

PRE-CHECK

1. DIAGNOSIS SYSTEM

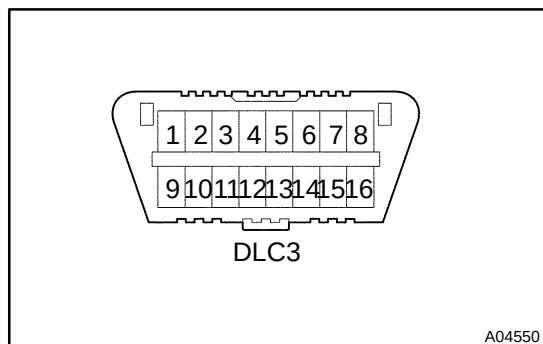
(a) Description

- (1) When troubleshooting OBD II vehicles, the only difference from the usual troubleshooting procedure is that you need to connect an OBD II scan tool complying with SAE J1987 or a hand-held tester to the vehicle, and read off various data output from the vehicle's ECM.
- (2) OBD II regulations require that the vehicle's on-board computer lights up 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 the MIL lighting up when a malfunction is detected, the applicable DTCs prescribed by SAE J2012 are recorded in the ECM memory (See page 05-5).

If the malfunction only occurs in 3 consecutive trips, the MIL goes off but the DTCs remain in the ECM memory.

- (3) To check the DTCs, connect OBD II scan tool or hand-held tester to the DLC3 of the vehicle. The OBD II scan tool or hand-held tester also enables you to erase the DTCs and check freeze frame data and various forms of engine data (For instruction book).
- (4) 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 the DTC chart on page 05-400).
- (5) The diagnosis system operates in the normal mode during the normal vehicle use, and also has a check mode for technicians to simulate malfunction symptoms and perform troubleshooting. Most DTCs use 2 trip detection logic(*) to prevent erroneous detection. By switching the ECM to the check mode when troubleshooting, the technician can cause the MIL to light up for a malfunction that is only detected once or momentarily. (hand-held tester).
- (6) *2 trip detection logic:
When a malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same malfunction is detected again during the second test drive, this second detection causes the MIL to light up .





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

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

HINT:

If your display shows **UNABLE TO CONNECT TO VEHICLE** when you have connected the cable of the OBD II scan tool or hand-held tester to the DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.

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



**2. Normal Mode:
INSPECT DIAGNOSIS**

- (a) Check the MIL.
(1) The MIL comes on when the ignition switch is turned ON and the engine is not running.

HINT:

If the MIL does not light up, troubleshoot the combination meter (See page 71-1).

- (2) 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.

- (b) Check the DTC.

NOTICE:

Hand-held tester only:

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.

- (1) Prepare an OBD II scan tool (complying with SAE J1978) or hand-held tester.
- (2) Connect the OBD II scan tool or hand-held tester to the DLC3 at the lower of the instrument panel.
- (3) Turn the ignition switch ON and press the OBD II scan tool or hand-held tester switch ON.
- (4) Use the OBD II scan tool or hand-held 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).
- (5) See page 05-400 to confirm the details of the DTCs.

NOTICE:

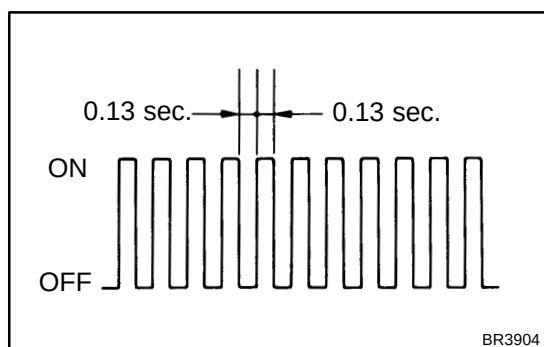
When simulating symptoms with an OBD II scan tool (excluding hand-held tester) to check the DTCs, use the normal mode. For codes on the DTCs chart subject to "2 trip detection logic", turn the ignition switch OFF after the symptom is simulated once. Then repeat the simulation process again. When the problem has been simulated twice, the MIL is indicated on the instrument panel and DTCs are recorded in the ECM.

3. Check Mode:**INSPECT DIAGNOSIS****HINT:**

Hand-held tester only:

Compared to the normal mode, the check mode has more sensitive ability to detect malfunctions. Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode.

- (a) Check the DTC.
 - (1) Check the initial conditions.
 - Battery positive voltage 11 V or more
 - Throttle valve fully closed
 - Transaxle in P position
 - A/C switched OFF
 - (2) Turn the ignition switch OFF.
 - (3) Prepare a hand-held tester.
 - (4) Connect the hand-held tester to the DLC3 at the lower of the instrument panel.
 - (5) Turn the ignition switch ON and push the hand-held tester ON.



- (6) Switch the hand-held tester from the normal mode to the check mode (Check that the MIL flashes).
- (7) Start the engine (MIL goes off after the engine starts).
- (8) Simulate the conditions of the malfunction described by the customer.

NOTICE:

Leave the ignition switch ON until you have checked the DTCs, etc.

- (9) After simulating the malfunction conditions, use the hand-held tester diagnosis selector to check the DTCs and freeze frame data, etc.

HINT:

Take care not to turn the ignition switch OFF, as turning it OFF switches the diagnosis system from the check mode to the normal mode, which erases all the DTCs, etc.

- (10) After checking the DTC, inspect the applicable circuit.
- (b) Clear the DTC.
- (1) When using OBD II scan tool or hand-held tester:
When operating an OBD II scan tool (complying with SAE J1978) or hand-held tester to erase the codes, the DTCs and freeze frame data will be erased. (See the OBD II scan tool's instruction book for operating instructions.)
 - (2) When not using OBD II scan tool or hand-held tester:
Remove the EFI and ETCS fuse from engine room J/B for 60 seconds or more.

4. DATA LIST**HINT:**

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

- (a) Warm up the engine.
- (b) Turn the ignition switch OFF.
- (c) Connect the OBD II scan tool or Hand-held tester to the DLC3.
- (d) Turn the ignition switch ON.
- (e) According to the display on tester, read the "DATA LIST".

Item	Measurement Item/ Display (Range)	Normal Condition	Diagnostic Note
STOP LIGHT SW	Stop light SW Status/ ON or OFF	• Brake Pedal is depressed: ON • Brake Pedal is released: OFF	←
SHIFT	Actual Gear Position/ 1st, 2nd, 3rd, 4th or 5th	Shift Lever Position is; • L: 1st • 2: 1st or 2nd • 3: 1st, 2nd or 3rd • 4: 1st, 2nd, 3rd or 4th • D: 1st, 2nd, 3rd, 4th or 5th	←
LOCK UP SOL	Lock Up Solenoid Status/ ON or OFF	• Lock Up: ON • Except Lock Up: OFF	←
PNP SW [NSW]	PNP SW Status/ ON or OFF	Shift lever position is; P or N: ON Except P or N: OFF	The shift lever position and these values are different, there are failures of the PNP switch or shift cable adjustment.
REVERSE	PNP SW Status/ ON or OFF	Shift lever position is; R: ON Except R: OFF	
5TH/DRIVE	PNP SW Status/ ON or OFF	Shift lever position is; D and 4: ON Except D and 4: OFF	
4th	PNP SW Status/ ON or OFF	Shift lever position is; 4: ON Except 4: OFF	
3rd	PNP SW Status/ ON or OFF	Shift lever position is; 3: ON Except 3: OFF	
2ND	PNP SW Status/ ON or OFF	Shift lever position is; 2 and L: ON Except 2 and L: OFF	
LOW	PNP SW Status/ ON or OFF	Shift lever position is; L: ON Except L: OFF	
SOLENOID (SLT)	Shift Solenoid SLT Status/ ON or OFF	IG SW ON: ON	←
AT FLUID TEMP	ATF Temp. Sensor Value/ min.: -40 °C (-40 °F) max.: 225 °C (437 °F)	80 °C (176 °F) (After Stall Test)	If the value is "-40 °C (-40 °F)" or "225 °C (437 °F)", ATF temp. sensor circuit is opened or shorted.
SPD (NC)	Counter Gear Speed display: 50 r/min	D Position is warmed up, 3rd; Same as input shaft speed	←

5. ACTIVE TEST

HINT:

Performing the ACTIVE TEST using the OBD II scan tool or Hand-held tester allows the relay, VSV, actuator and so on to operate without parts removal. Performing the ACTIVE TEST as a first step of troubleshooting is one of the method to shorten the 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 OBD II scan tool or Hand-held tester to the DLC3.
- (d) Turn the ignition switch ON.
- (e) According to the display on tester, perform the "ACTIVE TEST".

Item	Test Details	Diagnostic Note
SHIFT	[Test Details] Operate the shift solenoid valve and set the each shift position by yourself. [Vehicle Condition] Less than 50 km/h (31 mph) [Others] • Press → button: Shift up • Press ← button: Shift down	Possible to check the operation of the shift solenoid values.
LOCK UP	[Test Details] Control the shift solenoid DSL to set the ATM to the lock-up condition. [Vehicle Condition] Vehicle Speed: 58 km/h (36 mph) or more	Possible to check the DSL operation.
LINE PRESS UP	[Test Details] Operate the shift solenoid SLT and raise the line pressure. [Vehicle Condition] • Vehicle Stopped. • IDL: ON [Others] ON: Line pressure up. OFF: No action (normal operation)	-

6. PROBLEM SYMPTOM CONFIRMATION

- (a) Taking into consideration the results of the customer problem analysis, try to reproduce the symptoms of the trouble. 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.

7. ROAD TEST

NOTICE:

Perform the test at the ATF temperature 50 - 80°C (122 - 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 to see that 1 → 2, 2 → 3, 3 → 4 and 4 → 5th up-shifts take place, and that the shift points conform to the automatic shift schedule (See page 03-38).

HINT:

- 5th Gear Up-shift Prohibition Control (1. Coolant temp. is 55 °C (128 °F) or less. 2. Vehicle speed is 51 km/h (32 mph) or less.)
- 5th Gear Lock-up Prohibition Control (1. Brake pedal is depressed. 2. Coolant temp. is 60 °C (140 °F) or less.)

- (2) Check for shift shock and slip.
Check for shock and slip at the 1 → 2, 2 → 3, 3 → 4 and 4 → 5th up-shifts.
- (3) Check for abnormal noises and vibration.
Drive in the D position lock-up or 5th gear and check for abnormal noises and vibration.

HINT:

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

- (4) Check kick-down operation.
While running in the D position, 2nd, 3rd, 4th and 5th gears, check to see that the possible kick-down vehicle speed limits for 2 → 1, 3 → 2, 4 → 3 and 5th → 4 kick-downs conform to those indicated on the automatic shift schedule (See page 03-38).
- (5) Check abnormal shock and slip at kick-down.
- (6) Check the lock-up mechanism.
 - Drive in D position 5th gear, at a steady speed (lock-up ON).
 - Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

If there is a big jump in engine speed, there is no lock-up.

(b) 4 position test:

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

- (1) Check up-shift operation.
Check to see that the 1 → 2, 2 → 3 and 3 → 4 up-shift takes place and that the shift point conforms to the automatic shift schedule (See page 03-38).

HINT:

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

- (2) Check engine braking.
While driving in the 4 position and 4th gear, release the accelerator pedal and check the engine braking effect.
- (3) Check for abnormal noises during acceleration and deceleration, and for shock at up-shift and down-shift.

(c) 3 position test:

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

- (1) Check up-shift operation.
Check to see that the 1 → 2 and 2 → 3 up-shift takes place and that the shift point conforms to the automatic shift schedule (See page 03-38).
- (2) Check engine braking.
While running in the 3 position and 3rd gear, release the accelerator pedal and check the engine braking effect.
- (3) Check for abnormal noises during acceleration and deceleration, and for shock at up-shift and down-shift.

(d) 2 position test:

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

- (1) Check up-shift operation.
Check to see that the 1 → 2 up-shift takes place and that the shift point conforms to the automatic shift schedule (See page 03-38).
- (2) Check engine braking.
While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.
- (3) Check for abnormal noises during acceleration and deceleration, and for shock at up-shift and down-shift.

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

CAUTION:

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

- (g) P position test:
Stop the vehicle on a grade (more than 5°) and after shifting into the P position, release the parking brake. Then, check to see that the parking lock pawl holds the vehicle in place.
- (h) Up-grade/down-grade control function test:
- (1) Check that up-shifting to the 4th or higher gear cannot be made on up-grades.
 - (2) When brake is applied on down-grades, check that the gear is automatically down-shifted from the 5th to 4th, or from the 4th to 3rd gears.

8. 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 and R positions.

NOTICE:

- **Do the test at the normal operating fluid temperature of 50 - 80°C (122 - 176°F).**
 - **Do not continuously run this test longer than 5 seconds.**
 - **To ensure safety, conduct this test in a wide, clear and level area which provide 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) Fully apply the parking brake.
 - (3) Keep your left foot pressed firmly on the brake pedal.
 - (4) Start the engine.
 - (5) Shift into the D position. Press all the way down on the accelerator pedal with your right foot. Quickly read the stall speed at this time.

Stall speed: 2,600 ± 150 rpm

Evaluation:

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

(c) Stall speed high in R position	• Line pressure too low • Reverse clutch slipping • 1st and reverse brake slipping • U/D brake slipping
(d) Stall speed high in D and R positions	• Line pressure too low • Improper fluid level

(b) Measure the time lag.

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 conditions of the U/D direct clutch, forward clutch, and 1st and reverse brake.

NOTICE:

- **Do the test at the normal operating fluid temperature of 50 - 80°C (122 - 176°F).**
- **Be sure to allow 1 minute interval between the tests.**
- **Take 3 measurements and take the average value.**

(1) Fully apply the parking brake.

(2) Start the engine and check idle speed.

Idle speed: 700 ± 50 rpm (In N position and A/C OFF)

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

Measure the time lag of N → R in the same way.

Time lag:

N → D Less than 1.2 seconds

N → R Less than 1.5 seconds

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

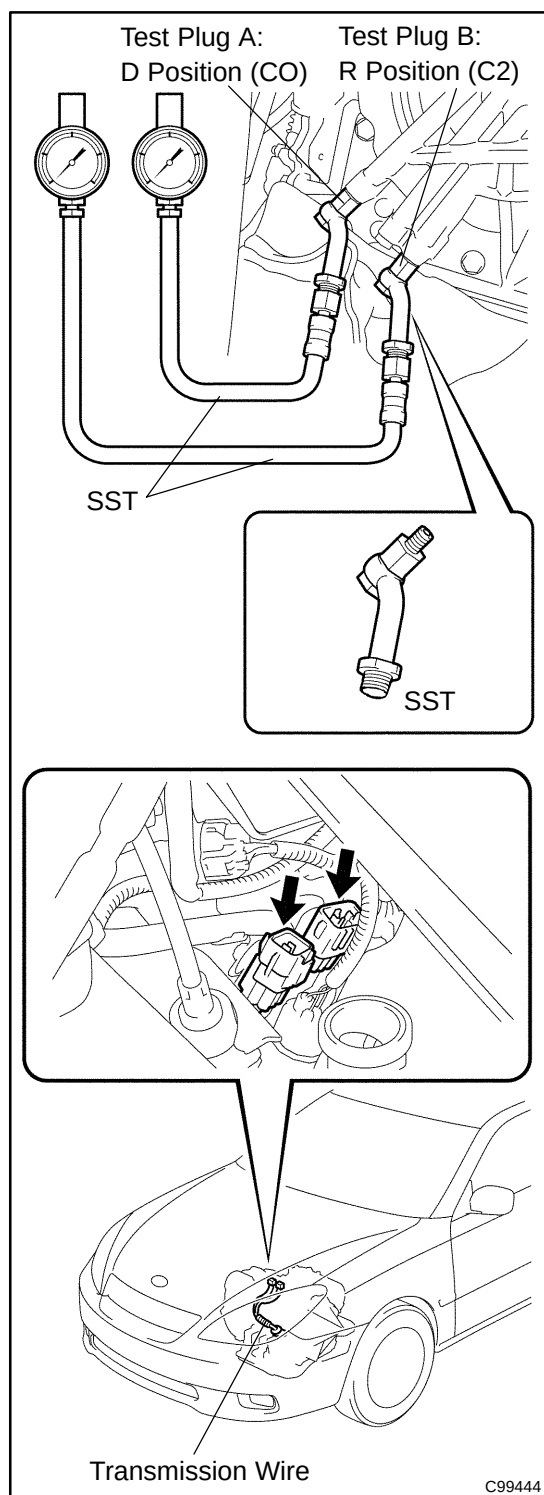
Problem	Possible cause
N → D time lag is longer	• Line pressure too low • Forward clutch worn • No. 1 one-way clutch not operating properly • U/D one-way clutch not operating • U/D brake worn
N → R time lag is longer	• Line pressure too low • Reverse clutch worn • 1st and reverse brake worn • U/D brake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

9. HYDRAULIC TEST

(a) Measure the line pressure.

NOTICE:

- **Do the test at the normal operation fluid temperature the 50 - 80°C (122 - 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 doing the test.**
- **Be careful to prevent SST's hose from interfering with the exhaust pipe.**
- **This check must be conducted after checking and adjusting engine.**
- **Do under condition that A/C is OFF.**
- **When being stalled, do not continue more than 10 seconds.**



- (1) Warm up the ATF.
- (2) Lift the vehicle up.
- (3) Remove 4 screws and 4 clips, and remove the engine under cover No.1.
- (4) Remove 2 bolts and 2 clips, and remove the front fender apron seal LH.
- (5) Remove 7 clips and remove radiator lower air deflector.
- (6) Remove 2 bolts off and remove the air cleaner inlet No.1.
- (7) Remove a bolt off and remove the air cleaner inlet No.1.

HINT:

Remove air cleaner, take 3 bolts off to raise the air cleaner case, and remove the air cleaner inlet No.1.

NOTICE:

Do not apply excessive force to the resonator.

- (8) Connect OBD II scan tool or hand-held tester to DLC3.
- (9) Remove the test plug A, install the SST and start engine.

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

NOTICE:

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

- (10) Using OBD II scan tool or hand-held tester, shift to D position and hold 3rd by active test, and measure the line pressure in idling.

Specified line pressure:

Condition	D position	kPa (kgf/cm ² , psi)
Idling	373 - 402	(3.8 - 4.1, 54 - 58)

- (11) Turn the ignition switch OFF.
- (12) Disconnect 2 connectors of transmission wire.

HINT:

Disconnect the 2 connectors only when performing the D position stall test.

- (13) Start engine.
- (14) Depress the brake pedal strongly, shift to D position, depress the accelerator pedal all the way down and check the line pressure in being stalled.

Specified line pressure:

Condition	D position	kPa (kgf/cm ² , psi)
Stall	931 - 1,030	(9.5 - 10.5, 135 - 149)

- (15) Turn the ignition switch OFF.
- (16) Remove the SST, install the test plug A.
- (17) Remove the test plug B, install the SST and start engine.

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

- (18) Connect 2 connectors of transmission wire, depress the brake pedal strongly, shift to R position and check the line pressure in idling and being stalled.

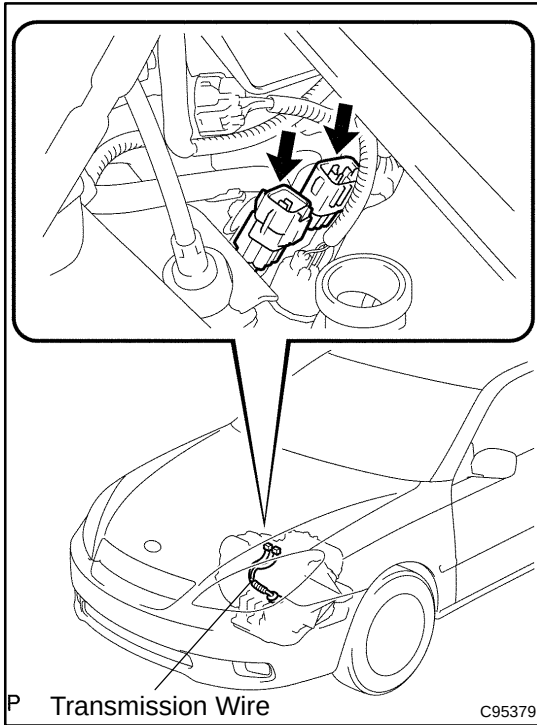
Specified line pressure:

Condition	R position kPa (kgf/cm ² , psi)
Idling	677 - 735 (6.9 - 7.5, 98 - 107)
Stall	1,775 - 1,961 (18.1 - 20.0, 257 - 284)

- (19) Remove the SST, install the test plug B.
(20) Clear the DTC.

Evaluation:

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



10. 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 2 connectors of transmission wire.
- (b) Drive with the transmission wire disconnected.
- Shifting the shift lever in the order of L, 2, 3, 4 and D to check whether the shifting condition changes the table below.

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

HINT:

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

- (c) Connect 2 connectors of transmission wire.
- (d) Clear the DTC.