

O/D OFF

Q10814

PRE-CHECK

1. DIAGNOSIS SYSTEM

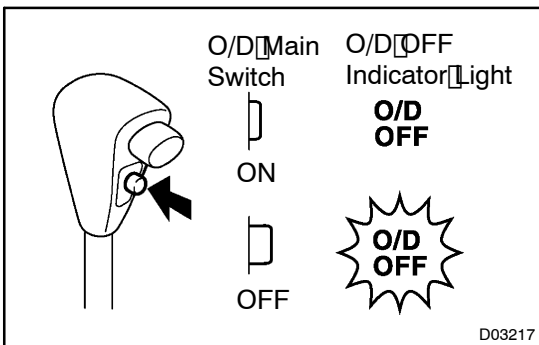
Description:

The automatic transmission has built-in self-diagnostic functions.

If a malfunction occurs in the system, the Engine & ECT ECU stores the trouble code in memory and the O/D OFF indicator light blinks to inform the driver. The DTC stored in memory can be read out by the following procedure.

HINT:

Warning and DTC can be read only when the O/D main switch is ON. If OFF, the O/D OFF indicator light will light up continuously and will not blink.



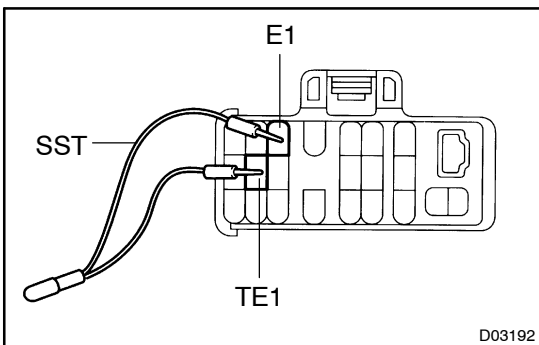
2. INSPECT O/D OFF INDICATOR LIGHT

(a) Turn the ignition switch ON.

(b) Check if the O/D OFF indicator light lights up when the O/D main switch is pushed out to OFF and goes off when the O/D main switch is pushed in to ON.

HINT:

If the O/D OFF indicator light does not light up or stay on all the time, carry out the check for "O/D OFF Indicator Light Circuit" on [page DI-37](#).



3. CHECK DTC

(a) Turn the ignition switch ON, but do not start the engine.

(b) Push in the O/D main switch to ON.

HINT:

Warning and DTCs can be read only when the O/D main switch is ON. If it is OFF, the O/D OFF indicator light will light continuously and will not blink.

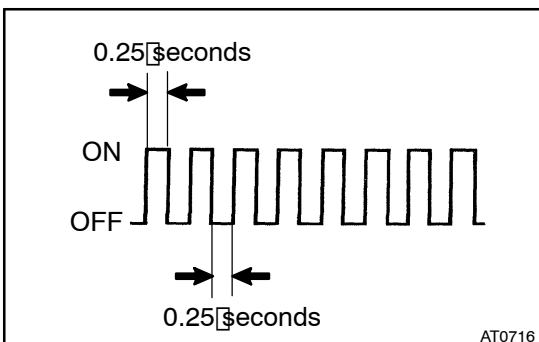
(c) Using SST, connect terminals TE1 and E1 of the check connector.

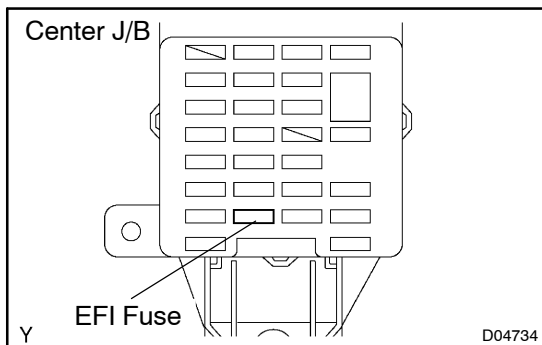
SST 09843-18020

(d) Read the DTC indicated by the number of times the O/D OFF indicator light blinks.

HINT:

If the system is operating normally, the light will blink 2 times per second.





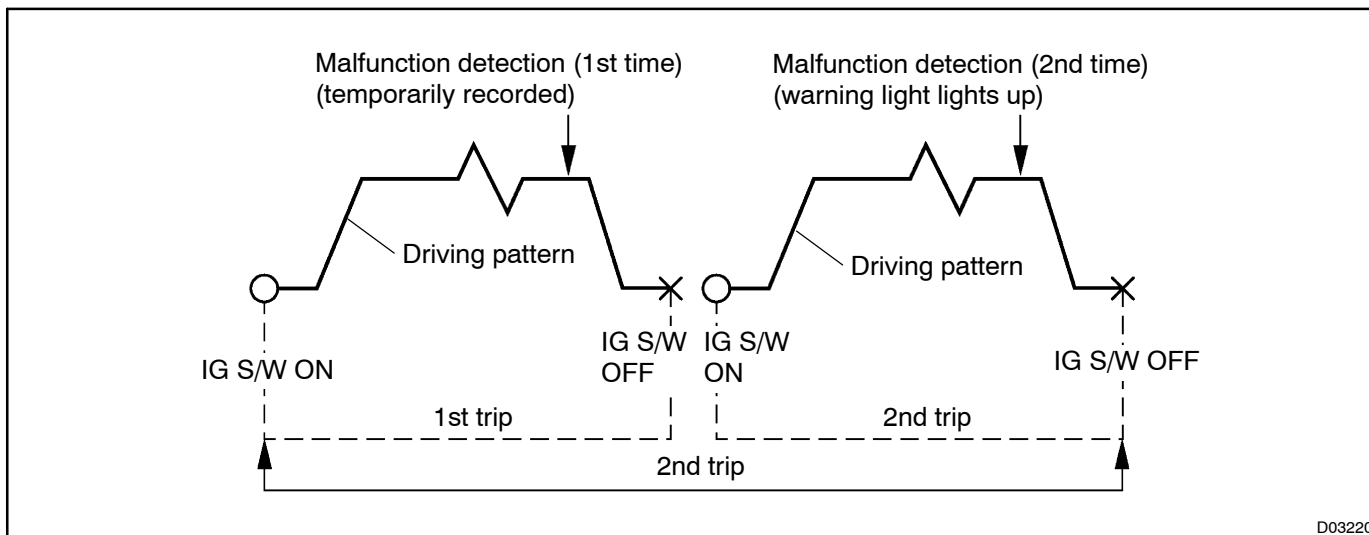
4. CANCEL DTC

After repairing of the trouble area, the DTC retained in the Engine & ECT ECU memory must be canceled out by removing the EFI fuse for 10 seconds or more, with the ignition switch OFF. Check that the normal code is output after connecting the fuse.

5. 2 TRIP DETECTION

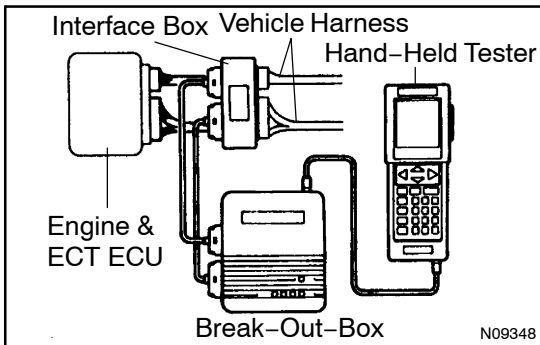
This indicates items for which "2 trip detection logic" is used. With this logic, when a logic malfunction is detected first, the malfunction is temporarily stored in the Engine & ECT ECU memory.

If the same case is detected again during the second drive test, this second detection causes the O/D OFF light to blink. The 2 trip repeats the same mode twice. (However, the IG switch must be turned OFF between the 1st trip and 2nd trip.)



HINT:

- If the malfunction returns to normal while a malfunction warning is being output, the O/D OFF indicator light stops blinking and goes off. However, the DTC is retained in memory until it is cleared from memory.
- If the diagnosis system outputs a DTC even though the O/D OFF indicator is not blinking, there is intermittent trouble. Check all the connections in the circuits corresponding to that code.
- Codes 62, 63 and 64 are limited to short or open circuits in the electrical system comprised of the solenoids, wire harnesses, and connectors. The Engine & ECT ECU is unable to detect mechanical trouble (sticking, for example) in the solenoid valves.
- If the speed sensors happen to fail simultaneously, the Engine & ECT ECU will neither alert the driver by blinking the O/D OFF indicator nor record any DTC. It will, however, decide that the vehicle can be driven only in 1st and none of the other gears, and shifting upward will be prohibited.



6. STANDARD VALUE OF ENGINE & ECT ECU TERMINALS

Using break-out-box and hand-held tester, measure the terminal values of the Engine & ECT ECU.

- (1) Hook up the break-out-box and hand-held tester to the vehicle.
- (2) Read the Engine & ECT ECU input/output values by following the prompts on the tester screen.

HINT:

Hand-held tester has "Snapshot" function. This record the measured values and is effective in the diagnosis of intermittent problems.

Please refer to the hand-held tester/break-out-box operator's manual for further details.

7. CHECK TERMINAL TT OUTPUT VOLTAGE

When a voltmeter is connected to the check connector, the following items can be checked.

- Throttle position sensor signal
- Brake signal
- Shift position signal

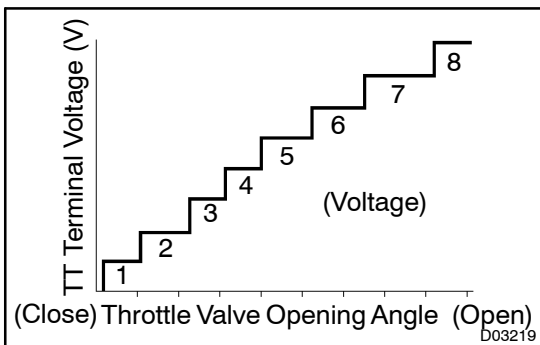
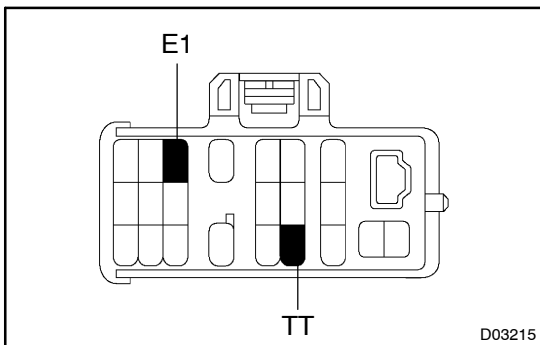
- (a) Voltmeter connection.

Connect the positive (+) probe of the voltmeter to terminal TT and the negative (–) probe to terminal E1 of the check connector.

HINT:

If a voltmeter with small internal resistance is used, the correct voltage will not be indicated, so use a voltmeter with an internal resistance of at least 10 k Ω /V.

- (b) Turn the ignition switch to ON (do not start the engine).



- (c) Check the throttle position sensor signal.
Check if the voltage changes from approximately 0 V to approximately 8 V when the accelerator pedal is gradually depressed from the fully closed position.
- (d) Check the brake signal (lock-up cut signal).
 - (1) Open the throttle valve fully to apply approximately 8 V to terminal TT.
 - (2) In this condition, check terminal TT voltage when the brake pedal is depressed and released.

TT terminal voltage:

0 V (When brake pedal is depressed)

8 V (When brake pedal is released)

- (e) Start the engine.
- (f) Check the shift position signal (vehicle speed above 60 km/h or 37 mph).

Check up-shifting together with terminal TT voltage.

HINT:

Check for light shocks from up-shifting and for changes in the tachometer.

Gear Position	TT Terminal Voltage (V)
1st	0
2nd	2
3rd	4
3rd Lock-up	5
O/D	6
O/D Lock-up	7

If terminal TT output voltage check cannot be done, check TT terminal circuit (See page DI-49).

8. ROAD TEST

NOTICE:

Do the test at normal operating ATF temperature 50 – 80 °C (122 – 176 °F).

(a) D range test (NORM and PWR pattern):

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

(1) Check up-shift operation.

1 → 2, 2 → 3 and 3 → O/D up-shift takes place, at the shift point shown in the automatic shift schedule (See page SS-5).

HINT:

- O/D Gear Up-shift Prohibition Control (1. Coolant temp. is 55 °C (131 °F) or less, when the vehicle speed is 30 km/h (50 mph) or more, however the prohibition of the O/D gear up-shift is reset independent of the coolant temp.. 2. If there is a 10 km/h (6 mph) difference between the set cruise control speed and vehicle speed.)
 - O/D Gear Lock-up Prohibition Control (1. Brake pedal is depressed. 2. Coolant temp. is 60 °C (140 °F) or less. 3. Throttle valve fully opened.)
- (2) Check for shift shock and slip.
Check for shock and slip at the 1 → 2, 2 → 3 and 3 → O/D up-shifts.
- (3) Check for abnormal noises and vibration.
Run at the D range lock-up or O/D 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, etc.

(4) Check kick-down operation.

While running in the D range, 2nd, 3rd and O/D gears, check to see that the possible kick-down vehicle speed limits for 2 → 1, 3 → 2 and O/D → 3 kick-downs conform to those indicated on the automatic shift schedule (See page SS-5).

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

(6) Check the lock-up mechanism.

- Drive in D range, O/D gear, at a steady speed (lock-up ON) of about 60 km/h (37 mph).
- Lightly depress the accelerator pedal and check that the engine speed does not change abruptly.

If there is a big jump in engine speed, lock-up mechanism is not functioning.

(b) 2 range test:

Shift into the 2 range 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 SS-5).

HINT:

There is no O/D up-shift and lock-up in the 2 range.

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

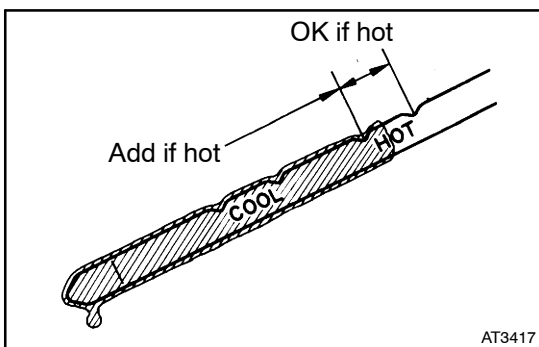
- (e) P range test:
Stop the vehicle on a grade (more than 5°) and after shifting into the P range, release the parking brake. Then, check to see that the parking lock pawl holds the vehicle in place.

9. BASIC INSPECTION

- (a) Check the fluid level.

HINT:

- Drive the vehicle so that the engine and transmission are at normal operating temperature.
Fluid temp.: 70 – 80 °C (158 – 176 °F)
- Only use the COOL range on the dipstick as a rough reference when the fluid is replaced or the engine does not run.



- (1) Park the vehicle on a level surface and set the parking brake.
- (2) With the engine idling and the brake pedal depressed, shift the shift lever into all ranges from P to L range and return to P range.
- (3) Pull out the dipstick and wipe it clean.
- (4) Push it back fully into the pipe.
- (5) Pull it out and check that the fluid level is in the HOT range.

If the level is not within the HOT range, add new fluid.

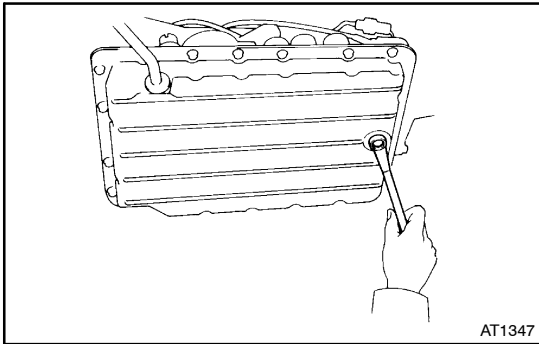
Fluid type: ATF D-II or DEXRON®III (DEXRON®II)

NOTICE:

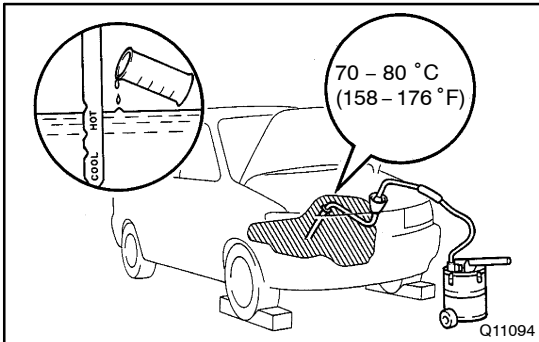
Do not overfill.

- (b) Check the fluid condition.

If the fluid smells burnt or is black, replace it.



- (c) Replace the ATF.
- (1) Remove the drain plug and drain the fluid.
 - (2) Reinstall the drain plug securely.



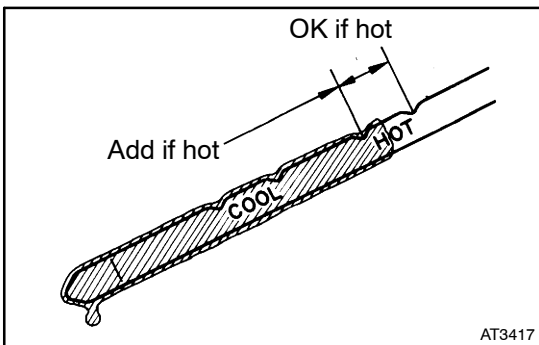
- (3) With the engine OFF add new fluid through the oil filler pipe.

Fluid type: ATF D-II or DEXRON®III (DEXRON®II)

Capacity:

Drain and refill: 2.4 liters (2.5 US qts, 2.1 Imp. qts)

- (4) Start the engine and shift the shift lever into all ranges from P to L range and then shift into P range.



- (5) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.
- (6) Check the fluid level at the normal operating temperature, 70 – 80 °C (158 – 176 °F), and add as necessary.

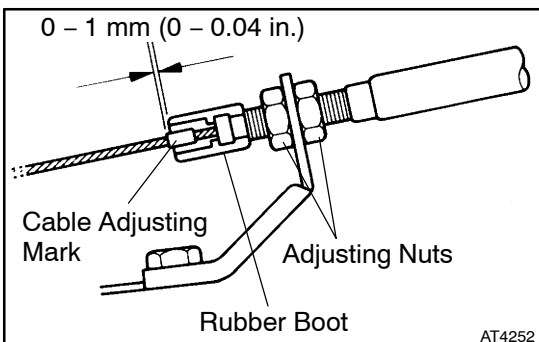
NOTICE:

Do not overfill.

- (d) Check the fluid leaks.

Check for leaks in the transmission.

If leaks occurs, it is necessary to repair or replace O-rings, FIPGs, oil seals, plugs or other parts.



- (e) Inspect and adjust the throttle cable.

- (1) Check that the accelerator pedal is fully released.
- (2) Check that the inner cable is not slack.
- (3) Measure the distance between the end of the boot and cable adjusting mark on the cable.

Standard distance: 0 – 1 mm (0 – 0.04 in.)

If the distance is not standard, adjust the cable with the adjusting nuts.

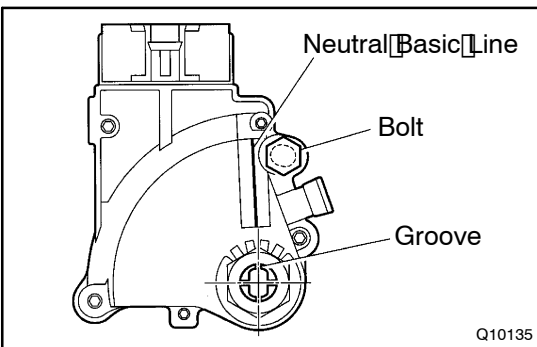
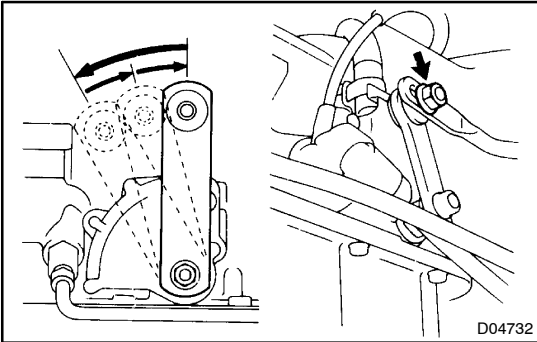
- (f) Inspect and adjust the shift lever range. When shifting the shift lever from the N range to other ranges, check that the lever can be shifted smoothly and accurately to each range and that the range indicator is not aligned with the correct range.

If the indicator is not aligned with the correct range, carry out the following adjustment procedures.

- (1) Loosen the nut on the shift lever.
- (2) Push the control shaft fully rearward.
- (3) Return the control shaft lever 2 notches to N range.
- (4) Set the shift lever to N range.
- (5) While holding the shift lever lightly toward the R range side, tighten the shift lever nut.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

- (6) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D range and reverses when shifting it to the R range.



- (g) Inspect and adjust the neutral start switch. Check that the engine can be started with the shift lever only in the N or P range, but not in other ranges.

If it is not as stated above, carry out the following adjustment procedures.

- (1) Loosen the neutral start switch bolt and set the shift lever to the N range.
- (2) Align the groove with neutral basic line.
- (3) Hold in range and tighten the bolt.

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

- (4) For continuity inspection of the neutral start switch, [See page DI-34.](#)

- (h) Check the idle speed range.

Idle speed (In N range and air conditioner OFF):
800 ± 50 rpm

10. MECHANICAL SYSTEM TESTS

- (a) Measure the stall speed.

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

NOTICE:

- Do the test at normal operating fluid temperature 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 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 a tachometer to the engine.
- (3) Fully apply the parking brake.
- (4) Keep your left foot pressing firmly on the brake pedal.
- (5) Start the engine.

- (6) Shift into the D range. Depress all the way down on the accelerator pedal with your right foot. Quickly read the stall speed at this time.

Stall speed: 2,300 ± 150 rpm

- (7) Do the same test in R range.

Stall speed: 2,300 ± 150 rpm

Evaluation:

Problem	Possible cause
(a) Stall speed low in D and R ranges	<ul style="list-style-type: none"> • Engine output may be insufficient • Stator one-way clutch not operating properly <p>HINT: If more than 600 rpm below the specified value, the torque converter could be faulty.</p>
(b) Stall speed high in D range	<ul style="list-style-type: none"> • Line pressure too low • Forward clutch slipping • No. 2 one-way clutch not operating properly • O/D one-way clutch not operating properly
(c) Stall speed high in R range	<ul style="list-style-type: none"> • Line pressure too low • Direct clutch slipping • 1st & reverse brake slipping • O/D one-way clutch not operating properly
(d) Stall speed high in D and R ranges	<ul style="list-style-type: none"> • Line pressure too low • Improper fluid level • O/D one-way clutch not operating properly

- (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 condition of the O/D direct clutch, forward clutch, direct clutch and 1st & reverse brake.

NOTICE:

- **Do the test at normal operating fluid temperature 50 – 80 °C (122 – 176 °F).**
- **Be sure to allow 1 minute interval between 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 (In N range and air conditioner OFF): 800 ± 50 rpm

- (3) Shift the shift lever from N to D range. 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

- (4) In the same manner, measure the time lag for N → R.

Time lag: 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	<ul style="list-style-type: none"> • Line pressure too low • Forward clutch worn • O/D one-way clutch not operating properly
N → R time lag is longer	<ul style="list-style-type: none"> • Line pressure too low • Direct clutch worn • 1st & reverse brake worn • O/D one-way clutch not operating properly

11. HYDRAULIC TEST

Measure the line pressure.

NOTICE:

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

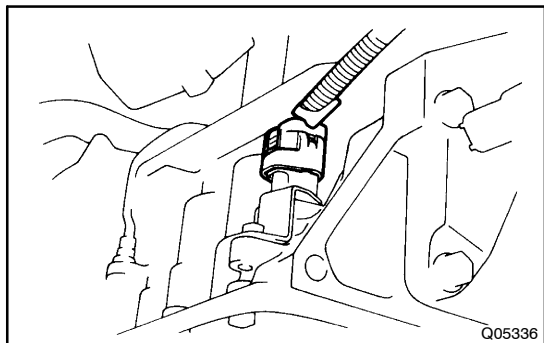
Specified line pressure:

Condition	D range kPa (kgf/cm ² , psi)	R range kPa (kgf/cm ² , psi)
Idling	392 – 431 (4.0 – 4.4, 57 – 63)	510 – 569 (5.2 – 5.8, 74 – 82)
Stall	1,216 – 1,363 (12.4 – 13.9, 176 – 198)	1,481 – 1,726 (15.1 – 17.6, 215 – 250)

If the measured pressures are not up to the specified values, recheck the throttle cable adjustment and re-test.

Evaluation

Problem	Possible cause
If the measured values at all ranges are higher.	<ul style="list-style-type: none"> • Throttle cable out of adjustment • Throttle valve defective • Regulator valve defective
If the measured values at all ranges are lower.	<ul style="list-style-type: none"> • Throttle cable out of adjustment • Throttle valve defective • Regulator valve defective • Oil pump defective • O/D direct clutch defective
If pressure is low in the D range only.	<ul style="list-style-type: none"> • D range circuit fluid leaks • Forward clutch defective
If pressure is low in the R range only.	<ul style="list-style-type: none"> • R range circuit fluid leakage • Direct clutch defective • 1st & reverse brake defective



12. MANUAL SHIFTING TEST

HINT:

With this test, it can be determined whether the trouble is within the electrical circuit or is a mechanical problem in the transmission.

- (a) Disconnect the solenoid wire.
- (b) Inspect the manual driving operation.

Check that the shift and gear positions correspond with the table below.

While driving, shift through the L, 2 and D ranges. Check that the gear change corresponds to the shift range.

Shift Range	Gear Position
D	O/D
2	3rd
L	1st
R	Reverse
P	Pawl Lock

HINT:

If the L, 2 and D range gear positions are difficult to distinguish, do the above road test.

If any abnormality is found in the above test, the problem is in the transmission itself.

- (c) Connect the solenoid wire.
- (d) Cancel out the DTC (See page DI-3).