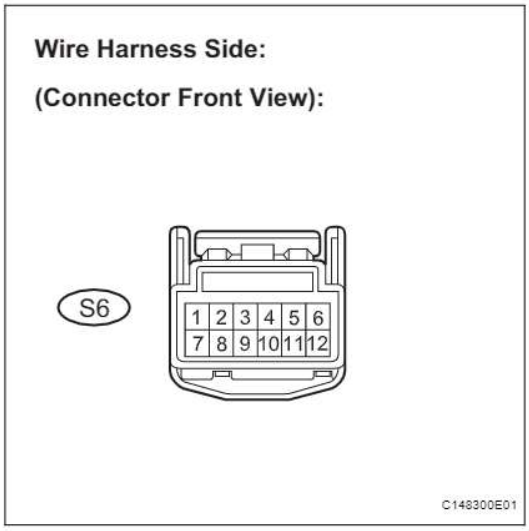
HINT:

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

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

**5 CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH - SHIFT LOCK CONTROL ECU)**




(a) Disconnect the connector of shift lock control ECU sub-assembly.

(b) Turn the ignition switch to the ON position, and measure the voltage according to the value(s) in the table below when the shift lever is moved to each position.

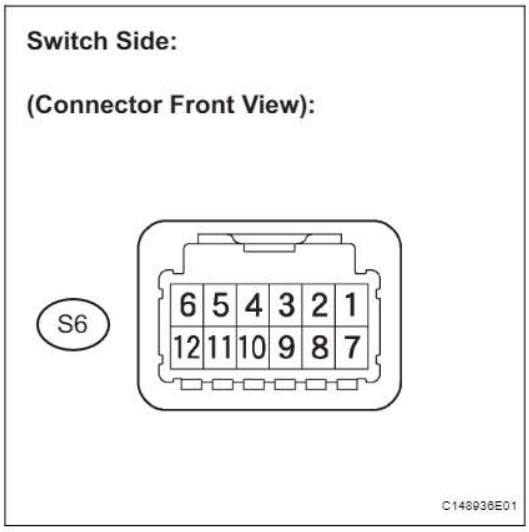
**Standard voltage**

| Shift Position | Tester Connection | Specified Condition |
|---|---|---|
| D and 3 | 9 - Body ground | 10 to 14 V |
| Except D and 3 | | Below 1 V |

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

**6 INSPECT SHIFT LOCK CONTROL ECU SUB-ASSEMBLY**




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

**Standard resistance**

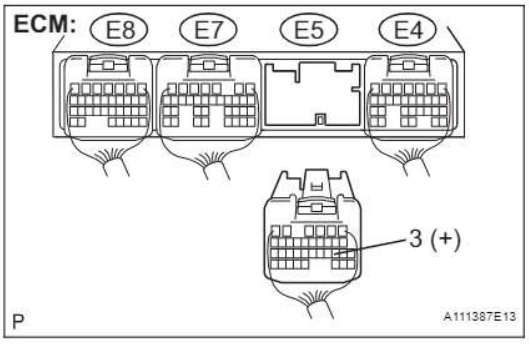
| Shift Position | Tester Connection | Specified Condition |
|---|---|---|
| 3 and 2 | 3 - 9 | Below 1 Ω |
| Except 3 and 2 | | 10 kΩ or higher |

NG → REPLACE SHIFT LOCK CONTROL ECU SUB-ASSEMBLY

OK

AX

| 7 | CHECK HARNESS AND CONNECTOR (SHIFT LOCK CONTROL ECU SUB-ASSEMBLY - ECM) |
|---|---|




(a) Connect the connector of shift lock control ECU sub-assembly.
(b) Turn the ignition switch to the ON position, and measure the voltage according to the value(s) in the table below when the shift lever is moved to each position.

**Standard voltage**

| Shift Position | Tester Connection | Specified Condition |
|---|---|---|
| 3 | E5-19 (3) - Body ground | 10 to 14 V |
| Except 3 | | Below 1 V |

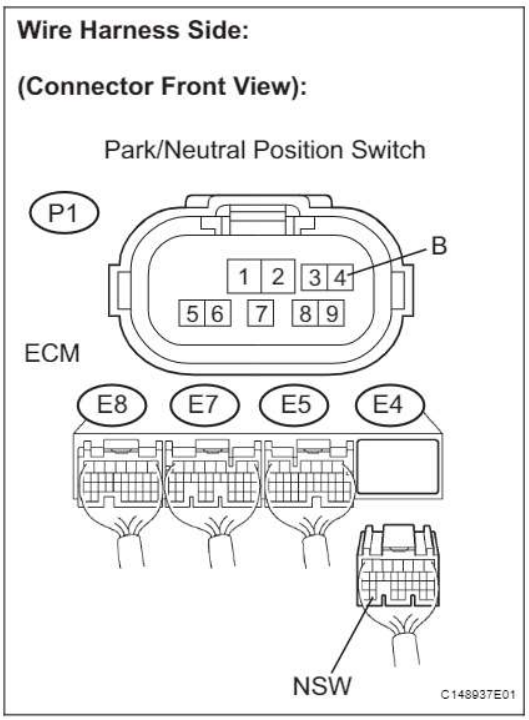
NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM

| 8 | CHECK HARNESS AND CONNECTOR (PARK/NEUTRAL POSITION SWITCH - ECM) |
|---|---|

AX




(a) Turn the ignition switch off.
(b) Disconnect the ECM connectors.
(c) Measure resistance according to the value(s) in the table below.

**Standard resistance (Check for open)**

| Tester Connection | Specified Condition |
|---|---|
| P1-4 (B) - E4-30 (NSW) | Below 1 Ω |

**Standard resistance (Check for short)**

| Tester Connection | Specified Condition |
|---|---|
| P1-4 (B) or E4-30 (NSW) - Body ground | 10 kΩ or higher |

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM

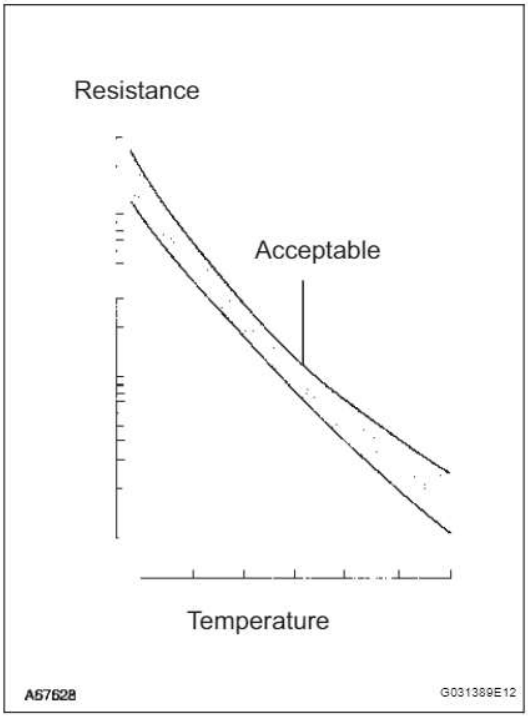
| DTC | P0710 | Transmission Fluid Temperature Sensor "A" Circuit |
|---|---|---|

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

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

## DESCRIPTION

The ATF (Automatic Transmission Fluid) temperature sensor converts the fluid temperature into a resistance value which is input into the ECM.
The ECM applies a voltage to the temperature sensor through ECM terminal THO1 (THO).
The sensor resistance changes with the transmission fluid temperature. As the temperature becomes higher, the sensor resistance decreases.
One terminal of the sensor is grounded so that the sensor resistance decreases and the voltage goes down as the temperature becomes higher.
The ECM calculates the fluid temperature based on the voltage signal.




AX

| DTC No. | DTC Detection Condition | Trouble Area |
|---|---|---|
| P0710 | (a) and (b) are detected momentarily within 0.5 sec. when neither P0712 nor P0713 is detected (1-trip detection logic)<br>(a) ATF temperature sensor resistance is less than 79 Ω.<br>(b) ATF temperature sensor resistance is more than 156 kΩ.<br>HINT:<br>Within 0.5 sec., the malfunction switches from (a) to (b) or from (b) to (a) | • Open or short in ATF temperature sensor circuit<br>• Transmission wire (ATF temperature sensor)<br>• ECM |

| DTC No. | DTC Detection Condition | Trouble Area |
|---|---|---|
| P0712 | ATF temperature sensor resistance is less than 79 Ω for 0.5 sec. or more (1-trip detection logic) | • Short in ATF temperature sensor circuit<br>• Transmission wire (ATF temperature sensor)<br>• ECM |
| P0713 | ATF temperature sensor resistance is more than 156 kΩ when 15 minutes or more have elapsed after the engine start<br>DTC is detected for 0.5 sec. or more (1-trip detection logic) | • Open in ATF temperature sensor circuit<br>• Transmission wire (ATF temperature sensor)<br>• ECM |

## MONITOR DESCRIPTION

These DTCs indicate an open or short in the automatic transmission fluid (ATF) temperature sensor (TFT sensor) circuit. The automatic transmission fluid (ATF) temperature sensor converts ATF temperature to an electrical resistance value. Based on the resistance, the ECM determines the ATF temperature, and the ECM detects an opens or shorts in the ATF temperature circuit. If the resistance value of the ATF temperature is less than 79 Ω *1or more than 156 kΩ *2, the ECM interprets this as a fault in the ATF sensor or wiring. The ECM will turn on the MIL and store the DTC.
*1: 150°C (302°F) or more is indicated regardless of the actual ATF temperature.
*2: -40°C (-40°F) is indicated regardless of the actual ATF temperature.
HINT:
The ATF temperature can be checked on the intelligent tester display.

## MONITOR STRATEGY

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

AX

## TYPICAL ENABLING CONDITIONS

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

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

### P0713: Range check (High resistance)

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

## TYPICAL MALFUNCTION THRESHOLDS

### P0710: Range check (Chattering)

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

### P0712: Range check (Low resistance)

| | |
|---|---|
| TFT sensor resistance | Less than 79 Ω |

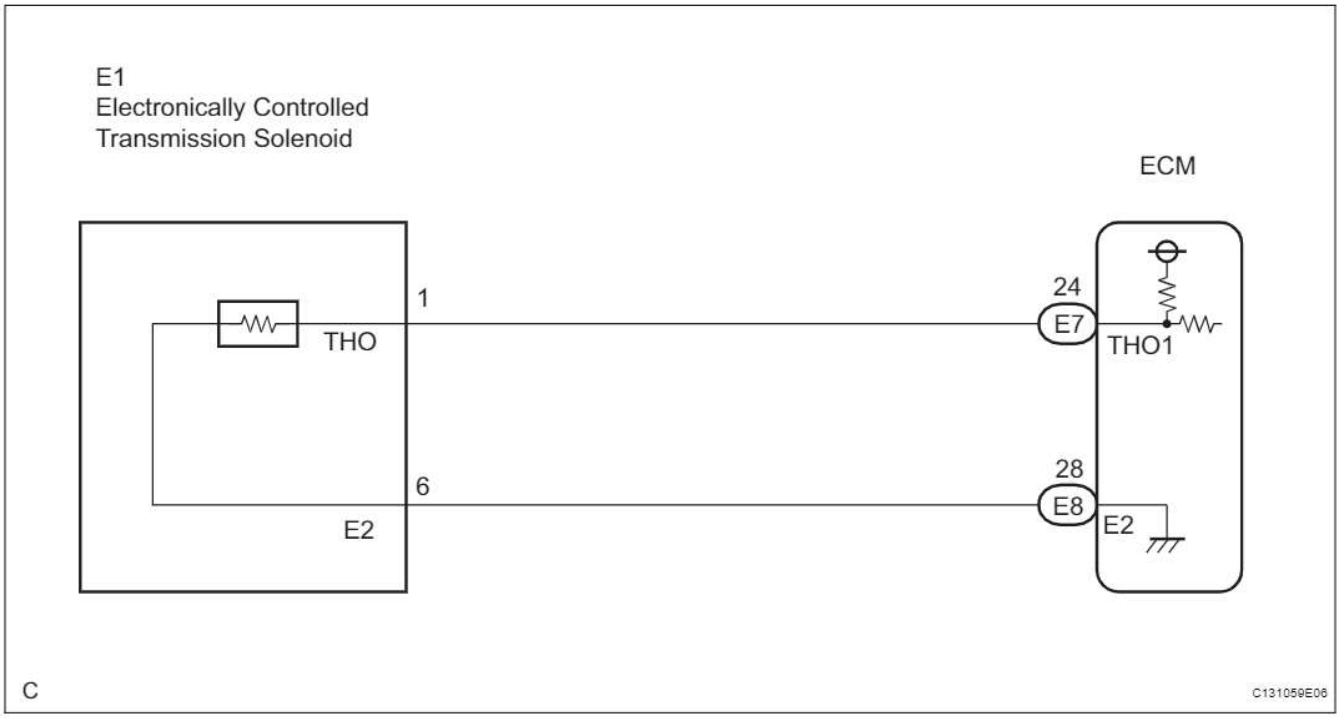
### P0713: Range check (High resistance)

| | |
|---|---|
| TFT sensor resistance | More than 156 kΩ |

## COMPONENT OPERATING RANGE

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

## WIRING DIAGRAM




## INSPECTION PROCEDURE

HINT:

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

**NOTICE:**

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

**1. READ DATA LIST**

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

| Tester Display | Measurement Item/Range | Normal Condition | Diagnostic Note |
|---|---|---|---|
| AT OIL TEMP1 | ATF Temp. Sensor Value/min.: -40°C (-40°F), max.: 215°C (419°F) | • After Stall Test; Approx. 80°C (176°F)<br>• Equal to ambient temperature when cold soak | If the value is "-40°C (-40°F)" or "215°C (419°F)", ATF temp. sensor circuit is opened or shorted. |

HINT:

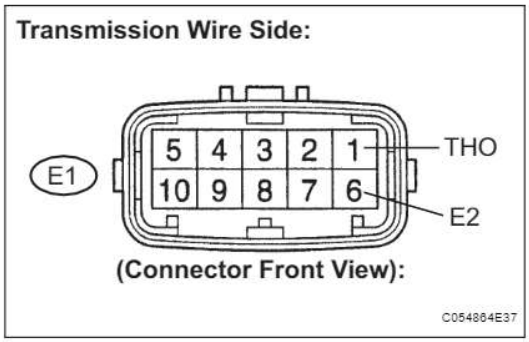
When DTC P0712 is output and OBD II scan tool or intelligent tester output is 150°C (302°F), there is a short circuit.

When DTC P0713 is output and OBD II scan tool or intelligent tester output is -40°C (-40°F), there is an open circuit.
Measure the resistance between terminal THO1 (THO) and body ground.

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

HINT:
If a circuit related to the ATF temperature sensor become open, P0713 is immediately set (in 0.5 second).
When P0713 is set, P0711 cannot be detected.
It is not necessary to inspect the circuit when P0711 is set.

## 1 INSPECT TRANSMISSION WIRE (ATF TEMPERATURE SENSOR)




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

**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| 1 (THO) - 6 (E2) | 79 Ω to 156 kΩ |
| 1 (THO) - Body ground | 10 kΩ or higher |
| 6 (E2) - Body ground | ↑ |

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

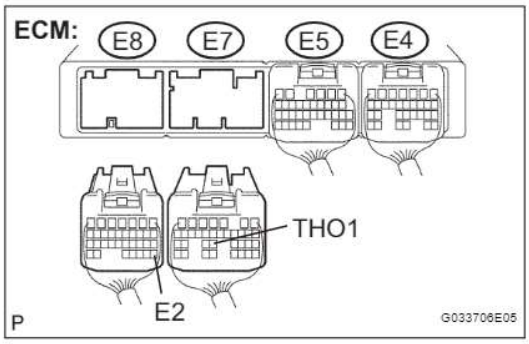
| ATF Temperature | Specified Condition |
|---|---|
| 10°C (50°F) | 5 to 8 kΩ |
| 25°C (77°F) | 2.5 to 4.5 kΩ |
| 110°C (230°F) | 0.22 to 0.28 kΩ |

AX

NG → REPAIR OR REPLACE TRANSMISSION WIRE

OK

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




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

**Standard resistance**

| Tester Connection | Specified Condition |
|---|---|
| E7-24 (THO1) - E8-28 (E2) | 79 Ω to 156 kΩ |

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

**Standard resistance (Check for short)**

| Tester Connection | Specified Condition |
|---|---|
| E7-24 (THO1) - Body ground | 10 kΩ or higher |
| E8-28 (E2) - Body ground | |

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM

AX

| DTC | P0711 | Transmission Fluid Temperature Sensor "A" Performance |
|---|---|---|

## DESCRIPTION

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

| DTC No. | DTC Detection Condition | Trouble Area |
|---|---|---|
| P0711 | Condition A (2-trip detection logic):<br>First, ECM checks for following conditions:<br>(a) 17 minutes or more after engine is started and after 9 km (5.6 miles) or more of driving, ECT is -15°C (5°F) or more<br>(b) After starting engine and certain period of time has elapsed, ECT and IAT are -10°C (14°F) or more<br>If conditions are met, ECM then checks if ATF temperature is less than 20°C (68°F). If so, ECM interprets this as fault and illuminates MIL.<br>Condition B (2-trip detection logic):<br>First, ECM checks for following conditions:<br>(a) ECT is 60°C (140°F) or more<br>(b) After starting engine and certain period of time has elapsed, ECT is less than 35°C (95°F)<br>If conditions are met, ECM then checks if ATF temperature is 100°C (212°F) or more. If so, ECM interprets this as fault and illuminates MIL. | • Open or short in ATF temperature sensor circuit<br>• Transmission wire (ATF temperature sensor)<br>• ECM |

## MONITOR DESCRIPTION

This DTC indicates that there is a problem with output from the 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, detects open or short circuits of the ATF temperature circuit, and detects faults in the ATF temperature sensor.
Condition A (2-trip detection logic):
First, the ECM checks for the following conditions:
(a) 17 minutes or more after the engine is started and after 9 km (5.6 miles) or more of driving, the ECT is -15°C (5°F) or more.
(b) After starting the engine and a certain period of time has elapsed, the ECT and IAT are -10°C (14°F) or more.
If the conditions are met, the ECM then checks if the ATF temperature is less than 20°C (68°F). If so, the ECM interprets this as a fault and illuminates the MIL.
Condition B (2 -trip detection logic):
First, the ECM checks for the following conditions:
(a) ECT is 60°C (140°F) or more.
(b) After starting the engine and a certain period of time has elapsed, the ECT is less than 35°C (95°F).
If the conditions are met, the ECM then checks if the ATF temperature is 100°C (212°F) or more. If so, the ECM interprets this as a fault and illuminates the MIL.

AX

## MONITOR STRATEGY

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

## TYPICAL ENABLING CONDITIONS

### All:

| | |
|---|---|
| The monitor will run whenever this DTC is not present. | None |

### Condition (A):

| | |
|---|---|
| Time After engine start | 17 min. or more |
| ECT | -15°C (5°F) or more |
| Driving distance after engine start | 9 km (5.6 mile) or more |
| IAT (Intake air temperature) (12 sec. after starting engine) | -10°C (14°F) or more |
| ECT (12 sec. after starting engine) | -10°C (14°F) or more |

### Condition (B):

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

## TYPICAL MALFUNCTION THRESHOLDS

### Condition (A):

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

### Condition (B):

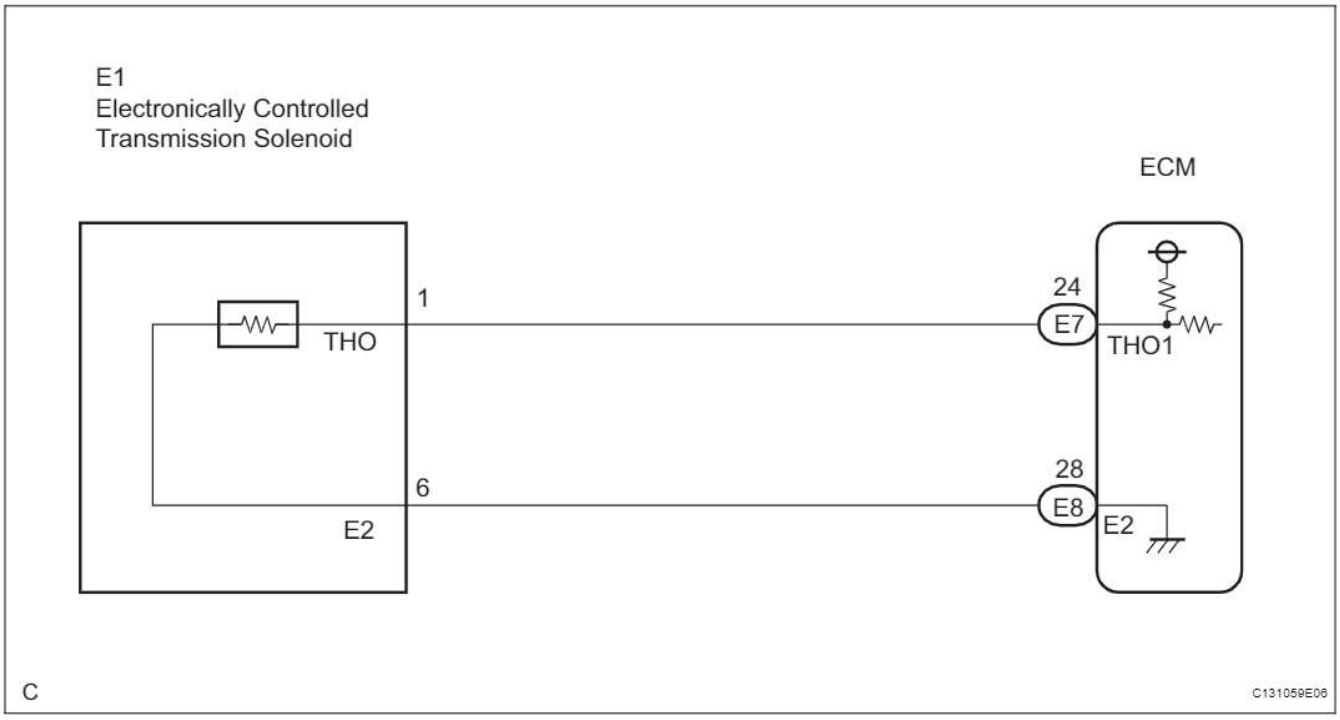
| | |
|---|---|
| ATF temperature sensor | 100°C (212°F) or more |

## COMPONENT OPERATING RANGE

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

## WIRING DIAGRAM

AX



## INSPECTION PROCEDURE

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

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

**1. READ DATA LIST**

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

| Tester Display | Measurement Item/Range | Normal Condition | Diagnostic Note |
|---|---|---|---|
| AT OIL TEMP1 | ATF Temp. Sensor Value/min.: -40°C (-40°F), max.: 215°C (419°F) | • After Stall Test; Approx. 80°C (176°F)<br>• Equal to ambient temperature when cold soak | If the value is "-40°C (-40°F)" or "215°C (419°F)", ATF temp. sensor circuit is opened or shorted. |

HINT:
When DTC P0712 is output and OBD II scan tool or intelligent tester output is 150°C (302°F), there is a short circuit.
When DTC P0713 is output and OBD II scan tool or intelligent tester output is -40°C (-40°F), there is an open circuit.
Measure the resistance between terminal THO1 (THO) and body ground.

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

AX

HINT:
If a circuit related to the ATF temperature sensor becomes open, P0713 is immediately set (in 0.5 second).
When P0713 is set, P0711 cannot be detected.
It is not necessary to inspect the circuit when P0711 is set.

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

(a) Connect the OBD II scan tool or the intelligent tester to the DLC3.
(b) Turn the ignition switch to the ON position and push the OBD II scan tool or the intelligent tester main switch ON.
(c) When you use intelligent tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".
(d) Read the DTCs using the OBD II scan tool or the intelligent tester.

**Result**

| Display (DTC output) | Proceed to |
|---|---|
| Only "P0711" is output | A |
| "P0711" and other DTCs | B |

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

B → GO TO 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)

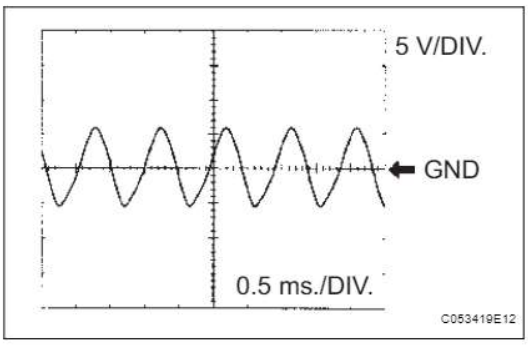
AX

| DTC | P0717 | Turbine Speed Sensor Circuit No Signal |
|---|---|---|

## DESCRIPTION

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

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




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

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

AX

## MONITOR DESCRIPTION

The NT terminal of the ECM detects a revolution signal from the speed sensor (NT) (input RPM). The ECM calculates a gearshift comparing the speed sensor (NT) with the speed sensor (NC).
While the vehicle is operating in 2nd, 3rd or 4th gear in the shift position of D, if the input shaft revolution is less than 300 rpm *1although the output shaft revolution is more than 1,000 rpm *2, the ECM detects the trouble, illuminates the MIL and stores the DTC.
*1: Pulse is not output or is irregularly output.
*2: The vehicle speed is 50 km/h (31 mph) or more.

## MONITOR STRATEGY

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

## TYPICAL ENABLING CONDITIONS

| | |
|---|---|
| The monitor will run whenever this DTC is not present. | P0500: VSS<br>P0748: Shift solenoid SL1<br>P0778: Shift solenoid SL2<br>P0982, P0983: Shift solenoid S4 |
| Shift change | Shift change is completed and before starting next shift change operation |
| ECM selected gear | 2nd, 3rd or 4th |
| Output shaft rpm | 1,000 rpm or more |
| NSW switch | OFF |
| R switch | OFF |
| L switch | OFF |
| Engine | Running |
| Battery voltage | 8 V or more |
| Ignition switch | ON |
| Starter | OFF |

## TYPICAL MALFUNCTION THRESHOLDS

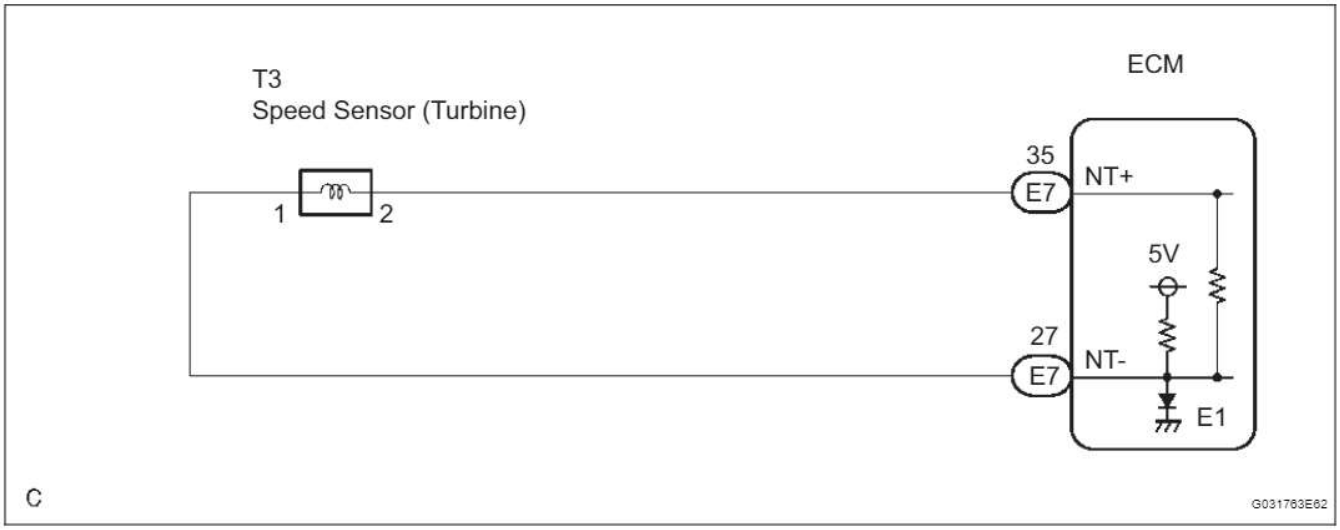
| | |
|---|---|
| Sensor signal rpm | Less than 300 rpm |

## COMPONENT OPERATING RANGE

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

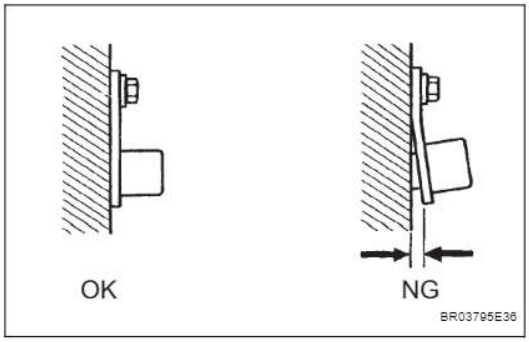
## WIRING DIAGRAM

AX



## INSPECTION PROCEDURE

### 1 INSPECT SPEED SENSOR INSTALLATION

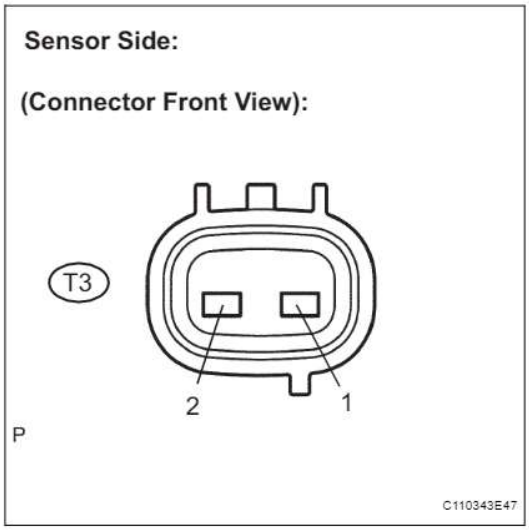



(a) Check the speed sensor installation.
**OK:**
**The installation bolt is tightened properly and there is no clearance between the sensor and transaxle case.**

NG → **REPLACE SPEED SENSOR (NT)**

OK

### 2 INSPECT SPEED SENSOR (NT)



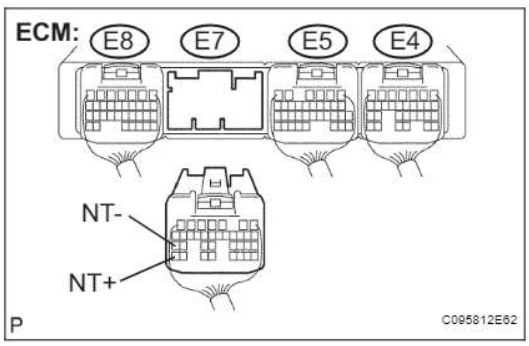

(a) Disconnect the speed sensor connector from the transaxle.
(b) Measure the resistance according to the value(s) in the table below.
**Standard resistance**

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

NG → **REPLACE SPEED SENSOR (NT)**

OK

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




(a) Connect the speed sensor connector.
(b) Disconnect the ECM connector.
(c) Measure the resistance according to the value(s) in the table below.
**Standard resistance**

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

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

**Standard resistance (Check for short)**

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

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM

AX

| DTC | P0724 | Brake Switch "B" Circuit High |
|---|---|---|

## DESCRIPTION

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

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

## MONITOR DESCRIPTION

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

## MONITOR STRATEGY

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

## TYPICAL ENABLING CONDITIONS

AX

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

## TYPICAL MALFUNCTION THRESHOLDS

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

## WIRING DIAGRAM

See page ES-215

## INSPECTION PROCEDURE

| 1 | READ VALUE OF DATA LIST |
|---|---|

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

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

| Tester Display | Measurement Item/Range | Normal Condition | Diagnostic Note |
|---|---|---|---|
| STOP LIGHT SW | Stop Light Switch Status/ON or OFF | • Brake pedal is depressed: ON<br>• Brake pedal is released: OFF | - |

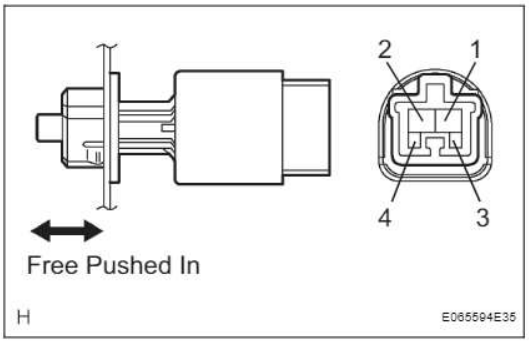
**NOTICE:**
**In the table below, the value listed under "Normal Condition" are reference values. Do not depend solely on these reference values when deciding whether apart is faulty or not.**

AX

OK → Go to step 3

NG

| 2 | INSPECT STOP LIGHT SWITCH ASSEMBLY |
|---|---|




(a) Remove the stop light switch assembly.
(b) Measure the resistance according to the value(s) in the table below.

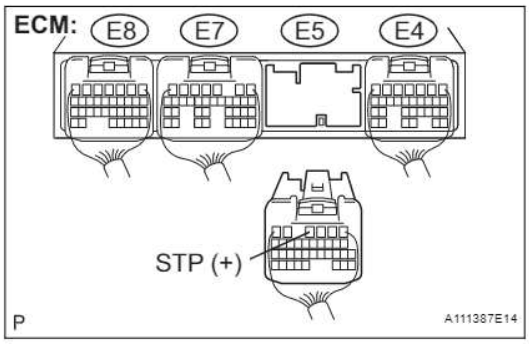
**Standard resistance**

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

NG → REPLACE STOP LIGHT SWITCH ASSEMBLY

OK

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




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

**Standard voltage**

| Condition | Tester Connection | Specified Condition |
|---|---|---|
| Brake pedal is depressed | E5-4 (STP) - Body ground | 10 to 14 V |
| Brake pedal is released | | Below 1 V |

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM

AX

| DTC | P0741 | Torque Converter Clutch Solenoid Performance (Shift Solenoid Valve DSL) |
|---|---|---|

## SYSTEM DESCRIPTION

The ECM uses the signals from the throttle position sensor, air-flow meter, turbine (input) speed sensor, intermediate (counter) shaft speed sensor and crankshaft position sensor to monitor the engagement condition of the lock-up clutch.
Then the ECM compares the engagement condition of the lock-up clutch with the lock-up schedule in the ECM memory to detect a mechanical problems of the shift solenoid valve DSL, valve body and torque converter clutch.

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

## MONITOR DESCRIPTION

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

- There is a difference in rotation between the input side (engine speed) and output side (input turbine speed) of the torque converter when the ECM commands lock-up.
  (Engine speed is at least 100 rpm greater than input turbine speed.)
- There is no difference in rotation between the input side (engine speed) and output side (input turbine speed) of the torque converter when the ECM commands lock-up off.
  (The difference between engine speed and input turbine speed is less than 35 rpm.)

## MONITOR STRATEGY

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

## TYPICAL ENABLING CONDITIONS

**ALL:**

| | |
|---|---|
| The monitor will run whenever this DTC is not present. | P0115 - P0118 (ECT sensor)<br>P0125 (Insufficient ECT for closed loop)<br>P0500 (VSS)<br>P0748, P0778 (Shift solenoid valve (range)) |
| ECT (Engine coolant temperature) | 60°C (140°F) or more |
| Transmission range | "D" |
| TFT (Transmission fluid temperature) | -20°C (-4°F) or more |
| TFT sensor circuit | Not circuit malfunction |
| ECT sensor circuit | Not circuit malfunction |
| Turbine speed sensor circuit | Not circuit malfunction |
| Intermediate shaft speed sensor circuit | Not circuit malfunction |
| Output speed sensor circuit | Not circuit malfunction |
| Shift solenoid valve SL1 circuit | Not circuit malfunction |
| Shift solenoid valve SL2 circuit | Not circuit malfunction |
| Shift solenoid valve S4 circuit | Not circuit malfunction |
| Shift solenoid valve DSL circuit | Not circuit malfunction |
| Electronic throttle system | Not circuit malfunction |

**OFF malfunction:**

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

**ON malfunction:**

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

AX

## TYPICAL MALFUNCTION THRESHOLDS

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

**ON malfunction:**

| | |
|---|---|
| Engine speed - input (turbine) speed | 100 rpm or more |

**OFF malfunction:**

2 detections are necessary per driving cycle:
1st detection; temporary flag ON
2nd detection; pending fault code ON
Vehicle speed must be under 10 km/h (6.2 mph) once before 2nd detection

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

## INSPECTION PROCEDURE

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

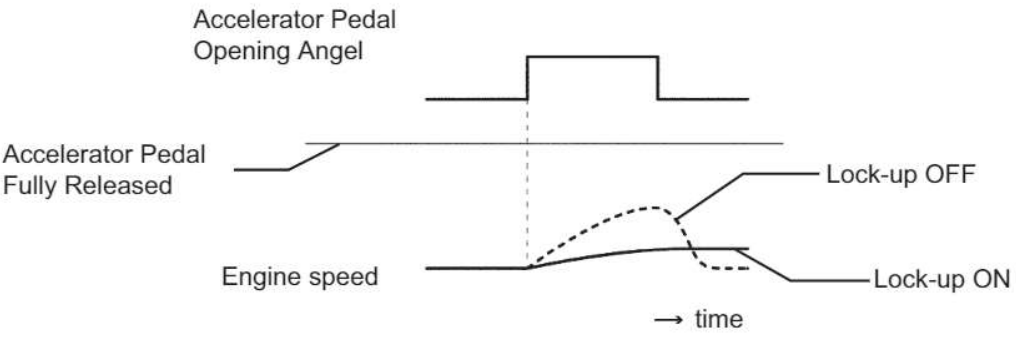
1. **PERFORM ACTIVE TEST**
   (a) Warm up the engine.

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

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

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

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




AX

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

(a) Connect the OBD II scan tool or the intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
(b) Turn the ignition switch to the ON position and turn the OBD II scan tool or the intelligent tester main switch ON.
(c) When you use intelligent tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".
(d) Read the DTCs using the OBD II scan tool or the intelligent tester.

**Result**

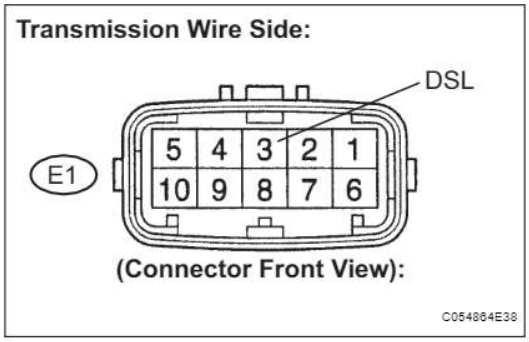
| Display (DTC output) | Proceed to |
|---|---|
| Only "P0741" is output | A |
| "P0741" and other DTCs | B |

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

B → GO TO DTC CHART

A

## 2 INSPECT TRANSMISSION WIRE (DSL)




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

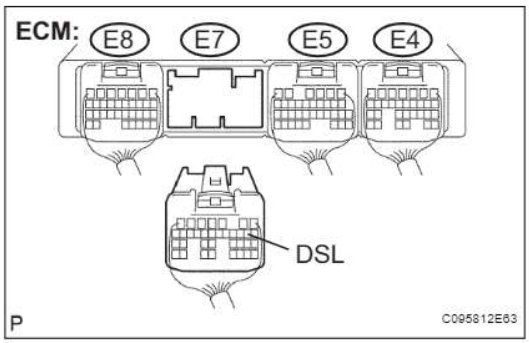
**Standard resistance**

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

NG → Go to step 4

OK

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




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

**Standard resistance**

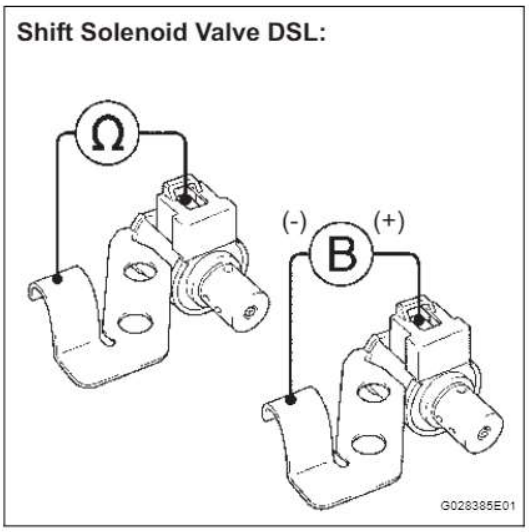
| Tester Connection | Specified Condition 20°C (68°F) |
|---|---|
| E7-9 (DSL) - Body ground | 11 to 13 Ω |

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

AX

| 4 | INSPECT SHIFT SOLENOID VALVE (DSL) |
|---|---|




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

**Standard resistance**

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

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

**OK:**

**The solenoid valve makes an operating sound.**

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

OK

| 5 | CHECK TRANSMISSION WIRE |
|---|---|

**OK:**

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

NG → **REPAIR OR REPLACE TRANSMISSION WIRE**

AX

OK

| 6 | INSPECT TRANSMISSION VALVE BODY ASSEMBLY |
|---|---|

**OK:**

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

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

OK

| 7 | INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY |
|---|---|

**OK:**

**The torque converter clutch operates normally.**

NG → **REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY**

OK

REPAIR AUTOMATIC TRANSAXLE ASSEMBLY

| DTC | P0746 | Pressure Control Solenoid "A" Performance (Shift Solenoid Valve SL1) |
|---|---|---|

## SYSTEM DESCRIPTION

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

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

## MONITOR DESCRIPTION

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

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P0746:<br>Shift solenoid valve SL1/OFF malfunction<br>Shift solenoid valve SL1/ON malfunction |
| Required sensors/Components | Shift solenoid valve SL1, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE) |
| Frequency of operation | Continuous |
| Duration | OFF malfunction, ON malfunction (A)<br>0.8 sec.<br>ON malfunction (B)<br>1 sec. |
| MIL operation | 2 driving cycles |
| Sequence of operation | None |

AX

## TYPICAL ENABLING CONDITIONS

### ALL:

| | |
|---|---|
| The monitor will run whenever this DTC is not present. | P0115 - P0118 (ECT sensor)<br>P0125 (Insufficient ECT for closed loop)<br>P0500 (VSS)<br>P0748, P0778 (Shift solenoid valve (range)) |
| ECT (Engine coolant temperature) | 60°C (140°F) or more |
| Transmission range | "D" |
| TFT (Transmission fluid temperature) | -20°C (-4°F) or more |
| TFT sensor circuit | Not circuit malfunction |
| ECT sensor circuit | Not circuit malfunction |
| Turbine speed sensor circuit | Not circuit malfunction |
| Intermediate shaft speed sensor circuit | Not circuit malfunction |
| Output speed sensor circuit | Not circuit malfunction |

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

**OFF malfunction:**

| | |
|---|---|
| ECM selected gear | 1st |
| Vehicle speed | 10 to 40 km/h (6.2 to 24.9 mph) |
| Throttle valve opening angle | 3.5% or more (varies with engine speed) |

**ON malfunction (A):**

| | |
|---|---|
| ECM selected gear | 2nd |
| Vehicle speed | 10 km/h (6.2 mph) or more |
| Throttle valve opening angle | 3.5% or more (varies with engine speed) |

**ON malfunction (B):**

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

## TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met:
OFF malfunction, or ON malfunction (A) and (B)
2 detections are necessary per driving cycle:
1st detection; temporary flag ON
2nd detection; pending fault code ON

**OFF malfunction:**

| | |
|---|---|
| Input (turbine) speed/Intermediated shaft speed | 1.49 to 1.63 |

**ON malfunction (A):**

| | |
|---|---|
| Input (turbine) speed/Intermediated shaft speed | 2.72 to 2.86 |

**ON malfunction (B):**

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

AX

## INSPECTION PROCEDURE

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

1. **PERFORM ACTIVE TEST**
   (a) Warm up the engine.
   (b) Turn the ignition switch off.
   (c) Connect the OBD II scan tool or intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
   (d) Turn the ignition switch to the ON position.
   (e) Turn on the tester.
   (f) Select the item "DIAGNOSIS / OBD/MOBD / ECT / ACTIVE TEST / SHIFT".
   (g) According to the display on the tester, perform the "ACTIVE TEST".
   HINT:
   While driving, the shift position can be forcibly changed with the intelligent tester.

Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (See page AX-29).

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

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

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

(a) Connect the OBD II scan tool or intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
(b) Turn the ignition switch to the ON position and turn the OBD II scan tool or the intelligent tester main switch ON.
(c) When you use intelligent tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".
(d) Read the DTCs using the OBD II scan tool or the intelligent tester.

**Result**

AX

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

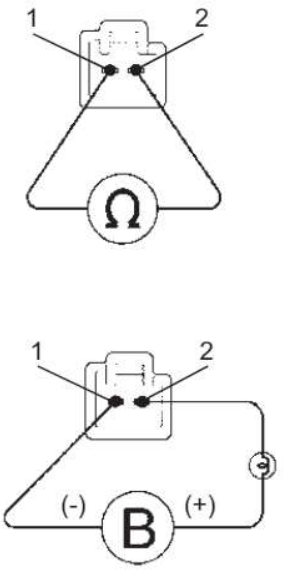
HINT:
If any other codes besides "P0746" are output, perform the troubleshooting for those DTCs first.

B → GO TO DTC CHART

A

| 2 | INSPECT SHIFT SOLENOID VALVE SL1 |
|---|---|

Shift Solenoid Valve SL1:




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

**Standard resistance**

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

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

**OK:**

**The solenoid makes an operating sound.**

NG → **REPLACE SHIFT SOLENOID VALVE SL1**

OK ↓

| 3 | INSPECT TRANSMISSION VALVE BODY ASSEMBLY |
|---|---|

**OK:**

**There are no foreign objects on each valve.**

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

OK ↓

| 4 | INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY |
|---|---|

**OK:**

**The torque converter clutch operates normally.**

NG → **REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY**

OK ↓

**REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSEMBLY**

AX

| DTC | P0748 | Pressure Control Solenoid "A" Electrical (Shift Solenoid Valve SL1) |
|---|---|---|

## DESCRIPTION

Shifting from 1st to 4th (O/D) is performed in combination with "ON" and "OFF" operation of the shift solenoid valves SL1 and SL2 which is controlled by the ECM. If an open or short circuit occurs in either of the shift solenoid valves, the ECM controls the remaining normal shift solenoid valve to allow the vehicle to be operated smoothly (Fail safe function).

| DTC No. | DTC Detection Condition | Trouble Area |
|---|---|---|
| P0748 | The ECM checks for an open or short in the shift solenoid valve SL1 circuit while driving and shift gears. (1-trip detection logic)<br>• 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<br>• Shift solenoid valve SL1<br>• ECM |

## MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other normal shift solenoid valves "ON/OFF" (In case of an open or short circuit, the ECM stops sending current to the circuit.) (See page AX-29).

## MONITOR STRATEGY

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

AX

## TYPICAL ENABLING CONDITIONS

| | |
|---|---|
| The monitor will run whenever this DTC is not present. | None |
| Battery voltage | 11 V or more |
| Ignition switch | ON |
| Starter | OFF |

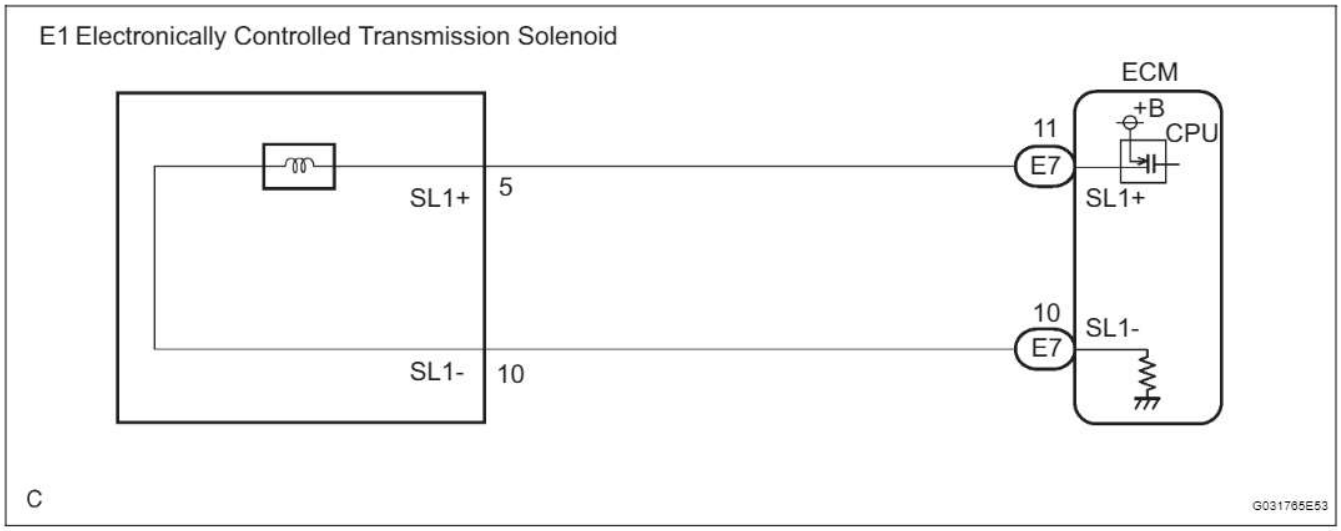
## TYPICAL MALFUNCTION THRESHOLDS

| | |
|---|---|
| Solenoid status from MIC | Fail (Open or Short) |

## COMPONENT OPERATING RANGE

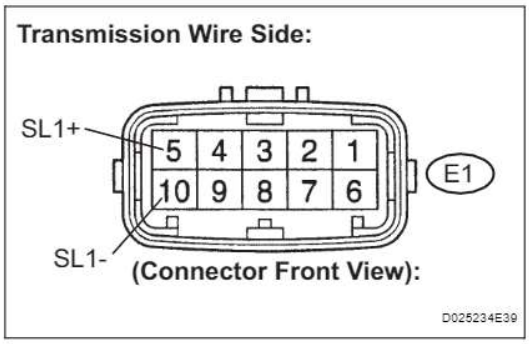
| | |
|---|---|
| Output signal duty | Less than 100% |

## WIRING DIAGRAM




## INSPECTION PROCEDURE

| 1 | INSPECT TRANSMISSION WIRE (SL1) |
|---|---|




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

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

**Standard resistance**

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

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

**Standard resistance (Check for short)**

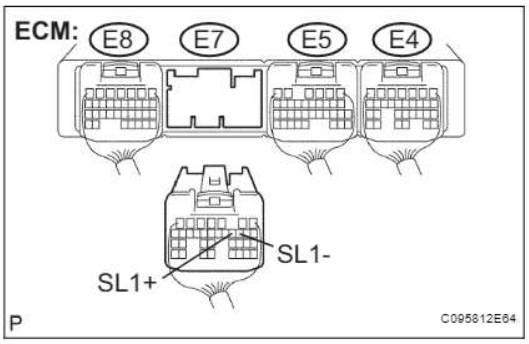
| Tester Connection | Specified Condition |
|---|---|
| 5 (SL1+) - Body ground | 10 kΩ or higher |
| 10 (SL1-) - Body ground | ↑ |

NG → Go to step 3

OK

AX

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




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

**Standard resistance**

| Tester Connection | Specified Condition 20°C (68°F) |
|---|---|
| E7-11 (SL1+) - E7-10 (SL1-) | 5.0 to 5.6 Ω |

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

**Standard resistance (Check for short)**

| Tester Connection | Specified Condition |
|---|---|
| E7-11 (SL1+) - Body ground | 10 kΩ or higher |
| E7-10 (SL1-) - Body ground | |

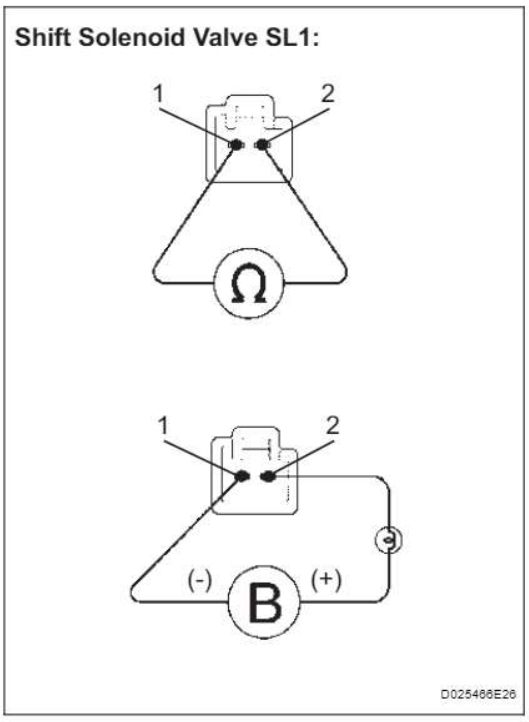
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

**REPLACE ECM**

| 3 | INSPECT SHIFT SOLENOID VALVE SL1 |
|---|---|

AX




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

**Standard resistance**

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

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

**OK:**

**The solenoid makes an operating sound.**

NG → **REPLACE SHIFT SOLENOID VALVE SL1**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

| DTC | P0766 | Shift Solenoid "D" Performance (Shift Solenoid Valve S4) |
|---|---|---|

## SYSTEM DESCRIPTION

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

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

## MONITOR DESCRIPTION

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

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P0766:<br>Shift solenoid valve S4/OFF malfunction<br>Shift solenoid valve S4/ON malfunction |
| Required sensors/Components | Shift solenoid valve S4, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE) |
| Frequency of operation | Continuous |
| Duration | 1 sec. |
| MIL operation | 2 driving cycles |
| Sequence of operation | None |

AX

## TYPICAL ENABLING CONDITIONS

**All:**

| | |
|---|---|
| The monitor will run whenever this DTC is not present. | P0115 - P0118 (ECT sensor)<br>P0125 (Insufficient ECT for closed loop)<br>P0500 (VSS)<br>P0748, P0778 (Shift solenoid valve (range)) |
| ECT (Engine coolant temperature) | 60°C (140°F) or more |
| Transmission range | "D" |
| TFT (Transmission fluid temperature) | -20°C (-4°F) or more |
| TFT sensor circuit | Not circuit malfunction |
| ECT sensor circuit | Not circuit malfunction |
| Turbine speed sensor circuit | Not circuit malfunction |
| Intermediate shaft speed sensor circuit | Not circuit malfunction |
| Output speed sensor circuit | Not circuit malfunction |
| Shift solenoid valve SL1 circuit | Not circuit malfunction |
| Shift solenoid valve SL2 circuit | Not circuit malfunction |
| Shift solenoid valve S4 circuit | Not circuit malfunction |
| Electronic throttle system | Not circuit malfunction |

**ON malfunction (A):**

| | |
|---|---|
| ECM selected gear | 3rd |

| | |
|---|---|
| Vehicle speed | 10 km/h (6.2 mph) or more |
| Throttle valve opening angle | 5% or more |
| Calculated load | 19.5% or more |

**OFF malfunction (B):**

| | |
|---|---|
| ECM selected gear | 4th |
| Vehicle speed | 10 km/h (6.2 mph) or more |
| Throttle valve opening angle | 5% or more |
| Calculated load | 19.5% or more |

## TYPICAL MALFUNCTION THRESHOLDS

Either of the following conditions is met:
OFF malfunction or ON malfunction
2 detections are necessary per driving cycle:
1st detection; temporary flag ON
2nd detection; pending fault code ON

**ON malfunction (A):**

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

**OFF malfunction (B):**

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

## INSPECTION PROCEDURE

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

**1. PERFORM ACTIVE TEST**

(a) Warm up the engine.
(b) Turn the ignition switch off.
(c) Connect the OBD II scan tool or intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
(d) Turn the ignition switch to the ON position.
(e) Turn on the tester.
(f) Select the item "DIAGNOSIS / OBD/MOBD / ECT / ACTIVE TEST / SHIFT".
(g) According to the display on the tester, perform the "ACTIVE TEST".
HINT:
While driving, the shift position can be forcibly changed with the intelligent tester.
Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (See page AX-29).

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

HINT:
• This test can be conducted when the vehicle speed is 50 km/h (31 mph) or less.

- The shift position commanded by the ECM is shown in the DATA LIST / SHIFT display on the intelligent tester.

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

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

**Result**

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

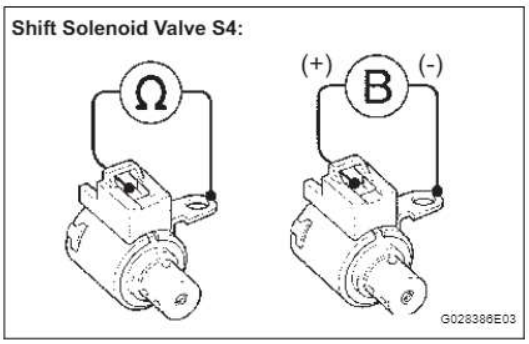
HINT:
If any other codes besides "P0766" are output, perform the troubleshooting for those DTCs first.

B → GO TO DTC CHART

A

| 2 | INSPECT SHIFT SOLENOID VALVE S4 |
|---|---|

AX




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

**Standard resistance**

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

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

**OK:**
**The solenoid makes an operating sound.**

NG → REPLACE SHIFT SOLENOID VALVE S4

OK

| 3 | INSPECT TRANSMISSION VALVE BODY ASSEMBLY |
|---|---|

**OK:**
**There are no foreign objects on each valve.**

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY

OK

| 4 | INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY |
|---|---|

OK:
The torque converter clutch operates normally.

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY

OK

REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSEMBLY

AX

| DTC | P0776 | Pressure Control Solenoid "B" Performance (Shift Solenoid Valve SL2) |
|---|---|---|

## SYSTEM DESCRIPTION

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

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

## MONITOR DESCRIPTION

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

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P0776:<br>Shift solenoid valve SL2/OFF malfunction<br>Shift solenoid valve SL2/ON malfunction |
| Required sensors/Components | Shift solenoid valve SL2, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE) |
| Frequency of operation | Continuous |
| Duration | 0.8 sec. |
| MIL operation | 2 driving cycles |
| Sequence of operation | None |

AX

## TYPICAL ENABLING CONDITIONS

### All:

| | |
|---|---|
| The monitor will run whenever this DTC is not present. | P0115 - P0118 (ECT sensor)<br>P0125 (Insufficient ECT for closed loop)<br>P0500 (VSS)<br>P0748, P0778 (Shift solenoid valve (range)) |
| ECT (Engine coolant temperature) | 60°C (140°F) or more |
| Transmission range | "D" |
| TFT (Transmission fluid temperature) | -20°C (-4°F) or more |
| TFT sensor circuit | Not circuit malfunction |
| ECT sensor circuit | Not circuit malfunction |
| Turbine speed sensor circuit | Not circuit malfunction |
| Intermediate shaft speed sensor circuit | Not circuit malfunction |
| Output speed sensor circuit | Not circuit malfunction |
| Shift solenoid valve SL1 circuit | Not circuit malfunction |
| Shift solenoid valve SL2 circuit | Not circuit malfunction |
| Shift solenoid valve S4 circuit | Not circuit malfunction |
| Electronic throttle system | Not circuit malfunction |

### OFF malfunction:

| | |
|---|---|
| ECM selected gear | 1st |

| | |
|---|---|
| Vehicle speed | 10 to 40 km/h (6.2 to 24.9 mph) or more |
| Throttle valve opening angle | 5% or more<br>3.5% or more at engine speed 1,900 rpm<br>(vary with engine speed) |

**ON malfunction:**

| | |
|---|---|
| ECM selected gear | 3rd or 4th |
| Vehicle speed | 10 km/h (6.2 mph) or more |
| Throttle valve opening angle | 3.5% or more at engine speed 1,900 rpm<br>(Varies with engine speed) |

## TYPICAL MALFUNCTION THRESHOLDS

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

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

**OFF malfunction:**

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

**ON malfunction:**

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

## INSPECTION PROCEDURE

### 1. PERFORM ACTIVE TEST

(a) Warm up the engine.
(b) Turn the ignition switch off.
(c) Connect the OBD II scan tool or intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
(d) Turn the ignition switch to the ON position.
(e) Turn on the tester.
(f) Select the item "DIAGNOSIS / OBD/MOBD / ECT / ACTIVE TEST / SHIFT".
(g) According to the display on the tester, perform the "ACTIVE TEST".
HINT:
While driving, the shift position can be forcibly changed with the intelligent tester.
Comparing the shift position commanded by the ACTIVE TEST with the actual shift position enables you to confirm the problem (See page AX-29).

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

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

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

(a) Connect the OBD II scan tool or intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
(b) Turn the ignition switch to the ON position and turn the OBD II scan tool or the intelligent tester main switch ON.
(c) When you use intelligent tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES".
(d) Read the DTCs using the OBD II scan tool or the intelligent tester.

**Result**

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

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

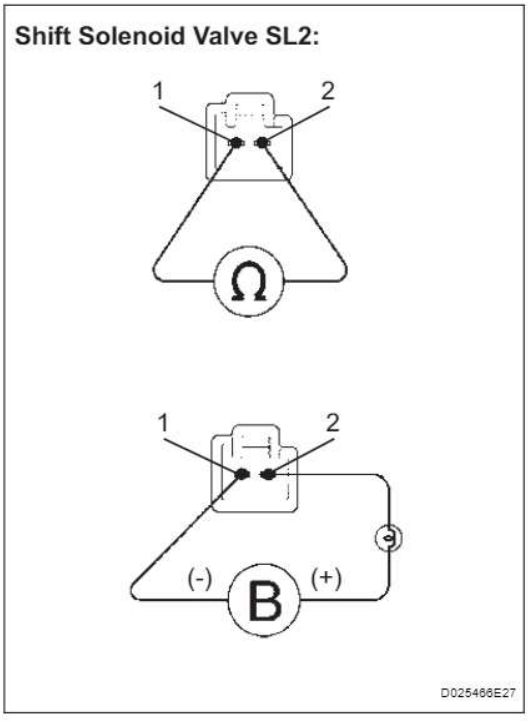
B → GO TO DTC CHART

A

| 2 | INSPECT SHIFT SOLENOID VALVE SL2 |
|---|---|

AX

**Shift Solenoid Valve SL2:**




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

**Standard resistance**

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

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

**OK:**

**The solenoid makes an operating sound.**

NG → REPLACE SHIFT SOLENOID VALVE SL2

OK

| | |
|---|---|
| 3 | INSPECT TRANSMISSION VALVE BODY ASSEMBLY |

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

NG → REPAIR OR REPLACE TRANSMISSION VALVE BODY ASSEMBLY

OK ↓

| | |
|---|---|
| 4 | INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY |

OK:
The torque converter clutch operates normally.

NG → REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY

OK ↓

REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSEMBLY

AX

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

## DESCRIPTION

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

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

## MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other normal shift solenoid valves "ON/OFF" (In case of an open or short circuit, the ECM stops sending current to the circuit.)
(See page AX-29).

## MONITOR STRATEGY

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

AX

## TYPICAL ENABLING CONDITIONS

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

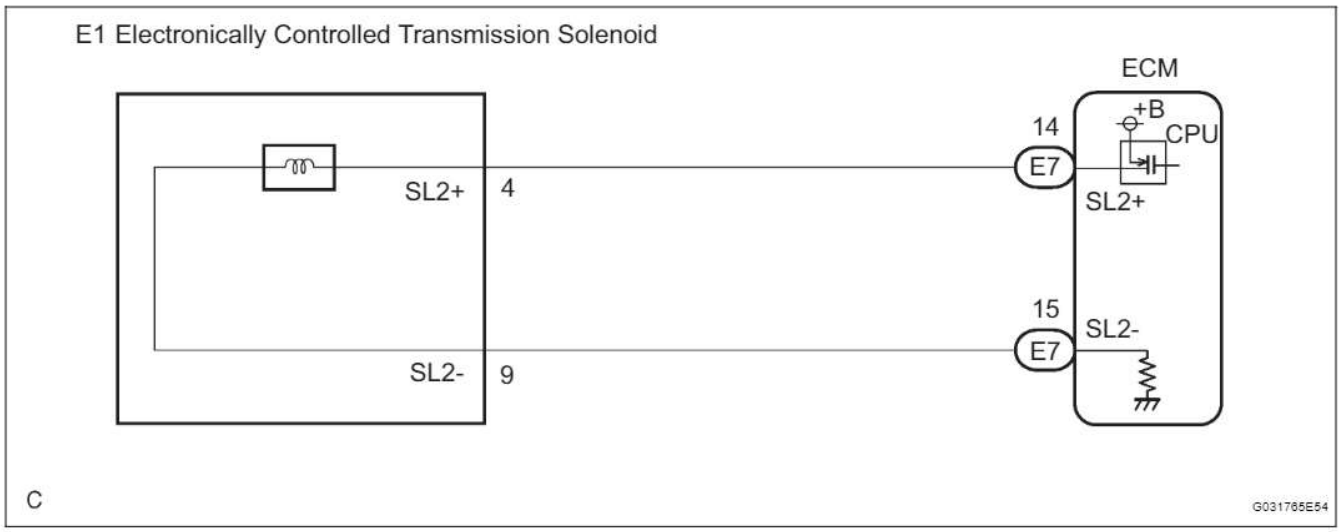
## TYPICAL MALFUNCTION THRESHOLDS

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

## COMPONENT OPERATING RANGE

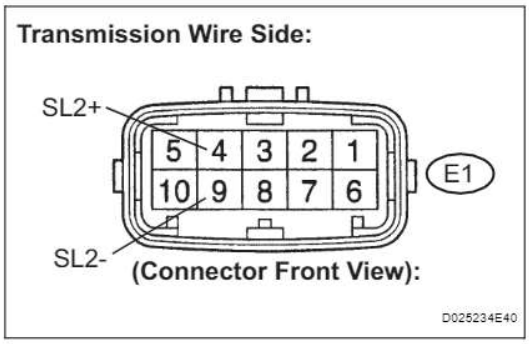
| | |
|---|---|
| Output signal duty | Less than 100% |

## WIRING DIAGRAM




## INSPECTION PROCEDURE

| 1 | INSPECT TRANSMISSION WIRE (SL2) |
|---|---|




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

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

**Standard resistance**

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

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

**OK**

**Standard resistance (Check for short):**

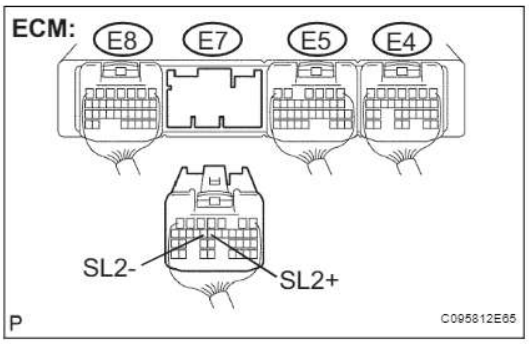
| Tester Connection | Specified Condition |
|---|---|
| 4 (SL2+) - Body ground | 10 kΩ or higher |
| 9 (SL2-) - Body ground | ↑ |

NG → Go to step 3

OK

AX

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




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

**Standard resistance**

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

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

**OK:**

**Standard resistance (Check for short)**

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

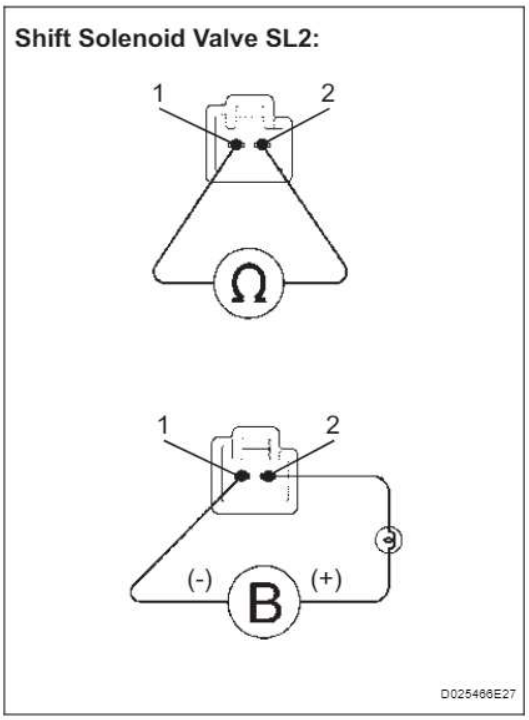
NG → **REPAIR OR REPLACE HARNESS OR CONNECTOR**

OK

**REPLACE ECM**

AX

| 3 | INSPECT SHIFT SOLENOID VALVE SL2 |
|---|---|




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

**Standard resistance**

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

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

**OK:**

**The solenoid makes an operating sound.**

NG → **REPLACE SHIFT SOLENOID VALVE SL2**

OK

REPAIR OR REPLACE TRANSMISSION WIRE

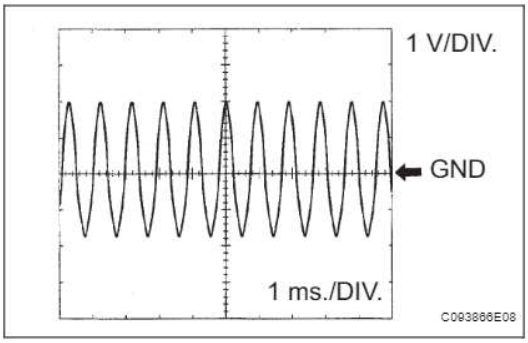
| DTC | P0793 | Intermediate Shaft Speed Sensor "A" |
|---|---|---|

## DESCRIPTION

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

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

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




**Refer to the illustration:**

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

AX

## MONITOR DESCRIPTION

The NC terminal of the ECM detects a revolution signal from the speed sensor (NC) (counter gear rpm). The ECM calculates a gearshift comparing the speed sensor (NT) with the speed sensor (NC).
While the vehicle is operating in 2nd, 3rd or 4th (O/D) gear in the shift position of D, if the counter gear revolution is less than 300 rpm *1although the output shaft revolution is more than 1,000 rpm *2, the ECM detects the trouble, illuminates the MIL and stores the DTC.
*1: Pulse is not output or is irregularly output.
*2: The vehicle speed is 50 km/h (31 mph) or more.

## MONITOR STRATEGY

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

## TYPICAL ENABLING CONDITIONS

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

## TYPICAL MALFUNCTION THRESHOLDS

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

## COMPONENT OPERATING RANGE

| | |
|---|---|
| Counter gear speed sensor (NC) | HINT:<br>4th (O/D) when shift lever position is D position (After warming up the engine);<br>• Intermediate shaft speed (NC) becomes close to the engine speed. |

## WIRING DIAGRAM




## INSPECTION PROCEDURE

**1. DATA LIST**

HINT:

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

READ DATA LIST

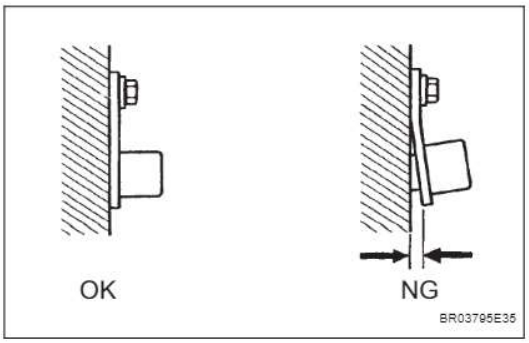
(a) Warm up the engine.
(b) Turn the ignition switch off.
(c) Connect the OBD II scan tool or intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
(d) Turn the ignition switch to the ON position.
(e) Turn on the tester.
(f) Select the item "DIAGNOSIS / OBD/MOBD / ECT / DATA LIST".

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

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

HINT:
- SPD (NC) is always 0 while driving:
  Open or short in the sensor or circuit.
- SPD (NC) is always more than 0 and less than 300 rpm while driving the vehicle at 50 km/h (31 mph) or more:
  Sensor trouble, improper installation, or intermittent connection trouble of the circuit.

**1 INSPECT SPEED SENSOR INSTALLATION**

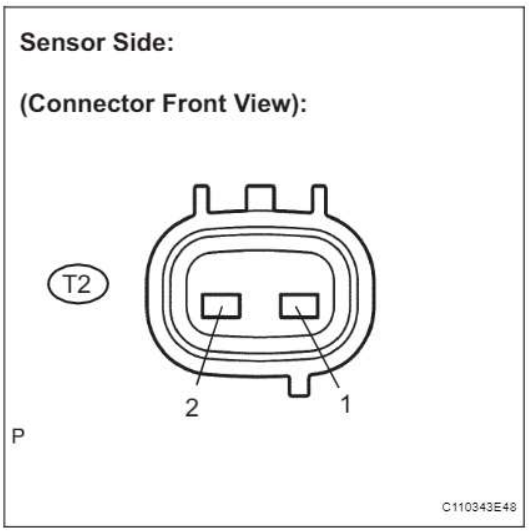



(a) Check the speed sensor installation.
**OK:**
**The installation bolt is tightened properly and there is no clearance between the sensor and transaxle case.**

**NG** → **REPLACE SPEED SENSOR (NC)**

**OK**

**2 INSPECT SPEED SENSOR (NC)**



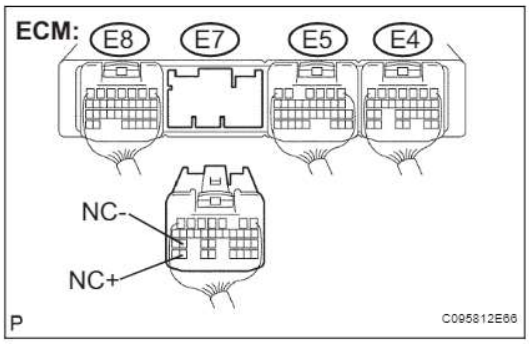

(a) Disconnect the speed sensor connector from the transaxle.
(b) Measure the resistance according to the value(s) in the table below.
**Standard resistance**

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

**NG** → **REPLACE SPEED SENSOR (NC)**

**OK**

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




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

**Standard resistance**

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

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

**Standard resistance (Check for short)**

| Tester Connection | Specified Condition |
|---|---|
| E7-34 (NC+) - Body ground | 10 kΩ or higher |
| E7-26 (NC-) - Body ground | |

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM

AX

| DTC | P0982 | Shift Solenoid "D" Control Circuit Low (Shift Solenoid Valve S4) |
|---|---|---|

| DTC | P0983 | Shift Solenoid "D" Control Circuit High (Shift Solenoid Valve S4) |
|---|---|---|

## DESCRIPTION

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

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

## MONITOR DESCRIPTION

The ECM commands gear shifts by turning the shift solenoid valves "ON/OFF". When there is an open or short circuit in any shift solenoid valve circuit, the ECM detects the problem and illuminates the MIL and stores the DTC. And the ECM performs the fail-safe function and turns the other normal shift solenoid valves "ON/OFF" (In case of an open or short circuit, the ECM stops sending current to the circuit.) (See page AX-29).

## MONITOR STRATEGY

AX

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

## TYPICAL ENABLING CONDITIONS

### P0982: Range check (Low resistance):

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

### P0983: Range check (High resistance):

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

## TYPICAL MALFUNCTION THRESHOLDS

### P0982: Range check (Low resistance):

| | |
|---|---|
| Shift solenoid valve S4 resistance | 8 Ω or less |

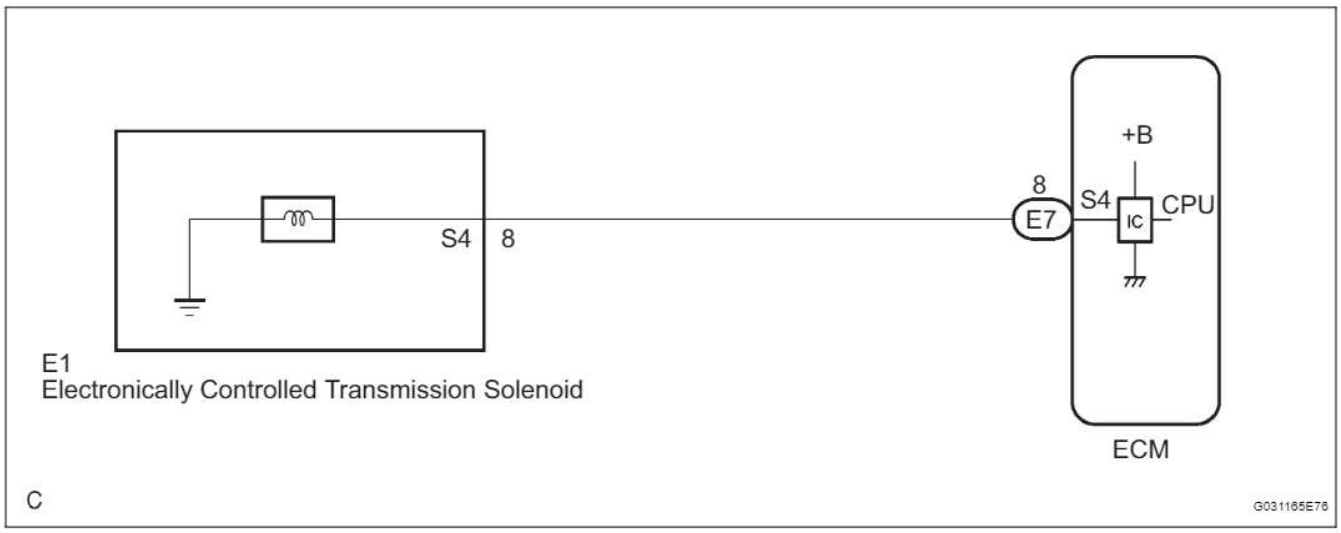
### P0983: Range check (High resistance):

| | |
|---|---|
| Shift solenoid valve S4 resistance | 100 kΩ or more |

## COMPONENT OPERATING RANGE

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

## WIRING DIAGRAM

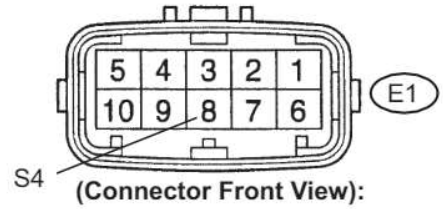



AX

## INSPECTION PROCEDURE

| 1 | INSPECT TRANSMISSION WIRE (S4) |
|---|---|

**Transmission Wire Side:**




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

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

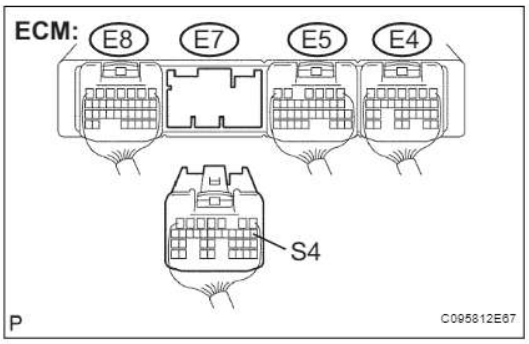
**Standard resistance**

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

NG → Go to step 3

OK

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




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

**Standard resistance**

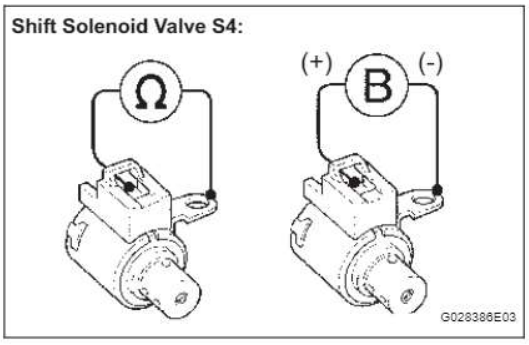
| Tester Connection | Specified Condition 20°C (68°F) |
|---|---|
| E7-8 (S4) - Body ground | 11 to 15 Ω |

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

OK

**REPLACE ECM**

| 3 | INSPECT SHIFT SOLENOID VALVE S4 |
|---|---|




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

**Standard resistance**

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

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

**OK:**

**The solenoid makes an operating sound.**

NG → **REPLACE SHIFT SOLENOID VALVE S4**

OK

**REPAIR OR REPLACE TRANSMISSION WIRE**

AX

| DTC | P2714 | Pressure Control Solenoid "D" Performance (Shift Solenoid Valve SLT) |
|---|---|---|

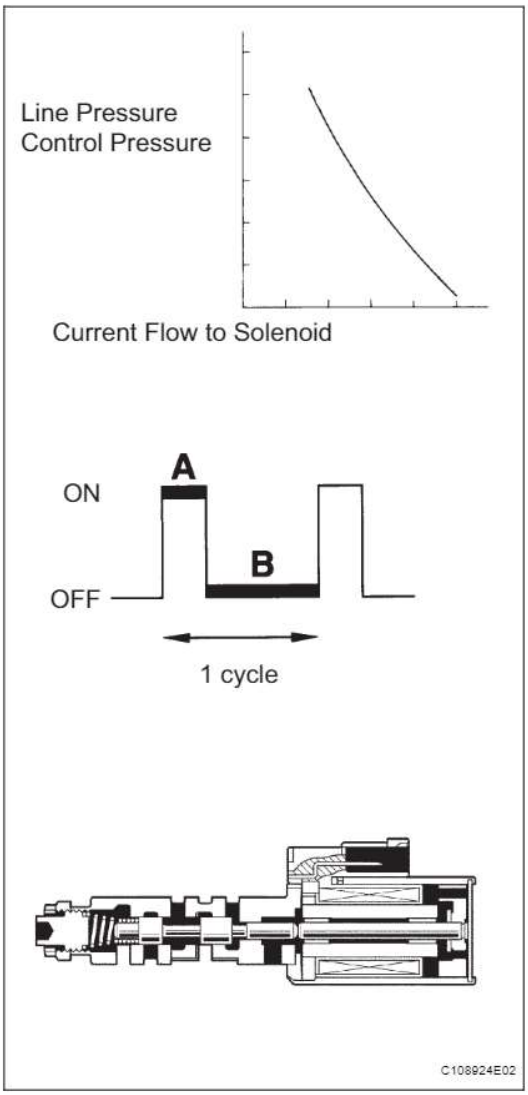
## SYSTEM DESCRIPTION

The linear solenoid valve (SLT) controls the transmission line pressure for smooth transmission operation based on signals from the throttle position sensor and the vehicle speed sensor. The ECM adjusts the duty ratio (*) of the SLT solenoid valve to control hydraulic line pressure coming from the primary regulator valve. Appropriate line pressure assures smooth shifting with varying engine outputs.

(*): Duty Ratio

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

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




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

## MONITOR DESCRIPTION

In any forward position, when the difference between the revolutions of the turbine, Intermediate and output shaft exceeds the specified value (varies with Intermediate, output speed) determined by the ECM, the ECM illuminates the MIL and outputs the DTC.
When shift solenoid valve SLT remains on, the oil pressure goes down and the clutch engagement force decreases.
**NOTICE:**
**If you continue driving 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 | Shift solenoid valve SLT, Speed sensor (NT), Speed sensor (NC), Crankshaft position sensor (NE) |
| Frequency of operation | Continuous |
| Duration | 1 sec. |
| MIL operation | 2 driving cycles |
| Sequence of operation | None |

## TYPICAL ENABLING CONDITIONS

**All:**

| | |
|---|---|
| The monitor will run whenever this DTC is not present. | None |
| Transmission range | "D" |
| TFT (Transmission fluid temperature) | -10°C (14°F) or more |
| TFT sensor circuit | Not circuit malfunction |
| ECT sensor circuit | Not circuit malfunction |
| Turbine speed sensor circuit | Not circuit malfunction |
| Intermediate shaft speed sensor circuit | Not circuit malfunction |
| Output speed sensor circuit | Not circuit malfunction |
| Shift solenoid valve SL1 circuit | Not circuit malfunction |
| Shift solenoid valve SL2 circuit | Not circuit malfunction |
| Shift solenoid valve S4 circuit | Not circuit malfunction |
| Shift solenoid valve DSL circuit | Not circuit malfunction |
| Shift solenoid valve SLT circuit | Not circuit malfunction |
| Electronic throttle system | Not circuit malfunction |

AX

**ON malfunction (a):**

| | |
|---|---|
| ECM gearshift command | 1st |
| Input (turbine) speed | 300 rpm or more |
| Output speed | 300 rpm or more |

**ON malfunction (b):**

| | |
|---|---|
| ECM gearshift command | 2nd |
| Input (turbine) speed | 300 rpm or more |
| Output speed | 300 rpm or more |

**ON malfunction (c):**

| | |
|---|---|
| ECM gearshift command | 3rd |
| Input (turbine) speed | 300 rpm or more |
| Output speed | 300 rpm or more |

**ON malfunction (d):**

| | |
|---|---|
| ECM gearshift command | 4th |
| Input (turbine) speed | 300 rpm or more |
| Output speed | 300 rpm or more |

## TYPICAL MALFUNCTION THRESHOLDS

**[ON malfunction]**

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

**ON malfunction (a):**

| | |
|---|---|
| NT - NC x 1st gear ratio (without counter gear and under drive gear)<br>NT: Input (turbine) speed<br>NC: Intermediate shaft speed | More than 300 rpm at intermediate shaft speed of 1,000 rpm<br>(Conditions vary with intermediate shaft speed) |
| Duration | 0.85 seconds or more |

**ON malfunction (b):**

| | |
|---|---|
| NT - NC x 2nd gear ratio (without counter gear and under drive gear) | More than 300 rpm at intermediate shaft speed of 1,000 rpm<br>(Conditions vary with intermediate shaft speed) |
| Duration | 0.85 seconds or more |

**ON malfunction (c):**

| | |
|---|---|
| NT - NC x 3rd gear ratio (without counter gear and under drive gear) | More than 300 rpm at intermediate shaft speed of 1,000 rpm<br>(Conditions vary with intermediate shaft speed) |
| Duration | 0.85 seconds or more |

**ON malfunction (d):**

| | |
|---|---|
| NC - NO x under drive gear ratio (Low or High) | More than 300 rpm at output speed of 1,000 rpm<br>(Conditions vary with output speed) |
| Duration | 0.85 seconds or more |

## INSPECTION PROCEDURE

AX

| 1 | CHECK OTHER DTCS OUTPUT (IN ADDITION TO DTC P2714) |
|---|---|

(a) Connect the OBD II scan tool or intelligent tester together with the CAN VIM (controller area network vehicle interface module) to the DLC3.
(b) Turn the ignition switch to the ON position and turn the OBD II scan tool or the intelligent tester main switch ON.
(c) When you use intelligent tester:
Select the item "DIAGNOSIS / ENHANCED OBD II / DTC INFO / CURRENT CODES"
(d) Read the DTCs using the OBD II scan tool or the intelligent tester.

**Result**

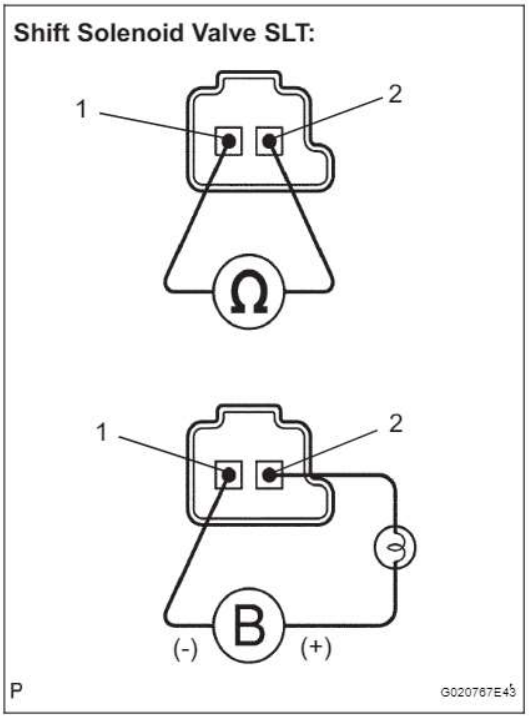
| Display (DTC output) | Proceed to |
|---|---|
| Only "P2714" is output | A |
| "P2714" and other DTCs | B |

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

B → GO TO DTC CHART

A

**2 INSPECT SHIFT SOLENOID VALVE SLT**




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

**Standard resistance**

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

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

**OK:**

**The solenoid makes an operating sound.**

NG → **REPLACE SHIFT SOLENOID VALVE SLT**

OK

AX

**3 INSPECT TRANSMISSION VALVE BODY ASSEMBLY**

**OK:**

**There are no foreign objects on each valve.**

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

OK

**4 INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY**

**OK:**

**The torque converter clutch operates normally.**

NG → **REPLACE TORQUE CONVERTER CLUTCH ASSEMBLY**

OK

**REPAIR OR REPLACE AUTOMATIC TRANSAXLE ASSEMBLY**

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

## DESCRIPTION

The linear solenoid valve (SLT) controls the transmission line pressure for smooth transmission operation based on signals from the throttle position sensor and the vehicle speed sensor. The ECM adjusts the duty cycle of the SLT solenoid valve to control hydraulic line pressure coming from the primary regulator valve. Appropriate line pressure assures smooth shifting with varying engine outputs.

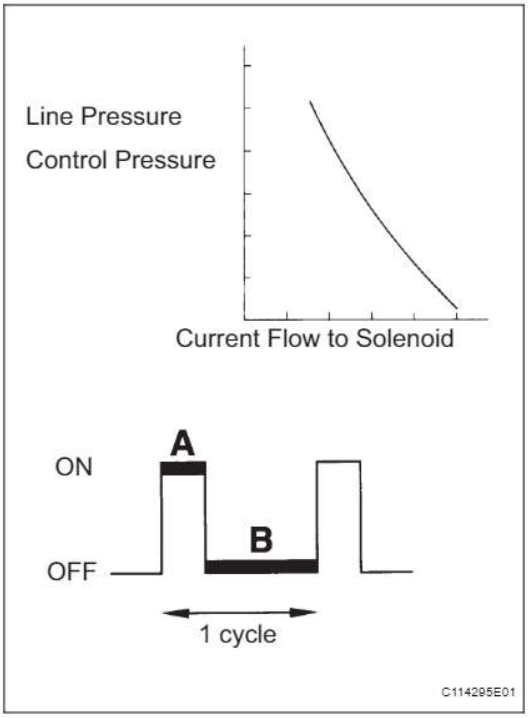
(*): Duty Ratio

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

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

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

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




## MONITOR DESCRIPTION

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

## MONITOR STRATEGY

| | |
|---|---|
| Related DTCs | P2716: Shift solenoid valve SLT/Range check |
| Required sensors/Components | Shift solenoid valve SLT |
| Frequency of operation | Continuous |
| Duration | 1 sec. |
| MIL operation | Immediate |
| Sequence of operation | None |

## TYPICAL ENABLING CONDITIONS

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

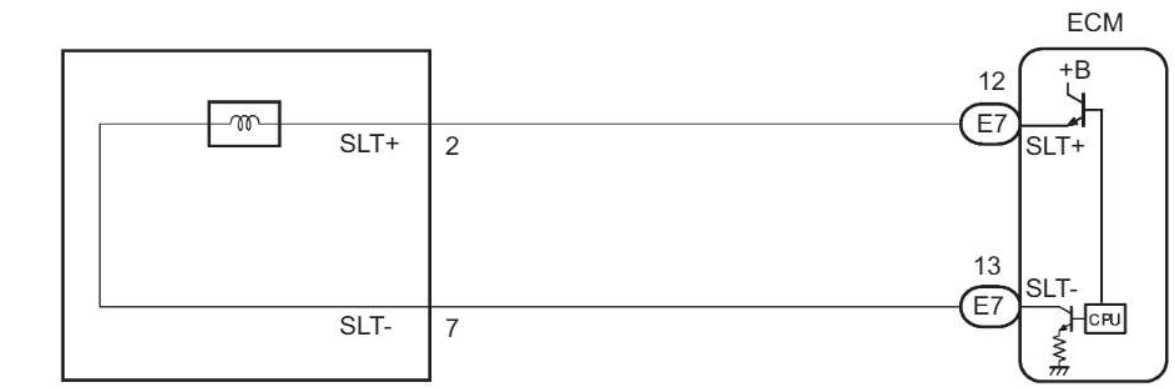
## TYPICAL MALFUNCTION THRESHOLDS

| | |
|---|---|
| Solenoid status from IC | Fail (Open or short) |

## COMPONENT OPERATING RANGE

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

## WIRING DIAGRAM




E1 Electronically Controlled Transmission Solenoid

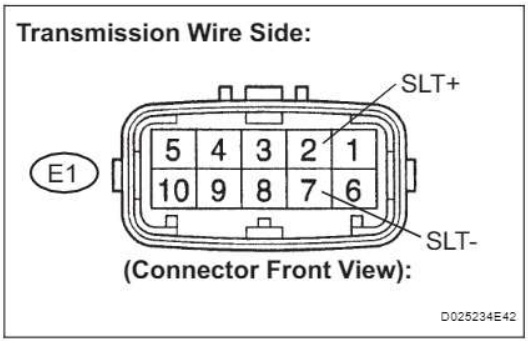
C

G031770E37

AX

## INSPECTION PROCEDURE

| 1 | INSPECT TRANSMISSION WIRE (SLT) |
|---|---|




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

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

**Standard resistance**

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

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

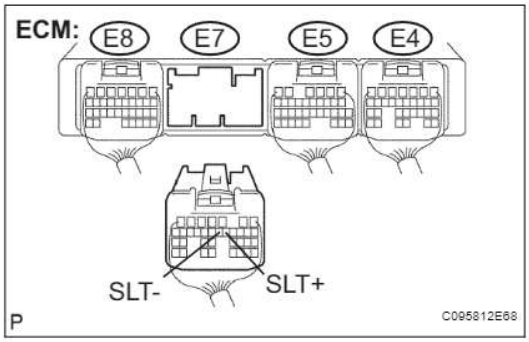
**Standard resistance (Check for short)**

| Tester Connection | Specified Condition |
|---|---|
| 2 (SLT+) - Body ground | 10 kΩ or higher |
| 7 (SLT-) - Body ground | ↑ |

NG → Go to step 3

OK

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




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

**Standard resistance**

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

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

**Standard resistance (Check for short)**

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

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

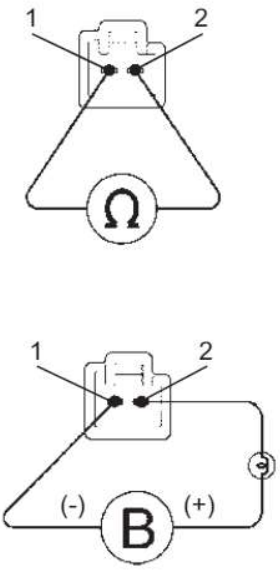
AX

OK

REPLACE ECM

| 3 | INSPECT SHIFT SOLENOID VALVE SLT |
|---|---|

**Shift Solenoid Valve SLT:**




D025466E28

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

**Standard resistance**

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

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

**OK:**

**The solenoid makes an operating sound.**

NG → **REPLACE SHIFT SOLENOID VALVE SLT**

OK →

**REPAIR OR REPLACE TRANSMISSION WIRE**

AX

| DTC | P2769 | Torque Converter Clutch Solenoid Circuit Low (Shift Solenoid Valve DSL) |
|---|---|---|

| DTC | P2770 | Torque Converter Clutch Solenoid Circuit High (Shift Solenoid Valve DSL) |
|---|---|---|

## DESCRIPTION

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

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

## MONITOR DESCRIPTION

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

## MONITOR STRATEGY

AX

| | |
|---|---|
| Related DTCs | P2769: Shift solenoid valve DSL/Range check (Low resistance)<br>P2770: Shift solenoid valve DSL/Range check (High resistance) |
| Required sensors/Components | Shift solenoid valve DSL |
| Frequency of operation | Continuous |
| Duration | 0.064 sec. or more |
| MIL operation | 2 driving cycles |
| Sequence of operation | None |

## TYPICAL ENABLING CONDITIONS

### P2769: Range check (Low resistance):

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

### P2770: Range check (High resistance):

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

| | |
|---|---|
| Starter | OFF |

## TYPICAL MALFUNCTION THRESHOLDS

### P2769: Range check (Low resistance):

| | |
|---|---|
| Shift solenoid valve DSL resistance | 8 Ω or less |

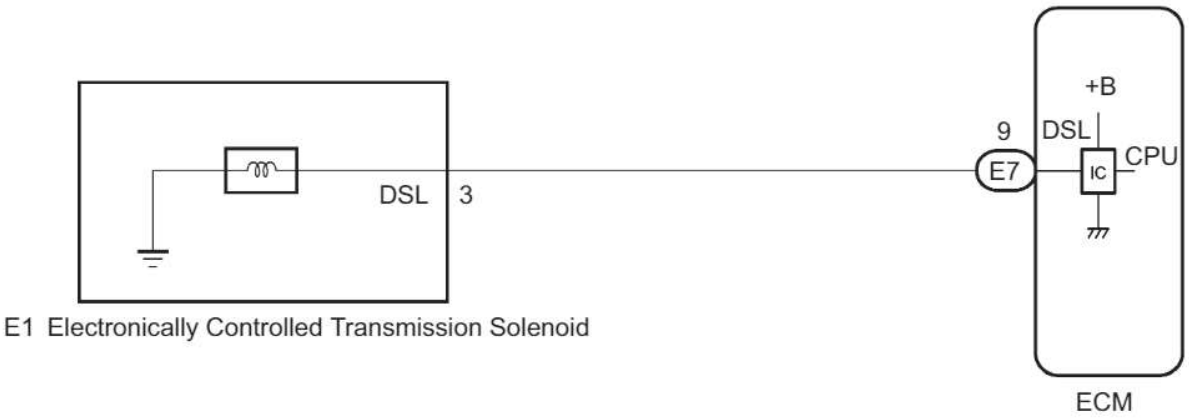
### P2770: Range check (High resistance):

| | |
|---|---|
| Shift solenoid valve DSL resistance | 100 kΩ or more |

## COMPONENT OPERATING RANGE

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

## WIRING DIAGRAM



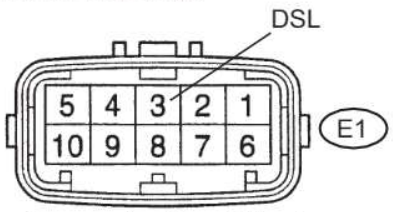

E1 Electronically Controlled Transmission Solenoid

AX

## INSPECTION PROCEDURE

**1 INSPECT TRANSMISSION WIRE (DSL)**

**Transmission Wire Side:**




**(Connector Front View):**

D025234E43

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

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

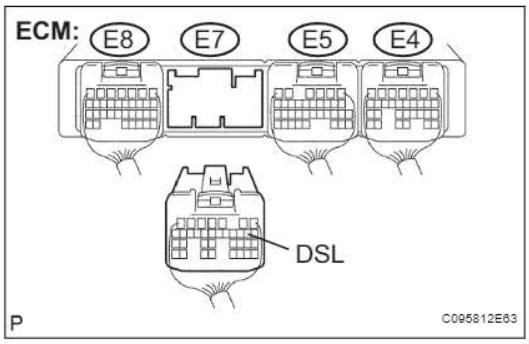
**Standard resistance**

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

**NG** → **Go to step 3**

**OK**

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




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

**Standard resistance**

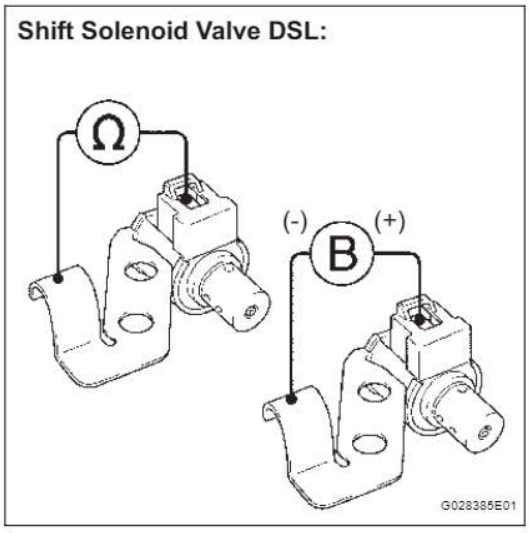
| Tester Connection | Specified Condition 20°C (68°F) |
|---|---|
| E7-9 (DSL) - Body ground | 11 to 13 Ω |

NG → REPAIR OR REPLACE HARNESS OR CONNECTOR

OK

REPLACE ECM

| 3 | INSPECT SHIFT SOLENOID VALVE (DSL) |
|---|---|




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

**Standard resistance**

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

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

**OK:**

**The solenoid valve makes an operating sound.**

NG → REPLACE SHIFT SOLENOID VALVE (DSL)

OK

REPAIR OR REPLACE TRANSMISSION WIRE

AX

# AUTOMATIC TRANSAXLE FLUID

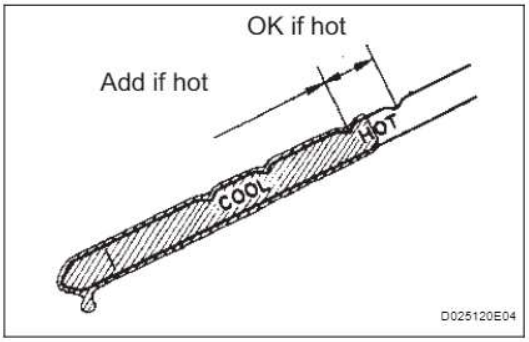
## ON-VEHICLE INSPECTION

### 1. CHECK THE FLUID LEVEL

HINT:

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

**Standard fluid temperature:**
**70 to 80°C (158 to 176°F)**

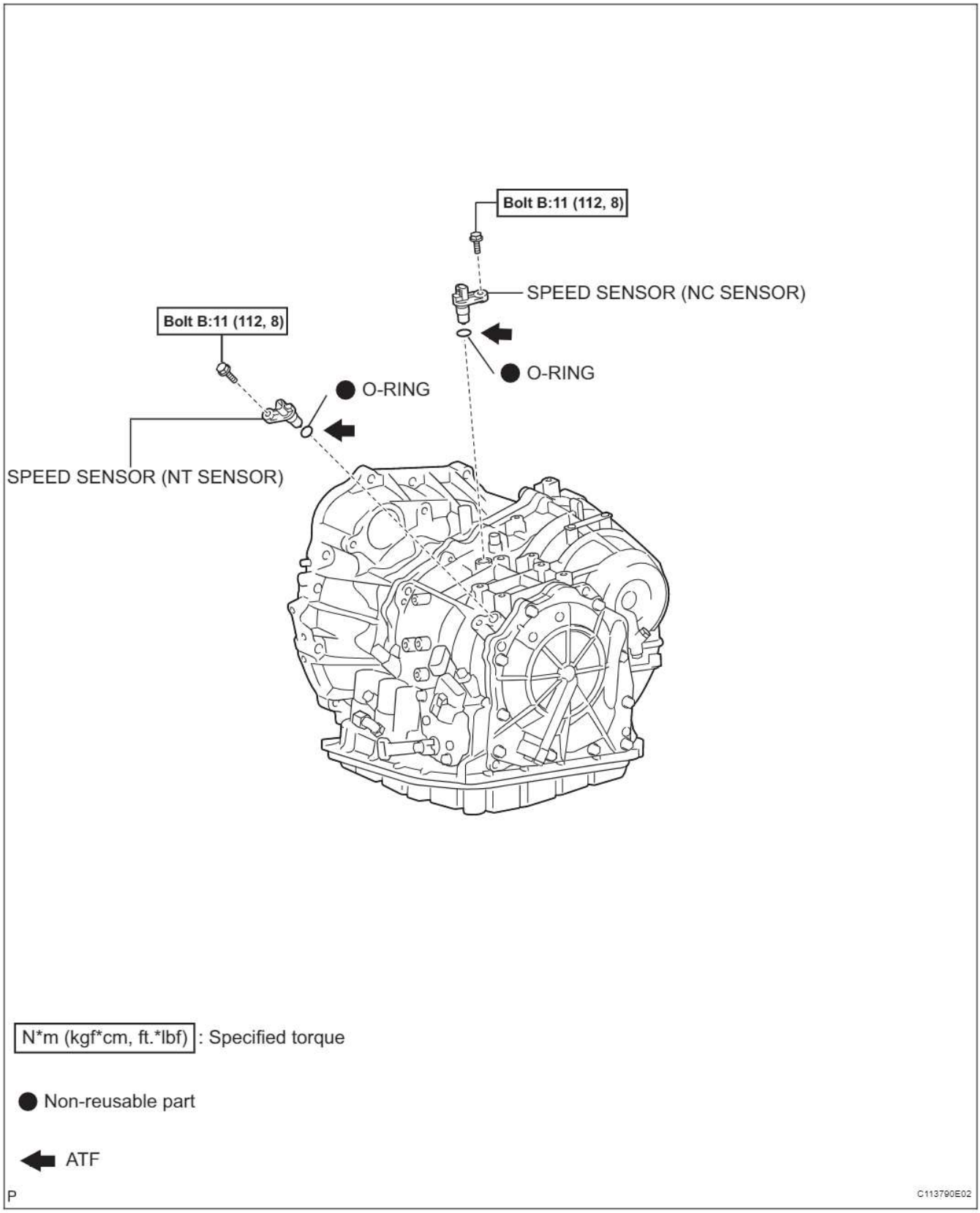



(a) Park the vehicle on a level surface and set the parking brake.
(b) With the engine idling and the brake pedal depressed, shift the shift lever into all positions from the P to the L position, and return it to the P position.
(c) Pull out the dipstick and wipe it clean.
(d) Push it back fully into the pipe.
(e) Pull it out again and check that the fluid level is within the HOT range.
If there are leaks, it is necessary to repair or replace O-rings, FIPGs, oil seals, plugs or other parts.

AX

# TRANSMISSION REVOLUTION SENSOR

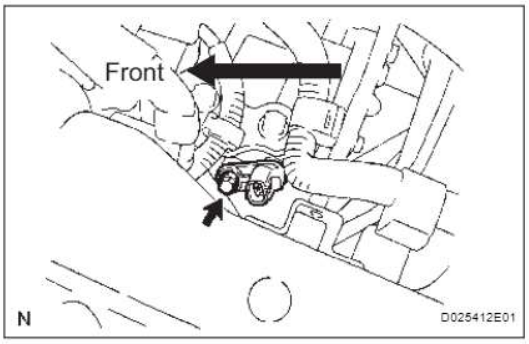
## COMPONENTS



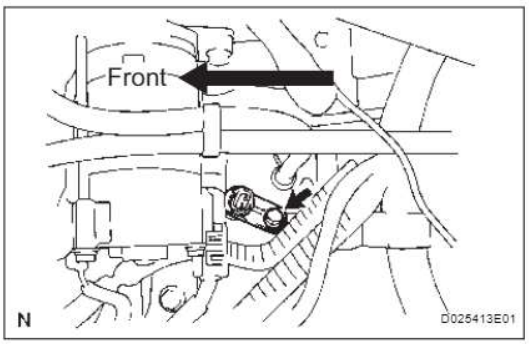

AX

# REMOVAL

1. **REMOVE BATTERY**
   **CAUTION:**
   **Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.**
2. **REMOVE BATTERY CARRIER (See page AX-147)**
3. **REMOVE AIR CLEANER ASSEMBLY (See page EM-94)**
4. **REMOVE SPEED SENSOR (NT SENSOR)**
   (a) Disconnect the sensor connector.
   (b) Remove the bolt and sensor.

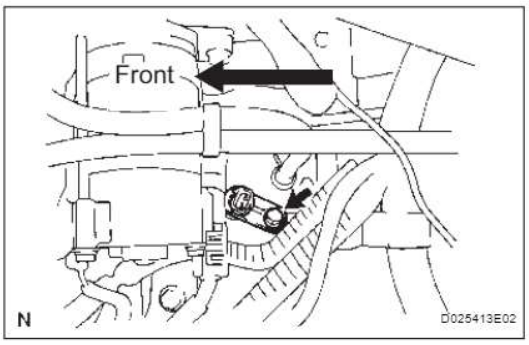



5. **REMOVE SPEED SENSOR (NC SENSOR)**
   (a) Disconnect the sensor connector.
   (b) Remove the bolt and sensor.

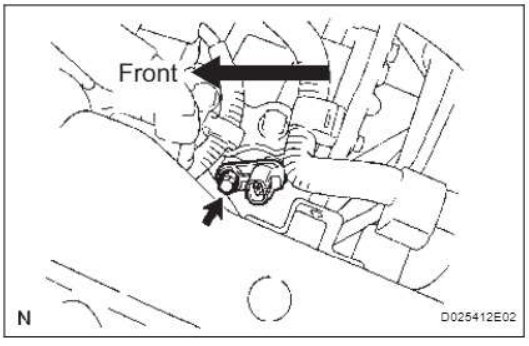



AX

# INSTALLATION




1. **INSTALL SPEED SENSOR (NC SENSOR)**
   (a) Coat a new O-ring with ATF and install it to the sensor.
   (b) Install the sensor with the bolt.
   **Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)**
   (c) Connect the sensor connector.




2. **INSTALL SPEED SENSOR (NT SENSOR)**
   (a) Coat a new O-ring with ATF and install it to the sensor.
   (b) Install the sensor with the bolt.
   **Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)**
   (c) Connect the sensor connector.
3. **INSTALL AIR CLEANER ASSEMBLY**
   **Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)**
4. **INSTALL BATTERY CARRIER (See page EM-107)**
5. **INSTALL BATTERY (See page AX-160)**

**6. PERFORM INITIALIZATION**

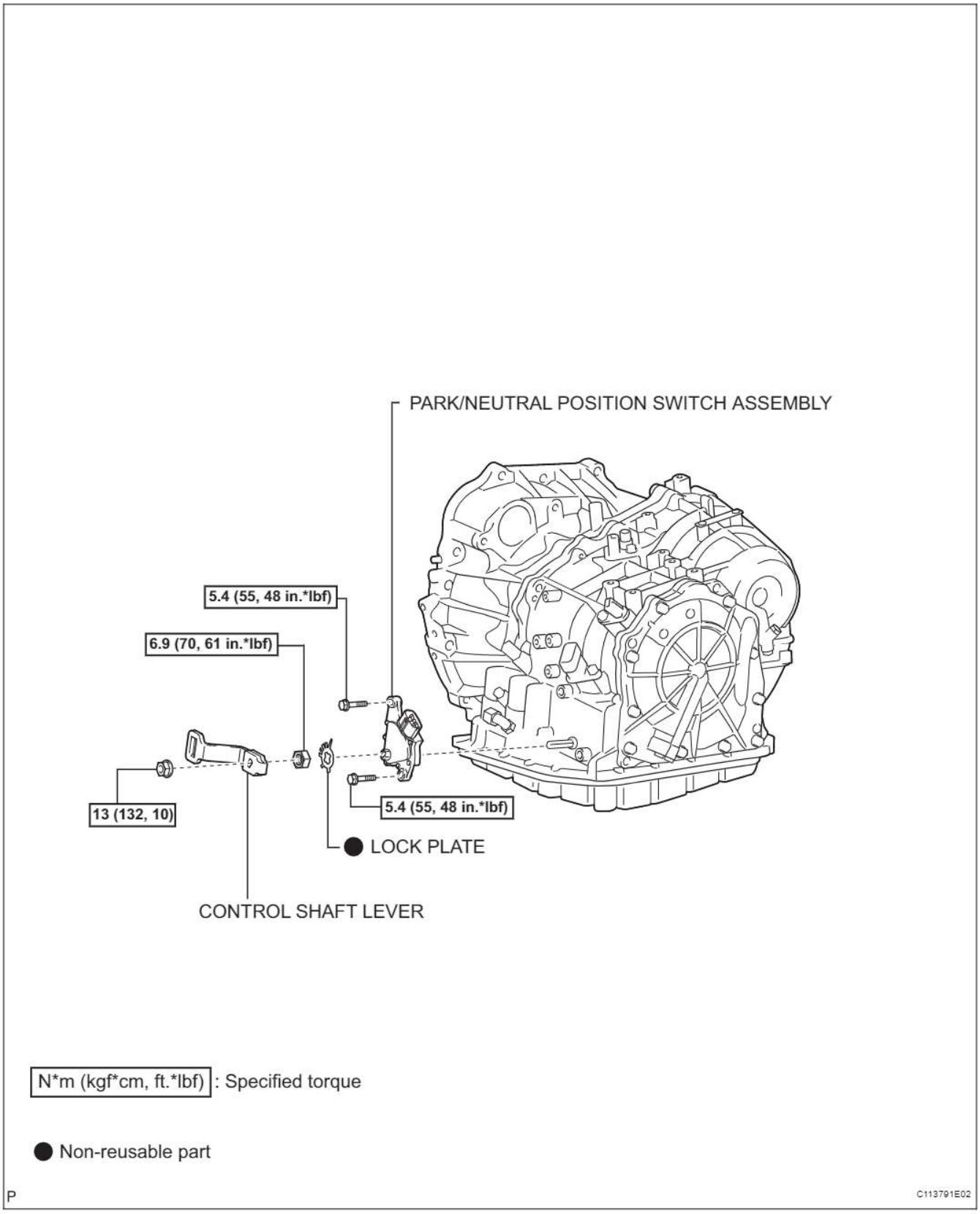
(a) Perform initialization (see page IN-23).

**NOTICE:**

**Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.**

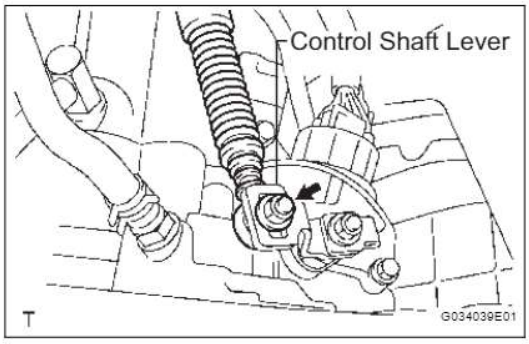
# PARK / NEUTRAL POSITION SWITCH

## COMPONENTS

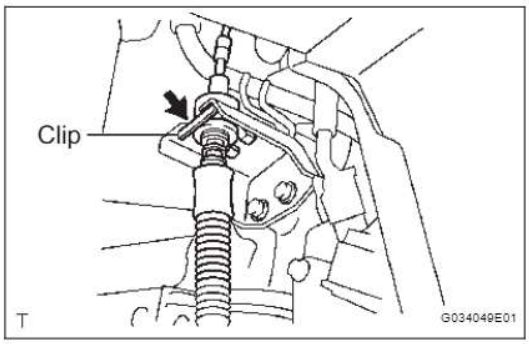


# REMOVAL

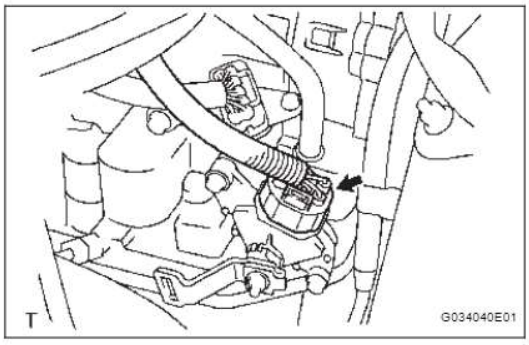
1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
   **CAUTION:**
   **Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.**
2. **REMOVE ENGINE UNDER COVER LH**
3. **DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**
   (a) Remove the nut from the control shaft lever.
   (b) Disconnect the control cable from the control shaft lever.



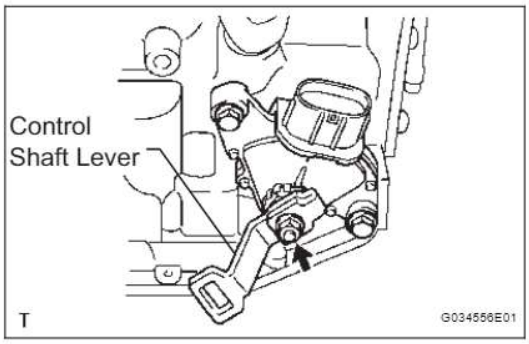

   (c) Remove the clip and disconnect the control cable from the control cable bracket.



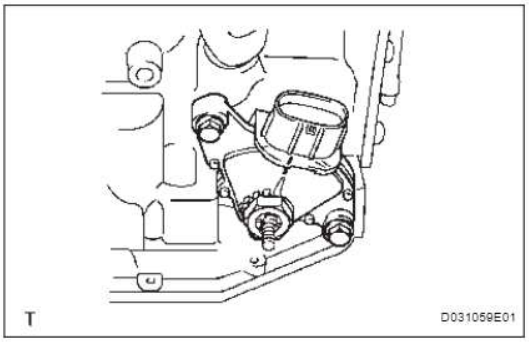

4. **REMOVE PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
   (a) Disconnect the switch connector.



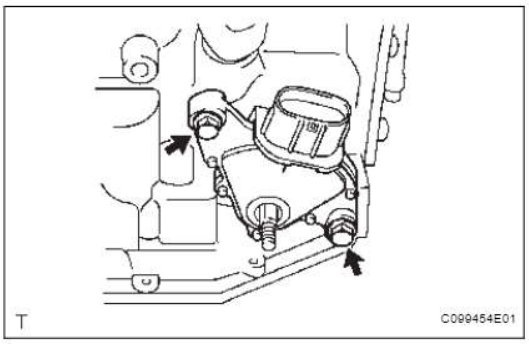

   (b) Remove the nut, washer and control shaft lever.



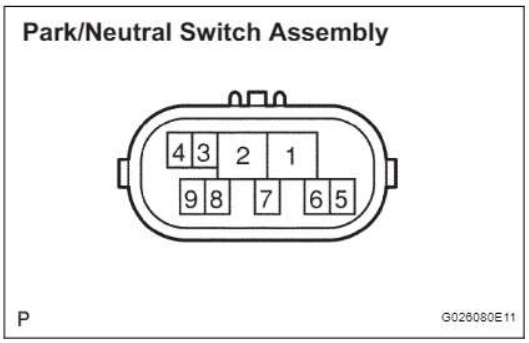

AX




(c) Pry up the lock plate and remove the nut and lock plate.




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




# INSPECTION

**1. INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY**

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

**Standard resistance**

| Tester Connection | Condition | Specified Condition |
|---|---|---|
| 1 - 2 | Shift position R | Below 1 Ω |
| 1 - 2 | Any shift position except R | 10 kΩ or higher |

AX

# ADJUSTMENT

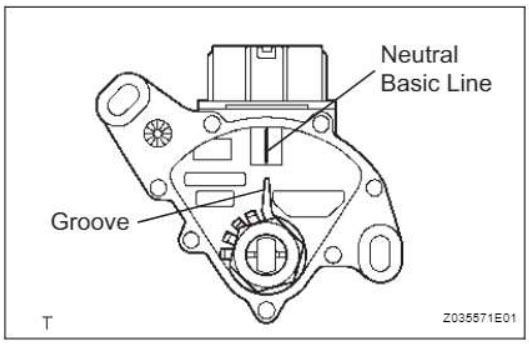
**1. INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY**

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

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

(c) Check that the back-up light comes on and the reverse warning buzzer sounds when the shift lever is set in the R position, but do not function in other positions.

If a failure is found, check the switch for continuity.




**2. ADJUST PARK/NEUTRAL POSITION SWITCH ASSEMBLY**

(a) Loosen the 2 bolts of the switch and move the shift lever to the N position.

(b) Align the groove and neutral basic line.

(c) Hold the switch in position and tighten the 2 bolts.
**Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)**

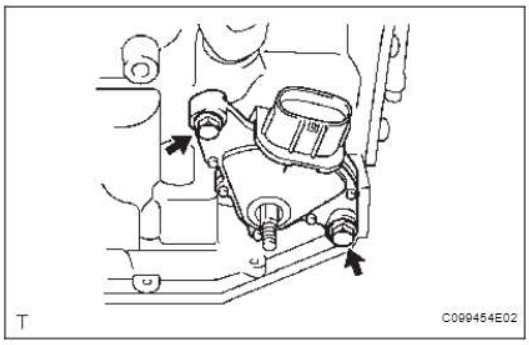
(d) After adjustment, perform the inspection described in the switch procedures.

# INSTALLATION

**1. INSTALL PARK/NEUTRAL POSITION SWITCH ASSEMBLY**

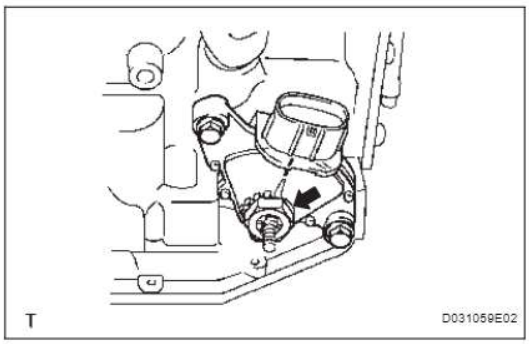
(a) Install the switch to the manual valve shaft.

(b) Temporarily install the 2 bolts.

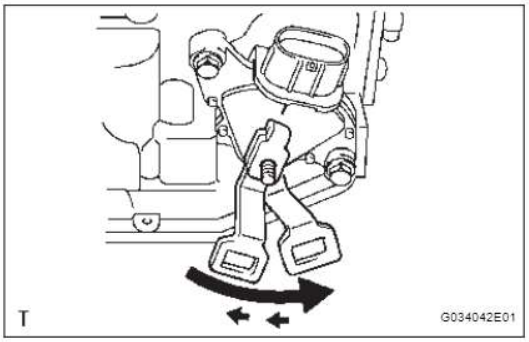



(c) Place a new lock plate and tighten the nut.
**Torque: 6.9 N*m (70 kgf*cm, 61 in.*lbf)**

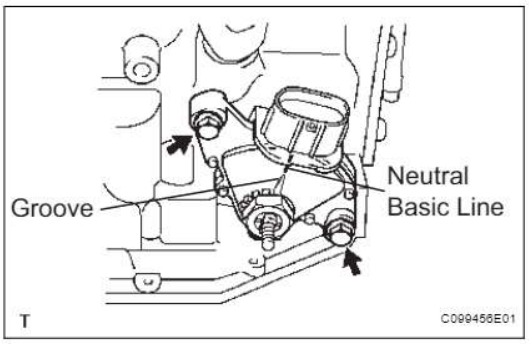
(d) Temporarily install the control shaft lever.



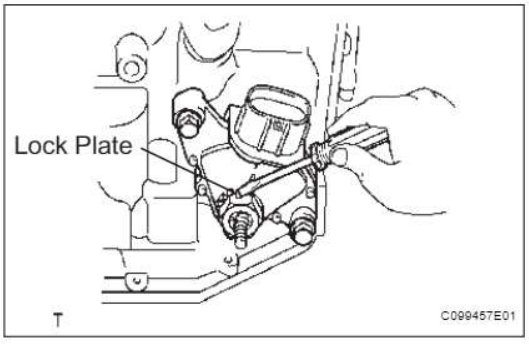

AX




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

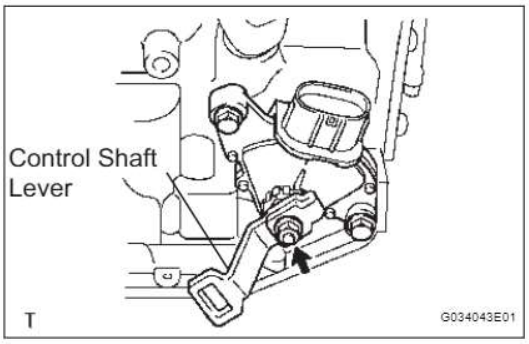



(g) Align the groove with the neutral basic line.
(h) Hold the switch in position and tighten the 2 bolts.
**Torque: 5.4 N*m (55 kgf*cm, 48 in.*lbf)**

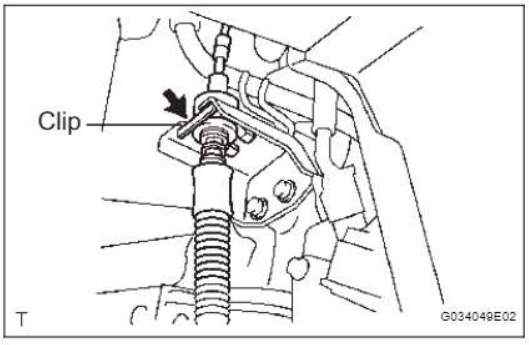



(i) Using a screwdriver, stake the nut with the lock plate.

AX

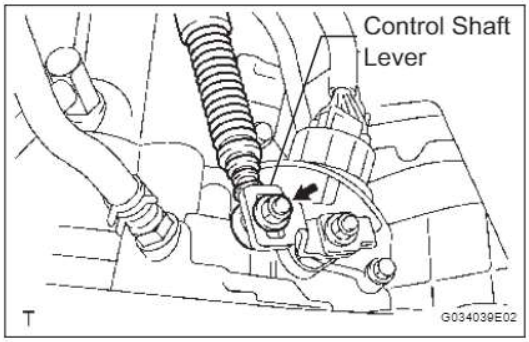



(j) Install the control shaft lever, with the washer and nut.
**Torque: 13 N*m (132 kgf*cm, 10 ft.*lbf)**
(k) Connect the switch connector.




**2. INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY**

(a) Install the control cable and clip to the control cable bracket with the clip.




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

3. **INSTALL ENGINE UNDER COVER LH**

4. **ADJUST SHIFT LEVER POSITION**
   (a) Adjust the shift lever position (see page AX-133).

5. **INSPECT SHIFT LEVER POSITION**
   (a) Inspect the shift lever position (see page AX-133).

6. **INSPECT PARK/NEUTRAL POSITION SWITCH ASSEMBLY**
   (a) Inspect the park/neutral position (see page AX-110).

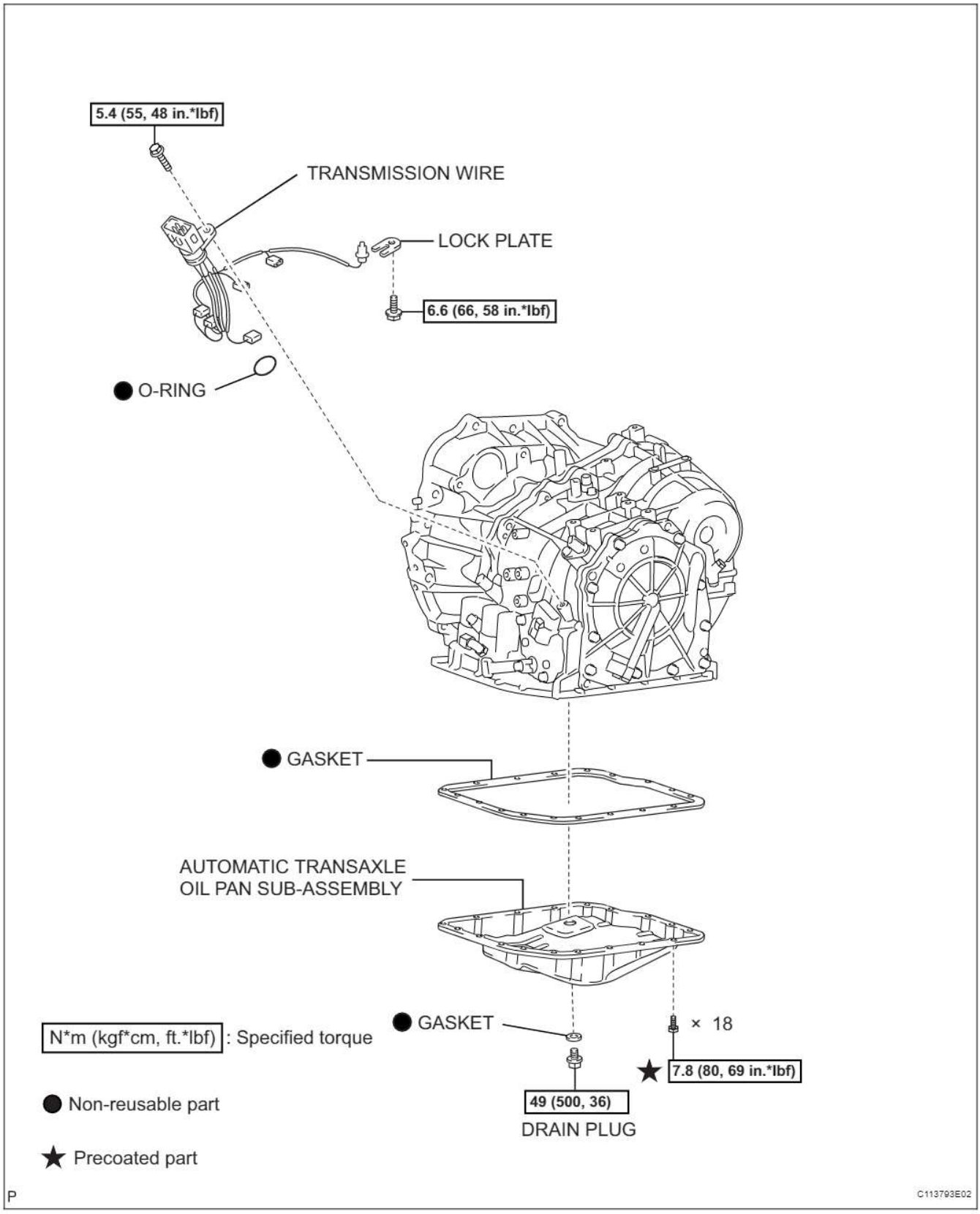
7. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

8. **PERFORM INITIALIZATION**
   (a) Perform initialization (see page IN-23).
   **NOTICE:**
   **Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.**

AX

# TRANSMISSION WIRE

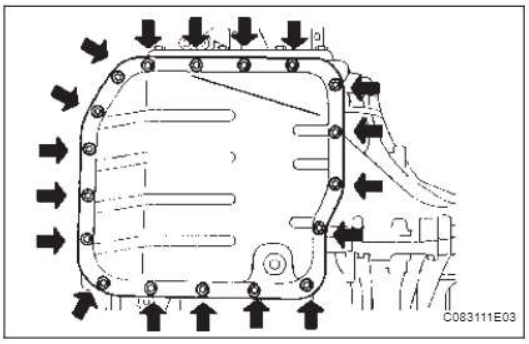
## COMPONENTS



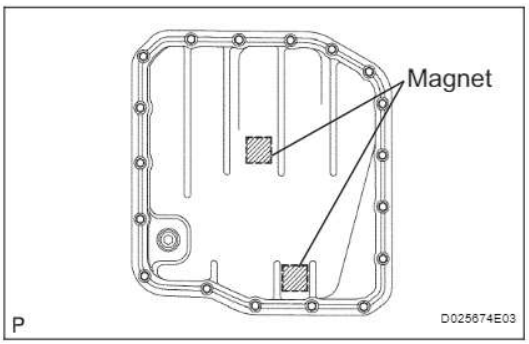

AX

# REMOVAL

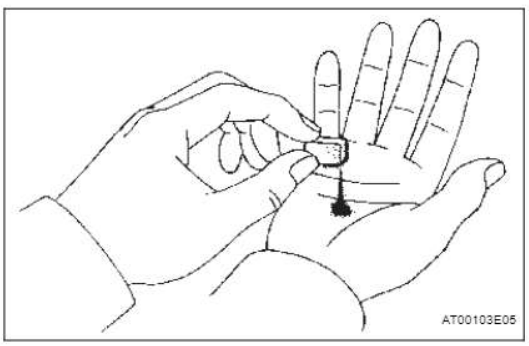
1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
   **CAUTION:**
   **Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.**
2. **REMOVE ENGINE UNDER COVER LH**
3. **DRAIN AUTOMATIC TRANSAXLE FLUID**
   (a) Remove the drain plug and gasket, and drain the ATF.
   (b) Install a new gasket and the drain plug.
   **Torque: 49 N*m (500 kgf*cm, 36 ft.*lbf)**
4. **REMOVE AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY**
   (a) Remove the 18 bolts, oil pan and gasket.
   **NOTICE:**
   **Some fluid will remain in the oil pan. Remove all of the oil pan bolts, and carefully remove the oil pan assembly. Discard the gasket.**



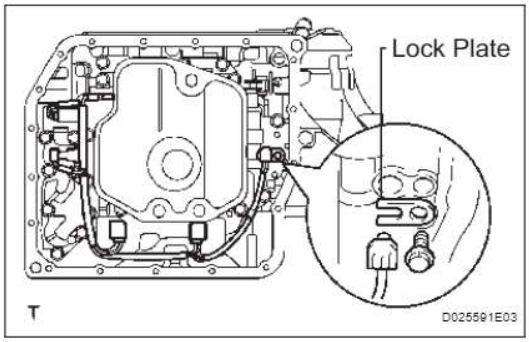

(b) Remove the 2 magnets from the oil pan.




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



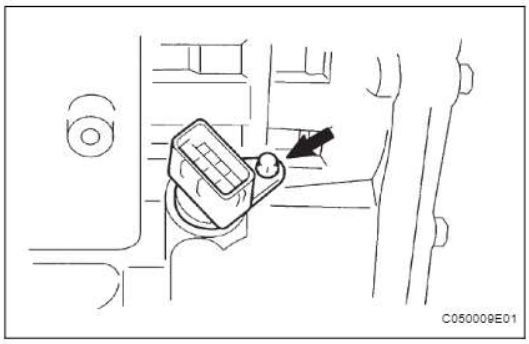

AX




**5. DISCONNECT TRANSMISSION WIRE**

(a) Disconnect the 5 solenoid valve connectors.

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

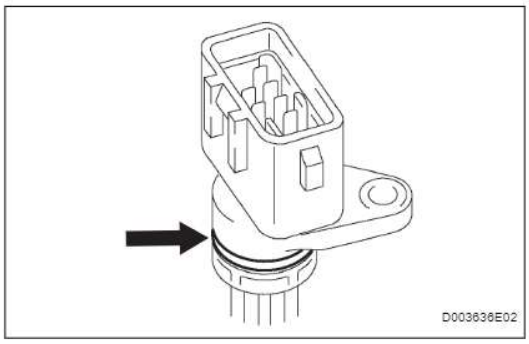



**6. REMOVE TRANSMISSION WIRE**

(a) Disconnect the transmission wire connector.

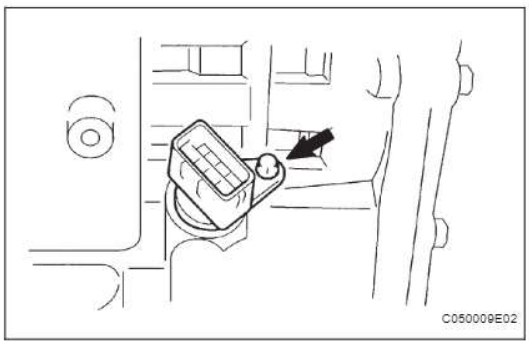
(b) Remove the bolt and transmission wire.

# INSTALLATION

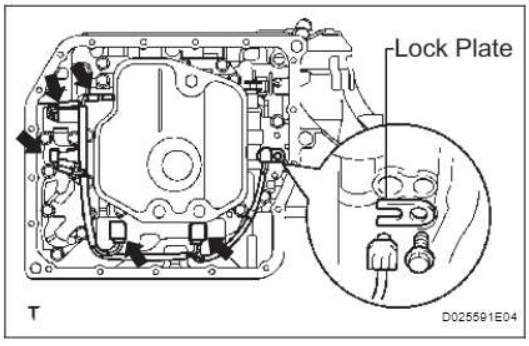



**1. INSTALL TRANSMISSION WIRE**

(a) Coat a new O-ring and install it to the wire.




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



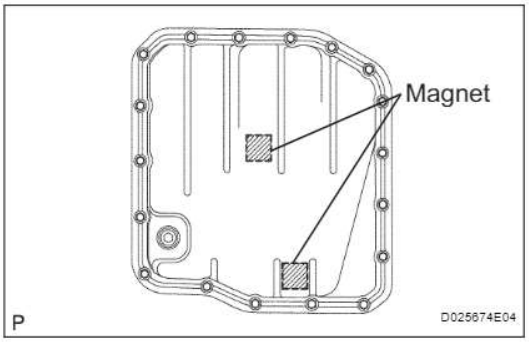

**2. CONNECT TRANSMISSION WIRE**

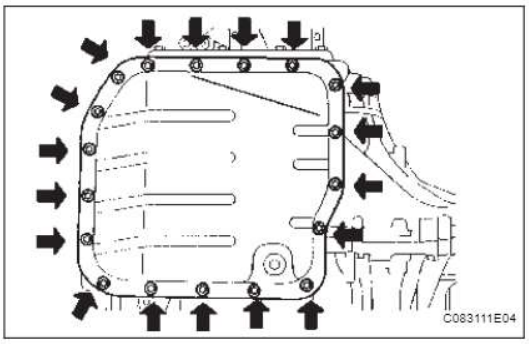
(a) Coat a new O-ring with ATF and install it to the ATF temperature sensor.

(b) Install the ATF temperature sensor with the lock plate and bolt.
**Torque: 6.6 N*m (67 kgf*cm, 58 in.*lbf)**

(c) Connect the 5 solenoid valve connectors.

AX



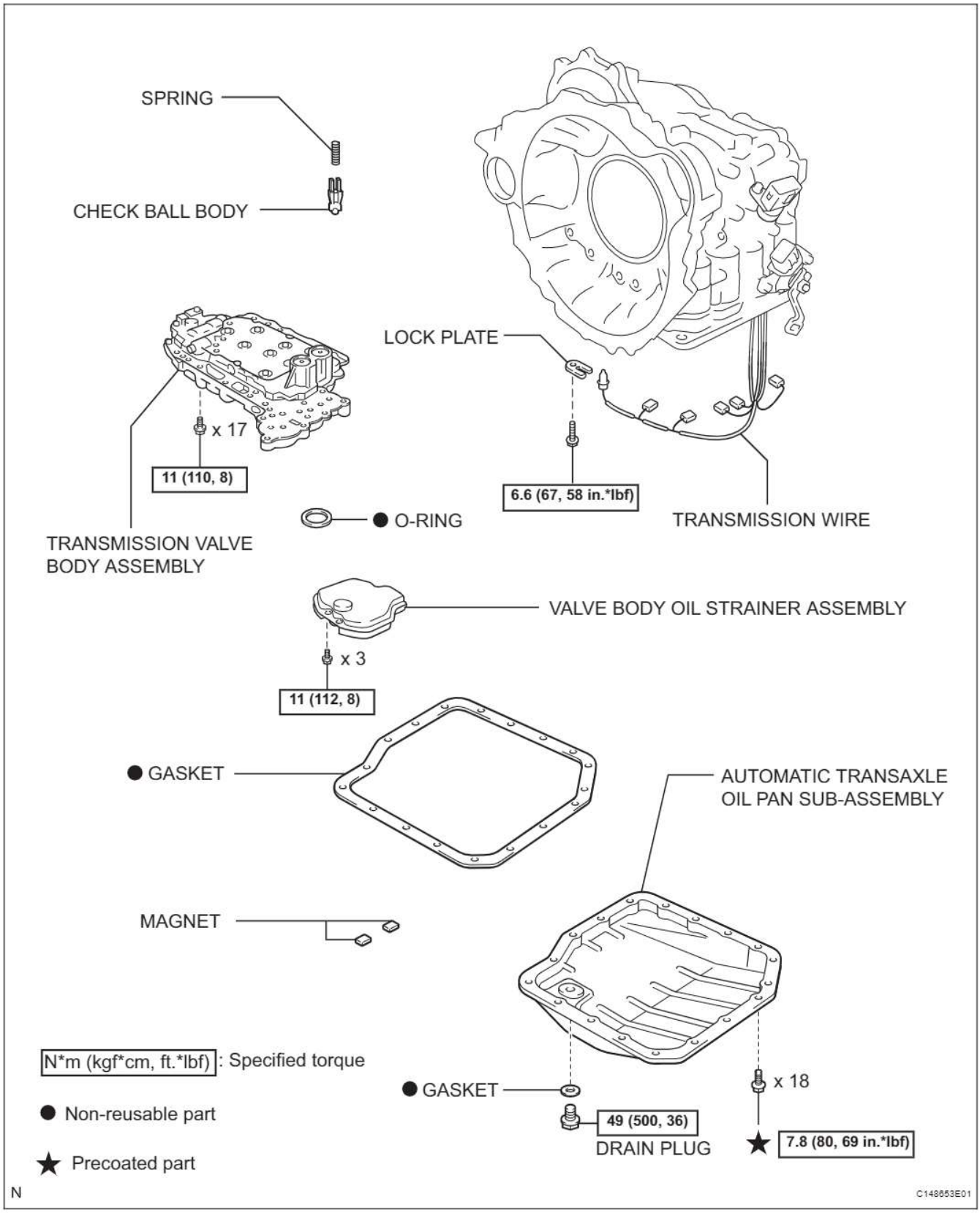



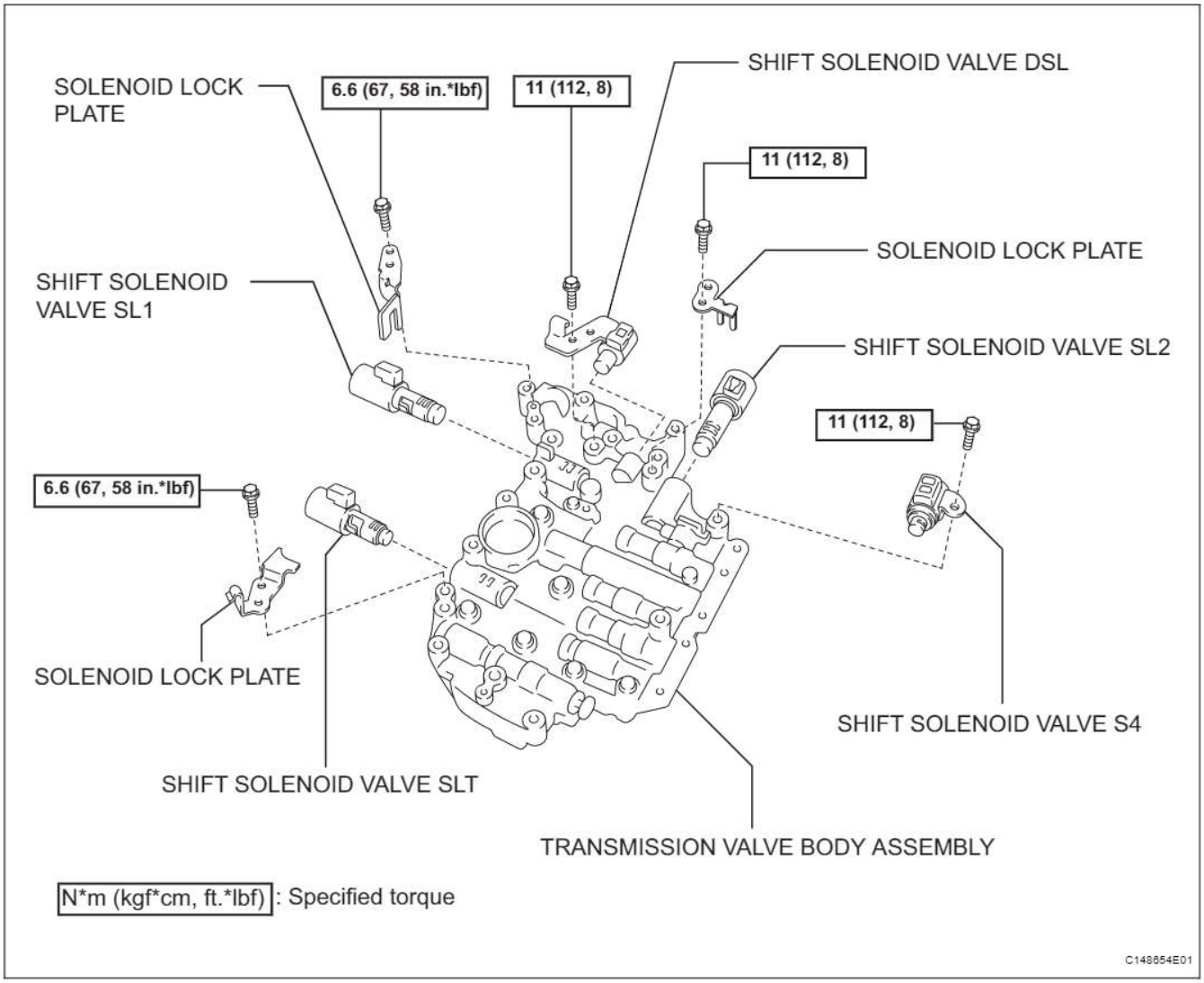

3. **INSTALL AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY**
   (a) Install the 2 magnets in the oil pan.
   (b) Apply seal packing or equivalent to the 18 bolts.
   **Seal packing:**
   **Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent**
   **NOTICE:**
   **Apply seal packing or equivalent to the bolts and tighten them within 10 minutes after application because the bolts should be seal bolts.**
   (c) Install a new gasket and the oil pan to the transaxle case with the 18 bolts.
   **Torque: 7.8 N*m (80 kgf*cm, 69 in.*lbf)**
4. **INSTALL ENGINE UNDER COVER LH**
5. **ADD AUTOMATIC TRANSAXLE FLUID**
   **Fluid type:**
   **Toyota Genuine ATF WS**
   **Standard capacity:**
   **3.5 liters (3.7 US qts, 3.1 Imp. qts)**
6. **INSPECT AUTOMATIC TRANSAXLE FLUID**
   (a) Inspect the fluid (see page AX-104).
7. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
8. **PERFORM INITIALIZATION**
   (a) Perform initialization (see page IN-23).
   **NOTICE:**
   **Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.**
9. **RESET MEMORY**

AX

# VALVE BODY ASSEMBLY

## COMPONENTS




SOLENOID LOCK PLATE
6.6 (67, 58 in.*lbf)
11 (112, 8)
SHIFT SOLENOID VALVE DSL
11 (112, 8)
SOLENOID LOCK PLATE
SHIFT SOLENOID VALVE SL1
SHIFT SOLENOID VALVE SL2
11 (112, 8)
6.6 (67, 58 in.*lbf)
SOLENOID LOCK PLATE
SHIFT SOLENOID VALVE S4
SHIFT SOLENOID VALVE SLT
TRANSMISSION VALVE BODY ASSEMBLY
N*m (kgf*cm, ft.*lbf): Specified torque
C148654E01

AX

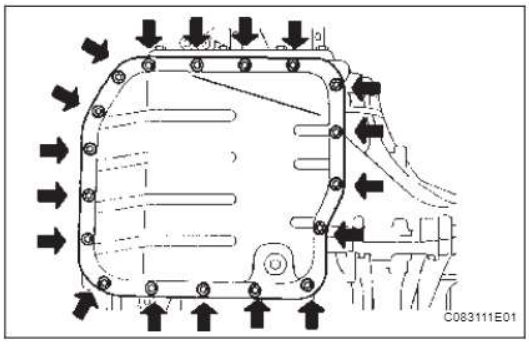
# REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
   **CAUTION:**
   **Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.**

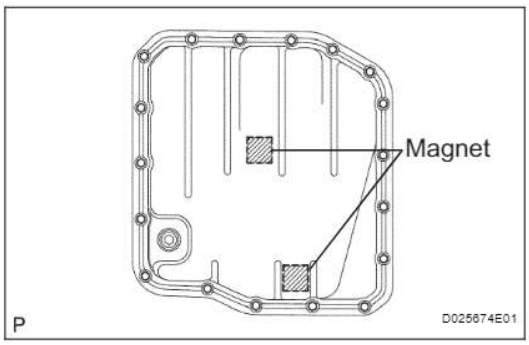
2. **REMOVE ENGINE UNDER COVER LH**

3. **DRAIN AUTOMATIC TRANSAXLE FLUID**
   (a) Remove the drain plug and gasket, and drain the ATF.
   (b) Install a new gasket and the drain plug.
   **Torque: 49 N*m (500 kgf*cm, 36 ft.*lbf)**

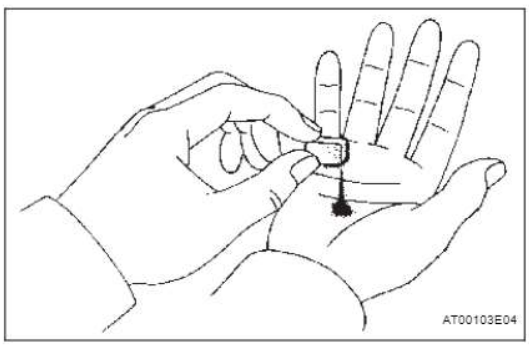
4. **REMOVE AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY**
   (a) Remove the 18 bolts, oil pan and gasket.
   **NOTICE:**
   **Some fluid will remain in the oil pan. Remove all of the oil pan bolts, and carefully remove the oil pan assembly. Discard the gasket.**



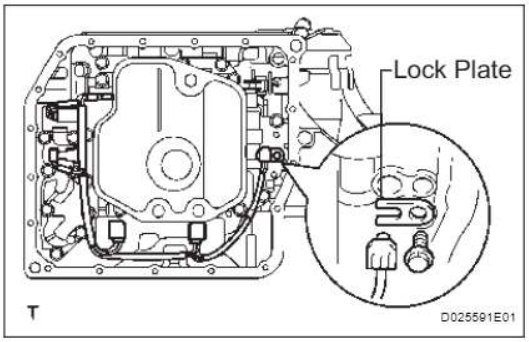

(b) Remove the 2 magnets from the oil pan.




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



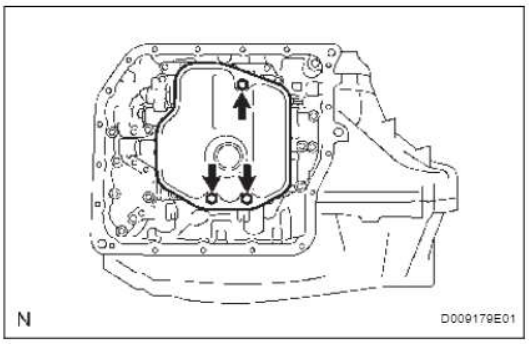

AX




**5. DISCONNECT TRANSMISSION WIRE**

(a) Disconnect the 5 solenoid valve connectors.

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

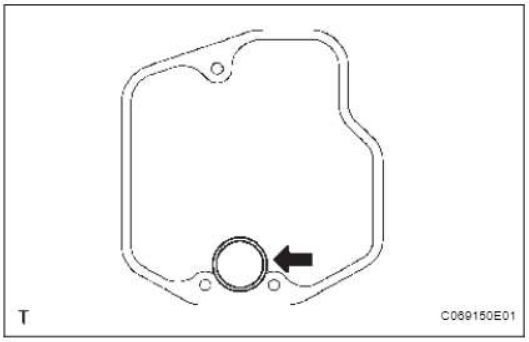



**6. REMOVE VALVE BODY OIL STRAINER ASSEMBLY**

(a) Remove the 3 bolts and oil strainer.

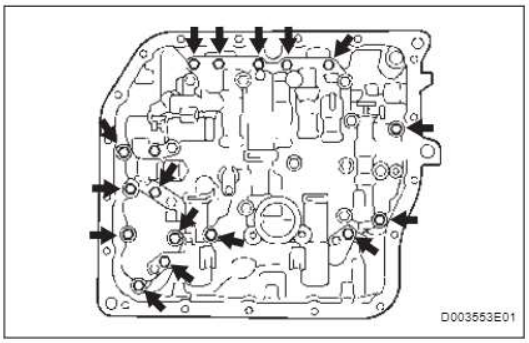
**NOTICE:**

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




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



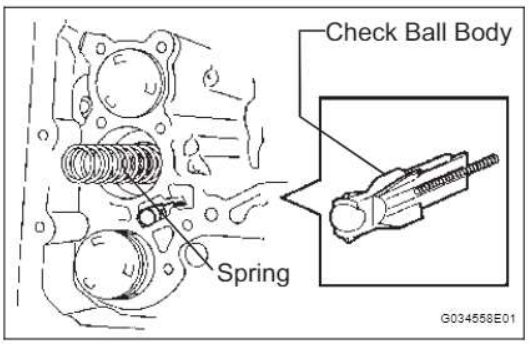



**7. REMOVE TRANSMISSION VALVE BODY ASSEMBLY**

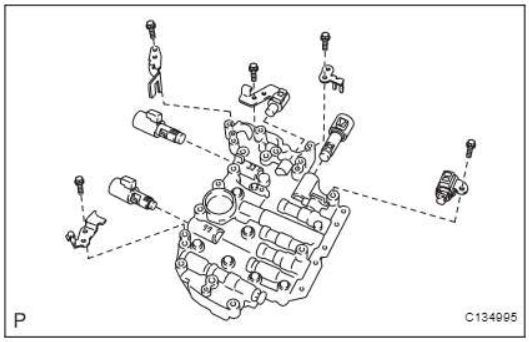
(a) Support the valve body, and remove the 17 bolts and valve body.

**NOTICE:**

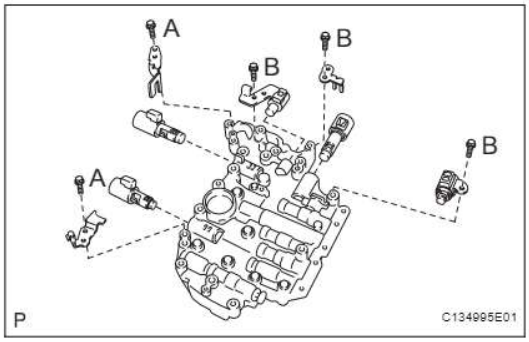
**Be careful not to drop the check ball body and spring.**




(b) Remove the check ball body and spring.




(c) Remove the 5 bolts, 3 plates and 5 shift solenoid valves.



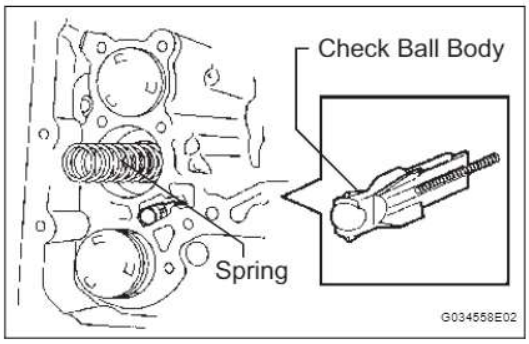

# INSTALLATION

## 1. INSTALL TRANSMISSION VALVE BODY ASSEMBLY

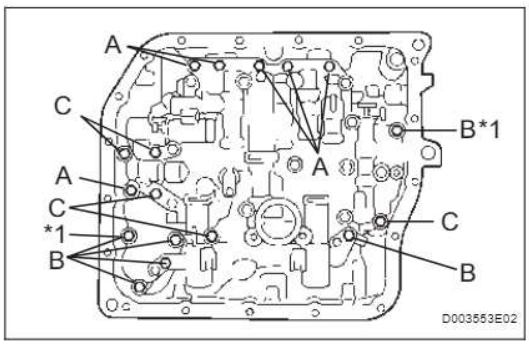
(a) Install the 5 shift solenoid valves with the 5 bolts and 3 plates.

**Torque: 6.6 N*m (67 kgf*cm, 58 in.*lbf) for bolt A**
**11 N*m (112 kgf*cm, 8 ft.*lbf) for bolt B**

**Bolt length:**
**12 mm (0.47 in.) for bolt A**
**45 mm (1.77 in.) for bolt B**




(b) Install the spring and check ball body.




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

(d) Install the valve body with the 17 bolts.

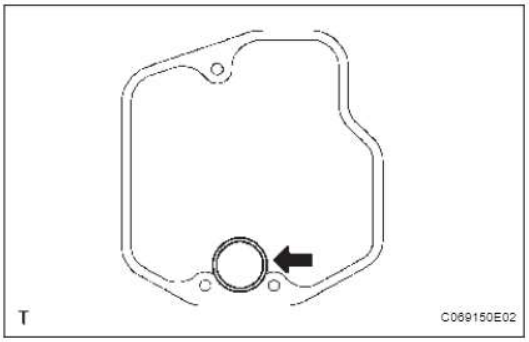
**Torque: 11 N*m (110 kgf*cm, 8 ft.*lbf)**

**NOTICE:**

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

**for bolt length:**
**25 mm (0.984 in.) for bolt A**
**41 mm (1.614 in.) for bolt B**
**45 mm (1.771 in.) for bolt C**

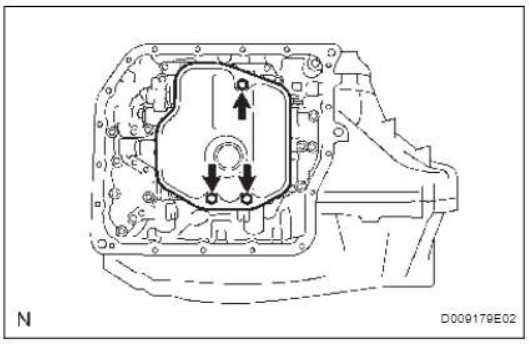
AX



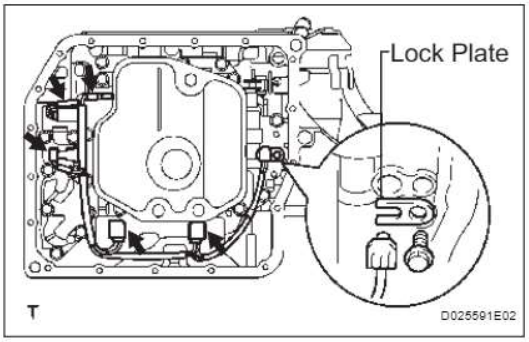

**2. INSTALL VALVE BODY OIL STRAINER ASSEMBLY**

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

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




(c) Install the oil strainer with the 3 bolts.
**Torque: 11 N*m (112 kgf*cm, 8 ft.*lbf)**

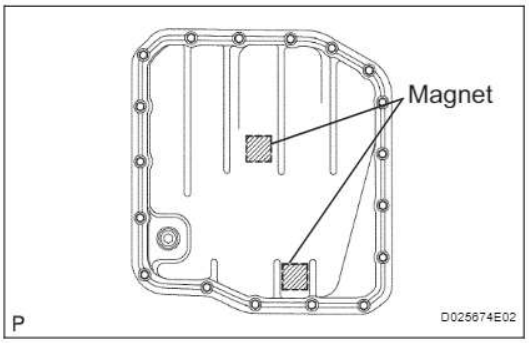



**3. INSTALL TRANSMISSION WIRE**

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

(b) Install the ATF temperature sensor with the lock plate and bolt.
**Torque: 6.6 N*m (67 kgf*cm, 58 in.*lbf)**

(c) Connect the 5 solenoid valve connectors.

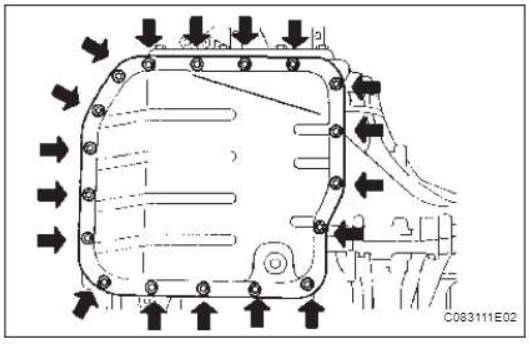



**4. INSTALL AUTOMATIC TRANSAXLE OIL PAN SUB-ASSEMBLY**

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

(b) Apply seal packing or equivalent to the 18 bolts.
**Seal packing:**
**Toyota Genuine Adhesive 1344, Three Bond 1344 or equivalent**
**NOTICE:**
**Apply seal packing or equivalent to the bolts and tighten them within 10 minutes after application because the bolts should be seal bolts.**

AX




(c) Install a new gasket and the oil pan to the transaxle case with the 18 bolts.
**Torque: 7.8 N*m (80 kgf*cm, 69 in.*lbf)**

5. **INSTALL ENGINE UNDER COVER LH**

6. **ADD AUTOMATIC TRANSAXLE FLUID**
**Fluid type:**
**Toyota Genuine ATF WS**
**Standard capacity:**
**3.5 liters (3.7 US qts, 3.1 lmp. qts)**

7. **INSPECT AUTOMATIC TRANSAXLE FLUID**
(a) Inspect the fluid (see page AX-104).

8. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

9. **PERFORM INITIALIZATION**
(a) Perform initialization (see page IN-23).
**NOTICE:**
**Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.**

10. **RESET MEMORY**

AX

# SHIFT LOCK SYSTEM

## ON-VEHICLE INSPECTION

### 1. CHECK SHIFT LOCK OPERATION

(a) Move the shift lever to the P position.
(b) Turn the ignition switch to the LOCK position.
(c) Check that the shift lever cannot be moved to any position other than P.
(d) Turn the ignition switch to the ON position, depress the brake pedal and check that the shift lever can be moved to another position.
If the operation cannot be done as specified, inspect the shift lock control unit.

### 2. CHECK SHIFT LOCK RELEASE BUTTON OPERATION

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

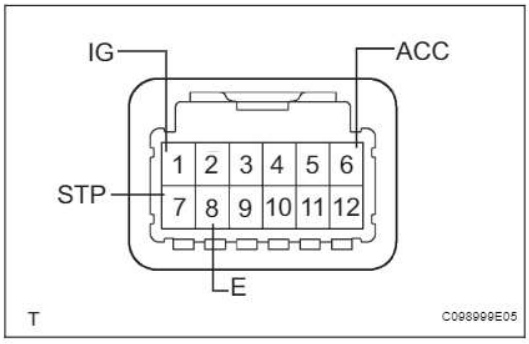
### 3. CHECK KEY INTER LOCK OPERATION

(a) Turn the ignition switch to the ON position.
(b) Depress the brake pedal and move the shift lever to any position other than P.
(c) Check that the ignition key cannot be turned to the LOCK position.
(d) Move the shift lever to the P position, turn the ignition key to the LOCK position and check that the ignition key can be removed.
If the operation cannot be done as specified, inspect the shift lock control unit.

AX

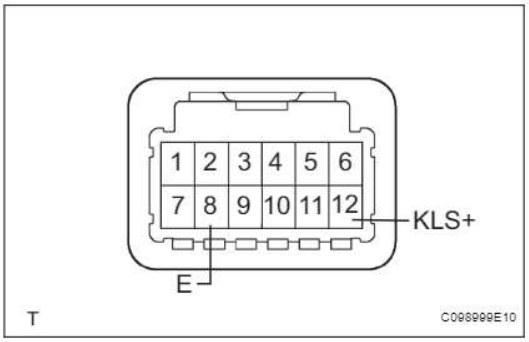
### 4. INSPECT SHIFT LOCK CONTROL ECU ASSEMBLY

(a) Disconnect the S6 ECU connector.
(b) Measure the voltage of the connector.




**Standard voltage**

| Tester Connection | Measuring Condition | Specified Condition |
|---|---|---|
| 6 (ACC) - 8 (E) | Ignition switch ACC | 10 to 14 V |
| 6 (ACC) - 8 (E) | Ignition switch OFF | Below 1 V |
| 7 (STP) - 8 (E) | Depress brake pedal | 10 to 14 V |
| 7 (STP) - 8 (E) | Release brake pedal | Below 1 V |
| 1 (IG) - 8 (E) | Ignition switch ON | 10 to 14 V |
| 1 (IG) - 8 (E) | Ignition switch OFF | Below 1 V |




(c) Reconnect the S6 ECU connector.
(d) Using a voltmeter, measure the voltage between terminals 12 (KLS+) and 8 (E).

**Standard Voltage**

| Tester Connection | Measuring Condition | Specified Condition |
|---|---|---|
| 12 (KLS+) - 8 (E) | Ignition switch ACC and shift lever P position | Below 1 V |
| 12 (KLS+) - 8 (E) | Ignition switch ACC and shift lever not in P position | 7.5 to 11 V |
| 12 (KLS+) - 8 (E) | Ignition switch ACC and shift lever not in P position (After approx. 1 second) | 6 to 9 V |

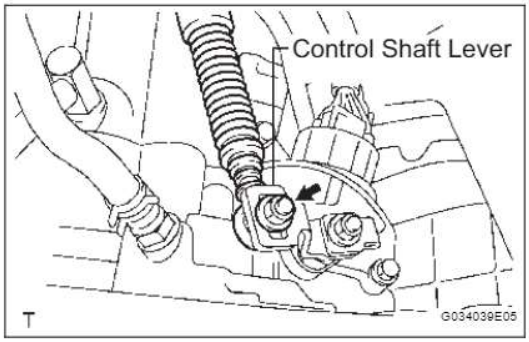
If the result is not as specified, replace the shift lock control ECU.

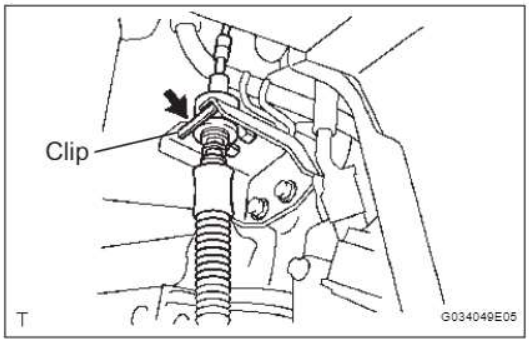
AX

# TRANSMISSION CONTROL CABLE ASSEMBLY

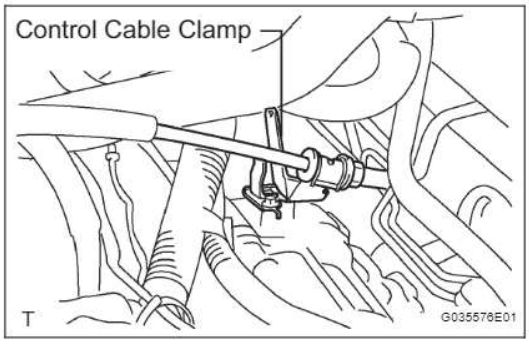
## REMOVAL

1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
   **CAUTION:**
   **Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.**
2. **REMOVE AIR CONDITIONING RADIATOR ASSEMBLY (See page AC-25)**
3. **REMOVE EXHAUST PIPE ASSEMBLY**
   (a) Remove the exhaust pipe (see page EX-2).
4. **REMOVE ENGINE UNDER COVER LH**
5. **DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**
   (a) Remove the nut from the control shaft lever.
   (b) Disconnect the cable from the control shaft lever.



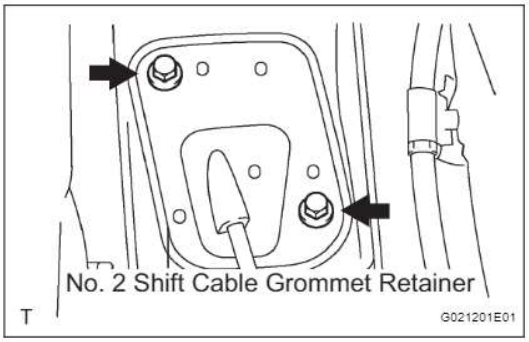




(c) Remove the clip and disconnect the cable from the control cable bracket.



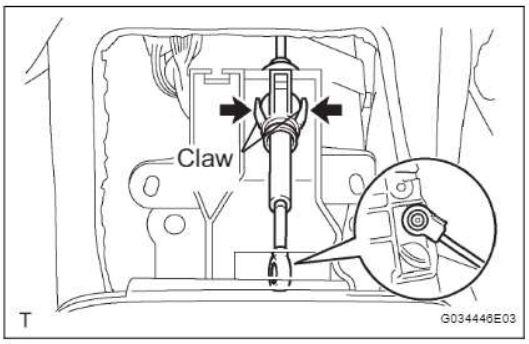

(d) Disconnect the cable from the control cable clamp.

AX



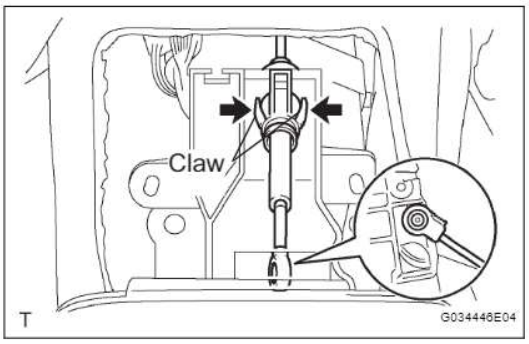

**6. REMOVE TRANSMISSION CONTROL CABLE ASSEMBLY**

(a) Remove the 2 bolts and disconnect the No. 2 shift cable grommet retainer.



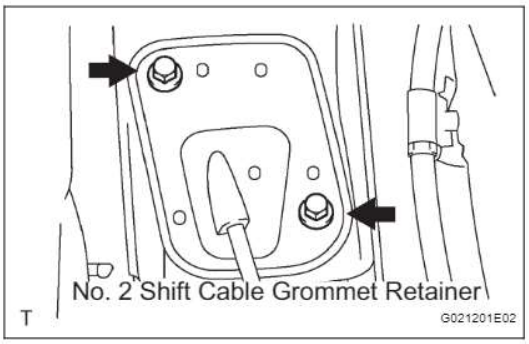

(b) Disconnect the floor shift cable from the transmission floor shift assembly.
(c) Pull out the cable from the body.
(d) Remove the No. 2 shift cable grommet retainer.

# INSTALLATION

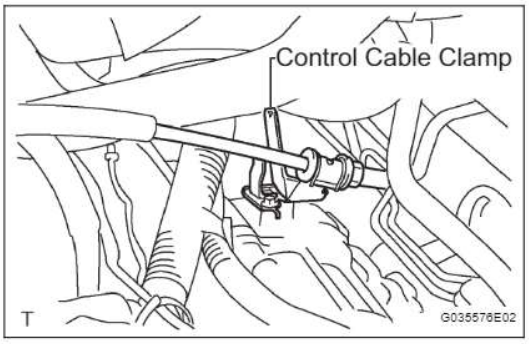



**1. INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY**

(a) Put the cable into the body.
(b) Install the No. 2 shift cable grommet retainer to the floor shift cable.
(c) Install the floor shift cable as shown in the illustration.
HINT:
Securely engage the claws.

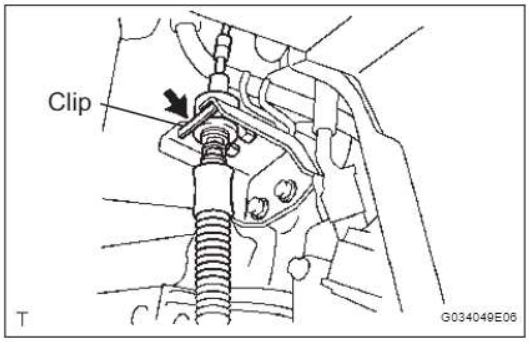


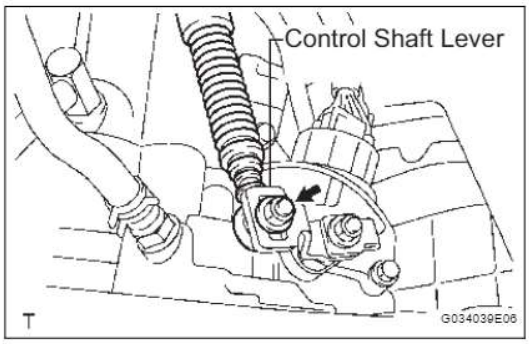

(d) Install the No. 2 shift cable grommet retainer with the 2 bolts.
**Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)**




**2. CONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**

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




(b) Connect the cable to the bracket with the clip.

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

3. **INSTALL AIR CONDITIONING RADIATOR ASSEMBLY (See page AC-32)**

4. **INSTALL EXHAUST PIPE ASSEMBLY**
   (a) Install exhaust pipe (see page EX-3).

5. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**

6. **PERFORM INITIALIZATION**
   (a) Perform initialization (see page IN-23).
   **NOTICE:**
   **Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.**

7. **INSPECT SHIFT LEVER POSITION (See page AX-133)**

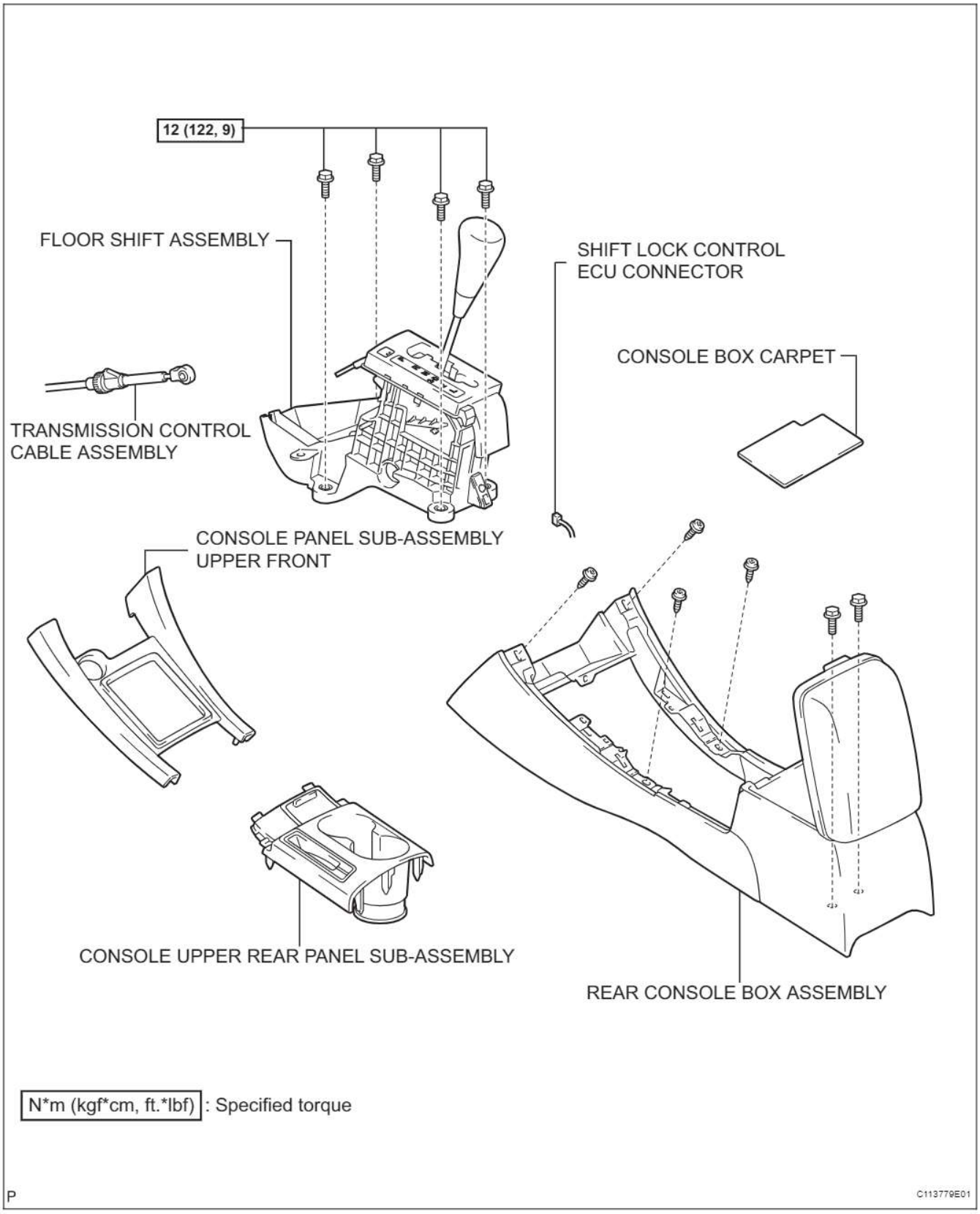
8. **ADJUST SHIFT LEVER POSITION (See page AX-134)**

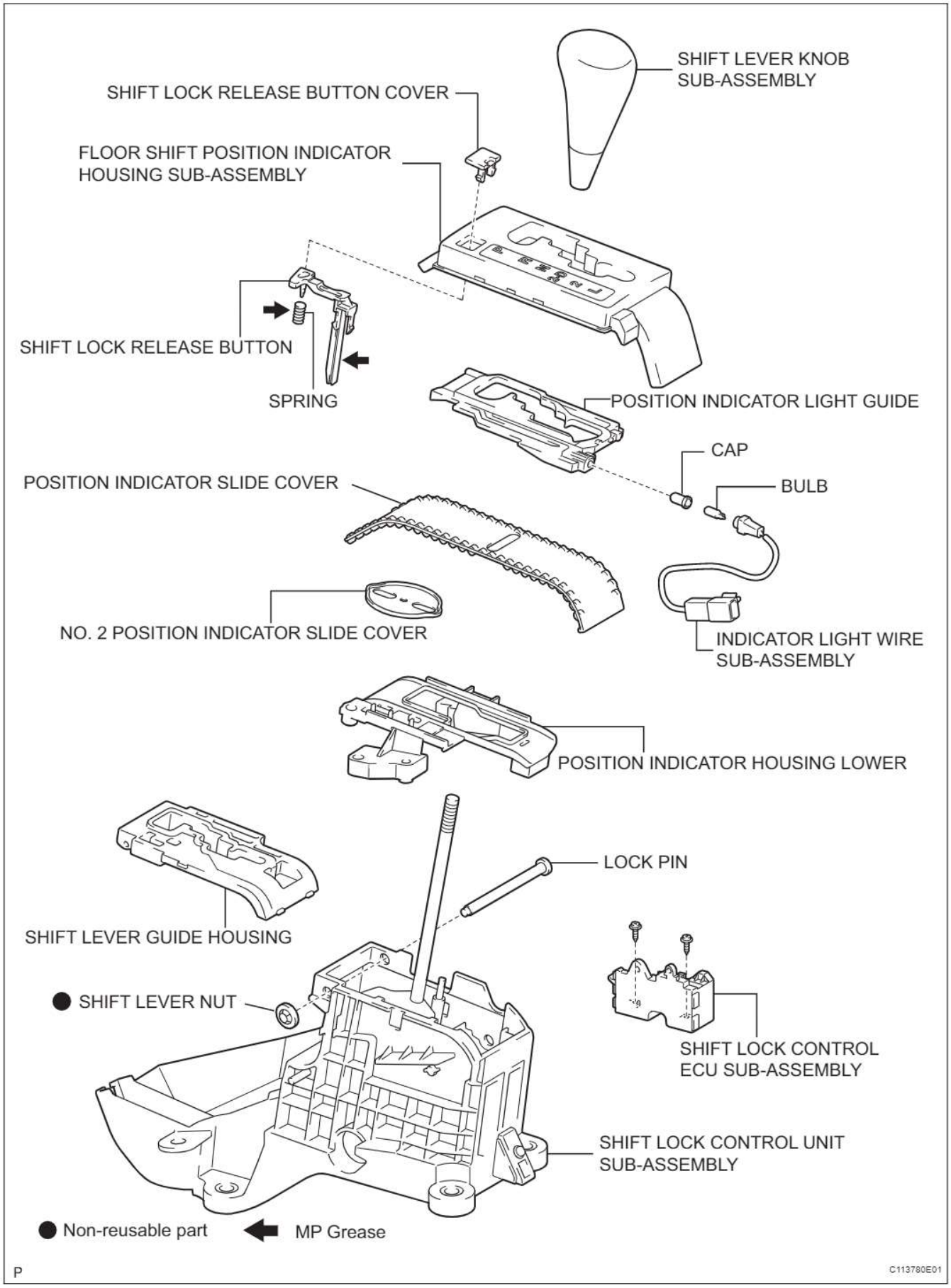
9. **INSTALL ENGINE UNDER COVER LH**

AX

# FLOOR SHIFT ASSEMBLY

## COMPONENTS

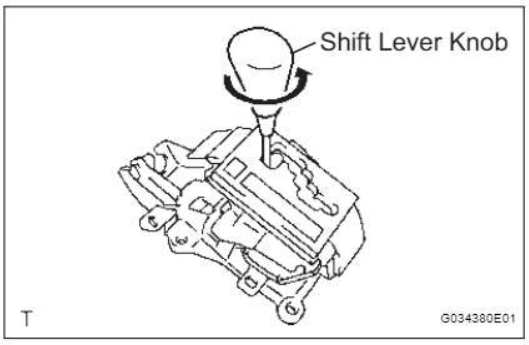



SHIFT LEVER KNOB SUB-ASSEMBLY
SHIFT LOCK RELEASE BUTTON COVER
FLOOR SHIFT POSITION INDICATOR HOUSING SUB-ASSEMBLY
SHIFT LOCK RELEASE BUTTON
SPRING
POSITION INDICATOR LIGHT GUIDE
CAP
BULB
POSITION INDICATOR SLIDE COVER
NO. 2 POSITION INDICATOR SLIDE COVER
INDICATOR LIGHT WIRE SUB-ASSEMBLY
POSITION INDICATOR HOUSING LOWER
LOCK PIN
SHIFT LEVER GUIDE HOUSING
SHIFT LEVER NUT
SHIFT LOCK CONTROL ECU SUB-ASSEMBLY
SHIFT LOCK CONTROL UNIT SUB-ASSEMBLY
Non-reusable part
MP Grease
P
C113780E01

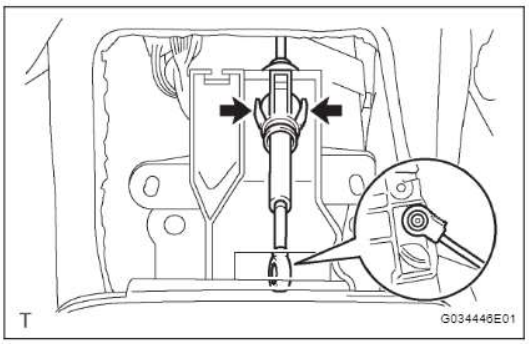
AX

# REMOVAL

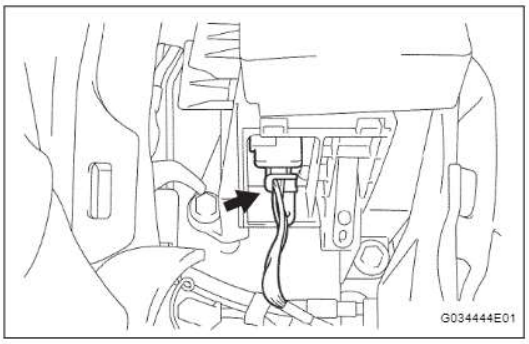
1. **DISCONNECT CABLE FROM NEGATIVE BATTERY TERMINAL**
   **CAUTION:**
   **Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.**
2. **REMOVE CONSOLE UPPER FRONT PANEL SUB-ASSEMBLY (See page IP-5)**
3. **REMOVE CONSOLE UPPER REAR PANEL SUB-ASSEMBLY (See page IP-18)**
4. **REMOVE REAR CONSOLE BOX ASSEMBLY (See page IP-18)**
5. **REMOVE SHIFT LEVER KNOB SUB-ASSEMBLY**
   (a) Remove the knob.

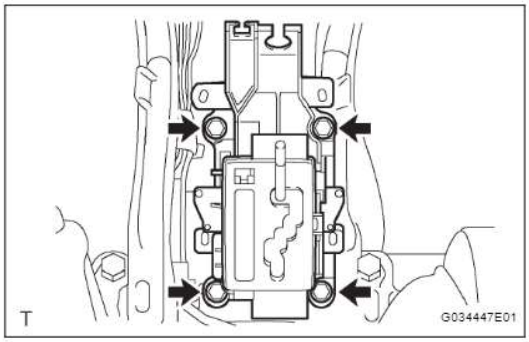



6. **DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**
   (a) Disconnect the cable from the floor shift.

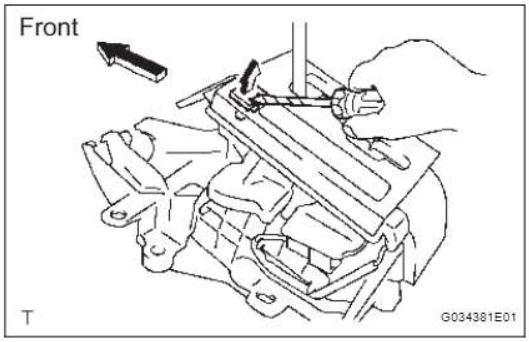



7. **REMOVE SHIFT LEVER ASSEMBLY**
   (a) Disconnect the shift lock control ECU connector.





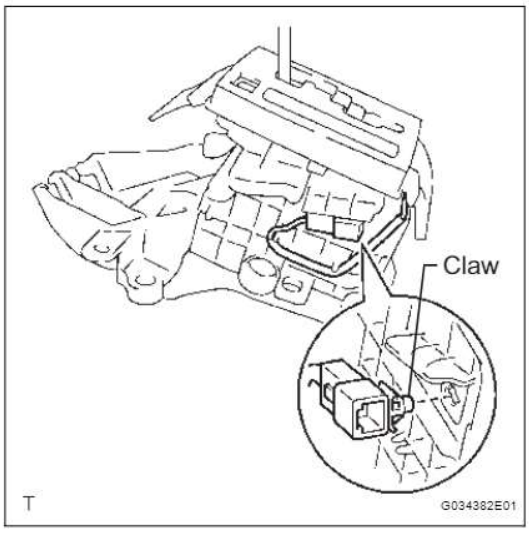

(b) Remove the 4 bolts and floor shift assembly.




## DISASSEMBLY

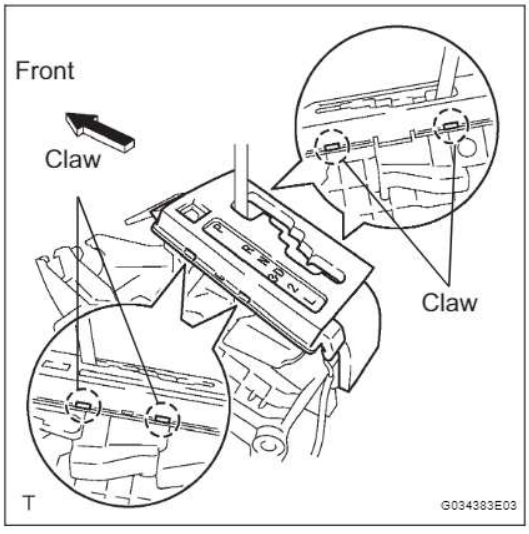
### 1. REMOVE SHIFT LOCK RELEASE BUTTON COVER

(a) Using a screwdriver, remove the cover from the position indicator housing.
HINT:
Tape the screwdriver tip before use.




### 2. DISCONNECT INDICATOR LIGHT WIRE SUB-ASSEMBLY

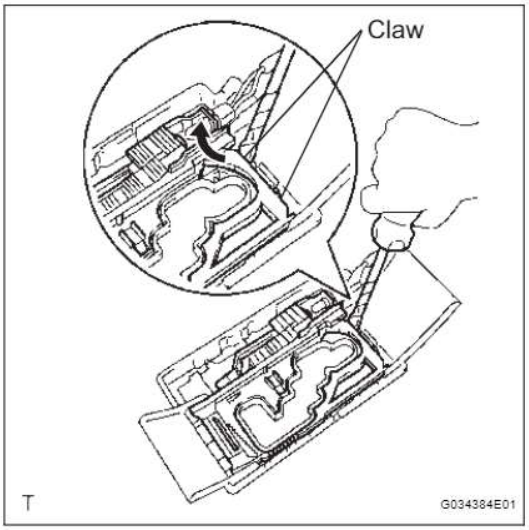
(a) Disconnect the wire connector from the floor shift.




### 3. REMOVE FLOOR SHIFT POSITION INDICATOR HOUSING SUB-ASSEMBLY

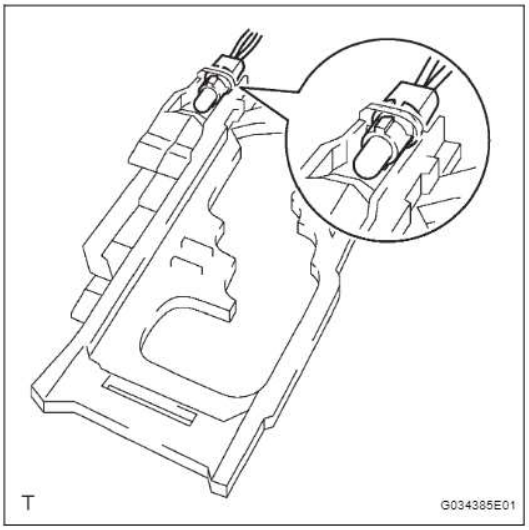
(a) Using a screwdriver, remove the housing from the shift lock control unit.
HINT:
Tape the screwdriver tip before use.

AX



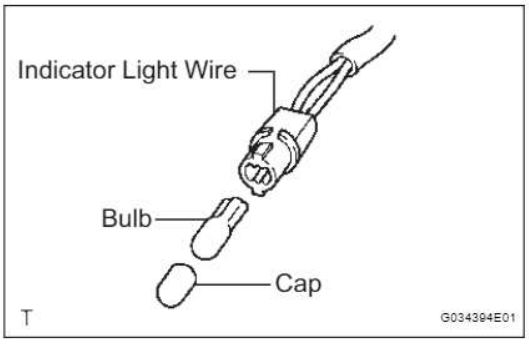

**4. REMOVE POSITION INDICATOR LIGHT GUIDE**

(a) Using a screwdriver, remove the guide from the floor shift position indicator housing sub-assembly.
HINT:
Tape the screwdriver tip before use.

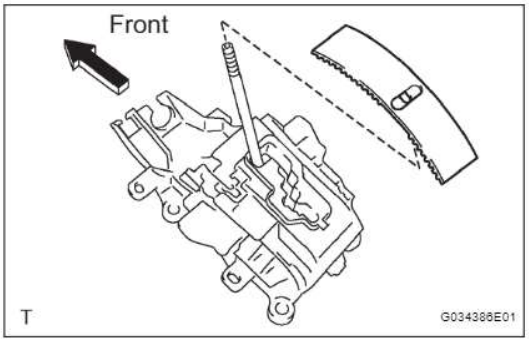



**5. REMOVE INDICATOR LIGHT WIRE SUB-ASSEMBLY**

(a) Remove the wire from the position indicator light guide.

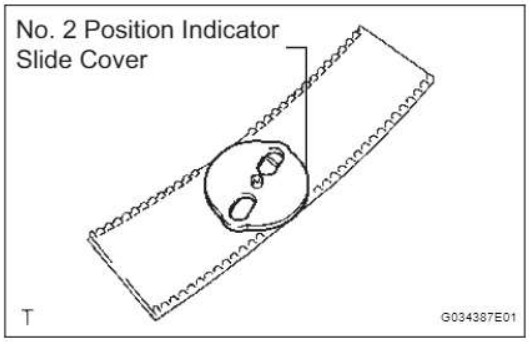



(b) Remove the bulb from the wire.
(c) Remove the cap from the bulb.



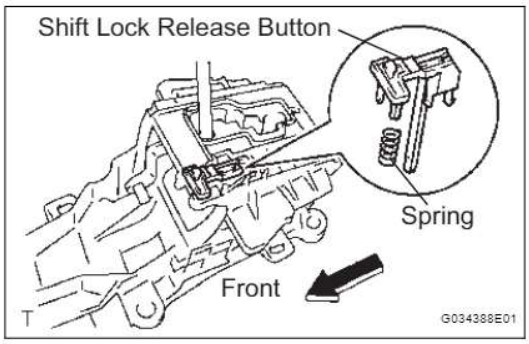

**6. REMOVE POSITION INDICATOR SLIDE COVER**

(a) Remove the cover from the shift lock control unit.



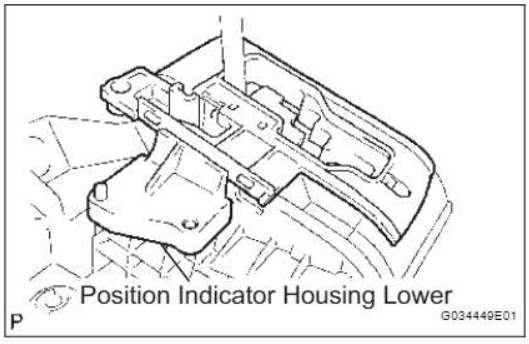

**7. REMOVE POSITION INDICATOR SLIDE COVER**

(a) Remove the cover from the position indicator slide cover.




**8. REMOVE SHIFT LOCK RELEASE BUTTON**

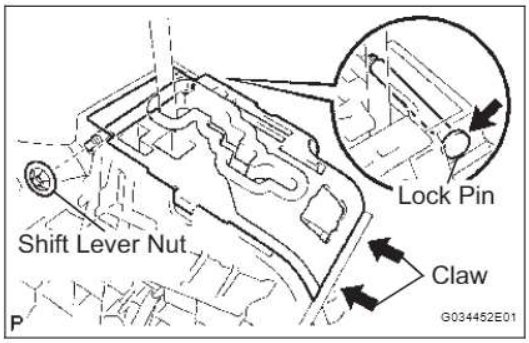
(a) Remove the button and spring from the shift lock control unit.




**9. REMOVE POSITION INDICATOR HOUSING LOWER**

(a) Remove the housing from the shift lock control unit.

AX

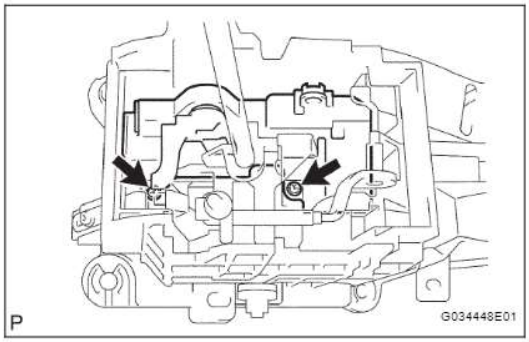



**10. REMOVE SHIFT LOCK CONTROL ECU SUB-ASSEMBLY**

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

(b) Remove the shift lever guide housing from the shift lock control unit.

**NOTICE:**
**First remove the shift lever nut and lock pin. Then disengage the 2 claws.**




(c) Remove the 2 screws and ECU.

# ADJUSTMENT

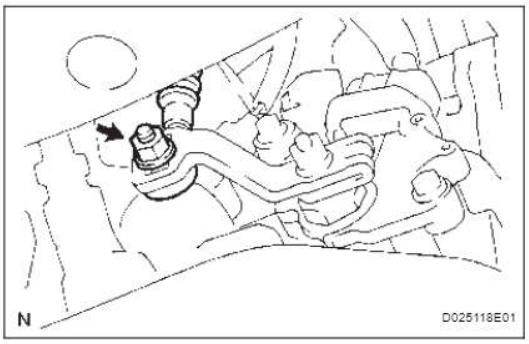
**1. INSPECT SHIFT LEVER POSITION**

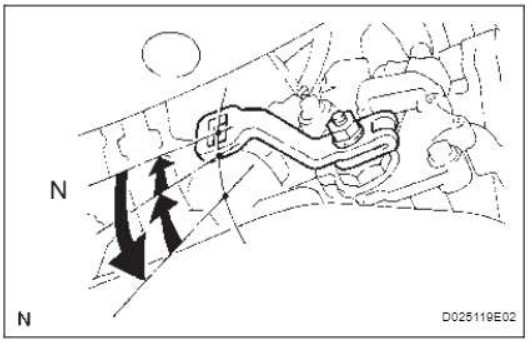
(a) When the shift lever is moved from the P to R position with the ignition switch ON and the brake pedal depressed, make sure that the shift lever moves smoothly and moves correctly into the position.

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

**2. ADJUST SHIFT LEVER POSITION**

(a) Remove the nut and disconnect the control cable from the control shaft lever.




(b) Turn the control shaft lever counterclockwise until it stops.

(c) Turn the control shift lever clockwise 2 notches to set it to the N position.

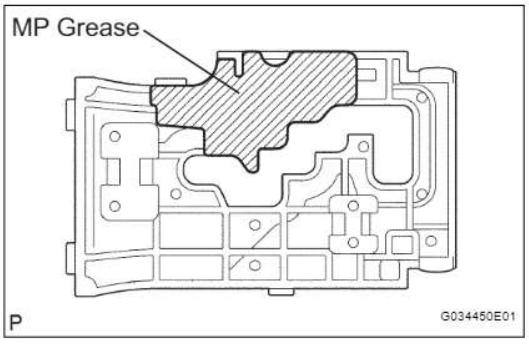
(d) Move the shift lever to the N position and install the control cable to the control shaft lever with the nut while pushing the end of the control cable up.
**Torque: 12 N*m (122 kgf*cm, 9 ft.*lbf)**
**NOTICE:**
- **The shift lever cannot be moved if the end of the control cable is pushed up to fan.**
- **Tighten the nut while the control cable is properly stretched.**

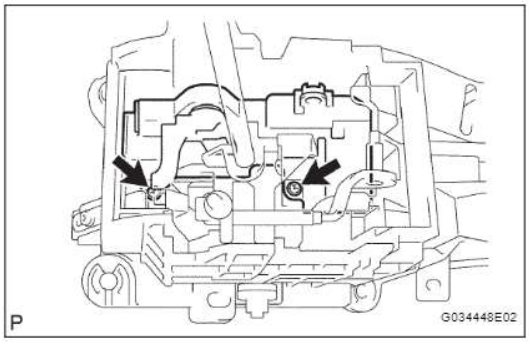
(e) After adjustment, check that the shift lever moves smoothly and the shift lever and gear operate correctly.

# REASSEMBLY

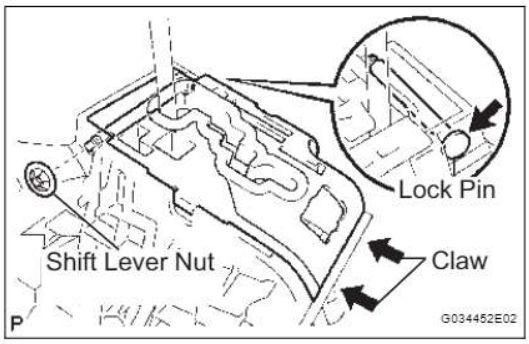
**1. INSTALL SHIFT LOCK CONTROL ECU SUB-ASSEMBLY**

(a) Apply MP grease to the hatched area of the shift lever guide housing as indicated in the illustration.



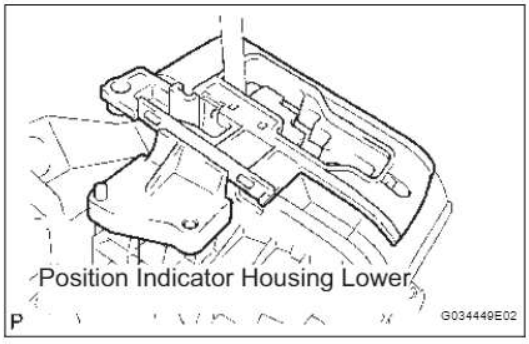



(b) Install the ECU with the 2 screws.




(c) Install the shift lever guide housing with the shift lever lock pin and a new shift lever nut.
**NOTICE:**
- **Install the shift lever nut and lock pin after first engaging the 2 claws.**
- **Securely engage the claws.**

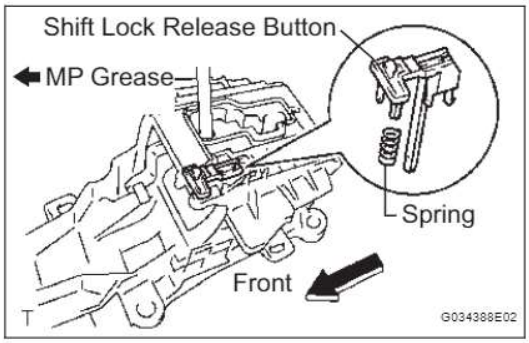
**2. INSTALL POSITION INDICATOR HOUSING LOWER**




(a) Install the housing to the shift lock control unit.

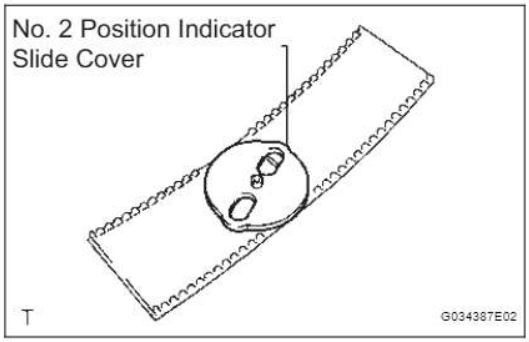


**3. INSTALL SHIFT LOCK RELEASE BUTTON**

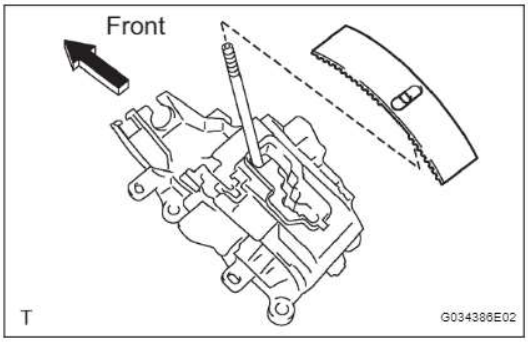



(a) Apply MP grease to the button and spring.
(b) Install the button and spring to the shift lock control unit.

**4. INSTALL POSITION INDICATOR SLIDE COVER**

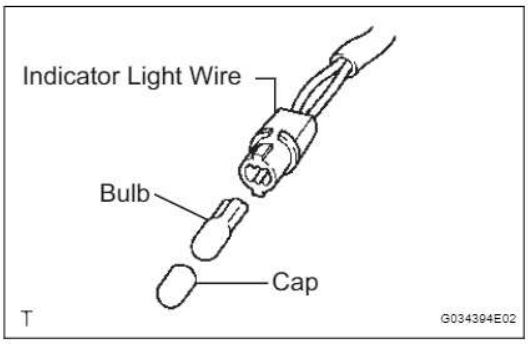



(a) Install the cover to the position indicator slide cover.




**5. INSTALL POSITION INDICATOR SLIDE COVER**

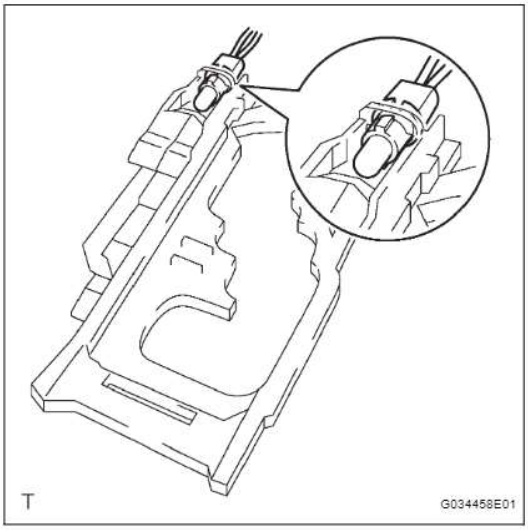
(a) Install the cover to the shift lock control unit.




**6. INSTALL INDICATOR LIGHT WIRE SUB-ASSEMBLY**

(a) Install the bulb to the indicator light wire.

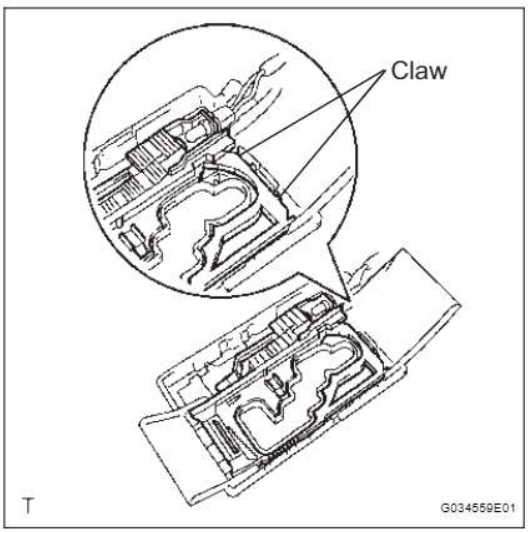
(b) Install the cap to the bulb.




(c) Install the wire to the position indicator light guide.

**NOTICE:**

**Make sure that the indicator light wire is securely installed to the position indicator light guide.**

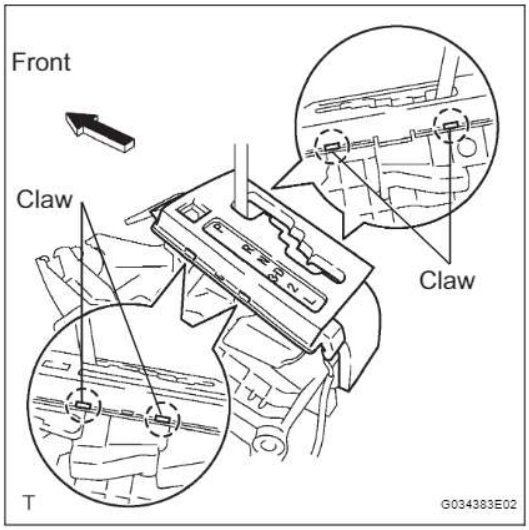



**7. INSTALL POSITION INDICATOR LIGHT GUIDE**

(a) Install the guide to the floor shift position indicator housing.

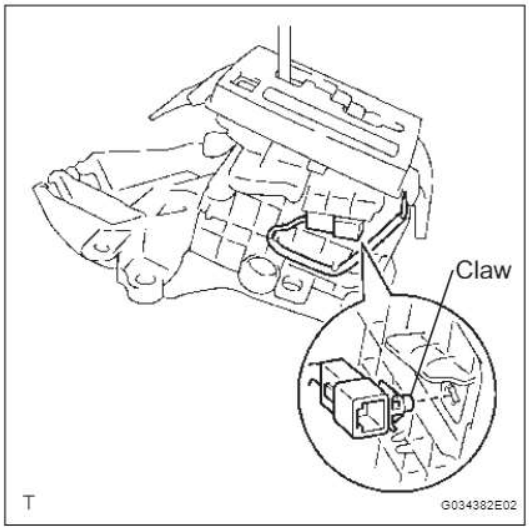
HINT:

Securely engage the claws.



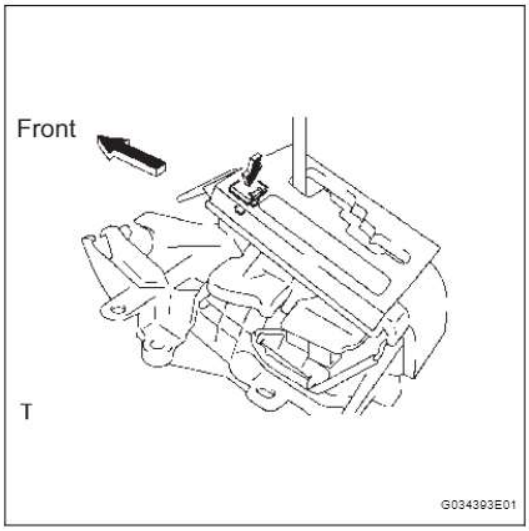

**8. INSTALL FLOOR SHIFT POSITION INDICATOR HOUSING SUB-ASSEMBLY**

(a) Install the housing to the shift lock control unit.
HINT:
Securely engage the 4 claws.




**9. CONNECT INDICATOR LIGHT WIRE SUB-ASSEMBLY**

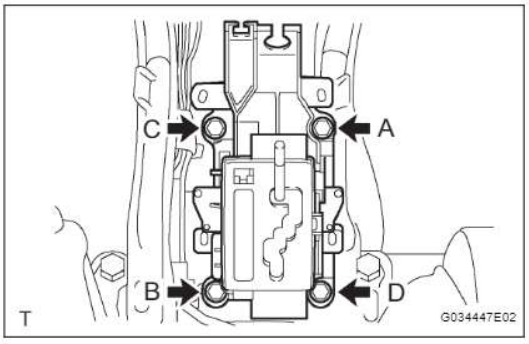
(a) Connect the wire connector to the floor shift.
**NOTICE:**
**Make sure that the indicator light wire is securely installed to the floor shift.**




**10. INSTALL SHIFT LOCK RELEASE BUTTON COVER**

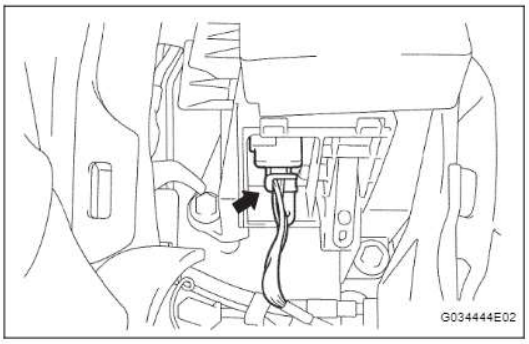
(a) Install the cover to the floor shift position indicator housing.

AX

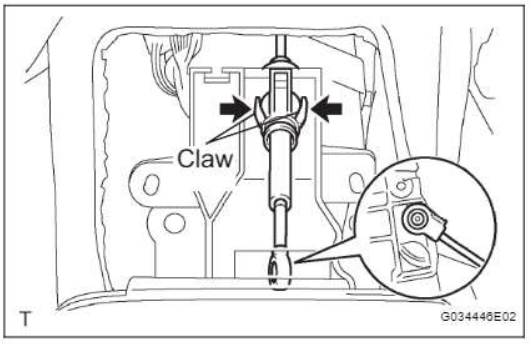



# INSTALLATION

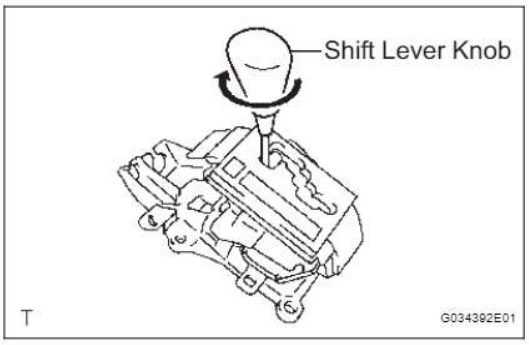
1. **INSTALL SHIFT LEVER ASSEMBLY**
   (a) Install the lever with the 4 bolts.
   **Torque: 12 N*m (122 kgf*cm, 9 ft.*lbf)**
   HINT:
   Tighten the bolts in the following order: A, B, C and D.
   **NOTICE:**
   **Be careful not to put the wires of the indicator light of the shift lock system between the floor shift assembly and the floor while installing the transmission floor shift lever assembly.**




   (b) Connect the shift lock control ECU connector.




2. **INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY**
   (a) Install the cable to the floor shift assembly.
   HINT:
   Securely engage the claws.




3. **INSTALL SHIFT LEVER KNOB SUB-ASSEMBLY**
4. **INSTALL CONSOLE UPPER REAR PANEL SUB-ASSEMBLY (See page IP-23)**
5. **INSTALL CONSOLE UPPER FRONT PANEL SUB-ASSEMBLY (See page IP-11)**
6. **INSTALL REAR CONSOLE BOX ASSEMBLY (See page IP-22)**
7. **CONNECT CABLE TO NEGATIVE BATTERY TERMINAL**
8. **PERFORM INITIALIZATION**
   (a) Perform initialization (see page IN-23).
   **NOTICE:**
   **Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.**

**9. INSPECT SHIFT LEVER POSITION**

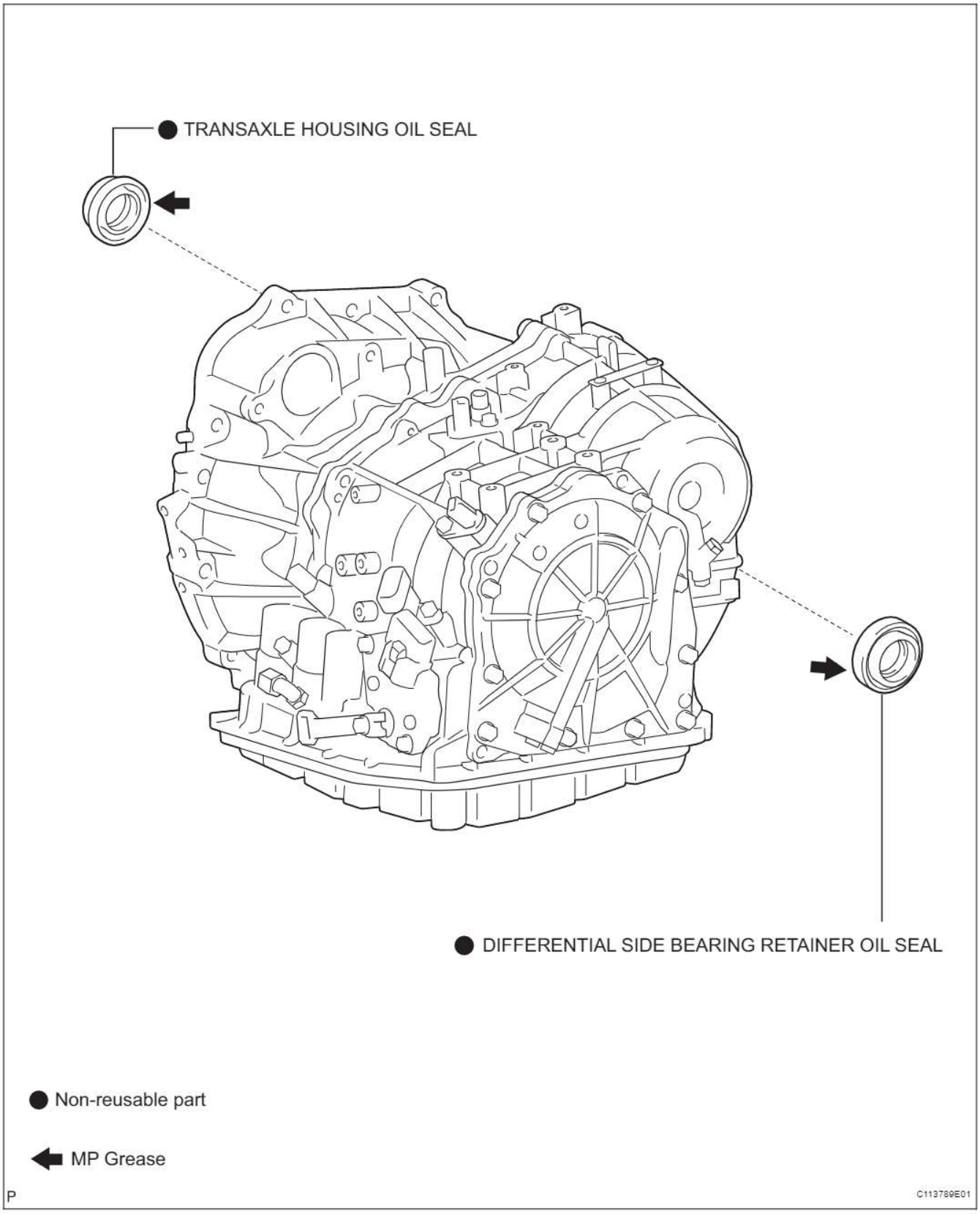
(a) Inspect the shift lever position (see page AX-133).

**10. ADJUST SHIFT LEVER POSITION**

(a) Adjustment the shift lever position (see page AX-133).

# DIFFERENTIAL OIL SEAL

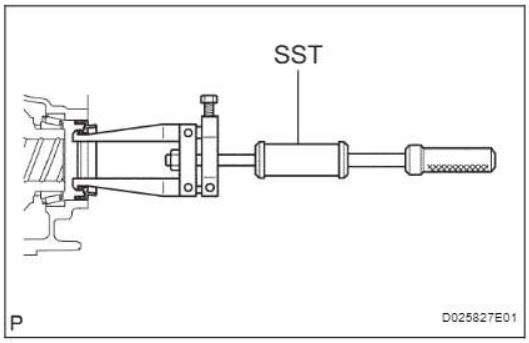
## COMPONENTS



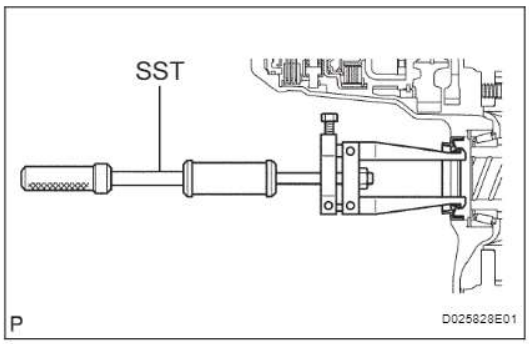

AX

# REMOVAL

1. **REMOVE FRONT WHEEL**
2. **REMOVE ENGINE UNDER COVER RH**
3. **REMOVE ENGINE UNDER COVER LH**
4. **DRAIN AUTOMATIC TRANSAXLE FLUID**
   (a) Remove the drain plug and gasket, and drain the ATF.
   (b) Install a new gasket and the drain plug.
   **Torque: 49 N*m (500 kgf*cm, 36 ft.*lbf)**
5. **REMOVE FRONT DRIVE SHAFT ASSEMBLY RH**
   (a) Remove the drive shaft (see page DS-5).
6. **REMOVE FRONT DRIVE SHAFT ASSEMBLY LH**
   (a) Remove the drive shaft (see page DS-5).
7. **REMOVE TRANSAXLE HOUSING OIL SEAL**
   (a) Using SST, tap out the oil seal.
   **SST 09308-00010**

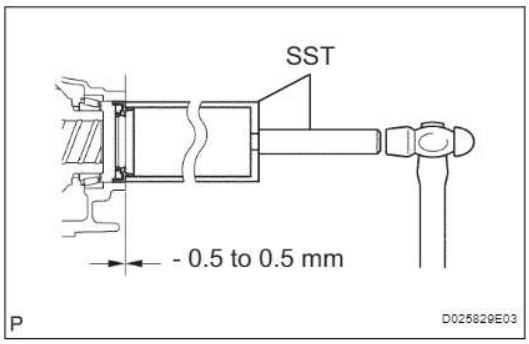



8. **REMOVE DIFFERENTIAL SIDE BEARING RETAINER OIL SEAL**
   (a) Using SST, tap out the oil seal.
   **SST 09308-00010**

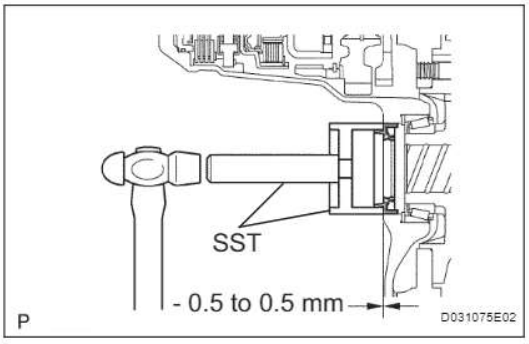



# INSTALLATION

1. **INSTALL TRANSAXLE HOUSING OIL SEAL**
   (a) Using SST and a hammer, tap in a new oil seal.
   **Standard depth:**
   **- 0.5 to 0.5 mm (- 0.020 to 0.020 in.)**
   **SST 09316-60011 (09316-00011), 09950-70010 (09951-07200)**
   (b) Coat the lip of the oil seal with MP grease.




AX

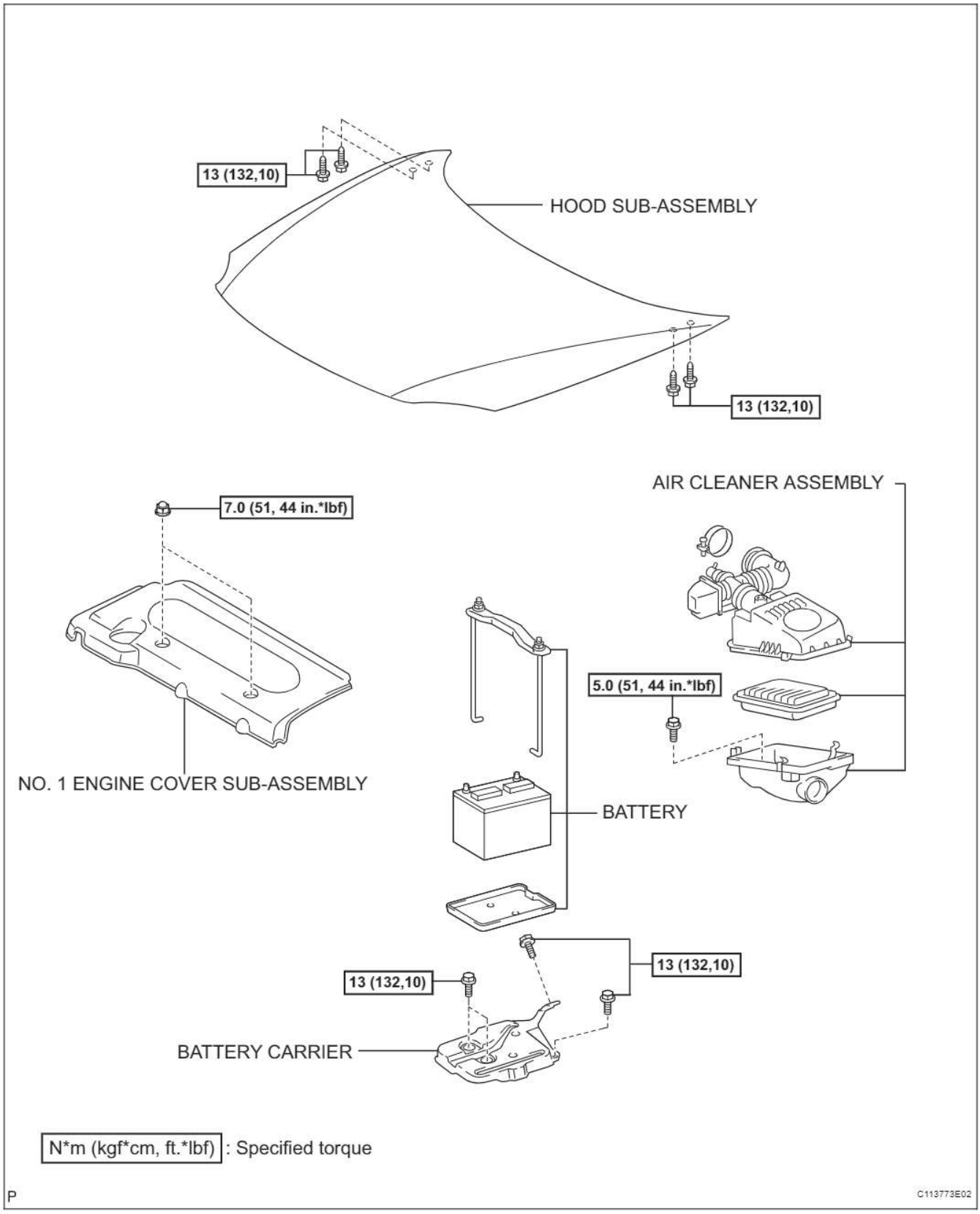



2. **INSTALL DIFFERENTIAL SIDE BEARING RETAINER OIL SEAL**
   (a) Using SST and a hammer, tap in a new oil seal.
   **SST 09649-17010, 09950-70010 (09951-07150)**
   **Standard depth:**
   **- 0.5 to 0.5 mm (- 0.020 to 0.020 in. )**
   (b) Coat the lip of the oil seal with MP grease.
3. **INSTALL FRONT DRIVE SHAFT ASSEMBLY LH**
   (a) Install the drive shift (see page DS-16).
4. **INSTALL FRONT DRIVE SHAFT ASSEMBLY RH**
   (a) Install the drive shift (see page DS-16).
5. **INSTALL ENGINE UNDER COVER RH**
6. **INSTALL ENGINE UNDER COVER LH**
7. **INSTALL FRONT WHEEL**
   **Torque: 103 N*m (1050 kgf*cm, 76 ft.*lbf)**
8. **ADD AUTOMATIC TRANSAXLE FLUID**
   **Fluid type:**
   **Toyota Genuine ATF WS**
   **Standard capacity:**
   **3.5 liters (3.7 US qts, 3.1 lmp. qts)**
9. **INSPECT AUTOMATIC TRANSAXLE FLUID**
   (a) Inspect the fluid (see page AX-104).

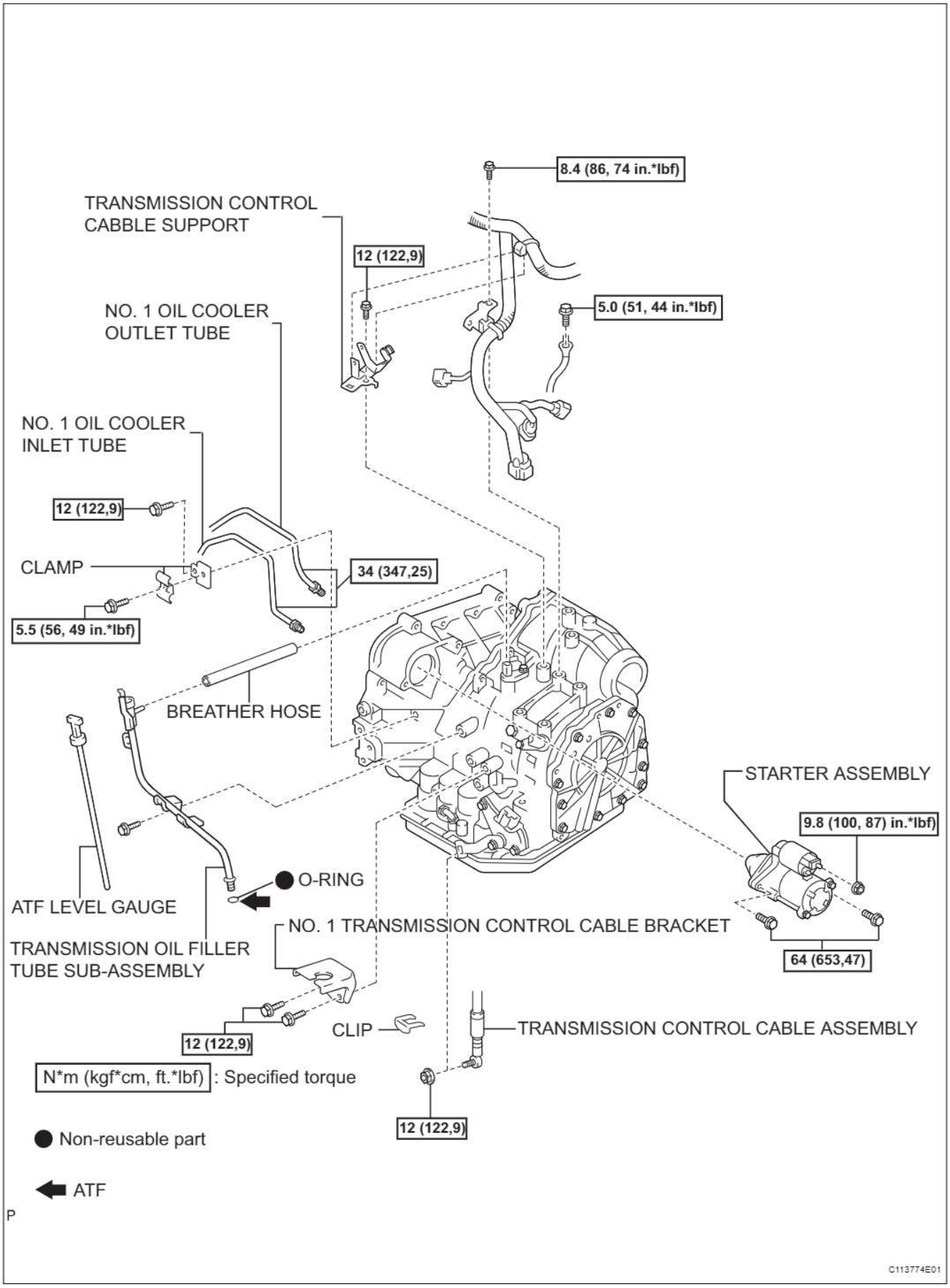
AX

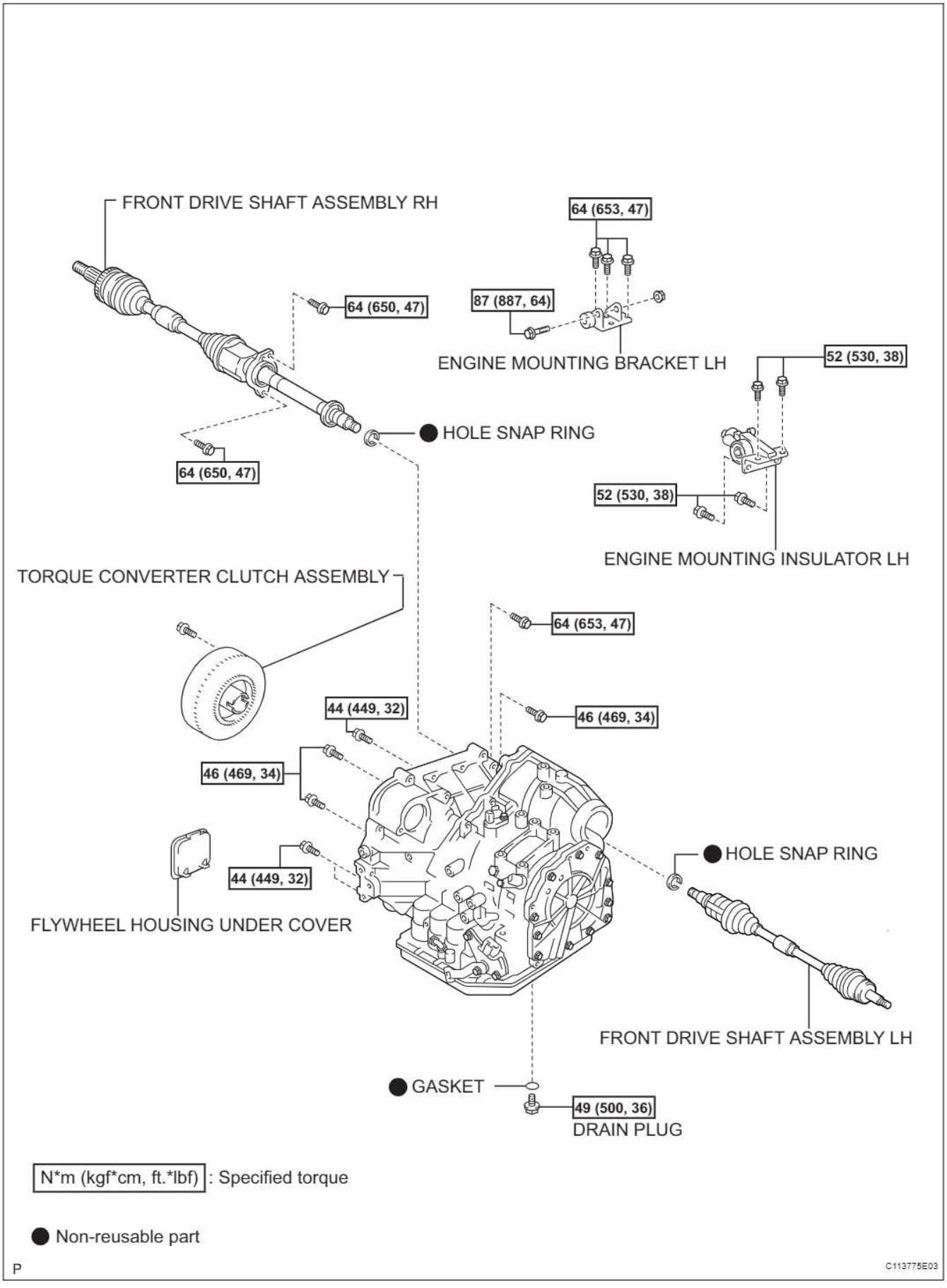
# AUTOMATIC TRANSAXLE ASSEMBLY

## COMPONENTS

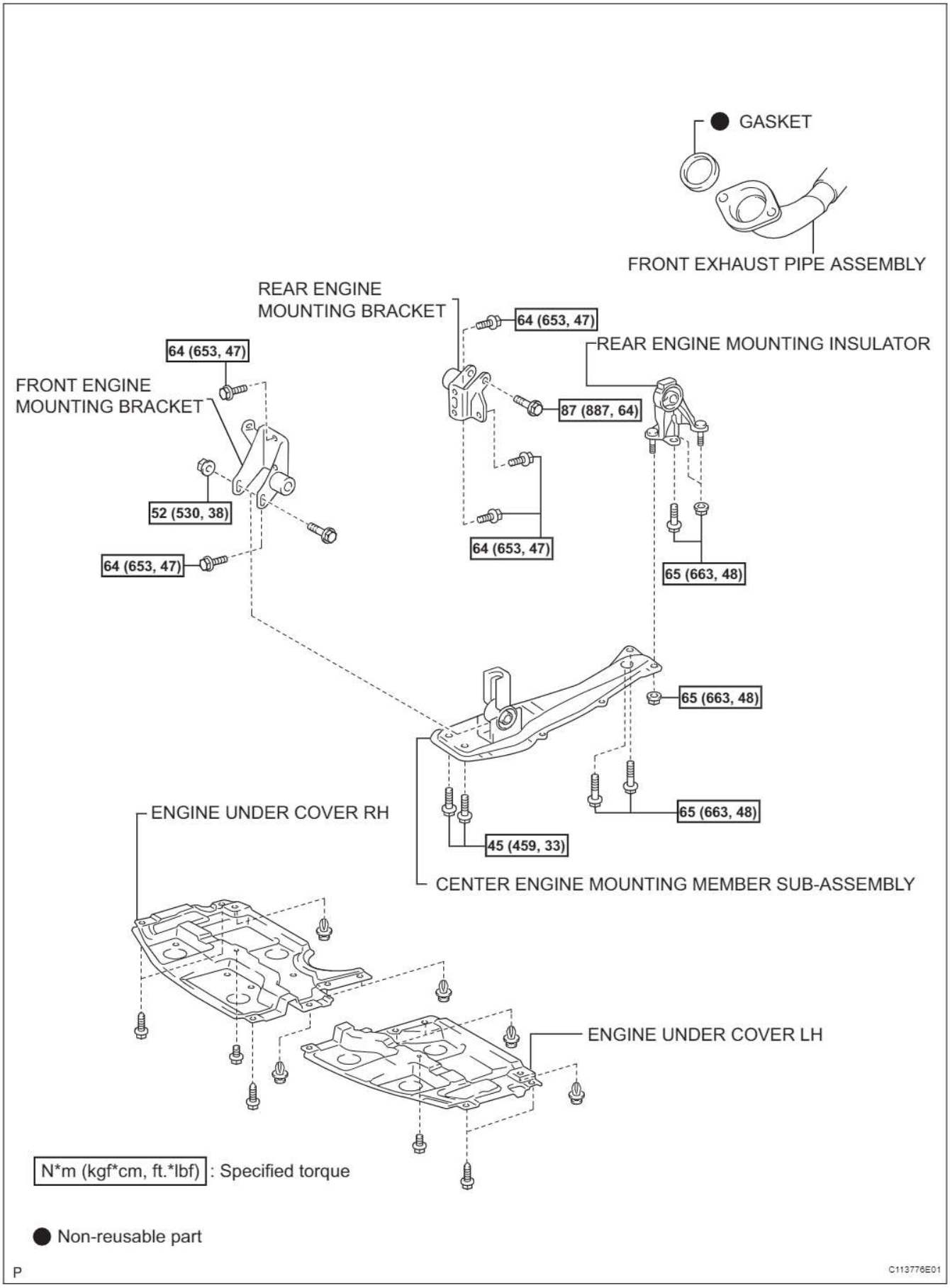



AX


8.4 (86, 74 in.*lbf)
TRANSMISSION CONTROL CABBLE SUPPORT
12 (122,9)
5.0 (51, 44 in.*lbf)
NO. 1 OIL COOLER OUTLET TUBE
NO. 1 OIL COOLER INLET TUBE
12 (122,9)
CLAMP
34 (347,25)
5.5 (56, 49 in.*lbf)
BREATHER HOSE
STARTER ASSEMBLY
9.8 (100, 87) in.*lbf)
O-RING
ATF LEVEL GAUGE
NO. 1 TRANSMISSION CONTROL CABLE BRACKET
TRANSMISSION OIL FILLER TUBE SUB-ASSEMBLY
64 (653,47)
CLIP
TRANSMISSION CONTROL CABLE ASSEMBLY
12 (122,9)
N*m (kgf*cm, ft.*lbf) : Specified torque
12 (122,9)
Non-reusable part
ATF
C113774E01

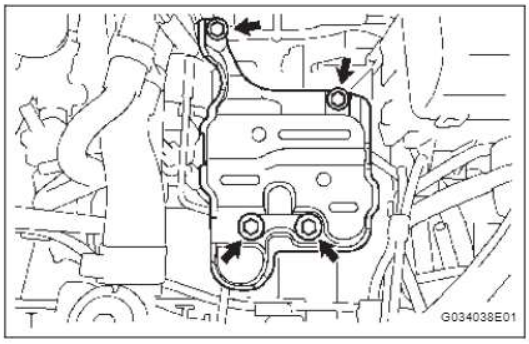

FRONT DRIVE SHAFT ASSEMBLY RH
64 (653, 47)
64 (650, 47)
87 (887, 64)
ENGINE MOUNTING BRACKET LH
52 (530, 38)
HOLE SNAP RING
64 (650, 47)
52 (530, 38)
ENGINE MOUNTING INSULATOR LH
TORQUE CONVERTER CLUTCH ASSEMBLY
64 (653, 47)
44 (449, 32)
46 (469, 34)
46 (469, 34)
HOLE SNAP RING
44 (449, 32)
FLYWHEEL HOUSING UNDER COVER
FRONT DRIVE SHAFT ASSEMBLY LH
GASKET
49 (500, 36)
DRAIN PLUG
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
P
C113775E03

AX

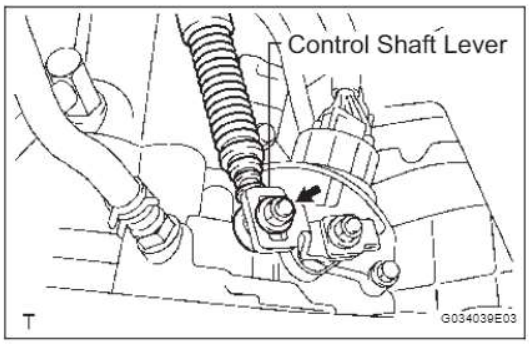

GASKET
FRONT EXHAUST PIPE ASSEMBLY
REAR ENGINE MOUNTING BRACKET
64 (653, 47)
REAR ENGINE MOUNTING INSULATOR
64 (653, 47)
FRONT ENGINE MOUNTING BRACKET
87 (887, 64)
52 (530, 38)
64 (653, 47)
64 (653, 47)
65 (663, 48)
65 (663, 48)
65 (663, 48)
45 (459, 33)
ENGINE UNDER COVER RH
CENTER ENGINE MOUNTING MEMBER SUB-ASSEMBLY
ENGINE UNDER COVER LH
N*m (kgf*cm, ft.*lbf) : Specified torque
Non-reusable part
P
C113776E01

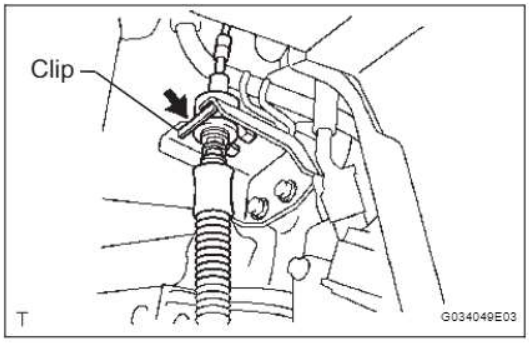
# REMOVAL

1. **REMOVE HOOD SUB-ASSEMBLY**
   (a) Remove the hood (see page ED-1).
2. **REMOVE NO. 1 ENGINE COVER SUB-ASSEMBLY**
   (a) Remove the 2 nuts and engine cover.
3. **REMOVE BATTERY**
   **CAUTION:**
   **Wait at least 90 seconds after disconnecting the cable from the negative (-) battery terminal to prevent airbag and seat belt pretensioner activation.**
4. **REMOVE BATTERY CARRIER**
   (a) Remove the 4 bolts and battery carrier.
5. **REMOVE AIR CLEANER ASSEMBLY**



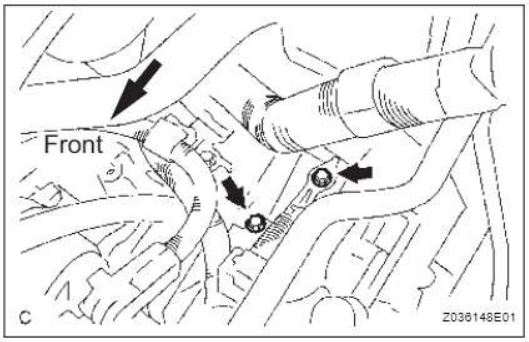

6. **DISCONNECT TRANSMISSION CONTROL CABLE ASSEMBLY**
   (a) Remove the nut from the control shaft lever.
   (b) Disconnect the control cable from the control shaft lever.



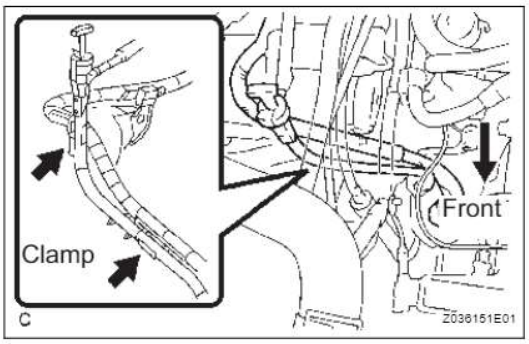

   (c) Remove the clip and disconnect the cable from the control cable bracket.

AX



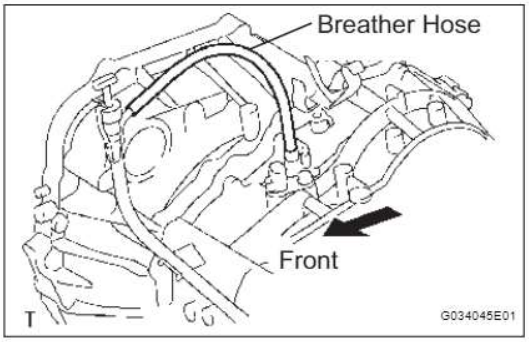

**7. DISCONNECT WIRE HARNESS**

(a) Remove the 2 bolts.
(b) Disconnect the harness and wire harness bracket.




**8. DISCONNECT CONNECTOR**

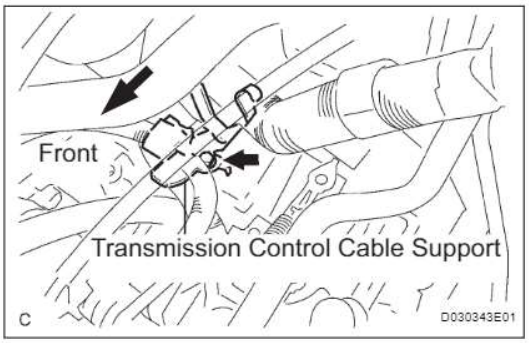
(a) Disconnect the 2 wire harness clamps from the oil filler tube.
(b) Disconnect the transmission wire connector.
(c) Disconnect the park/neutral position switch connector.
(d) Disconnect the 2 speed sensor connectors.




**9. REMOVE BREATHER PLUG HOSE**

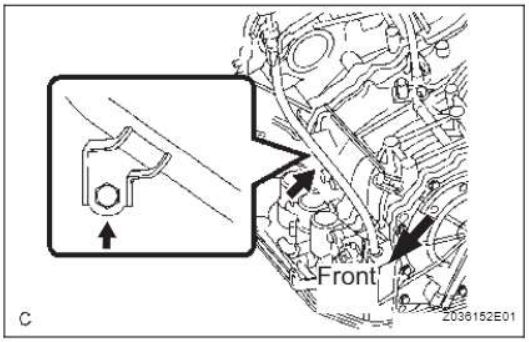
(a) Remove the hose from the transmission oil filler tube and automatic transaxle.

AX



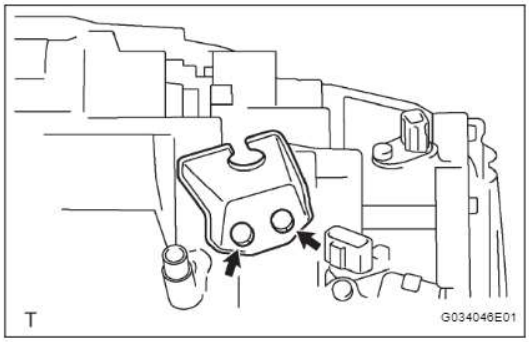

**10. REMOVE TRANSMISSION CONTROL CABLE SUPPORT**

(a) Remove the bolt and transmission control cable support from the automatic transaxle.

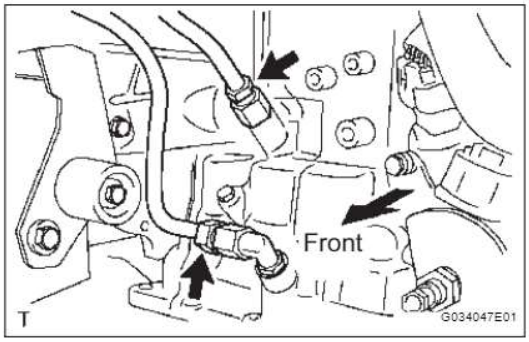



**11. REMOVE TRANSMISSION OIL FILLER TUBE SUB-ASSEMBLY**

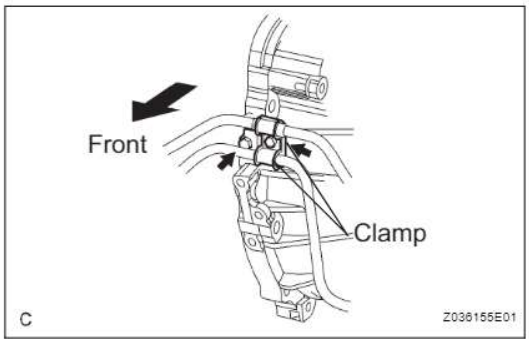
(a) Remove the ATF level gauge.
(b) Remove the bolt and oil filler tube.
(c) Remove the O-ring from the oil filler tube.



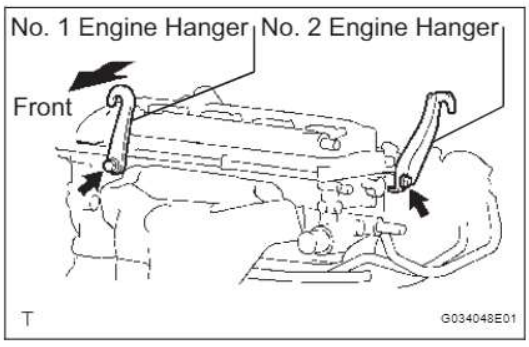

12. **REMOVE NO. 1 TRANSMISSION CONTROL CABLE BRACKET**
    (a) Remove the 2 bolts and bracket.
13. **REMOVE WHEEL**
14. **REMOVE ENGINE UNDER COVER RH**
15. **REMOVE ENGINE UNDER COVER LH**
16. **DRAIN AUTOMATIC TRANSAXLE FLUID**
    (a) Remove the drain plug and gasket, and drain the ATF.
    (b) Install a new gasket and the drain plug.
    **Torque: 49 N*m (500 kgf*cm, 36 ft.*lbf)**




17. **DISCONNECT NO. 1 OIL COOLER INLET TUBE**
18. **DISCONNECT NO. 1 OIL COOLER OUTLET TUBE**
    (a) Disconnect the tube.




    (b) Remove the 2 bolts and separate the 2 clamps.




19. **SUSPEND ENGINE ASSEMBLY**
    (a) Install the No. 1 and No. 2 engine hangers in the correct direction.
    Part No. :
    **No. 1 engine hanger:**
    **12281-28010**
    **No. 2 engine hanger:**
    **12282-28010**
    **Bolts:**
    **91512-61020**
    **Torque: 38 N*m (387 kgf*cm, 28 ft.*lbf)**
    (b) Attach the engine chain hoist to the engine hanger.
    **CAUTION:**
    **Do not attempt to hang the engine by hooking the chain to any other part.**
20. **REMOVE EXHAUST PIPE ASSEMBLY FRONT**
    (a) Remove the exhaust pipe (see page EX-2).

AX

**21. REMOVE FRONT DRIVE SHAFT ASSEMBLY RH**

(a) Remove the drive shaft (see page DS-5).

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

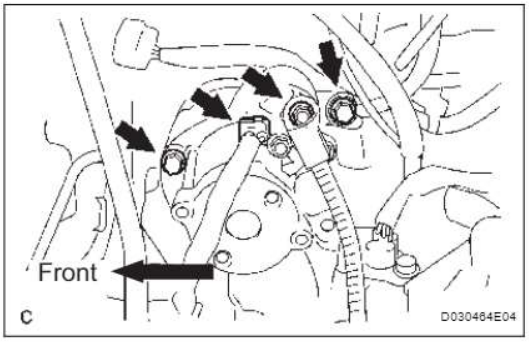
(a) Remove the drive shaft (see page DS-5).

**23. REMOVE STARTER ASSEMBLY**

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

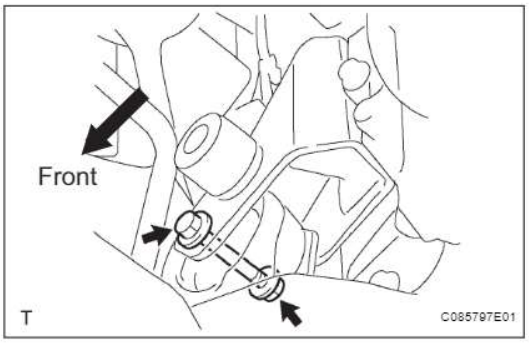
**24. SUPPORT AUTOMATIC TRANSAXLE ASSEMBLY**

(a) Support the transaxle with a transmission jack.



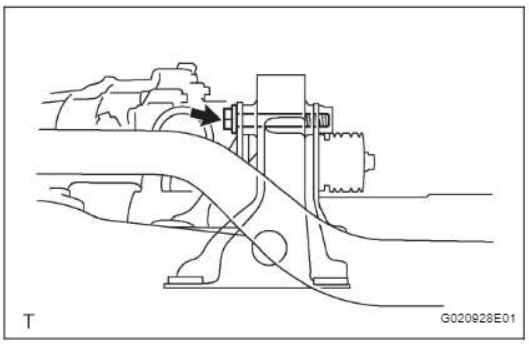

**25. DISCONNECT FRONT ENGINE MOUNTING INSULATOR**

(a) Remove the bolt and nut from the bracket.
(b) Disconnect the insulator from the bracket.

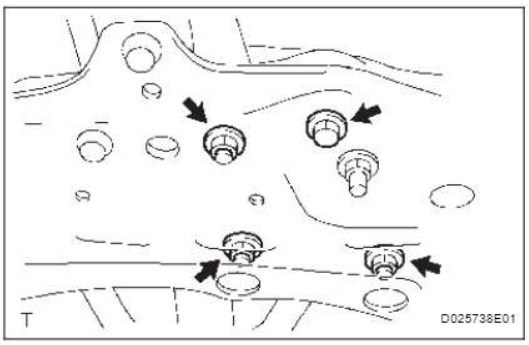



**26. REMOVE REAR ENGINE MOUNTING INSULATOR**

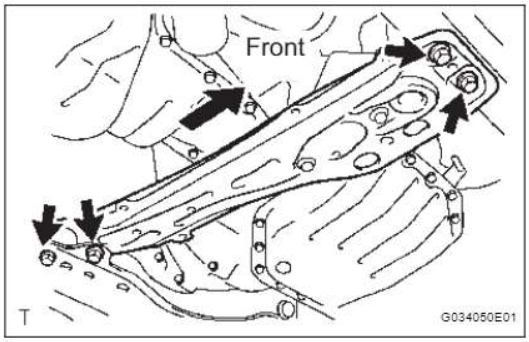
(a) Disconnect the hose clamp from the insulator.
(b) Remove the bolt from the rear engine mounting bracket.




(c) Remove the 3 nuts, bolt and insulator from the suspension member.

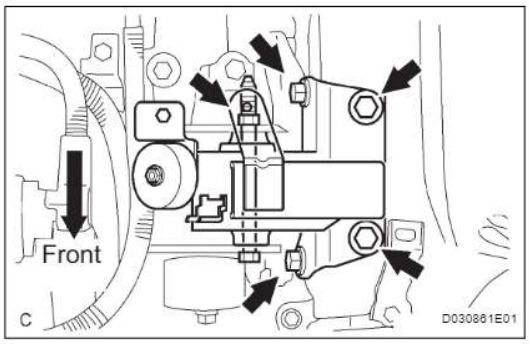



AX



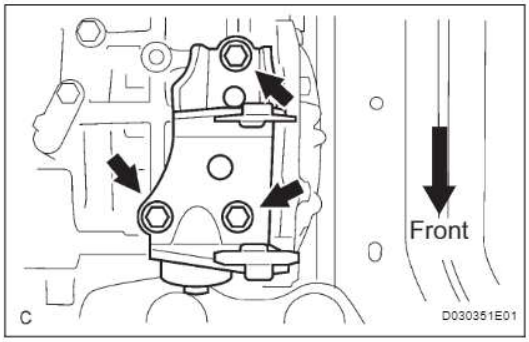

**27. REMOVE CENTER ENGINE MOUNTING MEMBER SUB-ASSEMBLY**

(a) Remove the 4 bolts and member with the front engine mounting insulator.




**28. REMOVE ENGINE MOUNTING INSULATOR LH**

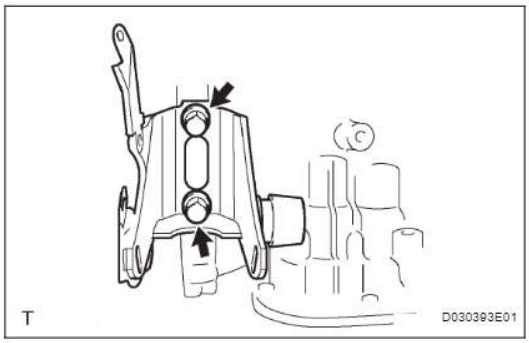
(a) Remove the 5 bolts, nut and insulator.




**29. REMOVE ENGINE MOUNTING BRACKET LH**

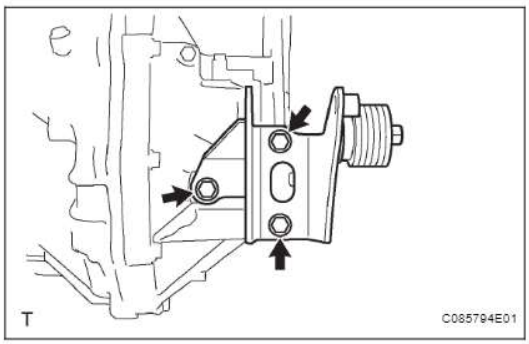
(a) Remove the 3 bolts and bracket from the automatic transaxle.

AX



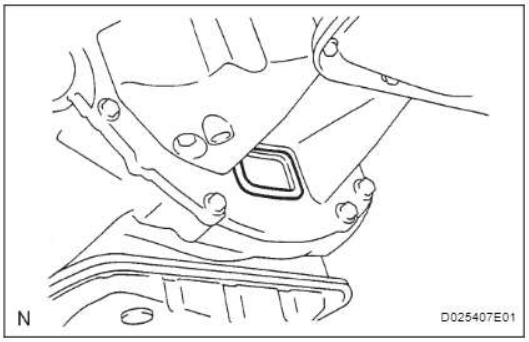

**30. REMOVE FRONT ENGINE MOUNTING BRACKET**

(a) Remove the 2 bolts and bracket from the automatic transaxle.



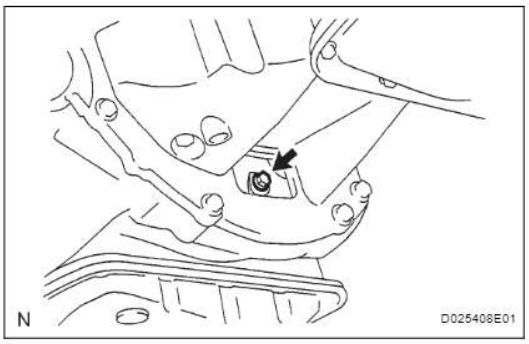

**31. REMOVE REAR ENGINE MOUNTING BRACKET**

(a) Remove the 3 bolts and bracket from the automatic transaxle.



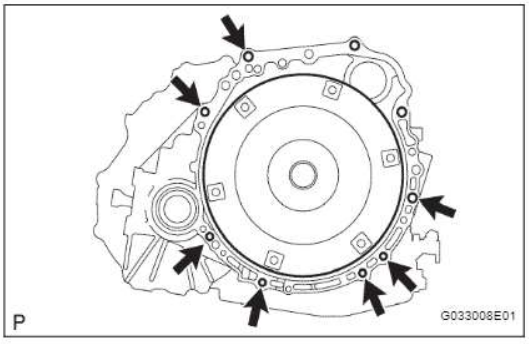

**32. REMOVE FLYWHEEL HOUSING UNDER COVER**

(a) Remove the cover from the automatic transaxle.




**33. REMOVE AUTOMATIC TRANSAXLE ASSEMBLY**

(a) Turn the crankshaft to remove the 6 bolts while holding the crankshaft pulley bolt with a wrench.



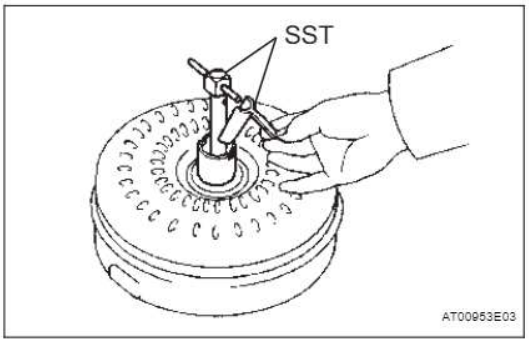

(b) Remove the 7 bolts.

(c) Remove the transaxle.

**34. REMOVE TORQUE CONVERTER CLUTCH ASSEMBLY**

AX

# INSPECTION




**1. INSPECT TORQUE CONVERTER CLUTCH ASSEMBLY**

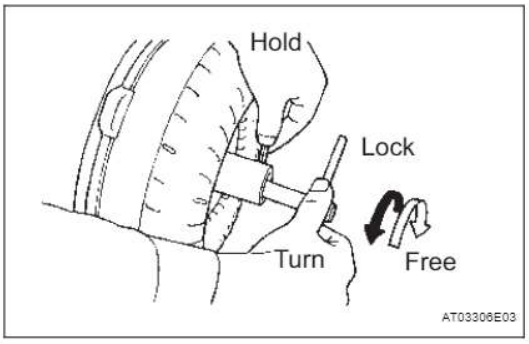
(a) Inspect the one-way clutch.

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

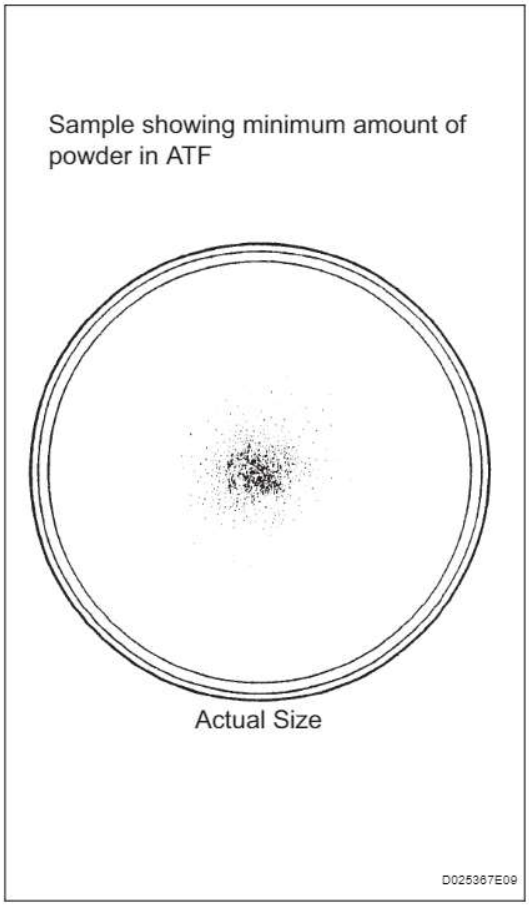
**SST 09350-32014 (09351-32010)**

(2) 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)**

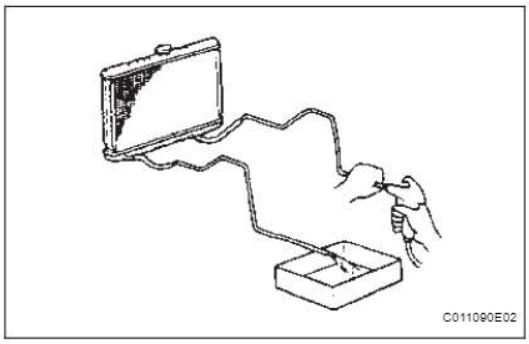



(3) With the torque converter clutch standing on its side, check that the one-way clutch locks when it is turned counterclockwise, and rotates smoothly when turned clockwise.
If necessary, clean the converter and retest the one-way clutch.
Replace the converter if the one-way clutch still fails the test.



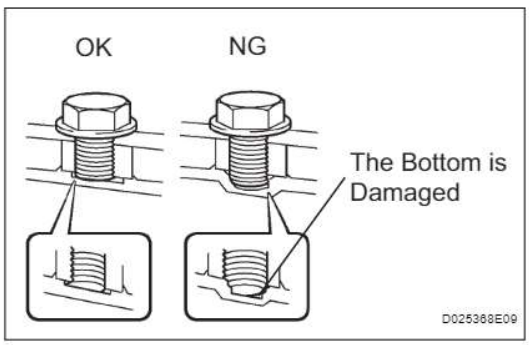

(b) Determine the condition of the torque converter clutch.
(1) If the inspection result of the torque converter clutch assembly meets the following criteria, replace the torque converter clutch.
**Malfunction:**
**Any metallic sound is heard from the torque converter clutch during the stall test or when the shift lever is in the neutral position. The one-way clutch is free or locked in both directions.**
Fine powder exceeding the sample limit is identified in the ATF. (See the sample.)
HINT:
The sample shows ATF of approximately. 0.25 liters (0.26 US qts, 0.22 Imp. qts) that has been 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 face for installation facing up.



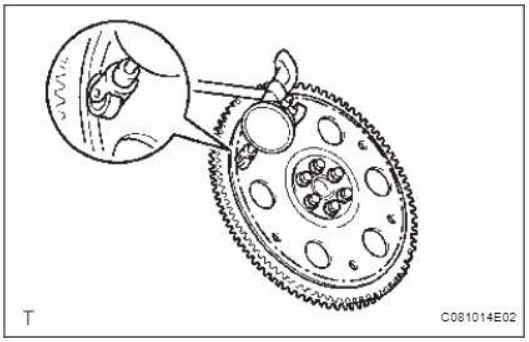

(d) Clean and check the oil cooler and oil pipe line.
(1) If the torque converter clutch is inspected or the ATF is changed, clean the oil cooler and oil pipe line.
**NOTICE:**
- **Spray compressed air of 196 kPa (2 kgf/cm$^2$, 28 psi) from the inlet hose.**
- **If plenty of fine powder is identified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

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




(e) Prevent deformation of the torque converter clutch and damage to the oil pump gear.
(1) When there is any damage on the end of the bolt for the torque converter clutch and on the bottom of the bolt hole, replace the bolt and the torque converter clutch.
(2) All of the bolts should be the same length.
(3) Do not lose the spring washer.

AX




**2. REMOVE DRIVE PLATE & RING GEAR SUB-ASSEMBLY**

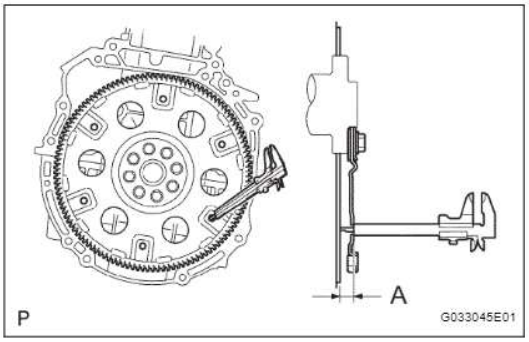
(a) Set up a dial indicator and measure the drive plate runout.

**Maximum runout:**
**0.20 mm**

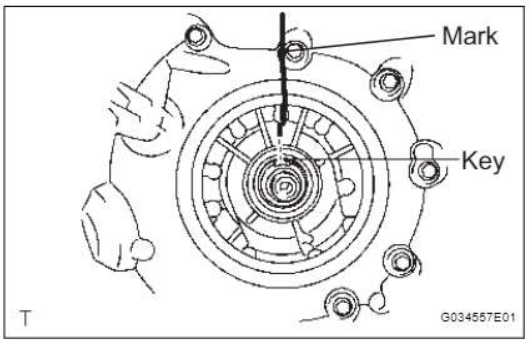
(b) Check for damage of the ring gear.
If the runout is greater than the maximum or the ring gear is damaged, replace the drive plate.

# INSTALLATION

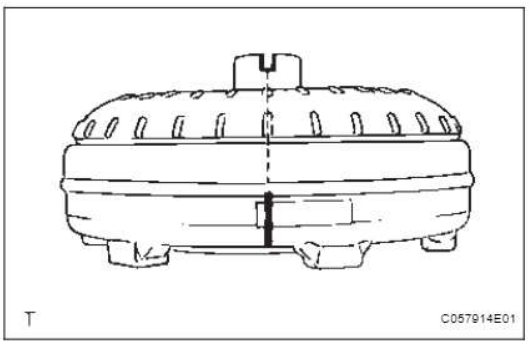
**1. INSTALL TORQUE CONVERTER CLUTCH ASSEMBLY**



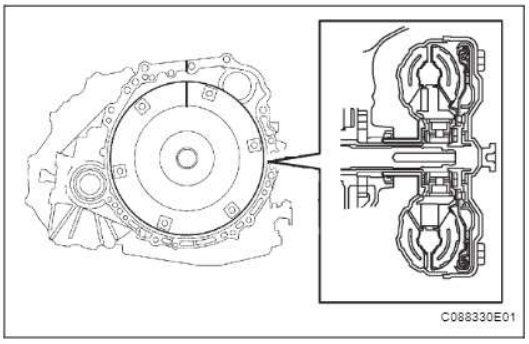

(a) Using a vernier caliper, measure dimension "A" between the transaxle fitting part of the engine and the converter fitting part of the drive plate.




(b) Set the key of the front oil pump drive gear to the top and put a mark on the housing.

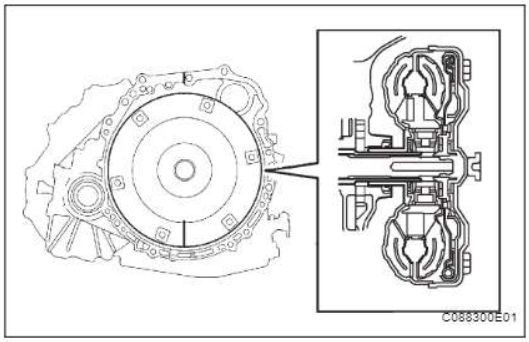



(c) Put a mark on the torque converter clutch so that its groove can be clearly indicated.

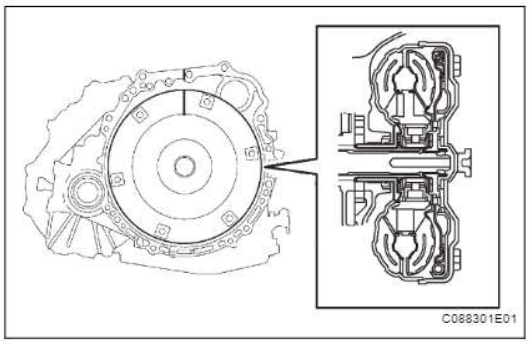



(d) Match the 2 marks on the transaxle case and the torque converter clutch and fit the spline part of the input shaft to the spline part of the turbine runner.

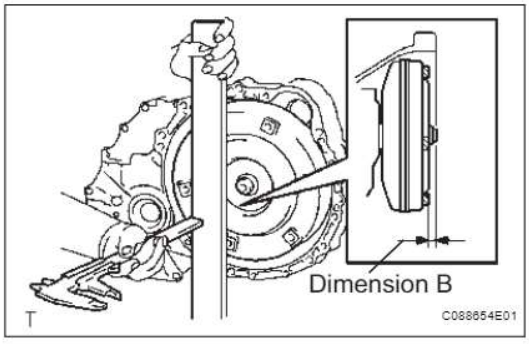
AX




(e) Rotating the torque converter clutch, fit the spline part of the stator shaft with the spline part of the stator.
HINT:
Rotate it about 180°.



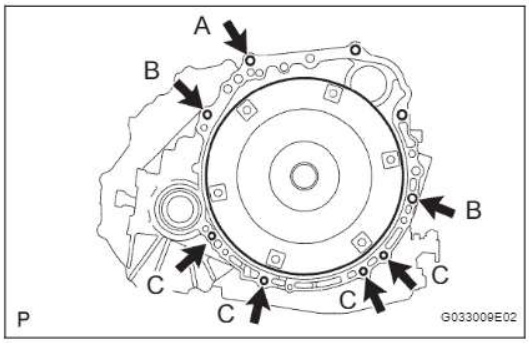

(f) Rotating the torque converter clutch, match the 2 marks on the case and the torque converter clutch again and fit the key of the oil pump drive gear into the key way of the torque converter clutch.
**NOTICE:**
**When rotating the torque converter clutch, do not push it with excessive force.**



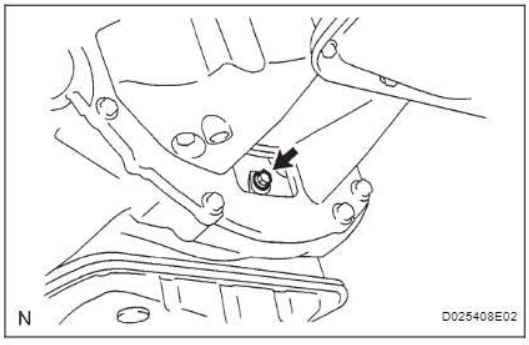

(g) Using a vernier caliper and straightedge, measure dimension B shown in the illustration and check that B is greater than A.
**Standard dimension:**
**B = A + 1.0 mm (0.039 in.) or more**

AX

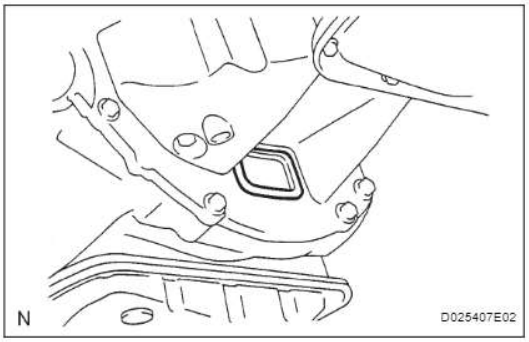
## 2. INSTALL AUTOMATIC TRANSAXLE ASSEMBLY




(a) Install the transaxle to the engine with the 7 bolts.
**Torque: 64 N*m (653 kgf*cm, 47 ft.*lbf) for bolt A**
**46 N*m (469 kgf*cm, 34 ft.*lbf) for bolt B**
**44 N*m (449 kgf*cm, 32 ft.*lbf) for bolt C**

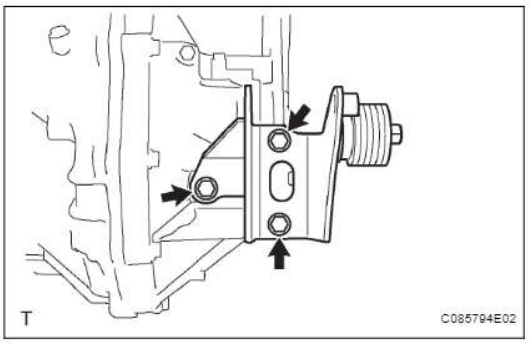



(b) Install the 6 torque converter clutch mounting bolts.
**Torque: 41 N*m (418 kgf*cm, 30 ft.*lbf)**
HINT:
First install the black colored bolt, and then the remaining 5 bolts.




**3. INSTALL FLYWHEEL HOUSING UNDER COVER**

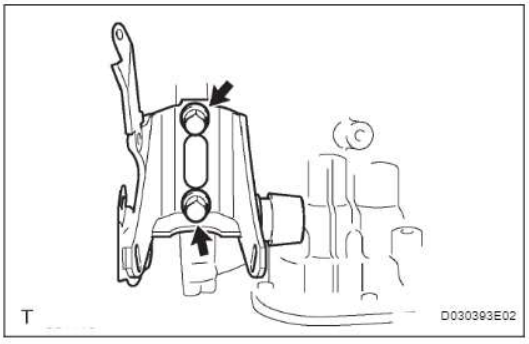
(a) Install the cover to the automatic transaxle.




**4. INSTALL REAR ENGINE MOUNTING BRACKET**

(a) Install the bracket to the automatic transaxle with the 3 bolts.

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

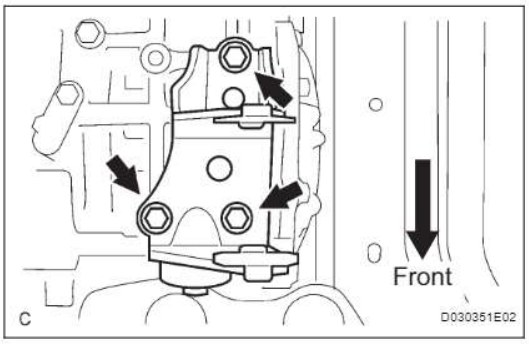



**5. INSTALL FRONT ENGINE MOUNTING BRACKET**

(a) Install the bracket to the automatic transaxle with the 2 bolts.

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

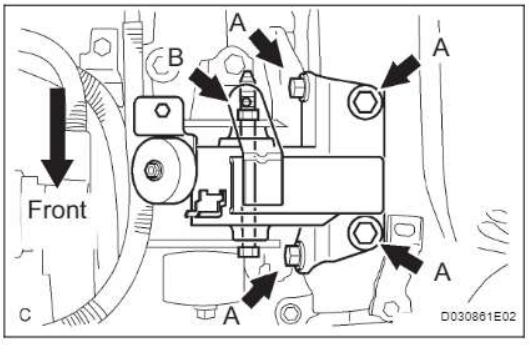
AX




**6. INSTALL ENGINE MOUNTING BRACKET LH**

(a) Install the bracket to the automatic transaxle with the 3 bolts.

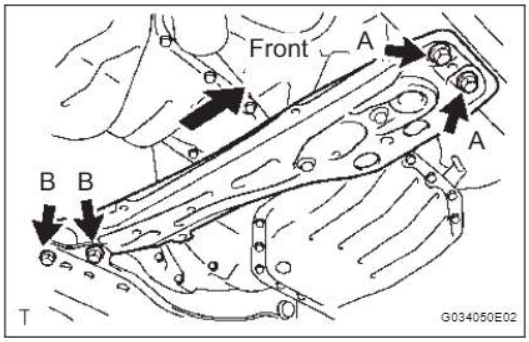
**Torque: 64 N*m (653 kgf*cm, 47 ft.*lbf)**




**7. INSTALL ENGINE MOUNTING INSULATOR LH**

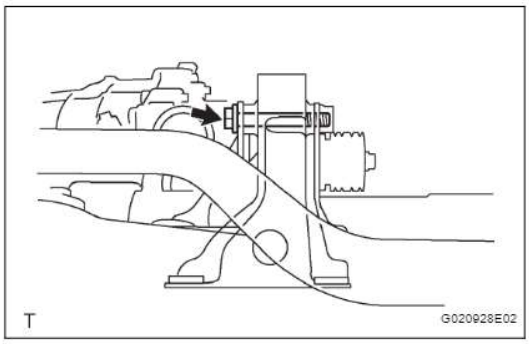
(a) Install the engine mounting insulator LH with the 5 bolts and nut.

**Torque: 52 N*m (530 kgf*cm, 38 ft.*lbf) for bolt A**
**87 N*m (887 kgf*cm, 64 ft.*lbf) for nut B**



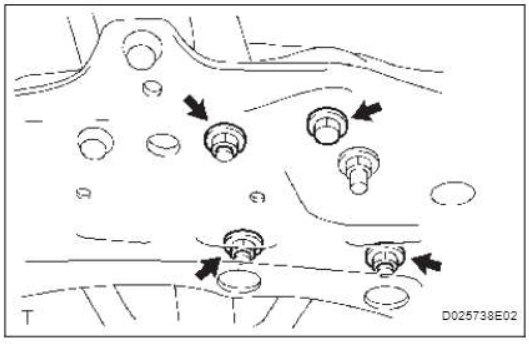

**8. INSTALL CENTER ENGINE MOUNTING MEMBER SUB-ASSEMBLY**

(a) Install the engine mounting member with the 4 bolts.
**Torque: 45 N*m (459 kgf*cm, 33 ft.*lbf) for bolt A**
**65 N*m (663 kgf*cm, 48 ft.*lbf) for bolt B**

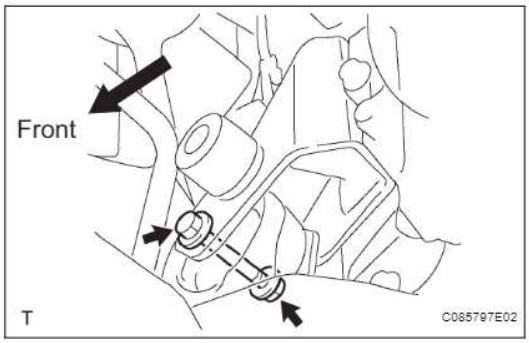



**9. INSTALL REAR ENGINE MOUNTING INSULATOR**

(a) Install the insulator to the rear engine mounting bracket with the bolt.
**Torque: 87 N*m (887 kgf*cm, 64 ft.*lbf)**

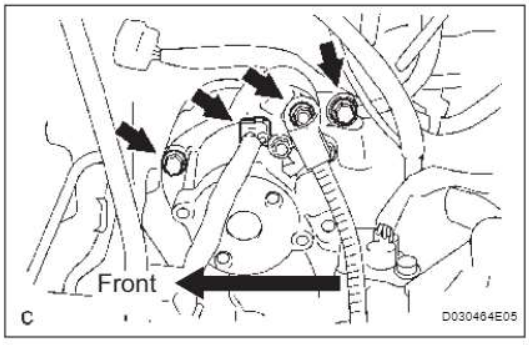



(b) Tighten the 3 nuts and bolt.
**Torque: 65 N*m (663 kgf*cm, 48 ft.*lbf)**




**10. INSTALL FRONT ENGINE MOUNTING INSULATOR**

(a) Install the insulator to the front engine mounting bracket with the bolt and nut.
**Torque: 52 N*m (530 kgf*cm, 38 ft.*lbf)**




**11. INSTALL STARTER ASSEMBLY**

(a) Install the starter with the 2 bolts.
**Torque: 64 N*m (653 kgf*cm, 47 ft.*lbf)**
(b) Connect the connector.
(c) Install the starter wire with the nut.
**Torque: 9.8 N*m (100 kgf*cm, 87 in.*lbf)**

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

(a) Install the drive shaft (see page DS-16).

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

(a) Install the drive shaft (see page DS-16).

AX

**14. INSTALL FRONT EXHAUST PIPE ASSEMBLY**

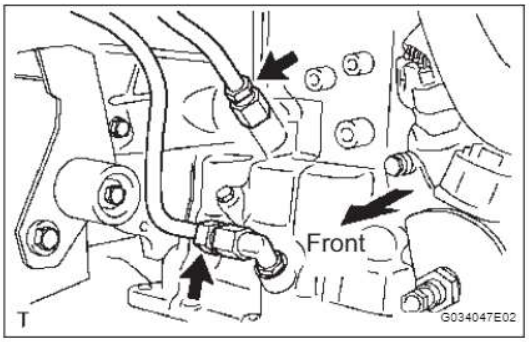
(a) Install the exhaust pipe (see page EX-3).

**15. INSTALL ENGINE UNDER COVER LH**

**16. INSTALL ENGINE UNDER COVER RH**

**17. INSTALL FRONT WHEEL**

**Torque: 103 N*m (1050 kgf*cm, 76 ft.*lbf)**




**18. INSTALL NO. 1 OIL COOLER OUTLET TUBE**

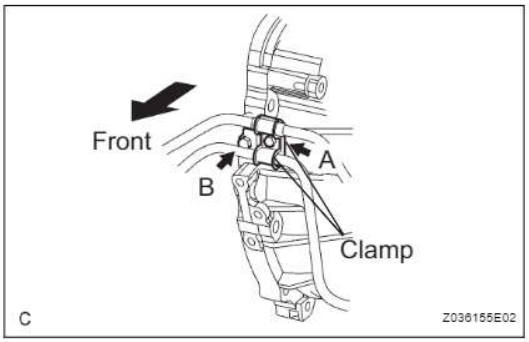
(a) Tighten the tube.

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

**19. INSTALL NO. 1 OIL COOLER INLET TUBE**

(a) Tighten the tube.

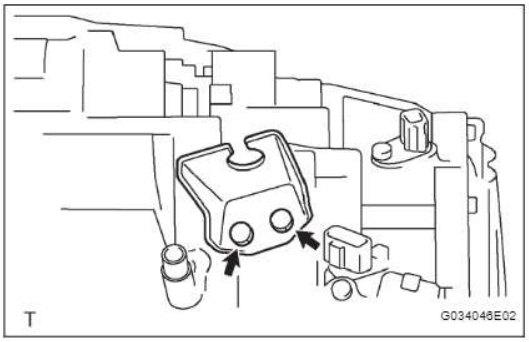
**Torque: 34 N*m (347 kgf*cm, 25 ft.*lbf)**




(b) Install the 2 oil cooler tube clamps with the 2 bolts.

**Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf) for bolt A**
**12 N*m (122 kgf*cm, 9 ft.*lbf) for bolt B**

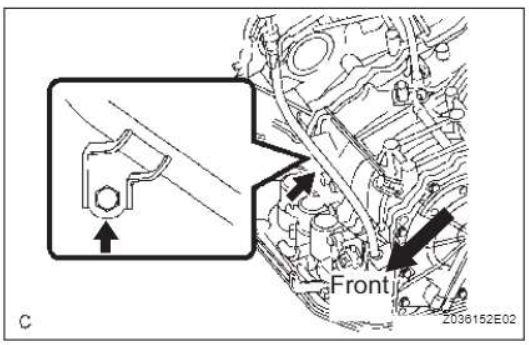
AX




**20. INSTALL NO. 1 TRANSMISSION CONTROL CABLE BRACKET**

(a) Install the cable bracket to the automatic transaxle with the 2 bolts.

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



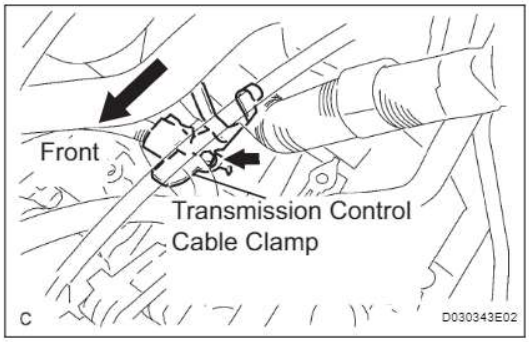

**21. INSTALL TRANSMISSION OIL FILLER TUBE SUB-ASSEMBLY**

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

(b) Install the oil filler tube to the automatic transaxle with the bolt.

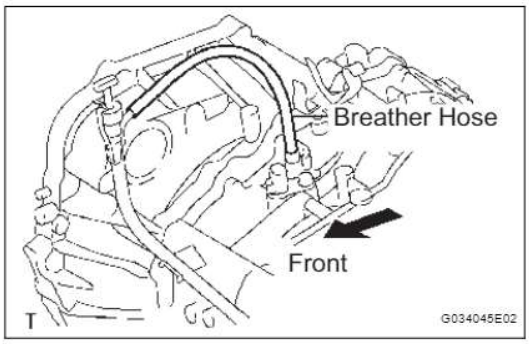
**Torque: 5.5 N*m (56 kgf*cm, 49 in.*lbf)**

(c) Install the ATF level gauge.



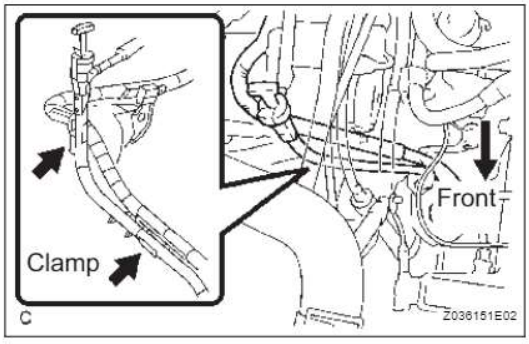

**22. INSTALL TRANSMISSION CONTROL CABLE CLAMP**

(a) Install the transmission control cable support to the automatic transaxle with the bolt.
**Torque: 12 N*m (122 kgf*cm, 9 ft.*lbf)**




**23. INSTALL BREATHER PLUG HOSE**

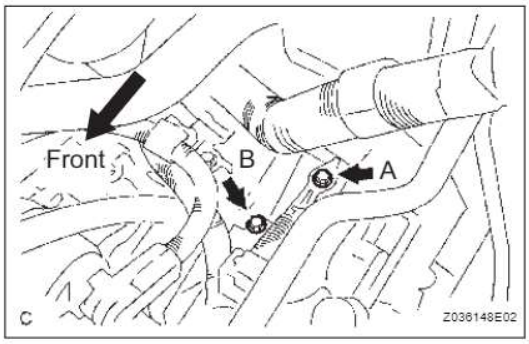
(a) Install the hose to the oil filler tube sub-assembly and automatic transaxle.




**24. CONNECT CONNECTOR**

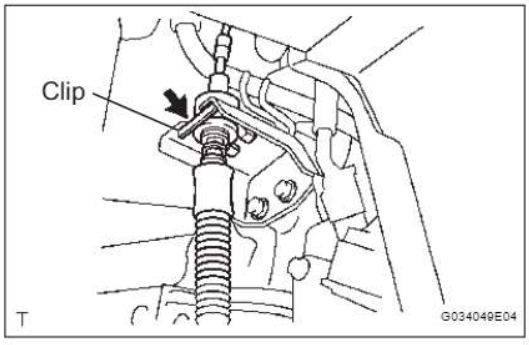
(a) Connect the 2 clamps to the oil filler tube.
(b) Connect the transmission wire connector.
(c) Connect the park/neutral position switch connector.
(d) Connect the 2 speed sensor connectors.

AX



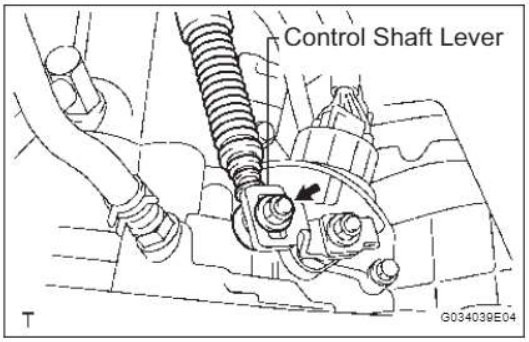

**25. INSTALL WIRE HARNESS**

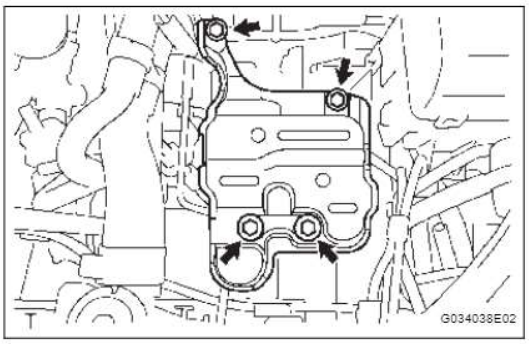
(a) Install the harness and wire harness bracket with the 2 bolts.
**Torque: 5.0 N*m (51 kgf*cm, 44 ft.*lbf) for bolt A**
**Torque: 8.4 N*m (86 kgf*cm, 74 in.*lbf) for bolt B**




**26. INSTALL TRANSMISSION CONTROL CABLE ASSEMBLY**

(a) Install the cable and clip to the bracket.




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

27. **INSTALL AIR CLEANER ASSEMBLY**
**Torque: 5.0 N*m (51 kgf*cm, 44 in.*lbf)**

28. **INSTALL BATTERY CARRIER**
(a) Install the carrier to the body with the 4 bolts.
**Torque: 13 N*m (132 kgf*cm, 10 ft.*lbf)**

29. **INSTALL BATTERY**

30. **INSTALL NO. 1 ENGINE COVER SUB-ASSEMBLY**
**Torque: 7.0 N*m (71 kgf*cm, 62 in.*lbf)**

31. **INSTALL HOOD SUB-ASSEMBLY**
**Torque: 13 N*m (132 kgf*cm, 10 ft.*lbf)**

32. **INSPECT HOOD SUB-ASSEMBLY**
(a) Inspect the food (see page ED-1).

33. **ADJUST HOOD SUB-ASSEMBLY**
(a) Adjust the food (see page ED-1).

34. **ADD AUTOMATIC TRANSAXLE FLUID**
**Fluid type:**
**Toyota Genuine ATF WS**
**Standard capacity:**
**3.5 liters (3.7 US qts, 3.1 Imp.qts)**

35. **ADJUST SHIFT LEVER POSITION**
(a) Adjust the lever position (see page AX-133).

36. **INSPECT SHIFT LEVER POSITION**
(a) Inspect the lever position (see page AX-133).

37. **INSPECT AUTOMATIC TRANSAXLE FLUID**
(a) Inspect the fluid (see page AX-104).

38. **INSPECT AND ADJUST FRONT WHEEL ALIGNMENT**
(a) Inspect and adjust the wheel alignment (see page SP-2).

39. **CHECK ABS SPEED SENSOR SIGNAL**
(a) Check the sensor signal (see page BC-20).

40. **RESET MEMORY**
(a) Reset memory (AT initialization) (see page AX-15).

41. **PERFORM INITIALIZATION**
(a) Perform initialization (see page IN-23).
**NOTICE:**
**Certain systems need to be initialized after disconnecting and reconnecting the cable from the negative (-) battery terminal.**

AX