TROUBLESHOOTING

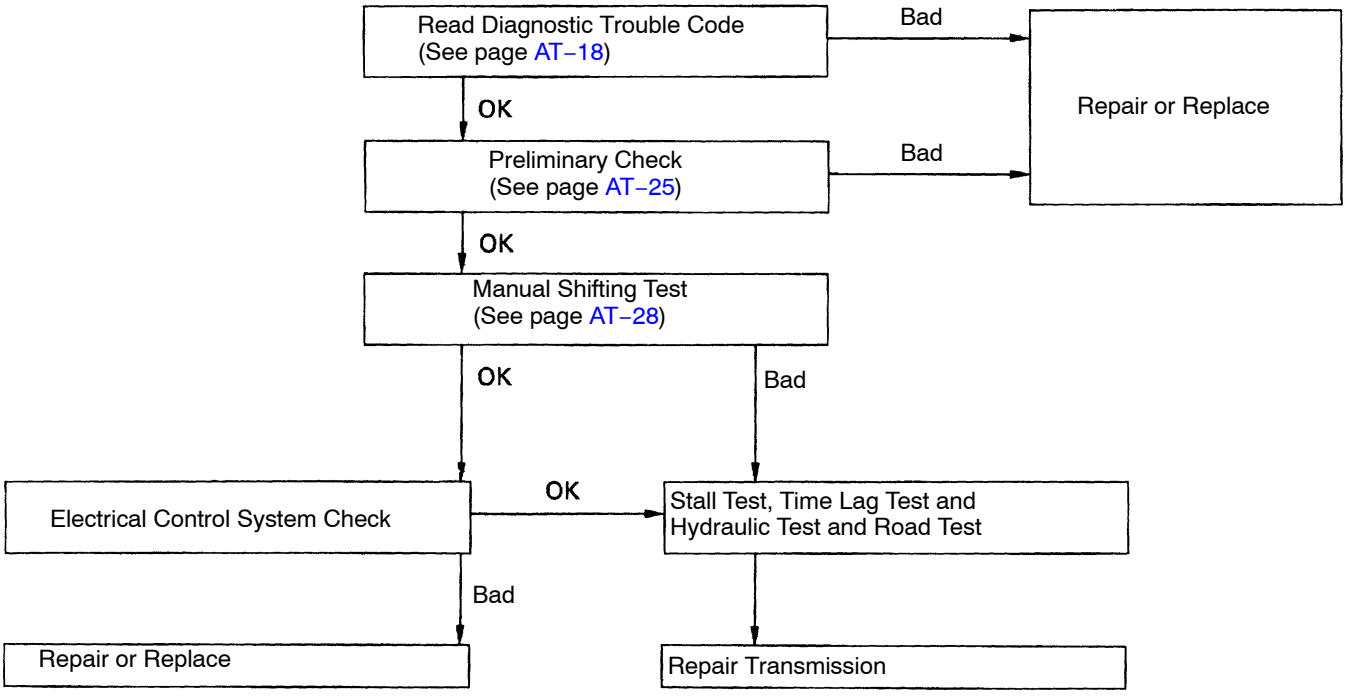
Trouble occurring in the electronically controlled transmission can stem from one of three sources: the engine, the electronically controlled transmission electronic control unit or the transmission itself. Before troubleshooting, determine in which these three sources the problem lies, and begin troubleshooting with the simplest operation, gradually working up in order of difficulty.

BASIC TROUBLESHOOTING

AT06F–03

Before troubleshooting an electronically controlled transmission, first determine whether the problem is electrical or mechanical. To do this, just refer to the basic troubleshooting flow–chart provided below.

If the cause is already known, using the basic troubleshooting chart below a long with the general troubleshooting chart on the following pages should speed the procedure.



V01587

NOTICE: Refer to '94 A442F Automatic Transmission Repair Manual when * mark appears in the column for page numbers.

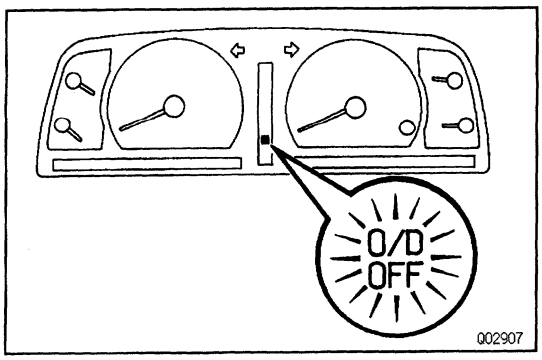
Problem	Possible cause	Remedy	Page
Fluid discolored or smells burnt	Fluid contaminated Torque converter clutch faulty Transmission faulty	Replace fluid Replace torque converter clutch Disassemble and inspect transmission	AT–25 AT–70 *
Vehicle does not move in any forward position or reverse	Manual linkage out of adjustment Valve body or primary regulator faulty Parking lock pawl faulty Torque converter clutch faulty Converter drive plate broken Oil pump intake screen blocked Transmission faulty	Adjust linkage Inspect valve body Inspect parking lock pawl Replace torque converter clutch Replace drive plate Clean screen Disassemble and inspect transmission	AT–26 * * AT–70 AT–71 * *
Shift lever position incorrect	Manual linkage out of adjustment Manual valve and lever faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–26 * *
Harsh engagement into any drive position	Throttle cable out of adjustment Valve body or primary regulator faulty Accumulator pistons faulty Transmission faulty	Adjust throttle cable Inspect valve body Inspect accumulator pistons Disassemble and inspect transmission	AT–26 * * * *
Delayed 1–2, 2–3 or 3–0/13 up–shift, or down–shift from OID–3 or 3–2 and shifts back to O/D or 3	Electronic control faulty Valve body faulty Solenoid valve faulty	Inspect electronic control Inspect valve body Inspect solenoid valve	AT–29 * AT–38, 39
Slips on 1–2, 2–3 or 3–0/1) up–shift, or slips or shudders on acceleration	Manual linkage out of adjustment Throttle cable out of adjustment Valve body faulty Solenoid valve faulty Transmission faulty	Adjust linkage Adjust throttle cable inspect valve body Inspect solenoid valve Disassemble and inspect transmission	AT–26 AT–26 * AT–38, 39 *
Drag, binding or tie–up on 1–2, 2–3 or 3–OID up–shift	Manual linkage out of adjustment Valve body faulty Transmission faulty	Adjust linkage Inspect valve body Disassemble and inspect transmission	AT–26 * *

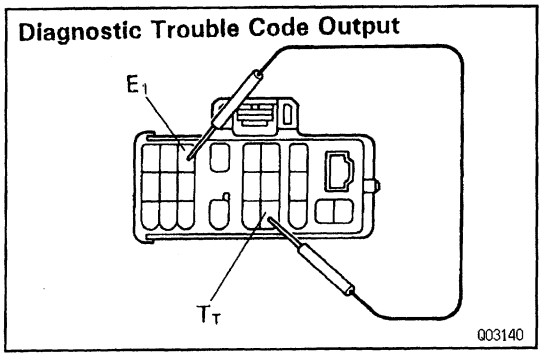
V01539

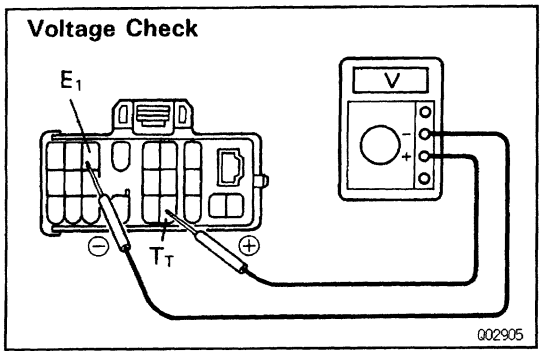
NOTICE: Refer to '94 A442F Automatic Transmission Repair Manual when * mark appears in the column for page numbers.

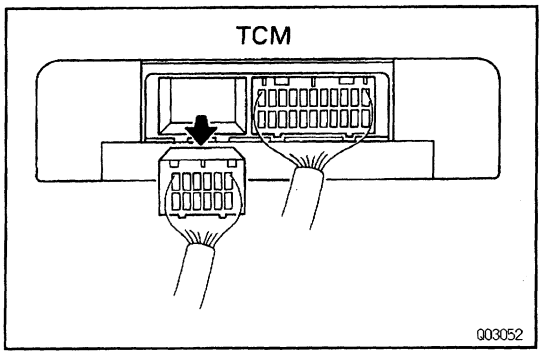
Problem	Possible cause	Remedy	Page
No lock–up in 3rd or O/D	Electronic control faulty Valve body faulty Solenoid valve faulty Transmission faulty	Inspect electronic control inspect valve body Inspect solenoid valve Disassemble and inspect transmission	AT–29 * AT–38, 39
Harsh dawn–shift	Throttle cable out of adjustment Throttle cable and cam faulty Accumulator pistons faulty Valve body faulty Transmission faulty	Adjust throttle cable Inspect throttle cable and cam Inspect accumulator pistons Inspect valve body Disassemble and inspect transmission	AT–26 AT–26
No down–shift when coasting	Valve body faulty Solenoid valve faulty Electronic control faulty	Inspect valve body Inspect solenoid valve Inspect electronic control	AT–38, 39 AT–29
Down–shift occurs too quickly or too late while coasting	Throttle cable faulty Valve body faulty Transmission faulty Solenoid valve faulty Electronic control faulty	Inspect throttle cable Inspect valve body Disassemble and inspect transmission Inspect solenoid valve Inspect– electronic control	AT–26 AT–38, 39 AT–29
No 0/0–3, 3–2 or 2–1 kick–down	Solenoid valve faulty Electronic control faulty Valve body faulty	Inspect solenoid valve Inspect electronic control Inspect valve body	AT–38, 39 AT–29
No engine braking 2 or L position	Solenoid valve faulty Electronic control faulty Valve body faulty Transmission faulty	Inspect solenoid valve Inspect electronic control Inspect valve body Disassemble and inspect transmission	AT–38, 39 AT–29 *
Vehicle does not hold in P	Manual linkage out of adjustment Parking lock pawl cam and spring faulty	Adjust linkage Inspect cam and spring	AT–26 AT–26

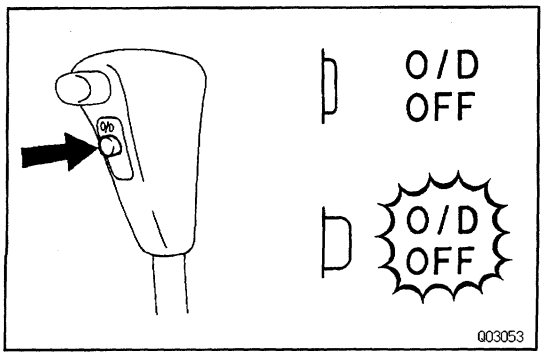
V02185











ATORB–01

DIAGNOSIS SYSTEM

DESCRIPTION

1. A self–diagnosis function is built into the electrical control system. Warning is indicated by the overdrive OFF indicator light.

HINT: Warning and diagnostic trouble codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light is lit continuously and will not blink.

(a) If a malfunction occurs within the vehicle speed sensors (No.1 or 2), solenoids (No.1 or 2), throttle sensor or engine speed signal, the overdrive OFF indicator light will blink to warn the driver.

However, there will be no warning of a malfunction with lock–up solenoid.

(b) The diagnostic trouble code can be read by the number of blinks of the overdrive OFF indicator light when terminals TT and E, are connected. (See page AT –18)

(c) The throttle position sensor or brake signal are not indicated, but inspection can be made by checking the voltage at terminal TT of the data link connector 1.

(d) The signals to each gear can be checked by measuring the voltage at terminal TT of the data link connector 1 while driving.

2. The diagnostic trouble code is retained in memory by the TCM and due to back–up voltage, is not canceled out when the engine is turned off. Consequently, after repair, it is necessary to turn the ignition switch off and remove the DOME fuse (10A) or disconnect the TCM connector to cancel out the diagnostic trouble code. (See page AT–20)

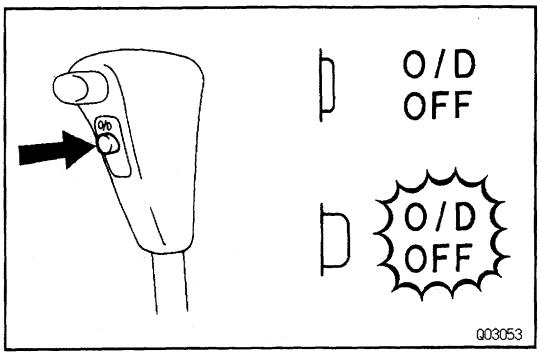
HINT:

- Low battery positive voltage will cause faulty operation of the diagnosis system. Therefore, always check the battery first.
- Use a voltmeter and ohmmeter that have an impedance of at least 10 kΩ/V.

CHECK “O/D OFF” INDICATOR LIGHT

1. Turn the ignition switch ON.
2. The “0/D OFF” light will come on when the O/D switch is placed at OFF.
3. When the O/D switch is set to ON, the “0/D OFF” light should go out.

If the “O/D OFF” light flashes when the 0/D switch is set to ON, the electronic control system is faulty.

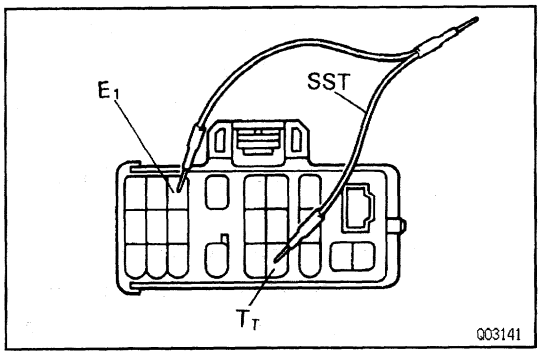


READ DIAGNOSTIC TROUBLE CODE

1. TURN IGNITION SWITCH AND O/D SWITCH TO ON

Do not start the engine.

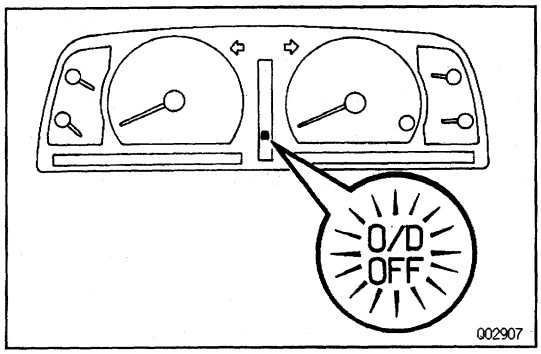
HINT: Warning and diagnostic trouble codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light will light continuously and will not blink.



2. CONNECT T_T AND E_1, TERMINALS OF CHECK CONNECTOR

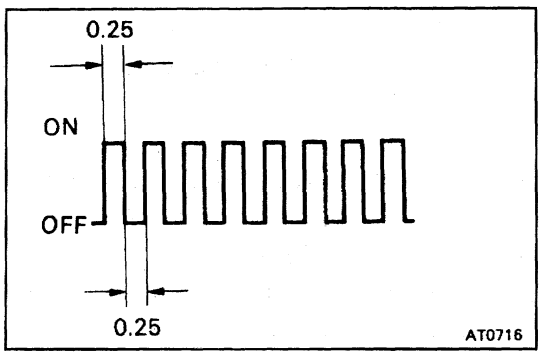
Using SST, connect terminals TT and E, of the data link connector 1.

SST 09843–18020



3. READ DIAGNOSTIC TROUBLE CODE

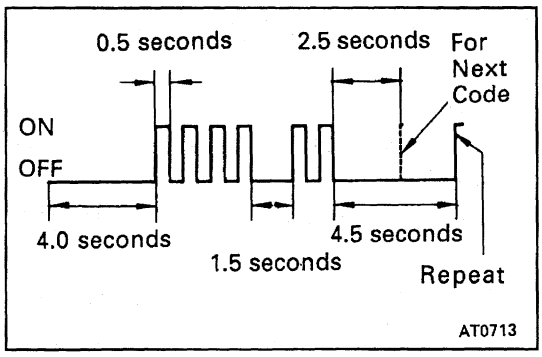
Read the diagnostic trouble code as indicated by the number of times the 0/D OFF light flashes.



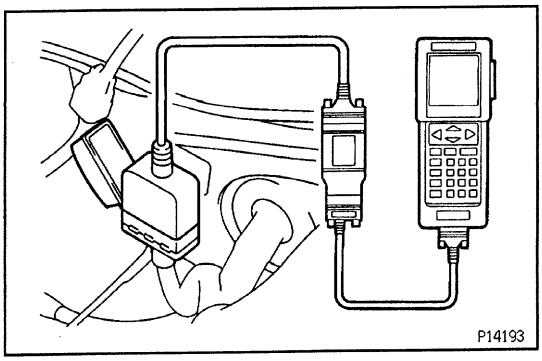
Diagnostic Trouble Code Indication:

- If the system is operating normally, the light will flash 2 times per second.
- In the event of a malfunction, the light will flash 1 time per second. The number of blinks will equal the first number and, after 1.5 seconds pause, the second number of the 2 digit diagnostic trou–ble code. If there are 2 or more codes, there will be a 2.5 seconds pause between each.

  HINT: In the event of several trouble codes occurring simultaneously, indication will begin from the smaller value and continue to the larger.



4. REMOVE SST



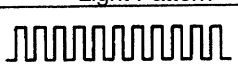
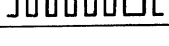
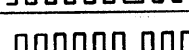
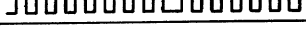
ECM DATA MONITOR USING TOYOTA

HAND–HELD–TESTER

1. Hook up the TOYOTA hand–held–tester to the DLC 1.
2. Monitor the ECM data by following the prompts on the tester screen.

HINT: TOYOTA hand –hsld–tester has a “Snapshot” function which records the monitored data.
Please refer to the TOYOTA hand – held – tester operator’s manual.

DIAGNOSTIC TROUBLE CODES

Code No.	Light Pattern	Diagnosis System
–		Normal
41		Severed throttle position sensor or short circuit– severed wire harness or short circuit
42		Defective No. 1 vehicle speed sensor (in combination meter)– severed wire harness or short circuit
61		Defective No. 2 vehicle speed sensor (in ATM) – severed wire harness or short circuit
62		Severed No. 1 solenoid or short circuit– severed wire harness or short circuit
63		Severed No. 2 solenoid or short circuit– severed wire harness or short circuit
64		Severed lock–up solenoid or short circuit– severed wire harness or short circuit
65		Severed timing solenoid or short circuit– severed wire harness or short circuit
86		Severed engine speed sensor or short circuit– severed wire harness or short circuit
88		Severed ECM and TCM or short circuit– severed wire harness or short circuit

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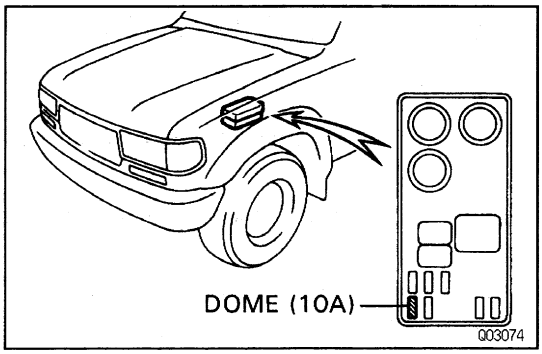
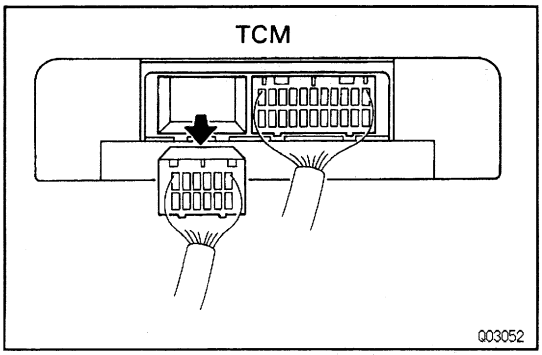
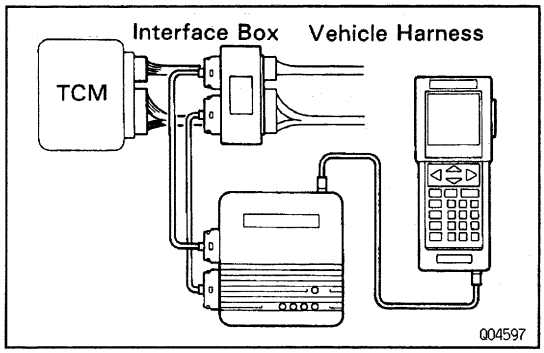
V02070

HINT: If codes 62, 63, 64, or 65 appear, there is an electrical malfunction in the solenoid.
Causes due to mechanical failure, such as a stuck valve, will not appear.







CANCEL OUT DIAGNOSTIC TROUBLE CODE

1. After repair of the trouble area, the diagnostic trouble code retained in memory by the TCM must be canceled by removing the DOME fuse (11 0A) for 10 seconds or more, depending on ambient temperature (the lower the temperature, the longer the fuse must be left out) with the ignition switch OFF.
HINT:

- Cancellation can be also done by removing the battery negative (–) terminal, but in this case other memory systems will be also canceled out.
- The diagnostic trouble code can be also canceled out by disconnecting the TCM connector.
- If the diagnostic trouble code is not canceled out, it will be retained by the TCM and appear along with a new code in event of future trouble.

2. After cancellation, perform a road test to confirm that a “normal code” is now read on the O/D OFF light.

TCM TERMINALS STANDARD VALUE

TCM TERMINAL VALUES
MEASUREMENT BY USING TOYOTA BREAK–OUT –BOX AND TOYOTA HAND–HELD–TESTER

1. Hook up the TOYOTA brake–out–box and TOYOTA hand–held–tester to the vehicle.
2. Read the TCM input/output values by following the prompts on the tester screen.
HINT: TOYOTA hand–held–tester has “Snapshot” function. This record the measured values and is effective in the diagnosis of intermittent problems.
Please refer to the TOYOTA hand – held – tester/ TOYOTA break – out – box operator’s manual for furher details.

TROUBLESHOOTING FLOW–CHART

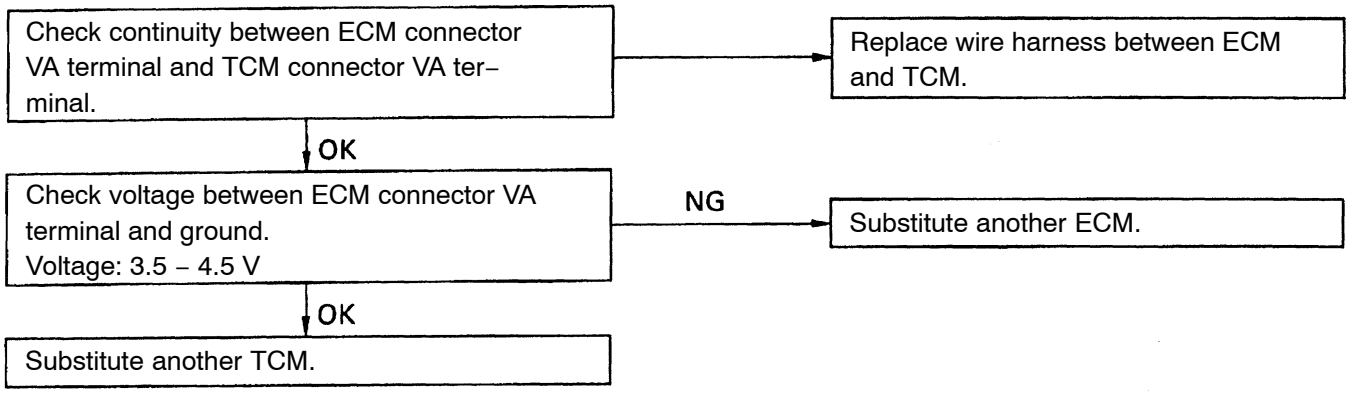
AT09H–02

HINT:

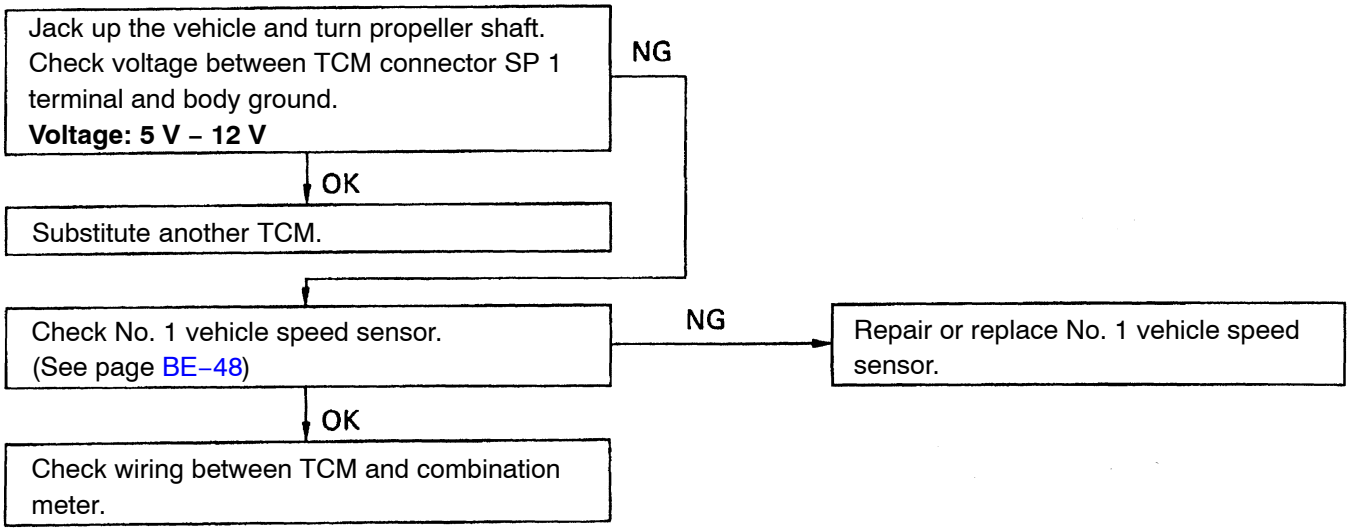
- If diagnostic trouble code Nos. 41, 42, 61, 62, 63, 64, 65, 86, 88 and are output, the overdrive OFF indicator light will begin to blink immediately to warn the driver. However, an impact or shock may cause the blinking to stop; but the code will still be retained in the TCM memory until canceled out.
- There is no warning for diagnostic trouble code No.64 and 65.
- In the event of a simultaneous malfunction of both No.1 and No.2 vehicle speed sensors, no diagnostic trouble code will appear and the fail–safe system will not function. However, when driving in the D position, the transmission will not up–shift from first gear, regardless of the vehicle speed.

Diagnostic trouble Code 41 (Throttle position sensor circuitry)

Check continuity between ECM connector NG

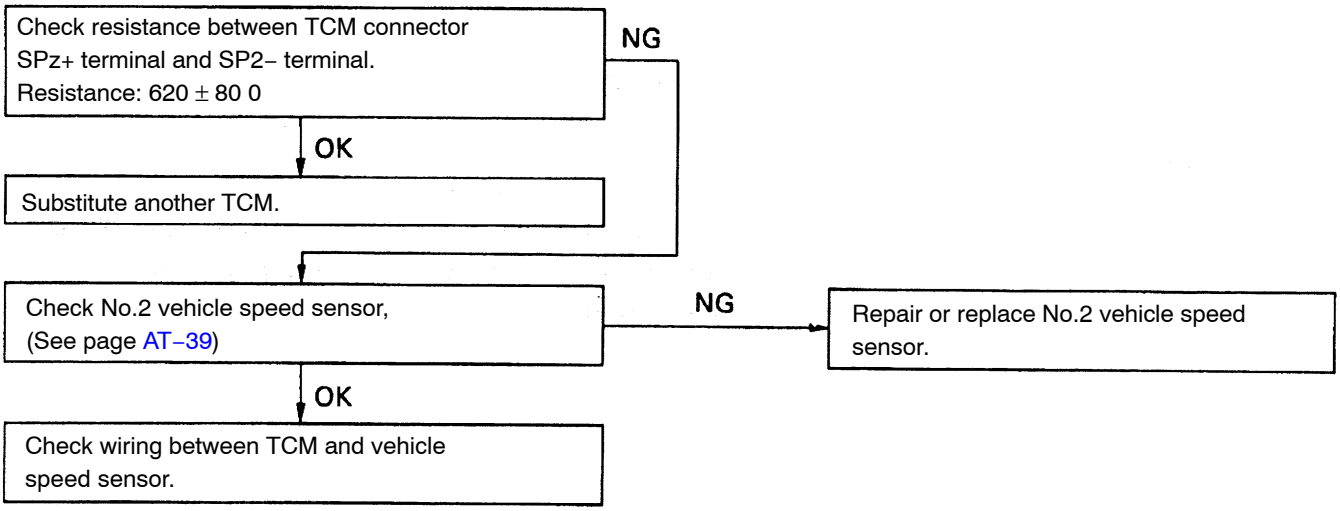


Diagnostic trouble Code 42 (No. 1 vehicle speed sensor circuitry)

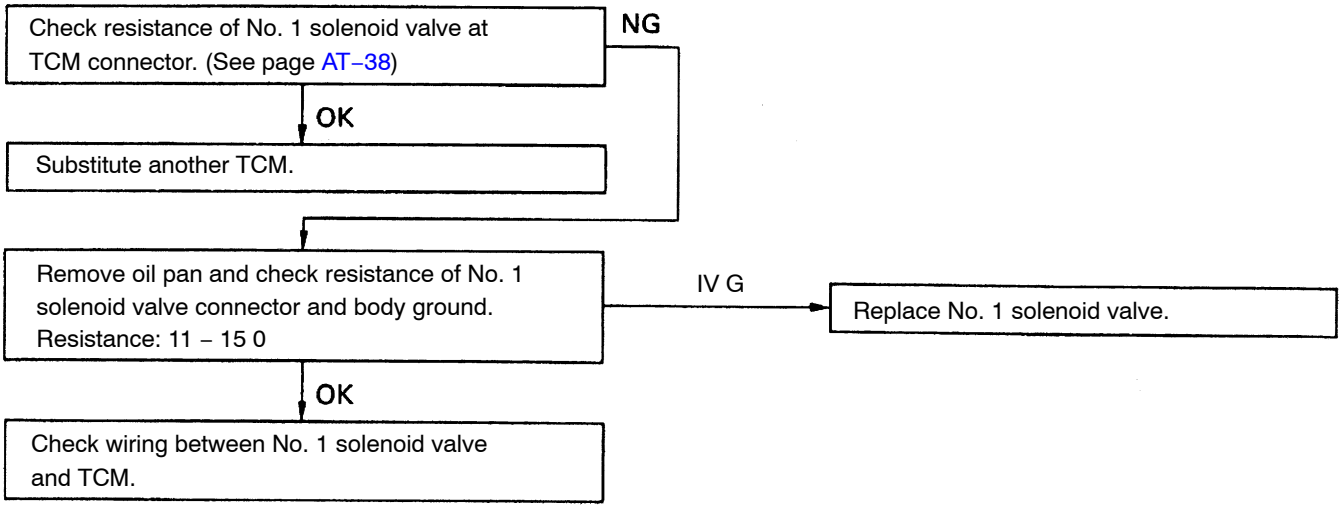


V02071

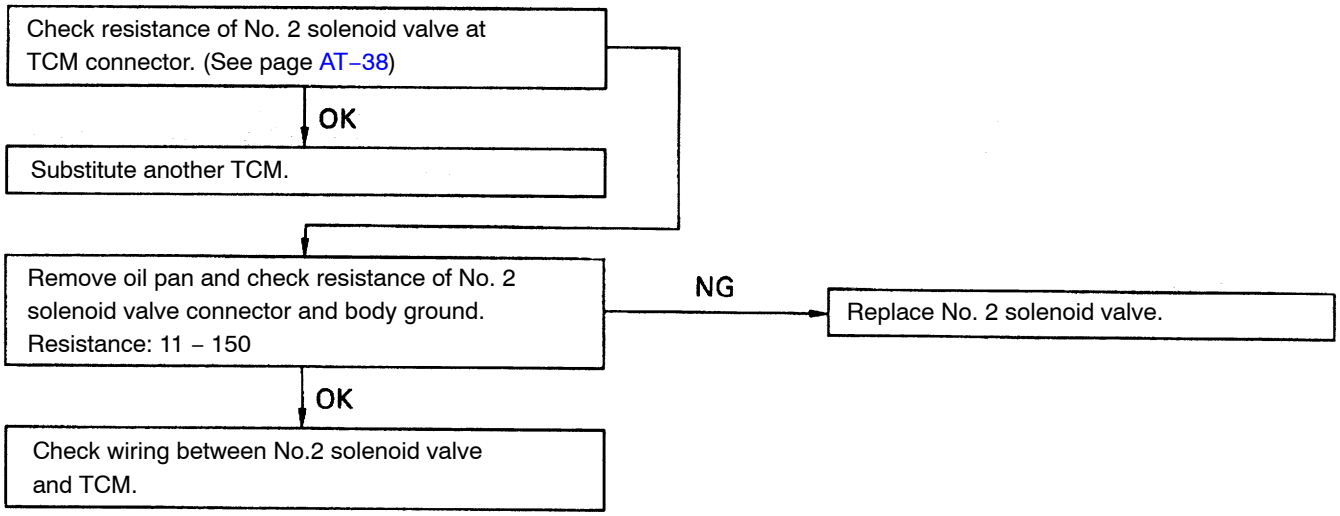
Diagnostic trouble Code 61 (No.2 vehicle speed sensor circuitry)



Diagnostic trouble Code 62 (No. 1 solenoid valve circuitry)

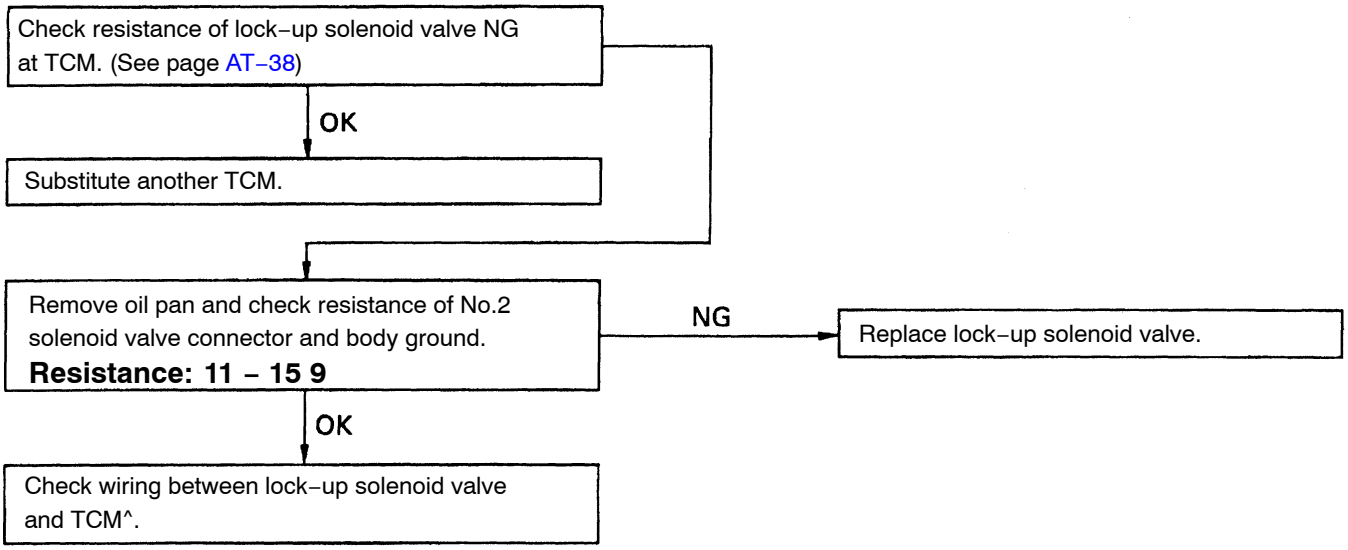


Diagnostic trouble Code 63 (No.2 solenoid valve circuitry)

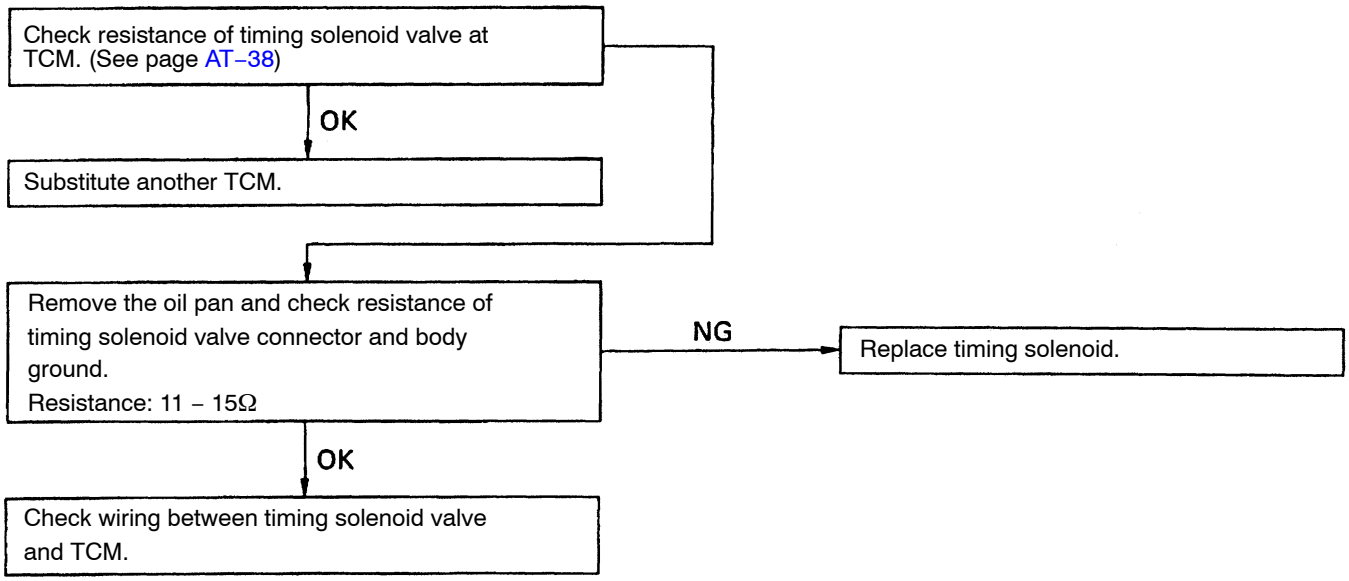


V02072

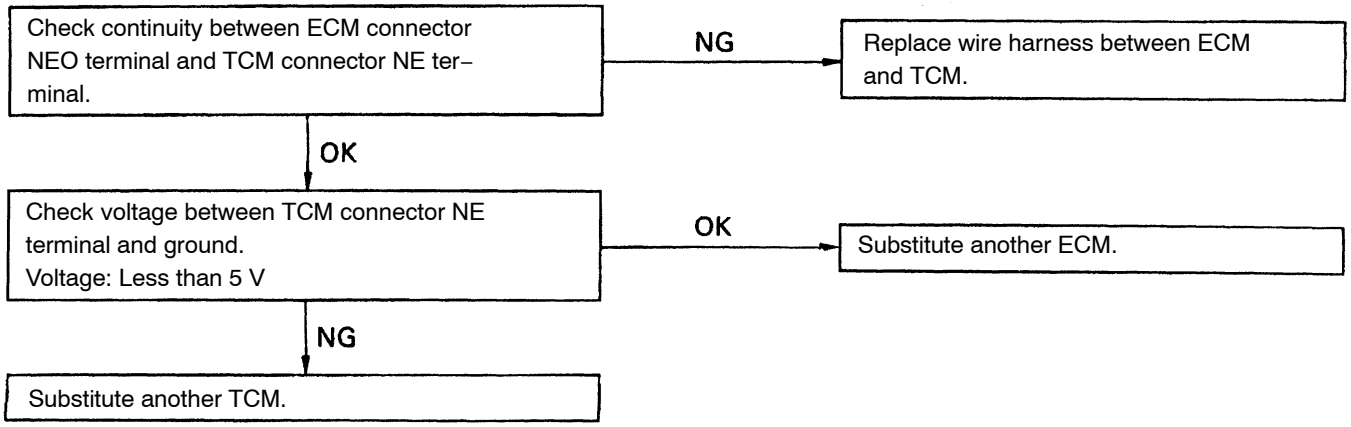
Diagnostic trouble Code 64 (Lock–up solenoid valve circuitry)



Diagnostic trouble Code 65 (Timing solenoid valve circuitry)

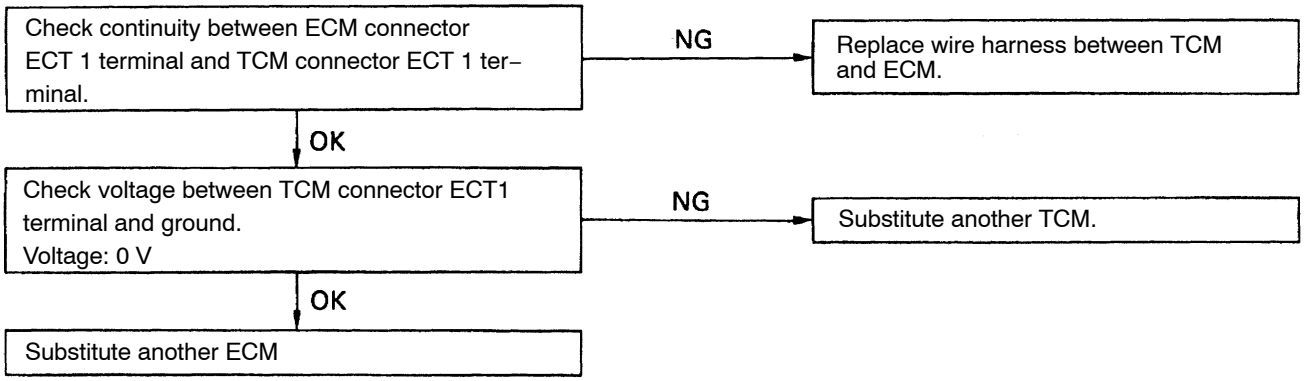


Diagnostic trouble Code 86 (Engine speed sensor circuitry)

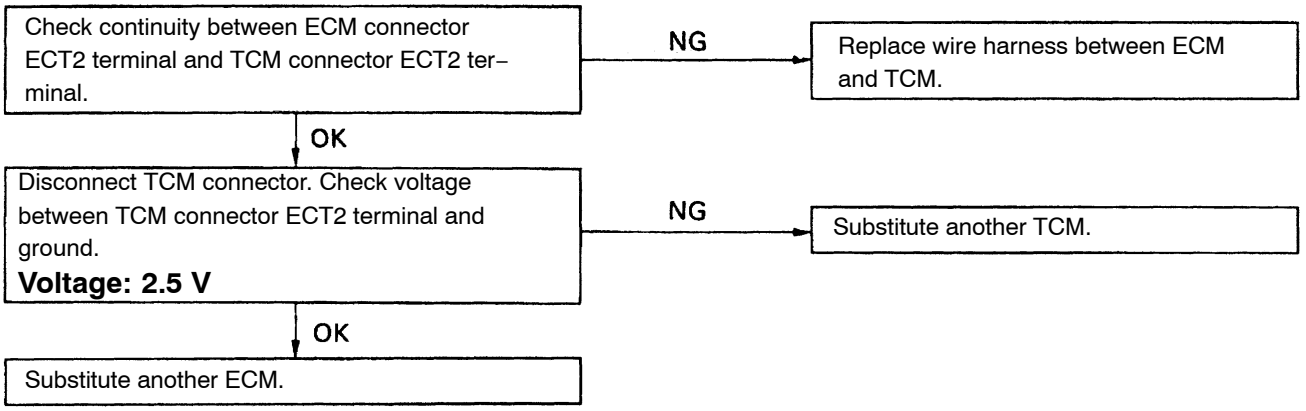


V02073

Timing retard demand signal



Fail safe signal



V02076

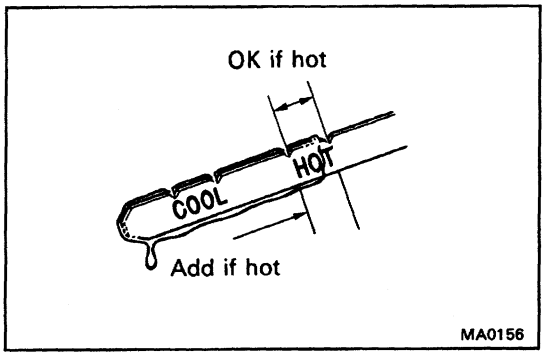
AT09J–02

PRELIMINARY CHECK

1. CHECK FLUID LEVEL

HINT:

- The vehicle must have driven so that the engine and transmission are at normal operating temperature.
- Fluid temperature: 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.



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

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

(c) Pull out the transmission dipstick and wipe it clean.

(d) Push it back fully into the tube.

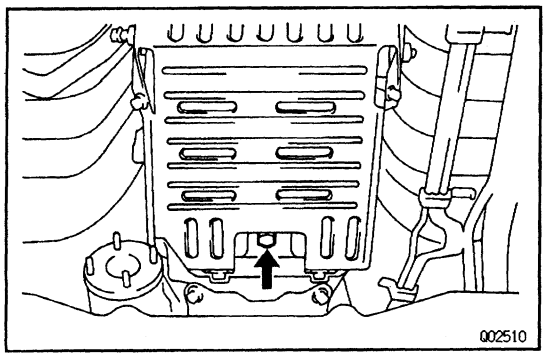
(e) Pull it out and check that the fluid level is on the HOT range.

If the level is at the low side, add fluid.

Fluid type:

ATF DEXRON® II

NOTICE: Do not overfill.



2. CHECK FLUID CONDITION

If the fluid smells burnt or is black, replace it as every manual follows.

(a) Remove the drain plug and drain the fluid.

(b) Reinstall the drain plug securely.

Torque: 27 N–m (280 kgf–cm, 20 ft.bf)

(c) With the engine OFF, add new fluid through the oil filler tube.

Fluid type:

ATF DEXRON® II

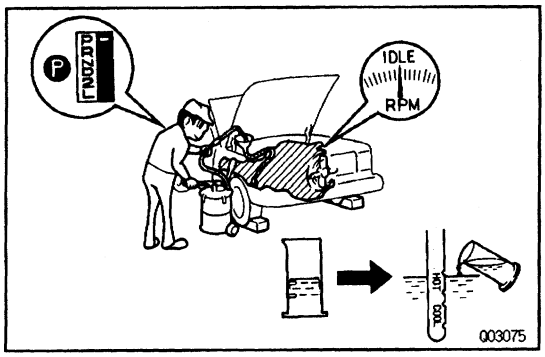
Capacity:

Total

15.4 liters (16.3 US qts, 13.6 Imp.qts)

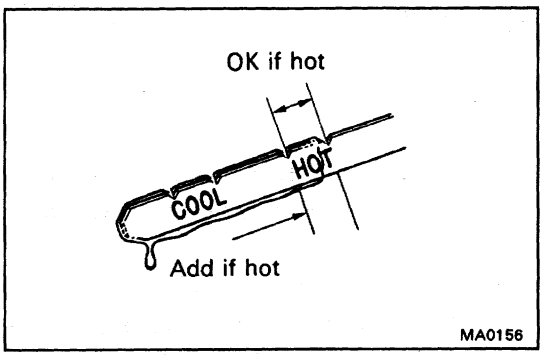
Drain and refill

6.0 liters (6.3 US qts, 5.3 Imp.qts)

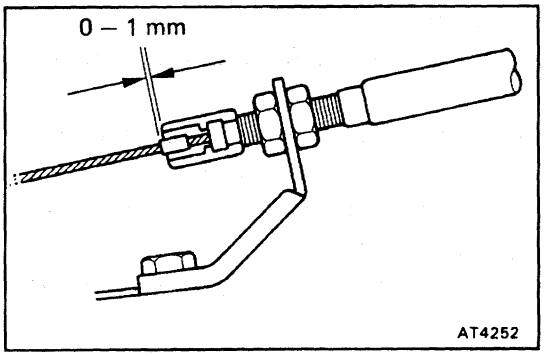


(d) Start the engine and shift the shift lever into all positions from P to L position and then shift into P position.

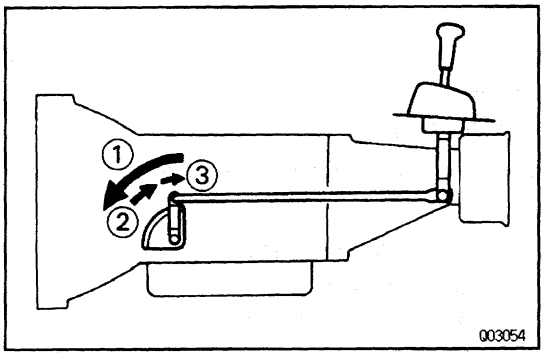
(e) With the engine idling, check the fluid level. Add fluid up to the COOL level on the dipstick.



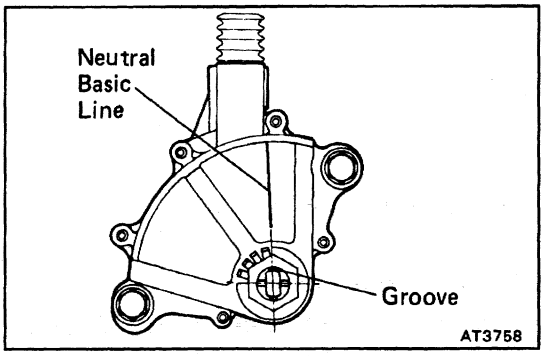
(f) Check the fluid level with the normal operating temperature 70 – 80° C (158 –176° F) and add as necessary.
NOTICE: Do not overfill.



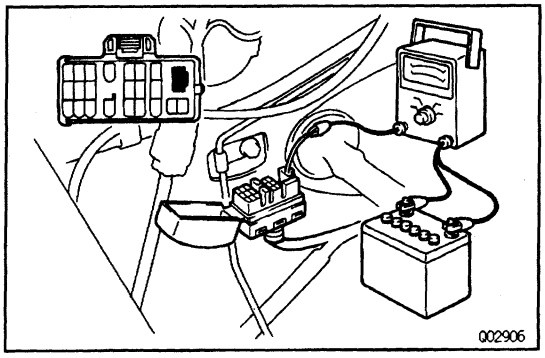
3. INSPECT THROTTLE CABLE
(a) Check that the throttle cable is installed correctly and not bent.
(b) With the throttle valve fully closed, measure the distance between the end of the boot and stopper on the cable.
Standard distance:
0 – 1 mm (0 – 0.04 in.)
If the distance is not standard, adjust the cable by the adjusting nuts.



4. INSPECT TRANSMISSION SHIFT LEVER POSITION
When shifting the shift lever from the N position to other positions, check that the lever can be shifted smoothly and accurately to each position and that the position indicator correctly indicates the position.
If the indicator is not aligned with the correct position, carry out the following adjustment procedures.
(a) Loosen the nut on the control rod.
(b) Push the control shaft lever fully toward the rear of the vehicle.
(c) Return the control shaft lever 2 notches to N position.
(d) Set the shift lever to N position.
(e) While holding the shift lever lightly toward the R position side, tighten the control rod nut.
(f) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverse when shifting it to the R position.



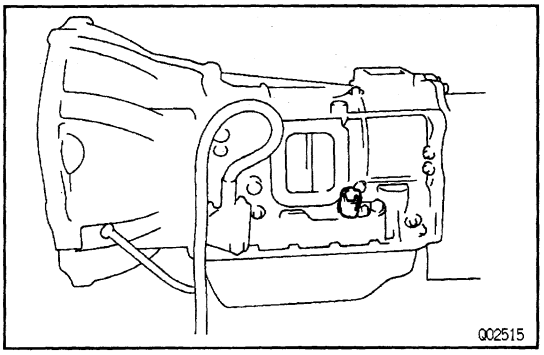
5. INSPECT PARK/NEUTRAL POSITION SWITCH
Check that the engine can be started with the shift lever only in the N or P position, but not in other positions.
If not as started above, carry out the following adjustment procedures.
(a) Loosen the park/neutral position switch bolts and set the shift lever to the N position.
(b) Align the groove and neutral basic line.
(c) Hold in position and tighten the bolts.
Torque: 13 N–m (130 kgf–cm, 9ft.lbf)



6. INSPECT IDLE SPEED (N POSITION)

Connect tachometer test probe to the check connector terminal IG , inspect the idle speed.

Idle speed:
650 rpm



MANUAL SHIFTING TEST

AT09K–03

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

1. DISCONNECT SOLENOID WIRE

2. INSPECT MANUAL DRIVING OPERATION

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

HINT: If the L, 2 and D position gear position are difficult to distinguish, perform the following road test.

- While driving, shift through the L, 2 and D positions.

Check that the gear change corresponds to the shift position.

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

3. CONNECT SOLENOID WIRE

4. CANCEL OUT DIAGNOSTIC TROUBLE CODE

(See page AT–20)

REFERENCE: Possible gear position in accordance with solenoid operating conditions.

Position	NORMAL			NO. 1 SOLENOID MALFUNCTIONING			NO.2 SOLENOID MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING		
	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position	Solenoid Valve		Gear Position
	No. 1	No. 2		No. 1	No. 2		No. 1	No. 2		No. 1	No.2	
D positon	ON	OFF	1 st	×	ON (OFF)	3rd (O/D)	ON	×	1st	×	×	O/D
	ON	ON	2nd	×	ON	3rd	OFF (ON)	×	O/D t 1 SO	×	×	O/D
	OFF	ON	3rd	×	ON	3rd	OFF	×	O/D	×	×	O/D
	OFF	OFF	O/D	×	OFF	O/D	OFF	×	O/D	×	×	O/D
2 position	ON	OFF	1st	×	ON (OFF)	3rd (O/D)	ON	×	1st	×	×	3rd
	ON	ON	2nd	×	ON	3rd	OFF (ON)	×	3rd (1 SO	×	×	3rd
	OFF	ON	3rd	×	ON	3rd	OFF	×	3rd	×	×	3rd
L position	ON	OFF	1 st	×	OFF	1st	ON	×	1st	×	×	1st
	ON	ON	2nd	×	ON	2nd	ON	×	1st	×	×	1st

( ): No fail–safe function x : Malfunctions

V01542

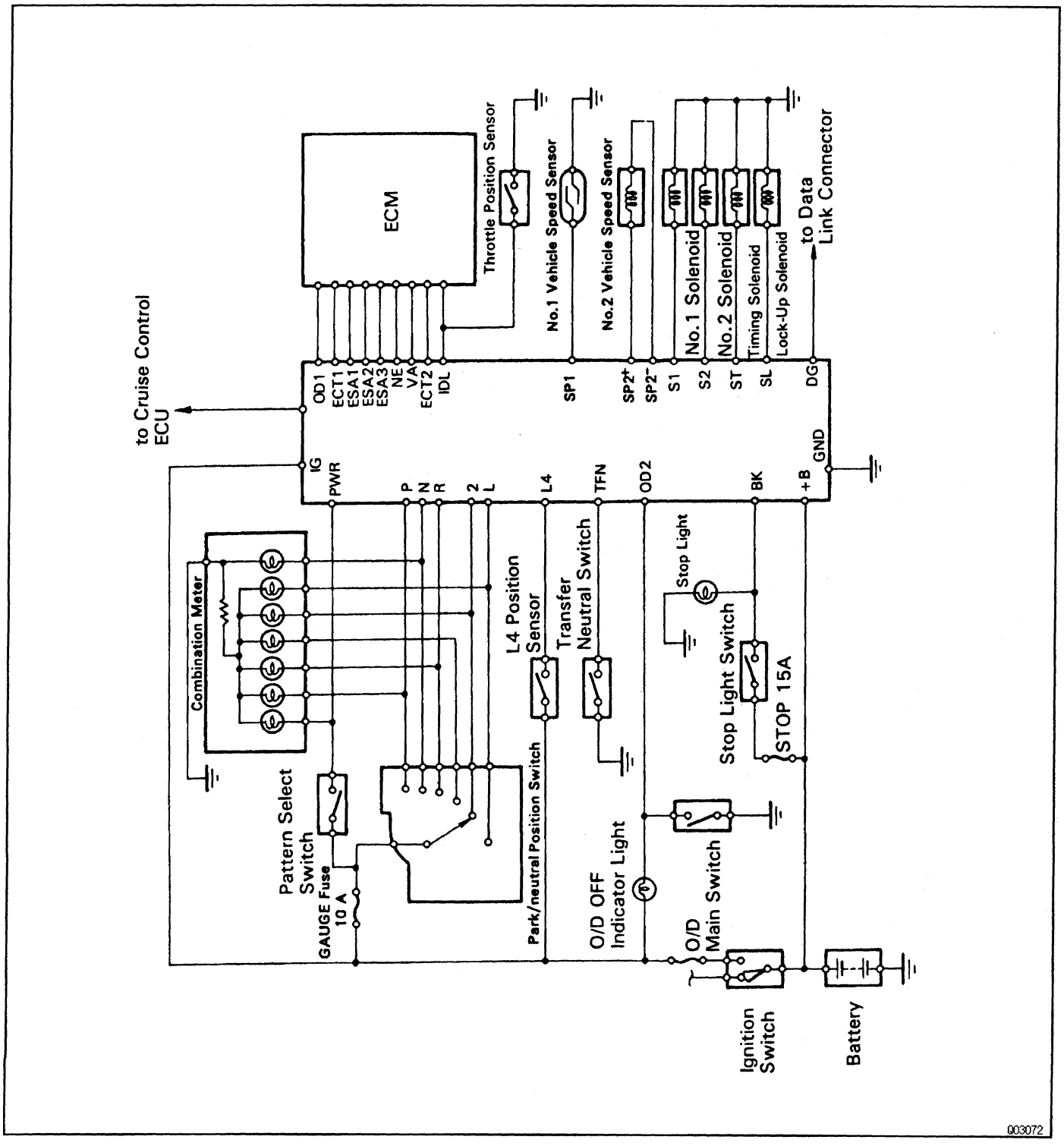
AT09L–03

ELECTRONIC CONTROL SYSTEM

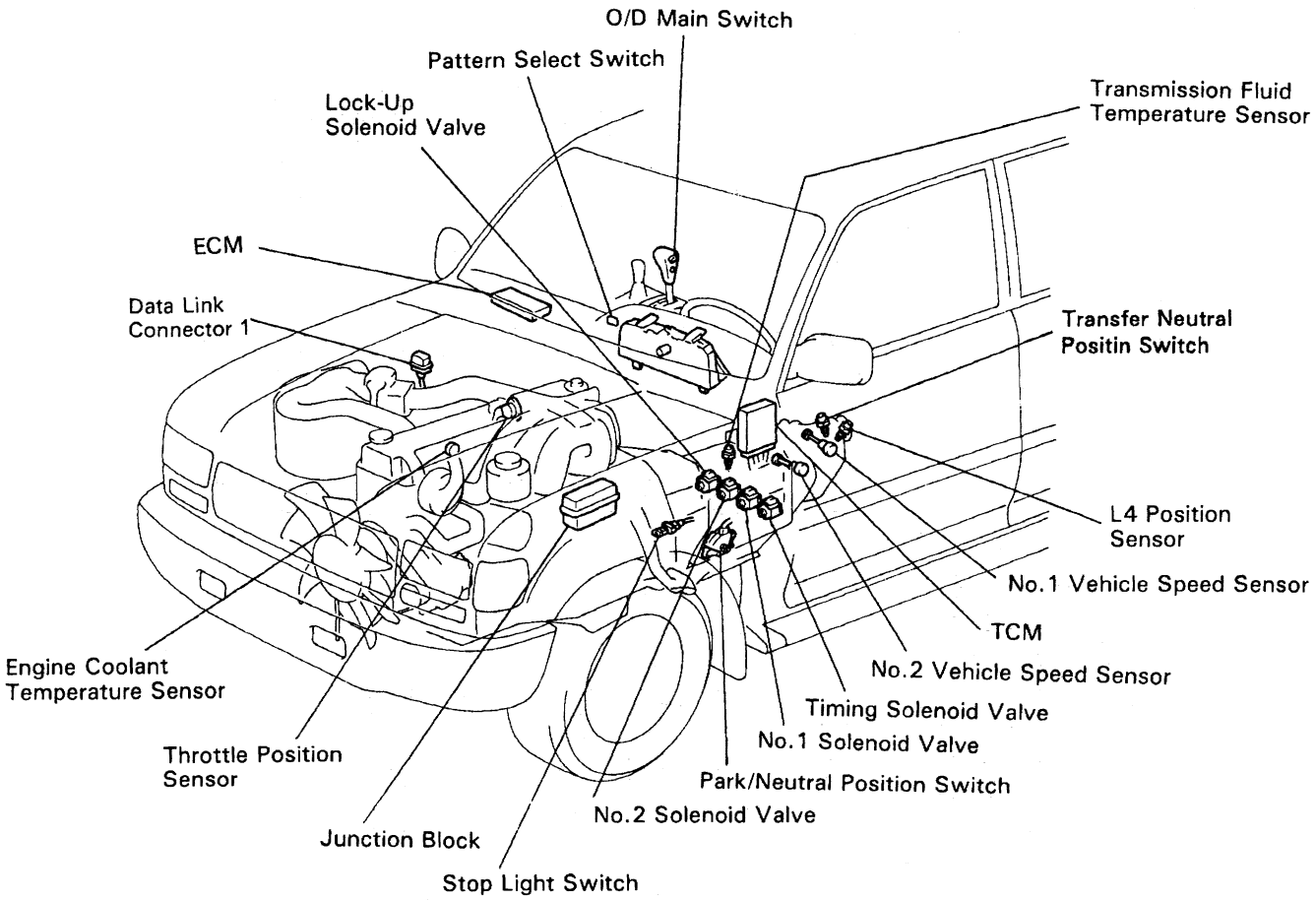
PRECAUTION

Do not open the cover or the case of the TCM and various ECU unless absolutely necessary.– (If the IC terminals are touched, the IC may be destroyed by static electricity.)

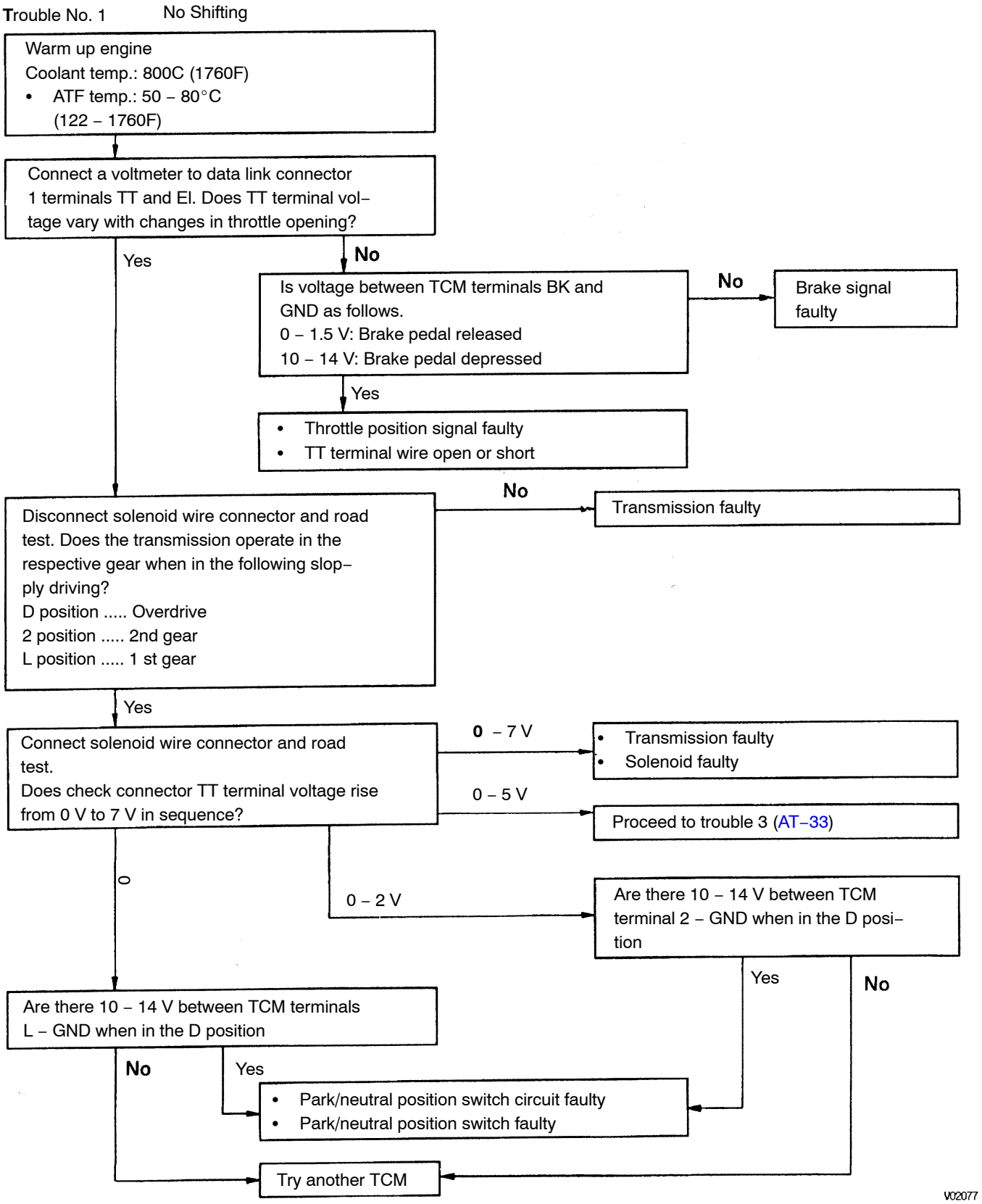
ELECTRONIC CONTROL CIRCUIT



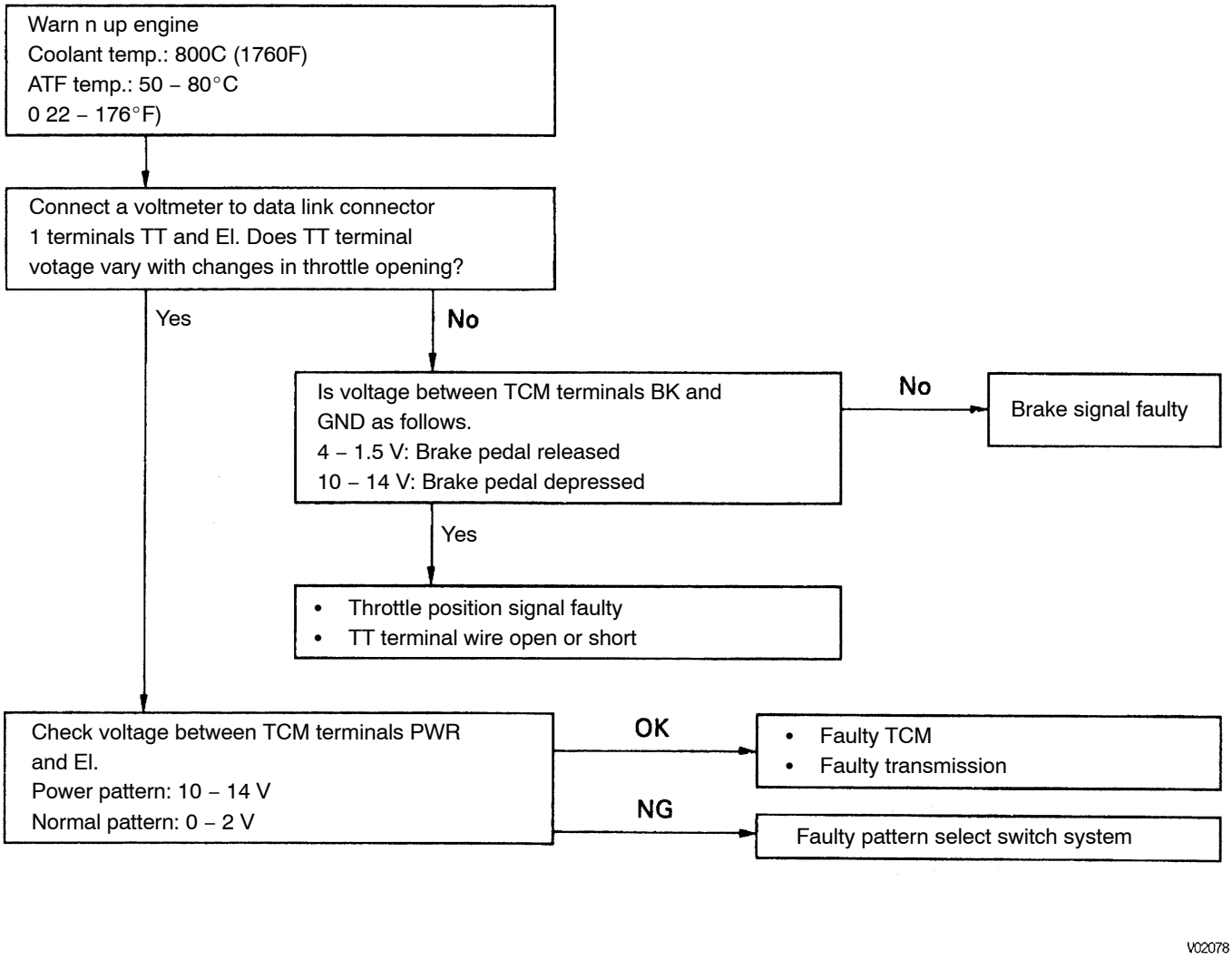
ELECTRONIC CONTROL COMPONENTS



TROUBLESHOOTING FLOW–CHART

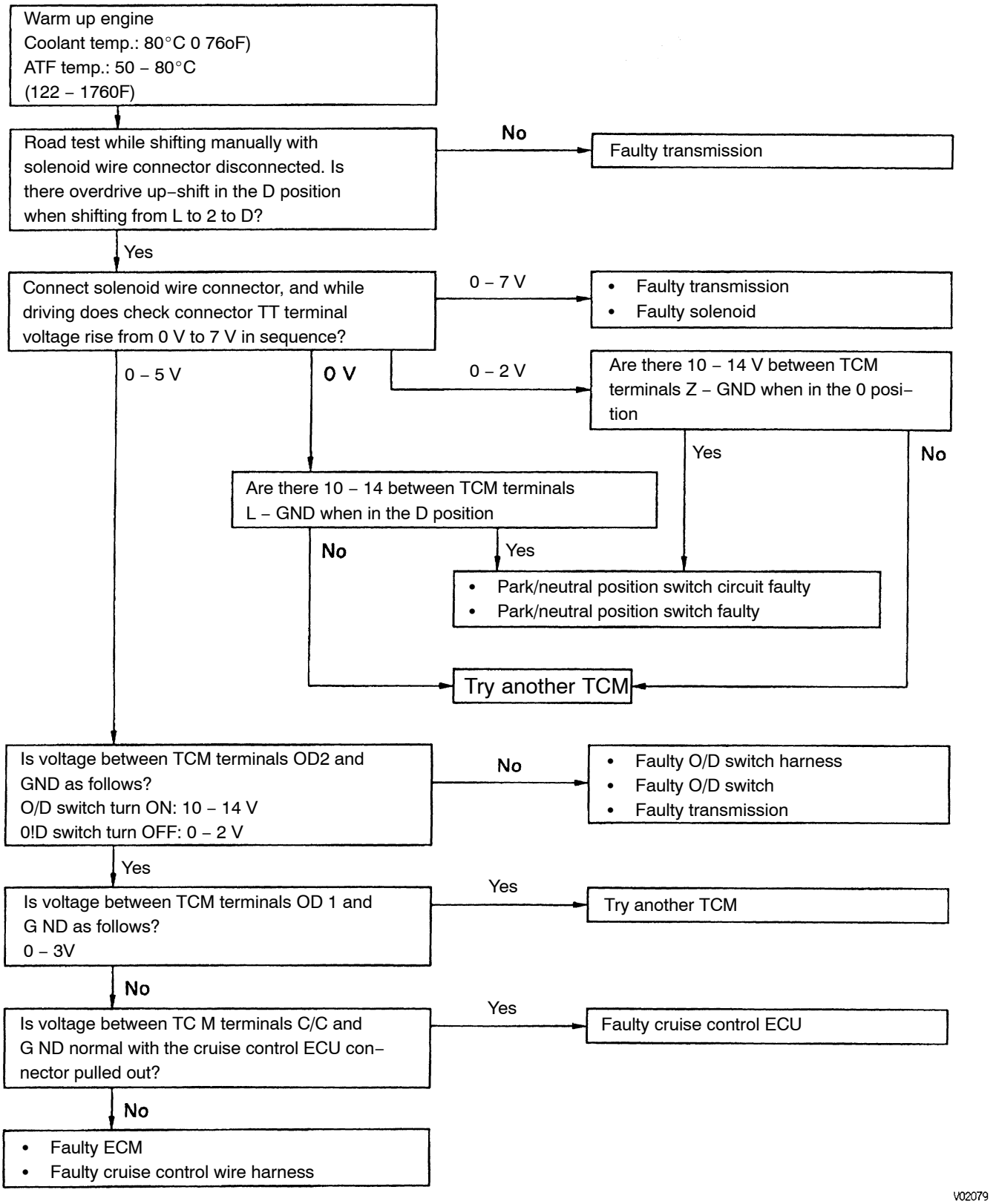


Trouble No.2 Shift point too high or too low

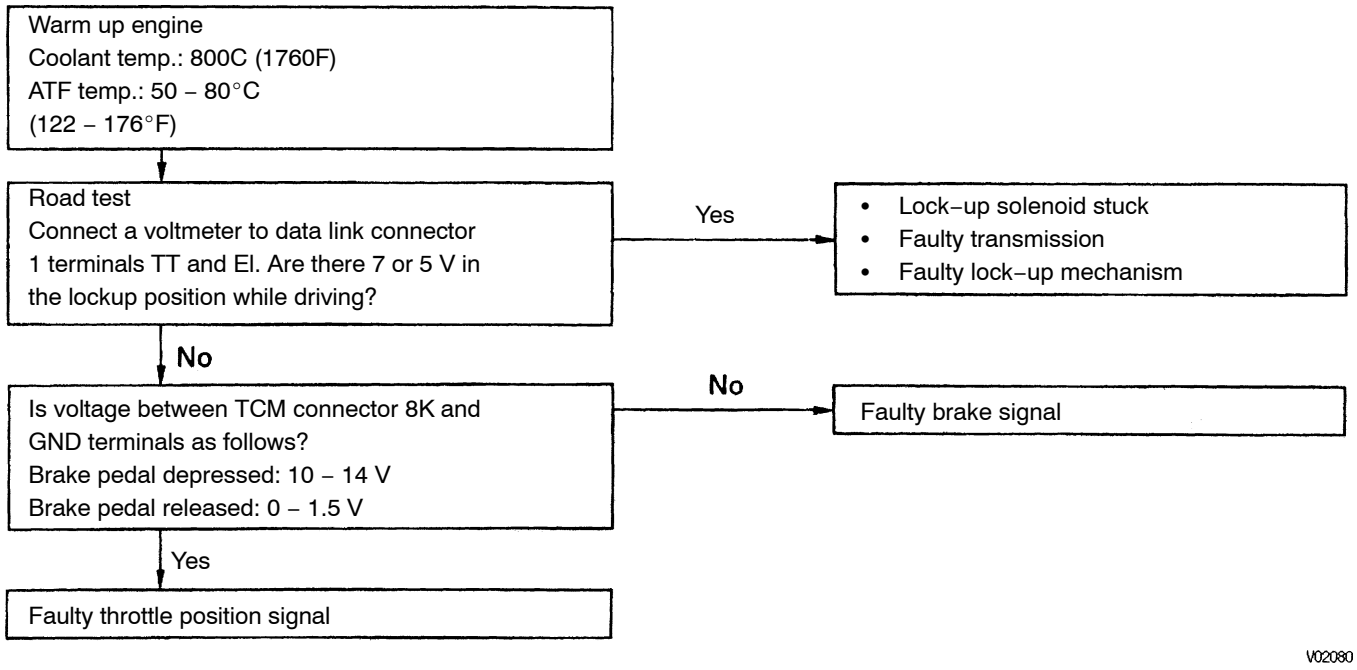


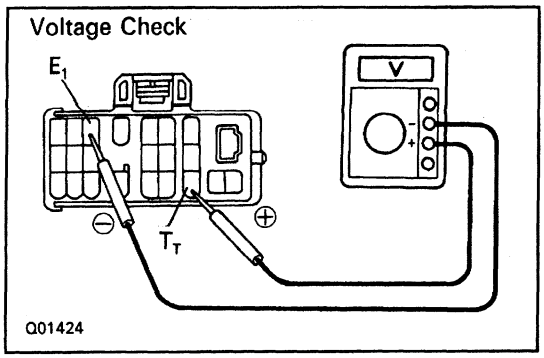
V02078

Trouble No.3 No up–shift to overdrive (After warm–up)



Trouble No.4 No lock–up (After warm–up)





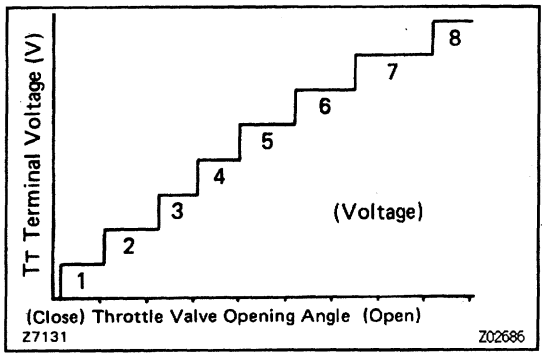
TERMINAL VOLTAGE INSPECTION

AT035–05

1. INSPECT THROTTLE POSITION SENSOR SIGNAL

(a) Turn the ignition switch to ON. Do not start the engine.

(b) Connect a voltmeter to data link connector 1 terminals TT and E,



(c) While slowly depressing the accelerator pedal, check that Tt terminal voltage rises in sequence.

If the voltage does not change in proportion to the throttle opening angle, there is a malfunction in the throttle position sensor or circuit..

2. INSPECT BRAKE SIGNAL

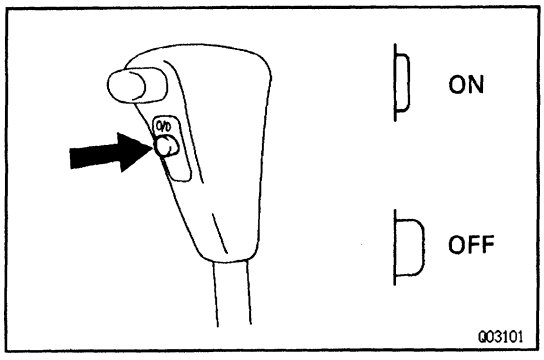
(a) Depress the accelerator pedal until the TT terminal indicates 8 V.

(b) Depress the brake pedal and check the voltage reading from the TT terminal.

Brake pedal depressed ..... 0 V

Brake pedal released ..... 8 V

If not as indicated, there is a malfunction in either the stop light switch or circuit.



3. INSPECT EACH UP–SHIFT POSITION

(a) Warm up the engine.

Coolant temperature:

80°C (1760 F)

(b) Turn the O/D switch to 'ON'.

(c) Place the pattern select switch in "Normal" and the shift lever into the D position.

(d) During a road test (about 10 km/h or 6 mph) check that voltage at the TT terminal is as indicated below for each up–shift position.

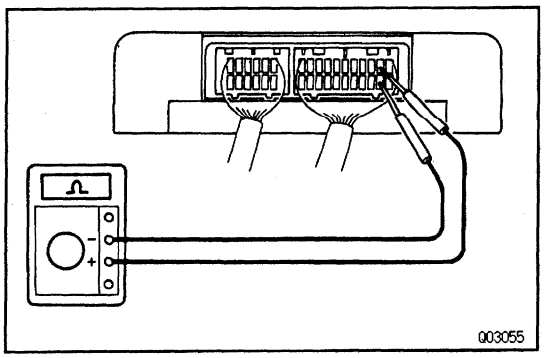
If the voltage rises from 0 V to 7 V in the sequence shown, the control system is okay.

The chart on the left shows the voltmeter reading and corresponding gears.

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

V02384

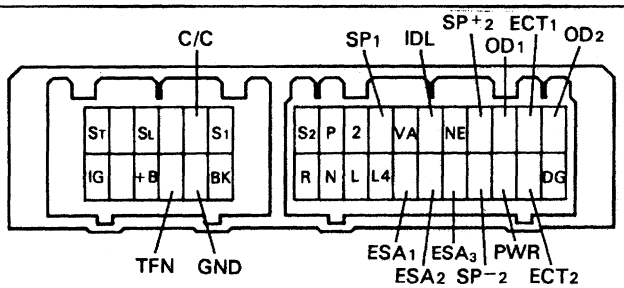
HINT: Determine the gear position by a light shock or change in engine RPM when shifting. The lock–up clutch will turn ON only infrequently during normal 3rd and 0/D gear operation. To trigger this action, press the accelerator pedal to 50% or more of its stroke. At more than 50%, the voltage may change in the sequence 2 V–4 V–6 V–7 V.



ELECTRONIC CONTROL COMPONENTS INSPECTION

1. INSPECT VOLTAGE OF TCM

(a) Turn on the ignition switch.
(b) Measure the voltage at each terminal.

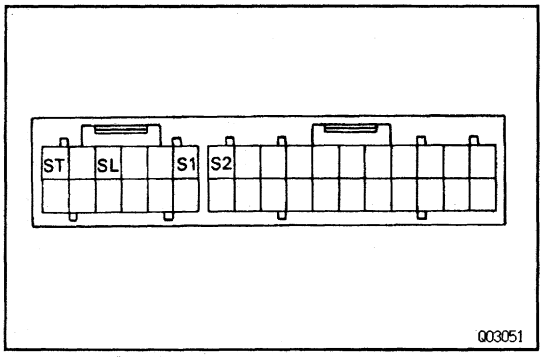


Q03115

Terminal	Measuring condition		Voltage (V)
Si – GND	Stop Vehicle	N position	9 – 14
		D position	9 – 14
S2 – GND	Stop Vehicle	N position	9 – 14
		D position	**o –** 1
SL – GND	Stop vehicle		0 –5 1.5
ST – GND	Stop vehicle		**o –** 1.5
BK – GND	Brake pedal is depressed		**7.5** – 14
	Brake pedal is released		0 – 1.5
TFN – GND	Transfer position is N position		**o –3**
	Transfer position is except N position		9 – 14
+B – GND	Stop engine and ignition switch ON		9 – 14
IG – GND	Stop engine and ignition switch ON		9 – 14
OD2 – GND	**O/D** main switch turned ON		0 – 3
	O/D main switch turned OFF		9 – 14
CIC – G ND	Stop engine and ignition switch ON		9 – 14
ECT1 – GND	Stop engine and ignition switch ON		9 – 14
OD1 – GND	Engine coolant temperature 55°C 0 31 °F) more than		9 – 14
	Engine coolant temperature 550C (131 °F) or less		0 –3
SP2+ – SP2–	Vehicle moving		Pulse generation
SP1 – GND	Vehicle moving		Pulse generation
NE – GND	Engine idling speed		Pulse generation
IDL – GND	Throttle valve fully closed		0 – 3
	Throttle valve fully open		9 – 14
V A – G ND	Throttle valve fully closed		3.5 – 4.5
	Throttle valve fully open		**2.5** – 3.5

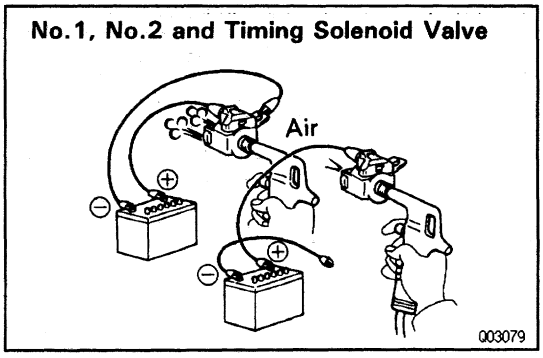
Terminal	Measuring condition	Voltage (V)
2 – GND	2 position	7.5 – 14
	Except 2 position	0 – 1.5
P – GND	P position	7.5 – 14
	Except P position	0 – 1.5
L – GND	L position	7.5– 14
	Except L position	0 – 1.5
N – GND	N position	7.5 – 14
	Except N position	o – 1.5
R – GND	R position	7.5 – 14
	Except R position	0 – 1.5
DG – GND	Engine stop and place ignition key at ON position	o – 1.5
ECT2 – GND	Engine coolant temperature 80°C 1176°F1 more than	2–3
PWR – GND	PWR pattern	7.5 – 14
	NORM pattern	0 – 1.5
ESA 1 – GND	Engine idling speed (Engine start after 10 second)	4.5 – 5.5
ESA2 – GND	Engine idling speed (Engine start after 10 second)	4.5 – 5.5
ESA3 – GND	Engine idling speed (Engine start after 10 second)	4.5–5.5
L4 – G N D	Transfer position is L4 position	7.5 – 14
	Transfer position is except L4 position	0 – 1.5

V02082



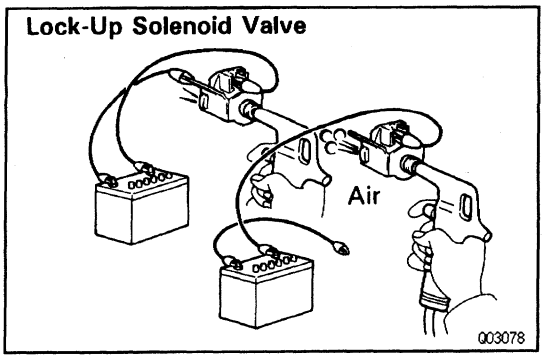
2. INSPECT SOLENOID

(a) Disconnect the connector from TCM.
(b) Measure the resistance between S,, S2, SL, ST and ground.
Resistance:
11–150
(c) Apply battery positive voltage to each terminal. Check that an operation noise can be heard from the sole–noid.

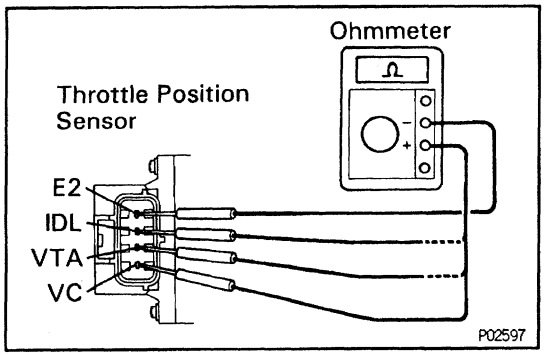


3. CHECK SOLENOID SEALS

If there is foreign material in the solenoid valve, there will be no fluid control even with solenoid operation.
(a) Check No.1, No.2 and timing solenoid valves.
Check that the solenoid valves do not leak when low–pressure compressed air is applied.
When supply battery positive voltage to the sole–noids, check that the solenoid valves open.



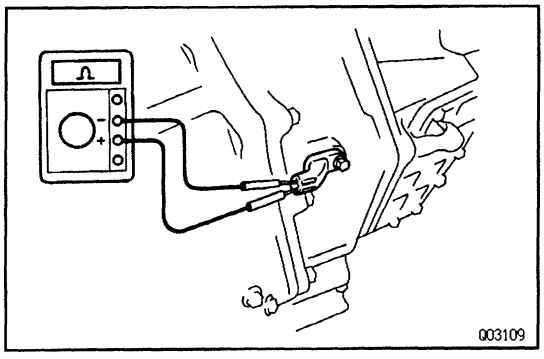
(b) Check the lock –up solenoid valve.
e Apply 490 kPa (5 kgf/crn2, 71 psi) of compressed air, check that the solenoid valve opens.
Apply battery positive voltage to the solenoid, check that the solenoid valve does not leak the air.
If malfunction is found during voltage inspection (step 1.), inspect the components listed below.



4. INSPECT THROTTLE POSITION SENSOR
Using an ohmmeter, check the resistance between terminals.

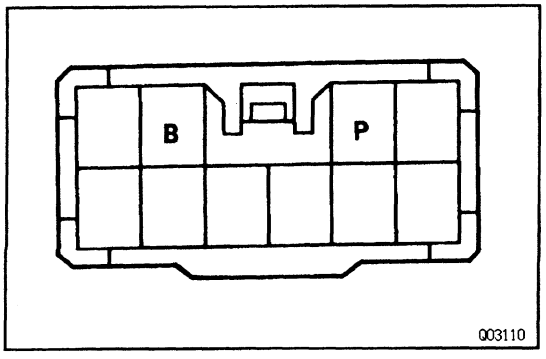
Terminal	Throttle valve condition	Resistance (kQ)
IDL – E2	Fully closed	2.3 kS2 or less
	Open	Infinity
VC – E2	–	2.5– 5.9
VTA – E2	Fully closed	0.2 – 5.7
	Fully open	2.0– 10.2

V02103



5. INSPECT NO.2 VEHICLE SPEED SENSOR
(a) Jack up the rear wheel on one side.
(b) Connect an ohmmeter between the terminals.
(c) Spin the wheel and check that the meter needle de–flects from 0 to ^Ω.

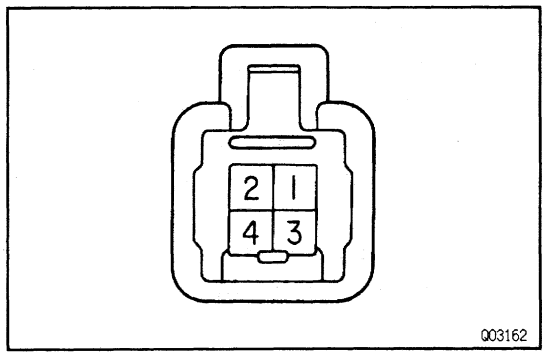
6. INSPECT NO.1 VEHICLE SPEED SENSOR
(SEE PAGE BE–48)



7. INSPECT PATTERN SELECT SWITCH
Using an ohmmeter, check the continuity of terminals for each switch position.
HINT: As there are diodes inside, be careful of the tester probe polarity.

Terminal / Pattern	B	P
PW R	○	○
NORM		

V02104

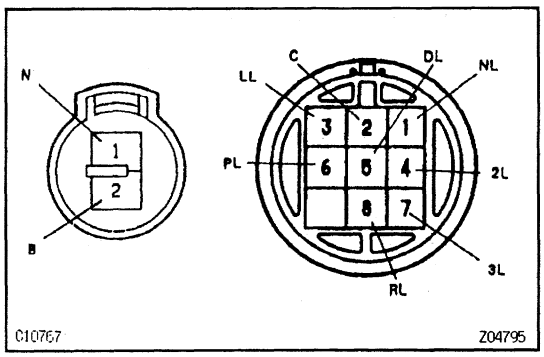


8. INSPECT O/D SWITCH

Using an ohmmeter, check the continuity of the terminals for each switch position.

sw position	2	4
ON		
OFF	○——	——○

V02105



9. INSPECT PARK/NEUTRAL POSITION SWITCH

Check that there is continuity between terminals.

: Continuity

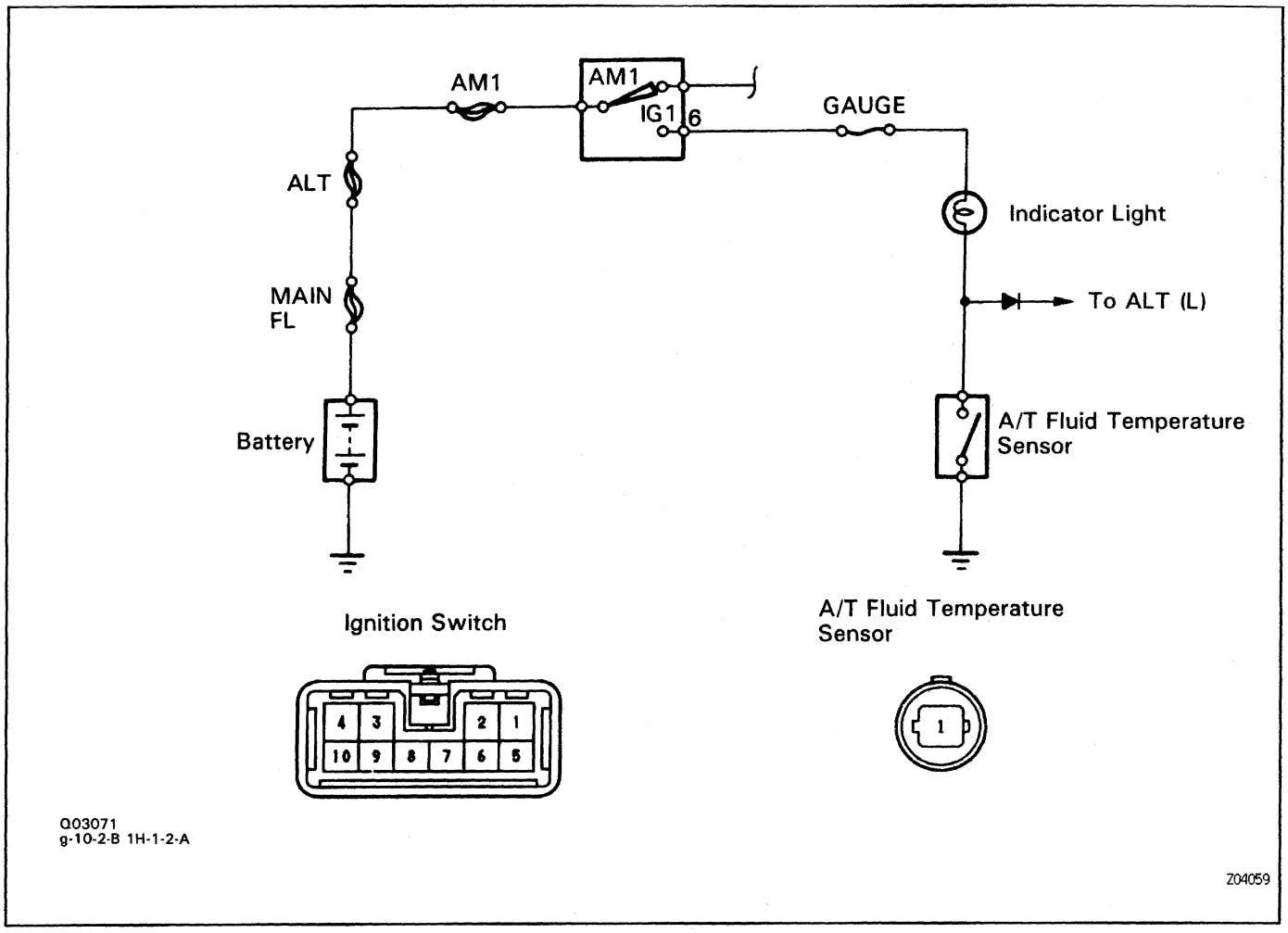
Shift position	B	N	C	PL	RL	NL	DL	3L	2L
P	○—○		○—○						
R			○——	——	——○				
N	○—○		○——	——	——	——○			
D			○——	——	——	——	——○		
2			○——	——	——	——	——	——○	
L			○——	——	——	——	——	——	——○

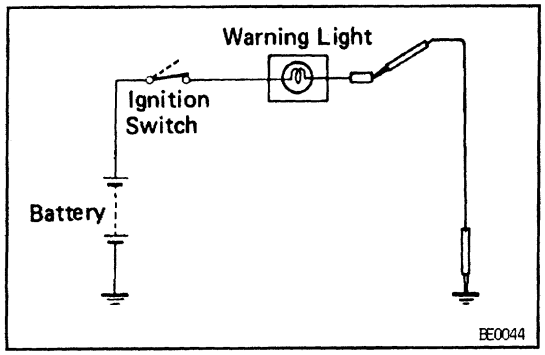
V02106

10. INSPECT ENGINE COOLANT TEMPERATURE SENSOR

(See page EG–300)

A / T FLUID TEMPERATURE WARNING SYSTEM CIRCUIT



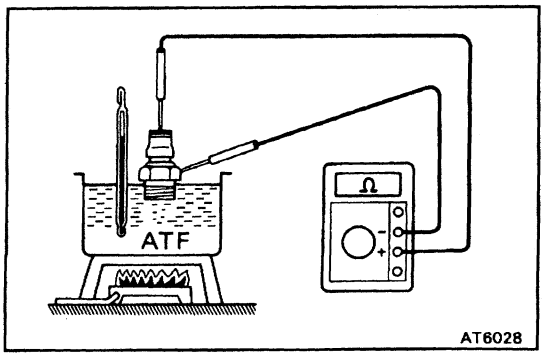


11. INSPECT A / T FLUID TEMPERATURE WARNING LIGHT

(a) Disconnect the connector from the temperature sensor. Connect terminal of the wire harness side connector and body ground.

(b) Turn the ignition switch ON, check that the light goes on.

If warning light does not light, test the bulb.



12. INSPECT A/T FLUID TEMPERATURE SENSOR

Check that there is continuity at the temperature of 145° C –155° C (325° F – 343° F).

If continuity is not as specified, replace the sensor.

AT027–00

STALL TEST

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

NOTICE:

- Perform the test at normal operating fluid temperature 50–$0°C (122–116°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 should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.

MEASURE STALL SPEED

(a) Warm up the transmission fluid.

(b) Chock the front and rear wheels.

(c) Connect a tachometer to the engine.

(d) Fully apply the parking brake.

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

(f) Start the engine.

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

Quickly read the stall speed at this time.

NOTICE: Release the accelerator pedal and stop test if the rear wheels begin to rotate before the engine speed reaches specified stall speed.

Stall speed:

2,150±150 rpm

(g) Perform the same test in R position.

Quickly read the stall speed at this time.

Stall speed:

2,150±150 rpm

EVALUATION

(a) If the stall speed is the same for both positions but lower than specified value:

- Engine output may be insufficient
- Stator one–way clutch is not operating properly

HINT: If more than 600 RPM below the specified value, the torque converter clutch could be faulty.

(b) If the stall speed in D position is higher than specified:

- Line pressure too low
- Forward clutch slipping
- No.2 one–way clutch not operating properly
- 0/D one–way clutch not operating properly

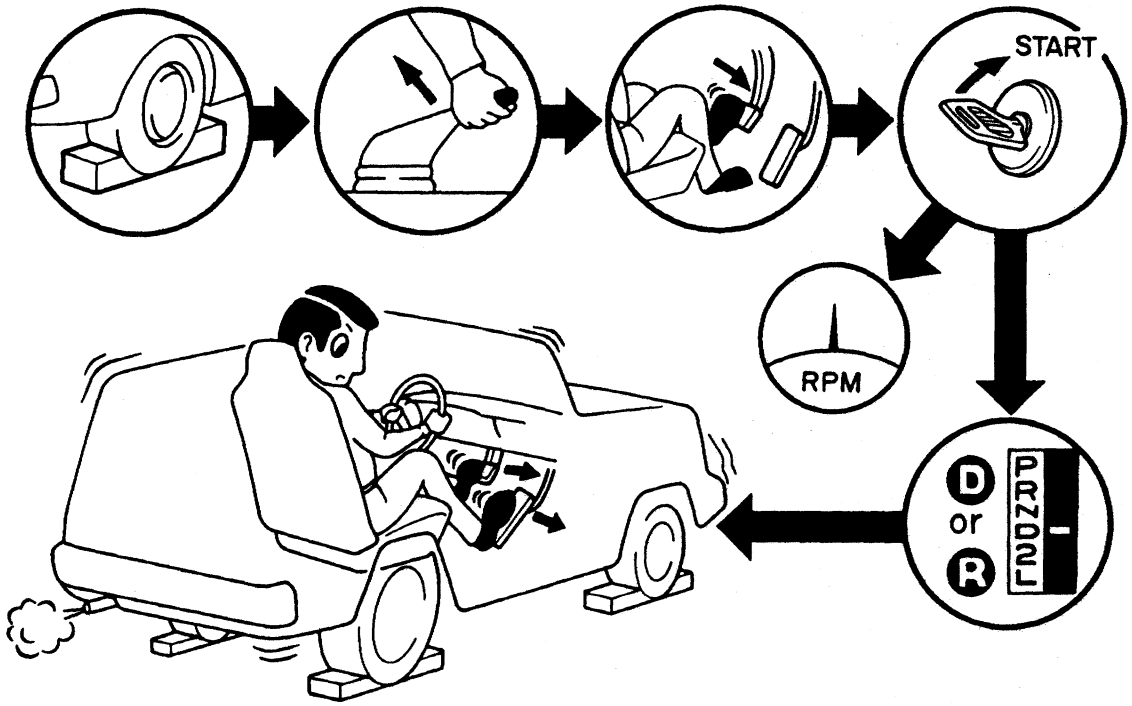
(c) If the stall speed in R position is higher than specified:

- Line pressure too low
- Direct clutch slipping
- First and reverse brake slipping
- 0/D one–way clutch not operating properly

(d) If the stall speed in both R and D positions are higher than specified:

- Line pressure too low
- Improper fluid level
- 0/D one–way clutch not operating properly

STALL TEST



Q03057

TIME LAG TEST

AT038–09

When the shift lever is shifted while the engine is idling, there will be a certain time elapse or lag before the shock can be felt. This is used for checking the condition of the 0/D direct clutch, forward clutch, direct clutch and first and reverse brake.

NOTICE:

- Perform the test at normal operating fluid temperature 50–80°C (122–176°F).
- Be sure to allow one minute interval between tests.
- Make three measurements and take the average value.

MEASURE TIME LAG

(a) Fully apply the parking brake.

(b) Start the engine and check the idle speed.

Idle speed:

650 RPM (N position)

(c) Shift the shift lever from N to D position. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

Time lag:

Less than 0.7 seconds

(d) In same manner, measure the time lag for N–iR.

Time lag:

Less than 1.2 seconds

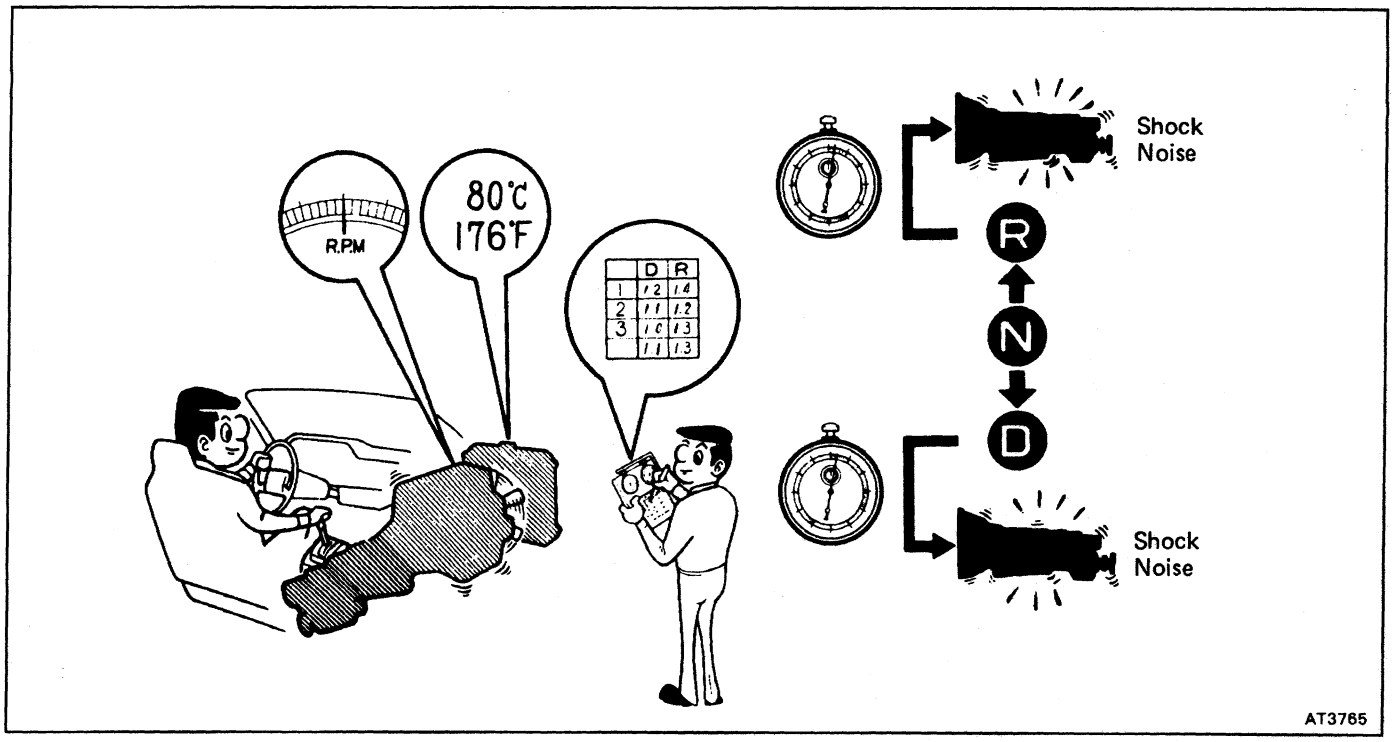
EVALUATION

(a) If N–iD time lag is longer than specified:

- Line pressure too low
- Forward clutch worn
- 0/D one–way clutch not operating properly

(b) If N–iR time lag is longer than specified:

- Line pressure too low
- Direct clutch worn
- First and reverse brake worn
- 0/D one–way clutch not operating properly


R.P.M
80°C
176°F
D
R
1
2
3
1.2
1.4
1.1
1.2
1.0
1.3
1.1
1.3
Shock
Noise
R
N
D
Shock
Noise
AT3765

HYDRAULIC TEST

AT0RC–01

PREPARATION

(a) Warm up the transmission fluid.

(b) Remove the transmission case test plug and connect the hydraulic pressure gauge.

SST 09992–00094 (Oil pressure gauge)

NOTICE:

- Perform the test at normal operating fluid temperature 50–$0° C (122–176° F).
- The line pressure test should always be carried out in pairs. One should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.

MEASURE LINE PRESSURE

(a) Fully apply the parking brake and chock the 4 wheels.

(b) Start the engine and check idling RPM.

(c) Keep your left foot pressed firmly on the brake pedal and shift into D position.

(d) Measure the line pressure when the engine is idling.

(e) Press the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.

NOTICE: Release the accelerator pedal and stop test if the rear wheels begin to rotate before the engine speed reaches specified stall speed.

(f) In the same manner, perform the test in R position.

Line pressure:

Condition	D position	**R** position
Idling	461– 520 kPa (4.7–5.3 kgf/cm2, 68–77 psi)	657–843 kPa (6.7–8.6 kgf/cml, 97–125 psi)
Stall	971 –1,225 kPa (9.9–12.5 kgf/emt, 144–181 psi)	1,618–1,853 kPa (16.5–18.9 kgf/cm2, 235–274 psi)

If the measured pressures are not up to specified values, recheck the throttle cable adjustment and perform a retest.

EVALUATION

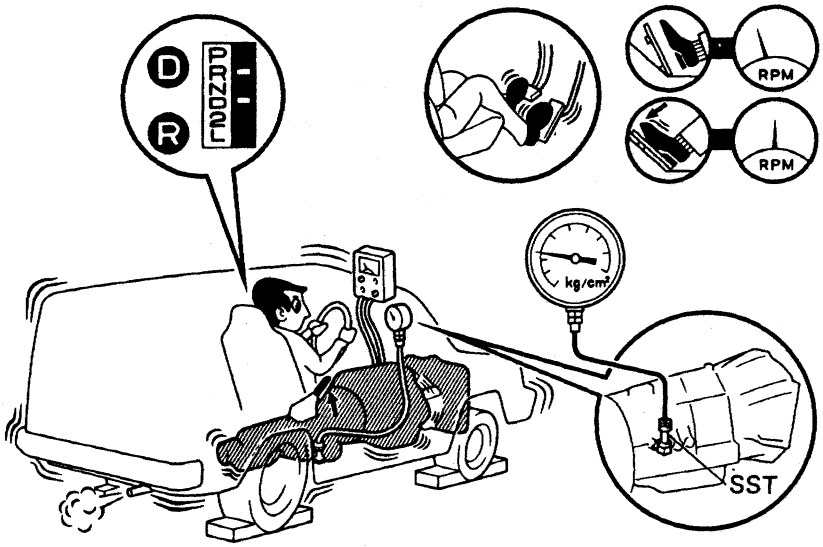
(a) If the measured values at all positions are higher than specified:
- Throttle cable out of adjustment
- Throttle valve defective
- Regulator valve defective

(b) If the measured values at all positions are lower than specified:
- Throttle valve defective
- Throttle cable out of adjustment
- Regulator valve defective
- Oil pump defective
- O/D direct clutch defective

(c) If pressure is low in the D position only:
- D position circuit fluid leakage
- Forward clutch defective

(d) If pressure is low in the R position only:
- R position circuit fluid leakage
- Direct clutch defective
- First and reverse brake defective

HYDRAULIC TEST



003100

AT03A–04

ROAD TEST

NOTICE: Perform the test at normal operating fluid temperature 50 – 80° C (122 –176° F).

1. D POSITION TEST IN NORM AND PWR PATTERN POSITIONS

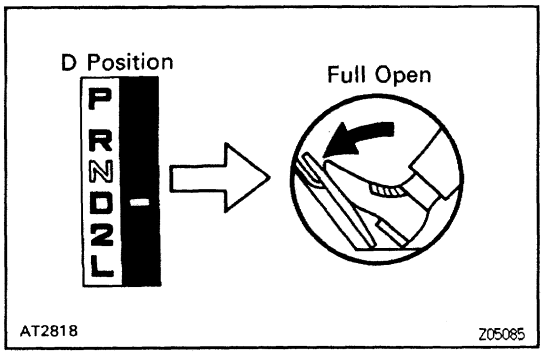
Shift into the D position and hold the accelerator pedal constant at the full throttle valve opening position.

Check the following:

(a) 1 –2, 2–3 and 3–O/D up–shifts should take place, and shift points should conform to those shown in the automatic shift schedule.

Conduct a test under both Normal and Power patterns.

HINT: There is no O/D up–shift or lock–up when the coolant temperature is below 55° C (131 ° F).



EVALUATION

(1) If there is no 1–2 up–shift:
- No.2 solenoid is stuck.
- 1–2 shift valve is stuck.

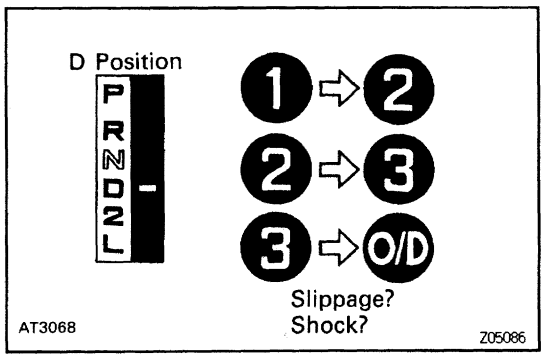
(2) !f there is no 2–3 up–shift:
- No.1 solenoid is stuck.
- 2–3 shift valve is stuck.

(3) If there is no 3–0/D up–shift:
- 3–4 shift valve is stuck.

(4) If the shift point is defective:
- Throttle valve, 1 – 2 shift valve, 2–3 shift valve,
- 3–4 shift valve etc., are defective.

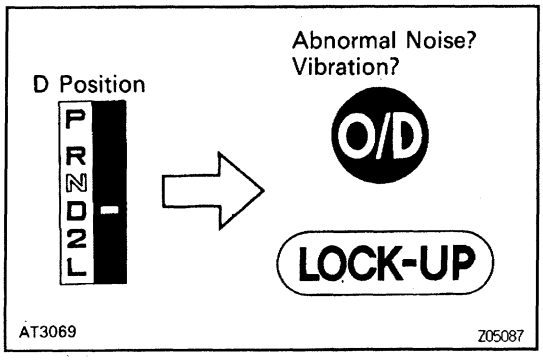
(5) If the lock–up is defective:
- Lock–up solenoid is stuck.
- Lock–up control valve is stuck.
- Lock–up signal value is stuck.

(b) In the same manner, check the shock and slip at the –2, 2–3, and 3–O/D up–shifts.

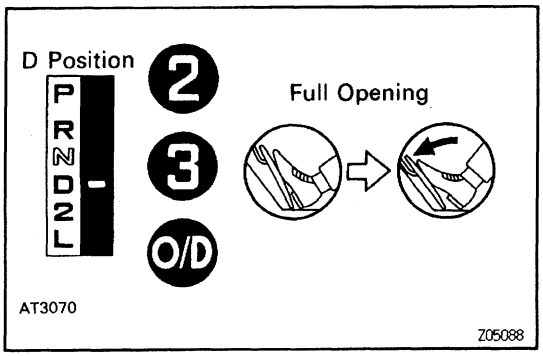


EVALUATION

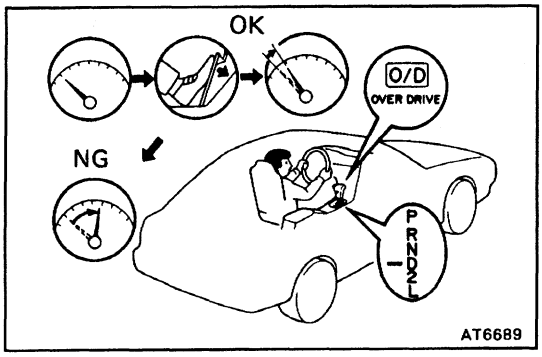
If the shock is excessive:
- Line pressure is too high.
- Accumulator is defective.
- Check ball is defective.



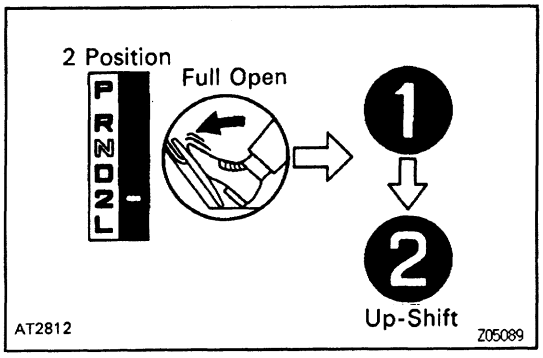
(c) Run at the D position lock –up or O/D gear and check for abnormal noise and vibration.
HINT: The check for the cause of ahnormal noise and vibration must be made with extreme care as it could also be due to loss of balance in the propeller shaft, differential, torque converter clutch, etc.



(d) While running in the D position, 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.
(e) Check for abnormal shock and slip at kick–down.



(f) Check for the lock–up mechanism.
(1) Drive in D position, 0/D gear, at a steady speed (lock–up ON) of about 95 km/h (59 mph).
(2) Lightly depress the accelerator pedal and check that the engine RPM does not change abruptly.
If there is a big jump in engine RPM, there is no lock–up.



2. 2 POSITION TEST

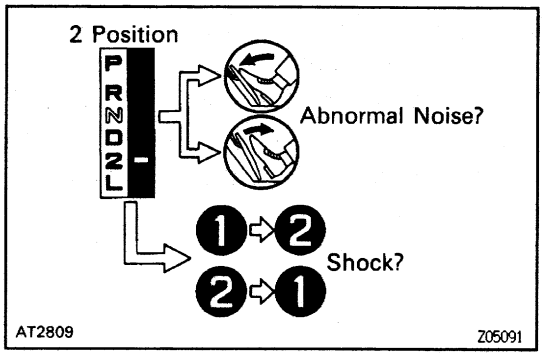
Shift into the 2 position and, while driving with the accelerator pedal held constantly at the full throttle valve opening position, push in one of the pattern selectors and check on the following points.

(a) Check to see that the 1–2 up–shift takes place and that the shift point conforms to that shown on the automatic shift schedule.
HINT: There is no 0/D up–shift and lock–up in the 2 position.
(b) While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.

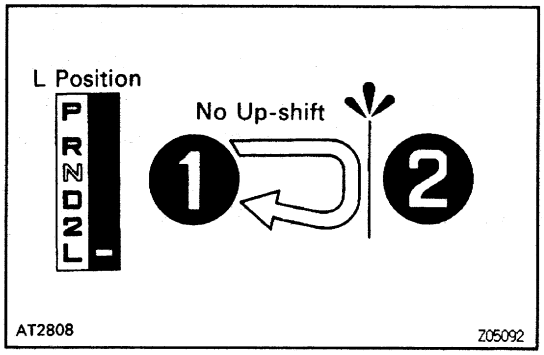
EVALUATION

If there is no engine braking effect:

- Second coast brake is defective.

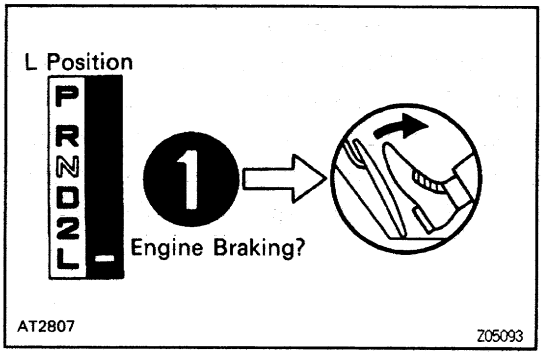


(c) Check for abnormal noise at acceleration and deceleration, and for shock at up–shift and down–shift.



3. L POSITION TEST

(a) While running in the L position, check to see that there is no up–shift to 2nd gear.

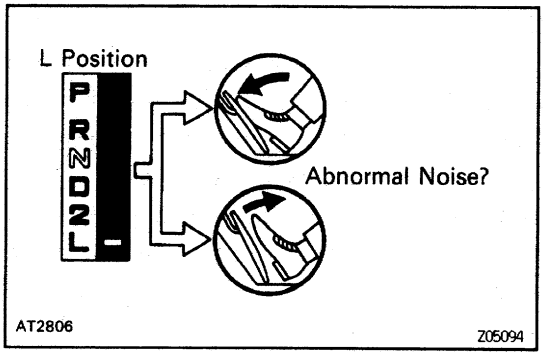


(b) While running in the L position, release the accelerator pedal and check the engine braking effect.

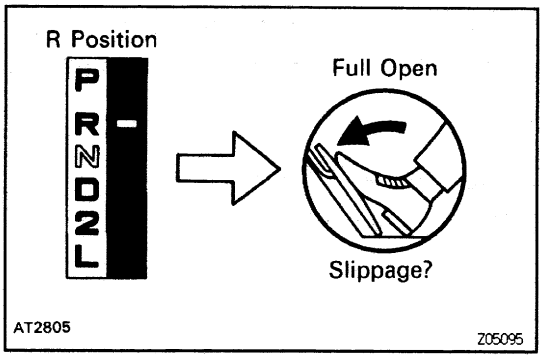
EVALUATION

If there is no engine braking effect:

- First and reverse brake is defective.

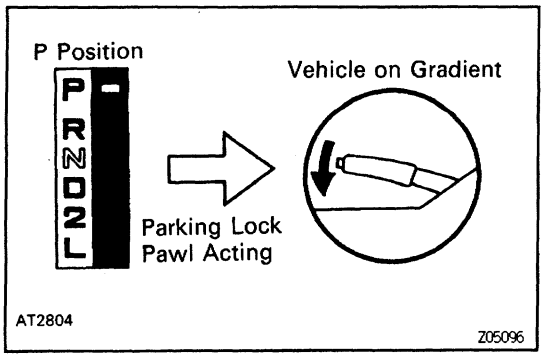


(c) Check for abnormal noise during acceleration and deceleration.



4. R POSITION TEST

Shift into the R position and, while starting at full throttle, check for slipping.



5. P POSITION TEST

Stop the vehicle on a gradient (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.

AUTOMATIC SHIFT SCHEDULE

AT08N–01

km/h (mph)

Throttle valve opening		100%			5%		100%		
Gear position		1 –2	2– 3	3– O/D	Lock–up ON	Lock–up OFF	O/D– 3	3 – 2	2 – 1
D position	Normal mode	52–58 (32–36)	106–117 (ss–73)	152–163 (94–101)	so–s6 (37–41)	55–80 (34–37)	145–15fi (90–97)	98–104 (61–65)	42–47 t26–29t
	Power mode	52–58 (32–36)	106–117 (66–73)	152–163 (94–101)	88–94 (55–58)	68–74 (42–46)	145–156 (90–97)	98–104 (61–65)	42–47 (2fi–29)
2 position	Normal mode Power mode	52–58 (32–36)	—	—	—	—	—	116–127 (72–79)	56–65 (37–40)
L position	Normal mode Power mode	—	—	—	—	—	—	—	

V01873

TROUBLESHOOTING MATRIX CHART

AT09P–03

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.
Remark *: Refer to '94 A442F Automatic Transmission Repair Manual.
(ON–VEHICLE)

See page / Parts Name / Trouble		★ 1 – 2 shift valve	★ 2 – 3 shift valve	★ 3 – 4 shift valve	★ Low coast modulator valve	★ Reverse control valve	★ Manual valve	★ No. 1 solenoid	★ No. 2 solenoid	★ Timing solenoid	★ Lock–up solenoid	★ Co exhaust valve	★ Bo accumulator	★ C, accumulator	★ B 1 accumulator	★ C2 accumulator	★ 2 – 3 shift timing valve	★ Modulator valve	★ Accumulator control valve	★ Lock–up signal valve	★ Lock–up control valve	AT–54 OFF–vehicle repair matrix chart	★ TC M	★ Throttle cable	★ Check ball
Does not move in any forward position																						1			
Does not move in reverse						3		2	2													4	1		
Does not move in any position							2															3	1		
No up–shift	1rst – 2rd	3							2													4	1		
	2nd – 3rd		3					2														4	1		
	3rd – O/D			3					2													4	1		
No down–shift	O/D – 3rd			3					2													4	1		
	3rd – 2nd		3					2														4	1		
	2rd – 1rst	3							2			4											1		
Shift point too high or too low																							1	2	
Harsh engagement	"N" – "R"															1						2	3		
	"N" – "D"													1								2	3		
	"N" – "D", "N" – "R"																					3	2	1	
	1rst – 2rd														4							5	6	1	2	3
	2nd – 3rd									3						5	4					6	7	1	2	
	3rd – O/D												4									5	6	1	2	3
	1rst – 2nd – 3rd – O/D																					2	3		1	
	O/D – 3rd																						4	1	2	3
	3rd – 2nd									3					6		5		7				8	1	2	4
Slip	Forward & Reverse																					1				
	"R" position																					1				
	1rst																					1				
	2nd																					1				
	3rd																					1				
	O/D																					1				
No engine braking	1st ("L" position)				4				2	3								5				6	1			
	2nd ("2" position)																					1				
No kick–down		4	4	4				3	3														1	2		
Poor acceleration									2			3										4	1			
No lock–up											2									3	4	5	1			

V02264

Remark★: Refer to '94 A442F Automatic Transmission Repair Manual.

(OFF–VEHICLE)

Trouble \ Parts Name	Torque converter clutch	Oil Pump	O/D brake (Bo)	2nd brake (B2)	1st and reverse brake (B3)	O/D direct clutch (Co)	Front clutch (C1)	Rear clutch (C2)	O/D one–way clutch (Fo)	No.2 one–way clutch (F2)	ON–Vehicle matrix chart	Front planetary gear	Rear planetary gear
See page	AT–69	★	★	★	★	★	★	★	★	★	AT–53	★	★
Does not move in any forward position							1						
Does not move in reverse position					3			2			1		
Does not move in any position	1	3				2			4			5	6
No up–shift	lSt–2nd				2					3	1		
	2nd–3rd						2		3		1		
	3rd – O/D			2							1		
No down–shift	O/D→3rd						2			3	1		
	3rd–2nd				2						1		
	2nd –1 st						2				1		
Shift point too high or too low											1		
Harsh engagement	"N"→"R"					3			2			1		
	"N"→"D"							2			3	1		
	"N"→"D", "N"→"R"						2			3		1		
	1 st–2nd				2							1		
	2nd→3rd						3		2			1		
	3rd→O/D			2								1		
	1 st →2nd→3rd →OID							2				1		
	O/D→3rd						2			3		1		
	3rd–2nd				2							1		
Slip	Forward & Reverse	2	3							4		1		
	"R" position					2			1					
	1 st							1			2			
	2nd				1			2						
	3rd							1	2					
	O/D			3				1	2					
No engine braking	1st ("L" position)					2						1		
	2nd ("2" position)						2					1		
No kick–down												1		
Poor acceleration	2					3						1		
No lock–up	2											1		

V04560