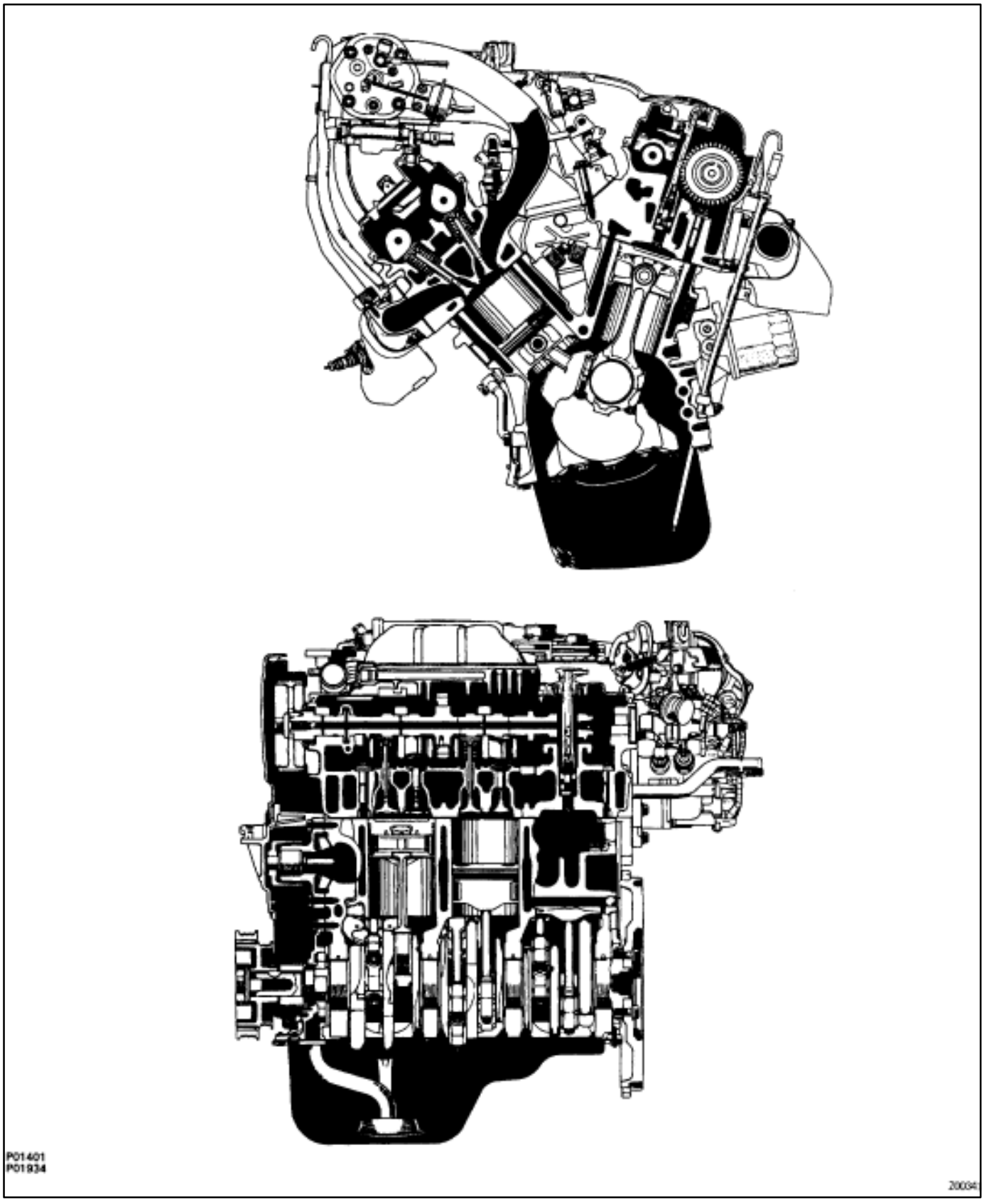
ENGINE

ENGINE MECHANICAL

DESCRIPTION

EG0EF–01

The 3VZ–FE engine is a V–6, 3.0 liter, DOHC 24–valve engine.



P01401
P01934

20034

The 3VZ–FE engine has 6 cylinder in a V arrangement at a bank angle of 60°. From the front of the RH bank cylinders are numbered 1–3–5, and from the front of the LH bank cylinders are numbered 2–4–6. The crankshaft is supported by 4 bearings inside the crankcase. These bearings are made of copper and lead alloy.

The crankshaft is integrated with semi 9 counter weights for balance. Oil holes are placed in the center of the crankshaft for supplying oil to the connecting rods, pistons and other components.

This engine's firing order is 1–2–3–4–5–6. The cylinder head is made of aluminum alloy, with a cross flow type intake and exhaust layout and with pent–roof type combustion chambers. The spark plugs are located in the center of the combustion chambers.

At the front and rear of the intake port of the intake manifold, a water passage has been provided which connects the RH and LH cylinder heads.

Exhaust and intake valves are equipped with irregular pitch springs made of special valve spring carbon steel which are capable of functioning no matter what the engine speed.

The RH and LH intake camshafts are driven by a single timing belt, and a gear on the intake camshaft engages with a gear on the exhaust camshaft to drive it. The camshaft journal is supported at 5 (intake) or 4 (exhaust) places between the valve lifters of each cylinder and on the front end of the cylinder head. Lubrication of the cam journals and gears is accomplished by oil being supplied through the oiler port in the center of the camshaft.

Adjustment of the valve clearance is done by means of an outer shim type system, in which valve adjusting shims are located above the valve lifters. This permits replacement of the shims without removal of the camshafts.

The timing belt cover is composed of the resin type No.2 and No.1 above and below the engine RH mounting bracket.

Pistons are made of high temperature–resistant aluminum alloy, and a depression is built into the piston head to prevent interference with the valves.

Piston pins are the full–floating type, with the pins fastened to neither the piston boss nor the connecting rods. Instead, snap rings are fitted on both ends of the pins, preventing the pins from falling out.

The No.1 compression ring is made of steel and the No.2 compression ring is made of cast iron.

The oil ring is made of a combination of steel and stainless steel. The outer diameter of each piston ring is slightly larger than the diameter of the piston and the flexibility of the rings allows them to hub the cylinder walls when they are mounted on the piston. Compression rings No.1 and No.2 work to prevent gas leakage from the cylinder and the oil ring works to clear oil off the cylinder walls to prevent it from entering the combustion chamber.

The cylinder block is made of cast iron with a bank angle of 60°. It has 6 cylinders which are approximately 1.6 times the length of the piston stroke. The top of the cylinders is closed off by the cylinder heads and the lower end of the cylinders becomes the crankcase, in which the crankshaft is installed. In addition, the cylinder block contains a water jacket, through which engine coolant is pumped to cool the cylinders.

The oil pan is bolted onto the bottom of the cylinder block. The oil pan is an oil reservoir made of pressed steel sheet.

PREPARATION
SST (SPECIAL SERVICE TOOLS)

EG0EG–01

	09011–38121	12 mm Socket Wrench for 12 Pointed Head	Connecting rod bolts
	09201–41020	Valve Stem Oil Seal Replacer	
	09201–70010	Valve Guide Bushing Remover & Replacer	
	09202–70010	Valve Spring Compressor	
	09213–54015	Crankshaft Pulley Holding Tool	
	09213–60017	Crankshaft Pulley & Gear Puller Set	
	(09213–00020)	Body With Bolt	
	(09213–00030)	Handle	
	(09213–00060)	Bolt Set	
	09213–70010	Crancksaft Pulley Holding Tool	
	09223–46011	Crankshaft Front Oil Seal Replacer	
	09223–56010	Crankshaft Rear Oil Seal Replacer	
	09248–55020	Valve Clearance Adjust Tool Set	

	(09248–05011) Valve Lifter Press	
	(09248–05021) Valve Lifter Stopper	
	09249–63010 Torque Wrench Adaptor	
	09278–54012 Drive Shaft Holding Tool	Camshaft timing pulley
	09309–37010 Transmission Bearing Replacer	Crankshaft front oil seal
	09330–00021 Companion Flange Holding Tool	Crankshaft pulley
	09550–10012 Replacer Set "B"	
	(09552–10010) No. 2 Replacer Handle	Spark plug tube gasket
	(09558–10010) Rear Axle Shaft Oil Seal Replacer	Spark plug tube gasket
	09631–22020 Power Steering Hose Nut 14 x 17 mm Wrench Set	
	09816–30010 Oil Pressure Switch Socket	Knock sensor

RECOMMENDED TOOLS

EG0EH–01

	09090–04010	Engine Sling Device	For suspending engine
	09200–00010	Engine Adjust Kit	
	09258–00030	Hose Plug Set	Plug for the vacuum hose, fuel hose etc.
	09904–00010	Expander Set	

EQUIPMENT

EG0EJ–01

Battery specific gravity gauge	
Caliper gauge	
CO/HC meter	
Connecting rod aligner	
Cylinder gauge	
Dial indicator	
Dye penetrant	
Engine tune–up tester	
Heater	
Soft brush	
Micrometer	
Piston ring compressor	
Piston ring expander	
Plastigage	
Precision straight edge	
Magnetic finger	
Spring tester	Valve spring

Steel square	Valve spring
Thermometer	
Torque wrench	
Valve seat cutter	
Vernier calipers	

SSM (SERVICE SPECIAL MATERIALS)

EG0EK–01

08826–00080	Seal packing or equivalent	Camshaft bearing cap Cylinder head cover rear oil seat retainer
08826–00100	Seal Packing 1282B, Three Bond 1282B or equivalent	Water by–pass pipe
08833–00070	Adhesive 1324, THREE BOND 1324 or equivalent	Flywheel or drive plate bolt
08833–00080	Adhesive 1344, THREE BOND 1344, LOCTITE 242 or equivalent	No.1 idler pulley bolt

TROUBLESHOOTING

EG0EL–01

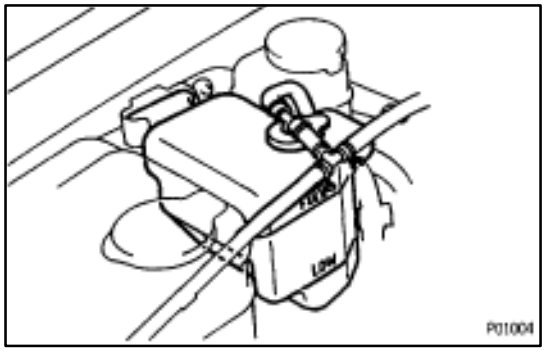
When the malfunction code is not confirmed in the diagnostic trouble code check and the problem still cannot be confirmed in the basic inspection, then proceed to this step and perform troubleshooting according to the numbers in the order given in the table below.

	See page	IG section	IG section	EG–228	EG–224	–	EG–230	EG–200	EG–203	–	–	–	–	EG–170	EG–183	EG–160	EG–186	EG–179 EG–223
	Suspect area / Symptom	RPM Signal Circuit	Ignition Circuit	Main Oxygen Sensor Circuit	Engine Coolant Temp. Sensor Circuit	Intake Air Temp. Sensor Circuit	Sub-Oxygen Sensor Circuit	Volume Air Flow Meter Circuit	Throttle Position Sensor Circuit	STA Signal Circuit	Knock Sensor Circuit	PNP Signal Circuit	A/C Signal Circuit	Fuel Pump	Fuel Pressure Regulator	Fuel Lines	Injectors	Cold Start System
Dose not start	Engine does not crank																	
	Starter runs - engine does not crank																	
	No initial combusion	12	2					5						6				13
	No complete combusion				4			1							3		9	10
Difficult to start	Engine cranks slowly												2					
	Difficult to start ordinaly	12	13		4	14								7	6	8	16	17
	Difficult to start in clod				1	6				2				8	7	9	10	5
	Difficult to start in hot				1	5								8	7	9	10	6
Poor idling	Incorrect first idle				3													
	High engine idle speed				3	5			6			8	7				9	10
	Low engine idle speed				1			4									5	
	Rough idling		18		2			12						7	6	8	16	17
	Misfire		4		6			8									9	10
Poor drivability	Hesitation Poor acceleration			12	10	11		9	8					14	13	15	18	19
	Backfire			6	3	7		5	4					9	8	10	11	
	Muffler explosion (after fire)			8	3	7		5	6						4		9	10
	Serging														1		4	
	Knocking										1							
Engine stall	Engine stall soon after starting				8			7						3	2	4	9	10
	After acceleration pedal depressed							1	3						5	6	7	
	After acceleration pedal released							3										
	During A/C operation												1					
	When N to D shift											1						
Others	Poor fuel economy			21	16	22	23	18	17			19	20				14	15
	Engine overheat										10							
	Engine overcool																	
	Excessive oil consumption																	
	Low oil pressure																	
	High oil pressure																	
	Starter keeps running																	
	Battery often discharge																	

HINT: When inspecting a wire harness or circuit, the electrical wiring diagrams at the end of repair manual should be referred to and the circuits of related systems also should be checked.

–	EG–263	EG–203	–	EG–27	EG–13	EG–24	EG–29	EG–246	EG–62	EG–294	EG–101	EG–101	EG–47	EG–109	–	EG–253	EG–253	EG–250	CH section	–	EG–290	CH section	EG–86
Brakes drag even When released	Cooling Fan System	Dash Pot	Clutch	Compression	Valve Clearance	Valve Timing	Timing Belt	Water Pump	Valve Stem Guide Bushing	Oil Pump	Connecting Rod Bearing	Crankshaft Bearing	Cylinder Head	Piston Ring	Flywheel or Drive Plate	Radiator and Radiator Cap	Water Outlet Cap	Thermostat	Drive Belt	Engine Coolant Temp. Sender Gauge	Oil Pressure Switch	Generator	Cylinder Block
															2								
				9		10	11																
				5		7	8							6									
											3	4											
				9		11								10									
		2																					
		2																					
				10	13	14	15						20	11									
				7																			
2			1	7	16	17																	
						2																	
						2																	
	8					5		10								6	7	9					
6		4	5	11		13								12									
	2					8	6	7		11			12			3	4	5		14			13
	1																	2		3			
				3					2				5	4									6
										2	3	4									5		
										1											2		
																			1			2	

	See page	EG–210	EG–220	EG–221	EG–236	EG–225	EG–231	-	-	-	-	ST section	-	ST section	IG section	IG section	EG–151	-
	Suspect area / Symptom	Idle Air Control Valve	SFI Main Relay	Circuit Opening Relay	Fuel Cut System	Fuel Pressure Control System	Engine control module (ECM)	Fuel Quality	Fuel Leakage	Coolant Leakage	Oil Leakage	Starter Relay	Park/Neutral position SW or Clutch Start SW	Starter	Spark Plug	Distributor	EGR System	Accelerator Pedal Link
Does not start	Engine does not crank											1	3	2				
	Starter runs - engine does not crank													1				
	No initial combusion	8	3	4			14	7								1		
	No complete combusion	2					11											
Difficult to start	Engine cranks slowly													1				
	Difficult to start ordinaly	3					18	1							2	15	5	
	Difficult to start in cold	4					11	3										
	Difficult to start in hot	3				4	11	2										
Poor idling	Incorrect first idle	4					5											1
	High engine idle speed	4					11											1
	Low engine idle speed	2					6										3	
	Rough idling	9					19	1							4	5	3	
	Misfire						11	1							3	5	2	
Poor drivability	Hesitation Poor acceleration						20	3							5	6	4	
	Backfire						12										1	
	Muffler explosion (after fire)				1		11											
	Serging						5								2	3		
	Knocking						11	2							3		4	
Engine stall	Engine stall soon after starting	6					11	1									5	
	After acceleration pedal depressed						8								4		2	
	After acceleration pedal released	1					4										2	
	During A/C operation	2					3											
	When N to D shift	2					3											
Others	Poor fuel economy				8		24	2	1						9	10	7	3
	Engine overheat									1					9			
	Engine overcool																	
	Excessive oil consumption										1							
	Low oil pressure										1							
	High oil pressure																	
	Starter keeps running											1		2				
	Battery often discharge																	



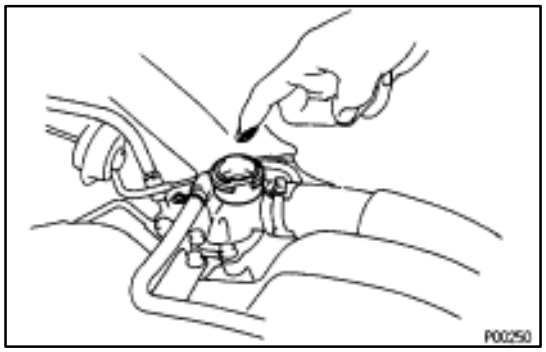
TUNE–UP
ENGINE COOLANT INSPECTION

EG0EM–01

1. CHECK ENGINE COOLANT LEVEL AT RESERVOIR TANK

The engine coolant level should be between the ”LOW” and ”FULL” lines at low temperature.

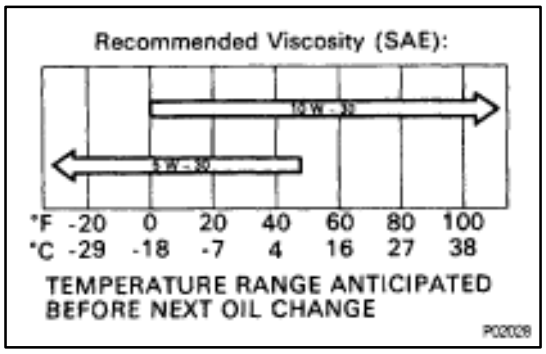
If low, check for leaks and add engine coolant up to the ”FULL” line.



2. CHECK ENGINE COOLANT QUALITY

There should be no excessive deposits of rust or scales around the radiator cap (water outlet side) or water outlet filter hole, and the engine coolant should be free from oil.

If excessively dirty, replace the engine coolant.



ENGINE OIL INSPECTION

EG0EN–02

1. CHECK OIL QUALITY

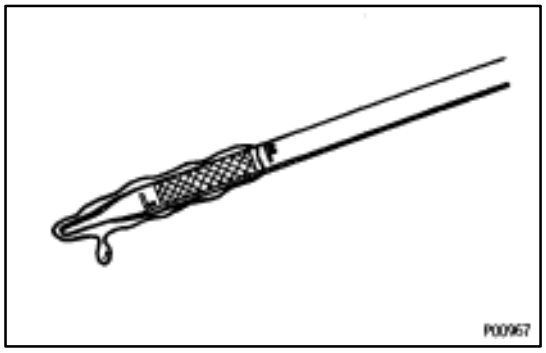
Check the oil for deterioration, entry of water discoloring or thinning.

If oil quality is poor, replace it.

Oil grade:

API grade SG Energy–Conserving II multigrade engine oil.

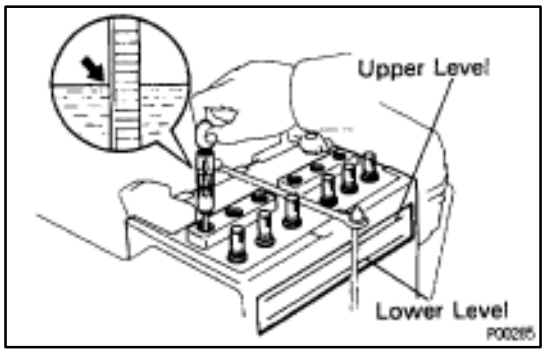
Recommended viscosity is as shown.



2. CHECK ENGINE OIL LEVEL

The oil level should be between the ”L” and ”F” marks on the dipstick.

If low, check for leakage and add oil up to the ”F” mark.



BATTERY INSPECTION

EG0EP–01

1. CHECK BATTERY SPECIFIC GRAVITY AND ELECTROLYTE LEVEL

(a) Check the electrolyte level of each cell.
If insufficient, refill with distilled (or purified) water.

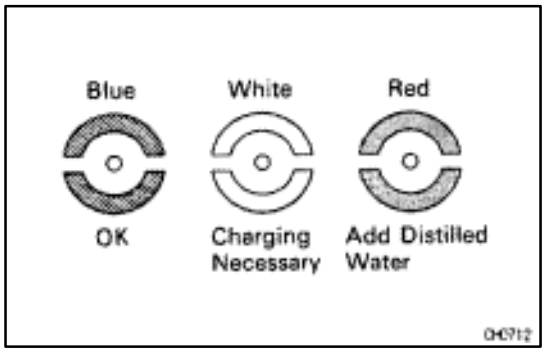
(b) Check the specific gravity of each cell.

Standard specific gravity at 20°C (68°F):

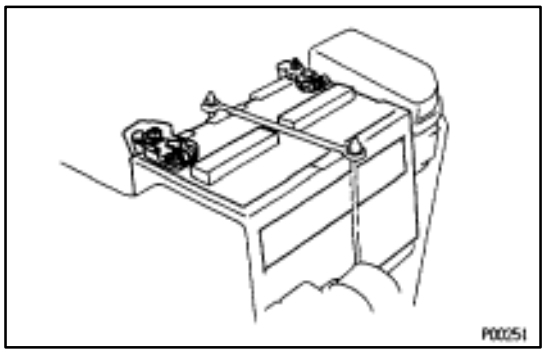
1.25–1.27 (55D23L Battery)

1.27–1.29 (80D26L Battery)

If not within specifications, charge the battery.



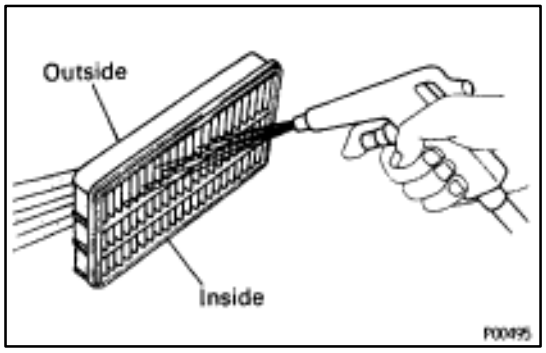
HINT: Check the indicator as shown.



2. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

(a) Check that the battery terminals are not loose or corroded.

(b) Check the fusible link and fuses for continuity.



AIR FILTER INSPECTION

EG0EQ–01

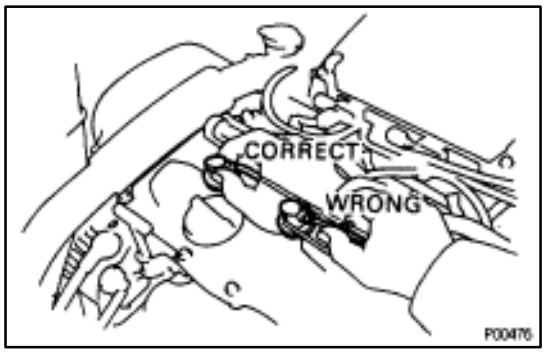
1. INSPECT AIR FILTER

Visually check that the air filter is not excessively dirty, damaged or oily.

2. CLEAN AIR FILTER

Clean the air filter with compressed air.

First blow air from the upper thoroughly. Then blow off the lower of the air filter.



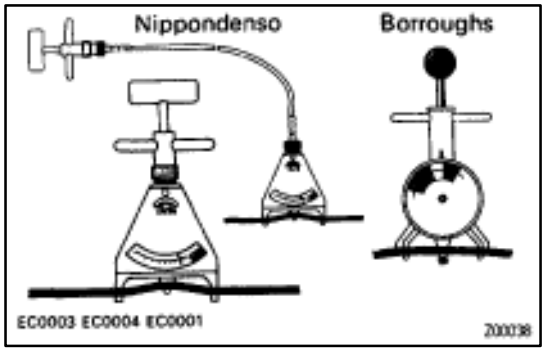
HIGH–TENSION CORDS INSPECTION

EG0ER–01

(See IG section)

Maximum resistance:

25 kΩ per cord



GENERATOR DRIVE BELT INSPECTION

EG0ES–01

(See CH section)

Drive belt tension:

New belt

175 ± 5 lbf

Use belt

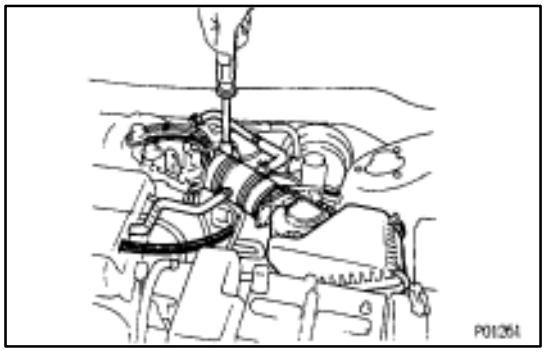
115 ± 20 lbf

VALVE CLEARANCE INSPECTION AND ADJUSTMENT

EG0ET–02

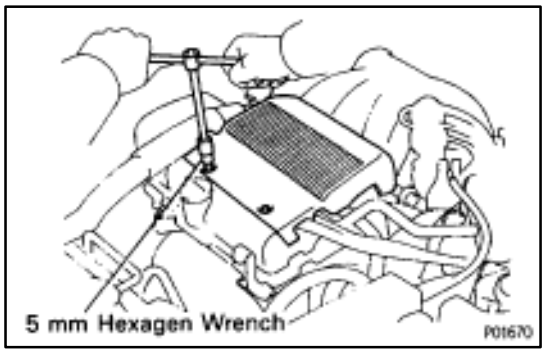
HINT: Inspect and adjust the valve clearance when the engine is cold.

1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
   CAUTION (w/ Airbag): Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.
2. **DRAIN ENGINE COOLANT**
3. **DISCONNECT ACCELERATOR CABLE FROM THROTTLE LINKAGE**
4. **(A/T)**
   DISCONNECT THROTTLE CABLE FROM THROTTLE LINKAGE

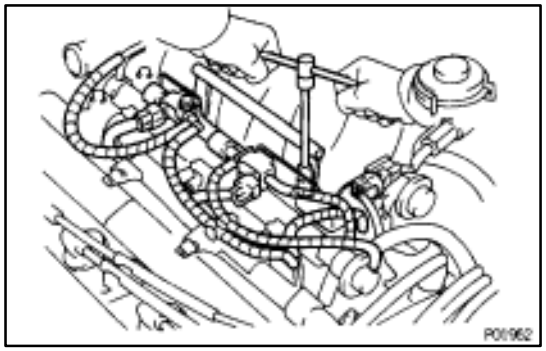


5. **REMOVE AIR CLEANER CAP, VOLUME AIR FLOW METER AND AIR CLEANER HOSE**

(a) Disconnect the volume air flow meter
(b) Disconnect the coil cord clamp.
(c) Disconnect the air hoses.
(d) Loosen the air cleaner hose clamp bolt.
(e) Disconnect the air cleaner cap clips.
(f) Remove the air cleaner cap and volume air flow meter together with the air cleaner hose.

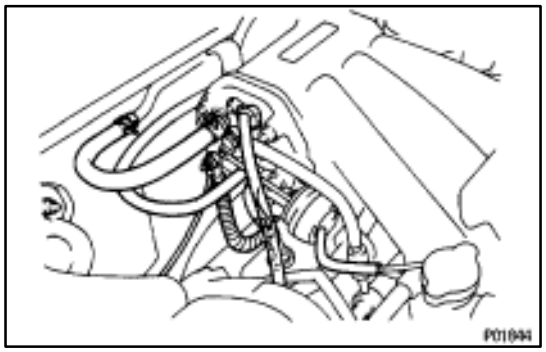


6. **REMOVE V–BANK COVER**
   Using a 5 mm hexagon wrench, remove the two nuts and V–bank cover.



7. REMOVE EMISSION CONTROL VALVE SET

(a) (Calif. only)
Disconnect the EGR gas temp. sensor connector clamp from the emission control valve set.
(b) Disconnect the two vacuum hoses of the fuel pressure control VSV.
(c) Disconnect the two vacuum hoses of the IACV VSV.
(d) Disconnect the two VSV connectors.
(e) Remove the two bolts and emission control valve set.



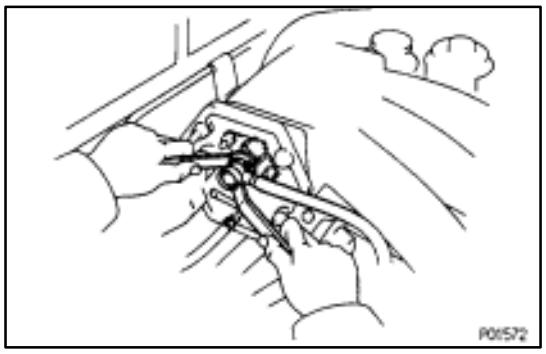
8. DISCONNECT HOSES

(a) Brake booster vacuum hose
(b) PS air hose
(c) PCV hose
(d) IACV vacuum hose

9. DISCONNECT GROUND STRAPS

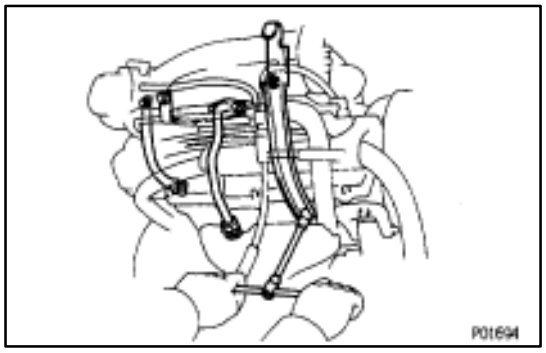
Remove the nut and disconnect the two ground straps.

10. DISCONNECT COLD START INJECTOR CONNECTOR



11. DISCONNECT COLD START INJECTOR PIPE (No.2 FUEL PIPE)

(a) Put a suitable container or shop towel under the injector pipe.
(b) Remove the union bolt and two gaskets, and disconnect the injector pipe.
HINT: Slowly loosen the union bolt.



12. REMOVE NO.1 ENGINE HANGER AND AIR INTAKE CHAMBER STAY

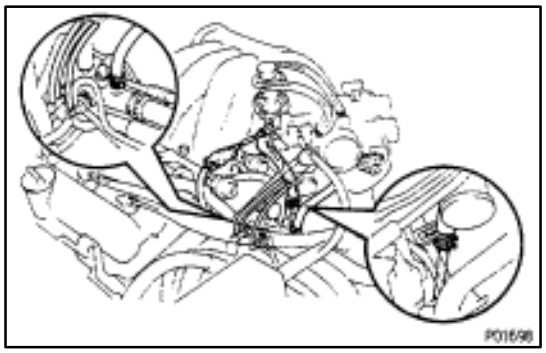
(a) Remove the two bolts and No.1 engine hanger.
(b) Remove the two bolts and air intake chamber stay.

13. REMOVE EGR PIPE

(a) Loosen the union nut.
(b) Remove the two bolts and EGR pipe.

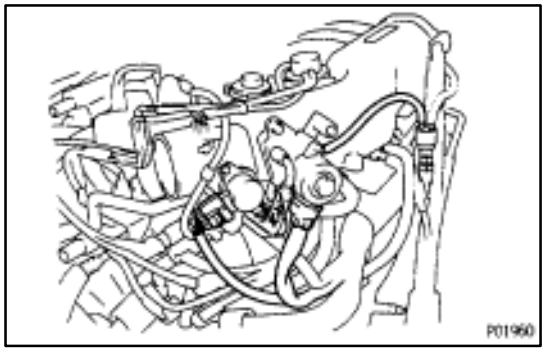
14. DISCONNECT HYDRAULIC MOTOR PRESSURE PIPE

Remove the bolt and disconnect the hydraulic pressure pipe from the air intake chamber.

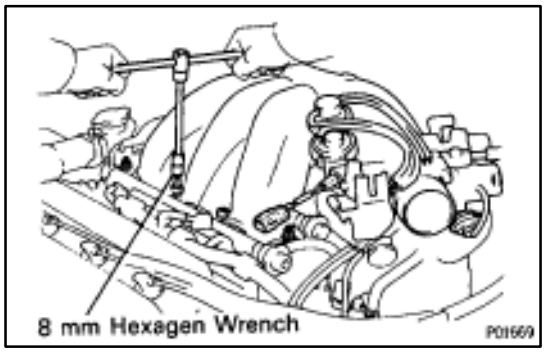


15. REMOVE AIR INTAKE CHAMBER

(a) Disconnect the three emission control vacuum hoses.
(b) Disconnect the two water by–pass hoses.
(c) (Calif. only)
Disconnect the EGR gas temp. sensor connector.

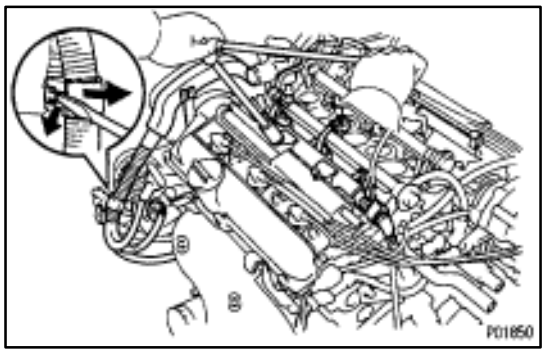


(d) Disconnect the throttle position sensor connector.
(e) Disconnect the IAC valve connector.
(f) Disconnect the IAC valve air hose.
(g) Disconnect the PS air hose.



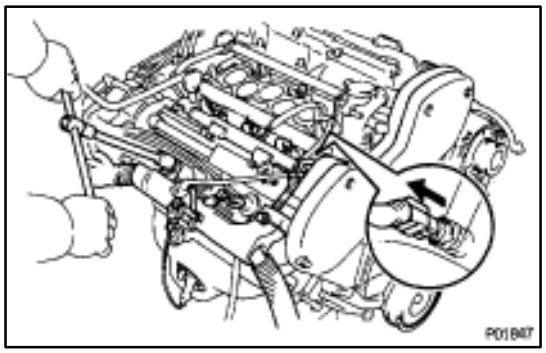
(h) Using 8 mm hexagon wrench, remove the two bolts, nuts air intake chamber and gasket.

16. DISCONNECT LH ENGINE WIRE HARNESS



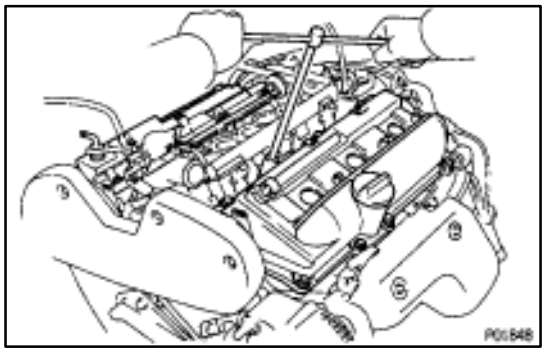
(a) Disconnect the following connectors:
  (1) Three injector connectors
  (2) Engine oil level sensor connector
  (3) Oil pressure switch connector
  (4) A/C compressor connector
  (5) Generator connector and wire
  (6) Engine Coolant temp.sensor connector (for hydraulic cooling fan)
(b) Remove the two bolts, and disconnect the five clamps and LH engine wire harness.

17. DISCONNECT RH ENGINE WIRE HARNESS



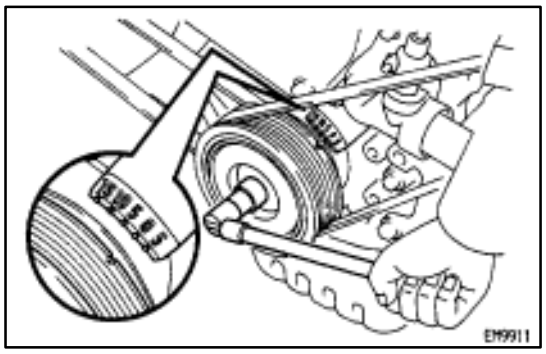
(a) Disconnect the following connectors:
  (1) Three injector connectors
  (2) Engine coolant temperature sender gauge connector
  (3) Oxygen sensor connector
  (4) PS pump connector
(b) Remove the two bolts, and disconnect the two clamps and RH engine wire harness.

18. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS



19. REMOVE CYLINDER HEAD COVERS

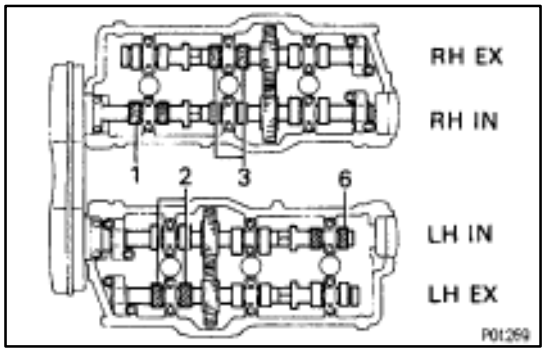
Remove the six nuts, seal washers, cylinder head cover and gasket. Remove the two cylinder head covers.



20. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley, and align its groove with the timing mark ”0” of the No.1 timing belt cover.

(b) Check that the valve lifters on the No.1 (IN) are loose and valve lifters on the on the No.1 (EX) are tight.
If not, turn the crankshaft one revolution (360°) and align the mark as above.



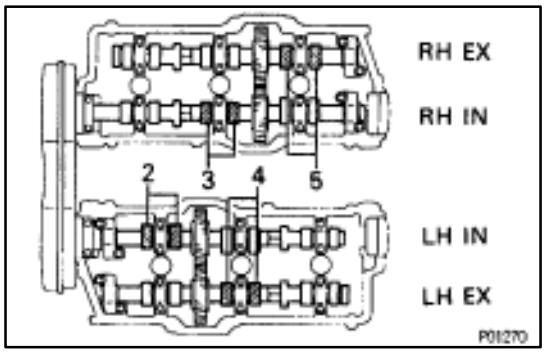
21. ADJUST VALVE CLEARANCE

(a) Check only those valves indicated in the illustration.
- Using a thickness gauge, measure the clearance between the valve lifter and camshaft.
- Record out of specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

Valve clearance (Cold):

Intake

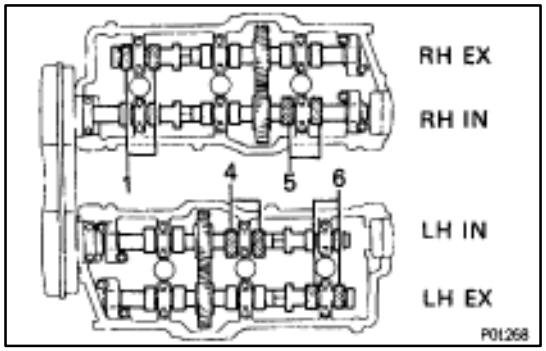
0.13–0.23 mm (0.005–0.009 in.)



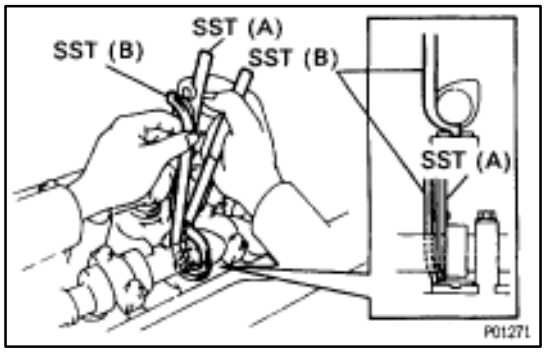
Exhaust

0.27–0.37 mm (0.011–0.015 in.)

(b) Turn the crankshaft 2/3 of a revolution (2405), and check only the valves indicated in the illustration.
Measure the valve clearance.
(See procedure step (a))



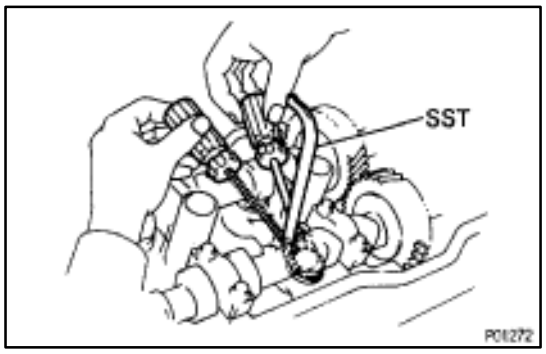
(c) Turn the crankshaft further 2/3 of a revolution (2405), and check only the valves indicated in the illustration.
Measure the valve clearance.
(See procedure step (a))

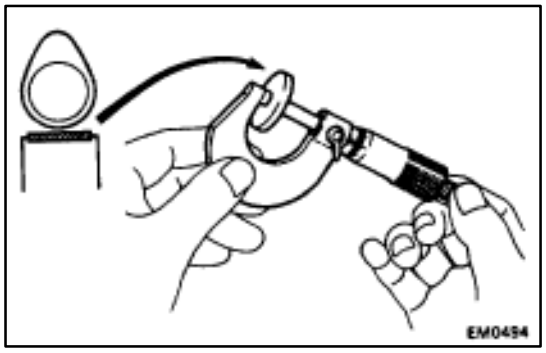


(d) Remove the adjusting shim.
- Turn the crankshaft so that the cam lobe for the valve to be adusted faces up.
- Press down the valve lifter with SST (A), and place SST (B) between the camshaft and valve lifter. Remove SST (A).

SST 09248–55020(09248–05011, 09248–05021)
HINT: Before pressing down the valve lifter, position the notch toward the spark plug.

- Remove the adjusting shim with a small screwdriver and magnetic finger.





(e) Determine the replacement adjusting shim size by following the Formula or Charts:
- Using a micrometer, measure the thickness of the removed shim.
- Calculate the thickness of a new shim so that the valve clearance comes within specified value.

T ___ Thickness of used shim
A ___ Measured valve clearance
N ___ Thickness of new shim

Intake:

N = T + (A–0.18 mm (0.007 in.))

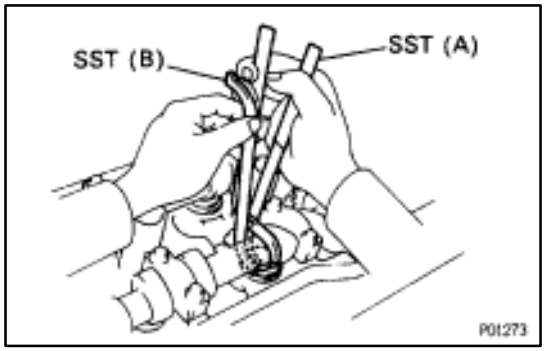
Exhaust:

N = T + (A–0.32 mm (0.013 in.))

- Select a new shim with a thickness as close as possible to the calculated values.

HINT: Shims are available in seventeen sizes in increments of 0.05 mm (0.0020 in.), from 2.50 mm (0.0984 in.) to 3.30 mm (0.1299 in.).

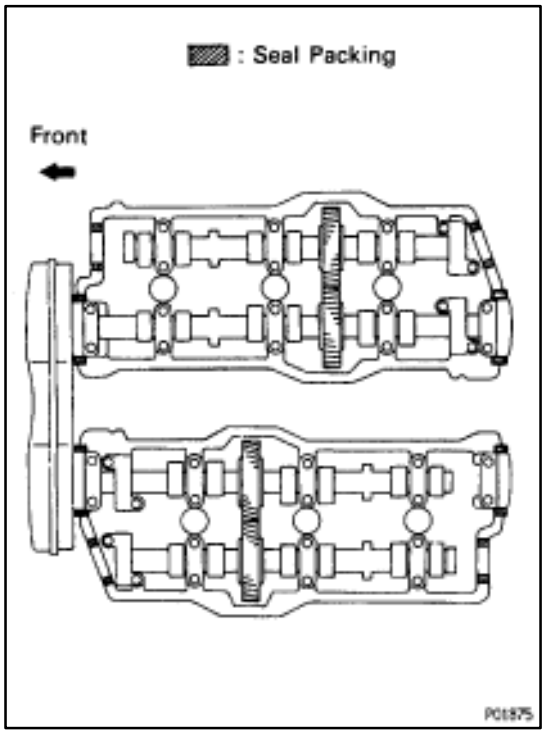
(f) Install a new adjusting shim.



•Place a new adjusting shim on the valve lifter.
•Press down the valve lifter with SST (A), and remove SST (B).

SST 09248–55020(09248–05011, 09248–05021)

(g) Recheck the valve clearance.

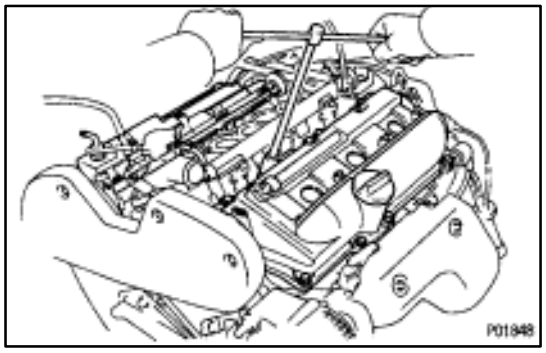


22. REINSTALL CYLINDER HEAD COVERS

(a) Apply seal packing to the cylinder heads as shown in the illustration.

Seal packing:

Part No.08826–00080 or equivalent

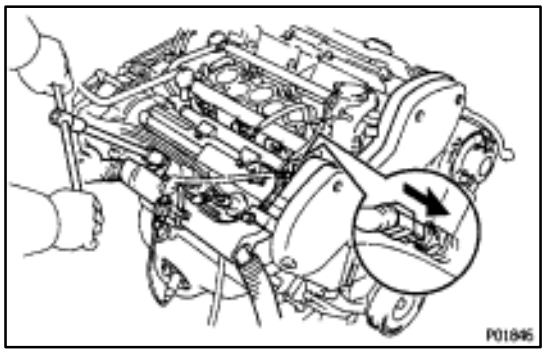


(b) Install the gasket to the cylinder head cover.

(c) Install the cylinder head cover with the six seal washers and nuts. Uniformly tighten the nuts in several passes. Install the two cylinder head covers.

Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)

23. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS

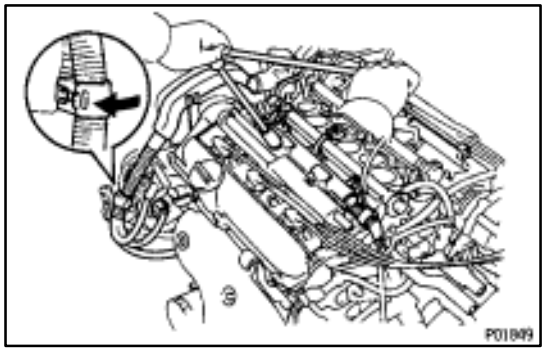


24. RECONNECT RH ENGINE WIRE HARNESS

(a) Connect the two clamps of the RH engine wire harness and install the wire harness with the two bolts.

(b) Connect the following connectors:

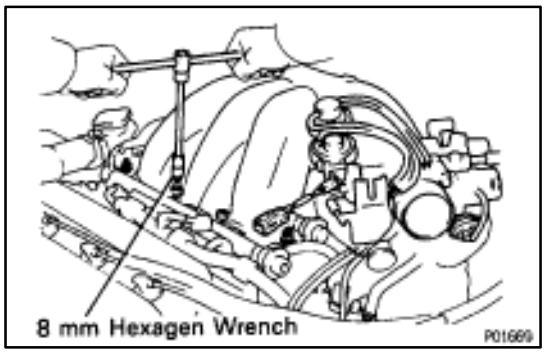
(1) Three injector connectors
(2) Engine coolant temperature sender gauge connector
(3) Oxygen sensor connector
(4) PS pump connector



25. RECONNECT LH ENGINE WIRE HARNESS

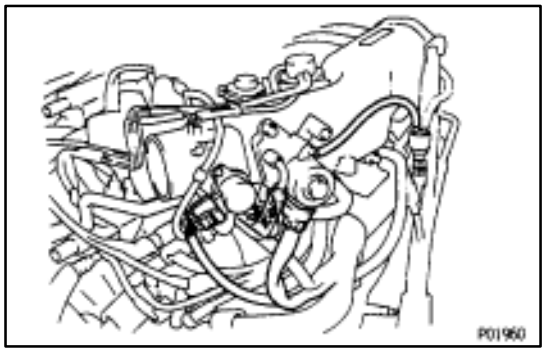
(a) Connect the three clamps of the LH engine wire harness and install the wire harness with the two bolts.

(b) Connect the following connectors:
- (1) Three injector connectors
- (2) Engine oil level sensor connector
- (3) Oil pressure switch connector
- (4) A/C compressor and wire
- (5) Generator connector and wire
- (6) Engine coolant temp. sensor connector (for hydraulic cooling fan)



26. REINSTALL AIR INTAKE CHAMBER

(a) Using 8 mm hexagon wrench, install a new gasket and the air intake chamber with the two bolts and nuts.
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

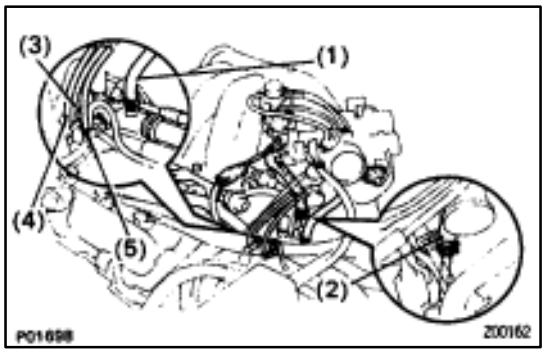


(b) Connect the throttle position sensor connector.

(c) Connect the IAC valve connector.

(d) Connect the IAC valve air hose.

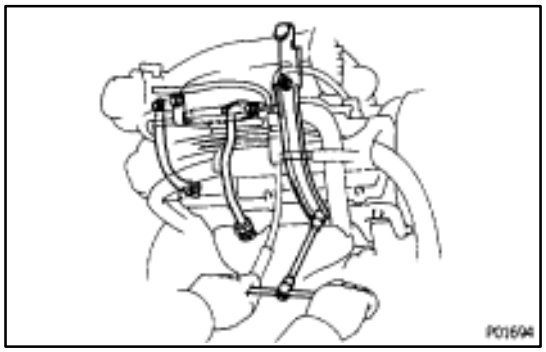
(e) Connect PS air hose.



(f) (Calif. only)
Connect the EGR gas temp. sensor connector.

(g) Connect the following hoses:
- (1) Water by–pass hose to throttle body
- (2) Water by–pass hose to EGR cooler
- (3) Vacuum hose (from EGR valve) to TVV (for EGR)
- (4) Vacuum hose (from EGR vacuum modulator) to TVV (for EGR)

(5) Vacuum hose (from throttle body) to TVV (for EVAP)



27. RECONNECT HYDRAULIC MOTOR PRESSURE PIPE

Connect the hydraulic pressure pipe to the air intake chamber with the bolt.

28. REINSTALL EGR PIPE

Install a new gasket, sleeve ball and the EGR pipe with the two bolts and union nut.

Bolt

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

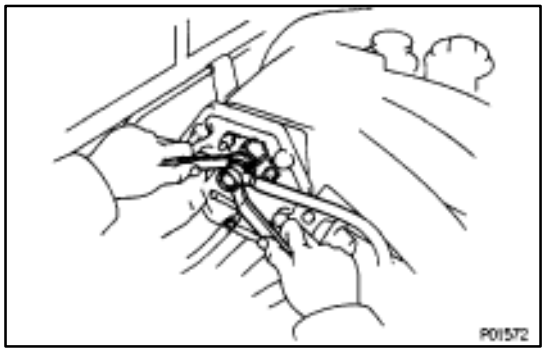
Union nut

Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)

29. REINSTALL NO. 1 ENGINE HANGER AND AIR INTAKE CHAMBER STAY

(a) Install the air intake chamber stay with the two bolts.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(b) Install the No.1 engine hanger with the two bolts.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

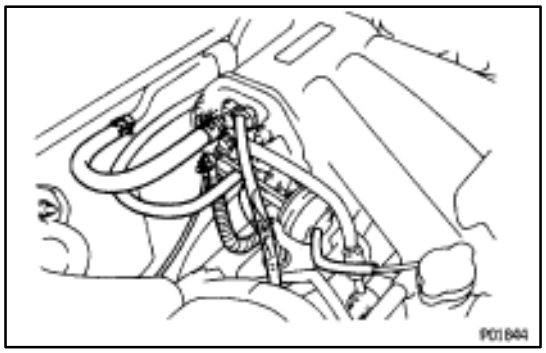


30. RECONNECT COLD START INJECTOR PIPE (NO.2 FUEL PIPE)

Connect the injector pipe with the two new gaskets and union bolt.

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

31. RECONNECT COLD START INJECTOR CONNECTOR



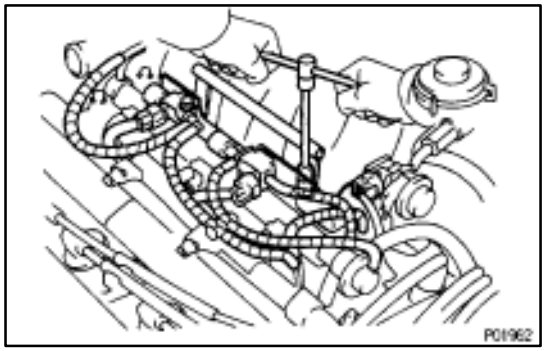
32. RECONNECT GROUND STRAPS

Connect the two ground straps with the nut.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

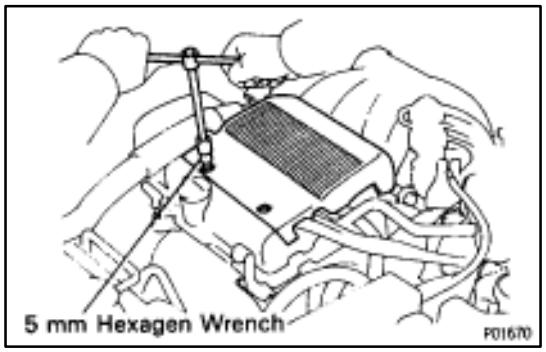
33. RECONNECT HOSES

(a) Brake booster vacuum hose
(b) PS air hose
(c) PCV hose
(d) IACV vacuum hose



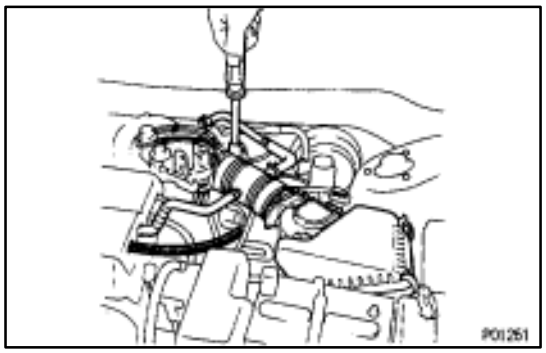
34. REINSTALL EMISSION CONTROL VALVE SET

(a) Install the emission control valve set with the two bolts.
(b) Connect the two VSV connectors.
(c) Connect the two vacuum hoses of the IACV VSV.
(d) Connect the two vacuum hoses of the fuel pressure control VSV.
(e) (Calif. only)
Connect the EGR gas temp. sensor connector clamp to the emission control valve set.



35. REINSTALL V–BANK COVER

Using a 5 mm hexagon wrench, install the V–bank cover with the two nuts.



36. INSTALL AIR CLEANER CAP, VOLUME AIR FLOW METER AND AIR CLEANER HOSE

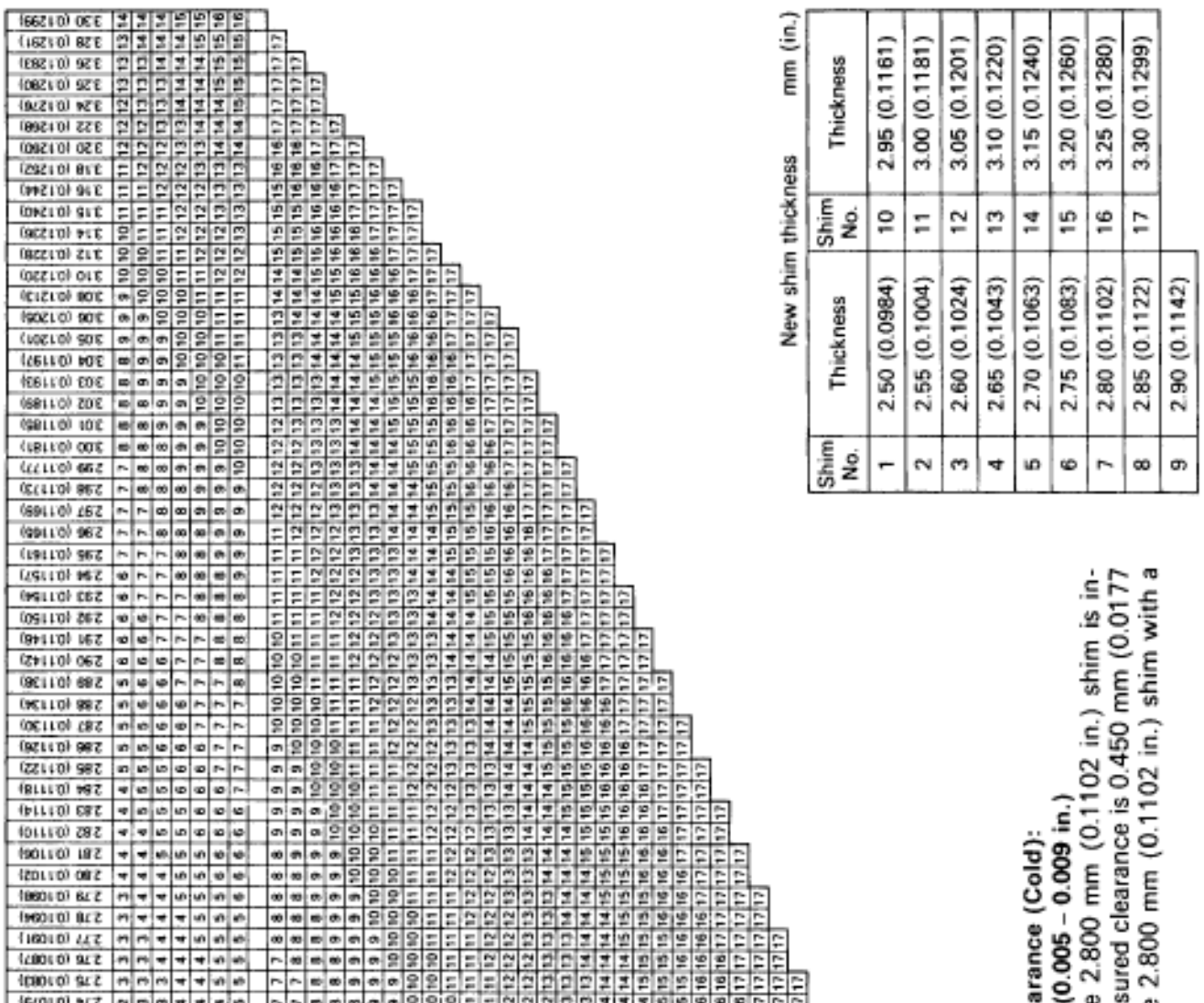
(a) Connect the air cleaner hose, and install the air cleaner cap and volume air flow meter with the four clips.
(b) Tighten the air cleaner hose clamp bolt.
(c) Connect the air hoses.
(d) Connect the coil cord clamp.
(e) Connect the volume air flow meter connector.

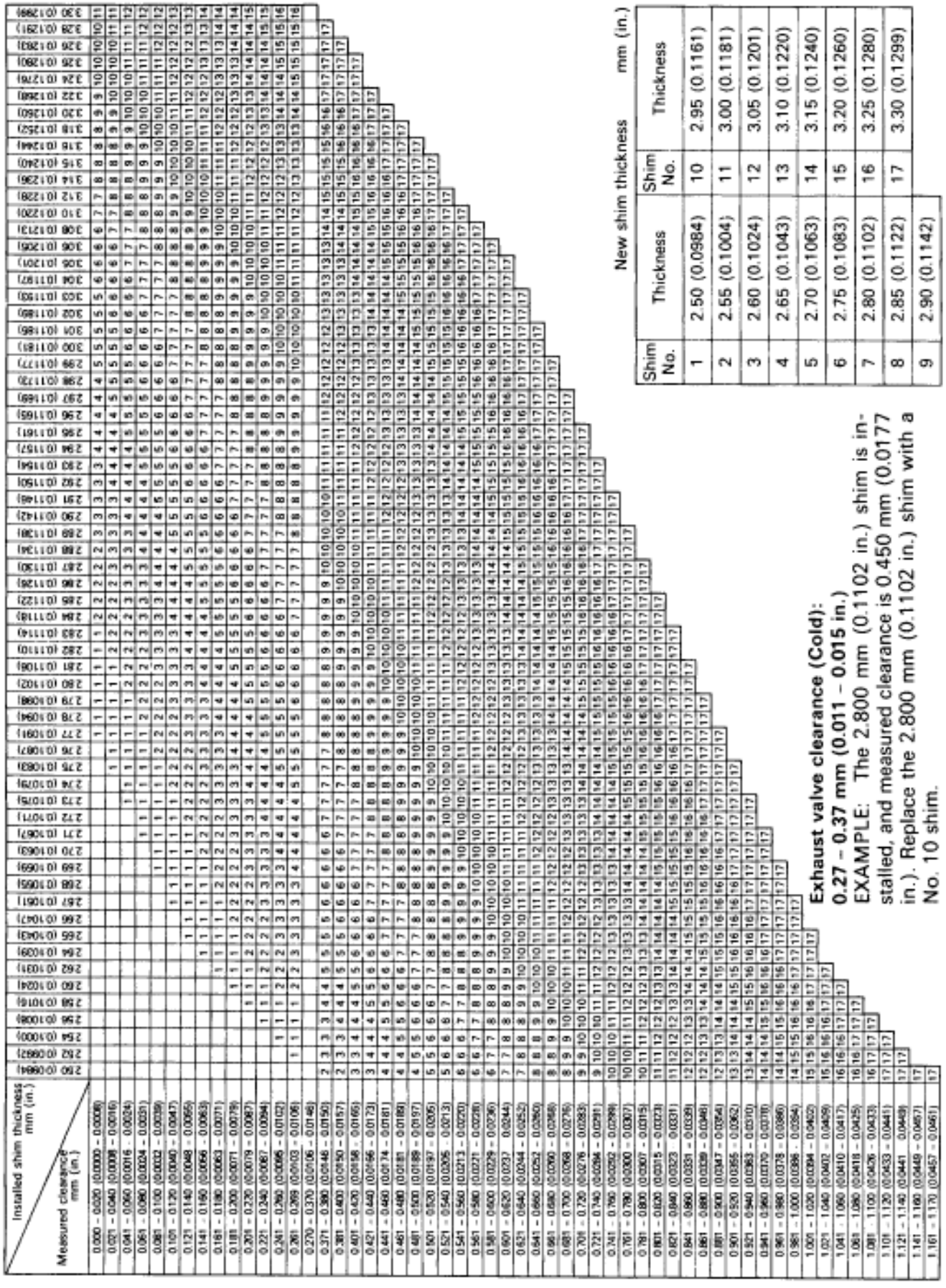
37. (A/T)
CONNECT THROTTLE CABLE, AND ADJUST IT

38. CONNECT ACCELERATOR CABLE, AND ADJUST IT

39. FILL WITH ENGINE COOLANT

40. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY


Adjusting Shim Selection Chart (Intake)
Installed shim thickness mm (in.)
Measured clearance mm (in.)
New shim thickness mm (in.)
Shim No. | Thickness | Shim No. | Thickness
1 | 2.50 (0.0984) | 10 | 2.95 (0.1161)
2 | 2.55 (0.1004) | 11 | 3.00 (0.1181)
3 | 2.60 (0.1024) | 12 | 3.05 (0.1201)
4 | 2.65 (0.1043) | 13 | 3.10 (0.1220)
5 | 2.70 (0.1063) | 14 | 3.15 (0.1240)
6 | 2.75 (0.1083) | 15 | 3.20 (0.1260)
7 | 2.80 (0.1102) | 16 | 3.25 (0.1280)
8 | 2.85 (0.1122) | 17 | 3.30 (0.1299)
9 | 2.90 (0.1142)
Intake valve clearance (Cold):
0.13 – 0.23 mm (0.005 – 0.009 in.)
EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed, and measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a No. 12 shim.
V00503


Adjusting Shim Selection Chart (Exhaust)
Installed shim thickness mm (in.)
Measured clearance mm (in.)
New shim thickness mm (in.)
Shim No. | Thickness | Shim No. | Thickness
1 | 2.50 (0.0984) | 10 | 2.95 (0.1161)
2 | 2.55 (0.1004) | 11 | 3.00 (0.1181)
3 | 2.60 (0.1024) | 12 | 3.05 (0.1201)
4 | 2.65 (0.1043) | 13 | 3.10 (0.1220)
5 | 2.70 (0.1063) | 14 | 3.15 (0.1240)
6 | 2.75 (0.1083) | 15 | 3.20 (0.1260)
7 | 2.80 (0.1102) | 16 | 3.25 (0.1280)
8 | 2.85 (0.1122) | 17 | 3.30 (0.1299)
9 | 2.90 (0.1142)
Exhaust valve clearance (Cold):
0.27 – 0.37 mm (0.011 – 0.015 in.)
EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed, and measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a No. 10 shim.

W00236

IGNITION TIMING INSPECTION AND ADJUSTMENT

EG0EU–01

(See IG section)

Ignition timing:

10° BTDC @ idle

(w/ Terminals TE1 and E1 connected)

IDLE SPEED INSPECTION

EG0EV–01

Idle speed:

700±50 rpm

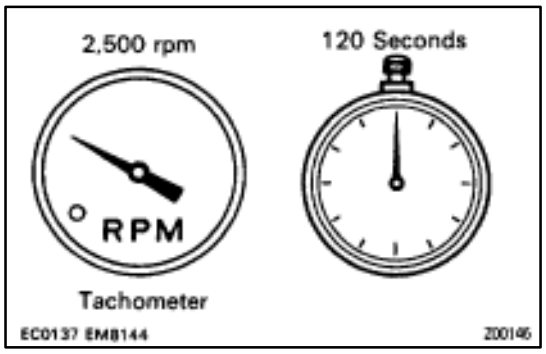
IDLE AND/OR 2,500 RPM CO/HC CHECK

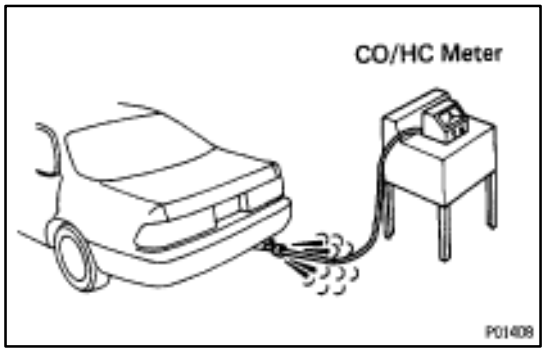
EG0EW–02

HINT: This check is used only to determine whether or not the idle CO/HC complies with regulations.

1. INITIAL CONDITIONS

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All operating accessories switched OFF
(e) All vacuum lines properly connected
HINT: All vacuum hoses for EGR systems, etc. should be properly connected.
(f) SFI system wiring connectors fully plugged in
(g) Transmission in neutral position
(h) Tachometer and CO/HC meter calibrated by hand





2. START ENGINE

3. RACE ENGINE AT 2,500 RPM FOR APPROX. 120 SECONDS

4. INSERT CO/HC METER TESTING PROBE INTO TAILPIPE LEAST 40 cm (1.3 ft)

5. CHECK CO/HC CONCENTRATION AT IDLE

Complete the measuring within three minutes.
HINT: When performing the 2 mode (2,500 rpm and idle) test, follow the measurement order prescribed by the regulations.

If the CO/HC concentration at 2.500 rpm does not comply with regulations, try the following procedure.
Race the engine again at 2,500 rpm for approx. 1 minute and quickly repeat steps 4 and 5 above.
This may correct the problem.

Troubleshooting

EG0EX–01

If the CO/HC concentration does not comply with regulations, perform troubleshooting in the order given below.

(a) Check oxygen sensor operation.
(See page EG–228)

(b) See the table below for possible causes, and then inspect and correct the applicable causes if necessary.

HC	CO	Problem	Cause
High	Normal	Rough idle	1. Faulty ignition: • Incorrect timing • Fouled, shorted or improperly gapped plugs • Open or crossed high–tension cords • Cracked distributor cap 2. Incorrect valve clearance 3. Leaky EGR valve 4. Leaky intake and exhaust valves 5. Leaky cylinder
High	Low	Rough idle (Fluctuating HC reading)	1. Vacuum leaks: • PCV hose • EGR valve • Intake manifold • Air intake chamber • Throttle body • IAC valve • Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Clogged air filter 2. Faulty SFI system • Faulty pressure regulator • Clogged fuel return line • Defective engine coolant temp. sensor • Defective air temp. sensor • Faulty ECM • Faulty injector • Faulty cold start injector • Faulty throttle position sensor • Volume air flow meter

COMPRESSION CHECK

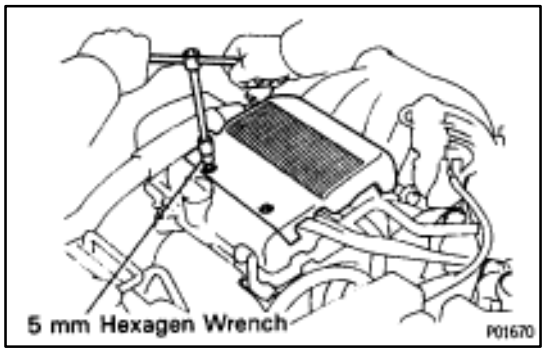
EG0EY–01

HINT: If there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

1. WARM UP AND STOP ENGINE

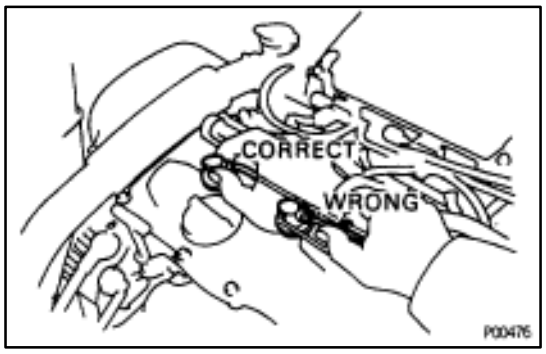
Allow the engine to warm up to normal operating temperature.

2. DISCONNECT DISTRIBUTOR CONNECTOR



3. REMOVE V–BANK COVER

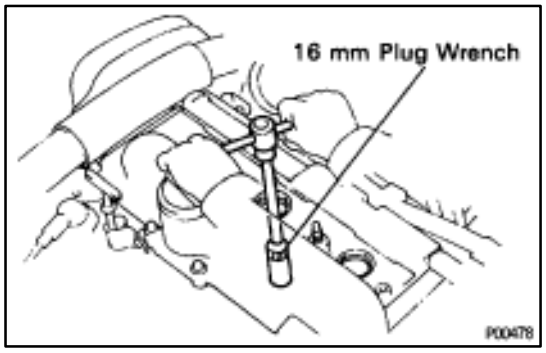
Using a 5 mm hexagon wrench, remove the two nuts and V–bank cover.



4. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS

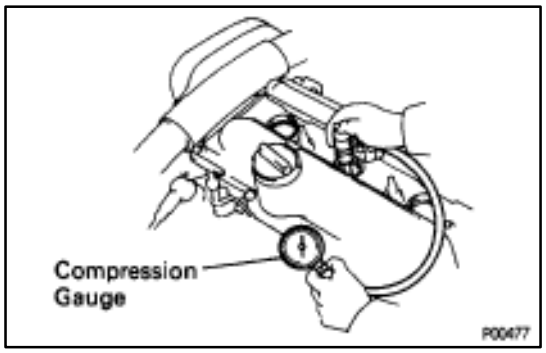
Disconnect the high–tension cords at the rubber boot. DO NOT pull on the cords.

NOTICE: Pulling on or bending the cords may damage the conductor inside.



5. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the spark plug.



6. CHECK CYLINDER COMPRESSION PRESSURE

(a) Insert a compression gauge into the spark plug hole.

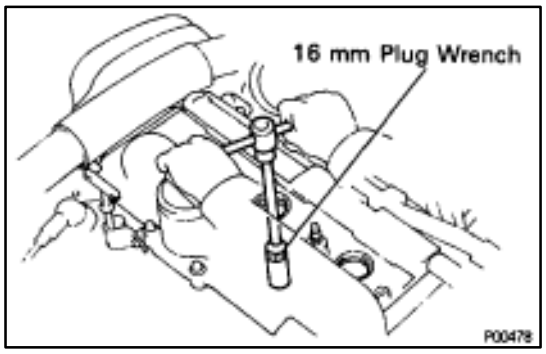
(b) Fully open the throttle.

(c) While cranking the engine, measure the compression pressure.

HINT: Always use a fully charged battery to obtain engine speed of 250 rpm or more.

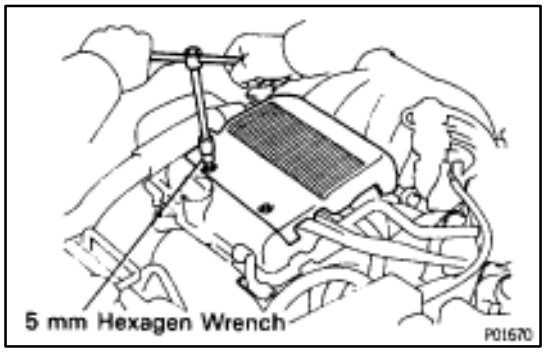
(d) Repeat steps (a) through (c) for each cylinder.
NOTICE: This measurement must be done in as short a time as possible.
Compression pressure:
1,226 kPa (12.5 kgf/cm^2, 178 psi) or more
Minimum pressure:
981 kPa (10.0 kgf/cm^2, 142 psi)
Difference between each cylinder:
98 kPa (1.0 kgf/cm^2, 14 psi) or less

(e) If the cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (c) for cylinders with low compression.
- If adding oil helps the compression chances are that the piston rings and/or cylinder bore are worn or damaged.
- If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.



7. REINSTALL SPARK PLUGS
Using a 16 mm plug wrench, install the spark plug.
Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)

8. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS

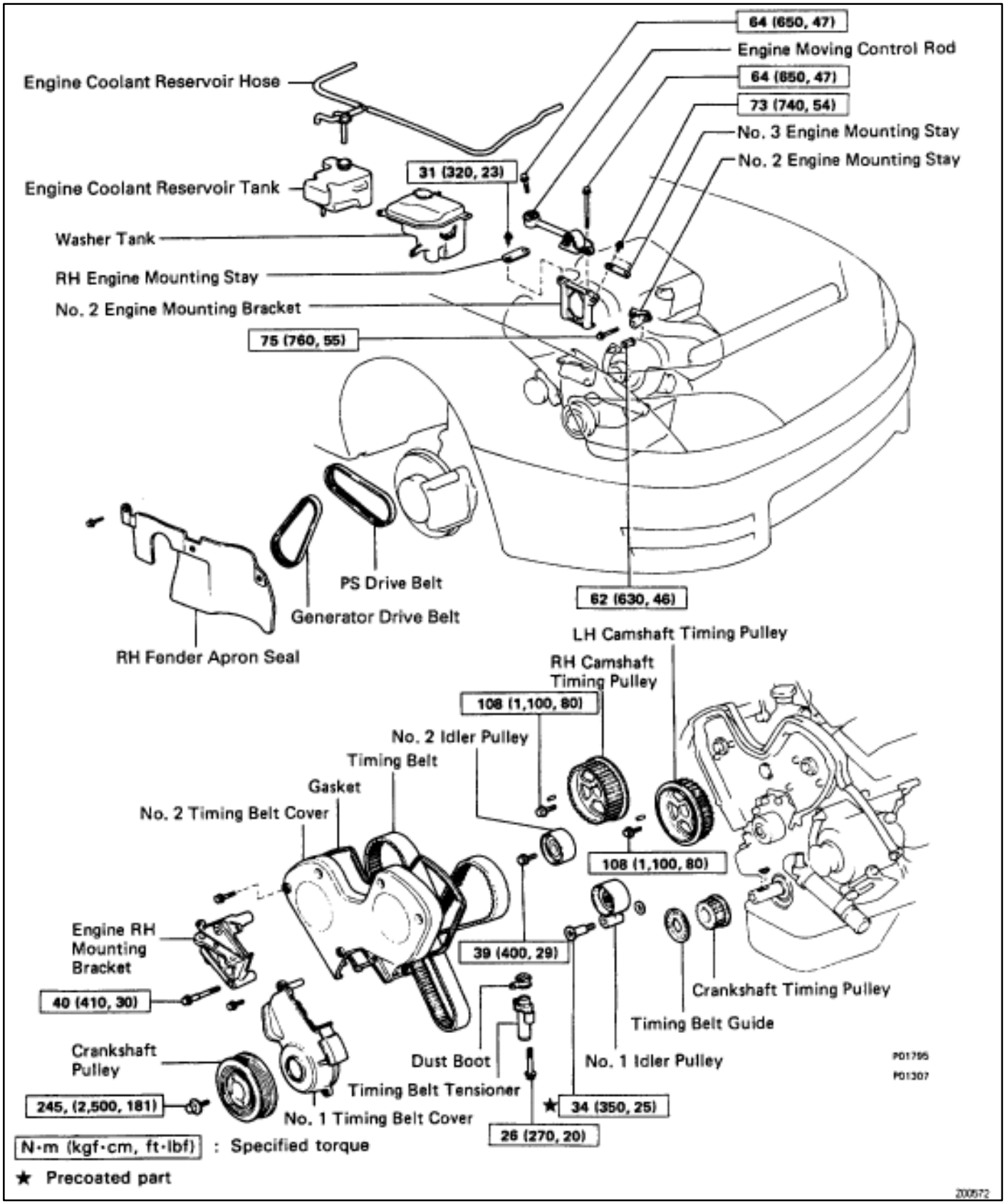


9. REINSTALL V–BANK COVER
Using a 5 mm hexagon wrench, install the V–bank cover with the two nuts.

10. RECONNECT DISTRIBUTOR CONNECTOR

TIMING BELT COMPONENTS

EG0EZ–02

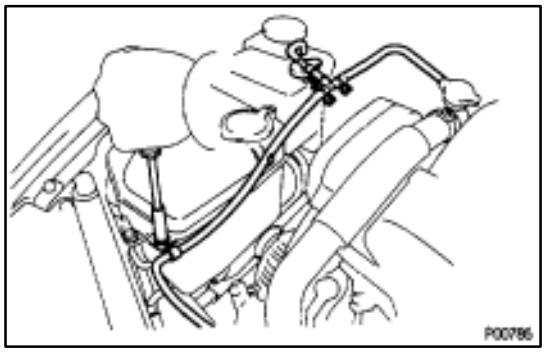


TIMING BELT REMOVAL

EG0F0–02

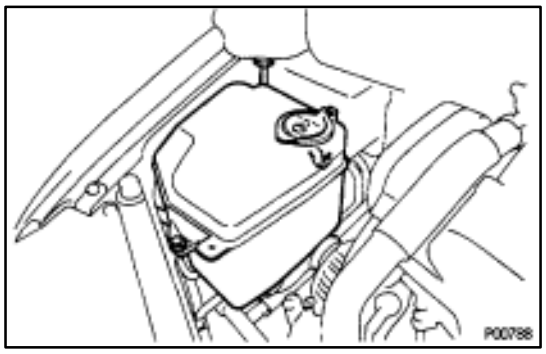
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION (w/ Airbag): Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the ”LOCK” position and the negative (–) terminal cable is disconnected from the battery.



2. DISCONNECT ENGINE COOLANT RESERVOIR HOSE

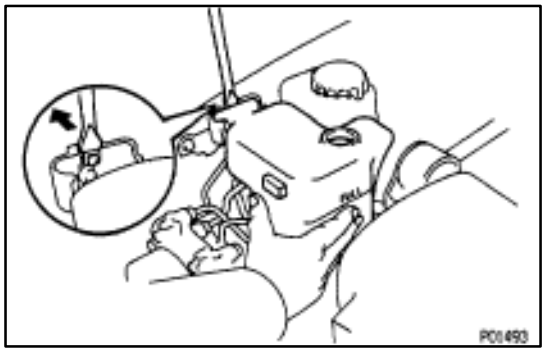
Remove the bolt and disconnect the reservoir hose.



3. REMOVE WASHER TANK

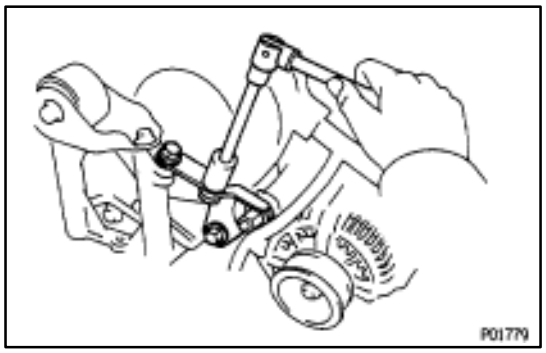
(a) Remove the three washer tank mounting bolts.

(b) Disconnect the connector and hose, and remove the washer tank.



4. REMOVE ENGINE COOLANT RESERVOIR TANK

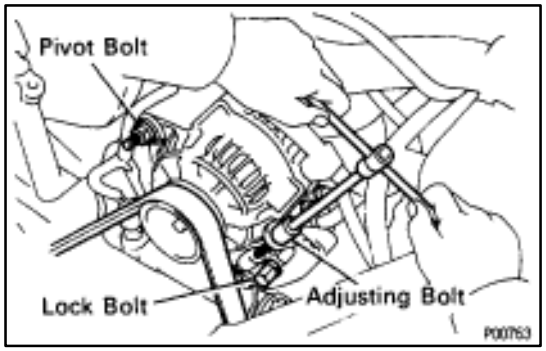
Using a screwdriver, remove the reservoir tank.



5. REMOVE NO.2 AND NO.3 RH MOUNTING STAYS

(a) Remove the two bolts and No.3 RH engine mounting stay.

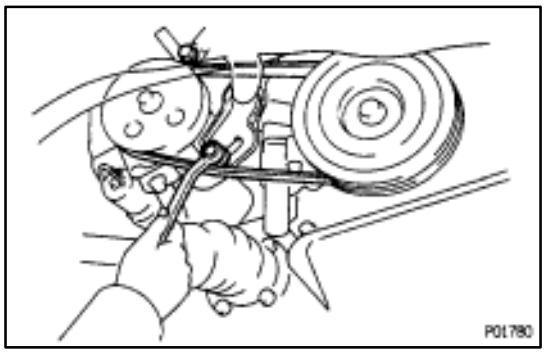
(b) Remove the bolt, nut and No.2 RH engine mounting stay.



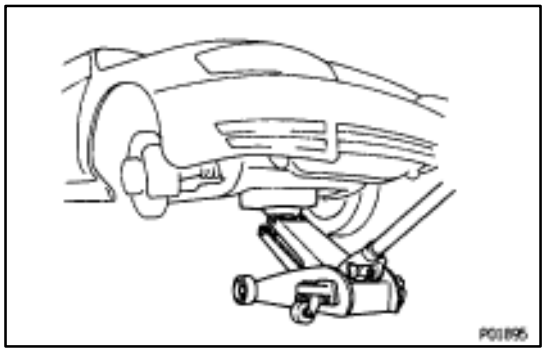
6. REMOVE GENERATOR DRIVE BELT
Loosen the pivot bolt and adjusting lock bolt, and remove the drive belt.

7. REMOVE RH FRONT WHEEL

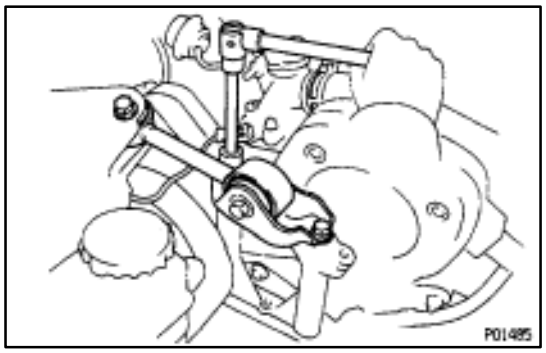
8. REMOVE RH FENDER APRON SEAL



9. REMOVE PS DRIVE BELT
Loosen the bolts, and remove the drive belt.

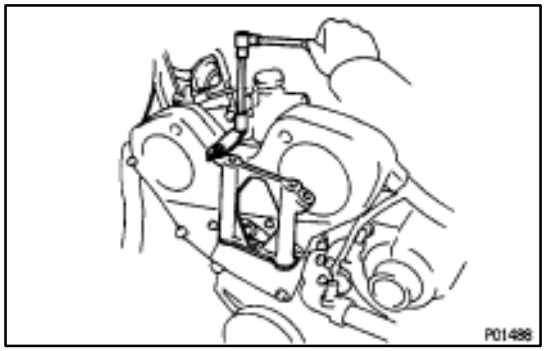


10. SLIGHTLY JACK UP ENGINE
Raise the engine enough to remove the weight from the engine mounting on the right side.



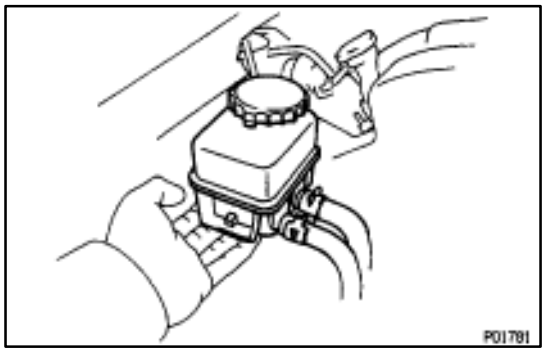
11. REMOVE ENGINE MOVING CONTROL ROD
Remove the three bolts and control rod.

12. DISCONNECT CONNECTOR FROM GROUND WIRE ON RH FENDER APRON



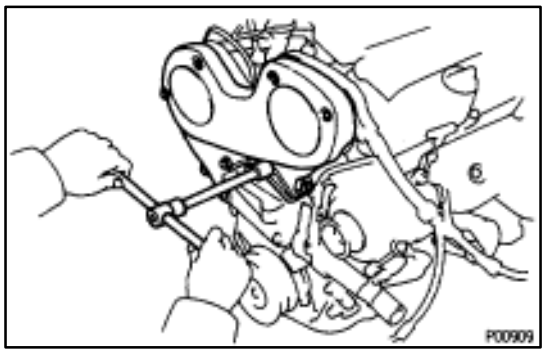
13. REMOVE RH ENGINE MOUNTING STAY AND NO.2 RH ENGINE MOUNTING BRACKET

Remove the bolt, nut, mounting stay and mounting bracket.



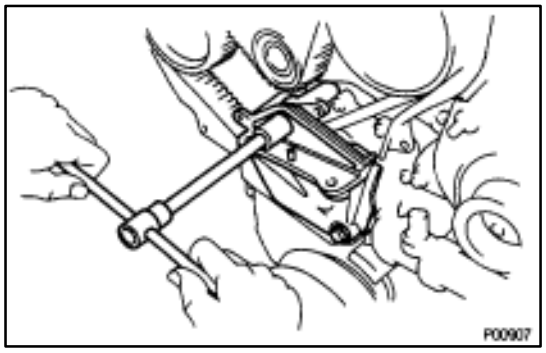
14. REMOVE PS OIL RESERVOIR TANK WITHOUT DISCONNECTING HOSES

15. REMOVE SPARK PLUGS



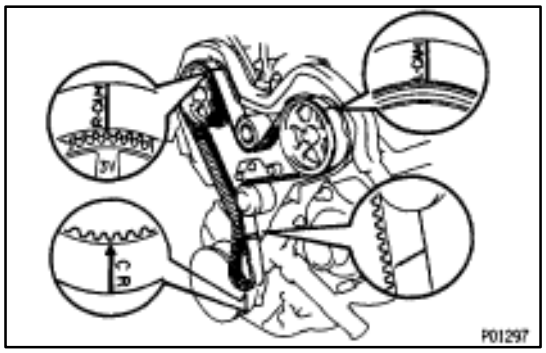
16. REMOVE NO.2 TIMING BELT COVER

Remove the eight bolts, timing belt cover and gasket.



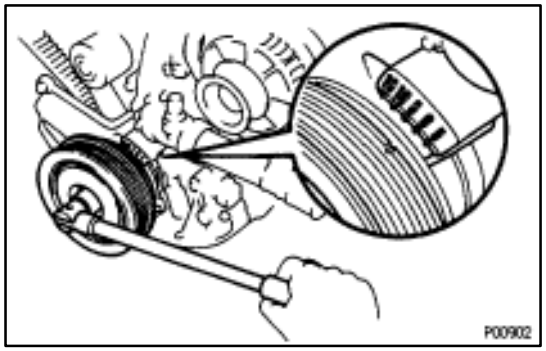
17. REMOVE ENGINE RH MOUNTING BRACKET

Remove the three bolts and mounting bracket.



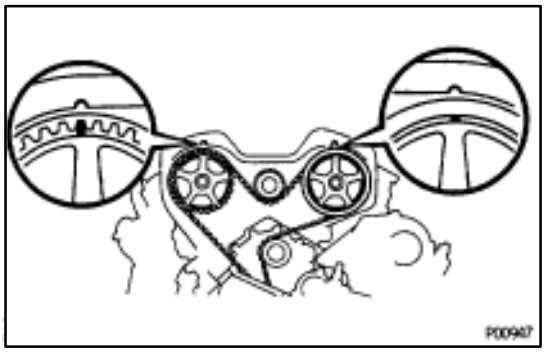
18. IF RE–USING TIMING BELT, CHECK INSTALLATION MARKS ON TIMING BELT

Check that there are four installation marks on the timing belt by turning the crankshaft pulley as shown in the illustration. If the installation marks have disappeared, place a new installation mark on the timing belt before removing each part.

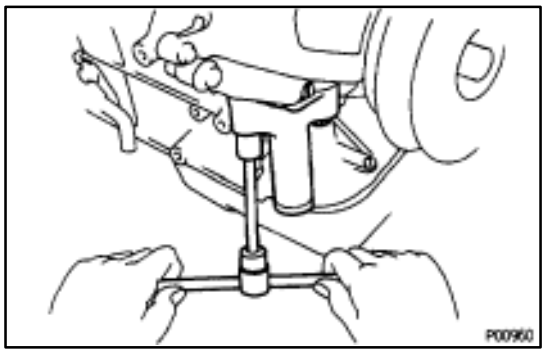


19. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley and align its groove with the timing mark ”O” of the No.1 timing belt cover.

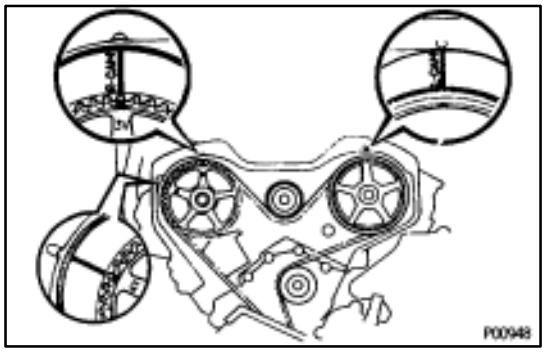


(b) Check that timing marks of the camshaft timing pulleys and No.3 timing belt cover are aligned.
If not, turn the crankshaft one revolution (360°).



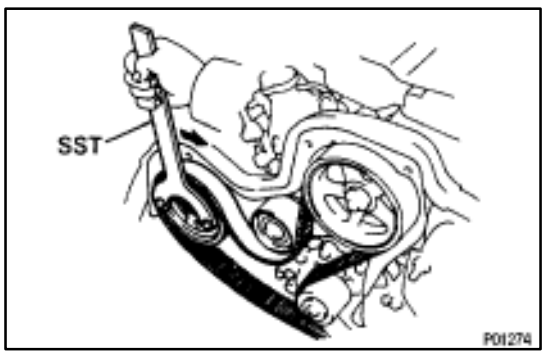
20. REMOVE TIMING BELT TENSIONER

Remove the two bolts, tensioner and dust boot.

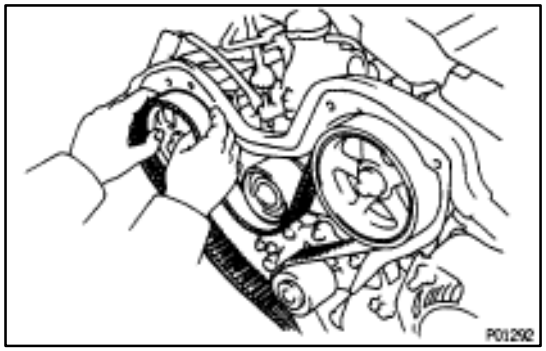


21. REMOVE TIMING BELT FROM CAMSHAFT TIMING PULLEY

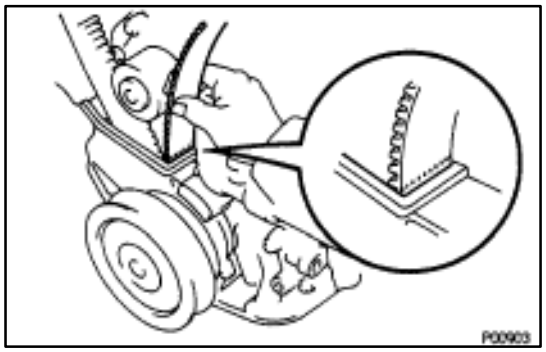
HINT (Re–using timing belt): If the installation marks have disappeared, before removing the timing belt, place new installation marks on the timing belt to match the timing marks of the camshaft timing pulleys.



(a) Using SST, loosen the tension between the LH and RH camshaft timing pulleys by slightly turning the RH camshaft timing pulley clockwise.
SST 09278–54012



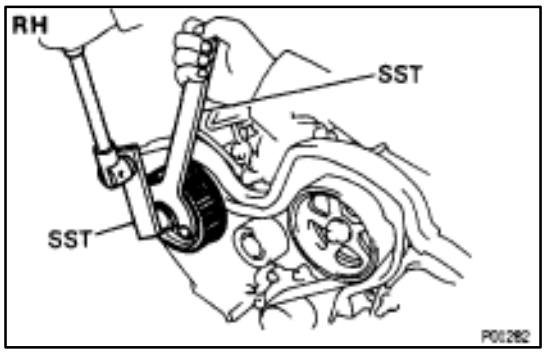
(b) Remove the timing belt from the camshaft timing pulleys.

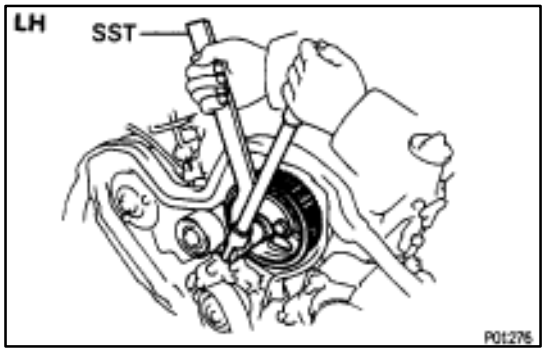


HINT (Re–using timing belt): If the installation marks have disappeared, after removing the timing belt from the camshaft timing pulleys, place new installation mark on the timing belt to match the end of the No.1 timing belt cover.

22. REMOVE CAMSHAFT TIMING PULLEYS

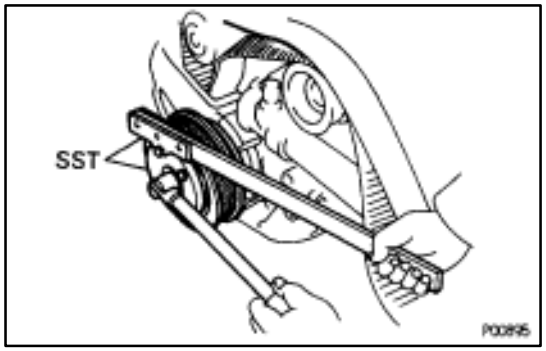
Using SST, remove the bolt, timing pulley and knock pin.
Remove the two timing pulleys.
SST RH 09249–63010 and 09278–54012
LH 09278–54012
HINT: Arrange the RH and LH pulleys.





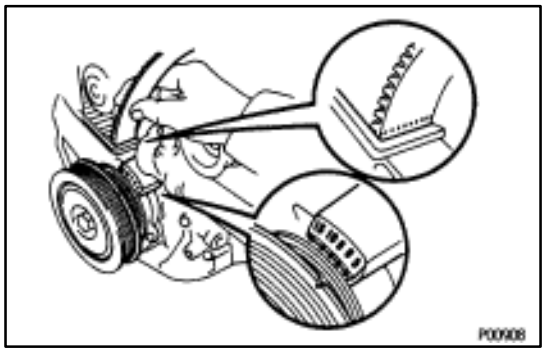
23. REMOVE NO.2 IDLER PULLEY

Remove the bolt and idler pulley.

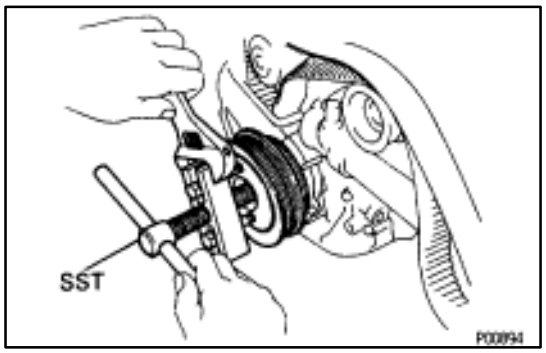


24. REMOVE CRANKSHAFT PULLEY

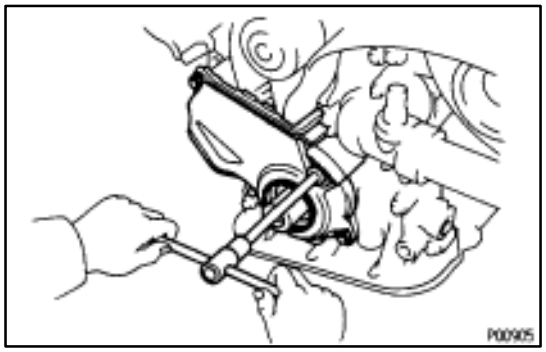
(a) Using SST, remove the pulley bolt.
SST 09213–54015, 09213–70010 (90105–08076)
09330–00021



HINT (Re–using timing belt): When the crankshaft pulley bolt is loosened, the position of the timing mark of the crankshaft pulley and also the installation mark may slip, so check and align them again.

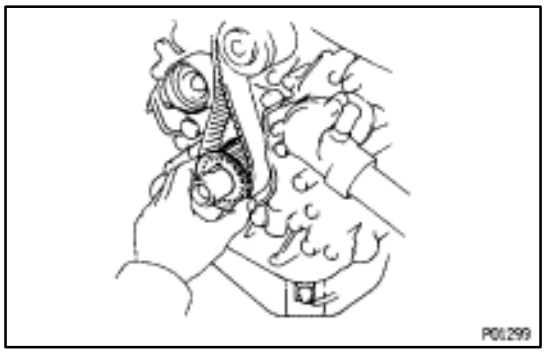


(b) Using SST, remove the pulley.
SST 09213–60017

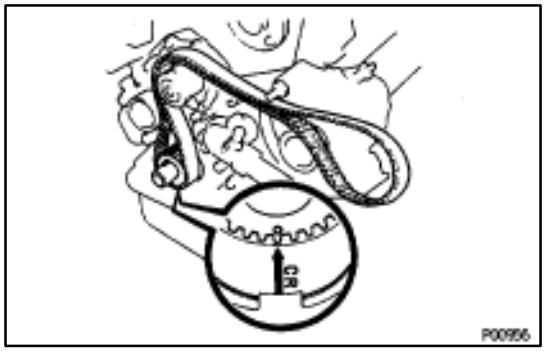


25. REMOVE NO.1 TIMING BELT COVER

Remove the four bolts, timing belt cover and gasket.

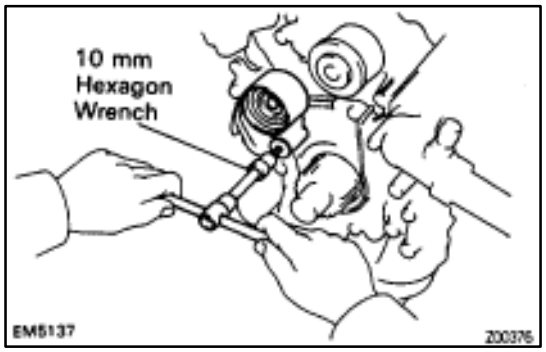


26. REMOVE TIMING BELT GUIDE



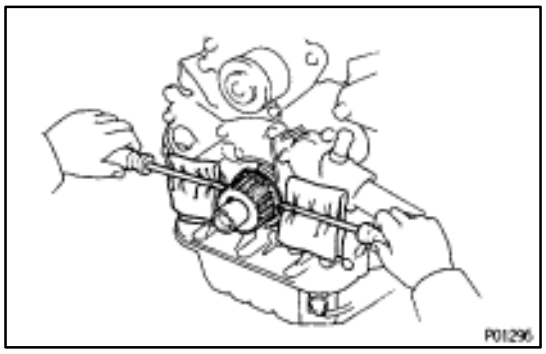
27. REMOVE TIMING BELT

HINT (Re–using timing belt): If the installation marks have disappeared, place a new installation mark on the timing belt to match the drilled mark of the crankshaft timing pulley.



28. REMOVE NO.1 IDLER PULLEY

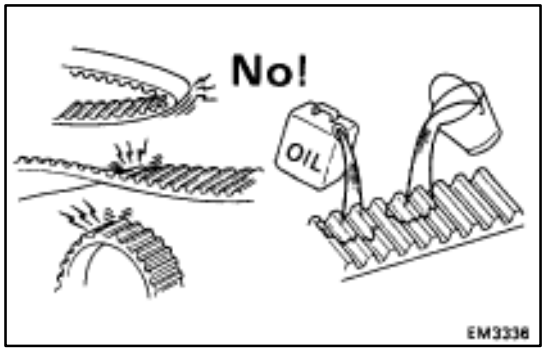
Using a 10 mm hexagon wrench, remove the bolt, idler pulley and plate washer.



29. REMOVE CRANKSHAFT TIMING PULLEY

If the pulley cannot be removed by hand, use two screw–drivers.

HINT: Position shop rags as shown to prevent damage.



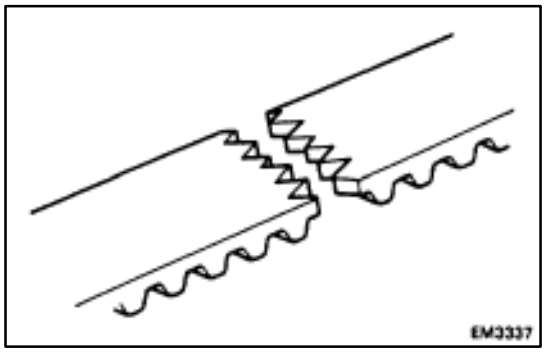
TIMING BELT INSPECTION

EG0F1–01

1. INSPECT TIMING BELT

NOTICE:

- **Do not bend, twist or turn the timing belt inside out.**
- **Do not allow the timing belt to come into contact with oil, water or steam.**
- **Do not utilize timing belt tension when installing or removing the mount bolt of the camshaft timing pulley.**

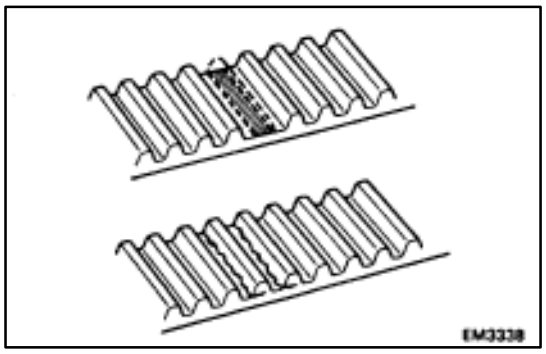


If there are any defects as shown in the figures, check the following points:

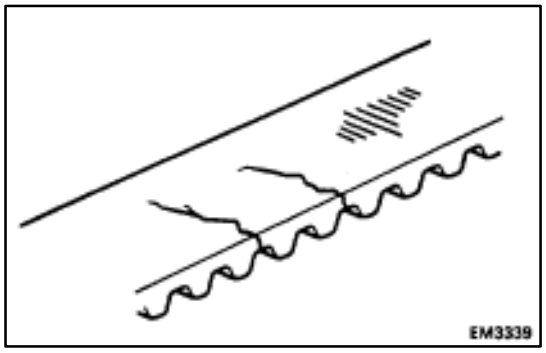
(a) Premature parting

•Check for proper installation.

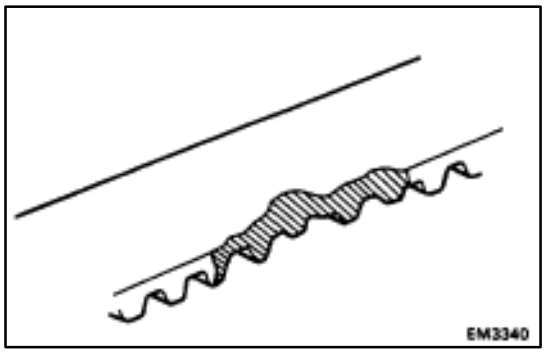
•Check the timing cover gasket for damage and proper installation.



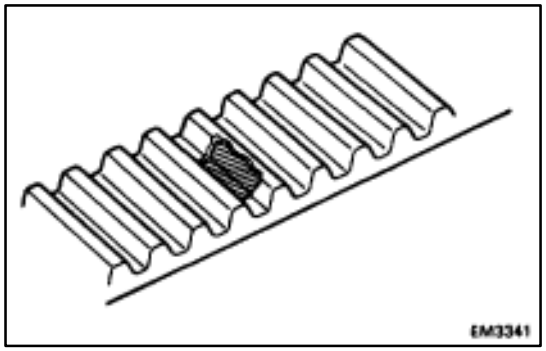
(b) If the belt teeth are cracked or damaged, check to see if either camshaft is locked.



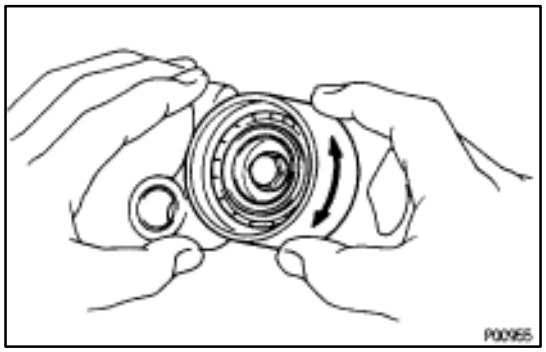
(c) If there is noticeable wear or cracks on the belt face, check to see if there are nicks on the side of the idler pulley lock and water pump.



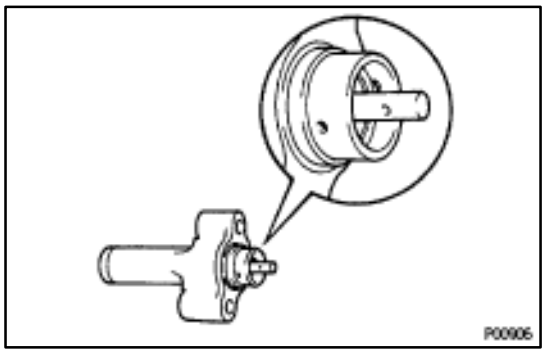
(d) If there is wear or damage on only one side of the belt, check the belt guide and the alignment of each pulley.



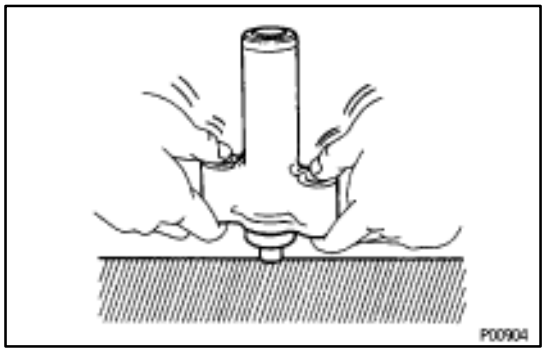
(e) If there is noticeable wear on the belt teeth, check timing cover for damage and check to correct gasket installation and for foreign material on the pulley teeth.
If necessary, replace the timing belt.



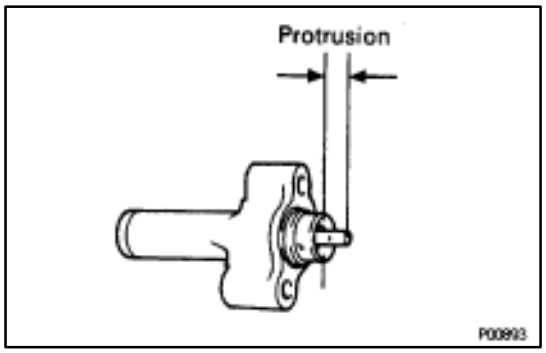
2. INSPECT IDLER PULLEYS
Check that the idler pulley turns smoothly.
If necessary, replace the idler pulley.



3. INSPECT TIMING BELT TENSIONER
(a) Visually check tensioner for oil leakage.
HINT: If there is only the faintest trace of oil on the seal on the push rod side, the tensioner is all right.
If leakage is found, replace the tensioner.



(b) Hold the tensioner with both hands and push the push rod strongly against the floor or wall to check that it doesn't move.
If the push rod moves, replace the tensioner.



(c) Measure the protrusion of the push rod from the housing end.
Protrusion:
10.0–10.5 mm (0.94–0.413 in.)
If the protrusion is not as specified, replace the tensioner.

TIMING BELT INSTALLATION

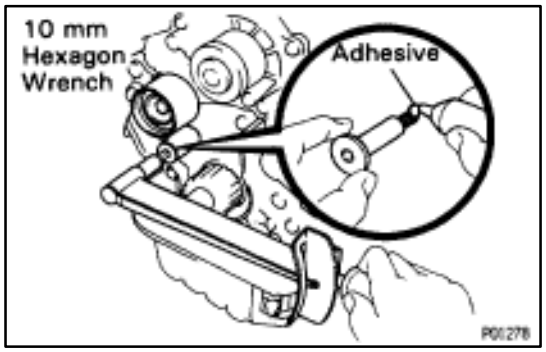
EG0F2–01

(See page EG–29)

1. INSTALL CRANKSHAFT TIMING PULLEY

(a) Align the pulley set key with the key groove of the timing pulley.

(b) Slide on the timing pulley, facing the flange side inward.

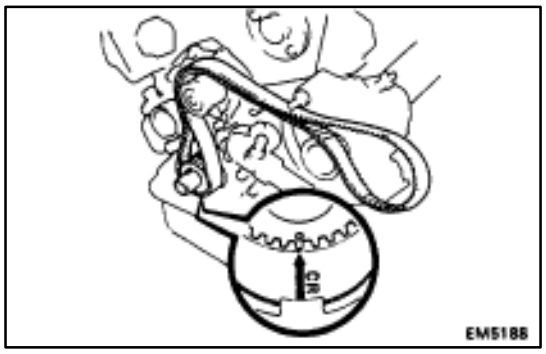


2. INSTALL NO.1 IDLER PULLEY

(a) Apply adhesive to two or three threads of the mount bolt end.
Adhesive:
Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Using a 10 mm hexagon wrench, install the idler pulley with the plate washer and bolt. Torque the bolt.
Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)

(c) Check that the pulley bracket moves smoothly.

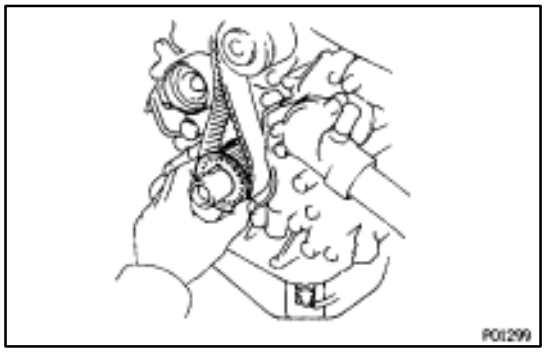


3. TEMPORARILY INSTALL TIMING BELT
NOTICE: The engine should be cold.

(a) Remove any oil or water on the crankshaft timing, No. 1 idler and water pump pulleys, and keep them clean.

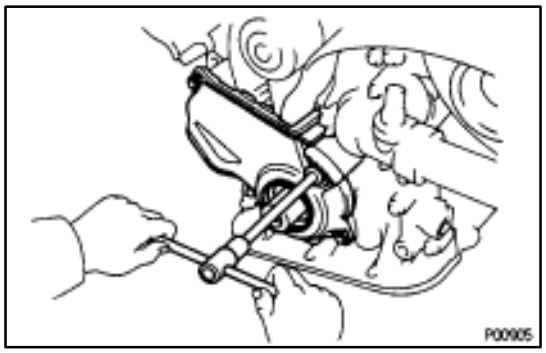
(b) Align the installation mark on the timing belt with the drilled mark of the crankshaft timing pulley.

(c) Install the timing belt on the crankshaft timing, No.1 idler and water pump pulleys.



4. INSTALL TIMING BELT GUIDE

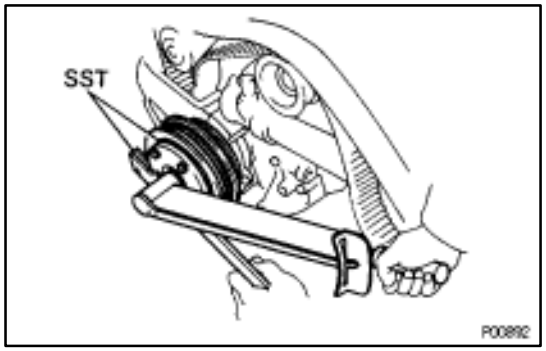
Install the belt guide, facing the cup side outward.



5. INSTALL NO.1 TIMING BELT COVER

(a) Install the gasket to the timing belt cover.

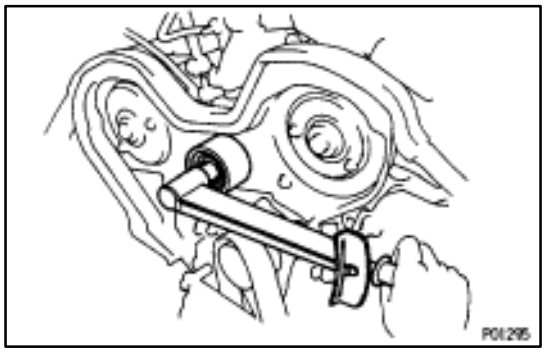
(b) Install the timing belt cover with the four bolts.



6. INSTALL CRANKSHAFT PULLEY

(a) Align the pulley set key with the key groove of the pulley, and slide the pulley.

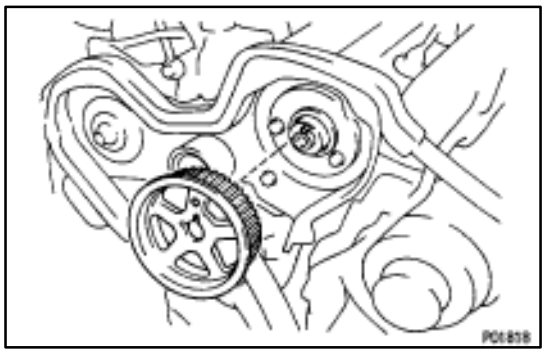
(b) Using SST, install and torque the bolt.
SST 09213–54015, 09213–70010 (90105–08076)
09330–00021
Torque: 245 N·m (2,500 kgf·cm, 181 ft·lbf)



7. INSTALL NO.2 IDLER PULLEY

(a) Install the idler pulley with the bolt. Torque the bolt.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(b) Check that the idler pulley moves smoothly.

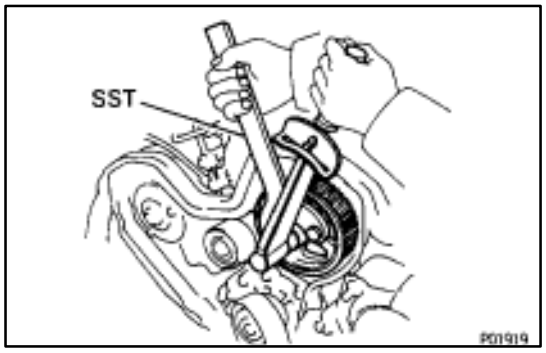


8. INSTALL LH CAMSHAFT TIMING PULLEY

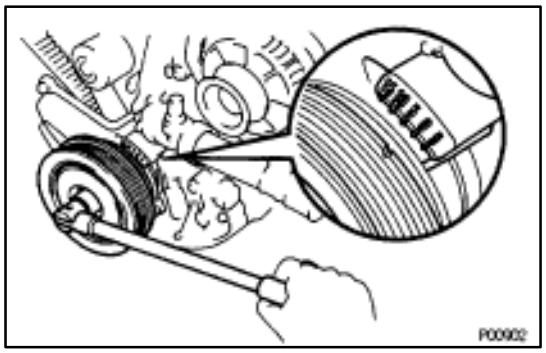
(a) Slide the timing pulley, facing the flange side outward.

(b) Align the knock pin hole of the camshaft with the knock pin groove of the timing pulley as shown.

(c) Install the knock pin.

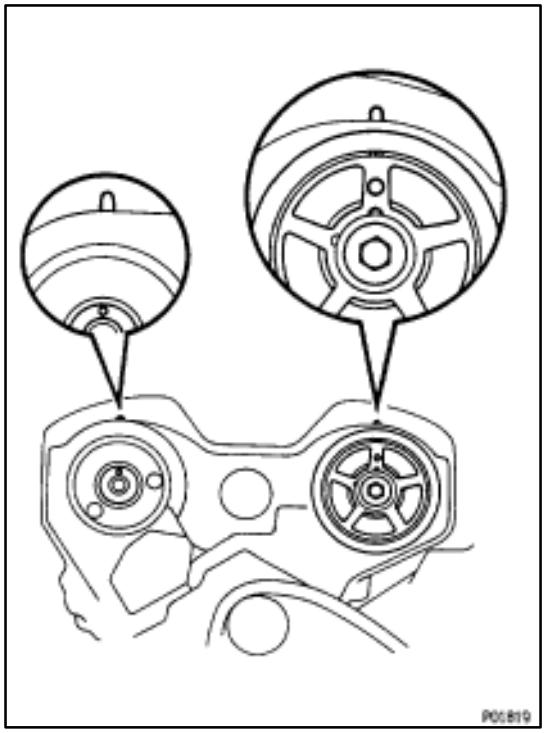


(d) Using SST, install and torque the bolt.
SST 09278–54012
Torque: 108 N·m (1,100 kgf·cm, 80 ft·lbf)



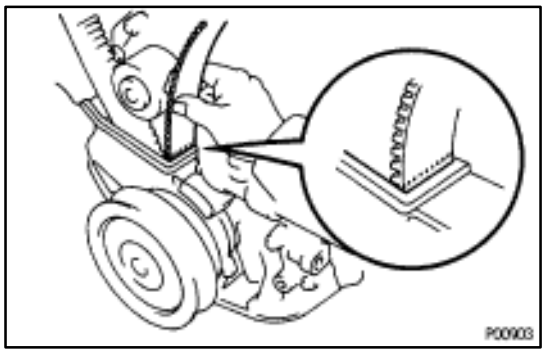
9. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) (Crankshaft Position)
Turn the crankshaft pulley, and align its groove with the ”O” timing mark of the No.1 timing belt cover.



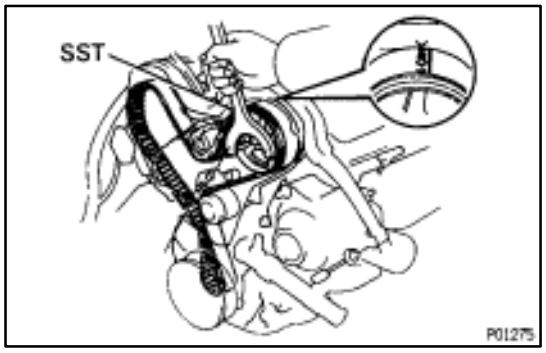
(b) (RH Camshaft Pulley Position)
Turn the camshaft, align the knock pin hole of the camshaft with the timing mark of the No.3 timing belt cover.

(c) (LH Camshaft Pulley Position)
Turn the camshaft timing pulley, align the timing marks of the camshaft timing pulley and No.3 timing belt cover.



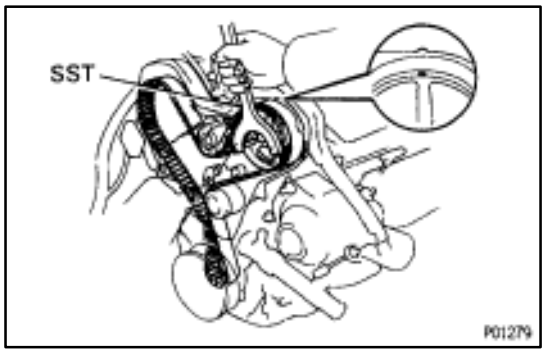
10. INSTALL TIMING BELT TO LH CAMSHAFT TIMING PULLEY

(a) Check that the installation mark on the timing belt matches the end of the No.1 timing belt cover.
If the installation marks do not align, shift the meshing of the timing belt and crankshaft timing pulley until they align.



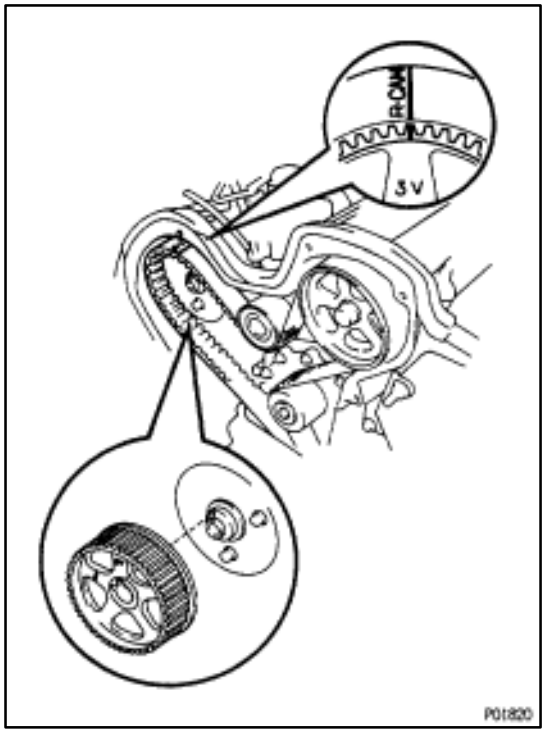
(b) Remove any oil or water on the LH camshaft timing pulley, and keep it clean.

(c) Using SST, slightly turn the LH camshaft timing pulley clockwise. Align the installation mark on the timing belt with the timing mark of the camshaft timing pulley, and hang the timing belt on the LH camshaft timing pulley.
SST 09278–54012



(d) Using SST, align the timing marks of the LH camshaft pulley and No.3 timing belt cover.
SST 09278–54012

(e) Check that the timing belt has tension between the crankshaft timing and LH camshaft timing pulleys.

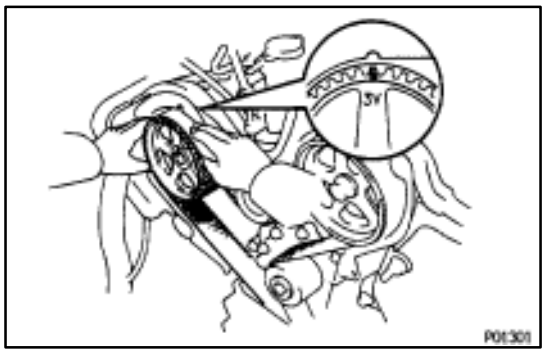


11. INSTALL RH CAMSHAFT TIMING PULLEY AND TIMING BELT

(a) Remove any oil or water on the RH camshaft timing and No.2 idler pulleys, and keep them clean.

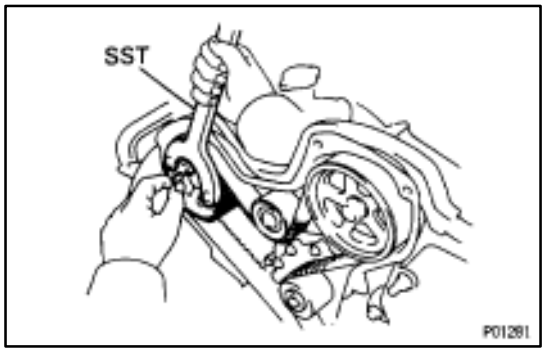
(b) Align the installation mark on the timing belt with the timing mark of the RH camshaft timing pulley as shown.

(c) Hang the timing belt on the RH camshaft timing pulley, facing the flange side inward.

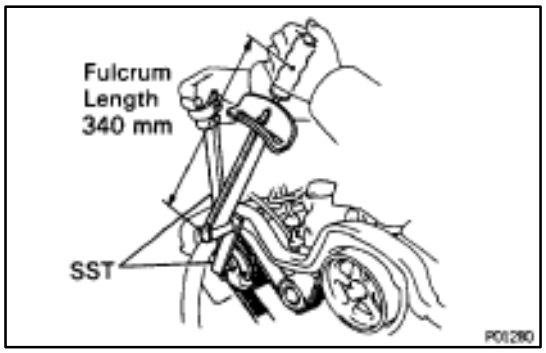


(d) Align the timing marks of the RH camshaft timing pulley and No.3 timing belt cover.

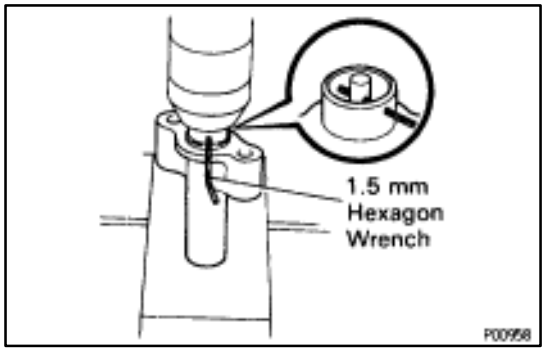
(e) Slide the RH camshaft timing pulley on the camshaft.



(f) Using SST, align the knock pin hole of the camshaft with the knock pin groove (3V mark side) of the pulley and install the knock pin.
SST 09278–54012



(g) Using SST, install and torque the bolt.
SST 09249–63010 and 09278–54012
Torque: 75 N·m (760 kgf·cm, 55 ft·lbf)
HINT: Use a torque wrench with a fulcrum length of 340 mm (13.39 in.)

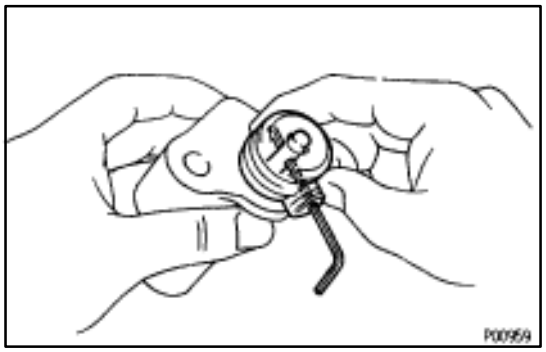


12. SET TIMING BELT TENSIONER

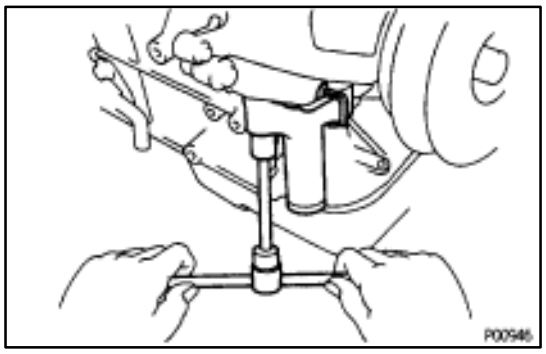
(a) Using a press, slowly press in the push rod using 981–9,807 N (100–1,000 kgf, 200–2,205 lbf) of pressure.

(b) Align the holes of the push rod and housing, pass a 1.5 mm hexagon wrench through the holes to keep the setting position of the push rod.

(c) Release the press.

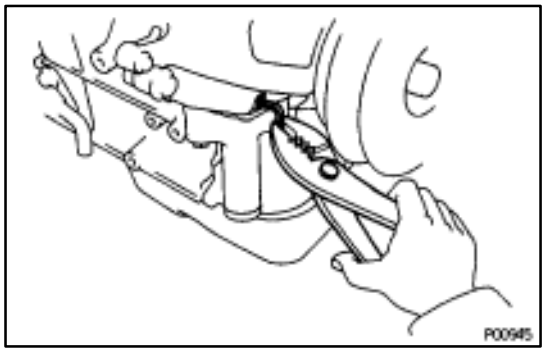


(d) Install the dust boot to the tensioner.

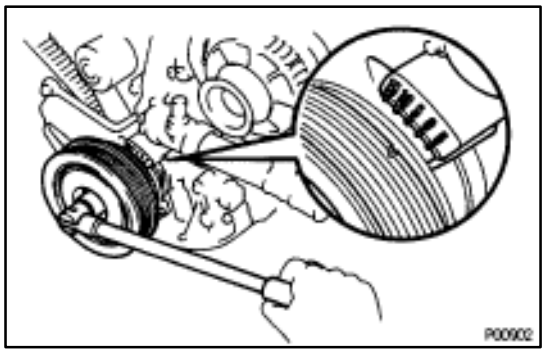


13. INSTALL TIMING BELT TENSIONER

(a) Install the tensioner with the two bolts.
Torque: 26 N·m (270 kgf·cm, 20 ft·lbf)

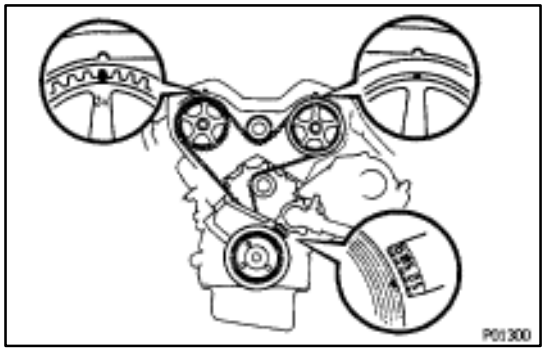


(b) Remove the 1.5 mm hexagon wrench from the tensioner.

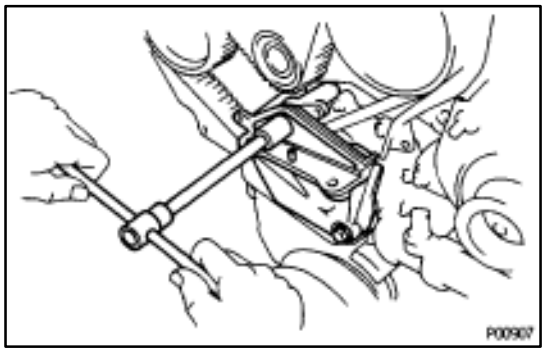


14. CHECK VALVE TIMING

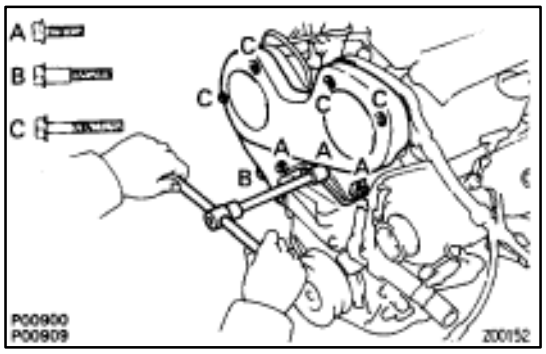
(a) Turn the crankshaft pulley two revolutions from TDC to TDC.
HINT: Always turn the crankshaft clockwise.



(b) CHeck that each pulley aligns with the timing marks as shown in the illustration.
If the marks do not align, remove the timing belt and reinstall it.



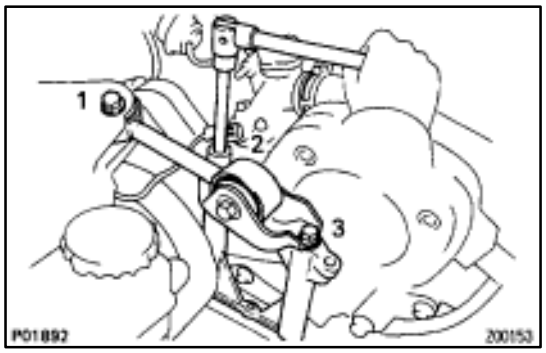
15. INSTALL ENGINE RH MOUNTING BRACKET
Install the mounting bracket with the three bolt.
Torque: 39 N·m (410 kgf·cm, 30 ft·lbf)



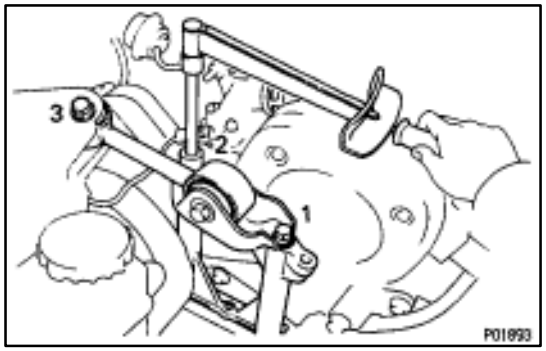
16. INSTALL NO.2 TIMING BELT COVER
(a) Install the gasket to the timing belt cover.
(b) Install the timing belt cover with the eight bolts.
HINT: Use the bolts indicated by A, B and C.

17. INSTALL SPARK PLUGS
Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)

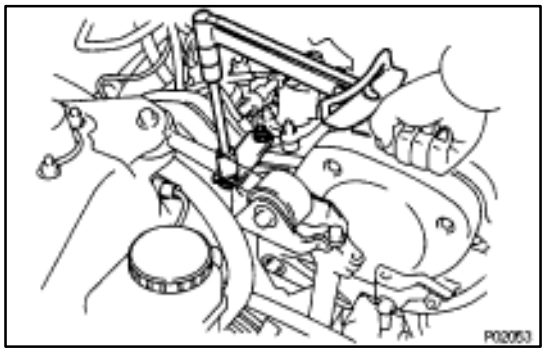
18. INSTALL PS OIL RESERVOIR TANK



19. INSTALL NO.2 RH ENGINE MOUNTING BRACKET AND ENGINE MOVING CONTROL ROD
(a) Temporarily install the No.2 RH engine mounting bracket and engine moving control rod with the three bolts in the sequence shown.

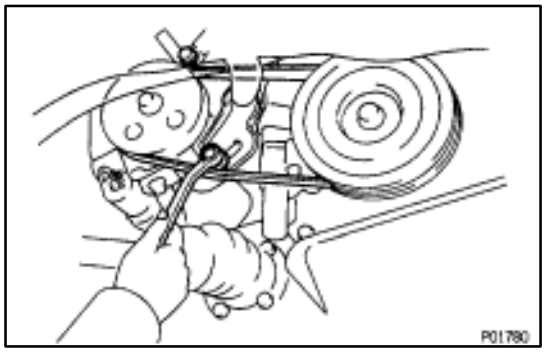


(b) Torque the three bolts in the sequence shown.
Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

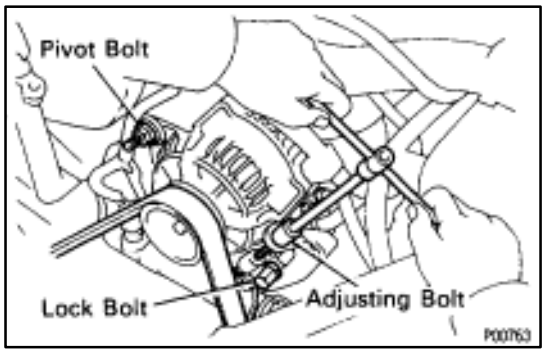


20. INSTALL RH ENGINE MOUNTING STAY
Install the mounting stay with the bolt and nut.
Torque: 31 N·m (320 kgf·cm, 23 ft·lbf)

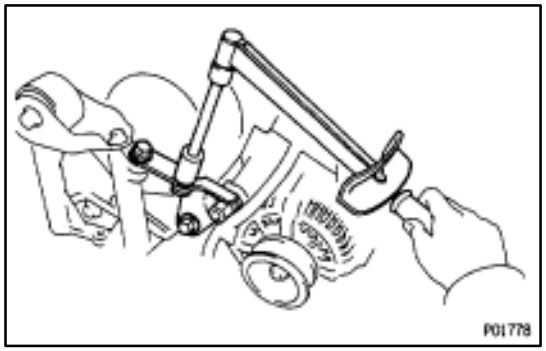
21. CONNECT CONNECTOR TO GROUND WIRE ON RH FENDER APRON
22. INSTALL RH FENDER APRON SEAL
23. INSTALL RH FRONT WHEEL



24. INSTALL AND ADJUST PS DRIVE BELT
Install the drive belt with the pivot and adjusting bolts.
Drive belt tension:
New belt
150–185 lb
Used belt
115±20 lb



25. INSTALL GENERATOR DRIVE BELT
Adjust the drive belt. (See CH section)
Drive belt tension:
New belt
175±5 lb
Used belt
115±20 lb



26. INSTALL NO.2 AND NO.3 RH ENGINE MOUNTING STAYS

(a) Install the No.2 RH engine mounting stay with the bolt and nut.

Bolt

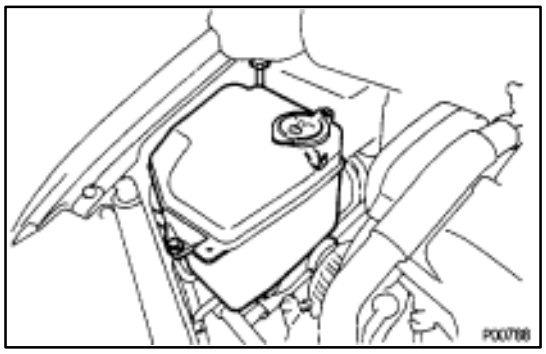
Torque: 75 N·m (760 kgf·cm, 55 ft·lbf)

Nut

Torque: 62 N·m (630 kgf·cm, 46 ft·lbf)

(b) Install the No.3 RH engine mounting stay with the two bolts.

Torque: 73 N·m (740 kgf·cm, 54 ft·lbf)

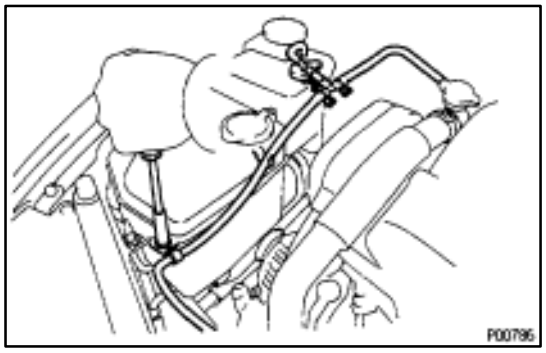


27. INSTALL ENGINE COOLANT RESERVOIR TANK

28. INSTALL WASHER TANK

(a) Connect the connector and vinyl hose to the washer tank.

(b) Install the washer tank with the three bolts.



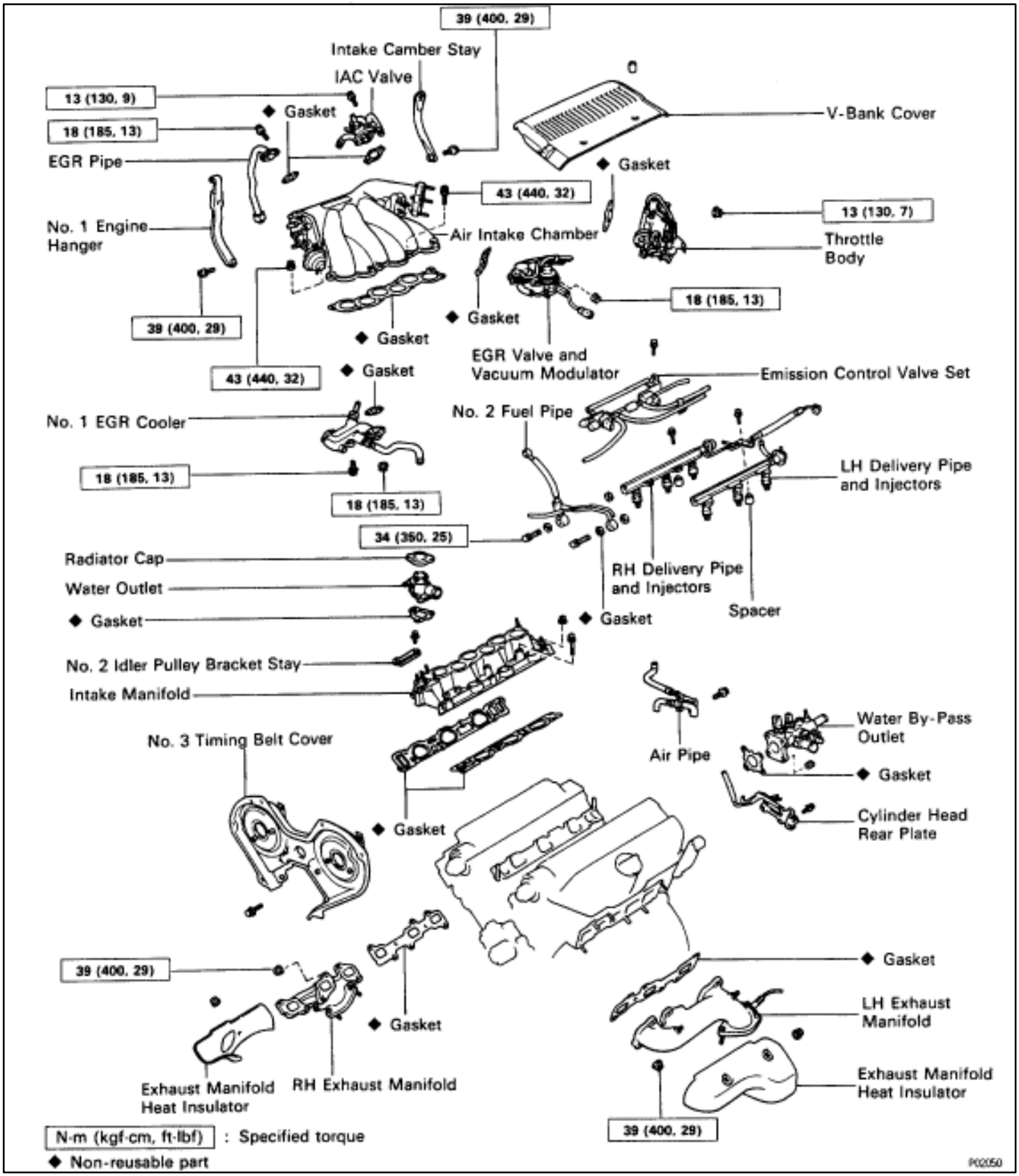
29. INSTALL ENGINE COOLANT RESERVOIR HOSE

Connect the reservoir hose with the bolt.

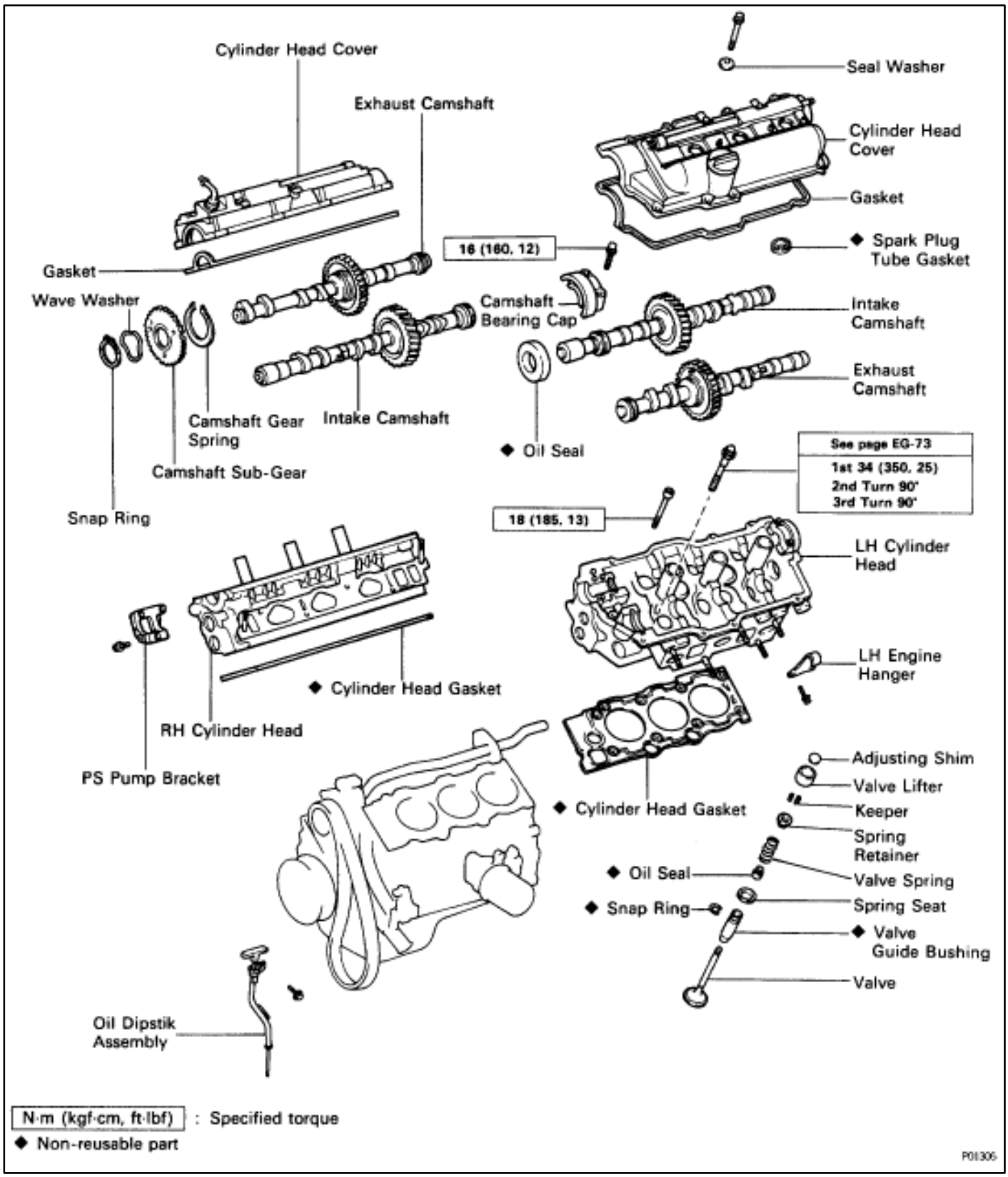
30. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

CYLINDER HEADS COMPONENTS

EG0F3–01



COMPONENTS (Cont'd)



CYLINDER HEADS REMOVAL

EG0F4–02

(See page EG–47)

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

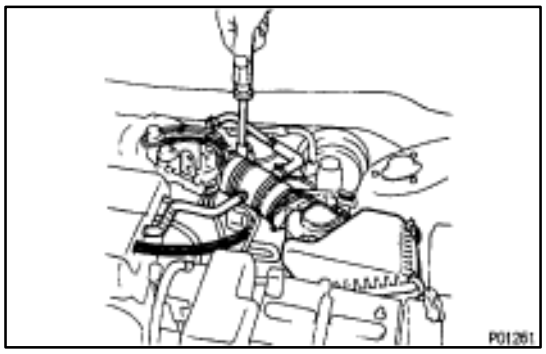
CAUTION (w / Airbag): Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT

3. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY

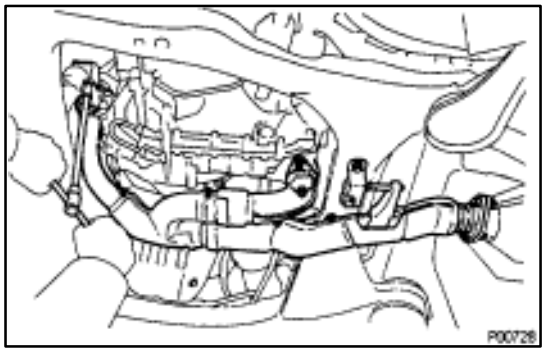
4. (A/T)

DISCONNECT THROTTLE CABLE FROM THROTTLE BODY



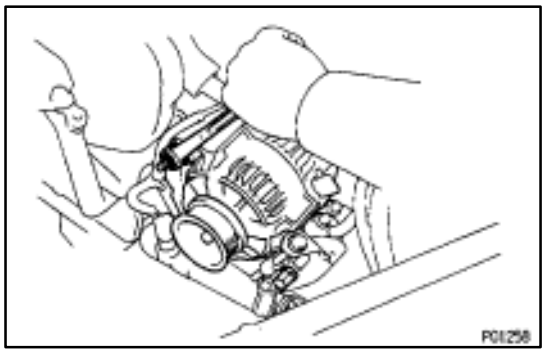
5. REMOVE AIR CLEANER CAP, VOLUME AIR FLOW METER AND AIR CLEANER HOSE

(a) Disconnect the volume air flow meter connector.
(b) Disconnect the coil cord clamp.
(c) Disconnect the air hoses.
(d) Loosen the air cleaner hose clamp bolt.
(e) Disconnect the air cleaner cap clips.
(f) Remove the air cleaner cap and volume air flow meter together with the air cleaner hose.

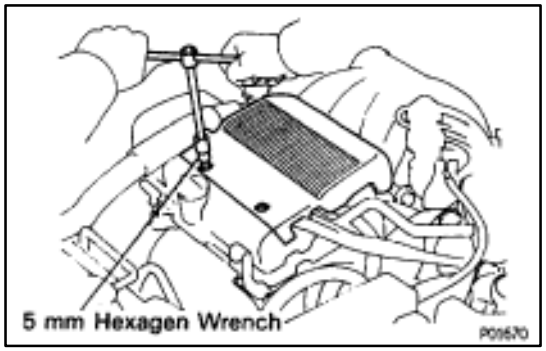


6. REMOVE FRONT EXHAUST PIPE

(a) Loosen the two bolts, and disconnect the bracket.
(b) Remove the two bolts and nuts holding the front exhaust pipe to the three–way catalytic converter.
(c) Remove the four nuts holding the front exhaust pipe to the exhaust manifolds.
(d) Remove the front exhaust pipe and gaskets.

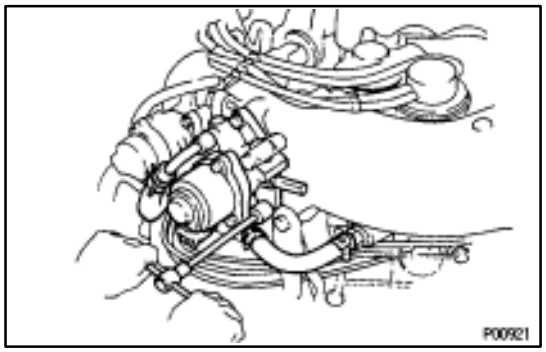


7. REMOVE GENERATOR (See CH section)



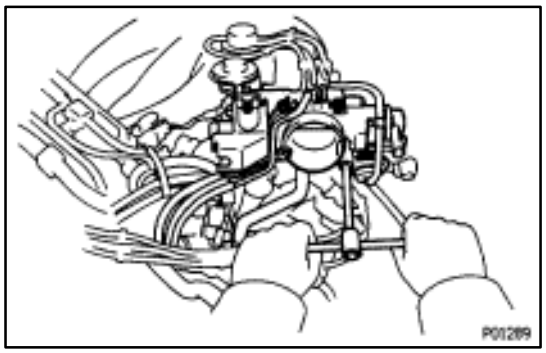
8. REMOVE V–BANK COVER

Using a 5 mm hexagon wrench, remove the two nuts and V–bank cover.



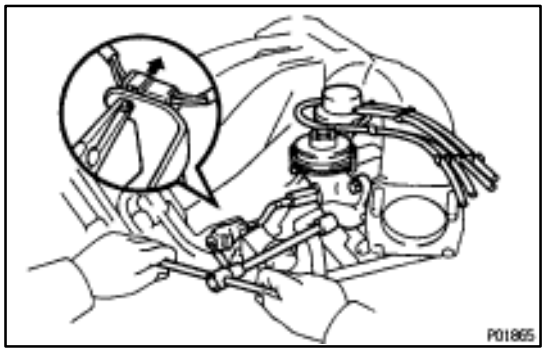
9. REMOVE IAC VALVE

(a) Disconnect the following hoses:
  (1) PS idle–up air hose
  (2) Water by–pass hoses
  (3) No.5 air hose
(b) Disconnect the IAC valve connector.
(c) Remove the two bolts, IAC valve and gasket.



10. REMOVE THROTTLE BODY

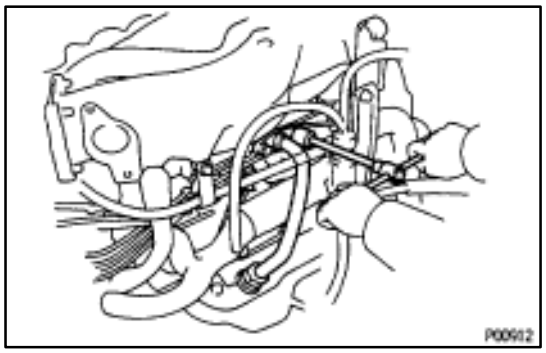
(a) Disconnect the following hoses:
  (1) Three TVV vacuum hoses
  (2) Four EGR vacuum hoses
  (3) Water by–pass hose
(b) Disconnect the throttle position sensor connector.
(c) Remove the two bolts, two nuts, throttle body and gasket.



11. REMOVE EGR VALVE AND VACUUM MODULATOR

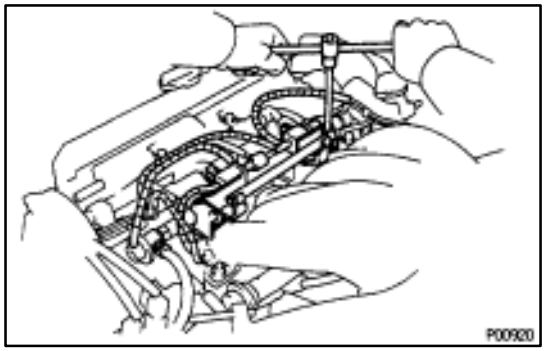
(a) (Calif. only)
Disconnect the EGR gas temp. sensor connector.
(b) Remove the two nuts, EGR valve, vacuum modulator and gasket.

12. REMOVE DISTRIBUTOR (See IG section)



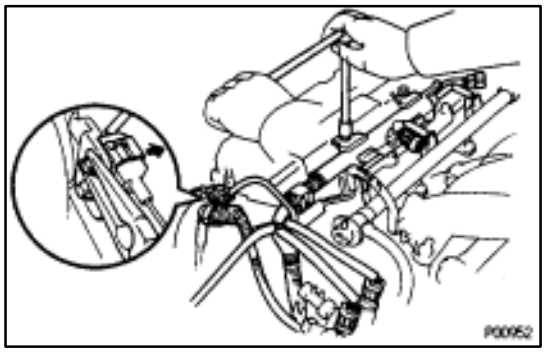
13. REMOVE EGR PIPE

(a) Loosen the union nut.
(b) Remove the two bolts, EGR pipe and gasket.



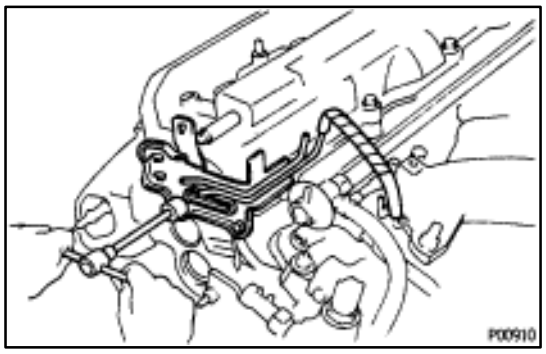
14. REMOVE EMISSION CONTROL VALVE SET

(a) Disconnect the two vacuum hoses of the fuel pressure control VSV.
(b) Disconnect the two vacuum hoses of the IACV VSV.
(c) Disconnect the two VSV connectors.
(d) Remove the two bolts and emission control valve set.



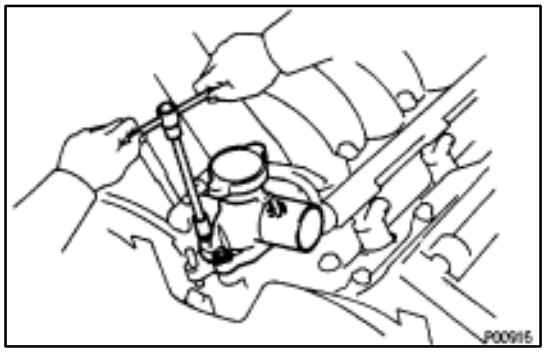
15. DISCONNECT LH ENGINE WIRE HARNESS

(a) Disconnect the following connectors:
  (1) Three injector connectors
  (2) Cold start injector time switch connector
  (3) Engine coolant temperature sensor connector
  (4) Oxygen sensor connector
  (5) Knock sensor connector
(b) Remove the two bolts, and disconnect the three clamps and LH engine wire.



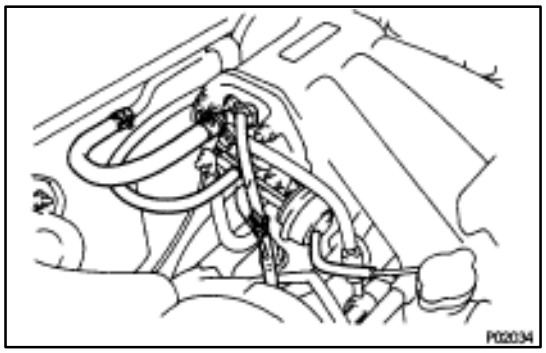
16. REMOVE CYLINDER HEAD REAR PLATE

(a) Disconnect the two vacuum hoses from the vacuum tank.
(b) Disconnect the vacuum hose from the air intake chamber.
(c) Remove the bolt, nut and rear plate.



17. REMOVE WATER OUTLET

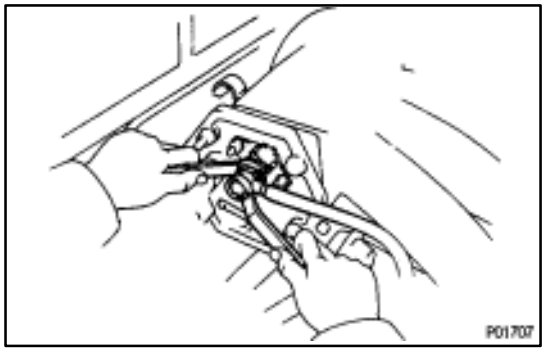
(a) Disconnect the radiator upper hose.
(b) Disconnect the engine coolant reservoir hose.
(c) Remove the three nuts, water outlet and gasket.



18. DISCONNECT HOSES

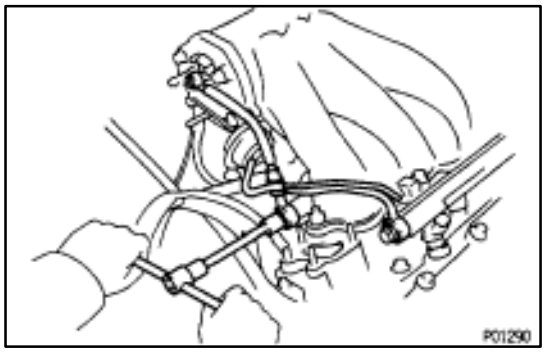
(a) Brake booster vacuum hose
(b) PS air hose
(c) Disconnect the PCV hose
(d) Disconnect EGR water by–pass hose

19. DISCONNECT COLD START INJECTOR CONNECTOR

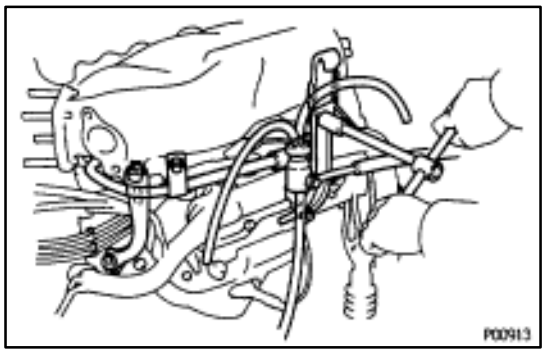


20. REMOVE NO.2 FUEL PIPE

(a) Remove the union bolt and two gaskets, and disconnect the No.2 fuel pipe from the cold start injector.

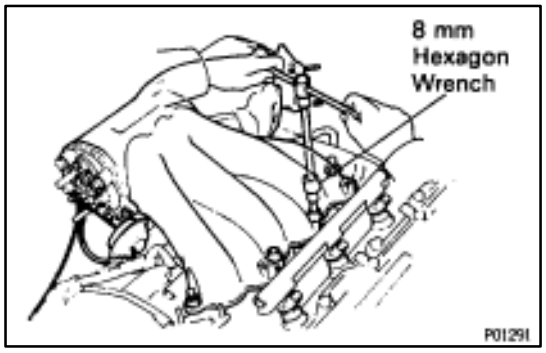


(b) Disconnect the IACV vacuum hose.
(c) Remove the two union bolts, four gaskets and No.2 fuel pipe.

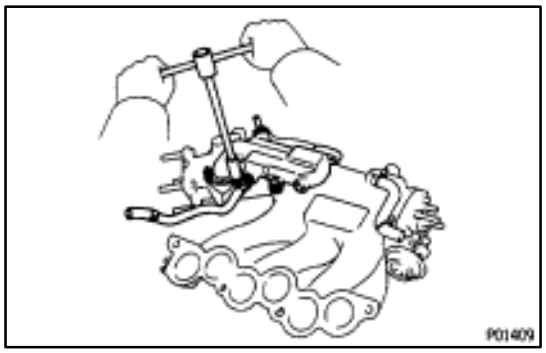


21. REMOVE AIR INTAKE CHAMBER

(a) Remove the nut and disconnect the PS ACV.
(b) Remove the two bolts and No.1 engine hanger.
(c) Remove the two bolts and air intake chamber stay.
(d) Remove the bolt and disconnect the hydraulic pressure pipe.

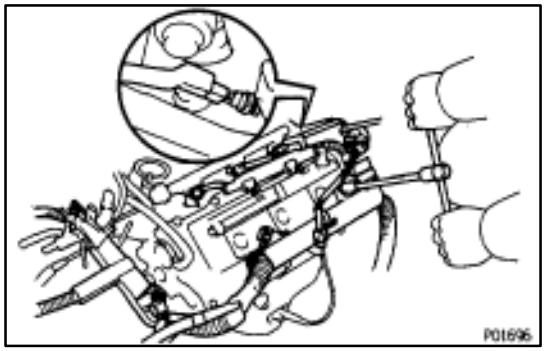


(e) Remove the nut and disconnect the two ground straps.
(f) Using a 8 mm hexagon wrench, remove the two bolts, nuts, air intake chamber and gasket.



22. REMOVE NO.1 COOLER

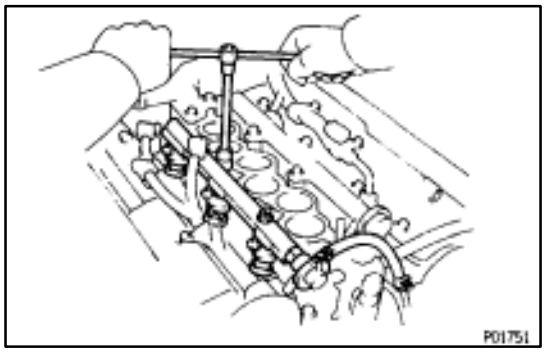
Remove the two nuts, bolt, No.1 EGR cooler and gasket.



23. DISCONNECT RH ENGINE WIRE HARNESS

(a) Disconnect the following connectors:
  (1) Three injector connectors
  (2) Engine coolant temp. sender gauge connector
  (3) Oxygen sensor connector
  (4) PS pump connector
  (5) Oil pressure switch connector
  (6) Engine oil level sensor connector
  (7) A/C compressor connector
  (8) Engine coolant temp. sensor connector (for hydraulic cooling fan)

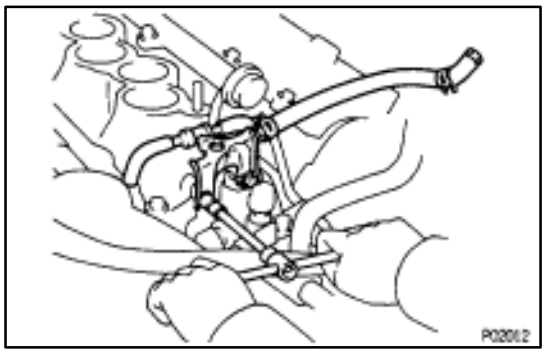
(b) Remove the two clamps, four bolts and engine wire harness.



24. REMOVE LH DELIVERY PIPE AND INJECTORS

(a) Disconnect the fuel return hose from the No.1 fuel pipe (fuel inlet hose).

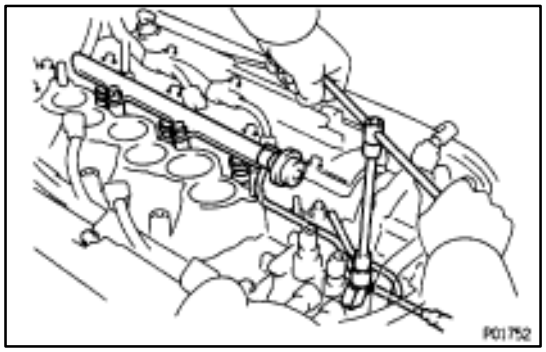
(b) Remove the two bolts and LH delivery pipe together with three injectors.



25. REMOVE AIR PIPE

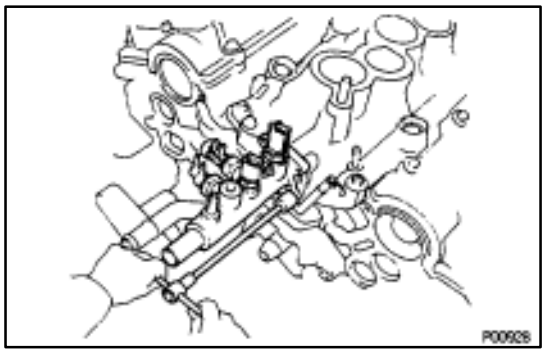
(a) Disconnect the two air hoses from the intake manifold.

(b) Remove the two bolts and air pipe.



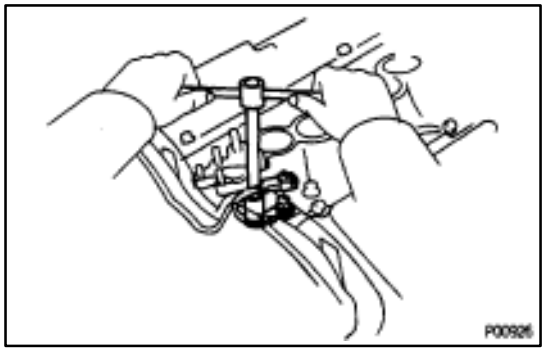
26. REMOVE RH DELIVERY PIPE AND INJECTORS

Remove the three bolts and RH delivery pipe together with the No.1 fuel pipe and three injectors.



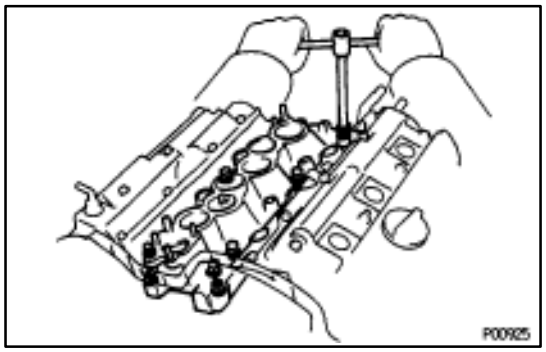
27. REMOVE WATER BY–PASS OUTLET

Remove the two nuts, water by–pass outlet and gasket.

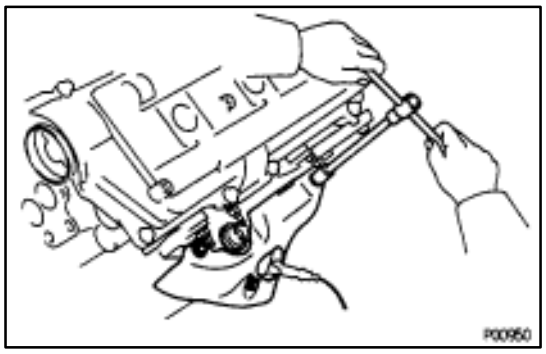


28. REMOVE INTAKE MANIFOLD

(a) Remove the two bolts and No.2 idler pulley bracket stay and disconnect the ground strap.

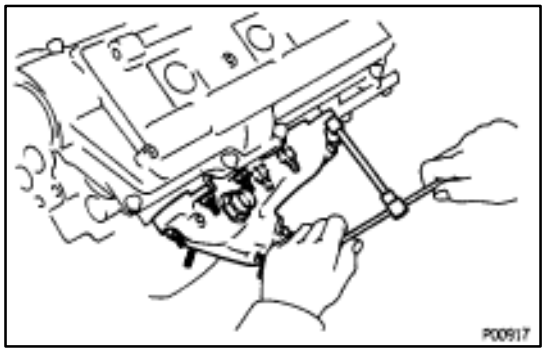


(b) Remove the eight bolts, four nuts, intake manifold and gasket.

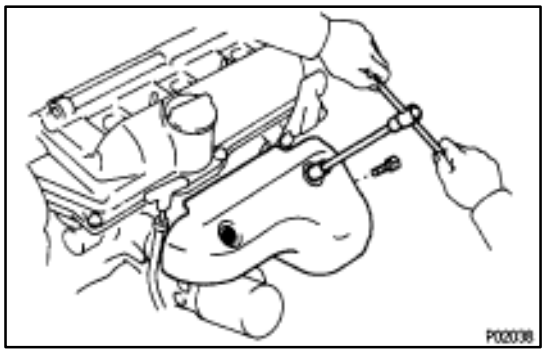


29. REMOVE RH EXHAUST MANIFOLD

(a) Remove the three nuts and heat insulator.

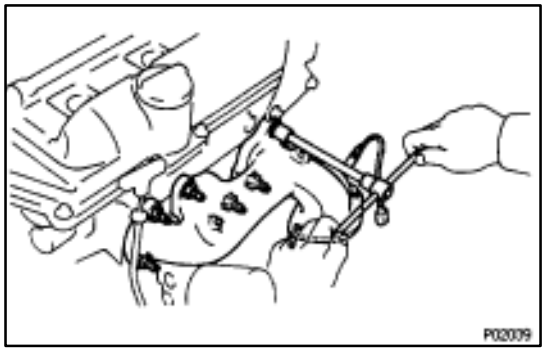


(b) Remove the six nuts, exhaust manifold and gasket.

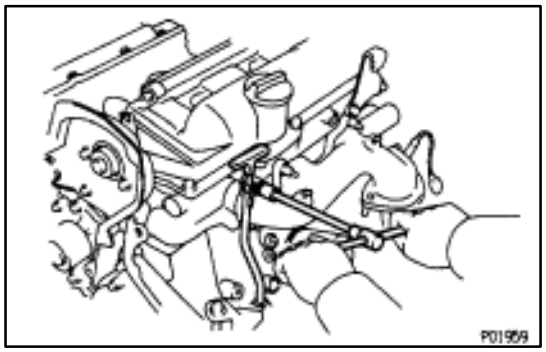


30. REMOVE LH EXHAUST MANIFOLD

(a) Remove the bolt, two nuts, and heat insulator.



(b) Remove the six nuts, exhaust manifold and gasket.



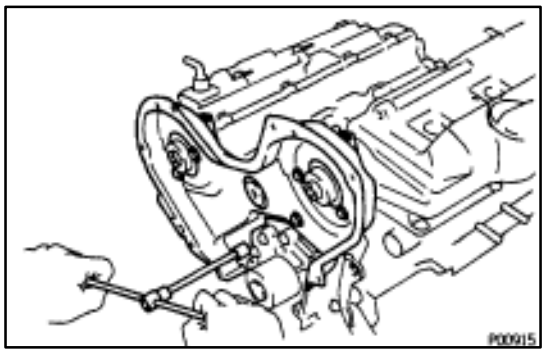
31. REMOVE OIL DIPSTICK ASSEMBLY

Remove the bolt and oil dipstick assembly.

32. REMOVE SPARK PLUGS

33. REMOVE TIMING BELT, CAMSHAFT TIMING PULLEYS AND NO.2 IDLER PULLEY

(See page EG–29)

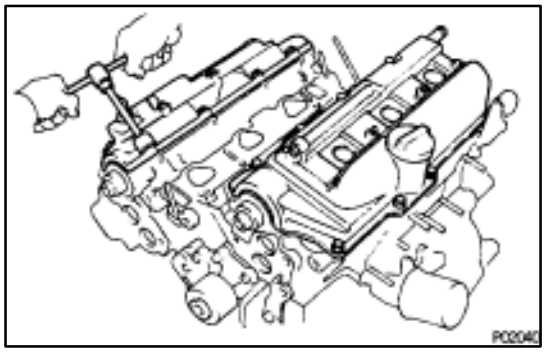


34. REMOVE No.3 TIMING BELT COVER

Remove the six bolts and timing belt cover.

NOTICE:

- **Support the belt, so the meshing of the crankshaft timing pulley and timing belt does not shift.**
- **Be careful not to drop anything inside of the timing belt cover.**
- **Do not allow the belt to come into contact with oil, water or dust.**

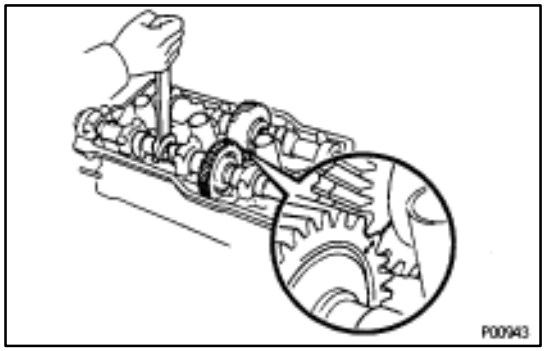


35. REMOVE CYLINDER HEAD COVERS

Remove the eight nuts, seal washers, cylinder head cover and gasket. Remove the two cylinder head covers.

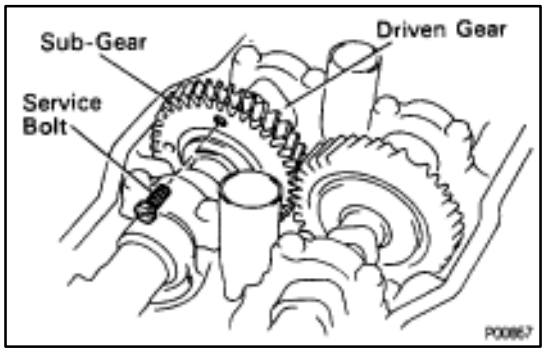
36. REMOVE CAMSHAFTS

NOTICE: Since the thrust clearance of the camshaft is small, the camshaft must be held level while it is being removed. If the camshaft is not kept level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.

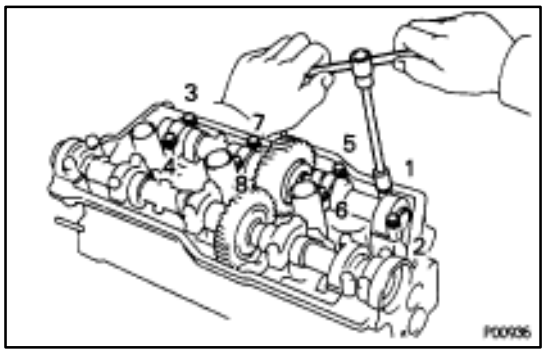


A. Remove exhaust camshaft of RH cylinder head

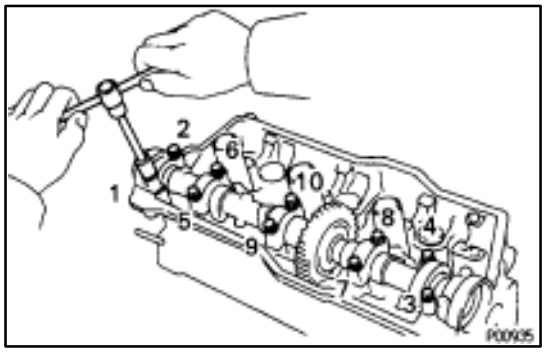
(a) Align the timing marks (two pointed marks) of the camshaft drive and driven gears by turning the camshaft with a wrench.



(b) Secure the exhaust camshaft sub–gear to the driven gear with a service bolt.
Recommended service bolt:
Thread diameter 6 mm
Thread pitch 1.0 mm
Bolt length 16–20 mm
HINT: When removing the camshaft, mark certain that the torsional spring force of the sub–gear has been eliminated by the above operation.

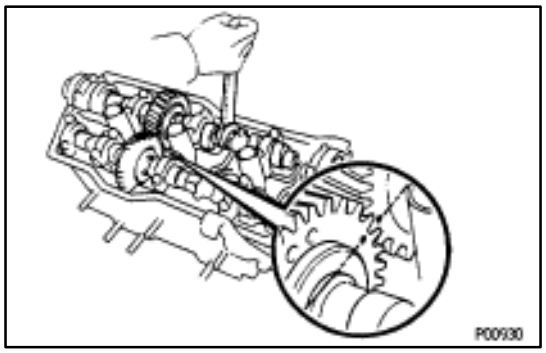


(c) Uniformly loosen and remove the eight bearing cap bolts in several passes, in the sequence shown.
(d) Remove the four bearing caps and exhaust camshaft.



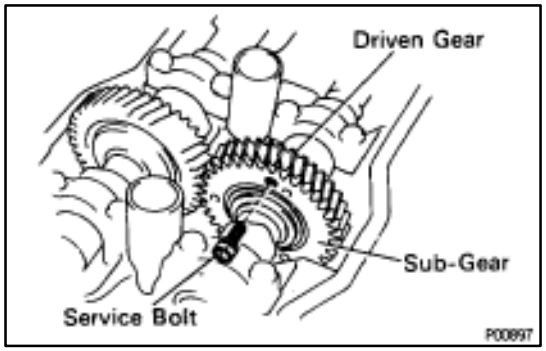
B. Remove intake camshaft of RH cylinder head

(a) Uniformly loosen and remove the ten bearing cap bolts in several passes, in the sequence shown.
(b) Remove the five bearing caps, oil seal and intake camshaft.

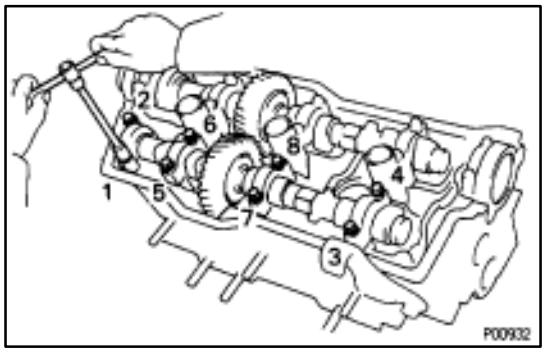


C. Remove exhaust camshaft of LH cylinder head

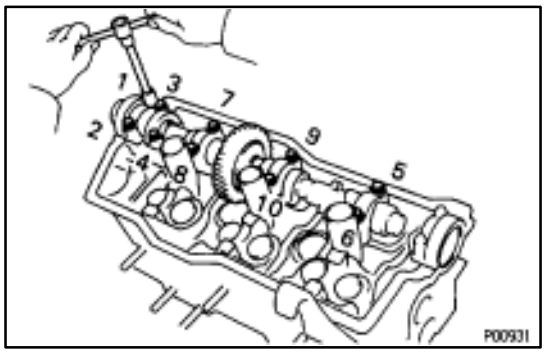
(a) Align the timing marks (one pointed mark) of the camshaft drive and driven gears by turning the camshaft with a wrench.



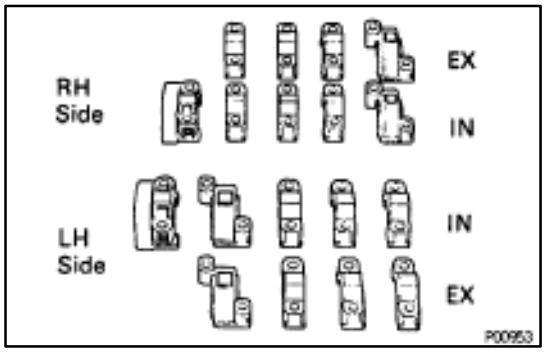
(b) Secure the exhaust camshaft sub–gear to the driven gear with a service bolt.
Recommended service bolt:
Thread diameter 6 mm
Thread pitch 1.0 mm
Bolt length 16–20 mm
HINT: When removing the camshaft, make certain that the torsional spring force of the sub–gear has been eliminated by the above operation.



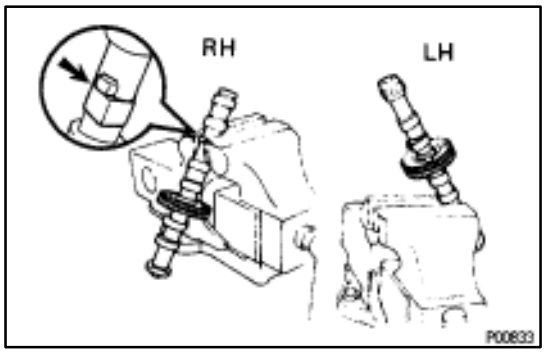
(c) Uniformly loosen and remove the eight bearing cap bolts in several passes, in the sequence shown.
(d) Remove the four bearing caps and exhaust camshaft.



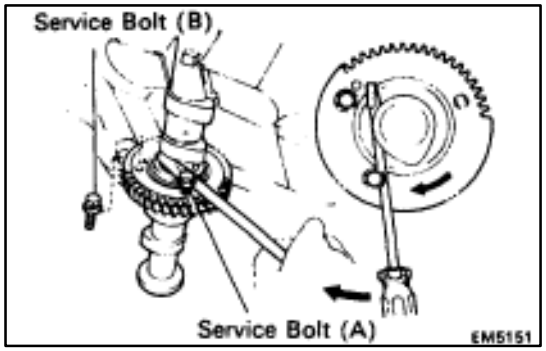
D. Remove intake camshaft of LH cylinder head
(a) Uniformly loosen and remove the ten bearing cap bolts in several passes, in the sequence shown.
(b) Remove the five bearing caps, oil seal and intake camshaft.



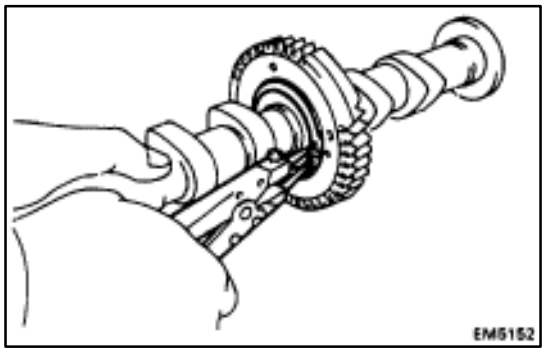
HINT: Arrange the bearing caps in correct order.



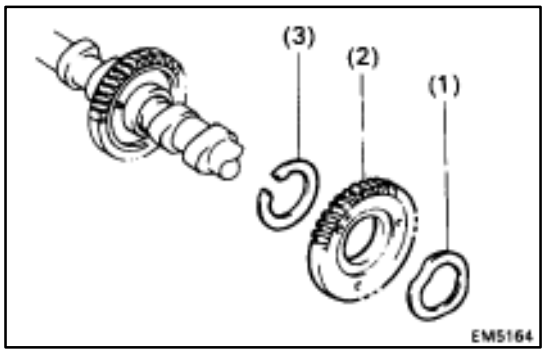
37. DISASSEMBLE EXHAUST CAMSHAFTS
(a) Mount the hexagonal wrench head portion of the camshaft in a vise.
NOTICE: Be careful not to damage the camshaft.



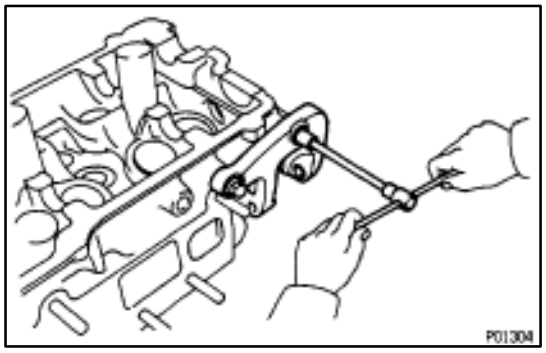
(b) Insert a service bolt (A) into the service hole of the camshaft sub–gear.
(c) Using a screwdriver, turn the sub–gear clockwise, and remove the service bolt (B).
NOTICE: Be careful not to damage the camshaft.



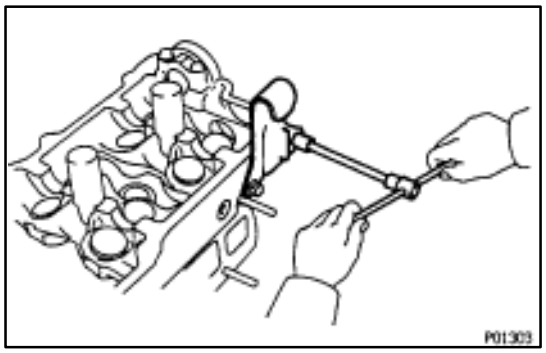
(d) Using snap ring pliers, remove the snap ring.



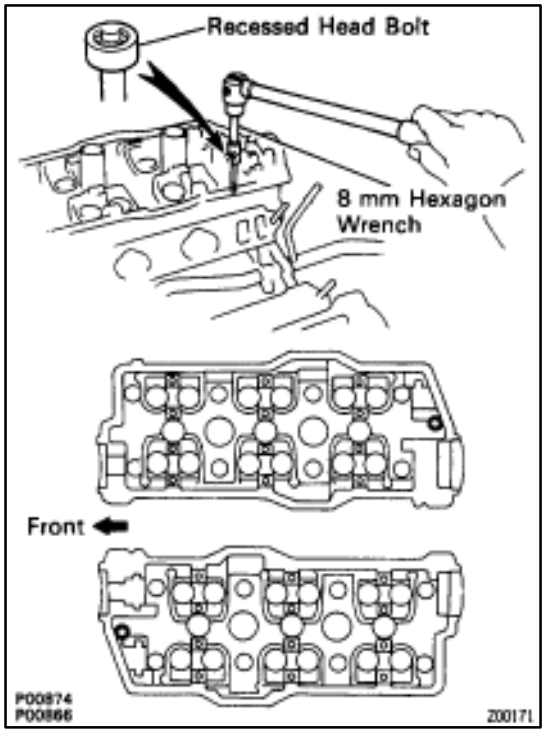
(e) Remove the following parts:
(1) Wave washer
(2) Camshaft sub–gear
(3) Camshaft gear spring.
HINT: Arrange the camshaft sub–gears and gear springs (RH and LH).



38. REMOVE PS PUMP BRACKET
Remove the two bolts and PS pump bracket.

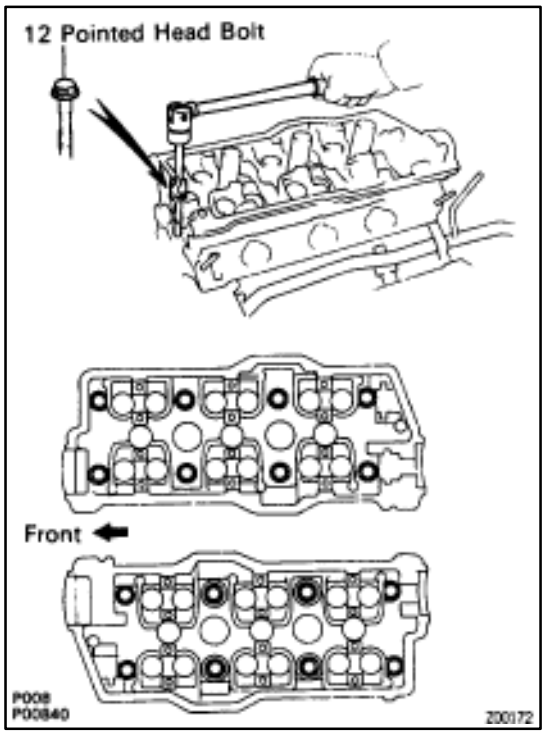


39. REMOVE LH ENGINE HANGER
Remove the two bolts and LH engine hanger.

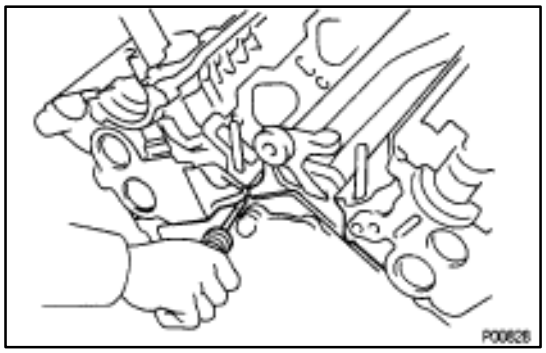


40. REMOVE CYLINDER HEADS

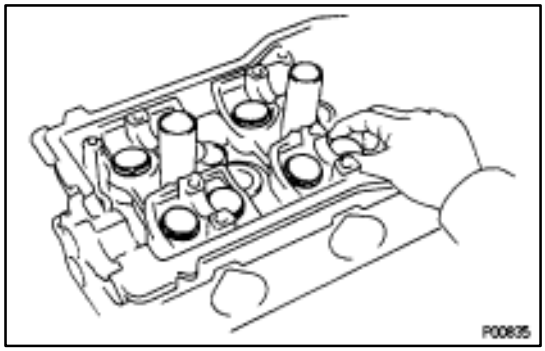
(a) Using a 8 mm hexagon wrench, remove the cylinder head (recessed head) bolts.



(b) Uniformly loosen and remove the cylinder head (12 pointed head) bolts in several passes, in the sequence shown.
NOTICE: Head warpage or cracking could result from removing bolts in an incorrect order.



(c) Lift the cylinder head from the dowels on the cylinder block and place the two cylinder heads on wooden blocks on a bench.
HINT: If the cylinder head is difficult to lift off, pry with a screwdriver between the cylinder head and cylinder block.
NOTICE: Be careful not to damage the contact surfaces of the cylinder head and cylinder block.

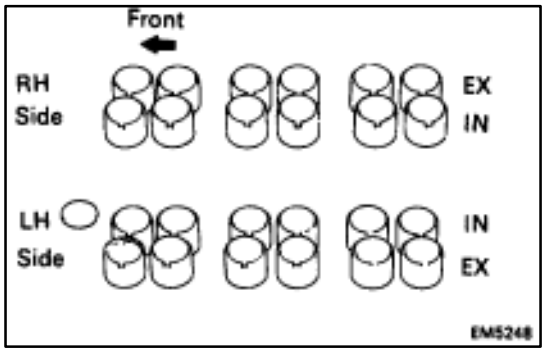


CYLINDER HEADS DISASSEMBLY

EG0F5–01

(See page EG–47)

1. REMOVE VALVE LIFTERS AND SHIMS

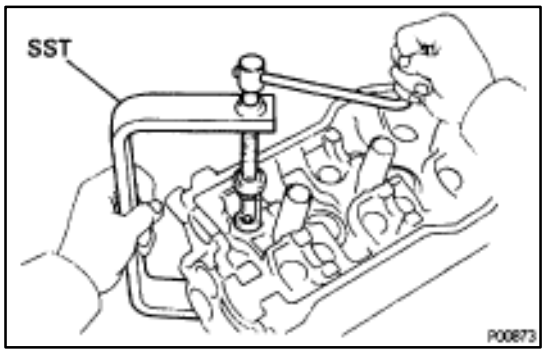


HINT: Arrange the valve lifters and shims in correct order.

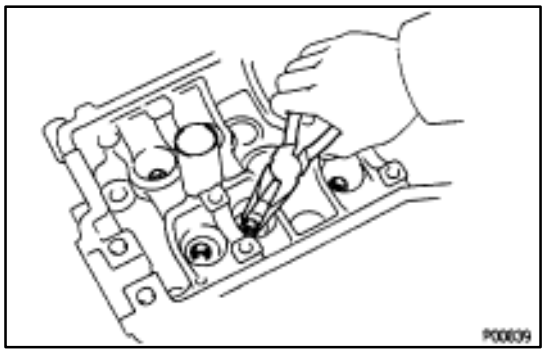
2. REMOVE VALVES

(a) Using SST, compress the valve spring and remove the two keepers.
SST 09202–70010

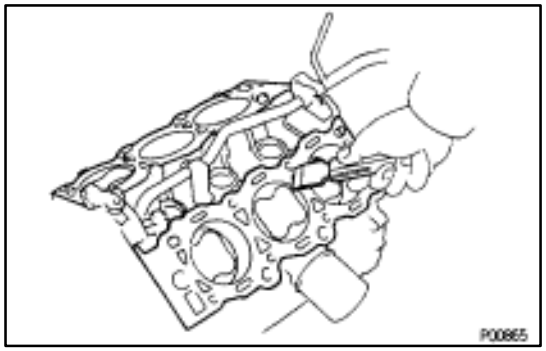
(b) Remove the spring retainer, valve spring, valve and spring seat.



HINT: Arrange the valves, valve springs, spring seats and spring retainers in correct order.



(c) Using needle–nose pliers, remove the oil seal.



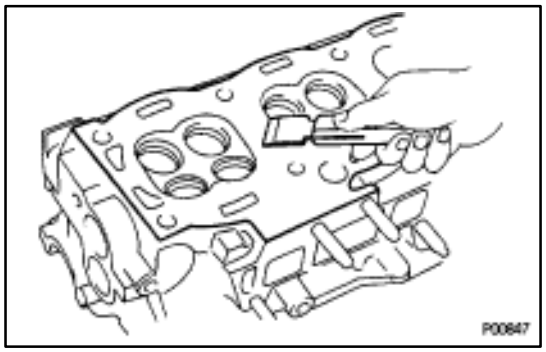
CYLINDER HEAD COMPONENTS INSPECTION, CLEANING AND REPAIR

EG0F6–01

1. CLEAN TOP OF PISTONS AND TOP OF BLOCK

(a) Turn the crankshaft and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston top surfaces.

(b) Using a gasket scraper, remove all the gasket material from the cylinder block surface.



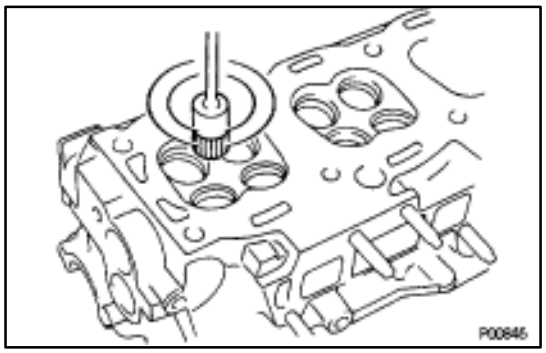
(c) Using compressed air, blow carbon and oil from the bolt holes.

CAUTION: Protect your eyes when using high–pressure compressed air.

2. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all the gasket material from the cylinder block contact surface.

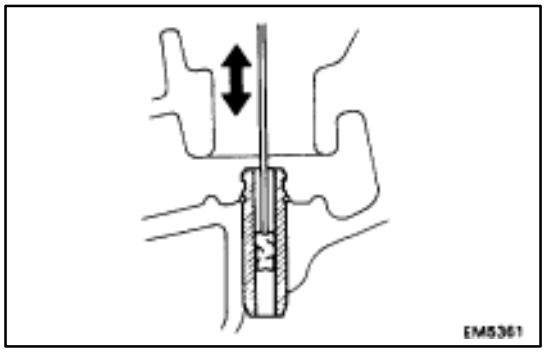
NOTICE: Be careful not to scratch the surfaces.



3. CLEAN COMBUSTION CHAMBERS

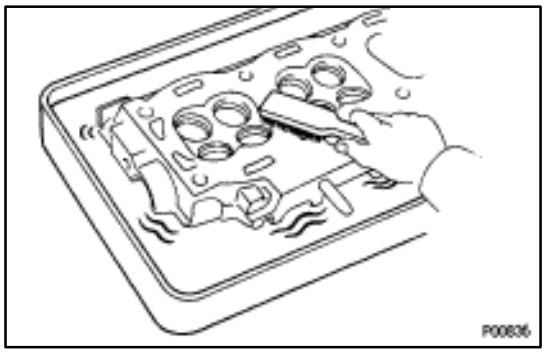
Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE: Be careful not to scratch the cylinder block contact surface.



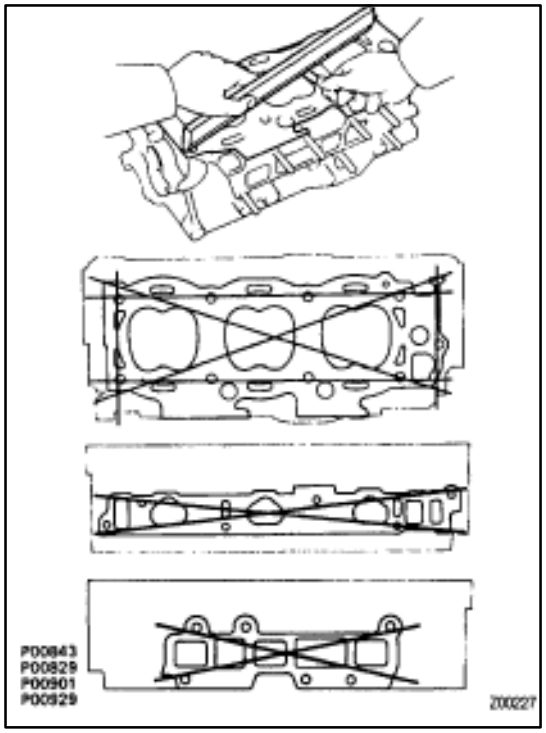
4. CLEAN VALVE GUIDE BUSHINGS

Using a valve guide bushing brush and solvent, clean all the guide bushings.



5. CLEAN CYLINDER HEADS

Using a soft brush and solvent, thoroughly clean the cylinder heads.



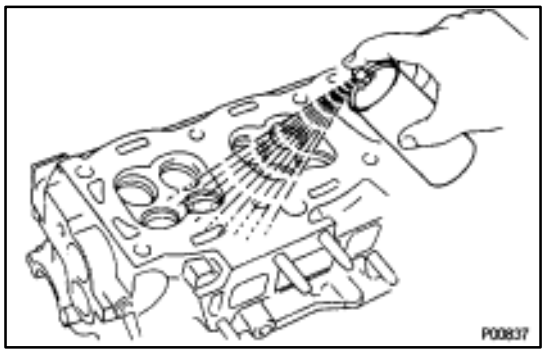
6. INSPECT CYLINDER HEADS FOR FLATNESS

Using precision straight edge and feeler gauge, measure the surfaces contacting the cylinder block and manifolds for warpage.

Maximum warpage:

0.10 mm (0.0039 in.)

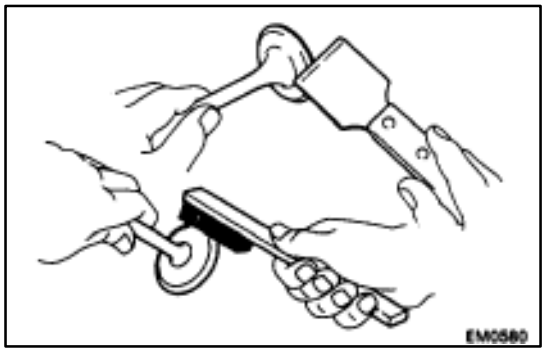
If warpage is greater than maximum, replace the cylinder head.



7. INSPECT CYLINDER HEAD FOR CRACKS

Using a dye penetrant, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks.

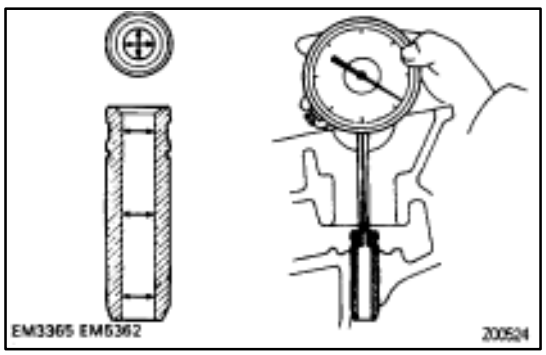
If cracked, replace the cylinder head.



8. CLEAN VALVES

(a) Using a gasket scraper, chip off any carbon from the valve head.

(b) Using a wire brush, thoroughly clean the valve.

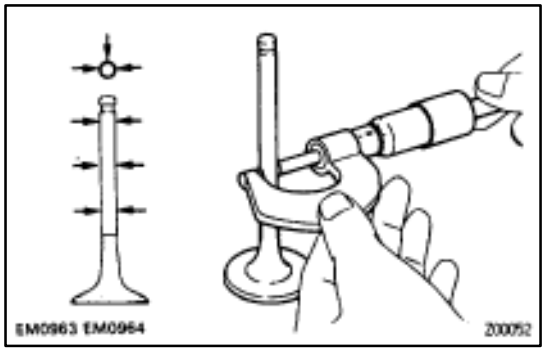


9. INSPECT VALVE STEMS AND GUIDE BUSHINGS

(a) Using a caliper gauge, measure the inside diameter of the guide bushing.

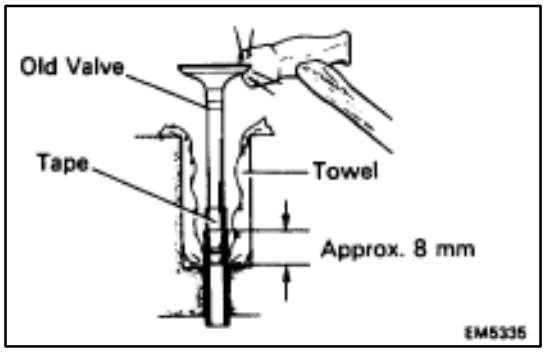
Bushing inside diameter:

6.010–6.030 mm (0.2366–0.2374 in.)



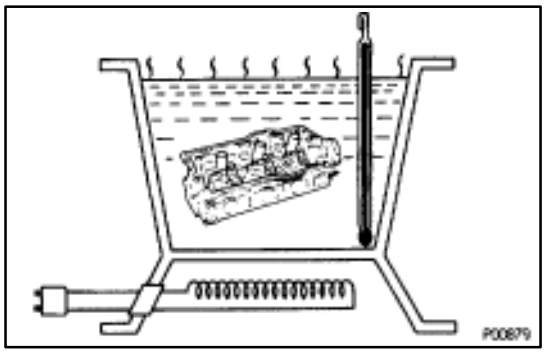
(b) Using a micrometer, measure the diameter of the valve stem.
Valve stem diameter:
Intake
5.970–5.985 mm (0.2350–0.2356 in.)
Exhaust
5.965–5.980 mm (0.2348–0.2354 in.)

(c) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.
Standard oil clearance:
Intake
0.025–0.060 mm (0.0010–0.0024 in.)
Exhaust
0.030–0.065 mm (0.0012–0.0026 in.)
Maximum oil clearance:
Intake
0.08 mm (0.0031 in.)
Exhaust
0.10 mm (0.0039 in.)
If the clearance is greater than maximum, replace the valve and guide bushing.

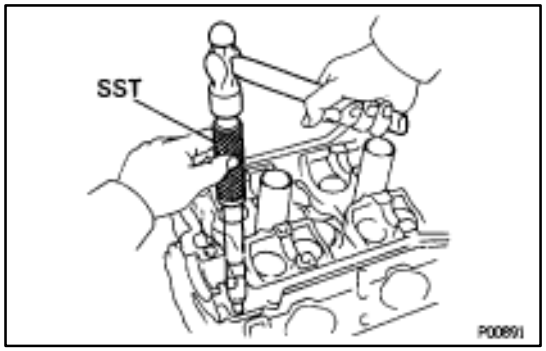


10. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

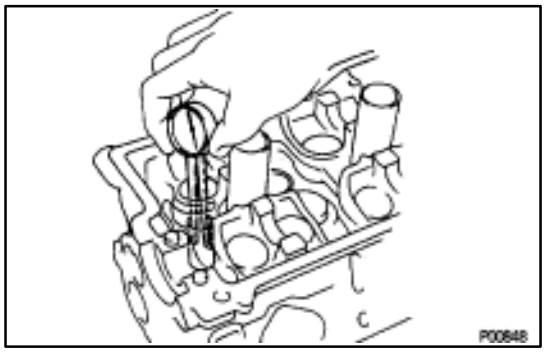
(a) Insert an oil valve wrapped with tape into the valve guide bushing, and break off the valve guide bushing by hitting it with a hammer. Remove the snap ring.
HINT: Wrap the tape approx. 8 mm (0.31 in.) from the valve stem end.
NOTICE: Be careful not to damage the valve lifter hole.



(b) Gradually heat the cylinder head to 80–100°C (176–212°F).



(c) Using SST and a hammer, tap out the guide bushing.
SST 09201–70010

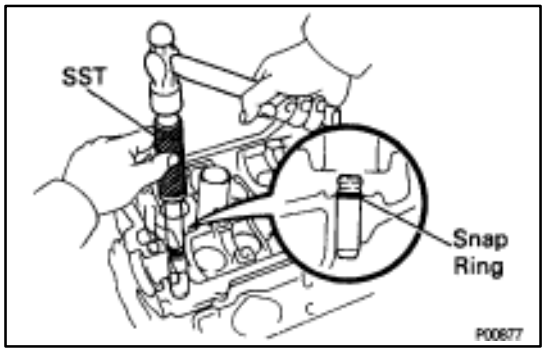


(d) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.
Both intake and exhaust

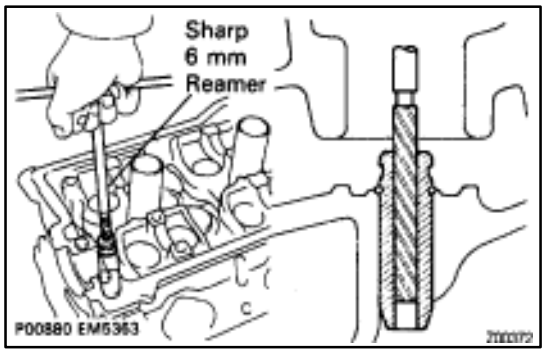
(e) Select a new guide bushing (STD size or O/S 0.05).

Bushing bore diameter mm (in.)	Bushing size
11.000–11.027 (0.4331–0.4342)	Use STD
11.050–11.077 (0.4350–0.4361)	Use O/S 0.05

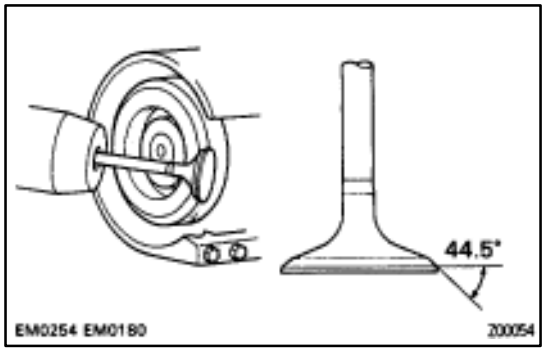
If the bushing bore diameter of the cylinder head is greater than 11.027 mm (0.4341 in.), machine the bushing bore to the following dimension:
11.050–11.077 mm (0.4350–0.4361 in.)
If the bushing bore diameter of the cylinder head is greater than 11.077 mm (0.4361 in.), replace the cylinder head.



(f) Gradually heat the cylinder head to 80–100°C (176–212°F).
(g) Using SST and a hammer, tap in a new guide bushing until the snap ring makes contact with the cylinder head.
SST 09201–70010



(h) Using a sharp 6 mm reamer, ream the guide bushing to obtain the standard specified clearance (See page EG–63) between the guide bushing and valve stem.



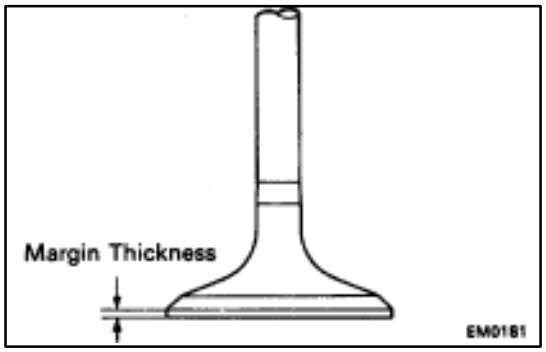
11. INSPECT AND GRIND VALVES

(a) Grind the valve enough to remove pins and carbon.

(b) Check that the valve is ground to the correct valve face angle.

Valve face angle:

44.5°



(c) Check the valve head margin thickness.

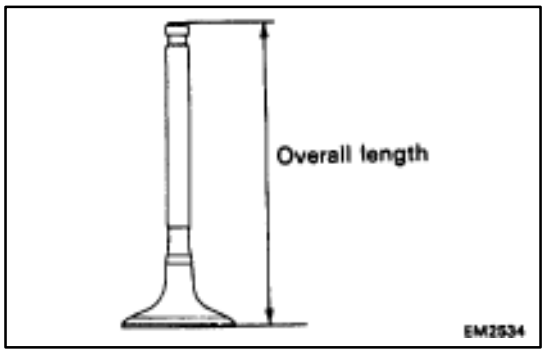
Standard margin thickness:

1.0 mm (0.039 in.)

Minimum margin thickness:

0.5 mm (0.020 in.)

If the margin thickness is less than minimum, replace the valve.



(d) Check the valve overall length.

Standard overall length:

Intake

95.15 mm (3.7461 in.)

Exhaust

94.90 mm (3.7362 in.)

Minimum overall length:

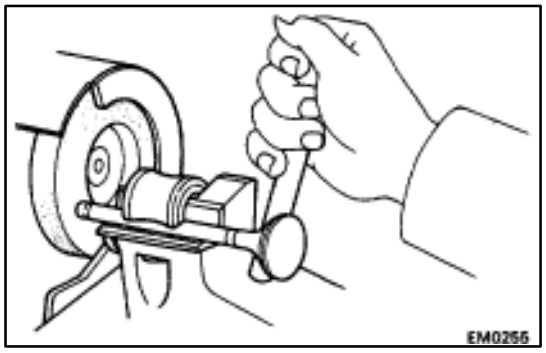
Intake

94.6 mm (3.724 in.)

Exhaust

94.4 mm (3.717 in.)

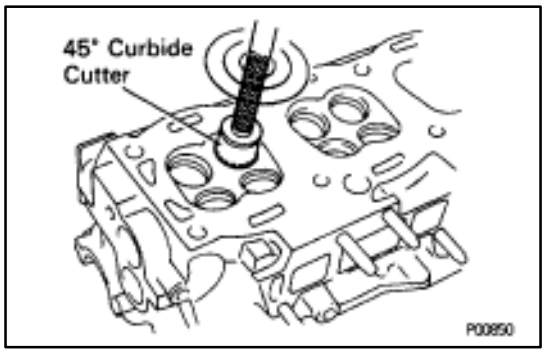
If the overall length is less than minimum, replace the valve.



(e) Check the surface of the valve stem tip for wear.

If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

NOTICE: Do not grind off more than minimum.



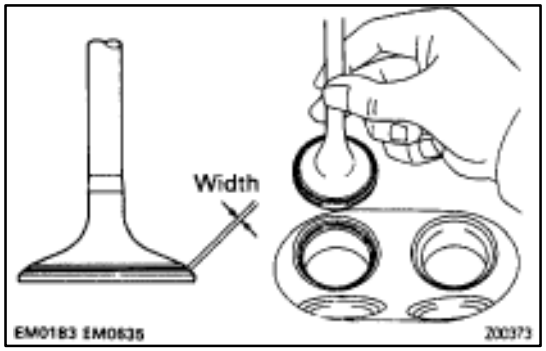
12. INSPECT AND CLEAN VALVE SEATS

(a) Using a 45 1 carbide cutter, resurface the valve seats.

Remove only enough metal to clean the seats.

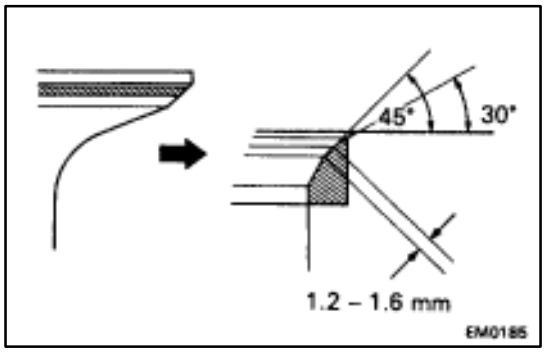
(b) Check the valve seating position.

Apply a thin coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate the valve.



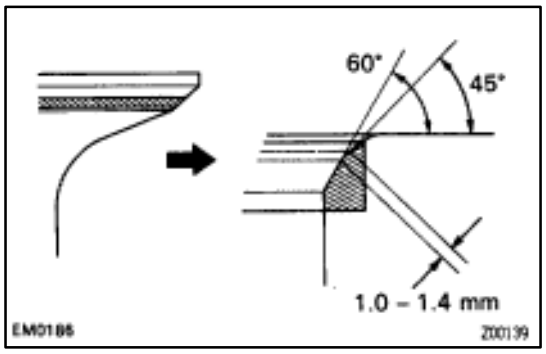
(c) Check the valve face and seat for the following:
- If blue appears 360 [1] around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360 [1] around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with the following width:

1.0–1.4 mm (0.039–0.055 in.)

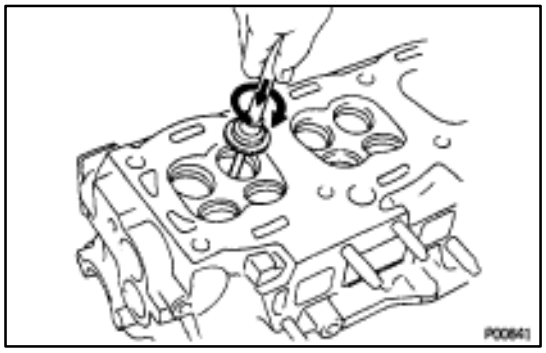


If not, correct the valve seats as follows:

(1) If the seating is too high on the valve face, use 30° and 45° cutters to correct the seat.

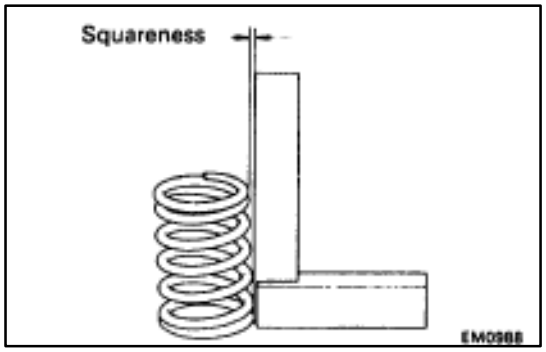


(2) If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.



(d) Hand–lap the valve and valve seat with an abrasive compound.

(e) After hand–lapping, clean the valve and valve seat.



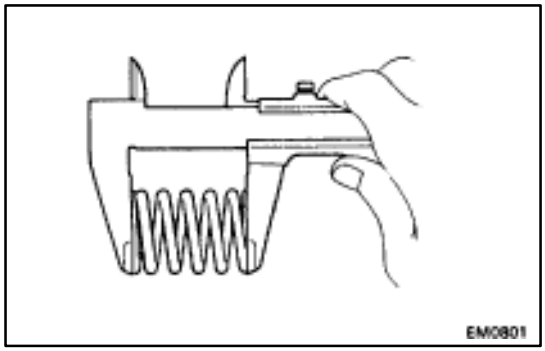
13. INSPECT VALVE SPRINGS

(a) Using a steel square, measure the squareness of the valve spring.

Maximum squareness:

2.0 mm (0.075 in.)

If deviation is greater than maximum, replace the valve spring.

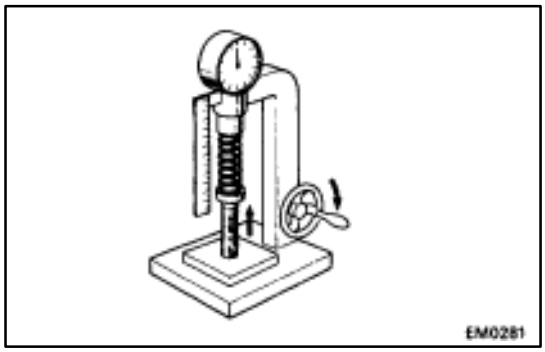


(b) Using a vernier caliper, measure the free length of the valve spring.

Free length:

41.4 mm (1.630 in.)

If the free length is not as specified, replace the valve spring.

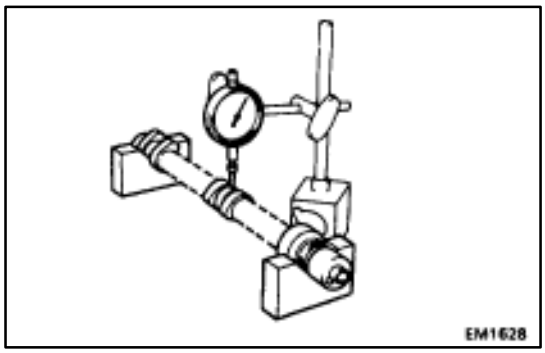


(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:

186–206 N (19.0–21.0 kgf, 38.4–42.4 lbf) at 33.3 mm (1.311 in.)

If the installed tension is not as specified, replace the valve spring.



14. INSPECT CAMSHAFTS AND BEARINGS

A. Inspect camshaft for runout

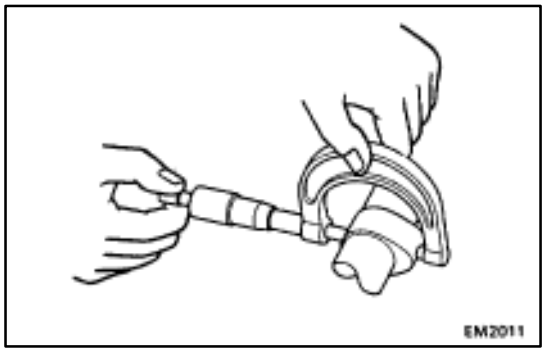
(a) Place the camshaft on V–blocks.

(b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout:

0.06 mm (0.0024 in.)

If the circuit runout is greater than maximum, replace the camshaft.



B. Inspect cam lobes

Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

Intake

42.160–42.260 mm (1.6598–1.6638 in.)

Exhaust

41.960–42.060 mm (1.6520–1.6559 in.)

Minimum cam lobe height:

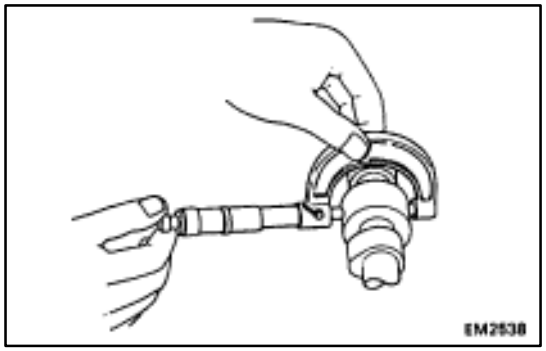
Intake

42.01 mm (1.6539 in.)

Exhaust

41.81 mm (1.6461 in.)

If the cam lobe height is less than minimum, replace the camshaft.



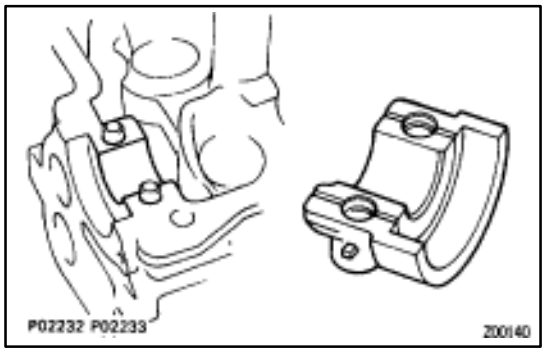
C. Inspect camshaft journals

Using micrometer, measure the journal diameter.

Journal diameter:

26.949–26.965 mm (1.0610–1.0616 in.)

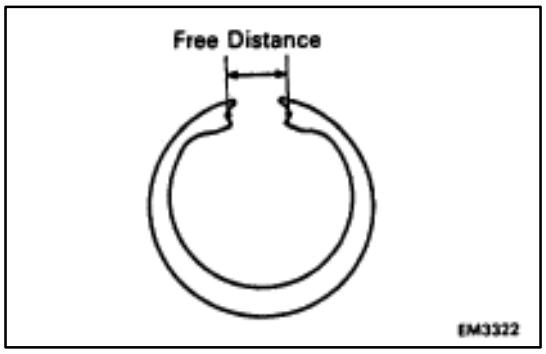
If the journal diameter is not as specified, check the oil clearance.



D. Inspect camshaft bearings

Check the bearings for flaking and scoring.

If the bearings are damaged, replace the bearing caps and cylinder head as a set.



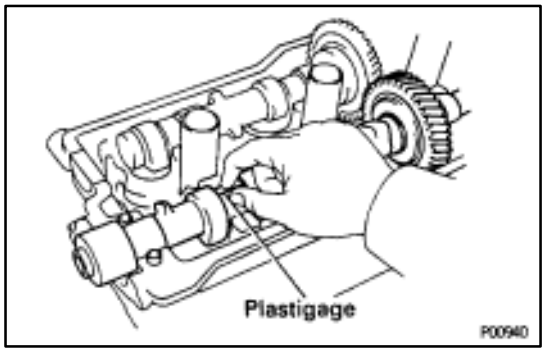
E. Inspect camshaft gear spring

Using a vernier caliper, measure the free distance between the spring end.

Free distance:

18.2–18.8 mm (0.712–0.740 in.)

If the free distance is not as specified, replace the gear spring.

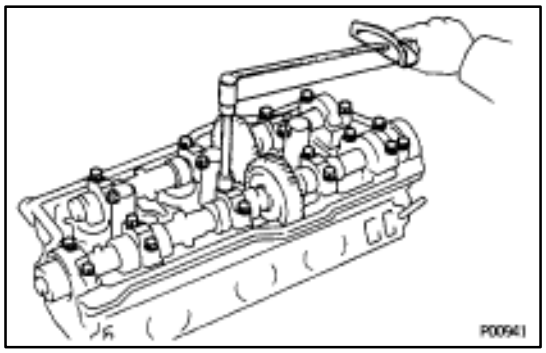


F. Inspect camshaft journal oil clearance

(a) Clean the bearing caps and camshaft journals.

(b) Place the camshafts on the cylinder head.

(c) Lay a strip of Plastigage across each of the camshaft journals.

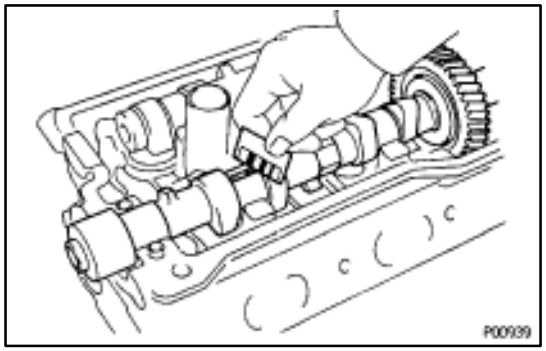


(d) Install the bearing caps.

(See step 5 on page EG–73)

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

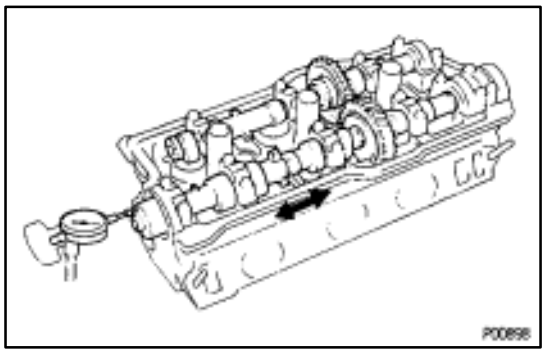
NOTICE: Do not turn the camshaft.



(e) Remove the bearing caps.
(f) Measure the Plastigage at its widest point.
Standard oil clearance:
0.035–0.072 mm (0.0014–0.0028 in.)
Maximum oil clearance:
0.10 mm (0.0039 in.)
If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.
(g) Completely remove the Plastigage.

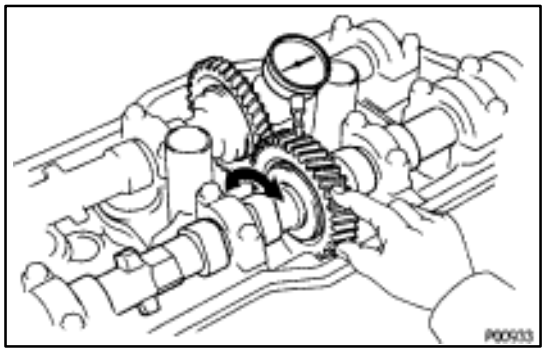
G. Inspect camshaft thrust clearance

(a) Install the camshafts.
(See step 5 on page EG–73)

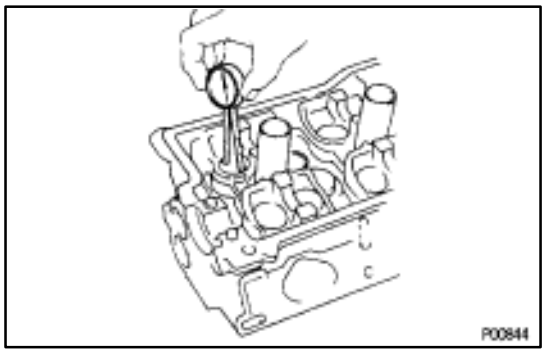


(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.
Standard thrust clearance:
0.033–0.080 mm (0.0013–0.0031 in.)
Maximum thrust clearance:
0.12 mm (0.0047 in.)
If the thrust clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

H. Inspect camshaft gear backlash

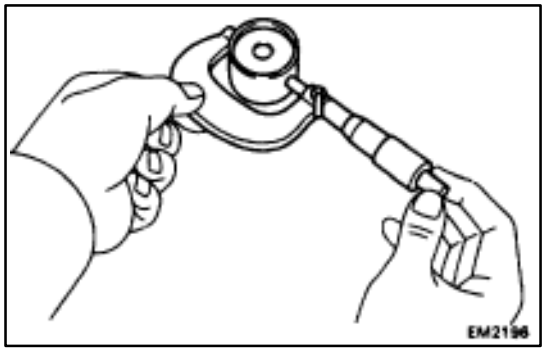


(a) Install the camshafts without installing the exhaust camshaft sub–gear.
(See step 5 on page EG–73)
(b) Using a dial indicator, measure the backlash.
Standard backlash:
0.020–0.200 mm (0.0008–0.0079 in.)
Maximum backlash:
0.30 mm (0.0188 in.)
If the backlash is greater than maximum, replace the camshafts.



15. INSPECT VALVE LIFTERS AND LIFTER BORES

(a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.
Lifter bore diameter:
31.000–31.018 mm (1.2204–1.2212 in.)



(b) Using a micrometer, measure the lifter diameter.

Lifter diameter:

30.966 – 30.976 mm (1.2191 – 1.2195 in.)

(c) Subtract the lifter diameter measurement from the lifter bore diameter measurements.

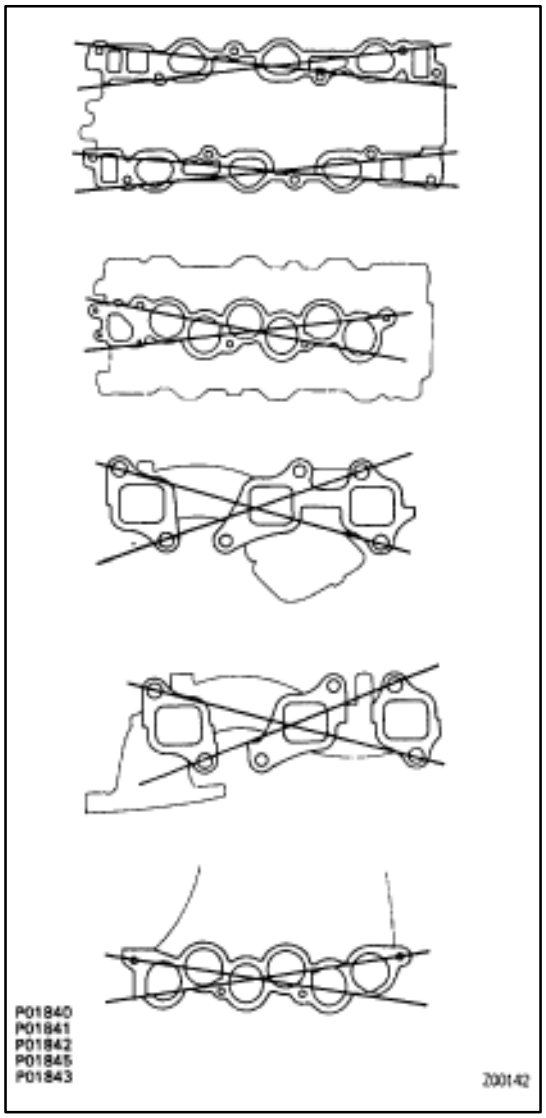
Standard oil clearance:

0.024 – 0.052 mm (0.0009 – 0.0020 in.)

Maximum oil clearance:

0.08 mm (0.0031 in.)

If the oil clearance is greater than maximum, replace the lifter. If necessary, replace the cylinder head.



16. INSPECT INTAKE MANIFOLD, EXHAUST MANIFOLDS AND AIR INTAKE CHAMBER

(a) (Intake Manifold)

Using precision straight edge and feeler gauge, measure the surfaces contacting the cylinder head and air intake chamber for warpage.

Maximum warpage:

0.10 mm (0.0039 in.)

If warpage is greater than maximum, replace the intake manifold.

(b) (Exhaust Manifolds)

Measure the surfaces contacting the cylinder head for warpage.

Maximum warpage:

1.00 mm (0.0394 in.)

If warpage is greater than maximum, replace the exhaust manifold.

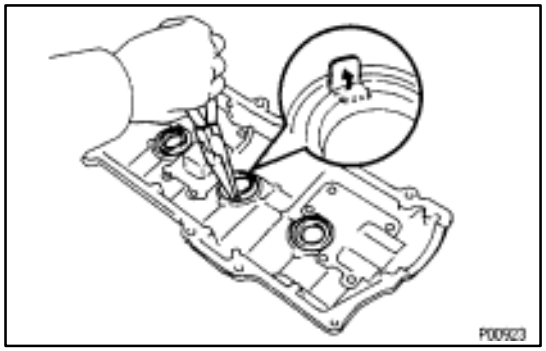
(c) (Air Intake Chamber)

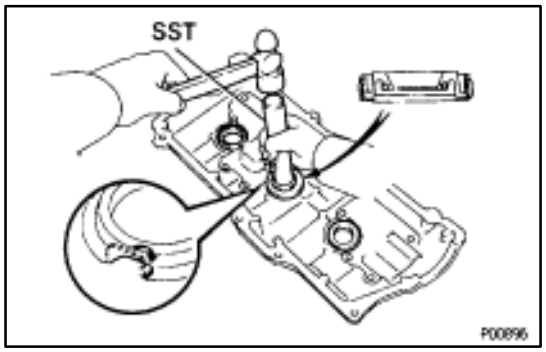
Measure the surfaces contacting the intake manifold for warpage.

Maximum warpage:

0.10 mm (0.0039 in.)

If warpage is greater than maximum, replace the air intake chamber.





17. IF NECESSARY, REPLACE SPARK PLUG TUBE GASKETS

(a) Bend up the tab on the ventilation baffle plate which prevents the gasket from slipping out.
NOTICE: Do not deform the baffle plate gasket.

(b) Push in part of the outer circumference of the plug tube gasket and use needle–nose pliers to remove the plug gasket.
NOTICE: Do not scratch or damage the joint of the cylinder head cover.

(c) Using SST, tap in a new gasket until its surface is flush with the upper edge of the cylinder head cover.
SST 09550–10012 (09552–10010, 09558–10010)

(d) Apply a light coat of MP grease to the gasket lip.

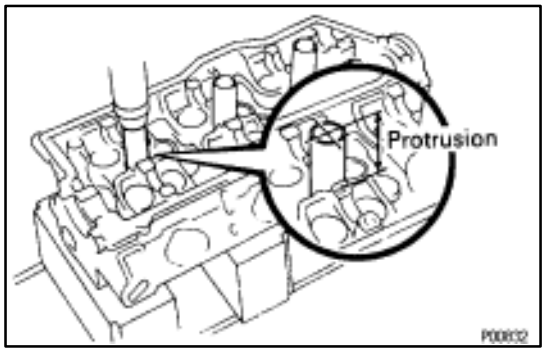
(e) Return the ventilation case claw to its original position.

CYLINDER HEADS ASSEMBLY

EG0F7–02

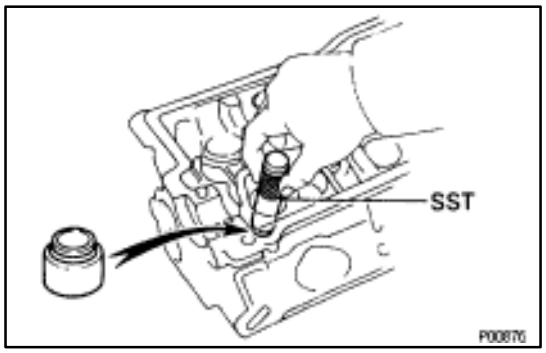
(See page EG–47)

HINT:
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.



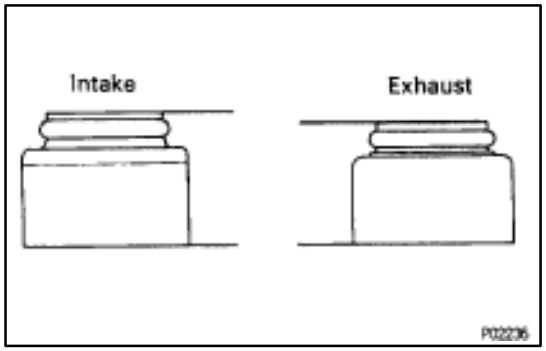
1. INSTALL SPARK PLUG TUBES

HINT: When using a new cylinder head, spark plug tubes must be installed.
Using a press, press in a new spark plug tube until there is 49.0–49.4 mm (1.929–1.945 in.) protruding from the camshaft bearing cap installation surface of the cylinder head.
NOTICE: Avoid pressing a new spark plug tube in too far by measuring the amount of protrusion while pressing.

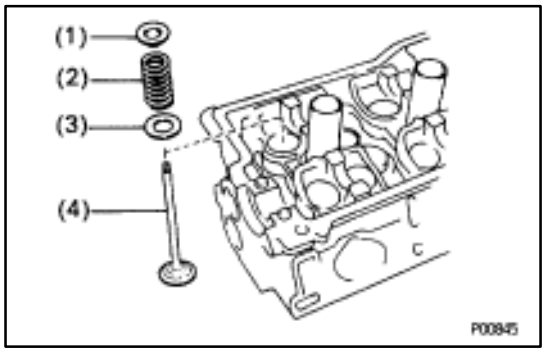


2. INSTALL VALVES

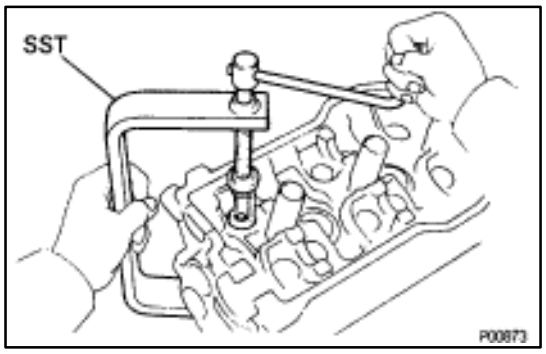
(a) Using SST, push in a new oil seal.
SST 09201–41020



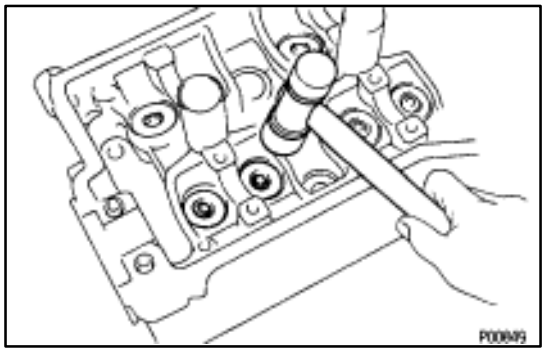
HINT: Different oil seals are used for the intake and exhaust.



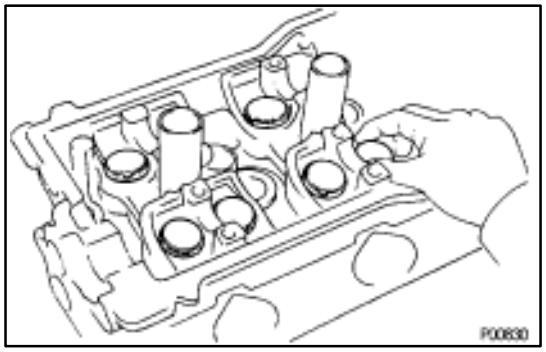
(b) Install the following parts:
(1) Valve
(2) Spring seat
(3) Valve spring
(4) Spring retainer



(c) Using SST, compress the valve spring and place the two keepers around the valve stem.
SST 09202–70010

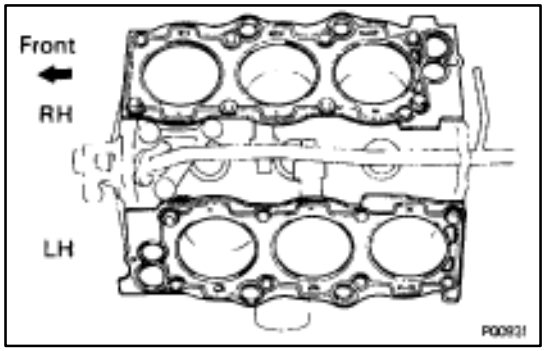


(d) Using a plastic–faced hammer, lightly tap the valve stem tip to assure proper fit.



3. INSTALL VALVE LIFTERS AND SHIMS

Check the valve lifter rotates smoothly by hand.



CYLINDER HEADS INSTALLATION

(See page EG–47)

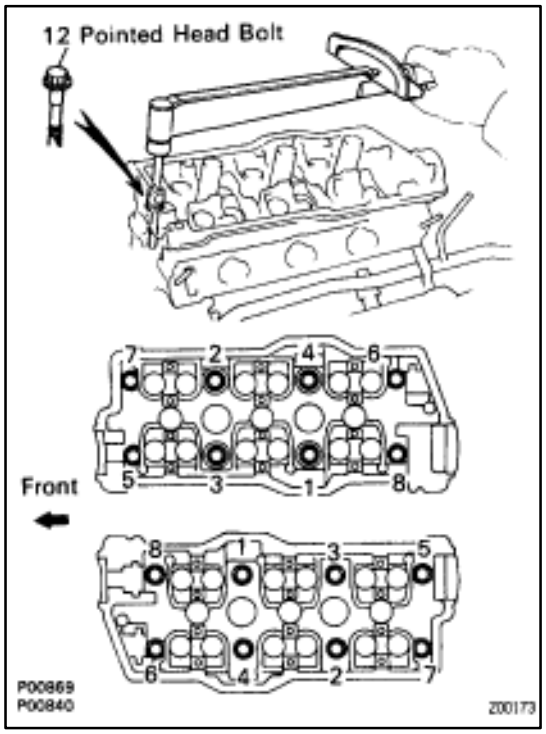
1. INSTALL CYLINDER HEADS

A. Place cylinder head on cylinder block

(a) Place a new cylinder head gasket in position on the cylinder block.

NOTICE: Be sure to install the gasket correctly.

(b) Place the cylinder head in position on the cylinder head gasket.



B. Install cylinder head (12 pointed head) bolts

HINT:

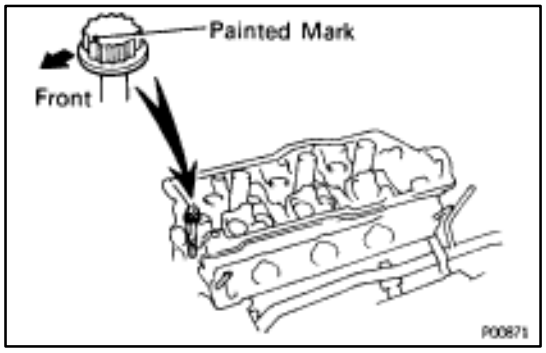
- The cylinder hrad bolts are tightened in three progressive steps (steps (b), (d) and (e)).
- If any bolts is broken or deformed, replace it.

(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

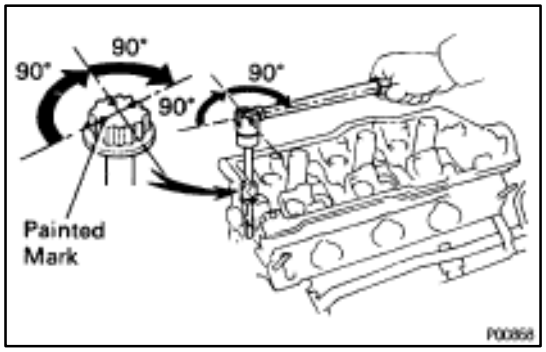
(b) Install and uniformly tighten the cylinder head bolts in several passes, in the sequence shown.

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

If any one of the bolts does not meet the torque specification, replace the bolt.



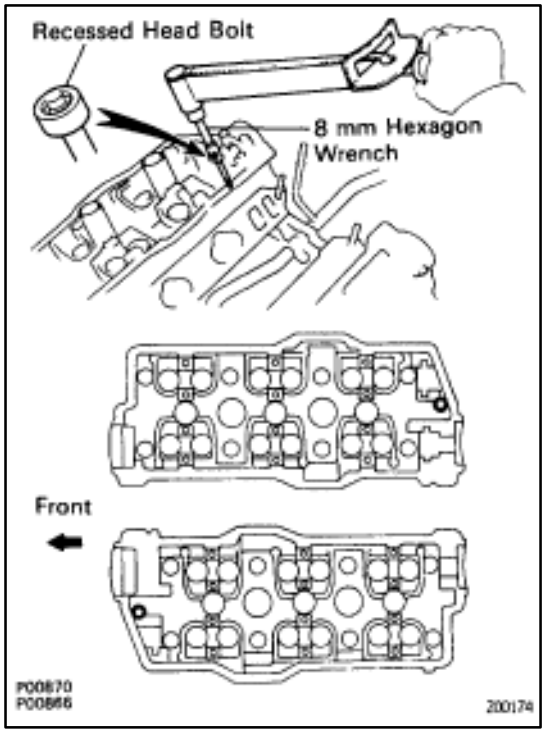
(c) Mark the front of the cylinder head bolt head with paint.



(d) Retighten the cylinder head bolts 90□1 in the numerical order shown.

(e) Retighten cylinder head bolts by an additional 90□1

(f) Check that the painted mark is now facing rearward.

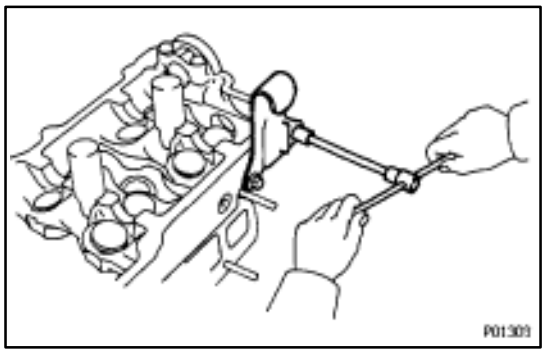


C. Install cylinder head (recessed head) bolts

(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

(b) Using a 8 mm hexagon wrench, install the cylinder head bolts.

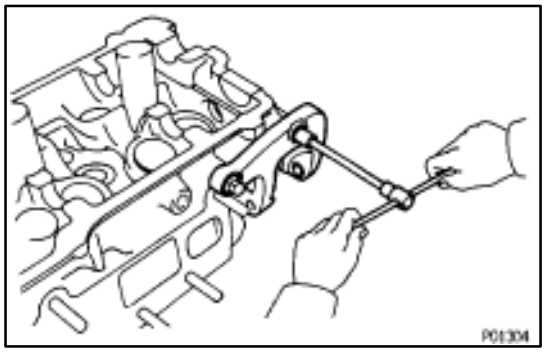
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)



2. INSTALL LH ENGINE HANGER

Install the LH engine hanger with the two bolts.

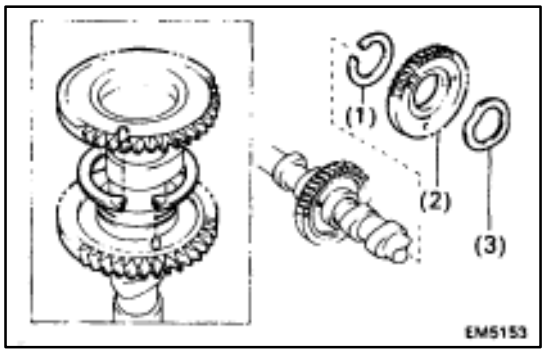
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)



3. INSTALL PS PUMP BRACKET

Install the PS pump bracket with the three bolts.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)



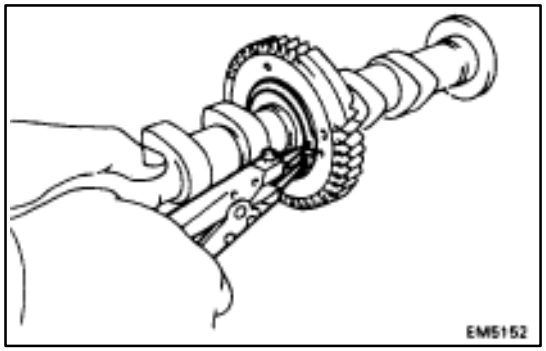
4. ASSEMBLY EXHAUST CAMSHAFTS

(a) Install the following parts:

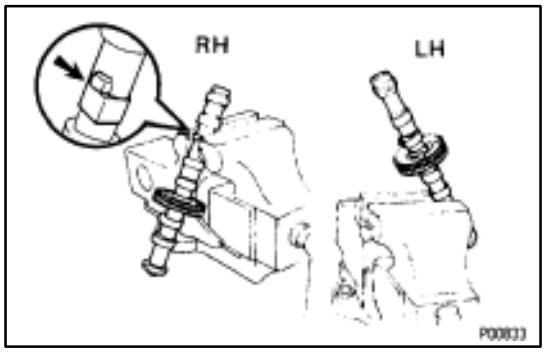
(1) Camshaft gear spring

(2) Camshaft sub–gear

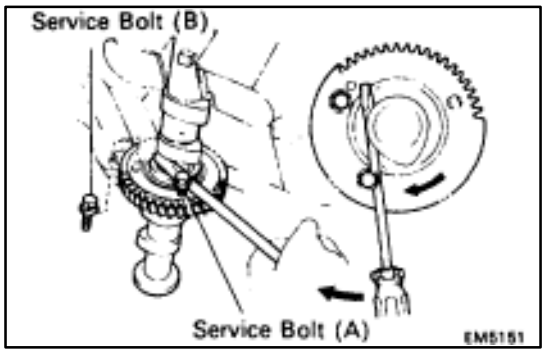
(3) Wave washer



(b) Using snap ring pliers, install the snap ring.

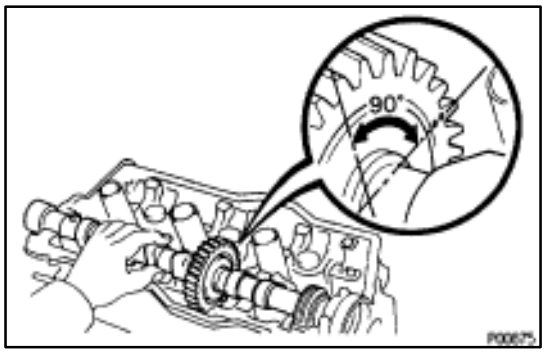


(c) Mount the hexagonal wrench head portion of the camshaft in a vise.
NOTICE: Be careful not to damage the camshaft.

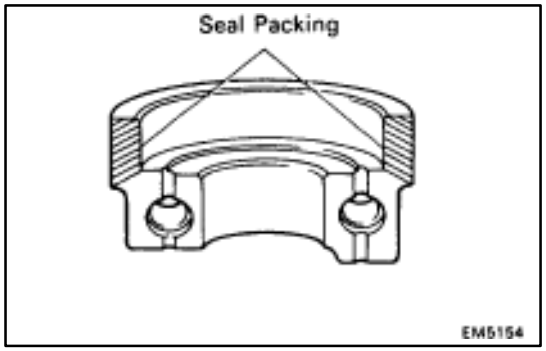


(d) Insert a service bolt (A) into the service hole of the camshaft sub–gear.
(e) Using a screwdriver, align the holes of the camshaft driven gear and sub–gear by turning camshaft subgear clockwise, and install a service bolt (B).
NOTICE: Be careful not to damage the camshaft.

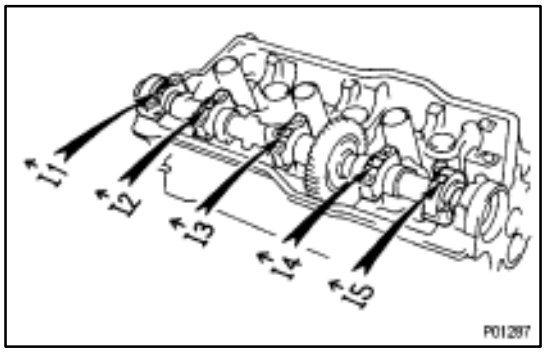
5. INSTALL CAMSHAFTS
NOTICE: Since the thrust clearance of the camshaft is small, the camshaft must be held level while it is being installed. If the camshaft is not level, the portion of the cylinder head receiving the shaft thrust may crack or be damaged, causing the camshaft to seize or break. To avoid this, the following steps should be carried out.



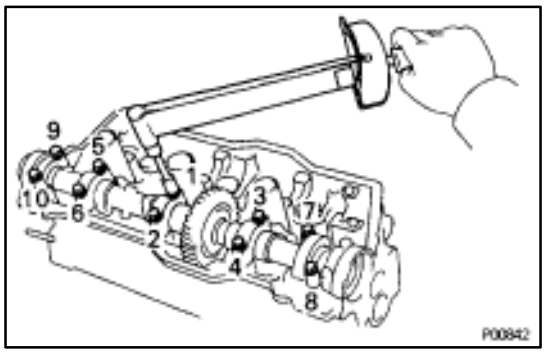
A. Install intake camshaft of RH cylinder head
(a) Apply MP grease to the thrust portion of the camshaft.
(b) Place the intake camshaft at 90□1angle of timing mark (two pointed marks) on the cylinder head.



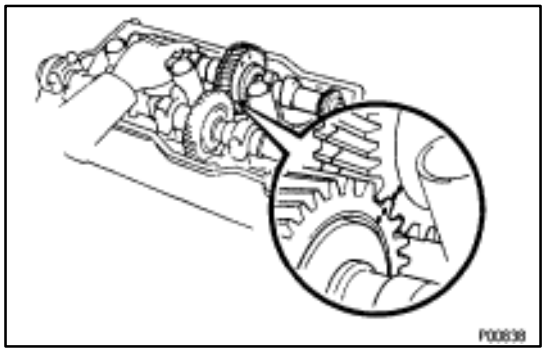
(c) Apply seal packing to the No.1 bearing cap as shown.
Seal packing:
Part No.08826–00080 or equivalent



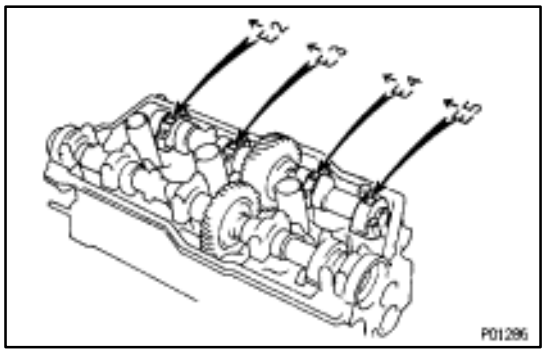
(d) Install the five bearing caps in their proper locations.



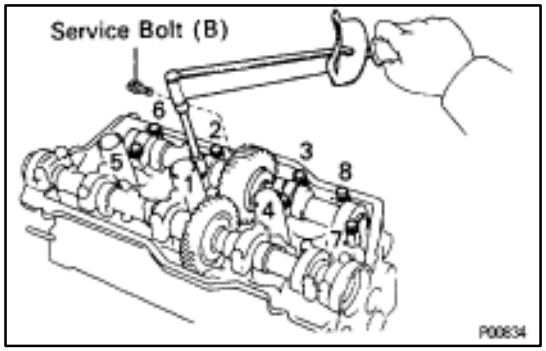
(e) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
(f) Install and uniformly tighten the ten bearing cap bolts in several passes, in the sequence shown.
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)



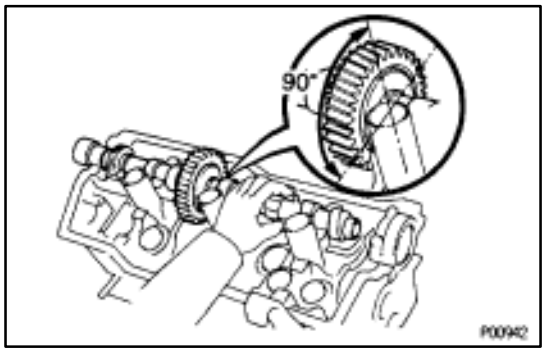
B. Install exhaust camshaft of RH cylinder head
(a) Apply MP grease to the thrust portion of the camshaft.
(b) Align the timing marks (two pointed marks) of the camshaft drive and driven gears.
(c) Place the exhaust camshaft on the cylinder head.



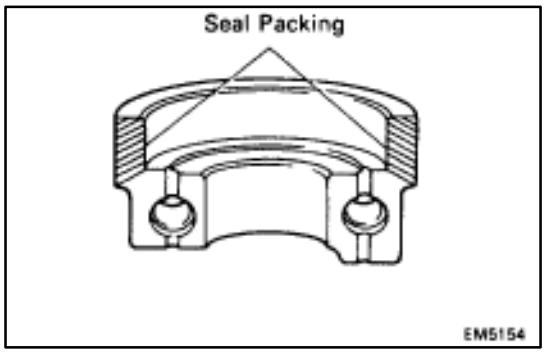
(d) Install the four bearing caps in their proper locations.



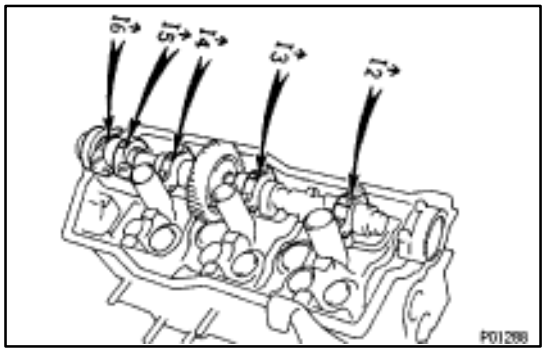
(e) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
(f) Install and uniformly tighten the eight bearing cap bolts in several passes, in the sequence shown.
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)
(g) Remove the service bolt (B).



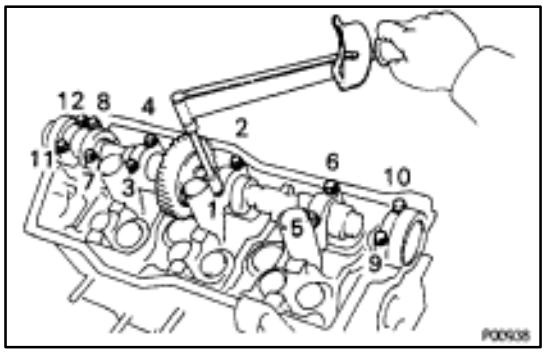
C. Install intake camshaft of LH cylinder head
(a) Apply MP grease to the thrust portion of the camshaft.
(b) Place the intake camshaft at 90□1angle of timing mark (one pointed mark) on the cylinder head.



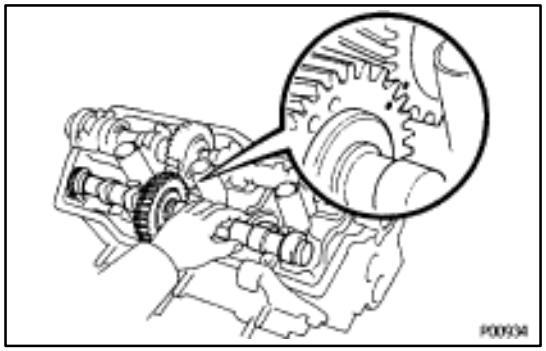
(c) Apply seal packing to the No.1 bearing cap as shown.
Seal packing:
Part No.08826–00080 or equivalent



(d) Install the five bearing caps in their proper locations.



(e) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
(f) Install and uniformly tighten the ten bearing cap bolts in several passes, in the sequence shown.
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)

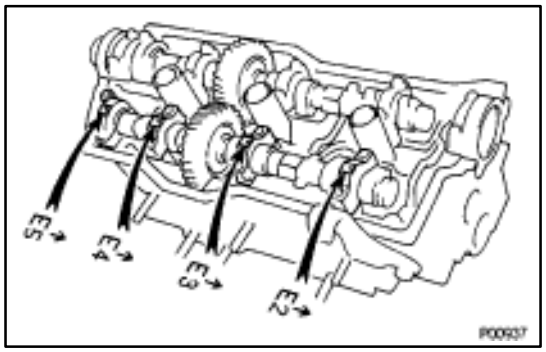


D. Install exhaust camshaft of LH cylinder head

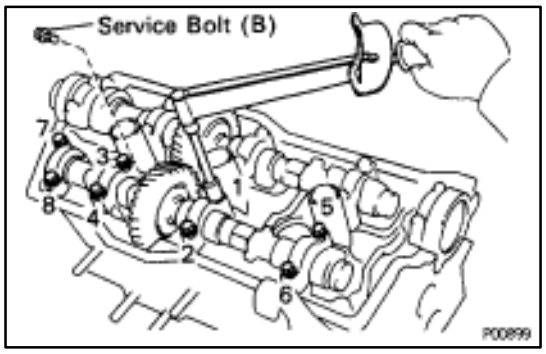
(a) Apply MP grease to the thrust portion of the camshaft.

(b) Align the timing marks (one pointed mark) of the camshaft drive and driven gears.

(c) Place the intake camshaft on the cylinder head.



(d) Install the four bearing caps in their proper locations.



(e) Apply a light coat of engine oil on the threads and under the heads of bearing cap bolts.

(f) Install and uniformly tighten the eight bearing cap bolts in several passes, in the sequence shown.

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

(g) Remove the service bolt (B).

6. CHECK AND ADJUST VALVE CLEARANCE
(See page EG–13)

Turn the camshaft and position the cam lobe upward, and check and adjust the valve clearance.

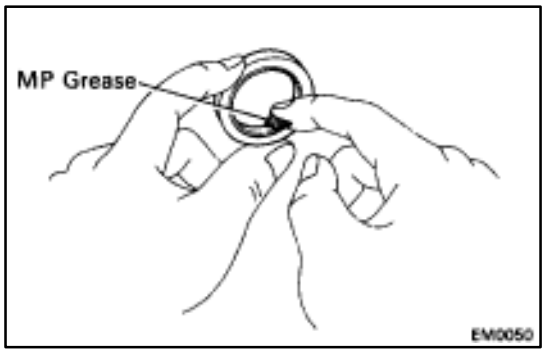
Valve clearance (Cold):

Intake

0.13–0.23 mm (0.005–0.009 in.)

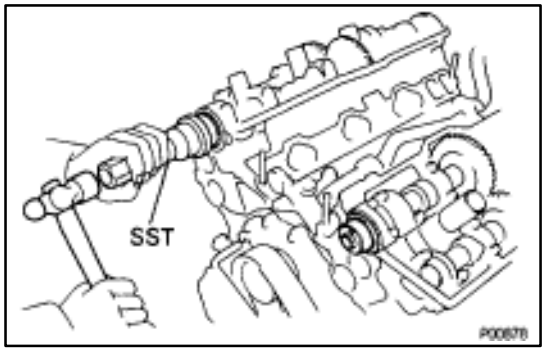
Exhaust

0.27–0.37 mm (0.011–0.015 in.)

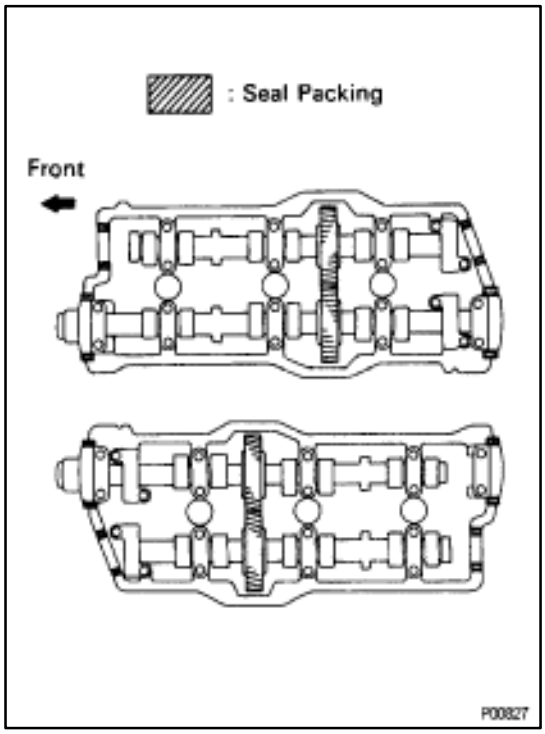


7. INSTALL CAMSHAFT OIL SEALS

(a) Apply MP grease to a new oil seal lip.

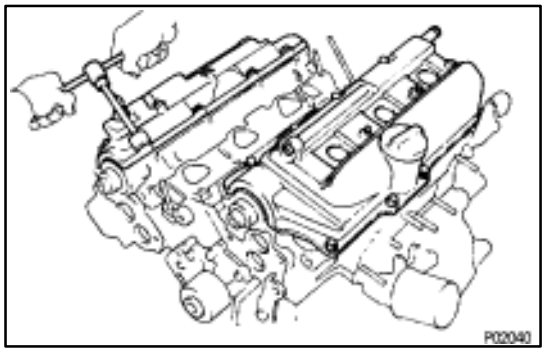


(b) Using SST, tap in the oil seals.
SST 09223–46011

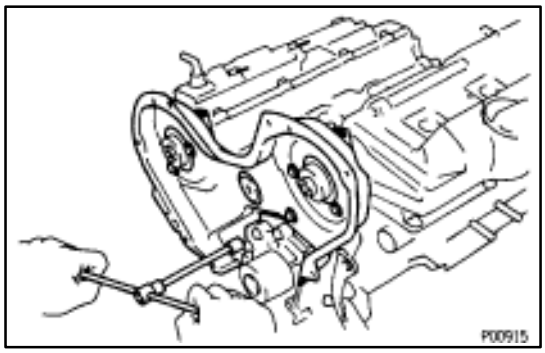


8. INSTALL CYLINDER HEAD COVERS

(a) Apply seal packing to the cylinder heads as shown in the illustration.
Seal packing:
Part No.08826–00080 or equivalent



(b) Install the gasket to the cylinder head cover.
(c) Install the cylinder head cover with the eight seal washers and nuts. Uniformly tighten the nuts in several passes. Install the two cylinder head covers.
Torque: 5.9 N·m (60 kgf·cm, 52 in.·lbf)



9. INSTALL NO.3 TIMING BELT COVER

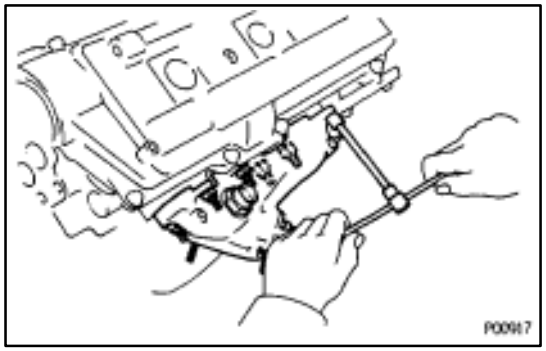
Install the timing belt cover with the six bolts.
Torque: 7.4 N·m (75 kgf·cm, 65 in.·lbf)

10. INSTALL NO.2 IDLER PULLEY, CAMSHAFT TIMING PULLEYS AND TIMING BELT

(See page EG–29)

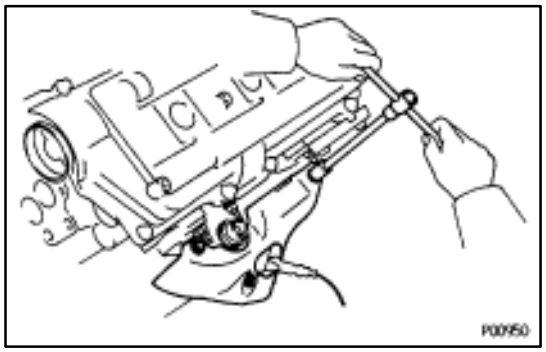
11. INSTALL SPARK PLUGS

Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)

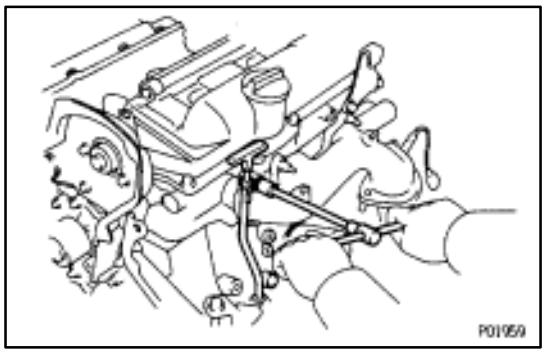


12. INSTALL RH EXHAUST MANIFOLD

(a) Install a new gasket and the exhaust manifold with new six nuts. Uniformly tighten the nuts in several passes.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

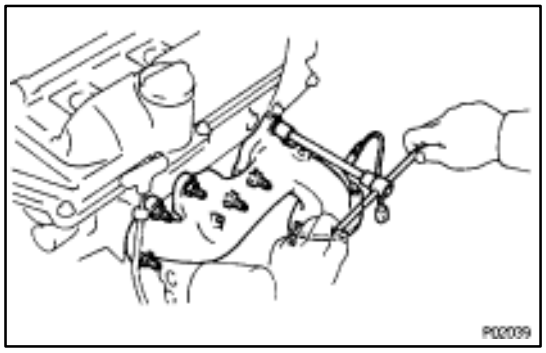


(b) Install the heat insulator with the three nuts.



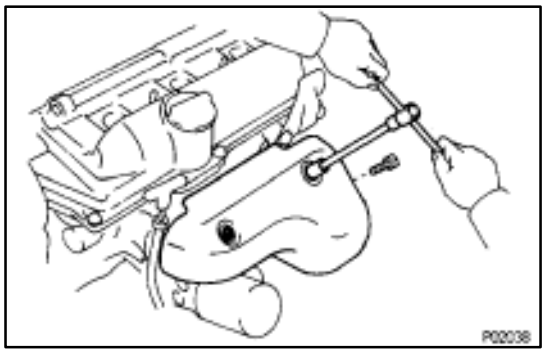
13. INSTALL OIL DIPSTICK

Install the oil dipstick with the bolt.

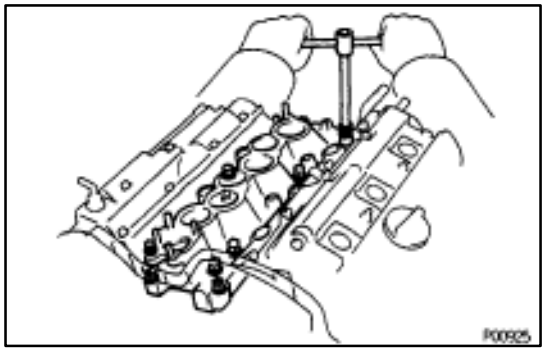


14. INSTALL LH EXHAUST MANIFOLD

(a) Install a new gasket and the exhaust manifold with six new nuts. Uniformly tighten the nuts in several passes.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

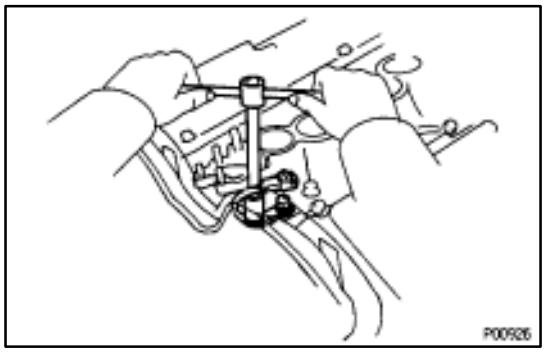


(b) Install the heat insulator with the bolt and two nuts.

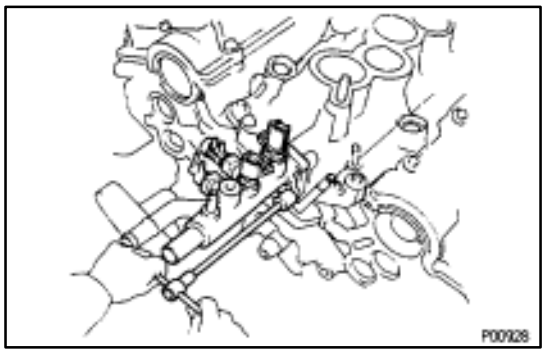


15. INSTALL INTAKE MANIFOLD

(a) Install two new gaskets and the intake manifold with the eight bolts and four nuts. Uniformly tighten the bolts and nuts in several passes.
Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)

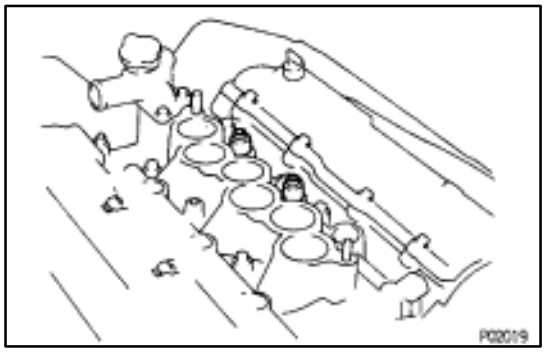


(b) Install the No.2 idler pulley bracket stay and ground strap with the two bolts.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)



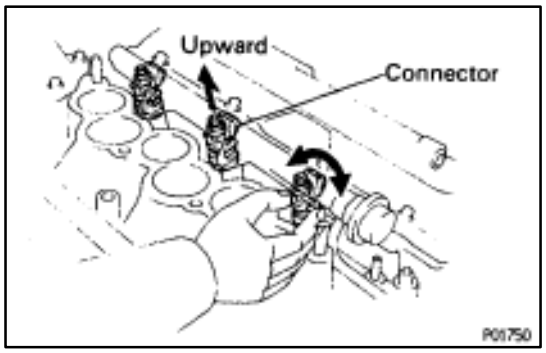
16. INSTALL WATER BY–PASS OUTLET

Install a new gasket and the water by–pass outlet with the two nuts.
Torque: 8.3 N·m (85 kgf·cm, 74 in.·lbf)

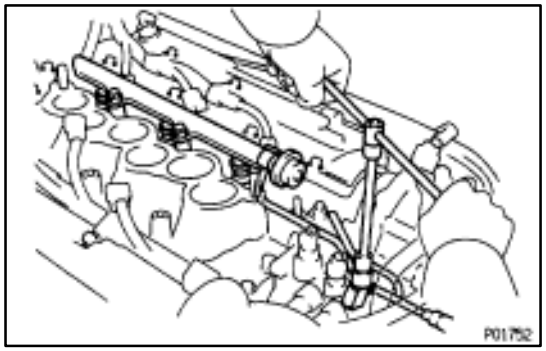


17. INSTALL RH DELIVERY PIPE AND INJECTORS

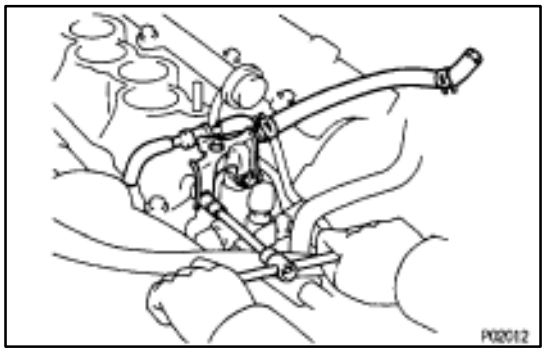
(a) Place the two spacers in position on the intake manifold.
NOTICE: Clean the injector holes before installing the injectors into the intake manifold.



(b) Place the three injectors together with the RH delivery pipe and No.1 fuel pipe in position on the intake manifold.
(c) Check that the injectors rotate smoothly.
HINT: If injectors do not rotate smoothly, the probable cause is incorrect installation of O–rings. Replace the O–rings.
(d) Position the injector connector upward.

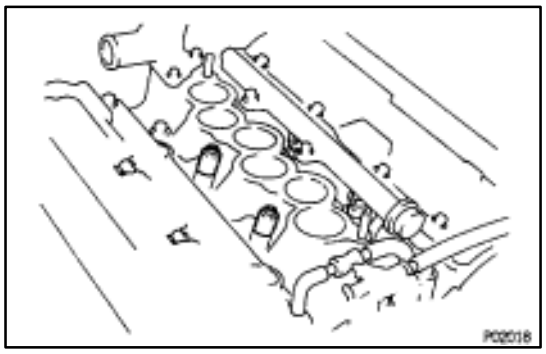


(e) Install the three bolts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)



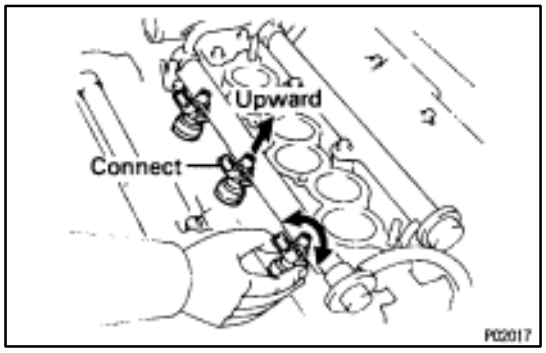
18. INSTALL AIR PIPE

(a) Install the air pipe with the two bolts.
Torque: 8.3 N·m (85 kgf·cm, 73 in.·lbf)

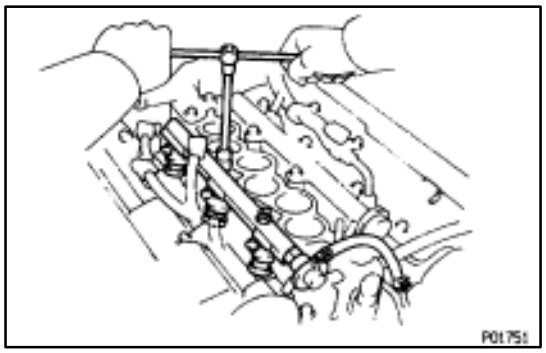


19. INSTALL LH DELIVERY PIPE AND INJECTORS

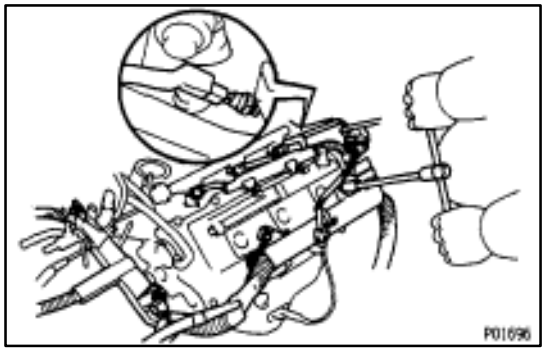
(a) Place the two spacers in position on the intake manifold.
NOTICE: Clean the injector holes before installing the injectors into the intake manifold.



(b) Place the three injectors together with the LH delivery pipe in position on the intake manifold.
(c) Check that the injectors rotate smoothly.
HINT: If injectors do not rotate smoothly, the probable cause is incorrect installation of O–rings. Replace the O–rings.
(d) Position injector connector upward.



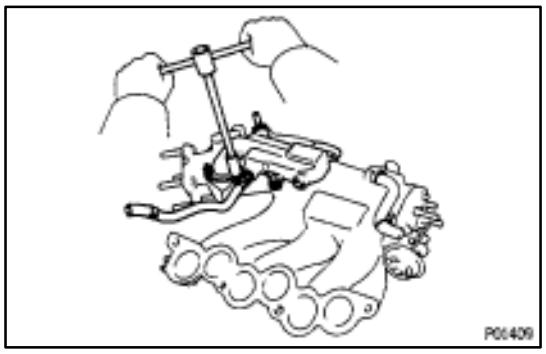
(e) Install the two bolts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)
(f) Connect the fuel return hose to the No.1 fuel pipe (fuel inlet hose).



20. CONNECT RH ENGINE WIRE HARNESS

(a) Connect the two clamps, and install the engine wire harness with the four bolts.

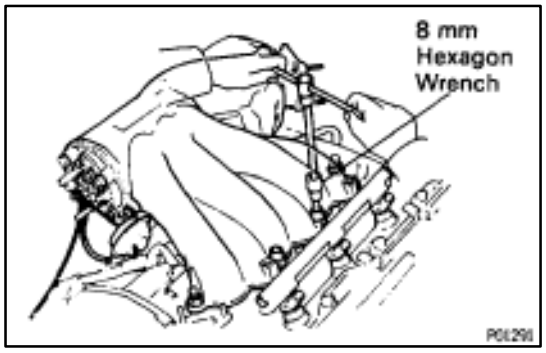
(b) Connect the following connectors:
- (1) Three injector connectors
- (2) Engine coolant temp. sender gauge connector
- (3) Oxygen sensor connector
- (4) PS pump connector
- (5) Oil pressure switch connector
- (6) Engine oil level sensor connector
- (7) A/C compressor connector
- (8) Engine coolant temp. sensor connector (for hydraulic cooling fan)



21. INSTALL NO.1 EGR COOLER

Install a new gasket and the No.1 EGR cooler with the bolt and two nuts.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

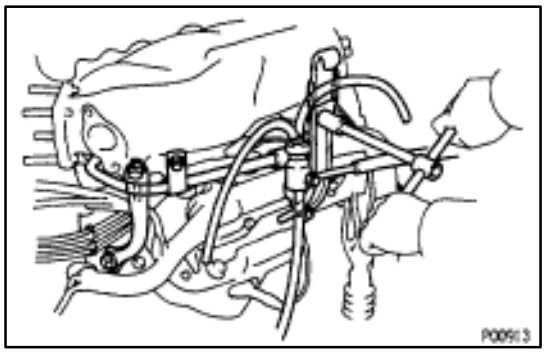


22. INSTALL AIR INTAKE CHAMBER

(a) Using 8 mm hexagon wrench, install a new gasket and the air intake chamber with the two bolts and nuts.
Uniformly tighten the bolts and nuts in several passes.
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

(b) Connect the two ground straps with the nut.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

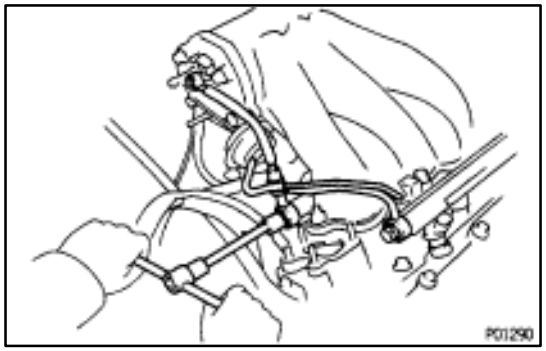
(c) Connect the hydraulic pressure pipe with the bolt.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)



(d) Install the air intake chamber stay.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(e) Install the No.1 engine hanger.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

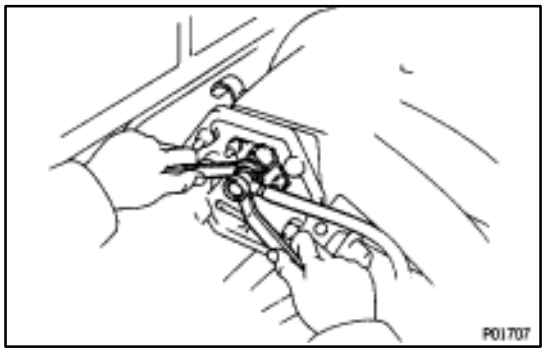
(f) Connect the PS ACV with the nut.



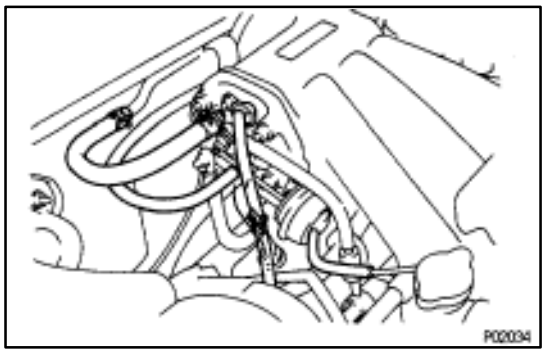
23. INSTALL NO.2 FUEL PIPE

(a) Install the No.2 fuel pipe with four new gaskets and the union boots.
Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)

(b) Connect the IACV vacuum hose.



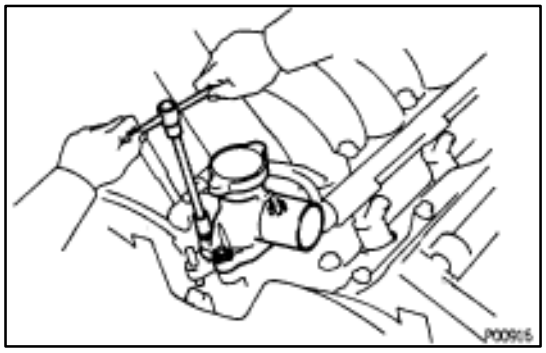
(c) Connect the No.2 fuel pipe with two new gaskets and the union bolt.
Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)



24. CONNECT COLD START INJECTOR CONNECTOR

25. CONNECT HOSES

(a) Brake booster vacuum hose
(b) PS air hose
(c) PCV hose
(d) EGR water by–pass hose

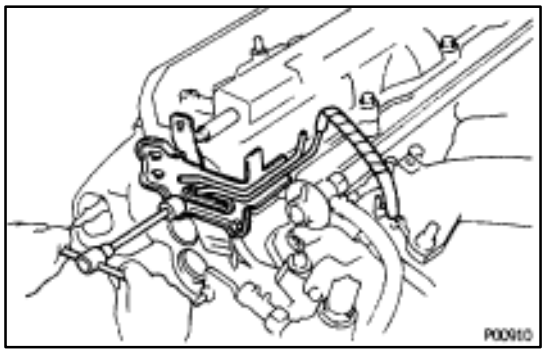


26. INSTALL WATER OUTLET

(a) Install a new gasket and the water outlet with the three bolts.
Torque: 8.3 N·m (85 kgf·cm, 73 ft·lbf)

(b) Connect the engine coolant reservoir hose.

(c) Connect the radiator upper hose.

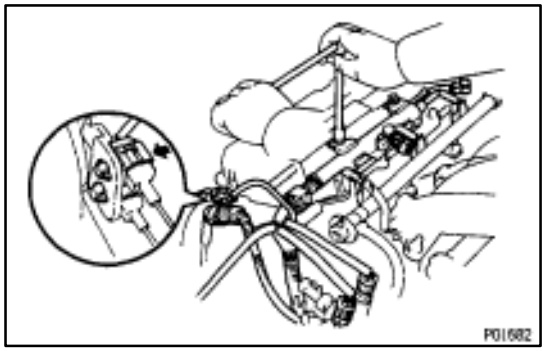


27. INSTALL CYLINDER HEAD REAR PLATE

(a) Install the rear plate with the bolt and nut.

(b) Connect the vacuum hose to the air intake chamber.

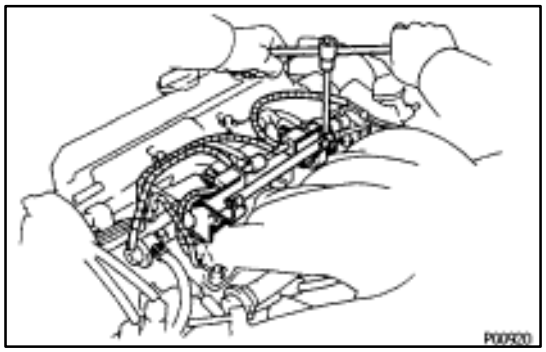
(c) Connect the two vacuum hoses to the vacuum tank.



28. CONNECT LH ENGINE WIRE HARNESS

(a) Connect the three clamps of the LH engine wire harness and install the wire harness with the two bolts.

(b) Connect the following connectors:
- (1) Three injector connectors
- (2) Cold start injector time switch connector
- (3) Engine coolant temperature sensor connector
- (4) Oxygen sensor connector
- (5) Knock sensor connector



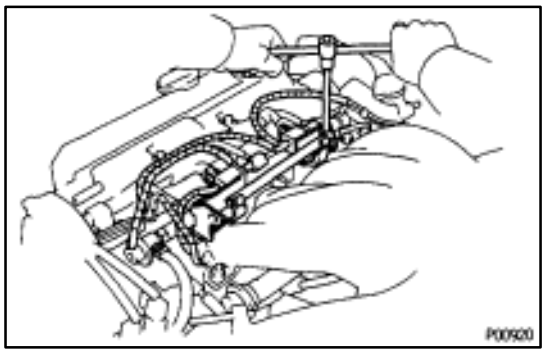
29. INSTALL EMISSION CONTROL VALVE SET

(a) Install the emission control valve set with the two bolts.
Torque: 8.3 N·m (85 kgf·cm, 73 in.·lbf)

(b) Connect the two VSV connectors.

(c) Connect the two vacuum hoses to the IACV VSV.

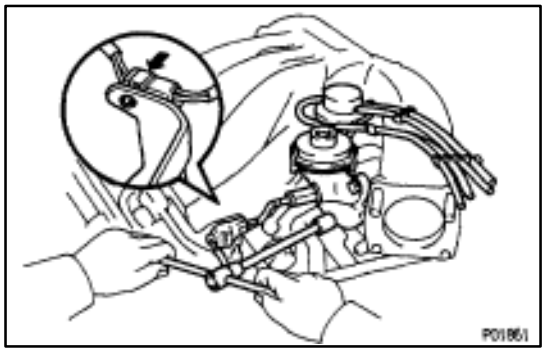
(d) Connect the two vacuum hoses to the fuel pressure control VSV.



30. INSTALL EGR PIPE

Install a new gasket, sleeve ball and the EGR pipe with the two bolts and union nut.
Bolt
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)
Union nut
Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)

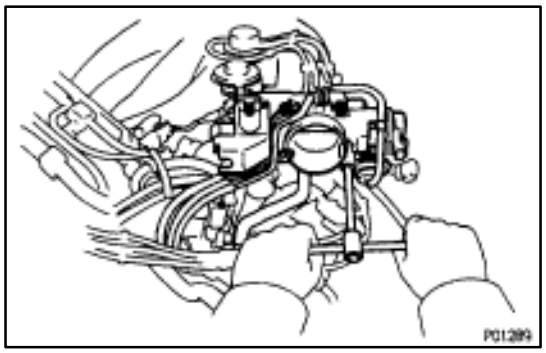
31. INSTALL DISTRIBUTOR (See IG section)



32. INSTALL EGR VALVE AND VACUUM MODULATOR

(a) Install a new gasket and the EGR valve and vacuum modulator with the two nuts.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

(b) (Calif. only)
Connect the EGR gas temp. sensor connector.

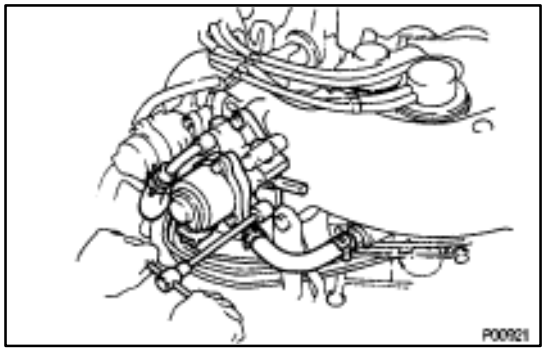


33. INSTALL THROTTLE BODY

(a) Install a new gasket and the throttle body with the two bolts and two nuts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

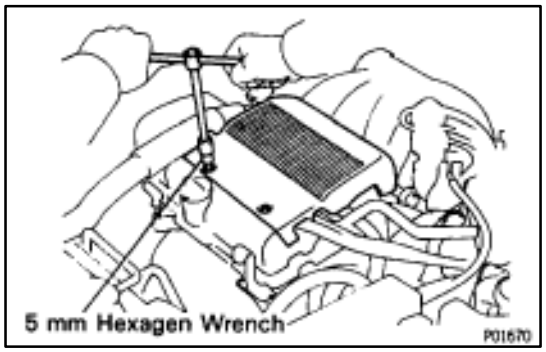
(b) Connect the throttle position sensor connector.

(c) Connect the following hoses:
- (1) Three TVV vacuum hoses
- (2) Four EGR vacuum hoses
- (3) Water by–pass hose



34. INSTALL IAC VALVE

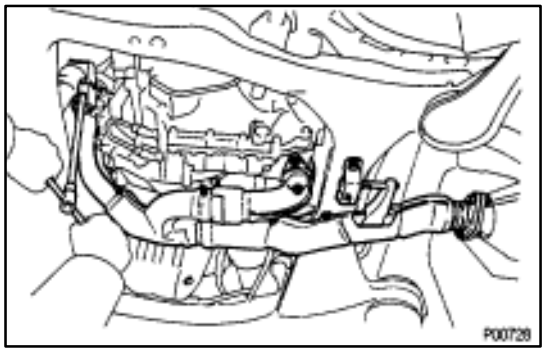
(a) Install a new gasket with the two bolts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)
(b) Connect the IAC valve connector.
(c) Connect the following connectors:
(1) PS idle–up air hose
(2) Water by–pass hoses
(3) No.5 air hose



35. INSTALL V–BANK COVER

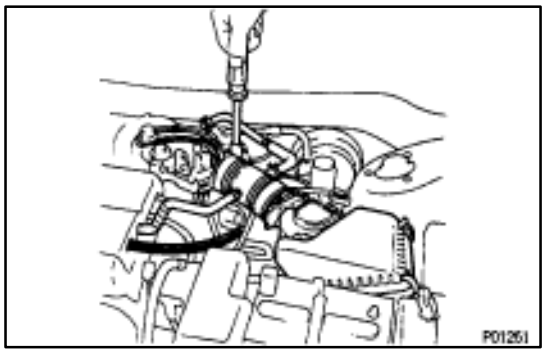
Using a 5 mm hexagon wrench, install the V–bank cover with the two nuts.

36. INSTALL GENERATOR
(See CH section)



37. CONNECT FRONT EXHAUST PIPE

(a) Place three new gaskets on the front pipe.
(b) Install the front pipe with the two bolts and six nuts.
Torque the nut.
To manifold
Torque: 62 N·m (630 kgf·cm, 46 ft·lbf)
To three–way catalytic converter
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)
(c) Connect the bracket with the two bolts.



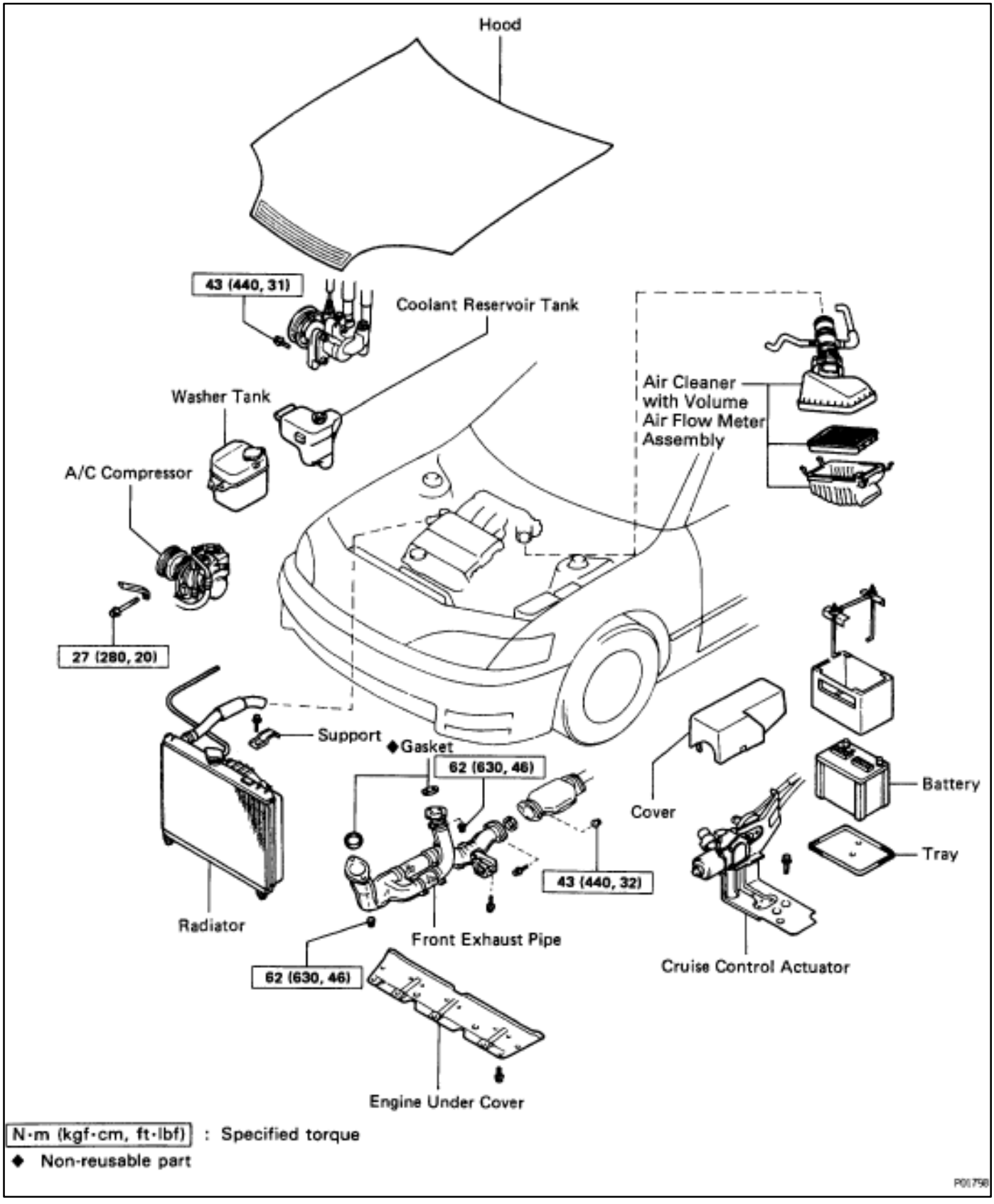
38. INSTALL AIR CLEANER CAP, VOLUME AIR FLOW METER AND AIR CLEANER HOSE

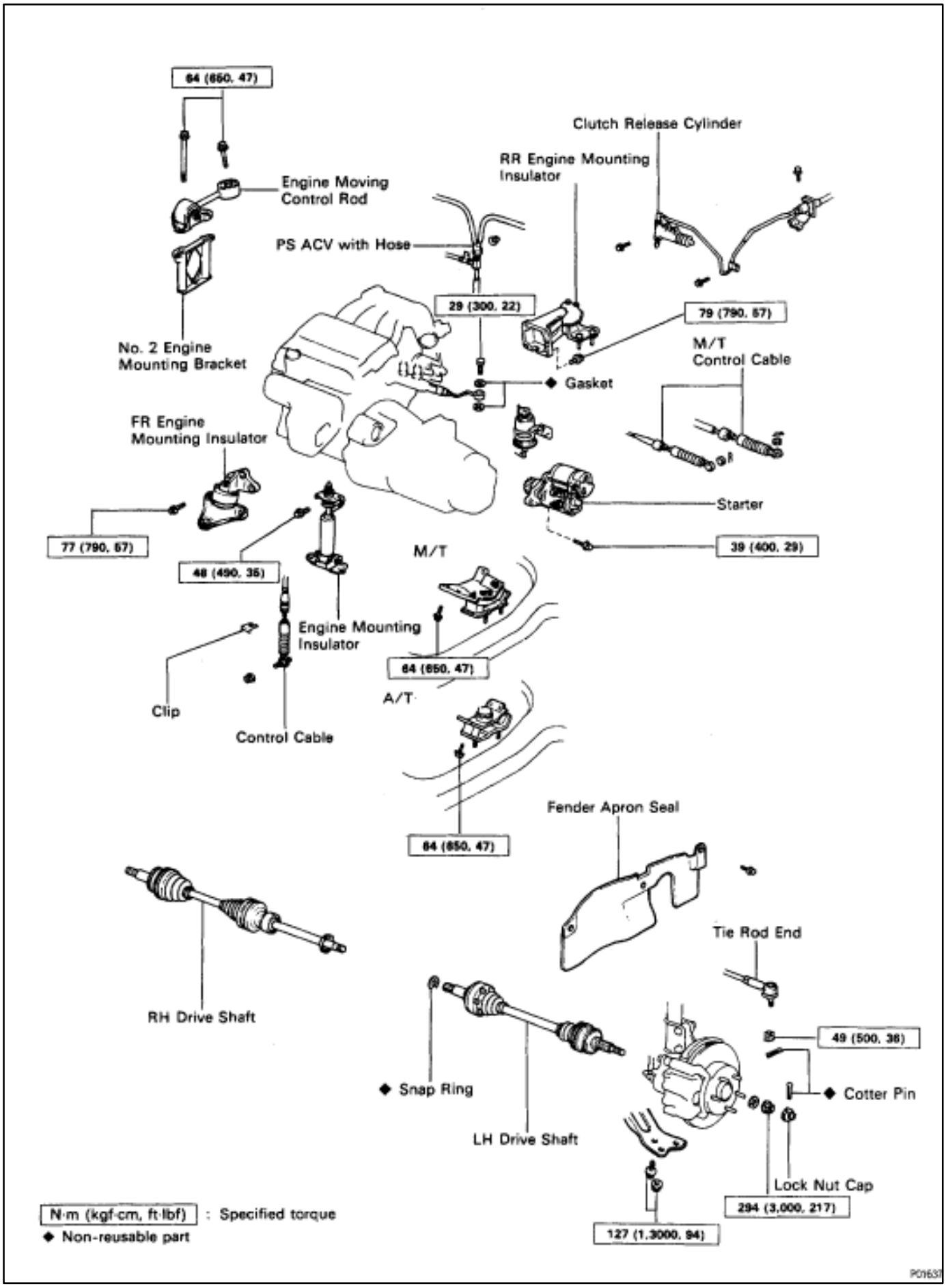
(a) Connect the air cleaner hose, and install the air cleaner cap and volume air flow meter with the four clips.
(b) Tighten the air cleaner hose clamp bolt.
(c) Connect the air hoses.
(d) Connect the coil cord clamp.
(e) Connect the volume air flow meter connector.

39. **(A/T)**
    CONNECT THROTTLE CABLE, AND ADJUST IT
40. **INSTALL ACCELERATOR CABLE, AND ADJUST IT**
41. **FILL WITH ENGINE COOLANT**
42. **CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**
43. **START ENGINE AND CHECK FOR LEAKS**
44. **ADJUST IGNITION TIMING (See IG section)**
    Ignition timing:
    10° BTDC @ idle
    (w/ Terminals TE1 and E1 connected)
45. **PERFORM ROAD TEST**
    Check for abnormal noise, shock, slippage, correct shift points and smooth operation.
46. **RECHECK ENGINE COOLANT LEVEL AND OIL LEVEL**

CYLINDER BLOCK
ENGINE REMOVAL

EG0F8–02




64 (650, 47)
Clutch Release Cylinder
RR Engine Mounting Insulator
Engine Moving Control Rod
PS ACV with Hose
29 (300, 22)
79 (790, 57)
No. 2 Engine Mounting Bracket
M/T Control Cable
◆ Gasket
FR Engine Mounting Insulator
Starter
77 (790, 57)
48 (490, 35)
39 (400, 29)
M/T
Engine Mounting Insulator
64 (650, 47)
Clip
A/T
Control Cable
64 (650, 47)
Fender Apron Seal
Tie Rod End
RH Drive Shaft
49 (500, 36)
◆ Snap Ring
◆ Cotter Pin
LH Drive Shaft
Lock Nut Cap
294 (3,000, 217)
127 (1,3000, 94)
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non-reusable part
P01637

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION (w/ Airbag): Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.

2. REMOVE BATTERY AND TRAY

3. REMOVE HOOD

4. REMOVE ENGINE UNDER COVER

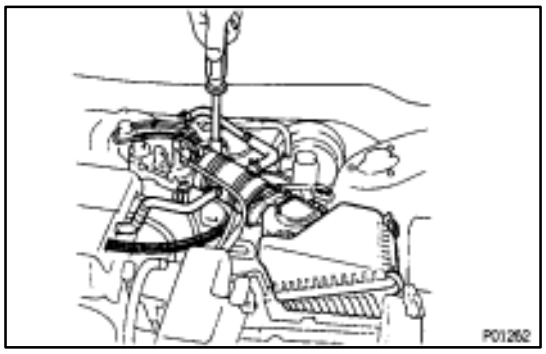
5. DRAIN ENGINE COOLANT

6. DRAIN ENGINE OIL

7. DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY

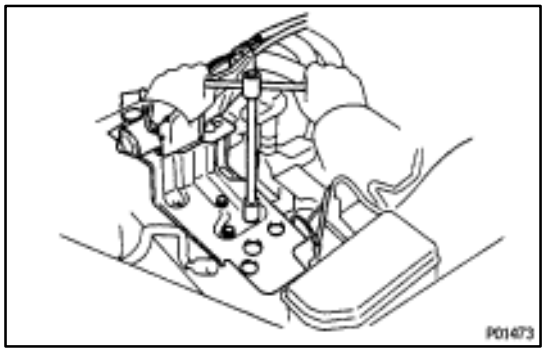
8. (A/T)

DISCONNECT THROTTLE CABLE FROM THROTTLE BODY



9. REMOVE AIR CLEANER ASSEMBLY, VOLUME AIR FLOW METER AND AIR CLEANER HOSE

(a) Disconnect the volume air flow meter connector.
(b) Disconnect the IAC valve and PCV hoses.
(c) Loosen the air cleaner hose clamp bolt.
(d) Disconnect the four air cleaner cap clips.
(e) Disconnect the air cleaner hose from the throttle body, and remove the air cleaner cap together with the volume air flow meter and air cleaner hose.
(f) Remove the air filter.



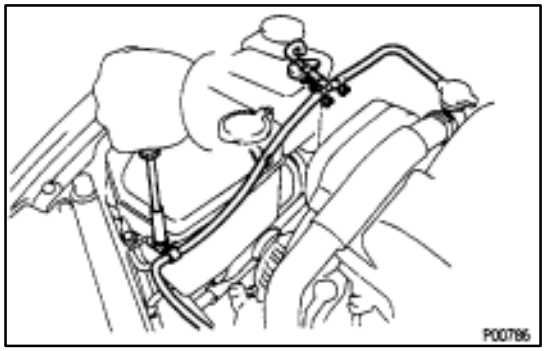
(g) Remove the three bolts and air cleaner case.

10. REMOVE CRUISE CONTROL ACTUATOR

(a) Remove the actuator cover.
(b) Disconnect the actuator connector.
(c) Remove the three bolts, and disconnect the actuator with the bracket.

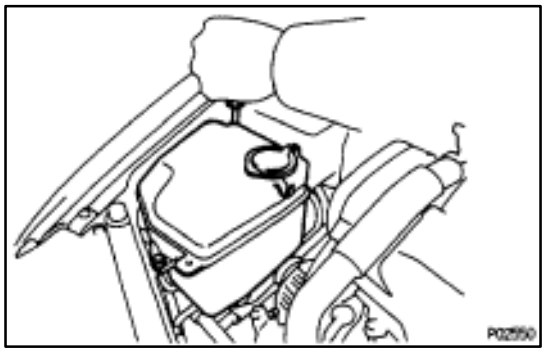
11. DISCONNECT GROUND STRAP FROM BATTERY CARRIER

12. REMOVE RADIATOR



13. DISCONNECT ENGINE COOLANT RESERVOIR HOSE

Remove the bolt and disconnect the reservoir hose.

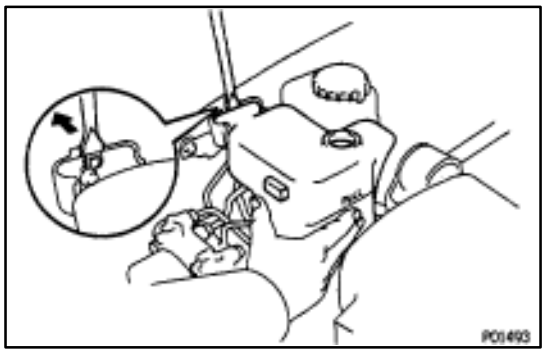


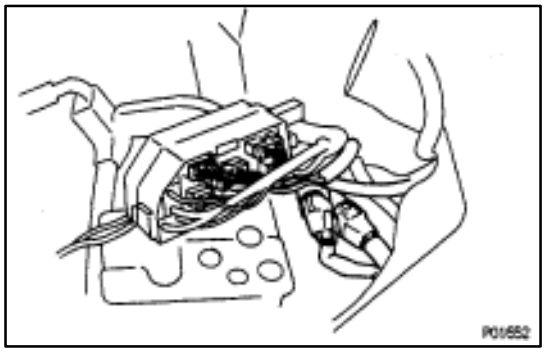
14. REMOVE WASHER TANK

(a) Remove the three washer tank mounting bolts.
(b) Disconnect the connector and hose, and remove the washer tank.

15. REMOVE ENGINE COOLANT RESERVOIR TANK

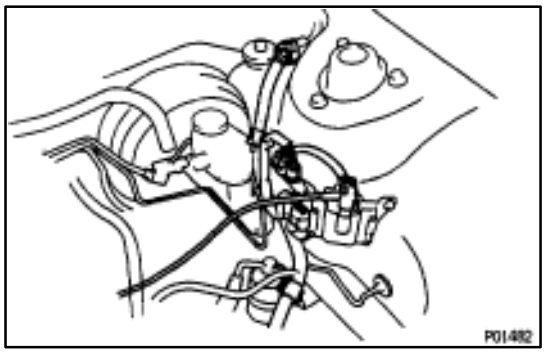
Using a screwdriver, remove the reservoir tank.



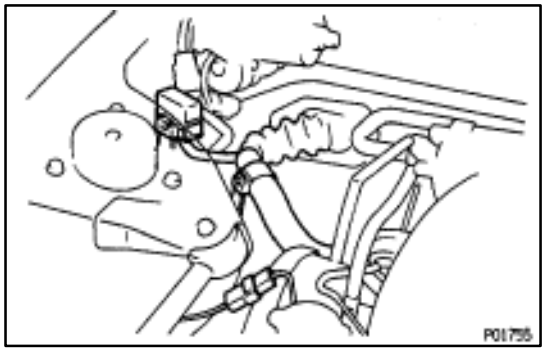


16. DISCONNECT WIRES AND CONNECTORS

(a) Remove the engine relay box, and disconnect the three connectors.
(b) Two connectors from LH fender apron

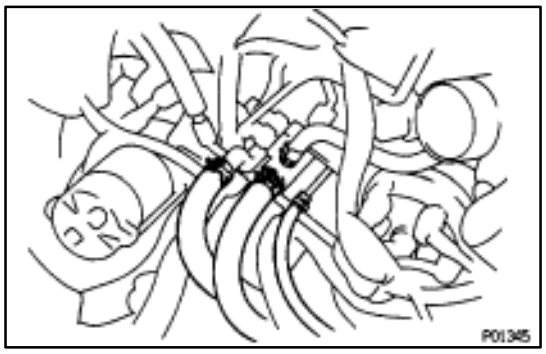


(c) Igniter connector
(d) Ignition coil connector
(e) High–tension cord from ignition coil
(f) Noise filter connector
(g) Connector from fender apron

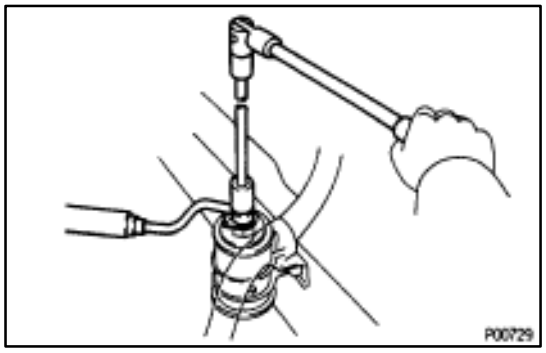


(h) Data link connector 1
(i) Ground strap from RH fender apron

(j) (M/T)
Back–up light switch connector
(k) (M/T)
Speed sensor connector

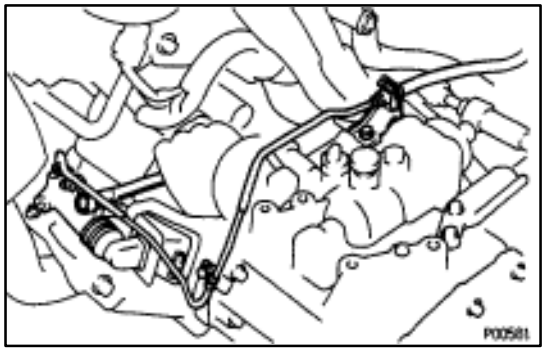


17. DISCONNECT HEATER HOSES
18. DISCONNECT FUEL RETURN HOSE
CAUTION: Catch leaking fuel in a container.

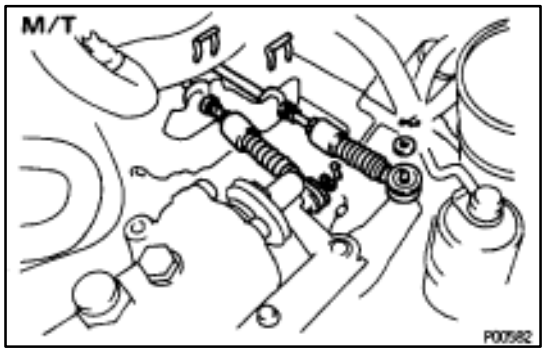


19. DISCONNECT FUEL INLET HOSE
CAUTION: Catch leaking fuel in a container.

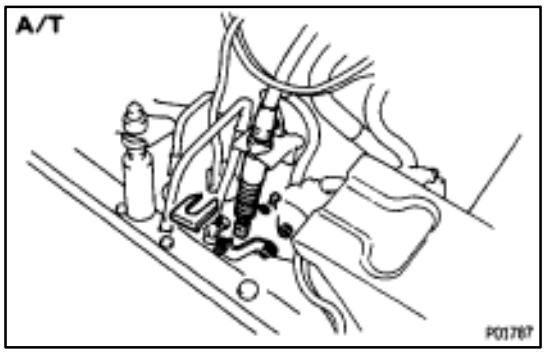
20. (M/T)
REMOVE STARTER



21. (M/T)
REMOVE CLUTCH RELEASE CYLINDER WITHOUT DISCONNECTING TUBE
Remove the four bolts, release cylinder and tube from the transaxle.

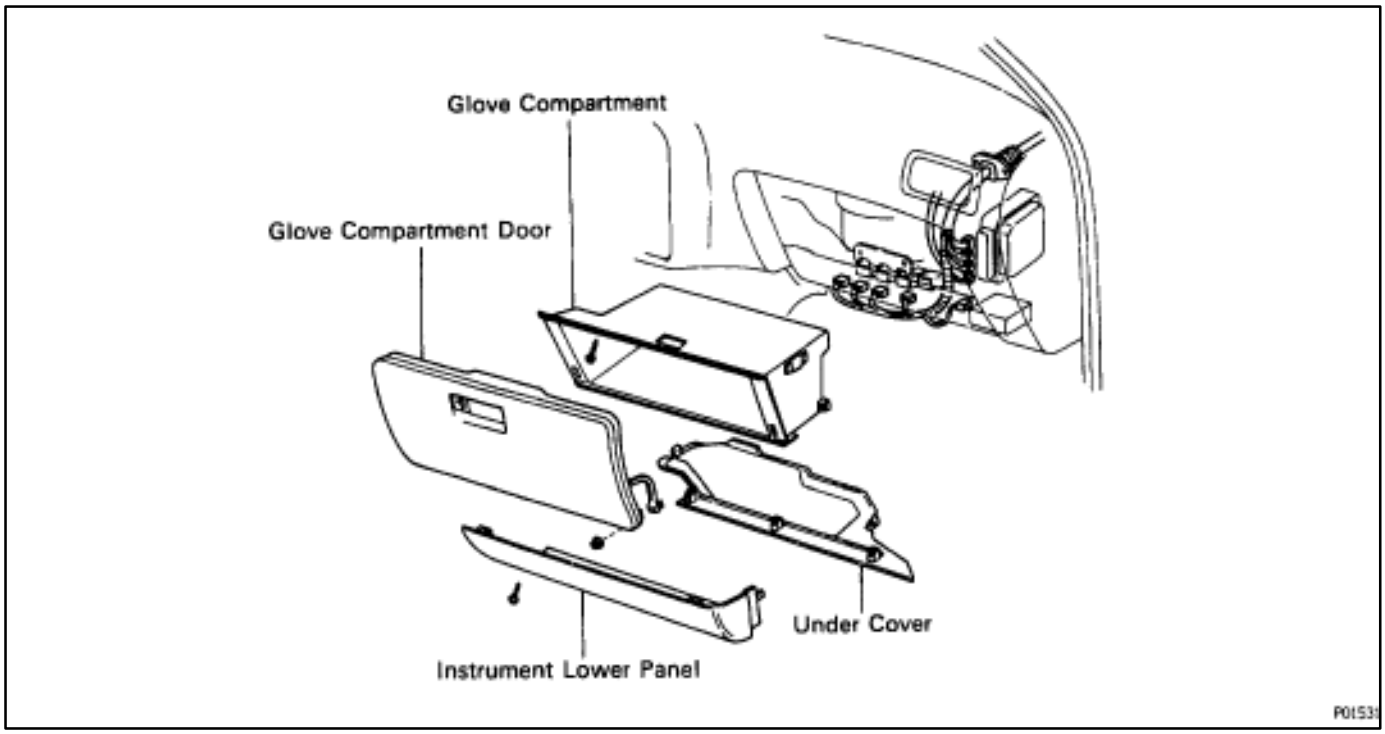


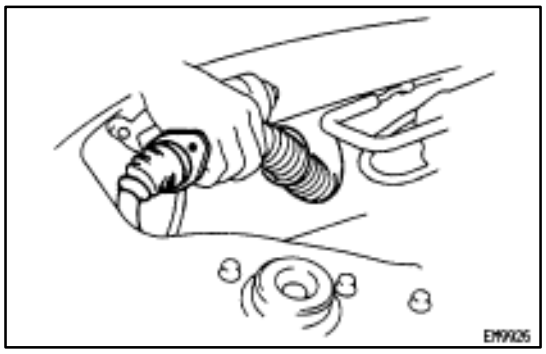
22. DISCONNECT TRANSAXLE CONTROL CABLE (S) FROM TRANSAXLE



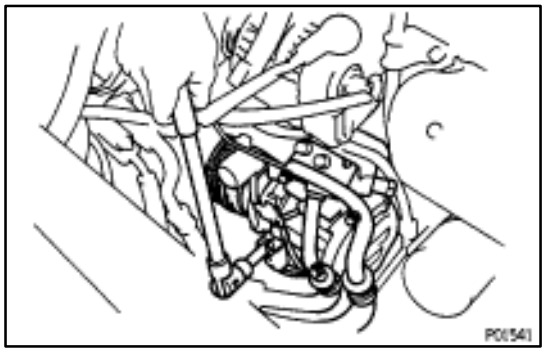
23. DISCONNECT VACUUM HOSES
(a) Brake booster vacuum hose from air intake chamber.
(b) Charcoal canister vacuum hose
(c) IACV vacuum tank vacuum hoses

24. DISCONNECT ENGINE WIRE FROM CABIN
(a) Remove the under cover.
(b) Remove the lower instrument panel.
(c) Remove the glove compartment door.
(d) Remove the glove compartment.
(e) Disconnect the following connectors:
  (1) Three engine control module (ECM) connectors
  (2) Five cowl wire connectors
  (3) Cooling fan ECU connector



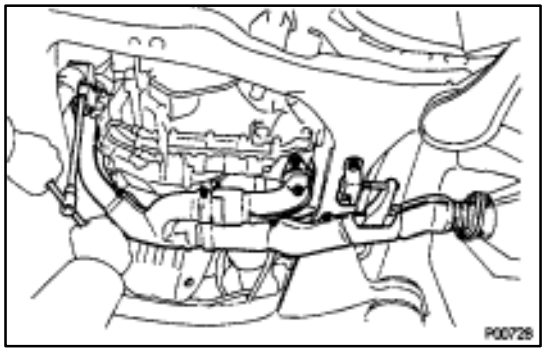


(f) Remove the two nuts, and pull out the engine wire from the cowl panel.



25. REMOVE A/C COMPRESSOR WITHOUT DISCONNECTING HOSES

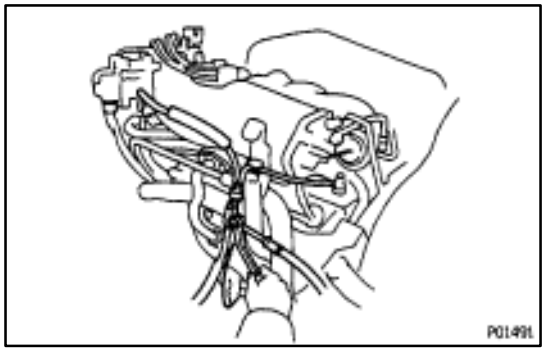
(a) Disconnect the A/C compressor connector.
(b) Remove the drive belt.
(c) Remove the five bolts, compressor stay and disconnect the A/C compressor.
HINT: Put aside the compressor, and suspend it to the radiator support with a string.



26. REMOVE FRONT EXHAUST PIPE

(a) Loosen the two bolts, and disconnect the bracket.
(b) Remove the two bolts and nuts holding the front exhaust pipe to the three–way catalytic converter.
(c) Remove the four nuts holding the exhaust pipe to the exhaust manifolds.
(d) Disconnect the front exhaust pipe and gaskets.

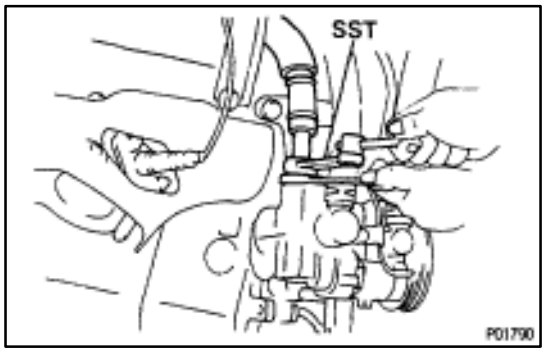
27. REMOVE DRIVE SHAFTS
(See SA section)



28. DISCONNECT PS ACV

(a) Disconnect the two PS air hoses.

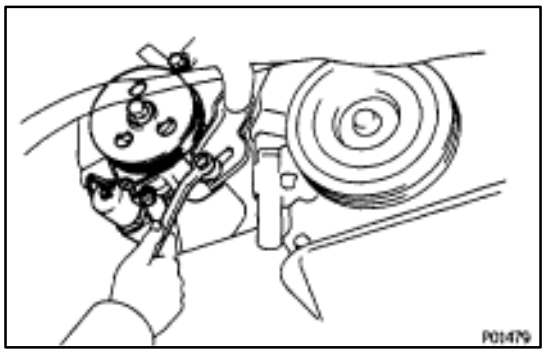
(b) Remove the nut and disconnect the PS ACV



29. DISCONNECT HYDRAULIC COOLING FAN PRESSURE HOSE

Using SST, disconnect the pressure hose.

SST 09631–22020

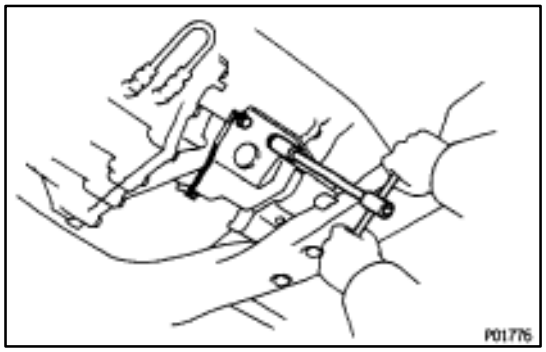


30. REMOVE PS PUMP WITHOUT DISCONNECTING HOSES

(a) Remove the PS drive belt.

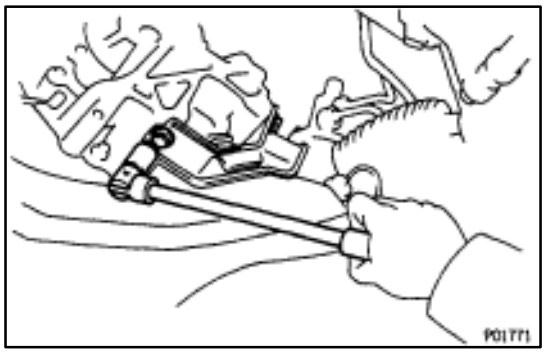
(b) Remove the two bolts, and disconnect the PS pump from the engine.

HINT: Put aside the pump and suspend it to the cowl with a string.



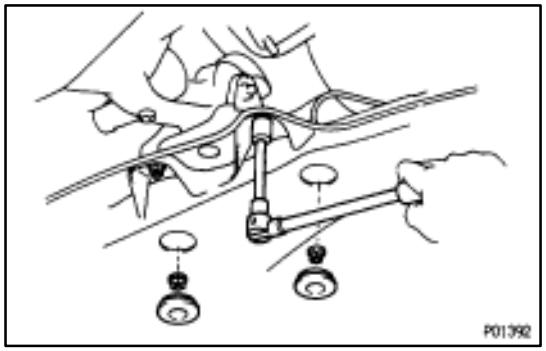
31. DISCONNECT LH ENGINE MOUNTING INSULATOR (M/T)

Remove the three bolts, and disconnect the mounting insulator.



(A/T)

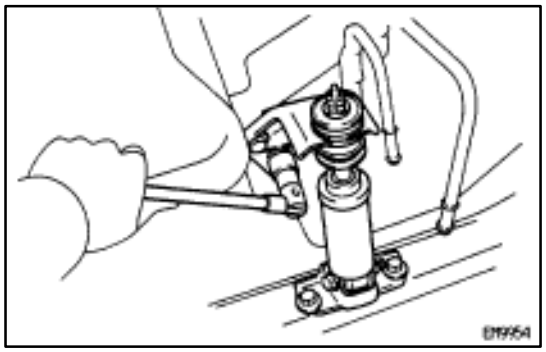
Remove the four bolts, and disconnect the mounting insulator.



32. DISCONNECT RR ENGINE MOUNTING INSULATOR

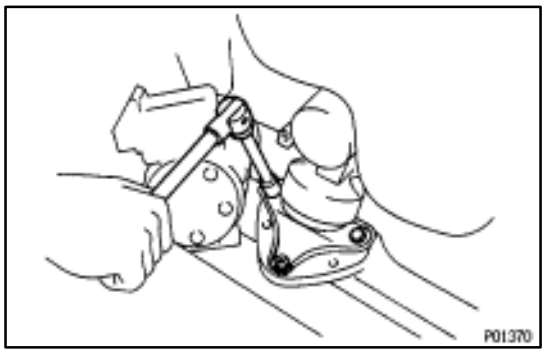
(a) Remove the hole plugs.

(b) Remove the four nuts, and disconnect the mounting insulator.



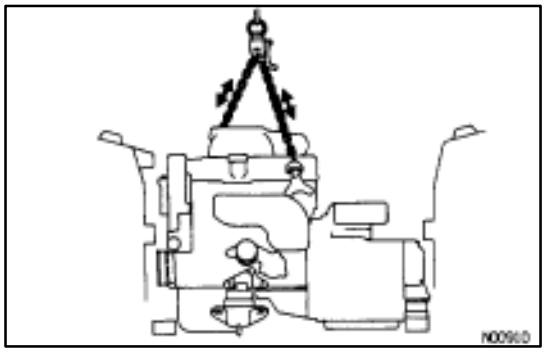
33. REMOVE ENGINE MOUNTING ABSORBER

Remove the four bolts and engine mounting absorber.

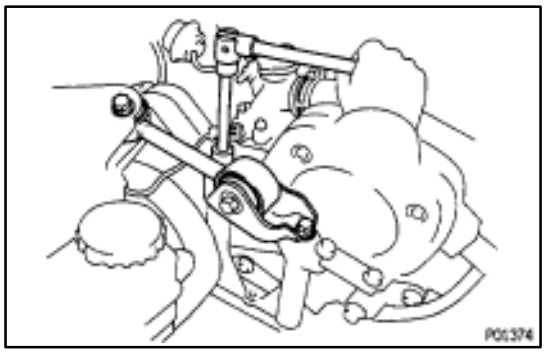


34. DISCONNECT FR ENGINE MOUNTING INSULATOR

Remove the three bolts, and disconnect the mounting insulator.

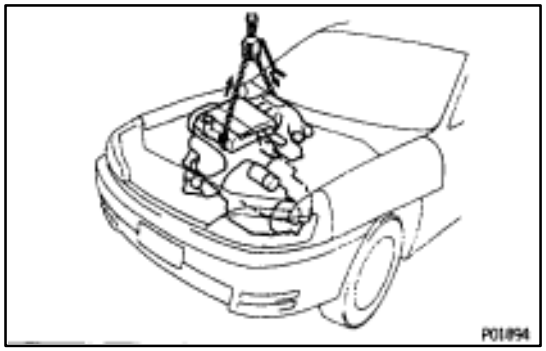


35. ATTACH ENGINE SLING DEVICE TO ENGINE HANGERS



36. REMOVE ENGINE MOVING CONTROL ROD

Remove the three bolts and control rod.



37. REMOVE ENGINE AND TRANSAXLE ASSEMBLY FROM VEHICLE

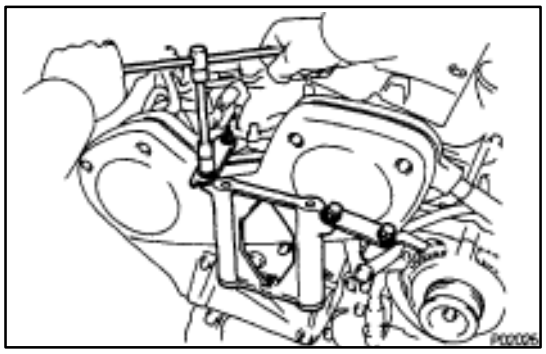
(a) Lift the engine out of the vehicle slowly and carefully.
NOTICE: Be careful not to hit the PS gear housing or park/neutral position switch (A/T).

(b) Make sure the engine is clear of all wiring, hoses and cables.

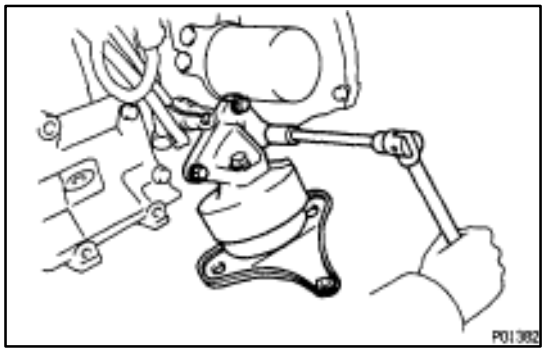
(c) Place the engine and transaxle assembly onto the stand.

38. (A/T)
REMOVE STARTER

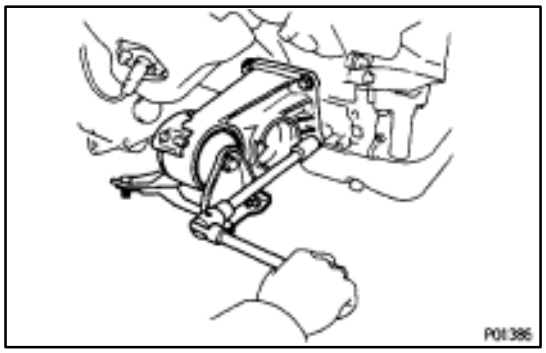
39. SEPARATE ENGINE AND TRANSAXLE
M/T (See MT section)
A/T (See AT section)



40. REMOVE NO.2 RH ENGINE MOUNTING BRACKET
Remove the three bolts and nut, RH engine mounting stays and engine mounting bracket.



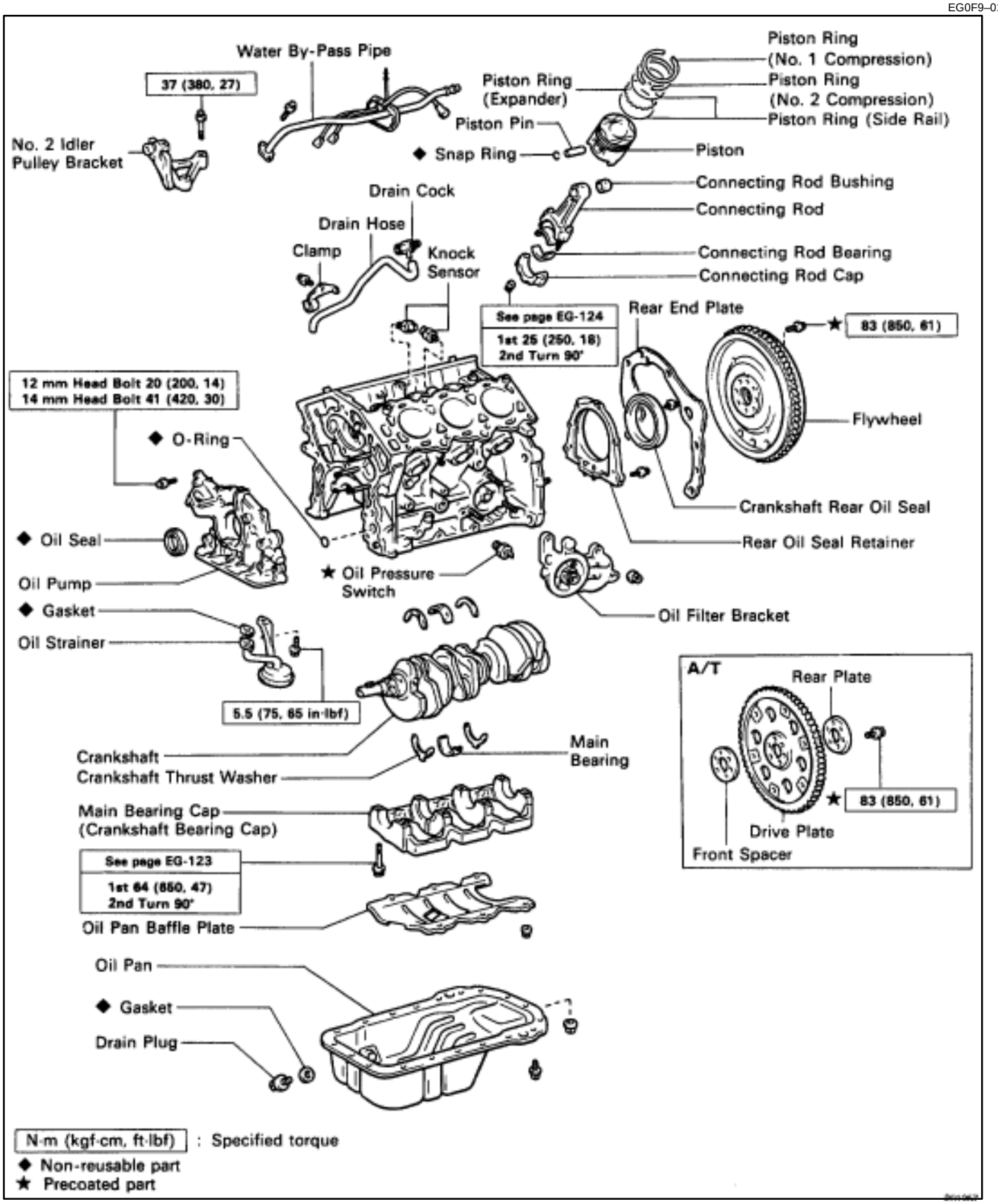
41. REMOVE FR ENGINE MOUNTING INSULATOR
Remove the three bolts and mounting insulator.



42. REMOVE RR ENGINE MOUNTING INSULATOR
Remove the four bolts and mounting insulator.

COMPONENTS

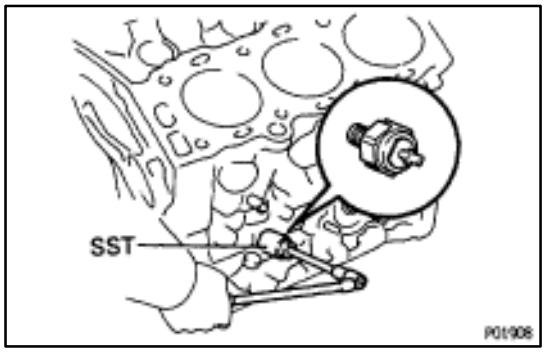
EG0F9–01



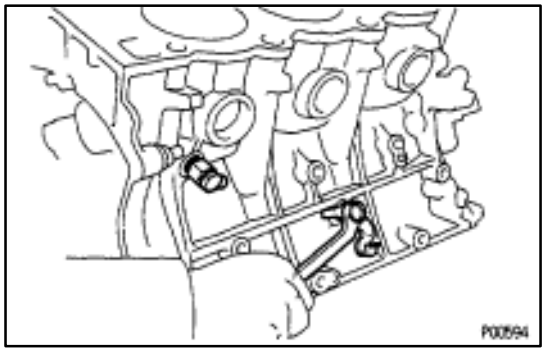
PREPARATION FOR DISASSEMBLY

EG0FA–01

1. **(M/T)**
   REMOVE CLUTCH COVER AND DISC
2. **(M/T)**
   REMOVE FLYWHEEL
3. **(A/T)**
   REMOVE DRIVE PLATE
4. **REMOVE REAR END PLATE**
   Remove the bolt and end plate.
5. **INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY**
6. **REMOVE DISTRIBUTOR (See IG section)**
7. **REMOVE TIMING BELT AND PULLEYS**
   (See page EG–29)
8. **REMOVE CYLINDER HEADS**
   (See page EG–47)
9. **REMOVE WATER PUMP (See page EG–246)**
10. **REMOVE OIL PAN AND OIL PUMP**
    (See page EG–294)
11. **REMOVE OIL FILTER AND FILTER BRACKET**
    (See page EG–307)

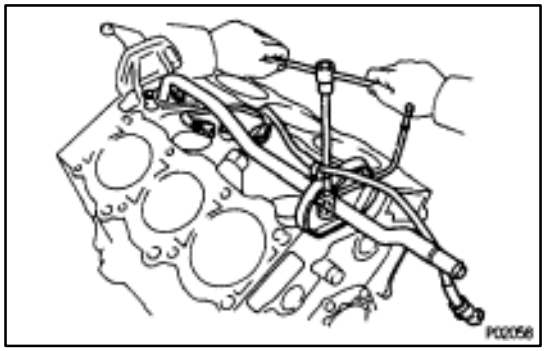


12. **REMOVE OIL PRESSURE SWITCH**
    Using SST, remove the oil pressure switch.
    SST 09816–30010



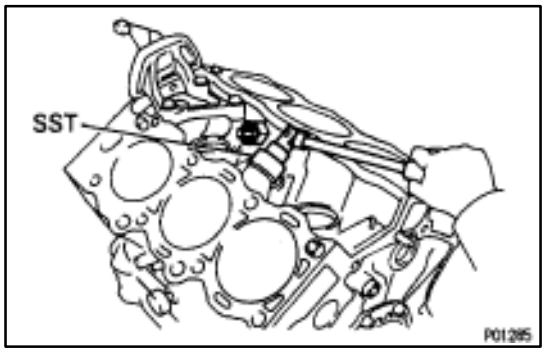
13. **REMOVE ENGINE COOLANT DRAIN COCK**

(a) Remove the water drain hose.
(b) Remove the bolt and hose clamp.
(c) Remove the drain cock.



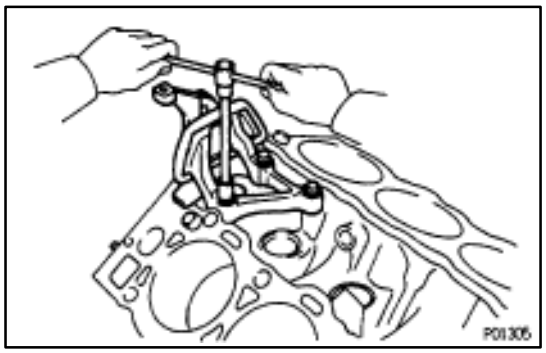
14. REMOVE WATER BY–PASS PIPE

(a) Disconnect the two knock sensor connectors.
(b) Remove the two bolts, nut and water by–pass pipe.



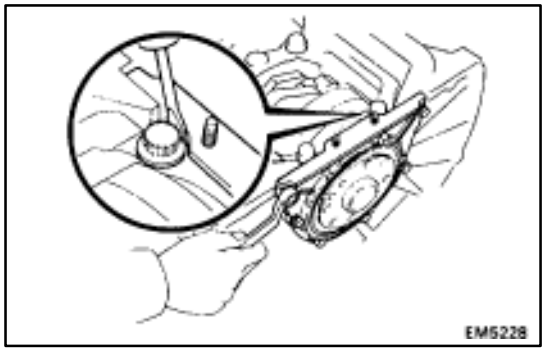
15. REMOVE KNOCK SENSORS

Using SST, remove the two knock sensors.
SST 09816–30010



16. REMOVE NO.2 IDLER PULLEY BRACKET

Remove the three bolts and idler pulley bracket.



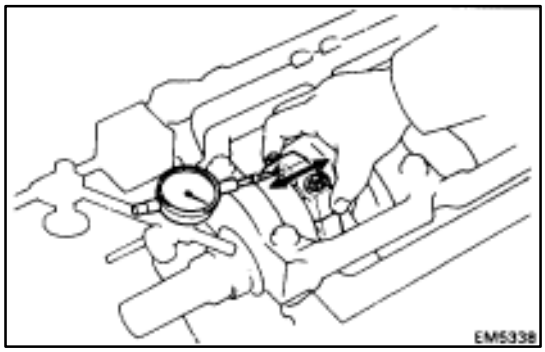
CYLINDER BLOCK DISASSEMBLY

EG0FB–01

(See page EG–98)

1. REMOVE REAR OIL SEAL RETAINER

Remove the six bolts and retainer.



2. CHECK CONNECTING ROD THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while moving the connecting rod back and forth.

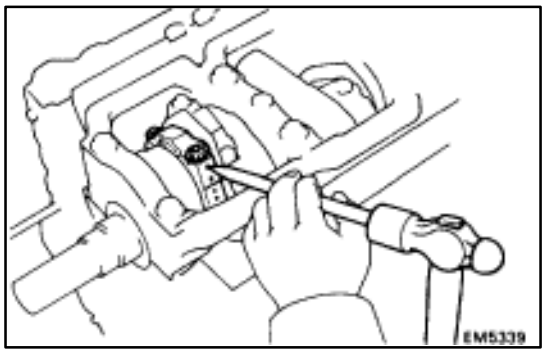
Standard thrust clearance:

0.150–0.330 mm (0.0059–0.0130 in.)

Maximum thrust clearance:

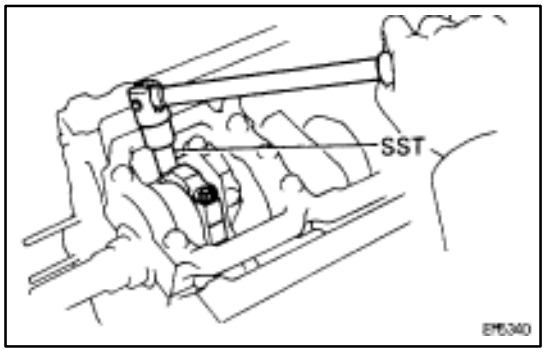
0.38 mm (0.0150 in.)

If the thrust clearance is greater than maximum, replace the connecting rod assembly. If necessary, replace the crankshaft.

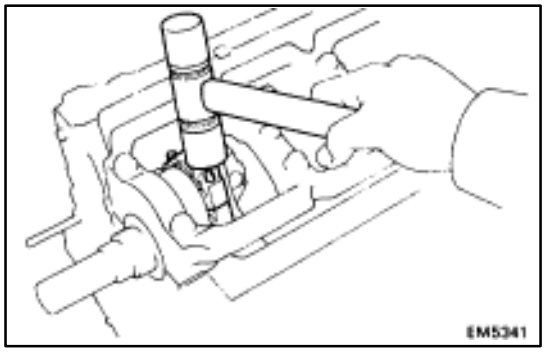


3. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

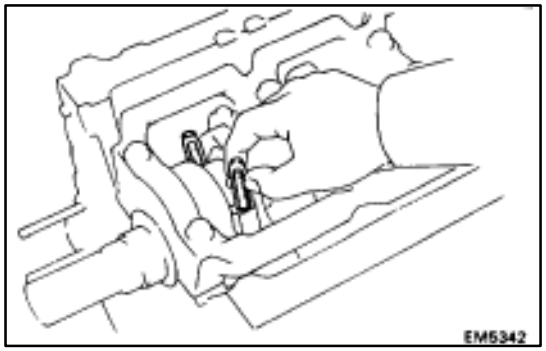
(a) Using a punch or numbering stamp, mark the connecting rod and cap to ensure correct reassembly.



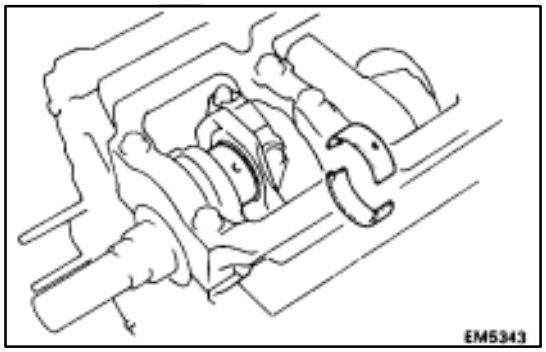
(b) Using SST, remove the connecting rod cap nuts.
SST 09011–38121



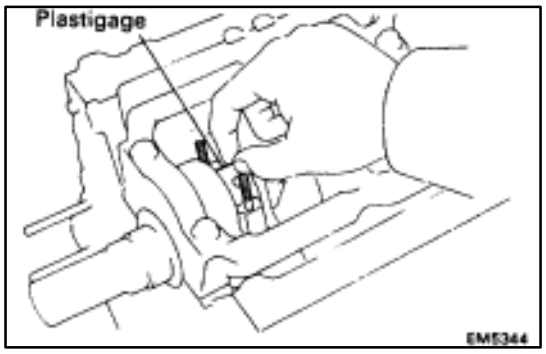
(c) Using a plastic–faced hammer, lightly tap the connecting rod bolts and lift off the connecting rod cap.
HINT: Keep the lower bearing inserted with the connecting cap.



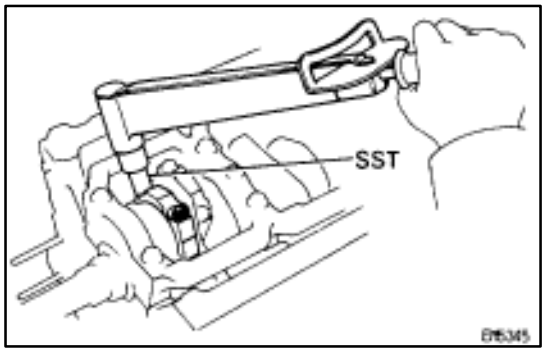
(d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



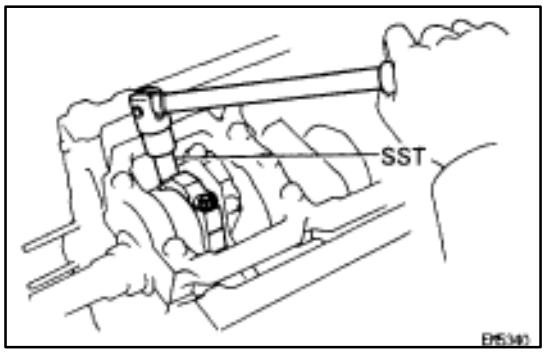
(e) Clean the crank pin and bearing.
(f) Check the crank pin and bearing for pitting and scratches.
If the crank pin or bearing is damaged, replace the bearings.
If necessary, grind or replace the crankshaft.



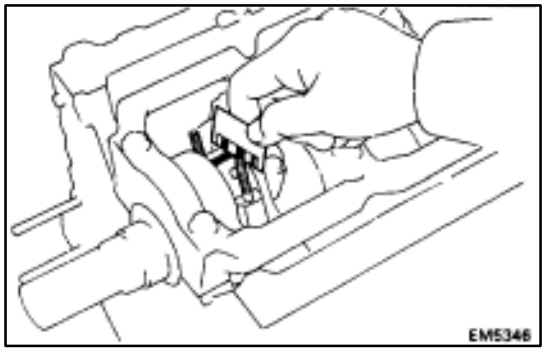
(g) Lay s strip of Plastigage across the crank pin.



(h) Install the connecting rod cap with the two nuts.
(See step 6 on page EG–124)
1st
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)
2nd Turn 90°
NOTICE: Do not turn the crankshaft.



(i) Remove the two nuts and connecting rod cap.
(See procedure (b) and (c) above)



(j) Measure the Plastigage at its widest point.

Standard oil clearance:

STD

0.028–0.065 mm (0.0011–0.0026 in.)

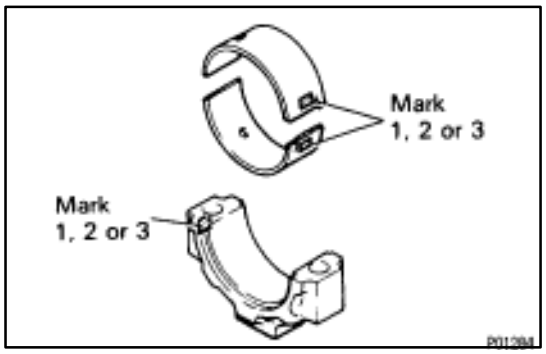
U/S 0.25

0.027–0.080 mm (0.0011–0.0031 in.)

Maximum oil clearance:

0.08 mm (0.0031 in.)

If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.



HINT: If using a standard bearing, replace with one having the same number marked on the connecting rod cap. There are three sizes of standard bearings, marked ”1”, ”2” and ”3” accordingly.

(Reference)

Standard sized bearing center wall thickness:

Mark ”1”

1.484–1.488 mm (0.0584–0.0586 in.)

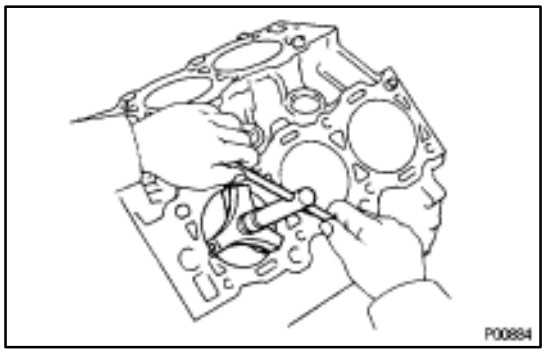
Mark ”2”

1.488–1.492 mm (0.0586–0.0587 in.)

Mark ”3”

1.492–1.496 mm (0.0587–0.0589 in.)

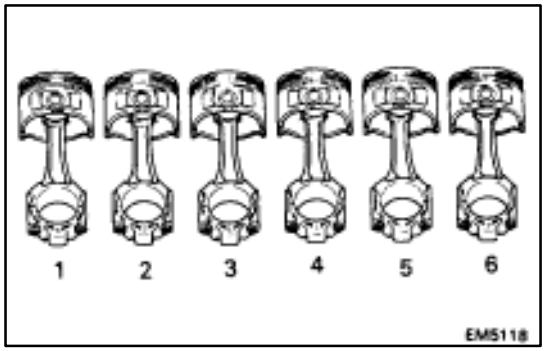
(k) Completely remove the Plastigage.



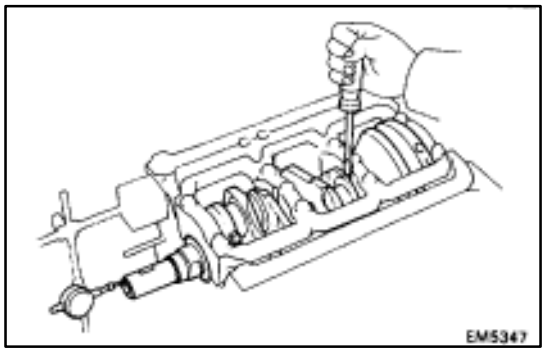
4. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

(a) Using a ridge reamer, remove the all carbon from the top of the cylinder.

(b) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.



HINT:
- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in correct order.



5. CHECK CRANKSHAFT THRUST CLEARANCE

Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard thrust clearance:

0.020–0.220 mm (0.0008–0.0087 in.)

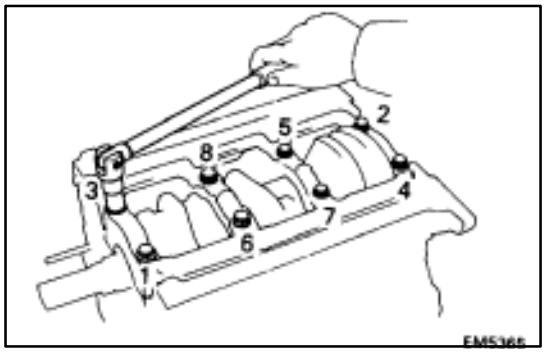
Maximum thrust clearance:

0.30 mm (0.0118 in.)

If the thrust clearance is greater than maximum, replace the thrust washers as a set.

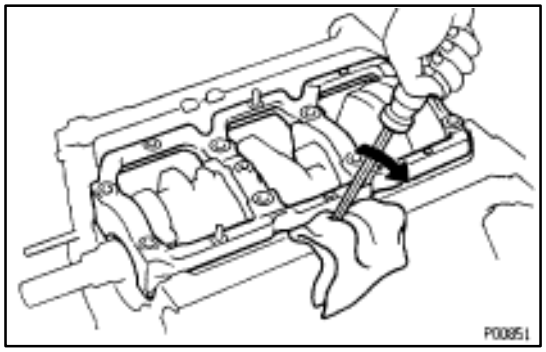
Thrust washer thickness:

2.440–2.490 mm (0.0961–0.0980 in.)



6. REMOVE MAIN BEARING CAP AND CHECK OIL CLEARANCE

(a) Uniformly loosen and remove the main bearing cap bolts in several passes, in the sequence shown.

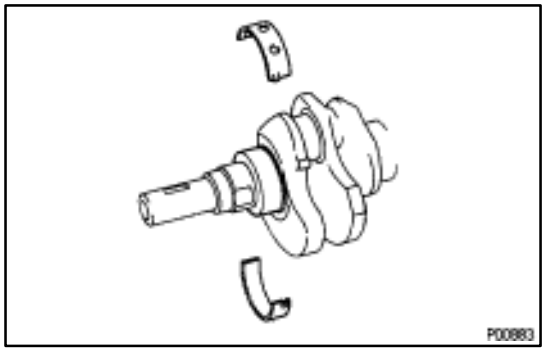


(b) Using a screwdriver, pry up the main bearing cap, and remove the main bearing cap, lower main bearings and lower thrust washers (No.2 journal position of main bearing cap only).

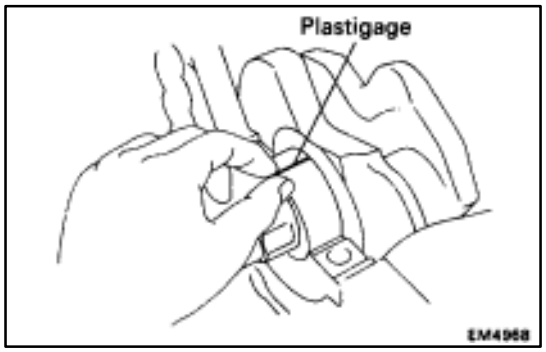
HINT: Keep the lower main bearings and lower thrust washers together with the main bearing cap.

(c) Lift out the crankshaft.

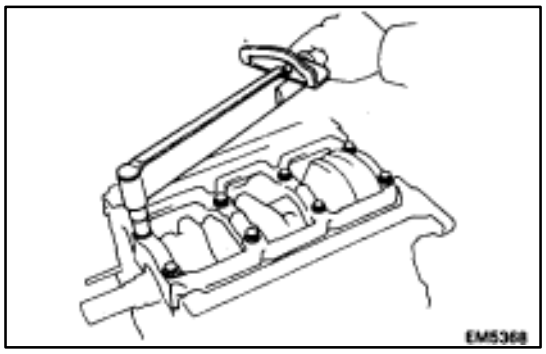
HINT: Keep the upper main bearings and upper thrust washers together with the cylinder block.



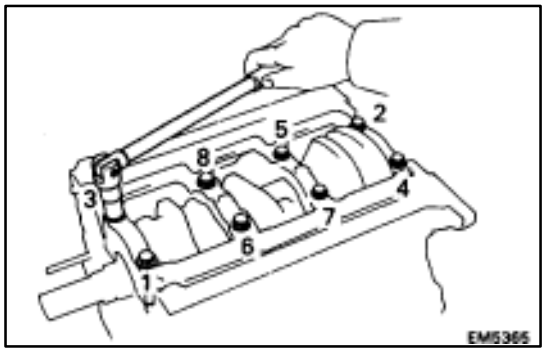
(d) Clean each main journal and bearing.
(e) Check each main journal and bearing for pitting and scratches.
If the journal or bearing is damaged, replace the bearings.
If necessary, grind or replace the crankshaft.



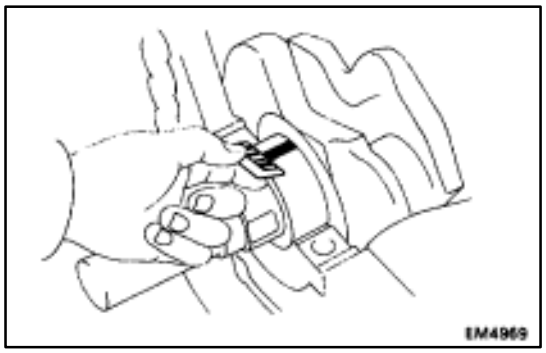
(f) Place the crankshaft on the cylinder block.
(g) Lay a strip of Plastigage across each journal.



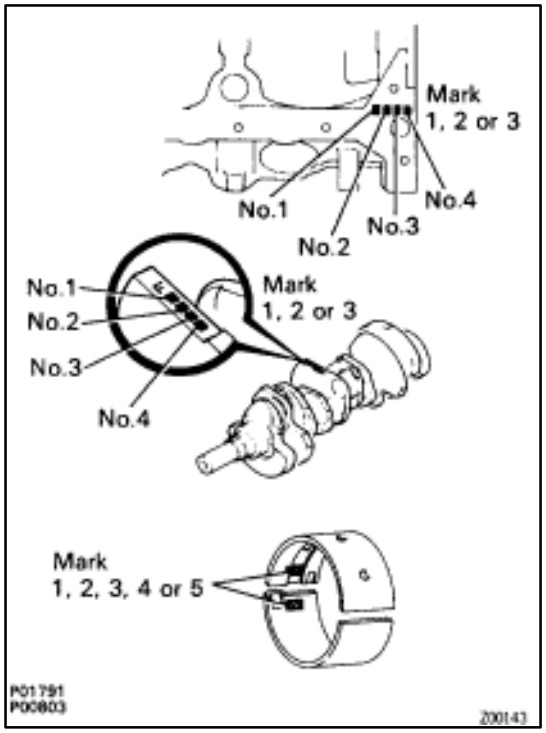
(h) Install the main bearing cap with the eight bolts.
(See step 4 on page EG–122)
1st
Torque: 61 N·m (625 kgf·cm, 45 ft·lbf)
2nd Turn 90°
NOTICE: Do not turn the crankshaft.



(i) Remove the eight bolts and main bearing cap.
(See procedure (a) and (b) above)



(j) Measure the Plastigage at its widest point.
Standard clearance:
STD
0.029–0.056 mm (0.0011–0.0022 in.)
U/S 0.25
0.028–0.080 mm (0.0011–0.0031 in.)
Maximum clearance:
0.08 mm (0.0031 in.)



HINT: If replacing the cylinder block subassembly, the bearing standard clearance will be:
0.031–0.067 mm (0.0012–0.0026 in.)
If the oil clearance is greater than maximum, replace the bearings. If necessary, grind or replace the crankshaft.
HINT: If using a standard bearing, replace with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then selecting the bearing with the same number as the total. There are five sizes of standard bearings, marked ”1”, ”2”, ”3”, ”4” and ”5” accordingly.

	Number marked								
Cylinder block	1			2			3		
Crankshaft	0	1	2	0	1	2	0	1	2
Use bearing	1	2	3	2	3	4	3	4	5

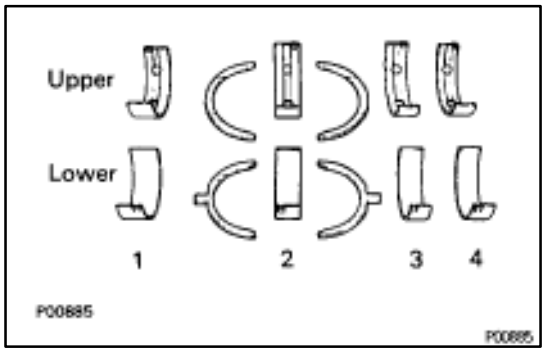
EXAMPLE: Cylinder block ”2” + Crankshaft ”1” = Total number 3 (Use bearing ”3”)

(Reference)
Cylinder block main journal bore diameter:
Mark ”1”
68.010–68.016 mm (2.6776–2.6778 in.)
Mark ”2”
68.016–68.022 mm (2.6778–2.6780 in.)
Mark ”3”
68.022–68.028 mm (2.6780–2.6783 in.)
Crankshaft journal diameter:
Mark ”0”
63.996–64.000 mm (2.5195–2.5197 in.)
Mark ”1”
63.990–63.996 mm (2.5193–2.5195 in.)
Mark ”2”
63.985–63.990 mm (2.5191–2.5193 in.)
Standard sized bearing center wall thickness:
Mark ”1”
1.989–1.992 mm (0.0783–0.0784 in.)
Mark ”2”
1.992–1.995 mm (0.0784–0.0785 in.)
Mark ”3”
1.995–1.998 mm (0.0785–0.0787 in.)
Mark ”4”
1.998–2.001 mm (0.0787–0.0788 in.)

Mark ”5”

2.001–2.004 mm (0.0788–0.0789 in.)

(k) Completely remove the Plastigage.



7. REMOVE CRANKSHAFT

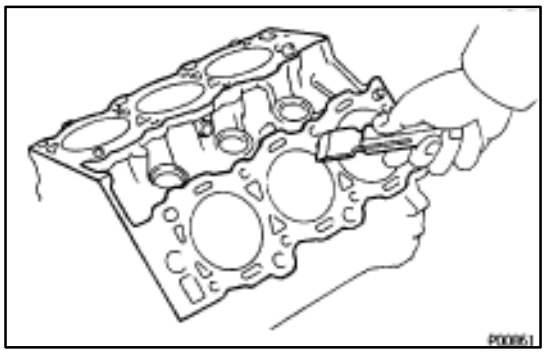
(a) Lift out the crankshaft.

(b) Remove the upper main bearings and upper thrust washers from cylinder block.

HINT: Arrange the main bearings and thrust washers in correct order.

CYLINDER BLOCK INSPECTION

EG0FC–01

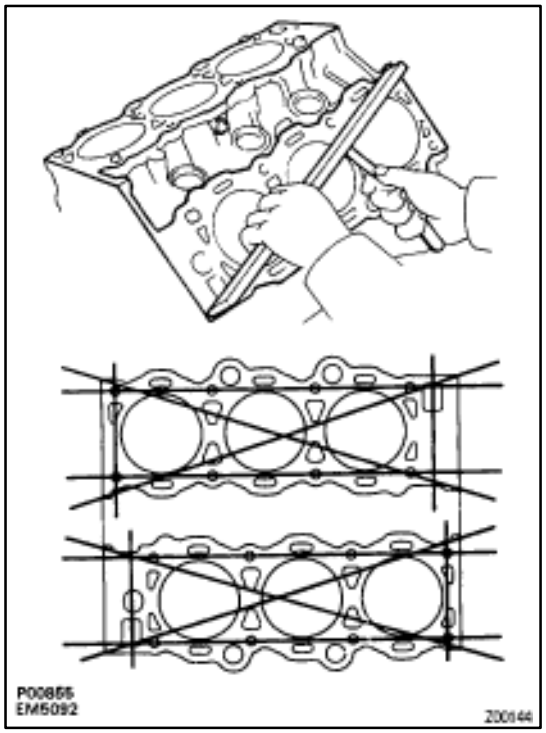


1. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all the gasket material from the top surfaces of the cylinder block.

2. CLEAN CYLINDER BLOCK

Using a soft brush and solvent, thoroughly clean the cylinder block.



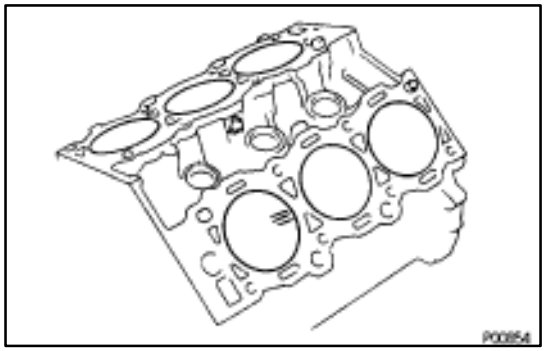
3. INSPECT TOP SURFACES OF CYLINDER BLOCK FOR FLATNESS

Using precision straight edge and feeler gauge, measure the top surfaces of the cylinder block for warpage.

Maximum warpage:

0.05 mm (0.0020 in.)

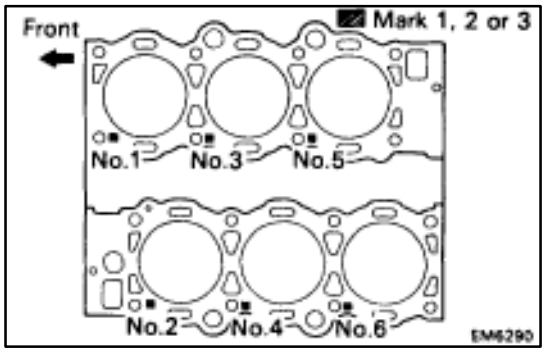
If warpage is greater than maximum, replace the cylinder block.



4. INSPECT CYLINDER FOR VERTICAL SCRATCHES

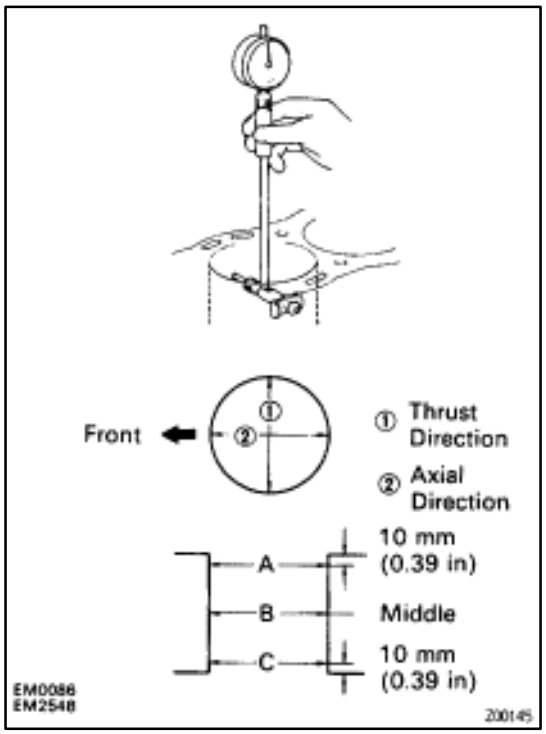
Visually check the cylinder for vertical scratches.

If deep scratches are present, rebore all the six cylinders or replace the cylinder block.



5. INSPECT CYLINDER BORE DIAMETER

HINT: There are three sizes of the standard cylinder bore diameter, marked ”1”, ”2” and ”3” accordingly, The mark is stamped on the top of the cylinder block.



Using a cylinder gauge, measure the cylinder bore diameter at positions A, B and C in the thrust and axial directions.

Standard diameter:

STD

Mark ”1”

87.500–87.510 mm (3.4449–3.4453 in.)

Mark ”2”

87.510–87.520 mm (3.4453–3.4457 in.)

Mark ”3”

87.520–87.530 mm (3.4457–3.4461 in.)

Maximum diameter:

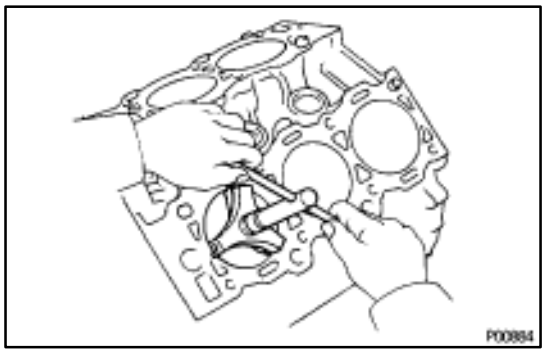
STD

87.73 mm (3.4539 in.)

O/S 0.50

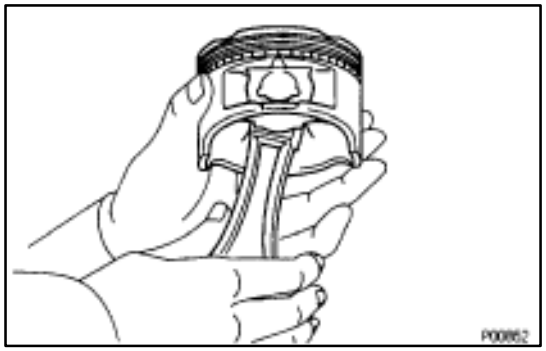
88.23 mm (3.4736 in.)

If the diameter is greater than maximum, rebore all the six cylinders or replace the cylinder block.



6. REMOVE CYLINDER RIDGE

If the wear is less than 0.2 mm (0.008 in.), using a ridge reamer, grind the top of the cylinder.

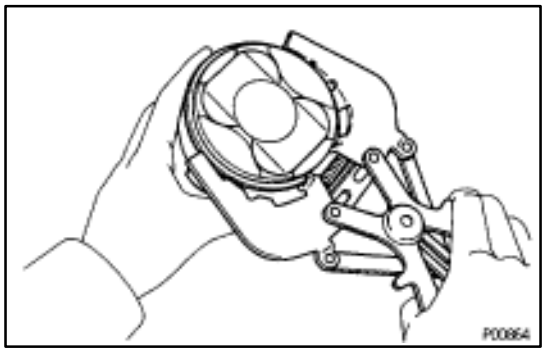


PISTON AND CONNECTING ROD ASSY DISASSEMBLY

EG0FD–01

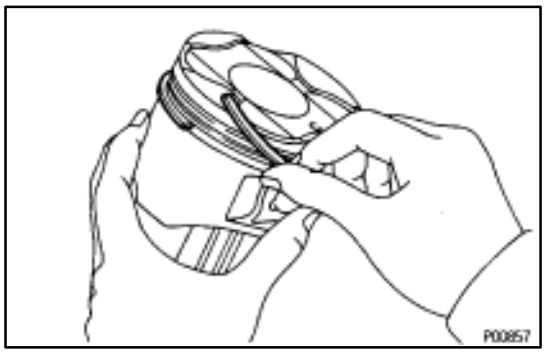
1. CHECK FIT BETWEEN PISTON AND PISTON PIN

Try to move the piston back and forth on the piston pin.
If any movement is felt, replace the piston and pin as a set.

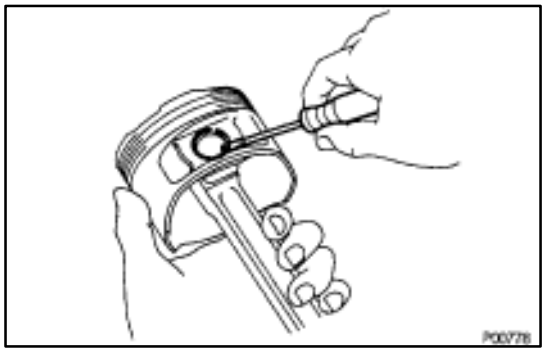


2. REMOVE PISTON RINGS

(a) Using a piston ring expander, remove the two compression rings.

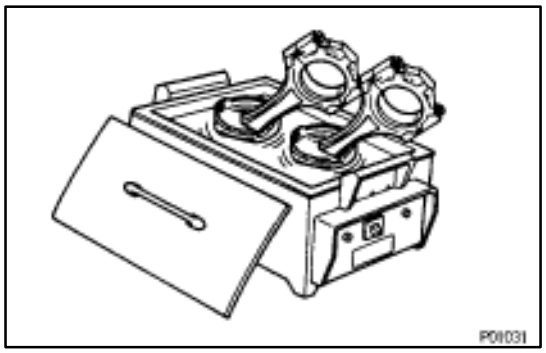


(b) Remove the two side rails and oil ring expander by hand.
HINT: Arrange the rings in correct order only.

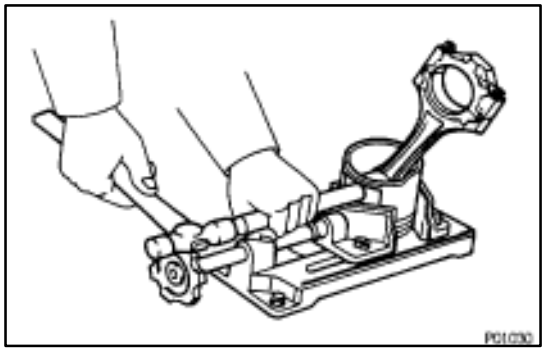


3. DISCONNECT CONNECTING ROD FROM PISTON

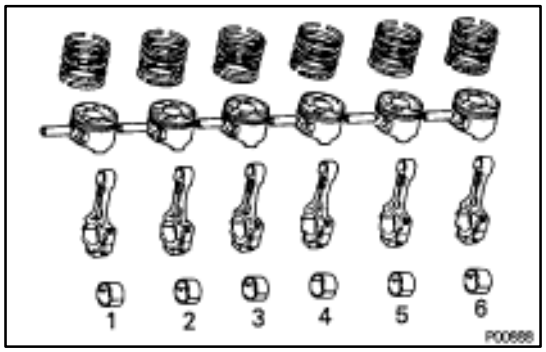
(a) Using a small screwdriver, pry off the snap ring from the piston.



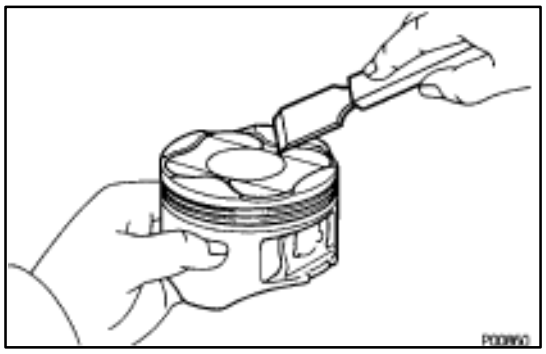
(b) Gradually heat the piston to approx. 605C (1405F).



(c) Using a plastic–faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.



HINT:
- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in correct order.

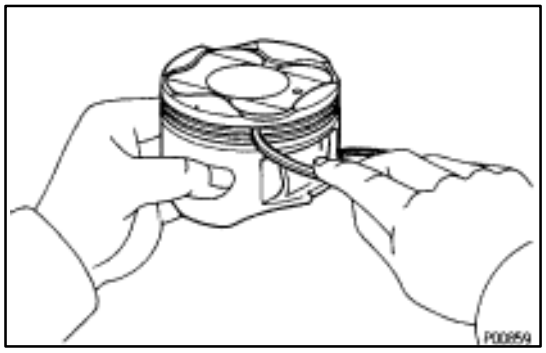


PISTON AND CONNECTING ROD INSPECTION

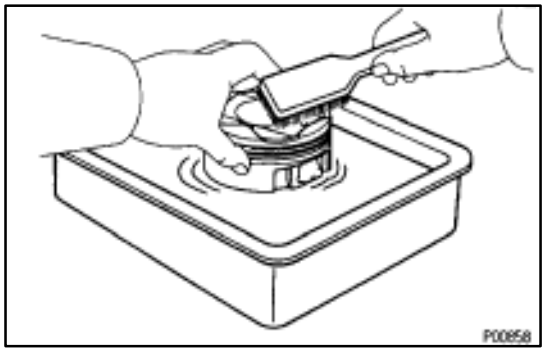
EG0FE–01

1. CLEAN PISTON

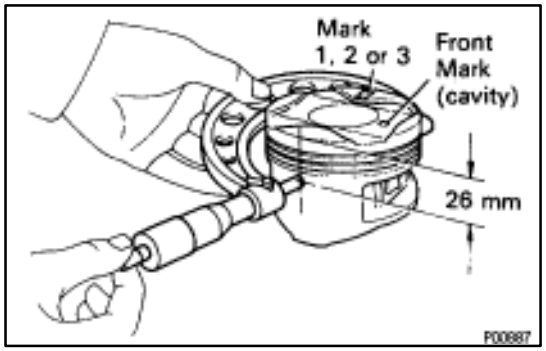
(a) Using a gasket scraper, remove the carbon from the piston top.



(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



(c) Using solvent and a brush, thoroughly clean the piston.
NOTICE: Do not use a wire brush.



2. INSPECT PISTON

A. Inspect piston oil clearance

HINT: There are three sizes of the standard diameter, marked ”1”, ”2” and ”3” accordingly. The mark is stamped on the top of the piston.

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 26 mm (1.02 in.) from the piston head.

Piston diameter:

STD

Mark ”1”

87.360–87.370 mm (3.4394–3.4398 in.)

Mark ”2”

87.370–87.380 mm (3.4398–3.4402 in.)

Mark ”3”

87.380–87.390 mm (3.4402–3.4405 in.)

O/S 0.50

87.410–87.440 mm (3.4413–3.4425 in.)

(b) Measure the cylinder bore diameter in the thrust directions. (See step 5 on page EG–108)

(c) Subtract the piston diameter measurement from the cylinder bore diameter measurement.

Standard oil clearance:

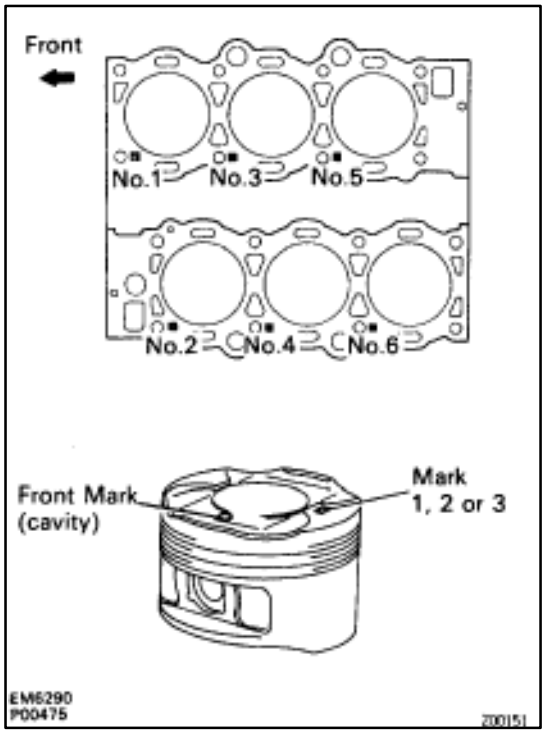
0.13–0.15 mm (0.0051–0.0059 in.)

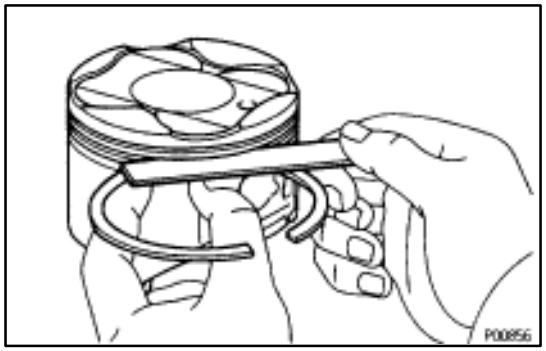
Maximum oil clearance:

0.17 mm (0.0067 in.)

If the oil clearance is greater than maximum, replace all the six pistons. If necessary, rebore all the six cylinders or replace the cylinder block.

HINT (Use new cylinder block): Use a piston with the same number mark as the standard bore diameter marked on the cylinder block.





B. Inspect piston ring groove clearance

Using a thickness gauge, measure the clearance between new piston ring and the wall of the piston ring groove.

Ring groove clearance:

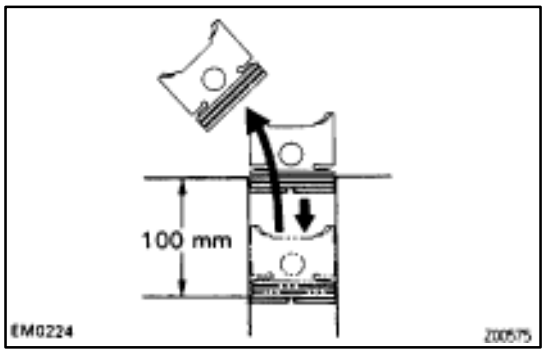
No.1

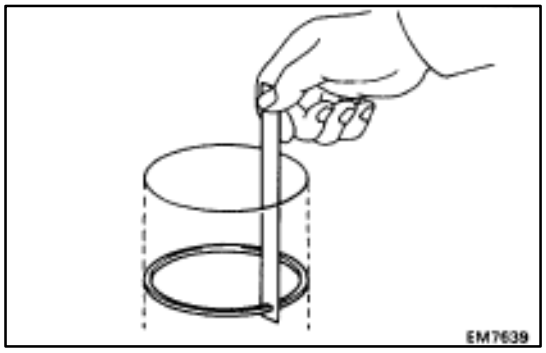
0.010–0.080 mm (0.0004–0.0031 in.)

No.2

0.030–0.070 mm (0.0012–0.0028 in.)

If the clearance is greater than maximum, replace the piston.





C. Inspect piston ring end gap

(a) Insert the piston ring into the cylinder bore.

(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 100 mm (3.94 in.) from the top of the cylinder block.

(c) Using a thickness gauge, measure the ring end gap.

Standard ring end gap:

No.1

0.280–0.500 mm (0.0110–0.0197 in.)

No.2

0.380–0.600 mm (0.0150–0.0236 in.)

Oil (Side rail)

0.150–0.570 mm (0.0059–0.0224 in.)

Maximum ring end gap:

No.1

1.10 mm (0.0433 in.)

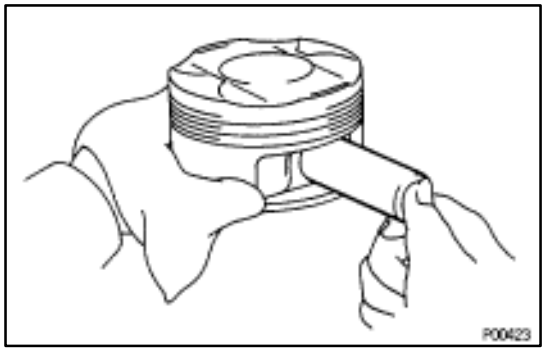
No.2

1.20 mm (0.0472 in.)

Oil (Side rail)

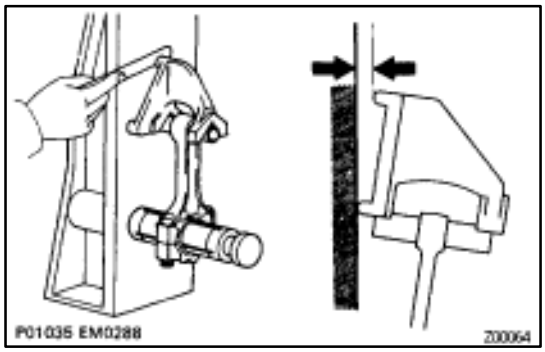
1.17 mm (0.0461 in.)

If the end gap is greater than maximum, replace the piston ring. If the end gap is greater than maximum, even with a new piston ring, rebore all the six cylinders or replace the cylinder block.



D. Inspect piston pin fit

At 60°C (140°F), you should be able to push the piston pin into the piston pin hole with your thumb.



3. INSPECT CONNECTING ROD

A. Inspect connecting rod alignment

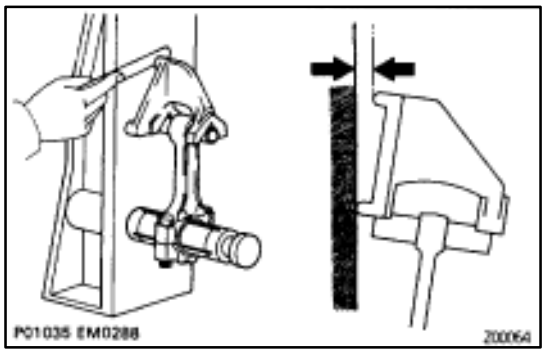
Using a rod aligner and thickness gauge, check the connecting rod alignment.

•Check for bend.

Maximum bend:

0.05 mm (0.0020 in.) per 100 mm (3.94 in.)

If bend is greater than maximum, replace the connecting rod assembly.

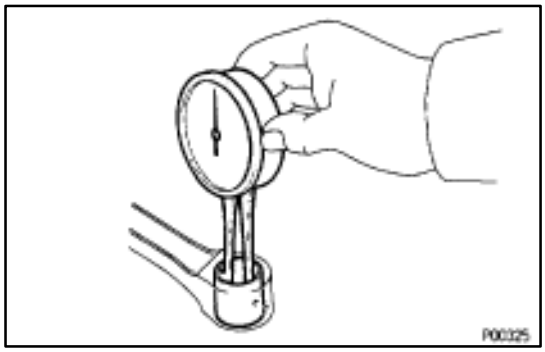


•Check for twist.

Maximum twist:

0.15 mm (0.0059 in.) per 100 mm (3.94 in.)

If twist is greater than maximum, replace the connecting rod assembly.



B. Inspect piston pin oil clearance

(a) Using a caliper gauge, measure the inside diameter of the connecting rod bushing.

Bushing inside diameter:

22.005–22.014 mm (0.8663–0.8667 in.)

(b) Using a micrometer, measure the piston pin diameter.

Piston pin diameter:

21.997–22.006 mm (0.8660–0.8664 in.)

(c) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.

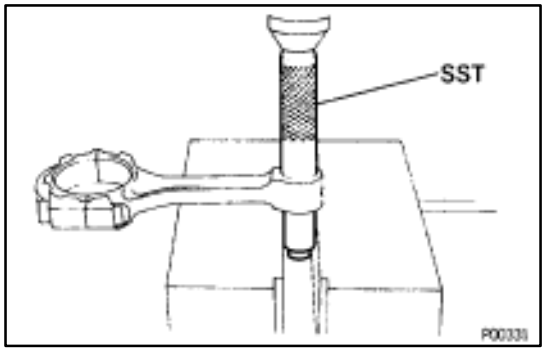
Standard oil clearance:

0.005–0.011 mm (0.0002–0.0004 in.)

Maximum oil clearance:

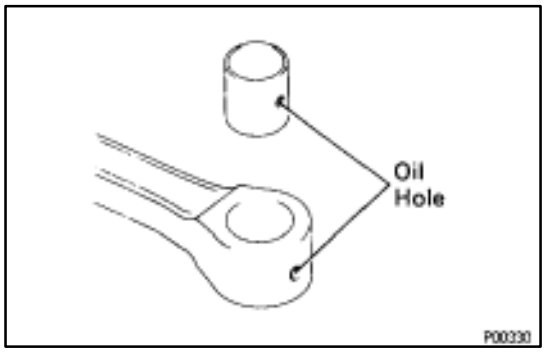
0.05 mm (0.0020 in.)

If the oil clearance is greater than maximum, replace the bushing. If necessary, replace the piston and piston pin as a set.

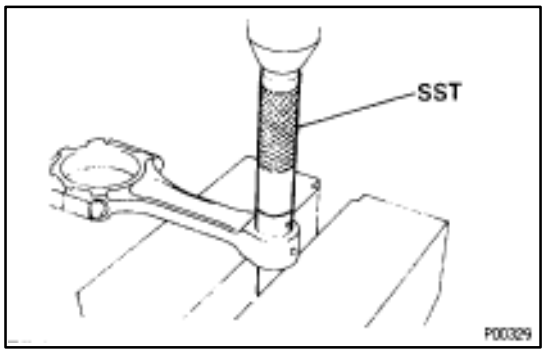


C. If necessary, replace connecting rod bushing

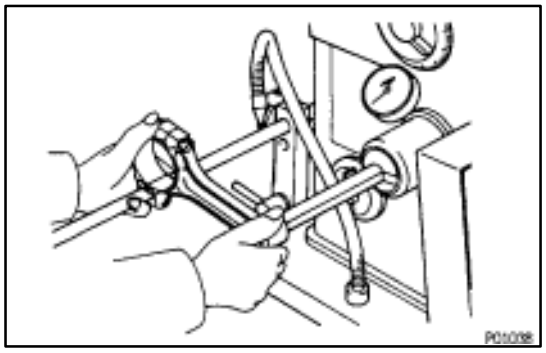
(a) Using SST and a press, press out the bushing.
SST 09222–30010



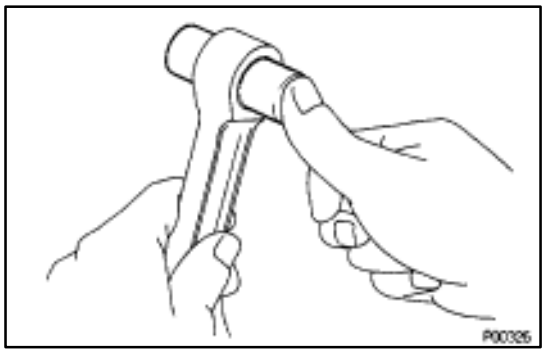
(b) Align the oil holes of a new bushing and the connecting rod.



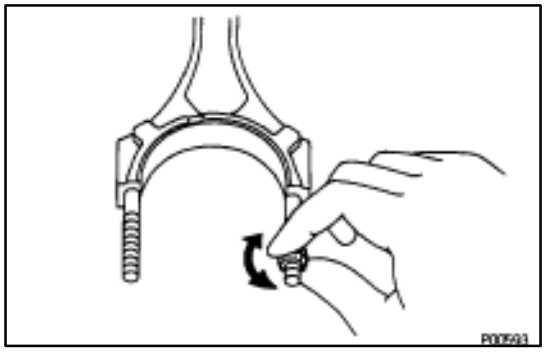
(c) Using SST and a press, press in the bushing.
SST 09222–30010



(d) Using a pin hone grinder, hone the bushing to obtain the standard specified clearance (see step B above) between the bushing and piston pin.

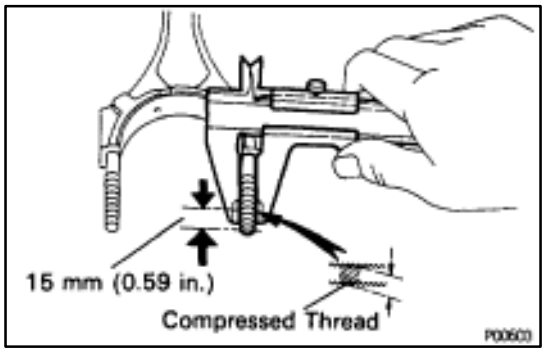


(e) Check the piston pin fit at normal room temperature. Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.



D. Inspect connecting rod bolts

(a) Install the cap nut to the connecting rod bolt. Check that the cap nut can be turned easily by hand to the end of the thread.



(b) If the cap nut cannot be turned easily, measure the outer diameter of the compressed thread with a vernier caliper.

Standard outer diameter:

7.860–8.000 mm (0.3094–0.3150 in.)

Minimum outer diameter:

7.60 mm (0.2992 in.)

HINT: If the location of this area cannot be judged by visual inspection, measure the outer diameter at the location shown in the illustration.

If the outer diameter is less than minimum, replace the connecting rod and cap nut as a set.

BORING OF CYLINDER

EG0FF–01

HINT:

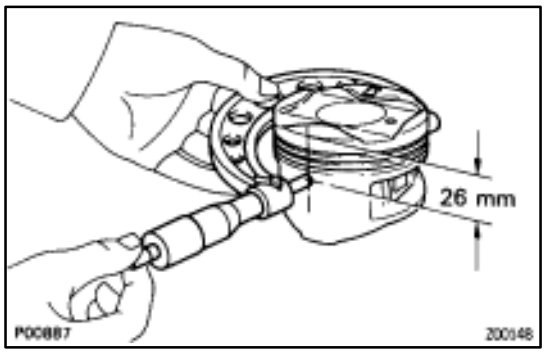
- Bore all the six cylinders for the oversized piston outside diameter.
- Replace the piston rings with ones to match the oversized pistons.

1. KEEP OVERSIZED PISTONS

Oversized piston diameter:

O/S 0.50

87.945–87.975 mm (3.4624–3.4636 in.)



2. CALCULATE AMOUNT TO BORE CYLINDER

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 26 mm (1.02 in.) from the piston head.

(b) Calculate the amount of which each cilinder is to be rebored as follows:

Size to be rebored = P + C – H

P = Piston diameter

C = Piston oil clearance

0.13–0.15 mm (0.0051–0.0059 in.)

H = Allowance for honing

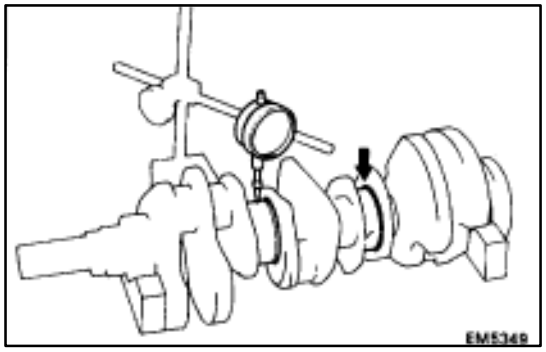
0.02 mm (0.0008 in.) or less

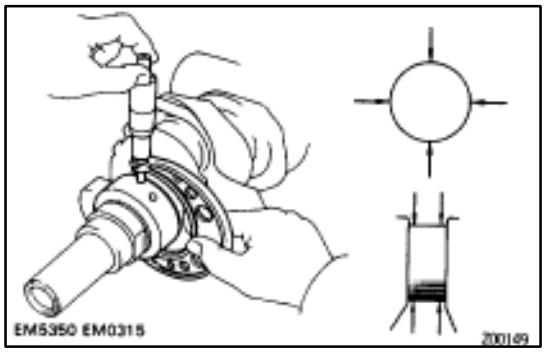
3. BORE AND HONE CYLINDERS TO CALCULATED DIMENSIONS

Maximum honing:

0.02 mm (0.0008 in.)

NOTICE: Excess honing will destroy the finished roundness.





CRANKSHAFT INSPECTION AND REPAIR

EGOFG–01

1. INSPECT CRANKSHAFT FOR RUNOUT

(a) Place the crankshaft on V–blocks.

(b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout:

0.06 mm (0.0024 in.)

If the circle runout is greater than maximum, replace the crankshaft.

2. INSPECT MAIN JOURNALS AND CRANK PINS

(a) Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter:

STD

63.985–64.00 mm (2.5191–2.5197 in.)

U/S 0.25

63.745–63.755 mm (2.5096–2.5100 in.)

Crank pin diameter:

STD

54.987–55.000 mm (2.1648–2.1654 in.)

U/S 0.25

54.745–54.755 mm (2.1553–2.1557 in.)

If the diameter is not as specified, check the oil clearance. (See page EG–104)

(b) Check each main journal and crank pin for taper and out–of–round as shown.

Maximum taper and out–of–round:

0.02 mm (0.0008 in.)

If the taper or out–of–round is greater than maximum, grind or replace the crankshaft.

3. IF NECESSARY, GRIND AND HONE MAIN JOURNALS AND/OR CRANK PINS

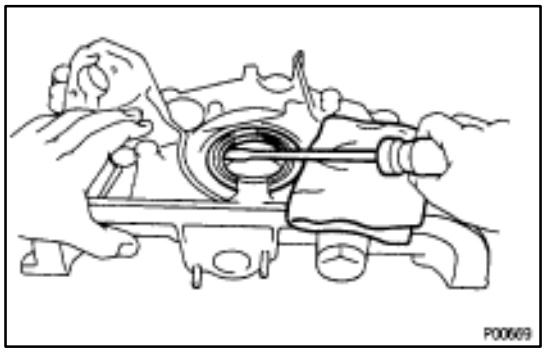
Grind and hone the main journals and/or crank pins to the finished undersized diameter (See procedure step 2).

Install new main journal and/or crank pin undersized bearings.

CRANKSHAFT OIL SEALS REPLACEMENT

EG0FH–01

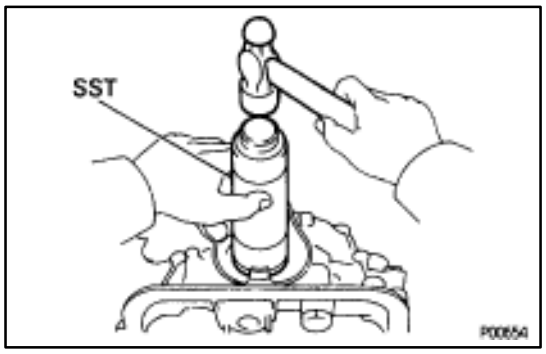
HINT: There are two methods (A and B) to replace the oil seal which are as follows:



1. REPLACE CRANKSHAFT FRONT OIL SEAL

A. If oil pump is removed from cylinder block:

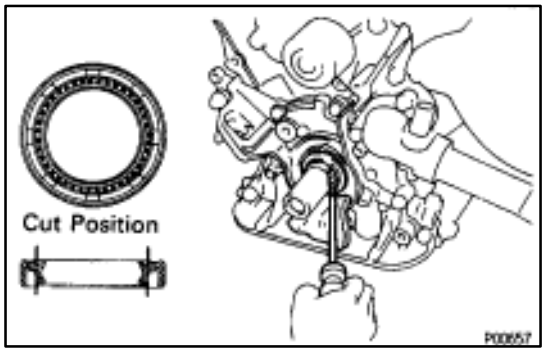
(a) Using a screwdriver, pry out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump case edge.
SST 09309–37010

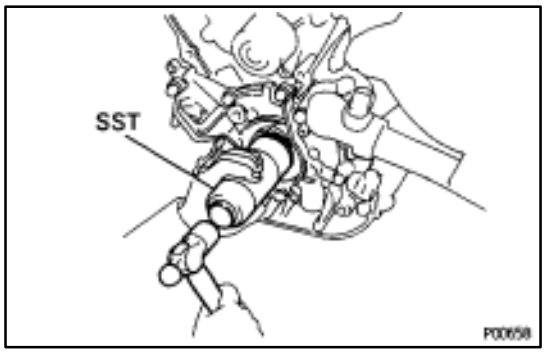
(c) Apply MP grease to the oil seal lip.

B. If oil pump is installed to the cylinder block:



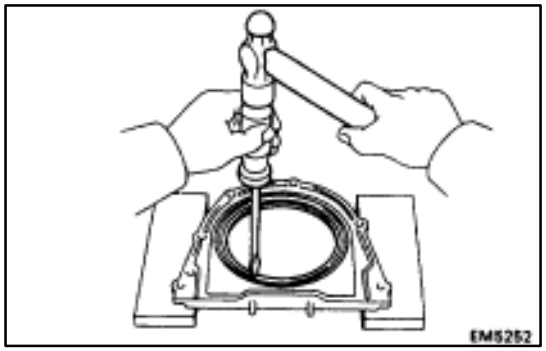
(a) Using a knife, cut off the oil seal lip.

(b) Using a screwdriver, pry out the oil seal.
NOTICE: Be careful not to damage the crankshaft.
Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.

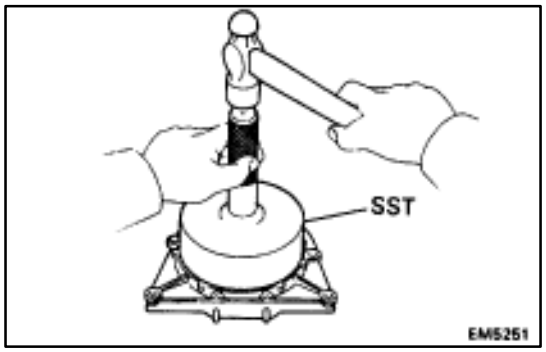
(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump case edge.
SST 09309–37010



2. REPLACE CRANKSHAFT REAR OIL SEAL

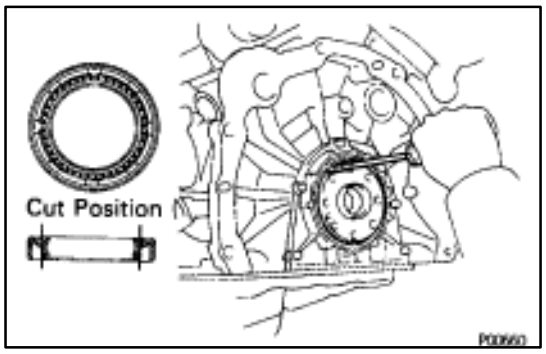
A. If rear oil seal retainer is removed from cylinder block:

(a) Using screwdriver and hammer, tap out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal edge.
SST 09223–56010

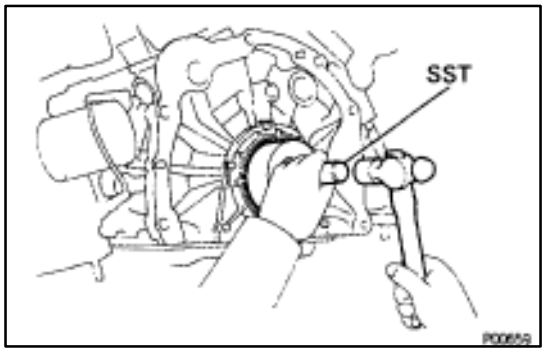
(c) Apply MP grease to the oil seal lip.



B. If rear oil seal retainer is installed to cylinder block:

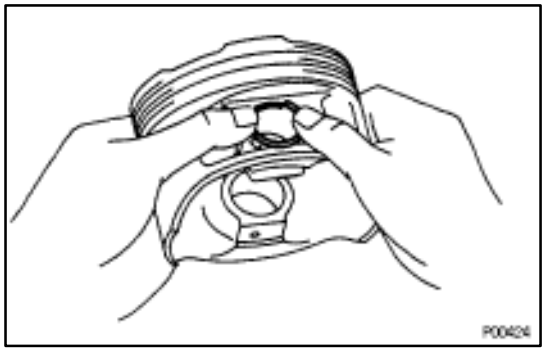
(a) Using a knife, cut off the oil seal lip.

(b) Using a screwdriver, pry out the oil seal.
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.

(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223–56010

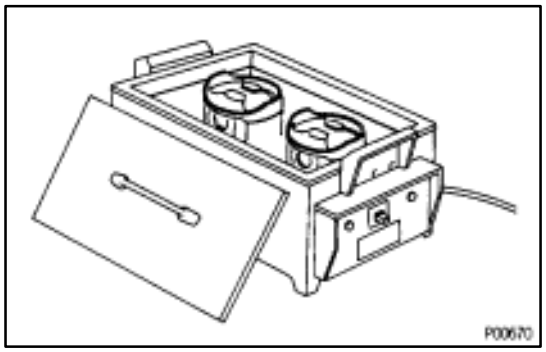


PISTON AND CONNECTING ROD ASSEMBLY

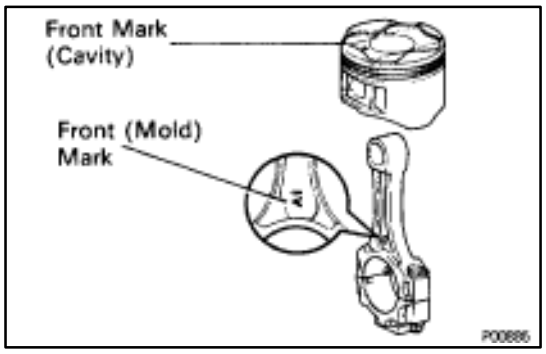
EG0FJ–01

1. ASSEMBLE PISTON AND CONNECTING ROD

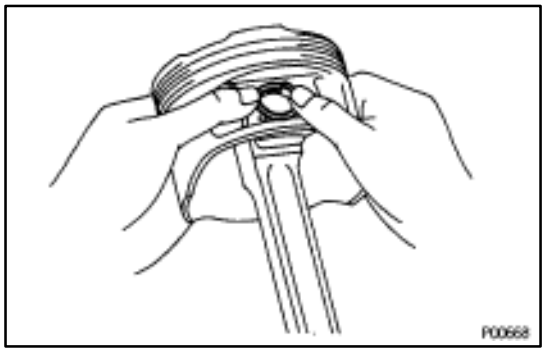
(a) Install a new snap ring on one side of the piston pin hole.
HINT: Be sure that end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.



(b) Gradually heat the piston to 60°C (140°F).



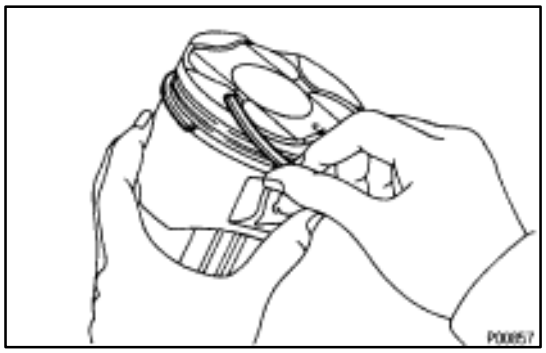
(c) Coat the piston pin with engine oil.
(d) Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb.
Connecting rod front (mold) mark:
A1, B6, 1B, 8A, C3 or etc.

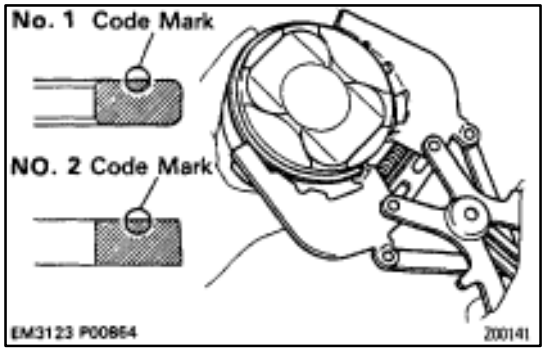


(e) Install a new snap ring on the other side of the piston pin hole.
HINT: Be sure that end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.

2. INSTALL PISTON RINGS

(a) Install the oil ring expander and two side rails by hand.





(b) Using a piston ring expander, install the two compression rings with the code mark facing upward.

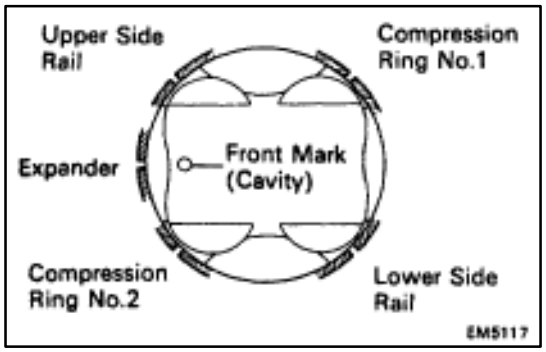
Code mark:

No.1

T or 1R

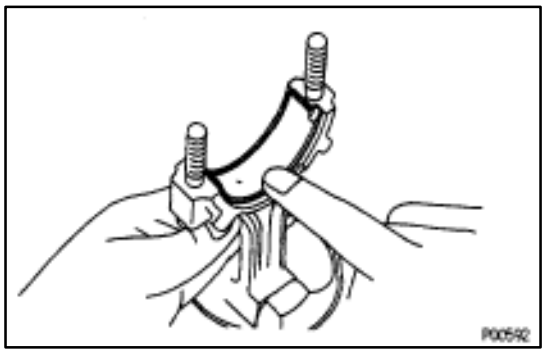
No.2

T2 or 2R



(c) Position the piston rings so that the ring ends are as shown.

NOTICE: Do not align the ring ends.



3. INSTALL BEARINGS

(a) Align the bearing claw with the groove of the connecting rod or connecting cap.

(b) Install the bearings in the connecting rod and connecting rod cap.

CYLINDER BLOCK ASSEMBLY

EG0FK–01

(See page EG–98)

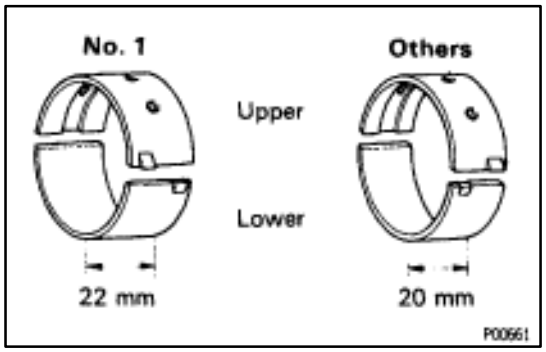
HINT:

- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O–rings and oil seals with new parts.

1. INSTALL MAIN BEARINGS

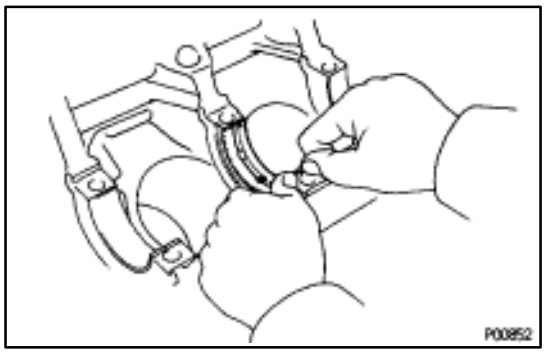
HINT:

- Main bearings come in widths of 20 mm (0.79 in.) and 22 mm (0.87 in.). Install the 22 mm (0.87 in.) bearings in the No.1 cylinder block journal position with the main bearing caps. Install the 20 mm (0.79 in.) bearings in the other positions.
- Upper bearings have oil holes, lower bearings do not.



(a) Align the bearing claw with the claw groove of the main bearing cap or cylinder block.

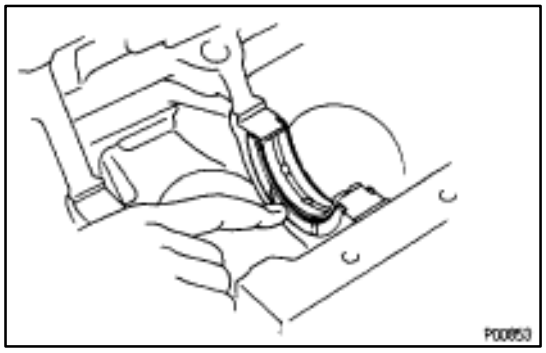
(b) Install the bearings in the cylinder block and main bearing cap.



2. INSTALL UPPER THRUST WASHERS

Install the thrust washers under the No.2 journal position of the block with the oil grooves facing outward.

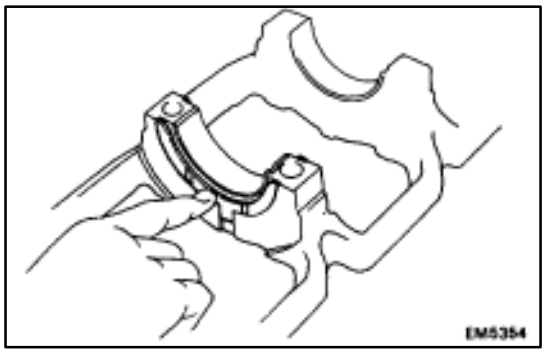
3. PLACE CRANKSHAFT ON CYLINDER BLOCK

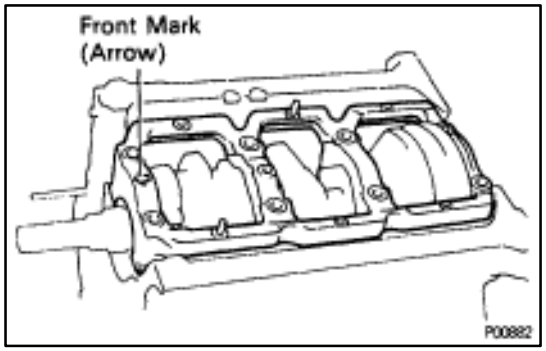


4. INSTALL MAIN BEARING CAP AND LOWER THRUST WASHERS

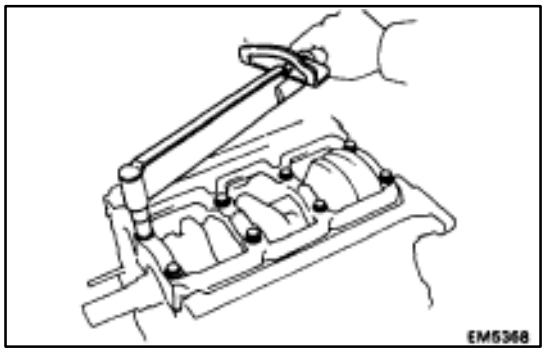
A. Place main bearing cap and lower thrust washers on cylinder block

(a) Install the thrust washers on the No.2 journal position of the bearing cap with the grooves facing outward.





(b) Install the main bearing cap with the front mark facing forward.



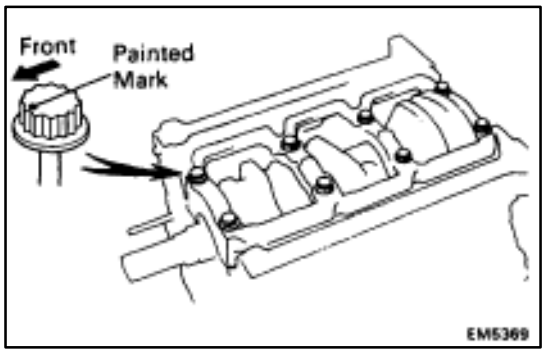
B. Install main bearing cap bolts

HINT:

- The main bearing cap bolts are tightened in two progressive steps (steps (b) and (d)).
- If any main bearing cap bolt is broken or deformed, replace it.

(a) Apply a light coat of engine oil on the threads and under the heads of the main bearing cap bolts.

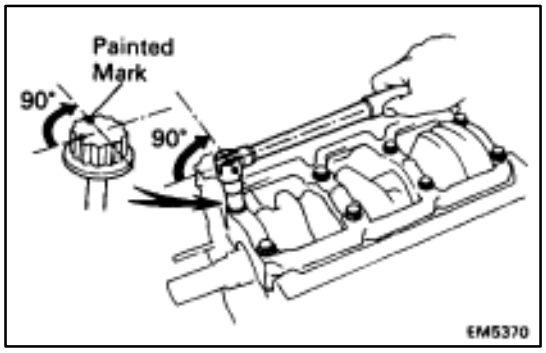
(b) Install and uniformly tighten the eight main bearing cap bolts in several passes, in the sequence shown.



Torque: 61 N·m (625 kgf·cm, 45 ft·lbf)

If any one of the main bearing cap bolts does not meet the torque specification, replace the cap bolt.

(c) Mark the front of the main bearing cap bolt with paint.

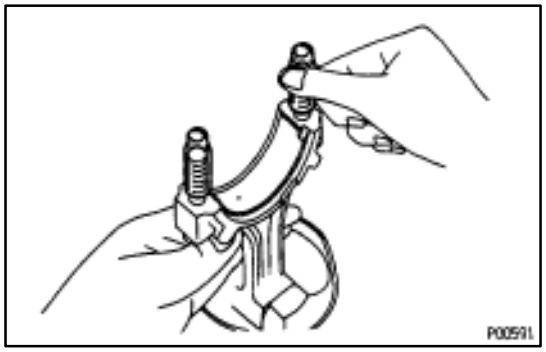


(d) Retighten the main bearing cap bolts 90° in the numerical order shown.

(e) Check that the painted mark is now at a 90° angle to the front.

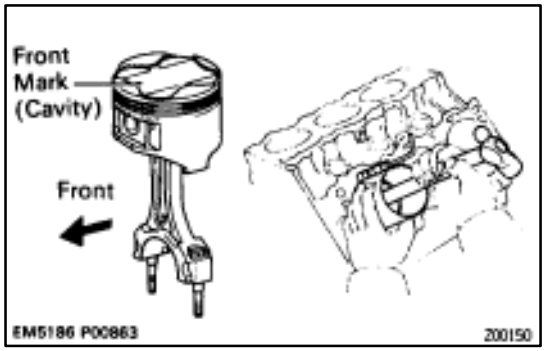
(f) Check that the crankshaft turns smoothly.

(g) Check the crankshaft thrust clearance.
(See step 5 on page EG–104)

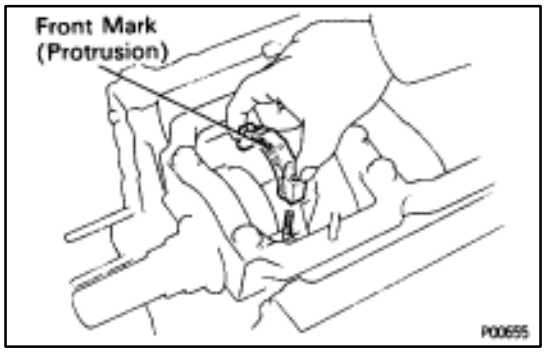


5. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

(a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



(b) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.



6. INSTALL CONNECTING ROD CAPS

A. Place connecting rod cap on connecting rod

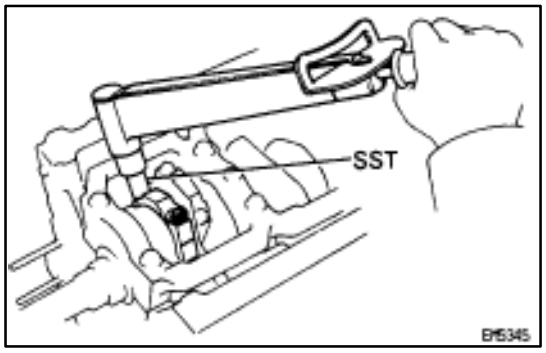
(a) Match the numbered connecting rod cap with the connecting rod.

(b) Install the connecting rod cap with the front mark facing forward.

B. Install connecting rod cap nuts

HINT:

- The connecting rod cap nuts are tightened in two progressive steps (steps (b) and (d)).
- If any connecting rod bolt is broken or deformed, replace them.



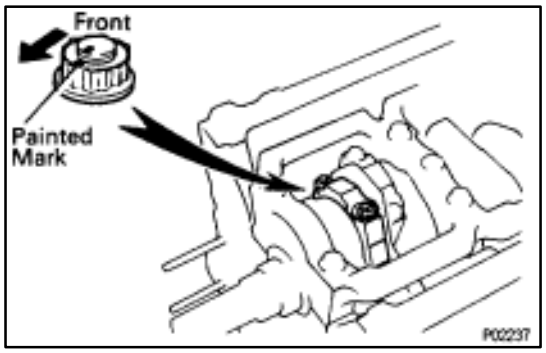
(a) Apply a light of engine oil on the threads and under the nuts of the connecting rod cap.

(b) Using SST, install and alternately tighten the nuts of the connecting rod cap in several passes.

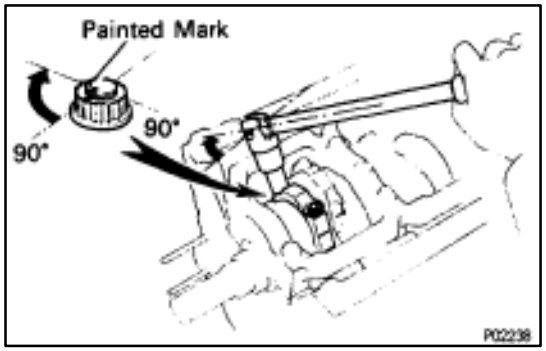
SST 09011–38121

Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

If any one of the connecting rod cap nuts does not meet the torque specification, replace the cap nut.



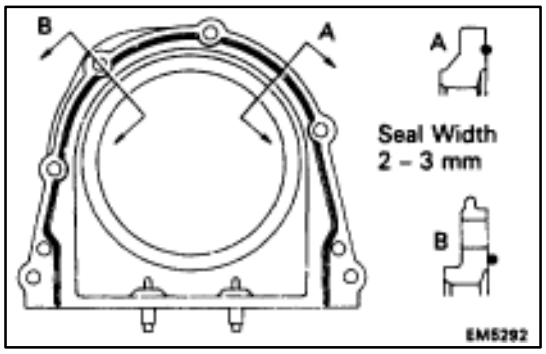
(c) Mark the front of the connecting rod cap nut and bolt with paint.



(d) Retighten the connecting rod cap nuts 905 as shown.
(e) Check that the painted mark is now at a 905 angle to the front.
(f) Check that the crankshaft turns smoothly.
(g) Check the connecting rod thrust clearance.
(See step 2 on page EG–101)

7. INSTALL REAR OIL SEAL RETAINER

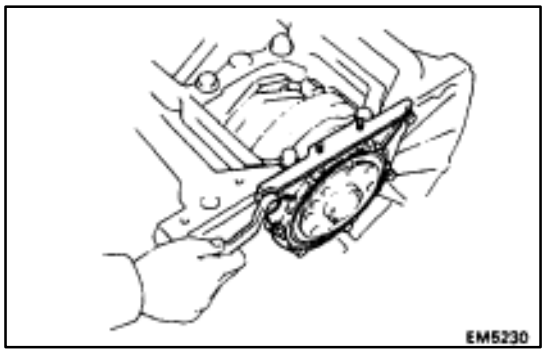
(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the retainer and cylinder block.
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

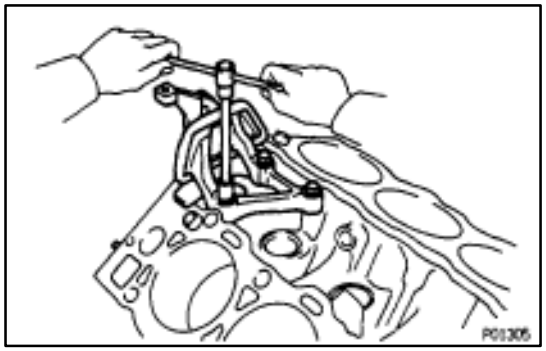


(b) Apply seal packing to the retainer as shown in the illustration.
Seal packing:
Part No.08826–00080 or equivalent
- Install a nozzle that has been cut to a 2–3 mm (0.08–0.12 in.) opening.

HINT: Avoid applying an excessive amount to the surface.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Install the retainer with the six bolts.
Torque: 7.8 N·m (80 kgf·cm, 69 in.·lbf)





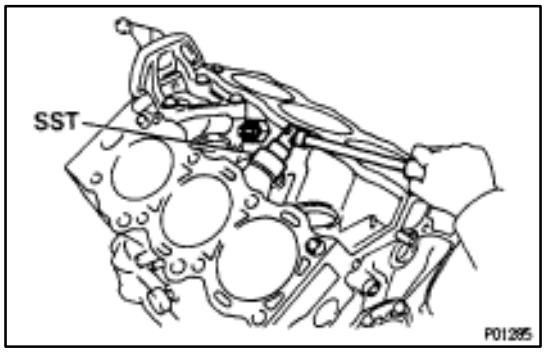
POST ASSEMBLY

EG0FL–01

1. INSTALL NO.2 IDLER PULLEY BRACKET

Install the pulley bracket with the three bolts. Torque the bolts.

Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)



2. INSTALL KNOCK SENSORS

Using SST, install the two knock sensors.

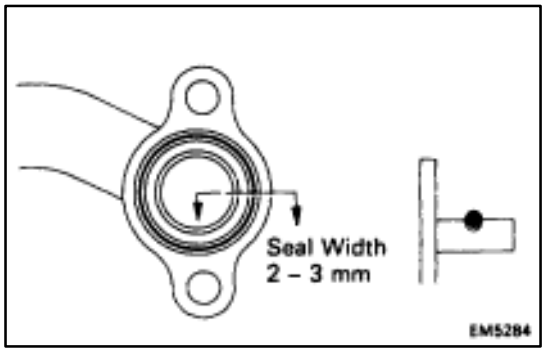
SST 09816–30010

Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)

3. INSTALL WATER BY–PASS PIPE

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the by–pass pipe and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.



(b) Apply seal packing to the groove of the by–pass pipe.

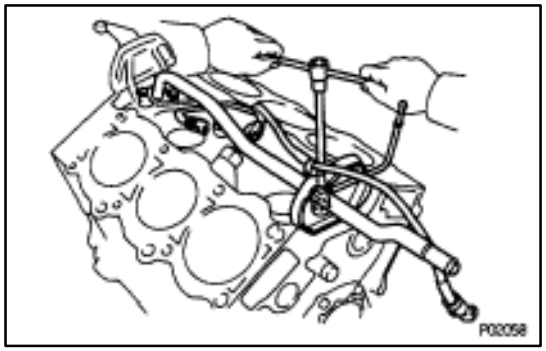
Seal packing:

Part No.08826–00100 or equivalent

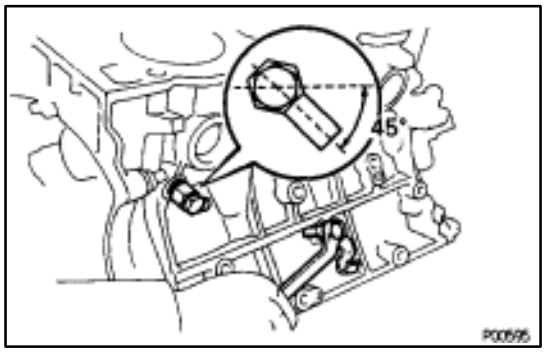
- Install a nozzle that has been cut to a 2–3 mm (0.08–0.12 in.) opening.

HINT: Avoid applying an excessive amount to the surface.

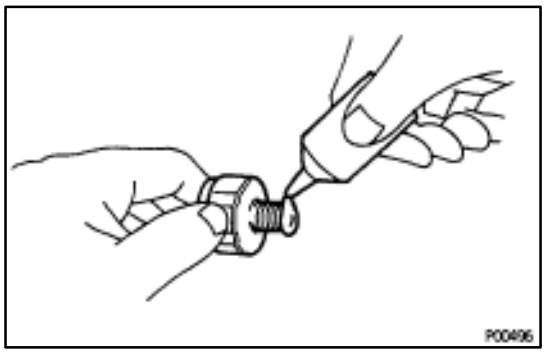
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



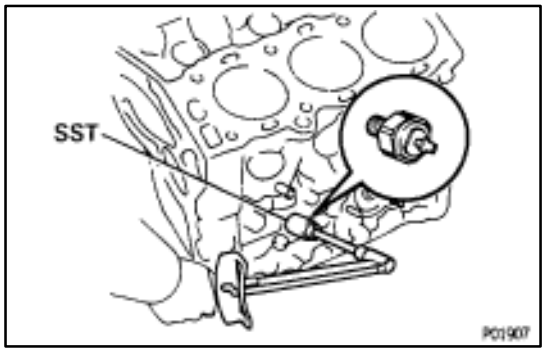
(c) Install the by–pass pipe with the two bolts and nut.
Torque: 8.3 N·m (85 kgf·cm, 74 ft·lbf)
(d) Connect the two knock sensor connectors.



4. INSTALL ENGINE COOLANT DRAIN COCK
(a) Install a new drain cock as shown.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)
(b) Install the drain hose clamp with the bolt.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)
(c) Install the drain hose.



5. INSTALL OIL PRESSURE SWITCH
(a) Apply adhesive to two or three threads.
Adhesive:
Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent



(b) Using SST, install the oil pressure switch.
SST 09816–30010
Torque: 14 N·m (150 kgf·cm, 11 ft·lbf)

6. INSTALL OIL FILTER BRACKET AND FILTER
(See page EG–307)
7. INSTALL OIL PUMP AND OIL PAN
(See page EG–294)
8. INSTALL WATER PUMP (See page EG–246)
9. INSTALL CYLINDER HEADS
(See page EG–47)
10. INSTALL PULLEYS AND TIMING BELT
(See page EG–29)

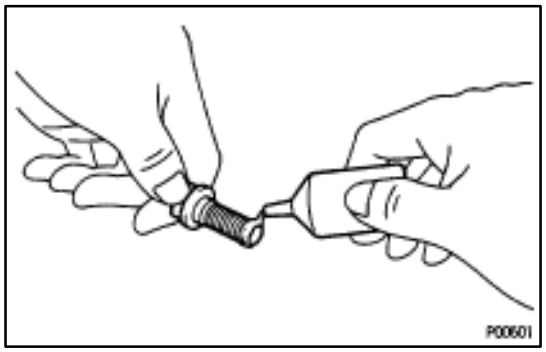
11. INSTALL DISTRIBUTOR (See IG section)

12. REMOVE ENGINE STAND

13. INSTALL REAR END PLATE

Install the end plate with the bolt.

Torque: 8.3 N·m (85 kgf·cm, 74 in.·lbf)



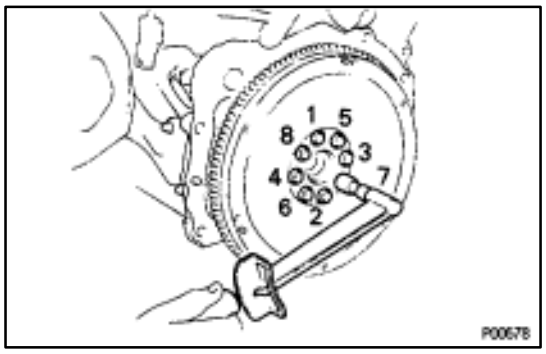
14. (M/T)

INSTALL FLYWHEEL

(a) Apply adhesive to two or three threads of the mount bolt end.

Adhesive:

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



(b) Install the flywheel on the crankshaft.

(c) Install and uniformly tighten the eight mount bolts in several passes, in the sequence shown.

Torque: 83 N·m (850 kgf·cm, 61 ft·lbf)

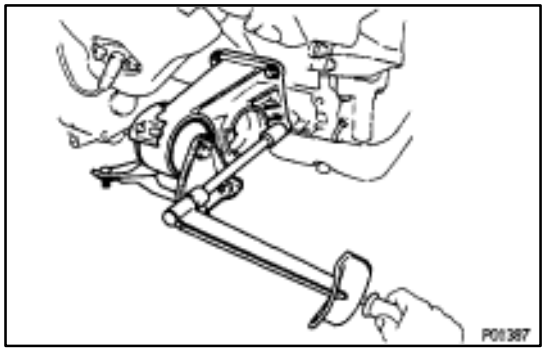
15. (A/T)

INSTALL DRIVE PLATE (See procedure step 14)

Torque: 83 N·m (850 kgf·cm, 61 ft·lbf)

16. (M/T)

INSTALL CLUTCH DISC AND COVER

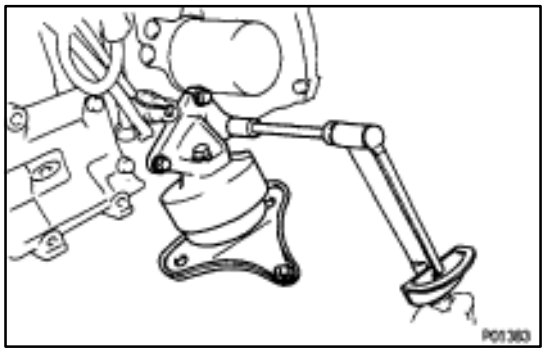


ENGINE INSTALLATION

EG0FM–02

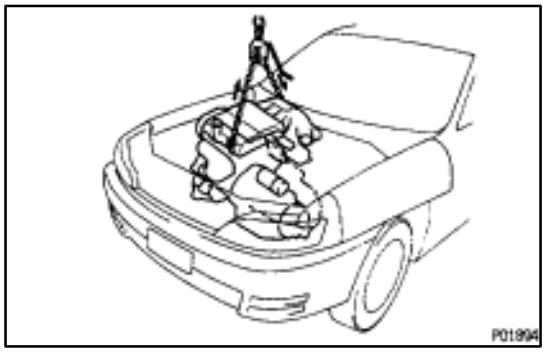
(See page EG–88)

1. **INSTALL RR ENGINE MOUNTING INSULATOR**
   Install the mounting insulator with the four bolts.
   Torque: 77 N·m (790 kgf·cm, 57 ft·lbf)



2. **INSTALL FR ENGINE MOUNTING INSULATOR**
   Install the mounting insulator with the three bolts.
   Torque: 77 N·m (790 kgf·cm, 57 ft·lbf)

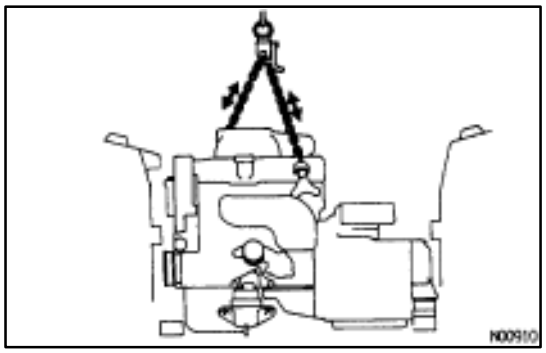
3. **ASSEMBLE ENGINE AND TRANSAXLE**
   M/T (See MT section)
   A/T (See AT section)
4. **(A/T)**
   INSTALL STARTER



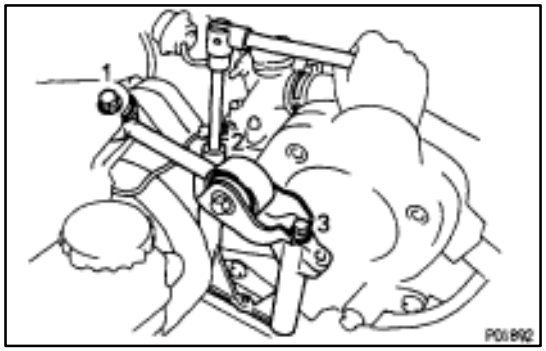
5. **INSTALL ENGINE AND TRANSAXLE ASSEMBLY IN VEHICLE**

(a) Attach the engine chain hoist to the engine hangers.

(b) Lower the engine into the engine compartment.
Tilt the transaxle downward, lower the engine and clear the LH mounting.
NOTICE: Be careful not to hit the PS gear housing or park/neutral position switch (A/T).

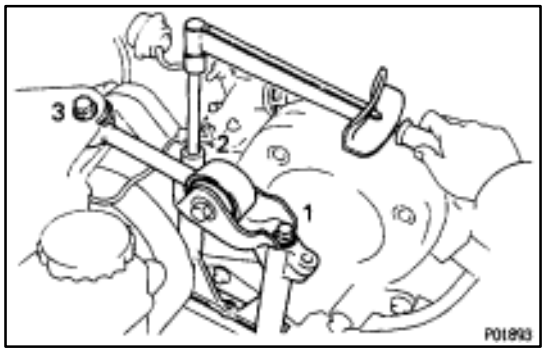


(c) Keep the engine level, and align RH and LH mountings with the body bracket.

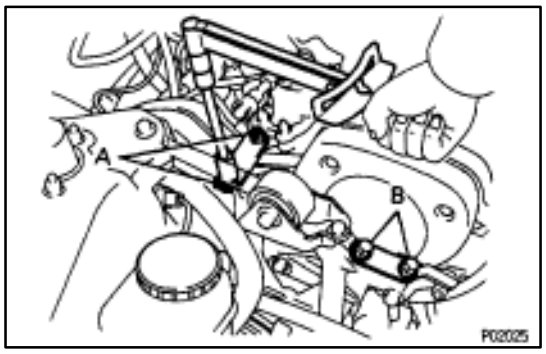


6. INSTALL NO.2 ENGINE MOUNTING BRACKET AND ENGINE MOVING CONTROL ROD

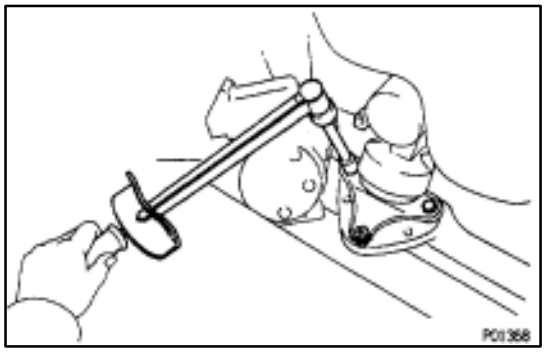
(a) Temporarily install the engine moving control rod and No.2 engine mounting bracket with the three bolts in the sequence shown.



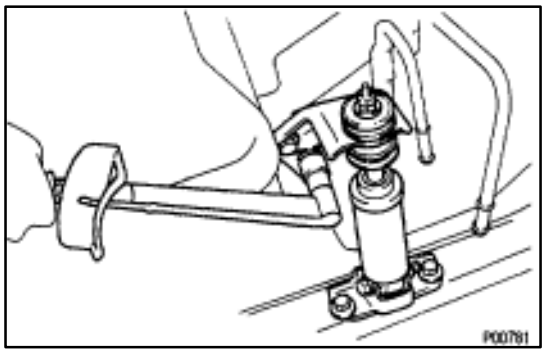
(b) Tighten the three bolts in the sequence shown.
Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)



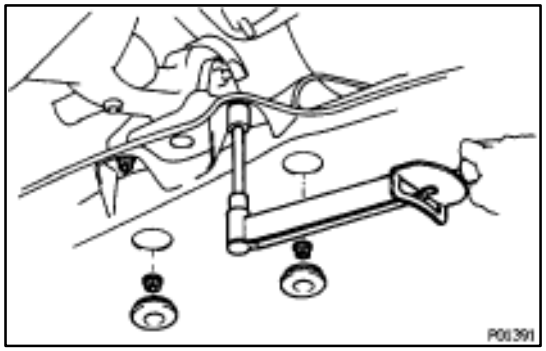
(c) Install the RH mounting stays with the three bolts and nut.
Bolt (A)
Torque: 31 N·m (320 kgf·cm, 23 ft·lbf)
Bolt (B)
Torque: 62 N·m (630 kgf·cm, 46 ft·lbf)



7. CONNECT FR ENGINE MOUNTING INSULATOR
Connect the mounting insulator with the three bolts.
Torque: 80 N·m (820 kgf·cm, 59 ft·lbf)



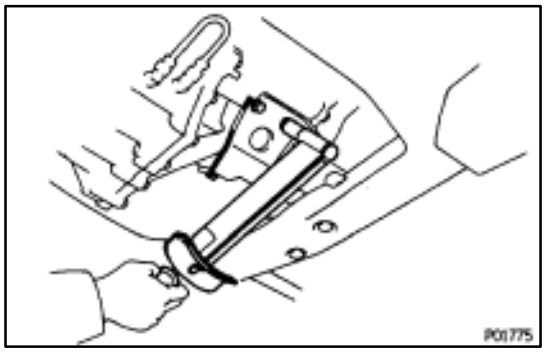
8. INSTALL ENGINE MOUNTING ABSORBER
Install the engine mounting absorber with the four bolts.
Torque: 48 N·m (490 kgf·cm, 35 ft·lbf)



9. CONNECT RR ENGINE MOUNTING INSULATOR

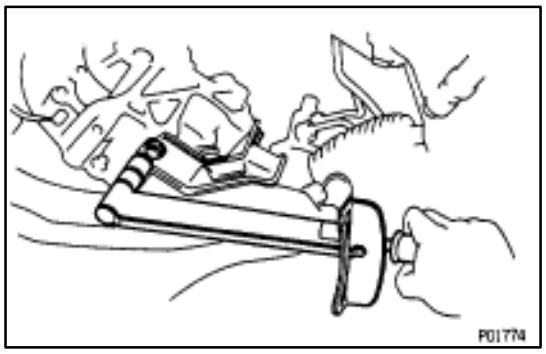
(a) Connect the mounting insulator with the four nuts.
Torque: 66 N·m (670 kgf·cm, 48 ft·lbf)

(b) Install the hole plugs.



10. CONNECT LH ENGINE MOUNTING INSULATOR (M/T)

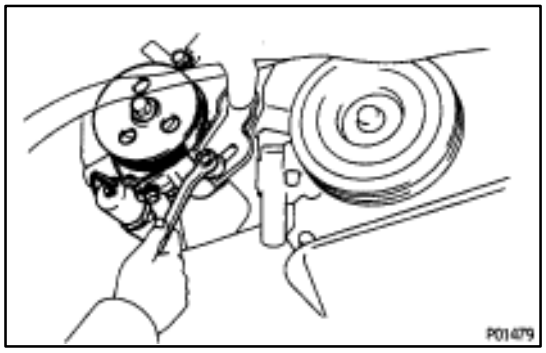
Connect the mounting insulator with the three bolts.
Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)



(A/T)

Connect the mounting insulator with the four bolts.
Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

11. REMOVE ENGINE SLING DEVICE

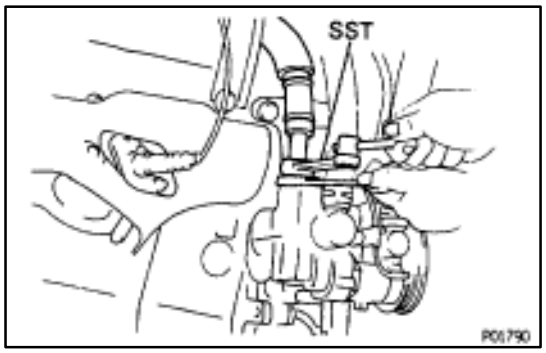


12. INSTALL PS PUMP

(a) Install the PS pump with the two bolts.
Torque: 43 N·m (440 kgf·cm, 31 ft·lbf)

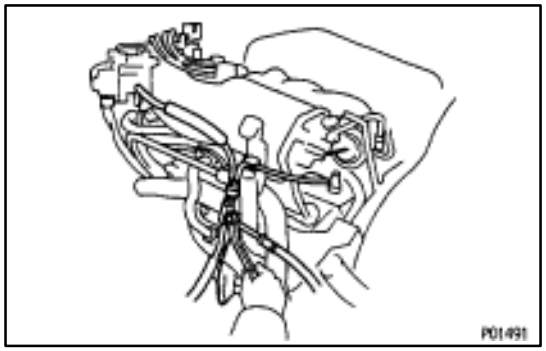
(b) Install the drive belt.

13. INSTALL DRIVE SHAFTS (See SA section)



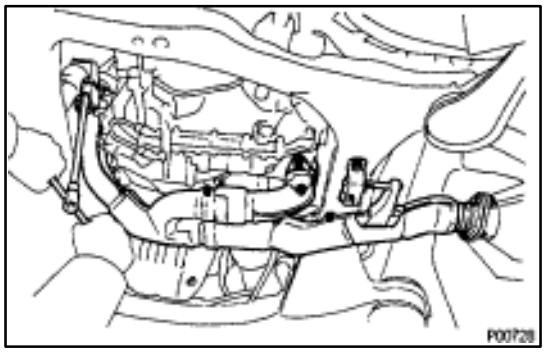
14. CONNECT HYDRAULIC COOLING FAN PRESSURE HOSE

Using SST, connect the pressure hose.
SST 09631–22020



15. CONNECT PS ACV

(a) Connect the PS ACV with the nut.
(b) Connect the two PS air hoses.

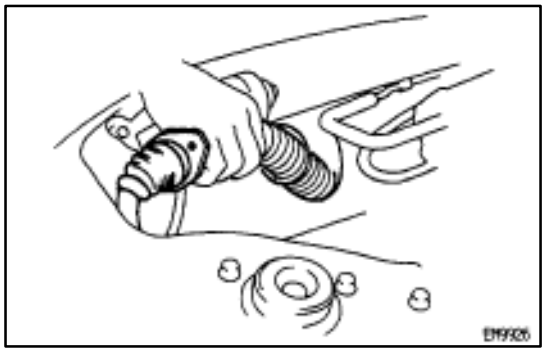


16. INSTALL FRONT EXHAUST PIPE

(a) Place three new gaskets on the front exhaust pipe.
(b) Install the front exhaust pipe with the bolts and six nuts. Torque the nuts.
To manifold
Torque: 62 N·m (630 kgf·cm, 46 ft·lbf)
To three–way catalytic converter
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)
(c) Connect the bracket with the two bolts.

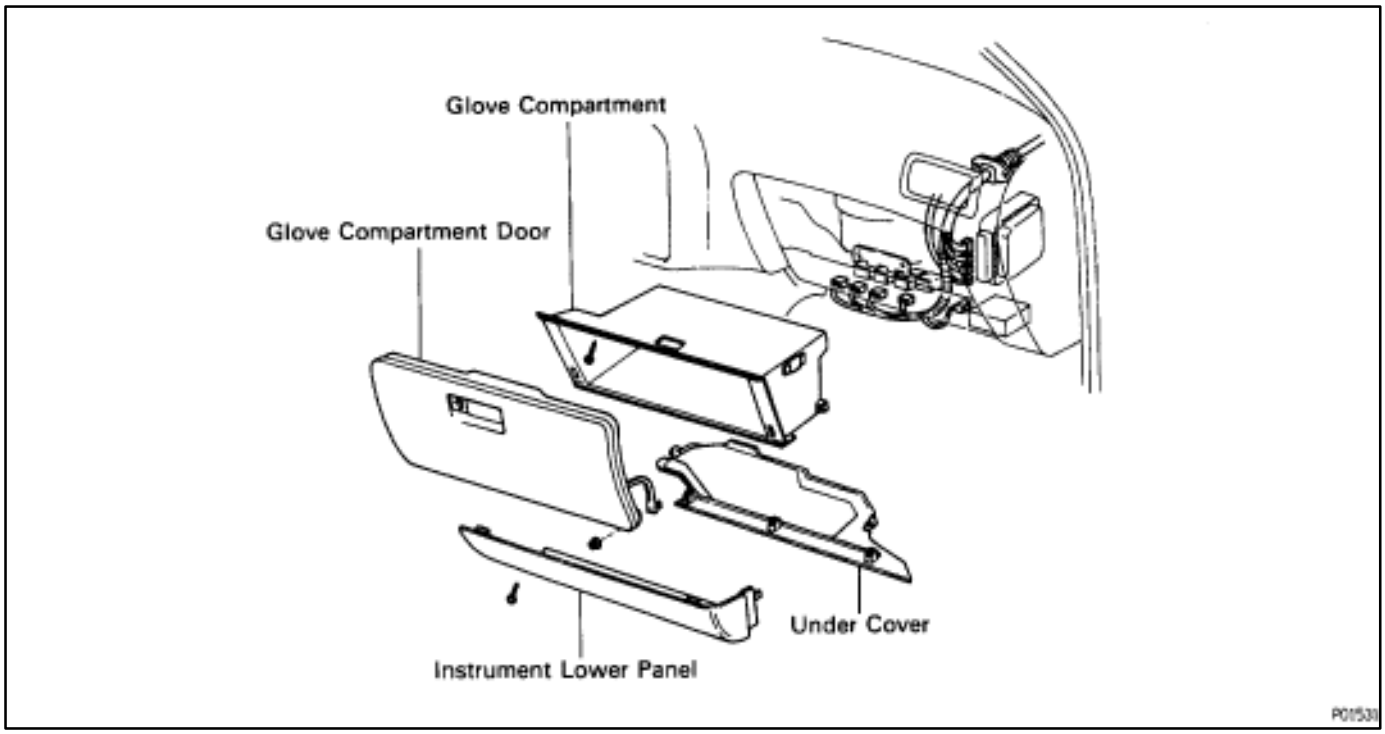
17. INSTALL A/C COMPRESSOR

(a) Install the compressor, compressor stay with the five bolts.
To generator bracket
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)
To cylinder block
Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)
(b) Install the drive belt.
(c) Connect the A/C compressor connector.



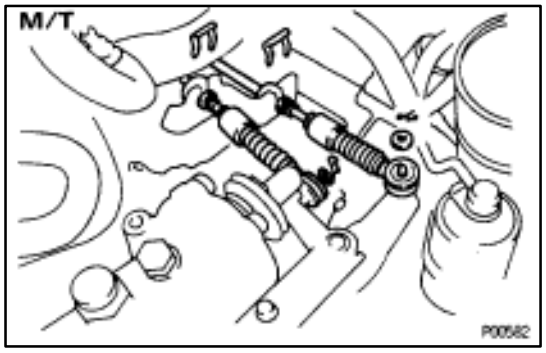
18. CONNECT ENGINE WIRE TO CABIN

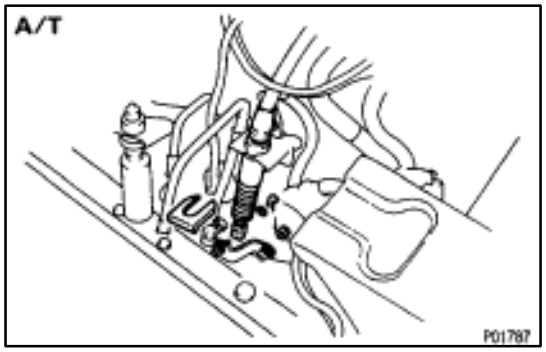
(a) Push in the engine wire through the cowl panel. Install the two nuts.
(b) Connect the following connectors:
(1) Three engine control module (ECM) connectors
(2) Five cowl wire connectors
(3) Cooling fan ECU connector
(c) Install the glove compartment.
(d) Install the glove compartment door.
(e) Install the lower instrument panel.
(f) Install the under cover.



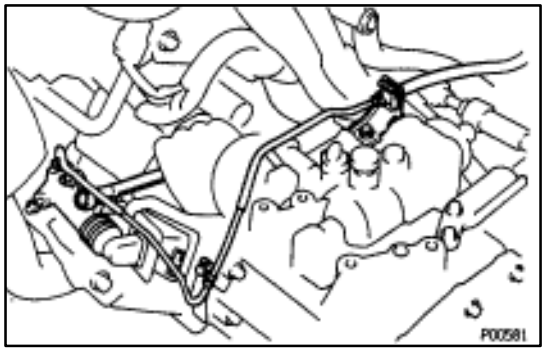
19. CONNECT VACUUM HOSES

(a) Brake booster vacuum hose to air intake chamber
(b) Charcoal canister vacuum hose
(c) IACV vacuum tank vacuum hose



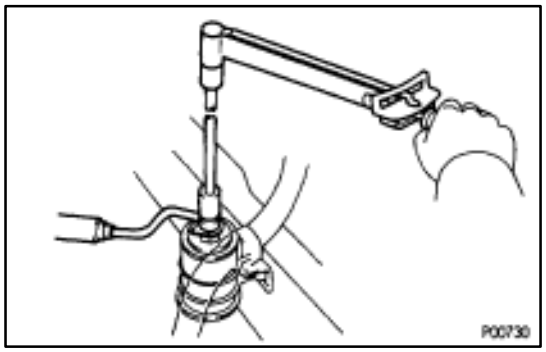


20. CONNECT TRANSAXLE CONTROL CABLE (S) TO TRANSAXLE

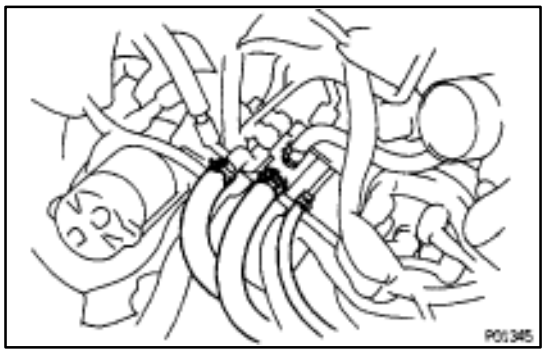


21. (M/T)
INSTALL CLUTCH RELEASE CYLINDER
Install the release cylinder and tube with the four bolts.

22. (M/T)
INSTALL STARTER

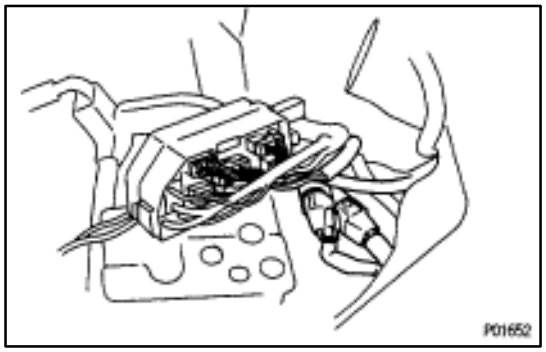


23. CONNECT FUEL INLET HOSE
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)



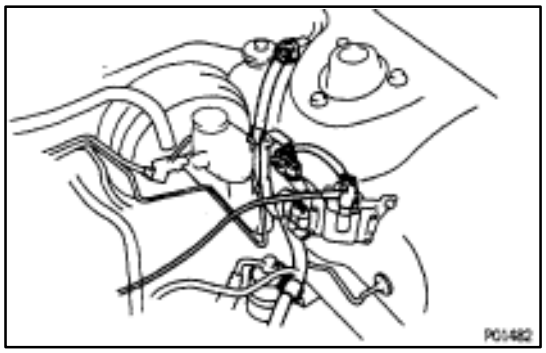
24. CONNECT FUEL RETURN HOSE

25. CONNECT HEATER HOSES

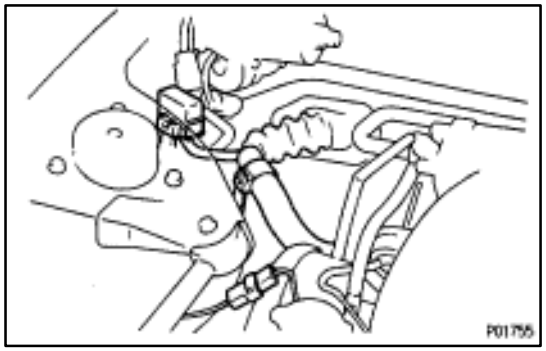


26. CONNECT WIRES AND CONNECTORS

(a) Connect the three connectors to the relay box.
(b) Install the engine relay box.
(c) Two connectors from LH fender apron



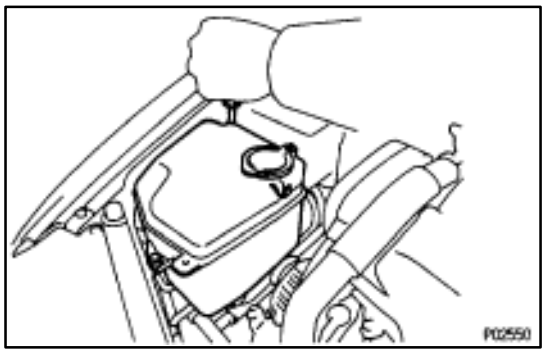
(d) Ignition connector
(e) Ignition coil connector
(f) High–tension cord to ignition coil
(g) Noise filter connector
(h) Connector from fender apron



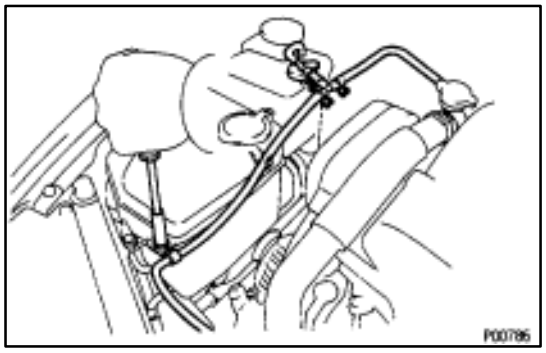
(i) Data link connector 1
(j) Ground strap from RH fender apron

(k) (M/T)
Back–up light switch connector
(l) (M/T)
Speed sensor connector

27. INSTALL ENGINE COOLANT RESERVOIR TANK

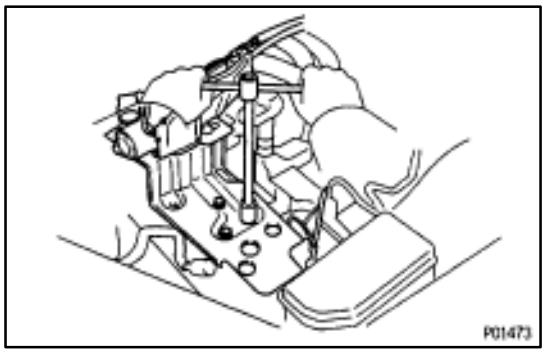


28. INSTALL WASHER TANK
(a) Connect the connector and vinyl hose to the washer tank.
(b) Install the washer tank with the three bolts.



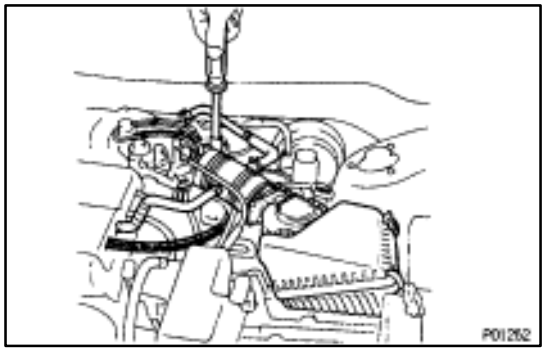
29. INSTALL ENGINE COOLANT RESERVOIR HOSE
Connect the reservoir hose with the bolt.

30. INSTALL RADIATOR



31. CONNECT GROUND STRAP TO BATTERY CARRIER

32. INSTALL CRUISE CONTROL ACTUATOR
(a) Install the actuator and bracket with the three bolts.
(b) Connect the actuator connector.
(c) Install the actuator cover.



33. INSTALL AIR CLEANER ASSEMBLY, VOLUME AIR FLOW METER AND AIR CLEANER HOSE

(a) Install the air cleaner case with three bolts.
(b) Install the air filter.
(c) Connect the air cleaner hose to the throttle body.
(d) Install the air cleaner cap together with the volume air flow meter and air cleaner hose.
(e) Connect the volume air flow meter connector.

34. (A/T)
CONNECT THROTTLE CABLE, AND ADJUST IT

35. INSTALL ACCELERATOR CABLE, AND ADJUST IT

36. FILL WITH ENGINE COOLANT

Capacity (w/ Heater):
NSR
M/T
8.5 liters (9.0 US qts, 7.5 lmp. qts)
A/T
8.4 liters (8.9 US qts, 7.4 lmp. qts)
NWR
9.0 liters (9.5 US qts, 7.9 lmp. qts)

37. FILL WITH ENGINE OIL

Capacity:
Drain and refill
w/ Oil filter change
3.7 liters (3.9 US qts, 3.3 lmp. qts)
w/o Oil filter change
3.9 liters (4.1 US qts, 3.4 lmp. qts)
Dry fill
4.6 liters (4.8 US qts, 4.0 lmp. qts)

38. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

39. START ENGINE AND CHECK FOR LEAKS

40. PERFORM ENGINE ADJUSTMENT

(a) Adjust the generator drive belt.
(See CH section)

Drive belt tension:
New belt
175±5 lb
Used belt
115±20 lb

(b) Adjust the PS drive belt.
(See SR section)
Drive belt tension:
New belt
150–185 lb
Used belt
115±20 lb

(c) Adjust the ignition timing.
(See IG section)
Ignition timing:
10° ± BTDC @ idle
(w/ Terminals TE1 and E1 connected)

41. INSTALL ENGINE UNDER COVERS

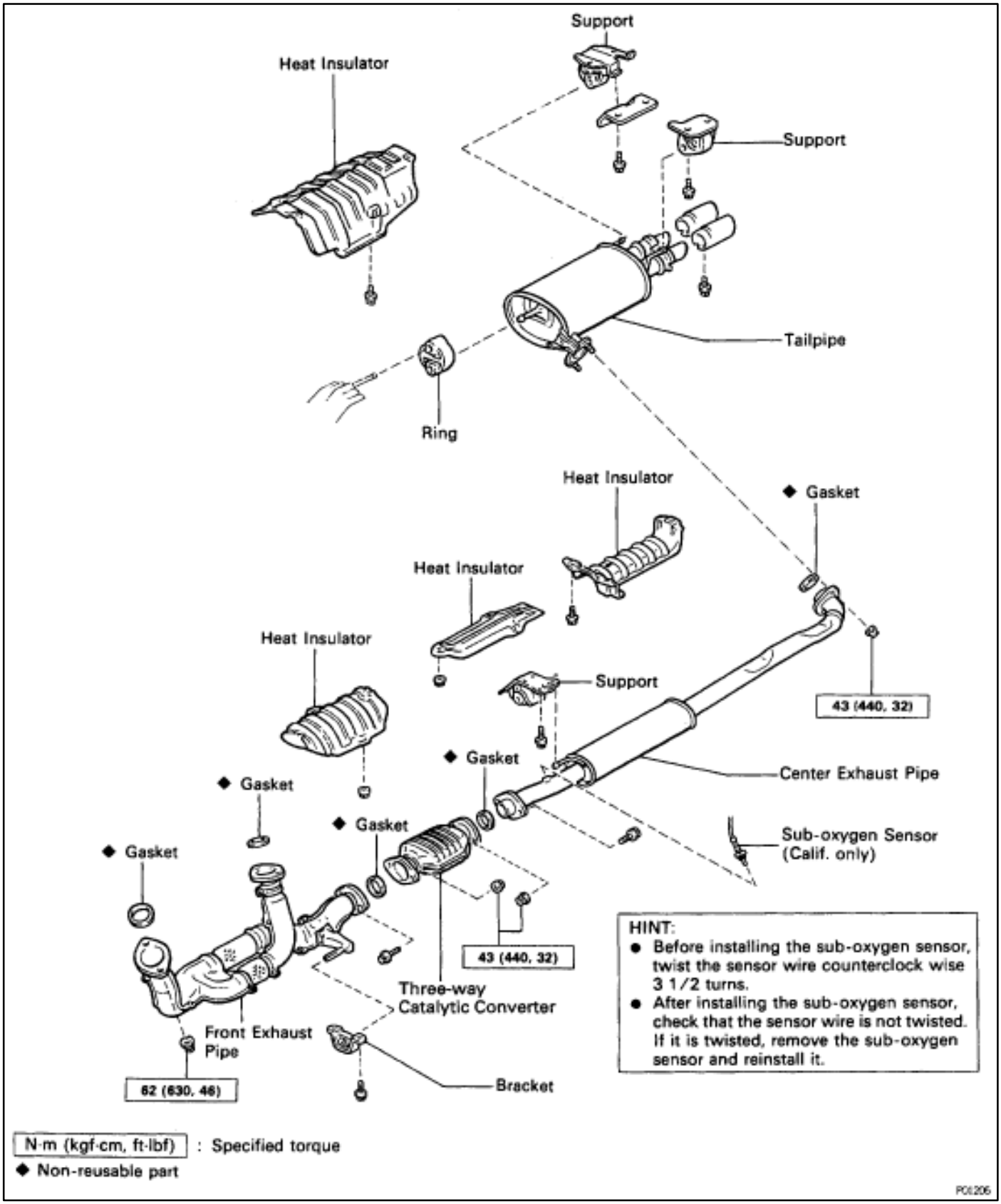
42. INSTALL HOOD

43. PREFORM ROAD TEST
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

44. RECHECK ENGINE COOLANT AND ENGINE OIL LEVELS

EXHAUST SYSTEM COMPONENTS

EG0FN–01



SERVICE SPECIFICATIONS
SERVICE DATA

EG0FP–01

Idle speed	—	700 ± 50 rpm
Intake manifold vacuum	at Idle speed	58.6 kPa (440 mmHg, 17.32 in.hg) or more
Compression pressure	at 250 rpm–STD	1.226 kPa (12.5 kgf/cm^2, 178 psi) or more
	at 250 rpm–Limit	981 kPa (10.0 kgf/cm^2, 142 psi)
	Difference of pressure between each cylinder	98 kPa (1.0kgf/cm^2, 14 psi) or less
Cylinder head	Cylinder block surface warpage–Limit	0.10 mm (0.0039 in.)
	Valve seat–Refacing angle	30°, 45°, 60°
	Valve seat–Contacting angle	45°
	Valve–Contacting width	1.0–1.4 mm (0.039–0.055 in.)
Valve guide bushing	Inside diameter	6.010–6.030 mm (0.2366–0.2374 in.)
	Outside diameter–STD	11.048–11.059 mm (0.4350–0.4354 in.)
	Outside diameter–O/S 0.05	11.098–11.109 mm(0.4369–0.4374 in.)
Valve	Valve overall length–STD (Intake)	95.15 mm (3.7461 in.)
	Valve overall length–STD (Exhaust)	94.90 mm(3.7362 in.)
	Valve overall length–Limit (Intake)	94.6 mm (3.724 in.)
	Valve overall length–Limit (Exhaust)	94.4 mm (3.717 in.)
	Valve face angle	44.5°
	Stem diameter–Intake	5.970–5.985 mm (0.2350–0.2356 in.)
	Stem diameter–Exhaust	5.965–5.980 mm (0.2348–0.2354 in.)
	Stem oil clearance–STD (Intake)	0.025–0.060 mm (0.0010–0.0024 in.)
	Stem oil clearance–STD (Exhaust)	0.030–0.065 mm (0.0012–0.0026 in.)
	Stem oil clearance–Limit (Intake)	0.08 mm (0.0031 in.)
	Stem oil clearance–Limit (Exhaust)	0.10 mm (0.0039 in.)
	Margin thickness–STD	1.0 mm (0.0394 in.)
	Margin thickness–Limit	0.5 mm (0.0197 in.)
Valve spring	Free length	41.4 mm (1.630 in.)
	Installed tension at 33.3 mm (1.311 in.)	186–206 N (19.0–21.0 kgf, 38.4–42.4 lbf)
	Squareness–Limit	2.0 mm (0.075 in.)
Valve lifter	Lifter diameter	30.966–30.976 mm (1.2191–1.2195 in.)
	Cylinder head lifter bore diameter	31.000–31.018 mm (1.2204–1.2212 in.)
	Oil clearance–STD	0.024–0.052 mm (0.0009–0.0020 in.)
	Oil clearance–Limit	0.08 mm (0.0031 in.)
Manifold	Warpage–Limit (Intake)	0.10 mm (0.0039 in.)
	Warpage–Limit (Exhaust)	1.00 mm (0.0394 in.)
Air intake chamber	Warpage–Limit	0.10 mm (0.0039 in.)

Camshaft	Thrust clearance–STD	0.033–0.080 mm (0.0013–0.0031 in.)
	Thrust clearance–Limit	0.12 mm (0.0047 in.)
	Journal oil clearance–STD	0.035–0.072 mm (0.0014–0.0028 in.)
	Journal oil clearance–Limit	0.10 mm (0.0039 in.)
	Journal diameter	26.949–26.965 mm (1.0610–1.0616 in.)
	Circle runout–Limit	0.06 mm (0.0024 in.)
	Cam lobe height–STD (Intake)	42.160–42.260 mm (1.6598–1.6638 in.)
	Cam lobe height–STD (Exhaust)	41.960–42.060 mm (1.6520–1.6559 in.)
	Cam lobe height–Limit (Intake)	42.01 mm (1.6539 in.)
	Cam lobe height–Limit (Exhaust)	41.81 mm (1.6461 in.)
	Camshaft gear backlash–STD	0.020–0.200 mm (0.0008–0.0079 in.)
	Camshaft gear backlash–Limit	0.30 mm (0.0188 in.)
	Camshaft gear spring end free distance	18.2–18.8 mm (0.712–0.740 in.)
Timing belt tensioner	Protrusion (from housing end)	10.0–10.8 mm (0.394–0.425 in.)
Cylinder block	Cylinder head surface warpage–Limit	0.05 mm (1.0020 in.)
	Cylinder bore diameter–STD (Mark 1)	87.500–87.510 mm (3.4449–3.4453 in.)
	Cylinder bore diameter–STD (Mark 2)	87.510–87.520 mm (3.4453–3.4457 in.)
	Cylinder bore diameter–STD (Mark 3)	87.520–87.530 mm (3.4457–3.4461 in.)
	Cylinder bore diameter–Limit (STD)	87.73 mm (2.4539 in.)
	Cylinder bore diameter–Limit (O/S 0.50)	88.23 mm (3.4736 in.)
Piston and piston ring	Piston diameter–STD (Mark 1)	87.360–87.370 mm (3.4394–3.4398 in.)
	Piston diameter–STD (Mark 2)	87.370–87.380 mm (3.4398–3.44020in.)
	Piston diameter–STD (Mark 3)	87.380–87.390 mm (3.4402–3.4405 in.)
	Piston diameter–O/S 0.50	87.410–87.440 mm (3.4413–3.4425 in.)
	Piston oil clearance–STD	0.13–0.15 mm (0.0051–0.0059 in.)
	Piston oil clearance–Limit	0.17 mm (0.0067 in.)
	Piston ring groove clearance–No. 1	0.010–0.080 mm (0.0004–0.0031 in.)
	Piston ring groove clearance–No.2	0.030–0.070 mm (0.0012–0.0028 in.)
	Piston ring end gap–STD (No. 1)	0.280–0.500 mm (0.00110–0.0197 in.)
	Piston ring end gap–STD (No. 2)	0.380–0.600 mm (0.0150–0.0236 in.)
	Piston ring end gap–STD (oil)	0.150–0.570 mm (0.0059–0.0224 in.)
	Piston ring end gap–Limit (No. 1)	1.10 mm (0.0433 in.)
	Piston ring end gap–Limit (No. 2)	1.20 mm (0.0472 in.)
	Piston ring end gap–Limit (Oil)	1.17 mm (0.0461 in.)

Connecting rod	Thrust clearance–STD	0.150–0.330 mm (0.0059–0.0130 in.)
	Thrust clearance–Limit	0.38 mm (0.0150 in.)
	Connecting rod oil clearance–STD (STD)	0.028–0.065 mm (0.0011–0.0026 in.)
	Connecting rod oil clearance–STD (U/S 0.25)	0.027–0.080 mm (0.0011–0.0031 in.)
	Connecting rod oil clearance–Limit	0.08 mm (0.0031 in.)
	Connecting rod bearing center wall thickness	
	–Mark 1	1.484–1.488 mm (0.0584–0.0586 in.)
	–Mark 2	1.488–1.492 mm (0.0586–0.0587 in.)
	–Mark 3	1.492–1.496 mm (0.0587–0.589 in.)
	Rod bending per 100 mm (3.94 in.)–Limit	0.05 mm (0.0020 in.)
	Rod twist per 100 mm (3.94 in.)–Limit	0.15 mm (0.0059 in.)
	Connecting rod bushing inside diameter	22.005–22.014 mm (0.8663–0.8667 in.)
	Piston pin diameter	21.997–22.006 mm (0.8860–0.8664 in.)
	Connecting rod bushing oil clearance–STD	0.005–0.011 mm (0.0002–0.0004 in.)
	Connecting rod bushing oil clearance–Limit	0.05 mm (0.0020 in.)
	Connecting rod bolt outer diameter–STD	7.860–8.000 mm (0.3094–0.3150 in.)
	Connecting rod bolt outer diameter–Limit	7.60 mm (0.2992 in.)
Crankshaft	Thrust clearance–STD	0.020–0.220 mm (0.0008–0.0087 in.)
	Thrust clearance–Limit	0.30 mm (0.0118 in.)
	Thrust washer thickness	2.440–2.490 mm (0.0961–0.0980 in.)
	Main journal oil clearance–STD (STD)	0.029–0.056 mm (0.0011–0.0022 in.)
	Main journal oil clearance–STD (U/S 0.25)	0.028–0.080 mm (0.0011–0.0031 in.)
	Main journal oil clearance–Limit	0.08 mm (0.0031 in.)
	Main journal diameter–STD	63.985–64.000 mm (2.5191–2.5197 in.)
	Main journal diameter–U/S 0.25	63.745–63.755 mm (2.5096–2.5100 in.)
	Main bearing center wall thickness–Mark 1	1.989–1.992 mm (0.0783–0.0784 in.)
	Main bearing center wall thickness–Mark 2	1.992–1.995 mm (0.0784–0.0785 in.)
	Main bearing center wall thickness–Mark 3	1.995–1.998 mm (0.0785–0.0787 in.)
	Main bearing center wall thickness–Mark 4	1.998–2.001 mm (0.0787–0.0788 in.)
	Main bearing center wall thickness–Mark 5	2.001–2.004 mm (0.0788–0.0789 in.)
	Crank pin diameter–STD	54.987–55.000 mm (2.1648–2.1654 in.)
	Crank pin diameter–U/S 0.25	54.745–54.755 mm (2.1553–2.1557 in.)
	Circle runout–Limit	0.06 mm (0.0024 in.)
	Main journal taper and out–of–round–Limit	0.02 mm (0.0008 in.)
	Crank pin taper and out–of–round–Limit	0.02 mm (0.0008 in.)

TORQUE SPECIFICATIONS

EG0FQ–01

Part tightened	N·m	kgf·cm	ft·lbf
Cylinder head cover X Cylinder head	5.9	60	52 in.·lbf
Air intake chamber X Intake manifold	43	440	32
EGR pipe X Exhaust manifold	78	800	58
EGR pipe X Air intake chamber	18	180	13
Hydraulic pressure pipe X Air intake chamber	20	200	14
Air intake chamber stay X Air intake chamber	39	400	29
Air intake chamber stay X Cylinder head	39	400	29
No. 1 engine hanger X Air intake chamber	39	400	29
No. 1 engine hanger X Cylinder head	39	400	29
Cold start injector pipe (No. 2 fuel pipe) X Cold start injector	15	150	11
Spark plug X Cylinder head	18	180	13

No. 1 idler pulley X Oil pump	34	350	25
Crankshaft pulley X crankshaft	245	2,500	181
No. 2 idler pulley X No. 2 idler pulley bracket	39	400	29
Camshaft timing pulley X Camshaft	108	1,100	80
Camshaft timing pulley X Camshaft (For use with SST)	75	760	55
Timing belt tensioner X Oil pump	26	270	20
Engine RH mounting bracket X Cylinder block	39	410	30
Engine moving control rod X No. 2 RH engine mounting bracket	64	650	47
RH engine mounting stay X Intake manifold	31	320	23
RH engine mounting stay X No. 2 RH engine mounting bracket	31	320	23
No. 2 RH engine mounting stay bolt	75	760	55
No. 2 RH engine mounting stay nut	62	630	46
No. 3 RH engine mounting stay bolt	73	740	54
Cylinder head X Cylinder block–12–pointed head bolt (1st)	34	350	25
Cylinder head X Cylinder block–12–pointed head bolt (2nd)	Turn 90°		
Cylinder head X Cylinder block–12–pointed head bolt (3rd)	Turn 90°		
Cylinder head X Cylinder block–Recessed head bolt	18	185	13
LH engine hanger X LH cylinder head	39	400	29
PS pump bracket X RH cylinder head	43	440	32
Camshaft bearing cap X Cylinder head	16	160	12
No. 3 timing belt cover X Cylinder head	7.4	75	65 in.·lbf
No. 3 timing belt cover X Cylinder block	7.4	75	65 in.·lbf
Exhaust manifold X Cylinder head	39	400	29
Intake manifold X Cylinder head	18	185	13
Air pipe X Intake manifold	8.3	85	74 in.·lbf
No. 2 idler pulley bracket stay X Intake manifold	18	185	13
No. 2 idler pulley bracket stay X No. 2 idler pulley bracket	18	185	13
Water by–pass outlet X Intake manifold	8.3	85	74 in.·lbf
Delivery pipe X Intake manifold	13	130	9
No. 1 EGR cooler X Air intake chamber	18	185	13
Water outlet X Intake manifold	8.3	85	74 in.·lbf
Emission control valve set X Air intake chamber	8.3	85	74 in.·lbf
EGR valve X Air intake chamber	18	185	13
Throttle body X Air intake chamber	13	130	9
Front exhaust pipe X Exhaust manifold	62	630	46
Front exhaust manifold X Three–way catalytic converter	43	440	32
Main bearing cap X Cylinder block–1st	61	625	45
Main bearing cap X Cylinder block–2nd	Turn 90°		
Connecting rod cap X Connecting rod–1st	25	250	18
Connecting rod cap X Connecting rod–2nd	Turn 90°		
Rear oil seal retainer X Cylinder block	7.8	80	69 in.·lbf
No. 2 idler pulley bracket X Cylinder block	37	380	27
Knock sensor X Cylinder block	44	450	33
Water by–pass pipe X Cylinder block	8.3	85	74
Coolant drain cock X Cylinder block	39	400	29
Drain hose clamp X Cylinder block	20	200	14
Rear end plate X Cylinder block	8.3	85	74 in.·lbf
Flywheel X Crankshaft (M/T)	83	850	61
Drive plate X Crankshaft (A/T)	83	850	61

RR engine mounting insulator X Cylinder block	77	790	57
FR engine mounting insulator X Cylinder block	77	790	57
FR engine mounting insulator X Front suspension member	80	820	59
Engine mounting absorber X Front suspension member	48	490	35
Engine mounting absorber X Transaxle	48	490	35
RR engine mounting insulator X Front suspension member	80	820	59
LH engine mounting insulator X Transaxle	64	650	47
PS pump X PS pump bracket	43	440	31
A/C compressor X Generator bracket	27	280	20
A/C compressor X Cylinder block	27	280	20
Fuel inlet hose X Fuel filter	29	300	22
Center exhaust pipe X Tail pipe	43	440	32

EMISSION CONTROL SYSTEMS

SYSTEM PURPOSE

EG08A–01

System	Abbreviation	Purpose
Positive crankcase ventilation	PCV	Reduces blow–by gas (HC)
Evaporative emission control	EVAP	Reduces evaporative HC
Exhaust gas recirculation	EGR	Reduces NOx
Three–way catalytic converter	TWC	Reduces HC, CO and NOx
Sequential Multiport Fuel Injection*	SFI	Regulates all engine conditions for reduction of exhaust emissions.

* For inspection and repair of the SFI system, refer to SFI Section.

PREPARATION
RECOMMENDED TOOLS

EG08B–01

	09082–00015 TOYOTA Electrical Tester	

EQUIPMENT

EG08C–01

Heater	TVV
Belt tension gauge	
Tachometer	TVV
Torque wrench	
Vacuum gauge	

SSM (SPECIAL SERVICE MATERIALS)

EG08D–01

08833–00070	Adhesive 1324, THREE BOND 1324 or equivalent	TVV

EMISSION CONTROL SYSTEMS

SYSTEM PURPOSE

EG08A–01

System	Abbreviation	Purpose
Positive crankcase ventilation	PCV	Reduces blow–by gas (HC)
Evaporative emission control	EVAP	Reduces evaporative HC
Exhaust gas recirculation	EGR	Reduces NOx
Three–way catalytic converter	TWC	Reduces HC, CO and NOx
Sequential Multiport Fuel Injection*	SFI	Regulates all engine conditions for reduction of exhaust emissions.

* For inspection and repair of the SFI system, refer to SFI Section.

PREPARATION
RECOMMENDED TOOLS

EG08B–01

	09082–00015 TOYOTA Electrical Tester	

EQUIPMENT

EG08C–01

Heater	TVV
Belt tension gauge	
Tachometer	TVV
Torque wrench	
Vacuum gauge	

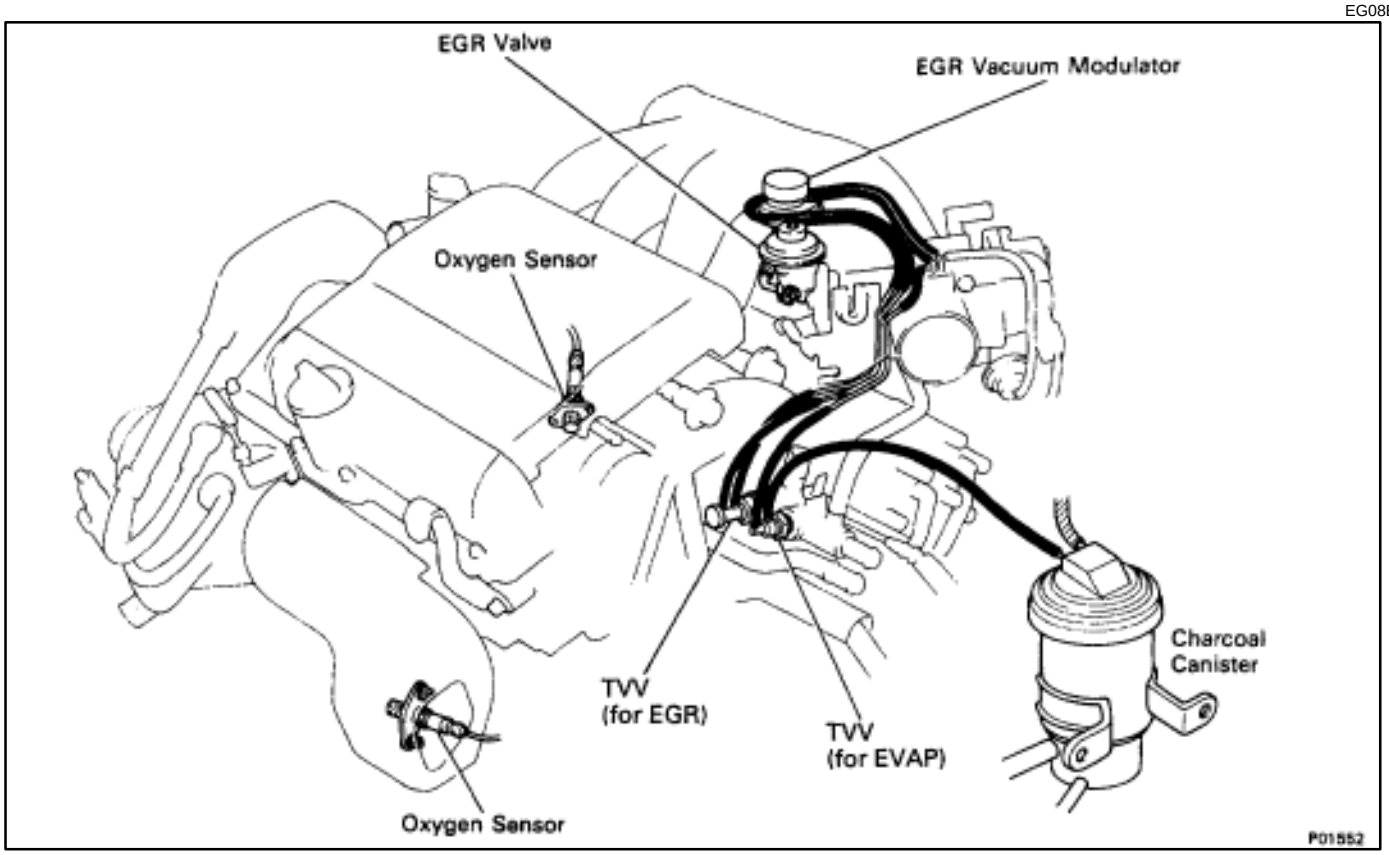
SSM (SPECIAL SERVICE MATERIALS)

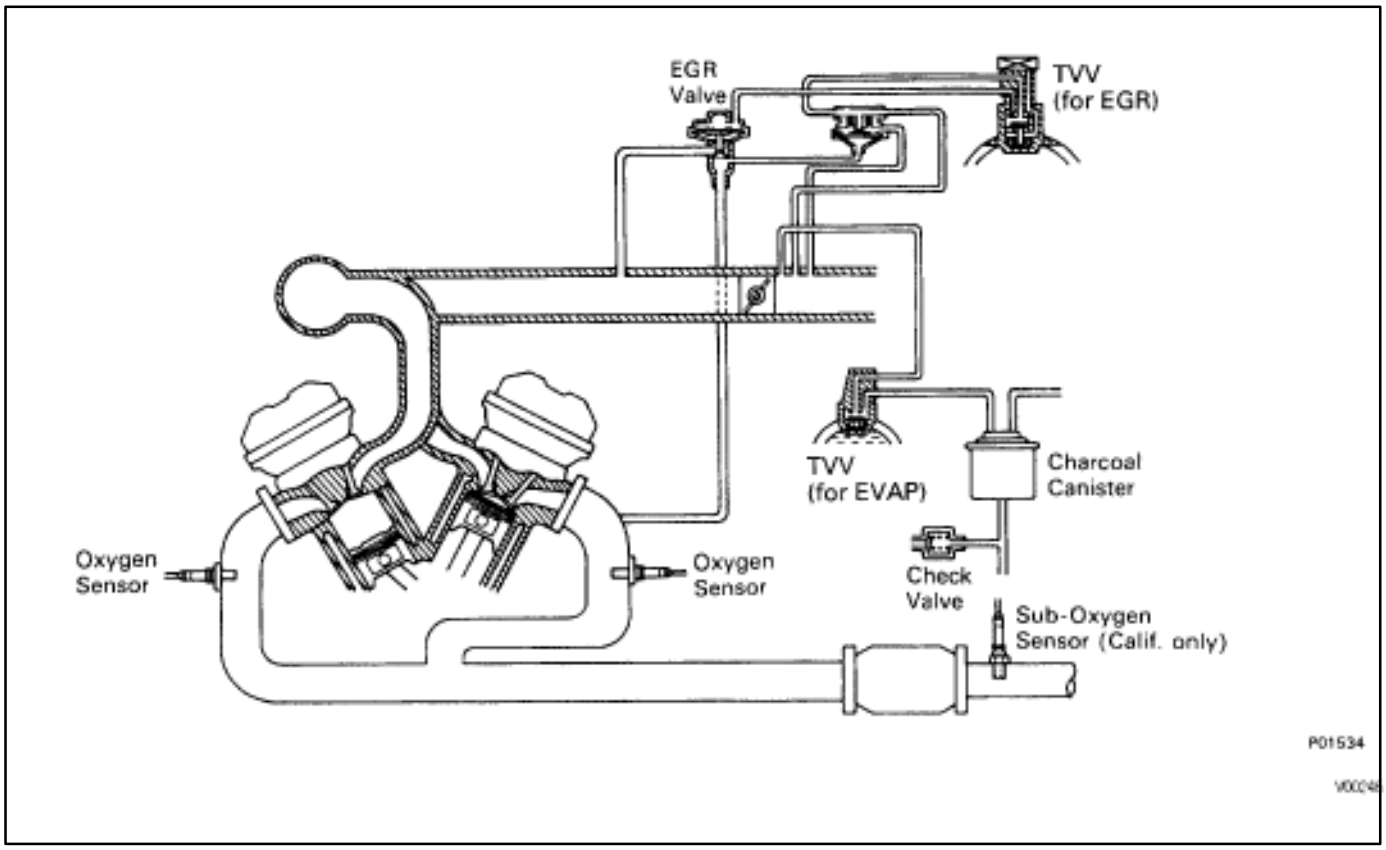
EG08D–01

08833–00070	Adhesive 1324, THREE BOND 1324 or equivalent	TVV

LAYOUT AND SCHEMATIC DRAWING

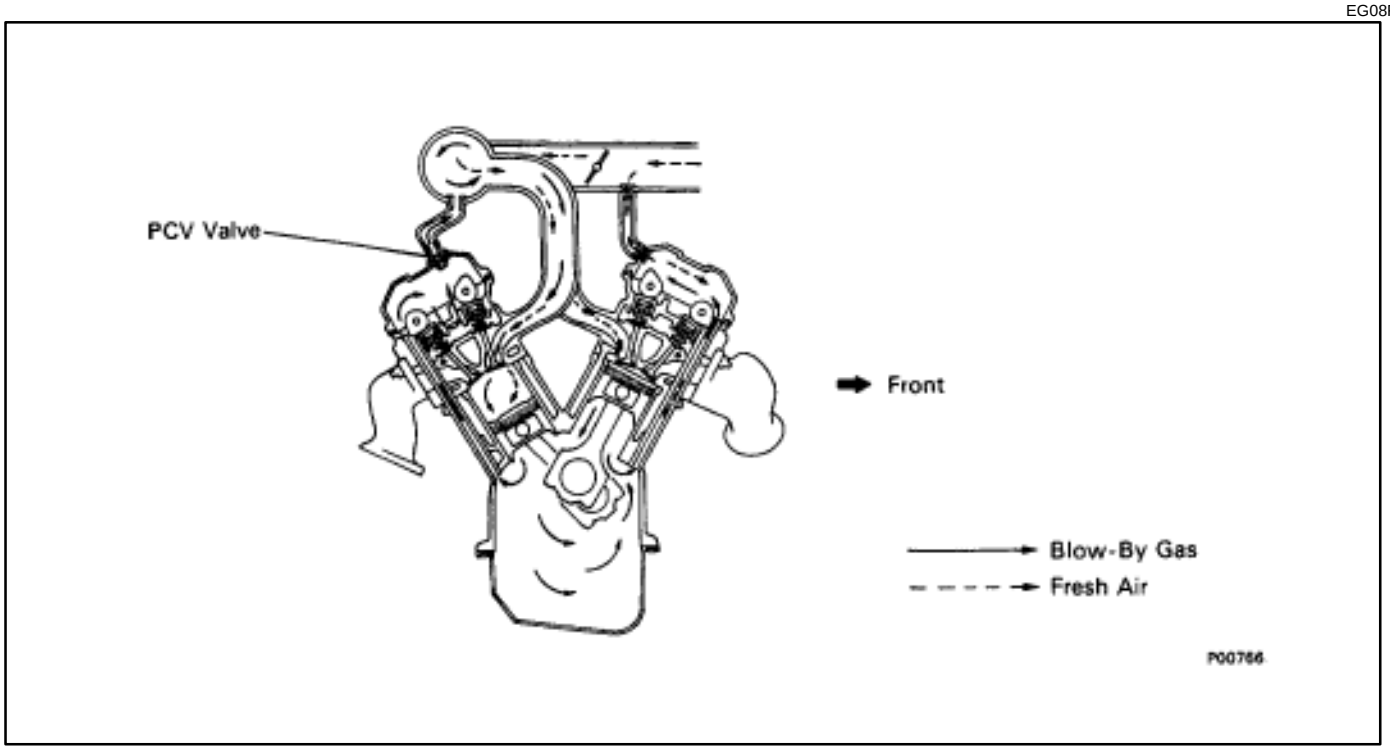
EG08E–01





POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

EG08F–01



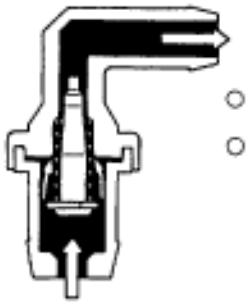
To reduce HC emission, crankcase blow–by gas (HC) is routed through the PCV valve to the air intake chamber for combustion in the cylinders.

Engine not Running

○ PCV VALVE IS CLOSED

EC4388

Normal Operation

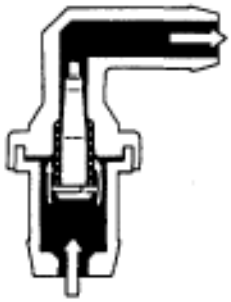


○ PCV VALVE IS OPEN

○ VACUUM PASSAGE IS LARGE.

EC4391

Idling or Deceleration

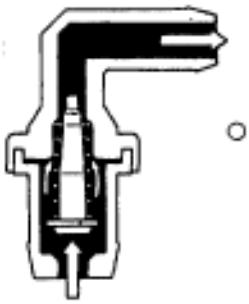


○ PCV VALVE IS OPEN.

○ VACUUM PASSAGE IS SMALL.

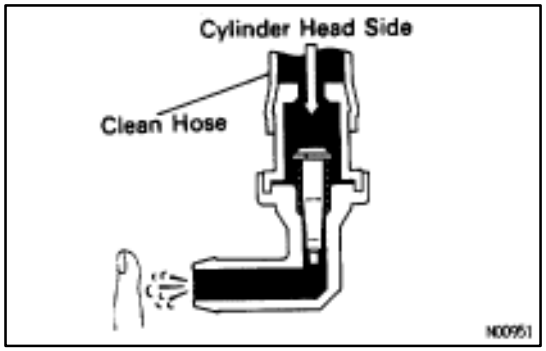
EC4390

Acceleration or High Load



○ PCV VALVE IS FULLY OPEN.

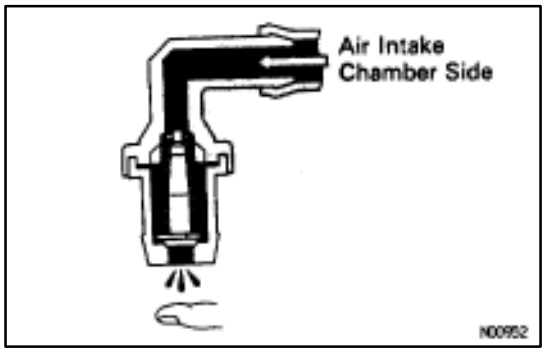
EC4389



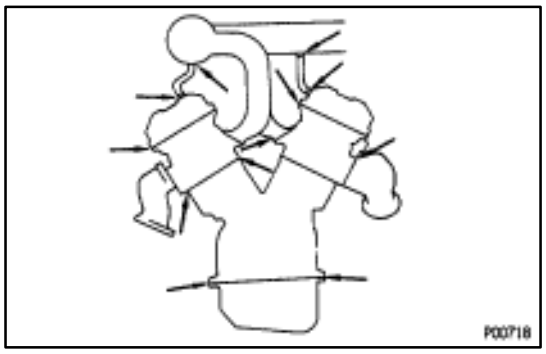
PCV VALVE INSPECTION

EG08G–01

1. **REMOVE PCV VALVE**
2. **INSTALL CLEAN HOSE TO PCV VALVE**
3. **BLOW AIR FROM CYLINDER HEAD SIDE**
   Check that air passes through easily.
   CAUTION: Do not suck air through the valve. Petroleum substances inside the valve are harmful.



4. **BLOW AIR FROM AIR INTAKE MANIFOLD SIDE**
   Check that air passes through with difficulty.
   If the PCV valve fails either of the checks, replace it.
5. **REMOVE CLEAN HOSE FROM PCV VALVE**



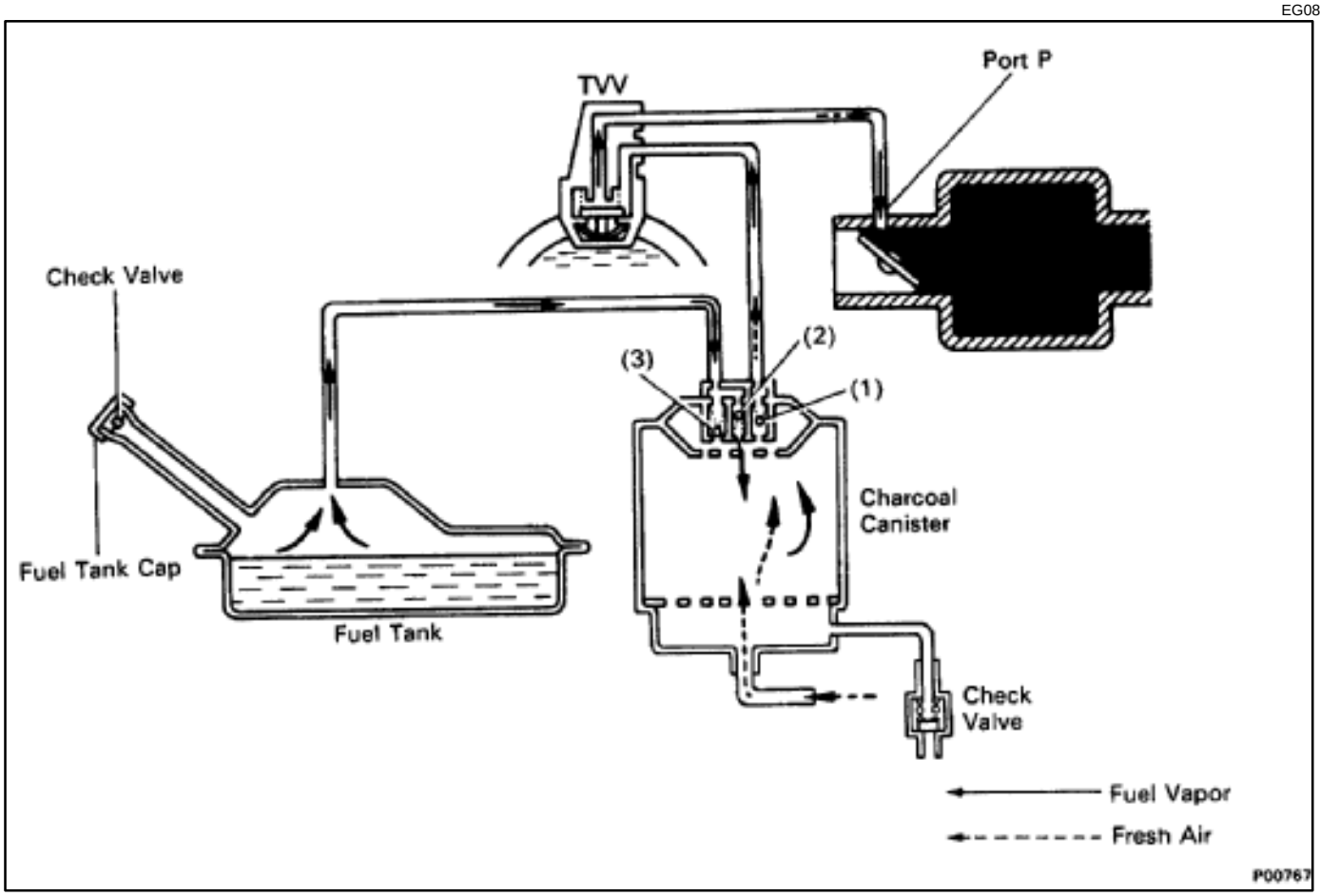
PCV HOSES AND CONNECTIONS INSPECTION

EG08H–01

VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS
Check for cracks, leaks or damage.

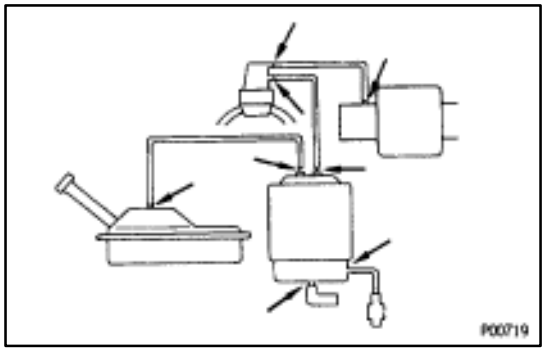
EVAPORATIVE (EVAP) EMISSION CONTROL SYSTEM

EG08J–01



To reduce HC emissions, evaporated fuel from the fuel tank is routed through the charcoal canister to the intake manifold for combustion in the cylinders.

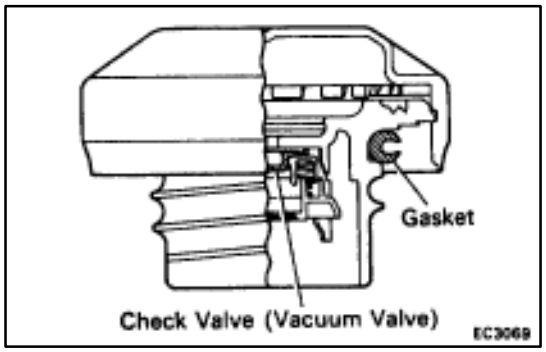
Engine Coolant Temp.	TVV	Throttle Valve Opening	Canister Check Valve			Check Valve in Cap	Evaporated Fuel (HC)
			(1)	(2)	(3)		
Below 35°C (95°F)	CLOSED	–	–	–	–	–	HC from tank is absorbed into the canister
Above 54°C (129°F)	OPEN	Positioned below port P	CLOSED	–	–	–	
		Positioned above port P	OPEN	–	–	–	HC from canister is led into air intake chamber.
High pressure in tank	–	–	–	OPEN	CLOSED	CLOSED	HC from tank is absorbed into the canister.
High vacuum in take	–	–	–	CLOSED	OPEN	OPEN	Air is led into the fuel tank.



FUEL VAPOR LINES, FUEL TANK AND TANK CAP INSPECTION

EG08K–01

1. **VISUALLY INSPECT LINES AND CONNECTIONS**
   Look for loose connections, sharp bends or damage.
2. **VISUALLY INSPECT FUEL TANK**
   Look for deformation, cracks or fuel leakage.

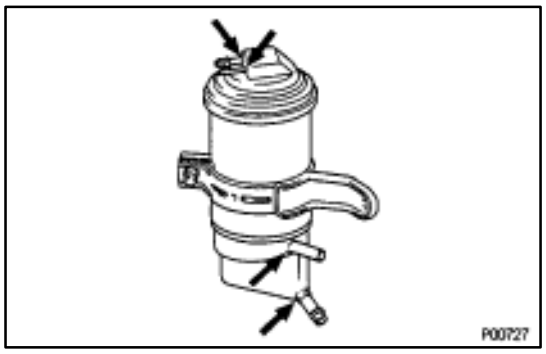


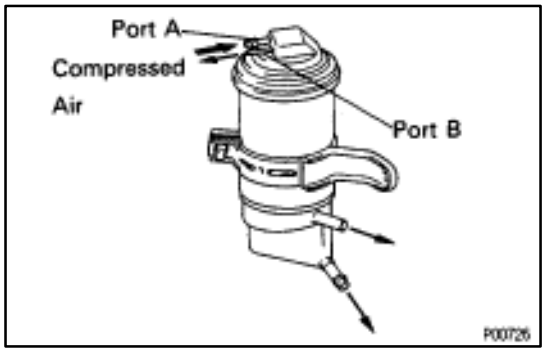
3. **VISUALLY INSPECT FUEL TANK CAP**
   Check if the cap and / or gasket are deformed or damaged.
   If necessary, repair or replace the cap.

CHARCOAL CANISTER INSPECTION

EG08L–01

1. **REMOVE CHARCOAL CANISTER**
2. **VISUALLY INSPECT CHARCOAL CANISTER**
   Look for cracks or damage.



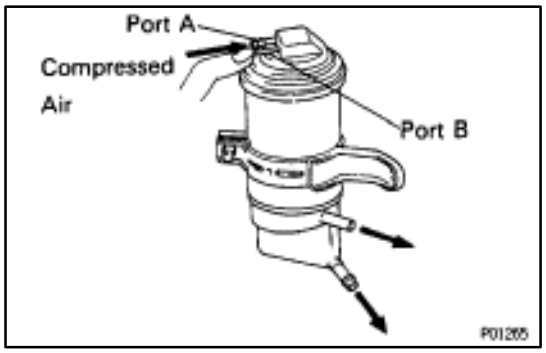


3. **CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE**

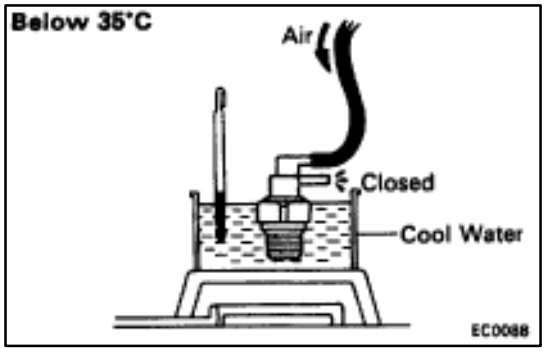
(a) Using low pressure compressed air, blow into port A and check that air flows without resistance from the other ports.

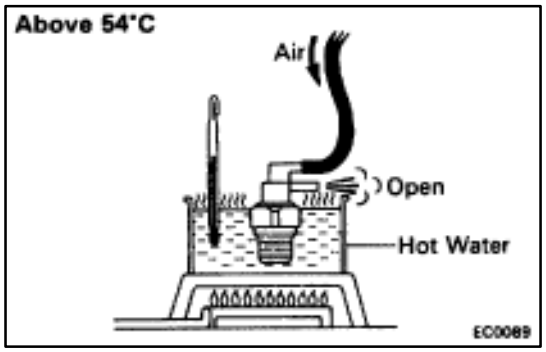
(b) Blow into port B and check that air does not flow from the other ports.

If a problem is found, replace the charcoal canister.



4. **CLEAN FILTER IN CANISTER**
   Clean the filter by blowing 294 kPa (3 kgf/cm^2, 43 psi) of compressed air into port A while holding port B closed.
   NOTICE:
   - **Do not attempt to wash the canister.**
   - **No activated carbon should come out.**
5. **REINSTALL CHARCOAL CANISTER**



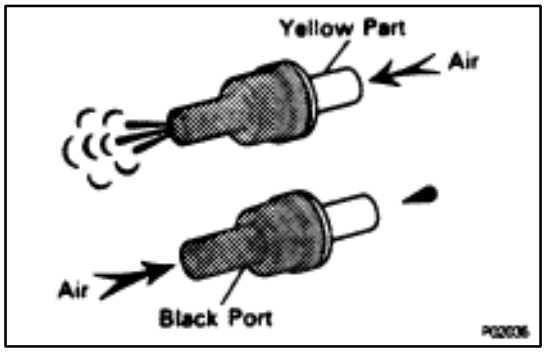


TVV INSPECTION

EG08M–01

CHECK TVV BY BLOWING AIR INTO PIPE

(a) Drain the engine coolant from the radiator into a suitable container.
(b) Remove the TVV from the water by–pass outlet.
(c) Cool the TVV to below 35°C (95°F) with cool water.
(d) Blow air into a port and check that the TVV is closed.
(e) Heat the TVV to above 54°C (129°F) with hot water.
(f) Blow air into a port and check that the TVV is open.
If a problem is found, replace the TVV.
(g) Apply adhesive to two or three threads of the TVV, and reinstall.
Adhesive:
Part No. 08833–00070, THREE BOND 1324 or equivalent
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)
(h) Refill the radiator and engine with engine coolant.



CHECK VALVE INSPECTION

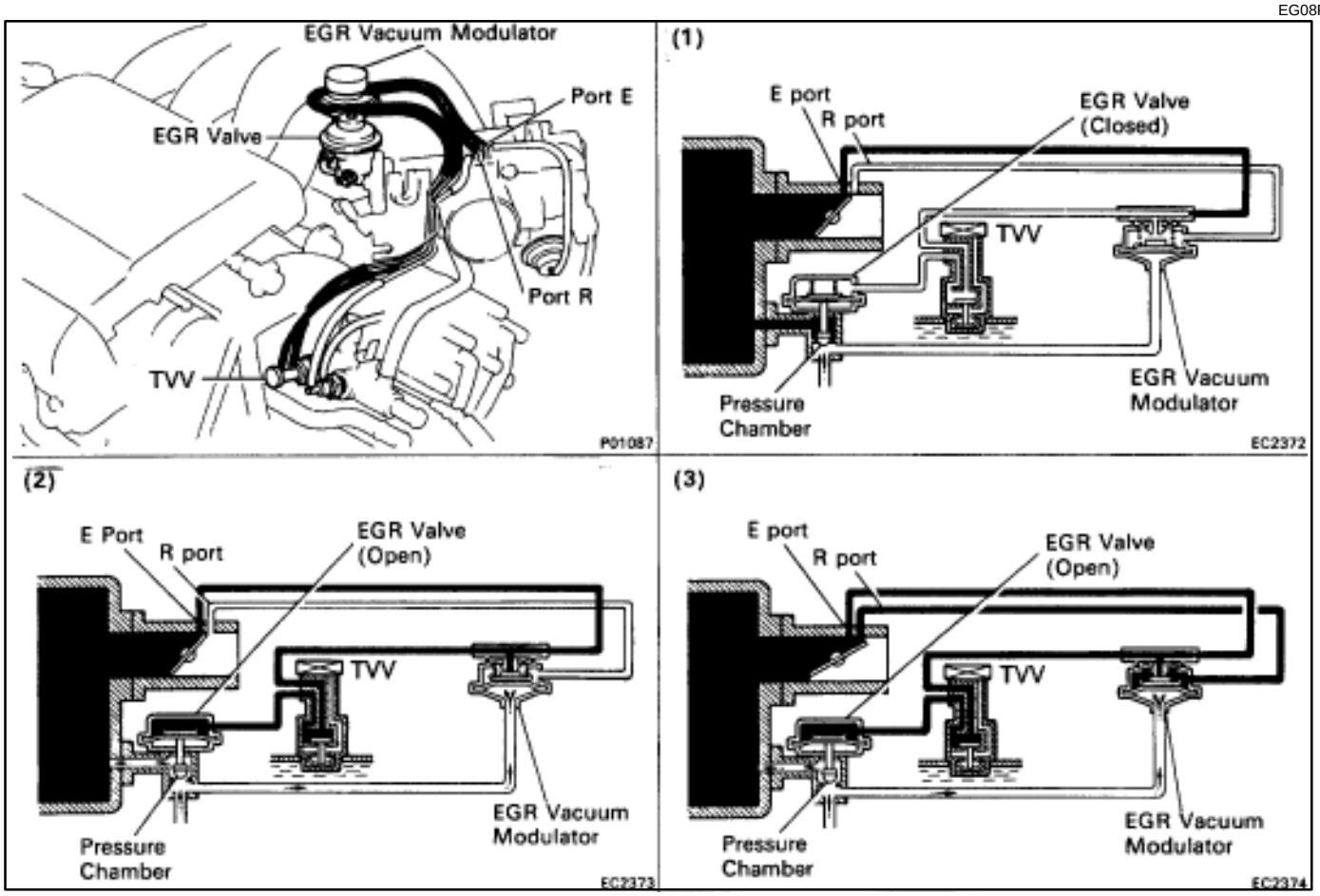
EG08N–01

INSPECT CHECK VALVE

(a) Check that air flows from the yellow port to the black port.
(b) Check that air does not flow from the black port to the yellow port.
If the operation is not as specified, replace the check valve.

EXHAUST GAS RECIRCULATION(EGR) SYSTEM

EG08P–01



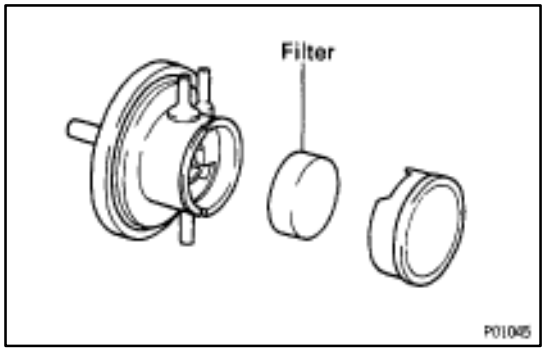
To reduce NOx emissions, part of the exhaust gases are recirculated through the EGR valve to the intake manifold to lower the maximum combustion temperature.

Engine coolant Temp.	TVV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 35°C (95°F)	CLOSED	–	–		–	CLOSED	Not recirculated
Above 56°C (133°F)	OPEN	Positioned below port E	–		–	CLOSED	Not recirculated
		Positioned between port E and port R	(1) LOW	*Pressure constantly alternating between low and high	OPENS passage to atmosphere	CLOSED	Not recirculated
			(2) HIGH		CLOSES passage to atmosphere	OPEN	Recirculated
		Positioned above port R	(3) HIGH	**	CLOSES passage to atmosphere	OPEN	Recirculated (increase)

Remarks: * Pressure increase → Modulator closes → EGR valve opens → Pressure drops → EGR valve closes → Modulator opens →

** When the throttle valve is positioned above port R, the EGR vacuum modulator will close the atmosphere passage and open the EGR valve to increase the EGR gas, even if the exhaust pressure is insufficiently low.

V00248



EGR SYSTEM INSPECTION

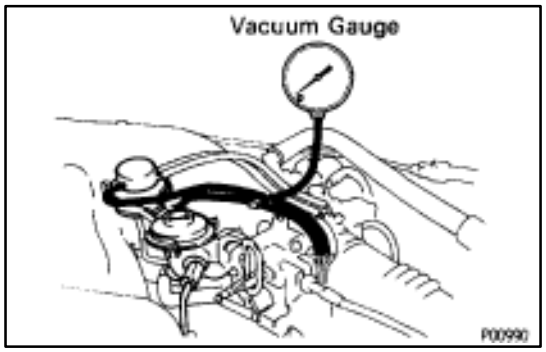
EG08Q–01

1. CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR

(a) Check the filter for contamination or damage.

(b) Using compressed air, clean the filter.

HINT: Install the filter with the coarser surface facing the atmospheric side (outward).

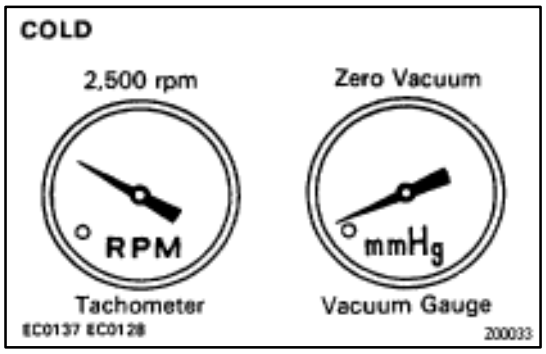


2. PREPARATION

Using a 3–way connector, connect a vacuum gauge to the hose between the EGR valve and vacuum pipe.

3. CHECK SEATING OF EGR VALVE

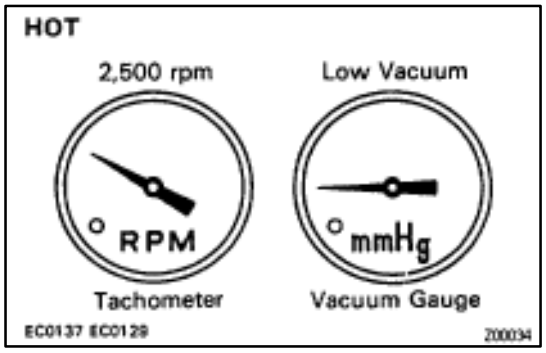
Start the engine and check that the engine starts and runs at idle.



4. CHECK TVV WITH COLD ENGINE

(a) The engine coolant temperature should be below 35°C (95°F).

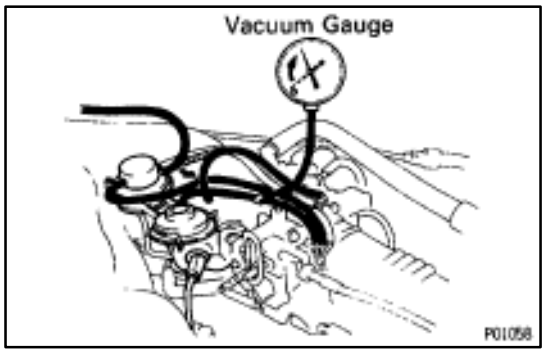
(b) Check that the vacuum gauge indicates zero at 2,500 rpm.



5. CHECK TVV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine.

(b) Check that the vacuum gauge indicates low vacuum at 2,500 rpm.

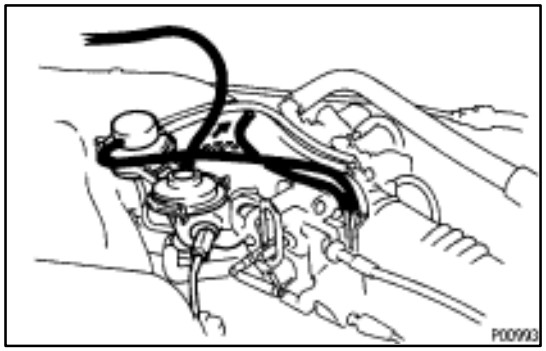


(c) Disconnect the vacuum hose from the R port of the EGR vacuum modulator and connect the R port directly to the intake manifold with another hose.

(d) Check that the vacuum gauge indicates high vacuum at 3,500 rpm.

HINT: As large amount of EGR gas enters, the engine will misfire slightly.

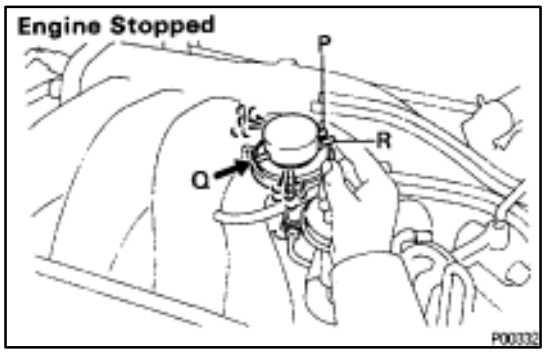
(e) Remove the vacuum gauge and reconnect the vacuum hoses to the proper locations.



6. CHECK EGR VALVE

(a) Apply vacuum directly to the EGr valve with the engine idling.
(b) Check that the engine runs rough or dies.
(c) Reconnect the vacuum hoses to the proper locations.

IF NO PROBLEM IS FOUND WITH THIS INSPECTION, SYSTEM IS NORMAL; OTHERWISE INSPECT EACH PART

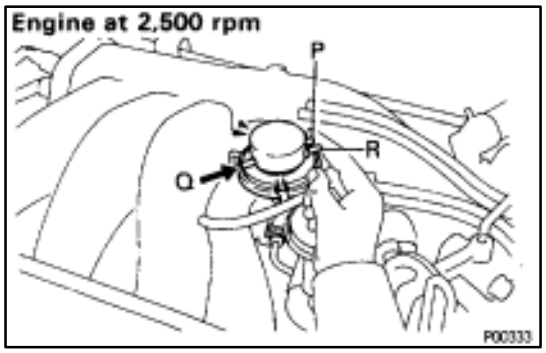


EGR VACUUM MODULATOR INSPECTION

EG08R–01

CHECK EGR VACUUM MODULATOR OPERATION

(a) Disconnect the vacuum hoses from ports P, Q and R of the EGR vacuum modulator.
(b) Block ports P and R with your finger.
(c) Blow air into port Q, and check that the air passes through to the air filter side freely.
(d) Start the engine, and maintain speed at 3,500 rpm.
(e) Repeat the above test. Check that there is a strong resistance to air flow.
(f) Reconnect the vacuum hoses to the proper locations.



EGR VALVE INSPECTION

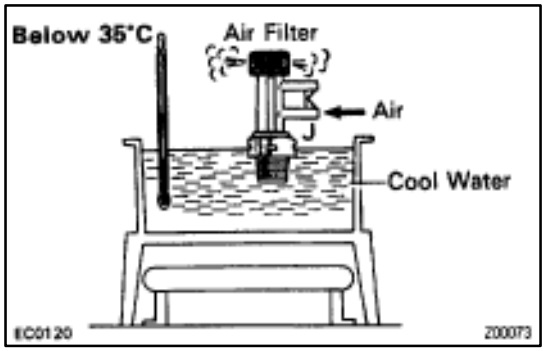
EG08S–01

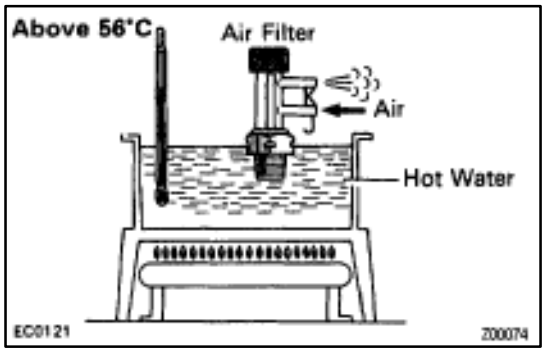
1. REMOVE EGR VALVE

Check for sticking and heavy carbon deposits.
If a problem is found, replace the valve.

2. REINSTALL EGR VALVE WITH NEW GASKET

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)





TVV INSPECTION

EG08T–01

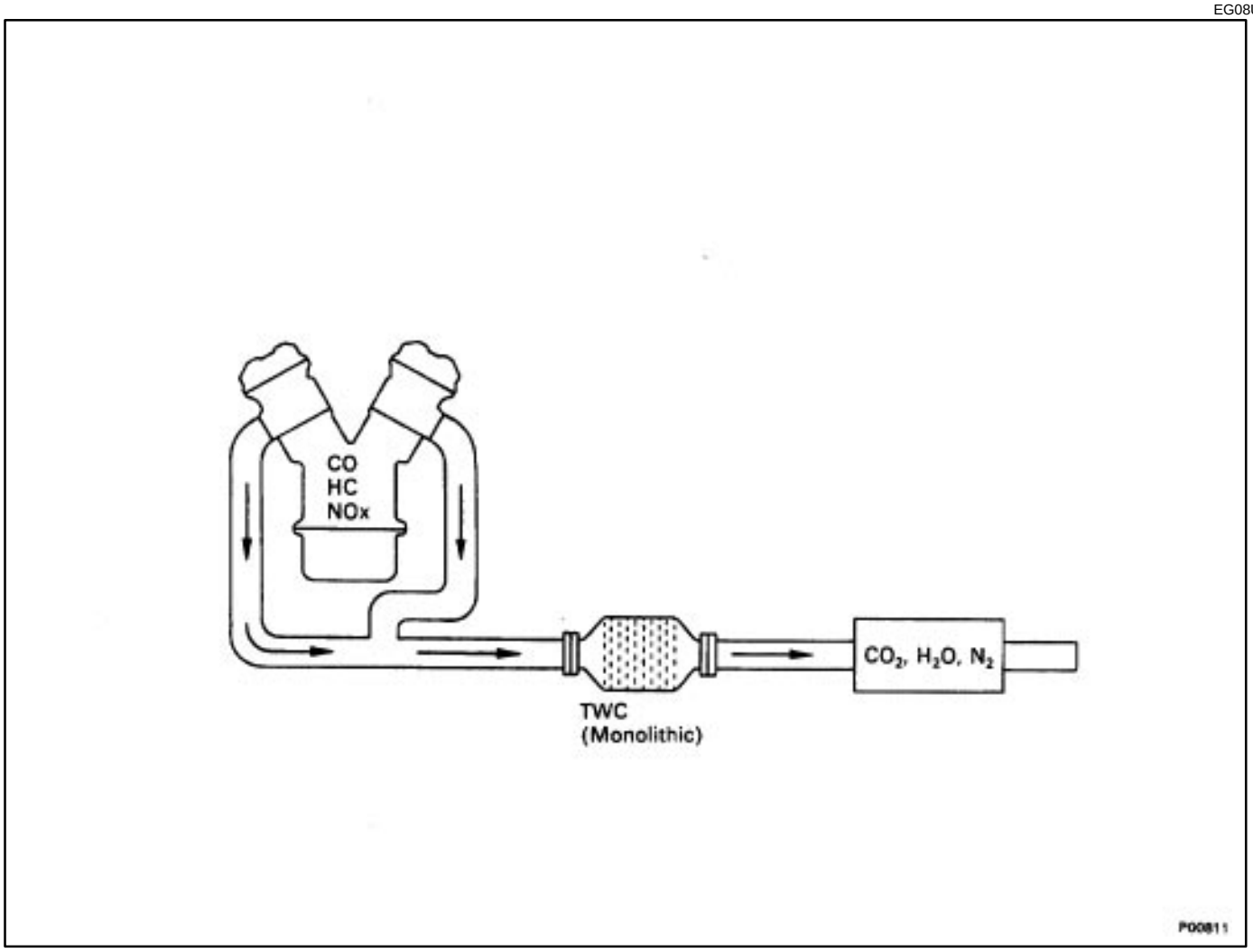
CHECK TVV BY BLOWING AIR INTO PIPE

(a) Drain the engine coolant from the radiator into a suitable container.
(b) Remove the TVV from the water by–pass outlet.
(c) Cool the TVV to below 35°C (95°F) with cool water.
(d) Blow air into the pipe, and check that the TVV is closed.

(e) Heat the TVV to above 56°C (133°F) with hot water.
(f) Blow air into the pipe, and check that the TVV is open.
If a problem is found, replace the TVV.
(g) Apply adhesive to two or three threads of the TVV, and reinstall.
Adhesive:
Part No. 08833–00070, THREE BOND 1324 or equivalent
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)
(h) Refill the radiator with engine coolant.

THREE–WAY CATALYTIC CONVERTER (TWC) SYSTEM

EG08U–01



To reduce HC, CO and NOx emissions, they are oxidized, reduced and converted to nitrogen (N_2), carbon dioxide (CO_2) and water (H_2O) by the three-way catalytic converter.

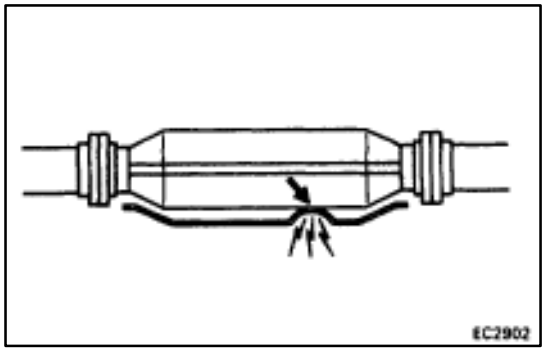
Exhaust port		TWC		Exhaust Gas
HC, CO, AND NOx	→	OXDATION AND REDUCTION	→	CO_2 H_2O H_2

V00215

EXHAUST PIPE ASSEMBLY INSPECTION

EG08V–01

1. CHECK CONNECTIONS FOR LOOSENESS OR DAMAGE
2. CHECK CLAMPS FOR WEAKNESS, CRACKS OR DAMAGE

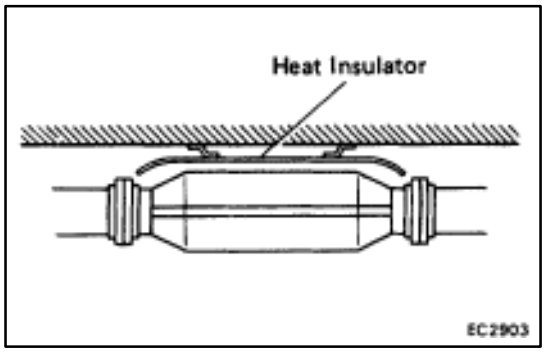


THREE–WAY CATALYTIC CONVERTER INSPECTION

EG08W–01

CHECK FOR DENTS OR DAMAGE

If any part of protector is damaged or dented to the extent that it contacts the three–way catalytic converter, repair or replace it.

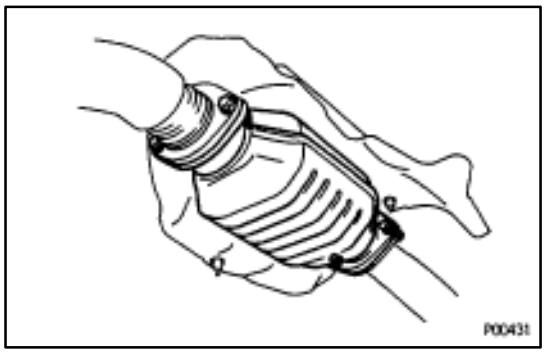


HEAT INSULATOR INSPECTION

EG08X–01

1. CHECK HEAT INSULATOR FOR DAMAGE

2. CHECK FOR ADEQUATE CLEARANCE BETWEEN THREE–WAY CATALYTIC CONVERTER AND HEAT INSULATOR



THREE–WAY CATALYTIC CONVERTER REPLACEMENT

EG08Y–01

1. REMOVE THREE–WAY CATALYTIC CONVERTER

(a) Jack up the vehicle.

(b) Check that the three–way catalytic converter is cool.

(c) Remove the four bolts and nuts holding the pipes to the three–way catalytic converter.

(d) Remove the three–way catalytic converter and two gaskets.

2. REINSTALL THREE–WAY CATALYTIC CONVERTER

(a) Place new two gaskets on the front and rear pipes.

(b) Install the three–way catalytic converter with the bolts and nuts. Torque the bolts and nuts.

Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

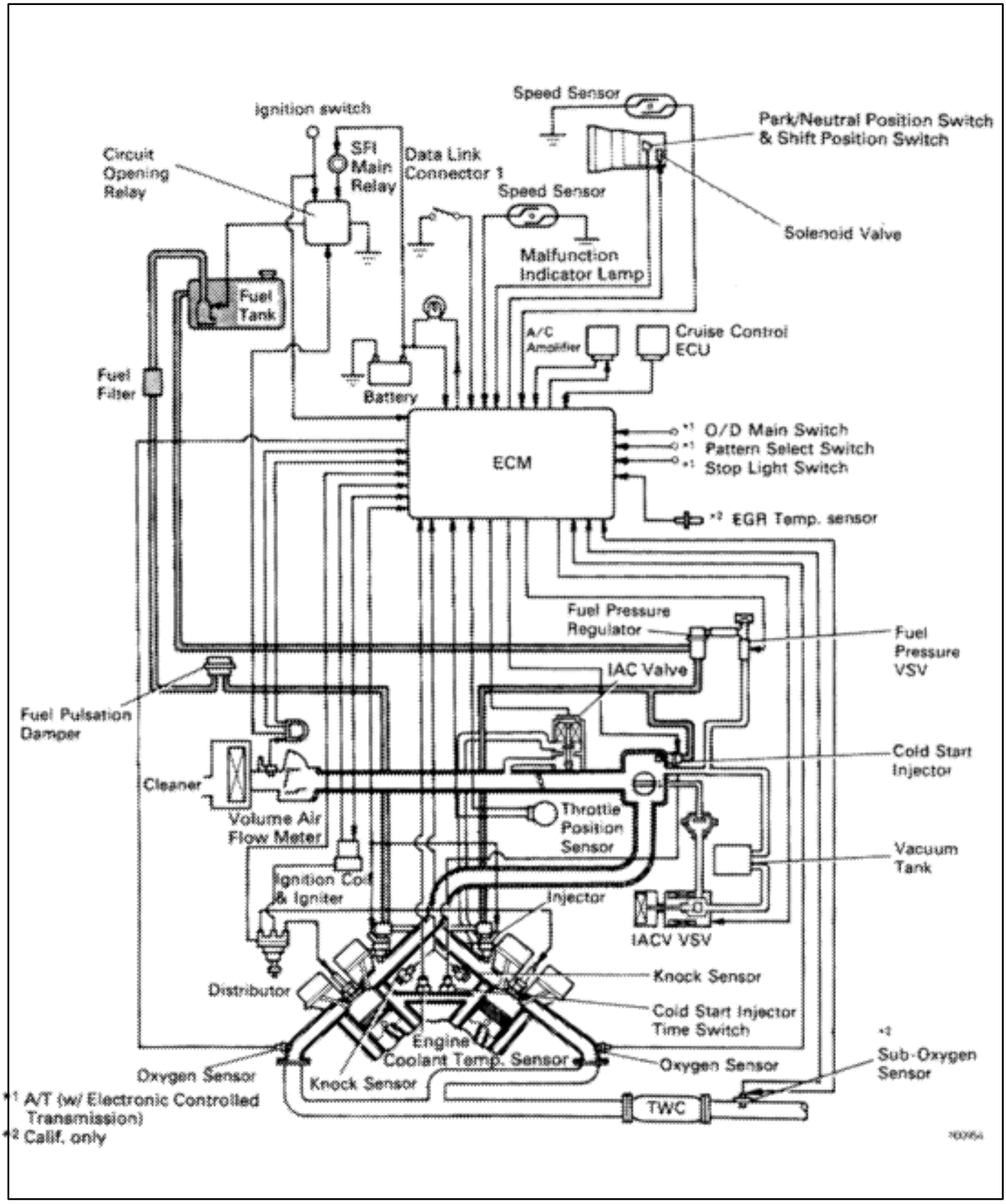
SERVICE SPECIFICATIONS
TORQUE SPECIFICATIONS

EG08Z–01

Part tightened	N·m	kgf·cm	ft·lbf
TVV X Water by–pass outlet	29	300	22
EGR valve X Intake manifold	18	185	13
Three–way catalytic converter X Exhaust pipe	43	440	32

SFI SYSTEM
DESCRIPTION
SYSTEM CIRCUIT

EG0FR–01



EG0FS–01

The SFI system is composed of three basic sub–systems: Fuel, Air Induction and Electronic Control Systems.

FUEL SYSTEM

EG0FT–01

Fuel is supplied under constant pressure to the SFI injectors by an electric fuel pump. The injectors inject a metered quantity of fuel into the intake manifold in accordance with signals from the ECM.

AIR INDUCTION SYSTEM

EG0FU–01

The air induction system provides sufficient air for engine operation.

ELECTRONIC CONTROL SYSTEM

EG0FV–01

The CAMRY 3VZ–FE engine is equipped with a TOYOTA Computer Controlled System (TCCS) which centrally controls the SFI, EI, IAC, Diagnosis systems etc. by means of an ECM (ECM–formerly SFI computer) employing a microcomputer.

By means of the ECM, the controls the following functions:

1. Sequential Multiport Fuel Injection (SFI)

The ECM receives signals from various sensors indicating changing engine operation conditions such as:

Intake air volume
Intake air temperature
Engine coolant temperature
Engine rpm
Acceleration/deceleration
Exhaust oxygen content etc.

The signals are utilized by the ECM to determine the injection duration necessary for an optimum air–fuel ratio.

2. Electronic Ignition (EI)

The ECM is programmed with data for optimum ignition timing under any and all operating conditions. Using data provided by sensors which monitor various engine functions (rpm, engine coolant temperature, etc.), the microcomputer (ECM) triggers the spark at precisely the right instant.
(See IG section)

3. Idle Air Control (IAC)

The ECM is programmed with target idling speed values to respond to different engine conditions (engine coolant temperature, air conditioning ON/OFF, etc.). Sensors transmit signals to the ECM which control the flow of air through the by–pass of the throttle valve and adjust idle speed to the target value.

4. Diagnosis

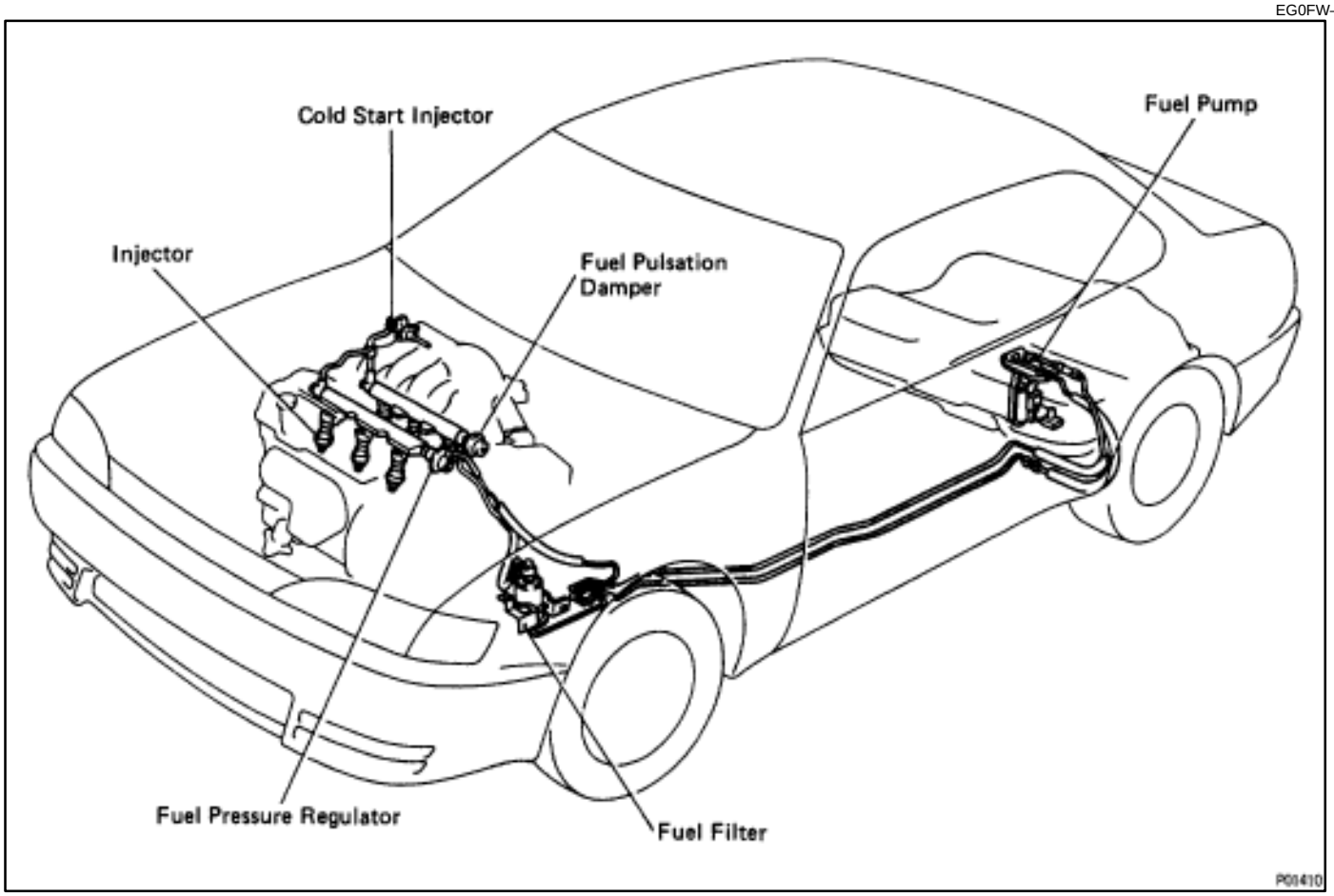
The ECM detects any malfunctions and abnormalities in the sensor network and lights a Malfunction Indicator Lamp on the combination meter. At the same time, the trouble is identified and a diagnostic trouble code is recorded by the ECM. The diagnostic trouble code can be read by the number of blinks of the Malfunction Indicator Lamp when terminals TE1 and E1 are connected. The diagnostic trouble codes are refer red to the later page. (See TR section)

5. Fail–Safe Function

In the event of the sensor malfunctioning, a back–up circuit will take over to provide minimal driveability, and the Malfunction Indicator Lamp will illuminate.

OPERATION
FUEL SYSTEM

EG0FW–02



Fuel is pumped up by the fuel pump, flows through the fuel filter and is distributed to each injector and cold start injector at a set pressure maintained by the pressure regulator.

The fuel pressure regulator adjusts the pressure of the fuel from the fuel line (high pressure side) to a pressure 284 kPa (2.9 kgf/cm^2, 41 psi) higher than the pressure inside the intake manifold, and excess fuel is returned to the fuel tank through the return pipe. When the engine is hot, the fuel pressure is increased to control percolation in the fuel system and improve restartability and idling stability.

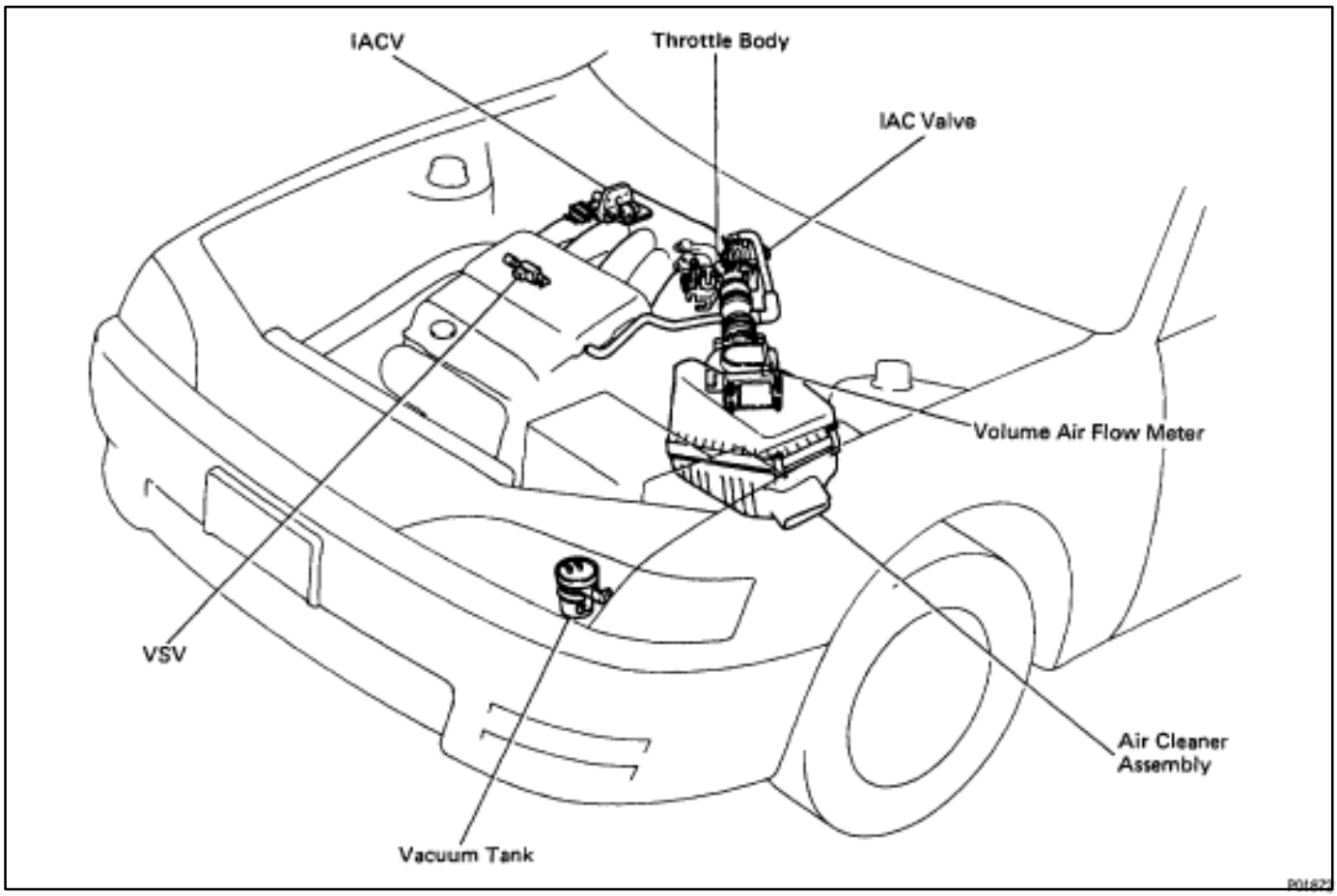
The pulsation damper absorbs the slight fluctuations in fuel pressure caused by fuel injector from the injector.

The injectors operate on input of injection signals from the ECM and inject fuel into the intake manifold.

The cold start injector operates when starting at low engine coolant temperature or at normal temperature ranges, injecting fuel into the air intake chamber to improve startability.

AIR INDUCTION SYSTEM

EG0FX–02



Air filtered through the air cleaner passes through the volume air flow meter and the amount flowing to the air intake chamber is determined according to the throttle valve opening in the throttle body and the engine rpm.

The volume air flow meter measures the intake air flow by the opening of the measuring plate in response to the volume of intake air to the engine.

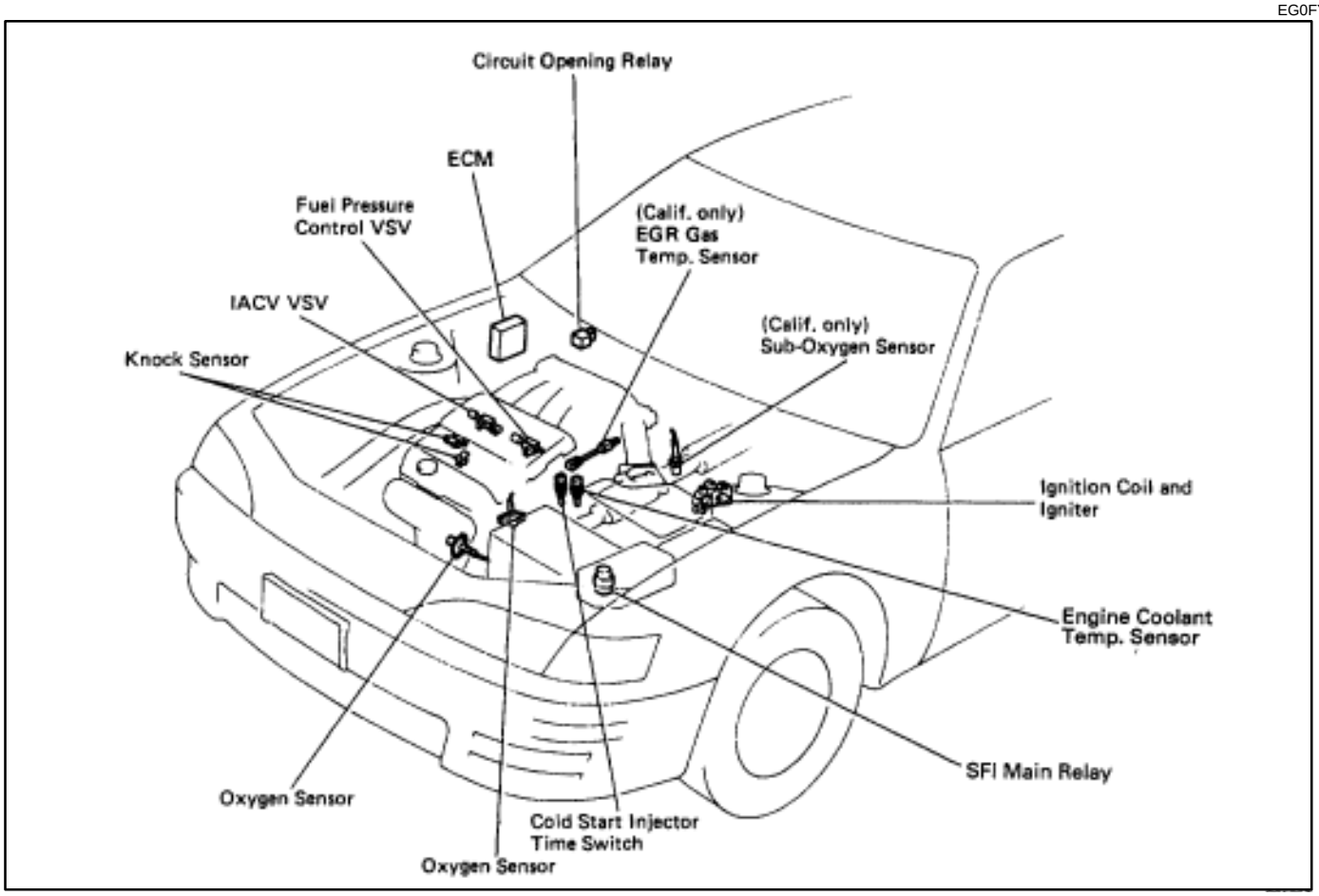
Located in the throttle body is the throttle valve, which regulates the volume of intake air to the engine. Intake air controlled by the throttle valve opening is distributed from the air intake chamber to the manifold of each cylinder and is drawn into the combustion chamber.

At low temperatures the IAC valve opens and the air flows through the IAC valve and the throttle body, into the air intake chamber. During engine warning up, even if the throttle valve is completely closed, air flows to the air intake chamber, thereby increasing the idle speed (first idle operation).

The air intake chamber prevents pulsation of the intake air, reduces the influence on the volume air flow meter and increases the accuracy of the measurement of the intake air volume. It also prevents intake air interference in each cylinder.

ELECTRONIC CONTROL SYSTEM

EG0FY–02



The control system consists of sensors which detect various engine conditions, and a ECM which determines the injection volume (timing) based on the signals from the sensors.

The various sensors detect the intake air volume, engine rpm, oxygen density in the exhaust gas, engine coolant temperature, intake air temperature and atmospheric pressure etc. and convert the information into an electrical signal which is sent to the ECM. Based on these signals, the ECM calculates the optimum ignition timing for the current conditions and operates the injectors.

The ECM not only controls the fuel injection timing, but also the self diagnostic function which records the occurrence of a malfunction, ignition timing control, idle rpm control, fuel pressure control and fuel pump control.

PREPARATION
SST (SPECIAL SERVICE TOOLS)

EG0FZ–01

	09268–41045 Injection Measuring Tool Set	
	(09268–41060) No.3 Union	
	(09268–41080) No.6 Union	
	(90405–09015) No.1 Union	
	09268–45012 EFI Fuel Pressure Gauge	
	09631–22020 Power Steering Hose Nut 14 x 17 mm Wrench Set	Fuel line flare nut
	09842–30055 Wire "G" EFI Inspection	
	09842–30070 Wiring "F" EFI Inspection	
	09843–18020 Diagnosis Check Wire	

RECOMMENDED TOOLS

EG0G0–01

	09082–00015 TOYOTA Electrical Tester	
	09200–00010 Engine Adjust Kit	
	09258–00030 Hose Plug Set	Plug for the vacuum hose, fuel hose etc.

EQUIPMENT

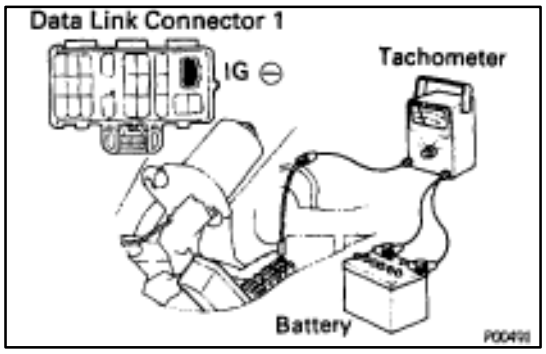
EG0G1–01

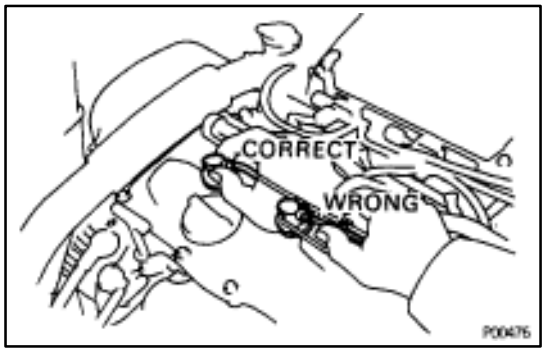
Graduated cylinder	Injector
Carburetor cleaner	Throttle body
Sound scope	Injector
Tachometer	
Torque wrench	
Vacuum gauge	
Soft brush	Throttle body

PRECAUTIONS

EG0G2–01

1. **Before working on the fuel system, disconnect the cable from negative (–) terminal of the battery.**
   HINT: Any diagnostic trouble code retained by the computer will be erased when the battery terminal is removed. Therefore, if necessary, read the diagnosis before removing the battery terminal.
2. **Do not smoke or work near an open flame when working on the fuel system.**
3. **Keep gasoline away from rubber or leather parts.**





MAINTENANCE PRECAUTIONS

EG0G3–01

1. **CHECK CORRECT ENGINE TUNE–UP**
   (See page EG–11)
2. **PRECAUTIONS WHEN CONNECTING GAUGE**

(a) Use the battery as the power source for the timing light, tachometer, etc.
(b) Connect the tester probe of a tachometer to the terminal IG⊕ of the data link connector 1.

3. **IN EVENT OF ENGINE MISFIRE, FOLLOWING PRECAUTIONS SHOULD BE TAKEN**

(a) Check proper connection of battery terminals, etc.
(b) Handle high–tension cords carefully.
(c) After repair work, check that the ignition coil terminals and all other ignition system lines are reconnected securely.
(d) When cleaning the engine compartment, be especially careful to protect the electrical system from water.

4. **PRECAUTIONS WHEN HANDLING OXYGEN SENSOR**

(a) Do not allow oxygen sensor to drop or hit against an object.
(b) Do not allow the sensor to come into contact with water.

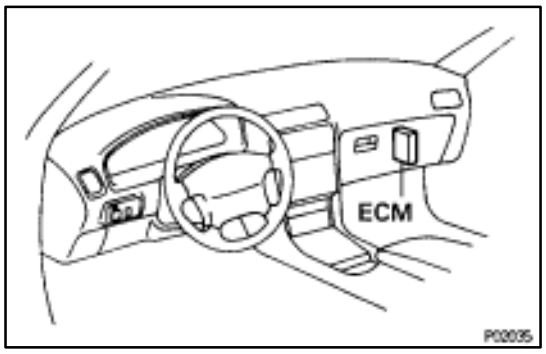
IF VEHICLE IS EQUIPPED WITH MOBILE RADIO SYSTEM (HAM, CB, ETC.)

EG0G4–02

The ECM has been designed so that it will not be affected by outside interference.

However, if your vehicle is equipped with a CB radio transceiver, etc. (even one with about 10 W output), it may, at times, have an affect upon ECM operation, especially if the antenna and feeder are installed nearby.

Therefore, observe the following precautions:

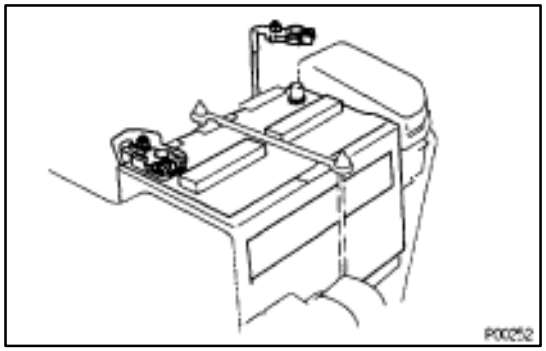


1. Install the antenna as far away as possible from the ECM. The ECM is located under the dash board on the passenger's side so the antenna should be installed at the rear side of the vehicle.
2. Keep the antenna feeder as far away as possible from the ECM wires–at least 20 cm (7.87 in.)–and, especially, do not wind them together.
3. Check that the feeder and antenna are properly adjusted.
4. Do not equip your vehicle with a powerful mobile radio system.
5. Do not open the cover or the case of the ECM unless absolutely necessary. (If the IC terminals are touched, the IC may be destroyed by static electricity.)

AIR INDUCTION SYSTEM

EG0G5–01

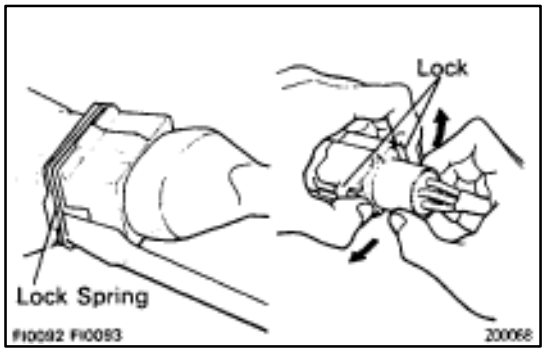
1. Separation of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause the engine to run out of tune.
2. Disconnection, looseness or cracks in the parts of the air induction system between the throttle body and cylinder head will allow air suction and cause the engine to run out of tune.



ELECTRONIC CONTROL SYSTEM

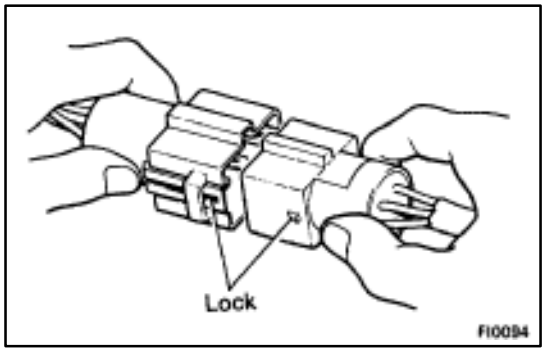
EG0G6–01

1. Before removing SFI wiring connectors, terminals, etc., first disconnect the power by either turning the ignition switch OFF or disconnecting the battery terminals.
   HINT: Always check the diagnostic trouble code before disconnecting the battery terminal.
2. When installing the battery, be especially careful not to incorrectly connect the positive (+) and negative (–) cables.
3. Do not permit parts to receive a severe impact during removal or installation. Handle all SFI parts carefully, especially the ECM.
4. Do not be careless during troubleshooting as there are numerous transistor circuits and even slight terminal contact can cause further troubles.
5. Do not open the ECM cover.
6. When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the SFI parts and wiring connectors.
7. Parts should be replaced as an assembly.

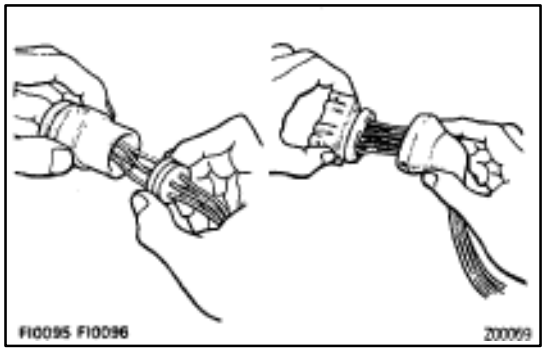


8. Care is required when pulling out and inserting wiring connectors.

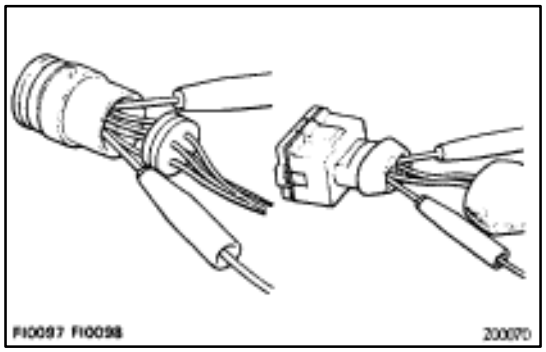
(a) Release the lock and pull out the connector, pulling on the connectors.



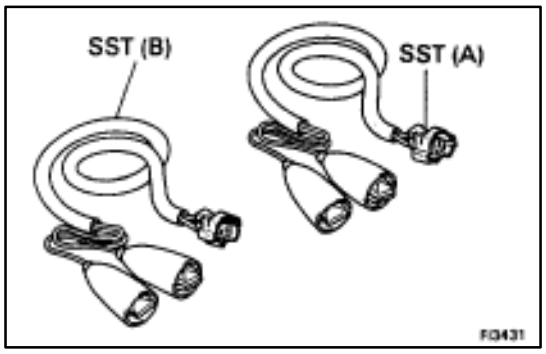
(b) Fully insert the connector and check that it is locked.



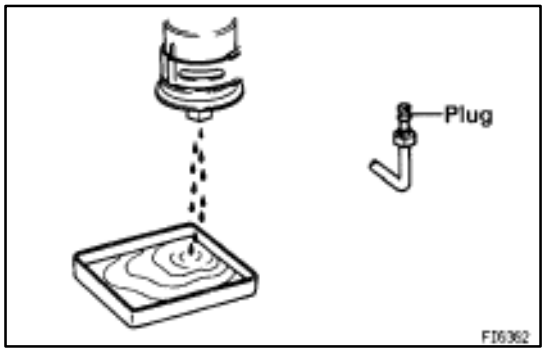
9. When inspecting a connector with a volt/ohmmeter.
(a) Carefully take out the water–proofing rubber if it is a water–proof type connector.



(b) Insert the test probe into the connector from wiring side when checking the continuity, amperage or voltage.
(c) Do not apply unnecessary force to the terminal.
(d) After checking, install the water–proofing rubber on the connector securely.



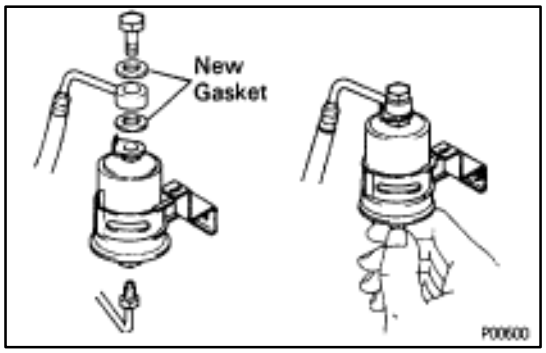
10. Use SST for inspection or test of the injector, cold start injector or its wiring connector.
SST 09842–30055 (A)
SST 09842–30070 (B)



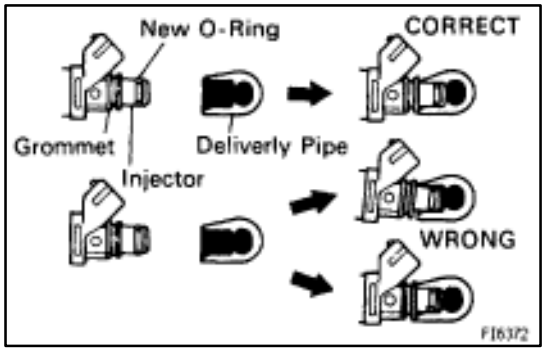
FUEL SYSTEM

EG0G7–01

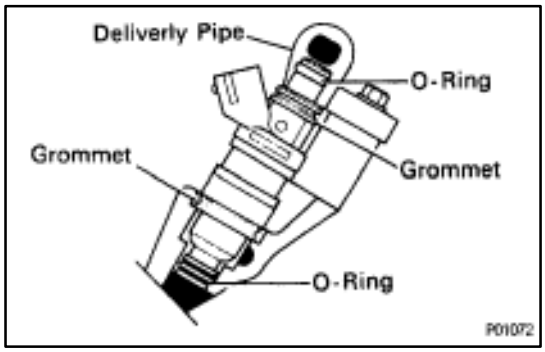
1. When disconnecting the high fuel pressure line, a large amount of gasoline will spill out, so observe the following procedures:
(a) Put a container under the connection.
(b) Slowly loosen the connection.
(c) Disconnect the connection.
(d) Plug the connection with a rubber plug.



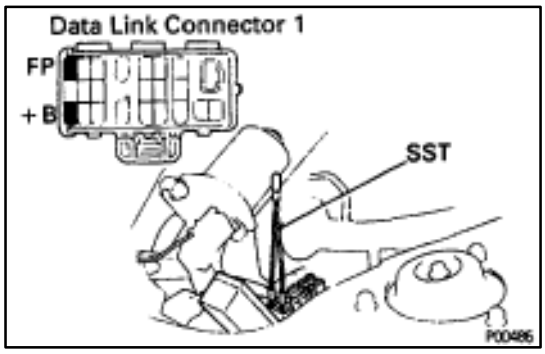
2. When connecting the flare nut or union bolt on the high pressure pipe union, observe the following procedures:
(Union Bolt Type)
(a) Always use a new gasket.
(b) Tighten the union bolt by hand.
(c) Tighten the union bolt to the specified torque.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)



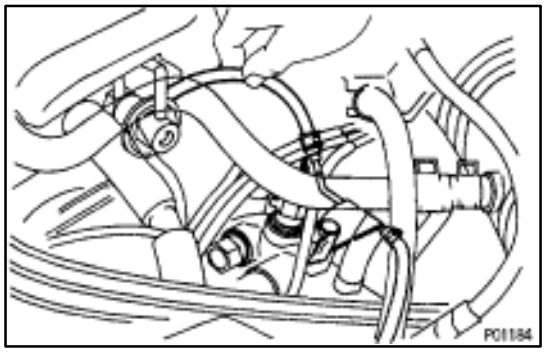
3. Observe the following precautions when removing and installing the injectors.
(a) Never reuse the O–ring.
(b) When placing a new O–ring on the injector, take care not to damage it in any way.
(c) Coat a new O–ring with spindle oil or gasoline before installing–never use engine, gear or brake oil.



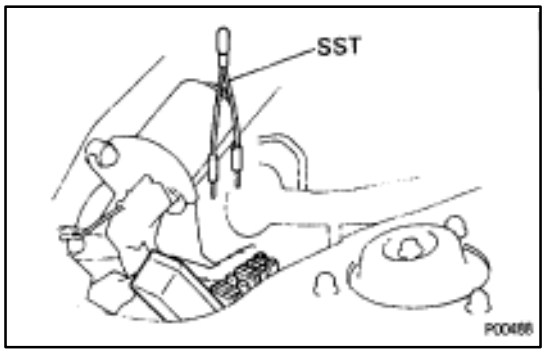
4. Install the injector to delivery pipe and intake manifold as shown in the illustration.



5. Check that there are no fuel leaks after performing any maintenance on the fuel system.
(a) Using SST, connect terminals +B and FP of the data link connector 1.
SST 09843–18020
(b) With engine stopped, turn the ignition switch ON.



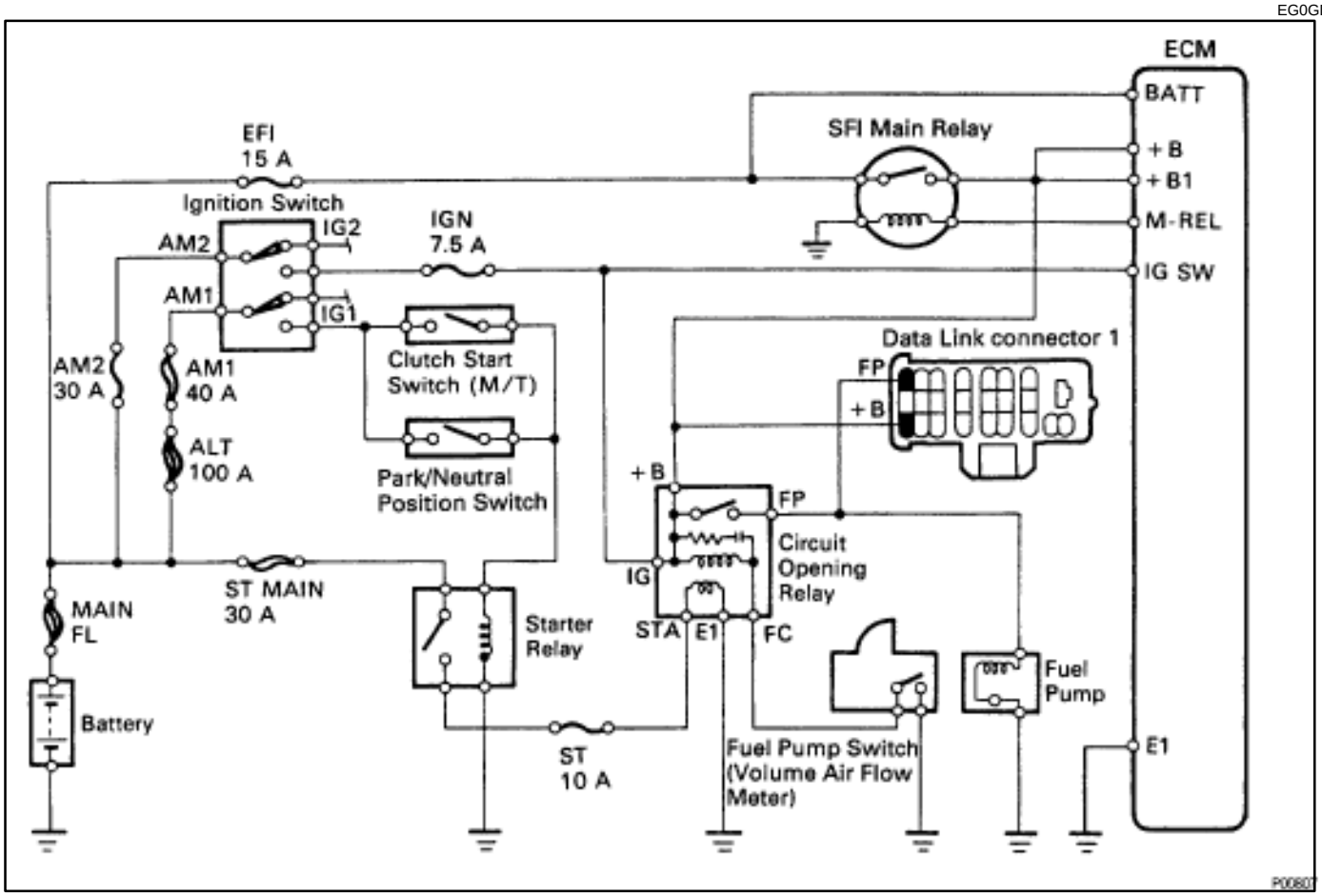
(c) When the fuel return hose is pinched, the pressure within high pressure line will rise to approx. 392 kPa (4 kgf/cm^2, 57 psi). In this state, check to see that there are no leaks from any part of the fuel system.
NOTICE: Always pinch the hose. Avoid bearing as it may cause the hose to crack.

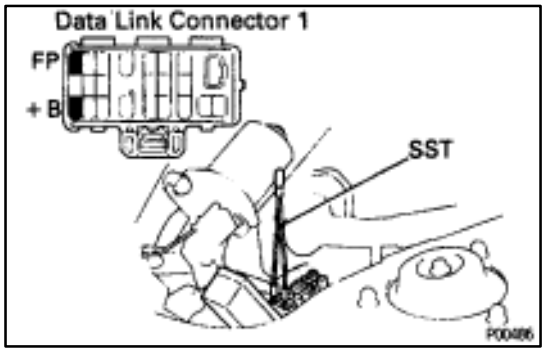


(d) Turn the ignition switch OFF.
(e) Remove the SST.
SST 09843–18020

FUEL PUMP SYSTEM CIRCUIT

EG0GD–01





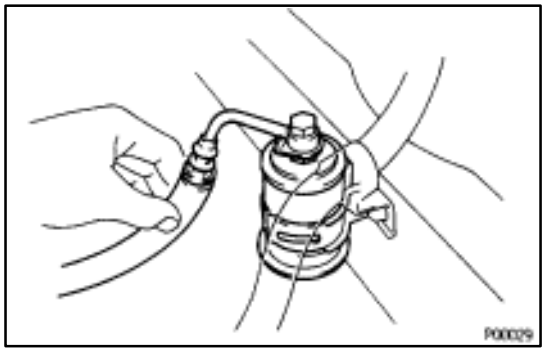
ON–VEHICLE INSPECTION

EG0GE–01

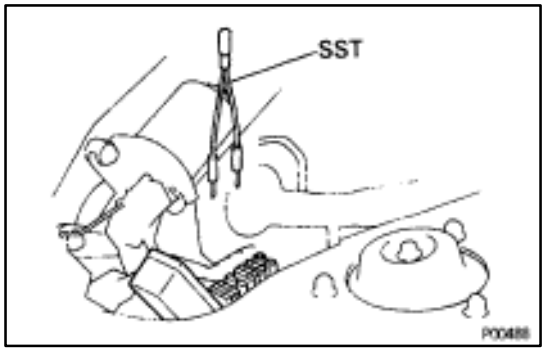
1. CHECK FUEL PUMP OPERATION

(a) Using SST, connect terminals +B and FP of the data link connector 1.
SST 09843–18020

(b) Turn the ignition switch ON.
NOTICE: Do not start the engine.



(c) Check that there is pressure in the hose from the fuel filter.
HINT: At this time, you will hear fuel return noise.



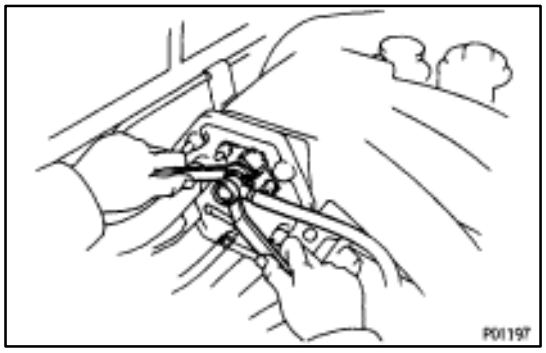
(d) Remove SST.
SST 09843–18020

(e) Turn the ignition switch OFF.
If there is no pressure, check the following parts:
- Fusible link
- Fuses (AM2 30A, EFI 15A, IGN 7.5A)
- SFI main relay
- Fuel pump
- ECM
- Wiring connections

2. CHECK FUEL PRESSURE

(a) Check that the battery voltage is above 12 volts.

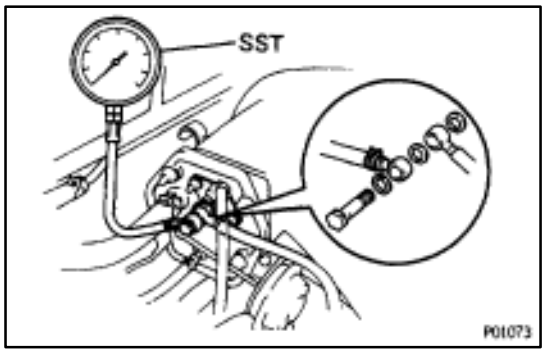
(b) Disconnect the cable from the negative (–) terminal of the battery.
CAUTION (w/ Airbag): Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.



(c) Disconnect the cold start injector connector.

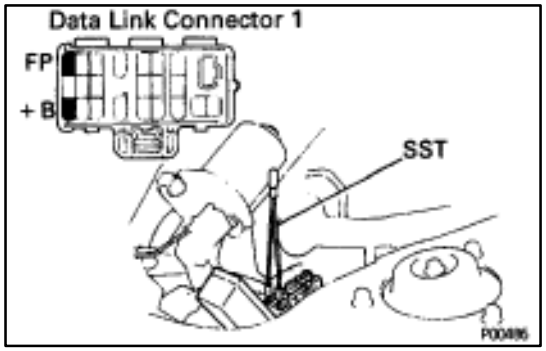
(d) Put a suitable container or shop towel under the cold start injector pipe (No.2 fuel pipe).

(e) Remove the union bolt and two gaskets, and disconnect the cold start injector pipe from the cold start injector.
HINT: Slowly loosen the union bolt.



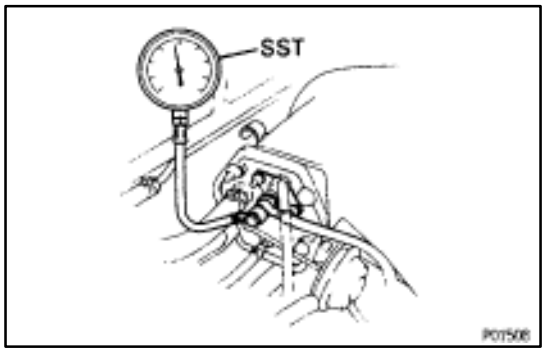
(f) Install SST (pressure gauge) to the cold start injector with three new gaskets and the union bolt.
SST 09268–45012
Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)

(g) Wipe off any splattered gasoline.



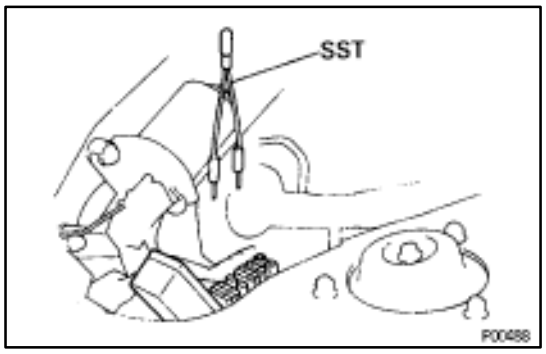
(h) Using SST, connect terminals +B and FP of the data link connector 1.
SST 09843–18020

(i) Reconnect the battery negative (–) cable.



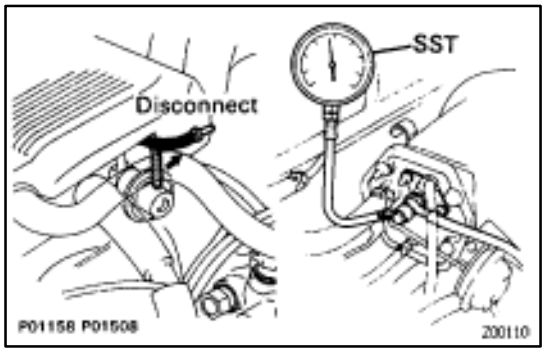
(j) Turn the ignition switch ON.

(k) Measure the fuel pressure.
Fuel pressure:
265–304 kPa (2.7–3.1 kgf/cm^2, 38–44 psi)
If pressure is high, replace the fuel pressure regulator.
If pressure is low, check the following parts:
•Fuel hoses and connection
•Fuel pump
•Fuel filter
•Fuel pressure regulator



•Injector

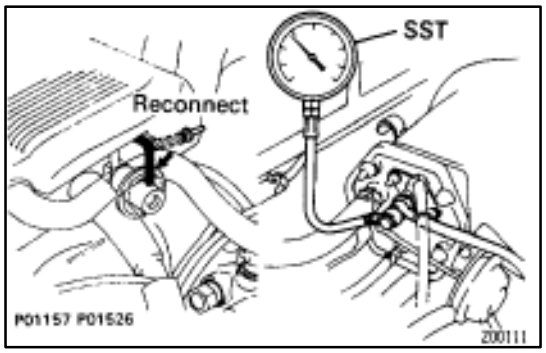
(l) Remove SST.
SST 09843–18020



(m) Start the engine.

(n) Disconnect the vacuum sensing hose from the fuel pressure regulator, and plug the hose end.

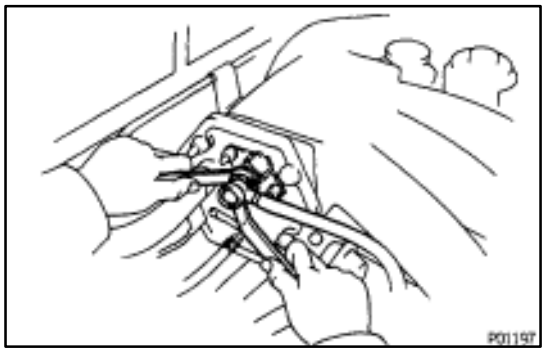
(o) Measure the fuel pressure at idle.
Fuel pressure:
265–304 kPa (2.7–3.1 kgf/cm^2, 38–44 psi)



(p) Reconnect the vacuum sensing hose to the fuel pressure regulator.

(q) Measure the fuel pressure at idle.
Fuel pressure:
226–265 kPa (2.3–2.6 kgf/cm^2, 33–37 psi)
If pressure is not as specified, check the vacuum sensing hose and fuel pressure regulator.

(r) Stop the engine. Check that the fuel pressure remains 147 kPa (1.5 kgf/cm^2, 21 psi) or more for 5 minutes after the engine is turned off.
If pressure is not as specified, check the fuel pump, pressure regulator and/or injector.



(s) After checking fuel pressure, disconnect the battery negative (–) cable and carefully remove the SST to prevent gasoline from splashing.
SST 09268–45012

(t) Connect the cold start injector pipe (No.2 fuel pipe) with two new gaskets and the union bolt.
Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)

(u) Reconnect the cold start injector connector.

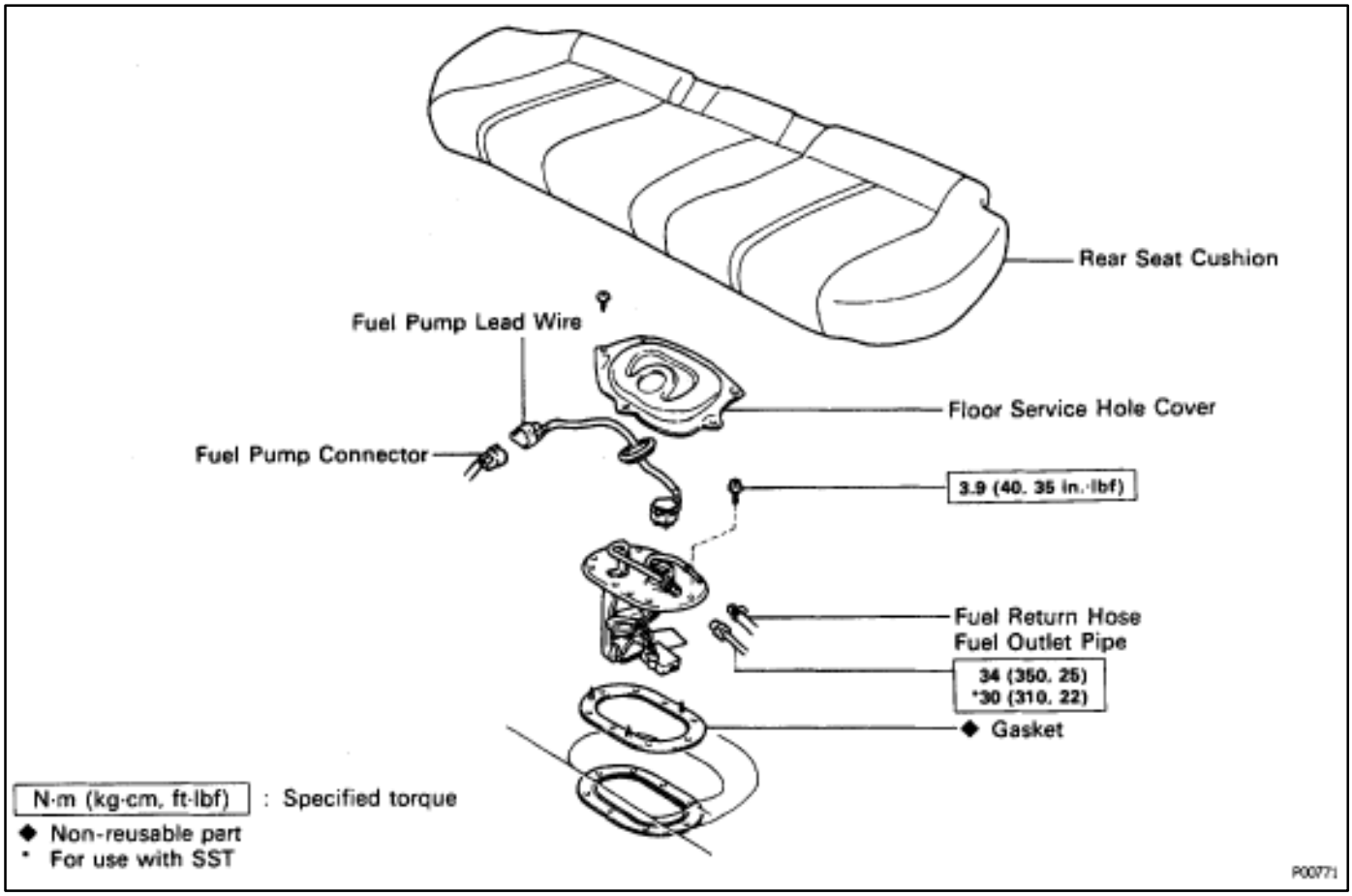
(v) Reconnect the cable to the negative (–) terminal of the battery.

(w) Check for fuel leakage.

FUEL PUMP REMOVAL AND INSPECTION

EG0GF–01

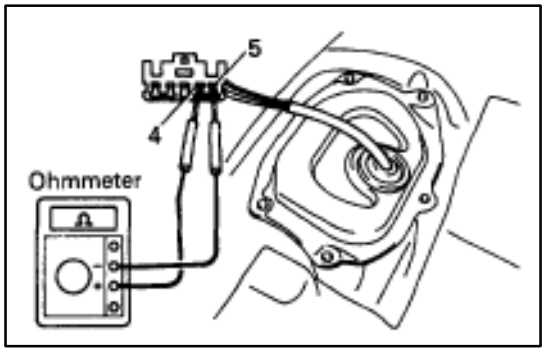
CAUTION: Do not smoke or work near an open flame when working on the fuel pump.



1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**

   CAUTION (w/ Air bag): Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.

2. **REMOVE REAR SEAT CUSHION**



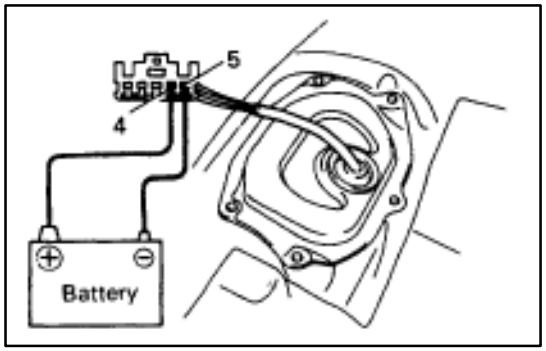
3. **INSPECT FUEL PUMP RESISTANCE**

   Using an ohmmeter, measure the resistance between terminals 4 and 5.

   Resistance (Cold):

   0.2–3.0 Ω

   If the resistance is not as specified, replace the fuel pump.



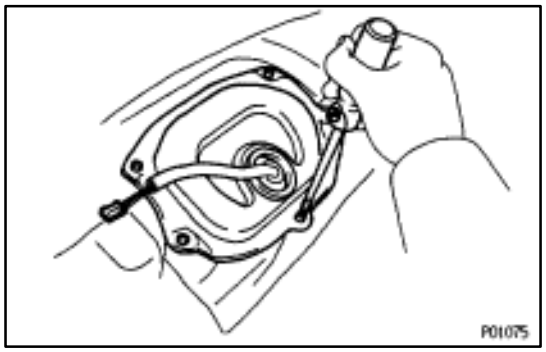
4. INSPECT FUEL PUMP OPERATION

Connect the positive (+) lead from the battery to terminal 4 of the connector, and the negative (–) lead to terminal 5. Check that the fuel pump operates.

NOTICE:

- **These tests must be performed quickly (within 10 seconds) to prevent the coil burning out.**
- **Keep the fuel pump as far away from the battery as possible.**
- **Always perform switching at the battery side.**

If operation is not as specified, replace the fuel pump.

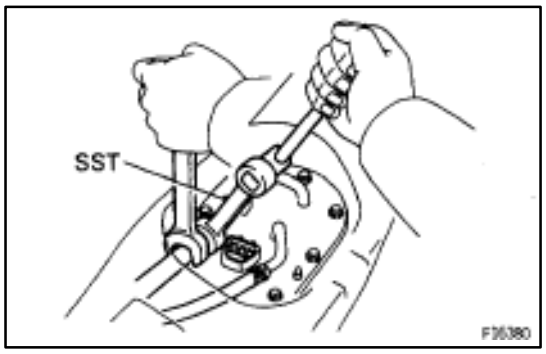


5. REMOVE FLOOR SERVICE HOLE COVER

(a) Disconnect the fuel pump connector.

(b) Remove the five screws and service hole cover.

6. REMOVE FUEL PUMP LEAD WIRE

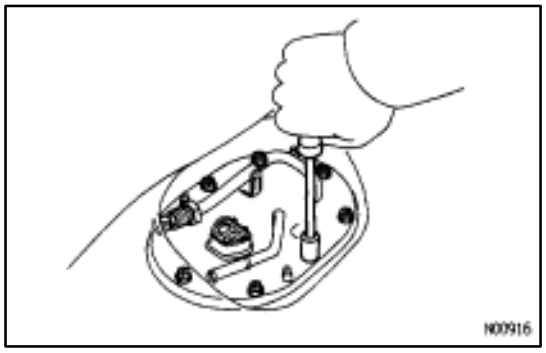


7. DISCONNECT FUEL PIPE AND HOSE FROM FUEL PUMP BRACKET

CAUTION: Remove the fuel filter cap to prevent the fuel from flowing out.

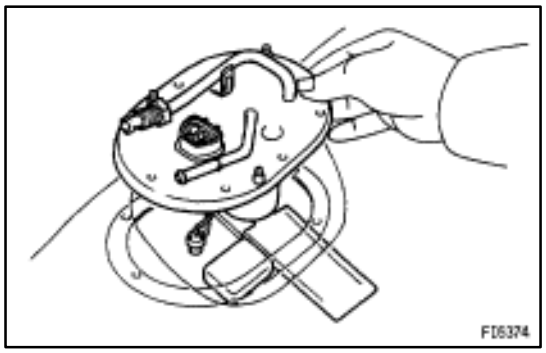
(a) Using SST, disconnect the outlet pipe from the pump bracket.
SST 09631–22020

(b) Disconnect the return hose from the pump bracket.



8. REMOVE FUEL PUMP BRACKET ASSEMBLY FROM FUEL TANK

(a) Remove the eight bolts.

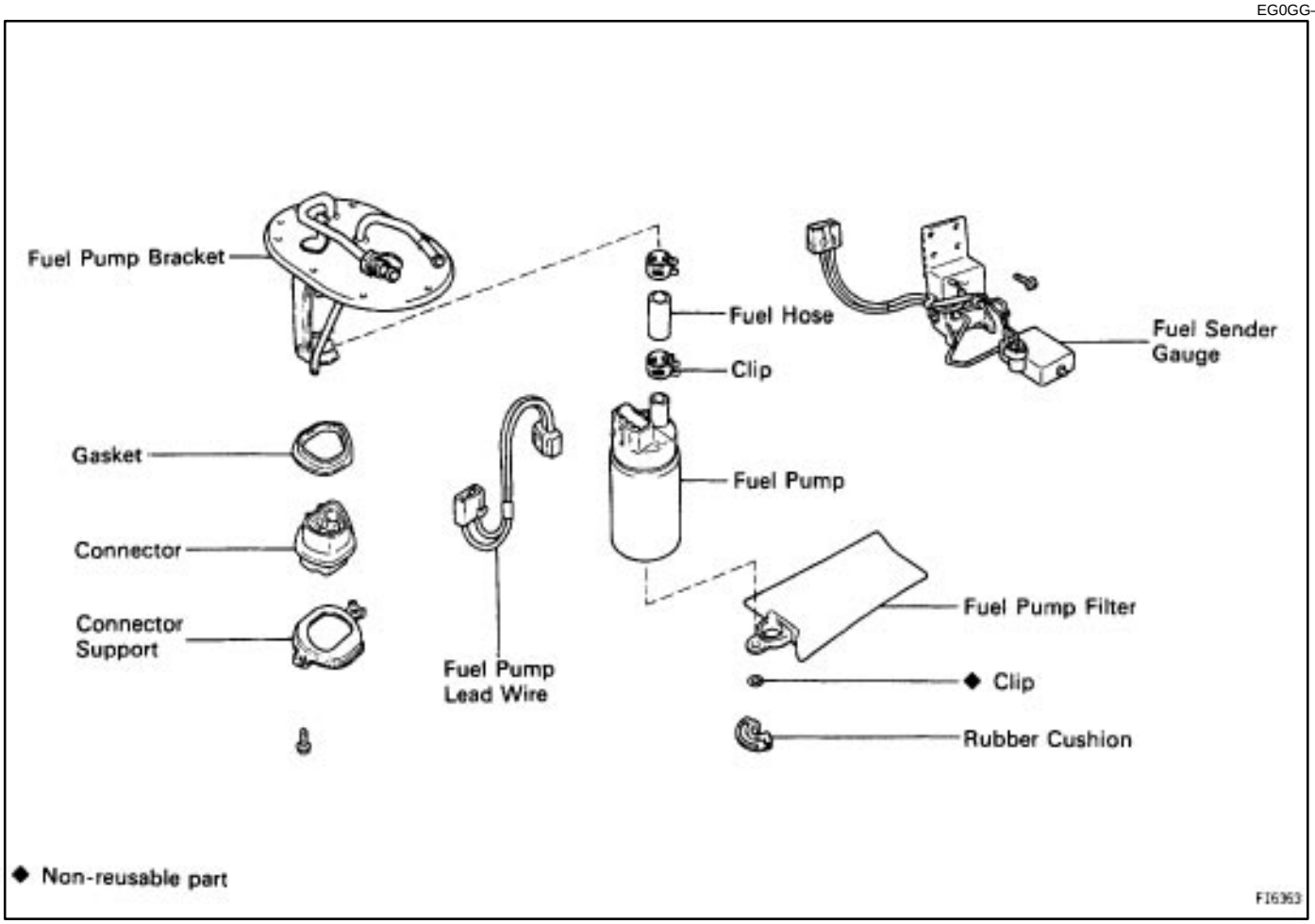


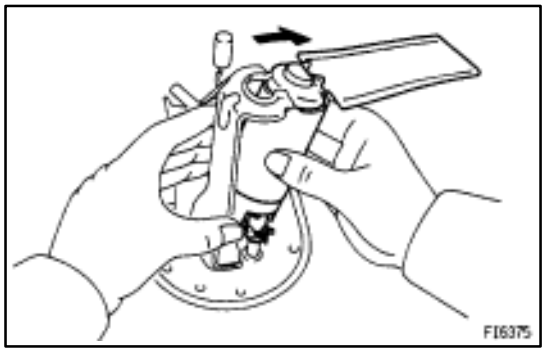
(b) Pull out the pump bracket assembly.

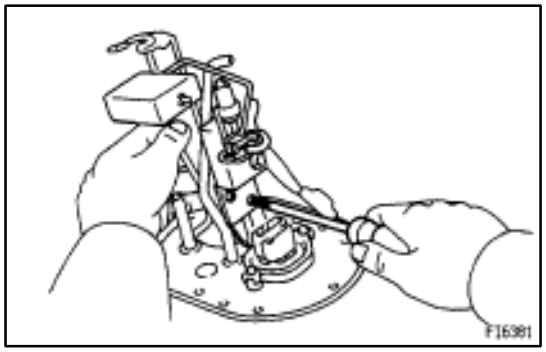
(c) Remove the gasket from the pump bracket.

COMPONENTS

EG0GG–01







FUEL PUMP DISASSEMBLY

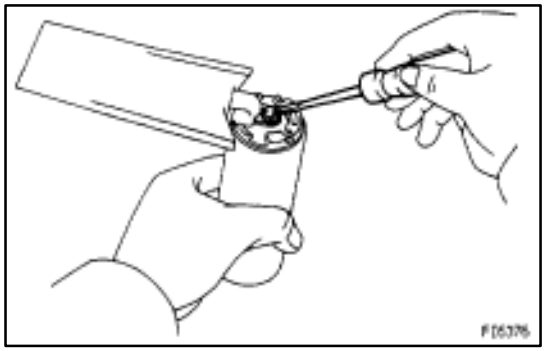
EG0GH–01

1. REMOVE FUEL PUMP FROM FUEL PUMP BRACKET

(a) Remove the fuel pump lead wire.
(b) Pull off the lower side of the fuel pump from the pump bracket.
(c) Disconnect the fuel hose from the fuel pump, and remove the fuel pump.
(d) Remove the rubber cushion from the fuel pump.

2. REMOVE FUEL SENDER GAUGE FROM FUEL PUMP BRACKET

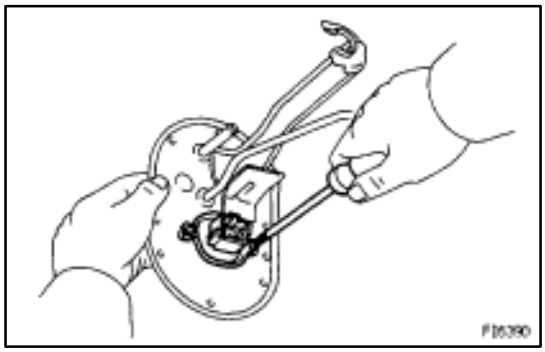
(a) Disconnect the fuel sender gauge connector.
(b) Remove the two screws and sender gauge.



3. REMOVE FUEL PUMP FILTER FROM FUEL PUMP

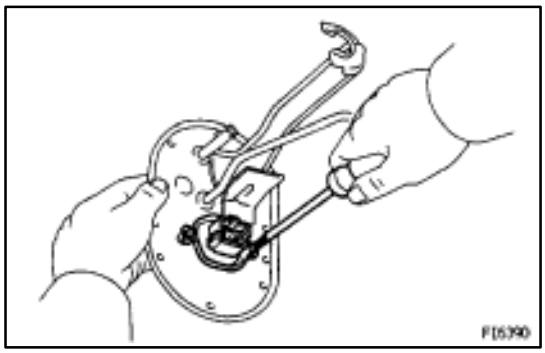
(a) Using a small screwdriver, remove the clip.

(b) Pull out the pump filter.



4. REMOVE CONNECTOR

Remove the two screws, connector support, connector and gasket.



FUEL PUMP ASSEMBLY

EG0GJ–01

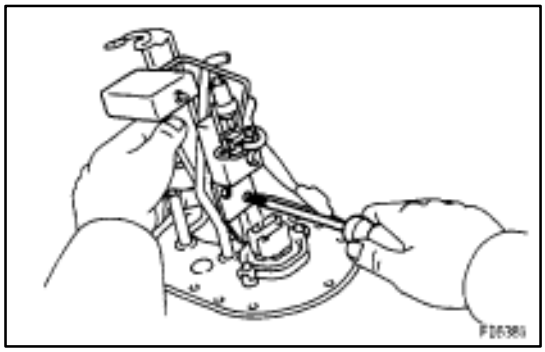
(See page EG–176)

1. INSTALL CONNECTOR

Install the gasket, connector and connector support with the two screws.

2. INSTALL FUEL PUMP FILTER TO FUEL PUMP

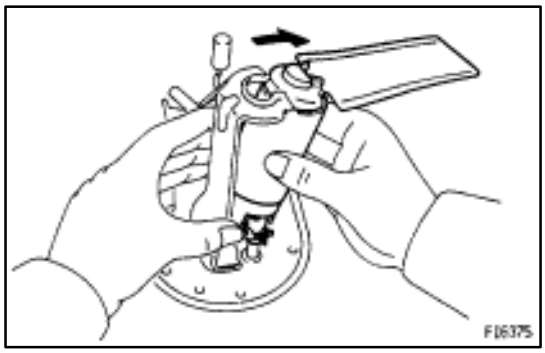
Install the pump filter with a new clip.



3. INSTALL FUEL SENDER GAUGE TO FUEL PUMP BRACKET

(a) Install the sender gauge with the two screws.

(b) Connect the fuel sender gauge connector.



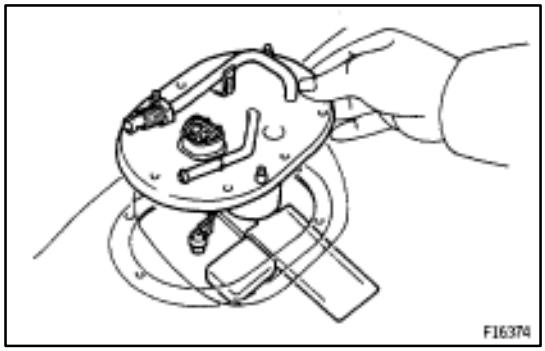
4. INSTALL FUEL PUMP TO FUEL PUMP BRACKET

(a) Install the rubber cushion to the fuel pump.

(b) Connect the fuel hose to the outlet port of the fuel pump.

(c) Install the fuel pump by pushing the lower side of the fuel pump.

(d) Install the fuel pump connector.



FUEL PUMP INSTALLATION

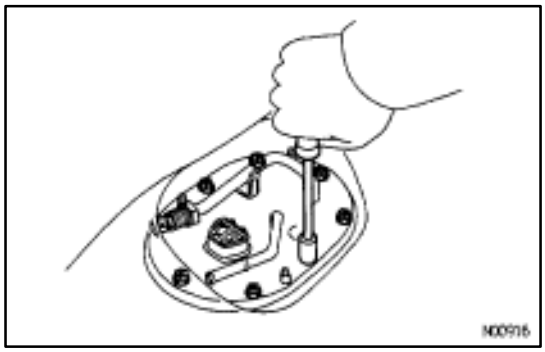
EG0GK–01

(See page EG–174)

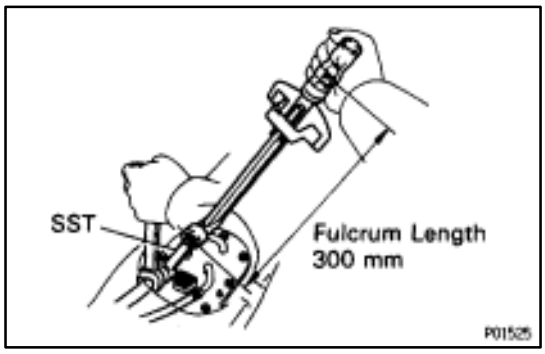
1. INSTALL FUEL PUMP BRACKET ASSEMBLY TO FUEL TANK

(a) Install a new gasket to the pump bracket.

(b) Insert the pump bracket assembly into the fuel tank.



(c) Install the pump bracket with the eight screws.
Torque: 3.9 N·m (40 kgf·cm, 35 in.·lbf)



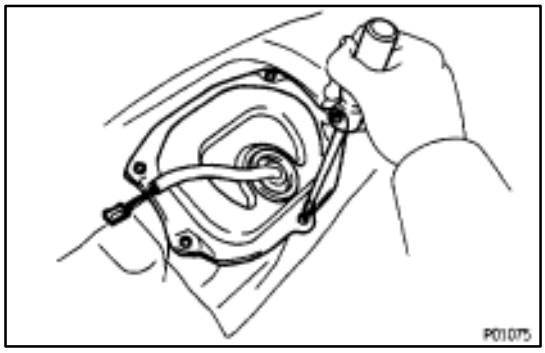
2. CONNECT FUEL PIPE AND HOSE TO FUEL PUMP BRACKET

(a) Using SST, connect the outlet pipe to the pump bracket.
SST 09631–22020
Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)

(b) Connect the return hoses to the pump bracket.

3. CHECK FOR FUEL LEAKAGE (See page EG–160)

4. CONNECT FUEL PUMP LEAD WIRE



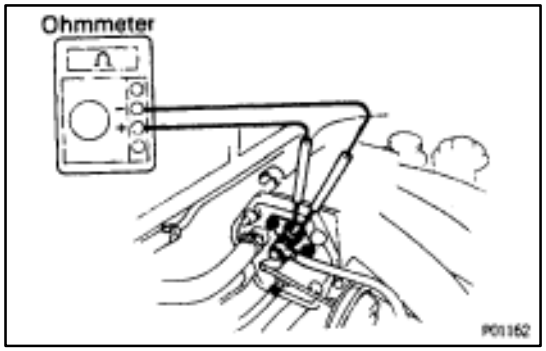
5. INSTALL FLOOR SERVICE HOLE COVER

(a) Install the service hole cover with the three screws.

(b) Connect the fuel pump (with fuel sender gauge) connector.

6. INSTALL REAR SEAT CUSHION

7. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY



COLD START INJECTOR ON–VEHICLE INSPECTION

EG0GL–01

INSPECT RESISTANCE OF COLD START INJECTOR

(a) Disconnect the cold start injector connector.

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

Resistance:

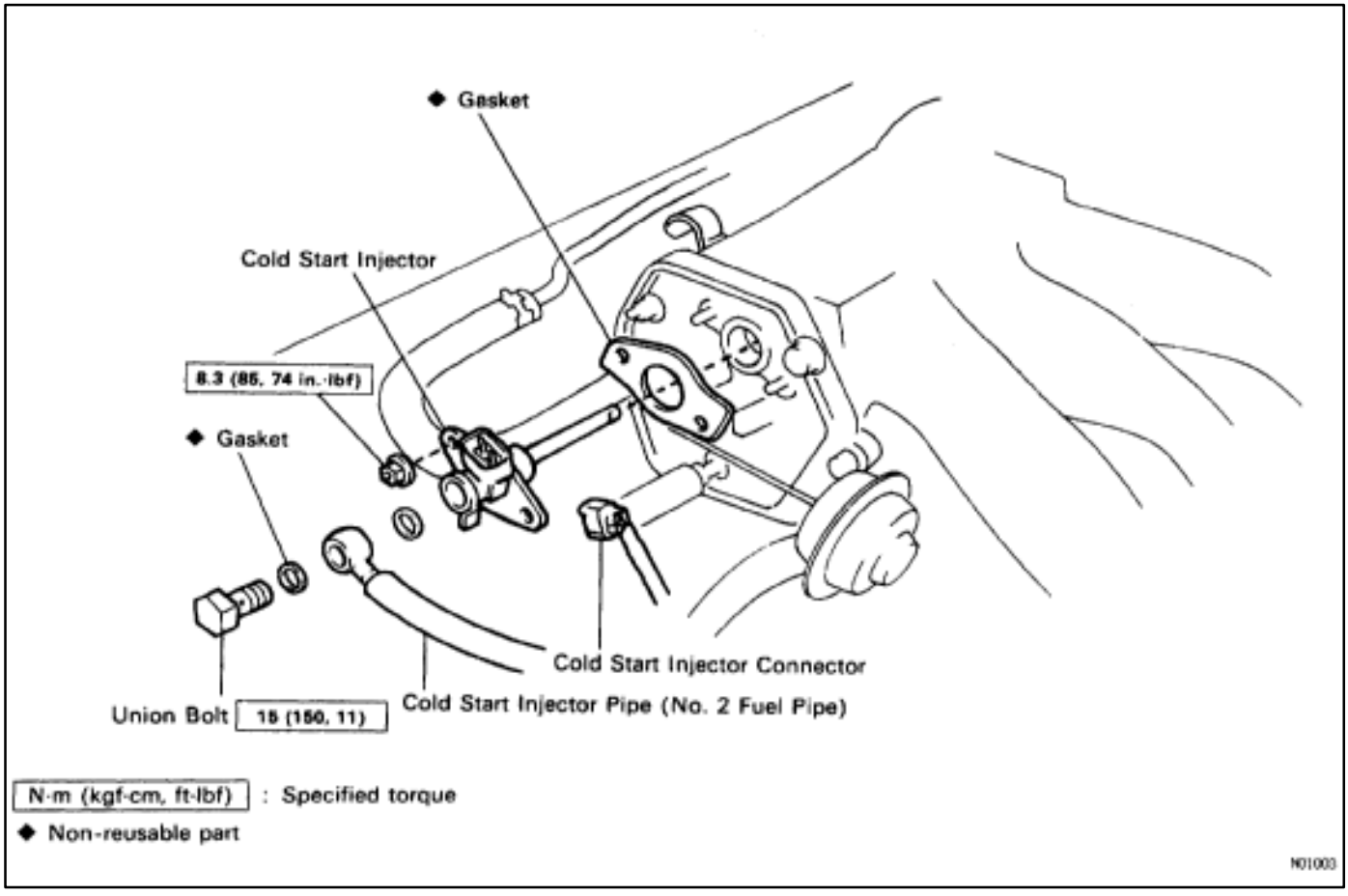
2–4 Ω

If the resistance is not as specified, replace the cold start injector.

(c) Reconnect the cold start injector connector.

COLD START INJECTOR REMOVAL

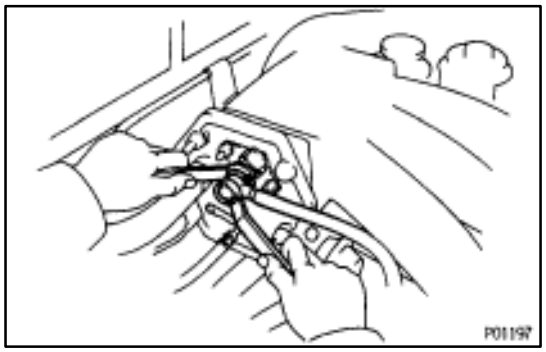
EG0GM–01



1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION (w/ Airbag): Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.

2. DISCONNECT COLD START INJECTOR CONNECTOR

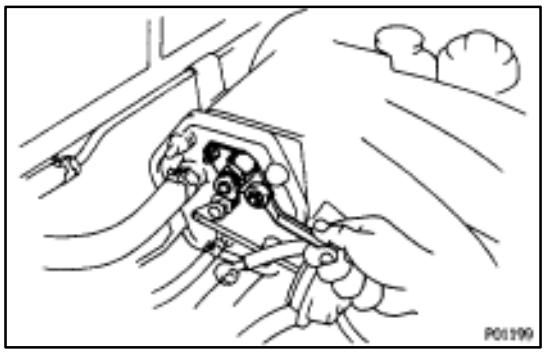


3. DISCONNECT COLD START INJECTOR PIPE (No.2 FUEL PIPE)

(a) Put a suitable container or shop towel under the injector pipe.

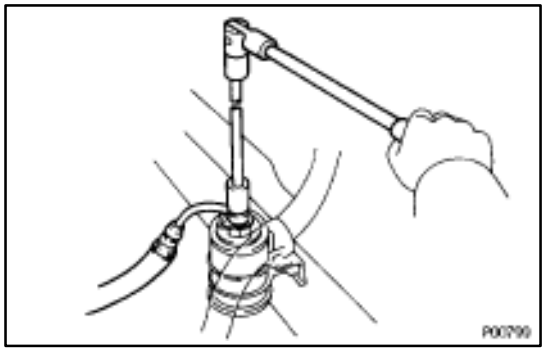
(b) Remove the union bolt and two gaskets, and disconnect the injector pipe.

HINT: Slowly loosen the union bolt.



4. REMOVE COLD START INJECTOR

Remove the two nuts, cold start injector and gasket.



COLD START INJECTOR INSPECTION

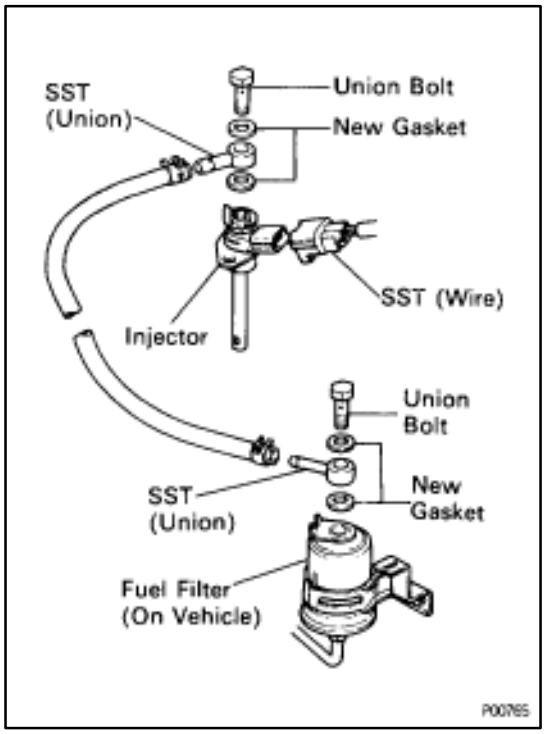
EG0GN–01

1. INSPECT INJECTION OF COLD START INJECTOR

CAUTION: Keep injector clear of sparks during the test.

(a) Put a suitable container or shop towel under the fuel filter.

(b) Remove the union bolt and two gaskets, and disconnect the fuel inlet hose from the fuel filter outlet.
HINT: Slowly loosen the union bolt.



(c) Install SST (two unions) to the injector and fuel filter outlet with new gaskets and the union bolts.
SST 09268–41045(09268–41080,09405–09015)

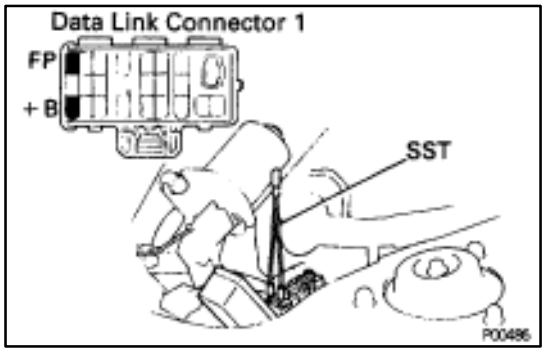
(d) Connect SST (hose) to the unions.
SST 09268–41045

(e) Connect SST (wire) to the injector.
SST 09842–30055

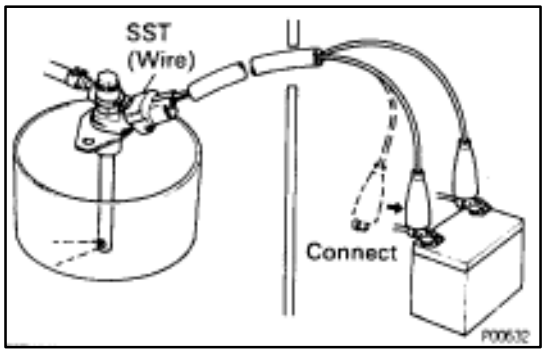
(f) Put a container under the injector.

(g) Reconnect the battery negative (–) cable.

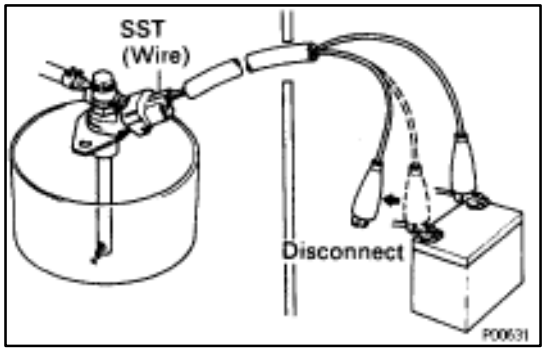
(h) Turn the ignition switch ON.
NOTICE: Do not start the engine.



(i) Using SST, connect terminals +B and FP of the data link connector 1.
SST 09843–18020



(j) Connect the test probes of the SST (wire) to the battery, and check that the fuel spray is as shown.
SST 09842–30055
NOTICE: Perform this check within the shortest possible time.

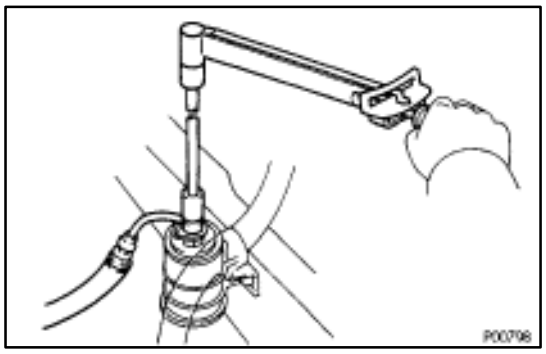


2. INSPECT LEAKAGE

(a) In the condition above, disconnect the test probes of SST (wire) from the battery and check fuel leakage from the injector.
SST 09842–30050
Fuel drop:
One drop or less per minute

(b) Disconnect the battery negative (–) cable.

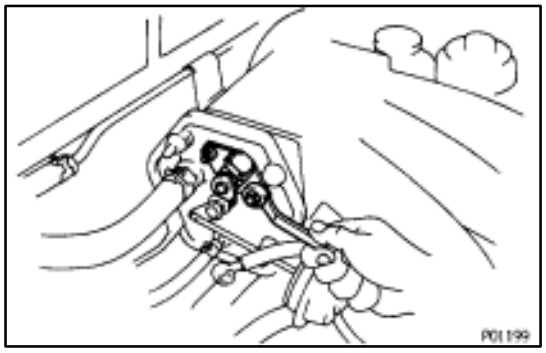
(c) Remove SST.
SST 09268–41045, 09842–30050 and 09843–18020



(d) Connect the fuel inlet hose with two new gaskets and the union bolt.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

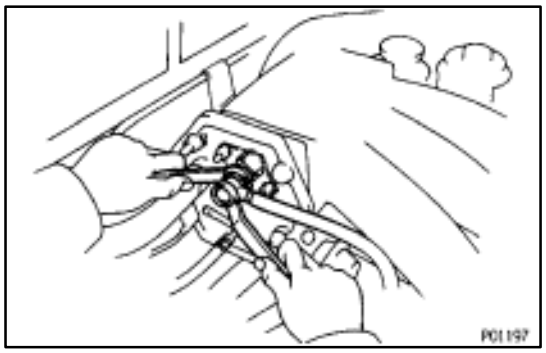
COLD START INJECTOR INSTALLATION

EG0GP–01



(See page EG–179)

1. INSTALL COLD START INJECTOR
Install a new gasket and the injector with the two nuts.
Torque: 8.3 N·m (85 kgf·cm, 74 in.·lbf)



2. CONNECT COLD START INJECTOR PIPE (NO. 2 FUEL PIPE)
Connect the injector pipe with two new gaskets and the union bolt.
Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)

3. CONNECT COLD START INJECTOR CONNECTOR

4. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

5. CHECK FOR FUEL LEAKAGE (See page EG–160)

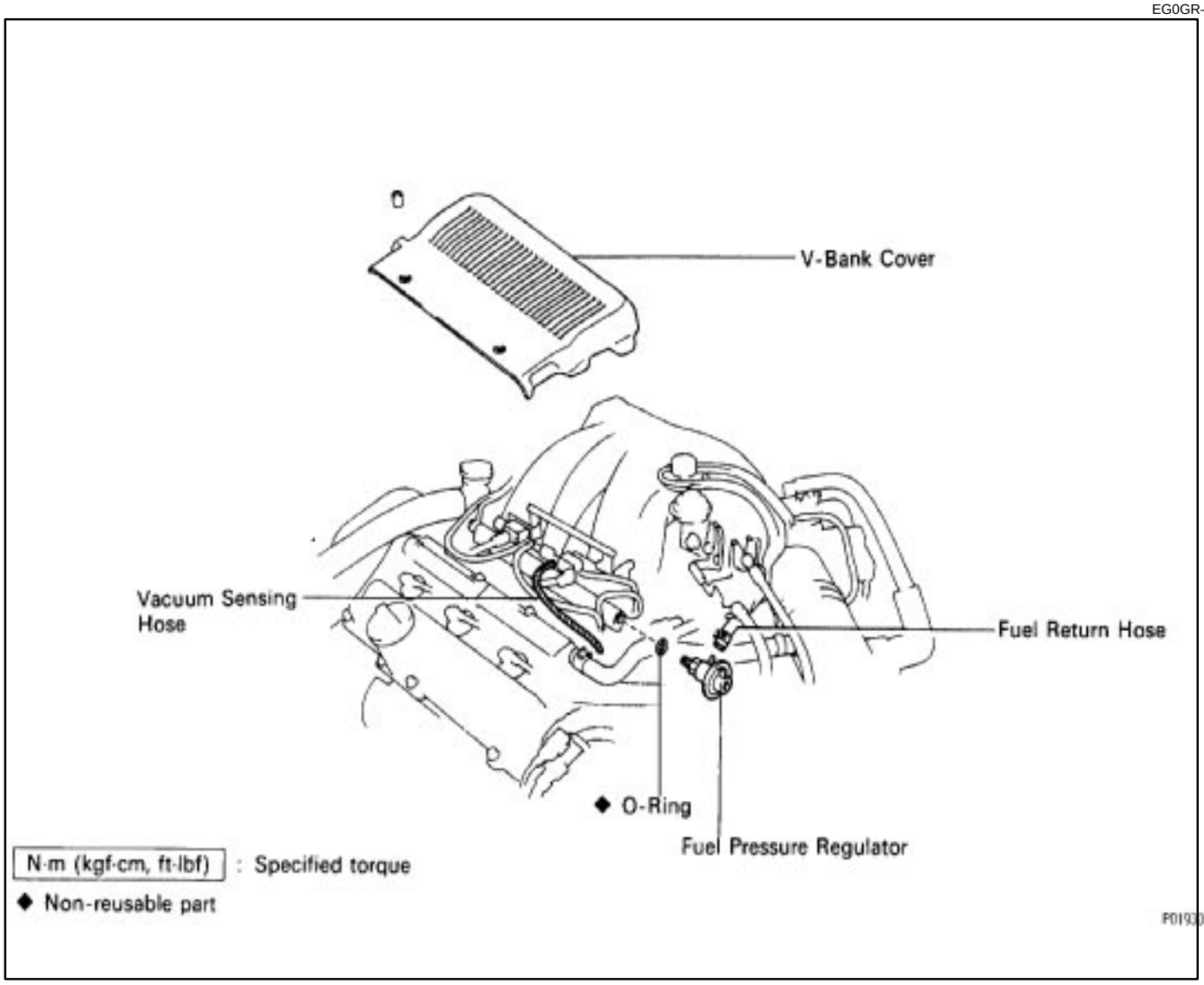
FUEL PRESSURE REGULATOR ON–VEHICLE INSPECTION

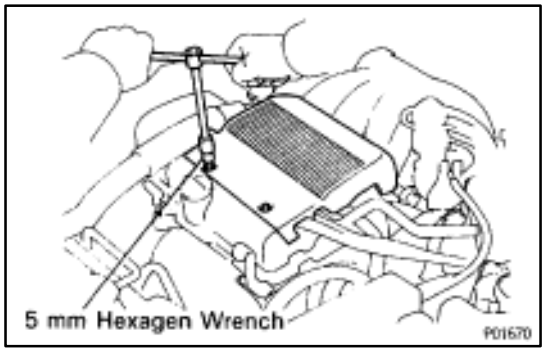
EG0GQ–01

INSPECT FUEL PRESSURE (See page EG–171)

FUEL PRESSURE REGULATOR REMOVAL

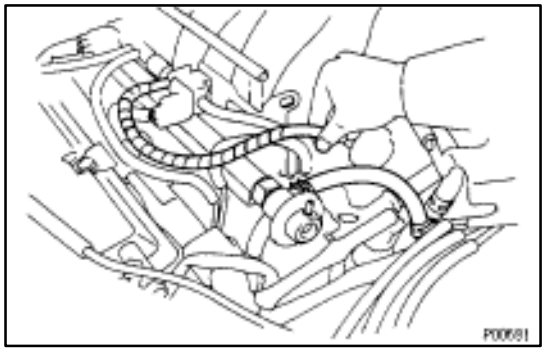
EG0GR–01





1. REMOVE V–BANK COVER

Using a 5 mm hexagon wrench, remove the two nuts and V–bank cover.

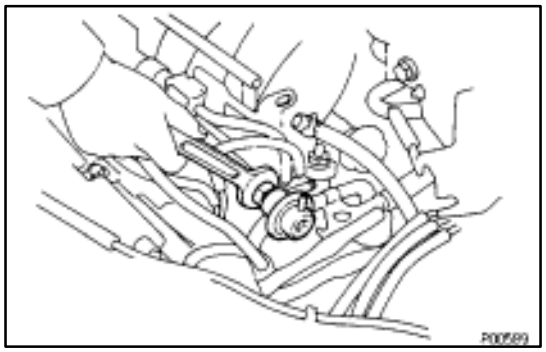


2. DISCONNECT VACUUM SENSING HOSE

3. DISCONNECT FUEL RETURN HOSE

(a) Put a suitable container or shop towel under the pressure regulator.

(b) Disconnect the return hose from the pressure regulator.



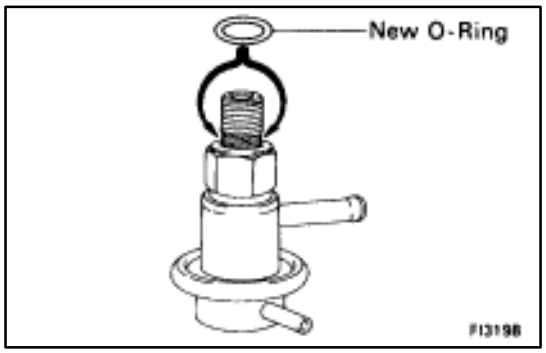
4. REMOVE FUEL PRESSURE REGULATOR

Loosen the lock nut, and remove the pressure regulator.

FUEL PRESSURE REGULATOR INSTALLATION

EG0GS–01

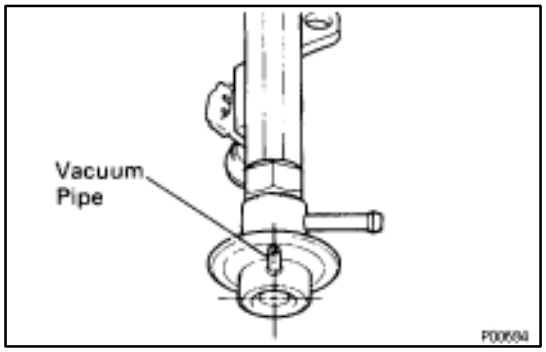
(See page EG–183)



1. INSTALL FUEL PRESSURE REGULATOR

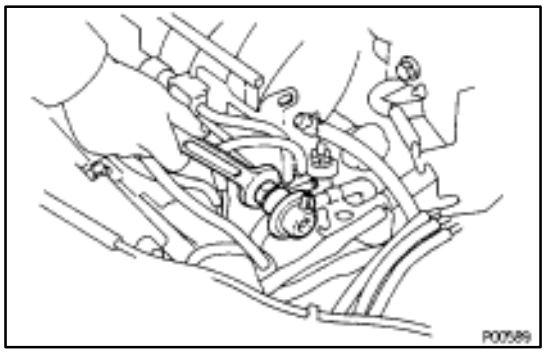
(a) Fully loosen the lock nut of the pressure regulator.

(b) Apply a light coat of gasoline to a new O–ring, and install it to the pressure regulator.



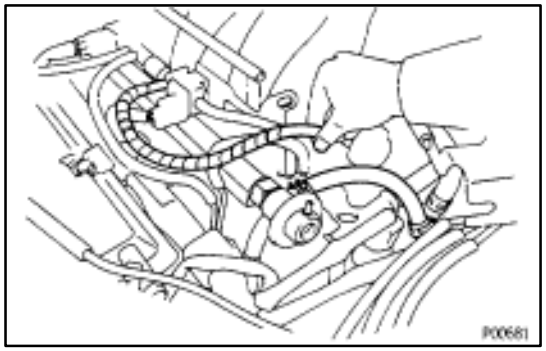
(c) Thrust the pressure regulator completely into the delivery pipe by hand.

(d) Turn the pressure regulator counterclockwise until the vacuum pipe faces in the direction indicated in the illustration.



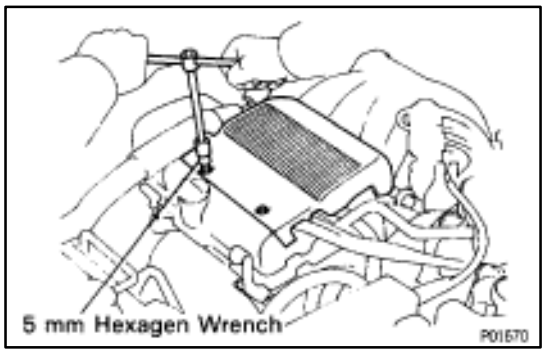
(e) Tighten the lock nut.

Torque: 22 N·m (220 kgf·cm, 16 ft·lbf)

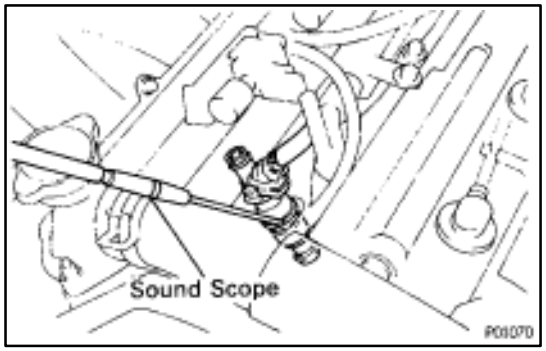


2. **CONNECT FUEL RETURN HOSE**
3. **CONNECT VACUUM SENSING HOSE**

4. **CHECK FOR FUEL LEAKAGE (See page EG–160)**



5. **INSTALL V–BANK COVER**
   Using a 5 mm hexagon wrench, install the V–bank cover with the two nuts.



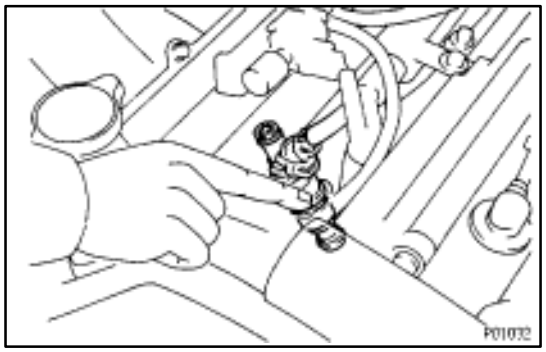
INJECTORS
ON–VEHICLE INSPECTION

EG0GT–01

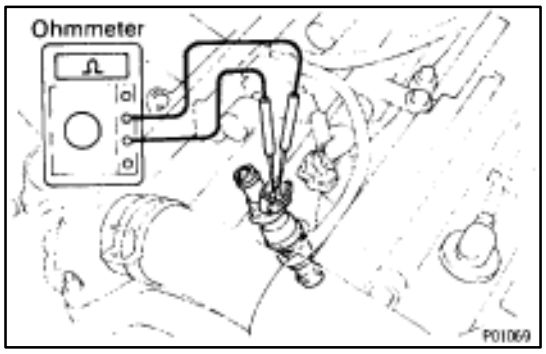
1. INSPECT INJECTOR OPERATION

Check operation sound from each injector.

(a) With the engine running or cranking, use a sound scope to check that there is normal operating noise in proportion to engine rpm.



(b) If you have no sound scope, you can check the injector transmission operation with your finger.
If no sound or unusual sound is heard, check the wiring connector, injector or injection signal from the ECM.



2. INSPECT INJECTOR RESISTANCE

(a) Disconnect the injector connector.

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

Resistance:

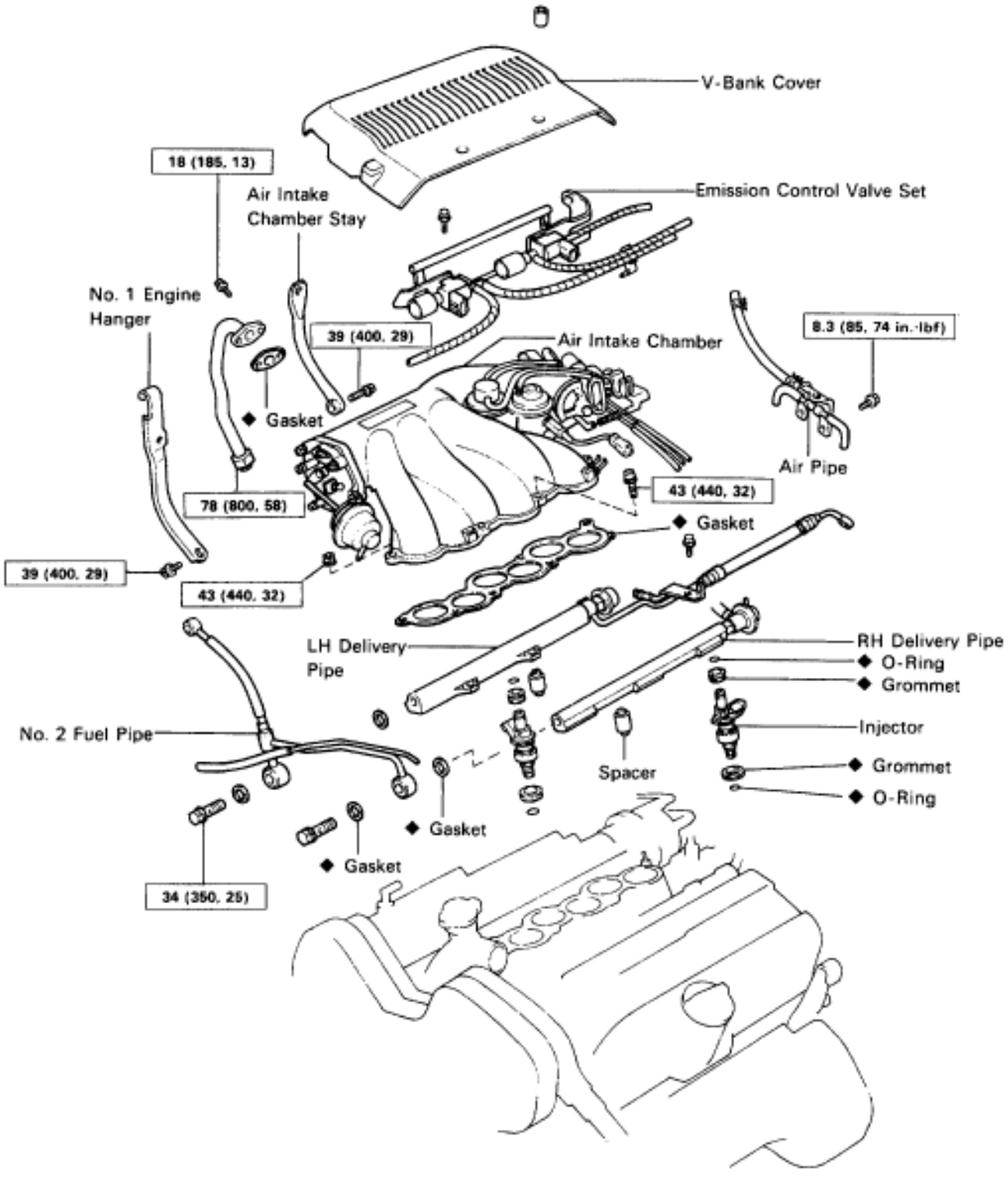
Approx. 13.8 Ω

If the resistance is not as specified, replace the injector.

(c) Reconnect the injector connector.

INJECTORS REMOVAL

EG0GU–01



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

P01969

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION (w/ Airbag): Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.

2. DRAIN ENGINE COOLANT

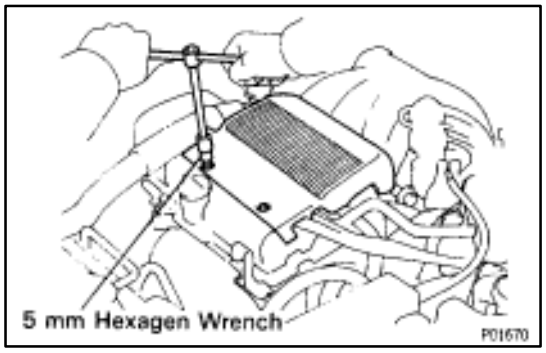
3. DISCONNECT ACCELERATOR CABLE FROM THROTTLE LINKAGE

4. (A/T)

DISCONNECT THROTTLE CABLE FROM THROTTLE LINKAGE

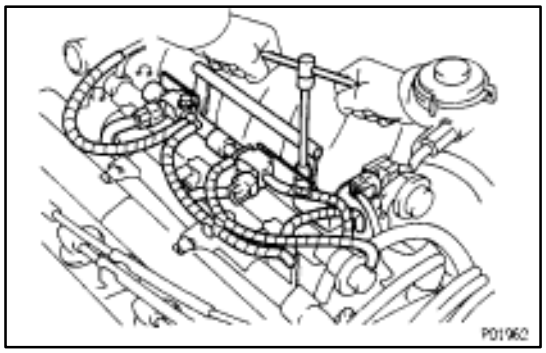
5. REMOVE AIR CLEANER CAP, VOLUME AIR FLOW METER AND AIR CLEANER HOSE

(a) Disconnect the volume air flow meter connector.
(b) Disconnect the coil cord clamp.
(c) Disconnect the air hoses.
(d) Loosen the air cleaner hose clamp bolt.
(e) Disconnect the air cleaner cap clips.
(f) Remove the air cleaner cap and volume air flow meter together with the air cleaner hose.



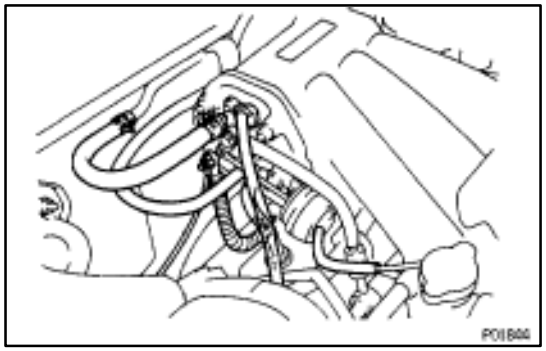
6. REMOVE V–BANK COVER

Using a 5 mm hexagon wrench, remove the two nuts and V–bank cover.



7. REMOVE EMISSION CONTROL VALVE SET

(a) Disconnect the EGR gas temp. sensor connector clamp from the emission control valve set.
(b) Disconnect the two vacuum hoses of the fuel pressure control VSV.
(c) Disconnect the two vacuum hoses of the IACV VSV.
(d) Disconnect the two VSV connectors.
(e) Remove the two bolts and emission control valve set.



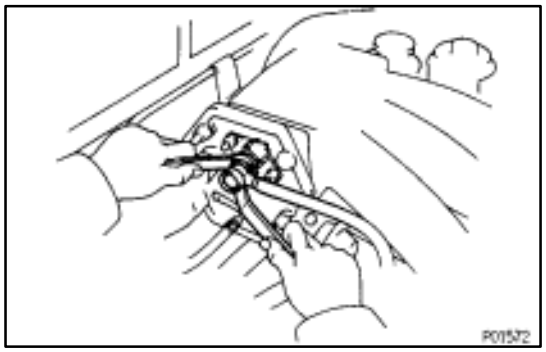
8. DISCONNECT HOSES

(a) Brake booster vacuum hose
(b) PS air hose
(c) PCV hose
(d) IACV vacuum hose

9. DISCONNECT GROUND STRAPS

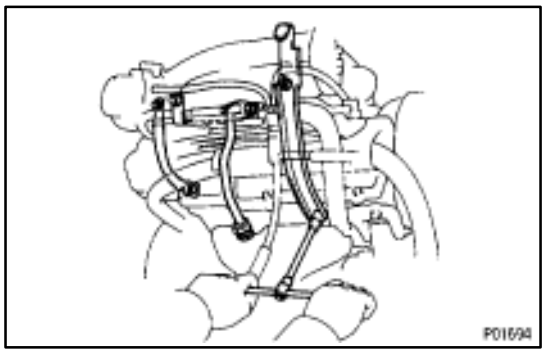
Remove the nut and disconnect the two ground straps.

10. DISCONNECT COLD START INJECTOR CONNECTOR



11. DISCONNECT COLD START INJECTOR PIPE (NO.2 FUEL PIPE)

(a) Put a suitable container or shop towel under the injector pipe.
(b) Remove the union bolt and two gaskets, and disconnect the injector pipe.
HINT: Slowly loosen the union bolt.



12. REMOVE NO.1 ENGINE HANGER AND AIR INTAKE CHAMBER STAY

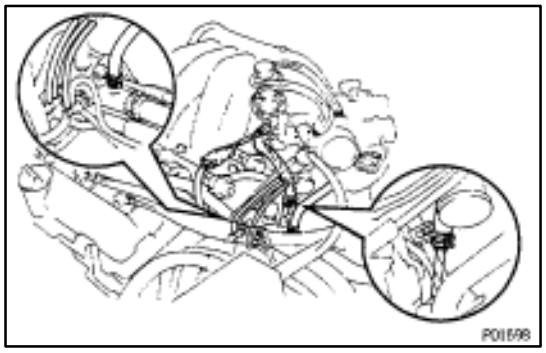
(a) Remove the two bolts and No.1 engine hanger.
(b) Remove the two bolts and air intake chamber stay.

13. REMOVE EGR PIPE

(a) Loosen the union nut.
(b) Remove the two bolts and EGR pipe.

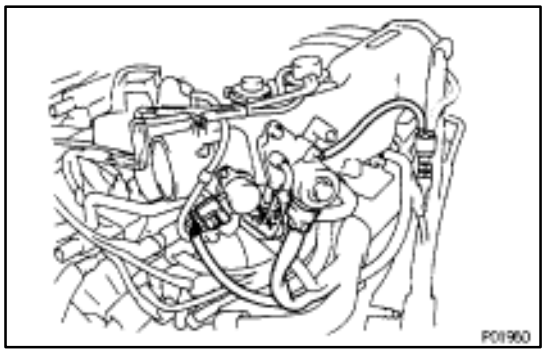
14. DISCONNECT HYDRAULIC MOTOR PRESSURE PIPE

Remove the bolt and disconnect the hydraulic pressure pipe from the air intake chamber.

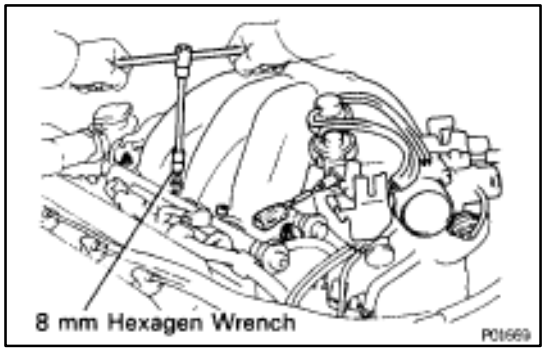


15. REMOVE AIR INTAKE CHAMBER

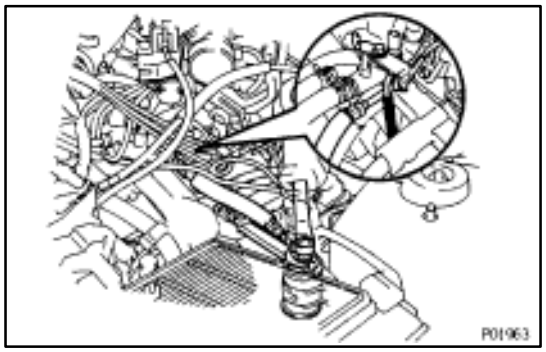
(a) Disconnect the three emission control vacuum hoses.
(b) Disconnect the two water by–pass hoses.
(c) (Calif. only)
Disconnect the EGR gas temp. sensor connector.



(d) Disconnect the throttle position sensor connector.
(e) Disconnect the IAC valve connector.
(f) Disconnect the IAC valve air hose.
(g) Disconnect the PS air hose.



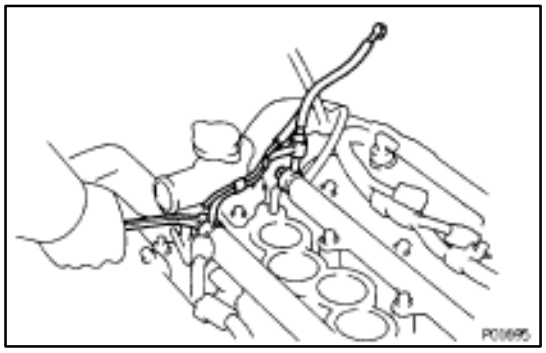
(h) Using 8 mm hexagon wrench, remove the two bolts, nuts, air intake chamber and gasket.



16. DISCONNECT FUEL INLET AND RETURN HOSES

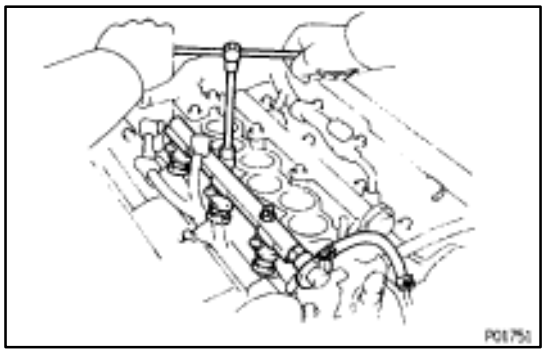
(a) Disconnect the fuel return hoses from the No.1 fuel pipe.
(b) Disconnect the fuel inlet hose from the fuel filter.

17. DISCONNECT INJECTOR CONNECTORS



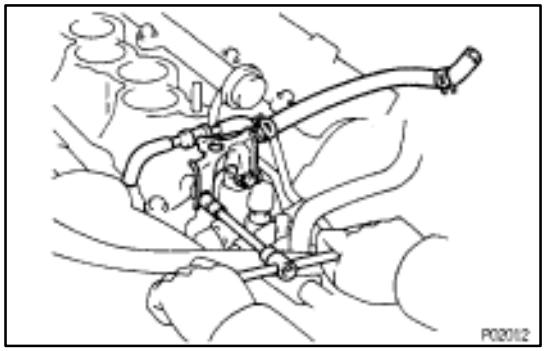
18. REMOVE NO.2 FUEL PIPE

(a) Disconnect the vacuum hose.
(b) Remove the two union bolts, four gaskets and No.2 fuel pipe.



19. REMOVE LH DELIVERY PIPES AND INJECTORS

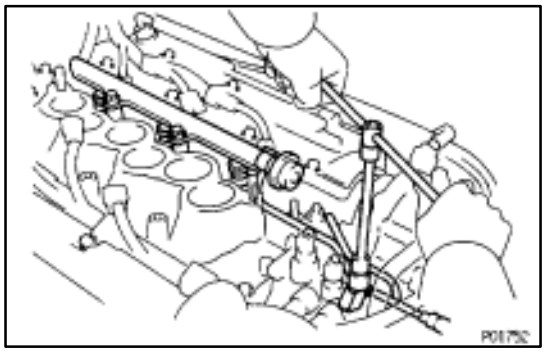
(a) Disconnect the fuel hose from the No.1 fuel pipe.
(b) Remove two bolts and LH delivery pipe together with the three injectors.
NOTICE: Be careful not to drop the injectors, when removing the LH delivery pipe.
(c) Pull out the three injectors from the LH delivery pipe.
(d) Remove the two spacers from the intake manifold.



20. REMOVE AIR PIPE WITH HOSES

(a) Disconnect the two air hoses.

(b) Remove the bolts and air pipe with hoses.



21. REMOVE RH DELIVERY PIPE AND INJECTORS

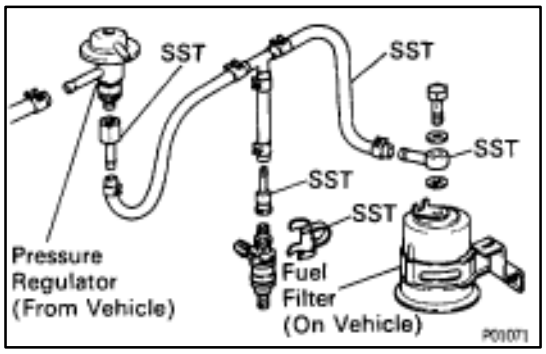
(a) Remove three bolts and RH delivery pipe together with the three injectors.
NOTICE: Be careful not to drop the injectors, when removing the LH delivery pipe.

(b) Pull out the three injectors from the RH delivery pipe.

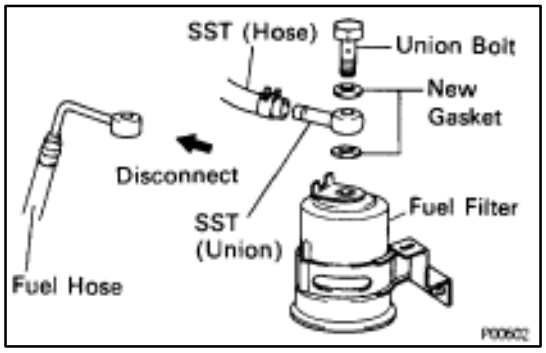
(c) Remove the two spacers from the intake manifold.

INJECTORS INSPECTION

EG0GV–01

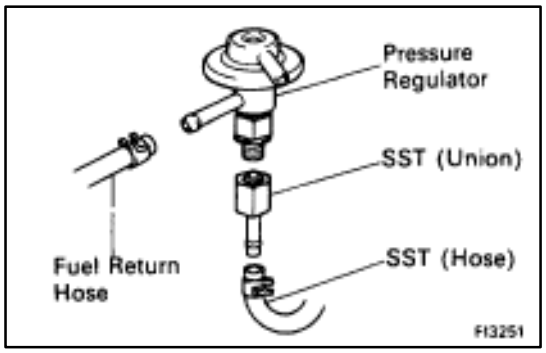


1. INSPECT INJECTOR INJECTION
CAUTION: Keep clear of sparks during the test.



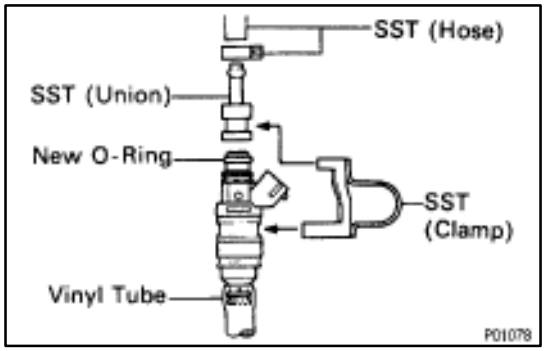
(a) Disconnect the fuel hose from the fuel filter outlet.

(b) Connect SST (union an hose) to the fuel filter outlet with two new gaskets and the union bolt.
SST 09268–41045(90405–09015)
HINT: Use the vehicle's fuel filter.

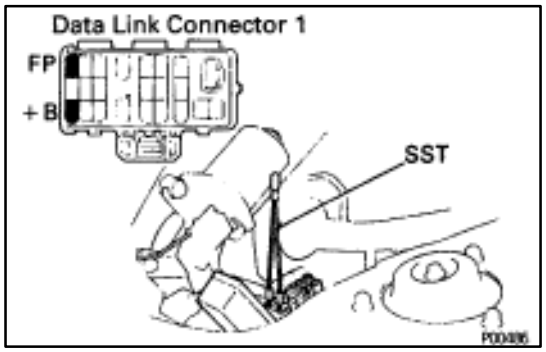


(c) Remove the pressure regulator. (See page EG–183)

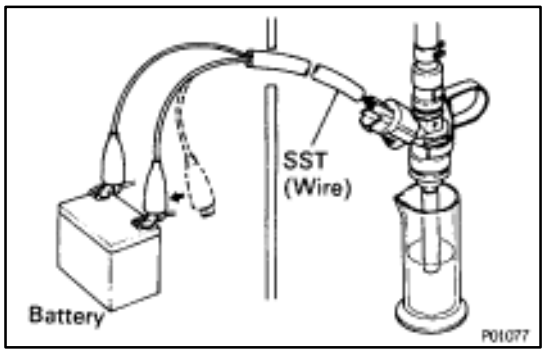
(d) Connect the fuel return hose and SST (hose) to the pressure regulator with SST (union).
SST 09268–41045(09268–41060)



(e) Install a new O–ring to the injector.
(f) Connect SST (union and hose) to the injector, and hold the injector and union with SST (clamp).
SST 09268–41045
(g) Put the injector into the graduated cylinder.
HINT: Install a suitable vinyl hose onto the injector to prevent gasoline from splashing out.

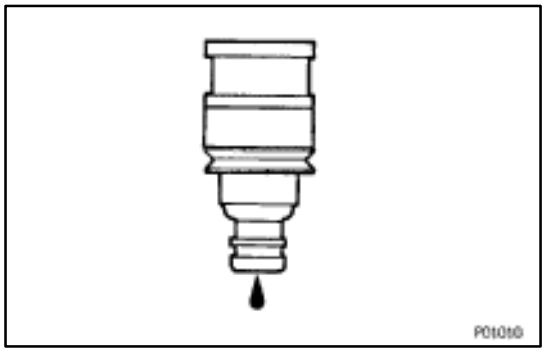


(h) Using SST, connect terminals +B and FP of the data link connector 1.
SST 00843–18020
(i) Reconnect the battery negative (–) cable.
(j) Turn the ignition switch ON.
NOTICE: Do not start the engine.

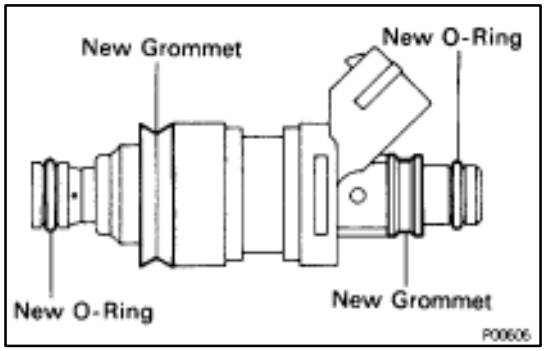


(k) Connect SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder. Test each injector two or three times.
SST 09842–30070
Volume:
54–64 cc (3.3–3.9 cu in.) per 15 sec.
Difference between each injector:
5 cc (0.3 cu in.) or less

If the ignition volume is not as specified, replace the injector.



2. INSPECT LEAKAGE
(a) In the condition above, disconnect the test probes of SST (wire) from the battery and check the fuel leakage from the injector.
SST 09842–30070
Fuel drop:
One drop or less per minute
(b) Disconnect the battery negative (–) cable.
(c) Remove SST.
SST 09268–41045 and 09843–18020



INJECTORS INSTALLATION

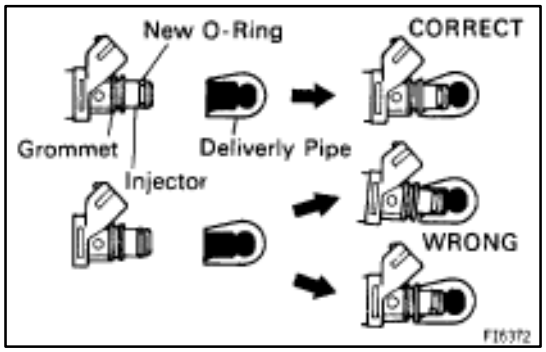
EG0GW–02

(See page EG–187)

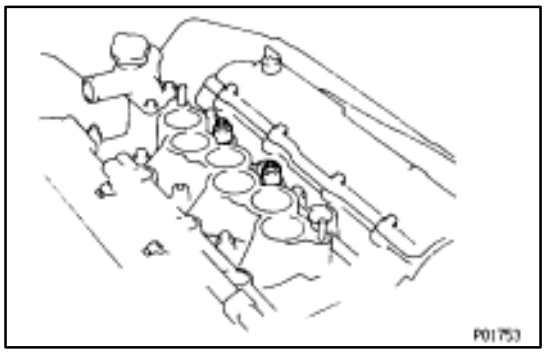
1. INSTALL INJECTORS TO DELIVERY PIPES

(a) Install two new grommets to the injector.

(b) Apply a light coat of gasoline to two new O–rings and install them to the injector.

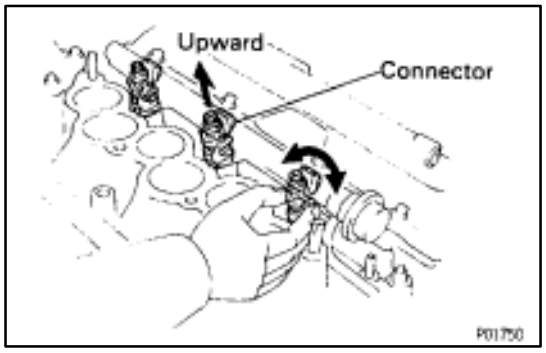


(c) When turning the injector left and right, install it to the delivery pipes. Install the six injectors.



2. INSTALL RH DELIVERY PIPE AND INJECTORS

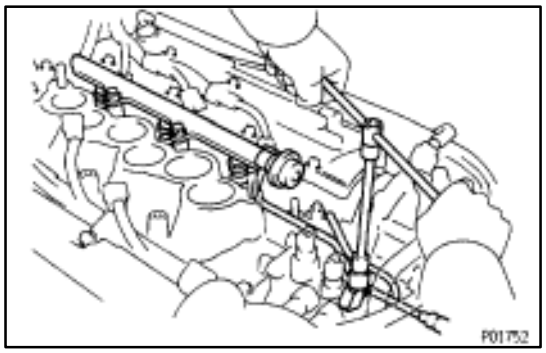
(a) Place the two spacers in position on the intake manifold.
Clean the injector holes before installing the injectors into the intake manifold.



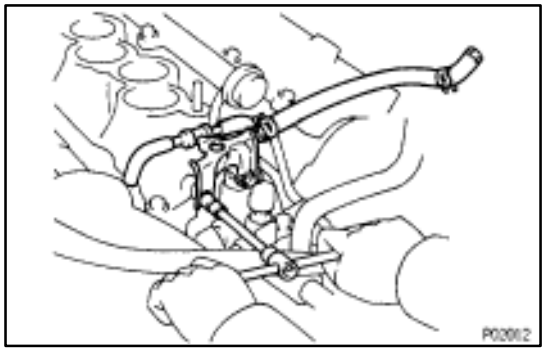
(b) Place the three injectors together with the RH delivery pipe and No.1 fuel pipe in position on the intake manifold.

(c) Check that the injectors rotate smoothly.
HINT: If the injectors do not rotate smoothly, the probable cause is incorrect installation of O–rings.
Replace the O–rings.

(d) Position the injector connector upward.



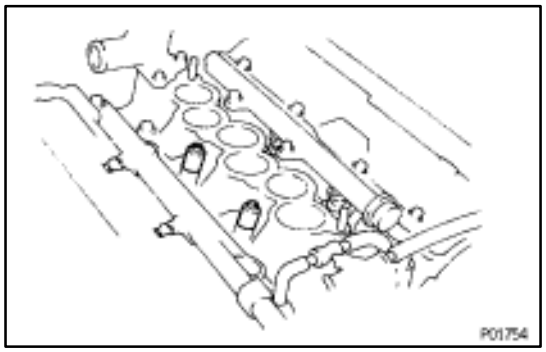
(e) Install and tighten the three bolts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)



3. INSTALL AIR PIPE WITH HOSES

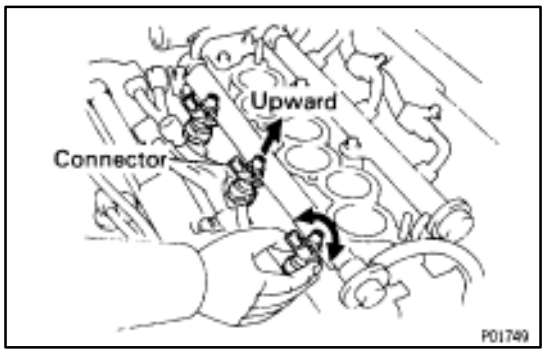
(a) Install the air pipe with the two bolts.
Torque: 8.3 N·m (85 kgf·cm, 74 in.·lbf)

(b) Connect the two air hoses.



4. INSTALL LH DELIVERY PIPE AND INJECTORS

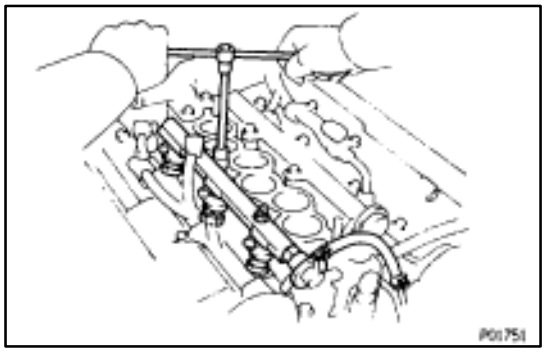
(a) Place the two spacers in position on the intake manifold.
Clean the injector holes before installing the injectors into the intake manifold.



(b) Place the three injectors together with the LH delivery pipe in position on the intake manifold.

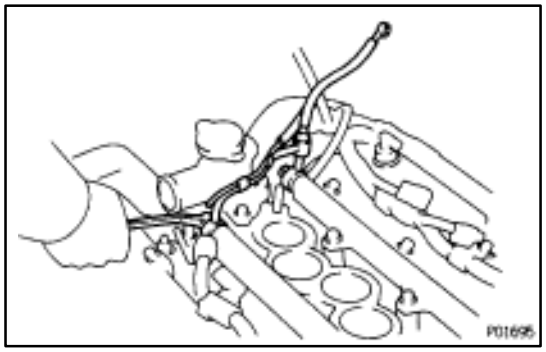
(c) Check that the injectors rotate smoothly.
HINT: If the injectors do not rotate smoothly, the probable cause is incorrect installation of O–rings.
Replace the O–rings.

(d) Position the injector connector upward.



(e) Install and tighten the two bolts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

(f) Connect the fuel hose to the No.1 fuel pipe.

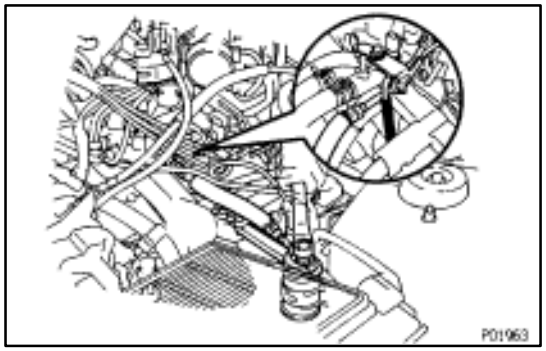


5. INSTALL NO.2 FUEL PIPE

(a) Install the No.2 fuel pipe with four new gaskets and the two union bolts.
Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)

(b) Connect the IACV vacuum hose.

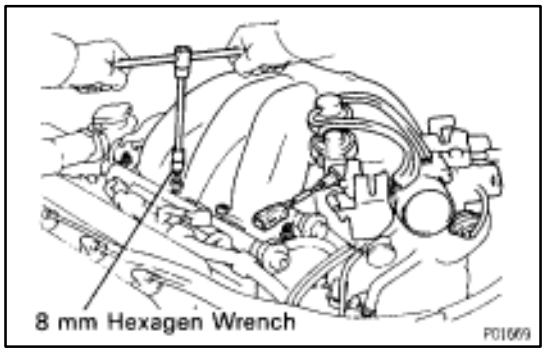
6. CONNECT INJECTOR CONNECTORS



7. CONNECT FUEL INLET AND RETURN HOSES

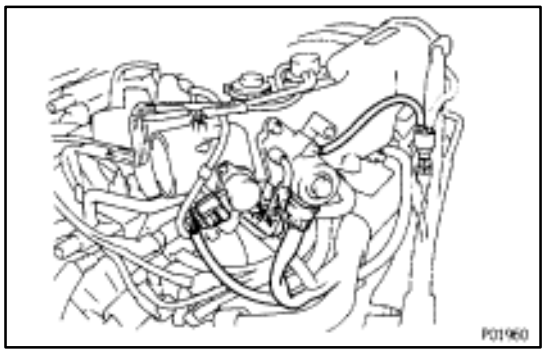
(a) Connect the inlet hose to the fuel filter with two new gaskets and union bolt.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

(b) Connect the return hose to the No.1 fuel pipe.

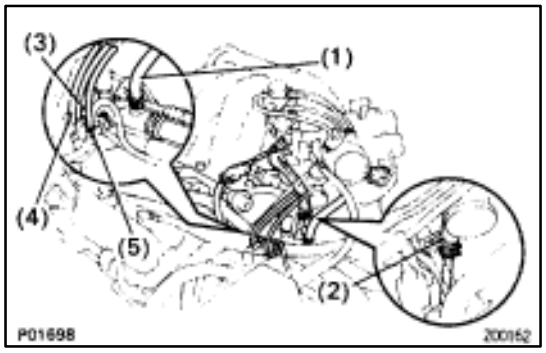


8. INSTALL AIR INTAKE CHAMBER

(a) Using 8 mm hexagon wrench, install a new gasket and the air intake number with the two bolts and nuts.
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

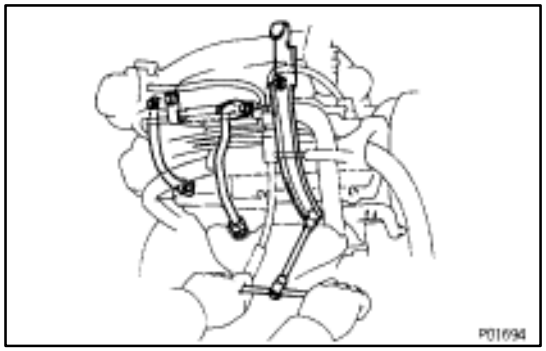


(b) Connect the throttle position sensor connector.
(c) Connect the IAC valve connector.
(d) Connect the IAC valve air hose.
(e) Connect PS air hose.



(f) (Calif. only)
Connect the EGR gas temp. sensor connector.

(g) Connect the following hoses:
(1) Water by–pass hose to throttle body
(2) Water by–pass hose to EGR cooler
(3) Vacuum hose (from EGR valve) to TVV (for EGR)
(4) Vacuum hose (from EGR vacuum modulator) to TVV (for EGR)
(5) Vacuum hose (from throttle body) to TVV (for EVAP)



9. CONNECT HYDRAULIC MOTOR PRESSURE PIPE

Connect the hydraulic pressure pipe to the air intake chamber with the bolt.

10. INSTALL EGR PIPE

Install a new gasket, sleeve ball and the EGR pipe with the two bolts and union nut.

Bolt

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

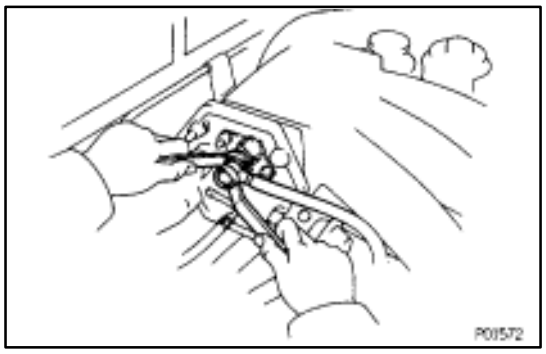
Union nut

Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)

11. INSTALL NO.1 ENGINE HANGER AND AIR INTAKE CHAMBER STAY

(a) Install the air intake chamber stay with the two bolts.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(b) Install the No.1 engine hanger with the two bolts.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

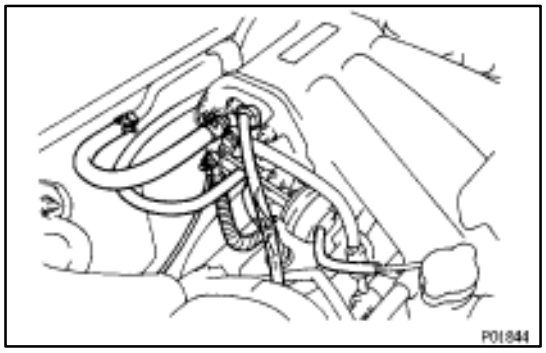


12. CONNECT COLD START INJECTOR PIPE (NO. 2 FUEL PIPE)

Connect the injector pipe with two new gaskets and union bolt.

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

13. CONNECT COLD START INJECTOR CONNECTOR



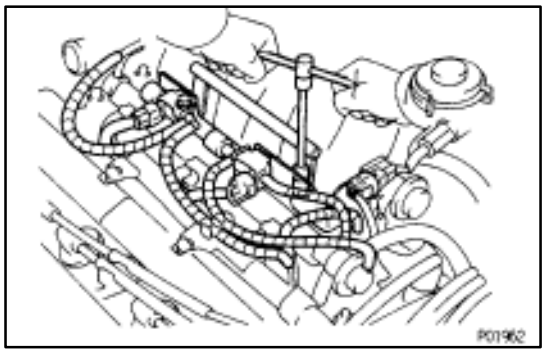
14. CONNECT GROUND STRAPS

Connect the two ground straps with the nut.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

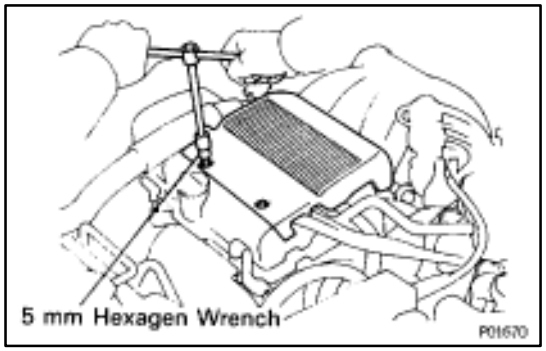
15. CONNECT HOSES

(a) Brake booster vacuum hose
(b) PS air hose
(c) PCV hose
(d) IACV vacuum hose



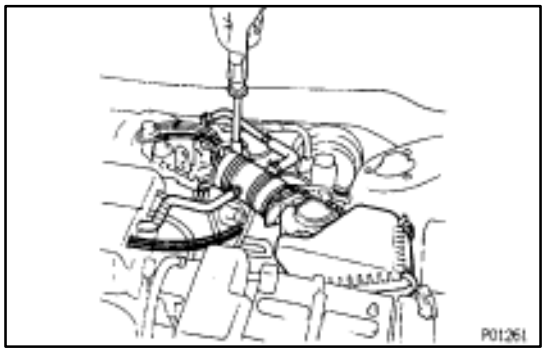
16. INSTALL EMISSION CONTROL VALVE SET

(a) Install the emission control valve set with the two bolts.
(b) Connect the two VSV connectors.
(c) Connect the two vacuum hoses of the IACV VSV.
(d) Connect the two vacuum hoses of the fuel pressure control VSV.
(e) Connect the EGR gas temp. sensor connector clamp to the emission control valve set.



17. INSTALL V–BANK COVER

Using a 5 mm hexagon wrench, install the V–bank cover with the two nuts.



18. INSTALL AIR CLEANER CAP, VOLUME AIR FLOW METER AND AIR CLEANER HOSE

(a) Connect the air cleaner hose, and install the air cleaner cap and volume air flow meter with the four clips.
(b) Tighten the air cleaner hose clamp bolt.
(c) Connect the air hoses.
(d) Connect the coil cord clamp.
(e) Connect the volume air flow meter connector.

19. (A/T)
CONNECT THROTTLE CABLE, AND ADJUST IT

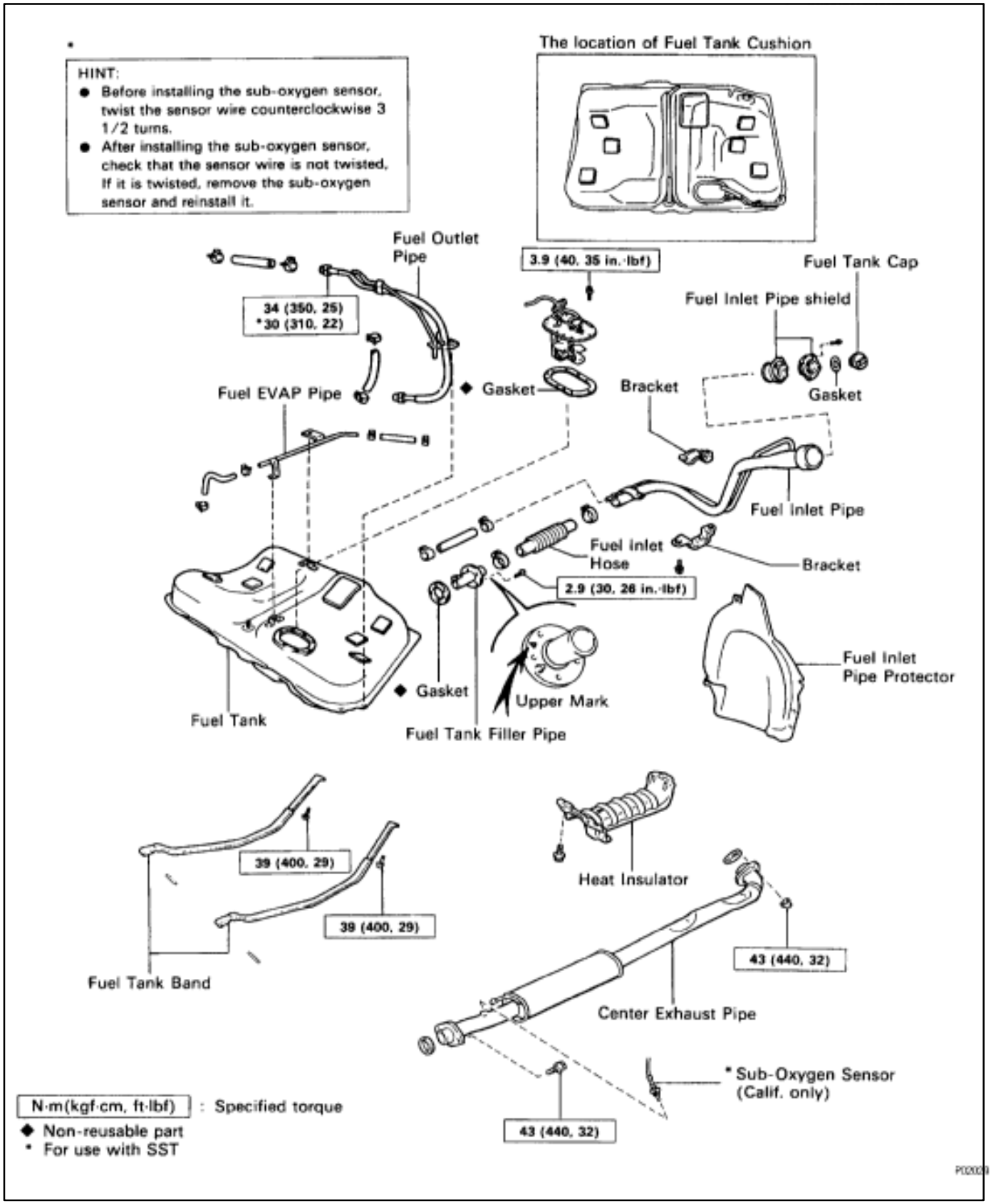
20. CONNECT ACCELERATOR CABLE, AND ADJUST IT

21. FILL WITH ENGINE COOLANT

22. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

FUEL TANK AND LINES COMPONENTS

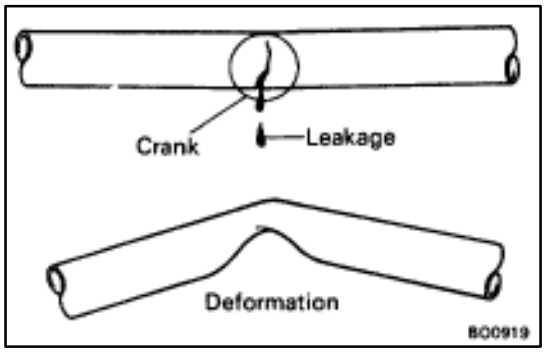
EG0GX–01

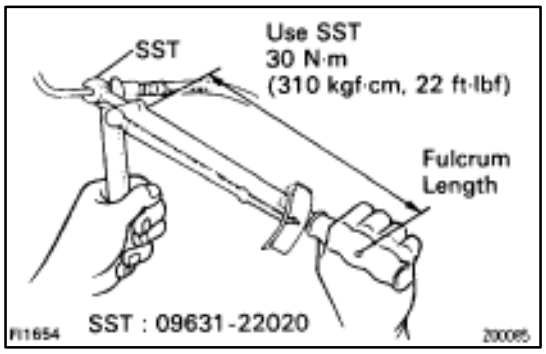


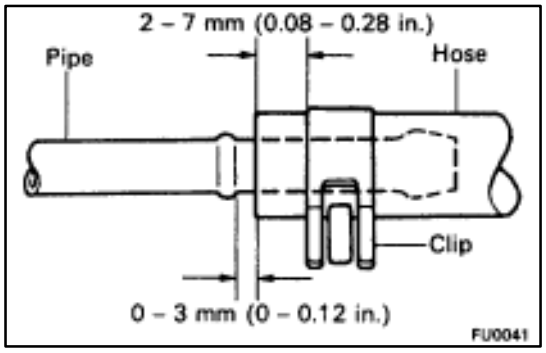
PRECAUTIONS

EG0GY–01

1. **Always use new gaskets when replacing the fuel tank or component parts.**
2. **Apply the proper torque to all parts tightened.**







FUEL LINES AND CONNECTIONS INSPECTION

EG0GZ–01

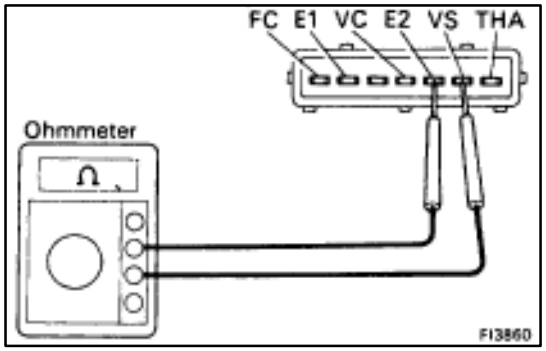
(a) Check the fuel lines for cracks or leakage, and all connections for deformation.

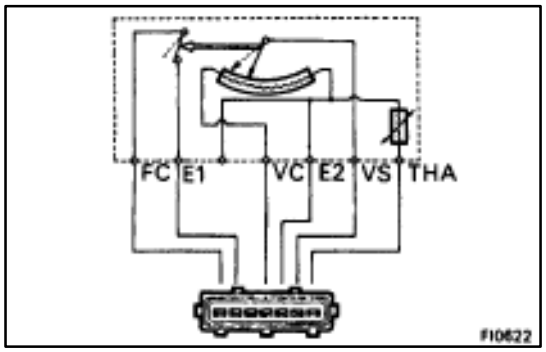
(b) Check the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage.

(c) Check the fuel tank for deformation, cracks, fuel leakage or tank band looseness.

(d) Check the filler neck for damage or fuel leakage.

(e) Hose and tube connections are as shown in the illustration. If a problem is found, repair or replace the parts as necessary.





VOLUME AIR FLOW METER ON–VEHICLE INSPECTION

EG0H0–01

INSPECT RESISTANCE OF VOLUME AIR FLOW METER

(a) Disconnect the volume air flow meter connector.

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

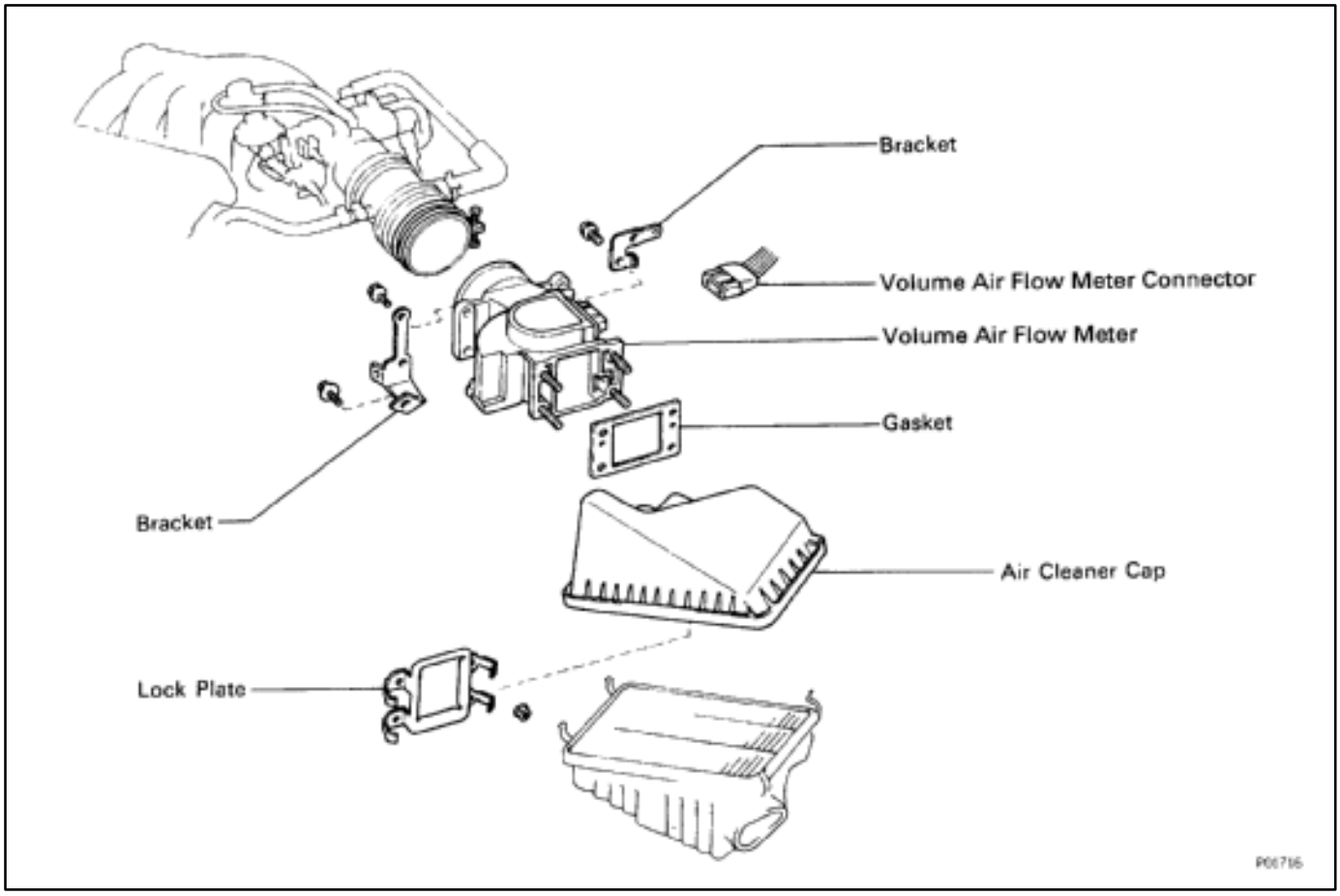
Between terminals	Resistance (Ω)	Temp. °C (°F)
VS–E2	200–600	–
VC–E2	200–400	–
THA–E2	10,000–20,000 4,000–7,000	–20 (–4) 0 (32)
FC–E1	Infinity	–

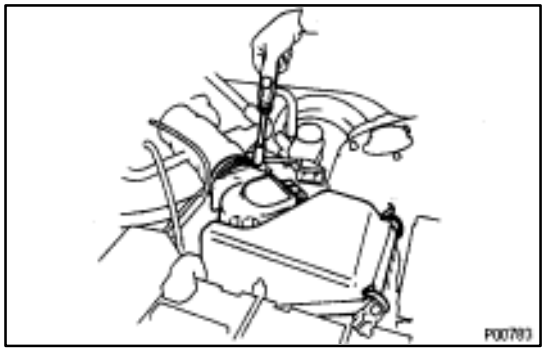
If the resistance is not as specified, replace the volume air flow meter.

(c) Reconnect the volume air flow meter connector.

VOLUME AIR FLOW METER REMOVAL

EG0H1–01





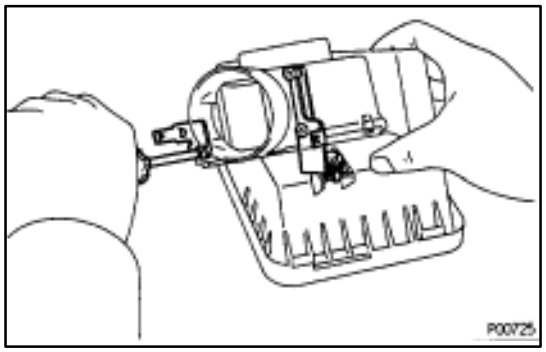
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

CAUTION (w/Airbag): Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable disconnected from the battery.

2. DISCONNECT COIL CORD CLAMP

3. DISCONNECT VOLUME AIR FLOW METER CONNECTOR

4. DISCONNECT AIR CLEANER HOSE

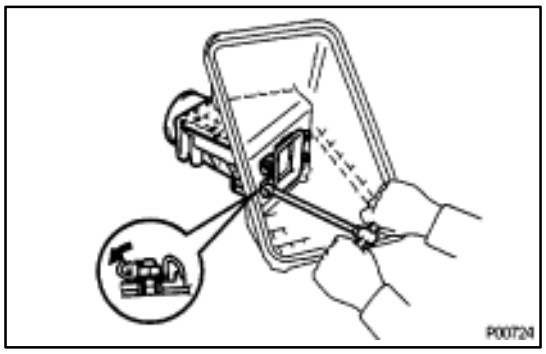


5. REMOVE AIR CLEANER CAP AND VOLUME AIR FLOW METER ASSEMBLY

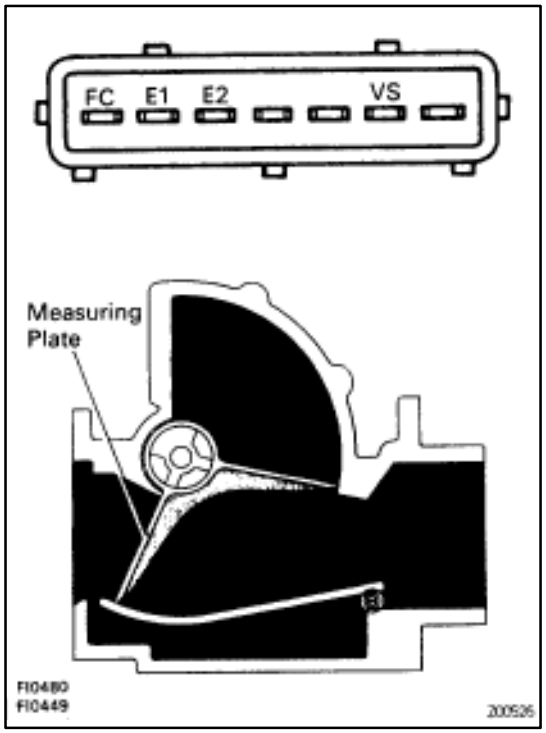
6. REMOVE VOLUME AIR FLOW METER FROM AIR CLEANER CAP

(a) Remove the screw and wire bracket.

(b) Remove the bolt, two screws and bracket.



(c) Pry off the lock plate, and remove the four nuts, lock plate, volume air flow meter and gasket.



VOLUME AIR FLOW METER INSPECTION

EG0H2–01

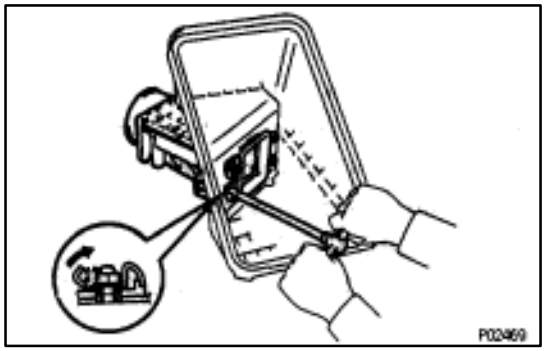
INSPECT RESISTANCE OF VOLUME AIR FLOW METER

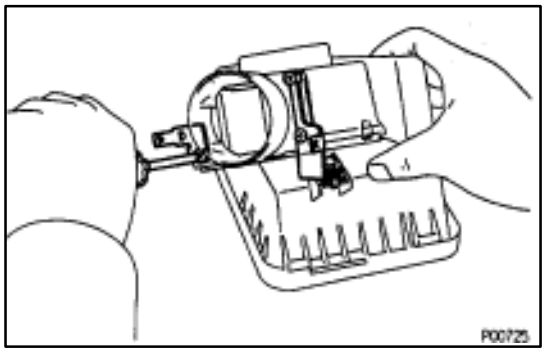
Using an ohmmeter, measure the resistance between each terminal by moving the measuring plate.

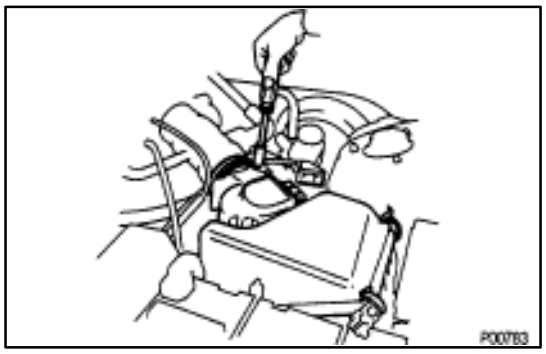
Between terminals	Resistance (Ω)	Measuring plate opening
FC–E1	Infinity	Fully closed
FC–E1	Zero	Other than closed
VS–E2	200–600	Fully closed
VS–E2	20–1,200	Fully open

HINT: Resistance between terminals E2 and VS will change in a wave pattern as the measuring plate slowly opens.

If the resistance is not as specified, replace the volume air flow meter.







VOLUME AIR FLOW METER INSTALLATION

EG0H3–01

(See page EG–200)

1. INSTALL VOLUME AIR FLOW METER TO AIR CLEANER CAP

(a) Install the volume air flow meter with the gasket, lock plate, four plate washers, four nuts and bolt. Pry the lock plate on the nut.

(b) Install the bracket with the bolt and two screws.

(c) Install the wire bracket with the screw.

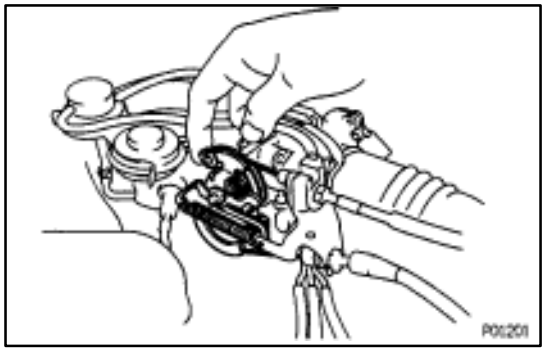
2. INSTALL AIR CLEANER CAP AND VOLUME AIR FLOW METER ASSEMBLY

3. CONNECT AIR CLEANER HOSE

4. CONNECT VOLUME AIR FLOW METER CONNECTOR

5. CONNECT COIL CORD CLAMP

6. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

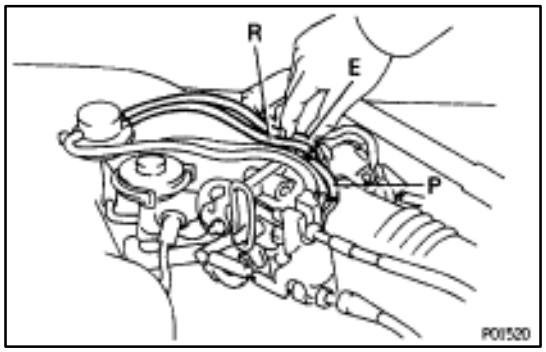


THROTTLE BODY
ON–VEHICLE INSPECTION

EG0H4–01

1. INSPECT THROTTLE BODY

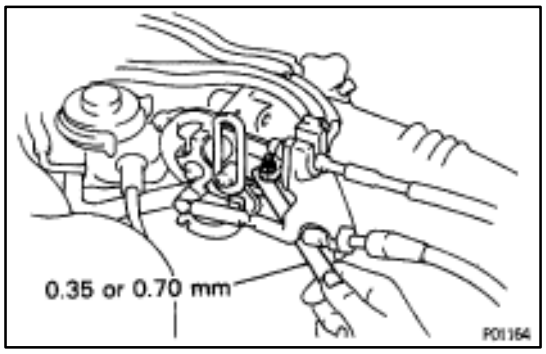
(a) Check that the throttle linkage moves smoothly.



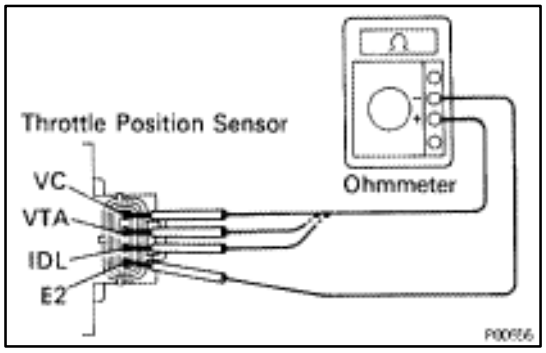
(b) Check the vacuum at each port.
- Start the engine.
- Check the vacuum with your finger.

Port name	At idle	Other than idle
P	No vacuum	Vacuum
E	No vacuum	Vacuum
R	No vacuum	Vacuum

2. INSPECT THROTTLE POSITION SENSOR

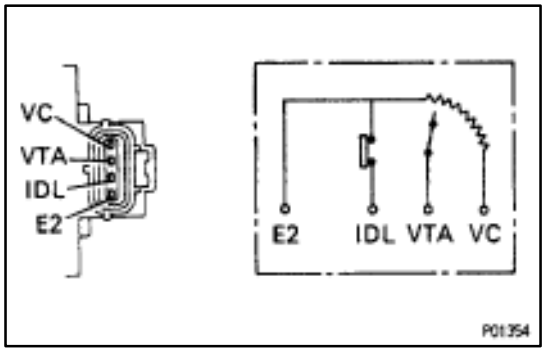


(a) Apply vacuum to the throttle opener.
(b) Disconnect the sensor connector.
(c) Insert a thickness gauge between the throttle stop screw and stop lever.



(d) Using an ohmmeter, measure the resistance between each terminal.

Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA–E2	0.28–6.4 kΩ
0.35 mm (0.014 in.)	IDL–E2	0.5 kΩ or less
0.70 mm (0.028 in.)	IDL–E2	Infinity
Throttle valve fully open	VTA–E2	2.0–11.6 kΩ
–	VC–E2	2.7–7.7 kΩ



(e) Reconnect the sensor connector.

3. INSPECT AND ADJUST DASH POT (DP)

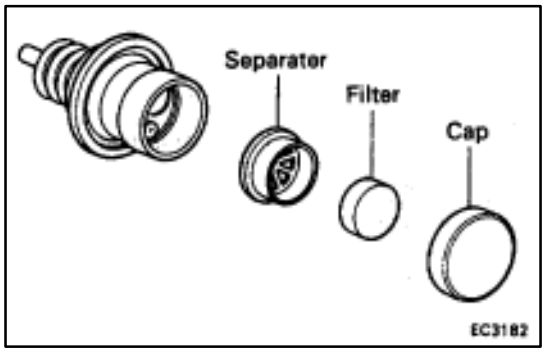
A. Warm up engine

Allow the engine to warm up to normal operating temperature.

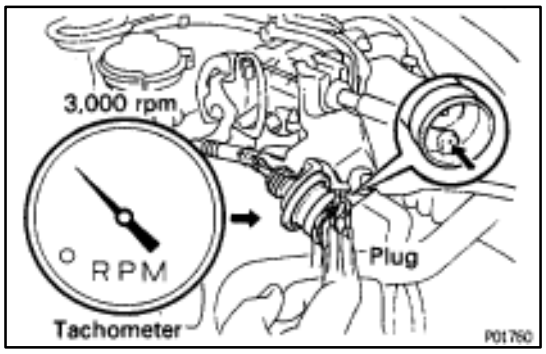
B. Check idle speed

Idle speed:

700 ± 50 rpm



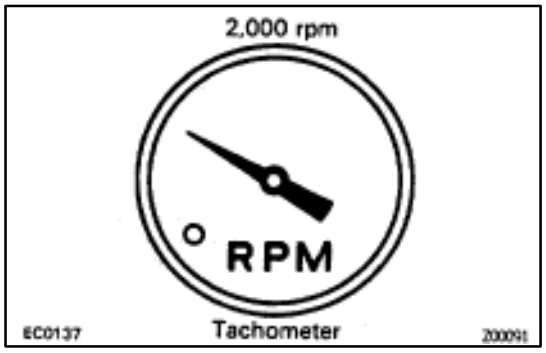
C. Remove cap, filter and separator from DP



D. Check and adjust DP setting speed

(a) Maintain the engine at 3,000 rpm.

(b) Plug the VTV hole with your finger.

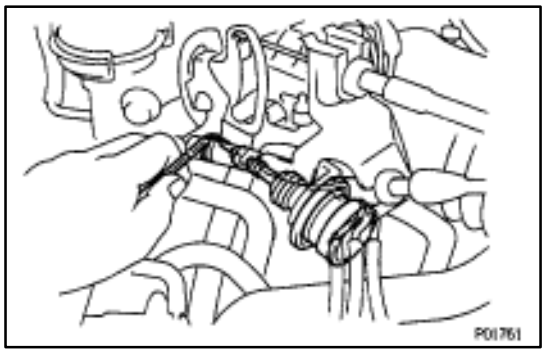


(c) Release the throttle valve.

(d) Check that the DP is set.

DP setting speed:

2,000 rpm



If not as specified, adjust with the DP adjusting screw.

E. Reinstall DP separator, filter and cap

HINT: Install the filter with the coarser surface facing the atmospheric side (outward).

4. INSPECT THROTTLE OPENER

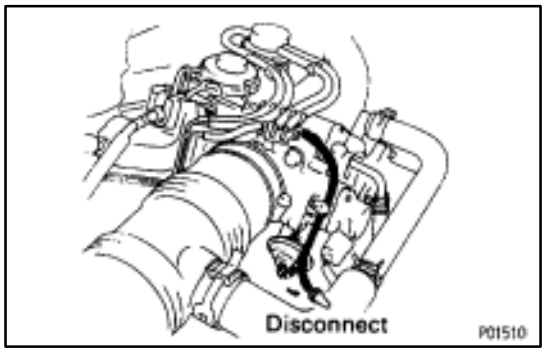
A. Warm up engine

Allow the engine to warm up to normal operating temperature.

B. Check idle speed

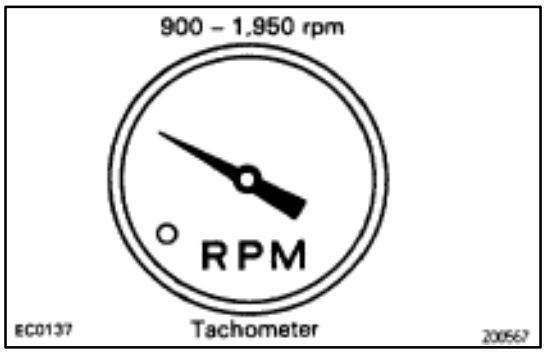
Idle speed:

700 ± 50 rpm



C. Check throttle opener setting speed

(a) Disconnect the vacuum hose from the throttle opener, and plug the hose end.



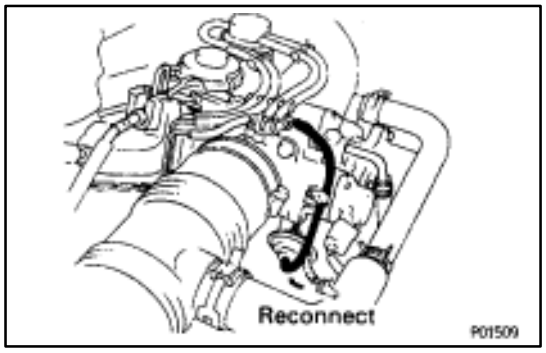
(b) Check the throttle opener setting speed.

Throttle opener setting speed:

900–1,950 rpm

If the throttle opener setting is not as specified, replace the throttle body.

(c) Stop the engine.

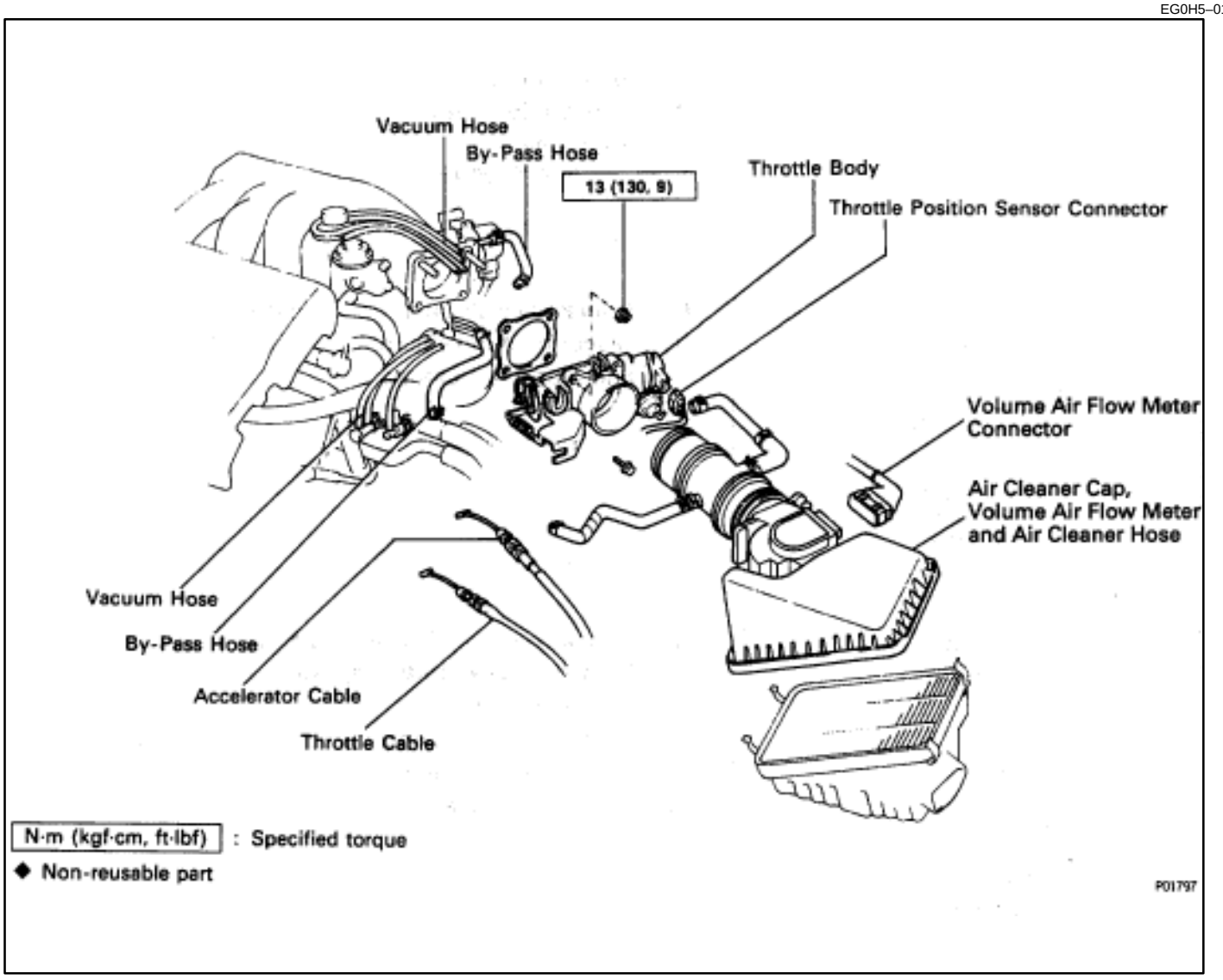


(d) Reconnect the vacuum hose to the throttle opener.

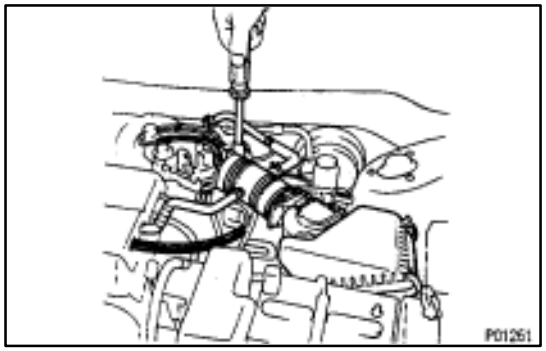
(e) Start the engine and check that the idle rpm returns to the correct speed.

THROTTLE BODY REMOVAL

EG0H5–01

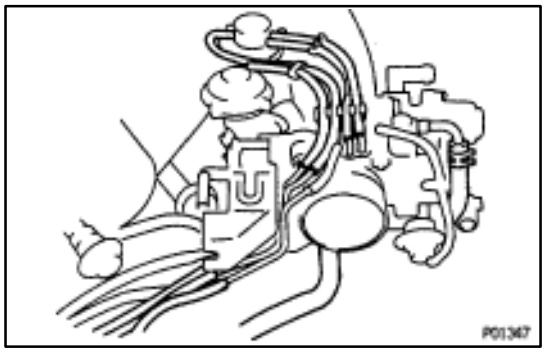


1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
   CAUTION (w / Airbag): Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.
2. **DRAIN ENGINE COOLANT**
3. **DISCONNECT ACCELERATOR CABLE FROM THROTTLE LINKAGE**
4. **(A/T)**
   DISCONNECT THROTTLE CABLE FROM THROTTLE LINKAGE



5. REMOVE AIR CLEANER CAP, VOLUME AIR FLOW METER AND AIR CLEANER HOSE

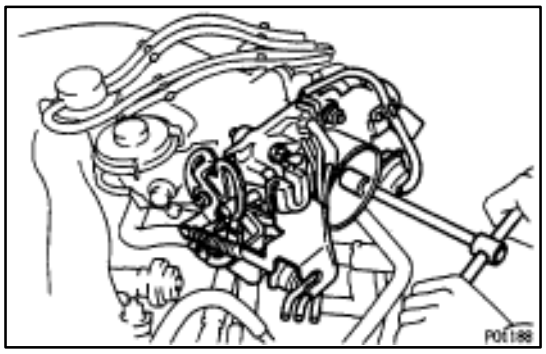
(a) Disconnect the volume air flow meter connector.
(b) Disconnect the coil cord clamp.
(c) Disconnect the air hoses.
(d) Loosen the air cleaner hose clamp bolt.
(e) Disconnect the air cleaner cap clips.
(f) Remove the air cleaner cap and volume air flow meter together with the air cleaner hose.



6. DISCONNECT THROTTLE POSITION SENSOR CONNECTOR

7. DISCONNECT HOSES FROM THROTTLE BODY

(a) Water by–pass hoses
(b) Emission control vacuum hoses

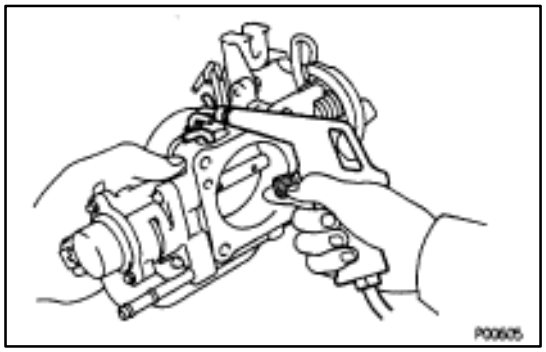


8. REMOVE THROTTLE BODY

Remove the two bolts and two nuts, throttle body and gasket.

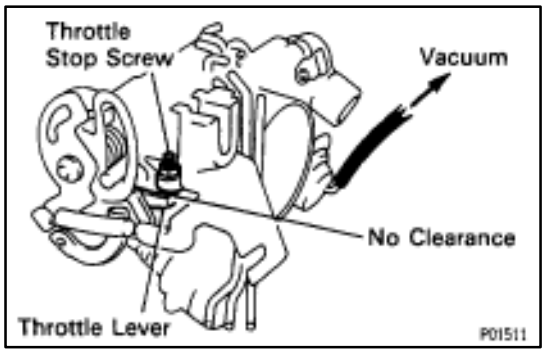
THROTTLE BODY INSPECTION

EG0H6–01



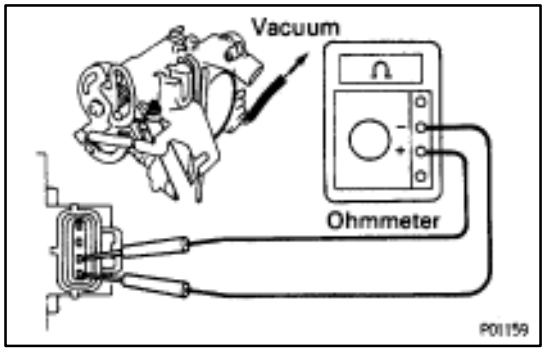
1. CLEAN THROTTLE BODY

(a) Using a soft brush and carburetor cleaner, clean the cast parts.
(b) Using compressed air, clean all the passages and apertures.
NOTICE: To prevent deterioration, do not clean the throttle position sensor.



2. INSPECT THROTTLE VALVE

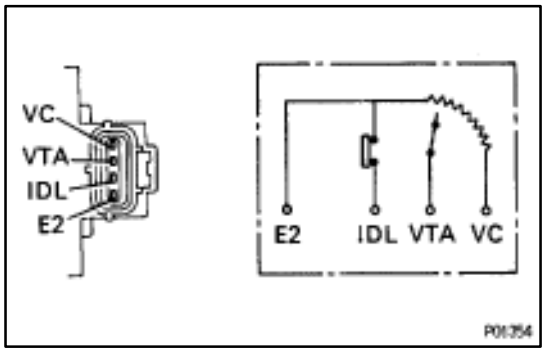
(a) Apply vacuum to the throttle opener.
(b) Check that there is no clearance between the throttle stop screw and throttle lever when the throttle valve is fully closed.



3. INSPECT THROTTLE POSITION SENSOR

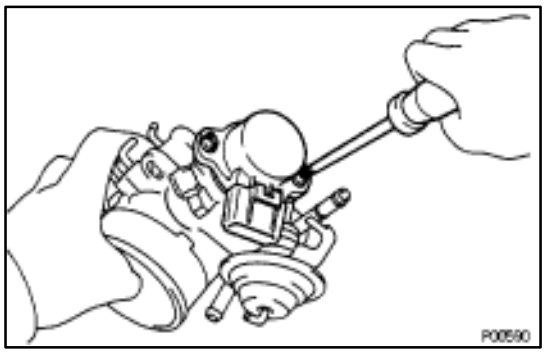
(a) Apply vacuum to the throttle opener.
(b) Insert a thickness gauge between the throttle stop screw and stop lever.
(c) Using an ohmmeter, measure the resistance between each terminal.

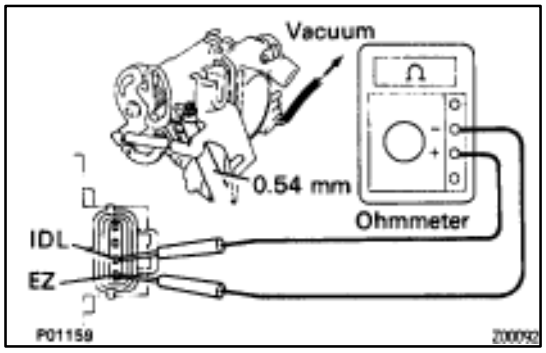
Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA–E2	0.28–6.4 kΩ
0.35 mm (0.014 in.)	IDL–E2	0.5 kΩ or less
0.70 mm (0.028 in.)	IDL–E2	Infinity
Throttle valve fully open	VTA–E2	2.0–11.6 kΩ
–	VC–E2	2.7–7.7 kΩ



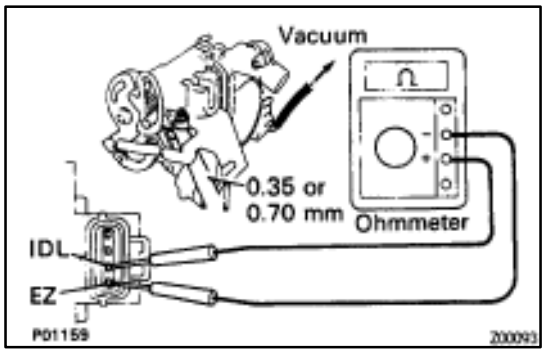
4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

(a) Loosen the two set screws of the sensor.



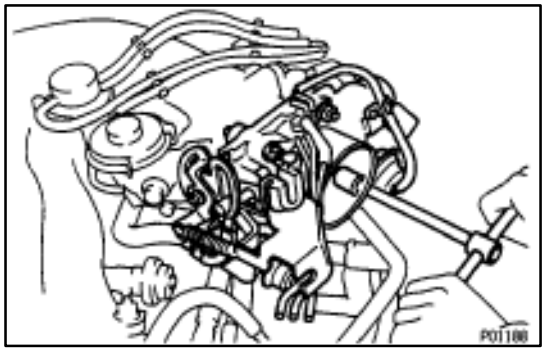


(b) Apply vacuum to the throttle opener.
(c) Insert a 0.54 mm (0.021 in.) thickness gauge, between the throttle stop screw and stop lever.
(d) Connect the test probe of an ohmmeter to the terminals IDL and E2 of the sensor.
(e) Gradually turn the sensor clockwise until the ohmmeter deflects, and secure it with the two set screws.



(f) Recheck the continuity between terminals IDL and E2.

Clearance between lever and stop screw	Continuity (IDL–E2)
0.35 mm (0.014 in.)	Continuity
0.70 mm (0.028 in.)	No continuity



THROTTLE BODY INSTALLATION

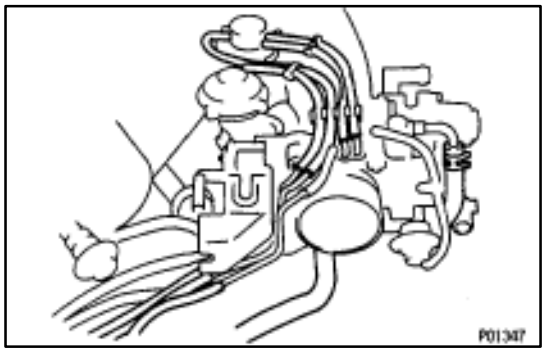
EG0H7–01

(See page EG–206)

1. INSTALL THROTTLE BODY

Install a new gasket and the throttle body with the two bolts and two nuts.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

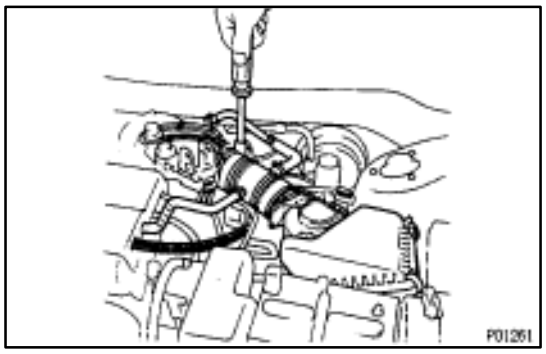


2. CONNECT HOSES TO THROTTLE BODY

(a) Water by–pass hose

(b) Emission control vacuum hoses

3. CONNECT THROTTLE POSITION SENSOR CONNECTOR



4. INSTALL AIR CLEANER CAP, VOLUME AIR FLOW METER AND AIR CLEANER HOSE

(a) Connect the air cleaner hose, and install the air cleaner cap and volume air flow meter with the four clips.

(b) Tighten the air cleaner hose clamp bolt.

(c) Connect the air hoses.

(d) Connect the coil cord clamp.

(e) Connect the volume air flow meter connector.

5. (A/T)
CONNECT THROTTLE CABLE, AND ADJUST IT

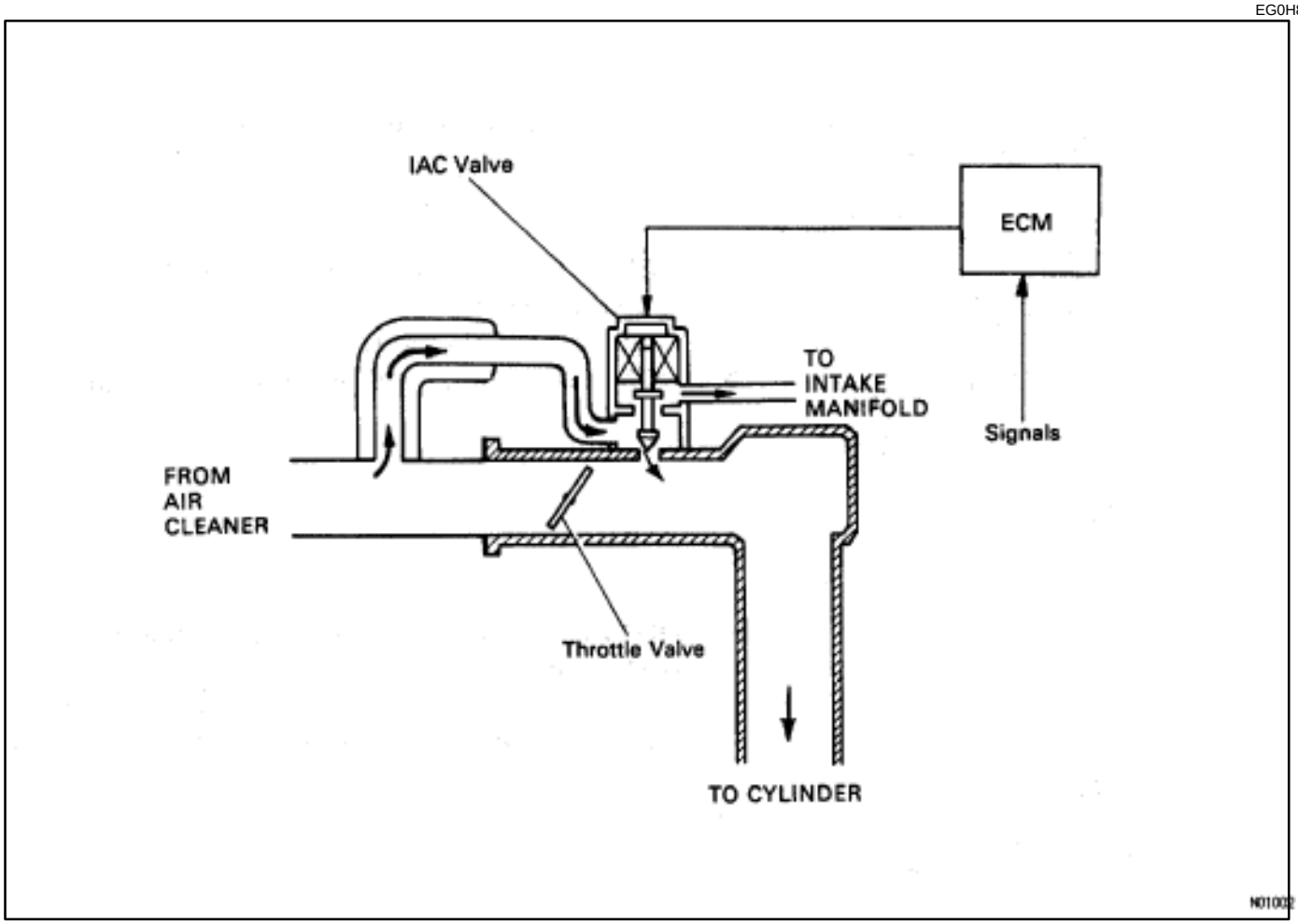
6. CONNECT ACCELERATOR CABLE, AND ADJUST IT

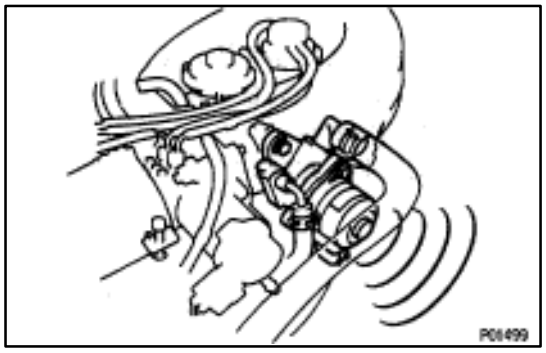
7. FILL WITH ENGINE COOLANT

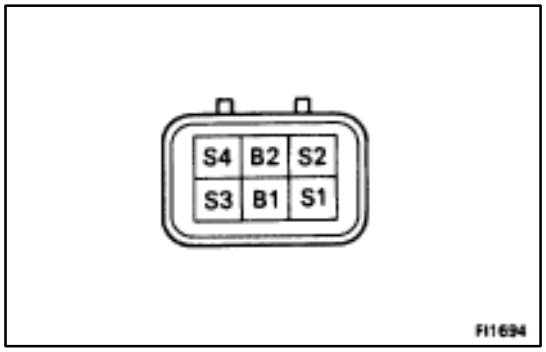
8. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

IAC VALVE

EG0H8–01







ON–VEHICLE INSPECTION

EG0H9–01

1. CHECK FOR OPERATING SOUND FROM IAC VALVE

Check that there is a clicking sound immediately stopping the engine.

2. INSPECT IAC VALVE RESISTANCE

(a) Disconnect the IAC valve connector.

(b) Using an ohmmeter, measure the resistance between terminals B1–S1 or S3, and B2–S2 or S4.

Resistance:

B1–S1 or S3

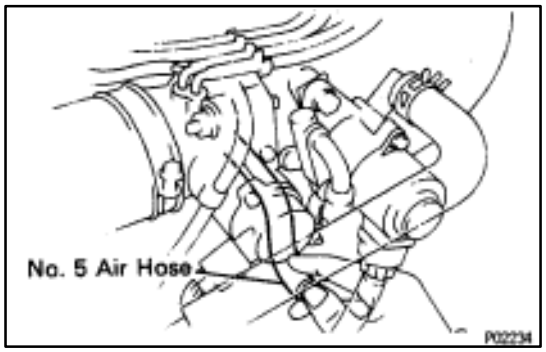
10–30 Ω

B2–S2 or S4

10–30 Ω

If resistance is not as specified, replace the IAC valve.

(c) Reconnect the IAC valve connector.



3. INSPECT AIR ASSIST SYSTEM

(a) Start and wame up the engine.

(b) Disconnect the No.5 air hose from the IAC valve and plug the hose end with your finger.

(c) Check that vacuum pressure acts against your finger.

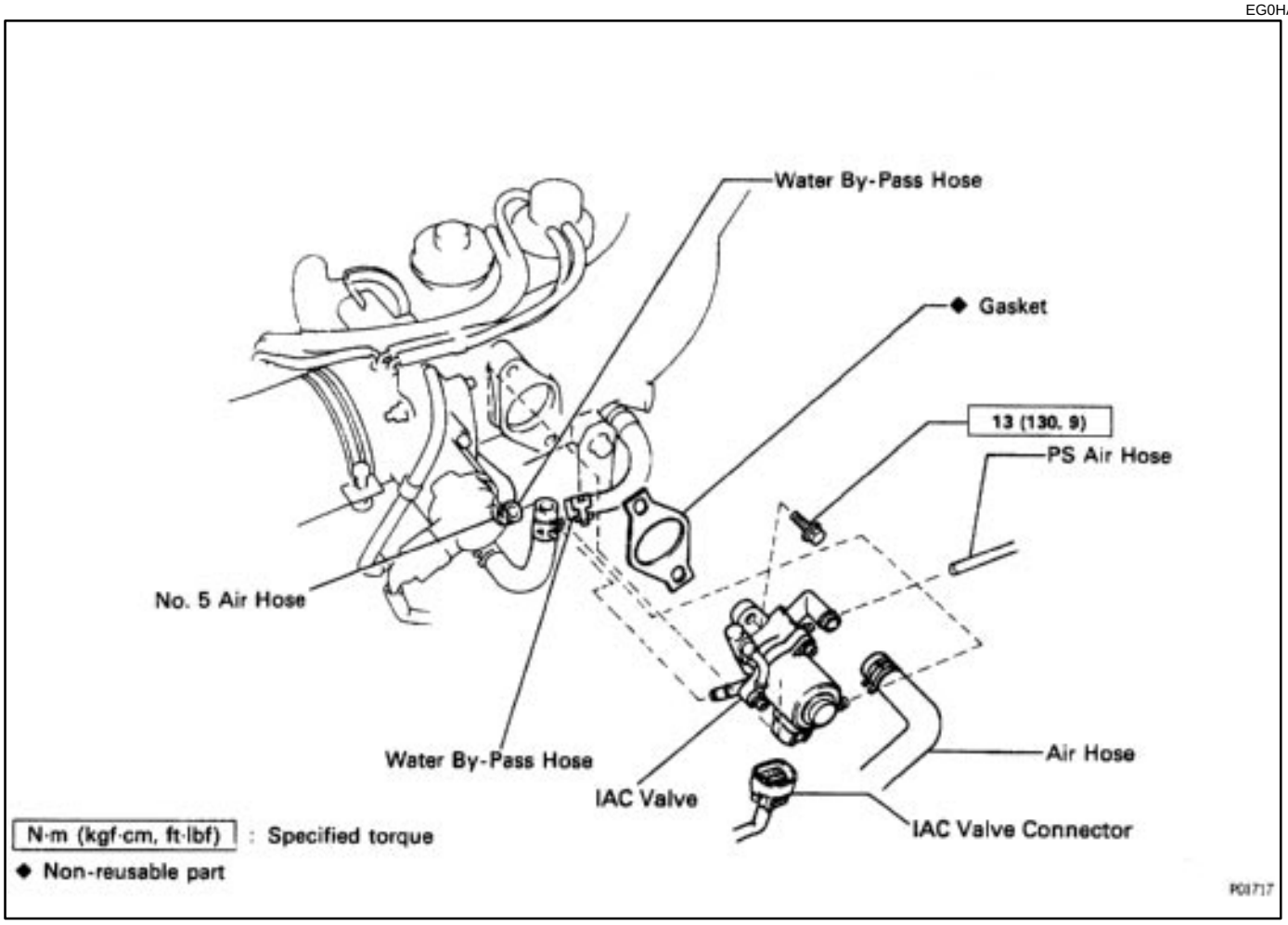
Reference vacuum:

27 kPa (200 mmHg, 7.9 in.Hg) or more

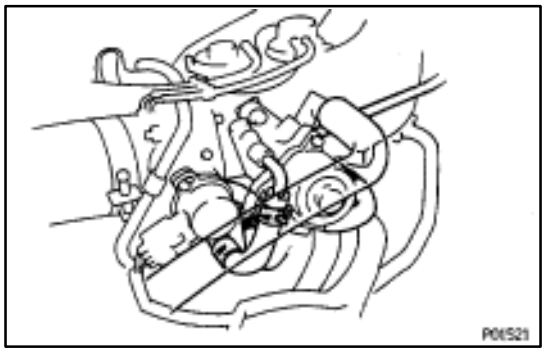
If no vacuum exists, check whether the air hose, pipe is clogged.

IAC VALVE REMOVAL

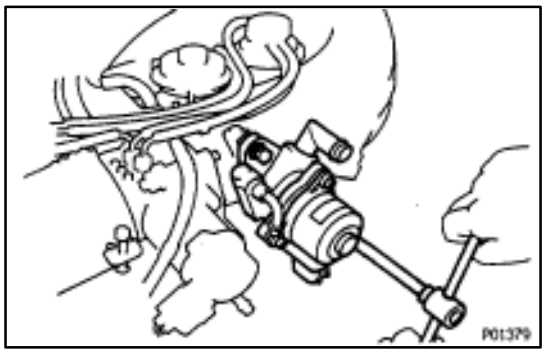
EG0HA–01



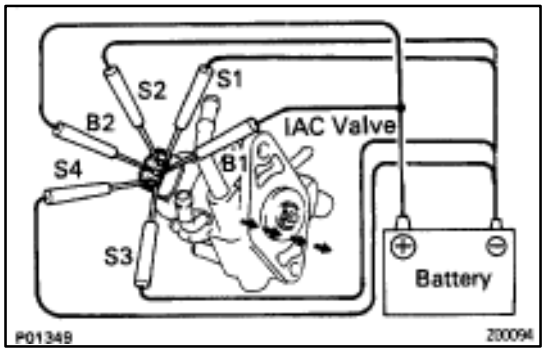
1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
   CAUTION (w/Airbag): Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.
2. **DRAIN ENGINE COOLANT**
3. **DISCONNECT IAC VALVE CONNECTOR**



4. **DISCONNECT TWO AIR HOSES**
5. **DISCONNECT TWO WATER BY–PASS HOSES**
6. **DISCONNECT PS IDLE UP VACUUM HOSE**



7. **REMOVE IAC VALVE**
   Remove the two bolts, IAC valve and gasket.

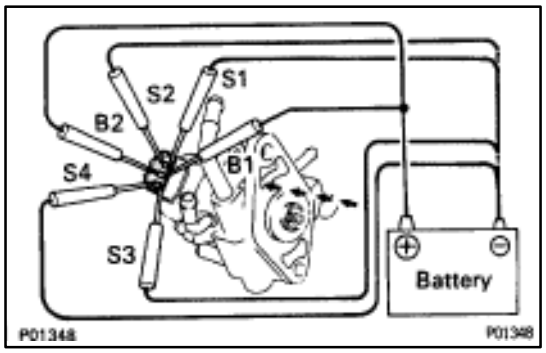


IAC VALVE INSPECTION

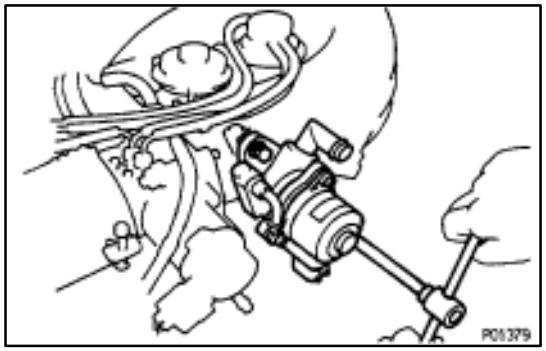
EG0HB–01

INSPECT IAC VALVE OPERATION

(a) Apply battery voltage to terminals B1 and B2, and while repeatedly grounding S1–S2–S3–S4–S1 in sequence, check that the valve moves toward the closed position.



(b) Apply battery voltage to terminals B1 and B2, and while repeatedly grounding S4–S3–S3–S1–S4 in sequence, check that the valve moves toward the open position.
If operation is not as specified, replace the IAC valve.



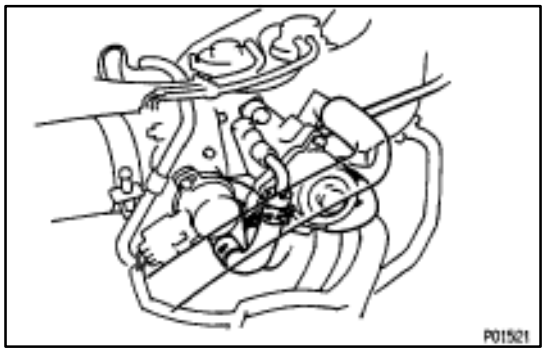
IAC VALVE INSTALLATION

EG0HC–01

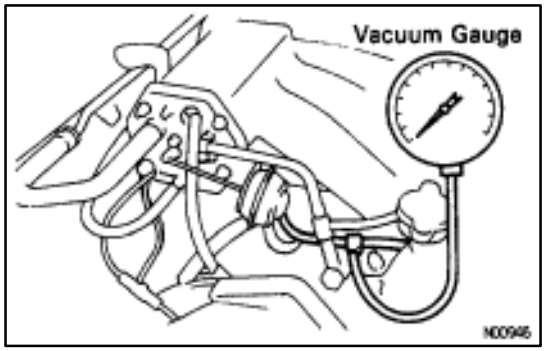
(See page EG–210)

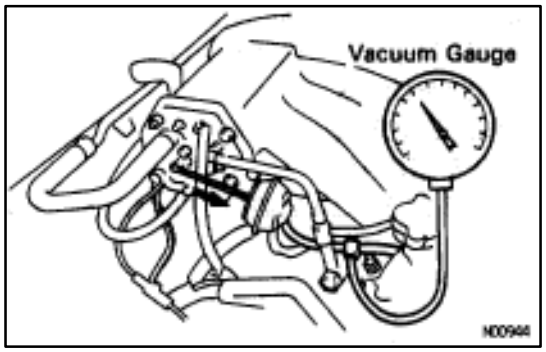
1. INSTALL IAC VALVE

(a) Install a new gasket and the IAC valve with the two bolts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)



2. CONNECT PS IDLE UP VACUUM HOSE
3. CONNECT TWO WATER BY–PASS HOSES
4. CONNECT TWO AIR HOSES
5. CONNECT IAC VALVE CONNECTOR
6. FILL WITH ENGINE COOLANT
7. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY





INTAKE AIR CONTROL VALVE (IACV) ON–VEHICLE INSPECTION

EG0HD–01

1. INSPECT IACV

(a) Using a 3–way connector, connect vacuum gauge to the actuator hose.

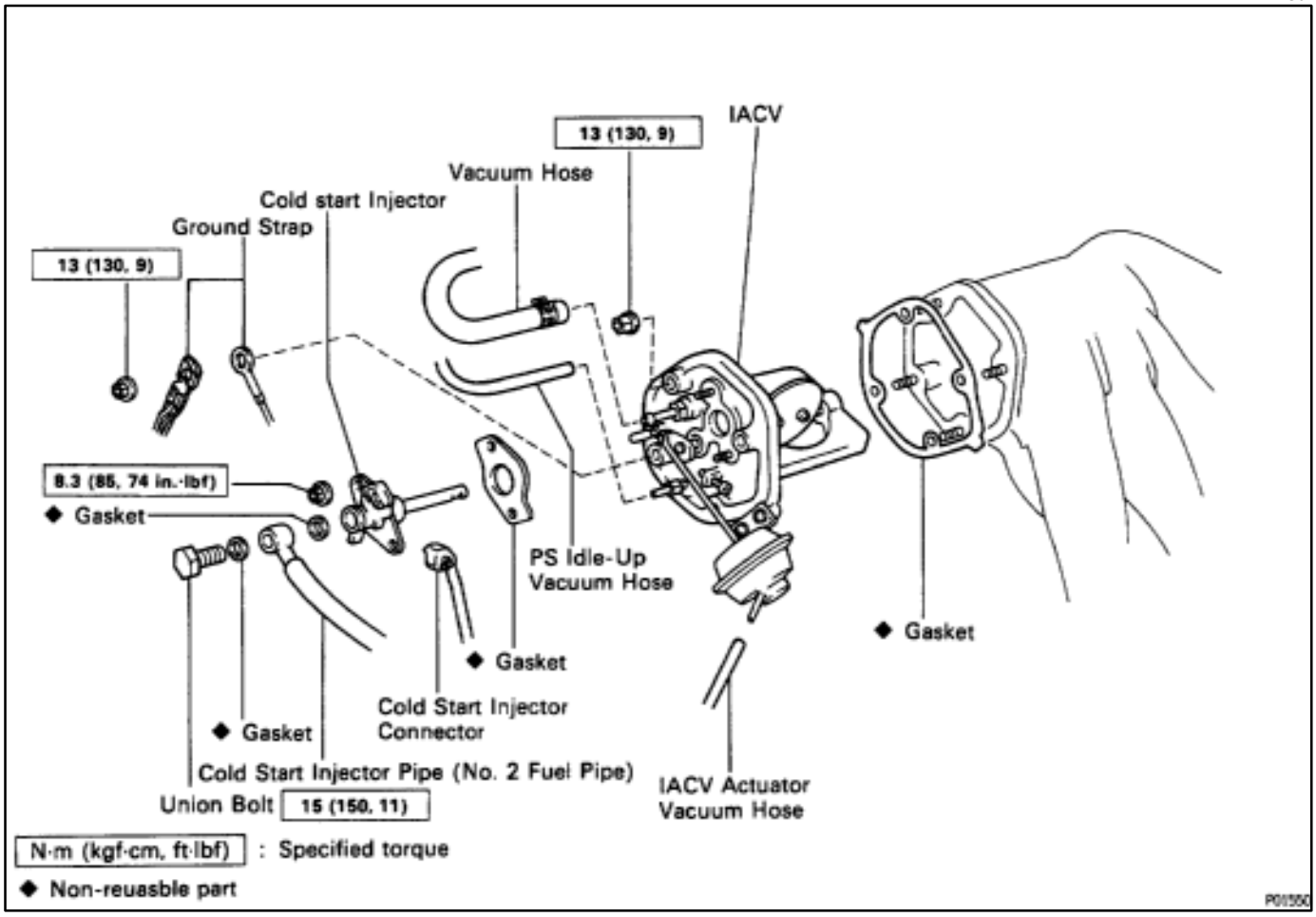
(b) Start the engine.

(c) While the engine is idling, check that the vacuum gauge needle does not move.

(d) Rapidly depress the accelerator pedal to fully open position and check that the vacuum gauge needle momentarily fluctuates approx. 26.7 kPa (200 mmHg, 7.9 in.Hg). (The actuator rod is pulled out.)

IACV REMOVAL

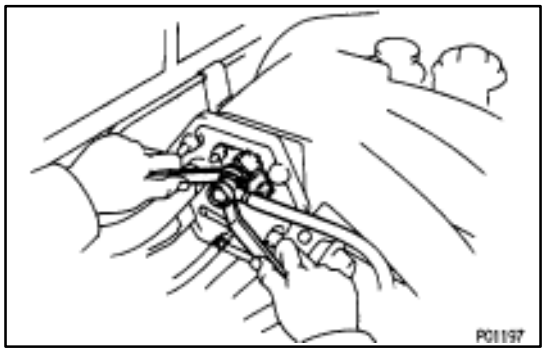
EG0HE–01



1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

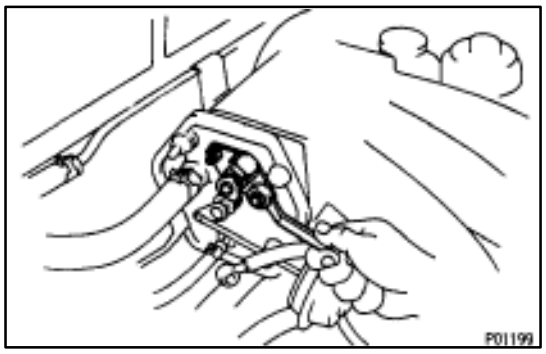
CAUTION (w / Airbag): Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.

2. DISCONNECT COLD START INJECTOR CONNECTOR



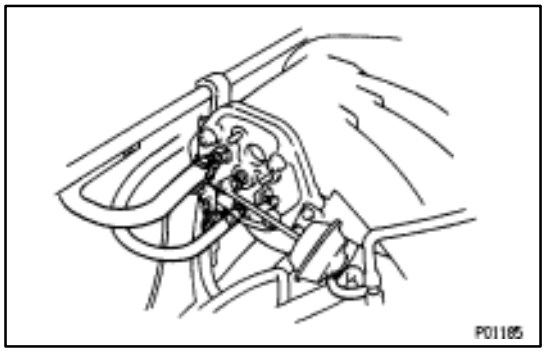
3. DISCONNECT COLD START INJECTOR PIPE (NO.2 FUEL PIPE)

(a) Put a suitable container or shop towel under the injector pipe.
(b) Remove the union bolt and two gaskets, and disconnect the injector pipe.
HINT: Slowly loosen the union bolt.



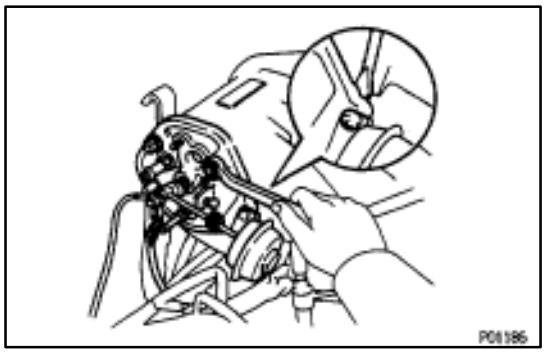
4. REMOVE COLD START INJECTOR

Remove the two nuts, cold start injector and gasket.



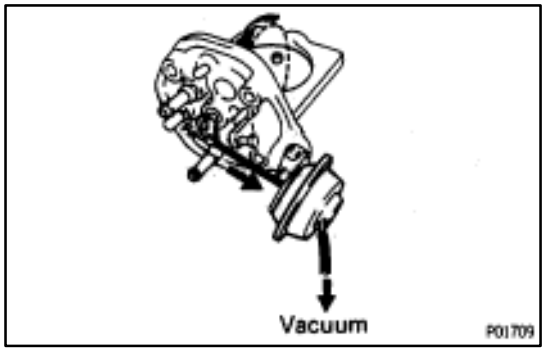
5. DISCONNECT HOSES FROM IACV

(a) Brake booster vacuum hose
(b) PS idle–up vacuum hose
(c) IACV actuator vacuum hose



6. REMOVE IACV

(a) Remove the four nuts and disconnect the two ground straps.
(b) Remove the IACV by prying a screwdriver between the IACV and intake manifold.
(c) Remove the gasket.



IACV AND COMPONENTS INSPECTION

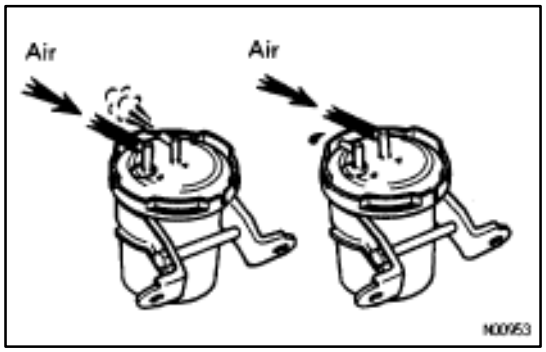
EG0HF–01

1. INSPECT IACV

(a) With 26.7 kPa (200 mmHg, 7.9 in.Hg) of vacuum applied to the actuator, check that the actuator rod moves.

(b) One minute after applying the vacuum in (a), check that the actuator rod does not return.

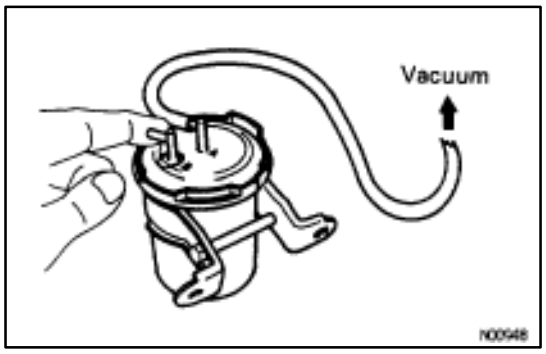
If the operation is not as specified, replace the IACV.



2. INSPECT VACUUM TANK

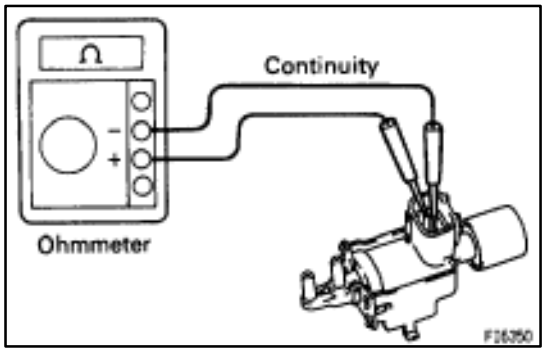
(a) Check that air flows from port B to port A.

(b) Check that air does not flow from port A to port B.



(c) Plug port B with your finger, and apply 26.7 kPa (200 mmHg, 7.9 in.Hg) of vacuum to port A, and check that there is no change in vacuum after one minute.

If the operation is not as specified, replace the vacuum tank.



3. INSPECT IACV VSV

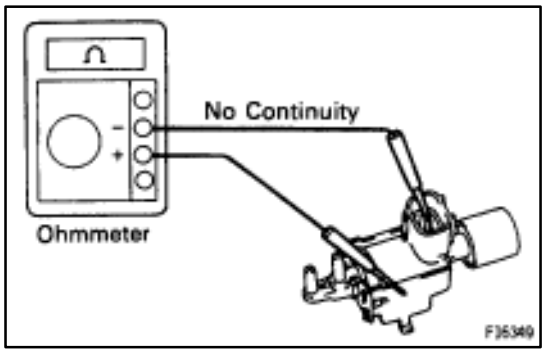
A. Inspect VSV for open circuit

Using an ohmmeter, check that there is continuity between the terminals.

Resistance (Cold):

33–39 Ω

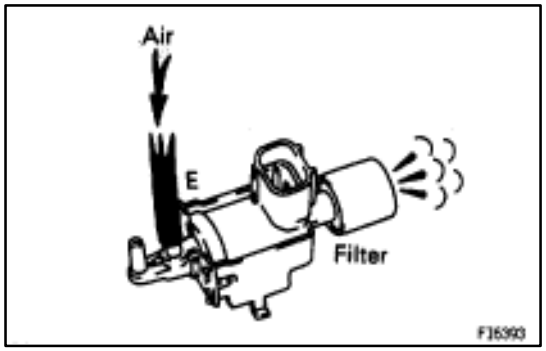
If there is not continuity, replace the VSV.



B. Inspect VSV for ground

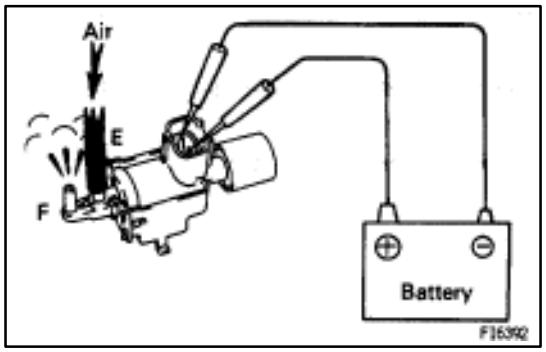
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



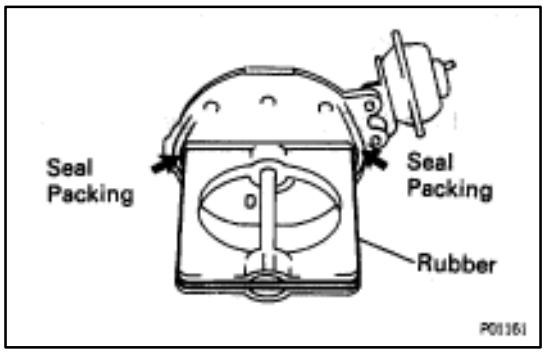
C. Inspect VSV operation

(a) Check that air flows from pipe E to the filter.



(b) Apply battery voltage across the terminals.

(c) Check that air flows from pipe E to pipe F.
If operation is not as specified, replace the VSV.



IACV INSTALLATION

EG0HG–01

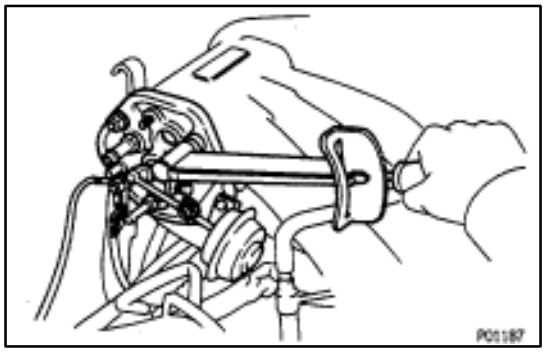
(See page EG–214)

1. INSTALL IACV

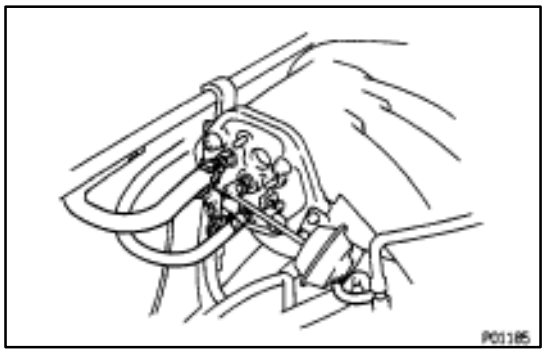
(a) Install a new gasket to the intake manifold.

(b) Apply a light coat of engine oil to the rubber portions.

(c) Apply seal packing to the positions of the IACV shown in the illustration.



(e) Install the IACV and two ground straps with the four nuts.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

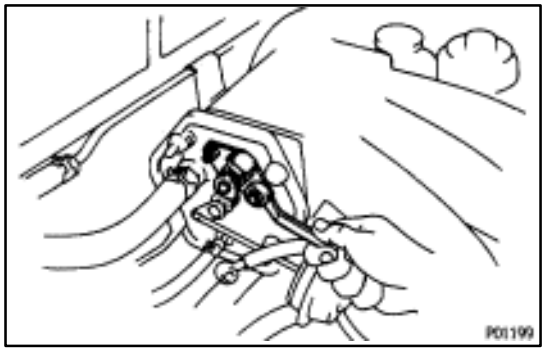


2. CONNECT HOSES TO IACV

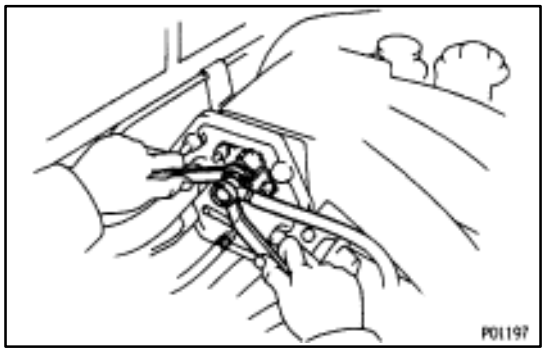
(a) Brake booster vacuum hose

(b) PS idle–up vacuum hose

(c) IACV actuator vacuum hose



3. **INSTALL COLD START INJECTOR**
Install a new gasket and the injector with the two nuts.
Torque: 8.3 N·m (85 kgf·cm, 74 in.·lbf)

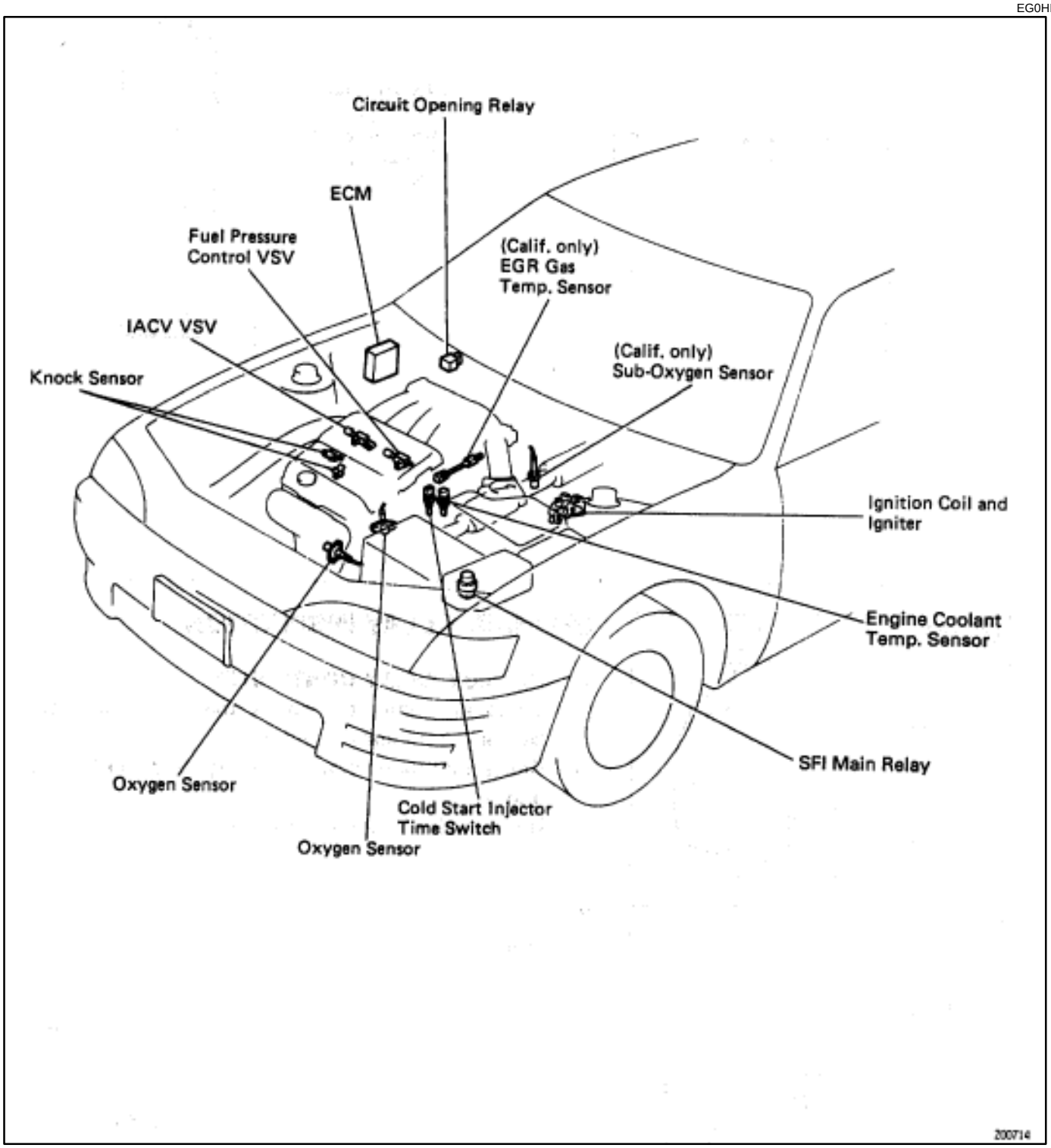


4. **CONNECT COLD START INJECTOR (NO.2 FUEL PIPE)**
Connect the injector pipe with two new gaskets and the union bolt.
Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)

5. **CONNECT COLD START INJECTOR CONNECTOR**
6. **CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY**
7. **CHECK FOR FUEL LEAKAGE (See page EG–160)**

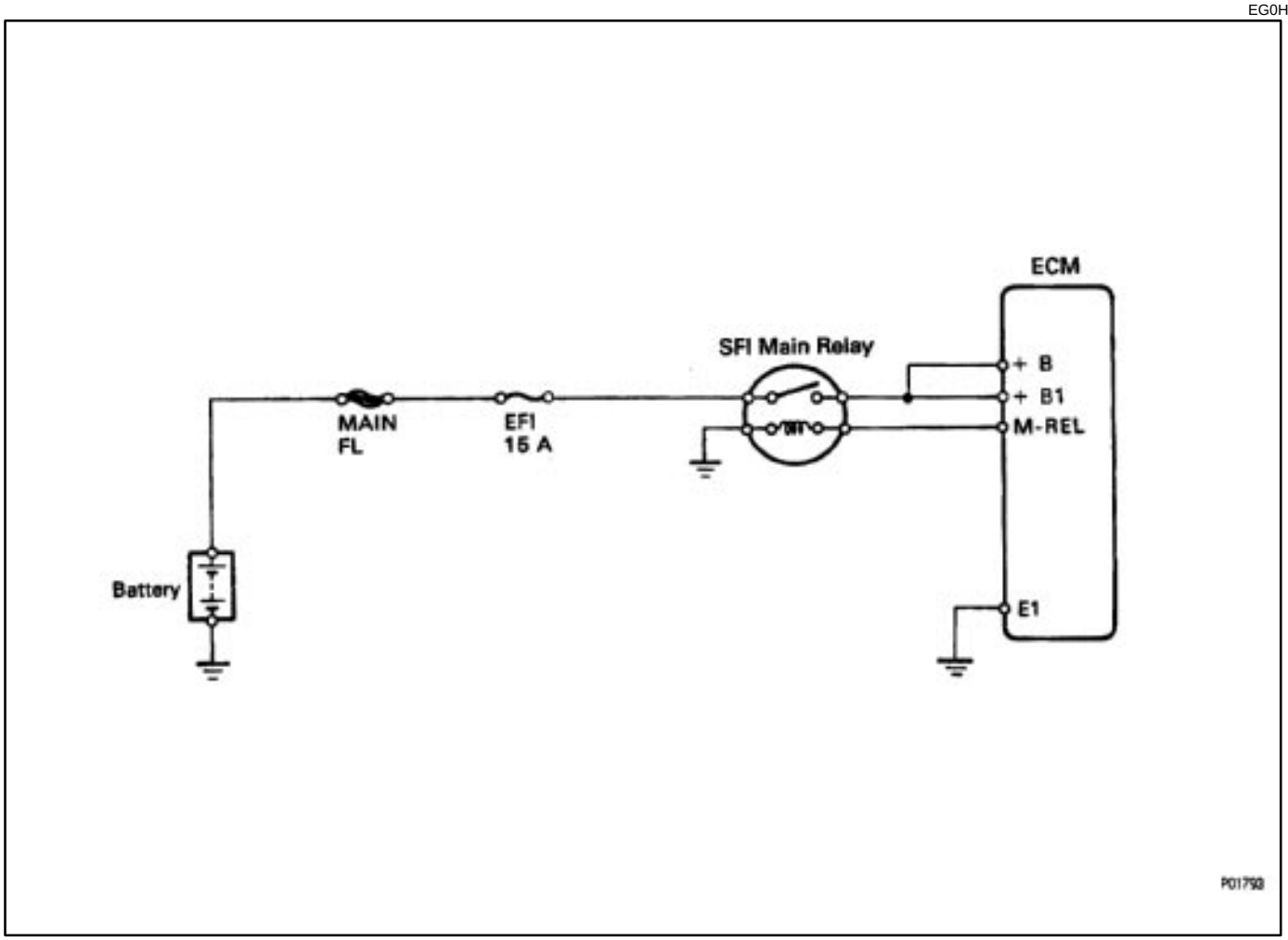
ELECTRONIC PARTS LOCATION

EG0HH–04



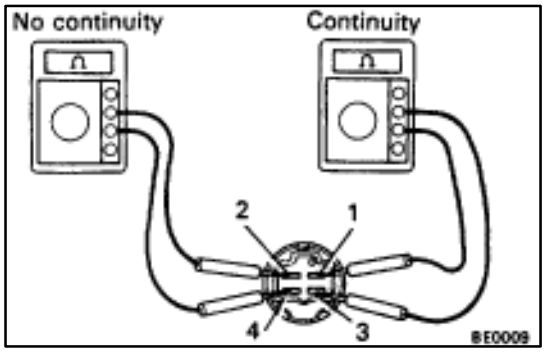
SFI MAIN RELAY

EG0HJ–01



SFI MAIN RELAY INSPECTION

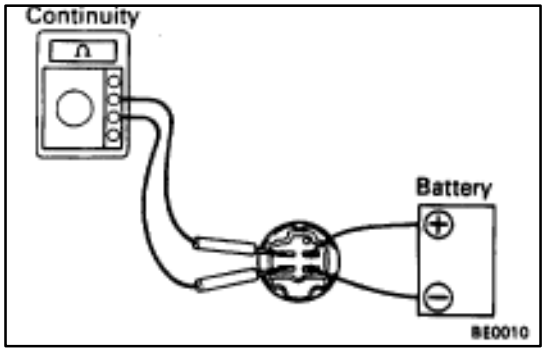
EG0HK–01



1. INSPECT RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 3.

(b) Check that there is no continuity between terminals 2 and 4.
If continuity is not as specified, replace the relay.



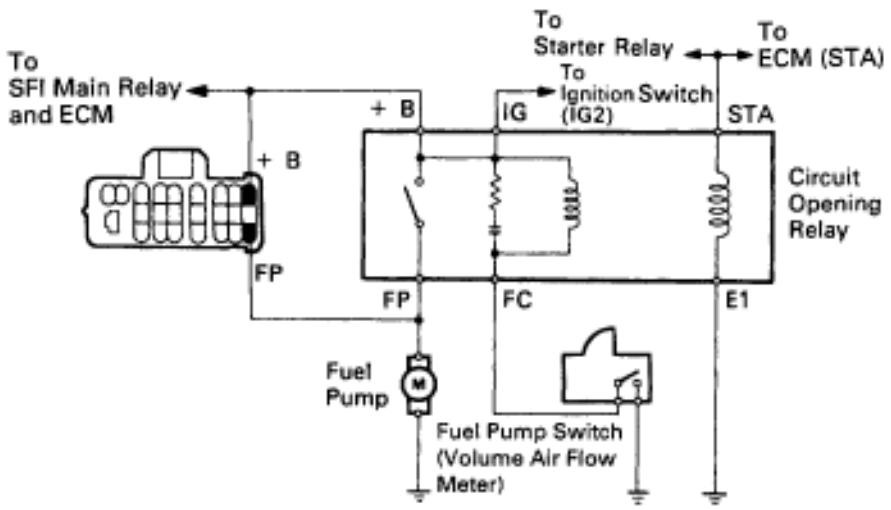
2. INSPECT RELAY OPERATION

(a) Apply battery voltage across terminals 1 and 3.

(b) Using an ohmmeter, check that there is continuity between terminals 2 and 4.
If operation is not as specified, replace the relay.

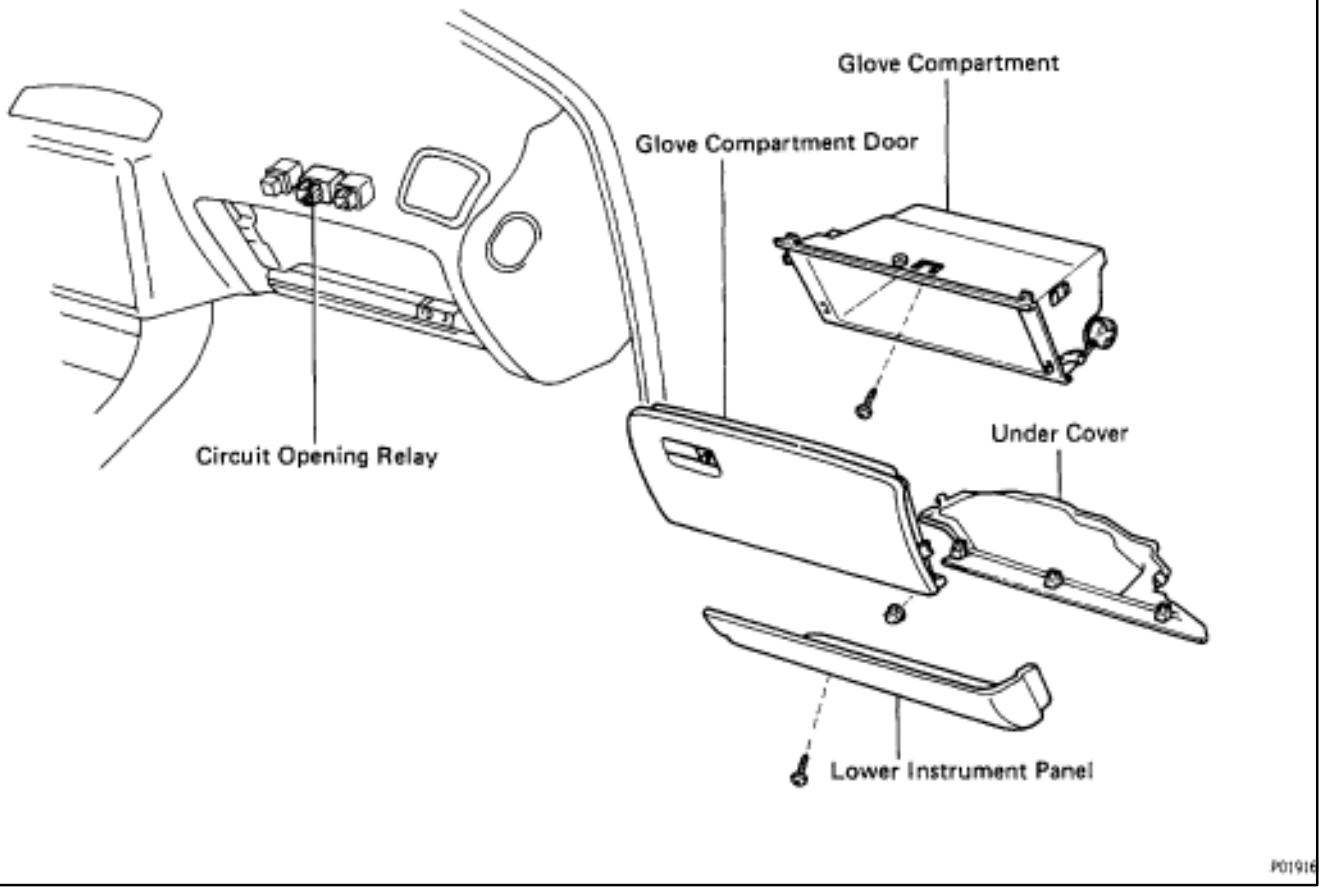
CIRCUIT OPENING RELAY

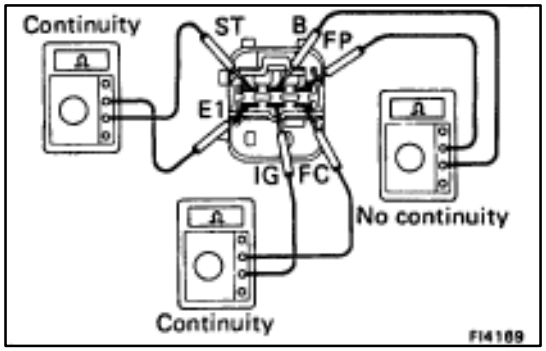
EGOHL–01

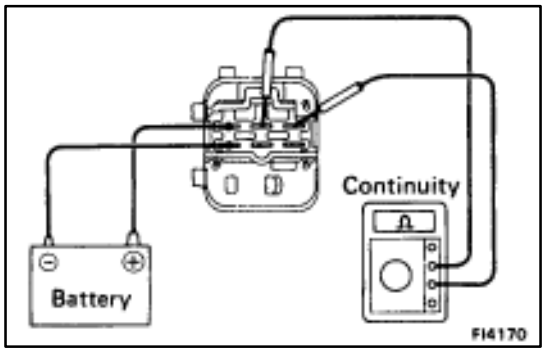


CIRCUIT OPENING RELAY REMOVAL AND INSTALLATION

EG0HM–02







CIRCUIT OPENING RELAY INSPECTION

EG0HN–01

1. INSPECT RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals ST and E1.

(b) Check that there is continuity between terminals IG and FC.

(c) Check that there is no continuity between terminals B and FP.

If continuity is not as specified, replace the relay.

2. INSPECT RELAY OPERATION

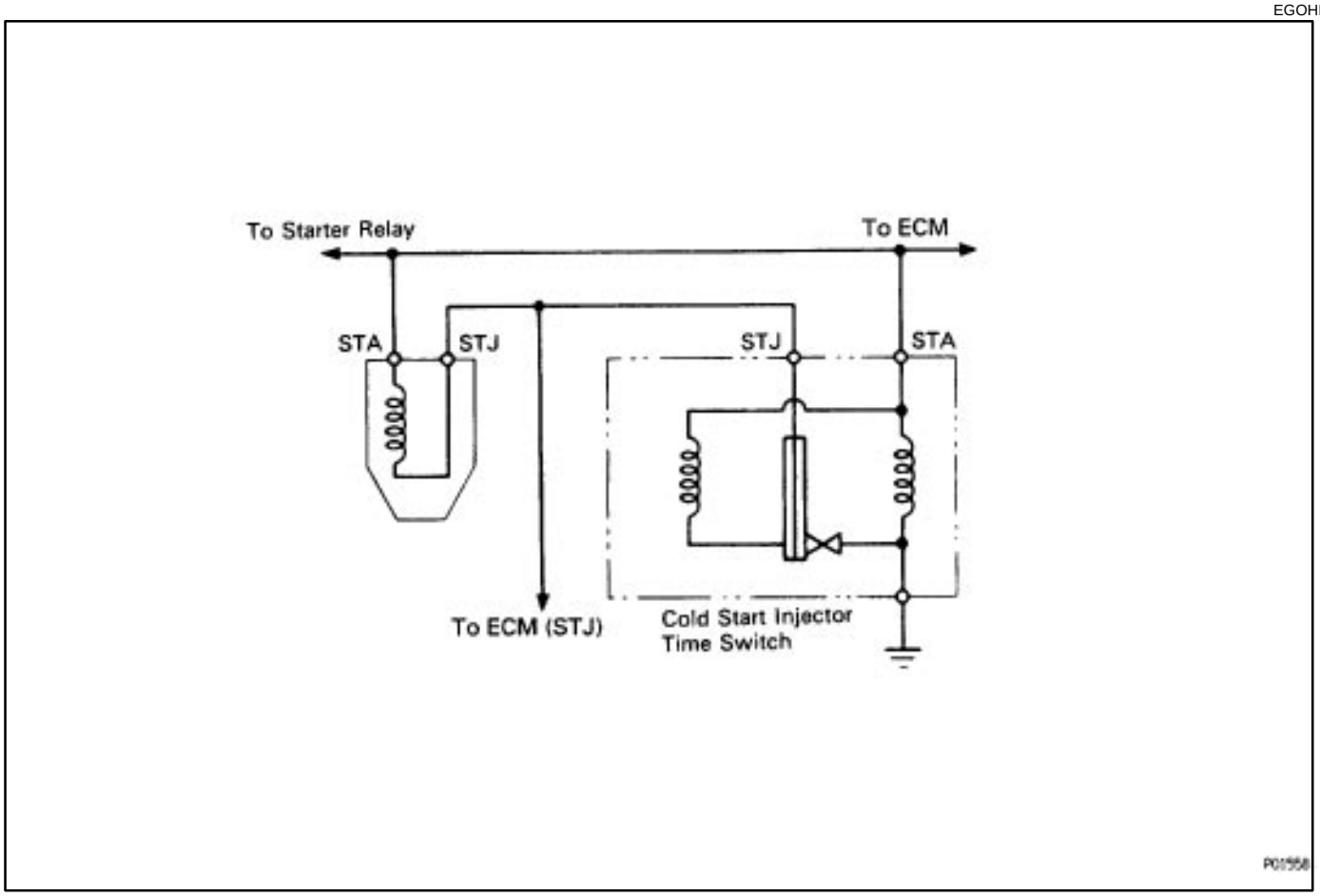
(a) Apply battery voltage across terminals ST and E1.

(b) Using an ohmmeter, check that there is continuity between terminals B and FP.

If operation is not as specified, replace the relay.

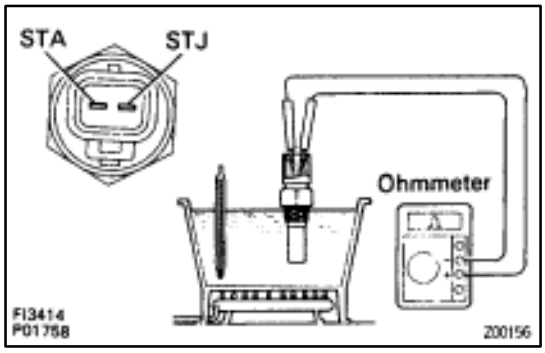
COLD START INJECTOR TIME SWITCH

EGOHP–01



COLD START INJECTOR TIME SWITCH INSPECTION

EGOHQ–01



INSPECT RESISTANCE OF COLD START INJECTOR TIME SWITCH

Using an ohmmeter, measure the resistance between each terminal.

Resistance:

STA–STJ

25–45 Ω below 15°C (59°F)

65–85 Ω above 30°C (86°F)

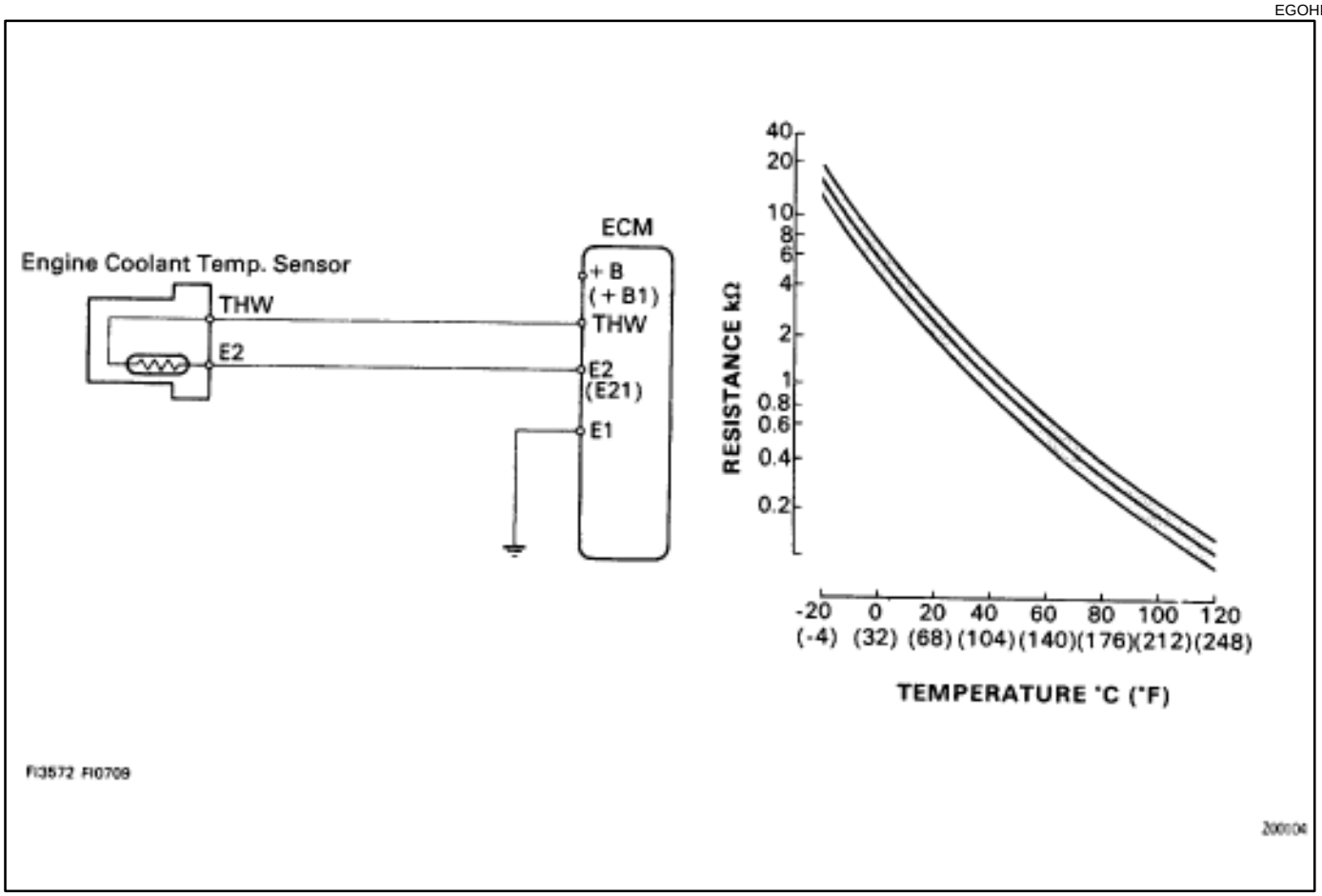
STA–Ground

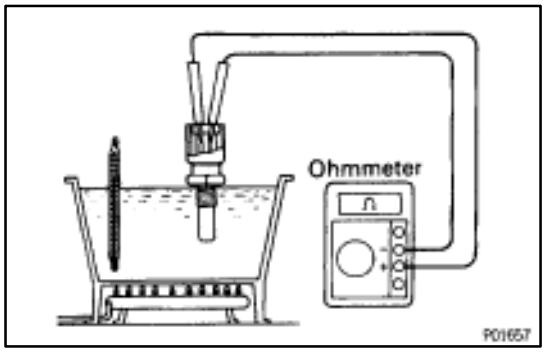
25–85 Ω

If the resistance is not as specified, replace the switch.

ENGINE COOLANT TEMPERATURE SENSOR

EGOHR–01





ENGINE COOLANT TEMPERATURE SENSOR INSPECTION

EGOHS–01

INSPECT RESISTANCE OF ENGINE COOLANT TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals.

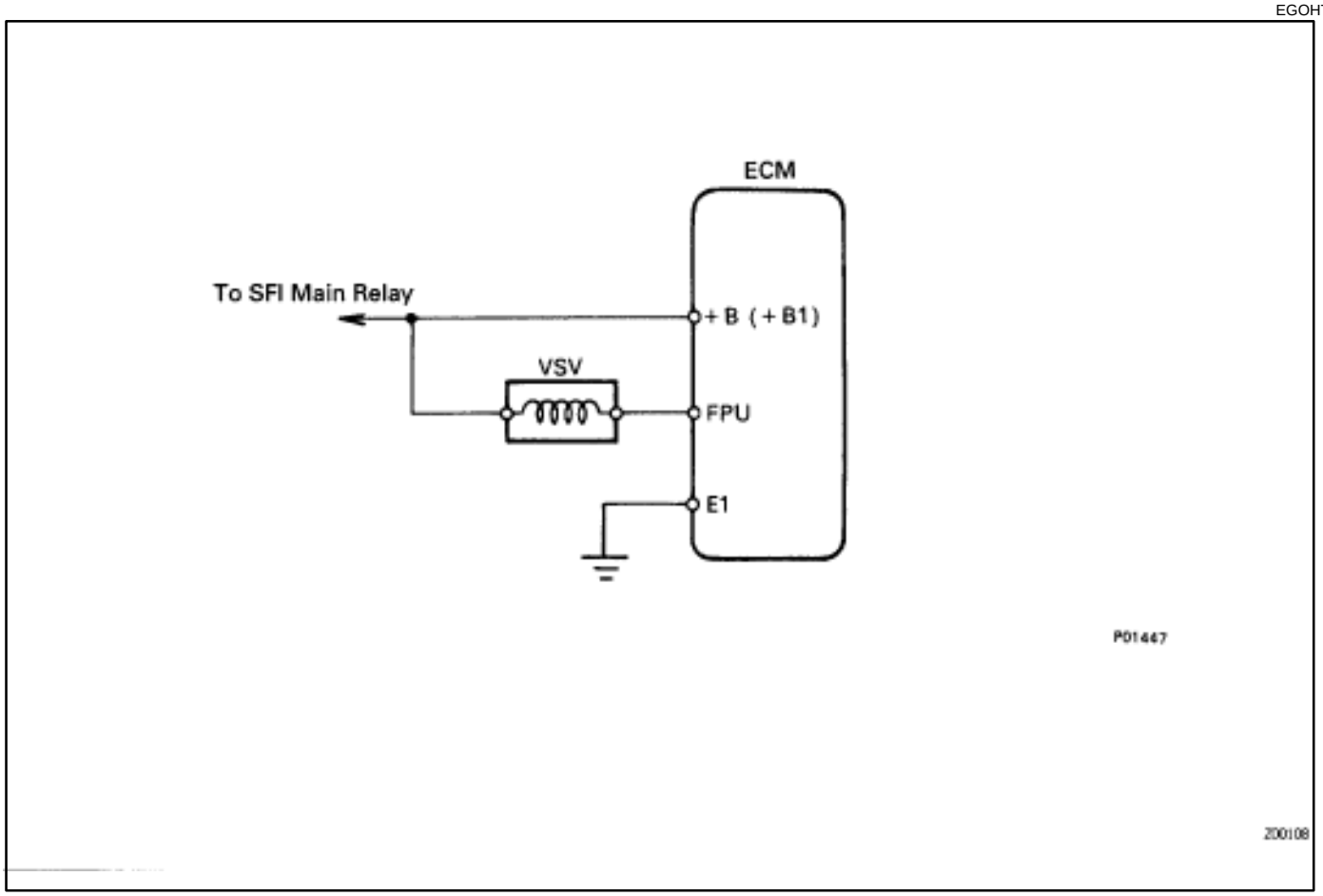
Resistance:

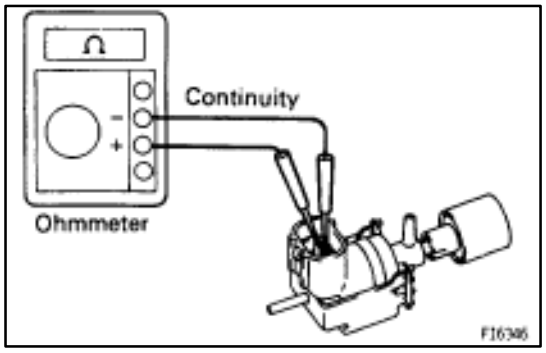
Refer to the chart above

If the resistance is not as specified, replace the sensor.

FUEL PRESSURE VSV

EGOHT–01





FUEL PRESSURE VSV INSPECTION

EGOHU–01

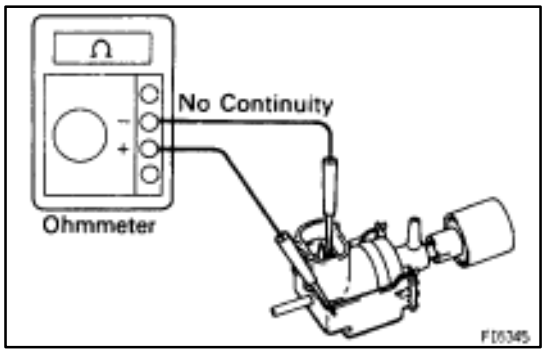
1. CHECK VSV FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the terminals.

Resistance (Cold):

33–39 Ω

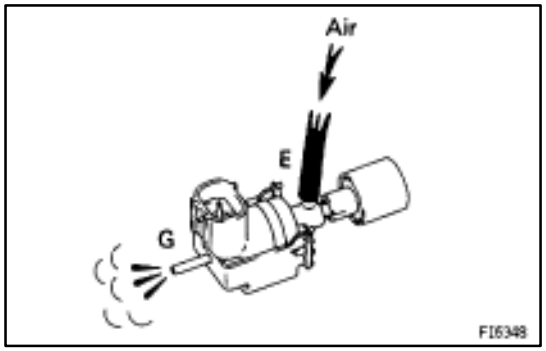
If there is no continuity, replace the VSV.



2. CHECK VSV FOR GROUND

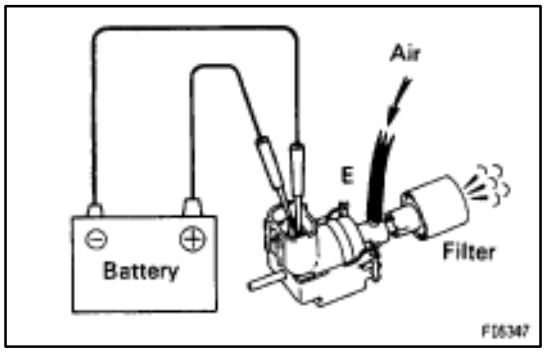
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



3. CHECK VSV OPERATION

(a) Check that the air flows from port E to port G.



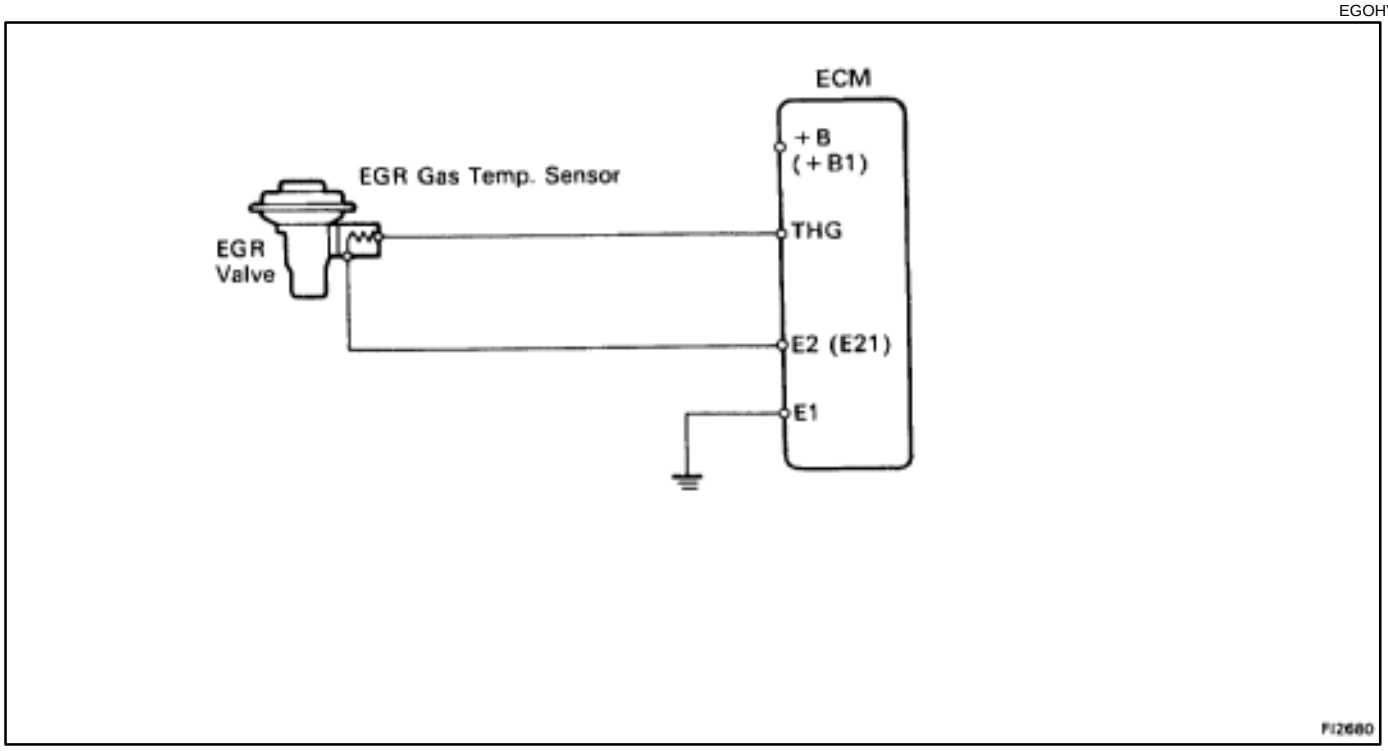
(b) Apply battery voltage across the terminals.

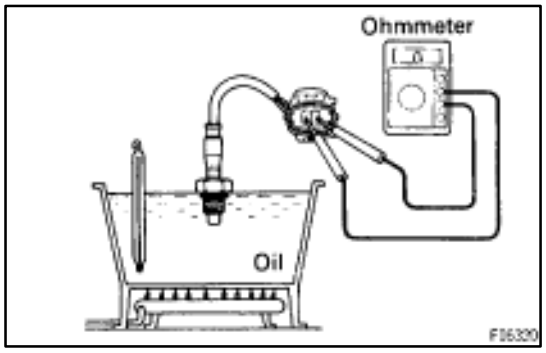
(c) Check that the air flows from port E to the filter.

If operation is not as specified, replace the VSV.

EGR GAS TEMPERATURE SENSOR (CALIFORNIA ONLY)

EGOHV–01





EGR GAS TEMPERATURE SENSOR INSPECTION

EG0HW–01

INSPECT EGR GAS TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance:

69–89 kΩ at 50°C (112°F)

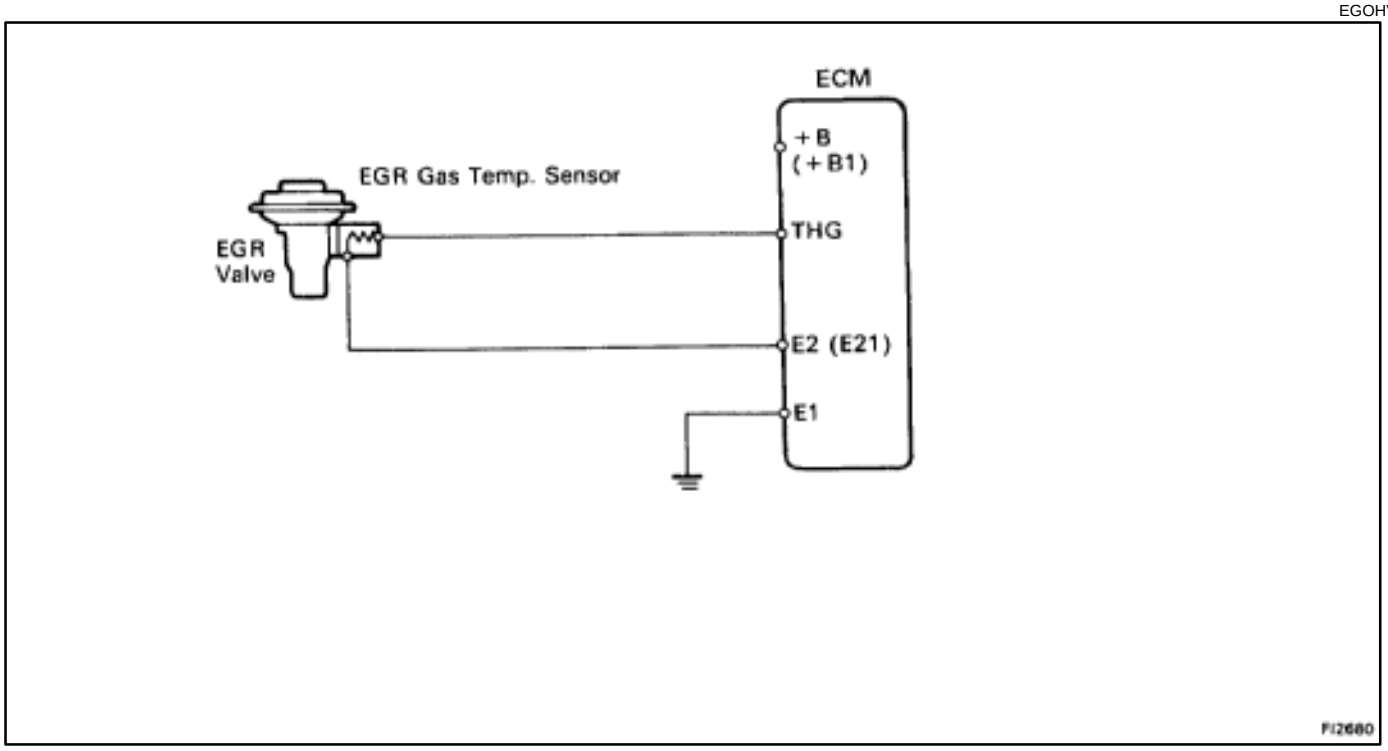
11 –15 kΩ at 100°C (212°F)

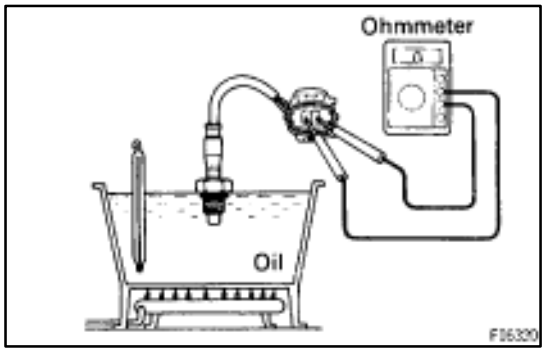
2 – 4 K kΩ at 150°C (302°F)

If the resistance is not as specified, replace the sensor.

EGR GAS TEMPERATURE SENSOR (CALIFORNIA ONLY)

EGOHV–01





EGR GAS TEMPERATURE SENSOR INSPECTION

EG0HW–01

INSPECT EGR GAS TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals.

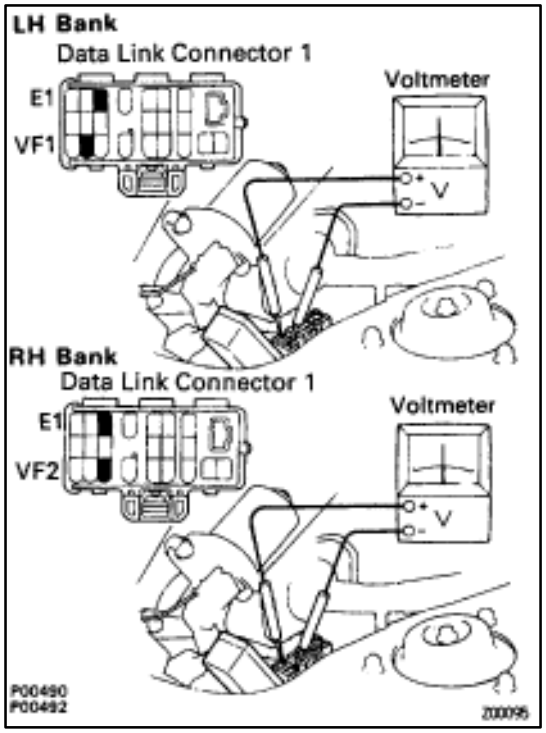
Resistance:

69–89 kΩ at 50°C (112°F)

11 –15 kΩ at 100°C (212°F)

2 – 4 K kΩ at 150°C (302°F)

If the resistance is not as specified, replace the sensor.



OXYGEN SENSOR
OXYGEN SENSOR INSPECTION

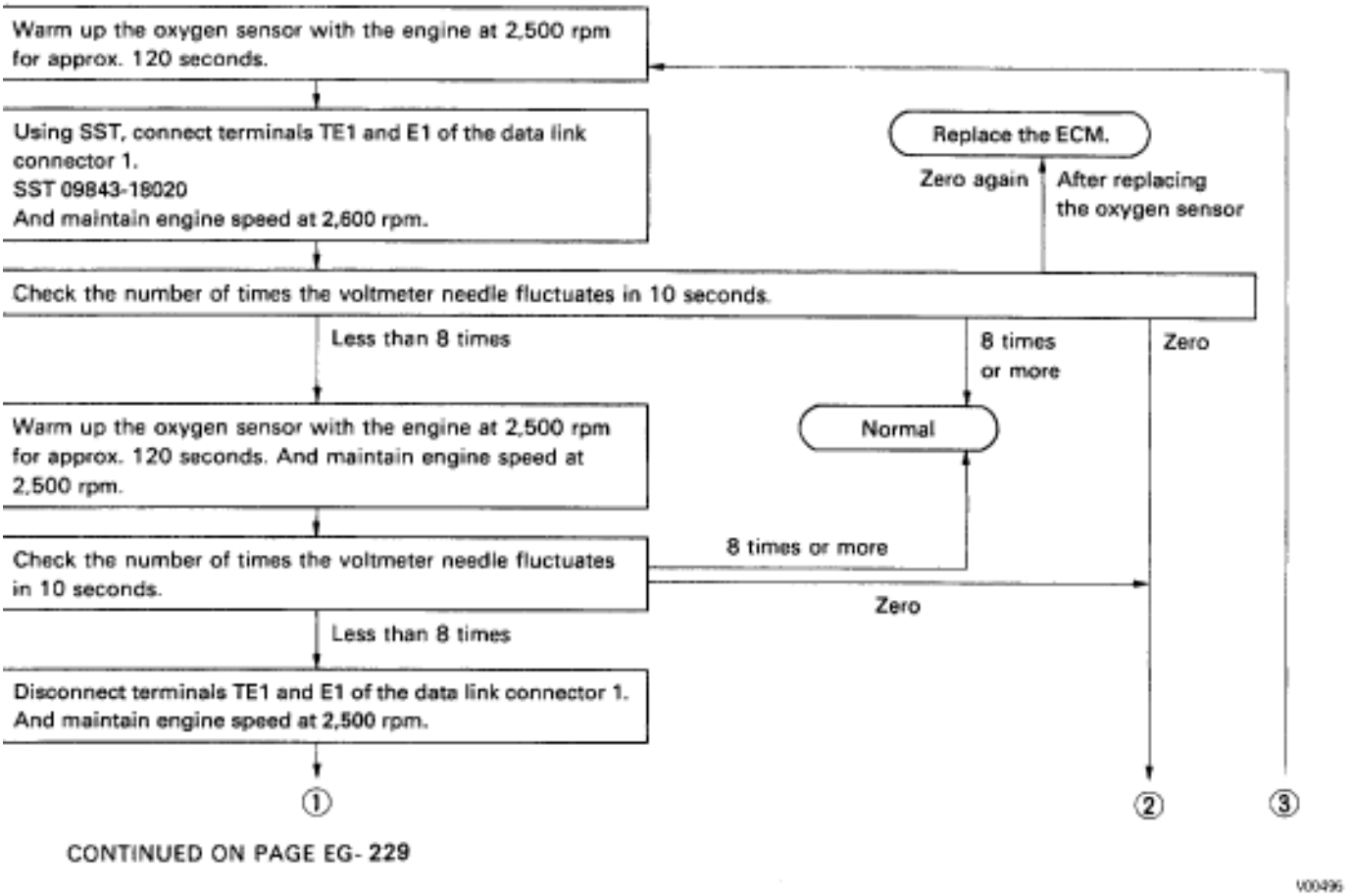
EG0HX–01

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

2. INSPECT FEEDBACK VOLTAGE

Connect the position (+) probe of a voltmeter to terminal VF1 (for LH bank) or VF2 (for RH bank) of the data link connector 1, and negative (–) probe to terminal E1. Perform the test as follows:



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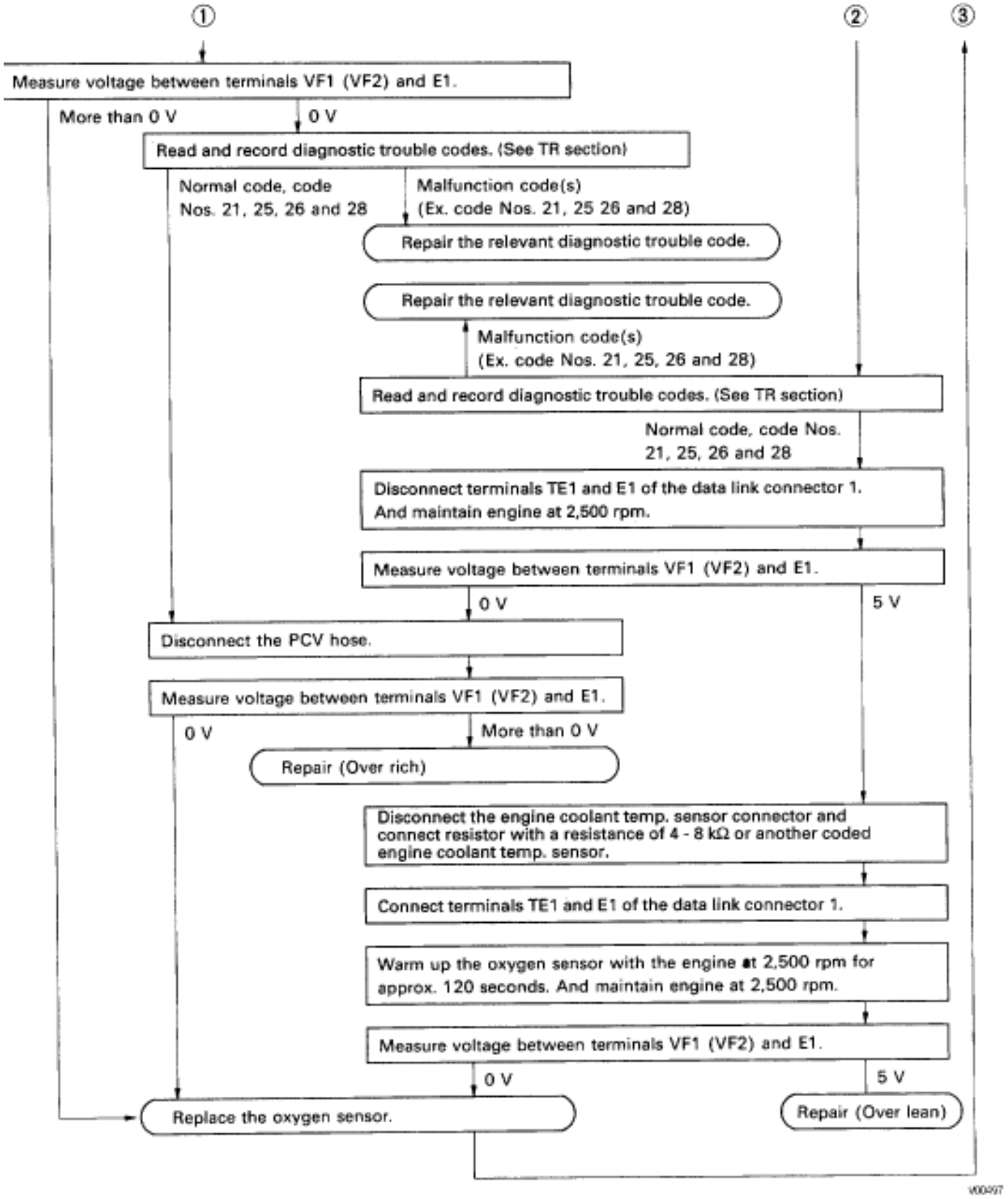
V00496

CONTINUED FROM PAGE EG- 228



SUB–OXYGEN SENSOR (CALIFORNIA ONLY)
SUB–OXYGEN SENSOR INSPECTION

EG0HY–01

1. INSPECT SUB–OXYGEN SENSOR

HINT: Inspect only when code No.27 is displayed.

(a) Cancel the diagnostic trouble code. (See TR section)

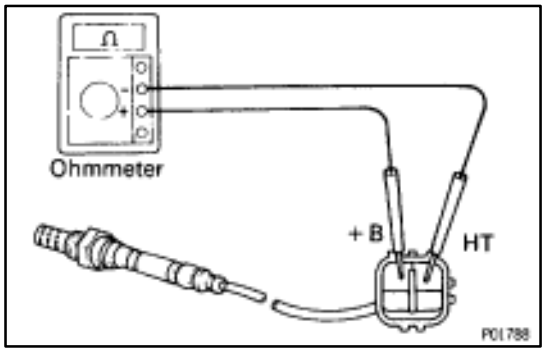
(b) Warm up the engine until it reaches normal operating temperature.

(c) (M/T)
Drive for 5 minutes or more at a speed less than 80 km/h (50 mph) in 4th or 5th gear.
(A/T)
Drive for 5 minutes or more at a speed less than 80 km/h (50 mph) in ”D” position.

(d) Following the conditions in step (c), fully depress on the accelerator pedal for 2 seconds or more.

(e) Stop the vehicle and turn the ignition switch OFF.

(f) Carry out steps (b), (c) and (d) again to test acceleration.
If code No.27 appears again, check the sub–oxygen sensor circuit. If the circuit is normal, replace the sub –oxygen sensor.



2. INSPECT HEATER RESISTANCE OF SUB–OXYGEN SENSOR

Using an ohmmeter, measure the resistance between terminals +B and HT.

Resistance:

11.7–14.3 Ω at 20°C (68°F)

If resistance is not as specified, replace the sub–oxygen sensor.

SUB–OXYGEN SENSOR (CALIFORNIA ONLY)
SUB–OXYGEN SENSOR INSPECTION

EG0HY–01

1. INSPECT SUB–OXYGEN SENSOR

HINT: Inspect only when code No.27 is displayed.

(a) Cancel the diagnostic trouble code. (See TR section)

(b) Warm up the engine until it reaches normal operating temperature.

(c) (M/T)
Drive for 5 minutes or more at a speed less than 80 km/h (50 mph) in 4th or 5th gear.
(A/T)
Drive for 5 minutes or more at a speed less than 80 km/h (50 mph) in ”D” position.

(d) Following the conditions in step (c), fully depress on the accelerator pedal for 2 seconds or more.

(e) Stop the vehicle and turn the ignition switch OFF.

(f) Carry out steps (b), (c) and (d) again to test acceleration.
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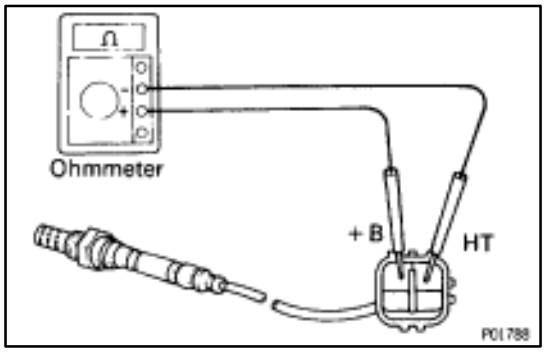


2. INSPECT HEATER RESISTANCE OF SUB–OXYGEN SENSOR

Using an ohmmeter, measure the resistance between terminals +B and HT.

Resistance:

11.7–14.3 Ω at 20°C (68°F)

If resistance is not as specified, replace the sub–oxygen sensor.

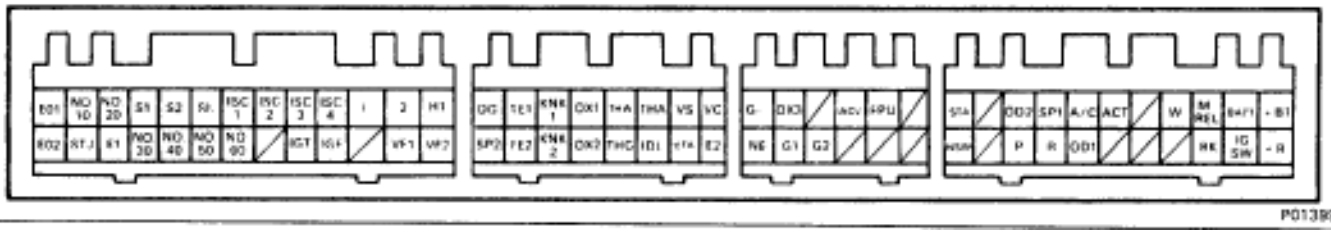
ENGINE CONTROL MODULE (ECM)
Engine Control Module (ECM) Terminals

EG0GB–01

Symbol	Terminal Name	Symbol	Terminal Name	Symbol	Terminal Name
E01	POWER GROUND	DG	DATA LINK CONNECTOR 1		–
E02	POWER GROUND	SP2	No.2 SPEED SENSOR		–
No.10	INJECTOR	TE1	DATA LINK CONNECTOR 1	STA	STARTER SWITCH
STJ	COLD START INJECTOR	TE2	DATA LINK CONNECTOR 1	*1 NSW	PARK/NEUTRAL POSITION SWITCH
No.20	INJECTOR	KNK1	KNOCK CONTROL SENSOR 1		–
E1	COMPUTER GROUND	KNK2	KNOCK CONTROL SENSOR 2		–
*1 S1	SOLENOID	OX1	OXYGEN SENSOR	OD2	OD MAIN SWITCH
No.30	INJECTOR	OX2	OXYGEN SENSOR	*1 P	PATTERN SELECT SWITCH
*1 S2	SOLENOID	THW	ENGINE COOLANT TEMP. SENSOR	SP1	No.1 SPEED SENSOR
No.40	INJECTOR	*2 THG	EGR GAS TEMP. SENSOR	*1 R	SHIFT POSITION SWITCH
*1 SL	SOLENOID	THA	AIR TEMP. SENSOR	A/C	A/C AMPLIFIE
No.50	INJECTOR	IDL	THROTTLE POSITION SENSOR	OD1	CRUISE CONTROL COMPUTER
ISC 1	IAC MOTOR NO.1 COIL	VS	VOLUME AIR FLOW METER	ACT	A/C AMPLIFIE
No.60	INJECTOR	VTA	THROTTLE POSITION SENSOR		–
ISC2	IAC MOTOR NO.2 COIL	VC	VOLUME AIR FLOW METER THROTTLE POSITION SENSOR		–
	–	E2	SENSOR GROUND		–
ISC3	IAC MOTOR NO.3 COIL	G–	DISTRIBUTOR	W	SERVICE REMINDER INDICATOR
IGT	IGNITER	NE	DISTRIBUTOR		–
ISC4	IAC MOTOR NO.4 COIL	*2 OX3	SUB-OXYGEN SENSOR	M-REL	SFI MAIN RELAY (COIL)
IGF	IGNITER	G1	DISTRIBUTOR	*1 BK	BRAKE SWITCH
*1 L	SHIFT POSITION SWITCH		–	BATT	BATTERY
	–	G2	DISTRIBUTOR	IGSW	IGNITION SWITCH
*1 2	SHIFT POSITION SWITCH	IACV	IACV VSV	+B1	SFI MAIN RELAY
VF1	CHECK CONNECTOR		–	+B	SFI MAIN RELAY
*2 HT	OXYGEN SENSOR HEATER	FPU	FUEL PRESSURE CONTROL VSV		
VF2	CHECK CONNECTOR		–		

*1 A/T (w/ Electronic Controlled Transmission)
*2 Calif.only

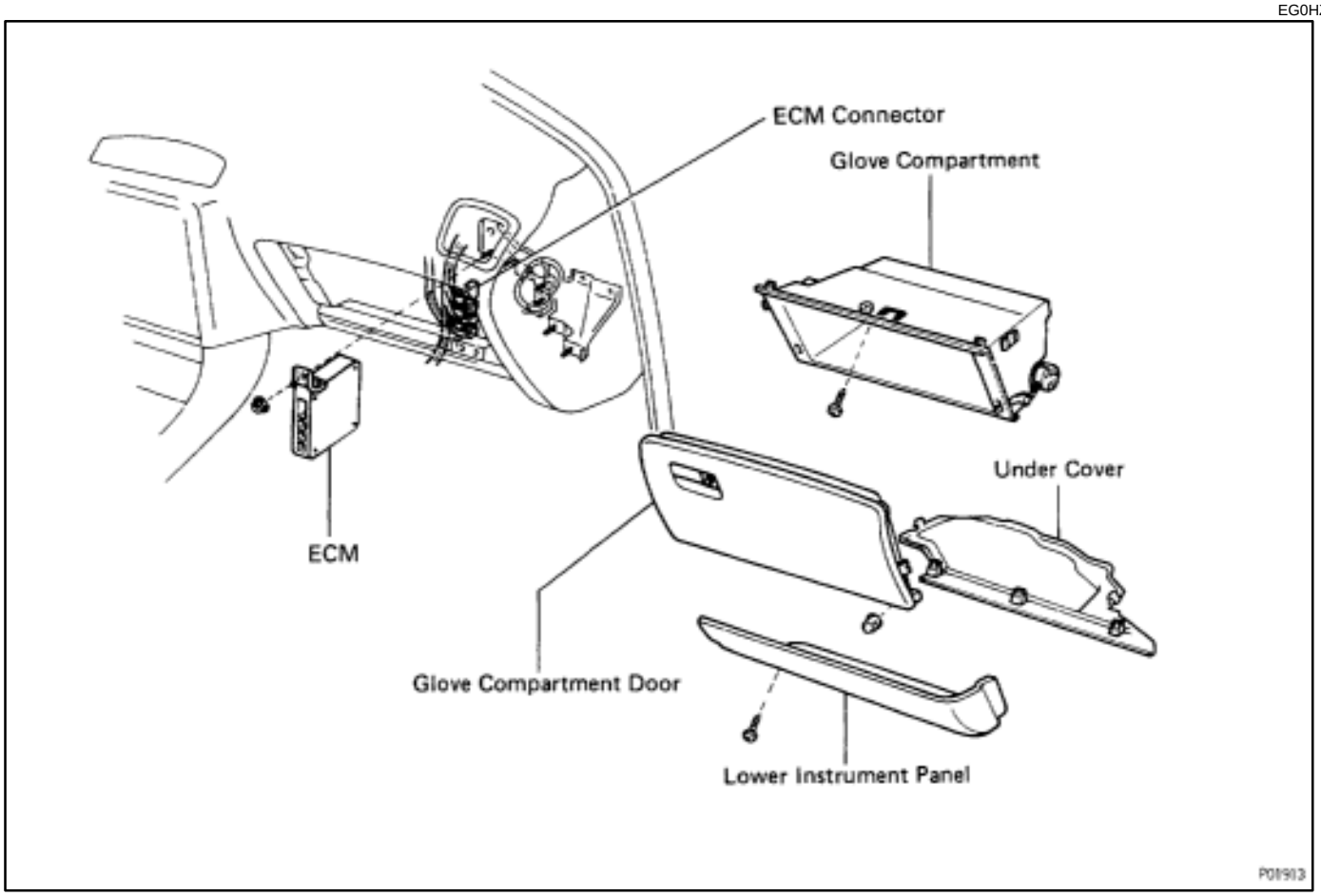
ECM Terminals



P01389

ECM REMOVAL AND INSTALLATION

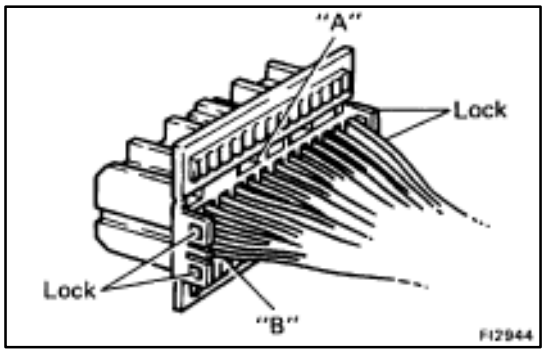
EG0HZ–01



ECM INSPECTION

EG0J0–01

HINT: The SFI circuit can be checked by measuring the resistance and voltage at the wiring connectors of the ECM.

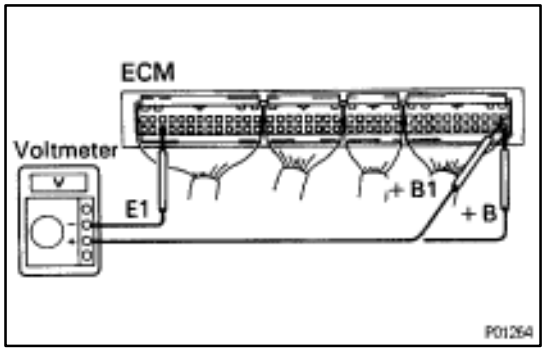


1. PREPARATION

(a) Disconnect the connectors from the ECM.

(b) Remove the locks as shown in the illustration so that the tester probe(s) can easily come in.

NOTICE: Pay attention to sections "A" and "B" in the illustration which can be easily broken.



2. INSPECT VOLTAGE OF ECM

Check the voltage between each terminal of the wiring connectors.

- Turn the ignition switch ON.
- Measure the voltage at each terminal.

HINT:

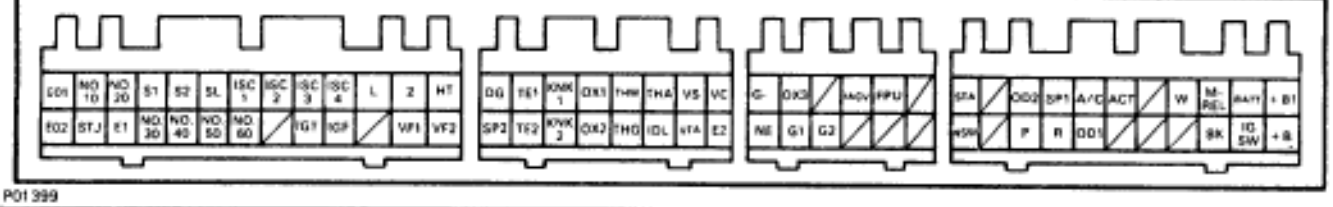
- Perform all voltage measurements with the connectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is ON.

ECM Wiring Connectors Voltage

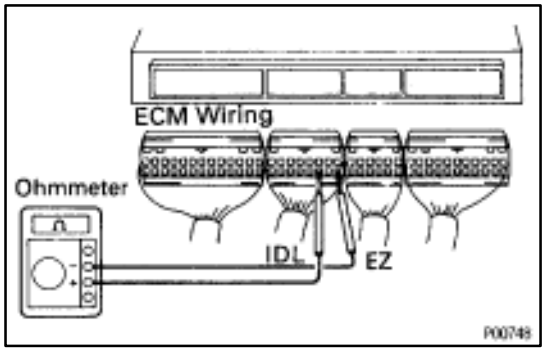
Terminals	Condition		STD voltage (V)
BATT – E1	–		10 – 14
IG SW – E1	IG SW ON		
M-REL – E1			
+B, +B1 – E1			
IDL – E2	IG SW ON	Throttle valve open	10 – 14
VTA – E2		Throttle valve fully closed (Throttle opener must be cancelled first)	0.3 – 0.8
		Throttle valve open	2.7 – 5.2
VC – E2		–	4 – 6
VS – E2		Measuring plate fully closed	3.7 – 4.3
		Measuring plate fully open	0.2 – 0.5
	Idling		1.6 – 4.1
	3,000 rpm		1.0 – 2.0
No.10, No.20, No.30, No.40, No.50, No.60 – E01, E02	IG SW ON		10 – 14
THA – E2	IG SW ON	Intake air temp. 20°C (68°F)	1 – 3
THW – E2		Engine coolant temp. 80°C (176°F)	0.1 – 1.0
STA – E1	Cranking		6 – 14
IGT – E1	Cranking or idling		1.0 – 3.0 (Fluctuate)
ISC1, ISC2, ISC3, ISC4 – E1	IG SW ON		9 – 14
W – E1	No trouble (Malfunction Indicator Lamp off) and engine running		10 – 14
*1 A/C – E1	IG SW ON	Air conditioning ON	8 – 14
*1 ACT – E1		Heater blower SW ON	4 – 6
TE1 – E1		Data Link Connector 1 TE1 - E1 not connected	4 – 6
TE2		Data Link Connector 1 TE1 - E1 connected	0.5 or less
*2 NSW – E1		Shift position P or N position	0 – 2
		Ex. shift position P or N position	10 – 14
*2 BK – E1	Stop light SW ON (Brake pedal depressed)		10 – 14

ECM Terminals

*1 w/ A/C
*2 w/ ECM



P01399



3. INSPECT RESISTANCE OF ECM

NOTICE:

- Do not touch the ECM terminals.
- **The tester probe should be inserted in the wiring connector from the wiring side.**

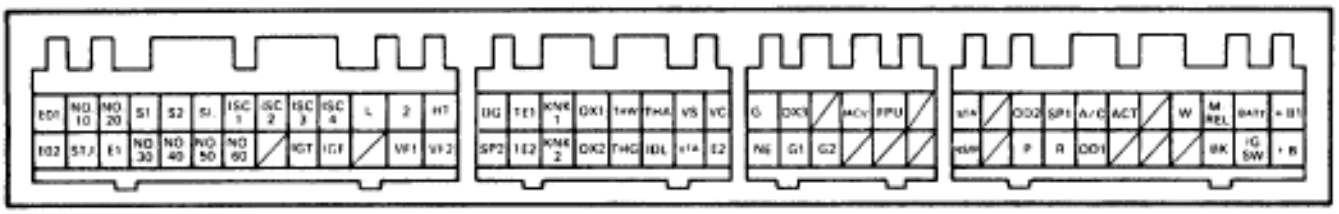
Check the resistance between each of the terminals of the wiring connector.

- Disconnect the connectors from the ECM.
- Measure the resistance at each terminal.

ECM Wiring Connectors Resistance

Terminals	Condition	STD resistance (Ω)
IDL – E2	Throttle valve open	Infinity
	Throttle valve fully closed	500 or less
VTA – E2	Throttle valve fully open	2,000 – 11,600
	Throttle valve fully closed	280 – 6,400
VC – E2	–	200 – 400
VS – E2	Measuring plate fully closed	200 – 600
	Measuring plate fully open	20 – 1,200
THA – E2	Intake air temp. 20°C (68°F)	2,000 – 3,000
THW – E2	Engine coolant temp. 80°C (176°F)	200 – 400
G1, G2 – G⊖	Cold	125 – 190
NE – G⊖	Cold	155 – 240
ISC1, ISC2, ISC3, ISC4 – +B, +B1	–	10 – 30

ECM Terminals



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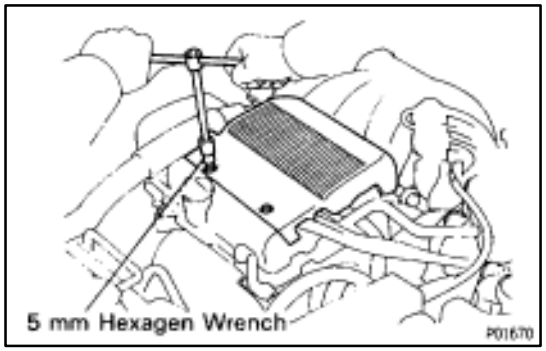
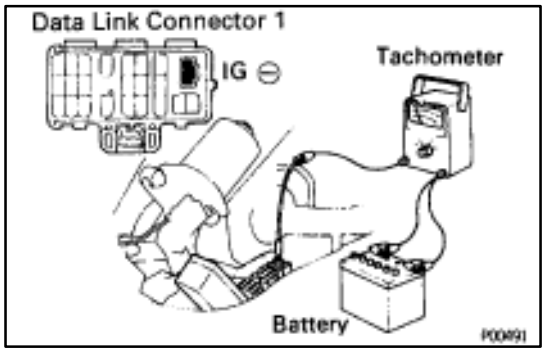
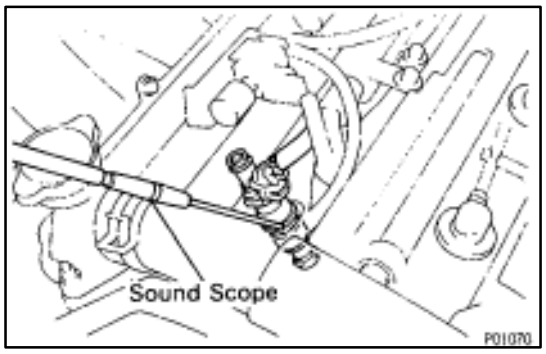






FUEL CUT RPM
FUEL CUT RPM INSPECTION

EG0J1–01

1. REMOVE V–BANK COVER

Using a 5 mm hexagon wrench, remove the two nuts and V–bank cover.

2. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

3. CONNECT TACHOMETER TO ENGINE

Connect the test probe of a tachometer to terminal IG ⊕ of the data link connector 1.

NOTICE:

- **NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your until before use.**

4. INSPECT FUEL CUT PRM

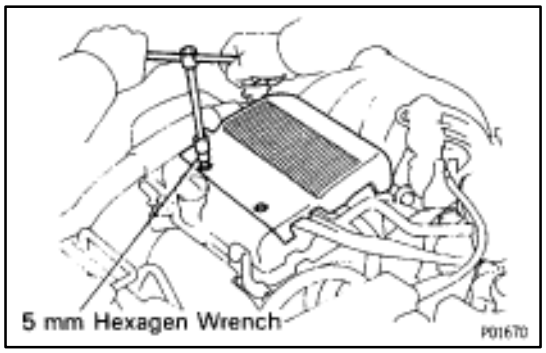
(a) Increase the engine speed to at least 2,500 rpm.
(b) Use a sound scope to check for injector operating noise.
(c) Check that when the throttle lever is released, injector operation noise stops momentarily and then resumes.

HINT: Measure with the A/C OFF.

Fuel return rpm:

1,200 rpm

5. DISCONNECT TACHOMETER



6. REINSTALL V–BANK COVER

Using a 5 mm hexagon wrench, install the V–bank cover with the two nuts.

SERVICE SPECIFICATIONS
SERVICE DATA

EG0J2–01

Fuel pressure regulator	Fuel pressure	at no vacuum	26–304 kPa (2.7–3.1 kgf/cm2, 38–44 psi)
Fuel pump	Resistance		0.2–3.0 Ω
Cold start injector	Resistance		2–4 Ω
	Fuel leakage		One drop or less per minute
Injector	Resistance		Approx. 13.8 Ω
	Injection volume		54–64 cc (3.3–3.9 cu in.)/15 sec
	Difference volume between each injector		5 cc (0.31 cu in.) or less
	Fuel leakage		One drop or less per minute
Volume air flow meter	Resistance VS–E2		200–600 Ω (Measuring plate fully closed)
			20–1,200 Ω (Measuring plate fully open)
	VC–E2		200–400 Ω
	FC–E1		Infinity (Measuring plate fully closed)
			Zero (Others)
	THA–E2	at –20°C (–4°F)	10–20 kΩ
		at 0°C (32°F)	4–7 kΩ
		at 20°C (68°F)	2–3 kΩ
		at 40°C (104°F)	0.9–1.5 kΩ
		at 60°C (140°F)	0.4–0.7 kΩ

Throttle position sensor	Clearance between stop screw and lever	Between terminals	Resistance
	0 mm 0 in.	VTA–E2	0.28–6.4 kΩ
	0.35 mm 0.014 in.	IDL–E2	0.5 kΩ or less
	0.70 mm 0.028 in.	IDL–E2	Infinity
	Throttle valve fully open	VTA–E2	2.0–11.6 kΩ
	–	VC–E2	2.7–7.7 kΩ

Dash pot (DP)	Setting speed		2,000 rpm
Throttle opener	Setting speed		1,500 ± 300 rpm
IAC valve	Resistance	B1–S1 or S3	10–30 Ω
		B2–S2 or S4	10–30 Ω
Cold start injector time switch	Resistance STA–STJ	below 15°C (59°F)	25–45 Ω
		above 30°C (86°F)	65–85 Ω
	STA–Ground		25–85 Ω
Engine coolant temp. sensor	Resistance	at –20°C (–4°F)	10–20 kΩ
		at 0°C (32°F)	4–7 kΩ
		at 20°C (68°F)	2–3 kΩ
		at 40°C (104°F)	0.9–1.3 kΩ
		at 60°C (140°F)	0.4–0.7 kΩ
		at 80°C (176°F)	0.2–0.4 kΩ
Fuel pressure VSV	Resistance		33–39 Ω
EGR gas temp. sensor (Calif. only)	Resistance	at 50°C (122°F)	69–89 kΩ
		at 100°C (212°F)	11–15 kΩ
		at 150°C (302°F)	2–4 kΩ
Sub–oxygen sensor	Heater resistance		11.7–14.3 Ω

SERVICE DATA (Cont'd)

ECM	HINT: Perform all voltage and resistance measurements with the ECM connected. Verify that the battery voltage is 11 V or above with the ignition switch is ON.			
	Voltage			
	Terminals	Condition		STD voltage (V)
	BATT–E1	–		10–14
	IG SW–E1	IG SW ON		
	M–REL–E1			
	+B, +B1 –E1			
	IDL–E2	IG SW ON	Throttle valve open	10–14
	VATA–E2		Throttle valve fully closed (Throttle opener must be cancelled first)	0.3–0.8
			Throttle valve open	2.7–5.2
	VC–E2		–	4–6
	VS–E2		Measuring plate fully closed	3.7–4.3
			Measuring plate fully open	0.2–0.5
		Idling		1.6–4.1
		3,000 rpm		1.0–2.0
	No.10, No.60 –E01, –E02	IG SW ON		10–14
	THA–E2	IG SW ON	Intake air temp. 20°C (68°F)	1–3
	THW–E2		Engine coolant temp. 80°C (176°F)	0.1–1.0
	STA–E1	Cranking		6–14
	IGT–E1	Cranking or idling		1.0–3.0 (Fluctuate)
	ISC1, ISC4 –E1	IG SW ON		9–14
	W–E1	No trouble (Malfunction Indicator Lamp off) and engine running		10–14
	*1A/C–E1	IG SW ON	Air conditioning ON	10–14
	*1ACT–E1		Heater blower SW ON	4–6
	TE1, TE2 –E1		Data Link Connector 1 TE1–E1 not connected	4–6
			Data Link Connector 1 TE1–E1 connected	0.5 or less
	*2NSW–E1		Shift position P or N position	0–2
			Ex. shift position P or N position	10–14
	*2BK–E1	Stop light SW ON (Brake pedal depressed)		10–14

*1 w/ A/C *2 w/ECM

SERVICE DATA (Cont'd)

ECM (cont'd)			
	Terminals	Condition	STD resistance (Ω)
	IDL–E2	Throttle valve open	Infinity
		Throttle valve fully closed (Throttle opener must be cancelled first)	500 or less
	VTA–E2	Throttle valve fully open	2,000–11,600
		Throttle valve fully closed (Throttle opener must be cancelled first)	280–6,400
	VC–E2	–	200–400
	VS–E2	Measuring plate fully closed	200–600
		Measuring plate fully open	20–1,200
	THA–E2	Intake air temp. 20°C (68°F)	2,000–3,000
	THW–E2	Engine coolant temp. 80°C (176°F)	200–400
	G1 –G ⊕ G2	Cold	125–190
	NE–G ⊕	Cold	155–240
	ISC1 ISC2 +B – ISC3 +B1 ISC4	–	10–30
Fuel cut rpm	Fuel return rpm		1,200 rpm

TORQUE SPECIFICATIONS

EG0J3–01

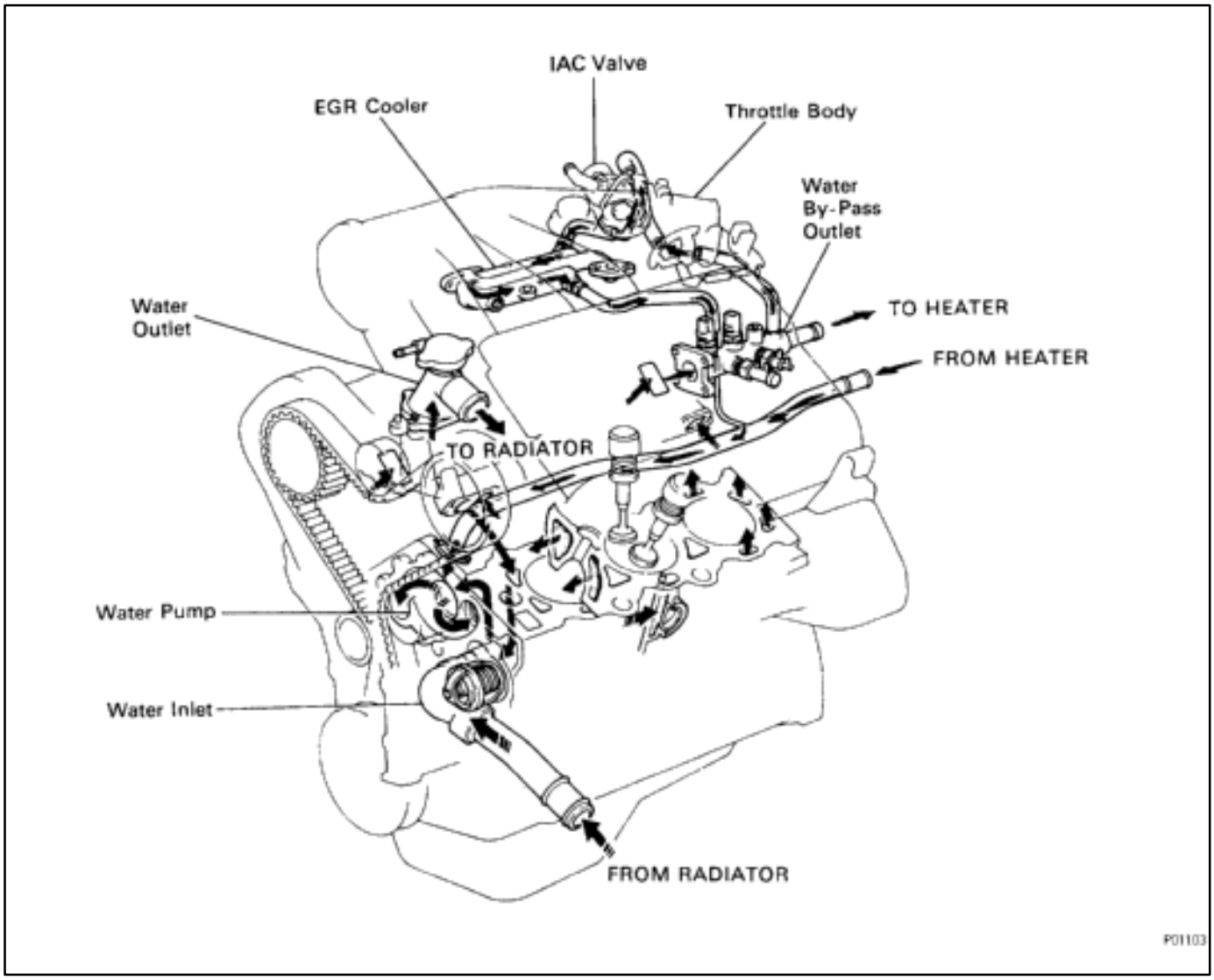
Part tightened	N·m	kgf·cm	ft·lbf
Fuel line (Union bolt type)	29	300	22
Fuel line (Flare nut type)	30	310	22
Fuel tank band X Body	39	400	29
Fuel pump X Fuel tank	3.9	40	35 in.·lbf
Fuel pressure regulator X Delivery pipe	5.4	55	48 in.·lbf
Fuel return pipe X Fuel pressure regulator	19	195	14
Delivery pipe X Cylinder head	13	130	9
Fuel pulsation damper X Delivery pipe	34	350	25
Intake manifold X Cylinder head	19	195	14
Intake manifold stay X Intake manifold	22	220	16
Intake manifold stay X Cylinder block	42	425	31
No.1 air intake chamber stay X Intake manifold	42	425	31
No.1 air intake chamber stay X Cylinder head	42	425	31
EGR pipe union nut	59	600	43
EGR pipe X Intake manifold	13	130	9
Throttle body X Intake manifold	42	425	31

COOLING SYSTEM

DESCRIPTION

EG09K–01

This engine utilizes a pressurized forced circulation cooling system which includes a thermostat equipped with a by–pass valve mounted on the inlet side.



The cooling system is composed of the water jacket (inside the cylinder block and cylinder head), radiator, water pump, thermostat, electronically controlled hydraulic cooling fan, hoses and other components.

Engine coolant which is heated in the water jacket is pumped to the radiator, through which a cooling fan blows air to cool the engine coolant as it passes through. Engine coolant which has been cooled is then sent back to the engine by the water pump, where it cools the engine.

The water jacket is a network of channels in the shell of the cylinder block and cylinder head through which engine coolant passes. It is designed to provide adequate cooling of the cylinders and combustion chambers which become heated during engine operation.

RADIATOR

The radiator performs function of cooling the engine coolant which has passed through the water jacket and become hot, and it is, mounted in the front of the vehicle. The radiator consists of an upper tank and lower tank, and a core which connects the two tanks. The upper tank contains the inlet for engine coolant from the water jacket and the filler inlet. It also has a hose attached through which excess engine coolant or steam can flow. The lower tank has an outlet and drain cock for the engine coolant. The core contains many tubes through which engine coolant flows from the upper tank to the lower tank as well as to cooling fins which radiate heat away from the engine coolant in the tubes. The air sucked through the radiator by the cooling fan, as well as the wind generated by the vehicle's travel, passes through the radiator, cooling the engine coolant. Models with automatic transmission include an automatic transmission fluid cooler built into the lower tank of the radiator. A cooling fan is mounted behind radiator to assist the flow of air through the radiator. When the engine coolant temperature is low, the fan operates slowly to help the warm up, and when the engine coolant temperature becomes high, the fan speed is increased to provide the air flow required for cooling.

RADIATOR CAP

The radiator caps are pressure type caps which seal the radiator and, resulting in pressurization of the radiator as the engine coolant expands. The pressurization prevents the engine coolant from boiling even when the engine coolant temperature exceeds 100°C (212°F). A relief valve (pressurization valve) and a vacuum valve (negative pressure valve) are built into the radiator cap. The relief valve opens and lets steam escape through the overflow pipe when the pressure generated inside the cooling system exceeds the limit (engine coolant temperature: 110–120°C (230–248°F), pressure; 69–113 kPa (0.7–1.15 kgf/cm^2, 10.0–16.4 psi). The vacuum valve opens to alleviate the vacuum which develops in the engine coolant system after the engine is stopped and the engine coolant temperature drops. The valve's opening, allows the engine coolant in the reservoir tank to return to the cooling system.

RESERVOIR TANK

The reservoir tank is used to catch engine coolant which overflows from the cooling system as a result of volumetric expansion when the engine coolant is heated. The engine coolant in the reservoir tank returns to the radiator when the engine coolant temperature drops, thus keeping the radiator full at all times and avoiding needless engine coolant loss.

Check the reservoir tank level to learn if the engine coolant needs to be replenished.

WATER PUMP

The water pump is used for forced circulation of engine coolant through the cooling system. It is mounted on the front of the cylinder block and driven by a timing belt.

THERMOSTAT

The thermostat has a wax type bypass valve and is mounted in the water inlet housing. The thermostat includes a type of automatic valve operated by fluctuations in the engine coolant temperature. This valve closes when the engine coolant temperature drops, preventing the circulation of engine coolant through the engine and thus permitting the engine to warm up rapidly. The valve opens when the engine coolant temperature has risen, allowing the circulation of engine coolant. Wax inside the thermostat expands when heated and contracts when cooled. Heating the wax thus generates pressure which overpowers the force of the spring which keeps the valve closed, thus opening the valve. When the wax cools, its contraction causes the force of the spring to take effect once more, closing the valve. The thermostat in this engine operates at a temperature of 82°C (180°F).

ELECTRONICALLY CONTROLLED HYDRAULIC COOLING FAN (See page EG–263)

PREPARATION
SST (SPECIAL SERVICE TOOLS)

EG09L–01

	09230–01010	Radiator Service Tool Set	
	09620–30010	Steering Gear Box Replacer Set	
	(09627–30010)	Steering Sector Shaft Bushing Replacer	Hydraulic motor oil seal
	(09631–00020)	Handle	Hydraulic motor oil seal
	09843–18020	Diagnosis Check Wire	

RECOMMENDED TOOLS

EG09M–01

	09025–00010	Small Torque Wrench	For measuring preload
	09082–00015	TOYOTA Electrical Tester	
	09905–00013	Snap Ring Pliers	

EQUIPMENT

EG09N–01

Heater	Water temperature switch
Radiator cap tester	
Thermometer	Water temperature switch
Torque wrench	
Vernier calipers	

LUBRICANT

EG09P–01

Item	Capacity	Classification
Power steering fluid (Total) (Hydraulic cooling fan fluid)	2.2 liters (2.3 US qts, 1.9 lmp.qts)	ATF DEXRON®II

COOLANT

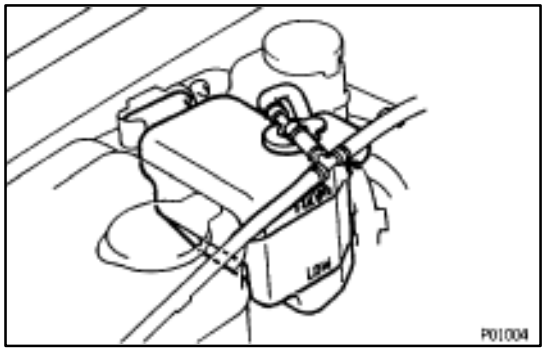
EG09Q–01

Item	Capacity	Classification
Engine coolant (w/Heater)		Ethylene–glycol base
NSR M/T	8.5 liters (9.0 US qts, 7.5 lmp.qts)	
NSR A/T	8.4 liters (8.9 US qts, 7.4 lmp.qts)	
NWR	9.0 liters (9.5 US qts, 7.9 lmp.qts)	

SSM (SPECIAL SERVICE MATERIALS)

EG09R–01

08826–00100	Seal Packing 1282B, Three Bond 1282B or equivalent	Water pump



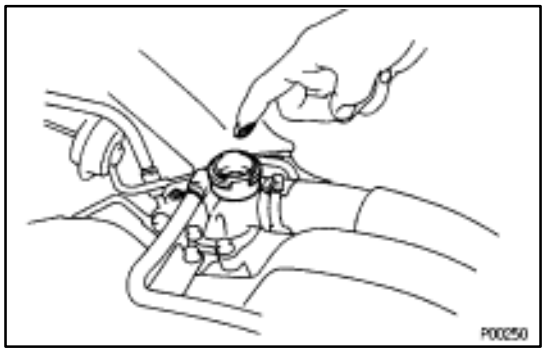
COOLANT CHECK AND REPLACEMENT

EG09S–01

1. CHECK ENGINE COOLANT LEVEL AT RESERVE TANK

The engine coolant level should be between the ”LOW” and ”FULL” lines.

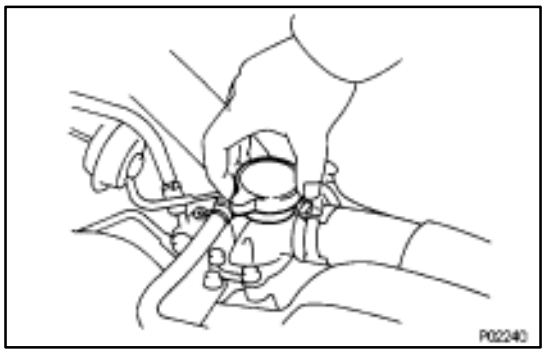
If low, check for leaks and add engine coolant up to the ”FULL” line.



2. CHECK ENGINE COOLANT QUALITY

There should not be any excessive deposits of rust or scales around the radiator cap (water outlet side) or water outlet filler hole, and the engine coolant should be free from oil.

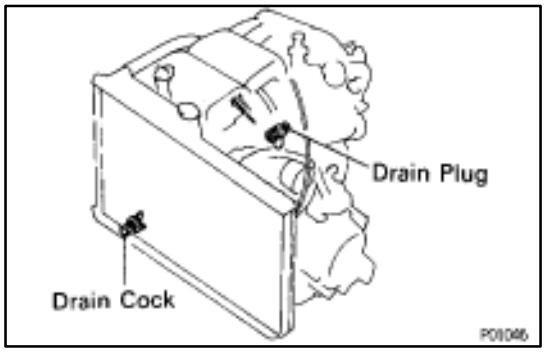
If excessively dirty, replace the engine coolant.



3. REPLACE ENGINE COOLANT

(a) Remove the radiator cap from the water outlet.

CAUTION: To avoid the danger of being burned, do not remove it while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.



(b) Drain the engine coolant from the radiator drain cock and engine drain plug (Engine drain plug at the right of engine block.)

(c) Close the drain cock.

Torque (Engine drain plug):

29 N·m (300 kgf·cm, 22 ft·lbf)

(d) Slowly fill the system with engine coolant from the water outlet.

- Use a good brand of ethylene–glycol base engine coolant and mix it according to the manufacturer’s directions.
- Using engine coolant which includes more than 50% ethylene–glycol (but not more than 70%) is recommended.

NOTICE:

- **Do not use alcohol type coolant.**
- **The engine coolant should be mixed with demineralized water or distilled water.**

Capacity (w / Heater):

NSR

M/T

8.5 liters (9.0 US qts, 7.5 lmp. qts)

A/T

8.4 liters (8.9 US qts, 7.4 lmp. qts)

NWR

9.0 liters (9.5 US qts, 7.9 lmp. qts)

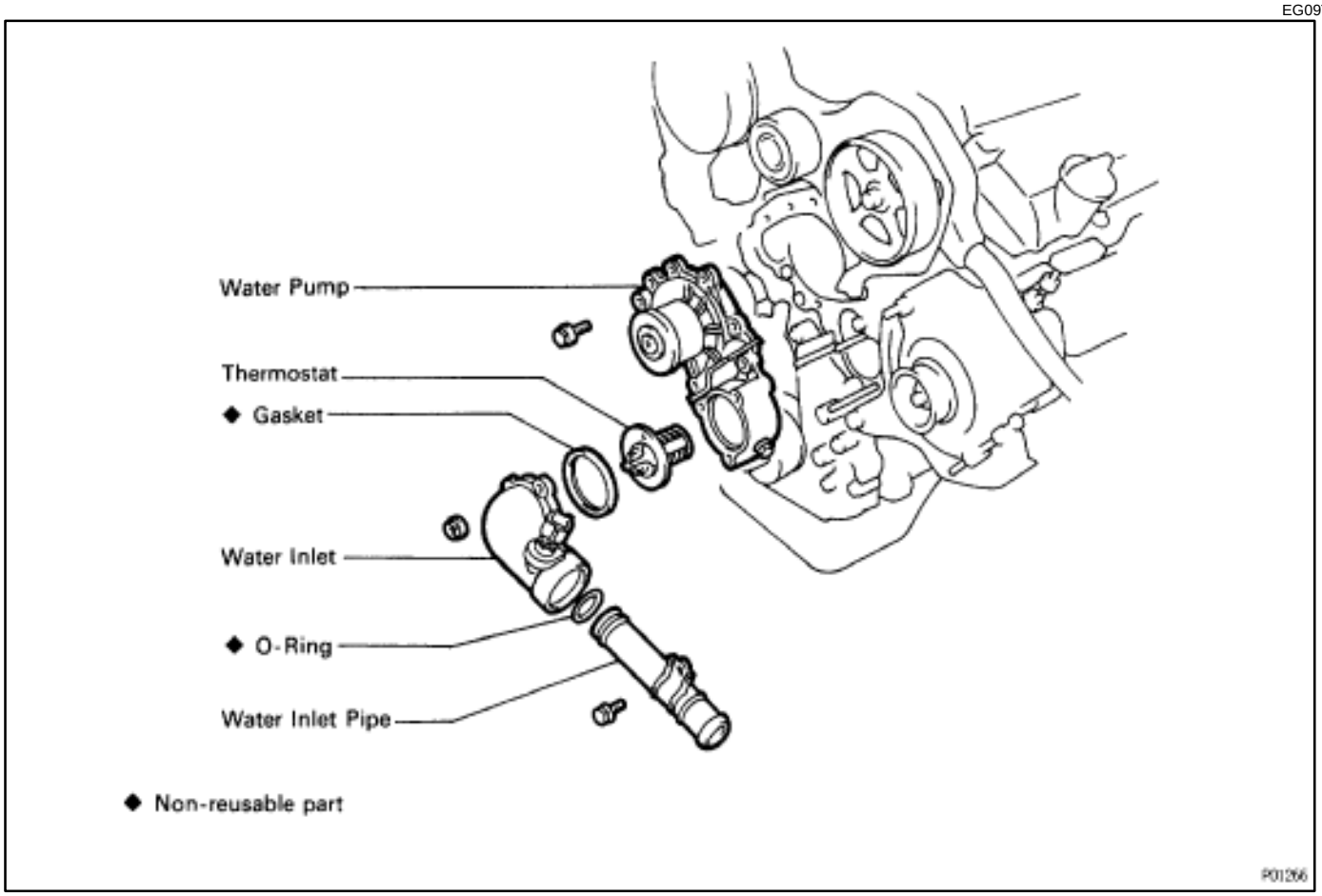
(e) Reinstall the radiator cap to the water outlet.

(f) Warm up the engine and check for leaks.

(g) Recheck the engine coolant level and refill as necessary.

WATER PUMP COMPONENTS

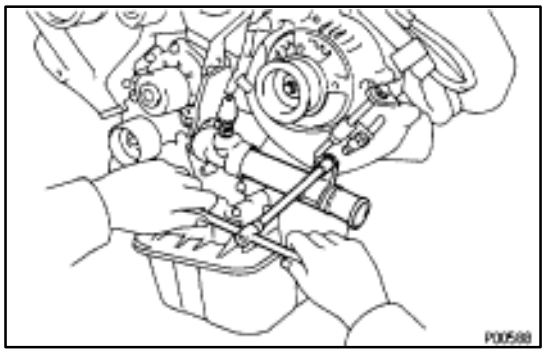
EG09T–01



WATER PUMP REMOVAL

EG09U–01

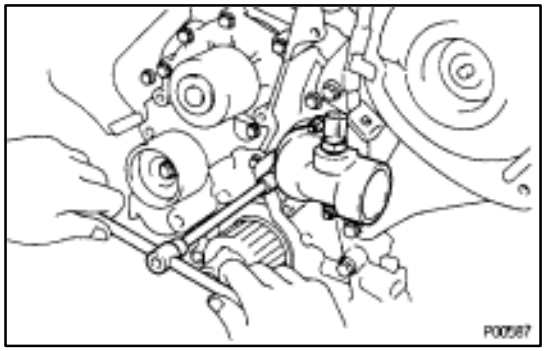
1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
   CAUTION (w / Airbag): Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.
2. **DRAIN ENGINE COOLANT (See page EG–244)**



3. **DISCONNECT RADIATOR LOWER HOSE FROM WATER INLET PIPE**
4. **REMOVE TIMING BELT (See page EG–29)**
5. **REMOVE WATER INLET PIPE**

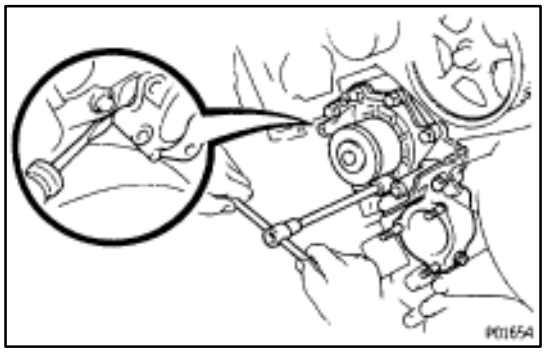
(a) Remove the bolt holding the water inlet pipe to the generator belt adjusting bar.

(b) Remove the water inlet pipe and O–ring.



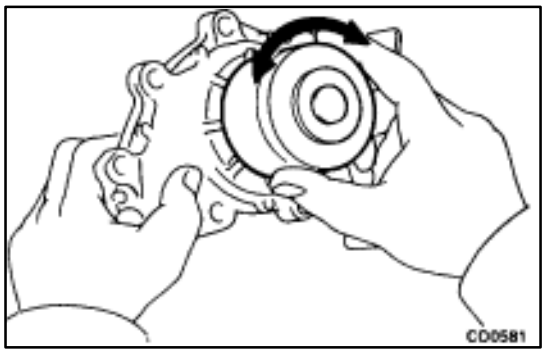
6. REMOVE WATER INLET AND THERMOSTAT

(a) Disconnect the engine coolant temperature sensor connector.
(b) Remove the three nuts and water inlet from the water pump.
(c) Remove the thermostat and gasket.



7. REMOVE WATER PUMP

(a) Remove the seven bolts.
(b) Remove the water pump by prying a screwdriver between the water pump and cylinder block.



WATER PUMP INSPECTION

EG09V–01

INSPECT WATER PUMP

Turn the pulley and check that the water pump bearing moves smoothly and quietly.

WATER PUMP INSTALLATION

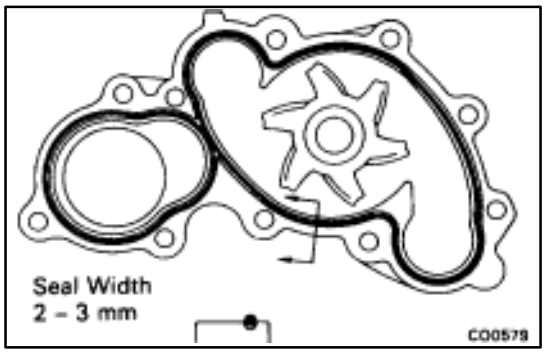
EG09W–01

(See page EG–246)

1. INSTALL WATER PUMP

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the water pump and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing groove.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.



(b) Apply seal packing to the water pump groove.

Seal packing:

Part No.08826–00100 or equivalent

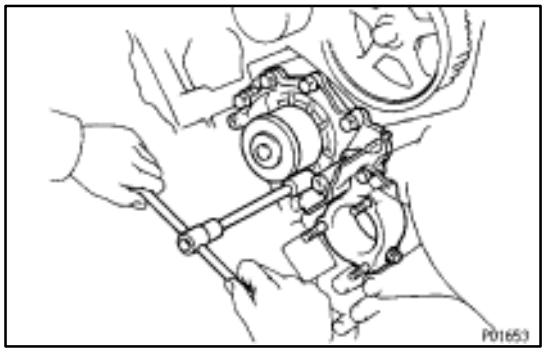
- Install a nozzle that has been cut to a 2–3 mm (0.08–0.12 in.) opening.

HINT: Avoid applying an excessive amount to the surface.

- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Install the water pump with the seven bolts.

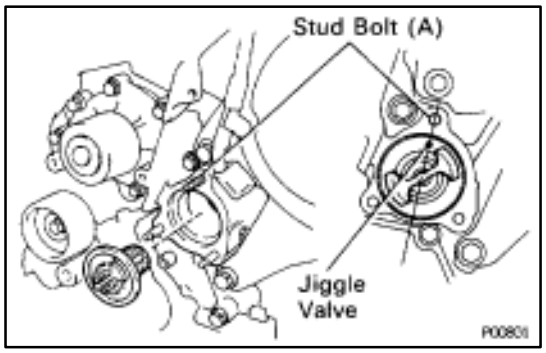
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

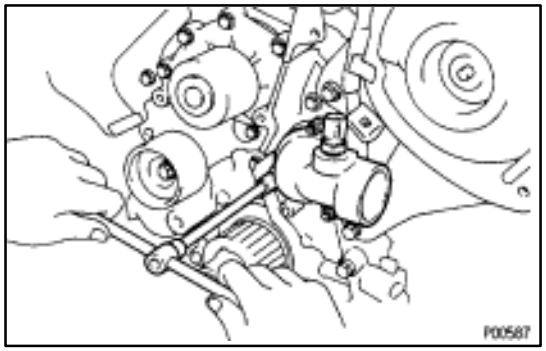


2. INSTALL WATER INLET AND THERMOSTAT

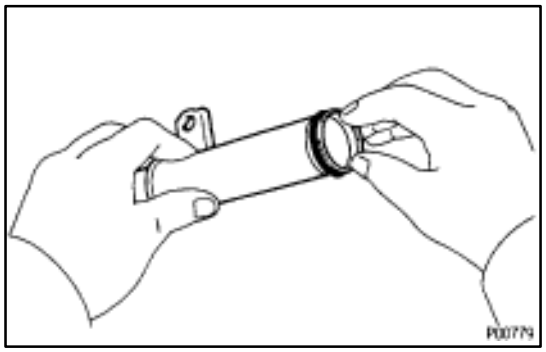
(a) Install a new gasket to the thermostat.

(b) Align the jiggle valve of the thermostat with stud bolt (A), and inset the thermostat in the water pump.

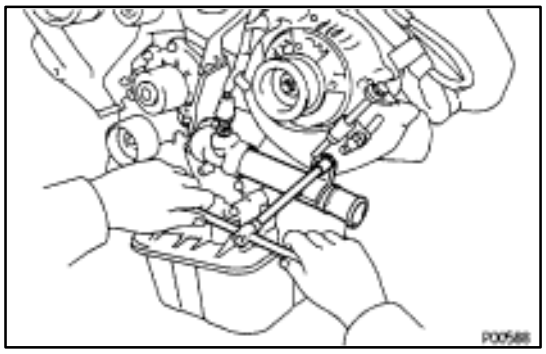




(c) Install the water inlet with the three nuts.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)



3. INSTALL WATER INLET PIPE
(a) Install a new O–ring to the water inlet pipe.



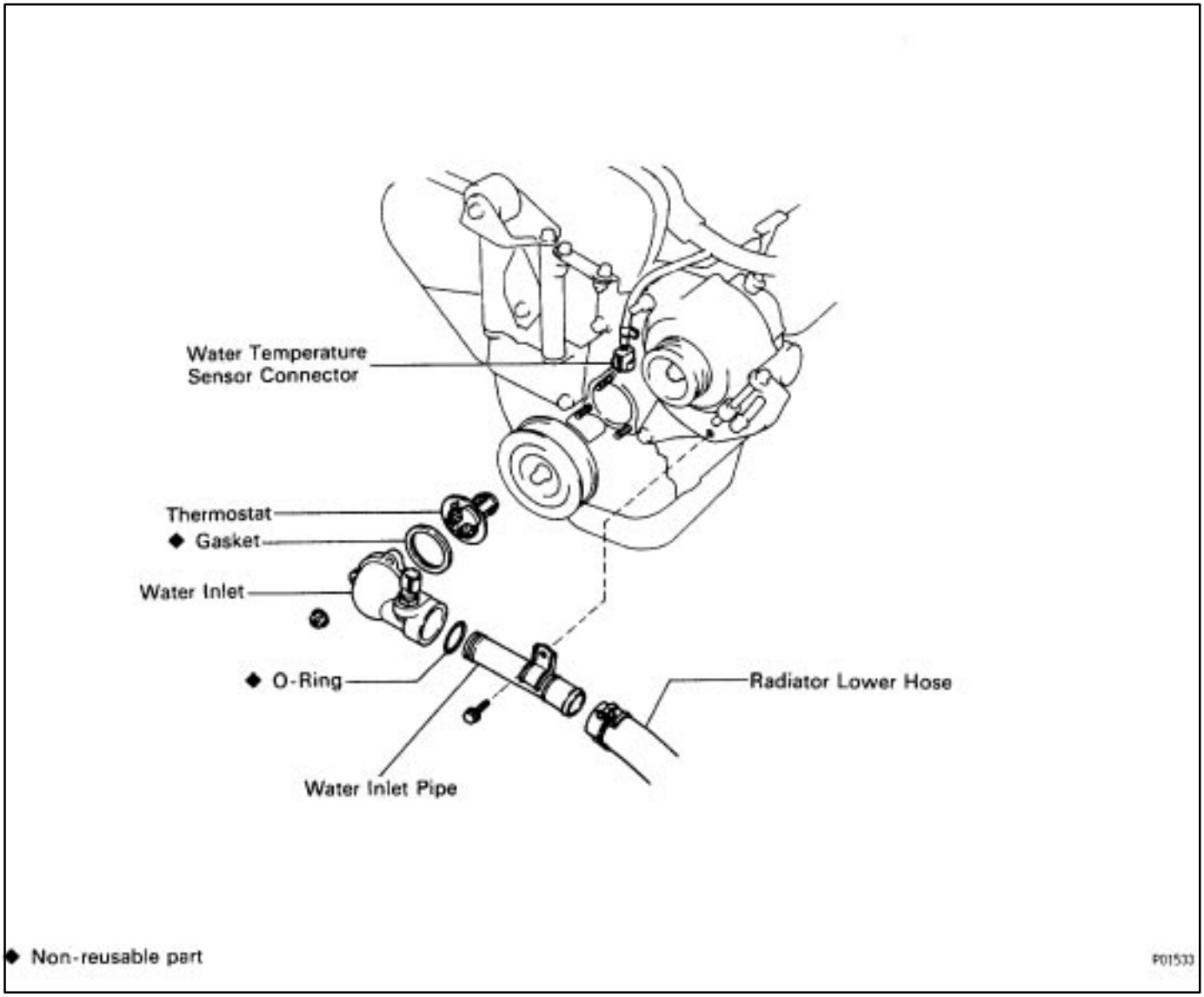
(b) Apply soapy water to the O–ring.
(c) Connect the water inlet pipe to the water inlet.
(d) Install the bolt holding the water inlet pipe to the generator belt adjusting bar.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

4. INSTALL TIMING BELT (See page EG–29)
5. CONNECT RADIATOR LOWER HOSE
6. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY
7. FILL WITH ENGINE COOLANT (See page EG–244)

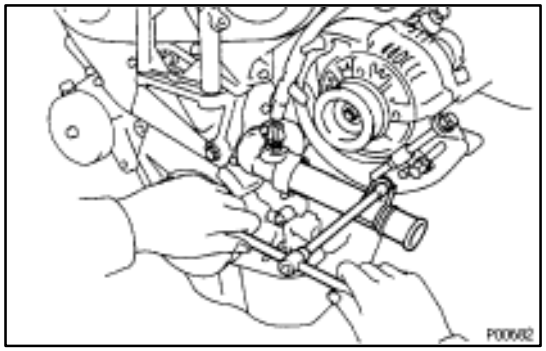
THERMOSTAT
THERMOSTAT REMOVAL

EG09X–01

HINT: Removal of the thermostat would have an adverse effect, causing a lowering of cooling efficiency. Do not remove the thermostat, even if the engine tends to overheat.



1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
   CAUTION (w / Airbag): Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.
2. **DRAIN ENGINE COOLANT (See page EG–244)**

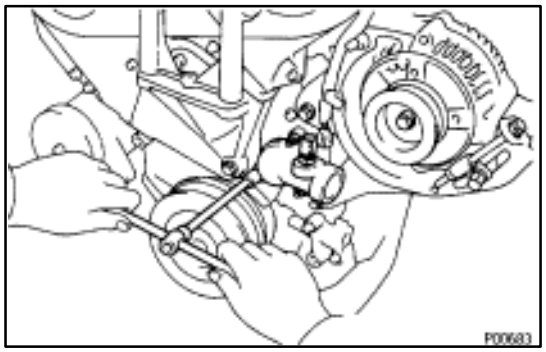


3. REMOVE WATER INLET PIPE

(a) Remove the bolt holding the water inlet pipe to the generator belt adjusting bar.

(b) Remove the water inlet pipe and O–ring.

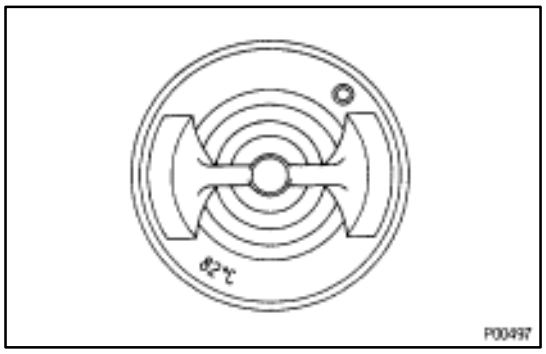
4. DISCONNECT ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR



5. REMOVE WATER INLET

Remove the three nuts and water inlet from water pump.

6. REMOVE THERMOSTAT AND GASKET

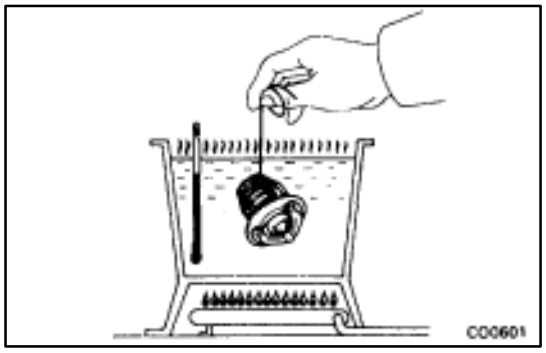


THERMOSTAT INSPECTION

EG09Y–01

INSPECT THERMOSTAT

HINT: The thermostat is numbered with the valve opening temperature.



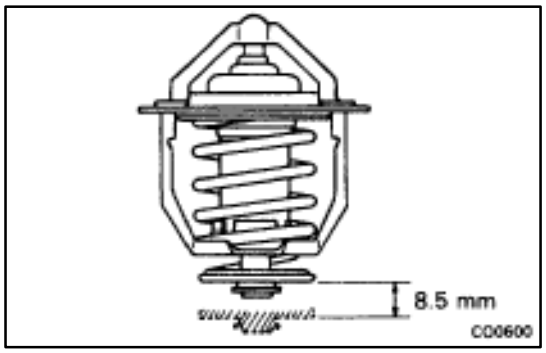
(a) Immerse the thermostat in water and gradually heat the water.

(b) Check the valve opening temperature.

Valve opening temperature:

80–84°C (176–183°F)

If the valve opening temperature is not as specified, replace the thermostat.



(c) Check the valve lift.

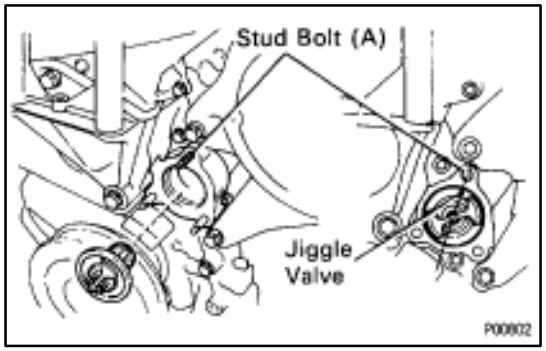
Valve lift:

8.5 mm (0.335 in.) or more at 95°C (203°F)

If the valve lift is not as specified, replace the thermostat.

(d) Check that the valve spring is tight when the thermostat is fully closed.

If not closed, replace the thermostat.



THERMOSTAT INSTALLATION

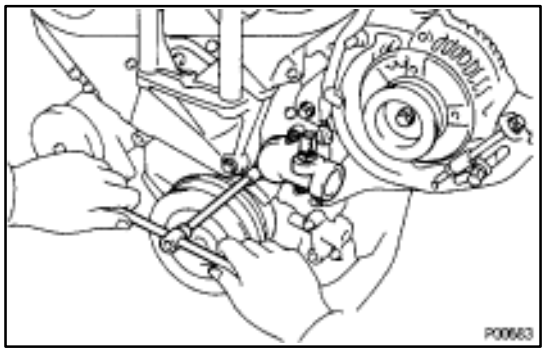
EG09Z–01

(See page EG–250)

1. PLACE THERMOSTAT IN WATER PUMP

(a) Install a new gasket to the thermostat.

(b) Align the jiggle valve of the thermostat with stud bolt (A), and insert the thermostat in the water pump.

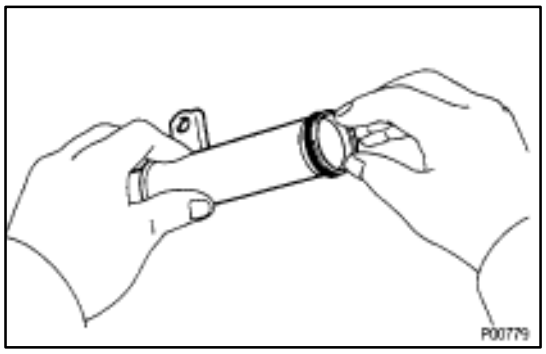


2. INSTALL WATER INLET

Install the water inlet with the three nuts.

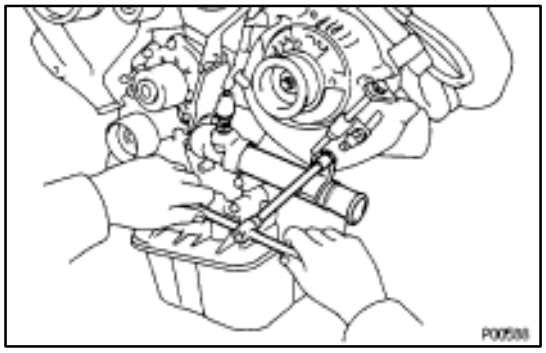
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

3. CONNECT ENGINE COOLANT TEMPERATURE SENSOR CONNECTOR



4. INSTALL WATER INLET PIPE

(a) Install a new O–ring to the water inlet pipe.



(b) Apply soapy water to the O–ring.

(c) Connect the water inlet pipe to the water inlet.

(d) Install the bolt holding the water inlet pipe to the generator belt adjusting bar.

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

5. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

6. FILL WITH ENGINE COOLANT (See page EG–244)

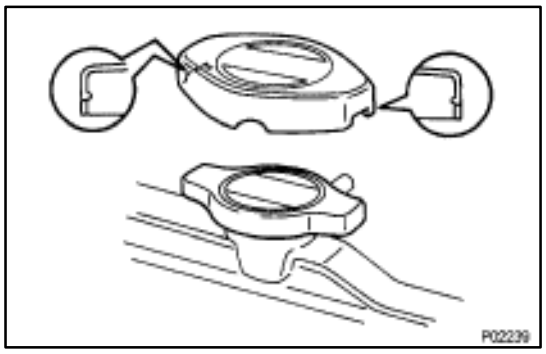
7. START ENGINE AND CHECK FOR LEAKS

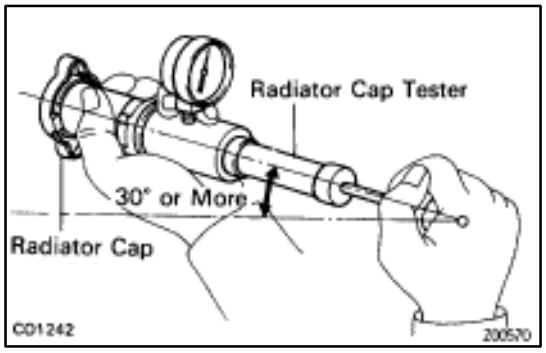
RADIATOR
RADIATOR CLEANING

EG0A0–01

Using water or a steam cleaner, remove any mud and dirt from the radiator core.

NOTICE: If using a high pressure type cleaner, be careful not to deform the fins of the radiator core. If the cleaner nozzle pressure is 2,942–3,432 kPa (30–35 kgf/cm^2, 427–498 psi), keep a distance at least 40–50 cm (15.75 –19.69 in.) between the radiator core and cleaner nozzle.





RADIATOR INSPECTION

EG0A1–01

1. INSPECT RADIATOR CAP

NOTICE:

- **The radiator cap cover is kept in place by the projections shown in the illustration, so do not try to remove the cap cover forcibly.**
- **When performing steps (a) and (b) below, keep the radiator pump tester at an angle of over 30 1 above the horizontal.**

(a) Using a radiator cap tester, slowly pump the tester and check that air is coming from the relief valve.

Pump speed:

1 push/3 seconds or more

NOTICE: Push the pump at a constant speed.

If air is not coming from the relief valve, replace the radiator cap.

(b) Pump the tester several times and measure the relief valve opening pressure.

Pump speed:

1st time

1 push/1 second or less

2nd time or more

Any speed

Standard opening pressure:

Radiator side

93–123 kPa(0.95–1.25 kgf/cm^2, 13.5–17.8 psi)

Water outlet side

83–113 kPa

(0.85–1.15 kgf/cm^2, 12.1–16.4 psi)

Minimum opening pressure:

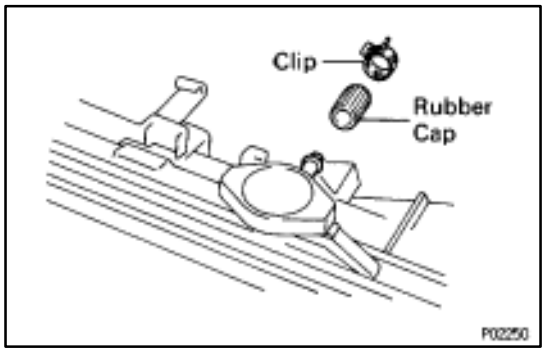
Radiator side

78 kPa (0.8 kgf/cm^2, 11.4 psi)

Water outlet side

69 kPa (0.7 kgf/cm^2, 10.0 psi)

If the opening pressure is less than minimum, replace the radiator cap.



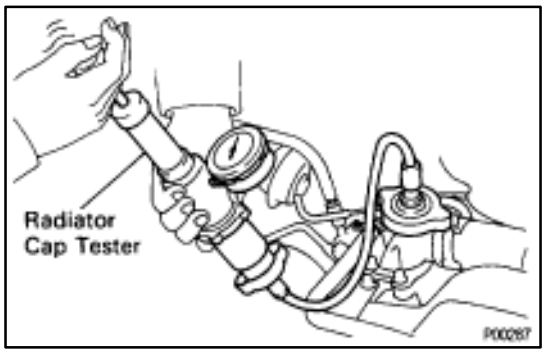
2. INSPECT COOLING SYSTEM FOR LEAKS

(a) Fill the radiator and engine with engine coolant and attach a radiator cap tester to the water outlet.

(b) Warm up the engine.

(c) Disconnect the reservoir hose from the radiator overflow pipe.

(d) Install a rubber cap onto the radiator overflow pipe, then fix the rubber cap in place with a clip.



(e) Pump it to 127 kPa (1.3 kgf/cm^2, 18.5 psi) and check that the pressure does not drop.
If the pressure drops, check for leaks from the hoses, radiator or water pump. If no external leaks are found, check the heater core, cylinder block and head.

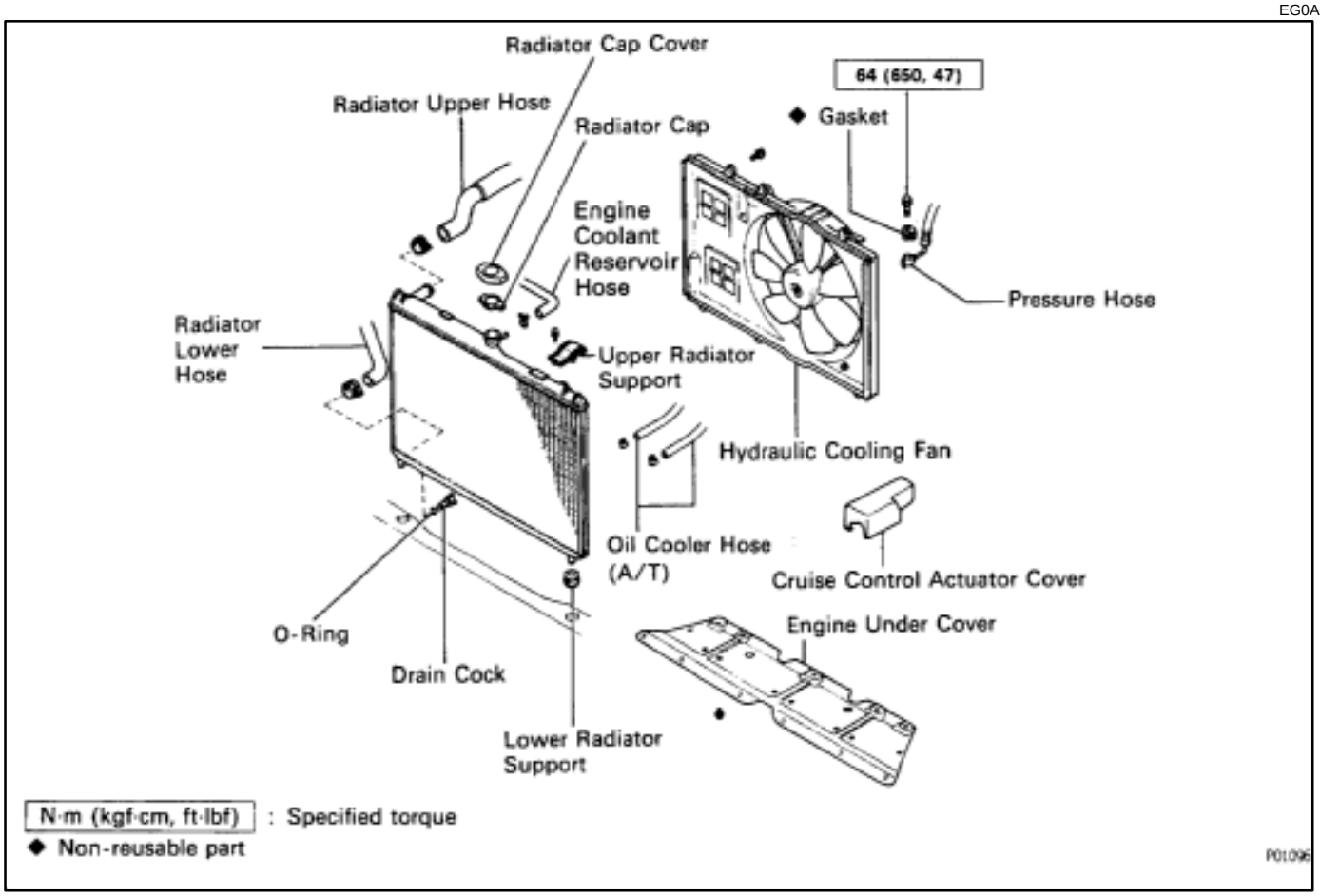
(f) Remove the radiator cap tester and install the radiator cap to the water outlet.

(g) Remove the clip and rubber cap from the radiator overflow pipe.

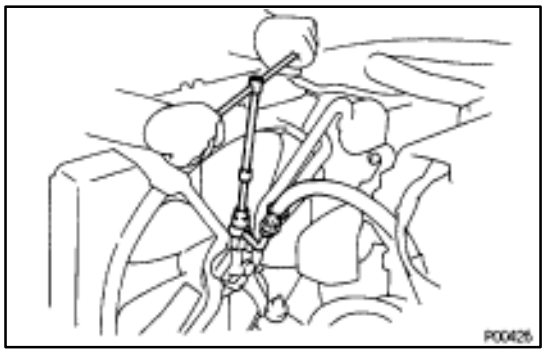
(h) Connect the reservoir hose to the radiator overflow pipe.

RADIATOR REMOVAL

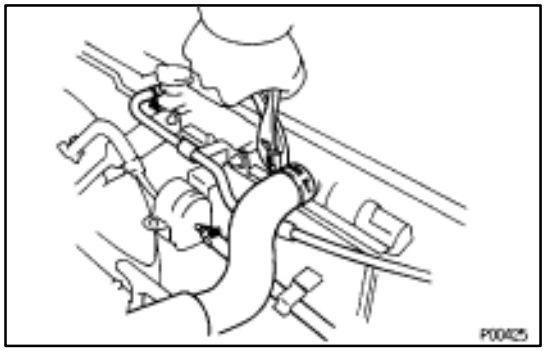
EG0A2–01



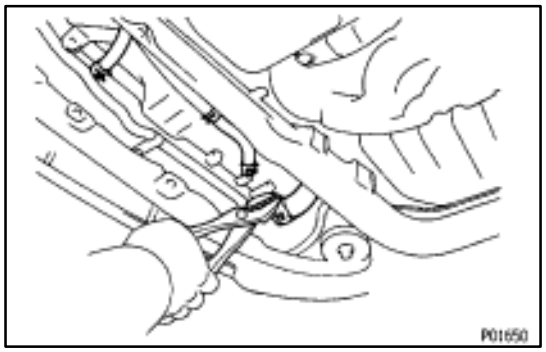
1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
   CAUTION (w / Airbag): Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.
2. **DRAIN ENGINE COOLANT (See page EG–244)**
3. **REMOVE CRUISE CONTROL ACTUATOR COVER**



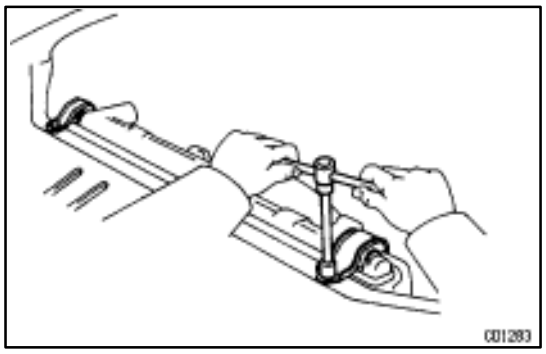
4. **DISCONNECT PRESSURE HOSE**
   Remove the union bolt and gasket, and disconnect the pressure hose from the hydraulic motor.
   NOTICE: Catch leaking oil in a container.



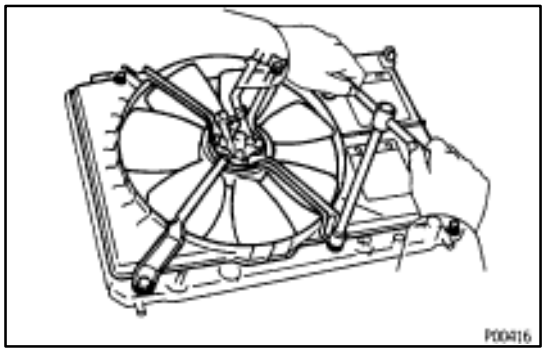
5. DISCONNECT RADIATOR UPPER HOSE
6. DISCONNECT ENGINE COOLANT RESERVOIR HOSE
7. DISCONNECT HYDRAULIC MOTOR RETURN HOSE
8. REMOVE ENGINE UNDER COVER



9. DISCONNECT RADIATOR LOWER HOSE
10. (A/T)
DISCONNECT OIL COOLER HOSE



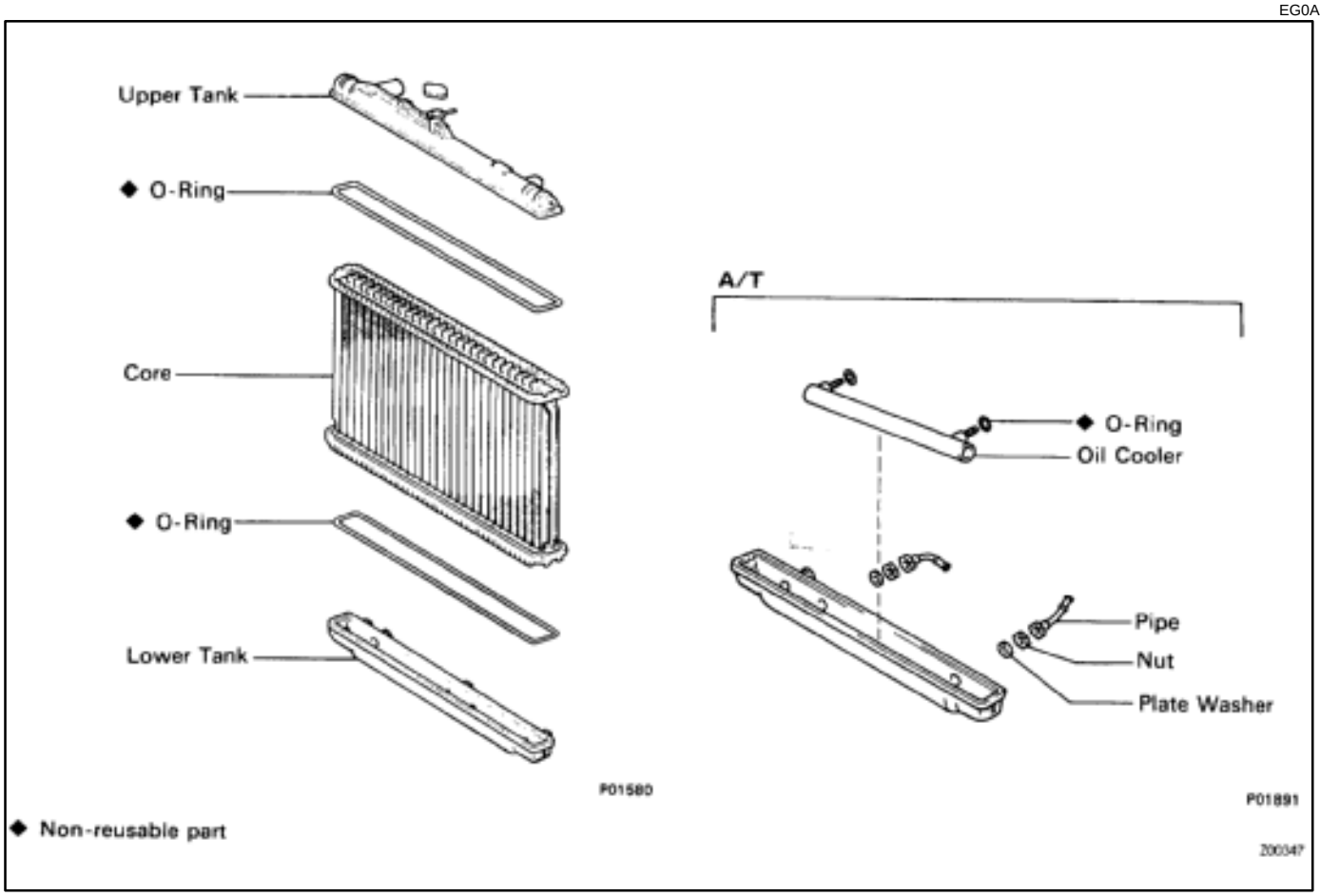
11. REMOVE RADIATOR AND HYDRAULIC COOLING FAN
(a) Remove the two bolts and two upper supports.
(b) Lift out the radiator.
(c) Remove the two lower radiator supports.



12. REMOVE HYDRAULIC COOLING FAN FROM RADIATOR
Remove the six bolts and cooling fan.

COMPONENTS

EG0A3–01



RADIATOR DISASSEMBLY

EG0A4–01

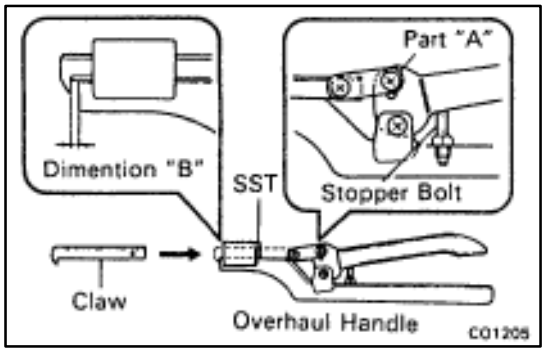
1. ASSEMBLY OF SST

SST 09230–01010

(a) Install the claw to the overhaul handle, inserting it in the hole in part ”A” as shown in the diagram.

(b) While gripping the handle, adjust the stopper bolt so that dimension ”B” shown in the diagram is 0.2–0.5 mm (0.008–0.020 in.).

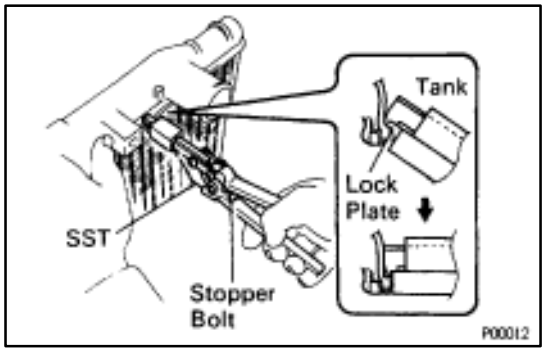
NOTICE: If this adjustment is not performed, the claw may be damaged.

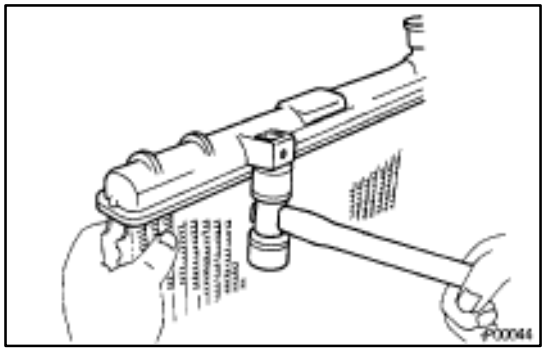


2. UNCAULK LOCK PLATES

Using SST to release the caulking, squeeze the handle until stopped by the stopper bolt.

SST 09230–01010

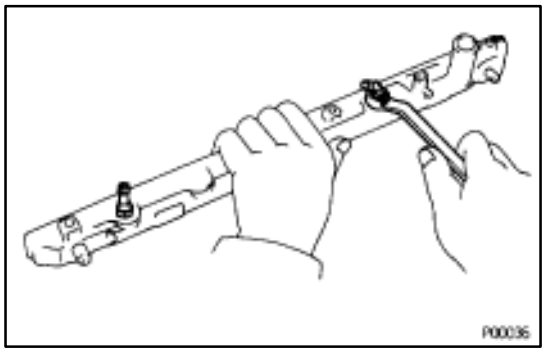




3. REMOVE TANKS AND O–RINGS

(a) Lightly tap the radiator hose inlet (or outlet) with a soft–faced hammer and remove the tank.

(b) Remove the O–ring.



4. (A/T)

REMOVE OIL COOLER FROM LOWER TANK

(a) Remove the pipes.

HINT: Make a note of the direction to face the pipes.

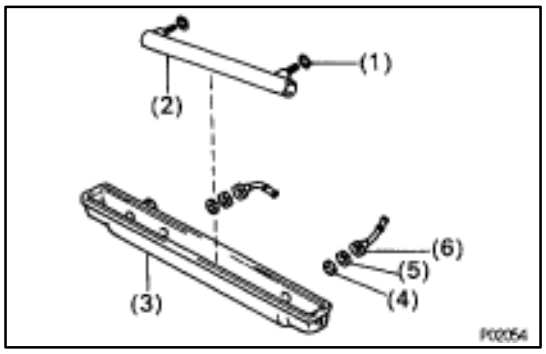
(b) Remove the nuts, and plate washers.

(c) Remove the oil cooler and O–rings.

RADIATOR ASSEMBLY

EG0A5–01

(See page EG–257)



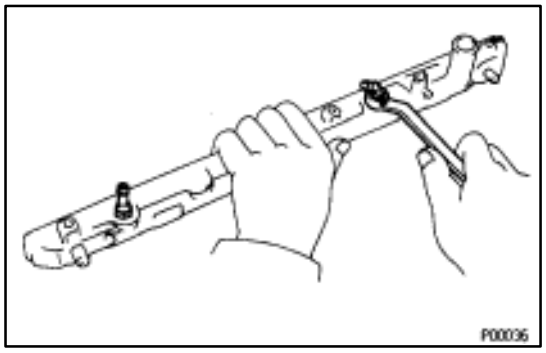
1. (A/T)

INSTALL OIL COOLANT TO LOWER TANK

(a) Clean the O–ring contact surface of the lower tank and oil cooler.

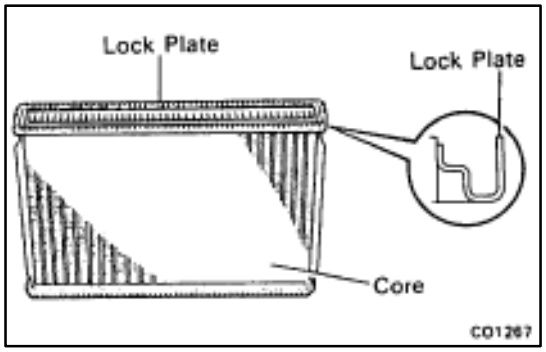
(b) Install new O–rings (1) to the oil cooler (2).

(c) Install the oil cooler (2) with the O–rings (1) to the lower tank (3).



(d) Install the plate washers (4), and nuts (5). Torque the nuts (5).
Torque: 8.3 N·m (85 kgf·cm, 74 ft·lbf)

(e) Install the pipes (6).
Torque: 22 N·m (220 kgf·cm, 16 ft·lbf)
HINT: Face the pipes in the same direction as before disassembly.



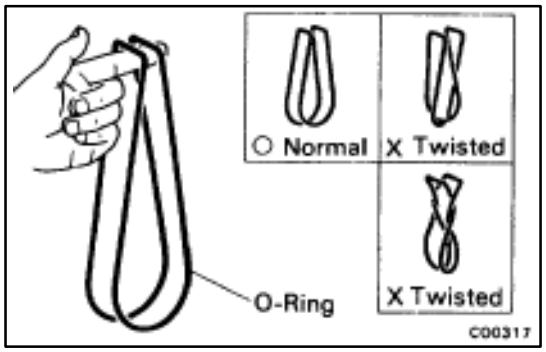
2. INSPECT LOCK PLATE

Inspect the lock plate for damage.

HINT:

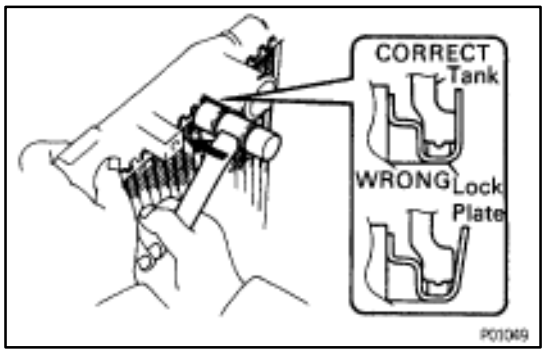
- If the sides of the lock plate groove are deformed, reassembly of the tank will be impossible.

•Therefore, first correct any deformation with pliers or like object. Water leakage will result if the bottom of the lock plate groove is damaged or dented, Therefore, repair or replace if necessary.

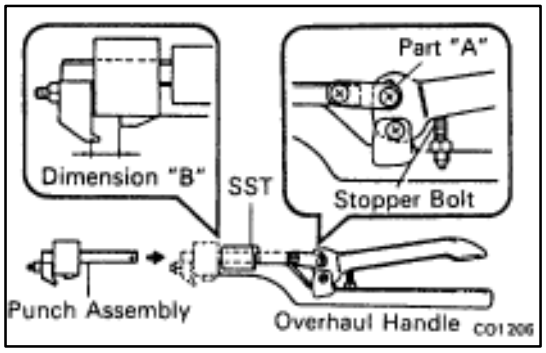


3. INSTALL NEW O–RINGS AND TANKS

(a) After checking that there are no foreign objects in the lock plate groove, install the new O–ring without twisting it.
HINT: When cleaning the lock plate groove, lightly rub it with sand paper without scratching it.



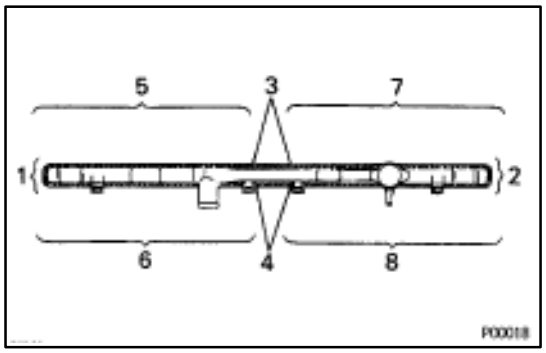
(b) Install the tank without damaging the O–ring.
(c) Tap the lock plate with a soft–faced hammer so that there is no gap between it and the tank.



4. ASSEMBLY OF SST

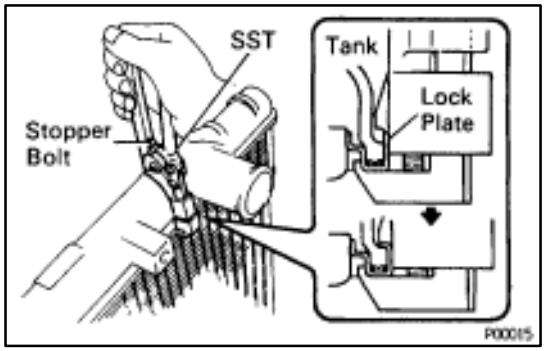
SST 09230–01010

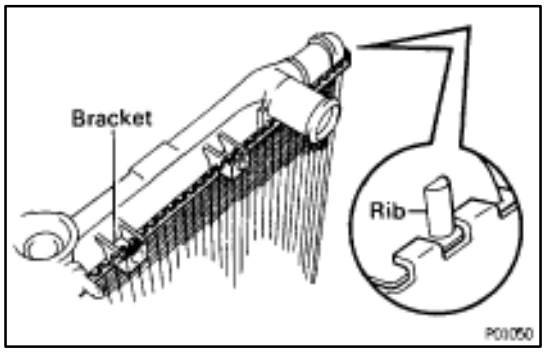
(a) Install the punch assembly to the overhaul handle, inserting it in the hole in part ”A” as shown in the illustration.
(b) While gripping the handle, adjust the stopper bolt so that dimension ”B” shown in the diagram is 7.7 mm (0.30 in.).



5. CAULK LOCK PLATE

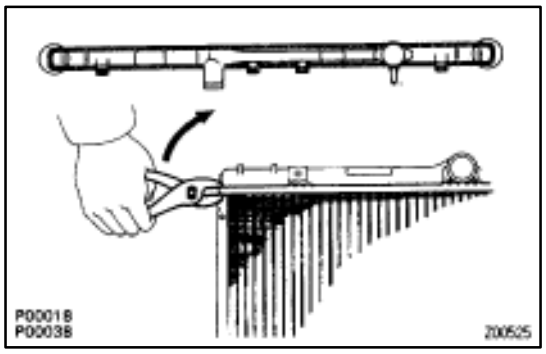
(a) Lightly press SST against the lock plate in the order shown in the illustration. After repeating this a few times, fully caulk the lock plate by squeezing the handle until stopped by the stopper plate.
SST 09230–01010



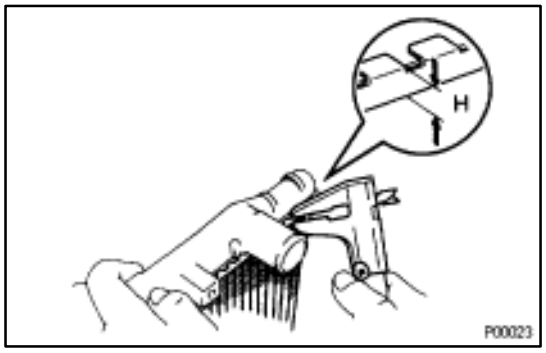


HINT:

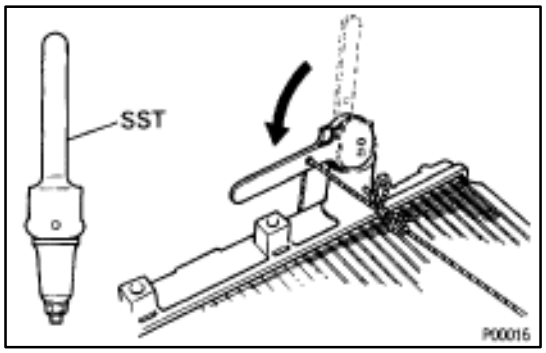
- Do not stake the areas protruding around the pipes, brackets or tank ribs.



- The points shown in the illustration and oil cooler near here (A/T) cannot be staked with the SST. Use a plier or like object and be careful not to damage the core plates.

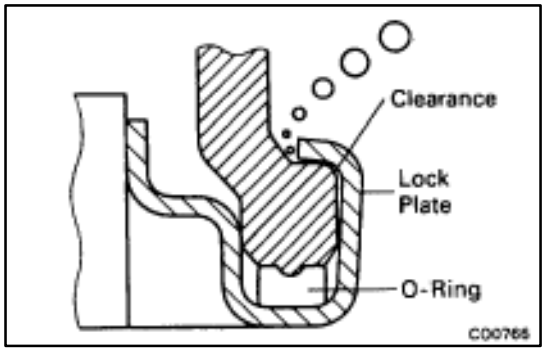


(b) Check the lock plate height (H) after completing the caulking.
Plate height:
7.75–8.25 mm (0.305–0.325 in.)
If not within the specified height, adjust the stopper bolt of the handle again and perform the caulking again.



6. INSPECT FOR WATER LEAKS

(a) Tighten the drain plug.
(b) Plug the inlet and outlet pipes of the radiator with SST.
SST 09230–01010
(c) Using a radiator cap tester, apply pressure to the radiator.
Torque: 177 kPa (1.8 kgf/cm^2, 26 psi)
(d) Inspect for water leaks.



HINT: On radiators with resin tanks, there is a clearance between the tank and lock plate where a minute amount of air will remain, giving the appearance of an oil leak when the radiator is submerged in water. Therefore, before performing the water leak test, first switch the radiator around in the water until all air bubbles disappear.

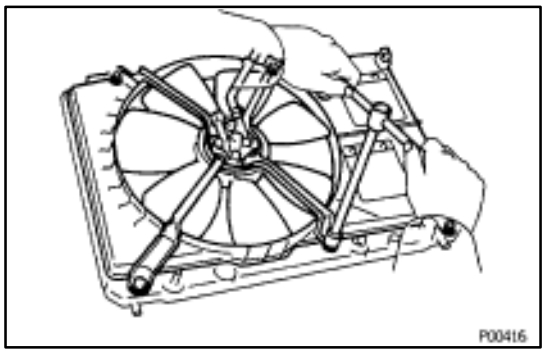
7. PAINT LOCK PLATES

HINT: If the water leak test checks out okay, allow the radiator to completely dry and then paint the lock plates.

RADIATOR INSTALLATION

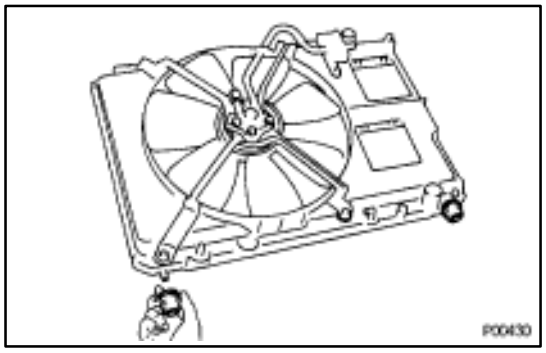
EG0A6–01

(See page EG–255)



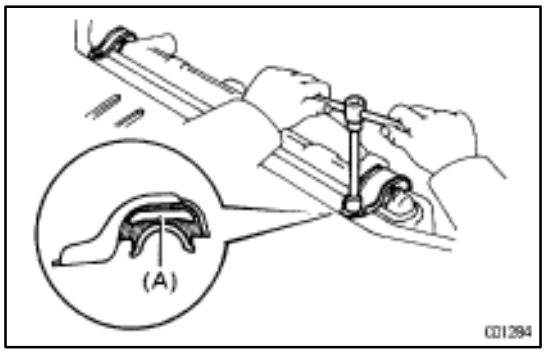
1. INSTALL HYDRAULIC COOLING FAN TO RADIATOR

Install the cooling fan with the six bolts.



2. INSTALL RADIATOR AND HYDRAULIC COOLING FAN

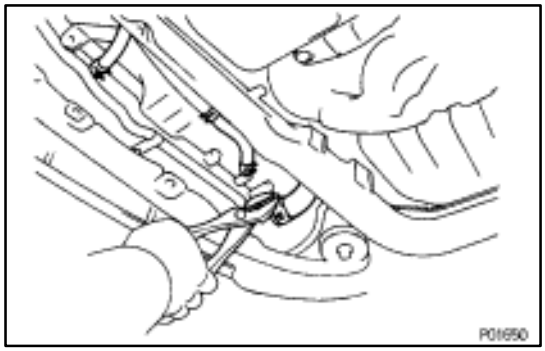
(a) Place the two lower radiator supports in position on the body.



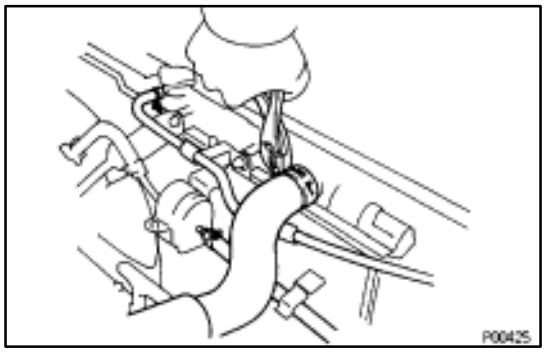
(b) Place the radiator in position, and install the two upper supports with the two bolts.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

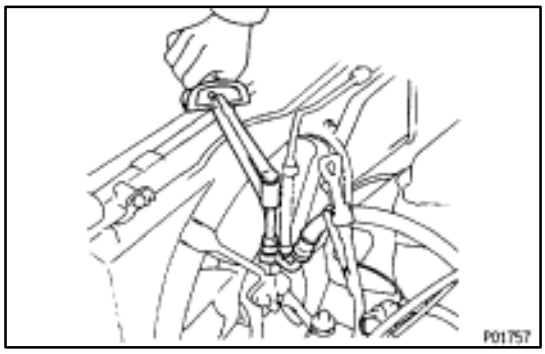
HINT: After installation, check that the rubber cushion (A) of the support is not depressed.



3. (A/T)
   CONNECT OIL COOLER HOSES
4. CONNECT RADIATOR LOWER HOSE
5. INSTALL ENGINE UNDER COVER



6. CONNECT HYDRAULIC MOTOR RETURN HOSE
7. CONNECT ENGINE COOLANT RESERVOIR HOSE
8. CONNECT RADIATOR UPPER HOSE



9. CONNECT PRESSURE HOSE TO HYDRAULIC MOTOR
   Connect the pressure hose with a new gasket and the union bolt.
   Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

10. INSTALL CRUISE CONTROL ACTUATOR COVER
11. FILL WITH ENGINE COOLANT (See page EG–244)
12. FILL COOLING FAN (PS) RESERVOIR TANK WITH FLUID
13. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY
14. START ENGINE AND CHECK FOR LEAKS
15. BLEED ELECTRONICALLY CONTROLLED HYDRAULIC COOLING FAN SYSTEM
    (See page EG–265)
16. (A/T)
    CHECK AUTOMATIC TRANSMISSION (A/T) FLUID LEVEL
    NOTICE: Do not overfill.

ELECTRONICALLY CONTROLLED HYDRAULIC COOLING FAN SYSTEM

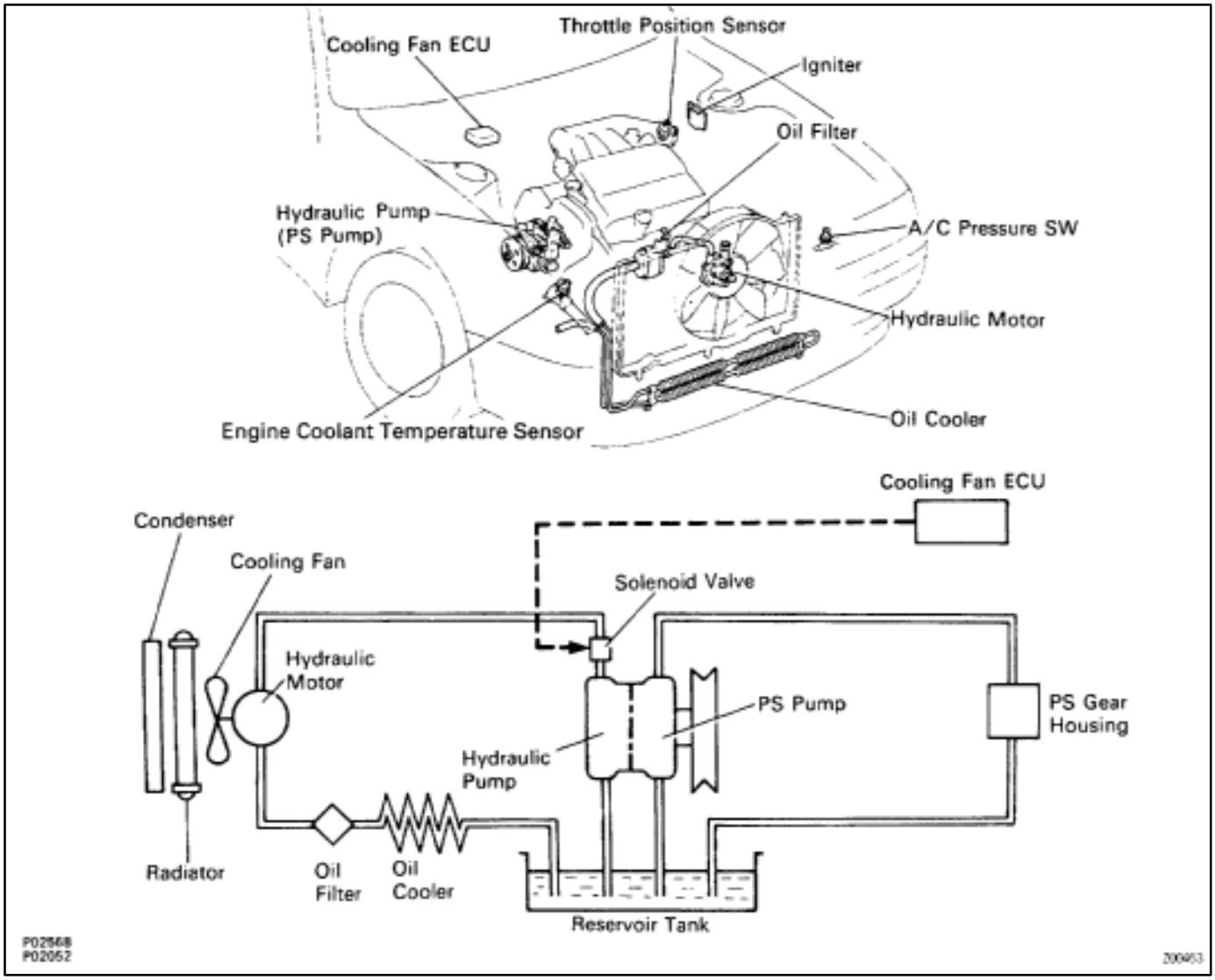
DESCRIPTION

EG0A7–01

In this system, the cooling fan ECU controls the hydraulic pressure acting on the hydraulic motor, thus controlling the speed of the cooling fan steplessly in response to the condition of the engine and air conditioning.

OPERATION

EG0A8–01



The hydraulic pump integrated with PS pump is driven by the PS pump drive belt. The solenoid valve adjusts the volume of oil sent from the hydraulic pump to the hydraulic motor which drives the fan directly, thereby controlling the fan speed.

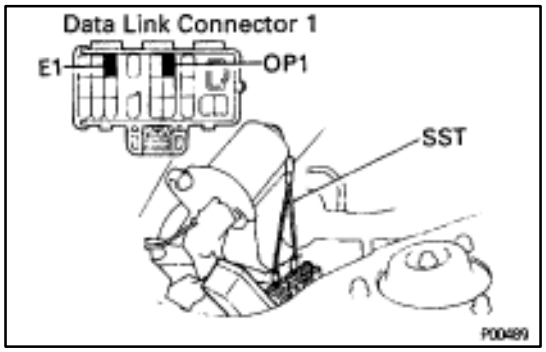
Oil which has passed through the hydraulic motor is cooled by the oil cooler before returning to the PS pump reservoir tank.

The solenoid valve is controlled by the computer in accordance with the engine rpm, engine coolant temp. and A/C signals.

ON–VEHICLE INSPECTION
FLUID LEVEL INSPECTION

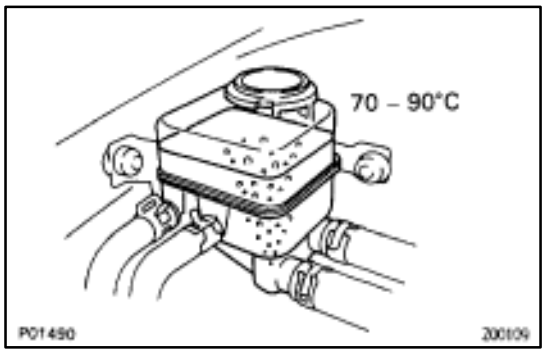
EG0A9–01

1. KEEP VEHICLE LEVEL



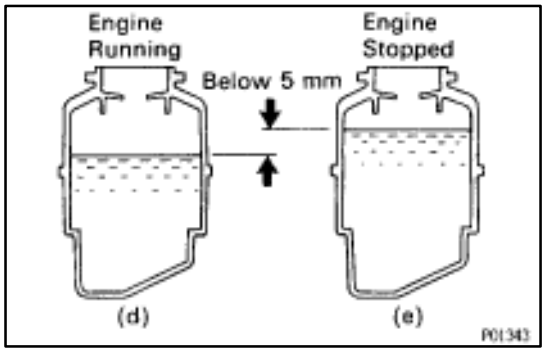
2. INSPECT FLUID LEVEL

(a) Using SST, connect terminals OP1 and E1 of the data link connector 1.
SST 09843–18020

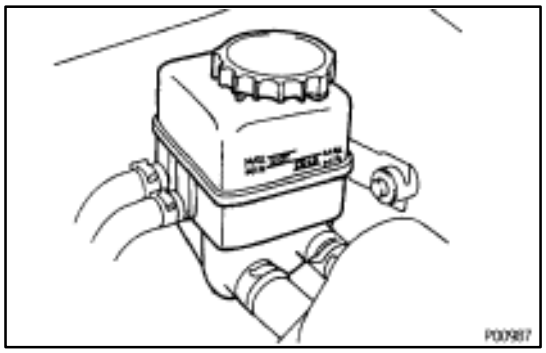


(b) Keep the engine speed at 2,000 rpm until the fluid temperature reaches the specified temperature.
Fluid temperature:
70–90°C (158–195°F)

(c) Check that that there is no foaming and emulsification of the fluid in the reservoir tank.

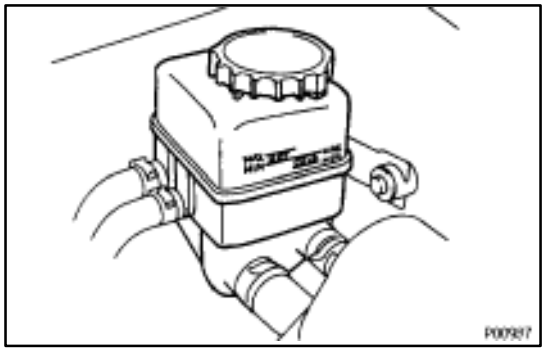


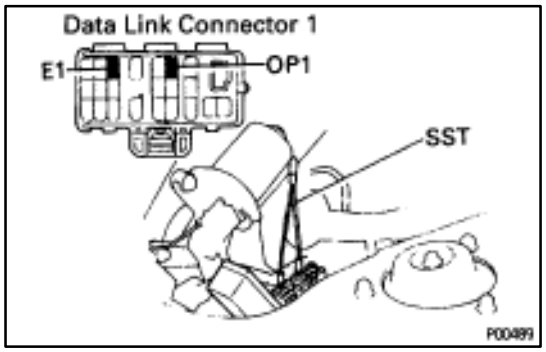
(d) Measure the fluid level with the engine running.
(e) Stop the engine, and measure the fluid level.
(f) Subtract (d) from (e).
Maximum stroke:
5 mm (0.20 in.)

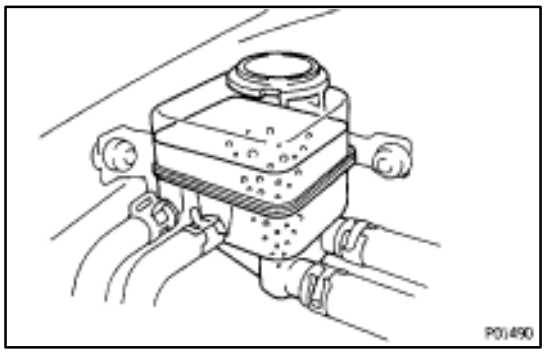


(g) Check the fluid level.
If low, add fluid.
Fluid:
ATF DEXRON® II
HINT: Check that fluid level is within the ”HOT” level on reservoir tank. If the fluid is cold, check that it is within the ”COLD” level on the tank.

(h) Remove the SST from the data link connector 1.
SST 09843–19020







HYDRAULIC COOLING FAN SYSTEM BLEEDING

EG0AA–01

1. CHECK FLUID LEVEL IN RESERVOIR TANK

If low, add fluid.

Fluid:

ATF DEXRON® II

HINT: Check that fluid level is within the ”HOT” level on reservoir tank. If the fluid is cold, check that it is within the ”COLD” level on the tank.

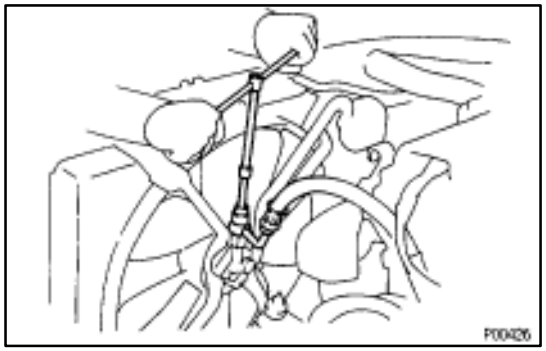
2. BLEED COOLING SYSTEM

(a) Using SST, connect terminals OP1 and E1 of the data link connector 1.
SST 09843–18020

(b) Start the engine without depressing the accelerator pedal.

(c) Leave the engine running for several seconds.

(d) Check that there is no foaming and emulsification of the fluid in the reservoir tank.

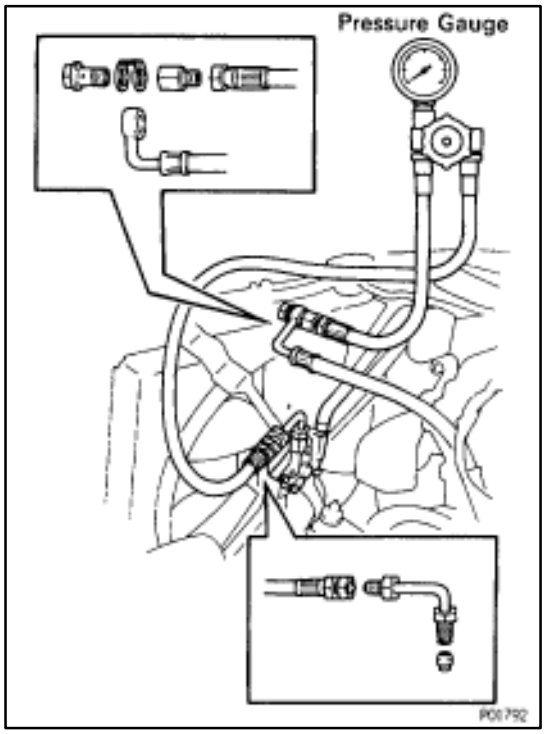


OIL PRESSURE INSPECTION

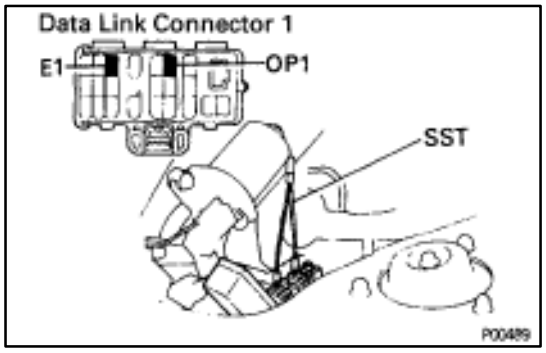
EG0AB–01

1. CONNECT PRESSURE GAUGE

(a) Remove the union bolt and gasket, and disconnect the pressure hose from the hydraulic motor.



(b) Connect the gauge side of a pressure gauge to pressure hose, and the valve side to the hydraulic motor.

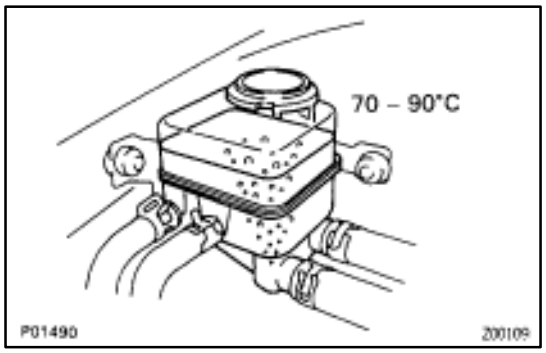


2. INSPECT OIL PRESSURE

HINT: Before inspecting the oil pressure, first check that the A/C is off.

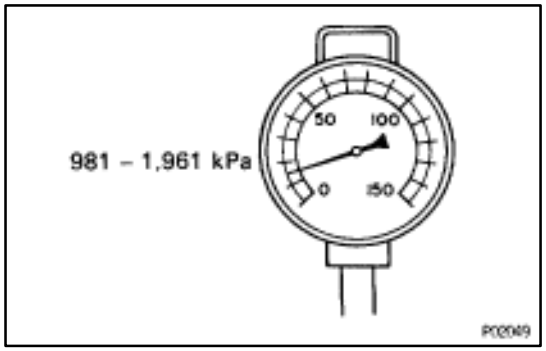
(a) Using SST, connect terminals OP1 and E1 of the data link connector 1.
SST 09843–18020

(b) Bleed the hydraulic cooling system.
(See page EG–265)

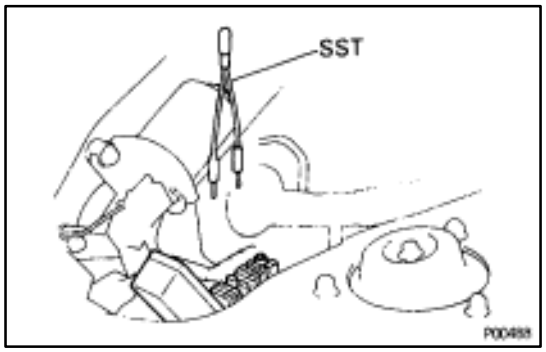


(c) Keep the engine speed at 2,000 rpm until the fluid temperature reaches the specified temperature.
Fluid temp.:
70–90°C (158–195°F)

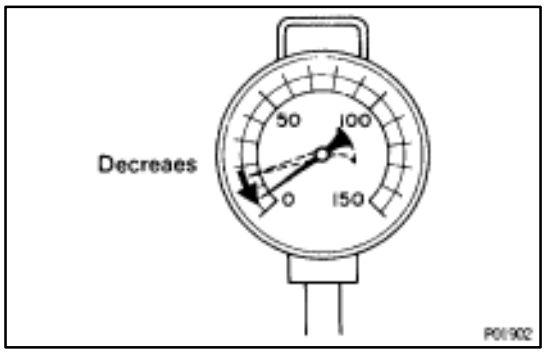
(d) Check the fluid level is correct.



(e) Measure the oil pressure at idling.
Oil pressure:
981–1,961 kPa (10–20 kgf/cm^2, 142–284 psi)



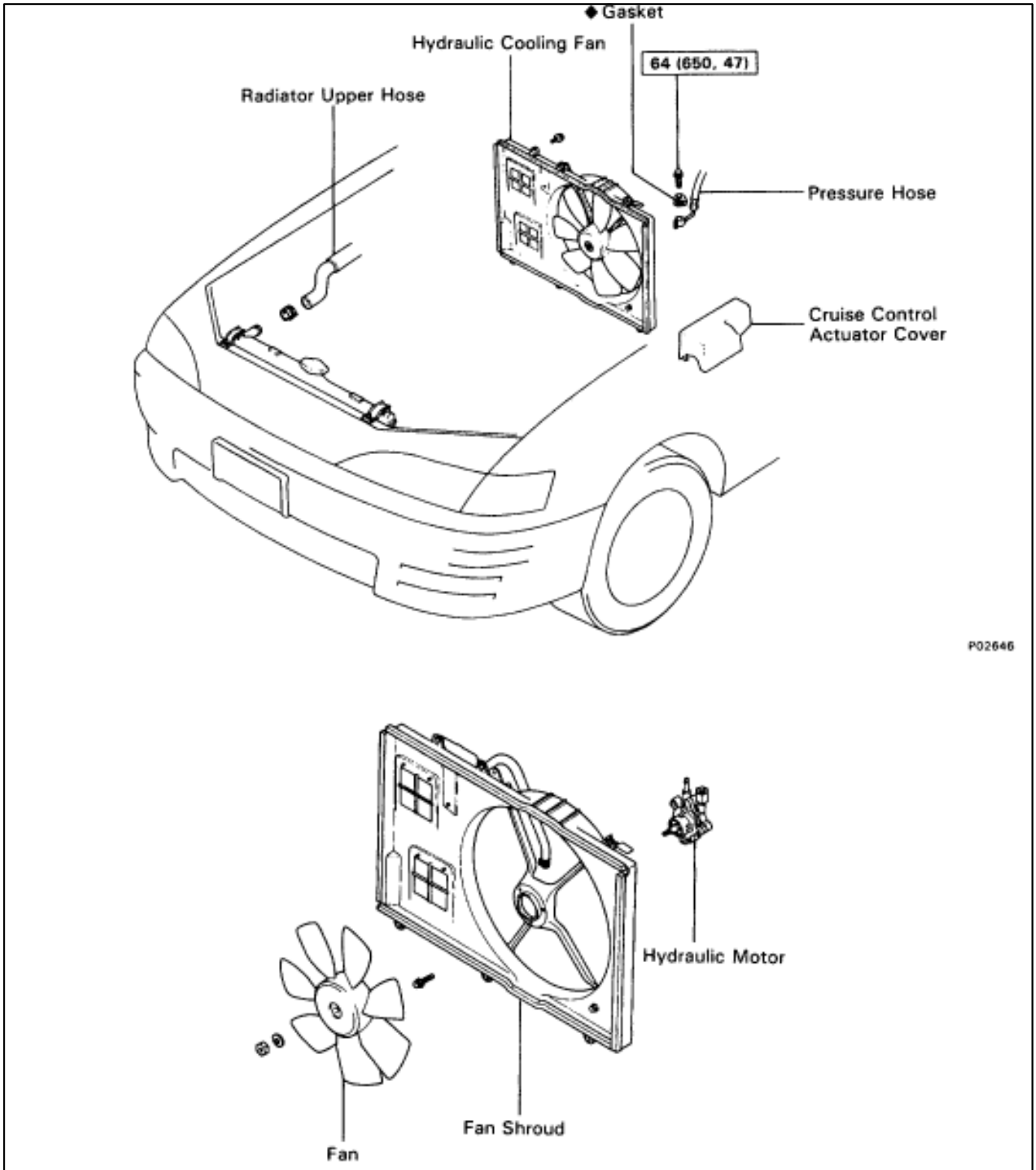
(f) Remove the SST from the data link connector 1.
SST 09843–18020



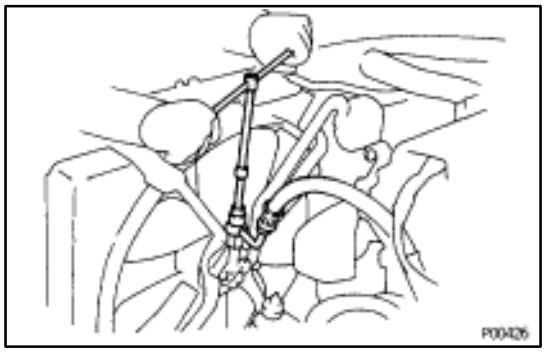
(g) Check that the oil pressure decreases.

HYDRAULIC MOTOR
HYDRAULIC MOTOR REMOVAL

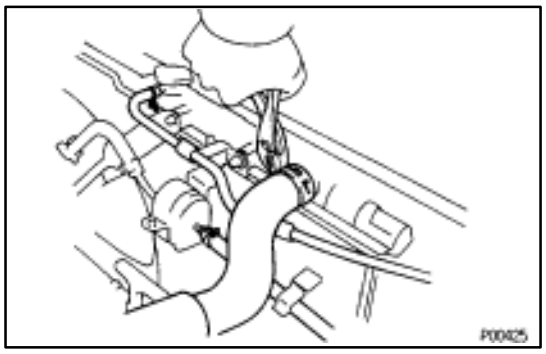
EG0AD–03



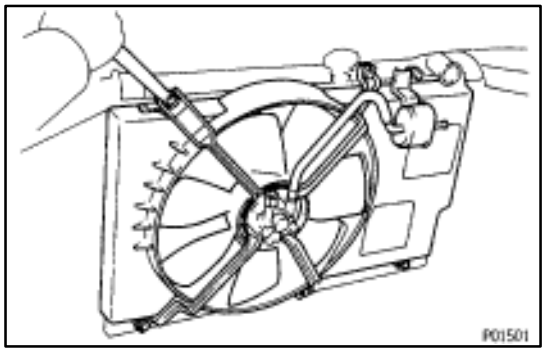
1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
   CAUTION (w / Airbag): Work must be started after approx. 30 seconds or longer from the time the ignition switch turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.
2. **DRAIN ENGINE COOLANT (See page EG–244)**
3. **REMOVE CRUISE CONTROL ACTUATOR COVER**



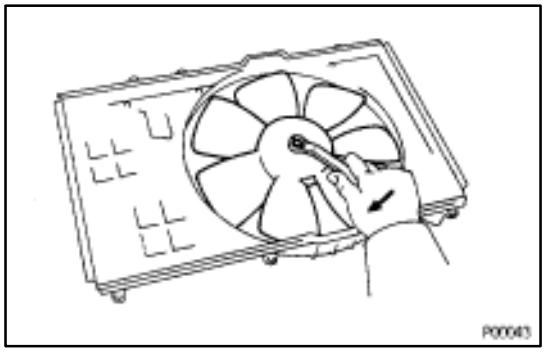
4. **DISCONNECT PRESSURE HOSE**
   Remove the union bolt and gasket, and disconnect the pressure hose from the hydraulic motor.
   NOTICE: Catch leaking oil in a container



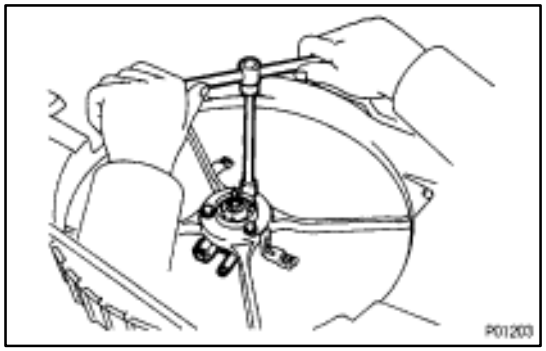
5. **DISCONNECT RADIATOR UPPER HOSE**
6. **DISCONNECT ENGINE COOLANT RESERVOIR HOSE**
7. **DISCONNECT HYDRAULIC MOTOR RETURN HOSE**



8. **REMOVE HYDRAULIC COOLING FAN**
   Remove the six bolts and hydraulic cooling fan.



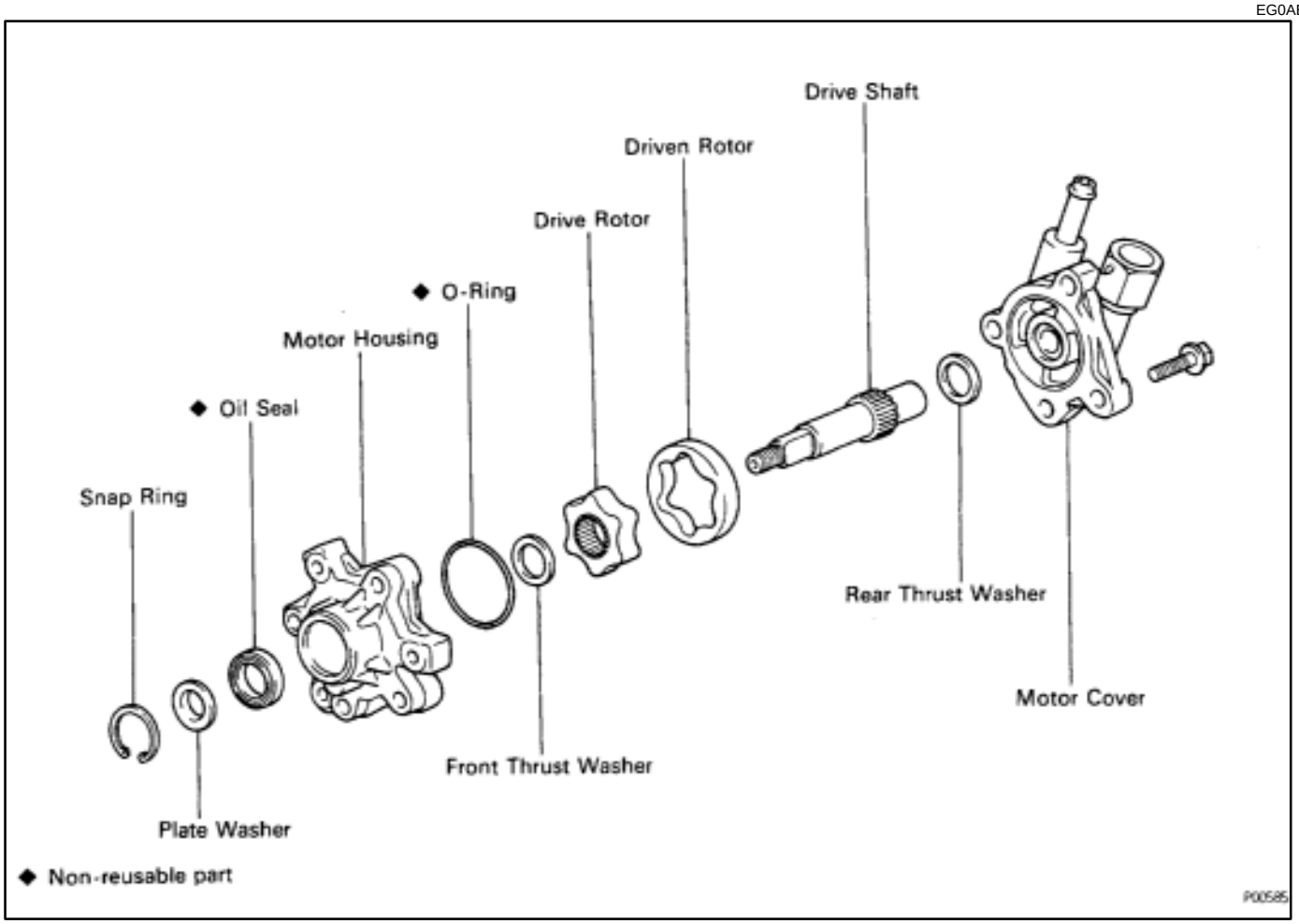
9. **REMOVE COOLING FAN FROM HYDRAULIC MOTOR**
   Loosen the fan mounting nut clockwise, and remove the nut, plate washer and fan.



10. REMOVE HYDRAULIC MOTOR FROM FAN SHROUD
Remove the three bolts and hydraulic motor.

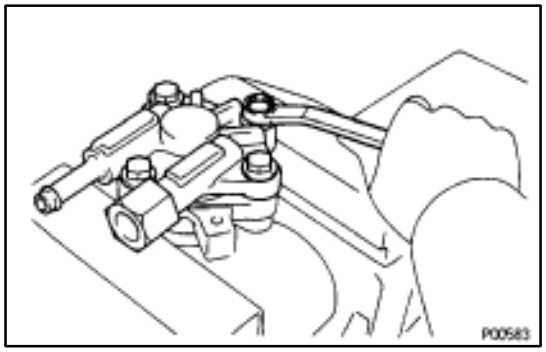
COMPONENTS

EG0AE–01



HYDRAULIC MOTOR DISASSEMBLY

EG0AF–01

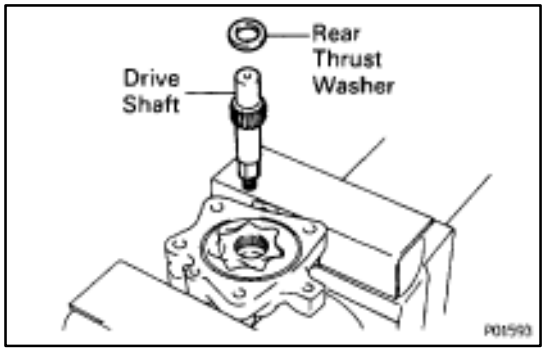


1. MOUNT MOTOR HOUSING
Slightly mount the motor housing in a vise.
NOTICE: Be careful not to damage the motor housing.

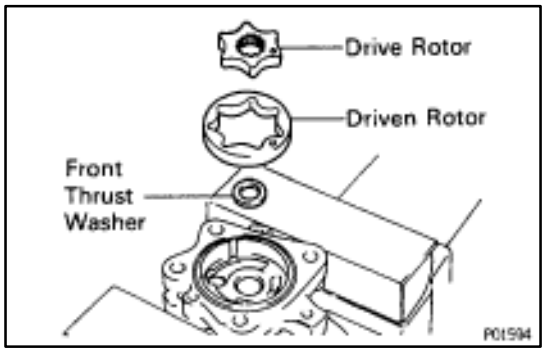
2. REMOVE MOTOR COVER

(a) Remove the four bolts and motor cover.

(b) Remove the O–ring from the motor cover.



3. REMOVE REAR THRUST WASHER AND DRIVE SHAFT

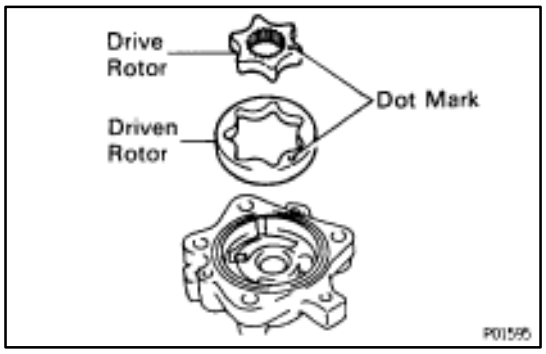


4. REMOVE DRIVE AND DRIVEN ROTORS

5. REMOVE FRONT THRUST WASHER

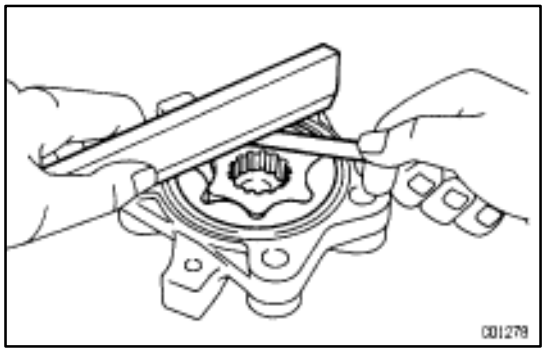
HYDRAULIC MOTOR INSPECTION

EG0AG–01



1. INSPECT DRIVE AND DRIVEN ROTORS

(a) Install the drive and driven rotor to the motor housing with the dot mark facing upward.



(b) Using a thickness gauge and precision straight edge, measure the side clearance between the rotor and precision straight edge.

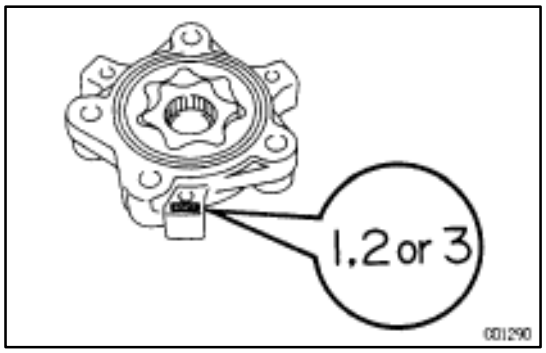
Standard side clearance:

0.01–0.04 mm (0.0004–0.0016 in.)

Maximum side clearance:

0.05 mm (0.0020 in.)

If the clearance is greater than maximum, replace the rotors as a set. If necessary, replace the motor assembly.



HINT: When replacing the rotors, select the new rotor set according to the imprinted mark on the motor housing.

Imprinted mark on housing	Rotor set
1	16906–50010
2	16906–50020
3	16906–50030

2. INSPECT OIL CLEARANCE OF DRIVE SHAFT

(a) Using a caliper gauge, measure the shaft hole inside diameter of the housing and cover.

Shaft hole inside diameter:

14.000–14.011 mm (0.5512–0.5516 in.)

(b) Using a micrometer, measure the drive shaft diameter.

Shaft diameter:

13.973–13.984 mm (0.5501–0.5506 in.)

(c) Subtract the drive shaft diameter measurement from the shaft hole diameter measurement.

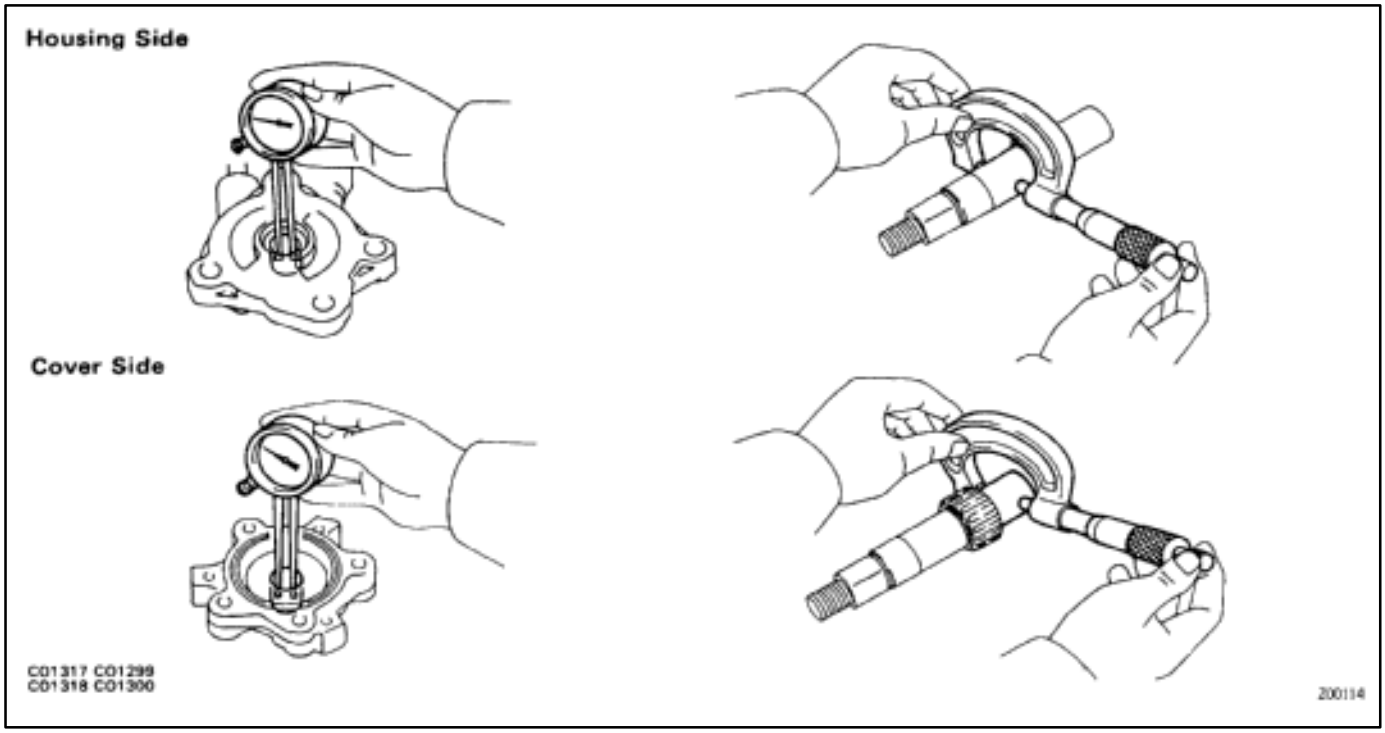
Standard clearance:

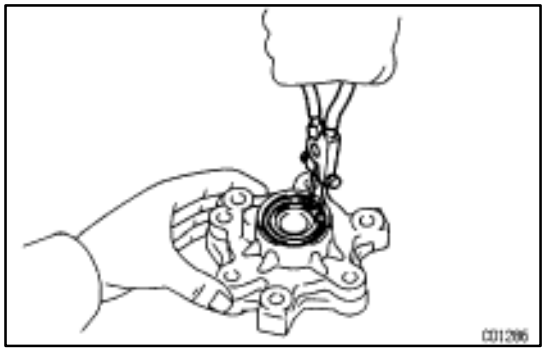
0.16–0.038 mm (0.0006–0.0015 in.)

Maximum clearance:

0.04 mm (0.0016 in.)

If the clearance is greater than maximum. replace the shaft. If necessary, replace the motor assembly.



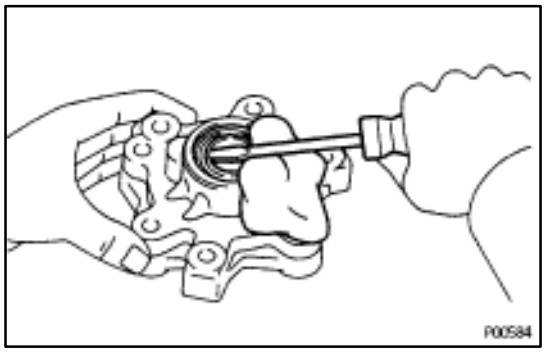


OIL SEAL REPLACEMENT

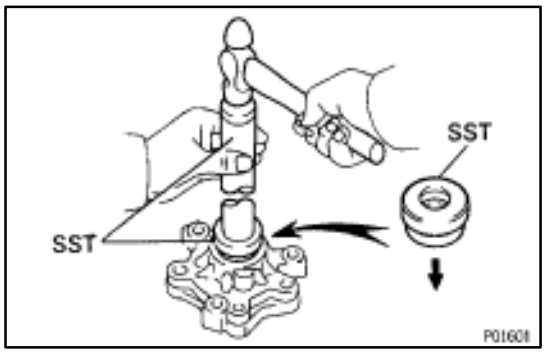
EG0AH–01

1. REMOVE OIL SEAL

(a) Using snap ring pliers, remove the snap ring and plate washer.

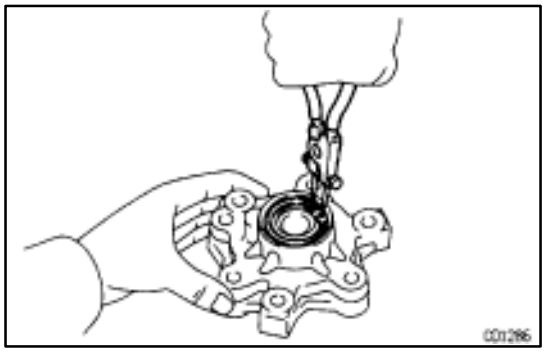


(b) Using a screwdriver, pry out the oil seal.
NOTICE: Be careful not to damage the housing.



2. INSTALL OIL SEAL

(a) Using SST, and a hammer, tap in a new oil seal to a depth of 4.5–5.5 mm (0.177–0.217 in.) from the housing edge.
SST 09620–30010(09627–30010,09631–00020)



(b) Using snap ring pliers, install the plate washer and snap ring.
(c) Apply fluid to the oil seal lip.

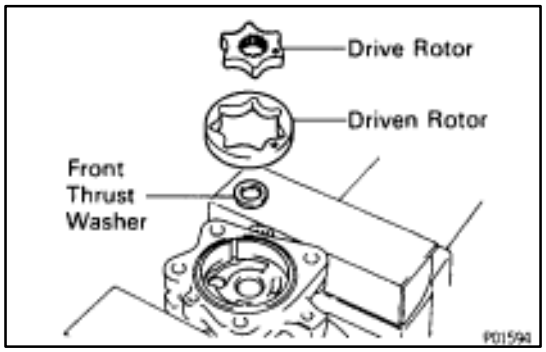
HYDRAULIC MOTOR ASSEMBLY

EG0AJ–01

(See page EG–270)

HINT:

- Throughly clean all parts to be assembled.
- Before installing the parts, apply new fluid to all sliding and rotating surfaces.



1. MOUNT MOTOR HOUSING

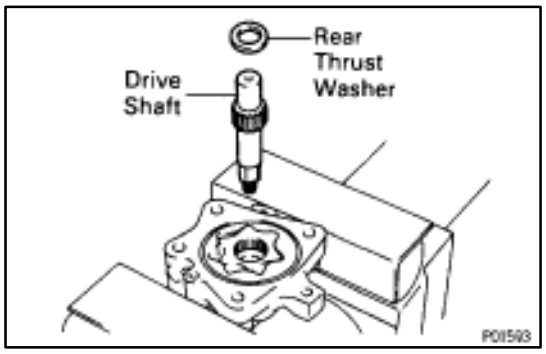
Slightly mount the motor housing in a vise.

NOTICE: Be careful not to damage the motor housing.

2. INSTALL FRONT THRUST WASHER

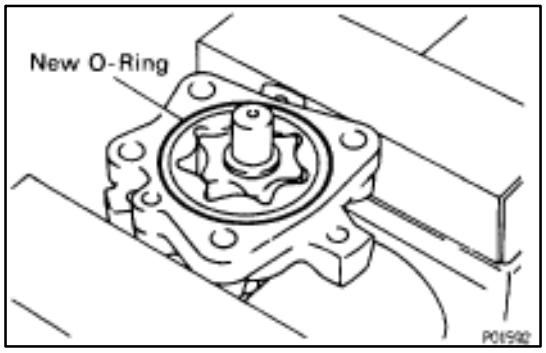
3. INSTALL DRIVEN AND DRIVE ROTORS

Install the drive and driven rotors with the dot mark facing upward.



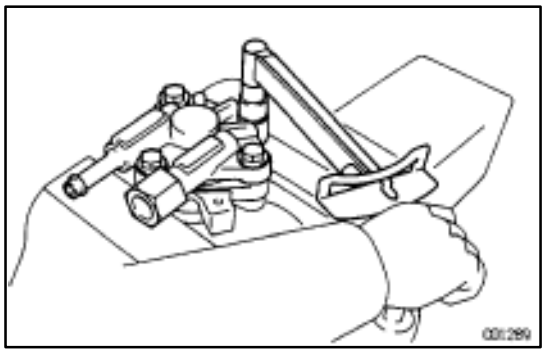
4. INSTALL DRIVE SHAFT

5. INSTALL REAR THRUST WASHER



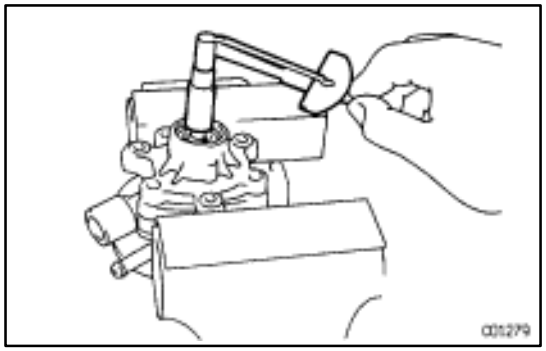
6. INSTALL MOTOR COVER

(a) Install a new O–ring to the motor housing groove.



(b) Install the motor cover with the four bolts.

Torque: 28 N·m (200 kgf·cm, 21 ft·lbf)



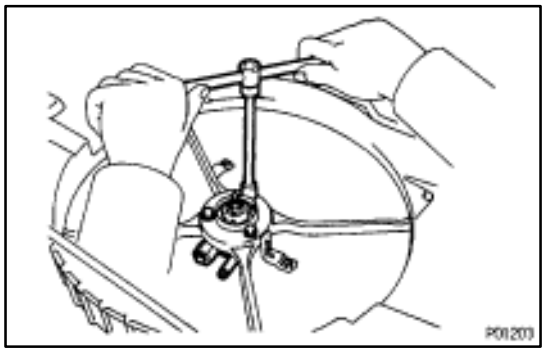
7. INSPECT DRIVE SHAFT PRELOAD

(a) Check that the drive shaft rotates smoothly without abnormal noise.

(b) Temporarily install the pulley nut, and check the rotating torque.

Rotating torque:

0.3 N·m (3.0 kgf·cm, 2.6 in.·lbf)



HYDRAULIC MOTOR INSTALLATION

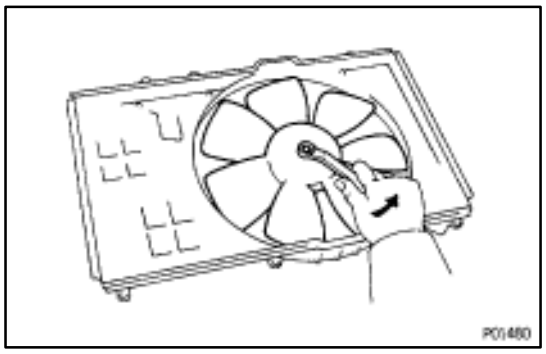
EG0AK–01

(See page EG–268)

1. INSTALL HYDRAULIC MOTOR TO FAN SHROUD

Install the hydraulic motor with the three bolts.

Torque: 4.9 N·m (50 kgf·cm, 43 in.·lbf)

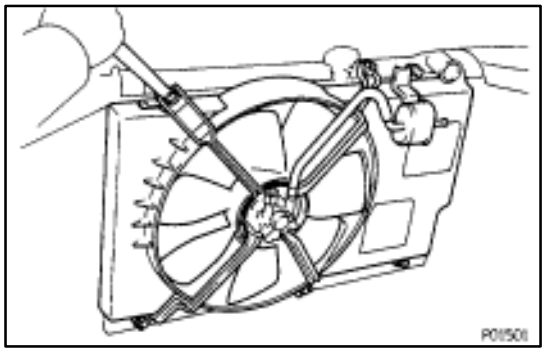


2. INSTALL COOLING FAN TO HYDRAULIC MOTOR

Install the fan with the plate washer and nut.

Tighten the nut by turning it counterclockwise.

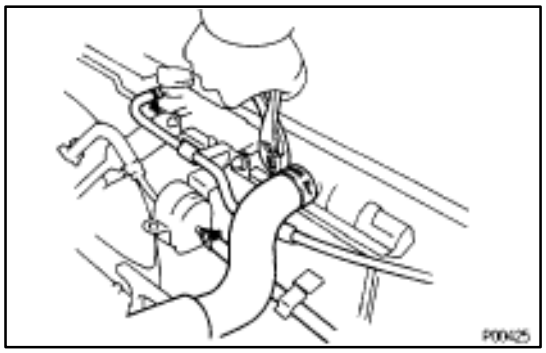
Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)



3. INSTALL HYDRAULIC COOLING FAN

Install the hydraulic cooling fan with the six bolts.

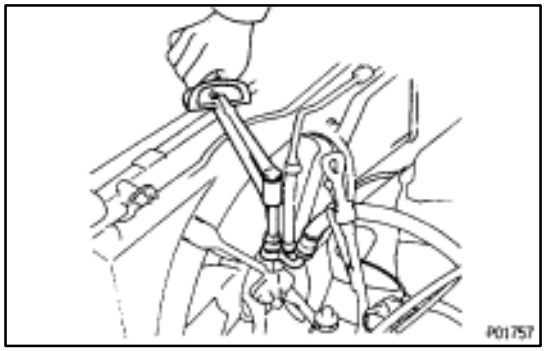
Torque: 4.9 N·m (50 kgf·cm, 43 in.·lbf)



4. CONNECT HYDRAULIC MOTOR RETURN HOSE

5. CONNECT ENGINE COOLANT RESERVOIR HOSE

6. CONNECT RADIATOR UPPER HOSE

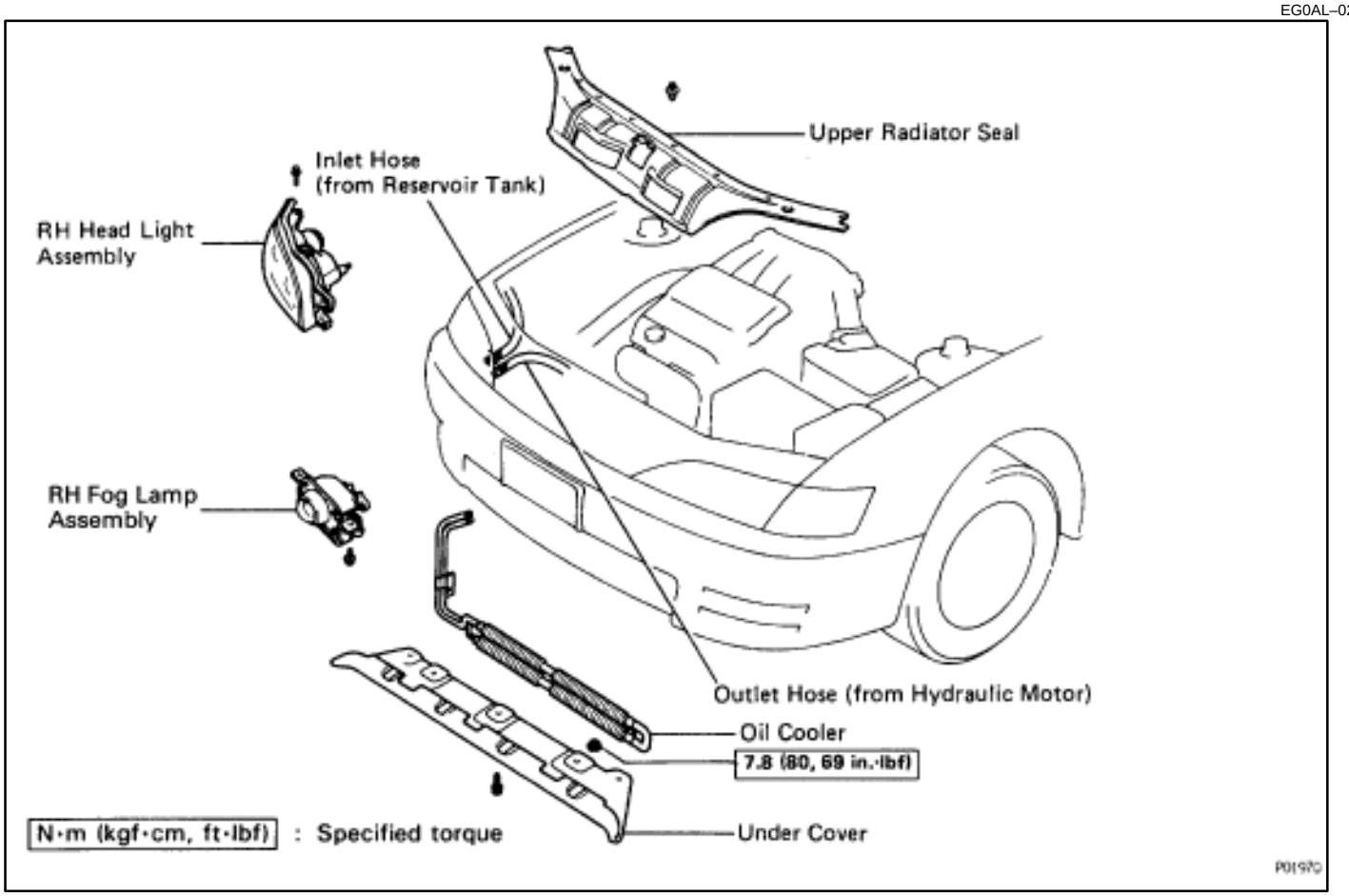


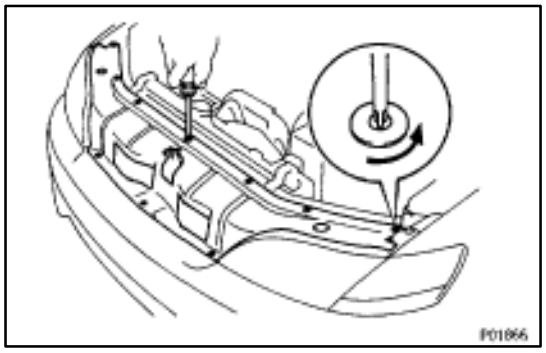
7. **CONNECT PRESSURE HOSE TO HYDRAULIC MOTOR**
   Connect the pressure hose with a new gasket and union bolt.
   Torque: 64 N·m (650 kgf·cm, 47 ft·lbf)

8. **INSTALL CRUISE CONTROL ACTUATOR COVER**
9. **FILL WITH ENGINE COOLANT**
   (See page EG–244)
10. **FILL PS RESERVOIR TANK WITH FLUID**
    (See page EG–264)
11. **BLEED ELECTRONICALLY CONTROLLED HYDRAULIC COOLING FAN SYSTEM**
    (See page EG–265)
12. **INSPECT OIL PRESSURE OF ELECTRONICALLY CONTROLLED HYDRAULIC COOLING FAN SYSTEM**
    (See page EG–266)

OIL COOLER
OIL COOLER REMOVAL

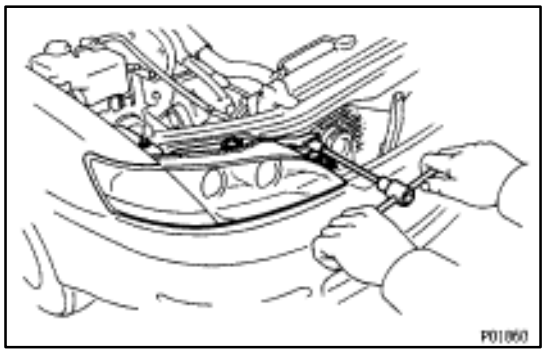
EG0AL–02





1. REMOVE UPPER RADIATOR SEAL

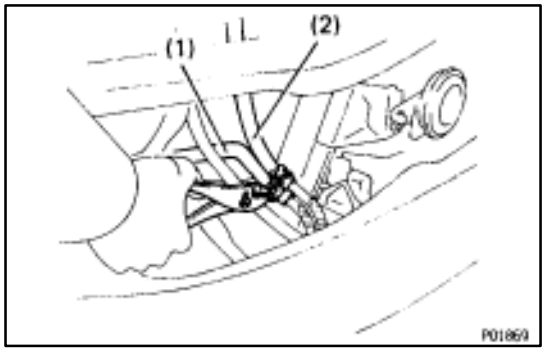
Remove the ten clips and radiator seal.



2. REMOVE RH HEADLIGHT ASSEMBLY

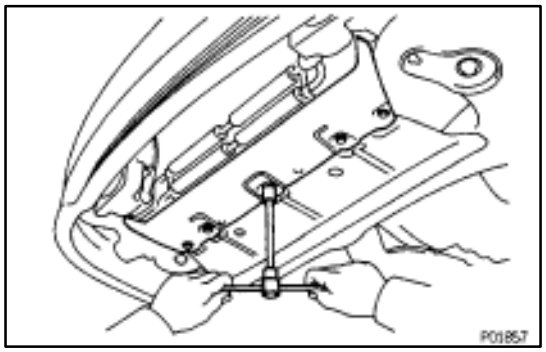
(a) Remove the three bolts.

(b) Disconnect the three connectors and remove the headlight assembly.



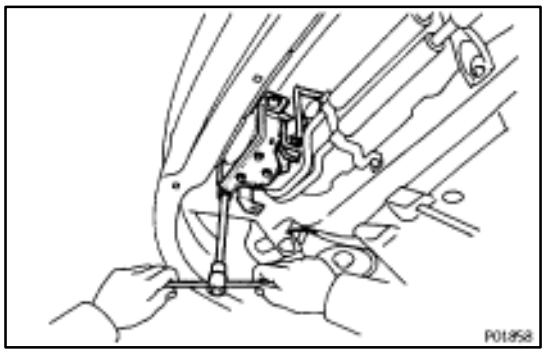
3. DISCONNECT HOSES FROM OIL COOLER

Disconnect the following hoses:
(1) Outlet hose (to reservoir tank)
(2) Inlet hose (from hydraulic motor)



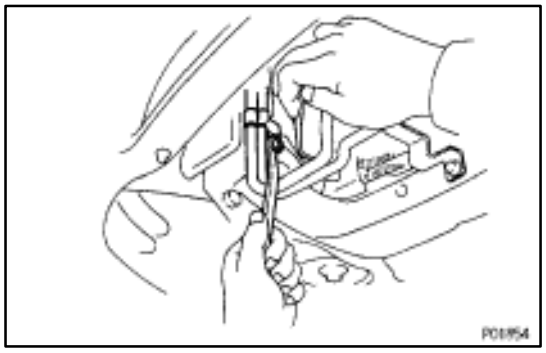
4. REMOVE UNDER COVER

Remove the five bolts and under cover.



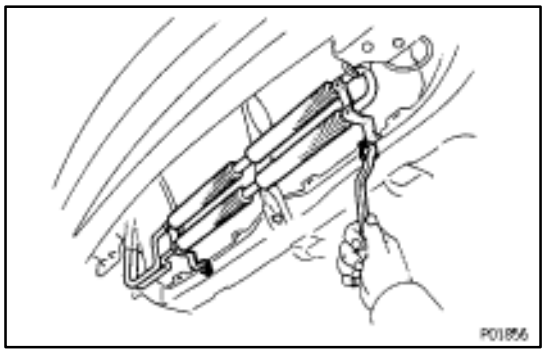
5. REMOVE RH FOG LAMP ASSEMBLY

(a) Remove the two bolts.
(b) Disconnect the connector and remove the fog lamp assembly.

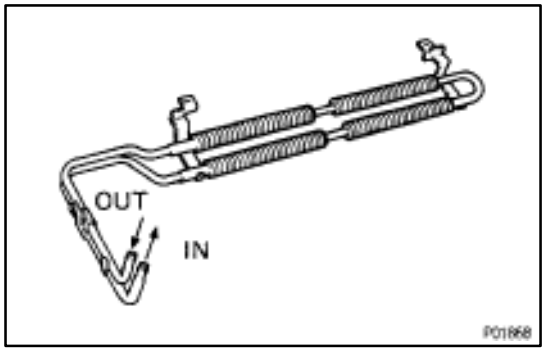


6. REMOVE OIL COOLER

(a) Pull aside the shroud to expose the bolt in the stay. Remove the bolt.



(b) Remove the two nuts and remove the oil cooler.

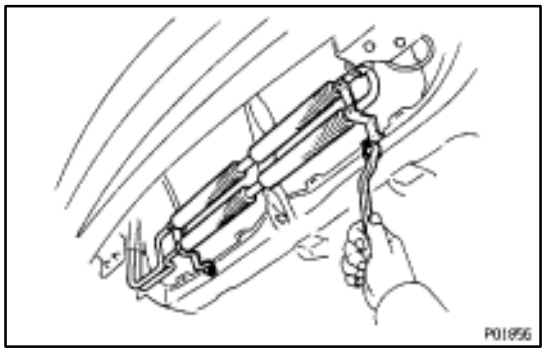


OIL COOLER INSPECTION

EG0AM–02

INSPECT OIL COOLER

Check the oil cooler for damage or clogging.
If necessary, replace the oil cooler.



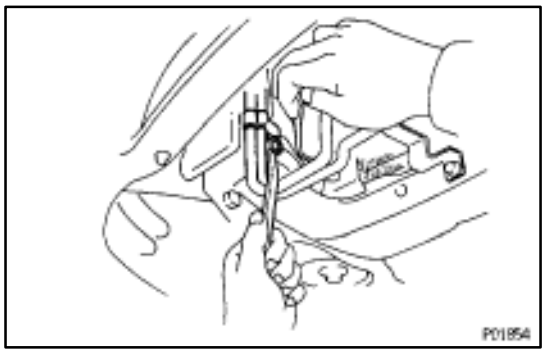
OIL COOLER INSTALLATION

EG0AN–02

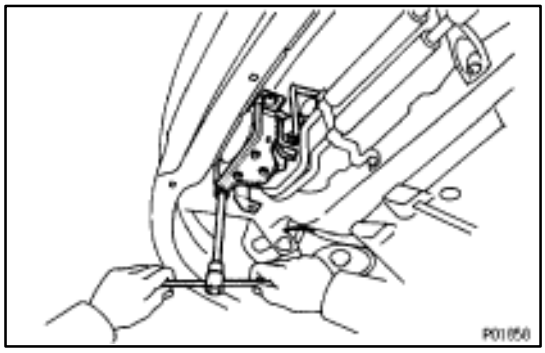
(See page EG–277)

1. INSTALL OIL COOLER

(a) Install the oil cooler with the two nuts.
Torque: 7.8 N·m (80 kgf·cm, 69 in·lbf)

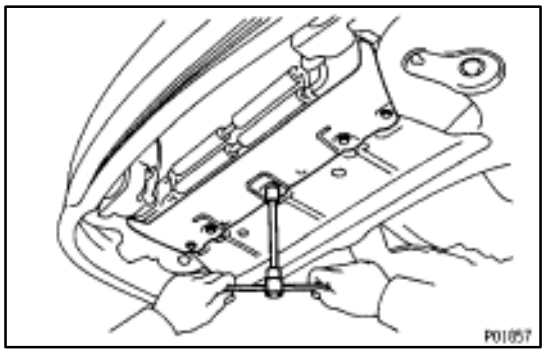


(b) Install the bolt while pulling aside the shroud.



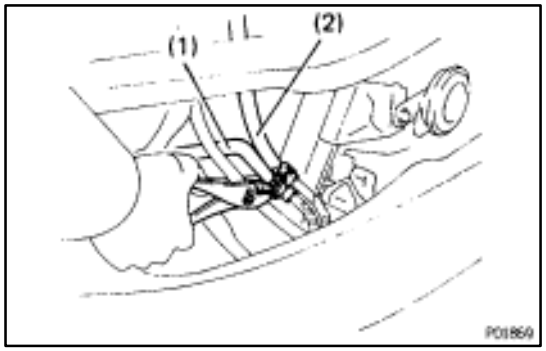
2. INSTALL RH FOG LAMP ASSEMBLY

(a) Connect the connector.
(b) Install the fog lamp assembly with the two bolts.



3. INSTALL UNDER COVER

Install the under cover with the five bolts

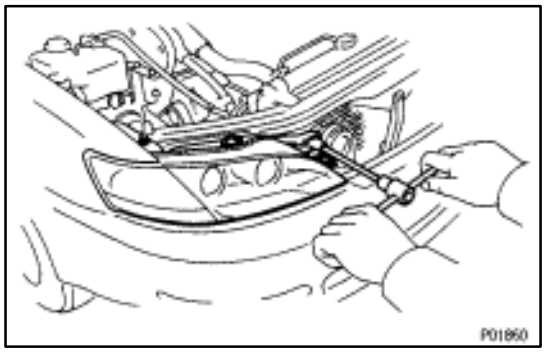


4. CONNECT HOSES TO OIL COOLER

Connect the following hoses:

(1) Outlet hose (to reservoir)

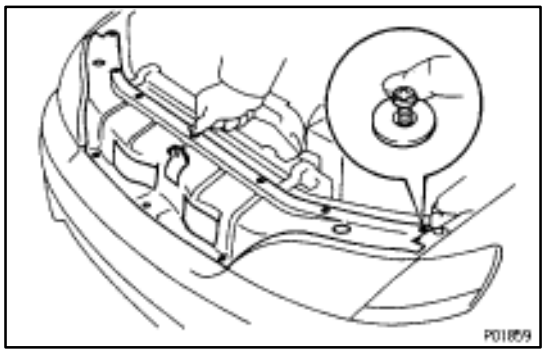
(2) Inlet hose (from hydraulic motor)



5. INSTALL RH HEADLIGHT ASSEMBLY

(a) Connect the three connectors.

(b) Install the headlight assembly with the three bolts.



6. INSTALL UPPER RADIATOR SUPPORT SEAL

Install the support seal with the ten clips.

7. FILL PS RESERVOIR TANK WITH FLUID

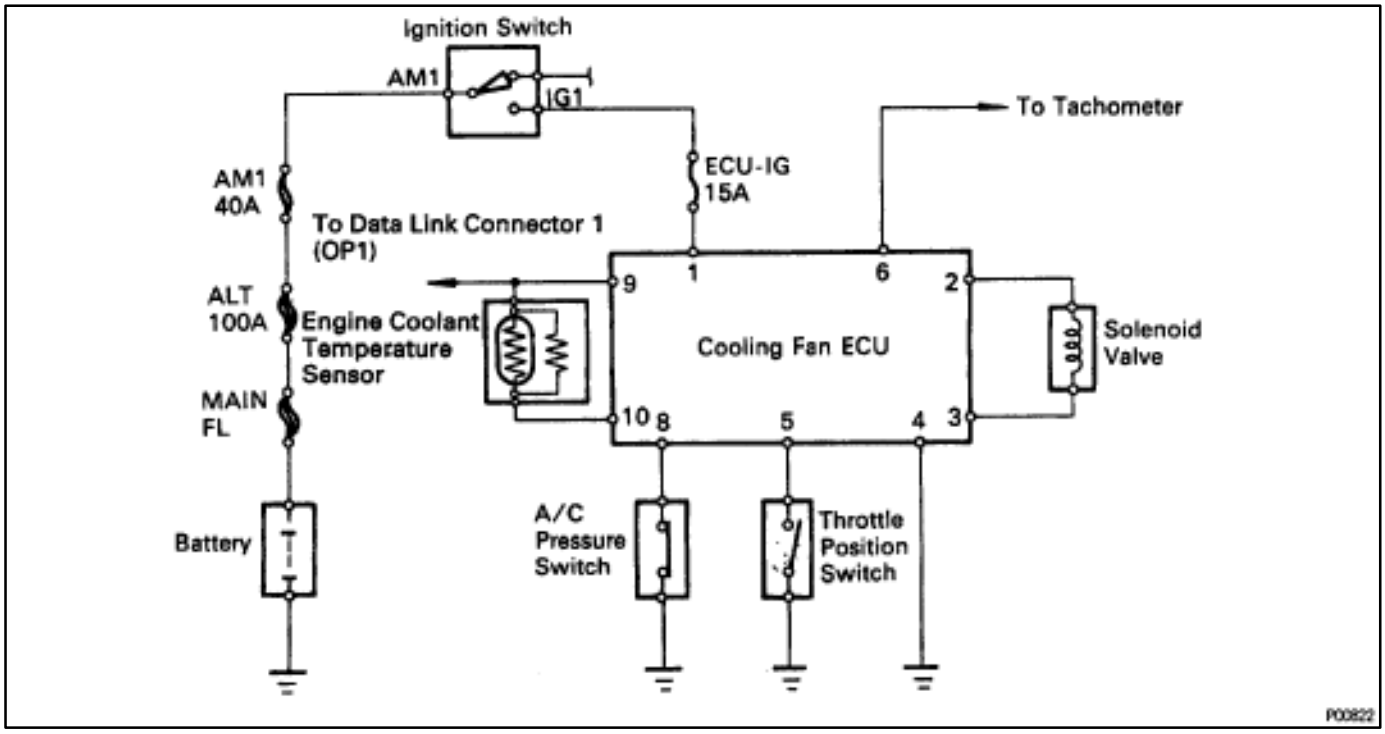
(See page EG–264)

8. BLEED ELECTRONICALLY CONTROLLED HYDRAULIC COOLING FAN SYSTEM

(See page EG–265)

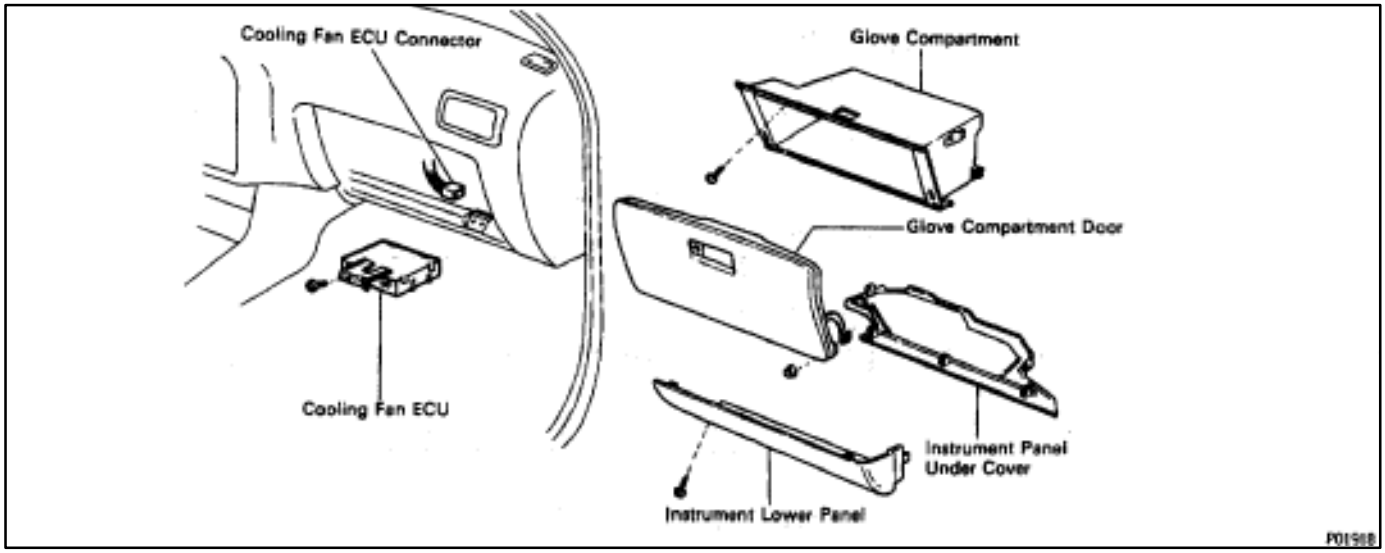
ELECTRONIC CONTROL PARTS SYSTEM CIRCUIT

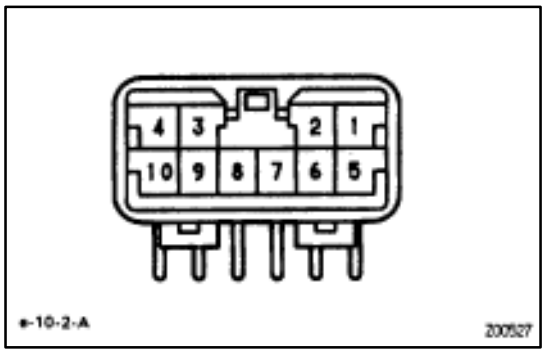
EG0AP–01



COOLING FAN ECU
COOLING FAN ECU REMOVAL AND INSTALLATION

EG0AQ–01





COOLING FAN ECU INSPECTION

EG0AR–01

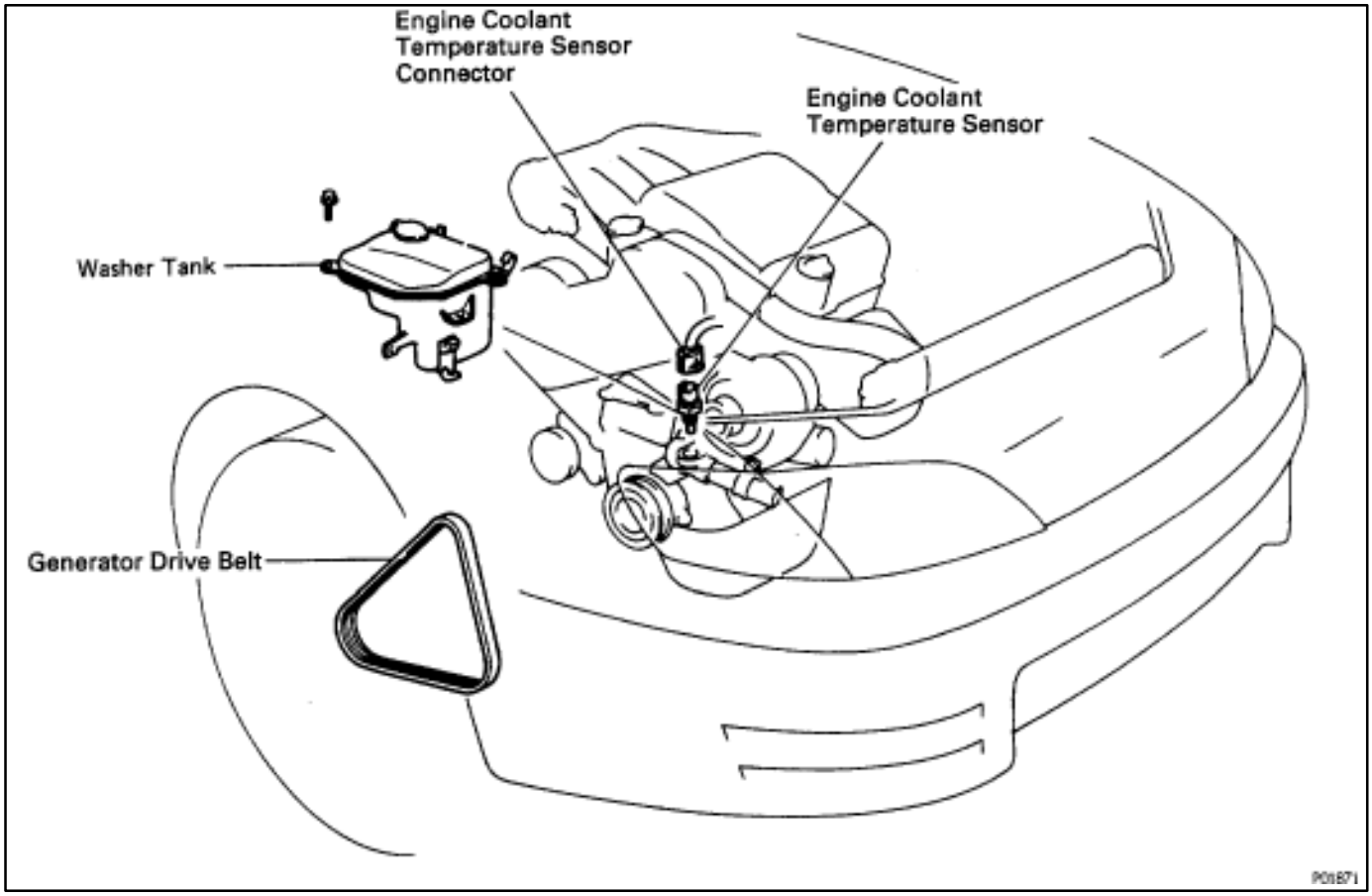
INSPECT COOLING FAN ECU

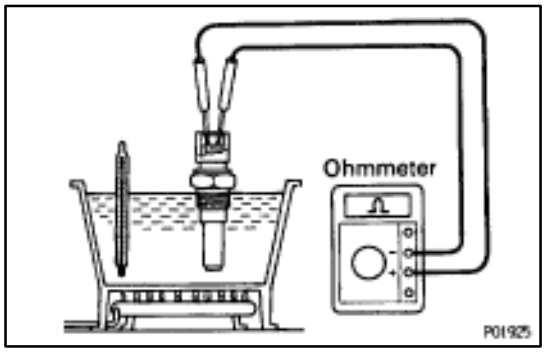
Check the connector on the wiring harness side as shown in the chart.

Check for	Tester connection	Condition	Specified value
Voltage	1–Ground	Ignition switch ON	Battery voltage
Resistance	2–3	Solenoid valve at cold (25°C (77°F))	7.6⊕8.0 Ω
Continuity	4–Ground	–	Continuity
Continuity	5–Ground	Throttle valve open	No continuity
		Throttle valve closed	Continuity
Continuity	8–Ground	A/C pressure SW connector disconnected	No continuity
		A/C pressure SW connector connected	Continuity
Resistance	9–10	Engine coolant temperature at 80°C (176°F)	1.48–1.58 kΩ

ENGINE COOLANT WATER TEMPERATURE SENSOR
ENGINE COOLANT TEMPERATURE SENSOR REMOVAL AND INSTALLATION

EG0AS–02





INSPECT ENGINE COOLANT TEMPERATURE SENSOR

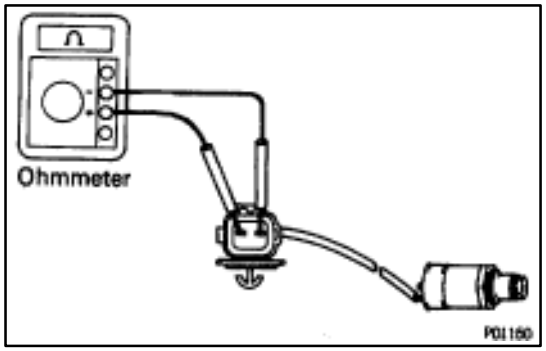
EG0AT–01

Using an ohmmeter, measure the resistance between the terminals.

Resistance:

1.48–1.58 kΩ at 80°C (176°F)

If the resistance is not as specified, replace the sensor.



SOLENOID VALVE
SOLENOID VALVE INSPECTION

EG0AU–01

INSPECT SOLENOID VALVE

Using an ohmmeter, measure the resistance between the terminals

Resistance:

7.6–8.0 Ω at 25°C (77°F)

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

SERVICE SPECIFICATIONS
SERVICE DATA

EG0AV–01

Thermostat	Valve opening pressure	80–84°C (176–183°F)
	Valve lift at 95°C (203°F)	8.5 mm (0.35 in.) or more
Radiator cap	Relief valve opening pressure	
	Radiator side (STD)	93–123 kPa (0.95–1.25 kgfcm2, 13.5–17.8 psi)
	Radiator side (Limit)	78 kPa (0.8 kgfcm2, 11.4 psi)
	Water outlet side (STD)	83–113 kPa (0.85–1.15 kgfcm2, 12.1–16.4 psi)
	Water outlet side (Limit)	69 kPa (0.7 kgfcm2, 10.0 psi)
Radiator	Plate height	7.75–8.25 mm (0.3051–0.3248 in.)
On–vehicle inspection for hydraulic–driven cooling motor	Oil pressure	981–1,961 kPa (10–20 kgfcm2, 142–284 psi)
Hydraulic motor	Rotor side clearance (STD)	0.01–0.04 mm (0.0004–0.0016 in.)
	Rotor side clearance (Limit)	0.05 mm (0.0020 in.)
	Drive shaft hole inside diameter	14.000–14.011 mm (0.5512–0.5516 in.)
	Drive shaft diameter	13.973–13.984 mm (0.5501–0.5506 in.)
	Drive shaft oil clearance (STD)	0.016–0.038 mm (0.0006–0.0015 in.)
	Drive shaft oil clearance (Limit)	0.04 mm (0.0031 in.)
	Drive shaft preload (rotating torque)	0.03 N·m (3.0 kgf·cm, 2.6 in.·lbf)
Engine coolant temp. sensor	Resistance at 80°C (176°F)	1.48–1.58 kΩ

TORQUE SPECIFICATIONS

EG0AW–01

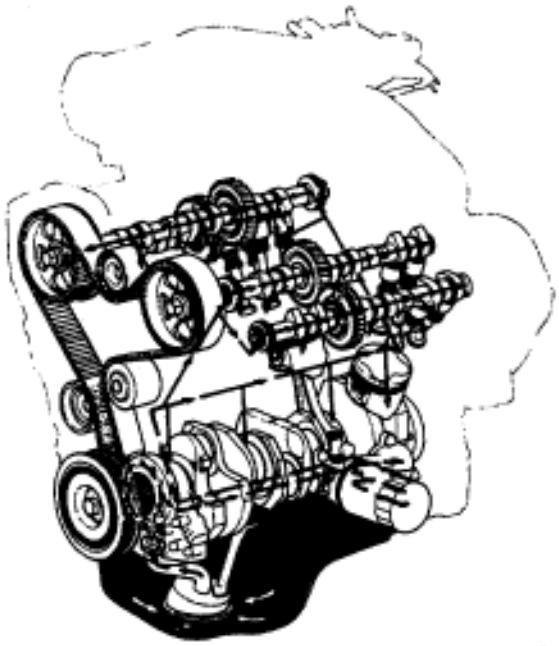
Part tightened	N·m	kgf·cm	ft·lbf
Cylinder block X Drain plug	29	300	22
Water pump X Cylinder block	20	200	14
Water inlet X Water pump	20	200	14
Water inlet pipe X Generator belt adjusting bar	20	200	14
Radiator oil cooler X Radiator lower tank	22	220	16
Pressure hose X Hydraulic motor	64	650	47
Radiator support bolt	13	130	9
Hydraulic motor housing X Motor cover	28	290	21
Hydraulic motor X Fan shroud	4.9	50	43 in.·lbf
Cooling fan X Hydraulic motor	15	150	11
Hydraulic cooling fan X Radiator	4.9	50	43 in.·lbf
Oil cooler (for hydraulic cooling fan) X Radiator lower support	7.8	80	69 in.·lbf

LUBRICATION SYSTEM

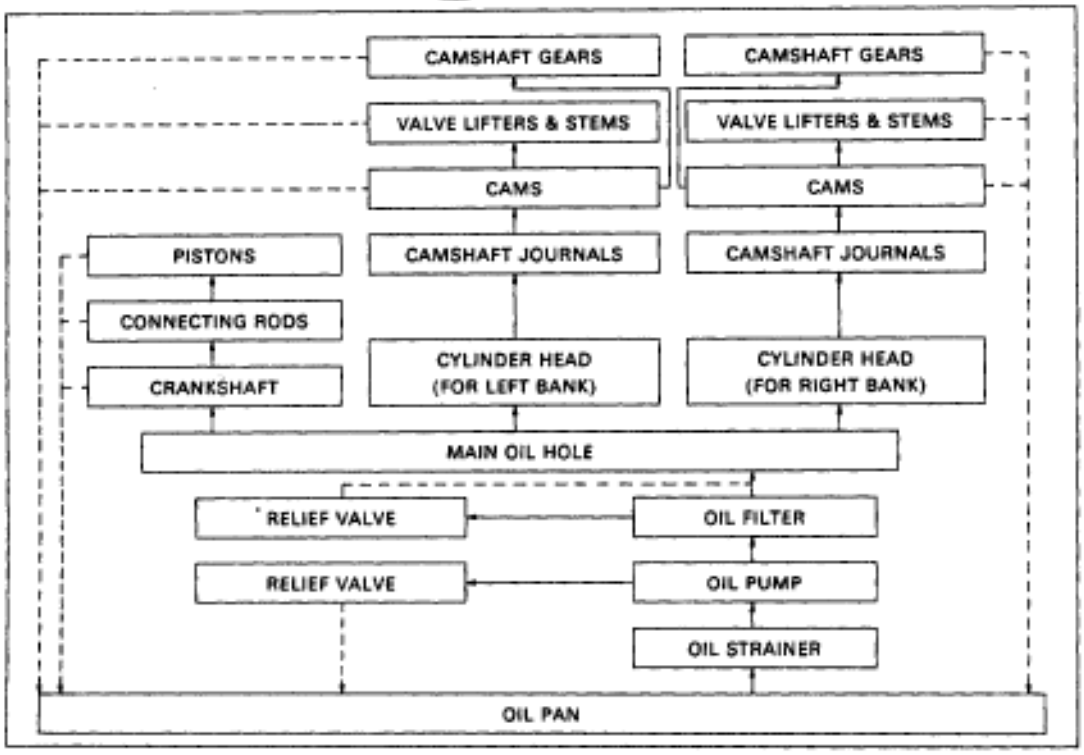
DESCRIPTION

EG090–01

A fully pressurized, fully filtered lubrication system has been adopted for this engine.



P01102



2005/1

A pressure feeding lubrication system has been adopted to supply oil to the moving parts of this engine. The lubrication system consists of an oil pan, oil pump, oil filter and other external parts which supply oil to the moving parts in the engine block. The oil circuit is shown in the illustration at the top of the previous page. Oil from the oil pan is pumped up by the oil pump. After it passes through the oil filter, it is fed through the various oil holes in the crankshaft and cylinder block. After passing through the cylinder block and performing its lubricating function, the oil is returned by gravity to the oil pan. A dipstick on the center left side of the cylinder block is provided to check the oil level.

OIL PUMP

The oil pump pumps up oil from the oil pan and feeds it under pressure to the various parts of the engine. An oil strainer is mounted in front of the inlet to the oil pump. The oil pump itself is a trochoid type pump, inside of which there is a drive rotor and a driven rotor. When the drive rotor rotates, the driven rotor rotates in the same direction, and since the axis of the drive rotor shaft is different from the center of the driven rotor, the space between the two rotors is changes as they rotate. Oil is drawn in when the space is wide and is discharged when the space in narrow.

OIL PRESSURE REGULATOR

At high engine speeds, the engine oil supplied by the oil pump exceeds the capacity of the engine to utilize it. For that reason, the oil pressure regulator works to prevent an oversupply of oil. During normal oil supply, a coil spring and valve keep the bypass closed, but when too much oil is being fed, the pressure become extremely high, overpowering the force of the spring and opening the valves. This allows the excess oil to flow through the relief valve and return to the oil pan.

OIL FILTER

The oil filter is a full flow type filter with a built–in paper filter element. Particles of metal from wear, air borne dirt, carbon and other impurities can get into the oil during use a could cause accelerated wear or sizing if allowed to circulate through the engine. The oil filter, integrated into the oil line, removes these impurities as the oil passes through it. The filter is mounted outside the engine to simplify replacement of the filter element. A relief valve is also included ahead of the filter element to relieve the high oil pressure in case that the filter element becomes clogged with impurities. The relief valve opens when the oil pressure overpowers the force of the spring. Oil passing through the relief valve by–passes the oil filter and flows directly into the main oil hole in the engine.

PREPARATION
SST (SPECIAL SERVICE TOOLS)

EG091–01

	09032–00100 Oil Pan Seal Cutter	
	09228–07500 Oil Filter Wrench	
	09309–37010 Transmission Bearing Replacer	Camshaft front oil seal
	09816–30010 Oil Pressure Switch Socket	

RECOMMENDED TOOLS

EG092–01

	09090–04000 Engine Sling Device	For suspension engine
	09200–00010 Engine Adjust Kit	

EQUIPMENT

EG093–01

Oil pressure gauge	
Precision straight edge	Oil pump
Torque wrench	

LUBRICANT

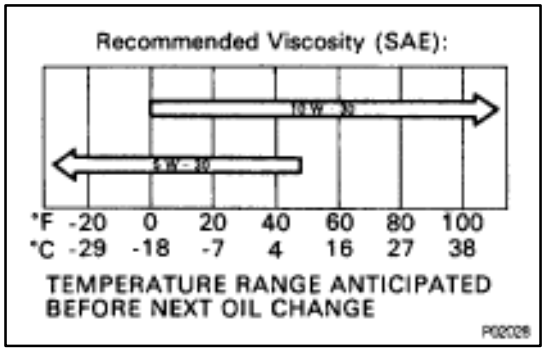
EG094–01

Item	Capacity	Classification
Engine oil		API grade SG, Energy–Conserving II, multigrade and recommended viscosity oil
Dry fill	5.0 liters (5.3 US qts, 4.4 lmp. qts)	
Drain and refill		
w/ Oil filter change	4.3 liters (4.5 US qts, 3.8 lmp. qts)	
w/o Oil filter change	4.1 liters (4.3 US qts, 3.6 lmp. qts)	

SSM (SPECIAL SERVICE MATERIALS)

EG095–01

08826–00080	Seal packing or equivalent	Oil pump, Oil pan baffle plate, Oil pan
08833–00080	Adhesive 1344, THREE BOND 1344, LOCTITE 242 or equivalent	Oil pressure switch



OIL PRESSURE CHECK

EG096–01

1. CHECK ENGINE OIL QUALITY

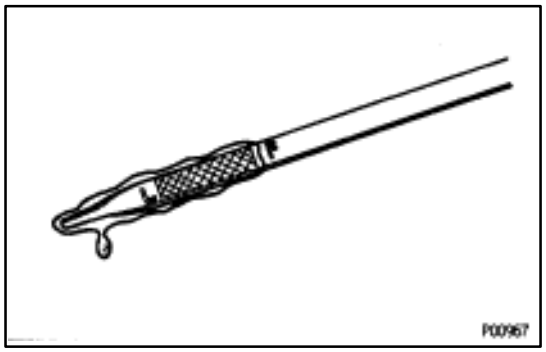
Check the oil for deterioration, entry of water, discoloring or thinning.

If the quality is poor, replace the oil.

Oil grade:

API grade SG Energy–Conserving II multigrade engine oil.

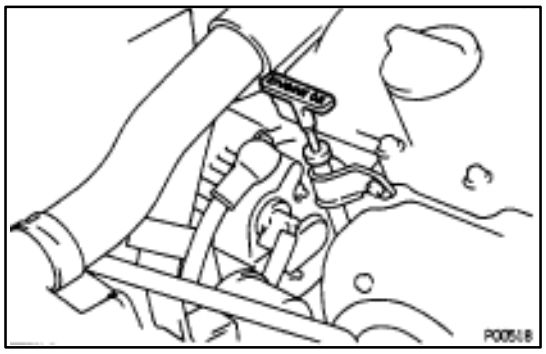
Recommended viscosity is as shown.



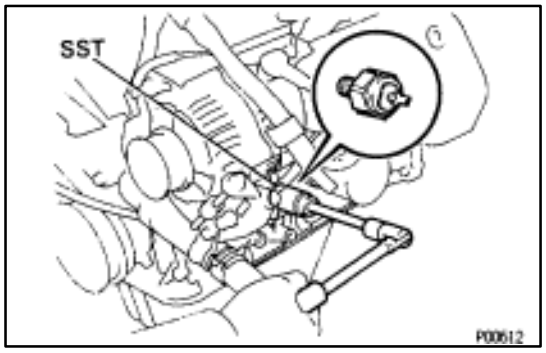
2. CHECK ENGINE OIL LEVEL

The oil level should be between the ”L” and ”F” marks on the dipstick.

If low, check for leakage and add oil up to ”F” mark.

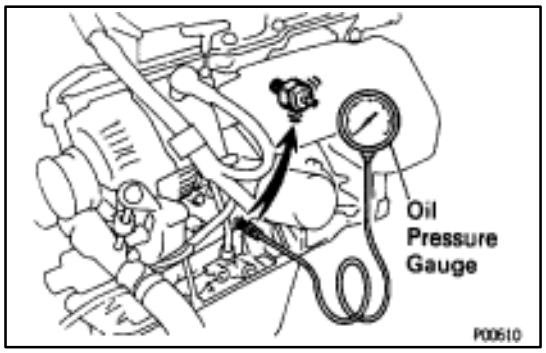


NOTICE: Install the oil dipstick facing the direction shown in the illustration.



3. REMOVE OIL PRESSURE SWITCH, AND INSTALL OIL PRESSURE GAUGE

(a) Using SST, remove the oil pressure switch.
SST 09816–30010



(b) Install the oil pressure gauge.

4. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

5. CHECK OIL PRESSURE

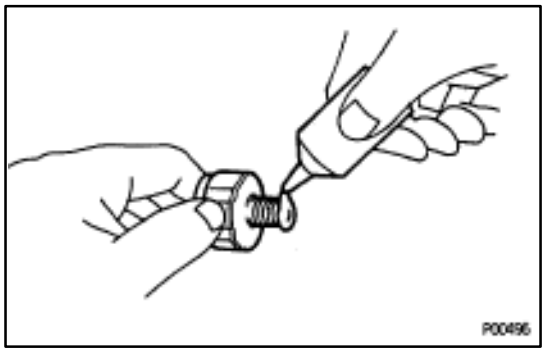
Oil pressure:

At idle

29 kPa (0.3 kgf/cm^2, 4.3 psi) or more

At 3,000 rpm

294–539 kPa (3.0–5.5 kgf/cm^2, 43–78 psi)



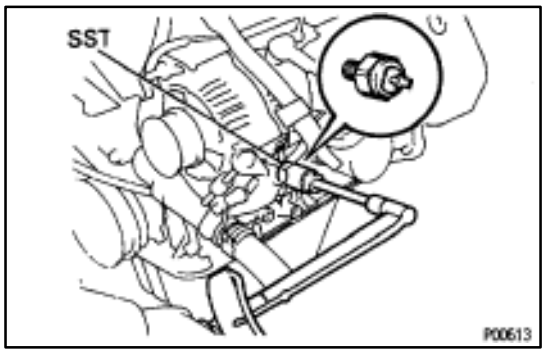
6. REMOVE OIL PRESSURE GAUGE AND REINSTALL OIL PRESSURE SWITCH

(a) Remove the oil pressure gauge.

(b) Apply adhesive to two or three threads of the oil pressure switch.

Adhesive:

Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent



(c) Using SST, reinstall the oil pressure switch.

SST 09816–30010

Torque: 14 N·m (150 kgf·cm, 11 ft·lbf)

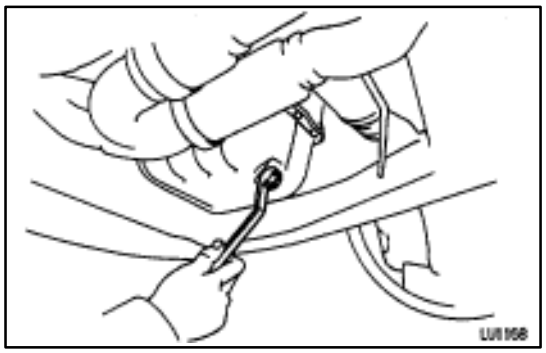
7. START ENGINE AND CHECK FOR LEAKS

OIL AND FILTER REPLACEMENT

EG097–01

CAUTION:

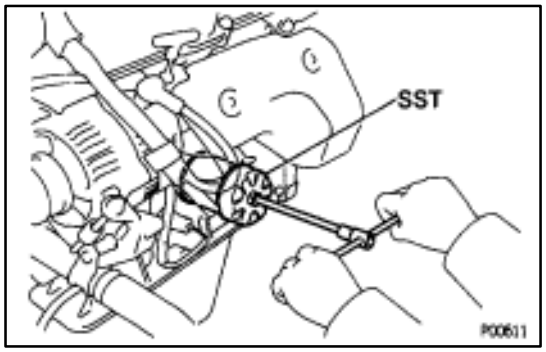
- **Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.**
- **Care should be taken, therefore, when changing engine, oil to minimize the frequency and length of time your skin is exposed to used engine oil. Protective clothing and gloves that cannot be penetrated by oil should be worn. The skin should be thoroughly washed with soap and water, or use waterless hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.**
- **In order to preserve the environment, used oil and used oil filter must be disposed of only at designated disposal sites.**



1. DRAIN ENGINE OIL

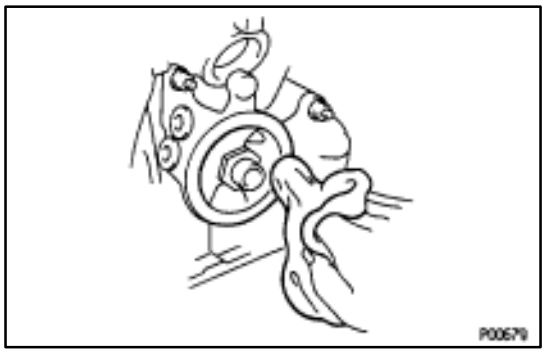
(a) Remove the oil filler cap.

(b) Remove the oil drain plug, and drain the oil into a container.

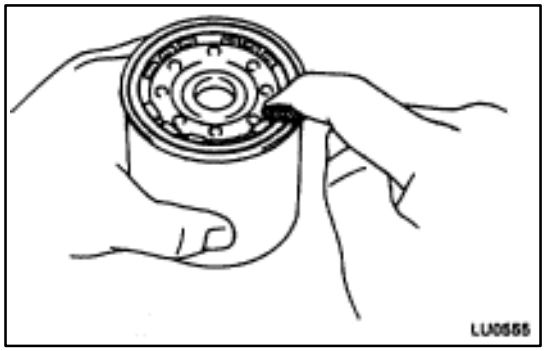


2. REPLACE OIL FILTER

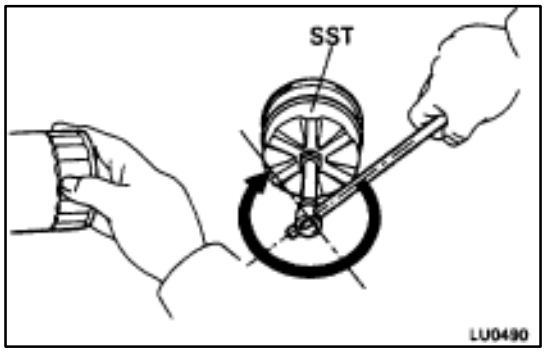
(a) Using SST, remove the oil filter.
SST 09228–07500



(b) Check and clean the oil filter installation surface.



(c) Apply clean engine oil to the gasket of a new oil filter.



(d) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.
(e) Using SST, tighten it an additional 3/4 turn.
SST 09228–07500

3. FILL WITH ENGINE OIL

(a) Clean the install the oil drain plug with a new gasket.
Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)

(b) Fill with new engine oil (API grade SG Energy–conserving II multigrade and recommended viscosity oil).
Capacity:
Drain and refill
w/ Oil filter change
4.3 liters (4.5 US qts, 3.8 lmp.qts)
w/o Oil filter change
4.1 liters (4.3 US qts, 3.6 lmp. qts)
Dry fill
5.0 liters (5.3 US qts, 4.4 lmp. qts)

(c) Reinstall the oil filler cap.

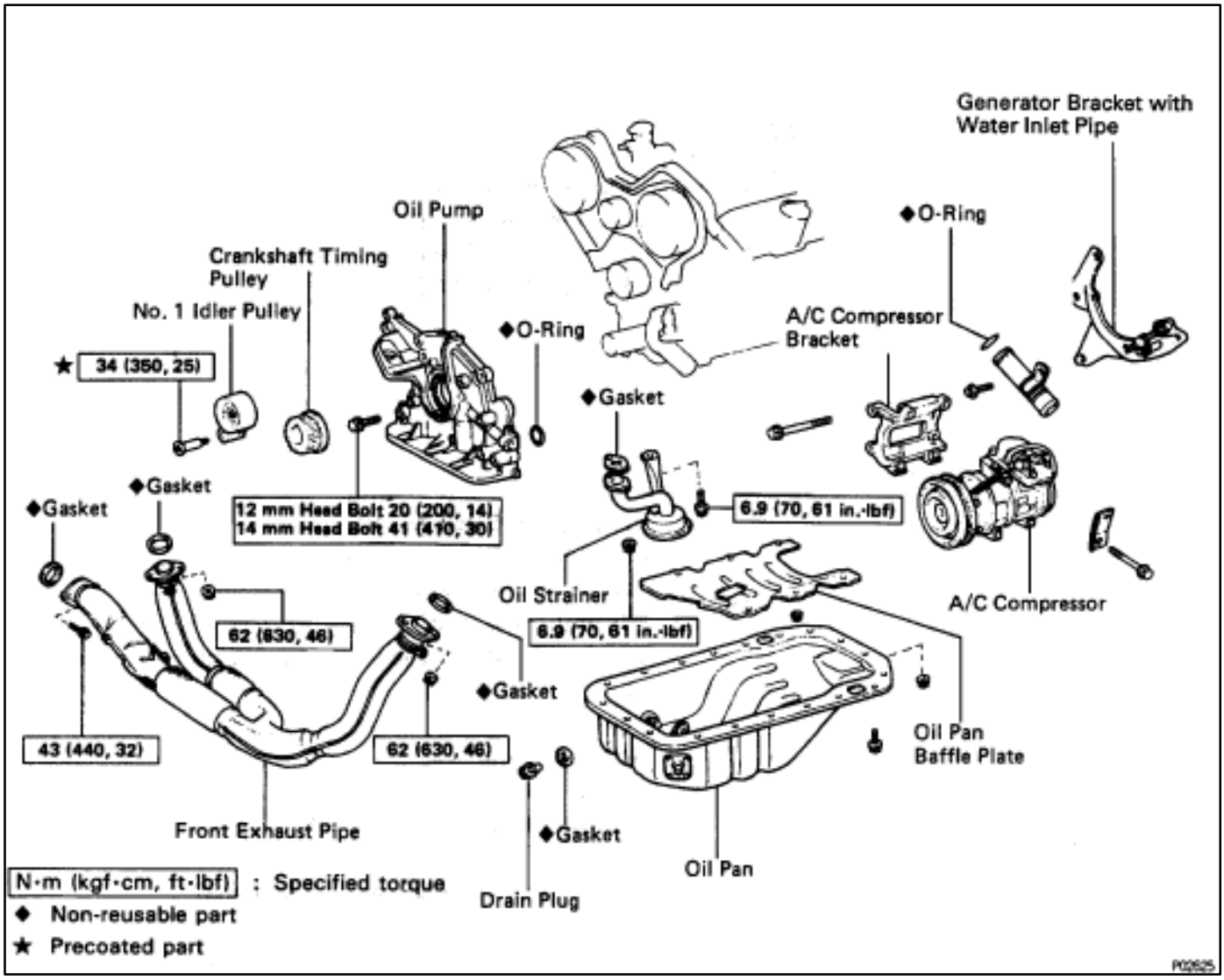
4. START ENGINE AND CHECK FOR LEAKS

5. RECHECK ENGINE OIL LEVEL (See page EG–290)

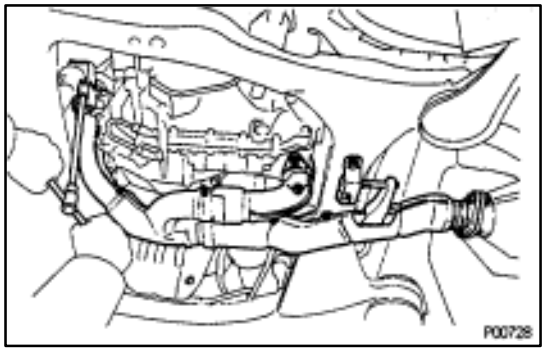
OIL PUMP
OIL PUMP REMOVAL

EG098–02

HINT: When repairing the oil pump, the oil pan and strainer should be removed and cleaned.

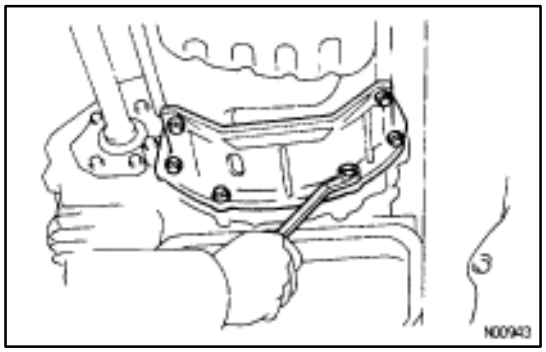


1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
   CAUTION (w / Airbag): Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.
2. **REMOVE HOOD**
3. **DRAIN ENGINE COOLANT**
4. **DRAIN ENGINE OIL**



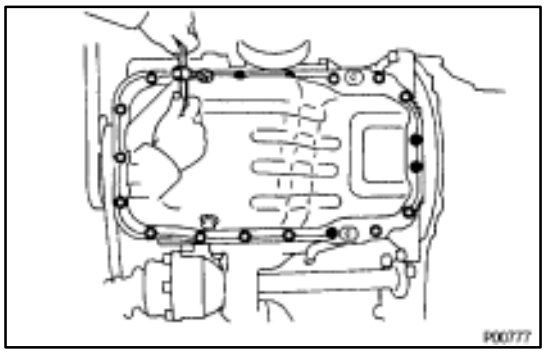
5. REMOVE FRONT EXHAUST PIPE

(a) Loosen the two bolts, and disconnect the bracket.
(b) Remove the two bolts and nuts holding the front exhaust pipe to the three–way catalyst converter.
(c) Remove the four nuts holding the front exhaust pipe to the exhaust manifolds.
(d) Remove the front exhaust pipe and gaskets.



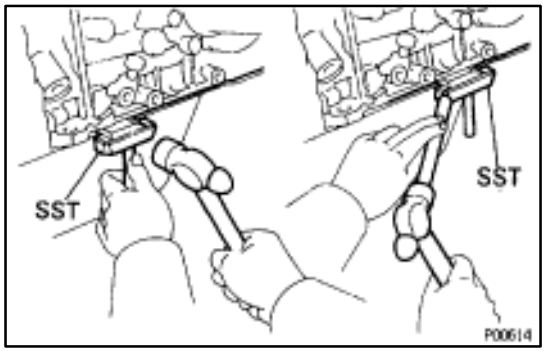
6. REMOVE STIFFENER PLATE

Remove the six bolts, stiffener plate and dust seal.

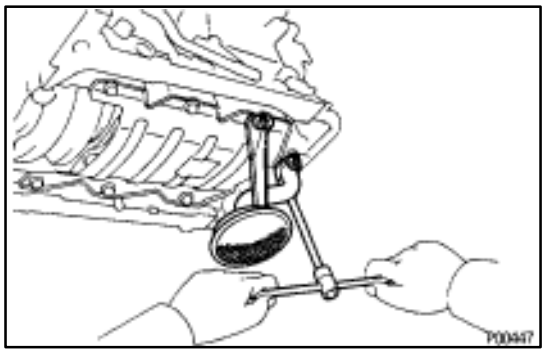


7. REMOVE OIL PAN

(a) Remove the dipstick.
(b) Remove the fifteen bolts and four nuts.

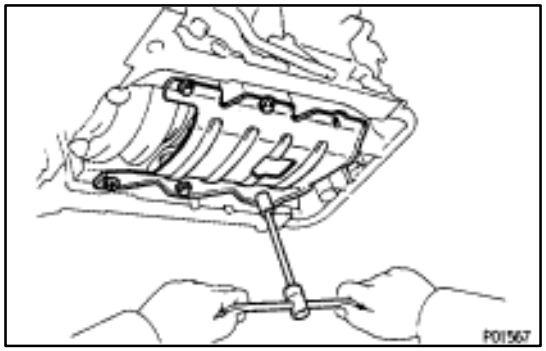


(c) Insert the blade of SST between the cylinder block and oil pan, and cut off applied sealer and remove the oil pan.
SST 09032–00100
NOTICE: Be careful not to damage the flanges of the oil pan and baffle plate.

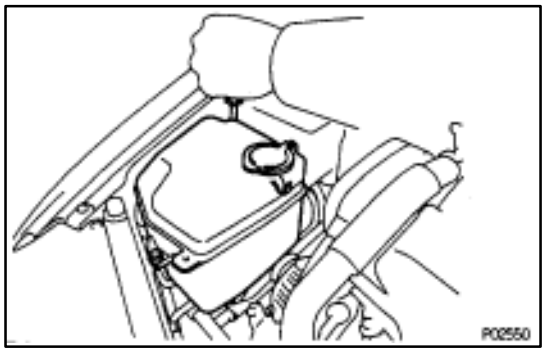


8. REMOVE OIL STRAINER

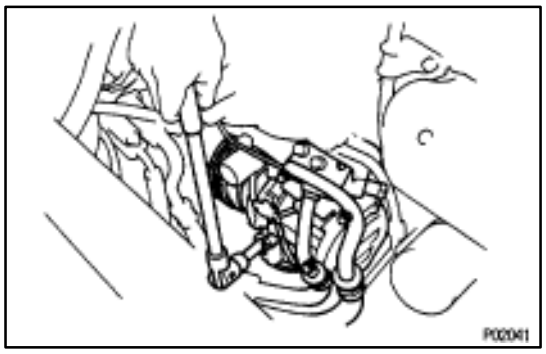
Remove the three nuts, oil strainer and gasket.



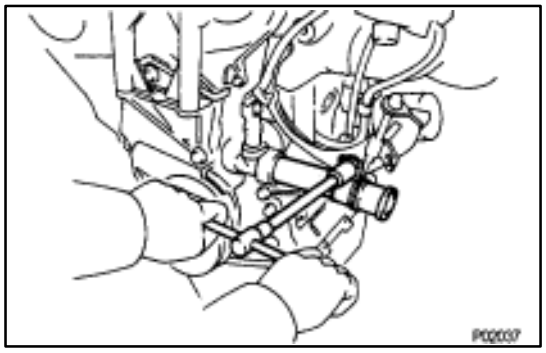
9. REMOVE OIL PAN BAFFLE PLATE
Remove the four bolts, nut and baffle plate.



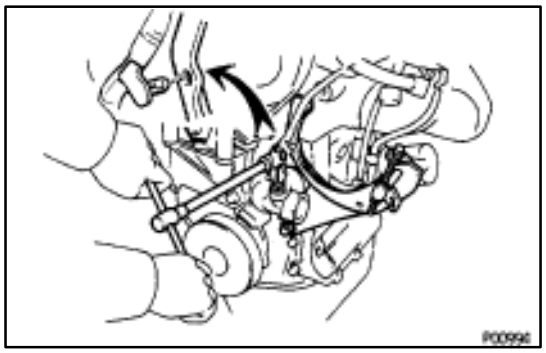
10. REMOVE WASHER TANK
(a) Remove the three washer tank mounting bolts.
(b) Disconnect the connector and hose, and remove the washer tank.
11. REMOVE GENERATOR (See CH section)
12. DISCONNECT RADIATOR LOWER HOSE



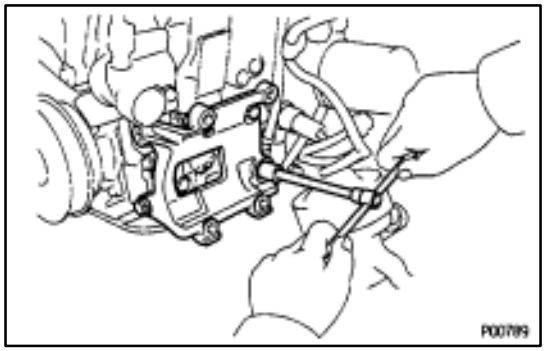
13. REMOVE A / C COMPRESSOR WITHOUT DISCONNECTING HOSES
(a) Disconnect the connector.
(b) Remove the five bolts, drive belt adjusting bar bracket and compressor.
HINT: Put aside the compressor, and suspend it to the radiator support with a string.



14. REMOVE WATER INLET PIPE
Remove the bolt and water inlet pipe.

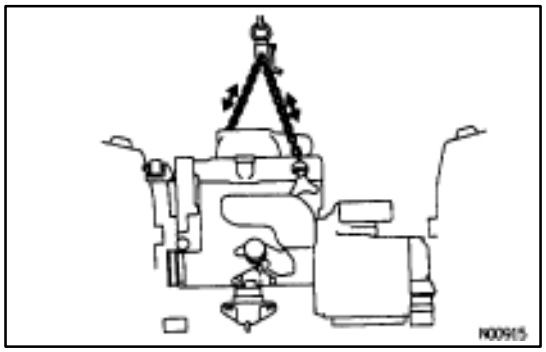


15. REMOVE GENERATOR BRACKET
Remove the two bolts and generator bracket.



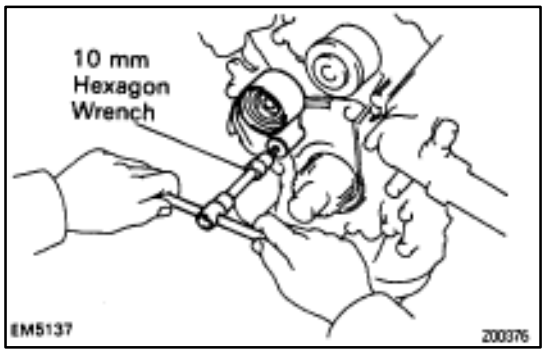
16. REMOVE A/C COMPRESSOR BRACKET

Remove the three bolts and A/C compressor bracket.



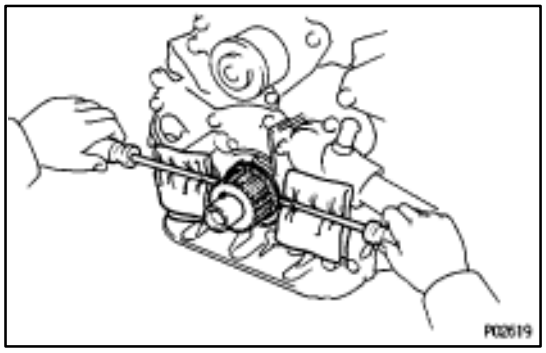
17. SUSPEND ENGINE WITH ENGINE SLING DEVICE

18. REMOVE TIMING BELT (See page EG–29)



19. REMOVE NO.1 IDLER PULLEY

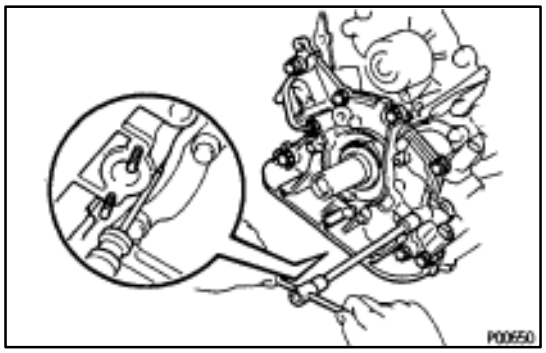
Using a 10 mm hexagon wrench, remove the bolt, idler pulley and plate washer.



20. REMOVE CRANKSHAFT TIMING PULLEY

If the pulley cannot be removed by hand, use two screwdrivers.

HINT: Position shop rags as shown to prevent damage.



21. REMOVE OIL PUMP

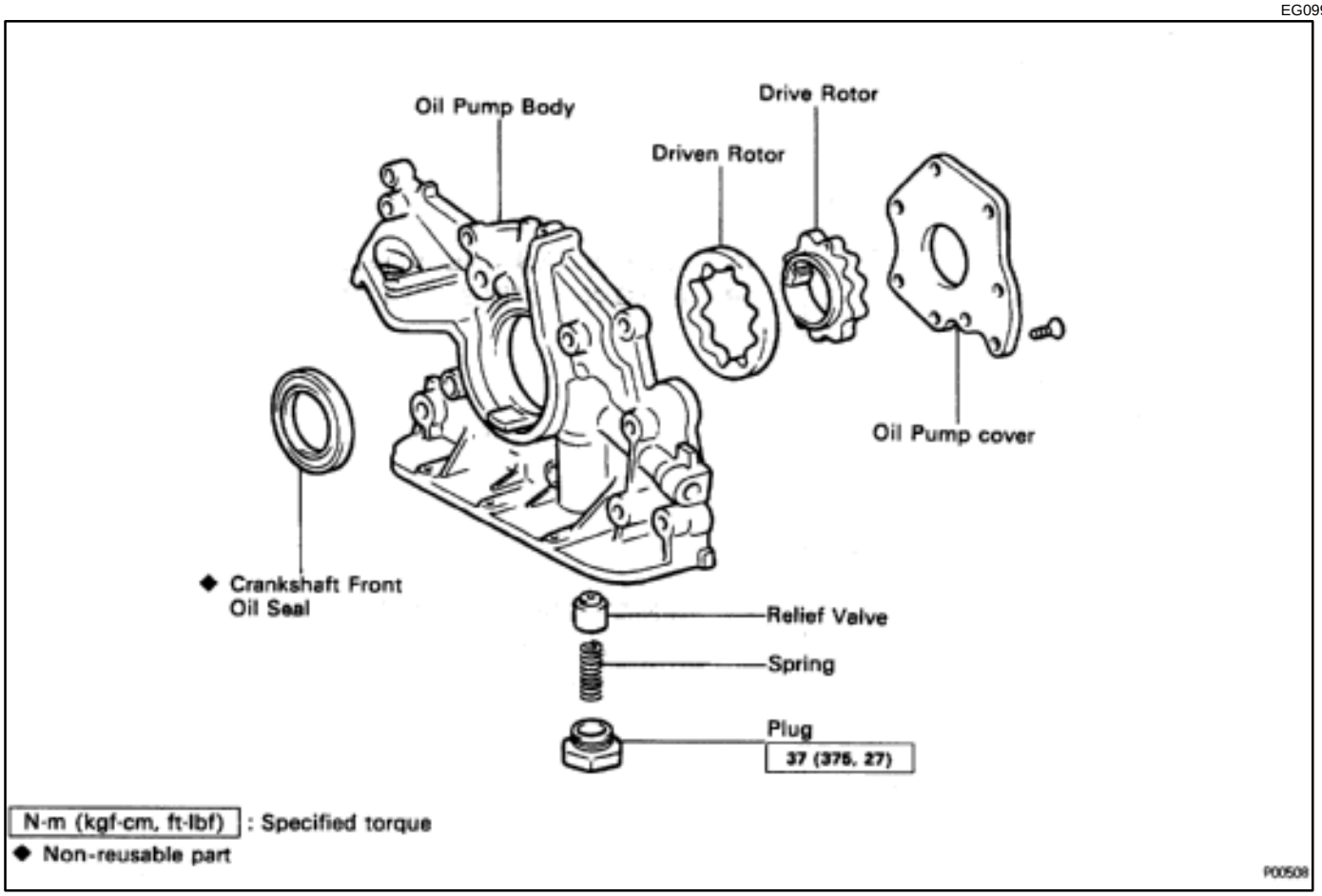
(a) Remove the nine bolts.

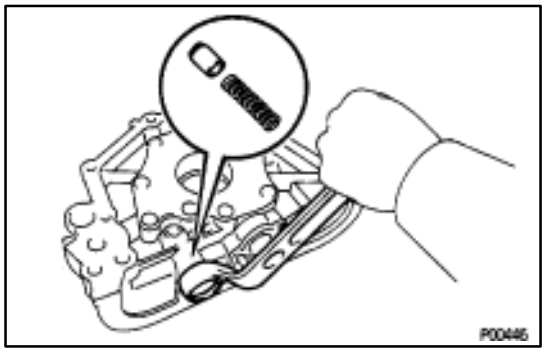
(b) Remove the oil pump by prying a screwdriver between the oil pump and main bearing cap.

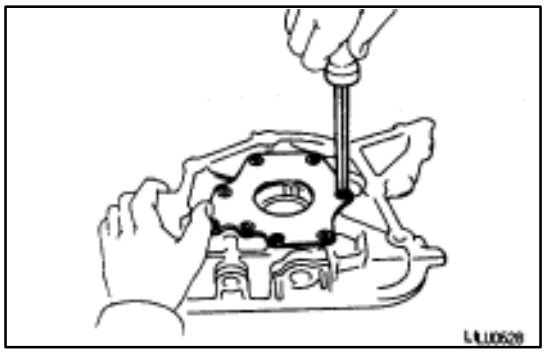
(c) Remove the O–ring.

COMPONENTS

EG099–01







OIL PUMP DISASSEMBLY

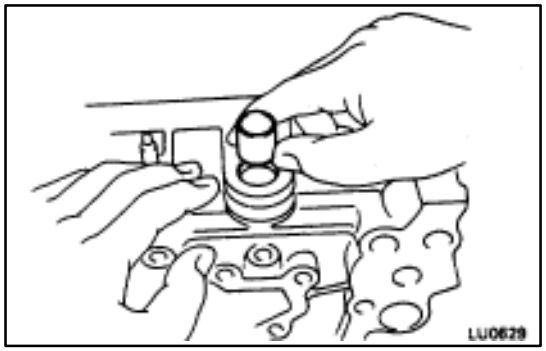
EG09A–01

1. REMOVE RELIEF VALVE

Remove the plug, spring and relief valve.

2. REMOVE DRIVE AND DRIVEN ROTORS

Remove the eight screws, pump body cover, the drive and driven rotors.



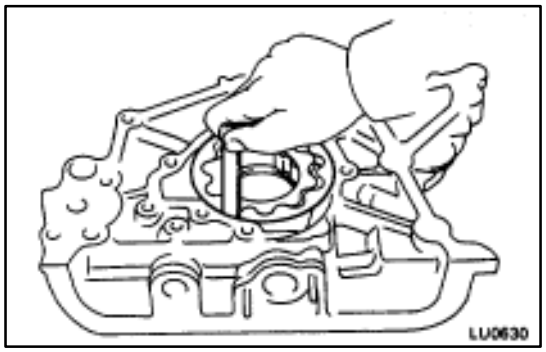
OIL PUMP INSPECTION

EG09B–01

1. INSPECT RELIEF VALVE

Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

If it does not, replace the relief valve. If necessary, replace the oil pump assembly.



2. INSPECT DRIVE AND DRIVEN ROTORS

A. Inspect rotor body clearance

Using a thickness gauge, measure the clearance between the driven rotor and body.

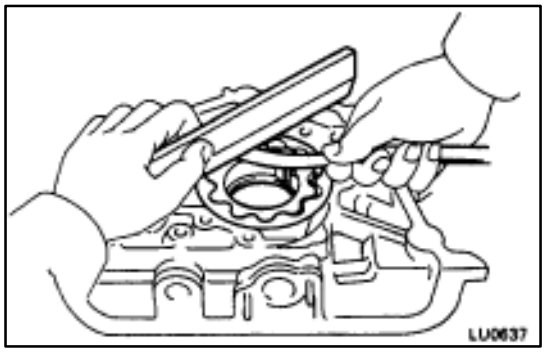
Standard body clearance:

0.100–0.175 mm (0.0039–0.0069 in.)

Maximum body clearance:

0.30 mm (0.0118 in.)

If the body clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.



B. Inspect rotor side clearance

Using a thickness gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.

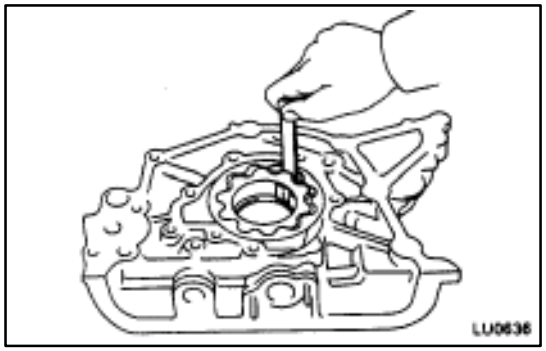
Standard side clearance:

0.030–0.090 mm (0.0012–0.0035 in.)

Maximum side clearance:

0.15 mm (0.0059 in.)

If the side clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.



C. Inspect rotor tip clearance

Using thickness gauge, measure the clearance between the drive and driven rotors.

Standard tip clearance:

0.110–0.240 mm (0.0043–0.0094 in.)

Maximum tip clearance:

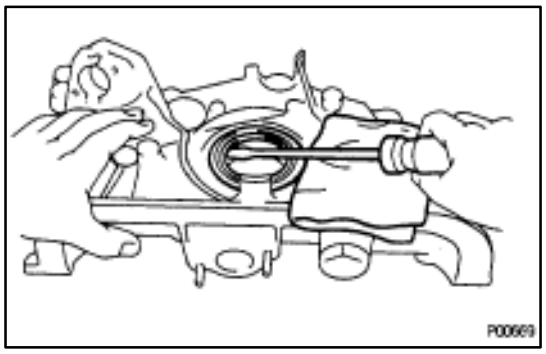
0.35 mm (0.0138 in.)

If the tip clearance is greater than maximum, replace the rotors as a set.

CRANKSHAFT FRONT OIL SEAL REPLACEMENT

EG09C–01

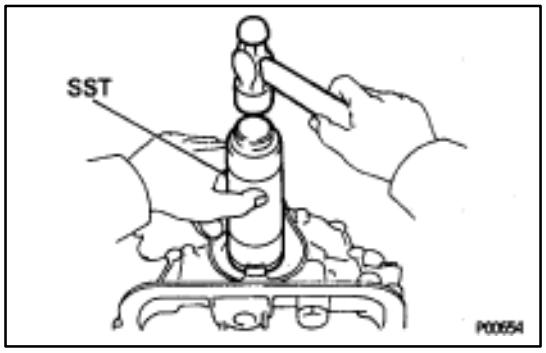
HINT: There are two methods (A and B) to replace the oil seal which are as follows:



REPLACE CRANKSHAFT FRONT OIL SEAL

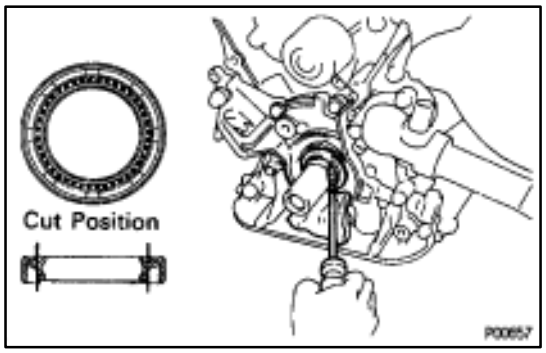
A. If oil pump is removed from cylinder block:

(a) Using a screwdriver, pry out the oil seal.



(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump case edge.
SST 09309–37010

(c) Apply MP grease to the oil seal lip.

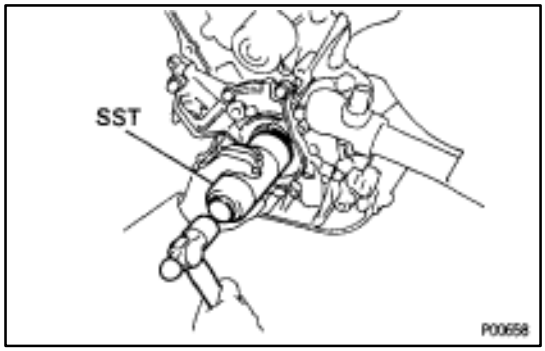


B. If oil pump is installed to the cylinder block:

(a) Using a knife, cut off the oil seal lip.

(b) Using a screwdriver, pry out the oil seal.

NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



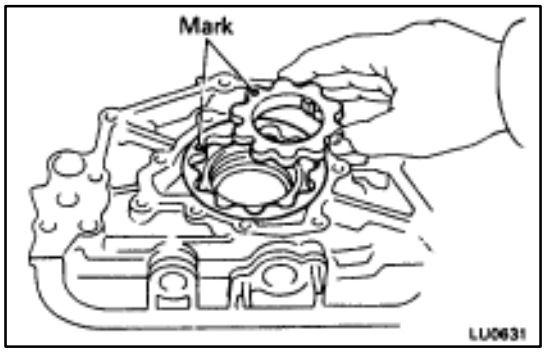
(c) Apply MP grease to a new oil seal lip.
(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump case edge.
SST 09309–37010

OIL PUMP ASSEMBLY

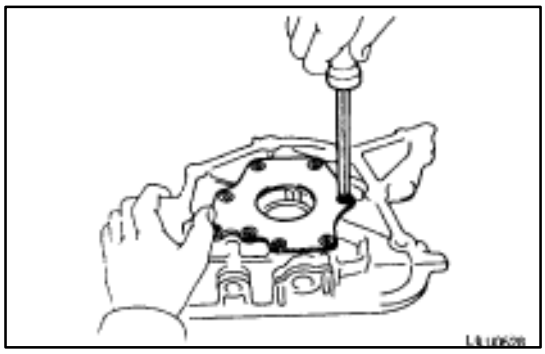
EG09D–01

(See page EG–298)

1. INSTALL DRIVE AND DRIVEN ROTORS

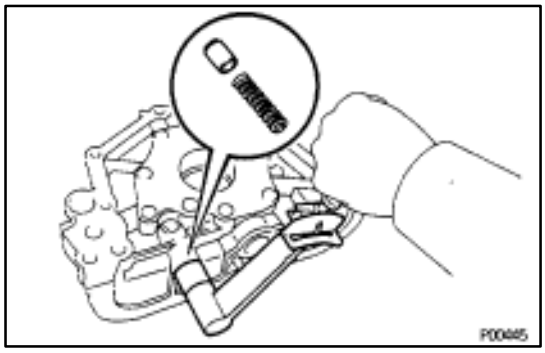


(a) Place the drive and driven rotors into pump body with the marks facing the pump body cover side.

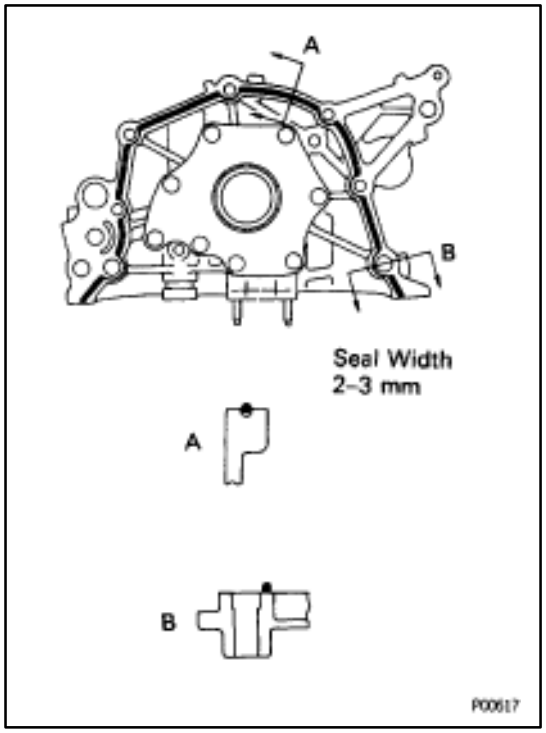


(b) Install the pump body cover with the eight screws.

2. INSTALL RELIEF VALVE



(a) Insert the relief valve and spring into the pump body hole.
(b) Install and torque the plug.
Torque: 37 N·m (375 kgf·cm, 37 ft·lbf)



OIL PUMP INSTALLATION

EG09E–02

(See page EG–294)

1. INSTALL OIL PUMP

(a) Remove any old packing (FIPG) material and be careful not to drop and oil on the contact surfaces of the oil pump and cylinder block.
- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

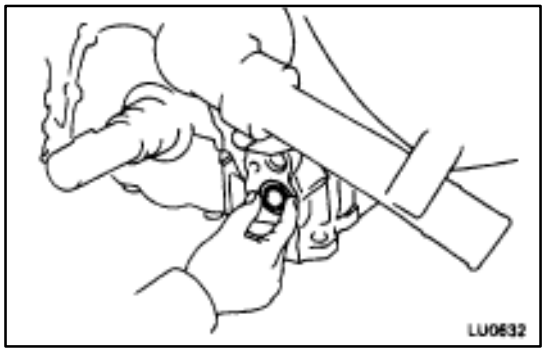
(b) Apply seal packing to the oil pump as shown in the illustration.

Seal packing:

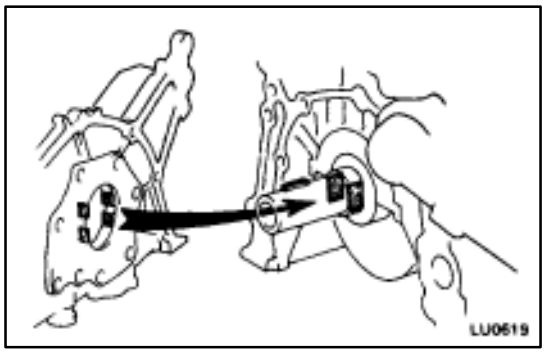
Part No. 08826–00080 or equivalent
- Install a nozzle that has been cut to a 2–3 mm (0.08–0.12 in.) opening.

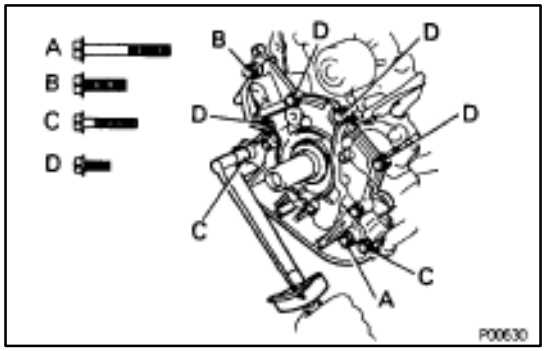
HINT: Avoid applying an excessive amount to the surface.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Place a new O–ring in position on the cylinder block.

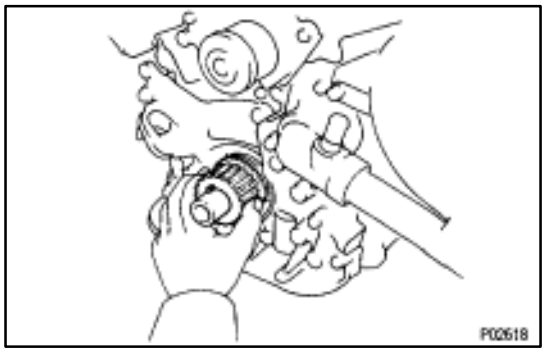


(d) Engage the spline teeth of the oil pump drive gear with the large teeth of the crankshaft, and slide.

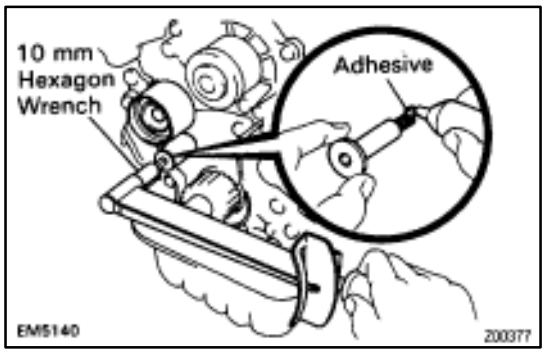




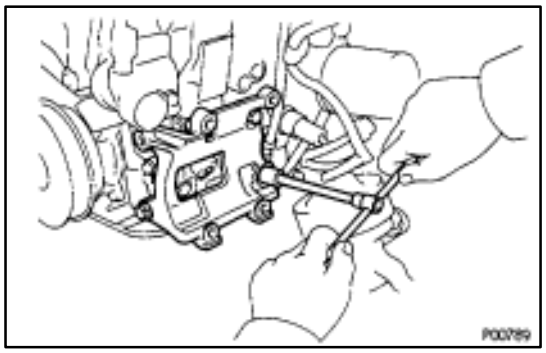
(e) Install the oil pump with the nine bolts.
12 mm head bolt (C and D)
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)
14 mm head bolt (A and B)
Torque: 41 N·m (420 kgf·cm, 30 ft·lbf)
HINT: On vehicles with A/C, tighten bolt A together with the A/C bracket.



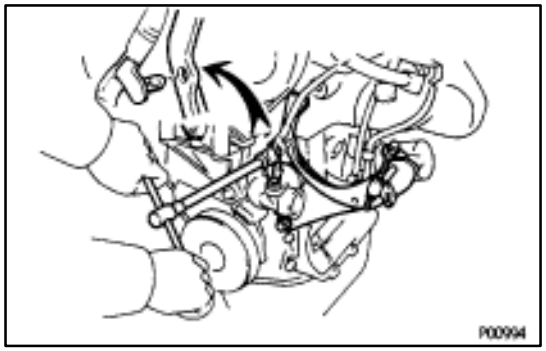
2. INSTALL CRANKSHAFT TIMING PULLEY
(a) Align the pulley set key with the key groove of the timing pulley.
(b) Slide on the timing pulley, facing the flange side inward.



3. INSTALL NO.1 IDLER PULLEY
(a) Apply adhesive to two or three threads of the mount bolt end.
Adhesive: Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
(b) Using a 10 mm hexagon wrench, install the idler pulley with the plate washer and bolt. Torque the bolt.
Torque: 350 N·m (25 kgf·cm, 34 ft·lbf)
(c) Check that the pulley bracket moves smoothly.
4. INSTALL TIMING BELT (See page EG–29)
5. REMOVE ENGINE SLING DEVICE FROM ENGINE

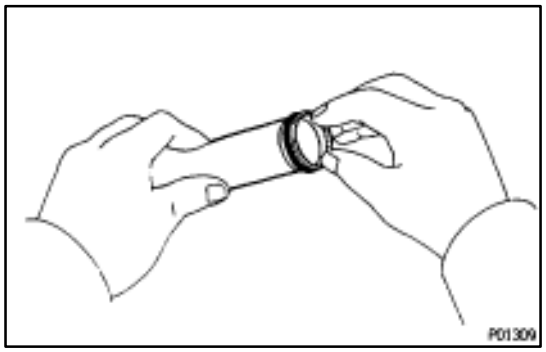


6. INSTALL A/C COMPRESSOR BRACKET
Install the A/C compressor bracket with the three bolts.



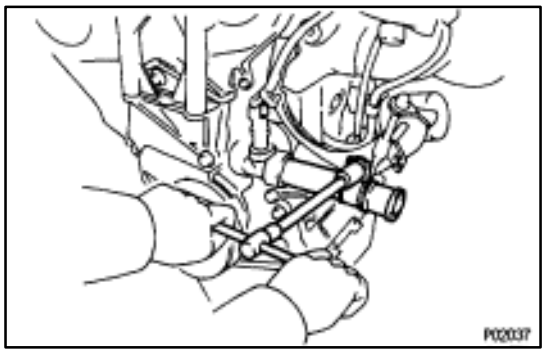
7. INSTALL GENERATOR BRACKET

Install the generator bracket with the two bolts.

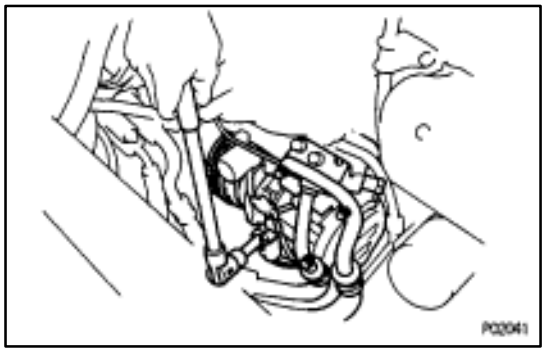


8. INSTALL WATER INLET PIPE

(a) Install a new O–ring to the water inlet pipe.



(b) Install the water inlet with the the bolt.



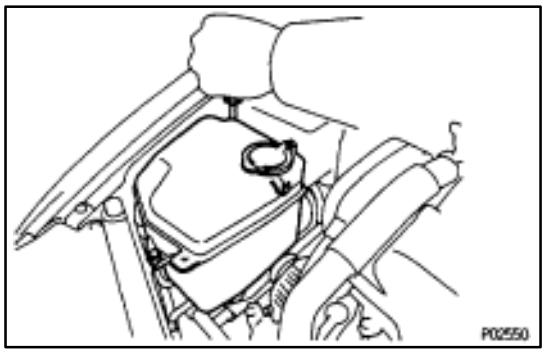
9. INSTALL A/C COMPRESSOR

(a) Install the A/C compressor and drive belt adjusting bar bracket with the five bolts.

(b) Connect the connector.

10. CONNECT RADIATOR LOWER HOSE

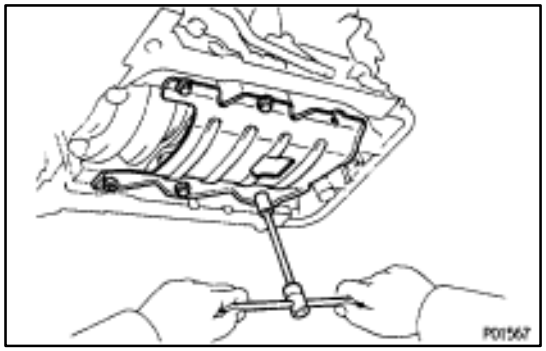
11. INSTALL GENERATOR (See CH section)



12. INSTALL WASHER TANK

(a) Connect the connector and vinyl hose to the washer tank.

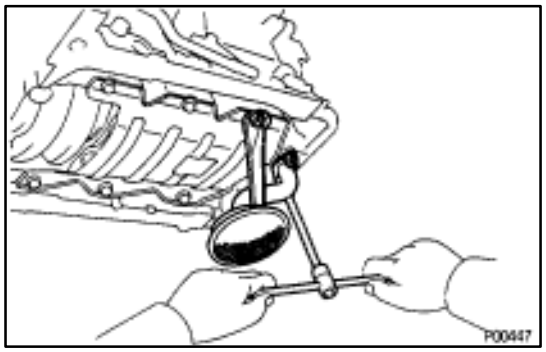
(b) Install the washer tank with the three bolts.



13. INSTALL OIL PAN BAFFLE PLATE

Install the baffle plate with the four bolts and nut.

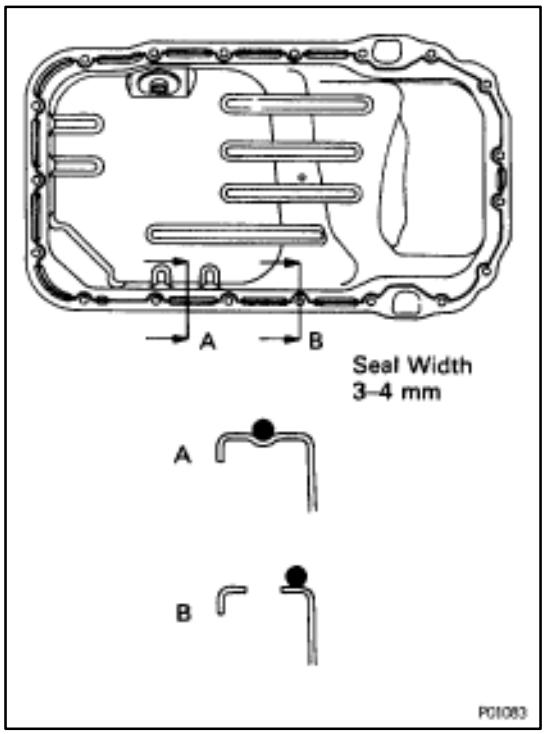
Torque: 5.5 N·m (75 kgf·cm, 65 in.·lbf)



14. INSTALL OIL STRAINER

Install a new gasket and the oil strainer with the three nuts.

Torque: 5.5 N·m (75 kgf·cm, 65 in.·lbf)



15. INSTALL OIL PAN

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surfaces of the oil pan and cylinder block.

- Using a razor blade and gasket scraper, remove all the old packing (FIPG) material from the gasket surfaces and sealing grooves.
- Thoroughly clean all components to remove all the loose material.
- Using a non–residue solvent, clean both sealing surfaces.

NOTICE: Do not use a solvent which will affect the painted surfaces.

(b) Apply seal packing to the oil pan as shown in the illustration.

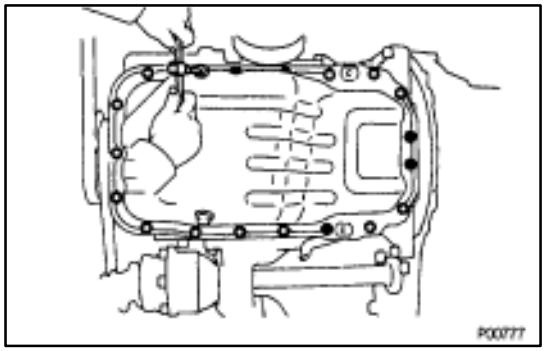
Seal packing:

Part No. 08826–00080 or equivalent

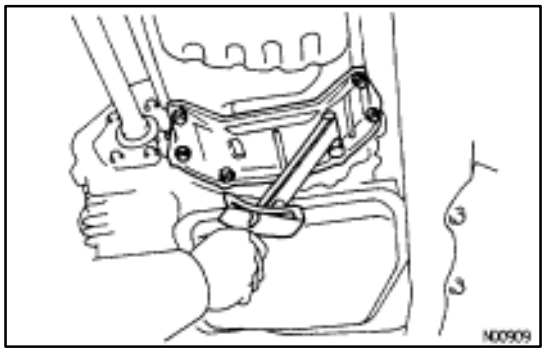
- Install a nozzle that has been cut to a 3–4 mm (0.12–0.16 in.) opening.

HINT: Avoid applying an excessive amount to the surface.

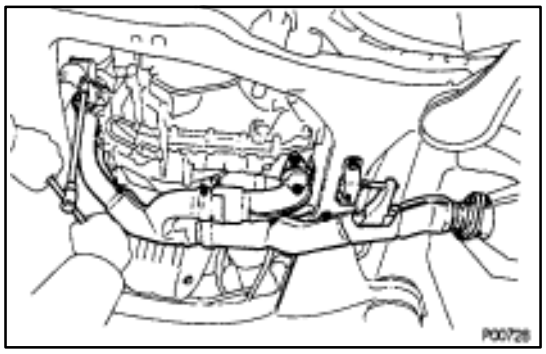
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(c) Install the oil pan with the fifteen bolts and four nuts.
Torque: 5.5 N·m (75 kgf·cm, 65 in.·lbf)
(d) Install the dipstick.



16. INSTALL STIFFENER PLATE
(a) Install the dust seal to the stiffener plate.
(b) Install the stiffener plate with the six bolts.
12 mm head bolt
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)
14 mm head bolt
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

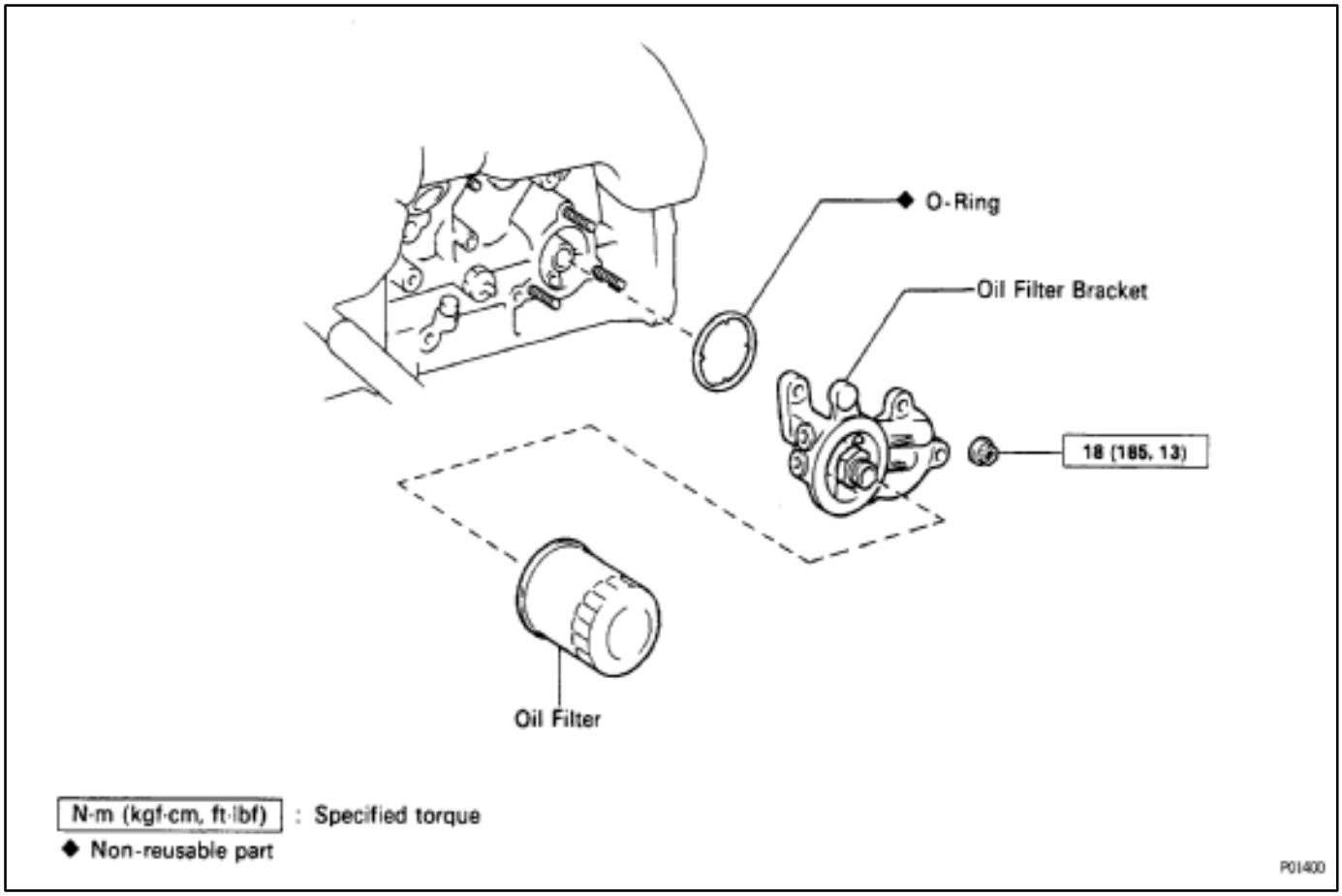


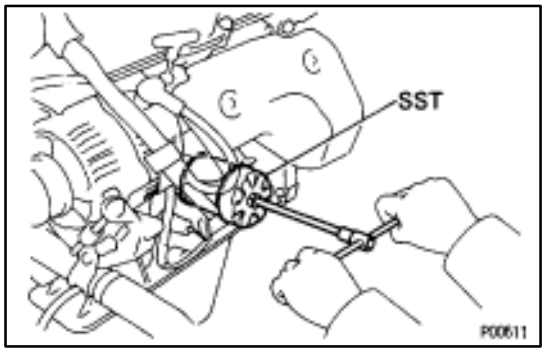
17. CONNECT FRONT EXHAUST PIPE
(a) Place three new gaskets on the front pipe.
(b) Install the front pipe with the two bolts and six nuts.
Torque the nut.
To manifold
Torque: 62 N·m (630 kgf·cm, 46 ft·lbf)
To three–way catalytic converter
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)
(c) Connect the bracket with the two bolts.
18. FILL WITH ENGINE OIL
19. FILL WITH ENGINE OIL
20. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY
21. START ENGINE AND CHECK FOR LEAKS
22. RECHECK ENGINE COOLANT AND ENGINE OIL LEVELS
23. INSTALL HOOD

OIL FILTER BRACKET

OIL FILTER BRACKET REMOVAL

EG09F–01

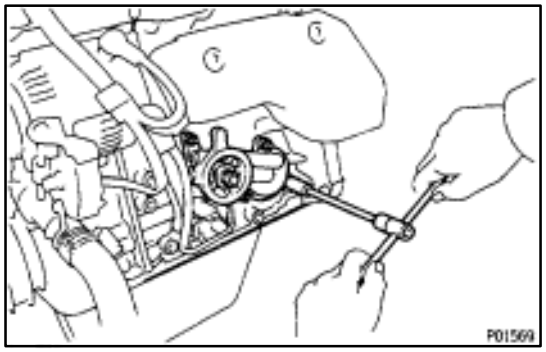




1. REMOVE OIL FILTER

Using SST, remove the oil filter.

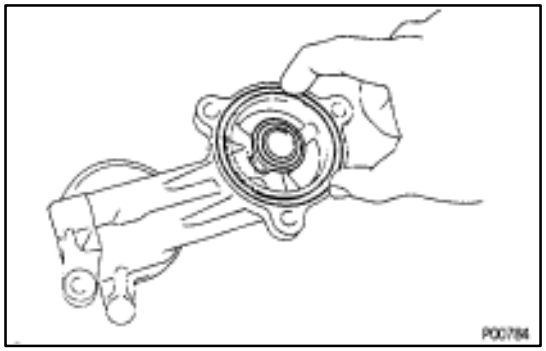
SST 09228–07500



2. REMOVE OIL FILTER BRACKET

(a) Remove the four nuts and oil filter bracket.

(b) Remove the O–ring from the oil filter bracket.



OIL FILTER BRACKET INSTALLATION

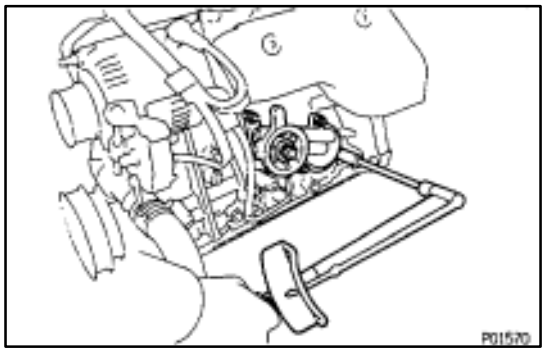
EG09G–01

(See page EG–307)

1. INSTALL OIL FILTER BRACKET

(a) Install a new O–ring to the oil filter bracket.

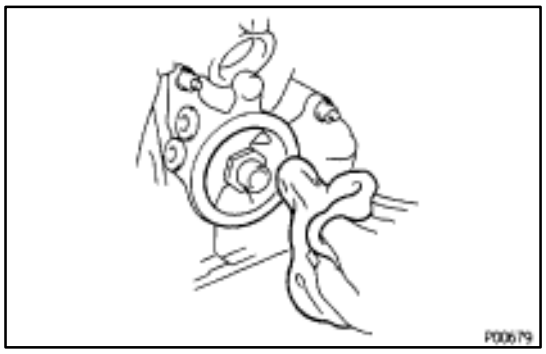
(b) Apply a light coat of engine oil on the O–ring.



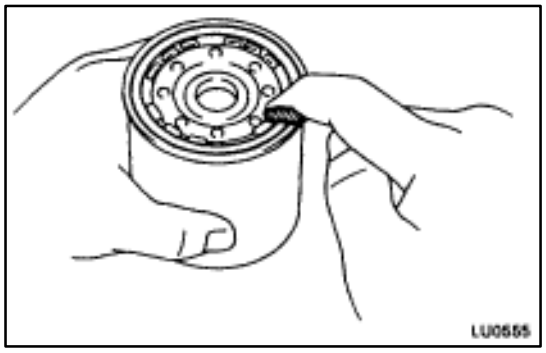
(c) Install the oil filter bracket with the four nuts.
Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

2. INSTALL OIL FILTER

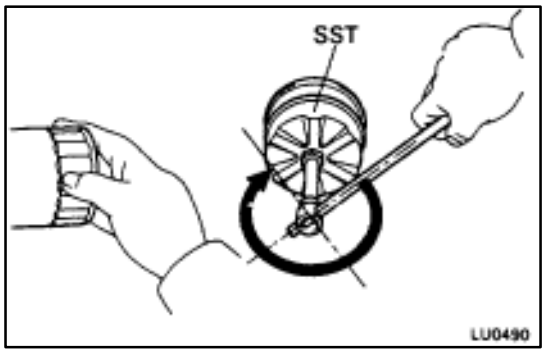
(a) Clean the filter contact surface on the filter mounting.



(b) Lubricate the filter rubber gasket with engine oil.



(c) Tighten filter until the gasket contacts seat of the filter mounting. Then using SST, give it an additional 3/4 turn to seat the filter.
SST 09228–07500



3. START ENGINE AND CHECK FOR LEAKS

4. CHECK ENGINE OIL LEVEL

SERVICE SPECIFICATIONS
SERVICE DATA

EG09H–01

Oil pressure	At idle speed (normal operating temperature)	29 kPa (0.3 kgfcm^2, 4.3 psi) or more
	At 3,000 rpm (normal operating temperature)	294–539 kPa (3.0–5.5 kgfcm^2, 43–78 psi)
Oil pump	Body clearance (STD)	0.100–0.175 mm (0.0039–0.0069 in.)
	Body clearance (Maximum)	0.30 mm (0.0118 in.)
	Tip clearance (STD)	0.110–0.240mm (0.0043–0.0094 in.)
	Tip clearance (Maximum)	0.35 mm (0.0138 in.)
	Side clearance (STD)	0.30–0.090 mm (0.0012–0.0035 in.)
	Side clearance (Maximum)	0.15 mm (0.0059 in.)

TORQUE SPECIFICATIONS

EG09J–01

Part tightened	N·m	kgf·cm	ft·lbf
Oil pressure switch x Cylinder block	14	150	11
Oil pan x drain plug	37	375	27
Oil pump x Cylinder block (12 mm head bolt)	20	200	14
Oil pump x Cylinder block (14 mm head bolt)	41	420	30
Oil strainer x Main bearing cap	5.5	75	65 in.·lbf
Oil strainer x Oil pump	5.5	75	65 in.·lbf
Oil pan x Cylinder block	5.5	75	65 in.·lbf
Oil pan x Oil pump	5.5	75	65 in.·lbf
Oil pan x Rear oil seal retainer	5.5	75	65 in.·lbf
Stiffener plate x Cylinder block	18	185	13
Stiffener plate x Transaxle case	37	380	27
Front exhaust pipe x Exhaust manifold	62	630	46
Front exhaust pipe x Three–way catalytic converter	43	440	32
Oil filter bracket x Cylinder block	19	195	14

–MEMO–

ENGINE TROUBLESHOOTING

HOW TO PROCEED WITH TROUBLESHOOTING

The Engine Control System broadly consists of the sensors, ECM and actuators. The ECM receives signals from various sensors, judges the operating conditions and determines the optimum injection duration, timing, ignition timing and idle speed.

In general, the Engine Control System is considered to be a very intricate system to troubleshoot. But, the fact is that if you proceed to inspect the circuit one by one following the procedures directed in this manual, troubleshooting of this system is not complex.

This section explains the most ideal method of troubleshooting and tells 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 details as possible about the problem.

2 CHECK AND CLEAR DIAGNOSTIC TROUBLE CODE (PRECHECK)

Before confirming the problem symptom, first check the diagnostic trouble code and make a note of any malfunction code which is output, then clear the code.

HINT: Output of the malfunction code indicates that there is a malfunction in the circuit indicated. However, it does not indicate whether the malfunction is still occurring or occurred in the past and returned to normal. In order to determine this, the problem symptoms should be confirmed in 44 first and the diagnostic trouble code be rechecked in 6.

Accordingly, if troubleshooting is begun based on the malfunction code only in diagnostic trouble code check in 2, it could result in a misdiagnosis, leading to troubleshooting of circuits which are normal and making it more difficult to locate the cause of the problem.

3 SETTING THE TEST MODE DIAGNOSIS, 4 PROBLEM SYMPTOM CONFIRMATION, 5 SYMPTOM SIMULATION

In order to find out the trouble more quickly, set the diagnosis check in test mode and with higher sensing ability of the ECM, confirm the problem symptoms. If the trouble does not reappear, use the symptom simulation method to make sure the trouble is reproduced.

6 DIAGNOSTIC TROUBLE CODE CHECK IN TEST MODE

Check the diagnostic trouble code in test mode. If the malfunction code is output, proceed to ”step 8 Diagnostic Trouble Code Chart”. If the normal code is output, proceed to ”step 7 Basic Inspection”.

7 BASIC INSPECTION

Carry out basic inspection such as the spark check and fuel pressure check, etc.

8 DIAGNOSTIC TROUBLE CODE CHART

If the malfunction code is displayed, proceed to inspect the circuit indicated by the chart for each code.

9 MATRIX CHART OF PROBLEM SYMPTOMS

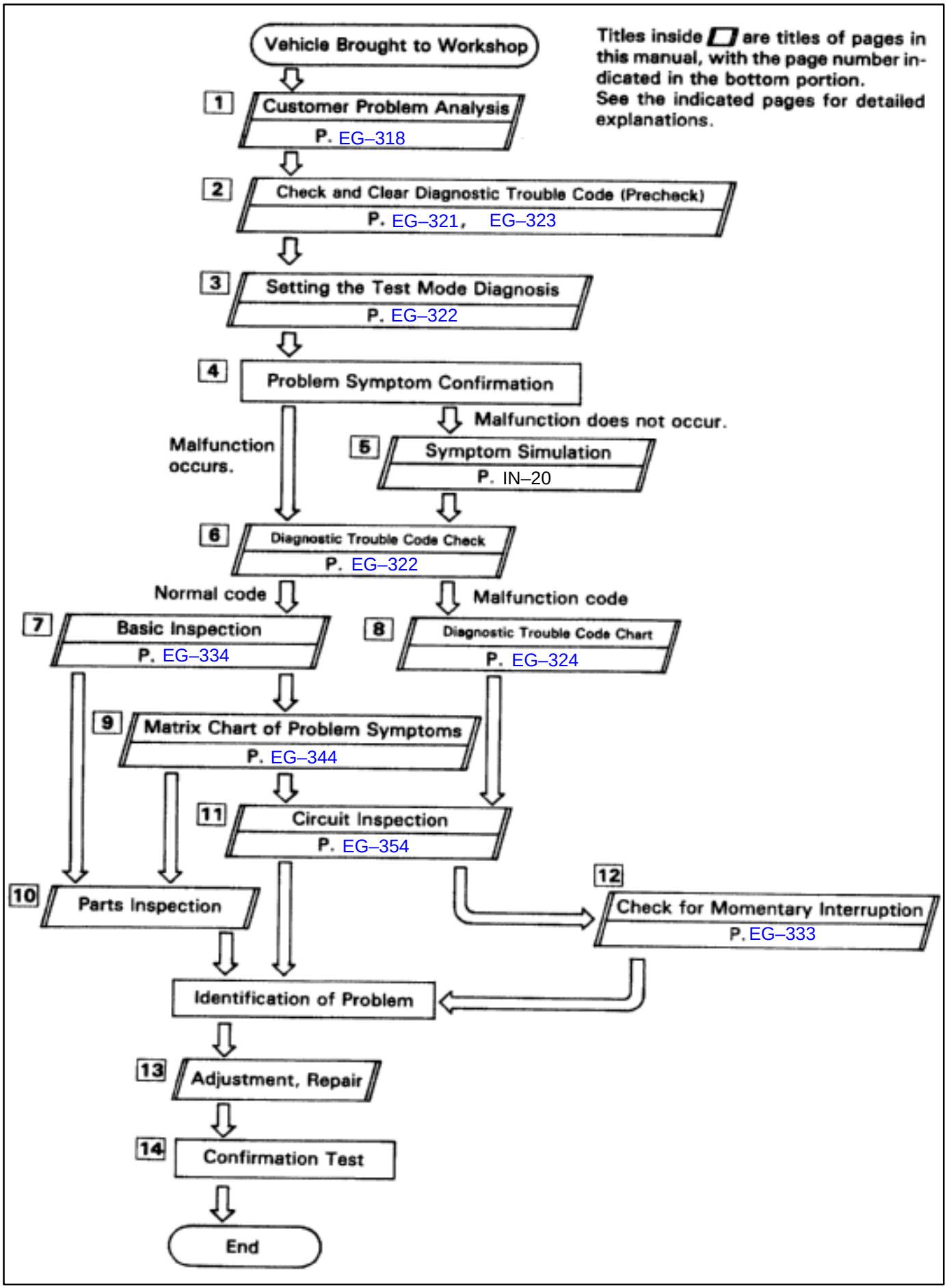
If the normal code is displayed in the diagnosis in test mode, perform troubleshooting according to the inspection order in the Matrix Chart of Problem Symptoms.

10 PARTS INSPECTION

When the Matrix Chart of Problem Symptoms instructs to check the parts, proceed to parts inspection section included in this manual.

[11] CIRCUIT INSPECTION

Determine if the malfunction is the sensor, actuator, wire harness, connector or the ECM.


Vehicle Brought to Workshop
Titles inside ▭ are titles of pages in this manual, with the page number indicated in the bottom portion.
See the indicated pages for detailed explanations.
1 Customer Problem Analysis
P. EG–318
2 Check and Clear Diagnostic Trouble Code (Precheck)
P. EG–321, EG–323
3 Setting the Test Mode Diagnosis
P. EG–322
4 Problem Symptom Confirmation
Malfunction does not occur.
Malfunction occurs.
5 Symptom Simulation
P. IN–20
6 Diagnostic Trouble Code Check
P. EG–322
Normal code
Malfunction code
7 Basic Inspection
P. EG–334
8 Diagnostic Trouble Code Chart
P. EG–324
9 Matrix Chart of Problem Symptoms
P. EG–344
11 Circuit Inspection
P. EG–354
10 Parts Inspection
12 Check for Momentary Interruption
P. EG–333
Identification of Problem
13 Adjustment, Repair
14 Confirmation Test
End

[12]. CHECK FOR MOMENTARY INTERRUPTION

By performing the check for momentary interruption, the place where momentary interruptions or momentary shorts are occurring due to poor contacts can be isolated.

[13] ADJUSTMENT, REPAIR

After the cause of the problem is located, perform adjustment or repairs by following the inspection and replacement procedures in this manual.

[14] 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.

–MEMO–

How to Proceed with Troubleshooting Using Volt/Ohm Meter and TCCS Checker

For the explanation of steps 1 ~ 6, 8 and 10 ~ [16], see the explanation of steps with the same title on page EG–312.

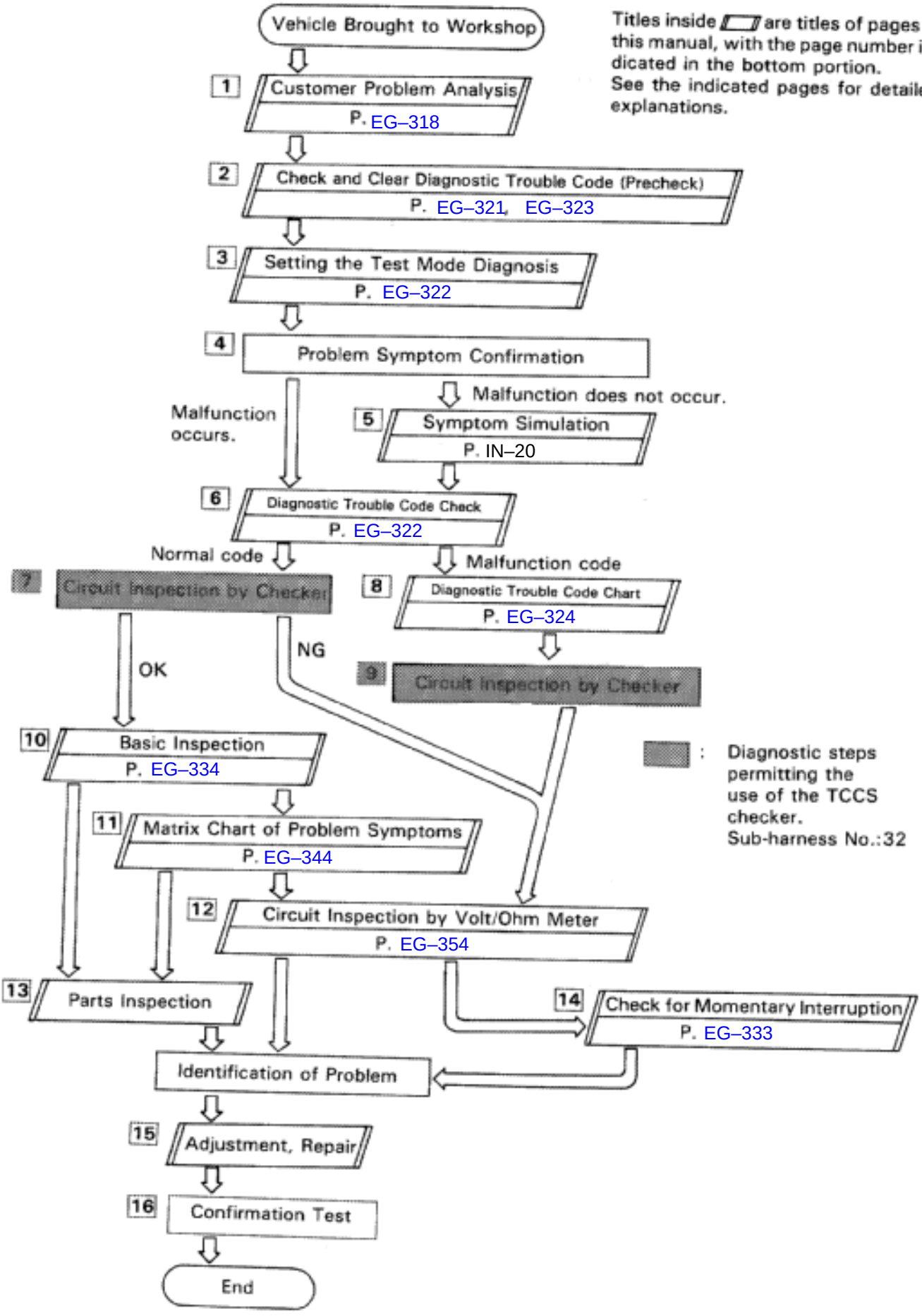
7 9 CIRCUIT INSPECTION BY CHECKER

If the Normal code is displayed in the diagnostic trouble code check, connect the checker to the vehicle and check all the circuits which can be inspected using the checker.

If a malfunctioning circuit is then detected, proceed to ”Circuit Inspection by Volt/Ohm Meter” and check the applicable circuit using a volt/ohm meter. Determine if the malfunction is in the sensor, actuator, wire harness, connector or the ECM. If the malfunctioning circuit cannot be detected using the checker, proceed to ”Basic Inspection” and perform troubleshooting.

If a malfunction code is displayed in the diagnostic trouble code check, use the checker to inspect the circuit indicated by the diagnostic trouble code chart for the displayed code.

For instructions on how to connect the checker to the vehicle and how to use the checker, please refer to the Instruction Manual for TCCS checker.


Vehicle Brought to Workshop
1 Customer Problem Analysis
P. EG–318
2 Check and Clear Diagnostic Trouble Code (Precheck)
P. EG–321, EG–323
3 Setting the Test Mode Diagnosis
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4 Problem Symptom Confirmation
Malfunction does not occur.
Malfunction occurs.
5 Symptom Simulation
P. IN–20
6 Diagnostic Trouble Code Check
P. EG–322
Normal code
Malfunction code
7 Circuit Inspection by Checker
8 Diagnostic Trouble Code Chart
P. EG–324
OK
NG
9 Circuit Inspection by Checker
10 Basic Inspection
P. EG–334
11 Matrix Chart of Problem Symptoms
P. EG–344
12 Circuit Inspection by Volt/Ohm Meter
P. EG–354
13 Parts Inspection
14 Check for Momentary Interruption
P. EG–333
Identification of Problem
15 Adjustment, Repair
16 Confirmation Test
End
Titles inside are titles of pages in this manual, with the page number indicated in the bottom portion. See the indicated pages for detailed explanations.
: Diagnostic steps permitting the use of the TCCS checker. Sub-harness No.:32

CUSTOMER PROBLEM ANALYSIS CHECK SHEET

ENGINE CONTROL System Check Sheet

Inspector's Name :

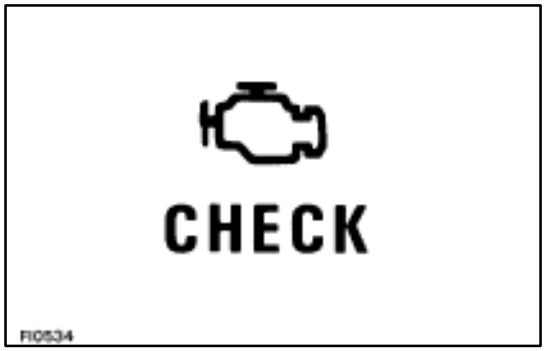
Customer's Name		Registration No.	
		Registration Year	/ /
		Frame No.	
Date Vehicle Brought In		Odometer Reading	km Miles

Date of Problem Occurrence		
Frequency of Problem Occurrence		☐ Constant ☐ Sometime (times per day/month) ☐ Once only ☐ Other ( )
Conditions at Time of Problem Occurrence	Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (Approx. °F (°C))
	Place	☐ Highway ☐ Suburbs ☐ Inner City ☐ Hill (☐ Up, ☐ Down) ☐ Rough road ☐ Other ( )
	Engine Coolant Temp.	☐ Cold ☐ Warming up ☐ After warming up ☐ Any temp. ☐ Other
	Engine Operation	☐ Starting ☐ Just after starting ☐ Idling ☐ Racing without load ☐ Driving (☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ Other ( ))

Problem Symptoms	☐ Engine does not Start	☐ Engine does not crank ☐ No initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other ( )
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal [☐ High ☐ Low (rpm)] ☐ Rough idling ☐ Other ( )
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after fire) ☐ Surging ☐ Knocking ☐ Other ( )
	☐ Engine Stall	☐ Engine stall soon after starting ☐ After acceleration pedal depressed ☐ After acceleration pedal released ☐ During A/C operation ☐ When N to D shift ☐ Other ( )
	☐ Others	

Condition of Malfunction Indicator Lamp		☐ Remains on ☐ Sometimes lights up ☐ Does not light up
Diagnostic Trouble Code Inspection	Normal Mode (Precheck)	☐ Normal code ☐ Malfunction code [code]
	Test Mode	☐ Normal code ☐ Malfunction code [code]

–MEMO–



DIAGNOSIS SYSTEM

DESCRIPTION

The ECM contains a built–in self–diagnosis system by which troubles with the engine signal network are detected and a Malfunction Indicator Lamp on the instrument panel lights up.

By analyzing various signals as shown in the later table (See page EG–324) the ECM detects system malfunctions relating to the sensors or actuators.

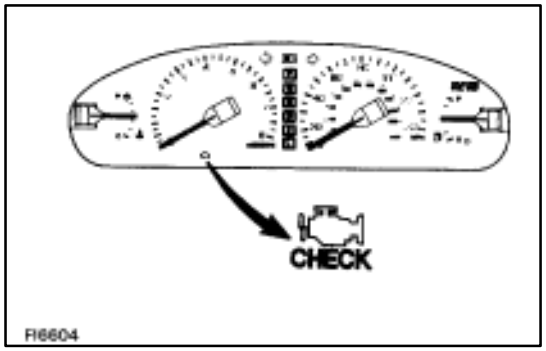
In the normal mode, the self–diagnosis system monitors 21 (California specification vehicles) or 18 (Other than California specification vehicles) items, indicated by code No. as shown in EG–324. A Malfunction Indicator Lamp informs the driver that a malfunction has been detected. The light goes off automatically when the malfunction has been repaired. But the diagnostic trouble code(s) remains stored in the ECM memory (except for code Nos. 16 and 53). The ECM stores the code(s) until it is cleared by removing the EFI fuse with the ignition switch off.

The diagnostic trouble code can be read by the number of blinks of the Malfunction Indicator Lamp when TE1 and E1 terminals on the data link connector 2 or data link connector 1 are connected. When 2 or more codes are indicated, the lowest number (code) will appear first.

In the test mode, 13 (California specification vehicles) or 10 (Other than California specification vehicles) items, indicated by code No. as shown in EG–324 are monitored. If a malfunction is detected in any one of the systems indicated by code Nos. 13, 21, 22, 24, 25, 26, 27, 28, 31, 32, 41, 42, and 71 (California specification vehicles) or 13, 21, 22, 24, 25, 28, 31, 32, 41 and 42 (Other than California specification vehicles) the ECM lights the Malfunction Indicator Lamp to warn the technician that malfunction has been detected. In this case, TE2 and E1 terminals on the data link connector 2 or data link connector 1 should be connected as shown later. (See page EG–322)

In the test mode, even if the malfunction is corrected, the malfunction code is stored in the ECM memory even when the ignition switch is off (except code Nos. 43 and 51). This also applies in the normal mode. The diagnostic mode (normal or test) and the output of the Malfunction Indicator Lamp can be selected by connecting the TE1, TE2 and E1 terminals on the data link connector 1 or data link connector 2, as shown later.

A test mode function has been added to the functions of the self–diagnosis system of the normal mode for the purpose of detecting malfunctions such as poor contact, which are difficult to detect in the normal mode. This function fills up the self–diagnosis system. The test mode can be implemented by the technician following the appropriate procedures of check terminal connection and operation described later. (See page EG–322)



Diagnosis Inspection (Normal Mode)

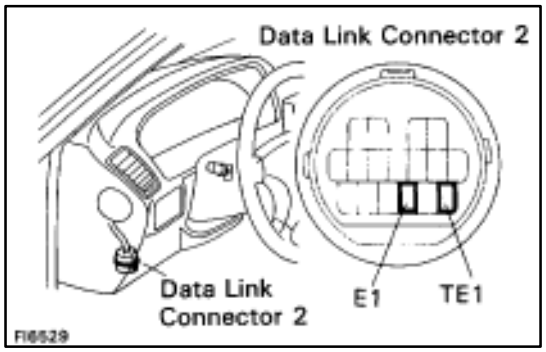
MALFUNCTION INDICATOR LAMP CHECK

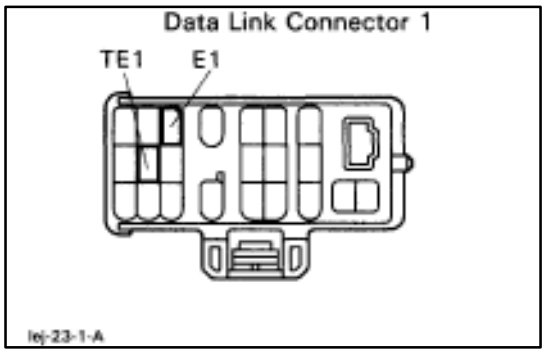
1. The Malfunction Indicator Lamp will come on when the ignition switch is turned ON and the engine is not running.
   HINT: If the Malfunction Indicator Lamp does not light up, proceed to troubleshooting of the combination meter (See page BE–144).
2. When the engine is started, the Malfunction Indicator Lamp should go off.

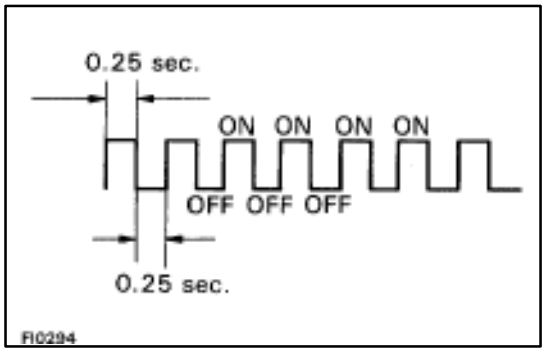
   If the light remains on, the diagnosis system has detected a malfunction or abnormality in the system.

DIAGNOSTIC TROUBLE CODE CHECK

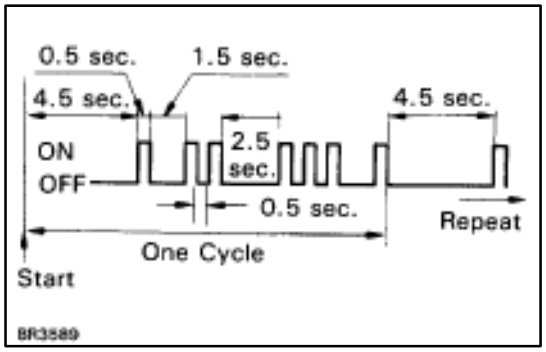
1. Turn ignition switch on.
2. Using SST, connect terminals between TE1 and E1 of Data link connector 2 or 1.
   SST 09843–18020



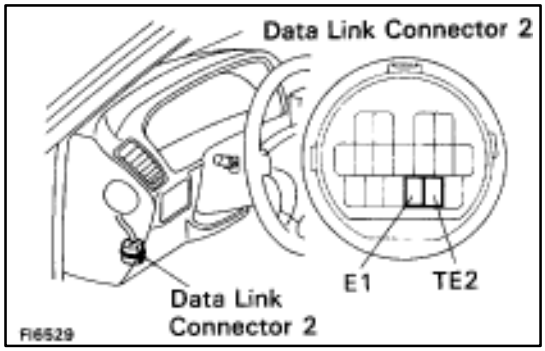


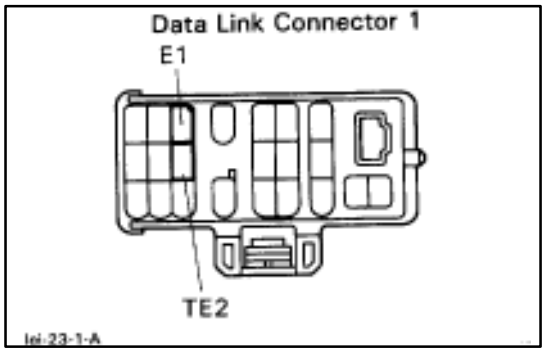


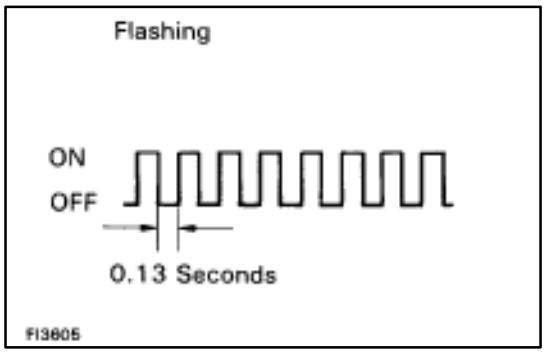
3. Read the diagnostic trouble code from Malfunction Indicator Lamp.
   HINT: If a diagnostic trouble code is not output, check the TE1 terminal circuit (See page EG–456).

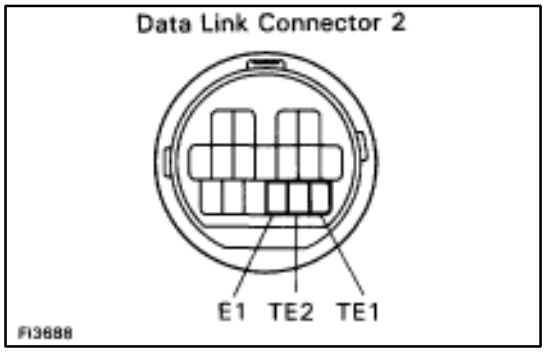


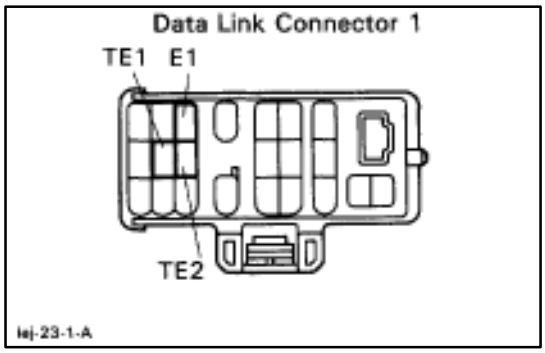
   As an example, the blinking patterns for codes; normal, 12 and 31 are as shown on the illustration.
4. Check the details of the malfunction using the diagnostic trouble code table on page EG–324.
5. After completing the check, disconnect terminals TE1 and E1, and turn off the display.
   HINT: In the event of 2 or more malfunction codes, indication will begin from the smaller numbered code and continue in order to the larger.











Diagnosis Inspection (Test Mode)

Compared to the normal mode, the test mode has high sensing ability to detect malfunctions.

It can also detect malfunctions in the starter signal circuit, the IDL contact signal of the throttle position sensor, air conditioning signal and park/neutral position switch signal.

Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the test mode.

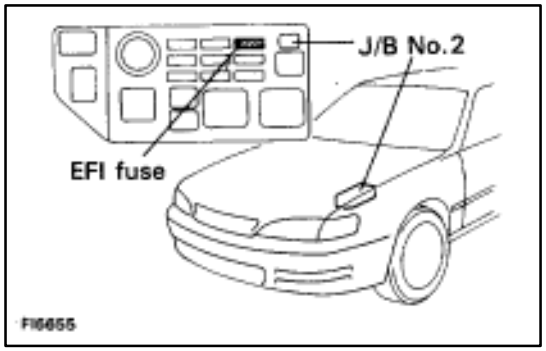
DIAGNOSTIC TROUBLE CODE CHECK

1. Initial conditions.
(a) Battery voltage 11 V or more.
(b) Throttle valve fully closed (throttle position sensor IDL points closed).
(c) Transmission in neutral position.
(d) Air conditioning switched off.
2. Turn ignition switch off.
3. Using SST, connect terminals TE2 and E1 of data link connector 2 or 1. SST 09843–18020

4. Turn ignition switch on.
HINT:
- To confirm that the test mode is operating, check that the Malfunction Indicator Lamp flashes when the ignition switch is turned to ON.
- If the Malfunction Indicator Lamp does not flash, proceed to troubleshooting of the TE2 terminal circuit on page EG–456.

5. Start the engine.

6. Simulate the conditions of the malfunction described by the customer.
7. After the road test, using SST, connect terminals TE1 and E1 of data link connector 2 or 1.
SST 09843–18020
8. Read the diagnostic trouble code on Malfunction Indicator Lamp on the combination meter (See page EG–321).
9. After completing the check, disconnect terminals TE1, TE2 and E1, and turn off the display.
HINT:
- The test mode will not start if terminals TE2 and E1 are connected after the ignition switch is turned on.
- When vehicle speed is 5 km/h (3mph) or below, diag. trouble code ”42” (Vehicle speed signal) is output, but this is not abnormal.
- When the engine is not cranked, diag. trouble code ”43” (Starter signal) output, but this is not abnormal.
- When the automatic transmission shift lever is in the ”D”, ”2”, ”L” or ”R” shift position, or when the air conditioning is on or when the accelerator pedal is depressed, code ”51” (Switch condition signal) is output, but this is not abnormal.



DIAGNOSTIC TROUBLE CODE CLEARANCE

1. After repair of the trouble areas, the diagnostic trouble code retained in the ECM memory must be cleared out by removing the EFI fuse (15A) from J/B No.2 for 10 seconds or more, with the ignition switch OFF.
   HINT:
   - Cancellation can also be done by removing the battery negative (–) terminal, but in this case, other memory systems (clock, etc.) will also be cancelled out.
   - If it is necessary to work on engine components requiring removal of the battery terminal, a check must first be made to see if a diagnostic trouble code has been recorded.
2. After cancellation, road test the vehicle to check that a normal code is now read on the Malfunction Indicator Lamp. If the same diagnostic trouble code appears, it indicates that the trouble area has not been repaired thoroughly.

DIAGNOSTIC TROUBLE CODE CHART

HINT: Parameters listed in the chart may not be exactly same as your reading due to type of the instruments or other factors.

Code No.	Number of Check Engine Blinks	Circuit	Diagnostic Trouble Code Detecting Condition
–	 BE3931	Normal	No code is recorded.
12	 BE3931	RPM Signal	No "NE" or "G1" and "G2" signal to ECM within 2 sec. after cranking. Open in "G⊖" circuit.
13	BE3931	RPM Signal	No NE signal to ECM for 0.1 sec. or more at 1,000 rpm or more. No 12 pulses of NE to ECM during the interval between G1 and G2 pulses.
14	 BE3931	Ignition Signal	No IGF signal to ECM for 6 consecutive IGT signal.
16	BE3931	Electronic Controlled Transmission Control Signal	Fault in communications between the engine CPU and Electronic Controlled Transmission CPU in the ECM.
21	BE3932	Main Oxygen Sensor Signal (on left bank)	Main oxygen sensor signal voltage is reduced to between 0.35 V and 0.70 V for 60 sec. under conditions (a) – (d). (2 trip detection logic)*4 (a) Engine coolant temp.: Between 70°C (158°F) and 90°C (194°F). (b) Engine speed: 1,500 rpm or more. (c) Load driving (EX. Electronic Controlled Transmission in 4th speed, A/C ON, Flat road, 50 mph (80 km/h)) (d) Main oxygen sensor signal voltage: Alternating above and below 0.45 V.

*4: See page EG–331.

If a malfunction code is displayed during the diagnostic trouble code check in test mode, check the circuit for that code listed in the table below (Proceed to the page given for that circuit).

Trouble Area	Malfunction Indicator Lamp*1		Memory*2	See Page
	Normal Mode	Test Mode		
–	–	–	–	–
□1 Open or short in NE, G circuit. □1 Distributor □1 Open or short in STA circuit. □1 ECM	ON	N.A.	O	EG–354
□1 Open or short in NE circuit. □1 Distributor □1 ECM	ON	N.A.	O	EG–357
□1 Open or short in NE circuit. □1 Distributor □1 ECM	N.A.	ON		
□1 Open or short in IGF or IGT circuit from igniter to ECM. □1 Igniter □1 ECM	ON	N.A.	O	EG–358
□1 ECM	ON	N.A.	X	EG–364
□1 Main oxygen sensor circuit □1 Main oxygen sensor	ON	ON	O	EG–366

*1, 2: See page EG–330.

DIAGNOSTIC TROUBLE CODE CHART (Cont'd)

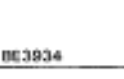
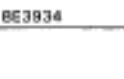
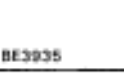
Code No.	Number of Check Engine Blinks	Circuit	Diagnostic Trouble Code Detecting condition
22	 BE3932	Engine Coolant Temp. Sensor Signal	Open or short in engine coolant temp. sensor circuit for 0.5 sec. or more.
24	 BE3932	Intake Air Temp. Sensor Signal	Open or short in intake air temp. sensor circuit for 0.5 sec. or more.
25	BE3932	Air-Fuel Ratio Lean Malfunction	(1) Main oxygen sensor voltage is 0.45 V or less (lean) for 90 sec. under conditions (a) and (b). (2 trip detection logic)*4 (a) Engine coolant temp.: 50°C (122°F) or more. (b) Engine speed: 1,500 rpm or more.
			(2)*3 Difference of air-fuel ratio feedback compensation value between right and left banks is more than 15 percentage for 20 sec. or more under conditions (a) and (b). (2 trip detection logic)*4 (a) Engine speed: Idling (b) Engine coolant temp.: Between 70°C (158°F) and 95°C (203°F).
26*3	 BE3932	Air-Fuel Ratio Rich Malfunction	Difference of air-fuel ratio feedback compensation value between right and left banks is more than 15 percentage for 20 sec. or more under conditions (a) and (b). (2 trip detection logic)*4 (a) Engine speed: Idling (b) Engine coolant temp.: Between 70°C (158°F) and 95°C (203°F).
27*3	 BE3932	Sub-Oxygen Sensor Signal	(1) Open or short in heater circuit of sub-oxygen sensor for 0.5 sec. or more.
			(2) Main oxygen sensor signal is 0.45 V or more and sub-oxygen sensor signal is 0.45 V or less under conditions (a) – (c). (2 trip detection logic)*4 (a) Engine coolant temp.: 80°C (176°F) or more. (b) Engine speed: 1,500 rpm or more. (c) Accel-pedal: Full depressed for 2 sec. or more.
28	 BE3932	Main Oxygen Sensor Signal (on right bank)	Same as Code No. 21

*3, 4: See page EG–330, 331.

Trouble Area	Malfunction Indicator Lamp*1		Memory*2	See Page
	Normal Mode	Test Mode		
□Open or short in engine coolant temp. sensor circuit. □Water temp. sensor □ECM	ON	ON	O	EG–370
□Open or short in intake air temp. sensor circuit □Intake air temp. sensor □ECM	OFF	ON	O	EG–374
	ON*3			
□Open or short in main oxygen sensor circuit. □Main oxygen sensor □Ignition system □ECM	ON	ON	O	EG–376
□Fuel line pressure (injector leak, blockage) □Mechanical system malfunction (skipping teeth of timing belt) □Ignition system □Compression pressure □Volume air flow meter □ECM				
□Fuel line pressure (injector leak, blockage) □Mechanical system malfunction (skipping teeth of timing belt) □Ignition system □Compression pressure □Volume air flow meter □ECM	ON	ON	O	EG–376
□Open or short in heater circuit of sub–oxygen sensor. □Sub–oxygen sensor heater. □ECM	ON	N.A.	O	EG–382
□Open or short in sub–oxygen sensor circuit. □Sub–oxygen sensor □ECM	ON	ON		
□Same as Code No. 21	ON	ON	O	EG–366

*1, 2, 3: See page EG–330.

DIAGNOSTIC TROUBLE CODE CHART (Cont'd)

Code No.	Number of Check Engine Blinks	Circuit	Diagnostic Trouble Code Detecting Condition
31	 BE3933	Volume Air Flow Meter Signal	All conditions below are detected continuously for 0.5 sec. or more. (a) Closed throttle position (b) Voltage of terminal VS: 0.1 V or less (c) Engine speed: 1,500 rpm or less
32	 BE3933	Volume Air Flow Meter Signal	VS exceeds 4.9 V for 0.5 sec. or more.
41	 BE3934	Throttle Position Sensor Signal	Open or short in throttle position sensor circuit (VTA) for 0.5 sec. or more.
42	 BE3934	Vehicle Speed Sensor Signal (for Electronic Controlled Transmission)	All conditions below are detected continuously for 8 sec. or more. (a) Vehicle speed signal: 0 km/h (mph) (b) Engine speed: 3,000 rpm or more (c) Park/Neutral position switch (PNP)
		Vehicle Speed Sensor Signal (for M/T)	All conditions below are detected continuously for 8 sec. or more. (a) Vehicle speed signal: 0 km/h (mph) (b) Engine speed: Between 3,000 rpm and 4,500 rpm (c) Engine coolant temp.: 80°C (176°F) or more (d) Load driving
43	 BE3934	Starter Signal	No starter signal to ECM.
52	 BE3935	Knock Sensor Signal (on left bank)	No No.2 knock sensor signal to ECM for 2 crank revolutions with engine speed between 1,600 rpm and 5,200 rpm.
53	 BE3935	Knock Control Signal	Engine control computer (for knock control) malfunction at engine speed between 650 rpm and 5,200 rpm.
55	 BE3935	Knock Sensor Signal (on right bank)	No No.1 knock sensor signal to ECM for 2 crank revolutions with engine speed between 1,600 rpm and 5,200 rpm.

Trouble Area	Malfunction Indicator Lamp*1		Memory*2	See Page
	Normal Mode	Test Mode		
□ Open (VC) or short (VC–E2) in volume air flow meter circuit. □ Volume air flow meter □ ECM	ON	ON	O	EG–388
□ Open (E2) or short (VC–VS) in volume air flow meter circuit. □ Volume air flow meter □ ECM	ON	ON	O	EG–390
□ Open or short in throttle position sensor circuit. □ Throttle position sensor □ ECM	OFF ON*3	ON	O	EG–392
□ No. 1 speed sensor □ Combination meter □ Open or short in No. 1 speed sensor circuit. □ ECM	OFF	OFF	O	EG–396
□ Open or short in starter signal circuit. □ Open or short in ignition switch or starter relay circuit. □ ECM	N.A.	OFF	X	EG–400
□ Open or short in knock sensor (on left bank) circuit. □ Knock sensor of left bank (looseness) □ ECM	ON	N.A.	O	EG–402
□ ECM	ON	N.A.	X	EG–402
□ Open or short in knock sensor (on right bank) circuit. □ Knock sensor of right bank (looseness) □ ECM	ON	N.A.	O	EG–402

*1, 2, 3: See page EG–330.

DIAGNOSTIC TROUBLE CODE CHART (Cont'd)

Code No.	Number of Check Engine Blinks	Circuit	Diagnostic Trouble Code Detecting condition
70*3	 BE3937	EGR System Malfunction	EGR gas temp. is 70°C (158°F) or below for 1 ~ 4 min. under conditions (a) and (b). (2 trip detection logic)*4 (a) Engine coolant temp.: 60°C (140°F) or more. (b) EGR operation possible (EX. ECM in D position, A/C ON, 60 mph (96 km/h), Flat road.).
51	 BE3935	Switch Condition Signal	(1) 3 sec. or more after engine starts, idle switch OFF (IDL). (2) Park/Neutral position switch OFF (PNP). (Shift position in "R", "D", "2" or "1" positions). (3) A/C switch ON.

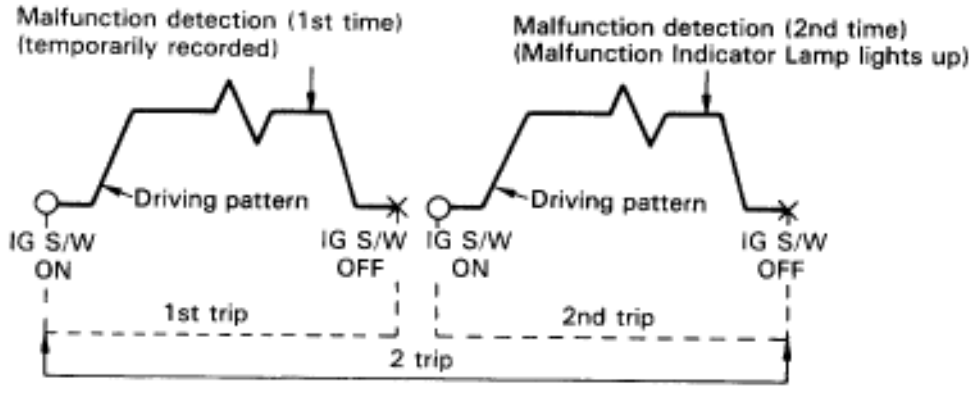
*1: "ON" displayed in the diagnosis mode column indicates that the Malfunction Indicator Lamp is lighted up when a malfunction is detected. "OFF" indicates that the "CHECK" does not light up during malfunction diagnosis, even if a malfunction is detected. "N.A." indicates that the item is not included in malfunction diagnosis.

*2: "O" in the memory column indicates that a diagnostic trouble code is recorded in the ECM memory when a malfunction occurs. "X" indicates that a diagnostic trouble code is not recorded in the ECM memory even if a malfunction occurs. Accordingly, output of diagnostic results in normal or test mode is performed with the IG switch ON.

*3: Only for California specification vehicles.

Trouble Area	Malfunction Indicator Lamp*1		Memory*2	See Page
	Normal Mode	Test Mode		
□Open in EGR gas temp. sensor circuit. □EGR or TVV vacuum hose disconnected, valve stuck. □Clogged EGR gas passage. □ECM	ON	ON	O	EG–408
□A/C switch circuit □Throttle position sensor IDL circuit □Park/Neutral position switch circuit □Accelerator pedal and cable □ECM	N.A.	OFF	X	EG–412

*4: This indicates items for which ”2 trip detection logic” is used. With this logic, when a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same case is detected again during the second drive test, this second detection causes the Malfunction Indicator Lamp to light up. The 2 trip repeats the same mode a 2nd time. (However, the IG switch must be turned OFF between the 1st trip and 2nd trip).
In the Test Mode, the Malfunction Indicator Lamp lights up the 1st trip a malfunction is detected.



EM9413

FAIL–SAFE CHART

If any of the following codes is recorded, the ECM enters fail–safe mode.

Code No.	Fail–Safe Operation	Fail–Safe Deactivation Conditions
14	Fuel cut	1 IGF1 detected in consecutive 3 ignitions.
16	Torque control prohibited	Returned to normal condition.
22	THW is fixed at 80°C (176°F)	Returned to normal condition.
24	THA is fixed at 20°C (68°F)	Returned to normal condition.
31 • **32**	Ignition timing fixed at 10° BTDC. Injection time fixed IDL ON__3.0 m sec. IDL OFF__5.6 m sec.	Returned to normal condition
41	VTA is fixed at 0°	The following 1 or 2 must be repeated at least 2 times consecutively. 1 0.1 V ⊕ VTA ⊕ 0.95 V 2 IDL ON
52	Max. timing retardation.	IG switch OFF.
53	Max. timing retardation.	Returned to normal condition.
55	Max. timing retardation.	IG switch OFF.

Back–Up Function

If there is trouble with the program in the ECM and the ignition signals (IGT) are not output, the ECM controls fuel injection and ignition timing at predetermined levels as a back–up function to make it possible to continue to operate the vehicle.

Furthermore, the injection duration is calculated from the starting signal (STA) and the throttle position signal (IDL). Also, the ignition timing is fixed at the initial ignition timing, 5° BTDC, without relation to the engine speed.

HINT: If the engine is controlled by the back–up function, the Malfunction Indicator Lamp lights up to warn the driver of the malfunction but the diagnostic trouble code is not output.

CHECK FOR MOMENTARY INTERRUPTION

As described in the preceding paragraph, abnormality detection ability in the test mode is increased compared to that in the normal mode, so that when momentary interruptions or momentary shorts occur in the ECM signal circuits (G1, G2, NE, THW, THA, VS, VTA) shown in the table below, the appropriate diagnostic trouble code is output.

Accordingly, when the diagnostic trouble codes shown in the table below (13, 22, 24, 31, 32, 41) are output during the diagnostic trouble code check, and inspection of the appropriate circuits reveals no abnormality, perform the check for momentary interruption as described below.

By performing the check for momentary interruption, the place where momentary interruptions or momentary shorts are occurring due to poor contacts can be isolated.

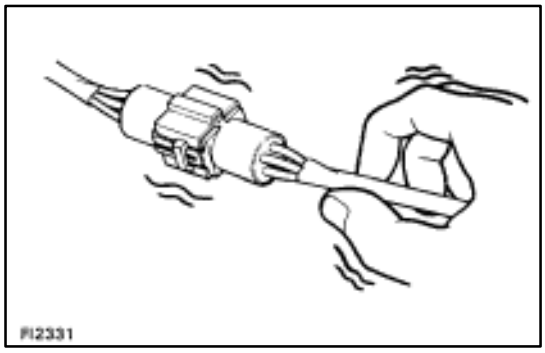
Diag. Code	Circuit
13	RPM signal circuit (No.2)
22	Engine coolant temp. sensor circuit
24	Intake air temp. sensor circuit
31·32	Volume air flow meter circuit
41	Throttle position sensor circuit

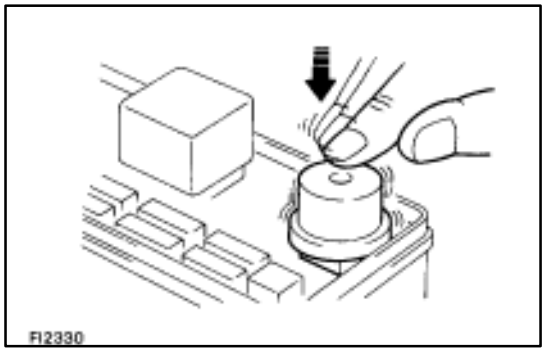
CLEAR DIAGNOSTIC TROUBLE CODES

See page EG–323.

SET TEST MODE

1. **With the ignition switch off, using SST, connect the terminals TE2 and E1 of the Data link connector 2 or 1.**
   SST 09843–18020
2. **Start the engine and check to see the Malfunction Indicator Lamp to go off.**





PERFORM A SIMULATION TEST

Using the symptom simulation (See page IN–20), 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 connections, dirt on the terminals, poor fit or other problems and repair as necessary.

HINT: After cancelling out the diagnostic trouble code in memory and set the test 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 ECM.

BASIC INSPECTION

When the normal code is displayed in the diagnostic trouble code check, troubleshooting should be performed in the order for all possible circuits to be considered as the causes of the problems.
In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently. Therefore, use of this check is essential in engine troubleshooting.

1 **Is battery voltage 11 V or more when engine is stopped?**

YES

NO → **Charge or replace battery.**

2 **Is engine cranked?**

YES

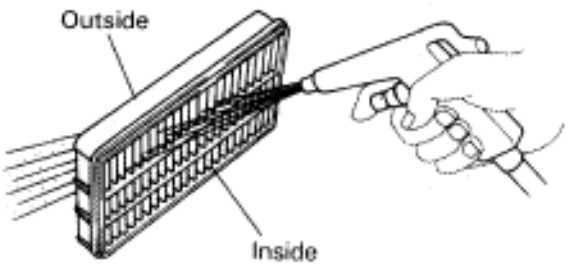
NO → **Proceed to matrix chart of problem symptoms on page EG–344.**

3 **Does engine start?**

YES

NO → **Go to step 3.**

4 **Check air filter.**



P Remove air filter.

C Visually check that the air filter is not excessively damaged or oily.

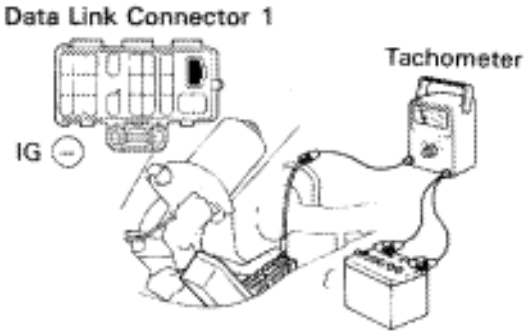
Hint If necessary, clean the air filter with compressed air. First blow from inside thoroughly, then blow off outside of the air filter.

OK

NG → **Repair or replace.**

Go to step 1.

5 **Check idle speed.**



P
1. Shift transmission into “N” position or neutral.
2. Warm up engine at normal operating temperature.
3. Switched off all accessories.
4. Switched off air conditioning.
5. Connect tachometer test probe to terminal IG ⊕ of data link connector 1.

C Check idle speed.

OK **Idle speed: 650 ∼ 750 rpm**

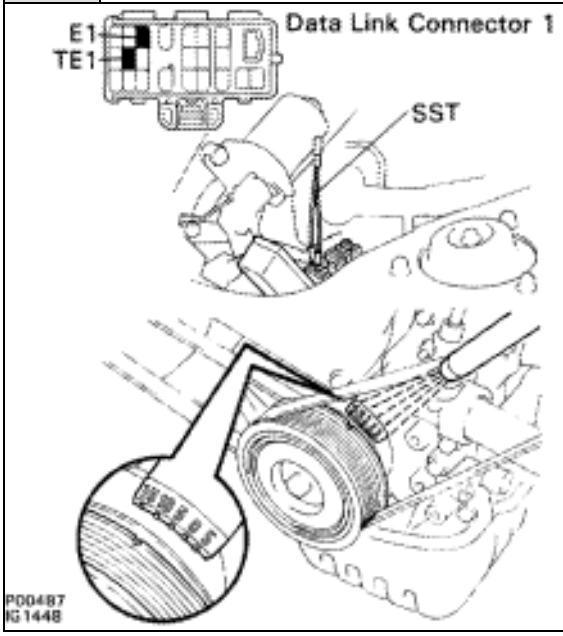
Caution:

□4 NEVER allow tachometer test probe to touch ground as it could result in damage to igniter and/or ignition coil.

□4 As some tachometers are not compatible with this ignition system, we recommend that you confirm compatibility of your unit before use.

OK → **NG** → **Proceed to matrix chart of problem symptoms on page EG–344.**

6 **Check ignition timing.**



P
1. Shift transmission into “N” position or neutral.
2. Warm up engine at normal operating temperature.
3. Keep the engine speed at idle.
4. Using SST, connect terminals TE1 and E 1 of data link connector 1.

SST 09843–18020

5. Using a timing light, connect the tester to No. 4 high–tension cord.

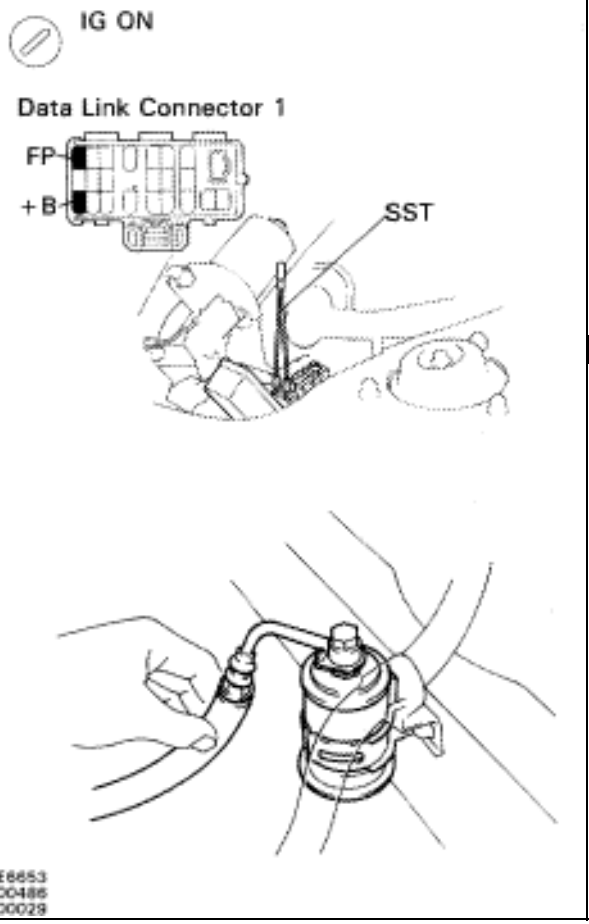
C Check ignition timing.

OK **Ignition timing: 10□5 BTDC at idle.**

OK → **NG** → **Proceed to page IG–19 and continue to troubleshoot.**

Proceed to matrix chart of problem symptoms on page EG–344.

7 **Check fuel pressure.**



P
1. Be sure that fuel is enough in tank.
2. Turn ignition switch on.
3. Using SST, connect terminals FP and +B of data link connector 1.

SST 09843–18020

C Check that there is pressure in the hose from the fuel filter.

Hint At this time, you will hear fuel return noise.

Caution: NEVER make a mistake with the terminal connection position as this will cause a malfunction.

OK

NG **Proceed to page EG–171 and continue to troubleshoot.**

8 **Check for spark.**

C Disconnect the high–tension cord from the distributor and, hold the end about 12.5 mm (1/2”) from the ground, see if spark occurs while the engine is being cranked.

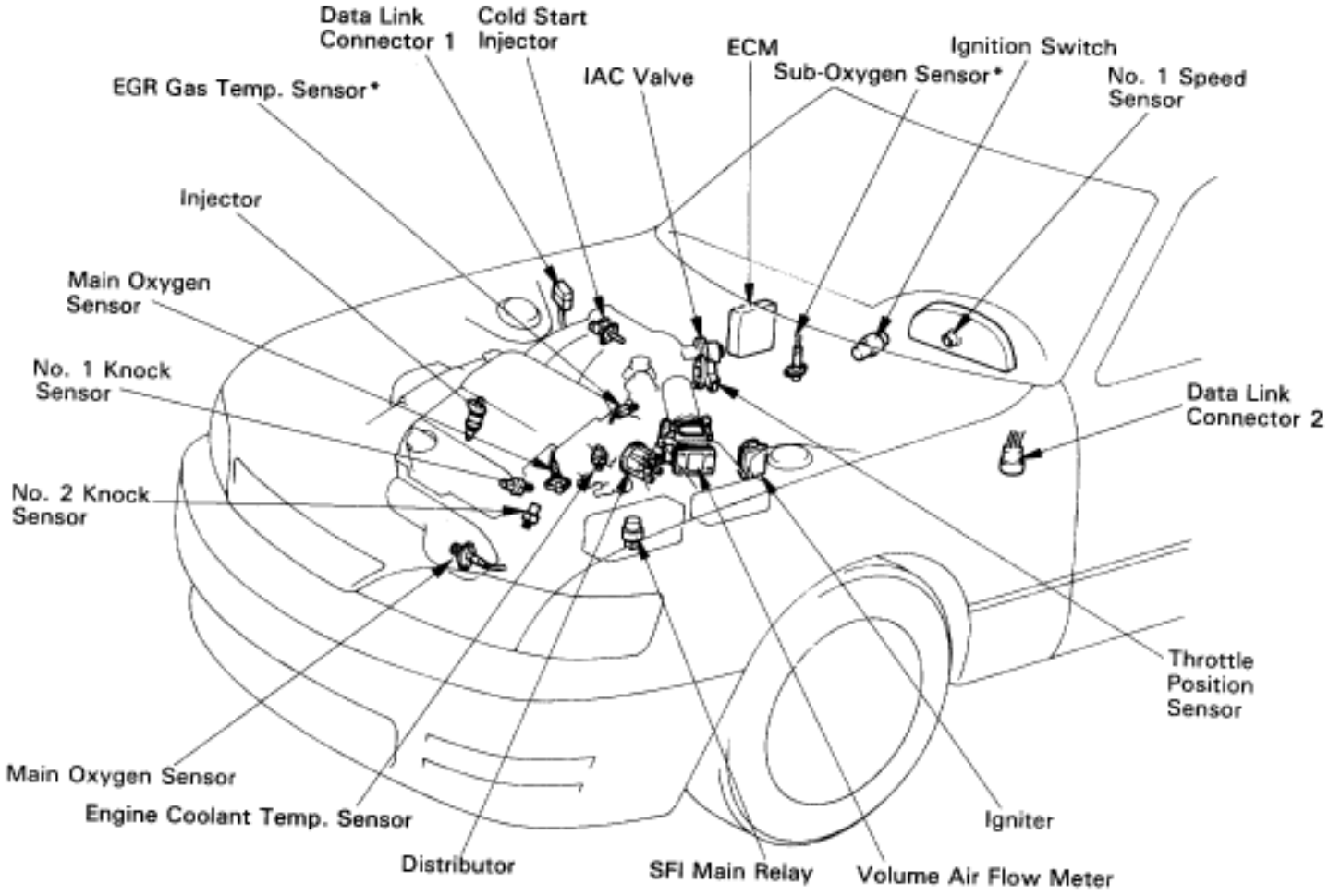
Hint To prevent excessive fuel injected from the injectors during this test. don’t crank the engine for more than 1 – 2 seconds at a time.

OK

NG **Proceed to page IG–6 and continue to troubleshoot.**

Proceed to matrix chart of problem symptoms on page EG–344.

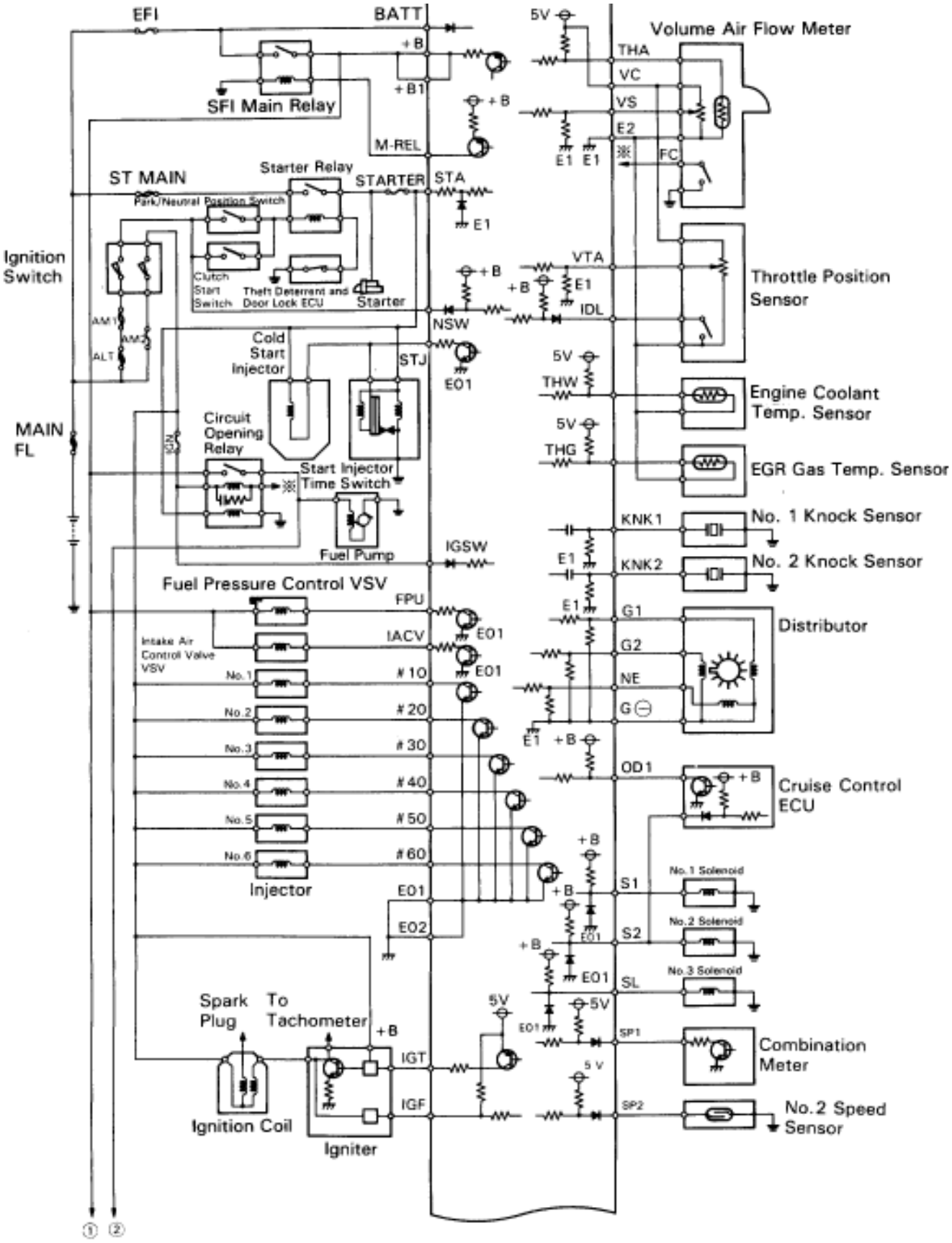
PARTS LOCATION

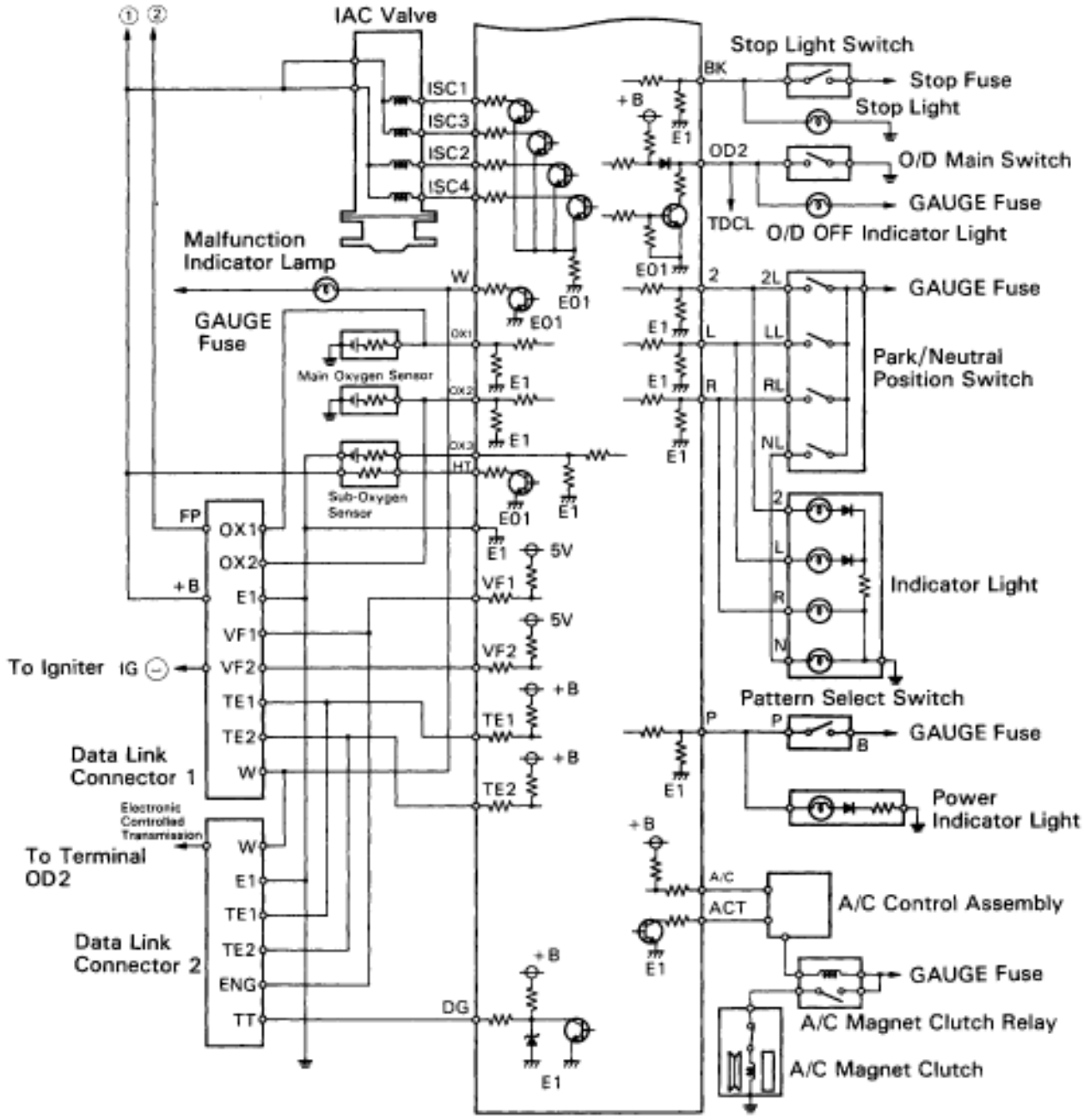


*: Only for Calif. spec.

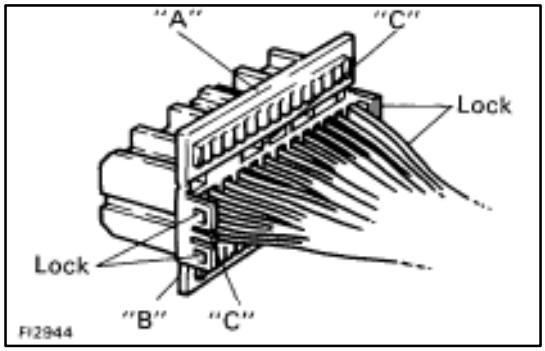
FI6803

WIRING DIAGRAM




IAC Valve
ISC1
ISC3
ISC2
ISC4
Malfunction Indicator Lamp
GAUGE Fuse
Main Oxygen Sensor
Sub-Oxygen Sensor
FP
OX1
OX2
+B
E1
VF1
VF2
TE1
TE2
W
To Igniter
IG
Data Link Connector 1
Electronic Controlled Transmission
To Terminal OD2
Data Link Connector 2
ENG
TT
DG
HT
E01
5V
Stop Light Switch
BK
Stop Fuse
Stop Light
OD2
O/D Main Switch
TDCL
O/D OFF Indicator Light
GAUGE Fuse
2
2L
L
LL
R
RL
NL
Park/Neutral Position Switch
Indicator Light
Pattern Select Switch
P
B
Power Indicator Light
A/C
ACT
A/C Control Assembly
A/C Magnet Clutch Relay
A/C Magnet Clutch

FI6575



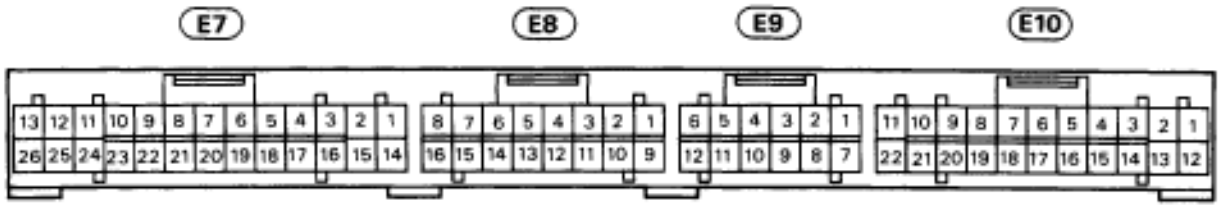
TERMINALS OF ECM

When measuring the voltage or resistance of the connector part of the ECM, remove the locks as required in the following procedure and always insert the test probe into the connector from the wire harness side.

PREPARATION

(a) Turn the ignition switch to LOCK position.
(b) Disconnect the connectors from the ECM.
(c) To remove section "A" and "B", carefully pull outward the lock on both sides as shown in the illustration.
NOTICE: Pay attention to section "C" in the illustration which can be easily broken.
(d) Reconnect the connectors to the ECM.

ECU Terminals



Terminal No.	Symbol	Connection	Terminal No.	Symbol	Connection
E7-1	HT*2	Sub-oxygen sensor heater	E7-14	VF2	Data link connector 1
-2	2*1	Park/Neutral position switch	-15	VF1	Data link connector 1
-3	L*1	Park/Neutral position switch	-16	–	———
-4	ISC4	IAC valve	-17	IGF	Igniter
-5	ISC3	IAC valve	-18	IGT	Igniter
-6	ISC2	IAC valve	-19	–	———
-7	ISC1	IAC valve	-20	#60	No. 6 injector
-8	SL*1	Solenoid	-21	#50	No. 5 injector
-9	S2*1	Solenoid	-22	#40	No. 4 injector
-10	S1*1	Solenoid	-23	#30	No. 3 injector
-11	#20	No.2 injector	-24	E1	ECM ground
-12	#10	No.1 injector	-25	STJ	Cold start injector
-13	E01	Power ground	-26	E02	Power ground

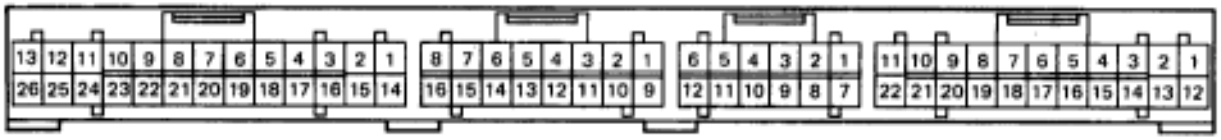
Terminal No.	Symbol	Connection	Termi-nal No.	Symbol	Connection
E8–1	VC	Throttle position sensor Volume air flow meter	**E9–10**	G2	Distributor
–2	VS	Volume air flow meter	**–11**	G1	Distributor
–3	THA	Intake air temp. sensor	**–12**	NE	Distributor
–4	THW	Engine coolant temp. sensor	**E10–1**	+B1	SFI main relay
–5	OX1	Main oxygen sensor (on right bank)	**–2**	BATT	Battery
–6	KNK1	No. 1 knock sensor	**–3**	M–REL	SFI main relay
–7	TE1	Data link connector 1	**–4**	W	Malfunction Indicator Lamp
–8	DG	Data link connector 1	**–5**	–	–
–9	E2	Sensor ground	**–6**	ACT	A/C control assembly
–10	VTA	Throttle position sensor	**–7**	A/C	A/C control assembly
–11	IDL	Throttle position sensor	**–8**	SP1	Speed sensor No.1
–12	THG*2	EGR gas temp. sensor	**–9**	OD2*1	O/D main switch
–13	OX2	Main oxygen sensor (on left bank)	**–10**	–	–
–14	KNK2	No. 2 knock sensor	**–11**	STA	Starter relay
–15	TE2	Data link connector 1	**–12**	+B	SFI main relay
–16	SP2*1	Speed sensor No. 2 (for ECT)	**–13**	IGSW	Ignition switch
E9–1	–	–	**–14**	BK*1	Stop light switch Stop light
–2	FPU	Fuel pressure up VSV	**–15**	–	–
–3	IACV	VSV (intake air control valve)	**–16**	–	–
–4	–	–	**–17**	–	–
–5	OX3*2	Sub–oxygen sensor	**–18**	OD1*1	Cruise control ECU
–6	G ⊕	Distributor	**–19**	R*1	Neutral start switch
–7	–	–	**–20**	P*1	Electronic Controlled Transmission pattern select switch
–8	–	–	**–21**	–	–
–9	–	–	**–22**	NSW*1	Park/Neutral position switch

*1: Only vehicles with Electronic Controlled Transmission.

*2: Only for California specification vehicles.

STANDARD VALUE OF ECM TERMINALS

ECM Terminals



Symbols (Terminals No.)	Wiring Color	STD Voltage (V)	Condition
BATT (E10-2)–E1 (E7-24)	W-L ↔ BR	10 ~ 14	Always
IGSW (E10-13) +B (E10-12)–E1 (E7-24) +B1 (E10-1)	BO (IGSW) B-O (+B) ↔ BR B-O (+B1)	10 ~ 14	IG switch ON.
VC (E8-1)–E2 (E8-9)	L-R ↔ BR	4.0 ~ 6.0	IG switch ON.
IDL (E8-11)–E2 (E8-9)	L ↔ BR	Below 1.0	IG switch ON. Closed throttle position
		10 ~ 14	IG switch ON. Throttle valve fully open
VTA (E8-10)–E2 (E8-9)	B ↔ BR	0.3 ~ 0.8	IG switch ON. Closed throttle position
		2.7 ~ 5.2	IG switch ON. Throttle valve fully open
VS (E8-2)–E2 (E8-9)	Y-L ↔ BR	3.7 ~ 4.3	IG switch ON.
		2.0 ~ 4.0	Idling
THA (E8-3)–E2 (E8-9)	L-B ↔ BR	1.0 ~ 3.0	Idling, Intake air temp. 20°C (68°F)
THW (E8-4)–E2 (E8-9)	G ↔ BR	0.1 ~ 1.0	Idling, Engine coolant temp. 80°C (176°F)
#10 (E7-12) #20 (E7-11) #30 (E7-23) – E01 (E7-13) #40 (E7-22) #50 (E7-21) #60 (E7-20)	W (#10) Y (#20) GR (#30) L (#40) R (#50) G (#60) ↔ W-B	10 ~ 14	IG switch ON.
		Pulse generation	Idling
IGT (E7-18)–E1 (E7-24)	W ↔ BR	Pulse generation (0 and 4 ~ 6)	Idling
IGF (E7-17)–E1 (E7-24)	W-R ↔ BR	Below 1.0	IG switch ON.
		Pulse generation (1.0 and 4 ~ 6)	Idling
G1 (E9-11) G2 (E9-10) – G⊖ (E9-6)	R (G1), L(G2) ↔ Y	Pulse generation (−1.3 ~ +1.3 or higher)	Idling
NE (E9-12)–G⊖ (E9-6)	B ↔ Y	Pulse generation (−0.6 ~ +0.6 or higher)	Idling
M-REL (E10-3)–E1 (E7-24)	RL ↔ BR	10 ~ 14	IG switch ON.

Symbols (Terminals No.)	Wiring Color	STD Voltage (V)	Condition
FPU (E9-2)–E1 (E7-24)	B-R ↔ BR	10 – 14	IG switch ON.
		Below 2.0	Restarting high temp. (Engine coolant temp.: 100°C (212°F) or more, Intake air temp.: 65°C (149°F) or more)
ISC1 (E7-7) ISC2 (E7-6) ISC3 (E7-5) ISC4 (E7-4) – E1 (E7-24)	W-L (ISC1) G-W (ISC2) L-R (ISC3) R-B (ISC4) ↔ BR	10 – 14	IG switch ON.
VF1 (E7-15) VF2 (E7-14) –E1 (E7-24)	R-W (VF1) B (VF2) ↔ BR	1.0 – 4.0	Maintain engine speed at 2,500 rpm for two minutes after warming up then return to idling.
OX1 (E8-5) OX2 (E8-13) –E1 (E7-24)	W (OX1) R-L (OX2) ↔ BR	Pulse generation (0 – 1.0)	Maintain engine speed at 2,500 rpm for two minutes after warming up.
HT (E7-1)–E01 (E7-13)	P-B ↔ W-B	10 – 14	IG switch ON.
		Below 2.0	Idling
KNK1 (E8-6) KNK2 (E8-14) –E1 (E7-24)	W (KNK1) R-L (KNK2) ↔ BR	Pluse generation (Frequency: 7.6 kHz)	Idling
NSW (E10-22)–E1 (E7-24)	B-W ↔ BR	10 – 14	IG switch ON. Shift position not in "P", "N" positions.
		Below 2.0	IG switch ON. Shift position in "P", "N" positions.
SP1 (E10-8)–E1 (E7-24)	V-Y ↔ BR	Pulse generation (0 and 4 – 6)	IG switch ON. Rotate driving wheel slowly.
TE1 (E8-7)–E1 (E7-24)	GR ↔ BR	10 – 14	IG switch ON.
TE2 (E8-15)–E1 (E7–24)	G-W ↔ BR	10 – 14	IG switch ON.
W (E10-4)–E1 (E7-24)	G-R ↔ BR	Below 2.0	IG switch ON.
		10 – 14	Idling
OD1 (E10-18)–E1 (E7-24)	Y-B ↔ BR	10 – 14	IG switch ON.
A/C (E10-7)–E1 (E7-24)	B-Y ↔ BR	Below 2.0	A/C switch ON. (At idling)
		10 – 14	A/C switch OFF.
ACT (E10-6)–E1 (E7-24)	LG-R ↔ BR	10 – 14	A/C switch ON. (At idling)
		Below 2.0	A/C switch OFF.
IACV (E9-3)–E01 (E7-13)	LG ↔ W-B	10 – 14	IG switch ON.
STA (E10-11)–E1 (E7-24)	B-W ↔ BR	6.0 or more	Cranking
STJ (E7-25)–E01 (E7-13)	G ↔ W-B	10 – 14	Starting

MATRIX CHART OF PROBLEM SYMPTOMS

When the malfunction code is not confirmed in the diagnostic trouble code check and the problem still can not be confirmed in the basic inspection, then proceed to this step and perform troubleshooting according to the numbered order given in the table below.

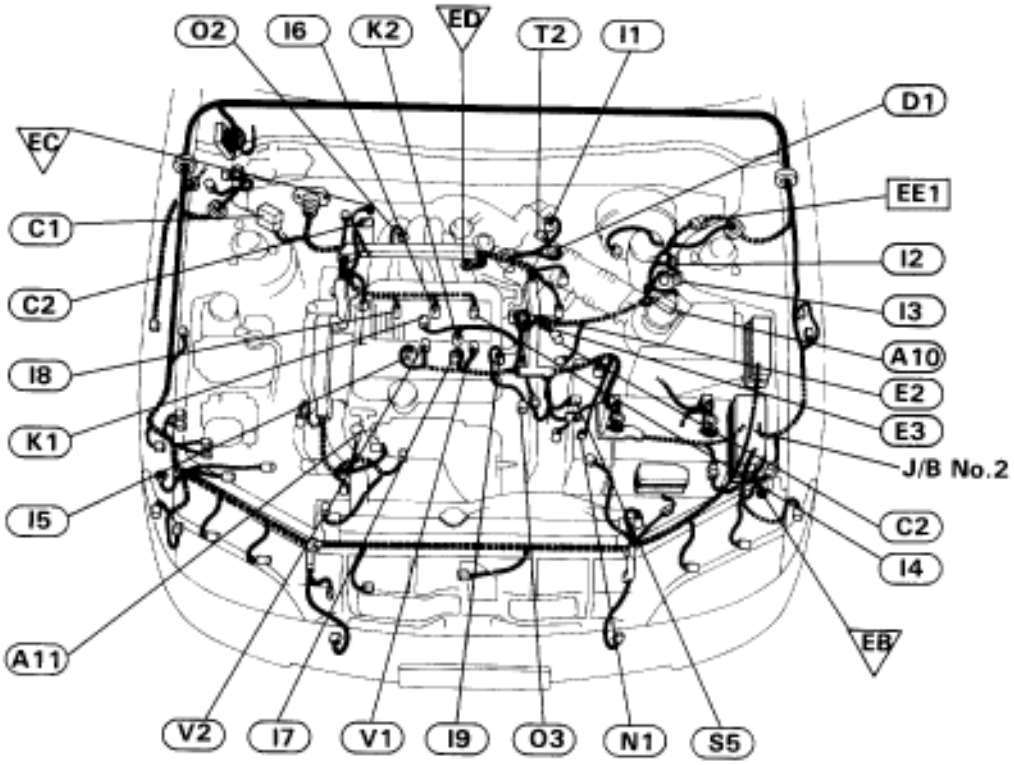
The circuits indicated by ※ on the matrix chart can be inspected using the TCCS checker.

Symptom	Suspect area	See page	Volume air flow meter circuit ※	Starter signal circuit ※	EGR System	Switch condition signal circuit	Park/Neutral position switch circuit ※	ECM power source circuit	Back up power source circuit	Injector circuit ※	Cold start injector circuit	IAC valve circuit	Fuel system circuit	Fuel pressure control VSV circuit	A/C cut control circuit	A/C signal circuit (Compressor circuit) ※	Starter and starter relay	Ignition signal circuit (Spark test)	Spark plug	Ignition coil	Distributor	Compression	Electronic Controlled Transmission faulty	Theft deterrent ECU	ECM
		EG–388, 390	EG–400,	EG–408,	EG–412,	EG–416,	EG–420,	EG–426	EG–428	EG–432	EG–436	EG–440	EG–446	EG–450	AC–84,	ST–17–19	IG–6	IG–9	IG–11	IG–11	EG–27	AX–66	BE–278	IN–32
Does not start	Engine does not crank						2										1							3	
	No initial combustion							1		5	6		3					2	4						
	No complete combustion									6	7		1					5	4	2	3				
Difficult to start	Difficult to start normally		1							8	9	2	3						6	4	5	7			
	Difficult to start in cold		1							5	3	2	4						8	6	7				
	Difficult to start in hot		1							5	6	2	4	3					9	7	8				
Poor Idling	Incorrect first idle				1							2													
	High engine idle speed				1	5	4	6				2				3									
	Low engine idle speed	7			3	4		8	6			1	5			2									
	Rough idling	3		5	1			12	4	13	2	8						6	11	9	10	7			
	Hunting	3			1		4				2	5													
Poor Driveability	Hesitation/Poor acceleration	2			1				3			4		9				5	8	6	7		10		
	Muffler explosion (after fire)				1				5										4	2	3				
	Surging				1				5			2							4		3				
Engine Stall	Engine stalls soon after starting	2								4	3	1													
	After acceleration pedal depressed	2			1					3															
	After acceleration pedal released								1	3	2														4
	During A/C operation										1				2										3
	When N to D shift					1				3	2														

–MEMO–

LOCATION OF CONNECTORS

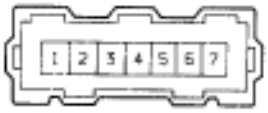
Location of Connectors in Engine Compartment



BE6660

A10

Intake Air Temp. Sensor (Inside the volume air flow meter)



J-7-1

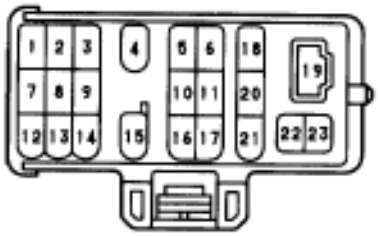
A11

Generator

X-142

C1

Data Link Connector 1



Ie-23-1-A

C2

Cold Start Injector

IS-2-1-I

D1

Distributor

Ie-4-1-E

E2

Engine Coolant Temp. Sensor

V-2-1-C

E3

EGR Gas Temp. Sensor

Ie-2-1-C

I1

IAC Valve

Ie-6-1-D

I2

Igniter

Ie-5-1

I3

Ignition Coil

Ie-2-1-n

I4

Injector No.1

IS-2-1-T

I5

Injector No. 2

IS-2-1-T

I6

Injector No.3

IS-2-1-T

I7

Injector No. 4

IS-2-1-T

I8

Injector No. 5

IS-2-1-T

I9

Injector No. 6

IS-2-1-T

K1

No. 1 Knock Sensor

Ie-1-1-B

K2

No. 2 Knock Sensor

Ie-1-1-B

N1

Park/Neutral Position Switch (Electronic Controlled Transmission)

SH-9-1-A

O2

Main Oxygen Sensor (On Right Bank)

Ie-1-1

O3

Main Oxygen Sensor (On Left Bank)

Ie-1-1

S4

Start Injector Time Switch

V-2-1-A

S5

Starter

H-1-1

T2

Throttle Position Sensor

IS-4-1-C

V1

VSV (For Fuel Pressure Control)

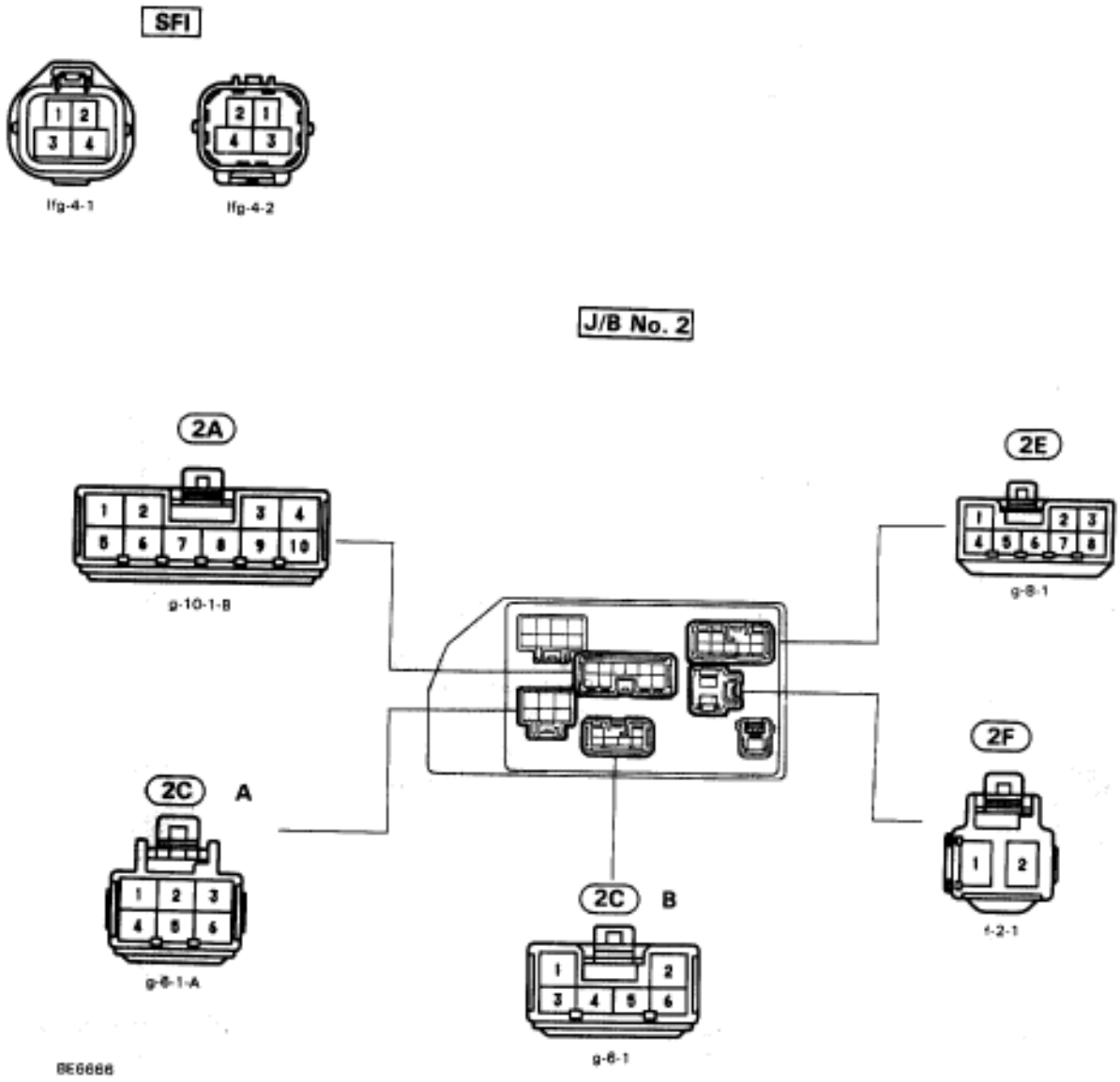
Ie-2-1-X

V2

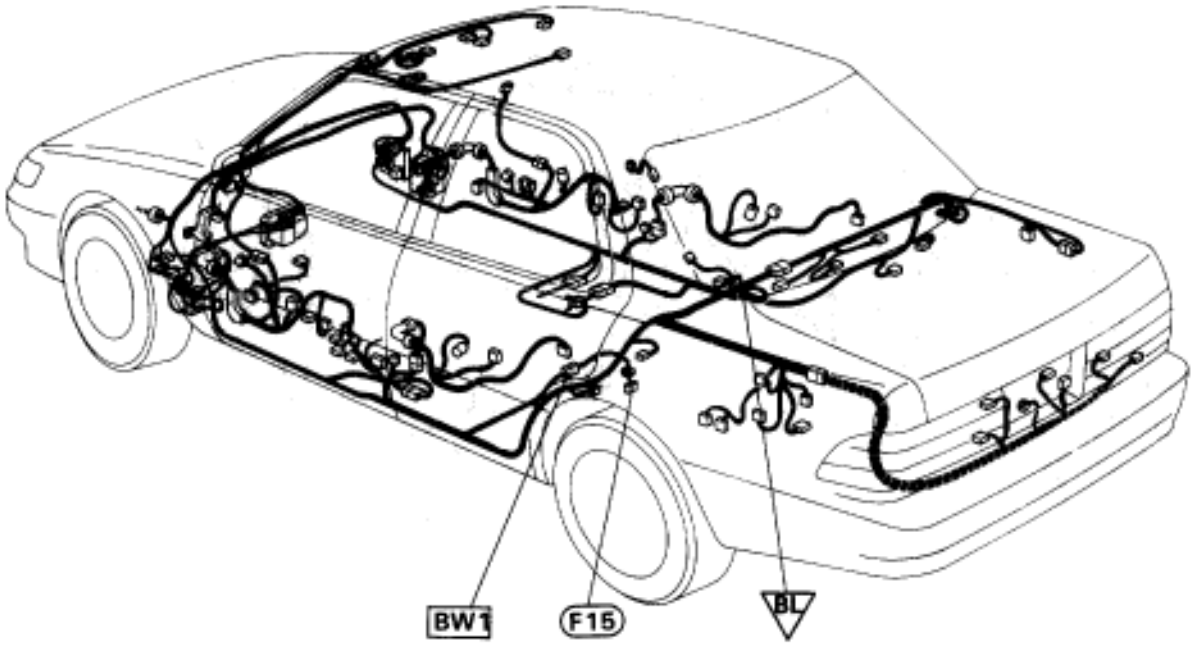
VSV (For Intake Air Control Valve)

Ie-2-1-W

Location of Connectors in Engine Compartment (Cont'd)



Location of Connectors in Body



BE6662

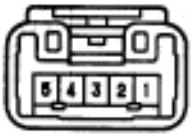
F15

Fuel Pump

Ia-5-1-A

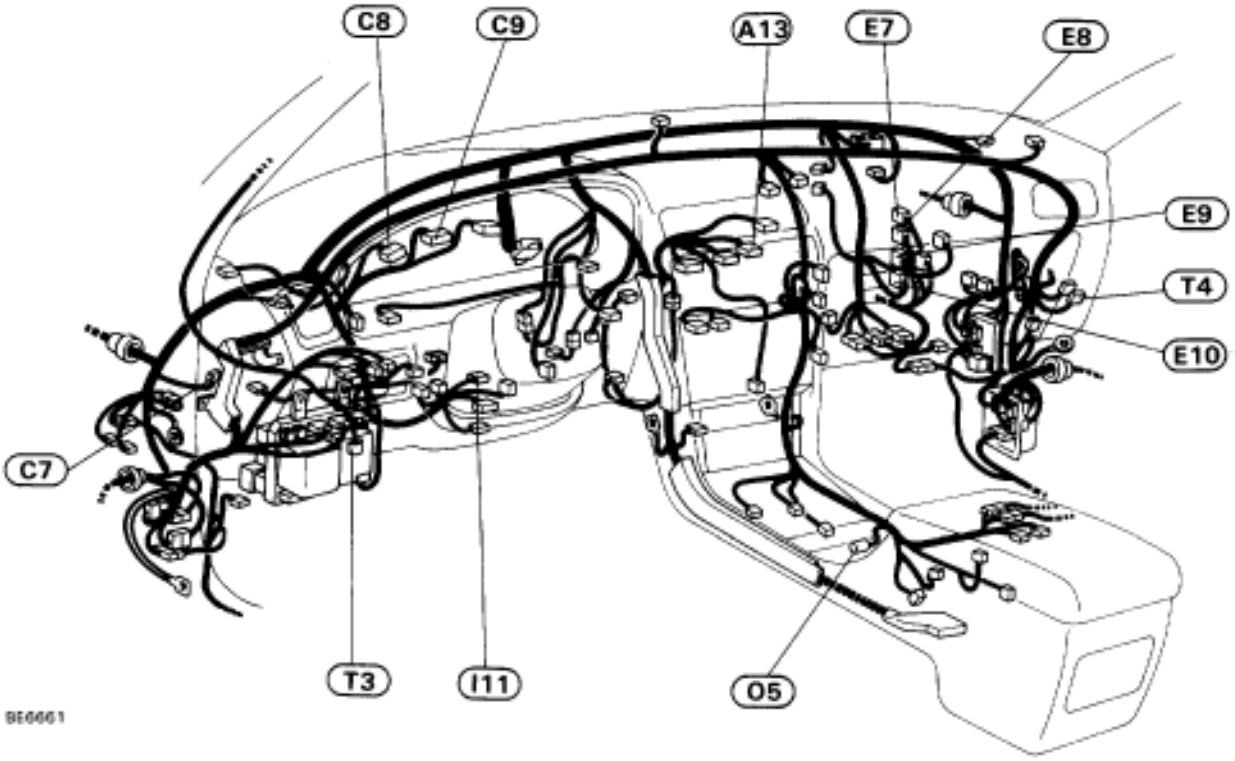
BW1

e-5-1



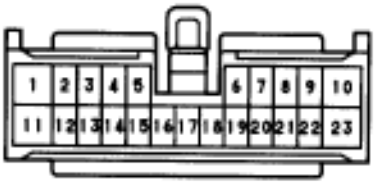
e-5-2

Location of Connectors in Instrument Panel



A13

A/C Control Assembly



eh-23-1

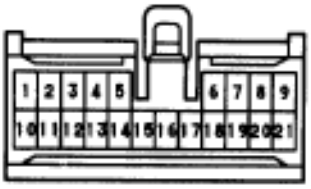
C7

Clutch Start Switch (M/T)

e-2-1

C8

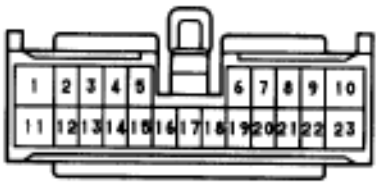
Charge Warning Light



h-21-1

C9

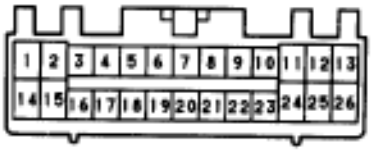
Meter Assembly



eh-23-1

E7

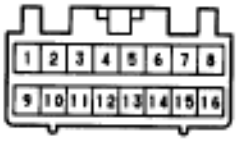
ECM



Vd-26-1

E8

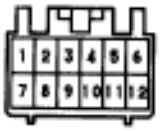
ECM



Vd-16-1

E9

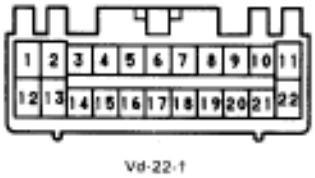
ECM



d-12-1

E10

ECM



Vd-22-1

(O5)

Sub-Oxygen Sensor

la-4-1-D

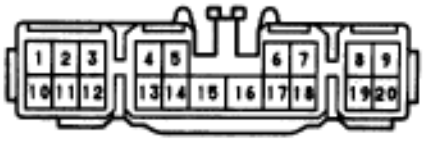
(T3)

Data Link Connector 1

S-17-1

(T4)

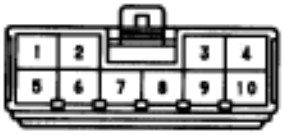
Theft Deterrent and Door Lock ECU



e-20-1

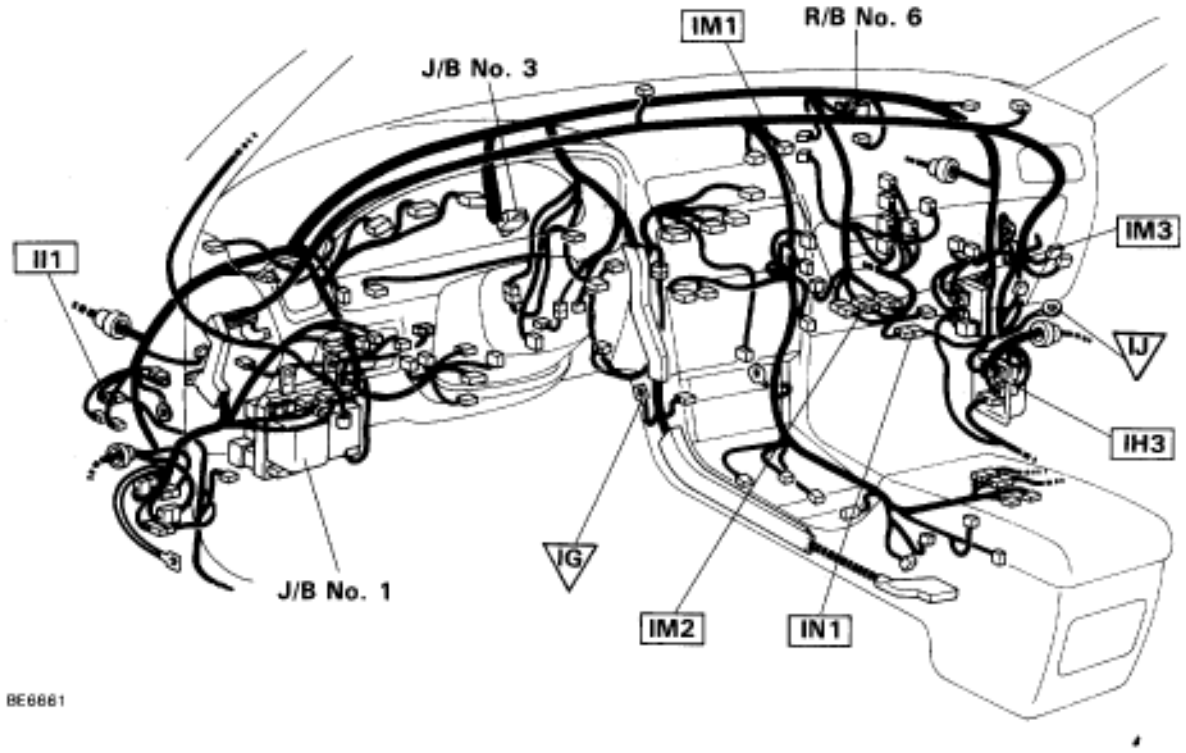
(I11)

Ignition Switch

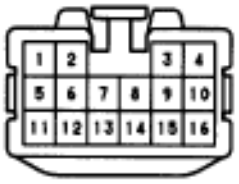


g-10-1-B

Location of Connectors in Instrument Panel (Cont'd)



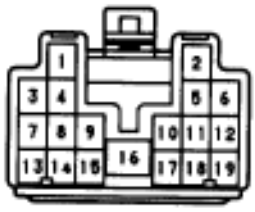
IH3



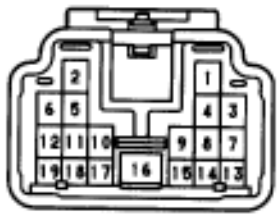
e-16-1

e-16-2

II1

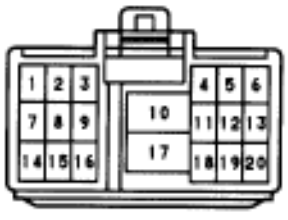


eg-19-1

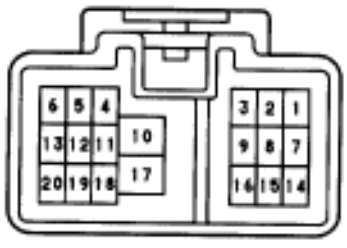


eg-19-2

IM1



e-20-1-B



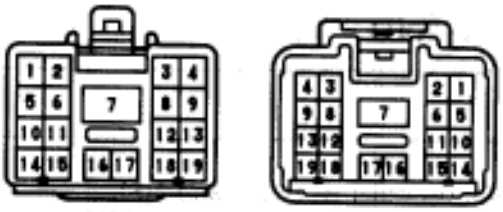
e-20-2-B

IM2

e-13-1

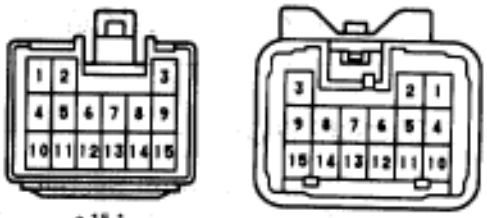
e-13-2

IM3



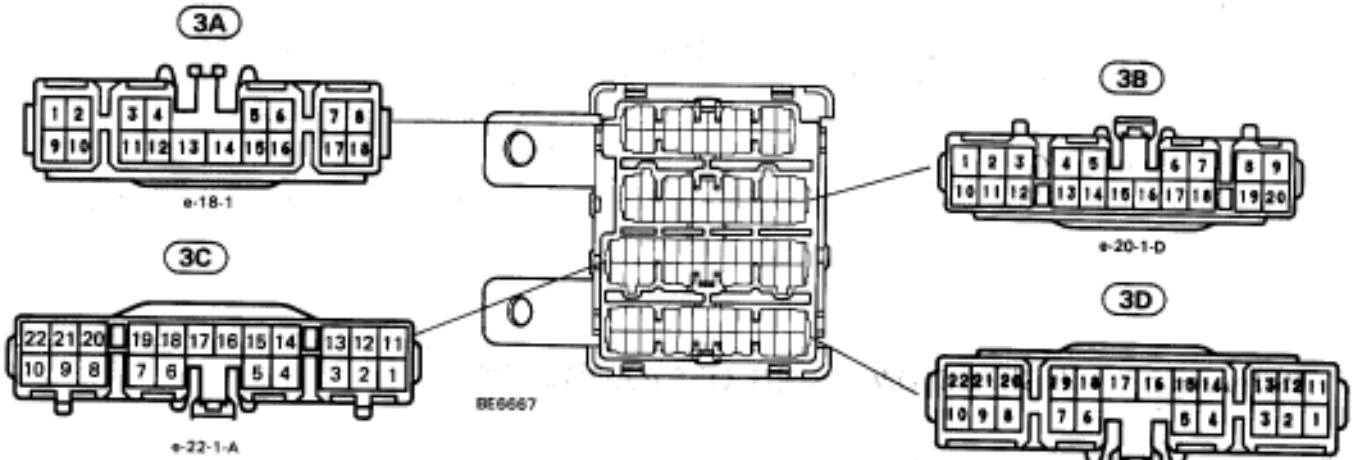
ef-19-1 ef-19-2

IN1

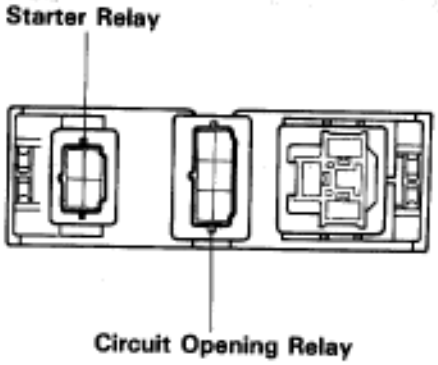


e-15-1 e-15-2

J/B No. 3



R/B No. 6



BE6670

CIRCUIT INSPECTION

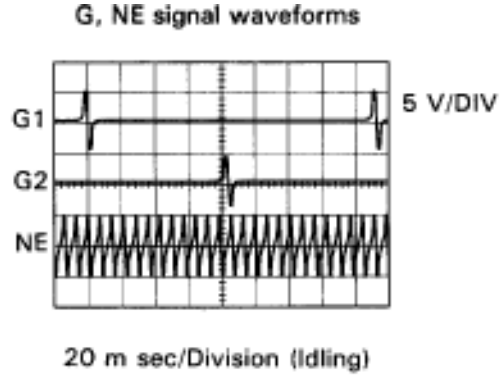
DTC	12	RPM Signal Circuit (No. 1)

— CIRCUIT DESCRIPTION —

The distributor in the Engine Control System contains three pick–up coils (G1, G2 and NE).
The G1, G2 signals inform the ECM of the standard crankshaft angle.
The NE signals inform the ECM of the crankshaft angle and the engine speed.

Code No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
12	No “NE” or “G1” and “G2” signal to ECM within 2 sec. after cranking.	□ Open or short in NE, G circuit. □ Distributor □ Open or short in STA circuit. □ ECM
	Open in “G ⊕” circuit.	

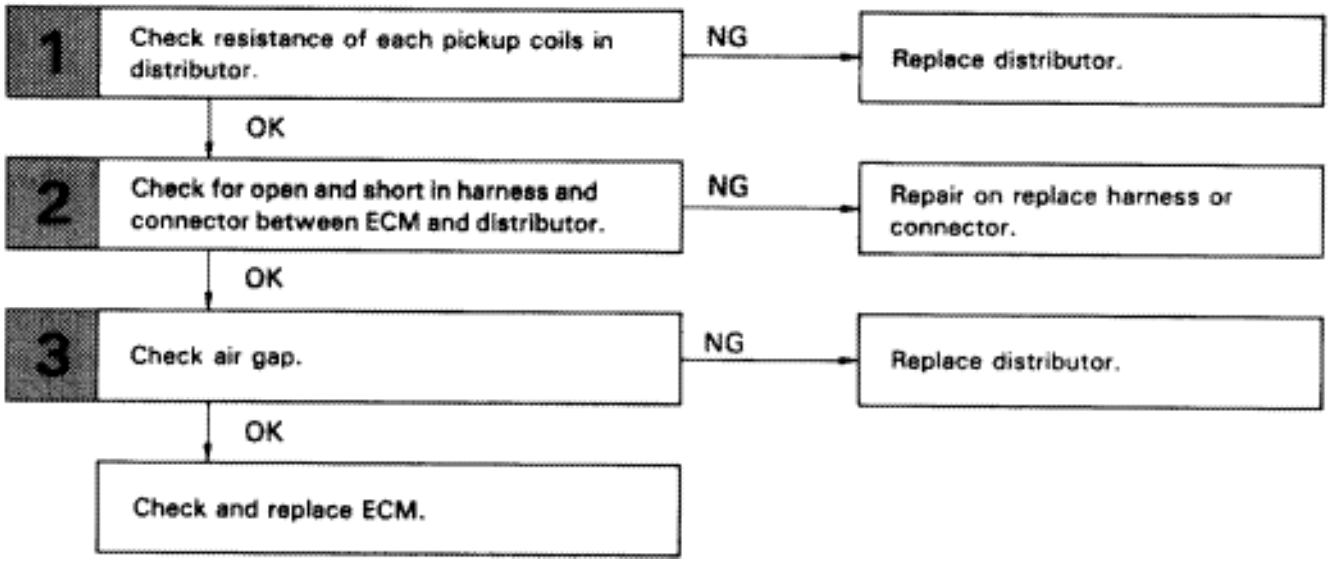
Reference INSPECTION USING OSCILLOSCOPE



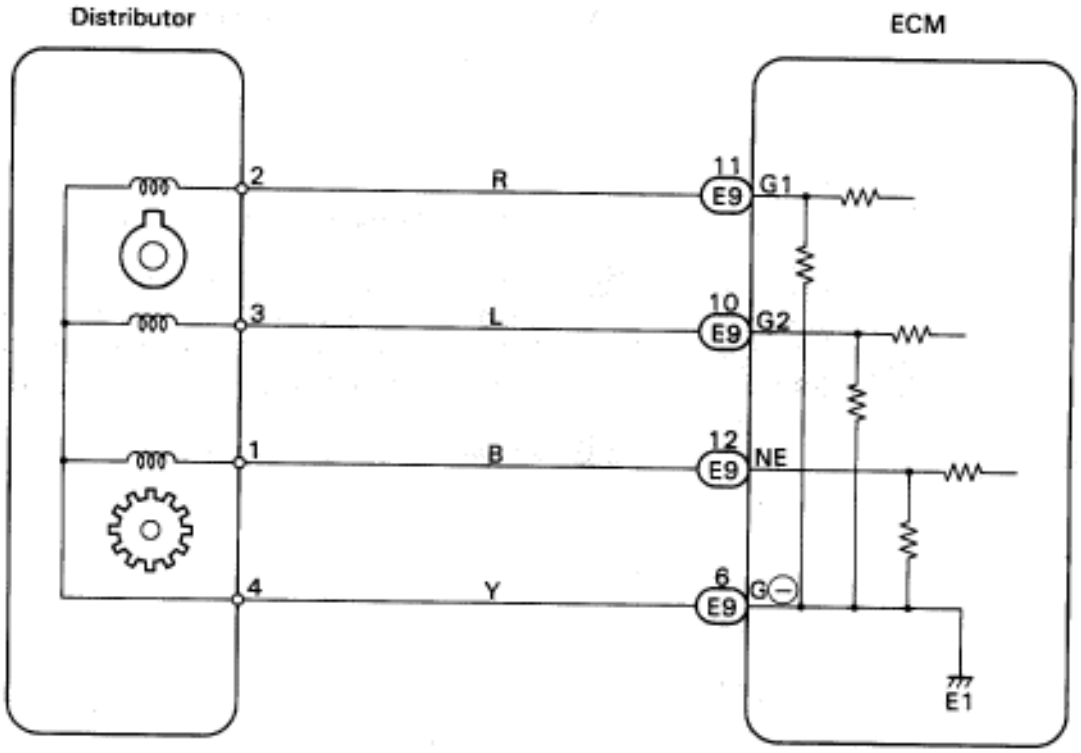
□ During cranking or idling, check between terminals G1, G2, NE and G ⊕ of ECM.

HINT: The correct waveforms appear as shown in the illustration on the left.

DIAGNOSTIC CHART



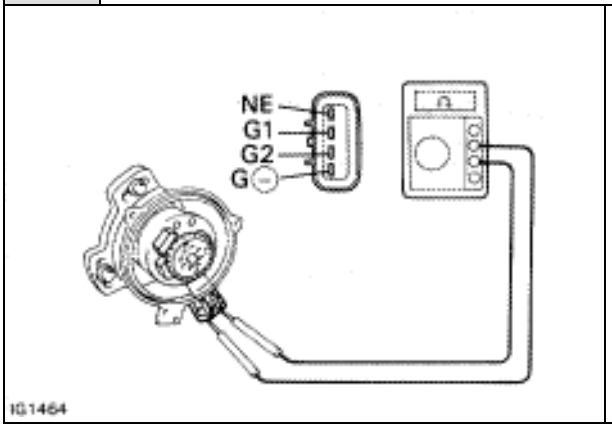
WIRING DIAGRAM



FI6543

INSPECTION PROCEDURE

1 **Check resistance of each pickup coils in distributor.**



P Disconnect distributor connector.

C Measure resistance between each terminal shown.

OK

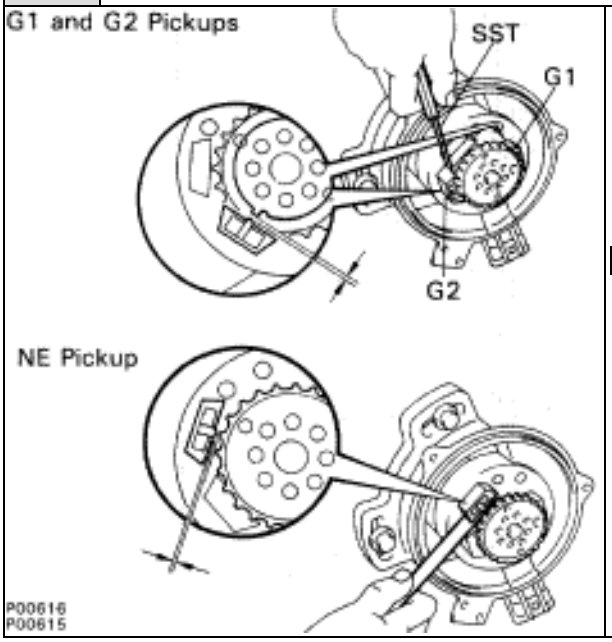
	Terminals	Resistance
G1 pickup coil (Cold)	G1–G⊖	125–190 Ω
G2 pickup coil (Cold)	G2–G⊖	125–190 Ω
NE pickup coil (Cold)	NE–G⊖	155–240 Ω

OK → **NG** → **Replace distributor.**

2 **Check for open and short in harness and connector between ECM and distributor (See page IN–27).**

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

3 **Check air gap.**



P Remove distributor cap and rotor.

C Using SST (G1 and G2 pickups) and a thickness gauge (NE pickup), measure the air gap between the signal rotor projection and pickup coil.

SST 09240–00020 for G1 and G2 pickups.

OK **Air gap: 0.2 – 0.4 mm (0.008 – 0.016 in.)**

OK → **NG** → **Replace distributor.**

Check and replace ECM.

DTC 13 RPM Signal Circuit (No. 2)

CIRCUIT DESCRIPTION

Refer to RPM signal circuit (No. 1) on page EG–354.

Code No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
13	No NE signal to ECM for 0.1 sec. or more at 1,000 rpm or more. No 12 pulses of NE to ECM during the interval between G1 and G2 pulses.	□ Open or short in NE circuit. □ Distributor □ ECM

DIAGNOSTIC CHART

This code indicates that a momentary interruption of the RPM signal from the distributor to the ECM has occurred, but that it is returned to normal. Note that although this problem may not necessarily appear at the time of inspection, it cannot be ignored because this diagnostic trouble code is output, indicating that there is or was a malfunction in the RPM signal circuit; this “malfunction” is usually a loose connector.
The distributor connector and the NE terminal of the ECM connector must therefore be checked for the following:

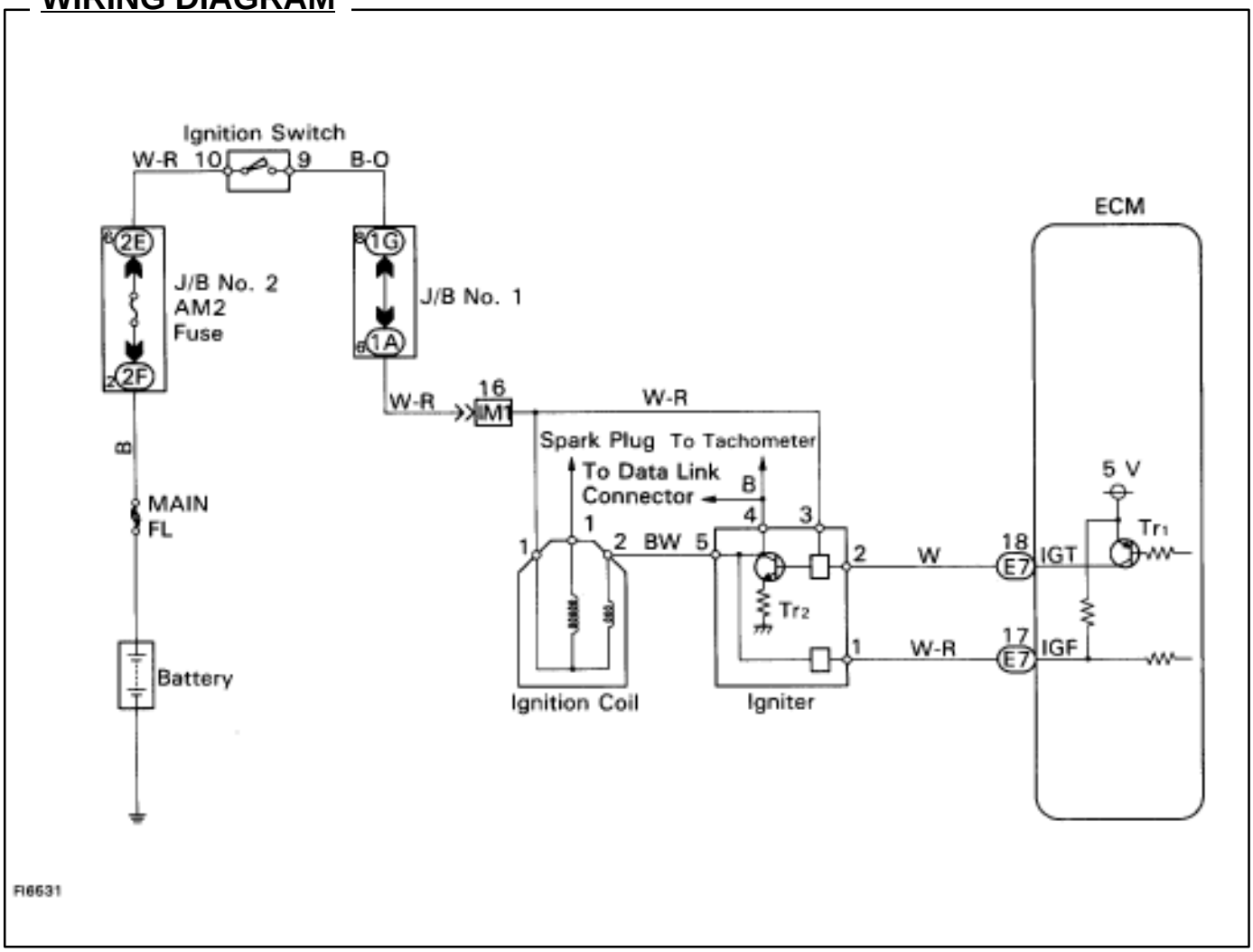
1. Loose connectors
2. Dirty connector terminals
3. Loose connector terminals

DTC 14 Ignition Signal Circuit

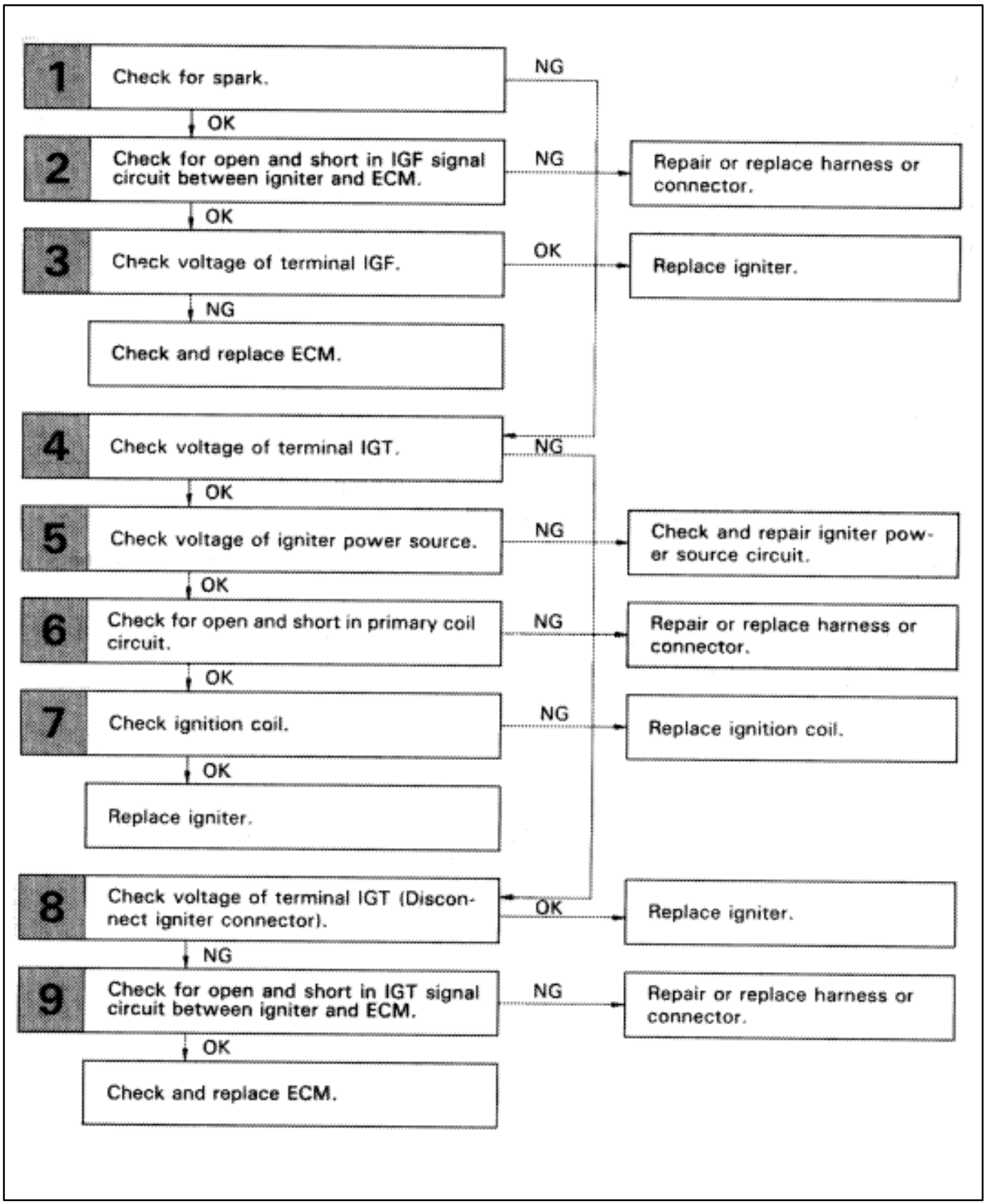
The ECM determines the ignition timing, turns on Tr_1 at a predetermined angle (□CA) before the desired ignition timing and outputs an ignition signal (IGT) “1” to the igniter.
Since the width of the IGT signal is constant, the dwell angle control circuit in the igniter determines the time the control circuit starts primary current flow to the ignition coil based on the engine rpm and ignition timing one revolution ago, that is, the time the Tr_2 turns on.
When it reaches the ignition timing, the ECM turns Tr_1 off and outputs the IGT signal “0”.
This turns Tr_2 off, interrupting the primary current flow and generating a high voltage in the secondary coil which causes the spark plug to spark. Also, by the counter electromotive force generated when the primary current is interrupted, the igniter sends an ignition confirmation signal (IGF) to the ECM. The ECM stops fuel injection as a fail safe function when the IGF signal is not input to the ECM.

Code No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
14	No IGF signal to ECM for 6 consecutive IGT signal.	□Open or short in IGF or IGT circuit from igniter to ECM. □Igniter □ECM

WIRING DIAGRAM



DIAGNOSTIC CHART



INSPECTION PROCEDURE

1	Check for spark.
C	Disconnect the high–tension cord from the distributor, hold its end about 12.5 mm (1/2”) from the ground, see if spark occurs while the engine is being cranked.
OK	Spark should be generated.
Hint	To prevent excessive fuel injected from the injectors during this check, don’t crank the engine for more the 1 – 2 seconds at a time.

OK

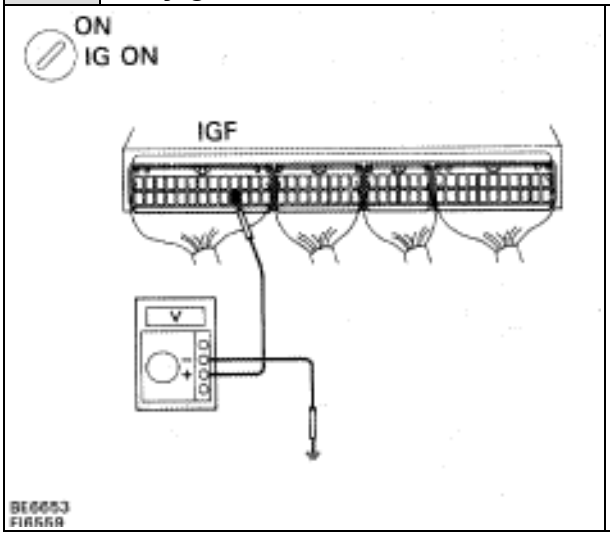
NG → Go to step 1.

2	Check for open and short in harness and connector in IGF signal circuit between ECM and igniter (See page IN–27).

OK

NG → Repair or replace harness or connector.

3	Disconnect igniter connector and check voltage between terminal IGF of ECM connector and body ground.



P
1. Disconnect igniter connector.
2. Remove glove compartment (See page BO–111).
3. Turn ignition switch on.

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

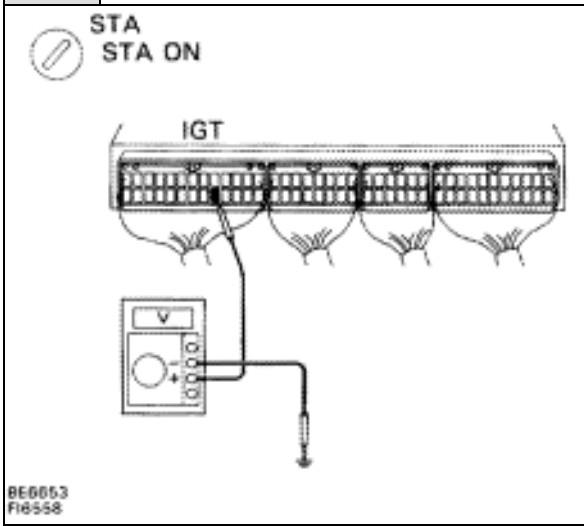
OK **Voltage: 4 – 6 V**

NG

OK → Replace igniter.

Check and replace ECM.

4 **Check voltage between terminal IGT of ECM connector and body ground.**

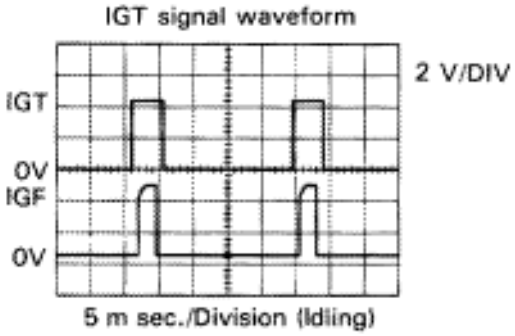


P Remove glove compartment (See page BO–111).

C Measure voltage between terminal IGT of ECM connector and body ground when engine is cranked.

OK **Voltage:** **0.5 – 1.0 V**
(Neither 0 V nor 5 V)

Reference **INSPECTION USING OSCILLOSCOPE**

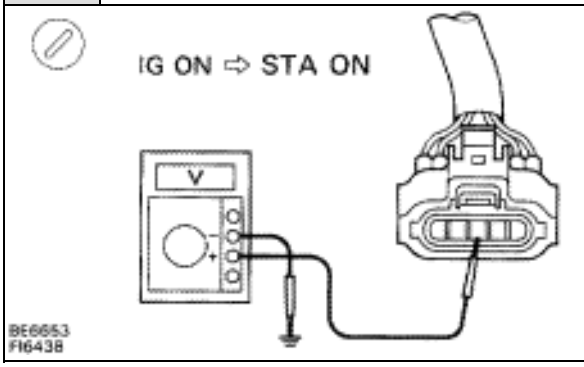


During cranking or idling, check waveform between terminal IGT and E1 of ECM.

HINT: The correct waveform appears as shown in the illustration on the left, with rectangle waves.

OK → **NG** → **Go to step** 3

5 **Check voltage between terminal 3 of igniter connector and body ground.**



P Disconnect igniter connector.

C Measure voltage between terminal 3 of igniter connector and body ground, when ignition switch is turned to "ON" and "STA" position.

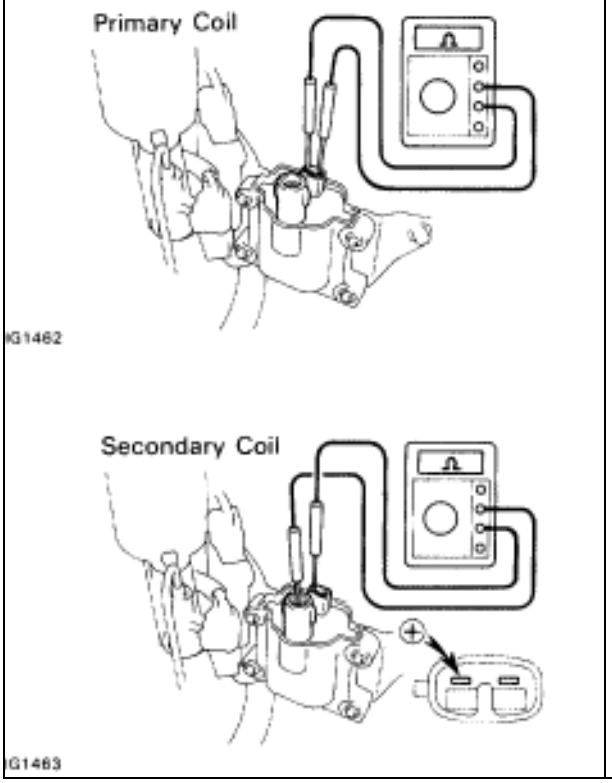
OK **Voltage:** **10 – 14 V**

OK → **NG** → **Check and repair igniter power source circuit.**

6	Check for open and short in harness and connector between ignition switch and ignition coil, ignition coil and igniter (See page IN–27).

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

7	Check ignition coil.



P Disconnect ignition coil connector.

C
1. Check primary coil.
   Measure resistance between terminals of ignition coil connector.
2. Check secondary coil.
   Measure resistance between terminal ⊕ of ignition coil connector and high–tension terminal.

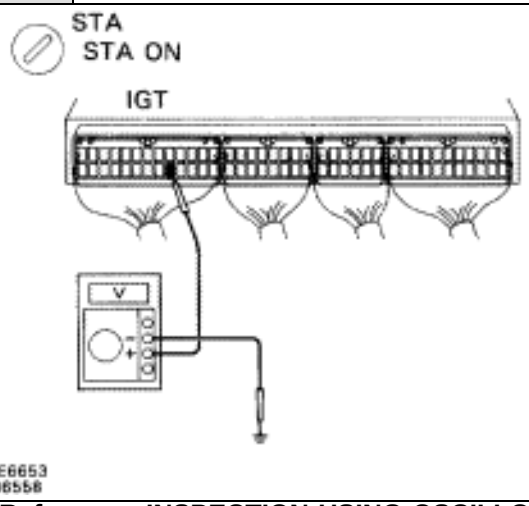
OK

	Resistance
Primary Coil (Cold)	0.2 – 0.3 Ω
Secondary Coil (Cold)	6 – 11 kΩ

OK → NG → **Replace ignition coil.**

Replace igniter.

8 **Disconnect igniter connector and check voltage between terminal IGT of ECM connector and body ground.**

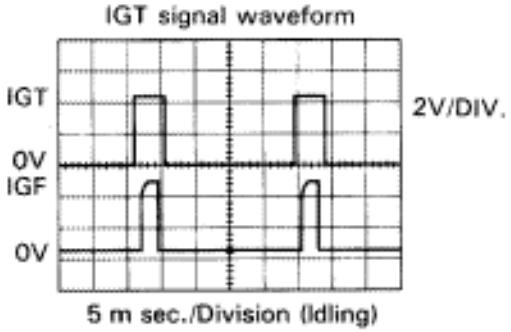


P Disconnect igniter connector.

C Measure voltage between terminal IGT of ECM connector and body ground when engine is cranked.

OK **Voltage:** **0.5 – 1.0 V**
(Neither 0 V nor 5 V)

Reference: INSPECTION USING OSCILLOSCOPE



During cranking or idling, measure between terminal IGT and E1 of ECM.

HINT: The correct waveform appears as shown in the illustration on the left, with rectangle waves.

NG

OK **Replace igniter.**

9 **Check for open and short in harness and connector in IGT signal circuit between ECM and igniter (See page IN–27).**

OK

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

Check and replace ECM.

DTC	16	ELECTRONIC CONTROLLED TRANSMISSION Control Signal Malfunction

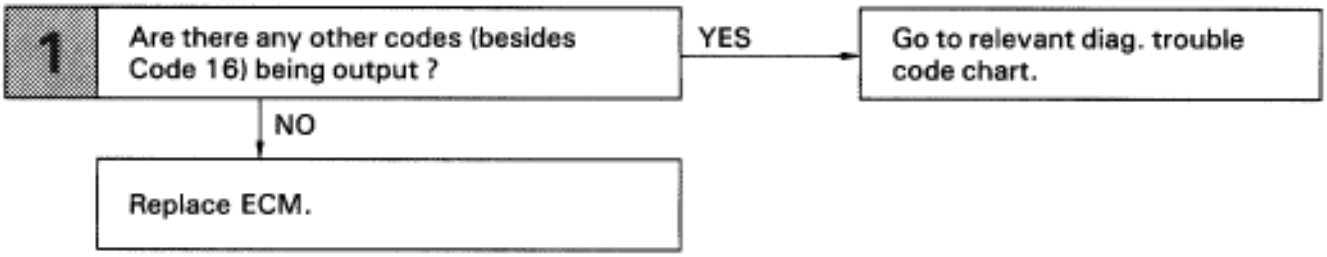
CIRCUIT DESCRIPTION

The signal from the Electronic Controlled Transmission CPU retards the ignition timing of the engine during Electronic Controlled Transmission gear shifting, thus momentarily reducing torque output of the engine for smooth clutch operation inside the transmission and reduced shift shock.

Code No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
16	Fault in communications between the engine CPU and Electronic Controlled Transmission CPU in the ECM.	ECM

If the ECM records the diagnostic code “16” in memory, it prohibits the torque control of the Electronic Controlled Transmission which performs smooth gear shifting.

DIAGNOSTIC CHART

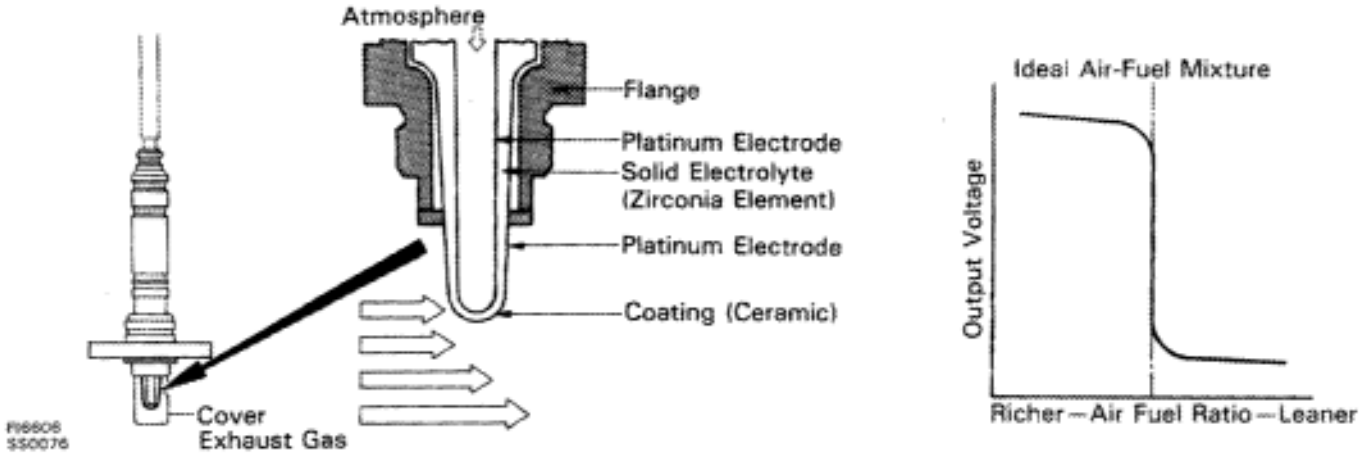


–MEMO–

DTC 21, 28 Main Oxygen Sensor Circuit

CIRCUIT DESCRIPTION

To obtain a high purification rate for the CO, HC and NO_x components of the exhaust gas, a Three–Way Catalyst Converter is used, but for the most efficient use of the Three–Way Catalyst Converter, the air–fuel ratio must be precisely controlled so that it is always close to the stoichiometric air–fuel ratio.
The oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air–fuel ratio. This characteristic is used to detect the oxygen concentration in the exhaust gas and provide feedback to the computer for control of the air–fuel ratio.
When the air–fuel ratio becomes LEAN, the oxygen concentration in the exhaust increases and the oxygen sensor informs the ECM of the LEAN condition (small electromotive force: 0 V).
When the air–fuel ratio is RICHER than the stoichiometric air–fuel ratio, the oxygen concentration in the exhaust gas is reduced and the oxygen sensor informs the ECM of the RICH condition (large electromotive force: 1 V).
The ECM judges by the electromotive force from the oxygen sensor whether the air–fuel ratio is RICH or LEAN and controls the injection time accordingly. However, if malfunction of the oxygen sensor causes output of abnormal electromotive force, the ECM is unable to perform accurate air–fuel ratio control.



Code No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
21 1 28	Main oxygen sensor signal voltage is reduced to between 0.35 V and 0.70 V for 60 sec. under conditions (a) ∼ (d). (2 trip detection logic)* (a) Engine coolant temp.: Between 70°C (158°F) and 90°C (194°F) (b) Engine speed: 1,500 rpm or more (c) Load driving (Ex. Electronic Controlled Transmission in 4th speed, A/C ON , flat road, 50 mph (80 km/h)) (d) Main oxygen sensor signal voltage: Alternating above and below 0.45 V.	1 Main oxygen sensor circuit 1 Main oxygen sensor

*: See page EG–331.
HINT: Diag. trouble code 21 is for the left bank main oxygen sensor circuit. Diag. Trouble code 28 is for the right bank main oxygen sensor circuit.

— CIRCUIT DESCRIPTION (Cont'd)

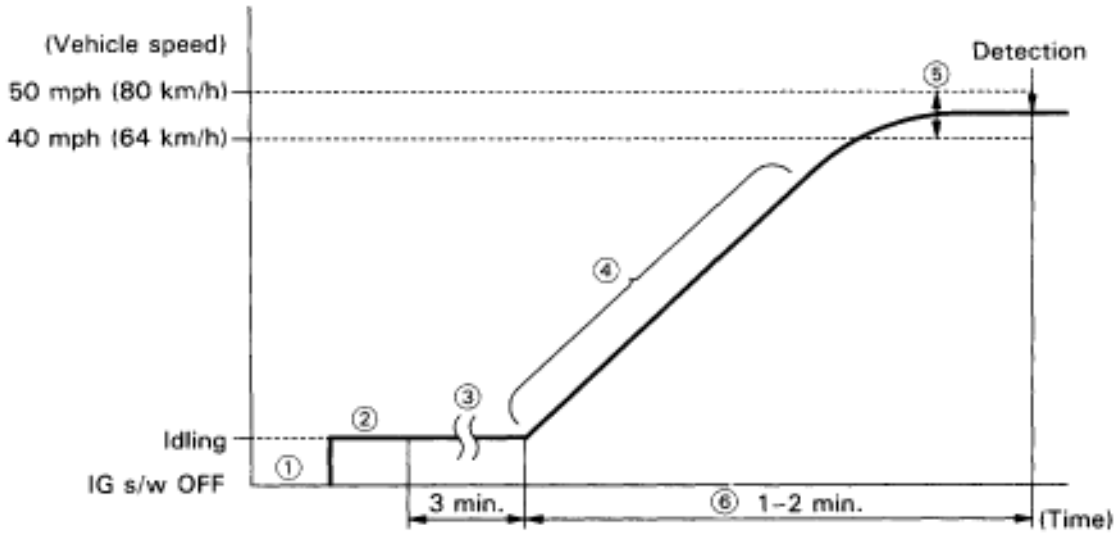
DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern

(a) To simulate diag. trouble code detecting condition after diag. trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed confirming that diag. trouble code is no longer detected.

Malfunction: Main Oxygen Sensor Deterioration



FI6464

1 Disconnect the EFI fuse (15 A) for 10 sec. or more, with IG switch OFF.
Initiate test mode (Connect terminal TE2 and E1 of data link connector 1 or 2 with IG switch OFF).

2 Start the engine and warm up with all ACC switch OFF.

3 After the engine is warmed up, let it idle for 3 min.

4 After performing the idling in 3, perform gradual acceleration with in the range 1,300 1,700 rpm (centered around 1,500 rpm) with the A/C switch ON and D position for A/T (5th for M/T). (Take care that the engine speed does not fall below 1,200 rpm when shifting. Gradually depress the accelerator pedal and keep it steady to that engine braking does not occur).

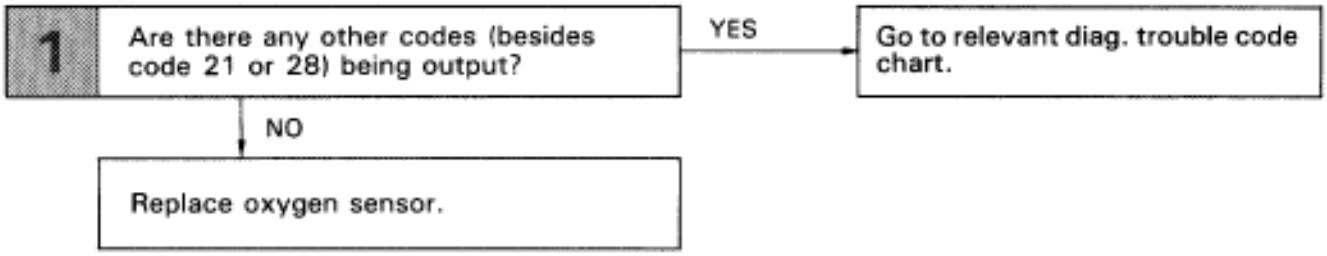
5 Maintain the vehicle speed at 40 – 50 mph (64 – 80 km/h).

6 Keep the vehicle running for 1 – 2 min. after starting acceleration.

HINT: If a malfunction exists, the Malfunction Indicator Lamp will light up after approx. 60 sec. from the start of acceleration.

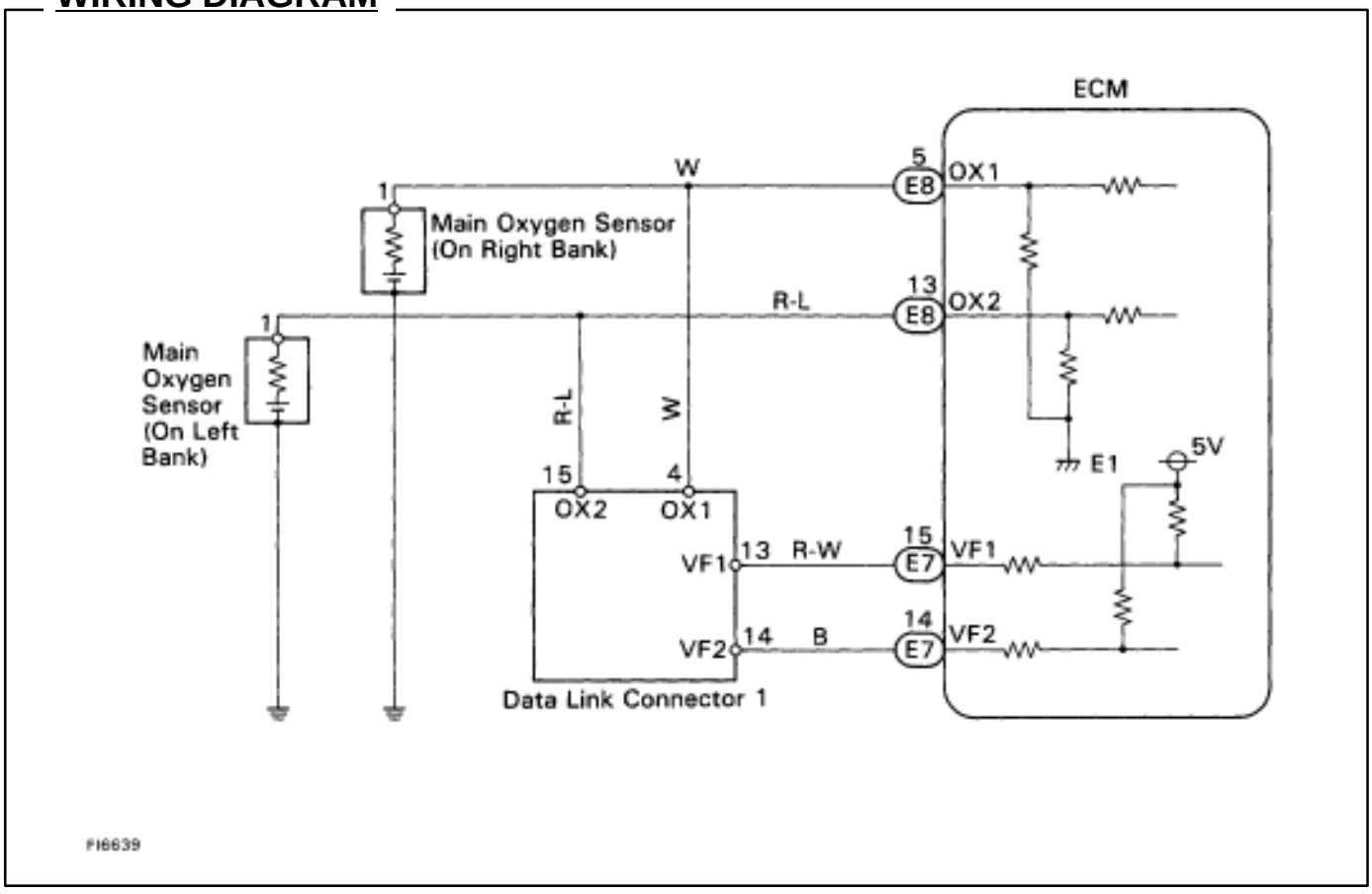
NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

DIAGNOSTIC CHART



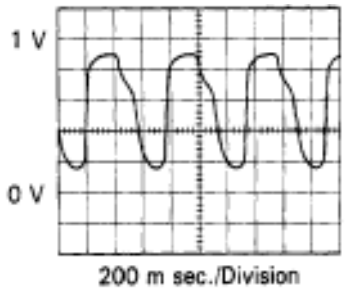
HINT: If diag. trouble code 21 is output, replace the left bank main oxygen sensor.
If diag. trouble code 28 is output, replace the right bank main oxygen sensor.

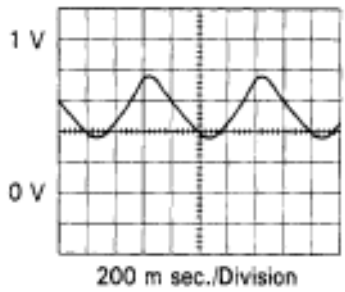
WIRING DIAGRAM



Reference: INSPECTION USING OSCILLOSCOPE

Ox signal waveform





F05514
F05515

With the engine racing (4,000 rpm) measure between terminals OX1, OX2 and E1 of ECM.

HINT: The correct waveform appears as shown in the illustration on the left, oscillating between approx. 0.1 V and 0.9 V.

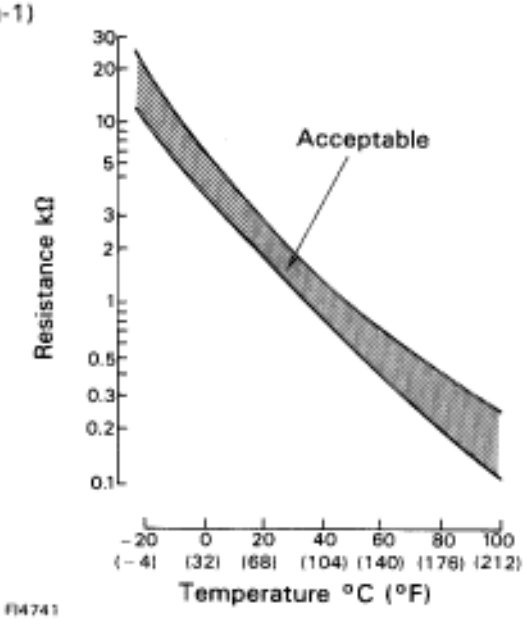
If the oxygen sensor is deteriorated, the amplitude of the voltage is reduced as shown on the left.

DTC 22 Engine Coolant Temp. Sensor Circuit

— CIRCUIT DESCRIPTION

The water temperature sensor senses the engine coolant temperature. A thermistor built in the sensor changes the resistance value according to the engine coolant temperature. The lower the engine coolant temperature, the greater the thermistor resistance value, and the higher the engine coolant temperature, the lower the resistance value (See Fig. 1). The engine coolant temperature sensor is connected to the ECM (See next page). The 5V power source voltage in the ECM is applied to the engine coolant temperature sensor form the terminal THW via a resistor R. That is, the resistor R and the engine coolant temperature sensor are connected in series. When the resistance value of the engine coolant temperature sensor changes in accordance with changes in the engine coolant temperature, the potential at the terminal THW also changes. Based on this signal, the ECM increases the fuel injection volume to improve drivability during cold engine operation. If the ECM records the diagnostic trouble code 22, it operates the fail safe function, keeping the engine coolant temperature at a constant 80□C (176□F).

(fig-1)



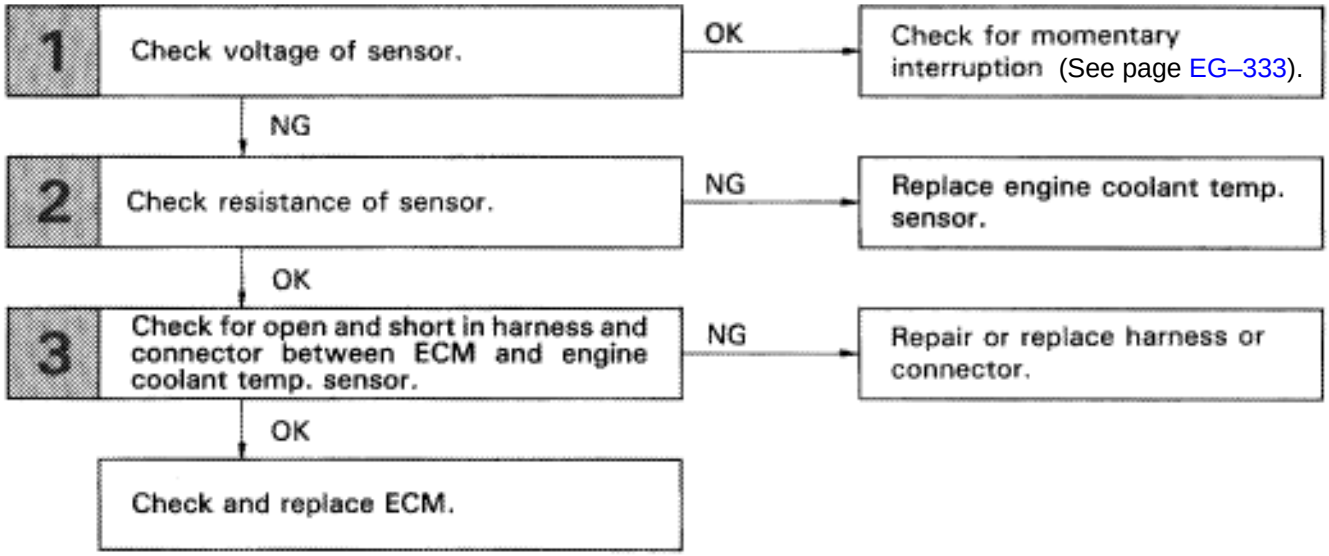
<Reference>

Engine Coolant Temp. □C (F□)	Resistance (kΩ)	Voltage (V)
–20 (–4)	16.0	4.3
0 (32)	5.9	3.4
20 (68)	2.5	2.4
40 (104)	1.2	1.5
60 (140)	0.6	0.9
80 (176)	0.3	0.5
100 (212)	0.2	.03

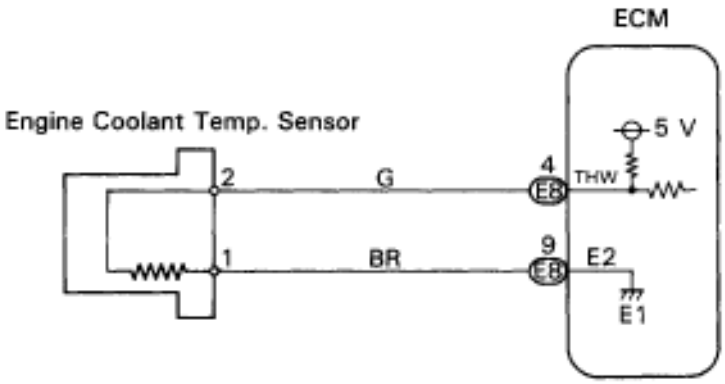
Code No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
22	Open or short in engine coolant temp. sensor circuit for 0.5 sec. or more.	□1 Open or short in engine coolant temp. sensor circuit □2 Engine coolant temp. sensor □3 ECM

DIAGNOSTIC CHART

HINT: If diagnostic trouble codes 22, 24, 32 and 41 are output simultaneously, E2 (Sensor ground) may be open.



WIRING DIAGRAM

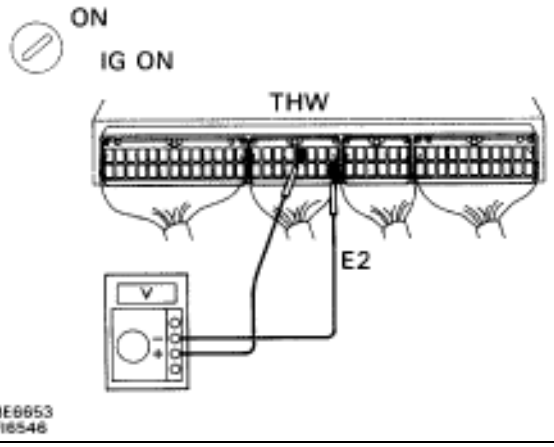


FI6448

INSPECTION PROCEDURE

HINT: If diagnostic trouble codes 22, 24, 32 and 41 are output simultaneously, E2 (sensor ground) may be open.

1 **Check voltage between terminals THW and E2 of ECM connector.**



P 1. Remove glove compartment (See page BO–111).
2. Turn ignition switch on.

C Measure voltage between terminals THW and E2 of ECM connector.

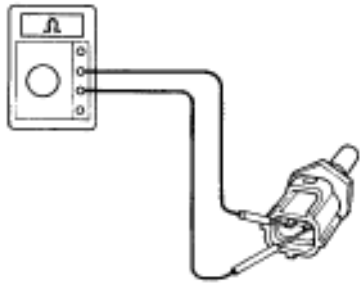
OK

Water Temp. °C (°F)	Voltage
20 (68) (Engine is cool)	1 – 3 V
80 (176) (Engine is hot)	0.1 – 1.0 V

NG

OK **Check for momentary interruption (See page EG–333).**

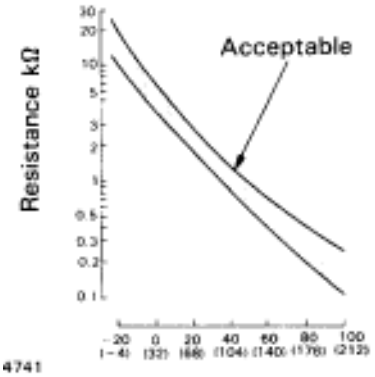
2 **Check engine coolant temp. sensor.**



P Disconnect the engine coolant temp. sensor connector, (See page EG–224).

C Measure resistance between terminals.

OK **Resistance is within Acceptable Zone on chart.**



Water temp. °C (°F)	Resistance
20 (68)	2 – 3 kΩ
80 (176)	0.2 – 0.4 kΩ

OK

NG **Replace engine coolant temp. sensor.**

3 **Check for open and short in harness and connector between ECM and water temp. sensor (See page IN–27).**

OK

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

Check and replace ECM.

–MEMO–

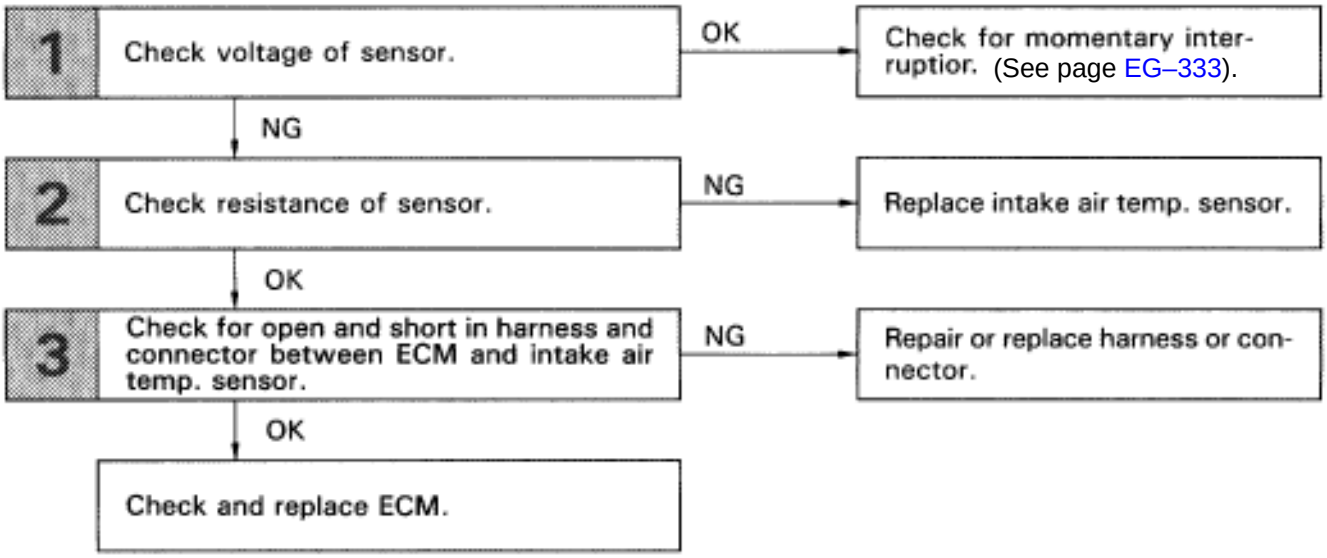
DTC 24 Intake Air Temp. Sensor Circuit

CIRCUIT DESCRIPTION

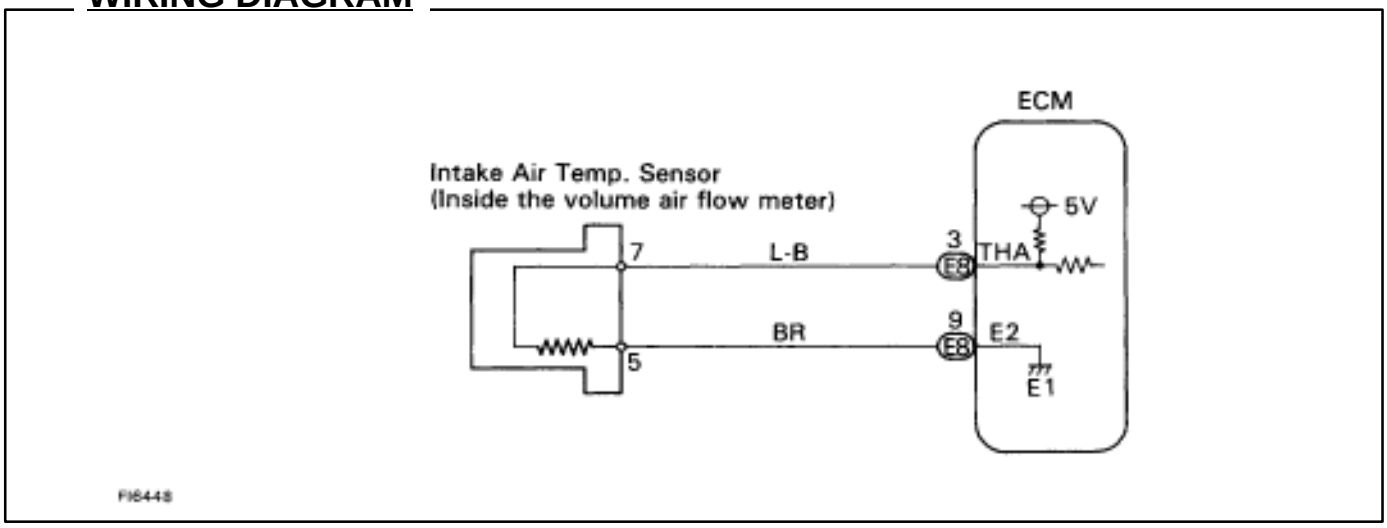
The intake air temp. sensor is built into the volume air flow meter and senses the intake air temperature.
The structure of the sensor and connection to the ECM is the same as the water temp. sensor shown on page EG–370.
If the ECM records the diagnostic trouble code “24”, it operates the fail safe function, keeping the intake air temperature at a constant 20□C (68□F).

Code No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
24	Open or short in intake air temp. sensor circuit for 0.5 sec. or more.	□Open or short in intake air temp. sensor circuit. □Intake air temp. sensor □ECM

DIAGNOSTIC CHART

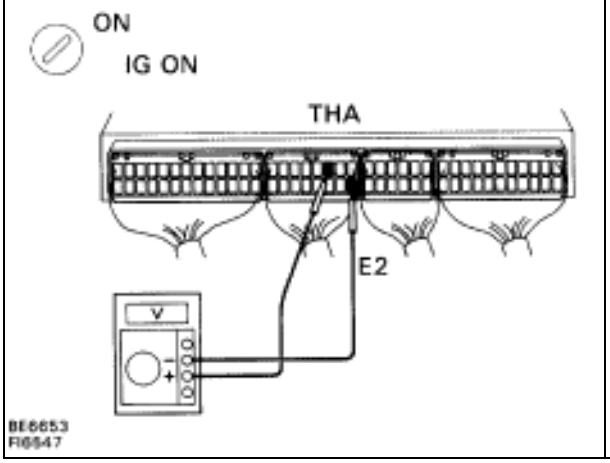


WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check voltage between terminals THA and E2 of ECM connector.**



P 1. Remove glove compartment. (See page BO–111).
2. Turn ignition switch on.

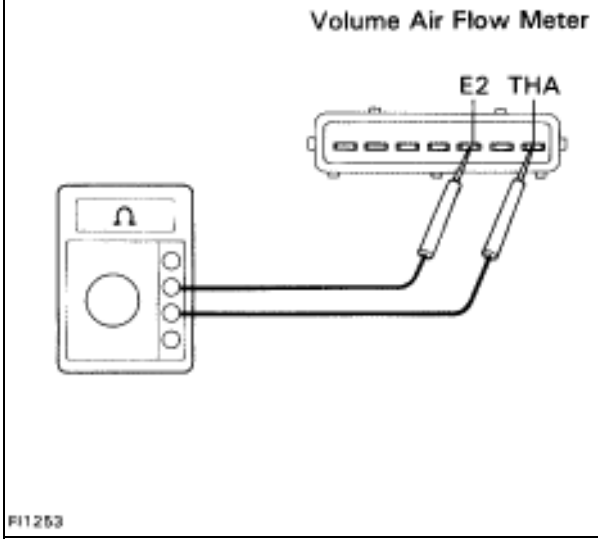
C Measure voltage between terminals THA and E2 of ECM connector.

OK

Intake air temp. °C (°F)	Voltage
20 (68)	1 – 3 V
60 (140)	0.5 – 1.0 V

NG → **OK** → **Check for momentary interruption (See page EG–333).**

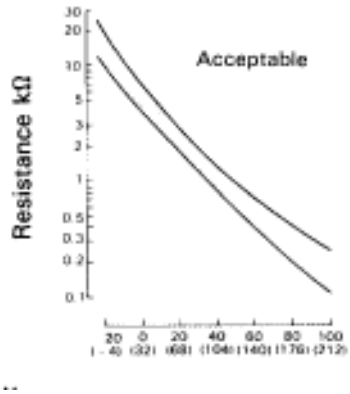
2 **Check intake air temp. sensor.**



P Disconnect he volume air flow meter connector.

C Measure resistance between terminals THA and E2 of volume air flow meter connector.

OK **Resistance is within Acceptable Zone on chart.**



Intake air temp. °C (°F)	Resistance
20 (68)	2 – 3 kΩ
60 (140)	0.4 – 0.7 kΩ

OK → **NG** → **Replace intake air temp. sensor (Replace volume air flow meter).**

3 **Check for open and short in harness and connector between ECM and intake air temp. sensor (See page IN–27).**

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

Check and replace ECM.

DTC	25	Air–Fuel Ratio Lean Malfunction
	26	Air–Fuel Ratio Rich Malfunction

— CIRCUIT DESCRIPTION

The main oxygen sensor is located in the exhaust manifold.
It indirectly determines whether the fuel mixture is rich or lean by detecting the concentrate of oxygen present in the exhaust gas.

Code No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
25	Main oxygen sensor voltage is 0.45 V or less (lean) for 90 sec. under conditions (a) and (b). (2 trip detection logic)*2 (a) Engine coolant temp.: 50°C (122°F) or more. (b) Engine speed: 1,500 rpm or more	● Open or short in main oxygen sensor circuit ● Main oxygen sensor ● Ignition system ● ECM
	*1 Difference of air–fuel ratio feedback compensation value between right and left banks is more than 15 percent for 20 sec. or more under conditions (a) and (b). (2 trip detection logic)*2 (a) Engine coolant temp.: Between 70°C (158°F) and 95°C (203°F) (b) Engine speed: Idling	● Fuel line pressure (injector leak, blockage) ● Mechanical system malfunction (skipping teeth of timing belt) ● Ignition system ● Compression pressure ● Volume air flow meter ● ECM
26	Difference of air–fuel ratio feedback compensation value between right and left banks is more than 15 percent for 20 sec. or more under conditions (a) and (b). (2 trip detection logic)*2 (a) Engine coolant temp.: Between 70°C (158°F) and 95°C (203°F) (b) Engine speed: Idling	● Fuel line pressure (injector leak, blockage) ● Mechanical system malfunction (skipping teeth of timing belt) ● Ignition system ● Compression pressure ● Volume air flow meter ● ECM

*1: Only for California specification vehicles
*2: See page EG–331.

— CIRCUIT DESCRIPTION (Cont'd)

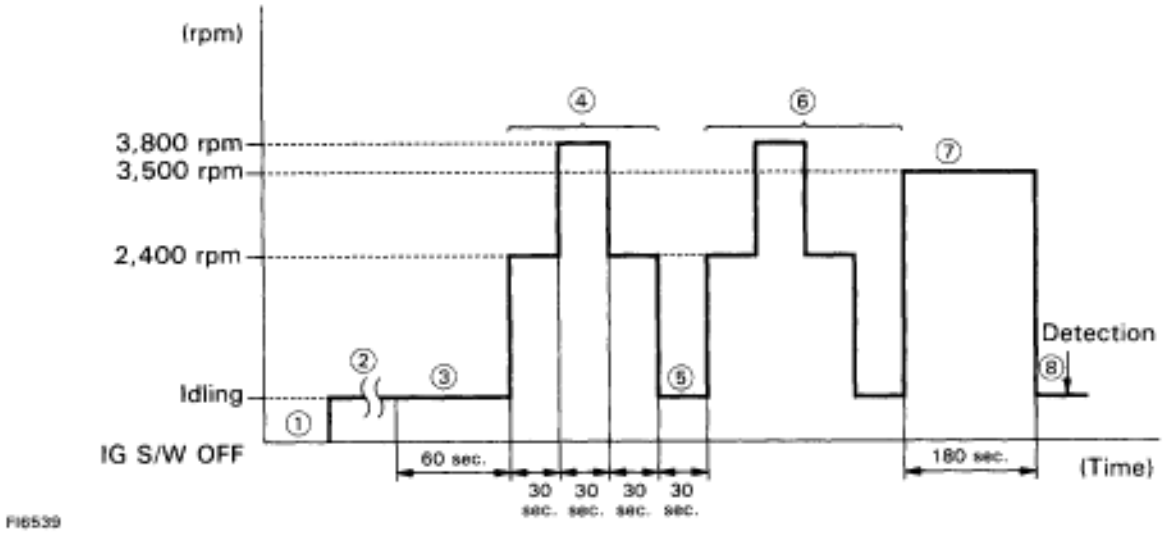
DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern

(a) To simulate diag. trouble code detecting condition after diag. trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed confirming that diag. trouble code is no longer detected.

Malfunction: Open or Short in Main Oxygen Sensor
Open or Short in Injector circuit, Injector Leak or Blockage



1 Disconnect the EFI fuse (15 A) for 10 sec. or more, with IG switch OFF.
Initiate test mode (Connect terminal TE2 and E1 of data link connector 1 or 2 with IG S/W OFF).

2 Start the engine and warm up with all ACC switch OFF.

3 After the engine is warmed up, let it idle for 60 sec.

4 After performing the idling in 3, perform racing at 2,400 rpm, 3,800 rpm then 2,400 rpm again for 30 sec. each.

5 After performing the racing in 4, perform idling for 30 sec.

6 After performing the idling in 5, perform steps 4 and 5 again.

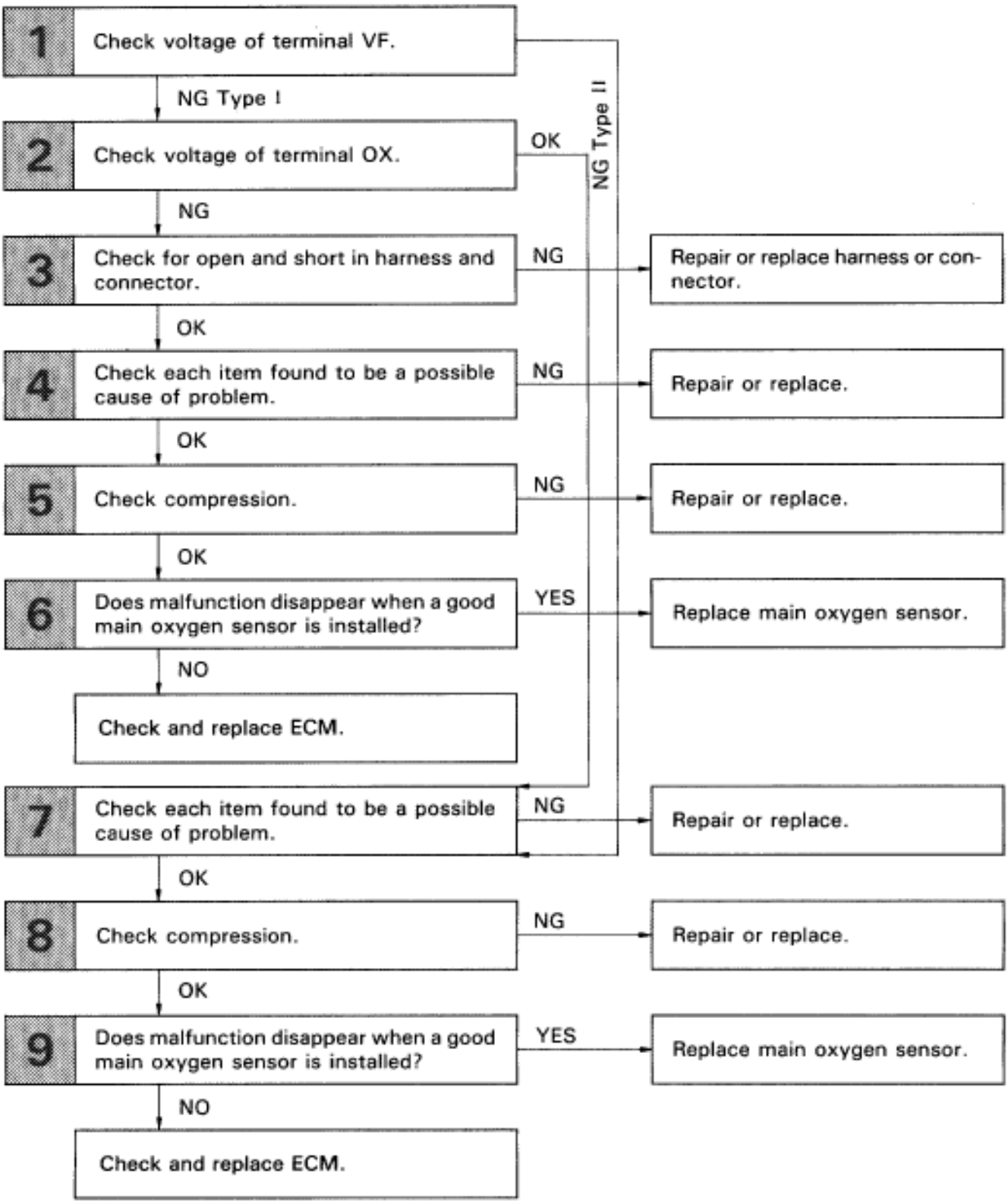
7 After performing the idling in 6, perform idling at 3,500 rpm for 180 sec.

8 After performing the racing in 7, perform idling 30 sec.

HINT: If a malfunction exists, the Malfunction Indicator Lamp will light up during step 8

NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

DIAGNOSTIC CHART

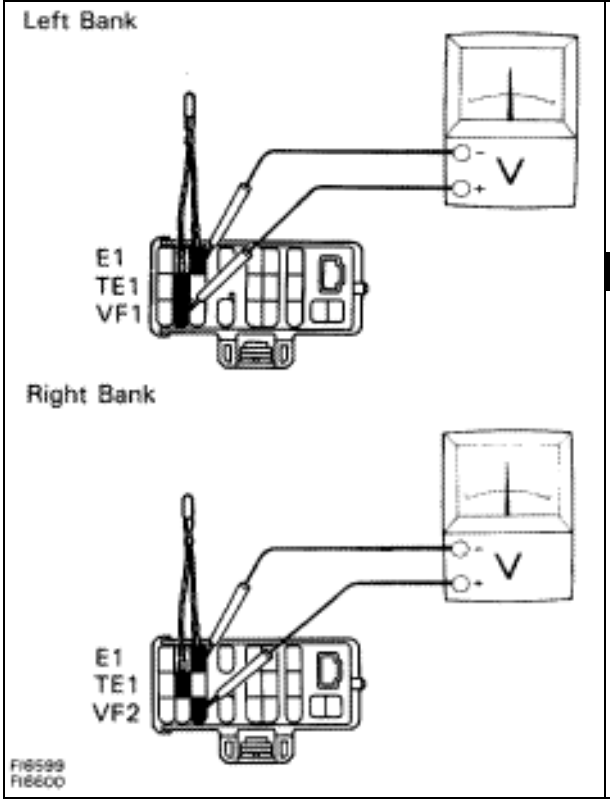


WIRING DIAGRAM

Refer to page EG–368 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

1 Check voltage between terminals VF1, VF2 and E1 of data link connector 1.



P
1. Warm up engine at normal operating temperature.
2. Connect terminals TE1 and E1 of data link connector 1.
3. Connect positive probe to terminal VF1, VF2 and negative probe to terminal E1 of data link connector.

C
1. Warm up the oxygen sensor by running engine at 2,500 rpm for about 2 minutes.
2. Then, maintaining engine at 2,500 rpm, count how may times needle of voltmeter fluctuates between 0 and 5 V.

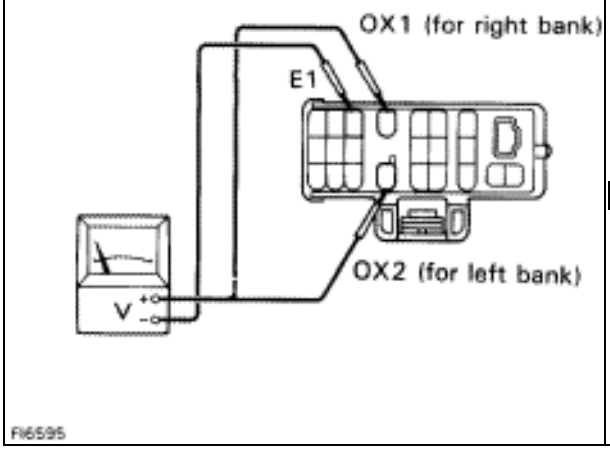
Result:

Result	
Needle fluctuates of 8 times for every ten seconds	OK
Continue at 0 V	NG Type I
Continue at 5 V	NG Type II

NG Type I

NG Type II → **Go to step 3.**

2 Check voltage between terminals OX1, OX2 and E1 of data link connector 1.



P Warm up engine at normal operating temperature.

C Measure voltage between terminals OX1, OX2 and E1 of data link connector 1 when engine is suddenly raced to full throttle.

OK **The voltage should be 0.5 V or higher at least once.**

Hint Perform inspection within 1 second.

NG

OK → **Go to step 3.**

3	Check for open and short in harness and connector between ECM and main oxygen sensor, ECM and data link connector 1 (See page IN–27).

OK → NG: Repair or replace harness or connector.

4	Check each item found to be a possible cause of problem.

Check each circuit found to be a possible cause of trouble according to the results of the check in 1 or 4. The numbers in the table below show the order in which the checks should be performed.

Main oxygen sensor signal from either side continues at 0 V.	Main oxygen sensor signals from both sides continue at 0 V.	Possible Cause	See page
1		Faulty sensor installation.	–
3		Injector circuit	EG–428
2	3	Misfire	IG–6
4		Valve timing	EG–43
	1	Air leakage	EG–166
	2	Fuel system	EG–440
	6	Characteristic deviation in volume air flow meter	EG–388 390
	4	Characteristic deviation in engine coolant temp.. sensor	EG–370
	5	Characteristic deviation in intake air temp. sensor	EG–374

OK → NG: Repair or replace.

5	Check compression (See page EG–27).

OK → NG: Repair or replace.

6	Does malfunction disappear when a good main oxygen sensor is installed?

NO → YES: Replace main oxygen sensor.

Check and replace ECM.

7 **Check each item found to be a possible cause of problem.**

Check each circuit found to be a possible cause of trouble according to the results of the check in 1. The numbers in the table below show the order in which the checks should be performed.

Main oxygen sensor signal from either side continues at 5.0 V.	Main oxygen sensor signals from both sides continue at 5.0 V.	Main oxygen sensor signals from both sides are normal.	Possible Cause	See page
1		7	Injector circuit	EG–428
		3	Misfire	IG–6
2		4	Valve timing	EG–43
		1	Air leakage	EG–166
	1	2	Fuel system	EG–440
3	4		Cold start injector circuit	EG–432
	5	8	Characteristic deviation in volume air flow meter	EG–388 390
	2	5	Characteristic deviation in engine coolant temp.. sensor	EG–370
	3	6	Characteristic deviation in intake air temp. sensor	EG–374

OK → **NG** → **Repair or replace.**

8 **Check compression (See page EG–27).**

OK → **NG** → **Repair or replace.**

9 **Does malfunction disappear when a good main oxygen sensor is installed?**

NO → **YES** → **Replace main oxygen sensor.**

Check and replace ECM.

DTC	27	Sub–Oxygen Sensor Circuit (only for California spec.)

— CIRCUIT DESCRIPTION

The sub–oxygen sensor is installed on the exhaust pipe. Its construction and operation is the same as the man oxygen sensor on page EG–366.

Code No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
27	(a) Open or short in heater circuit of sub–oxygen sensor for 0.5 sec. or more.	○1 Open or short in heater circuit of sub–oxygen sensor. ○2 Sub–oxygen sensor heater. ○3 ECM
	(b) Main oxygen sensor signal is 0.45 V or more and sub–oxygen sensor signal is 0.45 V or less under conditions (a) ∼ (c). (2 trip detection logic)* (a) Engine coolant temp.: 80°C (176°F) or more (b) Engine speed: 1,500 rpm or more. (c) Accel. pedal: Fully depressed for 2 sec or more	○1 Open or short in sub–oxygen sensor circuit. ○2 Sub–oxygen sensor ○3 ECM

*: See page EG–331

— CIRCUIT DESCRIPTION (Cont'd)

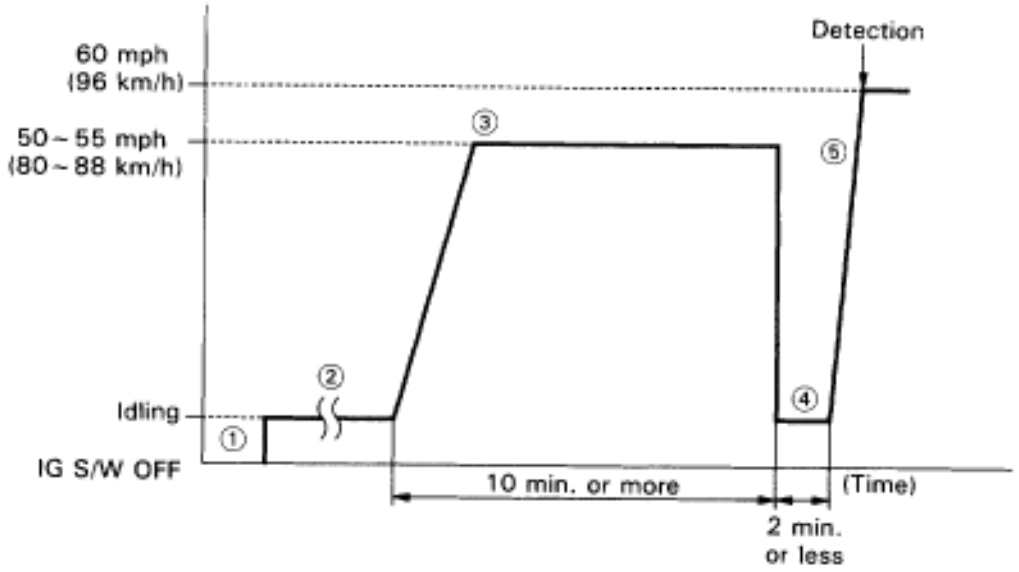
DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern

(a) To simulate diag. trouble code detecting condition after diag. trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed confirming that diag. trouble code is no longer detected.

Malfunction: Open or Short in Sub–Oxygen Sensor



FI6527

1 Disconnect the EFI fuse (15 A) for 10 sec. or more, with IG switch OFF.
Initiate test mode (Connect terminal TE2 and E1 of data link connector 1 with IG switch OFF).

2 Start the engine and warm up with all ACC switch OFF.

3 After the engine is warmed up, let it drive at 50 ∼ 55 mph (80 ∼ 88 km/h) for 10 min. or more.

4 After driving, stop at a safe place and perform idling for 2 min. or less.

5 After performing the racing in 4, perform acceleration to 60 mph (96 km/h) with the throttle valve fully open.

HINT: If a malfunction exists, the Malfunction Indicator Lamp will light up during step 5

NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

DIAGNOSTIC CHART

HINT:

3 When other codes are output in addition to 27 at the same time, check the circuits for other codes first.

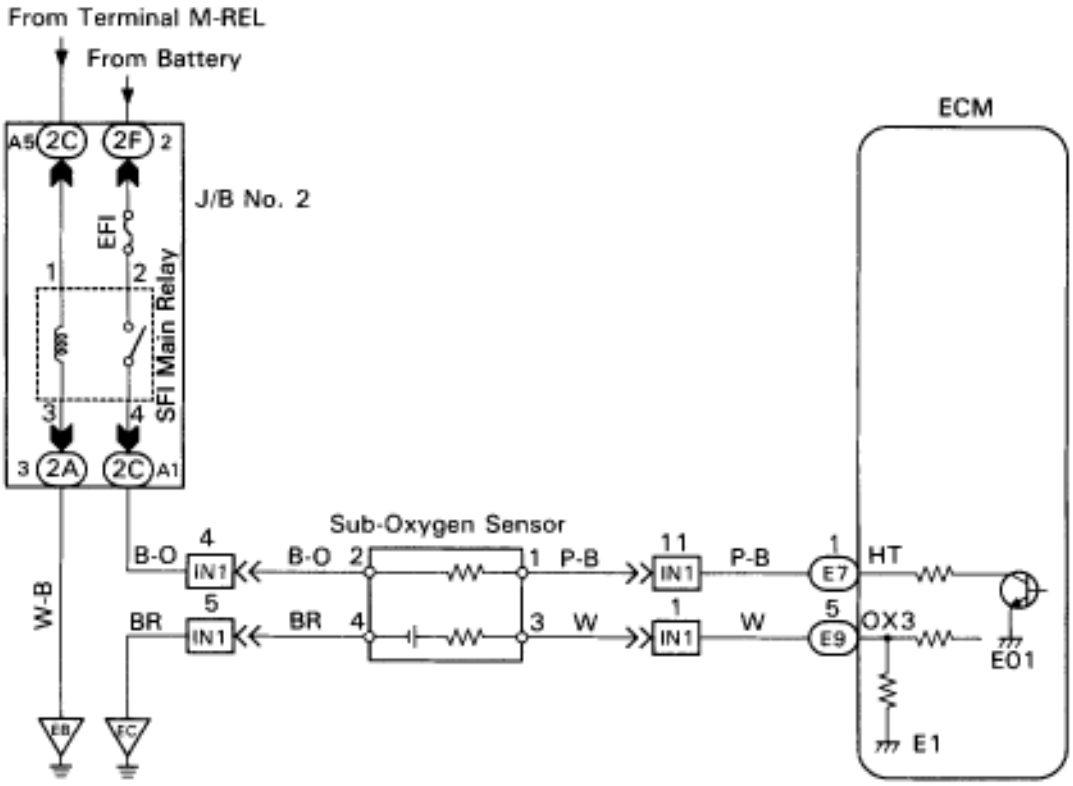
1 Check voltage of terminal HT.
- OK → 4
- NG → 2

2 Check resistance of sub-oxygen sensor heater.
- NG → Replace sub-oxygen sensor.
- OK → 3

3 Check for open and short in harness and connector between SFI main relay and ECM.
- NG → Repair or replace harness or connector.
- OK → Check and replace ECM.

4 Check operation of sub-oxygen sensor heater.
- OK → Replace sub-oxygen sensor.*
- NG → Check and replace ECM.

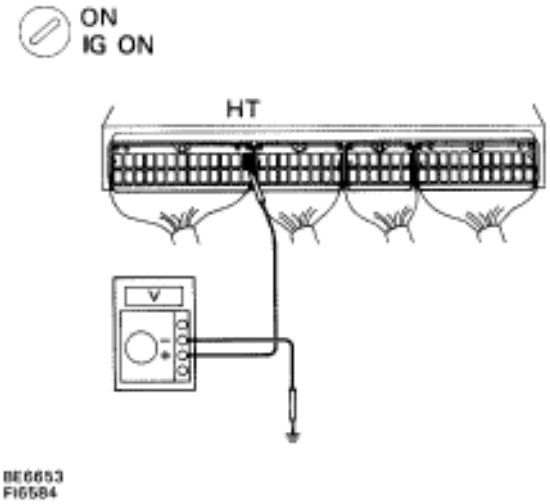
*: In this case, oxygen sensor can be deteriorated.



FI6544

INSPECTION PROCEDURE

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



P 1. Remove glove compartment. (See page BO–111).
2. Turn ignition switch on.

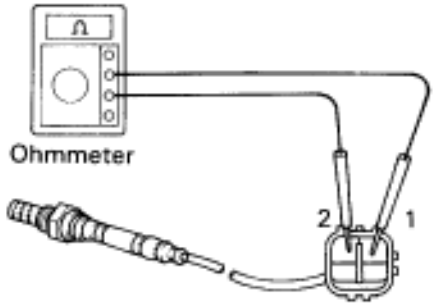
C Measure voltage between terminal HT of ECM connector and body ground.

OK **Voltage: 10 – 14 V**

NG

OK **Go to step 1.**

2 **Check sub–oxygen sensor heater.**



P Disconnect sub–oxygen sensor connector.

C Measure resistance between terminals 1 and 2 of sub–oxygen sensor connector.

OK **Resistance: 11.7 – 14.3 Ω 20°C (68°F)**

OK

NG **Replace sub–oxygen sensor.**

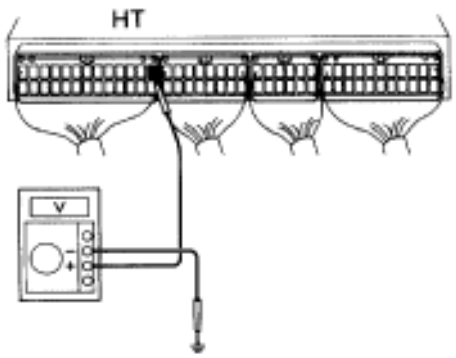
3 **Check for open and short in harness and connector between SFI main relay and ECM (See page IN–27).**

OK

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

Check and replace ECM.

4 **Check voltage between terminal HT of ECM connector and body ground**



P
1. Connect ECM connector.
2. Warm up engine to normal operating temperature.

C Measure voltage between terminal HT of ECM connector and body ground, when engine is idling and racing at 2,500 rpm.

OK

	Voltage
Idling	0 V
Racing at 2,500 rpm	10 – 14 V

Hint In the 2,500 rpm racing check, continue engine racing at 2,500 rpm for approx. 20 seconds or more.

NG

OK **Replace sub–oxygen sensor.***
*: In this case, oxygen sensor can be deteriorated.

Check and replace ECM.

–MEMO–

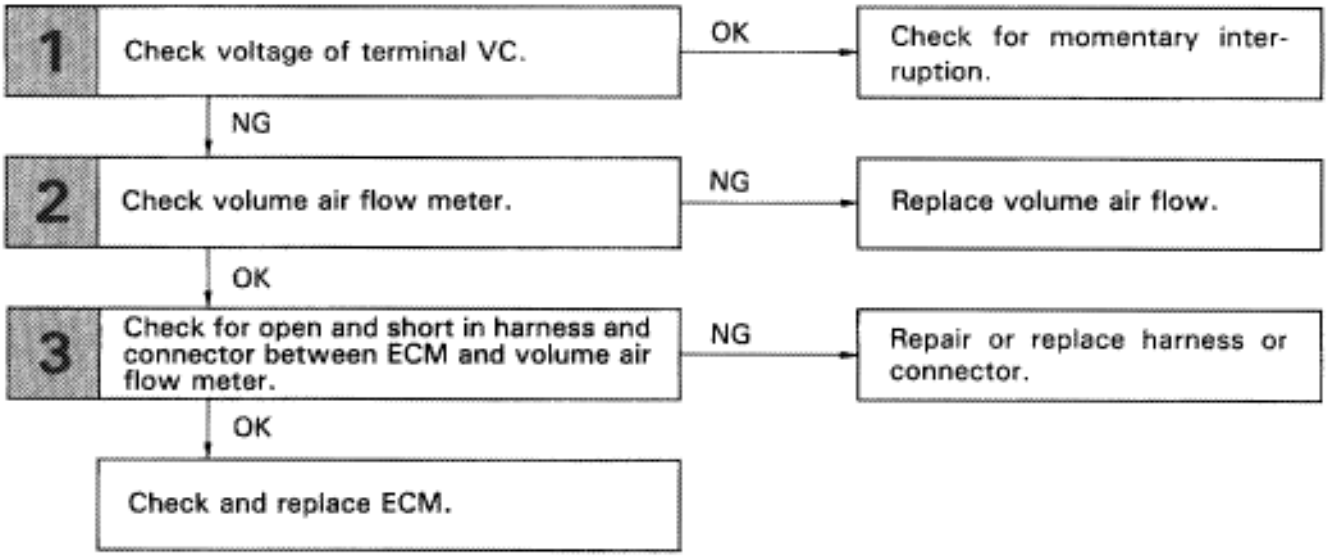
DTC 31 Volume Air Flow Meter Circuit (No. 1)

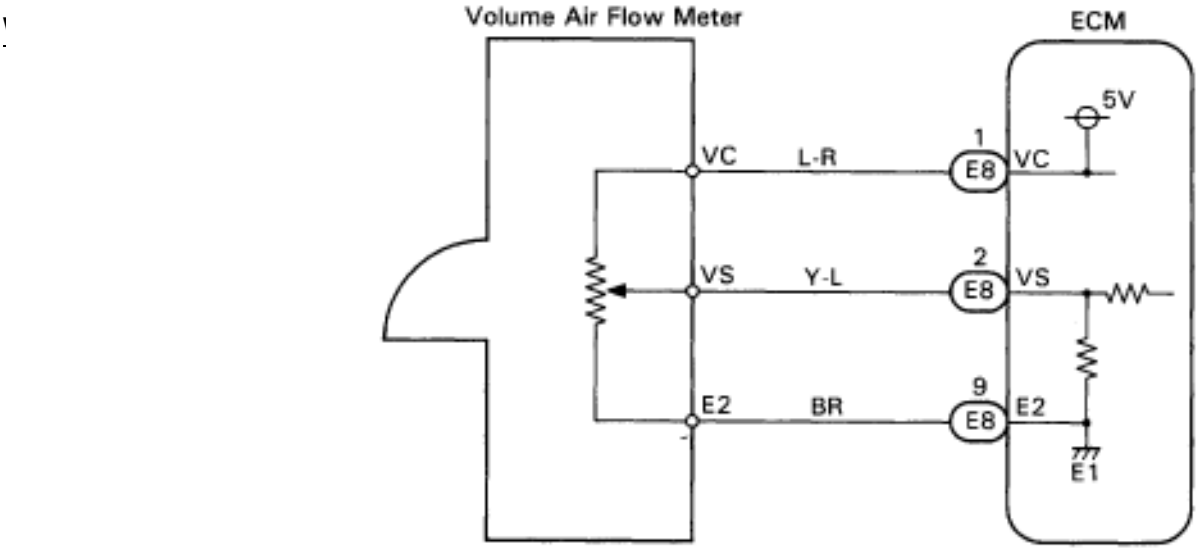
CIRCUIT DESCRIPTION

The volume ar flow meter is located directly behind the air cleaner, and detects the intake air volume. It converts the intake air readings into a voltage signal by means of a potentiometer. Intake air volume signal is used to calculate the basic injection duration and basic ignition advance angle.

Code No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
31	All conditions below are detected continuously for 0.5 sec. or more. (a) Idle switch: ON (IDL) (b) Voltage of terminal VS: 0.1 V or less (c) Engine speed: 1,500 rpm or less	□ Open (VC) or short (VC–32) in volume air flow meter circuit. □ Volume air flow meter □ ECM

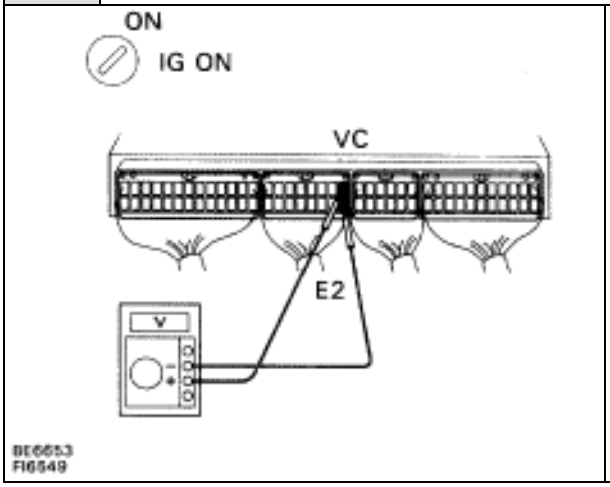
DIAGNOSTIC CHART





INSPECTION PROCEDURE

1 **Check voltage between terminals VC and E2 of ECM**



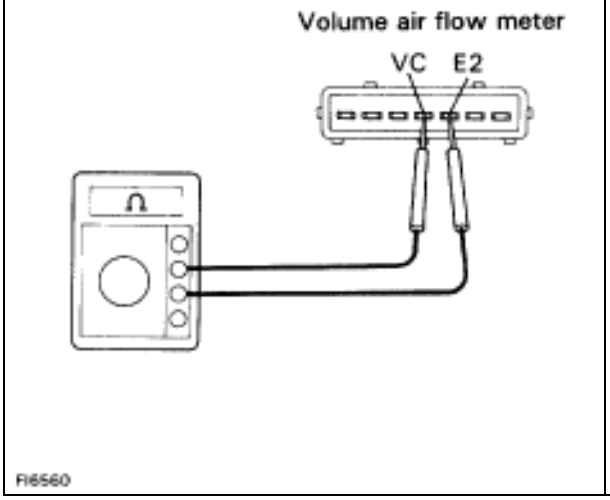
P 1. Remove glove compartment. (See page BO–111).
2. Turn ignition switch ON.

C Measure voltage between terminals VC and E2 of ECM.

OK **Voltage: 4 – 6 V**

NG → **OK** → **Check for momentary interruption (See page EG–333)**

2 **Check resistance between terminals VC and E2 of volume air flow meter.**



P Disconnect the volume air flow meter connector.

C Measure resistance between terminals VC and E2 of volume air flow meter.

OK **Resistance: 200 – 400 Ω**

OK → **NG** → **Replace volume air flow meter.**

3 **Check for open and short in harness and connector between ECM and volume air flow meter (See page IN–27).**

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

Check and replace ECM.

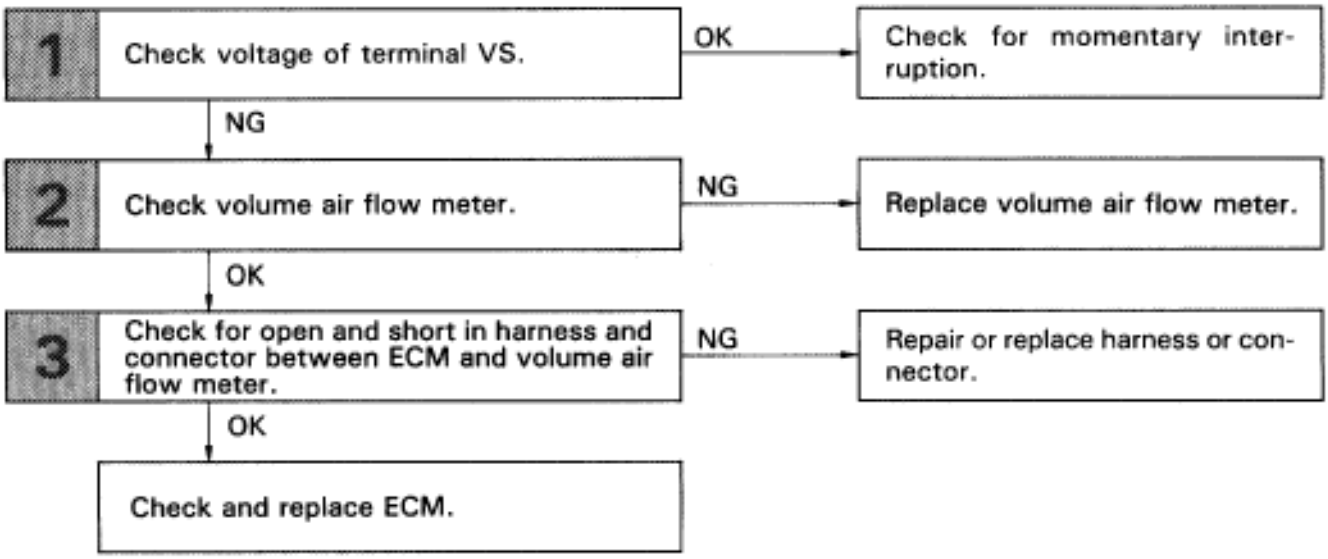
DTC 32 Volume Air Flow Meter Circuit (No. 2)

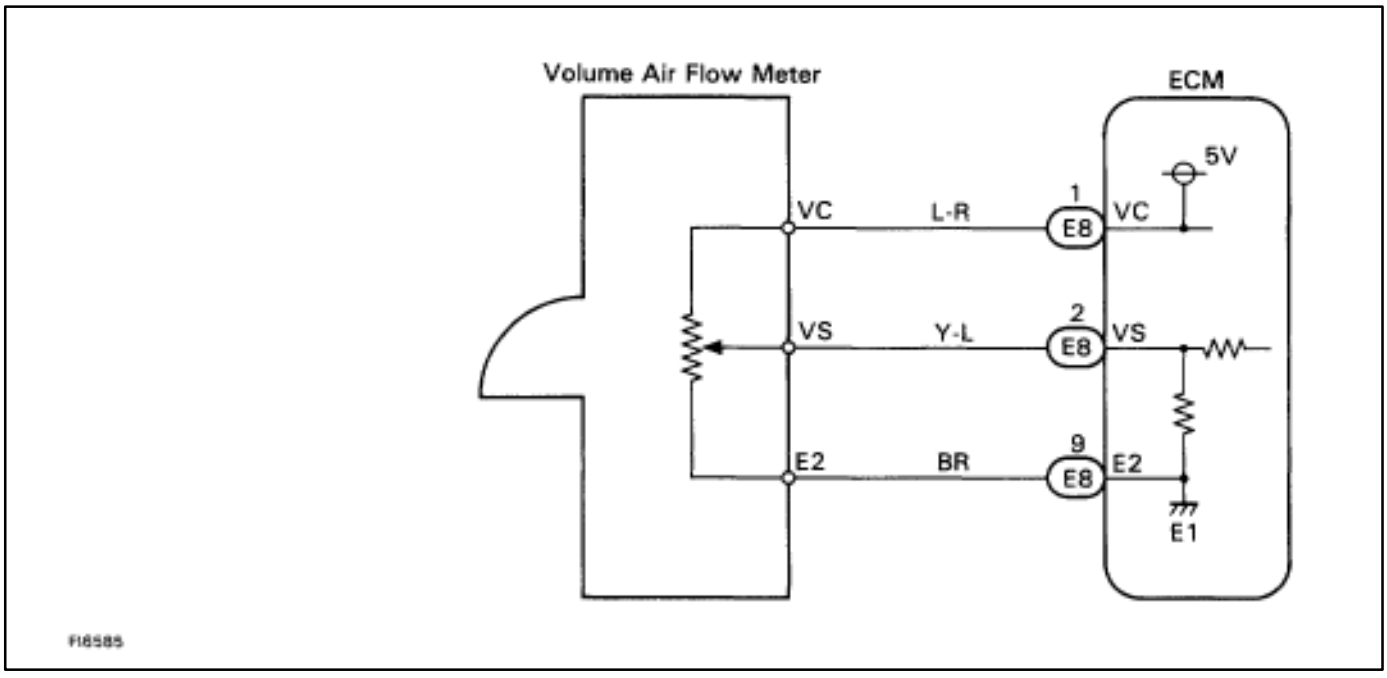
CIRCUIT DESCRIPTION

The volume ar flow meter is located directly behind the air cleaner, and detects the intake air volume. It converts the intake air readings into a voltage signal by means of a potentiometer. Intake air volume signal is used to calculate the basic injection duration and basic ignition advance angle.

Code No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
32	VS exceeds 4.9 V for 0.5 sec. or more.	□Open (E2) or short (VS–VS) in volume air flow meter circuit. □Volume air flow meter □ECM

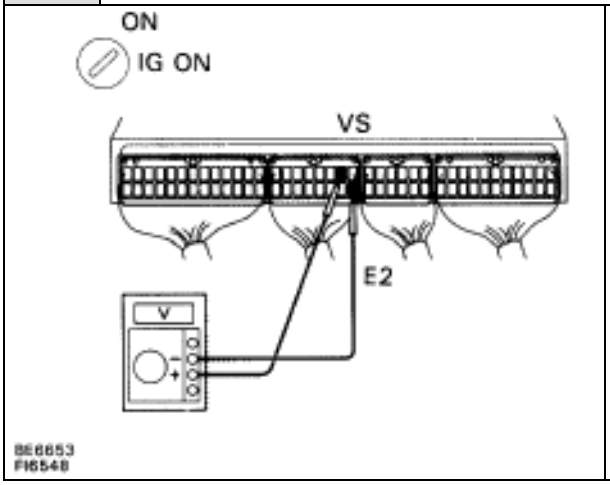
DIAGNOSTIC CHART





INSPECTION PROCEDURE

1 **Check voltage between terminals VS and E2 of ECM**



P
1. Remove air cleaner cap.

C
2. Remove glove compartment. (See page BO–111).
3. Turn ignition switch ON.

Measure voltage between terminals VS and E2 of ECM.

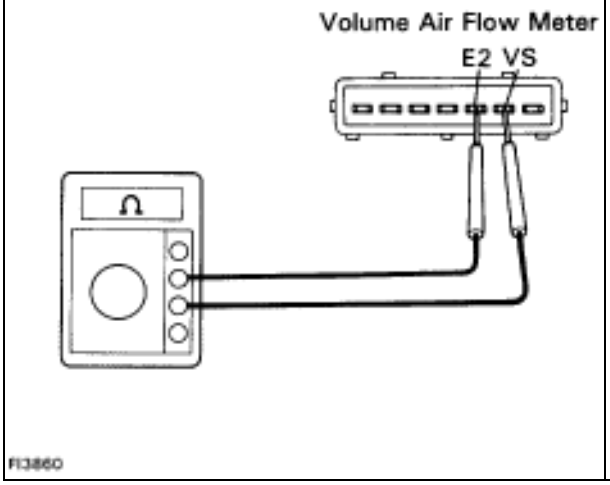
OK

Measuring Plate	Voltage
Fully closed	3.7 – 4.3 V
Fully open	0.2 – 0.5 V

NG

OK → **Check for momentary interruption (See page EG–333)**

2 **Check resistance between terminals VS and E2 of volume air flow meter.**



P
Disconnect the volume air flow meter connector.

C
Measure resistance between terminals VS and E2 of volume air flow meter.

OK

Measuring Plate	Resistance
Fully closed	200 – 600 Ω
Fully open	20 – 1,200 Ω

OK

NG → **Replace volume air flow meter.**

3 **Check for open and short in harness and connector between ECM and volume air flow meter (See page IN–27).**

OK

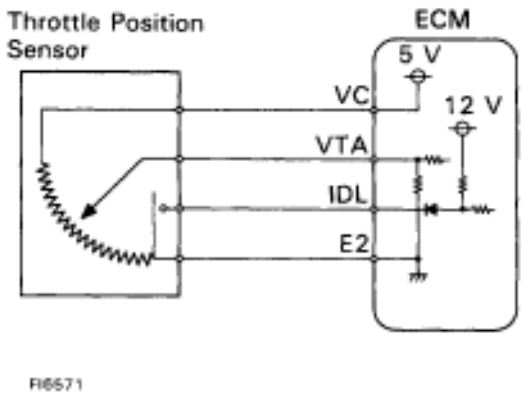
NG → **Repair or replace harness or connector.**

Check and replace ECM.

DTC 41 Throttle Position Sensor Circuit

— CIRCUIT DESCRIPTION

The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle. When the throttle valve is fully closed, the IDL contacts in the throttle position sensor are on, so the voltage at the terminal IDL of the ECM become 0 V. At this time, a voltage of approximately 0.7 is applied to the terminal VTA of the ECM. When the throttle valve is opened, the IDL contacts go off and thus the power source voltage of approximately 12 V in the ECM is applied to the terminal VTA of the ECM increases in proportion to the opening angle of the throttle valve and becomes approximately 3.5 0 5.0 V when the throttle valve is fully opened. The ECM judges the vehicle driving conditions from these signals input from the terminals VTA and IDL, and uses them as one of the conditions for deciding the air–fuel ratio correction, power increase correction and fuel–cut control etc.



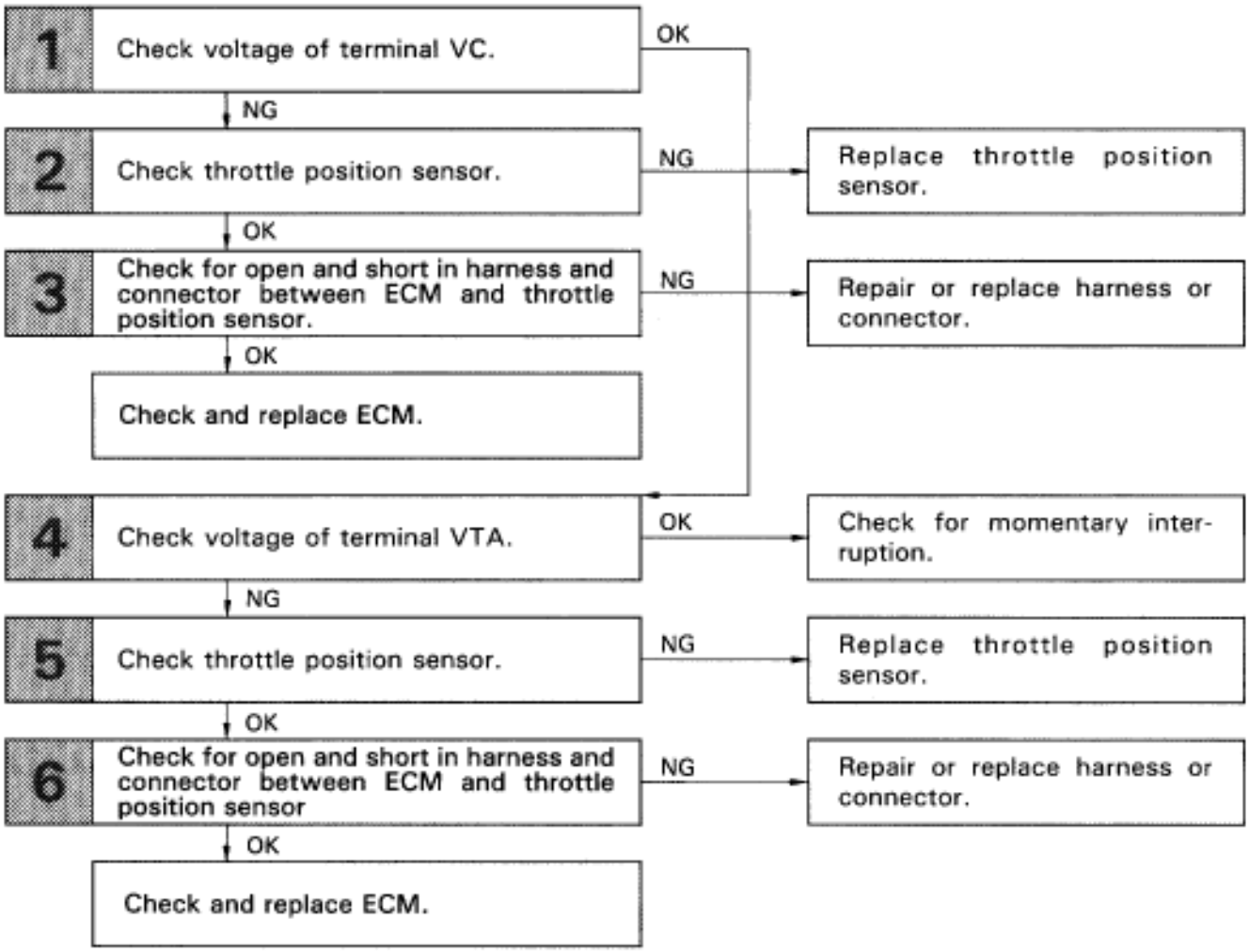
Text

Code No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
41	Open or short in throttle position sensor circuit (VTA) for 0.5 sec. or more.	1. Open or short in throttle position sensor circuit 2. Throttle position sensor 3. ECM

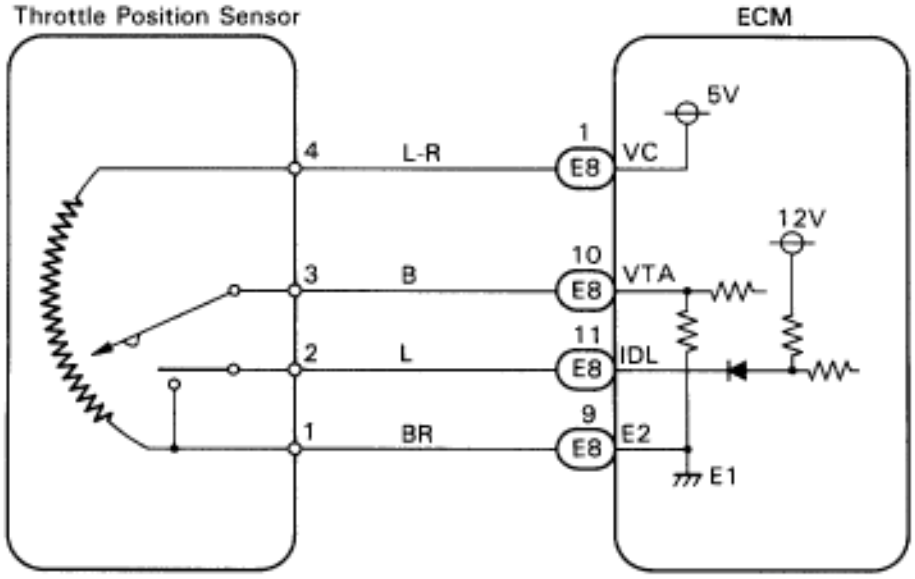
HINT: When the connector for the throttle position sensor is disconnected, diagnostic trouble code 41 is not displayed, Diagnostic trouble code 41 is displayed only when there is an open or short in the VTA signal circuit of the throttle position sensor.

DIAGNOSTIC CHART

HINT: If diagnostic trouble codes 22, 24, 32 and 41 are output simultaneously, E2 (sensor ground) may be open.



WI

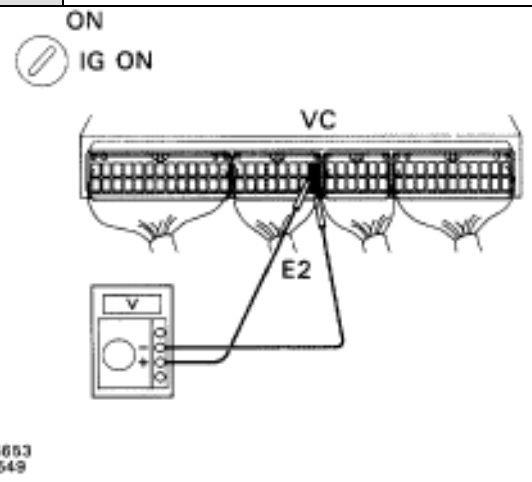


FI6573

INSPECTION PROCEDURE

HINT: If diagnostic trouble codes 22, 24, 32 an d41 are output simultaneously, E2 (sensor ground) may be open.

1 **Check voltage between terminals VC and E2 of ECM.**



P 1. Remove glove compartment. (See page BO–111).
2. Turn ignition switch ON.

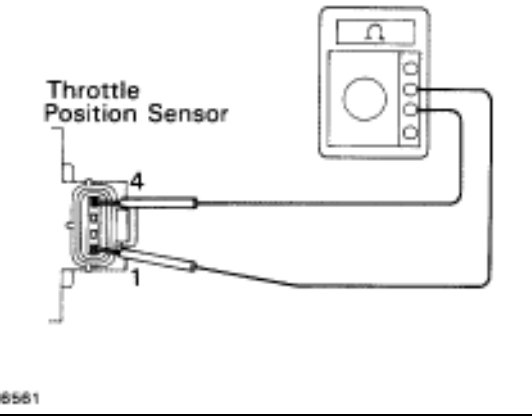
C Measure voltage between terminals VC and E2 of ECM.

OK **Voltage: 4 – 6 V**

NG

OK **Go to step 1.**

2 **Check resistance between terminals 4 and 1 of throttle position sensor.**



P Disconnect the throttle position sensor connector.

C Measure resistance between terminals 4 and 1 of throttle position sensor.

OK **Resistance: 4.25 – 8.25 kΩ**

OK

NG **Replace throttle position sensor.**

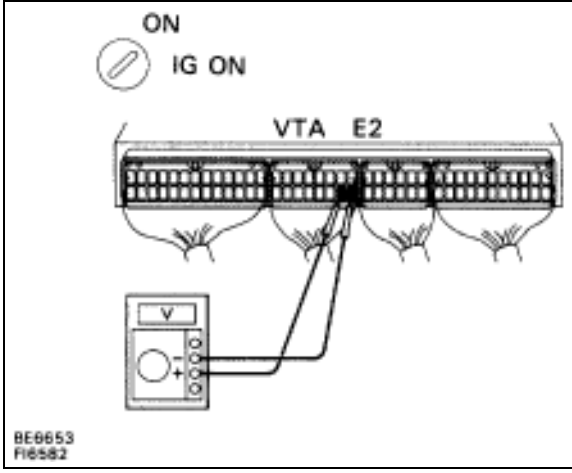
3 **Check for open and short in harness and connector between ECM and throttle position sensor (See page IN–27).**

OK

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

Check and replace ECM.

4 **Check voltage between terminals VTA and E2 of ECM.**



P Turn ignition switch ON.

C Measure voltage between terminals VTA and E2 of ECM.

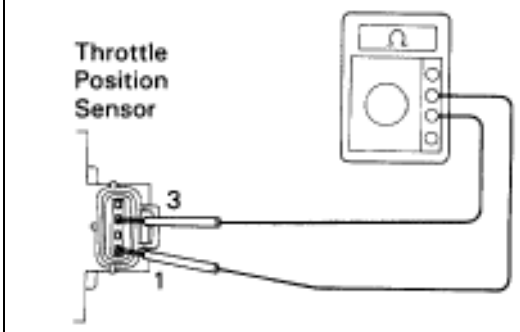
OK

Throttle Valve	Voltage
Fully closed	0.3 – 0.8 V
Fully open	2.7 – 5.2 V

NG

OK **Check for momentary interruption (See page EG–333).**

5 **Check resistance between terminals 3 and 1 of throttle position sensor.**



P Disconnect the throttle position sensor connector.

C Measure the resistance between terminals 3 and 1 of throttle position sensor.

OK

Throttle Valve	Resistance
Fully closed	0.3 – 6.3 kΩ
Fully open	3.5 – 10.3 kΩ

OK

NG **Replace throttle position sensor.**

6 **Check for open and short in harness and connector between ECM and throttle position sensor (See page IN–27).**

OK

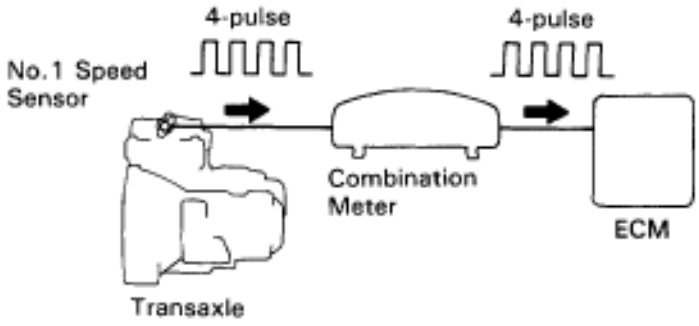
NG **Repair or replace harness or connector.**

Check and replace ECM.

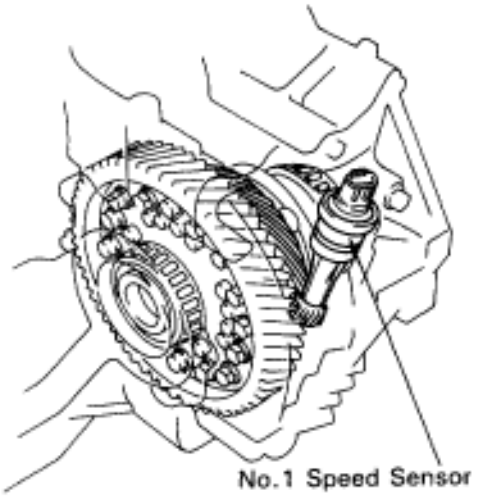
DTC 42 Vehicle Speed Sensor Signal Circuit

— CIRCUIT DESCRIPTION

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

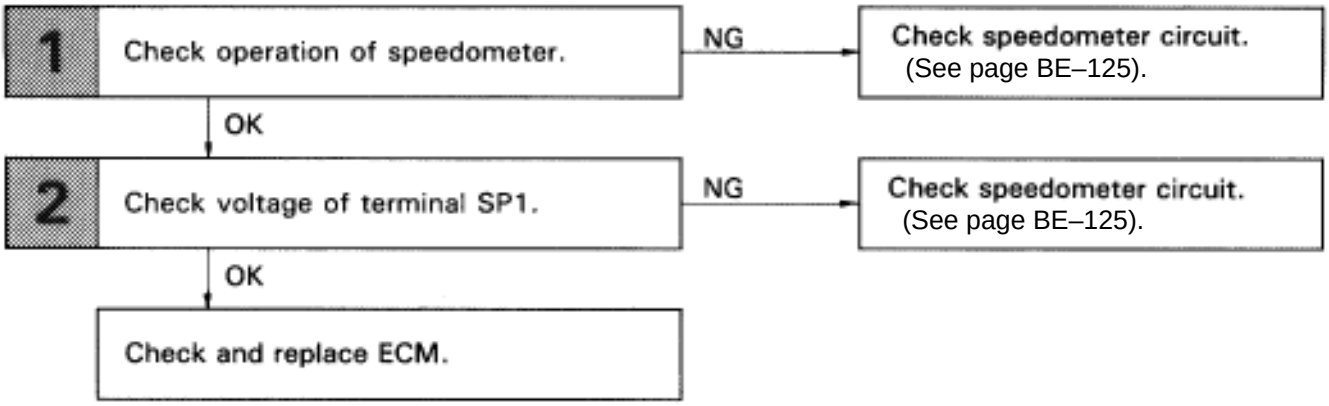


Q00515 Q00514

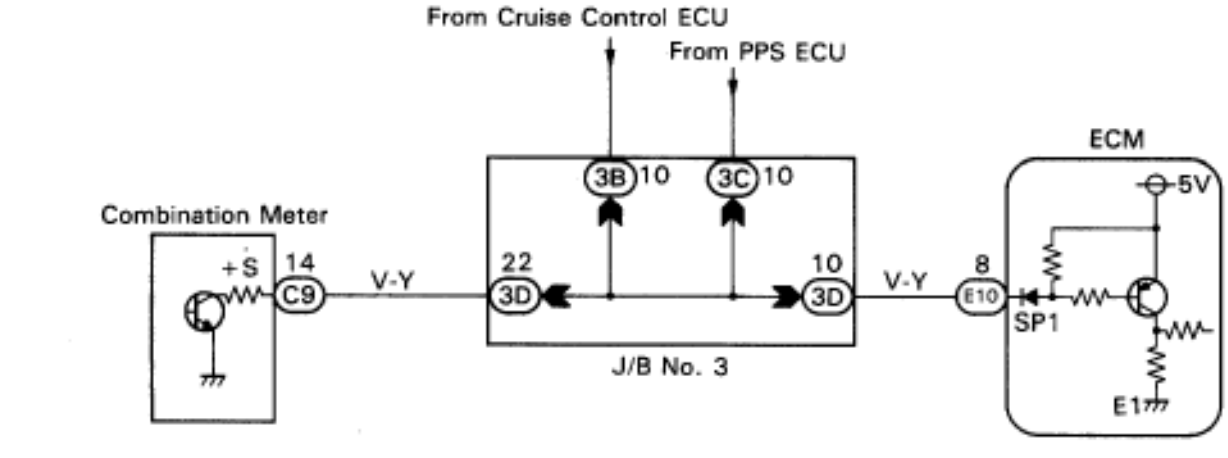


Code No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
45	For Electronic Controlled Transmission All conditions below are detected continuously for 8 sec. or more. (a) Vehicle speed signal: 0 km/h (mph) (b) Engine speed: 3,000 rpm or more (c) Park/Neutral position switch (PNP) OFF	□1 No. 1 speed sensor □2 Combination meter □3 Open or short in No. 1 speed sensor circuit □4 ECM
	For M/T All conditions below are detected continuously for 8 sec. or more. (a) Vehicle speed signal: 0 km/h (mph) (b) Engine speed: Between 3,000 ∼ 4,500 rpm (c) Engine coolant temp.: 80□C (176□F) or more (d) Load driving	

DIAGNOSTIC CHART



WIRING DIAGRAM



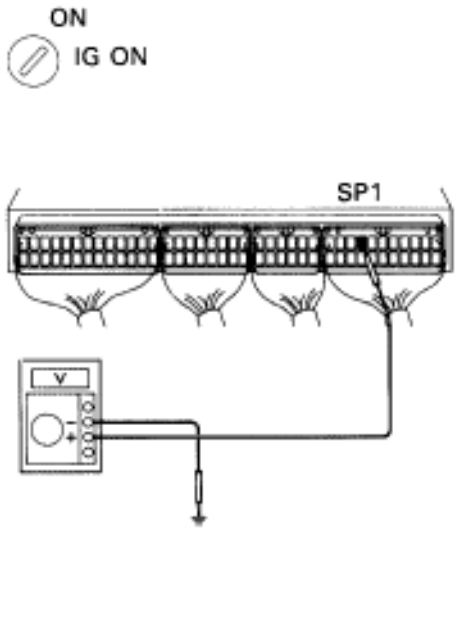
INSPECTION PROCEDURE

1	Check operation of speedometer.
C	Drive the vehicle and check if the operation of the speedometer in the combination meter is normal.
Hint	The No. 1 speed sensor is operating normally if the speedometer display is normal.

OK

NG **Check speedometer circuit. See combination meter troubleshooting on page BE–125.**

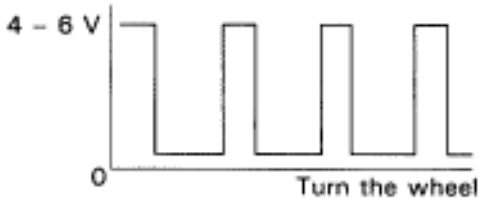
2	Check voltage between terminal SP1 of ECM connector and body ground.



P
1. Remove glove compartment. (See page BO–111).
2. Disconnect power steering ECU connector and cruise control ECU connector.
3. Shift the shift lever to N position or neutral.
4. Jack up a front wheel o one side.
5. Turn ignition switch on.

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

OK **Voltage is generated intermittently.**



OK

NG **Check speedometer circuit. See combination meter troubleshooting on page BE–125.**

Check and replace ECM.

–MEMO–

DTC 43 Starter Signal Circuit

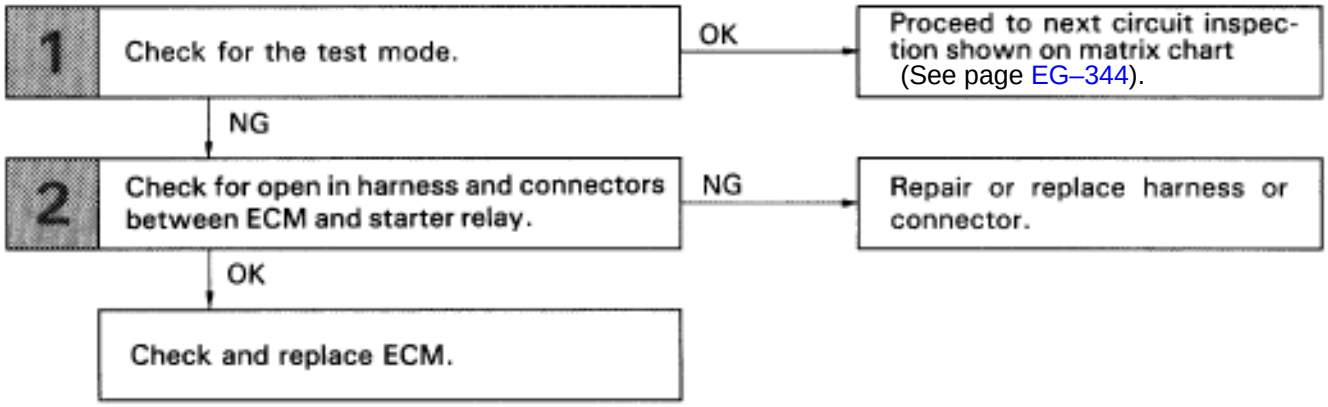
CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow is slow, so fuel vaporization is poor. A rich mixture is therefore necessary in order to achieve good startability. While the engine is being cranked, the battery voltage is applied to terminal STA of the ECM. The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after–start injection control.

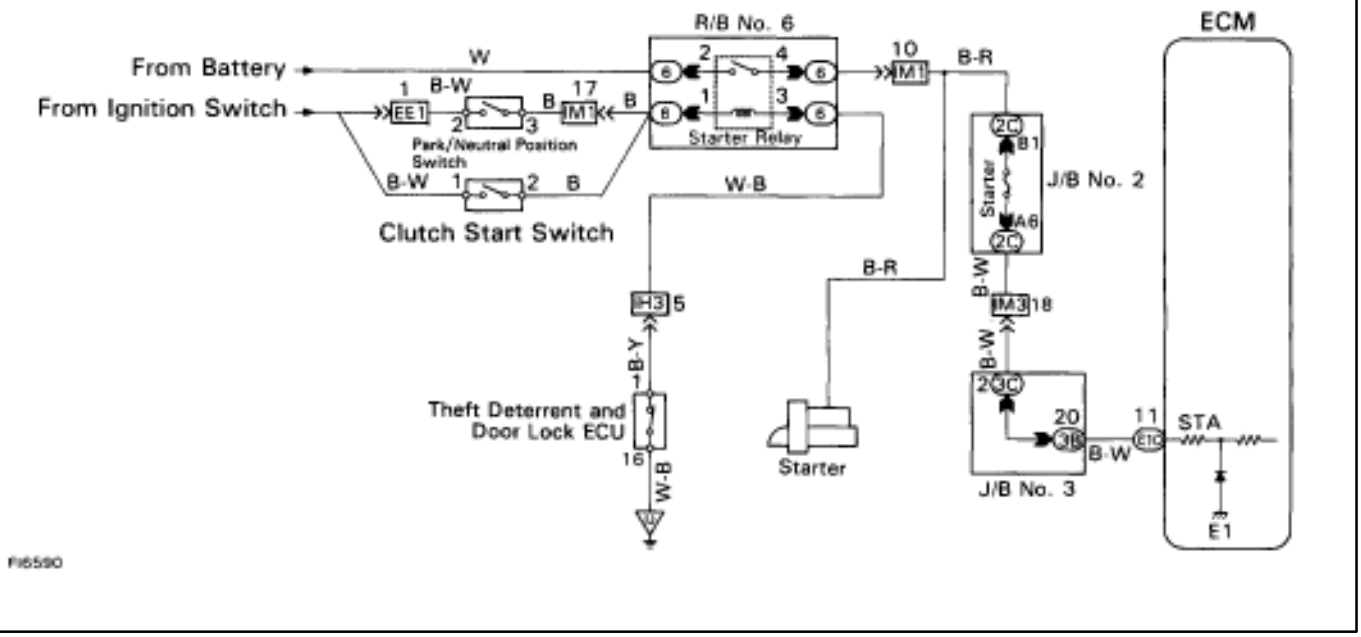
Code No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
43	No starter signal to ECM	□ Open or short in starter signal circuit. □ Open or short in ignition switch or starter relay circuit □ ECM

DIAGNOSTIC CHART

HINT: This diagnostic chart is based on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the matrix chart of problem symptoms on page EG–344.

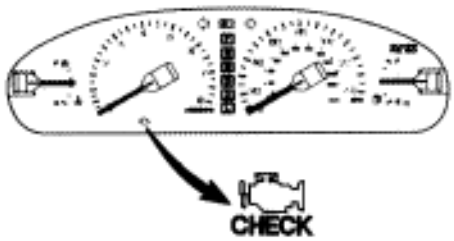


WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check output condition of diag. trouble code 43.**



FI6604

P Setting the test mode.

1. Turn ignition switch OFF.
2. Connect terminals TE2 and E1 of data link connector 2.
3. Turn ignition switch ON. (Don't start the engine.)
4. Connect terminals TE1 and E1 of data link connector 2.

C Check if code "43" is output by the Malfunction Indicator Lamp.

OK **Code "43" is output.**

C Start the engine. Check if the code "43" disappears.

OK **Code "43" is not output.**

NG

OK **Proceed to next circuit inspection shown on matrix chart (See page EG–344).**

2 **Check for open in harness and connectors between ECM and starter relay (See page IN–27).**

OK

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

Check and replace ECM.

DTC 52, 53, 55 Knock Sensor Circuit

— CIRCUIT DESCRIPTION

Knock sensors are fitted one each to the right bank and left bank of the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, ignition timing is retarded to suppress it.

Code No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
52	No No. 2 knock sensor signal to ECM for 4 crank revolutions with engine speed between 1,600 rpm ∼ 5,200 rpm.	○1 Open or short in No. 2 knock sensor circuit. ○2 No. 2 Knock sensor (looseness) ○3 ECM
53	Engine control computer (for knock circuit) malfunction at engine speed between 650 rpm and 5,2.00 rpm.	○1 ECM
55	No No. 1 knock sensor signal to ECM for 4 crank revolutions with engine speed between 1,600 rpm ∼ 5,200 rpm.	○1 Open or short in No. 1 knock sensor circuit. ○2 No. 1 knock sensor (looseness) ○3 ECM

If the ECM detects the above diagnosis conditions, it operates the fail safe function in which the corrective retard angle value is set to the maximum value.

— CIRCUIT DESCRIPTION (Cont'd)

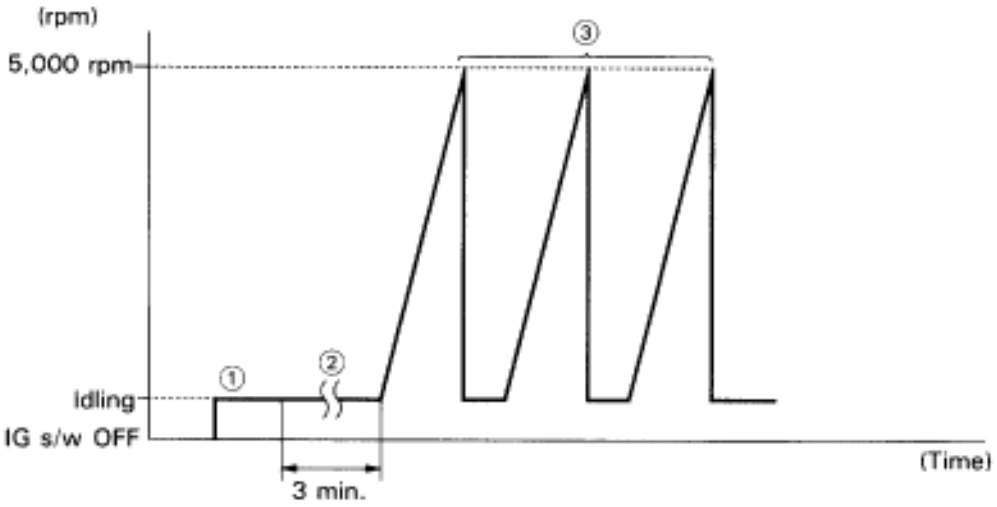
DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern.

(a) To simulate diag. trouble code detecting condition after diag. trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed confirming that diag. trouble code is no longer detected.

Malfunction: Open or Short in Knock Sensor



FI6461

1 Start the engine and warm up.

2 After the engine is warmed up, let it idle for 3 min.

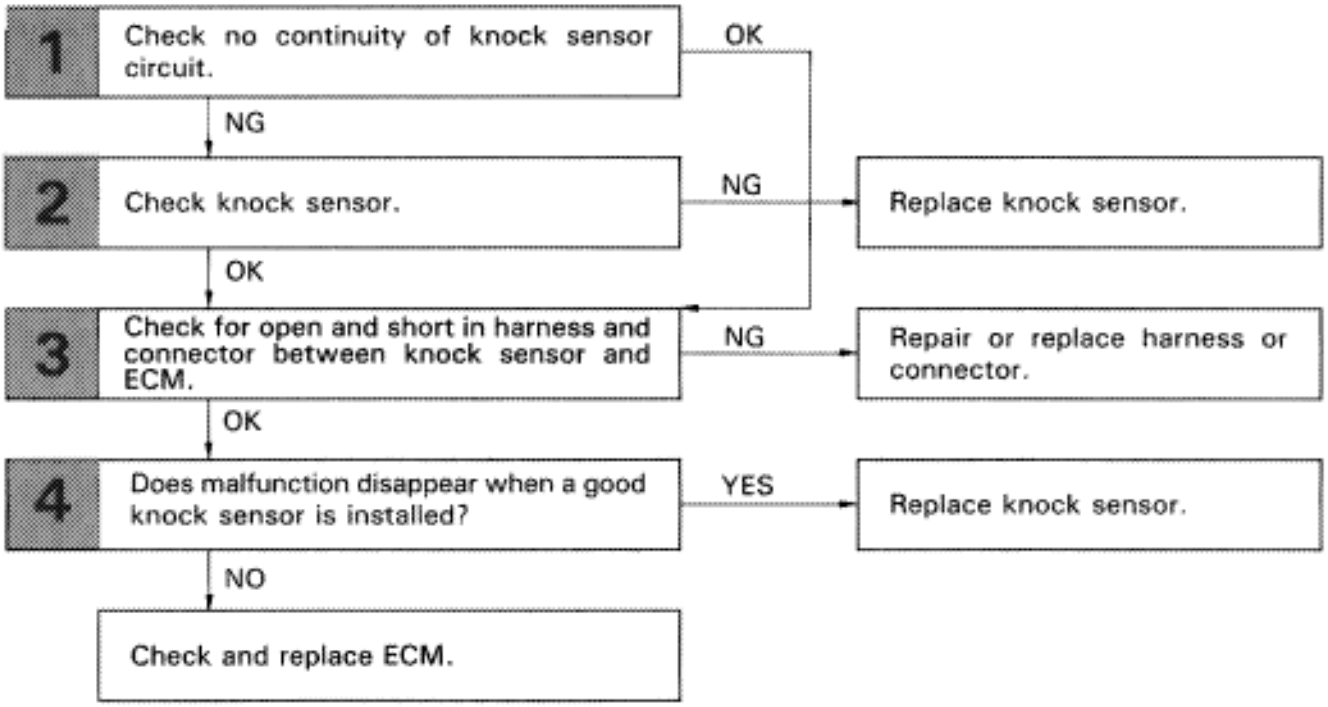
3 With the A/C ON, perform quick racing (5,000 rpm) three times.
(Rapidly depress the accelerator pedal and suddenly release it.)

HINT: If a malfunction exists, the Malfunction Indicator Lamp will light up when sudden racing is performed.

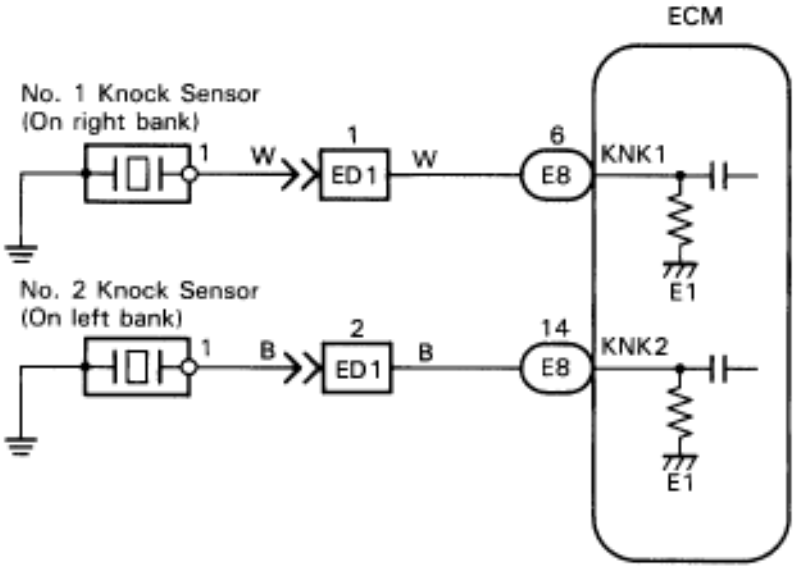
NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

DIAGNOSTIC CHART

HINT: If diag. trouble code 52 is displayed, check No.2 knock sensor (for left bank) circuit.
If diag. trouble code 55 is displayed, check No. 1 knock sensor (for right bank) circuit.
If diag. trouble code 53 is displayed, replace ECM.



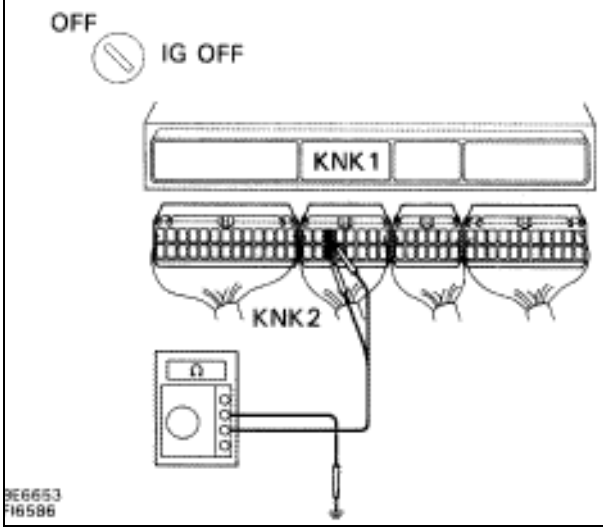
W



FI6610

INSPECTION PROCEDURE

1 **Check continuity between terminals KNK1, KNK2 of ECM connector and body ground.**



P 1. Remove glove compartment. (See page BO–111).
2. Disconnect the ECM connector.

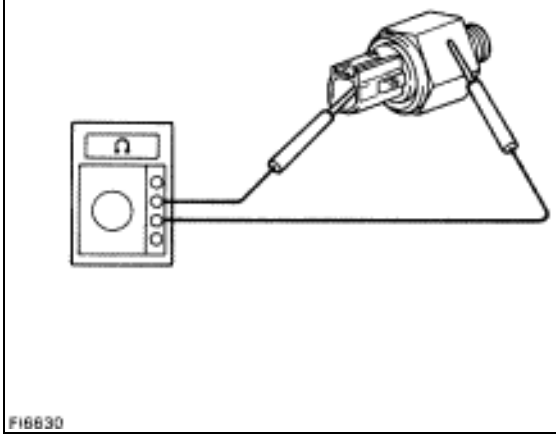
C Measure resistance between terminals KNK1, KNK2 of ECM connector and body ground.

OK **Resistance: 1 MΩ or higher**

NG

OK **Go to step** 1

2 **Check knock sensor.**



P Disconnect knock sensor connector.

C Measure resistance between the knock sensor terminal and body.

OK **Resistance: 1 MΩ or higher**

OK

NG **Replace knock sensor (See page EG–100).**

3	Check for open and short in harness and connectors between ECM and knock sensor (See page IN–27).

OK

NG → Repair or replace harness or connector.

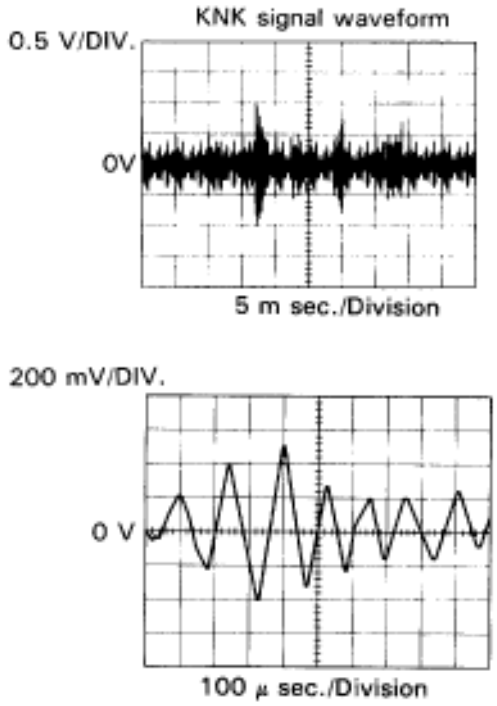
4	Does malfunction disappear when a good knock sensor is intalled?

NO

YES → Replace knock sensor (See page EG–100).

Check and replace ECM

Reference INSPECTION USING OSCILLOSCOPE



3. With the engine racing (4,000 rpm) measure between terminals KNK1, KNK2 of ECM and body ground.

HINT: The correct waveform appears as shown in the illustration on the left.

4. Spread the time on the horizontal axis, and confirm that period of the wave is 132 sec. (Normal mode vibration frequency of knock sensor: 7.6 KHz)

HINT: If normal mode vibration frequency is not 7.6 KHz, the sensor is malfunctioning.

–MEMO–

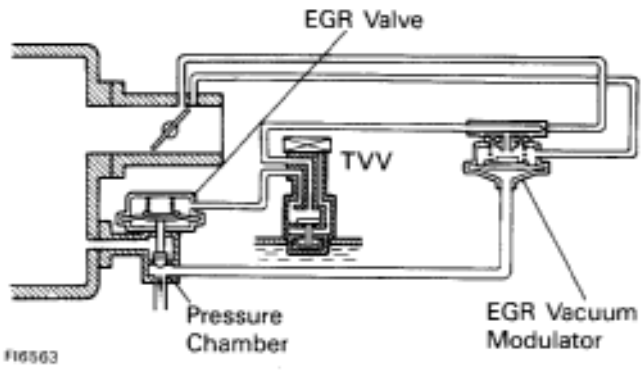
DTC	71	EGR System Malfunction (Only for California spec.)

— CIRCUIT DESCRIPTION

The EGR system, recirculates exhaust gas, which is controlled to the proper quantity to suit the driving conditions, into the intake air mixture to slow down combustion, reduce the combustion temperature and reduce NOx emissions. The amount of EGR is regulated by the EGR vacuum modulator according to the engine load.

Under the following conditions, EGR is cut to maintain driveability.

- Engine coolant temp. below 35°C (95°F)
- During deceleration (throttle valve closed)
- Light engine load (amount of intake air very small)
- Engine idling



Code No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
71	EGR gas temp. is 70°C (158°F) or below for 1 ~ 4 min. under conditions (a) and (b). (2 trip detection logic)* (a) Engine coolant temp: 60°C (140°F) or more (b) EGR operation possible. (EX. Electronic Controlled Transmission in D position, A/C ON, 60 mph (96 kn/h), Flat road).	Open in EGR gas temp. sensor circuit EGR or TVV vacuum hose disconnected valve stuck Clogged EGR gas passage ECM

*: See page EG–331.

— CIRCUIT DESCRIPTION (Cont'd)

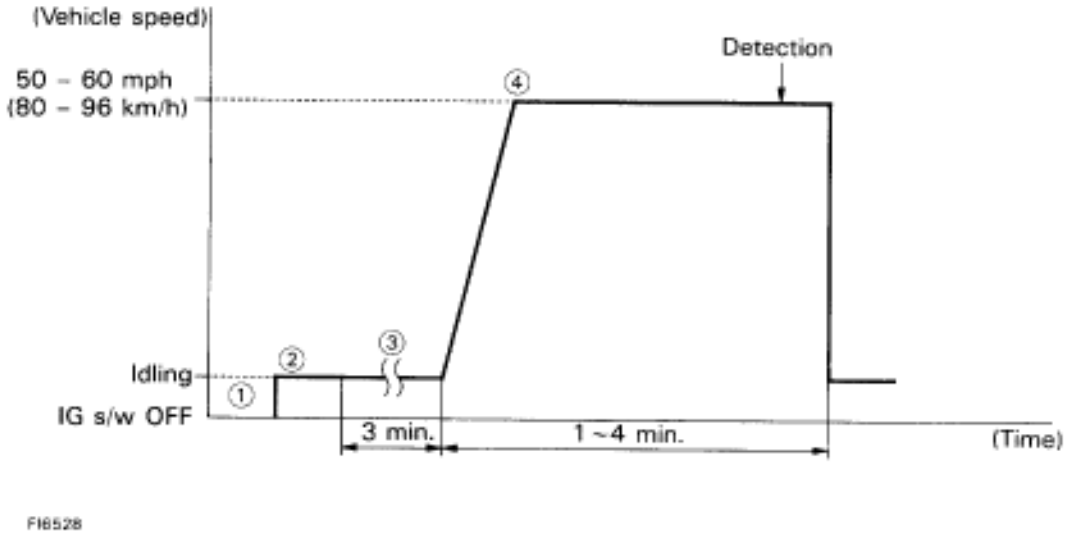
DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

Purpose of the driving pattern.

(a) To simulate diag. trouble code detecting condition after diag. trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed confirming that diag. trouble code is no longer detected.

Malfunction: Open in EGR gas temp. sensor circuit



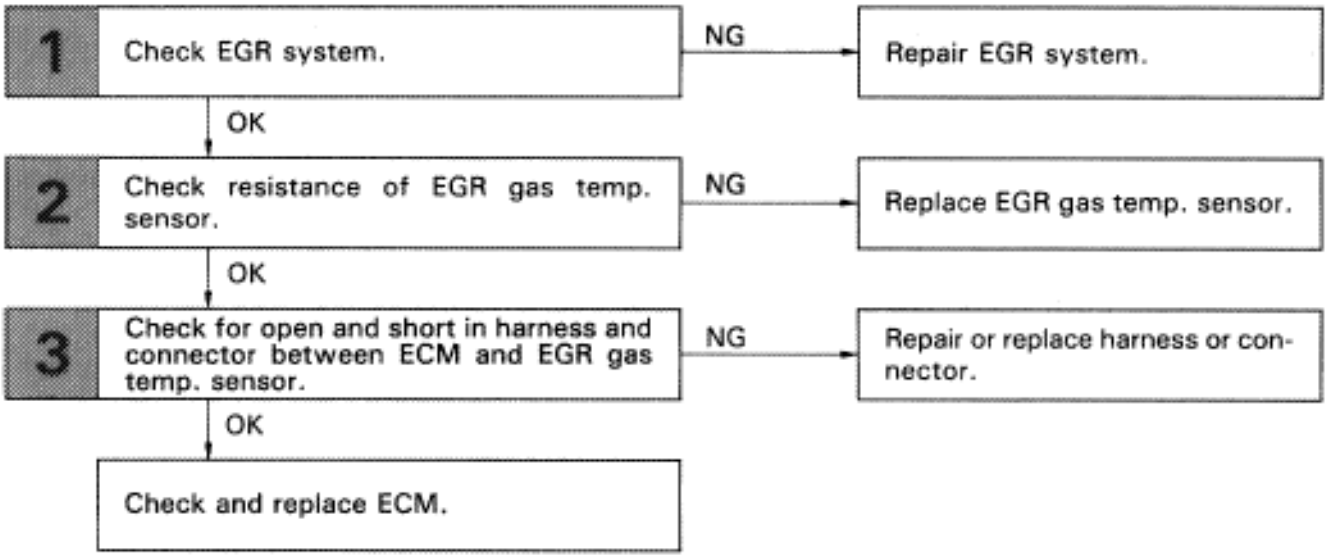
FI6528

1. Disconnect the EFI fuse (15 A) for 10 sec. or more, with IG switch OFF.
   Initiate test mode (Connect terminal TE2 and E1 of data link connector 1 or 2 with IG switch OFF).
2. Start the engine and warm up.
3. After the engine is warmed up, let it idle for 3 min.
4 With the A/C ON and transmission in 5th gear (D position for A/T), drive at 50 ~ 60 mph (80 ~ 96 km/h) for 4 min, or less.

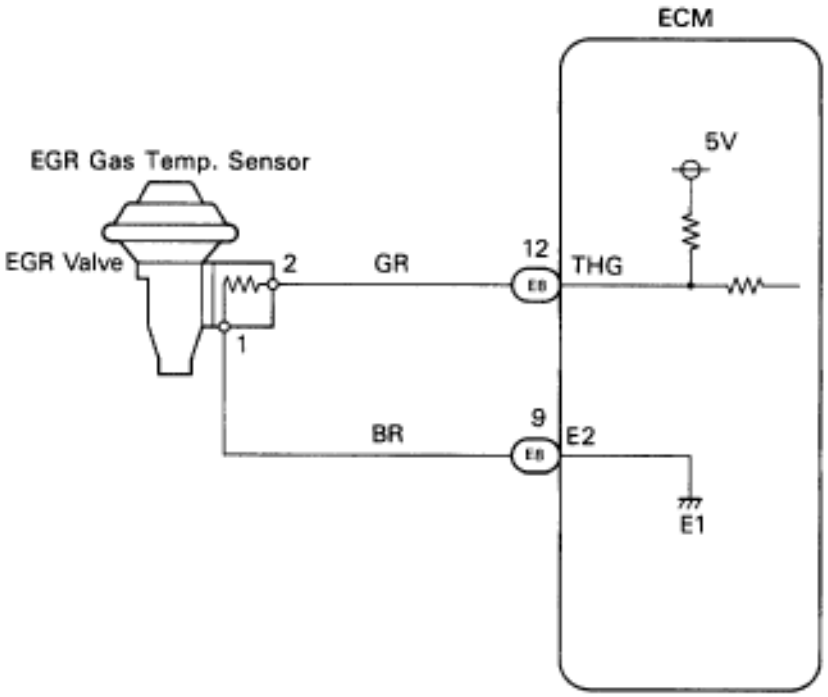
HINT: If a malfunction exists, the Malfunction Indicator Lamp will light up during step .

NOTICE: If the conditions in this test are not strictly observed, detection of the malfunction will not be possible.

DIAGNOSTIC CHART



WIRING DIAGRAM



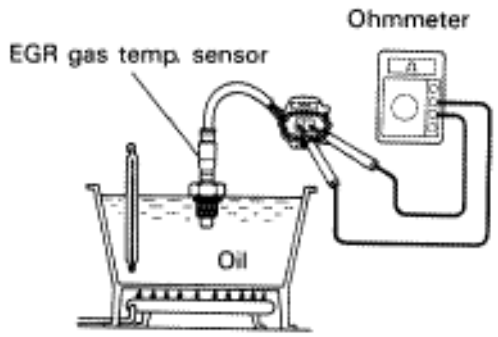
FI6579

INSPECTION PROCEDURE

1 **Check EGR system (See page EG–152).**

OK → **NG** → **Repair EGR system.**

2 **Check resistance of EGR gas temp. sensor.**



P Remove EGR gas temp. sensor.

C **OK** Measure resistance between terminals of EGR gas temp. sensor connector.

Resistance: **69 – 89 kΩ at 50°C (122°F)**
12 – 15 kΩ at 100°C (212°F)
2 – 4 kΩ at 150°C (302°F)

Hint

OK → **NG** → **Replace EGR gas temp. sensor**

3 **Check for open in harness and connector between EGR gas temp. sensor and ECM (See page IN–27).**

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

Check and replace ECM.

DTC 51 Switch Condition Signal Circuit

CIRCUIT DESCRIPTION

Park/Neutral Position Switch Signal*

The ECM uses the signals from the park/neutral position switch to determine whether the transmission is in park or neutral, or in some other position.

Air Conditioning Switch Signal

The ECM uses the output from the air conditioning switch to determine whether or not the air conditioning is operating so that it can increase the idling speed of the engine if necessary.

Throttle Position Sensor IDL Signal

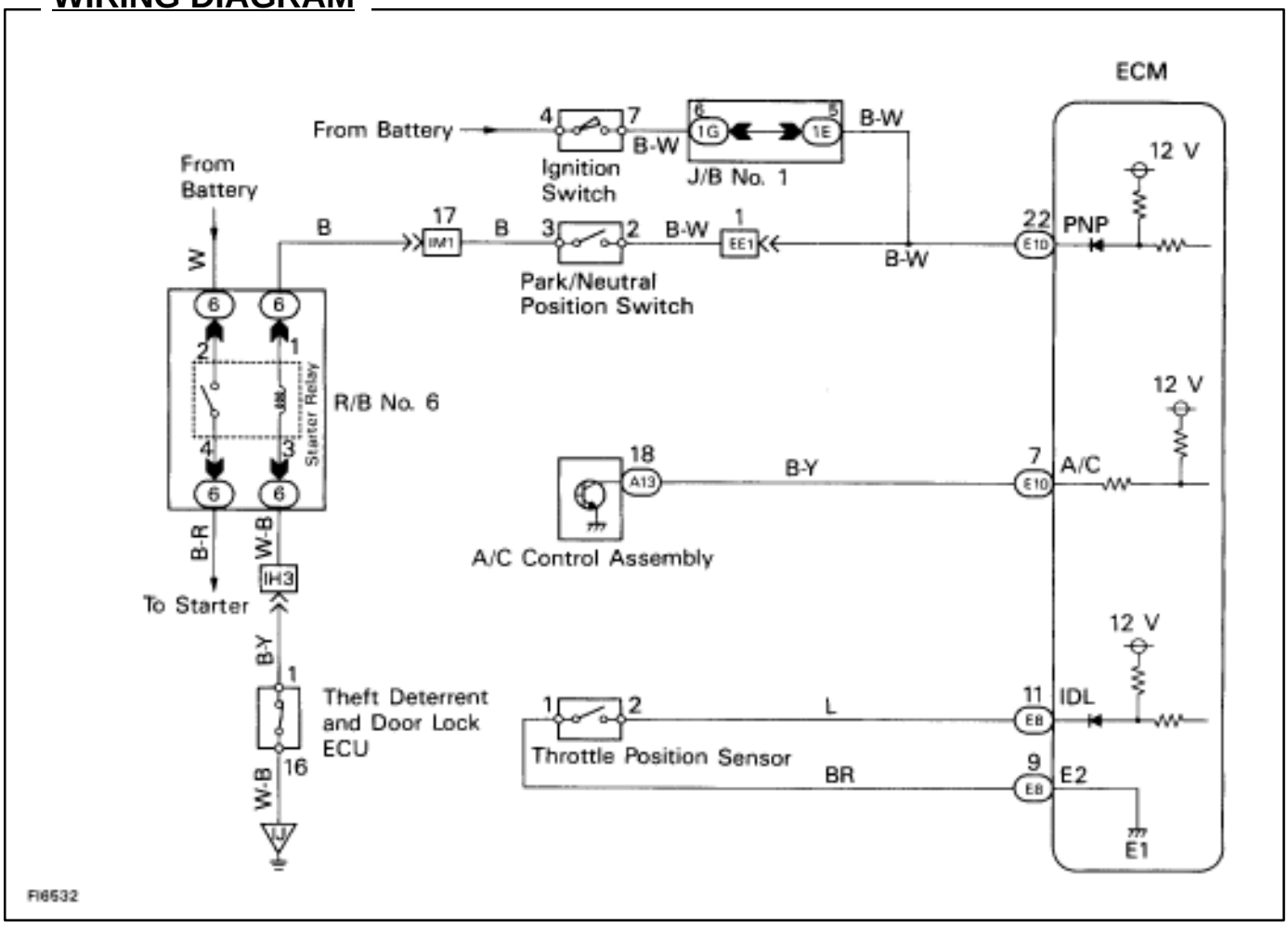
The IDL contacts are mounted in the throttle position sensor, and detects the idle condition.

Code No.	Diagnostic Trouble Code Detecting Condition	Trouble Area
51	1. 3 sec. or more after engine starts idle switch OFF (IDL 1) 2. *Park/Neutral position switch OFF (PNP). (Shift position in “R”, “D”, “2” or “1” position). 3. A/C switch ON.	○1 Throttle position sensor IDL circuit. ○2 Accelerator pedal and cable ○3 A/C switch circuit ○4 ECM

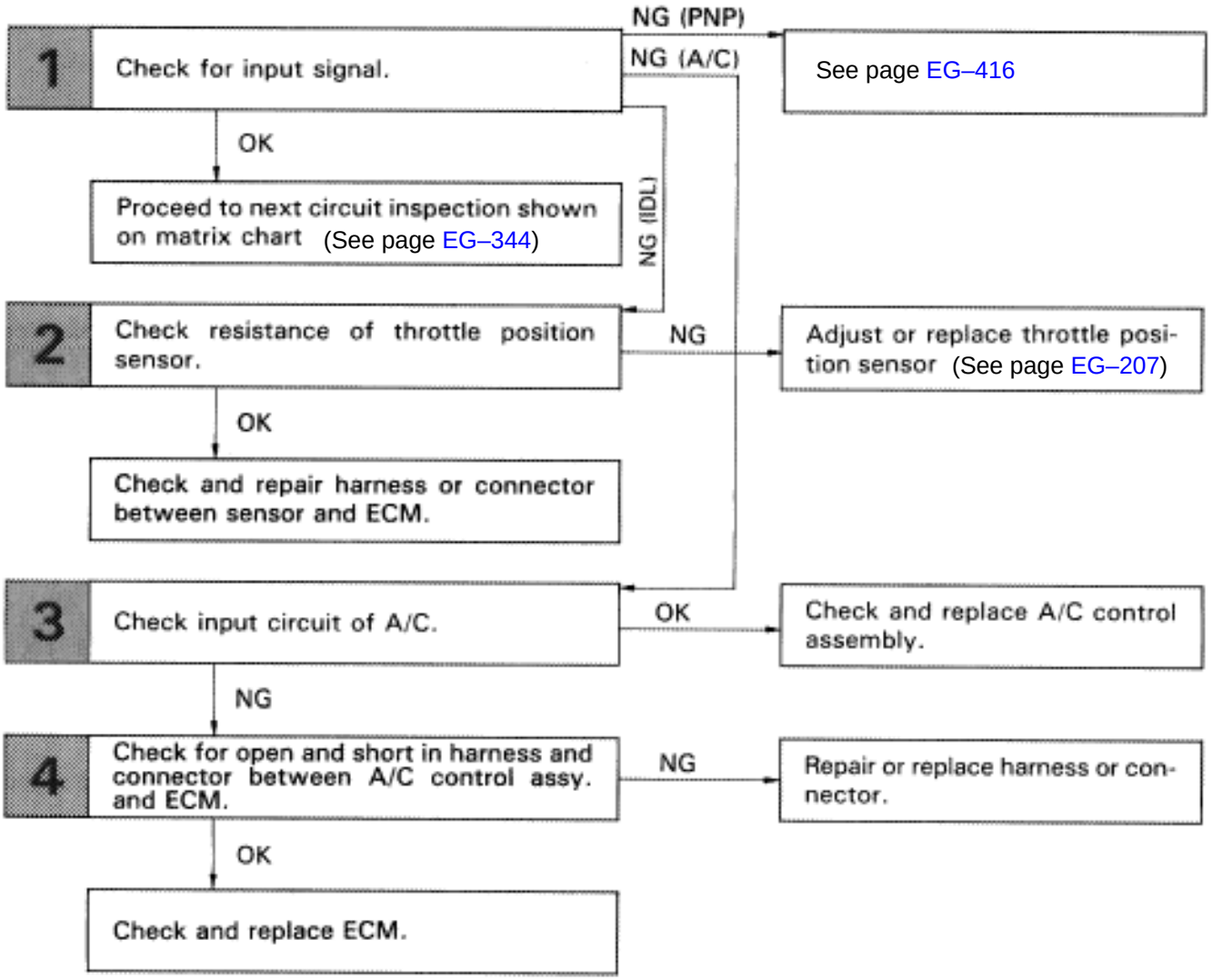
*: Only vehicles with Electronic Controlled Transmission.

HINT: In this circuit, diagnosis can only be made in the test mode.

WIRING DIAGRAM

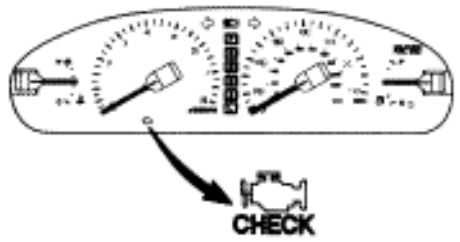


DIAGNOSTIC CHART



INSPECTION PROCEDURE

1 Check output condition of diag. trouble code 51.



FI6604

P Setting the test mode.

1. Turn ignition switch OFF.
2. Connect terminals TE2 and E1 of data link connector.
3. Turn ignition switch ON. (For checking terminal A/C, start the engine.)
4. Connect terminals TE1 and E1 of data link connector 2.

C Check if code “51” is output by the Malfunction Indicator Lam.

OK

	Condition	Code
Park/Neutral Position Switch (PNP)	P or N position	Normal*
	R, D, 2 or L position	51*
Throttle Position Sensor (IDL)	Accelerator pedal released	Normal*
	Accelerator pedal depressed	51*
A/C Switch (A/C)	A/C SW ON	51
	A/C SW OFF	Normal

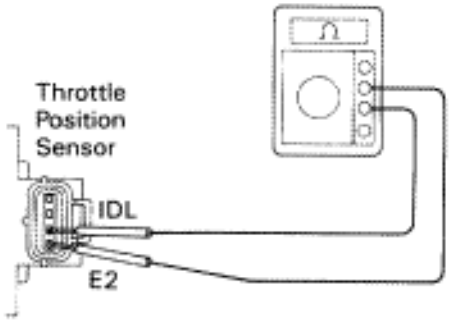
*: Before the STA signal is input (ST is not ON), diagnostic trouble code 43 is also output.

Hint Diag. trouble code 42 is output with vehicle speed 5 km/h (3 mph) or below.

OK → **Proceed to next circuit inspection shown on matrix chart (See page EG–344).**

NG → **IDL...Go to step 3** **PNP....Go to page EG–416**
A/C....Go to step 1

2 Check throttle position sensor.



FI6564

P Disconnect throttle position sensor connector.

C Measure resistance between terminals IDL and E2 of throttle position sensor connector.

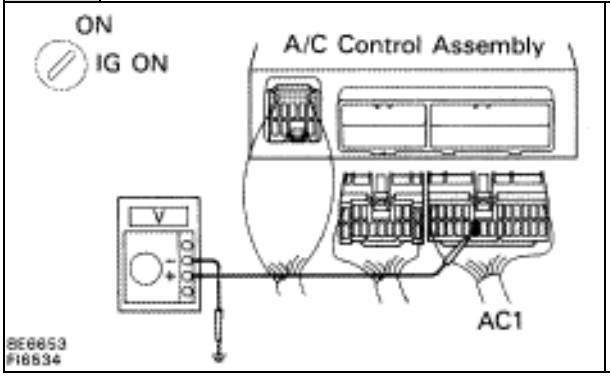
OK

Throttle Valve	Resistance
Fully closed	Less than 0.5 kΩ
Opened	1 MΩ or higher

OK → **Check and repair harness or connector between ECM and throttle position sensor.**

NG → **Adjust or replace throttle position sensor (See page EG–207).**

3	Disconnect A/C control assembly connector, check voltage between terminal AC1 of A/C control assembly connector and body ground.



P
1. Remove air conditioning control assembly.
2. Disconnect air conditioning control assembly connector.
3. Turn ignition switch on.

C Measure voltage between terminal AC1 of air conditioning control assembly connector and body ground.

OK **Voltage: 10 – 14 V**

NG

OK **Check and replace A/C control assembly.**

4	Check for open and short in harness and connector between ECM and A/C control assembly (See page IN–27).

OK

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

Check and replace ECM.

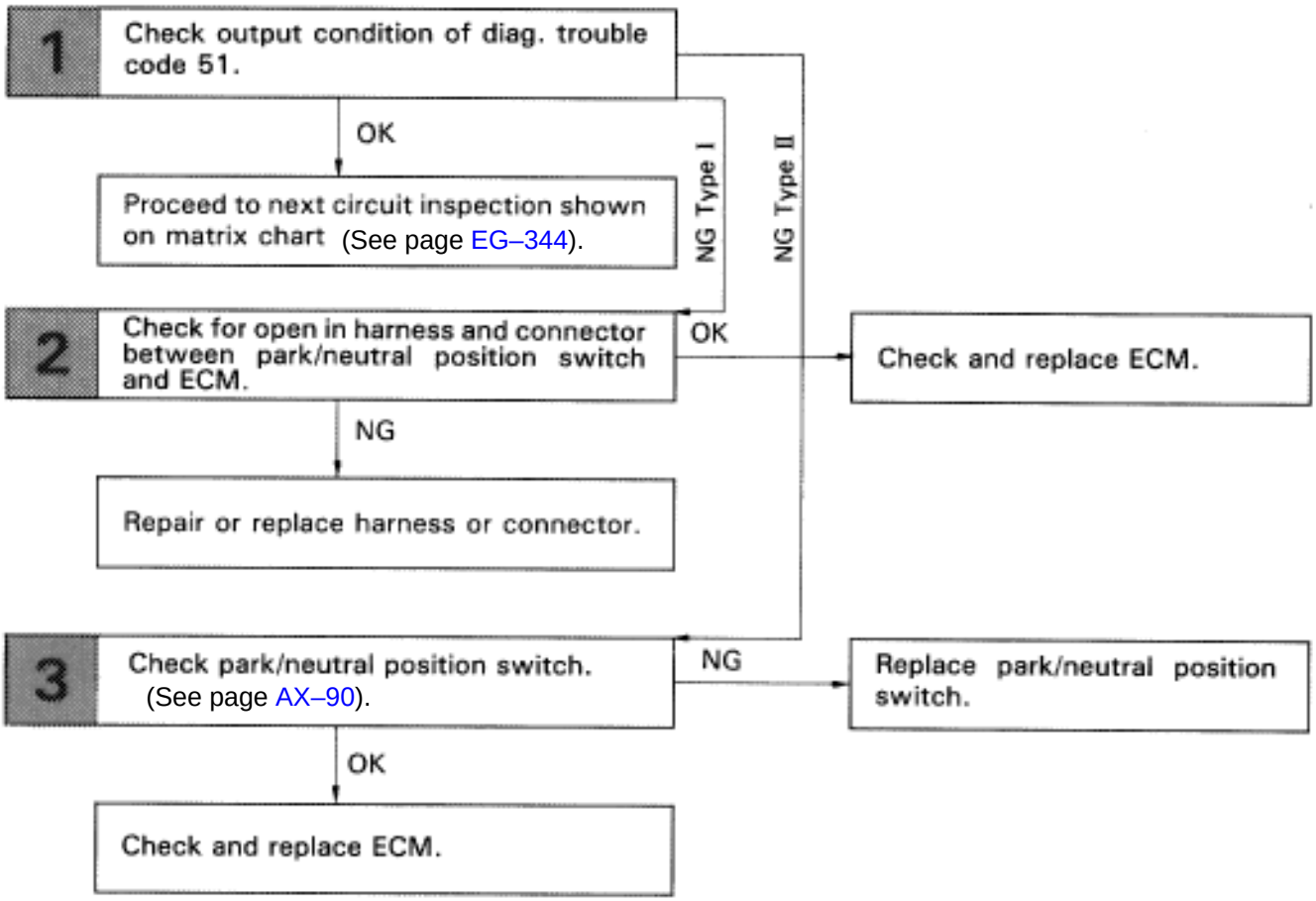
Park/Neutral Position Switch Circuit (Only vehicles with ELECTRONIC CONTROLLED TRANSMISSION)

CIRCUIT DESCRIPTION

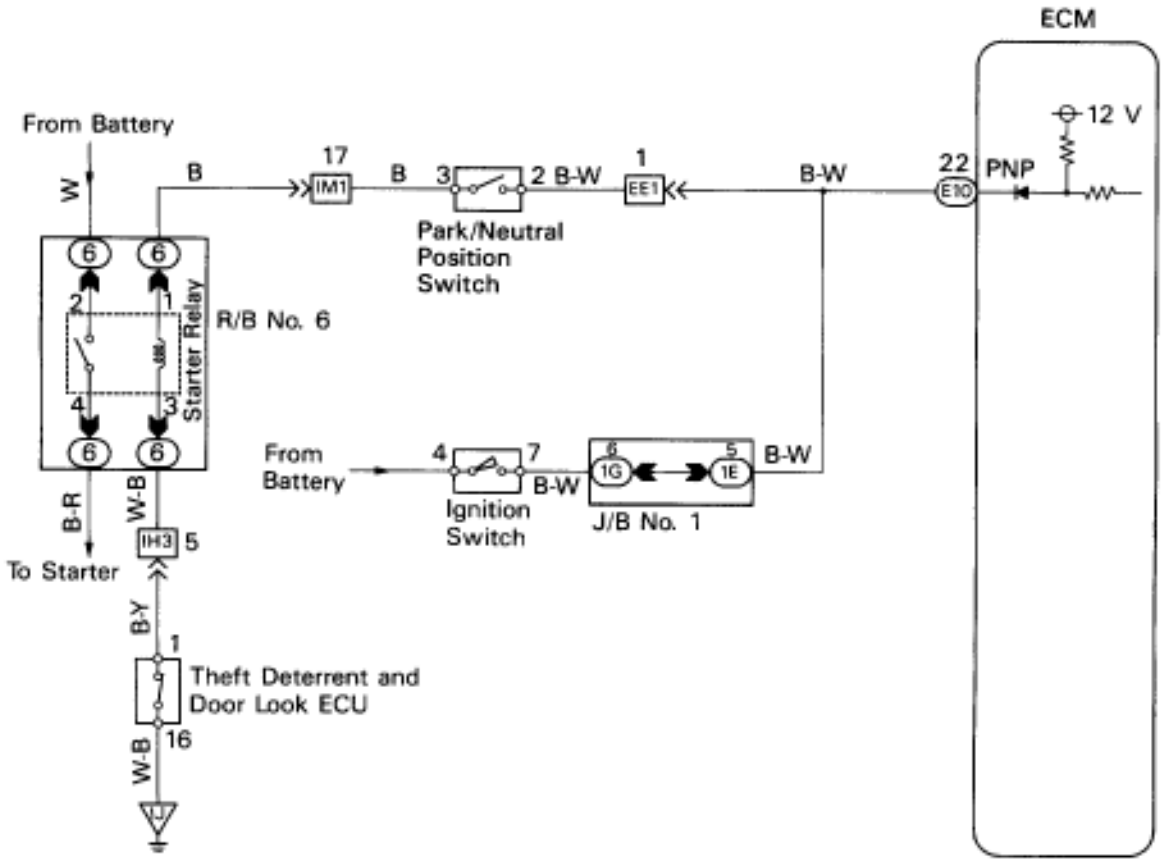
The park/neutral position switch goes on when the shift lever is in the N or P shift position. When it goes on the terminal PNP of the ECM is grounded to body ground via the starter relay and theft deterrent ECU, thus the terminal PNP voltage becomes O V. When the shift lever is in the D, 2, L or R position, the park/neutral position switch goes off, so the voltage of ECM terminal PNP becomes battery voltage, the voltage of the ECM internal power source.
If the shift lever is moved from the N position to the D position, this signal is used for air–fuel ratio correction and for idle speed control (estimated control), etc.
When the park/neutral position switch is off, code ”51” is output in the test mode diagnosis. (This is not abnormal.)

DIAGNOSTIC CHART

HINT: This diagnosis chart is based on premise that the engine is cranked normally. If the engine is not cranked, proceed to the matrix chart of problem symptoms on page EG–344.

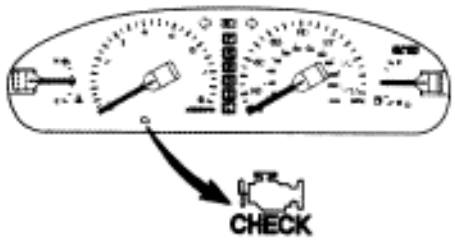


WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check output condition of diag. trouble code 51.**



FI6604

P
C
OK

1. Connect terminals TE2 and E1 of data link connector 2.
2. Turn ignition switch on.
3. Crank the engine.
4. Connect terminals TE1 and E1 of data link connector 2.

Result

Hint

Check if diagnostic trouble code “51” is output when the shift lever is in the P and D shift positions.

Shift Position	Result		
	OK	NG Type I	NG Type II
“P”	Normal Code	Code 51	Normal Code
“D”	Code 51	Code 51	Normal Code

OK → **Proceed to next circuit inspection shown on matrix chart (See page EG–344).**

NG TYPE I → **Go to step 3**

NG TYPE II → **Go to step 1**

2 **Check for open harness and connector between ECM and park/neutral position switch (See page IN–27).**

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

OK → **Check and replace ECM.**

3 **Check park/neutral position switch (See page AX–90).**

OK → **Check and replace ECM.**

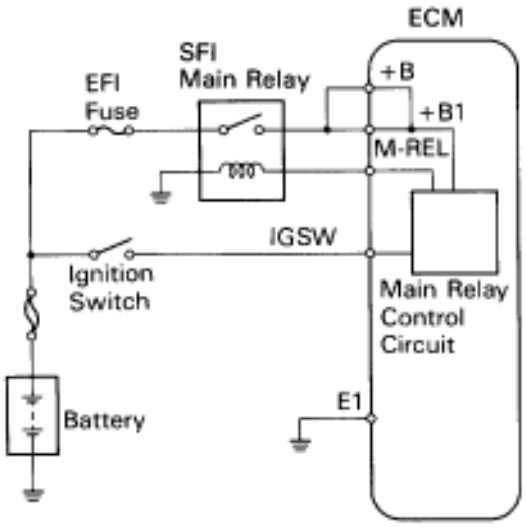
NG → **Replace park/neutral position switch.**

–MEMO–

ECM Power Source Circuit

CIRCUIT DESCRIPTION

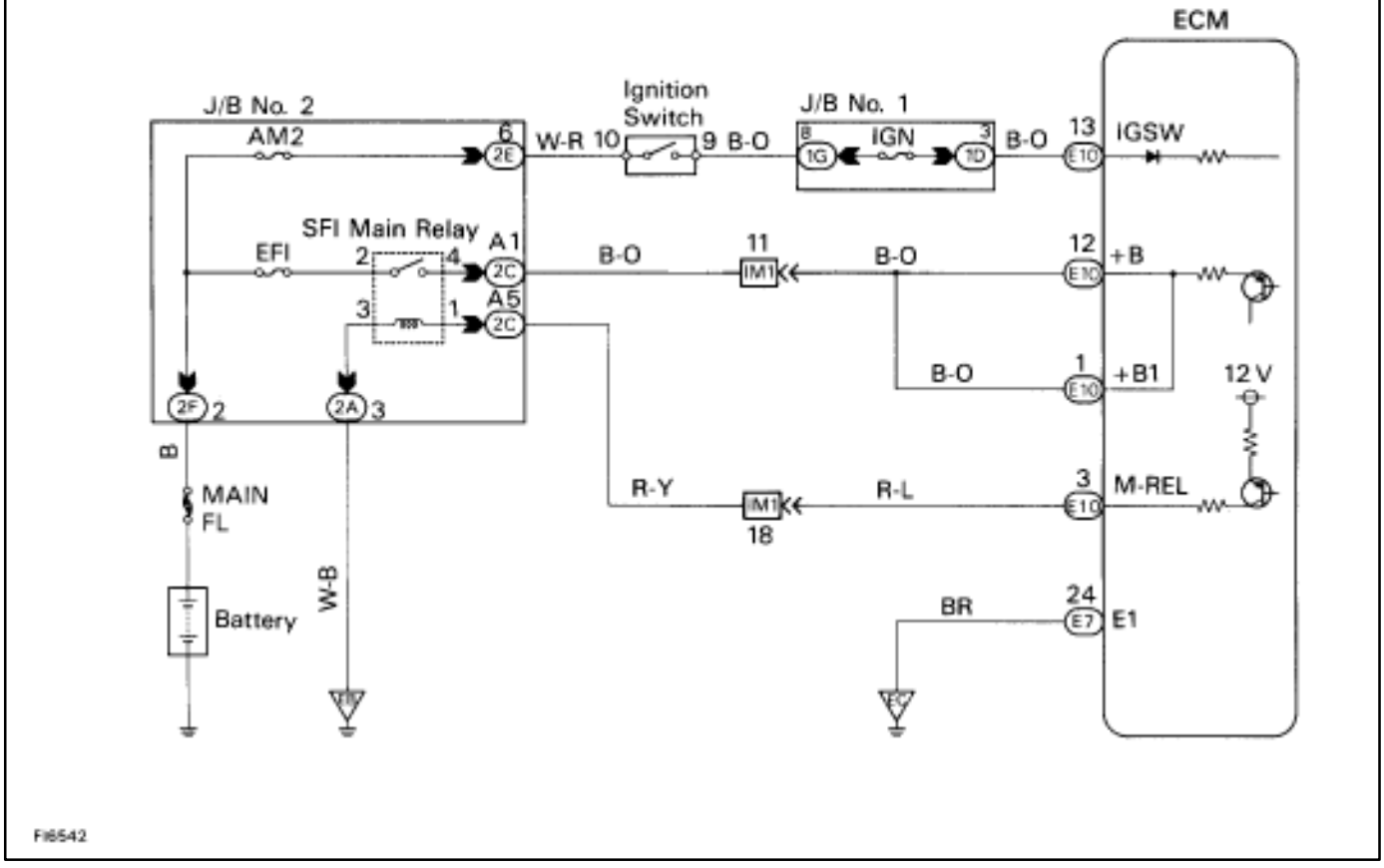
When the ignition switch is turned on, battery voltage is applied to the terminal IGSW of the ECM, and the main relay control circuit in the ECM sends a signal to the terminal M–REL of the ECM, switching on the main relay. This signal causes current to flow to the coil, closing the contacts of the main relay and supplying power to the terminals +B and +B1 of the ECM.
If the ignition switch is turned off, the ECM continues to switch on the main relay for a maximum of 2 seconds for the initial setting of the IAC valve.



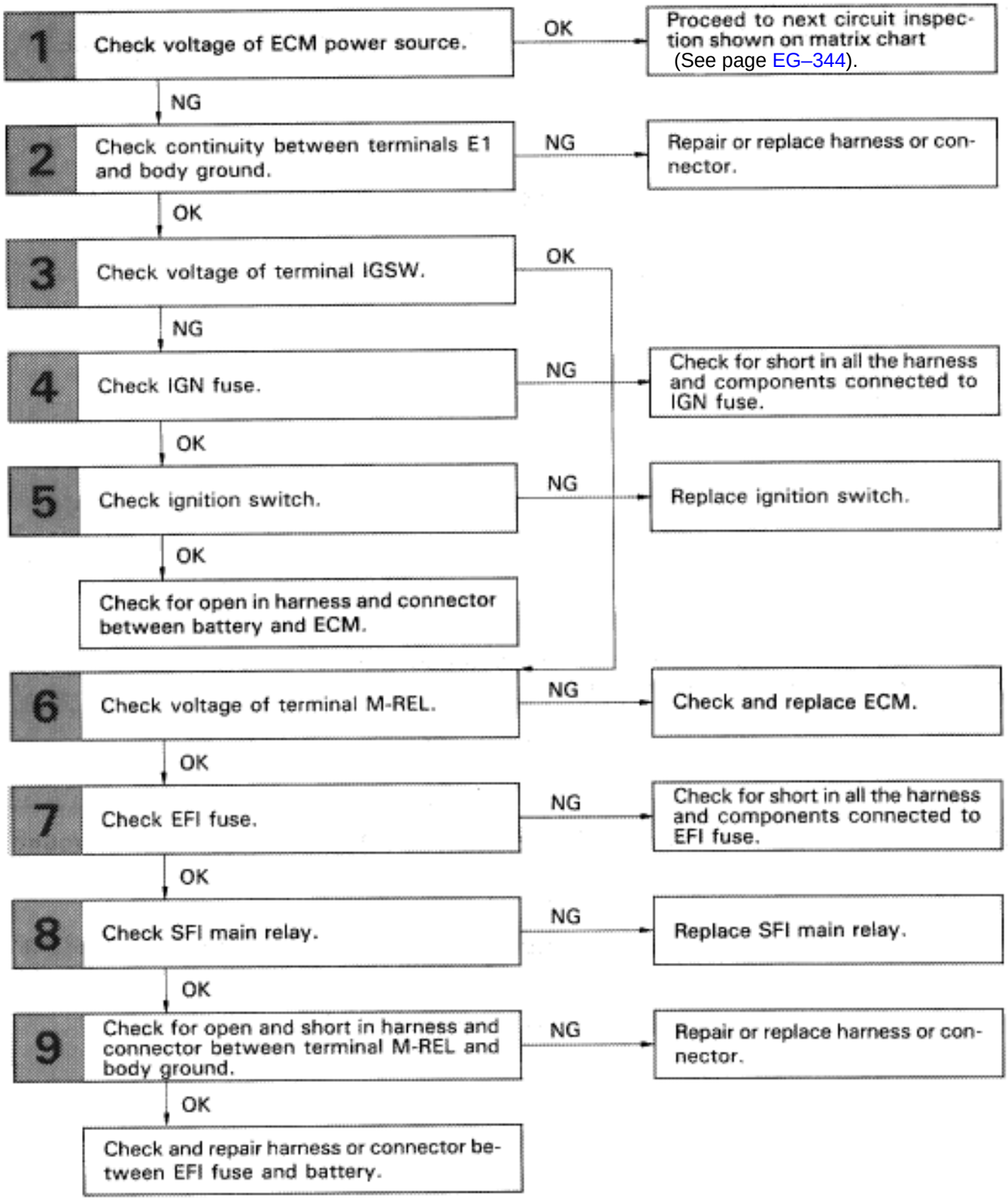
DIAGNOSTIC CHART

See next page for the DIAGNOSTIC CHART.

WIRING DIAGRAM

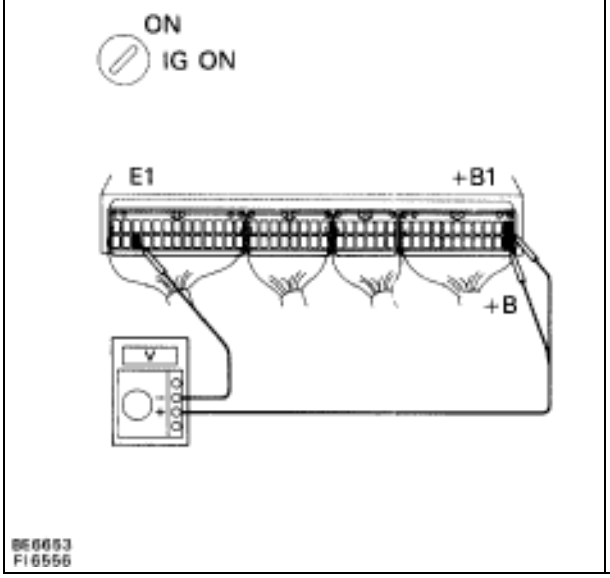


DIAGNOSTIC CHART



INSPECTION PROCEDURE

1 **Check voltage between terminals +B, +B1 and E1 of ECM connector.**



P 1. Remove glove compartment. (See page BO–111).
2. Turn ignition switch on

C Measure voltage between terminals +B, +B1 and E1 of ECM connector.

OK **Voltage: 10 – 14 V**

NG

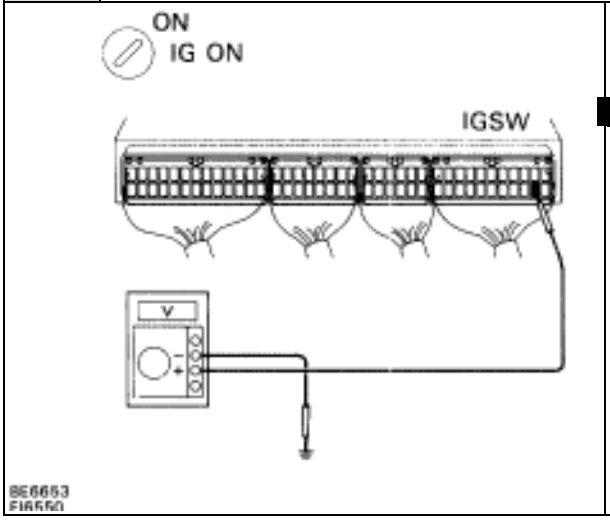
OK **Proceed to next circuit inspection shown on matrix chart (See page EG–344).**

2 **Check for open in harness and connector between terminal E1 of ECM and body ground (See page IN–27).**

OK

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

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



P Turn ignition switch on.

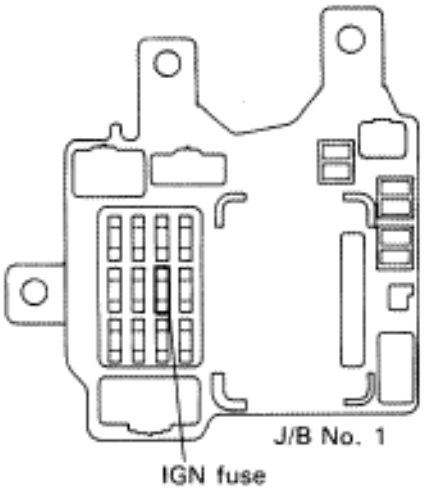
C Measure voltage between terminal IGSW of ECM connector and body ground.

OK **Voltage: 10 – 14 V**

NG

OK **Go to step** 1

4 **Check IGN fuse.**



P Remove IGN fuse form J/B No. 1

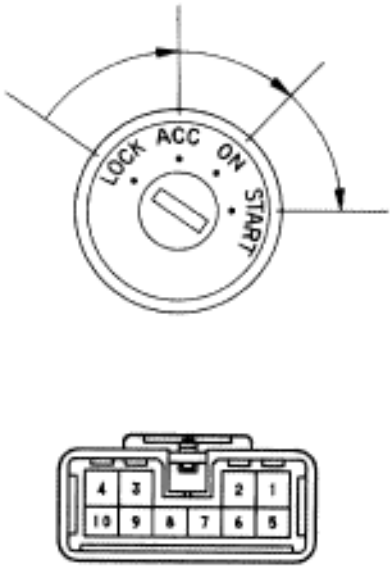
C Check continuity of IGN fuse.

OK **Continuity**

OK

NG **Check for short in all the harness and components connected to IGN fuse (See attached wiring diagram).**

5 **Check ignition switch.**



P Remove under cover and finish panel.

C Check continuity between terminals.

OK

○—○ continuity

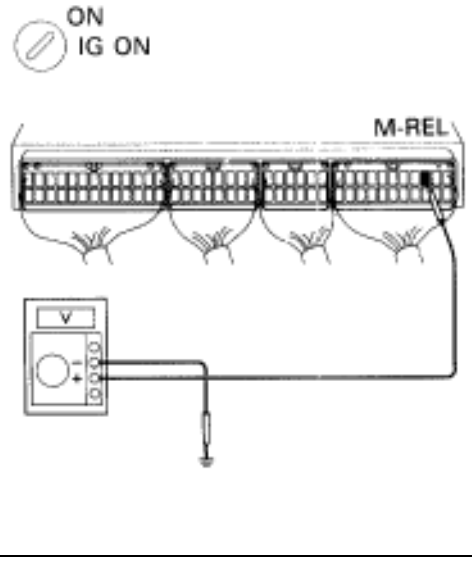
Terminal / Switch position	2 IG1	3 ACC	4 AM1	6 ST2	7 ST1	9 IG2	10 AM2
LOCK							
ACC		○	○				
ON	○	○	○			○	○
START	○		○	○	○	○	○

OK

NG **Replace ignition switch.**

Check and repair harness and connector between battery and ignition switch, ignition switch and ECM.

6 **Check voltage between terminal M–REL of ECM connector and body ground.**



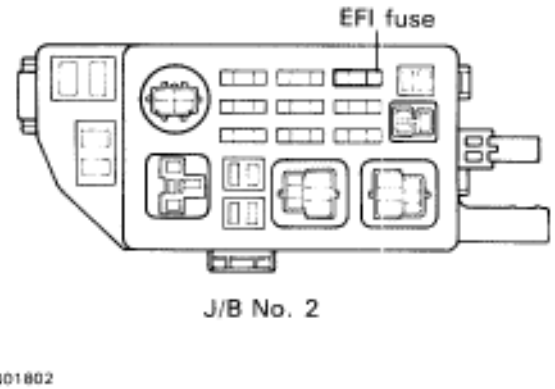
P Turn ignition switch on.

C Measure voltage between terminal M–REL of ECM connector and body ground.

OK **Voltage:** **10 – 14 V**

OK → **NG** → **Check and replace ECM.**

7 **Check EFI fuse.**



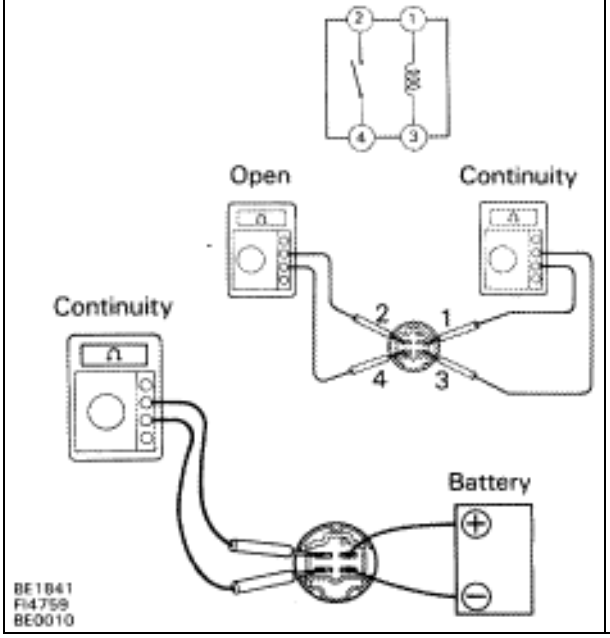
P Remove EFI fuse from J/B No. 2.

C Check continuity of EFI fuse.

OK **Continuity**

OK → **NG** → **Check for short in all the harness and components connected to EFI fuse (See attached wiring diagram).**

8 **Check SFI main relay.**



P Remove SFI main relay from J/B No. 2.

C Check continuity between terminals of SFI main relay shown below.

OK

Terminals 2 and 4	Open
Terminals 1 and 3	Continuity (Reference value 72 Ω)

C
1. Apply battery voltage between terminals 1 and 3.
2. Check continuity between terminals 2 and 4.

OK

Terminals 2 and 4	Continuity

OK → **NG** → **Replace SFI main relay.**

9 **Check for open and short in harness and connector between terminal M–REL of ECM and body ground (See page IN–27).**

OK → **NG** → **Repair or replace harness or connector,**

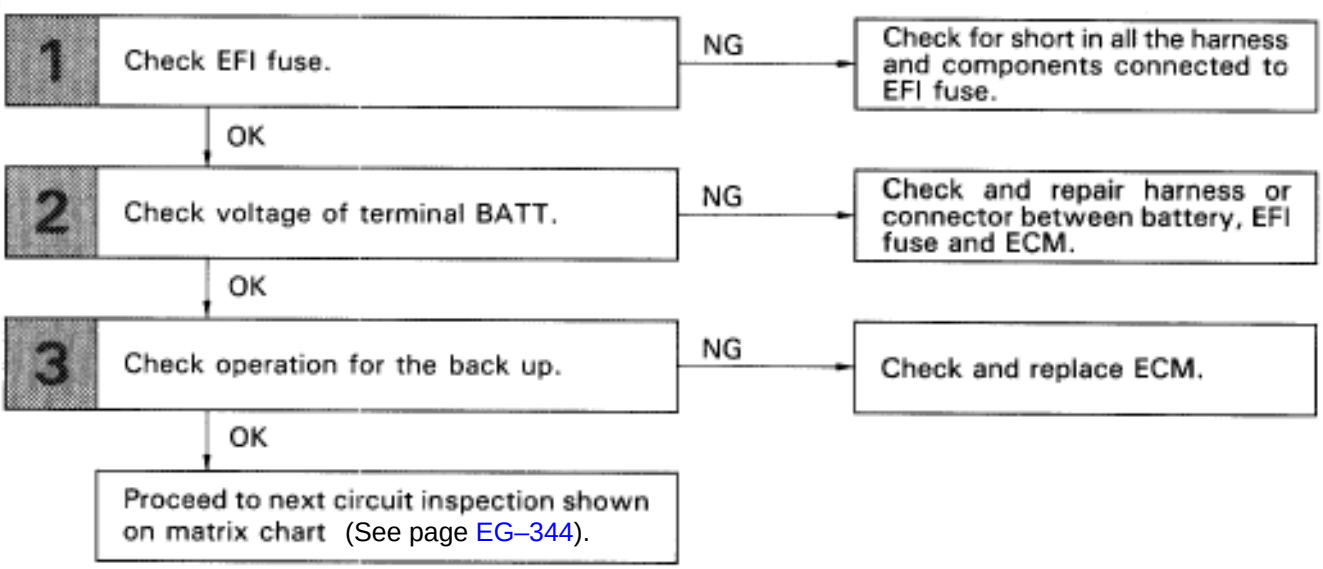
Check and repair harness or connector between EFI fuse and battery.

Back Up Power Source Circuit

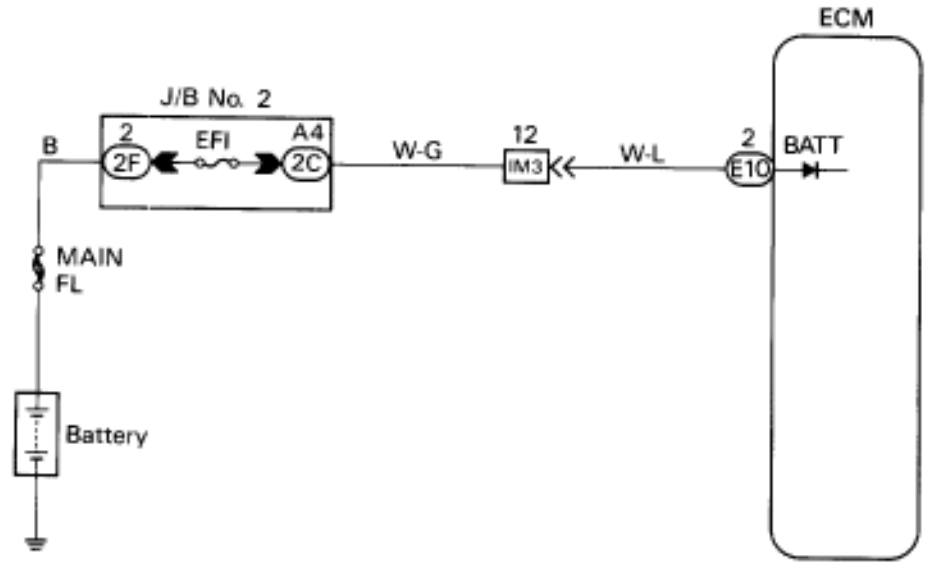
CIRCUIT DESCRIPTION

Battery voltage is supplied to terminal BATT of the ECM even when the ignition switch is off for use by the diagnostic trouble code memory and air–fuel ratio adaptive control value memory, etc.

DIAGNOSTIC CHART



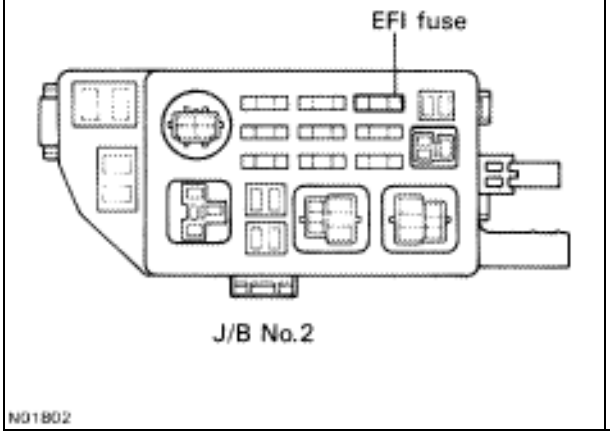
WIRING DIAGRAM



FI6581

INSPECTION PROCEDURE

1 **Check EFI fuse.**



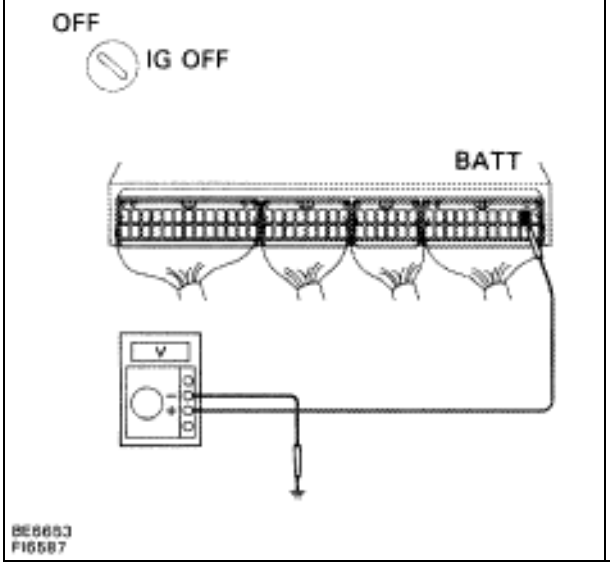
P Remove EFI fuse from J/B No. 2.

C Check continuity of EFI fuse.

OK **Continuity**

OK → **NG** → **Check for short in all the harness and components connected to EFI fuse (See attached wiring diagram).**

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



P Remove glove compartment. (See page BO–111).

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

OK **Voltage:** **10 – 14 V**

OK → **NG** → **Check and repair harness or connector between ECM and EFI fuse, EFI fuse and battery.**

3 **Are the diagnostic trouble codes still in the memory when the ignition switch is turned OFF?**

YES → **NO** → **Check and replace ECM.**

Proceed to next circuit inspection shown on matrix chart (See page EG–344).

Injector Circuit

— CIRCUIT DESCRIPTION

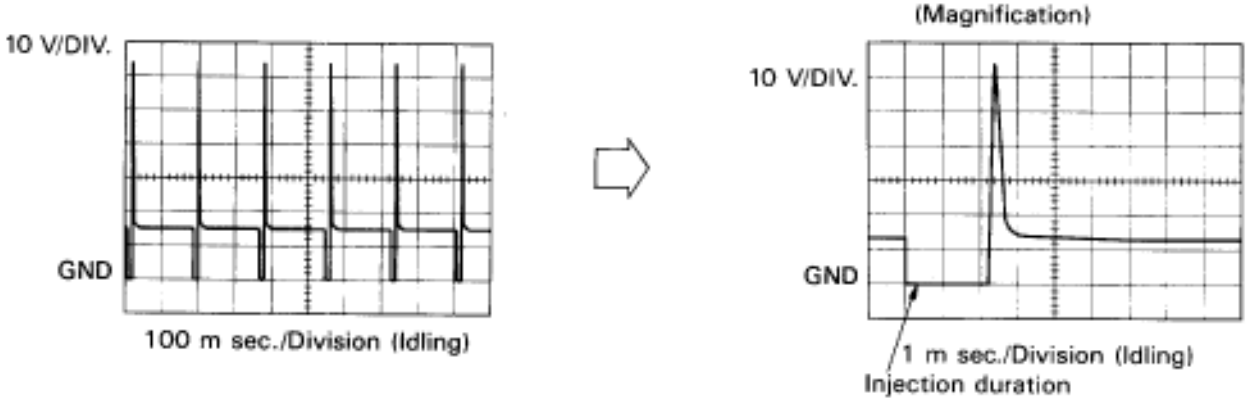
The injectors are provided to the intake manifold. They inject fuel into the cylinders based on the signals from the ECM.

Reference INSPECTION USING OSCILLOSCOPE

INJECTOR SIGNAL WAVEFORM

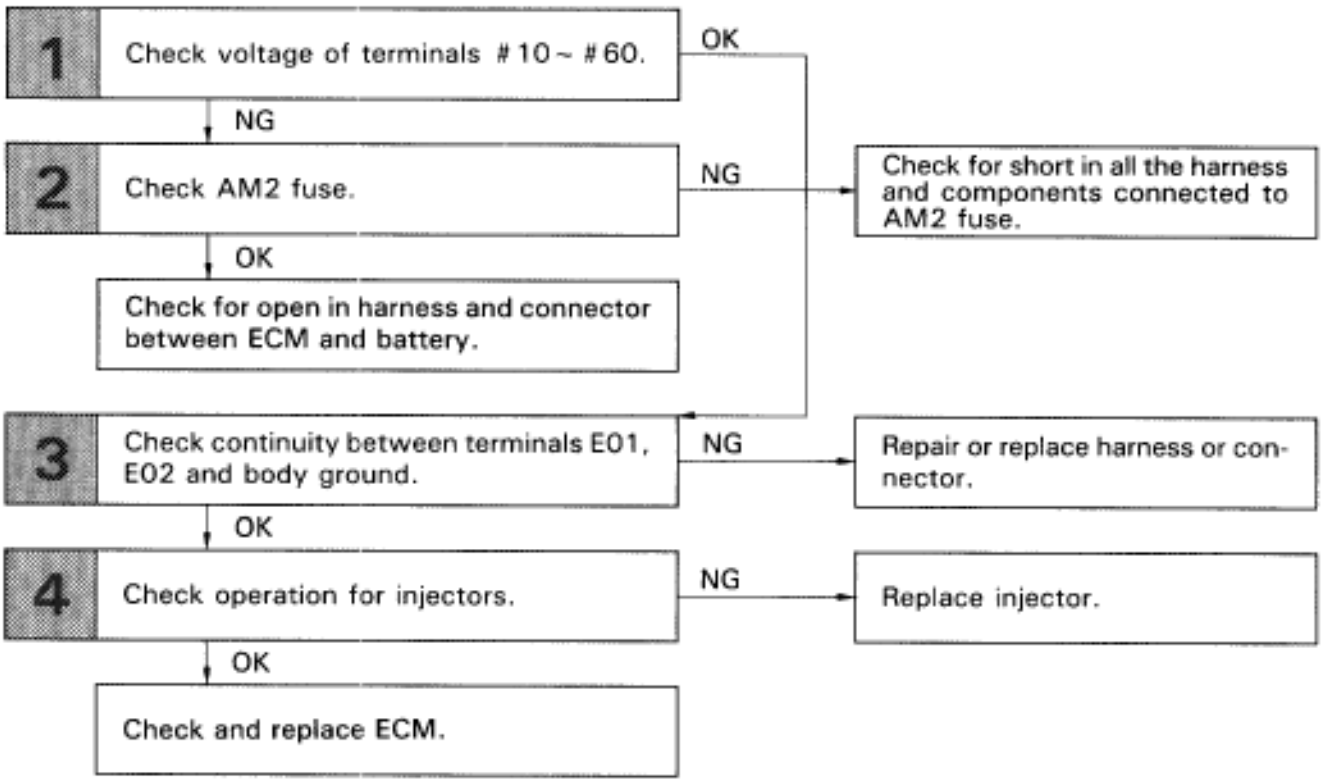
3 With the engine idling measure between terminals # 10 ~ # 60 and E01 of ECM.

HINT: The correct waveform appears as shown in the illustration on the below.

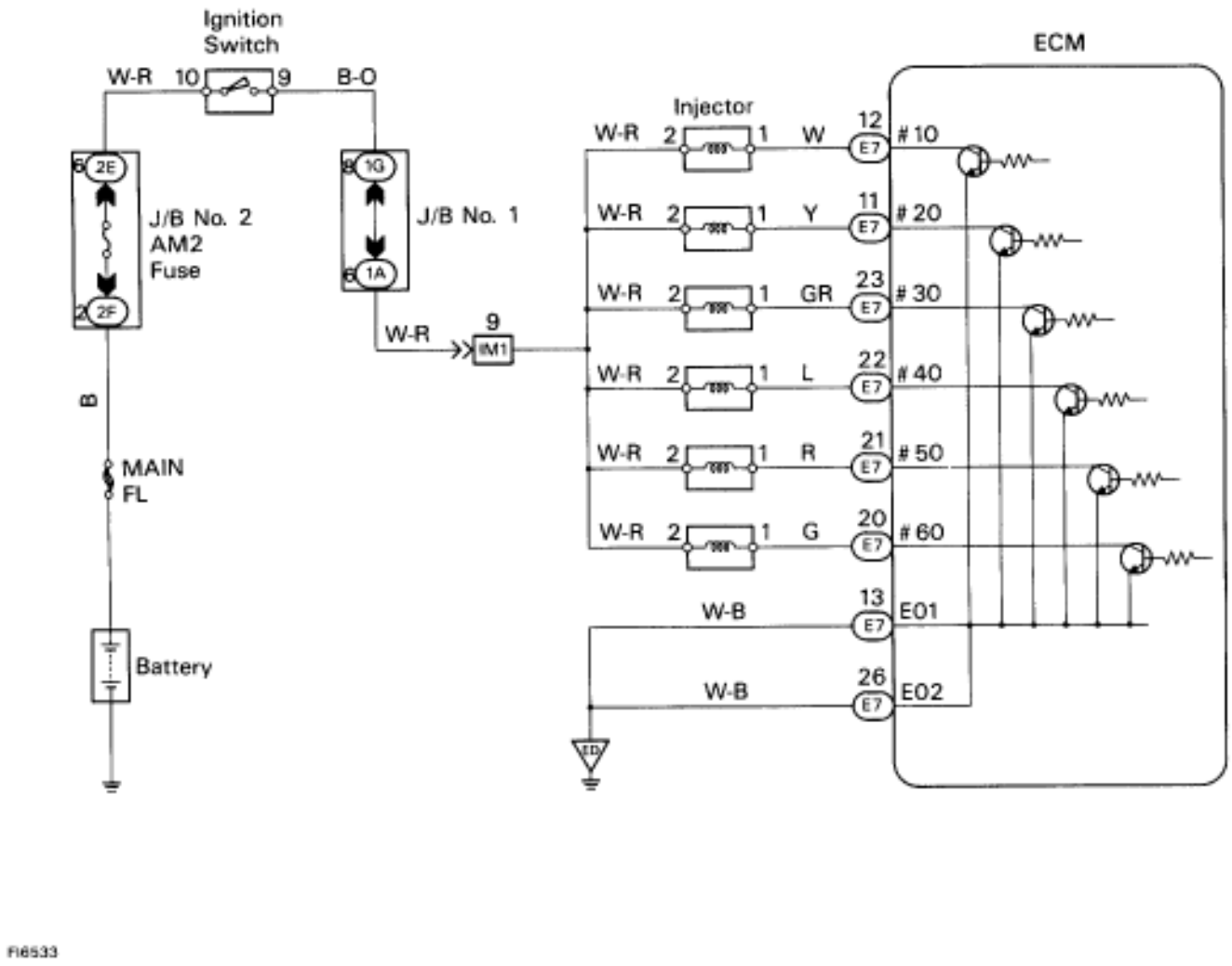


FI6588 FI6538

— DIAGNOSTIC CHART

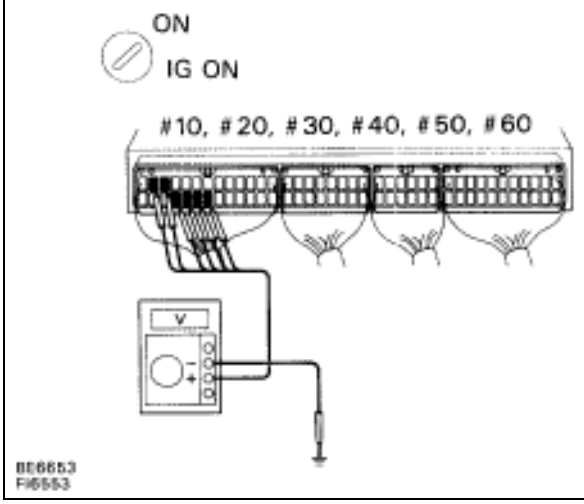


WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check voltage between terminals #10 ∼ 60 of ECM and body ground.**



P 1. Remove glove compartment. (See page BO–111).
2. Turn ignition switch on.

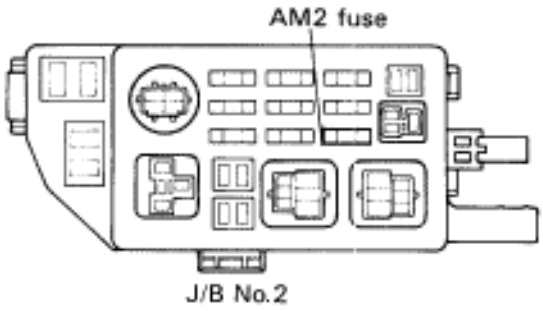
C Measure voltage between terminals #10 ∼ 60 of ECM and body ground.

OK **Voltage: 10 – 14 V**

NG

OK → **Go to step** 1

2 **Check AM2 fuse.**



P Remove AM2 fuse from J/B No. 2.

C Check continuity of AM2 fuse.

OK **Continuity**

OK

NG → **Check for short in all the harness and components connected to AM2 fuse.**

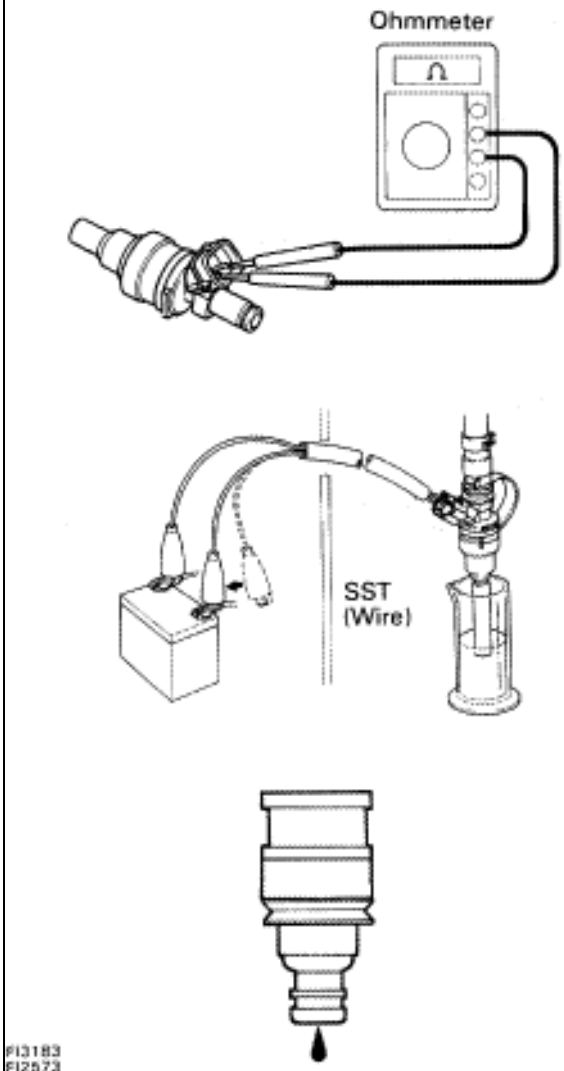
Check for open in harness and connector between ECM and battery.

3	Check for open in harness and connector between terminal E01, E02 of ECM connector and body ground (See page IN–27).

OK

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

4	Check injectors.



P Disconnect injector connector (See page EG–187).

C Measure resistance of injector.

OK **Resistance: 13.4 – 14.2 Ω at 20°C (68°F)**

C Check injection volume of injector (See page EG–191).

OK ③ **Injection volume**
58 – 68 cc/15 sec. (3.5 – 4.1 cu in.)
Difference between each injector:
Less than 5 cc (0.3 cu in.)

③ **Leakage**
Fuel drop: One drop or less per minute

OK

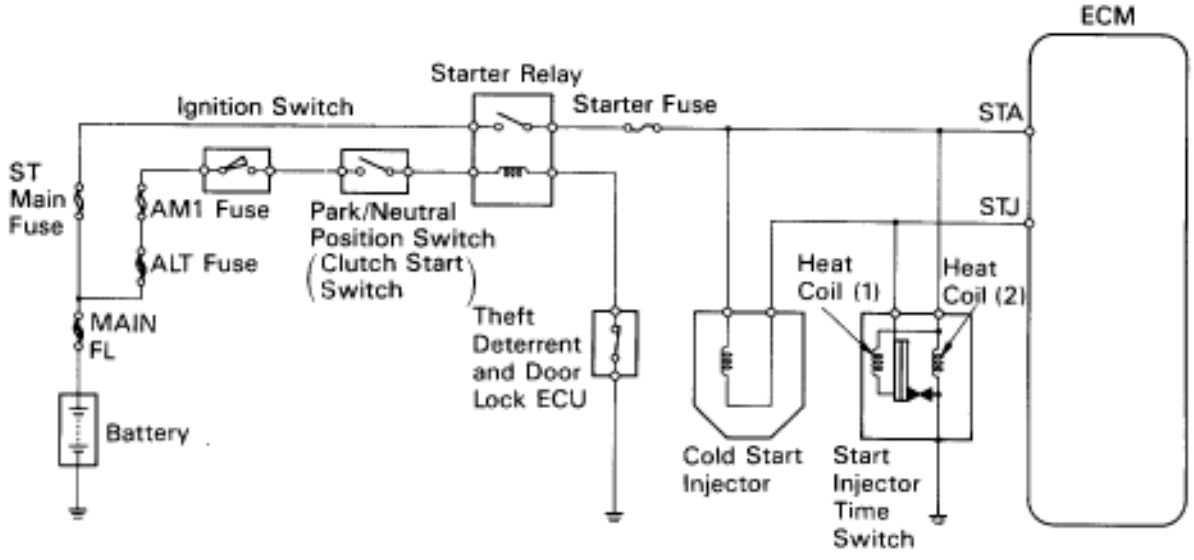
NG **Replace injector.**

Check and replace ECM.

Cold Start Injector Circuit

— CIRCUIT DESCRIPTION

The cold start injector is used to maintain the engine startability when it is cold. The injection volume, i,e, the length of time the injector is energized, is controlled by the ECM and the cold start injector time switch.
During a cold start, when the starter turns the contacts in the cold start injector time switch close. Thus current flows to the cold start injector coil, injecting fuel. At the same time, a bimetal in the heat coil is energized and heats up. This soon causes the contacts to open, cutting off the current flow to the injector coil and stopping fuel injection.
The injection duration of the cold start injector is determined by the engine coolant temperature and the length of time current flows to the heat coil. When the engine is warm, the contacts are opened by the bimetal and the cold start injector does not operate.
When the engine is hard to start and the starter is operated continuously, heat coil (2) heats up the bimetal keeping the contacts open to prevent spark plugs from becoming fouled, which is caused by the cold start injector operation when the open contacts close again.
When the engine is started at engine coolant temperature of 22°C (72°F) or lower, the cold start injector operation time is controlled by the cold start injector time switch.
When the engine coolant temperature is in the normal temperature range 22°C (72°F) or higher, the contacts of the cold start injector time switch are open and the time switch is off, instead, the ECM controls the operating time of the cold start injector.
In this way, the CO and HC levels can be reduced while the engine is being started and the engine startability is maintained. Control by the ECM ends when the engine coolant temperature reaches 60°C (140°F).



FI6576

DIAGNOSTIC CHART

1 Check voltage of cold start injector power source.
- OK → 3
- NG → 2

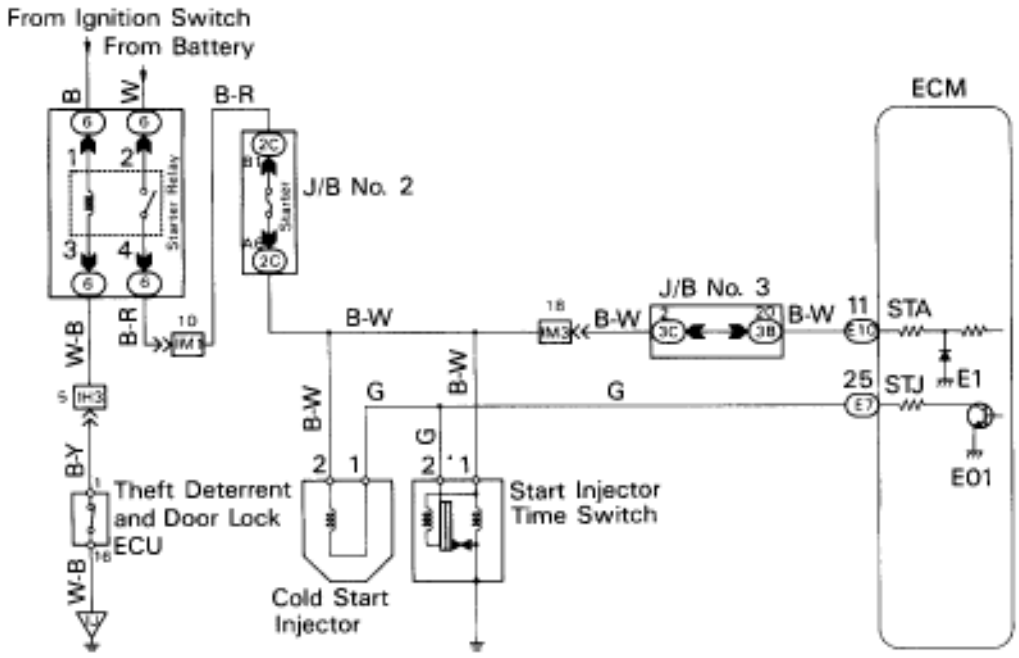
2 Check cold start injector.
- NG → Replace cold start injector.
- OK → Check for open in harness and connector between battery and ECM.

3 Check start injector time switch.
- NG → Replace start injector time switch.
- OK → 4

4 Check for open and short in harness and connector between cold start injector and start injector time switch.
- NG → Repair or replace harness or connector.
- OK → 5

5 Check fuel injection of cold start injector.
- NG → Replace cold start injector.
- OK → Proceed to next circuit inspection shown on matrix chart (See page EG–344).

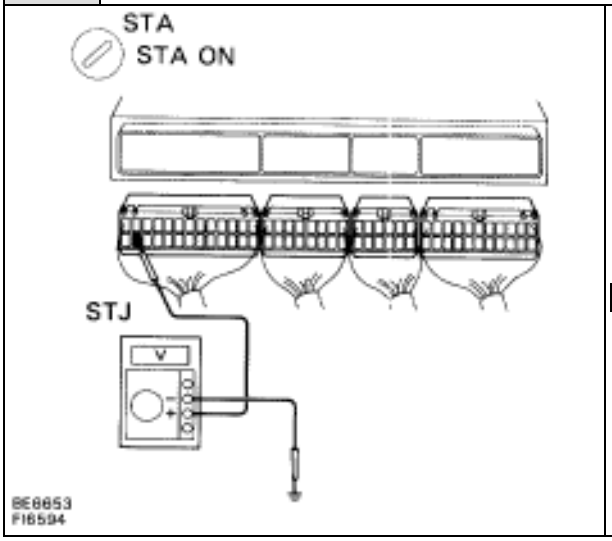
WIRING



FI6577

INSPECTION PROCEDURE

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



P
1. Remove glove compartment. (See page BO–111).
2. Disconnect start injector time switch connector.
3. Disconnect ECM connector.

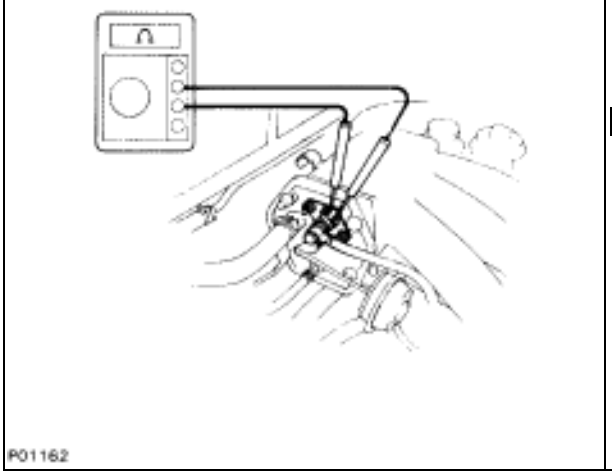
C Measure voltage between terminal STJ of ECM connector and body ground when ignition switch is turned to STA.

OK **Voltage: 10 – 14 V**

NG

OK → **Go to step 1**

2 **Check resistance of cold start injector.**



P Disconnect cold start injector connector.

C Measure resistance between terminals of cold start injector.

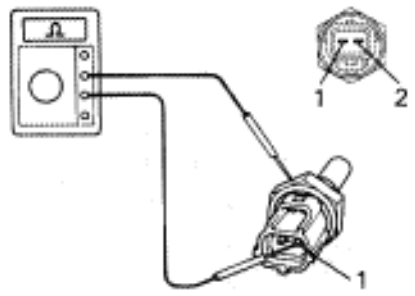
OK **Resistance: 2 – 4 Ω at 20°C (68°F)**

OK

NG → **Replace cold start injector.**

Check and repair harness and connector between ECM and cold start injector, cold start injector and battery.

3 **Check start injector time switch.**



R04175

P Remove start injector time switch (See page EG–219).

C Measure resistance between terminals shown below.

OK

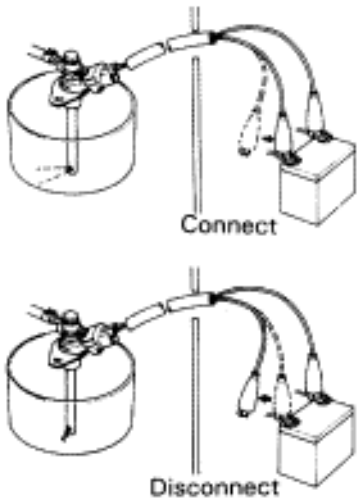
Terminals	Resistance	Engine coolant temperature
1 – 2	25 – 45 Ω	below 15°C (59°F)
	65 – 85 Ω	above 30°C (86°F)
1-Ground	25 – 85 Ω	–

OK → **NG** → **Replace start injector time switch.**

4 **Check for open and short in harness and connector between cold start injector and start injector time switch (See page IN–27).**

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

5 **Check fuel injection of cold start injector.**



P00632
P00631

P Remove cold start injector (See page EG–179),

C
1. Check fuel injection of cold start injector (See page EG–181).
2. Check fuel leakage of cold start injector (See page EG–182).

OK
1. **Fuel is injected normally.**
2. **Fuel leakage is less than one drop per minute.**

Notice: Perform this check within the shortest possible time.

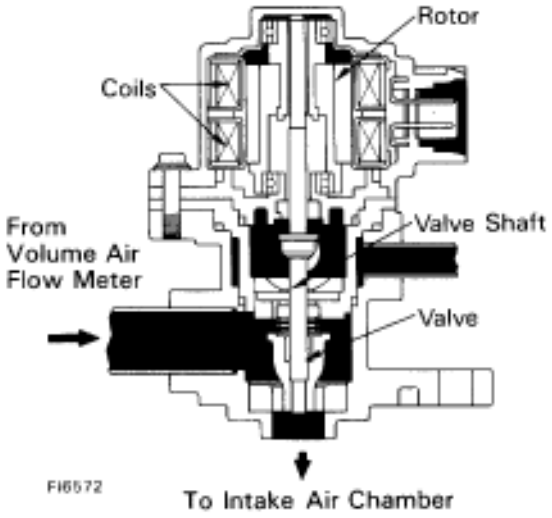
OK → **NG** → **Repair or replace cold start injector,**

Proceed to next circuit inspection shown on matrix chart (See page EG–344).

IAC Valve Circuit

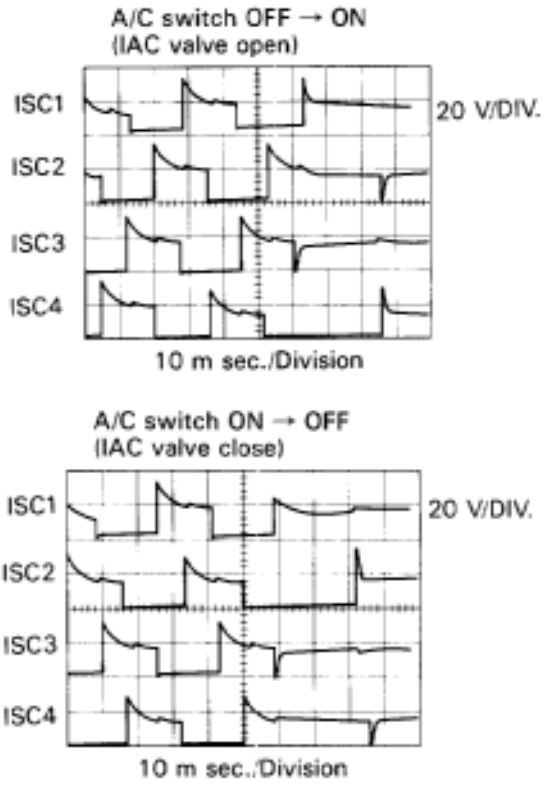
— CIRCUIT DESCRIPTION

The IAC valve is provided on the intake air chamber and intake air bypassing the throttle valve is directed to the IAC valve through a hose.
A step motor is built into the IAC valve. It consists of four coils, the magnetic rotor, valve shaft and valve.When current flows to the coils due to signals from the ECM, the rotor turns and moves the valve shaft forward or backward, changing the clearance between the valve and the valve seat.
In this way the intake air volume bypassing the throttle valve is regulated, controlling the engine speed.There are 125 possible positions to which the valve can be opened.



Reference: INSPECTION USING OSCILLOSCOPE

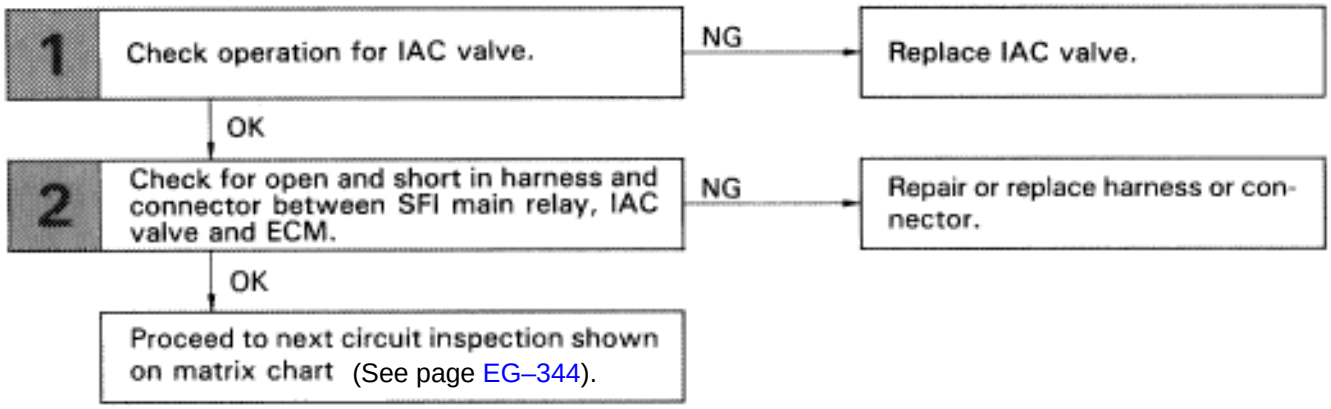
IAC SIGNAL WAVEFORM



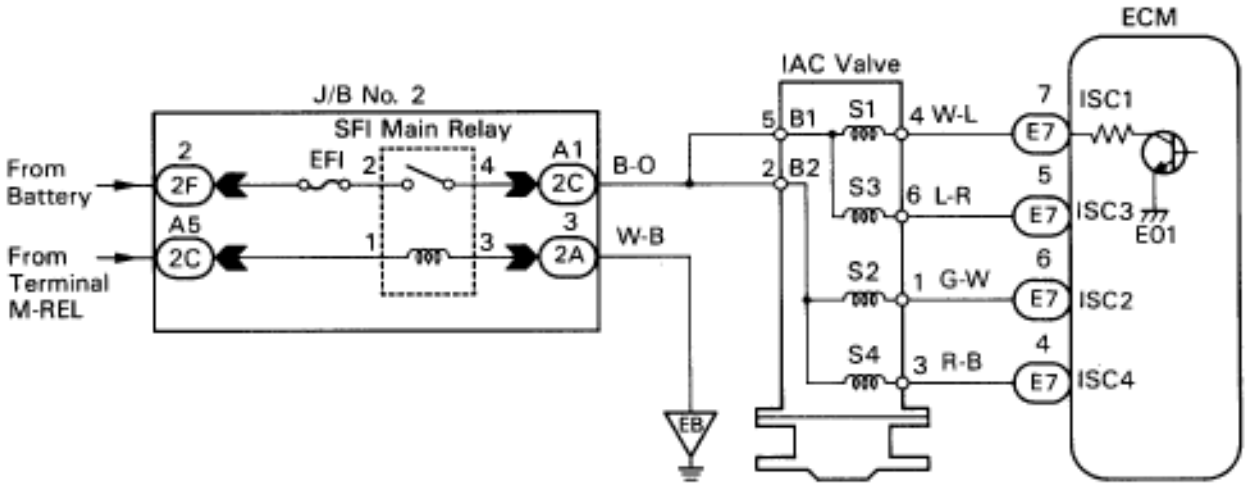
1 With the engine idling measure between terminals ISC1, ISC2, ISC3, ISC4 abd E01 of ECM when A/C switch ON or OFF.

HINT:
The correct waveform appears as shown in the illustration on the left.

DIAGNOSTIC CHART

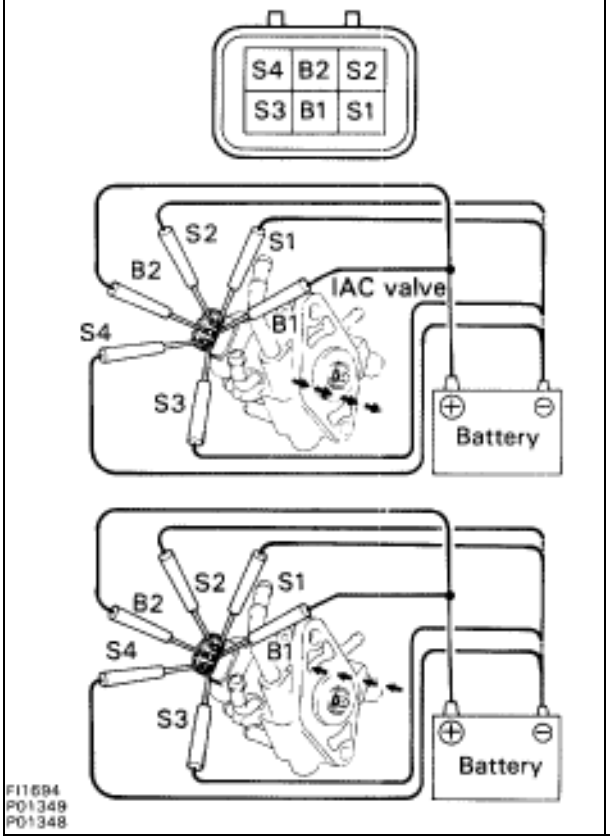


WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Check IAC valve.**



P Disconnect IAC valve connector.

C Measure resistance between terminals shown below.

OK

Terminal	Resistance
B1 – S1	10 Ω – 30 Ω
B1 – S3	10 Ω – 30 Ω
B2 – S2	10 Ω – 30 Ω
B2 – S4	10 Ω – 30 Ω

P Remove IAC valve.

C
1. Connect the battery positive lead to terminals B1 and B2, and the negative lead to terminals S1–S2–S3–S4 in that order.
2. Connect the battery positive lead to terminals B1 and B2, and the negative lead to terminals S4–S3–S2–S1 in that order.

OK
1. **The valve moves in the closing direction.**
2. **The valve moves in the opening direction.**

OK → **NG** → **Replace IAC valve.**

2 **Check for open and short in harness and connector between SFI main relay and IAC valve, IAC valve and ECM (See page IN–27).**

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

Proceed to next circuit inspection shown on matrix chart (See page EG–344).

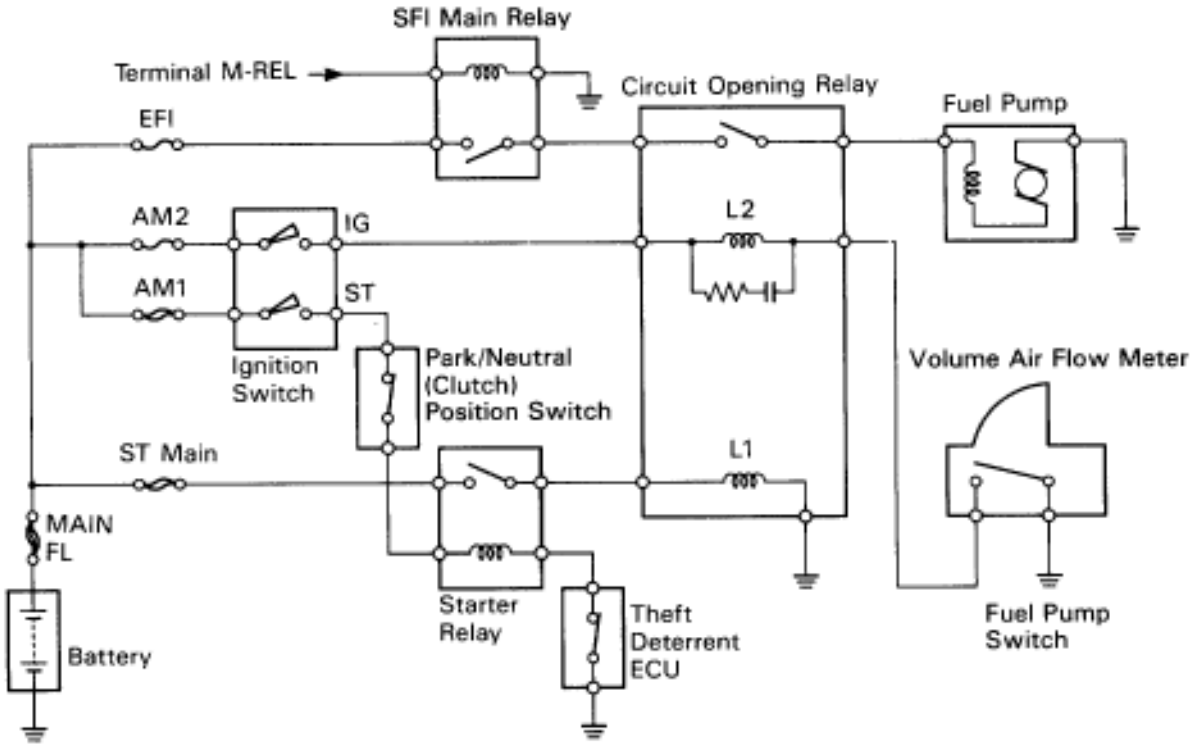
–MEMO–

Fuel System Circuit

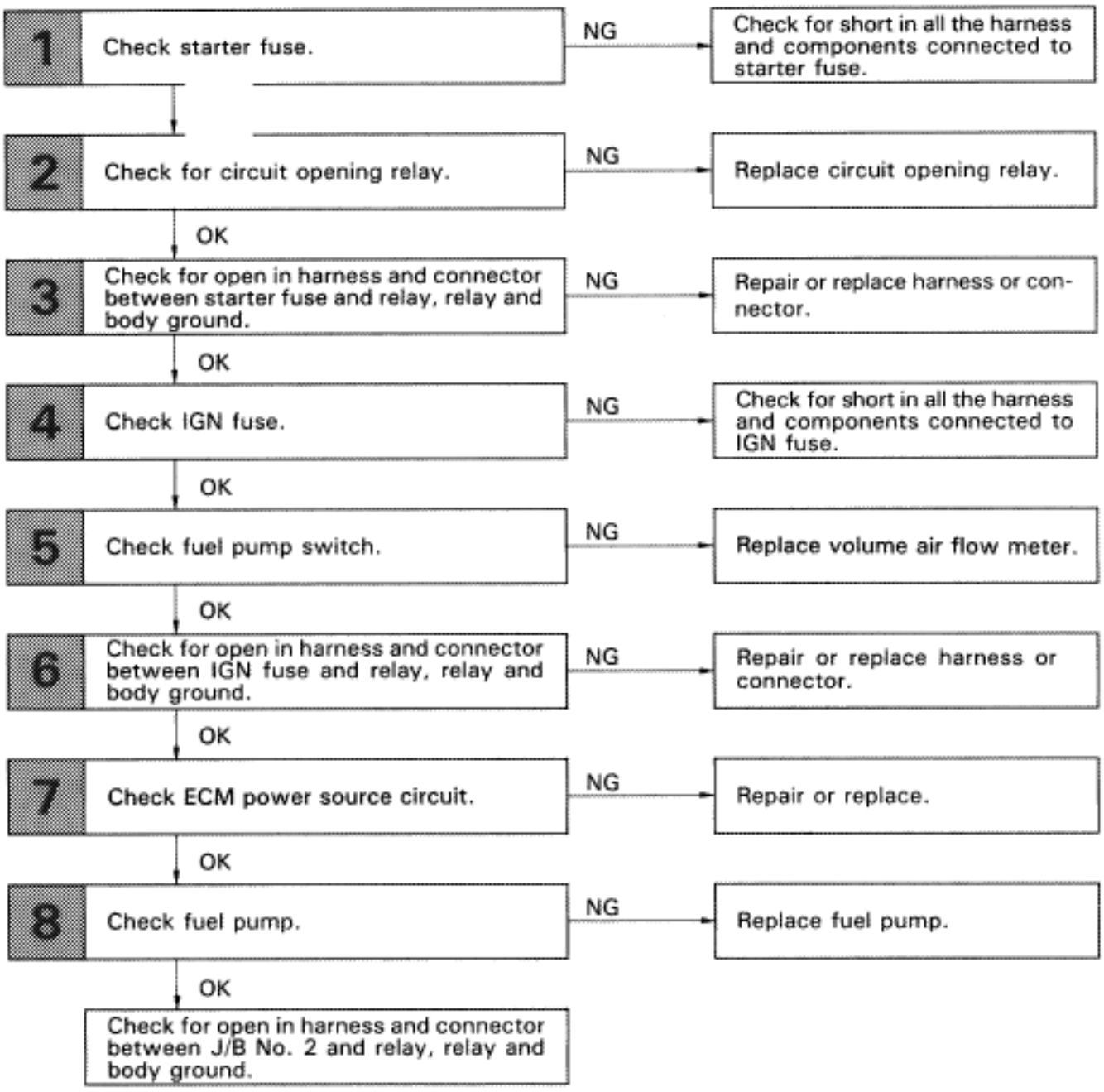
— CIRCUIT DESCRIPTION

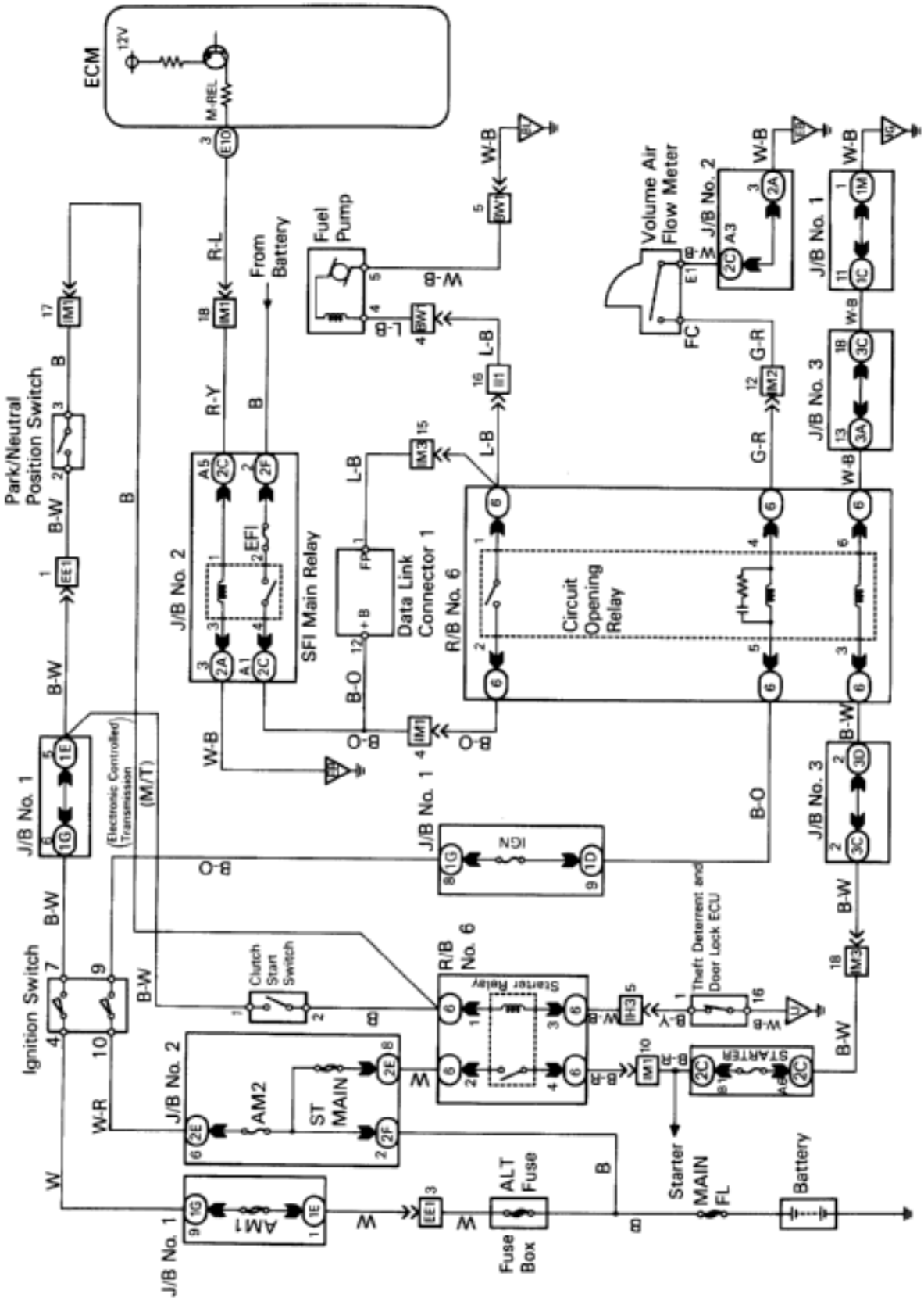
In the diagram below, when the engine is cranked, current flows from terminal ST of the ignition switch to the starter relay coil, the starter relay switches on and current flows to coil L1 of the circuit opening relay. Thus the circuit opening relay switches on, power is supplied to the fuel pump and the fuel pump operates. After the engine cranks, the cylinders beginning in air, causing the measuring plate inside the volume air flow meter to open. This turns on the fuel pump switch, which is connected to the measuring plate, and current flows to the L2 coil of the circuit opening relay.

After the engine starts and the ignition switch is turned from START back to ON, current flowing to the L1 coil of the circuit opening relay is cut off. However current continues to flow to the L2 coil even after the engine starts due to the fuel pump switch inside the volume air flow meter. As a result, the circuit opening relay stays on, allowing the fuel pump to continue operating.



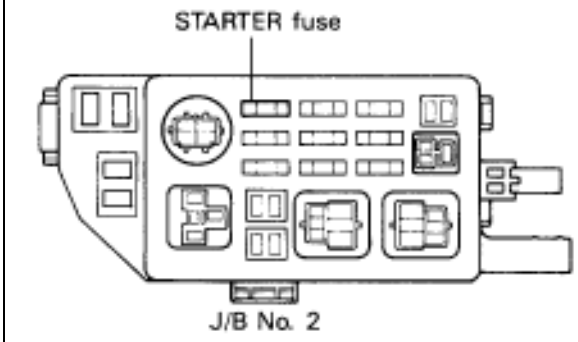
DIAGNOSTIC CHART




ECM
12V
M-REL
E10
R-L
From Battery
Fuel Pump
W-B
Volume Air Flow Meter
J/B No. 2
J/B No. 1
J/B No. 3
Park/Neutral Position Switch
R-Y
B
B-W
L-B
G-R
W-B
B-O
J/B No. 2
EFI
SFI Main Relay
Data Link Connector 1
R/B No. 6
Circuit Opening Relay
J/B No. 1
(Electronic Controlled Transmission (M/T))
IGN
Ignition Switch
Clutch Start Switch
R/B No. 6
Starter Relay
Theft Deterrent and Door Lock ECU
J/B No. 2
AM2
ST
MAIN
STARTER
Starter MAIN FL
Battery
J/B No. 1
AM1
ALT Fuse
Fuse Box

INSPECTION PROCEDURE

1 Check STARTER fuse.



P Remove STARTER fuse from J/B No. 2.

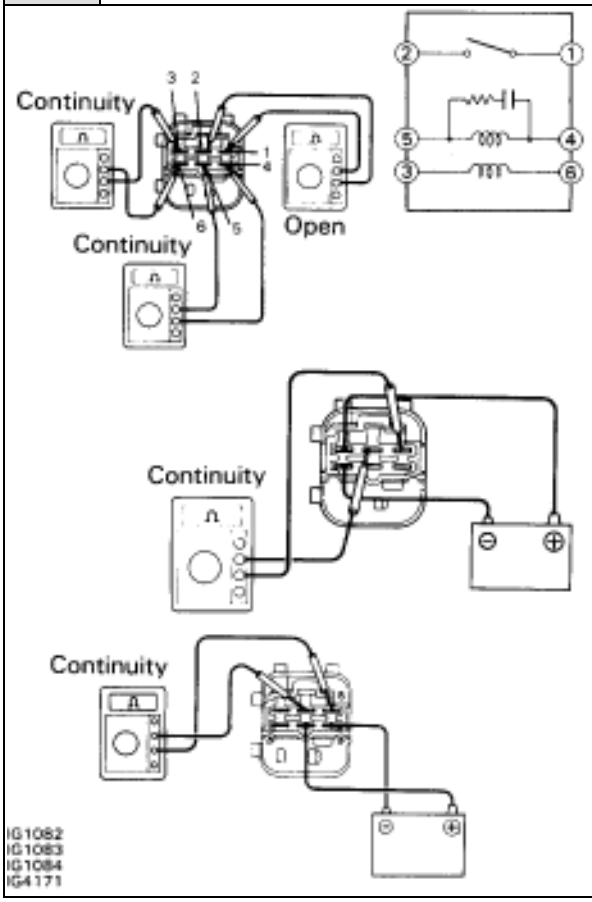
C Check continuity of STARTER fuse.

OK **Continuity.**

OK → Go to Step 2

NG → **Check for short in all the harness and components connected to STARTER fuse.**

2 Check circuit opening relay.



P
1. Remove glove compartment (See page BO–111).
2. Remove circuit opening relay from R/B No. 6.

C Check continuity between terminals of circuit opening relay shown below.

OK

Terminals 1 and 2	Open
Terminals 3 and 6	Continuity (Reference value 30 Ω)
Terminals 4 and 5	Continuity (Reference value 150 Ω)

C
1. Apply battery voltage between terminals 3 and 6, 4 and 5.
2. Check continuity between terminals 1 and 2.

OK

Terminals 1 and 2	Continuity

OK → Go to Step 3

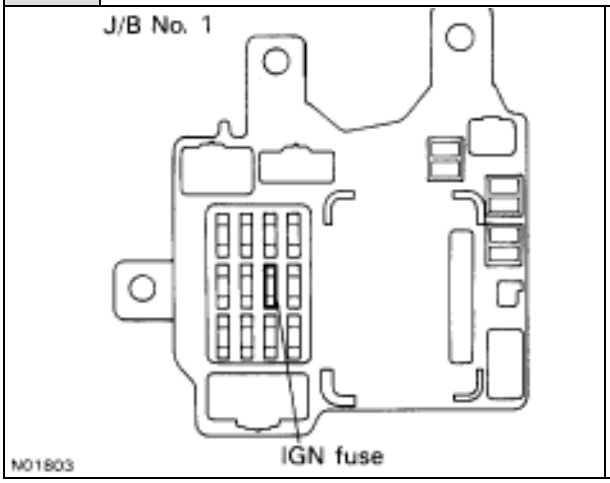
NG → **Replace circuit opening relay.**

3	Check for open in harness and connector between STARTER fuse and circuit opening relay, relay and body ground (See page IN–27).

OK

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

4	Check IGN fuse.



P Remove IGN fuse from J/B No. 1.

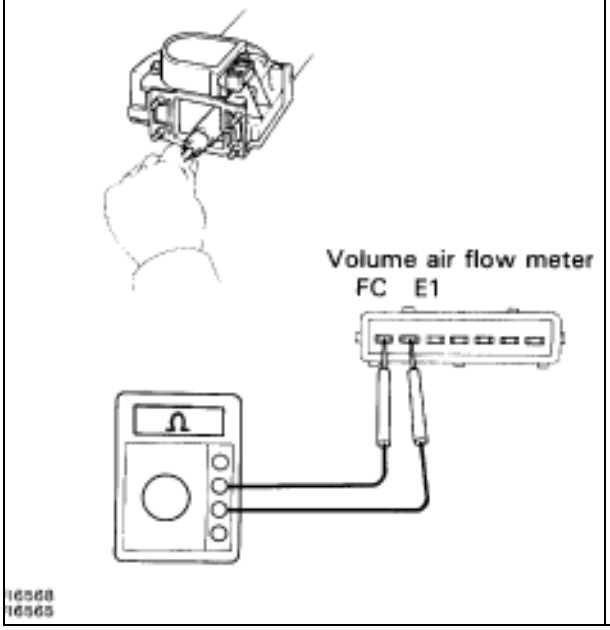
C Check continuity of IGN fuse.

OK **Continuity.**

OK

NG **Check for short in all the harness and components connected to IGN fuse.**

5	Check fuel pump switch (inside the volume air flow meter).



P
1. Remove air cleaner cap.
2. Disconnect volume air flow meter connector.

C Measure resistance between terminals FC and E1 of volume air flow meter connector when measuring plate is open and close with a screwdriver.

OK

Measuring plate	Resistance
Open	Continuity
Closed	1 MΩ or higher

OK

NG **Replace volume air flow meter.**

6	Check for open in harness and connector between IGN fuse and circuit opening relay, relay and body ground (See page IN–27).

OK

NG → Repair or replace harness or connector.

7	Check ECM power source circuit (See page EG–420).

OK

NG → Repair or replace.

8	Check fuel pump (See page EG–170).

OK

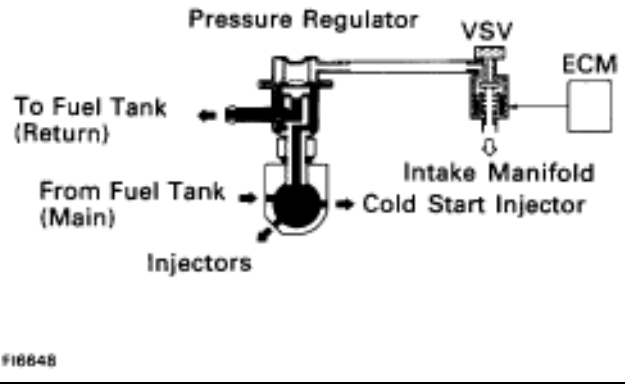
NG → Replace fuel pump.

Check for open in harness and connector between J/B No. 2 and circuit opening relay, relay and body ground (See page IN–27).

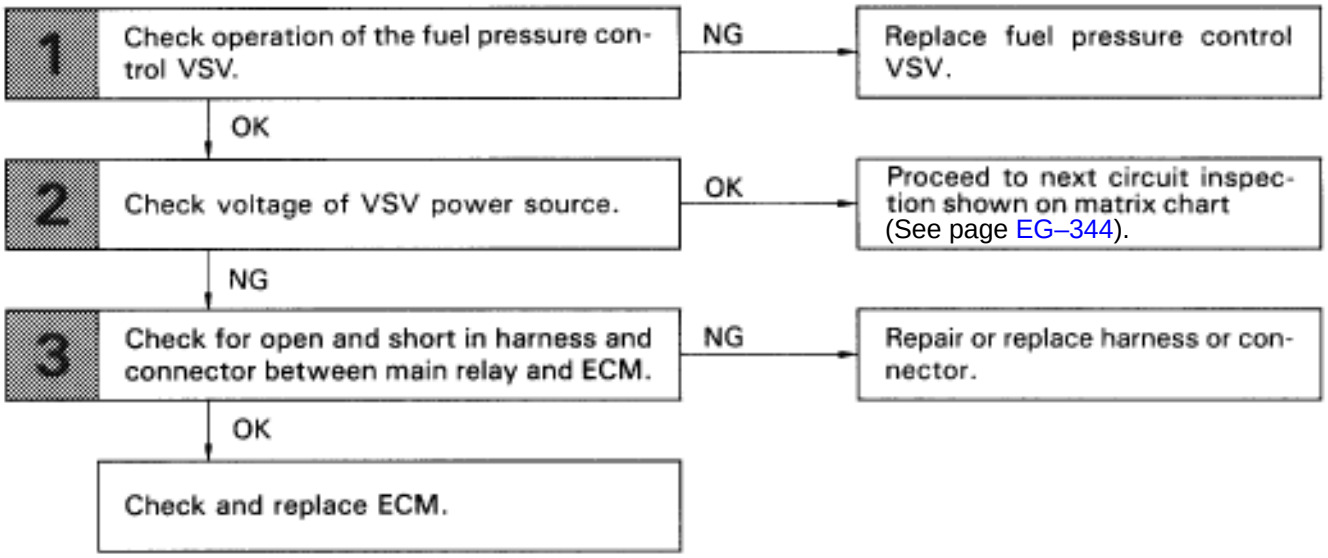
Fuel Pressure Control VSV Circuit

CIRCUIT DESCRIPTION

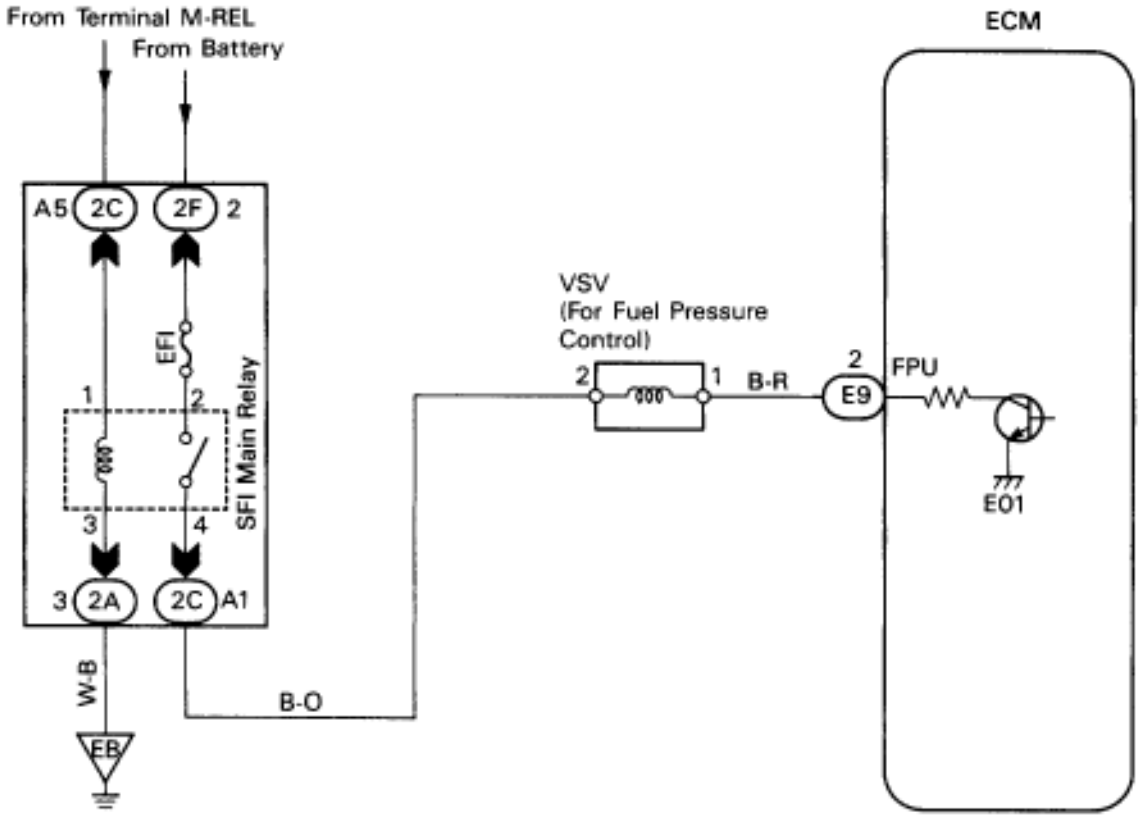
The ECM turns on a VSV (Vacuum Switching valve) to draw the air into the diaphragm chamber of the pressure regulator if it detects that the temperature of the engine coolant is too high during engine starting.
The air drawn into the chamber increases the fuel pressure to prevent fuel vapor lock at high engine temperature in order to help the engine start when it is warm.
Fuel pressure control ends approx. 120 sec. after the engine is started.



DIAGNOSTIC CHART



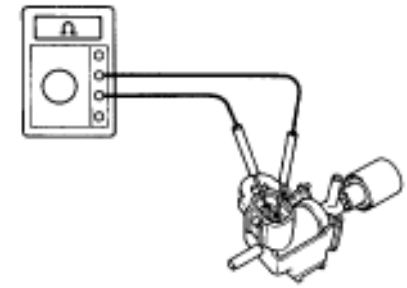
WIRING DIAGRAM

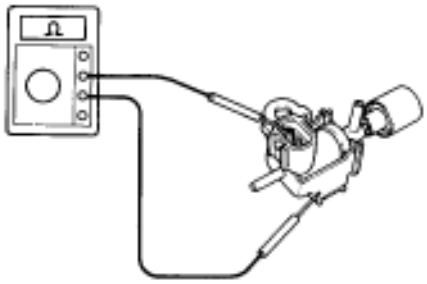


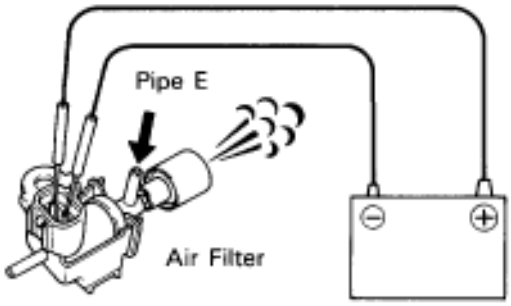
FI6535

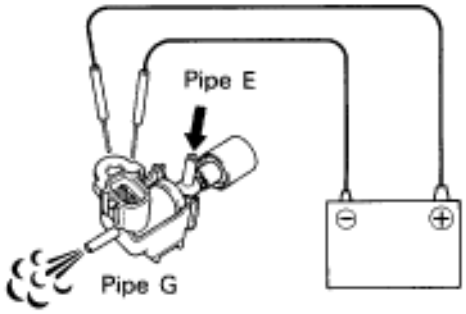
INSPECTION PROCEDURE

1 **Check fuel pressure control VSV.**









FI4181
FI4182
FI4183
FI4184

P
1. Remove fuel pressure control VSV.
2. Disconnect fuel pressure control VSV connector.

C
1. Measure resistance between terminals.
2. Measure resistance between each terminal and the body.

OK
1. **Resistance: 30 – 50 Ω at 20°C (68°F)**
2. **Resistance: 1 MΩ or higher**

C Check operation of fuel pressure control VSV when battery voltage is applied to the terminals of fuel pressure control VSV connector or not.

OK **Battery voltage is applied:**
The air from pipe E is flowing out through the air filter.

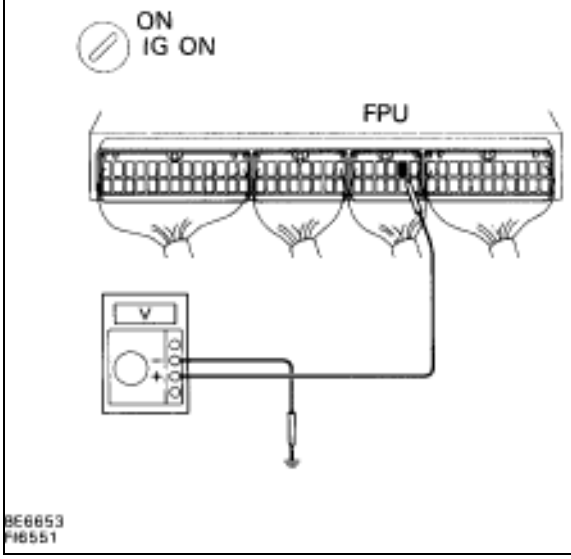
Battery voltage is not applied:
The air from pipe E is flowing out through pipe C.

OK

NG **Replace fuel pressure control VSV.**

Go to step 1

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



P
1. Remove glove compartment. (See page BO–111).
2. Turn ignition switch on.

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

OK **Voltage: 10 – 14 V**

NG

OK **Proceed to next circuit inspection shown on matrix chart (See page EG–344).**

3	Check for open and short in harness and connector between ECM and VSV, VSV and SFI main relay (See page IN–27).

OK

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

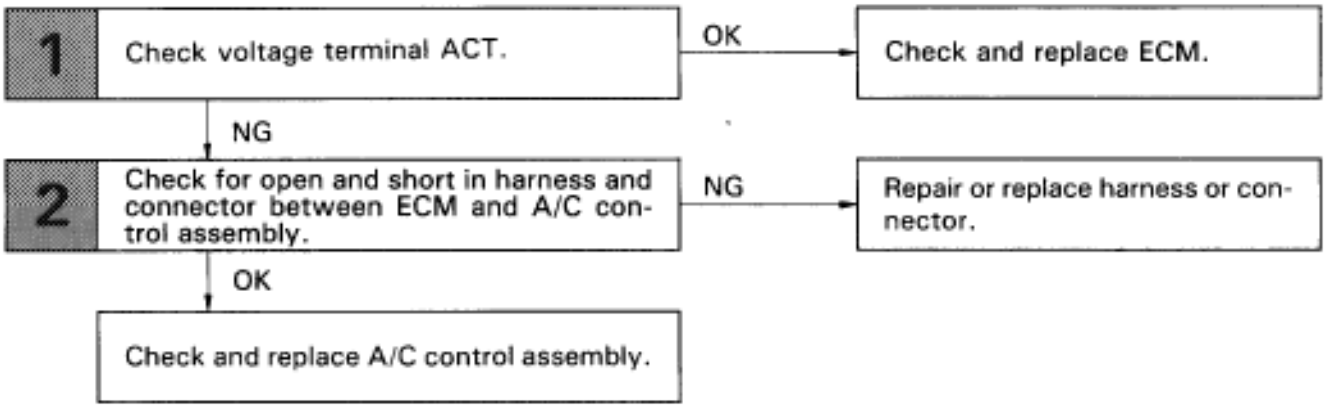
Check and replace ECM.

Air Conditioning Cut Control Circuit

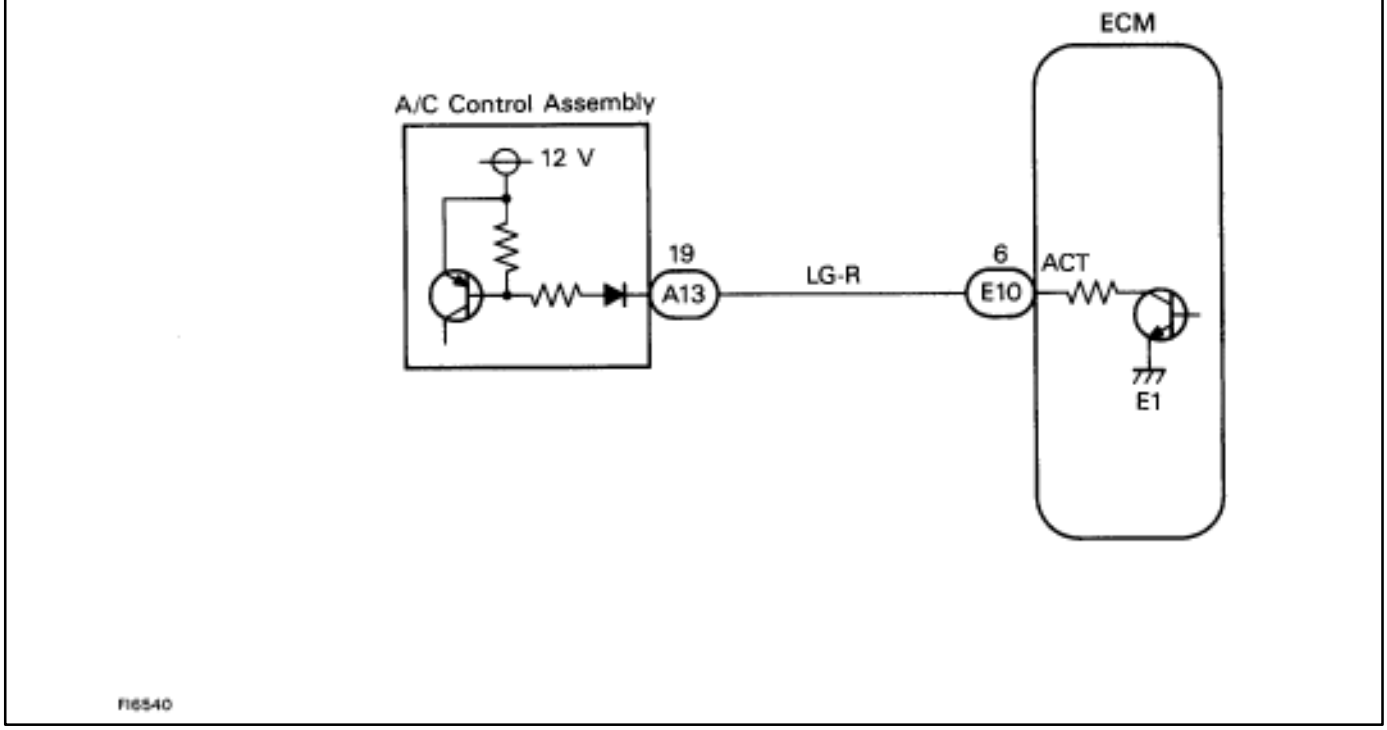
CIRCUIT DESCRIPTION

This circuit cuts air conditioning operation during vehicle acceleration in order to increase acceleration performance. During acceleration with the vehicle speed at 25 km/h (16 mph) or less, engine speed at 1,600 rpm or less and throttle valve opening angle at 60° or more, the A/C magnet switch is turned OFF for several seconds.

DIAGNOSTIC CHART

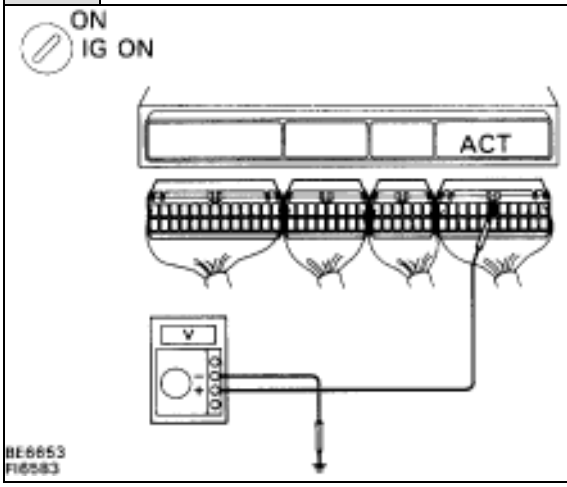


WIRING DIAGRAM



INSPECTION PROCEDURE

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



P
1. Remove glove compartment. (See page BO–111).
2. Disconnect ECM connector.
3. Turn ignition switch ON.

C Measure voltage between terminal ACT of ECM and body ground when A/C switch is turned to ON.

OK **Voltage: 10 – 14 V**

NG

OK **Check and replace ECM.**

2 **Check for open and short in harness and connector between ECM and A/C control assembly.**

OK

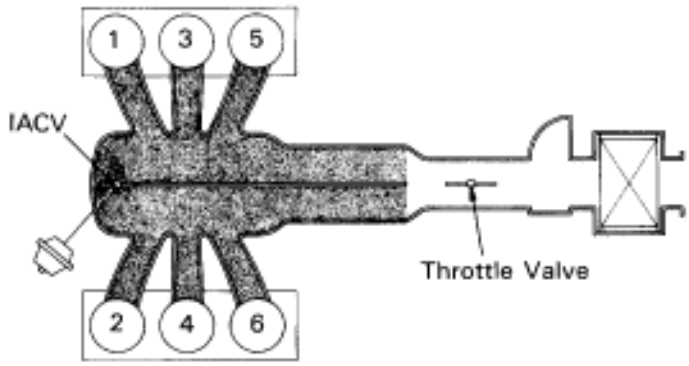
NG **Repair or replace harness or connector.**

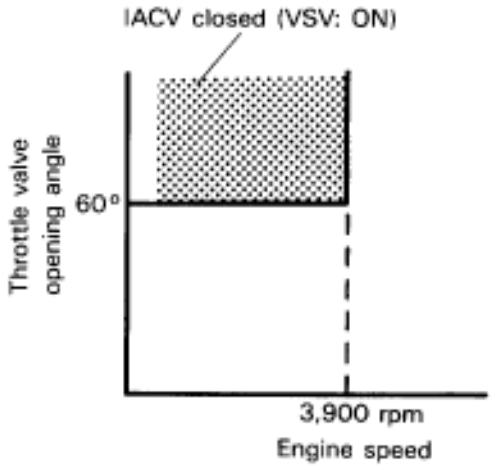
Check and replace A/C control assembly.

IACV Control VSV Circuit

CIRCUIT DESCRIPTION

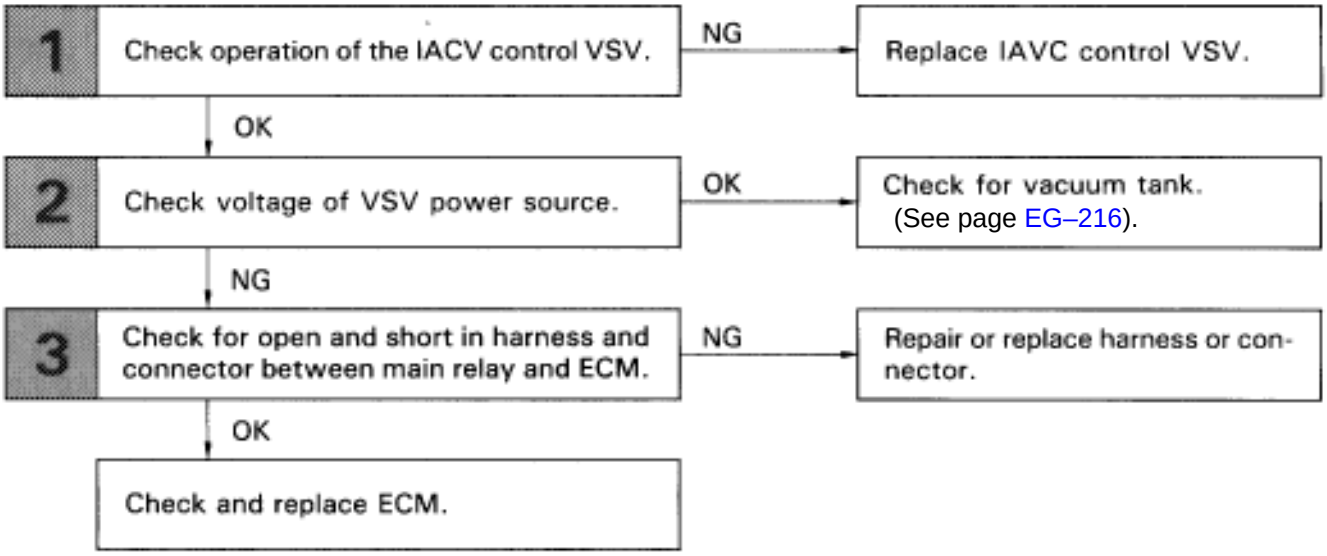
This circuit opens and closes the IACV (Intake Air Control Valve) in response to the engine load in order to increase the intake efficiency (ACIS: Acoustic Control Induction System).
When the engine speed is 3,900 rpm or less and the throttle valve opening angle is 60° or more, the ECM turns the VSV ON and closes the IACV. At all other times, the VSV is OFF, so the IACV is open.



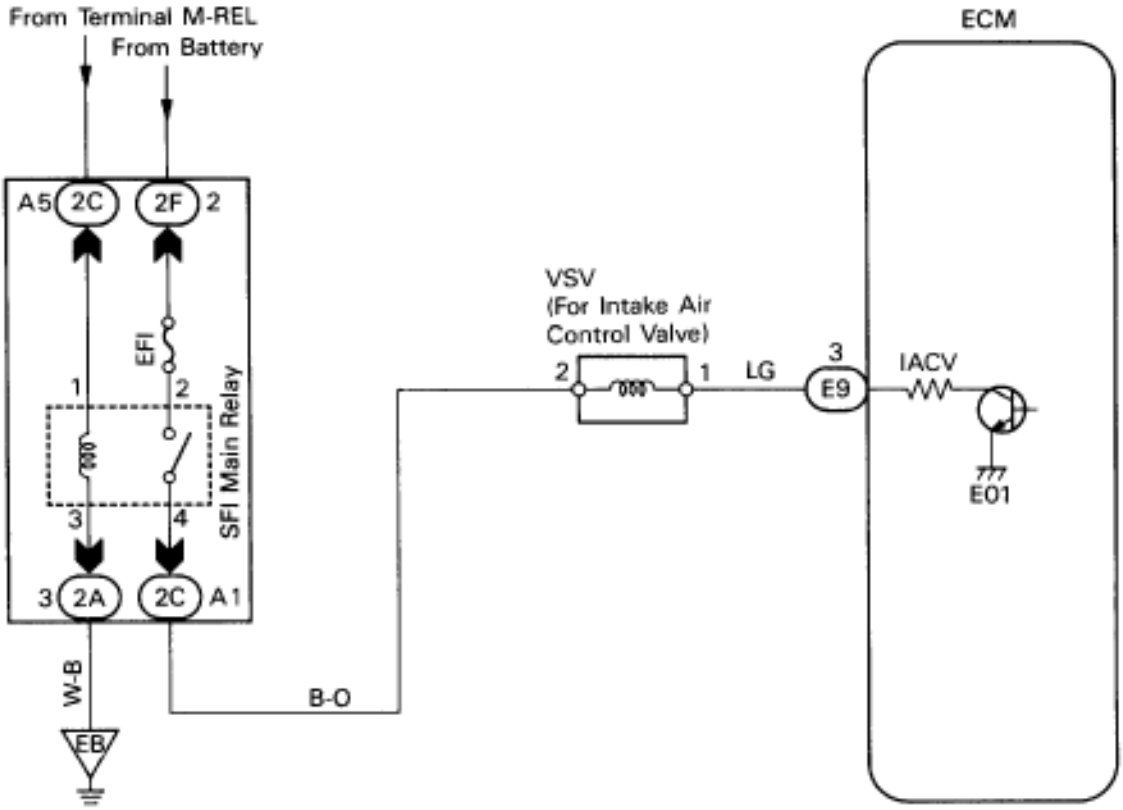


FI6569 FI6570

DIAGNOSTIC CHART

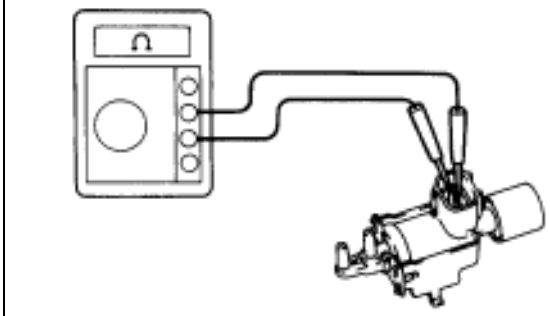


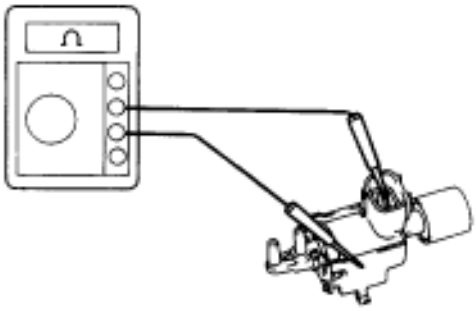
WIRING DIAGRAM

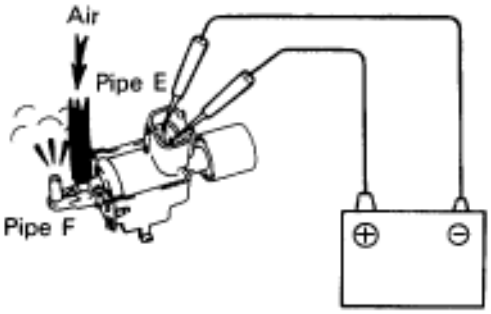


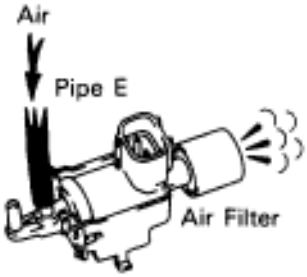
INSPECTION PROCEDURE

1 **Check IACV control VSV.**









FI6350
FI6349
FI6392
FI6393

P
1. Remove IACV control VSV.
2. Disconnect IACV control VSV connector.

C
1. Measure resistance between terminals.
2. Measure resistance between each terminal and the body.

OK
1. **Resistance: 33 – 39 Ω at 20°C (68°F)**
2. **Resistance: 1 MΩ or higher**

C Check operation of IACV control VSV when battery voltage is applied to the terminals of IACV control VSV connector or not.

OK **Battery voltage is applied:**
The air from pipe E is flowing out through pipe F.

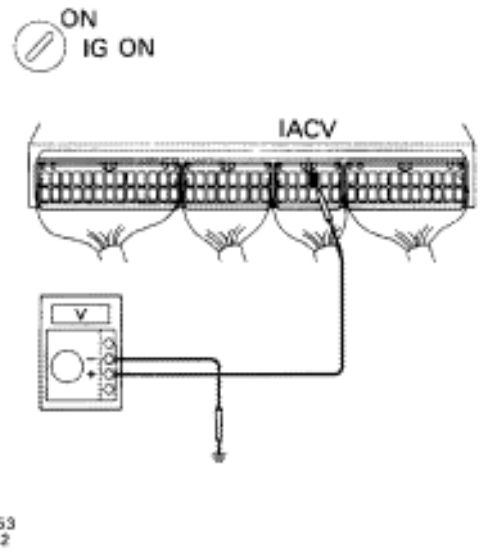
Battery voltage is not applied:
The air form pipe E is flowing out through the air filter.

OK

NG **Replace IACV control VSV.**

Go to step 1

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



P 1. Remove glove compartment. (See page BO–111).

C 2. Turn ignition switch on.

OK Measure voltage between terminals ISAAC of ECM connector and body ground.

Voltage: 10 – 14 V

Hint

NG

OK **Check for vacuum tank. (See page EG–216).**

3	Check for open and short in harness and connector between SFI main relay and ECM (See page IN–27).

OK

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

Check and replace ECM.

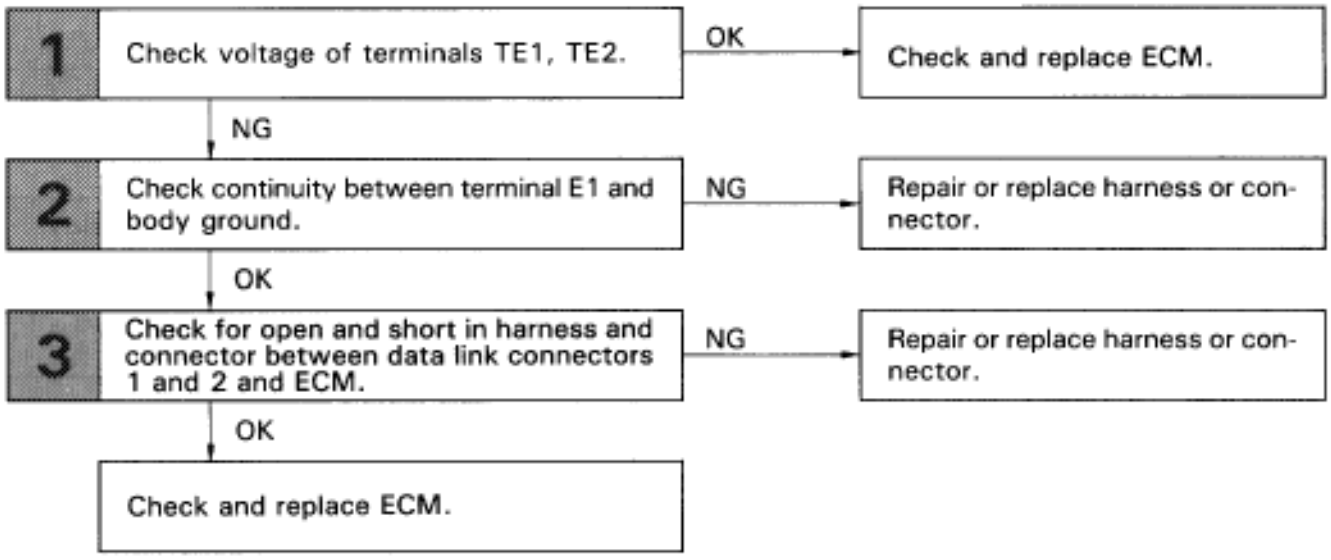
TE1, TE2 Terminal Circuit

CIRCUIT DESCRIPTION

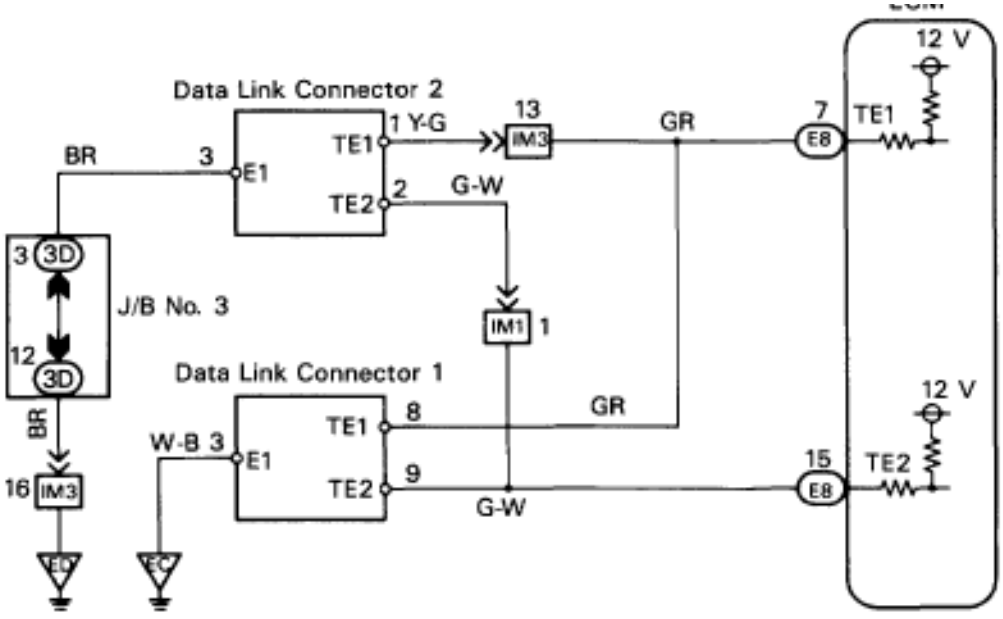
Terminals TE1 and TE2 are located in the data link connectors 1 and 2. The data link connector 1 located in the engine compartment and the data link connector 2 located in the cabin. When these terminals are connected with the E1 terminal, diagnostic trouble codes in normal mode or test mode can be read from the Malfunction Indicator Lamp on the combination meter.

DIAGNOSTIC CHART

HINT: If terminals TE1 and TE2 are connected with terminal E1, diagnostic trouble code is not output or test mode is not activated.
Even though terminal TE1 is not connected with terminal E1, the Malfunction Indicator Lamp blinks.
For the above phenomenon, the likely cause is an open or short in the wire harness, or malfunction inside the ECM.



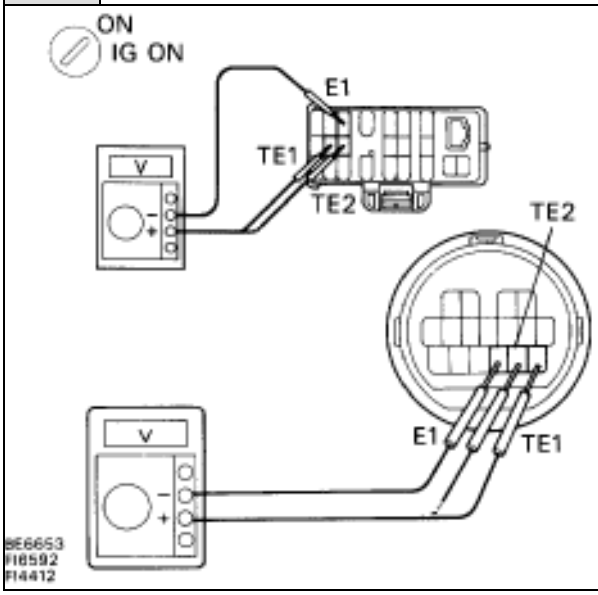
V



FI6609

INSPECTION PROCEDURE

1 **Check voltage between terminals TE1, TE2 and E1 of data link connectors 1 and 2.**



P Turn ignition switch on.

C Measure voltage between terminals TE1, TE2 and E1 of data link connectors 1 and 2.

OK **Voltage: 10 – 14 V**

NG

OK → **Check and replace ECM.**

2 **Check continuity between terminal E1 of data link connectors 1 and 2 and body ground.**

OK

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

3 **Check for open and short in harness and connector between ECM and data link connectors 1 and 2 (See page IN–27).**

OK

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

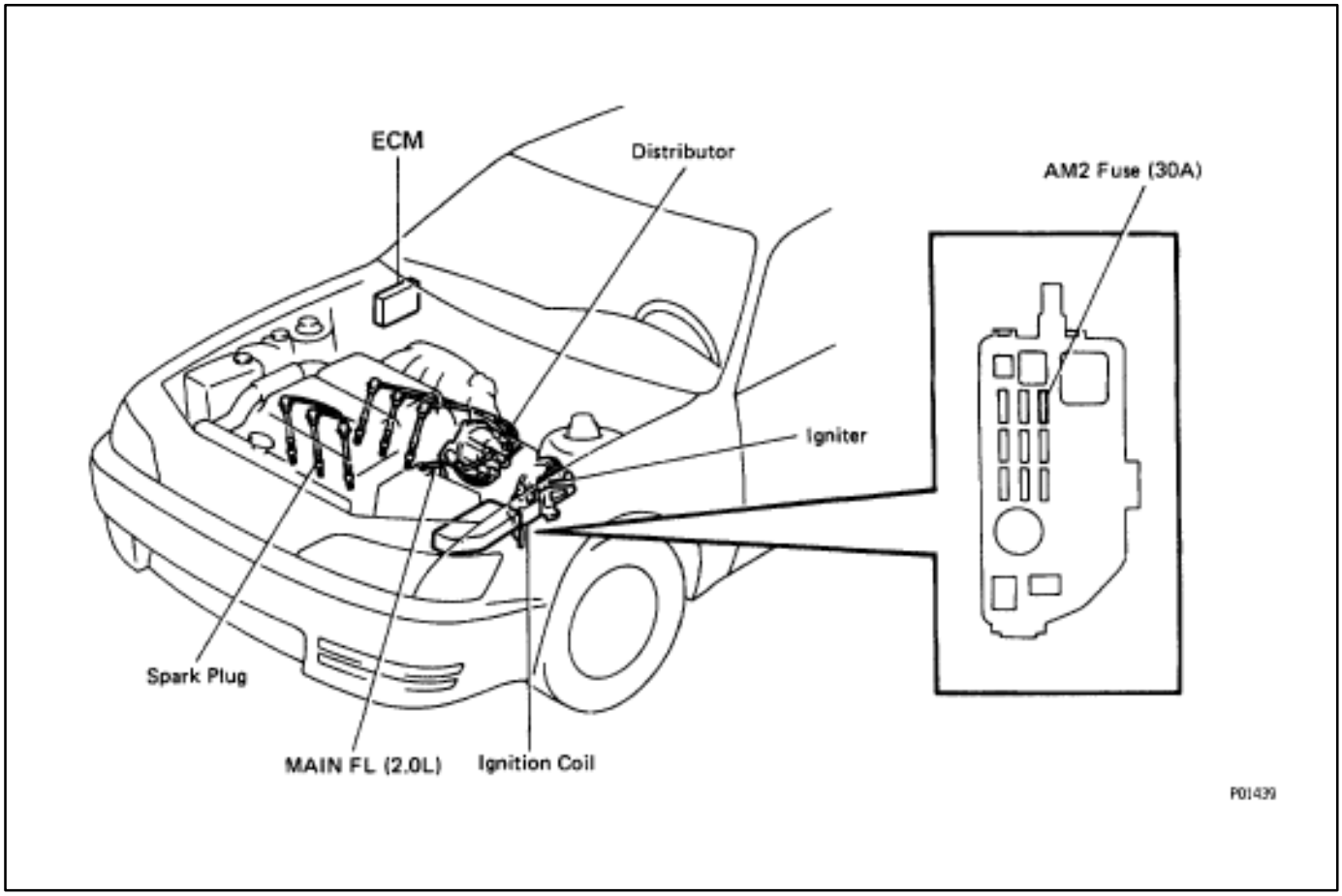
Check and replace ECM.

IGNITION SYSTEM

DESCRIPTION

IG018–02

The ECM is programmed with data for optimum ignition timing under any and all operating conditions. Using data provided by sensors which monitor various engine functions (rpm, intake air volume, eng, temperature, etc.), the microcomputer (ECM) triggers the spark at precisely the right instant.



The ECM monitors the engine condition by signals from each sensor, calculates the ignition timing and sends an ignition signal to the igniter. High voltage from the ignition is distributed to each spark plug in the appropriate order to generate a spark between the electrodes, which ignites the air–fuel mixture.

IGNITER

The igniter temporarily interrupts the primary current with the ignition signal (IGT signal) from the ECM and generates sparks at the spark plug. Also, as a fail–safe measure, when ignition occurs an ignition confirmation signal (IGF signal) is sent to the ECM.

IGNITION COIL

The ignition coil uses a closed core coil with the primary coil wrapped around the core and the secondary coil wrapped around the primary coil. This allows the generation of a high voltage sufficient to cause a spark to jump across the spark plug gap.

DISTRIBUTOR

This correctly distributes high voltage to the spark plug of each cylinder in the specified ignition order.

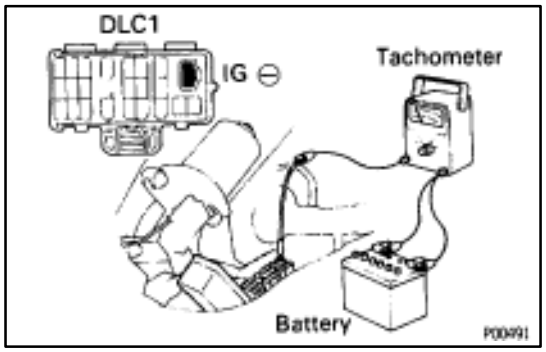
PICKUP COILS

The NE coil detects the crankshaft position, and the G1 and G2 coils detect the camshaft position.

PRECAUTIONS

IG019–01

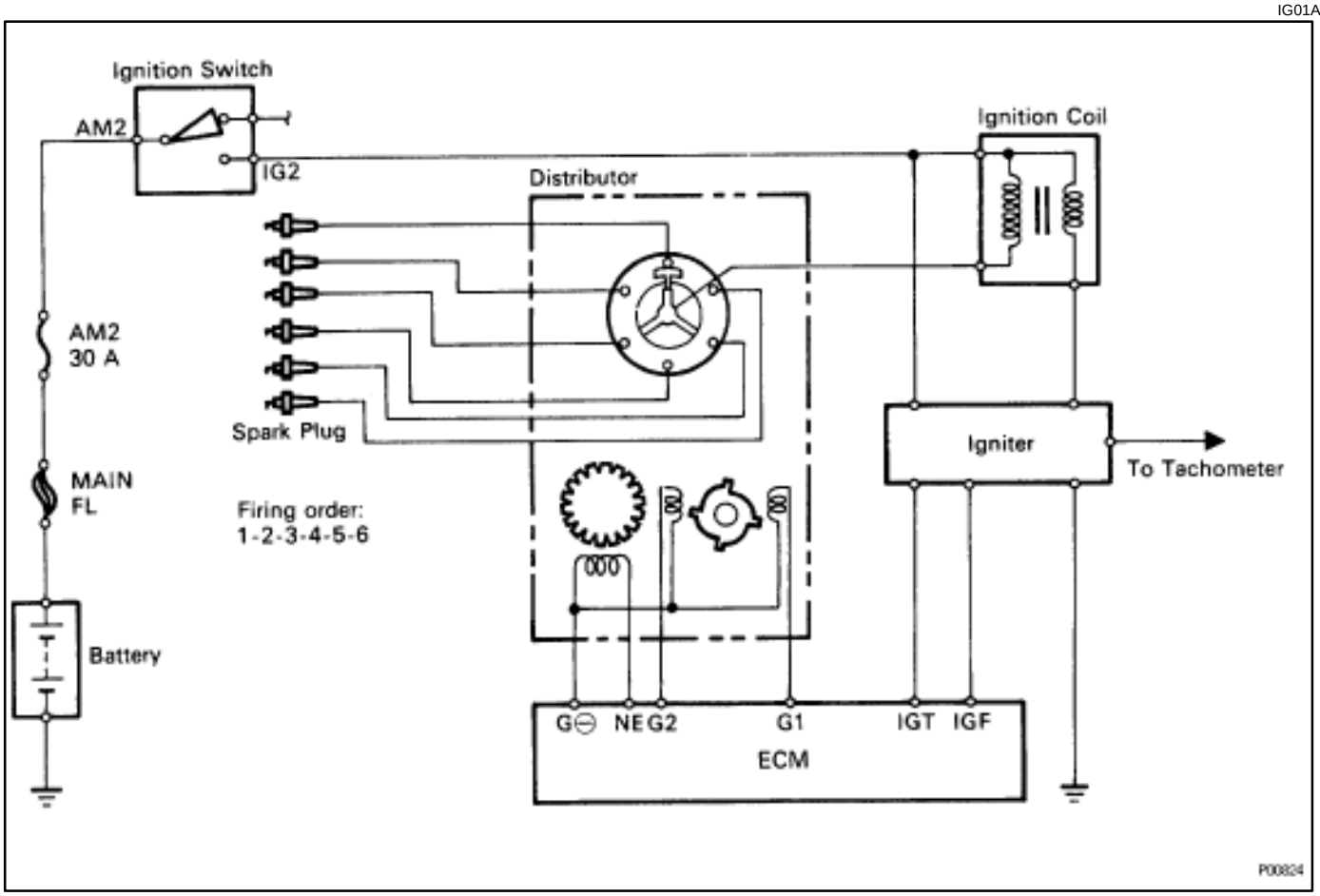
1. **Do not leave the ignition switch on for more than 10 minutes if the engine does not start.**



2. **With a tachometer connected to the system. Connect the test probe of the tachometer to terminal IG ⊕ of the DLC1.**
3. **As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your before use.**
4. **NEVER allow the tachometer terminals to touch ground as it could result in damage to the igniter and/or ignition coil.**
5. **Do not disconnect the battery while the engine is running.**
6. **Check that the igniter is properly grounded to the body.**

SYSTEM CIRCUIT

IG01A–01



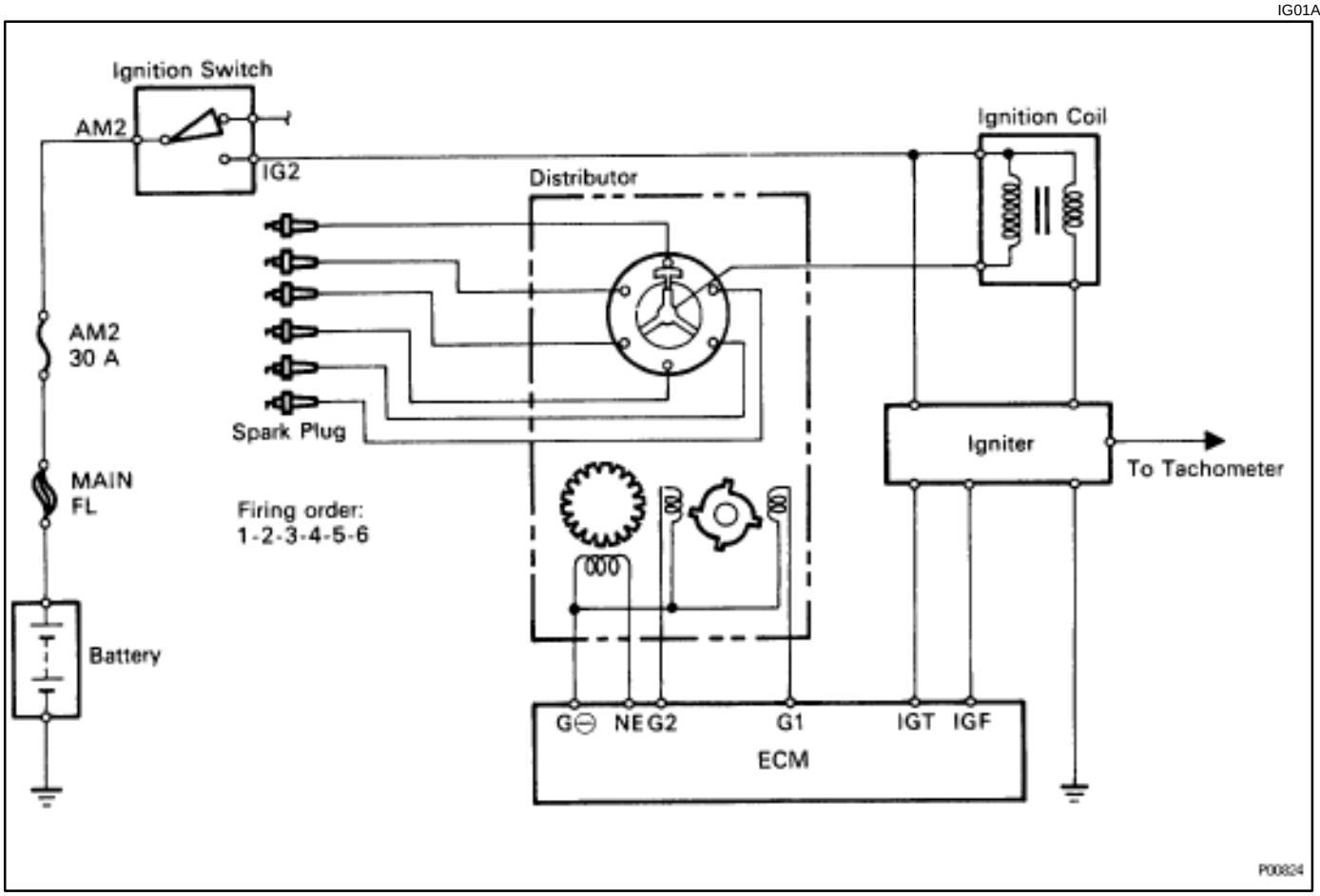
OPERATION

IG01B–01

To maintain the most appropriate ignition timing, the ECM sends a control signal so that the igniter sends current to the ignition coil and the spark plugs produce a spark.

SYSTEM CIRCUIT

IG01A–01



OPERATION

IG01B–01

To maintain the most appropriate ignition timing, the ECM sends a control signal so that the igniter sends current to the ignition coil and the spark plugs produce a spark.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

IG01C–01

	09240–00020 Wire Gauge Set	Air gap
	09843–18020 Diagnosis Check Wire	

RECOMMENDED TOOLS

IG01D–01

	09082–00015 TOYOTA Electrical Tester	
	09200–00010 Engine Adjust Kit	

EQUIPMENT

IG01E–01

Spark plug cleaner	
Tachometer	
Timing light	Ignition timing

ON–VEHICLE INSPECTION

SPARK TEST

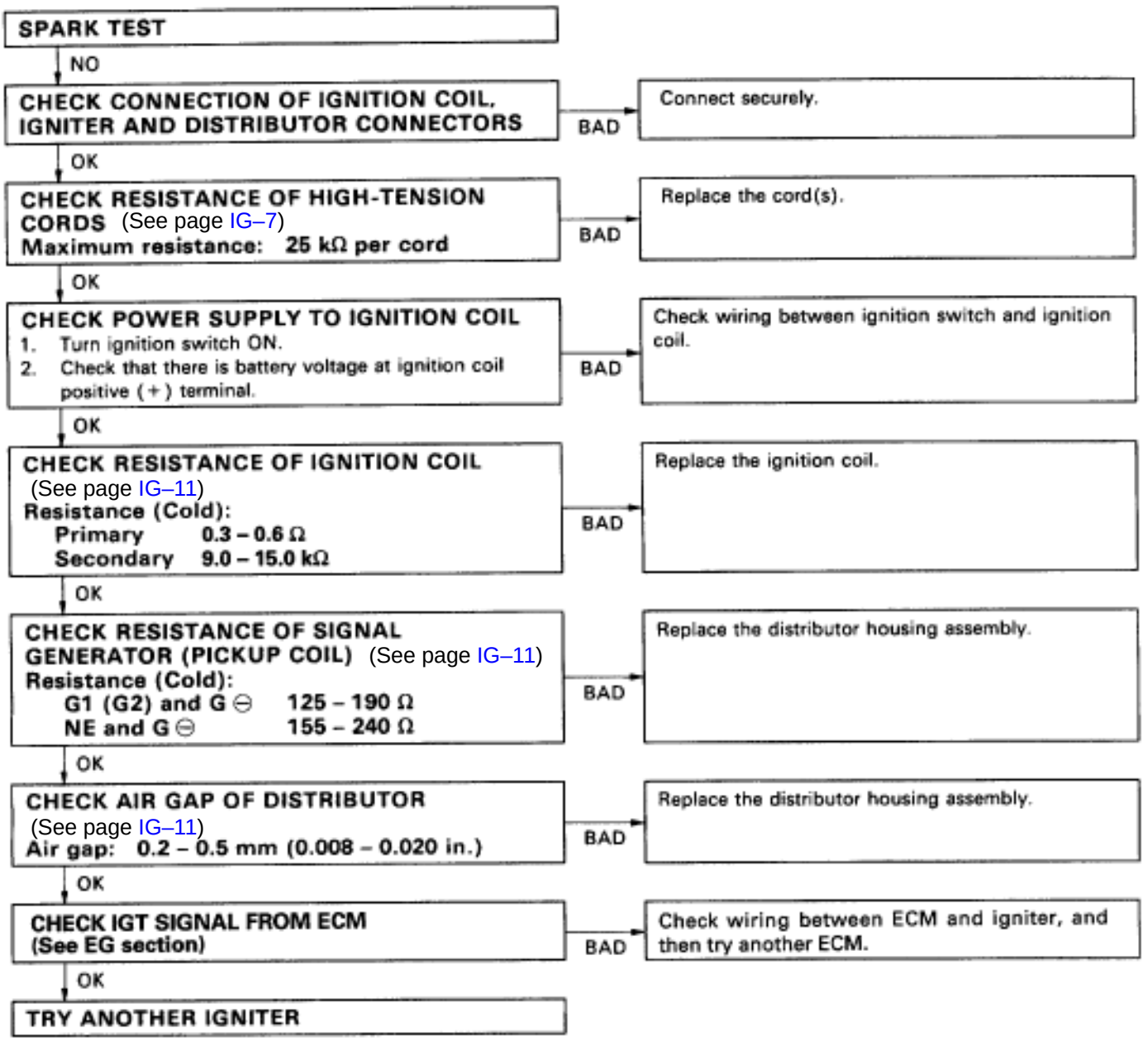
IG01R–02

CHECK THAT SPARK OCCURS

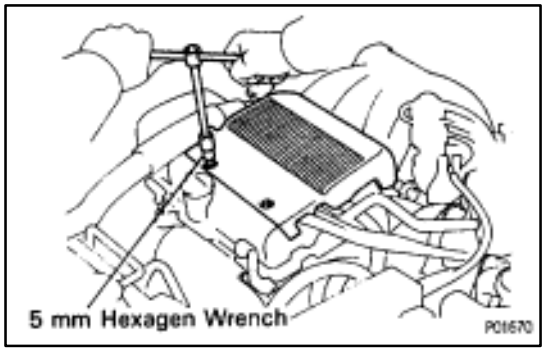
(a) Disconnect the high–tension cord from the distributor. (See page IG–7)

(b) Hold the end approx. 12.5 mm (0.50 in.) from the body of vehicle.

(c) See if spark occurs while engine is being cranked.
HINT: To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1–2 seconds at time.
If the spark does not occur, perform the test as follows:



V00216

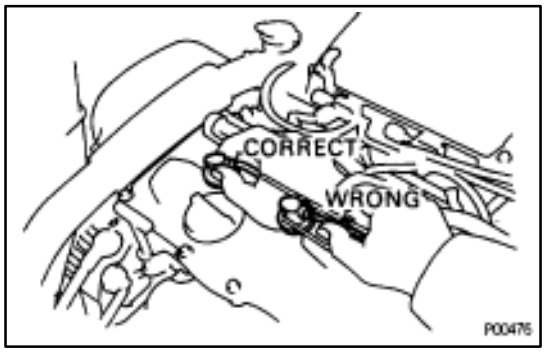


HIGH–TENSION CORDS INSPECTION

IG01F–01

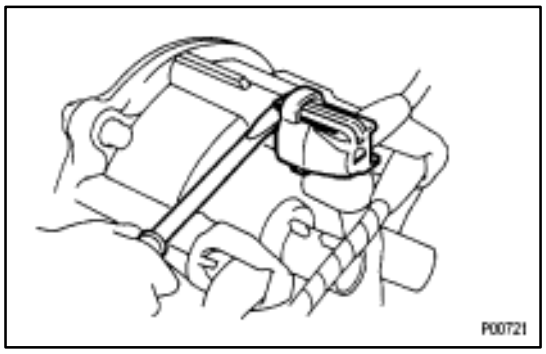
1. REMOVE V–BANK COVER

Using a 5 mm hexagon wrench, remove the two nuts and V–bank cover.



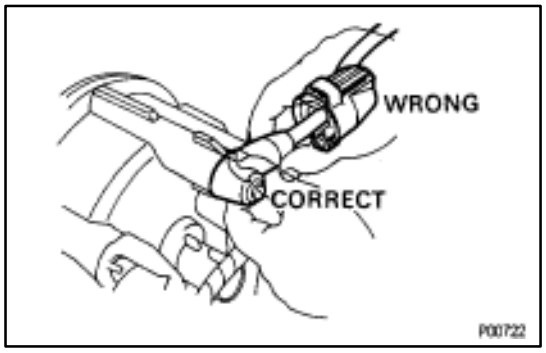
2. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS

Disconnect the high–tension cords at the rubber boot.
DO NOT pull on the cords.
NOTICE: Pulling on or bending the cords may damage the conductor inside.

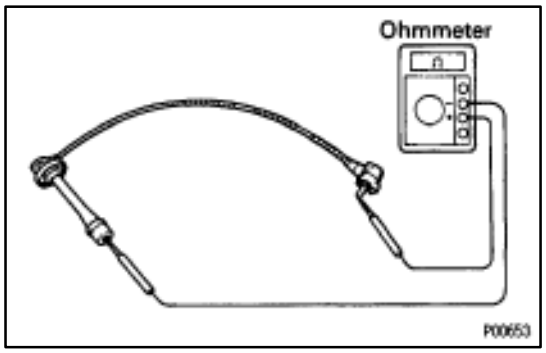


3. DISCONNECT HIGH–TENSION CORDS FROM DISTRIBUTOR CAP AND IGNITION COIL

(a) Using a screwdriver, lift up the lock claw and disconnect the holder from the distributor cap (ignition coil).



(b) Disconnect the high–tension cord at the grommet.
DO NOT pull on the cord.
NOTICE:
- **Pulling on or bending the cords may damage the conductor inside.**
- **Do not wipe any of the oil from the grommet after the high–tension cord is disconnected.**

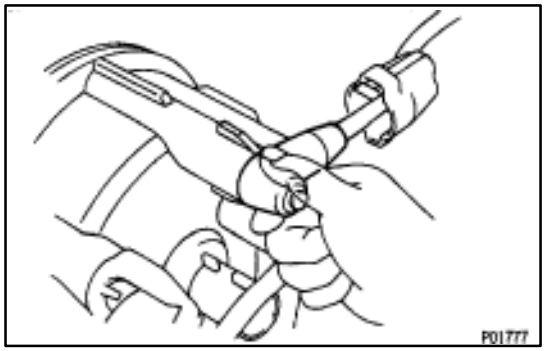


4. INSPECT HIGH–TENSION CORD RESISTANCE

Using an ohmmeter, measure the resistance.
Maximum resistance:

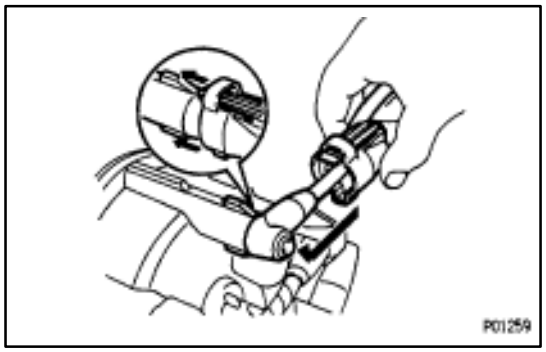
25 kΩ per cord

If the resistance is greater than maximum, check the terminals. If necessary, replace the high–tension cord.

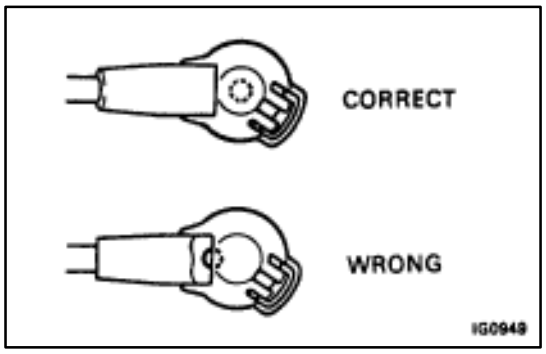


5. RECONNECT HIGH–TENSION CORDS TO DISTRIBUTOR CAP AND IGNITION COIL

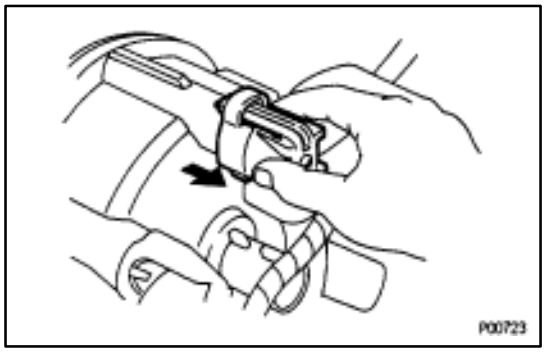
(a) (Ex. Center Cord on the Distributor Side)
Insert the grommet portion into the terminal hole of the distributor cap (ignition coil).



(b) (Ex. Center Cord on the Distributor Side)
Align the spline of the distributor (ignition coil) with the spline of the holder, and slide on the holder.



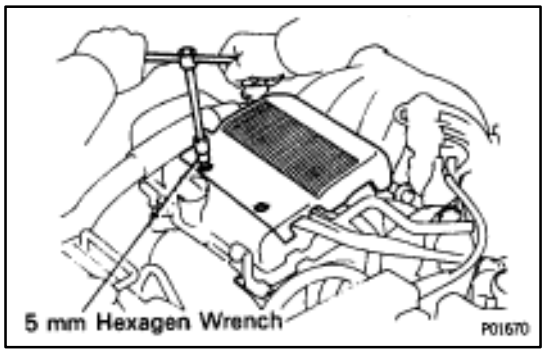
NOTICE: Check that the holder is correctly installed to the grommet and distributor cap as shown in the illustration.



(c) Check that the lock claw of the holder is engaged by lightly pulling the holder.

(d) (Center Cord on the Distributor Side)
Insert the grommet and holder together.

6. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS



7. REINSTALL V–BANK COVER

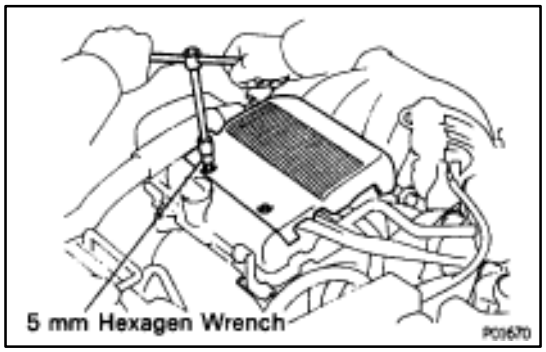
Using a 5 mm hexagon wrench, install the V–bank cover with the two nuts.

SPARK PLUGS INSPECTION

IG01G–02

NOTICE:

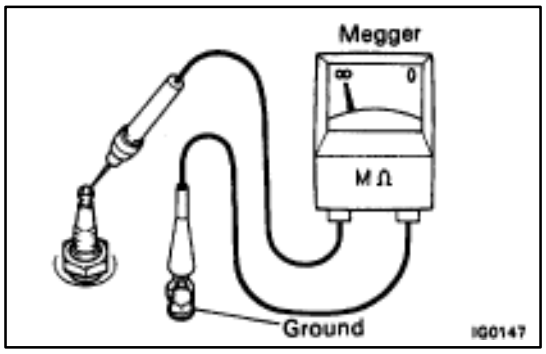
- **Never use a wire brush for cleaning.**
- **Never attempt to adjust the electrode gap on used spark plug.**
- **Spark plug should be replaced every 100,000 km (60,000 miles).**



1. REMOVE V–BANK COVER

Using a 5 mm hexagon wrench, remove the two nuts and V–bank cover.

2. DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS



3. INSPECT ELECTRODE

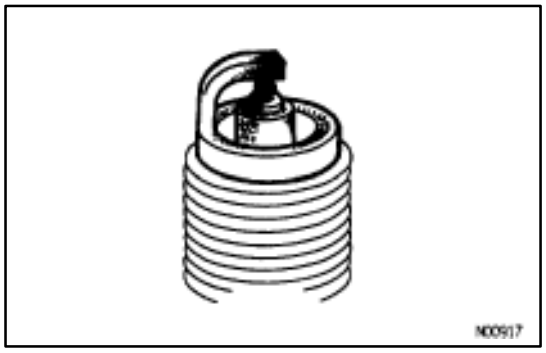
Using a megger (insulation resistance meter), measure the insulation resistance.

Standard correct insulation resistance:

10 M Ω or more

If the resistance is less than specified, proceed to step 4.

HINT: If a megger is not available, the following simple method of inspection provides fairly accurate results.



(Simple Method)

(a) Quickly race the engine to 4,000 rpm five times.

(b) Remove the spark plug. (See step 4)

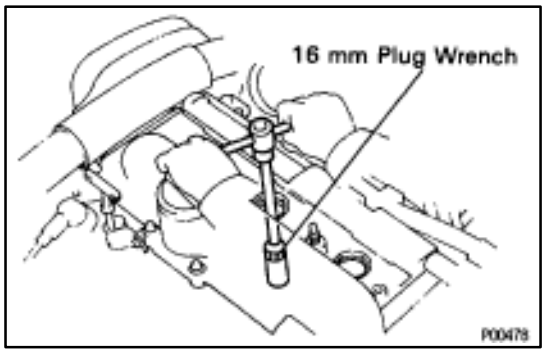
(c) Visually check the spark plug.

If the electrode is dry ... Okay

If the electrode is wet ... Proceed to step 5

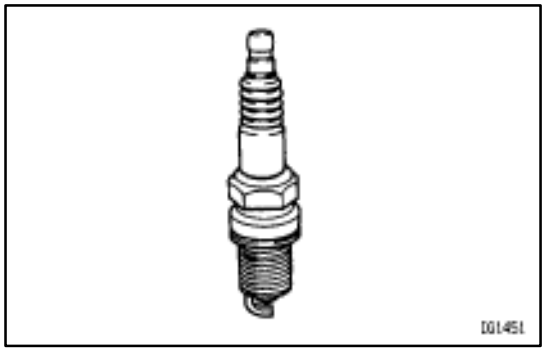
(d) Reinstall the spark plug.

(See step 8 on page IG–10)



4. REMOVE SPARK PLUGS

Using a 16 mm plug wrench, remove the spark plug.



5. VISUALLY INSPECT SPARK PLUGS

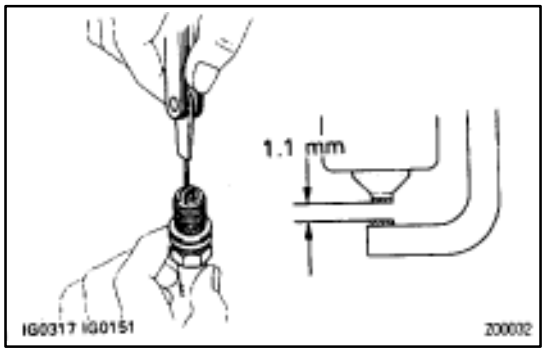
Check the spark plug for thread damage and insulator damage.

If abnormal, replace the spark plug.

Recommended spark plug:

ND PQ20R

NGK BCPR6EP–11



6. INSPECT ELECTRODE GAP

Maximum electrode gap:

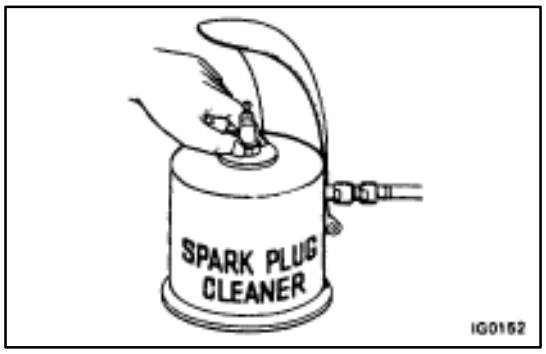
1.3 mm (0.051 in.)

If the gap is greater than maximum, replace the spark plug.

Correct electrode gap of new spark plug:

1.1 mm (0.043 in.)

NOTICE: If adjusting the gap of a new spark plug, bend only the base of the ground electrode. Do not touch the tip. Never attempt to adjust the gap on the used plug.



7. CLEAN SPARK PLUGS

If the electrode has traces of wet carbon, allow it to dry and then clean with a spark plug cleaner.

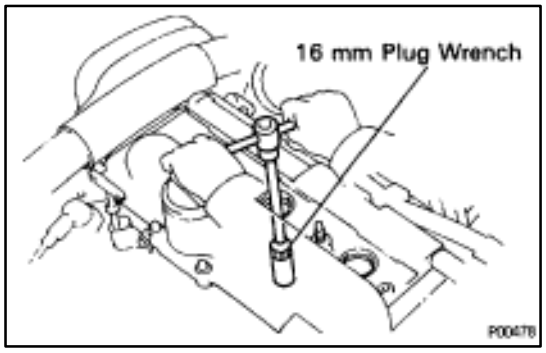
Air pressure:

Below 588 kPa (6 kgf/cm^2, 85 psi)

Duration:

20 seconds or less

HINT: If there are traces of oil, remove it with gasoline before using the spark plug cleaner.

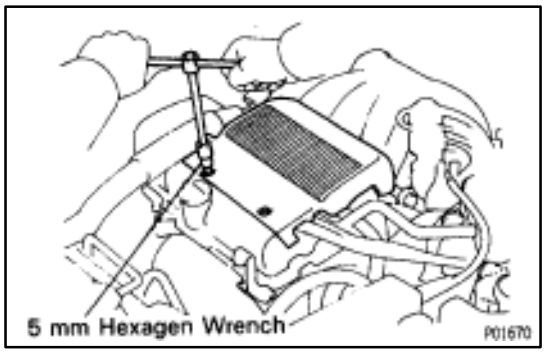


8. INSTALL SPARK PLUGS

Using a 16 mm plug wrench, install the spark plug.

Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)

9. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS



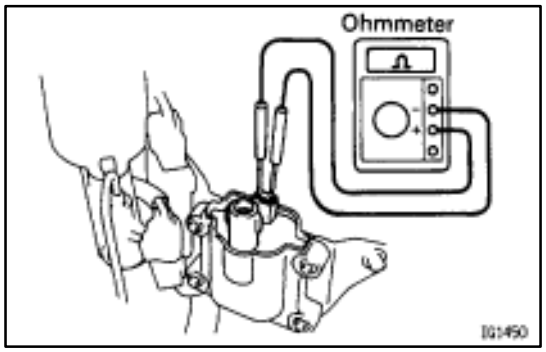
10. REINSTALL V–BANK COVER

Using a 5 mm hexagon wrench, install the V–bank cover with the two nuts.

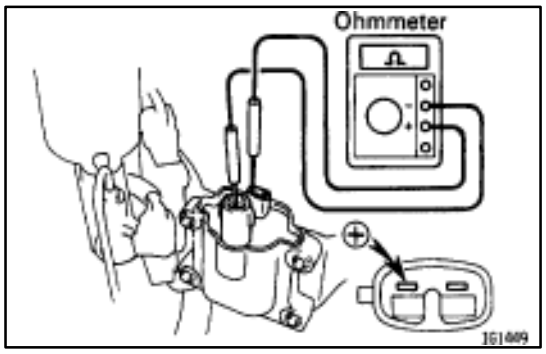
IGNITION COIL INSPECTION

IG02G–01

1. **DISCONNECT IGNITION COIL CONNECTOR**
2. **DISCONNECT HIGH–TENSION CORD**



3. **INSPECT PRIMARY COIL RESISTANCE**
   Using an ohmmeter, measure the resistance between the positive (+) and negative (–) terminals.
   Primary coil resistance (Cold):
   0.3–0.6 Ω
   If the resistance is not as specified, replace the ignition coil.

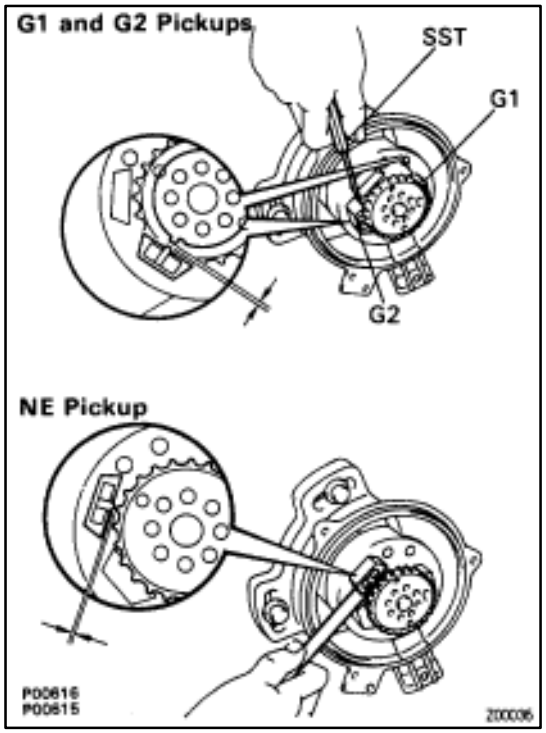


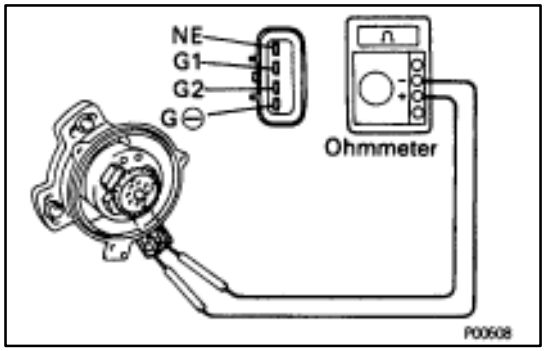
4. **INSPECT SECONDARY COIL RESISTANCE**
   Using an ohmmeter, measure the resistance between the positive (+) and high–tension terminals
   Secondary coil resistance (Cold):
   9.0–15.0 k Ω
5. **RECONNECT HIGH–TENSION CORD**
6. **RECONNECT IGNITION COIL CONNECTOR**

DISTRIBUTOR INSPECTION

IG01J–02

1. **DISCONNECT DISTRIBUTOR CONNECTOR**
2. **REMOVE DISTRIBUTOR CAP**
3. **REMOVE ROTOR**
4. **INSPECT AIR GAP**
   Using SST (G1 and G2 pickups) and a thickness gauge (NE pickup), measure the air gap between the signal rotor and pickup coil projection.
   SST 09240–00020 for G1 and G2 pickups
   Air gap:
   0.2–0.5 mm (0.008–0.020 in.)
   If the air gap is not as specified, replace the distributor housing assembly.





5. INSPECT SIGNAL GENERATOR (PICKUP COIL) RESISTANCE

Using an ohmmeter, measure the resistance between terminals.

Pickup coil resistance (Cold):

G1 and G ⊕

125–190 Ω at–10~40°C (14~104°F)

G2 and G ⊕

125–190 Ω at–10~40°C (14~104°F)

NE and G ⊕

155–240 Ω at–10~40°C (14~104°F)

If the resistance is not as specified, replace the distributor housing assembly.

6. REINSTALL ROTOR

7. REINSTALL DISTRIBUTOR CAP

8. RECONNECT DISTRIBUTOR CONNECTOR

IGNITER INSPECTION

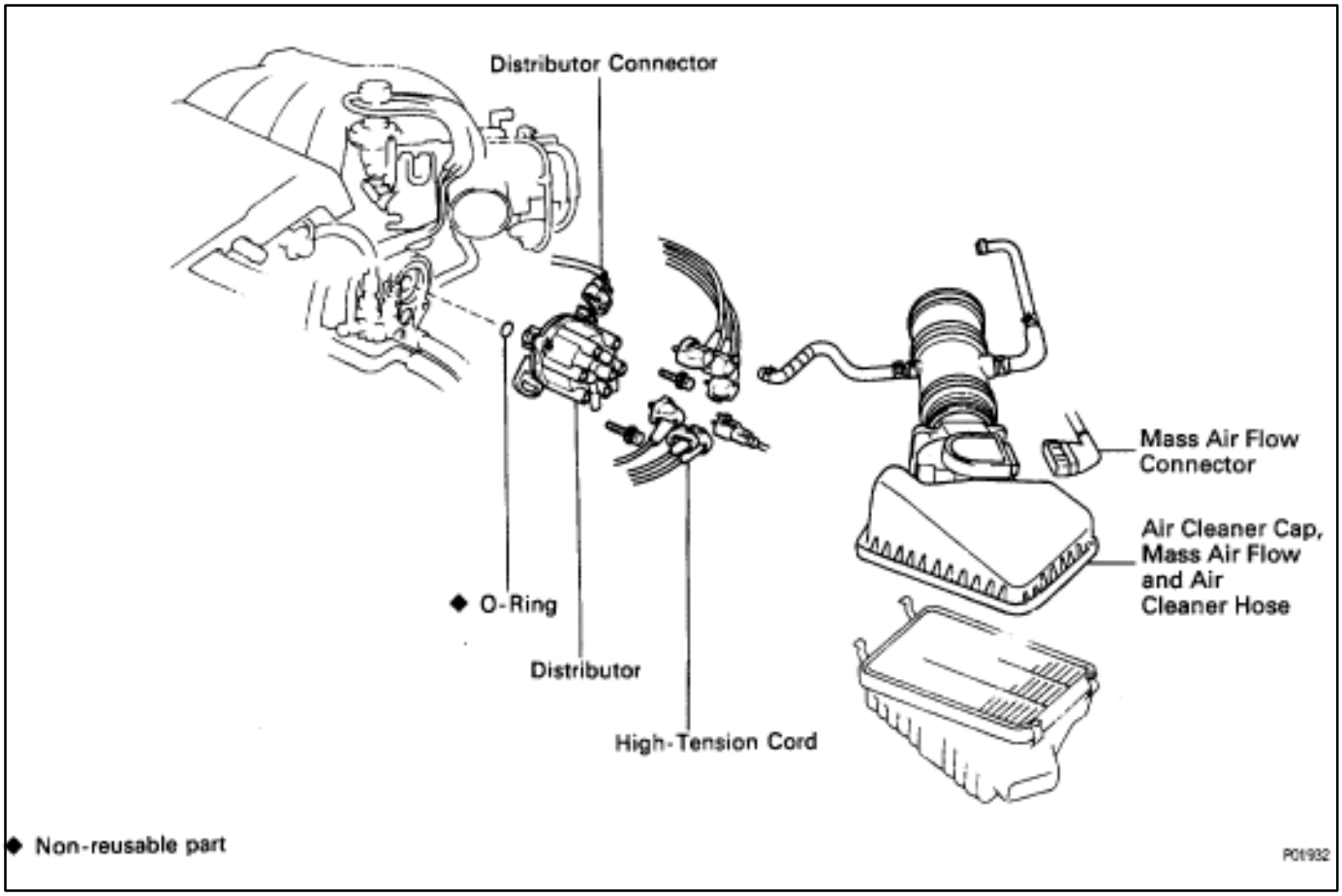
IG01S–02

(See procedure Spark Test on page IG–6)

DISTRIBUTOR

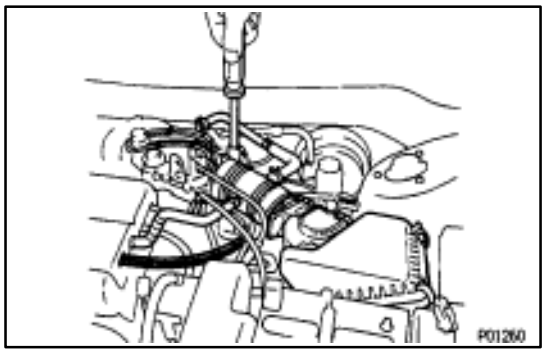
DISTRIBUTOR REMOVAL

IG01T–01

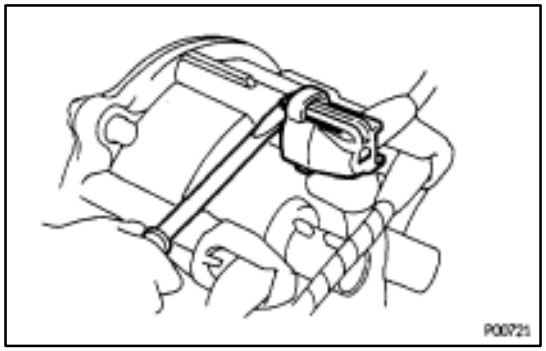


1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
   CAUTION (w / Airbag): Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.
2. **REMOVE AIR CLEANER CAP, MASS AIR FLOW AND AIR CLEANER HOSE**

(a) Disconnect the mass air flow connector.

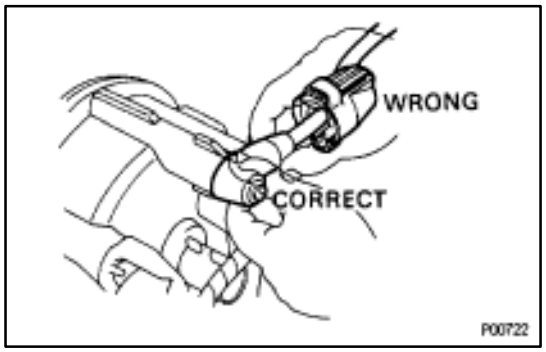


(b) Disconnect the mass air flow wire from the clamp on the mass air flow.
(c) Disconnect the air hoses.
(d) Loosen the air cleaner hose clamp bolt.
(e) Disconnect the four air cleaner cap clips.
(f) Disconnect the air cleaner hose from the throttle body, and remove the air cleaner cap together with the mass air flow and air cleaner hose.



3. DISCONNECT HIGH–TENSION CORDS FROM DISTRIBUTOR CAP AND IGNITION COIL

(a) Using a screwdriver, lift up the lock claw and disconnect the holder from the distributor cap (ignition coil).

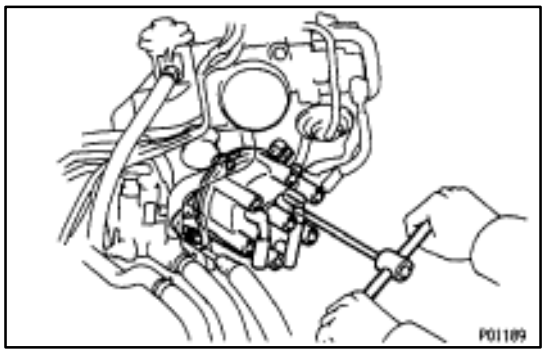


(b) Disconnect the high–tension cord at the grommet.
DO NOT pull on the cord.

NOTICE:

- **Pulling on or bending the cords may damage the conductor inside.**
- **Do not wipe any of the oil from the grommet after the high–tension cord is disconnected.**

4. DISCONNECT DISTRIBUTOR CONNECTOR

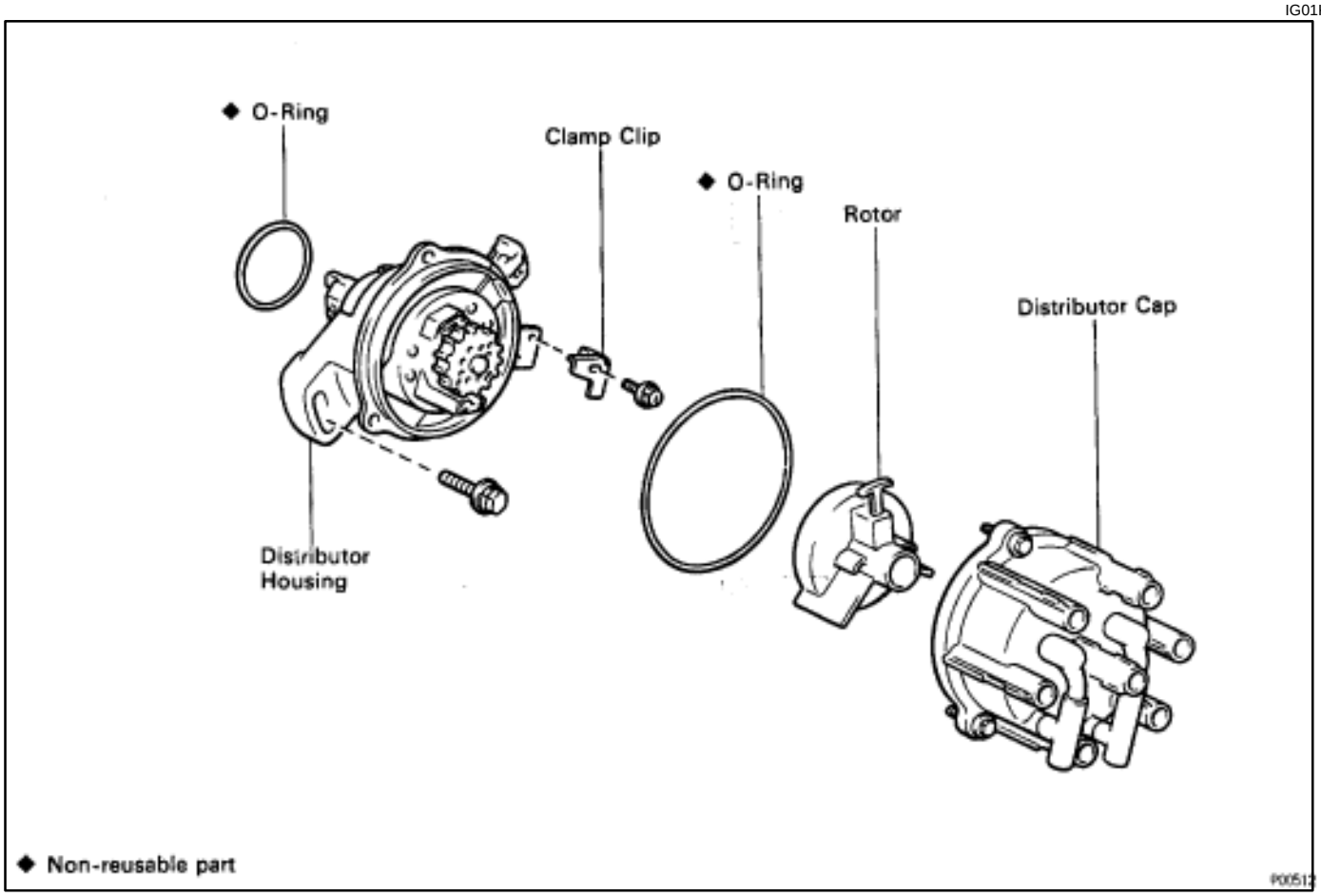


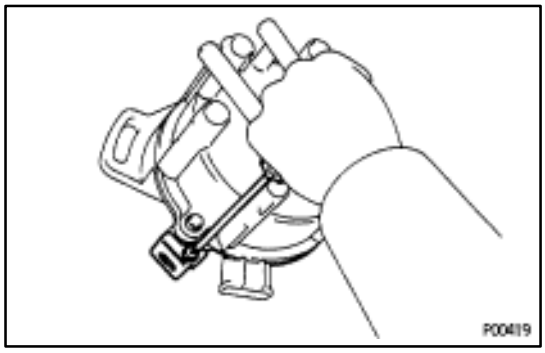
5. REMOVE DISTRIBUTOR

(a) Remove the hold–down bolts and pull out the distributor.
(b) Remove the O–ring from the distributor housing.

COMPONENTS

IG01K–01



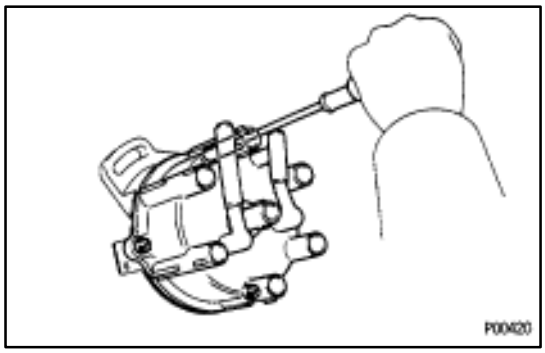


DISTRIBUTOR DISASSEMBLY

IG01L–01

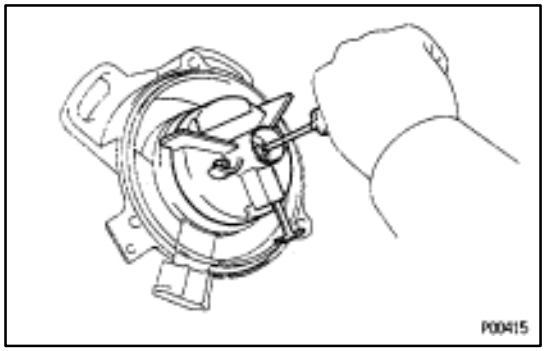
1. REMOVE WIRE HARNESS CLAMP CLIP

Remove the screw and clip.



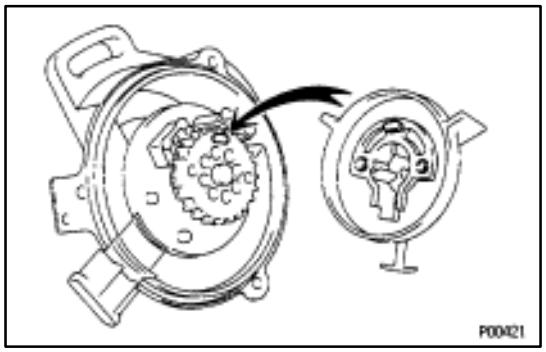
2. REMOVE DISTRIBUTOR CAP

Remove the three bolts and distributor cap.



3. REMOVE ROTOR

Remove the two screws and rotor.



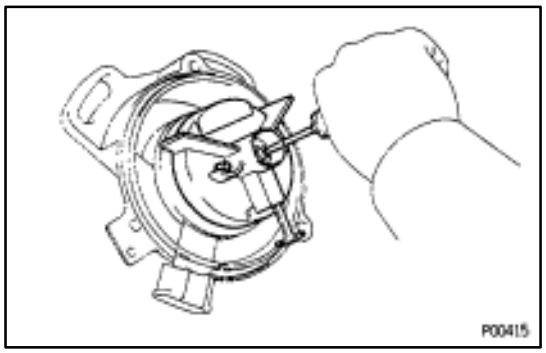
DISTRIBUTOR ASSEMBLY

IG01M–02

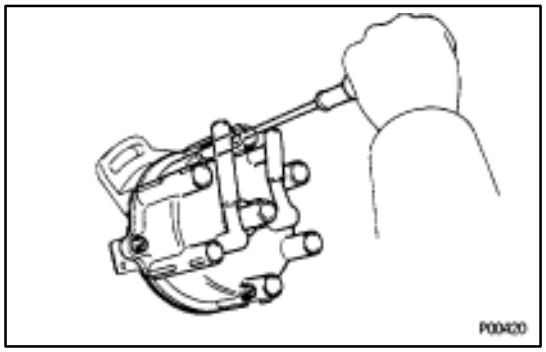
(See page IG–15)

1. INSTALL ROTOR

(a) Align the hollow of the signal rotor with the protrusion of the rotor.

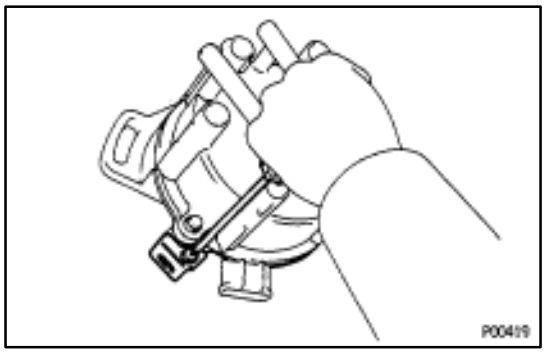


(b) Install the rotor with the two screws.



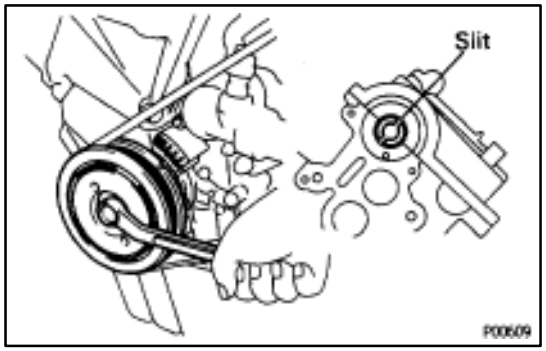
2. INSTALL DISTRIBUTOR CAP

Install the distributor cap with the three screws.



3. INSTALL WIRE HARNESS CLAMP CLIP

Install the clip with the screw.



DISTRIBUTOR INSTALLATION

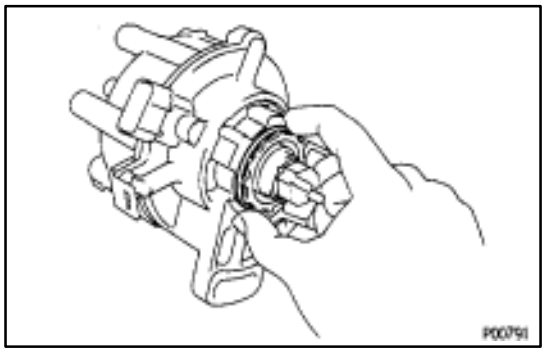
IG01N–02

(See page IG–13)

1. SET NO. 1 CYLINDER TO TDC/COMPRESSION

Turn the crankshaft clockwise, and position the slit of the intake camshaft (RH cylinder head) as shown.

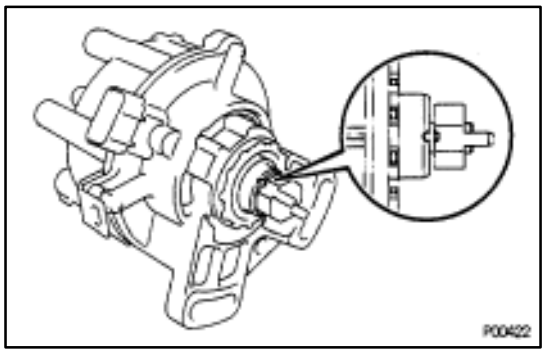
Look at the distributor attachment hole to set.



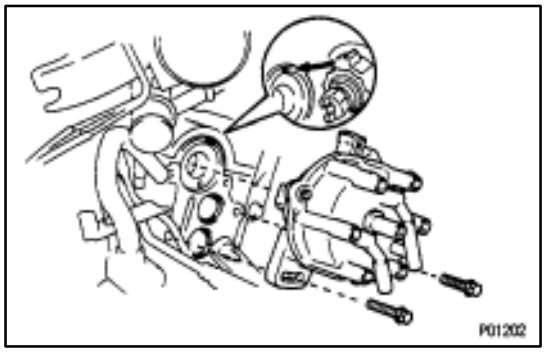
2. INSTALL DISTRIBUTOR

(a) Install a new O–ring to the housing.

(b) Apply a light coat of engine oil on the O–ring.

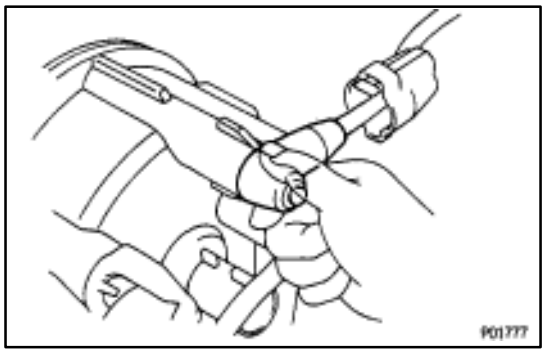


(c) Align the cutout marks of the coupling and housing.



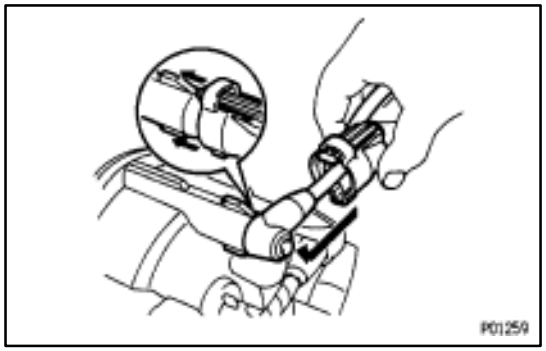
(d) Insert the distributor, aligning the line of the housing with the cutout of the distributor attachment bearing cap.

(e) Lightly tighten the two hold–down bolts.

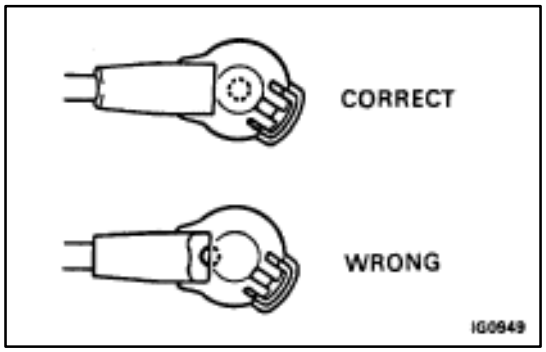


3. CONNECT HIGH–TENSION CORDS TO DISTRIBUTOR CAP

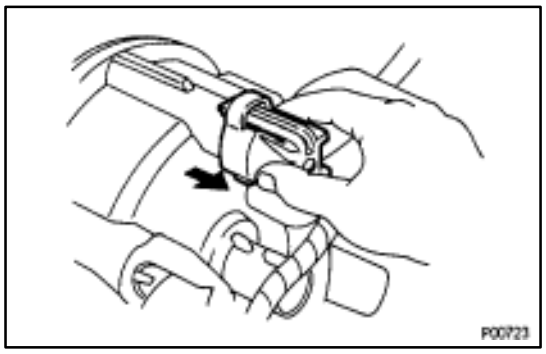
(a) (Ex. Center Cord)
First, insert the grommet part only.



(b) (Ex. Center Cord)
Align the spline of the distributor cap with the spline groove of the holder, and slide the holder.

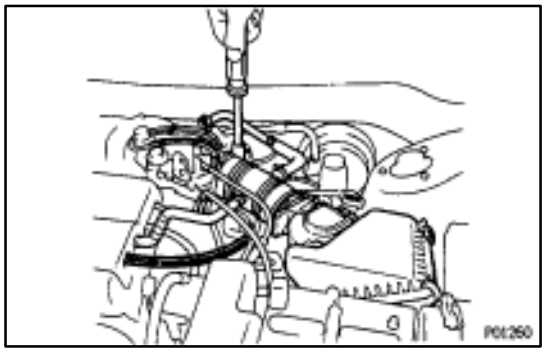


NOTICE: Check that the holder is correctly installed to the grommet and distributor cap as shown in the illustration.



(c) Check that the lock claw of the holder is engaged by lightly pulling the holder.
(d) (Center Cord)
Insert the grommet and holder together.

4. CONNECT DISTRIBUTOR CONNECTOR

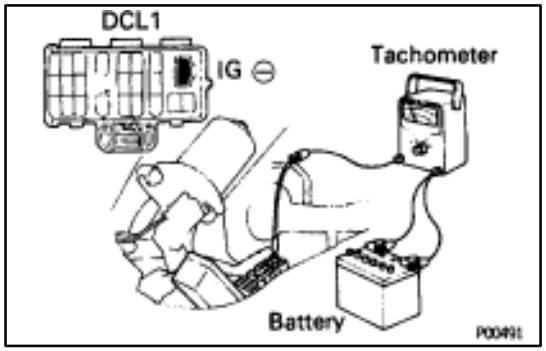


5. INSTALL AIR CLEANER CAP, MASS AIR FLOW AND AIR CLEANER HOSE

(a) Connect the air cleaner hose to the throttle body, and install the air cleaner cap together with the mass air flow with the four clips.
(b) Tighten the air cleaner hose clamp bolt.
(c) Connect the air hoses.
(d) Connect the mass air flow connector.
(e) Connect the mass air flow wire to the clamp on the mass air flow.

6. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

7. WARM UP ENGINE
Allow the engine to reach normal operating temperature.

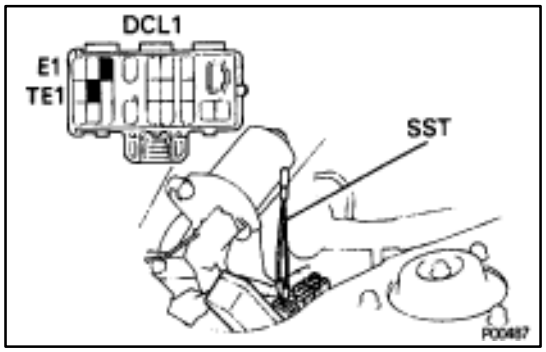


8. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE

Connect the tachometer test probe to terminal IG ⊕ of the DCL1.

NOTICE:

- **NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.**
- **As some tachometers are not compatible with this ignition system, we recommended that you confirm the compatibility of your unit before use.**



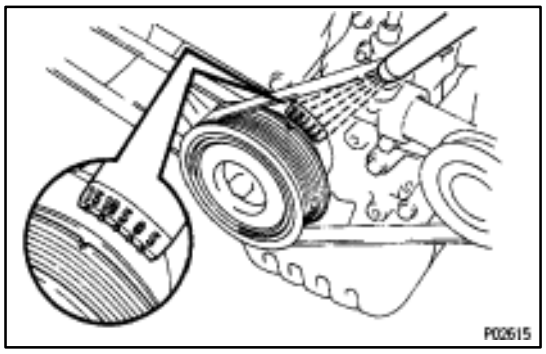
9. ADJUST IGNITION TIMING

(a) Check the idle speed.

Idle speed:

700 ± 50 rpm

(b) Using SST, connect terminals TE1 and E1 of the DCL1.
SST 09843–18020



(c) Using a timing light, check the ignition timing.

Ignition timing:

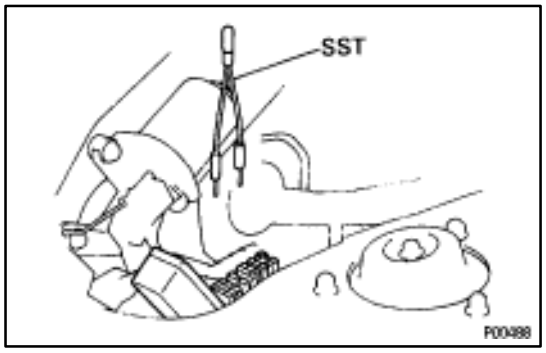
10° BTDC @ idle

(Transmission in neutral range)

(d) Loosen the two hold–down bolts, and adjust by turning the distributor.

(e) Tighten the hold–down bolts, and recheck the ignition timing.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)



(f) Remove SST.
SST 09843–18020

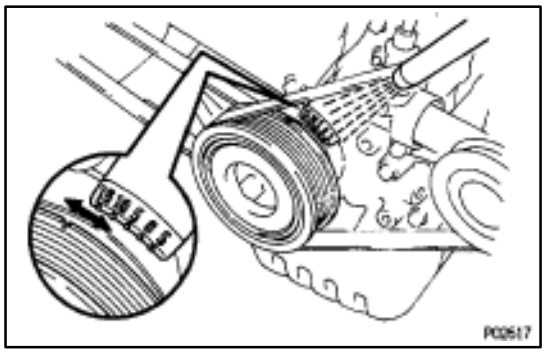
10. FURTHER CHECK IGNITION TIMING

Ignition timing:

10–20° BTDC @ idle

(Transmission in neutral range)

HINT: The timing mark moves in a range between 10° and 20°.



11. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

SERVICE SPECIFICATIONS

SERVICE DATA

IG01P–01

Ignition timing	w/ Terminals TE1 and E1 connected		10° BTDC @ idle
Firing order	–		1–2–3–4–5–6
High–tension cord	Resistance (Maximum)		25 kΩ per cord
Spark plug	Recommended spark plug	ND	PQ20R
	Recommended spark plug	NGK	BCPR6EP–11
	Correct electrode gap		1.1 mm (0.043 in.)
Ignition coil	Primary coil resistance (Cold)		0.3–0.6 Ω
	Secondary coil resistance (Cold)		9.0–15.0 kΩ
Distributor	Air gap		0.2–0.5 mm (0.08–0.020 in.)
	Signal generator (pickup coil) resistance (Cold)		
	G1–G⊕		125–190 Ω
	G2–G⊕		125–190 Ω
	NE–G⊕		155–240 Ω

TORQUE SPECIFICATIONS

IG01Q–01

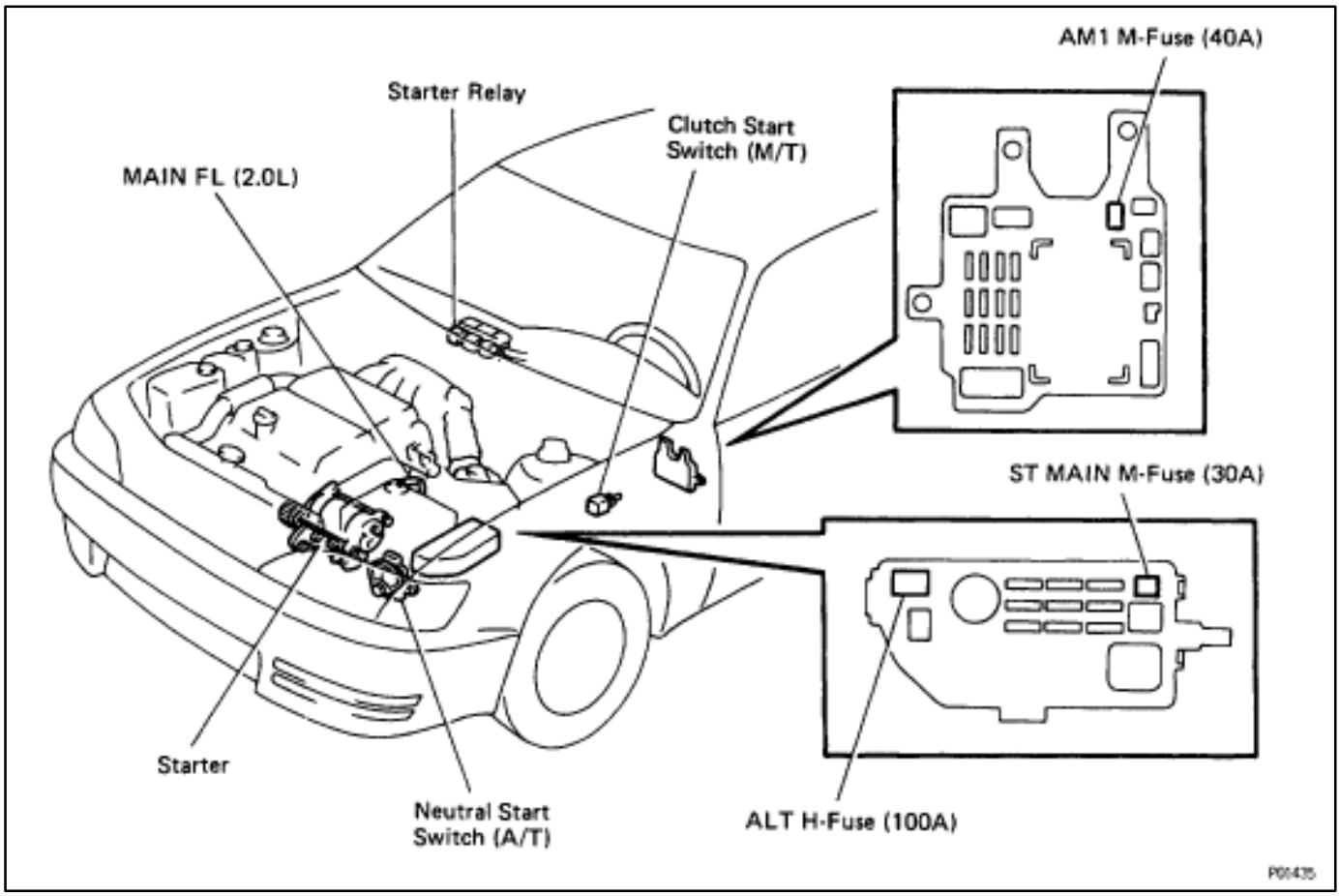
Part tightened	N·m	kgf·cm	ft·lbf
Spark plug X Cylinder head	18	180	13
Distributor X Cylinder head	18	185	13

STARTING SYSTEM

DESCRIPTION

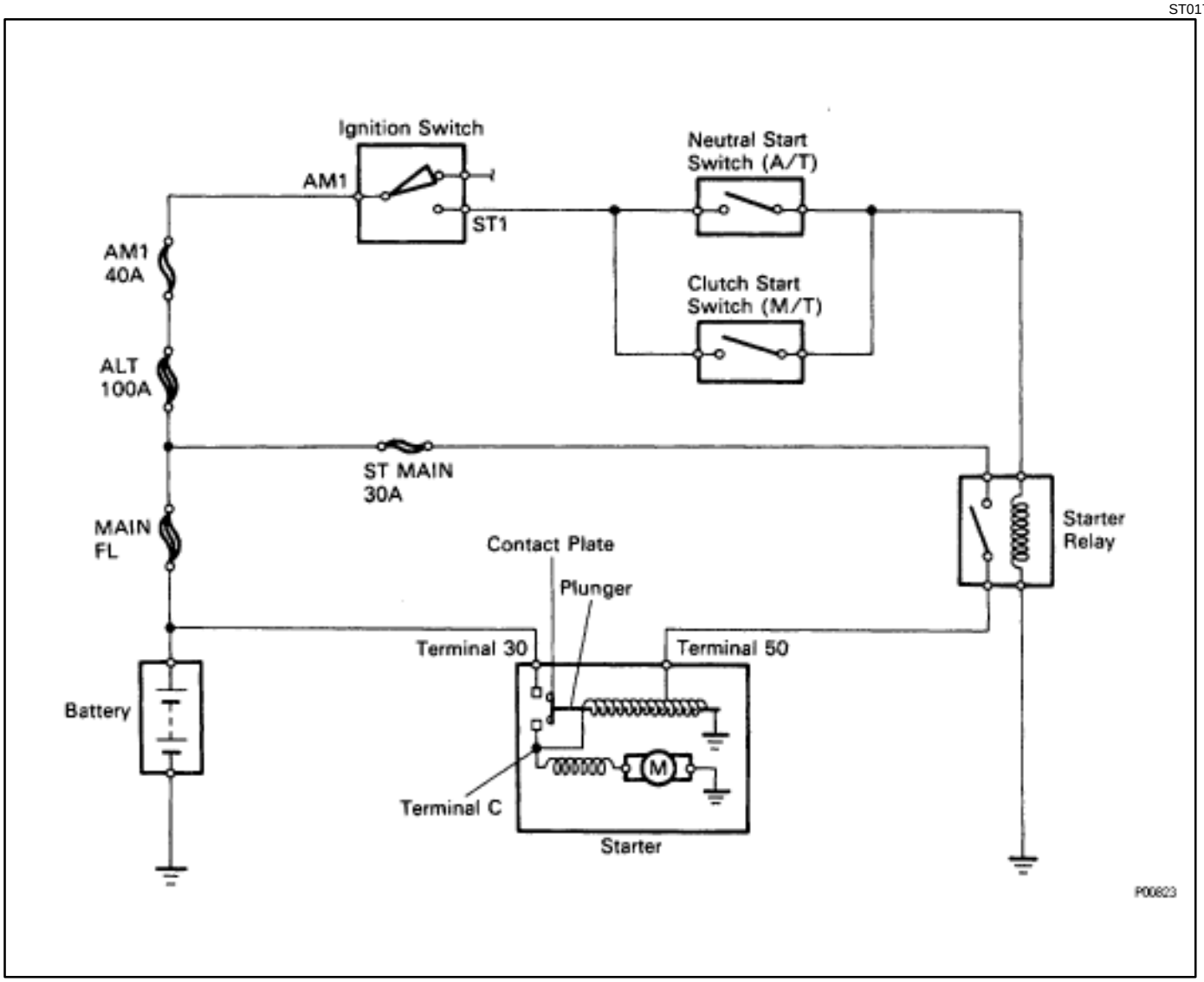
ST018–02

The starter is a reduction type with a small, high–speed motor used to drive the pinion gear.



SYSTEM CIRCUIT

ST017–01



OPERATION

ST019–01

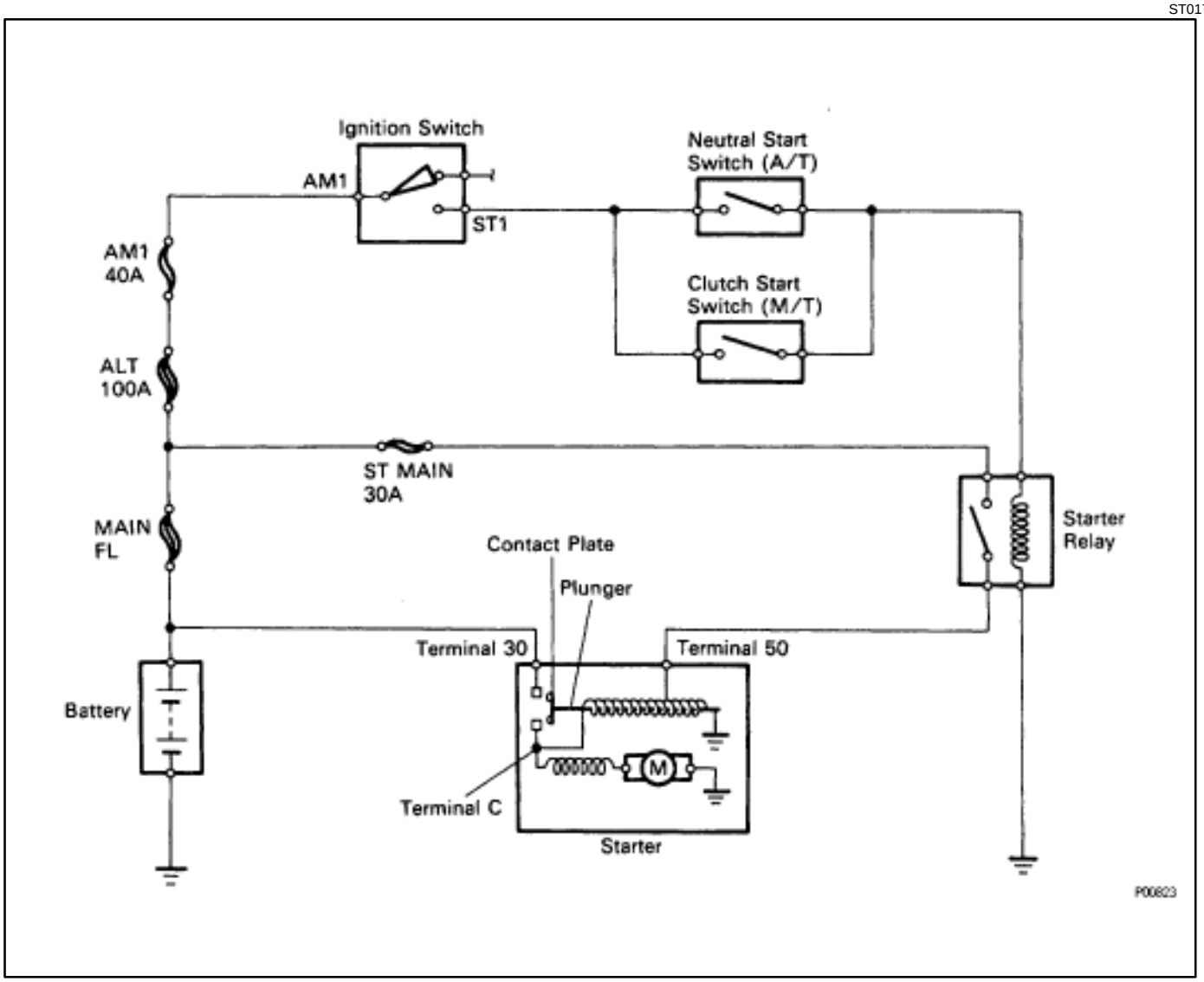
When the ignition switch is turned to START position, current flows from terminal 50 to the coil of the solenoid and the plunger is pulled by the magnetic force of the coil. When the plunger is pulled to the left as shown above, the contact plate of the plunger allows current from the battery to flow directly from terminal 30 to the motor, and the starter rotates.

When the engine is running and the ignition switch is returned to ON, the magnetic force of the coil disappears and the contact plate of the plunger is returned to its original position by the return spring.

Battery voltage no longer flows from terminal 30, so the motor stops.

SYSTEM CIRCUIT

ST017–01



OPERATION

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Battery voltage no longer flows from terminal 30, so the motor stops.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

ST01A–01

	09286–46011	Injection Pump Spline Shaft Puller	Armature bearing
	09820–00030	Alternator Rear Bearing Replacer	Armature front bearing

RECOMMENDED TOOLS

ST01C–01

	09082–00015	TOYOTA Electrical Tester	

EQUIPMENT

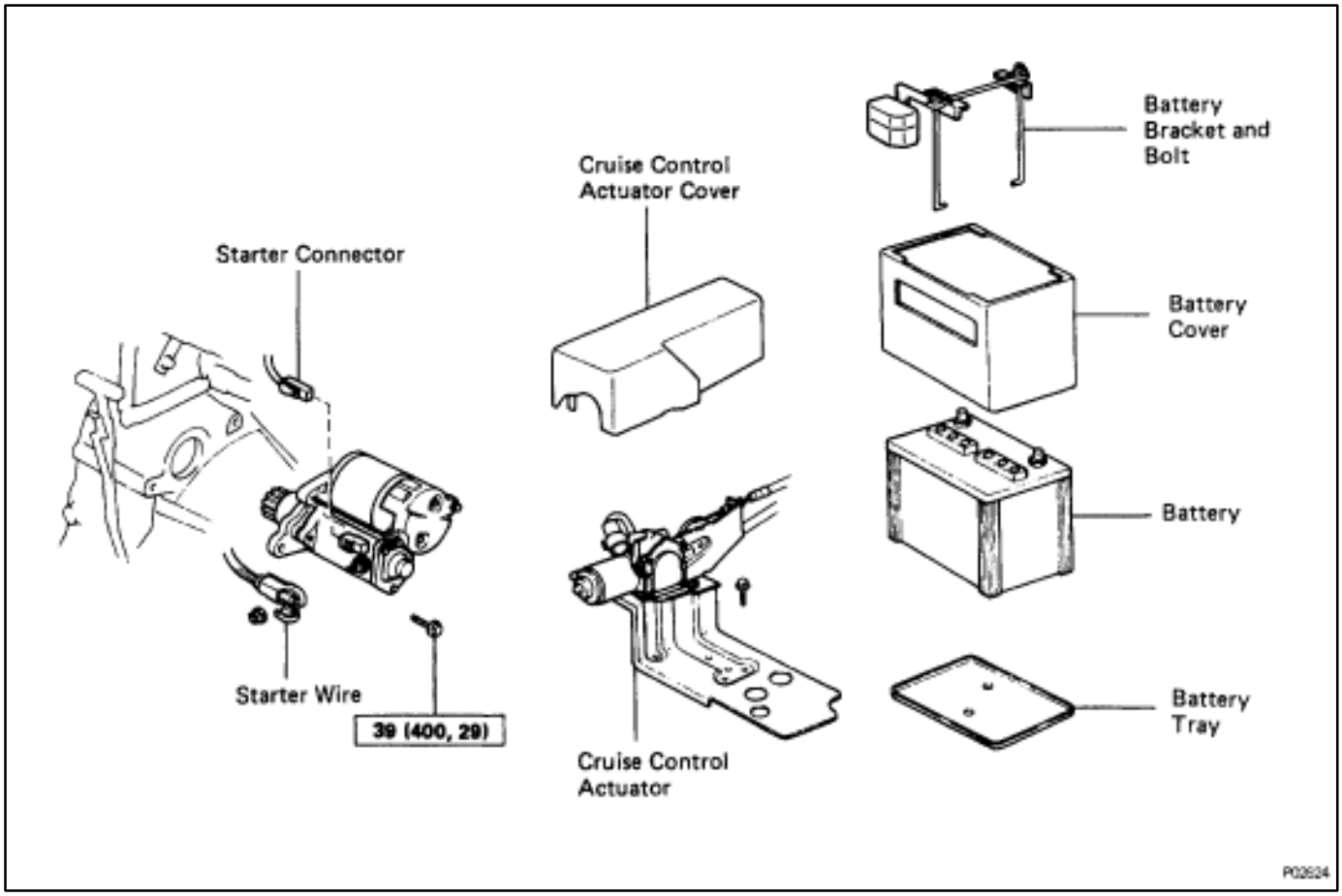
ST01E–01

Dial indicator	Commutator
Magnetic finger	Steel ball
Pull scale	Brush spring
Sandpaper	Commutator
Torque wrench	
V–block	Commutator
Vernier calipers	Commutator, Brush

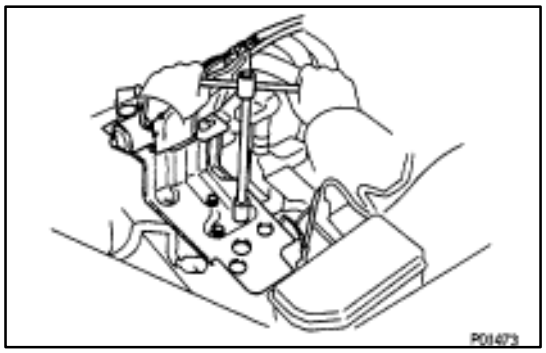
STARTER

STARTER REMOVAL

ST01B–02

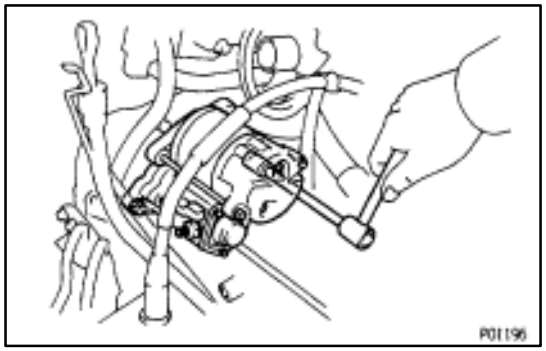


1. **DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY**
   CAUTION (w/ Airbag): Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.
2. **REMOVE BATTERY**



3. **REMOVE CRUISE CONTROL ACTUATOR**

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

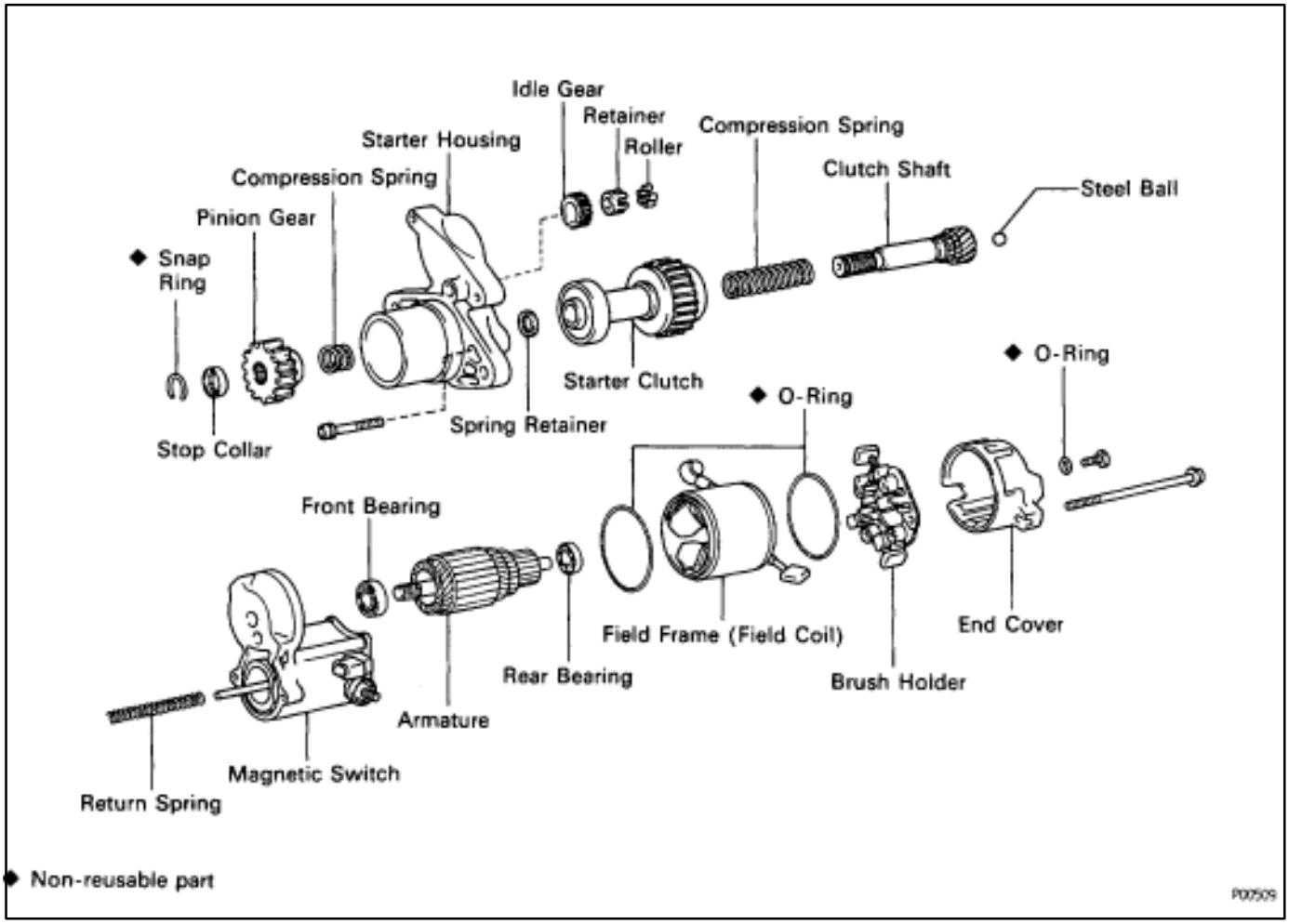


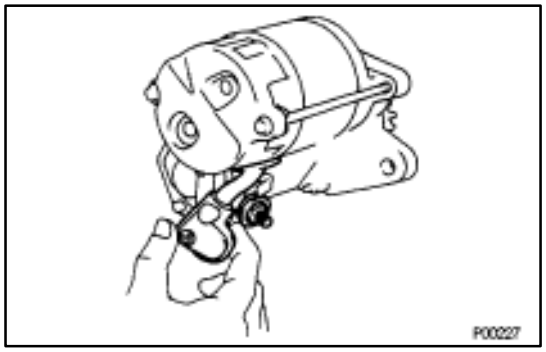
4. REMOVE STARTER

(a) Disconnect the starter connector.
(b) Remove the nut, and disconnect the starter wire.
(c) Remove the two bolts and starter.

COMPONENTS

ST01D–01



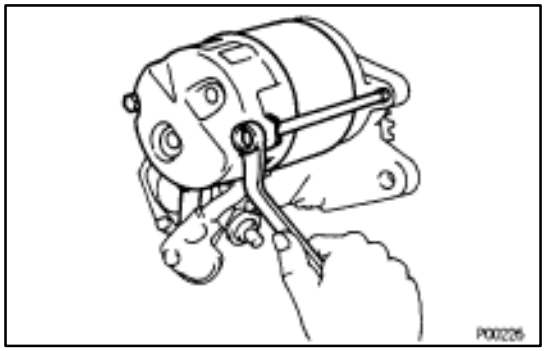


STARTER DISASSEMBLY

ST01F–01

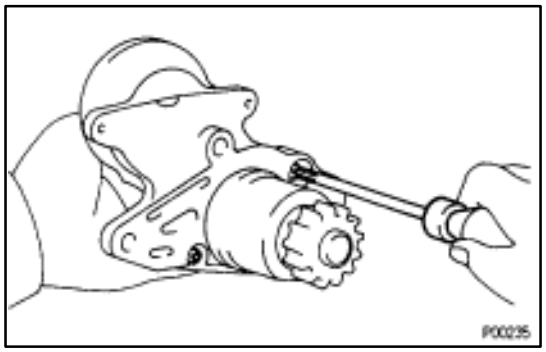
1. REMOVE FIELD FRAME AND ARMATURE

(a) Remove the nut, and disconnect the lead wire from the magnetic switch terminal.

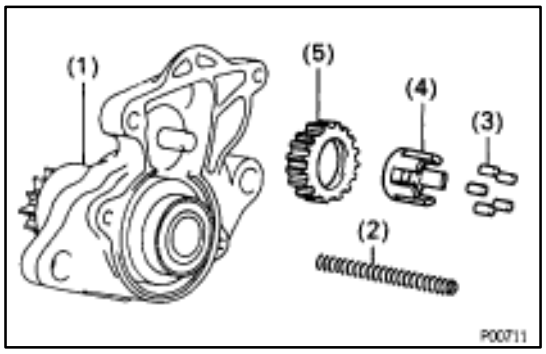


(b) Remove the two through bolts.
(c) Pull out the field frame with the armature from the magnetic switch assembly.
(d) Remove the O–ring.

2. REMOVE STARTER HOUSING, CLUTCH ASSEMBLY AND GEAR

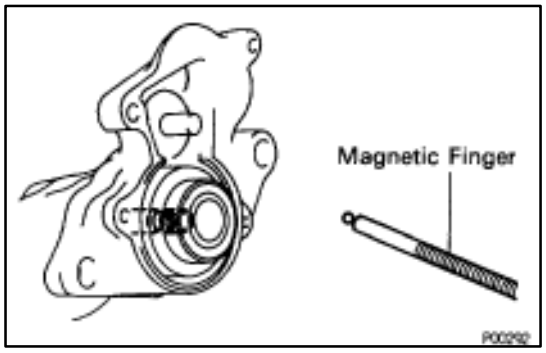


(a) Remove the two screws.



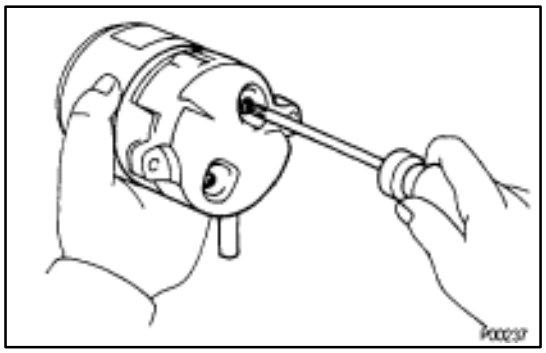
(b) Remove the following parts from the magnetic switch assembly:
(1) Starter housing and clutch assembly
(2) Return spring
(3) Roller
(4) Retainer
(5) Idler gear

3. REMOVE STEEL BALL

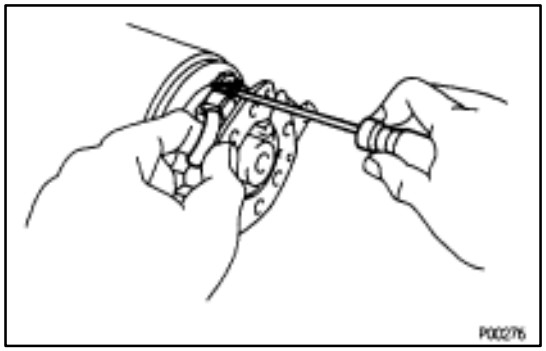


Using a magnetic finger, remove the steel ball from the clutch shaft hole.

4. REMOVE BRUSH HOLDER

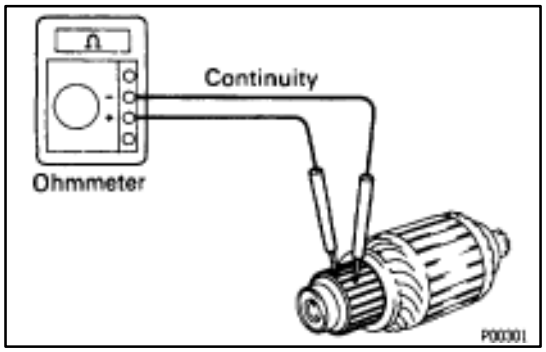


(a) Remove the two screws and end cover from the field frame.
(b) Remove the O–ring from the field frame.



(c) Using a screwdriver, hold the spring back and disconnect the brush from the brush holder. Disconnect the four brushes and remove the brush holder.

5. REMOVE ARMATURE FROM FIELD FRAME



STARTER INSPECTION AND REPAIR

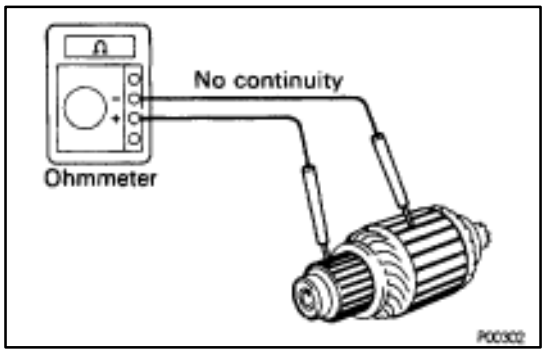
ST01G–01

Armature Coil

1. INSPECT COMMUTATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the segments of the commutator.

If there is no continuity between any segment, replace the armature.



2. INSPECT COMMUTATOR FOR GROUND

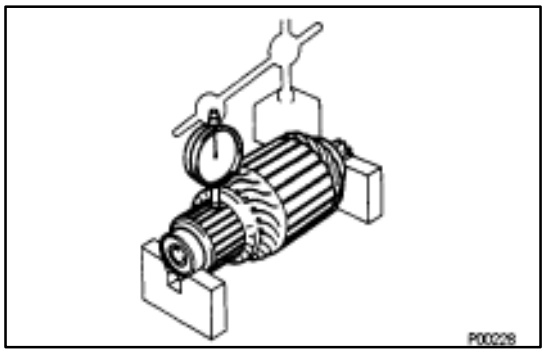
Using an ohmmeter, check that there is no continuity between the commutator and armature coil core.

If there is continuity, replace the armature.

Commutator

1. INSPECT COMMUTATOR FOR DIRTY AND BURNT SURFACES

If the surface is dirty or burnt, correct it with sandpaper (No.400) or on a lathe.



2. INSPECT COMMUTATOR CIRCLE RUNOUT

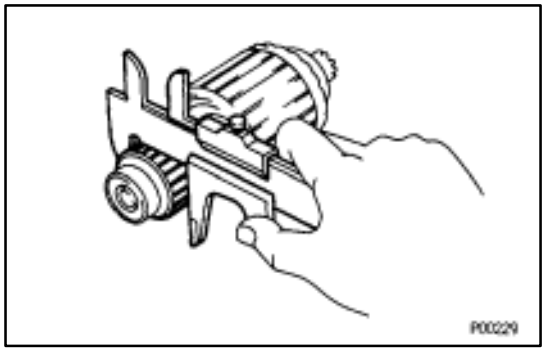
(a) Place the commutator on V–blocks.

(b) Using a dial gauge, measure the circle runout.

Maximum circle runout:

0.05 mm (0.0020 in.)

If the circle runout is greater than maximum, correct it on a lathe.



3. INSPECT COMMUTATOR DIAMETER

Using a vernier caliper, measure the commutator diameter.

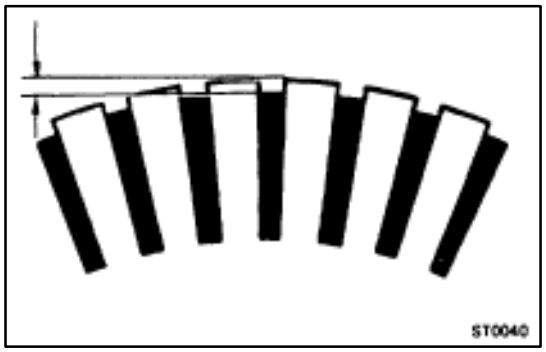
Standard diameter:

30 mm (1.18 in.)

Minimum diameter:

29 mm (1.14 in.)

If the diameter is less than minimum, replace the armature.



4. INSPECT UNDERCUT DEPTH

Check that the undercut depth is clean and free of foreign materials. Smooth out the edge.

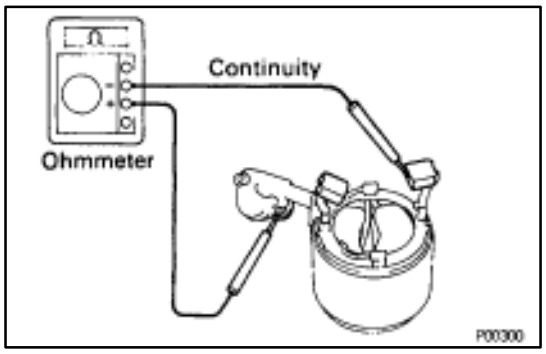
Standard undercut depth:

0.6 mm (0.024 in.)

Minimum undercut depth:

0.2 mm (0.008 in.)

If the undercut depth is less than minimum, correct it with a hacksaw blade.

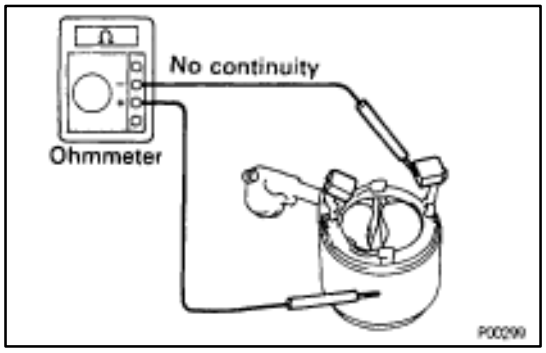


Field Frame (Field Coil)

1. INSPECT FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the lead wire and field coil brush lead.

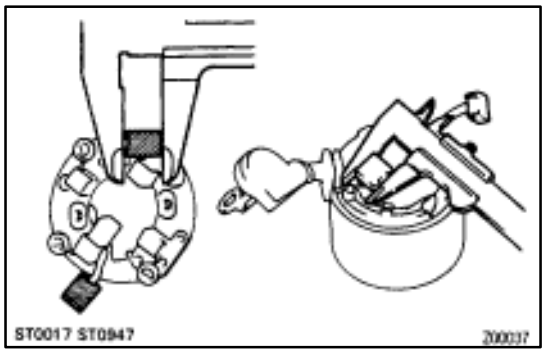
If there is no continuity, replace the field frame.



2. INSPECT FIELD COIL FOR GROUND

Using an ohmmeter, check that there is no continuity between the field coil end and field frame.

If there is continuity, repair or replace the field frame.



Brushes

INSPECT BRUSH LENGTH

Using a vernier caliper, measure the brush length.

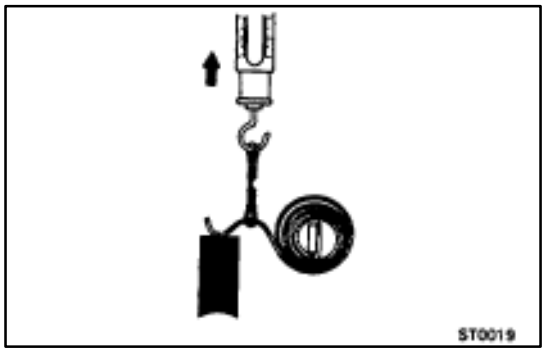
Standard length:

15.0 mm (0.591 in.)

Minimum length:

10.0 mm (0.394 in.)

If the length is less than minimum, replace the brush holder and field frame.



Brush Springs

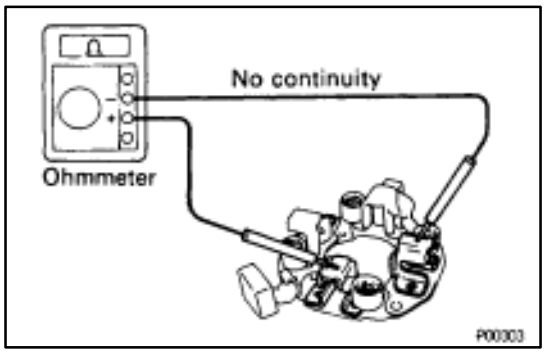
INSPECT BRUSH SPRING LOAD

Take the pull scale reading the instant the brush spring separates from the brush.

Spring installed load:

18–24 N (1.79–2.41 kgf, 3.9–5.3 lbf)

If the installed load is not within specification, replace the brush springs.



Brush Holder

INSPECT BRUSH HOLDER INSULATION

Using an ohmmeter, check that there is no continuity between the positive (+) and negative (–) brush holders.

If there is continuity, repair or replace the brush holder.

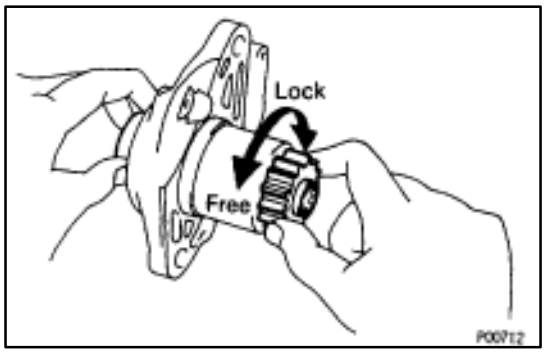
Clutch and Gears

1. INSPECT GEAR TEETH

Check the gear teeth on the pinion gear, idle gear and clutch assembly for wear or damage.

If damaged, replace the gear or clutch assembly.

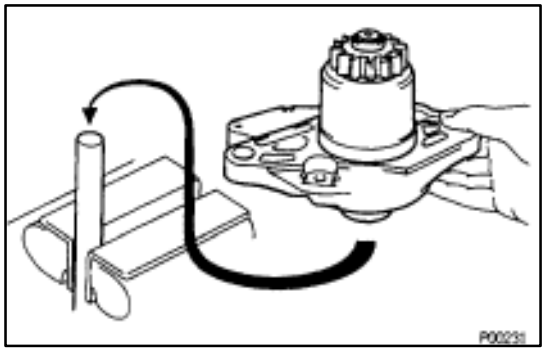
If damaged, also check the drive plate ring gear for wear or damage.



2. INSPECT CLUTCH PINION GEAR

Hold the starter clutch and rotate the pinion gear counterclockwise, and check that it turns freely. Try to rotate the pinion gear clockwise and check that it locks.

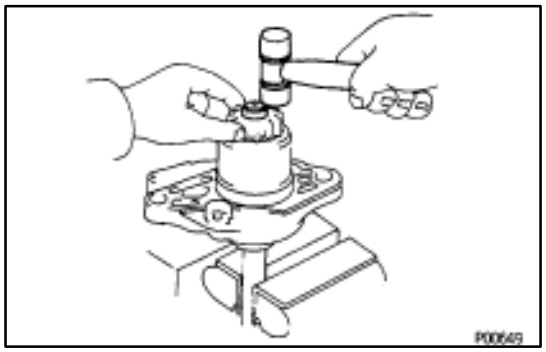
If necessary, replace the clutch assembly.



3. IF NECESSARY, REPLACE CLUTCH ASSEMBLY

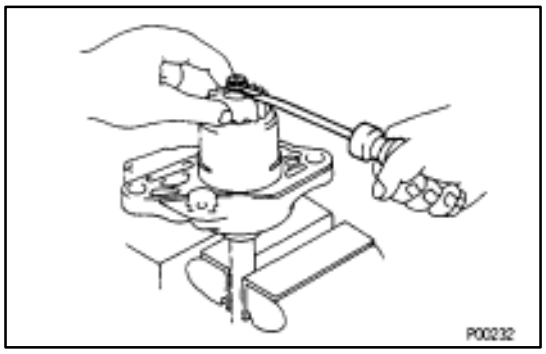
A. Disassembly of starter housing and clutch assembly

(a) Mount a brass bar in a vise, and install the starter housing and clutch assembly to the brass bar.

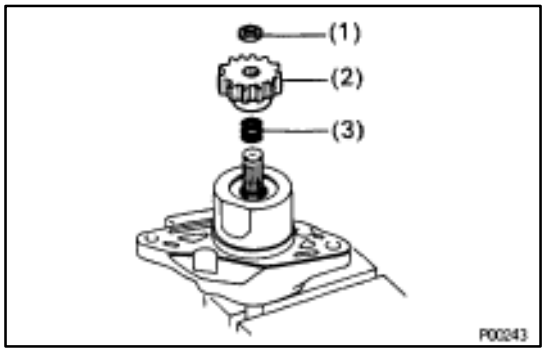


(b) Push down the pinion gear

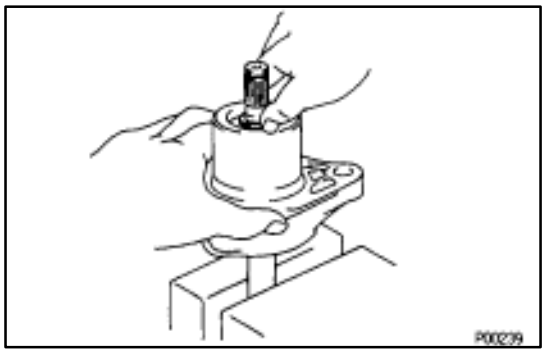
(c) Using a plastic–faced hammer, tap down the stop collar.



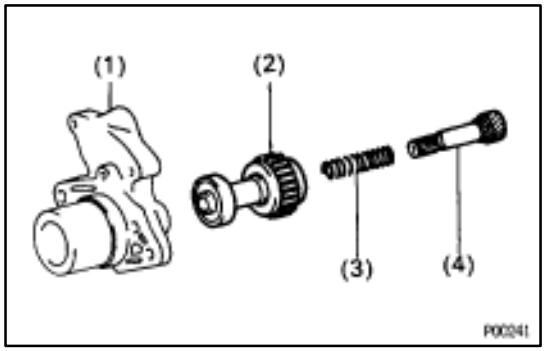
(d) Using a screwdriver, pry out the snap ring.



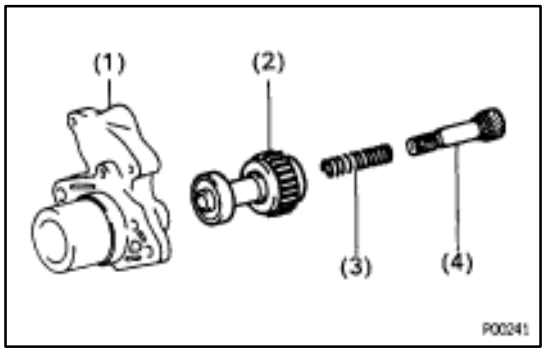
(e) Remove the following parts:
   (1) Stop collar
   (2) Pinion gear
   (3) Compression spring



(f) Push down the starter housing, and remove the spring retainer.

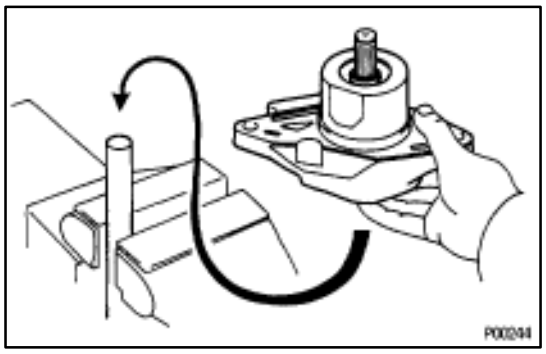


(g) Disassemble the following parts:
(1) Starter housing
(2) Starter clutch
(3) Compression spring
(4) Clutch shaft

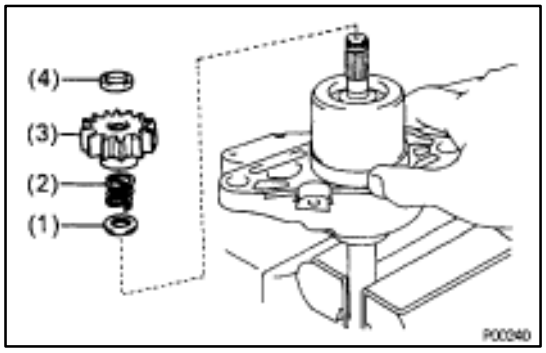


B. Assemble starter housing and clutch assembly

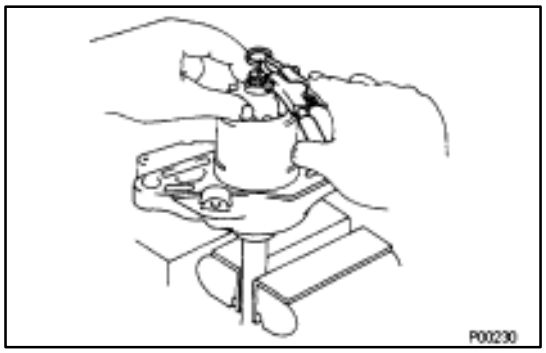
(a) Assemble the following parts:
(1) Starter housing
(2) Starter clutch
(3) Compression spring
(4) Clutch shaft



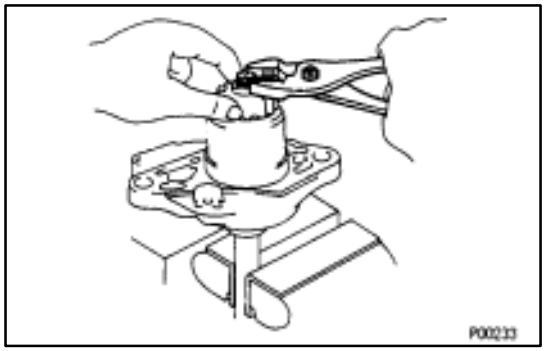
(b) Mount a brass bar in a vise, install the starter housing and clutch assembly to the brass bar.



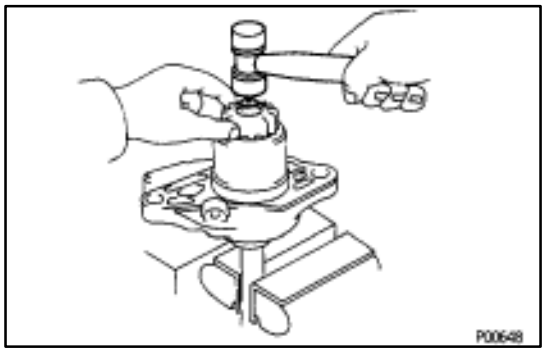
(c) Push down the starter housing, and install the following parts:
(1) Spring retainer
(2) Compression spring
(3) Pinion gear
(4) Stop collar



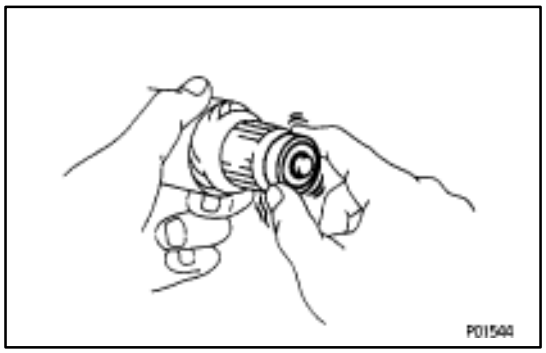
(d) Push down the pinion gear.
(e) Using snap ring pliers, install a new snap ring.



(f) Using pliers, compress the snap ring.
(g) Check that the snap ring fits correctly.



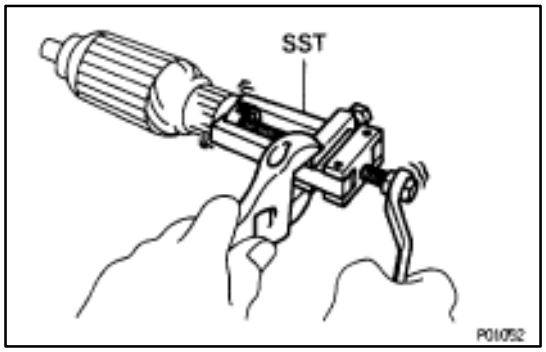
(h) Remove the starter housing and clutch assembly from the brass bar.
(i) Using a plastic–faced hammer, tap the clutch shaft and install the stop collar onto the snap ring.



Bearings

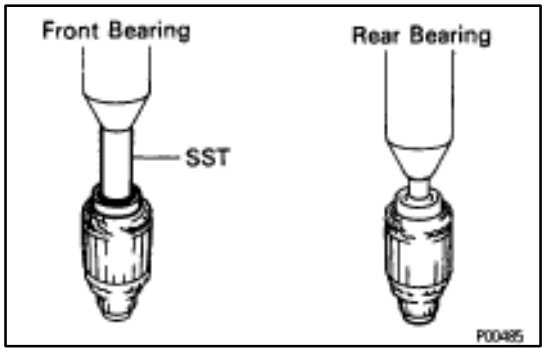
1. INSPECT BEARINGS

Turn each bearing by hand while applying inward force.
If resistance is felt or the bearing sticks, replace the bearing.

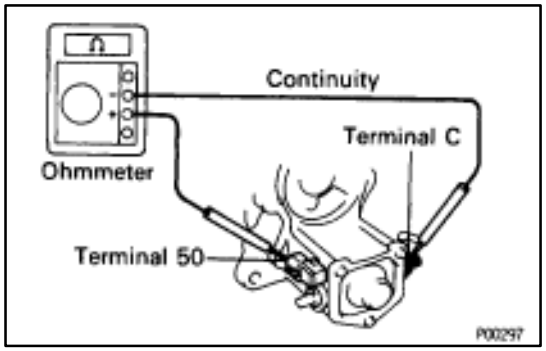


2. IF NECESSARY, REPLACE BEARING

(a) Using SST, remove the bearing.
SST 09286–46011



(b) Using SST and a press, press in a new front bearing.
SST 09820–00030
(c) Using a press, press in a new rear bearing.

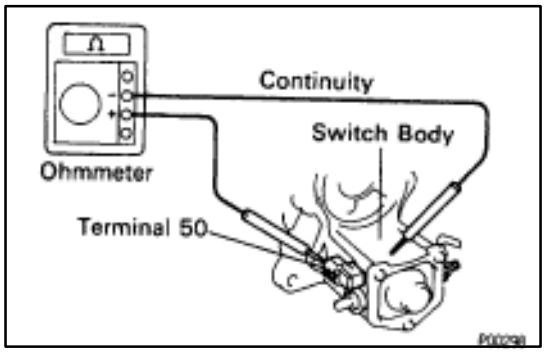


Magnetic Switch

1. PERFORM PULL–IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminals 50 and C.

If there is no continuity, replace the magnetic switch.



2. PERFORM HOLD–IN COIL OPEN CIRCUIT TEST

Using an ohmmeter, check that there is continuity between terminal 50 and the switch body.

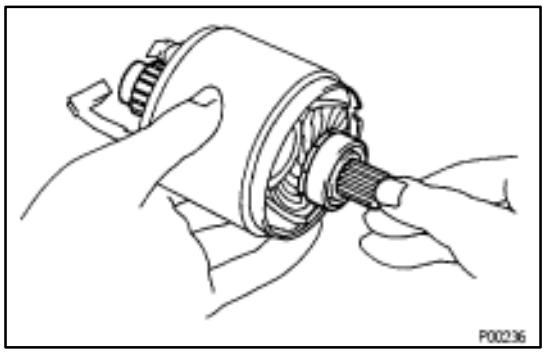
If there is no continuity, replace the magnetic switch.

STARTER ASSEMBLY

ST01J–02

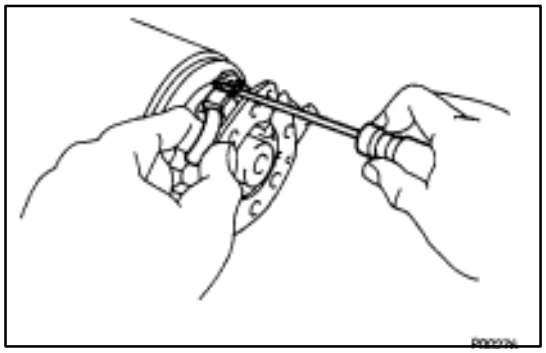
(See page ST–6)

HINT: Use high–temperature grease to lubricate the bearings and gears when assembling the starter.



1. PLACE ARMATURE INTO FIELD FRAME

Apply grease to the armature bearings, and insert the armature into the field frame.

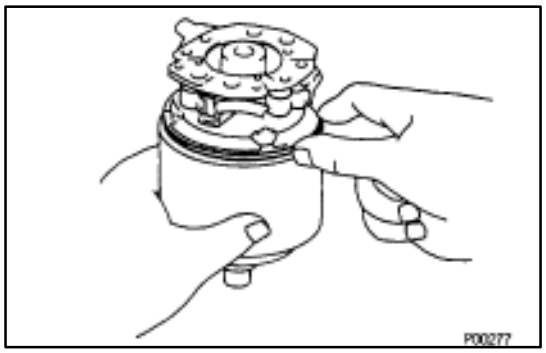


2. INSTALL BRUSH HOLDER

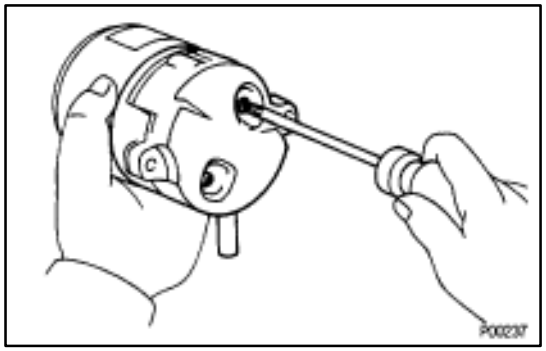
(a) Place the brush holder on the armature.

(b) Using a screwdriver, hold the brush spring back, and connect the brush into the brush holder. Connect the four brushes.

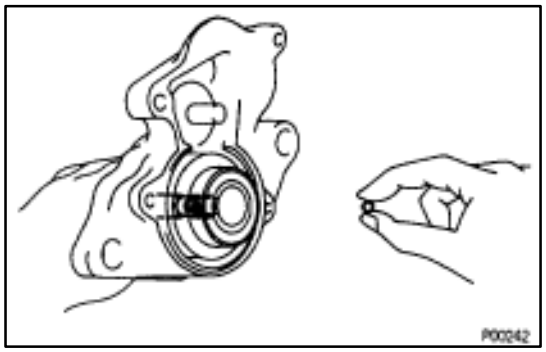
NOTICE: Check that the positive (+) lead wires are not grounded.



(c) Place a new O–ring in position on the field frame.

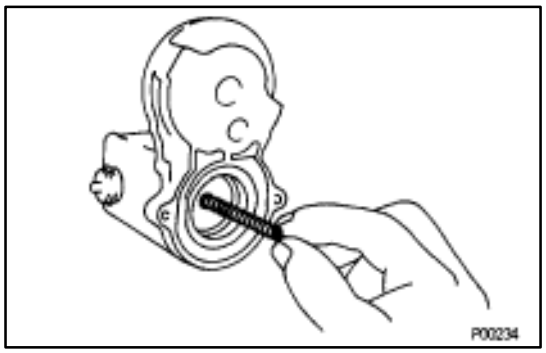


(d) Install a new O–ring to the end cover screw.
(e) Install the end cover to the field frame with the two screws.



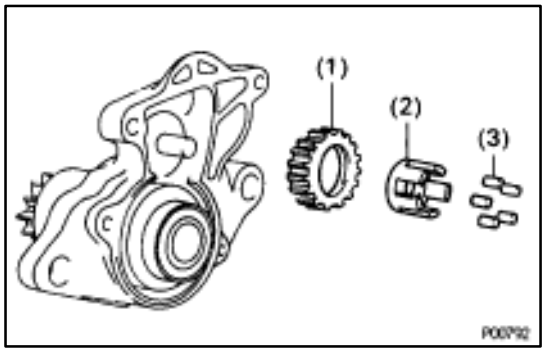
3. INSERT STEEL BALL INTO CLUTCH SHAFT HOLE

(a) Apply grease to the steel ball.
(b) Insert the steel ball into the clutch shaft hole.

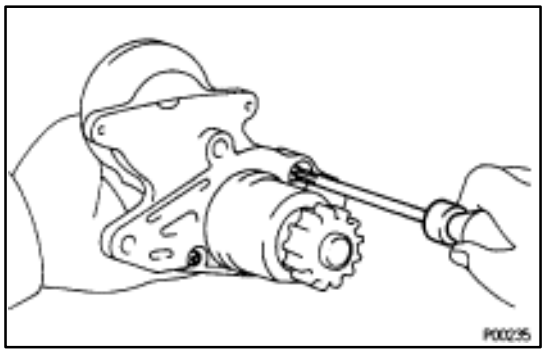


4. INSTALL STARTER HOUSING, CLUTCH ASSEMBLY AND GEAR

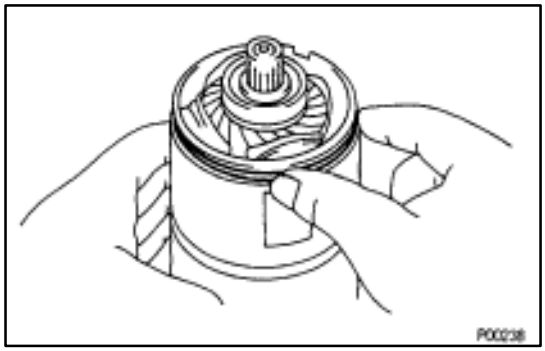
(a) Apply grease to the return spring.
(b) Insert the return spring into the magnetic switch hole.



(c) Place the following parts in position on the starter housing:
    (1) Idler gear
    (2) Retainer
    (3) Roller

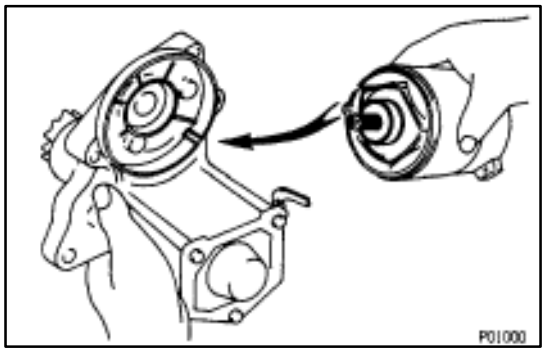


(d) Assemble the starter housing and magnetic switch assembly and install the two screws.

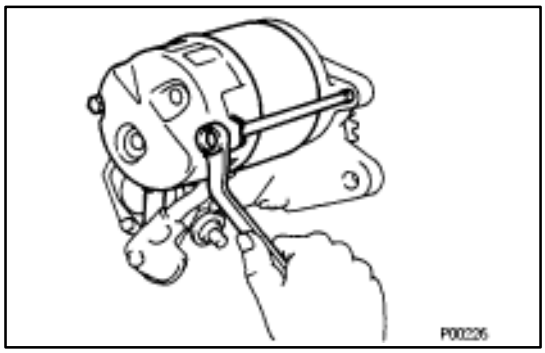


5. INSTALL FIELD FRAME AND ARMATURE ASSEMBLY

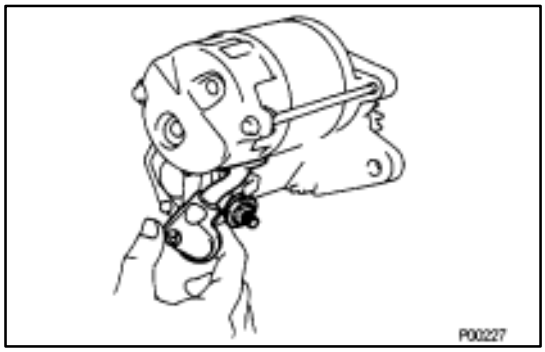
(a) Place a new O–ring in position on the field frame.



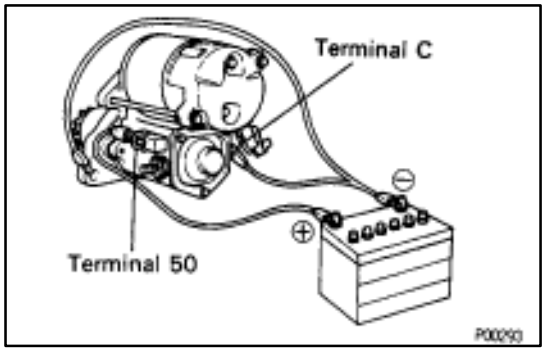
(b) Align the protrusion of the field frame with the cutout of the magnetic switch.



(c) Install the field frame and armature assembly with the two through bolts.



(d) Connect the lead wire to terminal C, and install the nut.



STARTER PERFORMANCE TEST

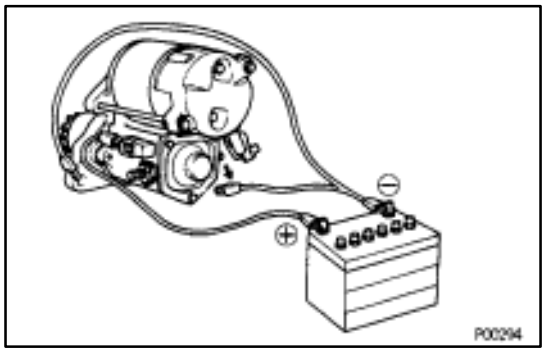
ST01L–01

NOTICE: These tests must be performed within 3 to 5 seconds to avoid burning out the coil.

1. PERFORM PULL–IN TEST

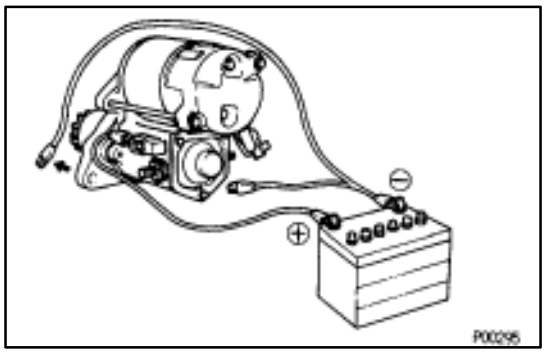
(a) Disconnect the field coil lead wire from terminal C.

(b) Connect the battery to the magnetic switch as shown.
Check that the clutch pinion gear moves outward.
If the clutch pinion gear does not move, replace the magnetic switch assembly.



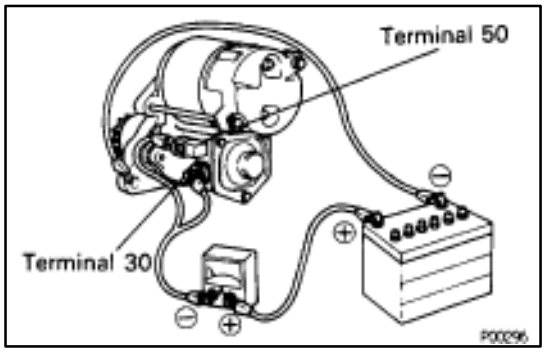
2. PERFORM HOLD–IN TEST

With battery connected as above with the clutch pinion gear out, disconnect the negative (–) lead from terminal C. Check that the pinion gear terminals out.
If the clutch pinion gear returns inward, replace the magnetic switch assembly.



3. INSPECT CLUTCH PINION GEAR RETURN

Disconnect the negative (–) lead from the switch body.
Check that the clutch pinion gear returns inward.
If the clutch pinion gear does not return, replace the magnetic switch assembly.



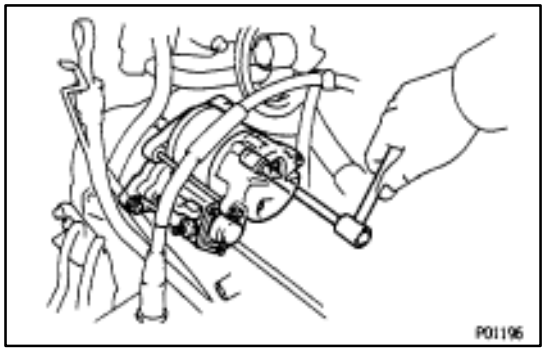
4. PERFORM NO–LOAD PERFORMANCE TEST

(a) Connect the battery and ammeter to the starter as shown.

(b) Check that the starter rotates smoothly and steadily with the pinion gear moving out. Check that the ammeter shows the specified current.

Specified current:

90 A or less at 11.5 V



STARTER INSTALLATION

ST01M–02

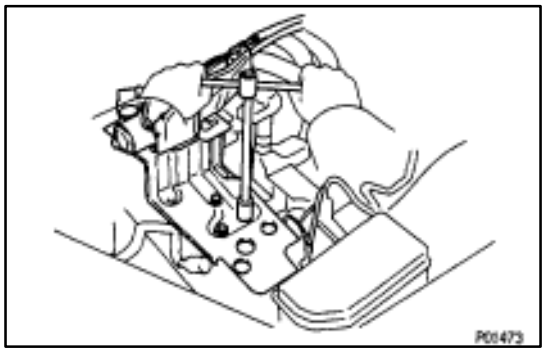
(See page ST–5)

1. INSTALL STARTER

(a) Install the starter with the two bolts.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(b) Connect the starter wire with the nut.

(c) Connect the starter connector.



2. INSTALL CRUISE CONTROL ACTUATOR

(a) Install the cruise control actuator with the three bolts.

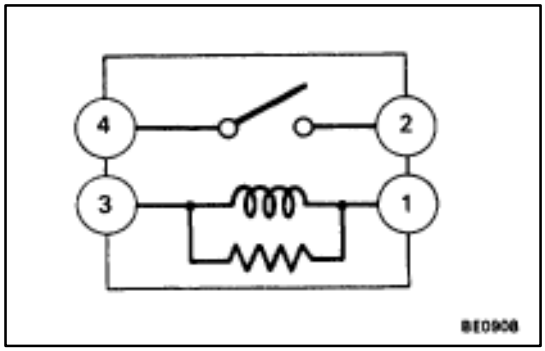
(b) Connect the actuator connector.

(c) Install the actuator cover.

3. INSTALL BATTERY

4. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

5. CHECK THAT ENGINE STARTS

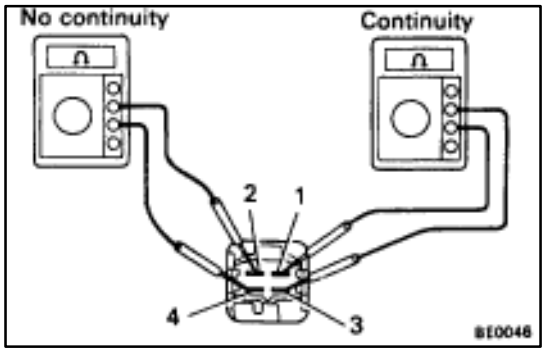


STARTER RELAY

STARTER RELAY INSPECTION

ST01H–02

LOCATION: (See page ST–2)

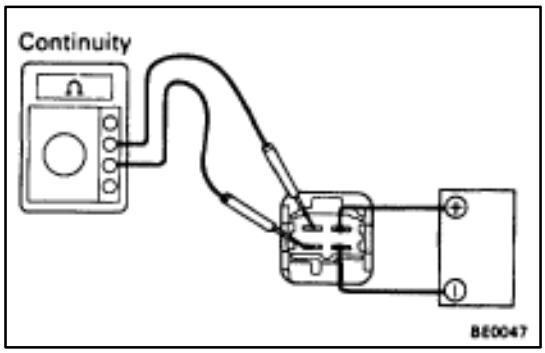


1. INSPECTION RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 3.

(b) Check that there is no continuity between terminals 2 and 4.

If continuity is not as specified, replace the relay.



2. INSPECT RELAY OPERATION

(a) Apply battery voltage across terminals 1 and 3.

(b) Using an ohmmeter, check that there is continuity between terminals 2 and 4.

If operation is not as specified, replace the relay.

CLUTCH START SWITCH

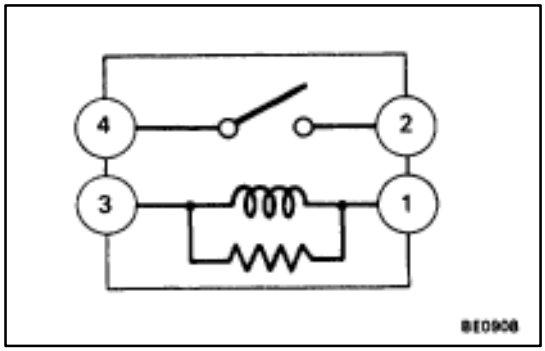
ST01K–01

(See MX section)

NEUTRAL START SWITCH

ST01N–01

(See AX section)

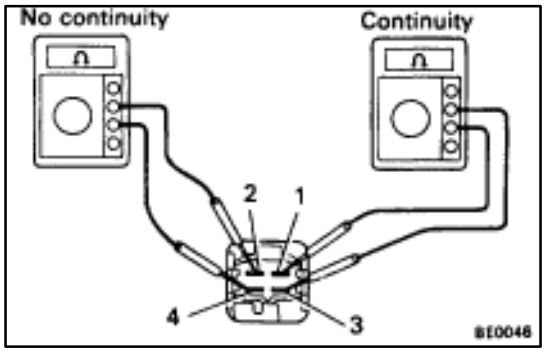


STARTER RELAY

STARTER RELAY INSPECTION

ST01H–02

LOCATION: (See page ST–2)



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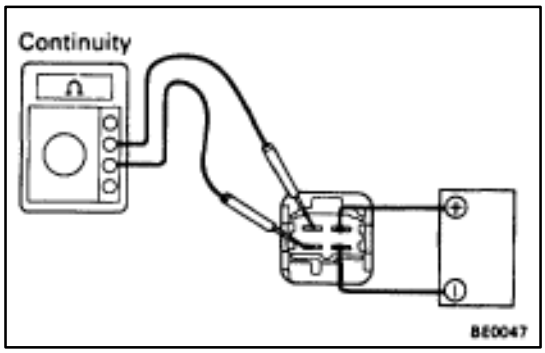


2. INSPECT RELAY OPERATION

(a) Apply battery voltage across terminals 1 and 3.

(b) Using an ohmmeter, check that there is continuity between terminals 2 and 4.

If operation is not as specified, replace the relay.

CLUTCH START SWITCH

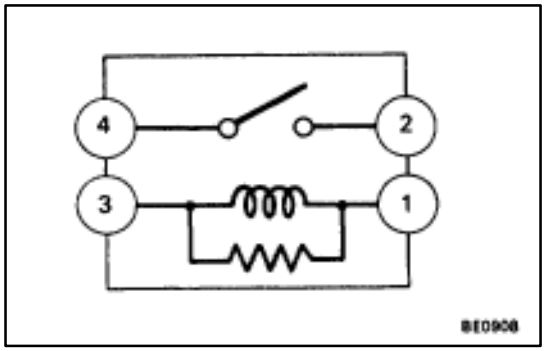
ST01K–01

(See MX section)

NEUTRAL START SWITCH

ST01N–01

(See AX section)

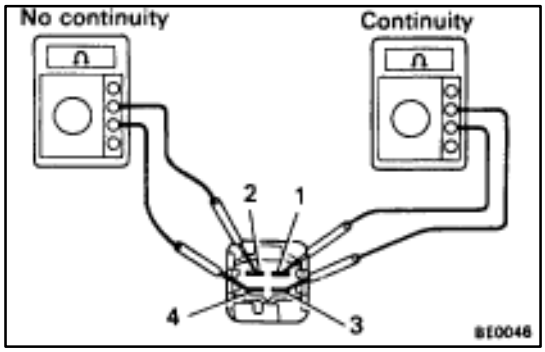


STARTER RELAY

STARTER RELAY INSPECTION

ST01H–02

LOCATION: (See page ST–2)



1. INSPECTION RELAY CONTINUITY

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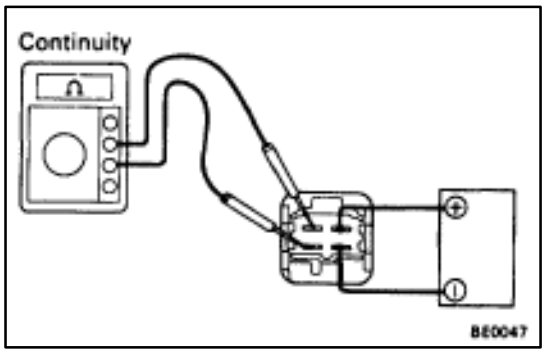
(b) Check that there is no continuity between terminals 2 and 4.

If continuity is not as specified, replace the relay.



2. INSPECT RELAY OPERATION

(a) Apply battery voltage across terminals 1 and 3.

(b) Using an ohmmeter, check that there is continuity between terminals 2 and 4.

If operation is not as specified, replace the relay.

CLUTCH START SWITCH

ST01K–01

(See MX section)

NEUTRAL START SWITCH

ST01N–01

(See AX section)

SERVICE SPECIFICATIONS

SERVICE DATA

ST01P–01

Starter	Rated voltage and output power	12 V 1.4 kW
	No–load characteristics (Current)	90 A or less at 11.5 V
	No–load characteristics (rpm)	3,000 rpm or more
	Brush length (STD)	15.0 mm (0.591 in.)
	Brush length (Minimum)	10.0 mm (0.394 in.)
	Spring installed load	18–24 N (1.79–2.41 kgf, 3.9–5.3 lbf)
	Commutator	
	Diameter (STD)	30 mm (1.18 in.)
	Diameter (Minimum)	29 mm (1.14 in.)
	Undercut depth (STD)	0.6 mm (0.024 in.)
	Undercut depth (Minimum)	0.2 mm (0.008 in.)
	Circle runout (Maximum)	0.05 mm (0.0020 in.)

TORQUE SPECIFICATIONS

ST01Q–01

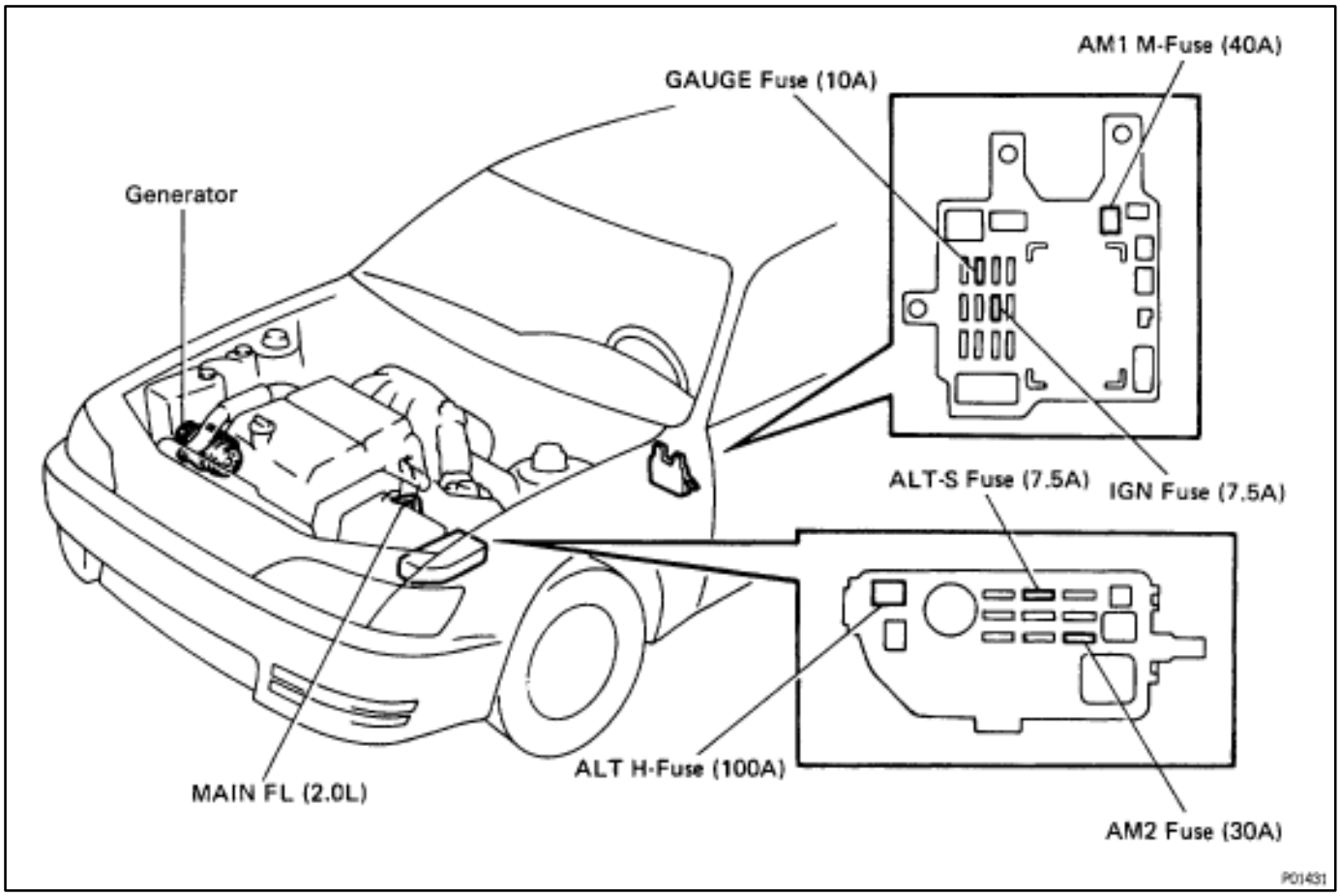
Part tightened	N·m	kgf·cm	ft·lbf
Starter mounting bolt	39	400	29

CHARGING SYSTEM

DESCRIPTION

CH00H–02

The generator is a small, high rpm, high performance type with an IC regulator incorporated. The IC regulator uses integrated circuits and controls the voltage produced by the generator.



PRECAUTIONS

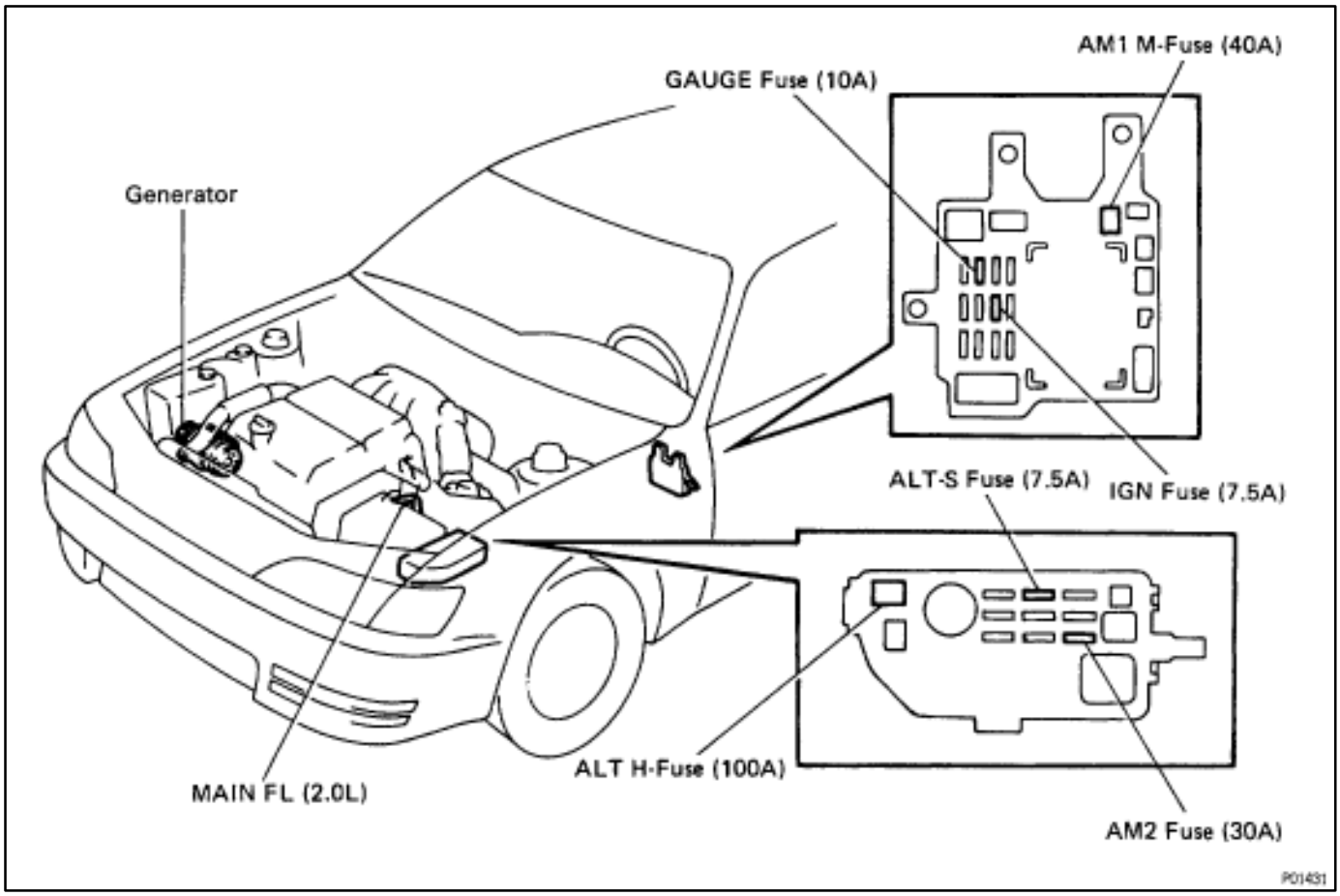
CH00K–01

1. **Check that the battery cables are connected to the correct terminals.**
2. **Disconnect the battery cables when the battery is given a quick charge.**
3. **Do not perform tests with a high voltage insulation resistance tester.**
4. **Never disconnect the battery while the engine is running.**

DESCRIPTION

CH00H–02

The generator is a small, high rpm, high performance type with an IC regulator incorporated. The IC regulator uses integrated circuits and controls the voltage produced by the generator.



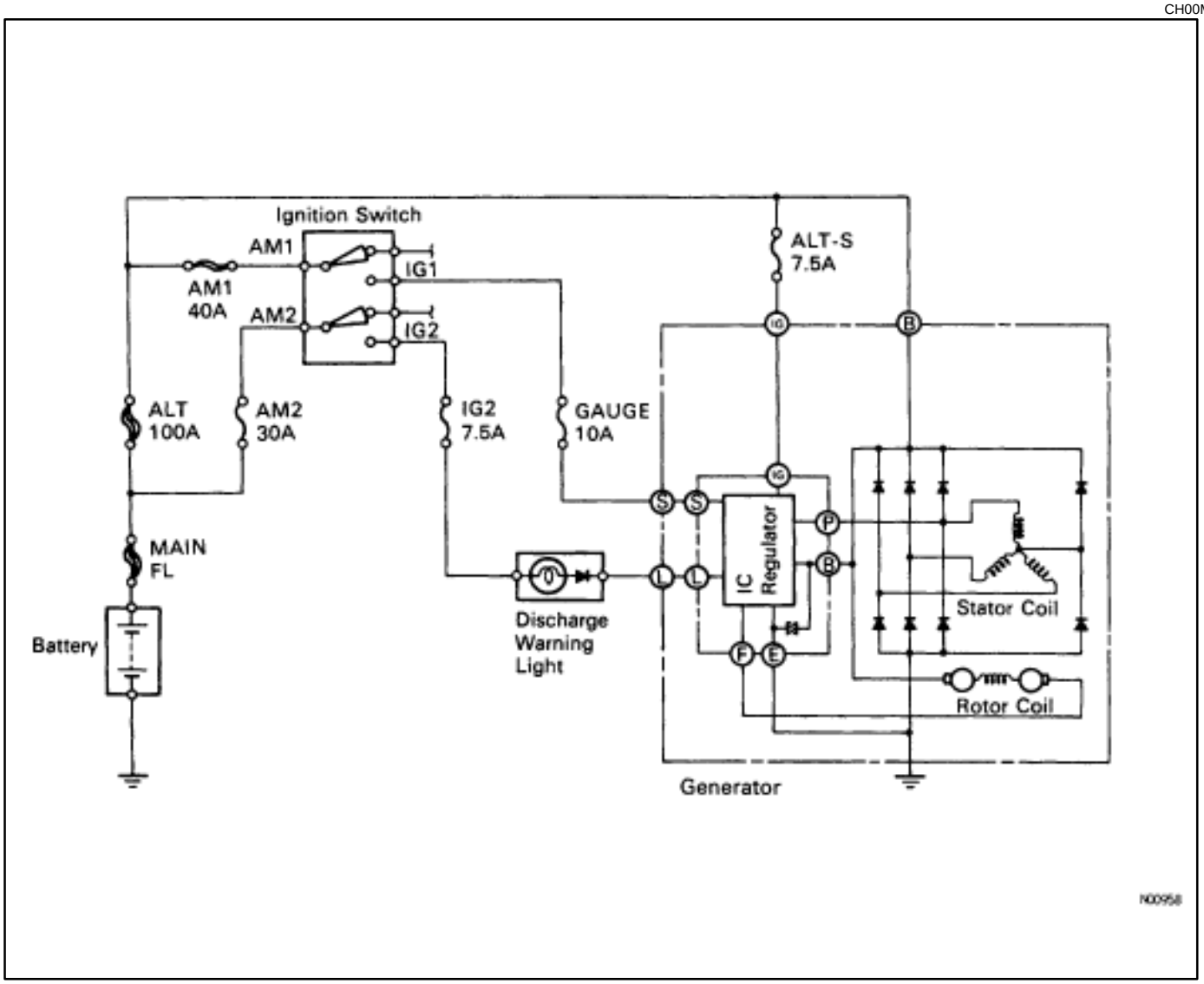
PRECAUTIONS

CH00K–01

1. **Check that the battery cables are connected to the correct terminals.**
2. **Disconnect the battery cables when the battery is given a quick charge.**
3. **Do not perform tests with a high voltage insulation resistance tester.**
4. **Never disconnect the battery while the engine is running.**

SYSTEM CIRCUIT

CH00M–01



OPERATION

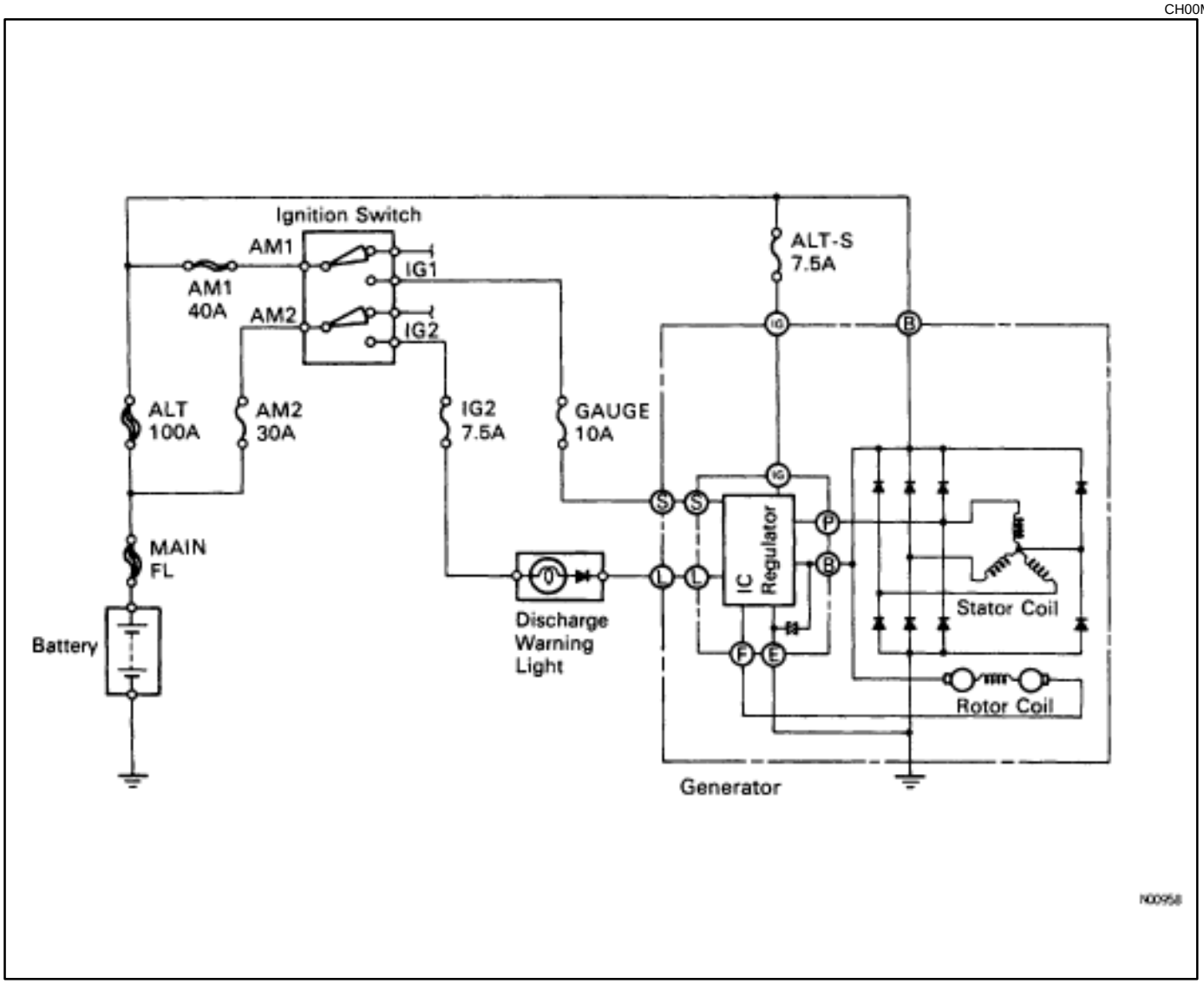
CH00P–01

When the ignition switch is turned ON, current from the battery flows from terminal L of the generator through the IC regulator to terminal E, causing the discharge warning light to light up. Then when the engine is started, the voltage output increases as the generator rpm increases. When the voltage output becomes greater than the battery positive voltage, current for recharging flows from terminal B.

Simultaneously, voltage at terminal L increases and the potential difference between battery and terminal L disappears, causing the discharge warning light to go off. When the voltage output exceeds the regulator adjustment voltage, the transistor inside the IC regulator regulates the voltage so that the voltage from the generator remains constant.

SYSTEM CIRCUIT

CH00M–01



OPERATION

CH00P–01

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PREPARATION

SST (SPECIAL SERVICE TOOLS)

CH00R–01

	09285–76010	Injection Pump Camshaft Bearing Cone Replacer	Rotor rear bearing cover
	09286–46011	Injection Pump Spline Shaft Puller	Rectifier end frame
	09608–20012	Front Hub & Drive Pinion Bearing Tool Set	
	(09608–00030)	Replacer	Rotor front bearing
	09820–00021	Alternator Rear Bearing Puller	
	09820–00030	Alternator Rear Bearing Replacer	Rotor rear bearing
	09820–63010	Alternator Pulley Set Nut Wrench Set	

RECOMMENDED TOOLS

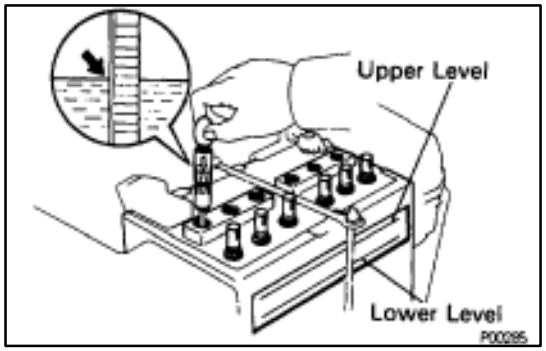
CH00T–01

	09082–00015	TOYOTA Electrical Tester

EQUIPMENT

CH00V–01

Ammeter(A)	
Battery specific gravity gauge	Battery
Belt tension gauge	
Torque wrench	
Vernier calipers	Rotor (Slip ring)



ON–VEHICLE INSPECTION

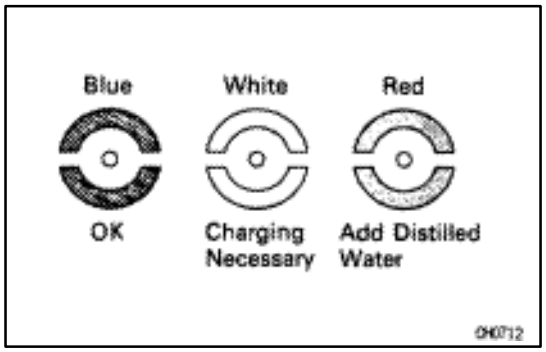
CH00X–01

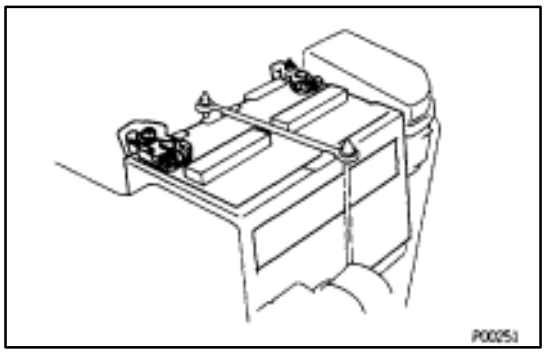
1. CHECK BATTERY SPECIFIC GRAVITY AND ELECTROLYTE LEVEL

(a) Check the electrolyte level of each cell.
If insufficient, refill with distilled (or purified) water.

(b) Check the specific gravity of each cell.
Standard specific gravity at 20°C (68°F):
1.25–1.27 (55D23L Battery)
1.27–1.29 (80D26L Battery)

If not within specifications, charge the battery.
HINT: Check the indicator as shown.

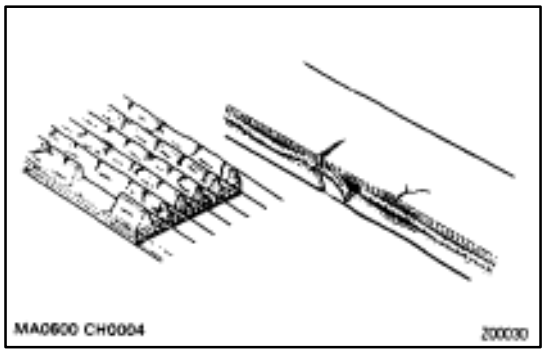




2. CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

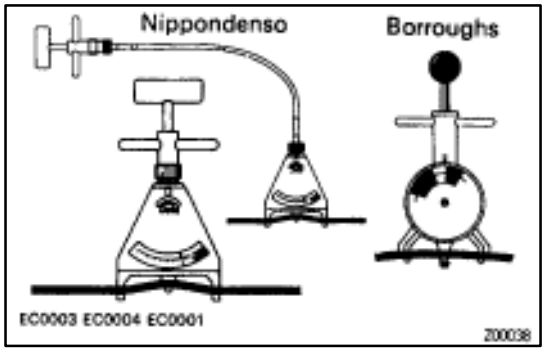
(a) Check that the battery terminals are not loose or corroded.

(b) Check the fusible link and fuses for continuity.
Fusible link:
MAIN 2.0 L
H–Fuse:
ALT 100 A
M–Fuse:
AM1 40 A
Fuse:
AM2 30 A
IG2 7.5 A
GAUGE 10 A
ALI–S 7.5 A



3. INSPECT DRIVE BELT

(a) Visually check the belt for excessive wear, frayed cords etc.
If any defect has been found, replace the drive belt.
HINT: Cranks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.



(b) Using a belt tension gauge, measure the drive belt tension.

Belt tension gauge:

Nippondenso BTG–20 (95506–00020)

Borroughs No. BT–33–73F

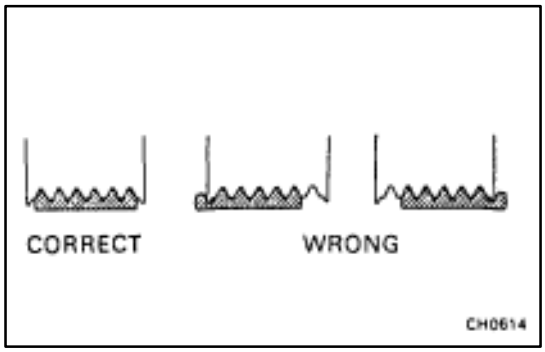
Drive belt tension:

New belt

175±5 lb

Used belt

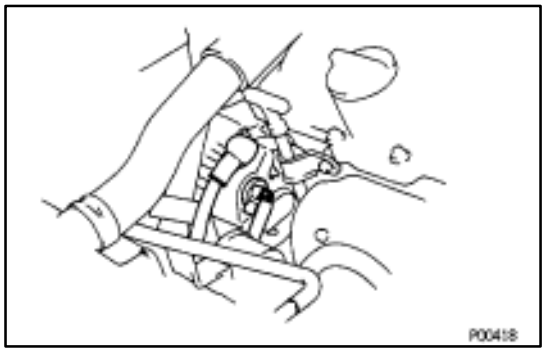
115±20 lb



If the belt tension is not as specified, adjust it.

HINT:

- "New belt" refers to a belt which has been used less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing a belt, check that it fits properly in the ribbed grooves.
- Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.
- After installing a new belt, run the engine for about 5 minutes and recheck the belt tension.



4. VISUALLY CHECK GENERATOR WIRING AND LISTEN FOR ABNORMAL NOISES

(a) Check that the wiring is in good condition.

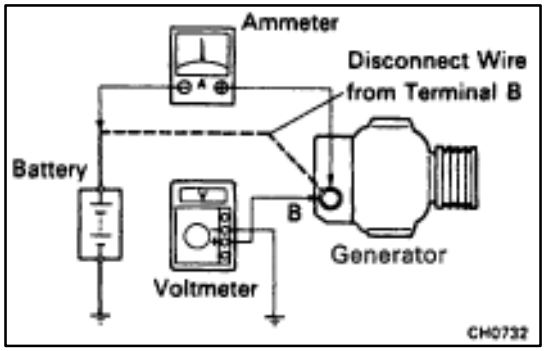
(b) Check that there is no abnormal noise from the generator while the engine is running.

5. INSPECT DISCHARGE WARNING LIGHT CIRCUIT

(a) Turn the ignition switch "ON". Check that the discharge warning light comes on.

(b) Start the engine. Check that the light goes off.

If the light does not operate as specified, troubleshoot the discharge warning light circuit.

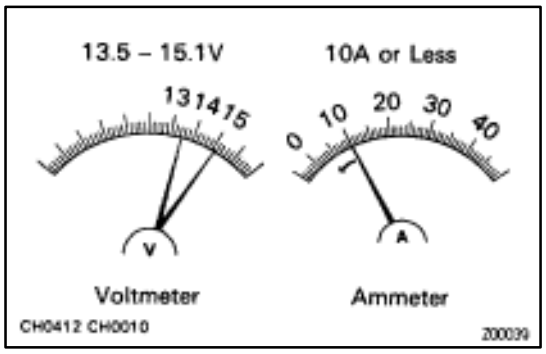


6. INSPECT CHARGING CIRCUIT WITHOUT LOAD

HINT: If a battery/generator tester is available, connect the tester to the charging circuit as per manufacturer's instructions.

(a) If a tester is not available, connect a voltmeter and ammeter to the charging circuit as follows:

- Disconnect the wire from terminal B of the generator and connect it to the negative (–) lead of the ammeter.
- Connect the positive (+) lead of the ammeter to terminal B of the generator.
- Connect the positive (+) lead of the voltmeter to terminal B of the generator.
- Ground the negative (–) lead of the voltmeter.



(b) Check the charging circuit as follows:

With the engine running from idle to 2,000 rpm, check the reading on the ammeter and voltmeter.

Standard amperage:

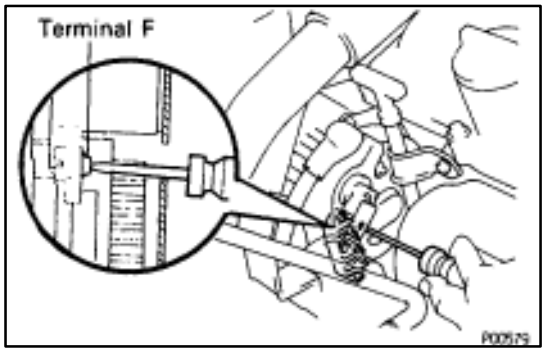
10 A or less

Standard voltage:

14.0–15.0 V at 25°C (77°F)

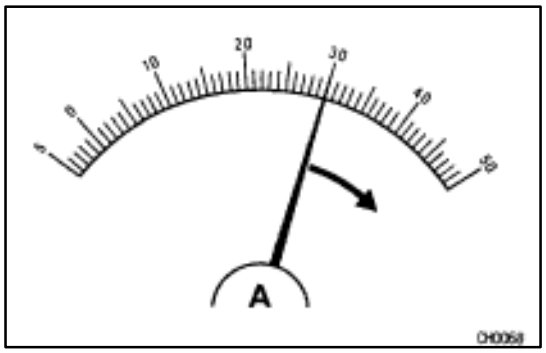
13.5–14.3 V at 115°C (239°F)

If the voltmeter reading is more than standard voltage, replace the IC regulator.



If the voltmeter reading is less than standard voltage, check the IC regulator and generator as follows:

- With terminal F grounded, start the engine and check the voltmeter reading of terminal B.
- If the voltmeter reading is more than standard voltage, replace the IC regulator.
- If the voltmeter reading is less than standard voltage, check the generator.



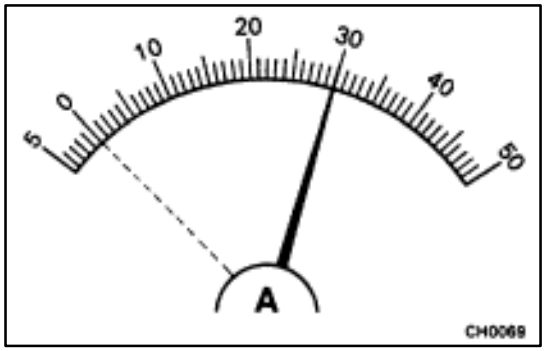
7. INSPECT CHARGING CIRCUIT WITH LOAD

(a) With the engine running at 2,000 rpm, turn on the high beam headlights and place the heater blower switch at "HI".

(b) Check the reading on the ammeter.

Standard amperage:

30 A or more

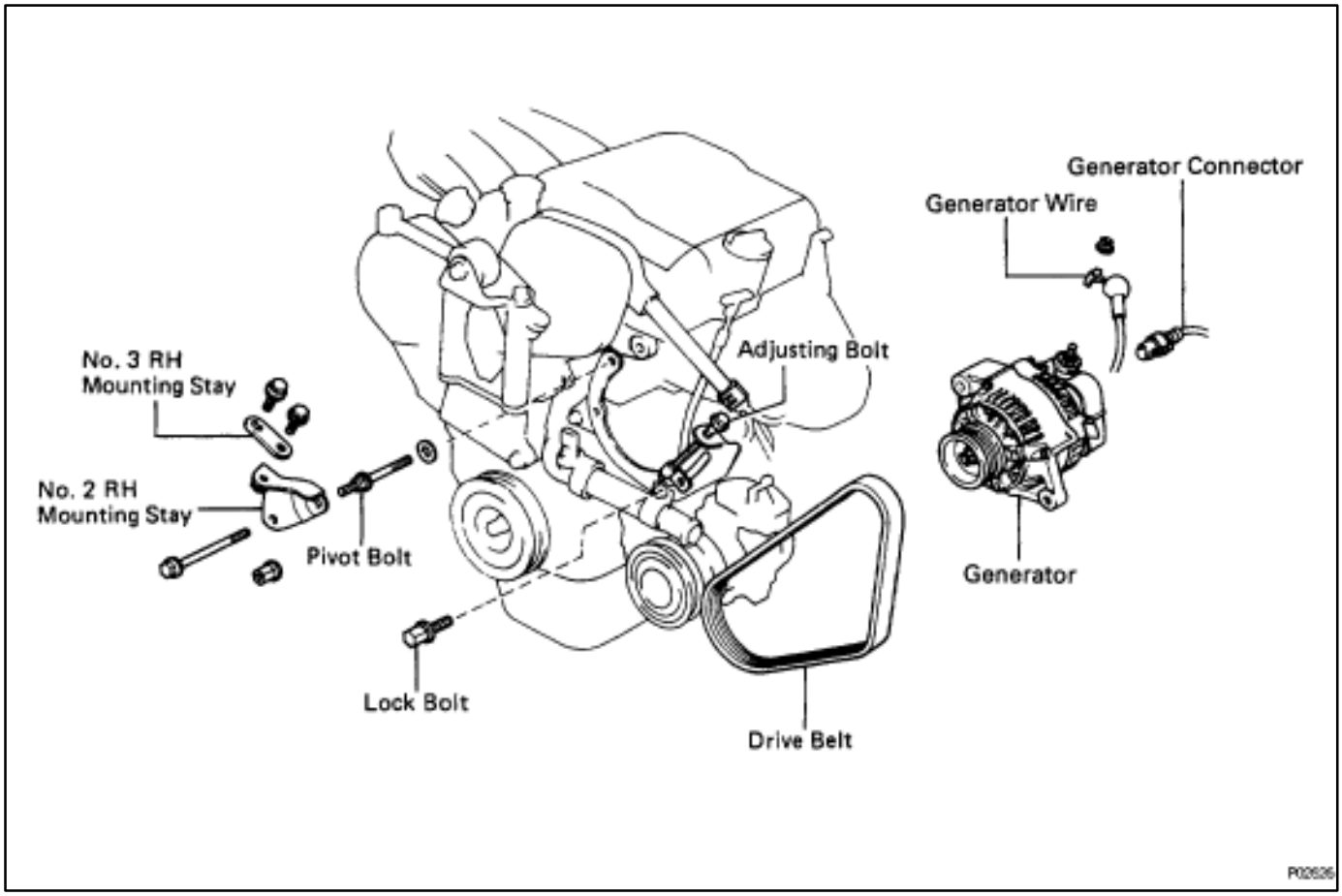


If the ammeter reading is less than the standard amperage, repair the generator. (See page CH–9)
HINT: If the battery is fully charged, the indication will sometimes be less than standard amperage.

GENERATOR

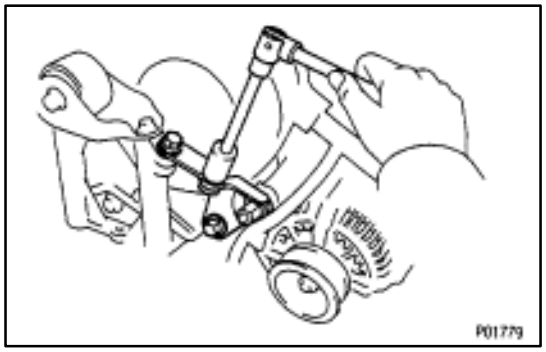
GENERATOR REMOVAL

CH00Z–02



1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

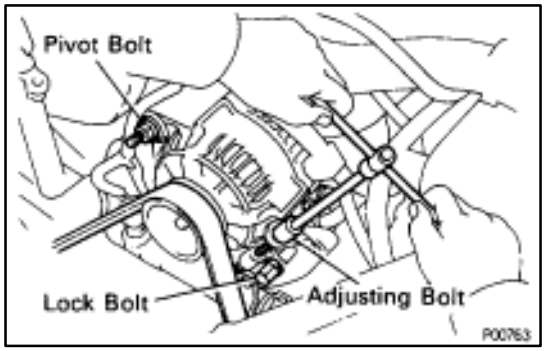
CAUTION (w / Airbag): Work must be started after approx. 30 seconds or longer from the time the ignition switch is turned to the "LOCK" position and the negative (–) terminal cable is disconnected from the battery.



2. REMOVE NO.2 AND NO.3 RH ENGINE MOUNTING STAYS

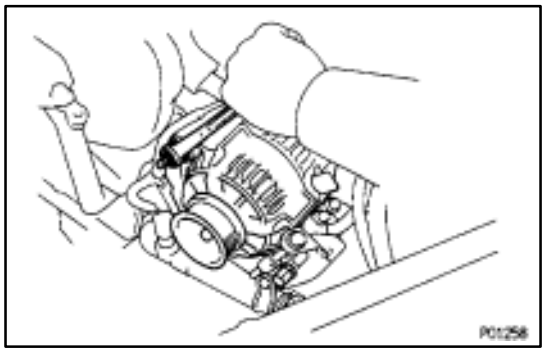
(a) Remove the two bolts and No.3 RH engine mounting stay.

(b) Remove the bolt, nut and No.2 RH engine mounting stay.



3. REMOVE DRIVE BELT

Loosen the pivot bolt and adjusting lock bolt, and remove the drive belt.

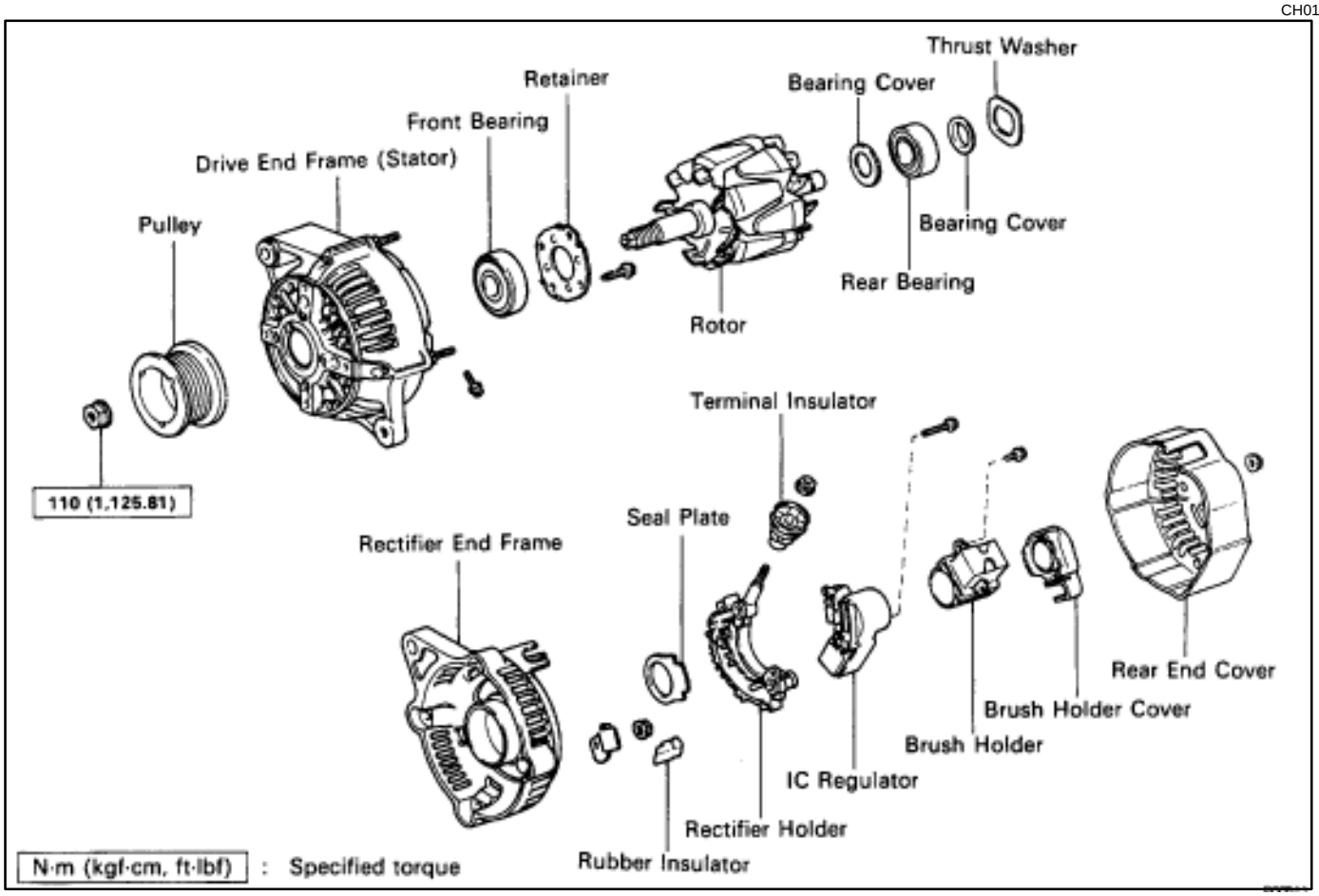


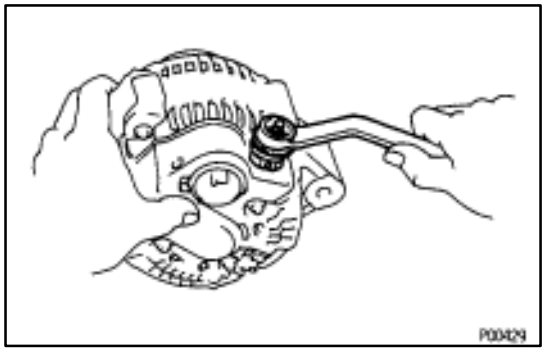
4. REMOVE GENERATOR

(a) Disconnect the generator connector.
(b) Remove the nut, and disconnect the generator wire.
(c) Disconnect the wire harness from the clip.
(d) Remove the pivot bolt, adjusting lock bolt and generator.

COMPONENTS

CH011–01



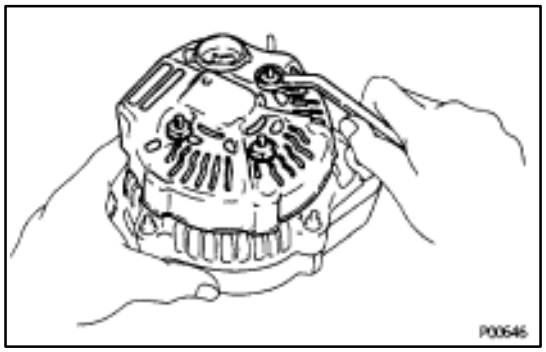


GENERATOR DISASSEMBLY

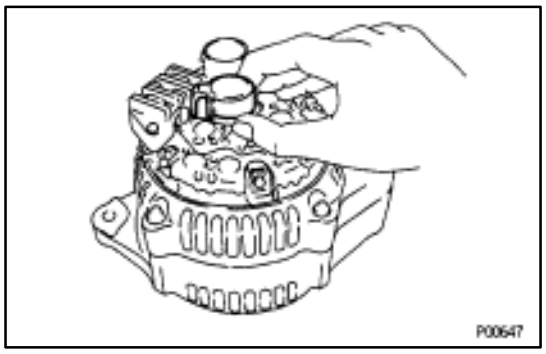
CH013–01

1. REMOVE REAR END COVER

(a) Remove the nut and terminal insulator.

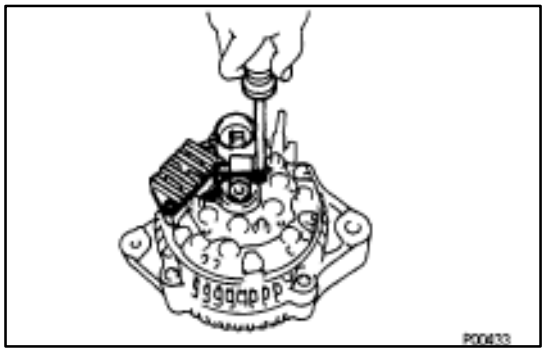


(b) Remove the three nuts and end cover.

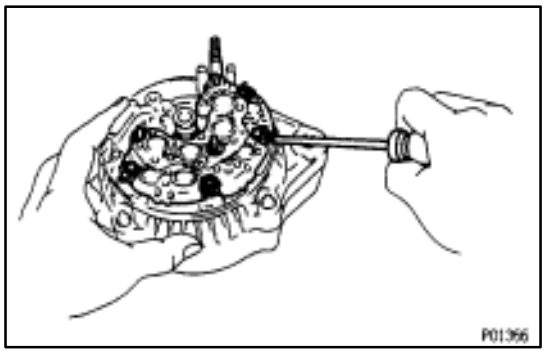


2. REMOVE BRUSH HOLDER AND IC REGULATOR

(a) Remove the brush holder cover from the brush holder.

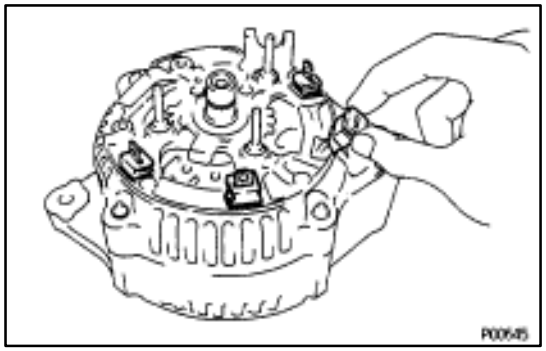


(b) Remove the five screws, brush holder and IC regulator.

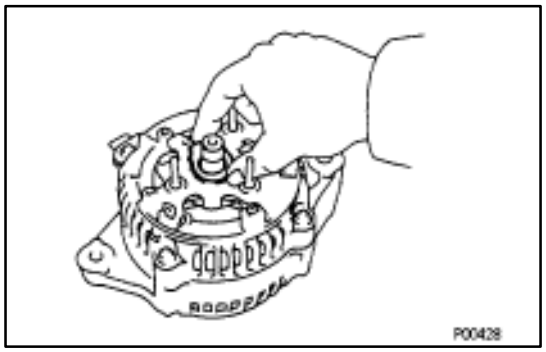


3. REMOVE RECTIFIER HOLDER

(a) Remove the four screws and rectifier holder.



(b) Remove the four rubber insulators.

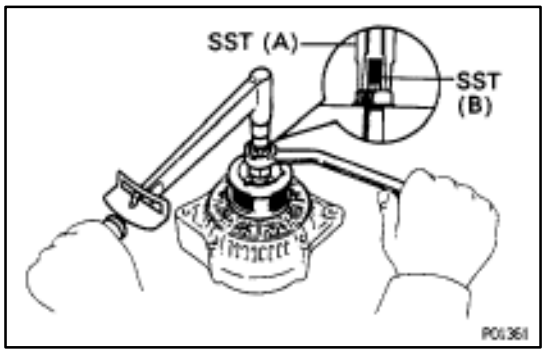


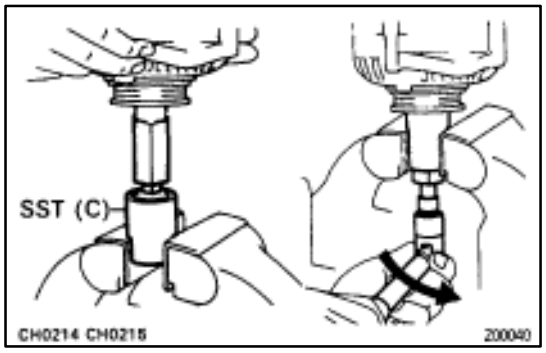
(c) Remove the seal plate.

4. REMOVE PULLEY

(a) Hold SST (a) with a torque wrench, and tighten SST (B) clockwise to the specified torque.
SST 09820–63010
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(b) Check that SST (A) is secured to the rotor shaft.





(c) As shown in the illustration, mount SST (c) in a vise, and install the generator to SST (C).

(d) To loosen the pulley nut, turn SST (A) in the direction shown in the illustration.
NOTICE: To prevent damage to the rotor shaft, do not loosen the pulley nut more than one–half of a turn.

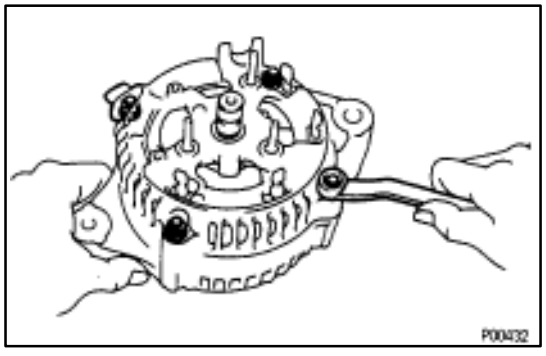
(e) Remove the generator from SST (C).

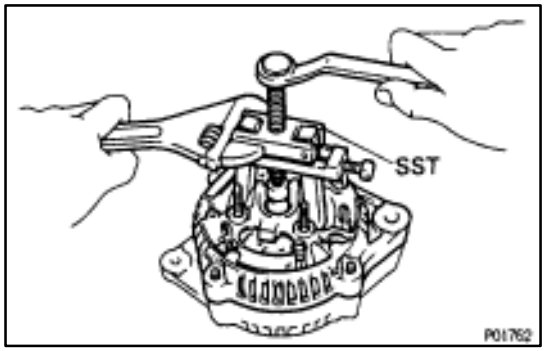
(f) Turn SST (B) and remove SST (A and B).

(g) Remove the pulley nut and pulley.

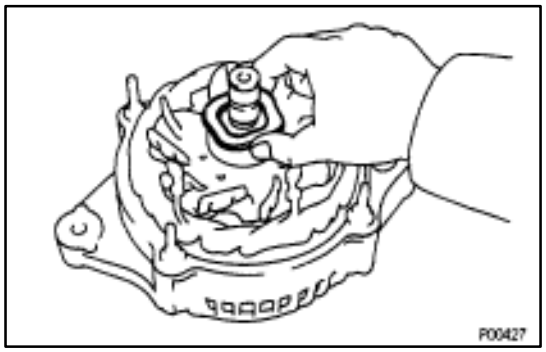
5. REMOVE RECTIFIER END FRAME

(a) Remove the four nuts and cord clip.

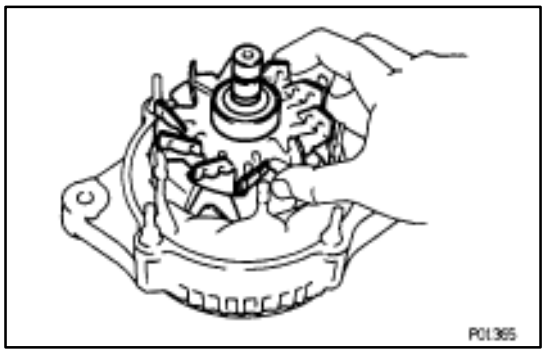




(b) Using SST, remove the rectifier end frame.
SST 09286–46011



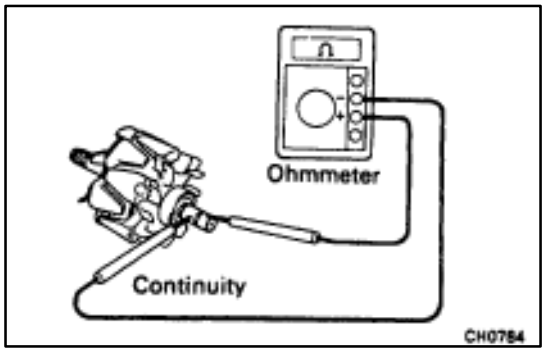
(c) Remove the thrust washer.

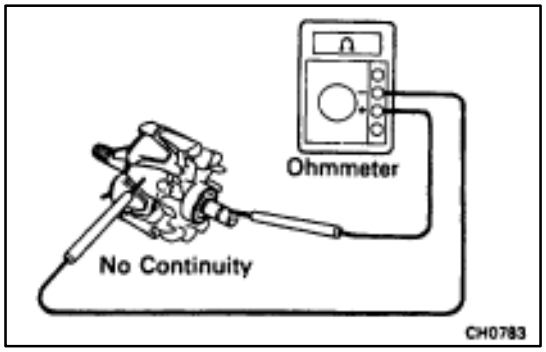


6. REMOVE ROTOR FROM DRIVE END FRAME

GENERATOR INSPECTION AND REPAIR

CH015–01





Rotor

1. INSPECT ROTOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the slip rings.

Standard resistance (Cold):

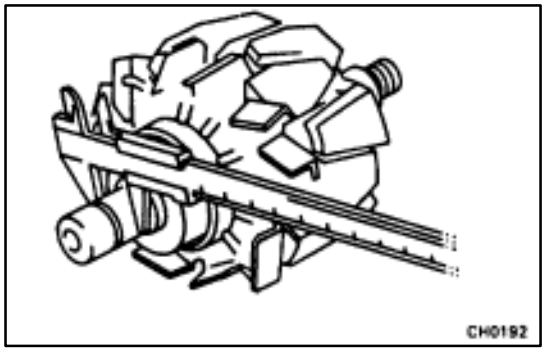
2.8–3.0 Ω

If there is no continuity, replace the rotor.

2. INSPECT ROTOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the slip ring and rotor.

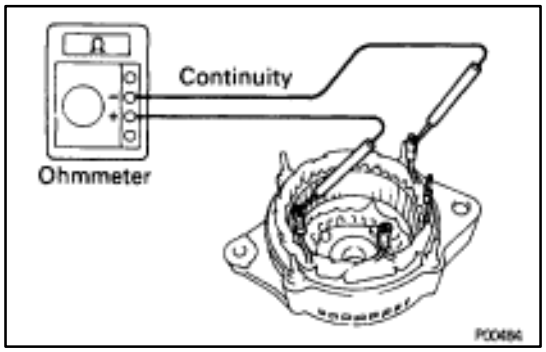
If there is continuity, replace the rotor.



3. INSPECT SLIP RINGS

(a) Check that the slip rings are not rough or scored.
If rough or scored, replace the rotor.

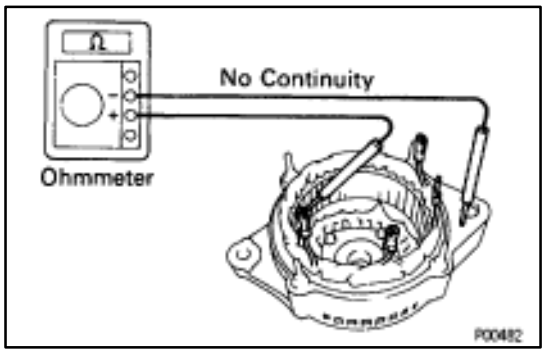
(b) Using a vernier caliper, measure the slip ring diameter.
Standard diameter:
4.2–14.4 mm (0.559–0.567 in.)
Minimum diameter:
12.8 mm (0.504 in.)
If the diameter is less than minimum, replace the rotor.



Stator (Drive End Frame)

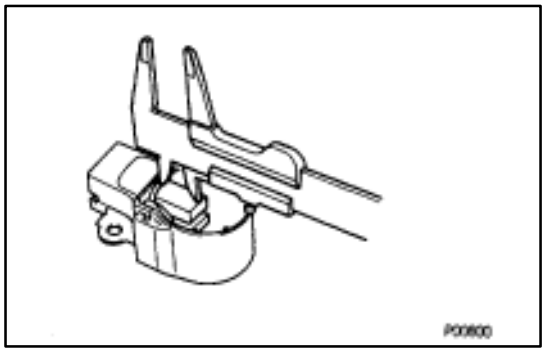
1. INSPECT STATOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the coil leads.
If there is no continuity, replace the drive end frame assembly.



2. INSPECT STATOR FOR GROUND

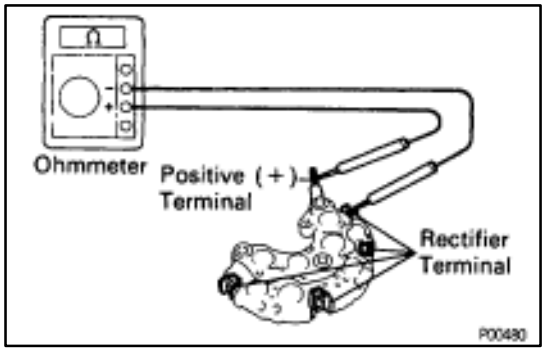
Using an ohmmeter, check that there is no continuity between the coil lead and drive end frame.
If there is continuity, replace the drive end frame assembly.

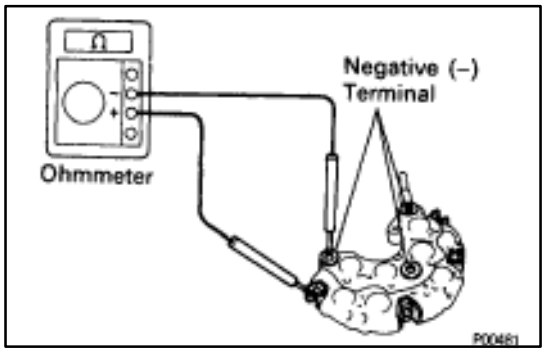


Brushes

1. INSPECT EXPOSED BRUSH LENGTH

Using a vernier caliper, measure the exposed brush length.
Standard exposed length:
10.5 mm (0.413 in.)
Minimum exposed length:
1.5 mm (0.059 in.)
If the exposed length is less than minimum, replace the brushes and brush holder assembly.





Rectifiers (Rectifier Holder)

1. INSPECT POSITIVE RECTIFIER

(a) Using an ohmmeter, connect one tester probe to the positive (+) terminal and the other to each rectifier terminal.

(b) Reverse the polarity of the tester probes and repeat step (a).

(c) Check that one shows continuity and the other shows no continuity.

If continuity is not as specified, replace the rectifier holder.

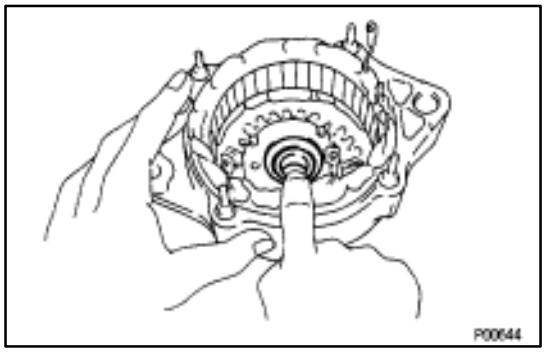
2. INSPECT NEGATIVE RECTIFIER

(a) Using an ohmmeter, connect one tester probe to each negative (–) terminal and the other to each rectifier terminal.

(b) Reverse the polarity of the tester probes and repeat step (a).

(c) Check that one shows continuity and the other shows no continuity.

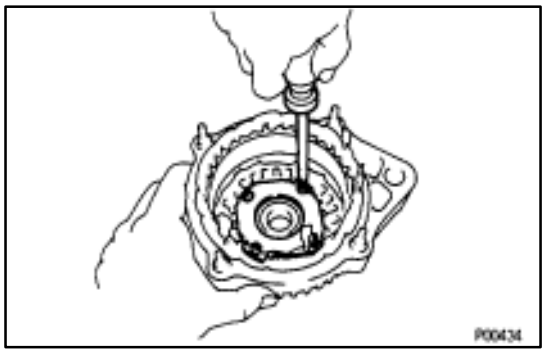
If continuity is not as specified, replace the rectifier holder.



Bearings

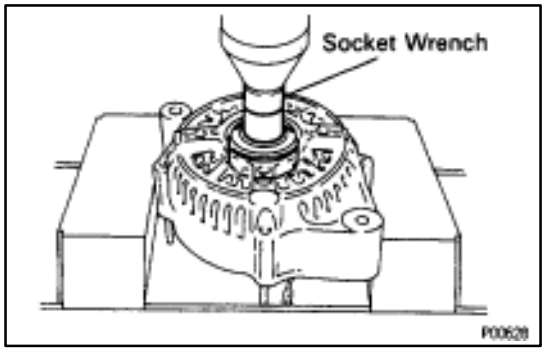
1. INSPECT FRONT BEARING

Check that the bearing is not rough or worn.

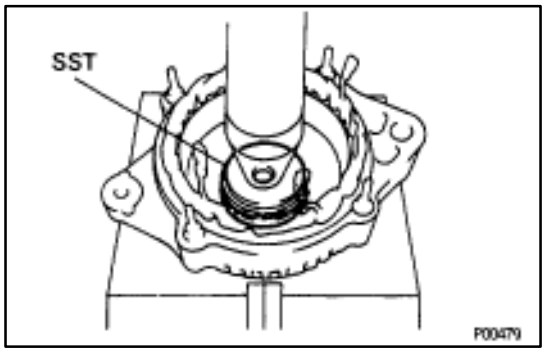


2. IF NECESSARY, REPLACE FRONT BEARING

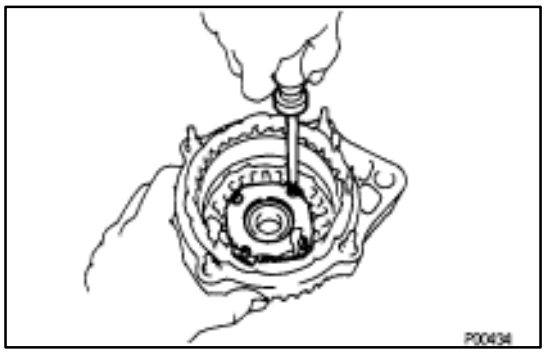
(a) Remove the four screws, bearing retainer and bearing



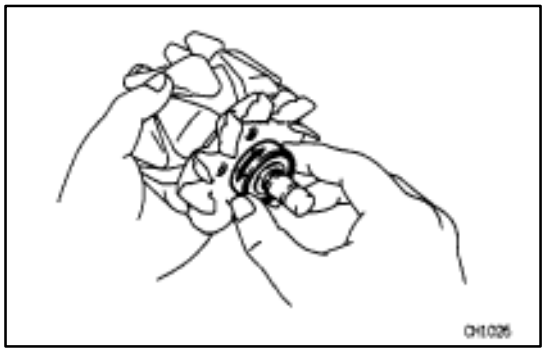
(b) Using a socket wrench and press, press out the bearing.



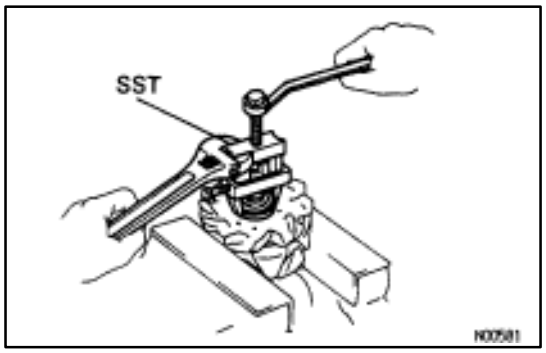
(c) Using SST and a press, press in a new bearing.
SST 09608–20012(09608–00030)



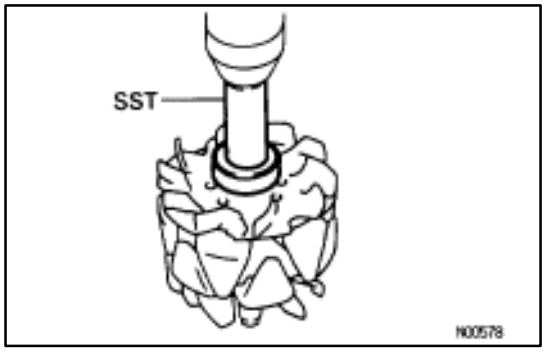
(d) Install the bearing retainer with the four screws.



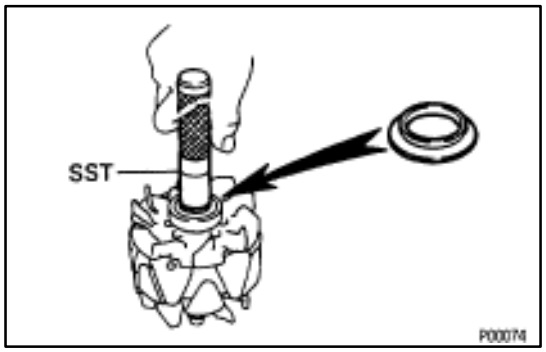
3. INSPECT REAR BEARING
Check that the bearing is not rough or worn.



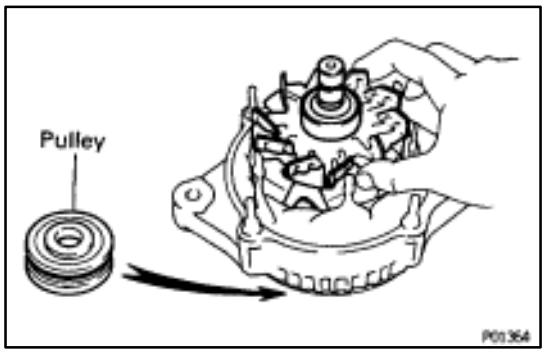
4. IF NECESSARY, REPLACE REAR BEARING
(a) Using SST, remove the bearing covers and bearing.
SST 09820–00021
NOTICE: Be careful not to damage the fan.
(b) Place the bearing cover on the rotor.



(c) Using SST and a press, press in a new bearing.
SST 09820–00030



(d) Using SST, push in the bearing cover.
SST 09285–76010



GENERATOR ASSEMBLY

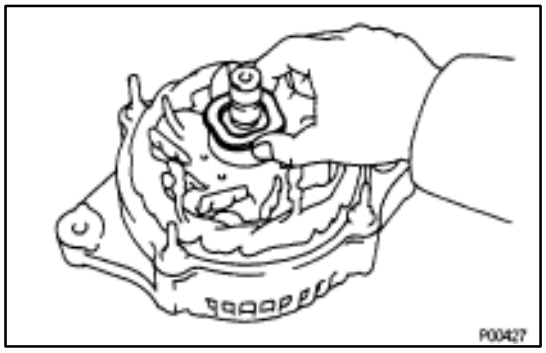
CH017–02

(See page CH–10)

1. INSTALL ROTOR TO DRIVE END FRAME

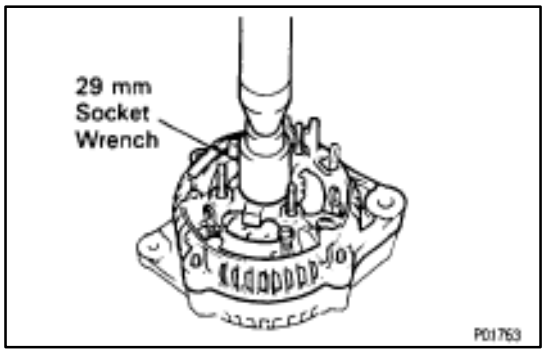
(a) Place the rectifier end frame on the pulley.

(b) Install the rotor to the rectifier end frame.

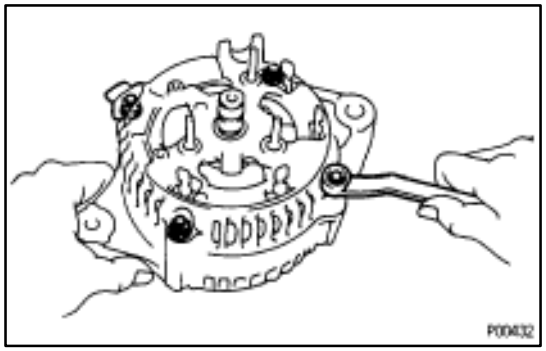


2. INSTALL RECTIFIER END FRAME

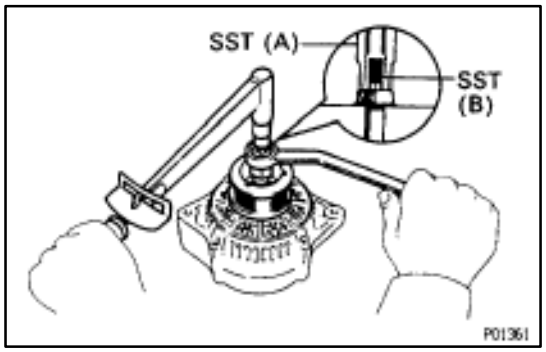
(a) Place the thrust washer on the rotor.



(b) Using a 29 mm socket wrench and press, slowly press in the rectifier end frame.



(c) Install the cord clip and four nuts.

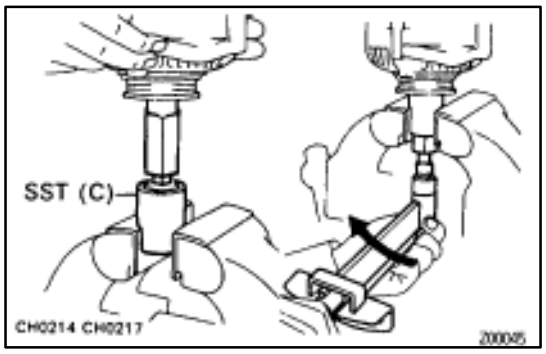


3. INSTALL PULLEY

(a) Install the pulley to the rotor shaft by tightening the pulley nut by hand.

(b) Hold SST (A) with a torque wrench, and tighten SST (b) clockwise to the specified torque.
SST 09820–63010
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)

(c) Check that SST (A) is secured to the pulley shaft.

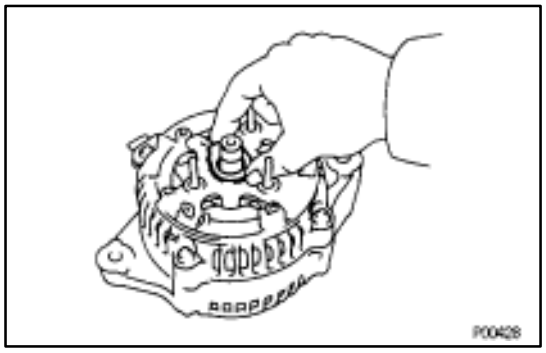


(d) As shown in the illustration, mount SST (C) in a vise, and install the generator to SST (C).

(e) To torque the pulley nut, turn SST (A) in the direction shown in the illustration.
Torque: 110 N·m (1,125 kgf·cm, 81 ft·lbf)

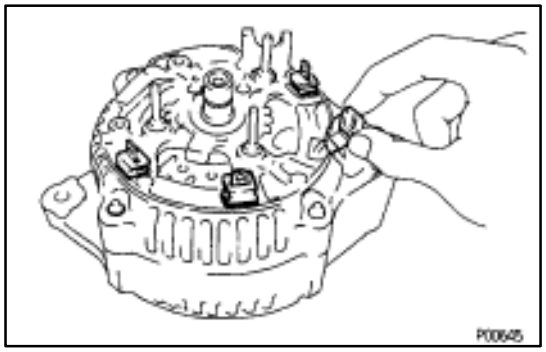
(f) Remove the generator from SST (C).

(g) Turn SST (B) and remove SST (A and B).

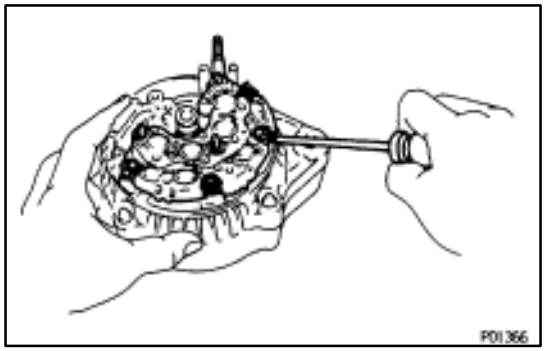


4. INSTALL RECTIFIER HOLDER

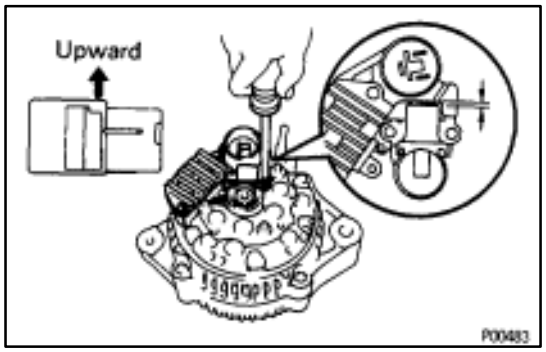
(a) Place the seal plate on the rectifier end frame.



(b) Install the four rubber insulators on the lead wires.



(c) Install the rectifier holder with the four screws.

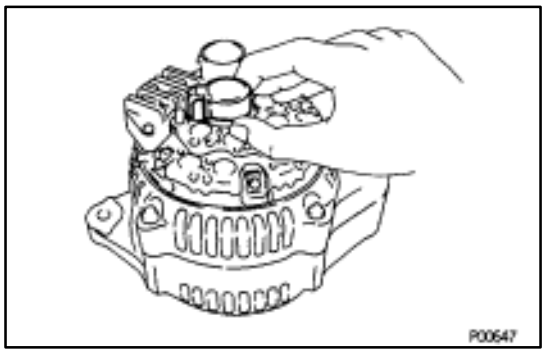


5. INSTALL IC REGULATOR AND BRUSH HOLDER

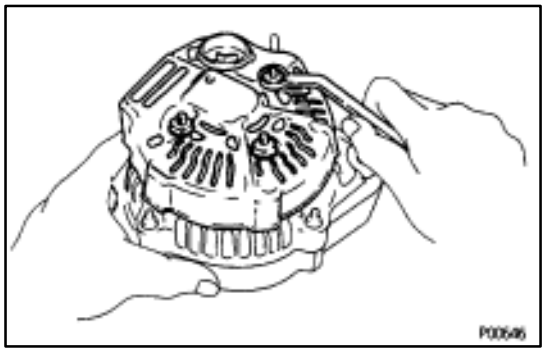
(a) Place the IC regulator and brush holder on the rectifier end frame.

NOTICE: Be careful of the holder installation direction.

(b) Install the five screws until there is a clearance of approx. 1 mm (0.04 in.) between the brush holder and connector.

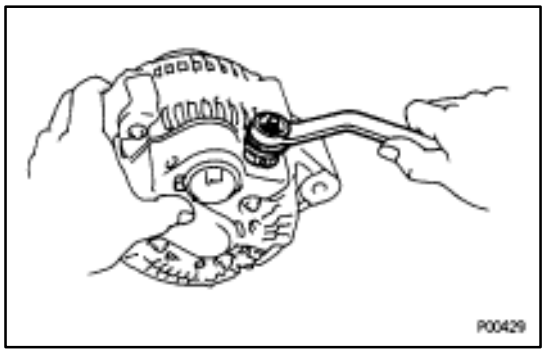


(c) Place the brush holder cover on the brush holder.

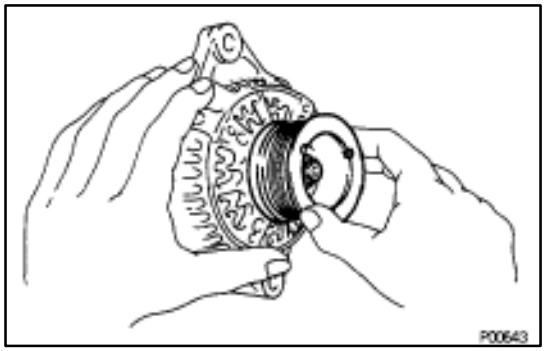


6. INSTALL REAR END COVER

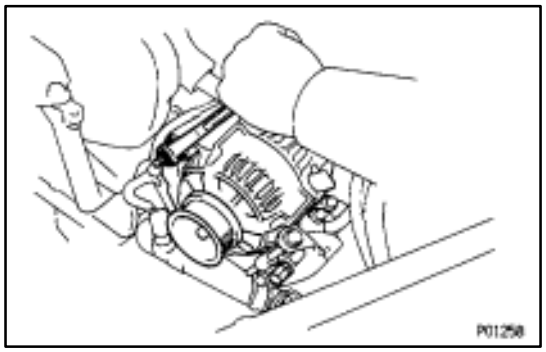
(a) Install the end cover with the three nuts.



(b) Install the terminal insulator with the nut.



7. CHECK THAT ROTOR ROTATES SMOOTHLY



GENERATOR INSTALLATION

CH019–02

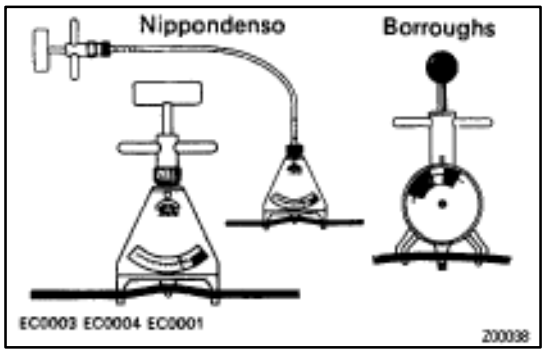
(See page CH–9)

1. INSTALL GENERATOR

(a) Mount generator on the generator bracket with the pivot bolt and adjusting lock bolt. Do not tighten the bolts yet.

(b) Connect the generator connector.

(c) Connect the generator wire with the nut.



2. INSTALL DRIVE BELT

(a) Install the drive belt.

(b) Using a belt tension gauge, measure the drive belt tension.

Belt tension gauge:

Nippondenso BTG–20 (95506–00020)

Borroughs No. BT–33–73F

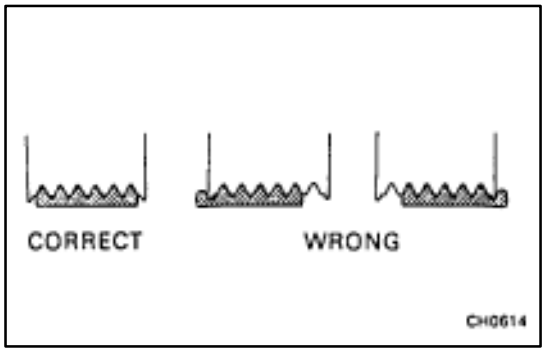
Drive belt tension:

New belt

175±5 lb

Used belt

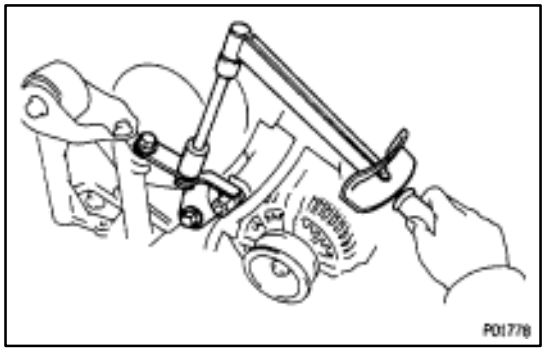
115±20 lb



(c) Tighten the pivot and adjusting lock bolt.

HINT:

- “New belt” refers to a belt which has been used less than 5 minutes on a running engine.
- “Used belt” refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing a belt, check that it fits properly in the ribbed grooves.
- Check by hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.
- After installing a new belt, run the engine for about 5 minutes and recheck the belt tension.



3. INSTALL NO.2 AND NO.3 RH ENGINE MOUNTING STAYS

(a) Install the No.2 RH engine mounting stay with the bolt and nut.

Bolt

Torque: 75 N·m (760 kgf·cm, 55 ft·lbf)

Nut

Torque: 62 N·m (630 kgf·cm, 46 ft·lbf)

(b) Install the No.3 RH engine mounting stay with the two bolts.

Torque: 73 N·m (740 kgf·cm, 54 ft·lbf)

4. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

5. PERFORM ON–VEHICLE INSPECTION

(See page CH–5)

SERVICE SPECIFICATIONS

SERVICE DATA

CH01B–02

Battery	Specific gravity (When full charged at 20°C (68°F))	
	55D23L battery	1.25–1.27
	80D26L battery	1.27–1.29
Drive belt	Tension	
	New belt	175 ± 5 lb
	Used belt	115 ± 10 lb
Generator	Rated output	12 V–80 A
	Rotor coil resistance	2.8–3.0 Ω
	Slip ring diameter (STD)	14.2–14.4 mm (0.559–0.5679 in.)
	Slip ring diameter (Minimum)	12.8 mm (0.504 in.)
	Brush exposed length (STD)	10.5 mm (0.413 in.)
	Brush exposed length (Minimum)	1.5 mm (0.059 in.)
Generator regulator (IC)	Regulating voltage at 25°C (77°F)	14.0–14.3 V
	Regulating voltage at 115°C (239°F)	13.5–14.3 V

TORQUE SPECIFICATIONS

CH01D–01

Part tightened	N·m	kgf·cm	ft·lbf
Pulley nut	110	1,125	81
No.2 RH engine mounting stay	75	760	55
No.2 RH engine mounting stay nut	62	630	46
No.3 RH engine mounting stay bolt	73	740	54