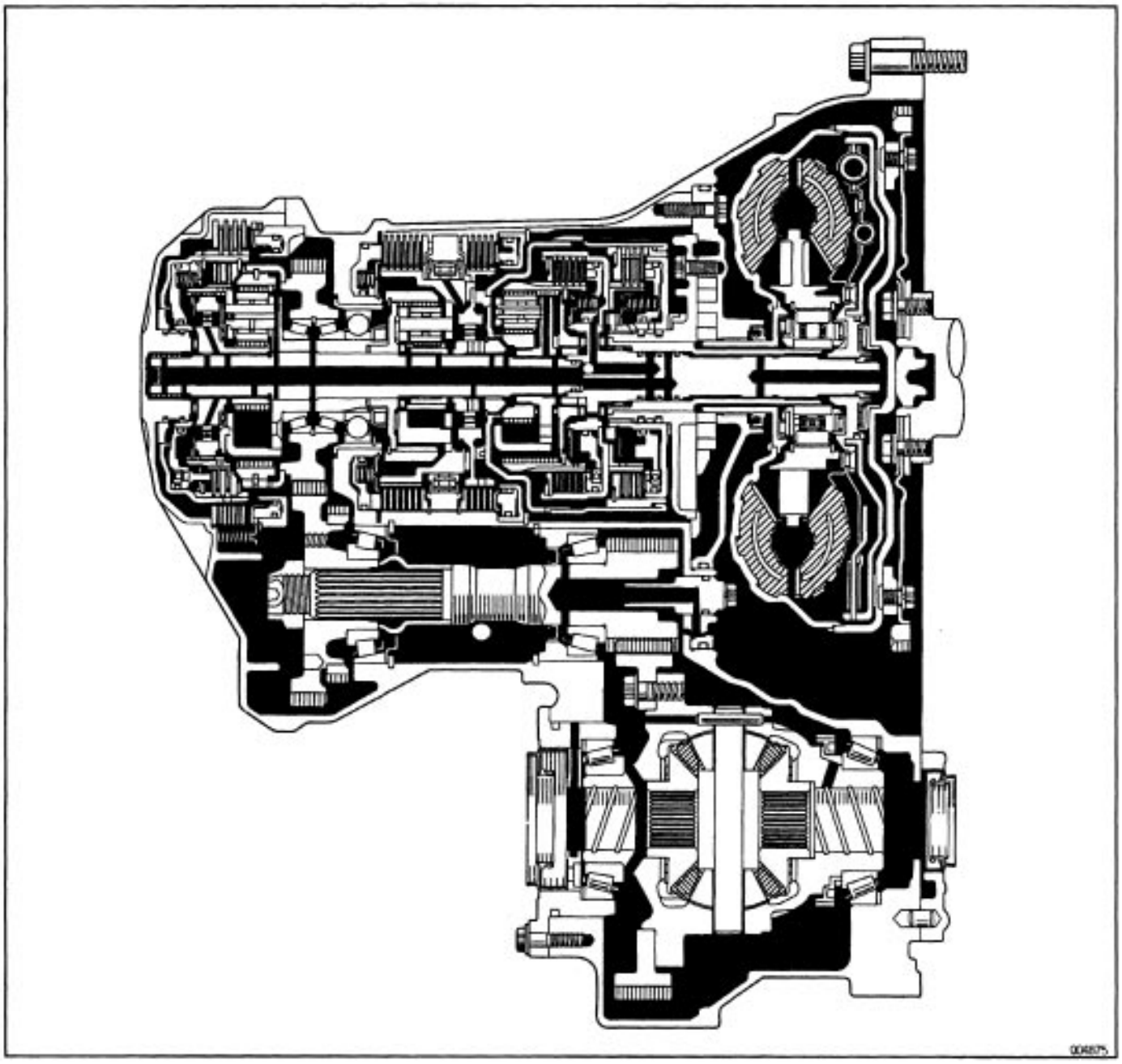
A541E AUTOMATIC TRANSAXLE

DESCRIPTION

GENERAL DESCRIPTION

The ’94 model years A541 E automatic transaxle is a revised version of the previous model year’s A540E automatic transaxle. The following changes have been made to match the brand new 1 MZ –FE engine:

- Adoption of an Electronically Controlled Transaxle with an intelligent control system. This version has evolved from the previous electronically Controlled Transaxle system.
- The hydraulic pressure contrl system has been revised accordingly.
- The torque converter clutch and the gear train have been revised.

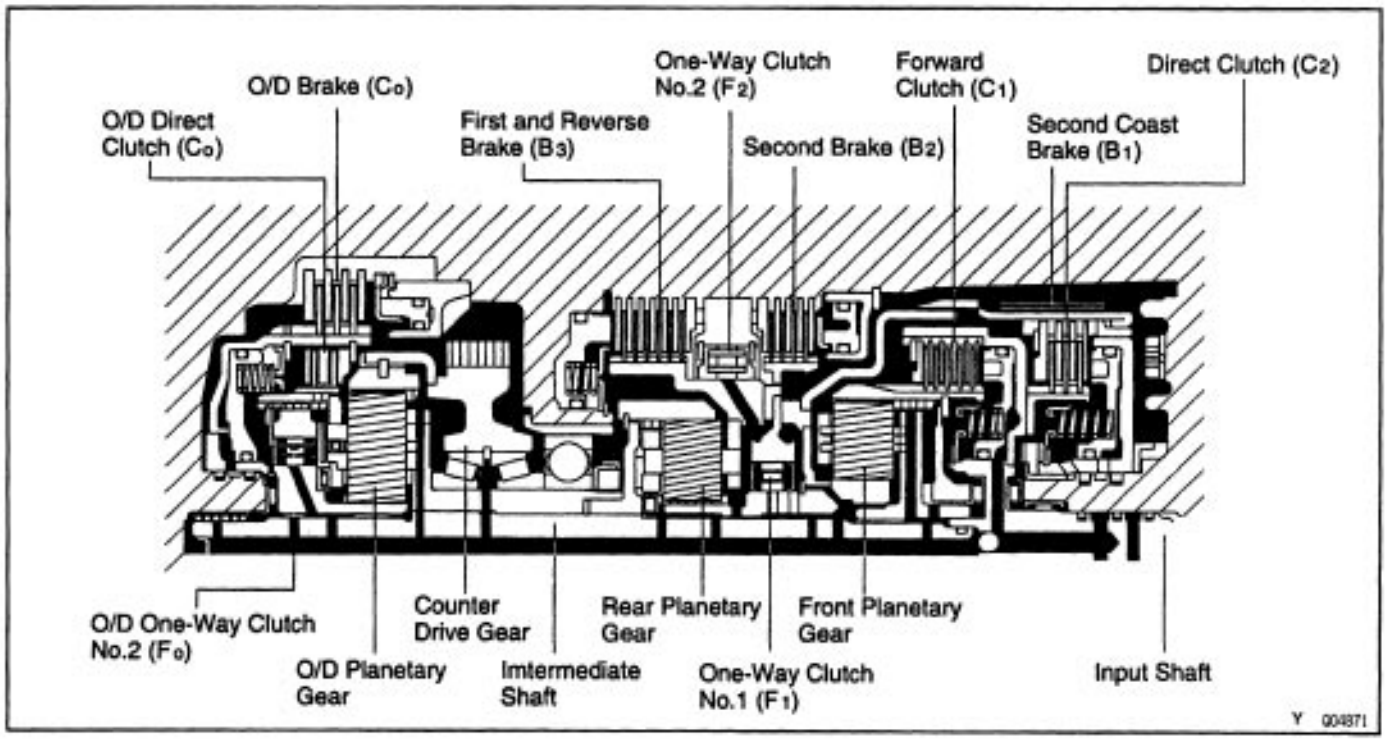


GENERAL SPECIFICATIONS

Type of Transaxle		A541E
Type of Engine		1MZ–FE
Torque Converter Clutch Stall Torque Ratio		1.8 : 1
Torque Converter Clutch Lock–up Mechanism		Equipped
Gear Ratio	1 st Gear	2.810
	2nd Gear	1.549
	3rd Gear	1.000
	O/D Gear	0.735
	Reverse Gear	2.296
Transaxle	Number of Discs and Plates	
	0/D Direct Clutch (Co)	2 / 2
	Forward Clutch (C,)	5 / 5
	. Direct Clutch (Ct)	3 / 3
	2nd Brake (B:j	4 / 4
	First and Reverse Brake (Bj	6 / 6
	O/D Brake (Bo)	3 / 3
B, Band Width	mm (in.)	31 (1.22)
ATF Type		ATF DEXRON® II
Capacity liter (US qts, Imp.qts)	A/T	6.75(7.1, 5.9)
	D/F	0.85 (0.9, 0.7)

OPERATION

1. MECHANICAL OPERATION



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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	1 st	○	○						○		○
	2nd	○	○				○		○	○	
	3rd	○	○	○			○		○		
	O/D		○	○	○		○				
2	1 st	○	○						○		○
	2nd	○	○			○	○		○	○	
	*3rd	○	○	○			○		○		
L	1 St	○	○					○	○		○
	‘2nd	○	○			○	○		○	○	

*Down–shift only – no up–shift

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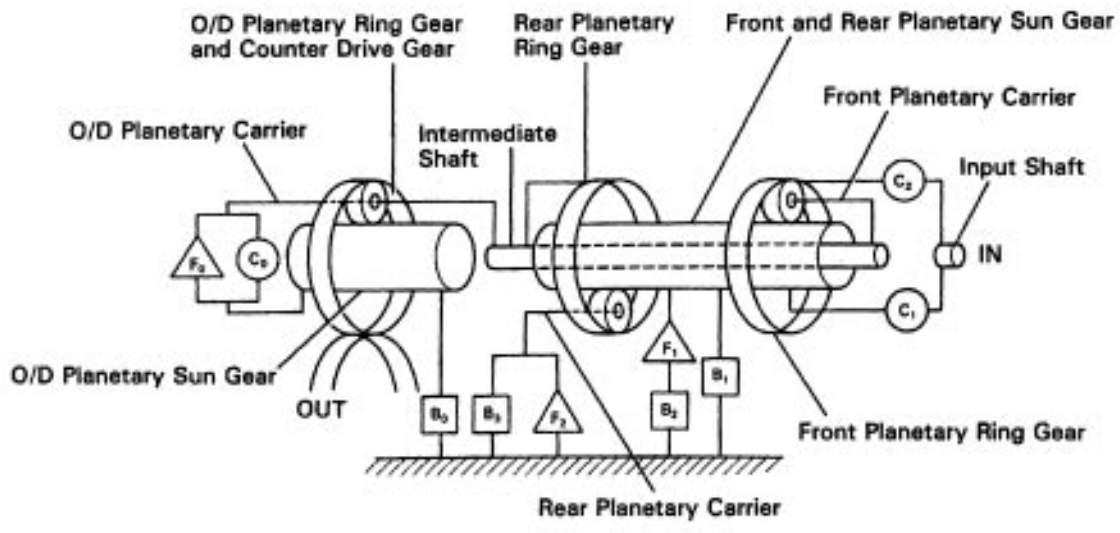
2. FUNCTION OF COMPONENTS

COMPONENT		FUNCTION
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 counterclockwi
2nd Brake	B_2	Prevents outer race o I from turning either clockwise or counterclockwise, thus preventing front & rear planetary sun gear from turning counterclockwise
1 st & Reverse Brake	B_3	Prevents rear planetary carrier from turning either clockwise or counterclockwise
No. 1 One–Way Clutch	F_1	When BZ 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
O/D Direct Clutch	C_0	Connects overdrive sun gear and overdrive planetary carrier
O/D Brake	B_0	Prevents overdrive sun gear from turning either clockwise or counterclockwise
O/D One–Way Clutch	F_0	When transaxle is– being driven by engine, connects overdrive sun gear and overdrive carrier
Planetary Gears		These gears change the route through which driving force is transmitted in accor–dance with the operation of each clutch and brake in order to increase or reduce the in–put and output speed



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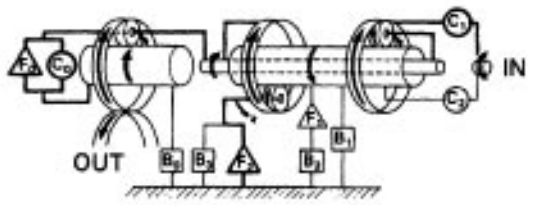
Power from the engine transmitted to the input shaft via the torque converter clutch is then transmitted to the planetary gears by the operation of the clutch.
By operation of the brake and one–way clutch, either the planetary carrier or the planetary sun gear are immobilized, altering the speed of revolution of the planetary gear unit.
Shift change is carried out by altering the combination of clutch and brake operation.
Each clutch and brake operates by hydraulic pressure; gear position is decided according to the throttle opening angle and vehicle speed, and shift change automatically occurs.
The conditions of operation for each gear position are shown on the following illustrations:

D or 2 Position 1 st Gear



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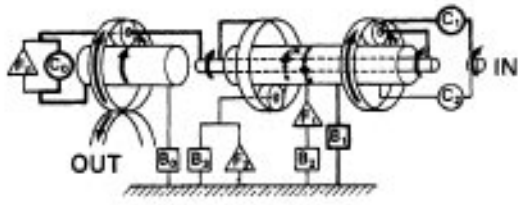
2 Position 2nd Gear



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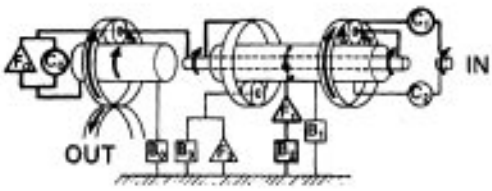
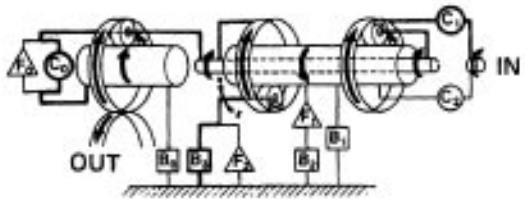
D Position 2nd Gear



AT1098

L Position 1 st Gear



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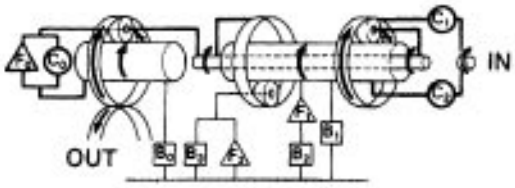
D Position 3rd Gear



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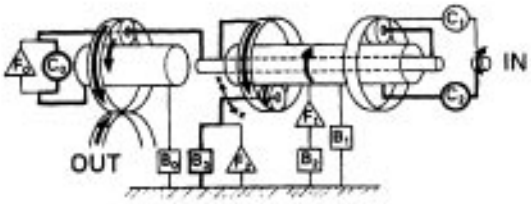
R Position Reverse Gear



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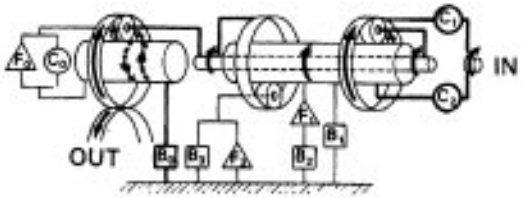
D Position O/D Gear



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3. HYDRAULIC CONTROL SYSTEM

The hydraulic control system is composed of the oil pump, the valve body, the solenoid valves, the accumulators, the clutches and brakes as well as the fluid passagas which connect all of these components.

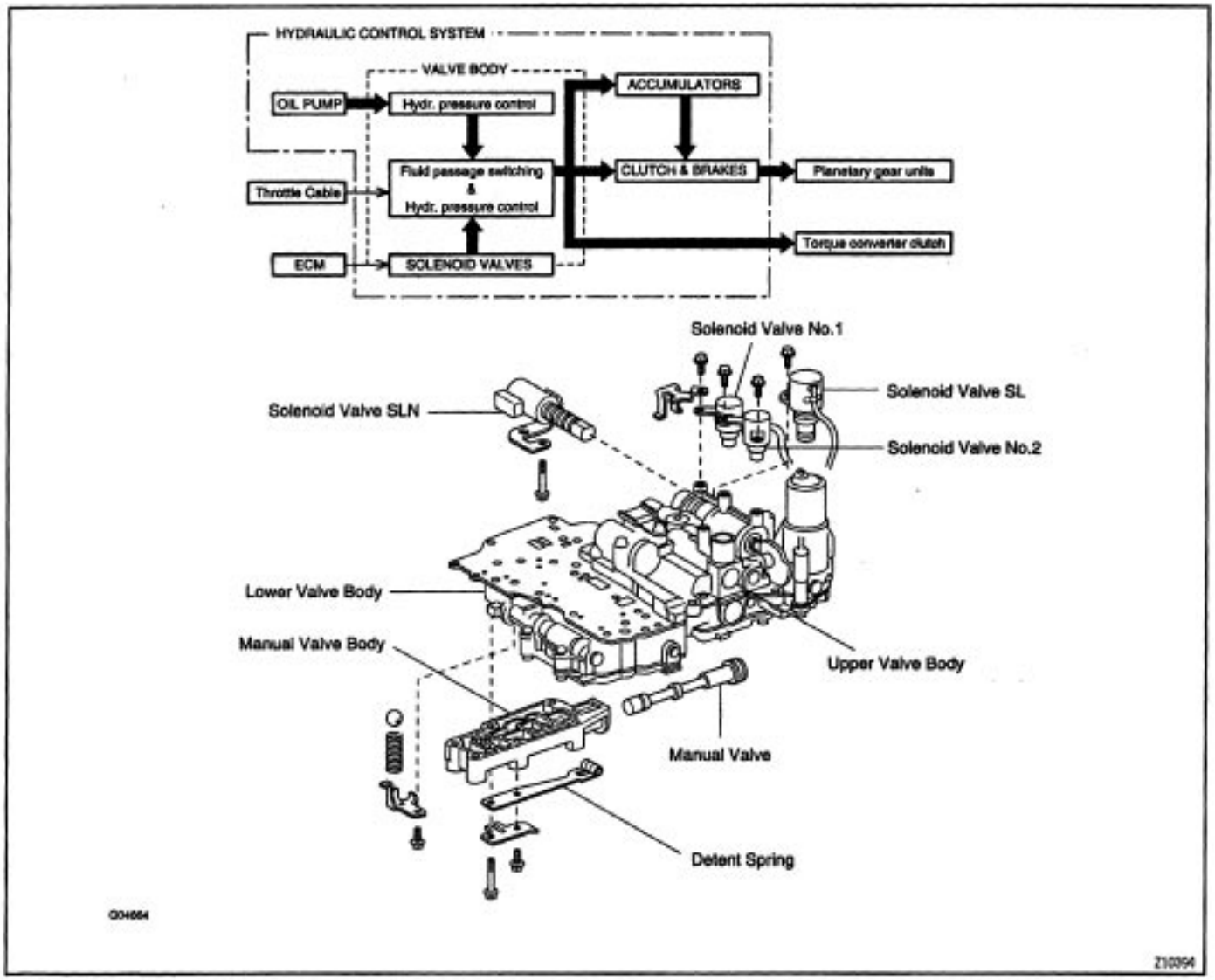
Based on the hydraulic pressure created by the oil pump, the hydraulic control system governs the hydraulic pressure acting on the torque converter clutch, clutches and brakes in accordance with the vehicle driving conditions.

There are three solenoid valves on the valve body.

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

The SL solenoid valve is operated by signals from the ECM to engage or disengage the lock –up clutch of the torque converter clutch.

The SLN solenoid valve is operated by signals from the ECM to control the engagement speed and reduce gear shift shock.



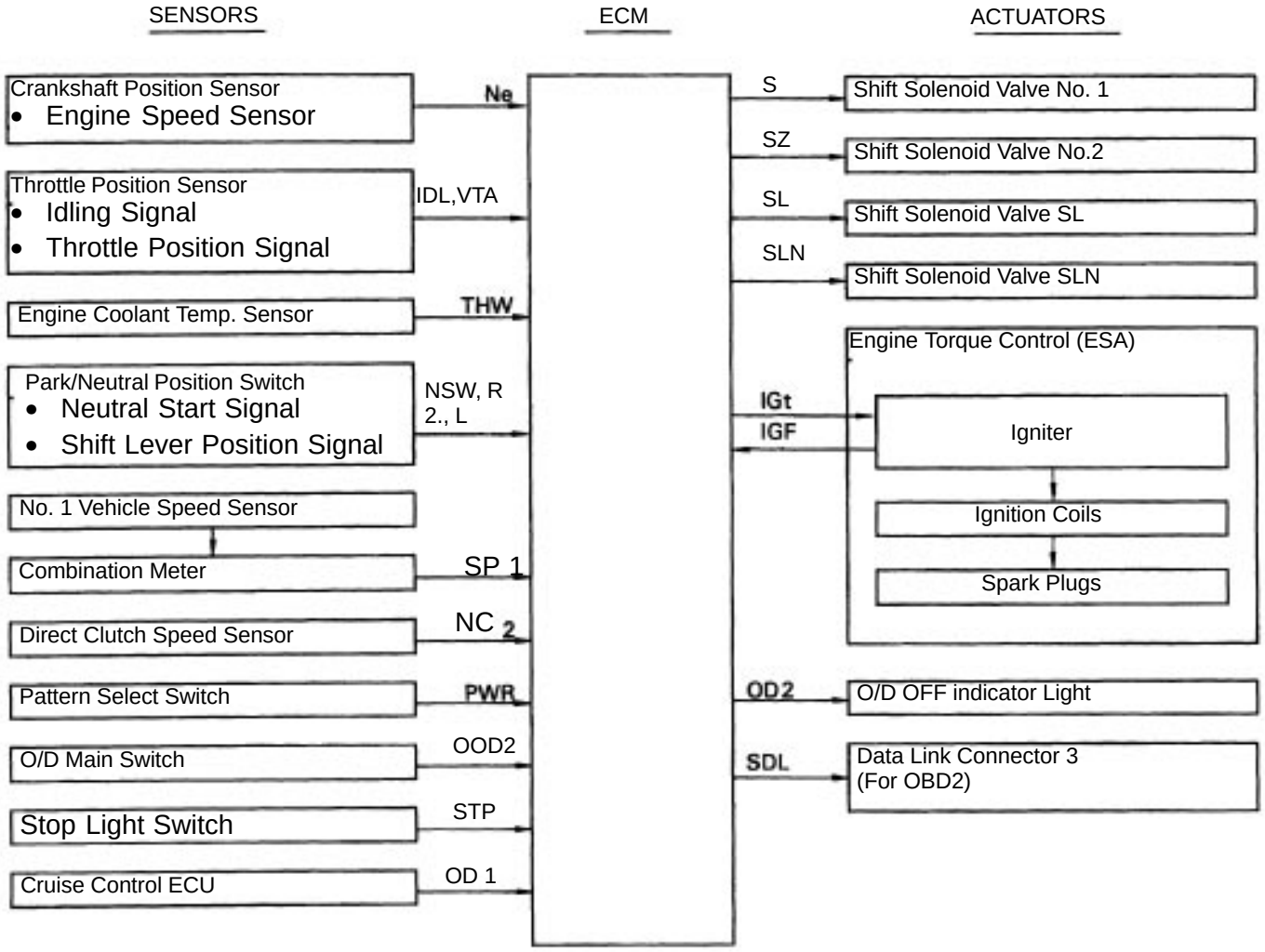
4. ELECTRONIC CONTROL SYSTEM

GENERAL

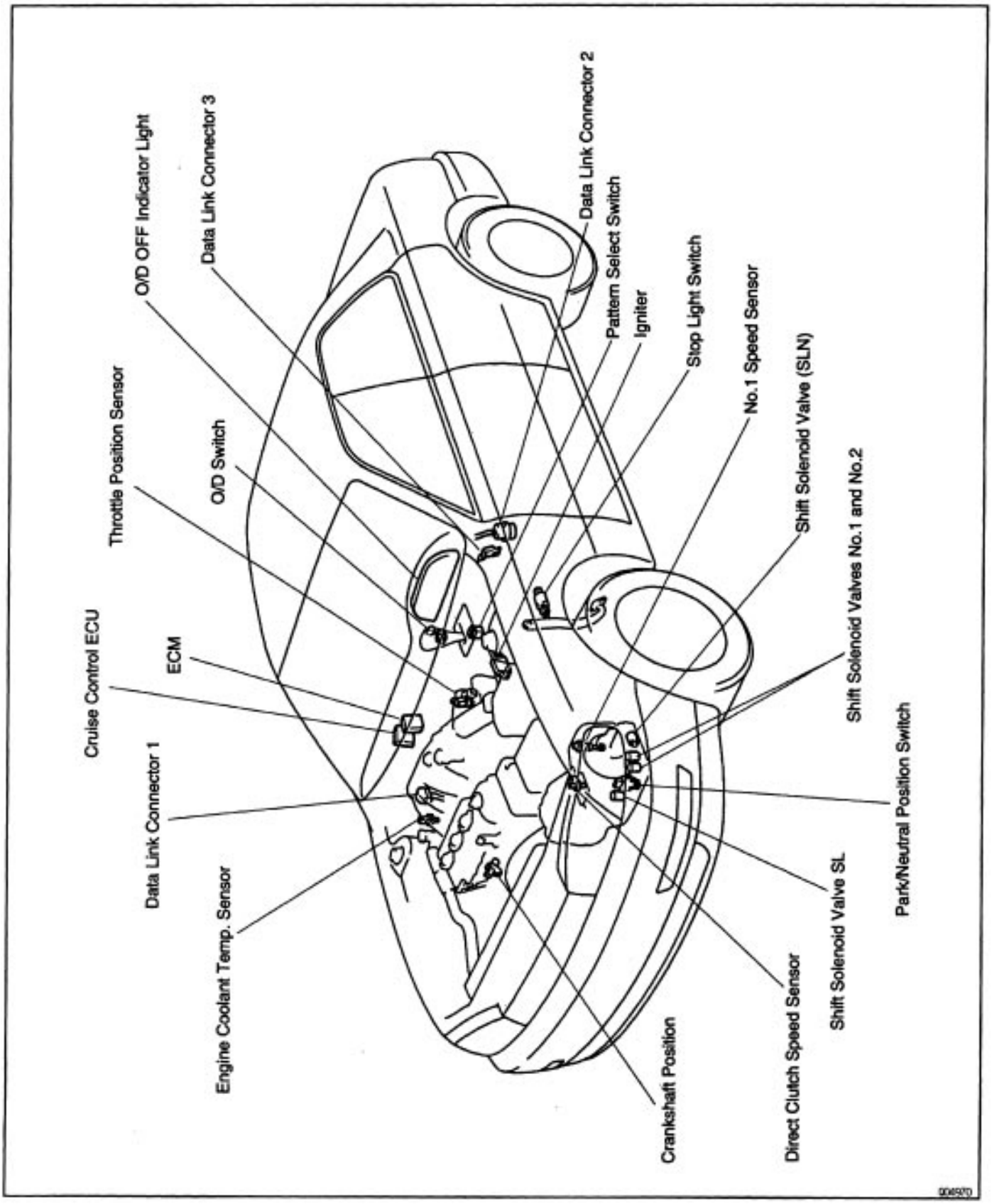
The electronic control system for the A541 E automatic transaxte provides extremely precise control of the gear shift timing and lock–up timing in response to driving conditions as sensed by various sensors located throughout the vehicle and in response to the engine's running condition. At the same 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 of electronically controlled components and warns the driver, and a fail–safe system which makes it possible for the vehicle to continue functioning when a malfunction occurs.

CONSTRUCTION

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

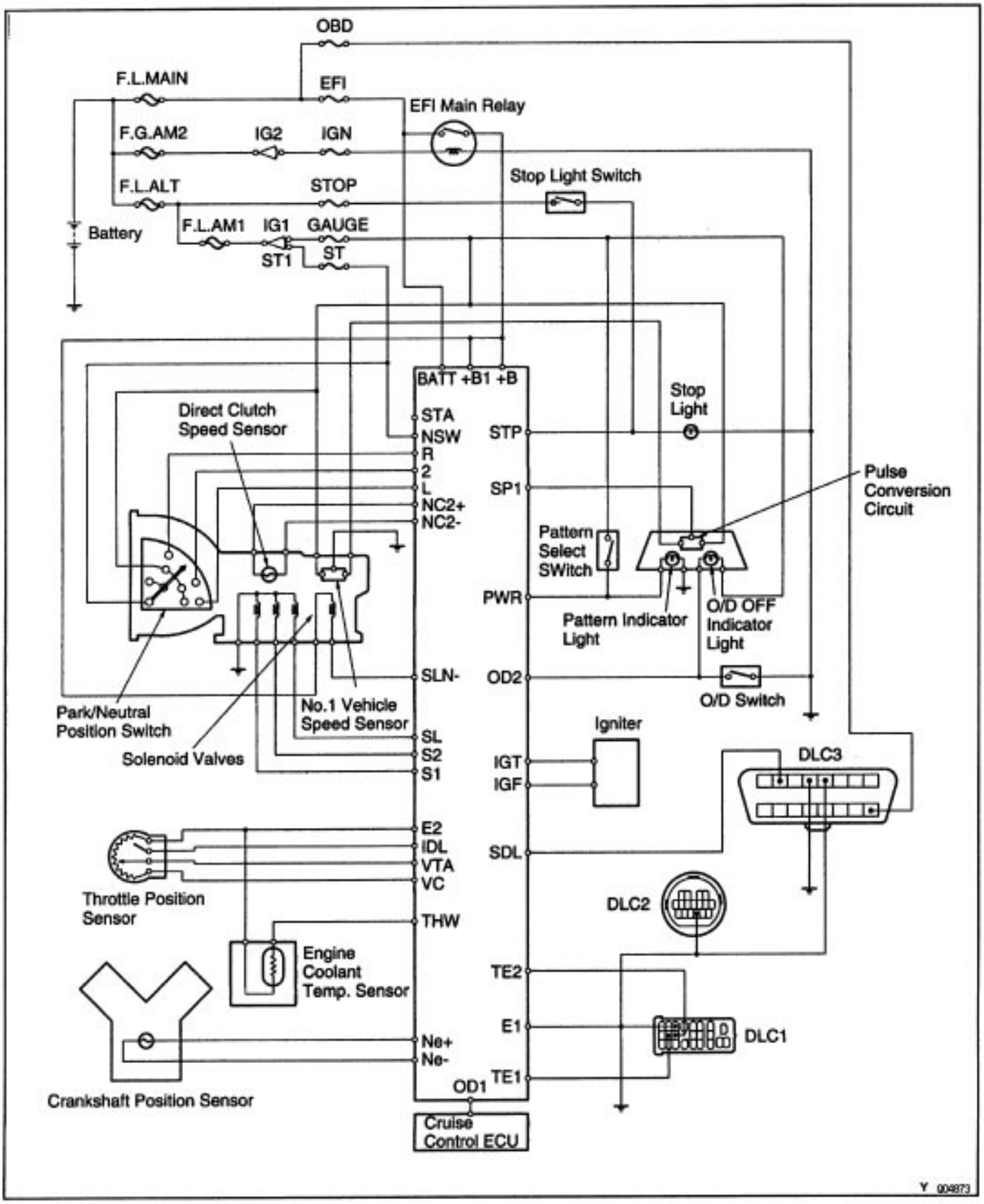


ARRANGEMENT OF COMPONENTS



No.	Components	functions
①	Park/Neutral Position Switch	Detects the shift lever position.
②	Direct Clutch Speed Sensor	Detects the input shaft speed from 1 st gear to 3rd gear.
③	Shift Solenoid Valve SL	Controls the hydraulic pressure applied to the lock–up clutch and controls lock–up timing.
④	Shift Solenoid Valve SLN	Controls the hydraulic pressure applied to the back cham–ber of the accumulator and smooths the engagement of clutches and brakes during shifting .
⑤	Shift Solenoid Valve No. 1 and No.2	Controls the hydraulic pressure applied to each shift valve, and control the gear shift position and timing.
⑥	Stop Light Switch	Detects if the brake pedal is depressed.
⑦	Vehicle Speed Sensor	Detects and sends a vehicle speed signal to the ECM.
⑧	Pattern Select Switch	Selects the Power mode or the Normal mode for shift and lock–up timing.
⑨	0/D OFF Indicator Light	Blinks and warns the driver, while the 0/D main switch is pushed in, when the electronic control circuit is malfunc–tioning. ’
⑩	O/D Switch	Prevents up–shift to the O/D gear if the O/D switch is off.
⑪	ECM	Controls the engine and transaxle actuators based on signals from each sensor.
⑫	Throttle Position Sensor	Detects the throttle valve opening angle.
⑬	Engine Coolant Temp. Sensor	Detects the engine coolant temperature.
⑭	Cruise Control ECU	This ECM prevents the transaxle from shifting into over–drive and prohibits lock–up control when the vehicle’s speed drops below the auto drive set speed parameter.
⑮	Data Link Connector 3	By connecting the OBD II scan tool or TOYOTA hand–held tester the transaxle control data can be read.

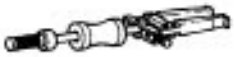
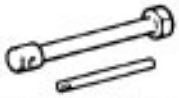
SYSTEM DIAGRAM



PREPARATION

SST (SPECIAL SERVICE TOOLS)

AX011E–38

	09043–38100 Hexagon 10 mm Wrench	Remove and install oil pan drain plug.
	09223–15010 Crankshaft Rear Oil Seal Replacer	
	09308–00010 Oil Seal Puller	Remove side gear shaft oil seal.
	09316–60010 Transmission & Transfer Bearing Reptacer	Install RH side bearing to differential case.
	(09316–00010) Replacer Pipe	Install right sid, gear shaft oil seal.
	09350–32014 TOYOTA Automatic Transmission Tool Set	
	(09351–32010) One–way Clutch Test Tool	
	(09351–32020) Stator Stopper	
	09992–00094 Automatic Transmission Oil Pressure Gauge Set	Line pressure

RECOMMENDED TOOLS

	09031–00030 Pin Punch	Pin diameter 3 mm(0.12 in.)
	09082–00050 TOYOTA Electrical Tester 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

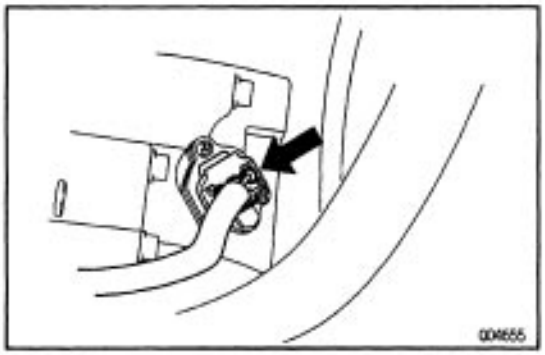
Item	Capacity	Classification
Automatic transaxle fluid (w/o Differential oil) Dry fill Drain and refill	 6.75 liters (7.1 US qts, 5.9 Imp. qts) 3.5 liters (3.7 US qts, 3.1 imp. qts)	 ATF DEXRON' II
Differential Fluid	0.85 liters (0.9 US qts, 0.7 Imp. qts)	ATF DEXRON' 1I

SSM (Special Service Materials)

08833–00070 Adhesive 1311, THREE BOND 1311 or equivalent	Torque converter clutch mounting bolt

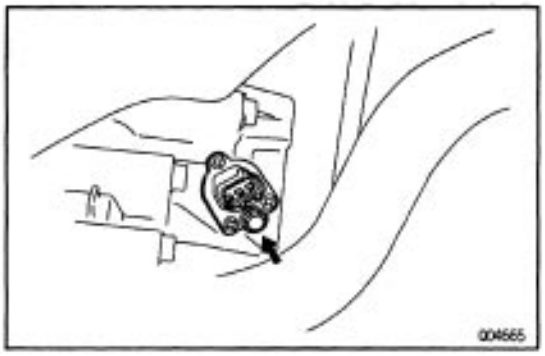
ON–VEHICLE REPAIR

CAUTION: Work must be started after 90 seconds from the time the ignition switch is turned to the ”LOCK” position and the negative (–) terminal cable is disconnected from the battery.



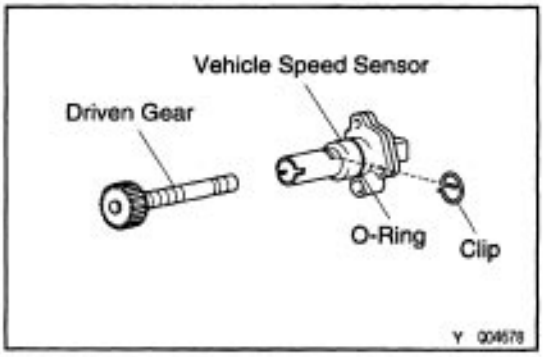
VEHICLE SPEED SENSOR REPLACEMENT (w/Speedometer Driven Gear)

1. DISCONNECT VEHICLE SPEED SENSOR CONNECTOR



2. REMOVE VEHICLE SPEED SENSOR ASSEMBLY

(a) Remove the bolt and vehicle speed sensor assembly.



(b) Remove the clip and speedometer driven gear from vehicle speed sensor.

(c) Remove the O–ring from vehicle speed sensor.

3. INSPECT VEHICLE SPEED SENSOR

4. INSTALL VEHICLE SPEED SENSOR ASSEMBLY

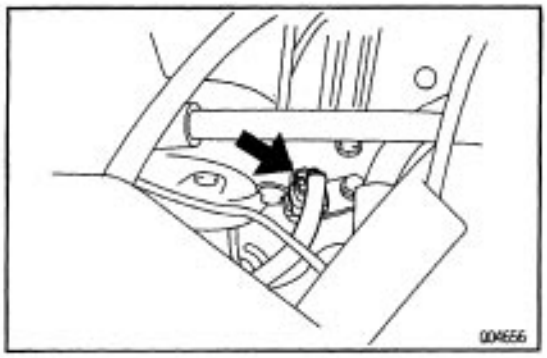
(a) Coat a new 0–ring with ATF and install it to the vehicle speed sensor.

(b) Install the speedometer driven gear to the vehicle speed sensor and clip.

(c) Install the vehicle speed sensor assembly and torque the bolts.

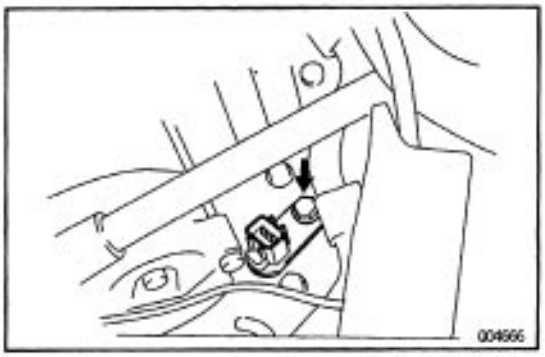
Torque: 16 N–m (160 kgf–cm. 12 ft–lbf)

5. CONNECT VEHICLE SPEED SENSOR CONNECTOR



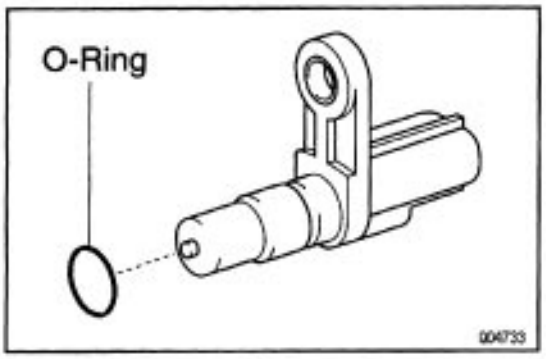
DIRECT CLUTCH SPEED SENSOR REPLACEMENT

1. DISCONNECT DIRECT CLUTCH SPEED SENSOR CONNECTOR



2. REMOVE DIRECT CLUTCH SPEED SENSOR

(a) Remove the bolt and direct clutch speed sensor.



(b) Remove the 0 –ring from direct clutch speed sensor.

3. INSPECT DIRECT CLUTCH SPEED SENSOR

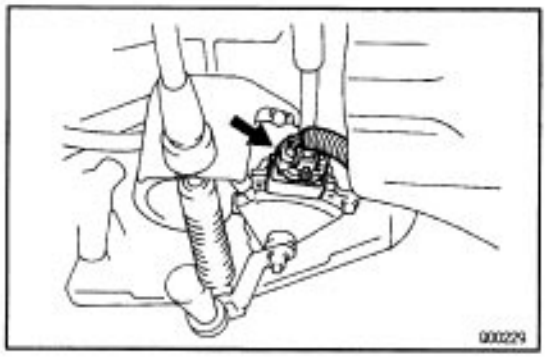
(See page AX2–108)

4. INSTALL DIRECT CLUTCH SPEED SENSOR

(a) Coat a new 0–ring with ATF and install it to the direct clutch speed sensor.

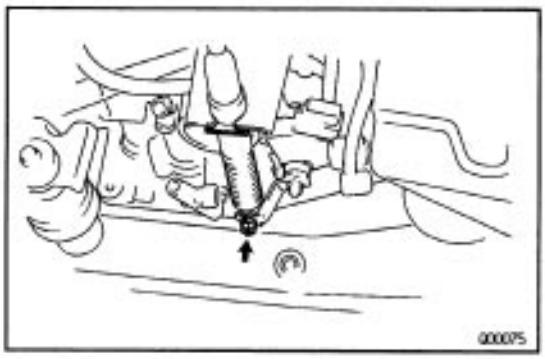
(b) Install the direct clutch speed sensor and torque the bolt.

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



PARK/NEUTRAL POSITION SWITCH REPLACEMENT

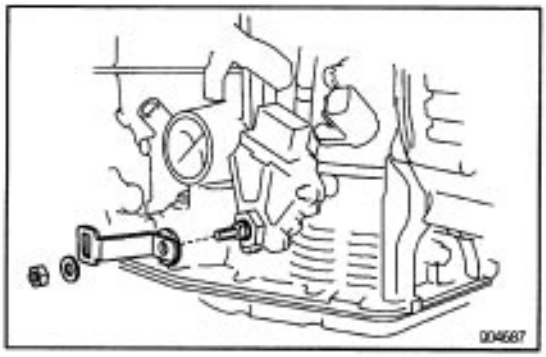
1. DISCONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR



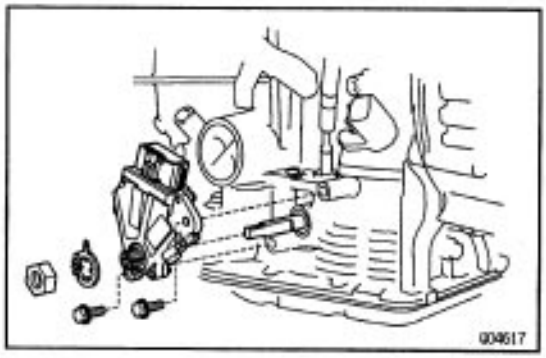
2. REMOVE PARK/NEUTRAL POSITION SWITCH

(a) Remove the clip from the shift control cable.

(b) Remove the nut and control cable.



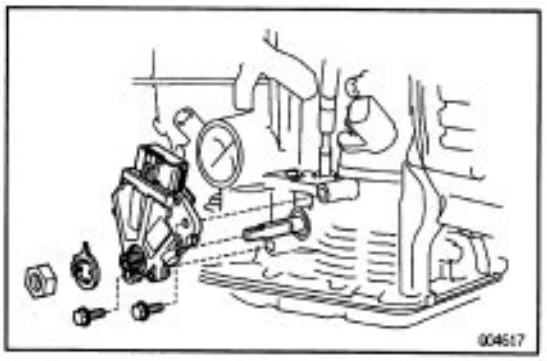
(c) Remove the transaxle control shaft lever.



(d) Remove the park/neutral position switch.

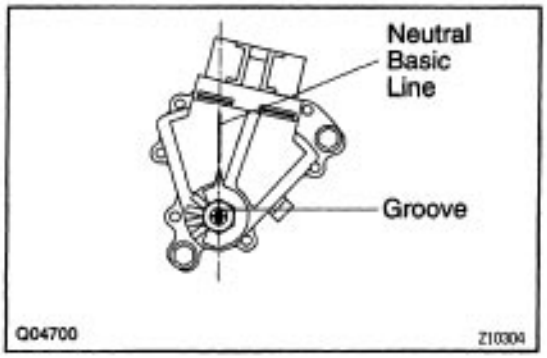
3. INSPECT PARK/NEUTRAL POSITION SWITCH

(See page AX2–116)

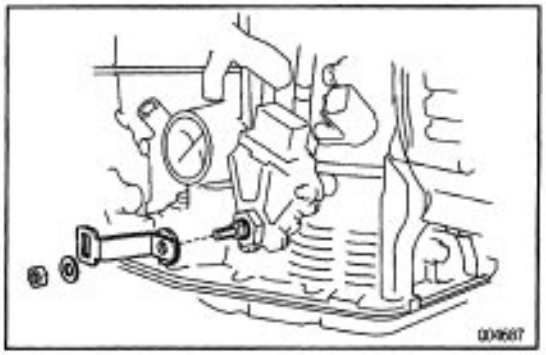


4. INSTALL AND ADJUST PARK/NEUTRAL POSITION SWITCH

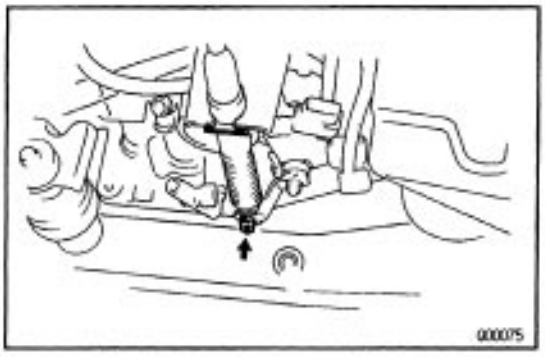
(a) Install the park/neutral position switch.



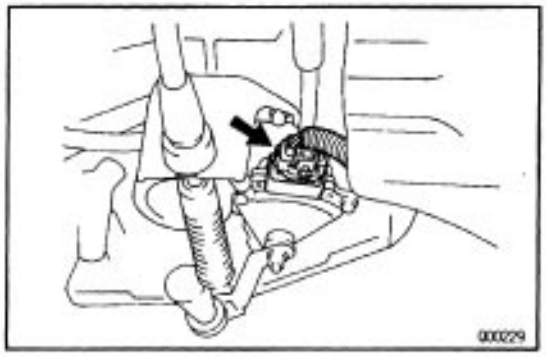
(b) Adjust the park/neutral position switch.
(See page AX2–69)



(c) Install the transaxle control shaft lever.

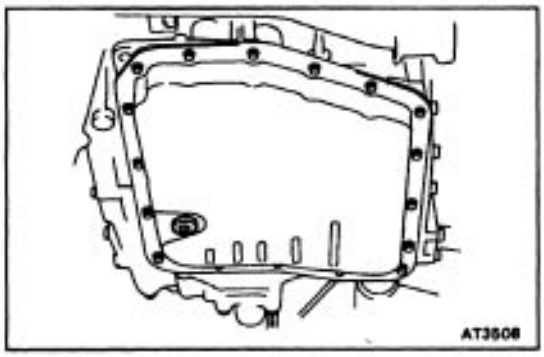


(d) Install the control cable and nut.
(e) Install the clip to the shift control cable.



5. CONNECT PARK/ NEUTRAL POSITION SWITCH CONNECTOR

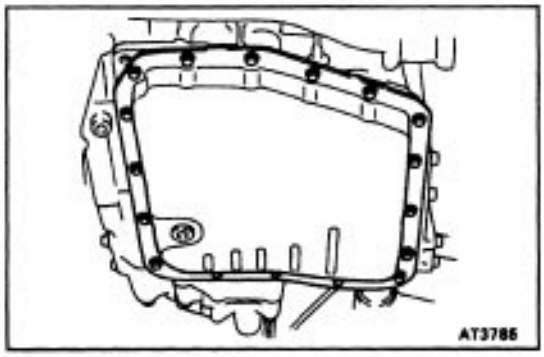
6. TEST DRIVE VEHICLE



VALVE BODY REMOVAL

1. CLEAN TRANSAXLE EXTERIOR

To help prevent contamination, clean the exterior of the transaxle.



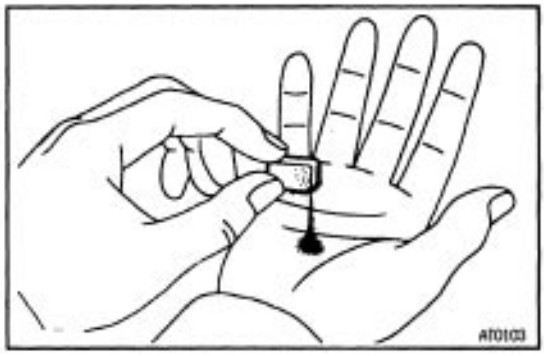
2. DRAIN TRANSAXLE FLUID

Using SST, remove the drain plug and the fluid into suitable container.

SST 09043 – 38100

3. REMOVE OIL PAN AND GASKET

NOTICE: Some fluid will remain in the oil pan. Remove all pan bolts, and carefully remove the pan assembly. Discard the gasket.

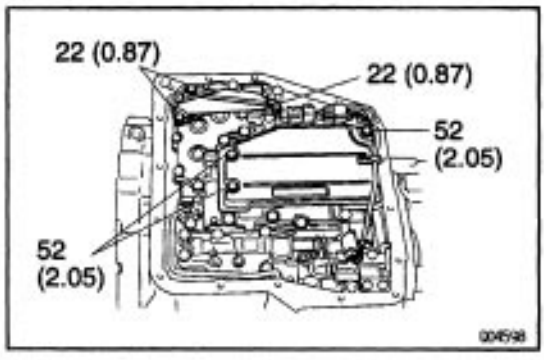


4. EXAMINE PARTICLES IN PAN

Remove the magnets and use them to collect any steel chips. Look carefully at the chips and particles in the pan and the magnet to anticipate what type of wear you will find in the transaxle.

Steel (magnetic): bearing, gear and plate wear

Brass (non–magnetic): bushing wear

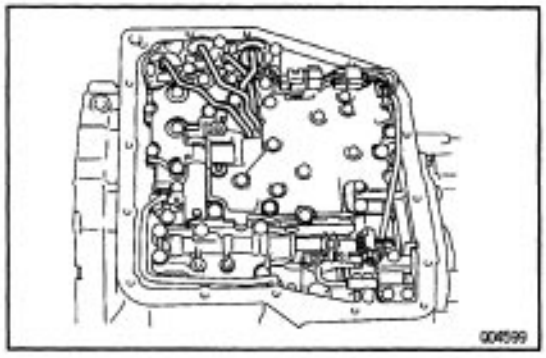


5. REMOVE OIL STRAINER AND APPLY TUBE BRACK–ET

(a) Remove the 3 bolts and the oil strainer.

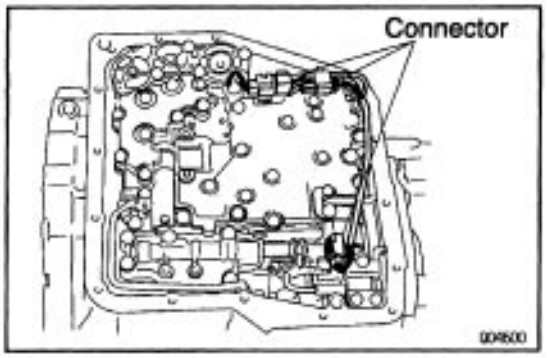
NOTICE: Be careful as oil will come out of the strainer when it is removed.

(b) Remove the 3 bolts and the apply tube bracket.

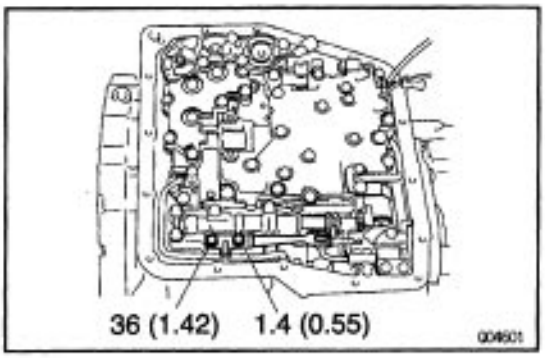


6. REMOVE OIL TUBES

Pry up both tube ends with a large screwdriver and remove the 5 tubes.

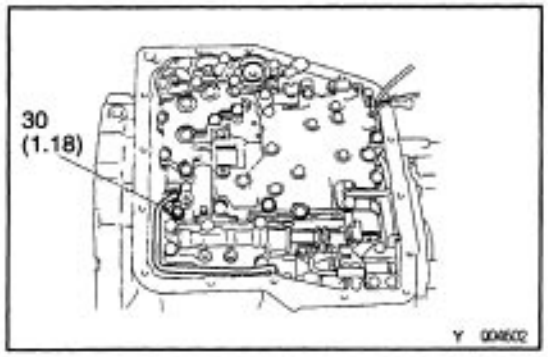


7. DISCONNECT SOLENOID CONNECTORS

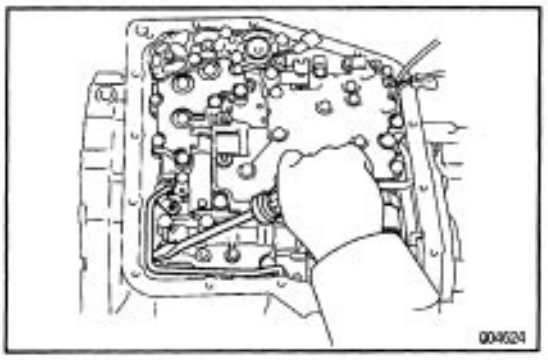


8. REMOVE TRANSFER LUBRICATION APPLY TUBE

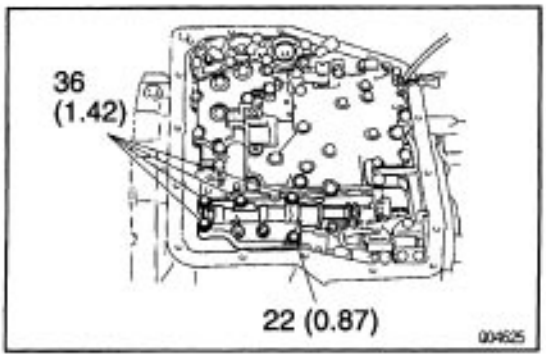
(a) Remove the 2 bolts and detent spring.



(b) Remove the tube set bolts.

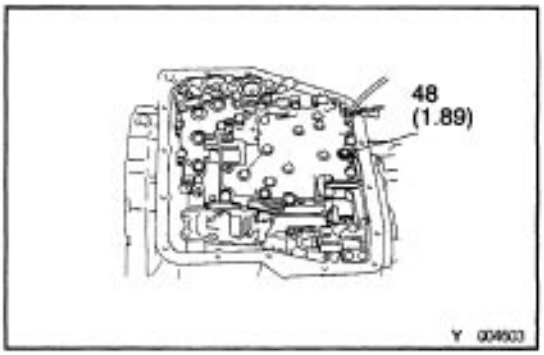


(c) Pry up the tube with a screwdriver and remove the tube.



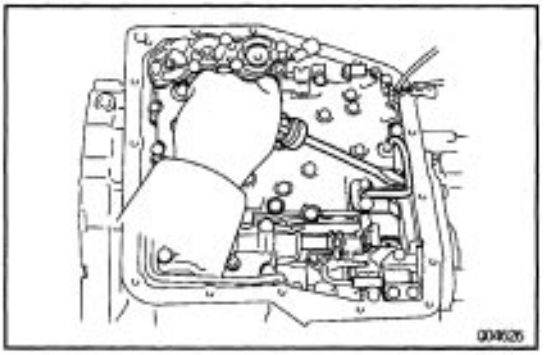
9. REMOVE MANUAL VALVE BODY

Remove the 5 bolts and manual valve body.

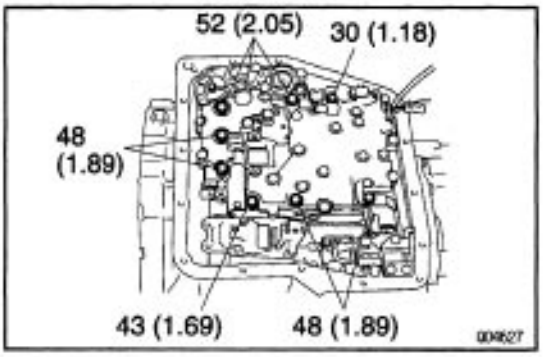


10. REMOVE B3 APPLY TUBE

(a) Remove the tube retainer.

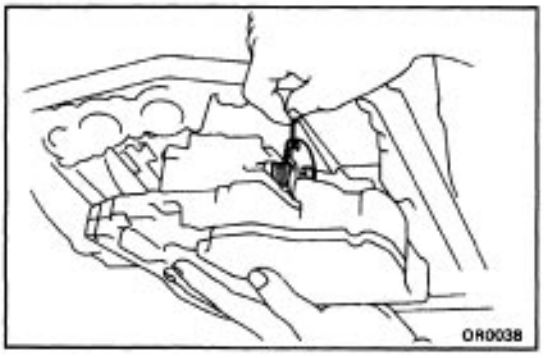


(b) Pry up the tube with a screwdriver and remove the tube.

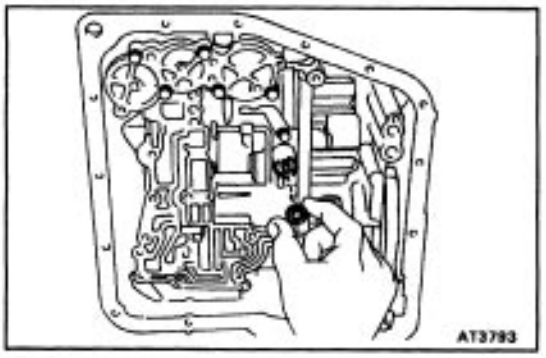


11. REMOVE VALVE BODY

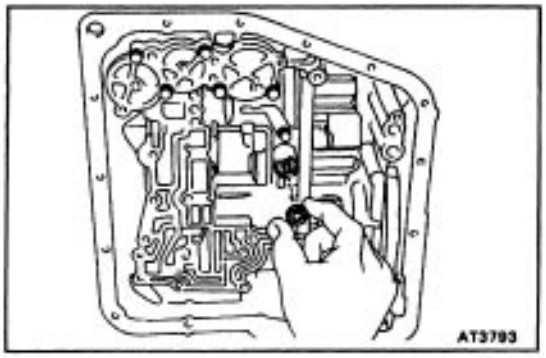
(a) Remove the 11 bolts.



(b) Disconnect the throttle cable from cam and remove the valve body.

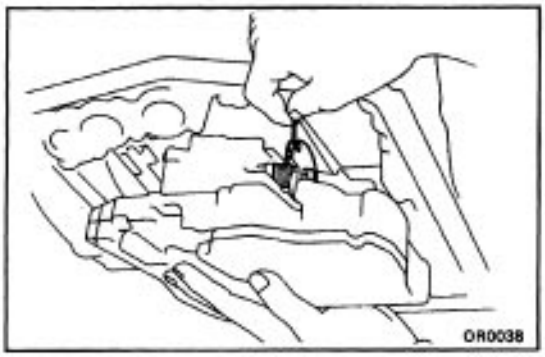


12. REMOVE SECOND BRAKE APPLY GASKET



VALVE BODY INSTALLATION

1. INSTALL NEW SECOND BRAKE APPLY GASKET

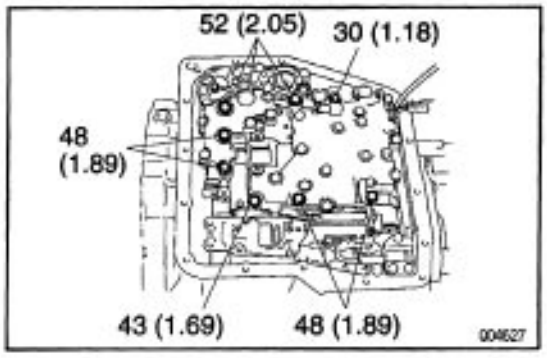


2. INSTALL VALVE BODY

(a) While holding the cam down with your hand, slip the cable end into the slot.

(b) Bring valve body into place.

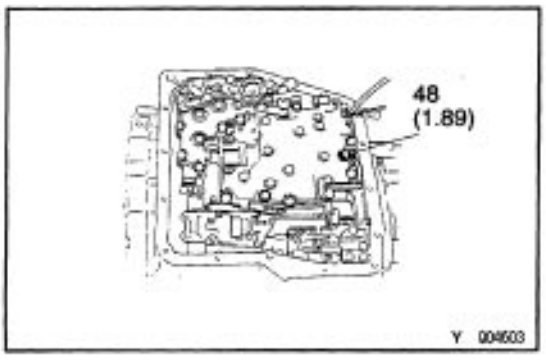
NOTICE: Be careful not to entangle the solenoid wire.



(c) Finger tighten all bolts first. Then tighten them with a torque wrench.

HINT: Each bolt length (mm, in.) is indicated in the illustration.

Torque: 11 N–m (110 kgf–cm. 8 ft–lbf)



3. INSTALL 133 APPLY TUBE

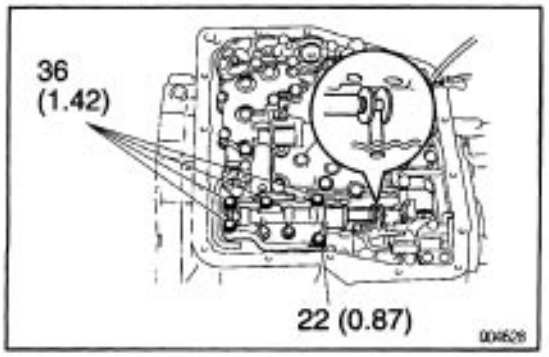
(a) Using a plastic hammer, install the tube into the position indicated in the illustration.

NOTICE: Be careful not to bend or damage the tubs.

(b) Install the tube retainer.

HINT: The bolt length (mm, in.) is indicated in the illustration.

Torque: 11 N–m (110 kgf–cm, 8 ft–lbf)



4. INSTALL MANUAL VALVE BODY

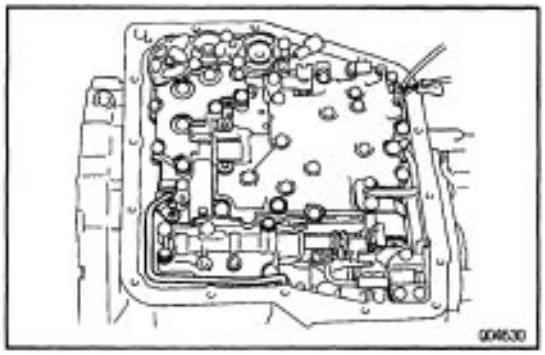
(a) Align the manual valve with the pin on the manual valve lever.

(b) Install the valve body into place.

(c) Finger tighten the 5 bolts first. Then tighten them with a torque wrench.

HINT: Each bolt length (mm, in.) is indicated in the illustration.

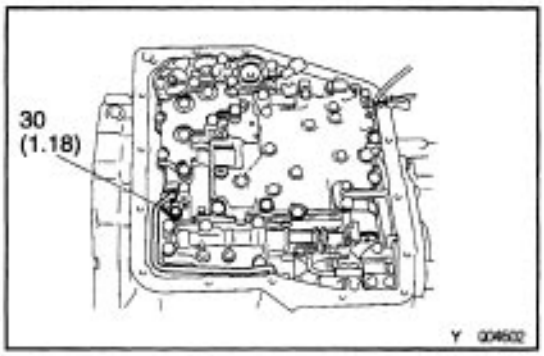
Torque: 11 N–m (110 kgf–cm, 8 ft–lbf)



5. INSTALL TRANSFER LUBRICATION APPLY TUBE AND DETENT SPRING

(a) Using a plastic hammer, install the tube into the position indicated in the illustration.

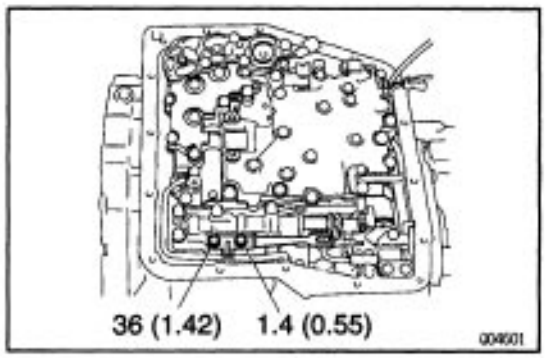
NOTICE: Be careful not to bend or damage the tube.



(b) Install the bolt.

HINT: The bolt length (mm, in.) is indicated in the illustration.

Torque: 11 N–m (170 kgf–cm, 8 ft–lbf)

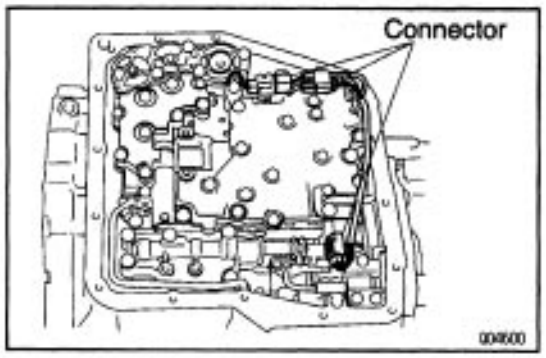


(c) Install the detent spring.

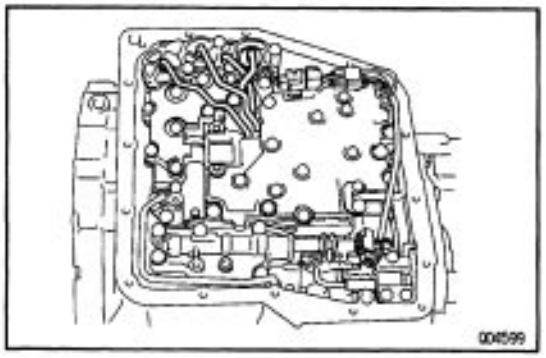
HINT: Each bolt length (mm, in.) is indicated in the illustration.

Torque: 11 N–m (110 kgf–cm, 8 ft–lbf)

(d) Check that the manual valve lever is in contact with the center of the roller at the tip of the detent spring.



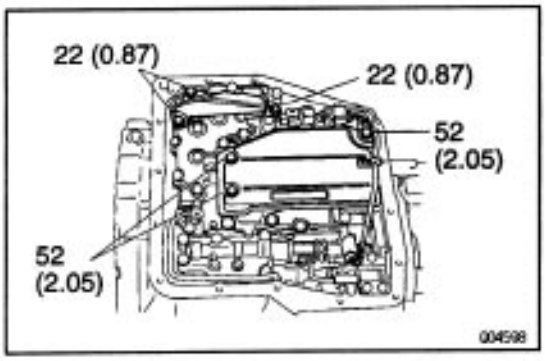
6. CONNECT SOLENOID CONNECTORS



7. INSTALL OIL TUBES

(a) Using a plastic hammer, install the tubes into the positions indicated in the illustration.

NOTICE: Be careful not to bend or damage the tubes.



8. INSTALL OIL STRAINER AND APPLY TUBE BRACK–ET

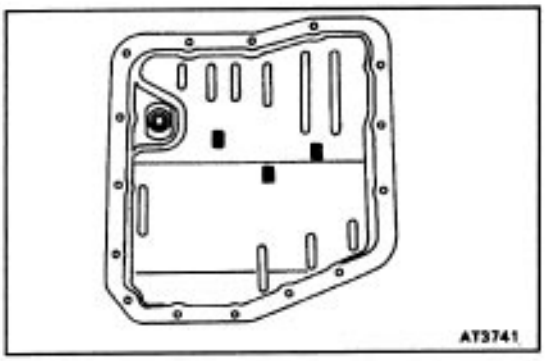
Install the oil strainer.

Torque: 11 N–m (110 kgf–cm, 8 ft–lbf)

Install the tube bracket.

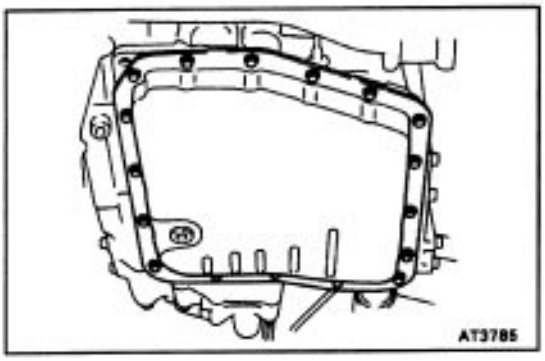
Torque: 10 N–m (100 kgf–cm, 7 ft–lbf)

HINT: Each bolt length (mm, in.) is indicated in the illustration.



9. INSTALL MAGNETS

NOTICE: Make sure that the magnet does not interfere with the oil tubes.

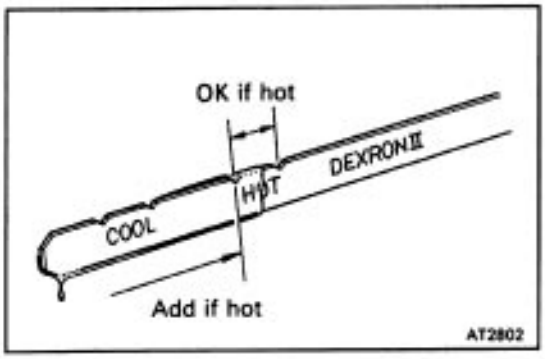


10. INSTALL OIL PAN

(a) Install a new gasket and oil pan.

(b) Install and torque 17 bolts.

Torque: 4.9 N–m (50 kgf–cm, 43 ft–lbf)



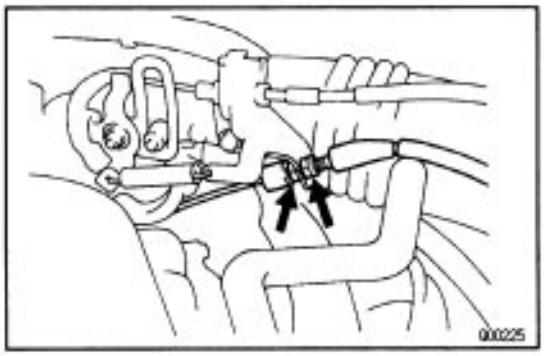
11. FILL TRANSAXLE WITH ATF

NOTICE: Do not overfill.

Fluid type:

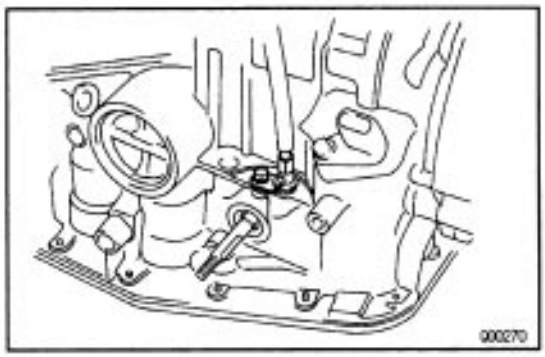
ATF DEXRON° II

12. CHECK FLUID LEVEL (See page AX2–68)

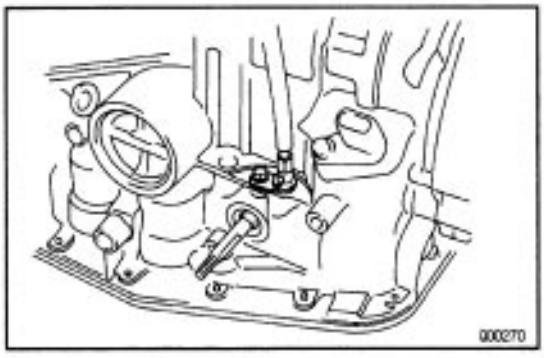


THROTTLE CABLE REMOVAL

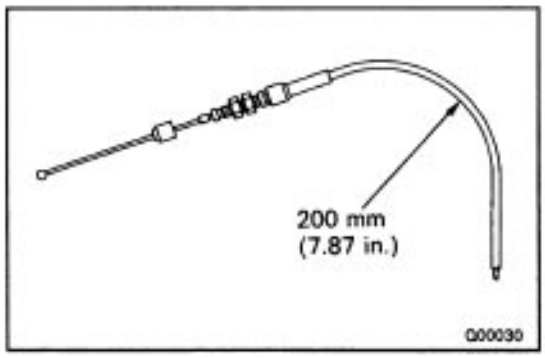
1. DISCONNECT THROTTLE CABLE FROM ENGINE
Disconnect the cable from the throttle linkage.
2. REMOVE PARK/NEUTRAL POSITION SWITCH
(See page AX2–61)
3. REMOVE VALVE BODY
(See page AX2–18)



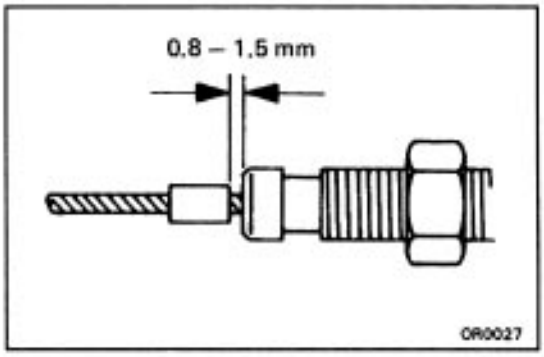
4. REMOVE THROTTLE CABLE
(a) Remove the bolt and retaining plate.
(b) Pull out the cable from the transaxle case.



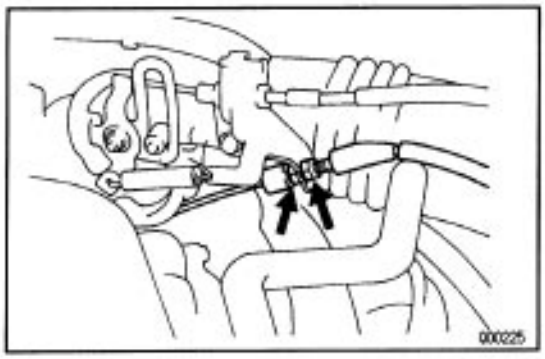
THROTTLE CABLE INSTALLATION
1. INSTALL CABLE INTO TRANSAXLE CASE
(a) Be sure to push it in all the way.
(b) Install the retaining plate and bolt.
2. INSTALL VALVE BODY (See page AX2–21)



3. IF THROTTLE CABLE IS NEW, STAKE STOPPER OR
PAINT MARK ON INNER CABLE
HINT: New cables do not have a staked cable stopper.
(a) Bend the cable so there is a radius of about 200 mm (7.87 in.).
(b) Pull the inner cable lightly until a light resistance is felt, and hold it in position there.



(c) Stake the stopper, 0.8–1.5 mm (0.031 –0.059 in.) from the end of outer cable.



4. CONNECT THROTTLE CABLE TO ENGINE

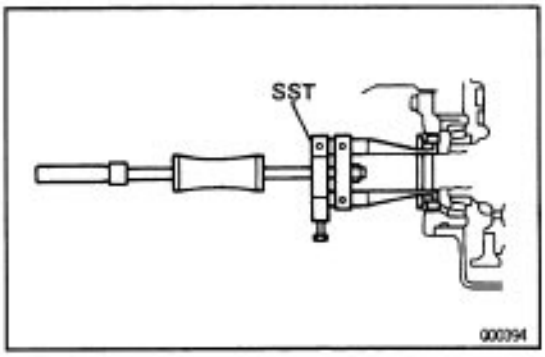
5. ADJUST THROTTLE CABLE

(See page AX2–69)

6. INSTALL PARK/NEUTRAL POSITION SWITCH

(See page AX2–16)

7. TEST DRIVE VEHICLE



SIDE GEAR SHAFT OIL SEAL REPLACEMENT

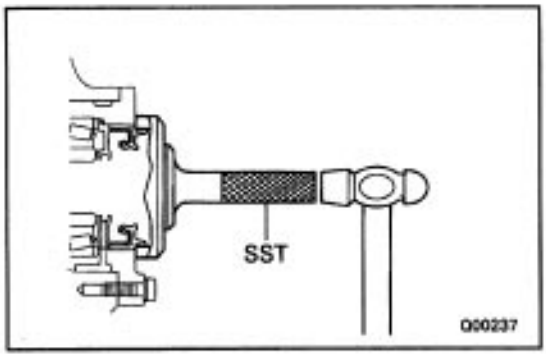
1. REMOVE BOTH DRIVE SHAFTS

(See page SA–22)

2. REMOVE BOTH SIDE GEAR SHAFT OIL SEALS

Using SST, pull out the oil seal.

SST 09308–00010



3. INSTALL LEFT SIDE GEAR SHAFT OIL SEAL

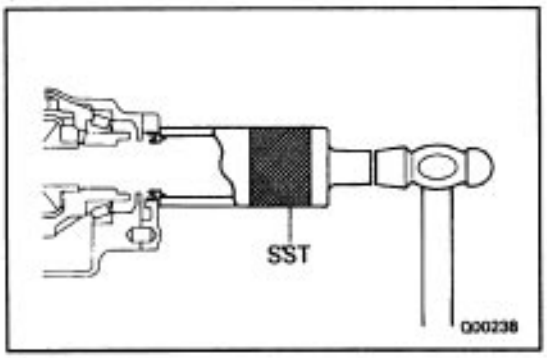
(a) Using SST, drive in a new oil seal.

SST 09223–15010

Oil seal depth:

0 ± 0.5 mm (0 ± 0.02 in.)

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



4. INSTALL RIGHT SIDE GEAR SHAFT OIL SEAL

(a) Using SST, drive in a new oil seal.

SST 09316–60010 (09316–00010)

Oil seal depth:

0 ± 0.5 mm (0 ± 0.02 in.)

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

5. INSTALL BOTH DRIVE SHAFTS

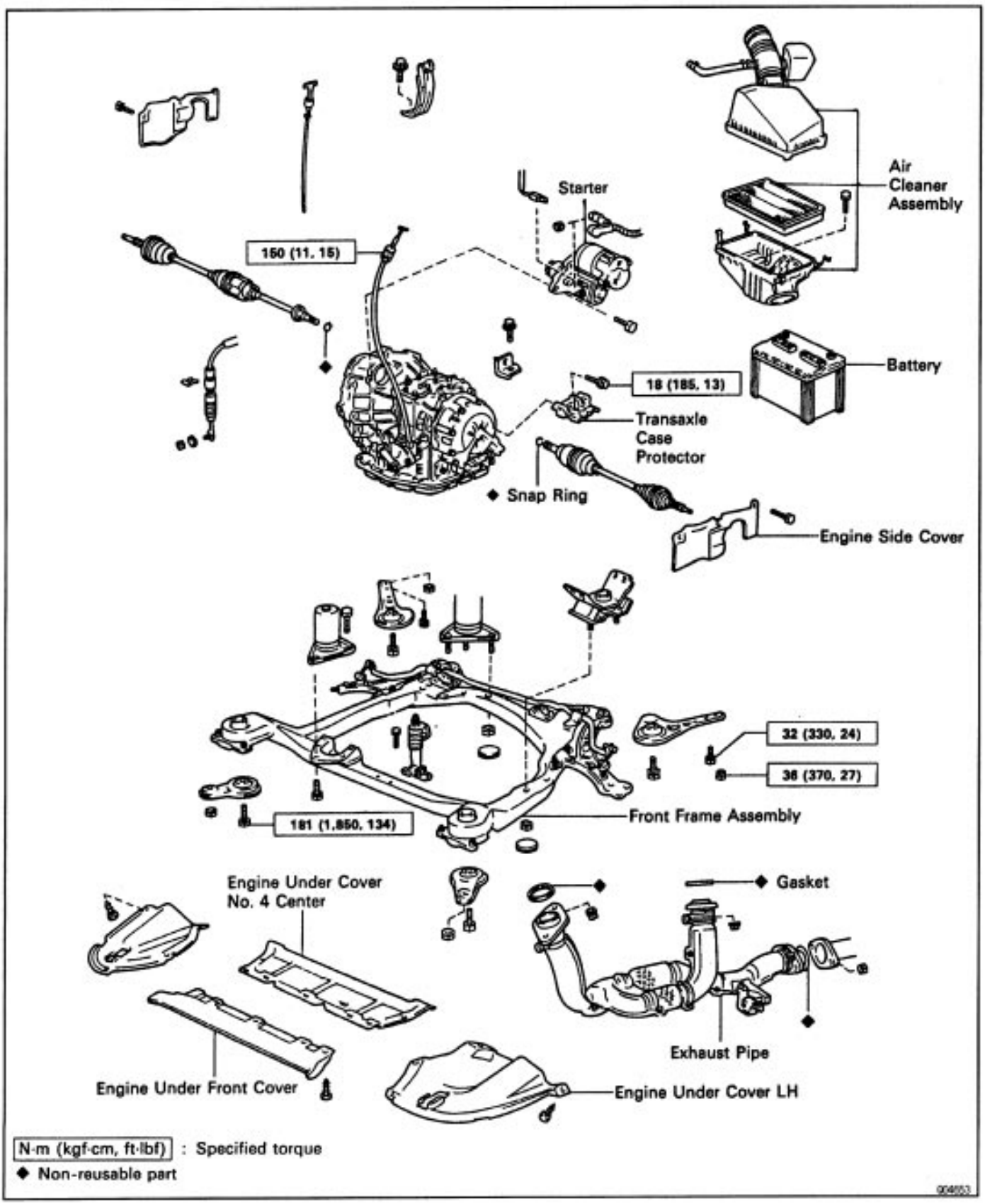
(See page SA–25)

6. CHECK TRANSAXLE FLUID LEVEL

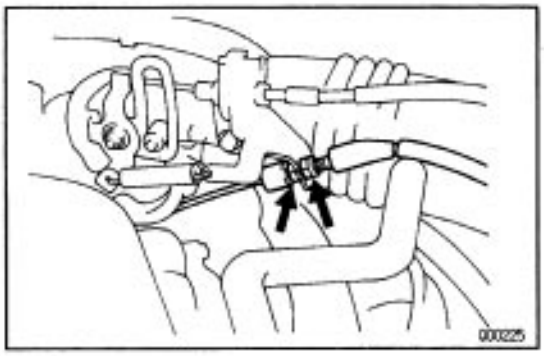
(See page AX2–68)

ASSEMBLY REMOVAL AND INSTALLATION

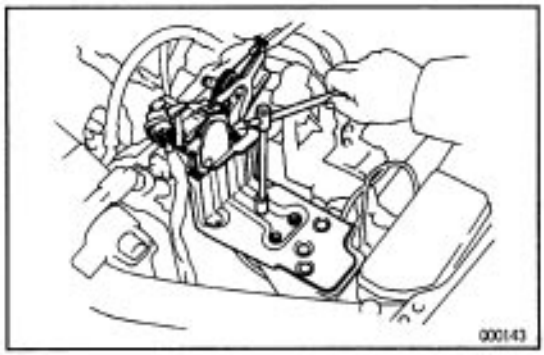
Remove and install the parts as shown.



TRANSAXLE REMOVAL

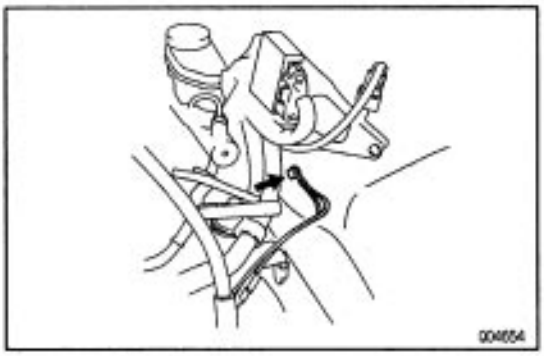


1. DISCONNECT AND REMOVE BATTERY
2. REMOVE AIR CLEANER ASSEMBLY
3. REMOVE THROTTLE CABLE FROM ENGINE

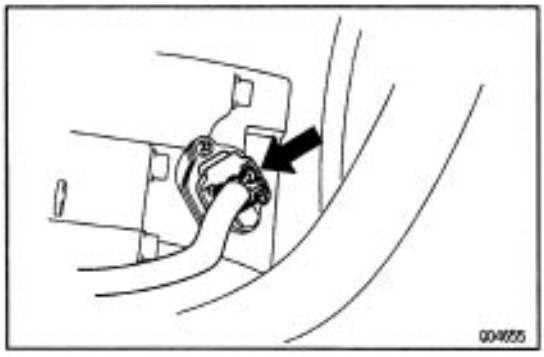


4. REMOVE CRUISE CONTROL ACTUATOR

(a) Remove the cruise control actuator cover.
(b) Disconnect the connector.
(c) Remove the 3 bolts and cruise control actuator with bracket.

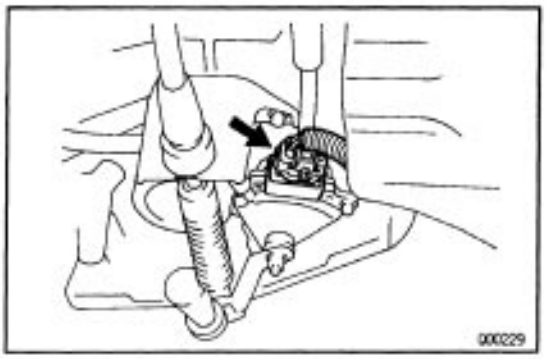


5. REMOVE GROUND TERMINAL

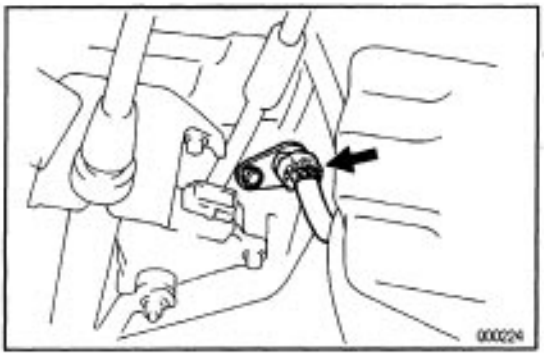


6. DISCONNECT VEHICLE SPEED SENSOR CONNEC–TOR

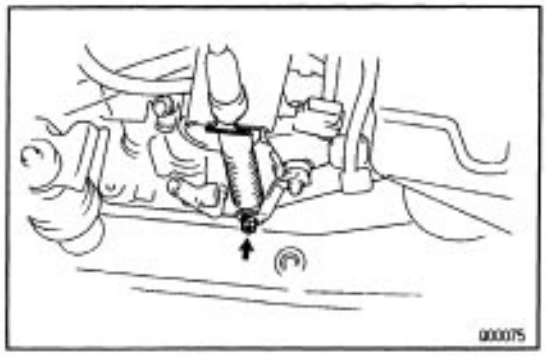
7. DISCONNECT DIRECT CLUTCH SPEED SENSOR CONNECTOR



8. DISCONNECT PARK/NEUTRAL POSITION SWITCH CONNECTOR

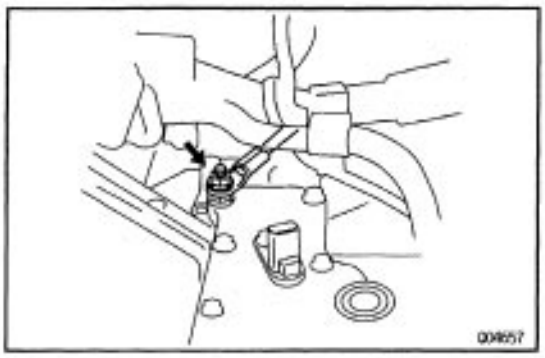


9. DISCONNECT SOLENOID CONNECTOR

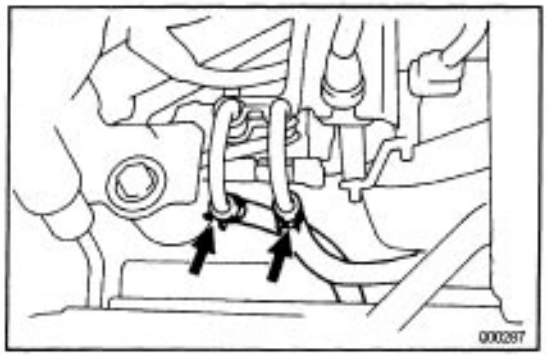


10. DISCONNECT SHIFT CONTROL CABLE

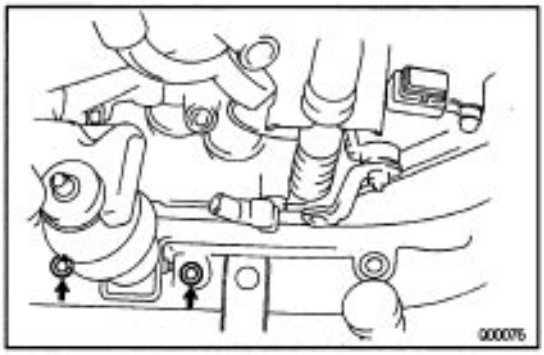
(a) Remove the clip from the shift control cable.
(b) Remove the unit.



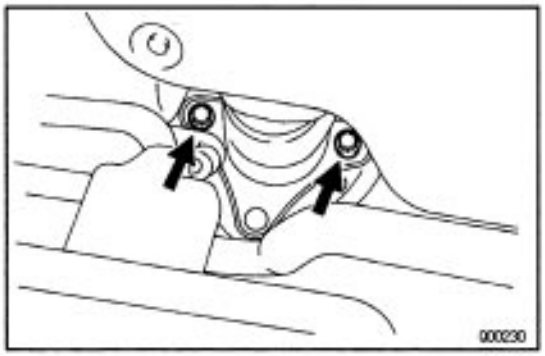
11. REMOVE EARTH CABLES



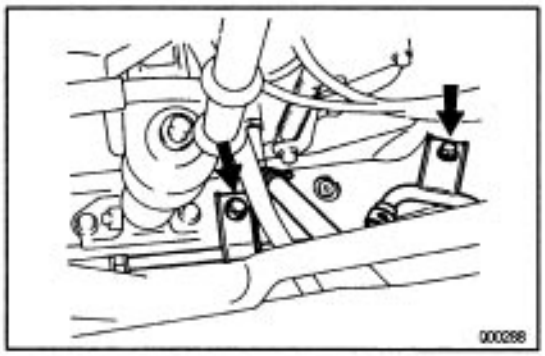
12. DISCONNECT OIL COOLER HOSE



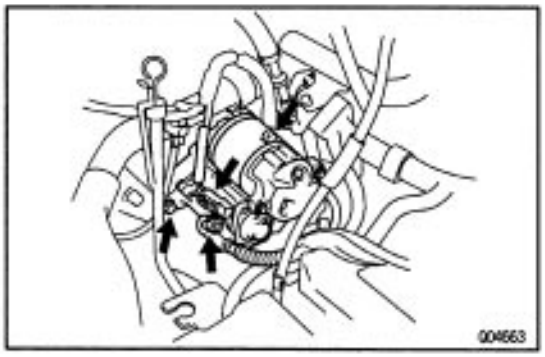
13. REMOVE 2 FRONT SIDE TRANSAXLE MOUNTING BOLTS



14. REMOVE 2 FRONT SIDE ENGINE MOUNTING BOLTS

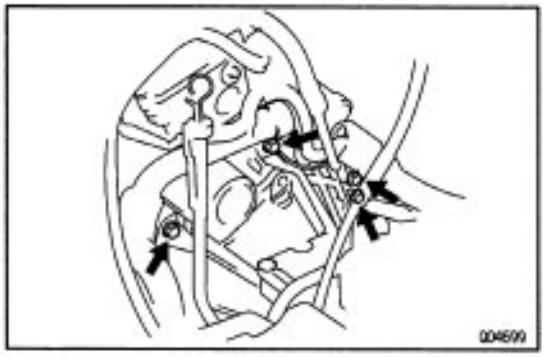


15. REMOVE 2 OIL COOLER CLAMPING BOLTS FROM FRONT FRAME ASSEMBLY

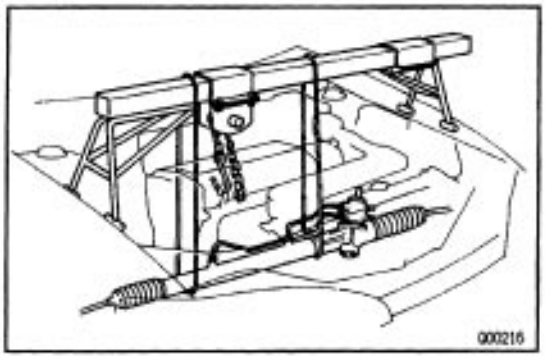


16. REMOVE STARTER

(a) Disconnect the connector and remove the nut.
(b) Remove the 2 bolts and the starter.

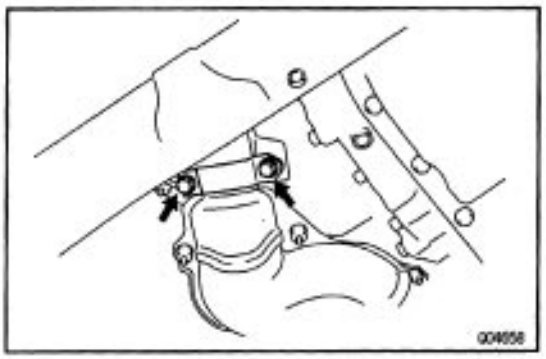


17. REMOVE 4 UPPER TRANSAXLE TO ENGINE BOLTS



18. INSTALL ENGINE SUPPORT FIXTURE

19. TIE STEERING GEAR HOUSING TO ENGINE SUPPORT FIXTURE BY CODE OR EQUIVALENT

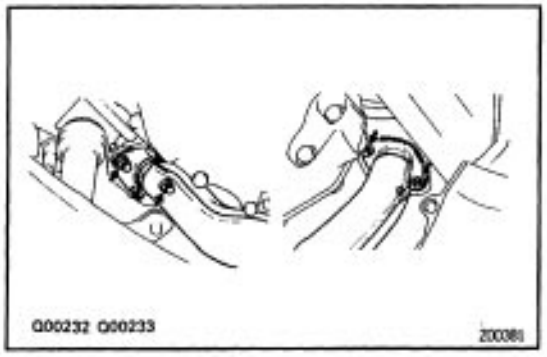


20. RAISE AND SUITABLY SUPPORT VEHICLE

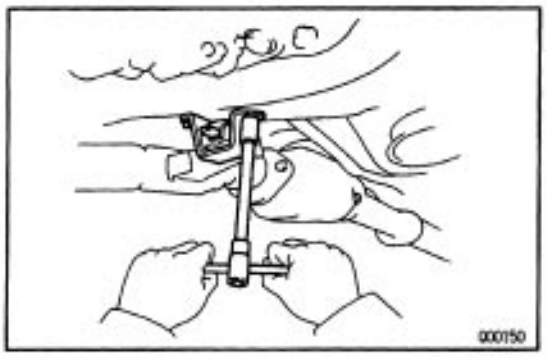
21. REMOVE FRONT WHEEL

22. REMOVE EXHAUST FRONT PIPE

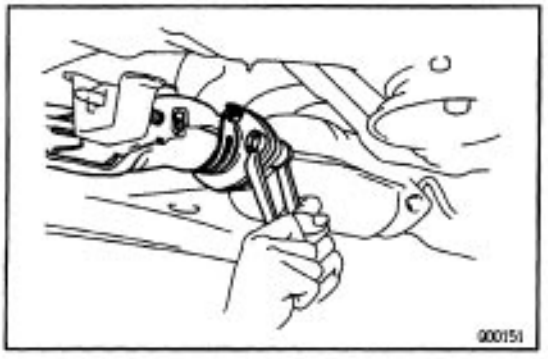
(a) Remove the 2 bolts and exhaust front pipe clamp.



(b) Remove the 4 nuts.



(c) Remove the 2 bolts and exhaust front pipe support.

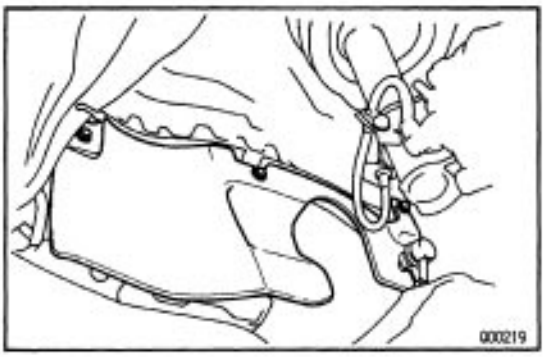


(d) Remove the 2 bolts and nuts.

(e) Remove the exhaust front pipe.

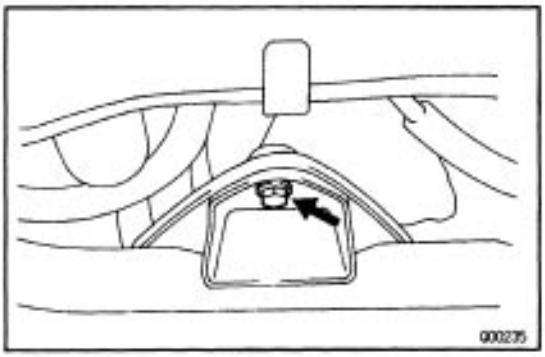
23. REMOVE DIFFERENTIAL FLUID DRAIN PLUG AND GASKET

24. DRAIN DIFFERENTIAL FLUID INTO A SUITABLE CONTAINER



26. REMOVE RIGHT AND LEFT ENGINE SIDE COVER NO.2

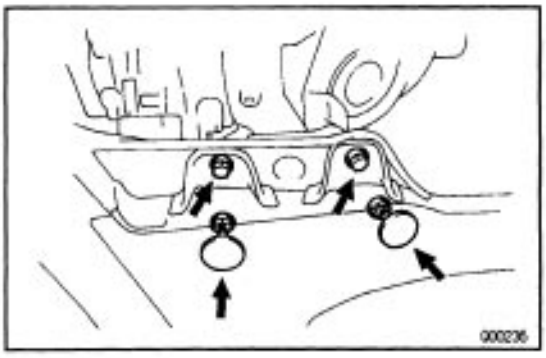
26. REMOVE ENGINE UNDER FRONT COVER NO.1 AND NO.2



27. REMOVE DRIVE SHAFT

(See page SA–22)

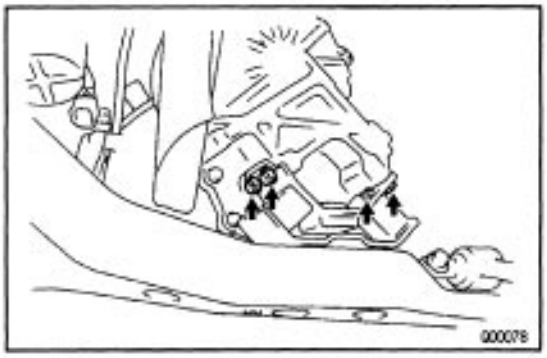
28. REMOVE FRONT SIDE ENGINE MOUNTING NUT



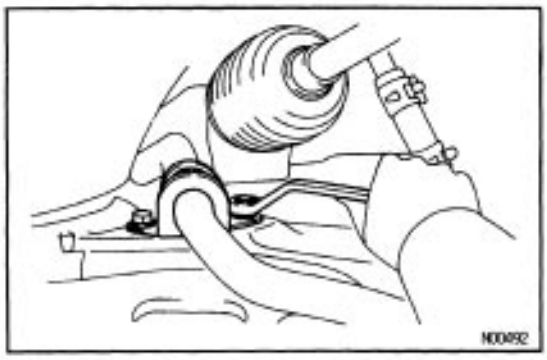
29. REMOVE REAR SIDE ENGINE MOUNTING BOLTS

(a) Remove 2 hole plugs.

(b) Remove 2 bolts and nuts.

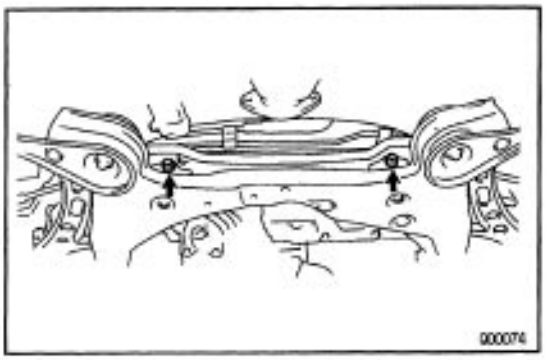


30. REMOVE 4 LEFT SIDE TRANSAXLE MOUNTING BOLTS

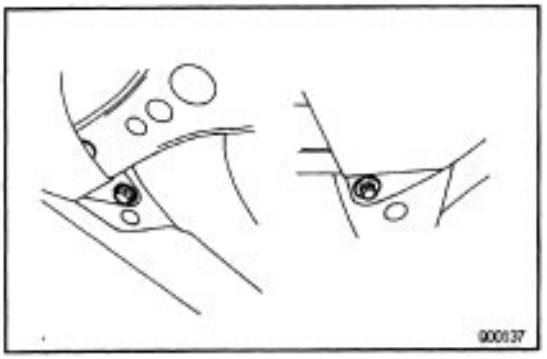


31. REMOVE STEERING GEAR HOUSING

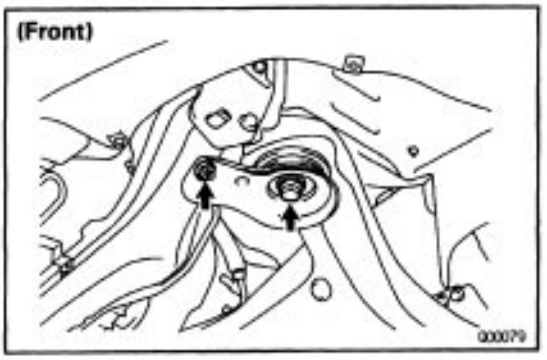
(a) Remove the 4 bolts and disconnect the stabilizer bar bushing bracket from the front frame assembly.



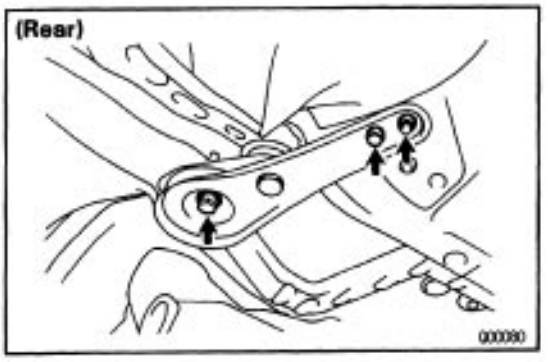
(b) Remove 2 bolts and nuts from the steering gear housing.
(c) Remove the steering gear housing.

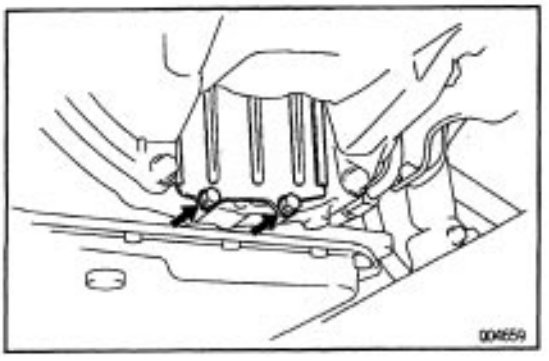


32. REMOVE FRONT FRAME ASSEMBLY
(a) Hold the front frame assembly with a jack.
(b) Remove 2 set screws from the right and left fender liners.

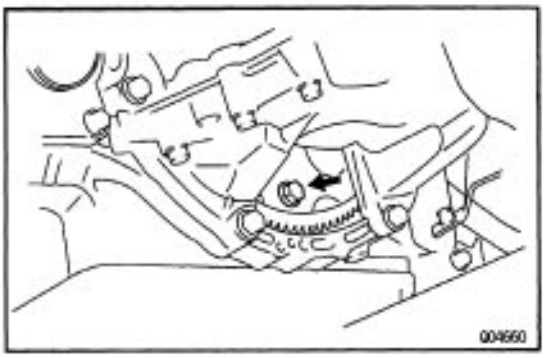


(c) Remove 6 bolts and 4 nuts.
(d) Remove the front frame assembly.

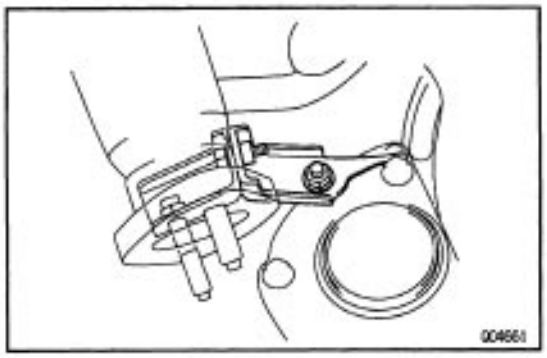




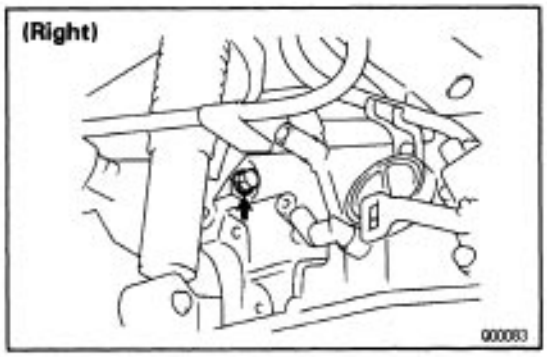
33. HOLD TRANSAXLE WITH A JACK
34. REMOVE TORQUE CONVERTER CLUTCH MOUNTING BOLTS
(a) Remove the 2 bolts and hole cover.



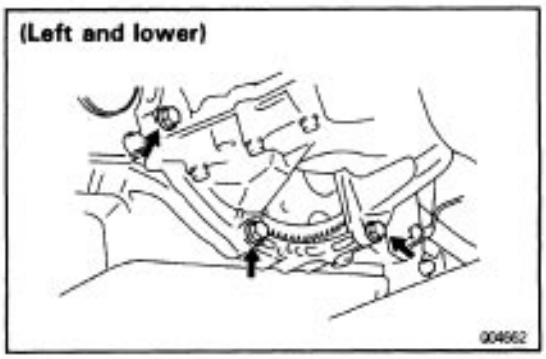
(b) Turn the crankshaft to gain access to each bolt.
(c) Hold the crankshaft pulley nut with a wrench and remove the 6 bolts.

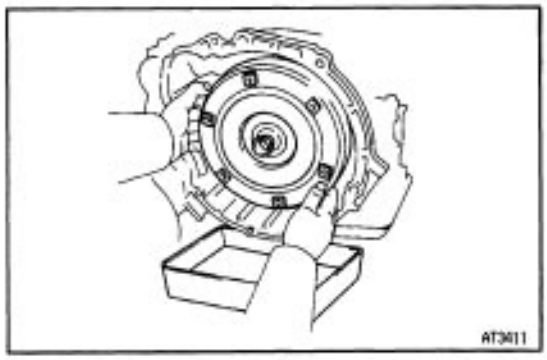


35. REMOVE EXHAUST MANIFOLD PLATE



36. REMOVE TRANSAXLE TO ENGINE BOLTS

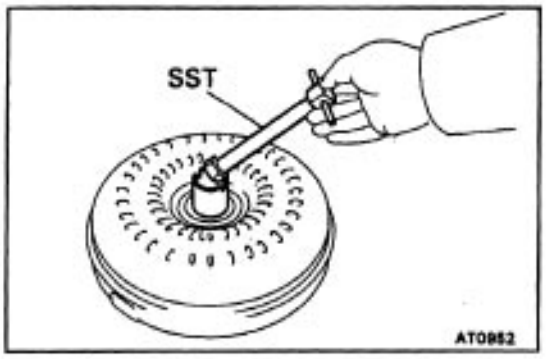




37. REMOVE TRANSAXLE ASSEMBLY

Separate transaxle and engine, and lower the transaxle.

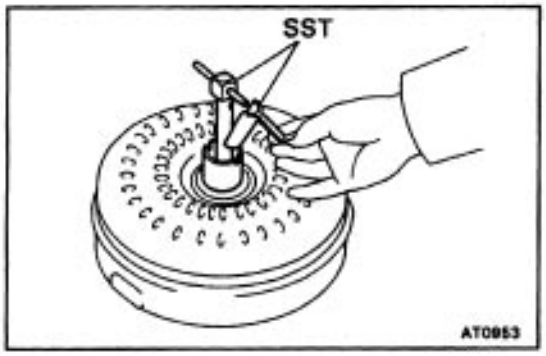
38. REMOVE TORQUE CONVERTER CLUTCH FROM TRANSAXLE



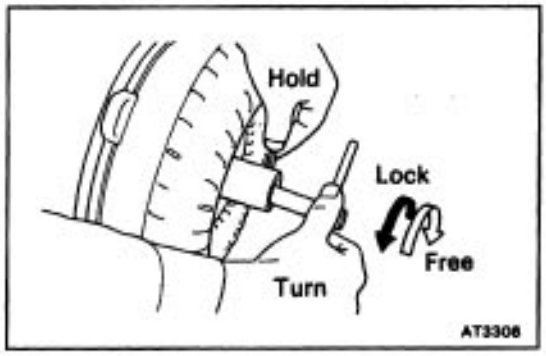
TORQUE CONVERTER CLUTCH AND DRIVE PLATE INSPECTION

1. INSPECT ONE–WAY CLUTCH

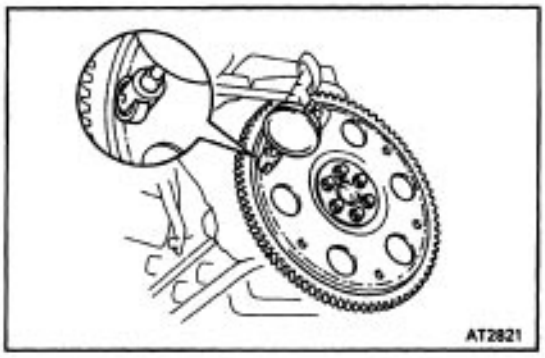
(a) Install SST into the inner race of the one–way clutch.
SST 09350–32014 (09351–32020)



(b) Install SST so that it fits in the notch of the converter hub and outer race of the one–way clutch.
SST 09350–32014 (09351 –32020)



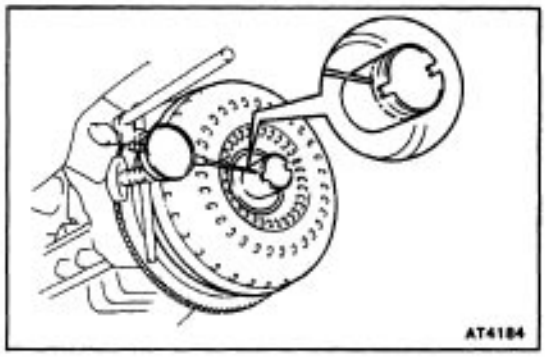
(c) With the torque converter clutch standing on its side, the clutch locks when turned counterclockwise, and rotates freely and smoothly clockwise.
If necessary, clean the converter and retest the clutch. Replace the converter if the clutch still fails the test.



2. MEASURE DRIVE PLATE RUNOUT AND INSPECT RING GEAR

Set up a dial indicator and measure the drive plate runout.
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: 83 N–m (850 kgf–cm, 61 ft–lbf)



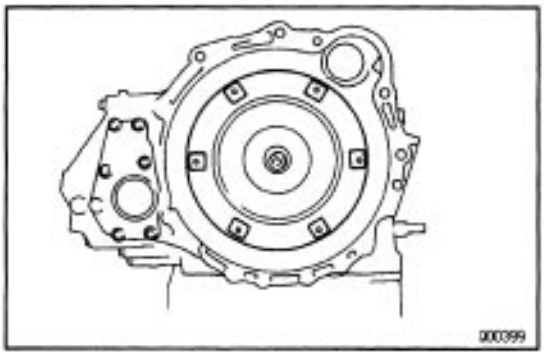
3. MEASURE TORQUE CONVERTER CLUTCH SLEEVE RUNOUT

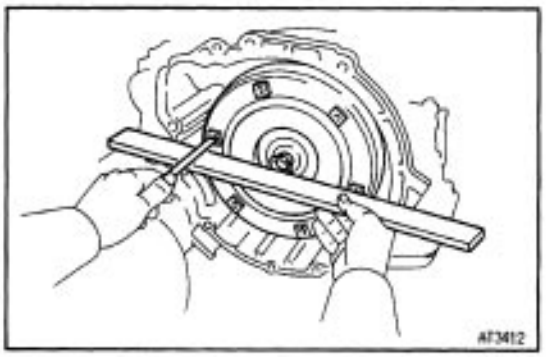
(a) Temporarily mount the torque converter clutch to the drive plate. Set up a dial indicator.

If runout exceeds 0.30 mm (0.0118 in.), try to correct by reorienting the installation of the converter. If excessive runout cannot be corrected replace the torque converter clutch.

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

(b) Remove the torque converter clutch.





TRANSAXLE INSTALLATION

1. INSTALL TORQUE CONVERTER CLUTCH IN TRANSAXLE

If the torque converter clutch has been drained and washed, refill with new ATF.

Fluid type:

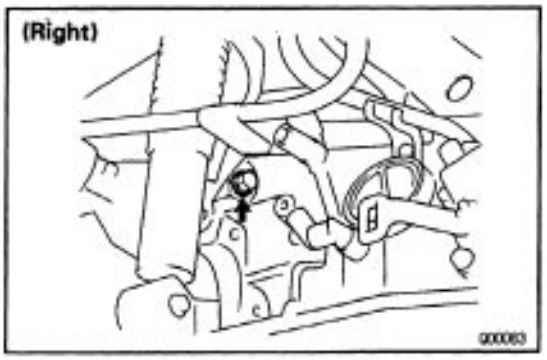
ATF DEXRON II

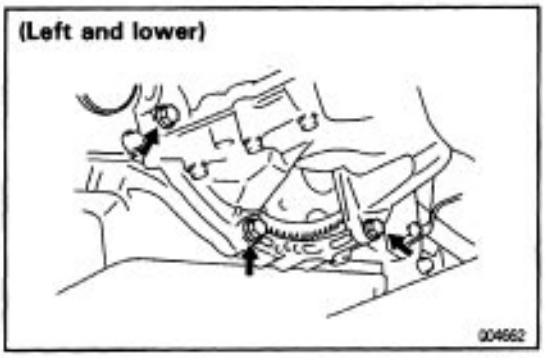
2. CHECK TORQUE CONVERTER CLUTCH INSTALLATION

Using calipers and a straight edge, measure from the installed surface to the front surface of the transaxle housing.

Correct distance:

More than 13.7 mm (0.539 in.)





3. ALIGN TRANSAXLE AT INSTALLATION POSITION

(a) Align the 2 knock pins on the block with the converter housing.

(b) Temporarily install the bolt.

4. INSTALL TRANSAXLE TO ENGINE BOLTS

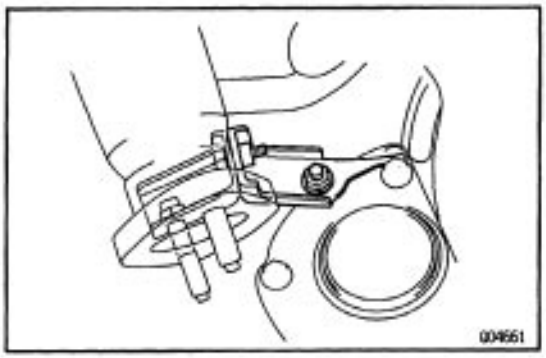
Install the transaxle to engine bolts.

12 mm head bolt

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

10 mm head bolt

Torque: 46 N–m (470 kgf–cm. 34 ft–lbf)



5. INSTALL EXHAUST MANIFOLD PLATE

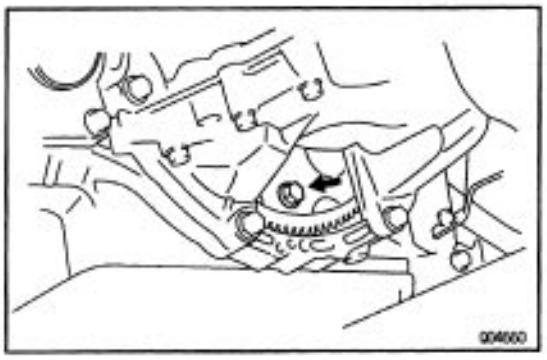
(a) Install the exhaust manifold plate.

(b) Install and torque the bolt and nut.

Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)

(c) Install and torque the nut.

Torque: 20 N–m (200 kgf–cm, 14 ft–lbf)



6. INSTALL TORQUE CONVERTER CLUTCH MOUNTING BOLTS

(a) Clean the threads of the bolts with gasoline.

(b) Coat the threads of the bolts with sealer.

Sealer:

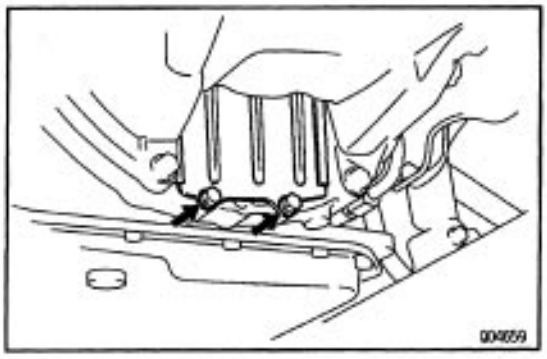
Part No.08833–00070, THREE BOND 1324 or equivalent

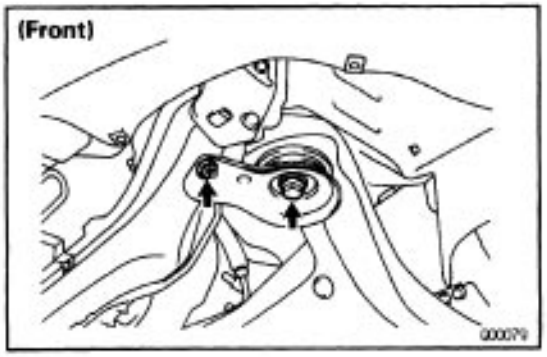
(c) Tighten the bolts evenly.

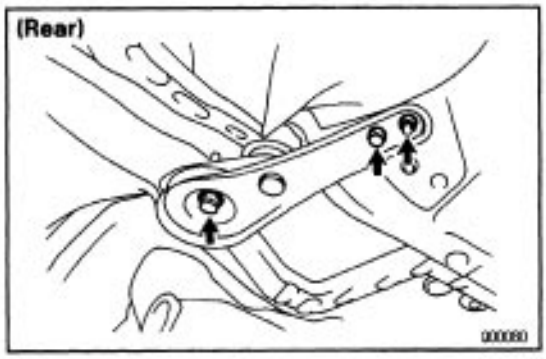
Torque: 27 N–m (280 kgf–cm, 20 ft–lbf)

HINT: First install dark green colored bolt and then the 5 bolts.

(d) Install the hole cover with 2 bolts.

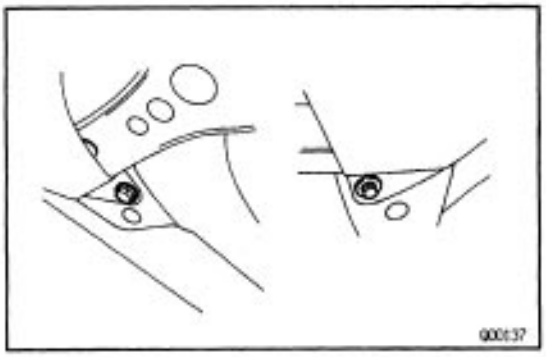




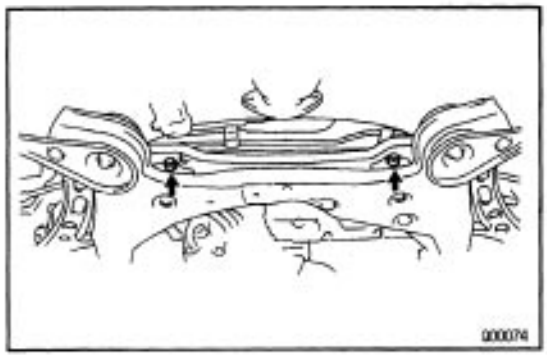


7. INSTALL FRONT FRAME ASSEMBLY

(a) Hold the front frame assembly.
(b) Install the6 bolts and 4 nuts.
(c) Torque the bolts and nuts.
19 mm head bolt
Torque: 1$1 N–m (1,850 kgf–cm, 134 ft–lbf)
12 mm head bolt
Torque: 32 N–m (330 kgf–cm, 24 ft–lbf)
Nut
Torque: 36 N–m (370 kgf–cm, 27 ft–lbf)

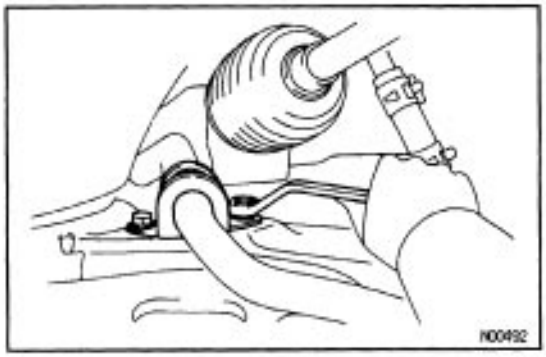


(d) Install the 2 set screws in the right and left fender liners.

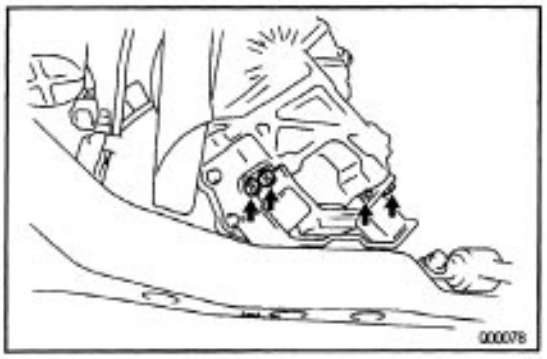


8. INSTALL STEERING GEAR HOUSING

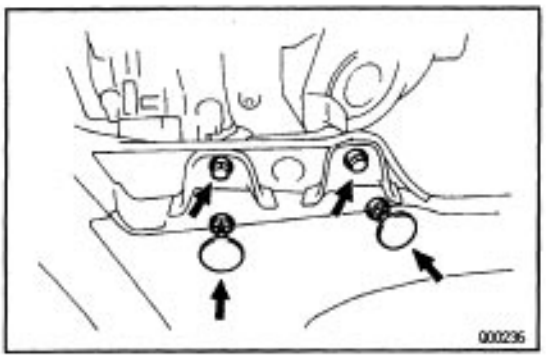
(a) Install the steering gear housing to the front frame assembly.
(b) Install and torque the 2 bolts and nuts.
Torque: 181 N–m (1,850 kgf–cm, 134 ft–lbf)



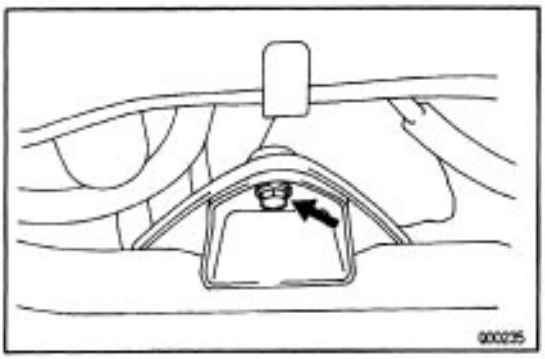
(c) Connect the stabilizer bar bushing bracket with the 4 bolts.
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)



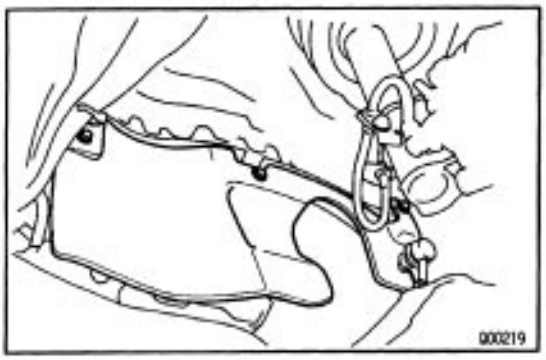
9. INSTALL FOUR LEFT SIDE TRANSAXLE MOUNTING BOLTS
Torque: 52 N–m (530 kgf–cm. 38 ft–lbf)



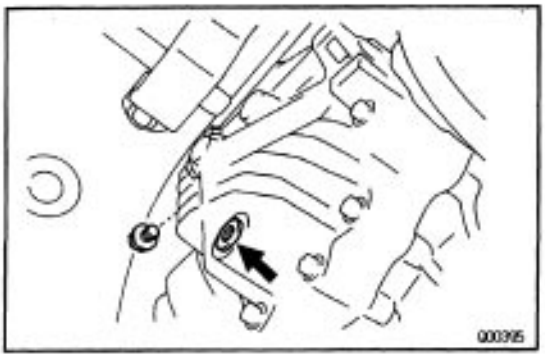
10. INSTALL REAR SIDE MOUNTING BOLTS AND NUTS
(a) Install and torque the 2 bolts and nuts.
Torque:66 N–m (670 kgf–cm, 48 ft–lbf)
(b) Install 2 hole plugs.



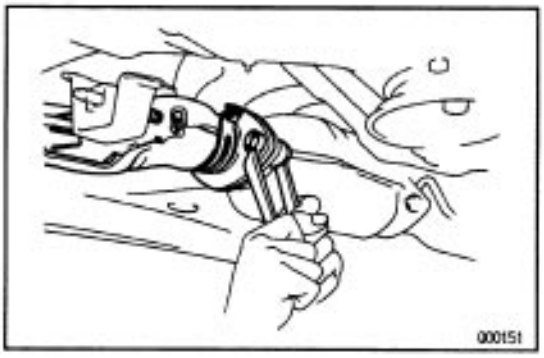
11. INSTALL FRONT SIDE ENGINE MOUNTING NUT
Torque: 80 N–m (820 kgf–cm, 59 ft–lbf)
12. INSTALL DRIVE SHAFT
(See page SA–25)



13. INSTALL RIGHT AND LEFT ENGINE SIDE COVER NO.2
14. INSTALL ENGINE UNDER FRONT COVER NO.1 AND NO.2

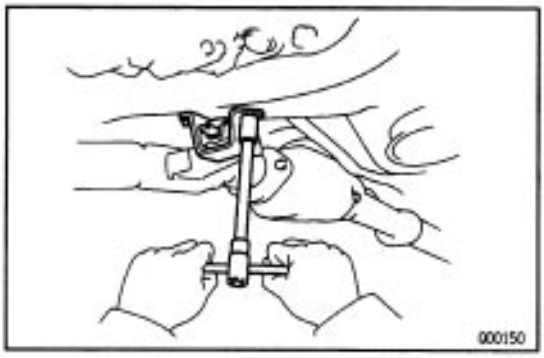


15. INSTALL DIFFERENTIAL FLUID DRAIN PLUG WITH A NEW GASKET
16. FILL DIFFERENTIAL
Fluid Type:
ATF DEXRON II Capacity:
0.85 liters (0.9 US qts, 0.7 Imp. qts)
17. CHECK DIFFERENTIAL FLUID LEVEL

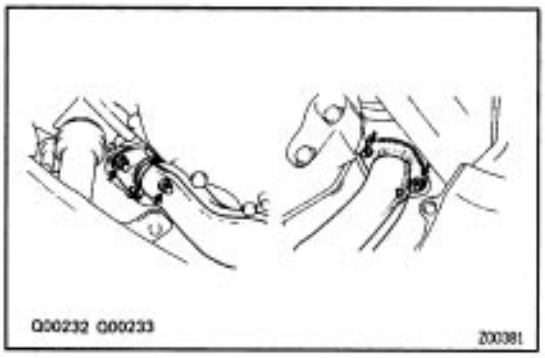


18. INSTALL EXHAUST FRONT PIPE

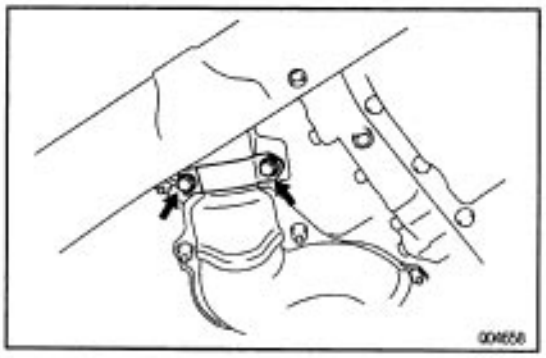
(a) Install a new gasket.
(b) Install the exhaust front pipe.
(c) Install and torque 2 bolts and new nuts.
Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)



(d) Install the exhaust front pipe support and 2 bolts.

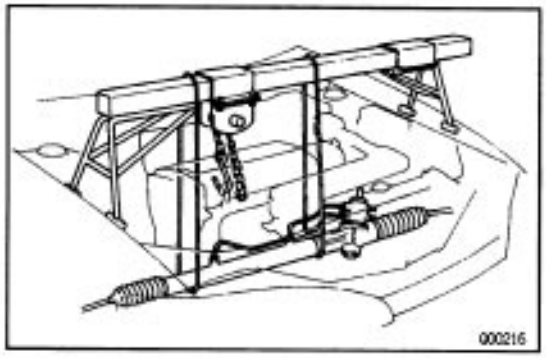


(e) Install 2 new gaskets.
(f) Install and torque 4 new nuts.
Torque: 62 N–m (630 kgf–cm, 46 ft–lbf)

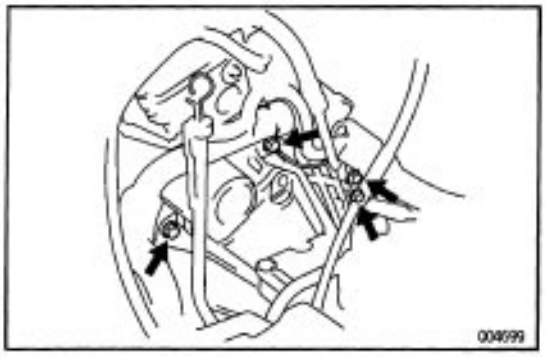


(g) Install the exhaust front pipe clamp and 2 bolts.
Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)

19. INSTALL FRONT WHEEL AND LOWER VEHICLE
Torque: 103 N–m (1,050 kgf–cm, 76 ft–lbf)

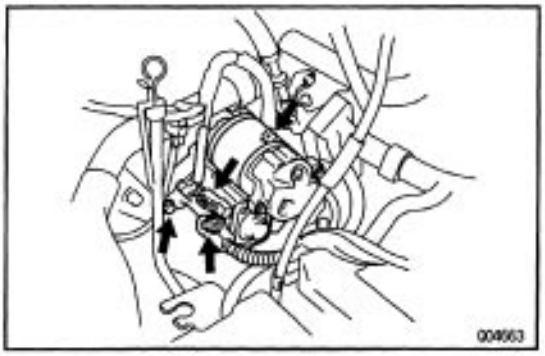


20. UNTIE STEERING GEAR HOUSING REMOVE ENGINE SUPPORT FIXTURE



21. INSTALL 4 UPPER TRANSAXLE TO ENGINE BOLTS

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



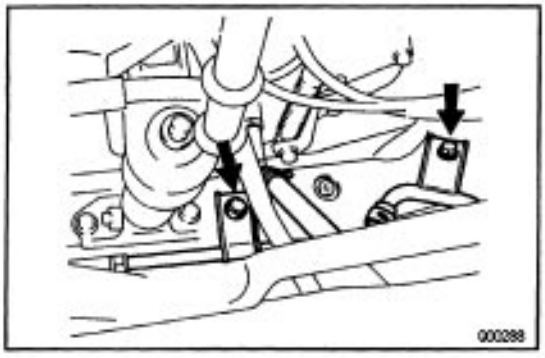
22. INSTALL STARTER

(a) Install the starter with the 2 bolts.

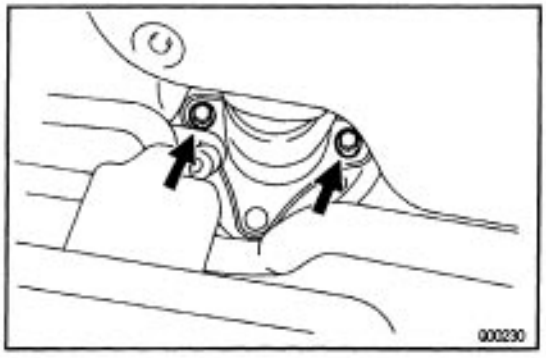
(b) Torque the 2 bolts.

Torque: 38 N–m (400 kgf–cm, 29 ft–lbf)

(c) Connect the connector and install the nut.

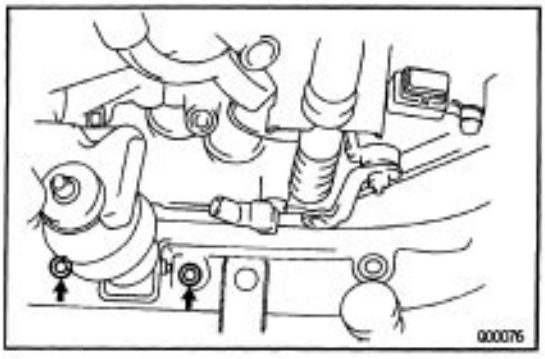


23. INSTALL OIL COOLER CLAMPING BOLTS TO FRONT FRAME ASSEMBLY



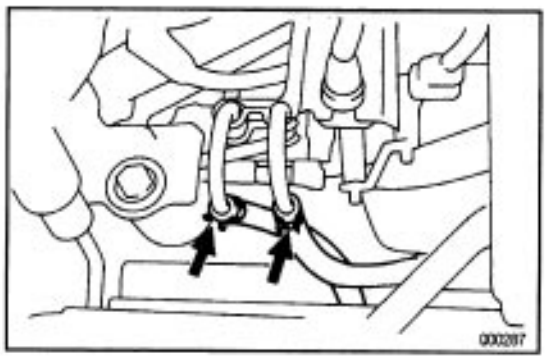
24. INSTALL TWO FRONT SIDE ENGINE MOUNTING BOLTS

Torque: 80 N–m (820 kgf–cm, 59 ft–lbf)

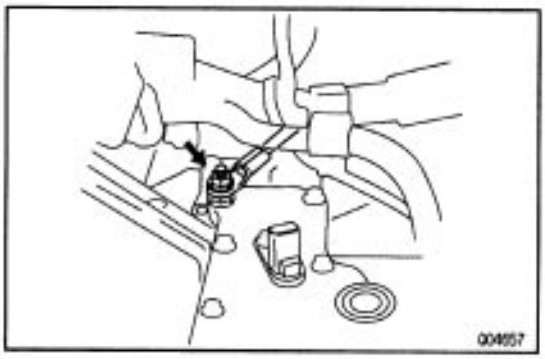


25. INSTALL TWO FRONT SIDE TRANSAXLE MOUNTING BOLTS

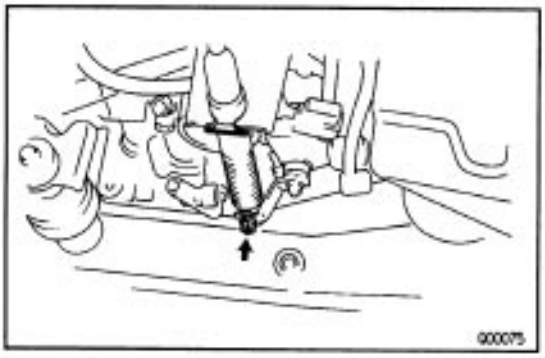
Torque: 80 N–m (820 kgf–cm, 59 ft–lbf)



26. CONNECT OIL COOLER HOSE

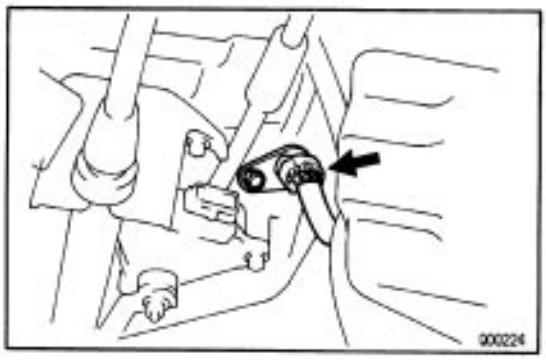


27. INSTALL EARTH CABLES

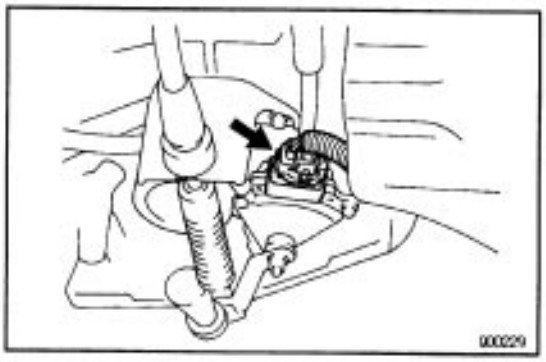


28. CONNECT SHIFT CONTROL CABLE

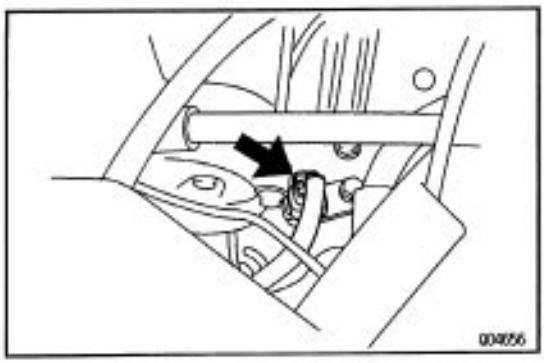
(a) Install the clip from the shaft control cable.
(b) Install and torque the nut.
(c) Adjust the shift control cable.
(See page AX2–69)



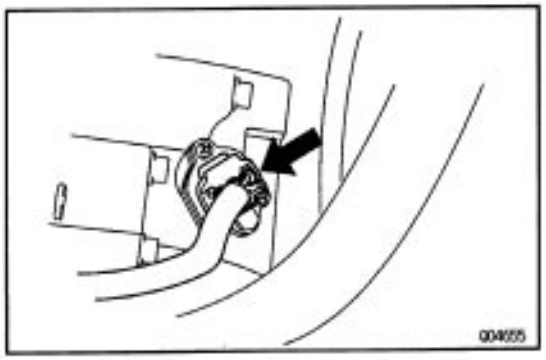
29. CONNECT SOLENOID CONNECTOR



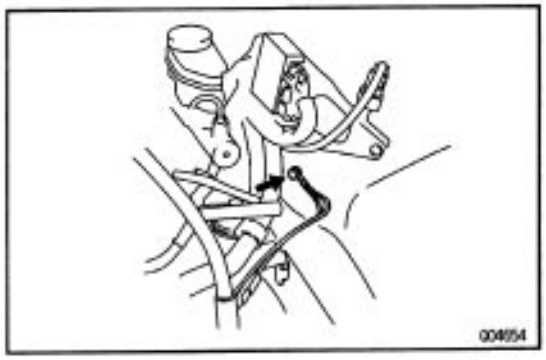
30. CONNECT PARK/ NEUTRAL POSITION SWITCH CONNECTOR



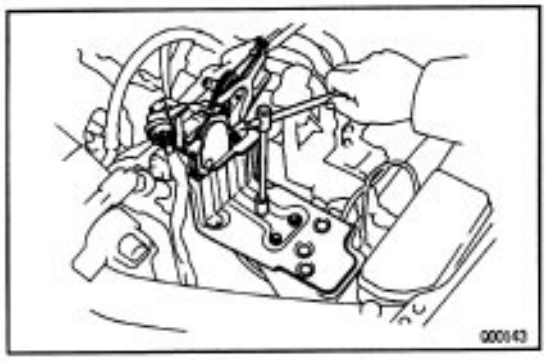
31. CONNECT DIRECT CLUTCH SPEED SENSOR CONNECTOR



32. CONNECT VEHICLE SPEED SENSOR CONNECTOR



33. INSTALL GROUND TERMINAL

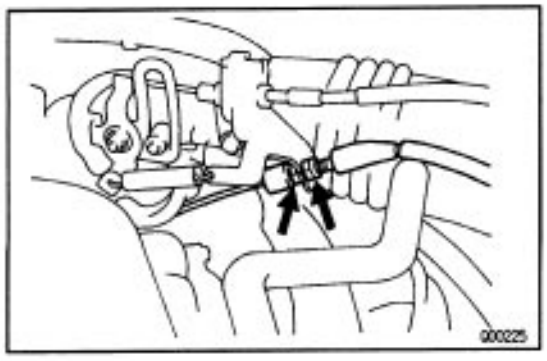


34. INSTALL CRUISE CONTROL ACTUATOR

(a) Install the cruise control actuator with bracket the 3 bolts.

(b) Connect the connector.

(c) Install the cruise control actuator cover.



35. INSTALL THROTTLE CABLE TO ENGINE

(a) Torque the nuts.

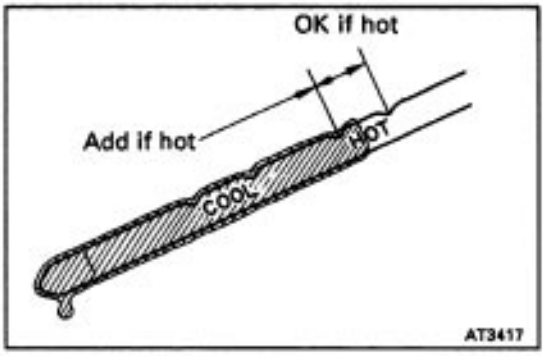
Torque: 15 N–m (150 kgf–cm, 11 ft–lbf)

(b) Adjust the throttle cable.

(See page AX2–69)

36. INSTALL AIR CLEANER ASSEMBLY

37. INSTALL BATTERY



38. FILL TRANSAXLE WITH ATF AND CHECK FLUID LEVEL

(See page AX2–68)

NOTICE: Do not overfill.

Fluid type:

ATF DEXRON II

39. INSPECT FRONT WHEEL ALIGNMENT

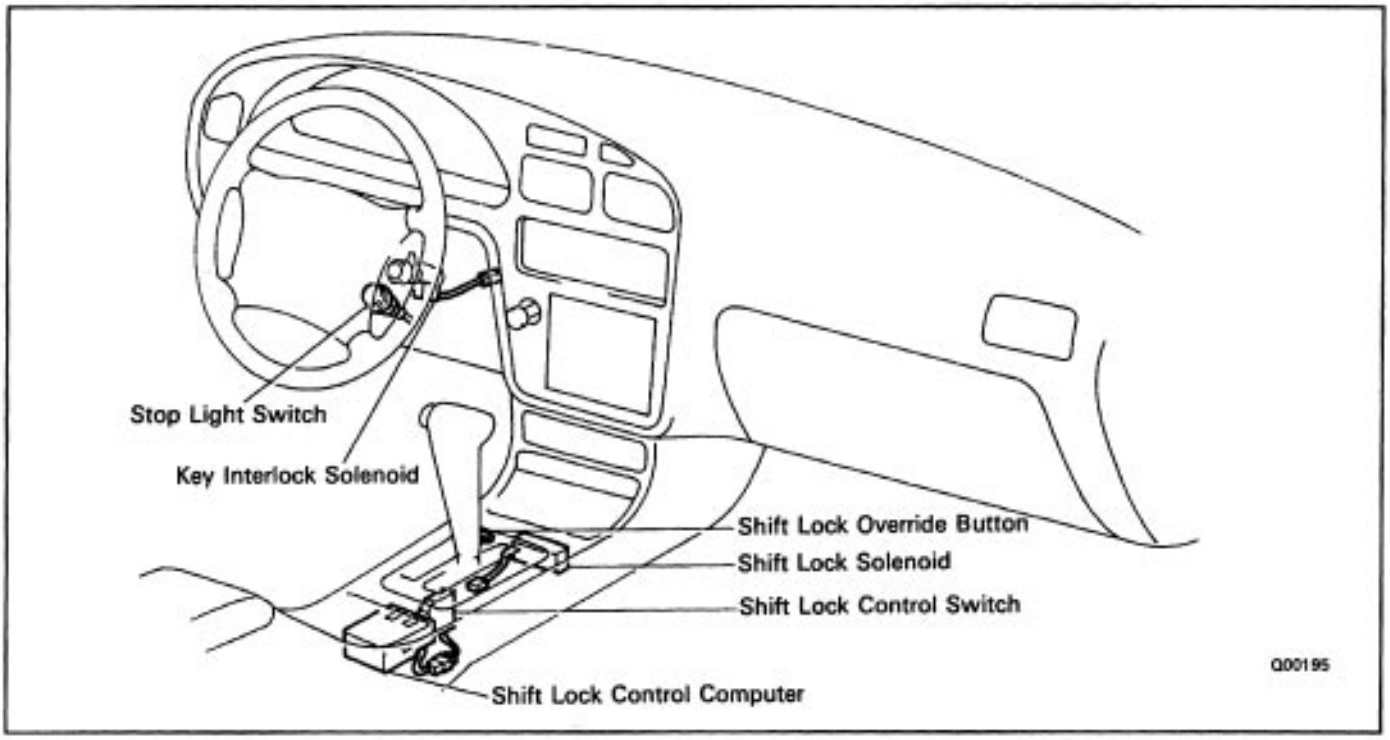
(See page SA–4)

40. PERFORM ROAD TEST

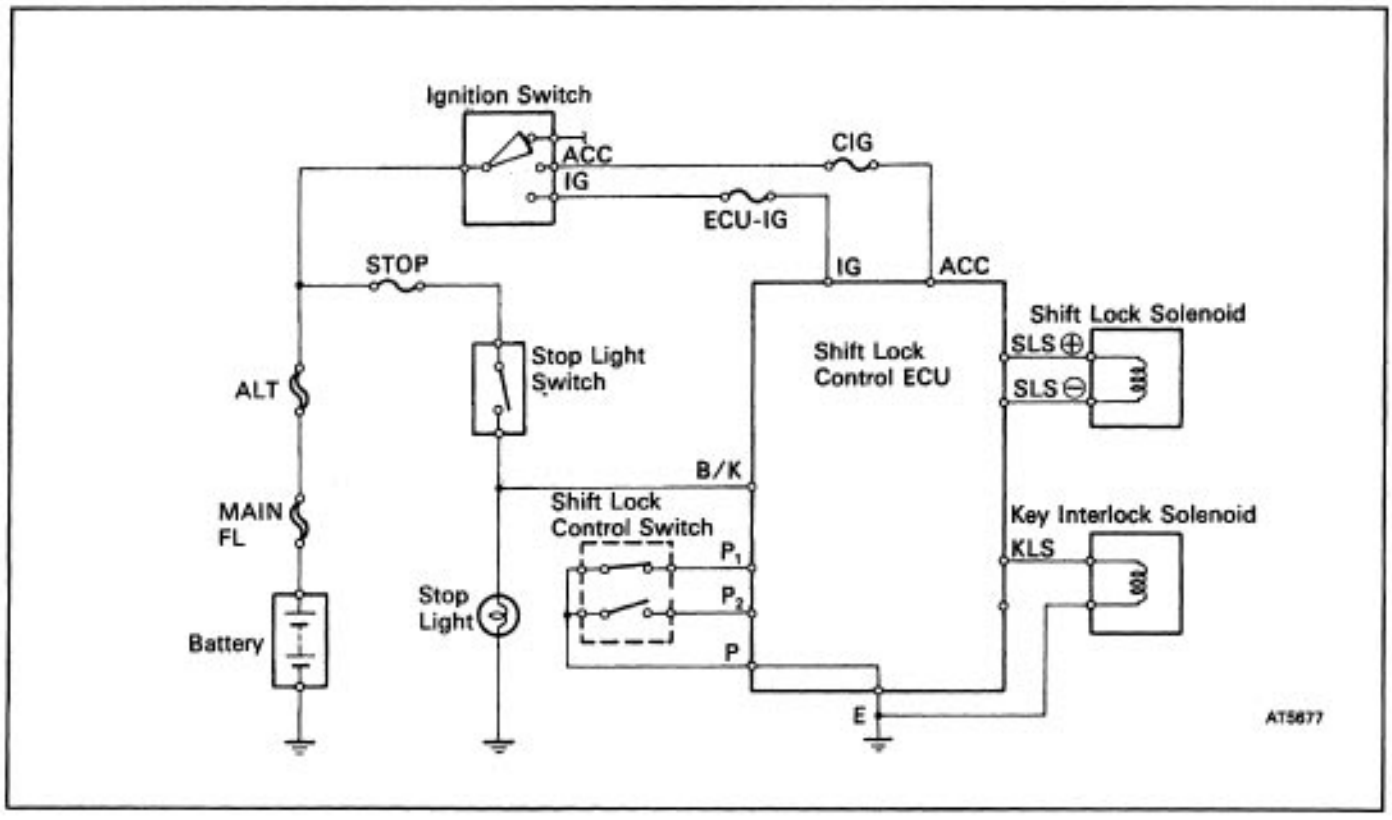
Check for abnormal noise and smooth shifting.

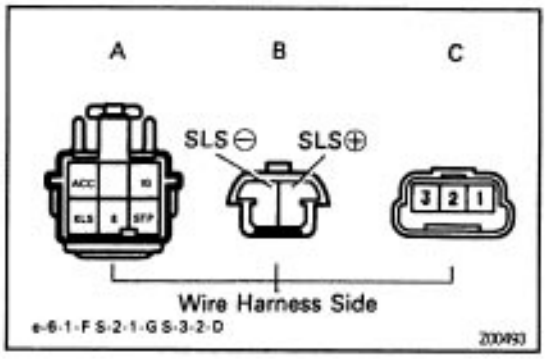
SHIFT LOCK SYSTEM

COMPONENT PARTS LOCATION



WIRING DIAGRAM





ELECTRIC CONTROL COMPONENTS INSPECTION

1. INSPECT SHIFT LOCK CONTROL ECU

Using a voltmeter, measure the voltage at each terminal.

HINT: Do not disconnect the computer connector.

Connector	Terminal	Measuring condition	Voltage (V)
A	ACC – E	Ignition switch ACC position	10 – 14
	IG – E	Ignition switch ON position	10 – 14
	B/K – E	Depress brake pedal	10 – 14
	KLS – E	① Ignition switch ACC position and P position	0
		② Ignition switch ACC position and except P position	10 – 14
		③ (Approx–after one second)	6 – 9
B	SLS+ – SLS–	① Ignition switch ON position and P position	0
		② Depress brake pedal	8.5 – 13.5
		③ (Approx–after 20 seconds)	5.5 – 9.5
		④ Except P position	0
C	P_1 – P	① Ignition switch ON, P position and depress brake pedal	0
		② Shift except P position under conditions above	9 – 13.5
	P_2 – P	① Ignition switch ACC position and P position	9 – 13.5
		② Shift except P position under condition above	0

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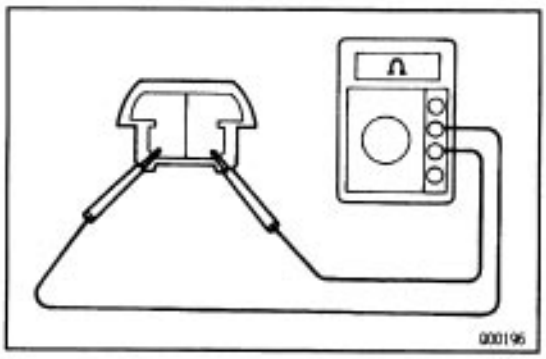
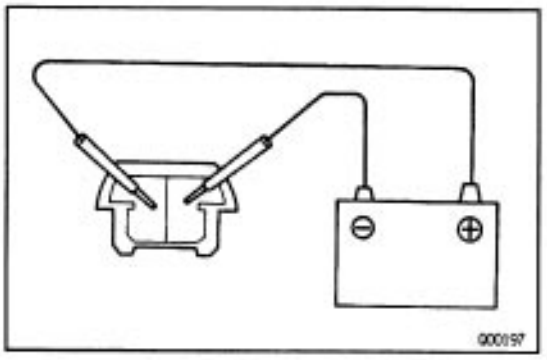


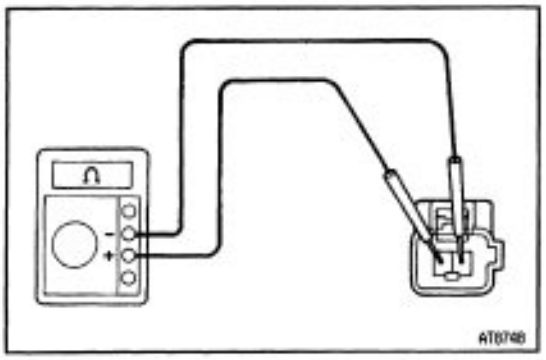
2. INSPECT SHIFT LOCK SOLENOID

(a) Disconnect the solenoid connector.

(b) Using an ohmmeter, measure the resistance between terminals.
Standard resistance:
21–27Ω



(c) Apply the battery positive voltage between terminals.
Check that an operation noise can be heard from the solenoid.



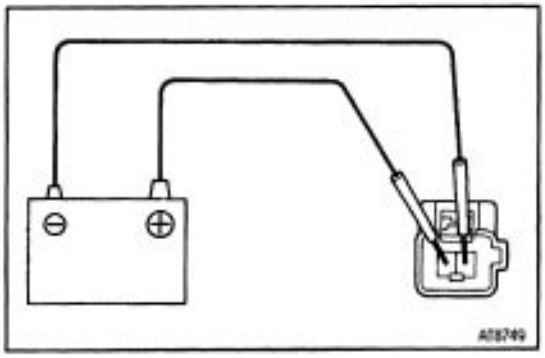
3. INSPECT KEY INTERLOCK SOLENOID

(a) Disconnect the solenoid connector.

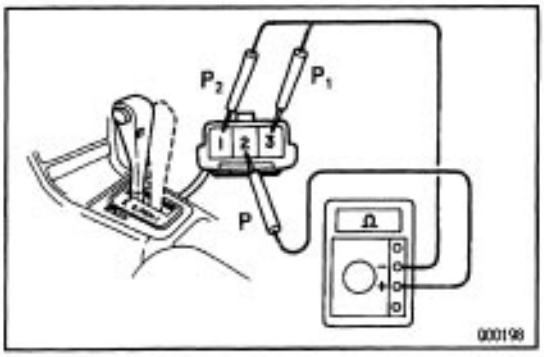
(b) Using an ohmmeter, measure the resistance between terminals.

Standard resistance:

12.5–16–60



(c) Apply the battery positive voltage between terminals. Check that an operation noise can be heard from the solenoid.



4. INSPECT SHIFT LOCK CONTROL SWITCH

Inspect that there is continuity between each terminal.

Shift Position \ Terminal	P	P_1	P_2
P position (Release button is not pushed)	○—○	○—○	
P position (Release button is pushed)	○—○	○—○	○
R, N, D, 2, L position	○	○	○

–Memo–

TROUBLESHOOTING

HOW TO PROCEED WITH TROUBLESHOOTING

The Transaxle Control System broadly consists of the sensors, ECM and actuators. The ECM receives signals from various sensors, judges the operating conditions and determines the shift and lock–up timing.

When troubleshooting OBD n vehicles, use an OBD II Scan Tool complying with SAE J 1978 or TOYOTA hand–held tester to confirm the diagnostic trouble codes, freezed frame data and engine data.

This will enable you to determine the system causing the problem.

This section explains the best method of troubleshooting and how to carry out the necessary repairs.

(1) CUSTOMER PROBLEM ANALYSIS

Using the customer problem analysis check sheet for reference, ask the customer in as much detail as possible about the problem.

(2) CONNECT THE OBDII SCAN TOOL OR TOYOTA HAND–HELD TESTER TO DLC3

Connect the OBD ll scan tool complying with SAE J 1978 or TOYOTA hand–held tester to the vehicle’s data link connector 3.

NOTICE: For OBDll scan tool or TOYOTA hand–held tester operating instructions, see the instruction booklet accompanying the scan tool.

If your display shows ”UNABLE TO CONNECT TO VEHICLE” when you have you have connected the scan tool/TOYOTA hand–held tester cable to DLC3, turned the ignition switch ON and operated the scan tool/TOYOTA hand–held tester, inspect DLC3 (See page AX2–57).

(3) CHECK DIAGNOSTIC TROUBLE CODE AND FREEZED FRAME DATA (PRECHECK)

First check the diagnostic trouble codes. If a code is output, make a note of it.

Also check and note the freezed frame data.

HINT: Output of the malfunction code indicates a circuit malfunction. However, it does not indicate whether the malfunction is still occurring or occurred in the past and returned to normal. To determine this, first confirm the problem symptoms in (7) and then recheck the diagnostic trouble code in¿¿. If troubleshooting has begun based only on the malfunction code in the diagnostic trouble code check in 0, it could result in a misdiagnosis and troubleshooting of circuits which are normal, making it more difficult to locate the cause of the problem.

(4) CLEAR DIAGNOSTIC TROUBLE CODE AND FREEZED FRAME DATA

Use the OBDII scan tool or TOYOTA hand – held tester to erase the diagnostic trouble codes and freezed frame data.

NOTICE: For OBDII scan tool or TOYOTA hand–held tester operating instructions, see the instruction booklet accompanying the scan tool.

(5) VISUAL INSPECTION

(6) SETTING THE CHECK MODE DIAGNOSIS

(7) PROBLEM SYMPTOM CONFIRMATION

Confirm the problem symptoms.

(8) SYMPTOM SIMULATION

If the problem does not reappear, be sure to simulate the problem by mainly checking the circuits indicated by the diagnostic trouble code in step (3), using ”Problem Simulation method”.

(9) DIAGNOSTIC TROUBLE CODE CHECK

Check the diagnostic trouble codes. Check if there is abnormality in the sensors or the wire harness.

If a malfunction code is output, proceed to (9) Diagnostic Trouble Code Chart”. If the normal code is output, proceed to (14) Matrix Chart of Problem Symptoms”.

Be sure to proceed to (9) Diagnostic Trouble Code Chart” after the steps (2) to (6) inclusive are

completed. If troubleshooting is attempted only by following the malfunction code stored in the memory is output, errors could be made in the diagnosis.

⑩ **DIAGNOSTIC TROUBLE CODE CHART**

If a trouble code is confirmed in the diagnostic trouble code check, proceed to the inspection procedure indicated by the matrix chart for each diagnostic trouble code.

⑪ **PRELIMINARY CHECK**

Carry out a preliminary check of the transmission oil level, throttle cable adjustment, etc..

⑫ **MECHANICAL SYSTEM TEST**

(Stall Test, Time Leg Test, Line Pressure Test)

If the malfunction is found in the stall test, time lag test or line pressure test, check the parts indicated in the respective tests.

⑬ **MANUAL SHIFTING TEST**

If the results of the manual driving test are NG, it is likely that the trouble is in the mechanical system or hydraulic system. Proceed to Part 2 (Mechanical System) under the Matrix Chart of Problem Symptoms.

⑭ **MATRIX CHART OF PROBLEM SYMPTOMS**

If the normal code is confirmed in the diagnostic trouble code check, perform inspection according to the inspection order in the matrix chart of problem symptoms. Perform diagnosis of each circuit or part in the order shown in the Matrix Chart. The Matrix Chart contains 3 chapters, Electronically Controlled Circuits in Chapter 1, On–vehicle Inspection in Chapter 2 and Off–vehicle Inspection in Chapter 3. If all the circuits indicated in Chapter 1 are normal, proceed to Chapter 2. If all the parts indicated in Chapter 2 are normal, proceed to Chapter 3. If all the circuits and parts in Chapter 1 – Chapter 3 are normal and the trouble still occurs, check and replace the ECM.

⑮ **CIRCUIT INSPECTION**

Perform diagnosis of each circuit in accordance with the inspection order confirmed in (9) and (13). Judge whether the cause of the problem is in the sensor, actuators, wire harness and connectors, or the ECM. In some cases, the Flow Chart instructs that a throttle signal check or brake signal check be performed. These are diagnosis functions used to check if signals are being input correctly to the ECM.

⑯ **PARTS INSPECTION**

Check the individual parts of the mechanical system and hydraulic system in the order of the numbers indicated in the Matrix Chart.

⑰ **REPAIRS**

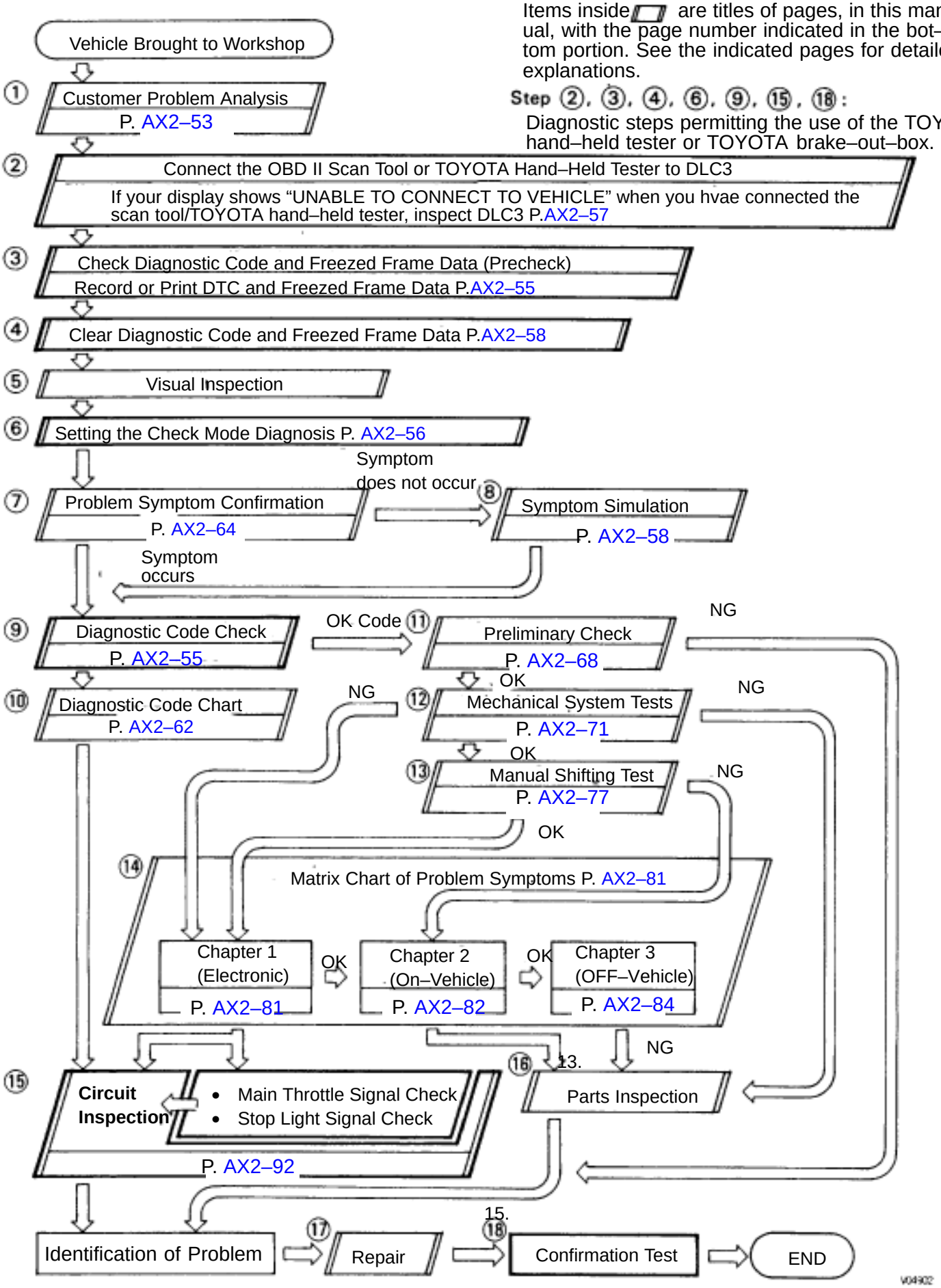
After the cause of the problem is located, perform repairs by following the inspection and replacement procedures in this manual or’94 A541 E Automatic Transaxle Repair Manual.(for’94 CAM RY)

⑱ **CONFIRMATION TEST**

After completing adjustment or repairs, confirm not only that the malfunction is eliminated, but also conduct a test drive, etc., to make sure the entire Engine Control System is operating normally.

Items inside ▱ are titles of pages, in this manual, with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.

Step ②, ③, ④, ⑥, ⑨, ⑮, ⑱:
Diagnostic steps permitting the use of the TOYOTA hand–held tester or TOYOTA brake–out–box.



CUSTOMER PROBLEM ANALYSIS CHECK SHEET

Electronically Controlled Transaxle Check Sheet	Inspector's Name :

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

Date of 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 ☐ 3rd → 2nd ☐ 2nd → 1st)
	☐ Lock-up malfunction
	☐ 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 Chack	1st Time	☐ Normal Code ☐ Malfunction Code (Code)
	2nd time	☐ Normal Code ☐ Malfunction Code (Code)

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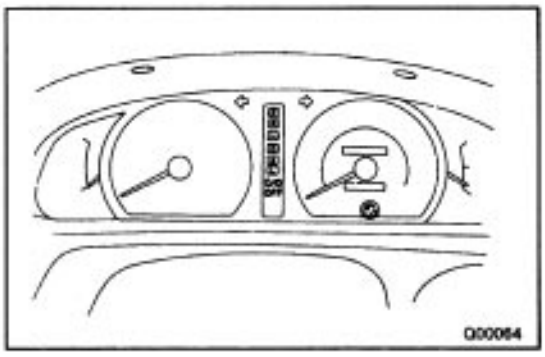


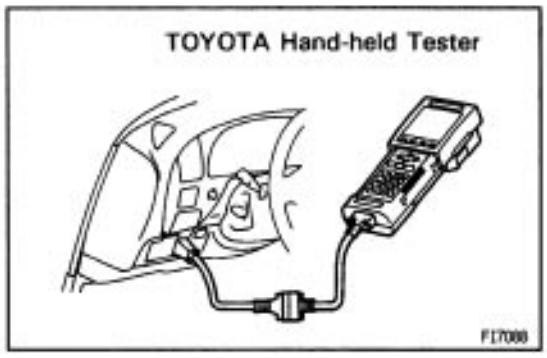
DIAGNOSIS SYSTEM

DESCRIPTION

When troubleshooting OBDII vehicles, the only dif–ference from the usual troubleshooting procedure is that you connect to the vehicle the OBDII scan tool complying with SAE J1978 or TOYOTA hand–held tester, and read off various data output from the vehicle's ECM.

OBD ll regulations require that the vehicle's on –board computer lights up the Malfunction Indicator Lamp (MIL) on the instrument panel when the com–puter detects a malfunction in the computer itself or in drive system components which affect vehicle emi–ssions. As in previous models, when the ECM detects a malfunction in the transaxle control section, the MIL lights up and the O/D OFF indicator light blinks. In addition to the MIL lighting up when a malfunction is detected, the applicable diagnostic trouble codes pre–scribed by SAE J 2012 are recorded in the ECM memory. (See page EG–404)

If the malfunction only occurs in 3 trips, the MIL goes off but the diagnostic trouble codes remain recorded in the ECM memory. The O/D OFF indicator light goes off as soon as the trouble is no longer detected.



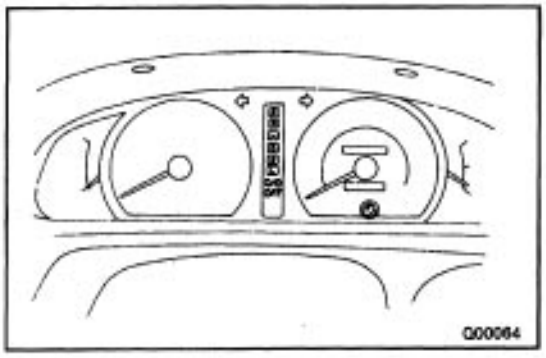
To check the diagnostic trouble codes, connect the OBDII scan tool or TOYOTA hand–held tester to Data Link Connector 3 on the vehicle. The OBD ll scan tool or TOYOTA hand–held tester also enables you to erase the diagnostic trouble codes and check freezed frame data and various forms of engine data. (For operating instructions, see the OBD III scan tool's instruction book.)

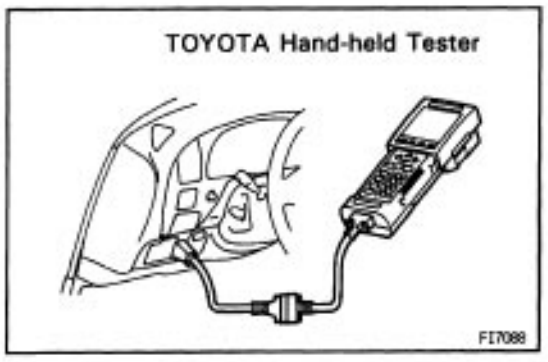
Diagnostic trouble codes include SAE controlled codes and Manufacturer controlled codes.

SAE controlled codes must be set as prescribed by the SAE, while Manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits.

(See diagnostic trouble code chart on page AX2–62)

The diagnosis system operates in normal mode during normal vehicle use, and also has a check mode for technicians to simulate malfunction symptoms and perform troubleshooting. Most diagnostic trouble codes use 2 trip detection logic(') to prevent errone–ous detection. By switching the ECM to check mode when troubleshooting, the technician can cause the MIL to light up and 0/D OFF indicator lights to blink for a malfunction that is only detected once or mo–mentarily. (TOYOTA hand–held tester)
(See page AX2–56)
' 2 trip detection logic:
When a logic malfunction is first detected, the mal–function is temporarily stored in the ECM memory. If the same malfunction is detected again during the second test drive, this second detection causes the MIL to light up and O/D OFF indicator lights to blink.





DIAGNOSIS INSPECTION (NORMAL MODE)

MALFUNCTION INDICATOR LAMP CHECK

1. The malfunction indicator lamp comes on when the ignition switch is turned ON and the engine is not running.

HINT: If the malfunction indicator lamp does not light up, troubleshoot the combination meter (See page BE–65)

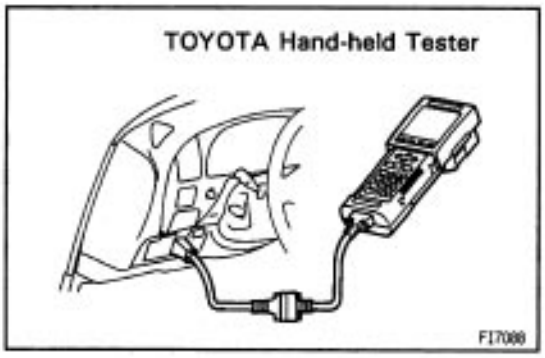
2. When the engine is started, the malfunction indicator lamp should go oft. If the lamp remains on, the diagno–sis system has detected a malfunction or abnormality in the system

DIAGNOSTIC TROUBLE CODE CHECK

NOTICE (TOYOTA hand–held tester only): When the diagnostic system is switched from normal mode to check node, it erases all diagnostic trouble codes and freezed frame data recorded in normal mode. So before switching modes, always check the diagnostic trouble codes and freezed frame data, and note them down.

1. Prepare the OBDII scan tool (complying with SAE J 1978) or TOYOTA hand–held tester.
2. Connect the OBDll scan tool or TOYOTA hand–held tester to data link connector 3 in the fuse box at the lower left of the instrument panel.
3. Turn the ignition switch ON and turn the OBDII scan tool or TOYOTA hand–held tester switch ON.

4. Use the OBD n scan tool or TOYOTA hand–held tester to check the diagnostic trouble codes and freezed frame data. Note them down. (For operating instructions, see the OBD n scan tool's instruction book.)
5. See page AX2–62 to confirm the details of the diagnostic trouble codes.
   NOTICE: When simulating symptoms with an OBD ll scan tool (excluding TOYOTA hand–held tester) to check the diagnostic trouble codes, use normal mode. For codes on the diagnostic trouble code chart subject to "2 trip detection logic", turn the ignition switch off after the symptoms have been simulated the first time. Then repeat the simulation process again. When the program has been simulated twice, the MIL lights up and the diagnostic trouble codes are recorded in the ECM.



DIAGNOSIS INSPECTION (CHECK MODE)

TOYOTA hand–held tester only

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

DIAGNOSTIC TROUBLE CODE CHECK

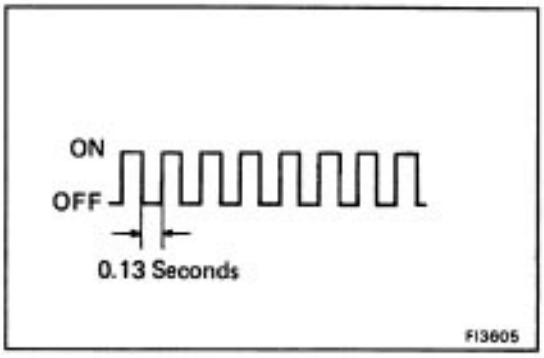
1. Initial conditions.
   (a) Battery positive voltage 11 V or more.
   (b) Throttle valve fully closed.
   (c) Transaxle in PARK position.
   (d) Air conditioning switched off.

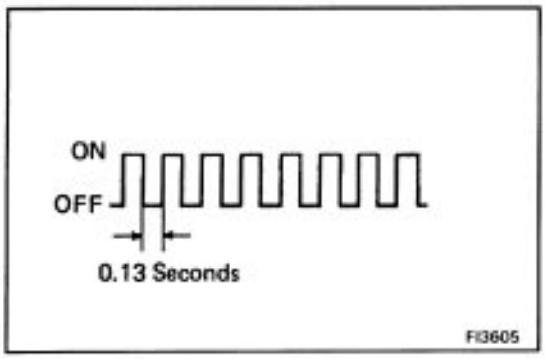
2. Turn ignition switch off.

3. Prepare the TOYOTA hand–held tester.

4. Connect the TOYOTA hand–held tester to data link connector 3 in the fuse box at the lower left of the instrument panel.

5. Turn the ignition switch ON and switch the TOYOTA hand–held tester ON.





6. Switch the TOYOTA hand – held tester normal mode check mode. (Check that the MIL flashes.)

7. Start the engine. (MIL and O/D OFF indicator light go out after the engine starts.)

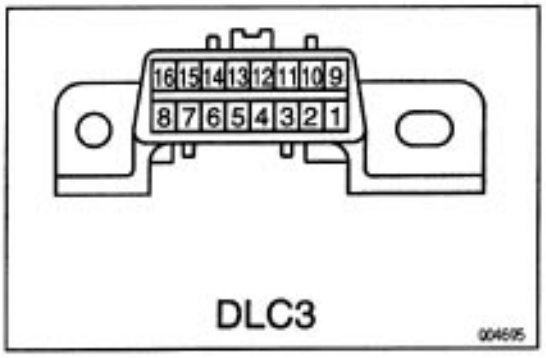
8. Simulate the conditions of the malfunction descr–ibed by the customer.

NOTICE: Leave the ignition switch ON until you have checked the diagnostic trouble codes, etc.

9. After simulating the malfunction conditions, use the TOYOTA hand–held tester diagnosis selector to check the diagnostic trouble codes and freezed frame data, etc.

HINT: Take care not to turn the ignition switch OFF, Turning the ignition switch off switches the diagnosis system from check mode to normal mode, so all diag–nostic codes, etc. are erased.

10. After checking the diagnostic trouble code, inspect the applicable circuit.



DATA LINK CONNECTOR 3 INSPECTION

The vehicle's ECM uses V.P.

W. (Variable Pulse Width)

for communication to comply with SAE J1850. The

terminal arrangement of DLC 3 complies with SAE J 1962 and matches the V.P.

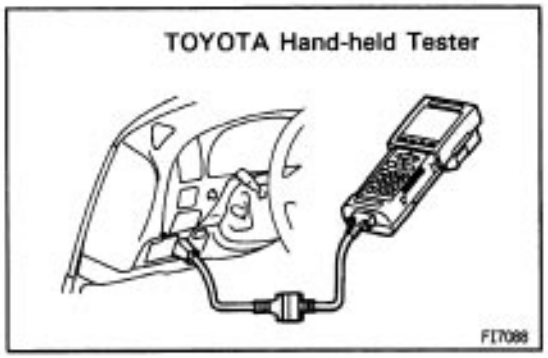
W. format.

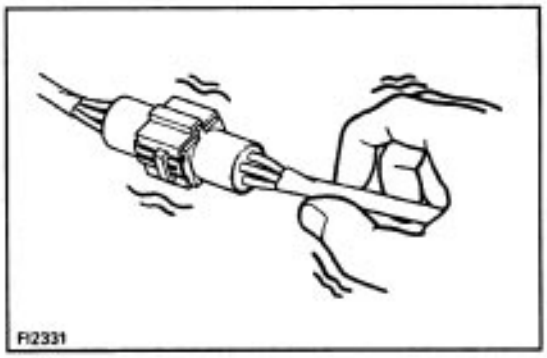
Terminal No.	Conn¿ection/Voltage or Resistance	Condition
2	Bus 〉 Line	During transmission
4	Chassis Ground 〈 Body 1Ω or less	Always
5	Signal Ground 〈 Body 1Ω or less	Always
16	Battery Positive 〈 Body 1Ω Body 9 ~ 14 V	Always

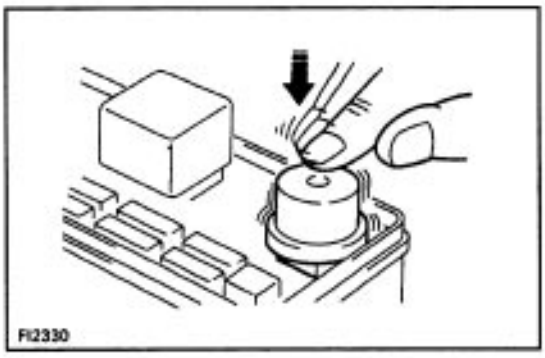
HINT: If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of the OBD ll scan tool or TOYOTA hand–held tester to DLC 3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.

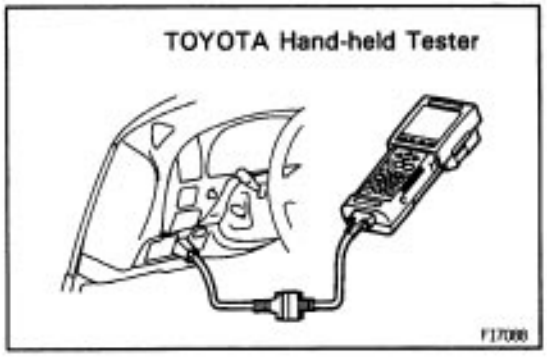
(1) If communication is normal when the tool is con–nected to another vehicle, inspect DLC 3 on the original vehicle.

(2) If communication is still not possible when the tool is connected to another vehicle, the problem is probably in the tool itself, so consult the Service Department listed in the tool's instruction manual.









AXON–M

CHECK FOR INTERMITTENT PROBLEMS

–TOYOTA hand–held tester only–
By putting the vehicle's EC11A in check mode, 1 trip detection logic is possible instead of 2 trip detection logic and sensitivity to detect open circuits is increased, This makes it easier to detect a intermittent problems.

CLEAR DIAGNOSTIC TROUBLE CODES

See page AX2–58

SET CHECK MODE

See page AX2–56

PERFORM A SIMULATION TEST

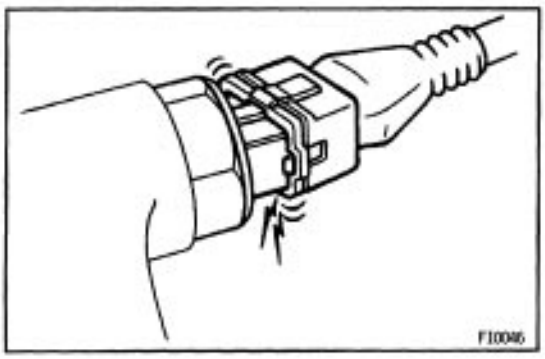
Using the symptom simulation (See page IN–24), apply vibration to and pull lightly on the wire harness, connector or terminals in the circuit indicated by the malfunction code. In this test, if the malfunction indicator lamp lights up, it indicates that the place where the wire harness, connector or terminals being pulled or vibrated has faulty contact. Check that point for loose connection, dirt on the terminals, poor fit or other problems and repair as necessary.
HINT: After canceling out the diagnostic trouble code in memory and setting the check mode, if the malfunction indicator lamp does not go off after the engine is started, check thoroughly for faulty contact, etc., then try the check again. If the malfunction indicator lamp still does not go off, check and replace the EC11A.

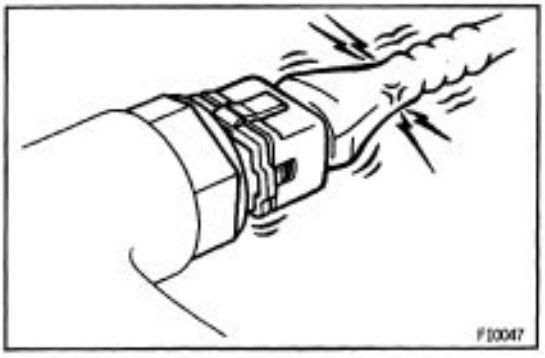
DIAGNOSTIC TROUBLE CODE CLEARANCE

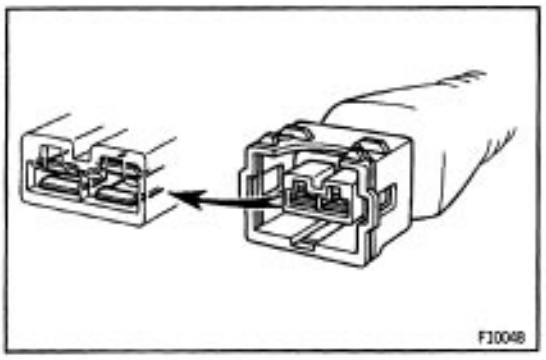
The following actions will erase the diagnostic trouble codes and freezed frame data.

1. Operating the OBD ll scan tool (complying with SAE J 1978) or TOYOTA hand–held tester to erase the codes. (See the OBDII scan tool's instruction book for operating instructions.)
2. Disconnect the battery terminal or EFI fuse.

NOTICE: If the TOYOTA hand–held tester switches the ECM from normal mode to check mode or vice – versa, or if the ignition switch is turned from ON to ACC or OFF during check mode, the diagnostic trou–ble codes and freeted frame dada will be erased.







CONNECTOR CONNECTION AND TERMINAL IN–SPECTION

When checking for an open circuit or short circuit, it is important to check the connector connection and the condition of the terminals.

OPEN CIRCUIT:

This could be due to a disconnected wire harness, faulty contact in the connector, a connector terminal pulled out, etc.

HINT:

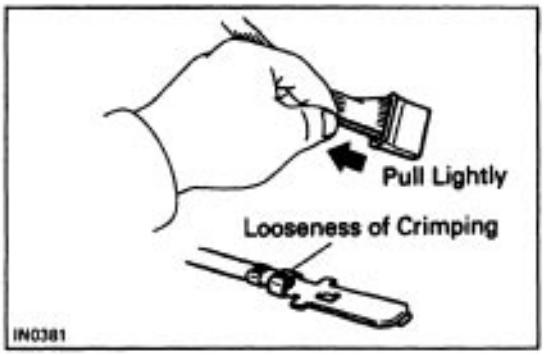
1. A wire rarely breaks in the middle of it's length. Most cases occur at the connector. In particular, carefully check the connectors of sensors and ac–tuators.
2. Faulty contact could be due to rusting of the con–nector terminals, to foreign materials entering ter–minal or a drop in the contact pressure between the male and female terminals of the connector. Simply disconnecting and reconnecting the connectors once changes the condition of the connection and may result in a return to normal operation. There–fore, in troubleshooting, if no abnormality is found in the wire harness and connector check, but the problem disappears after the check, them the cause is considered to be in the wire harness or connec–tors.

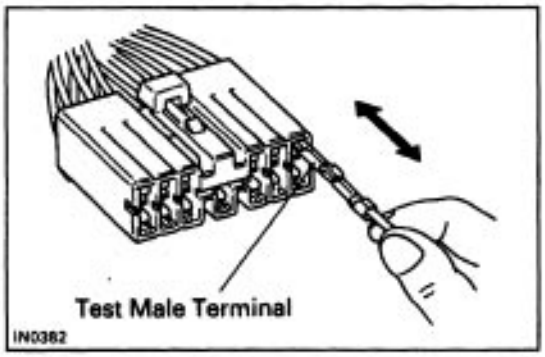
SHORT CIRCUIT:

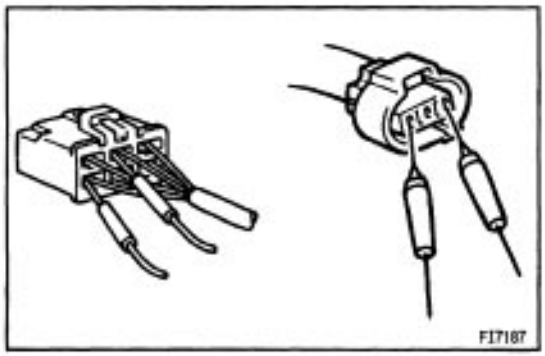
This could be due to a short circuit between the wire harness and the body ground or to a short inside the switch etc.

HINT:

When there is a short between the wire harness and body ground, check thoroughly whether the wire har–ness is caught in the body or is clamped properly.







VISUAL CHECK AND CONTACT PRESSURE CHECK

(a) Disconnect the connectors at both ends.
(b) Check for rust or foreign material, etc. in the terminals of the connectors.
(c) Check crimped portions for looseness or damage and check if the terminals are secured in the lock portion.

HINT: The terminals should not come out when pulled lightly.

(d) Prepare a test male terminal and insert it in the female terminal, then pull it out.

NOTICE: When testing a gold–plate female terminal, always use a gold–plated male terminal.

HINT: When the test terminal is pulled out more easily than others, there may be poor contact in that section.

CONNECTOR HANDLING

When inserting tester probes into a connector, insert them from the rear of the connector. When necessary, use mini test leads. For water resistant connectors which cannot be accessed from behind, take good care not to deform the connector terminals.

–MEMO–

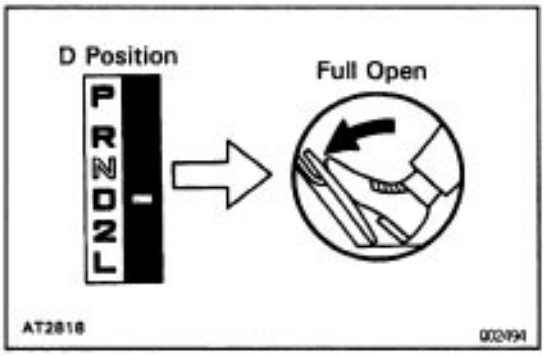
DIAGNOSTIC TROUBLE CODE CHART

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.	Detection Item	Diagnostic Trouble Code Detecting Condition
P0720	Output Speed Sensor Circuit Malfunction (for Electronically Controlled Transaxle)	When DTC No. P0500 is detected
P0750	Shift Solenoid A Malfunction	During normal driving the gear required by the ECM does not match the actual gear. (2 trip detection logic)
P0753	Shift Solenoid A Electrical (Shift Solenoid Valve No.1 j	Open or short in shift solenoid A circuit.
P0755	Shift Solenoid B Malfunction (Shift Solenoid Valve No.2)	Same as for DTC No.P0750
P0758	Shift Solenoid B Electrical (Shift Solenoid Valve No.2)	Open or short in shift solenoid B circuit
P0770	Shift Solenoid E Malfunction (Shift Solenoid Valve SL)	Lock–up does not occur when driving in the lock–up range (normal driving at 80 km/h (50 mph). Or lock–up remains ON in the lock–up OFF range. (2 trip detection logic)
P0773	Shift Solenoid E Electrical (Shift Solenoid Valve SL)	Open or short in shift solenoid E circuit for 1 time. (2 trip detection logic)
P1705	”NC2” Revolution Sensor Circuit Malfunction (Direct Clutch Speed Sensor)	Output of direct clutch speed sensor (NC2) is 300 rpm or less under condition a) or b) a) Vehicle speed: 32 km/h (20 mph) or more b) Park/neutral position switch: OFF (2 trip detection logic)
P1765	Shift Solenoid Valve SLN Circuit (For Accumulator Back Pressure Modulation)	After the engine is warmed up, the current flow to the shift solenoid valve SLN is 0.2 A or less for at least 1 second under condition a) or b) (2 trip detection logic) a) Engine speed: 500 RPM or more b) Park/neutral position switch: ON (P or N position)
P1780	Park/neutral Position Switch Malfunction	Two or more switches are ON simultaneously for ’N’, ’2’ and ’L’ position. (2 trip detection logic) ——— When driving under condition a) and b) for 30 seconds or more the park/neutral position switch is ON (N position). (2 trip detection logic) a) Vehicle speed: 44 mph (70 km/h) or more b) Engine speed: 1,500–2,500 rpm

–...MIL does not light up
〈 ...MIL lights up
C...MIL lights up, O/D OFF indicator light blinks

Trouble Area	MIL	Memory	See page
• Same as for DTC No. P0500.	●	○	AX2–92
• Shift solenoid valve No.1 is stuck open or closed • Valve body is blocked up or stuck.	●	○	AX2–96
• Open or short in shift solenoid valve No.1 circuit. • Shift solenoid valve No.1 • ECM	●	○	AX2–98
• Shift solenoid valve No.2 is stuck open or closed • Valve body is blocked up or stuck.	●	○	AX2–96
• Open or short in shift solenoid valve No.2 circuit. • Shift solenoid valve No.2 ECM	●	○	AX2–98
• Shift solenoid valve SL is stuck open or closed. • Lock–up clutch • Valve body is blocked up or stuck.	●	○	AX2–102
• Open or short in shift solenoid valve SL circuit. • Shift solenoid valve SL • ECM	●	○	AX2–104
• Open or short in direct clutch speed sensor circuit. • Direct clutch speed sensor • ECM	●	○	AX2–108
• Open or short in shift solenoid valve SLN circuit. • Shift solenoid valve SLN • ECM	–	○	AX2–112
• Short in park/neutral position switch circuit. • Park/neutral position switch • ECM	●	○	AX2–116



ROAD TEST

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

1. D POSITION TEST (NORM AND PWR PATTERN)

Shift into the D position and fully depress the accelerator pedal and check the following points:

(a) Check up–shift operation.1⟨ 2, 2⟨ 3 and 3⟨ O/D up–shift takes place, at the shift point shown in the automatic shift schedule. (See page AX2–67)

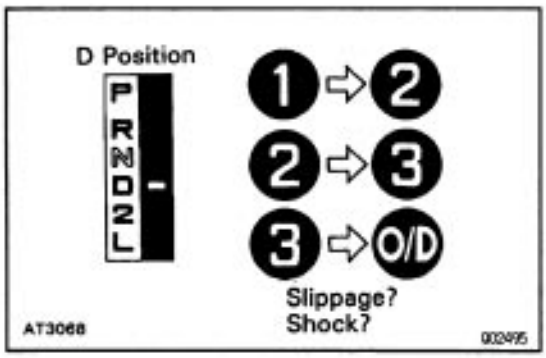
HINT:

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

- Coolant temp. is 55°C (131°F) or less
- If there is a 10 km/h (6 mph) difference between the set cruise control speed and vehicle speed.
- 0/D main switch is pushed ON
  (During the O/D OFF indicator light lights up.)

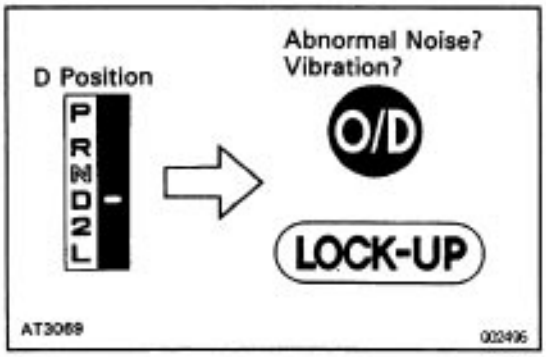
(2) O/D Gear Lock–up Prohibition Control

- Brake pedal is depressed.
- Coolant temp. is 55 °C (131 °F) or less.



(b) Check for shift shock and slip.

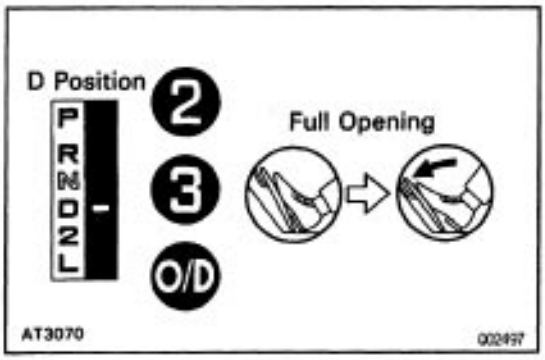
Check for shock and slip at the 1–2, 2–3 and 3–O/D up–shifts.



(c) Check for abnormal noises and vibration.

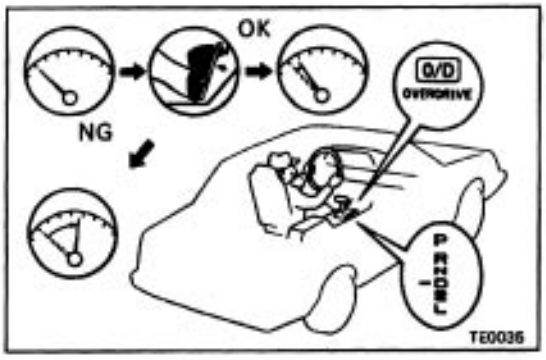
Run at the D position lock–up or O/D gear and check for abnormal noises and vibration.

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



(d) Check kick–down operation
While running in the D position, 2nd, 3rd and 0/D gears, check to see that the possible kick–down vehicle speed limits for 2→1, 3→2 and 0/D→3 kick–downs conform to those indicated on the automatic shift schedule. (See page AX2–67)

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

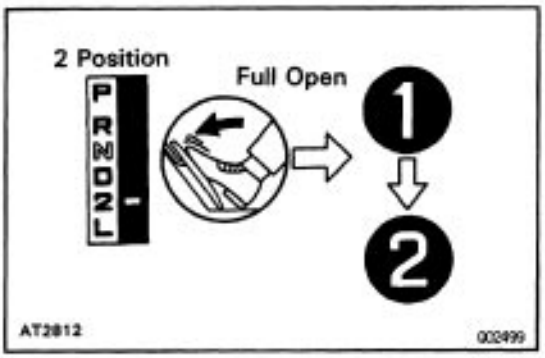


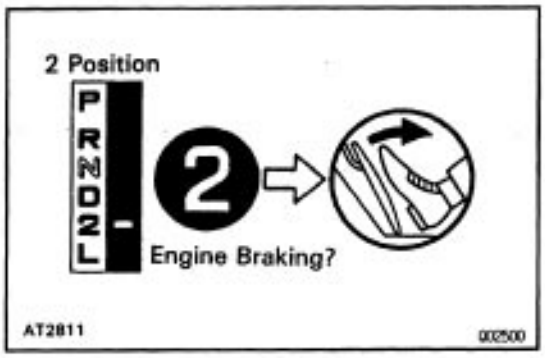
(f) Check the lock–up mechanism.
(1) Drive in D position, O/D gear, at a steady speed (lock–up ON) of about 70 km/h (43 mph).
(2) Lightly depress the accelerator pedal and check that the engine RPM does not change abruptly. If there is a big jump in engine RPM, there is no lock–up.

2. 2 POSITION TEST

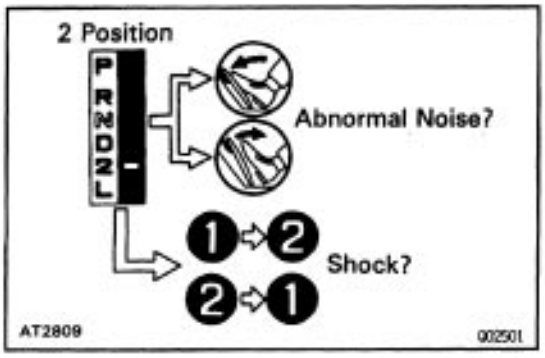
Shift into the 2 position and fully depress the accelerator pedal and check the following points:

(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 AX2–67)
HINT: There is no 0/D up–shift and lock–up in the 2 position.

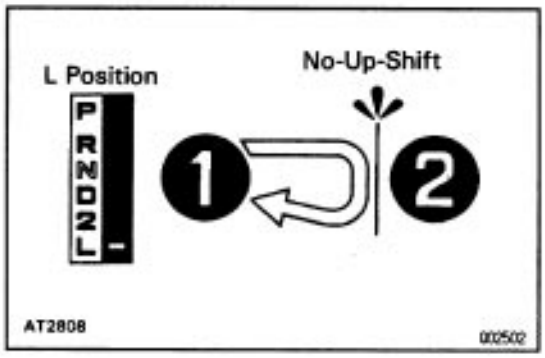




(b) Check engine braking.
While running in the 2 position and 2nd gear, release the accelerator pedal and check the engine braking effect.



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

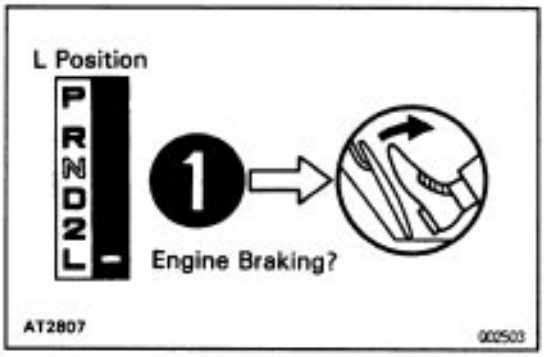


3. L POSITION TEST

Shift into the 2 position and fully depress the acceler–ator pedal and check the following points:

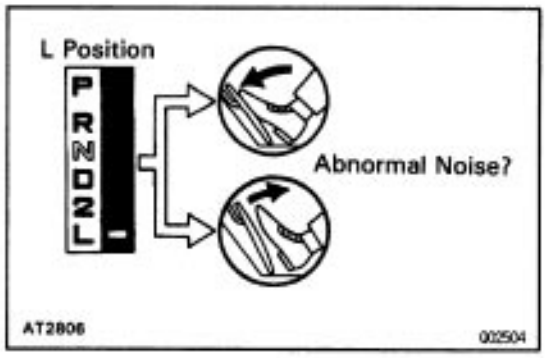
(a) Check no up–shift.

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

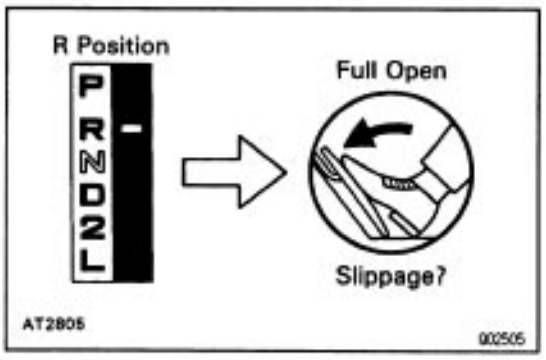


(b) Check engine braking.

While running in the L position, release the accelera–tor pedal and check the engine braking effect.



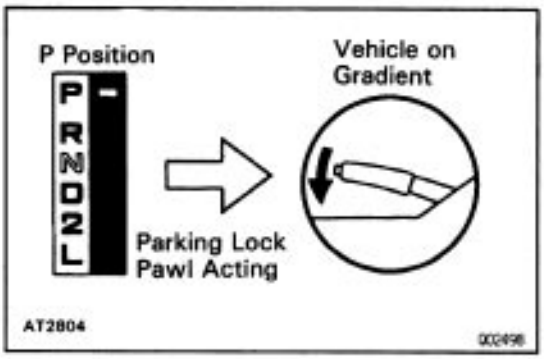
(c) Check for abnormal noises during acceleration and deceleration.



4. R POSITION TEST

Shift into the R position and fully depress the acceler–ator pedal and check for slipping.

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



5. P POSITION TEST

Stop the vehicle on a gradient (more than 5°) and after shifting into the P position, release the parking brake. Then, check to see that the parking lock pawl holds the vehicle in place.

AUTOMATIC SHIFT SCHEDULE

SHIFT POINT

Shift position	Shifting point		Vehicle speed km/h (mph)
D position	Throttle valve fully opened	1→2	60–65 (37–40)
		2→3	113–121 (70–75)
		3→O/D	174–182 (108–113)
		O/D→3	168–176 (104–109)
		3→2	104–112 (65–70)
		2→1	50–54 (31–34)
	Throttle valve fully closed	3→O/D	40–44 (25–27)
		O/D→3	20–24 (12–15)
2 position	Throttle valve fully opened	1→2	60–65 (37–40)
		3→2	122–130 (76–81)
		2→1	50–54 (31–34)
L position	Throttle valve fully opened	3→2	107–114 (66–71)
		2→1	55–59 (34–37)

LOCK–UP POINT

D position km/h (mph) Throttle valve opening 596	Lock–up ON	Lock–up OFF
'3rd Gear	60–65 (37–40)	53–57 (33–35)
0/D Gear	60–64 (37–40)	53–57 (33–35)

*: 0/D Switch OFF

HINT:

(1) There is no lock–up in the 2 and L positions.

(2) In the following cases, the lock–up will be released regardless of the lock–up pattern.

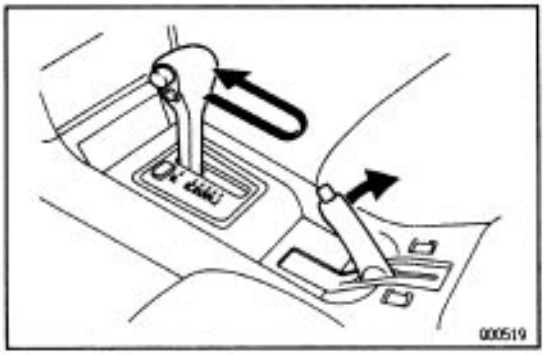
- **When the throttle valve is completely closed.**
- **When the brake light switch is ON.**

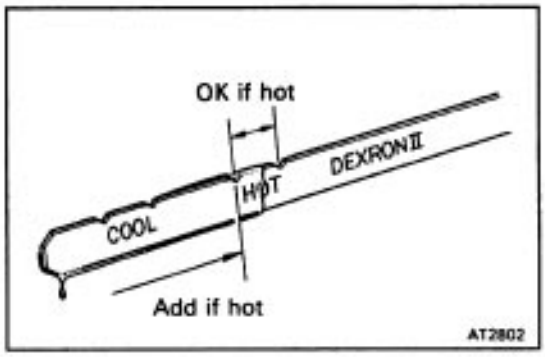
(3) Shift up to 3rd will not occur when the engine coolant temp. is below 35°C (95°F) and the vehicle speed is below 40 km/h (25 mph).

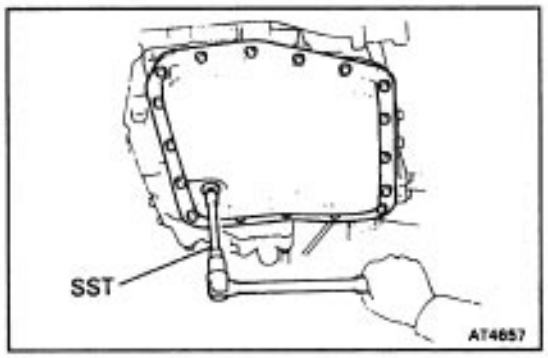
(4) Shift–up to 0/D will not occur when the engine coolant temp. is below 60 °C (140 °F) and the vehicle speed is below 63 km/h (39 mph).

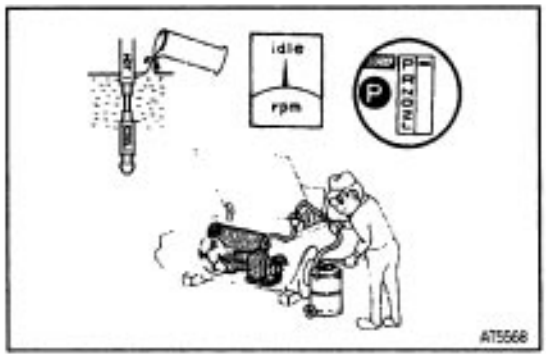
(5) During cruise control operation ; the shift pattern is fixed in NORM. And when the vehicle speed drops to 10 km/h (6 mph) or more below the cruise control set vehicle speed, shift down from 0/D to 3rd occurs.

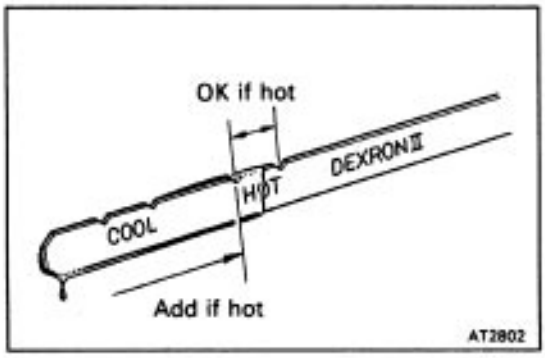
(6) The kick–down foot switch turns ON when the accelerator pedal is depressed further with the throttle valve already fully open.











PRELIMINARY CHECK

1. CHECK FLUID LEVEL

HINT:

- Drive the vehicle so that the engine and transmis–sion 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 dipstick and wipe it clean.

(d) Push it back fully into the tube.

(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:

DEXRON ° II or equivalent

NOTICE: Do not overfill.

2. CHECK FLUID CONDITION

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

3. REPLACE TRANSAXLE 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 tube.

Fluid type:DEXRON^II or Equivalent

Capacity:

Total: 6.75 liters (7.1 US qts, 5.9 Imp. qts)

Drain and refill: 3.5 liters (3.7 US qts, 3.1 Imp. qts)

(d) Start the engine and shift the shift lever into all posi–tions from P to L position and then shift into P posi–tion.

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

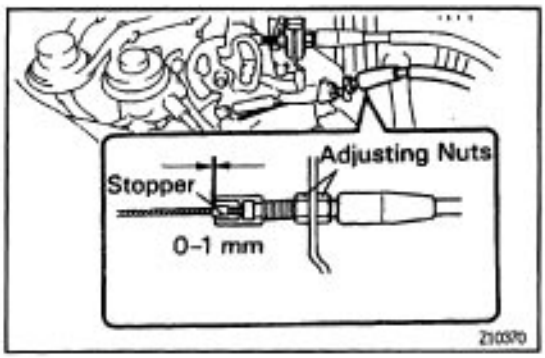
(f) Check the fluid level at the normal operating tempera–ture, 70–80 C (158–176 *F), and add as necessary.

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 0 –rings, seal packings, oil seals, plugs or other parts.



5. INSPECT AND ADJUST THROTTLE CABLE

(a) Check that the accelerator pedal is fully released.
(b) Check that the inner cable is not slack.
(c) Measure the distance between the outer cable end and stopper on the cable.

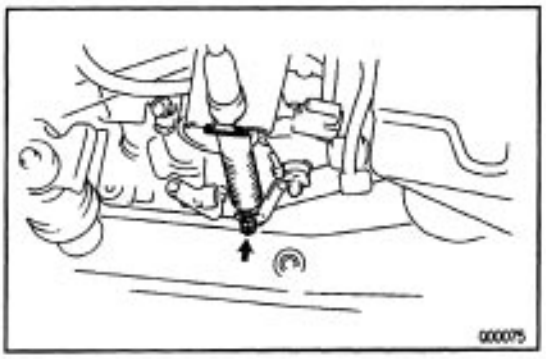
Standard distance:

0–1 mm (0–0.04 In.)

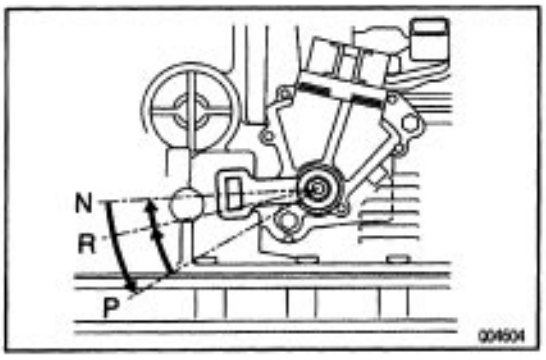
If the distance is not standard, adjust the cable by the adjusting nuts.

6. 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.



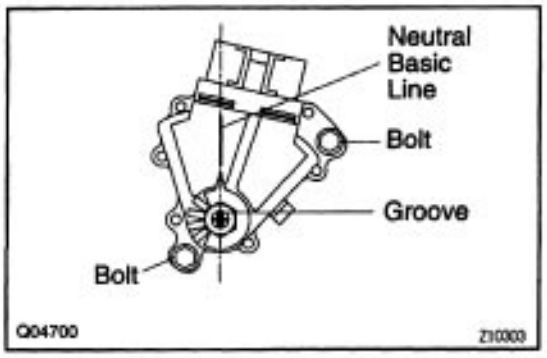
(a) Loosen the swivel nut on the manual shift lever.
(b) Push the manual lever fully toward the right side of the vehicle.



(c) Return the 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 swivel 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 posi–tion.

7. 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 started above, carry out the following adjust–ment procedure.



(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: 5.4 N–m (55 kgf–cm, 48 in.–lbf)

For continuity inspection of the park/neutral position switch, see page AX–116.

8. INSPECT IDLE SPEED

Idle speed:

650–750 RPM

(In N position and air conditioner OFF)

MECHANICAL SYSTEM TESTS

STALL TEST

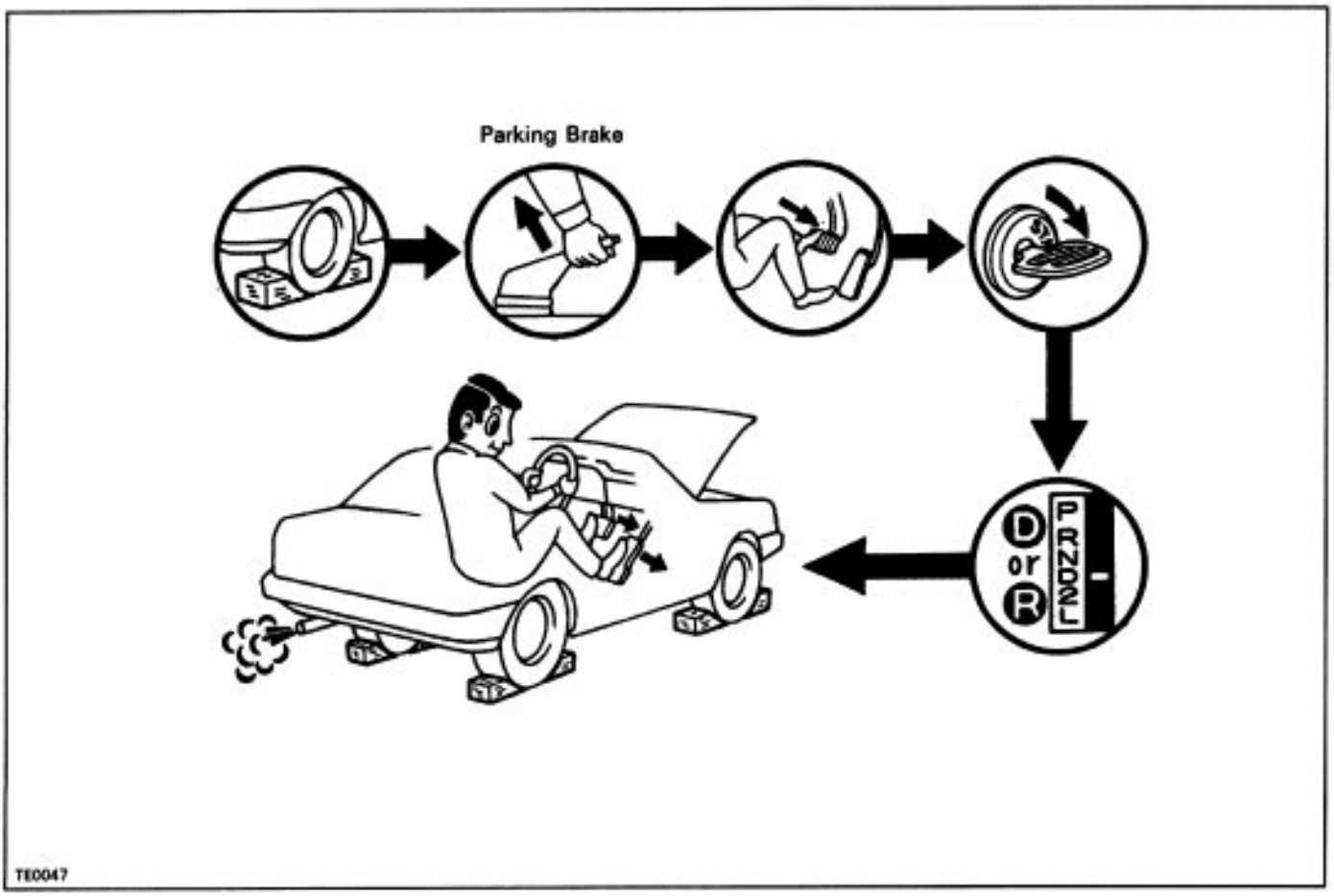
The object of this test is to check the overall performance of the transaxle and engine by measuring the stall speeds in the D and R positions.

NOTICE:

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

MEASURE STALL SPEED

(a) Chock the four wheels.
(b) Connect a tachometer to the engine.
(c) Fully apply the parking brake.
(d) Keep your left foot pressed firmly on the brake pedal.
(e) Start the engine.
(f) Shift into the D position. Press all the way down on the accelerator pedal with your right foot.
Quickly read the stall speed at this time.
Stall speed:
2,600 ±150 RPM
(g) Perform the same test in R position.



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 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 position.	• 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 0/D direct clutch, forward clutch, direct clutch, and first and reverse brake.

NOTICE:

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

MEASURE TIME LAG

(a) Fully apply the parking brake .

(b) Start the engine and check idle speed.

Idle speed:

650–750 RPM (In N position and air conditioner OFF)

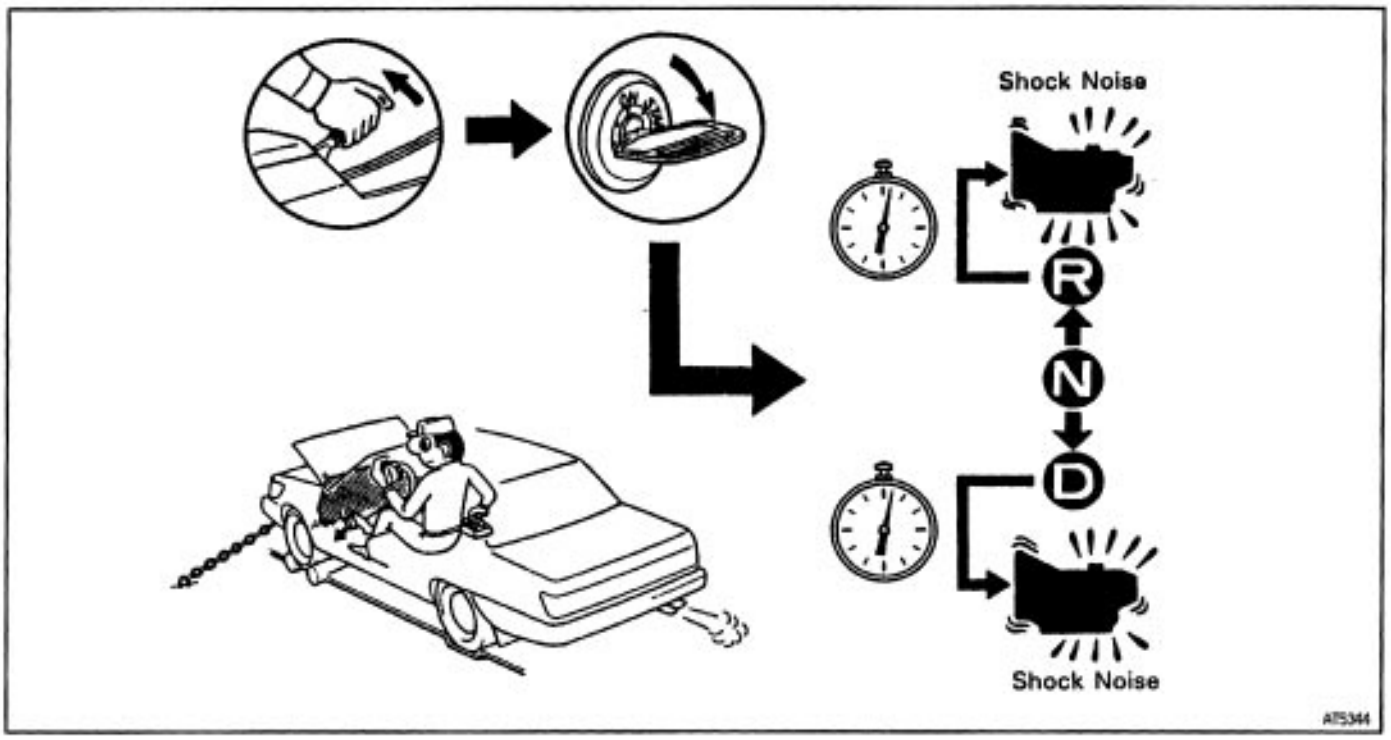
(c) Shift the shift lever from N to D position. Using a stop watch, measure the time it takes from shifting the lever until the shock is felt.

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 are longer than specified:

Problem	Possible cause
N D time lag is longer	• Line pressure too low • Forward clutch worn • 0/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 one–way clutch not operating properly

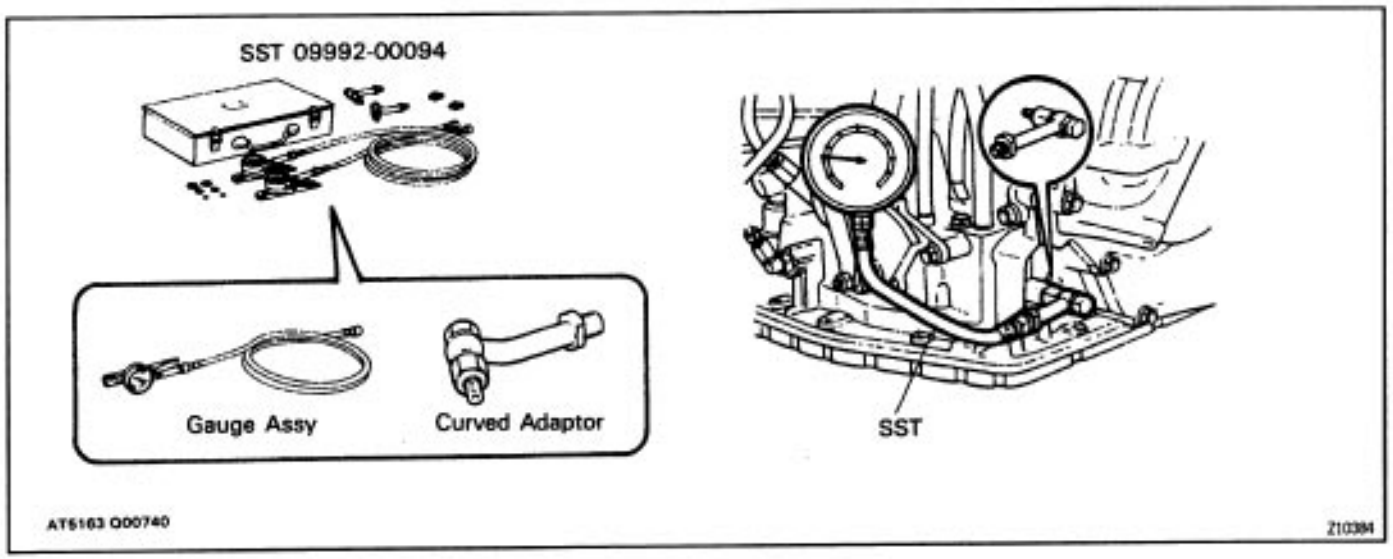
MEASURE LINE PRESSURE

NOTICE:

- Perform the test at normal operating fluid temperature 50–80 °C (122–176 °F).
- The line pressure test should always be carried out in pairs. One technician should observe the conditions of wheels or wheel stoppers outside the vehicle while the other is performing 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 transaxle case left side and connect the oil pressure gauge SST.
SST 09992–00094



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

(d) Start the engine and check idling RPM.

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

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

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

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

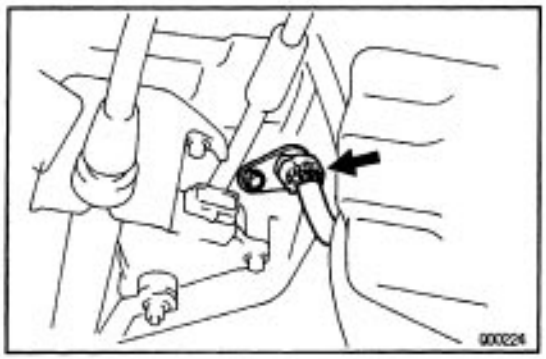
SPECIFIED LINE PRESSURE

Condition	D position kPa (kgf/cm2, psi)	R position kPa (kgf/cm2, psi)
Idling	401–461 (4.1–4.7, 58–66)	804–882 (8.2–9.0, 117–128)
Stall	1,138–1,236 (11.6–12.6, 165–179)	1,716–1,854 (17.5–18.9, 249–269)

If the measured pressures are not up to specified values, recheck the throttle cable adjustment 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 • 0/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



MANUAL SHIFTING TEST

HINT: With this test, it can be determined whether the trouble is within the electrical circuit or is a mechani–cal problem in the transaxle.

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

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

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

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

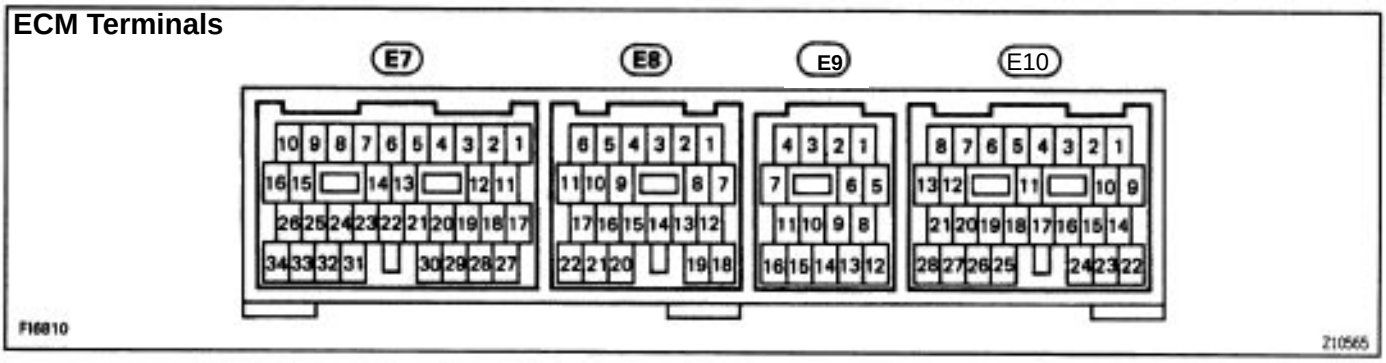
3. CONNECT SOLENOID WIRE

4. CANCEL OUT DIAGNOSTIC TROUBLE CODE

(See page AX2–58**)**

STANDARD VALUE OF ECM TERMINAL

AX0082–01



Connector,Terminal No. Symbols Wiring Color	Condition	Standard Value
E10,12 – E9,16 SP1 – E1 V·Y – BR	1. Disconnect cruise control connector. 2. Turn ignition switch ON. Standing still Turn one front wheel slowly	Below 1 V Pulse signal is output Below 1V ↔ 5V
E7,11 – E9,16 S1 – E1 V – BR	IG OFF IG ON 1 st or 2nd gear 3rd or O/D gear	11 – 15 Ω B+ B+ Below 1V
E7,17 – E9,16 S2 – E1 P·L – BR	IG OFF IG ON 2nd or 3rd gear 1 st or O/D gear	11 – 15 Ω Below 1V B+ Below 1 V
E7,27 – E9,16 SL – E1 Y·L – BR	IG OFF IG ON Vehicle driving under lock–up position	11 – 15 Ω Below 1 V B+
E8,9 – E8,4 NC2⊕ – NC2⊖ Y·L – W·L	IG OFF Engine is running	580 – 680 Ω Puls signal is output Below 1 V ↔ 4–5 V
E7,3 – E9,16 SLN⁻ – E1 Y·G – BR	IG switch ON	B+
E10,7 – E9,16 OD1 – E1 Y·B – BR	IG switch ON	B+
E10,6 – E9,16 OD2 – E1 G·O – BR	0/D main switch ON O/D main switch OFF	B+ Below 1 V
E10,3 – E9,16 P – E1 L·R – BR	IG switch ON Pattern select switch 'NORM' Pattern select switch 'PWR'	Below 1 V B+

E10,2 – E9,16 L – E1 Y-L – BR	IG switch ON Shift lever L position Shift lever other than L position	 B+ Below 1 V
E10,10 – E9,16 2 – E1 O – BR	1G switch ON Shift lever 2 position Shift lever other than 2 position	 B+ Below 1 V
E10,15 – E9,16 R – E1 R-B – BR	IG switch ON Shift lever R position Shift lever other than R position	 B+ Below 1 V
E10,14 – E9,16 NSW – E1 B-W – BR	IG switch ON Shift lever P or N position Shift lever other than P and N position	 B+ Below 1 V
E10,24 – E9,16 STP – E1 G-W – BR	IG switch ON Brake pedal is depressed Brake pedal is released	 B+ Below 1 V

AXXRY–01

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.

Chapter 1. Electronic Circuit

Suspect Area / Symptom		See Page	OD Cansel Signal Circuit AX2–120	0/D Main Switch & O/D OFF Indicator Light Circuit AX2–122	Pattern Select Switch Circuit AX2–126	Park/Neutral Position Switch Circuit AX2–116	Stop Light Switch Circuit AX2–128	On–Vehicle repair matrix chart AX2–82	Of–Vehicle repair matrix chart AX2–84
Vehicle does not move in any forward range and reverse range								1	2
Vehicle does not move in particular range or ranges								1	2
No up–shift	1st→2nd							1	2
	2nd→3rd							1	2
	3rd→O/D		1		2			3	4
No down–shift	O/D→3rd							1	
	3rd→2nd							1	2
	2nd→1st							1	2
No lockup							1	2	3
No lockup off							1	2	
Shift point too high or too low						1			
Upshifts is to 2nd while in L range Upshifts to 3rd while in L range									
Upshifts to O/D from 3rd while O/D switch is OFF					1				
Upshifts to O/D from 3rd while engine is cold								1	2
Harsh engagement	N→D							1	2
	Lockup							1	2
	Any driving range							1	2
Slip or Shudder	Forward and reverse							1	2
	Particular range							1	2
No engine Braking								1	2
Poor acceleration									1
No kickdown								1	
No pattern select									
Large shift shock or Engine stalls when starting off or stopping.									1

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Chapter 2. On–Vehicle Repair
(* : A541 E AUTOMATIC TRANSAXLE Repair Manual)

See page / Suspect Area / Symptom		★ Manual valve	★ Primary regulator valve	★ Throttle valve	★ Down–shift plug	★ Cut–Back valve	★ Secondary regulator valve	★ 2nd coast modulator valve	★ Low coast modulator valve
Vehicle does not move in R position									
Vehicle does not move in any forward position or reverse position		1	2						
No lock–up							2		
No lock–up OFF									
No kick–down									
No engine braking	1st								1
	2nd							1	
No up–shift	1st⊖2nd								
	2nd ⊖ 3rd								
	3rd⊖O/D								
No down–shift	O/D ⊖3rd								
	3rd ⊖2nd								
	2nd→1 st								
Harsh engagement	N⊖R								
	N⊖D								
	N ⊖L								
	1 st⊖2nd (D position)								
	1 st⊖2nd (2 Position)								
	1st⊖2nd⊖3rd								
	1st⊖2nd ⊖3rd⊖O/D		1	2	3				
	2nd⊖3rd								
	3rd⊖O/D								
	O/D⊖3rd								
	3rd⊖2nd							2	
Sliper shudder in forward and reverse (Directly after E/G start)			3	4	5				

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★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★
2nd lock valve	B_1 Orifice control valve	Lock–up relay valve,	1–2 shift valve	2–3 shift valve	3–4 shift valve	Accumulator control valve	Solenoid modulator valve	Co accumulator	C_1 a cumulator	C_2 accumulator	Bo accumulator	B_2accumulator	Pressure relief valve	Parking lock pawl	Oil strainer	OFF–Vehicle repair matrix chart
			1	2												3
																3
		1														3
		1														2
			1	2	3											
																2
																2
			1													2
				1												2
					1											2
					1											
				1												
			1													2
										1						2
									1							2
									1							
												1				2
						4										
										1						
											1					2
								1			2					
												1				3
													1		2	6

AX2–84

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Chapter 3. Off–Vehicle Repair
(* : A541 E AUTOMATIC TRANSAXLE Repair Manual)

See page / Suspect Area / Symptom		*	★	★	★	★	★
		Torque converter clutch	Parking lock pawl	O/D direct clutch (CO)	Forward clutch (C_1)	Direct Clutch (C2)	O/D brake (Bo)
Vehicle does not move in any forward position					1	6	
Vehicle does not move in reverse position				5		4	
Vehicle does not move in any forward position and reverse position			1	3			4
No lock–up		1					
No lock–up OFF		1					
Large shock during lock–up		1					
E/G stalls when starting off and stopping		1					
No up–shift	1 st⊖2nd						
	2nd⊖3rd					1	
	3rd⊖O/D						1
No down shift 2nd→1 st							
Harsh engagement	N⊖R					1	
	N⊖D				1		
	1 st⊖2nd (D position)						
	2nd⊖3rd						
	3rd⊖O/D			1			2
Slip on shudder	Forward and reverse (After warm–up)	1		3			
	Forward and reverse (Directly after E/G start)	1					
	R position			2		1	
	1 st				1		
	2nd						
	2nd⊖3rd (Up–shift)					1	
	3rd					1	
	O/D						1
No engine braking	1 st ⊕3rd			1			
	1st						
	2nd						
Poor acceleration	A11 positions	1					
	O/D			1			
	Other than O/D						1
	Other than 2nd						
	1 st and 2nd						1
	1 st and R position						
	R position				1		

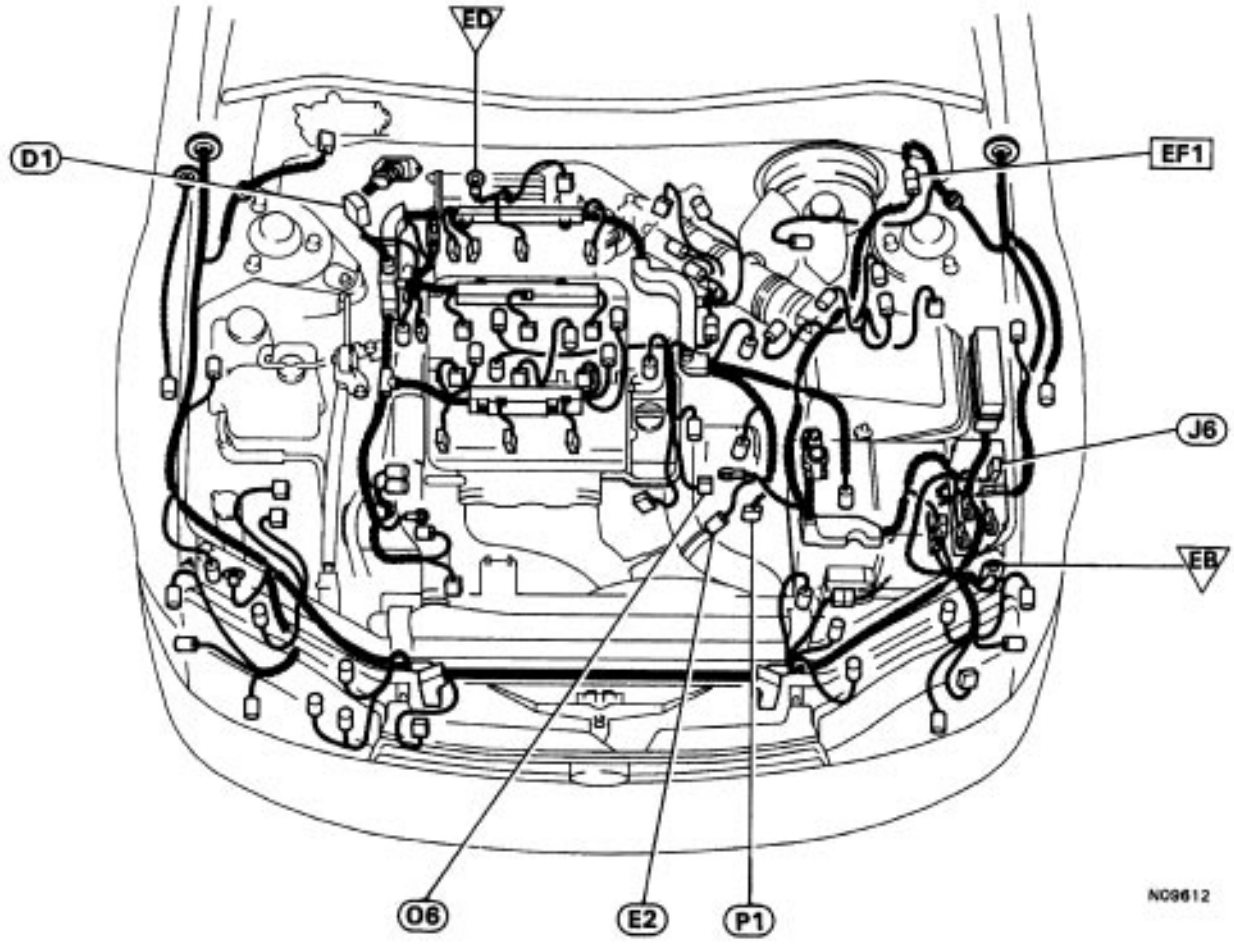
V04627

★	★	★	★	★	★	★	★	★
2nd coast brake (B,)	Second brake (621	1 st and reverse brake (B3)	O/D one–way clutch (FD)	No. 1 one–way clutch (F i)	No.2 one–way clutch IF21	O/D planetary gear	Front planetary gear	Rear planetary gear
4	5	3			2			
1		6					2	3
			2			7	5	6
	1			2				
1								
		2						
		1						
1								
						3		
				2				
			3					
					2			
	1			2				
		1						
1								
						2		
						2		
1	2							
		1						

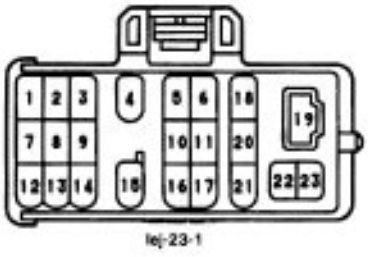
LOCATION OF CONNECTORS

AX0MW–01

Location of Connectors in Engine Compartment



D1
Data Link Connector 1

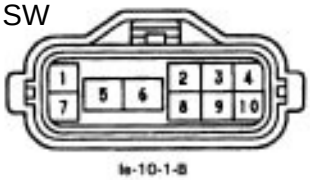


E2
Electronic Controlled Transaxle Connector

J6
Junction Connector

O6
O/D Direct Clutch Speed Sensor

P1
Park/neutral Position SW

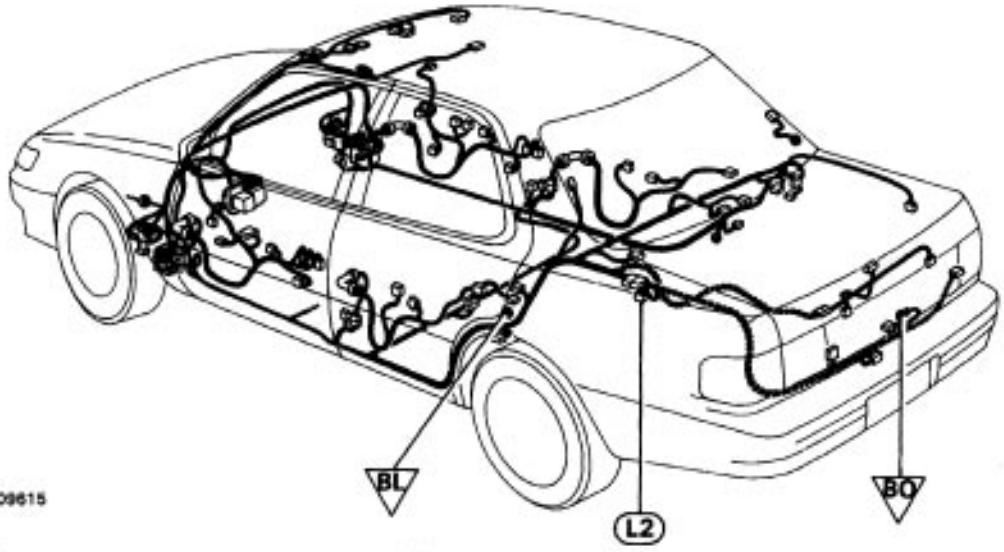


EF 1

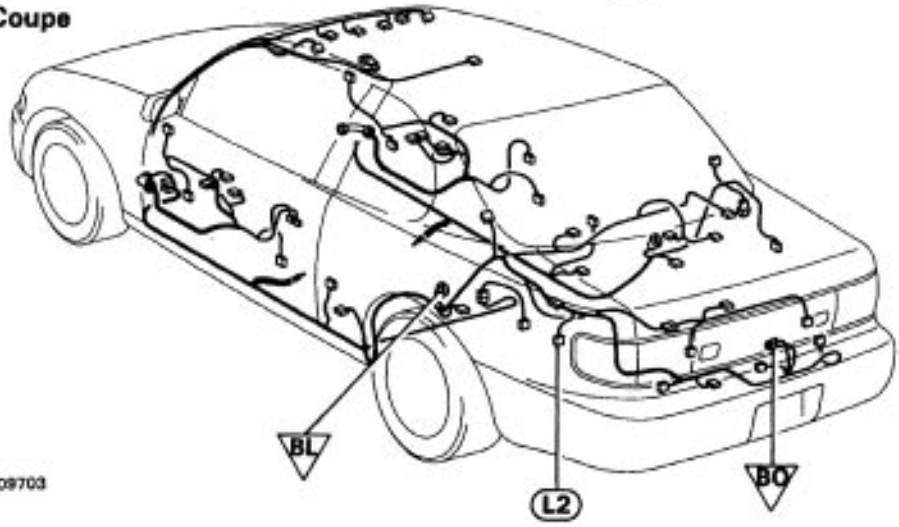
V04860

Location of Connectors in Body

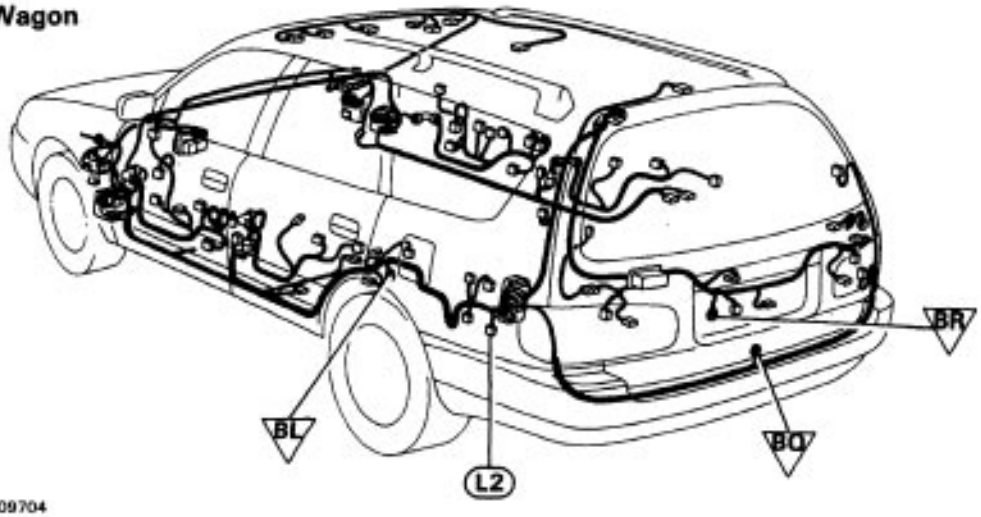
Sedan



Coupe



Wagon

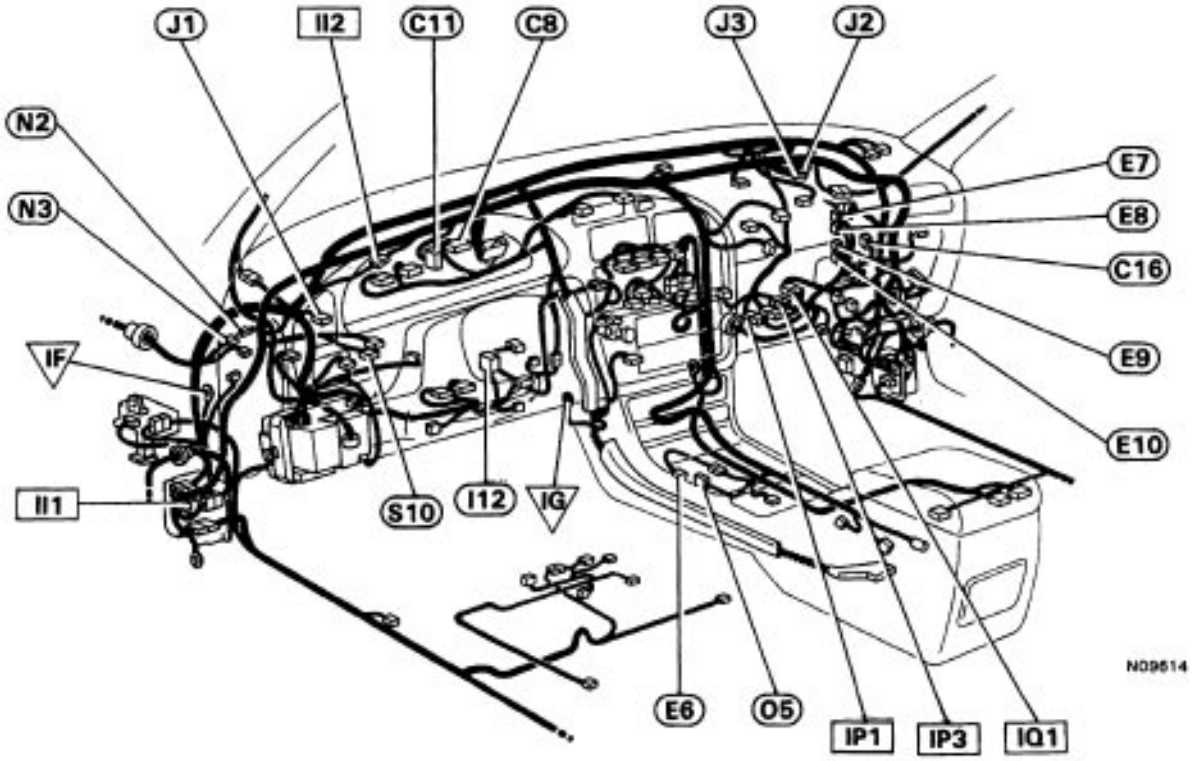


L2
Light Failure Sensor

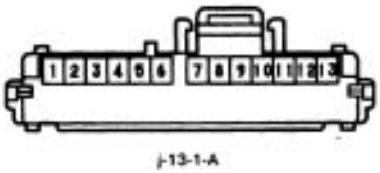
e-12-1

V04863

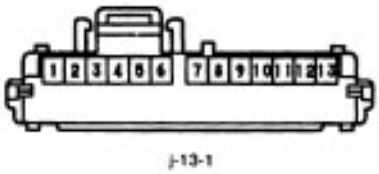
Location of Connectors in Instrument Panel



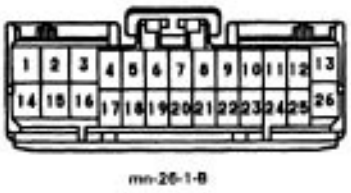
C8
Combination Meter



C11
Combination Meter

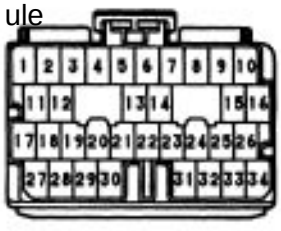


C16
Cruise Control ECU



E6
Electronic Controlled Transaxle Pattern Select Switch

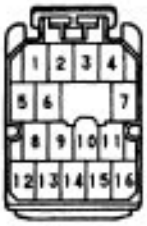
E7
Engine Control Module



E8
Engine Control Module

V04851

E9
Engine Control Module

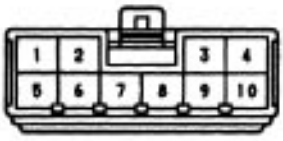


n-16-1

E10
Engine Control Module

n-28-1

112
Ignition SW and Unlock Warning SW



e-1c-1-B

N2
Noise Filter

g-2-2

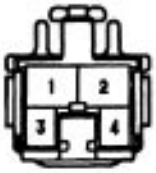
N3
Noise Filter

g-2-1

O5
O/D Main SW

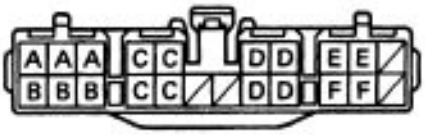
s-4-2-B

S10
Stop Light Switch



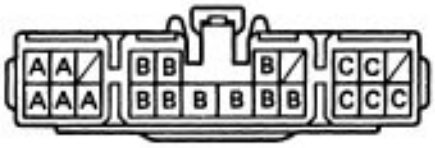
eg-4-1

J1
Junction Connector



e-22-1-A

J2
Junction Connector



e-22-1

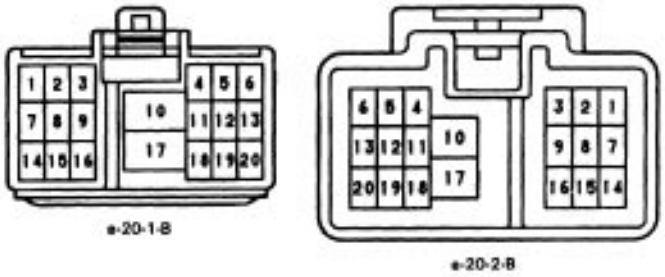
J3
Junction Connector

e-14-1-A

I11

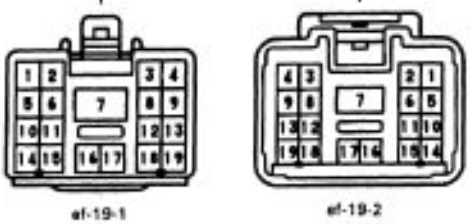
e-10-1
e-10-2

112 **1P1**



e-20-1-B
e-20-2-B

IP3



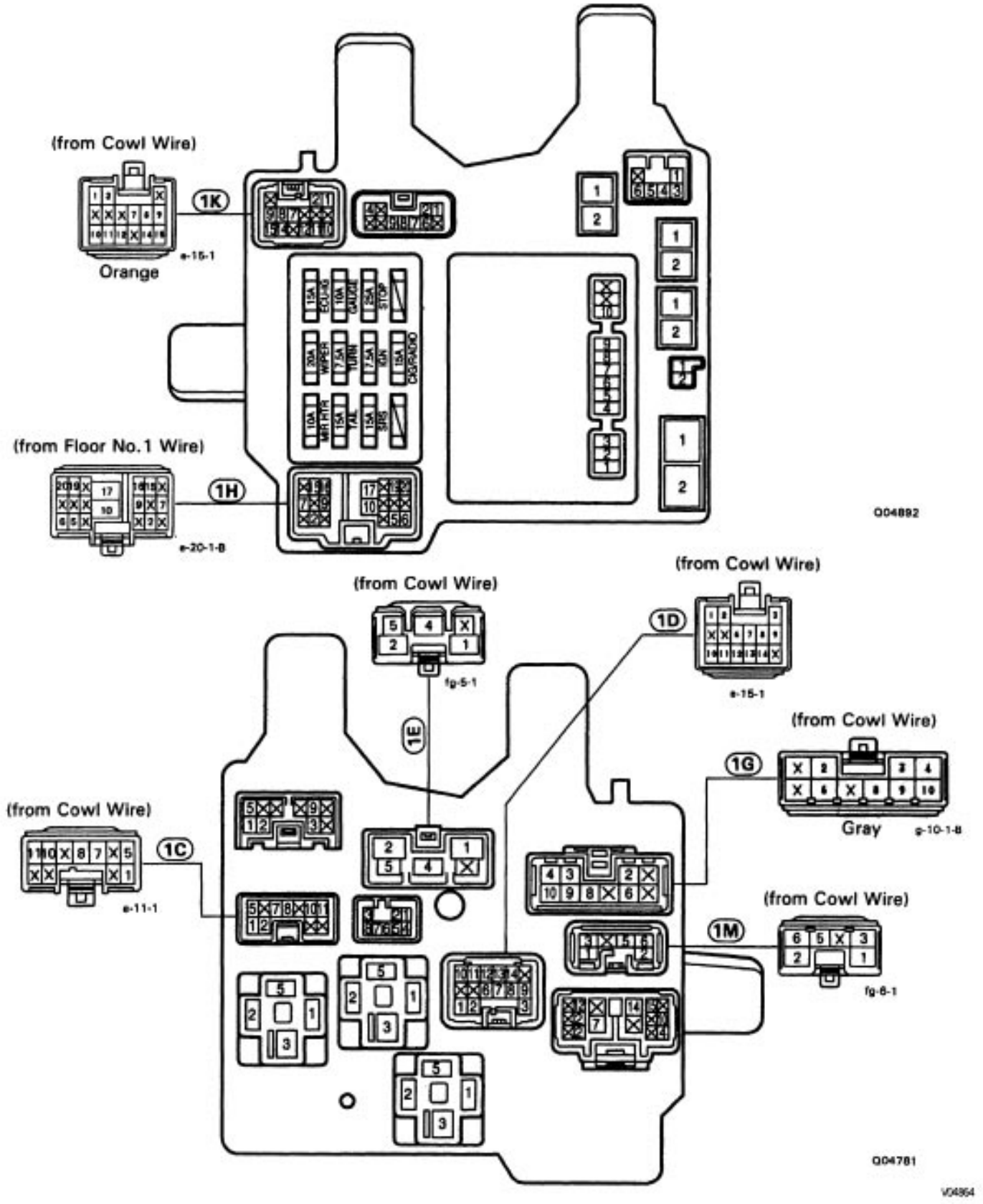
ef-19-1
ef-19-2

Ia1

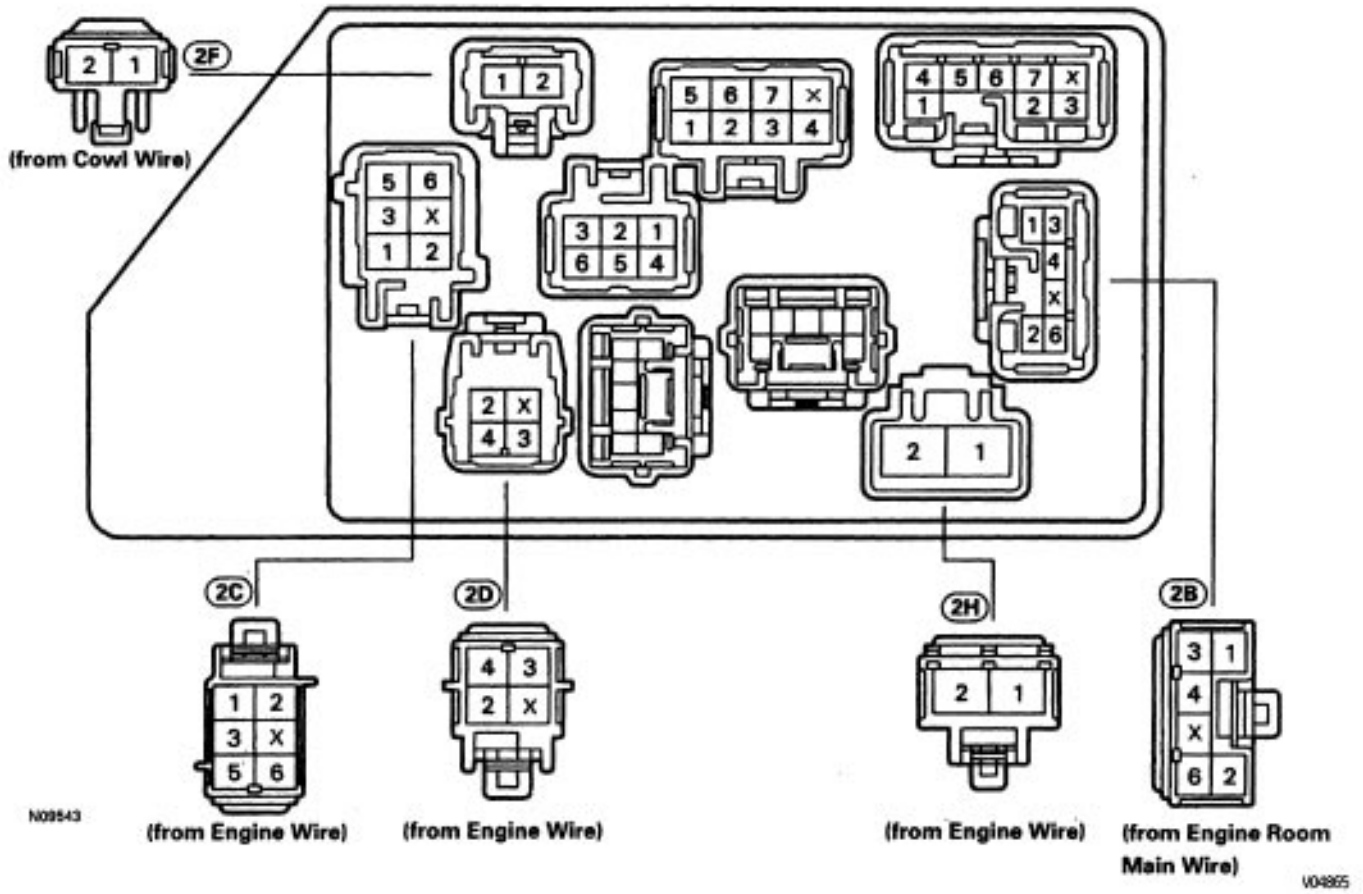
e-6-1
e-6-2

V04852

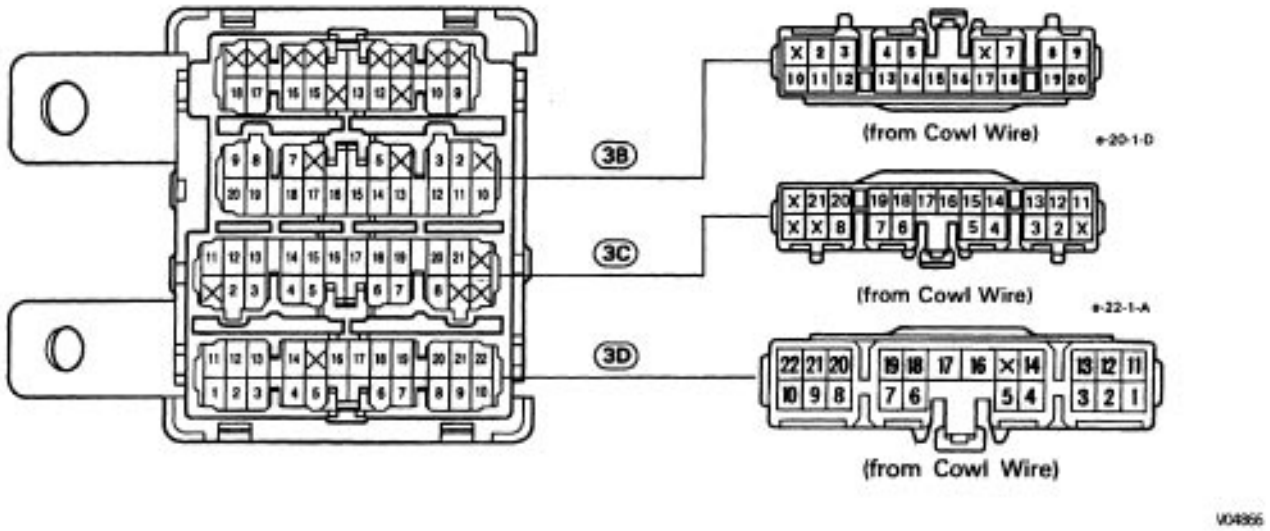
J/B No.1


(from Cowl Wire)
1K
e-15-1
Orange
(from Floor No.1 Wire)
1H
e-20-1-8
Q04892
(from Cowl Wire)
1D
e-15-1
(from Cowl Wire)
fg-5-1
1E
(from Cowl Wire)
1G
Gray
e-10-1-8
(from Cowl Wire)
1C
e-11-1
(from Cowl Wire)
1M
fg-6-1
Q04781
V04864

J/B No.2


2F
(from Cowl Wire)
2C
(from Engine Wire)
2D
(from Engine Wire)
2H
(from Engine Wire)
2B
(from Engine Room Main Wire)
N09543
V04865

J/B No–3


3B
3C
3D
(from Cowl Wire)
(from Cowl Wire)
(from Cowl Wire)
V04866

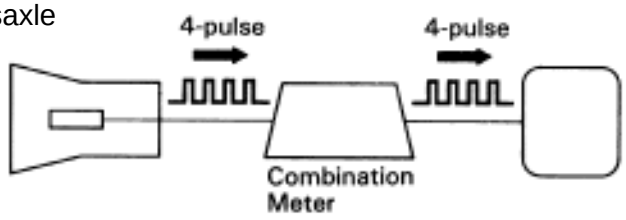
CIRCUIT INSPECTION

DTC P0720 Output Speed Sensor Circuit Malfunction (For Electronically Controlled Transaxle)

CIRCUIT DESCRIPTION

The vehicle speed sensor outputs a 4–pulse signal for every revolution of the transaxle differential.
After this signal has been converted into a more precise rectangular wave form by the wave form shaping circuit inside the combination meter, it is then transmitted to the ECM.

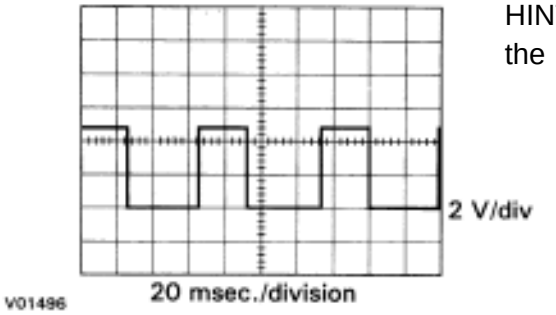
Transaxle



DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0720	When DTC No. P0500 is detected	• Same as for DTC No. P0500

< Reference >

- Waveform between terminals SP 1 and E l when vehicle speed is approx. 20 km/h (12 MPH).

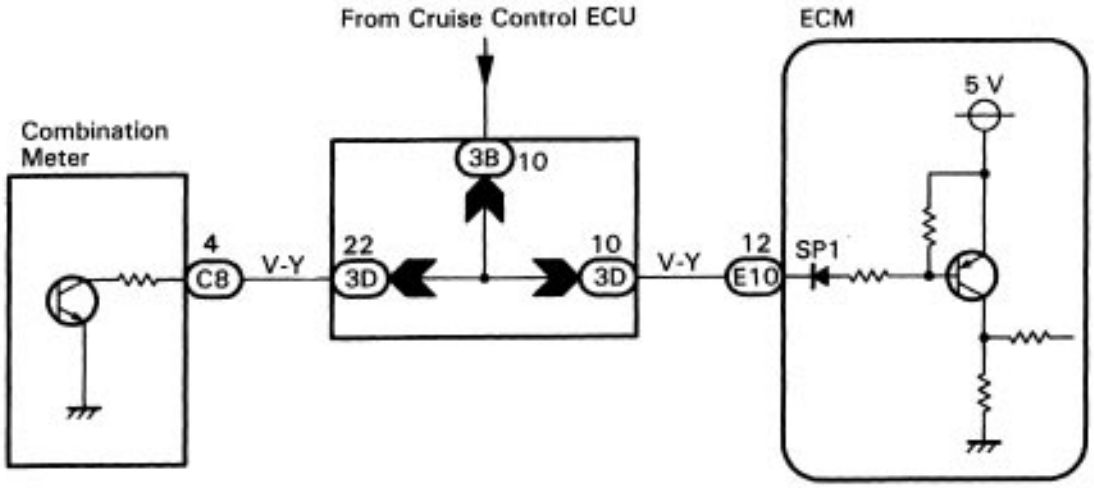


HINT: The greater the vehicle speed, the greater the number of VSS signals produced.

DIAGNOSTIC CHART

1	Measure voltage between terminals SP 1 and E, of ECM connector.	NG	Go to step 3
OK			
2	Measure voltage between terminal 14 of combination meter center connector and body ground.	NG	Check for open circuit between ECM and combination meter.
OK			
Check combination meter.		NG	Check for short circuit between ECM, cruise control ECU and combination meter.
3	Check continuity between terminal SP1 of ECM connector and body ground.		
OK			
Replace ECM.			

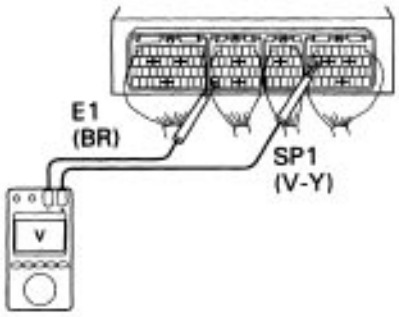
WIRING DIAGRAM



Q04759

INSPECTION PROCEDURE

1 **Measure voltage between terminals SP 1 and E 1 of ECM connector.**



QO1558

P 1. Disconnect cruise control ECU connector.
2. Turn IG switch ON.

C Measure voltage between terminals SP1 and E1 of ECM connector.

OK **Voltage: 5 V**

OK → NG → **Go to step 3.**

2 **Measure voltage between terminal 14 of combination meter center connector and body ground.**

Q04767

P 1. Remove the combination meter, but do not disconnect the connectors.
2. Turn 1 G switch ON.

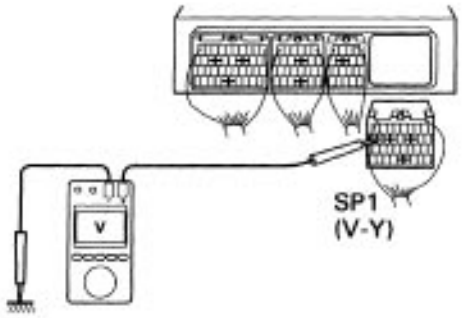
C Measure voltage between terminal 4 of combination meter connector and body ground.

OK **Voltage: 5 V**

OK → NG → **Check for open circuit between ECM and combination meter.**

Check combination meter.

3 Check continuity between terminal SP1 of ECM connector and body ground.



Q004757

P Disconnect connector from ECU.

C Check continuity between terminal SP1 of ECM connector and body ground.

OK **No continuity**

OK

NG **Check for short circuit between ECM, cruise control ECU and combination meter.**

Replace ECM.

DTC P0750 Shift Solenoid A Malfunction Shift Solenoid No.1
DTC P0755 Shift Solenoid B Malfunction Shift Solenoid No.2

SYSTEM DESCRIPTION

The ECM uses signals from the NC2 revolution sensor and vehicle speed sensor to detect the actual gear position(1 st, 2nd, 3rd or O/D gear).
Then the ECM compares the actual gear with the shift schedule in the ECM memory to detect mechanical trouble of the shift solenoid valves and valve body.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0750 P0755	During normal driving the gear required by the ECM does not match the actual gear. (2 trip detection logic)	• Shift solenoid valve No.1lNo.2 is stuck open or closed. • Valve body is blocked up or stuck.

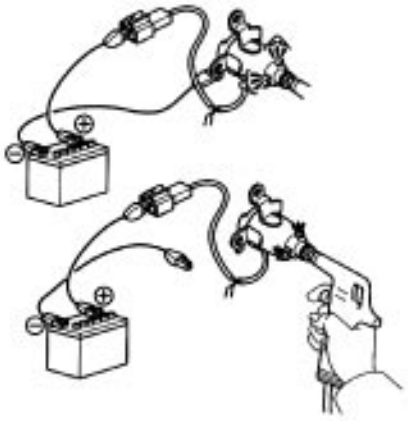
Check the No. 1 solenoid when diagnostic trouble code P0750 is output and check No.2 solenoid when diagnostic trouble code P0755 is output

DIAGNOSTIC CHART

1	Check solenoid valve No. 1 or No. 2 opera–tion.	NG	Replace No. 1 or No. 2 solenoid valve.
OK			
2	Check valve body (See page AX2–82).	NG	Repair or replace valve body.
OK			
Repair or replace transaxle (See page AX2–27).			

INSPECTION PROCEDURE

1 Check solenoid valve No. 1 or No.2 operation.



G04773

P
1. Remove the oil pan.
2. Remove the No. 1 or No. 2 solenoid valve.

C
1. Applying 490 kPa (5 kg/flcm2, 71 psi) of com–pressed air, check that the solenoid valves do not leak the air.
2. When battery voltage is supplied to the solenoid valves, check that the solenoid valves open.

OK

NG → **Replace No. 1 or No.2 solenoid valve.**

2 Check valve body (See page AX2–82).

OK

NG → **Repair or replace valve body.**

Repair or replace transaxle (See page AX2–27).

DTC P0753 Shift Solenoid A Electrical Malfunction (Shift Solenoid Valve No. 7)
DTC P0758 Shift Solenoid B Electrical Malfunction (Shift Solenoid Valve No. 2)

CIRCUIT DESCRIPTION

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

Fail Safe Function

If either of the shift solenoid valve circuits develops an open or a short, the ECM turns the other shift solenoid ON and OFF to shift to the gear positions shown in the table below. The ECM also turns the shift solenoid valve SL OFF at the same time. If both solenoids malfunction, hydraulic control cannot be perform–ed electronically and must be done 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	1 st	×	ON	3rd	ON	×	1 st	O/D
	ON	ON	2nd	×	ON	3rd	OFF	×	O/D	O/D
	OFF	ON	3rd	×	ON	3rd	OFF	×	O/D	O/D
	OFF	OFF	O/D	×	OFF	O/D	OFF	×	O/D	O/D
2	ON	OFF	1 st	×	ON	3rd	ON	×	1 st	O/D
	ON	ON	2nd	×	ON	3rd	OFF	×	O/D	O/D
	OFF	ON	3rd	×	ON	3rd	OFF	×	O/D	O/D
L	ON	OFF	1 st	×	OFF	1 st	ON	×	1 st	1st
	ON	ON	2nd	×	ON	2nd	ON	×	1 st	1 st

x; Malfunctions

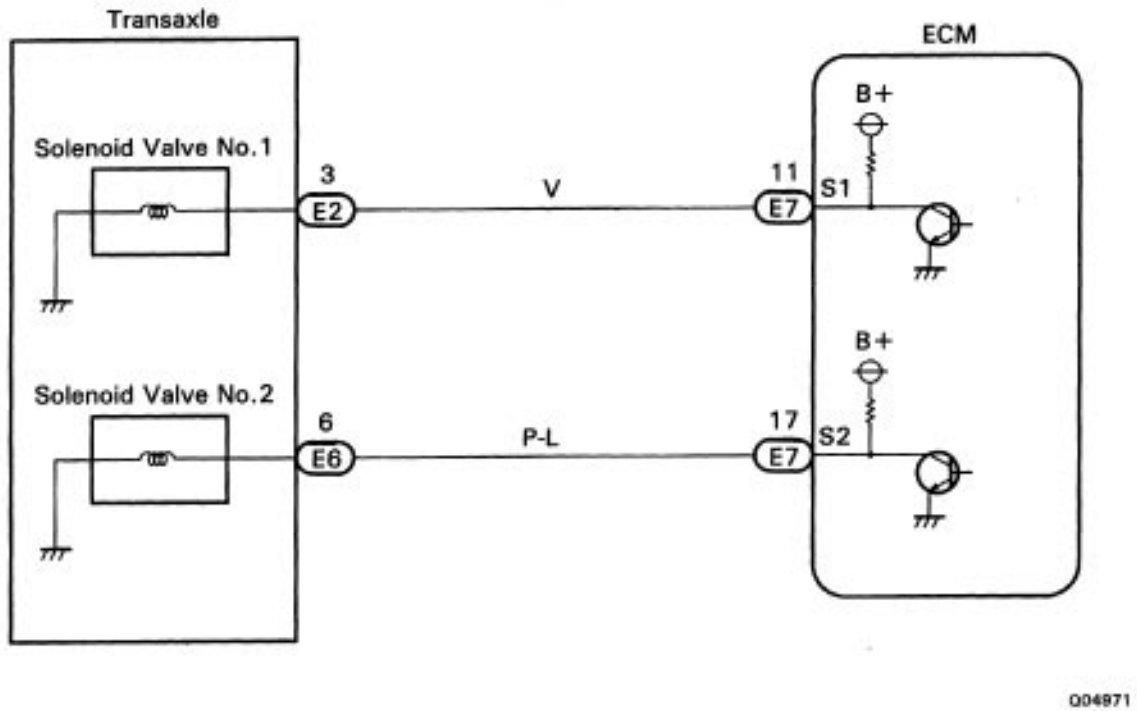
Check the shift solenoid valve No. 1 when diagnostic trouble code P0753 is output and check the shift solenoid valve No.2 when diagnostic trouble code P0758 is output.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0753 **P0758**	Short or open in shift solenoid valve No. 1 l No. 2 circuit.	• Shift solenoid valve No. 1 INo.2 circuit. • Shift solenoid valve No. 1INo.2. • ECM

DIAGNOSTIC CHART

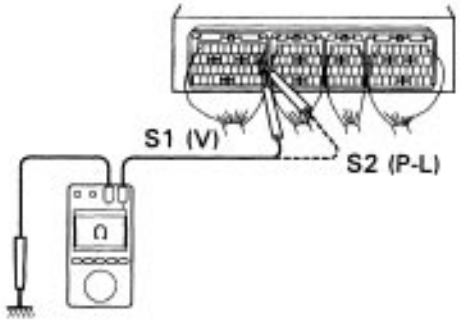
1	Measure resistance between S 1 or S2 terminal of ECM connector and body ground.	OK	Replace ECM.
NG			
2	Check harness and connector between ECM and automatic transaxle solenoid connector.	NG	Repair or replace harness or connector.
OK			
3	Inspect No.1 or No.2 solenoid valve.	NG	Replace malfunctioned solenoid valve.
OK			
Repair or replace solenoid wire.			

WIRING DIAGRAM



INSPECTION PROCEDURE

1 Measure resistance between S 1 or S2 terminals of ECM connector and body ground.



Q04756

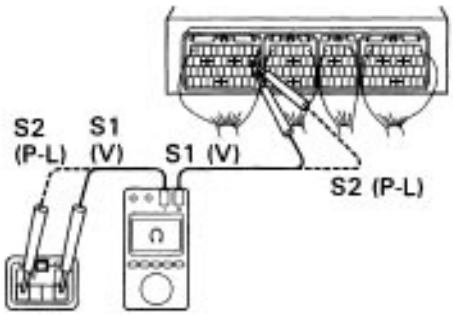
C Measure resistance between S 1 or S2 terminals of ECM connector and body ground.

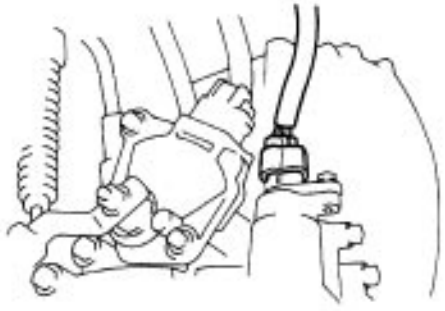
OK **Resistance: 10–16 9**

NG

OK **Replace ECM.**

2 Check harness and connector between ECM and automatic transaxle solenoid connector.





Q04748
Q02283

P Disconnect the solenoid connector on the automatic transaxle.

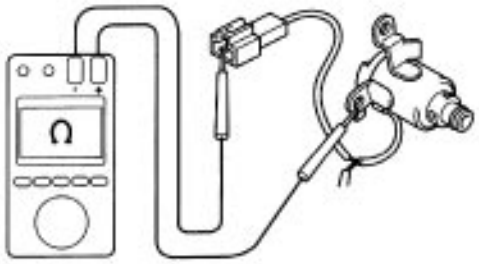
C Check harness and connector between S 1 and S2 terminals of ECM connector and 3 terminals of solenoid connector.

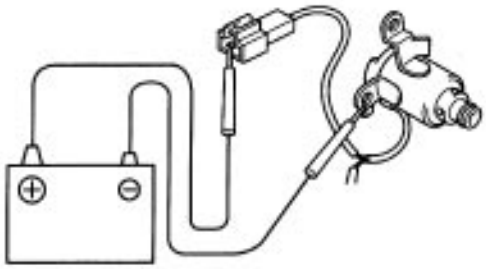
OK **There is no open and no short circuit.**

OK

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

3 Check No. 1 or No.2 solenoid valves.





G04771
G04772

P 1. Jack up the vehicle.
2. Remove oil pan.
3. Disconnect solenoid connector.
4. Remove No. 1 or No. 2 solenoid valve.

C Measure resistance between solenoid connector and body ground.

Resistance: 10–16 Ω

OK Connect positive⊕ lead to terminal of solenoid connector, negative⊖ lead to solenoid body

C

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

OK

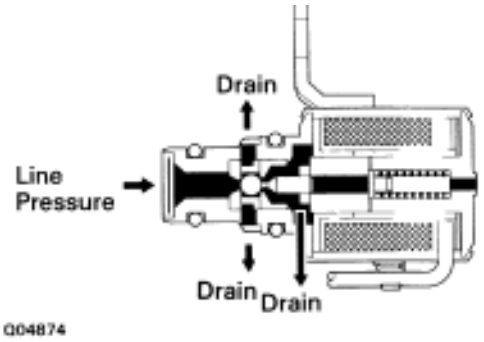
NG **Replace solenoid valve.**

Repair or replace solenoid wire.

DTC P0770 Shift Solenoid E Malfunction (Shift Solenoid Valve SL)

SYSTEM DESCRIPTION

The ECM uses the signals from the NC2 revolution sensor and crankshaft position sensor to monitor the engagement condition of the lock–up clutch.
Then the ECM compares the engagement condition of the lock–up clutch with the lock–up schedule in the ECM memory to detect mechanical trouble of the shift solenoid valve SL, valve body and torque converter.



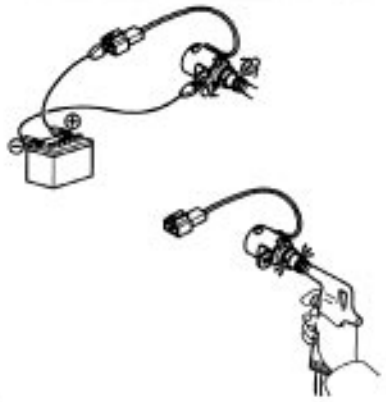
DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0770	Lock–up does not occur when driving in the lock–up range (normal driving at 50mph [80kmlh]. Or lock–up remains ON in the lock–up OFF range. (2 trip detection logic)	• Shift solenoid valve SL is stuck open or closed. • Valve body, blocked up or stuck. • Lock–up clutch.

DIAGNOSTIC CHART

1	Check solenoid valve SL operation.	NG	Replace solenoid valve SL.
OK			
2	Check valve body (See page AX2–82).	NG	Repair or replace valve body.
OK			
Replace torque converter clutch (See page AX2–27).			

INSPECTION PROCEDURE

1 Check solenoid valve SL operation.



D04770

P Remove SL solenoid valve from valve body.

C
1. Applying 490 kPa (5 kgf/cm2, 71 psi)of com–pressed air, check that the solenoid valves do not leak air.
2. When battery voltage is supplied to the solenoid valves, check that the solenoid valves open.

OK

NG → **Replace solenoid valve SL.**

2 Check valve body (See page AX2–82).

OK

NG → **Repair or replace valve body.**

Replace torque converter clutch.

DTC P0773 Shift Solenoid E Electrical Malfunction (Shift Solenoid Valve SL)

CIRCUIT DESCRIPTION

The shift solenoid valve SL is turned ON and OFF by signals from the ECM to control the hydraulic pressure acting on the lock–up relay valve, which then controls operation of the lock–up clutch.

Fail Safe Function

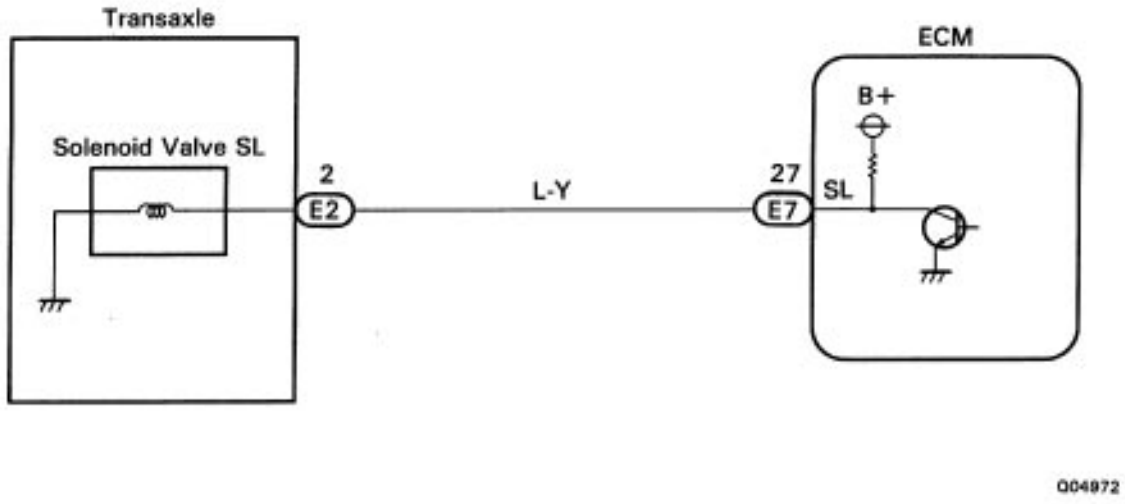
If the ECM detects a malfunction, it turns the shift solenoid valve SL OFF.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P0773	Open or short in shift solenoid SL circuit for 1 time. (2 trip detection logic)	• Open or short in shift solenoid valve SL circuit. • Shift solenoid valve SL. • ECM

DIAGNOSTIC CHART

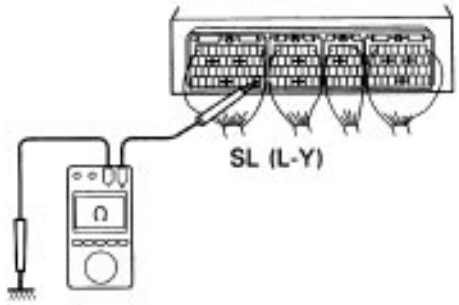
1	Measure resistance between terminals SL and E, of ECM connector.	OK	Replace ECM.
NG			
2	Check harness and connector between ECM and automatic transaxle.	NG	Repair or replace harness or connector between ECM and automatic transaxle solenoid connector.
OK			
3	Check SL solenoid valve.	NG	Replace SL solenoid valve.
OK			
Check and replace or repair the solenoid wire.			

WIRING DIAGRAM



INSPECTION PROCEDURE

1 Measure resistance between terminals SL of ECM connector and body ground.



Q04755

P Disconnect connector from the ECM.

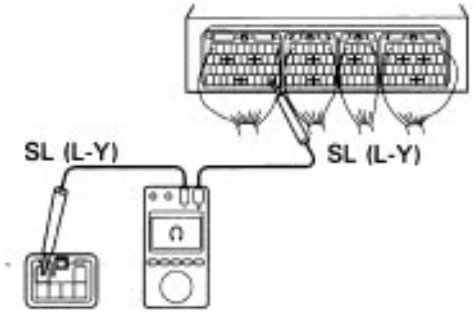
C Measure resistance between terminals SL and E, of the ECM.

OK **Resistance: 8–100,000Ω**

NG

OK **Replace ECM.**

2 Check harness and connector between ECM and automatic transaxle.



Q04749

P 1. Disconnect the connector from the ECM.
2. Disconnect the solenoid connector from the transaxle.

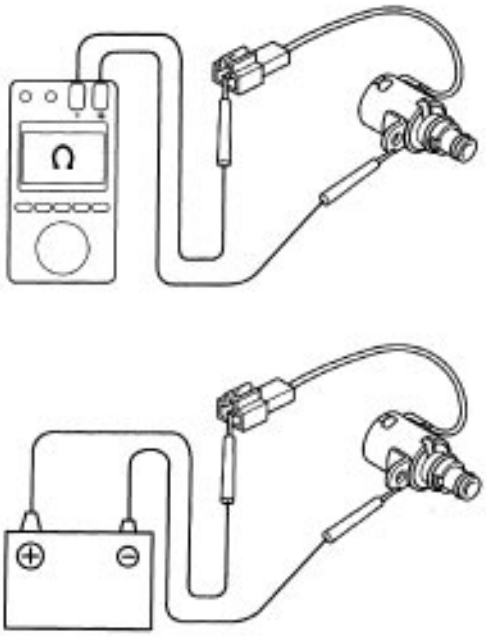
C Check harness between terminal SL of the ECM connector and terminal 3 of automatic transaxle solenoid connector.

OK **There is no open or short circuit.**

OK

NG **Repair or replace harness or connector between ECM connector and automatic transaxle solenoid connector.**

3 Check SL solenoid valve.



G04774
G04775

P
1. Jack–up the vehicle.
2. Remove oil pan.
3. Disconnect SL solenoid valve connector.
4. Remove SL solenoid valve.

C
Measure resistance between SL solenoid connec–tor terminal and its body ground.

OK
Resistance: 10–16 9

C
Check SL solenoid valve operation noise when applying battery voltage to the solenoid connec–tor terminal and it's body.

OK
The SL solenoid valve makes operation noise.

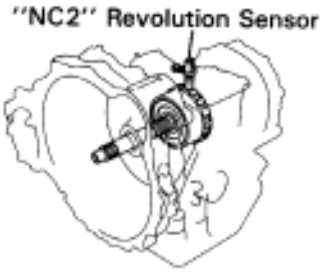
OK

NG → **Replace SL solenoid valve.**

Check and replace or repair the solenoid wire.

DTC PI705 “NC2” Revolution Sensor Circuit Malfunction (Direct Clutch Speed Sensor)

CIRCUIT DESCRIPTION



Q04869

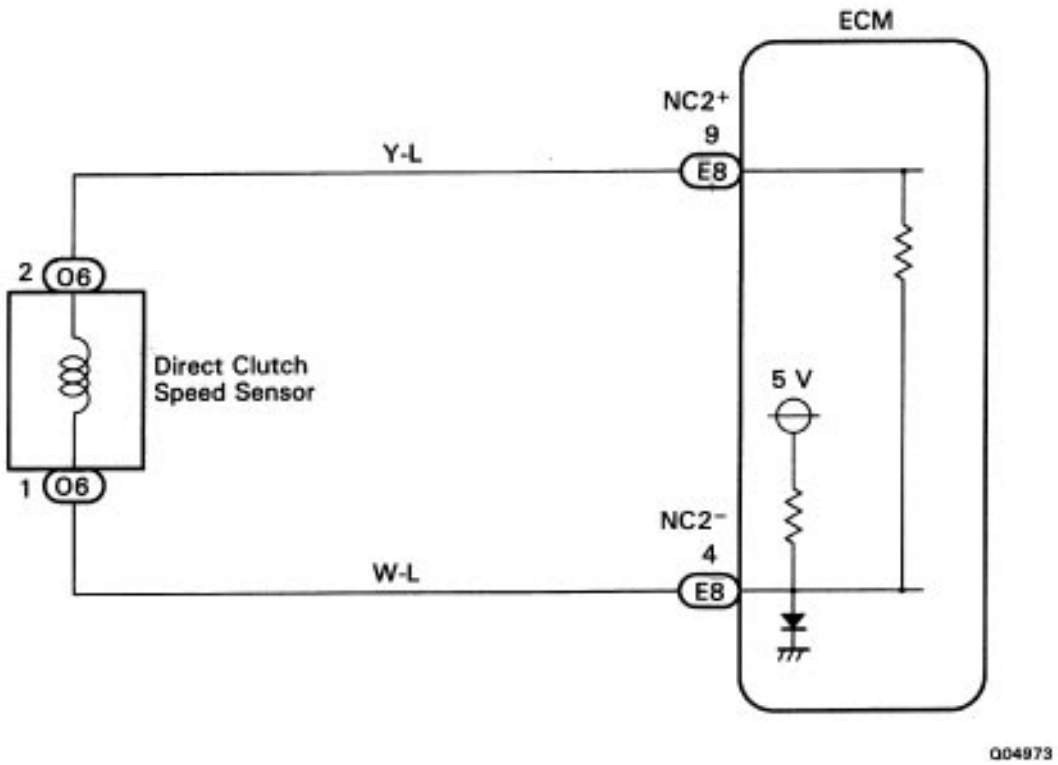
This sensor detects the rotation speed of the direct clutch drum. By comparing the direct clutch speed signal and the vehicle speed sensor signal, the ECM detects the shift timing of the gears and ap–propriately controls the engine torque and hydraulic pressure in response to various conditions, thus performing smooth gear shif–ting.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P1705	Out put of direct clutch speed sensor (NC2) is 300 rpm or less under condition a) and b). a) Vehicle speed: 32 km/h (20 mph) or more b) Park/neutral position switch: OFF (2 trip detection logic)	• Open or short in direct clutch speed sen–sor circuit. • Direct clutch speed sensor. • ECM

DIAGNOSTIC CHART

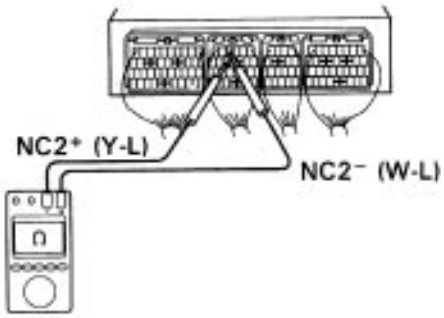
1	Check resistance between terminals NC2+ and NC2–of ECM connector.	OK	Replace ECM.
NG			
2	Check direct clutch speed sensor.	NG	Replace direct clutch speed sen–sor.
OK			
Check and repair harness and connector between ECM and O/D direct clutch speed sensor.			

WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check resistance between terminals NC2+ and NC2–of ECM connector.



C Check resistance between terminals NC2+ and NC2–of ECM connector.

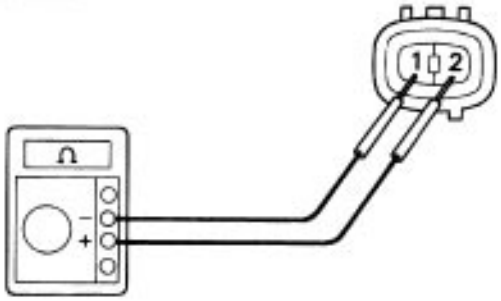
OK **Resistance: 560–680 9**

Q04754

NG

OK **Replace ECM.**

2 Check direct clutch speed sensor.



P Remove direct clutch speed sensor.
(See page AX2–1 5)

C Measure resistance between terminals 1 and 2 of speed sensor.

OK **Resistance: 560–680Ω**
〈 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 voltages generated is extremely low.**

AT5629
Q04949

OK

NG **Replace direct clutch speed sensor.**

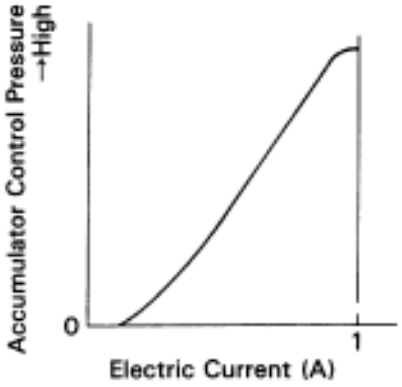
Check and repair harness and connector between ECM and direct clutch speed sensor.

–MEMO–

DTC P1765 Shift Solenoid Valve SLN Circuit (For Accumulator Back Pressure Modulation)

CIRCUIT DESCRIPTION

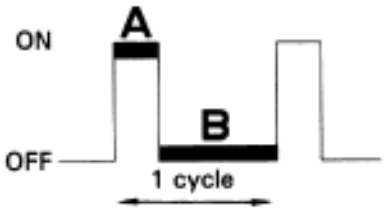
The shift solenoid valve SLN controls the hydraulic pressure acting on the accumulator control valve when gears are shifted and per–forms smooth gear shifting.
The ECM determines optimum operating pressure according to the signals from the throttle position sensor, vehicle speed sensor and direct clutch speed sensor and controls the volume of current flow to the solenoid valve.
The amount of current to the solenoid is controlled by the (*) duty ratio of ECM output signals, causing a 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 low.



AT5808

(*) 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

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

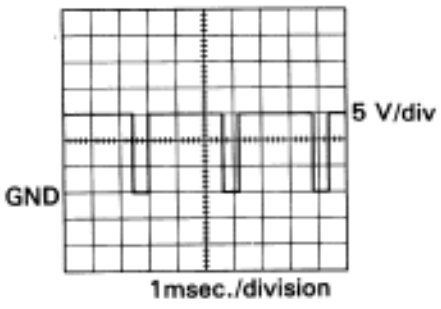


8E4056

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P1765	After the engine is warmed up, the current flow to the shift solenoid valve SLN is 0.2A or less for at least 1 sec. under condition ay or b). (2 trip detection logic) aj Engine speed: 500 rpm or more b) Park/neutral position switch: ON (P or N position)	• Open or short in shift solenoid valve SLN circuit. • Shift solenoid valve SLN. • ECM

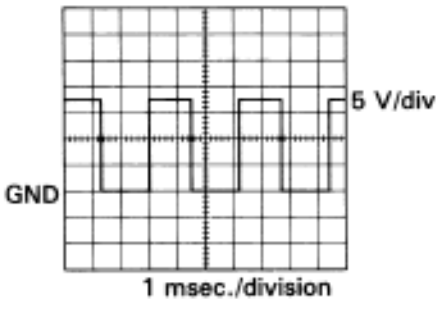
< Reference >

- Waveform between terminals SLN– and E 1 when engine is idling.



AT8764

- Waveform between terminals SLN– and E 1 during shift change.



AT8766

DIAGNOSTIC CHART

1	Check solenoid valve SLN.	NG	Replace solenoid valve SLN.

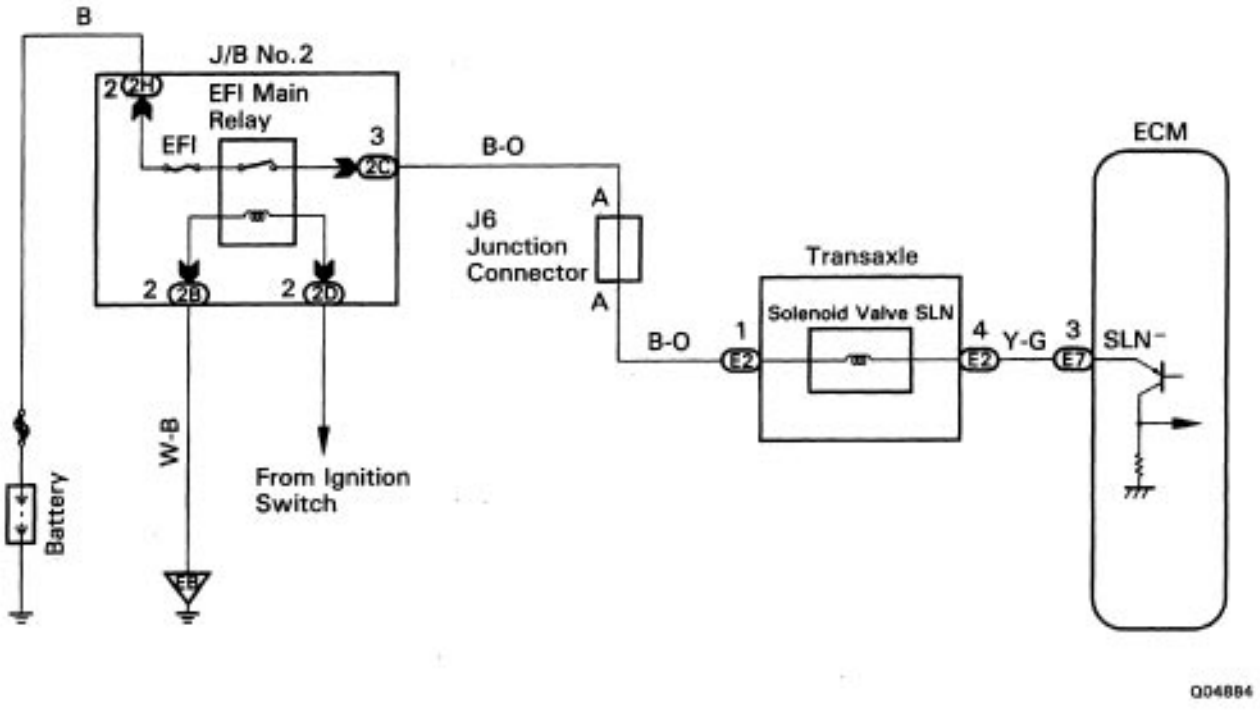
OK

2	Check harness and connector between battery and solenoid valve SLN, solenoid valve SLN and ECM (See page IN–31).	NG	Repair or replace harness or connector.

OK

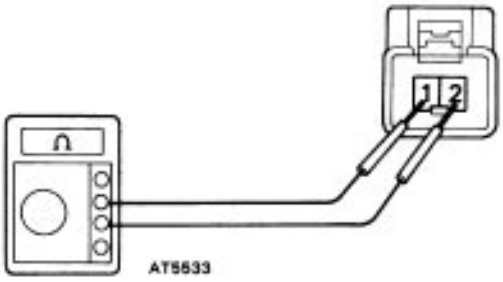
Replace ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check shift solenoid valve SLN.

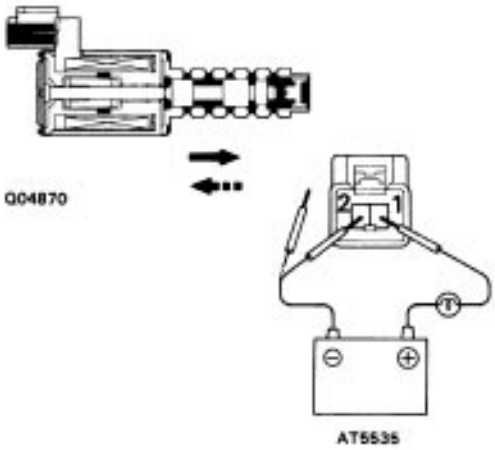


Check solenoid resistance

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

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

OK **Resistance: 5.1–5.5 9**

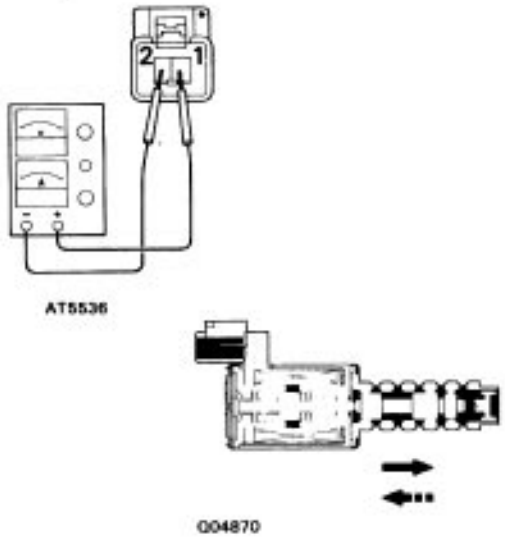


Check solenoid operation

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 voltage is applied.	Valve moves in mm1 ➡ direction in illustration. (on the left)
When battery voltage is cut off.	Valve moves in ⬅ direction in illustration. (on the right)



< 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 0 lead to terminal 2.
3. Check the movement of the valve when the voltage is gradually increased. (A current greater than 1 A 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 solenoid valve SLN.**

2	**Check harness and connector between battery and shift solenoid valve SLN, shift solenoid valve SLN and ECM (See page IN–31).**

OK

Replace ECM.

NG

Repair or replace harness or connector.

DTC P1780 Park Neutral Position Switch Malfunction

CIRCUIT DESCRIPTION

The park/neutral position switch detects the shift lever position and sends signals 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.

DTC No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
P 1780	Two or more switches are ON simultaneously for "N", "2" and "L" position. (2 trip detection logic)	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM
	When driving under conditions a) and b) for 30 seconds or more, the park/neutral position switch is ON (N position). (2 trip detection logic) a) Vehicle speed: 44 mph (70 km/h) or more b) Engine speed: 1,500–2,500 rpm	

DIAGNOSTIC CHART

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

OK → Proceed to next circuit inspection shown on matrix chart (See page AX2–8 1).

NG

2 Check PNP switch.

NG → Replace PNP switch.

OK

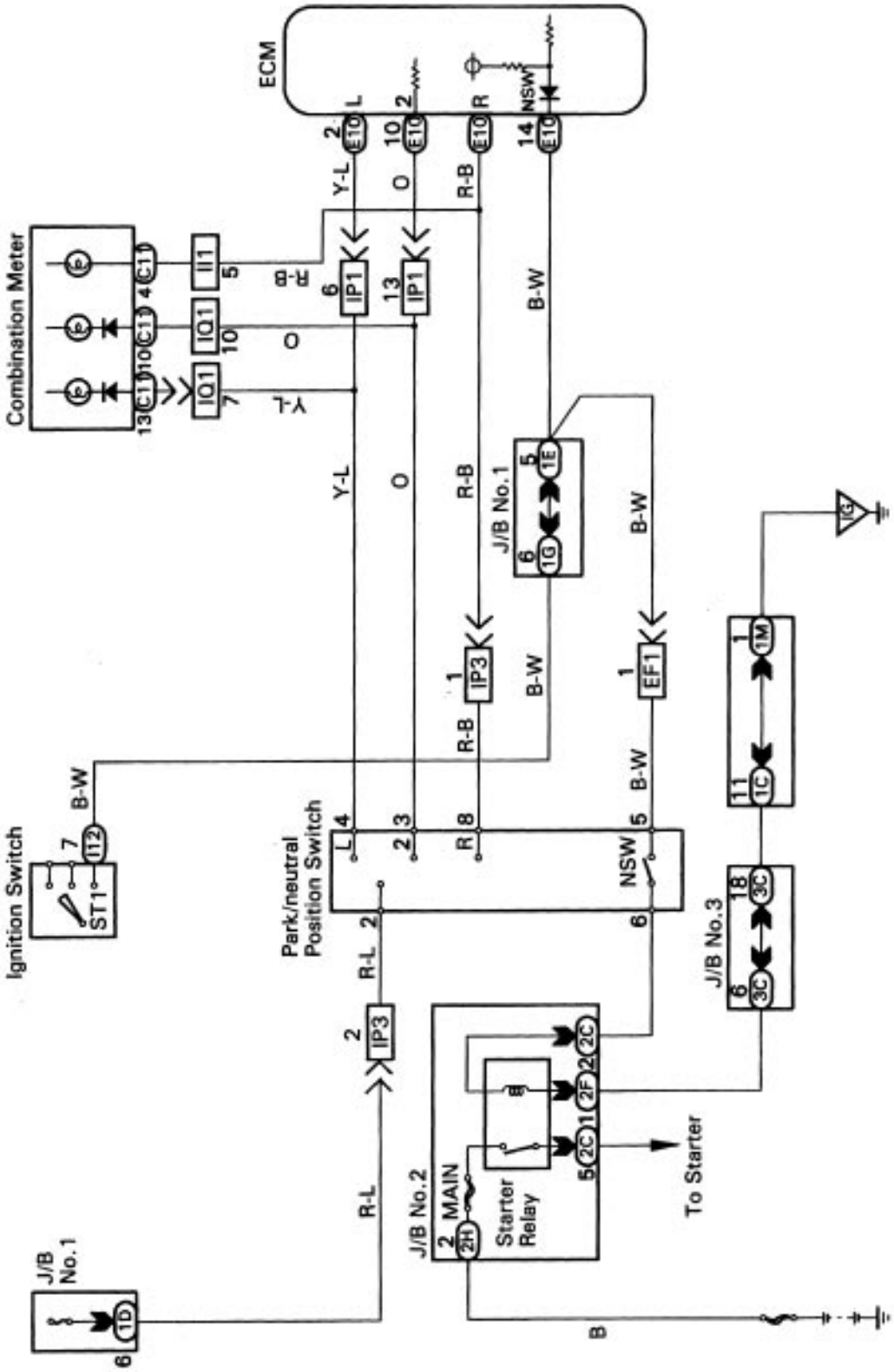
3 Check harness and connector between ECM and PNP switch, PNP switch and battery.

NG → Repair or replace harness or connector.

OK

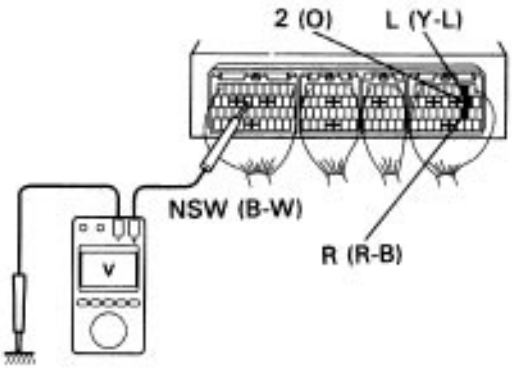
Check and replace ECM.

WIRING DIAGRAM



INSPECTION PROCEDURE

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



Q04750

P Turn ignition switch ON.

C Measure voltage between terminals R, NSW, 2, L of ECM connector and body ground when the shift lever is shifted to the following positions.

OK

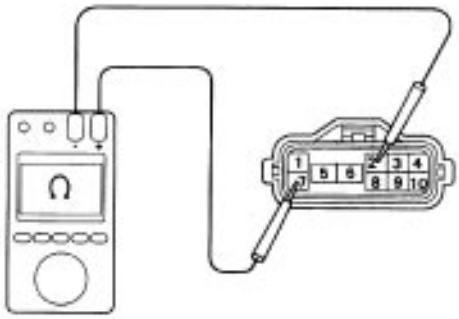
Position	R–body ground	NSW–body ground	2–body ground	L–body ground
P, N	0 V	0 V	0 V	0 V
R	10–14V*	10–14V*	0 V	0 V
D	0 V	10–14V	0 V	0 V
2	0 V	10–14V	10–14 V	0 V
L	0 V	10–14V	0 V	10–14V

*: 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 AX2–81).**

2 **Check PNP switch.**



Q04767

[ ] Remove PNP switch (See page AX2–16).

[ ] Check continuity between each terminal shown below when the shift lever is shifted to each position.

○—○ Continuity

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

OK

NG → **Replace PNP switch.**

3	**Check harness and connector between ECM and PNP switch, PNP switch and battery.**

OK

Check and replace ECM.

NG

Repair or replace harness and connector.

OD Cancel Signal Circuit

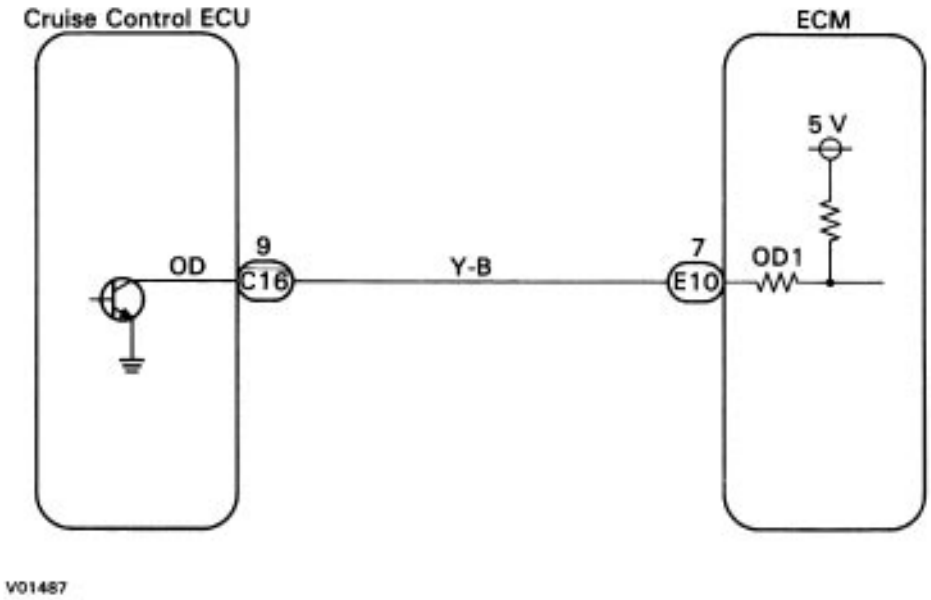
CIRCUIT DESCRIPTION

While driving uphill with cruise control activated, in order to minimize gear shifting and provide smooth cruis–ing, 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 shif–ting until these signals are discontinued.

DIAGNOSTIC CHART

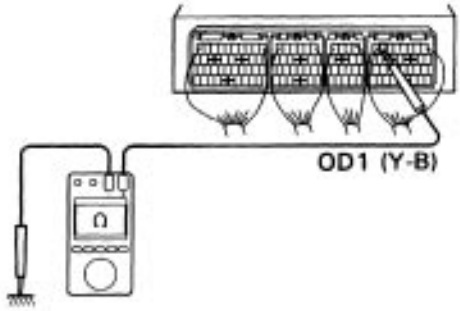
1	Check voltage between terminal OD 1 of ECM connector and body ground.	OK	Proceed to next circuit inspection shown on matrix chart (See Page AX2–81).
NG			
2	Check voltage between terminal OD of cruise control ECU harness side connector and body ground.	OK	Check and replace cruise control ECU.
NG			
3	Check harness and connector between cruise control ECU and ECM.	NG	Repair or replace harness or con–nector.
OK			
Check and replace ECM.			

WIRING DIAGRAM



INSPECTION PROCEDURE

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



Q04753

P Turn ignition switch ON.

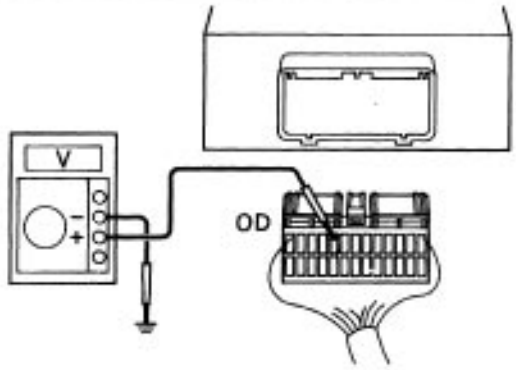
C Measure voltage between terminal OD 1 of ECM connector and body ground.

OK **Voltage: 4–6 V**

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page AX2–81).**

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



BE6653
BE6623

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 or connector between cruise control ECU and ECM.**

OK

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

Check and replace ECM.

OD Main Switch & OD OFF Indicator Light Circuit

CIRCUIT DESCRIPTION

The O/D main switch contacts go off when the switch is pushed in and come 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 OBD II scan tool or TOYOTA hand–held tester to the DLC3 can display the diagnostic trouble code.

DIAGNOSTIC CHART

O/D OFF indicator light does not light up.

1	Check operation of O/D main switch.	NG	Go to step 4
OK			
2	Check voltage between terminal OD2 of ECM connector and body ground.	OK	Proceed to next circuit inspection shown on matrix chart (See page AX–81).
NG			
3	Check. harness and connector between O/D off indicator light and ECM.	NG	Repair or replace harness or connector.
OK			
Check and replace ECM.			
4	Check O/D main switch.	NG	Replace O/D main switch.
OK			
Check and replace combination meter. (See combination meter troubleshooting)			

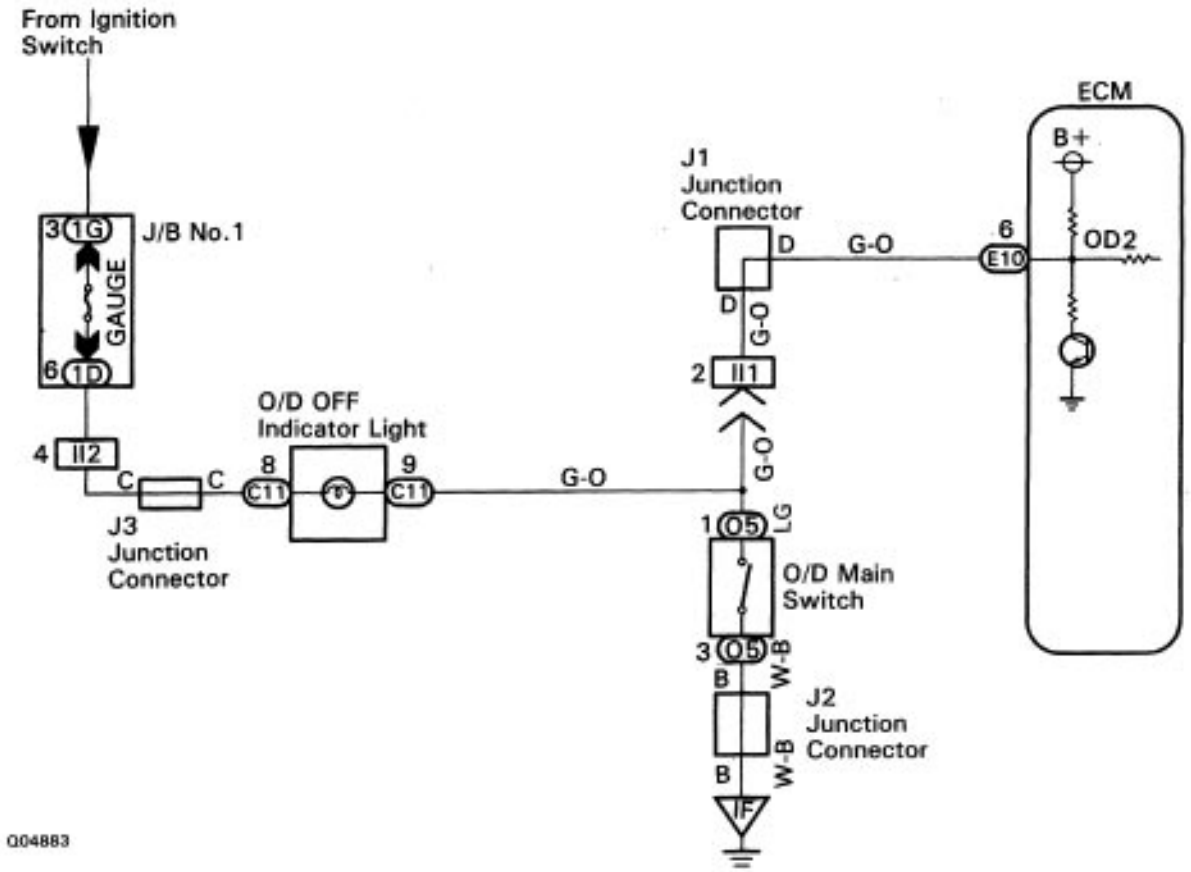
O/D OFF indicator light remains ON

1	Check O/D main switch.	NG	Replace O/D main switch.
OK			
2	Check harness and connector between O/D off indicator light and O/D main switch, O/D off indicator light and ECM.	NG	Repair or replace harness or connector.
OK			
Check and replace ECM.			

O/D OFF indicator light blinks

Perform diagnostic code check (See page **AX2–55**).

WIRING DIAGRAM



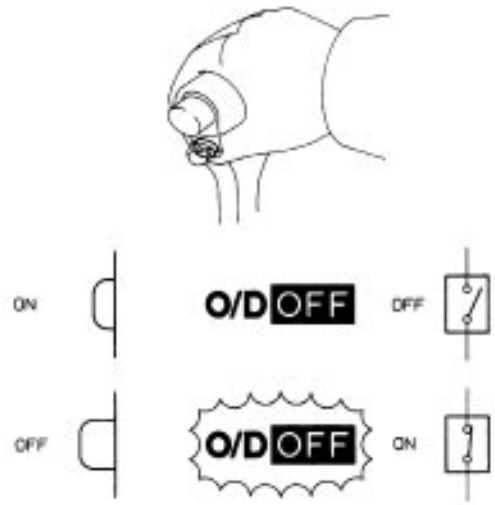
(*) O/D Main Switch

Contacts go off with switch pushed in.

Contacts go on with switch pushed out.

INSPECTION PROCEDURE

1 Check operation of O/D Main Switch.



Q00751
AT5623

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

OK **“O/D OFF” light goes off.**

C 3. Check ”O/D OFF” light when O/D main switch is pushed again, to OFF.

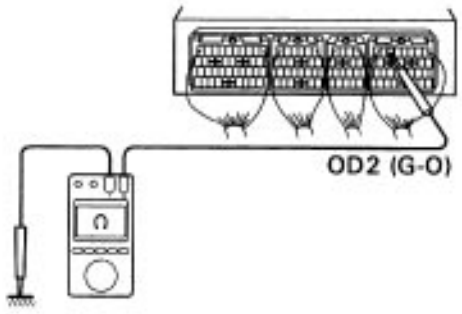
OK “**O/D OFF” light lights up.**

Hint If the–O/D OFF” lights blinks when the O/D main switch is pushed in to ON, a malfunction is occurr–ing 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.



Q04752

P Turn ignition switch ON.

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

OK

O/D Main Switch	Voltage
OFF	Below 1 V
ON	10 ^–14 V

NG

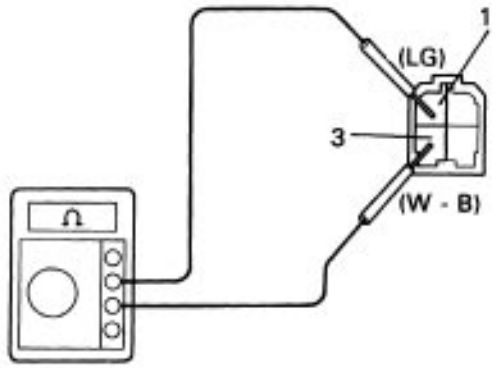
OK **Proceed to next circuit inspection shown on matrix chart (See page AX2–81).**

3 **Check harness and connector between O/D off indicator light and ECM.**

OK → **Check and replace ECM.**

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

4 **Check O/D Main Switch.**



AT5529

C

1. Disconnect O/D main switch connector.
2. Measure resistance between terminals 1 and 3 of O/D main switch connector.

OK

O/D Main Switch	Resistance
ON	^ 9 (open)
OFF	0 S2 (continuity)

OK → **Check and replace combination meter. (See combination meter troubleshooting.)**

NG → **Replace O/D Main Switch.**

Pattern Select Switch Circuit

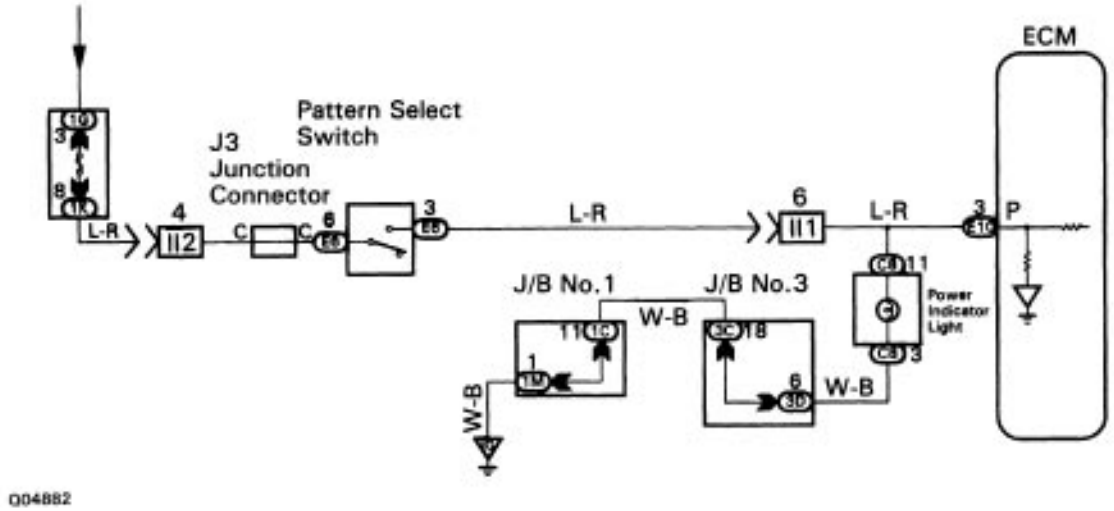
CIRCUIT DESCRIPTION

The ECM memory contains the shift programs for the NORMAL and POWER patterns, 2 position, and L position and the lockup 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 transaxle gear change and the lockup clutch operation.

DIAGNOSTIC CHART

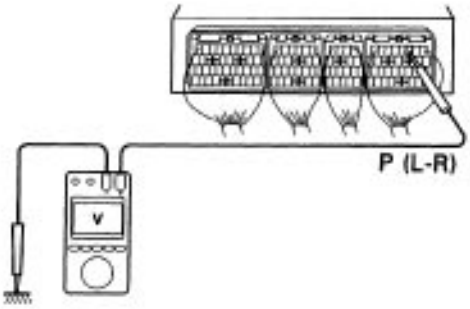
1	Check voltage between terminal P of ECM connector and body ground.	OK	Proceed to next circuit inspection shown on matrix chart (See page AX2–81) .
NG			
2	Check pattern select switch.	NG	Replace pattern select switch.
OK			
3	Check harness and connector between ECM and pattern select switch, pattern select switch and battery (See page IN–31).	NG	Repair or replace harness or con–nector.
OK			
Check and replace ECM.			

WIRING DIAGRAM



INSPECTION PROCEDURE

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



Q04751

P Turn ignition switch ON.

C Measure voltage between terminal P of ECM connector and body ground when the pattern select switch is set to the PWR (POWER) position and NORM (NORMAL) position.

OK

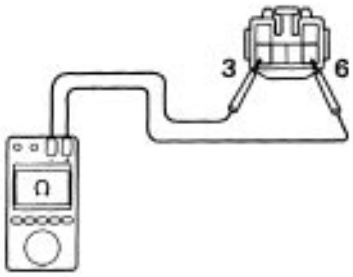
Pattern select switch	Voltage
PW R	10–14 V
NORM	Below 1 V

Hint **The ECU uses the normal pattern signal if the power signal is not input.**

NG

OK **Proceed to next circuit inspection shown on matrix chart (See page AX2–81).**

2 Check pattern select switch.



Q04768

P Disconnect pattern select switch connector. (See BO–section)

C Measure resistance between terminals 3 and 6 of pattern select switch connector when the select switch is set to PWR and NORM positions.

OK

Pattern	Resistance
PWR	0 Q (continuity)
NORM	^ 0 (open)

OK

NG **Replace pattern select switch.**

3 Check harness and connector between ECM and pattern select switch, pattern select switch and battery (See page IN–31).

OK

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

Check and replace ECM.

Stop Light Switch Circuit

CIRCUIT DESCRIPTION

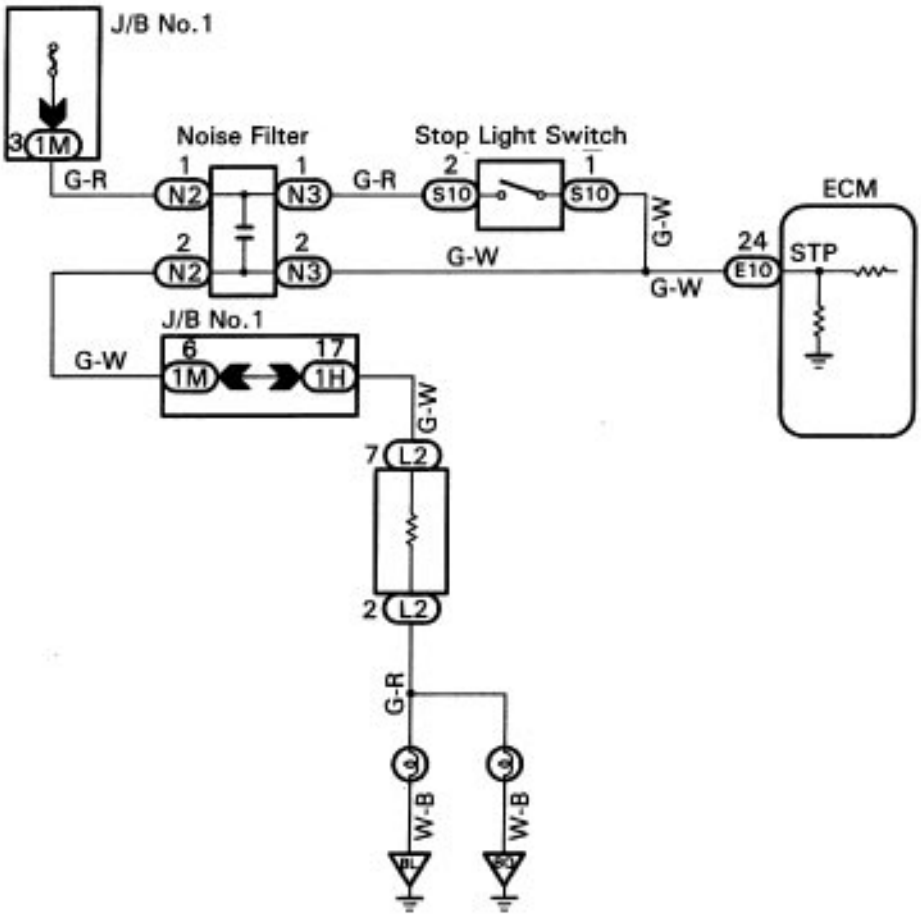
The purpose of this circuit is to prevent the engine from stalling, while driving in lockup condition, when brakes are suddenly applied.

When the brake pedal is operated, this switch sends a signal to ECM. Then the ECM cancels operation of the lockup clutch while braking is in progress.

DIAGNOSTIC CHART

1	Check operation of stop light.	NG	Check and repair stop light circuit.
OK			
2	Connect the TOYOTA hand–held tester and check STP signal.	OK	Proceed to next circuit inspection shown on matrix chart (See page AX2–8 1).
NG			
3	Check harness and connector between ECM and stop light switch.	NG	Repair or replace harness or con–nector.
OK			
Check and replace ECM.			

WIRING DIAGRAM



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INSPECTION PROCEDURE

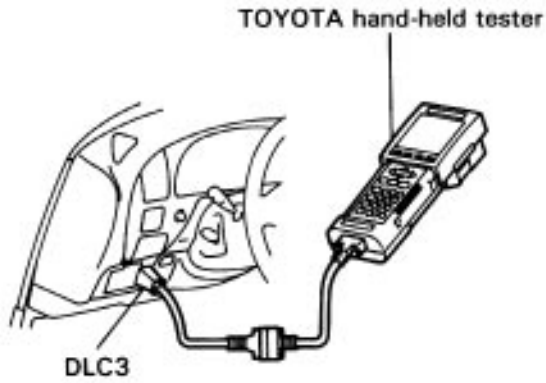
1 Check operation of stop light.

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

OK

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

2 Connect TOYOTA hand–held tester and check STP signal.



P
1. Remove the fuse cover on the instrument panel.
2. Connect the TOYOTA hand–held tester to the DLC 3 (OBD II connector).
3. Turn ignition switch ON and TOYOTA hand–held tester main switch ON.

C Read the STP signal on the TOYOTA hand–held tester.

OK
Brake pedal is depressed: STP ON
Brake pedal is released: STP OFF

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page AX2–81).**

3 Check harness and connector between ECM and stop light switch.

OK

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

Check and replace ECM.

SERVICE SPECIFICATIONS

SERVICE DATA

Line pressure (whell locked)	Engine idling D position R position AT stall D position R position	401–461 kPa 804–882 kPa 1,138–1,236 kPa 1,716–1,854 kPa	4.1–4.7 kgf/cm² 8.2–9.0 kgf/cm² 11.6–12.6 kgf/cm² 17.5–18.9 kgf/cm²	58–66 psi 117–128 psi 165–179 psi 249–269 psi
Engine stall revolution		2,600±150 RPM		
Time lag	N position–D position N position–R position	Less than 1.2 seconds Less than 1.5 seconds		
Engine idle speed (Cooling fan and A/C OFF) N position		650–750 RPM		
Throttle cable adjustment (Throttle valve fully opened)		Between boot and face and inner cable stopper 0–1 mm		0–0.04 in.
Torque converter clutch runout Drive plate runout	Limit Limit	0.30 mm 0.20 mm		0.0118 in. 0.0079 in.

SHIFT POINT

Shift position	Shifting point		Vehicle speed km/h (mph)
D position	Throttle valve fully opened	1→2	60–65 (37–40)
		2→3	113–121 (70–75)
		3→O/D	174–182 (108–113)
		O/D→3	168–176 (104–109)
		3→2	104–112 (65–70)
		2→1	50–54 (31–34)
	Throttle valve fully closed	3→O/D	40–44 (25–27)
		O/D→3	20–24 (12–15)
2 position	Throttle valve fully opened	1→2	60–65 (37–40)
		3→2	112–130 (76–81)
		2→1	50–54 (31–34)
L position	Throttle valve fully opened	3→2	107–114 (66–71)
		2→1	55–59 (34–37)

LOCK–UP POINT

D position km/h (mph) Throttle valve opening 596	Lock–up ON	Lock–up OFF
3rd Gear (O/D switch OFF)	60–65 (38–40)	53–57 (33–35)
O/D Gear	60–64 (37–40)	53–57 (33–35)

TORQUE SPECIFICATIONS

Part tightened		N–m	kgf–cm	ft–lbf
Engine front mounting bracket x Front suspention menber		80	820	59
Engine rear mounting bracket x Front suspention menber		66	670	48
LH transaxle mounting		52	530	38
Transaxle x Engine	12mm bolt	64	650	47
Transaxle x Engine	10mm bolt	46	470	34
Torque converter clutch x Drive–plate		27	280	20
Valve body x Transaxle case		11	110	8
Oil strainer		11	110	8
Oil pan		4.9	50	43 in.-lbf
Oil pan drain plug		49	500	36
Park/Neutral position switch x Transaxle case (bolt)		5.4	55	48 in.-lbf
Park/Neutral position switch (nut)		6.9	70	61 in.-lbf
B, apply tube retainer		11	110	8
Manual valve body		11	110	8
Detent spring		11	110	8
Oil tube bracket		10	100	7
Steering gear housing x Front suspention Menber		181	1850	134
Stabilizer bar bracket		19	195	14
Vehicle speed sensor		16	160	12
Direct clutch speed sensor		5.4	55	48in.-lbf
Transfer lubulication apply tube retainer		11	110	8
Exhaust manifold plate		20	200	14
Front frame x Body	19 mm	181	1,850	134
Front frame x Body	12 mm	32	330	24
Front frame x Body	Nut	36	370	27
Exhaust front pipe x Exhaust tale pipet		43	440	32
Exhaust manifold x Exhaust front pipe		62	630	46
Exhaust pipe clamp		43	440	32
Starter		39	400	29
Throttle cable adjusting nut		15	150	11