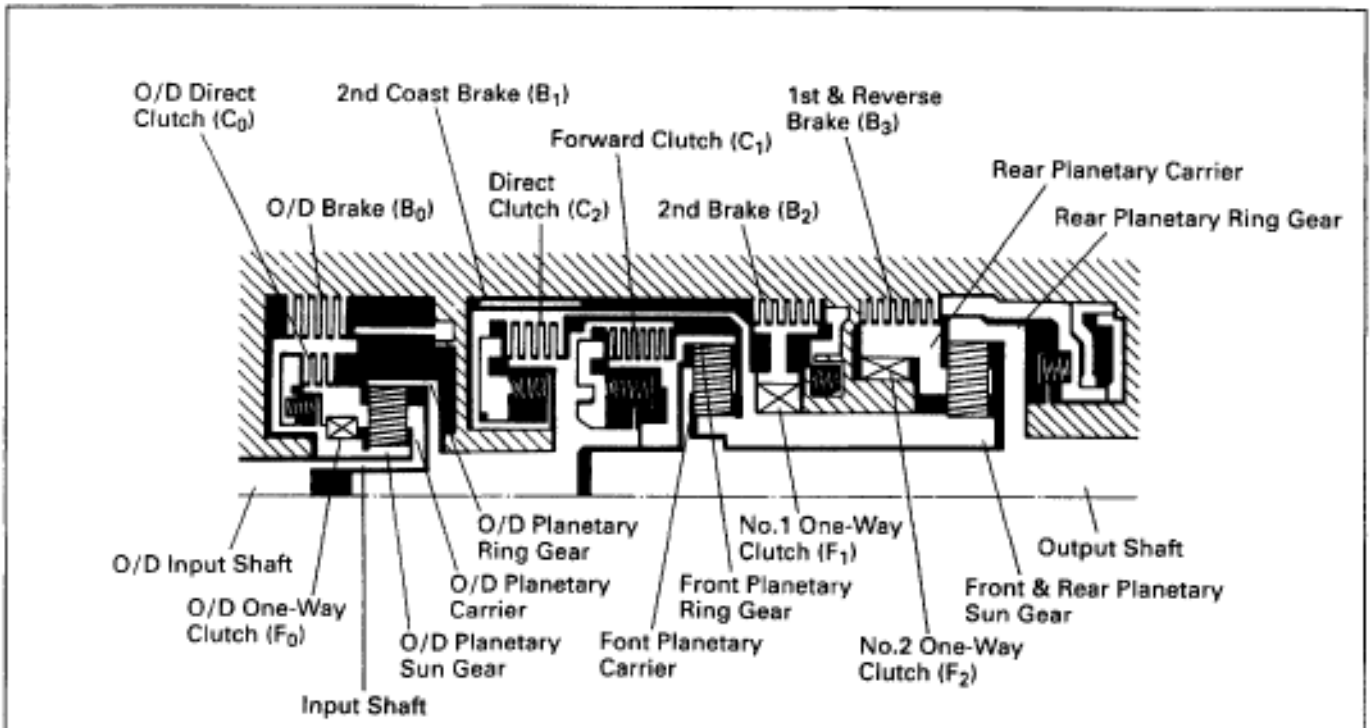
A340E (2JZ–GTE)
AUTOMATIC TRANSMISSION

OPERATION

FUNCTION OF COMPONENTS



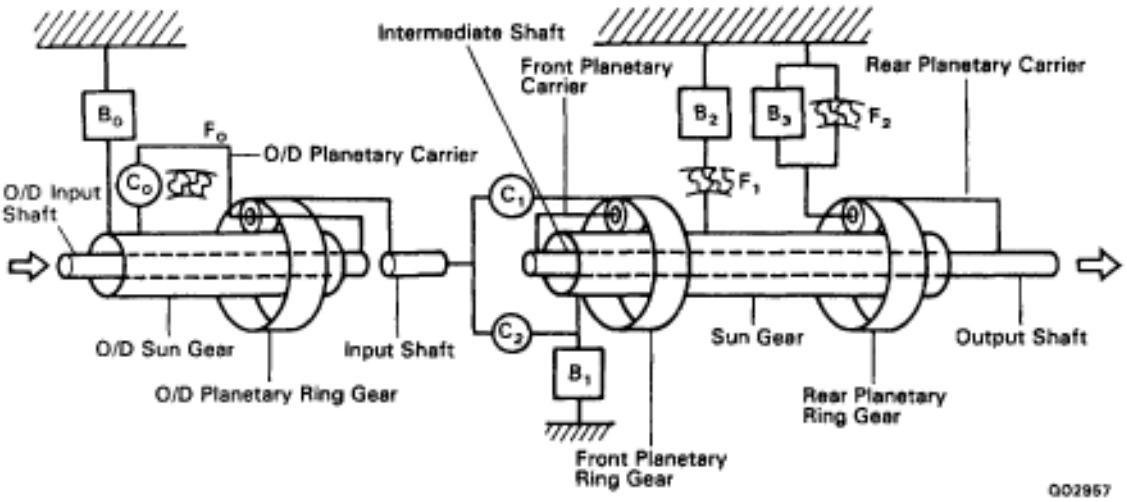
AT2157

○ ..... Operating

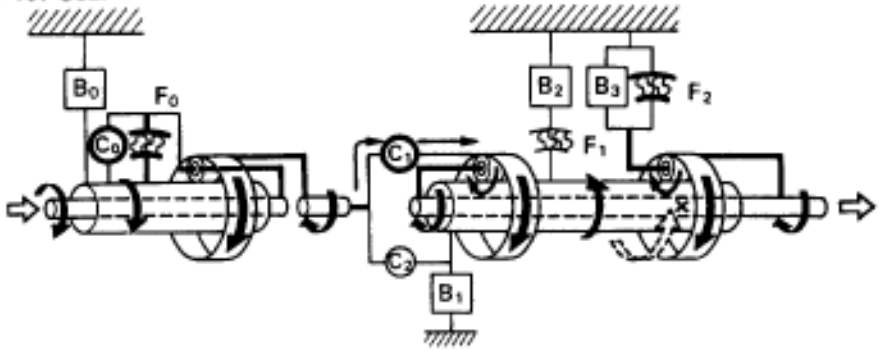
Shift lever position	Gear position	C_0	C_1	C_2	B_0	B_1	B_2	B_3	F_0	F_1	F_2
P	Parking	○									
R	Reverse	○		○				○	○		
N	Neutral	○									
D	1st	○	○						○		○
	2nd	○	○				○		○	○	
	3rd	○	○	○			○		○		
	O/D		○	○	○		○				
2	1st	○	○						○		○
	2nd	○	○			○	○		○	○	
	*3rd	○	○	○			○		○		
L	1st	○	○					○	○		○
	*2nd	○	○			○	○		○	○	

*Down–shift only–no up–shift

Component	Function
O/D Direct Clutch (C_0)	Connect overdrive sun gear and overdrive carrier
O/D Brake (B_0)	Prevents overdrive sun gear from turning either clockwise or counterclockwise
O/D One–Way Clutch (F_0)	When transmission is being driven by engine, connects overdrive sun gear and overdrive carrier
Forward Clutch (C_1)	Connects input shaft and front planetary ring gear
Direct Clutch (C_2)	Connects input shaft and front & rear planetary sun gear
2nd Coast Brake (B_1)	Prevents front & rear planetary sun gear from turning either clockwise or counterclockwise
2nd Brake (B_2)	Prevents outer race of F_1 from turning either clockwise or counterclockwise, thus preventing front & rear planetary sun gear from turning counterclockwise
1st & Reverse Brake (B_3)	Prevents rear planetary carrier from turning either clockwise or counterclockwise
No.1 One–Way clutch (F_1)	When B_2 is operating, prevents front & rear planetary sun gear from turning counterclockwise
No.2 One–Way Clutch (F_2)	Prevents rear planetary carrier from turning counterclockwise

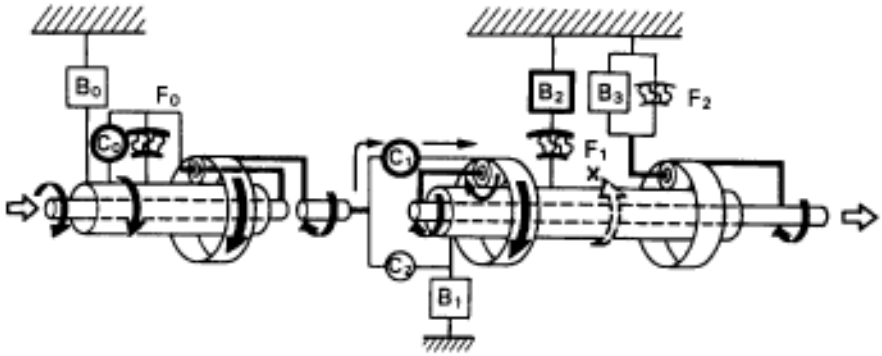


D or 2 Position 1st Gear



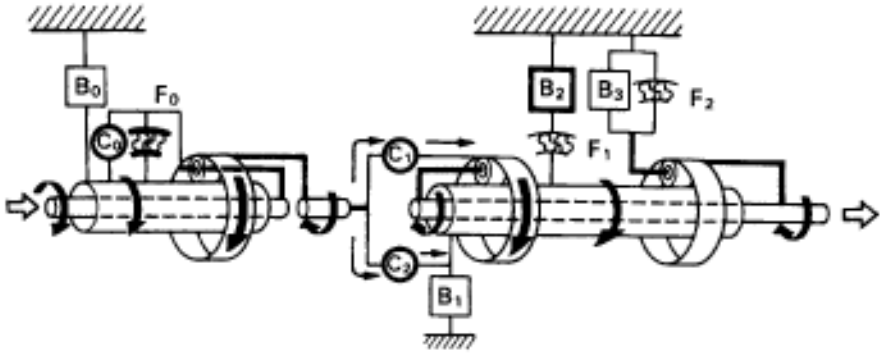
AT6675

D Position 2nd Gear



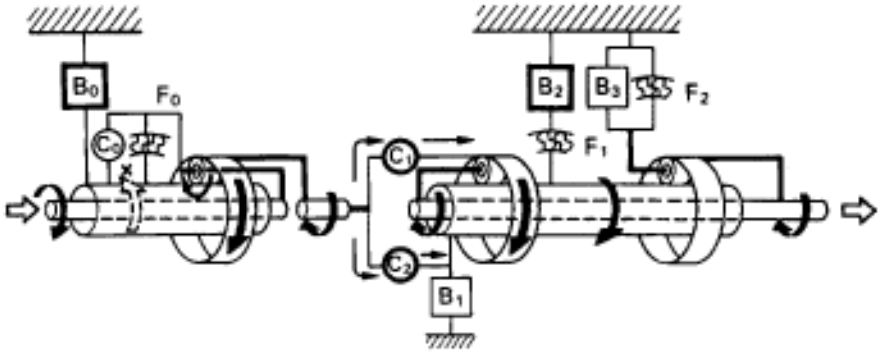
AT6676

D or 2 Position 3rd Gear



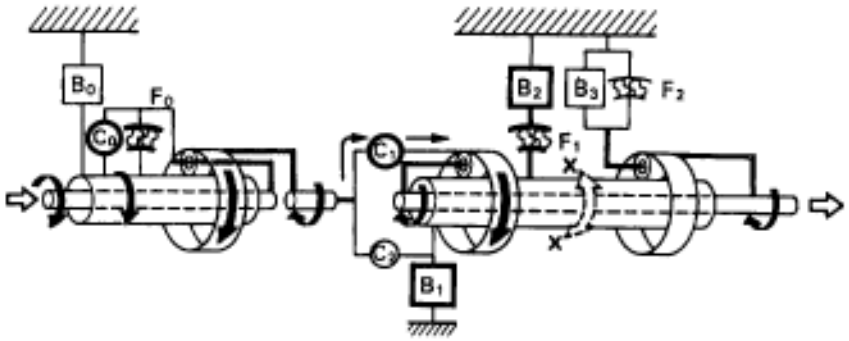
AT6677

D Position O/D



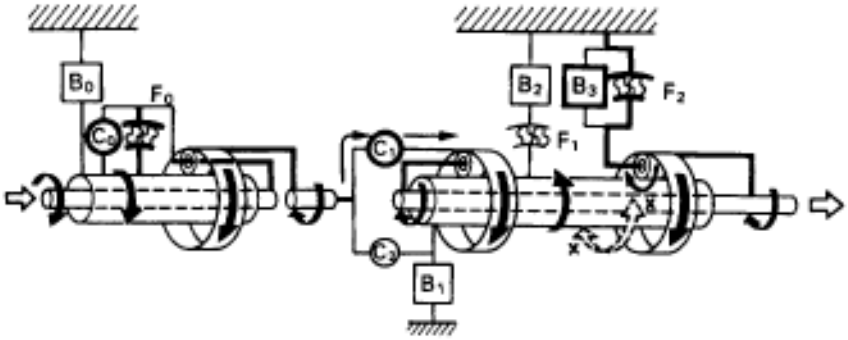
AT6678

2 or L Position 2nd Gear



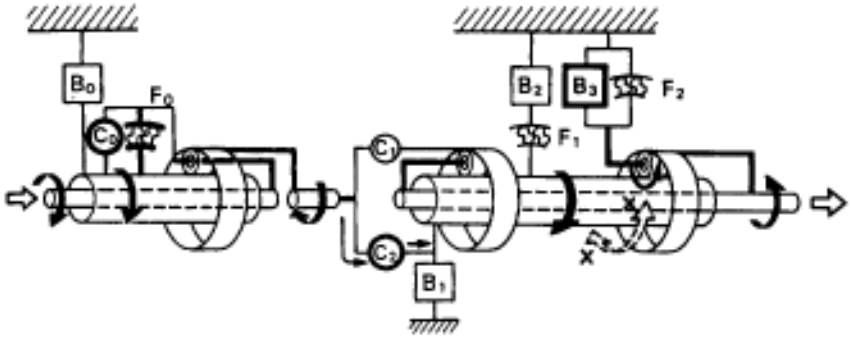
AT6679

L Position 1st Gear



AT6680

R Position Reverse Gear



AT6681

HYDRAULIC CONTROL SYSTEM

The hydraulic control system is composed of an oil pump, valve body, solenoid valves, accumulators, clutches and brakes, as well as the fluid passages which connect all of these components. Based on the hydraulic pressure created by the oil pump, the hydraulic control system governs the hydraulic pressure acting on the torque converter clutch, clutches and brakes in accordance with the vehicle driving conditions.

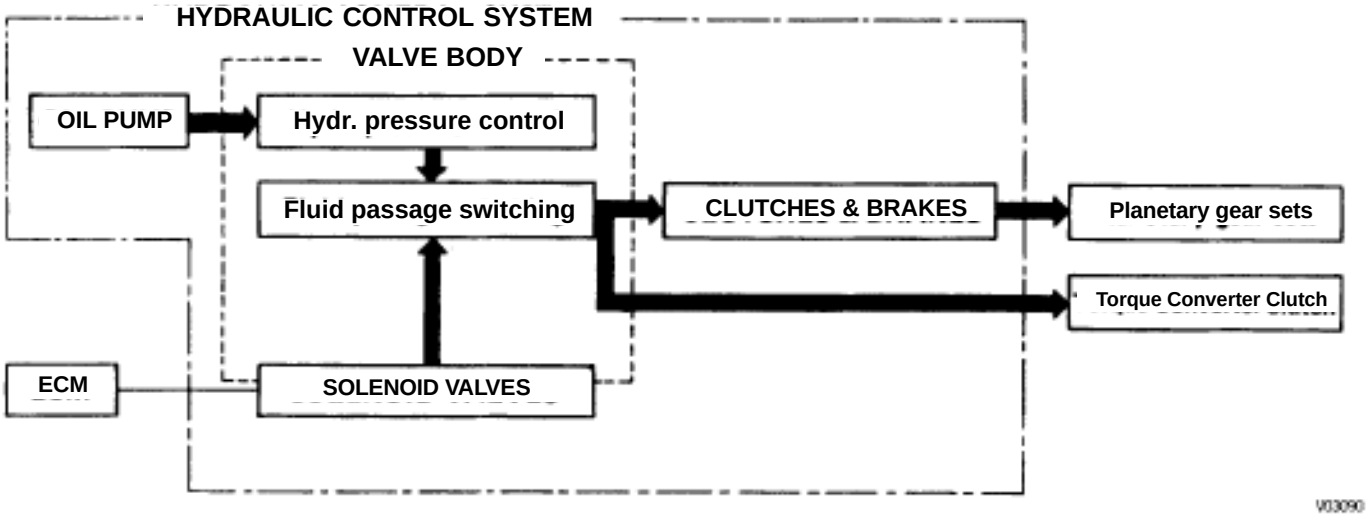
There are five solenoid valves on the valve body.

The No.1 and No.2 solenoid valves are turned on and off by signals from the ECM to control the shift valves, and change the gear shift position.

The No.3 solenoid valve is operated by signals from the ECM to engage or disengage the lock–up clutch of the torque converter clutch.

The No.4 solenoid valve is operated by signals from the ECM to control the engagement speed and reduce gear shift shock.

The No.5 solenoid valve is operated by signals from the ECM to regulate the line pressure to throttle pressure.



ELECTRONIC CONTROL SYSTEM

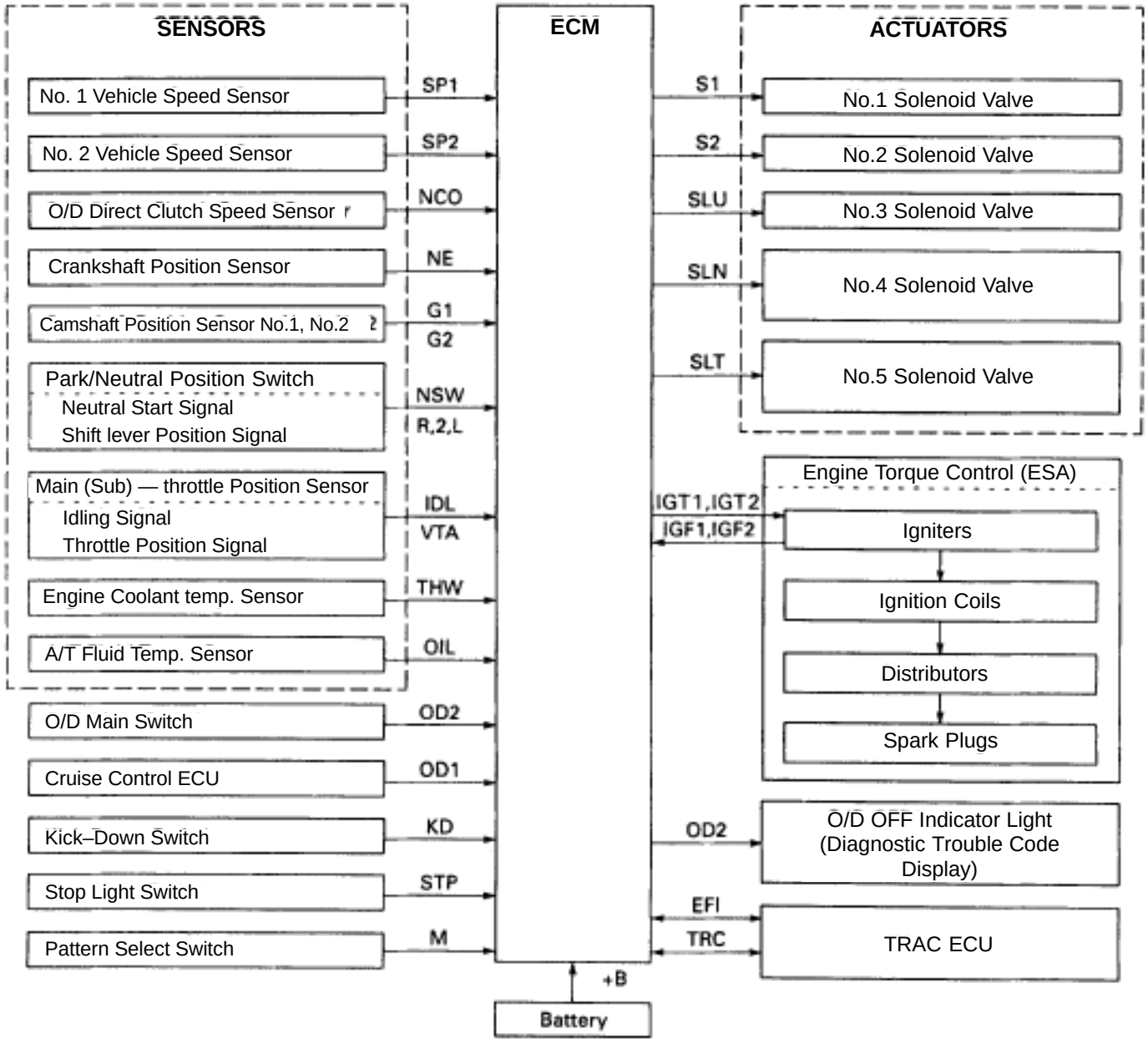
The electronic control system for the A340E automatic transmission provides extremely precise control of the gear shift timing and lock–up timing in response to driving conditions as sensed by various sensors located throughout the vehicle and in response to the engine's running condition.

At the same time, the ECM control reduces vehicle squat when the vehicle starts out and gear shift shock.

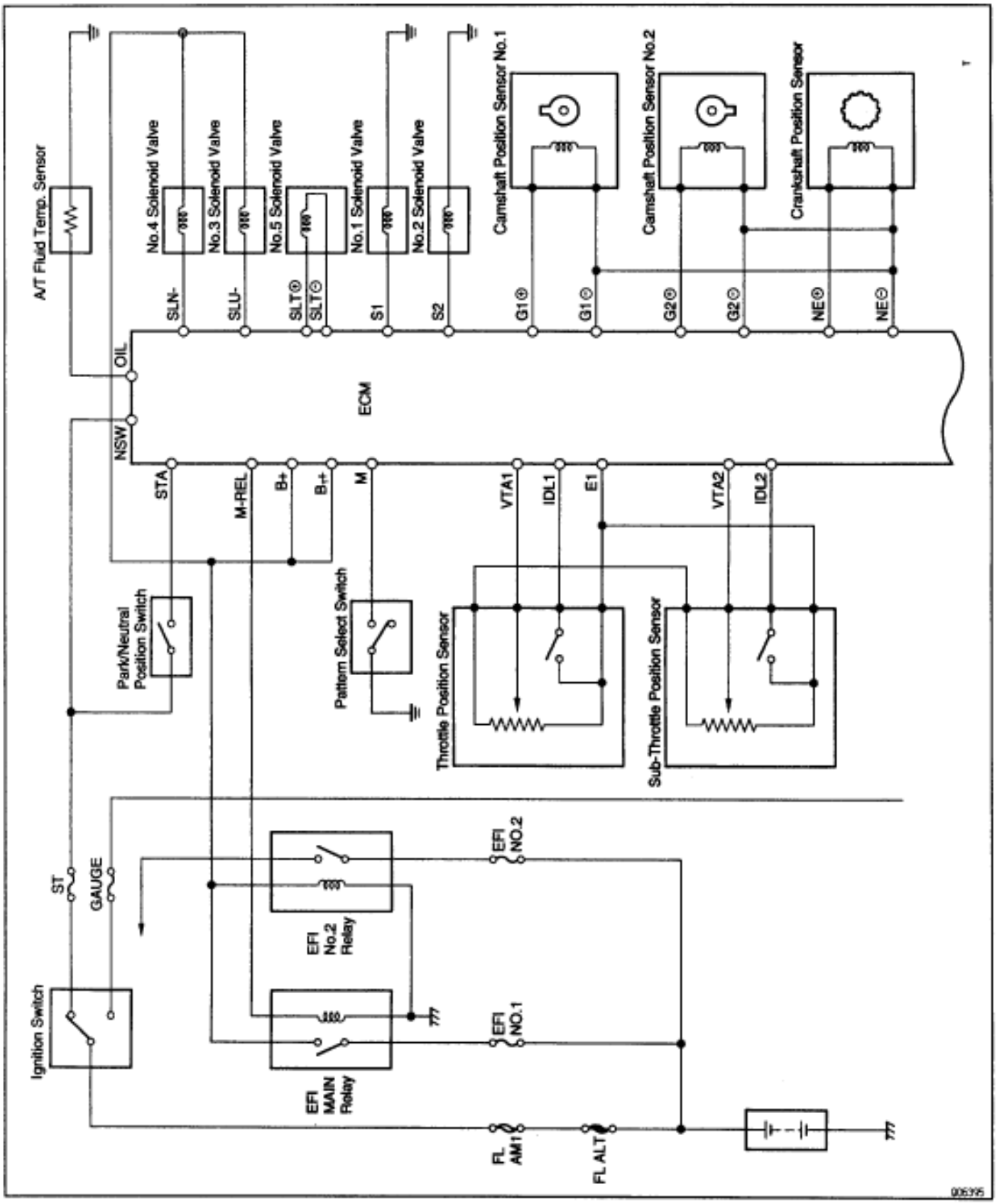
The electronic control system is also equipped with a self diagnosis system which diagnoses malfunctions for the vehicle to continue functioning when a malfunction occurs.

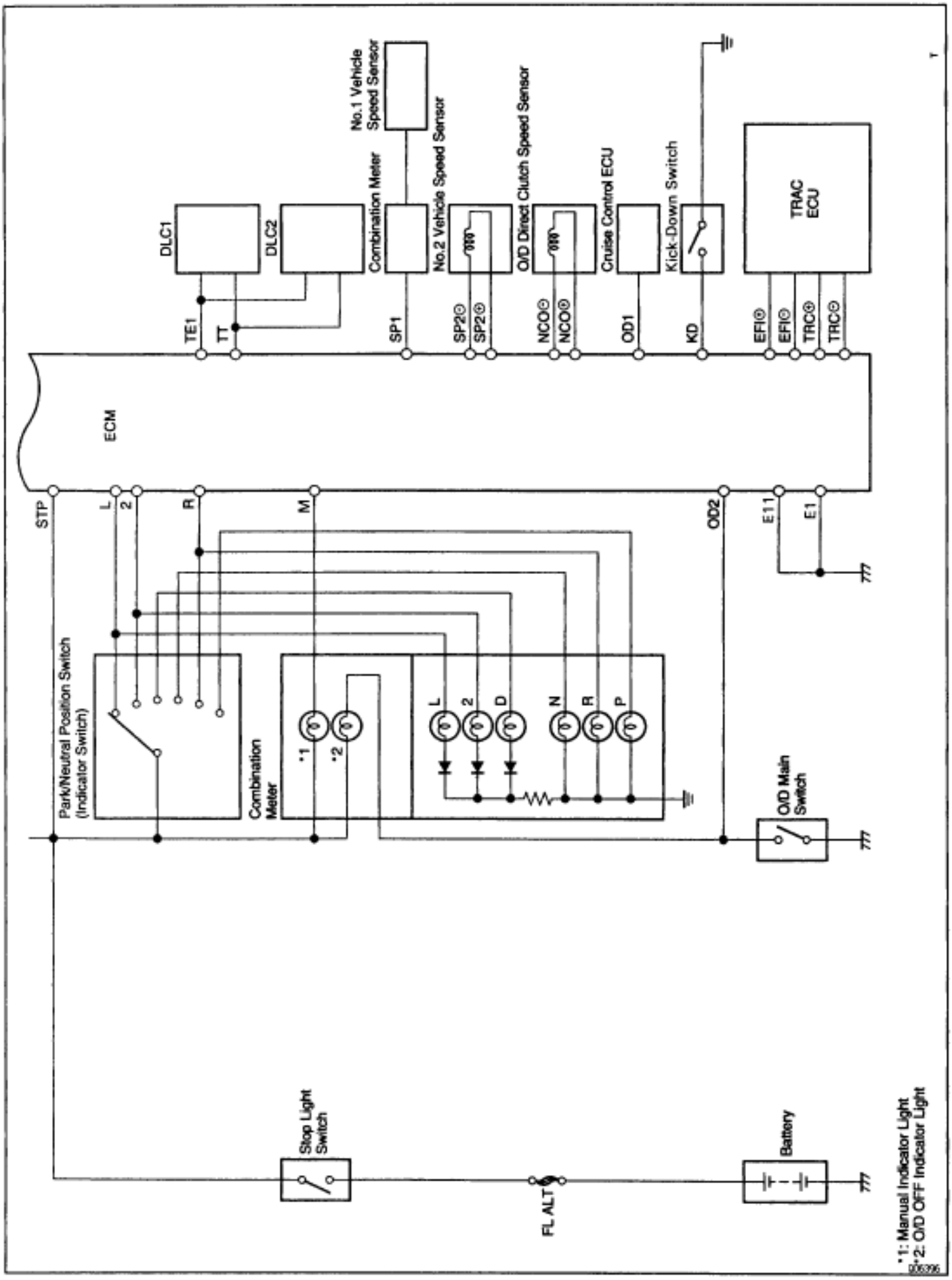
CONSTRUCTION

The electronic control system can be broadly divided onto three groups; the sensors, ECM and actuators.

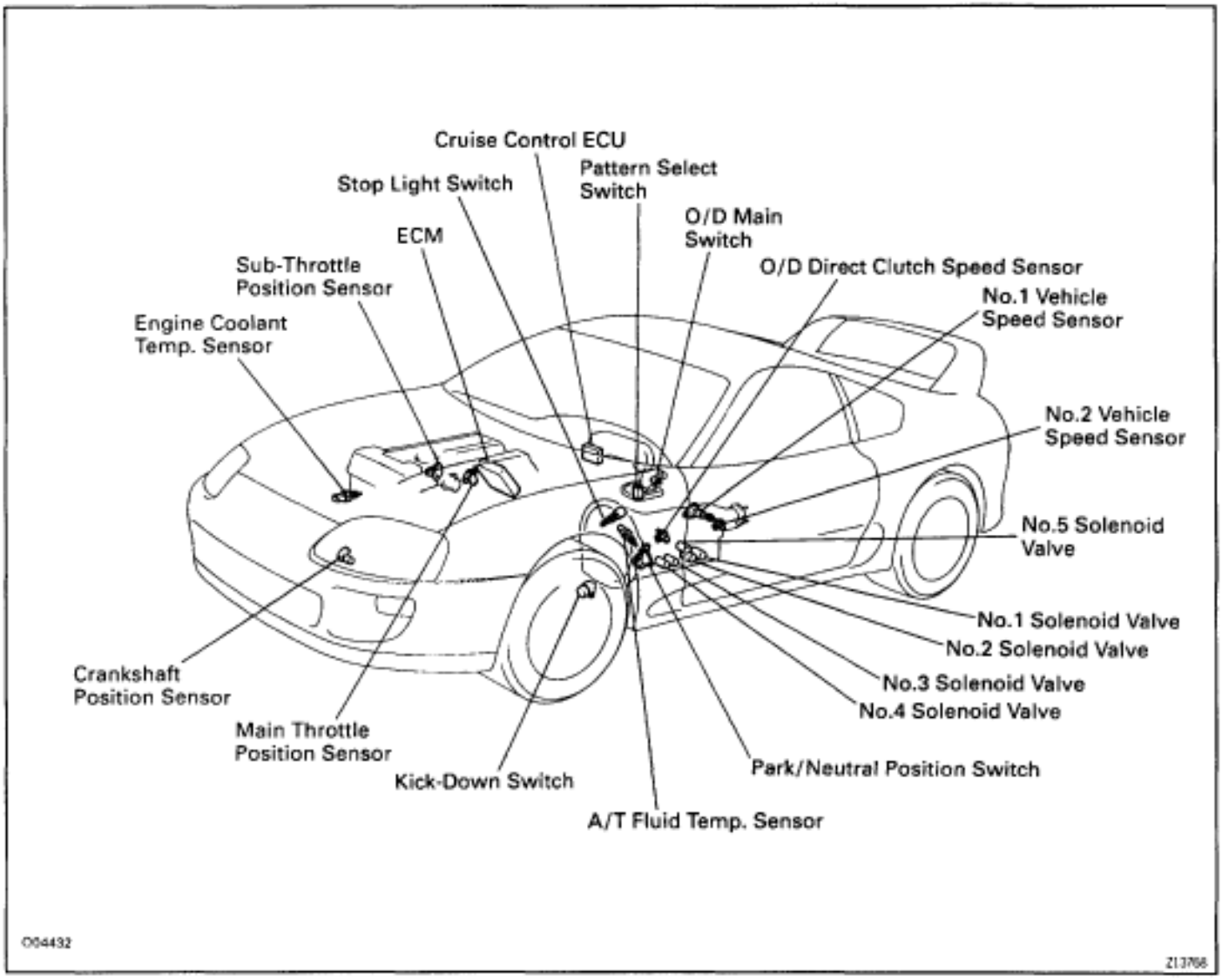


SYSTEM DIAGRAM




DLC1
DLC2
Combination Meter
No.1 Vehicle Speed Sensor
No.2 Vehicle Speed Sensor
O/D Direct Clutch Speed Sensor
Cruise Control ECU
Kick-Down Switch
TRAC ECU
TE1
TT
SP1
SP2⊖
SP2⊕
NCO⊖
NCO⊕
OD1
KD
EFI⊕
EFI⊖
TRC⊕
TRC⊖
ECM
STP
L
2
R
M
OD2
E11
E1
Park/Neutral Position Switch (Indicator Switch)
Combination Meter
*1
*2
L
2
D
N
R
P
O/D Main Switch
Stop Light Switch
FL ALT
Battery
*1: Manual Indicator Light
*2: O/D OFF Indicator Light

ARRANGEMENT OF COMPONENTS



Components	Function
Pattern Select Switch	Selects the Power mode or the Normal mode for shift and lock–up timing.
Crankshaft Position Sensor and Camshaft Position Sensor	Detects the engine speed.
Park/Neutral Position Switch	Detects the shift lever position.
Stop Light Switch	Detects if the brake pedal is depressed.
Throttle Position Sensor	Detects the throttle valve opening angle.
O/D Main Switch	Prevents up–shift to the O/D gear if the O/D switch is off.
Cruise Control ECU	This ECU prevents the transmission from shifting into O/D and prohibits lock–up control when the vehicle's speed drops below the cruise control set speed parameter.
No.1 and No.2 Vehicle Speed Sensor.	Detects the vehicle speed. Ordinarily, transmission control uses signals from the No.2 vehicle speed sensor, and the No.1 vehicle speed sensor is used as a back–up.

O/D Direct Clutch Speed Sensor	Detects the input shaft speed from 1st gear to 3rd gear
Engine Coolant Temp. Sensor	Detects the engine coolant temp.
ECM	Controls the engine and transmission actuators based on signals from each sensor.
No.1 and No.2 Solenoid Valves	Control the hydraulic pressure applied to each shift valve, and control the gear position and timing.
No.4 Solenoid Valve (For accumulator back pressure modulation)	Controls the hydraulic pressure applied to the back chamber of the accumulator and smoothes the engagement of clutches and brakes during shifting.
No.3 Solenoid Valve (For lock–up control pressure modulation)	Controls the hydraulic pressure applied to the lock–up clutch and controls lock–up timing.
No.5 Solenoid Valve (For line pressure modulation)	Controls the line pressure.
O/D OFF Indicator Light	Blinks and warns the driver, while the O/D main switch is pushed in, when the electronic control circuit is malfunctioning.
A/T Fluid Temp. Sensor	Detects A/T fluid temp.

PRECAUTION

PRECAUTIONS

When working with FIPG material, you must observe the following.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces.
- Thoroughly clean all components to remove all the loose material.
- Clean both sealing surfaces with a non–residue solvent.
- Apply the FIPG in an approx. 1 mm (0.04 in.) wide bead along the sealing surface.
- Parts must be assembled within 10 minutes of application. Otherwise, the FIPG material must be removed and reapplied.

If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

	09032–00100 Oil Pan Seal Cutter	
	09308–00010 Oil Seal Puller	
	09309–37010 Transmission Bearing Replacer	
	09350–30020 TOYOTA Automatic Transmission Tool Set	
	(09351–32010) One–way Clutch Test Tool	
	(09351–32020) Stator Stopper	
	09517–36010 Rear Axle Shaft Oil Seal Replacer	
	09843–18020 Diagnosis Check Wire	
	09990–01000 Engine Control Computer Check Harness “A”	

	09992–00094 Automatic Transmission Oil Pressure Gauge Set	

RECOMMENDED TOOLS

	09082–00050 TOYOTA Electrical Toaster Set	

EQUIPMENT

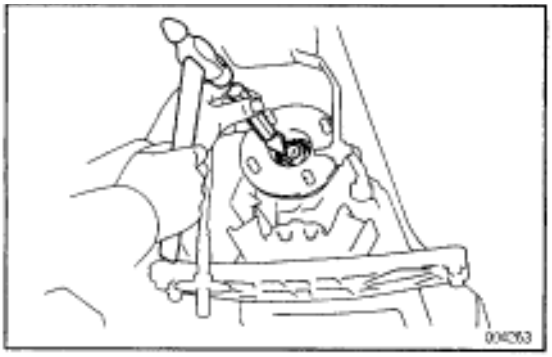
Straight edge	Check torque converter clutch installation.
Vernier calipers	Check torque converter clutch installation.
Dial indicator or dial indicator with magnetic base	Measure drive plate runout
Torque wrench	

LUBRICANT

Item	Capacity	Classification
Automatic transmission fluid Dry fill Drain and refill	 8.2 liters (8.7 US qts, 7.2 lmp. qts) 1.9 liters (2.0 US qts, 1.6 lmp. qts)	 ATF TYPE T–II or Equivalent

SSM (Special Service Materials)

08826–00090	Seal Packing 128 THREE BOND 1281 or equivalent (FIPG)	Oil pan



ON–VEHICLE REPAIR

EXTENSION HOUSING REAR OIL SEAL REPLACEMENT

1. DRAIN A/T FLUID

2. REMOVE FRONT EXHAUST PIPE AND HEAT INSULATOR (See page AT2–22)

3. REMOVE PROPELLER SHAFT (See page PR–7)

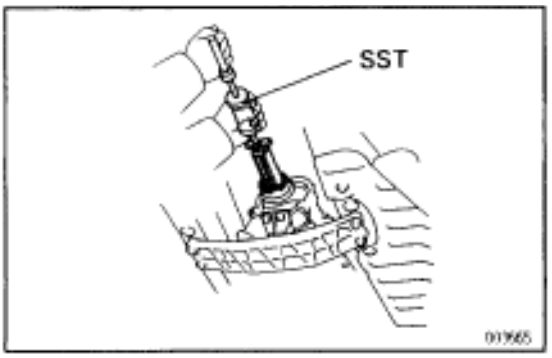
4. REMOVE TRANSMISSION OUTPUT FLANGE

(a) Using a hammer and chisel, loosen the staked part of the nut.
HINT: Shift the shift lever to the P position.

(b) Remove the nut.

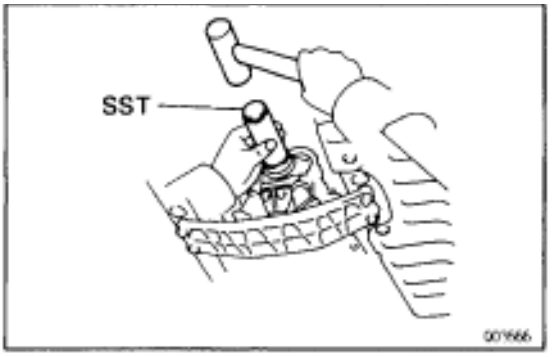
(c) Tap the output flange with a plastic hammer to remove it and 2 washers.

(d) Using a screwdriver, remove the oil seal from the output flange.



5. REMOVE EXTENSION HOUSING REAR OIL SEAL

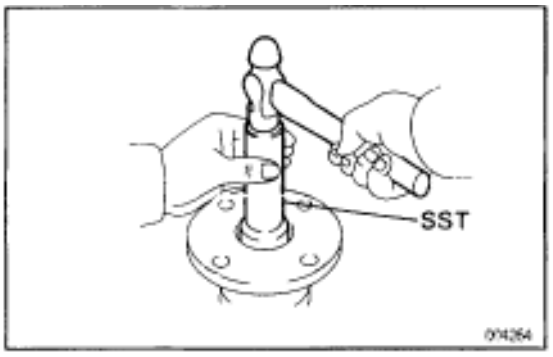
Using SST, remove the oil seal.
SST 09308–00010



6. INSTALL EXTENSION HOUSING REAR OIL SEAL

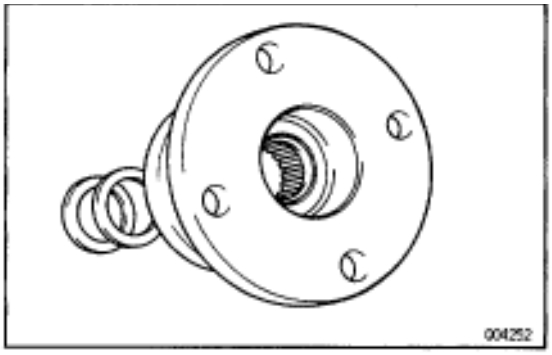
(a) Coat the lip of a new oil seal with MP grease.

(b) Using SST and a hammer, drive in the oil seal with the lip facing downward.
SST 09309–37010
Oil seal depth from flat end:
0–0.3 mm (0–0.012 in.)

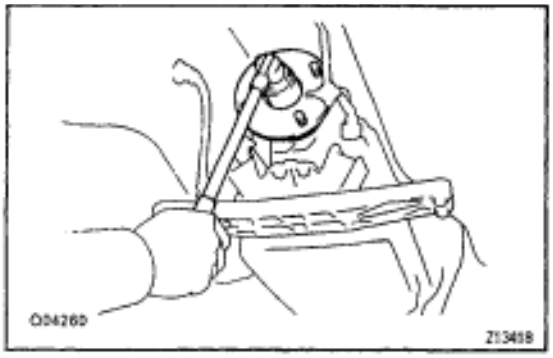


7. INSTALL TRANSMISSION OUTPUT FLANGE

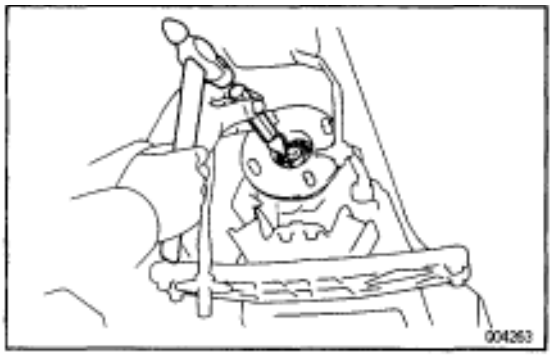
(a) Using SST and a hammer, drive in a new oil seal.
SST 09517–36010



(b) Install the output flange and 2 washers.



(c) Install and torque a new nut.
Torque: 123 N·m (1.250 kgf·cm, 90 ft·lbf)
HINT: Shift the shift lever to the P position

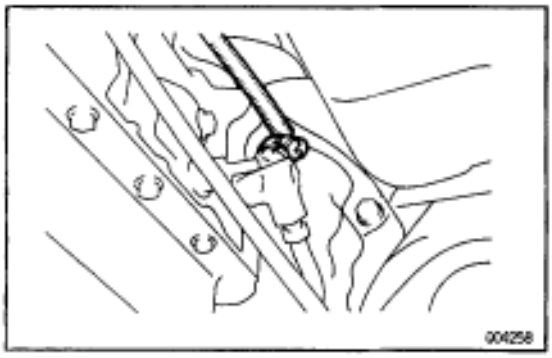


(d) Using a hammer and chisel, stake the nut.

8. INSTALL PROPELLER SHAFT
(See page PR–13)

9. INSTALL FRONT EXHAUST PIPE AND HEAT INSULATOR
(See page AT2–22)

10. FILL AND CHECK A/T FLUID (See page AT2–42)



A/T FLUID TEMP. SENSOR REPLACEMENT

1. DISCONNECT A/T FLUID TEMP. SENSOR CONNECTOR

2. REMOVE A/T FLUID TEMP. SENSOR

(a) Remove the A/T fluid temp. sensor.

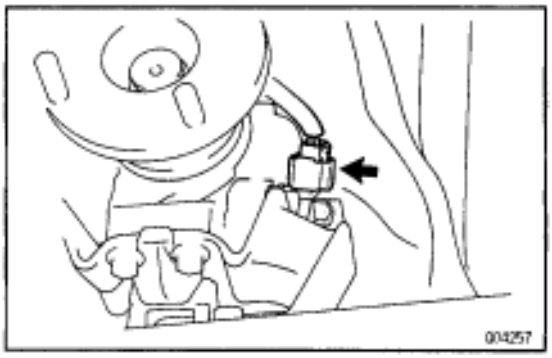
(b) Remove the O–ring from it.

3. INSTALL A/T FLUID TEMP. SENSOR

(a) Coat a new O–ring with A/T fluid and install it to the A/T fluid temp. sensor

(b) Install the A/T fluid temp. sensor.
Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)

4. CONNECT A/T FLUID TEMP. SENSOR CONNECTOR



NO.1 VEHICLE SPEED SENSOR ASSEMBLY REPLACEMENT

1. DISCONNECT NO.1 VEHICLE SPEED SENSOR CONNECTOR

2. REMOVE NO.1 VEHICLE SPEED SENSOR ASSEMBLY

(a) Remove the bolt and No.1 vehicle speed sensor assembly.

(b) Remove the speedometer driven gear from the No.1 speed sensor.

(c) Remove the O–ring from the No.1 vehicle speed sensor.

3. INSTALL NO.1 VEHICLE SPEED SENSOR ASSEMBLY

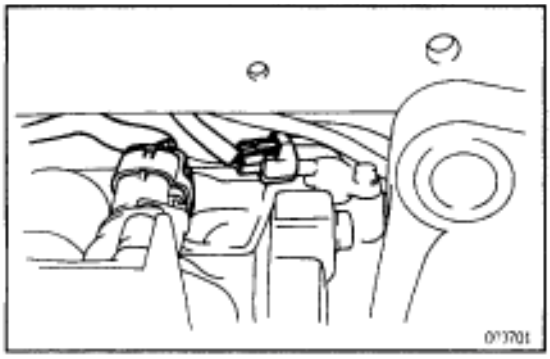
(a) Coat a new O–ring with A/T fluid and install it to the No.1 vehicle speed sensor.

(b) Install the speedometer driven gear to the No.1 vehicle speed sensor.

(c) Install the No.1 vehicle speed sensor to the extension housing and torque the bolt.

Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)

4. CONNECT NO.1 VEHICLE SPEED SENSOR CONNECTOR



NO.2 VEHICLE SPEED SENSOR REPLACEMENT

1. DISCONNECT NO.2 VEHICLE SPEED SENSOR CONNECTOR

2. REMOVE NO.2 VEHICLE SPEED SENSOR

(a) Remove the bolt and No.2 vehicle speed sensor.

(b) Remove the O–ring.

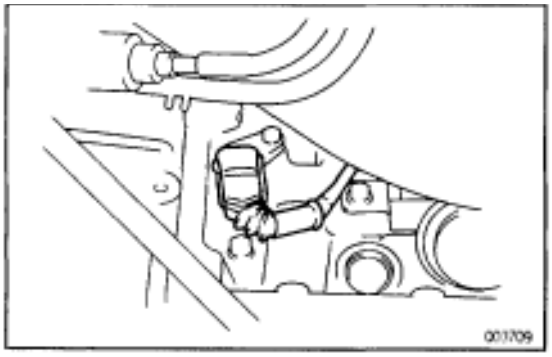
3. INSTALL NO.2 VEHICLE SPEED SENSOR

(a) Coat a new O–ring with A/T fluid and install it to the No.2 vehicle speed sensor.

(b) Install the No.2 vehicle speed sensor to the extension housing and torque the bolt.

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

4. CONNECT NO.2 VEHICLE SPEED SENSOR CONNECTOR



O/D DIRECT CLUTCH SPEED SENSOR REPLACEMENT

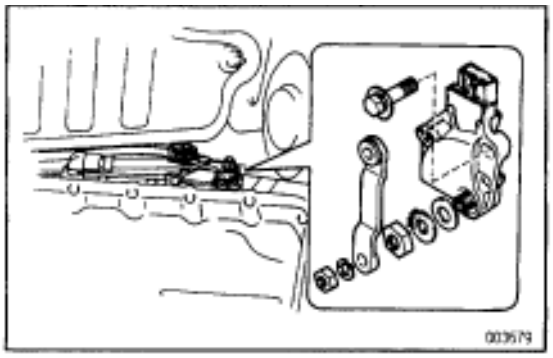
1. **DISCONNECT O/D DIRECT CLUTCH SPEED SENSOR CONNECTOR**
2. **REMOVE O/D DIRECT CLUTCH SPEED SENSOR**

(a) Remove the bolt and O/D direct clutch speed sensor.
(b) Remove the O–ring.

3. **INSTALL O/D DIRECT CLUTCH SPEED SENSOR**

(a) Coat a new O–ring with A/T fluid and install it to the O/D direct clutch speed sensor.
(b) Install the O/D direct clutch speed sensor to the transmission case and torque the bolt.
Torque: 5.4 N·m (55 kgf·cm, 48 in.·lbf)

4. **CONNECT O/D DIRECT CLUTCH SPEED SENSOR CONNECTOR**

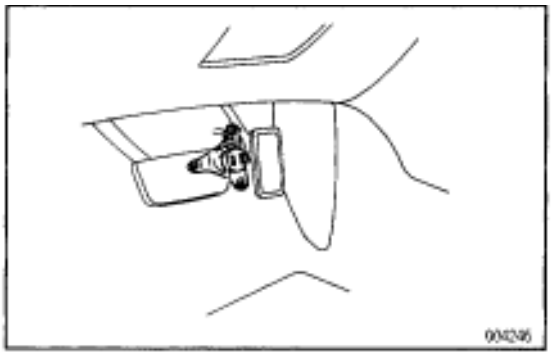


PARK/NEUTRAL POSITION SWITCH REPLACEMENT

1. **REMOVE FRONT EXHAUST PIPE**
(See page AT2–22)
2. **DISCONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR**
3. **REMOVE PARK/NEUTRAL POSITION SWITCH**

(a) Remove the control shaft lever.
(b) Pry off the lock washer and remove the nut.
(c) Remove the bolt and pull out the park/neutral position switch.

4. **INSTALL AND ADJUST PARK/NEUTRAL POSITION SWITCH**
5. **CONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR**
6. **INSTALL FRONT EXHAUST PIPE**
(See page AT2–22)



KICK–DOWN SWITCH REPLACEMENT

1. **REMOVE KICK–DOWN SWITCH**

(a) Remove the 3 bolts and kick–down switch.
(b) Disconnect the kick–down switch connector.

2. **INSTALL KICK–DOWN SWITCH**

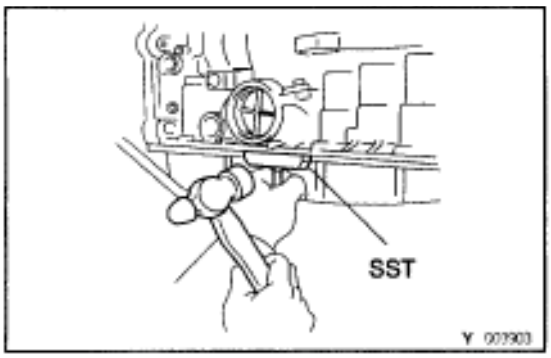
(a) Connect the kick–down switch connector.
(b) Install the kick–down switch and 3 bolts.

VALVE BODY REMOVAL

Installation is in the reverse order of removal.

INSTALLATION HINT: After installation, fill A/T fluid and check fluid level. (See page AT2–42)

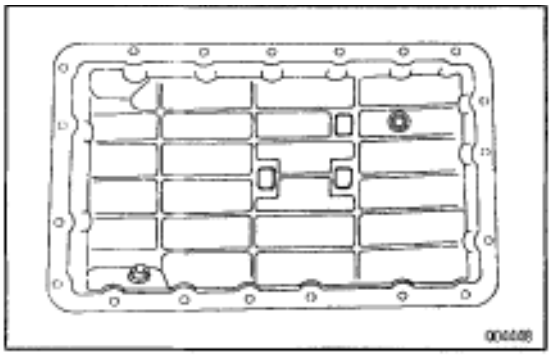
1. **DRAIN A/T FLUID**
2. **REMOVE EXHAUST PIPE**
   (See page AT2–22)



3. **REMOVE OIL PAN**

(a) Remove the 19 bolts.
Torque: 7.4 N·m (75 kgf·cm, 85 in.·lbf)

(b) Install the blade of SST between the transmission case and oil pan, cut off applied sealer.
SST 09032–00100
REMOVAL NOTICE: Be careful not to damage the oil pan flange.



4. **EXAMINE PARTICLES IN PAN**

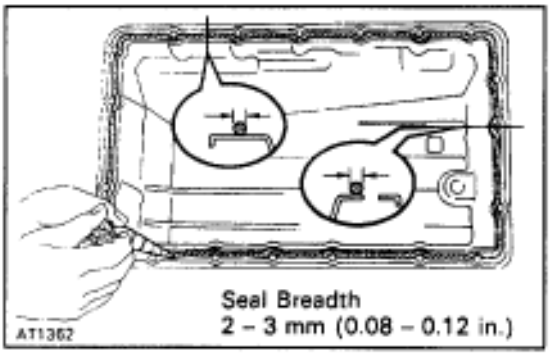
Remove the magnets and use them to collect steel particles. Carefully look at the foreign matter and particles in the pan and on the magnets to anticipate the type of wear you will find in the transmission:

Steel (magnetic)
bearing, gear and clutch plate wear

Brass (non–magnetic)
bushing wear

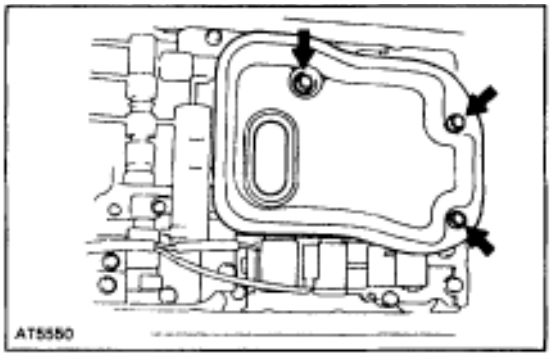
INSTALLATION HINT:

- Install the 3 magnets in the indentations of the oil pan, as shown in the illustration.



- Remove any packing material and be careful not to drop oil on the contacting surfaces of the transmission case and oil pan.
- Apply FIPG to the oil pan, as shown in the illustration.

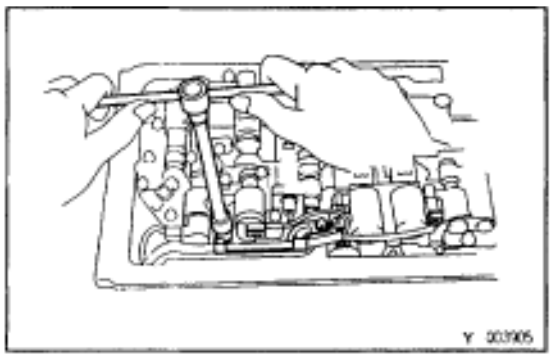
FIPG
Part No.08826–00090, THREE BOND 1281 or equivalent



5. REMOVAL OIL STRAINER

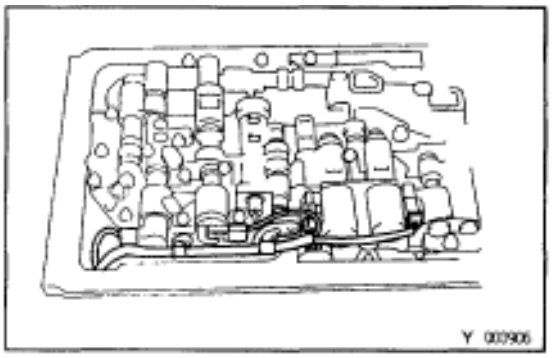
Remove the 3 bolts holding the oil strainer to the valve body.

Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

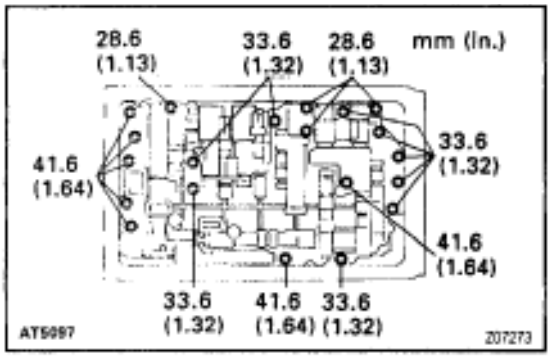


6. REMOVE SOLENOID WIRING

(a) Remove the 2 bolts and clamp.



(b) Disconnect the 5 connectors from the solenoid valves.



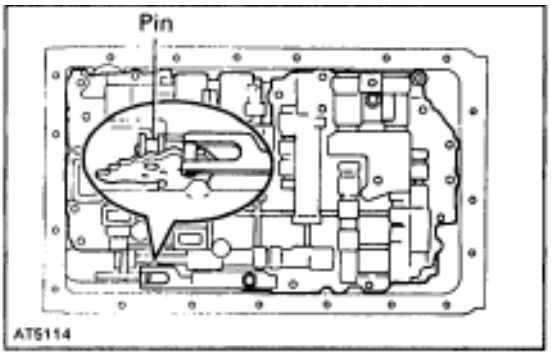
7. REMOVE VALVE BODY

(a) Remove the 20 bolts.

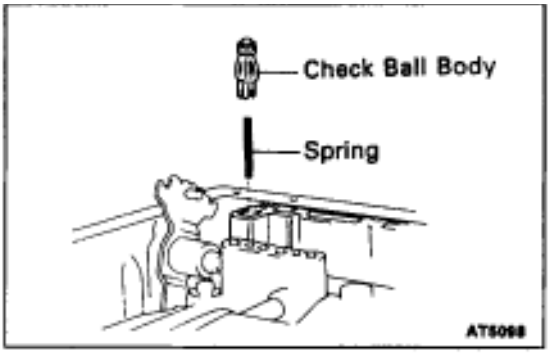
Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

INSTALLATION HINT: Each bolt length is indicated in the illustration.

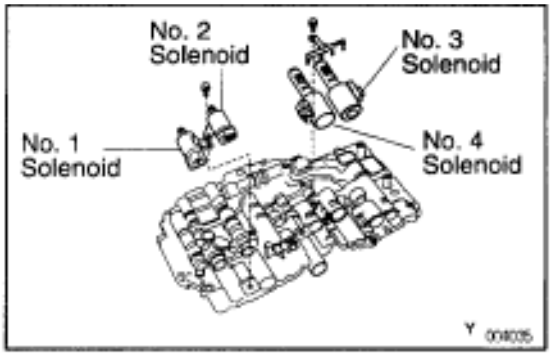
(b) Remove the valve body.



INSTALLATION HINT: Align the groove of the manual valve to the pin of the lever.



REMOVAL NOTICE: Do not drop the check ball body and spring.

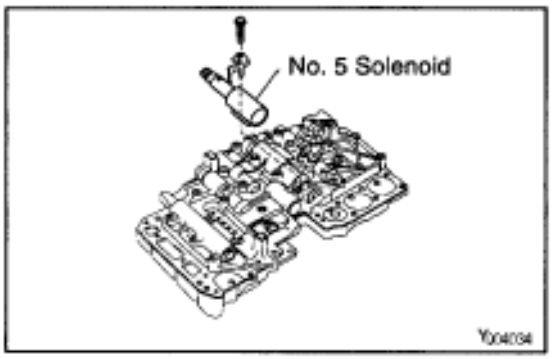


8. REMOVE 5 SOLENOID VALVES

(a) Remove the No.1, No.2 solenoid valves.

(b) Remove the O–ring from the No.1 and No.2 solenoid valves.
INSTALLATION HINT: Replace the O–rings with new ones.

(c) Remove the lock plate, No.3 and No.4 solenoid valves.



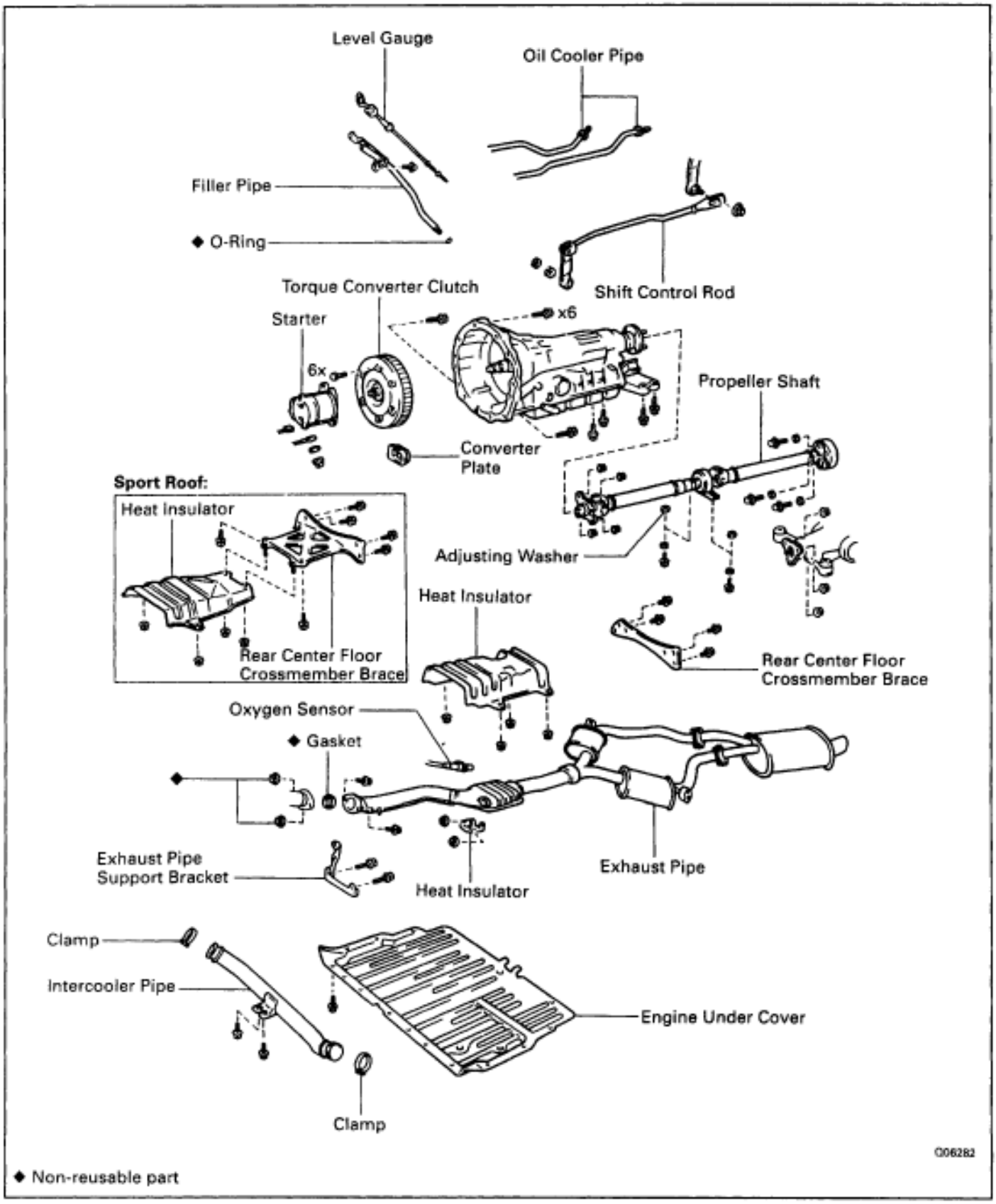
(d) Remove the No.5 solenoid valve.

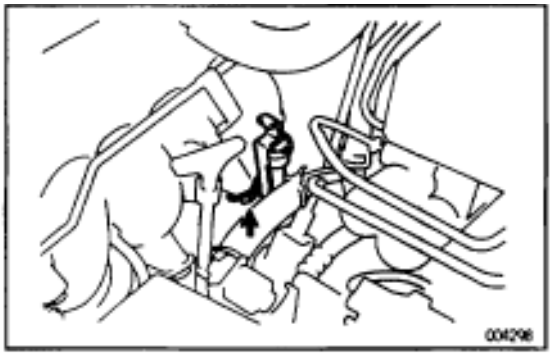
9. INSPECT VALVE BODY

Refer to A 340 E Automatic Transmission Repair Manual.

ASSEMBLY REMOVAL AND INSTALLATION

COMPONENTS





TRANSMISSION REMOVAL

Installation is in the reverse order of removal.

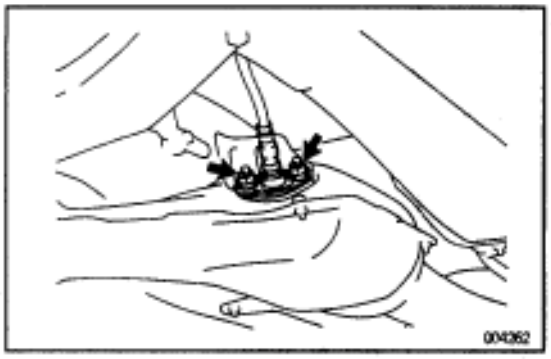
INSTALLATION HINT: After installation, fill A/T fluid and check fluid level. (See page AT2–42)

1. REMOVE LEVEL GAUGE

2. REMOVE FILLER PIPE

Remove the bolt and filler pipe.

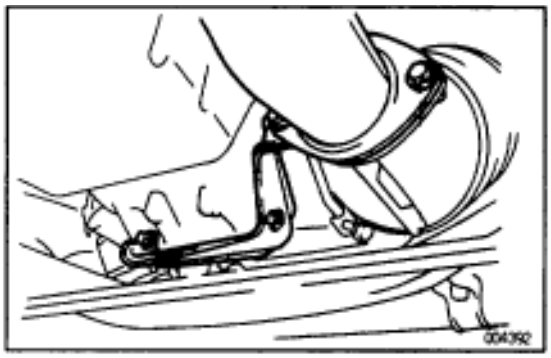
3. REMOVE ENGINE UNDER COVER



4. DISCONNECT OXYGEN SENSOR

(a) Remove the 2 nuts.

(b) Remove the cover and the sensor.



5. REMOVE EXHAUST PIPE

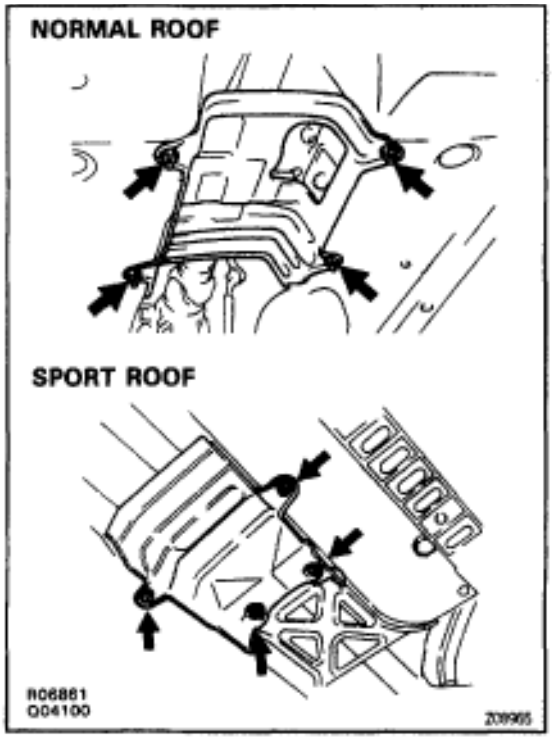
(a) Remove the 2 nuts and 4 bolts.

(b) Disconnect the rings from the exhaust pipe brackets.

(c) Remove the exhaust pipe, gasket and bracket.

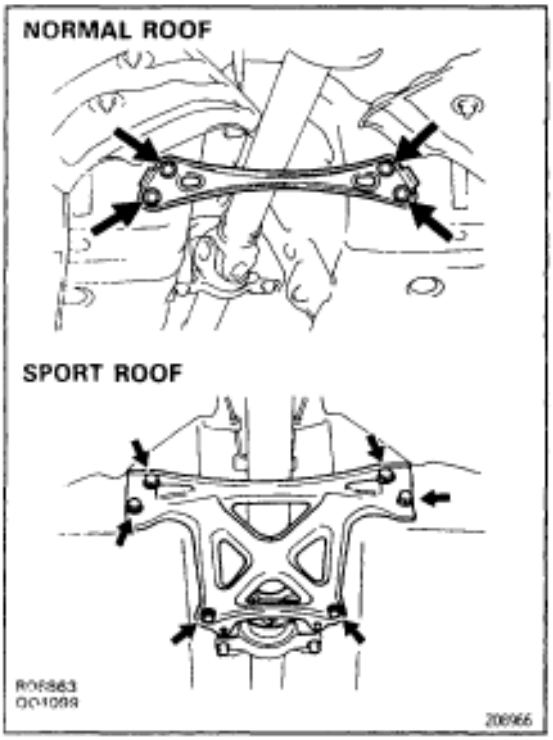
Torque:

Bracket X Transmission housing:
37 N·m (380 kgf·cm, 27 ft·lbf)
No.2 exhaust pipe X Center exhaust pipe:
58 N·m (590 kgf·cm, 43 ft·lbf)



6. REMOVE HEAT INSULATOR

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



7. REMOVE REAR CENTER FLOOR CROSSMEMBER BRACE

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

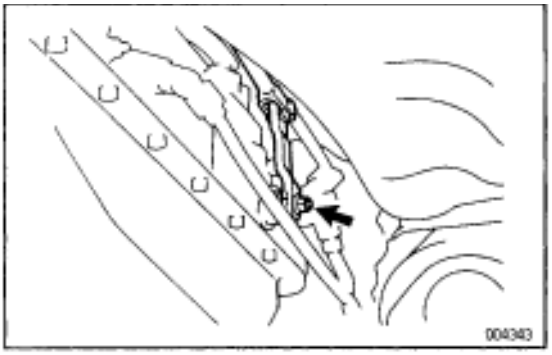
8. REMOVE PROPELLER SHAFT

(See page PR–7)

9. DISCONNECT SHIFT CONTROL ROD FROM SHIFT LEVER

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

INSTALLATION HINT: Inspect and adjust the park/ neutral position switch. (See page AT2–43)

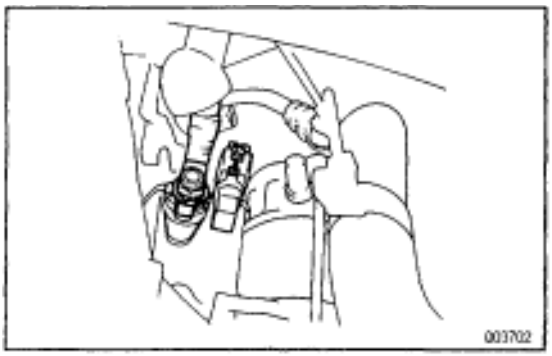


10. REMOVE SHIFT CONTROL ROD FROM PARK/NEUTRAL POSITION SWITCH

Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)

11. DISCONNECT THESE CONNECTORS:

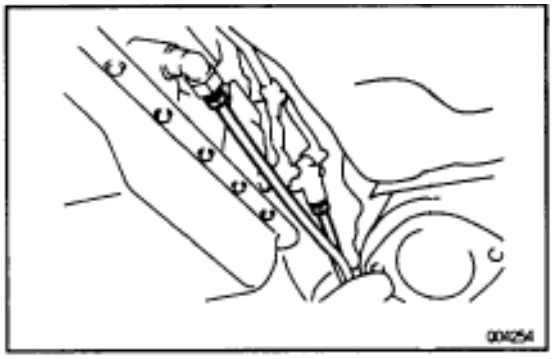
- O/D direct clutch speed sensor
- No.1 vehicle speed sensor
- No.2 vehicle speed sensor
- Solenoid wire
- Park/neutral position switch
- A/T fluid temp. sensor



12. DISCONNECT CONNECTORS AND CABLE FROM STARTER

(a) Remove the nut and disconnect the wire harness.

(b) Disconnect the connectors.



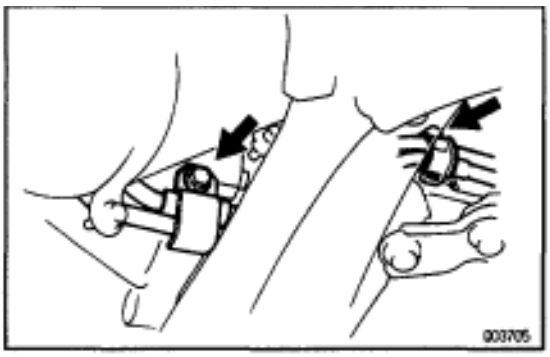
13. REMOVE OIL COOLER PIPES

(a) Loosen the 2 oil cooler union nuts.

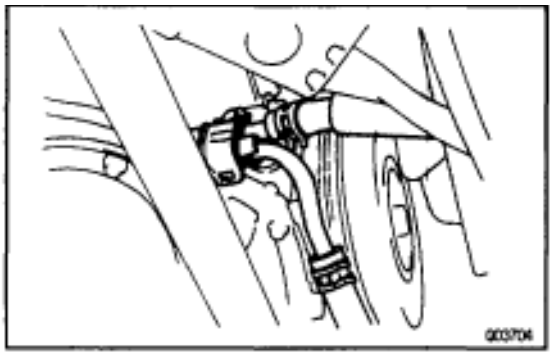
INSTALLATION HINT:

- Place the 2 oil cooler pipes at installation position.
- Tighten the 2 oil cooler union nuts to the transmission.

Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)

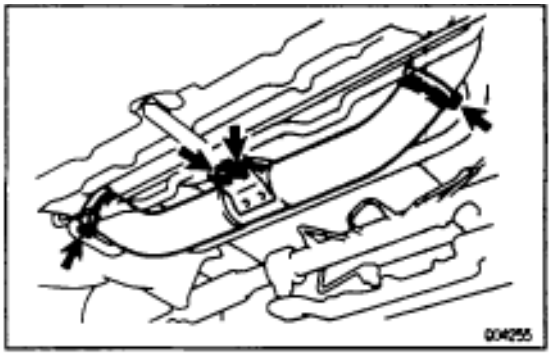


(b) Remove the center and rear oil cooler pipe brackets.
Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)



(c) Remove the front oil cooler pipe bracket.
Torque: 10 N·m (100 kgf·cm, 7 ft·lbf)

(d) Disconnect the 2 oil cooler pipes.

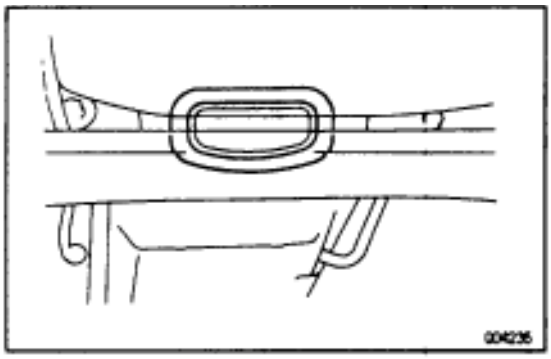


14. REMOVE INTERCOOLER PIPE

(a) Remove the 2 bolts.

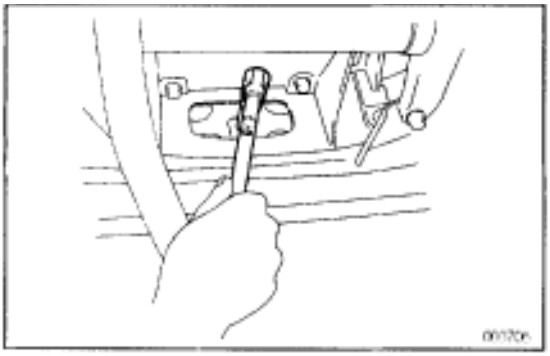
(b) Loosen the 2 clamps.

(c) Remove the pipe.

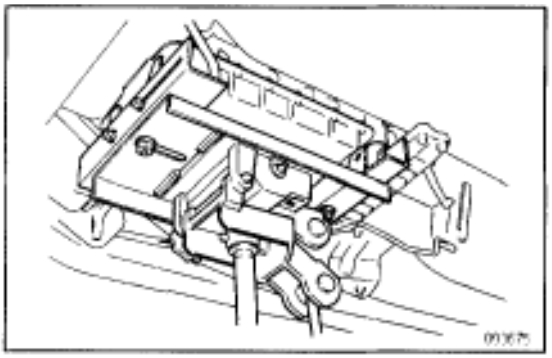


15. REMOVE TORQUE CONVERTER CLUTCH MOUNTING BOLTS

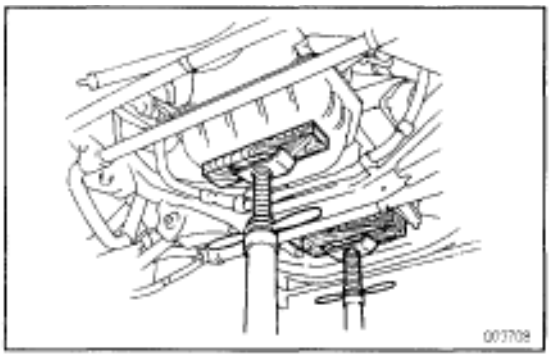
(a) Remove the converter plate.



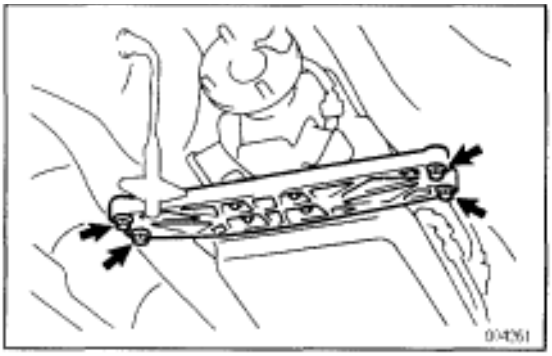
(b) Turn the crankshaft to gain access and remove the 6 bolts.
Torque: 33 N·m (340 kgf·cm, 25 ft·lbf)



16. SET TRANSMISSION JACK

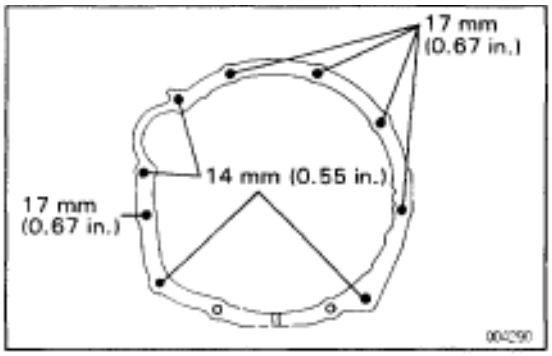


17. SUPPORT ENGINE
NOTICE: Use a wooden block so not to damage the engine oil pan.

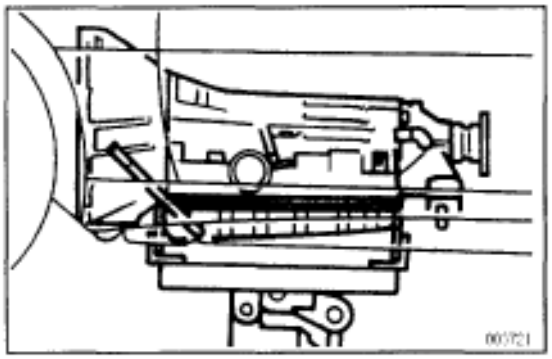


18. REMOVE TRANSMISSION REAR SUPPORT
Torque: 25 N·m (250 kgf·cm, 19 ft·lbf)

19. REMOVE 4 WIRE HARNESS CLAMPS
Lower the transmission and remove the 4 wire harness clamps from the retainer.



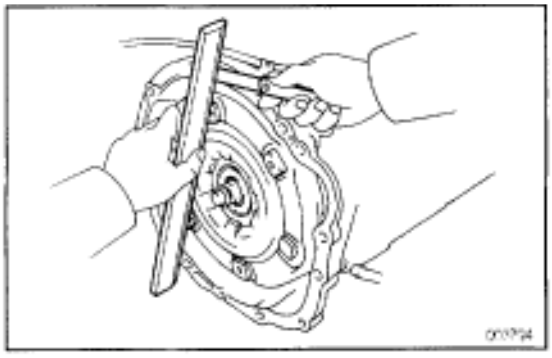
20. REMOVE STARTER AND TRANSMISSION SET BOLTS
Torque:
17 mm head bolt:
72 N·m (730 kgf·cm, 53 ft·lbf)
14 mm head bolt:
37 N·m (380 kgf·cm, 27 ft·lbf)



21. REMOVE TRANSMISSION FROM ENGINE

INSTALLATION HINT:

- Jack up and push the transmission fully into position.
- Make sure the engine and transmission are aligned precisely.
- Adjust the angle of the engine and transmission so that the engine installation surface and transmission surfaces are parallel.



TORQUE CONVERTER CLUTCH INSTALLATION

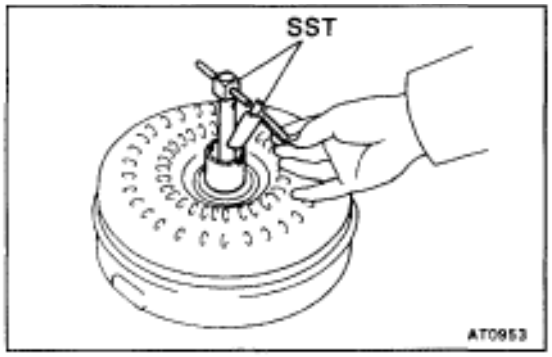
1. INSTALL TORQUE CONVERTER CLUTCH IN TRANSMISSION

2. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

Using calipers and a straight edge, measure between the installed surface of the transmission and the straight edge.

Clearance:

Less than 0.1 mm (0.004 in.)

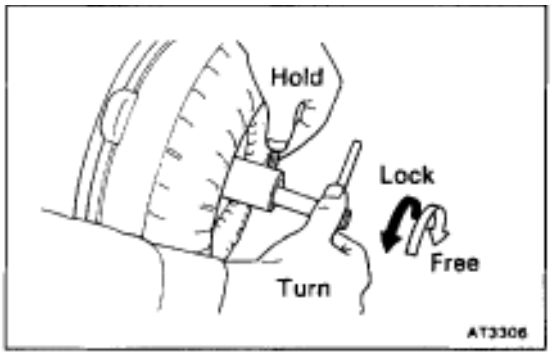


TORQUE CONVERTER CLUTCH AND DRIVE PLATE INSPECTION

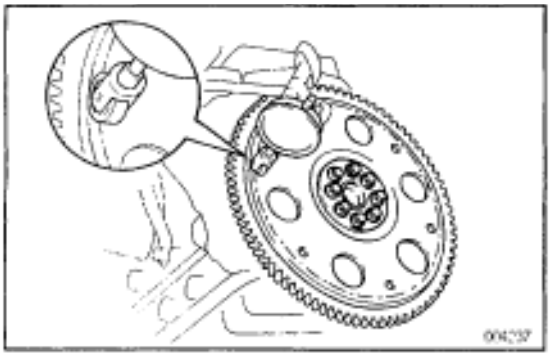
1. INSPECT ONE–WAY CLUTCH

(a) Install SST into the inner race of the one–way clutch.
SST 09350–30020 (09351–32010)

(b) Install SST so that is fits in the notch of the converter clutch hub and outer race of the one–way clutch.
SST 09350–30020 (09351–32020)



(c) With the torque converter clutch standing on its side, the clutch locks when turned counterclockwise, and rotates freely and smoothly clockwise.
If necessary, clean the converter clutch and retest the clutch. Replace the converter clutch if the clutch still fails the test.



2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

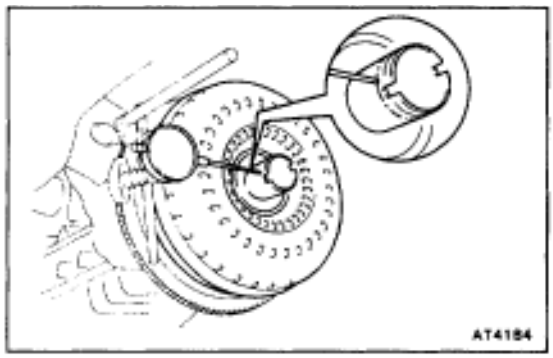
Set up a dial indicator and measure the drive plate runout.

Maximum runout:

0.20 mm (0.0079 in.)

If runout exceeds 0.20 mm (0.0079 in.) or if the ring gear is damaged replace the drive plate. If installing a new drive plate, note the orientation of spacers and tighten the bolts.

Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)



3. MEASURE TORQUE CONVERTER CLUTCH SLEEVE RUNOUT

(a) Temporarily mount the torque converter clutch to the drive plate. Set up a dial indicator.

Maximum runout:

0.30 mm (0.0118 in.)

If runout exceeds 0.30 mm (0.0118 in.), try to correct by reorienting the installation of the converter clutch.

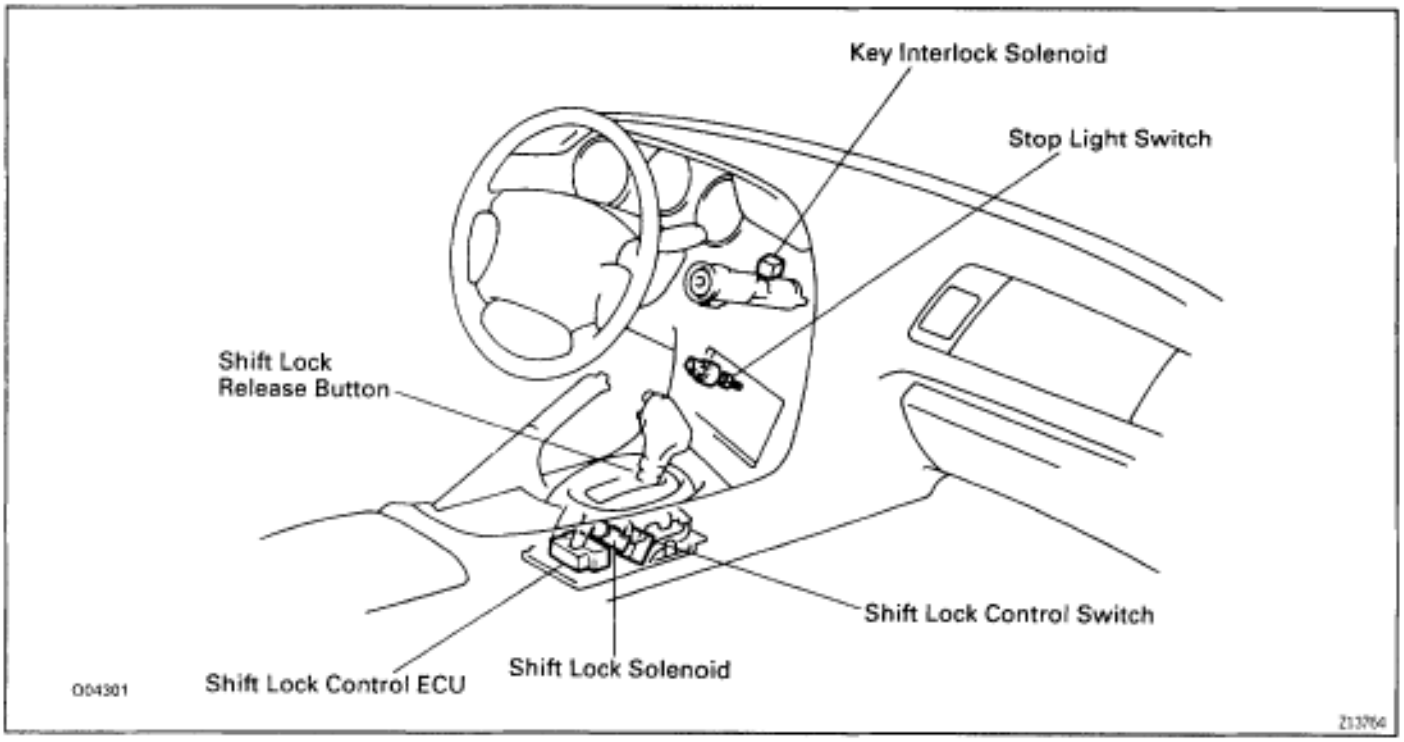
If excessive runout cannot be corrected, replace the torque converter clutch.

HINT: Mark the position of the converter clutch to ensure correct installation.

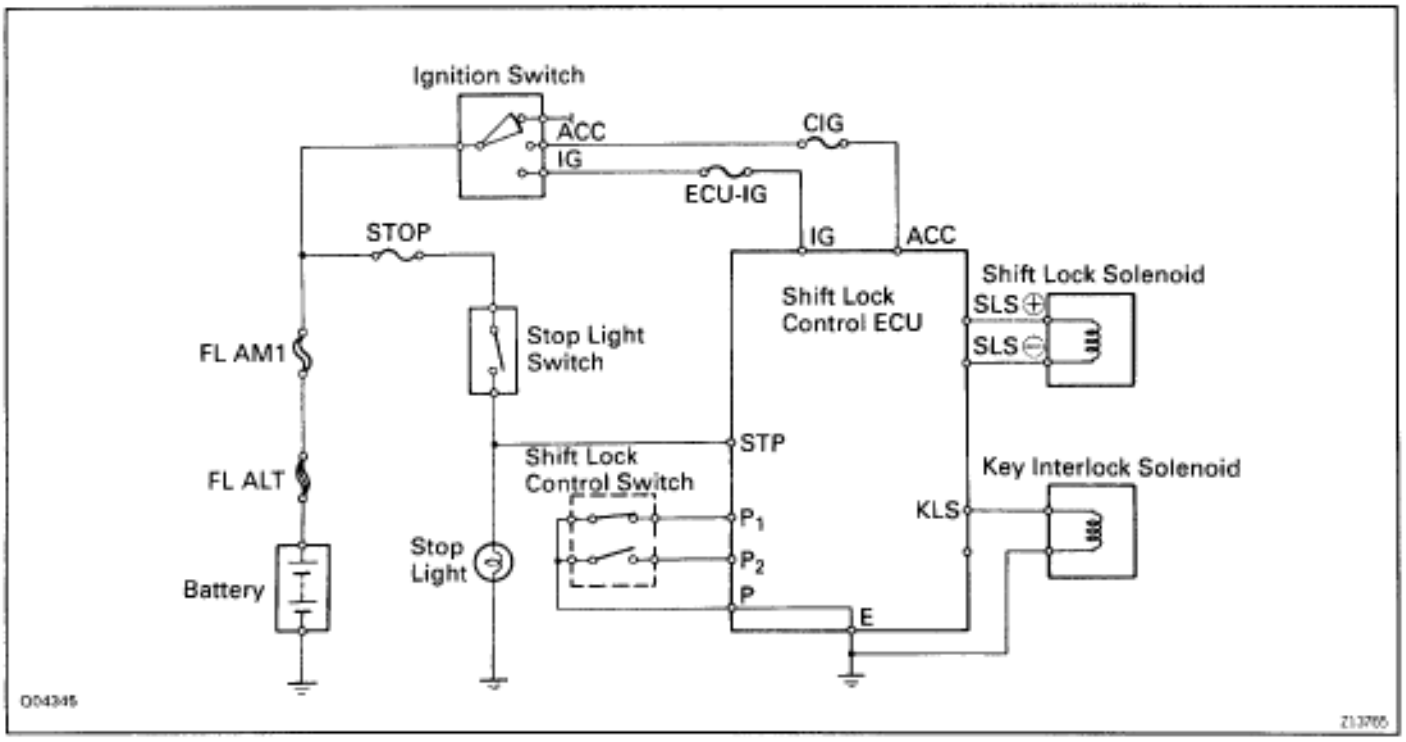
(b) Remove the torque converter clutch.

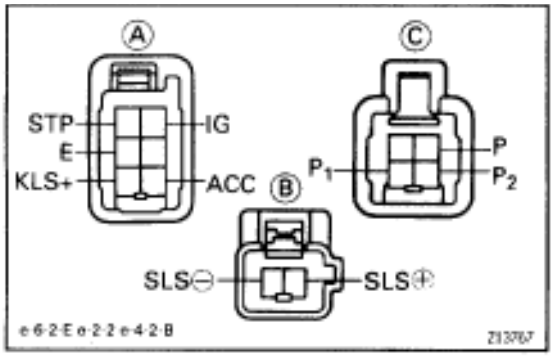
SHIFT LOCK SYSTEM

COMPONENT PARTS LOCATION



WIRING DIAGRAM



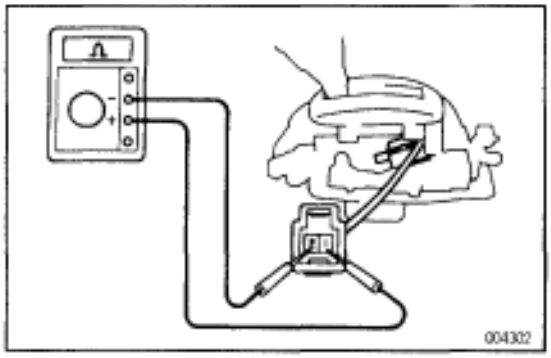


ELECTRIC CONTROL COMPONENTS INSPECTION

1. INSPECT SHIFT LOCK CONTROL ECU

Using a voltmeter, measure the voltage at each terminal.

Connector	Terminal	Measuring condition	Voltage (v)
A	ACC – E	IG SW ACC	10 – 14
	IG – E	IG SW ON	10 – 14
	STP – E	Depress brake pedal	10 – 14
	KLS – E	(1) IG SW ACC and P position	0
		(2) R, N, D, 2, L position	7.5 – 11
		(3) R, N, D, 2, L position (after one second)	6 – 9.5
B	SLS(+) – SLS(–)	(1) IG SW ON and P position	0
		(2) Depress brake pedal	8 – 13.5
		(3) Depress brake pedal (after 20 seconds)	6 – 8.5
		(4) R,N,D,2,L position	0
C	P_1 – P	(1) IG SW ON, P position and depress brake pedal	0
		(2) R,N,D,2,L position	9 – 13.5
	P_2 – P	(1) IG SW ACC and P position	9 – 13.5
		(2) R,N,D,2,L position	0



2. INSPECT SHIFT LOCK SOLENOID

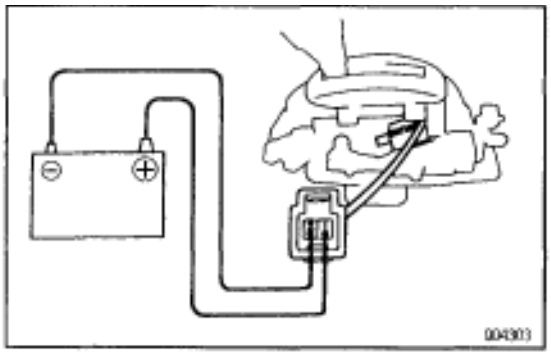
(a) Disconnect the solenoid connector.

(b) Using an ohmmeter, measure the resistance between terminals 1 and 2.

Standard resistance:

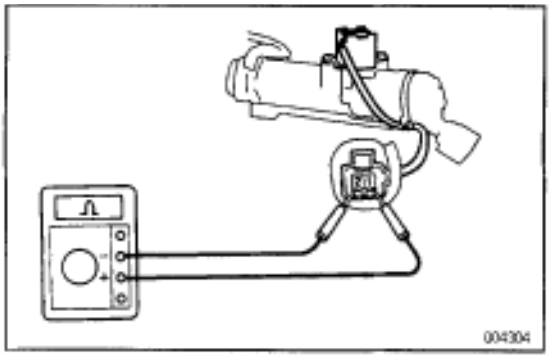
20–28

If resistance value is not as specified, replace the solenoid.



(c) Apply the battery positive voltage between terminals 1 and 2. At this time, confirm that the solenoid operates.

If the solenoid does not operated, replace the solenoid.



3. INSPECT KEY INTERLOCK SOLENOID

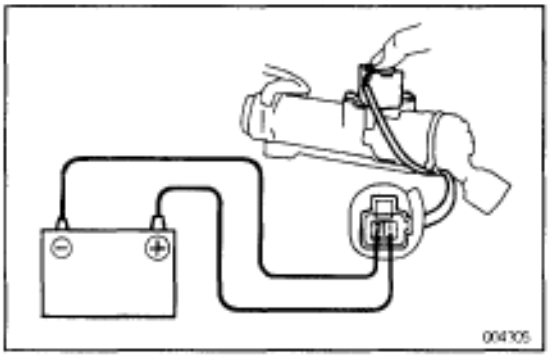
(a) Disconnect the solenoid connector.

(b) Using an ohmmeter, measure the resistance between terminals 1 and 2.

Standard resistance:

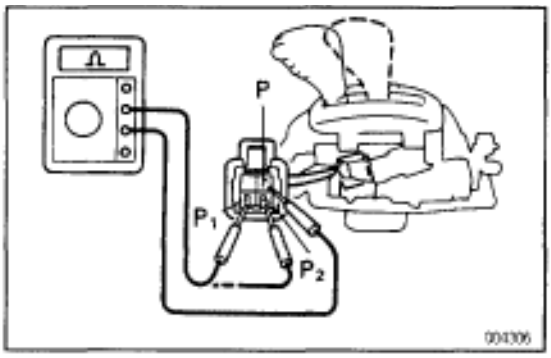
12–17

If resistance value is not as specified, replace the solenoid.



(c) Touch the solenoid with your finger and check that solenoid operation can be felt when battery positive voltage is applied intermittently to the terminals 1 and 2.

If the solenoid does not operate, replace the solenoid.



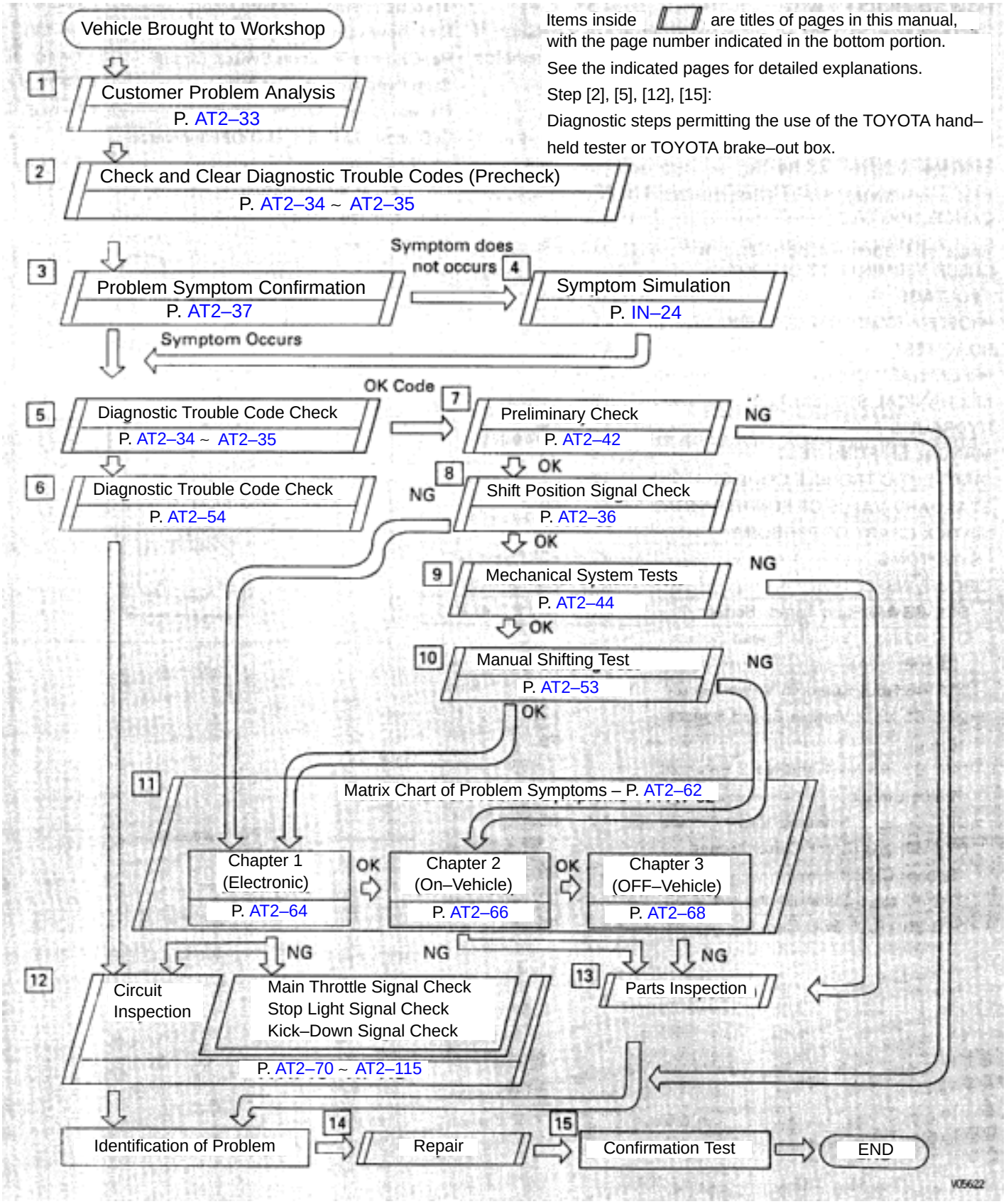
4. INSPECT SHIFT LOCK CONTROL SWITCH

Inspect that there is continuity between each terminal.

Shift position	Tester condition to terminal number	Specified value
P position (Release button is not pushed)	$P–P_1$	Continuity
R, N, D, 2, L position	$P–P_2$	Continuity

TROUBLESHOOTING

HOW TO PROCEED WITH TROUBLESHOOTING



CUSTOMER PROBLEM ANALYSIS

Electronically Controlled Transmission Check Sheet

Inspector's Name:

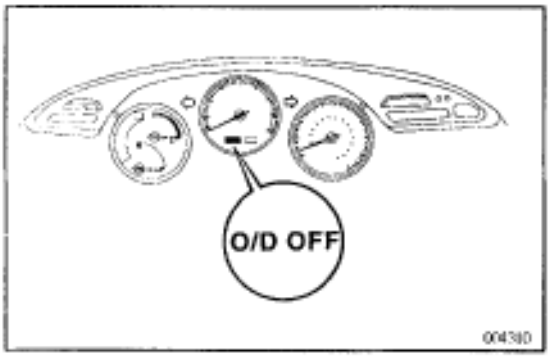
Customer's Name		**Registration No.**	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In	/ /	**Odometer Reading**	km Miles

Date Problem Occurred	/ /
How often Does Problem Occur?	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ Vehicle does not move. (☐ Any position ☐ Particular position)
	☐ No up–shift (☐ 1st → 2nd ☐ 2nd → 3rd ☐ 3rd → O/D)
	☐ No down–shift (☐ O/D → 3rd ☐ 3nd → 2rd ☐ 2rd → 1st)
	☐ Lock–up malfuction
	☐ Shift point too high or too low.
	☐ Harsh engagement (☐ N → D ☐ Lock–up ☐ Any drive position)
	☐ Slip or shudder
	☐ No Kick–down
	☐ No pattern select
	☐ Others ( )

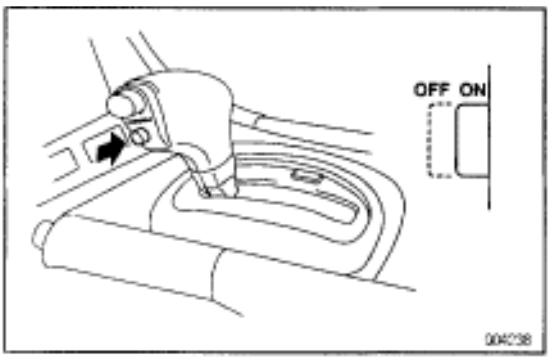
Check Item	**Malfunction Indicator Lamp**	☐ Normal	☐ Remains ON

Diagnostic Trouble Code (O/D OFF Indicator LIght)	1st Time	☐ Normal Code	☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code	☐ Malfunction Code (Code)



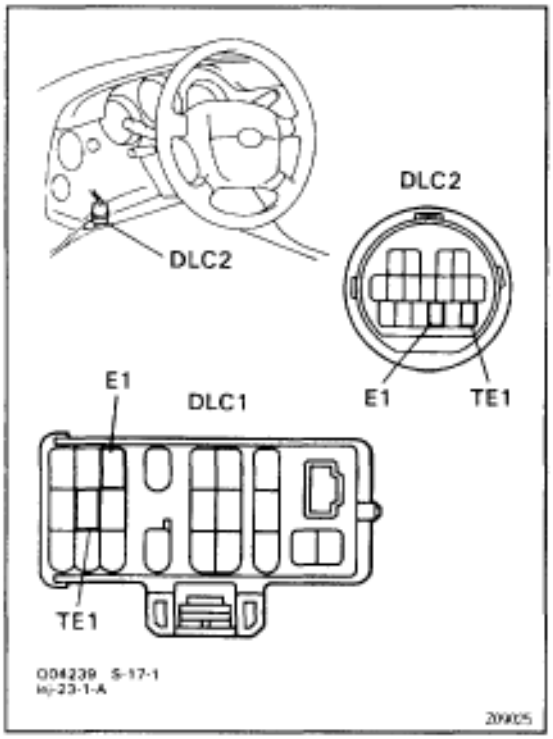
DIAGNOSIS SYSTEM

The automatic transmission has built–in self–diagnostic functions. If a malfunction occurs in the system, the ECM stores the diagnostic trouble code in memory and the O/D OFF (Overdrive OFF) indicator light blinks to inform the driver. The diagnostic trouble code stored in memory can be read out by the following procedure.



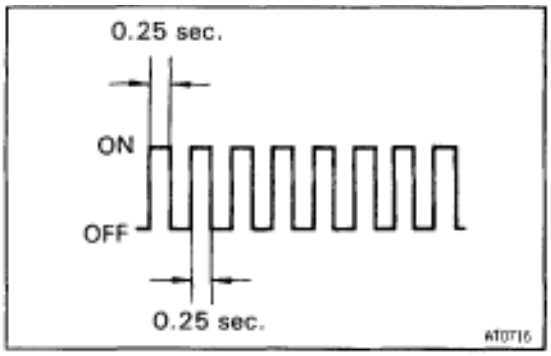
O/D OFF INDICATOR LIGHT INSPECTION

1. Turn the ignition switch ON.
2. Check if the O/D OFF indicator light lights up when the O/D main switch is pushed out to OFF and goes off when the O/D main switch is pushed in to ON.
   HINT: If the O/D OFF indicator light does not light up or stay on all the time, carry out the check for ”O/D OFF Indicator Light Circuit” on page AT2–108.

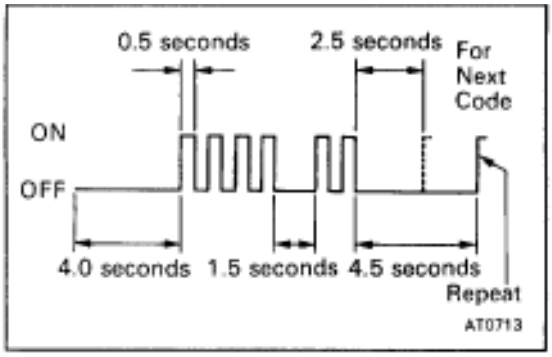


DIAGNOSTIC TROUBLE CODE CHECK

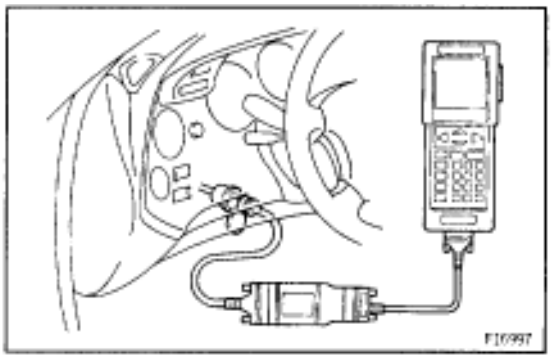
1. Turn the ignition switch ON, but do not start the engine.
2. Push in the O/D main switch to ON.
   HINT: Warning and diagnostic trouble codes can be read only when the O/D main switch is ON. If it is OFF, the O/D OFF indicator light up will light continuously and will not blink.
3. Using SST, connect terminals TE1 and E1 of the DLC 1 or DLC2.
   SST 09843–18020



4. Read the diagnostic trouble code indicated by the number of times the O/D OFF indicator light blinks
   (See next page).
   HINT: If the system is operating normally, the light will blink 2 times per second.

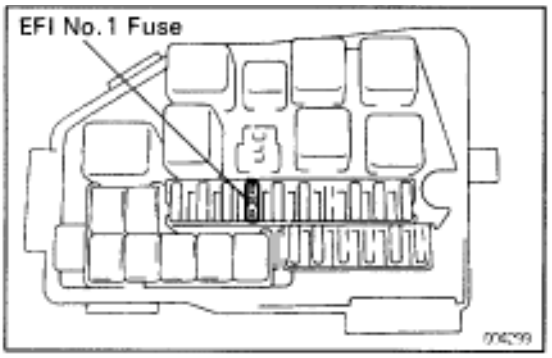


The trouble code is indicated as shown in the illustration at left (Diagnostic trouble code ”42” is shown as an example).
HINT: When 2 or more trouble codes are stored in memory, the lower–numbered code is displayed first.
If no diagnostic trouble code is output, or if a diagnostic trouble code is output even though no diagnostic trouble code output operation is performed, check the TE1 terminal circuit on page AT2–113



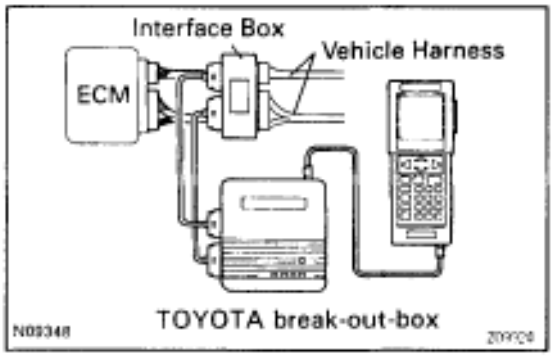
ECM DATA MONITOR USING TOYOTA HAND–HELD TESTER

1. Hook up the TOYOTA hand–held tester to the DLC2.
2. Monitor the ECM data by following the prompts on the tester screen.
   HINT: TOYOTA hand–held tester has a ”Snapshot” function which records the monitored data.
   Please refer to the TOYOTA hand–held tester operator’s manual.



CANCELING DIAGNOSTIC TROUBLE CODE

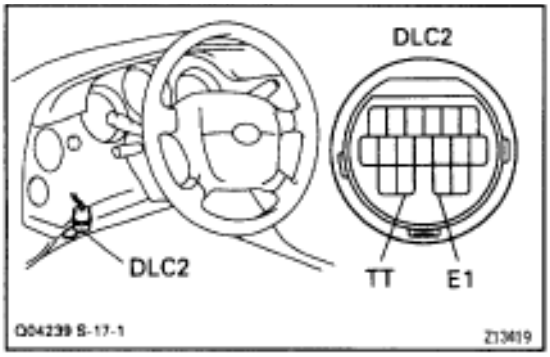
After repair of the trouble area, the diagnostic trouble code retained in the ECM memory must be canceled out by removing the EFI No.1 fuse for 10 seconds or more, with the ignition switch OFF.
Check that the normal code is output after connecting the fuse.

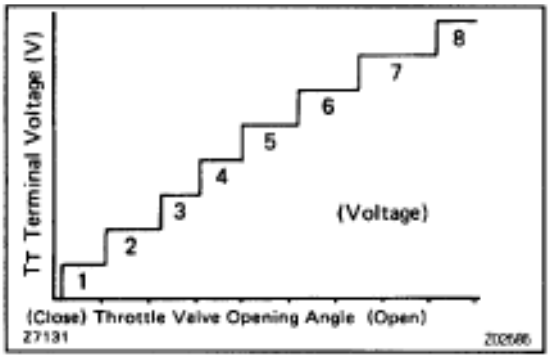


ECM TERMINALS STANDARD VALUE

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

1. Hook up the TOYOTA break–out–box and TOYOTA hand–held tester to the vehicle.
2. Read the ECM 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 further details.





CHECK TERMINAL TT OUTPUT VOLTAGE

When a voltmeter is connected to the DLC2, the following items can be checked.

1. Throttle position sensor signal
2. Brake signal
3. Shift position signal

1. VOLTMETER CONNECTION

Connect the positive (+) probe of the voltmeter to terminal TT and the negative (–) probe to terminal E1 of the DLC2.

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

2. TURN IGNITION SWITCH TO ON (DO NOT START THE ENGINE)

3. CHECK THROTTLE POSITION SENSOR SIGNAL

Check if the voltage changes from approx. 0 V to approx. 8 V when the accelerator pedal is gradually depressed from the fully closed position.

4. CHECK BRAKE SIGNAL (LOCK–UP CUT SIGNAL)

(a) Open the throttle valve fully to apply approx. 8 V to terminal TT.

(b) In this condition, check terminal TT voltage when the brake pedal is depressed and released.

TT terminal voltage:

0 V (When brake pedal is depressed)

8 V (When brake pedal is released)

5. START ENGINE

6. CHECK SHIFT POSITION SIGNAL (VEHICLE SPEED ABOVE 10 km/h, 6 mph)

Check up–shifting together with terminal TT voltage.

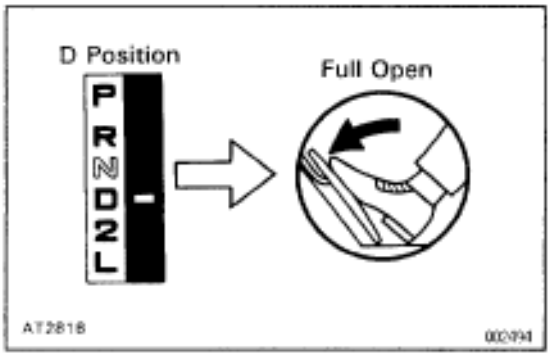
Gear Position	Terminal TT output voltage
1st Gear	0 V
2nd Gear	2 V
3rd Gear	4 V
3rd Lock–up	5 V
O/D	6 V
O/D Lock–up	7 V

HINT: Check for light shocks from up–shifting and for changes in the tachometer.

If terminal TT Output voltage check cannot be done, do the check of TT terminal circuit on page AT2–115.

PROBLEM SYMPTOM CONFIRMATION

Taking into consideration the results of the customer problem analysis, try to reproduce the symptoms of the trouble. If the problem is that the transmission does not up–shift, does not down–shift, or the shift point is too high or too low, conduct the following road test to confirm the automatic shift schedule and simulate the problem symptoms.



ROAD TEST

NOTICE: Do the test at normal A/T fluid operating temp. 50–80°C (122–176°F).

1. D POSITION TEST (NORM PATTERN)

Shift into the D position and keep the accelerator pedal constant at the full throttle valve opening position, and check the following points:

(a) Check up–shift operation.

Check that 1–2, 2–3 and 3–O/D up–shift takes place, at the shift point shown in the automatic shift schedule.

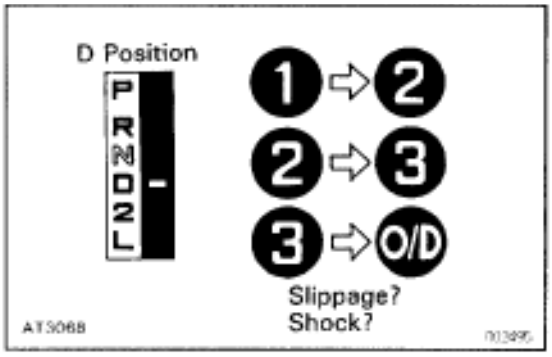
(See page AT2–116)

HINT:

(1) O/D Gear Up–shift Prohibition Control.

- Coolant temp. is 60°C (140°F) or less.
- If there is a 10 km/h (6 mph) difference between the set cruise control speed and vehicle speed.
- O/D main switch is pushed ON.

‘(During O/D OFF, indicator light lights up.)

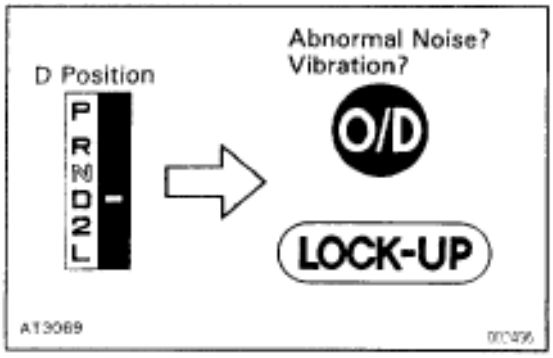


(2) O/D Gear Lock–up Prohibition Control.

- Brake pedal is depressed.
- Coolant temp. is 60°C (140°F) or less.

(b) Check for shift shock and slip.

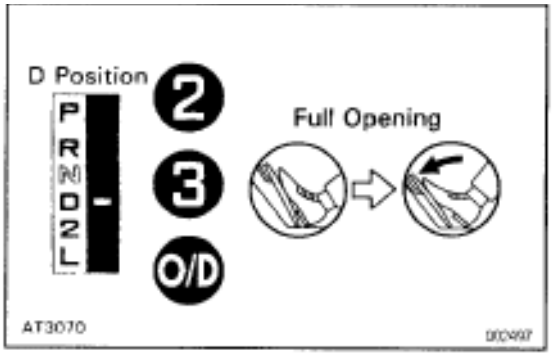
Check for shock and slip at the 1–2, 2–3, and 3–O/ D up–shifts.



(c) Check for abnormal noise and vibration.

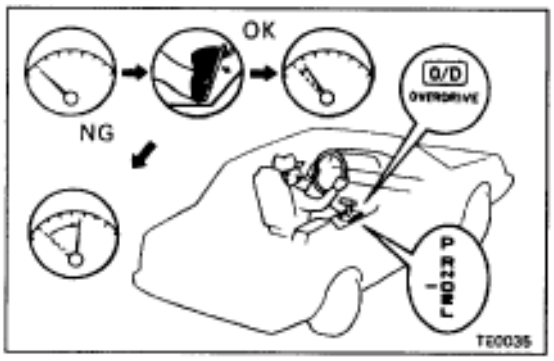
Run at the D position lock–up or O/D gear and check for abnormal noise and vibration.

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

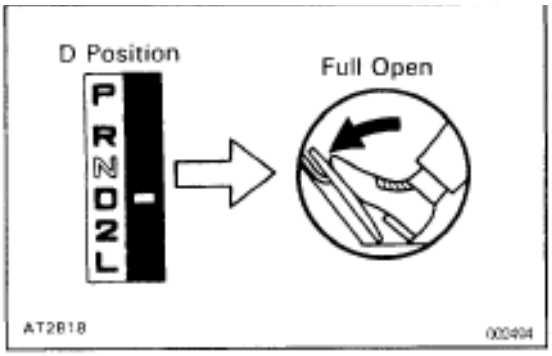


(d) Check kick–down operation.
While running in the D position, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 2 → 1, 3 → 2 and O/D → 3 kick–downs conform to those indicated on the automatic shift schedule.
(See page AT2–116)

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

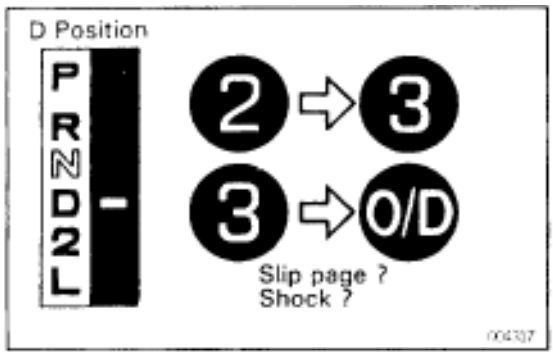


(f) Check the lock–up mechanism.
(1) Drive in D position, O/D gear, at a steady speed (lock–up ON) of about 59 km/h (37 mph).
(2) Lightly depress the accelerator pedal and check that the RPM does not change abruptly.
If there is a big jump in RPM, there is no lock–up.

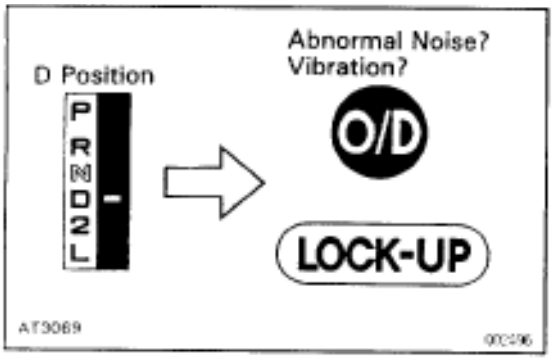


2. D POSITION TEST (MANU PATTERN)
Shift into the D position and hold the accelerator pedal constant at the full throttle valve opening position, and check the following points:

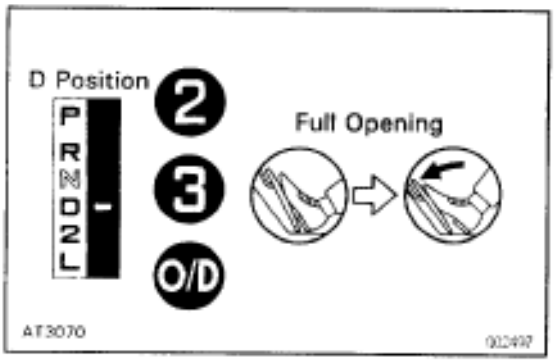
(a) Check up–shift operation.
2–3 and 3–O/D up shifts should take place, and shift points should conform to those shown in the automatic shift schedule.
(See page AT2–116)
HINT:
- O/D up–shift or lock–up will not occur when the engine coolant temp. is below 60°C (140°F) and speed is under 60 km/h (37 mph), or if there is a 10 km/h (6 mph) difference between the set cruise control speed.
- 3rd up–shift or lock–up will not occur when engine coolant temp. is 35°C (95°F) and speed is under 40 km/h (25 mph).



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

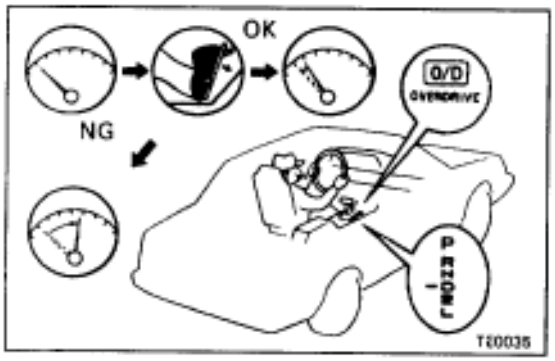


(c) Check for abnormal noise and vibration.
Run at the D position lock–up or O/D gear and check for abnormal noise and vibration.
HINT: The check for the cause of abnormal noise and vibration must be made with extreme care as it could also be due to loss of balance in the propeller shaft, differential,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



(d) Check kick–down operation.
While running in the D position, 2nd, 3rd and O/D gears, check to see that the possible kick–down vehicle speed limits for 3 → 2 and O/D → 3 kick–downs conform to those indicated on the automatic shift schedule.
(See page AT2–116)

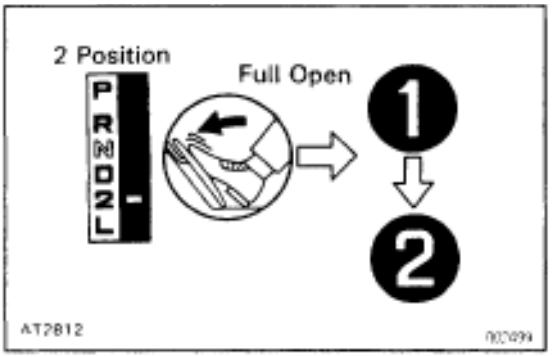
(e) Check for abnormal shock slip at kick–down.



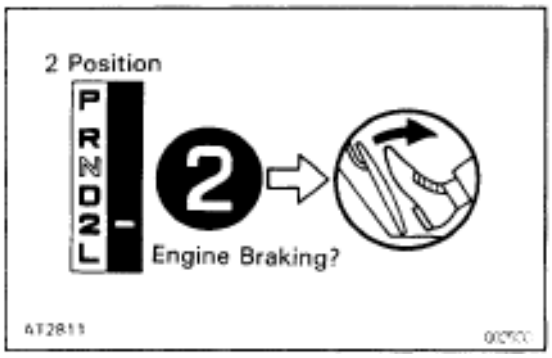
(f) Check the lock–up mechanism.
(1) Drive in D position, O/D gear, at a steady speed (lock–up ON) of about 195 km/h (121 mph).
(2) Lightly depress the accelerator pedal and check that the engine RPM does not change abruptly.
If there is big jump in the engine RPM there is no lock –up.

3. 2 POSITION TEST (NORM PATTERN)

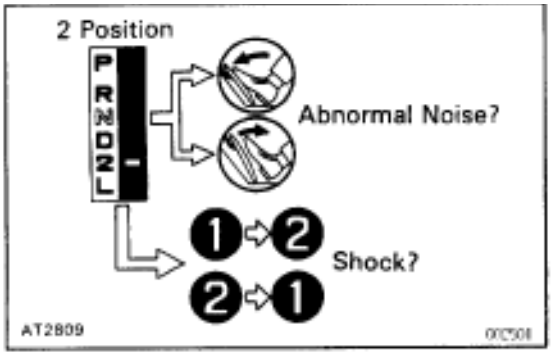
Shift into the 2 position and, while driving with the accelerator pedal held constantly at the full throttle valve opening position, check on the following points:



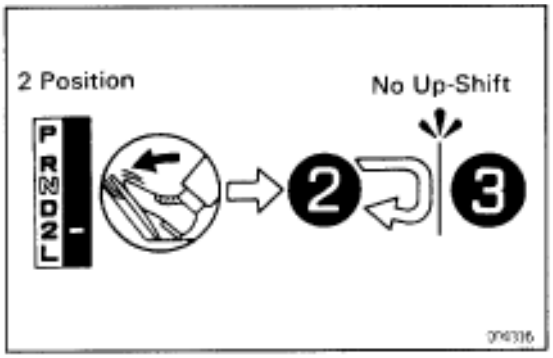
(a) Check up–shift operation.
Check to see that the 1 → 2 up–shift takes place and that the shift point conforms to the automatic shift schedule.
(See page AT2–116)
HINT: There is no O/D up–shift and lock–up in the 2 position.



(b) Check engine braking.
While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.



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

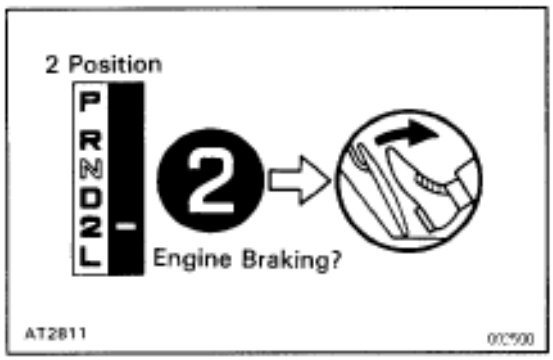


4. 2 POSITION TEST (MANU PATTERN)

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 these points:

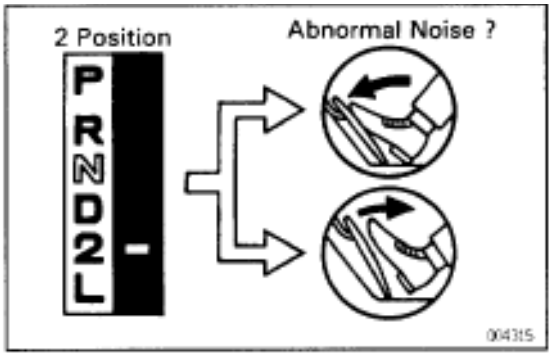
(a) Check no up–shift.

While running in the 2 position, check to see that there is no up–shift to 3rd gear.

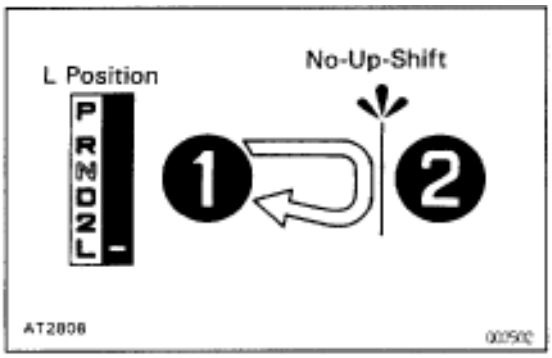


(b) Check engine braking.

While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.



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

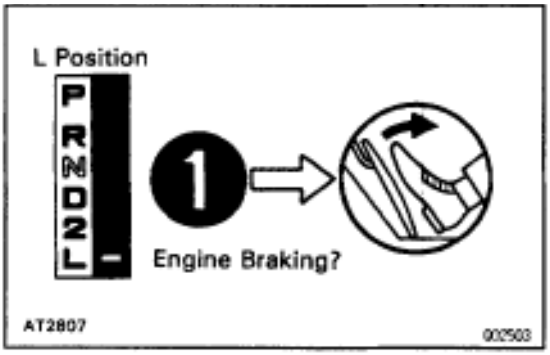


5. L POSITION TEST

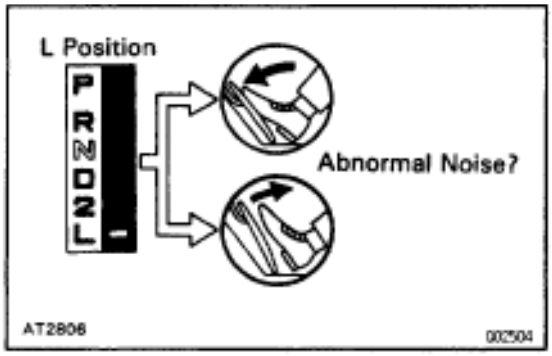
Shift into the L position and while driving with the accelerator pedal held constantly at the full throttle valve opening position, check these points:

(a) Check no up–shift.

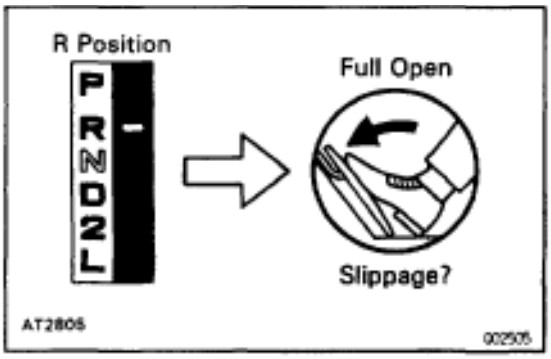
While running in the L position, check that there is no up–shift to 2nd gear.



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



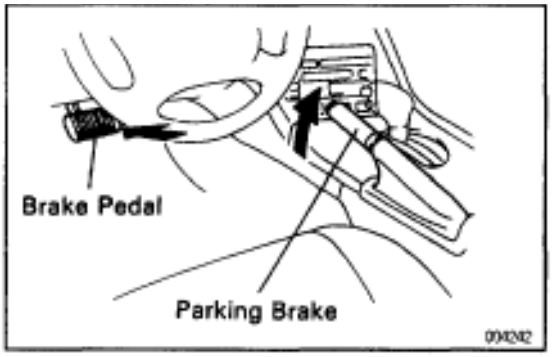
(c) Check for abnormal noise during acceleration and deceleration.



6. R POSITION TEST

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

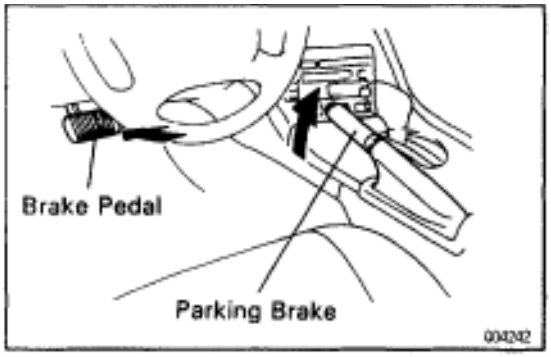
CAUTION: Before conducting this test ensure that the test area is free from personnel and obstruction.

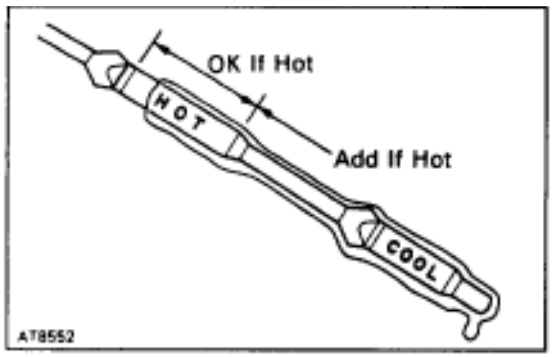


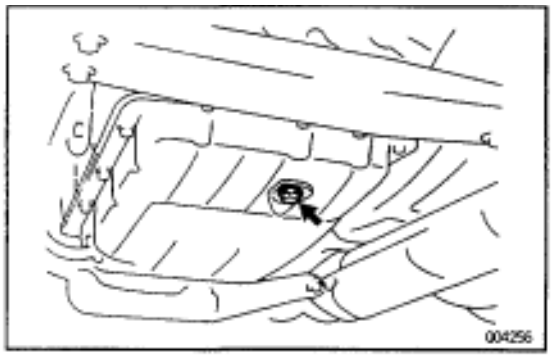
7. P POSITION TEST

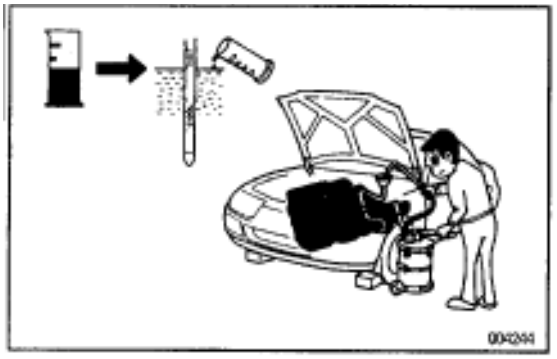
Stop the vehicle on a gradient (more than 5°) and after shifting into the P position, release the parking brake.

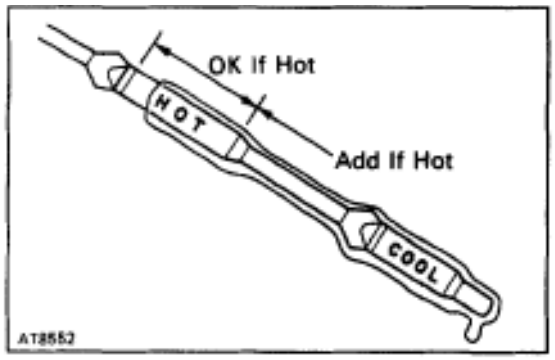
Then check to see that the parking lock pawl holds the vehicle in place.











PRELIMINARY CHECK

1. CHECK FLUID LEVEL

HINT:

- Drive the vehicle so that the engine and transmission are at normal operating temperature.
  Fluid temp.: 70–80°C (158–176°F)
- Only use the COOL 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 and set the parking brake.

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

(c) Pull out the oil level gauge and wipe it clean.

(d) Push it back fully into the pipe.

(e) Pull it out and check that the fluid level is in the HOT position. If the level is at the low side, add fluid.

Fluid type:

ATF TYPE T–II or Equivalent

NOTICE: Do not overfill

2. CHECK FLUID CONDITION

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

3. REPLACE TRANSMISSION FLUID

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

(b) Reinstall the drain plug securely.

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

Fluid type:

ATF TYPE T–II or Equivalent

Capacity:

Dry fill: 8.2 liters (8.7 US qts, 7.2 Imp. qts)

Drain and refill: 1.9 liters (2.0 US qts, 1.6 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.

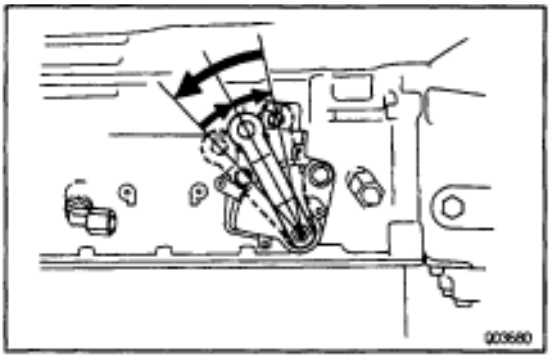
(f) Check the fluid level at the normal operating temperature 70–80°C (158–176°F) and add as necessary.

NOTICE: Do not overfill.

4. CHECK FLUID LEAKS

Check for leaks in the transmission.

If there are leaks, it is necessary to repair or replace O –rings, seal packings, oil seals, plugs or other parts.

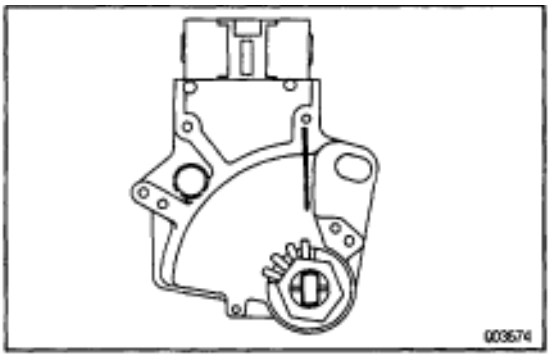


5. INSPECT AND ADJUST SHIFT LEVER POSITION

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 rearward.
(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 shift lever nut.
(f) Start the engine and make sure that the vehicle moves forward when shifting the lever from the N to D position and reverses when shifting it to the R position.



6. INSPECT AND ADJUST 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 stated above, carry out these adjustment procedures:

(a) Loosen the park/neutral position switch bolt and set the shift lever to the N position.
(b) Align the groove and neutral basic line.
(c) Hold in position and tighten the bolt.

Torque: 12 N·m (125 kgf·cm, 9 ft·lbf)

For continuity inspection of the park/neutral position switch, see page AT2–101.

7. INSPECT IDLE SPEED

Idle speed:

650±50 rpm

(In N position and air conditioner OFF)

MECHANICAL SYSTEM TESTS

STALL TEST

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

NOTICE:

- **Do the test at normal operating fluid temp. 50–80°C (122–176°F).**
- **Do not continuously run this test longer than 5 seconds.**
- **To ensure safety, conduct this test in a wide, clear, level area which provides good traction.**
- **The stall test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**

MEASURE STALL SPEED

(a) Chock the 4 wheels.

(b) Fully apply the parking brake.

(c) Connect a tachometer to the engine.

(d) Start the engine and check idle.

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

(f) Shift into the D position. Fully depress the accelerator pedal.

Quickly read the stall speed.

Stall speed:

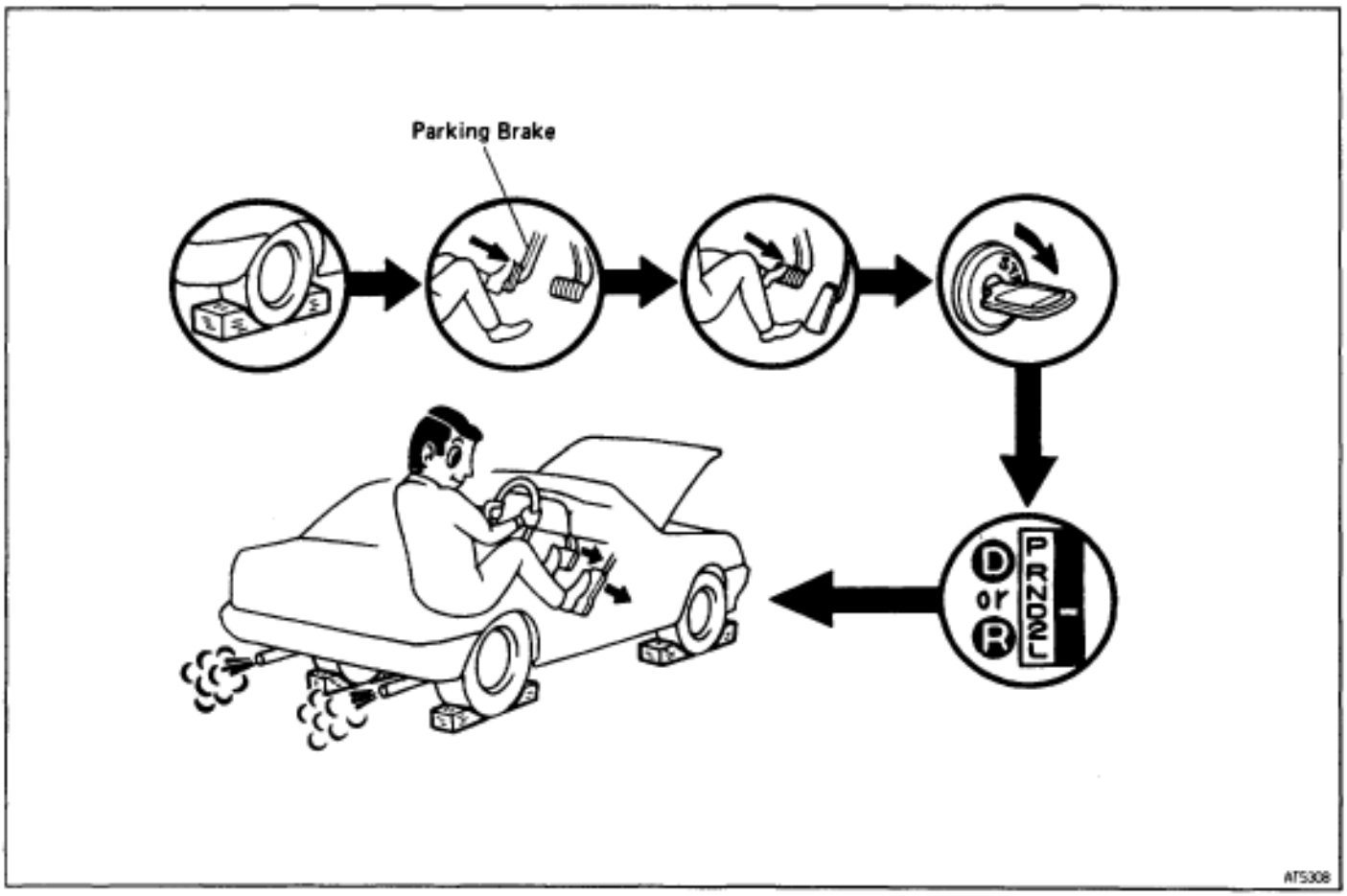
2,600±150 rpm

(g) Do the same test in R position.

Quickly read the stall speed.

Stall speed:

2,600±150 rpm



EVALUATION

Problem	Possible cause
(a) Stall speed low in D and R positions.	★Engine output may be insufficient. ★Stator one–way clutch is operating properly HINT: If more than 600 rpm below the specified value, the torque converter clutch could be faulty.
(b) Stall speed high in D position	★Line pressure too low. ★Forward clutch slipping ★No.2 one–way clutch not operating properly ★O/D one–way clutch not operating properly
(c) Stall speed high in R position.	★Line pressure too low ★Direct clutch slipping ★First and reverse brake slipping ★O/D clutch slipping
(d) Stall speed high in D and R positions.	★Line pressure too low ★Improper fluid level ★O/D one–way clutch not operating properly

TIME LAG TEST

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

NOTICE:

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

MEASURE TIME LAG

(a) Fully apply the parking brake

(b) Start the engine and check idle speed.

Idle speed:

650±50 rpm (In N position and air conditioner OFF)

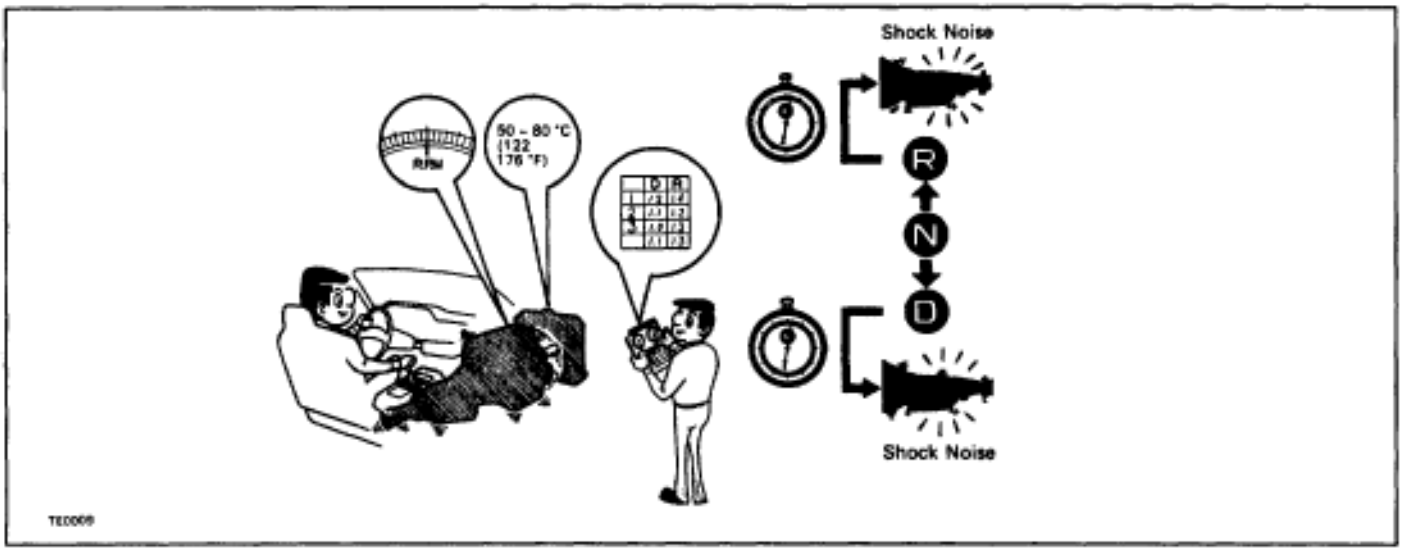
(c) Shift the shift lever from N to D position. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

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

Time lag:

N → D Less than 1.2 seconds

N → R Less than 1.5 seconds



EVALUATION

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

Problem	Possible cause
N→D time lag is longer	★Line pressure too low ★Forward clutch worn ★O/D one–way clutch not operating properly
N→R time lag is longer	★Line pressure too low ★Direct clutch worn ★First and reverse brake worn ★O/D clutch worn

HYDRAULIC TEST

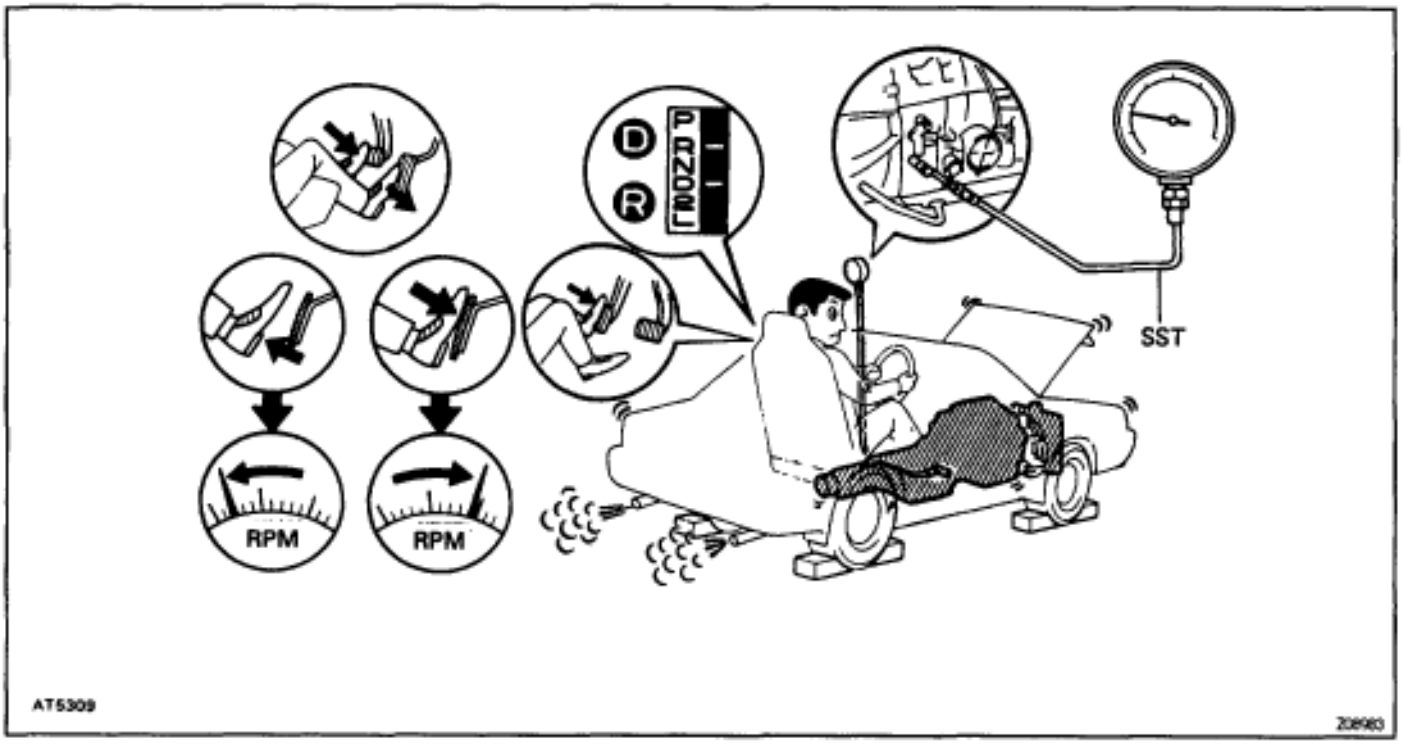
MEASURE LINE PRESSURE

NOTICE:

- **Do the test at normal operating fluid temp. 50–80°C (122–176°F)**
- **The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is doing the test.**
- **Be careful to prevent the oil pressure gauge hose from interfering with the exhaust pipe.**

(a) Warm up the transmission fluid.

(b) Remove the test plug on the transmission case left side and connect the oil pressure gauge (SST).
SST 09992–00094 (Oil pressure gauge)
HINT: Connecting the oil pressure gauge will be made easier by moving LH side heat insulator side.



(c) Chock the 4 wheels.

(d) Fully apply the parking brake.

(e) Start the engine and check idling speed.

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

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

(h) Fully depress the accelerator. Quickly read the highest line pressure when engine speed reaches stall speed.
NOTICE: Release the accelerator pedal and stop test if the wheels begin to rotate before the engine speed reaches specified stall speed.

(i) In the same manner, do the test in R position.

SPECIFIED LINE PRESSURE

Line pressure:

Condition	D position kPa (kgf/cm^2 psi)	R position kPa (kgf/cm^2, psi)
Idling	471–530 (4.8–5.4, 68–77)	686–785 (7.0–8.0, 100–114)
Stall	1,334–1,470 (13.6–15.0, 193–213)	1,697–2,030 (17.3–20.7, 246–294)

If the measured pressures are not up to specified values, check the No.5 solenoid valve and retest.

EVALUATION

Problem	Possible cause
If the measured values at all positions are higher.	Throttle cable out of adjustment Throttle valve defective Regulator valve defective
If the measured values at all positions are lower.	Throttle cable out of adjustment Throttle valve defective Regulator valve defective Oil pump defective O/D direct clutch defective
If pressure is low in the D position only.	D position circuit fluid leakage Forward clutch defective
If pressure is low in the R position only.	R position circuit fluid leakage Direct clutch defective First and reverse brake defective

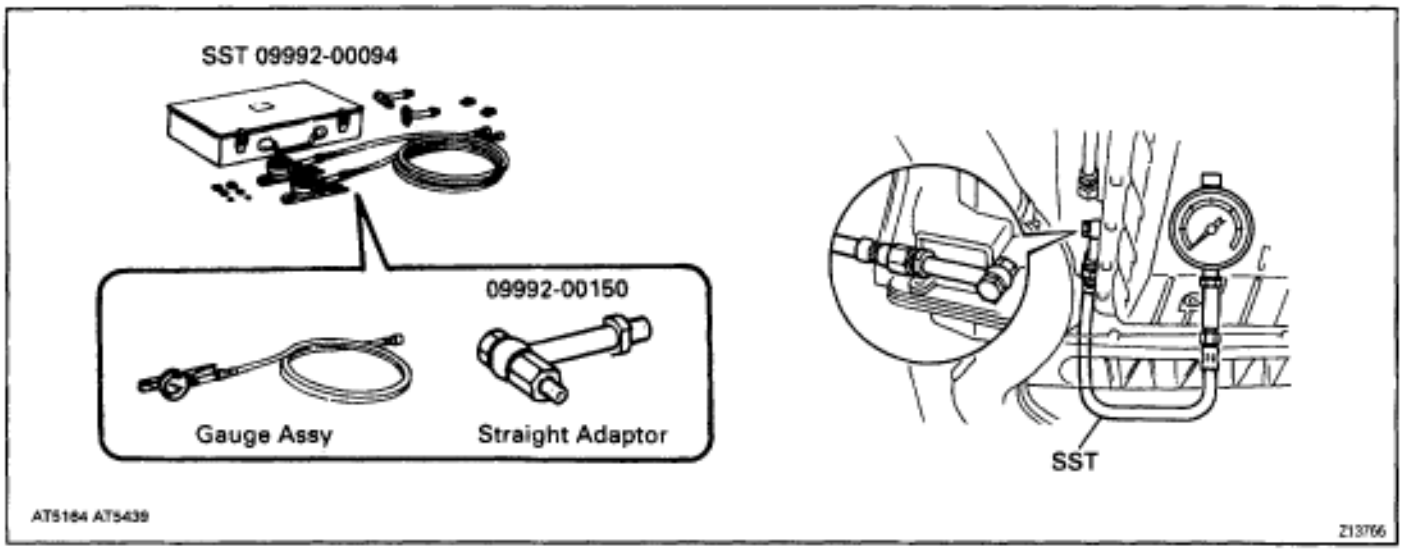
MEASURE ACCUMULATOR BACK PRESSURE

NOTICE:

- **Do the test at normal operating fluid temp. 50–80°C (122–176°F).**
- **Be careful to prevent the oil pressure gauge hose from interfering with the exhaust pipe.**

(a) Warm up the transmission fluid.

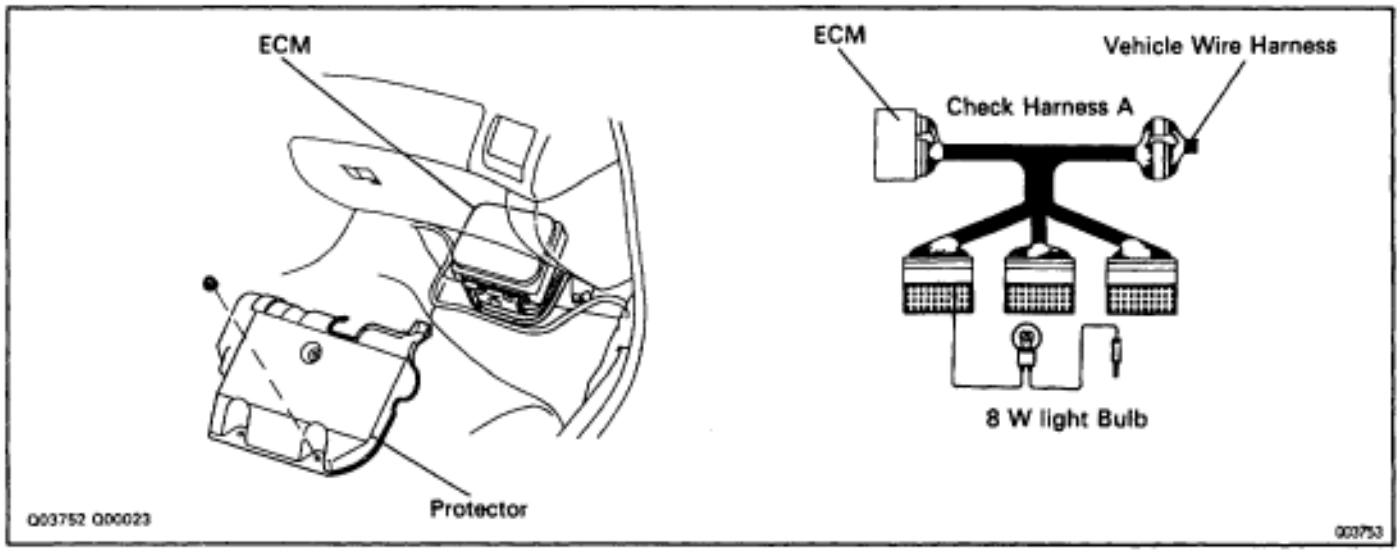
(b) Remove the test plug on the transmission case rear right side and connect the oil pressure gauge (SST)
SST 09992–00094 (Oil pressure gauge)
HINT: Connecting the oil pressure gauge will be made easier by moving the RH side head insulator aside.



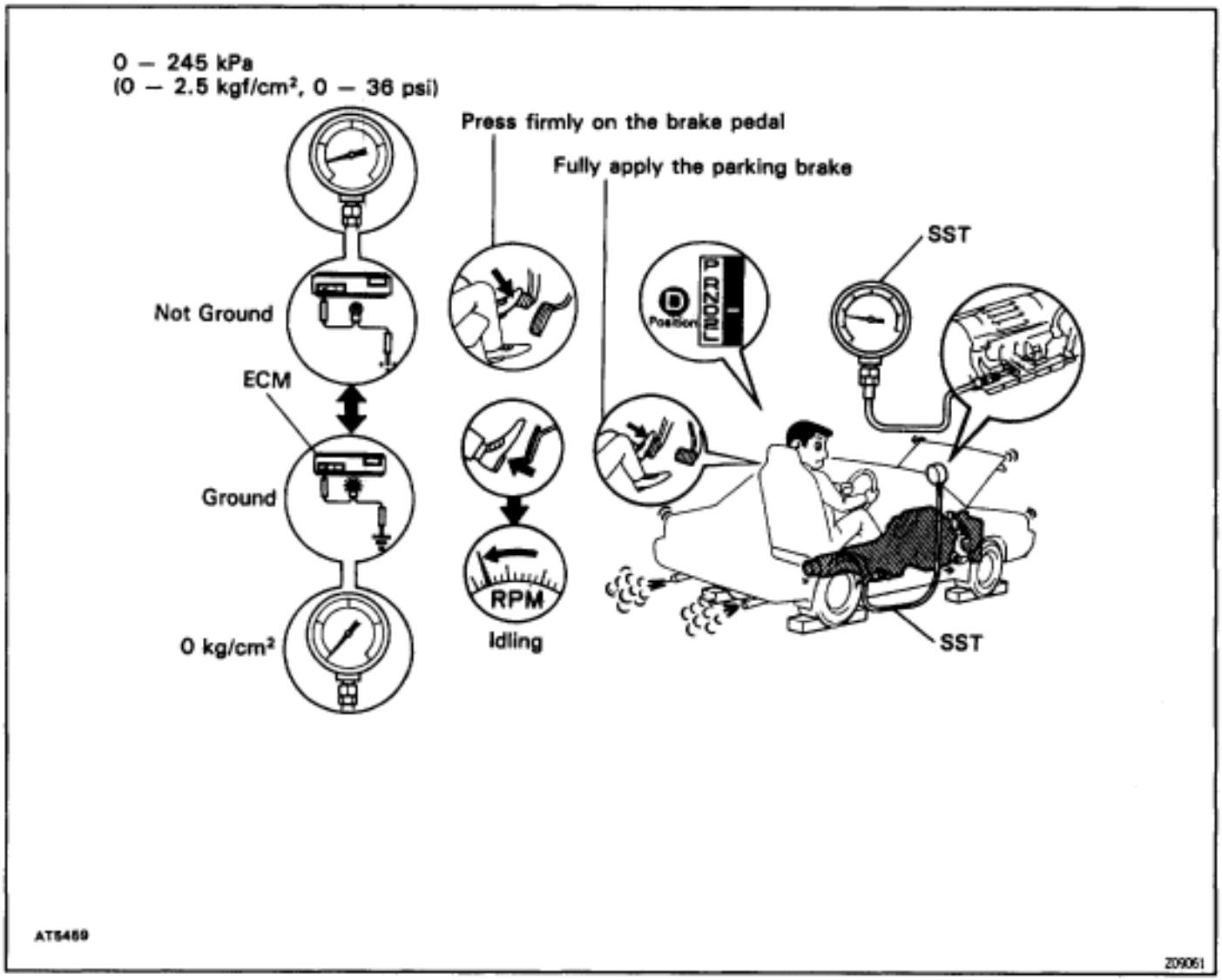
(c) Remove the passenger side floor carpet and ECM protector.

(d) Connect the SST (check harness A) between ECM and connector of vehicle wire harness.
SST: 09990–01000

(e) Install one test lead probe into the terminal SLN of the ECM wire harness side connector and take care not to ground the other test lead probe.
HINT: Prepare test leads which are connected with an approximately 8 W light bulb.



(f) Fully apply the parking brake and chock the 4 wheels.
(g) Start the engine and check idling speed.
(h) Keep your left foot pressed firmly on the brake pedal and shift into D position.
(i) Measure the accumulator back pressure.
(j) With the conditions the same as in (h), ground the other probe or the test lead which has one end inserted into the terminal SLN of the ECM harness side connector, then measure the accumulator back pressure again.

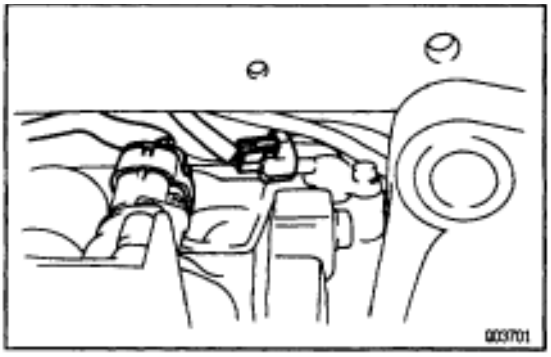


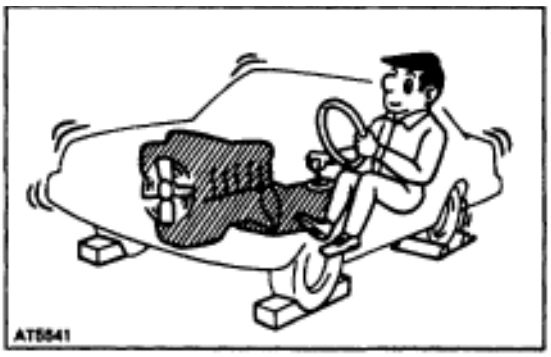
SPECIFIED ACCUMULATOR BACK PRESSURE (D position, Idling)

Condition of ECM terminal SLN	Not ground	Ground
Accumulator back pressure kPa (kgf/cm^2, psi)	177–255 (1.8–2.6, 26–37)	0

EVALUATION

Problem	Possible cause
The accumulator back pressure is not as specified (high or low) when the terminal SLN is not ground.	Throttle cable out of adjustment Throttle valve defective Solenoid modulator valve defective SLN solenoid valve defective Accumulator control valve defective
The accumulator back pressure does not become 0 kgf/cm^2 when the terminal SLN is grounded.	SLN solenoid valve defective





MANUAL SHIFTING TEST

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

1. **DISCONNECT SOLENOID WIRE**
2. **INSPECT MANUAL DRIVING OPERATION**

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

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

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

- While driving, shift through the L, 2 and D positions. Check that the gear change corresponds to the shift position.

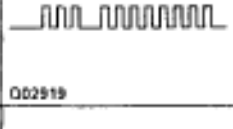
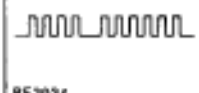
If any abnormality is found in the above test, the problem is in the transmission itself.

3. **CONNECT SOLENOID WIRE**
4. **CANCEL OUT DIAGNOSTIC TROUBLE CODE**

(See page AT2–35**)**

DIAGNOSTIC TROUBLE CODE CHART

If a diagnostic trouble code is displayed during the diagnostic trouble code check, check the circuit listed for that code in the table below and proceed to the page given.

DTC. No.	Blinking Pattern	Circuit	Diagnostic Trouble Code Detection Condition
38		A/T fluid temp. sensor	Either (a) or (b) are detected for 0.5 sec. or more: (a) Temp. sensor resistance less than 79 (b) After the engine has been operating for 15 minutes or more, the resistance at the temp. sensor is more than 156 k .
42		No.1 vehicle speed sensor	All conditions below are detected for 4 secs. or more: (2 trip detection logic)*3 (a) No. No.1 vehicle speed sensor signal in 16 pulses of No.2 vehicle speed sensor signal (b) Vehicle speed: 9 km/h (5.6 mph) or more for or more (c) Park/neutral position switch: OFF (Other than P or N position)
46		No.4 solenoid valve	All conditions below are detected for 1 sec. or more: (2 trip detection logic)*3 (a) ECM output duty signal to No.4 solenoid in 90% or higher duty ratio (b) Current to No.4 solenoid: 330±100 mA or less
61		No.2 vehicle speed sensor	All conditions below are detected: (2 trip detection logic)*3 (a) No. No.2 vehicle speed sensor signal in 4 pulses of No.1 vehicle speed sensor signal (b) Vehicle speed: 9 km/h (5.6 mph) or more for 4 secs. or more (c) Park/neutral position switch: OFF (Other than P or N position)
62		No.1 solenoid valve	(1) Solenoid resistance of 8 or less is detected (*) times or more when NO.1 solenoid is energized. (2) Solenoid resistance of 100 k or more is detected (*) 8 times or more when No.1 solenoid is not energized. (*) If the above failure are detected less than 8 times, the ECM memorizes the malfunction code but the O/D OFF indicator light does not blink.
63		No.2 solenoid valve	(1) Solenoid resistance of 8 or less is detected (*) times or more when NO.2 solenoid is energized. (2) Solenoid resistance of 100 k or more is detected (*) 8 times or more when No.2 solenoid is not energized. (*) If the above failure are detected less than 8 times, the ECM memorizes the malfunction code but the O/D OFF indicator light does not blink.
64		No.3 solenoid circuit	All conditions below are detected for 1 sec. or more: (2 trip detection logic)*3 (a) ECM output duty signal to No.3 solenoid in 90% or higher duty ratio (b) Current to No.3 solenoid: 450±100 mA or less

Trouble Area	O/D OFF Indicator Light *1 Blinks	Memory *2	See Page
Harness or connector between A/T fluid temp. sensor and ECM A/T fluid temp. sensor ECM	★	★	AT2–70
Harness or connector between No.1 vehicle speed sensor and ECM No.1 vehicle speed sensor Telltale light RH ECM	★	★	AT2–72
Harness or connector between No.4 solenoid valve and ECM No.4 solenoid valve ECM	★	★	AT2–75
Harness or connector between No.2 vehicle speed sensor and ECM No.2 vehicle speed sensor ECM	★	★	AT2–79
Harness or connector between No.1 solenoid valve and ECM No.1 solenoid valve ECM	★	★	AT2–82
Harness or connector between No.2 solenoid valve and ECM No.2 solenoid valve ECM	★	★	AT2–82
Harness or connector between No.3 solenoid valve and ECM No.3 solenoid valve ECM	X	★	AT2–85

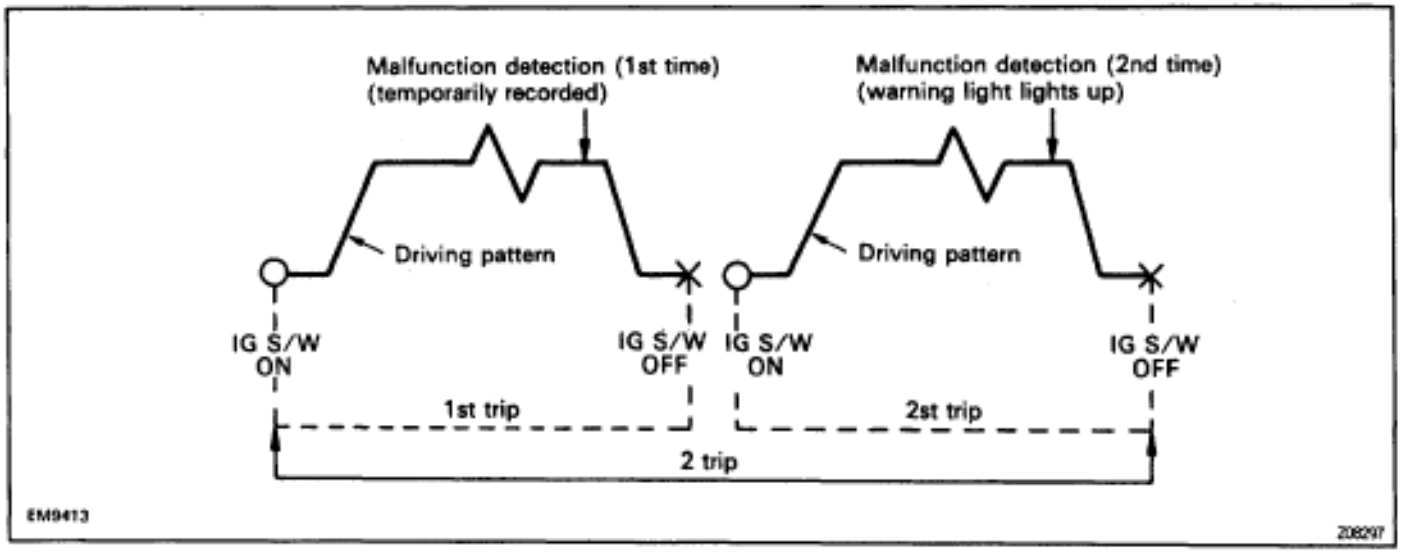
DTC. No.	Blinking Pattern	Circuit	Diagnostic Trouble Code Detection Condition
67	 BE3936	O/D direct clutch speed sensor	All conditions below are detected for 4 secs. or more: (2 trip detection logic)*3 (a) Gear change not being performed. (b) Gear position: 1st, 2nd or 3rd (c) T/M input shaft rpm: Less than 300 rpm (d) T/M output shaft rpm: 1000 rpm or more
77	 BE3937	No.5 solenoid circuit	Any of condition below are detected: (2 trip detection logic)*3 (a) SLT⁻ terminal: 0 V or 5 V for 1 sec. or more.
89	 R05005	TRAC ECU circuit	All conditions below are detected for 5 secs. or more: (a) No.1 vehicle speed sensor: 9 km/h (5.6 mph) or more (b) Mirror check of TRAC ECU input signal is abnormal. (c) TRAC ECU input signal does not inform to ECM. (d) TRAC ECU input signal order is abnormal.

Trouble Area	O/D OFF Indicator Light *1 Blinks	Memory *2	See Page
Harness or connector between O/D direct clutch speed sensor and ECM O/D direct clutch speed sensor ECM	★	★	AT2–89
Harness or connector between No.5 solenoid valve and ECM No.5 solenoid valve ECM	★	★	AT2–92
Harness or connector between TRAC ECU and ECM. TRAC ECU	★	★	AT2–95

*1: ”O” mark means ”O/D OFF” light blinks once every 2 seconds.
”X” mark means ”O/D OFF” light never blinks.

*2: ”O” marks means the ECM memorizes the malfunction code if the ECM detects the diagnostic trouble code detection condition.

*3: This indicates items for which ”2 trip detection logic” is used. With this logic, when a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same case is detected again during the second drive test, this second detection causes the O/D OFF indicator light to blink. The 2 trip repeats the same mode twice. (However, the IG switch must be turned OFF between the 1st trip and 2nd trip.)

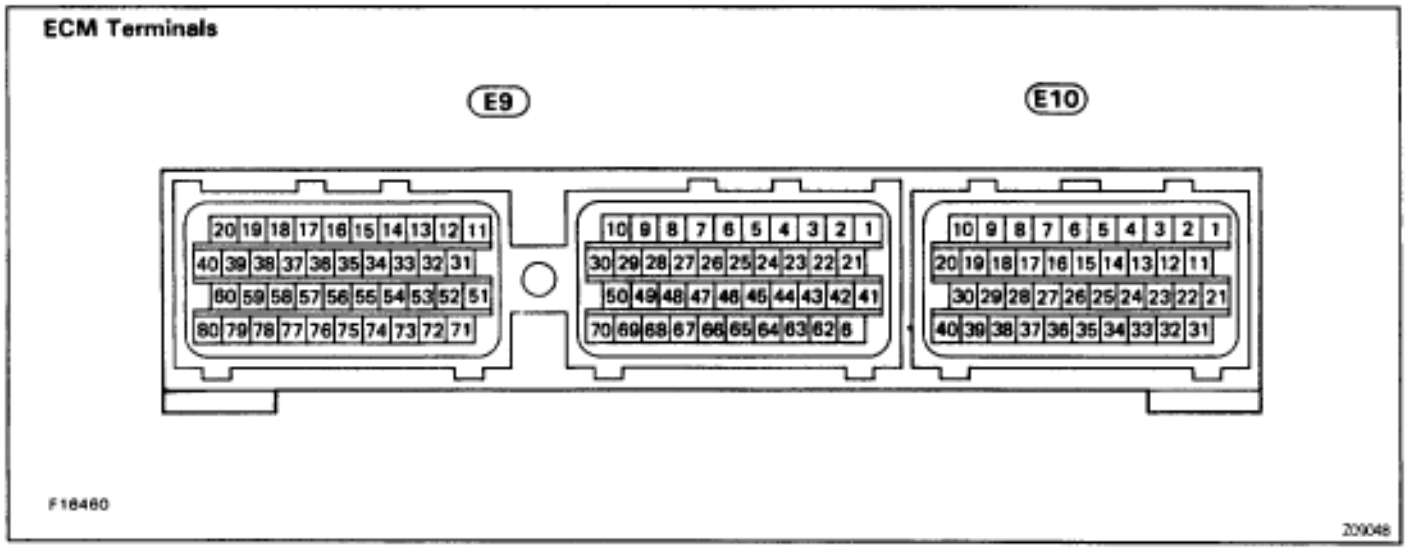


HINT:

- If the malfunction returns to normal while a malfunction warning is being output, the O/D OFF indicator light stops blinking and goes off.
  However, the diagnostic trouble code is retained in memory until it is cleared from memory.
- If the diagnosis system outputs a diagnostic trouble code even though the O/D OFF indicator was not blinking, there is intermittent trouble. Check all the connections in the circuits corresponding to that code.
- Codes 42, 62, 63 and 64 are limited to short or open circuits in the electrical system comprised of the solenoids, wire harnesses, and connectors. The ECM is unable to detect mechanical trouble (sticking, for example) in the solenoid valves.
- If the speed sensors No.1 and No.2 happen to fail simultaneously, the ECM will neither alert the driver by blinking the O/D OFF indicator nor record any diagnostic trouble code. It will, however, decide that the vehicle can be driven only in 1st and none of the other gears, shifting upward will then be prohibited.

Memo

STANDARD VALUE OF ECM TERMINAL



(*A= (E10), B= (E9))

Terminals	Symbols	Wiring Color	Condition		Standard Value
B13 – B69	SLN⊖–E1	Y–G ↔ BR	Ignition switch ON		10 – 14 V
B14 – B69	SLU⊖–E1	LG–B ↔ BR	Ignition switch ON		10 – 14 V
B76 – B69	NSW–E1	B–W ↔ BR	IG ON	Shift Lever: P or N position	Below 1 V
				Shift Lever: Other than P or N position	10 – 14 V
B1 – B21	NCO⊖–NCO⊕	L ↔ Y	IG OFF, Disconnect ECM connector		560 – 680
B3 – B23	SP2⊖–SP2⊕	G ↔ R	IG OFF		560 – 680
B10 – B69	S1 – E1	WR ↔ BR	IG OFF		10 – 16
			Vehicle driving in 2nd gear position		10 – 14 V
			IG ON		10 – 14 V
B9 – B69	S2 – E1	RL ↔ BR	IG OFF		10 – 16
			Vehicle driving in 2nd or 3rd position		10 – 14 V
			IG ON		Below 0.5 V
B43 – B65	VTA1 – E2	Y ↔ BR	IG ON	Accel. Pedal is not depressed	Below 1.5 V
				Accel. Pedal is fully depressed	3.0 – 5.5 V
B64 – B65	IDL1 – E2	R ↔ BR	IG ON	Accel. Pedal is not depressed	Below 1 V
				Accel. Pedal is depressed	10 – 14 V
A2 – B65	SP1 – E2	P ↔ BR	Ignition switch ON turn one rear wheel slowly		Repeat 0–8 V or above
A3 – B69	KD – E1	Y ↔ BR	IG ON	Kickdown SW: OFF (Accel. pedal is not depressed)	10 – 14 V
				Kickdown SW: ON (Accel. pedal is fully depressed)	Below 0.5 V
A7 – B69	R – E1	RB ↔ BR	IG ON	Shift position: R position	10 – 14 V
				Shift position: Other than R position	Below 0.5 V
A9 – B69	2 – E1	LG–R ↔ BR	IG ON	Shift position: 2 position	10 – 14 V
				Shift position: Other than 2 position	Below 0.5 V
A10 – B69	L – E1	G–B ↔ BR	IG ON	Shift position: L position	10 – 14 V
				Shift position: Other than L position	Below 0.5 V
A12 – B69	OD1 – E1	BR–B ↔ BR	Ignition switch ON		4 – 6 V

(*A= (E10), B= (E9))

Terminals	Symbols	Wiring Color	Condition		Standard Value
A14 – B69	TRC⊕ – E1	O ↔ BR	Ignition switch ON		10 – 14 V
A13 – B69	TRC⊖– E1	W–R ↔ BR	Ignition switch ON		10 – 14 V
B12 – B31	SLT⊖–SLT⊕	LG–R ↔ W–G	Ignition switch ON		10 – 14 V
A18 – B69	M – E1	G–Y ↔ BR	IG ON	Pattern select SW: MANU	10 – 14 V
				Pattern select SW: NORM	Below 1 V
A28 – B69	OD2 – E1	V–G ↔ BR	IG ON	O/D main SW: ON	10 – 14 V
				O/D main SW: OFF	Below 0.5 V
A27 – B69	EFI⊕ – E1	B ↔ BR	Ignition switch ON		10 – 14 V
A26 – B69	EFI⊖ – E1	W ↔ BR	Ignition switch ON		10 – 14 V

MATRIX CHART OF PROBLEM SYMPTOMS

If a normal code is displayed during the diagnostic trouble code check but the trouble still occurs, check the circuits for each symptom in the order given in the charts on the following pages and proceed to the page given for troubleshooting.

The Matrix Chart is divided into 3 chapters.

Chapter 1: Electronic Circuit Matrix Chart

Chapter 2: On–vehicle Repair Matrix Chart

Chapter 3: Off–vehicle Repair Matrix Chart

When troubleshooting, check Chapter 1 first. If instructions are given in Chapter 1 to proceed to Chapter 2 or 3, proceed as instructed.

1. If the instruction ”Proceed to next circuit inspection shown on matrix chart” is given in the flow chart for each circuit, proceed to the circuit with the next highest number in the table to continue the check.
2. If the trouble still occurs even though there are no abnormalities in any of the other circuits, then check or replace the ECM.

–Memo–

Chapter 1. Electronic Circuit

Symptom / Suspect Area	See Page	AT2–72	AT2–75	AT2–79	AT2–82	AT2–85	AT2–89	AT2–97
		No.1 Vehicle speed sensor circuit	No.4 solenoid circuit	No.2 Vehicle speed sensor circuit	No.1, No.2 solenoid circuit	No.3 solenoid circuit	O/D direct clutch speed sensor circuit	(Sub)–throttle position sensor circuit
Vehicle does not move in any forward position and reverse position								
Vehicle does not move in particular position or positions								
No up–shift	1st → 2nd	3		4	1			2
	2nd → 3rd	3		4	1			2
	3rd → O/D	3		4	2			5
No down–shift	O/D → 3rd	3		4	1			2
	3rd → 2nd	3		4	1			2
	2nd → 1st	3		4	1			2
No lock–up		3		4		1		2
No lock–up off		3		4		1		2
Shift point too high or too low		3		4				1
Up–shifts to 2nd while in L position Up–shifts to 3rd while in L position								
Up–shifts to O/D from 3rd while O/D switch is OFF								
Up–shifts to O/D from 3rd while engine is cold								
Harsh engagement	N → D		3			1	4	5
	Lock–up	3		4		1		2
	Any driving position	6	3	7		1	4	5
Slip or Shudder	Forward and reverse							
	Any particular position							
No engine braking								
Poor acceleration		4		5	6	7		3
No kick–down		3			4			2
*No pattern select								
Large shift shock or Engine stalls when starting off or stopping.						1		

* The automatic transmission in not shifted into the manual mode when the automatic transmission fluid temperature is too high.

Park/neutral position switch AT2–101	Kick–down switch circuit AT2–99	Stop light switch circuit AT2–103	Pattern select switch circuit AT2–105	O/D switch O/D OFF indicator light circuit AT2–108	O/D cancel signal circuit AT2–111	Engine coolant temp. sensor circuit EG–312	ECM AT2–60	On–Vehicle repair matrix chart AT2–66	OFF–Vehicle repair matrix chart AT2–68	No.5 solenoid circuit AT2–92	TRAC ECU BR–128	A/T fluid temp. sensor circuit AT2–70
								2	3	1		
								1	2			
6							8	5	7			
6							8	5	7			
6				1	7	8	11	9	10			
							6	5	-			
							6	5	-			
							7	5	6			
7	6	5				8	11	9	10			
		5					8	6	7			
			2				6	-	-		5	
1							2	-	-			
				1			2	-	-			
						1	4	2	3			
6							10	7	8		9	2
							7	5	6			
							11	8	9		10	2
								1	2			
								1	2			
								2	3	1		
	2						10	-	8	1	9	
	1						6	5	-			
			1				2	-	-			
		2					5	-	3		4	

Chapter 2. On–Vehicle Repair

(★ : A340E, A340F, A340H AUTOMATIC TRANSMISSION Repair Manual Pub. No.RM391U)

See Page / Suspect Area / Symptom		AT2–43	★	★	★	★	★	★
		Transmission control rod	Oil strainer	Parking lock pawl	Manual valve	Reverse control valve	1–2 shift valve	2–3 shift valve
Vehicle does not move in any forward position and reverse		1		3	2			
Vehicle does not move in R position						1		
Vehicle does not move in any particular position or positions (except R position)								
No up–shift	1st → 2nd						1	
	2nd → 3rd							1
	3rd → O/D							
No down–shift	O/D → 3rd							
	3rd → 2nd							1
	2nd → 1st						1	
No lock–up or No lock–up off								
Harsh engagement	N → D							
	Lock–up							
	N → R							
	N → L							
	1st → 2nd (D position)							
	1st → 2nd (2 position)							
	1st → 2nd → 3rd → O/D							
	2nd → 3rd							
	3rd → O/D							
	O/D → 3rd							
Slip or Shudder	Forward and Reverse	1	2					
	Particular position	1						
No engine braking	1st							
	2nd							
No kick–down							1	2

*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
3–4 shift valve	Lock–up control valve	Lock–up relay valve	Accumulator control valve	Solenoid modulator valve	C_1 accumulator	Orifice control valve	Solenoid relay valve	C_2 accumulator	Low coast modulator valve	B_2 accumulator	2nd coast modulator valve	B_0 accumulator	C_0 accumulator	Pressure relief valve	OFF–Vehicle repair matrix chart
															4
															2
															1
															2
															2
1															2
1															
															2
	1	2													3
			1	2	3	4									5
	1	2					3								4
			1	3				2							4
									1						
			1	2						3					
			1	2							3				
			1	2											
			1	2				3							4
			1	2								3			4
			1	2									3		4
														3	4
															2
									1						2
											1				2

Chapter 3. Off–Vehicle Repair

(★ : A340E, A340F, A340H AUTOMATIC TRANSMISSION Repair Manual Pub. No.RM391U)

Symptom \ Suspect Area	See Page	★ O/D one–way clutch (F_O)	★ O/D brake (B_O)	★ O/D direct clutch (C_O)	★ O/D planetry gear unit	★ Torque converter clutch	★ 1st and reverse brake (B_3)
Vehicle does not move in any forward position and reverse position		1	2	3	4	5	
Vehicle does not move in R position				5			4
Vehicle does not move in:	D, 2 and L position						
	D and 2 positions						
	2 position						1
	L position						
No up–shift	1st → 2nd						
	2nd → 3rd						
	3rd → O/D		1				
No down–shift	2nd → 1st						
No lock–up or No lock–up off						1	
Harsh engagement	N → D						
	N → R						2
	2nd → 3rd						
	3rd → O/D		2	1	3		
	O/D → 3rd		1				
	Lock–up					1	
Slip or Shudder	Forward & Reverse (After warm–up)_	2		3		1	
	Forward & Reverse (Just after engine starts)					1	
	R position						2
	R position						
	2nd						
	3rd						
	O/D		1				
No engine braking	1st ~ 3rd			1			
	1st						1
	2nd						
Poor acceleration	All positions					1	
	O/D			1	2		
	Other than O/D		1				
	Other than 2nd						
	1st an 2nd						
	1st and R position						1
	R position						
Engine stalls when starting off or stopping						1	

*	*	*	*	*	*	*
2nd coast brake (B_1)	Direct clutch (C_2)	Front and rear planetary gear unit	Forward clutch (C_1)	No.2 one–way clutch (F_2)	2nd brake (B_2)	No.1 one–way clutch (F_1)
1	3	2				
			1			
				1		
2	3				1	
					1	2
	1					
1					2	
			1			
	1					
1						
	1					
			1	2		
2					1	3
	1					
1						
1					2	
	1					
			1			

CIRCUIT INSPECTION

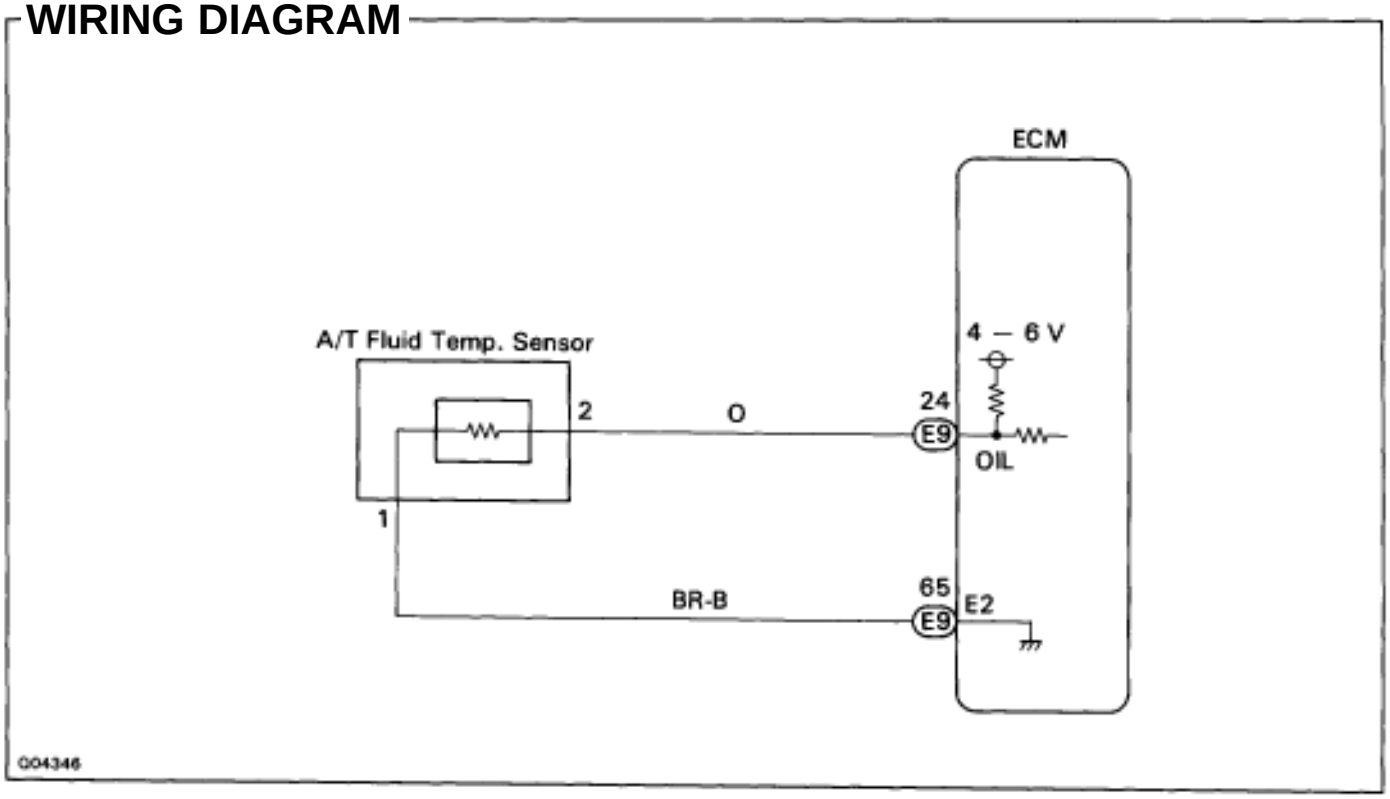
DTC 38 A T Fluid Temperature Sensor Circuit

— CIRCUIT DESCRIPTION

The fluid temp. sensor converts fluid temp. into resistance values which is input into the ECM.

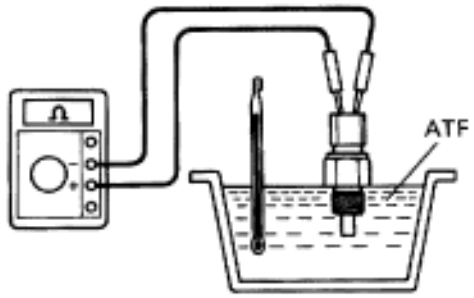
DTC No.	Diagnostic Trouble Code Detection Condition	Trouble Area
38	Either (a) or (b) are detected for 0.5 sec. or more. (a) Temp. sensor resistance less 79 (b) After the engine has been operating for 15 minutes or more, the resistance at the temp. sensor is more than 156 k	Harness or connector between A/T fluid temp. sensor and ECM A/T fluid temp. sensor ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check A/T fluid temp. sensor.**



20˚C (68˚F) and 110˚C (230˚F).

Check sensor resistance

P Remove A/T fluid temp. sensor.

C Measure resistance between terminals of A/T fluid temp. sensor at 20˚C (68˚F) and 110˚C (230˚F).

OK **Resistance:**

20˚C (68˚F): Approx. 12.08 k.

110˚C (230˚F): Approx. 0.78 k.

OK

NG **Replace A/T fluid temp. sensor.**

2 **Check harness and connector between A/T fluid temp. sensor and ECM (See page IN–30).**

OK

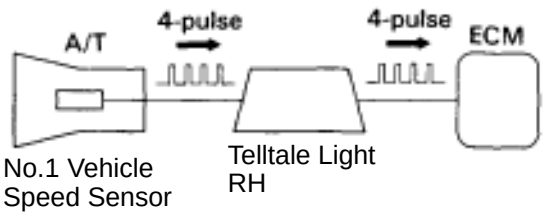
NG **Repair or replace harness or connector.**

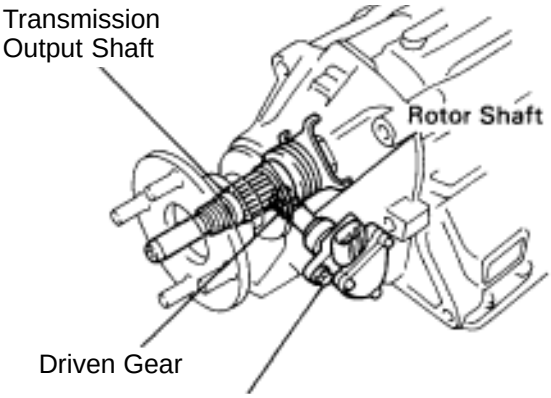
Check and replace ECM.

DTC 42 No.1 Vehicle Speed Sensor Signal Circuit

CIRCUIT DESCRIPTION

The No. 1 vehicle speed sensor outputs a 4–pulse signal for every revolution of the rotor shaft, which is rotated by the transmission output shaft via the driven gear. After this signal is converted into a more precise rectangular waveform by the waveform shaping circuit inside the combination meter, it is then transmitted to the engine control module. The ECM determines the vehicle speed based on the frequency of these pulse signals.





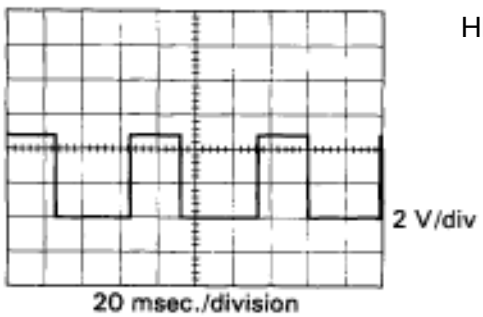
FI6643 Q04361

DTC No.	Diagnostic Trouble Code Detection Condition	Trouble Area
42	All conditions below are detected for 4 secs. or more. (2 trips detection logic)* (a) No No.1 vehicle speed sensor signal in 16 pulses of No.2 vehicle speed sensor signal. (b) Vehicle speed: 9 km/h (5.6 mph) or more (c) Park/neutral position switch: OFF (Other than P or N position)	No. 1 vehicle Speed sensor Telltale light RH Harness or connector between No. 1 vehicle speed sensor and ECM ECM

* See page AT2–58

HINT: In test mode, diagnostic trouble code 42 is output when vehicle speed is 5 km/h (3 mph) or below.

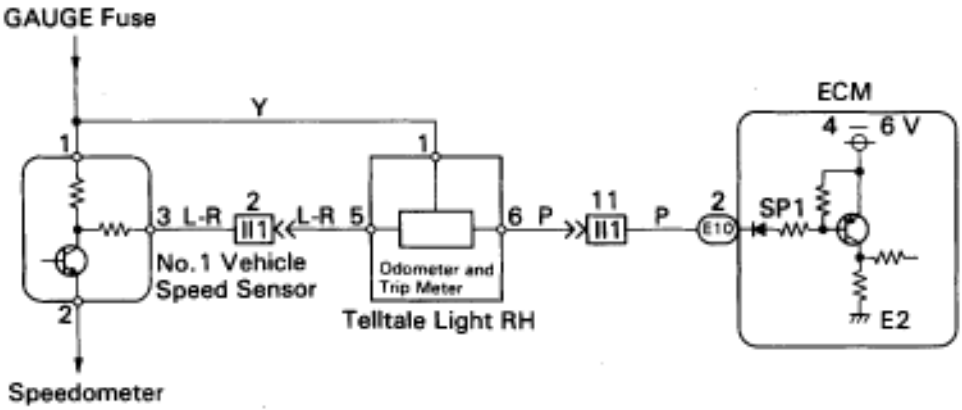
<Reference>
Waveform between terminals SP1 and E2 when vehicle speed is approx. 20 km/h (12 mph).



V01496

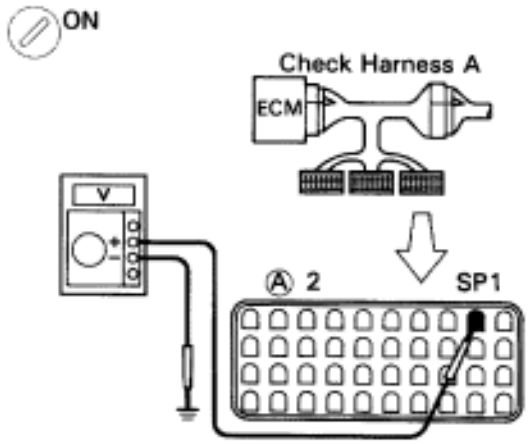
HINT: As the vehicle's speed increases, the signal output from SP1 increases.

WIRING DIAGRAM



INSPECTION PROCEDURE

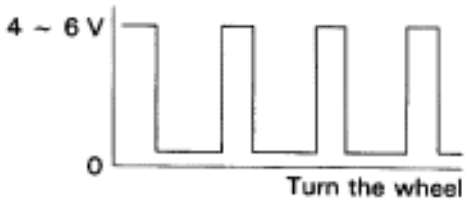
1 **Check voltage between terminal SP1 of ECM connector and body ground.**



P
1. Shift the shift lever to N position
2. Jack up one of the rear wheels.
3. Connect the Check Harness A. See page EG–510)
(1) Disconnect power steering ECU connector and cruise control ECU connector.
(5) Turn ignition switch ON.

C Measure voltage between terminal SP1 of ECM connector and body ground when the wheel is turned slowly.

OK **Voltage is generated intermittently.**



NG

OK → **Check and replace ECM.**

2 **Check operation of odometer and trip meter (telltale light RH (See page BE–48)).**

NG

OK → **Repair or replace harness or connector between ECM and telltale light RH.**

Go to 3 .

3 **Check operation of No.1 vehicle speed sensor (see page BE–46).**

NG

Replace No.1 vehicle speed sensor.

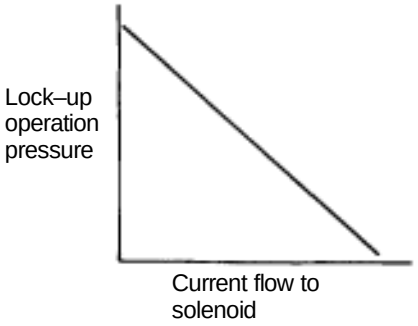
OK

Repair or replace harness or connector between telltale light RH and No.1 vehicle speed sensor.

DTC 46 No.4 Solenoid Valve Circuit (For Accumulator Back Pressure Modulation)

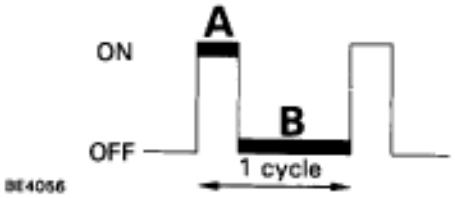
CIRCUIT DESCRIPTION

The No.4 solenoid valve controls the hydraulic pressure acting on the brakes and clutches of the planetary gear units when gears are shifted and performs smooth gear shifting.
The ECM determines optimum operating pressure according to the signals from the throttle position sensor, vehicle speed sensor and O/D clutch speed sensor and controls the volume of current flow to the solenoid valve.
The amount of electric current to the solenoid is controlled by the (*) duty ratio of ECM output signals, causing momentary change to the hydraulic pressure acting on the clutches during gear shifting. When the duty ratio is high, the hydraulic pressure acting on the clutches is now.



(*) Duty Ratio
The duty ratio is the ratio of the period of continuity in one cycle.
For example, if A is the period of continuity in one cycle, and B is the period of non–continuity, then

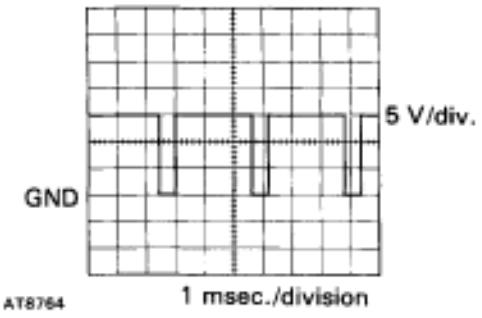
$$\text{Duty Ratio} = \frac{A}{A + B} \times 100\ (\%)$$



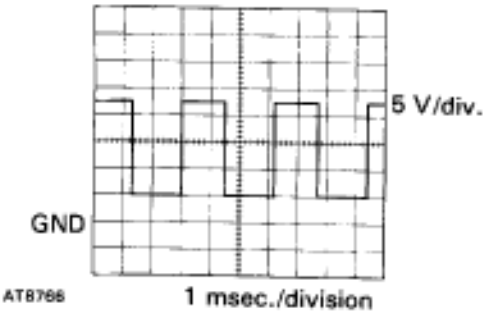
DTC No.	Diagnostic Trouble Code Detection Condition	Trouble Area
46	All conditions below are detected for 1 sec. or more. (2 trips detection logic)* (a) ECM outputs duty signal to No.4 solenoid in 90% or higher duty ratio. (b) Current to No.4 solenoid: 330 ± 100 mA or less (O/D OFF indicator light doesn't blink)	No. 4 solenoid valve Harness or connector between No.4 solenoid valve and ECM ECM

* See page AT2–58

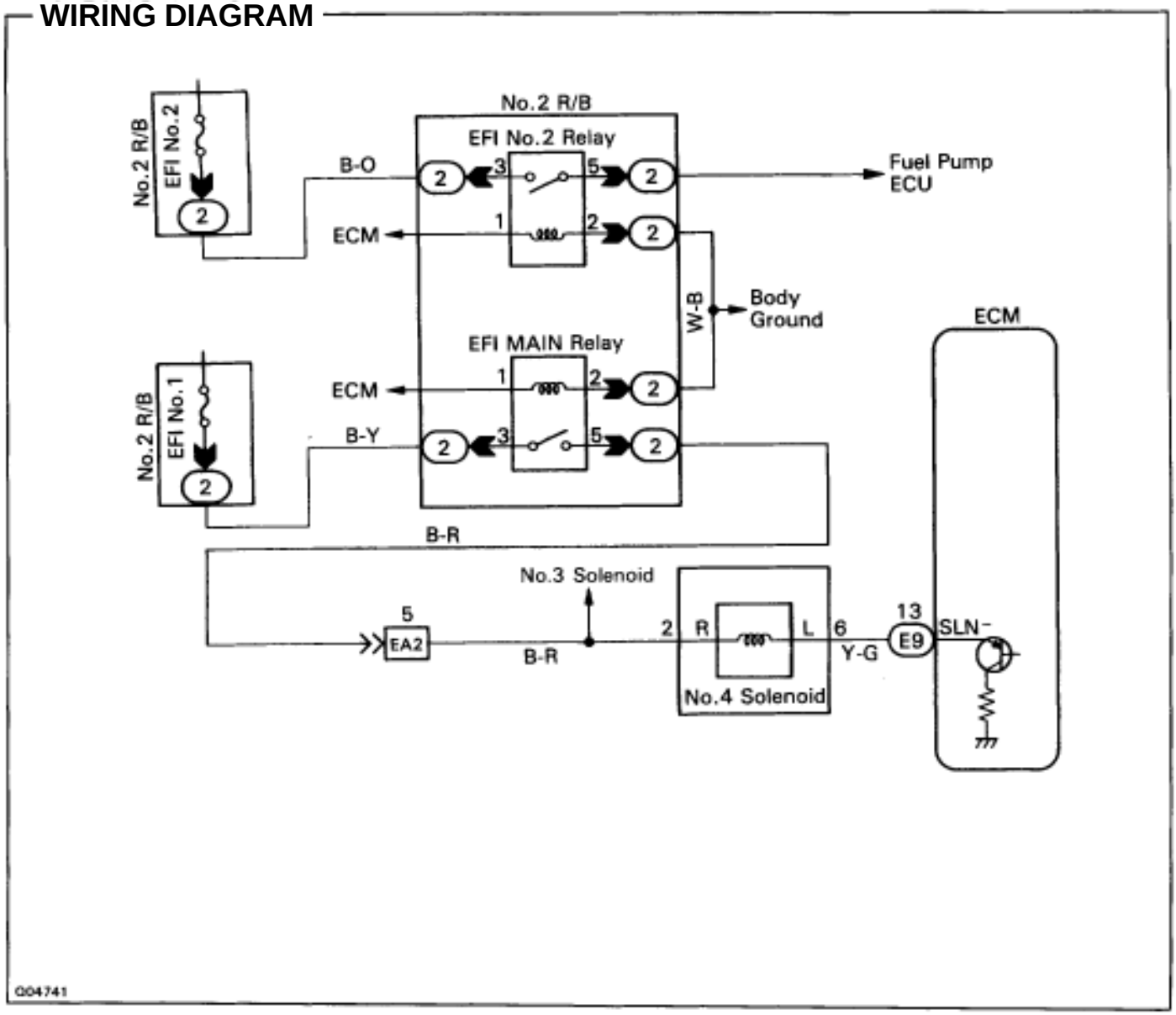
<Reference>
Waveform between terminals SLN and E1 when engine is idling.



Waveform between terminals SLN and E1 during shift change.

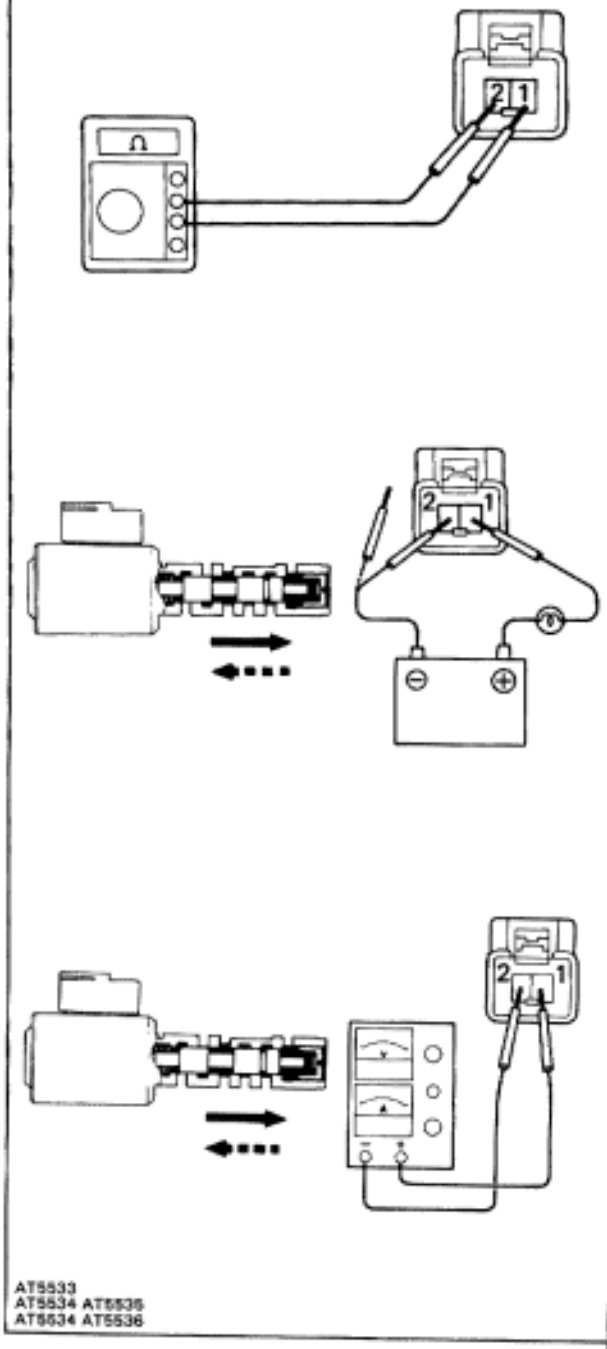


WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check No.4 solenoid valve.



AT5533
AT5534 AT5535
AT5534 AT5536

Check solenoid resistance

P
1. Jack up the vehicle.
2. Remove oil pan.
3. Disconnect the connector

C Measure resistance between terminal 1 and 2 of solenoid connector.

OK **Resistance: 5.1 — 5.5 .**

Check solenoid operation

C Connect positive ⊕ lead with an 8 — 10 W bulb to terminal 1 of solenoid connector and negative ⊖ lead to terminal 2, then check the movement of the valve.

OK

When battery positive voltage is applied.	Valve moves in ➡ direction in illustration at left.
When battery positive voltage is cut off.	Valve moves in ⬅ direction in illustration at left.

<Reference>

Check solenoid's operation

C
1. Prepare a variable power supply.
2. Connect positive ⊕ lead of the variable power supply to terminal 1 of solenoid connector and negative ⊖ lead to terminal 2.
3. Check the movement of the valve when the voltage is gradually increased. (A current greater than 1A should not be supplied.)

OK **As the voltage is increased, the valve should move slowly in the ➡ direction.**

C 4. Check the movement of the valve when the volt age is cut off.

OK **The valve should return in the ⬅ direction.**

OK

NG **Replace No.4 solenoid valve.**

Go to step [2].

2 **Check harness and connector between battery and No.4 solenoid valve, No.4 solenoid valve and ECM (See page IN–30).**

OK

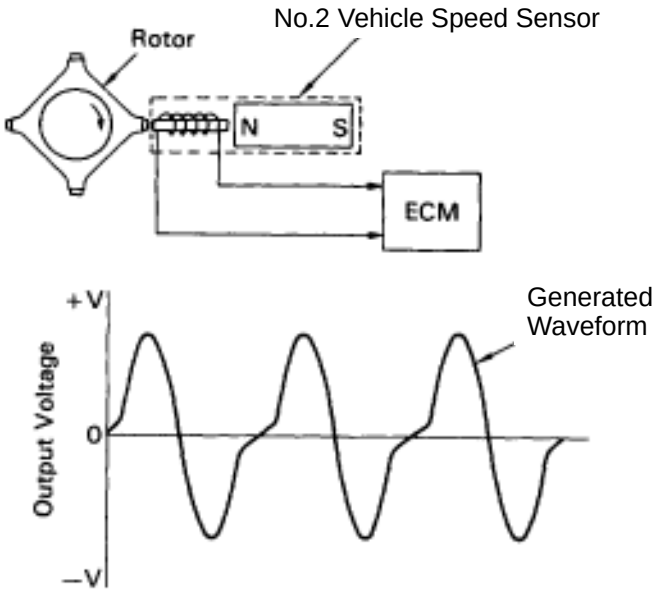
NG → **Repair or replace harness or connector.**

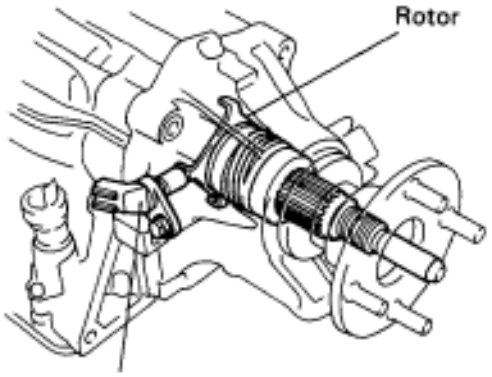
Proceed to next circuit inspection shown on matrix chart (See page AT2–64). However, when diagnostic trouble code 46 is displayed, check and replace ECM.

DTC 61 No.2 Vehicle Speed Sensor Circuit

CIRCUIT DESCRIPTION

The No. 2 vehicle speed sensor detects the rotation speed of the transmission output shaft and sends signals to the ECM. The ECM determines the vehicle speed based on these signals. An AC voltage is generated in the No.2 vehicle speed sensor coil as the rotor mounted on the output shaft rotates, and this voltage is sent to the ECM.
The gear shift point and lock–up timing are controlled by the ECM based on the signals from this vehicle speed sensor and the throttle position sensor signal.
If the No.2 vehicle speed sensor malfunctions, the ECM uses input signals from the No.1 vehicle speed sensor as a back–up signal.

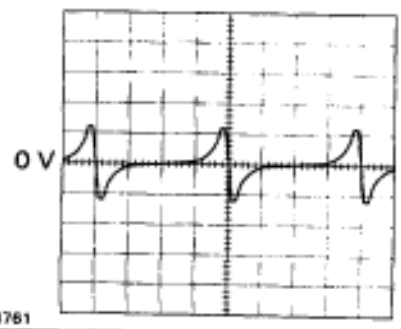




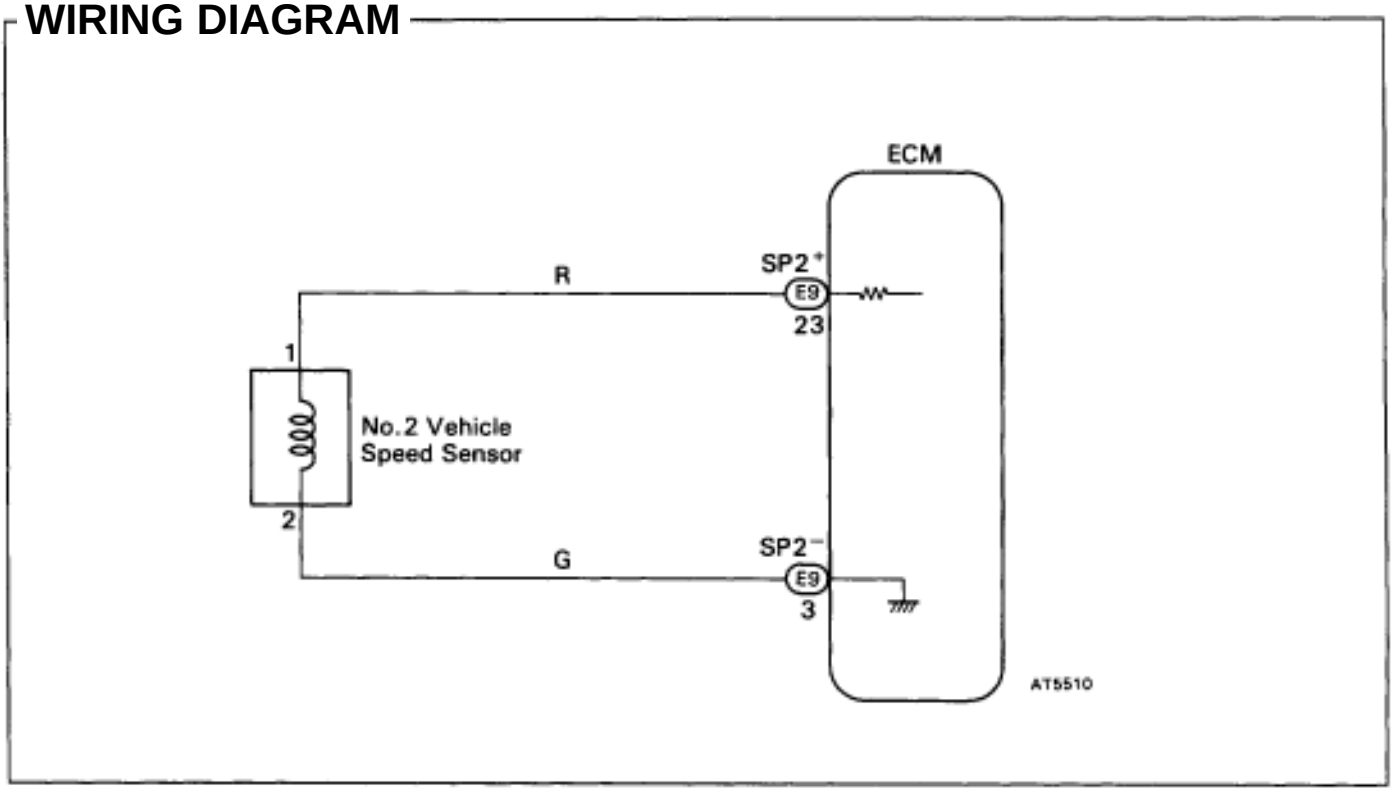
AT5605
AT5606 G04362

DTC No.	Diagnostic Trouble Detection Condition	Trouble Area
61	All conditions below are detected. (2 trips detection logic)* (a) No No.2 vehicle speed sensor signal in 4 pulses of No. 1 vehicle speed sensor signal. (b) Vehicle speed: 9 km/h (5.6 mph) or more for 4 secs. or more. (c) Park/neutral position switch: OFF (Other than P or N position)	No. 2 vehicle speed sensor Harness or connector between No.2 vehicle speed sensor and ECM ECM

*: See page AT2–58
<Reference>
Waveform between terminals $SP2^+$ and $SP2^-$ when vehicle speed is approx. 60 km/h (37 mph).

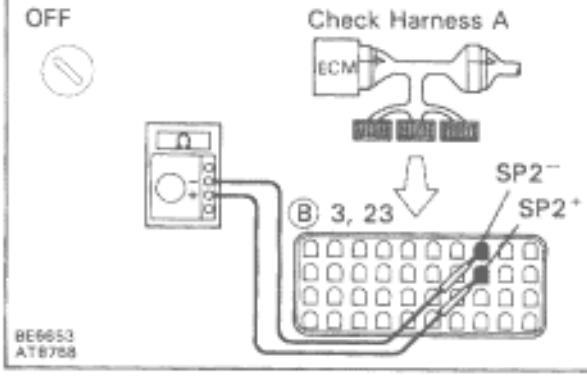


WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check resistance between terminals SP2+ and SP2− of ECM connector.**



P Connect the Check Harness A to the ECM. (See page EG–510).

C Check resistance between terminals SP2+ and SP2− of ECM.

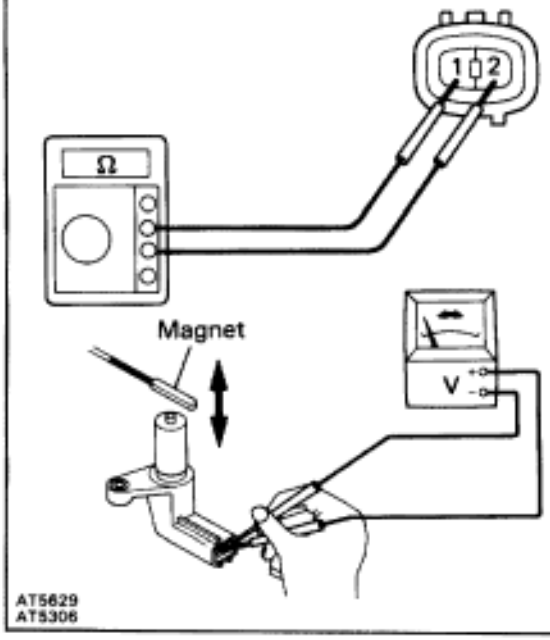
OK **Resistance: 560 — 680 .**

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page AT2–64).**

Go to step [2].

2 Check No.2 vehicle speed sensor.



P Remove No.2 vehicle speed sensor from transmission (See page AT2–16).

C Measure resistance between terminals 1 and 2 of No.2 vehicle speed sensor.

OK **Resistance: 560 — 680 .**

<Reference>

Check the speed sensor's function

C Check voltage between terminals 1 and 2 of the speed sensor when a magnet is put close to the front end of the speed sensor then taken away quickly.

OK **Voltage is generated intermittently.**

Hint The voltage generated is extremely low.

NG **Replace No.2 vehicle speed sensor.**

OK

Check and repair harness and connector between ECM and No.2 vehicle speed sensor (See page IN–30).

DTC 62 63 No.1 No.2 Solenoid Valve Circuit

— CIRCUIT DESCRIPTION

Shifting from 1st to O/D is done in combination with ON and OFF of the No.1 and No.2 solenoid valves controlled by ECM. If an open or short circuit occurs in either of the solenoid valves, the ECM controls the remaining normal solenoid to allow the vehicle to be operated smoothly (Fail safe function).

Fail Safe Function

If either of the solenoid valve circuits develops a short or an open, the ECM turns the other solenoid ON and OFF to shift the gear positions shown in the table below. If both solenoids malfunction, the hydraulic control is not made electronically and can only be operated manually.

Manual shifting, as shown in the following table must be done (In the case of a short circuit, the ECM stops sending current to the short circuited solenoid).

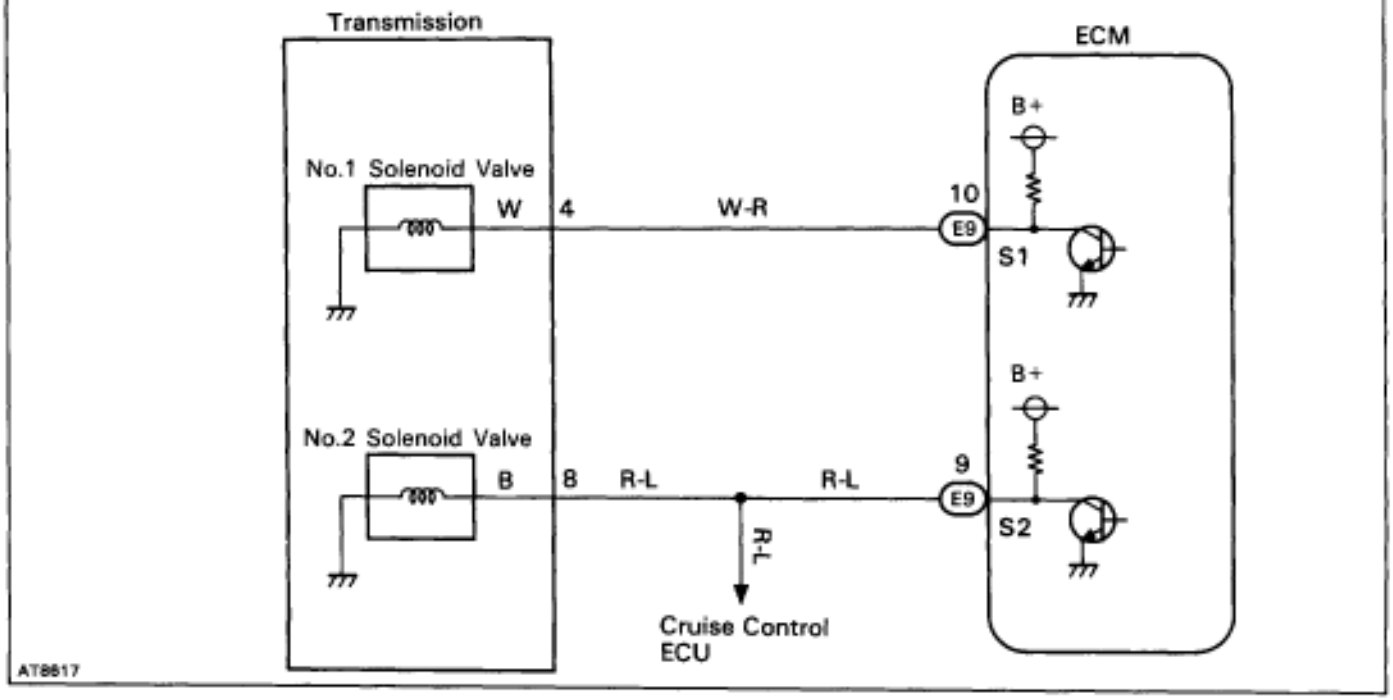
Position	NORMAL			NO 1 SOLENOID MALFUNCTIONING			NO 2 SOLENOID MALFUNCTIONING			BOTH SOLENOIDS MALFUNCTIONING
	Solenoid valve		Gear	Solenoid valve		Gear	Solenoid valve		Gear	Gear when shift selector is manually operated
	No.1	No.2		No.1	No.2		No.1	No.2		
D	ON	OFF	1st	X	ON	3rd	ON	X	1st	O/D
	ON	ON	2nd	X	ON	3rd	OFF	X	O/D	O/D
	OFF	ON	3rd	X	ON	3rd	OFF	X	O/D	O/D
	OFF	OFF	O/D	X	OFF	O/D	OFF	X	O/D	O/D
2 (S)	ON	OFF	1st	X	ON	3rd	ON	X	1st	3rd
	ON	ON	2nd	X	ON	3rd	OFF	X	3rd	3rd
	OFF	ON	3rd	X	ON	3rd	OFF	X	3rd	3rd
L	ON	OFF	1st	X	OFF	1st	ON	X	1st	1st
	ON	ON	2nd	X	ON	2nd	ON	X	1st	1st

X: Malfunctions

Check the No.1 solenoid when diagnostic trouble code 62 is output and check the No.2 solenoid when diagnostic trouble code 63 is output.

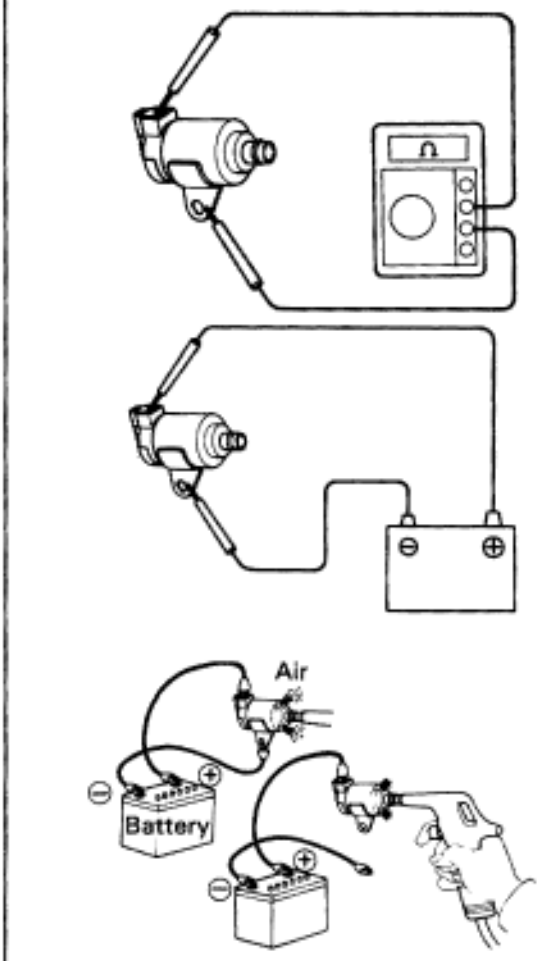
DTC No.	Diagnostic Trouble Code Detection Condition	Trouble Area
62, 63	(a) Solenoid resistance is 8 or lower (short circuit) when solenoid is energized. (b) Solenoid resistance is 100 k or higher (open circuit) when solenoid is not energized. The ECM checks for an open or short circuit in the No.1 and No.2 solenoid circuit when it changes gear position. The ECM records DTC 62 or 63 if condition (a) or (b) is detected once, but it does not blink the O/D OFF indicator light. After the ECM detects the condition (a) or (b) continuously 8 times or more, it causes the O/D OFF indicator light to blink until condition (a) or (b) disappears. After that, if the ECM detects condition (a) or (b) one, it starts blinking the O/D OFF indicator light again.	Solenoid valve Harness or connector between sole–noid and ECM ECM

WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check No.1 No.2 solenoid valves.



AT5530
AT5531
AT5628

Electrical Check

P
1. Jack up the vehicle.
2. Remove the oil pan.
3. Disconnect the solenoid connector.

C Measure resistance between the solenoid connector and solenoid body.

OK **Resistance: 10 — 16 .**

C Connect positive × lead to terminal of solenoid connector, negative ⊕ lead to solenoid body.

OK **The solenoid makes an operating noise.**

Mechanical Check

P
1. Remove the oil pan.
2. Remove the No.1 and No.2 solenoid valves.

C
1. Applying 490 kPa (5 kgf/cm^2, 71 psi) of compressed air, check that the solenoid valves do not leak air.
2. When battery positive voltage is supplied to the solenoid valves, check that the solenoid valves open.

OK

NG **Replace solenoid valve.**

2 Check harness and connector between ECM and solenoid (See page IN–30).

OK

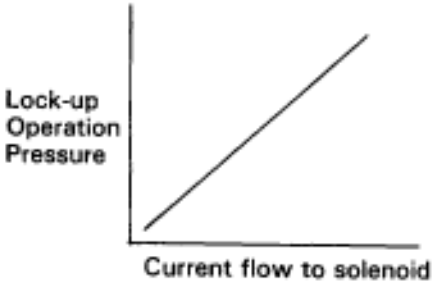
NG **Repair or replace harness or connector.**

Proceed to next circuit inspection shown on matrix chart (See page AT2–64). However, when diagnostic trouble code 62 or 63 is displayed, check and replace ECM.

DTC 64 No. 3 Solenoid Valve Circuit (For Lock–up Control Pressure Modulation)

CIRCUIT DESCRIPTION

The No.3 solenoid valve is provided for lock–up operations. The lock–up operation pressure is controlled by the linear solenoid for smooth engagement.
The amount of current flow to the solenoid is controlled by the duty ratio (See page AT2–75) of ECM output signal. The higher the duty ratio becomes, the higher the lock–up hydraulic pressure becomes during the lock–up operation. If the malfunction occurs in this circuit and diagnostic trouble code 64 is stored in memory, but the O/D OFF indicator light does not blink.

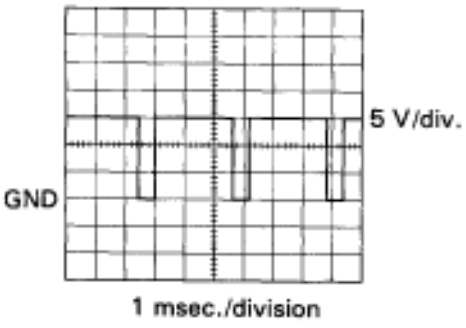


DTC No.	Diagnostic Code Detection Condition	Trouble Area
64	All conditions below are detected for 1 sec. or more. (2 trips detection logic)* (a) ECM outputs duty signal to No.3 solenoid in 90% or higher duty ratio. (b) Current to No.3 solenoid: 450 ± 100 mA or less.	No.3 solenoid valve Harness or connector between No.3 solenoid valve and ECM ECM

*: See page AT2–58

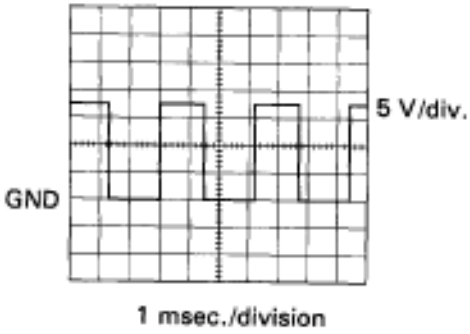
<Reference>

Waveform between terminals SLN– and E1 when engine is idling.



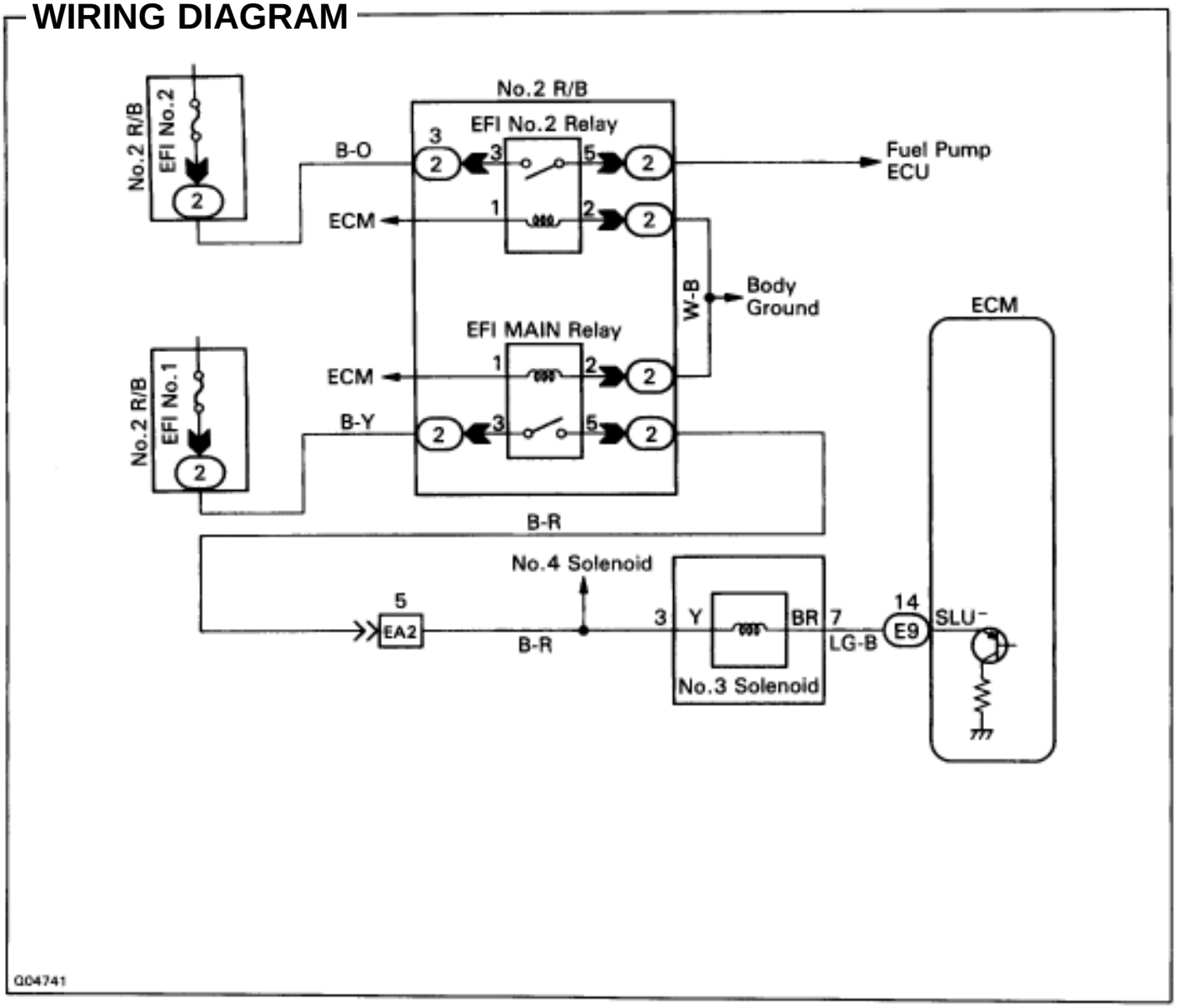
AT8764

Waveform between terminals SLN– and E1 during shift change.



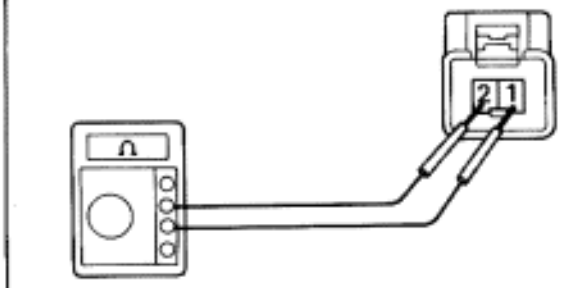
AT8765

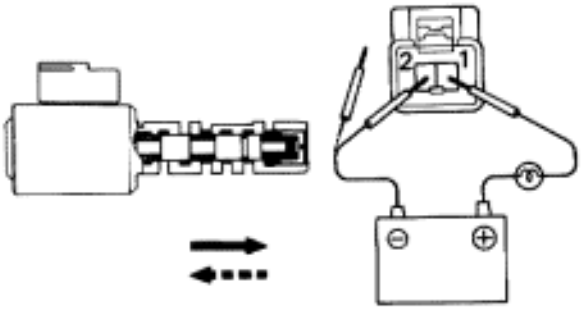
WIRING DIAGRAM

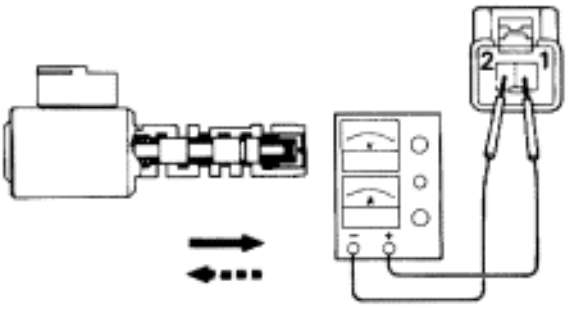


INSPECTION PROCEDURE

1 Check No.3 solenoid valve.







AT5533
AT5534 AT5535
AT5534 AT5536

Check solenoid resistance

P
1. Jack up the vehicle.
2. Remove the oil pan.
3. Disconnect the solenoid connector

C Measure resistance between terminal 1 and 2 of the solenoid connector.

OK **Resistance: 3.5 — 3.9 .**

Check solenoid operation

C Connect positive × lead with an 8 — 10 W bulb to terminal 1 of solenoid connector and negative ⊕ lead to terminal 2, then check the movement of the valve.

OK

When battery positive voltage is applied.	Valve moves in ➡ direction in illustration at left.
When battery positive voltage is cut off.	Valve moves in ⬅ direction in illustration at left.

<Reference>

Check solenoid's operation

C
1. Prepare a variable power supply.
2. Connect positive × lead of the variable power supply to terminal 1 of solenoid connector and negative ⊕ lead to terminal 2.
3. Check the movement of the valve when the voltage is gradually increased. (A current greater than 1A should not be supplied.)

OK **As the voltage is increased, the valve should move slowly in the ➡ direction.**

C 4. Check the movement of the valve when the voltage is cut off.

OK **The valve should return in the ⬅ direction.**

OK

Go to step 2.

NG **Replace No.3 solenoid valve.**

2 **Check harness and connector between battery and No.3 solenoid valve, No.3 solenoid valve and ECM (See page IN–30).**

OK

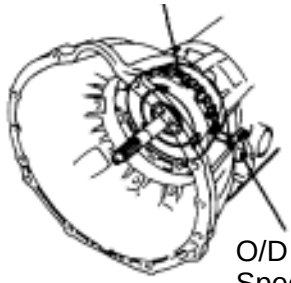
NG **Repair or replace harness or connector.**

Proceed to next circuit inspection shown on matrix chart (See page AT2–64). However, when diagnostic trouble code 64 is displayed, check and replace ECM.

DTC 67 O D Direct Clutch Speed Sensor Circuit

CIRCUIT DESCRIPTION

O/D Direct Clutch Drum



AT5609

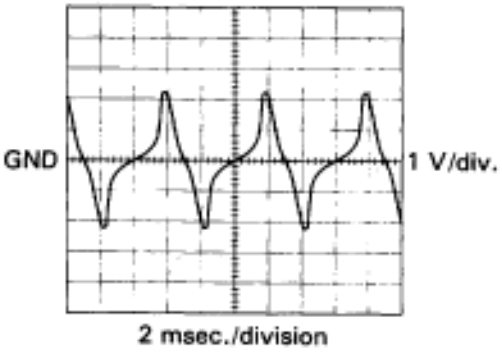
This sensor detects the rotation speed of the O/D input shaft from the rotation of the O/D direct clutch drum.
Its construction is the same as that of the No.2 vehicle speed sensor (See page AT2–79).
By comparing the O/D direct clutch speed signal and the No.2 vehicle speed sensor signal, the ECM detects the shift timing of the gears and appropriately controls the engine torque and hydraulic pressure in response to various conditions, thus performing smooth gear shift.

DTC No.	Diagnostic Trouble Code Detection Condition	Trouble Area
67	All conditions below are detected for 4 secs. or more. (2 trips detection logic)* (a) Gear position: 1st, 2nd or 3rd (b) T/M input shaft rpm: 1000 rpm or more (c) T/M output shaft rpm: Less than 300 rpm (d) NSW OFF (other than P or N position)	O/D direct clutch speed sensor Harness or connector between O/D direct clutch speed sensor and ECM ECM

*: See page AT2–58

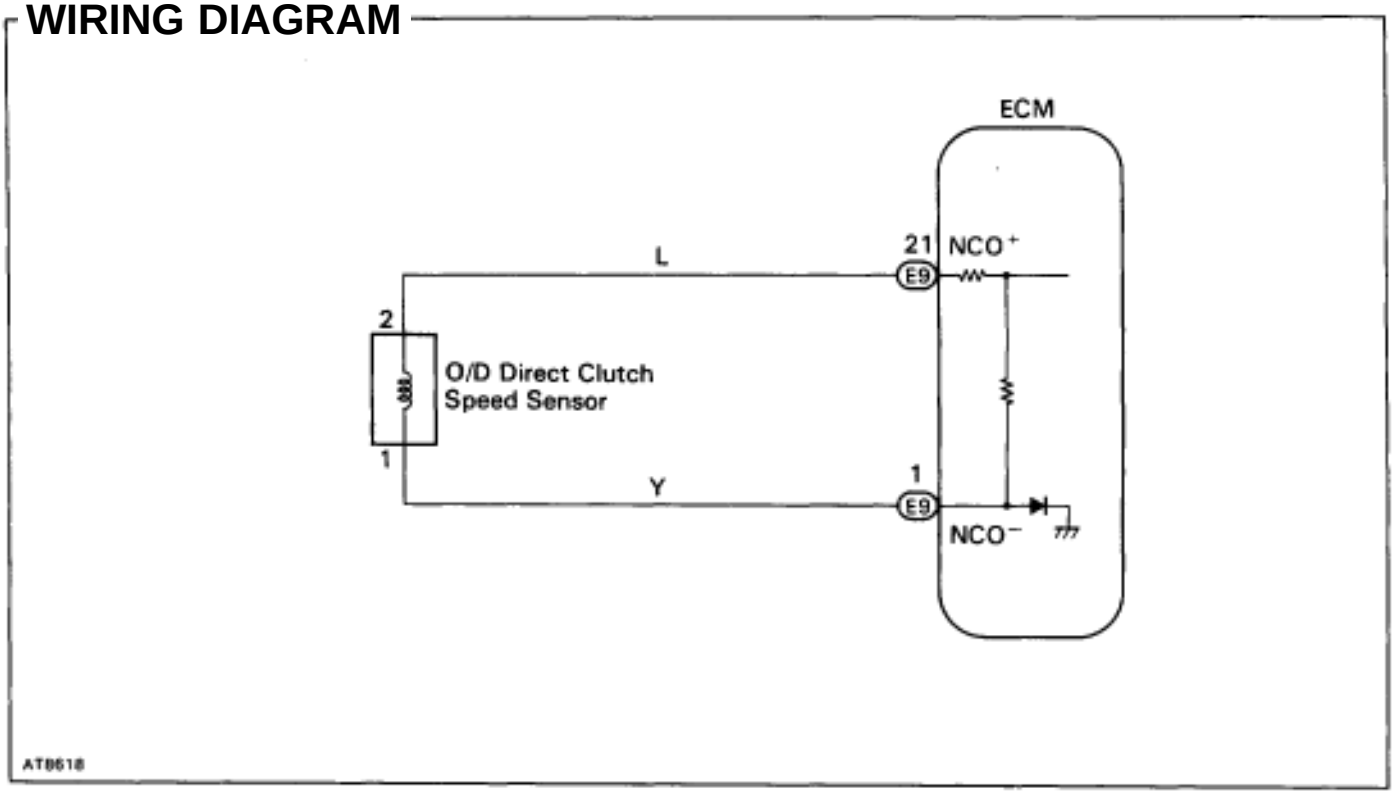
<Reference>

Waveform between terminals NCO^{+} and NCO^{-} during engine idling.



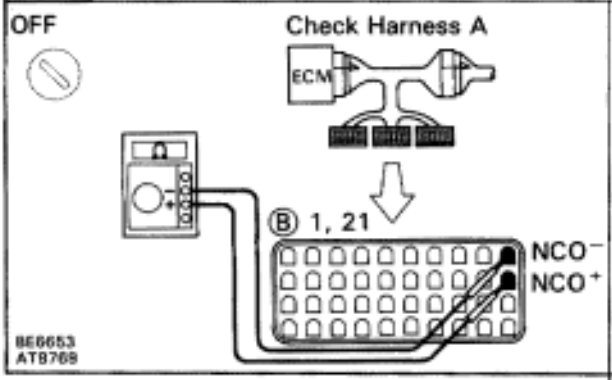
AT8763

WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check resistance between terminals NCO+ and NCO− of ECM.**



P Connect the Check Harness A to the ECM (See page EG–510).

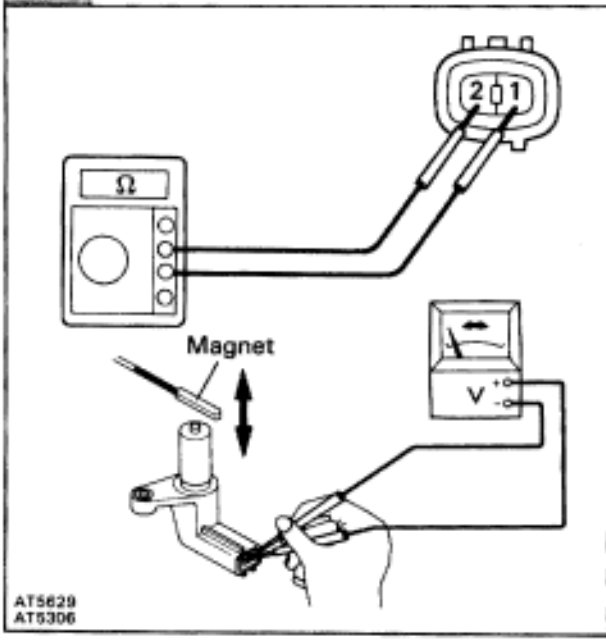
C Check Resistance between terminals NCO+ and NCO− of ECM.

OK **Resistance: 560 — 680**

OK → **Proceed to next circuit inspection shown on matrix chart (See page AT2–64). However, when diagnostic trouble code 67 is displayed, check and replace ECM.**

NG → G to **2**.

2 Check O/D direct clutch speed sensor.



P Remove the O/D direct clutch speed sensor from the transmission (See page AT2–17).

C Measure resistance between the terminals 1 and 2 of the O/D direct clutch speed sensor.

OK **Resistance: 560 — 680**

<Reference>
Check the speed sensor function

C Check voltage between the terminals 1 and 2 of the speed sensor when a magnet is put close to the front end of the speed sensor then taken away quickly.

OK **Voltage is generated intermittently.**

Hint The voltage generated is extremely low.

OK

NG **Replace O/D direct clutch speed sensor.**

Check and repair harness and connector between ECM and O/D direct clutch speed sensor (See page IN–30).

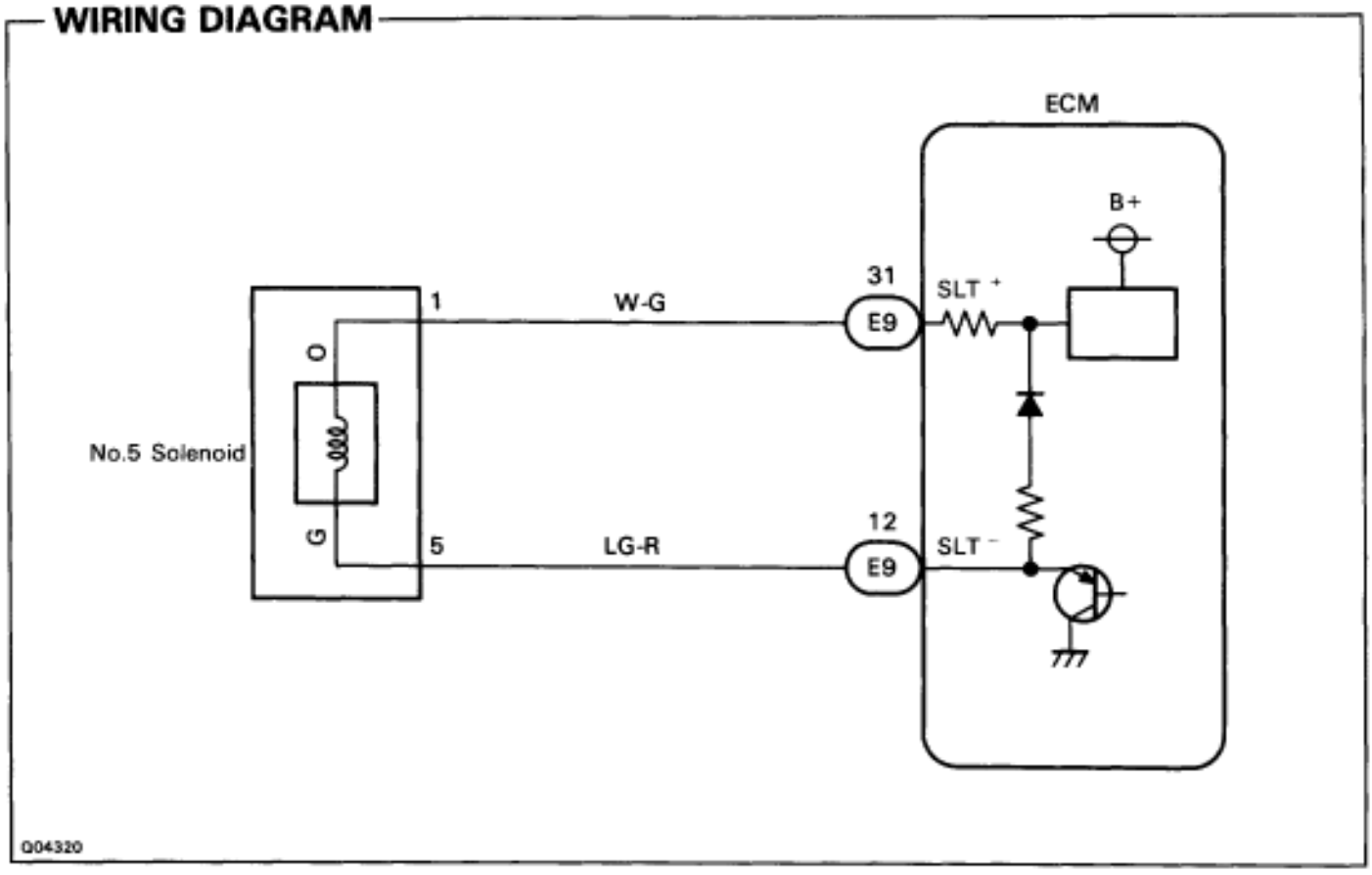
DTC 77 No.5 Solenoid Valve Circuit (For Line Pressure Modulation)

CIRCUIT DESCRIPTION

The throttle pressure that is applied to the primary regulator valve (which modulates line pressure) causes the No.5 solenoid valve, under electronic control, to precisely and minutely modulate and generate line pressure according to the accelerator pedal effort, or engine power output detected. This reduces the fluctuation of line pressure and provides smooth shifting characteristics.
Upon receiving the throttle valve opening angle signal, ECM controls the line pressure by sending a predetermined duty ratio to the No.5 solenoid valve located in the valve body, activating the solenoid valve, modulating the line pressure, generating throttle pressure.

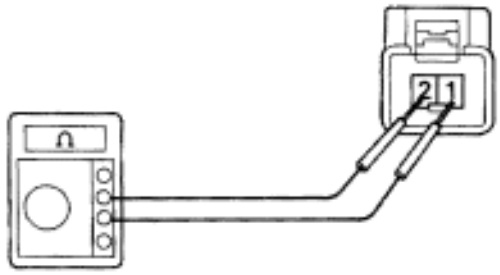
DTC No.	Diagnostic Trouble Code Detection Condition	Trouble Area
77	Any of condition below are detected. (2 trip detection logic) SLT⁻ terminal: 0 V or 5 V for 1 sec. or more.	No.5 solenoid valve Harness or connector between No.5 solenoid valve and ECM ECM

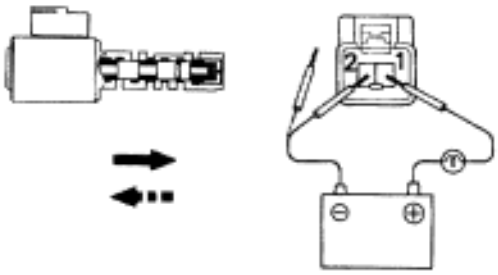
WIRING DIAGRAM

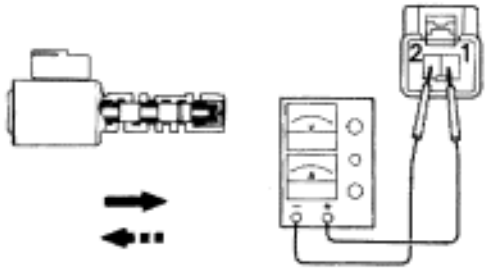


INSPECTION PROCEDURE

1 Check No.5 solenoid valve.







AT5533
AT5534 AT5535
AT5534 AT5536

Check solenoid resistance

P
1. Jack up the vehicle.
2. Remove the oil pan.

C
1. Disconnect the solenoid connector.
2. Measure resistance between terminals 1 and 2 of solenoid connector.

OK **Resistance: 3.6 — 4.0 Ω.**

Check solenoid operation

C Connect positive × lead with an 8 — 10 W bulb to terminal 1 of solenoid connector and negative ⊕ lead to terminal 2, then check the movement of the valve.

OK

When battery positive voltage is applied.	Valve moves in ➡ direction in illustration at left.
When battery positive voltage is cut off.	Valve moves in ⬅ direction in illustration at left.

<Reference>

Check solenoid operation

C
1. Prepare a variable power supply.
2. Connect positive × lead of the variable power supply to terminal 1 of solenoid connector and negative ⊕ lead to terminal 2.
3. Check the movement of the valve when the voltage is gradually increased. (A current greater than 1A should not be supplied.)

OK **As the voltage is increased, the valve should move slowly in the ➡ direction.**

C 4. Check the movement of the valve when the voltage is cut off.

OK **The valve should return in the ⬅ direction.**

OK

NG **Replace No.5 solenoid valve.**

Go to step 2.

2 **Check harness and connector between battery and No.5 solenoid valve, No.5 solenoid valve and ECM (See page IN–30).**

NG → **Repair or replace harness or connector.**

OK

Proceed to next circuit inspection shown on matrix chart (See page AT2–64). However, when diagnostic trouble code 77 is displayed, check and replace ECM.

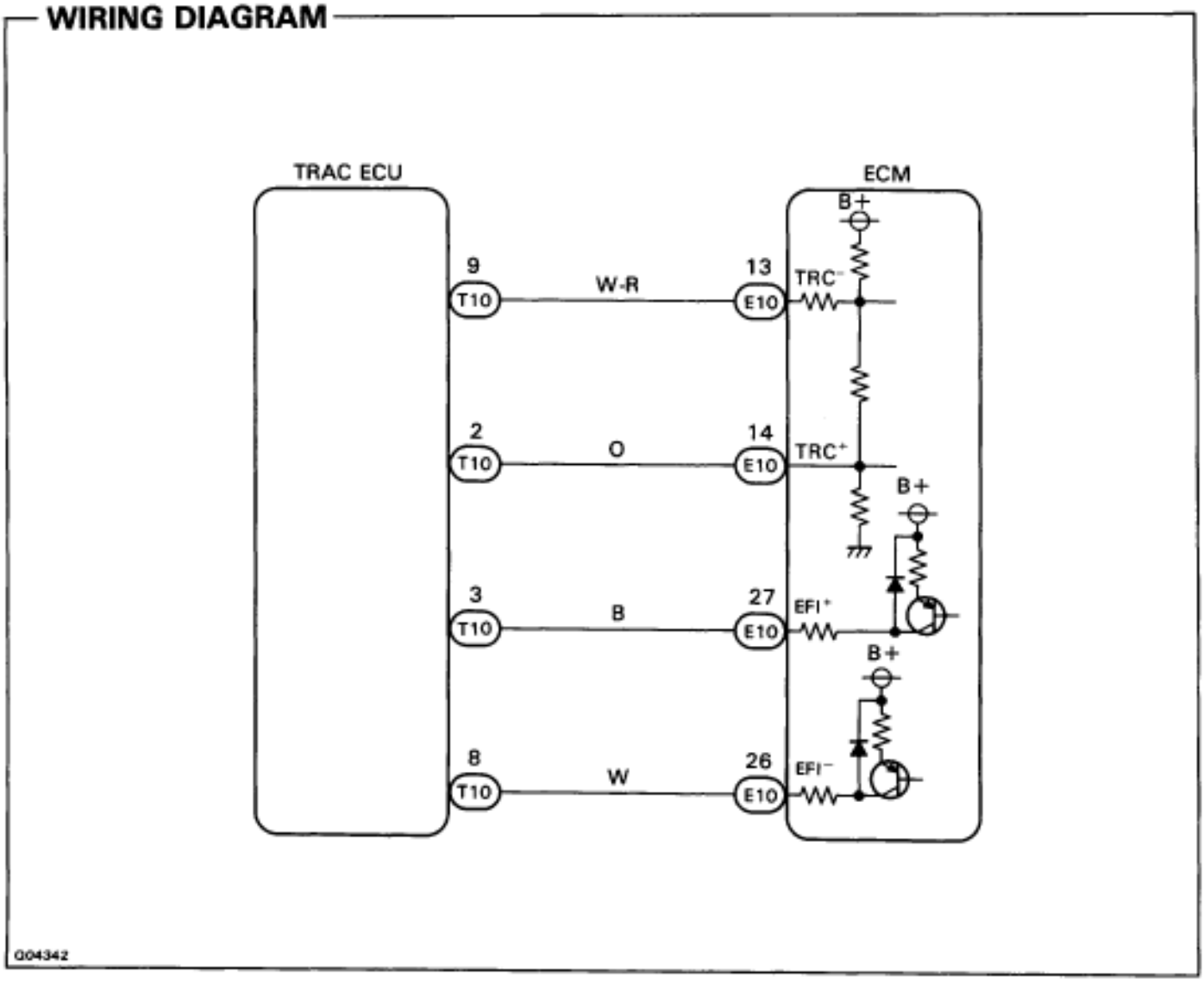
DTC 89 TRAC ECU Circuit

— CIRCUIT DESCRIPTION

When the transmission is in the shift up or stall condition, the TRAC ECU sends a sub–throttle valve close signal to the sub–throttle actuator.

DTC No.	Diagnostic Code Detection Condition	Trouble Area
89	All conditions below are detected 5 secs. or more. (a) No.1 vehicle speed sensor: 9 km/h (5.6 mph) or more (b) Mirror check of TRAC ECU input signal is abnormal. (c) TRAC ECU input signal does not inform to ECM. (d) TRAC ECU input signal order is abnormal.	Harness or connector between TRAC ECU and ECM TRAC ECU

— WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check harness and connector between ECM and TRAC ECU (See page IN–30).

- OK
- NG → Repair or replace harness or connector.

2 Check diagnostic trouble code of TRAC ECU (See page BR–128).

- OK
- NG → Substitute another TRAC ECU.

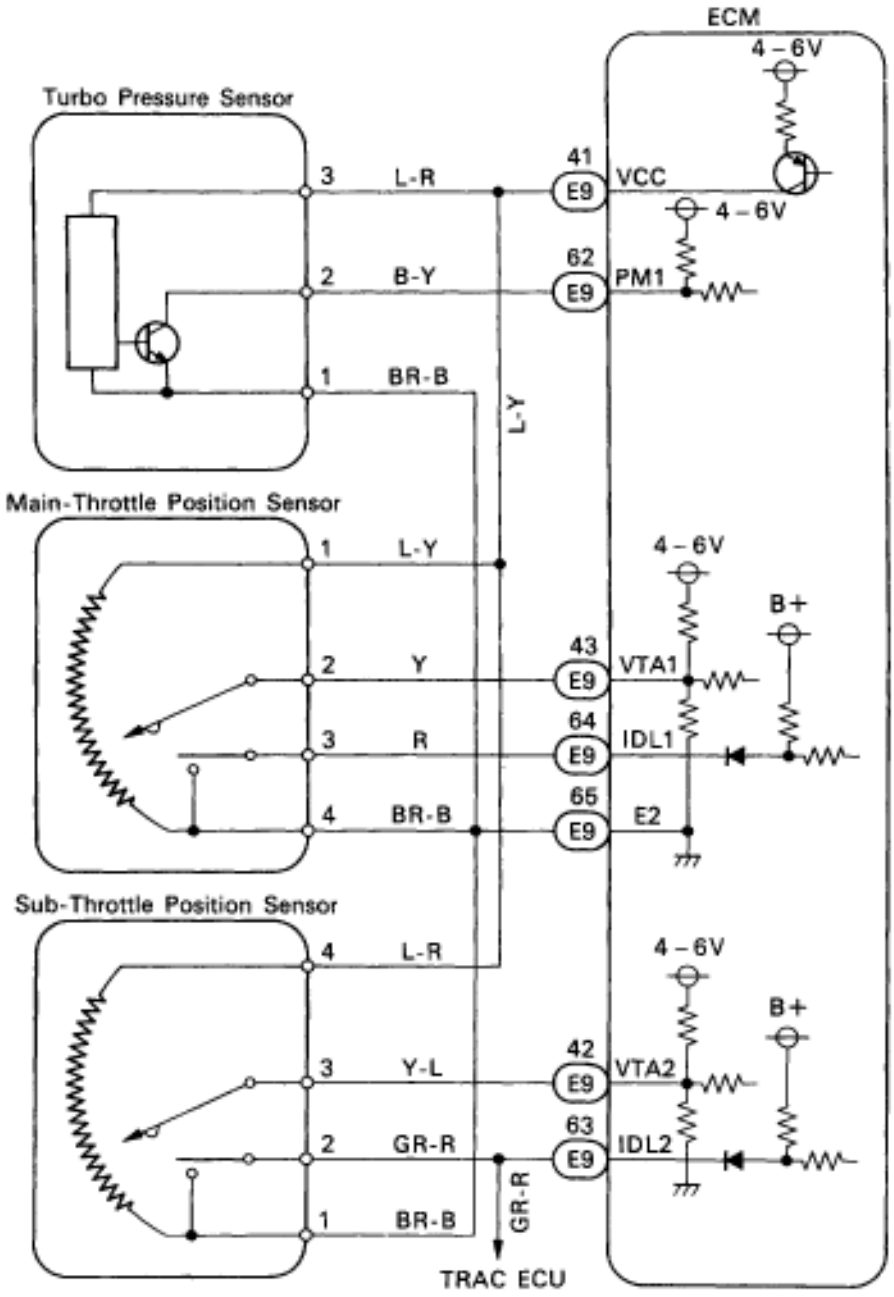
If the same code is still output after the diagnostic trouble code is deleted, check the contact condition of each connection.
If the connections are normal, the TRAC ECU may be defective.

Throttle Position Sensor Circuit

CIRCUIT DESCRIPTION

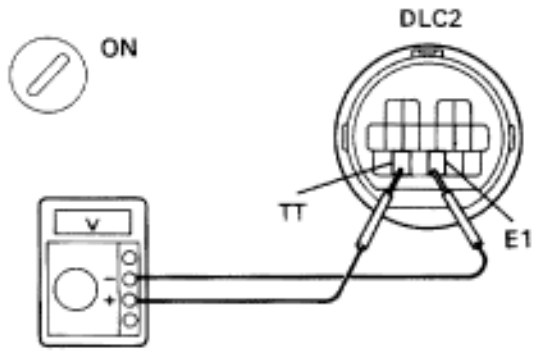
The throttle position sensor detects the throttle valve opening angle and sends signals to ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

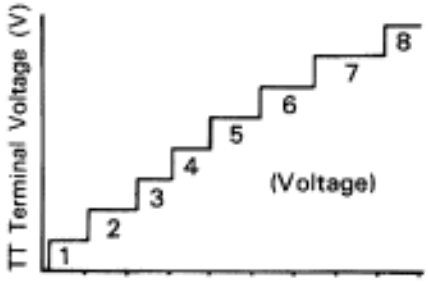
1 Check main throttle position signal.



P Turn ignition switch ON.

C Check voltage at the terminal TT of the DLC2 while gradually depressing the accelerator pedal from the fully closed position to the fully opened position.

OK **Voltage changes from 0 V to 8 V by stages.**



Hint Do not depress the brake pedal during the test. The voltage will stay at 0 V if depressed.

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page AT2–64).**

2 Check main (sub)–throttle position sensor. (see page EG–292, 293)

OK

NG → **Replace throttle position sensor.**

3 Check harness and connector between ECM and Main (Sub)–throttle position sensor (See page IN–30).

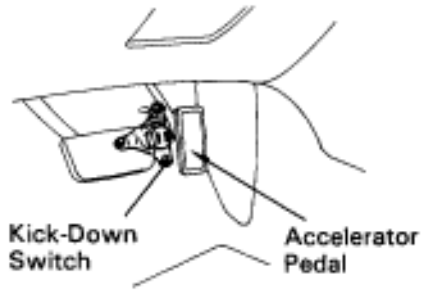
OK

NG → **Repair or replace harness or connector.**

Check and replace ECM.

Kick–down Switch Circuit

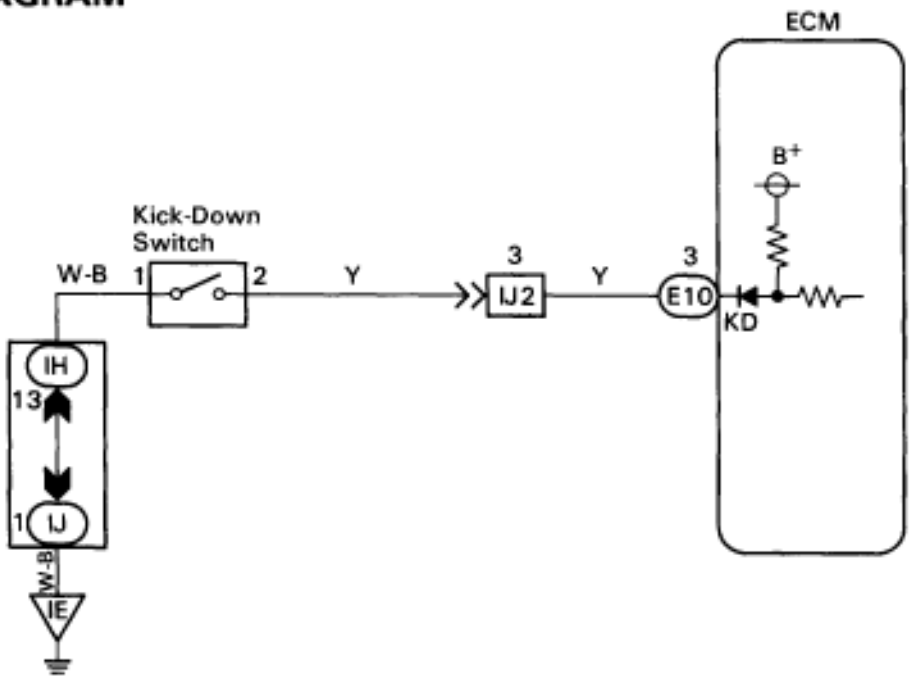
CIRCUIT DESCRIPTION



Q04246

The kick–down switch is turned on when the accelerator pedal is depressed beyond the full throttle opening and sends signals to ECM.
When the kick–down switch is turned on, the ECM controls gear shifting according to the programmed shift diagrams.
If a short circuit develops in the kick–down switch, the ECM disregards the kick–down signals and controls shifting at the normal shift points.

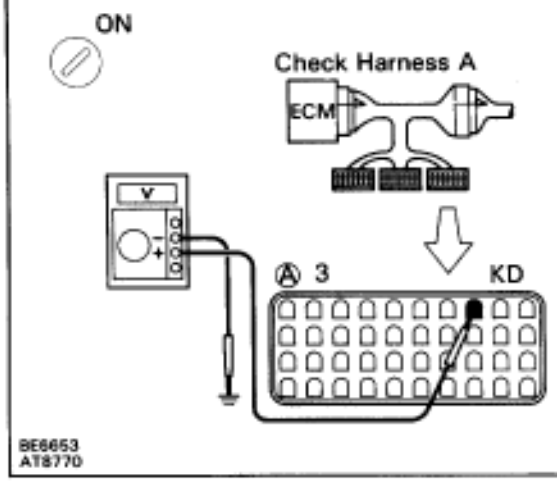
WIRING DIAGRAM



Q04321

INSPECTION PROCEDURE

1 **Check voltage between terminal KD of ECM connector and body ground.**



P
1. Connect the Check Harness A to the ECM (See page EG–510).
2. Turn ignition switch ON.

C Measure voltage between terminal KD of ECM connector and body ground when accel. pedal is fully depressed or not.

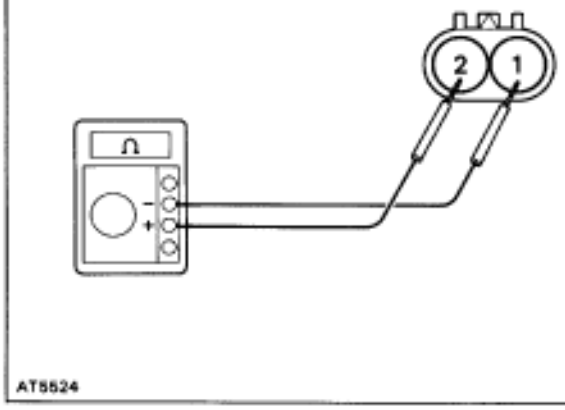
OK

Accel. pedal	Voltage
Fully depressed (Kick–down SW is ON)	Below 0.5 V
Released (Kick–down SW is OFF)	10 — 14 V

NG

OK **Proceed to next circuit inspection shown on matrix chart (See page AT2–64).**

2 **Check kick–down switch.**



C
1. Disconnect kick–down switch connector.
2. Measure resistance between terminals 1 and 2 of kick–down switch connector when kick–down switch is on and off.

OK

Kick–down switch	Resistance
ON	0 Ω (continuity)
OFF	∞ Ω (open)

OK

NG **Replace kick–down switch.**

3 **Check harness and connector between ECM and kick–down switch, kick–down switch and body ground (See page IN–30).**

OK

NG **Repair or replace harness or connector.**

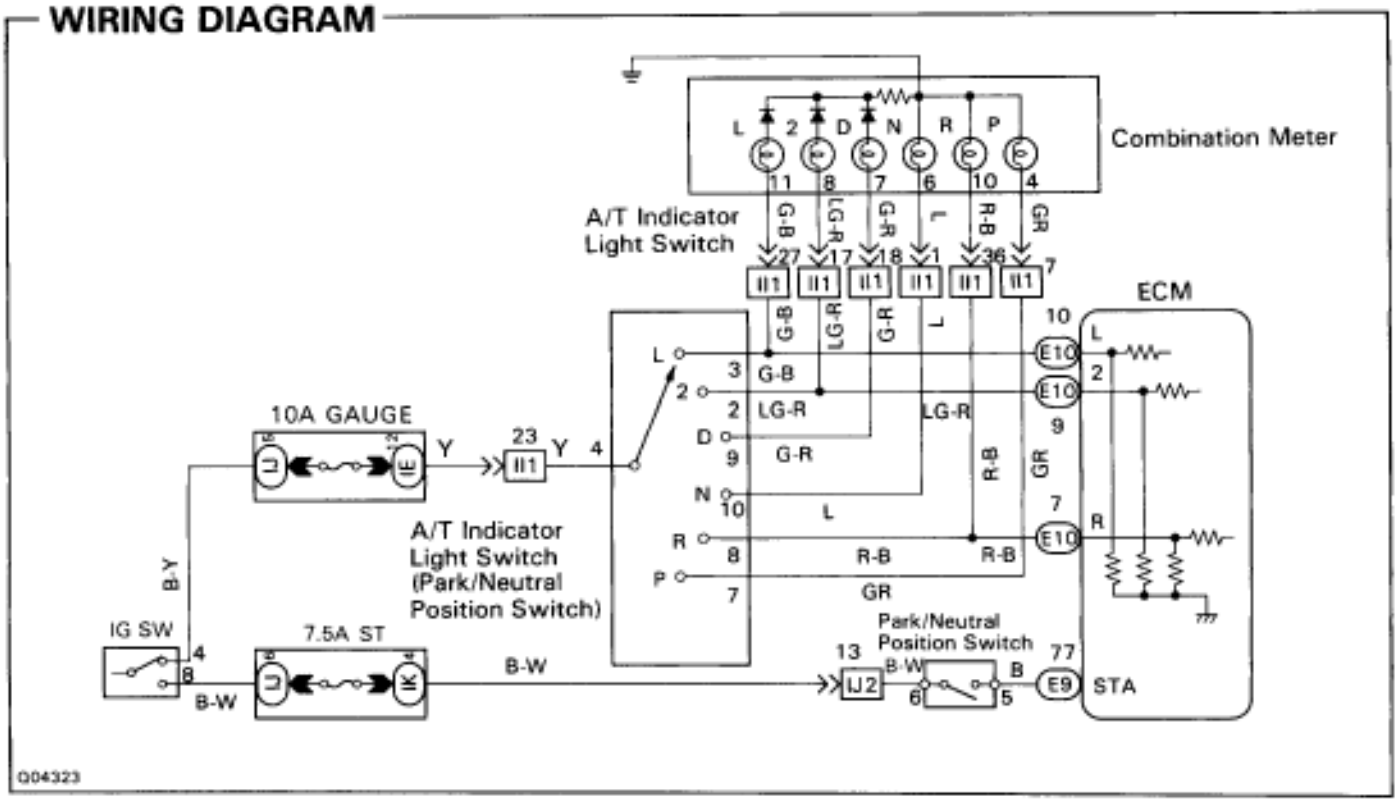
Check and replace ECM.

Park Neutral Position Switch Circuit

CIRCUIT DESCRIPTION

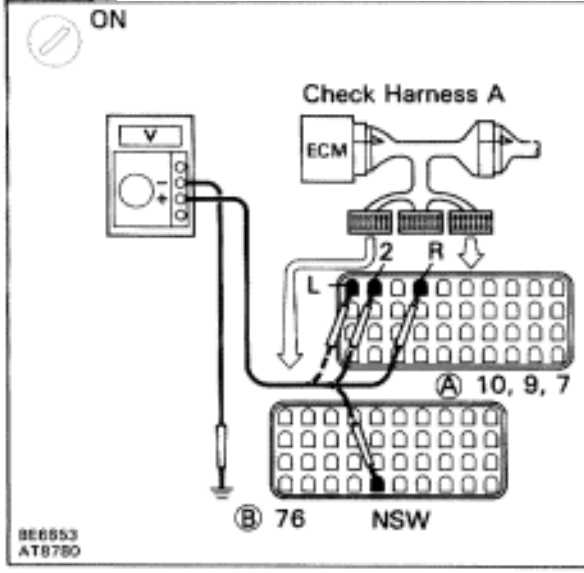
The park/neutral position switch detects the shift lever position and sends signal to ECM.
The ECM receives signals (R, NSW, 2 and L) from the park/neutral position switch. When the signal is not sent to the ECM from the park/neutral position switch, the ECM judges that the shift lever is in the D position.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check voltage between terminals R, NSW, 2, L of ECM connector and body ground.



P
1. Connect the Check Harness A to the ECM (See page EG–510).
2. Turn ignition switch ON.

C
Measure voltage between terminals R, NSW, 2, L of the Check Harness A connector and body ground when the shift lever is positioned to the following ranges.

OK

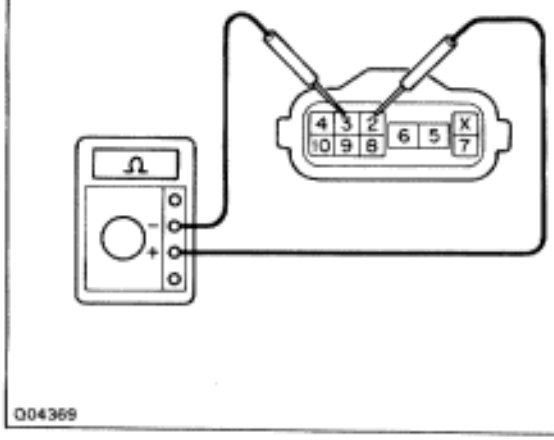
Position	R-body ground	NSW-body ground	2-body ground	L-body ground
P, N	Below 0.5 V	Below 0.5 V	Below 0.5 V	Below 0.5 V
R	10 – 14 V*	10 – 14 V*	Below 0.5 V	Below 0.5 V
D	Below 0.5 V	10 – 14 V	Below 0.5 V	Below 0.5 V
2	Below 0.5 V	10 – 14 V	10 – 14 V	Below 0.5 V
L	Below 0.5 V	10 – 14 V	Below 0.5 V	10 – 14 V

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

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page AT2–64).**

2 Check park/neutral position switch.



P
1. Jack up the vehicle.
2. Remove the park/neutral position switch (See page AT2–17).

C
Check continuity between each terminal shown below when the shift lever is positioned to each position.

○—○ Continuity

Position \ Terminal	6	5	4	7	8	10	9	2	3
P	○	○	○	○					
R			○	○					
N	○	○	○			○			
D			○				○		
2			○					○	
L			○						○

OK

NG → **Replace the park/neutral position switch.**

3 Check harness and connector between battery and park/neutral position switch, park/neutral position switch and ECM (See page IN–30).

OK

NG → **Repair or replace harness and connector.**

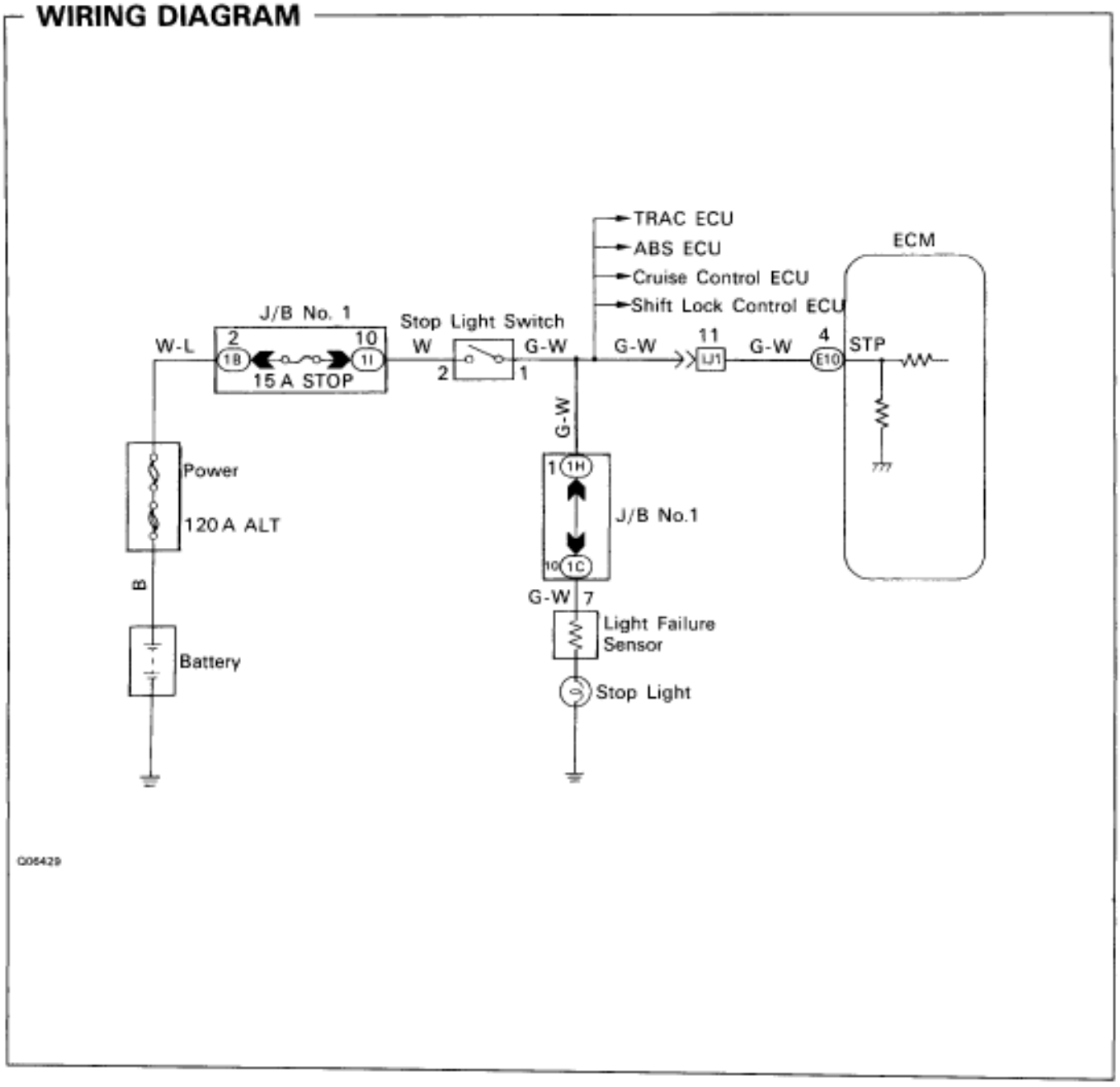
Check and replace ECM.

Stop Light Switch Circuit

CIRCUIT DESCRIPTION

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

WIRING DIAGRAM



INSPECTION PROCEDURE

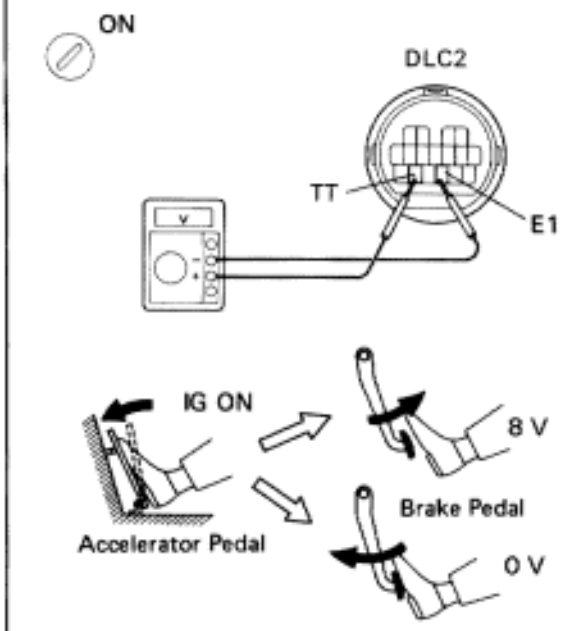
1 Check operation of stop light.

C Check if the stop lights go on and off normally when the brake pedal is depressed and released.

OK → **2**

NG → **Check and repair stop light circuit.**

2 Check stop light signal.



C
1. Connect the voltmeter to the terminals TT and E1 of the DLC2.
2. Turn ignition switch ON.
3. Fully depress the accelerator pedal until the voltmeter indicates 8 V and hold it.
4. Depress and release the brake pedal and check the voltage.

OK

Brake pedal	Voltage
Depressed	0 V
Released	8 V

NG → **3**

OK → **Proceed to next circuit inspection shown on matrix chart (See page AT2–64).**

3 Check harness and connector between ECM and stop light switch (See page IN–30).

OK → **Check and replace ECM.**

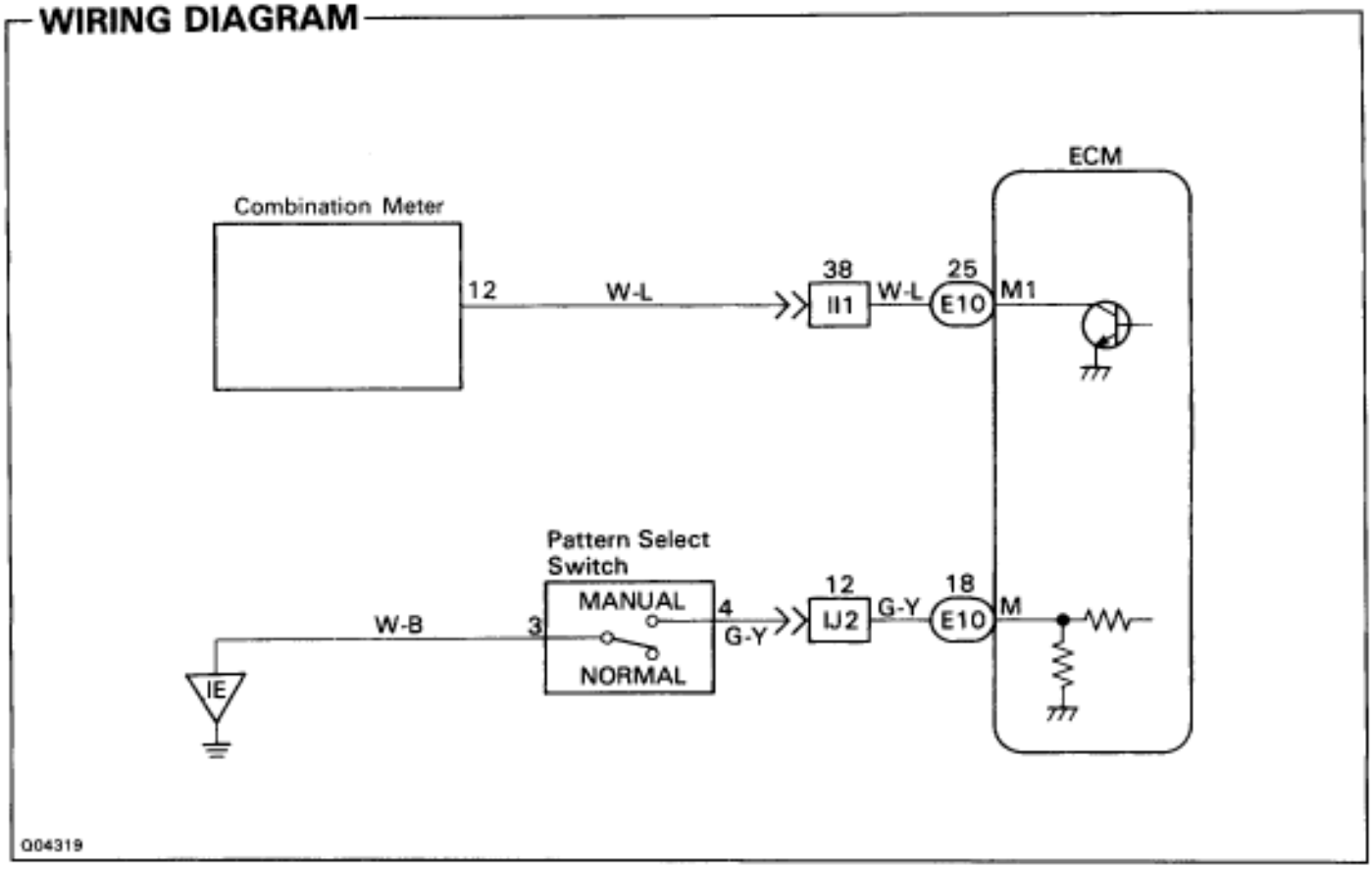
NG → **Repair or replace harness or connector.**

Pattern Select Switch Circuit

CIRCUIT DESCRIPTION

The ECM memory contains the shift programs for the NORMAL and MANUAL patterns, 2 position, L position and the lock–up patterns. Following the programs corresponding to the signals from the pattern select switch, the park/neutral position switch and other various sensors the ECM switches the solenoid valves ON and OFF, thereby controlling the transmission gear change and the lock–up clutch operation.

WIRING DIAGRAM

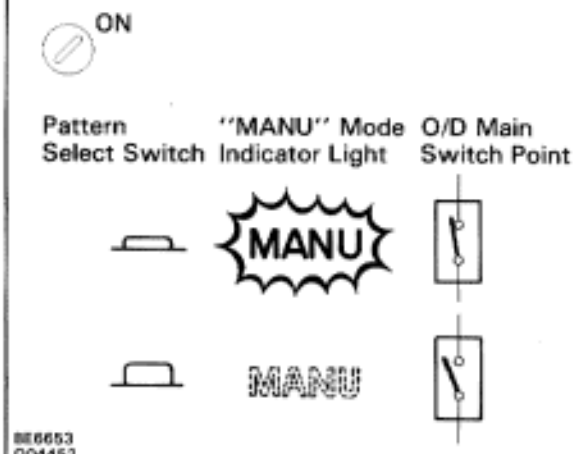


INSPECTION PROCEDURE

1 **Check A/T fluid temp. sensor (See page AT2–70).**

OK → NG: **Replaces A/T fluid temp. sensor.**

2 **Check if A/T fluid temp. is too hot.**



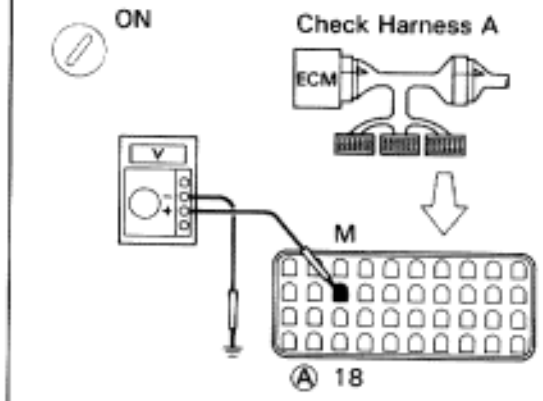
P
1. Turn ignition switch ON.
2. Check "MANU" mode indicator light when pattern select switch is pushed in to ON.

OK: "MANU" mode indicator light comes on and stays on.

Hint: If the A/T fluid temp. becomes too hot, the "MANU" mode indicator light flashes for several seconds and goes off. The driving mode then automatically changes from Manual mode to the Normal mode.

OK → NG: **Wait until the A/T fluid temp. is reduced.**

3 **Check voltage between terminal M of ECM connector and body ground.**



P
1. Connect the Check Harness A to the ECM (See page EG–510).
2. Turn ignition switch ON.

C: Measure voltage between the terminal M of the ECM connector and body ground when the pattern select switch is set to the MANU (MANUAL) position and NORM (NORMAL) position.

OK

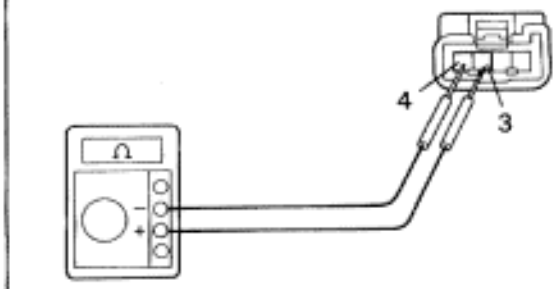
Pattern select switch	Voltage
MANU	10 — 14 V
NORM	Below 1 V

Hint: The ECM uses the Normal pattern signal if the Manual signal is not input.

NG → OK: **Proceed to next circuit inspection shown on matrix chart (See page AT2–64).**

Go to step. 4.

4 **Check pattern select switch.**



P Disconnect the pattern select switch connector.

C Measure resistance between the terminals 3 and 4 of the pattern select switch connector when the select switch is set to MANU and NORM positions.

OK

Pattern	Resistance
MANU	0 Ω (continuity)
NORM	∞ Ω (open)

OK

NG → **Replace pattern select switch.**

5 **Check harness and connector between battery and pattern select switch, pattern select switch and ECM (See page IN–30).**

OK

NG → **Repair or replace harness or connector.**

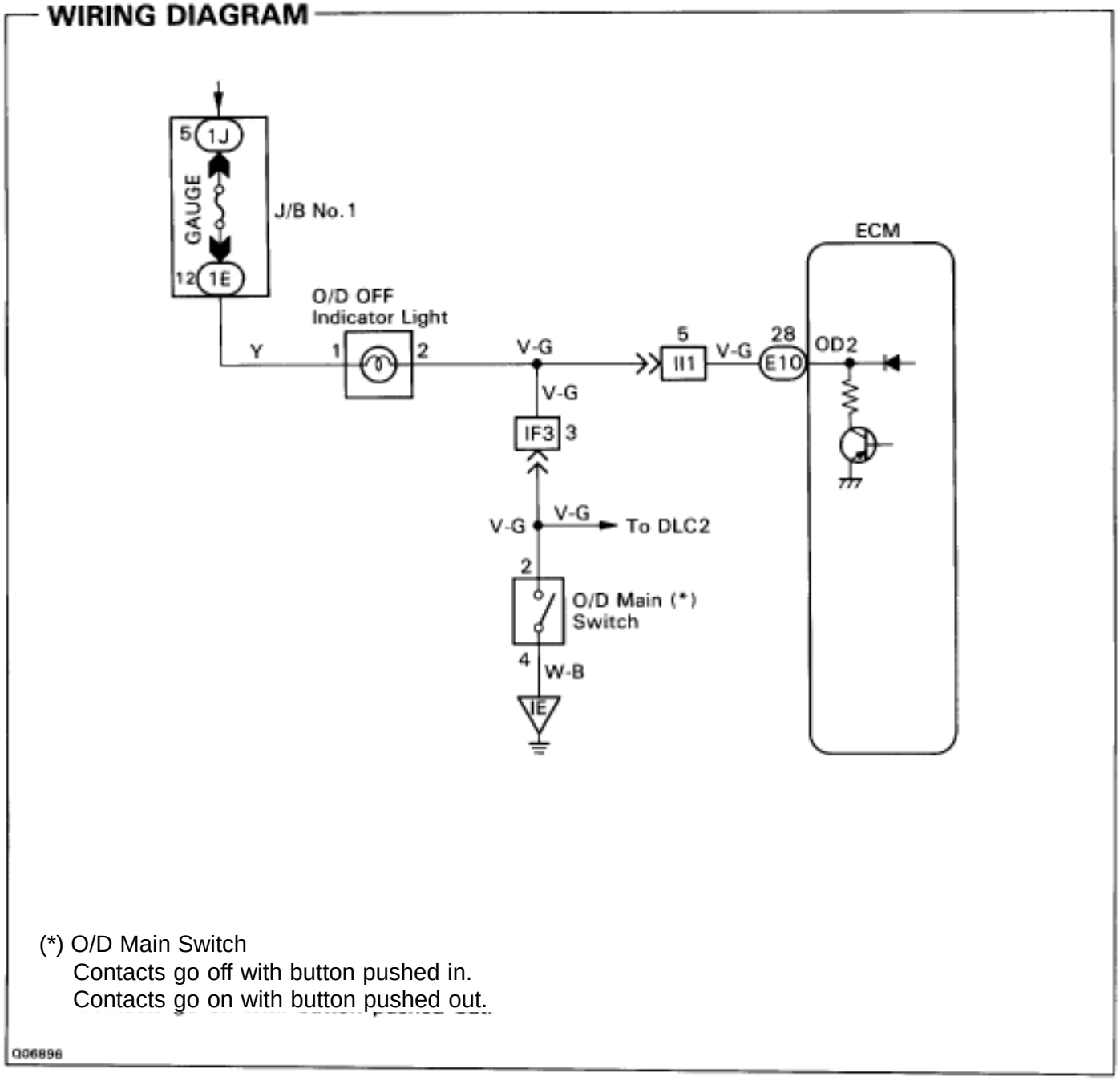
Check and replace ECM.

O D Main Switch & O D OFF Indicator Light Circuit

CIRCUIT DESCRIPTION

The O/D main switch contacts go off when the switch is pushed in and comes on when it is pushed out. In O/D main switch OFF position the O/D OFF indicator lights up, and the ECM prohibits shifting to overdrive. The ECM also causes the O/D OFF indicator light to blink when a malfunction is detected. In this case, connecting the terminals in the DLC2 or DLC1 can display the malfunction code.

WIRING DIAGRAM



(*) O/D Main Switch
Contacts go off with button pushed in.
Contacts go on with button pushed out.

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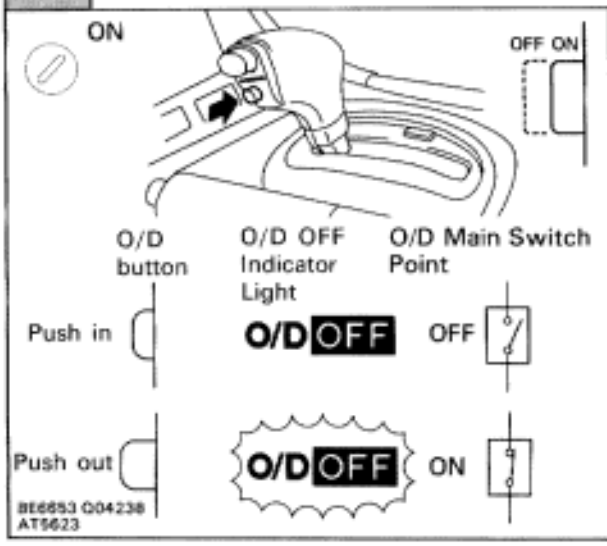
INSPECTION PROCEDURE

O/D OFF indicator light does not light up.

1 Check operation of O/D main switch.



C
1. Turn ignition switch ON.
2. Check “O/D OFF” indicator light when O/D button is pushed in to ON.

OK **“O/D OFF” indicator light goes off.**

C
3. Check “O/D OFF” indicator light when O/D button is pushed again, to OFF.

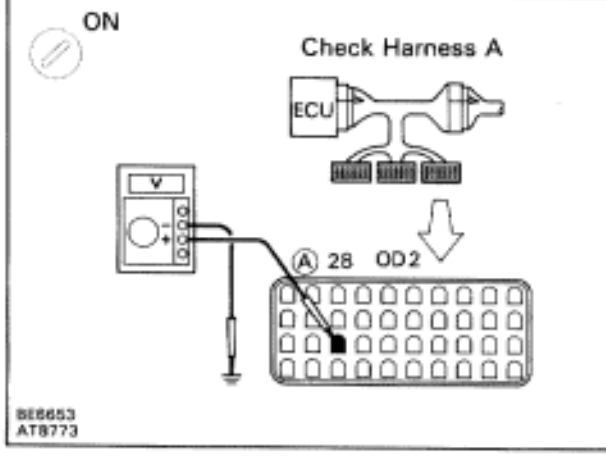
OK **“O/D OFF” indicator light lights up.**

Hint If the “O/D OFF” indicator light blinks when the O/D button is pushed in to ON, a malfunction is occurring in the system.
Check the diagnostic trouble code.

OK

NG **Go to step 4.**

2 Check voltage between terminal OD2 of ECM connector and body ground.



P
1. Connect the Check Harness A to the ECM (See page EG–510).
2. Turn ignition switch ON.

C Check voltage between terminal OD2 of ECM and body ground.

OK

O/D Main Switch	Voltage
OFF	Below 0.5 V
ON	10 ~ 14 V

NG

OK **Proceed to next circuit inspection shown on matrix chart (See page AT2–64).**

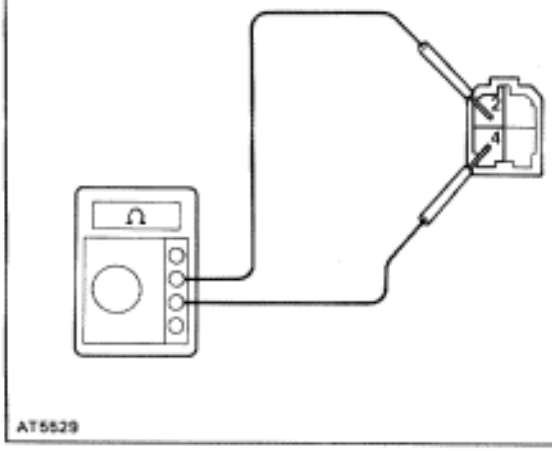
3 Check harness and connector between O/D off indicator light and ECM (See page IN–30).

OK

NG **Repair or replaces harness or connector.**

Check and replace ECM.

4 Check O/D main switch.



C
1. Disconnect O/D main switch connector.
2. Measure resistance between terminals 2 and 4 of O/D main switch connector.

OK

O/D Main Switch	Resistance
ON	∞ Ω (open)
OFF	0 Ω (continuity)

OK

NG → **Replace O/D main switch.**

Check and replace combination meter. (See combination meter troubleshooting section on page BE–41).

O/D OFF indicator light remains ON

1 Check O/D main switch.

OK

NG → **Replace O/D main switch.**

2 Check harness and connector between O/D off indicator light and ECM (See page IN–30).

OK

NG → **Repair or replace harness or connector.**

Check and replace ECM.

O/D OFF indicator light blinks

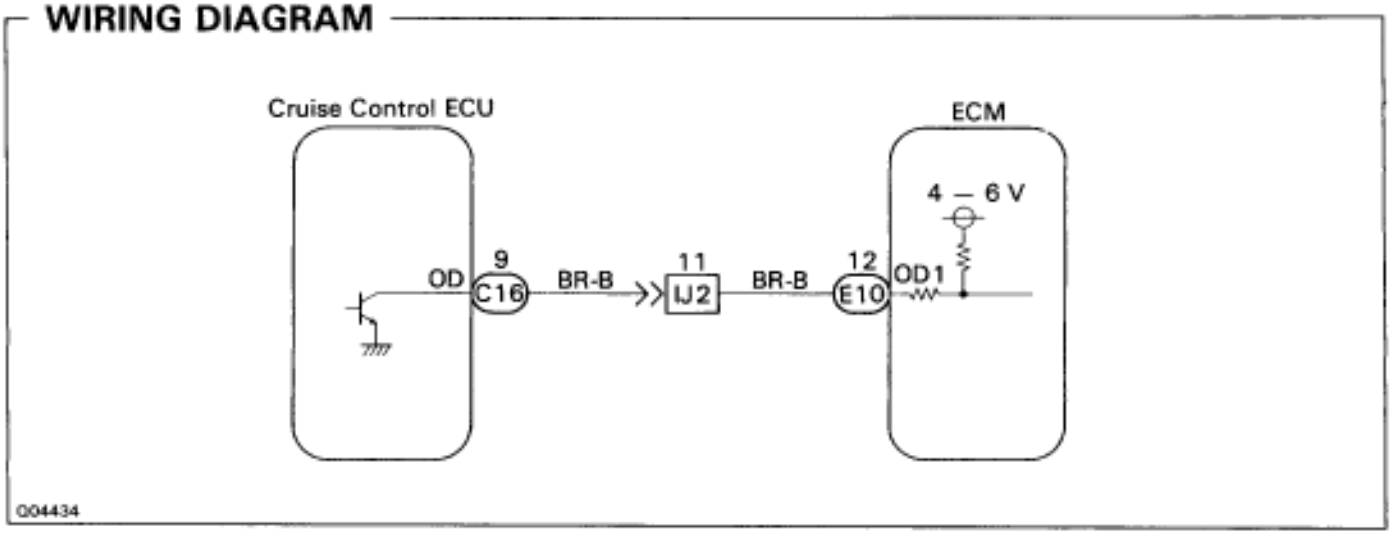
Do diagnostic trouble code check (See page AT2–34).

O D Cancel Signal Circuit

— CIRCUIT DESCRIPTION

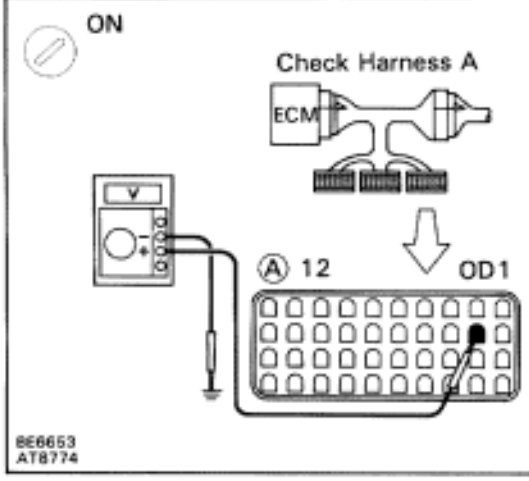
While driving with cruise control activated, in order to minimize gear shifting and provide smooth up–hill cruising, overdrive may be prohibited temporarily in some conditions.
The Cruise Control ECU sends O/D cut signals to the ECM as necessary and the ECM cancels overdrive shifting until these signals are discontinued.
(For details see the cruise control section, page BE–162)

WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check voltage between terminal OD1 of ECM connector and body ground.**



P
1. Connect the Check Harness A to the ECM
2. Turn ignition switch ON.

C Measure voltage between terminal OD1 of ECM connector and body ground.

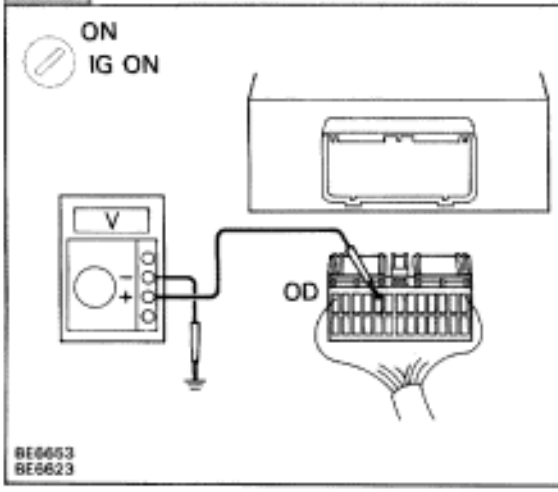
OK **Voltage: 4 — 6 V**

NG

Go to **2** .

OK Proceed to next circuit inspection shown on matrix chart (See page AT2–64).

2 **Check voltage between terminal OD of Cruise Control ECU harness side connector and body ground.**



P
1. Disconnect Cruise Control ECU connector.
2. Turn ignition switch ON.

C
Measure voltage between terminal OD of Cruise Control ECU harness side connector and body ground.

OK
Voltage: 4 — 6 V

NG

OK → **Check and replace Cruise Control ECU.**

3 **Check harness and connector between Cruise Control ECU and ECM (See page IN–30).**

OK

NG → **Repair or replace harness or connector.**

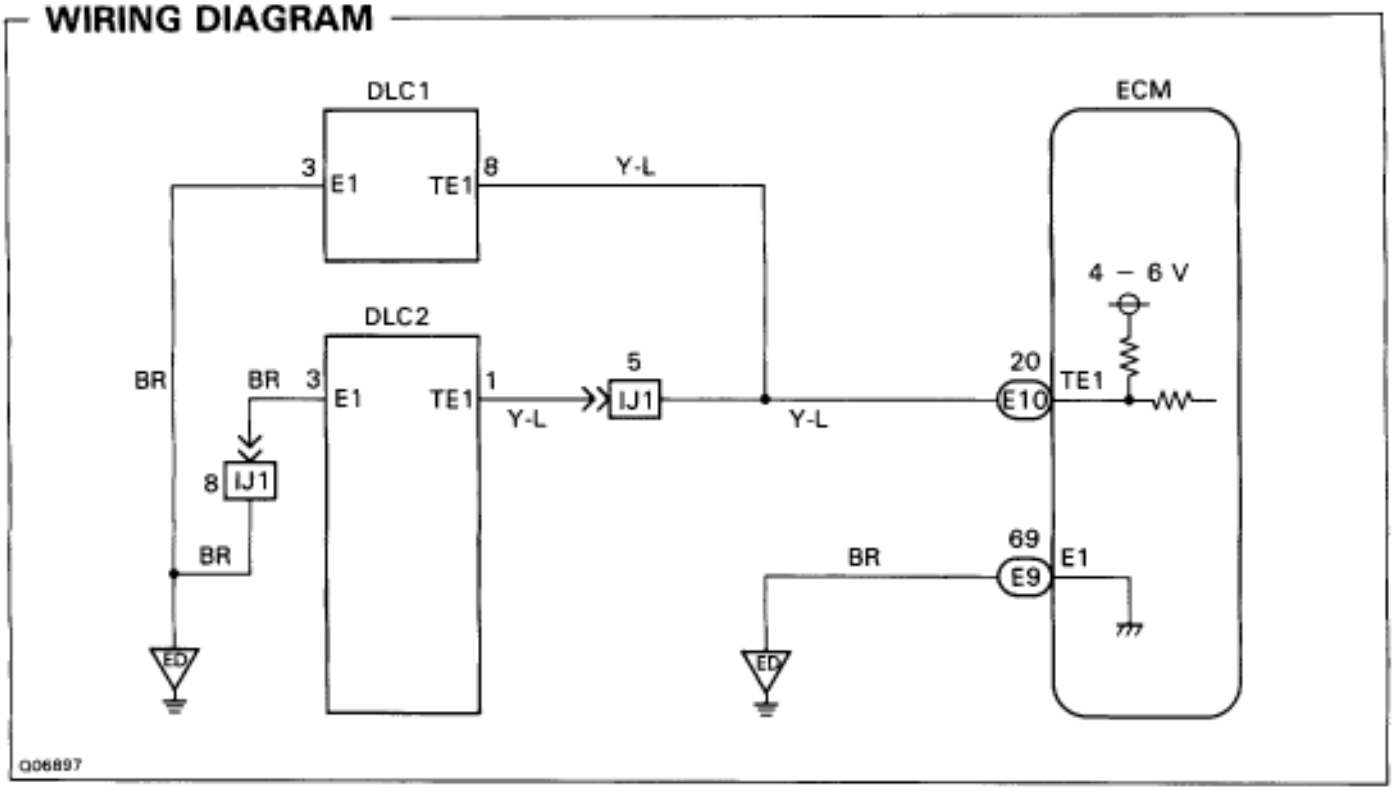
Check and replace ECM.

TE1 Terminal Circuit

CIRCUIT DESCRIPTION

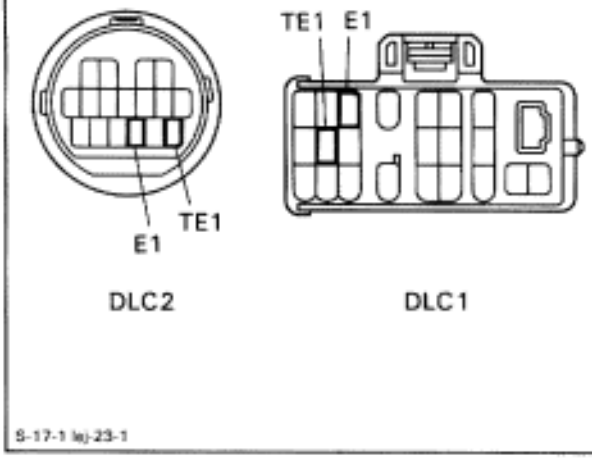
ECM displays diagnostic trouble codes using the O/D OFF indicator light when terminals TE1 and E1 of the DLC2 or DLC1 are connected.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check voltage between terminal TE1 and E1 of DLC2 or DLC1.**



C Measure voltage between terminals TE1 and E1 of DLC2 or DLC1.

OK **Voltage: 4 — 6 V**

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page AT2–64).**

2 **Check harness and connector between ECM and DLC2, DLC1 and body ground (See page IN–30).**

OK

NG → **Repair or replace harness or connector.**

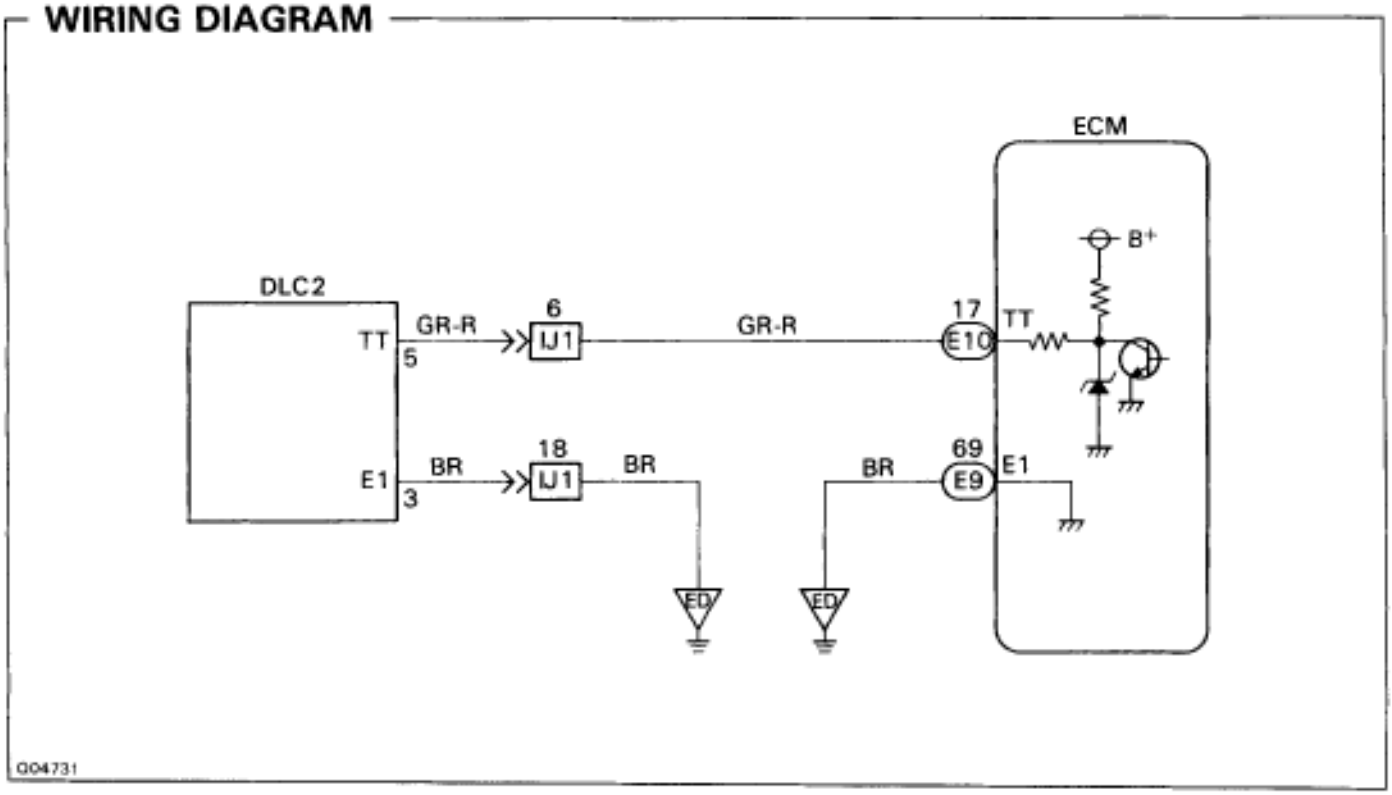
Check and replace ECM.

TT Terminal Circuit

CIRCUIT DESCRIPTION

Checks of ECM input and output signals related to the throttle position sensor, brakes, shift position and other circuits can be performed by measuring the voltages at terminal TT of the DLC2

WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check harness and connector between ECM and DLC2, DLC1 and body ground (See page IN–30).**

OK

NG **Repair or replace harness or connector.**

Check and replace ECM.

SERVICE SPECIFICATIONS

SERVICE DATA

Line pressure (wheel locked)	Engine idling			
	D position	471–530 kPa	4.8–5.4 kgf/cm^2	68–77 psi
	R position	686–785 kPa	7.0–8.0 kgf/cm^2	100–114 psi
	AT stall			
	D position	1,334–1,470 kPa	13.6–15.0 kgf/cm^2	193–213 psi
	R position	1,697–2,030 kPa	17.3–20.7 kgf/cm^2	246–294 psi
Engine stall revolution	D and R position	2,600 ± 150 rpm		
Time lag	N → D position	Less than 1.2 seconds		
	N → R positionposition	Less than 1.5 seconds		
Engine idle speed (In N position and air conditioner OFF)		650 ± 50 rpm		
Drive plate runout	Max.	0.20 mm		0.0079 in.
Torque converter clutch runout	Max.	0.1 mm		0.004 in.

SHIFT POINT

NORM Mode

Shift position	Shifting point		Vehicle speed km/h (mph)
D	Throttle valve fully opened	1→2	62–72 (39–45)
		2→3	120–129 (75–80)
		3→O/D	187–201 (116–125)
		O/D→3	181–195 (112–121)
		3→2	109–117 (68–73)
		2→1	41–47 (25–29)
	Throttle valve fully closed	3→O/D	29–34 (18–25)
		O/D→3	23–28 (14–17)
2	Throttle valve fully opened	1→2	62–72 (39–45)
		*3→2	135–147 (84–91)
		2→1	41–47 (25–29)
L	Throttle valve fully opened	*2→1	60–66 (37–41)

MANU Mode

Shift position	Shifting point		Vehicle speed km/h (mph)
D	Throttle valve fully opened	2→3	122–131 (76–81)
		3→O/D	194–207 (121–129)
		O/D→3	187–201 (116–125)
		3→2	109–117 (68–73)
	Throttle valve fully closed	3→O/D	181–195 (112–121)
		O/D→3	23–28 (14–17)
2	Throttle valve fully opened	*3→2	135–147 (84–91)
L	Throttle valve fully opened	*2→1	60–66 (37–41)

* Shift points is the same when the throttle valve is closed as when the throttle valve is opened.

LOCK–UP POINT

NORM Mode

D position Throttle valve opening 5%	Lock–up ON km/h (mph)	Lock–up OFF km/h (mph)
3rd Gear	60–66 (37–41)	50–56 (31–35)
O/D Gear	53–59 (33–37)	50–56 (31–35)

MANU Mode

D position Throttle valve opening 5%	Lock–up ON km/h (mph)	Lock–up OFF km/h (mph)
2nd Gear (2 position)	60–66 (37–41)	57–63 (35–39)
3rd Gear (D position)	60–66 (37–41)	57–63 (35–39)
O/D Gear (D position)	181–195 (112–121)	69–76 (43–47)

HINT:

(1) There is no lock–up in the L positions.
(2) In the following cases, the lock–up will be released regardless of the lock–up pattern.
- When the throttle valve is completely closed.
- When the brake light switch is ON.

(3) Shift up to 3rd will not occur when the engine coolant temp. is below 35˚C (95˚F) and the vehicle speed is below 40 km/h (25 mph).
(4) Shift–up to O/D will not occur when the engine coolant temp. is below 60˚C (140˚F) and the vehicle speed is below 60 km/h (37 mph).
(5) When the vehicle speed drops to 10 km/h (6 mph) or more below the cruise control set vehicle speed, shift down from O/D to 3rd occurs.

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
No.1 vehicle speed sensor	16	160	12
No.2 vehicle speed sensor	5.4	55	48 in.·lbf
O/D direct clutch speed sensor	5.4	55	48 in.·lbf
A/T fluid temp. sensor	15	150	11
Valve body	10	100	7
Oil strainer	10	100	7
Oil pan	7.4	75	65 in.·lbf
Starter	37	380	27
Rear support X Body	25	260	19
Torque converter X Drive plate	34	340	25
Oil cooler union nut	34	350	25
Oil cooler pipe bracket	10	100	7
Propeller shaft X Transmission	56	570	41
Propeller shaft X Differential	79	805	58
Propeller shaft center support	49	500	36
Propeller shaft adjusting nut	53	540	39
Oil pan drain plug	17	175	13
Drive plate X Torque converter	33	340	25
Drive plate X Crankshaft	64	650	47
Transmission X Engine block 14 mm bolt 17 mm bolt	37 72	380 730	27 53
Park/neutral position switch X Transmission case	16	160	12
Transmission output flange	123	1,250	90
Shift control rod X Shift lever	13	130	9
Shift control rod X Park/neutral position switch	16	160	12
Exhaust pipe bracket X Transmission housing	37	380	27
No.2 exhaust pipe X Center exhaust pipe	58	590	43
Rear center floor crossmember brace X Body	13	130	9
Heat insulator X Body	5.4	55	48 in.·lbf