TROUBLESHOOTING

AT09E-02

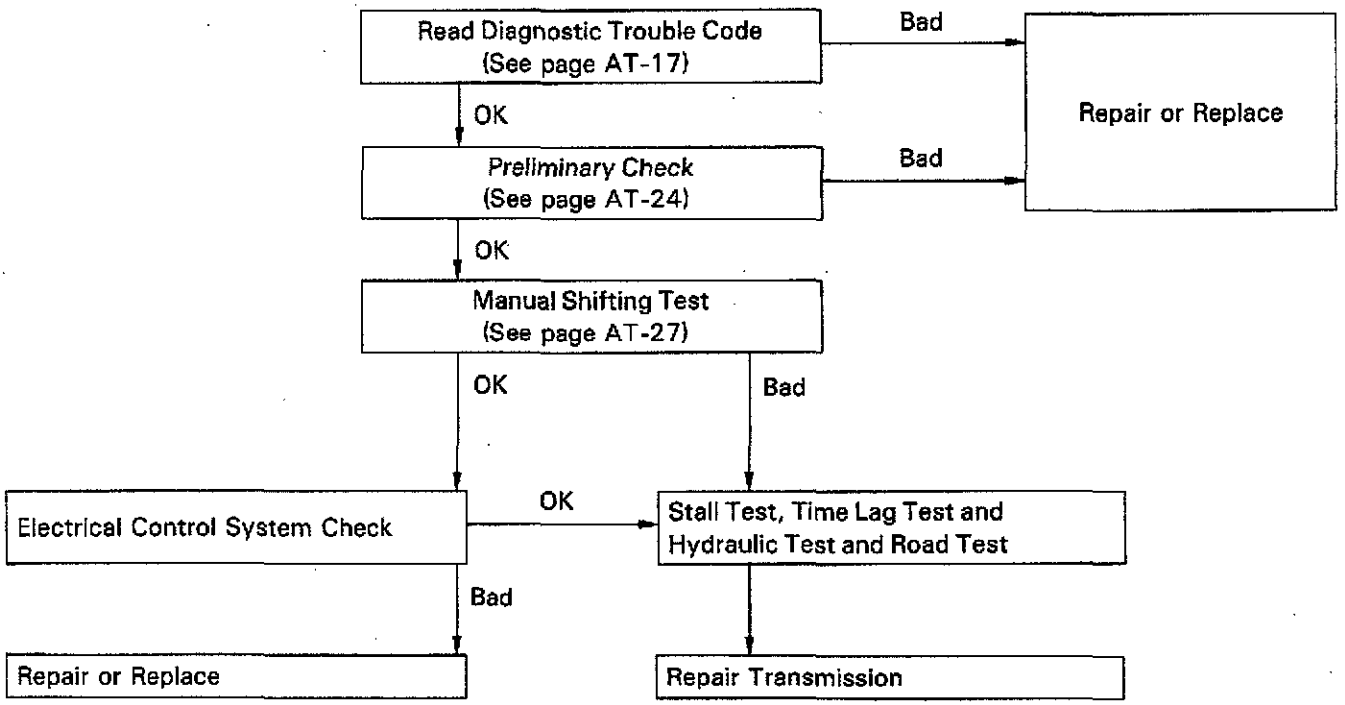
Trouble occurring in the ECT can stem from one of three sources: the engine, the transmissions electronic control unit or the transmission itself. Before troubleshooting, determine the sources of the problem, and begin troubleshooting with the simplest operation, gradually working up in order of difficulty.

AT09F-02

BASIC TROUBLESHOOTING

Before troubleshooting an ECT, 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 along with the general troubleshooting chart on the following pages should speed up the procedure.

AT



V01587

NOTICE: Refer to A441E Automatic Transmission Repair Manual (Pub. No. RM341E) when ★ mark appears in the column for page numbers.

AT

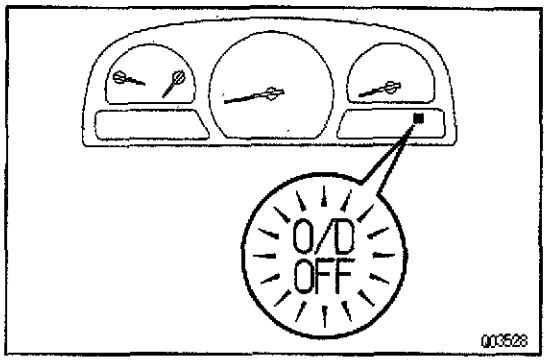
Problem	Possible cause	Remedy	Page
Fluid discolored or smells burnt	Fluid contaminated	Replace fluid	AT-24
	Torque converter faulty	Replace torque converter	AT-60
	Transmission faulty	Disassemble and inspect transmission	★
Vehicle does not move in any forward position or reverse	Manual linkage out of adjustment	Adjust linkage	AT-25
	Valve body or primary regulator faulty	Inspect valve body	★
	Parking lock pawl faulty	Inspect parking lock pawl	★
	Torque converter faulty	Replace torque converter	AT-60
	Converter drive plate broken	Replace drive plate	AT-60
	Oil pump intake screen blocked	Clean screen	★
	Transmission faulty	Disassemble and inspect transmission	★
Shift lever position incorrect	Manual linkage out of adjustment	Adjust linkage	AT-25
	Manual valve and lever faulty	Inspect valve body	★
	Transmission faulty	Disassemble and inspect transmission	★
Harsh engagement into any drive position	Throttle cable out of adjustment	Adjust throttle cable	AT-25
	Valve body or primary regulator faulty	Inspect valve body	★
	Accumulator pistons faulty	Inspect accumulator pistons	★
	Transmission faulty	Disassemble an inspect transmission	★
Delayed 1-2, 2-3 or 3-O/D up-shift, or down-shift from O/D-3 or 3-2 and shifts back to O/D or 3	Electronic control faulty	Inspect electronic control	AT-28
	Valve body faulty	Inspect valve body	★
	Solenoid valve faulty	Inspect solenoid valve	AT-37
Slips on 1-2, 2-3 or 3-O/D up-shift, or slips or shudders on acceleration	Manual linkage out of adjustment	Adjust linkage	AT-25
	Throttle cable out of adjustment	Adjust throttle cable	AT-25
	Valve body faulty	Inspect valve body	★
	Solenoid valve faulty	Inspect solenoid valve	AT-37
	Transmission faulty	Disassemble and inspect transmission	★
Drag, binding or tie-up on 1-2, 2-3 or 3-O/D up-shift	Manual linkage out of adjustment	Adjust lindage	AT-25
	Valve body faulty	Inspect valve body	★
	Transmission faulty	Disassemble and inspect transmission	★

NOTICE: Refer to A441E Automatic Transmission Repair Manual (Pub. No. RM341E) when ★ mark appears in the column for page numbers.

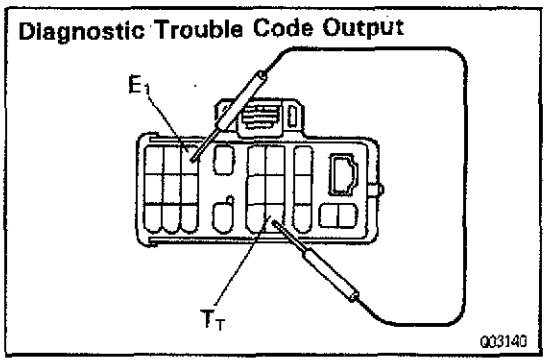
Problem	Possible cause	Remedy	Page
No lock-up in 3rd or O/D	electronic control faulty	Inspect electronic control	AT-28
	Valve body faulty	Inspect valve body	★
	Solenoid valve faulty	Inspect solenoid valve	AT-37
	Transmission faulty	Disassemble and inspect transmission	★
Harsh down-shift	Throttle cable out of adjustment	Adjust throttle cable	AT-25
	Throttle cable and cam faulty	Inspect throttle cable and cam	AT-25
	Accumulator pistons faulty	Inspect accumulator pistons	★
	Valve body faulty	Inspect valve body	★
	Transmission faulty	Disassemble and inspect transmission	★
No down-shift when coasting	Valve body faulty	Inspect valve body	★
	Solenoid valve faulty	Inspect solenoid valve	AT-37
	Electronic control faulty	Inspect electronic control	AT-28
Down-shit occurs too quickly or too late while coasting	Throttle cable faulty	Inspect throttle cable	AT-25
	Valve body faulty	Inspect valve body	★
	Transmission faulty	Disassemble and inspect transmission	★
	Solenoid valve faulty	Inspect solenoid valve	AT-37
	Electronic control faulty	Inspect electronic control	AT-28
No O/D-3, 3-2 or 2-1 kick-down	Solenoid valve faulty	Inspect solenoid valve	AT-37
	Electronic control faulty	Inspect electronic control	AT-28
	Valve body faulty	Inspect valve body	★
No engine braking 2 or L position	Solenoid valve faulty	Inspect solenoid valve	AT-37
	Electronic control faulty	Inspect electronic control	AT-28
	Valve body faulty	Inspect valve body	★
	Transmission faulty	Disassemble and inspect transmission	★
Vehicle does not hold in P	Manual linkage out of adjustment	Adjust linkage	AT-25
	Parking lock pawl cam and spring faulty	Inspect cam and spring	★

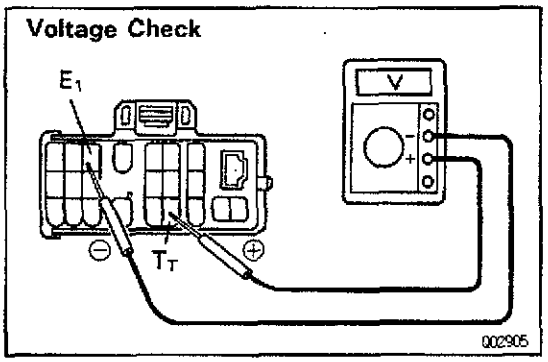
V02185

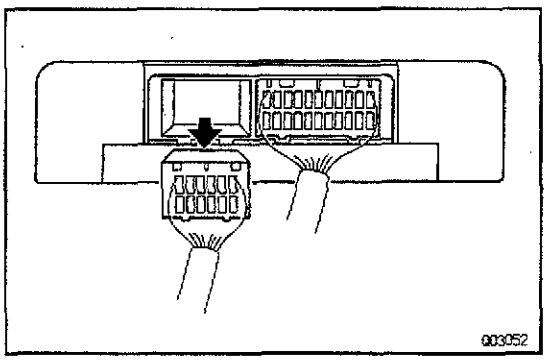
AT



AT







DIAGNOSIS SYSTEM

AT006-02

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

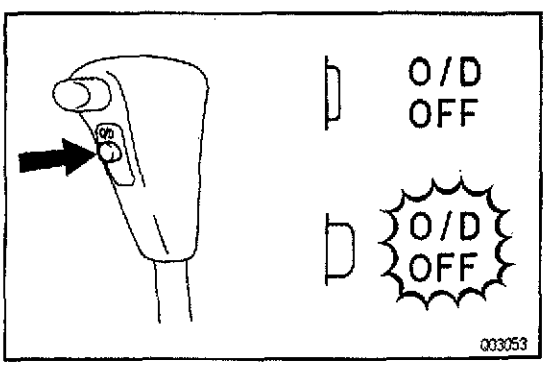
(a) If a malfunction occurs within the vehicle speed sensors (No.1 or 2), solenoids (No.1 or 2), throttle sensor or engine speed signal, the overdrive OFF indicator light will blink to warn the driver.
However, there will be no warning of a malfunction with lock–up and shift timing solenoids.

(b) The diagnostic code can be read by the number of blinks of the overdrive OFF indicator light when terminals T_T and E_1 are connected.

(c) The throttle position sensor and stoplight switch circuits inspection can be made by checking the voltage at terminal T_T of the check connector.

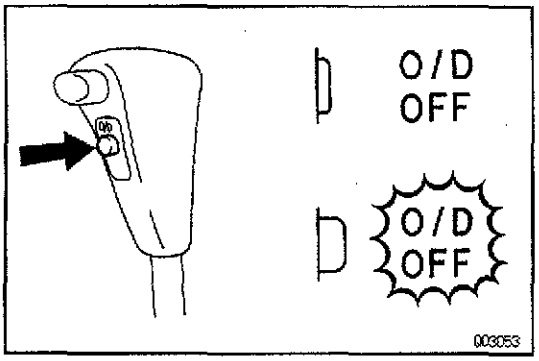
(d) The signals to each gear can be checked by measuring the voltage at terminal T_T of the check connector while driving.

2. The diagnostic code is retained in memory by the ECT ECU 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 ECT ECU connector to cancel out the diagnostic code. (See page AT–19)
   HINT:
   - Low battery 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.



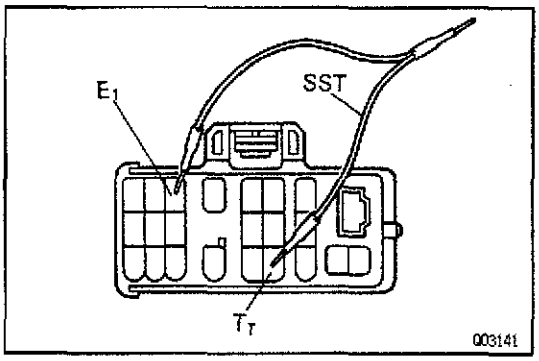
CHECK "O/D OFF" INDICATOR LIGHT

1. Turn the ignition switch ON.
2. The "O/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 "O/D OFF" light should go out.
   If the "O/D OFF" light flashes when the O/D switch is set to ON, the electronic control system is faulty.

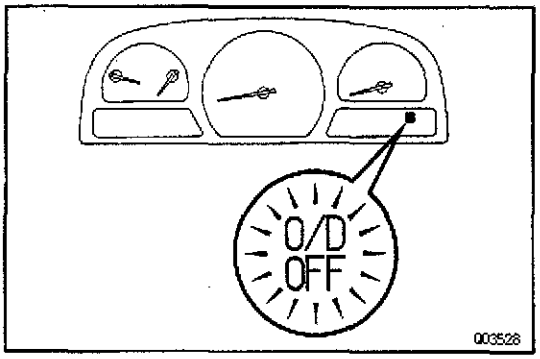


READ DIAGNOSTIC CODE

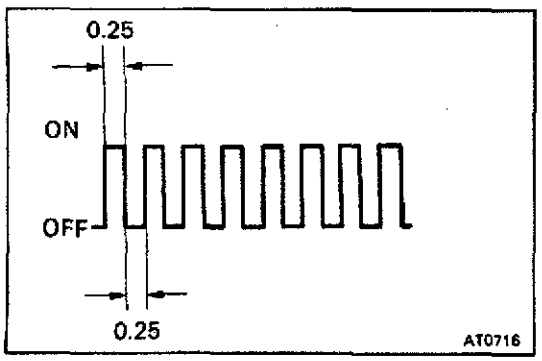
1. **TURN IGNITION SWITCH AND O/D SWITCH TO ON**
   Do not start the engine.
   HINT: Warning and diagnostic codes can be read only when the overdrive switch is ON. If OFF, the overdrive OFF light will light continuously and will not blink.



2. **CONNECT T_T AND E_1 TERMINALS OF CHECK CONNECTOR**
   Using SST, connect T_T and E_1 terminal of the check connector.
   SST 09843–18020



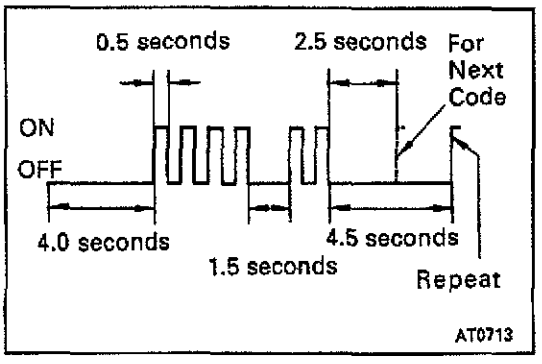
3. **READ DIAGNOSTIC CODE**
   Read the diagnostic code as indicated by the number of times the O/D OFF light flashes.



(Diagnostic 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 code. If there are 2 or more codes, there will be a 2.5 seconds pause between each.

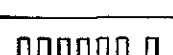
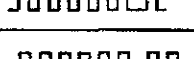
HINT: In the event of several diagnostic codes occurring simultaneously, indication will begin from the smaller value and continue to the larger.



4. **REMOVE SST**

DIAGNOSTIC TROUBLE CODES

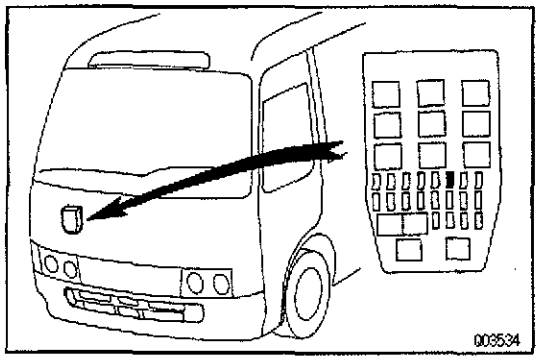
AT

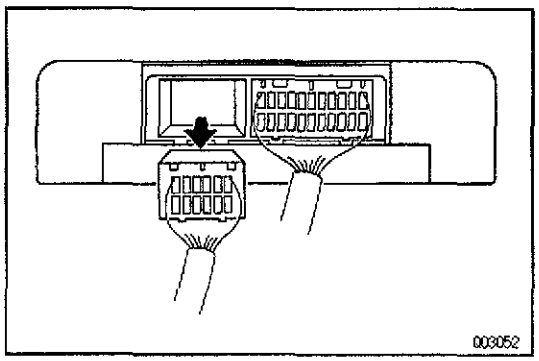
Code No.	Light Pattern	Diagnosis System
–		Normal
41		Severed throttle position sensor or short circuit– severed wire harness or short circuit
42		Defective No. 1 vehicle speed sensor (in combination meter)– severed wire harness or short circuit
61		Defective No. 2 vehicle speed sensor (in ATM)– severed 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

Q03076

V03056

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 CODE

1. After repair of the area, the diagnostic code retained in memory by the ECT ECU must be canceled by removing the DOME fuse (10A) 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 code can be also canceled out by disconnecting the ECT ECU connector.
   - If the diagnostic code is not canceled out, it will be retained by the ECT ECU 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.

AT

AT0G1-01

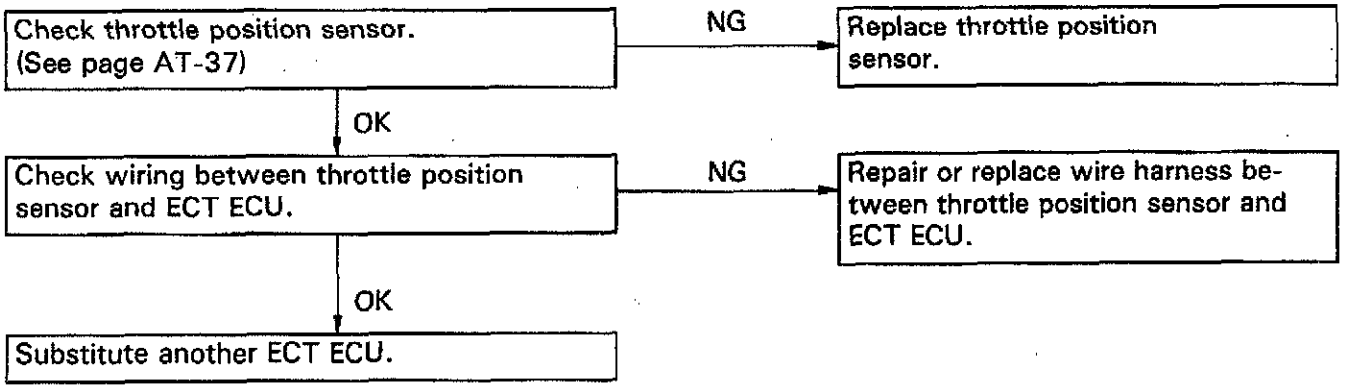
TROUBLESHOOTING FLOW—CHART

HINT:

- If diagnostic code Nos.41, 42, 61, 62, 63 and/or 86 are detected 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 ECT ECU memory until canceled out.
- There is no warning for diagnostic code No.64 and 65.

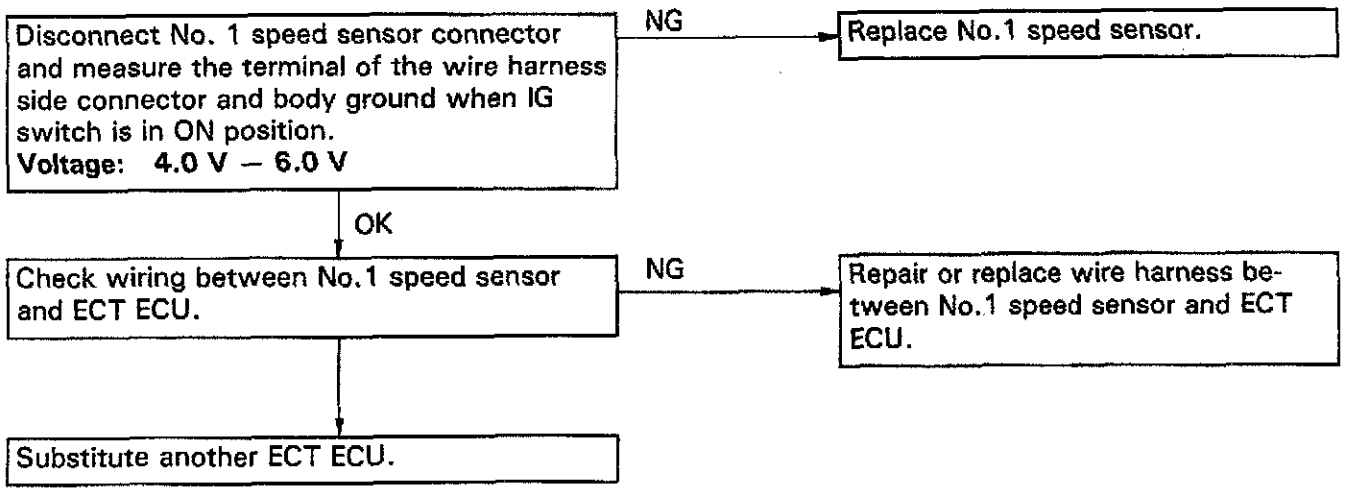
Diagnostic Code 41 (Throttle position sensor circuitly)

AT



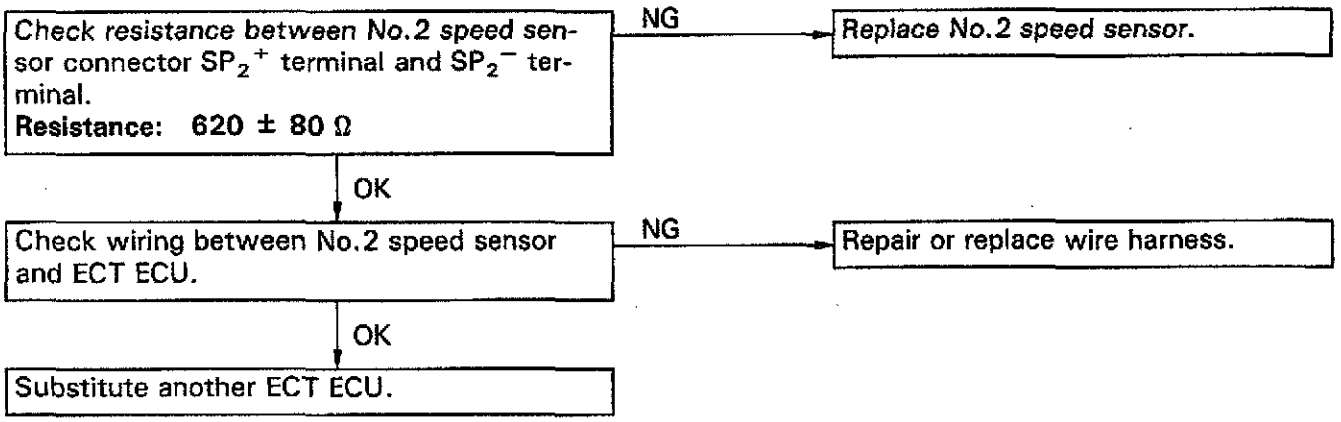
V03046

Diagnostic Code 42 (No.1 speed sensor circuitly)



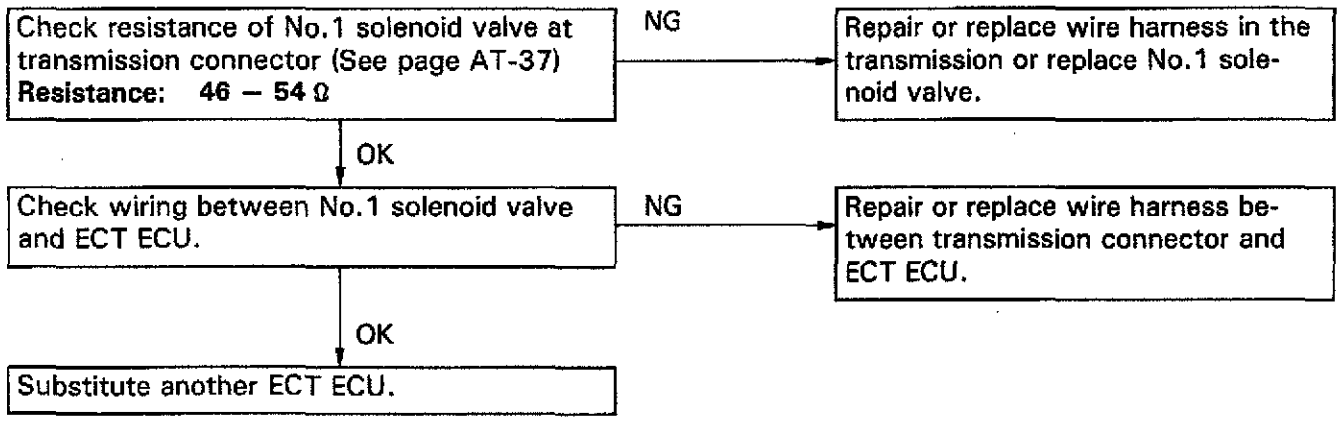
V03047

Diagnostic Code 61 (No.2 speed sensor circuitly)



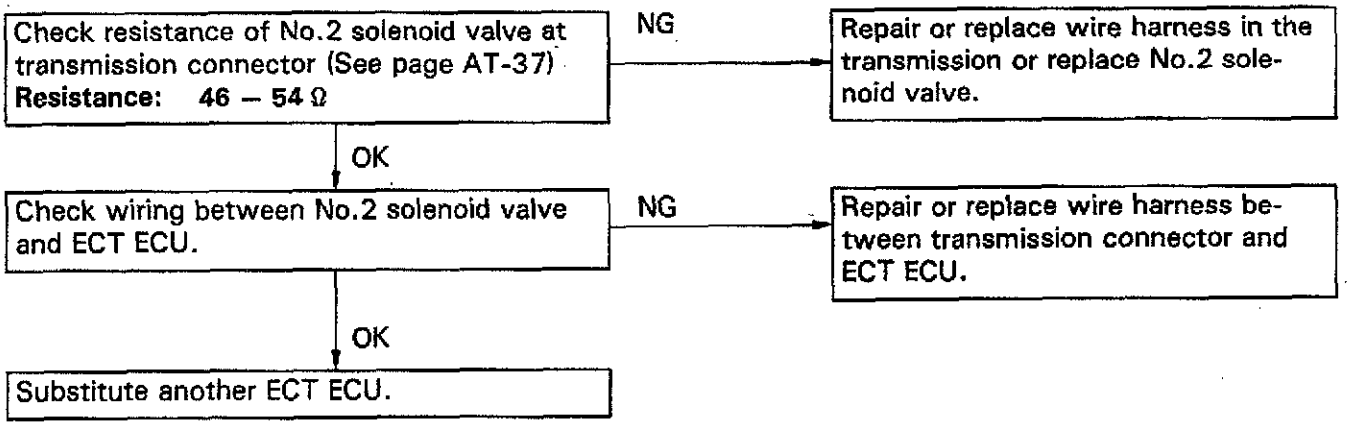
V03048

Diagnostic Code 62 (No.1 solenoid valve circuitly)



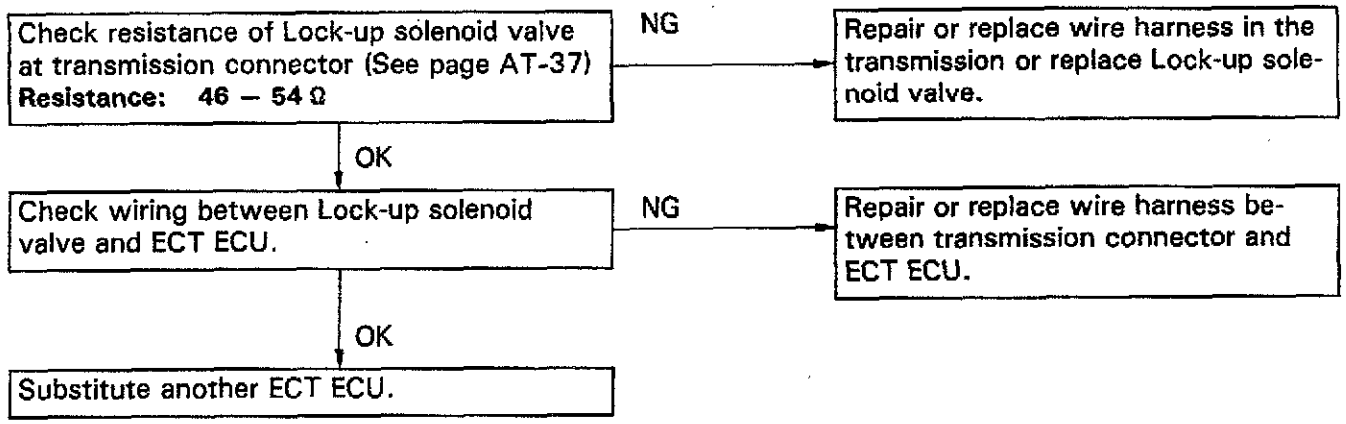
V03049

Diagnostic Code 63 (No.2 solenoid valve circuitly)



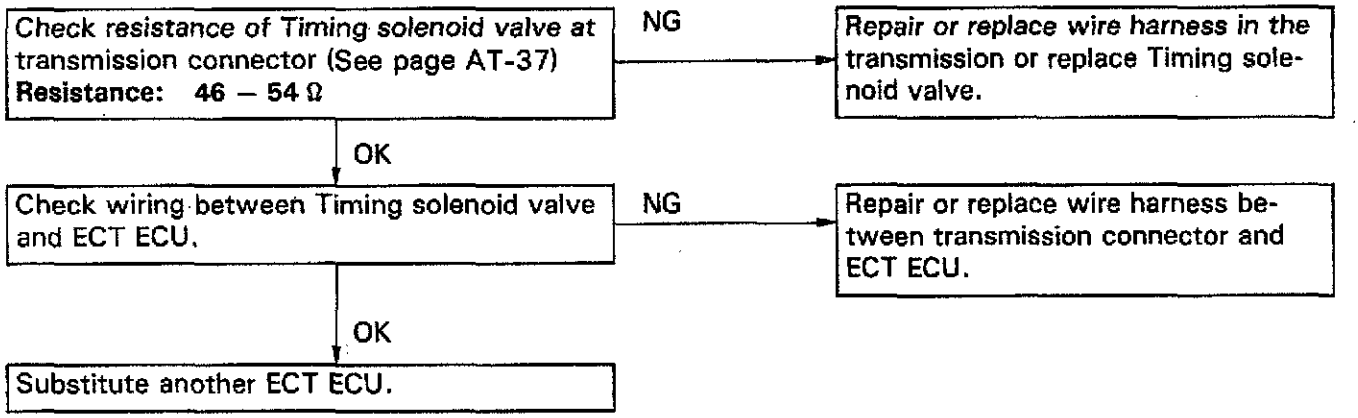
V03050

Diagnostic Code 64 (Lock—up solenoid valve circuitly)



V03051

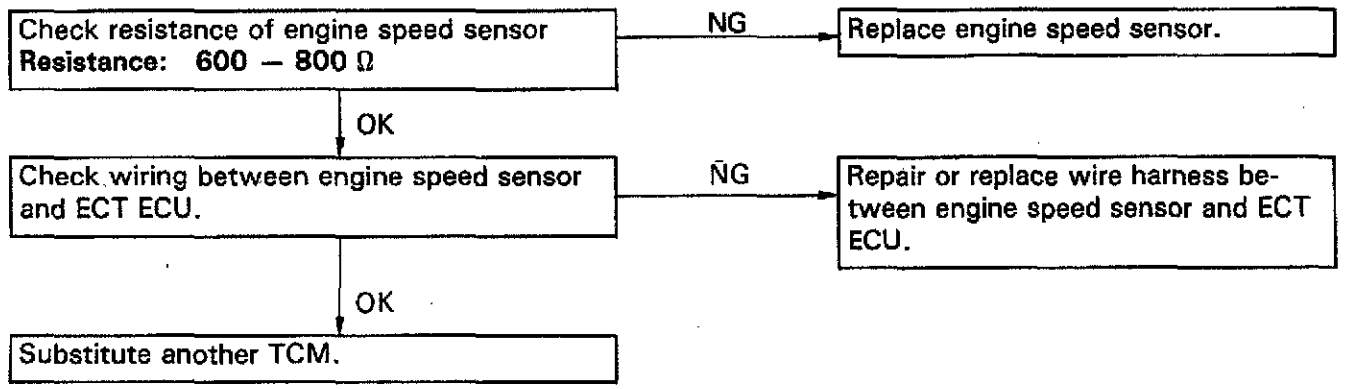
Diagnostic Code 65 (Timing solenoid valve circuitly)



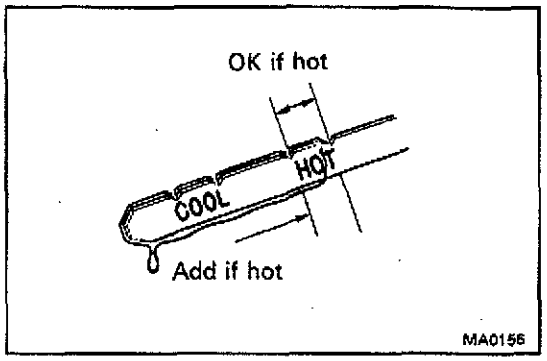
V03052

AT

Diagnostic Code 86 (Engine speed sensor circuitly)



V03053



AT

AT0B2-01

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 or 158–176°F)

- Only use the COOL position 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 ranges from P to L range and return to P range.

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

(d) Push it back fully into the tube.

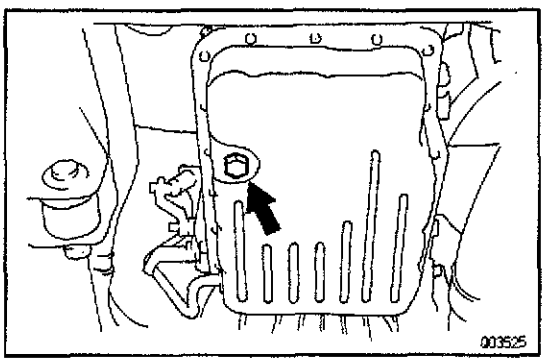
(e) Pull it out and check that the fluid level is on the HOT position.

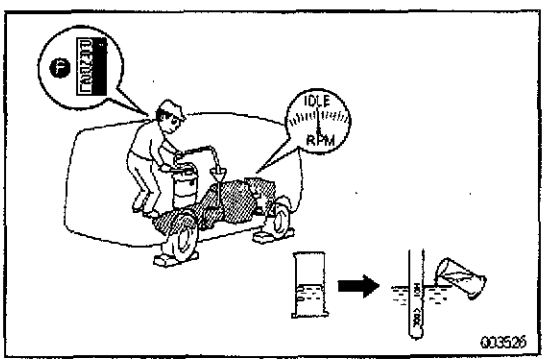
If the level is on the low side, add fluid.

Fluid type:

ATF DEXRON® II

NOTICE: Do not overfill.





2. CHECK FLUID CONDITION

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

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

(b) Reinstall the drain plug securely.

Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)

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

Fluid type:

ATF DEXRON® II

Capacity:

Total

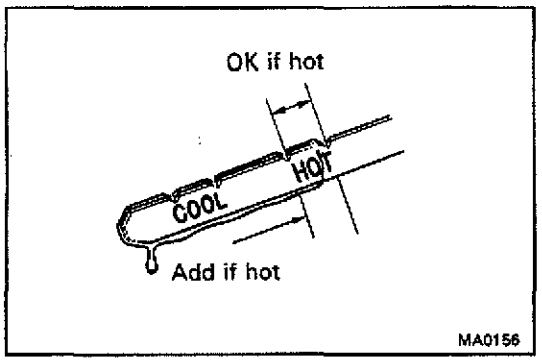
13.0 liters (13.7 US qts, 11.4 Imp.qts)

Drain and refill

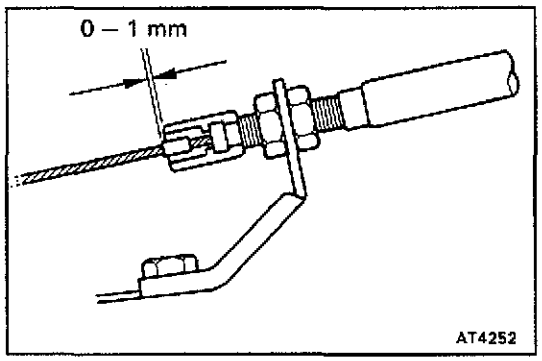
6.0 liters (6.3 US qts, 5.3 Imp.qts)

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

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

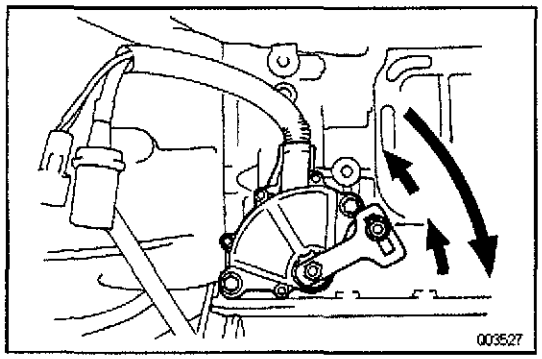


(f) Check the fluid level with the normal operating temperature (70–80°C or 158–176°F) and add as necessary.
NOTICE: Do not overfill.



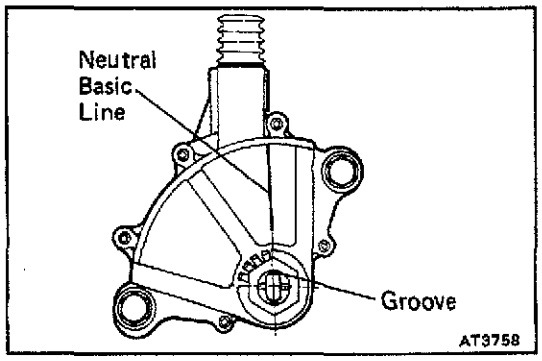
3. CHECK AND ADJUST THROTTLE CABLE

(a) Check that the throttle cable is installed correctly and not bending.
(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 nut.



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 shaft lever.
(b) Push the control shaft lever fully toward the front 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 cable 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.

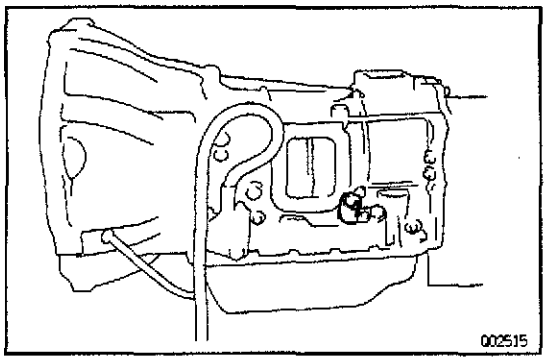


5. INSPECT NEUTRAL START SWITCH

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 stated above, carry out the following adjustment procedures.
(a) Loosen the neutral start switch bolts and set the shift lever to the N range.
(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)
Idle speed:
660 – 760 rpm



AY06K–02

MANUAL SHIFTING TEST

HINT: With this test, it can be determined 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 the transmission itself.
3. **CONNECT SOLENOID WIRE**
4. **CANCEL OUT DIAGNOSTIC TROUBLE CODE**
   (See page AT–19)

AT

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	1st	×	ON (OFF)	3rd (O/D)	ON	×	1st	×	×	O/D
	ON	ON	2nd	×	ON	3rd	OFF (ON)	×	O/D (1st)	×	×	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 (1st)	×	×	3rd
	OFF	ON	3rd	×	ON	3rd	OFF	×	3rd	×	×	3rd
L position	ON	OFF	1st	×	OFF	1st	ON	×	1st	×	×	1st
	ON	ON	2nd	×	ON	2nd	ON	×	1st	×	×	1st

( ): No fail-safe function ×: Malfunctions

V01542

ELECTRONIC CONTROL SYSTEM

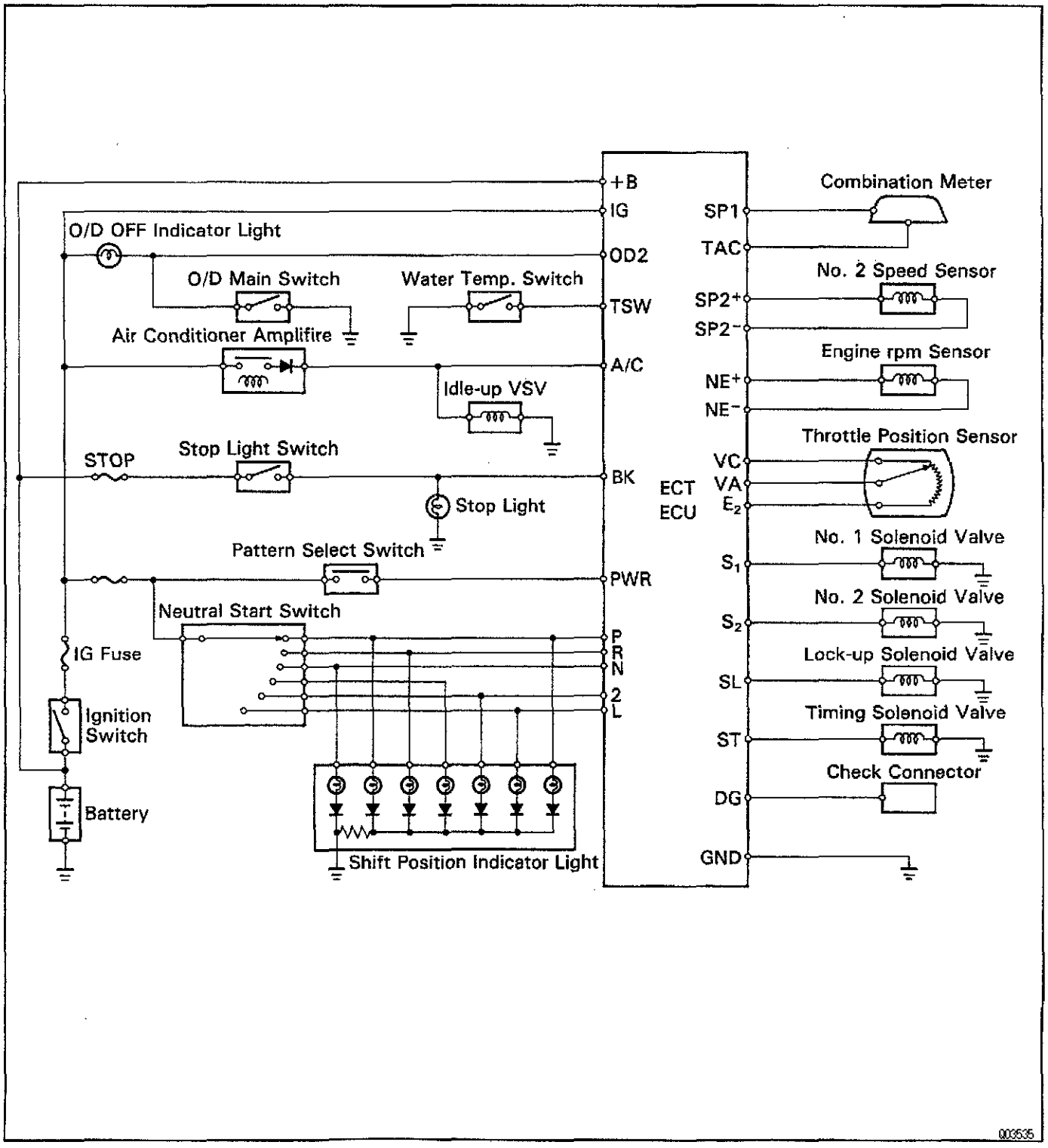
AT09L–02

PRECAUTION

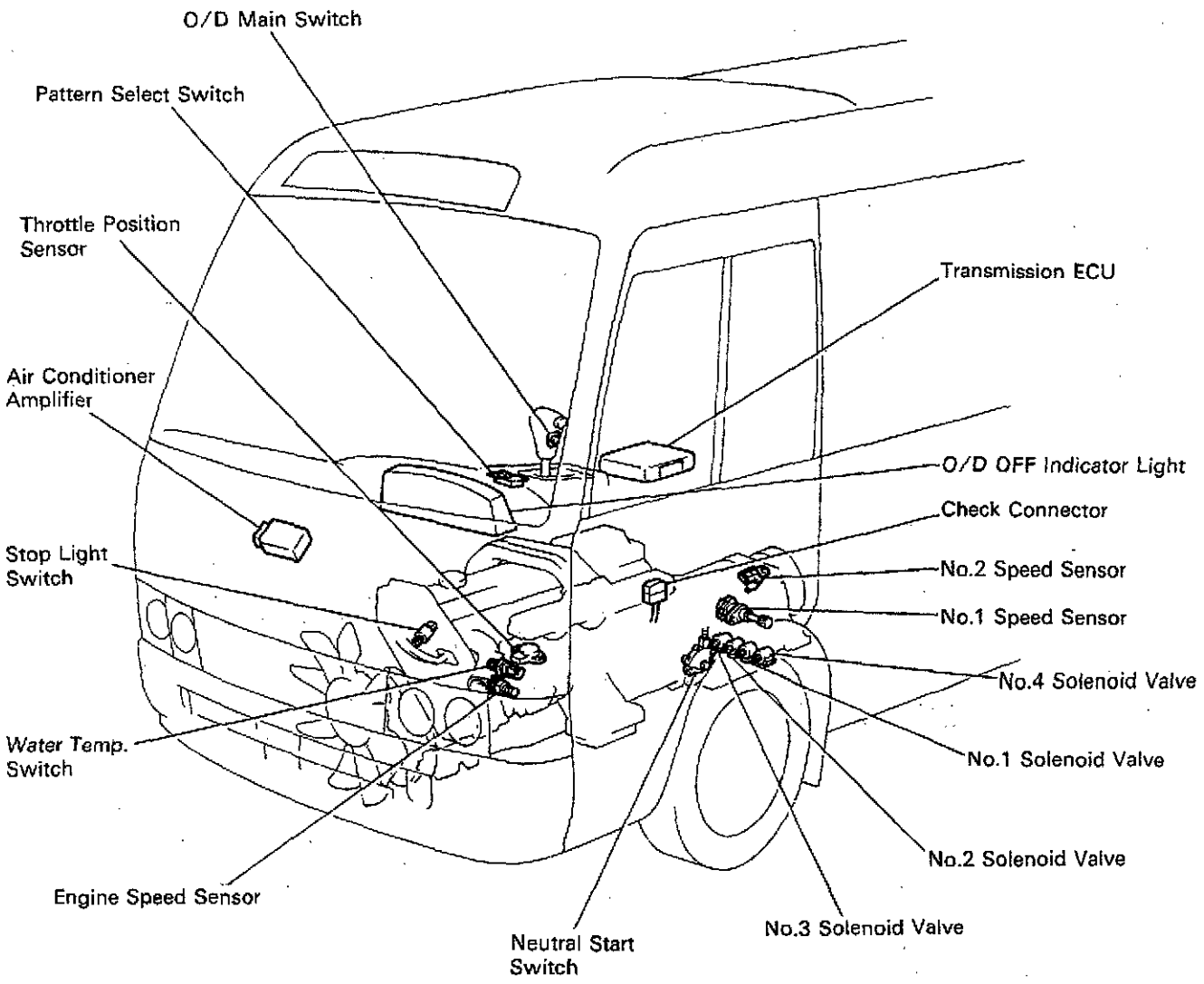
Do not open the cover or the case of the ECT ECU and various computer unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)

ELECTRONIC CONTROL CIRCUIT

AT

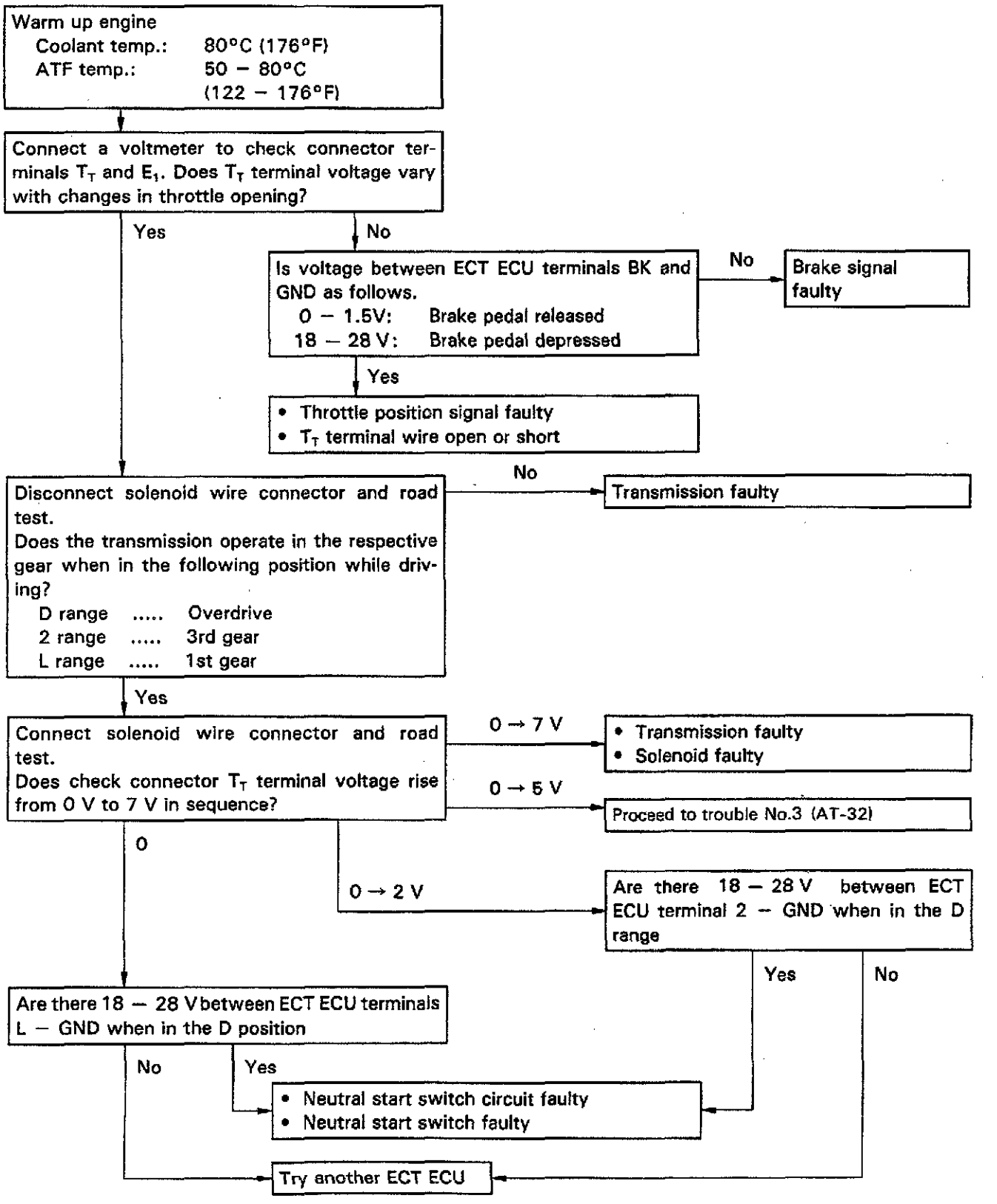


ELECTRONIC CONTROL COMPONENTS



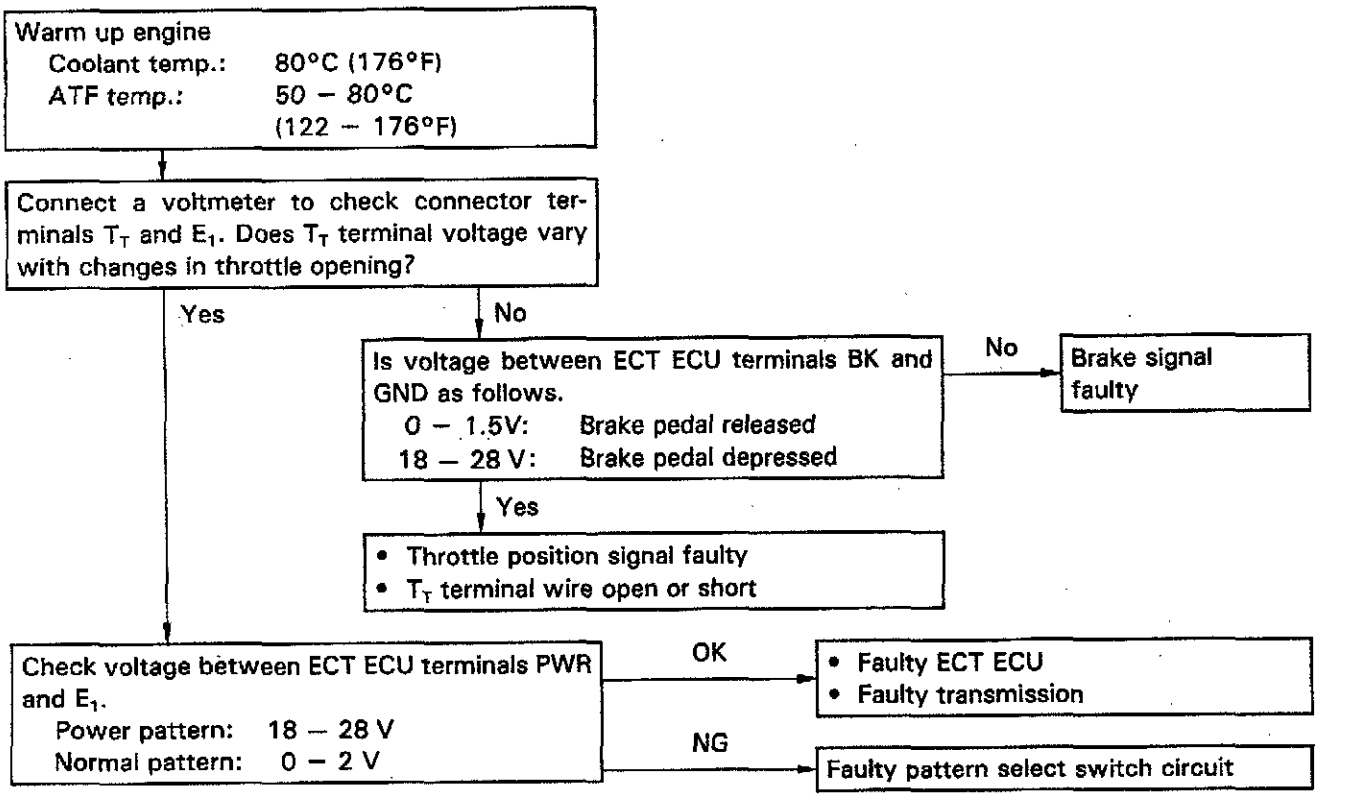
TROUBLESHOOTING FLOW–CHART

Trouble No.1 No shifting



V03060

Trouble No.2 Shift point too high or too low

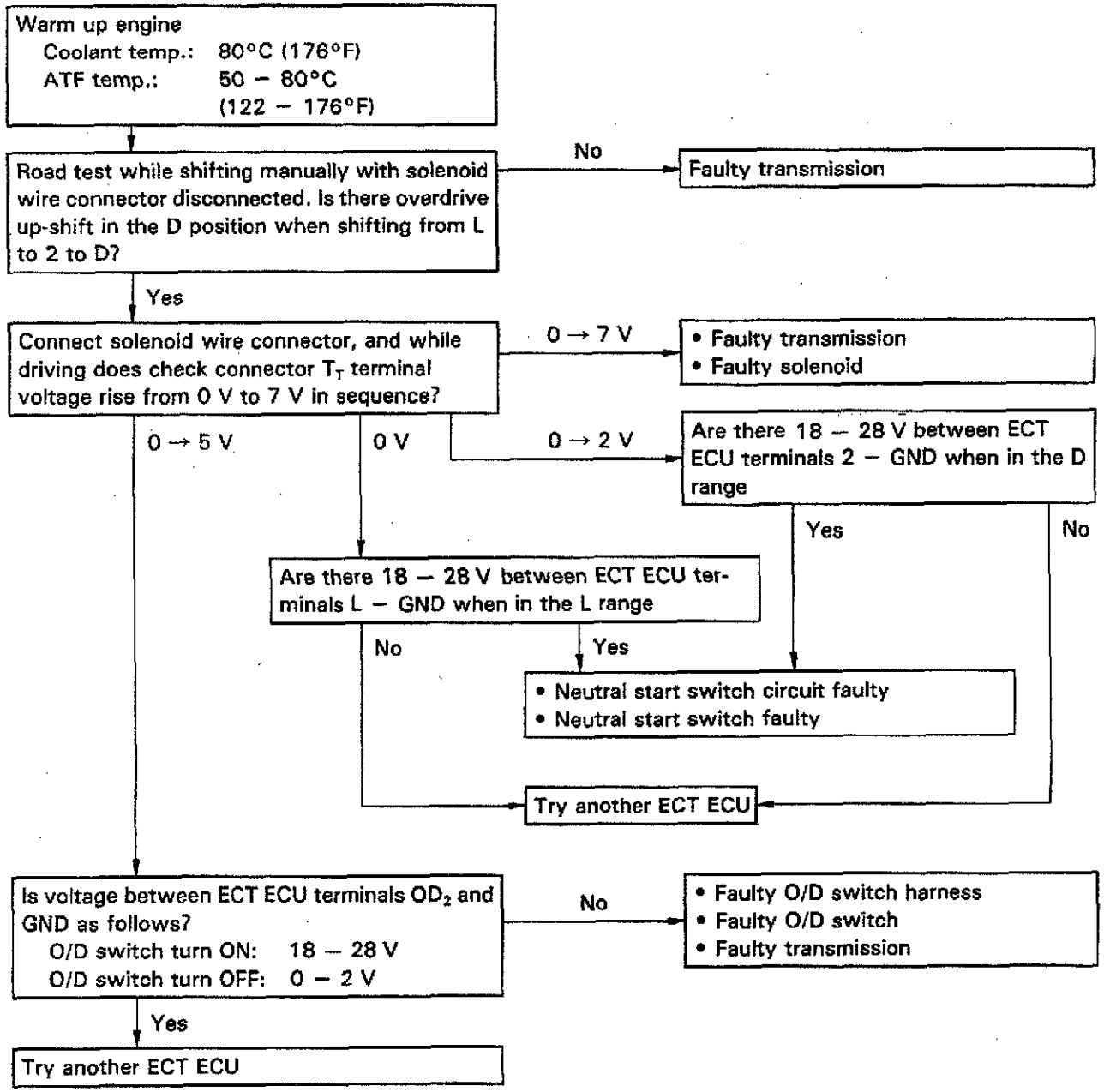


V03058

AT

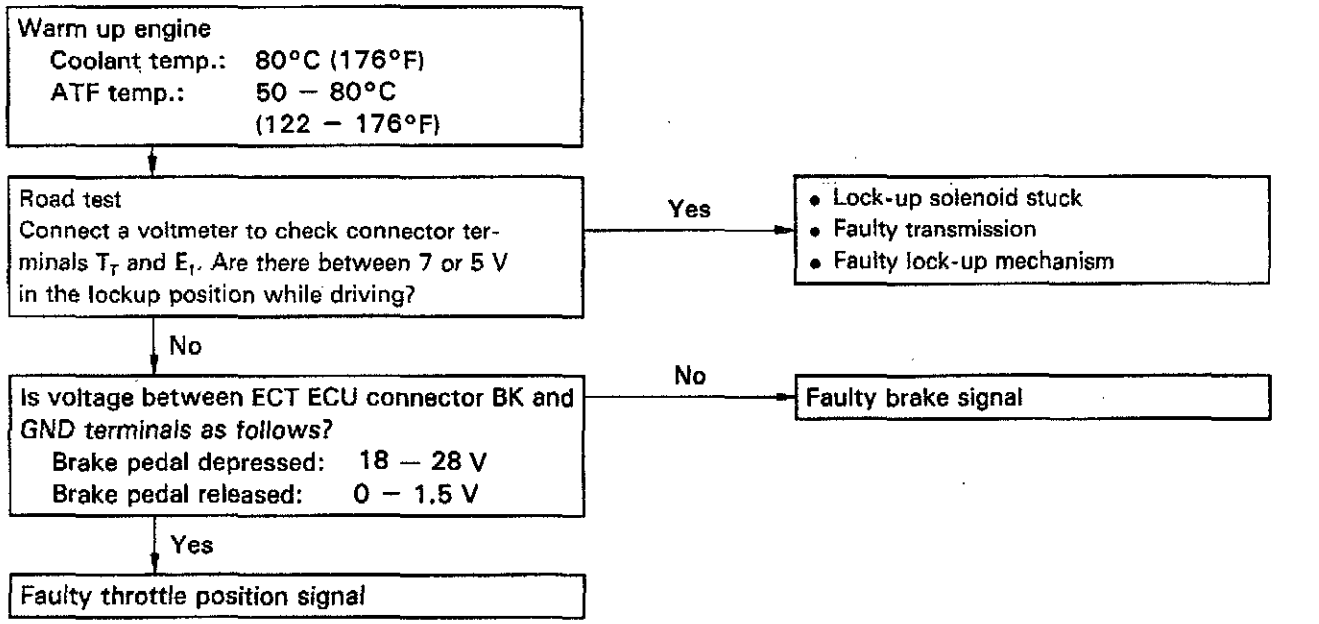
Trouble No.3 No up–shift to overdrive (After warm–up)

AT

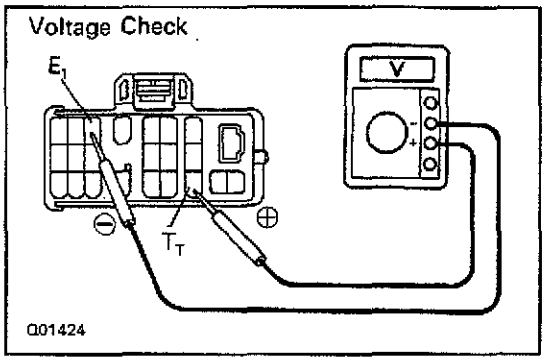


V03059

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



AT



T_T TERMINAL VOLTAGE INSPECTION

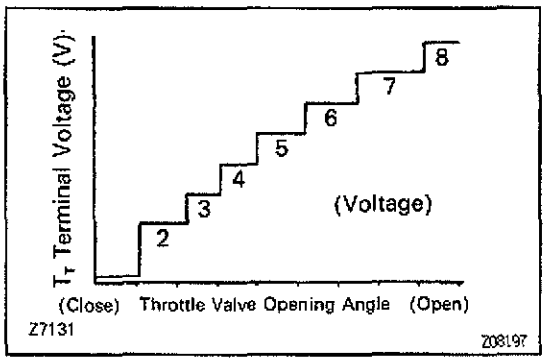
AT003-01

1. INSPECT THROTTLE POSITION SENSOR SIGNAL

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

(b) Connect a voltmeter to check connector terminals T_T and E_1.

AT

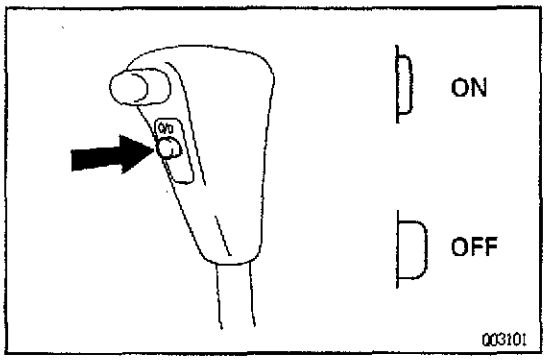


(c) While slowly depressing the accelerator pedal, check that T_T terminal voltage rises in sequence.
If the voltage does not change in proportion to the throttle opening angle, there is a malfunction in the throttle position sensor or circuit.

2. INSPECT BRAKE SIGNAL

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

(b) Depress the brake pedal and check the voltage reading from the T_T 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 (176°F)

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

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

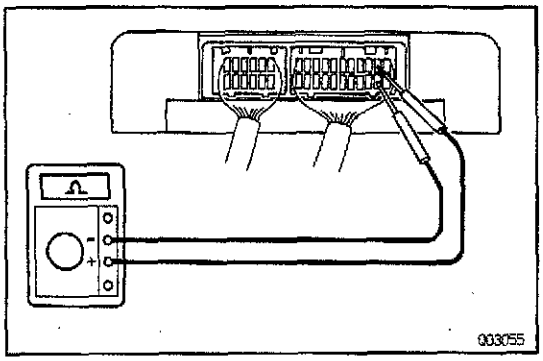
(d) During a road test (about 10 km/h or 6 mph) check that voltage at the T_T terminal is as indicated below for each up–shift position.

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

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.

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 2 nd and 3rd 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–5 V.



ELECTRONIC CONTROL COMPONENTS INSPECTION

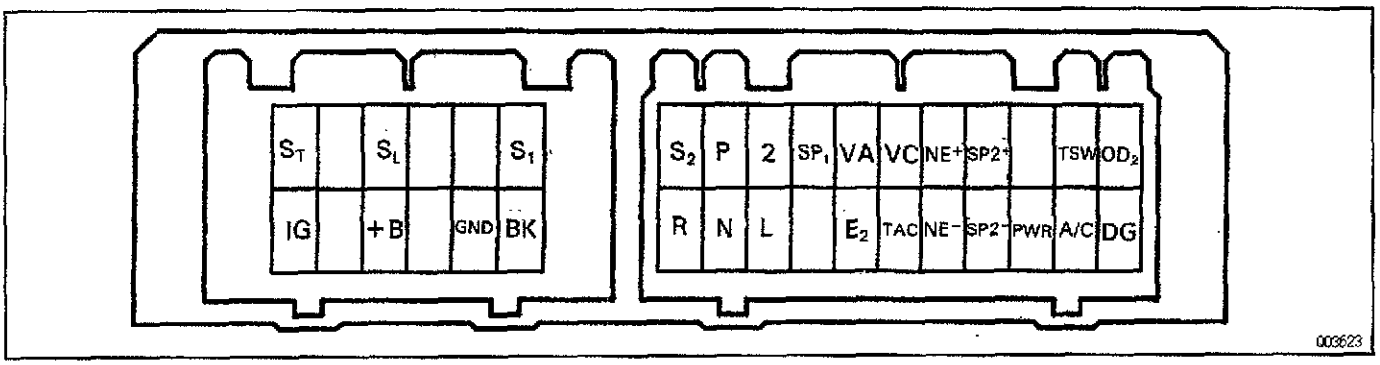
ATOG4-01

1. INSPECT VOLTAGE OF TCM

(a) Turn the ignition switch ON.

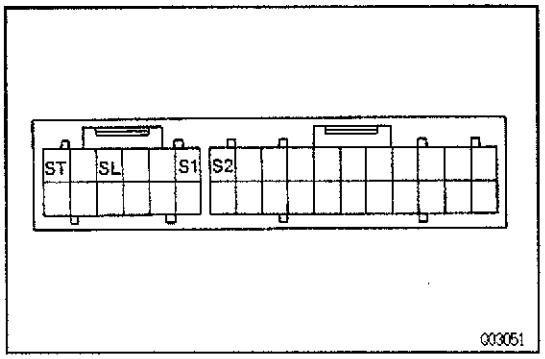
(b) Measure the voltage at each terminal.

AT



Terminal	Measuring condition		Voltage (V)
S1 — GND	Vehicle stationary	N position	18 — 28
		D position	18 — 28
S2 — GND	Vehicle stationary	D position	0 — 1.5
SL — GND	Vehicle stationary		0 — 1.5
ST — GND	Vehicle stationary		0 — 1.5
BK — GND	Brake pedal is depressed		18 — 28
	Brake pedal is released		0 — 1.5
A/C — GND	Air conditioner operating		18 — 28
	Air conditioner not operating		0 — 1.5
+B — GND	Engine stopped		18 — 28
IG — GND	Engine stopped and ignition switch ON		18 — 28
OD_2 — GND	O/D main switch turned ON		0 — 3
	O/D switch turned OFF		18 — 28
VC — E_2	Vehicle stationary		4.4 — 5.5
TAC — GND	Engine idling		Pulse generation
TSW — GND	Engine coolant temp. 50°C or more		18 — 28
	Engine coolant temp. less than 50°C		0 — 3
$SP2^+$ — $SP2^-$	Vehicle moving		Pulse generation
SP1 — GND	Vehicle moving		Pulse generation
NE+ — NE−	Engine idling		Pulse generation
VA — E_2	Accelerlator pedal is released		2.79 — 3.79
	Accelerator pedal is fully depressed		0.1 — 1.1
2 — GND	position 2		18 — 28
	Except position 2		0 — 1.5
P — GND	P position		18 — 28
	Except P position		0 — 1.5
L — GND	L position		18 — 28
	Except L position		0 — 1.5

N – GND	N position	18 – 28
	Except N position	0 – 1.5
R – GND	R position	18 – 28
	Except R position	0 – 1.5
DG – GND	Engine stopes and ignition key at ON position	0 – 1.5
PWR – GND	PWR pattern	18 – 28
	NORM pattern	0 – 1.5



2. INSPECT SOLENOID

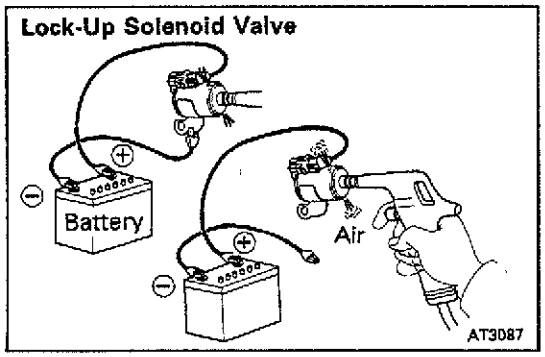
(a) Disconnect the connector from ECT ECU.

(b) Measure the resistance between S_1, S_2, S_L, S_T and ground.

Resistance:

46 – 54 Ω

(c) Apply battery voltage to each terminal. Check that an operating noise can be heard from the solenoid.

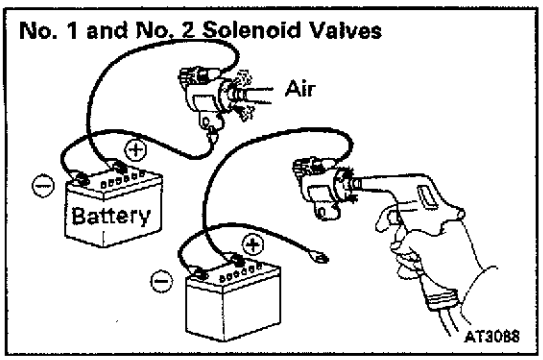


3. CHECK SOLENOID SEALS

If there is foreign material in the solenoid valve, there will be no fluid control even with solenoid operation.

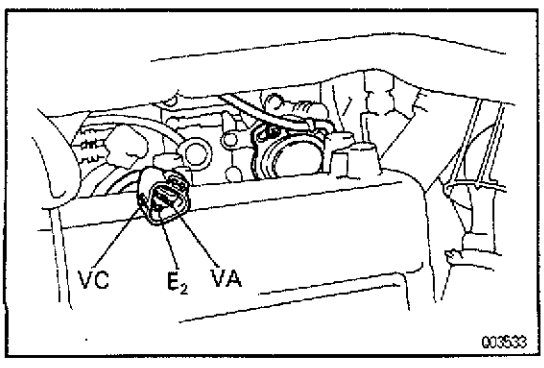
(a) Check No.1, No.2 and timing solenoid valves.

- Check that the solenoid valves do not leak when low–pressure compressed air is applied.
- When supply battery voltage to the solenoids, check that the solenoid valves open.



(b) Check the lock–up solenoid valve.

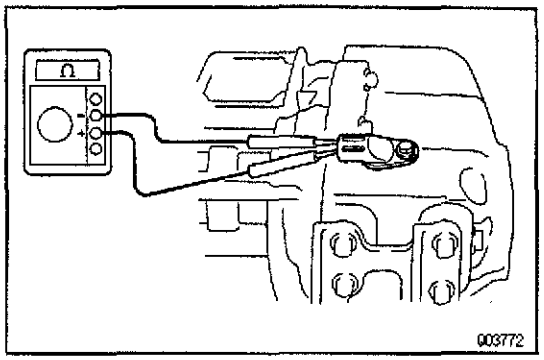
- Apply 490 kPa (5 kgf/cm², 71 psi) of compressed air, check that the solenoid valve opens.
- When supply battery voltage to the solenoid, check that the solenoid valve does not leak the air.



4. INSPECT THROTTLE POSITION SENSOR

Using an ohmmeter, check the resistance between terminals.

Terminal	Accelerator pedal condition	Resistance kΩ
VC – E_2	–	1.83 – 3.43
VA – E_2	Fully depressed	0.32
	Fully released	1.73



5. INSPECT NO.2 SPEED SENSOR

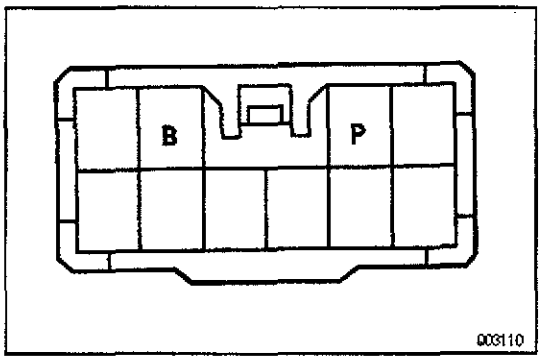
(a) Disconnect the No.2 speed sensor connector.

(b) Measure the No.2 speed sensor resistance.

Resistance : 560 – 680 Ω

6. INSPECT NO.1 VEHICLE SPEED SENSOR (See BE section)

AT

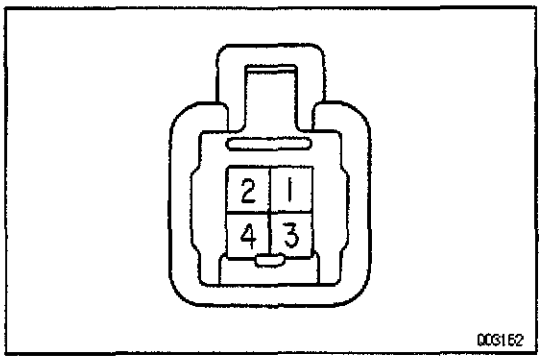


7. INSPECT PATTERN SELECT SWITCH

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.

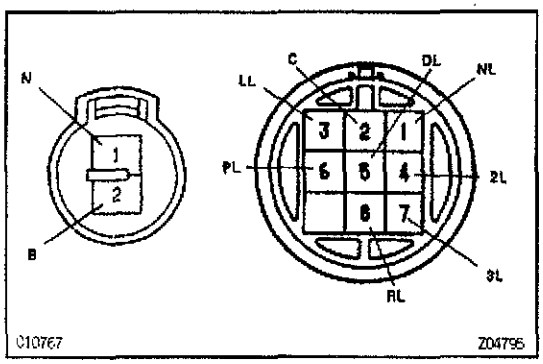
Switch condition	Terminal	Continuity
PWR	B – P	Continuity
NORM	B – P	No continuity



8. INSPECT O/D SWITCH

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

Switch condition	Terminal	Continuity
O/D ON	2 – 4	No continuity
O/D OFF	2 –4	Continuity



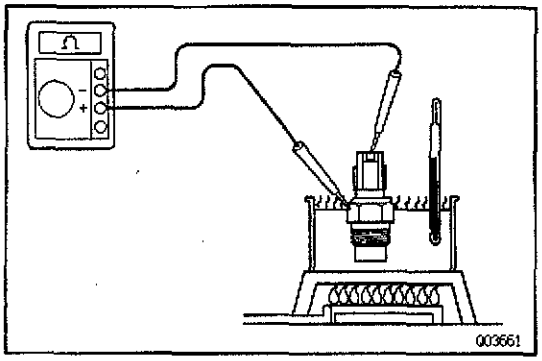
9. INSPECT NEUTRAL START SWITCH

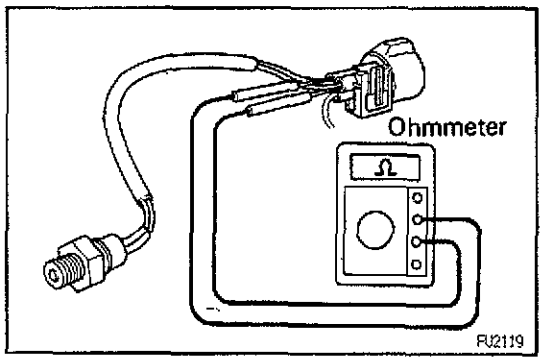
Check that there is continuity between terminals.

O—O : Continuity

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

V02106





10. INSPECT ENGINE COOLANT TEMPERATURE SWITCH

(a) Remove the engine coolant temp. switch.

(b) Using a ohmmeter, check continuity between terminals.

Temperature	Continuity
45 – 55°C (113 – 131°F) or more	*No continuity*
42°C (109°F) or less	Continuity

If neccesary replace the engine coolant temp. switch.

11. INSPECT PICKUP SENSOR

(a) Remove the pickup sensor.

(b) Measure pickup sensor resistance.

Resistance:

600 – 800 Ω

If neccesary replace the pickup sensor.

AT

AT037-04

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 ranges.

NOTICE:

- **Perform the test at normal operating fluid temperature (50–80°C, or 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 should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing the test.**

AT

MEASURE STALL SPEED

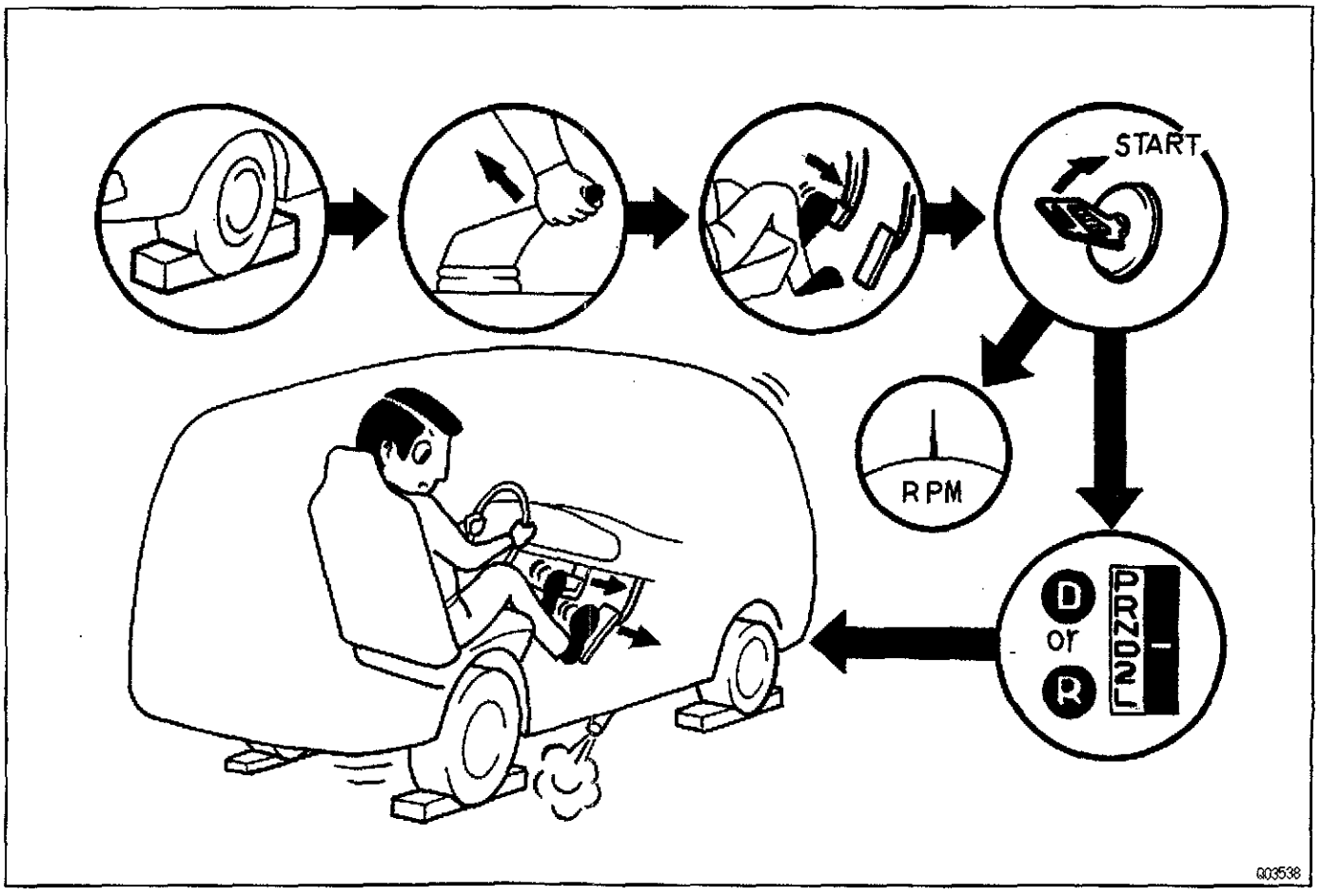
(a) Warm up the transmission fluid.
(b) Chock the front and rear wheels.
(c) Connect a tachometer to the engine.
(d) Fully apply the parking brake.
(e) Keep your left foot pressed firmly on the brake pedal.
(f) Start the engine.
(g) Shift into the D range. Step all the way down on the accelerator pedal 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:

1,900±150 RPM

(h) Perform the same test in R range.



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 could be faulty.

(b) If the stall speed in D range is higher than specified:
- Line pressure too low
- Forward clutch slipping
- No.2 one–way clutch not operating properly
- O/D one–way clutch not operating properly

(c) If the stall speed in R range is higher than specified:
- Line pressure too low
- Direct clutch slipping
- First and reverse brake slipping
- O/D one–way clutch not operating properly

(d) If the stall speed in both R and D range are higher than specified:
- Line pressure too low
- Improper fluid level
- O/D one–way clutch not operating properly

AT088-04

TIME LAG TEST

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

NOTICE:

- **Perform the test at normal operating fluid temperature (50–80°C or 122–176°F).**
- **Be sure to allow one minute interval between tests.**
- **Make 3 measurements and take the average value.**

MEASURE TIME LAG

AT

(a) Fully apply the parking brake.

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

Idle speed:

660 – 760 rpm (N position)

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

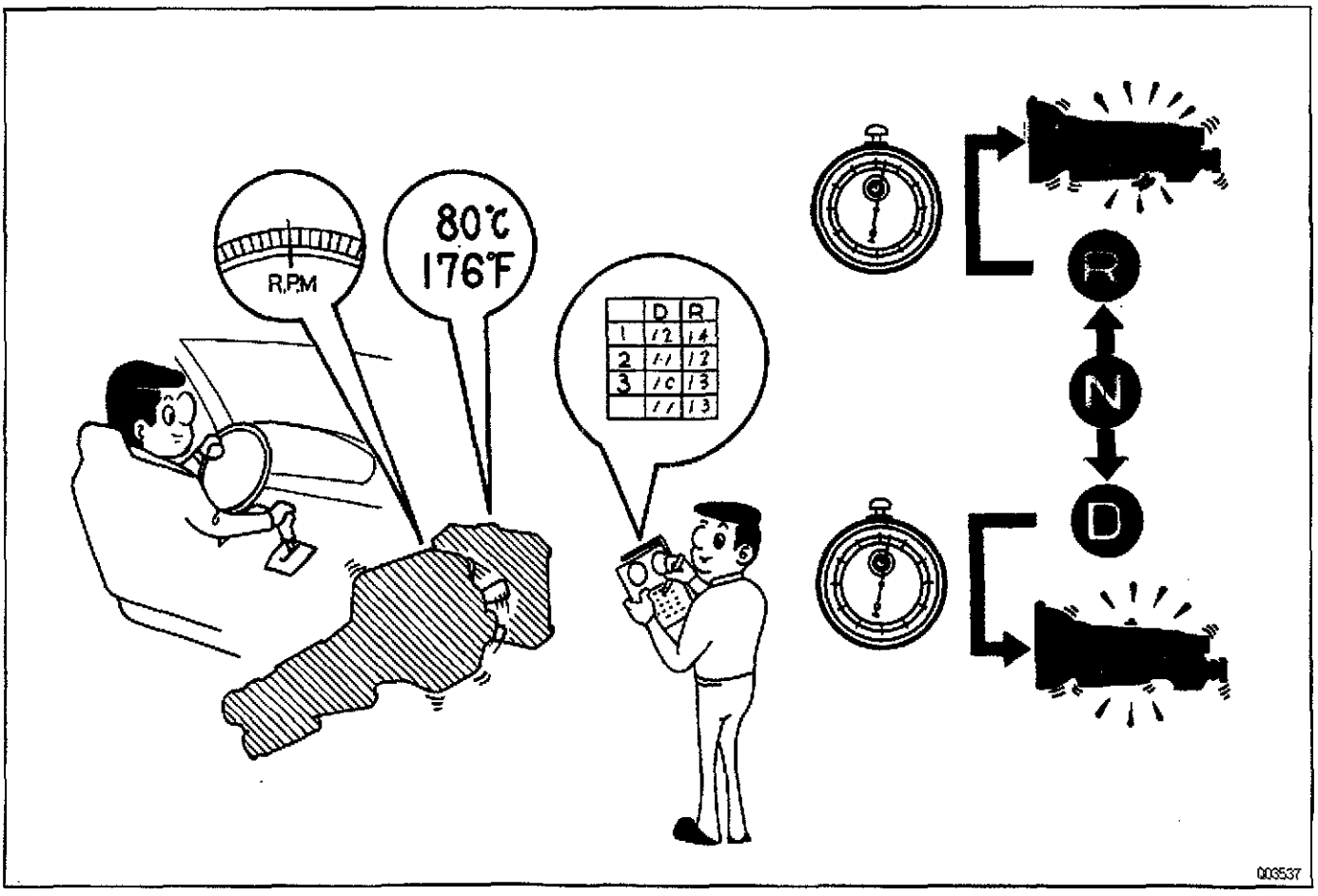
Time lag:

Less than 0.7 seconds

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

Time lag:

Less than 1.2 seconds



EVALUATION

(a) If N→D time lag is longer than specified:
- Line pressure too low
- Forward clutch worn
- O/D one–way clutch not operating properly

(b) If N→R time lag is longer than specified:
- Line pressure too low
- Direct clutch worn
- First and reverse brake worn
- O/D one–way clutch not operating properly

AT0GS-01

HYDRAULIC TEST

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 (50–80°C or 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.**

AT

MEASURE LINE PRESSURE

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

(b) Start the engine and check idling rpm.

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

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

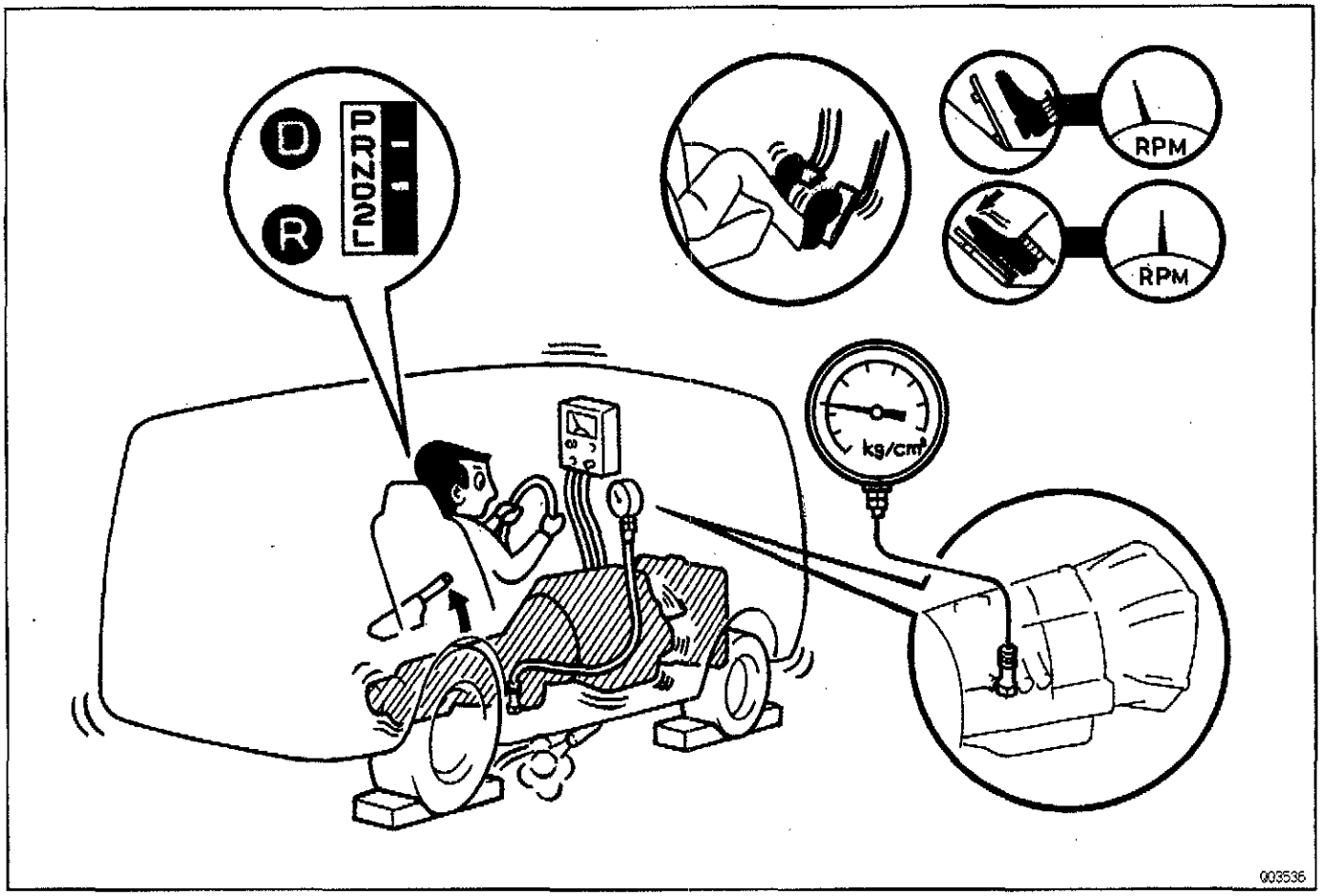
(e) Press the accelerator pedal all the way down. Quickly read the highest line pressure when engine speed reaches stall speed.
NOTICE: Release the accelerator pedal and stop test if the rear wheels begin to rotate before the engine speed reaches specified stall speed.

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

kPa (kgf/cm², psi)

Shift lever position	Idling	Stall
D range	383 – 422 (3.7 – 4.3, 53 – 61)	1,089 – 1,334 (11.1 – 13.6, 158 – 193)
R range	441 – 539 (4.5 – 5.5, 64 – 78)	1,373 – 1,667 (14.0 – 17.0, 199 – 242)

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



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 cable out of adjustment
- Throttle valve defective
- Regulator valve defective
- Oil pump defective
- O/D direct clutch defective

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

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

AT08A–05

ROAD TEST

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

1. **D RANGE TEST IN NORM AND PWR PATTERN POSITIONS**

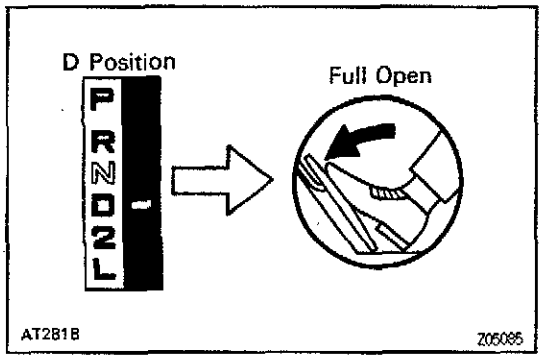
Shift into the D range and hold the accelerator pedal constant at the full throttle valve opening position.

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

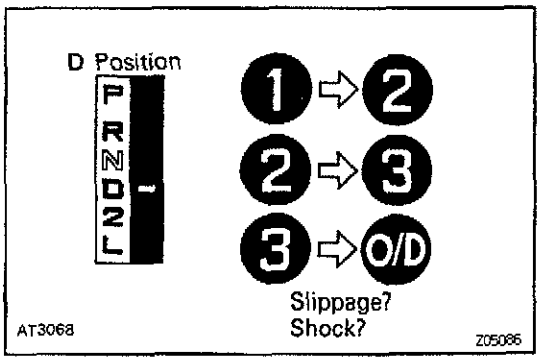
(1) If there is no 1→2 up–shift:
- No.2 solenoid is stuck.
- 1–2 shift valve is stuck.

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

(3) If there is no 3→O/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.

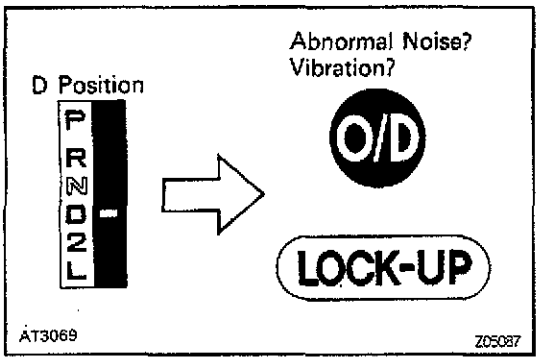
(5) If the lock–up is defective:
- Lock–up solenoid is stuck.
- Lock–up relay valve is stuck.



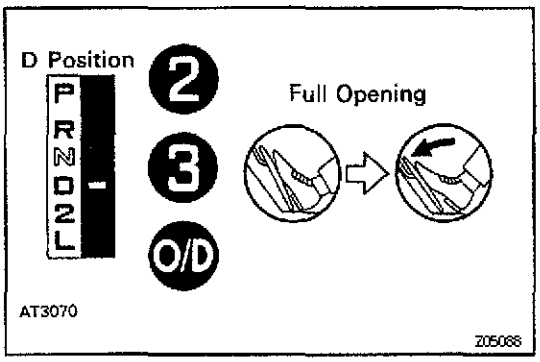
(b) In the same manner, check the shock and slip at the 1→2, 2→3, and 3→O/D up–shifts.

EVALUATION

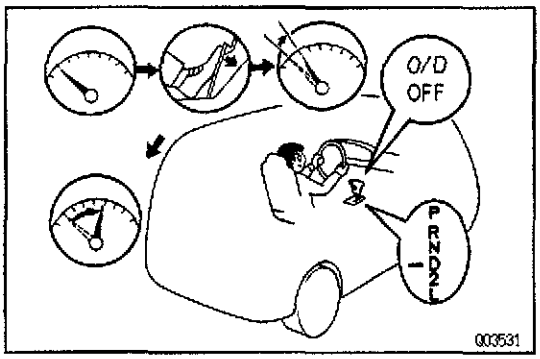
If the shock is excessive:
- Line pressure is too high.
- Accumulator is defective.
- Check ball is defective.



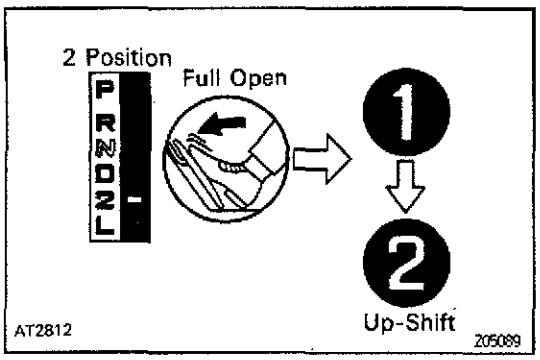
(c) Run at the D range lock–up or O/D gear and check for abnormal noise and vibration.
HINT: The check for the cause of abnormal noise and vibration must be made with extreme care as it could also be due to loss of balance in the propeller shaft, differential, torque converter, etc.



(d) 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.
(e) Check for abnormal shock and slip at kick–down.



(f) Check for the lock–up mechanism.
(1) *Drive in D range, O/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.



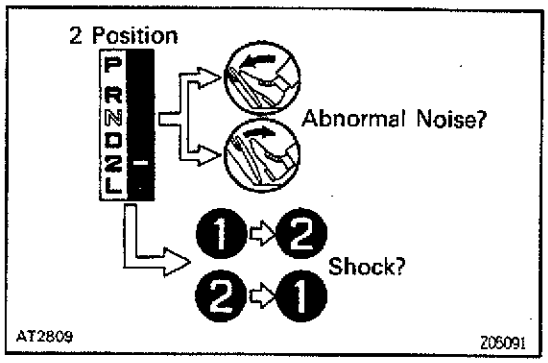
2. 2 POSITION TEST

Shift into the 2 range and, while driving with the accelerator pedal held constantly at the full throttle valve opening position, push in 1 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 it shown on the automatic shift schedule.
HINT: There is no O/D up–shift and lock–up in the 2 range.
(b) While running in the 2 range and 2nd gear, release the accelerator pedal and check the engine braking effect.

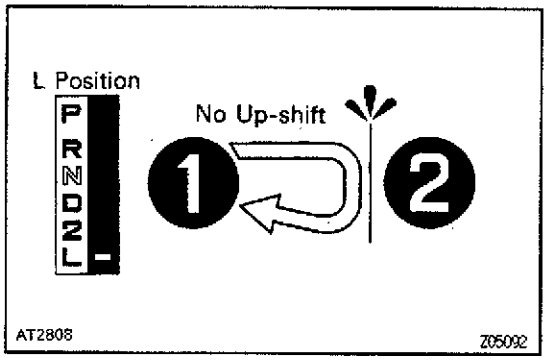
EVALUATION

If there is no engine braking effect:
- Second coast brake is defective.



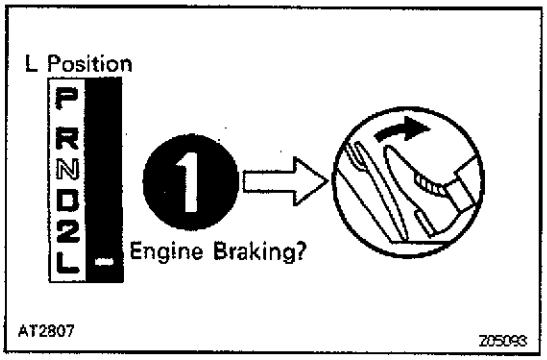
(c) Check for abnormal noise during acceleration and deceleration, and for shock at up–shift and down–shift.

AT



3. L RANGE TEST

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

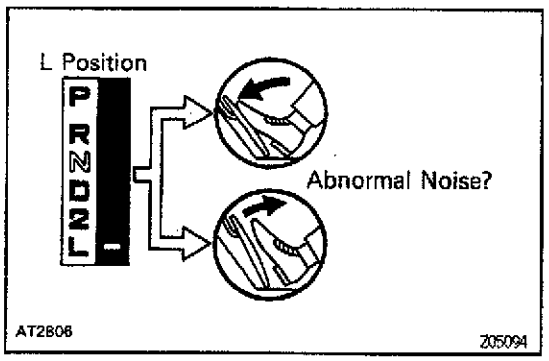


(b) While running in the L range, release the accelerator pedal and check the engine braking effect.

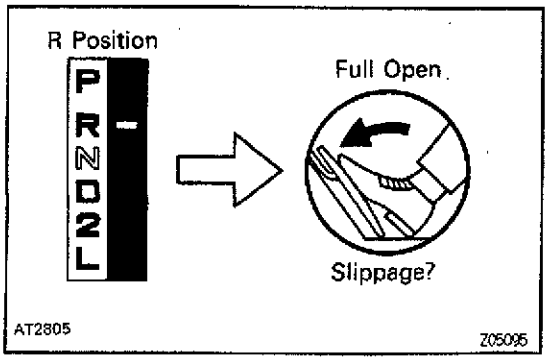
EVALUATION

If there is no engine braking effect:

- First and reverse brake is defective.

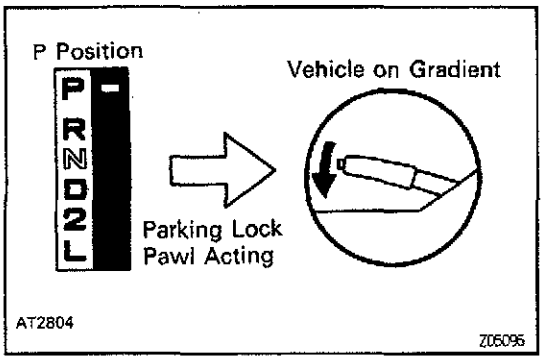


(c) Check for abnormal noise during acceleration and deceleration.



4. R RANGE TEST

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



5. P RANGE TEST:

Stop the vehicle on a gradient (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.

AT

AUTOMATIC SHIFT SCHEDULE

AT0G8-01

km/h (mph)

Up–shift point	(Throttle valve opening ratio 100%)	1 → 2	2 → 3	3 → O/D
D range	Normal mode	26–30 (16–19)	57–63 (35–39)	80–89 (50–55)
	Power mode	26–30 (16–19)	57–63 (35–39)	80–89 (50–55)
2 range	Normal, Power mode	–	–	–
L range	Normal, Power mode	–	–	–
Down–shift point	(Throttle valve opening ratio 100%)	O/D → 3	3 → 2	2 → 1
D range	Normal mode	75–84 (47–52)	50–56 (31–35)	19–23 (12–14)
	Power mode	75–84 (47–52)	50–56 (31–35)	19–23 (12–14)
2 range	Normal, Power mode	–	60–65 (37–40)	–
L range	Normal, Power mode	–	–	25–30 (16–19)

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km/h (mph)

Lock–up point	Lock–up ON	Lock–up OFF
D range Normal mode	38–43 (24–27)	34–39 (21–24)
D range Power mode	45–50 (28–31)	41–46 (25–29)

(Throttle opening ratio 5%)

AT09P-02

TROUBLESHOOTING MATRIX CHART

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.

(ON–VEHICLE)

See page		★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	AT-52	★	★	★
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	C_0 exhaust valve	B_0 accumulator	C_1 accumulator	B_2 accumulator	C_2 accumulator	2 – 3 shift timing valve	Modulator valve	Accumulator control valve	Lock-up signal valve	Lock-up control valve	OFF-vehicle repair matrix chart	ECT ECU	Throttle cable	Check ball
Does not move in any forward position																						1			
Does not move in reverse position						3		2	2													4	1		
Does not move in any position							2															3	1		
No up-shift	1st → 2nd	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		
	2nd → 1st	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	
	1st → 2nd														4				5			6	1	2	3
	2nd → 3rd									3						5	4		6			7	1	2	
	3rd → O/D												4						5			6	1	2	3
	1st → 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			
	1st																					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		

AT

Remark ★: Refer to A441E Automatic Transmission Repair Manual. (Pub. No. RM341E)

(OFF—VEHICLE)

AT

See page		AT-67	★	★	★	★	★	★	★	★	★	★	AT-51	★	★
Parts Name / Trouble		Torque converter	Oil pump	O/D brake (B_0)	2nd brake (B_2)	1st and reverse brake (B_3)	O/D direct clutch (C_0)	Front clutch (C_1)	Rear clutch (C_2)	O/D one-way clutch (F_0)	No.2 one-way clutch (F_2)	ON-Vehicle matrix chart	Front planetary gear	Rear planetary gear
Does not move in any forward position								1				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	1st → 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 → 1st						2				3	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		
	1st → 2nd				2							1		
	2nd → 3rd						3		2			1		
	3rd → O/D			2								1		
	1st → 2nd → 3rd → O/D							2				1		
	O/D → 3rd						2			3		1		
	3rd → 2nd				2							1		
Slip	Forward & Reverse	2	3							4		1		
	"R" position					2			1					
	1st							1			2			
	2nd							2						
	3rd							2	3					
	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		

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