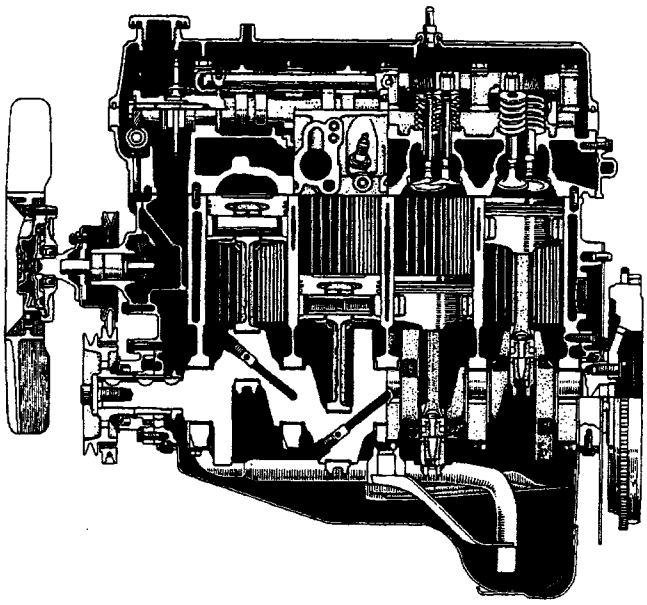
22R–E ENGINE

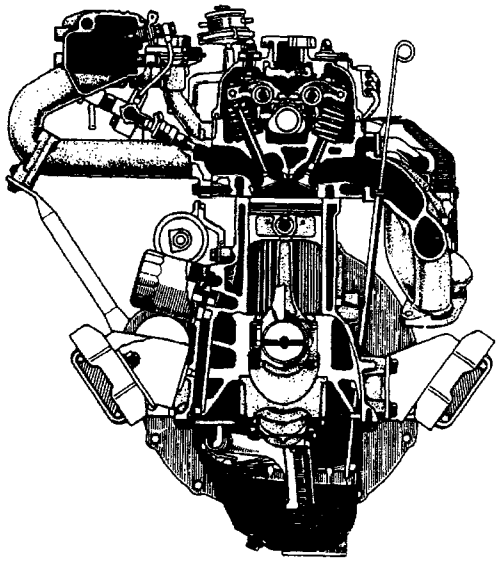
ENGINE MECHANICAL

DESCRIPTION

The 22R–E engine is an in–line 4 cylinder 2.4 liter OHC 8 valve engine.

EG1UV–01





EM5984
EM5985

P09078

The 22R–E engine is in–line 4–cylinder engine with the cylinders numbered 1–2–3–4 from the front. The crankshaft is supported by 5 bearings inside the crankcase. These bearing are made of kelmet.

The crankshaft is integrated with 4 weights which are cast with it for balance. Oil holes are made in the center of the crankshaft to supply oil to the connecting rods, bearing, pistons and other components.

The firing order is 1–3–4–2. 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 to the left of the combustion chambers.

Coolant is introduced into the intake manifold, improving drivability during engine warm up.

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

The camshaft is driven by a timing chain. The cam journal is supported at 3 places, located at the center and the front and rear of ends of each cylinder head. Lubrication of the cam journal gear is accomplished by oil supplied through the oil passage in the cylinder head.

Adjustment of the valve clearance is done by means of an adjusting screw on the rocker arm for easy adjustment.

The timing chain cover is made of aluminum alloy, with a water pump and oil pump on the outside.

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

Piston pins are the full–floating type, with the pins fastened to neither the connecting rods nor the piston boss, but with a snap ring fitted to both ends of each pin to prevent it from slipping out.

The No. 1 compression ring is made of stainless steel and the No. 2 compression ring is made of cast iron. The oil ring is made of 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 hug the cylinder walls when they are mounted on the piston. No. 1 and No. 2 compression rings work to prevent leakage of gas from the cylinder and the oil ring works to scrape oil off the cylinder walls to prevent it from entering the combustion chambers.

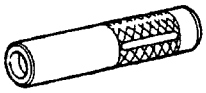
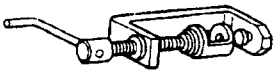
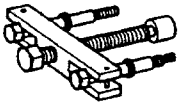
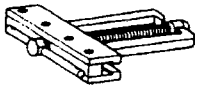
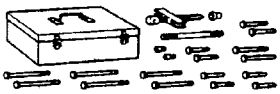
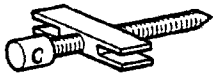
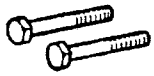
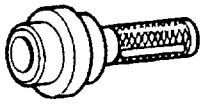
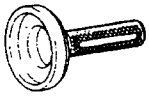
The cylinder block is made of cast iron. It has 4 cylinders which are approximately 2 times the length of the piston stroke. The top of each cylinder is closed off by the cylinder head and in the lower end of the cylinders the crankshaft is installed, supported by 5 journals. In addition, the cylinder block contains a water jacket, through which coolant is pumped to cool the cylinders.

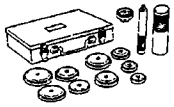
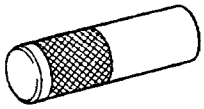
The oil pan is bolted onto the bottom of the cylinder block. The oil pan is an oil reservoir made of pressed steel sheet. A dividing plate is included inside the oil pan to keep sufficient oil in the bottom of the pan even when the vehicle is tilted. The dividing plate prevents the intake of air and allows oil circulation to be maintained even if the oil forms waves when the vehicle brakes suddenly.

PREPARATION

EGOAY–0A

SST (SPECIAL SERVICE TOOLS)

	09201–41020 Valve Stem Oil Seal Replacer	
	09201 –60011 Valve Guide Bushing Remover & Replacer	
	09202–43013 Valve Spring Compressor	
	09213–31021 Crankshaft Pulley Puller	
	09213–36020 Timing Gear Remover	
	09213–60017 Crankshaft Pulley & Gear Puller Set	
	(09213–00020) Body With .Bolt	
	(00213–00030) Handle	
	(09213–00060) Bolt Set	
	09222–30010 Connecting Rod Bushing Remover & Replacer	
	09223–50010 Crankhaft Front oil Seal Replacer	Camshaft oil seal
	09223–41020 Crankshaft Rear Oil Seal Replacer	
	09213–70010 Crankshaft Pulley Holding Tool	

 09606–35014 Axle Hub & Drive Pinion Bearing Tool Set	
 (09608–06040) Front Hub Inner Bearing Cone Replacer	
 09330–00021 Companion Flange Holding Tool	Crankshaft pulley
 09843–18020 Diagnosis Check Wire	

EG0AZ–08

RECOMMENDED TOOLS

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

EG0BC–07

EQUIPMENT

Battery specific gravity gauge	
Belt tension gauge	
Caliper gauge	
CO/HC meter	
Compression gauge	
Connecting rod aligner	
Cylinder gauge	
Dial indicator	

Dye penetrant	
Engine tune–up tester	
Heater	
Magnetic finger	
Micrometer	
Piston ring compressor	
Piston ring expander	
Plastigage	
Precision straight edge	
Soft brush	
Spring tester	Valve spring
Steel square	Valve spring
Thermometer	
Torque wrench	
Valve seat cutter	
Vernier calipers	

EG0B1–0C

SSM (SERVICE SPECIAL MATERIALS)

08826–00080 Seal packing or equivalent	Camshaft bearing cap Cylinder head cover Rear oil sear retainer
08833–00070 Adhesive 1324, THREE BOND 1324 or equivalent	Flywheel or drive plate mounting bolt

TROUBLESHOOTING

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 to the numbers in the order given in the table below.

	See page	IG–5	IG–5	EG1–212	EG1–131, 149 or 167	EG1–129, 147 or 165	EG1–129, 147 or 165	EG1–127, 145 or 163	EG1–132, 150 or 168	—	—	—	EG1–177	EG1–186	EG1–192	EG1–187	EG1–183 or 208	—
	Suspect area / Symptom	RPM Signal Circuit	Ignition Circuit	Main Oxygen Sensor Circuit	Engine Coolant Temp. Sensor Circuit	Intake Air Temp. Sensor Circuit	Volume Air Flow Meter Circuit	Throttle Position Sensor Circuit	STA Signal Circuit	Knock Sensor Circuit	PNP Switch Signal Circuit	A/C Signal Circuit	Fuel Pump	Fuel Pressure Regulator	Fuel Lines	Injectors	Cold Start System	Idle Air Control Valve
Does not start	Engine does not crank																	
	Starter runs – engine does not crank																	
	No initial combustion	12	2				5						6				13	8
	No complete combustion				4		1							3		9	10	2
Difficult to start	Engine cranks slowly											2						
	Under normal condition	12	13		4	14							7	6	8	16	17	3
	Cold engine				1	6			2				8	7	9	10	5	4
	Hot engine				1	5							8	7	9	10	6	3
Poor idling	Incorrect first idle				3													4
	High engine idle speed				4	6		7			9	8				10	11	5
	Low engine idle speed				1		4									5		2
	Rough idling		18		2		12						7	6	8	16	17	9
	Misfire		4		6		8									9	10	
Poor drivability	Hesitation Poor acceleration			12	10	11	9	8					14	13	15	18	19	
	Back fire			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	Soon after starting				8		7						3	2	4	9	10	6
	After accelerator pedal depressed						1	3						5	6	7		
	After accelerator pedal released						3											1
	During A/C operation											1						2
	When N to D shift										1							2
Others	Poor fuel economy			21	16	22	18	17			19	20				14	15	
	Engine overheat									9								
	Engine overcool																	
	Excessive oil consumption																	
	Low oil pressure																	
	High oil pressure																	
	Starter keeps running																	
	Battery often discharges																	

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.

V01853

	See page	EG1–198	EG1–199	CL section	EG1–14	MA–11	EG1–39	EG1–39	EG1–226	EG1–23	EG1–238	EG1–51	EG1–54	EG1–21	EG1–58	–	EG1–229
	Suspect area / Symptom	Dash Pot	Throttle Opener	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
Does not start	Engine does not crank																
	Starter runs – engine does not crank															2	
	No initial combustion				9		10	11									
	No complete combustion				5		7	8							6		
Difficult to start	Engine cranks slowly											3	4				
	Under normal condition				9		11								10		
	Cold engine																
	Hot engine																
Poor idling	Incorrect first idle	2	3														
	High engine idle speed	2															
	Low engine idle speed																
	Rough idling				10	13	14	15						20	11		
	Misfire				7												
Poor drivability	Hesitation Poor acceleration			1	7	16	17										
	Back fire						2										
	Muffler explosion (after fire)						2										
	Serging																
	Knocking						5		9								6
Engine stall	Soon after starting																
	After accelerator pedal depressed																
	After accelerator pedal released																
	During A/C operation																
	When N to D shift																
Others	Poor fuel economy	4		5	11		13								12		
	Engine overheat						7	5	6		10			11			3
	Engine overcool																
	Excessive oil consumption				3					2				5	4		
	Low oil pressure										2	3	4				
	High oil pressure										1						
	Starter keeps running																
	Battery often discharges																

V01854

Thermostat	Drive Belt	Engine Coolant Temp. Sender Gauge	Oil Pressure Switch	Generator	Cylinder Block	EFI Main Relay	Circuit Opening Relay	Fuel Cut System	Fuel Pressure Control System	ECM	Fuel Quality	Fuel Leakage	Coolant Leakage	Oil Leakage	Starter Relay	PNP Switch or Clutch Start SW	Starter	Spark Plug	Distributor	EGR System	Accelerator Pedal Link	Brakes drag even when released
EG1–228	CH section	BE section	BE section	CH section	EG1–55	EG1–206	EG1–207	EG1–219	EG1–210	EG1–215	—	—	EG1–225	EG1–235	ST section	AT or CL section	ST section	IG–6	IG–7	EG1–88 or 92	—	—
															1	3	2					
																	1					
						3	4			14	7								1			
										11												
																	1					
										18	1							2	15	5		
										11	3											
									4	11	2											
										5											1	
										12											1	
										6										3		
										19	1							4	5	3		
										11	1							3	5	2		
										20	3							5	6	4		2
										12										1		
								1		11												
										5								2	3			
8										10	2							3		4		
										11	1									5		
										8								4		2		
										4										2		
										3												
										3												
								8			2	1						9	10	7	3	6
4		13			12								1					8				
2		3																				
					6									1								
			5											1								
			2																			
															1		2					
	1			2																		

V01855

TUNE–UP

EG1UX–01

ENGINE COOLANT INSPECTION

(See steps 1 and 2 on page EG1–225)

EG1UY–01

ENGINE OIL INSPECTION

(See steps 1 and 2 on page EG1–235)

EG1UZ–01

AIR FILTER INSPECTION

(See step 4 on page MA–7)

EG1V0–02

BATTERY INSPECTION

(See CM section)

EG1V1–01

HIGH–TENSION CORD INSPECTION

(See page IG–6)

EG1V2–01

SPARK PLUGS INSPECTION

(See page IG–8)

EG1V3–01

DRIVE BELTS INSPECTION

(See step 2 on page MA–6)

EG1V4–01

VALVE CLEARANCE INSPECTION AND ADJUSTMENT

(See step 14 on page MA–11)

EG1V5–01

IGNITION TIMING INSPECTION AND ADJUSTMENT

(See step 5 on page IG–10)

EG1V6–01

IDLE SPEED INSPECTION AND ADJUSTMENT

(See step 15 on page MA–11)

HINT: Adjust idle mixture as necessary.

IDLE AND OR 2500 RPM CO HC CHECK

HINT: This check method is used only to determine whether or not the idle and/or 2,500 rpm 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 intake system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected

HINT: All vacuum hoses for the air suction, EGR sys–tems, etc. should be properly connected.

(f) MFI system wiring connectors fully plugged
(g) Ignition timing set correctly
(h) Transmission in neutral
(i) Idle speed set correctly
(j) Tachometer and CO/HC meter calibrated and at hand

2. START ENGINE

3. RACE ENGINE AT 2,500 RPM FOR APPROX.3 MINUTES

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

5. IMMEDIATELY CHECK CO/HC CONCENTRATION AT IDLE AND/OR 2,500 RPM

HINT:
When performing the 2 mode (2,500 rpm and idle) test, follow the measurement order prescribed by the applicable local regulations.

EG1V8–01

TROUBLESHOOTING

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

1. Check oxygen sensor operation
(See page EG1–212)

2. See the table below for possible cause, and then inspect and correct the applicable causes if neces–sary.

HC	CO	Symptoms	Causes
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 exhaust valves 5. Leaky cylinder
High	Low	Rough idle (Fluctuating HC reading)	1. Vacuum leak: • Vacuum hose • Intake manifold • Intake chamber • PCV line • Throttle body
High	High	Rough idle (Black smoke from exhaust)	1. Clogged air filter 2. Plugged PCV valve 3. Pulsed Secondary Air Injection (PAIR) system problems 4. Faulty MFI system: • Faulty pressure regulator • Clogged fuel return line • Faulty volume air flow meter • Defective engine coolant temp. sensor • Defective intake air temp. sensor • Faulty ECM • Faulty injector • Faulty cold start injector

V01856

COMPRESSION CHECK

HINT: If there is lack of power, excessive oil con–sumption or poor fuel mileage, measure the cylinder compression pressure.

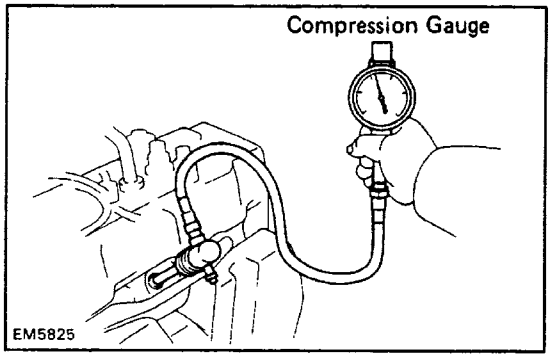
1. WARM UP ENGINE

2. REMOVE SPARK PLUGS

3. DISCONNECT DISTRIBUTOR CONNECTOR

4. DISCONNECT COLD START INJECTOR CONNEC–TOR

5. MEASURE CYLINDER COMPRESSION PRESSURE



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

(b) Fully open the throttle.

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

NOTICE: This test must be done for as short a time as possible to avoid overheating of the catalytic converter.

HINT: A fully charged battery must be used to obtain at least 250 rpm.

(d) Repeat steps (a) through (c) for each cylinder.

Compression pressure:
1,177 kPa (12.0 kgf/cm^2, 171 psi)

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 cylinder compression in one or more cylinders is low, pour a small amount of engine oil into the cylin–der through the spark plug hole and repeat steps (a) through (c) for the low compression cylinder.

- 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 improperly, or there may be leakage past the gasket.

6. CONNECT COLD START INJECTOR CONNECTOR

7. CONNECT DISTRIBUTOR CONNECTOR

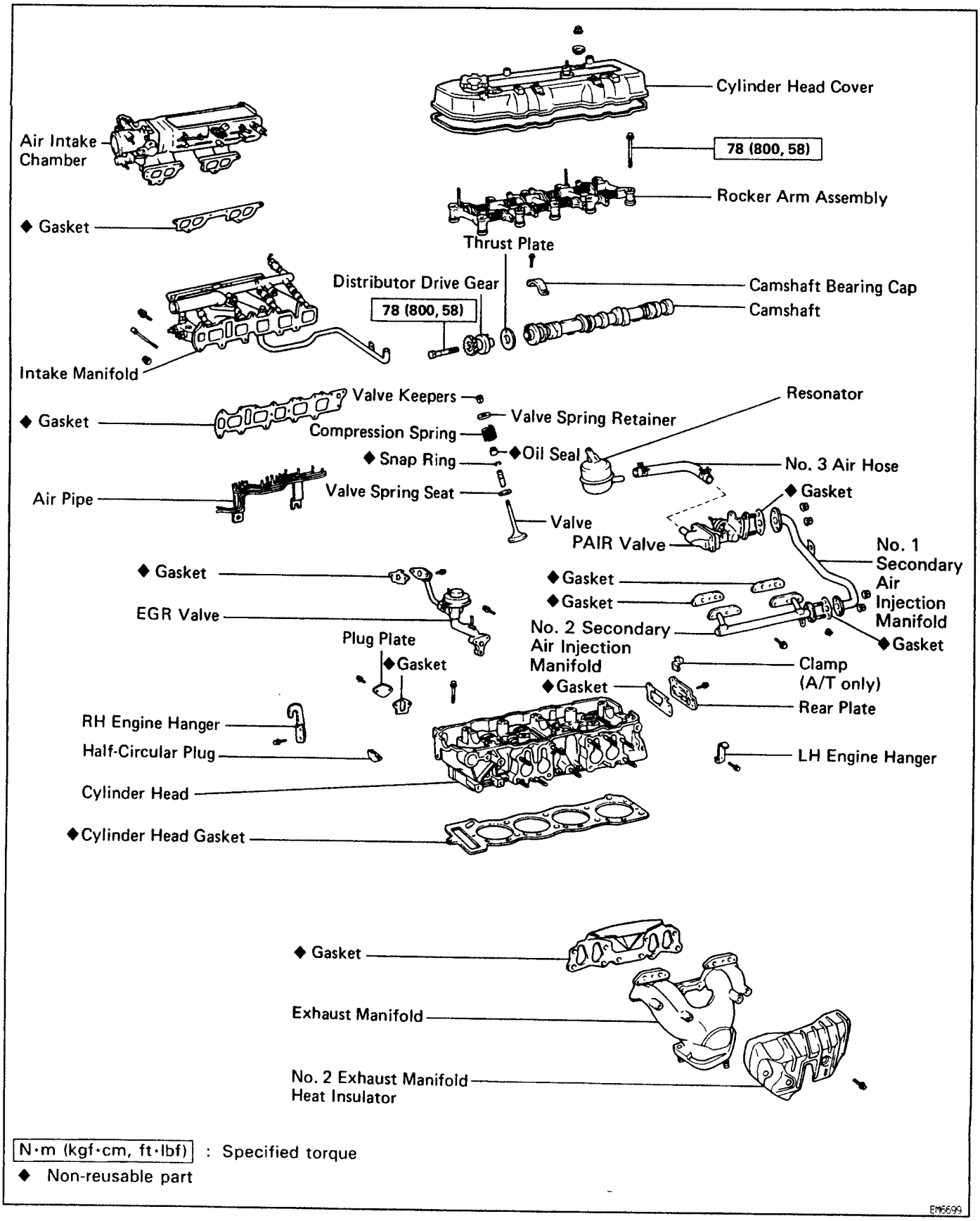
8. INSTALL SPARK PLUGS

Torque: 18N–m (180 kgf–cm, 13ft–lbf)

CYLINDER HEAD

EG1VA–01

COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

EM6699

EG1Vb–01

PREPARATION FOR REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DRAIN COOLANT FROM RADIATOR AND CYLIN– DER BLOCK

(See step 3 on page EG1–225**)**

3. REMOVE INTAKE AIR CONNECTOR

4. DISCONNECT EXHAUST PIPE FROM EXHAUST MANIFOLD

(a) Remove the exhaust pipe clamp.

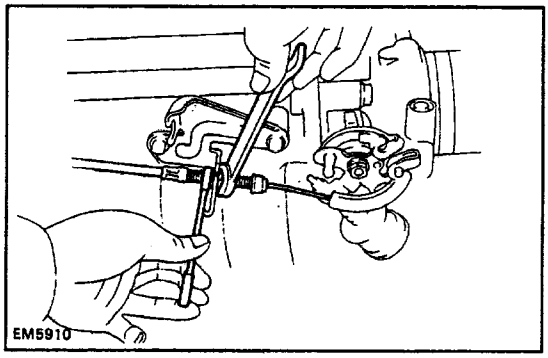
(b) Remove the three nuts, and disconnect the exhaust pipe.

5. REMOVE OIL DIPSTICK

6. REMOVE DISTRIBUTOR AND SPARK PLUGS

7. REMOVE RADIATOR INLET HOSE

8. DISCONNECT HEATER WATER INLET HOSE FROM HEATER WATER INLET PIPE



9. DISCONNECT ACCELERATOR CABLE

10. (A/T)

DISCONNECT THROTTLE CABLE

Disconnect the throttle cable from the bracket and clamp. .

11. DISCONNECT GROUND STRAP FROM ENGINE REAR SIDE

12. DISCONNECT FOLLOWING PARTS:

(a) No.1 and No. 2 PCV hoses

(b) Brake booster hose

(c) (w/PS)

Air control valve hoses

(d) (with A/C)

VSV hoses

(e) EVAP hose

(f) EGR vacuum modulator hose

(g) EGR valve hose

(h) Fuel pressure up hose

(i) PAIR valve hose

(j) Pressure regulator hose

(k) Vacuum hoses from throttle body

(l) No. 2 and No. 3 water by–pass hoses from the thr– ottle body

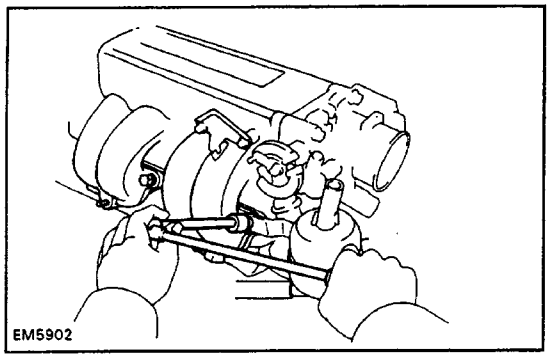
(m) (w/Oil cooler)

Disconnect the No. 1 oil cooler hose from the intake manifold.

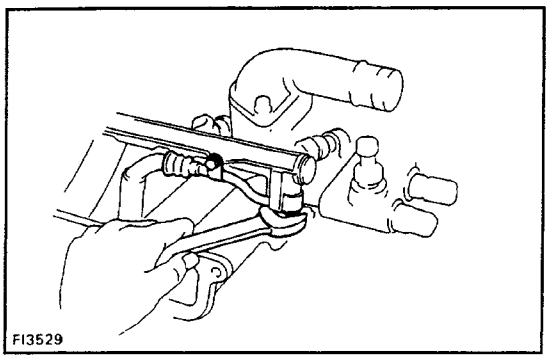
(w/o Oil cooler)

Disconnect the No. 1 water by–pass hose from the intake manifold. ‘

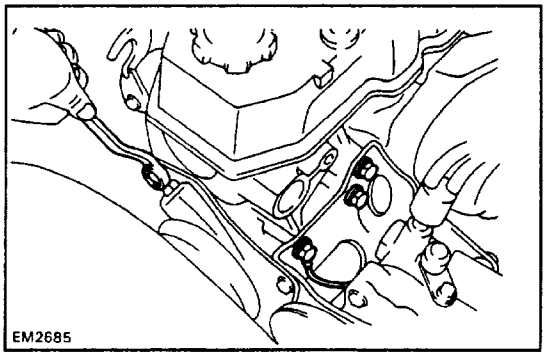
13. REMOVE EGR VACUUM MODULATOR
14. DISCONNECT FOLLOWING WIRES:
(a) Cold start injector wire
(b) Throttle position wire
(c) (California only)
EGR gas temp. sensor wire



15. REMOVE CHAMBER WITH THROTTLE BODY
(a) Remove the union bolt holding the cold start injector pipe to the chamber.
(b) Remove the bolts holding the No. 1 EGR pipe to the chamber.
(c) Remove the bolts holding the manifold stay to the chamber.
(d) Remove the four bolts, two nuts, bond strap and fuel hose clamp.
(e) Remove the chamber with the throttle body, resona–tor and gasket.
16. DISCONNECT FUEL RETURN HOSE
17. DISCONNECT FOLLOWING WIRES:
(a) Knock sensor wire
(b) Oil pressure sender gauge wire
(c) Starter wire (terminal 50)
(d) Transmission wires
(e) (with A/C)
Compressor wires
(f) Injector wires
(g) Engine coolant temp. sender gauge wire
(h) (A/T)
OD temp. switch wire
(i) Igniter wire
(j) VSV wires
(k) Start injector time switch wire
(l) Engine Coolant temp. sensor wire



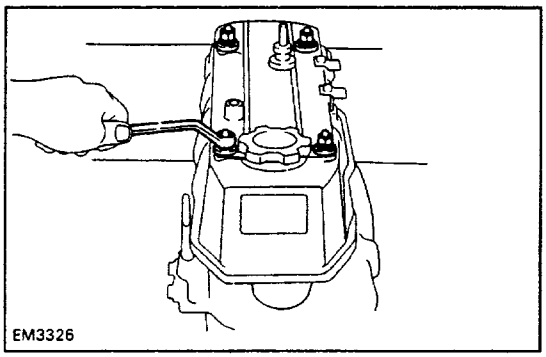
18. DISCONNECT FUEL HOSE FROM DELIVERY PIPE
Remove the bolt, union bolt and two gaskets.
19. DISCONNECT BY – PASS HOSE FROM INTAKE MANIFOLD
20. (w/PS)
REMOVE PS BELT



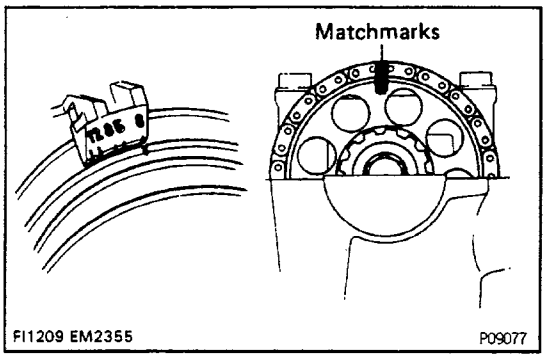
21. (w/PS)
DISCONNECT PS BRACKET FROM CYLINDER HEAD
Remove the four bolts, disconnect the ground strap and bracket.

EG1VC–01

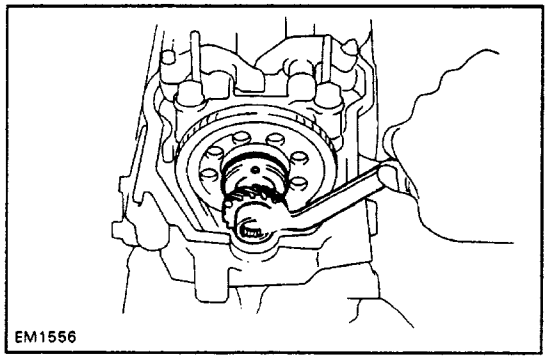
CYLINDER HEAD REMOVAL



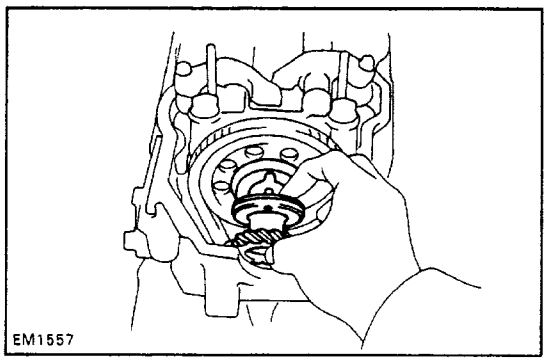
1. REMOVE HEAD COVER
(a) Remove the ground strap from the body.
(b) Remove the four nuts and seals.
(c) Remove the head cover.
NOTICE: Cover the oil return hole in the head with a rag to prevent objects from falling in.



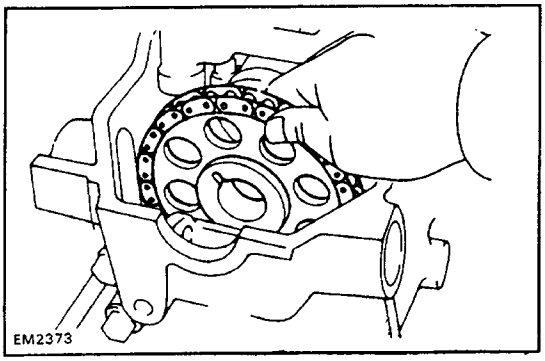
2. REMOVE CAM SPROCKET BOLT
(a) Turn the crankshaft until the No. 1 cylinder position is set at TDC compression.
(b) Place matchmarks on the sprocket and chain.
(c) Remove the half–circular plug.



(d) Remove the cam sprocket bolt.

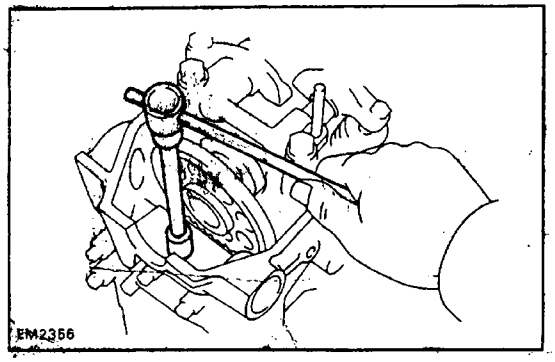


3. REMOVE DISTRIBUTOR DRIVE GEAR AND CAM–SHAFT THRUST PLATE



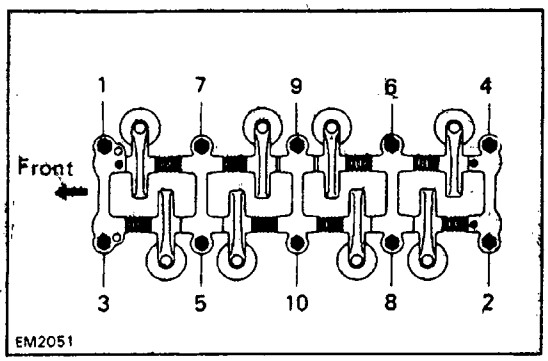
4. REMOVE CAM SPROCKET

Remove the cam sprocket and chain from the cam–shaft and leave on the vibration damper.



5. REMOVE CHARY COVER BOLT

Remove the bolt in.–front of the head before the other head bolts are removed.



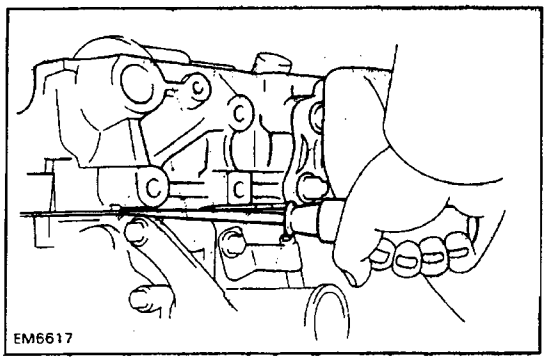
6. REMOVE CYLINDER HEAD BOLTS

Remove the head bolts gradually in two or three passes and in the numerical order shown.

NOTICE: Head warpage or cracking could result from removing bolts incorrect order.

7. REMOVE ROCKER ARM ASSEMBLY

If may be necessary to use a pry bar on the front and rear of the rocker arm assembly to separate it from the head.

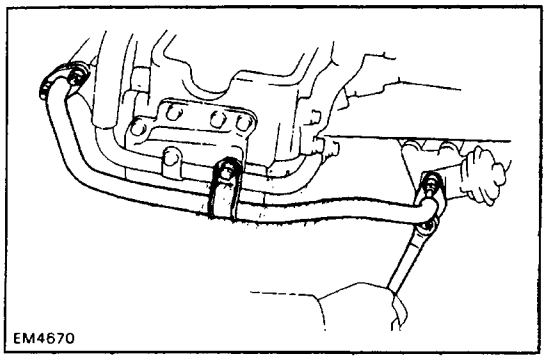


8. REMOVE CYLINDER HEAD

Lift the cylinder head from the dowels on the cylinder block and place the head on wooden blocks on a bench.

HINT: If the cylinder head is difficult to lift off, pry with a screwdriver between the head and block sa–liences.

NOTICE: Be careful not to damage the cylinder head and block surfaces of the cylinder head gasket.



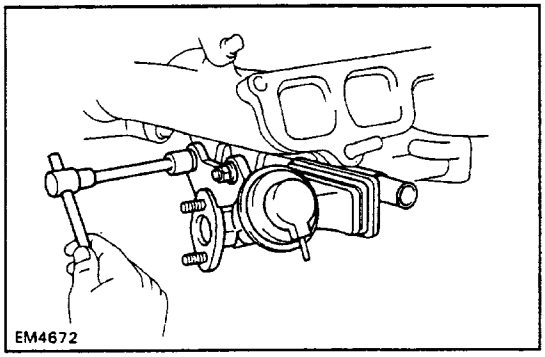
CYLINDER HEAD DISASSEMBLY

EG1VD–01

(See page EG1–15)

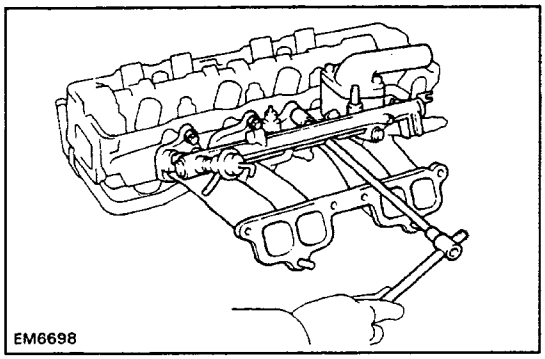
1. REMOVE NO. 1 SECONDARY AIR INJECTION MANIFOLD

Remove the bolt, four nuts, No. 1 secondary air in–jection manifold and two gaskets.

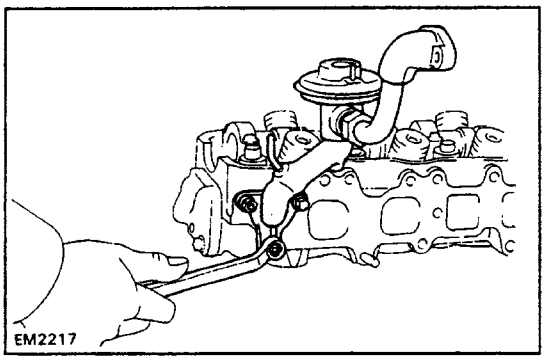


2. REMOVE INTAKE MANIFOLD WITH DELIVERY PIPE AND INJECTORS

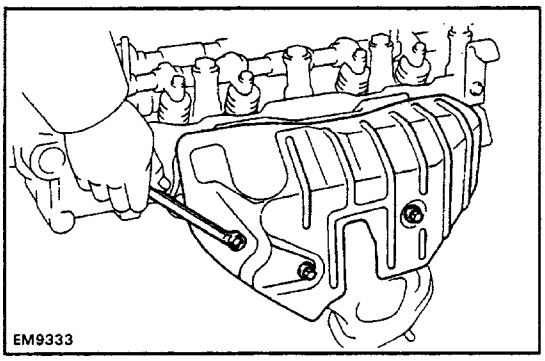
(a) Remove the two nuts and reed valve.



(b) Remove the bolt and the heater inlet pipe from the cylinder head.
(c) Remove the seven bolts, one hexagon bolt, two nuts and No. 1 air pipe.
(d) Remove the intake manifold together with the delivery pipe, injectors and heater water inlet pipe.

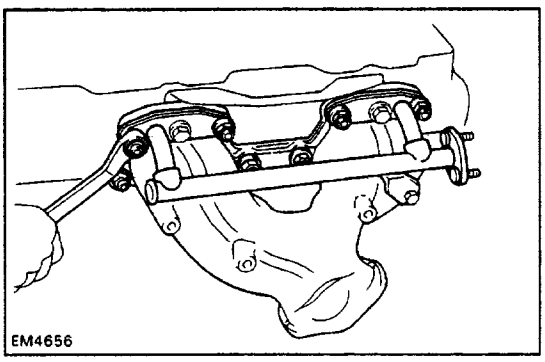


3. REMOVE EGR VALVE



4. REMOVE EXHAUST MANIFOLD WITH NO. 2 SECONDARY AIR INJECTION MANIFOLD

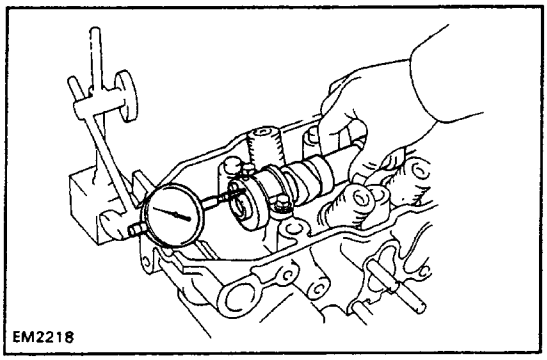
(a) Remove the three bolts and No. 2 exhaust manifold heat insulator.



(b) Remove the eight nuts, exhaust manifold and No. 2 secondary air injection manifold.

5. REMOVE TWO ENGINE HANGERS AND GROUND STRAP

6. REMOVE CYLINDER HEAD REAR OVER



7. MEASURE CAMSHAFT THRUST CLEARANCE

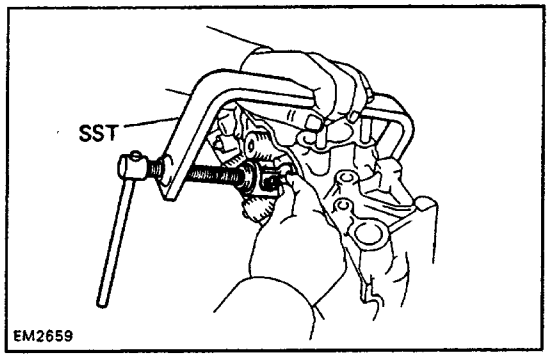
Using a dial gauge, measure the camshaft thrust clearance.

Standard clearance: 0.08 – 0.18 mm (0.0031–0.0071 in.)

Maximum clearance: 0.25 mm (0.0098 in.)

If clearance is greater than maximum, replace the head.

8. REMOVE CAM BEARING CAPS AND SHAFT



9. REMOVE VALVES

(a) Using SST, compress the valve retainer until the two keepers can be removed.

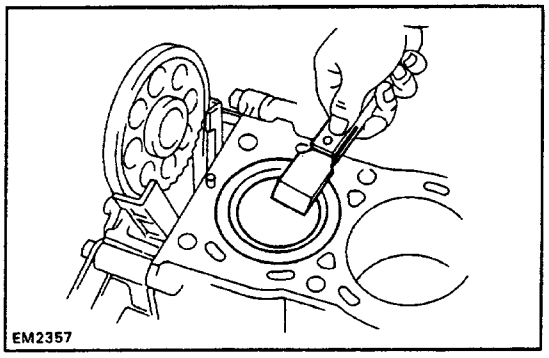
SST 09202–43013

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

(c) Pry out the oil seal.

(d) Using a small screwdriver or magnet, remove the valve spring seat.

HINT: Keep the valves arranged so they can be ins–talled in the same order as removed.



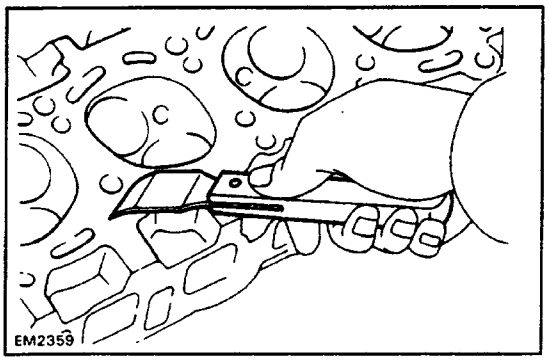
INSPECTION, CLEANING AND REPAIR OF CYLINDER HEAD COMPONENTS

1. CLEAN TOP OF PISTONS AND TOP OF CYLINDER BLOCK

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

(b) Using a gasket scraper, remove all gasket material from the top of the block. Blow carbon and oil from the bolt holes.

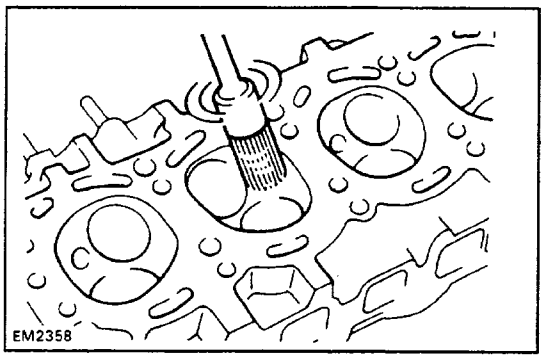
CAUTION: Protect your eyes when using high pressure sir.



2. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all gasket material from the head and manifold surfaces.

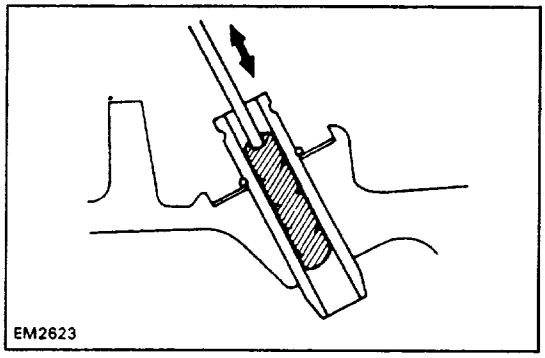
NOTICE: Be careful not to scratch the surfaces.



3. CLEAN COMBUSTION CHAMBERS

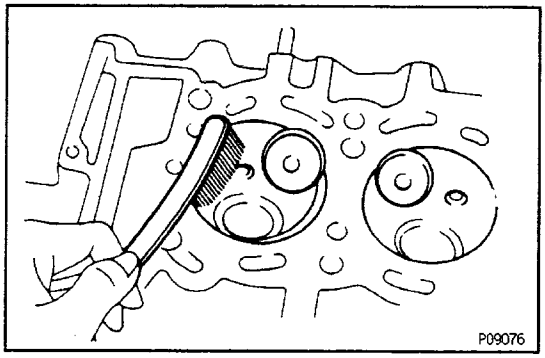
Using a wire brush, remove all the carbon from the combustion chambers.

NOTICE: Be careful not to scratch the head gasket con–tact surface.



4. CLEAN VALVE GUIDE BUSHINGS

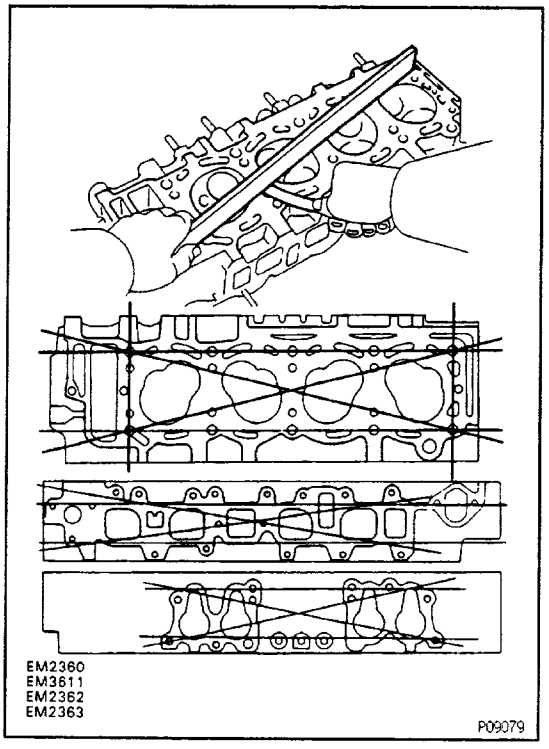
Using a valve guide brush and solvent, clean all the valve guide bushings.



5. CLEAN CYLINDER HEAD

Using a soft brush and solvent, clean the head.

NOTICE: Do not clean the head in a hot tank as this will seriously damage it.



6. INSPECT CYLINDER HEAD FOR FLATNESS

Using a precision straight edge and thickness gauge, measure the surface contacting the cylinder block and manifold for warpage.

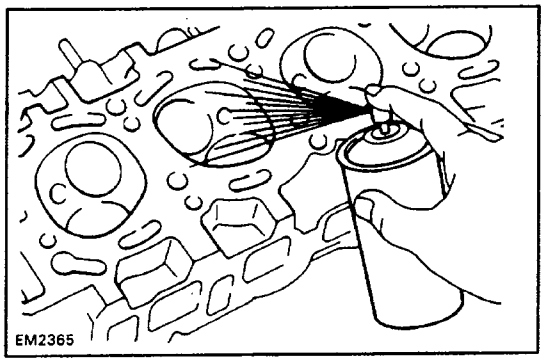
Maximum head surface warpage:

0.15 mm (0.0059 in.)

Maximum manifold surface warpage:

0.20 mm (0.0079 in.)

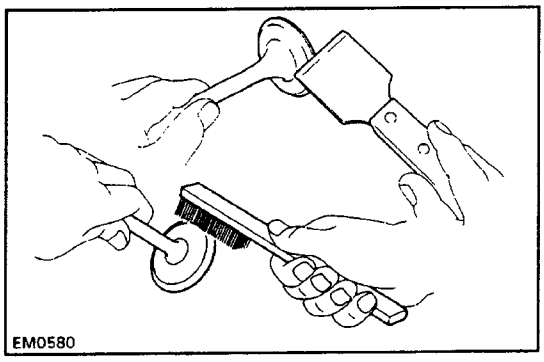
If warpage is greater than maximum, replace the cyl–inder head.



7. INSPECT CYLINDER HEAD FOR CRACKS

Using a dye penetrant, check the combustion cham–bers, intake and exhaust ports, head surface and the top of the head for cracks.

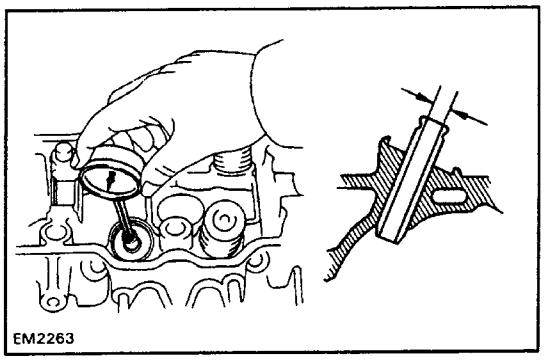
If a crack is found, replace the head.



8. CLEAN VALVES

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

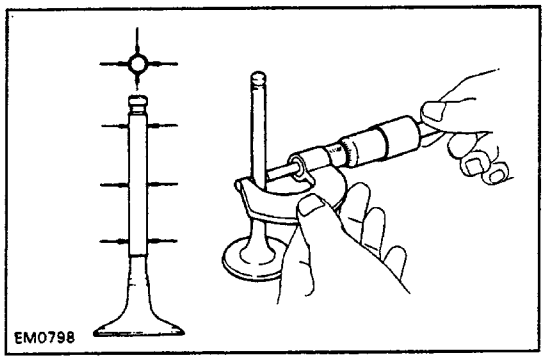
(b) Using a wire brush, thoroughly clean the valve.



9. INSPECT VALVE STEMS AND GUIDE BUSHINGS

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

Standard inside diameter: 8.01 – 8.03 mm
(0.3154 – 0.3161 in.)



(b) Using a micrometer, measure the diameter of the valve stem.

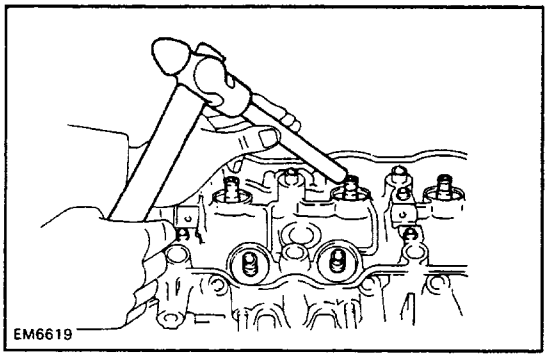
Standard valve stem diameter:
Intake 7.970 – 7.985 mm
(0.3138 – 0.3144 in.)
Exhaust 7.965 – 7.980 mm
(0.3136 – 0.3142 in.)

(c) Subtract the valve stem diameter measurement from the valve guide bushing diameter measurement.

Standard oil clearance:
Intake 0.025 – 0.060 mm
(0.0010 – 0.0024 in.)
Exhaust 0.030 – 0.650 mm
(0.0012 – 0.0026 in.)

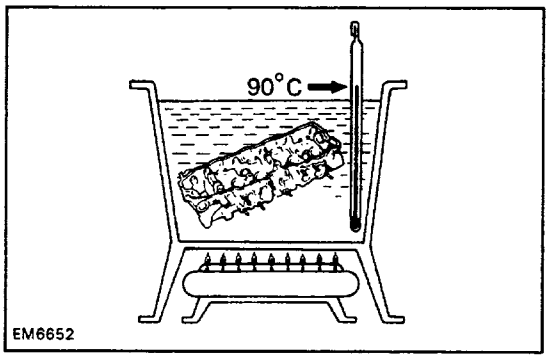
Maximum stem oil clearance:
Intake 0.08 mm (0.0031 in.)
Exhaust 0.10 mm (0.0039 in.)

If the clearance is greater than maximum, replace the valve and guide bushing.

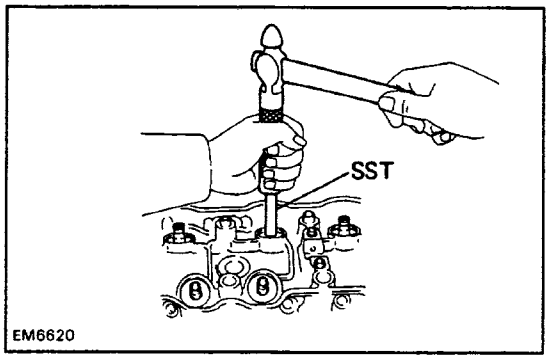


10. IF NECESSARY, REPLACE VALVE GUIDE BUSH–INGS

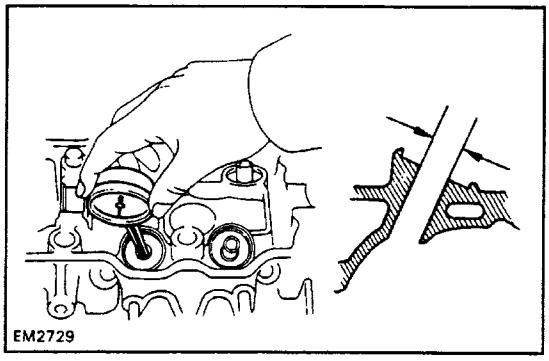
(a) Using a brass bar and hammer, break the valve –guide bushing.



(b) Gradually heat the cylinder head to approx. 90°C (194°F).



(c) Using SST and a hammer, drive out valve guide bus–hing.
SST 09201–60011

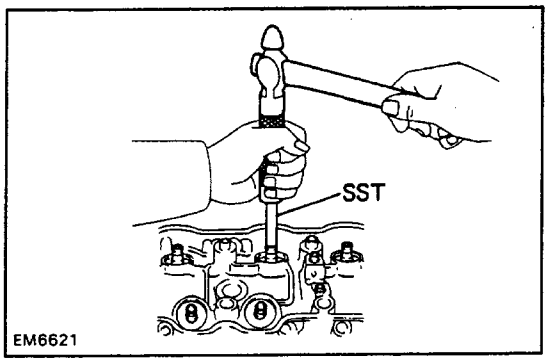


(d) Using a caliper gauge, measure the valve guide bus–hing bore of the cylinder head.

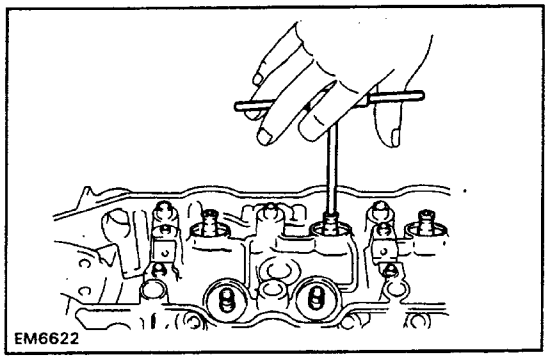
Bore intake and exhaust

Bushing bore mm (in.)	Bushing size
13.000 – 13.018 (0.5118 – 0.5125)	Use STD
Over 13.018 (0.5125)	Use O/S 0.05

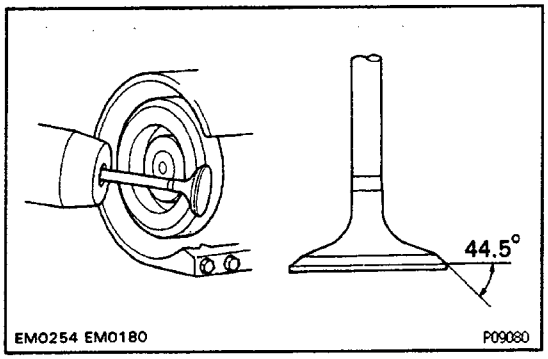
(e) Select a new valve guide bushing.
If the valve guide bushing bore of the cylinder head is more than 13.018 mm (0.512 in.), machine the bore to the following dimension.
Rebored valve guide bushing bore dimension (cold):
13.050 – 13.068 mm (0.5138 – 0.5145 in.)



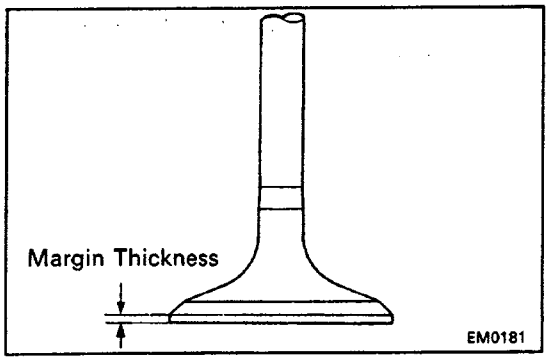
(f) Gradually heat the cylinder head to approx. 90°C (194° F).
(g) Using SST a and hammer, drive in a new valve guide bushing unit the snap ring makes contact with the cylinder head.
SST 09201–6001 1



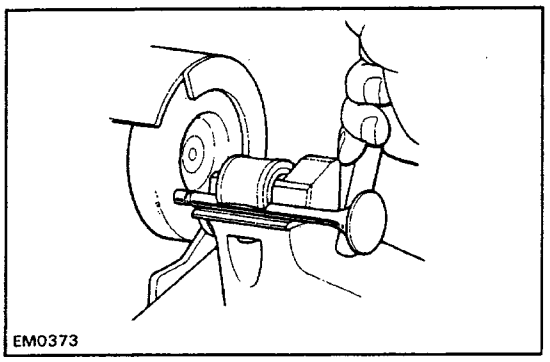
(h) Using a sharp 8 mm (0.31 mm) reamer, ream the valve guide bushing to obtain standard specified clearance (See page EG1–23) between the valve guide bushing and new valve.



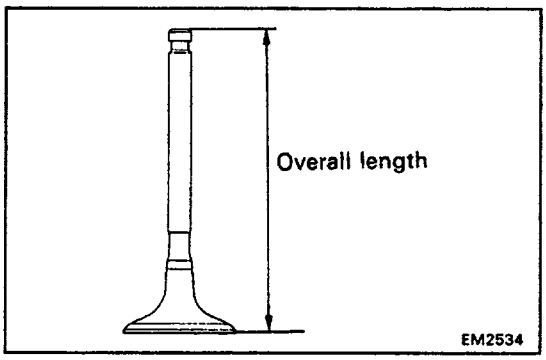
11. INSPECT AND GRIND VALVES
(a) Grind the valve only enough to remove pits and carbon.
(b) Check that valve is ground to the correct valve face angle.
Valve face angle: 44.5°



(c) Check the valve head margin thickness.
Standard margin thickness: 1.0 mm (0.039 in.)
Minimum margin thickness: 0.6 mm (0.024 in.)
If the valve head margin thickness is less than mini–mum, replace the valve.



(d) Check the surface of the valve stem tip for wear.
If the valve stem tip is worn, regrind it with grinder or replace the valve if necessary.
NOTICE: Do not grind off more than minimum overall length.
Minimum overall length:
Intake 113.0 mm (4.449 in.)
Exhaust 111.9 mm (4.406 in.)



(e) Check the valve overall length.

Standard overall length:

Intake 113.5 mm (4.468 in.)

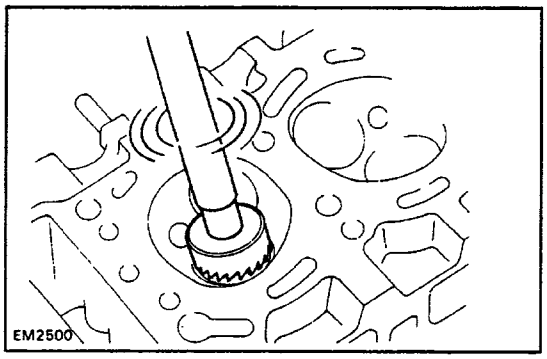
Exhaust 112.4 mm (4.425 in.)

Minimum overall length:

Intake 113.0 mm (4.449 in.)

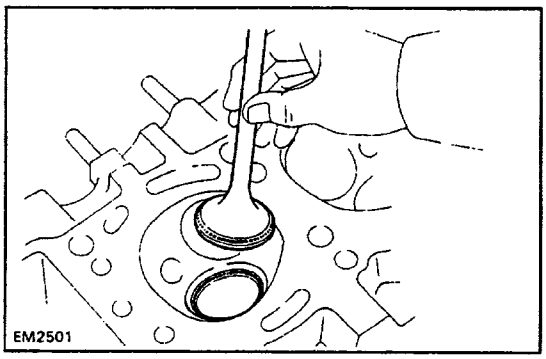
Exhaust 111.9 mm (4.406 in.)

If the valve overall length is less than minimum, re–place the valve.



12. INSPECT AND CLEAN VALVE SEATS

(a) Using a 45° carbide cutter, resurface the valve seats. Remove only enough metal to clean the seats.



(b) Check the valve seating position.

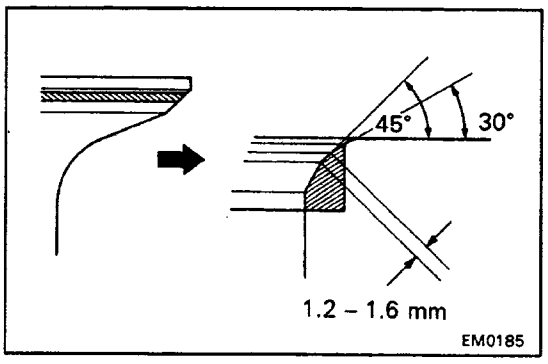
Apply a light coat of prussian blue (or white lead) to the valve face. Install the valve. Lightly press the valve against the seat. Do not rotate the valve.

(c) Check the valve face and seat for the following:

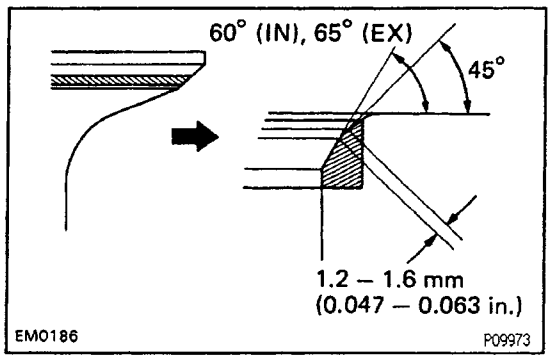
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and seat are concentric. If not, resurface the seat.
- Check that the seat contact is on the middle of the valve face with the following width:

1.2 – 1.6 mm (0.047 – 0.063 in.)

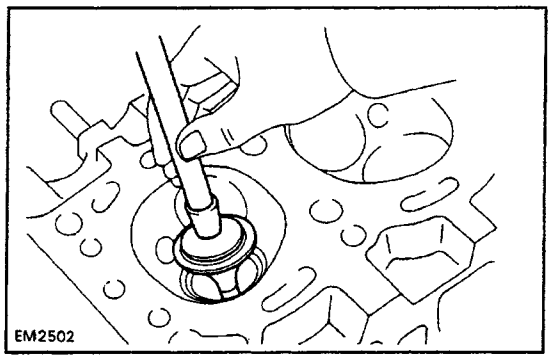
If not, correct the valve seat as follows:



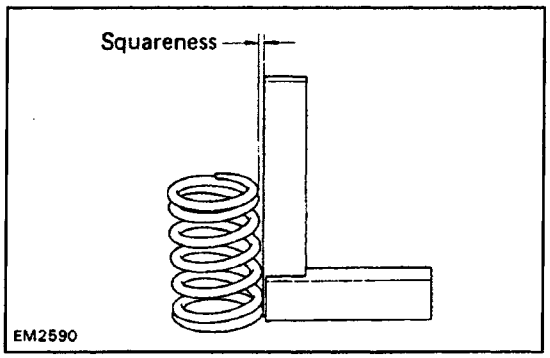
- If seating is too high on the valve face, use 30° and 45° cutters to correct the seat.



- If seating is too low on the valve face, use 60° (IN) or 65° (EX) and 45° cutters to correct the seat.



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

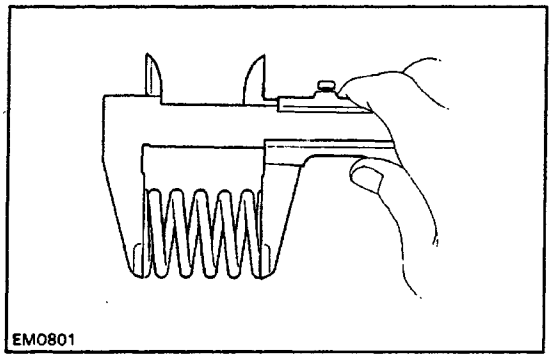


13. INSPECT VALVE SPRINGS

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

Maximum squareness: 1.6 mm. (0.063 in.)

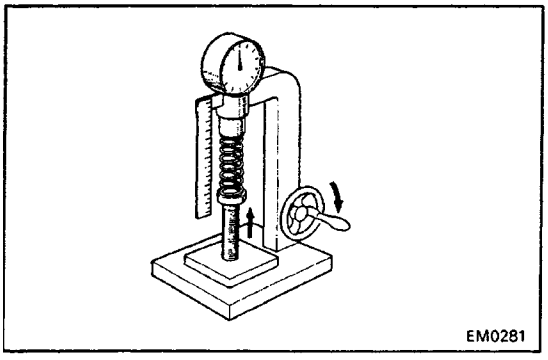
If squareness is greater than maximum, replace the valve spring.



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

Free length: 48.5 mm (1.909 in.)

If the free length is not within specification, replace the valve spring.



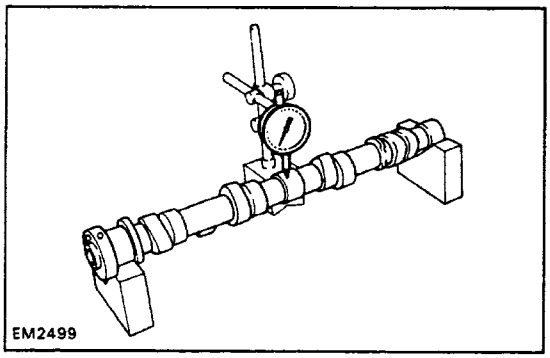
(c) Using a spring tester, check the tension of each spring at the specified installed height.

Installed height: 40.5 mm (1.594 in.)

Standard installed tension: 294 N (30.0 kgf, 66.1 lbf)

Minimum installed tension: 279 N (28.5 kgf, 62.8 lbf)

If the installed tension is less than minimum, replace the spring.

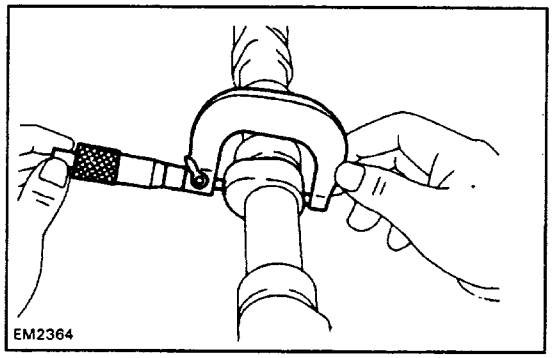


14. INSPECT CAMSHAFT AND BEARING CAPS

(a) Place the cam shaft on V – blocks and , using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.2 mm (0.008 in.)

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



(b) Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

Intake 42.63 – 42.72 mm (1.6783 – 1.6818 in.)

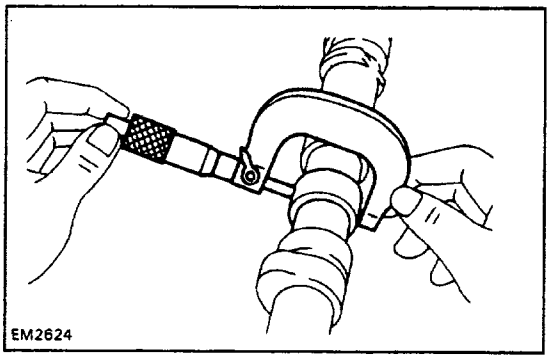
Exhaust 42.69 – 42.78 mm (1.6807 – 1.6842 in.)

Maximum cam lobe height:

Intake 42.25 mm (1.6634 in.)

Exhaust 42.30 mm (1.6654 in.)

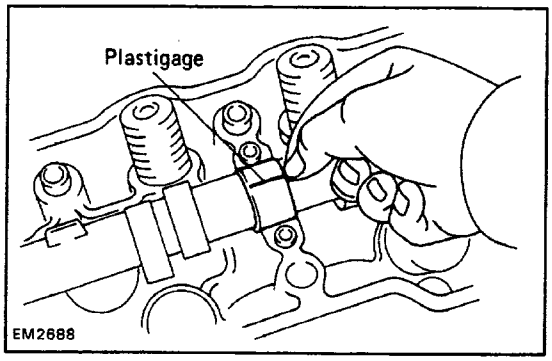
If the lobe height is less than ,minimum, replace the camshaft.



(c) Using a micrometer, measure the journal diameter.

Standard diameter: 32.98 – 33.00 mm (1.2984 – 1.2992 in.)

If the journal diameter is less than specified, replace the camshaft.

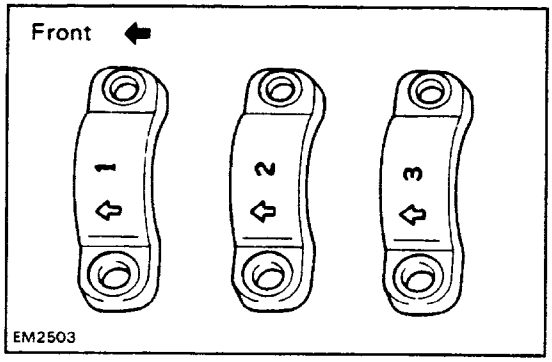


15. INSPECT CAMSHAFT OIL CLEARANCE

(a) Clean the bearing caps and camshaft journal.

(b) Place the camshaft in the cylinder head.

(c) Lay a strip of Plastigage across each journal.

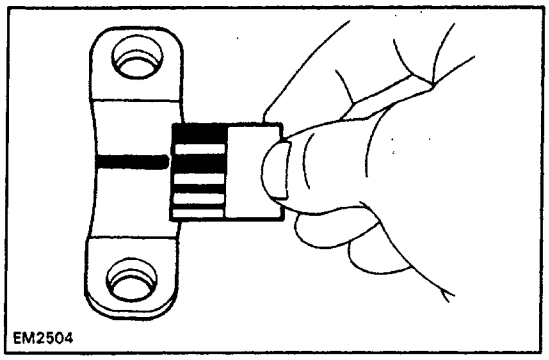


(d) Install the correct numbered bearing cap on each journal with the arrows pointing toward the front.

Torque each bolt.

Torque: 20 N–m (200kgf.–cm, 14ft–lbf)

HINT: Do not turn the camshaft while the Plastigags is in place.


EM2504

(e) Remove the caps and measure the Piastigage at its widest point.

Standard clearance: 0.01 – 0.05 mm (0.0004 – 0.0020 in.)

Maximum clearance: 0.1 mm (0.004 in.)

!f clearance is greater than maximum, replace the cylinder head and/or camshaft.

(f) Clean out the pieces of Plastigage from the bearing and journal.

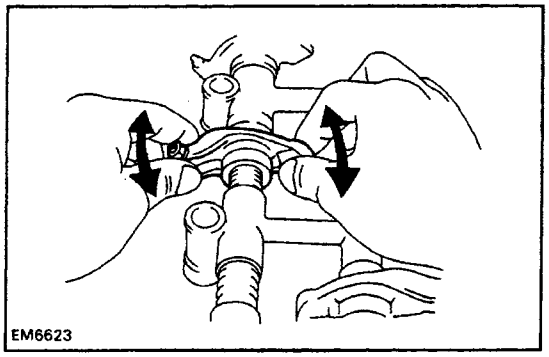
16. INSPECT ROCKER ARMS

Check the clearance between the rocker arms and shaft by moving the rocker arms as shown. Little or no movement should be felt.

If movement is felt, disassemble the rocker arm as–sembly and measure the oil clearance as follows:

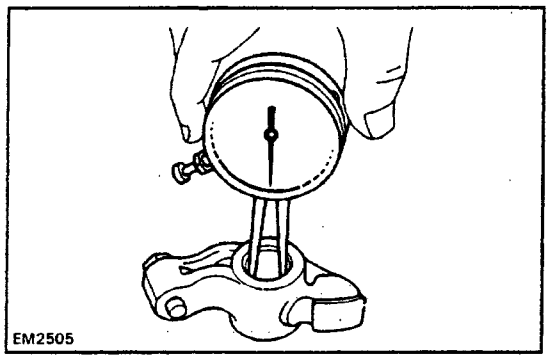
(a) Disassemble rocker arm assembly.

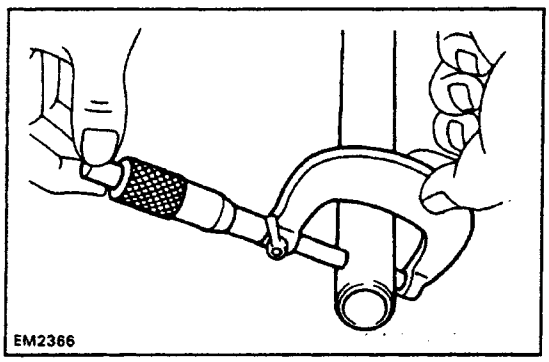
- Remove the three screws.
- Slide the rocker stands, spring and rocker arms off the shafts.


EM6623

(b) Using a dial indicator or telescoping gauge, measure the inside diameter of the rocker arm.

Standard inside diameter: 16.000 – 16.018 mm. (0.6299 – 0.6306 in.)


EM2505


EM2366

(c) Using a micrometer, measure the outside diameter of the shaft.

Standard diameter: 15.97 –15.99 mm (0.6287 – 0.6295 in.)

(d) Subtract the shaft diameter measurement from the rocker arm diameter measurement.

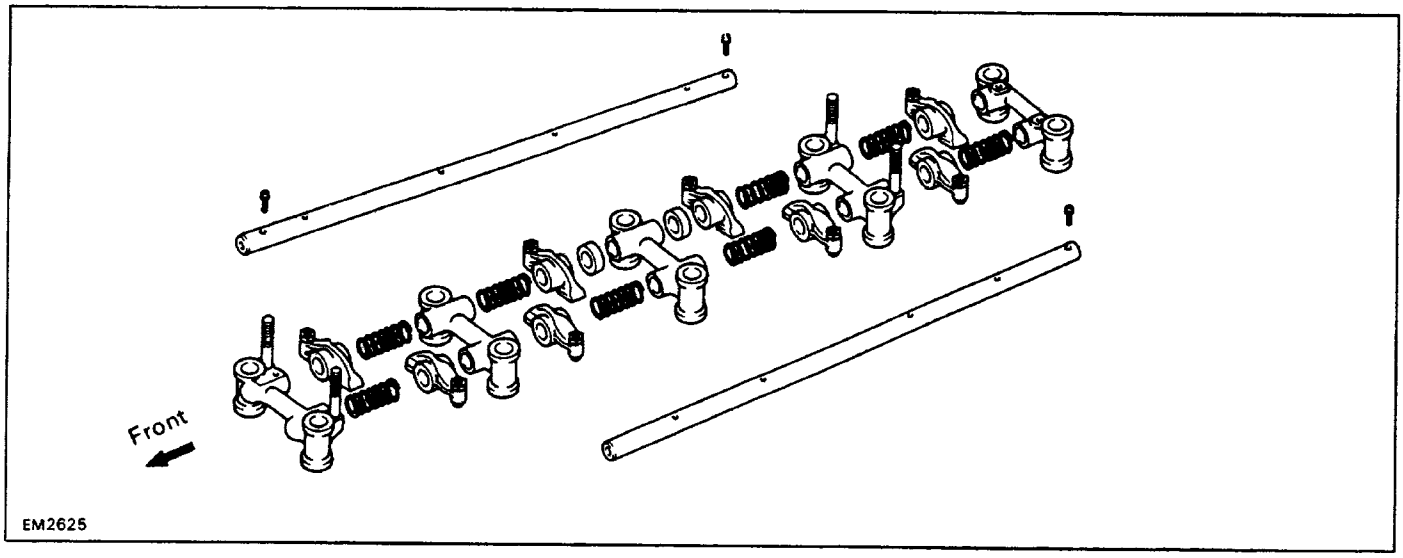
Standard oil clearance: 0.01 – 0.05 mm (0.0004 – 0.0020 in.)

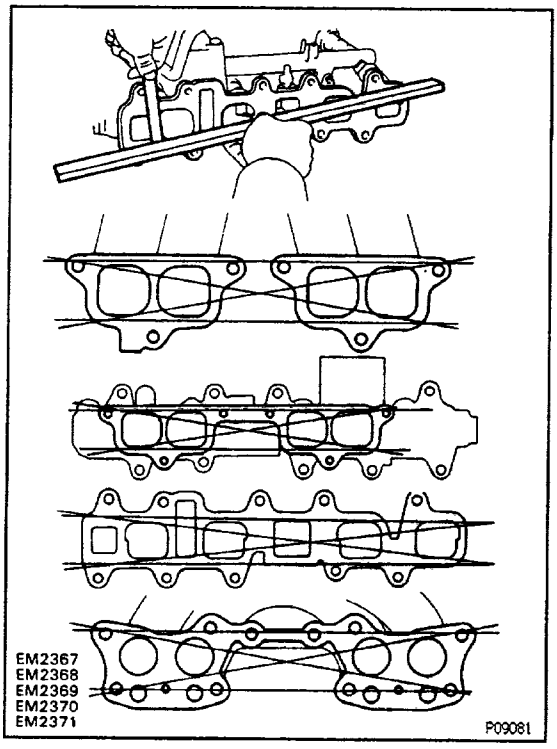
Maximum oil clearance: 0.08 mm (0.0031 in.)

If the oil clearance is grater than maximum, replace the rocker arm and/or shaft.

(e) Assemble the rocker arm assembly as shown, and install the three screws.

HINT: All rocker arms are the same but all rocker stands are different and must be assembled in the correct order.





17. INSPECT INTAKE, EXHAUST MANIFOLDS AND AIR INTAKE CHAMBER

Using a precision straight edge and thickness gauge, check the surface contacting the cylinder head or intake manifold for warpage.

Maximum intake warpage: 0.2 mm (0.008 in.)
Maximum exhaust warpage: 0.7 mm (0.28 in.)
Maximum air intake chamber warpage: 0.2 mm (0.008 in.)

If warpage is greater than maximum, replace the manifold and/or air intake chamber.

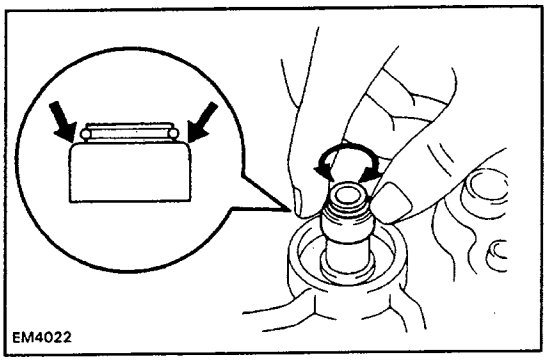
CYLINDER HEAD ASSEMBLY

EG1VF–02

(See page EG1–15**)**

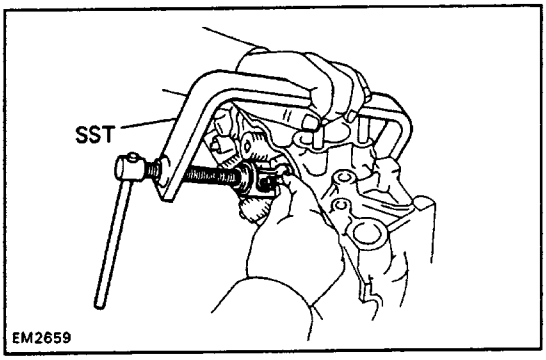
HINT:

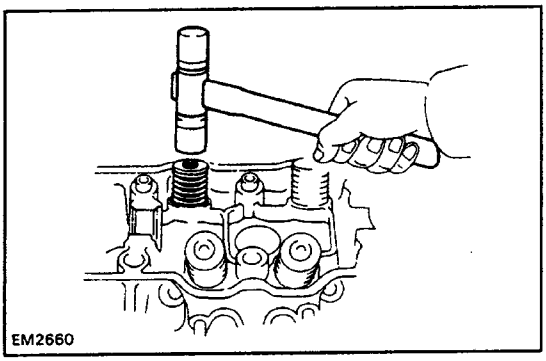
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new parts.



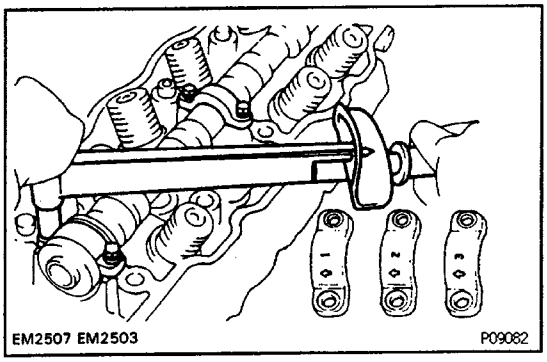
1. INSTALL VALVES

(a) Install a new oil seal on the valve guide bushing.
HINT Pushing down at the place shown in the illus–tration.
(b) Rotate the oil seal to check that it is firmly installed.
(c) Lubricate and insert valve in the valve guide bushing.
Check that valves are installed in the correct order.
(d) Install spring seat, spring and spring retainer on the cylinder head.
(e) Using SST, compress valve retainer and place two keepers around the valve stem.
SST 09202–43013



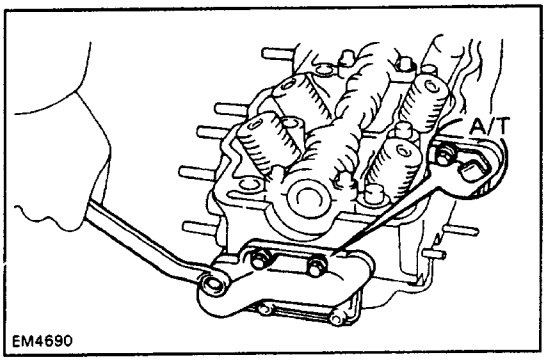


(f) Tap the stem lightly to assure proper fit.



2. INSTALL CAMSHAFT

(a) Place the camshaft in the cylinder head and install the bearing caps in numbered order from the front with arrows pointed toward the front.
(b) Install and torque the cap bolts.
Torque: 20N–m (200kgf–cm, 14ft–lbf)
(c) Turn the camshaft to position the dowel at the top.

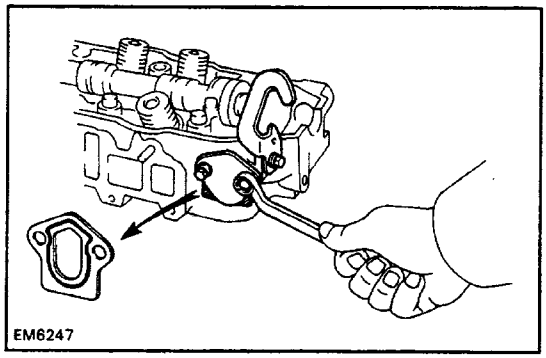


3. INSTALL CYLINDER HEAD REAR COVER

Install a new gasket, cylinder head rear cover and throttle cable clamp (for A/T) with the four bolts.

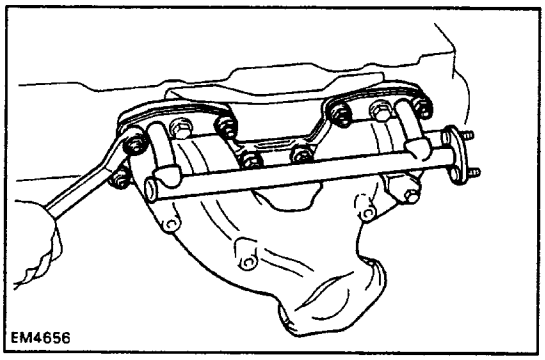
4. INSTALL LH ENGINE HANGER AND GROUND STRAP

5. INSTALL RH ENGINE HANGER



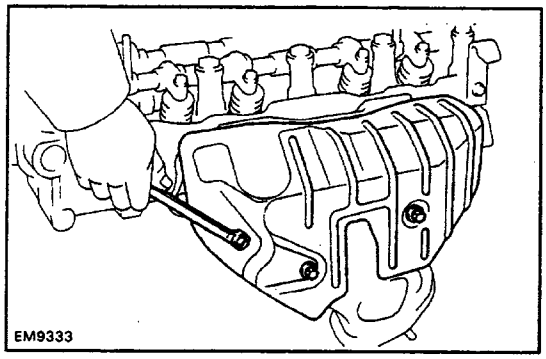
6. INSTALL PLUG PATE

Install a new gasket and plug plate with the two bolts.
HINT: Attach the flat side of the gasket to the cylinder head.

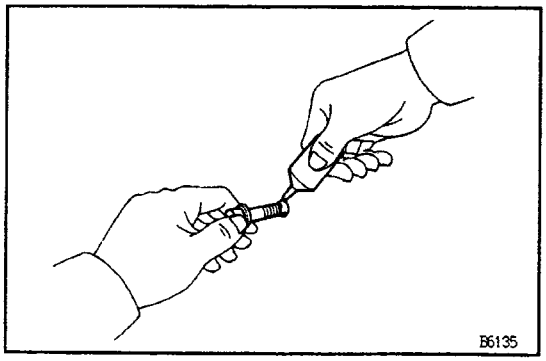


7. INSTALL EXHAUST MANIFOLD

(a) Position a new gasket on the cylinder head.
(b) Install the exhaust manifold with the eight nuts.
Torque the nuts.
Torque: 44N–m (450kgf–cm, 33ft–lbf)



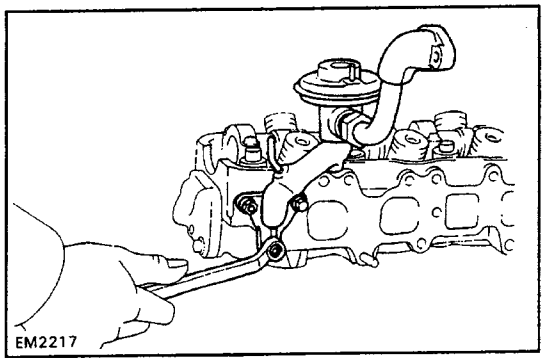
(c) Install the No. 2 exhaust manifold heat insulator with the three bolts.
Torque: 19N–m (195kgf–cm, 14ft.–lbf)



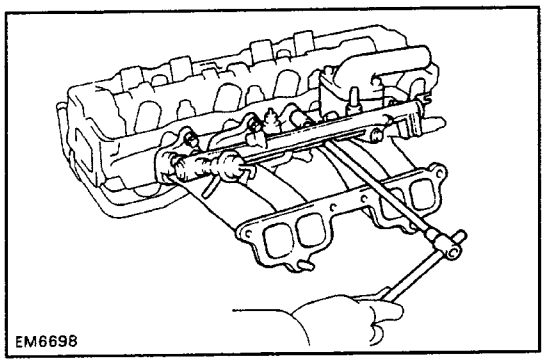
8. INSTALL EGR VALVE

(a) Clean the set bolt (closest to the front) threads and cylinder head bolt holes of any sealer, oil or foreign particles.
Remove any oil with kerosene or gasoline.
(b) Apply sealant to 2 or 3 threads of the bolt end.
Sealant: Part No. 08833–00070, THREE BOND 1324 or equivalent

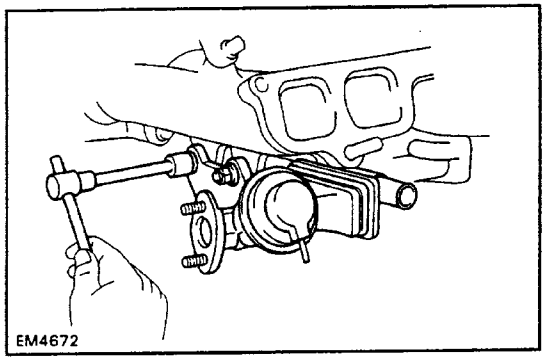
- This adhesive will not harden while exposed to air. It will act as a sealer or binding agent only when applied to threads, etc. and air is cut off.



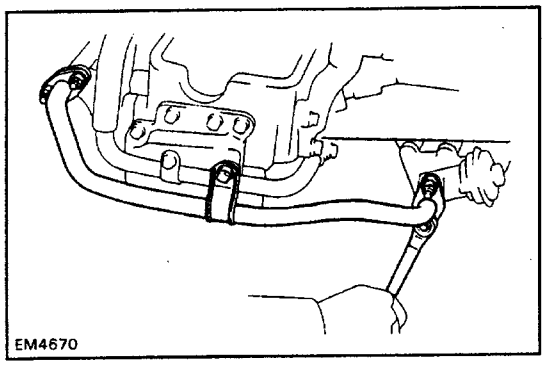
(c) Install the EGR valve with the two bolts and nut.



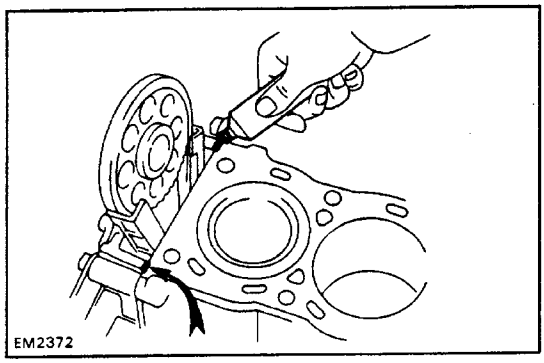
9. INSTALL INTAKE MANIFOLD
(a) Position a new gasket on the cylinder head.
(b) Install the intake manifold with the delivery pipe and injectors and No. 1 air pipe.
(c) Install the seven bolts, one hexagon bolt and two nuts. Torque the bolts and nuts.
Torque: 19Nm (195kgf–cm, 14ft–lbf)
(d) Install the heater inlet pipe to the cylinder head with the bolt.



(e) Install the PAIR valve with the two nuts.
Torque: 13N–m (130kgf–cm, 9 ft–lbf)



10. INSTALL NO. 1 SECONDARY AIR INJECTION MANIFOLD
(a) Position new gaskets on the PAIR valve and No. 1 secondary air injection pipe.
(b) Install the No. 1 secondary air injection pipe with the four nuts and bolt.
Torque: 13Nm (130kgf–cm. 9ft–lbf)



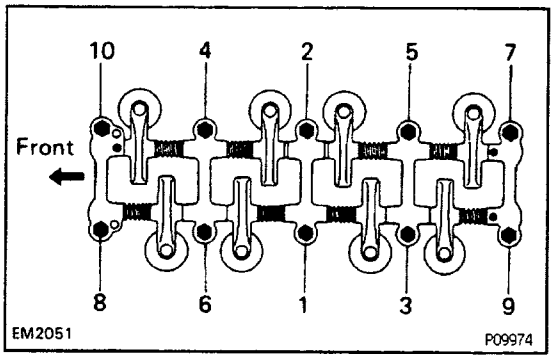
EG1VG–02

CYLINDER HEAD INSTALLATION

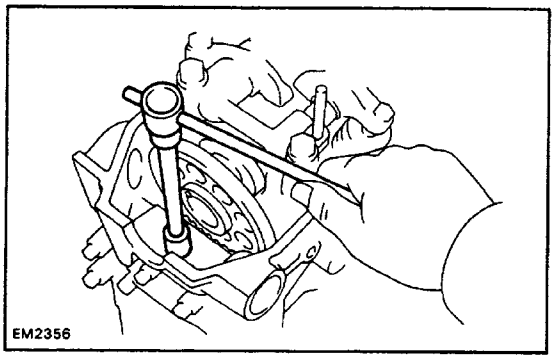
(See page EG1–15)

1. APPLY SEAL PACKING TO CYLINDER BLOCK
(a) Apply seal packing to two locations as shown.
Seal packing: Part No. 08826–00080 or equivalent
(b) Place a new head gasket over dowels on the cylinder block.
2. INSTALL CYLINDER HEAD

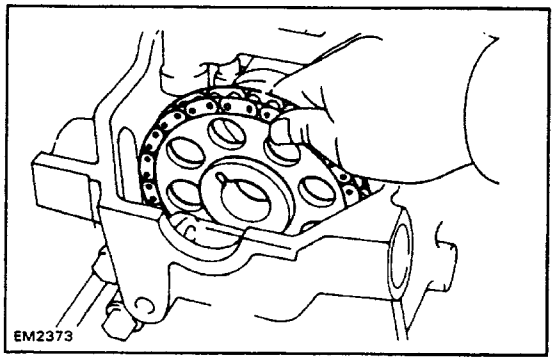
(a) If the sprocket was removed, align the alignment marks placed on the sprocket and chain during re–moval.
(b) position the cylinder head over dowels on the block.



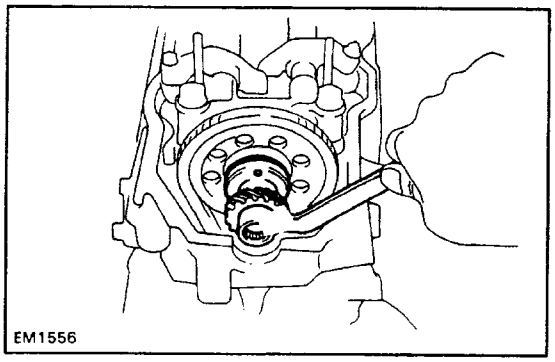
3. INSTALL ROCKER ARM ASSEMBLY
(a) Place the rocker arm assembly over the dowels on the cylinder head.
(b) Install and tighten the head bolts gradually in three passes in the sequence shown. Torque the bolts on the final pass.
Torque: 78N–m (800kgf–cm, 58ft–lbf)



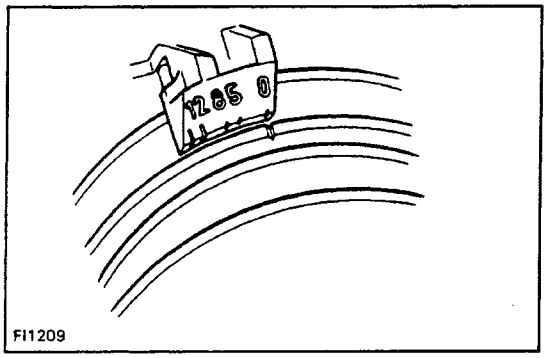
4. INSTALL CHAIN COVER BOLT
Torque the bolt.
Torque: 13N–m (130kgf–cm, 9ft–lbf)



(a) While holding up on the sprocket and chain, turn the crankshaft until the No. 1 and No. 4 cylinders are at top dead center.
(b) Place the chain sprocket over the camshaft dowel.
HINT: If the chain does not seem long enough,turn the crankshaft back and forth while pulling up on the chain and sprocket.



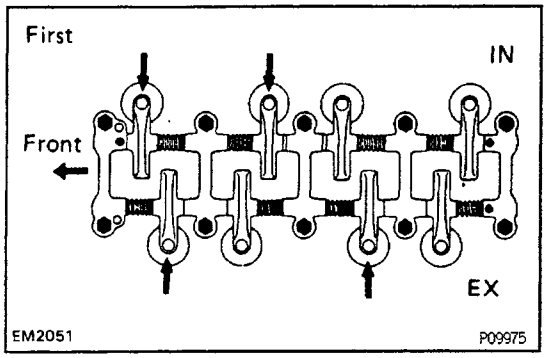
5. INSTALL DISTRIBUTOR DRIVE GEAR AND CAM–SHAFT THRUST PLATE
Place the distributor drive gear and camshaft thrust plate over the chain sprocket. Torque the bolt.
Torque: 78N–m (800kgf–cm, 58ft–lbf)



6. ADJUST VALVE CLEARANCE

(a) Set the No. 1 cylinder to TDC/compression.

- Turn the crankshaft with a wrench to align the timing, marks at TDC. Set the groove on the pulley at the ”0” mark position of the chain cover.
- Check that the rocker arms on the No. 1 cylinder are loose and the rocker arms on No. 4 cylinder are tight.
  If not, turn the crankshaft one complete revolution and align the marks as above.



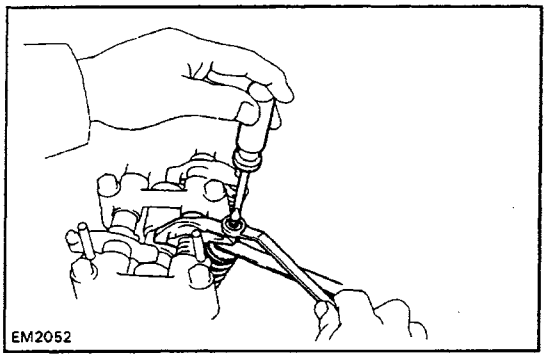
(b) Adjust the clearance of half of the valves.
Adjust only the valves indicated by arrows as shown.

Valve clearance (Cold):

Intake 0.20 mm (0.008 in.)

Exhaust 0.30 mm (0.012 in.)

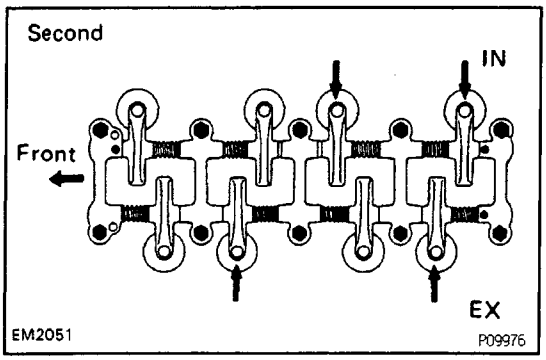
HINT: After installing the cylinder head, warm up the engine and adjust the valve clearance.



Use a thickness gauge to measure between the valve stern and rocker arm. Loosen the lock nut and turn the adjusting screw to set the proper clearance. Hold the adjusting screw in position and tighten the lock nut.

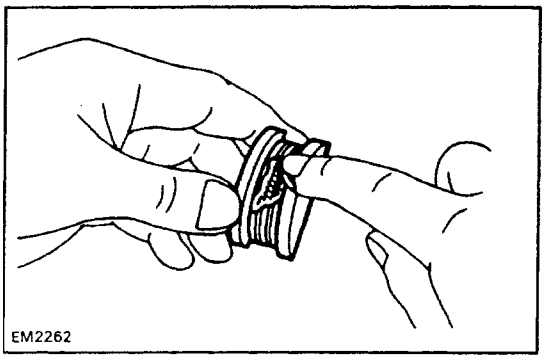
Torque: 25N–m (250kgf–cm, 18ft–lbf)

Recheck the clearance. The thickness gauge should move. with a very slight drag.



(c) Turn the crankshaft one revolution and adjust the other valves.

(d) Set the No. 1 cylinder to TDC/compression.

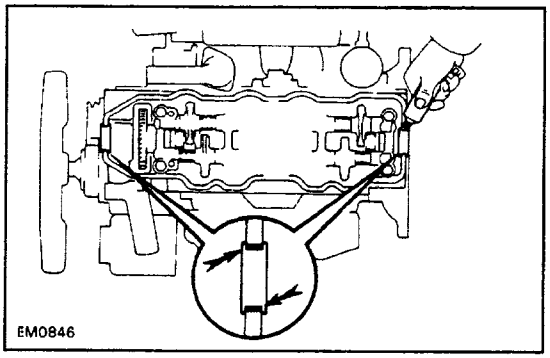


7. INSTALL HALF–CIRCULAR PLUGS

(a) Apply seal packing to the cylinder head installation surface of the plug.

Seal packing: Part No. 08826–00080 or equivalent

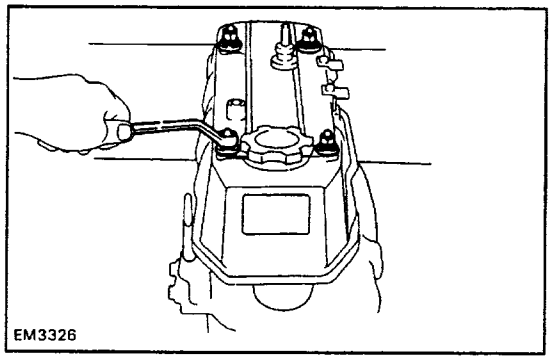
(b) Install the half–circular plugs to the cylinder head.



8. INSTALL HEAD COVER

(a) Apply seal packing to the four locations shown.

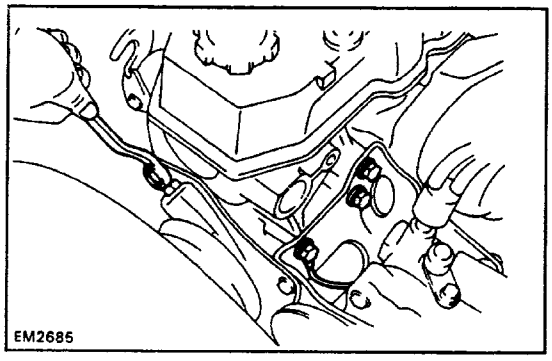
Seal packing: Part No. 08826–00080 or equivalent



(b) Install the gasket to the cylinder head.

(c) Place the head cover on the cylinder head and install the four seals and nuts.

Torque: 5.9N–m (60kgf–cm, 52in.–lbf)



EG1VH–02

POST INSTALLATION

1. (w/PS)

CONNECT PS BRACKET TO CYLINDER HEAD

Install the four bolts and bond strap. Torque the bolts.

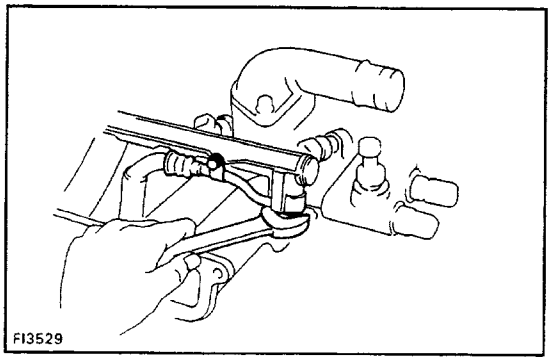
Torque: 44N–m (450kgf–cm, 33ft–lbf)

2. (w/PS)

INSTALL DRIVE BELT AND ADJUST BELT TEN–SION

(See step 2 on page MA–6)

3. CONNECT BY–PASS HOSE TO INTAKE MANIFOLD



4. CONNECT FUEL HOSE TO DELIVERY PIPE

Install new gaskets and the fuel hose with union bolt.

Torque: 44N–m (450kgf–cm, 33ft–lbf)

5. CONNECT FOLLOWING WIRES:

(a) Engine coolant temp. sensor wire

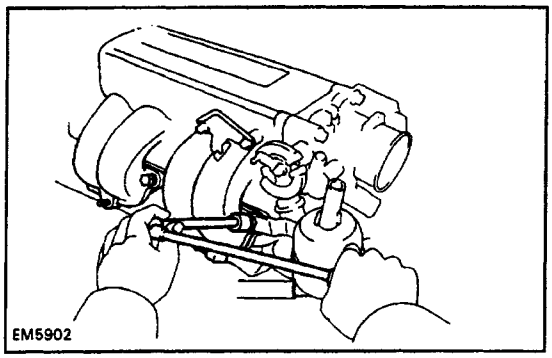
(b) Cold start injector time switch wire

(c) VSV wires

(d) Igniter wire

(e) (A/T)
OD temp. switch wire
(f) Engine coolant temp. sender gauge wire
(g) Injector wires
(h) (with A/C)
Compressor wires
(i) Transmission wires
(j) Starter wire (terminal 50)
(k) Oil pressure sender gauge wire
(l) Knock sensor wire

6. CONNECT FUEL RETURN HOSE



7. INSTALL CHAMBER WITH THROTTLE BODY

(a) Position new gaskets on the intake manifold and No. 1 EGR pipe.
(b)– Install the chamber, throttle body, fuel hose clamp, resonator and bond strap with the four bolts and two nuts.
(c) Connect the chamber and stay with a bolt.
(d) Install the bolts holding the EGR valve to the chamber.
(e) Install the new gaskets and cold start injector pipe.

8. CONNECT FOLLOWING WIRES:

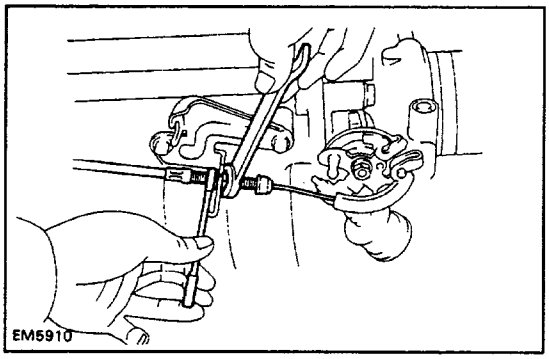
(a) (California only)
EGR gas temp. sensor wire
(b) Throttle position wire
(c) Cold start injector wire

9. INSTALL EGR VACUUM MODULATOR

10. CONNECT FOLLOWING PARTS:

(a) (w/ Oil cooler)
Connect the No. 1 oil cooler hose to the intake man–ifold.
(w/o Oil cooler)
Connect the No. 1 water by–pass hose to the intake manifold.
(b) No. 2 and No. 3 water by–pass hoses to the throttle body
(c) Vacuum hoses to throttle body
(d) Pressure regulator hose
(e) Fuel pressure up hose
(f) PAIR valve hose
(g) EGR valve hose

(h) EGR vacuum modulator hose
(i) EVAP hose
(j) (with A/C)
VSV hoses
(k) (w/PS)
Air control valve hoses
(l) Brake booster hose
(m) No. 1 and No. 2 PCV hoses

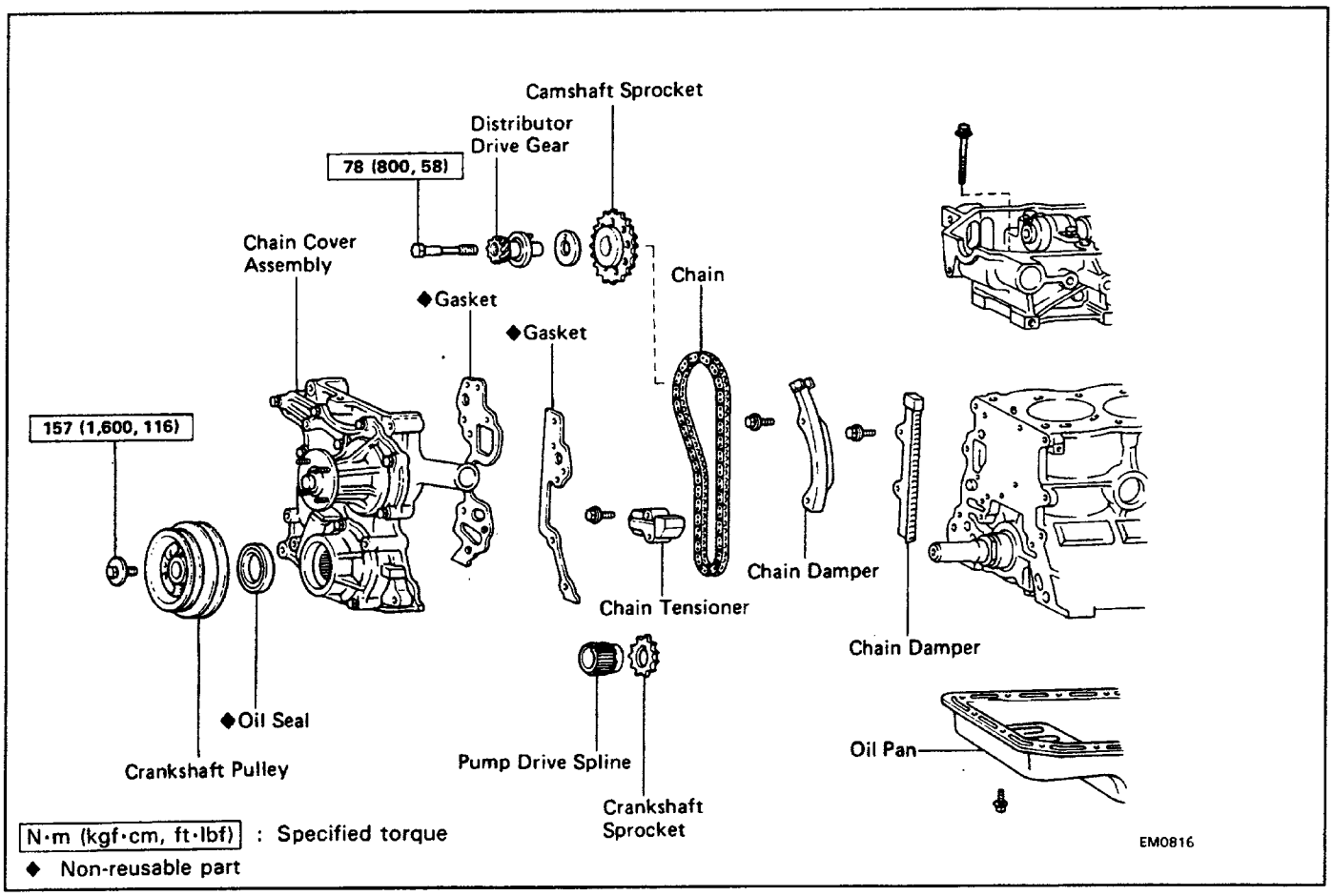


11. CONNECT GROUND STRAP TO ENGINE REAR SIDE
12. (A/T)
CONNECT THROTTLE CABLE
Connect the throttle cable to the clamp and bracket.
13. CONNECT ACCELERATOR CABLE
14. CONNECT HEATER WATER INLET HOSE TO HEATER WATER INLET PIPE
15. INSTALL RADIATOR INLET HOSE
16. INSTALL SPARK PLUGS AND DISTRIBUTOR
(See pages IG–6**, 9)**
17. INSTALL OIL DIPSTICK
18. CONNECT EXHAUST PIPE TO EXHAUST MANI–FOLD
(a) Install the new gaskets, and connect the exhaust pipe to the exhaust manifold with the three nuts.
(b) Install the exhaust pipe clamp.
19. INSTALL INTAKE AIR CONNECTOR
20. FILL WITH ENGINE OIL
(See step 3 on page EG1–236**)**
21. FILL WITH COOLANT
(See step 3 on page EG1–225**)**
22. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY
23. START ENGINE
Warm up the engine and inspect for leaks.
24. PERFORM ENGINE ADJUSTMENT
(See page EG1–10**)**
25. RECHECK COOLANT AND ENGINE OIL LEVEL
26. ROAD TEST
Road test the vehicle.
27. RECHECK COOLANT AND ENGINE OIL LEVEL

TIMING CHAIN

EG1VJ–01

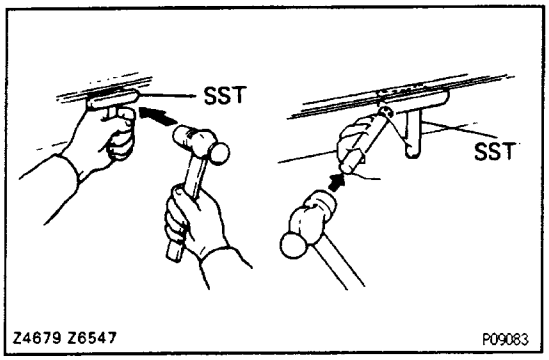
COMPONENTS



EG1VK–02

PREPARATION OF REMOVAL

1. REMOVE CYLINDER HEAD
(See page EG1–16)
2. REMOVE RADIATOR
(See page EG1–230)
3. (4WD)
REMOVE FRONT DIFFERENTIAL
(See SA section)



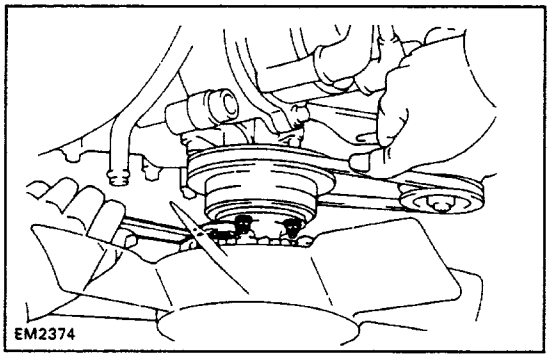
4. REMOVE OIL PAN
(a) Remove the engine undercover.
(b) Remove the engine mounting bolts.
(c) (2WD)
Place a jack under the transmission and raise the engine approx. 25 mm (0.98 in.)
(d) Remove the sixteen bolts and nuts.
(e) Using SST and brass bar, separate the oil pan from the cylinder block.

SST 09032 – 00100
HINT: When removing the oil pan, be careful not to damage the oil pan flange.

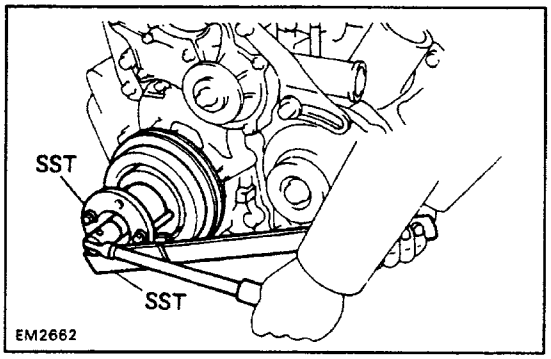
EG1VL–02

TIMING CHAIN REMOVAL

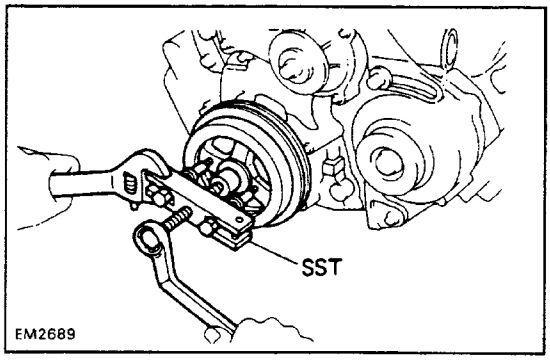
1. (W/PS)
REMOVE PS BELT
2. (with A/C)
REMOVE A/C BELT, COMPRESSOR AND BRACKET



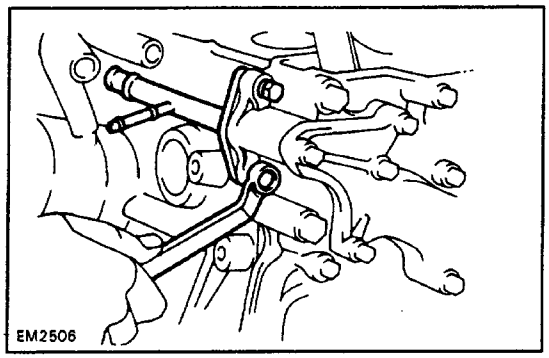
3. REMOVE FLUID COUPLING WITH FAN AND WATER PUMP PULLEY
(a) Loosen the water pump pulley set bolts.
(b) Loosen the belt adjusting bolt and pivot bolt of the generator, and remove the drive belt.
(c) Remove the set nuts, fluid coupling with fan and water pump pulley.



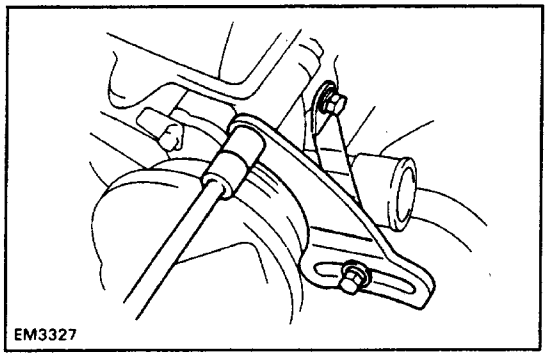
4. REMOVE CRANKSHAFT PULLEY
(a) (with A/C (w/o Air pump) or w/PS (w/ Air pump)) Remove the No. 2 crankshaft pulley.
(b) Using SST to hold the crankshaft pulley, loosen the pulley bolt.
SST 09213–70010 and 09330–00021



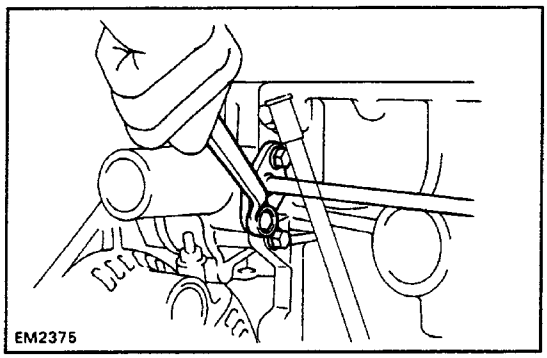
(c) Using SST, remove the crankshaft pulley.
SST 09213–310231
HINT: If the front seal is to be replaced, see page EG1–236.



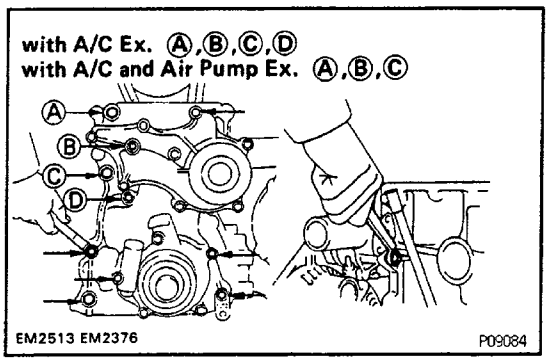
5. REMOVE NO. 1 WATER BY–PASS PIPE
Remove the two bolts and pipe.



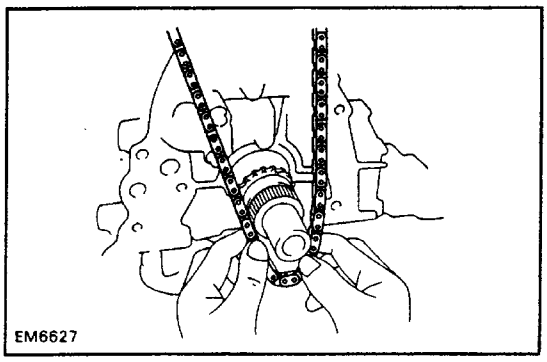
6. REMOVE FAN BELT ADJUSTING BAR
(a) (w/ PS)
Remove the bolt and PS lower bracket.
(b) Remove the three bolts and bar.



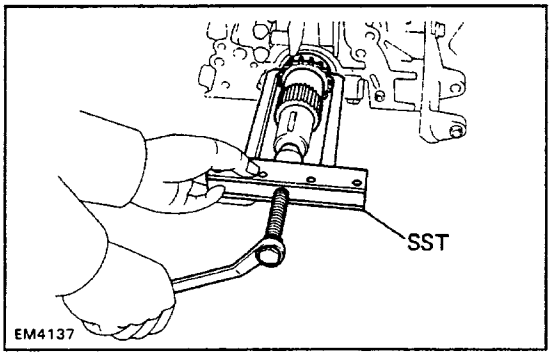
7. DISCONNECT HEATER WATER OUTLET PIPE
Remove the two bolts, and disconnect heater water outlet pipe.



8. REMOVE CHAIN COVER ASSEMBLY
(a) Remove timing chain cover bolts shown by the arrows.
(b) Using a plastic faced hammer, loosen the chain cover and remove it.



9. REMOVE CHAIN AND CAMSHAFT SPROCKET
(a) Remove the chain from the damper.
(b) Remove the cam sprocket and chain together.



10. REMOVE PUMP DRIVE SPLINE AND CRANKSHAFT SPROCKET

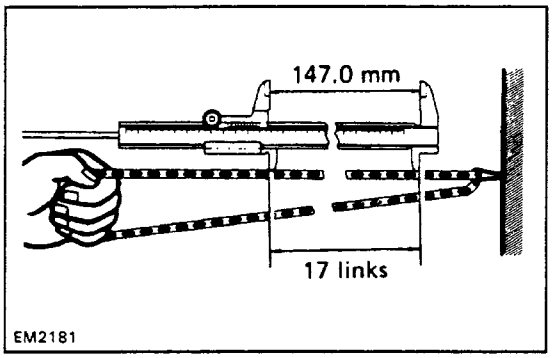
If the oil pump drive spline and sprocket cannot be removed by hand, use SST to remove them together.

SST 09213–36020

11. REMOVE GASKET MATERIAL ON CYLINDER BLOCK

EG1VM–01

COMPONENTS INSPECTION



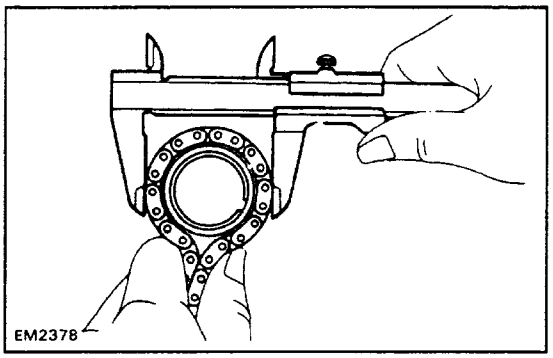
1. MEASURE CHAIN AND SPROCKET WEAR

(a) Measure the length of 17 links with the chain fully stretched.

(b) Make the same measurements at least three other places selected at random.

Chain elongation limit at 17 links: 147.0 mm (5.787 in.)

If over the limit at any one place the chain.



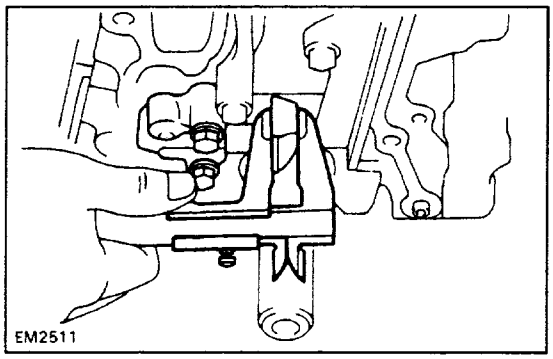
(c) Wrap the chain around the sprocket.

(d) Using a caliper gauge, measure the outer sides of the chain rollers as shown. Measure both sprockets.

Crankshaft sprocket minimum: 59.4 mm (2.339 in.)

Camshaft sprocket minimum: 113.8 mm (4.480 in.)

If the measurement is less than minimum, replace the chain and two sprockets.

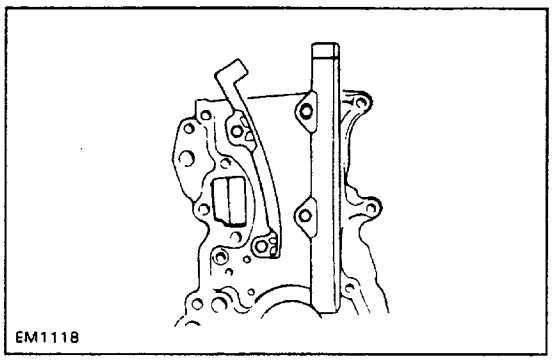


2. MEASURE CHAIN TENSIONER

Using a caliper gauge, measure the tensioner as shown.

Tensioner minimum: 11.0 mm (0.433 in.)

If the tensioner is worn or less than minimum, replace the chain tensioner.



3. MEASURE CHAIN DAMPERS

Using a micrometer, measure each damper.

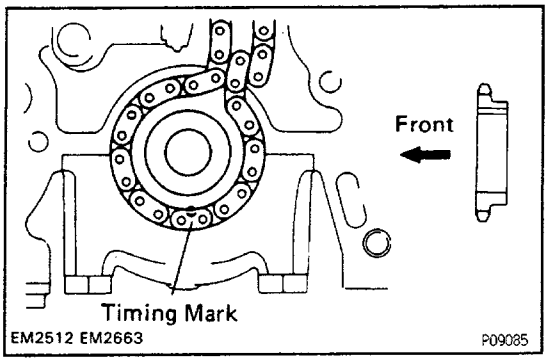
Damper wear limit: 0.5 mm (0.020 in.)

If either damper is worn or less than minimum, replace the damper.

EG1VN–03

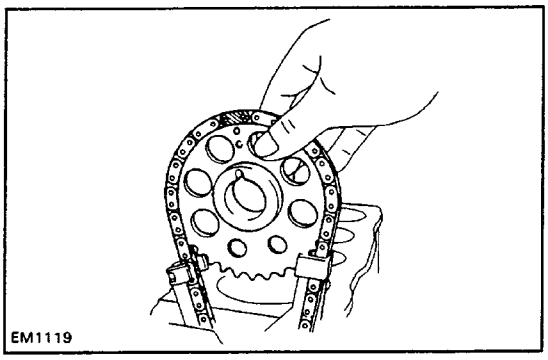
TIMING CHAIN INSTALLATION

(See page EG1–39)



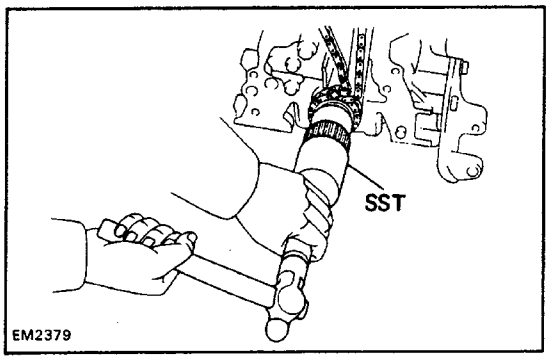
1. INSTALL CRANKSHAFT SPROCKET AND CHAIN

(a) Turn the crankshaft until the shaft key is on top.
(b) Slide the sprocket over the key on the crankshaft.
(c) Place the timing chain on the sprocket with the single bright chain link aligned with the timing mark on the sprocket.



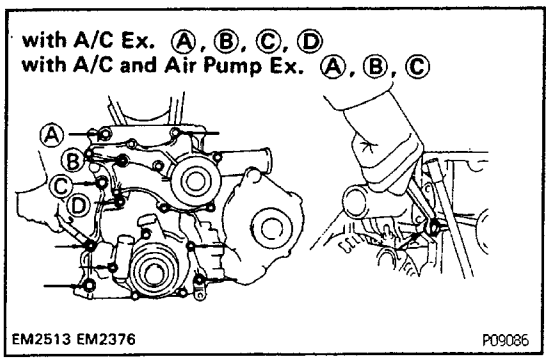
2. PLACE CHAIN ON CAMSHAFT SPROCKET

(a) Place the timing chain on the sprocket so that the bright chain link is aligned with the timing mark on the sprocket.
(b) Make sure the chain is positioned between the dam–pers.
(c) Turn the camshaft sprocket counterclockwise to take the slack out of the chain.



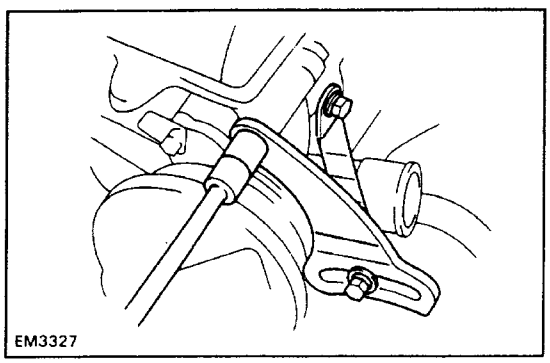
3. INSTALL OIL PUMP DRIVE SPLINE

Slide the oil pump drive spline over the crankshaft key.
HINT: If the oil pump drive spline is difficult to install by hand, install using SST.
SST 09608–35014 (09608–06040)



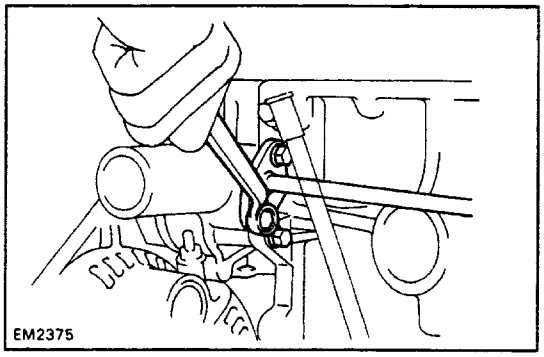
4. INSTALL TIMING CHAIN COVER ASSEMBLY

(a) Remove the old cover gaskets. Clean the gasket sur–face. Install new gaskets over the dowels.
(b) Slide the cover assembly over the dowels and pump spline.
(c) Insert the bolts as shown and torque them.
Torque: 8 mm bolt 13 N–m(130kgf–cm, 9ft–lbf)
10 mm bolt 13 N–m(400kgf–cm, 29ft–lbf)

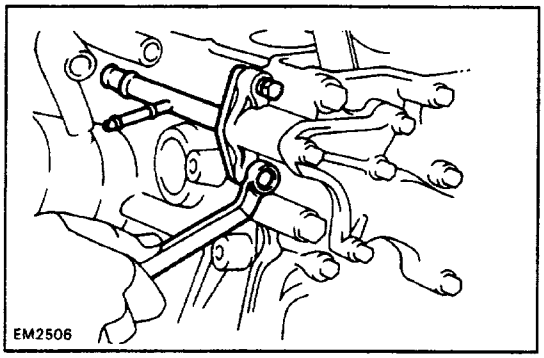


5. INSTALL FAN BELT ADJUSTING BAR

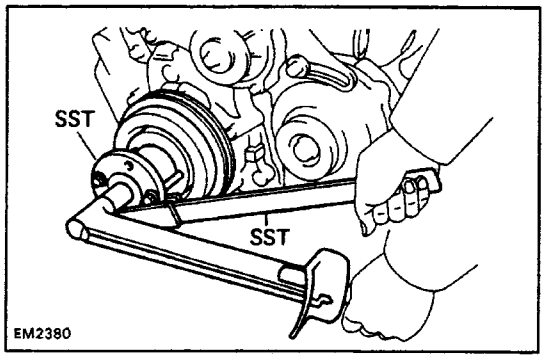
(a) Temporarily install the adjusting bar to the alternator.
(b) Install the adjusting bar to the chain cover and cylin–der head.
Torque: 13N–m(130kgf–cm, 9ft–lbf)



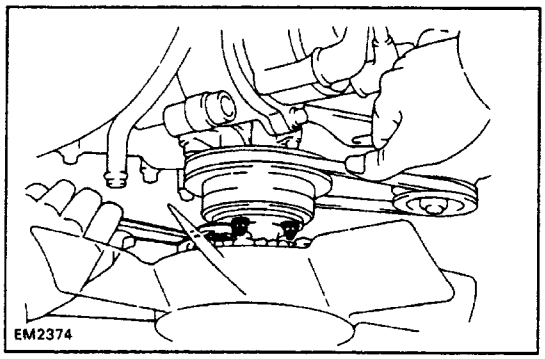
6. INSTALL HEATER WATER OUTLET PIPE
Connect the heater water outlet pipe to the timing chain cover with the two bolts.



7. INSTALL NO.1 WATER BY–PASS PIPE
Install the pipe with the two bolts.

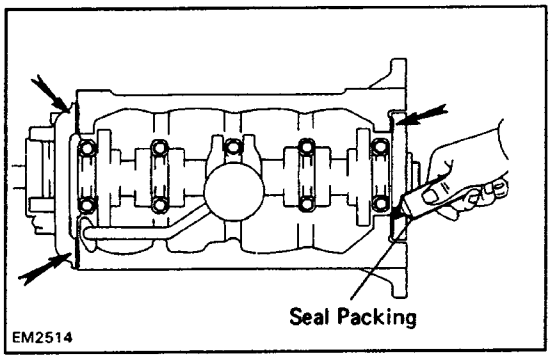


8. INSTALL CRANKSHAFT PULLEY
(a) Install the crankshaft pulley and bolt.
(b) Using SST to hole the crankshaft pulley, torque the. bolt.
SST 09213–70010 and 09660–00021
Torque: 157N–m(1,600kgf–cm, 116ft–lbf)
(c) (with A/C) Install the NO.2 crankshaft pulley.



9. INSTALL WATER PUMP PULLEY AND FLUID COUPLING WITH FAN
(a) Temporarily install the water pump pulley and fluid coupling with fan with the four nuts.
(b) Place the drive belt onto each pulley.
(c) Stretch the belt tight and tighten the four nuts.
10. ADJUST DRIVE BELT TENSION
(See page MA–6)
11. (with A/C) INSTALL A/C COMPRESSOR BRACKET, COMPRESSOR AND BELT
(See page MA–6)
12. (w/PS) INSTALL PS BELT
(See page MA–6)
13. INSTALL OIL PAN
(a) Remove any old packing material and be careful not to drop any oil on the contacting surfaces of the oil pan and cylinder block.

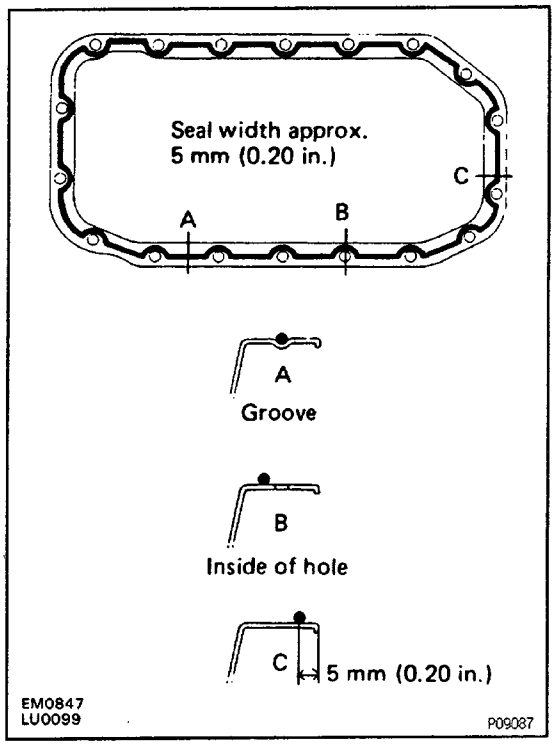
- Using a razor blade and gasket scraper, remove all the packing (FIPG) material from the gasket surfaces.
- Thoroughly clean all components to remove all the loose material.
- Clean both sealing surfaces with a non–residue solvent.



NOTICE: Do not use a solvent which will affect the pai–nted surfaces.

(b) Apply seal packing to the joint part of the cylinder block and chain cover, cylinder block and rear oil seal retainer.

Seal packing: Part No.08826–00080 or equivalent



(c) 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 5–mm (0.20 in.) opening.

HINT: Avoid applying an excess amount to the sur–face. Be especially careful near oil passages.

- If parts are not assembled within 5 minutes of applying the seal packing, the effectiveness of the seal packing is lost and the seal packing must be removed and reapplied.
- Immediately remove the nozzle from the tubs and reinstall the cap after using the seal packing.

(d) Install the oil pan over the studs on the block with the sixteen bolts and two nuts. Torque the bolts and nuts.

Torque: 13N–m(130kgf–cm, 9ft–lbf)

(e) Lower the engine and install the engine mounting bolts.

(f) Install the engine under cover.

EG1VP–02

POST INSTALLATION

1. INSTALL RADIATOR

2. INSTALL CYLINDER HEAD

(See page EG1–34**)**

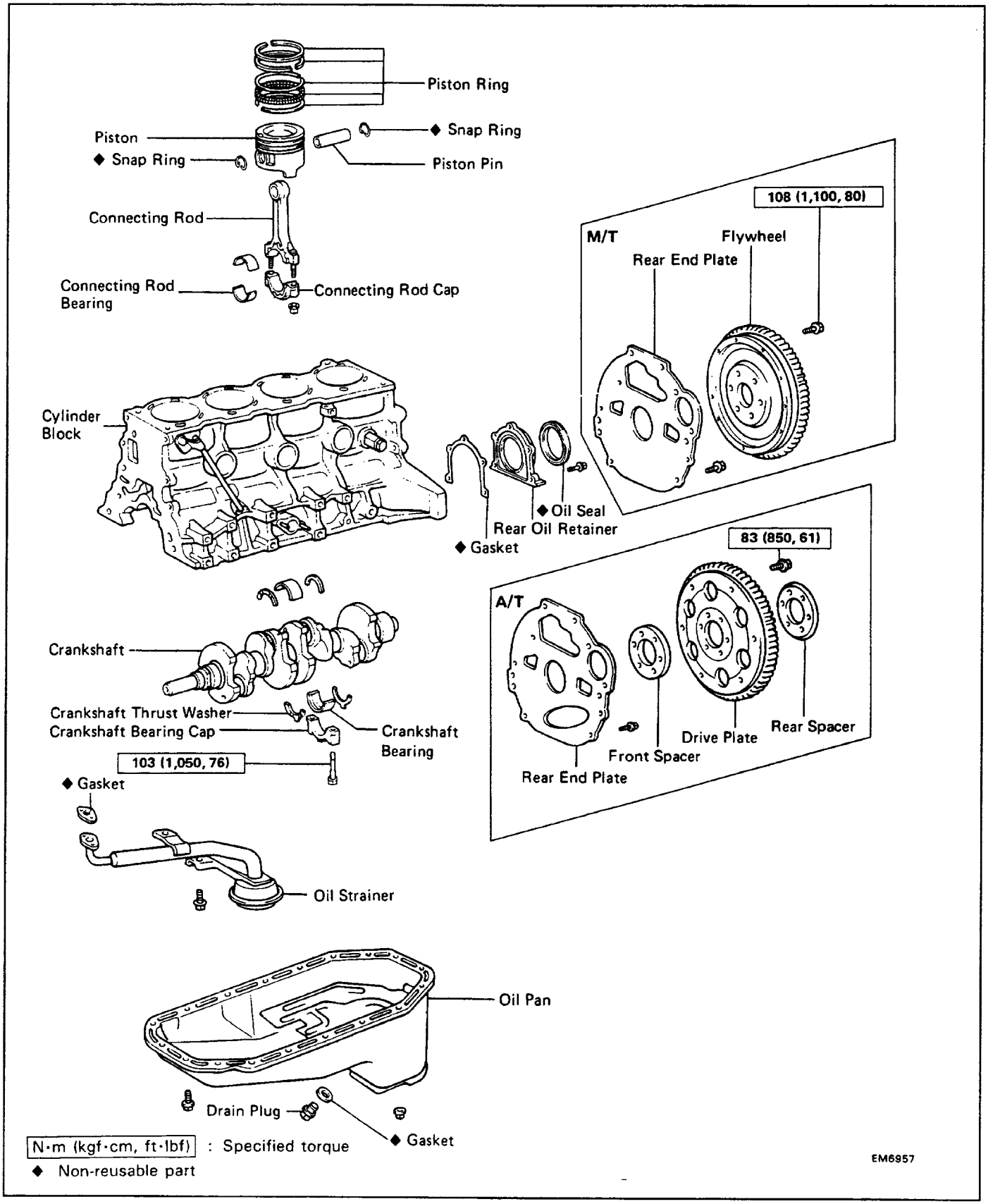
3. (4WD) INSTALL FRONT DIFFERENTIAL

(See SA section)

CYLINDER BLOCK

EG1VQ–01

COMPONENTS



EG1VR–02

ENGINE REMOVAL

1. REMOVE HOOD

2. REMOVE BATTERY

3. REMOVE ENGINE UNDER COVER

4. DRAIN COOLANT FROM RADIATOR AND CYLIN–DER BLOCK

(See step 3 on page EG1–225**)**

5. DRAIN ENGINE OIL

(See step 1 on page EG1–236**)**

6. REMOVE AIR CLEANER CASE AND INTAKE AIR CONNECTOR

7. REMOVE RADIATOR

(See page EG1–230**)**

8. REMOVE PS PUMP BELT

(a) Stretch the belt tight and loosen the PS pump pulley lock nut.

(b) Remove the PS belt.

9. (with A/C)

REMOVE A/C BELT

10. REMOVE GENERATOR DRIVE BELT, FLUID COU–PLING AND FAN PULLEY

(See step 3 on page EG1–40**)**

11. DISCONNECT FOLLOWING WIRES AND CONNEC–TORS:

(a) Ground strap from LH fender apron

(b) Generator connector and wire

(c) Igniter connector

(d) Generator wires

(e) High–tension cord for ignition coil

(f) Distributor wire from igniter

(g) Ground strap from engine rear side

(h) ECM connectors

(i) (M/T)

Starter relay connector

(j) Check connector

(k) (with A/C)

A/C compressor connector

12. DISCONNECT FOLLOWING HOSES:

(a) PS air hoses from gas filter and air pipe

(b) Brake booster hose

(c) (w/Cruise control)

Cruise control vacuum hose

(d) Charcoal canister hose from canister

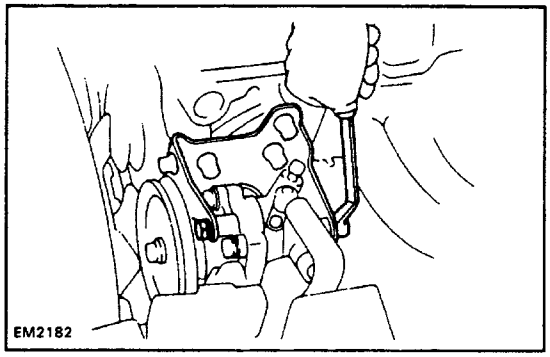
13. DISCONNECT FOLLOWING CABLE:

(a) Accelerator cable

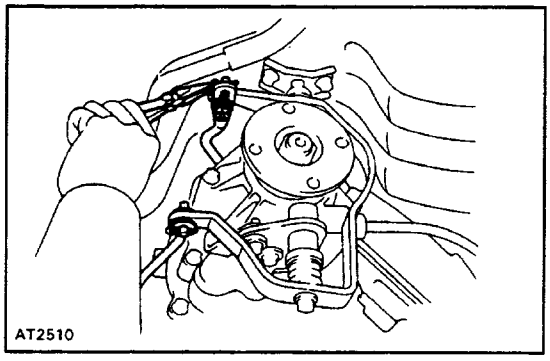
(b) (A/T)

Throttle cable

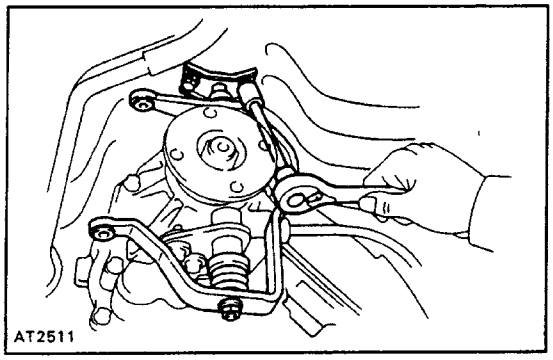
(c) (w/Cruise control)
Cruise control cable



14. (w/PS)
REMOVE PS PUMP FROM BRACKET
(a) Remove the drive belt.
(b) Remove the four bolts.
(c) Remove the PS pump.
HINT: Lay the PS pump to one side without disconn–ecting the hoses.
15. DISCONNECT GROUND STRAP FROM PS PUMP BRACKET
16. (with A/C)
REMOVE COMPRESSOR FROM BRACKET
(a) Loosen the drive belt adjusting bolt and remove the drive belt.
(6) Remove the compressor on the front side without disconnecting the hoses.
17. DISCONNECT GROUND STRAPS FROM ENGINE REAR SIDE AND RH SIDE
18. (M/T)
REMOVE SHIFT LEVER(S) FROM INSIDE OF VEHI–CLE
19. REMOVE REAR PROPELLER SHAFT
(See PR section)
20. (2WD A/T)
DISCONNECT MANUAL SHIFT LINKAGE FROM PNP SWITCH



21. (4WD A/T)
DISCONNECT TRANSFER SHIFT LINKAGE
(a) Disconnect the No.1 and No.2 transfer shift linkages from the cross shaft.



(b) Remove the cross shaft from the body.

22. DISCONNECT SPEEDOMETER CABLE

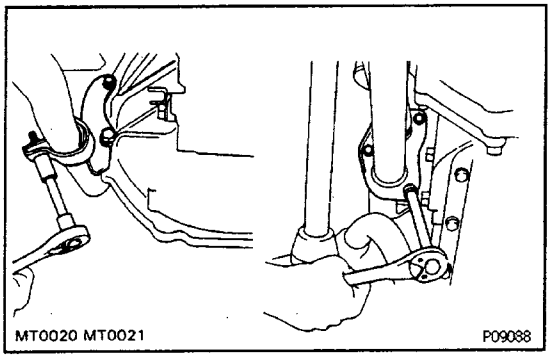
NOTICE: Do not lose the felt dust protector and washers.

23. (4WD)
REMOVE TRANSFER UNDER COVER

24. (4WD)
REMOVE STABILIZER BAR

25. (4WD)
REMOVE FRONT PROPELLER SHAFT
(See PR section)

26. REMOVE NO.1 FRAME CROSSMEMBER



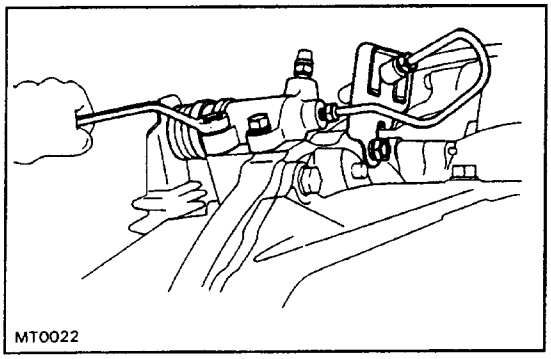
27. REMOVE FRONT EXHAUST PIPE

(a) Disconnect the oxygen sensor connector.

(b) Disconnect the exhaust pipe from the exhaust mani–fold.

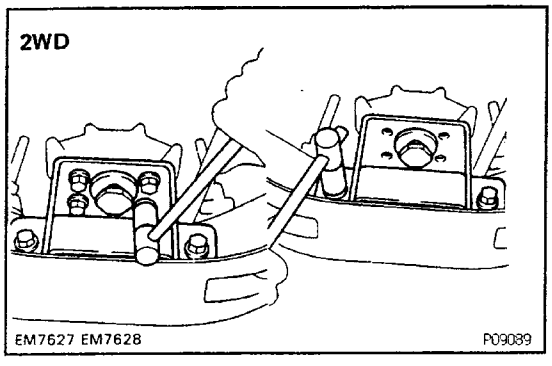
(c) Remove the exhaust pipe clamp from the clutch housing.

(d) Remove the exhaust pipe from the catalytic converter.



28. (M/T)
REMOVE CLUTCH RELEASE CYLINDER WITH BRACKET FROM TRANSMISSION

29. (4WD)
REMOVE NO.1 FRONT FLOOR HEAT INSULATOR AND BRAKE TUBE HEAT INSULATOR

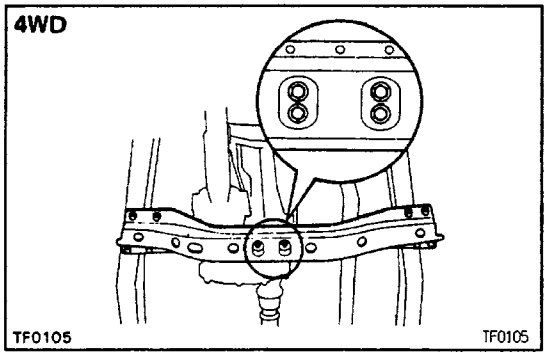


30. (2WD)
REMOVE ENGINE REAR MOUNTING AND BRACKET

(a) Remove the four bolts from the engine rear mounting.

(b) Raise the transmission slightly by raising the engine with a jack.

(c) Remove the four bolts from the support member.



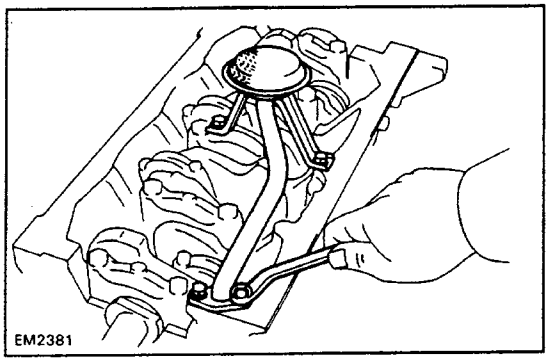
31. (4WD)
REMOVE NO.2 FRAME CROSSMEMBER FROM SIDE FRAME
(a) Remove the four bolts from the engine rear mounting.
(b) Raise the transmission slightly with a jack.
(c) Remove the four bolts from the side frame and remove the No.2 frame crossmember.
32. REMOVE ENGINE WITH TRANSMISSION FOR VE–HICLE
(a) Attach the engine hoist chain to the lift brackets of the engine.
(b) Remove the mounting nuts and bolts.
(c) Lift engine out of the vehicle slowly and carefully.

HINT: Make sure the engine is clear of all wiring and hoses.
33. REMOVE TRANSMISSION FROM ENGINE
(a) (A/T)
Remove the A/T oil cooler pipes.
(b) Remove the starter.
(c) Remove the two stiffener plates and exhaust pipe bracket from engine.
(d) Remove the transmission from the engine.
34. (M/T)
REMOVE CLUTCH COVER AND DISC

EG1VS–02

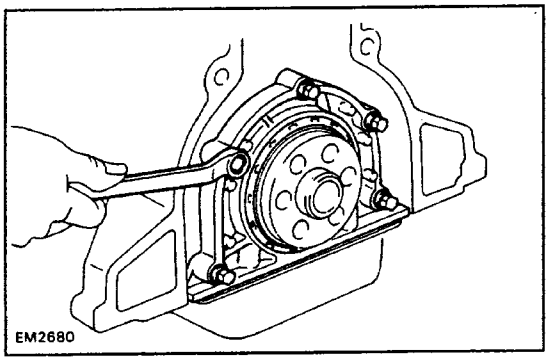
CYLINDER BLOCK DISASSEMBLY

(See page EG1–46**)**
1. REMOVE FLYWHEEL OR DRIVE PLATE
2. REMOVE REAR END PLATE
3. INSTALL ENGINE STAND FOR DISASSEMBLY
4. REMOVE CYLINDER HEAD
(See page EG1–18**)**
5. REMOVE TIMING CHAIN (See page EG1–40)
6. REMOVE GENERATOR (See CH section)
7. REMOVE LH ENGINE MOUNTING BRACKET AND GENERATOR BRACKET
8. REMOVE CHAIN DAMPERS
9. REMOVE CHAIN TENSIONER
10. REMOVE OIL FILTER
(See step 2 on page EG1–236**)**
11. REMOVE RH ENGINE MOUNTING BRACKET, CHA–MBER STAY AND GROUND STRAP
12. (A/T)
REMOVE FLEXIBLE HOSE CLAMP
13. REMOVE OIL PRESSURE SENDER GAUGE OR SWITCH
14. REMOVE KNOCK CONTROL SENSOR
15. REMOVE FUEL–FILTER AND BRACKET



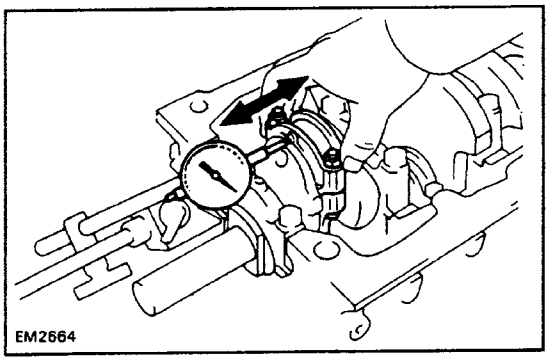
16. REMOVE OIL STRAINER

Remove the four bolts, strainer and gasket.



17. REMOVE REAR OIL SEAL RETAINER

Remove the five bolts, rear oil seal retainer and gasket.



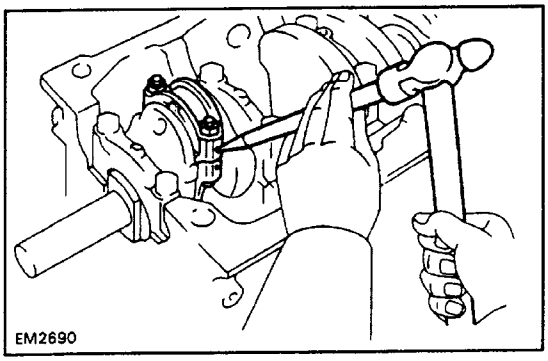
18. MEASURE CONNECTING ROD THRUST CLEARANCE

Using a dial gauge, measure the thrust clearance.

Standard clearance: 0.16 – 0.26 mm
(0.063 – 0.0102 in.)

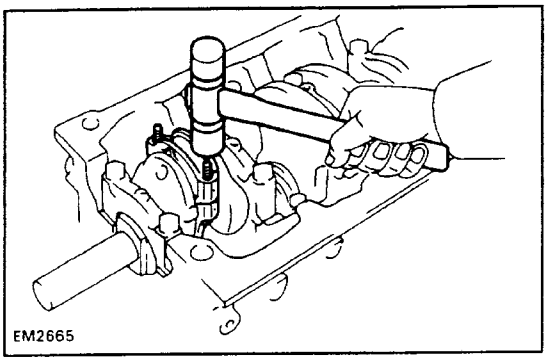
Maximum clearance: 0.3 mm(0.012 in.)

If clearance is greater than maximum, replace the connecting rod and/or crankshaft.



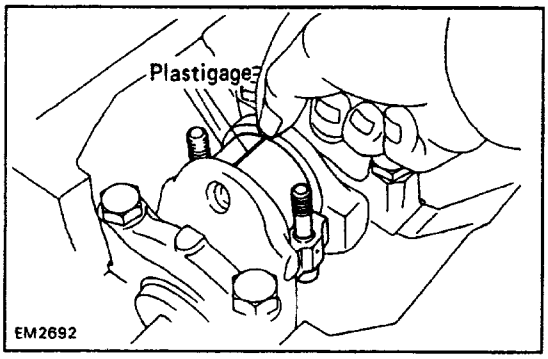
19. MEASURE CONNECTING ROD OIL CLEARANCE

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

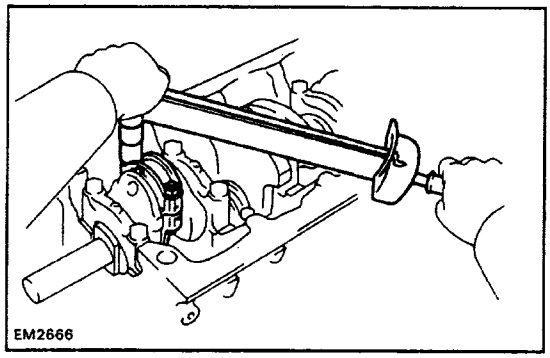


(c) Using a plastic–faced hammer, tap the rod bolts lightly and lift off the rod cap.

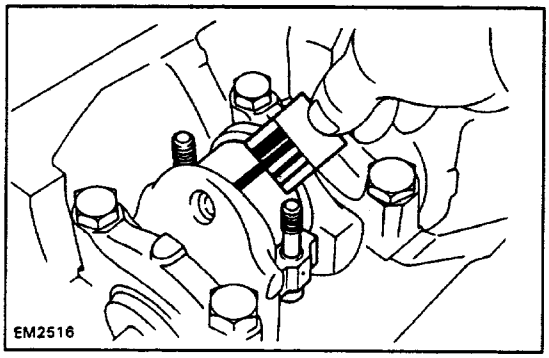
HINT: Keep the bearing inserted in the cap.
(d) Clean the bearing and crankshaft pins.
(e) Inspect each bearing for pitting and radial scratches.
If bearing are damaged, replace the bearings.



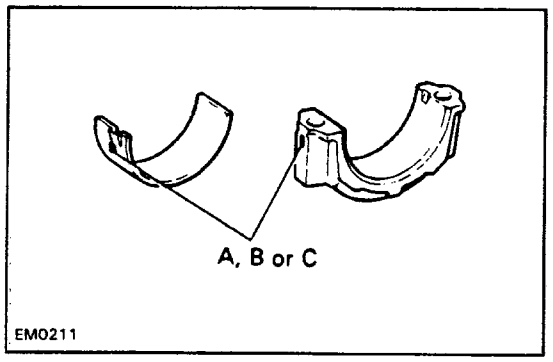
(f) Lay a strip of Plastigage across the crankshaft pin.



(g) Align the rod and cap marks and fit on the cap. Install and torque the cap nuts.
Torque: 69 N–m(700 kgf–cm, 51 ft–lbf)
HINT:
- Do not turn the crankshaft.
- Apply a light coat of engine oil on the nut threads and under the nut before installation.



(h) Remove the rod cap.
(i) Measure the Plastigage at its widest point.
Standard clearance: 0.025 – 0.055 mm
(0.0010 – 0.8022 in.)
Maximum clearance: 0.10 mm (0.0039 in.)
If the clearance is greater than maximum, replace the bearings and/or grind the crank pins.
Undersized bearing: U/S 0.25
Clean any Plastigage from bearing and crankshaft pin.

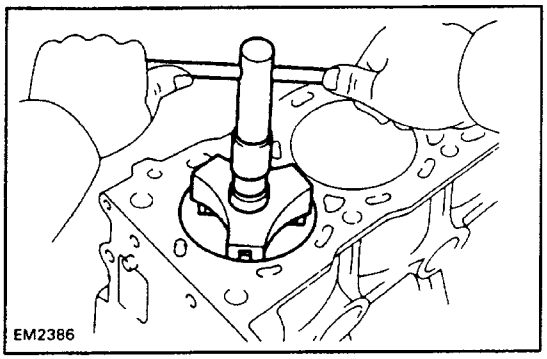


HINT: If replacing a standard size bearing, replace with one having the same letter as marked on the bearing cap. There are three sizes of standard bear–ings supplied, marked A, B or C respectively.

mm (in.)

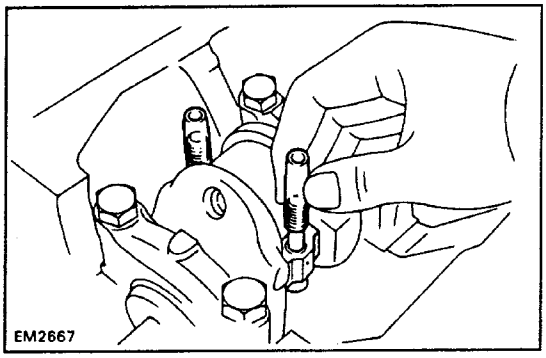
Size	Big End Inner Diameter	Crank Pin Diameter	Bearing Center Wall Thickness
A	56.000 – 56.006 (2.2047 – 2.2050)	52.988 – 53.000 (2.0861 – 2.0866)	1.484 – 1.488 (0.0584 – 0.0586)
B	56.006 – 56.012 (2.2050 – 2.2052)		1.488 – 1.492 (0.0586 – 0.0587)
C	56.012 – 56.018 (2.2052 – 2.2054)		1.492 – 1.496 (0.0587 – 0.0589)
U /S 0.25	56.000 – 56.018 (2.2047 – 2.2054)	52.701 – 52.711 (2.0748 – 2.0752)	1.626 – 1.636 (0.0640 – 0.0644)

V01858

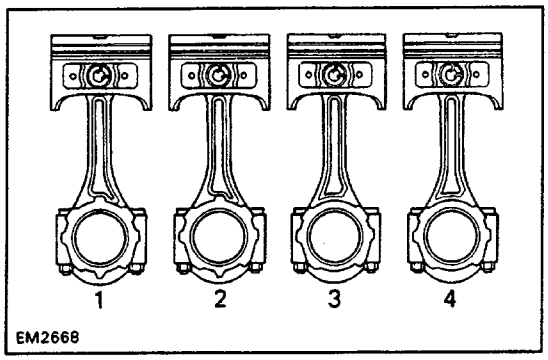


20. PUSH OUT PISTON AND CONNECTING ROD ASSEMBLY

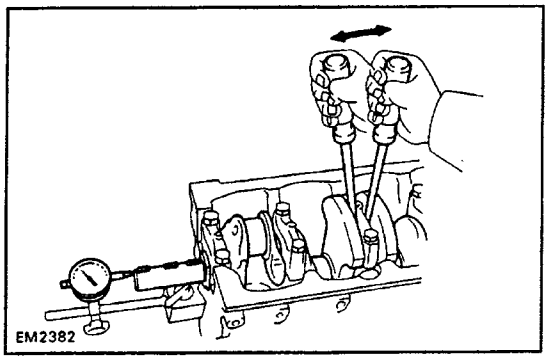
(a) Remove all the carbon from top of the bore to the top of the cylinder.



(b) Cover the rod bolts with a short piece of hose to protect the crank pin from damage.
(c) Push the piston and connecting rod assembly out through the top of the cylinder block.



(d) Arrange the piston and connecting rod caps in order.



21. MEASURE CRANKSHAFT THRUST CLEARANCE

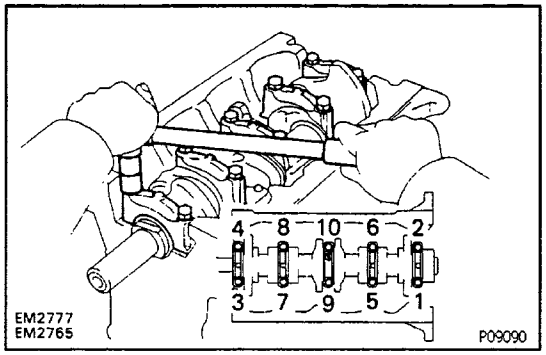
Using a dial gauge, measure the crankshaft thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard clearance: 0.02 – 0.22 mm
(0.0008 – 0.0087 in.)
Maximum clearance: 0.3 mm (0.012 in.)

If the clearance is greater than maximum, replace the thrust washers as a set and/or crankshaft.

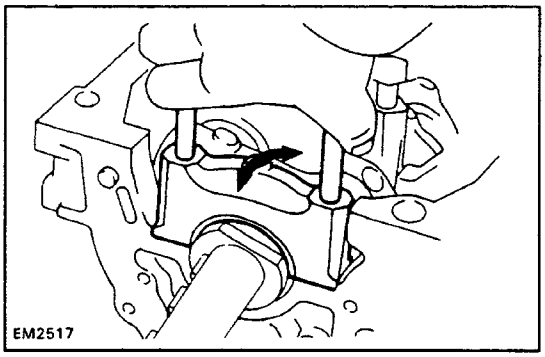
Thrust washer thickness:

Standard
2.690 – 2.740 mm (0.1059 – 0.1079 in.)
0/S 1.25
2.753 – 2.803 mm (0.1084 – 0.1104 in.)
4/S 2.50
2.815 – 2.865 mm (0.1108 – 0.1128 in.)



22. MEASURE CRANKSHAFT OIL CLEARANCE

(a) Gradually loosen and remove the bearing cap bolts in three passes and in numerical order shown.



(b) Using the removed bearing cap bolts, pry the bearing cap fore and aft, and remove it with the lower bearing and thrust washers (No.3 journal only).

HINT:

- Keep the lower bearing inserted in the cap.
- Arrange the caps and lower thrust washers in correct order.

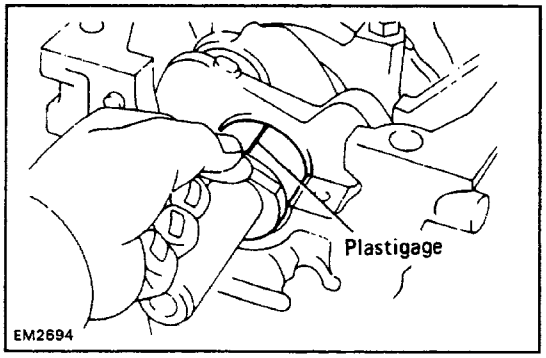
(c) Lift off the crankshaft.

HINT: Keep the upper bearings and upper thrust washers (for the No.3 journal only) inserted in the cylinder block.

(d) Clean the journals and bearings.

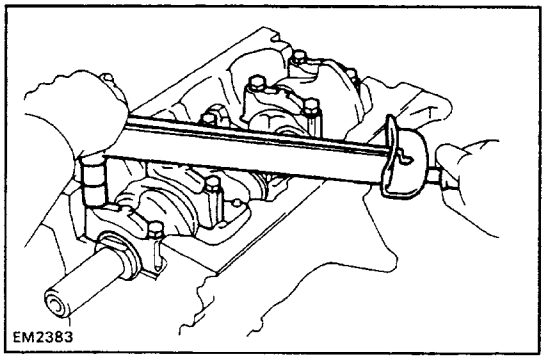
(e) Check the journals and bearings for pitting and scr–atches.

If the journal or bearing is damaged, grind or replace the crankshaft and replace the bearing.



(f) Install the upper main bearings on the cylinder block and crankshaft.

(g) Lay a strip of Plastigage across the main journals.



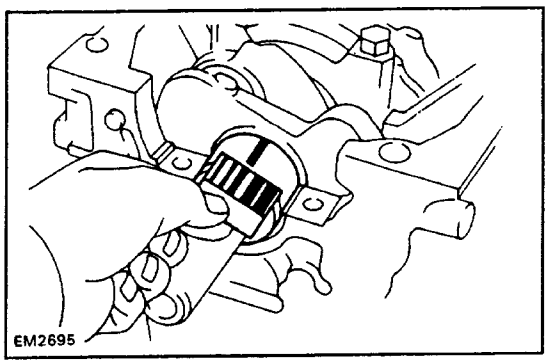
(h) Install the main bearing caps with the front mark facing forward. Install and torque the cap bolts.

Torque: 103 N–m (1,050 kgf–cm, 76 ft–lbf)

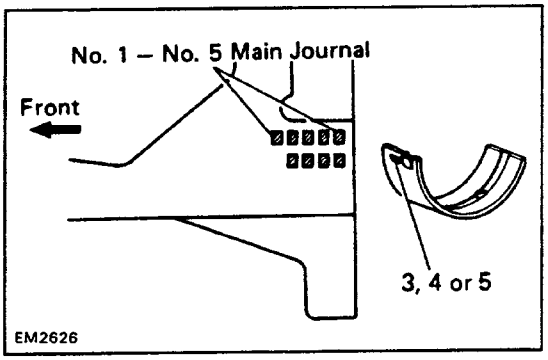
HINT:

Do not turn the crankshaft.

Apply a light coat of engine oil on the bolt threads before installation.


EM2695

(i) Remove the main bearing caps.
(j) Measure the Plastigage at its widest point.
Standard clearance: 0.025 – 0.055 mm (0.0010 – 0.0022 in.)
Maximum clearance: 0.08 mm (0.0031 in.)
If the clearance is greater than maximum, replace the bearings and/or grind the main journals.
Undersized bearing: U/S 0.25
(k) Clean out the pieces of Plastigage from the bearings and journals.
HINT: If using a standard bearing, replace with one having the same number as marked on the cylinder block. There are three sizes of standard bearings, marked 3, 4, 5 accordingly.



EM2626

mm (in.)

Size	Cylinder Block Main Journal Bore	Main Journal Diameter	Bearing Center Wall Thickness
3	64.004 – 64.010 (2.5198 – 2.5201)	59.984 – 60.000 (2.3616 – 2.3622)	1.988 – 1.992 (0.0783 – 0.0784)
4	64.010 – 64.016 (2.5201 – 2.5203)		1.992 – 1.996 (0.0784 – 0.0786)
5	64.016 – 64.022 (2.5203 – 2.5205)		1.996 – 2.000 (0.0786 – 0.0787)
U /S Q.25	64.004 – 64.022 (2.5198 – 2.5205)	59.701 – 59.711 (2.3504 – 2.3508)	2.126 – 2.136 (0.0837 – 0.0841)

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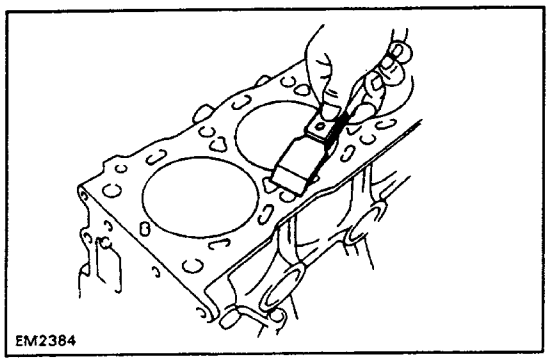
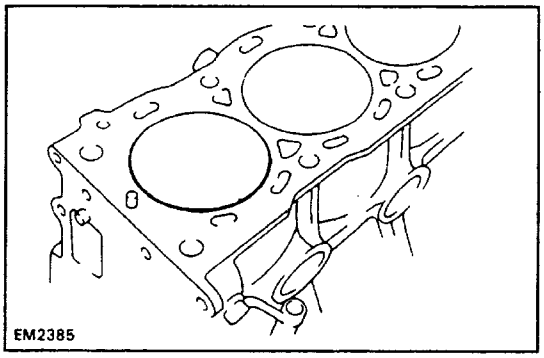
23. REMOVE CRANKSHAFT ,
(a) Lift out the crankshaft.
(b) Remove the upper main bearings from the cylinder block.
(c) Arrange the caps and bearings in order.


EM2384

EG1VT–01

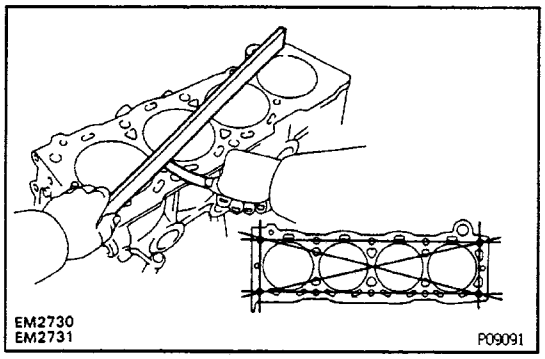
CYLINDER BLOCK INSPECTION

1. REMOVE GASKET MATERIAL
Using a gasket scraper, remove all gasket material from cylinder block surfaces.
2. CLEAN CYLINDER BLOCK
Using a soft brush and solvent, clean the block.



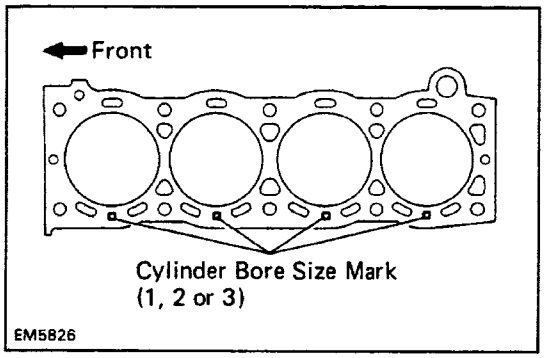
3. INSPECT CYLINDERS

Visually inspect cylinders for vertical scratches.
If deep scratches are present, rebore all four cylinders.
(See page EG1–66**)**



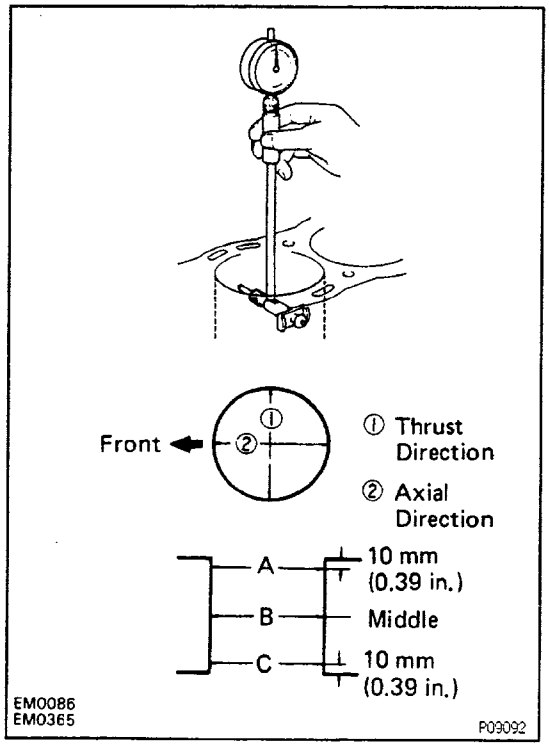
4. INSPECT CYLINDER BLOCK WARPAGE

Warpage limit: 0.5 mm (0.0020 in.)
If warpage is greater than specified value, replace the cylinder block.



5. MEASURE CYLINDER BORE

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



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

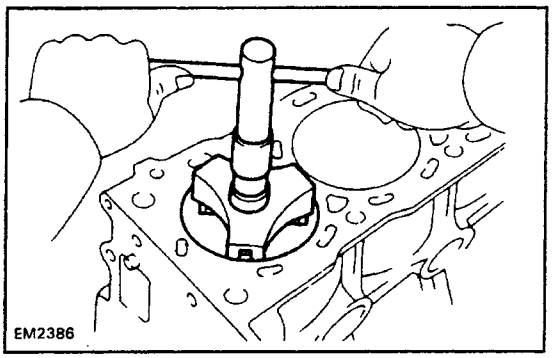
Standard diameter:

STD Mark ’1’
92.00 – 92.01 mm
(3.6220 – 3.6224 in.)
Mark ’2’
92.01 – 92.02 mm
(3.6224 – 3.6228 in.)
Mark ’3’
92.02 – 92.03 mm
(3.6228 – 3.6232 in.)
O/S 0.50
92.50 – 92.53 m m
(3.6417 – 3.6429 in.)
1.00
93.00 – 93.03 mm
(3.6614 – 3:6626 in.)

Maximum diameter:

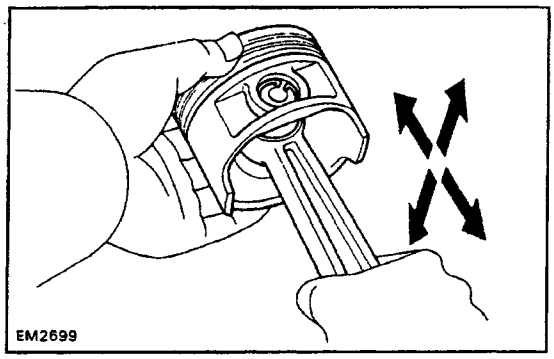
STD 92.23 mm (3.6311 in.)
0/S 0.50 92.73 mm (3.6508 in.)
0/S 1.00 93.23 mm (3.6705 in.)

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



6.REMOVE CYLINDER RIDGE

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

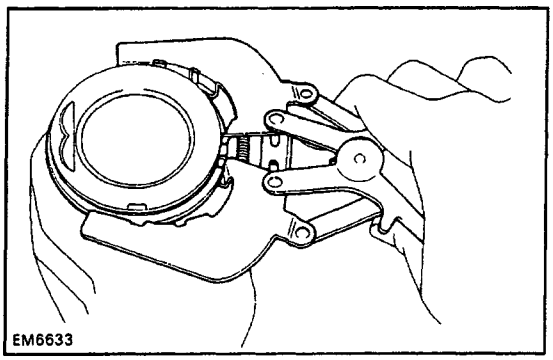


EG1VU–01

DISASSEMBLY OF PISTON AND CONNECTING ROD ASSEMBLY

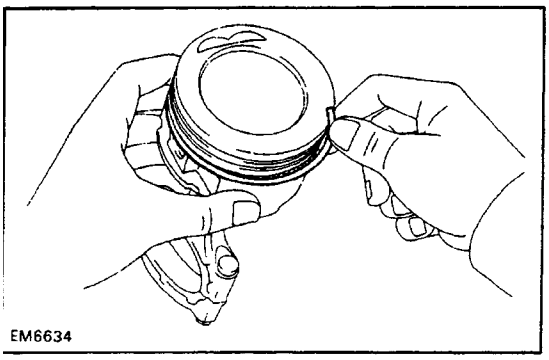
1. CHECK FIT BETWEEN PISTON AND PIN

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



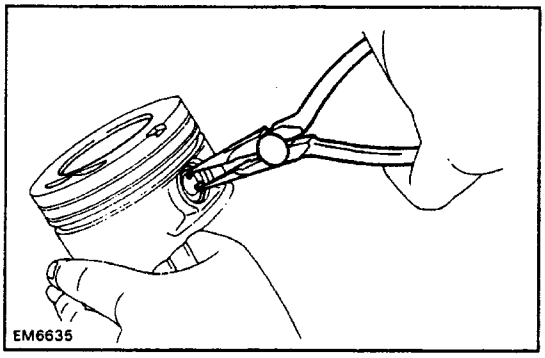
2. REMOVE PISTON RINGS

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



(b) Remove the two side rails and oil ring expander by hand.

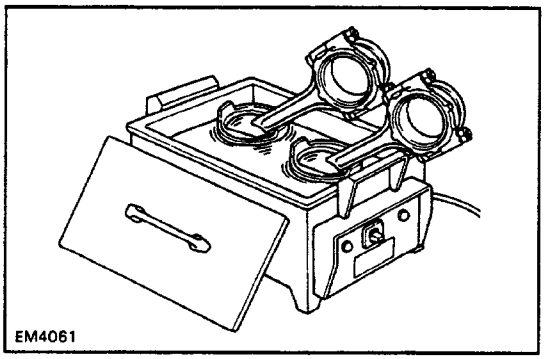
HINT: Keep the rings for each cylinder separated.

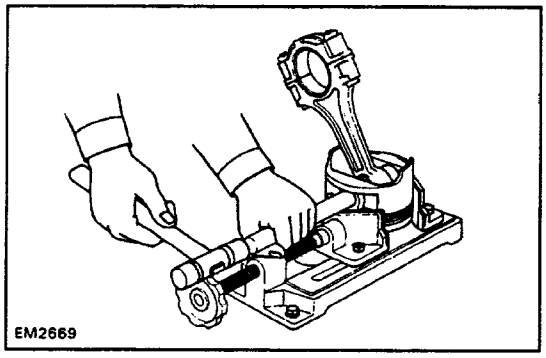


3. DISCONNECT CONNECTING ROD FROM PISTON

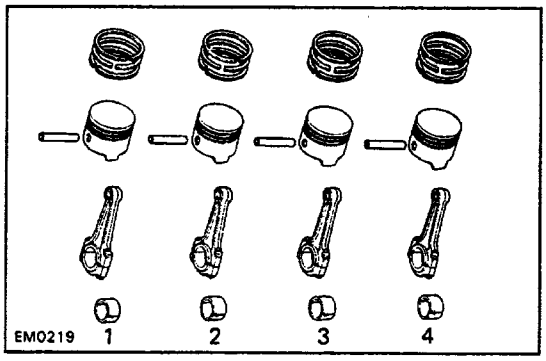
(a) Using needle – nose pliers, remove the snap rings from the piston.

(b) Heat the piston in hot water approx. 60°C(140°F).



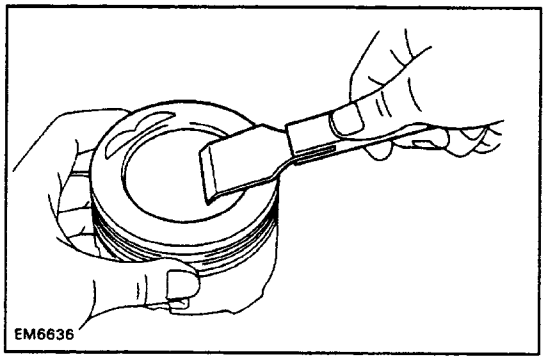


(c) Using a plastic–faced hammer and brass bar, lightly tap out the piston pin from the piston.



HINT:

- The piston and pin are a matched set.
- Keep the piston, pin, rings and connecting rod together for each cylinder.

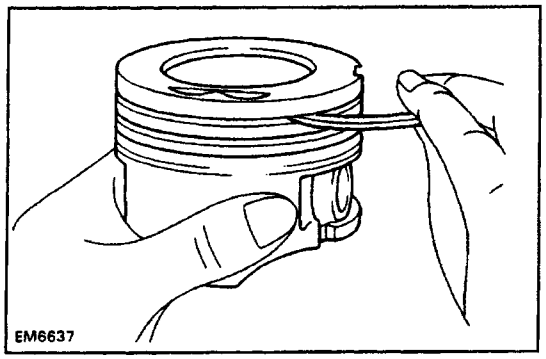


EG1VV–02

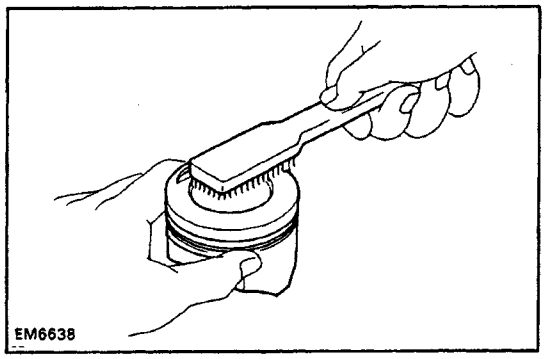
INSPECTION OF PISTON AND CONNECTING ROD

1. CLEAN PISTON

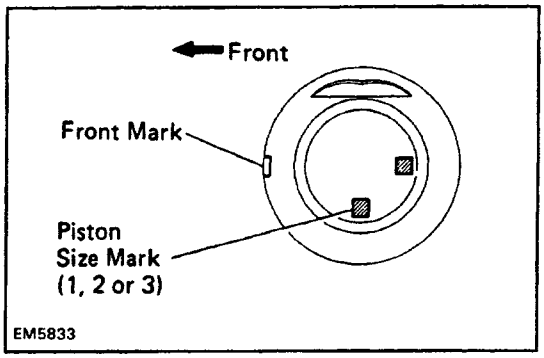
(a) Using a gasket scraper, remove the carbon from the piston top.



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

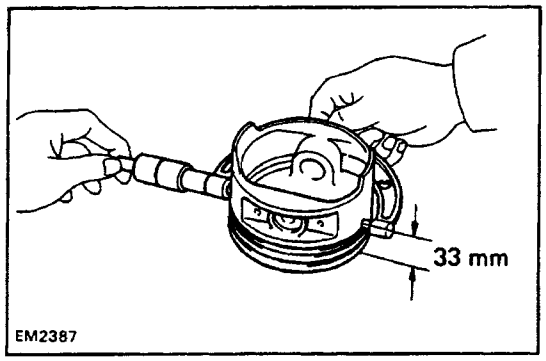


(c) Using solvent and a brush, thoroughly clean the piston.
NOTICE: Do not use a wire brush.



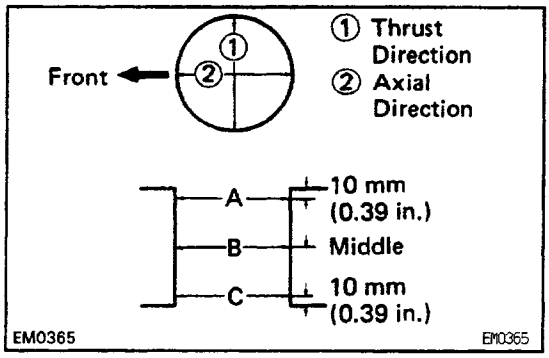
2. INSPECT PISTON DIAMETER AND OIL CLEARANCE

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

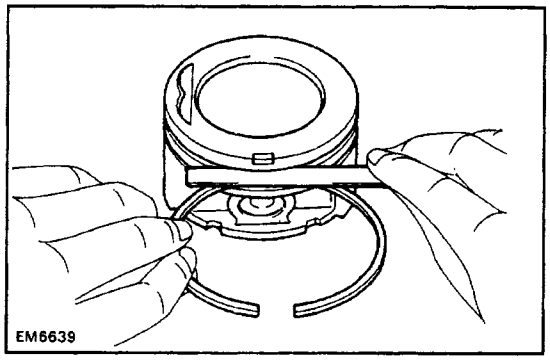


(a) Using a micrometer and with the piston upside down, measure the piston diameter at right angles to 'the piston pin hole center line, at the indicated distance from the piston head.
Distance: 33 mm (1.30 in.)

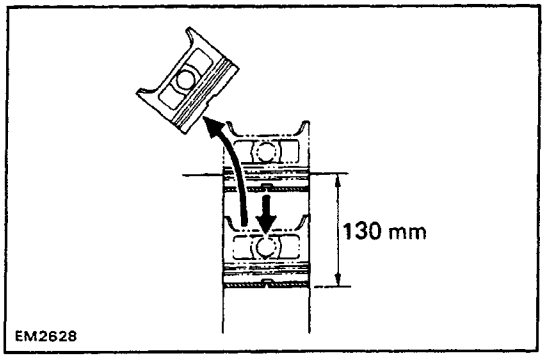
Piston diameter:
STD Mark ”
91.975 – 91.985 mm
(3.6211 – 3.6214 in.)
Mark ”2’
91.985 – 91.995 mm
(3.6214 – 3.6218 in.)
Mark ’3”
91.995 – 92.005 mm
(3.6218 – 3.6222 in.)
0/S 0.50
92.475 – 92.505 mm
(3.6407 – 3.6419 in.)
1.00
92.975 – 93.005 mm
(3.6604 – 3.6616 in.)



(b) Measure the cylinder bore diameter in thrust direc–tions (See page EG1–56) and subtract the piston di–ameter measurement from the cylinder bore diameter measurement.
Piston clearance: 0.015 – 0.035 mm
(0.0006 – 0.0014 in.)
If not within specification, replace the pistons. If necessary, rebore or replace the cylinder block.
HINT: (Use cylinder block sub–assembly)
When installing a standard piston, install one with the same mark as the standard bore diameter mark on the cylinder block.



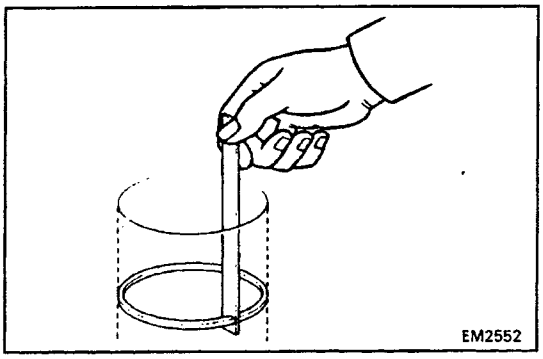
3. MEASURE CLEARANCE BETWEEN PISTON GROOVE AND PISTON RING
Using a thickness gauge, measure the clearance be–tween the piston ring and the ring land.
Standard ring groove clearance: 0.03 – 0.07 mm
(0.0012 – 0.0028 in.)
Maximum ring groove clearance: 0.2 mm (0.008 in.)
If the clearance is greater than maximum, replace the piston ring and/or piston.



4. MEASURE RING END GAP

(a) Insert the piston ring into the cylinder.

(b) Using a piston, push the ring a little beyond the bottom of the ring travel.
(130 mm (5.12 in.) from top surface of cylinder block)

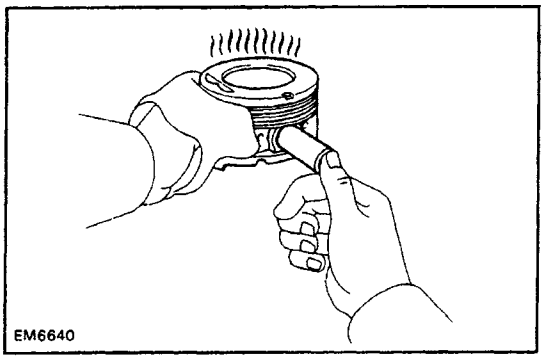


(c) Using a thickness gauge, measure the end gap.

Ring end gap:

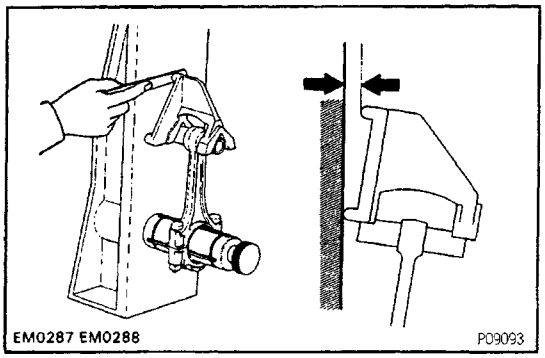
Standard No.1 0.25 – 0.47 mm
(0.0098 – 0.0185 in.)
No–2 0.60 – 0.82 mm
(0.0236 – 0.0323 in.)
Oil 0.20 – 0.57 mm
(0.0079 – 0.0224 in.)
Maximum No.1 1.07 mm (0.0421 in.)
No.2 1.42 mm (0.0559 in.)
Oil 1.17 mm (0.0461 in.)

If the gap is greater than maximum, replace the ring.
Do not file the ring end.



5. INSPECT PISTON PIN FIT

At 80°C(176° F), you should able to push the pin into the piston with your thumb.
If the pin can be installed at a lower temperature, replace it and the piston.



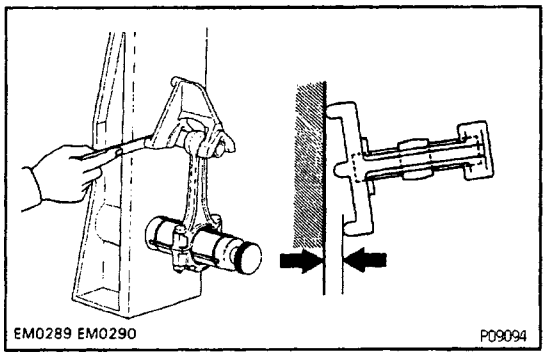
6. INSPECT CONNECTING RODS

(a) Using a rod aligner, check the connecting rod align–ment.
If the rod is bent or twisted, replace the connecting rod.

- Check that the rod is not bent.

Maximum bend:

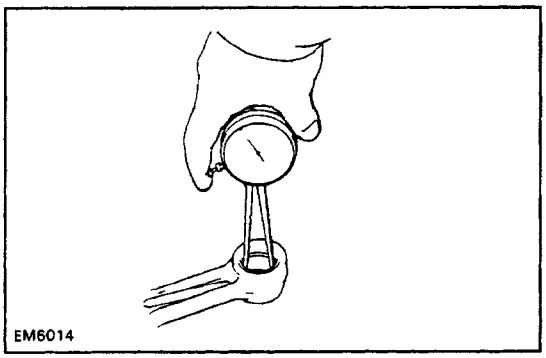
0.05 mm (0.0020 in.) per 100 mm (3.94 in.)



- Cheek that the rod is not twisted.

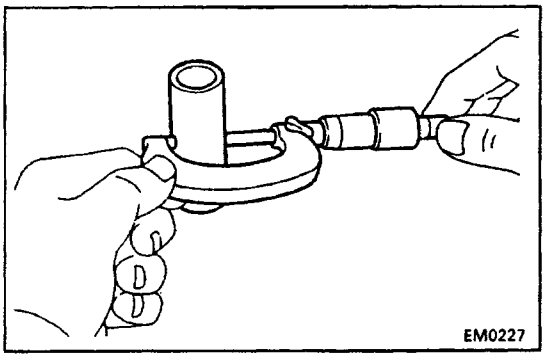
Maximum twist:

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



(b) Measure the oil clearance between the rod bushing and piston pin.

- Using an inside dial indicator, measure the inside diameter of the rod bushing.



- Using a micrometer, measure the diameter of the piston pin.
- Check that the difference between the meas–urements is less than the oil clearance limit.

Standard oil clearance: 0.005 – 0.011 mm (0.0002 – 0.0004 in.)

Maximum oil clearance: 0.015 mm (0.0006 in.)

If the clearance is greater than maximum, replace the rod bushing.

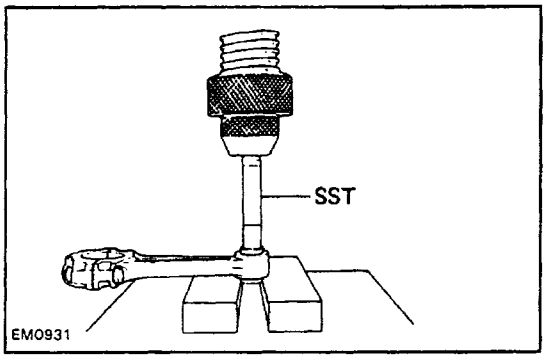
EG1VW–01

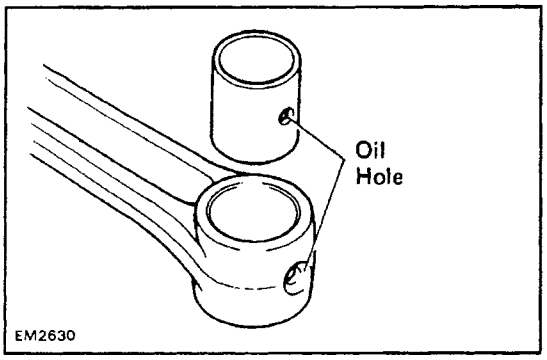
ROD BUSHING REPLACEMENT

1. REMOVE ROD BUSHING

Using SST, remove the rod bushing from the conne–cting rod.

SST 09222–30010



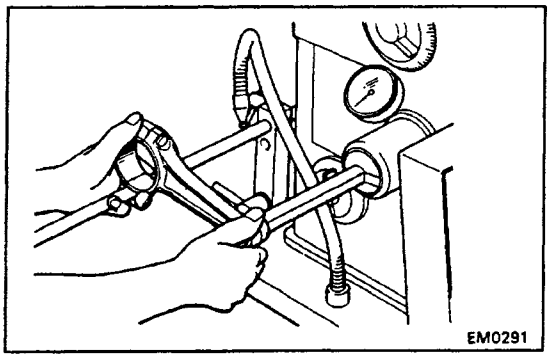


2. INSTALL NEW ROD BUSHING

Using SST, install the rod bushing to the connecting rod.

SST 09222 – 30010

HINT: Align the bushing oil hole with the connecting rod oil hole.

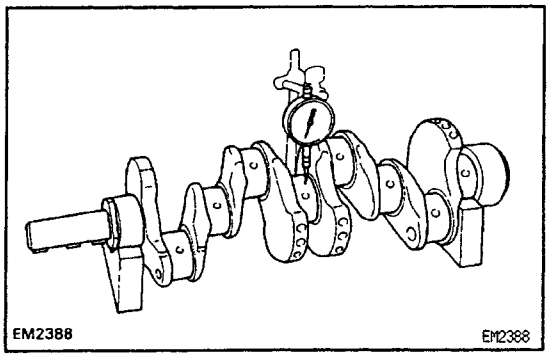


3. HONE NEW BUSHING AND CHECK PIN FIT IN CONNECTING ROD

(a) Hone the new bushing and check that the oil clearance is within standard specification.

Standard oil clearance: 0.005 – 0.011 mm (0.0002 – 0.0004 in.)

(b) Check the pin fit at the normal room temperature. Coat the pin with engine oil and push the pin into the rod with thumb pressure.



CRANKSHAFT INSPECTION AND REPAIR

1. MEASURE CRANKSHAFT FOR RUNOUT

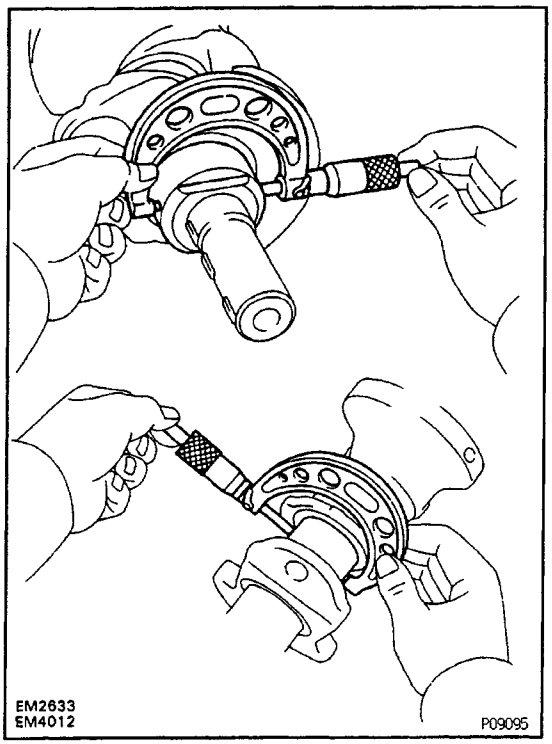
(a) Place the crankshaft on V–blocks.

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

Maximum circle runout: 0.1 mm (0.004 in.)

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

HINT: Use a long spindle on the dial gauge.



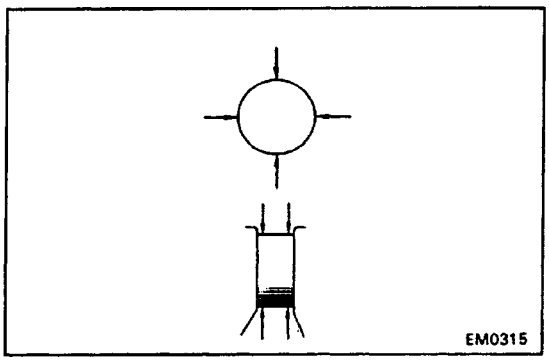
2. INSPECT MAIN JOURNALS AND CRANK PINS

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

Main journal diameter: 59.984 – 60.000 mm (2.3616 – 2.3622 in.)

Crank pin diameter: 52.988 – 53.000 mm (2.0861 – 2.0866 in.)

If journals are worn, regrind or replace the crankshaft.



(b) Measure the journals for out–of–round and taper as shown.

Maximum taper: 0.01 mm (0.0004 in.)

Maximum out–of–round: 0.01 mm (0.0004 in.)

If taper and out–of–round are greater than maximum, regrind and/or replace the crankshaft.

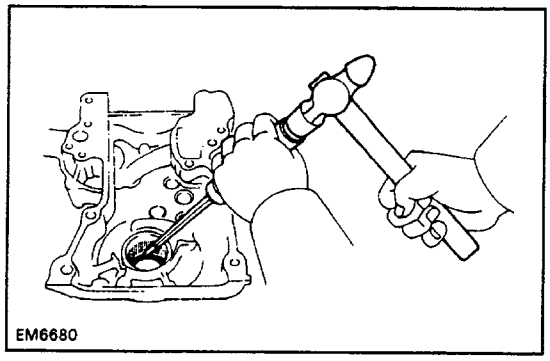
3. GRIND CRANK PIN AND/OR MAIN JOURNAL, IF NECESSARY

(a) Grind the crank pins and/or main journals to the undersized finished diameter.
Bearing size (U/S 0.25)
Main journal finished diameter:
59.701 – 59.711 mm (2.3504 – 2.3508 in.)
Crank pin finished diameter:
52.701 – 52.711 mm (2.0748 – 2.0752 in.)
(b) Install a new pin and/or main undersized bearings.

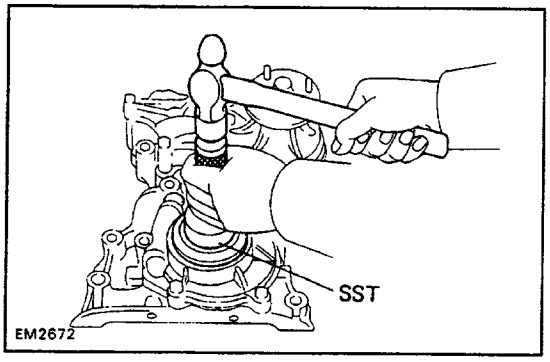
EG1VY–01

OIL SEALS REPLACEMENT

HINT: There are two ways of oil seal replacement in accordance with the timing chain cover or rear oil seal retainer condition.

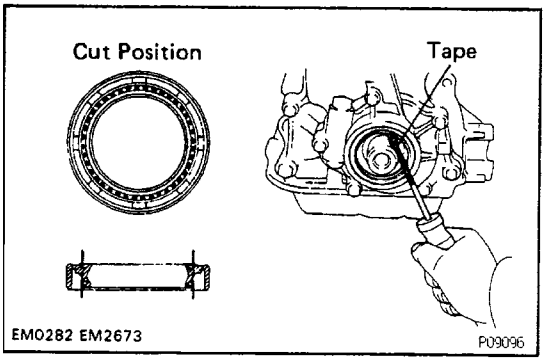

EM6680

1. IF TIMING CHAIN COVER IS REMOVED FROM CYLINDER BLOCK (Replacement of front oil seal)
(a) Using a screwdriver, remove the oil seal.



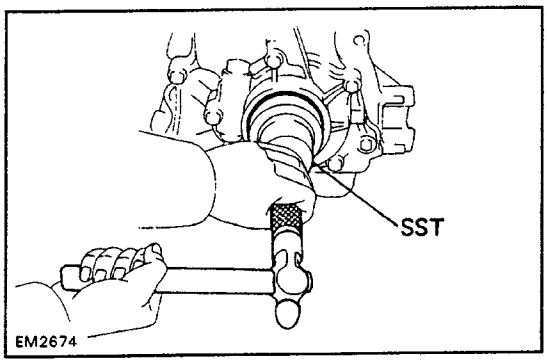
EM2672

(b) Apply MP grease to a new oil seal lip.
(c) Using SST, install the oil seal.
SST 09223–50010

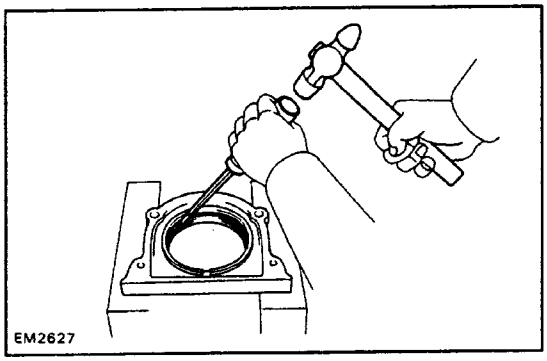


EM0282 EM2673 P09096

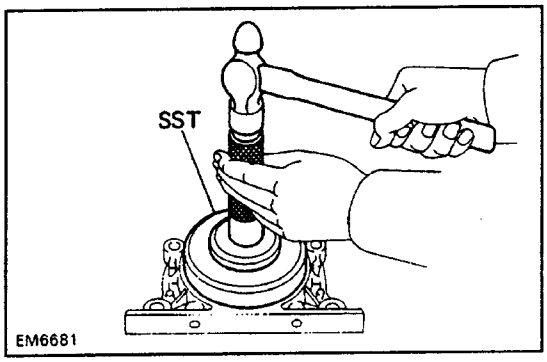
2. IF TIMING CHAIN COVER IS INSTALLED ON CYL–INDER BLOCK (Replacement of front oil seal)
(a) Using a knife, cut off the oil seal lip.
(b) Using a screwdriver, pry out the oil seal.
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



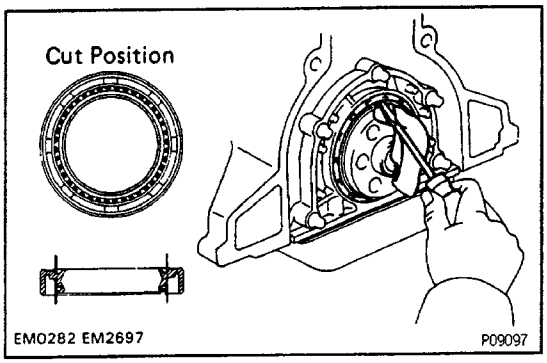
(c) Apply MP grease to a new oil seal lip.
(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the timing chain cover edge.
SST 09223 – 50010



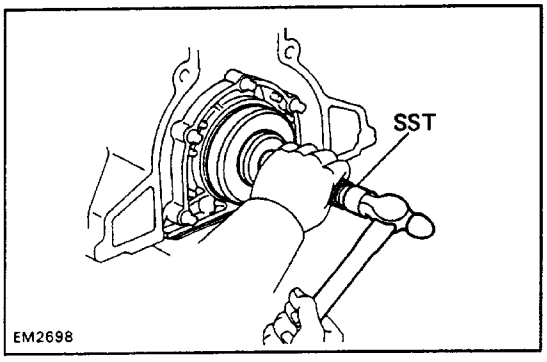
3. IF REAR OIL SEAL RETAINER IS REMOVED FROM CYLINDER BLOCK (Replacement of rear oil seal)
(a) Using a screwdriver, remove the oil seal.



(b) Apply MP grease to a new oil seal lip.
(c) Using SST, install the oil seal.
SST 09223–41020



4. IF REAR OIL SEAL RETAINER IS INSTALLED ON CYLINDER BLOCK (Replacement of rear oil seal)
(a) Using a knife, cut off lip of oil seal.
(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 09223–41020

EG1VZ–01

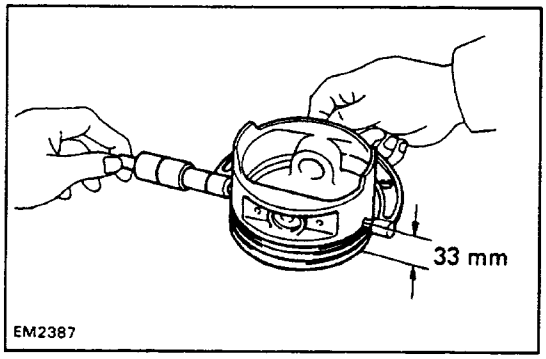
Size	Outside Diameter mm 0 n.)
O/S 0. 50	92.475 – 92.505 (3.6407 – 3.6419)
O/S 1.00	92.975 – 93.005 (3.6604 – 3.6616)

V01771

CYLINDERS BORING

1. SELECT OVERSIZED PISTON

O/S pistons with pins are available in the sizes listed. Replace pistons in matched sets. Take the largest bore measured and select the oversized piston for that bore. Bore all cylinders for the oversized piston sel–ected.



2. CALCULATE DIMENSION TO BORE CYLINDERS

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 33 mm (1.30 in.) from the piston head.

(b) Calculate the size each cylinder is to be rebored as follows:

Size to be rebored = P + C – H

P = piston diameter

C = piston clearance

0.015 – 0.035 mm (0.0006 – 0.0014 in.)

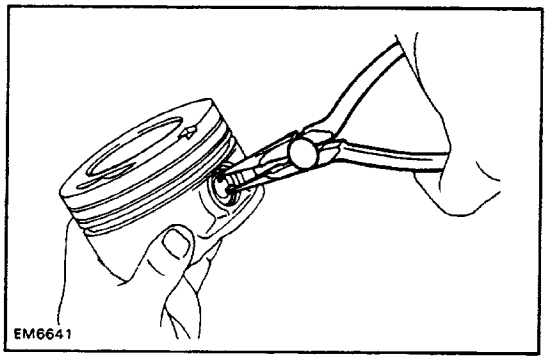
H = allowance for honing

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 round–ness.

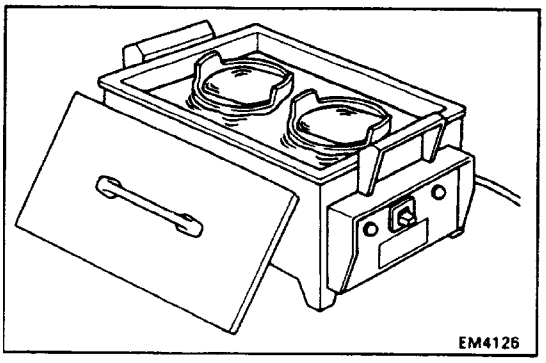


EG1WO–01

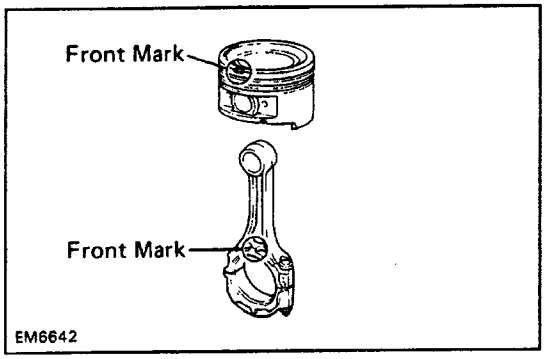
PISTON AND CONNECTING ROD ASSEMBLY

1. ASSEMBLE PISTON AND CONNECTING ROD

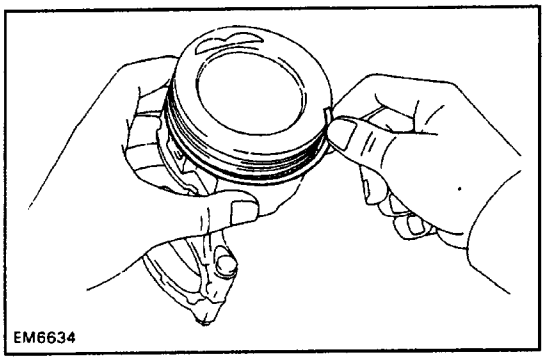
(a) Install a new snap ring on one side of the piston pin hole.



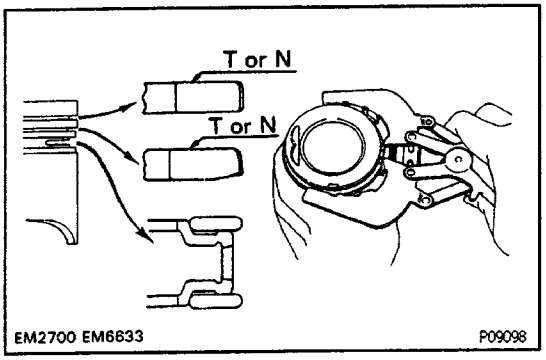
(b) Heat the piston in hot water to approx. 80°C(176°F).



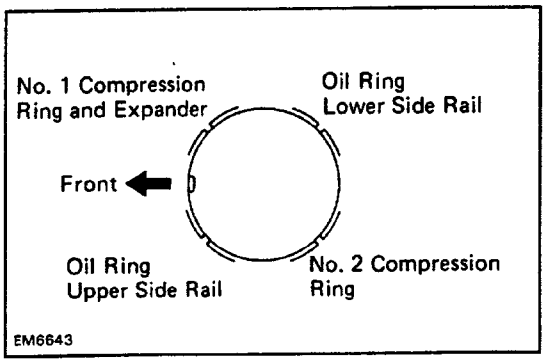
(c) Align the notch on the piston with the mark on the rod and push the piston pin in with your thumb.
(d) Install a new snap ring on the other side of the pin.



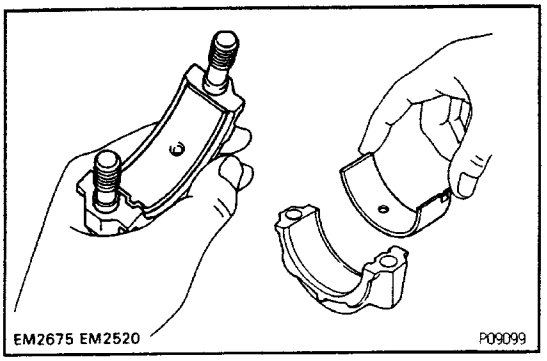
2. PLACE RINGS ON PISTON
(a) Install the oil ring expander and two side rails by hand.



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



(c) Position the piston rings so that the ring end gaps are as shown.
NOTICE: Do not align the end gaps.



3. INSTALL BEARINGS
(a) Install the bearing in the connecting rod and rod cap.
(b) Lubricate the face of the bearings with engine oil.
NOTICE: Install the bearings with the oil hole in the connecting rod.

E61W1_0

INSTALLATION OF CRANKSHAFT, PISTON AND CONNECTING ROD ASSEMBLY

(See page EG1–46)

GENERAL ASSEMBLY

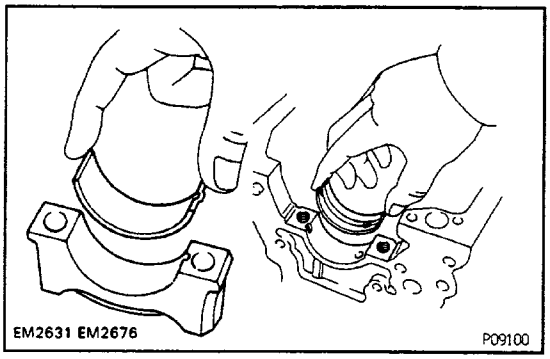
HINT:

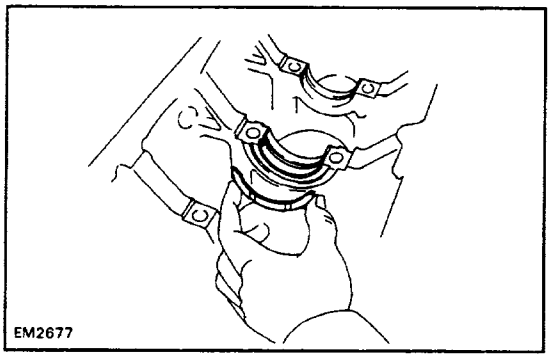
- Thoroughly clean all parts to be assembled.
- Before installing parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, 0–ring and oil seals with new parts.

1. INSTALL MAIN BEARINGS

Install the bearing in the cylinder block and bearing caps.

NOTICE: Install the upper bearing with the oil hole in the block.

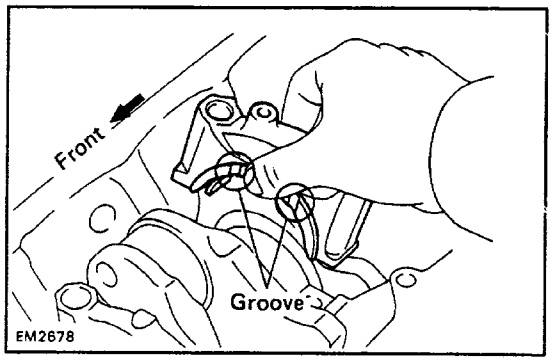




2. INSTALL UPPER THRUST WASHERS

Install the thrust washers under the No.3 main bearing cap position of the block with the oil grooves facing outward.

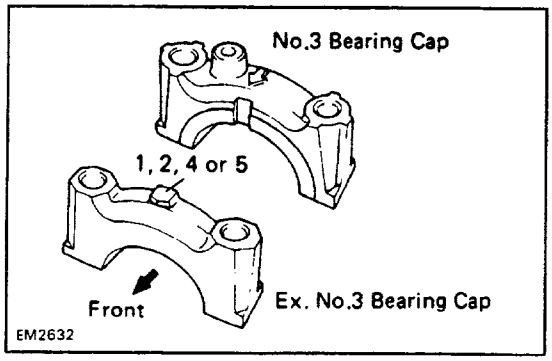
3. PLACE CRANKSHAFT ON CYLINDER BLOCK



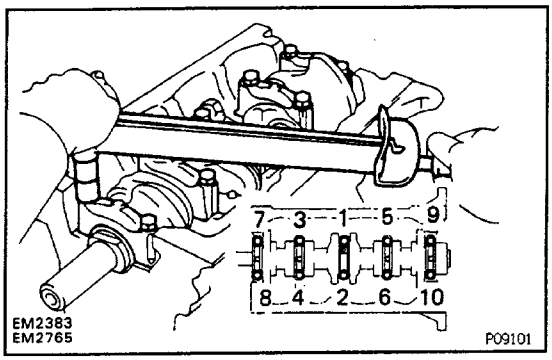
4. INSTALL MAIN BEARING CAPS WITH LOWER THRUST WASHERS

HINT: Each bearing cap is numbered.

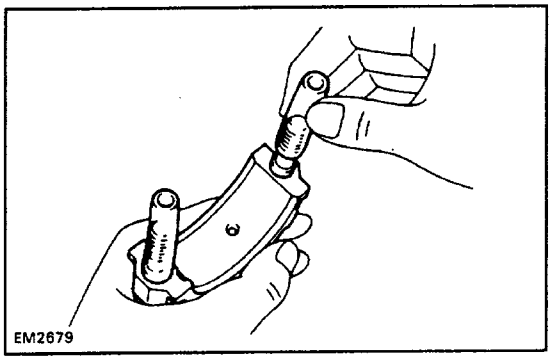
(a) Install the thrust washers on the No.3 bearing cap with the grooves facing outward.



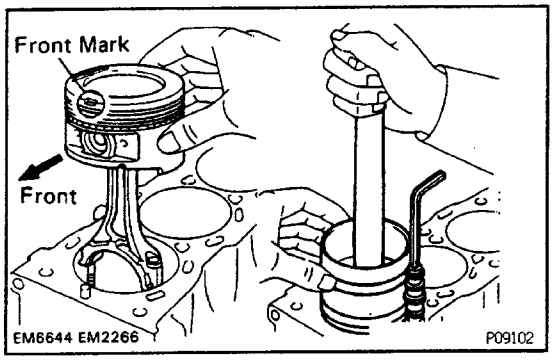
(b) Install the bearing caps in their proper locations.



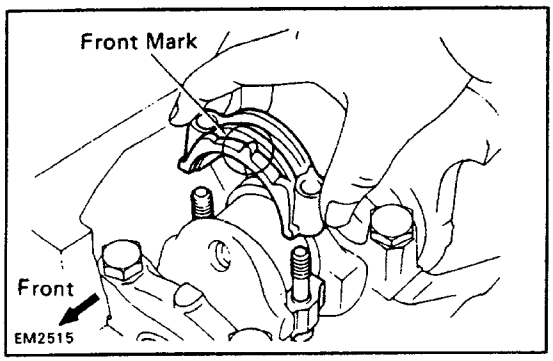
(c) Apply a light coat of engine oil on the threads and under the cap bolt heads.
(d) Install and tighten the cap bolts in two or three passes and in the sequence shown.
Torque: 103 N–m(1,050 kgf–cm, 76 ft–lbf)
(e) Check that the crankshaft turns smoothly.
(f) Check the crankshaft thrust clearance.
(See page EG1–53



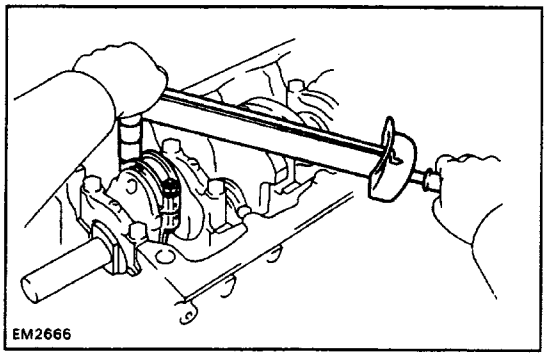
5. INSTALL PISTON AND CONNECTING ROD ASSEMBLY
(a) Cover the rod bolts with a short piece of hose to protect the crankshaft from damage.



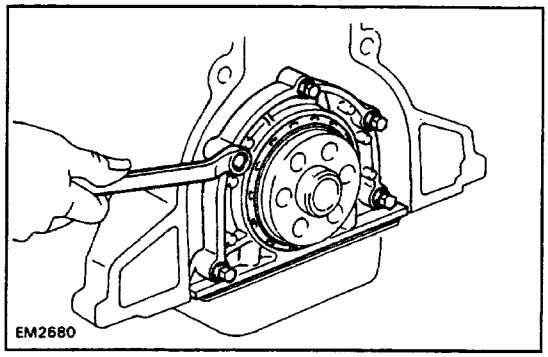
(b) Lubricate the cylinder bore and rod journal with clean engine oil.
(c) Using a ring compressor, tighten the compressor snugly but NOT tightly against the piston and gently tap the correctly numbered piston and rod assembly into its cylinders with a wooden hammer handle or like object. Make sure the notch and mark are facing forward.
HINT: If the ring compressor is wound too tightly around the piston, the bottom edge of the ring compressor will catch against the beveled surface at the top of the cylinder when tapping the piston in.



6. INSTALL CONNECTING ROD CAPS
(a) Match the numbered cap with the numbered rod.
(b) Install the cap with the front mark facing forward.



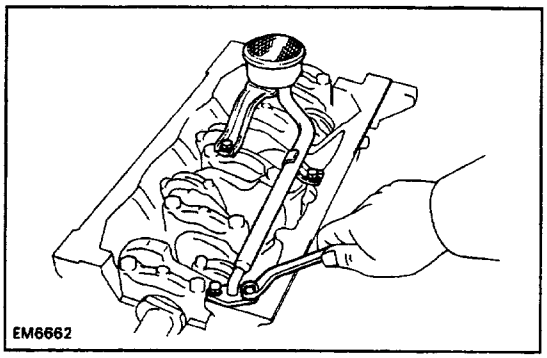
(c) Apply a light coat of engine oil on the threads and under the rod nuts.
(d) Install and tighten the rod nuts alternately and in two or three passes.
Torque: 69 N–m (700 kgf–cm, 51 ft–lbf)
(e) Check that the crankshaft turns smoothly.
(f) Check the rod thrust clearance.
(See page EG1–51)



EG1W2–01

CYLINDER BLOCK ASSEMBLY

(See page EG1–46)
1. INSTALL REAR OIL SEAL RETAINER
Install a new gasket and the retainer with the four bolts. Torque the bolts.
Torque: 18 N–m (180 kgf–cm, 13 ft–lbf)



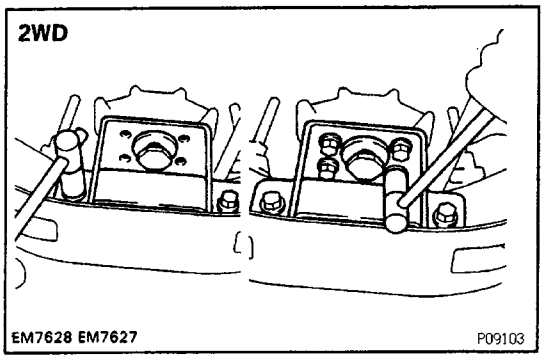
2. INSTALL OIL STRAINER
(a) Clean the oil strainer.
(b) Place the gasket in place and install the oil strainer assembly with the four bolts. Torque the bolts.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)
3. INSTALL FUEL FILTER BRACKET AND FILTER
4. INSTALL KNOCK CONTROL SENSOR
5. INSTALL OIL PRESSURE SENDER GAUGE
6. (A/T)
INSTALL FLEXIBLE HOSE CLAMP
7. INSTALL RH ENGINE MOUNTING BRACKET, CHA–MBER STAY AND GROUND STRAP
8. INSTALL OIL FILTER
(See step 2 on page EG1–236)
9. INSTALL CHAIN TENSIONER
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)
10. INSTALL CHAIN DAMPERS
Torque: 22 N–m (220 kgf–cm, 16 ft–lbf)
11. INSTALL GENERATOR BRACKET AND LH ENGINE MOUNTING BRACKET
12. INSTALL TIMING CHAIN (See page EG1–43)
13. INSTALL GENERATOR
14. INSTALL CYLINDER HEAD (See page EG1–34)
15. REMOVE ENGINE STAND
16. INSTALL REAR END PLATE
17. INSTALL FLYWHEEL OR DRIVE PLATE
Install the flywheel (M / T) or spacer, drive plate, spacer (A/T) on the crankshaft with the six bolts. Torque the bolts.

Torque: M/T 108 N–m (1,100 kgf–cm, 80 ft–lbf)
A/T 83 N–m (850 kgf–cm, 61 ft–lbf)

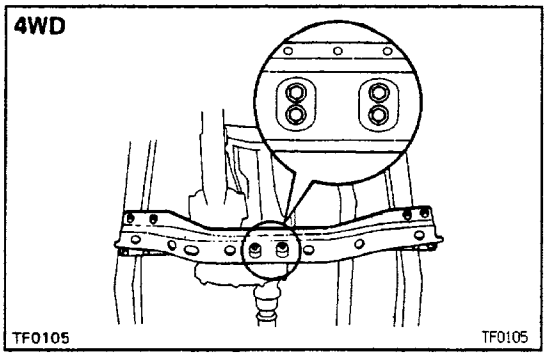
EG1W3–04

ENGINE INSTALLATION

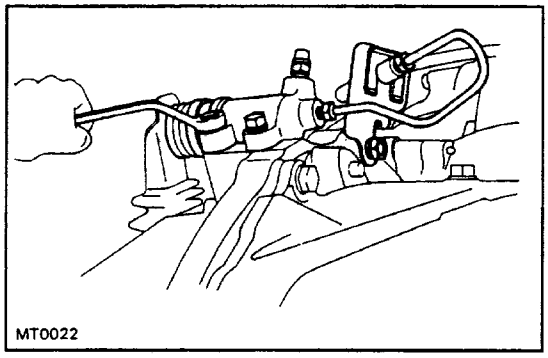
1. (M/T)
INSTALL CLUTCH DISC AND COVER TO FLY–WHEEL
(See CL section)
2. CONNECT TRANSMISSION TO ENGINE
3. PLACE ENGINE WITH TRANSMISSION IN VEHICLE
(a) Attach the engine hoist chain to the lifting brackets on the engine.
(b) Lower the engine with transmission into the engine compartment.
4. (4WD)
PLACE JACK UNDER TRANSMISSION
Be sure to put a wooden block between the jack and the transmission pan.
5. JACK UP AND PUT TRANSMISSION ONTO MEMBER
6. INSTALL ENGINE MOUNTING TO FRAME BRACK–ET
(a) Align the engine mounting and frame bracket.
(b) Install the engine mounting bolts on each side of the engine.
(c) Remove the hoist chain.
7. (2WD)
INSTALL ENGINE REAR MOUNTING AND BRACKET
(a) Raise the transmission slightly by raising the engine with a jack and a wooden block under the transmis–sion.



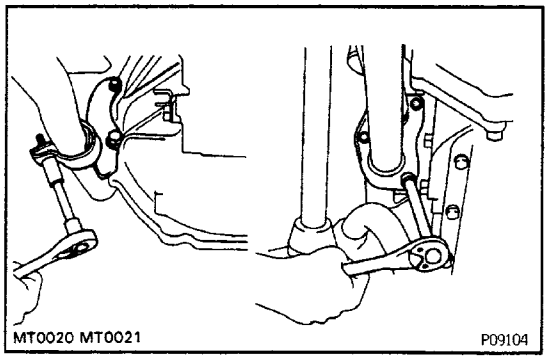
(b) Install the engine rear mounting bracket to the sup–port member. Torque the bolts.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)
(c) Lower the transmission and rest it on the extension housing.
(d) Install the bracket to the mounting. Torque the bolts.
Torque: 25 N–m (260 kgf–cm, 19 ft–lbf)



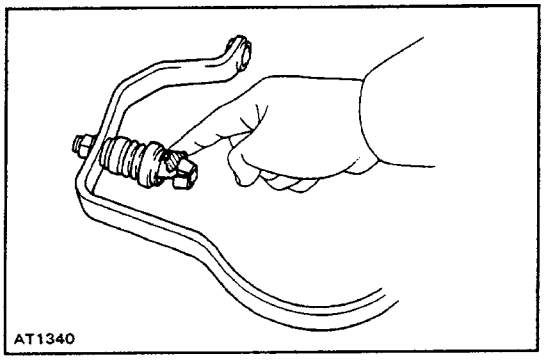
(4WD)
INSTALL NO.2 FRAME CROSSMEMBER
(a) Raise the transmission slightly with a jack.
(b) Install the No.2 frame crossmember to the side frame with the bolts. Torque the bolts
Torque: 95 N–m (970 kgf–cm, 70 ft–lbf)
(c) Lower the transmission and transfer.
(d) Install the four mounting bolts to the engine rear mounting. Torque the bolts.
Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)
8. (4WD)
INSTALL BRAKE TUBE HEAT INSULATOR AND NO. 1 FRONT FLOOR HEAT INSULATOR



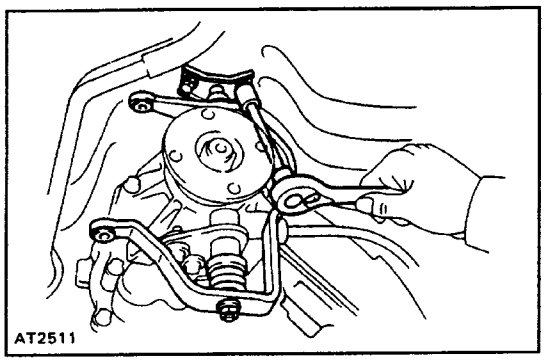
9. (M/T)
INSTALL CLUTCH RELEASE CYLINDER WITH BRACKET TO TRANSMISSION
Torque:
Bracket 39 N–m (400 kgf–cm, 28 ft–lbf)
Release cylinder 12 N–m (120 kgf–cm, 9 ft–lbf)



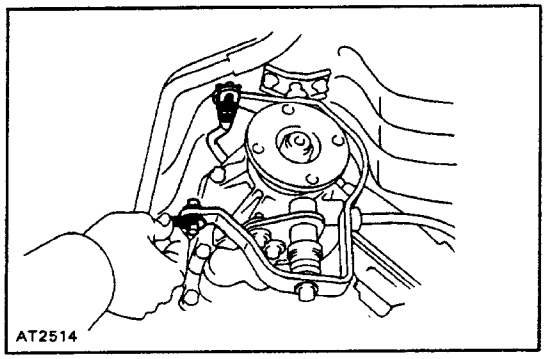
10. INSTALL EXHAUST PIPE
(a) Connect the exhaust pipe to the catalytic converter.
(b) Connect the exhaust pipe to the exhaust manifold.
(c) Install the exhaust pipe clamp.
(d) Connect the oxygen sensor connector.
11. INSTALL NO.1 FRAME CROSSMEMBER
12. (4WD)
INSTALL FRONT PROPELLER SHAFT
(See PR section)
13. (4WD)
INSTALL STABILIZER BAR
(See SA section)
14. (4WD)
INSTALL TRANSFER UNDER COVER
15. CONNECT SPEEDOMETER CABLE



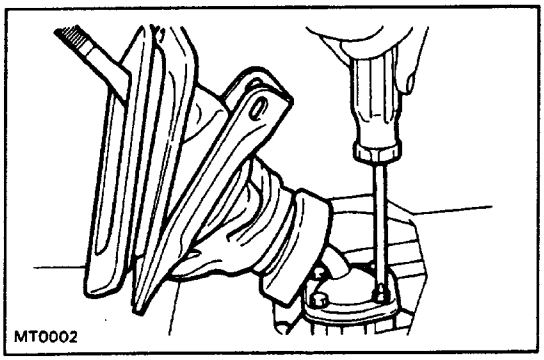
16. (4WD A/T)
CONNECT TRANSFER SHIFT LINKAGE
(a) Apply MP grease to the cross shaft joint.



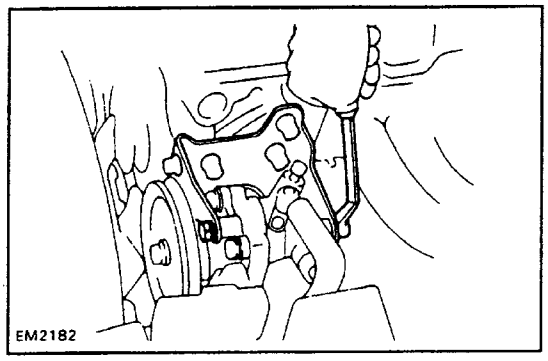
(b) Install the cross shaft to the body.



(c) Connect the No.1 and No.2 transfer shift linkage to the cross shaft.
17. (A/T)
CONNECT MANUAL SHIFT LINKAGE TO PNP SWITCH
18. INSTALL PROPELLER SHAFT
(See PR section)
19. (R150)
INSTALL SHIFT LEVER RETAINER



20. (M/T)
INSTALL SHIFT LEVER
(a) Apply MP grease to the shift lever.
(b) Instal) the shift lever to the transmission.
21. CONNECT GROUND STRAPS TO ENGINE REAR SIDE AND RH SIDE
22. (with A/C)
INSTALL COMPRESSOR TO BRACKET
(a) Install the compressor with the four bolts.
(b) Install the drive belt and adjust the belt tension.



23. CONNECT GROUND STRAP FOR PS PUMP BRA–CKET
24. (w/PS)
INSTALL PS PUMP WITH PS PUMP BRACKET
Install the PS pump with the four bolts.
25. CONNECT FOLLOWING CABLES:
(a) (A/T)
Throttle cable

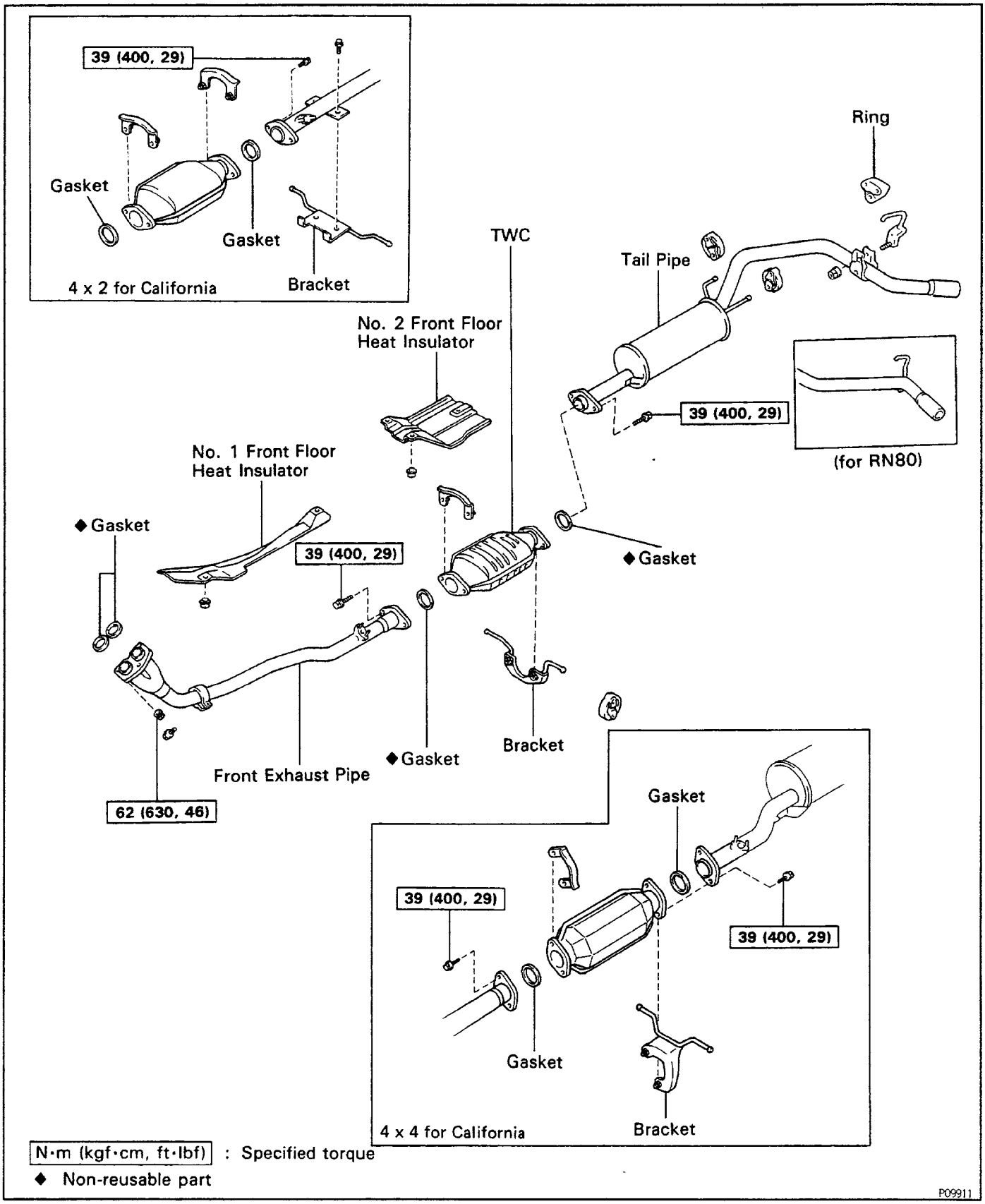
(b) (w/Cruise control)
Cruise control cable
(c) Accelerator cable
26. CONNECT FOLLOWING HOSES:
(a) Charcoal canister hose to canister
(b) (w/Cruise control)
Cruise control vacuum hose
(c) Brake booster hose
(d) PS air hoses to gas filter and air pipe
27. CONNECT FOLLOWING WIRES AND CONNEC–TORS:
(a) (with A/C)
A/C compressor connector
(b) Check connector
(c) (M/T)
Starter relay connectors
(d) ECM connectors
(e) Ground strap to engine rear side
(f) Distributor wire
(g) High–tension cords
(h) Generator wires
(i) Igniter connector
(j) Generator connector and wire
(k) Ground strap to LH fender apron
28. INSTALL FAN PULLEY, BELT GUIDE, FLUID COU–PLING AND GENERATOR DRIVE BELT
(See step 9 on page EG1–44**)**
29. (with A/C)
INSTALL A/C BELT
(see step 2 on page MA–6**)**
30. INSTALL PS PUMP AND BELT
(a) Place the PS drive belt onto each pulley.
(b) Stretch the belt tight and tighten the nuts.
(c) Torque the PS pump pulley lock nut.
Torque: 43 N–m (440 kgf–cm, 32 ft–lbf)
(d) adjust the belt tension.
(See step 2 on page MA–6)
31. INSTALL RADIATOR
32. INSTALL AIR CLEANER CASE AND INTAKE AIR CONNECTOR
33. FILL WITH ENGINE OIL
(See step 3 on page EG1–236**)**
34. FILL WITH COOLANT
(See step 3 on page EG1–225**)**
35. INSTALL ENGINE UNDER COVER
36. INSTALL BATTERY
37. INSTALL HOOD
38. START ENGINE
Warm up the engine and inspect for leaks.

39. PERFORM ENGINE ADJUSTMENT
(See page EG1–10)
40. ROAD TEST
Road test the vehicle.
41. RECHECK COOLANT AND ENGINE OIL LEVEL

EXHAUST SYSTEM

EG1W4–01

COMPONENTS



SERVICE SPECIFICATIONS

EG1WS–01

SERVICE DATA

Compression pressure		STD	1,177 kPa	12.0 kgf/cm²	171 psi
		Limit	981 kPa	10.0 kgf/cm²	142 psi
	Difference between each cylinder		980 kPa (1.0 kgf/cm², 14 psi) or less		
Cylinder head	Head surface warpage	Limit	0.15 mm		0.0059 in.
	Manifold surface warpage	Limit	0.20 mm		0.0079 in.
	Valve seat Refacing angle	Intake	30°, 45°, 60°		
		Exhaust	30°, 45°, 65°		
		Contacting angle	45°		
		Contacting width	1.2 – 1.6 mm		0.047 – 0.063 in.
Valve guide bushing	Inner diameter	Intake	8.01 – 8.03 mm		0.3154 – 0.3161 in.
		Exhaust	8.01 – 8.03 mm		0.3154 – 0.3161 in.
	Outer diameter	STD	13.040 – 13.051 mm		0.5134 – 0.5138 in.
		O/S 0.05	13.090 – 13.101 mm		0.5154 – 0.5158 in.
	Replacing temperature (cylinder head side)		Approx. 90°C (194°F)		
Valve	Valve overall length	STD Intake	113.5 mm		4.468 in.
		Exhaust	112.4 mm		4.425 in.
	Valve face angle		44.5°		
	Stem diameter	STD Intake	7.970 – 7.985 mm		0.3138 – 0.3144 in.
		Exhaust	7.965 – 7.980 mm		0.3136 – 0.3142 in.
	Stem end refacing	Limit	0.5 mm		0.020 in.
	Stem oil clearance	STD Intake	0.025 – 0.06 mm		0.0010 – 0.0024 in.
		Exhaust	0.03 – 0.065 mm		0.0012 – 0.0026 in.
		Limit Intake	0.08 mm		0.0031 in.
		Exhaust	0.10 mm		0.0039 in.
	Valve head edge thickness	STD	1.0 mm		0.039 in.
		Limit	0.6 mm		0.024 in.
Valve spring	Free length		48.5 mm		1.909 in.
	Installed load at 40.5 mm (1.594 in.)				
		STD	294 N	30.0 kgf	66.1 lbf
		Limit	279 N	28.5 kgf	62.8 lbf
	Squareness	Limit	1.6 mm		0.063 in.
Rocker arm and shaft	Rocker arm inside diameter		16.000 – 16.018 mm		0.6299 – 0.6306 in.
	Rocker shaft diameter		15.97 – 15.99 mm		0.6287 – 0.6295 in.
	Shaft to arm oil clearance	STD	0.01 – 0.05 mm		0.0004 – 0.0020 in.
		Limit	0.08 mm		0.0031 in.
Intake, exhaust manifolds and air intake chamber	Manifold surface warpage				
	Limit Intake		0.2 mm		0.008 in.
	Exhaust		0.7 mm		0.028 in.
	Air intake chamber		0.2 mm		0.008 in.
Chain and sprocket	Crankshaft sprocket wear	Limit	59.4 mm		2.339 in.
	Camshaft sprocket wear	Limit	113.8 mm		4.480 in.

Tension and damper	Tensioner head thickness	Limit		11.0 mm	0.433 in.
	No. 1 damper wear	Limit		0.5 mm	0.020 in.
	No. 2 damper wear	Limit		0.5 mm	0.020 in.
Camshaft	Thrust clearance	STD		0.08 – 0.18 mm	0.0031 – 0.0071 in.
		Limit		0.25 mm	0.0098 in.
	Journal oil clearance	STD		0.01 – 0.05 mm	0.0004 – 0.0020 in.
		Limit		0.1 mm	0.004 in.
	Journal diameter	STD		32.98 – 33.00 mm	1.2984 – 1.2992 in.
	Circle runout	Limit		0.2 mm	0.008 in.
	Cam height	STD	Intake	42.63 – 42.72 mm	1.6783 – 1.6891 in.
			Exhaust	42.69 – 42.78 mm	1.6807 – 1.6842 in.
		Limit	Intake	42.25 mm	1.6634 in.
			Exhaust	42.30 mm	1.6654 in.
Cylinder block	Cylinder head surface warpage		Limit	0.05 mm	0.0020 in.
	Cylinder bore STD		No. 1	92.00 – 92.01 mm	3.6220 – 3.6224 in.
			No. 2	92.01 – 92.02 mm	3.6224 – 3.6228 in.
			No. 3	92.02 – 92.03 mm	3.6228 – 3.6232 in.
	Cylinder bore wear		Limit	0.02 mm	0.008 in.
	Cylinder block main journal bore				
		STD	No. 3	64.004 – 64.010 mm	2.5198 – 2.5201 in.
			No. 4	64.010 – 64.016 mm	2.5201 – 2.5203 in.
			No. 5	64.016 – 64.022 mm	2.5203 – 2.5205 in.
		U/S 0.25		64.004 – 64.022 mm	2.5198 – 2.5205 in.
Piston and piston ring	Piston diameter	STD	No. 1	91.975 – 91.985 mm	3.6211 – 3.6214 in.
			No. 2	91.985 – 91.995 mm	3.6214 – 3.6218 in.
			No. 3	91.995 – 92.005 mm	3.6218 – 3.6222 in.
		O/S 0.50		92.475 – 92.505 mm	3.6407 – 3.6419 in.
		O/S 1.00		92.975 – 93.005 mm	3.6604 – 3.6616 in.
	Piston to cylinder clearance			0.015 – 0.035 mm	0.0006 – 0.0014 in.
	Ring to ring groove clearance				
		STD		0.03 – 0.07 mm	0.0012 – 0.0028 in.
		Limit		0.2 mm	0.008 in.
	Piston ring end gap	STD	No. 1	0.25 – 0.47 mm	0.0098 – 0.0185 in.
			No. 2	0.60 – 0.82 mm	0.0236 – 0.0323 in.
			Oil	0.20 – 0.57 mm	0.0079 – 0.0224 in.
		Limit	No. 1	1.07 mm	0.0421 in.
			No. 2	1.42 mm	0.0559 in.
			Oil	1.17 mm	0.0461 in.
	Piston pin installing temperature			80°C	176°F
Connecting rod and bearing	Thrust clearance	STD		0.16 – 0.26 mm	0.0063 – 0.0102 in.
		Limit		0.3 mm	0.012 in.
	Bearing oil clearance	STD		0.025 – 0.055 mm	0.0010 – 0.0022 in.
		Limit		0.10 mm	0.0039 in.

Connecting rod and bearing (cont'd)	Big end inner diameter	STD	A	56.000 – 56.006 mm	2.2047 – 2.2050 in.
			B	56.006 – 56.012 mm	2.2050 – 2.2052 in.
			C	56.012 – 56.018 mm	2.2052 – 2.2054 in.
		U/S 0.25		56.000 – 56.018 mm	2.2047 – 2.2054 in.
	Connecting rod bearing center wall thickness				
		STD	A	1.484 – 1.488 mm	0.0584 – 0.0586 in.
			B	1.488 – 1.492 mm	0.0586 – 0.0587 in.
			C	1.492 – 1.496 mm	0.0587 – 0.0589 in.
		U/S 0.25		1.626 – 1.636 mm	0.0640 – 0.0644 in.
	Pin to bushing oil clearance				
		STD		0.005 – 0.011 mm	0.0002 – 0.0004 in.
		Limit		0.015 mm	0.0006 in.
	Rod bend 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.
Crankshaft	Thrust clearance	STD		0.02 – 0.22 mm	0.0008 – 0.0087 in.
		Limit		0.3 mm	0.012 in.
	Thrust washer thickness	STD		2.690 – 2.740 mm	0.1059 – 0.1079 in.
		O/S 1.25		2.753 – 2.803 mm	0.1084 – 0.1104 in.
		O/S 2.50		2.815 – 2.865 mm	0.1108 – 0.1128 in.
	Main journal oil clearance	STD		0.025 – 0.055 mm	0.0010 – 0.0022 in.
		Limit		0.08 mm	0.0031 in.
	Main journal diameter	STD		59.984 – 60.000 mm	2.3616 – 2.3622 in.
	Main journal finished diameter				
		U/S 0.25		59.701 – 59.711 mm	2.3504 – 2.3508 in.
	Main bearing center wall thickness				
	STD		No. 3	1.988 – 1.992 mm	0.0783 – 0.0784 in.
			No. 4	1.992 – 1.996 mm	0.0784 – 0.0786 in.
			No. 5	1.996 – 2.000 mm	0.0786 – 0.0787 in.
		U/S 0.25		2.216 – 2.136 mm	0.0837 – 0.0841 in.
	Crank pin diameter	STD		52.988 – 53.000 mm	2.0861 – 2.0866 in.
	Crank pin finished diameter				
	U/S 0.25			52.701 – 52.711 mm	2.0748 – 2.0752 in.
	Circle runout Limit			0.1 mm	0.004 in.
	Main journal taper and out–of–round				
	Limit			0.01 mm	0.0004 in.
	Crank pin journal taper and out–of round				
	Limit			0.01 mm	0.0004 in.

EG1W6–01

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Cylinder head x Cylinder head cover	5.9	60	52 in.·lbf
Cylinder head x Camshaft bearing cap	20	200	14
Cylinder head x Spark plug	18	180	13
Cylinder head x Intake manifold	19	195	14
Cylinder head x No. 1 secondary air injection manifold	13	130	9
Cylinder head x EGR valve	13	130	9
Cylinder head x Exhaust manifold	44	450	33
Cylinder head x Cylinder head rear cover	13	130	9
Cylinder block x Cylinder head	78	800	58
Cylinder block x Chain damper	22	220	16
Cylinder block x Chain tensioner	19	195	14
Cylinder block x Engine mounting	39	400	29
Cylinder block x Rear oil seal retainer	18	180	13
Cylinder block x Fuel filter bracket	19	195	14
Oil cooler relief valve x Cylinder block	69	700	51
Cylinder block x Crankshaft bearing cap	103	1,050	76
Cylinder block x Oil strainer	13	130	9
Cylinder block x Oil pan	13	130	9
Cylinder block x Engine mounting bracket	44	400	33
Valve clearance adjusting screw	25	250	18
Camshaft x Distributor drive gear	78	800	58
Crankshaft pulley x No. 2 crankshaft pulley	19	195	14
Air intake chamber x EGR pipe	13	130	9
Air intake chamber x Intake manifold	19	195	14
Air intake chamber x Accelerator control cable bracket	13	130	9
Intake manifold x Water outlet	19	195	14
Intake manifold x PAIR valve	13	130	9
No. 1 secondary air injection manifold x PAIR valve	13	130	9
No. 1 secondary air injection manifold x No. 2 secondary air injection manifold	13	130	9
Exhaust manifold x No. 2 exhaust manifold heat insulator	19	195	14
Exhaust manifold x No. 2 secondary air injection manifold			
10 mm bolt	44	450	33
8 mm bolt	22	220	16
Connecting rod x Connecting rod cap	69	700	51
Crankshaft x Crankshaft pulley	157	1,600	116
Crankshaft x Flywheel	108	1,100	80
Crankshaft x Drive plate	83	850	61
Oil pan x Drain plug	25	250	18

EMISSION CONTROL SYSTEMS

SYSTEM PURPOSE

System	Abbreviation	Purpose
Positive crankcase ventilation	PCV	Reduces blow–by gas (HC)
Fuel evaporative emission control	EVAP	Reduces evaporative HC
Exhaust gas recirculation	EG R	Reduces NOx
Pulsed secondary air injection	PAIR	Reduces HC and CO
Three –way catalytic converter	TWC	Reduces HC CO and NOx
Multiport fuel injection *	MFI	Regulates all engine conditions for reduction of exhaust emissions.

Remark: *For inspection and repair of the MFI system,refer to the MFI section this manual.

PREPARATION

EG05U–01

SST (SPECIAL SERVICE TOOLS)

09843–18024 Diagnosis Check Wire 	

EG05V–01

RECOMMENDED TOOLS

09082–00015 TOYOTA Electrical Tester 	

EG05W–05

EQUIPMENT

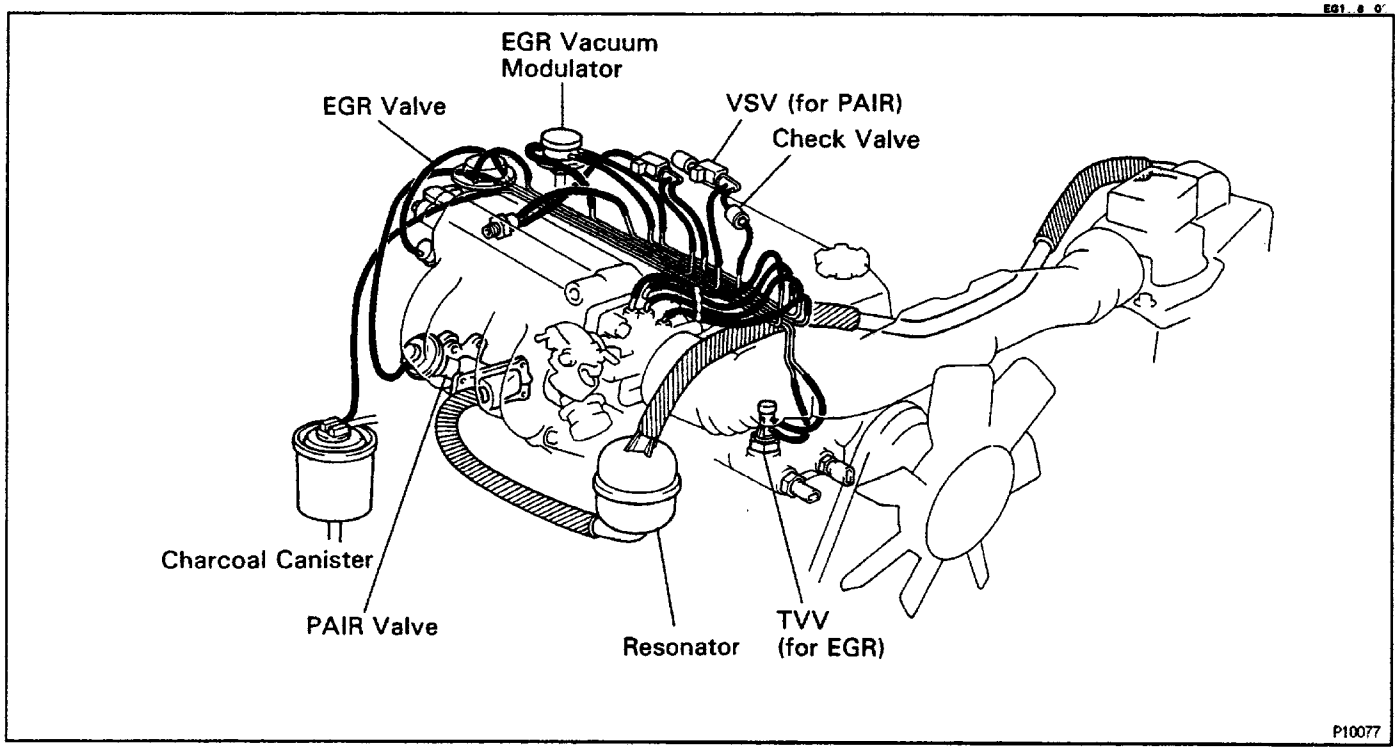
Heater	TVV
Thermometer	TVV
Tachometer	
Torque wrench	
Vacuum gauge	

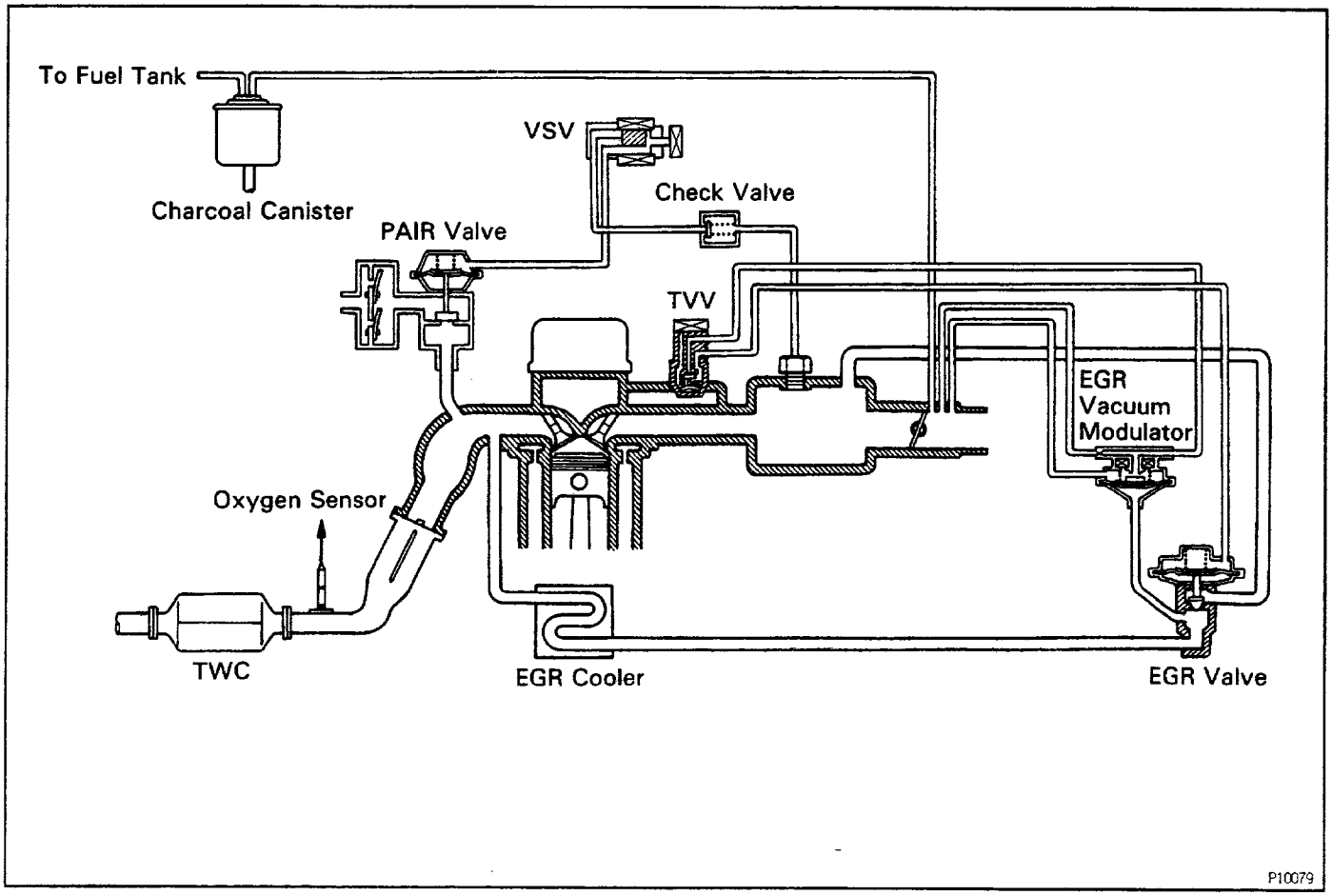
EG05X–05

SSM (SPECIAL SERVICE MATERIALS)

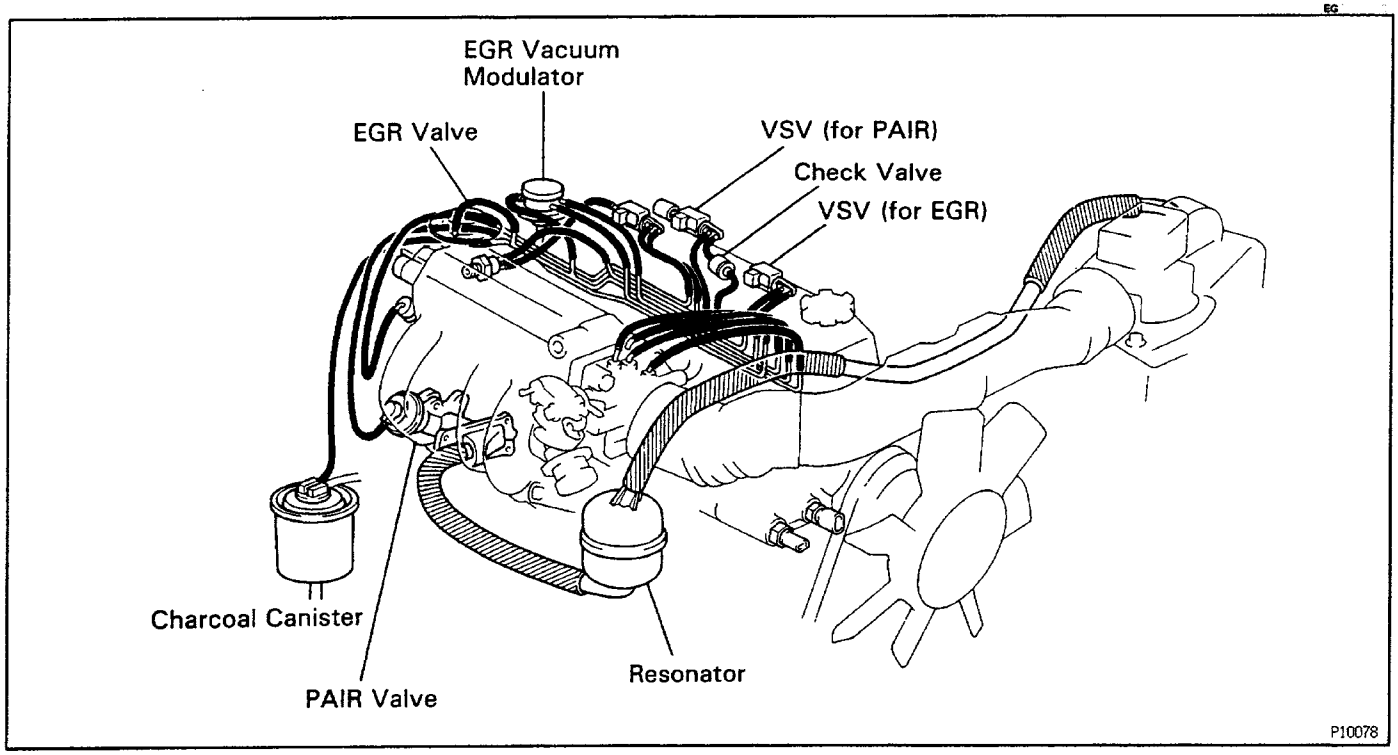
08833–00070 Adhesive 1324, THREE BOND 1324 or equivalent	TVV

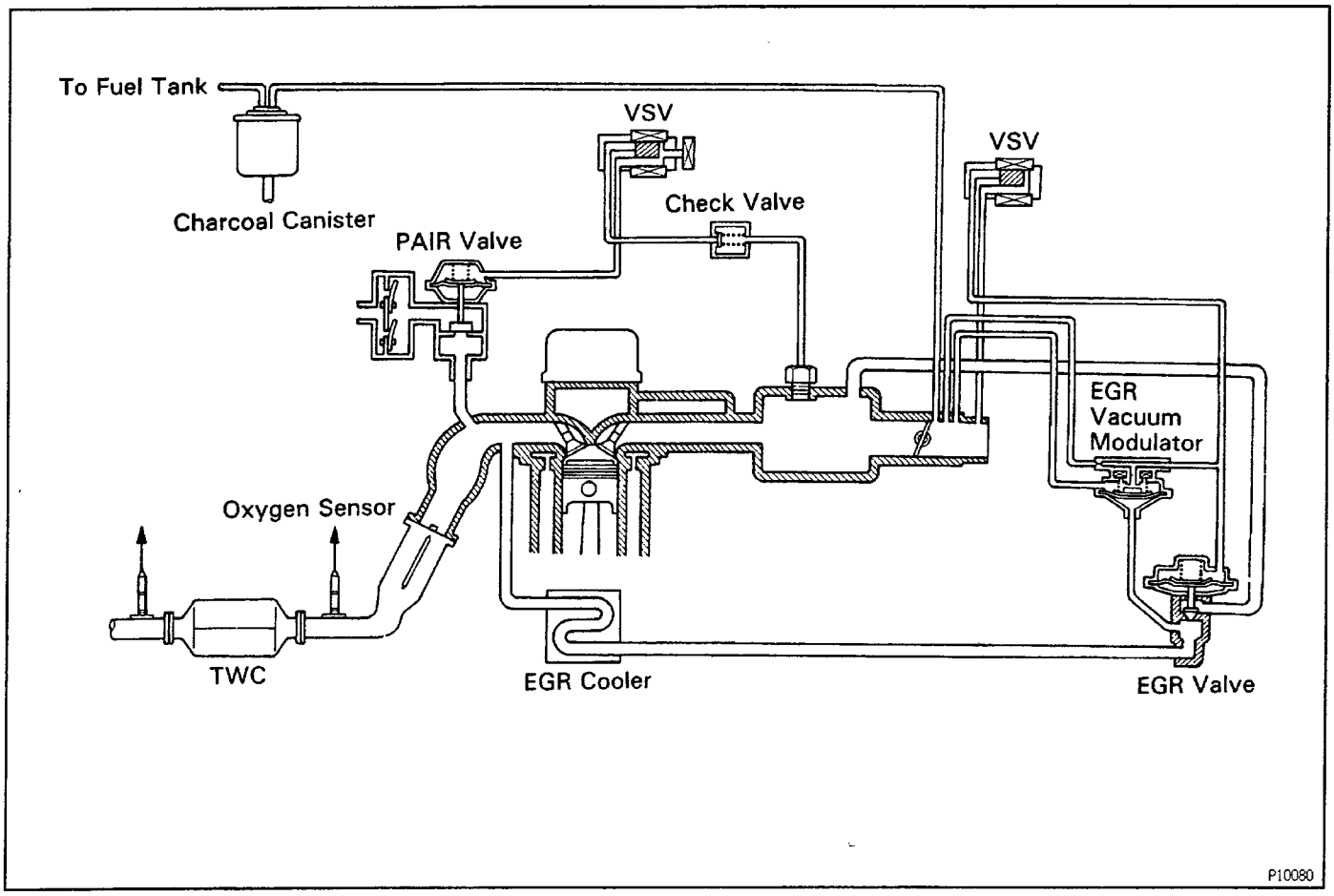
LAYOUT AND SCHEMATIC DRAWING (Federal and Canada)





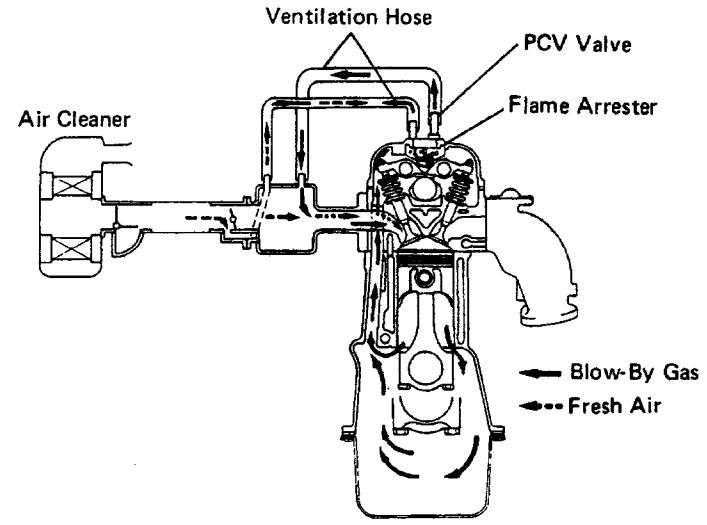
LAYOUT AND SCHEMATIC DRAWING (Calif.)





POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

EG1WA–01

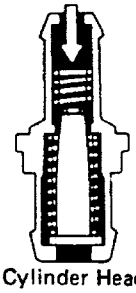


EC2572

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

Engine not Running or Backfiring

Intake Manifold Side

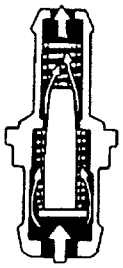


Cylinder Head Side

EC1001

- PCV VALVE IS CLOSED.

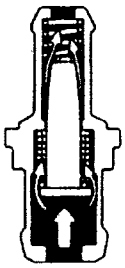
Normal Operation



EC1002

- PCV VALVE IS OPEN.
- VACUUM PASSAGE IS LARGE.

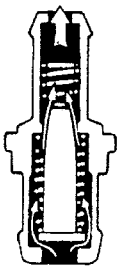
Idling or Decelerating



EC1003

- PCV VALVE IS OPEN.
- VACUUM PASSAGE IS SMALL.

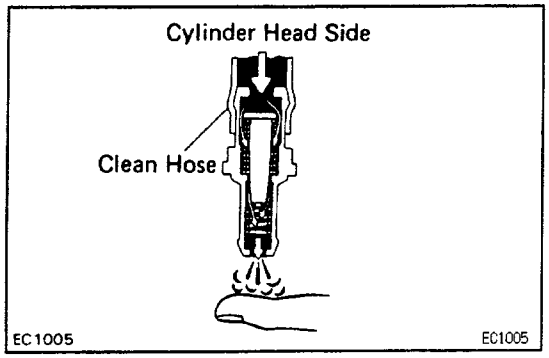
Acceleration or Heavy Load



EC1004

- PCV VALVE IS FULLY OPEN.

V01772



EG1WB–01

PCV VALVE INSPECTION

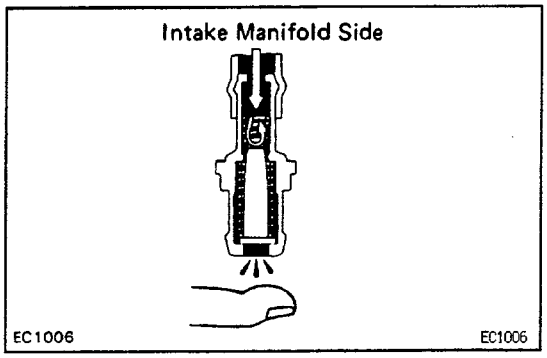
1. REMOVE PCV VALVE

2. ATTACH CLEAN HOSE TO PCV VALVE

3. BLOW AIR FROM CYLINDER HEAD SIDE

Check that air passes through easily.

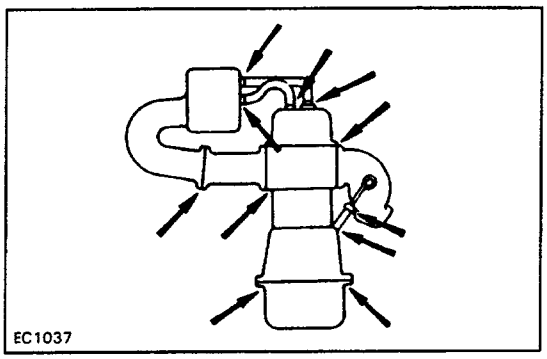
NOTICE:Do not suck air through the valve. Petroleum substances inside the valve are harmful.



4. BLOW AIR FROM INTAKE MANIFOLD SIDE

Check that air passes through with difficulty. If the PCV valve fails either check, replace it.

5. REINSTALL PCV VALVE



EG1WC–01

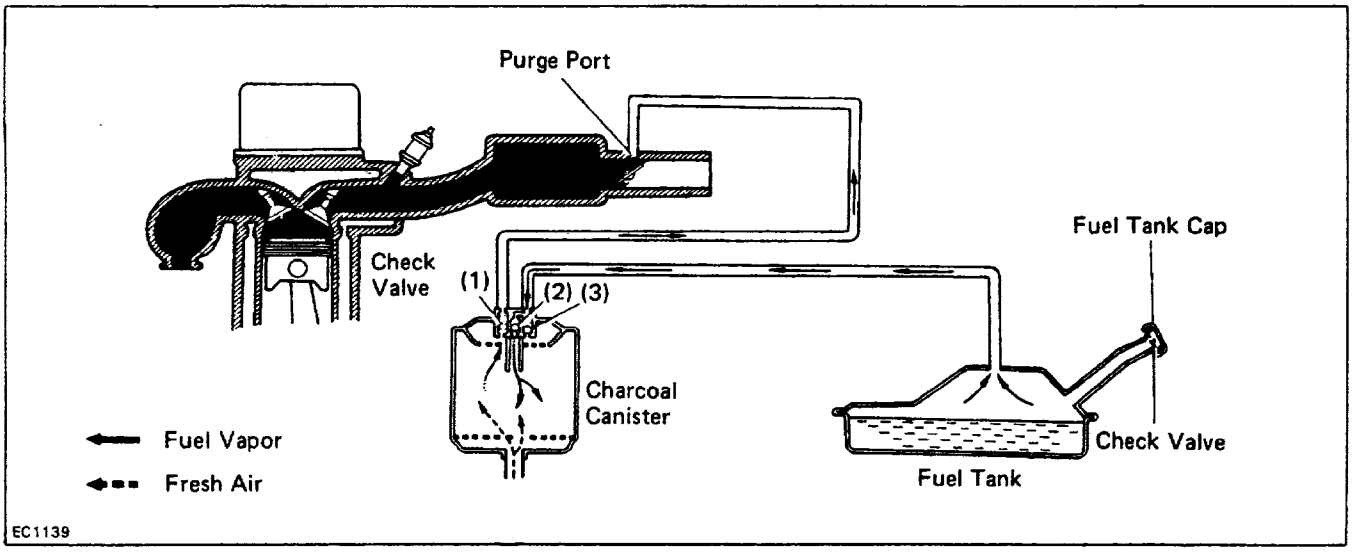
PCV HOSES AND CONNECTIONS INSPECTION

VISUALLY INSPECT HOSES,CONNECTIONS AND GASKETS

Check for cracks,leaks or damage.

EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM

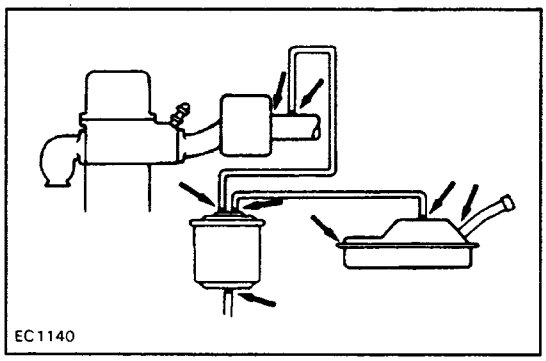
EG1WD–01



To reduce HC emission, evaporated fuel from the fuel tank is routed through the charcoal canister to the throttle body for combustion in the cylinders.

Throttle Valve Opening	Check Valve in Charcoal Canister			Check Valve in Fuel Tank Cap	Evaporated Fuel (HC)
	(1)	(2)	(3)		
Positioned below purge port	CLOSED	—			HC from tank is absorbed in the canister.
Positioned above purge port	OPEN		—		HC from canister is led into throttle body.
High pressure in tank		OPEN	CLOSED	CLOSED	HC from tank is absorbed in the canister.
High vacuum in tank	—	CLOSED	OPEN	OPEN	(Air is led into the tank.)

V01773



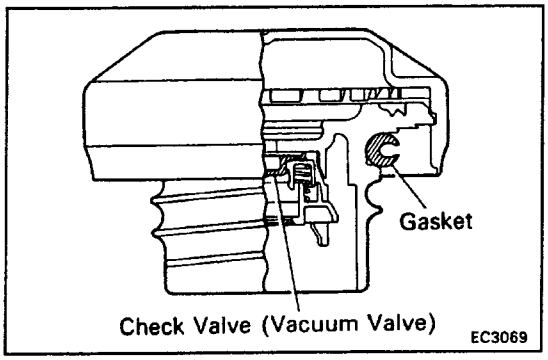
INSPECTION OF FUEL VAPOR LINES,FUEL TANK AND TANK CAP

1. VISUALLY INSPECT LINES AND CONNECTIONS

Look for loose connections,sharp bends or damage.

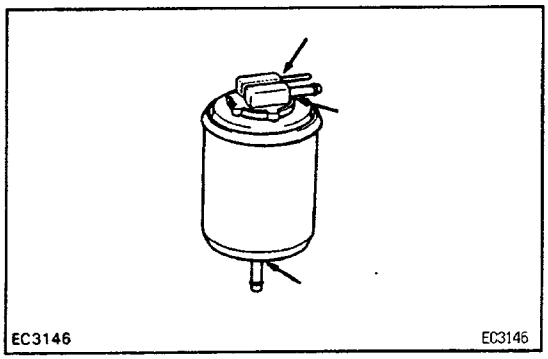
2. VISUALLY INSPECT FUEL TANK

Look for deformation,cracks or fuel leakage.



3. VISUALLY INSPECT FUEL TANK CAP

Look for a damaged or deformed gasket and cap. If necessary, repair or replace the cap.



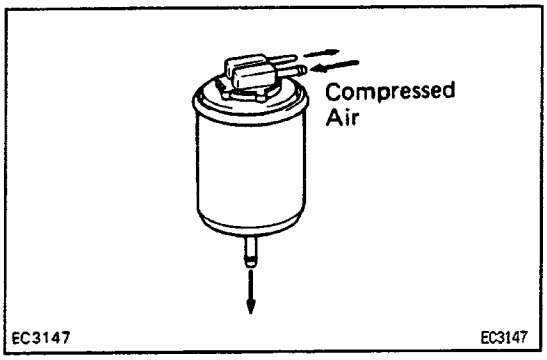
CHARCOAL CANISTER INSPECTION

EG1WF–01

1. REMOVE CHARCOAL CANISTER

2. VISUALLY INSPECT CHARCOAL CANISTER CASE

Look for cracks or damage.

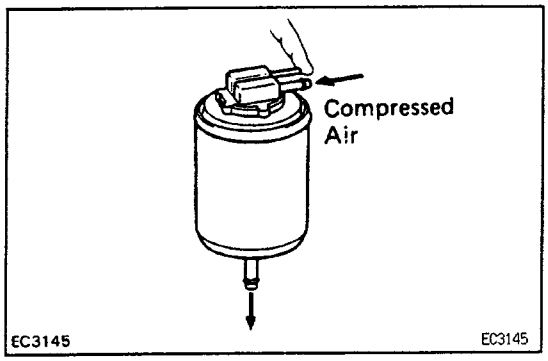


3. CHECK FOR CLOGGED FILTER AND STUCK CHECK VALVE

(a) Using low pressure compressed air,blow air into the tank pipe and check that the air flows without re–sistance from the other pipes.

(b) Blow into the purge pipe and check that the air does not flow from the other pipes.

If a problem is found, replace the charcoal canister.



4. CLEAN FILTER IN CANISTER

Clean the filter by blowing 294 kPa(3 kgf/cm^2,43psi) of compressed air into the tank pipe, while holding the purge pipe closed.

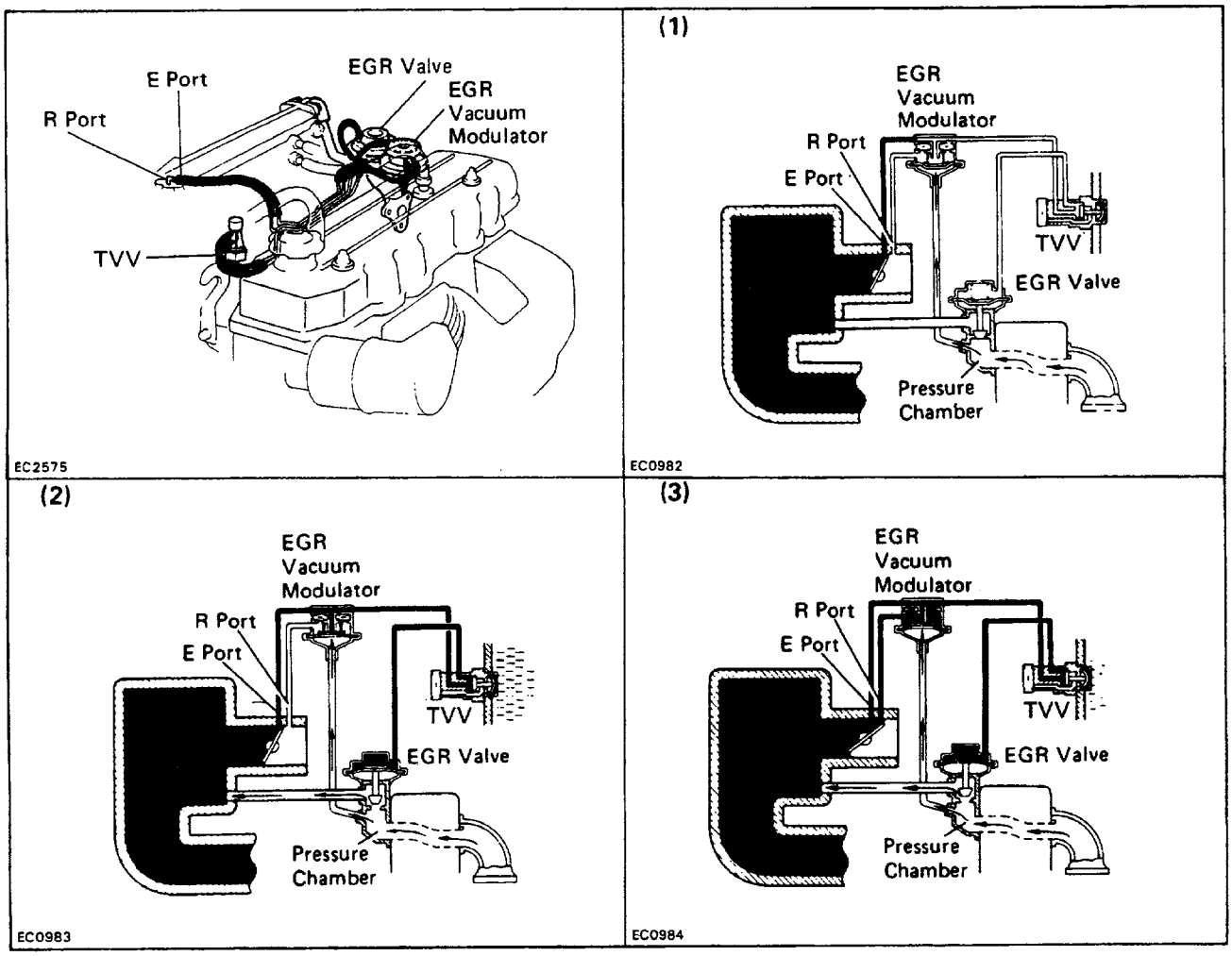
HINT:

- Do not attempt to wash the canister.
- No activated carbon should come out.

5. INSTALL CHARCOAL CANISTER

EXHAUST GAS RECIRCULATION (EGR) SYSTEM (Federal and Canada)

EG1WG–01



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

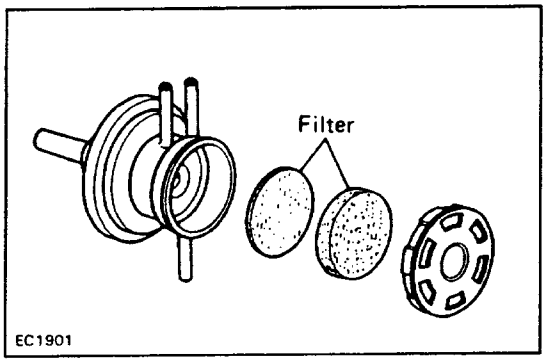
Coolant Temp.	TVV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 30°C (86°F)	CLOSED	—	—		—	CLOSED	Not recirculated
Above 44°C (111°F)	OPEN	Positioned below E port	—		—	CLOSED	Not recirculated
		Positioned between E port and R port	(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 R port	(3) HIGH	**	CLOSES passage to atmosphere	OPEN	Recirculated (increase)

Remarks: * Pressure increases→Modulator closes→EGR valve opens→Pressure drops
↑ EGR valve closes←Modulator opens←

**When the throttle valve is positioned above the R port, 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.

V01774

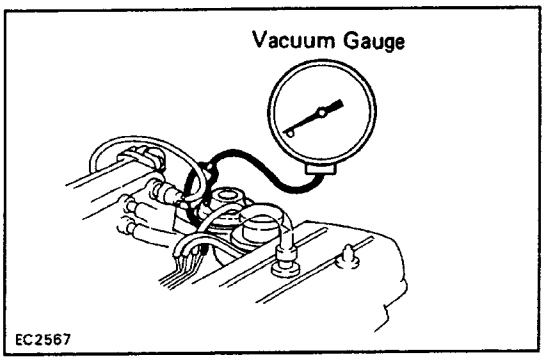
EG1WH–01



EGR SYSTEM INSPECTION

1. CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR

(a) Check the filter for contamination or damage.
(b) Using compressed air,clean the filter.

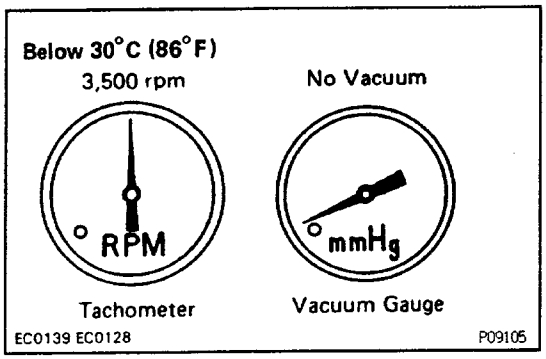


2. PREPARATION

Disconnect the vacuum hose from the EGR valve and, using a three way union,connect a vacuum gauge to it.

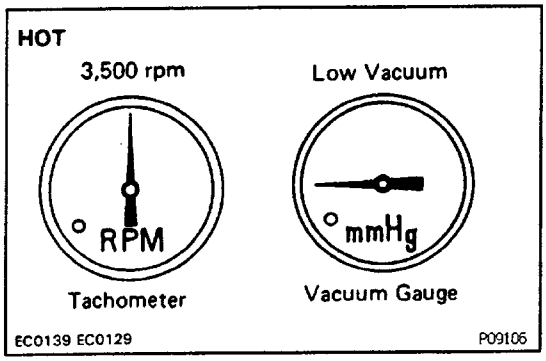
3. CHECK SEATING OF EGR VALVE

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



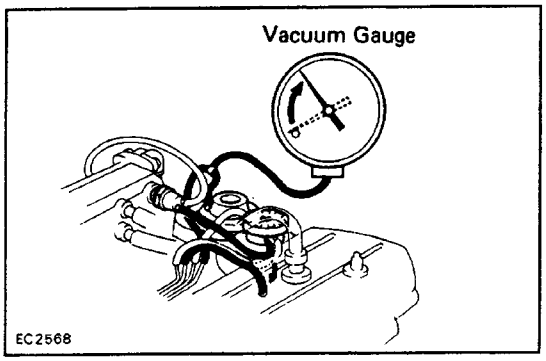
4. CHECK TVV WITH COLD ENGINE

(a) The coolant temperature should be below 30°C(86°F).
(b) Check that the vacuum gauge indicates zero at 3.500 rpm.

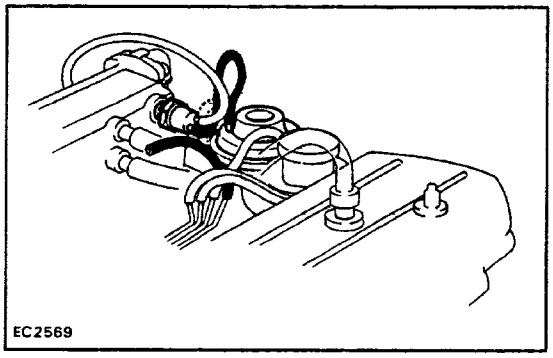


5. CHECK TVV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine.
(b) Check that the vacuum gauge indicates low vacuum at 3,500 rpm.



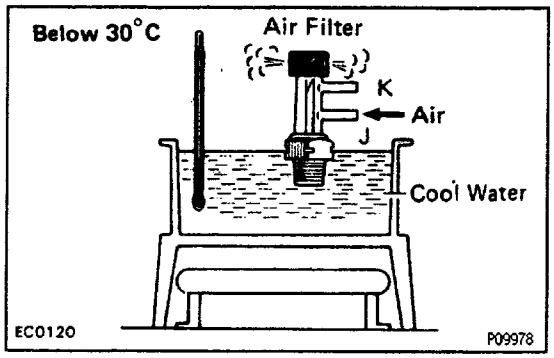
(c) Disconnect the vacuum hose from R port of the EGR vacuum modulator and connect R port directly to the intake manifold with another hose.
(d) Check that the vacuum gauge indicates high vacuum at 3,000 rpm.
HINT: As a large amount of EGR gas enters, the engine will misfire slightly at this time.
(e) Disconnect 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, THE SYSTEM IS OKAY; OTHERWISE INSPECT EACH PART

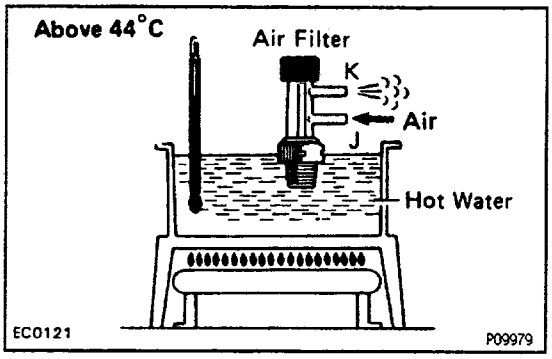


EG1WJ–01

TVV INSPECTION

CHECK TVV BY BLOWING AIR INTO PIPE

(a) Drain the coolant from the radiator into a suitable container.
(b) Remove the TVV.
(c) Cool the TVV to below 30 °C(86°F).
(d) Check that the air flows from pipe J to the air filter.

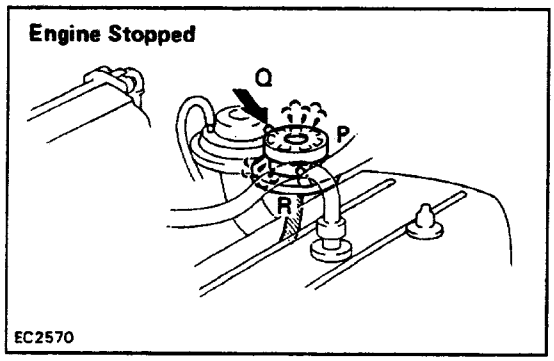


(e) Heat the TVV to above 44 °C(111 ° F).
(f) Check that the air flows from pipe J to pipe K.
(g) Apply sealant to the threads of the TVV and reinstall.

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

(h) Fill the radiator with coolant.

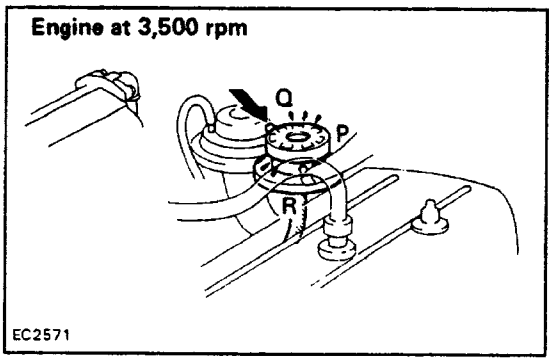
If a problem is found, replace the TVV.



EGR VACUUM MODULATOR INSPECTION

CHECK EGR VACUUM MODULATOR OPERATION

(a) Disconnect the vacuum hoses from ports, Q and R of the EGR vacuum modulator.
(b) Plug ports P and R with your finger.
(c) Blow air into Q. Check that the air passes through to the air filter side freely.
(d) Start the engine and maintain the 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.

EG1WL–01

EGR VALVE INSPECTION

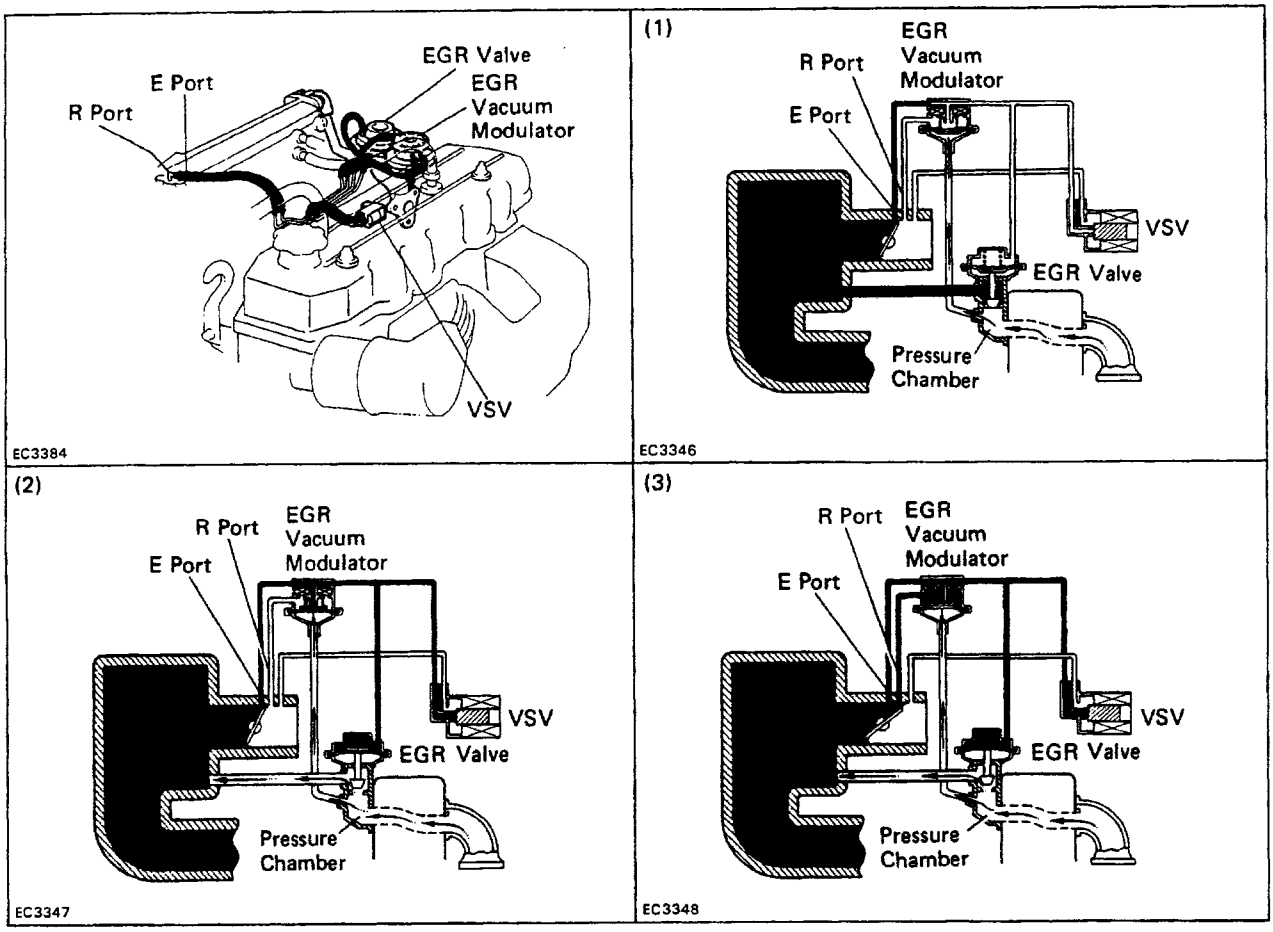
1. REMOVE EGR VALVE

Check the valve for sticking and heavy carbon de–posits. If a problem is found, replace it.

2. INSTALL EGR VALVE WITH NEW GASKET

EXHAUST GAS RECIRCULATION (EGR) SYSTEM (Calif.)

EG1WM–01



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

Coolant Temp.	Driving Condition	VSV	Throttle Valve Opening Angle	Pressure in the EGR Valve Pressure Chamber		EGR Vacuum Modulator	EGR Valve	Exhaust Gas
Below 34°C (93°F)	—	ON	—	—		—	CLOSED	Not recirculated
Above 40°C (104°F)	Low load	ON	—	—		—	CLOSED	Not recirculated
	Heavy load, etc.	OFF	Positioned below E port	—		—	CLOSED	Not recirculated
			Positioned between E port and R port	(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 R port	(3) HIGH	**	CLOSES passage to atmosphere	OPEN	Recirculated (increase)

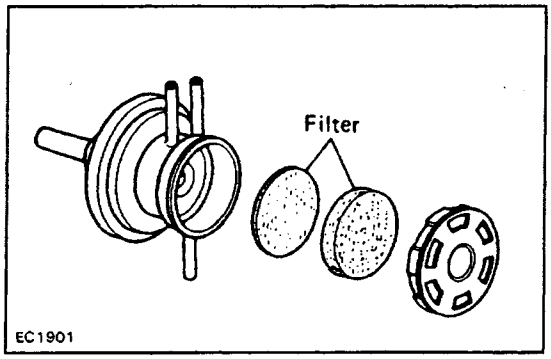
Remarks: * Pressure increases→Modulator closes→EGR valve opens→Pressure drops
↑ EGR valve closes←Modulator opens←

**When the throttle valve is positioned above the R port, 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.

V01775

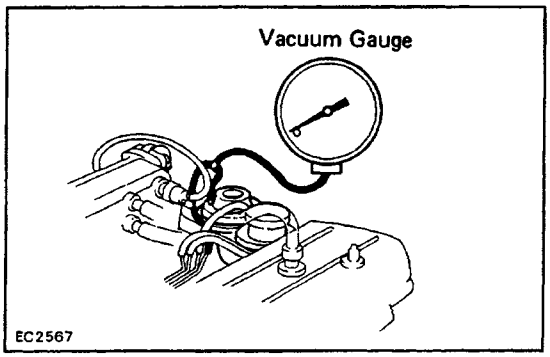
EG1WN–01

EGR SYSTEM INSPECTION



1. CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR

(a) Check the filter for contamination or damage.
(b) Using compressed air, clean the filter.

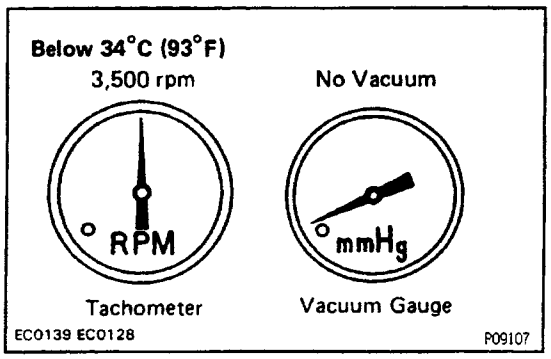


2. PREPARATION

Disconnect the vacuum hose from the EGR valve, and using a three way union, connect a vacuum gauge to it.

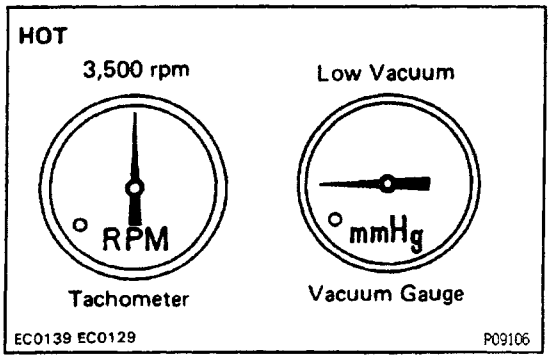
3. CHECK SEATING OF EGR VALVE

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



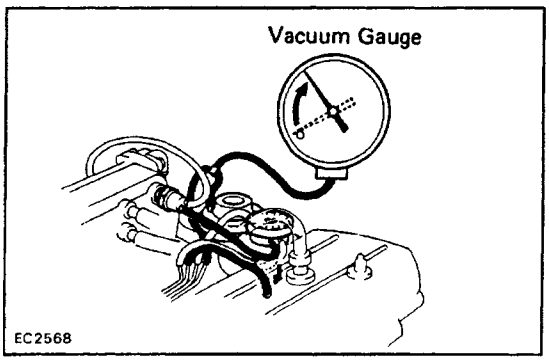
4. CHECK VSV WITH COLD ENGINE

(a) The coolant temperature should be below 34 °C (93° F).
(b) Check that the vacuum gauge indicates zero at 3,500 rpm.



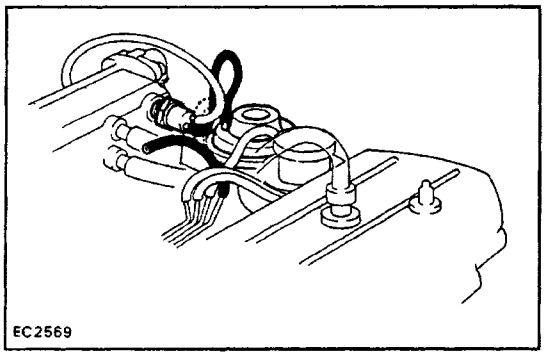
5. CHECK VSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine.
(b) Check that the vacuum gauge indicates low vacuum at 3,500 rpm.



(c) Disconnect the vacuum hose from R port of the EGR vacuum modulator and connect R port directly to the intake manifold with another hose.
(d) Check that the vacuum gauge indicates high vacuum at 3,000 rpm.

HINT: As a large amount of EGR gas enters, the engine will misfire slightly at this time.
(e) Disconnect the vacuum gauge and reconnect the vacuum hoses to the proper locations.


EC2569

6. CHECK EGR VALVE

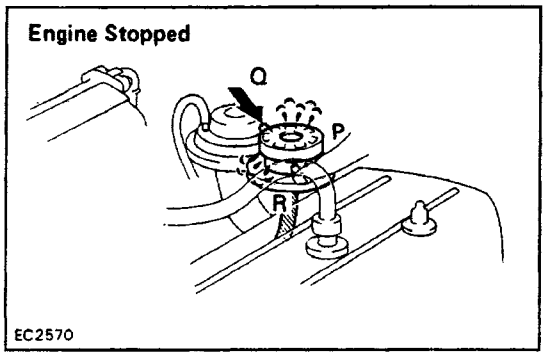
(a) Apply vacuum directly to the EGR valve with the engine idling.
(b) Check that the engine runs rough or dies.
(c) Reconnect the vacuum hoses to the proper locations.

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

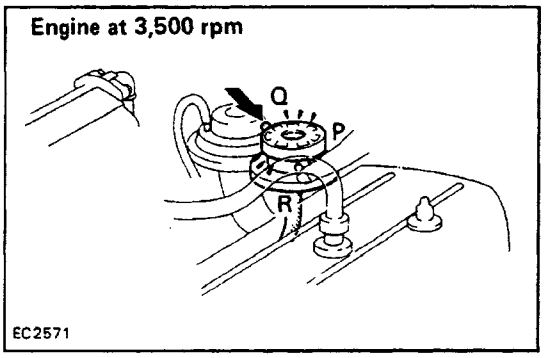
EGR VACUUM MODULATOR INSPECTION

CHECK EGR VACUUM MODULATOR OPERATION

(a) Disconnect the tow vacuum hoses from ports P, Q and R of the EGR vacuum modulator.
(b) Plug ports P and R with your finger.
(c) Blow air into port Q. Check that the air passes through to the air filter side freely.



EC2570



EC2571

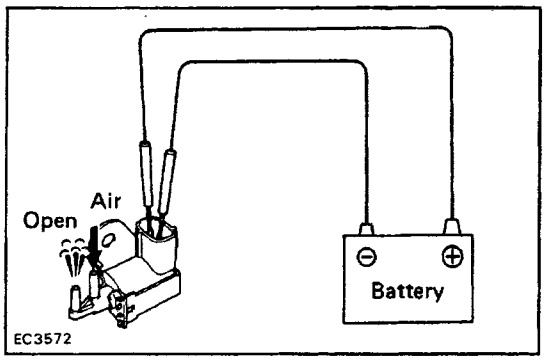
(d) Start the engine and maintain the speed at 3,500 rpm.
(e) Repeat the above test. Check that there is a strong resistance to air flow.
(f) Reconnect the vacuum hoses to the proper locations.

EG1WQ–01

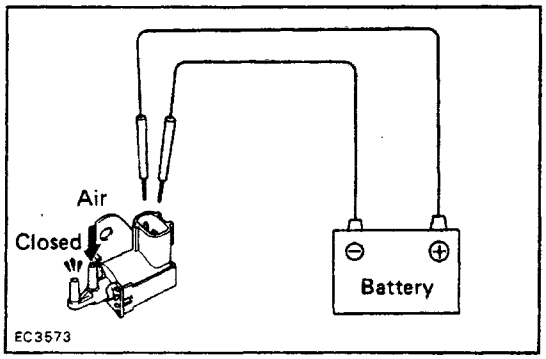
VSV INSPECTION

1. CHECK VACUUM CIRCUIT CONTINUITY IN THE VSV BY BLOWING AIR INTO PIPE

(a) Connect the VSV terminals to the battery terminals as illustrated.
(b) Blow air into a pipe and check that the VSV is open.



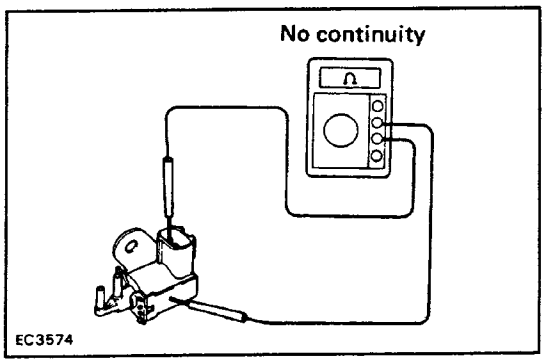
EC3572



EC3573

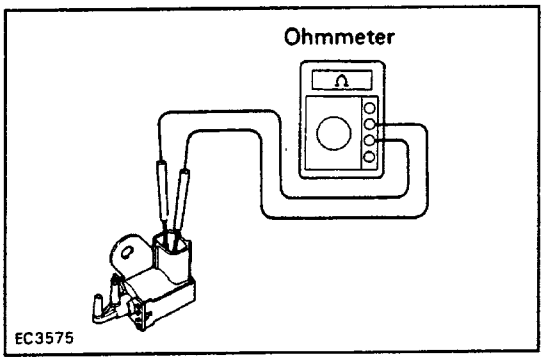
(c) Disconnect the battery.
(d) Blow air into a pipe and check that VSV is closed.

If a problem is found, replace the VSV.



2. CHECK FOR SHORT CIRCUIT

Using an ohmmeter, check that there is no continuity between the terminals and the VSV body.



3. CHECK FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between the terminals.

Specified resistance: 30 – 50 Ω at 20° C(68° F)

If the resistance is not within specification, replace the VSV.

EG1WR–01

EGR VALVE INSPECTION

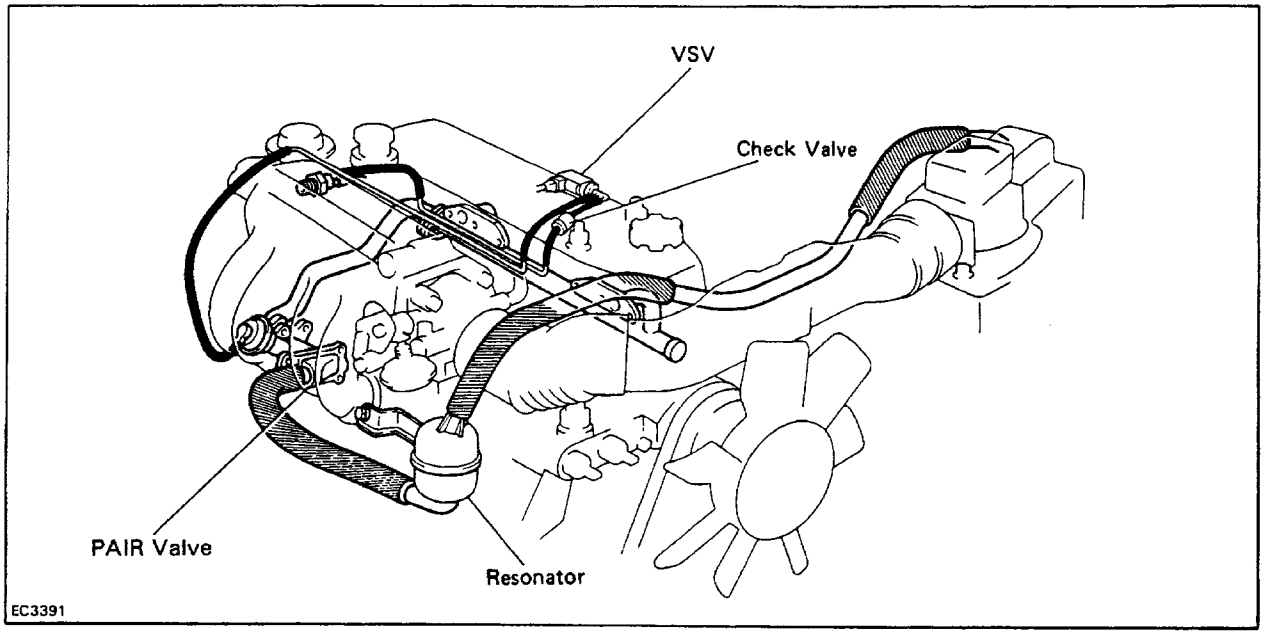
1. REMOVE EGR VALVE

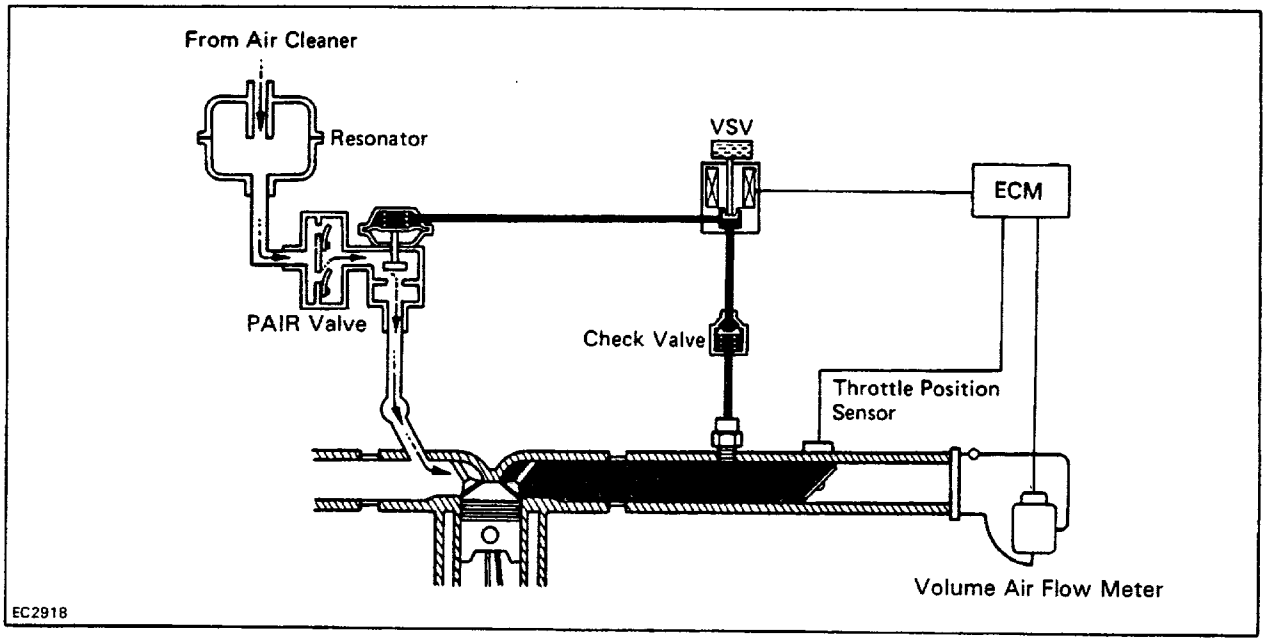
Check the valve for sticking and heavy carbon de–posits. If a problem is found, replace it.

2. INSTALL EGR VALVE WITH NEW GASKET

PULSED SECONDARY AIR INJECTION (PAIR) SYSTEM

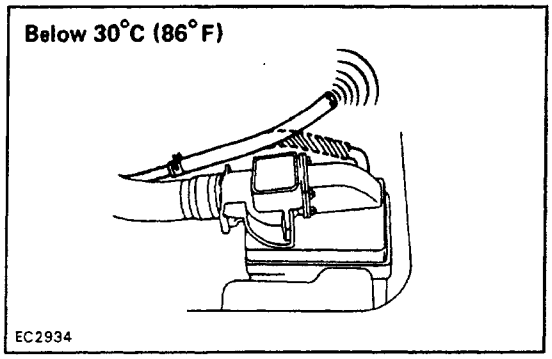
EG1W8–01





To reduce HC and CO emissions, this system draws in air into exhaust ports to accelerate oxidation, using vacuum generated by the exhaust pulsation in the exhaust manifold.

Condition	Coolant Temp.	Throttle valve position	Vehicle speed	Engine RPM	VSV	PAIR
Normal driving	Below 30°C (86° F)			Below 3,600 rpm	ON	ON
				Above 3,600 rpm	OFF	OFF
Deceleration	Above 40°C) (104°F)	Idling	Below 4 km/h (2 mph)	Below 1,000 rpm	OFF	OFF
				Above 1,000 rpm	ON	ON
			Above 4 km/h (2 mph)	Below 1,000 rpm	ON	ON
				Above 1,000 rpm	ON	ON



EG1WT–02

PAIR SYSTEM INSPECTION

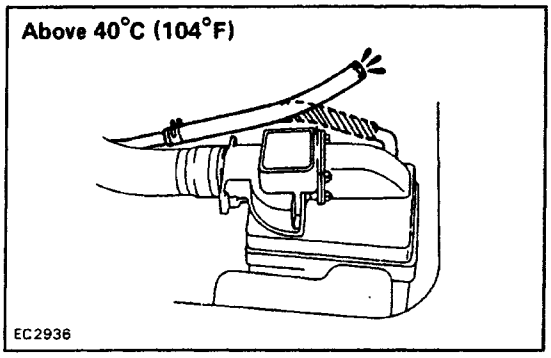
1. VISUALLY CHECK HOSES AND TUBES FOR CRACKS, KINKS, DAMAGE OR LOOSE CONNEC–TIONS

2. CHECK PAIR SYSTEM WITH COLD ENGINE

(a) The coolant temperature should be below 30 °C(86° F).

(b) Disconnect the NO.1 PAIR hose from the air cleaner case.

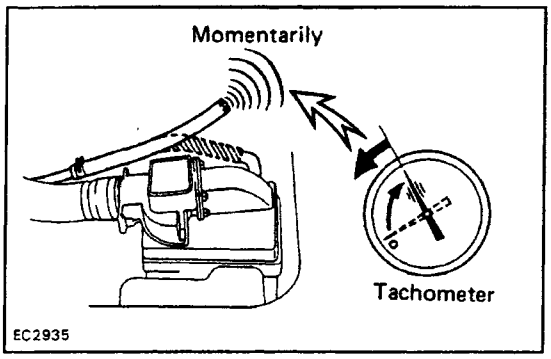
(c) Check that a bubbling noise is heard from the N0.1 PAIR hose at idle.



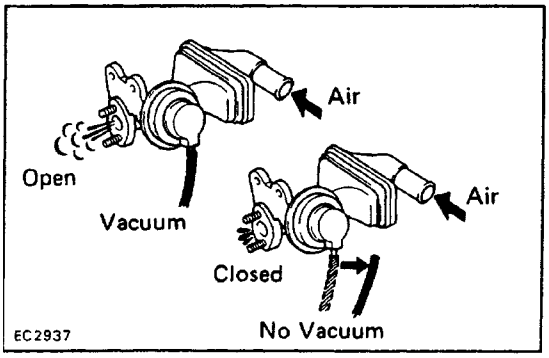
3. CHECK PAIR SYSTEM WITH WARM ENGINE

(a) Warm up the engine to above 40°C(104°F).

(b) With the engine idling, check that a bubbling noise is not heard from the NO. 1 hose.



(c) Race the engine and quickly close the throttle valve. Check that a bubbling noise stops momentarily.



EG1WU–01

PAIR VALVE INSPECTION

CHECK PAIR VALVE BY BLOWING AIR INTO PIPE

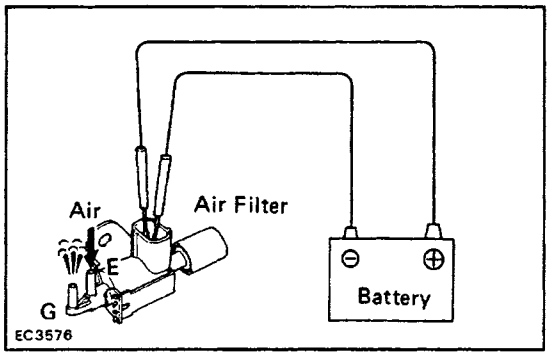
(a) Apply vacuum to the pair valve diaphragm.

(b) Blow air into a pipe and check that the pair valve is

(c) Release the vacuum and check that the pair valve is closed.

EG1WV–01

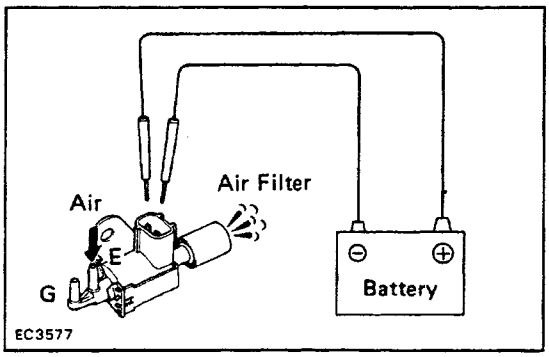
VSV INSPECTION



1. CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE

(a) Connect the VSV terminals to the battery terminals as illustrated.

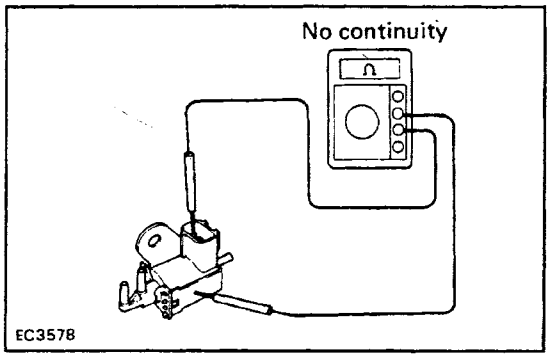
(b) Blow air into pipe E and check that air comes out of pipe G.



(c) Disconnect the battery.

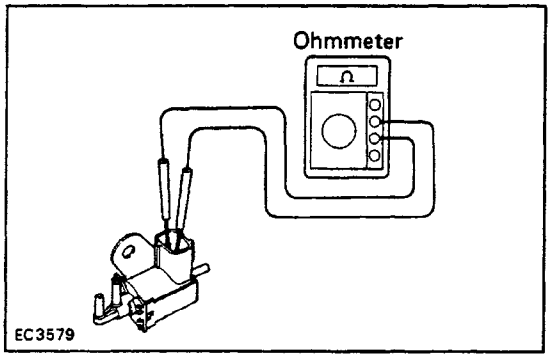
(d) Blow air into pipe E and check that air comes out of air filter.

If a problem is found, repair the VSV.



2. CHECK FOR SHORT CIRCUIT

Using an ohmmeter, check that there is no continuity between the terminal and the VSV body. If there is continuity, replace the VSV. –



3. CHECK FOR OPEN CIRCUIT

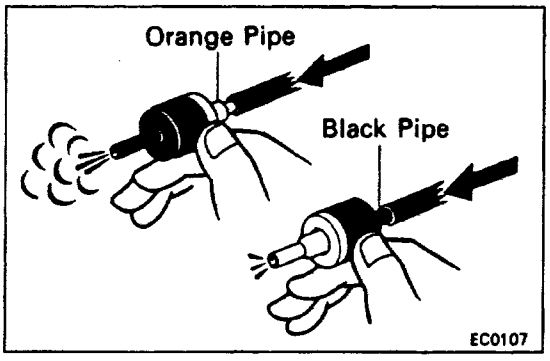
Using an ohmmeter, measure the resistance between the terminals as shown.

Specified resistance: 30–50 Ω at 20°C(68° F)

If the resistance is not within specification, replace the VSV.

EG1WW–01

CHECK VALVE INSPECTION



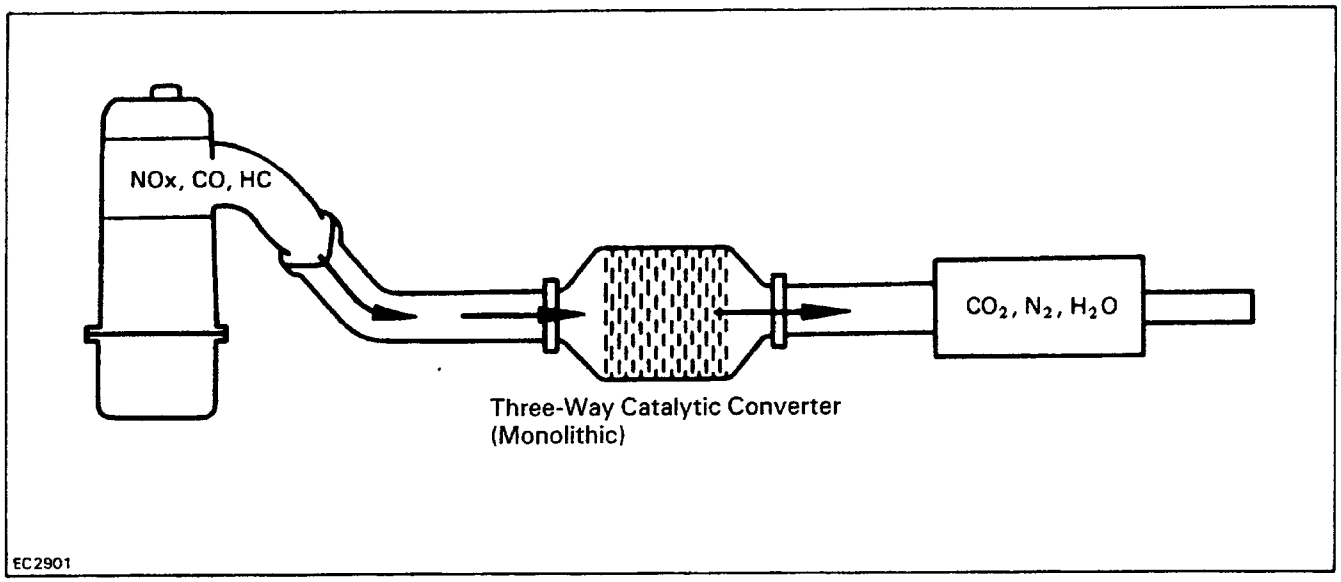
CHECK VALVE BY BLOWING AIR INTO EACH PIPE

(a) Check that air flows from the orange pipe to the black pipe.

(b) Check that air does not flow from the black pipe to the orange pipe.

THREE–WAY CATALYTIC CONVERTER (TWC) SYSTEM

EG1WX–01



To reduce HC, CO and NOx emissions, they are oxidized, reduced and converted to nitrogen (N_2), carbon dioxide ($C0_2$) and water (H_2O) by the catalytic converter.

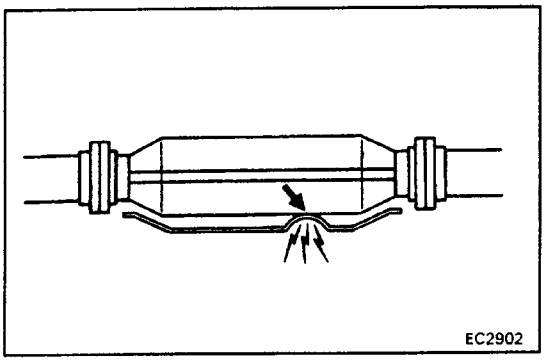
Exhaust Port		TWC		Exhaust Gas
HC, CO and NOx	→	Oxidation and reduction	→	CO_2 H_2O N_2

V01777

EXHAUST PIPE ASSEMBLY INSPECTION

1. CHECK CONNECTIONS FOR LOOSENESS OR DAMAGE

2. CHECK CLAMPS FOR WEAKNESS, CRACKS OR DAMAGE

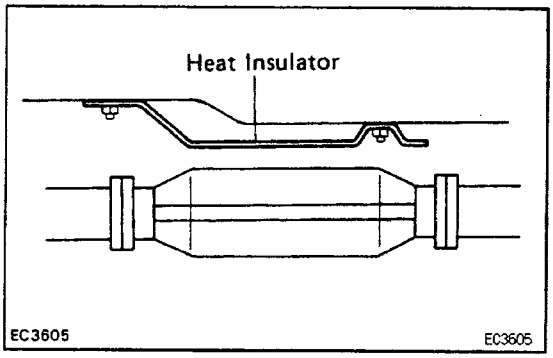


EG1WZ–01

CATALYTIC CONVERTER INSPECTION

CHECK FOR DENTS OR DAMAGE

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

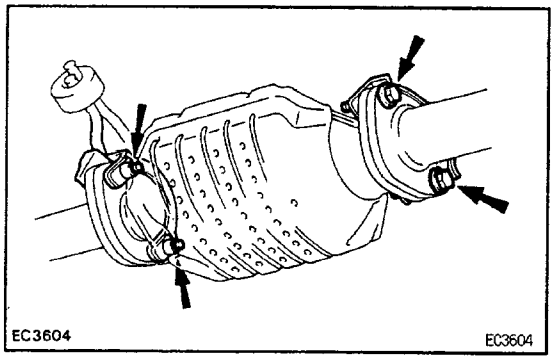


HEAT INSULATOR INSPECTION

EG1X0–01

1. CHECK HEAT INSULATOR FOR DAMAGE

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



CATALYTIC CONVERTER REPLACEMENT

1. REMOVE CONVERTER

(a) Jack up the vehicle.

(b) Check that the converter is cool.

(c) Remove the bolts at the front and rear of the con–verter.

(d) Remove the converter and gaskets.

2. INSTALL CONVERTER

(a) Place new gaskets on the converter front and rear pipes, and connect the converter to the exhaust pipes.

(b) Torque the bolts.

Torque: Catalytic converter–Exhaust pipe
39 N–m (400kgf–cm, 29ft–lbf)

(c) Reinstall the bracket bolts and tighten them.

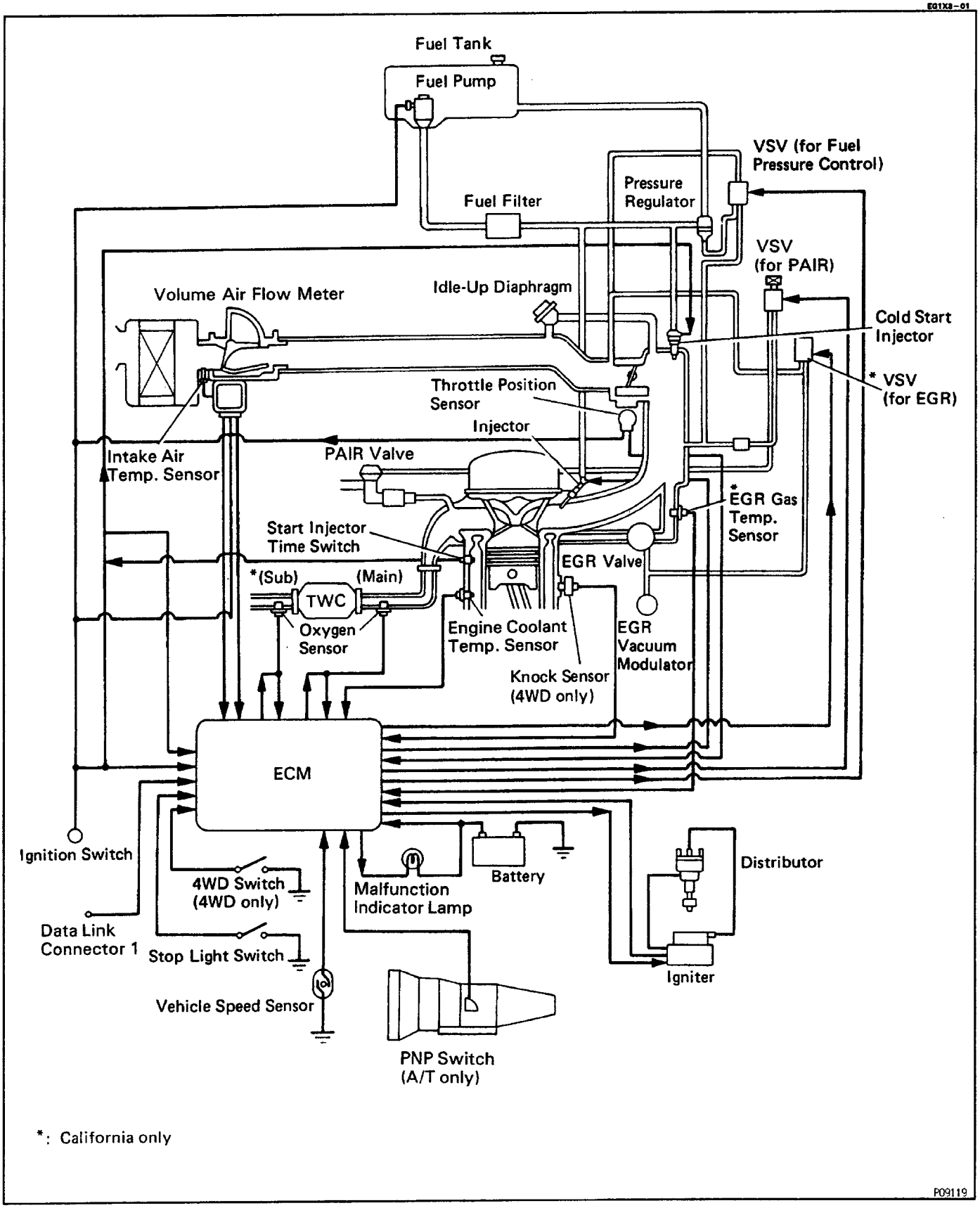
SERVICE SPECIFICATIONS
TORQUE SPECIFICATIONS

EG1X2–01

Part tightened	N·m	kgf·cm	ft·lbf
Cylinder Head x EGR Valve	13	130	9
Air Intake Chamber x EGR Pipe	13	130	9
Intake Manifold x PAIR Reed Valve	13	130	9
No. 1 Air Injection Manifold x PAIR Reed Valve	13	130	9
	13	130	9

MFI SYSTEM

DESCRIPTION



The MFI system is composed of three basic subsystems: Fuel, Air Induction and Electronic Control Systems.

FUEL SYSTEM

An electric fuel pump supplies sufficient fuel, under a constant pressure, to the MFI injectors. In accordance with signals from the ECM, these injectors inject the most appropriate quantity of fuel for the engine condition into the intake manifold.

Each injector injects, at the same time, one half of the fuel required for ideal combustion with each engine revolution.

AIR INDUCTION SYSTEM

The air induction system provides just the right amount of air for the engine operating condition.

ELECTRONIC CONTROL SYSTEM

The 22R–E engine is equipped with a Toyota Computer Controlled System (TCCS) which centrally controls the MFI, ESA, A/T (4WD), diagnosis systems, etc. by means of an Engine Control Module (ECM, formerly the MFI computer) employing a microcomputer.

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

1. Multiport Fuel Injection (MFI)

The receives signals from various sensors indicating changing engine operating conditions such as: Intake air volume

Intake air temperature

Coolant temperature

Engine rpm

Acceleration/deceleration

Exhaust oxygen content etc.

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

2. Electronic Spark Advance (ESA)

The ECM is programmed with data for optimum ignition timing under all operating conditions various engine functions (RPM, intake air volume, coolant temperature etc.), the microcomputer (ECM) triggers the spark at precisely the right instant. .

3. Diagnosis Function

When the ECM detects malfunction or abnormalities in the sensor network, it lights the Mal–function Indicator Lamp in 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 explained on pages EG1–114,115.

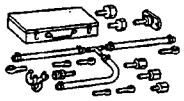
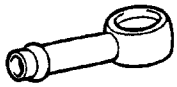
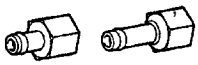
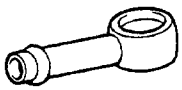
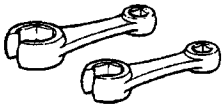
4. Fail–Safe Function

In the event of a sensor malfunction, a backup circuit will take over to provide minimal drivability, and the Malfunction Indicator Lamp will light up.

PREPARATION

EGOCF–06

SST (SPECIAL SERVICE TOOLS)

 09268–41045 Injection Measuring Tool Set	
 (09268–41080) No.6 Union	
 – . (09268–52010) Injection Measuring Attachment	
 (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
 09842–30070 Wiring ”F” EFI Inspection	
 09843–18020 Diagnosis Check Wire	

EGOCG–03

RECOMMENDED TOOLS

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

EGOCH – 04

EQUIPMENT

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

PRECAUTIONS

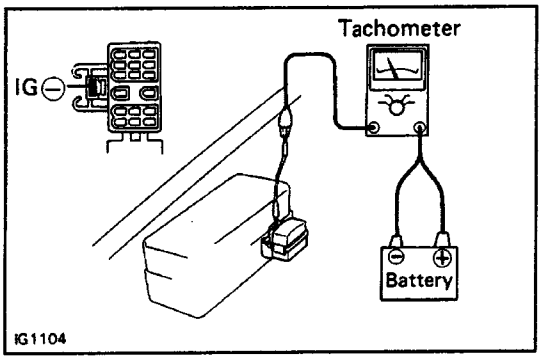
1. Before working on the system, disconnect the negative terminal from the battery.

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.



EG1X5–01

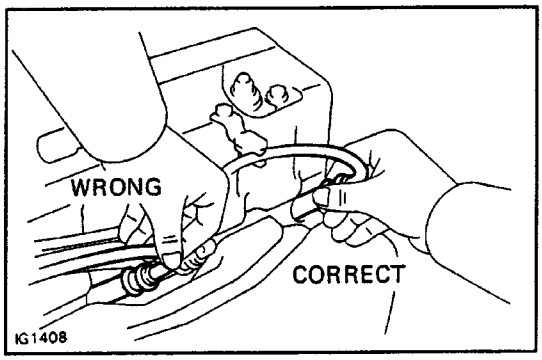
MAINTENANCE PRECAUTIONS

1. CHECK CORRECT ENGINE TUNE–UP

2. PRECAUTION WHEN CONNECTING GAUGE

(a) When a tachometer is connected to the system,connect the tachometer test probe to the IG(–) terminal of the DLC1.

(b) Use the battery as the power source for the timing light, tachometer, etc.



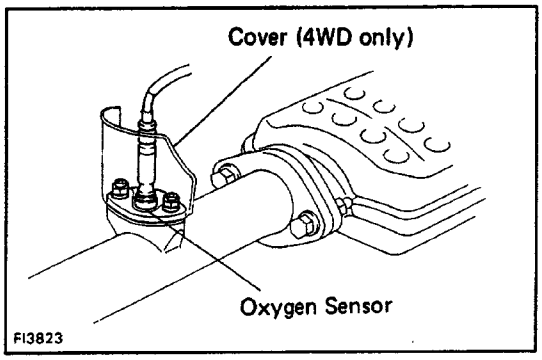
3. IN EVENT OF ENGINE MISFIRE, THE FOLLOWING PRECAUTIONS SHOULD BE TAKEN

(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.

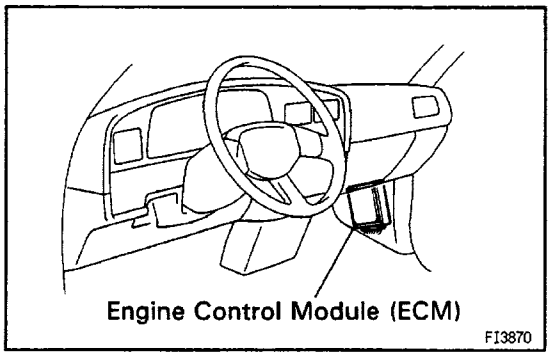
(d) When cleaning the engine compartment, be especially careful to protect the electrical system from water.



4. PRECAUTIONS WHEN HANDLING OXYGEN SENSOR

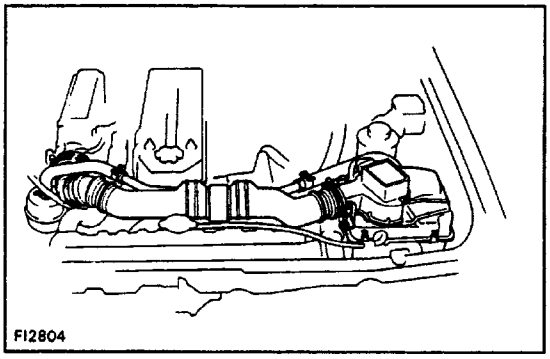
(a) Do not allow the oxygen sensor to drop or hit against an object.

(b) Do not allow the sensor to come into contact with water.


Engine Control Module (ECM)
FI3870

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

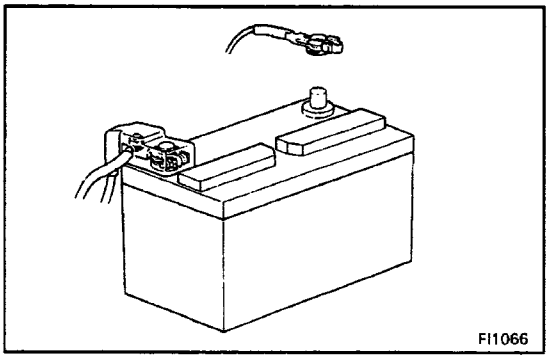
The ECM is designed so that it will not be affected outside interference.
However, if your vehicle is equipped with an amateur radio transceiver, etc. (even one with about 10 W output), it may, at times, have an effect upon ECM operation, especially if the antenna and feeder are installed nearby. Therefore, observe the following precautions:
(a) Install the antenna as far away as possible from the ECM. The ECM is located in the right side kick panel so the antenna should be installed at the rear, left side of the vehicle.
If installing on the bumper, do so on the right side, if possible.
(b) 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.
(c) Check that the feeder and antenna are properly adj–usted.
(d) Do not equip your vehicle with a powerful mobile radio system.
(e) Do not open the cover or the ECM unless absolutely necessary. (If the terminals are touched, the IC may be destroyed by static electricity.)


FI2804

EG1X7–01

AIR INDUCTION SYSTEM

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 air flow meter and cylinder head will cause air suction and cause the engine to run out of tune.

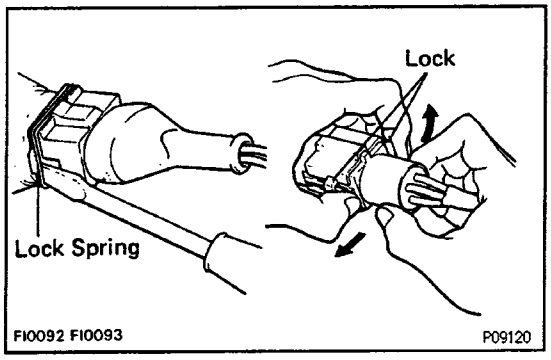

FI1066

EG1X8–01

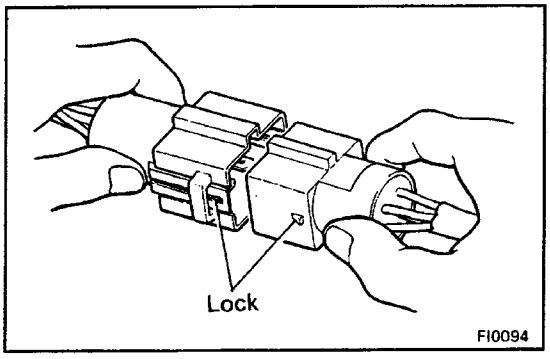
ELECTRONIC CONTROL SYSTEM

1. Before removing MFI wiring connectors, terminals, etc., first disconnect power by either turning the ignition switch OFF or disconnecting the battery terminals.
2. When installing a battery, be especially careful not to incorrectly connect the positive and negative cables.

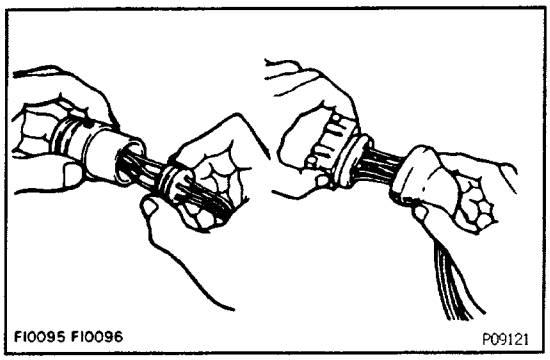
3. Do not permit parts to receive a severe impact during removal or installation. Handle all MFI parts carefully especially the ECM.
4. Take great care during troubleshooting as there are numerous transistor circuits and even slight terminal contact can cause further troubles.
5. Do not open the ECM cover.
6. When inspecting during rainy weather, take care to prevent entry of water. Also, when the engine compartment, prevent water from getting on the MFI parts and wiring connectors.
7. Parts should be replaced as an assembly.



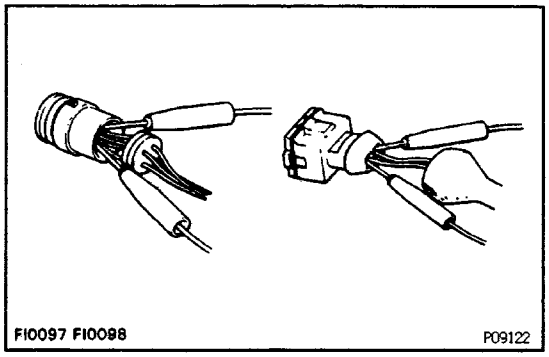
8. Sufficient care is required when pulling out and inserting wiring connectors.
(a) To pull the connector out, release the lock and pull on the connector.



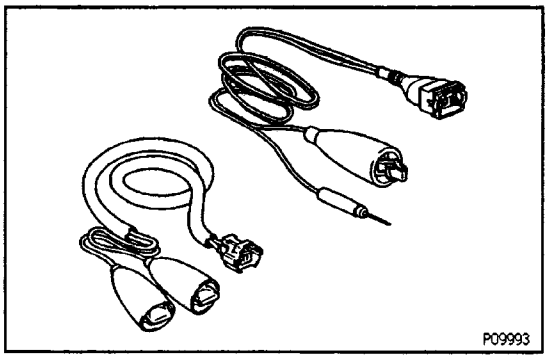
(b) Fully insert the connector and check that it is locked.



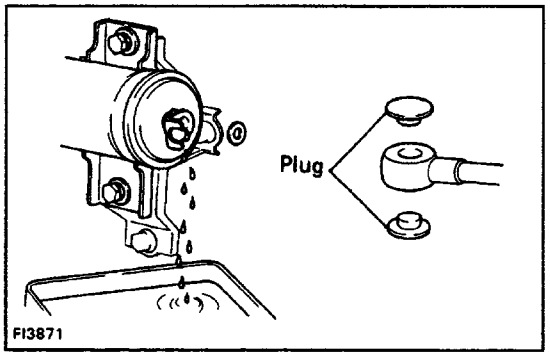
9. When inspecting a connector with a volt/ohmmeter.
(a) Carefully take out the water– proofing rubber if it is a water–proof type connector.



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



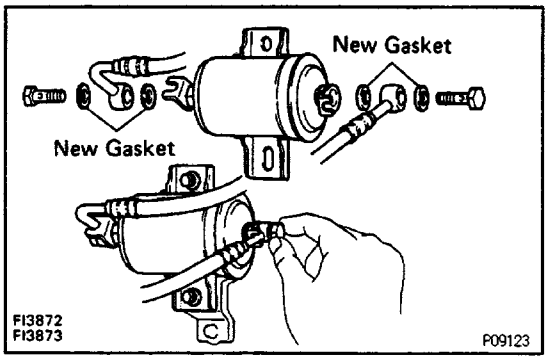
10. Use SST for inspection or testing of the injector, cold start injector or their wiring connectors.
SST 09842 – 30050 and 09842 – 30070

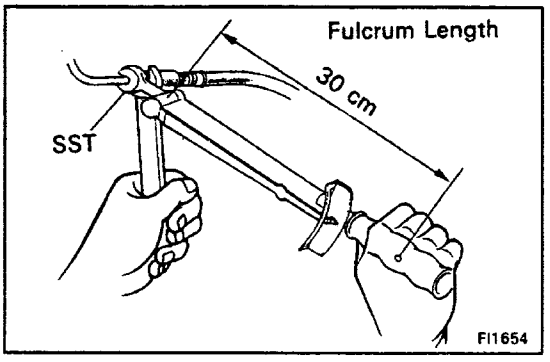


EG1X9–01

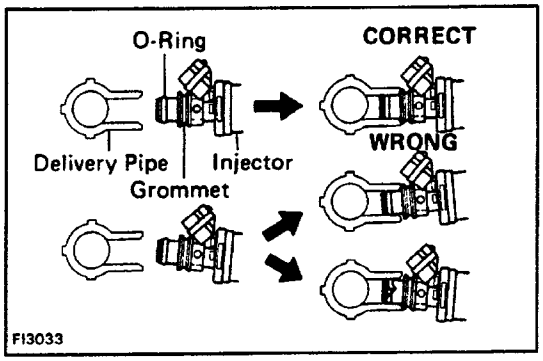
FUEL SYSTEM

1. When disconnecting the connection of the high fuel pressure line, a large amount of gasoline may come out so observe the following procedure:
(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 procedure:
(Union bolt type)
(a) always use a new gasket.
(b) Tighten the union bolt by hand.
(c) Torque the bolt to the specified torque.
Torque: 30 N–m (310 kgf–cm, 22 ft–lbf)

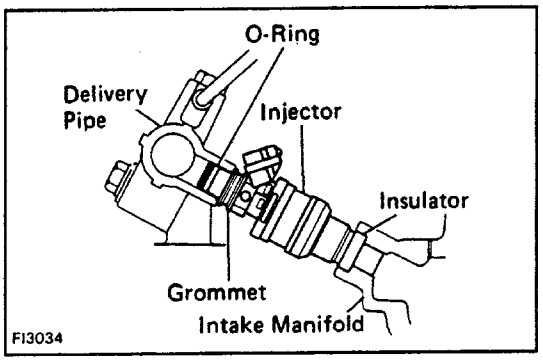




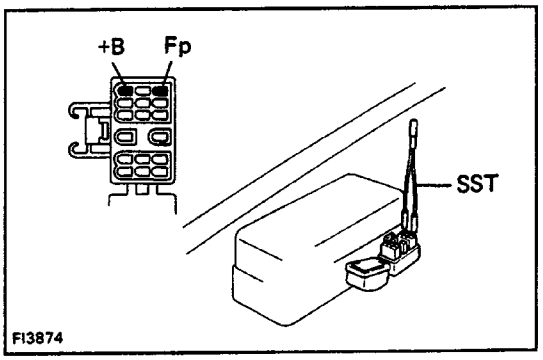
(Flare nut type)
(a) Apply a light coat of engine oil to the flare and tighten the flare nut by hand.
(b) Then using SST, tighten the nut to the specified torque.
SST 09631–22020
Torque: 27 N–m (280 kgf–cm, 20 ft–lbf)
HINT: use a torque with a fulcrum length of 30 cm (11.81 in.).



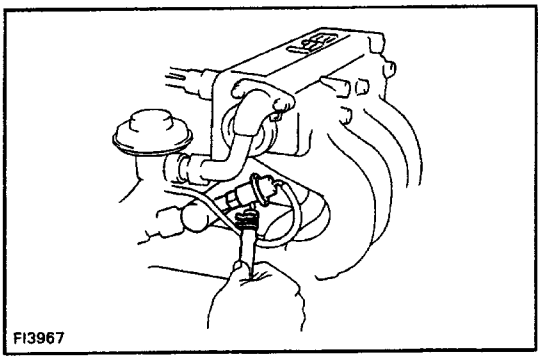
3. Take the following precautions when removing and installing the injectors.
(a) Never re–use the O–ring.
(b) When placing a new 0–ring on the injector, take care not to damage it in any way.
(c) Lubricate the O–ring spindle oil or gasoline before installing – never use engine, gear or brake oil.



4. Install the injector to the 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) With engine stopped, turn the ignition switch On.
(b) Using SST, connect terminals Fp and B of the DLC1.
SST 09843–18020
HINT: The DLC1 is located near the No. 2 relay block.



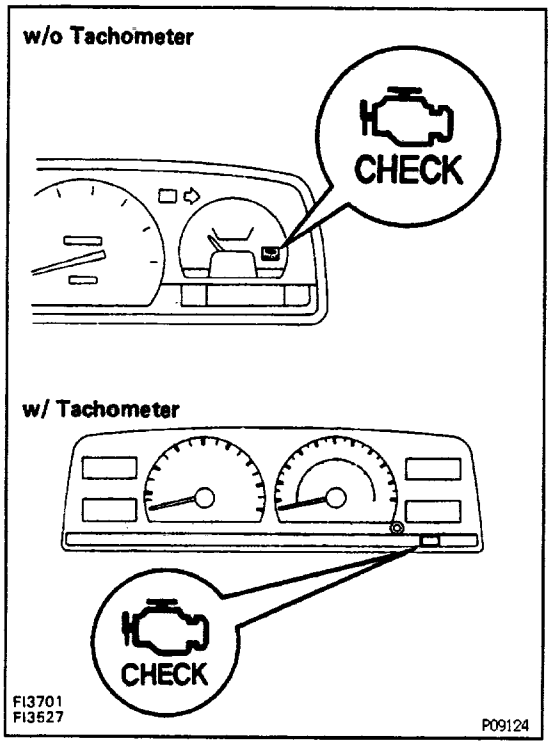
(c) When the pressure regulator fuel return hose (shown in the illustration at left), is pinched, the pressure within the high pressure line will rise to approx. 392 kPa (4 kgf/cm^2, 57 psi). In this state, check to see that there are no leaks from any part of the fuel system.
NOTICE: Always pinch the hose. Avoid bending the hose as it may cause the hose to crack.

DIAGNOSIS SYSTEM

DESCRIPTION

EG1XA–01

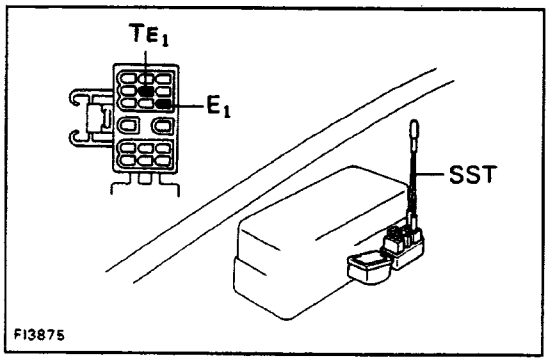
The ECM contains a built–in self–diagnosis system which detects troubles within the engine signal network and flashes the Malfunction Indicator Lamp in the combination meter.
By analyzing various signals shown in the table(See pages EG1–114,115)the detects system malfunctions which are related to the various operating parameter sensors or to the actuator.
The ECM stores the failure code associated with the detected failure until the diagnosis system is cleared by removing the EFI fuse with the ignition switch off.
The malfunction Indicator Lamp in the combination meter informs the driver that a malfunction has been detected. The light goes automatically when the malfunction has been corrected.



MALFUNCTION INDICATOR LAMP

EG1XB–01

1. The Malfunction Indicator Lamp will come on when the ignition switch is placed at On and the engine is not running.
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 CODES OUTPUT

To obtain an output of diagnostic trouble codes, proceed as follows:

1. Initial conditions

(a) Battery voltage 11 volts or more.
(b) Throttle valve fully closed (throttle position sensor IDL points closed).
(c) Transmission in neutral range.

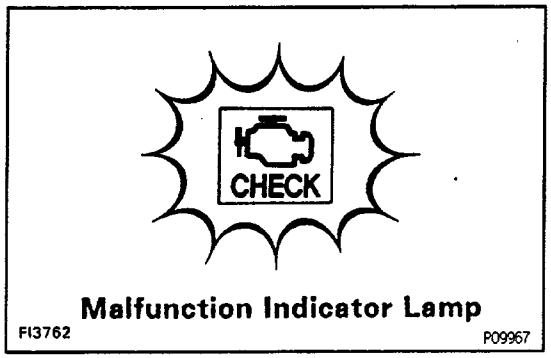
(d) Accessories switched OFF.
(e) Engine at normal operating temperature.

2. Turn the ignition switch ON. Do not start the engine.

3. Using SST, connect terminals TE, and E, of the DLC 1.

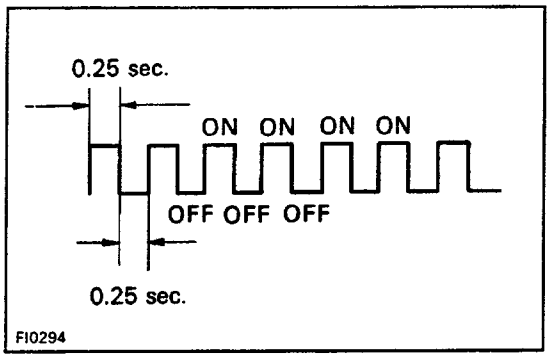
SST 09843–18020

HINT: The DLC1 is located near the No. 2 relay block.



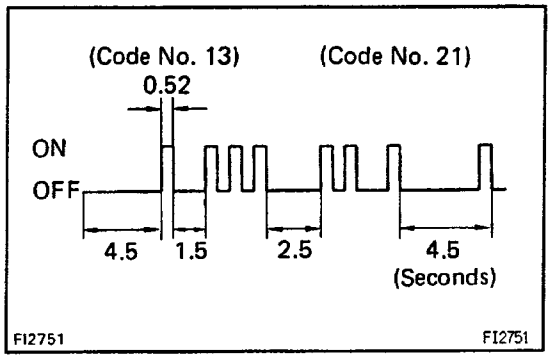
4. Read the diagnostic trouble code as indicated by the number of flashes of the Malfunction Indicator Lamp.

Diagnostic trouble code (Seepage EG1–114 and 115)



(a) Normal System Operation

The lamp will blink 2 times per second.

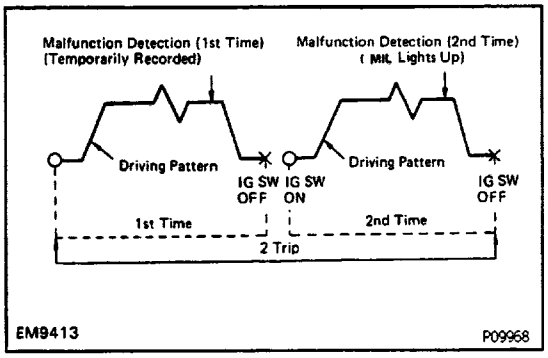


(b) Malfunction Code Indication

- The lamp will blink a number of times equal to the malfunction code with pauses as follows: 1. Between the first digit and second digit, 1.5 seconds. 2. Between code and code, 2.5 seconds. 3. Between all malfunction codes, 4.5 seconds.

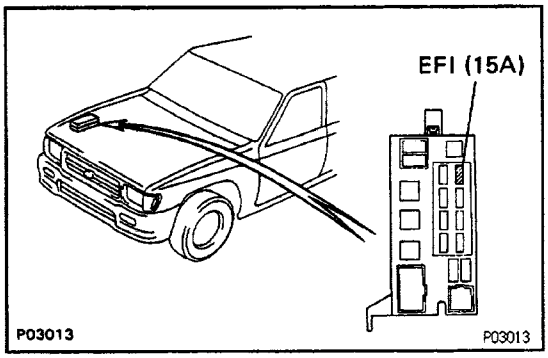
The diagnostic trouble code series will be repeated as long as the DLC1 terminals TE1 and E1 are connected.

HINT: In the event of a number of trouble codes, indication will begin from the small value and continue to the larger in order.



(c) (2 trip detection logic)
The diagnostic trouble codes 21, 25, 26, 27 and 71 use ”2 trip detection logic”. 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 Indica–tor Lamp to light up.
The 2 trip repeats the same mode a 2nd time. (How–ever, the IG SW must be turned OFF between the 1st time and 2nd time).

5. After the diagnostic check, remove SST.



EG1XC–01

DIAGNOSTIC TROUBLE CODES CANCELLATION

1. After repair of the trouble area, the diagnostic tro–uble code retained in memory by the ECM must be canceled out by removing the EFI fuse (15A) 30 seconds or more, depending on ambient tempera–ture (the lower the temperature, the longer the fuse must be left out) with the ignition switch off.
HINT:

- Cancellation can also be done by removing the battery negative (–) terminal, but in this case other memory systems (radio ETR, etc.) will also be canceled out.
- If the diagnostic trouble code is not canceled out, it will be retained by the ECM and appear along with a new code in the event of future trouble.
- If it is necessary to work on engine components req–uiring 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, if neces–sary, confirm that a ’normal’ code is now read on the Malfunction Indicator Lamp.
If the same diagnostic trouble code appears, it in–dicates that the trouble area has not been repaired thoroughly.

EG1XD–02

DIAGNOSIS INDICATION

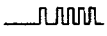
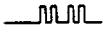
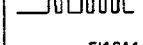
(1) When 2 or more codes are indicated, the lowest number (code) will appear first.
(2) All detected diagnostic trouble codes, except for code No. 51 and No. 53, will be retained in memory by the ECM from the time of detection until canceled out.
(3) Once the malfunction is cleared, the Malfunction Indicator Lamp on the instrument panel will go off but the diagnostic trouble code(s) remain stored in ECM memory (except for code 51 and 53).

EG1XE–01

DIAGNOSTIC TROUBLE CODES

HINT:

- If a malfunction is detected during the diagnostic trouble code check, refer to the circuit indicated in the table, and turn to the corresponding page.
- Your readings may vary from the parameters listed in the table, depending on the instruments used.

Code No.	Number of blinks Malfunction Indicator Lamp	System	MIL	Diagnosis	Trouble Area	*2 Memory	See Page
–	 FI1401	Normal	–	No trouble code is recorded.	———	–	–
12	 FI1389	RPM Signal	ON	No NE signal is input to the ECM for 2 secs. or more after STA turns ON.	• Open or short in NE circuit • Distributor • Open or short in STA circuit • ECM	○	IG–4 EG1–132 EG1–150 EG1–168
13	 FI1390	RPM Signal	ON	NE signal is not input to ECM for 300 msec. or more when engine speed is 1,500 rpm or more.	• Open or short in NE circuit • Distributor • ECM	○	IG–4
14	 FI1391	Ignition Signal	ON	IGF signal from igniter is not input to ECM for 4 consecutive ignition.	• Open or short in IGF or IGT circuit from igniter to ECM • Igniter • ECM	○	EG1–134 EG1–152 EG1–170
21	FI1400	Main Oxygen Sensor Signal	ON	(1) Open or short in heater circuit of main oxygen sensor for 500 msec. or more. (HT) (2) At normal driving speed (below 60 mph and engine speed is above 1,700 rpm), amplitude of main oxygen sensor signal (OX 1) is reduced to between 0.35–0.70 V continuously for 60 secs. or more. *6 (2 trip detection logic) (2)	• Open or short in heater circuit of main oxygen sensor • Main oxygen sensor heater • ECM • Open or short in main oxygen sensor circuit • Main oxygen sensor • ECM	○	EG1–138 EG1–156 EG1–174
22	FI1392	Engine Coolant Temp. Sensor Signal	ON	Open or short in engine coolant temp. sensor circuit for 500 msec. or more. (THW)	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM	○	EG1–131 EG1–149 EG1–167
24	 FI1611	Intake Air Temp. Sensor Signal	'3 ON	Open or short in intake air temp. sensor circuit for 500 rnsec. or more. (THA)	• Open or short in intake air temp. circuit • Intake air temp. sensor • ECM	○	EG1–129 EG1–147 EG1–165
25	 FI2562	Air–Fuel Ratio Lean Mal–function	ON	(1) Oxygen sensor output is less than 0.45 V for at least 90 secs. when oxygen sensor is warmed up (racing at 2,000 rpm). –Only for code 25. *4 (2) When the air–fuel compensation value fluctuates more than 20% from the ECM set range within 60 secs. period while driving at 15 km/h (9 mph) or more at coolant temp. of 70˚C (158˚F) or above. *6 (2 trip detection logic) (1) and (2)	• Engine ground bolt loose • Open in E1 circuit • Open in injector circuit • Fuel line pressure (Injector blockage, etc.) • Open or short in oxygen sensor circuit • Oxygen sensor • Ignition system • Engine coolant temp. sensor • Volume air flow meter (Air intake) • ECM	○	EG1–138 EG1–156 EG1–174 EG1–136 EG1–154 EG1–172
*5 26	FI2563	Air–Fuel Ratio Rich Mal–function	ON		• Engine ground bolt loose • Open in E1 circuit • Short in injector circuit • Fuel line pressure (injector leakage, etc.) • Open or short in cold start • injector circuit • Cold start injector • Open or short in oxygen sensor circuit • Oxygen sensor • Engine coolant temp. sensor • Volume air flow meter • Compression pressure • ECM	○	

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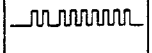
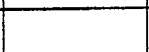
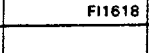
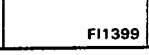
DIAGNOSTIC TROUBLE CODES (Cont'd)

Code No.	Number of blinks Malfunction Indicator Lamp	System	MIL	Diagnosis	Trouble Area	*2 Memory	See Page
*5 27	 FI3294	Sub–Oxygen Sensor Signal	ON	(1) When sub–oxygen sensor is warmed up and full acceleration continued for 2 seconds, output of main oxygen sensor is 0.45 V or more (rich) and output of sub–oxygen sensor is 0.45 V or less (lean). (OX2) (2) Open or short detected continuously for 500 msec. or more in sub–oxygen sensor heater circuit *6 (2 trip detection logic) (1) and (2)	• Short or open in sub–oxygen sensor circuit • Sub–oxygen sensor • Open or short in sub–oxygen sensor heater • ECM	○	EG1–138 EG1–156 EG1–174
31	 FI1394	Volume Air Flow Meter Signal	ON	Open or short detected continuously for 500 msec. or more in volume air flow meter circuit • Open – VC or E2 • Short – VC–E2 or VS–VC	• Open or short in volume air flow meter circuit • Volume air flow meter • ECM	○	EG1–129 EG1–147 EG1–165
41	 FI1396	Throttle Position Sensor Signal	–3 ON	Open or short detected in throttle position sensor signal (VTA) for 500 msec. or more.	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM	○	EG1–128 EG1–146 EG1–164
42	 FI1397	Vehicle Speed Sensor Signal	OFF	SPD signal is not input to the ECM for at least 8 seconds during high load driving with engine speed between 2,200 rpm and 5,000 rpm.	• Open or short in vehicle speed sensor circuit • Vehicle speed sensor • ECM	○	–
43	 FI1398	Starter Signal	OFF	Starter signal (STA) is not input to ECM even once until engine reaches 800 rpm or more when cranking.	• Open or short in starter signal circuit • Open or short in IG SW or main relay circuit • ECM	○	EG1–132 EG1–150 EG1–168
52	 FI1618	Knock Sensor Signal	ON	With engine speed 2,000 rpm or more signal from knock sensor is not input to ECM for 25 revolution. (KNK)	• Open or short in knock signal circuit • Knock sensor (looseness, ect.) • ECM	○	–
53	 FI1619	Knock Control Signal	ON	The engine control computer (for knock control) malfunction is detected.	• ECM	×	–
*5 71	 FI2622	EGR System Mal–function	ON	With the coolant temp. at 65°C (149°F) or more, 50 seconds from start of EGR operation. The EGR gas temp. is less than 70°C (158°F) and the EGR gas temp. has risen less than 3°C during the 50 seconds. *6 (2 trip detection logic)	• Open in EGR gas temp. sensor circuit • Open in VSV circuit for EGR • EGR vacuum hose disconnected, valve stuck • Clogged in EGR gas passage • ECM	○	EG1–140 EG1–158 EG1–176
51	 FI1399	Switch Condition Signal	OFF	Displayed when IDL contact OFF or shift position in "R", "D", "2", or "I" ranges with the check terminals E1 and TE1 connected.	• Throttle position sensor IDL circuit • PNP switch circuit • Accelerator pedal, cable • ECM	×	EG1–127 EG1–145 EG1–163

REMARKS

*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 MIL does not light up during malfunction diagnosis, even if a malfunction is detected.

*2: "0" in the memory column indicates that a diagnostic code is recorded in the ECM memory when a malfunction occurs. " x " indicates that a diagnostic code is not recorded in the ECM memory even if a malfunction occurs. Accordingly, output of diagnostics results is performed with the IG SW ON.

*3: The "Malfunction Indicator Lamp comes on if malfunction occurs only for California specifications.

*4: No. (2) in the diagnostic contents of codes No.25 and 26 apply to California specification vehicles only. While

(1) applies to all models.

*5: Codes 27 and 71 are used only for California specifications.

*6: "2 trip detection logic" (See page EG1–112)

V01786

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN

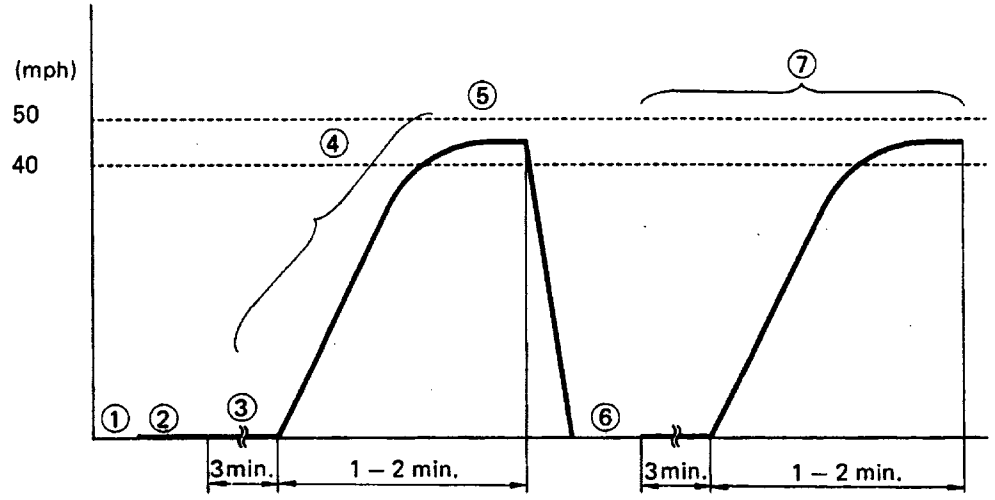
Purpose of the driving pattern.

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed confirming that diagnostic trouble code is no longer detected.

DTC	21	Main Oxygen Sensor Circuit

Malfunction: Main Oxygen Sensor Deterioration



P02539

(1) Disconnect the fuse EFI (15 A) for 10 sec. or more, with IG switch OFF.

(2) Start the engine and warm the engine up with all ACC switch OFF.

(3) After the engine is warmed up, let it idle for 3 min.

(4) Accelerate gradually and maintain at approximately 1,500 rpm, or within the 1,300 to 1,700 rpm range. Turn the A/C on, and drive in ”D” for A/T, or in case of M/T, upshift appropri–ately shift carefully so that the engine speed would not fall below 1,200 rpm. depress the accelerator pedal gradually and maintain a steady speed to avoid engine braking.

(5) Maintain the vehicle speed at 40 – 50 mph.

Keep the vehicle running for 1 – 2 min. after starting acceleration.

(6) After driving, stop at a safe place and turn the IG switch OFF for 3 sec. or more.

(7) Start the engine and perform steps (3), (4) and (5) again.

HINT: If a malfunction is detected, the Malfunction Indicator Lamp will light up during step (7).

NOTICE: If this procedure is not strictly followed, you can not detect the malfunctions.

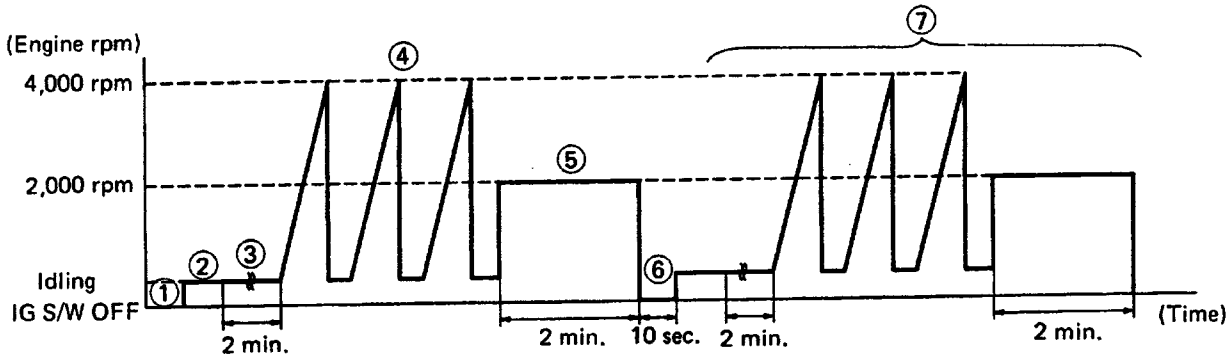
V01787

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

Purpose of the driving pattern.
(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.
(b) To check that the malfunction is corrected when the repair is completed confirming that diagnostic trouble code is no longer detected.

DTC	25	Air–Fuel Ratio Lean Malfunction

Malfunction: Open or Short in Oxygen Sensor



P02492

(1) Disconnect the fuse EFI (15 A) for 10 sec. or more, with IG switch OFF.
(2) Start the engine and warm the engine up.
(3) After the engine is warmed up, let it idle for 2 min.
(4) After performing the idling in (3), perform sudden racing to 4,000 rpm three times.
(5) After performing the sudden racing in (4), perform racing at 2,000 rpm for 2 min.
(6) After performing the racing in (5), turn the IG switch OFF for 10 sec.
(7) Start the engine and perform steps (2), (3), (4) and (5) again:
HINT: 1f a malfunction is detected, the Malfunction Indicator Lamp will light up during step.
NOTICE: If this procedure is not strictly followed, you can not detect the malfunctions.

V01788

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

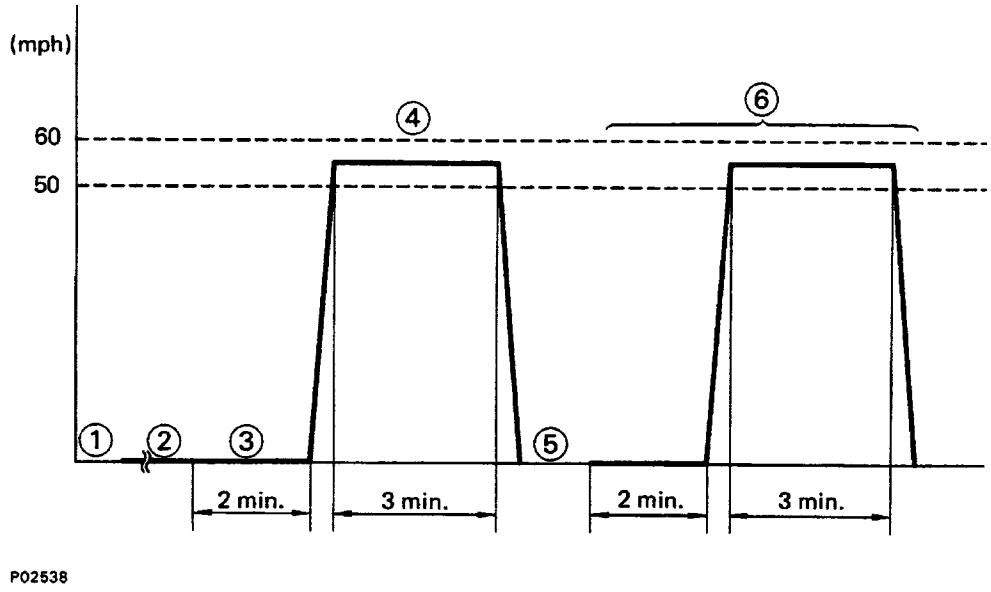
Purpose of the driving pattern.

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed confirming that diagnostic trouble code is no longer detected.

DTC	25	Air–Fuel Ratio Lean Malfunction (CALIFORNIA)
	26	Air–Fuel Ratio Rich Malfunction (CALIFORNIA)

Malfunction: Open or Short in Oxygen Sensor, Open or Short in Injector Leak, Blockage



① Disconnect the EFI fuse (15 A) for 10 sec. or more, with IG switch OFF.
② Start the engine and warm the engine up with all ACC switch OFF.
③ After the engine is warmed up, let it idle for 2 min.
④ With the transmission in 5th gear ("D" range for A/T), drive at 50 – 60 mph for 3 min.
⑤ After driving, stop at a safe place and turn the IG switch OFF for 3 – 10 sec.
⑥ Start the engine and perform steps (3) and (4) again.

HINT: If a malfunction is detected, the Malfunction Indicator Lamp will light up during step (6).

NOTICE: If this procedure is not strictly followed, you can not detect the malfunctions.

V01789

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

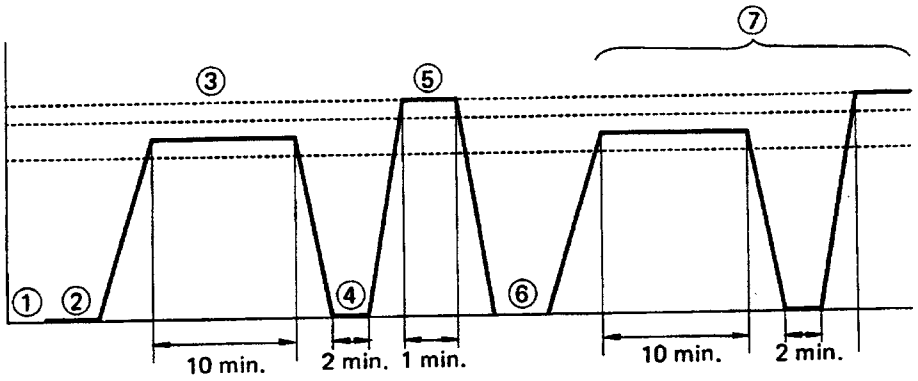
Purpose of the driving pattern.

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed confirming that diagnostic trouble code is no longer detected.

DTC	27	Sub–Oxygen Sensor Circuit

Malfunction: Open or Short in Sub–Oxygen Sensor



P02541

① Disconnect the fuse EFI (15 A) for 10 sec. or more, with IG switch OFF.
② Start the engine and warm the engine up with all ACC switch OFF.
③ After the engine is warmed up, let it drive at 50 – 55 mph 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 idling in (4) , perform acceleration to 60 mph with the throttle fully open and drive at 60 mph for 1 min.
⑥ After driving, stop at a safe place and turn the IG switch OFF for 3 sec. or more..
⑦ Start the engine and perform steps (3) , (4), and (5) again.

HINT: If a malfunction is detected, the Malfunction Indicator Lamp will light up during step (7).

NOTICE: If this procedure is not strictly followed, you can not detect the malfunctions.

V01790

DIAGNOSTIC TROUBLE CODE DETECTION DRIVING PATTERN (Cont'd)

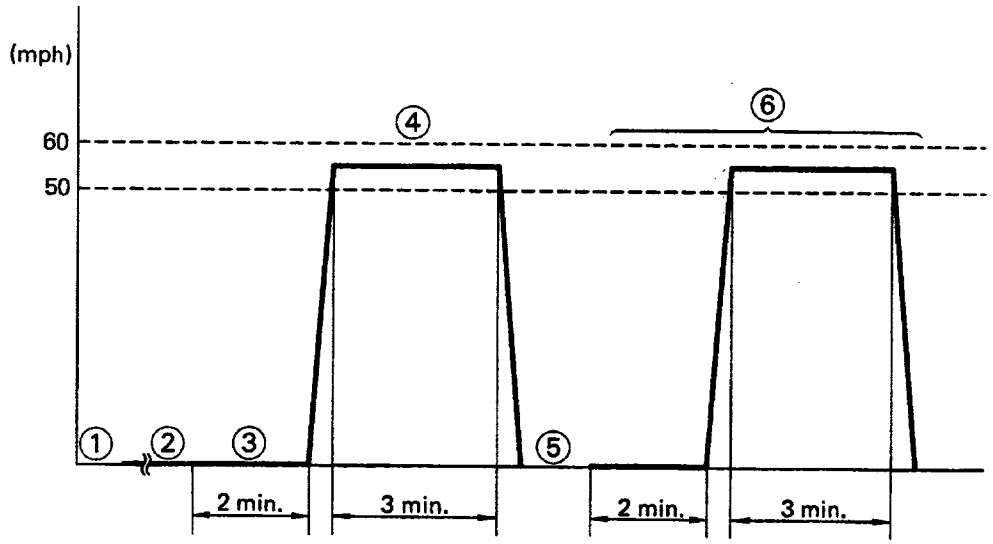
Purpose of the driving pattern.

(a) To simulate diagnostic trouble code detecting condition after diagnostic trouble code is recorded.

(b) To check that the malfunction is corrected when the repair is completed confirming that diagnostic trouble code is no longer detected.

DTC	71	EGR System Malfunction

Malfunction: Short in VSV Circuit for EGR, Loose EGR Hose, Valve Stuck



P02538

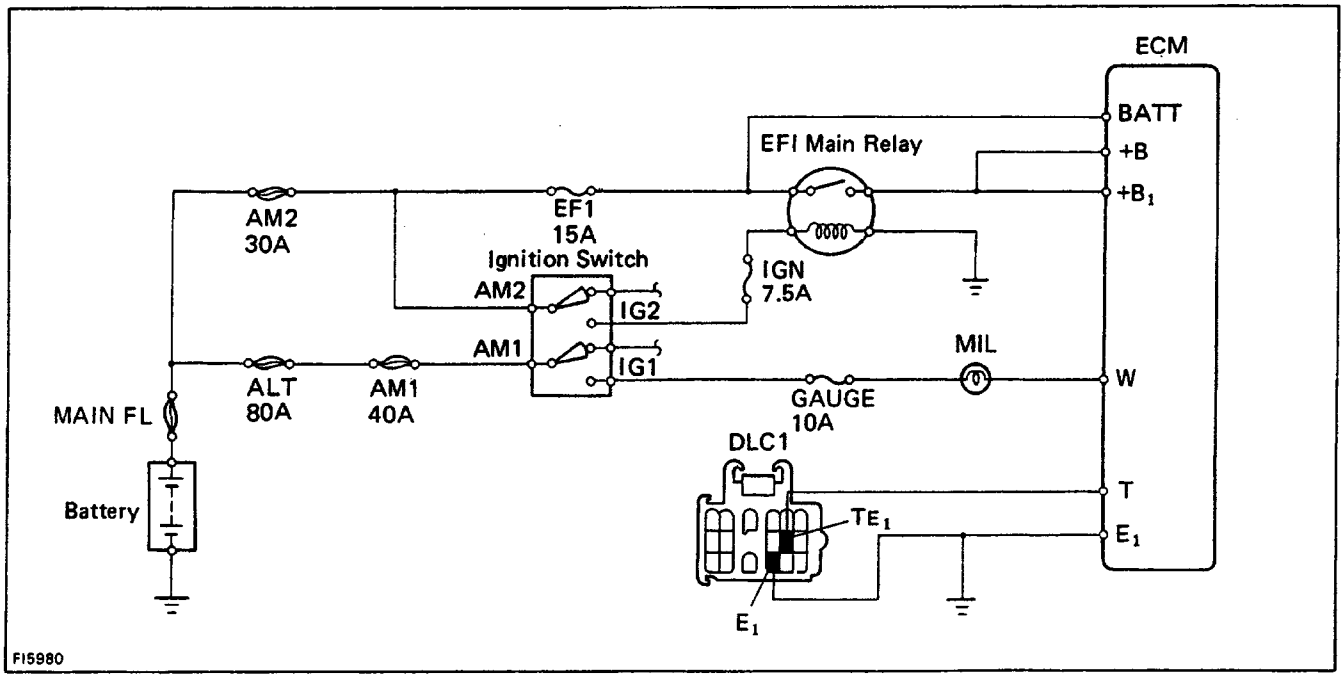
① Disconnect the EFI fuse (15 A) for 10 sec. or more, with IG switch OFF.
② Start the engine and warm the engine up with all ACC switch OFF.
③ After the engine is warmed up, let it idle for 2 min.
④ With the transmission in 5th gear ("D" range for AlT), drive at 50 – 60 mph for 3 min.
⑤ After driving, stop at a safe place and turn the IG switch OFF for 3 – 10 sec.
⑥ Start the engine and perform steps (3), and (4) again.

HINT: If a malfunction is detected, the Malfunction Indicator Lamp will light up during step (6).

NOTICE: If this procedure is not strictly followed, you can not detect the malfunctions.

V01791

INSPECTION OF DIAGNOSIS CIRCUIT



1. Does Malfunction Indicator Lamp come on when ignition switch is at ON?
   - YES → System Normal
   - NO → Does MIL come on when ECM terminal W is grounded to the body?
     - YES → Check wiring between ECM terminal E1 and body ground.
       - OK → Try another ECM.
       - BAD → Repair or replace.
     - NO → Check bulb, fuse and wiring between ECM and ignition switch.
       - BAD → Repair or replace.

2. Does MIL go off when the engine is started?
   - YES → System Normal
   - NO → Check wiring between ECM and MIL.
     - BAD → Repair.
     - OK → Is there diagnostic trouble code output when DLC 1 terminals TE1 and E1 are connected?
       - NO → Check wiring between ECM terminal T and DLC1 terminal TE1, and ECM terminal E1 and DLC 1 terminal E1.
         - OK → Try another ECM.
       - YES → Does MIL go off after repair according to malfunction code?
         - NO → Further repair required.
         - YES → System OK → Cancel out diagnostic trouble code.

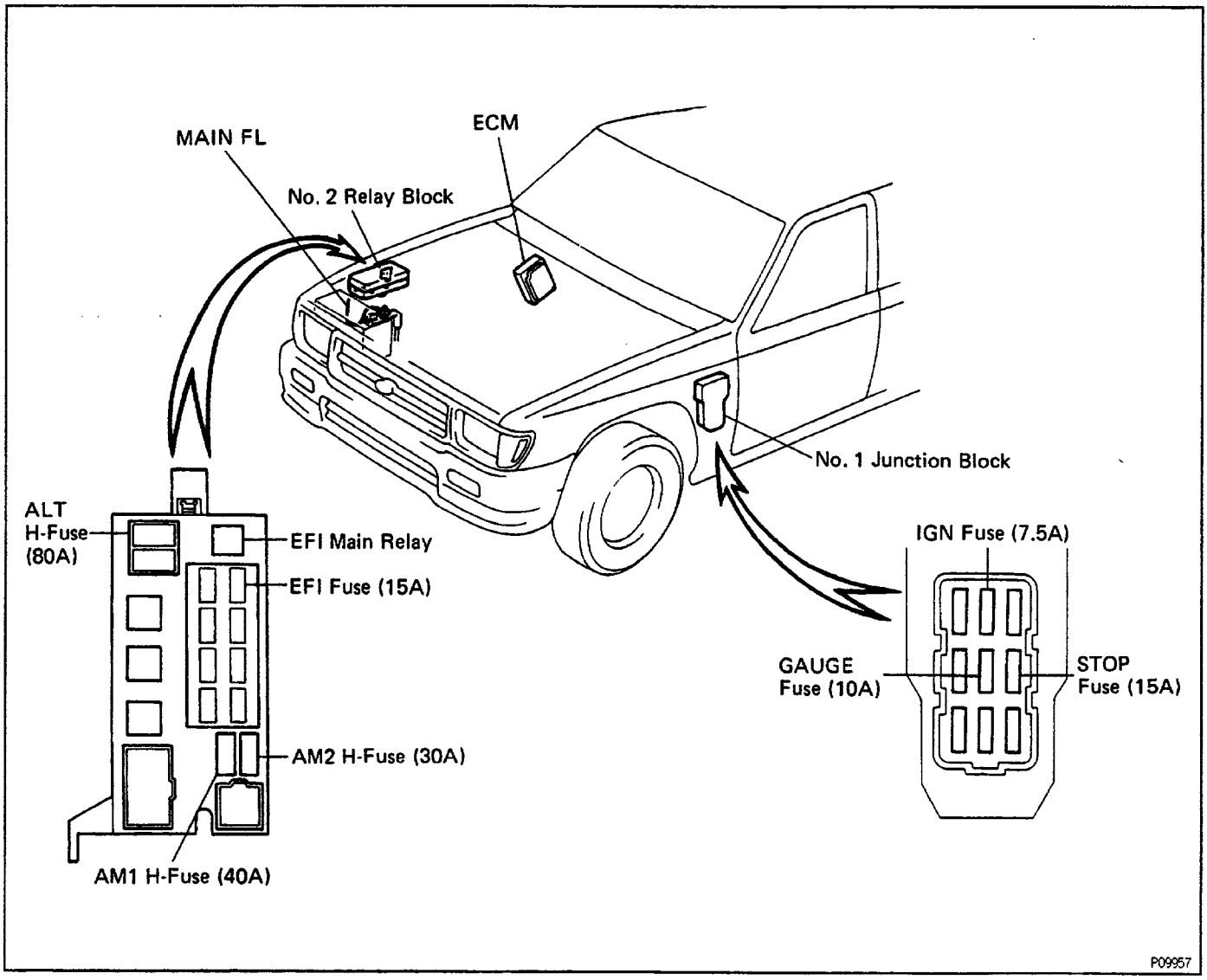
V01792

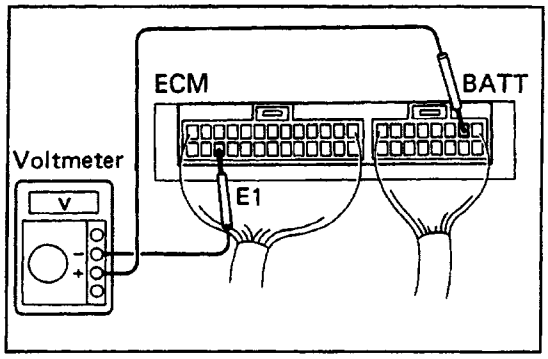
TROUBLESHOOTING WITH VOLT OHMMETER

HINT: Because the following troubleshooting procedures are designed for inspection of each separate system, the actual troubleshooting procedure may vary somewhat.
However, please refer to these procedures and perform actual troubleshooting, conforming to the inspection methods described.
For example it is better to first make a simple check of the fuses, fusible links and connecting condition of the connectors before making your inspection according to the procedures listed.
The following troubleshooting procedures are based on the supposition that the trouble lies in either a short or open circuit in a component outside the computer or a short circuit within the computer. If engine trouble occurs even though proper operating voltage is detected in the computer connector, then the ECM is faulty and should be replaced.

FUSES, H–FUSES AND FUSIBLE LINK LOCATION

EG1XG–01





SYSTEM CHECK PROCEDURE (2WD)

EG1XH–01

HINT:

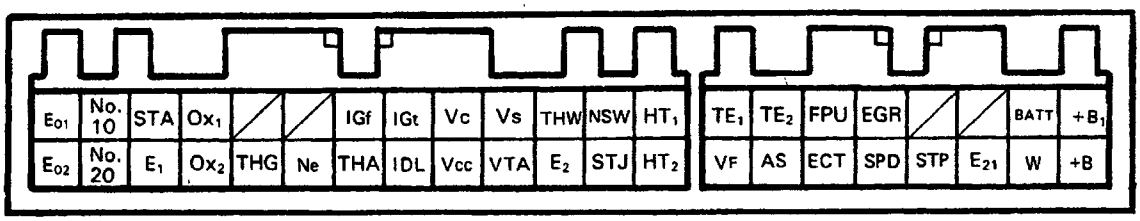
- Perform all voltage measurements with the connec–tors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is in ”ON” position.
  Using a voltmeter with high impedance (l0 kΩ/V minimum), measure the voltage at each terminal of the wiring connectors.

Terminals of ECM (2WD)

Symbol	Terminal Name	Symbol	Terminal Name
E_{01}	ENGINE GROUND	E_2	SENSOR GROUND
E_{02}	ENGINE GROUND	*2 NSW	PNP SWITCH
No.10	INJECTOR	STJ	COLD START INJECTOR
No.20	INJECTOR	HT_1	OXYGEN SENSOR HEATER (MAIN)
STA	STARTER SWITCH	*1 HT_2	OXYGEN SENSOR HEATER (SUB)
E_1	ENGINE GROUND	TE_1	DLC 1
Ox_1	OXYGEN SENSOR (MAIN)	V_F	DLC 1
*1 Ox_2	OXYGEN SENSOR (SUB)	TE_2	DLC 1
*1 THG	EGR GAS TEMP. SENSOR	AS	PAIR VALVE
Ne	DISTRIBUTOR	Fpu	FUEL PRESSURE CONTROL VSV
IGf	IGNITER	*2 ECT	OD relay
THA	INTAKE AIR TEMP. SENSOR	*1 EGR	EAR VSV
IGt	IGNITER	SPD	SPEED SENSOR
IDL	THROTTLE POSITION SENSOR	STP	STOP LIGHT SWITCH
Vc	VOLUME AIR FLOW METER	E_{21}	SENSOR GROUND
Vcc	THROTTLE POSITION SENSOR	BATT	BATTERY POSITIVE VOLTAGE
Vs	VOLUME AIR FLOW METER	W	MALFUNCTION INDICATOR LAMP
VTA	THROTTLE POSITION SENSOR	$+B_1$	MAIN RELAY
THW	ENGINE COOLANT TEMP. SENSOR	+B	MAIN RELAY

*1: California only *2: A/T only

ECM Terminals



FI4266

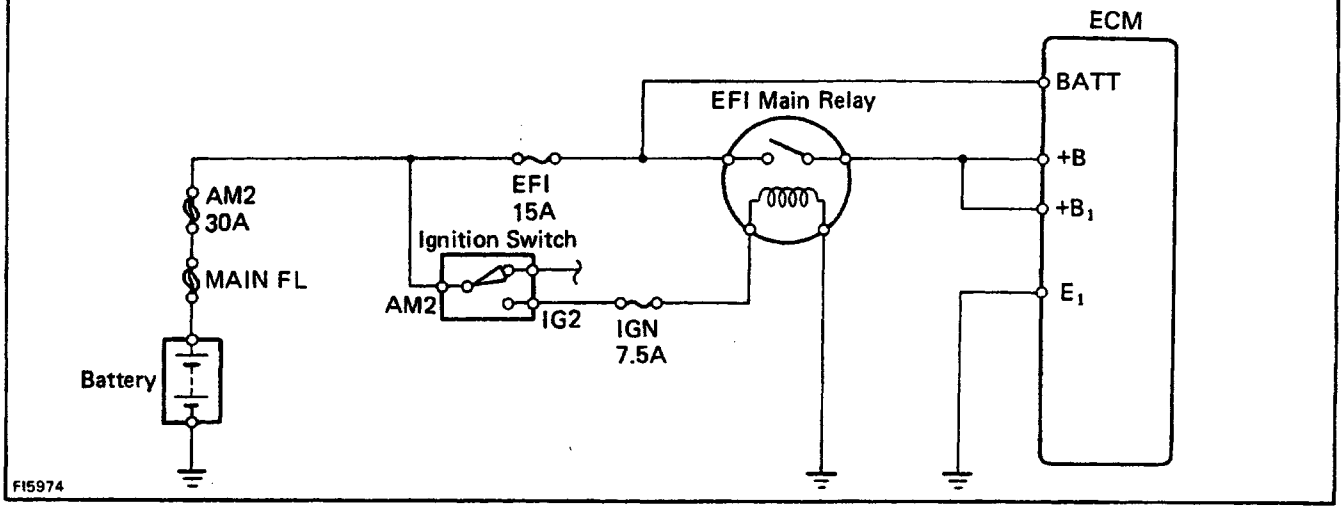
V01793

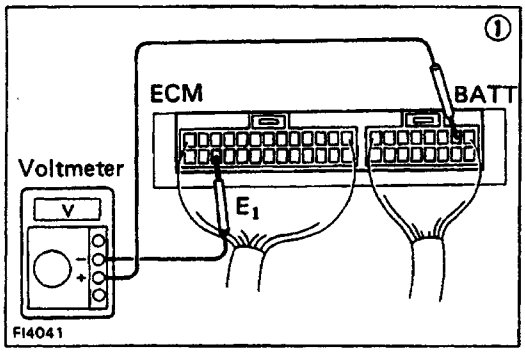
Voltage at ECM Wiring Connectors (2WD)

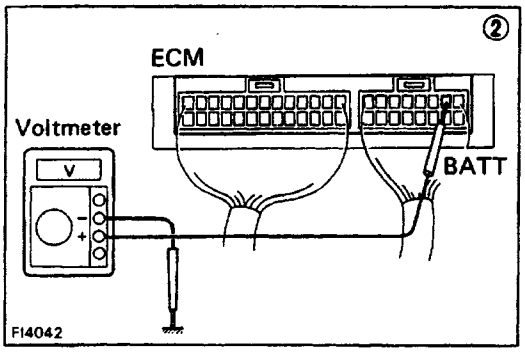
No.	Terminals	Condition		STD voltage	See page
1	BATT – E_1	–		9 – 14	EG1–125
	+B – E_1	Ignition switch ON			
	$+B_1$ – E_1				
2	IDL – E_2 (E_{21})	Ignition switch ON	Throttle valve open	9 – 14	EG1–127
	Vcc – E_2 (E_{21})		–	4.5 – 5.5	
	VTA – E_2 (E_{21})		Throttle valve fully closed	0.3 – 0.8	
			Throttle valve fully open	3.2 – 4.9	
3	Vc – E_2 (E_{21})	Ignition switch ON	–	6 – 10	EG1–129
	Vs – E_2 (E_{21})		Measuring plate fully closed	0.5 – 2.5	
			Measuring plate fully open	5 – 10	
		Idling		2 – 8	
	THA – E_2 (E_{21})	Ignition switch ON	Intake air temperature 20°C (68° F)	0.5 – 3.4	
4	THW – E_2 (E_{21})	Ignition switch ON	Coolant temperature 80°C (176° F)	0.2 – 1.0	EG1–131
5	STA – E_1	Ignition switch START position		6 – 12	EG1–132
6	No. 10 – E_{01} No. 20 – E_{02}	Ignition switch ON		9 – 14	EG1–133
7	IGt – E_1	Idling		0.7 – 1.0	EG1–134
8	W – E_1	No trouble (MIL off) and engine running		9 – 14	EG1–135
9	STJ – E_1	Ignition switch START position	Coolant temperature 80 °C (176°F)	6 – 12	EG1–136
10	STP – E_1	Stop light switch ON		7.5 – 14	EG1–137

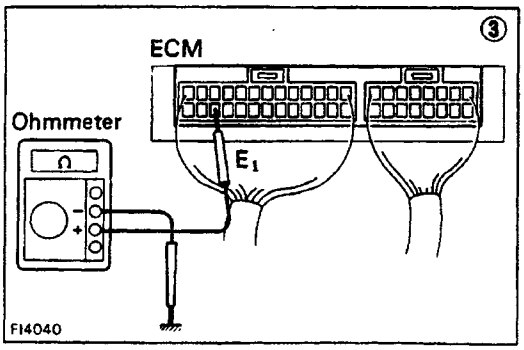
V01795

No.	Terminals	Trouble	Condition	STD Voltage
1	**BATT – E_1**	No voltage	–	**9 – 14 V**
	+B – E_1		Ignition switch ON	
	+B_1 – E_1			









- **BATT – E 1**

(1) There is no voltage between ECM terminals BATT and E1.

↓

(2) Check that there is voltage between ECM terminal BATT and body ground.

NO → ↓ OK

↓

(3) Check wiring between ECM terminal E1 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

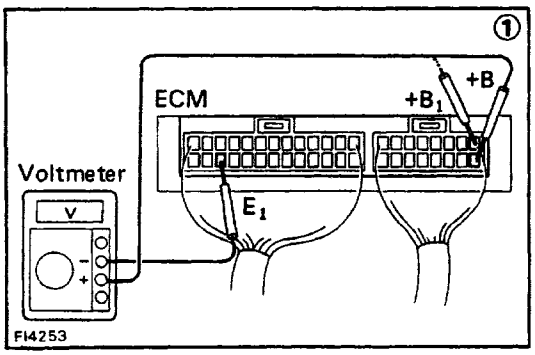
↓

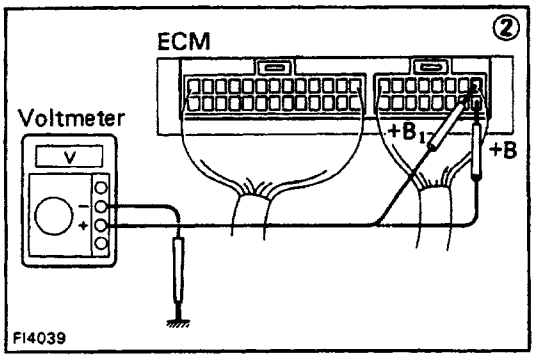
Check fuse and fusible link. BAD → Replace.

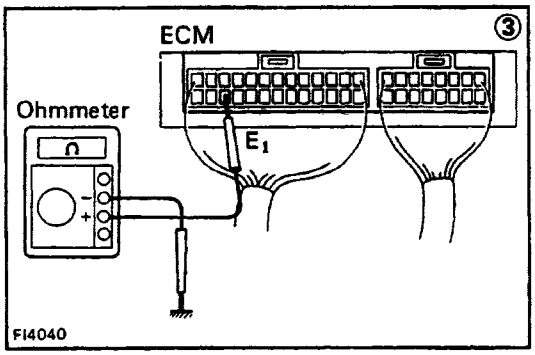
↓ OK

Check wiring between fuse and ECM. BAD → Repair or replace.

V01796







- **+B (+B1) – E 1**

(1) There is no voltage between ECM terminals + B (+B1) and E1. **(IG SW ON)**

(2) Check that there is voltage between ECM terminal + B (+ B1) an body ground. **(IG SW ON)**

NO → **OK**

(3) Check wiring between ECM terminal E1 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

Check fuse, fusible link and ignition switch. BAD → Repair or replace.

OK

Check EFI main relay. BAD → Replace.

OK

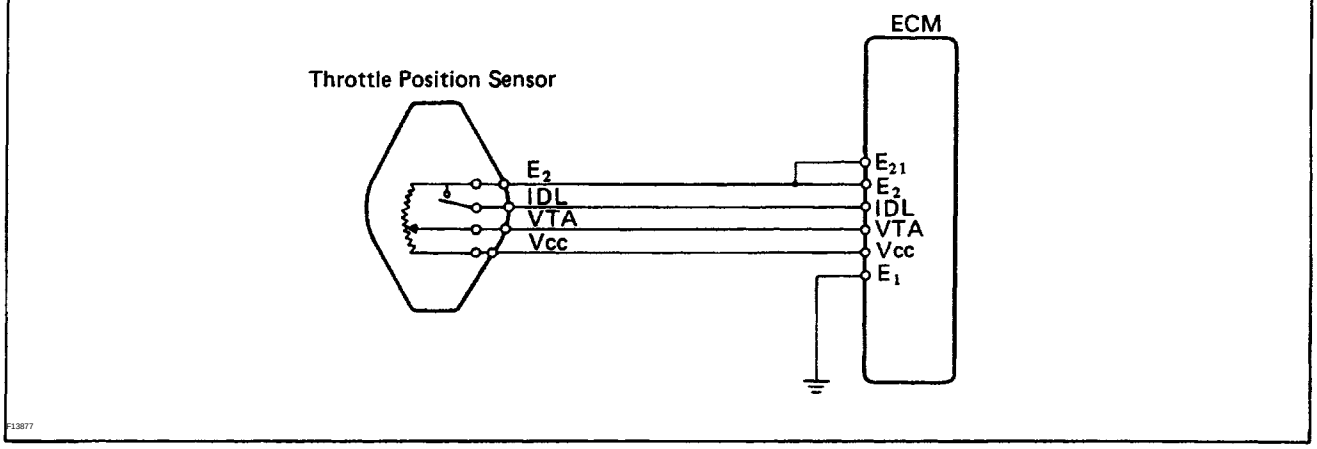
Check wiring between EFI main relay and battery. BAD → Repair or replace.

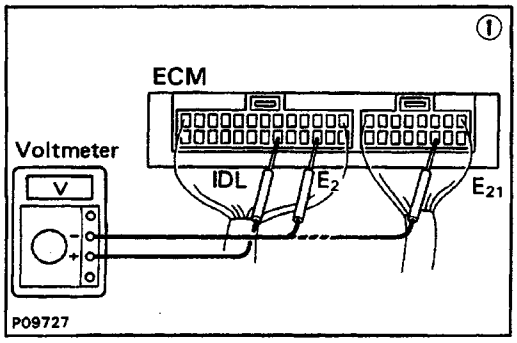
OK

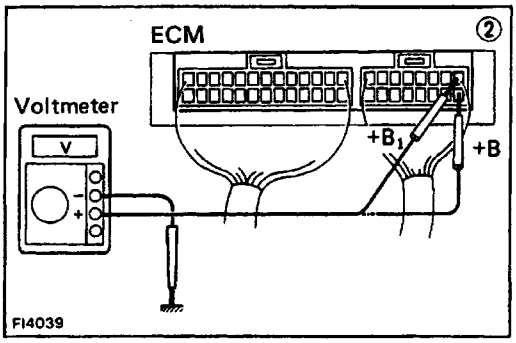
Check wiring between EFI main relay and ECM terminal +B (+B1). BAD → Repair or replace.

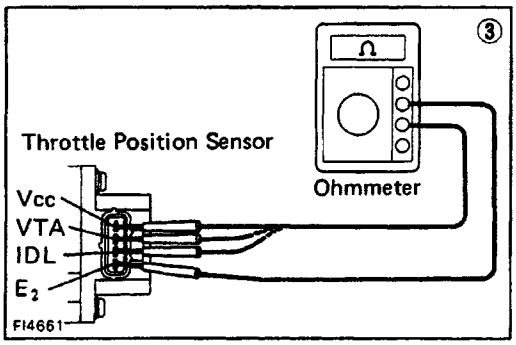
V01797

No.	Terminals	Trouble	Condition		STD Voltage
2	IDL – E_2 (E_{21})	No voltage	Ignition switch ON	Throttle valve open	9 – 14 V
	Vcc – E_2 (E_{21})			–	4.5 – 5.5 V
	VTA – E_2 (E_{21})			Throttle valve fully closed	0.3 – 0.8 V
				Throttle valve fully open	3.2 – 4.9 V









- **IDL – E2 (E21)**

(1) There is no voltage between ECM terminals IDL and E2 (E21). **(IG SW ON)** (Throttle valve open)

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground. **(IG SW ON)**

NO → Refer to No. 1. → BAD → Replace or repair.

OK → Check wiring between ECM terminal E1 and body ground.

OK → Check throttle position sensor.

BAD → Replace or repair throttle position sensor.

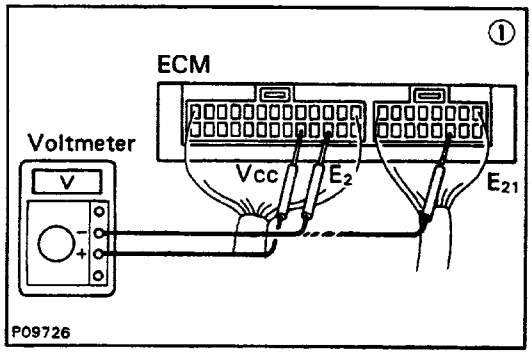
OK → Check wiring between ECM and throttle position sensor.

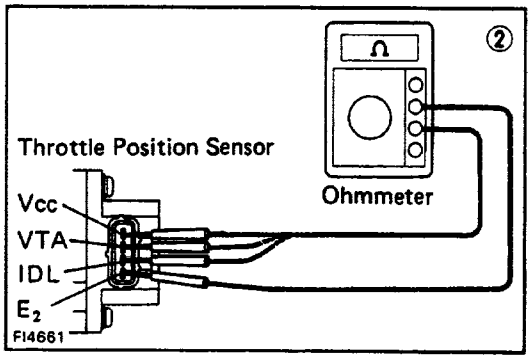
OK → Try another ECM.

BAD → Replace or repair.

BAD → Replace or repair.

V01798





- **Vcc – E2 (E21)**

(1)There is no voltage between ECM terminals Vcc and E2(E21) **(IG SW ON)**

Check that there is voltage between ECM terminals + B (+ B1) and E1. **(IG SW ON)**

OK → (2) Check throttle position sensor.

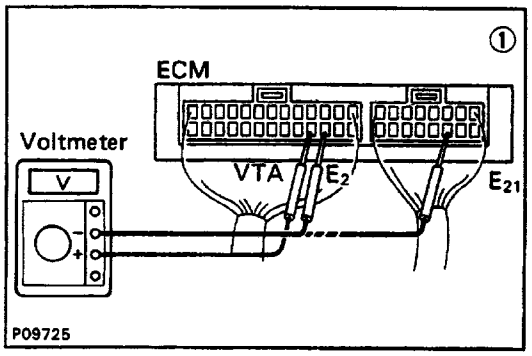
NO → Refer to No. 1.

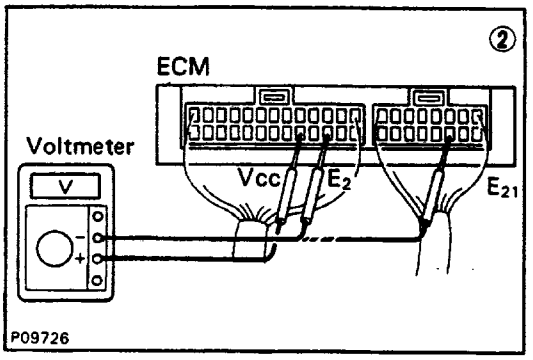
BAD → Repair or replace.

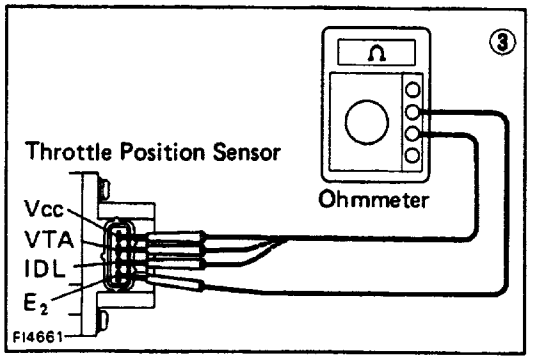
OK → Check wiring between ECM and throttle position sensor.

OK → Try another ECM.

BAD → Repair or replace wiring.







- **VTA – E2 (E21)**

(1) There is no voltage between ECM terminals VTA and E2 (E21). **(IG SW ON)**

(2) Check that there is voltage between ECM terminals Vcc and E2 (E21). **(IG SW ON)**

OK → Check throttle position sensor.

NO → Perform inspection of Vcc – E2(E21).

BAD → Repair or replace.

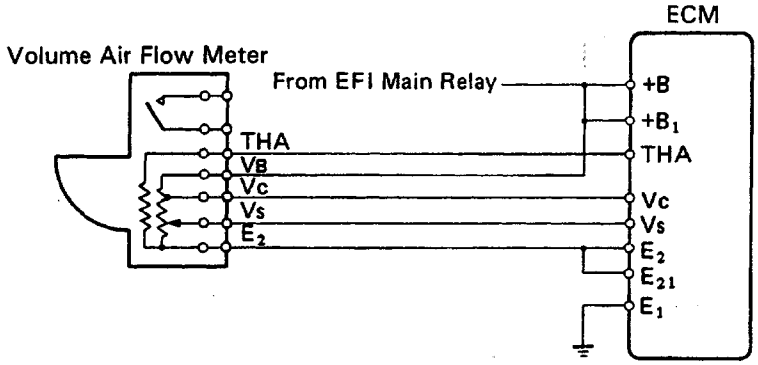
OK → Check wiring between ECM and throttle position sensor.

BAD → Repair or replace.

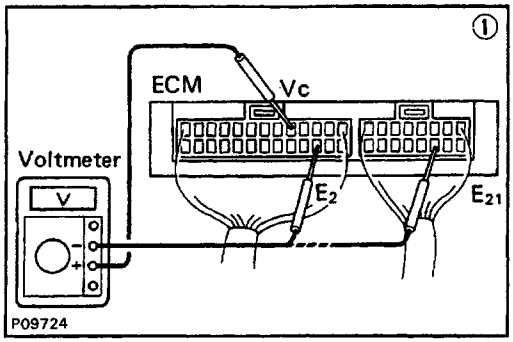
OK → Try another ECM.

V01799

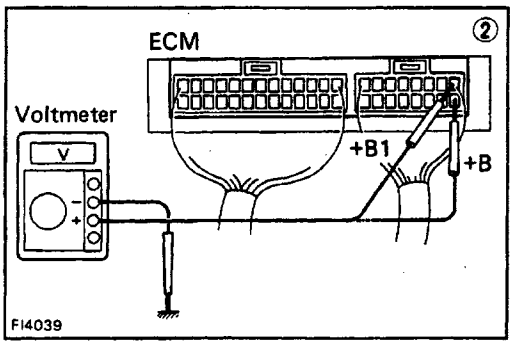
No.	Terminals	Trouble	Condition		STD Voltage
3	**Vc – E_2 (E_{21})**	No voltage	Ignition switch	–	**6 – 10 V**
	Vs – E_2 (E_{21})			Measuring plate fully closed	**0.5 – 2.5 V**
				Measuring plate fully open	**5 – 10 V**
			ON	Idling	**2 – 8 V**
	THA – E_2 (E_{21})		Ignition switch ON	Intake air temperature 20°C (68° F)	**0.5 – 3.4 V**



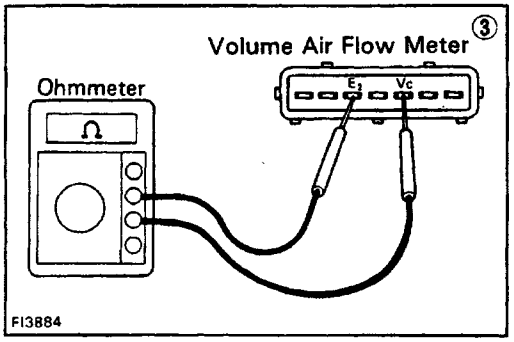
FI3881



P09724



FI4039



FI3884

- **Vc–E2 (E21)**

(1) There is no voltage between ECM terminals Vc and E2 (E21). **(IG SW ON)**

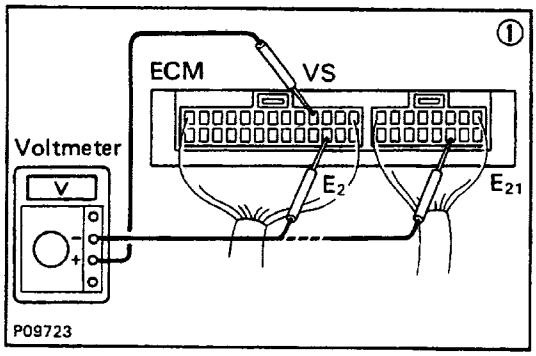
↓

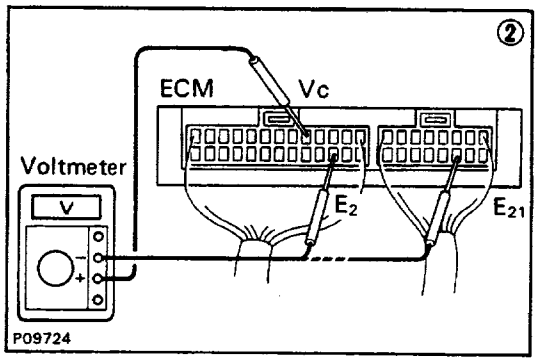
(2) Check that there is voltage between ECM terminals + B (+ B1) and E1. **(IG SW ON)**

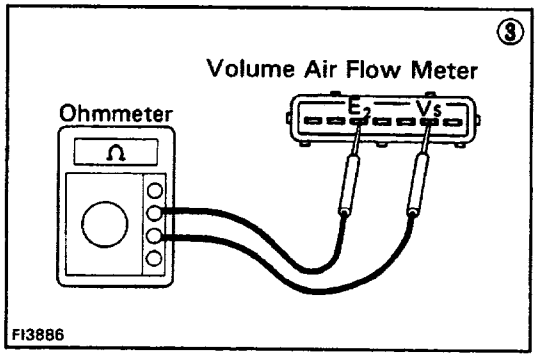
↓ OK → (3) Check volume air flow meter.

- BAD → Replace or repair volume air flow meter.
- OK → Check wiring between ECM and volume air flow meter.
  - OK → Try another ECM.
  - BAD → Replace or repair wiring.

NO → Refer to No. 1.







- **Vs – E2 (E21)**

(1) There is no voltage between ECM terminals Vs and E2 (E21) **(IG SW ON)**

(2) Check that there is voltage between ECM terminals Vc and E2 (E12). **(IG SW ON)**

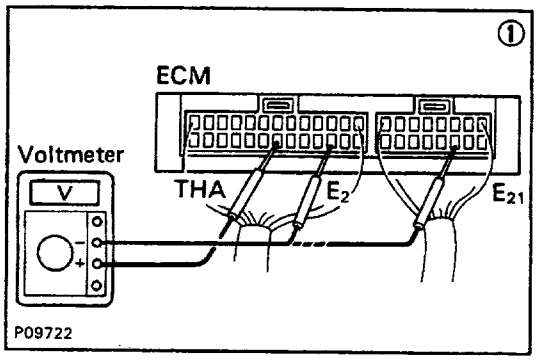
OK → (3) Check volume air flow meter.

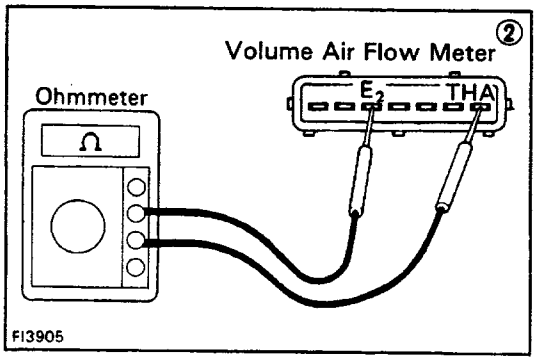
NO → Refer to Vc – E2 (E21). BAD → Repair or replace.

(3) Check volume air flow meter. BAD → Repair or replace.

OK → Check wiring between ECM and volume air flow meter. BAD → Repair or replace.

OK → Try another ECM.





- **THA – E2 (E21)**

(1) There is no voltage between ECM terminals THA and E2(E21). **(IG SW ON)**

Check that there is voltage between ECM terminals + B (+ B1) and body ground. (IG SW ON)

OK → Check intake air temp. sensor.

NO → Refer to No. 1.

Check intake air temp. sensor.

BAD → Replace volume air flow meter.

OK → Check wiring between ECM and intake air temp. sensor.

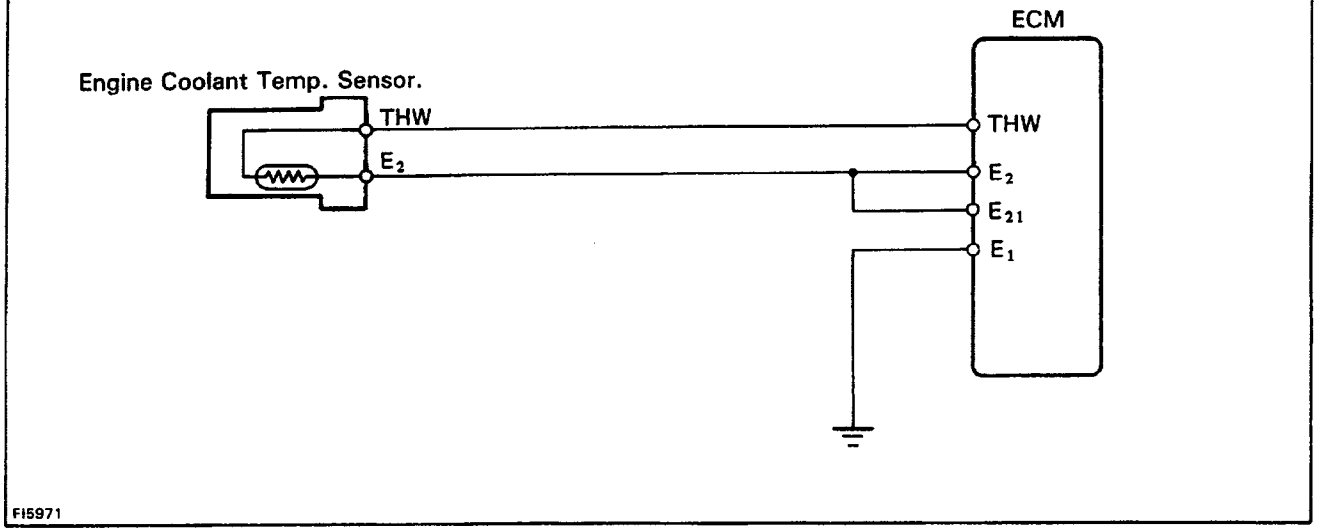
Check wiring between ECM and intake air temp. sensor.

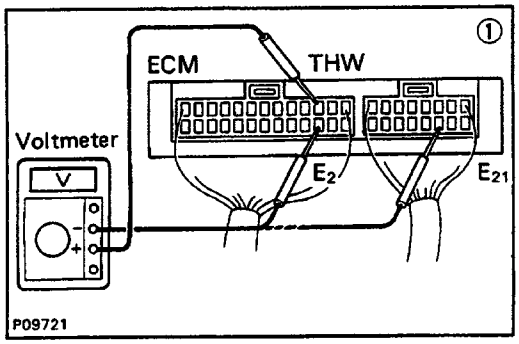
OK → Try another ECM.

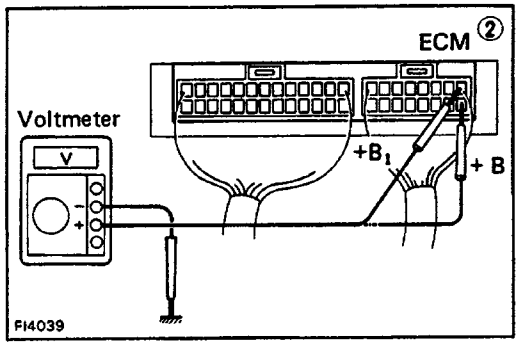
BAD → Repair or replace wiring.

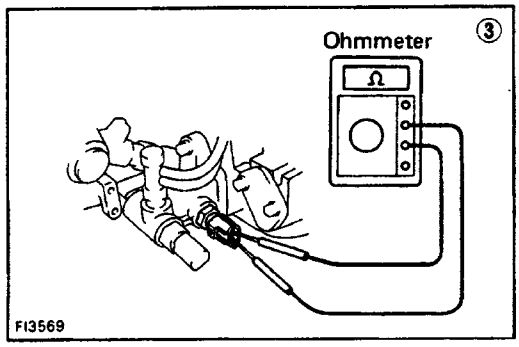
V01801

No.	Terminals	Trouble	Condition		STD Voltage
4	THW – E_2 (E_{21})	No voltage	Ignition switch ON	Coolant temperature 80°C (176° F)	0.2 – 1.0 V









(1) There is no voltage between ECM terminals THW and E2 (E21) **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground.**(IG SW ON)**

OK → ↓

NO → Refer to No. 1.

↓

Check wiring between ECM terminal E1 and body ground.

OK → ↓

BAD → Repair or replace.

↓

(3) Check engine coolant temp. sensor.

BAD → Replace engine coolant temp. sensor.

OK → ↓

Check wiring between ECM and engine coolant temp. sensor.

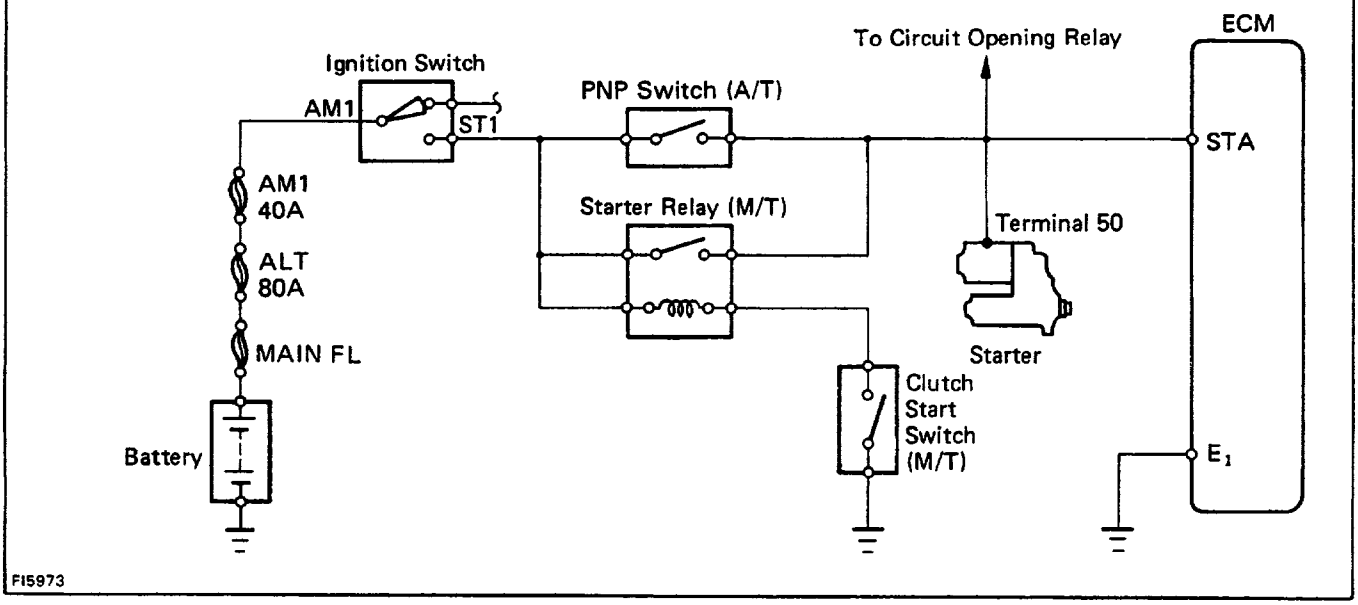
OK → ↓

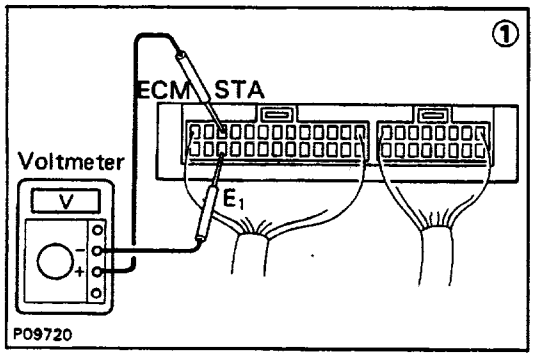
Try another ECM

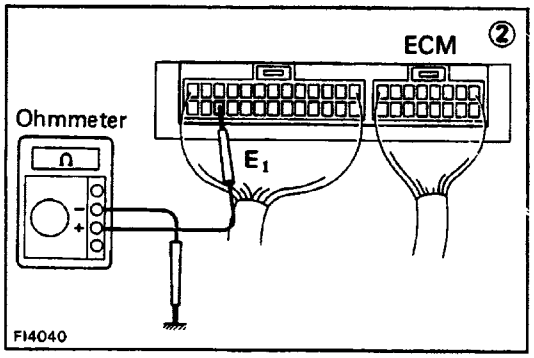
BAD → Repair or replace.

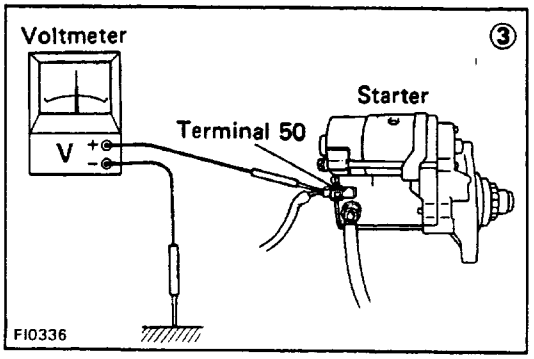
V01802

No.	Terminals	Trouble	Condition	STD Voltage
5	STA – E 1	No voltage	Ignition switch START position	6 –12v









(1) There is no voltage between ECM terminals STA and E1 **(IG SW START)**

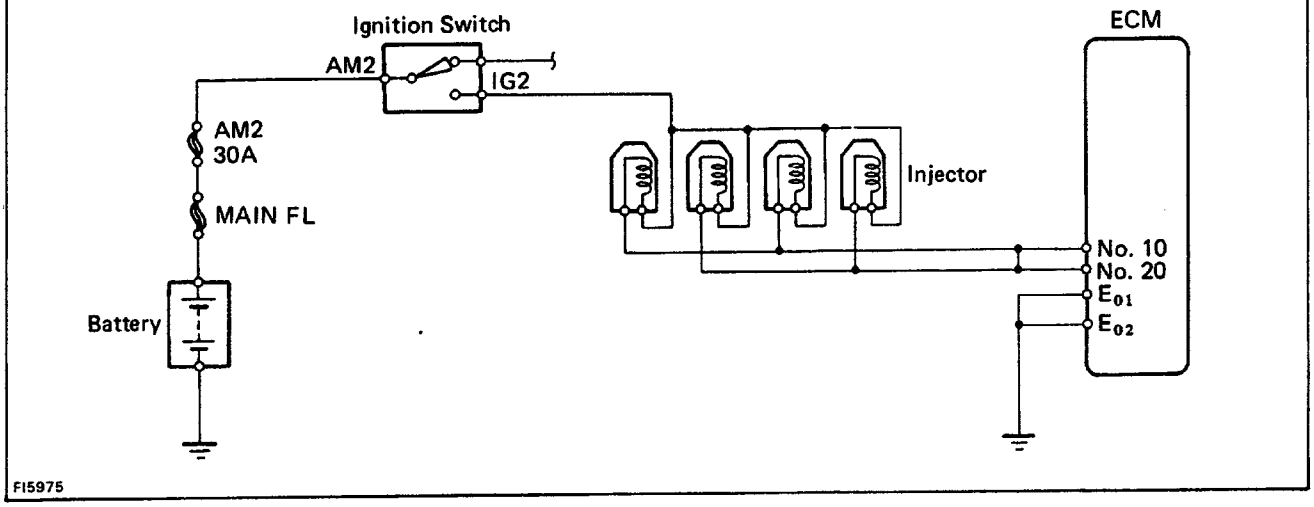
Check starter operation.
- OK → Check wiring between ECM and ignition switch terminal ST.
  - OK → (2) Check wiring between ECM terminal E1 an body ground.
    - OK → Try another ECM.
    - BAD → Repair or replace.
  - BAD → Repair or replace.
- BAD

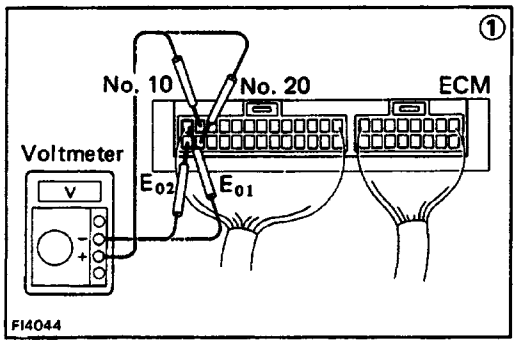
Check fusible link, battery, wiring and ignition switch.
- BAD → Repair or replace.
- OK

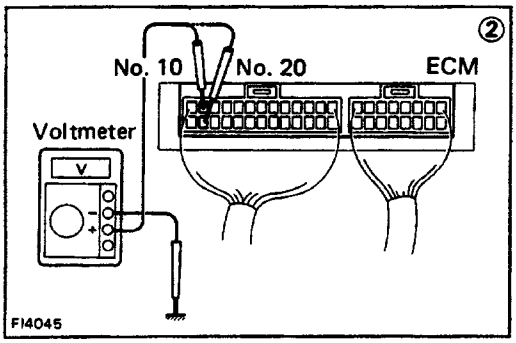
(3) Check that there is voltage at terminal 50 of starter. **(IG SW START) STD Voltage: 6 –12 V**
- OK → Check starter. (See ST section)
- NO → Check wiring between ignition switch ST1 terminal and starter terminal 50.

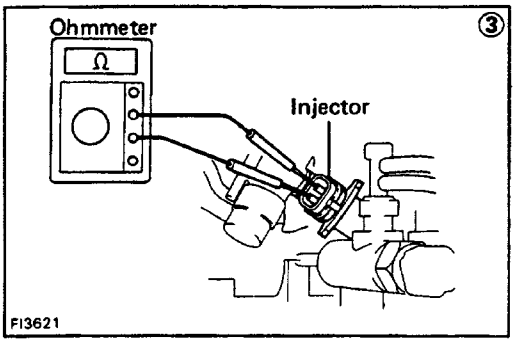
V01803

No.	Terminals	Trouble	Condition	STD Voltage
6	No. 10 _ E_{01} No. 20 E_{02}	.No voltage	Ignition switch ON	9 – 14 V









(1)There is no voltage between ECM terminals No. 10 and/or No. 20 and E01, and/or E02. **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminal No. 10 and/or No. 20 and body ground.

NO → OK

OK → Check wiring between ECM terminal E01, and/or E02 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

NO → Check fusible link and ignition switch.

BAD → Repair or replace.

OK →

(3) Check resistance of magnetic coil in each injector
STD resistance: 13.4 – 14.2Ω

OK →

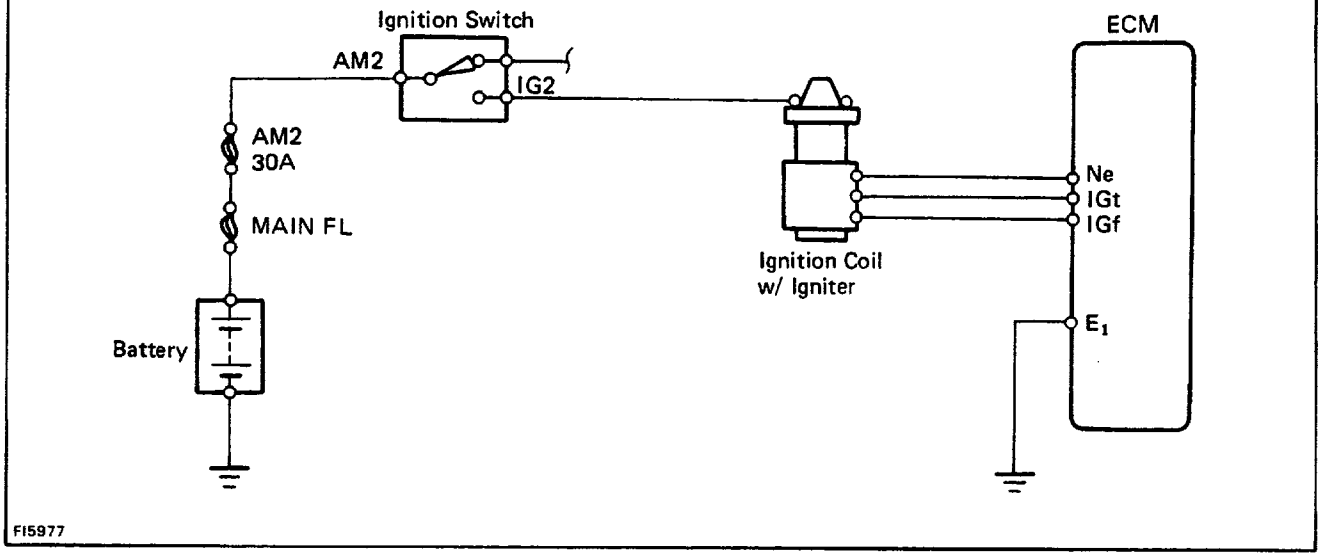
NO → Replace injector.

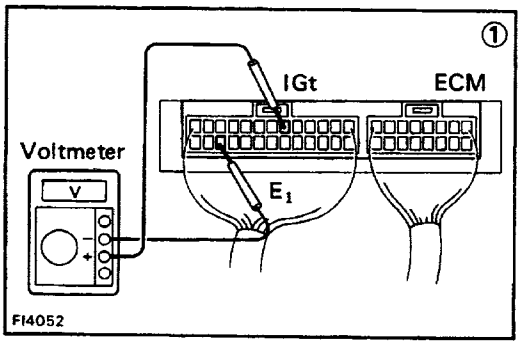
Check wiring between ECM terminal No. 10 and/or No. 20 and battery.

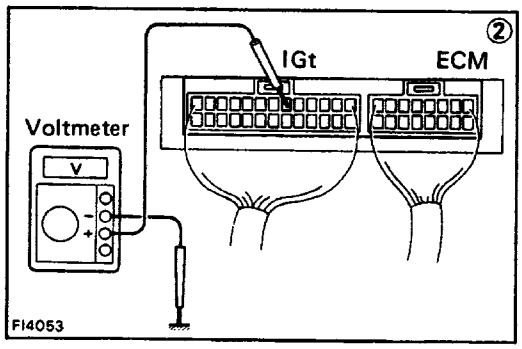
BAD → Repair or replace.

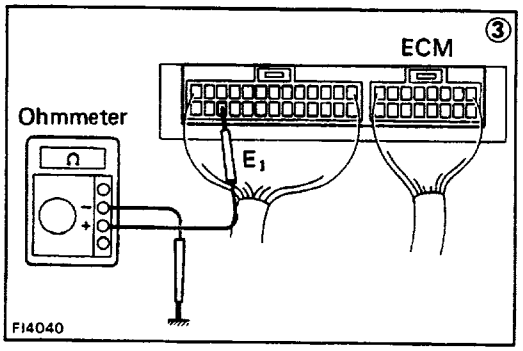
V01804

No.	Terminals	Trouble	Condition	STD Voltage
7	IGt – E1	No voltage	Idling	0.7 – 1.0 v









(1) There is no voltage between ECM terminals IGt and E1. **(idling)**

↓

(2) Check that there is voltage between ECM terminal IGt and body ground. **(Idling)**

↓ NO

→ OK

(3) Check wiring between ECM terminal E1 and body ground.

↓ BAD

Refer to No. 1. → BAD → Repair or replace.

↓ OK

Check wiring between igniter and distributor. → BAD → Repair or replace.

↓ OK

Check distributor. → BAD → Replace.

↓ OK

Check wiring between ECM and igniter. → BAD → Repair or replace.

↓ OK

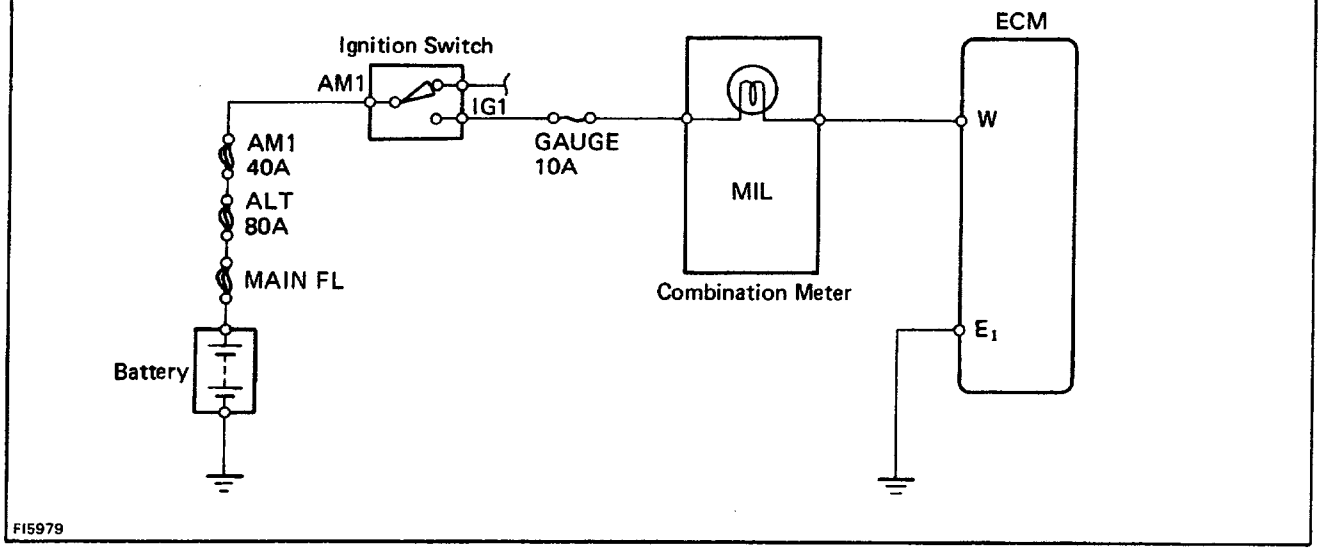
Check igniter. → BAD → Repair or replace.

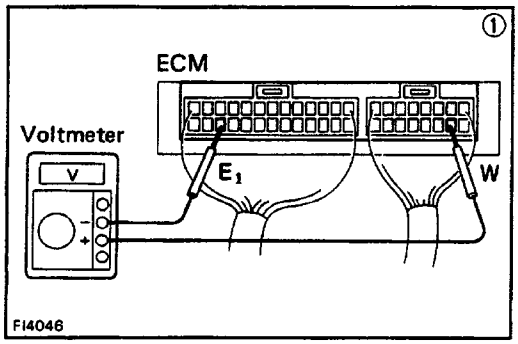
↓ OK

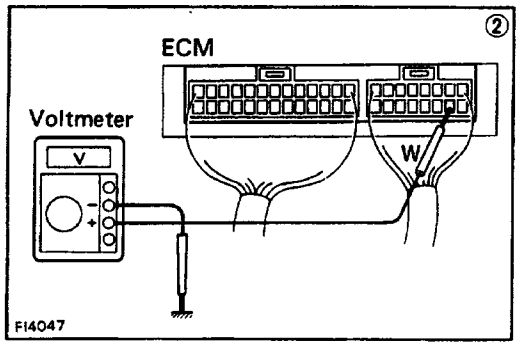
Try another ECM.

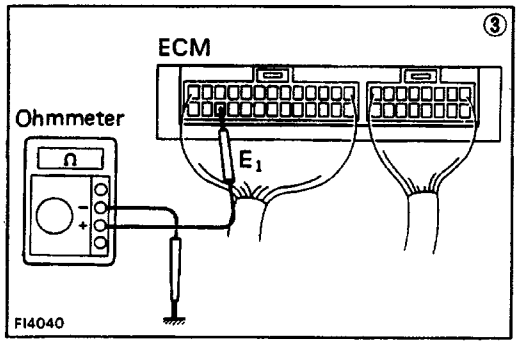
V01805

No.	Terminals	Trouble	Condition	STD Voltage
8	W – E1	No voltage	No trouble (MIL off) and engine running	9 – 14V









(1) There is no voltage between ECM terminals W and E1.
(Idling)

↓

(2) Check that there is voltage between ECM terminal W and body ground.

NO → ↓

OK → (3) Check wiring between ECM terminal E1 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

↓

Check GAUGE fuse (10 A) and MIL.

OK → ↓

BAD → Repair or replace.

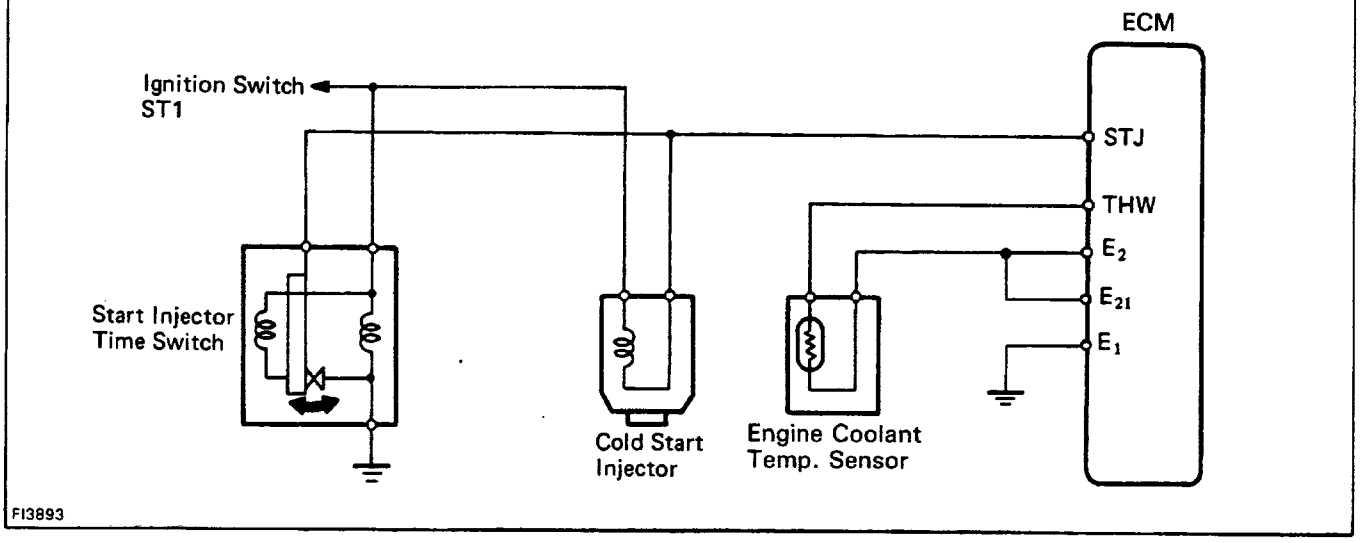
Fuse blows again → ↓

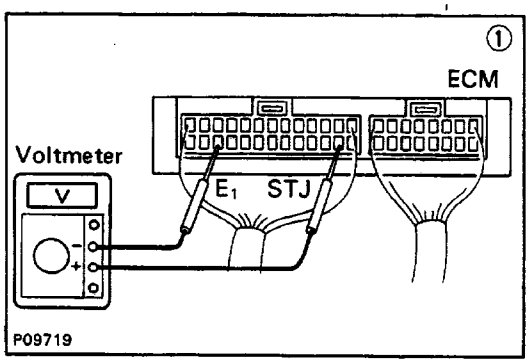
Check wiring between ECM terminal W and fuse.

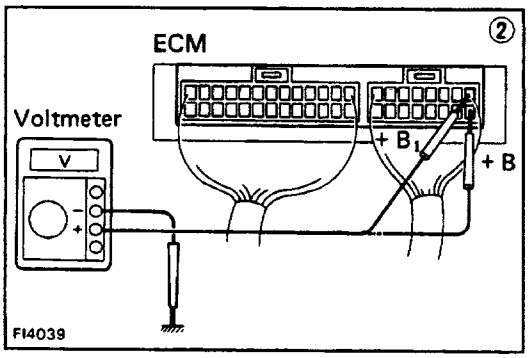
BAD → Repair or replace.

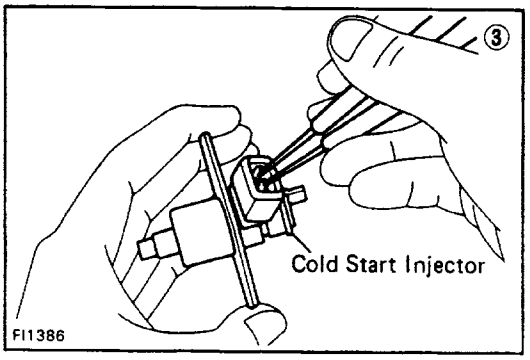
V01806

No.	Terminal	Trouble	Condition		STD Voltage
9	STJ – E 1	No voltage	Ignition switch . START position	Coolant temperature 80°C (176° F)	6 –12V









(1) There is no voltage between ECM terminals STJ and E1. (IG SW START)

(2) Check that there is voltage between ECM terminal +B (+ B, and body ground. (IG SW ON)

OK → (3) Check cold start injector.

NO → Refer to No. 1.

BAD → Replace cold start injector.

OK → Check wiring between ECM and cold start injector.

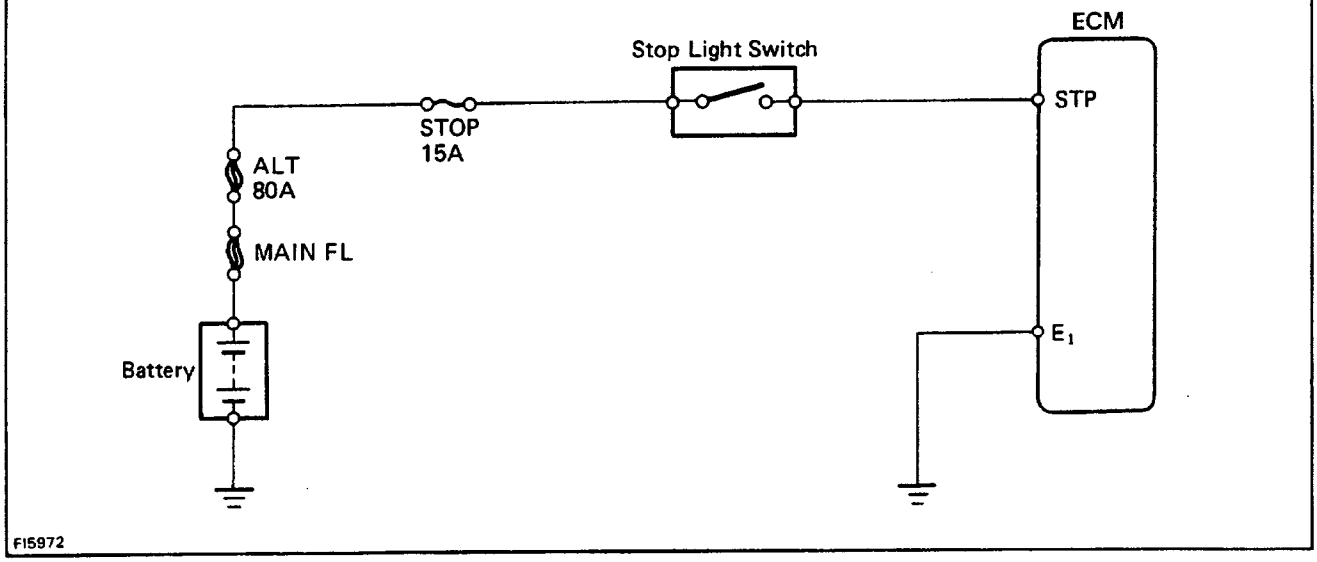
OK → Check wiring between ECM terminal E1 and body ground.

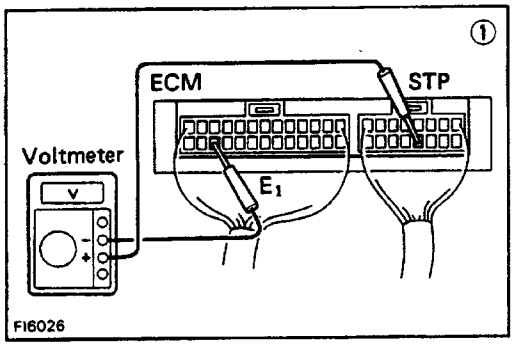
OK → Try another ECM.

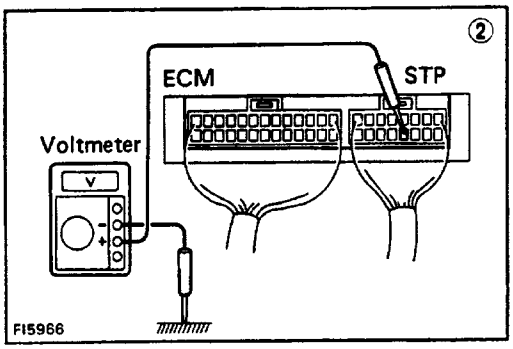
BAD → Repair or replace wiring.

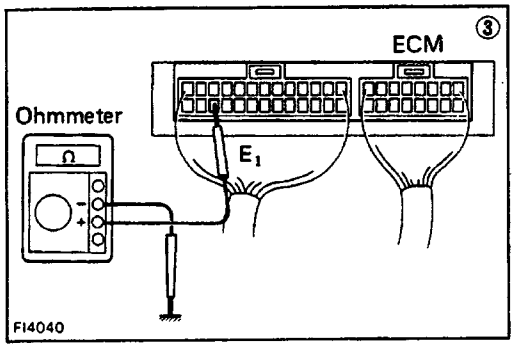
V01807

No.	Terminals	Trouble	Condition	STD Voltage
10	STP – E1	No voltage	Stop light switch ON	7.5 – 14 V









(1) There is no voltage between ECM terminals STP and E1.

↓

(2) Check that there is voltage between ECM terminal STP and body ground when the brake pedal is depressed.

NO → ↓ OK

↓

(3) Check wiring between ECM terminal E1 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

↓

Check STOP fuse (15A) and stop light switch.

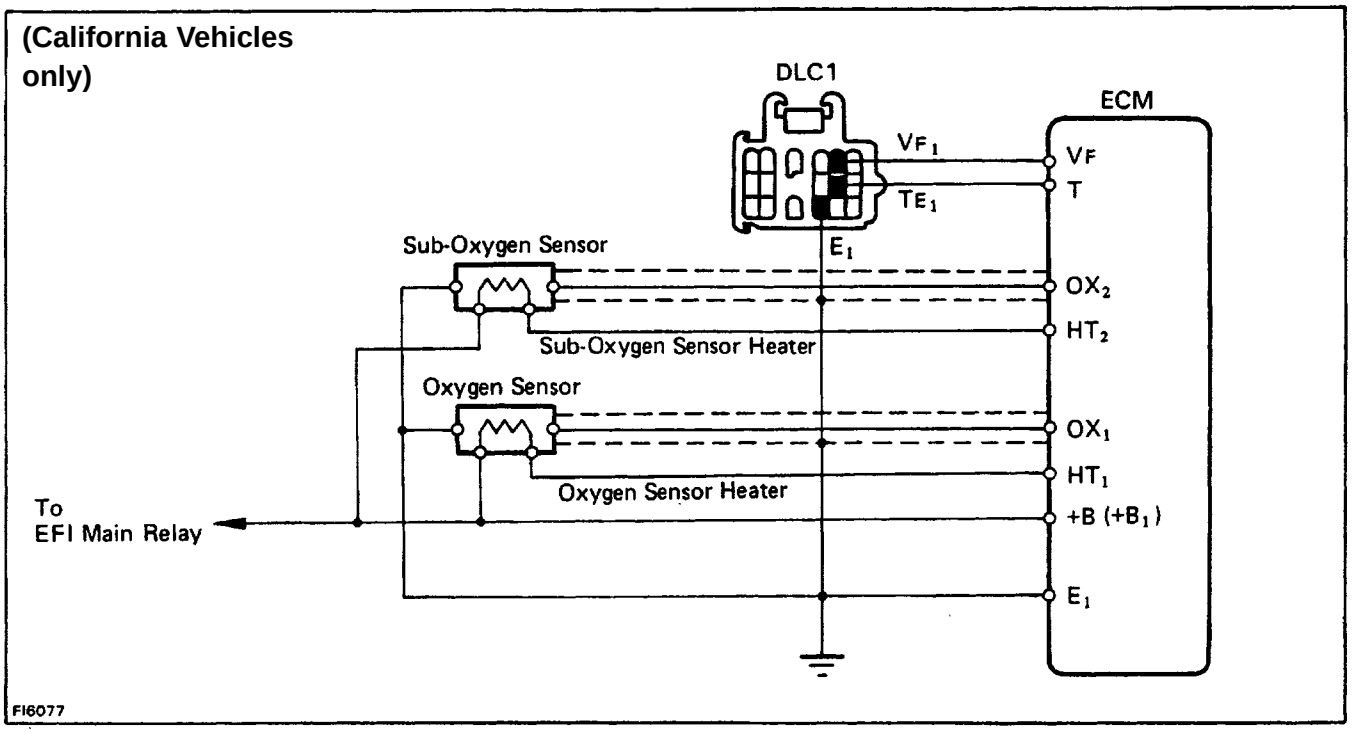
BAD → Repair or replace.

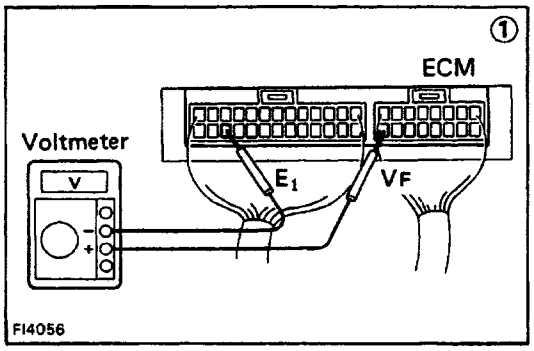
↓ OK

Check wiring between ECM terminal STP and battery.

BAD → Repair or replace.

V01808





(1) There is no voltage between ECM terminals VF and E1.

Check that there is voltage between ECM terminal VF and body ground.

NO

OK

Check wiring between ECM terminal E1 and body ground.

OK

BAD

Try another ECM.

Repair or replace.

Is air leaking into air induction system?

YES

Repair air leak.

NO

Check spark plugs.

BAD

Repair or replace.

OK

Check distributor and ignition system.

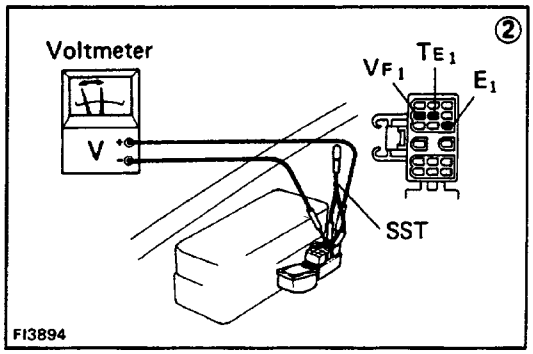
BAD

Repair or replace.

OK

CONTINUED ON PAGE EG1–139

V01809



CONTINUED FROM PAGE EG1–138

OK

Check fuel pressure. → BAD → Repair or replace.

OK

Check injector. → BAD → Repair or replace.

OK

Check cold start injector.* → BAD → Repair or replace.

OK

Check volume air flow meter. → BAD → Repair or replace.

OK

(2) Check operation of oxygen sensor. → OK → System normal.

BAD

Check wiring between oxygen sensor and ECM connector. → BAD → Repair wiring.

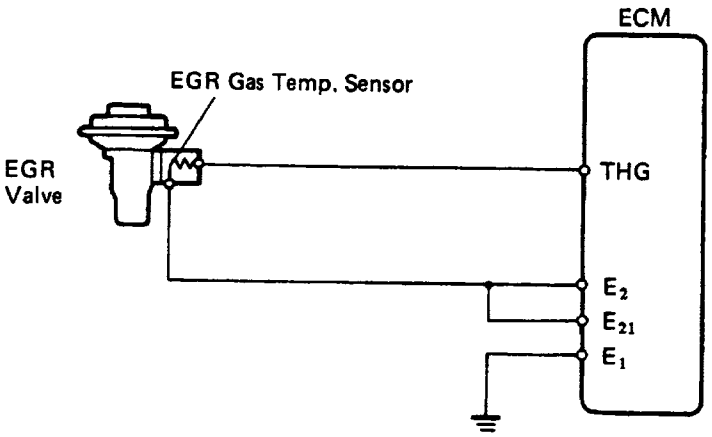
OK

Replace oxygen sensor.

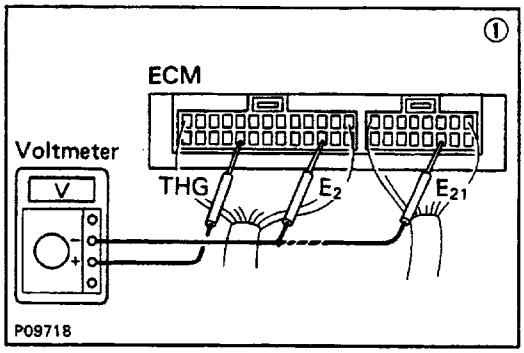
*Rich malfunction only.

V01810

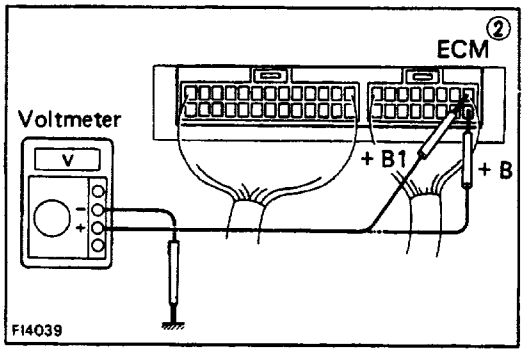
(California Vehicles only)



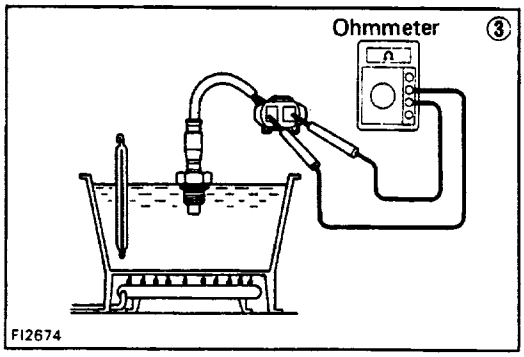
FI3895



P09718



FI4039



FI2674

(1) There is no voltage between ECM terminals THG and E2 (E21).
(Engine running at 2,000 rpm)

↓

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground. **(IG SW ON)**

OK → ↓

NO → Refer to No. 1.

↓

Check wiring between ECM terminal E1 and body ground.

OK → ↓

BAD → Repair or replace.

↓

Check EGR system.

BAD → Repair or replace.

OK → ↓

(3) Check EGR gas temp. sensor.

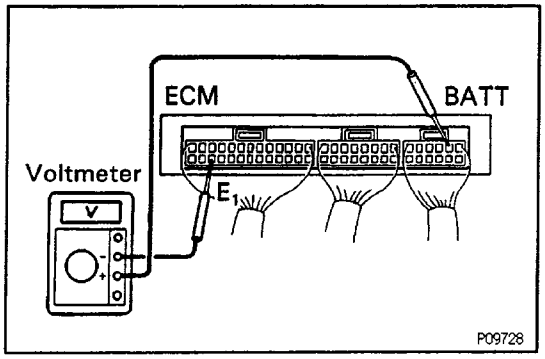
BAD → Replace EGR gas temp. sensor.

OK → Check wiring between ECM and EGR gas temp. sensor.

OK → Try another ECM.

BAD → Repair or replace.

V01811



MFI SYSTEM CHECK PROCEDURE (4WD M/T)

HINT:

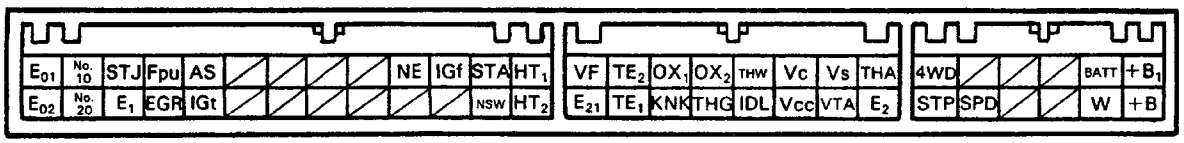
- Perform all voltage measurements with the connec–tors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is in ”ON” position.
  Using a voltmeter with high impedance (10 kΩ/V minimum), measure the voltage at each terminal of the wiring connector.

Terminals of ECM KWD M/T)

Symbol	Terminal Name	Symbol	Terminal Name
E_{01}	ENGINE GROUND	Ox_1	OXYGEN SENSOR (MAIN)
E_{02}	ENGINE GROUND	KNK	KNOCK SENSOR
No. 10	INJECTOR	* Ox_2	OXYGEN SENSOR (SUB)
No. 20	INJECTOR	* THG	EGR GAS TEMP. SENSOR
STJ	COLD START INJECTOR	THW	ENGINE COOLANT TEMP. SENSOR
E_1	ENGINE GROUND	IDL	THROTTLE POSITION SENSOR
Fpu	FUEL PRESSURE CONTROL VSV	Vc	VOLUME AIR FLOW METER
* EGR	EGR VSV	Vcc	THROTTLE POSITION SENSOR
AS	PAIR VSV	Vs	VOLUME AIR FLOW METER
IGt	IGNITER	VTA	–THROTTLE POSITION SENSOR
Ne	DISTRIBUTOR	THA	INTAKE AIR TEMP. SENSOR
IGf	IGNITER	E_2	SENSOR GROUND
STA	STARTER SWITCH	4WD	4WD SWITCH
NSW	PNP SWITCH	STP	STOP LIGHT SWITCH
HT_1	OXYGEN SENSOR HEATER (MAIN)	SPD	SPEED SENSOR
* HT_2	OXYGEN SENSOR HEATER (SUB)	BATT	BATTERY POSITIVE VOLTAGE
VF	DLC 1	W	MALFUNCTION INDICATOR LAMP
E_{21}	SENSOR GROUND	$+B_1$	MAIN RELAY
TE_2	D LC 1	+B	MAIN RELAY
TE_1	D LC 1		

* : California only

ECM Terminals



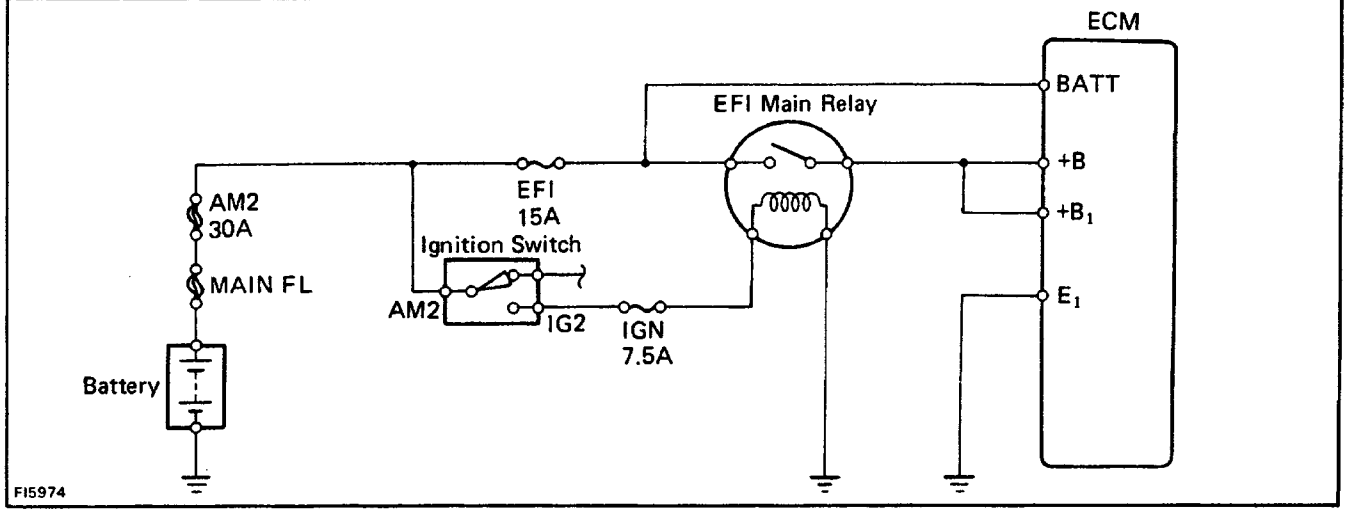
P09752

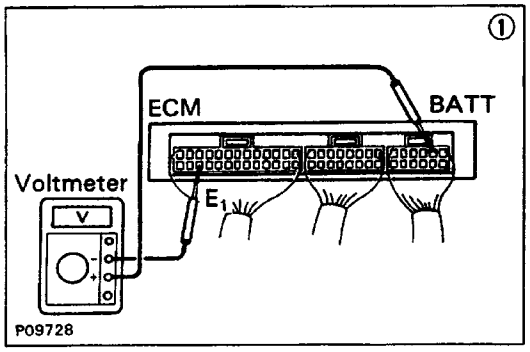
Voltage at ECM Wiring Connectors (4WD M/T)

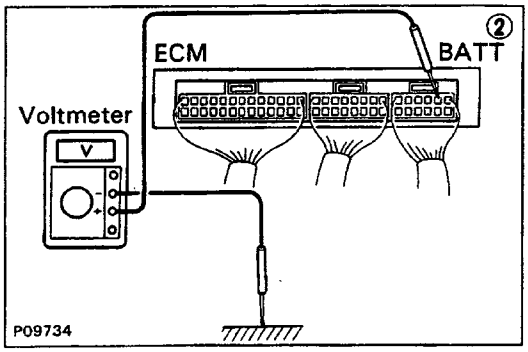
No.	Terminals	Condition		STD voltage	See page
1	BATT – E_1	–		9 – 14	EG1–143
	+B – E_1	Ignition switch ON			
	$+B_1$ – E_1				
2	IDL – E_2 (E_{21})	Ignition switch ON	Throttle valve open	9 – 14	EG1–145
	Vcc – E_2 (E_{21})		–	4.5 – 5.5	
	VTA – E_2 (E_{21})		Throttle valve fully closed	0.3 – 0.8	
			Throttle valve fully open	3.2 – 4.9	
3	Vc – E_2 (E_{21})	Ignition switch ON	–	6–10	EG1–147
	Vs – E_2 (E_{21})		Measuring plate fully closed	0.5–2.5	
			Measuring plate fully open	5–10	
		Idling		2–8	
	THA – E_2 (E_{21})	Ignition switch ON	Intake air temperature 20°C (68°F)	0.5 – 3.4	
4	THW – E_2 (E_{21})	Ignition switch ON	Coolant temperature 80°C (176°F)	0.2 – 1.0	EG1–149
5	STA – E_1	Ignition switch START position		6–12	EG1–150
6	No. 10 – E_{01} No. 20 – E_{02}	Ignition switch ON		9 – 14	EG1–151
7	IGt – E_1	Idling		0.7–1.0	EG1–152
8	W – E_1	No trouble (MIL off) and engine running		9 – 14	EG1–153
9	STJ – E_1	Ignition switch START position	Coolant temperature 80°C (1 76°F)	6–12	EG1–154
10	STP – E_1	Stop light switch ON		7.5 – 14	EG1–155

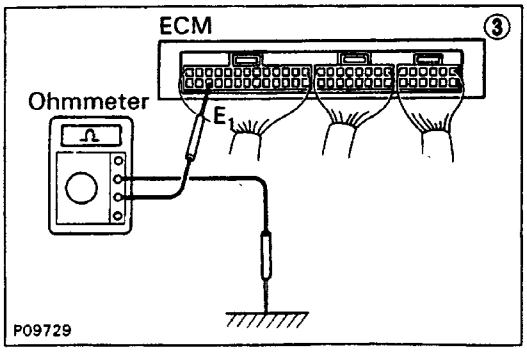
V01813

No.	Terminals	Trouble	Condition	STD Voltage
1	BATT – E_1	No voltage	–	9 – 14 V
	+B – E_1		Ignition switch ON	
	$+B_1$ – E_1			









- **BATT – E 1**

(1) There is no voltage between ECM terminals BATT and E1.

↓

(2) Check that there is voltage between ECM terminal BATT and body ground.

NO → ↓ OK

(3) Check wiring between ECM terminal E1 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

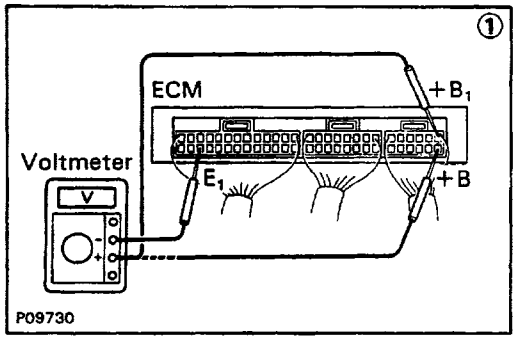
↓

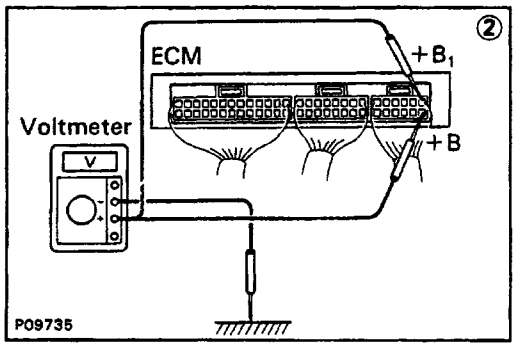
Check fuse and fusible link. BAD → Replace.

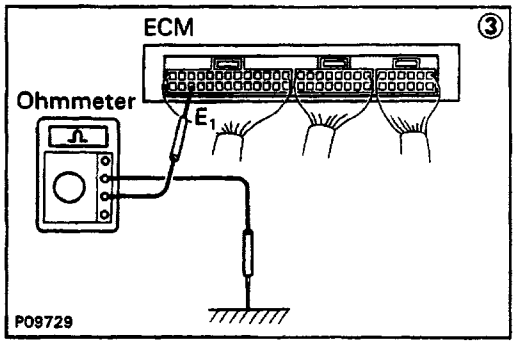
↓ OK

Check wiring between fuse and ECM. BAD → Repair or replace.

V01815







- **+B (B1) – E1**

(1) There is no voltage between ECM terminals + B (+ B1) and E1. **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground. **(IG SW ON)**

NO → ↓ OK

(3) Check wiring between ECM terminal E1 and body ground.

OK → ↓ Try another ECM.

BAD → Repair or replace.

Check fuse, fusible link and ignition switch. BAD → Repair or replace.

↓ OK

Check EFI main relay. BAD → Replace.

↓ OK

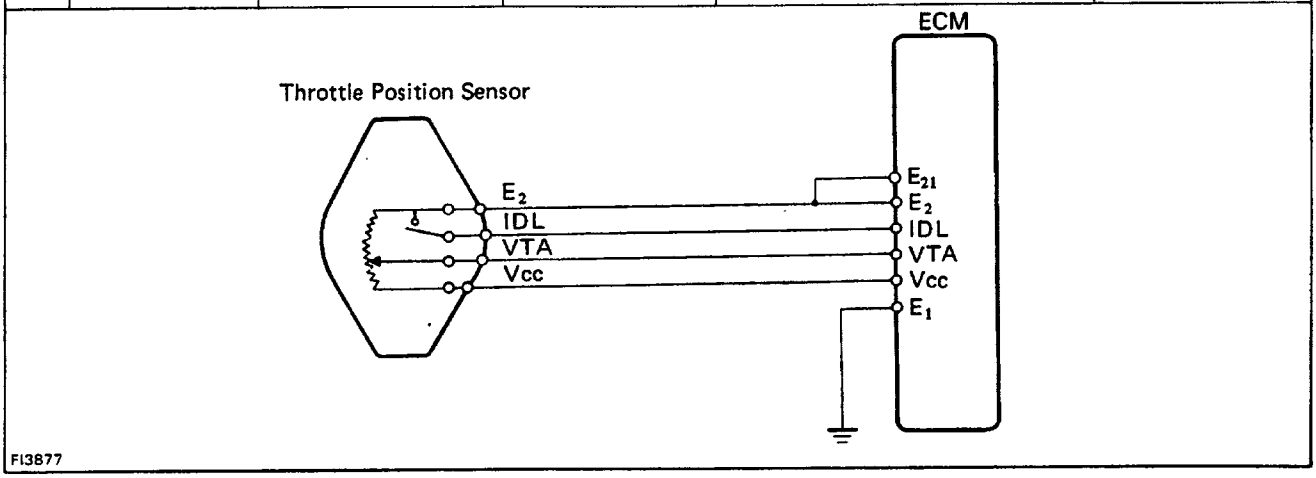
Check wiring between EFI main relay and battery. BAD → Repair or replace.

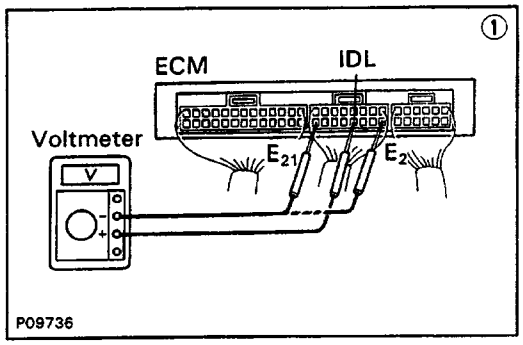
↓ OK

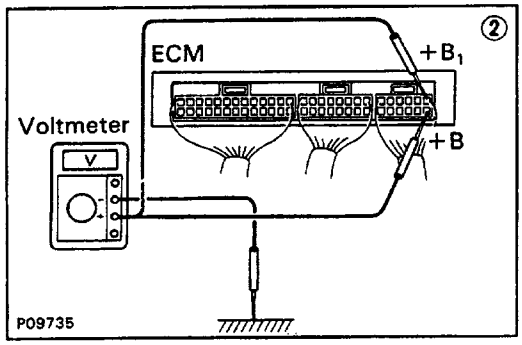
Check wiring between EFI main relay and ECM terminal + B (+ B1). BAD → Repair or replace.

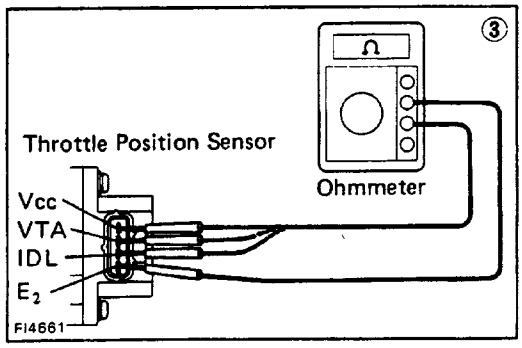
V01814

No.	Terminals	Trouble	Condition		STD Voltage
2	IDL – E_2 (E_{21})	No voltage	Ignition switch ON	Throttle valve open	9 – 14 V
	Vcc – E_2 (E_{21})			–	4.5 – 5.5 V
	VTA – E_2 (E_{21})			Throttle valve fully closed	0.3 – 0.8 V
				Throttle valve fully open	3.2 – 4.9 V









- **IDL – E2 (E21)**

(1) There is no voltage between ECM terminals IDL and E2 (E21). **(IG SW ON)**

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground. **(IG SW ON)**

NO

Refer to No. 1. — BAD → Replace or repair.

OK

OK

Check wiring between ECM terminal E1 and body ground.

OK

BAD

Replace or repair.

BAD

(3) Check throttle position sensor.

BAD

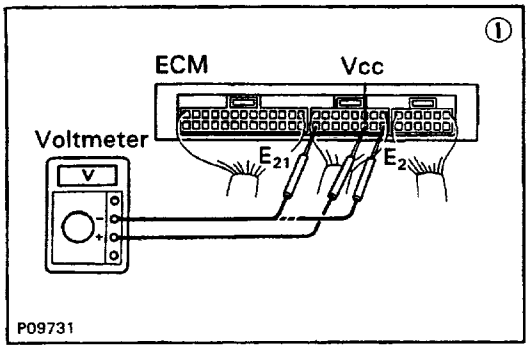
OK

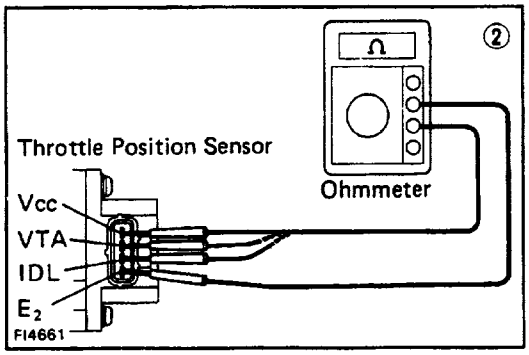
Replace or repair throttle position sensor.

Check wiring between ECM and throttle position sensor.

OK

Try another ECM.





- **Vcc – E2 (E21)**

(1) There is no voltage between ECM terminals Vcc and E2 (E21). **(IG SW ON)**

↓

Check that there is voltage between ECM terminals + B (+ B1) and E1. (IG SW ON)

OK → (2) Check throttle position sensor.

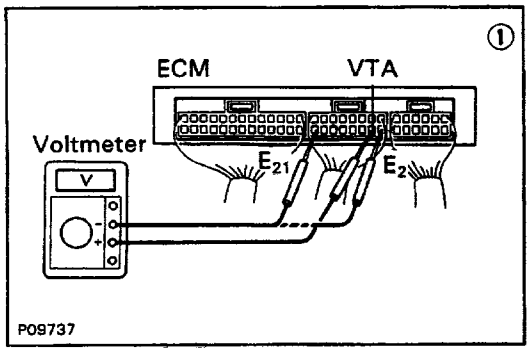
NO → Refer to No. 1.

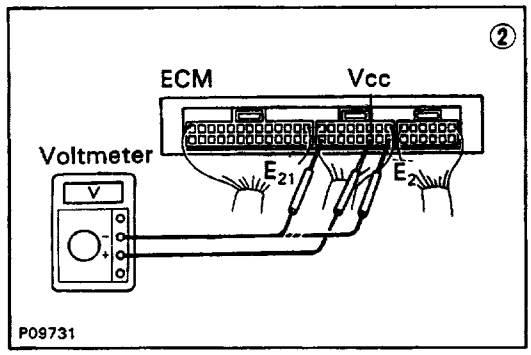
BAD → Repair or replace.

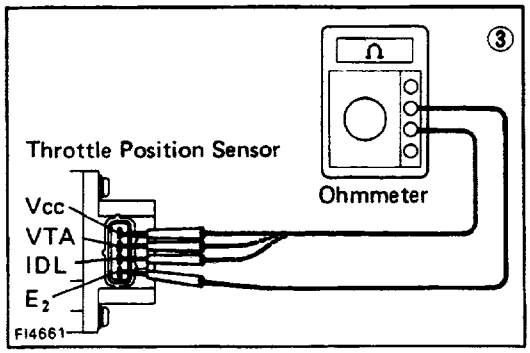
OK → Check wiring between ECM and throttle position sensor.

OK → Try another ECM.

BAD → Repair or replace wiring.







- **VTA – E2 (E21)**

(1) There is no specified voltage between ECM terminals VTA and E2 (E21).**(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminals Vcc and E2 (E21). **(IG SW ON)**

OK → (3) Check throttle position sensor.

NO → Perform inspection of Vcc – E1 (E21)

BAD → Repair or replace.

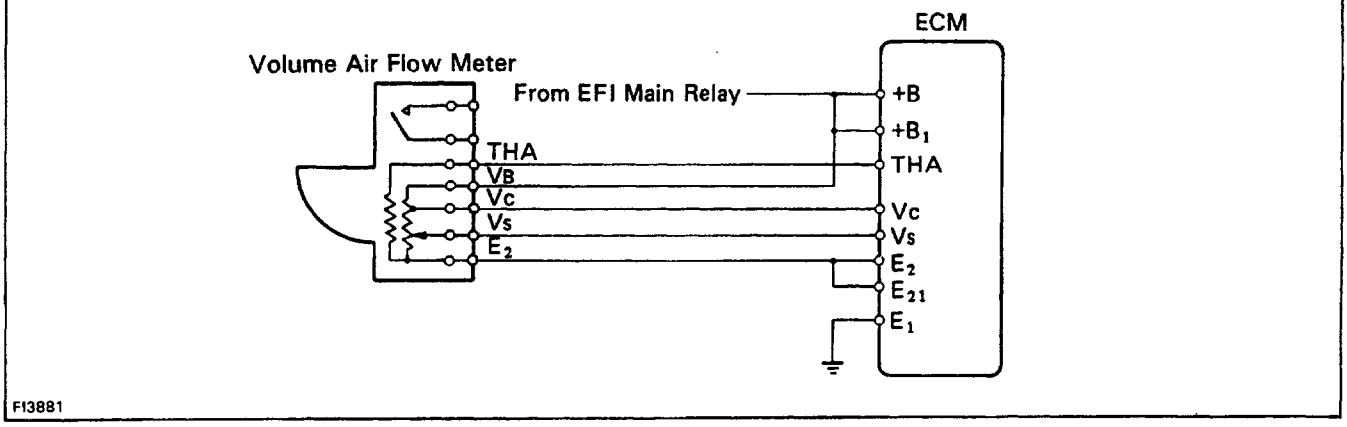
OK → Check wiring between ECM and throttle position sensor.

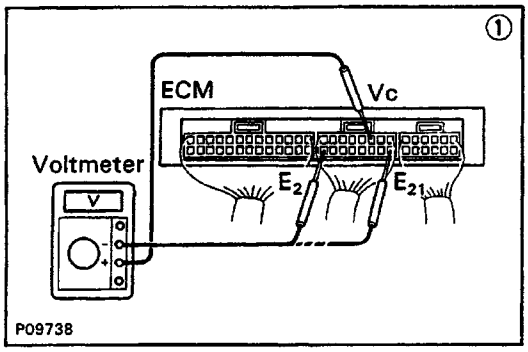
BAD → Repair or replace.

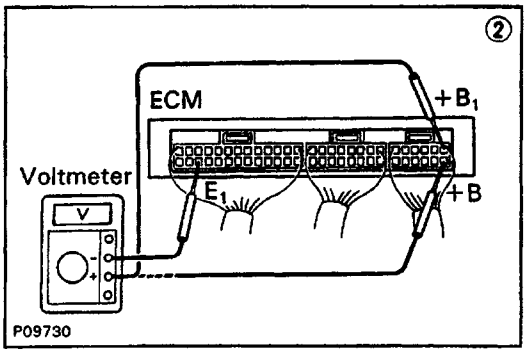
OK → Try another ECM.

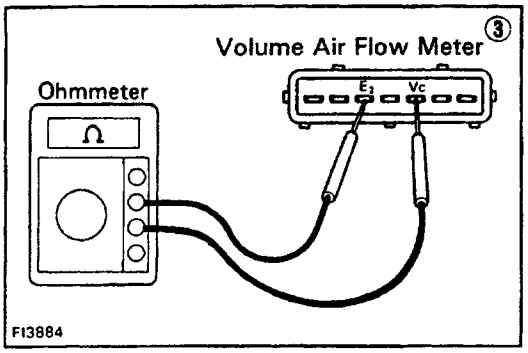
V01817

No.	Terminals	Trouble	Condition		STD Voltage
3	**Vc – E_2 (E_{21})**	No voltage	Ignition switch ON	–	**6 – 10 V**
	Vs – E_2 (E_{21})			Measuring plate fully closed	**0.5 – 2.5 V**
				Measuring plate fully open	**5 – 10 V**
			Idling		**2 – 8 V**
	THA – E_2 (E_{21})		Ignition switch ON	Intake air temperature 20°C (68° F)	**0.5 – 3.4 V**









- **Vc –E2 (E21)**

(1) There is no voltage between ECM terminals Vc and E2 (E21). **(IG SW ON)**

(2) Check that there is voltage between ECM terminals + B (+ B1) and E1. **(IG SW ON)**

OK → (1) Check volume air flow meter.

NO → Refer to No. 1.

(1) Check volume air flow meter.

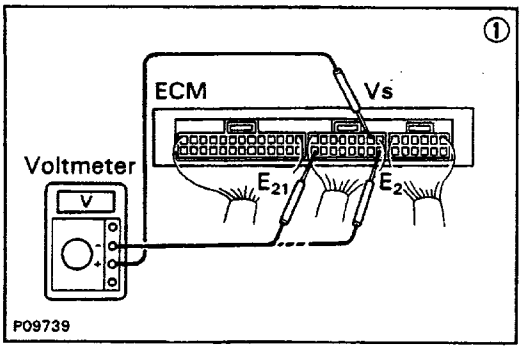
BAD → Replace or repair volume air flow meter.

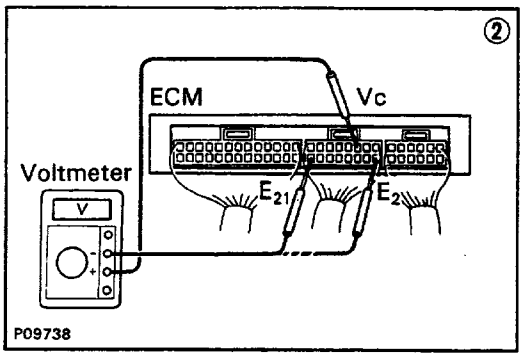
OK → Check wiring between ECM and volume air flow meter.

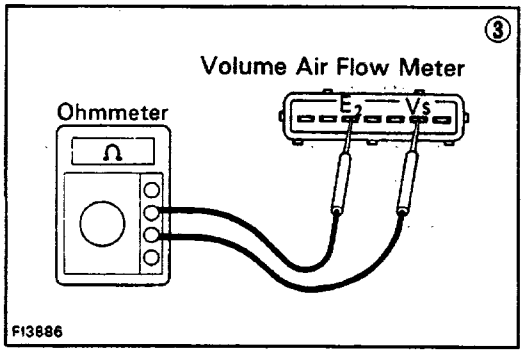
Check wiring between ECM and volume air flow meter.

OK → Try another ECM.

BAD → Replace or repair wiring.







- **Vs – E2 (E21)**

(1) There is no voltage between ECM terminals Vs and E2 (E21). **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminals Vc and E2 (E21). **(IG SW ON)**

OK ↓ / NO → Refer to Vc – E2 (E21) → BAD → Repair– or replace.

↓

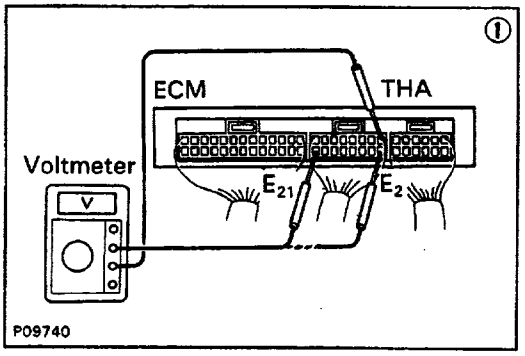
(3) Check volume air flow meter. → BAD → Repair or replace.

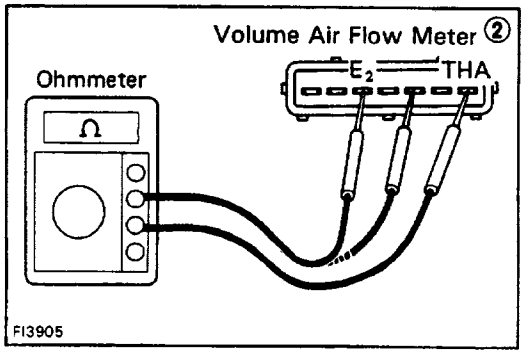
↓ OK

Check wiring between ECM and volume air flow meter. → BAD → Repair or replace.

↓ OK

Try another ECM.





- **THA – E2 (E21).**

(1) There is no voltage between ECM terminals THA and E2 (E21). **(IG SW ON)**

↓

Check that there is voltage between ECM terminal + B (+ B1) and body ground. **(IG SW ON)**

OK ↓ / NO → Refer to No. 1.

(2) Check intake air temp. sensor.

BAD ↓ / OK →

Replace volume air flow meter.

Check wiring between ECM and intake air temp. sensor.

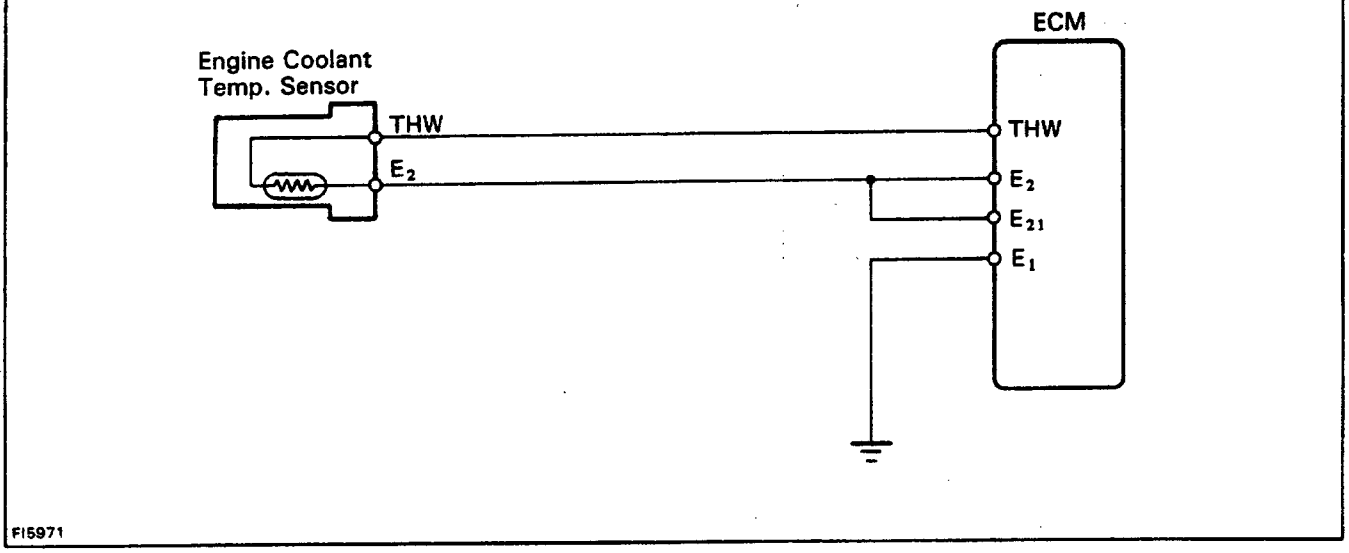
OK ↓ / BAD →

Try another ECM.

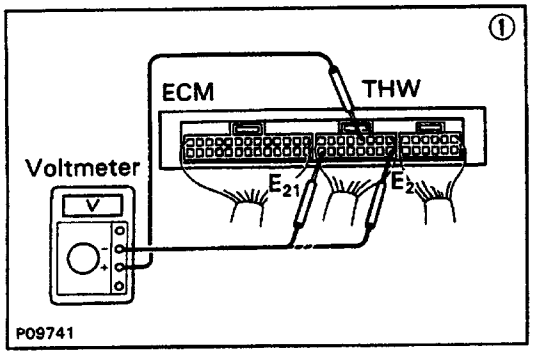
Repair or replace wiring.

V01819

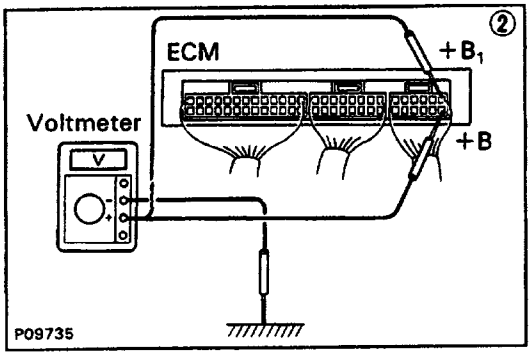
No.	Terminals	Trouble	Condition		STD– Voltage
4	THW – E_2 (E_{21})	No voltage	Ignition switch ON	Coolant temperature 80°C (176°)	0.2 – 1.0 V



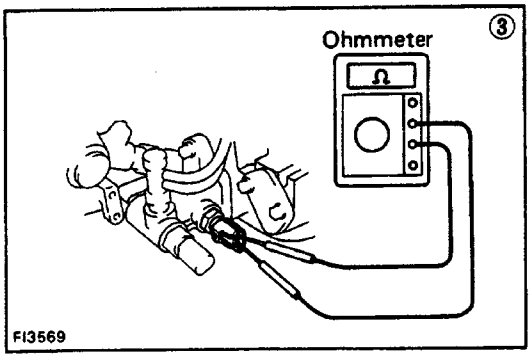
FI5971



P09741



P09735



FI3569

(1) There is no voltage between ECM terminals THW and E2 (E21). **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminal +B (+B1) and body ground.* **(IG SW ON)**

OK ↓

NO → Refer to No. 1.

↓

Check wiring between ECM terminal E1 and body ground.

OK ↓

BAD → Repair or replace.

↓

Check engine coolant temp. sensor.

BAD ↓

OK ↓

Replace engine coolant temp. sensor.

↓

Check wiring between ECM and engine coolant temp. sensor.

OK ↓

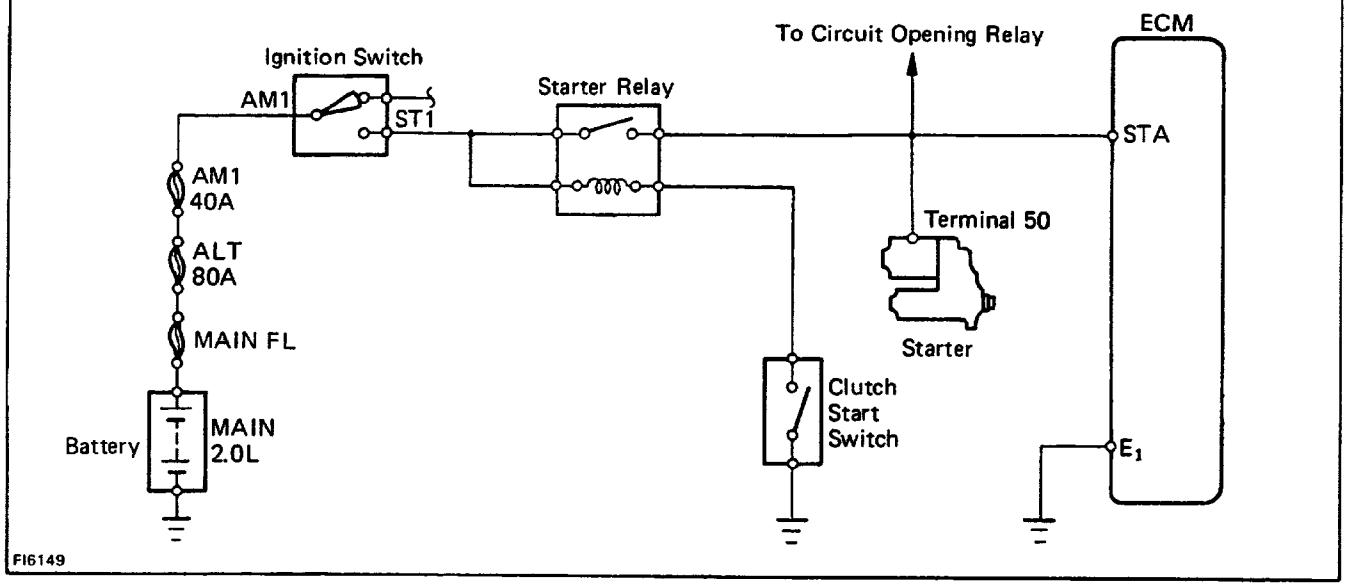
BAD → Repair or replace.

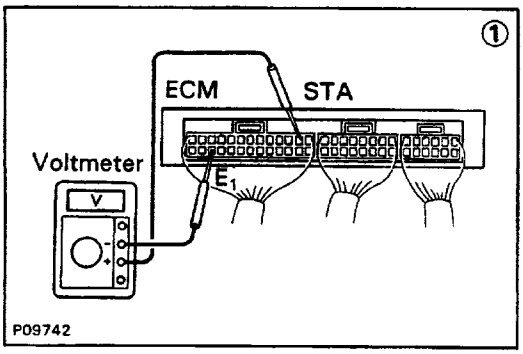
↓

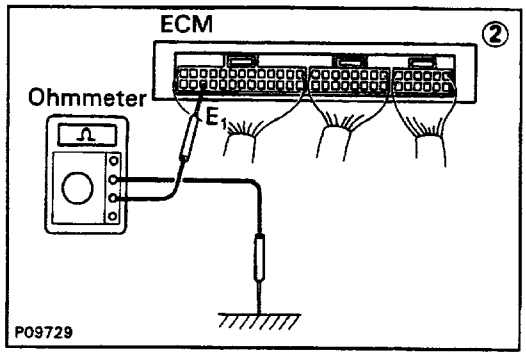
Try another ECM.

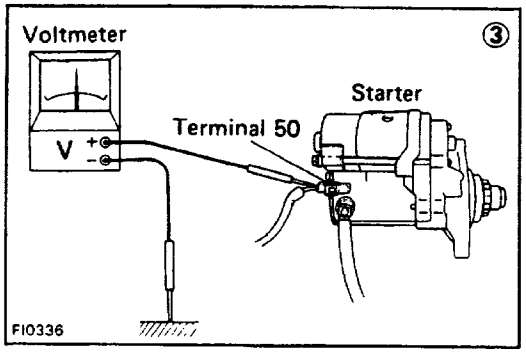
V01820

No.	Terminals	Trouble	Condition	STD Voltage
5	STA – E_1	No voltage	Ignition switch START position	6 – 12 V









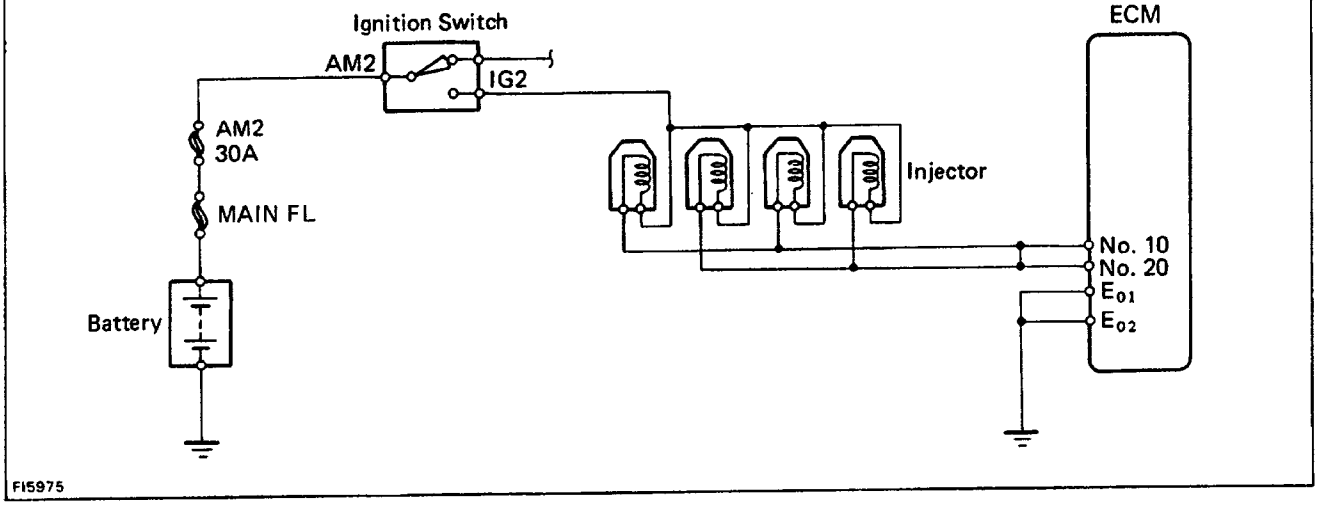
(1) There is no voltage between ECM terminals STA and E1.
(IG SW START)

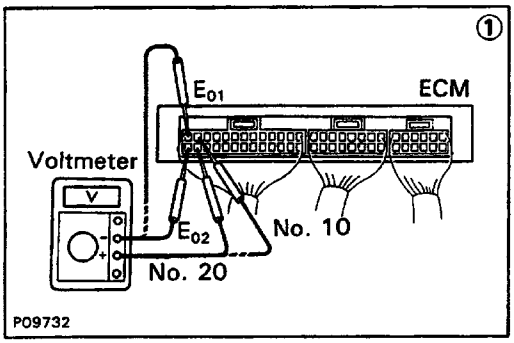
Check starter operation.
- OK. → Check wiring between ECM and ignition switch terminal ST.
  - BAD → Repair or replace.
- BAD → (2) Check wiring between ECM terminal E1 and body ground.
  - OK → Try another ECM.
  - BAD → Repair or replace.

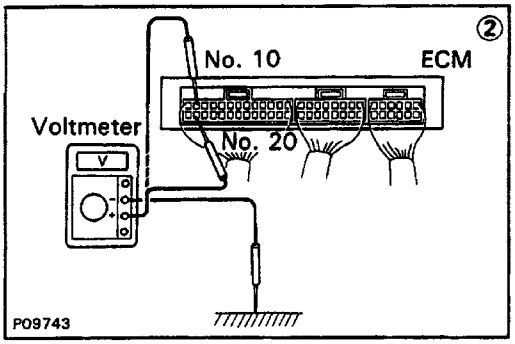
Check fusible link, battery, wiring and ignition switch.
- BAD → Repair or replace.
- OK → (3) Check that there is voltage at terminal 50 of starter.
  (IG SW START) STD voltage: 6 –12 V
  - OK → Check starter. (See ST section)
  - NO → Check wiring between ignition switch ST1 terminal and starter terminal 50.

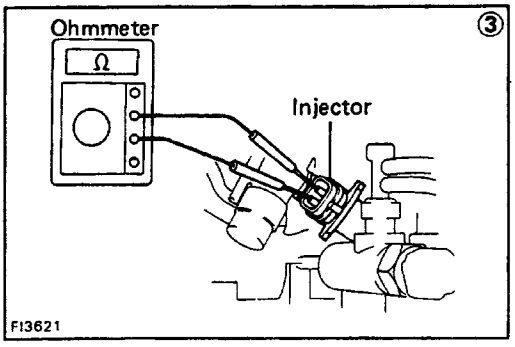
V01821

No.	Terminals	Trouble	Condition	STD Voltage
6	No. 10 – E_{01} No. 20 – E_{02}	No voltage	Ignition switch ON	9 – 14 V









(1) There is no voltage between ECM terminals No. 10 and/or No. 20 and E01, and/or E02– **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminal No. 10 and/or No. 20 and body ground.

NO → Check fusible link and ignition switch.

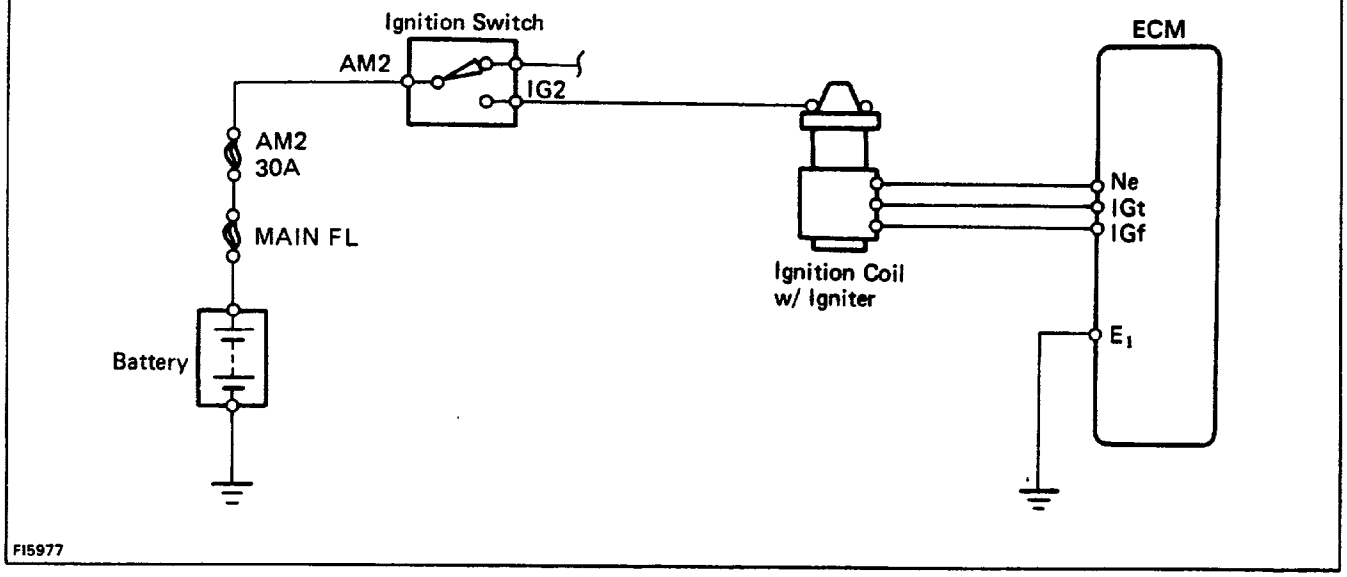
- BAD → Repair or replace.
- OK → (3) Check resistance of magnetic coil in each injector. **STD resistance: 13.4 – 14.2Ω**
  - NO → Replace injector.
  - OK → Check wiring between ECM terminal No. 10 and/or No. 20 and battery.
    - BAD → Repair or replace.

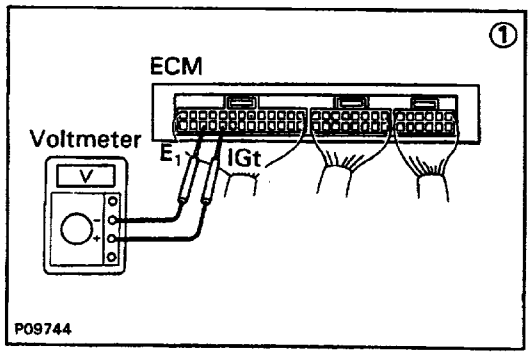
OK → Check wiring between E01, and/or E02 and body ground.

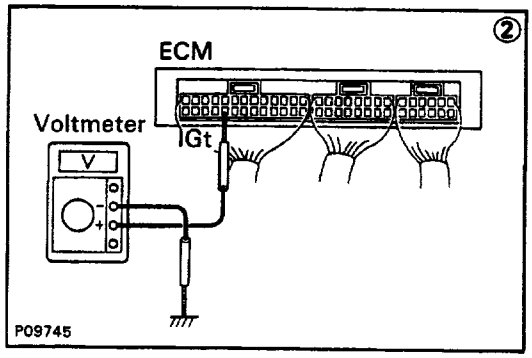
- BAD → Repair or replace.
- OK → Try another ECM.

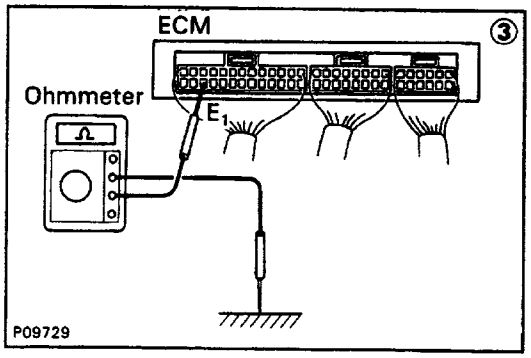
V01822

No.	Terminals	Trouble	Condition	STD Voltage
7	IGt – E_1	No voltage	Idling	0.7 – 1.0 V









(1) There is no voltage between ECM terminals IGt and E1. **(Idling)**

↓

(2) Check that there is voltage between ECM terminal IGt an body ground. **(Idling)**

NO → ↓

OK → (3) Check wiring between ECM terminal E1 and body ground.

BAD → Repair or replace.

↓

Refer to No. 1. — BAD → Repair or replace.

↓ OK

Check wiring between igniter and distributor. — BAD → Repair or replace.

↓ OK

Check distributor. — BAD → Replace.

↓ OK

Check wiring between ECM and igniter. — BAD → Repair or replace.

↓ OK

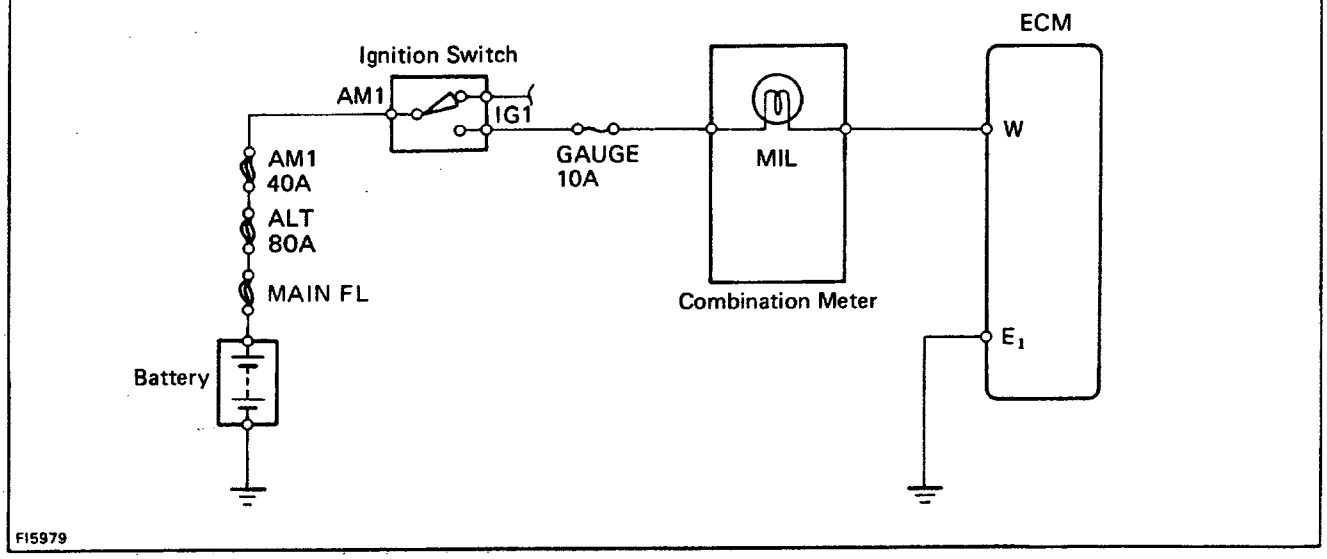
Check igniter. — BAD → Repair or replace.

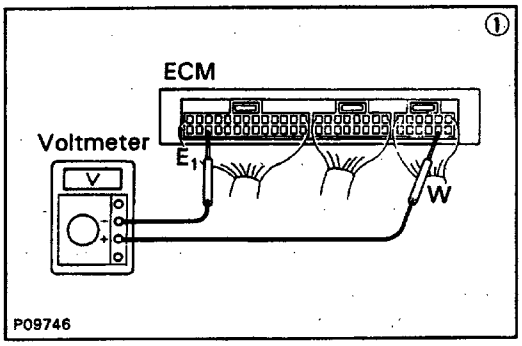
↓ OK

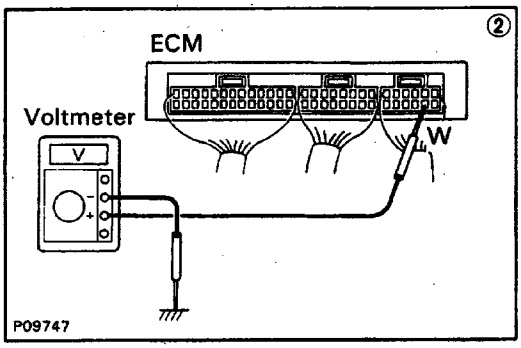
Try another ECM.

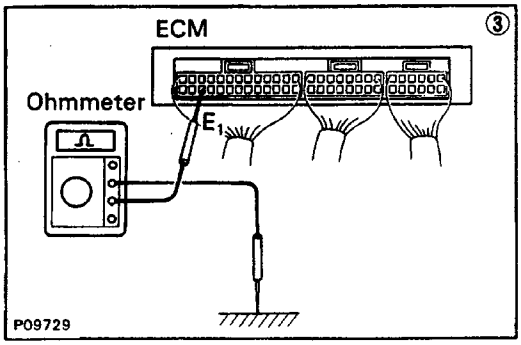
V01823

No.	Terminals	Trouble	Condition	STD Voltage
8	**W – E_1**	No voltage	No trouble (MIL off) and engine running	**9 – 14 V**









(1) There is no voltage between ECM terminals W and E1. **(Idling)**

↓

(2) Check that there is voltage between ECM terminal W and body ground.

NO → (3) Check wiring between ECM terminal E1 and body ground.

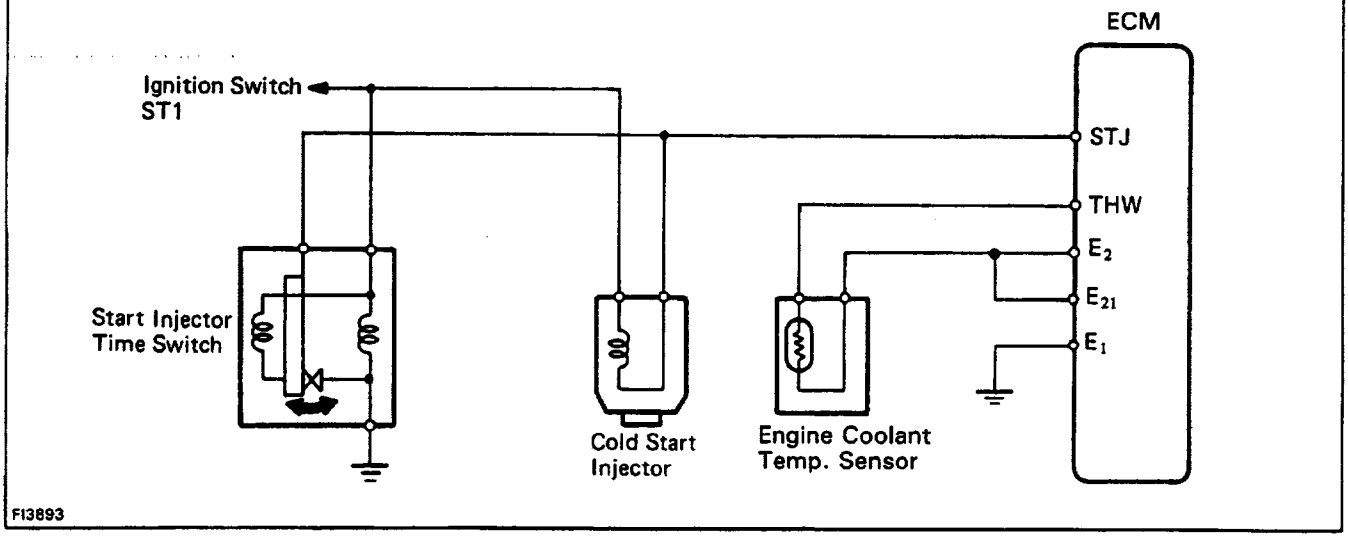
- OK → Try another ECM.
- BAD → Repair or replace.

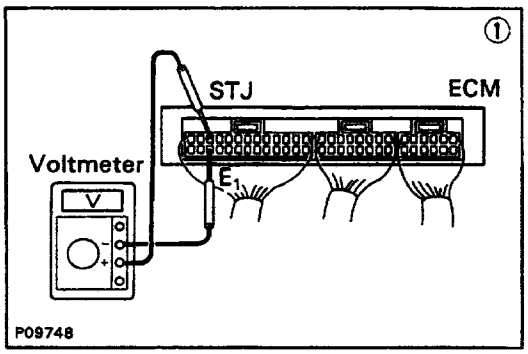
OK → Check GAUGE fuse (10 A) and MIL.

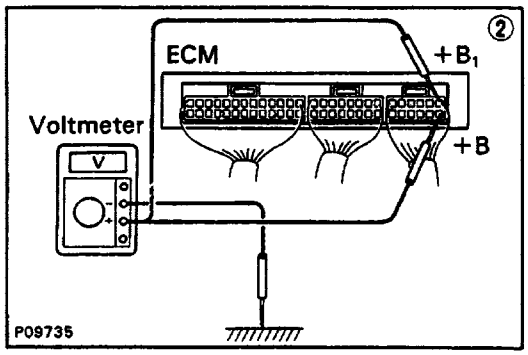
- BAD → Repair or replace.
- Fuse blows again → Check wiring between ECM terminal W and fuse.
  - BAD → Repair or replace.

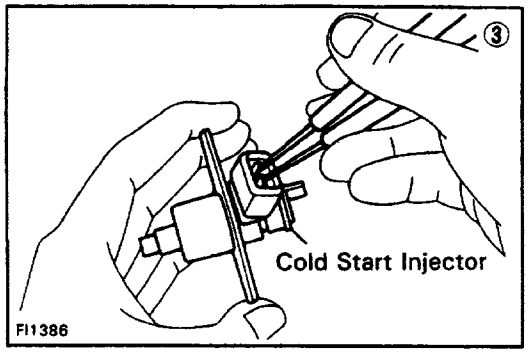
V01824

No.	Terminal	Trouble	Condition		STD Voltage
9	STJ – E_1	No voltage	Ignition switch ST position	Coolant temperature 80°C (176° F)	6 – 12 V









(1) There is no voltage between ECM terminals STJ and E1 **(IG SW ON)**

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground. **(IG SW ON)**

OK → (3) Check cold start injector.

NO → Refer to No. 1.

BAD → Replace cold start injector.

OK → Check wiring between ECM and cold start injector.

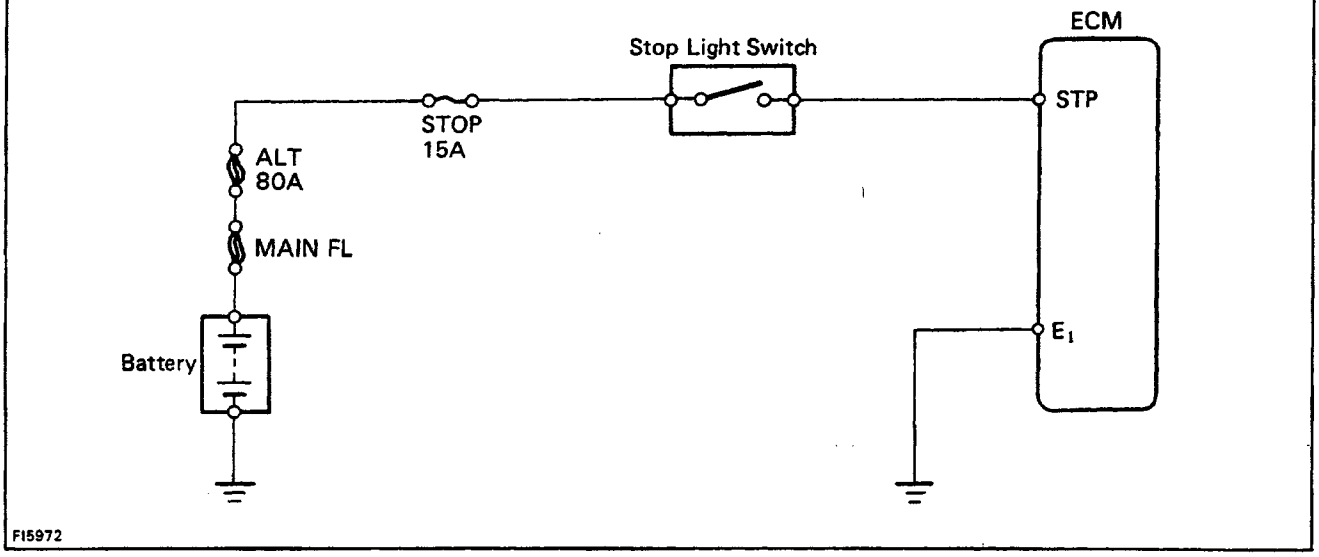
OK → Check wiring between ECM terminal E1 and body ground.

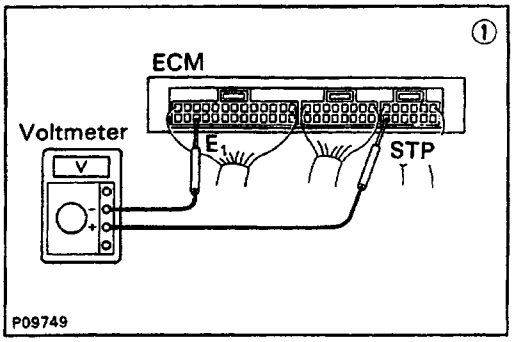
OK → Try another ECM.

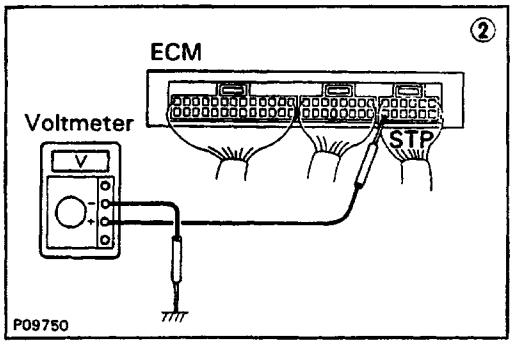
BAD → Repair or replace wiring.

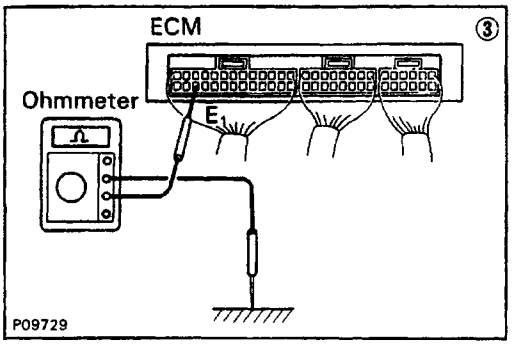
V01825

No.	Terminals	Trouble	Condition	STD Voltage
10	STP – E_1	No voltage	Stop tight switch ON	7.5 – 14 V









(1) There is no voltage between ECM terminals STP and E1.

↓

(2) Check that there is voltage between ECM terminal STP an body ground when the brake pedal is depressed.

NO → Check STOP fuse (15A) and stop light switch.

BAD → Repair or replace.

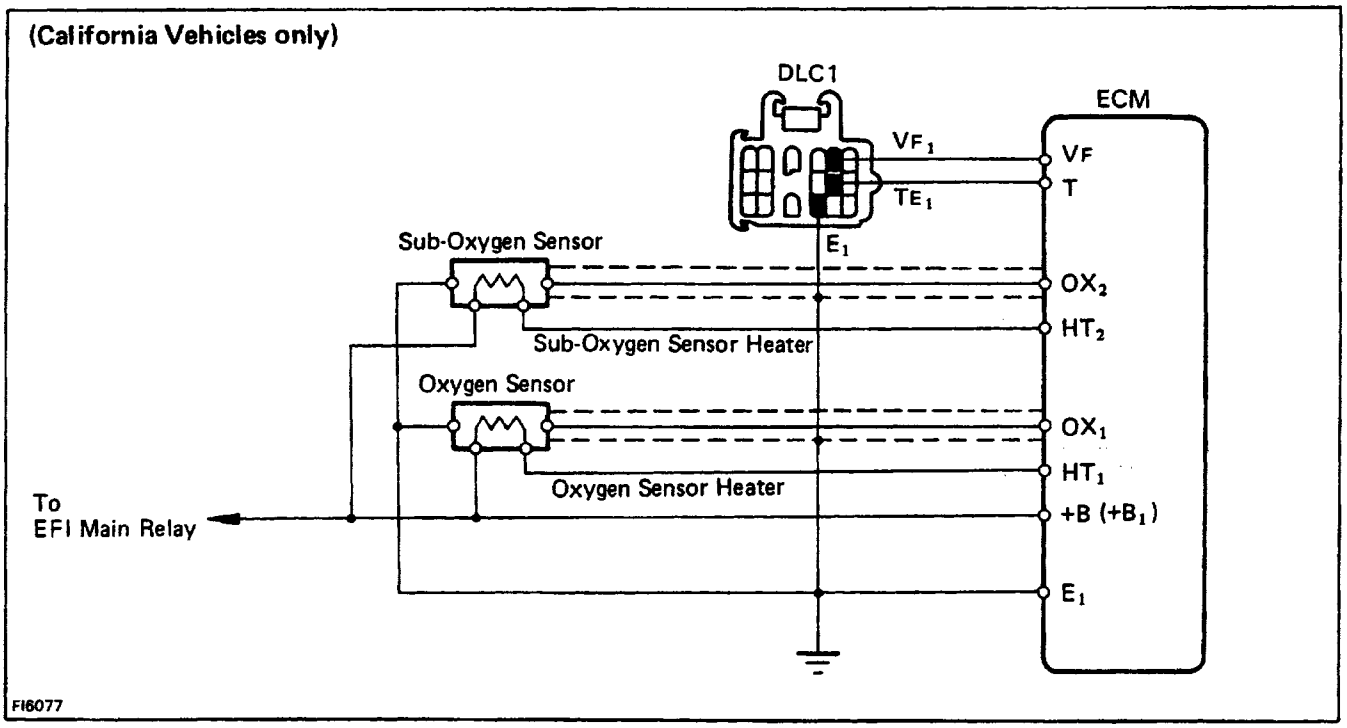
OK → Check wiring between ECM terminal STP and battery.

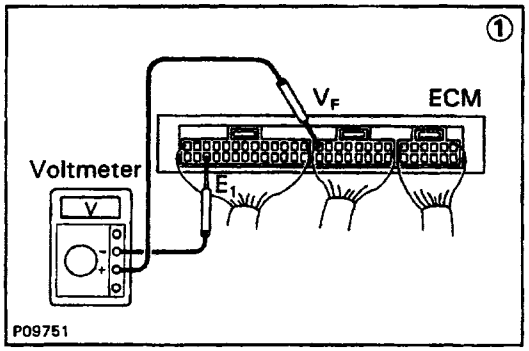
BAD → Repair or replace.

OK → (3) Check wiring between ECM terminal E1 and body ground.

OK → Try another ECM.

BAD → Repair or replace.





(1) There is no voltage between ECM terminals VF and E1.

(2) Check that there is voltage between ECM terminal VF and body ground.

NO

OK

Check wiring between ECM terminal E1 and body ground.

OK

BAD

Try another ECM.

Repair or replace.

Is air leaking into air induction system?

YES

Repair air leak.

NO

Check spark plugs.

BAD

Repair or replace.

OK

Check distributor and ignition system.

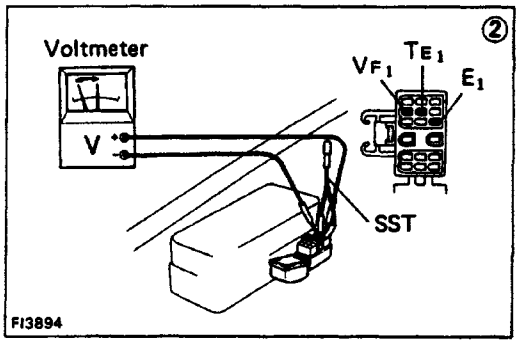
BAD

Repair or replace.

OK

CONTINUED ON PAGE EG1–157

V01827



CONTINUED FROM PAGE EG1–156

OK

Check fuel pressure. → BAD → Repair or replace.

OK

Check injector. → BAD → Repair or replace.

OK

Check cold start injector.* → BAD → Repair or replace.

OK

Check volume air flow meter. → BAD → Repair or replace.

OK

Check operation of oxygen sensor. → OK → System normal.

BAD

Check wiring between oxygen sensor and ECM connector. → BAD → Repair wiring.

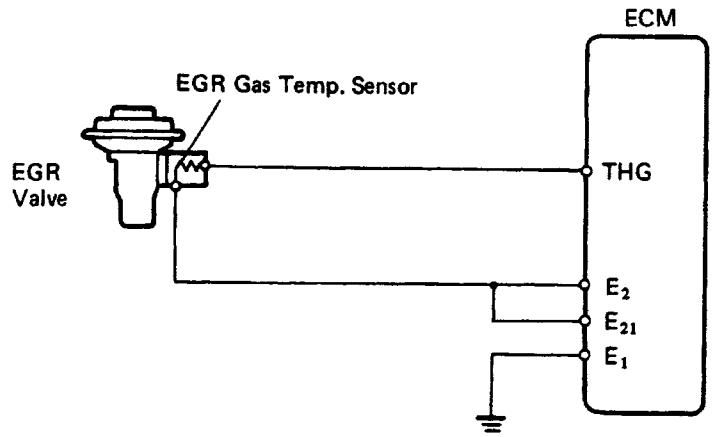
OK

Replace oxygen sensor.

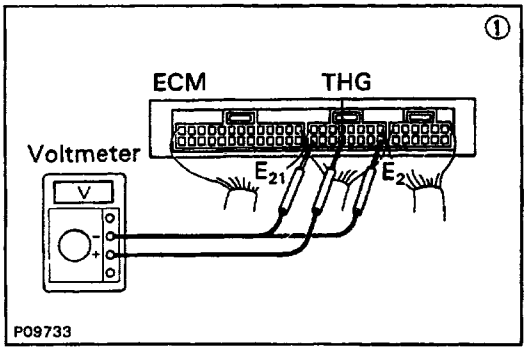
*Rich malfunction only.

V01829

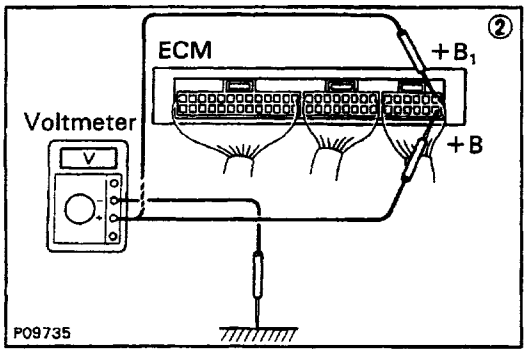
(California Vehicles only)



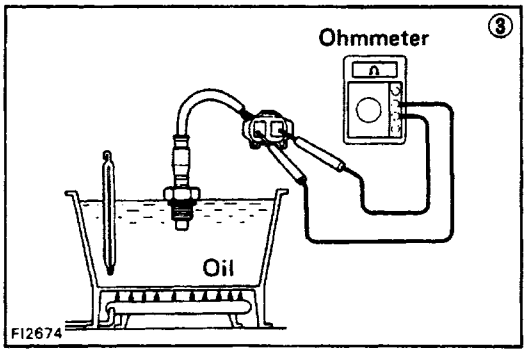
FI3895



P09733



P09735



FI2674

(1) There is no voltage between ECM terminals THG and E2 (E21) **(Engine running at 2,000 rpm)**

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground. **(IG SW ON)**

OK → Check wiring between ECM terminal E, and body ground.

NO → Refer to No. 1.

OK → Check EGR system.

BAD → Repair or replace.

BAD → Repair or replace.

OK → (3) Check EGR gas temp. sensor.

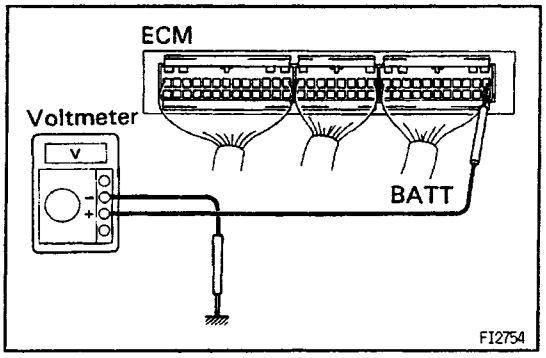
BAD → Replace EGR gas temp. sensor.

OK → Check wiring between ECM and EGR gas temp. sensor.

OK → Try another ECM.

BAD → Repair or replace.

V01828



MFI SYSTEM CHECK PROCEDURE (4WD A/T)

HINT:

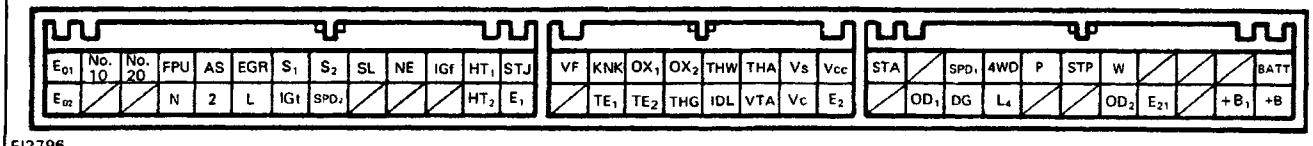
- Perform all voltage measurements with the connec–tors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is in ”ON” position.
  Using a voltmeter with high impedance (10 kΩ/V minimum), measure the voltage at each terminal of the wiring connector.

Terminals of ECM (4WD A/T)

Symbol	Terminal Name	Symbol	Terminal Name
E_{01}	ENGINE GROUND	TE_2	DLC 1
E_{02}	ENGINE GROUND	* Ox_2	OXYGEN SENSOR (SUB)
No.10	INJECTOR	* THG	EGR GAS TEMP. SENSOR
No.20	INJECTOR	THW	ENGINE COOLANT TEMP. SENSOR
Fpu	FUEL PRESSURE CONTROL VSV	IDL	THROTTLE POSITION SENSOR
N	PNP SWITCH	THA	INTAKE AIR TEMP. SENSOR
AS	PAIR VALVE	VTA	THROTTLE POSITION SENSOR
2	PNP SWITCH	Vs	VOLUME AIR FLOW METER
* EGR	EGR VSV	Vc	VOLUME AIR FLOW METER
L	PNP SWITCH	Vcc	THROTTLE POSITION SENSOR
S_1	No.1 SOLENOID	E_2	SENSOR GROUND
IGt	IGNITER	STA	STARTER SWITCH
S_2	No.2 SOLENOID	OD_1	CRUISE CONTROL COMPUTER
SPD_2	SPEED SENSOR	SPD_1	SPEED SENSOR
S_L	SL .SOLENOID	DG	DLC 1
Ne	DISTRIBUTOR	4WD	4WD SWITCH
IGf	IGNITER	L_4	TRANSFER POSITION SWITCH
HT_1	OXYGEN SENSOR HEATER (MAIN)	P	PATTERN SELECT SWITCH
* HT_2	OXYGEN SENSOR HEATER (SUB)	STP	STOP LIGHT SWITCH
STJ	COLD START INJECTOR	W	MALFUNCTION INDICATOR LAMP
E_1	ENGINE GROUND	OD_2	CRUISE CONTROL COMPUTER
V_F	DLC 1	E_{21}	SENSOR GROUND
KNK	KNOCK SENSOR	$+B_1$	MAIN RELAY
TE_1	DLC 1	BATT	BATTERY POSITIVE VOLTAGE
Ox_1	OXYGEN SENSOR (MAIN)	+B	MAIN RELAY

* : California only

ECM Terminals

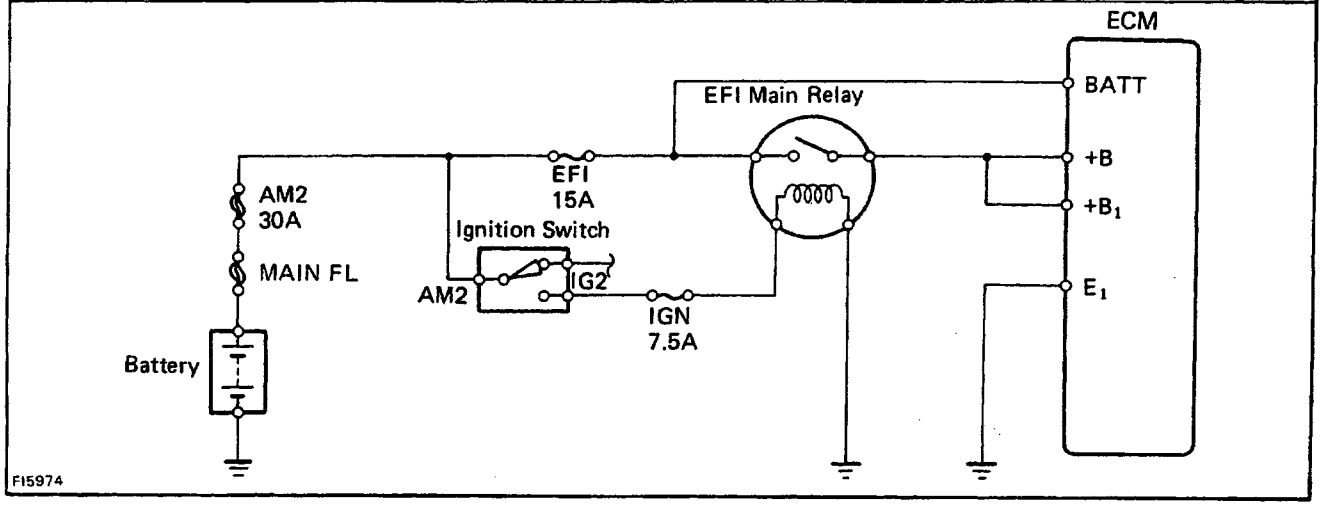


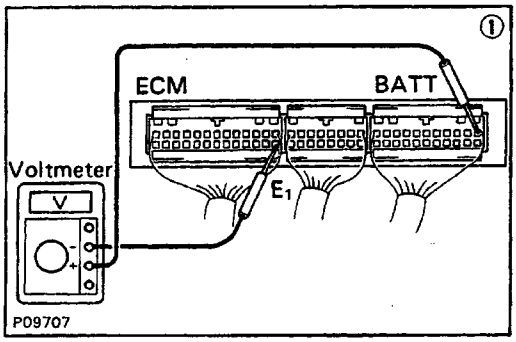
Voltage at ECM Connectors (4WD A/T)

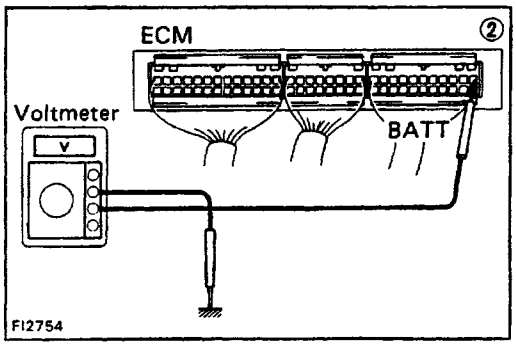
No.	Terminals	Condition		STD voltage	See page
1	BATT – E_1	–		9 – 14	EG1–161
	+B – E_1	Ignition switch ON			
	+B_1 – E_1				
2	IDL – E_2 (E_{21})	Ignition switch ON	Throttle valve open	9 – 14	EG1–163
	Vcc – E_2 (E_{21})		–	4.5 – 5.5	
	VTA – E_2 (E_{21})		Throttle valve fully closed	0.3 – 0.8	
			Throttle valve fully open	3.2 – 4.9	
3	Vc – E_2 (E_{21})	Ignition switch ON	–	6 – 10	EG1–165
	Vs – E_2 (E_{21})		Measuring plate fully closed	0.5 – 2.5	
			Measuring plate fully open	5 – 10	
		Idling		2 – 8	
	THA – E_2 (E_{21})	Ignition switch ON	Intake air temperature 20°C (68°F)	0.5 – 3.4	
4	THW – E_2 (E_{21})	Ignition switch ON	Coolant temperature 80°C (176°F)	0.2 – 1.0	EG1–167
5	STA – E_1	Ignition switch START position		6 – 12	EG1–168
6	No. 10 – E_{01} No. 20 – E_{02}	Ignition switch ON		9 – 14	EG1–169
7	IGt – E_1	Idling		0.7 – 1.0	EG1–170
8	W – E_1	No trouble (MIL off) and engine running		9 – 14	EG1–171
9	STJ – E_1	Ignition switch START position	Coolant temperature 80°C (176°F)	6 – 12	EG1–172
10	STP – E_1	Stop light switch ON		7.5 – 14	EG1–173

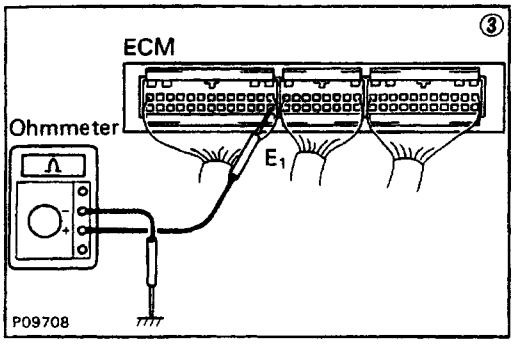
V01831

No.	Terminals	Trouble	Condition	STD Voltage
1	BATT – E_1	No voltage	–	9 – 14 V
	+B – E_1		Ignition switch ON	
	$+B_1$ – E_1			









- **BATT – E 1**

(1) There is no voltage between ECM terminals BATT and E1.

↓

(2) Check that there is voltage between ECM terminal BATT and body ground.

NO → ↓ OK

↓

(3) Check wiring between ECM terminal E1 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

↓

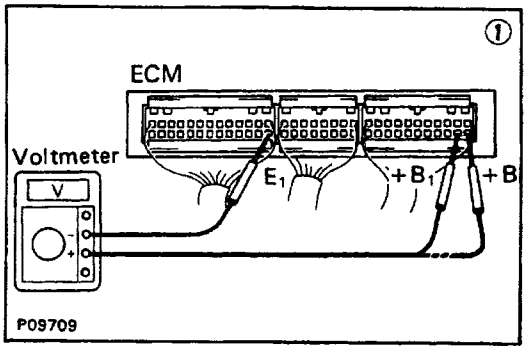
Check fuse and fusible link.

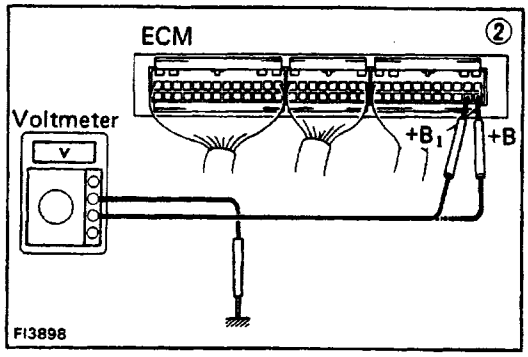
BAD → Replace.

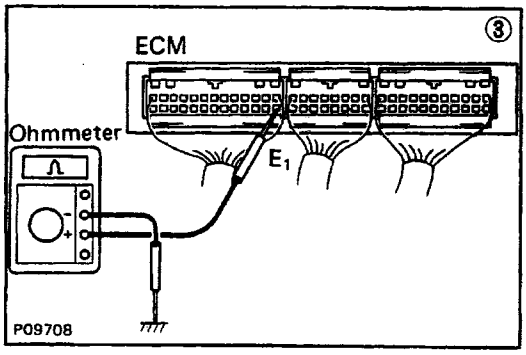
↓ OK

Check wiring between fuse and ECM.

BAD → Repair or replace.







- **+B (B+) –E1**

(1) There is no voltage between ECM terminals +B (+B1) and E1. **(IG SW ON)**

(2) Check that there is voltage between ECM terminal + B (+B1) and body ground. **(IG SW ON)**

NO — **OK**

(3) Check wiring between ECM terminal E1 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

Check fuse, fusible link and ignition switch. — BAD → Repair or replace.

OK

Check EF I main relay. — BAD → Replace.

OK

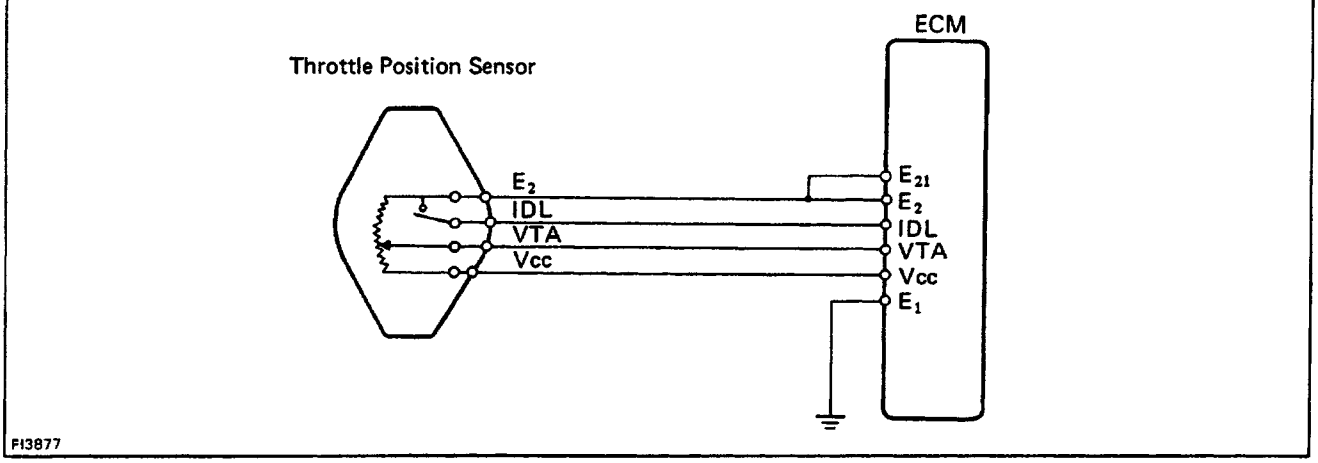
Check wiring between EFI main relay and battery. — BAD → Repair or replace.

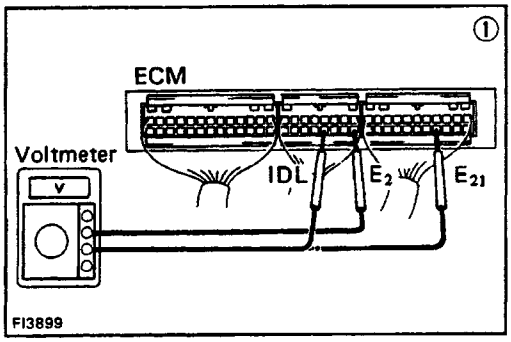
OK

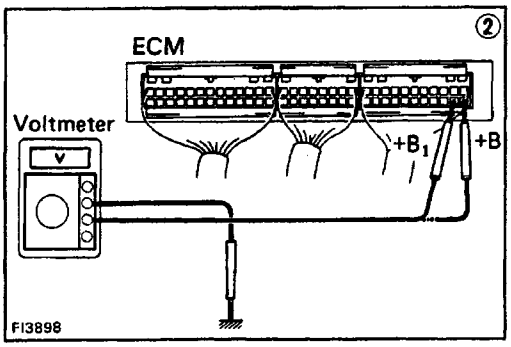
Check wiring between EM main relay and ECM terminal +B (+B1). — BAD → Repair or replace.

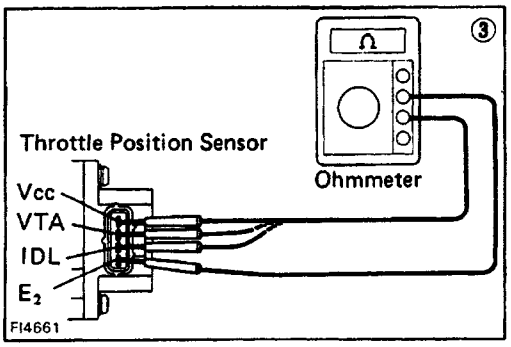
V01832

No.	Terminals	Trouble	Condition		STD Voltage
2	IDL – E_2 (E_{21})	No voltage	Ignition switch ON	Throttle valve open	9 – 14V
	Vcc – E_2 (E_{21})			–	4.5 – 5.5 V
	VTA – E_2 (E_{21})			Throttle valve fully dosed	0.3 – 0.8 V
				Throttle valve fully open	3.2 – 4.9 V









- **IDL – E2 (E21)**

(1) There is no voltage between ECM terminals IDL and E2 (E21). **(IG SW ON)** (Throttle valve open)

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground. **(IG SW ON)**

NO

Refer to No. 1. — BAD → Replace or repair.

OK

OK

Check wiring between ECM terminal E1 and body ground.

OK

BAD → Replace or repair.

BAD

(3) Check throttle position sensor.

BAD

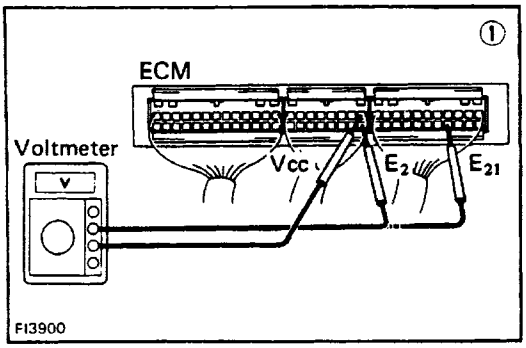
Replace or repair throttle position sensor.

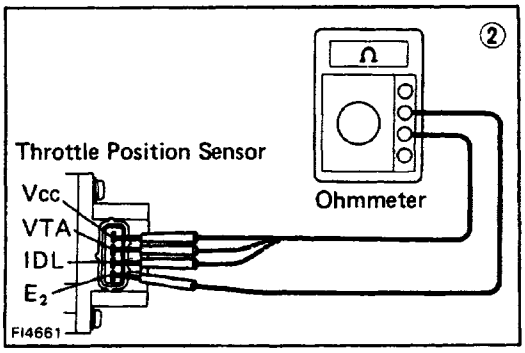
OK

Check wiring between ECM and throttle position sensor.

OK

Try another ECM.





- **Vcc – E2 (E21)**

(1)There is no voltage between ECM terminals Vcc and E2. **(IG SW ON)**

(1) Check that there is voltage between ECM terminals + B (+ B1) and E1. **(IG SW ON)**

OK → Check throttle position sensor.

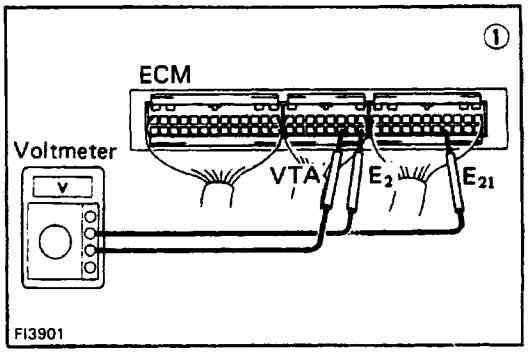
NO → Refer to No. 11 .

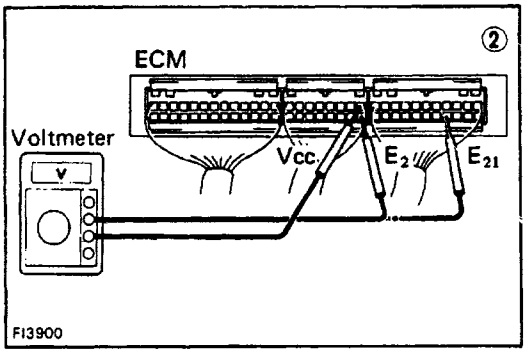
BAD → Repair or replace.

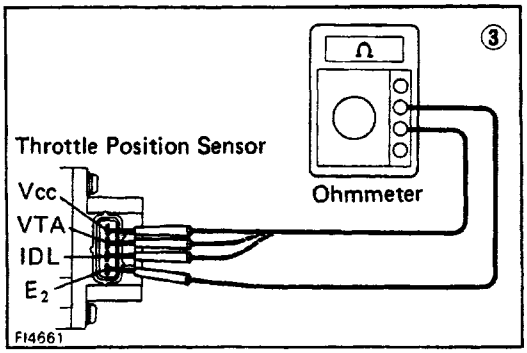
OK → Check wiring between ECM and throttle position sensor.

OK → Try another ECM.

BAD → Repair or replace wiring.







- **VTA – E2 (E21)**

(1) There is no voltage between ECM terminals VTA and E2 (E21). **(IG SW ON)**

(2) Check that there is voltage between ECM terminals Vcc and E2 (E21). **(IG SW ON)**

OK → (3) Check throttle position sensor.

NO → Perform inspection of Vcc – E2 (E21).

BAD → Repair or replace.

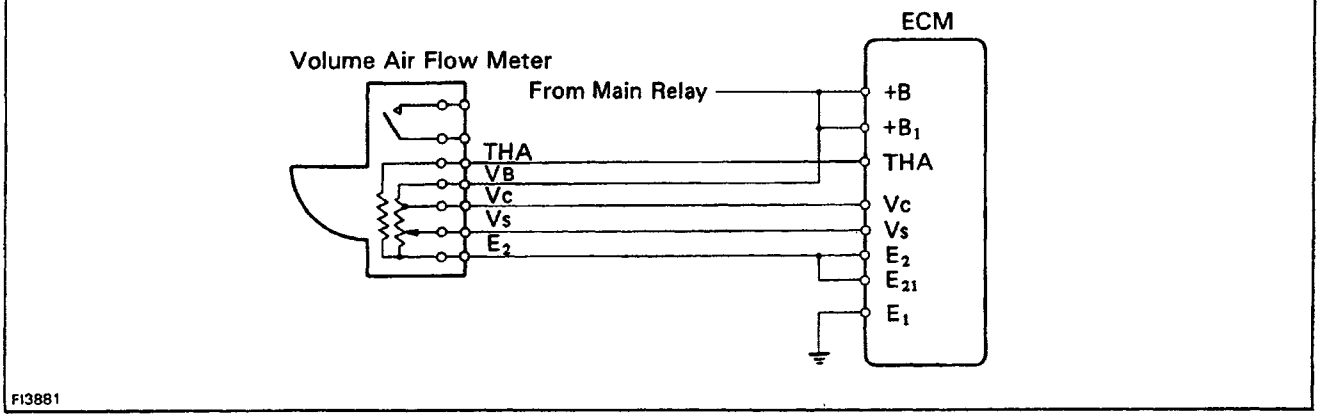
OK → Check wiring between ECM and throttle position sensor.

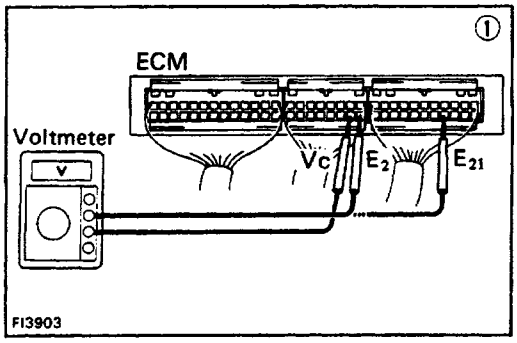
BAD → Repair or replace.

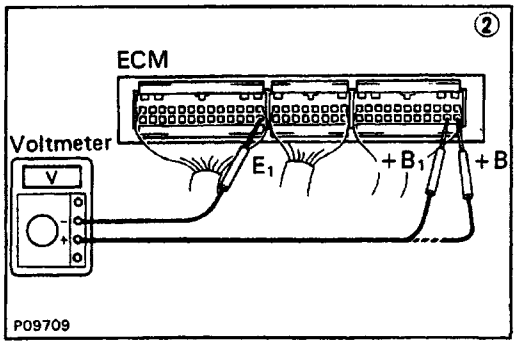
OK → Try another ECM.

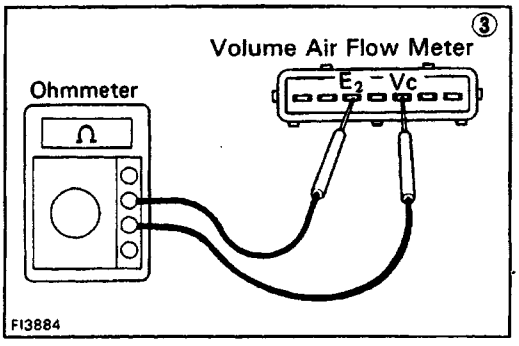
V01835

No.	Terminals	Trouble	Condition		STD Voltage
3	**Vc – E_2 (E_{21})**	No voltage	Ignition switch ON	–	**6 – 10 V**
	Vs – E_2 (E_{21})			Measuring plate fully closed	**0.5 – 2.5 V**
				Measuring plate fully open	**5 – 10 V**
			Idling		**2 – 8 V**
	THA – E_2 (E_{21})		Ignition switch ON	Intake air temperature 20°C (68°F)	**0.5 – 3.4 V**









- **Vc – E2 (E21)**

(1) There is no voltage between ECM terminals Vc and E2 (E21). **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminals +B (+ B1) and E1. **(IG SW ON)**

↓ OK

(3) Check volume air flow meter.

↓ BAD

Replace or repair volume air flow meter.

↓ OK

Check wiring between ECM and volume air flow meter.

↓ OK

Try another ECM.

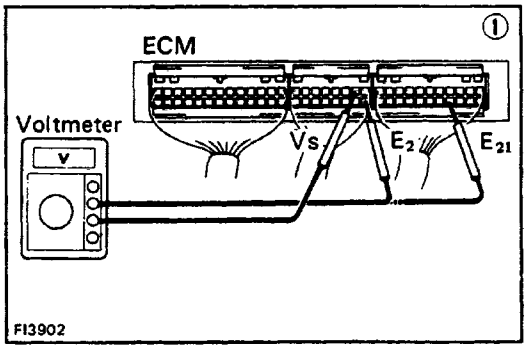
↓ BAD

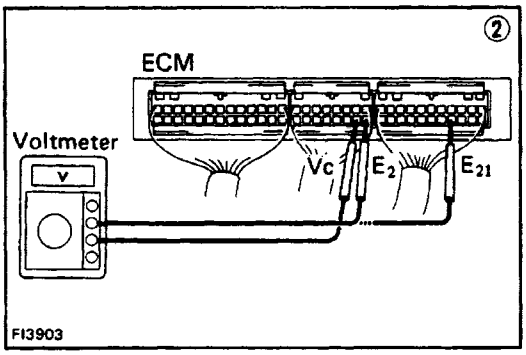
Replace or repair wiring.

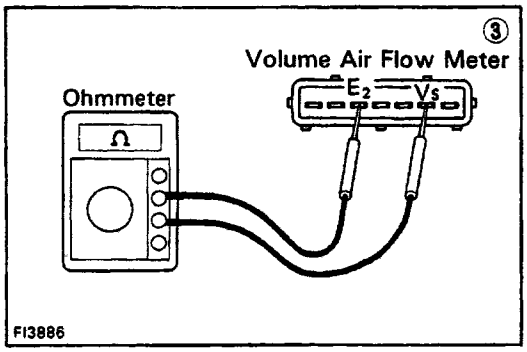
NO

Refer to No. 1.

V01836







- **Vs – E2 (E21)**

(1) There is no voltage between ECM terminals Vs and E2 (E21). **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminals Vc and E2 (E201). **(IG SW ON)**

OK ↓ / NO → Refer to Vcc – E2 (E21). BAD → Repair or replace.

↓

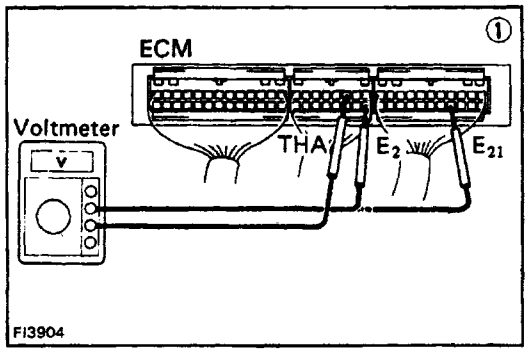
Check volume air flow meter. BAD → Repair or replace.

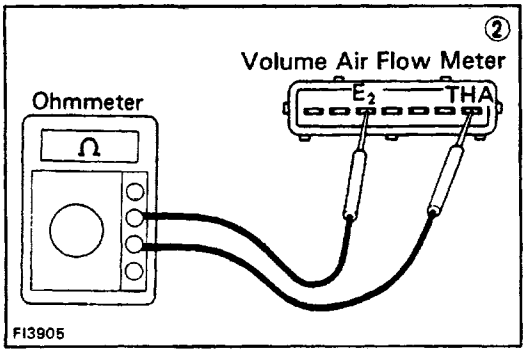
↓ OK

Check wiring between ECM and volume air flow meter. BAD → Repair or replace.

↓ OK

Try another ECM.





- **THA – E2 (E21)**

(1) There is no voltage between ECM terminals THA and E2 (E21). **(IG SW ON)**

↓

Check that there is voltage between ECM terminal +B (+ B1) and body ground. (**IG SW ON)**

OK ↓ / NO → Refer to No. 1.

↓

(2) Check intake air temp. sensor.

BAD ↓ / OK →

Replace volume air flow meter.

Check wiring between ECM and intake air temp. sensor.

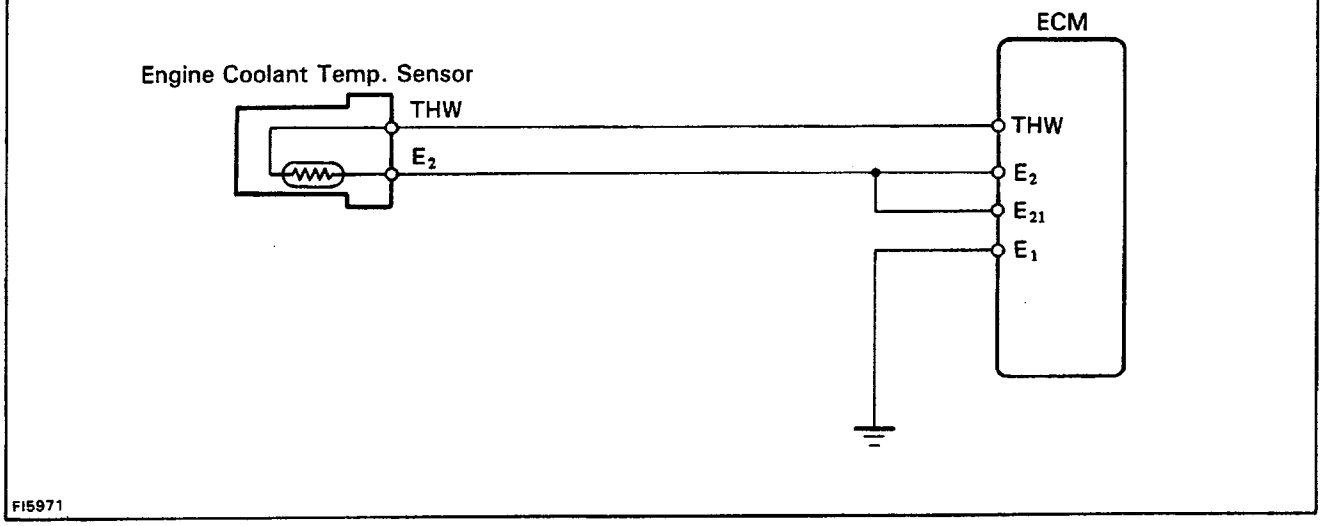
OK ↓ / BAD →

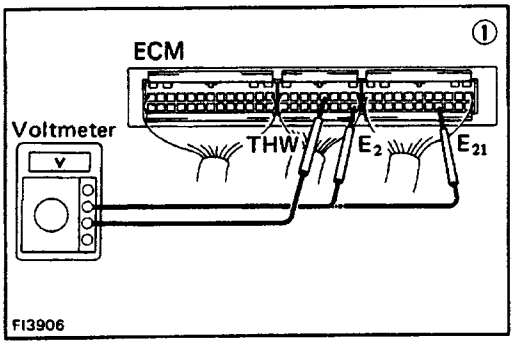
Try another ECM.

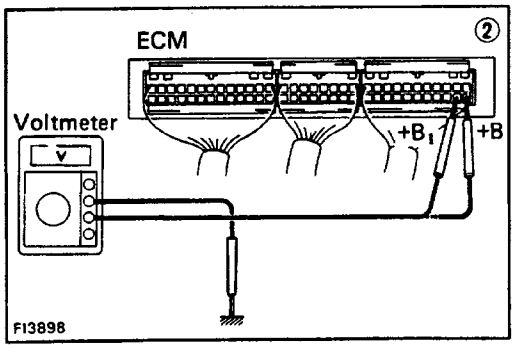
Repair or replace wiring.

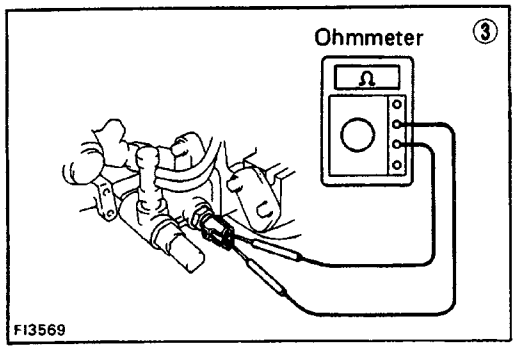
V01837

No.	Terminals	Trouble	Condition		STD Voltage
4	**THW – E_2 (E_{21})**	No voltage	Ignition switch ON	Coolant temperature 80°C (176°F)	**0.2 – 1.0 V**









(1) There is no voltage between ECM terminals THW and E2 (E21) **(IG SW ON)**

↓

(2) Check that there is voltage between ECM terminal + B (+ B1) and body ground. **(IG SW ON)**

OK → ↓

NO → Refer to No. 1.

↓

Check wiring between ECM terminal E1 and body ground.

OK → ↓

BAD → Repair or replace.

↓

Check engine coolant temp. sensor.

BAD → Replace engine coolant temp. sensor.

OK → ↓

Check wiring between ECM and engine coolant temp. sensor.

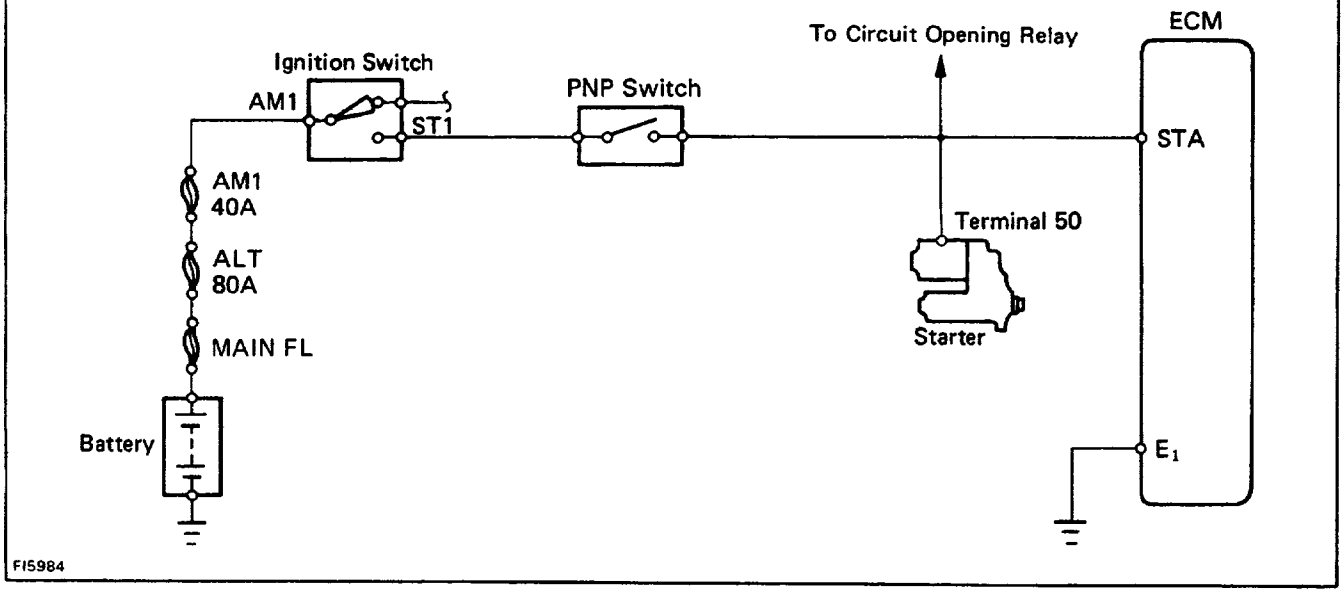
OK → ↓

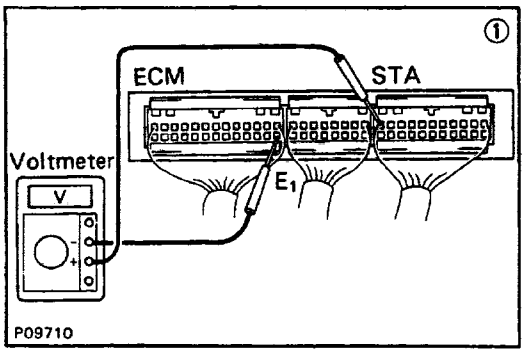
BAD → Repair or replace.

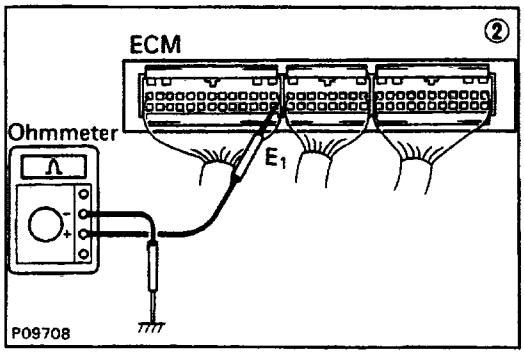
↓

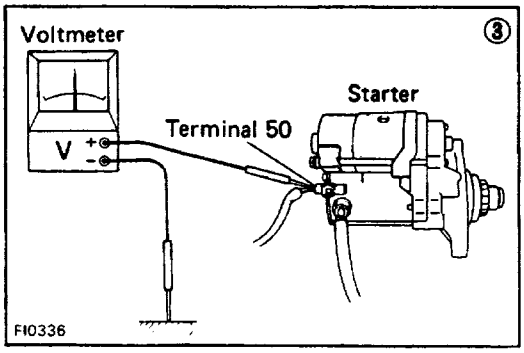
Try another ECM.

No.	Terminals	Trouble	Condition	STD Voltage
5	STA – E 1	No voltage	Ignition switch START position	6–12V









(1) There is no voltage between ECM terminals STA and E1 **(IG SW START)**

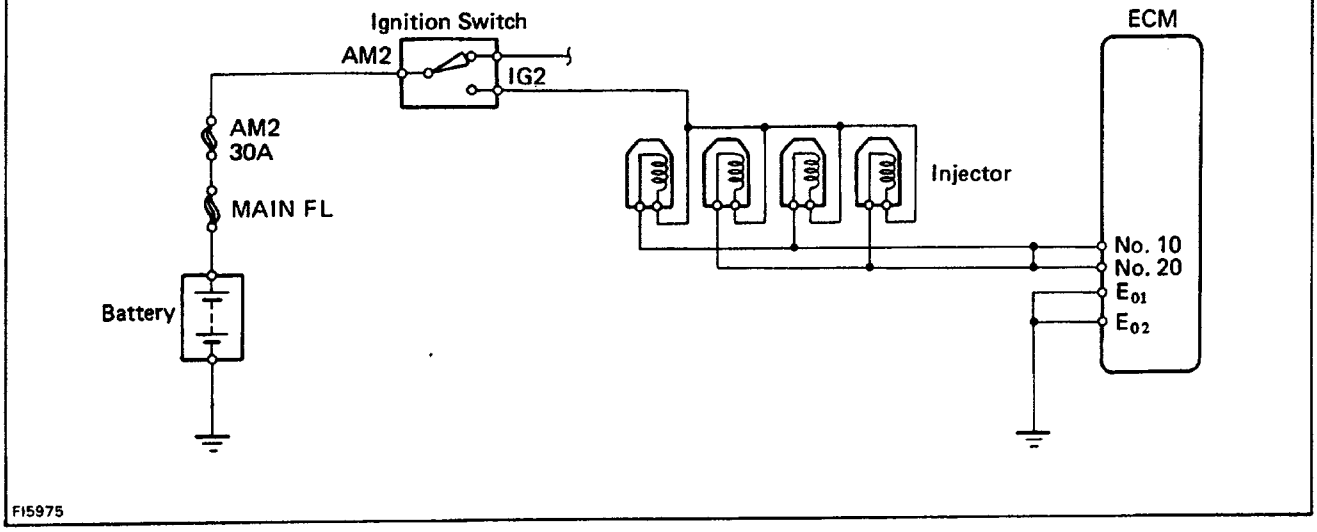
Check starter operation.
- OK → Check wiring between ECM and ignition switch terminal ST.
  - OK → Check wiring between ECM terminal E1 and body ground.
    - OK → Try another ECM.
    - BAD → Repair or replace.
  - BAD → Repair or replace.
- BAD

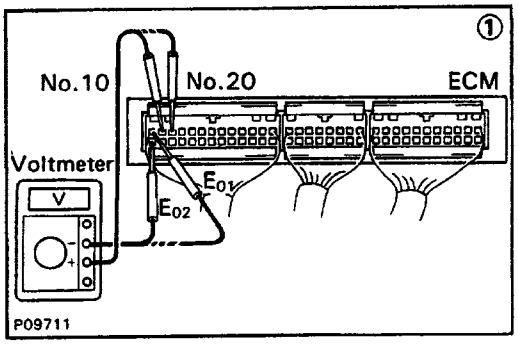
Check fusible link, battery, wiring and ignition switch.
- BAD → Repair or replace.
- OK

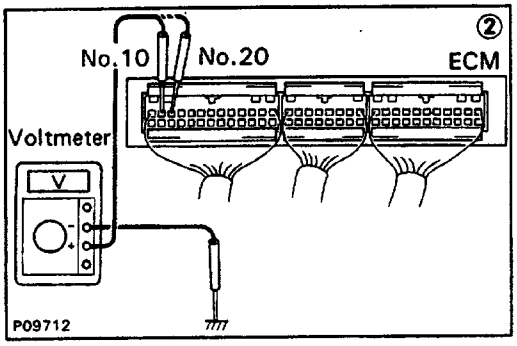
(3) Check that there is voltage at terminal 50 of starter. **(IG SW ST) STD voltage: 6 –12 V**
- OK → Check starter. (See ST section)
- NO → Check wiring between ignition switch ST1 terminal and starter terminal 50.

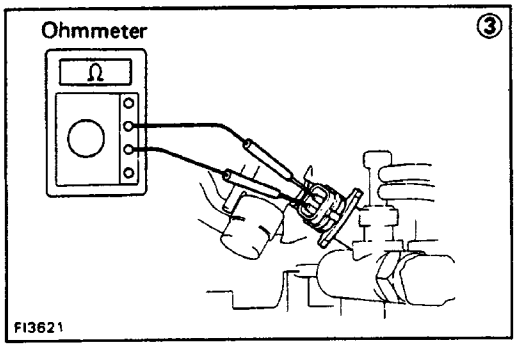
V01839

No.	Terminals	Trouble	Condition	STD Voltage
6	No. 10 – E_{01} No. 20 – E_{02}	No voltage	Ignition switch ON	9 – 14 V









(1) There is no voltage between ECM terminals No. 10 and/or No. 20 and E01, and/or E02– **(IG SW ON)**

↓

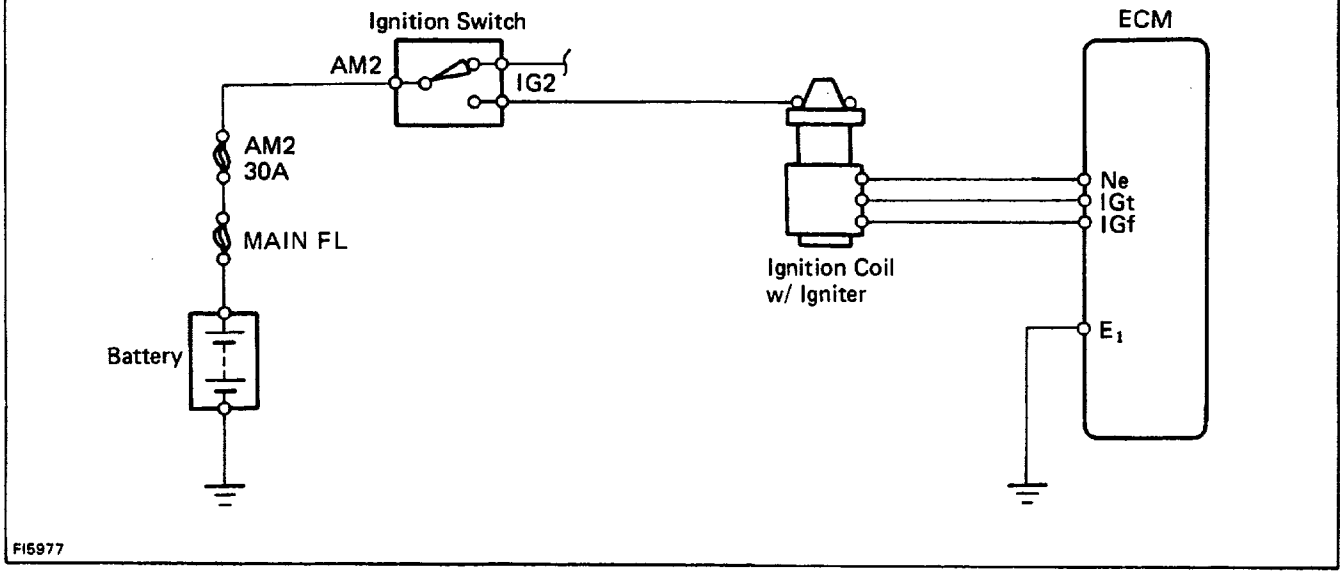
(2) Check that there is voltage between ECM terminal No. 10 a and/or No. 20 and body ground.

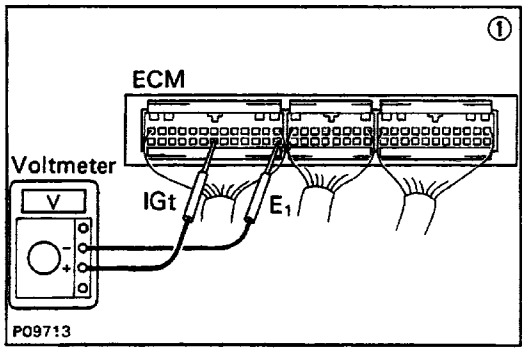
NO → Check fusible link and ignition switch.
- BAD → Repair or replace.
- OK → (3) Check resistance of magnetic coil in each injector **STD resistance: 13.4 – 14.2 Ω**
  - NO → Replace injector.
  - OK → Check wiring between ECM terminal No. 10 and/or No. 20 and battery.
    - BAD → Repair or replace.

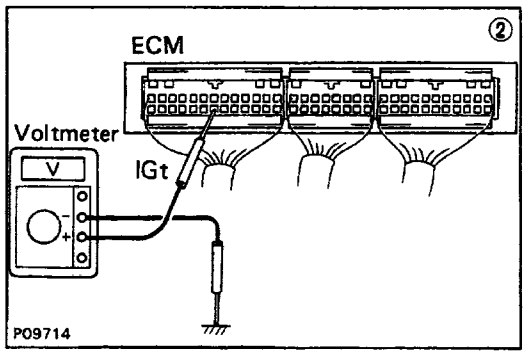
OK → Check wiring between ECM terminal E01, and/or E02 and body ground.
- OK → Try another ECM.
- BAD → Repair or replace.

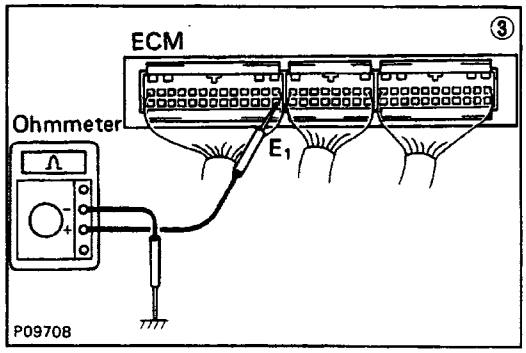
V01840

No.	Terminals	Trouble	Condition	STD Voltage
7	**IGt – E_1**	No voltage	Idling	**0.7 – 1.0 V**









(1) There is no voltage between ECM terminals IGt and E1. **(Idling)**

(2) Check that there is voltage between ECM terminal IGt and body ground. **(Idling)**

NO

OK

(3) Check wiring between ECM terminal E1 and body ground.

BAD

Repair or replace.

Refer to No. 1.

. BAD

OK

Check wiring between igniter and distributor.

BAD

Repair or replace.

OK

Check distributor.

BAD

Replace.

OK

Check wiring between ECM and igniter.

BAD

Repair or replace.

OK

Check igniter.

BAD

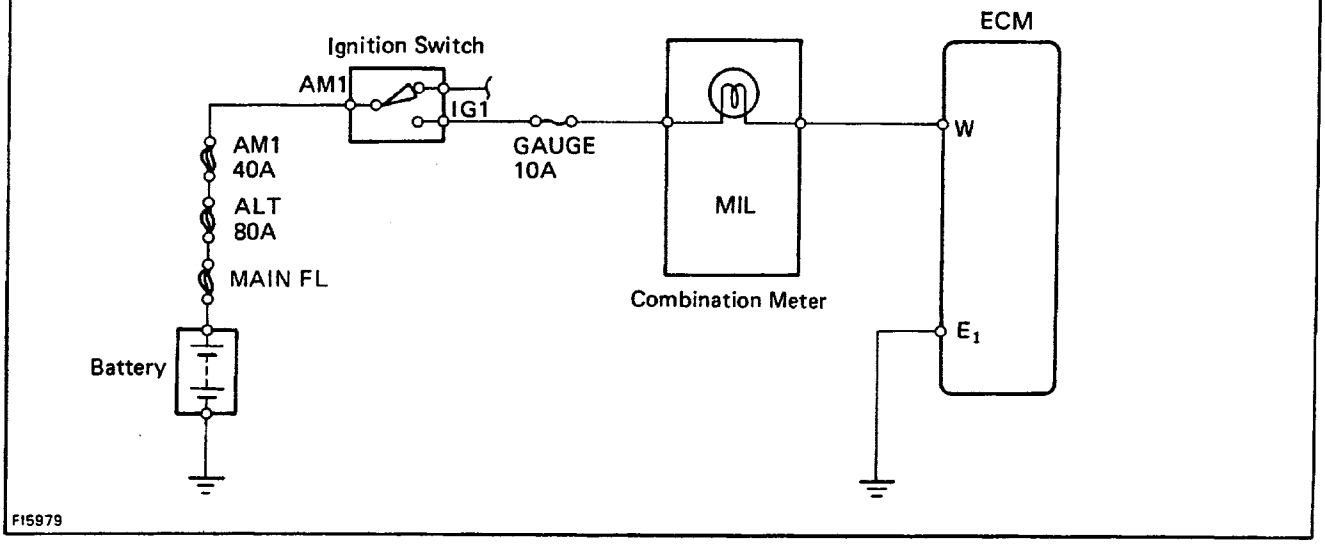
Repair or replace.

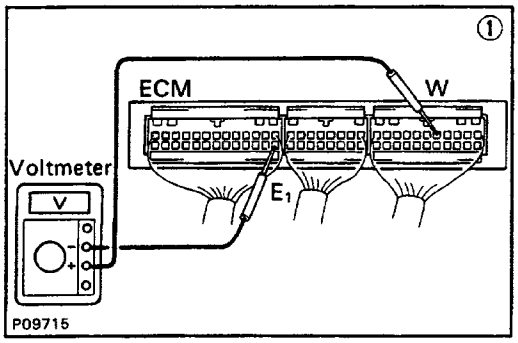
OK

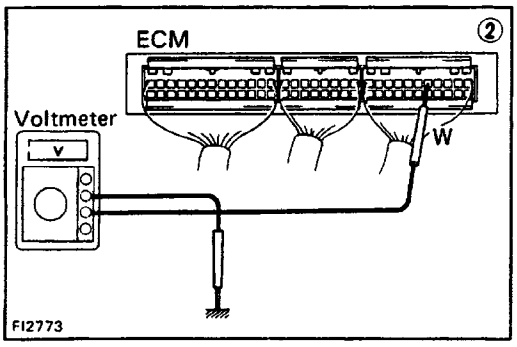
Try another ECM.

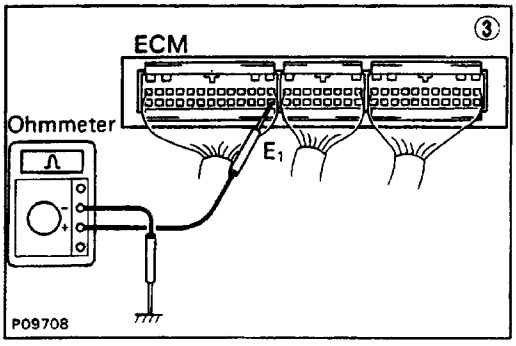
V01841

No.	Terminals	Trouble	Condition	STD Voltage.
8	W – E_1	No voltage	No trouble (MIL off) and engine running	9 – 14 V









(1) There is no voltage between ECM terminals W and E1. **(Idling)**

↓

(2) Check that there is voltage between ECM terminal W and body ground.

NO → ↓

OK →

(3) Check wiring between ECM terminal E1 and body ground.

OK → Try another ECM.

BAD → Repair or replace.

↓

Check GAUGE fuse (10 A) and MIL.

OK → ↓

BAD → Repair or replace.

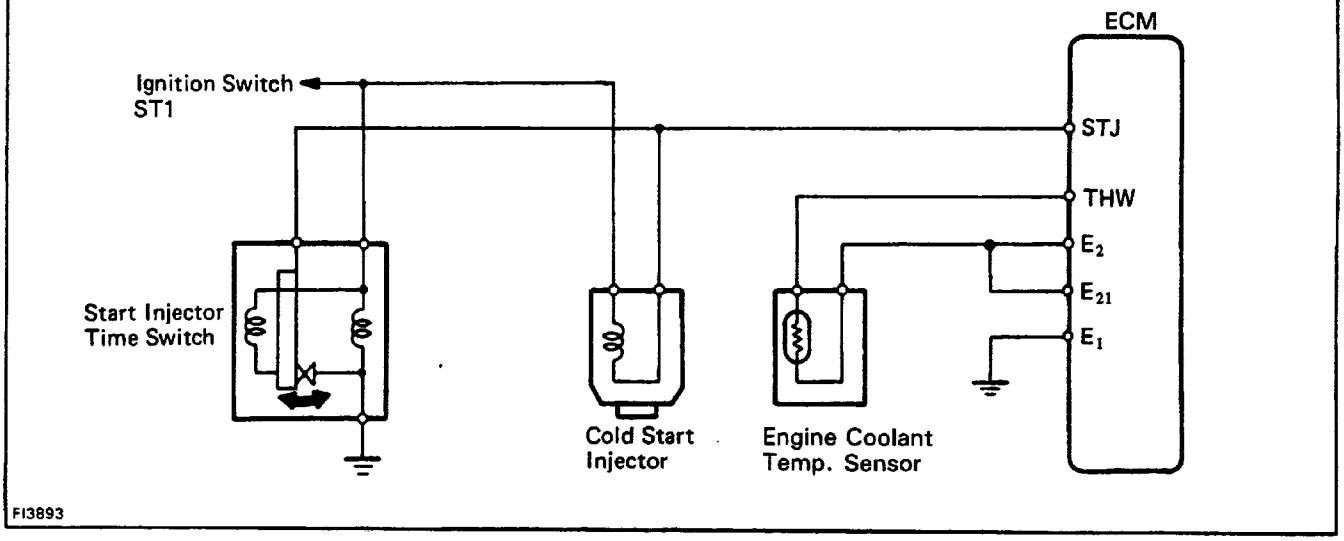
Fuse blows again → ↓

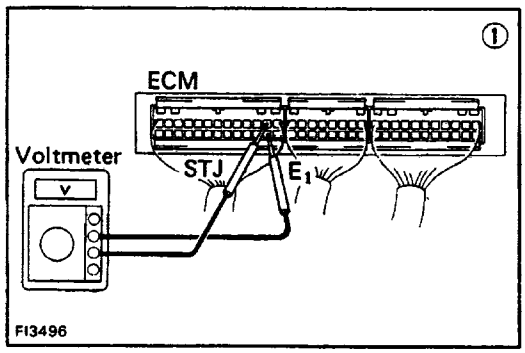
Check wiring between ECM terminal W and fuse.

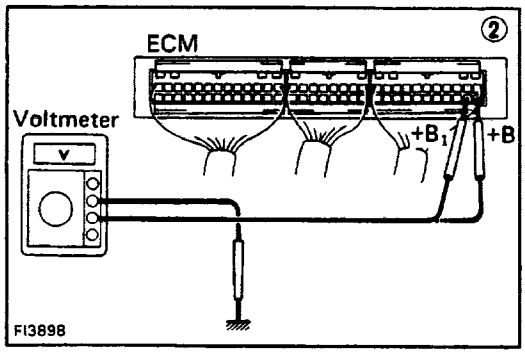
BAD → Repair or replace.

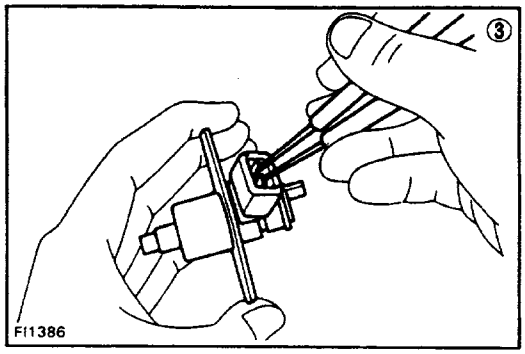
V01842

No.	Terminal	Trouble	Condition		STD Voltage
9	**STJ – E_1**	No voltage	Ignition switch START position	Coolant temperature 80°C (176° F)	**6 – 12 V**









(1) There is no voltage between ECM terminals STJ and E1. **(IG SW START)**

↓

(2) Check that there is voltage between ECM terminal +B (+ B1) and body ground. **(IG SW ON)**

OK → ↓ | **NO** → Refer to No. 1.

↓

(3) Check cold start injector.

BAD → Replace cold start injector. → ↓

OK → Check wiring between ECM and cold start injector.

OK → ↓ | BAD → Repair or replace wiring.

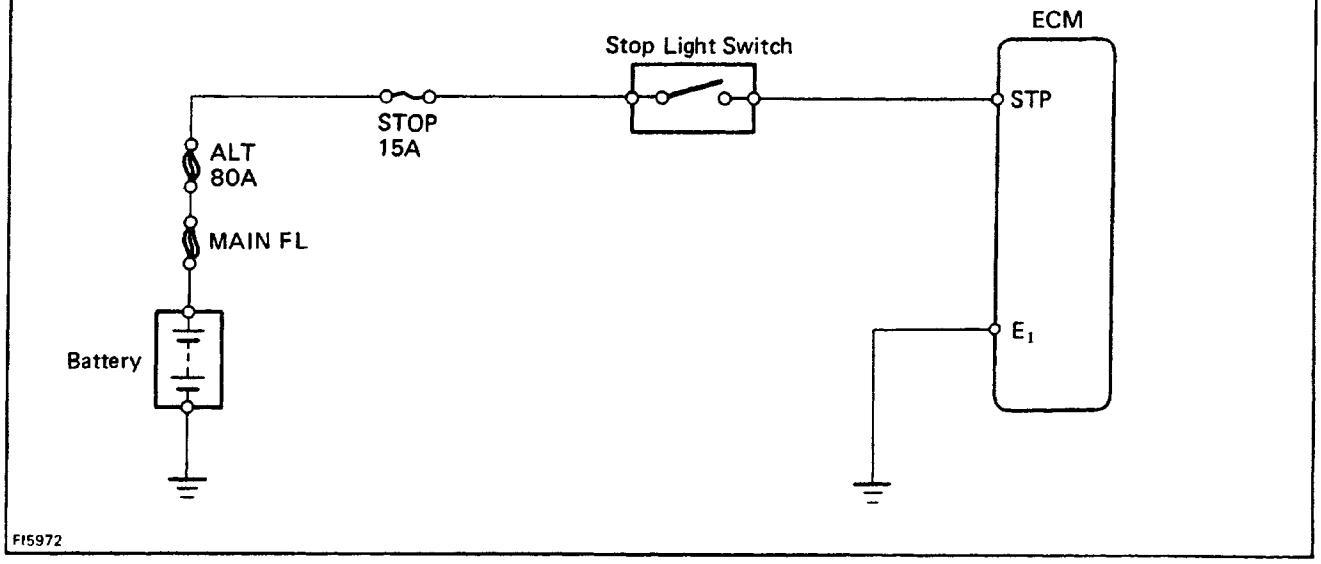
Check wiring between ECM terminal E1 and body ground.

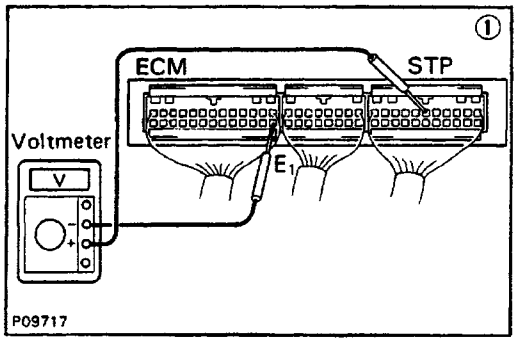
OK → ↓

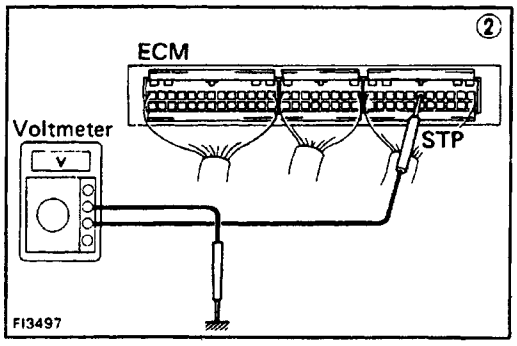
Try another ECM.

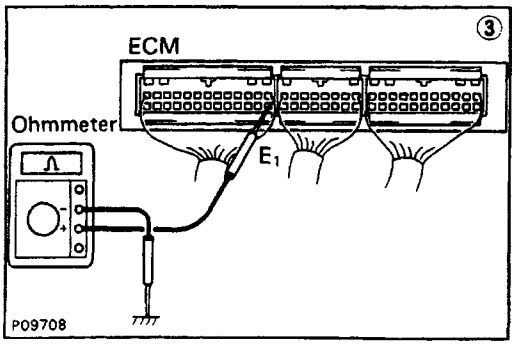
V01843

No.	Terminals	Trouble	Condition	STD Voltage
10	**STP – E_1**	No voltage	Stop light switch ON	**7.5 – 14 V**









(1) There is no voltage between ECM terminals STP and E1.

↓

(2) Check that there is voltage between ECM terminal STP and body ground when the brake pedal is depressed.

NO → Check STOP fuse (15A) and stop light switch.

OK → (3) Check wiring between ECM terminal E1 and body ground.

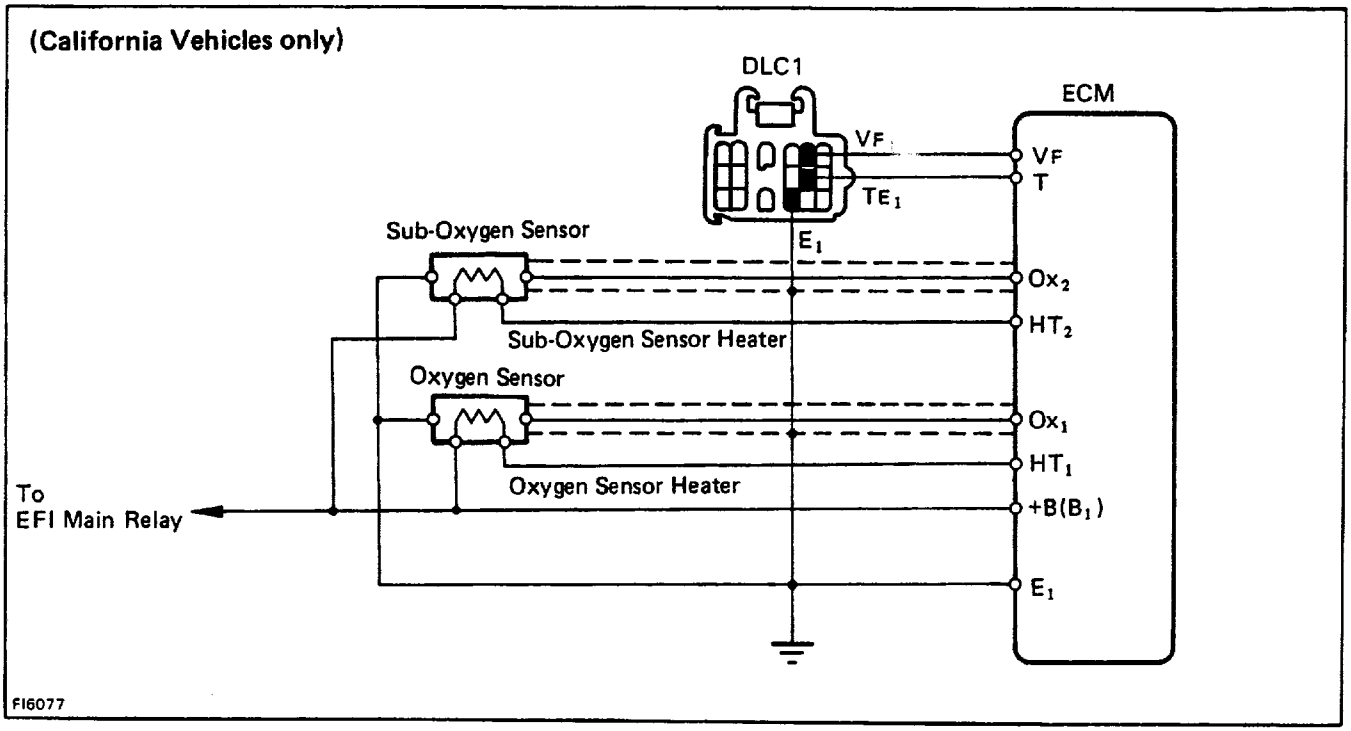
OK → Try another ECM.

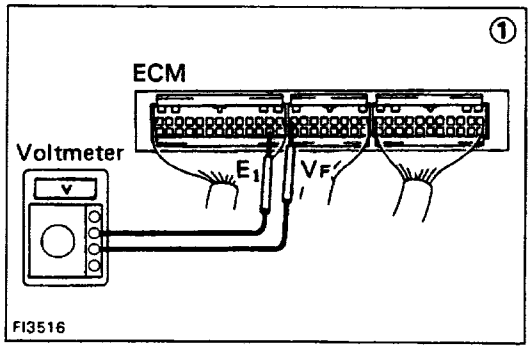
BAD → Repair or replace.

Check STOP fuse (15A) and stop light switch. BAD → Repair or replace.

OK → Check wiring between ECM terminal STP and battery. BAD → Repair or replace.

V01844





(1) There is no voltage between ECM terminals VF and E1.

(2) Check that there is voltage between ECM terminal VF and body ground.

NO — OK

(3) Check wiring between ECM terminal E1 and body ground.

OK — BAD

Try another ECM.

Repair or replace.

Is air leaking into air induction system? — YES → Repair air leak.

NO

Check spark plugs. — BAD → Repair or replace.

OK

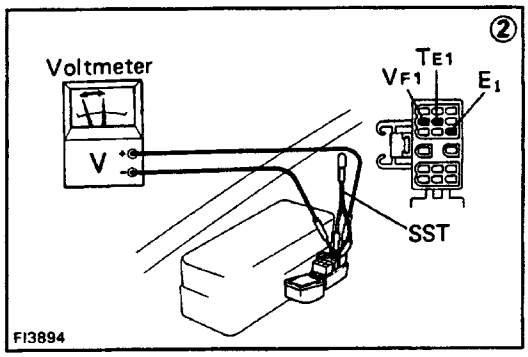
Check distributor and ignition system. — BAD → Repair or replace.

OK

CONTINUED 4N PAGE EG1–175

V01845

CONTINUED FROM PAGE EG1–174



OK

Check fuel pressure. — BAD → Repair or replace.

OK

Check injector. — BAD → Repair or replace.

OK

Check cold start injector.* — BAD → Repair or replace.

OK

Check volume air flow meter. — BAD → Repair or replace.

OK

Check operation of oxygen sensor. — OK → System normal.

BAD

Check wiring between oxygen sensor and ECM connector. — BAD → Repair wiring.

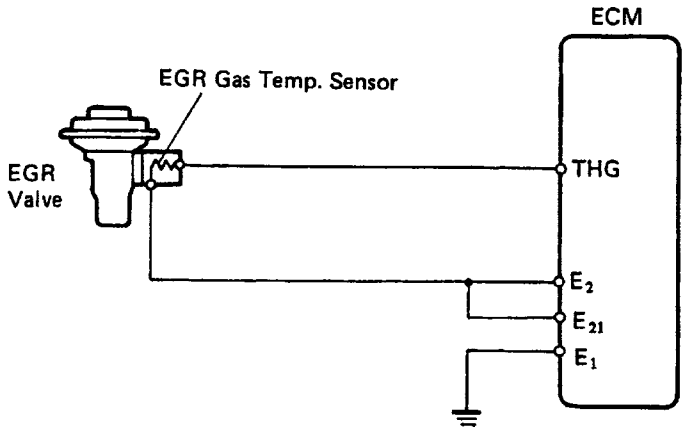
OK

Replace oxygen sensor.

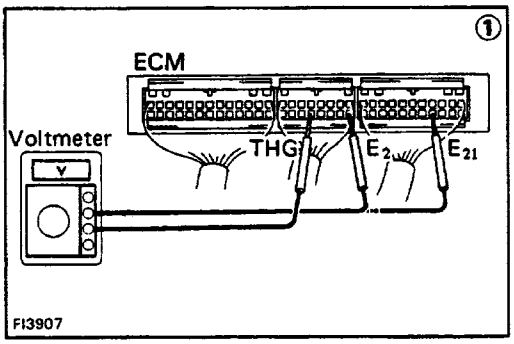
*Rich malfunction only.

V01847

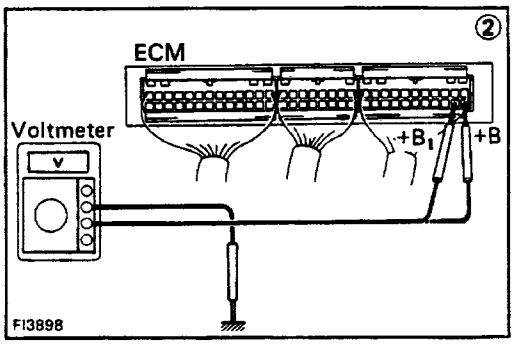
(California Vehicles only)



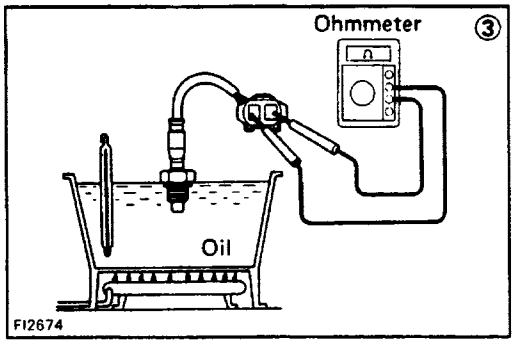
FI3895



FI3907



FI3898



FI2674

(1) There is no voltage between ECM terminals THG and E2 (E21) (Engine running at 2,000 rpm)

↓

(2) Check that there is voltage between ECM terminal +B (+B1) and body ground. **(IG SW ON)**

OK → ↓

NO → Refer to No. 1 .

↓

Check wiring between ECM terminal E1 and body ground.

OK → ↓

BAD → Repair or replace.

↓

Check EGR system.

BAD → Repair or replace.

OK → ↓

↓

Check EGR gas temp. sensor.

BAD → Replace EGR gas temp. sensor.

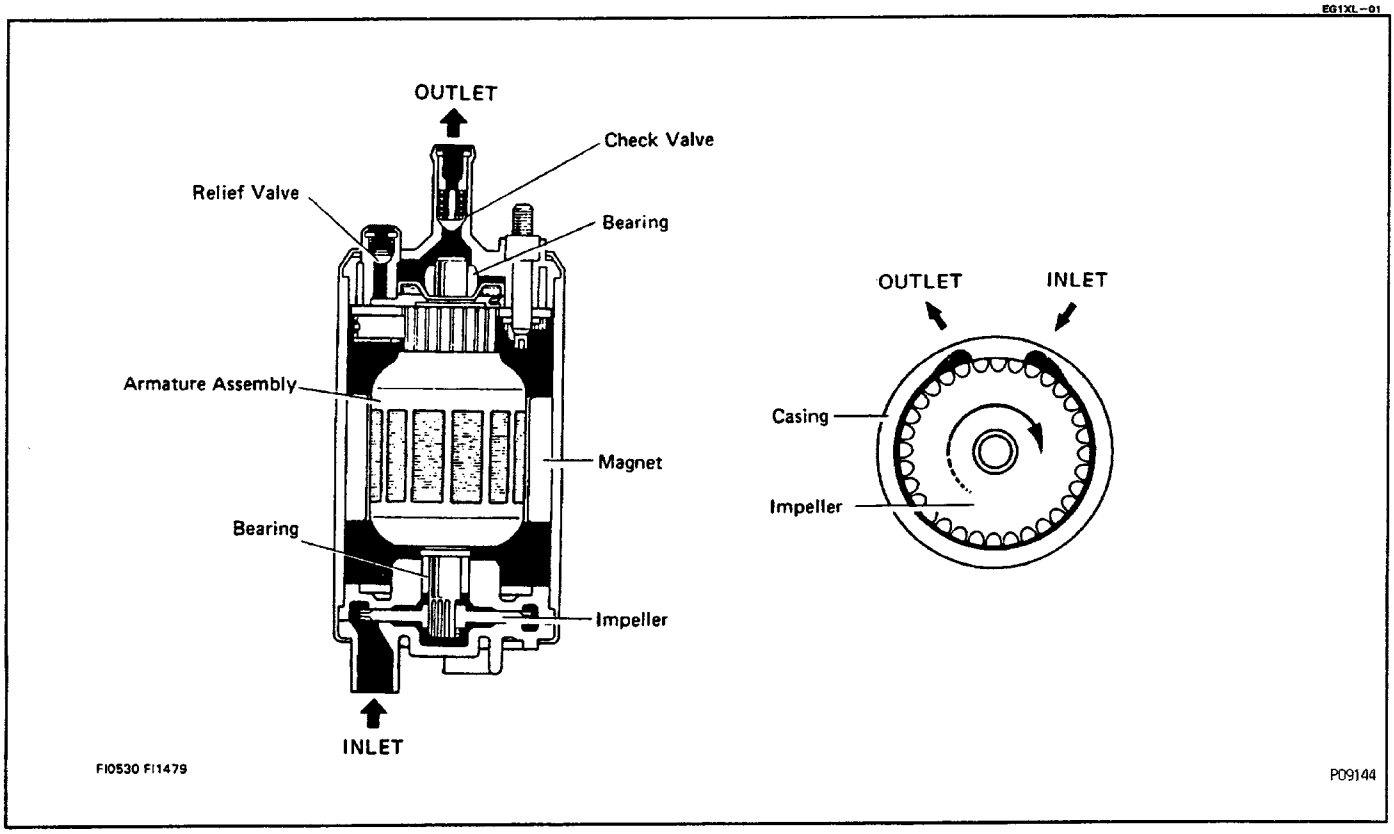
OK → Check wiring between ECM and EGR gas temp. sensor.

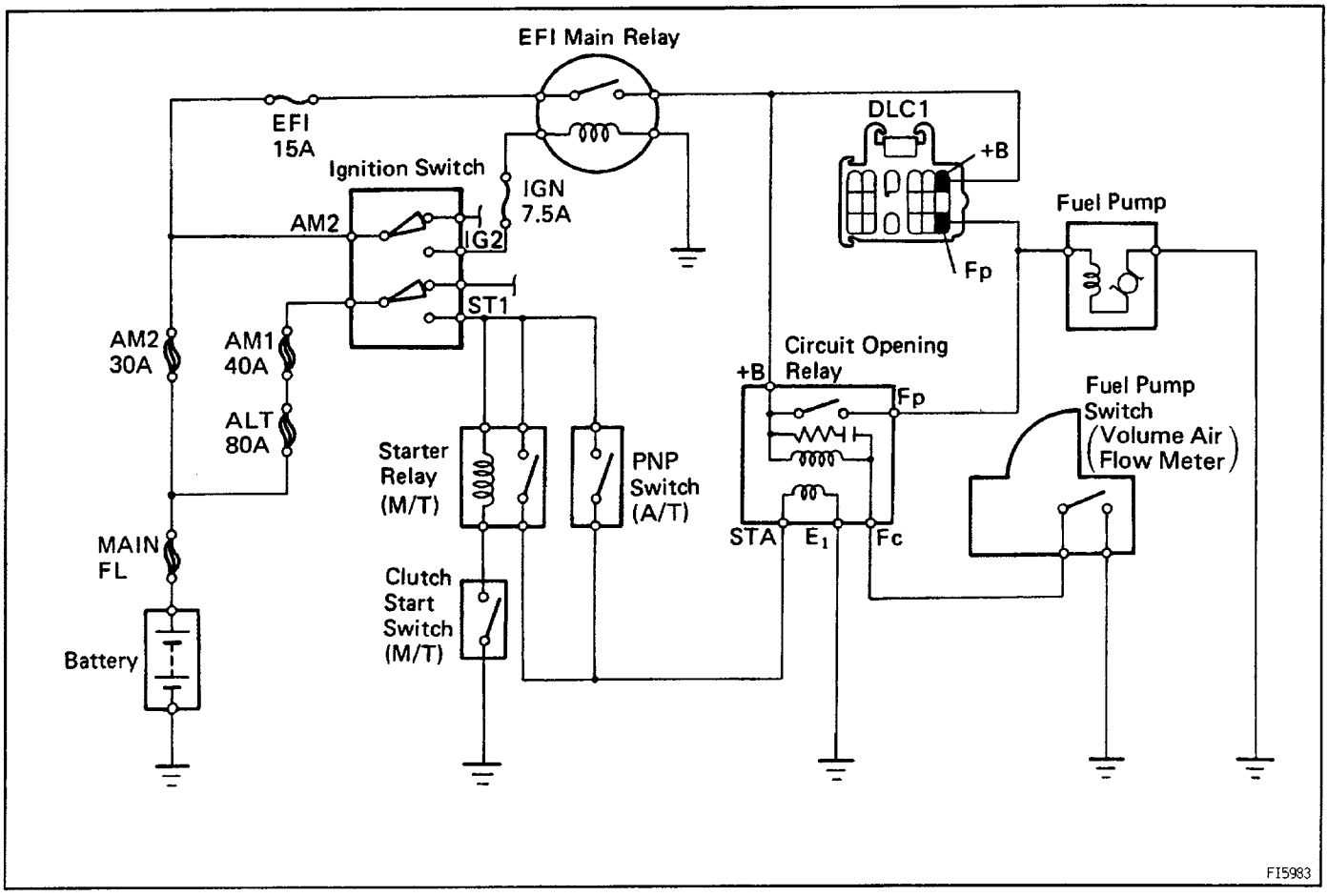
OK → Try another ECM.

BAD → Repair or replace.

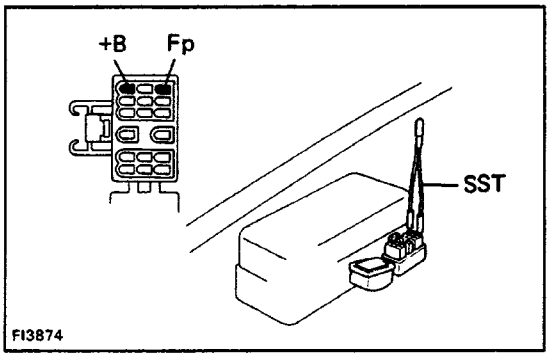
V01846

FUEL PUMP


EG1XL–01
OUTLET
Check Valve
Relief Valve
Bearing
Armature Assembly
Magnet
Bearing
Impeller
INLET
FI0530 FI1479
OUTLET
INLET
Casing
Impeller
P09144


EFI Main Relay
EFI
15A
Ignition Switch
IGN
7.5A
AM2
IG2
ST1
AM2
30A
AM1
40A
ALT
80A
MAIN
FL
Battery
Starter
Relay
(M/T)
PNP
Switch
(A/T)
Clutch
Start
Switch
(M/T)
DLC1
+B
Fp
Fuel Pump
Circuit Opening
Relay
+B
Fp
STA
E1
Fc
Fuel Pump
Switch
(Volume Air
Flow Meter)
FI5983

EG1XM–01



ON–VEHICLE INSPECTION

1. CHECK FUEL PUMP OPERATION

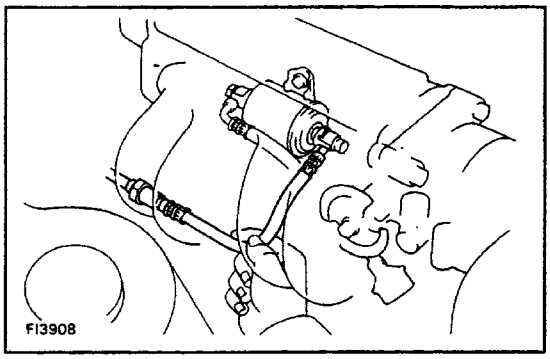
(a) Turn the ignition switch ON.

HINT: Do not start the engine.

(b) Using SST, connect terminals Fp and +B of the DLC1.

SST 09843–18020

HINT: The DLC1 is located near the No. 2 relay block.



(c) Check that there is pressure in the fuel inlet hose.

HINT: At this time, you will hear fuel return noise from the pressure regulator.

(d) Remove SST from the DLC1.

(e) Turn the ignition switch OFF.

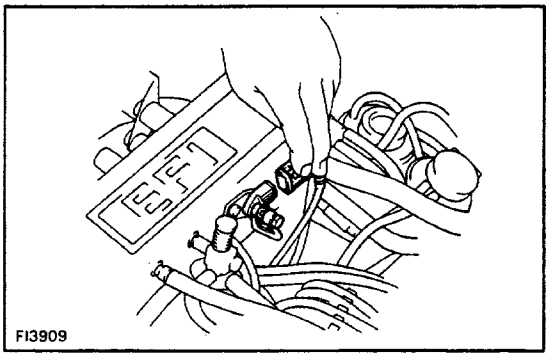
If there is no pressure, check the following parts:

- Fusible links
- Fuses (EFI 15A, IGN 7.5A)
- EFI main relay
- Circuit opening relay
- Fuel pump
- Wiring connections

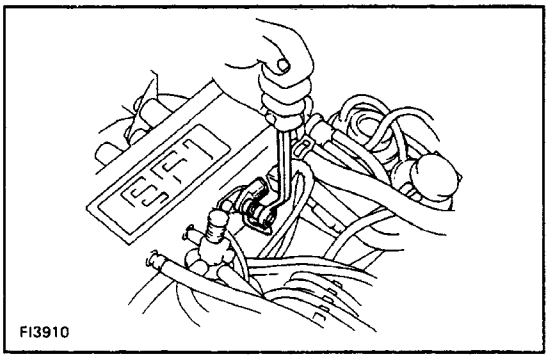
2. CHECK FUEL PRESSURE

(a) Check that the battery voltage is above 12 volts.

(b) Disconnect the cable from the negative terminal of the battery.



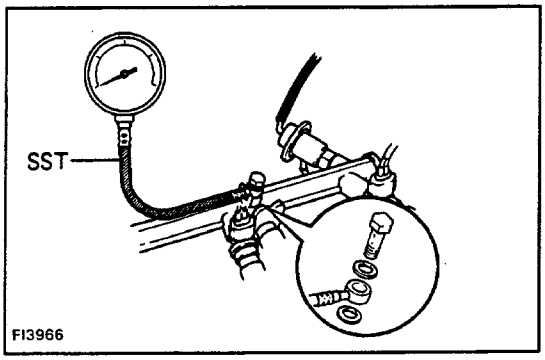
(c) Disconnect the wiring connector from the cold start injector.



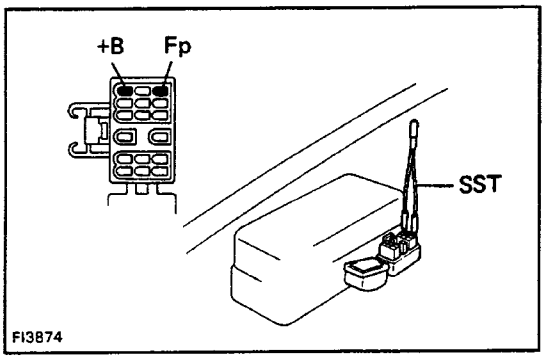
(d) Put a suitable container or shop towel under the cold start injector pipe.

(e) Slowly loosen the union bolts of the cold start injector pipe and remove the bolts, cold start injector pipe and four gaskets. ,

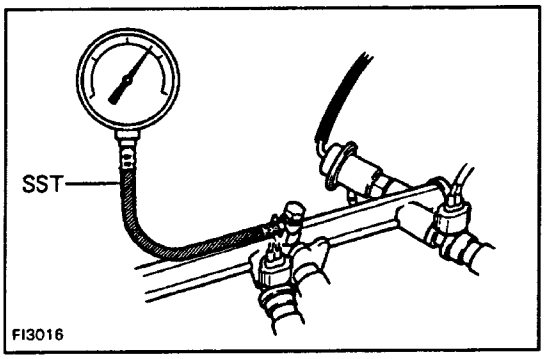
(f) Drain the fuel from the delivery pipe.



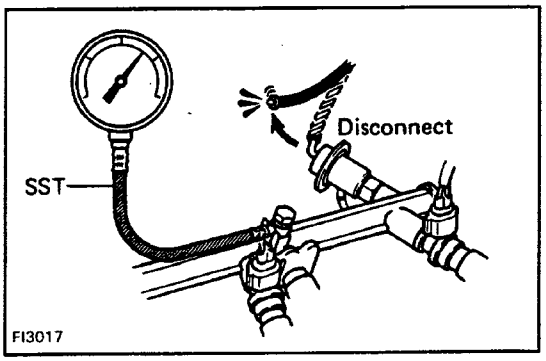
(g) Install a gasket, SST, another gasket and union bolt to the delivery pipe as shown in the illustration.
SST 09268–45012
(h) Wipe off any splattered gasoline.



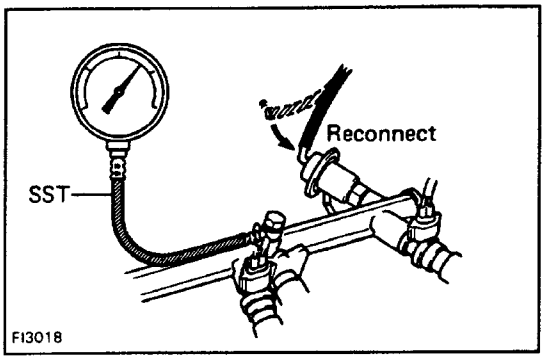
(i) Reconnect the battery negative terminal.
(j) Using SST, connect terminals Fp and +B of the DLC1.
SST 09843–18020



(k) Turn the ignition switch ON.
(l) Measure the fuel pressure.
Fuel pressure: 265–304 kPa
(2.7–3.1 kgf/cm^2, 38–44 psi)
If high, replace the pressure regulator.
If low, check the following parts:
- Fuel hoses and connections
- Fuel pump
- Fuel filter
- Pressure regulator



(m) Remove SST from the DLC1.
(n) Start the engine.
(o) Disconnect the vacuum hose from the pressure reg–ulator and plug it closed.
(p) Measure the fuel pressure at idling.
Fuel pressure: 265–304 kPa
(2.7–3.1 kg f/cm^2, 38–44 psi)

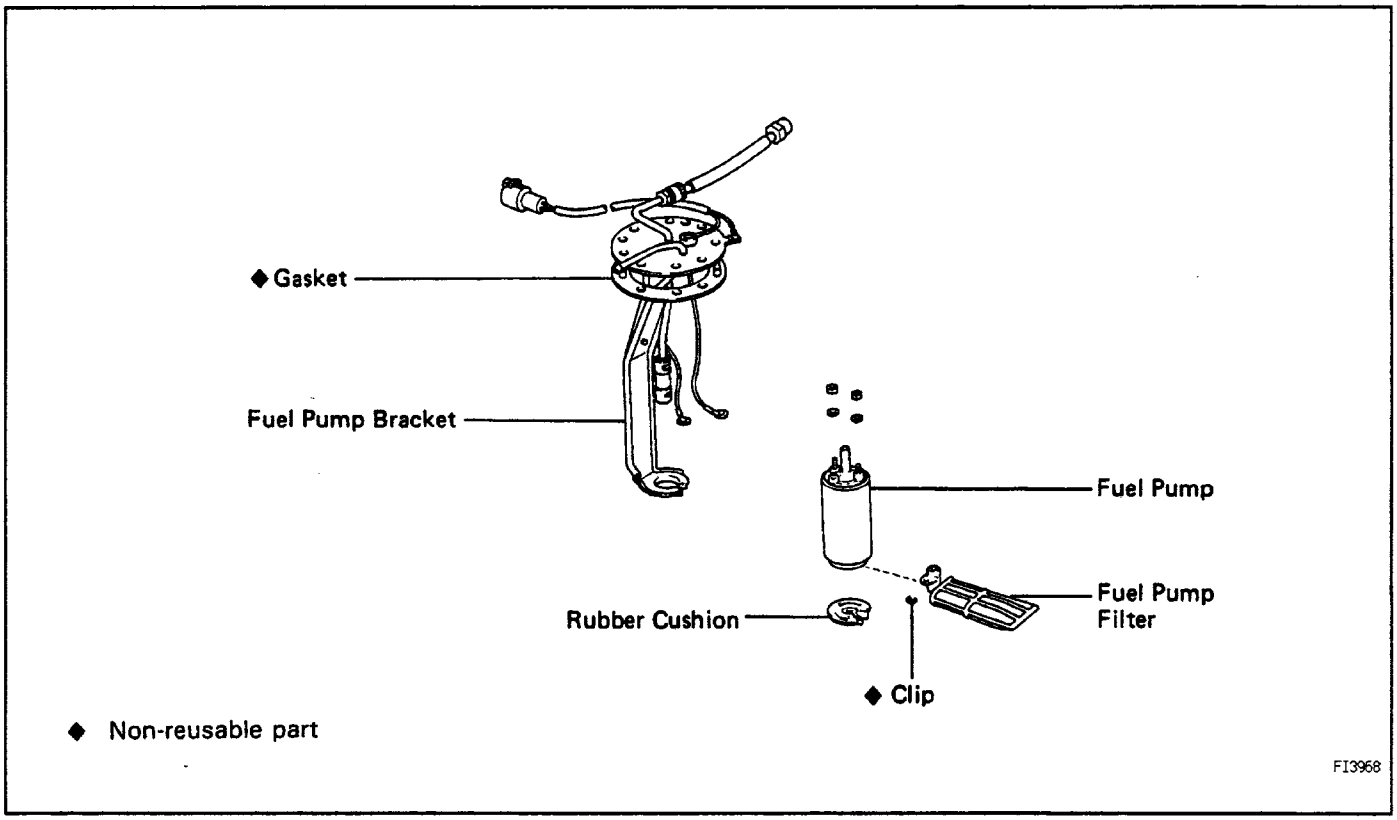


(q) Reconnect the vacuum hose to the pressure regulator.
(r) Measure the fuel pressure at idling.
Fuel pressure: 226–265 kPa
(2.3–2.6 kgf/cm^2, 33–37 psi)
If not within the specified pressure, check the vacuum hose and pressure regulator.
(s) Stop the engine. Check that the fuel pressure remains above 147 kPa (1.5 kgf/cm^2, 21 psi) for 5 minutes after the engine is turned off.

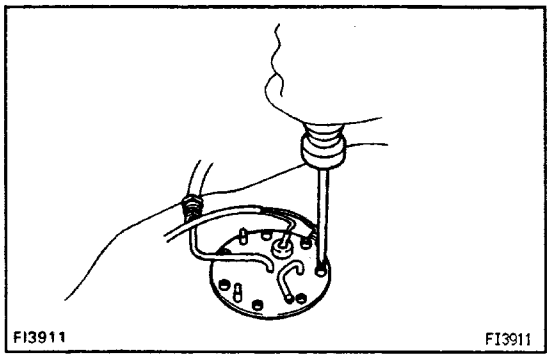
If not within the specification, check the fuel pump, pressure regulator and/or injectors.
(t) After checking fuel pressure, disconnect the battery ground strap and carefully remove the SST to prevent gasoline from splashing.
(u) Using new gaskets, reconnect the cold start injector pipe to the delivery pipe and cold start injector.
(v) Connect the wiring connector to the cold start injec–tor.
(w) Start the engine and check for fuel leakage.

FUEL PUMP REMOVAL

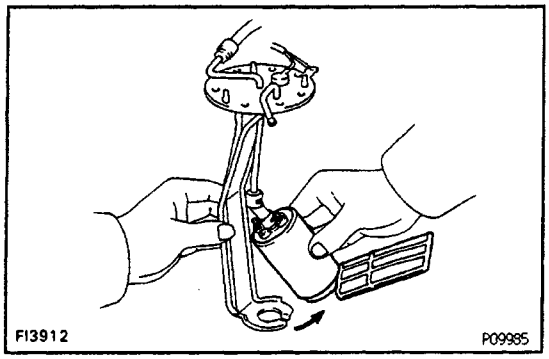
EG1XN–01



1. DRAIN FUEL FROM FUEL TANK
CAUTION: Do not smoke or work near an open flame when working on the fuel pump.
2. REMOVE FUEL TANK



3. REMOVE FUEL PUMP BRACKET
(a) Remove the seven bolts.
(b) Pull out the fuel pump bracket.

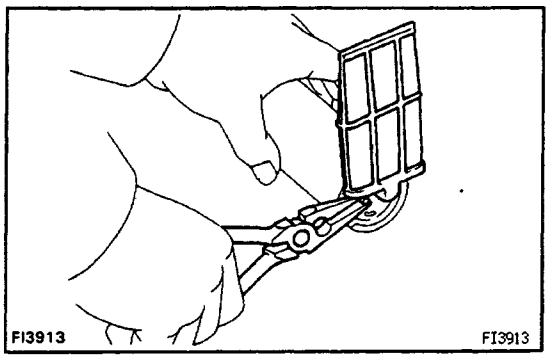


4. REMOVE FUEL PUMP

(a) Remove the two nuts and disconnect the wires from the fuel pump.

(b) Pull off the fuel pump from the lower side of the bracket.

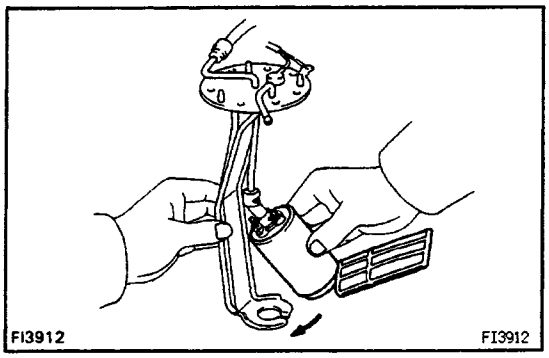
(c) Remove the fuel pump from the fuel hose.



5. REMOVE FUEL PUMP FILTER

(a) Remove the rubber cushion.

(b) Remove the clip and pull out the filter.



EG1XP–01

FUEL PUMP INSTALLATION

(See page EG1–180)

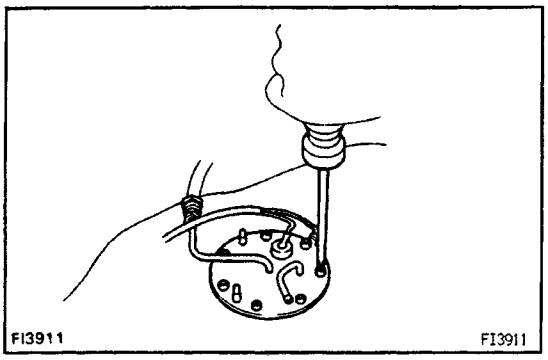
1. INSTALL FUEL PUMP FILTER

2. INSTALL FUEL PUMP

(a) Insert the outlet port of the fuel pump into the fuel hose.

(b) Install the rubber cushion to the lower side of the fuel pump.

(c) Push the lower side of the pump, together with the rubber cushion, into the pump bracket.



3. INSTALL FUEL PUMP BRACKET

(a) Place the bracket with a new gasket on the fuel tank.

(b) Install and torque the seven screws.

Torque: 3.8 N–m (40 kgf–cm, 34 in.–lbf)

4. INSTALL FUEL TANK

NOTICE:

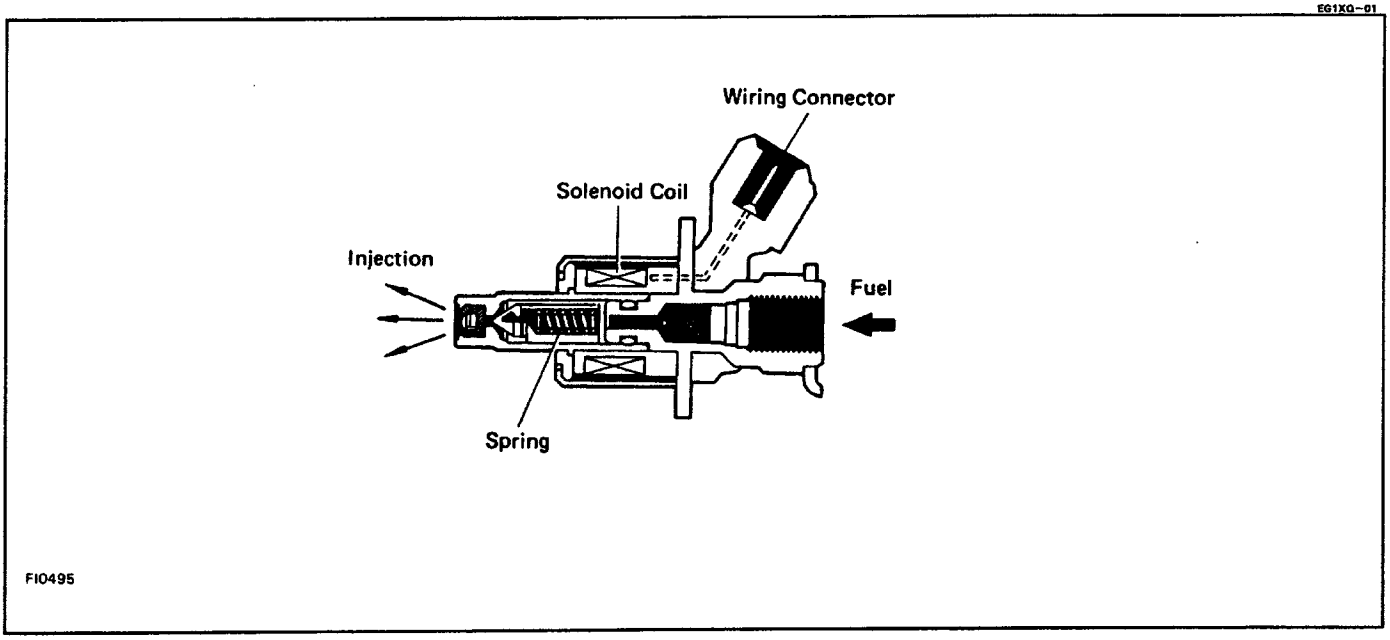
- **Tighten the fuel tank mounting bolts, etc. to the specified torque.**

- **Tighten the pipe and flare nut type hose to the specified torque.**
- **Push in the pipe and insert–type hose to the specified position, and install the clip to the specified location.**
- **If reusing the hose, reinstall the clip at the original location.**

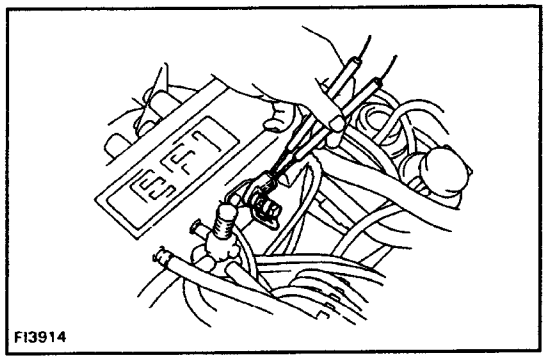
5. REFILL WITH FUEL

COLD START INJECTOR

EG1XQ–01



EG1XR–01



ON–VEHICLE INSPECTION

MEASURE RESISTANCE OF COLD START INJECTOR

(a) Disconnect the cold start injector connector.

(b) Using ohmmeter, check the resistance of the injector.

Resistance: 2 –4 Ω

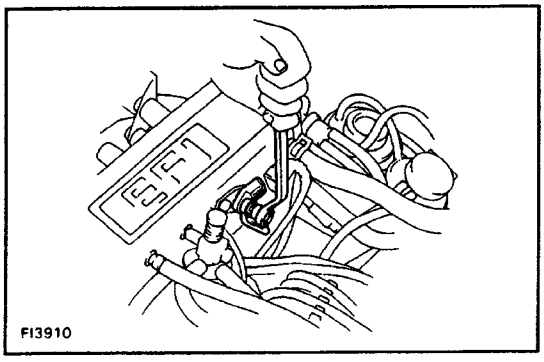
(c) Connect the cold start injector connector.

EG1XS–01

COLD START INJECTOR REMOVAL

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY

2. DISCONNECT COLD START INJECTOR CONNEC–TOR



3. REMOVE COLD START INJECTOR

(a) Put a suitable container or shop towel under the cold star injector pipe.

(b) Remove the union bolts and four gaskets, and remove the cold start injector pipe.

HINT: Slowly loosen the union bolt.

(c) Remove the two bolts and cold start injector with the gasket.

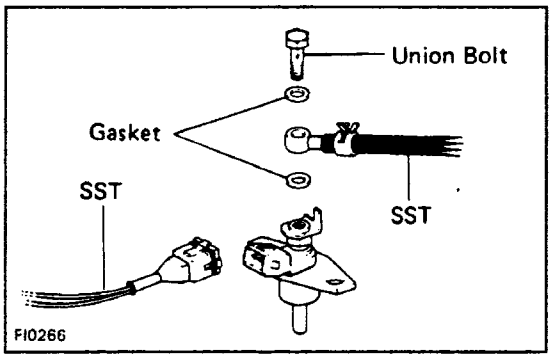
E01XT–01

COLD START INJECTOR INSPECTION

CHECK INJECTION OF COLD START INJECTOR

HINT: The engine should be cold.

(a) Remove the cold start injector.



(b) Install a gasket, SST (two unions), another gasket and two union bolts to the delivery pipe and injector.

(c) Connect the SST (hose) to each union.

SST 09268–41045 (092368–41080)

(d) Connect the SST (wire) to the injector.

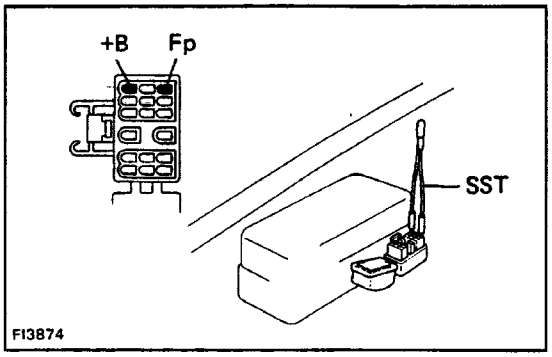
SST 09842–30050

CAUTION: Position the injector as far away from the battery as possible.

(e) Put a container under the injector.

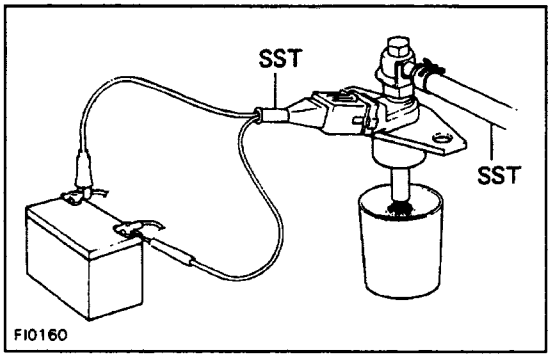
(f) Turn the ignition switch ON.

HINT: Do not start the engine.



(g) Using SST, connect terminals Fp and + B of the DLC 1.

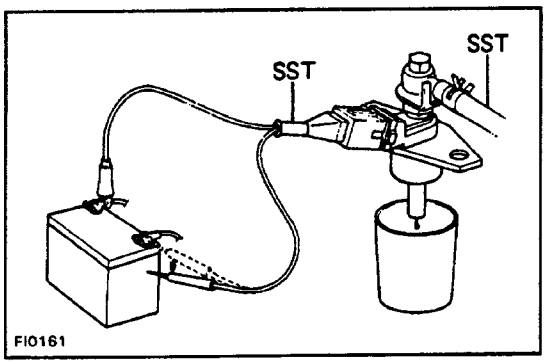
SST 09843–18020



(h) Connect the test probes of the SST to the battery and check that the fuel injection is as shown.

SST 09842–30050

NOTICE: Perform this check within the shortest possible time.

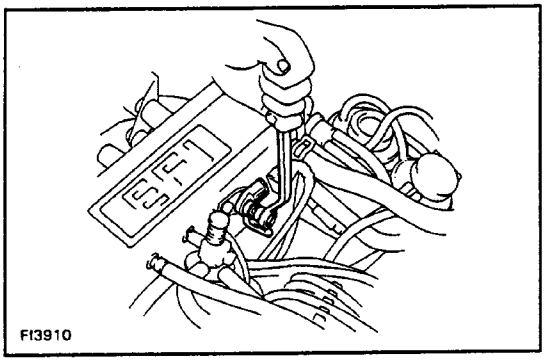


(i) Disconnect the test probes from the battery and check fuel leakage from the injector.

Fuel drop: One drop or less per minute

(j) After checking, remove SST and restore the following parts to their original conditions.

- DLC1
- Ignition switch
- Cold start injector
- Injector wiring



COLD START INJECTOR INSTALLATION

1. INSTALL COLD START INJECTOR

(a) Using new gasket, install the cold start injector with the two bolts.

Torque: 7.8 N–m (80 kgf–cm, 69 in.–lbf)

(b) Install the fuel pipe between the cold start injector and fuel delivery pipe with new gaskets.

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)

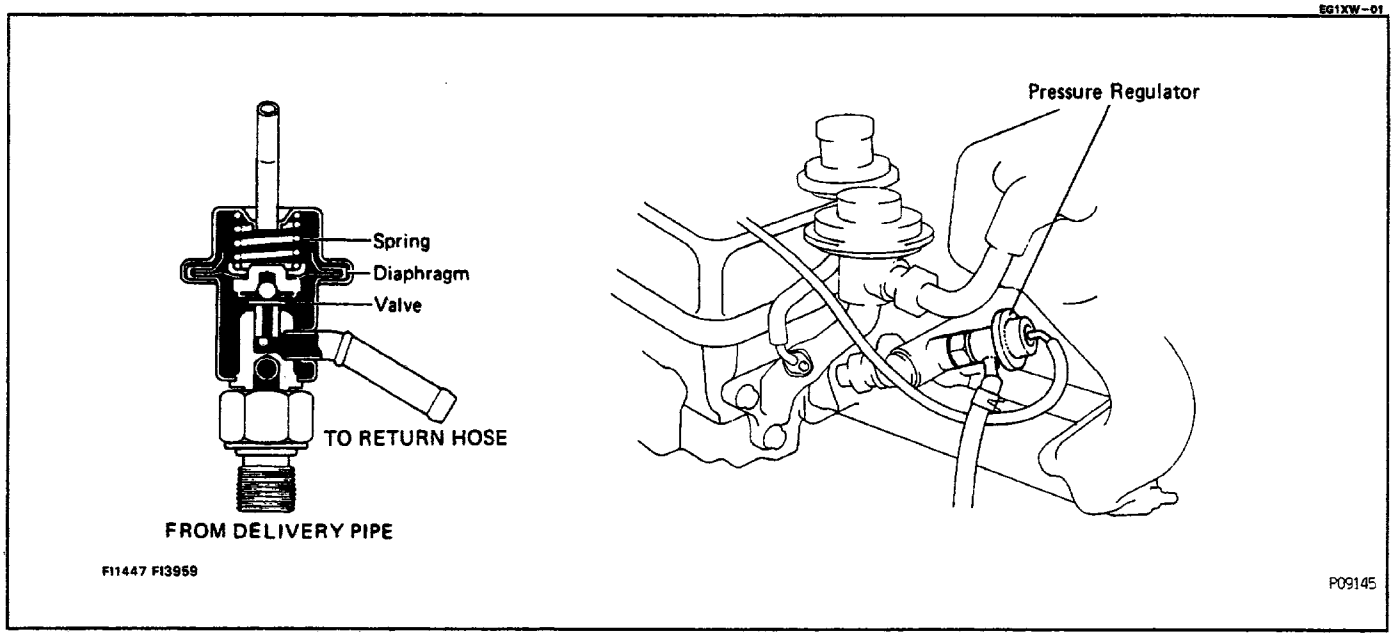
2. CONNECT COLD START INJECTOR CONNECTOR

3. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

4. CHECK FOR FUEL LEAKAGE

FUEL PRESSURE REGULATOR

EG1XW–01



EG1XX–0

ON–VEHICLE INSPECTION

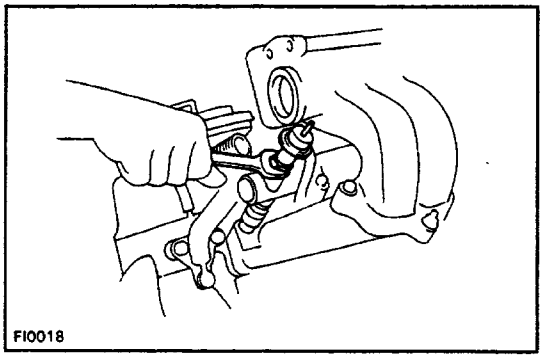
CHECK FUEL PRESSURE (See page EG1–178)

EG1XY–01

PRESSURE REGULATOR REMOVAL

1. DISCONNECT VACUUM SENSING HOSE

2. REMOVE NO. 1 EGR PIPE



3. DISCONNECT FUEL HOSE

(a) Put a suitable container or shop towel under the pressure regulator.

(b) Disconnect the fuel hose the pressure regulator.

4. REMOVE PRESSURE REGULATOR

Loosen the lock nut, and remove pressure regulator.

PRESSURE REGULATOR INSTALLATION

1. INSTALL PRESSURE REGULATOR

Install the pressure regulator. Torque the lock nut.

Torque: 29 N–m (300 kgf–cm. 22 ft–lbf)

2. CONNECT FUEL HOSE

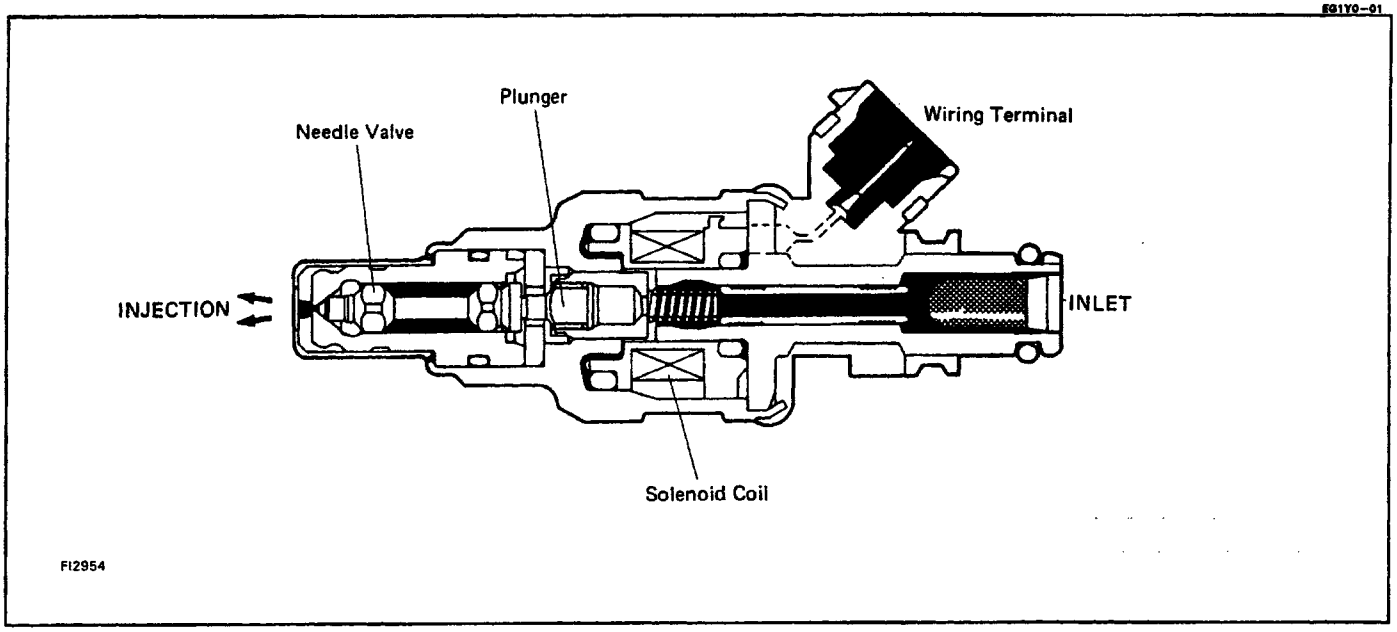
3. INSTALL NO. 1 EGR PIPE

Install a new gasket and No. 1 EGR pipe.

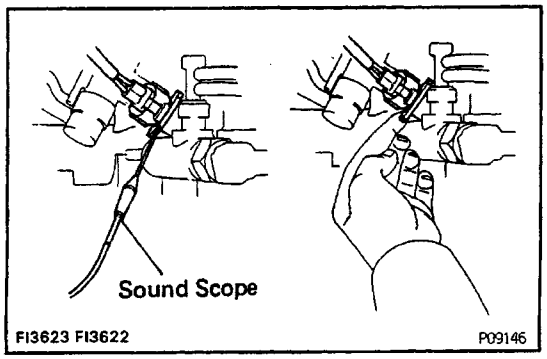
4. CONNECT VACUUM SENSING HOSE

INJECTOR

EG1Y0–01



EG1Y1–01



ON–VEHICLE INSPECTION

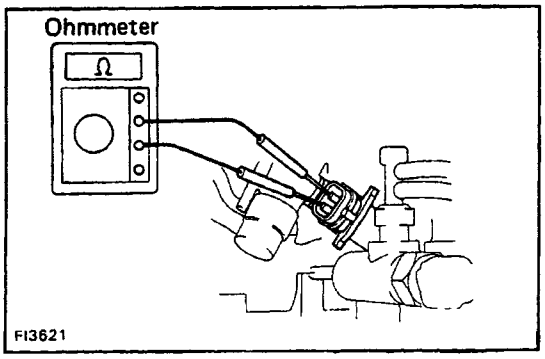
1. CHECK INJECTOR OPERATION

Check for operating 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 you finger.

If no sound or an unusual sound is head, check the wiring connector, injector or injection signal from ECM.



2. MEASURE RESISTANCE OF INJECTOR

(a) Unplug the wiring connector from the injector.

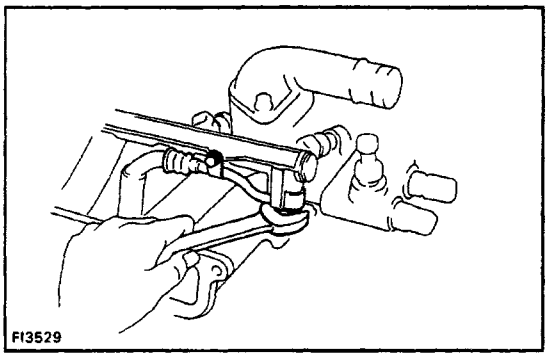
(b) Using an ohmmeter, measure the resistance of both terminals.

Resistance: 13.4–14.2 Ω

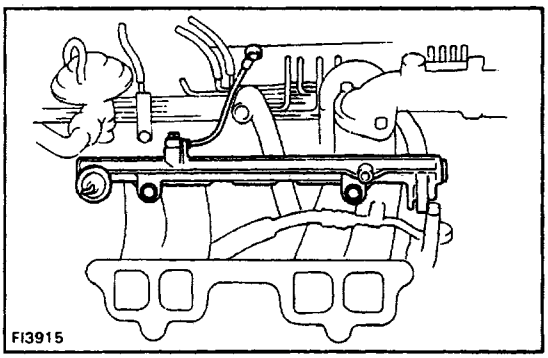
INJECTORS REMOVAL

EG1Y2–01

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. DRAIN COOLANT
3. REMOVE CHAMBER WITH THROTTLE BODY
(See steps 9 to 15 on pages EG1–16,17)
4. DISCONNECT WIRES
(See step 17 page EG1–17)



5. DISCONNECT FUEL HOSE FROM DELIVERY PIPE
Remove the bolt, union bolt and two gaskets.

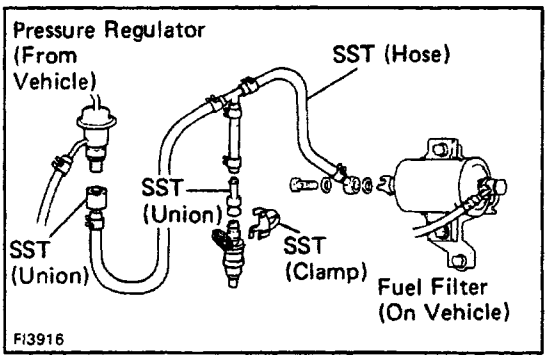


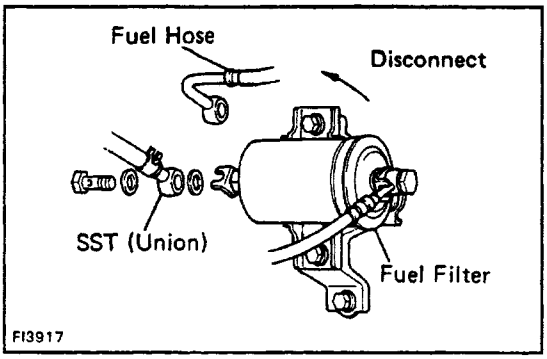
6. REMOVE DELIVERY PIPE WITH INJECTORS
Remove two bolts and then remove the delivery pipe with the injectors.

INJECTORS INSPECTION

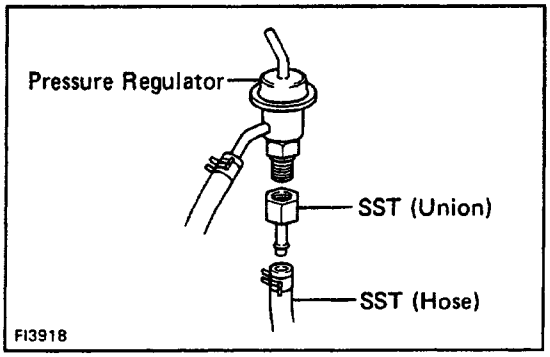
EG1Y3–01

1. TEST INJECTION OF INJECTOR
CAUTION: Keep injector clear of sparks during the test.

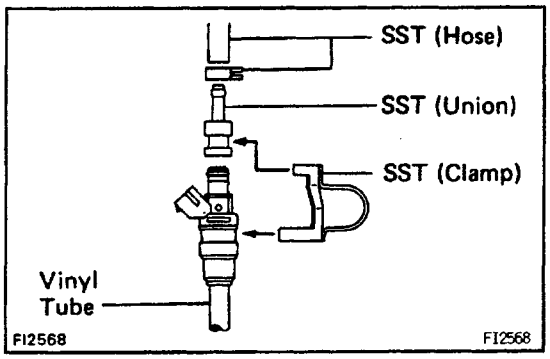




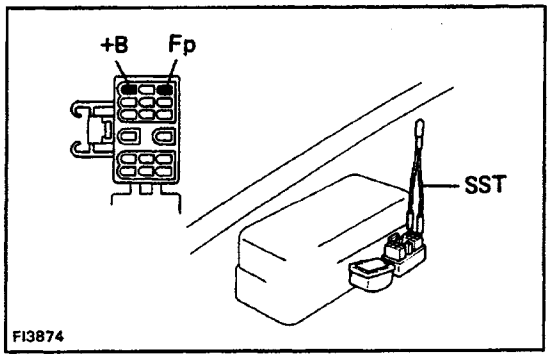
(a) Disconnect the fuel hose from the fuel filter outlet.
(b) Connect SST (Union) to the fuel filter outlet.
SST 09268–41045 (90405–09015)
HINT: Use the vehicle's fuel filter.



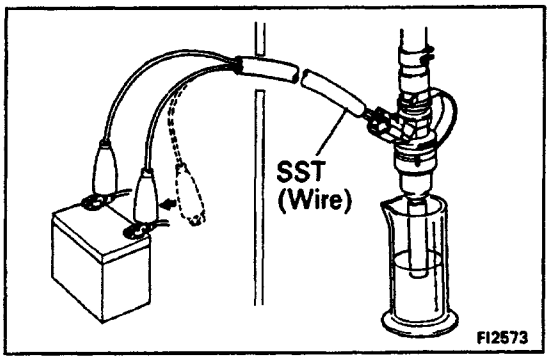
(c) Install SST (Union) to the removed pressure regulator.
SST 09268–41045 (09268–52010)



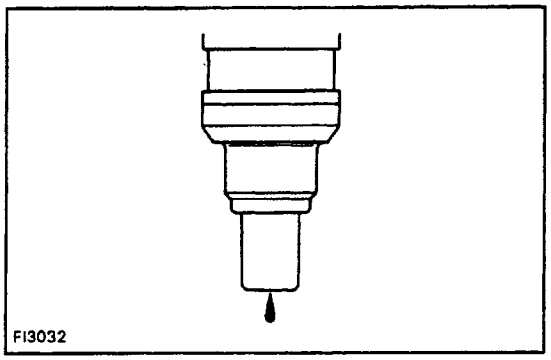
(d) Install SST (Union) to the injector and hold the injector and union with SST (Clamp).
SST 09268–41045
(e) Put the injector into the graduated cylinder.
HINT: Install a suitable vinyl tube unto the injector to prevent gasoline from splashing out.
(f) Connect the battery cable.
(g) Turn the ignition switch ON.
HINT: Do not start the engine.



(h) Using SST, connect terminals Fp and +B of the DLC1.
SST 09843–18020
HINT: Fuel pump will operate.



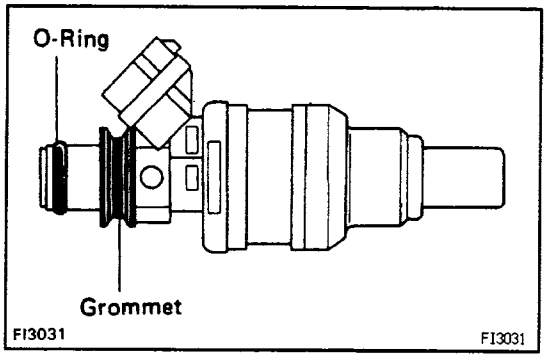
Connect SST (wire) to the injector and battery for 15 seconds and measure the injection volume with a graduated cylinder. Test each injector two or three times.
SST 09842 – 30070
Volume: 45–55 cm^3/15 sec. (2.7– 3.4 cu in.)
Difference between each injector:
6 cm^3 (0.4 cu in.) or less
If not within specified volume, replace the injector.



2. CHECK LEAKAGE
(a) In the condition above, disconnect SST from the battery and check for fuel leakage from the injector nozzle.
SST 09842–30060
Fuel drop: One drop or less per minute
(b) Disconnect the battery cable.
(c) Remove SST.

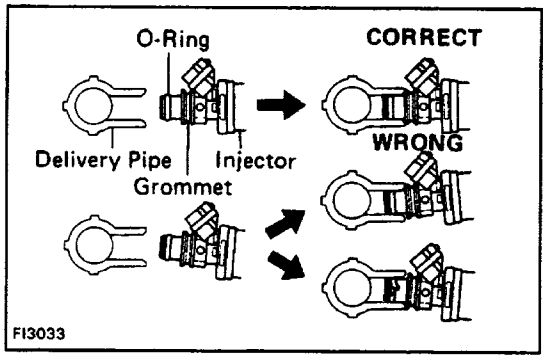
EG1Y4–01

INJECTORS INSTALLATION

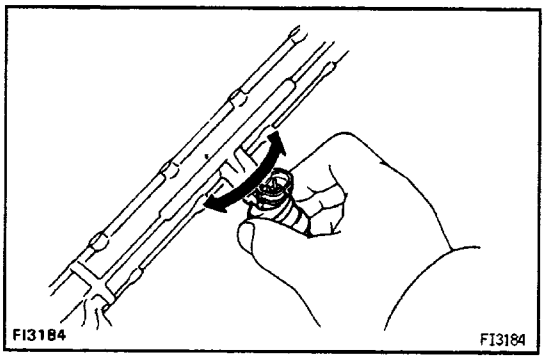


1. INSTALL INJECTORS INTO DELIVERY PIPE

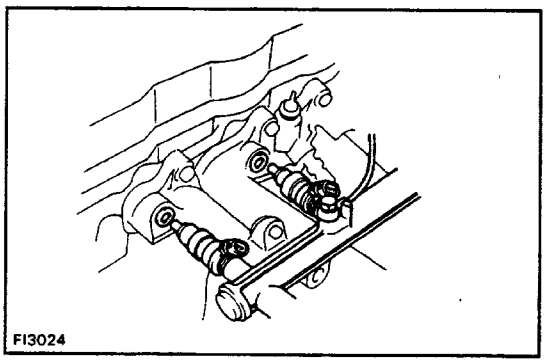
(a) Install the grommet and anew 0 –ring to the injector.



(b) Apply a light coat of gasoline to the O–rings and install the injectors into the delivery pipe.

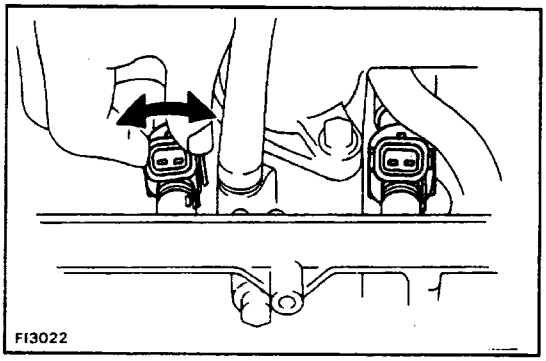


(c) Make sure that the injectors rotate smoothly.
HINT: If the injectors do not rotate smoothly, the O–rings are probably incorrectly installed. Replace the O –rings.



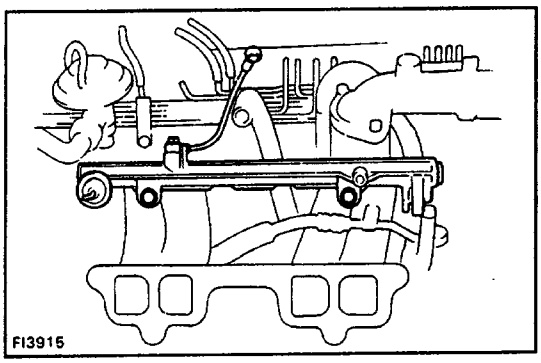
2. INSTALL DELIVERY PIPE WITH INJECTORS

(a) Install the four insulators into the injector hole of the intake manifold.
(b) Place the injectors together with the delivery pipe to the manifold.

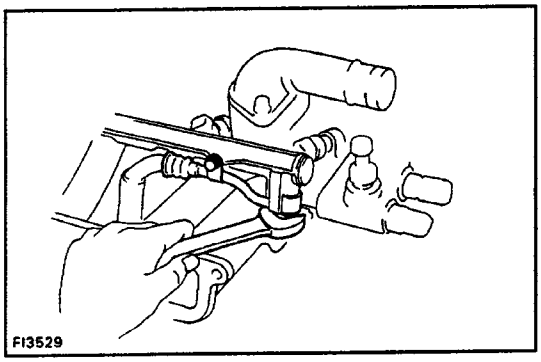


(c) Make sure that the injectors rotate smoothly.

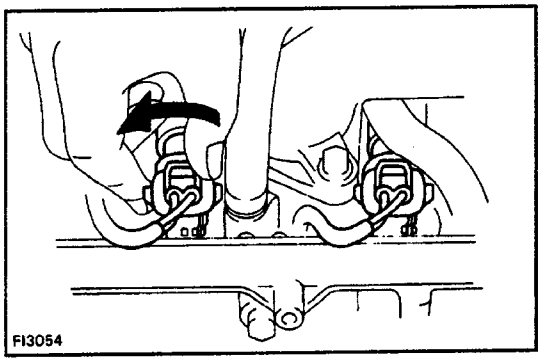
HINT: If the injectors do not rotate smoothly, probable cause may be incorrect installation of O–rings. Re–place O–rings again after removing the injectors.



(d) install and torque the bolts.
Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)

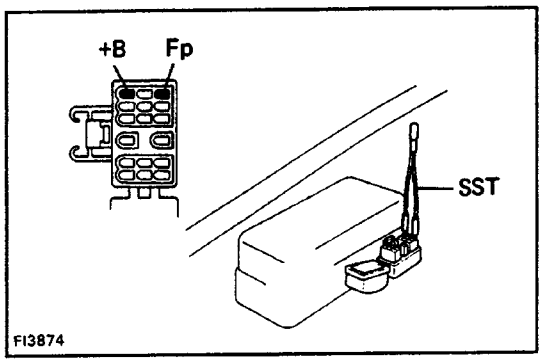


3. CONNECT FUEL HOSE TO DELIVERY PIPE
(a) Install the fuel hose with a bolt.
(b) Install the union bolt and new gaskets. Torque the union bolt.
Torque: 44 N–m (450 kgf–cm, 33 ft–lbf)



4. CONNECT WIRES
(See step 5 on page EG1–36)
Turn the injector so that the injector positioning guide is aligned with the positioning rib of the delivery pipe.

5. INSTALL CHAMBER WITH THROTTLE BODY
(See steps 7 to 14 on pages EG1–37, 38)
6. FILL WITH COOLANT
(See step 3 on page EG1–225)
7. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

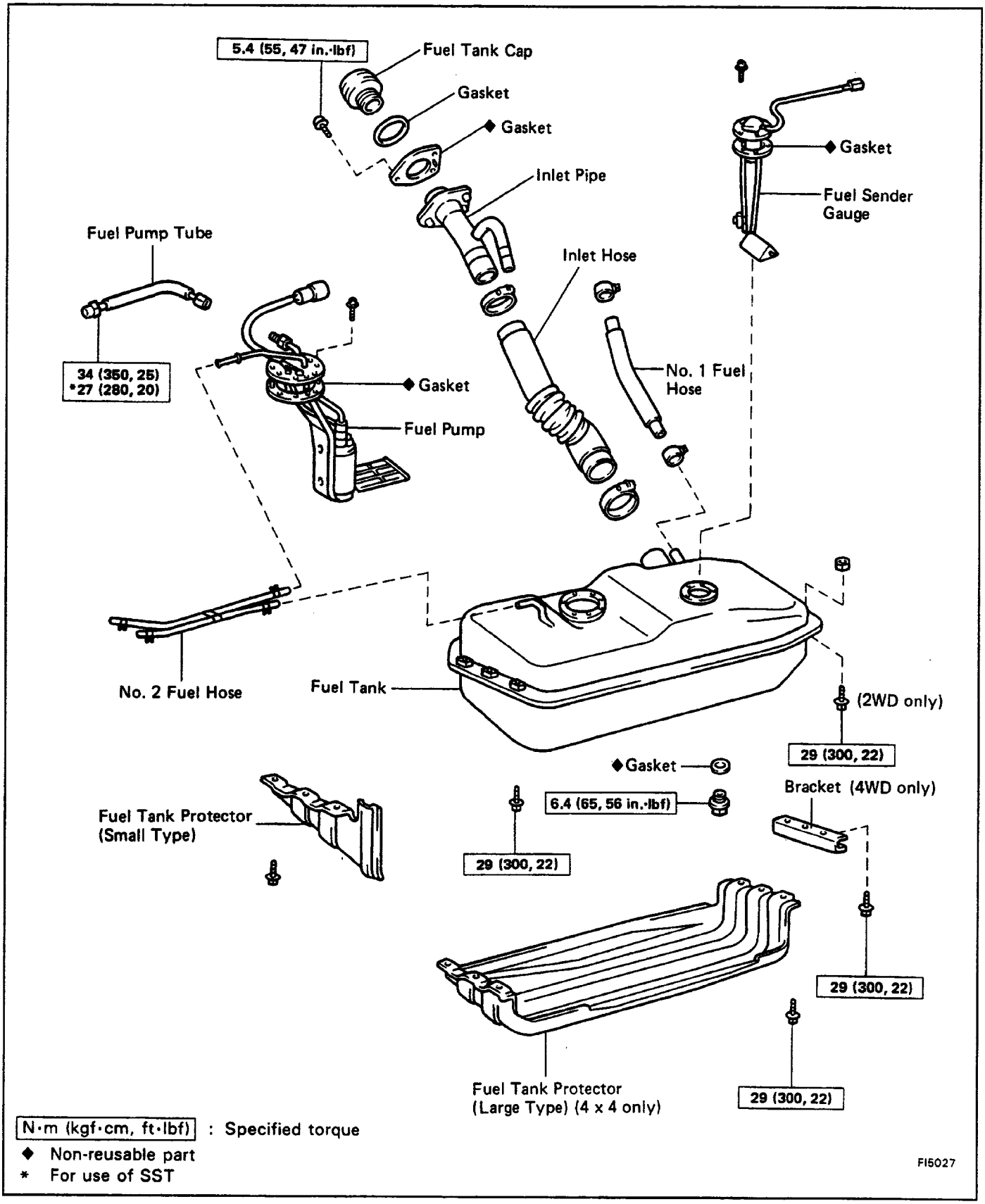


8. CHECK FOR FUEL LEAKAGE
(a) With the ignition switch ON, use SST to connect terminals Fp and +B of the DLC1.
SST 09843–18020
(b) Check for fuel leakage.
(c) Remove SST from the DLC1.

FUEL TANK AND LINE

EG1Y6–01

COMPONENTS

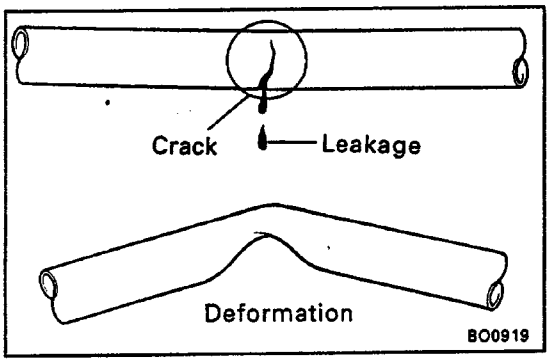


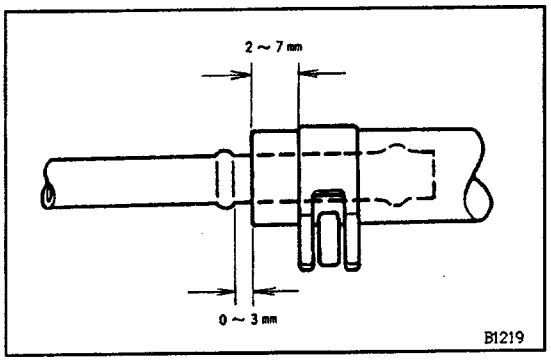
EG1Y6–01

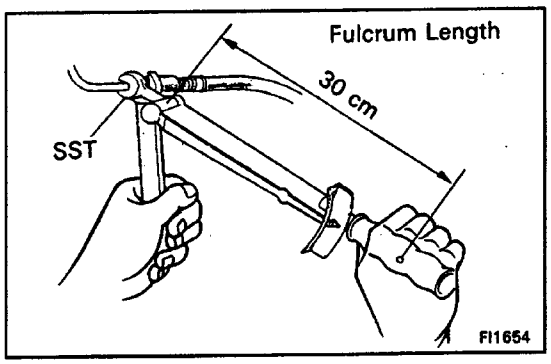
PRECAUTIONS

1. Always use new gaskets when replacing the fuel tank or component part.

2. Apply the proper torque to all parts tightened.







EG1Y7–01

FUEL LINES AND CONNECTIONS INSPECTION

(a) Inspect the fuel lines for cracks or leakage, and all connections for deformations.

(b) Inspect the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage.

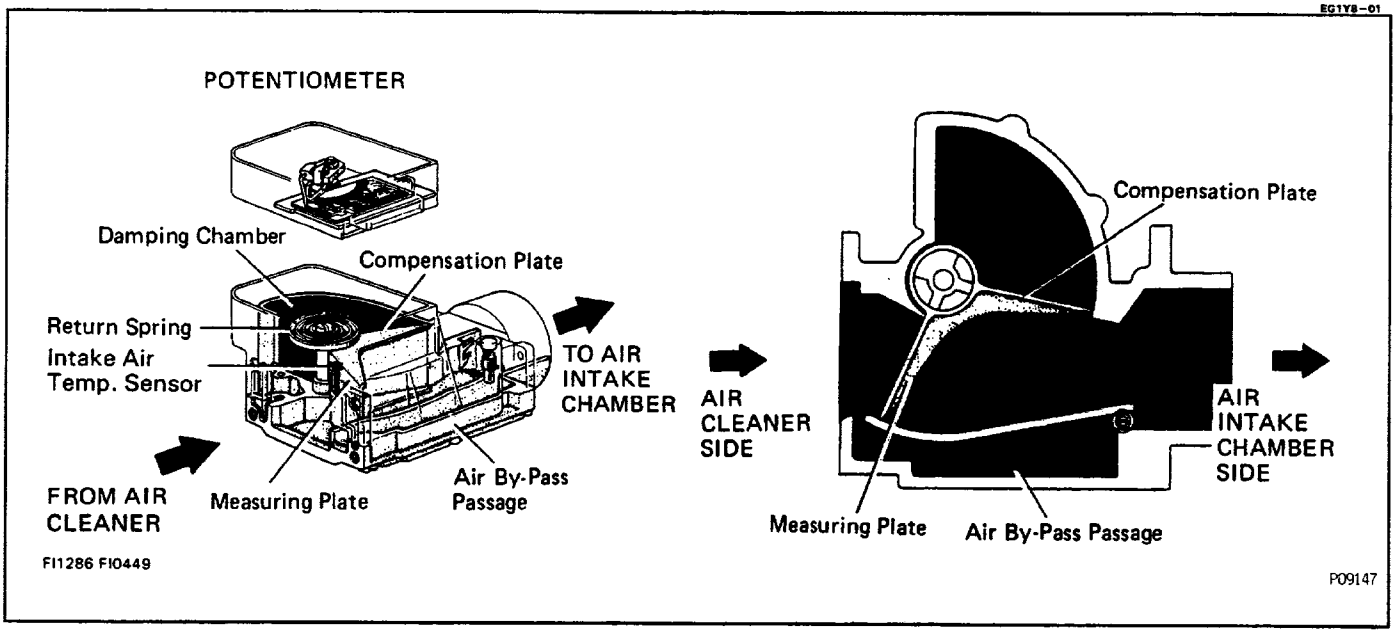
(c) Inspect the fuel tank for deformations, cracks or fuel leakage.

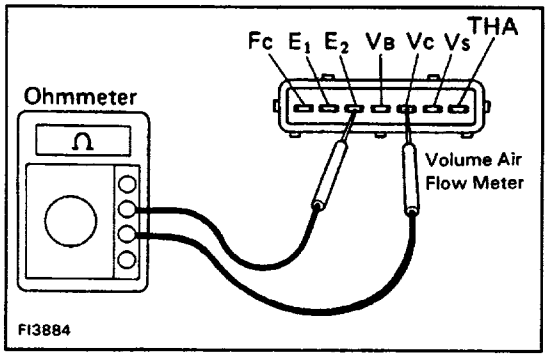
(d) Inspect the filler neck for damage or fuel leakage.

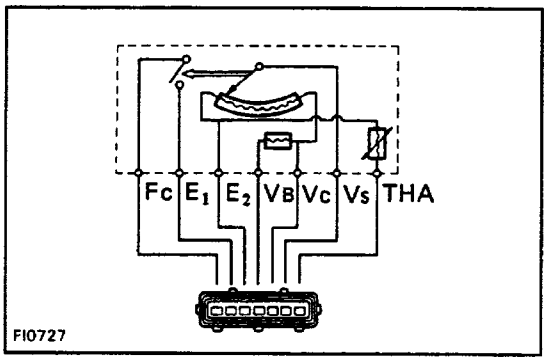
(e) Hose and tube connections are as shown in the il–lustration.

If a problem is found, repair or replace the parts as necessary. .

VOLUME AIR FLOW (VAF) METER







EG1Y9–01

ON–VEHICLE INSPECTION

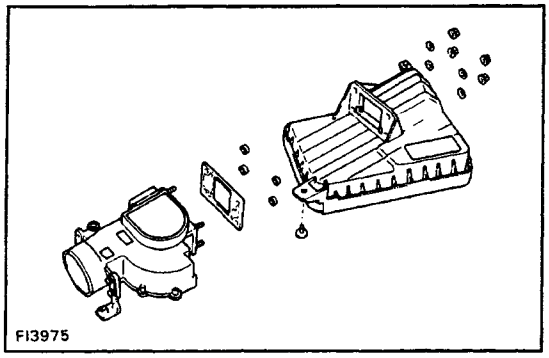
MEASURE RESISTANCE OF VOLUME AIR FLOW METER

(a) Disconnect the connector from the volume air flow meter.
(b) Using an ohmmeter, measure the resistance between each terminal.

Between terminals	Resistance	Temperature
E_2 – V_S	20 – 400 Ω	–
E_2 – V_C	100 – 300 Ω	–
E_2 – V_B	200 – 400 Ω	–
E_2 – THA	10 – 20 kΩ 4 – 7 kΩ 2 – 3 kΩ 0.9 – 1.3 kΩ 0.4 – 0.7 kΩ	–20°C (–4°F) 0°C (32°F) 20°C (68°F) 40°C (104°F) 60°C (140°F)
E_1 – F_C	Infinity	–

V02175

If not within specification, replace the volume air flow meter.



EG1YA–01

VAF METER REMOVAL

1. DISCONNECT INTAKE AIR CONNECTOR

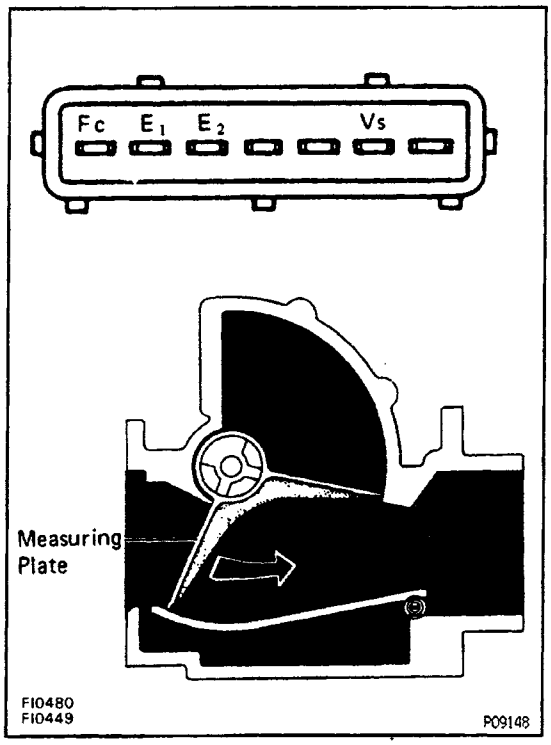
2. REMOVE AIR CLEANER CAP WITH VOLUME AIR FLOW METER

(a) Disconnect the volume air flow meter connector.

(b) Remove the air cleaner cap with volume air flow meter.

3. REMOVE VOLUME AIR FLOW METER

Remove the bolt, four nuts, washers, volume air flow meter and gasket.



EG1YB–01

VAF METER INSPECTION

MEASURE RESISTANCE OF VAF METER

Using an ohmmeter, measure the resistance between each terminal by moving the measuring plate.

Between terminals	Resistance (Ω)	Measuring plate opening
E1– Fc	Infinity	Fully closed
	Zero	Other than closed position
E2 – Vs	20–400	Fully closed
	20– 1,000	Fully open

HINT: Resistance between terminals E2 and Vs will change in a wave pattern as the measuring plate slowly opens.

EG1YC–01

VAF METER INSTALLATION

1. INSTALL VOLUME AIR FLOW METER

Install the gasket, volume air flow meter, washers, nuts and bolt. Torque the nuts and bolt.

2. INSTALL AIR CLEANER CAP WITH VAF METER

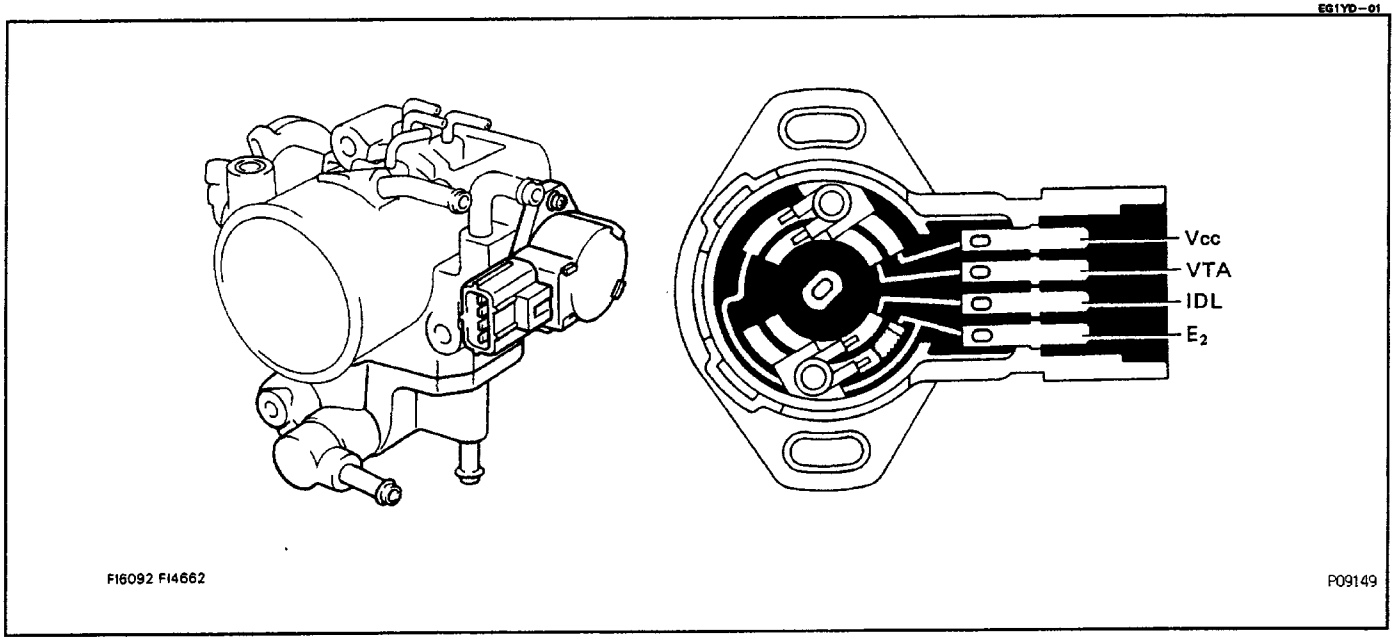
(a) Install the air cleaner cap with VAF meter to the air cleaner case.

(b) Connect the VAF meter connector.

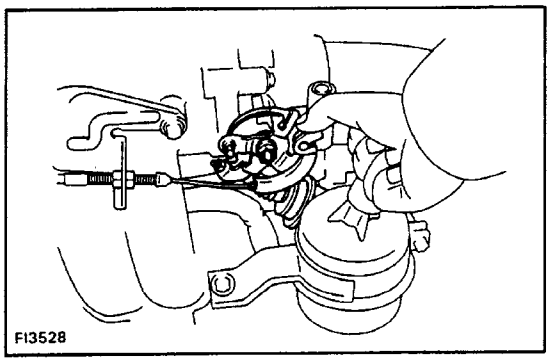
3. INSTALL INTAKE AIR CONNECTOR

THROTTLE BODY

EG1YD–01



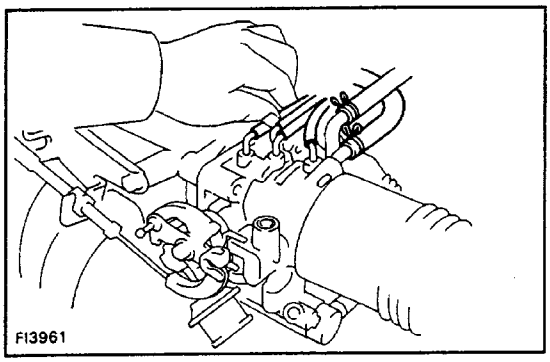
EG1YE–05



ON–VEHICLE INSPECTION

1. INSPECT THROTTLE BODY

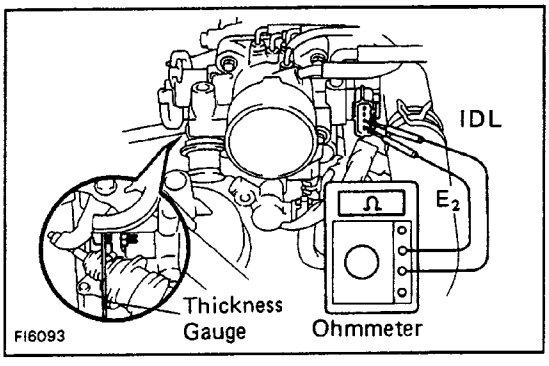
(a) Check that the throttle linkage moves smoothly.



(b) Check the vacuum at each port.

- Start the engine.
- Check the vacuum with your finger.

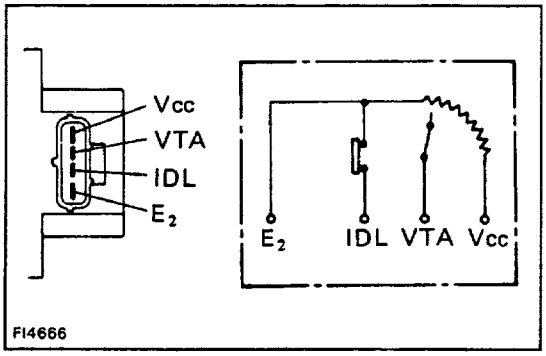
Port name	At idling	At 3,500 rpm
E	No vacuum	Vacuum
R	No vacuum	Vacuum
P	No vacuum	Vacuum



2. INSPECT THROTTLE POSITION SENSOR

Check the resistance between the terminals.

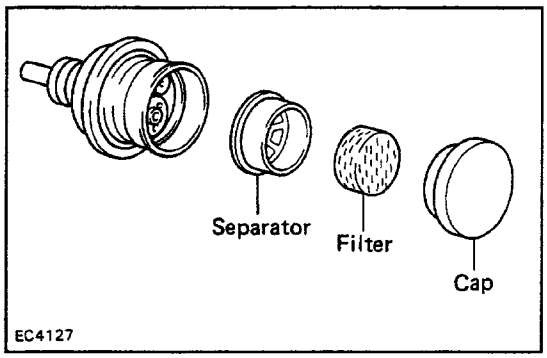
- Unplug the connector from the sensor.
  Insert a thickness gauge between the throttle stop screw and stop lever.
- Using an ohmmeter, check the resistance between each terminal.



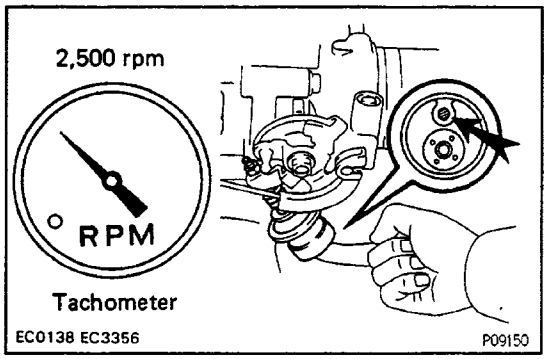
Clearance between lever and stop screw	Between terminals	Resistance
0 mm 10 in.	VTA – E2	0.47 – 8.1 kΩ
0.57 mm 10.0224 in.)	IDL – E2	2.3 kΩ or less
0.85 mm (0.0335 in.)	IDL – E2	Infinity
Throttle valve fully open	VTA – E2	3.1 – 12.1 kΩ
–	Vcc – E2	3.9 – 9.4 kΩ

V01951

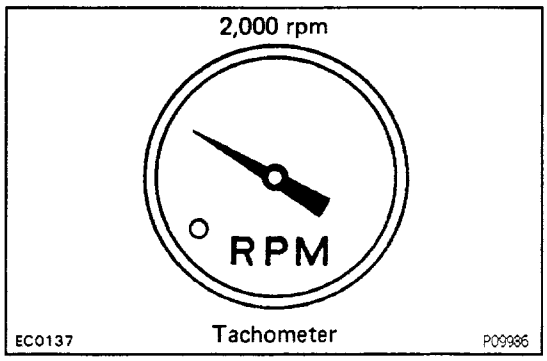
3. (M/T)
INSPECT DASH POT (DP)
A. Warm up engine
Allow the engine to warm up to normal operating temperature.
B. Check idle speed and adjust if necessary
(See page MA–11)
Idle speed: 750 rpm



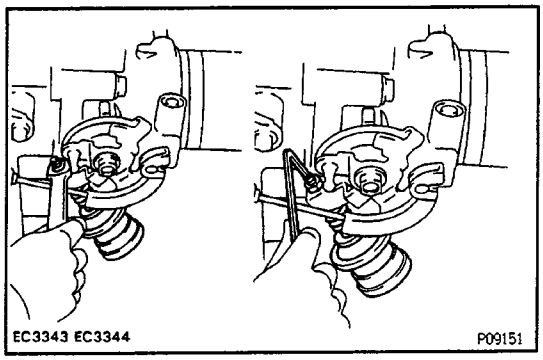
C. Remove cap, filter, and separator from DP



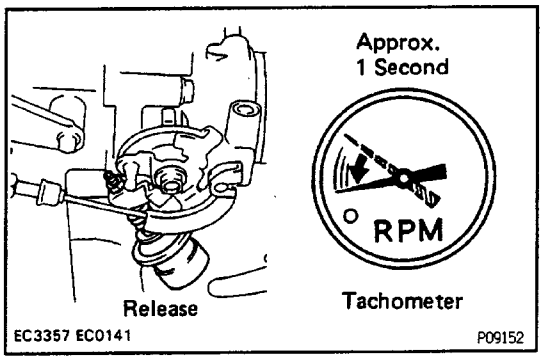
D. Check and adjust dash pot (DP) setting speed
(a) Maintain engine speed at 2,500 rpm.
(b) Plug the VTV hole with your finger.



(c) Release the throttle valve.
(d) Check the DP is set.
DP setting speed: 2,000 rpm



(e) If not as specified, adjust with the DP adjusting screw.



E. Check operation of VTV

(a) Set the DP setting speed in the same procedure as above; (a) to (c).

(b) Remove your finger from the hole and check that the engine returns to idle speed in approx. 1 second.

F. Reinstall DP separator, filter and cap

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

4. (A/T)

INSPECT THROTTLE OPENER

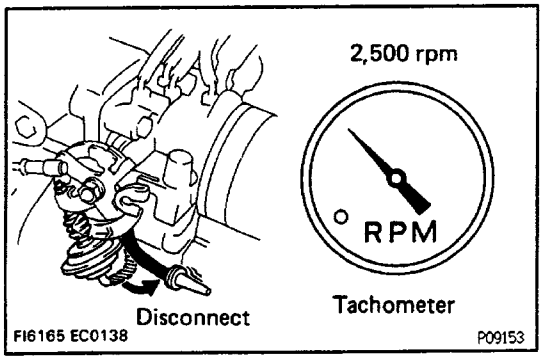
A. Warm up engine

Allow the engine to warm up to normal operating temperature.

B. Check idle speed

Idle speed: 2WD 750 50 rpm

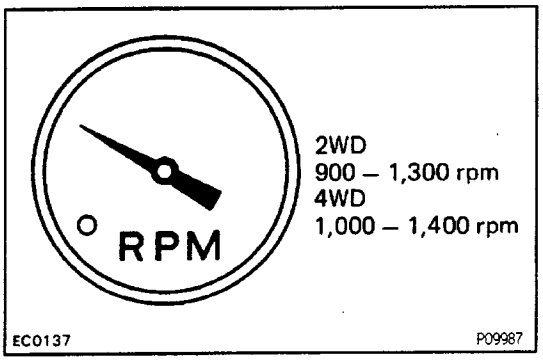
4WD 850 ± 50 rpm



C. Check and adjust throttle opener setting speed

(a) Disconnect the vacuum hose from the throttle opener, and plug the hose end.

(a) Disconnect the vacuum hose from the throttle opener, and plug the hose end.



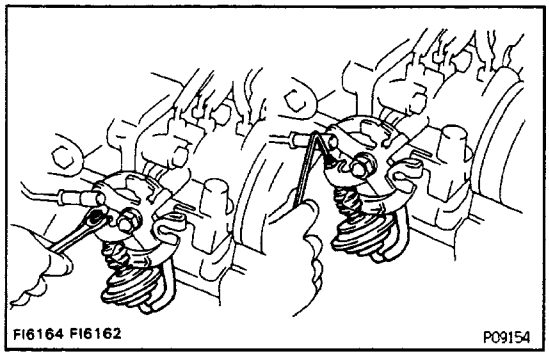
(c) Release the throttle valve.

(d) Check that the throttle opener is set.

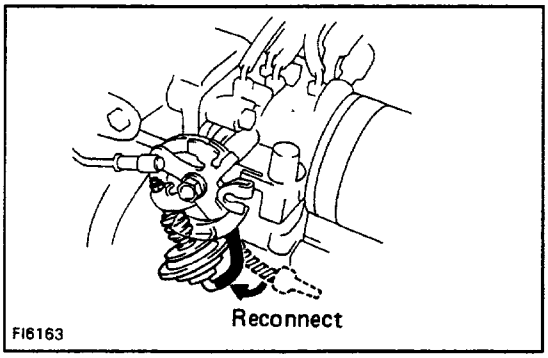
Throttle opener setting speed:

2WD 900–1,300 rpm

4WD 1,000–1,400 rpm



(e) If not as specified, adjust with the throttle opener adjusting screw.

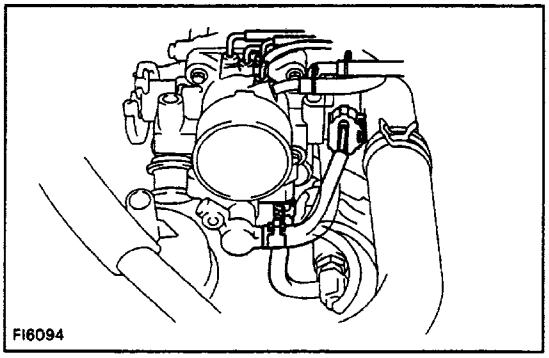


(f) Reconnect the vacuum hose to the throttle opener.

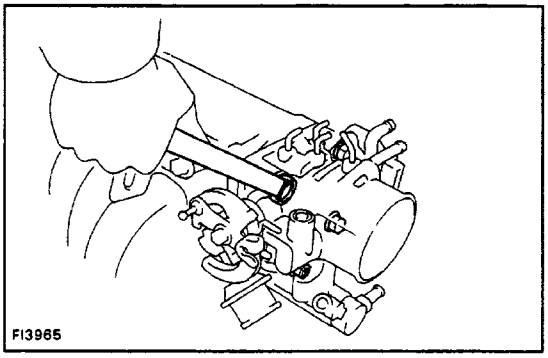
EG1YF–01

THROTTLE BODY REMOVAL

1. REMOVE INTAKE AIR CONNECTOR
2. DRAIN COOLANT
3. DISCONNECT ACCELERATOR CABLE



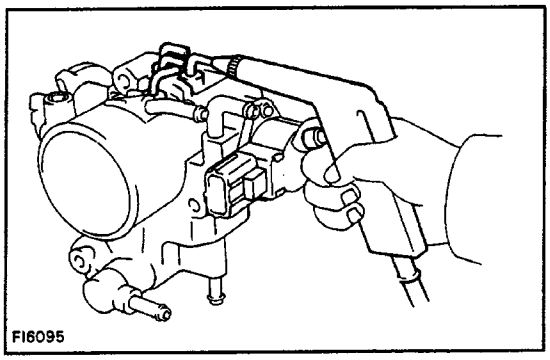
4. DISCONNECT FOLLOWING HOSES:
(a) (with A/C)
A/C idle up hose.
(b) PCV hose
(c) No. 2 and No. 3 water by–pass hoses.
(d) Label and disconnect the emission control hoses.
5. DISCONNECT THROTTLE SENSOR CONNECTOR



6. REMOVE THROTTLE BODY
Remove the three bolts and but, and remove the throttle body and gasket.

THROTTLE BODY INSPECTION

EG1YG–01

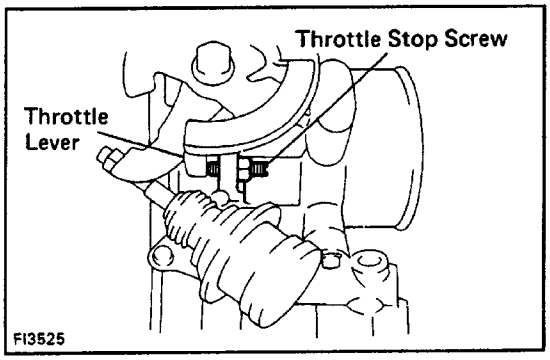


1. CLEAN THROTTLE BODY BEFORE INSPECTION

(a) Wash and clean the cast parts with a soft brush in carburetor cleaner.

(b) Using compressed air, clean all the passages and apertures in the throttle body.

NOTICE: To prevent deterioration, do not clean the throttle position sensor.

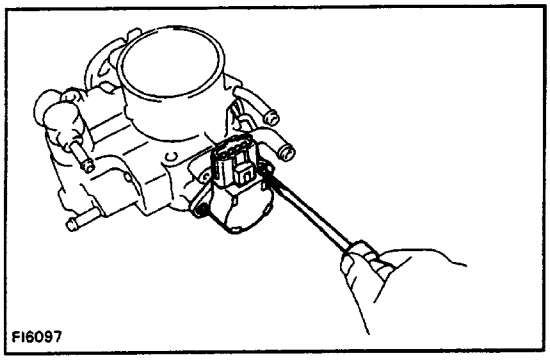


2. CHECK THROTTLE VALVE

Check that there is no clearance between the throttle stop screw and throttle lever when the throttle valve is fully closed.

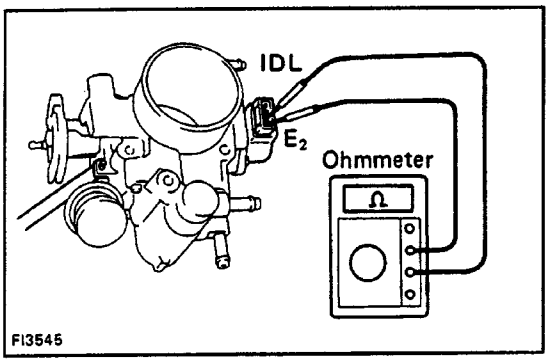
3. CHECK THROTTLE POSITION SENSOR

(See step 2 on page EG1–197)

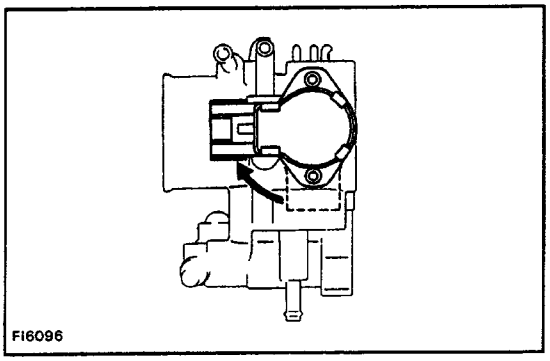


4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

(a) Loosen the two screws of the sensor.



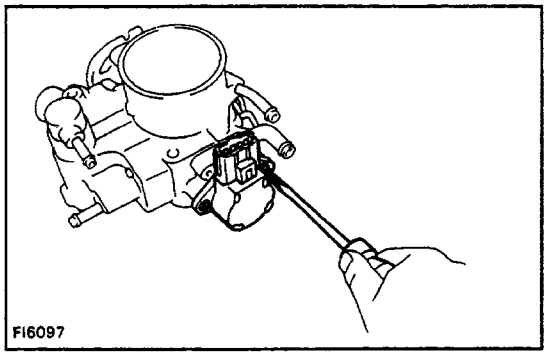
(b) Insert a thickness gauge (0.70 mm or 0.0276 in.) between the throttle stop screw and lever, and connect the ohmmeter to terminals IDL and E2.



(c) Gradually turn the sensor clockwise until the ohmmeter deflects, and secure the sensor with the two screws.

(d) Using a thickness gauge, recheck the continuity between terminals IDL and E2.

Clearance between lever and stop screw	Continuity (IDLE – E2)
0.57 mm (0.0224 in.)	Continuity
0.85 mm (0.0335 in.)	No continuity

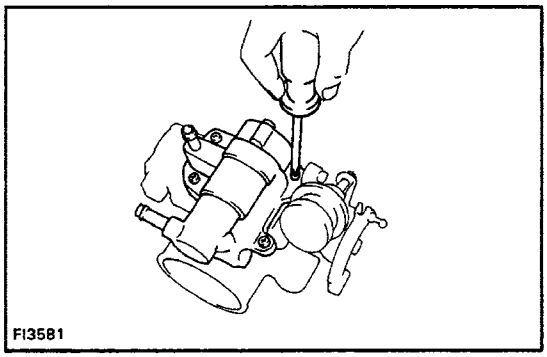


EG1YH–01

THROTTLE BODY DISASSEMBLY

1. REMOVE THROTTLE POSITION SENSOR

Remove the two screws and sensor.



2. REMOVE AUXILIARY AIR VALVE

Remove the four screws, air valve and O–ring.

3. (M/T)

REMOVE DASH POT

4. (A/T)

REMOVE THROTTLE OPENER

EG1YJ–01

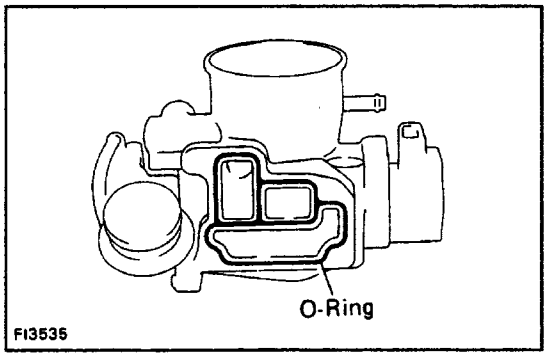
THROTTLE BODY ASSEMBLY

1. (M/T)

INSTALL DASH POT

2. (A/T)

INSTALL THROTTLE OPENER



3. INSTALL AIR VALVE

(a) Place a new O–ring on the throttle body.

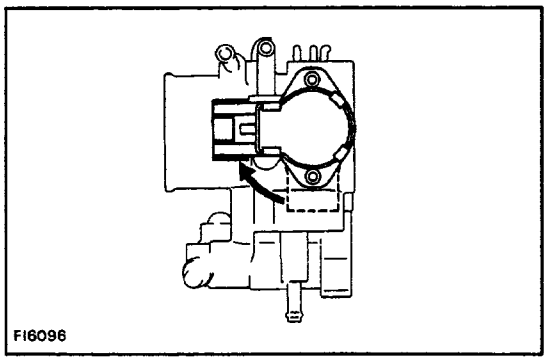
(b) Install the air valve with the four screws.

4. INSTALL THROTTLE POSITION SENSOR

(a) Check that the throttle valve is fully closed.

(b) Place the sensor on the throttle body as shown in the illustration.

(c) Turn the sensor clockwise, and temporarily install the two screws.



5. ADJUST THROTTLE POSITION SENSOR

(See step 4 on page EG1–202**)**

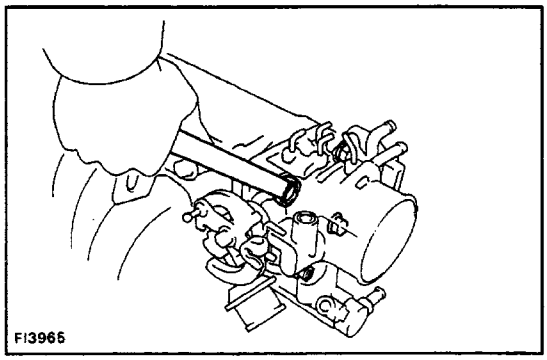
EG1YK–01

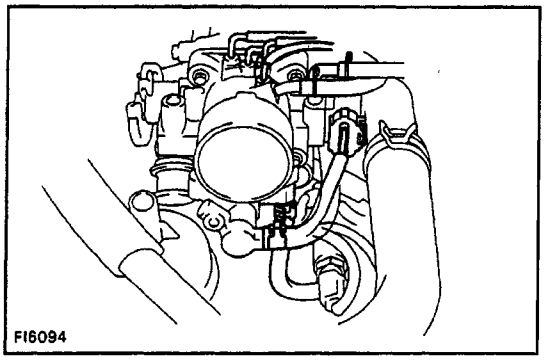
THROTTLE BODY INSTALLATION

1. INSTALL THROTTLE BODY

Using a new gasket, install the throttle body, three bolts and nut.

Torque: 19 N–m (195 kgf–cm. 14 ft–lbf)

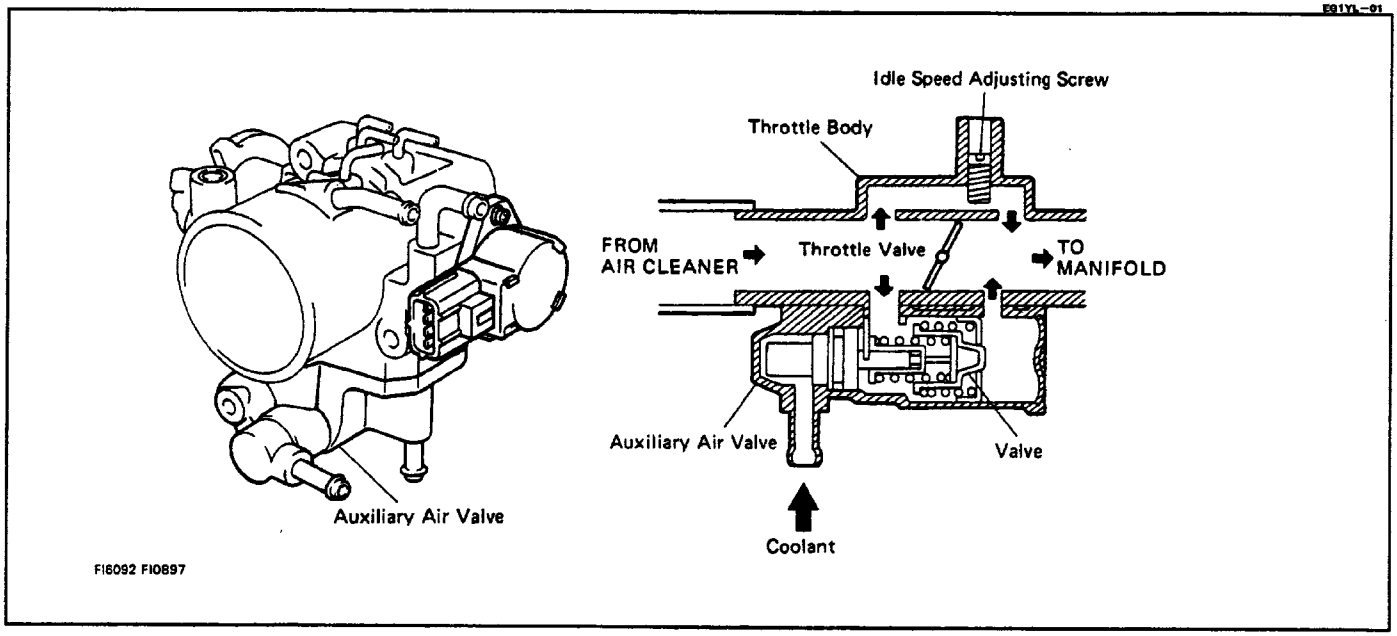


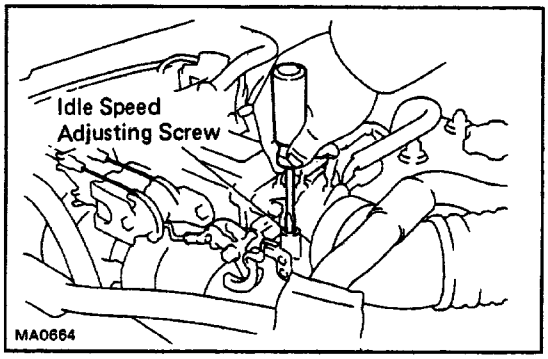


2. CONNECT THROTTLE SENSOR CONNECTOR
3. CONNECT FOLLOWING HOSES:
(a) Emission control hoses
(b) No. 2 and No. 3 water by–pass hoses
(c) PCV hose
(d) (with A/C) A/C idle up hose
4. CONNECT ACCELERATOR CABLE
5. INSTALL AIR INTAKE CONNECTOR
6. FILL WITH COOLANT

AUXILIARY AIR VALVE

EG1YL–01





EG1YM–02

ON –VEHICLE INSPECTION

CHECK OPERATION OF AUXILIARY AIR VALVE

Check the engine rpm by fully screwing in the idle speed adjusting screw.

At low temp. (Coolant temp.: below 80°C/176°F)

- When the idle speed adjusting screw is in, the engine rpm should drop.

  After warm–up
- When the idle speed adjusting screw is in, the engine rpm should drop below idle speed stop.

EG1YN–01

AUXILIARY AIR VALVE REMOVAL

1. REMOVE THROTTLE BODY

(See page EG1–200**)**

2. REMOVE AUXILIARY AIR VALVE

(See step 2 on page EG1–202**)**

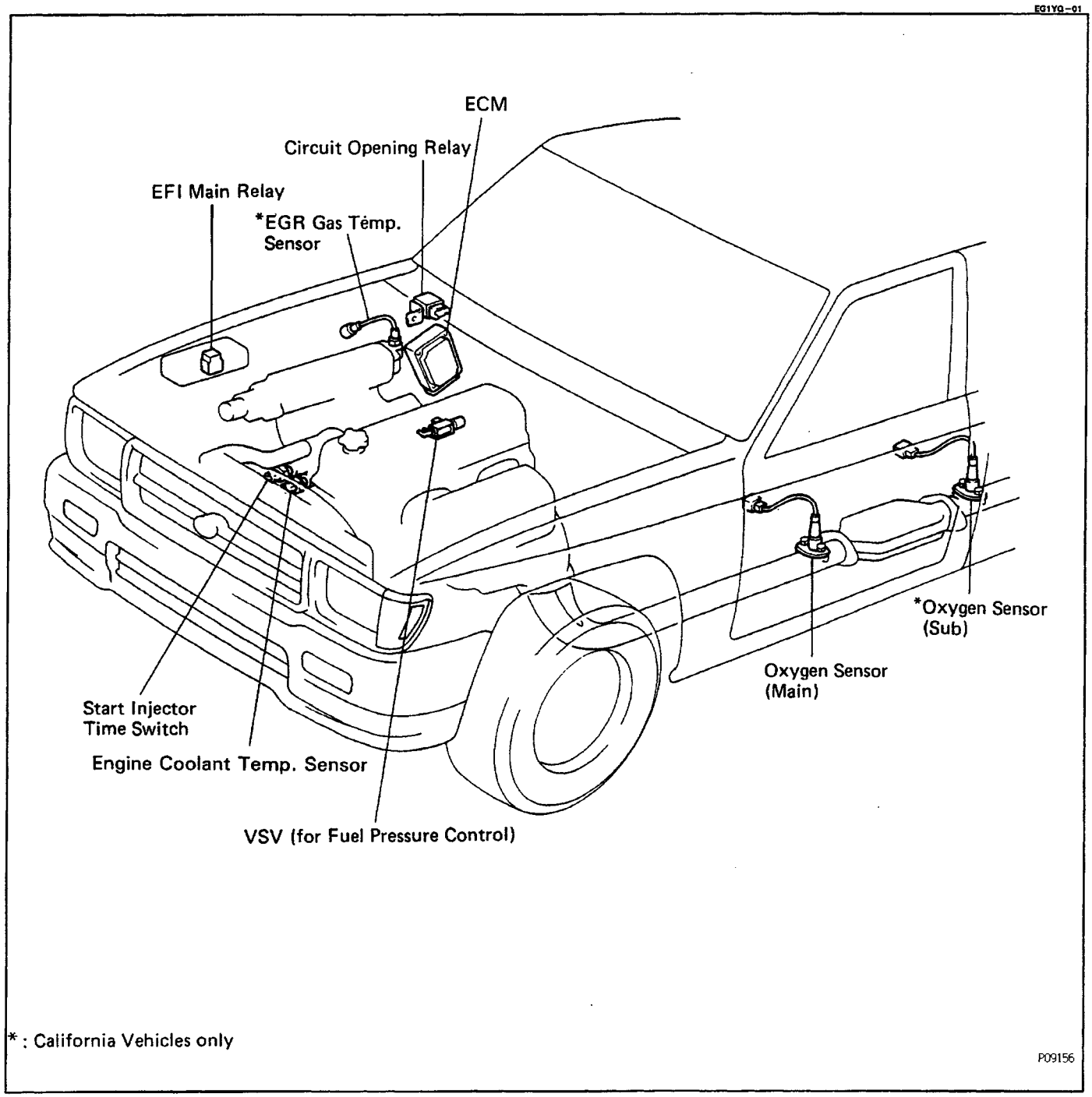
AUXILIARY AIR VALVE INSTALLATION w

1. INSTALL AUXILIARY AIR VALVE

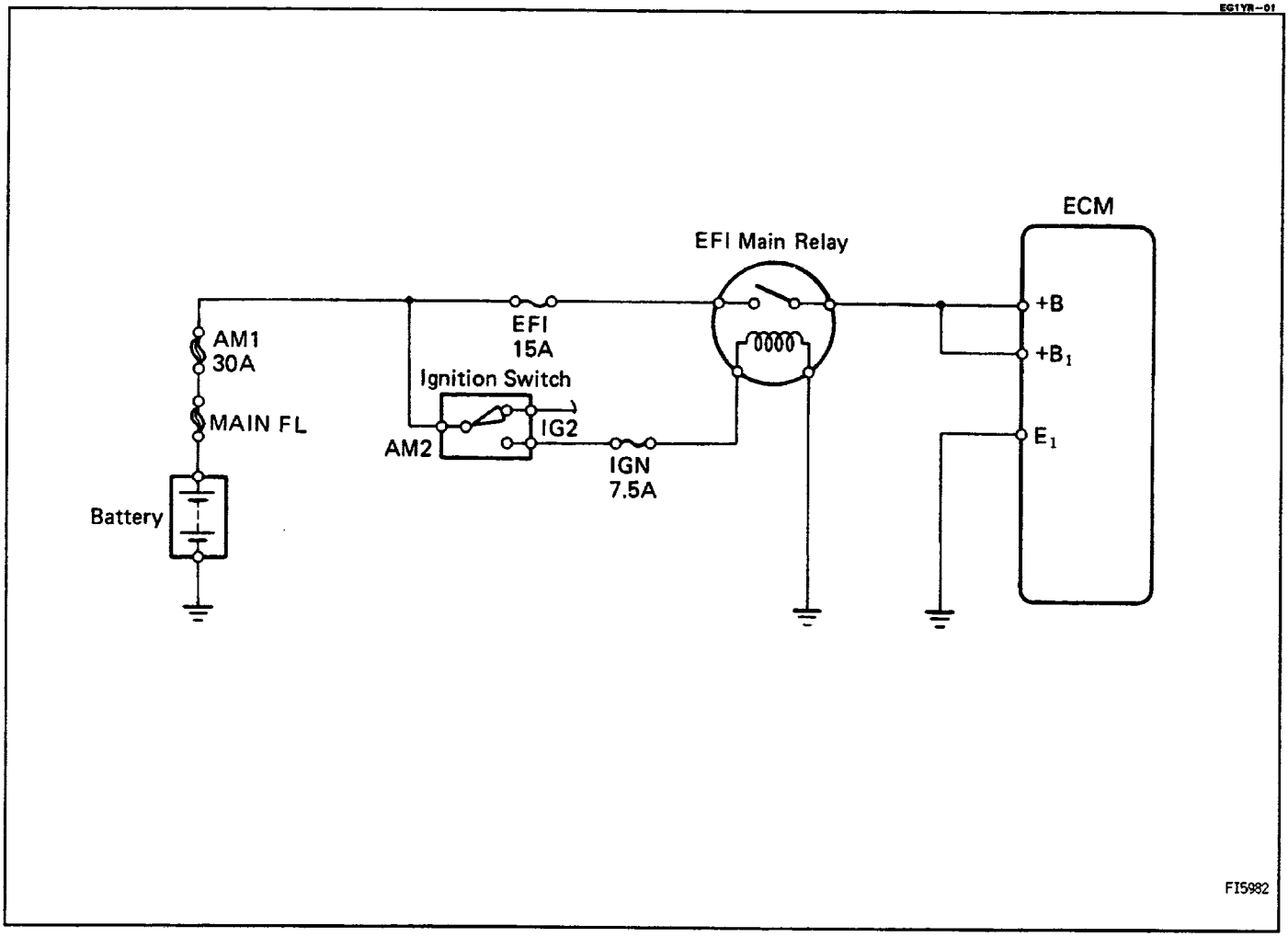
(See step 2 on page EG1–202**)**

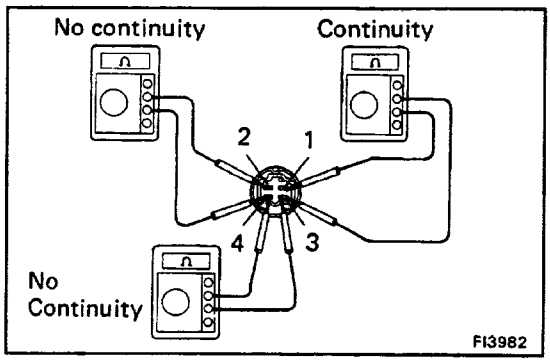
2. INSTALL THROTTLE BODY
(See page EG1–202)

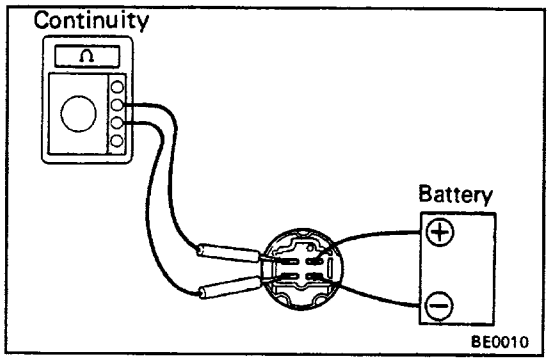
ELECTRONIC PARTS LOCATION



EFI MAIN RELAY







EFI MAIN RELAY INSPECTION

EG1YS–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.

(c) Check that there is no continuity between terminals 3 and 4.

If operation is not as specified, replace the relay.

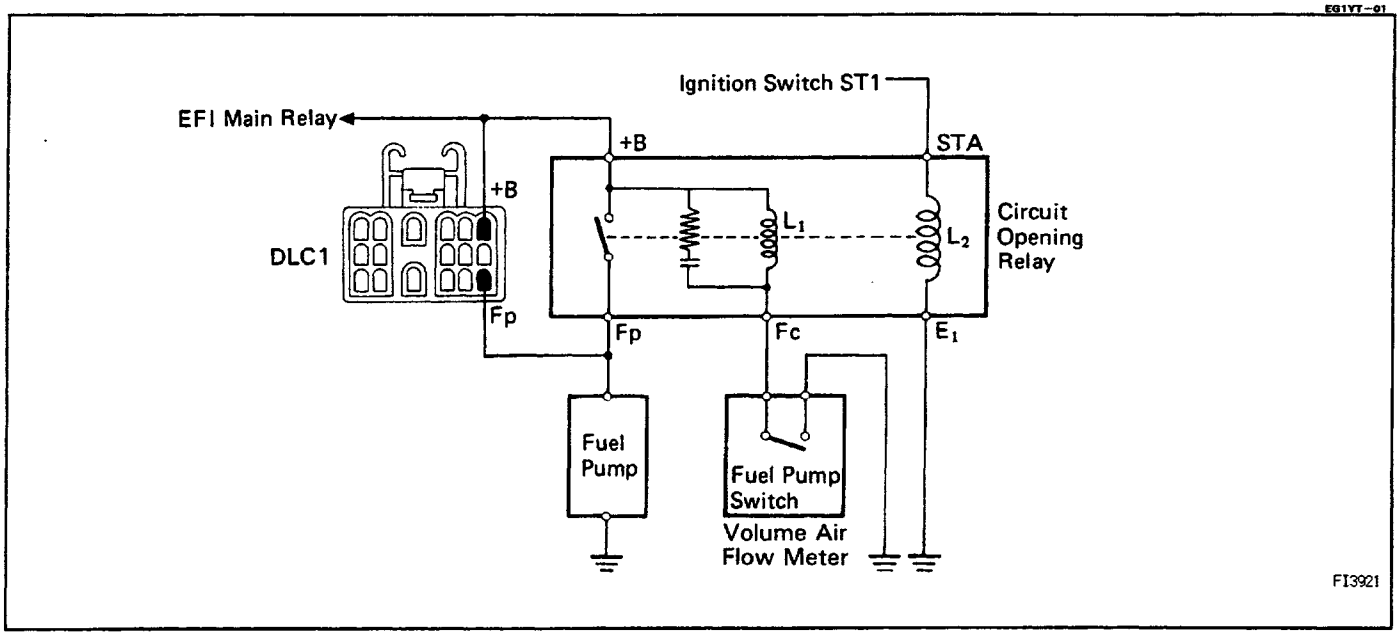
2. INSPECT RELAY OPERATION

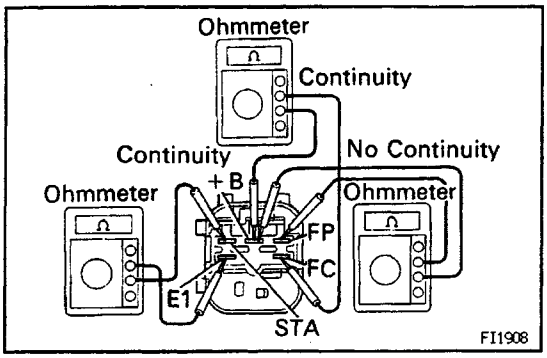
(a) Apply battery voltage across terminals 1 and 3.

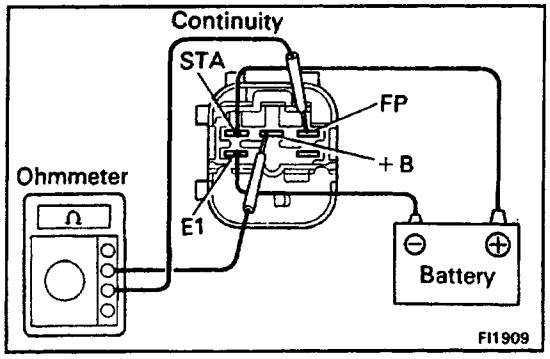
(b) Using an ohmmeter, check that there is continuity between terminals 2 and 4.

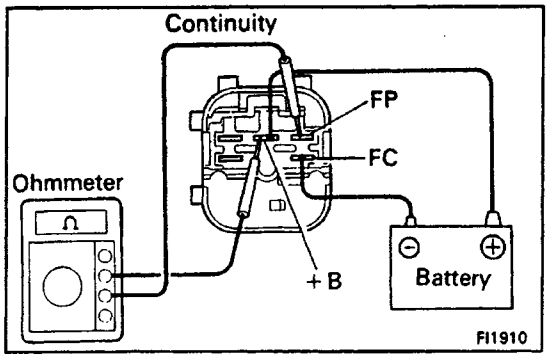
If operation is not as specified, replace the relay.

CIRCUIT OPENING RELAY









CIRCUIT OPENING RELAY INSPECTION

1. INSPECT RELAY CONTINUITY

(a) Using an ohmmeter, check that there is continuity between terminals STA and E1.

(b) Check that there is no continuity between terminals B 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 STA and E1.

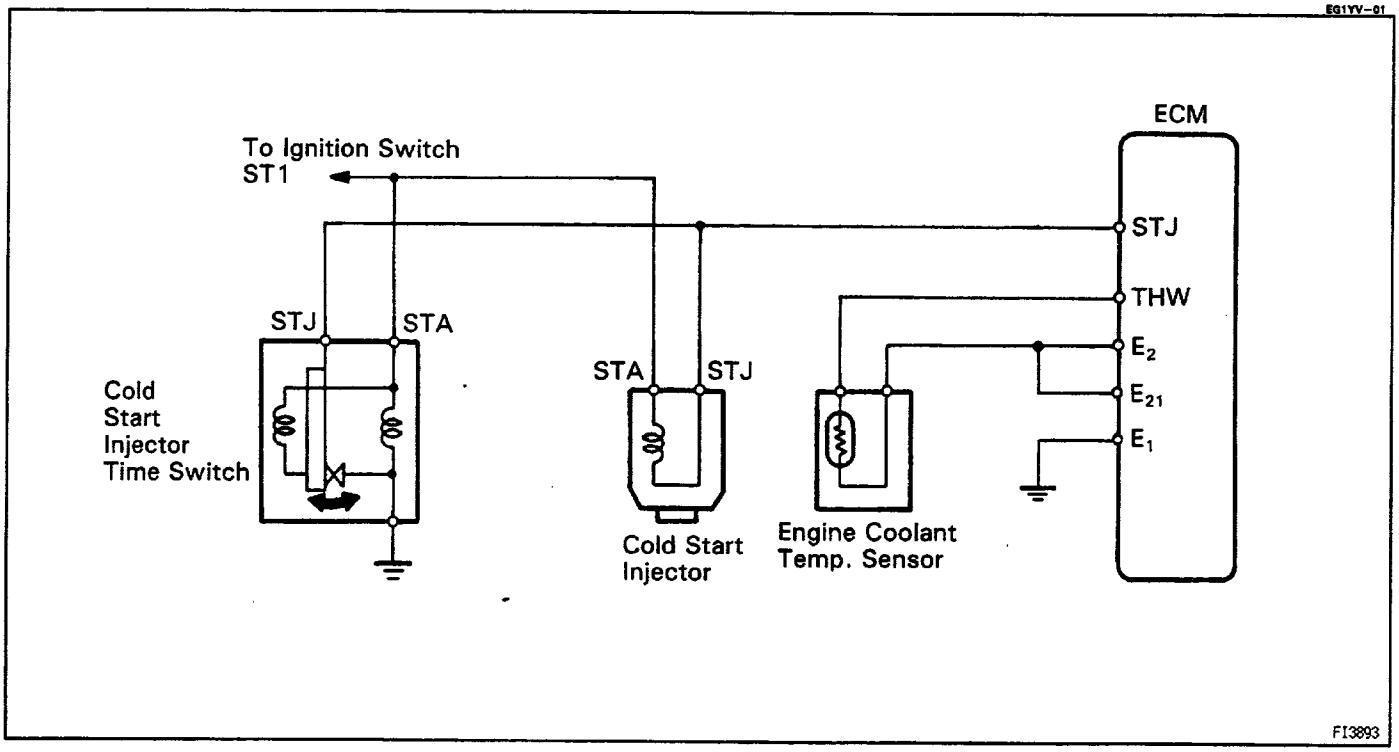
(b) Using an ohmmeter, check that there is continuity between terminals B and FP.

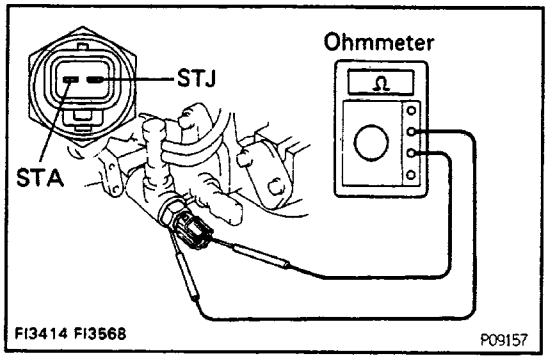
(c) Apply battery voltage across terminals B and FC.

(d) Check that there is continuity between terminals B and FP.

If operation is not as specified, replace the relay.

COLD START INJECTOR TIME SWITCH





START INJECTOR TIME SWITCH INSPECTION

EG1YW–01

MEASURE RESISTANCE OF START INJECTOR TIME SWITCH

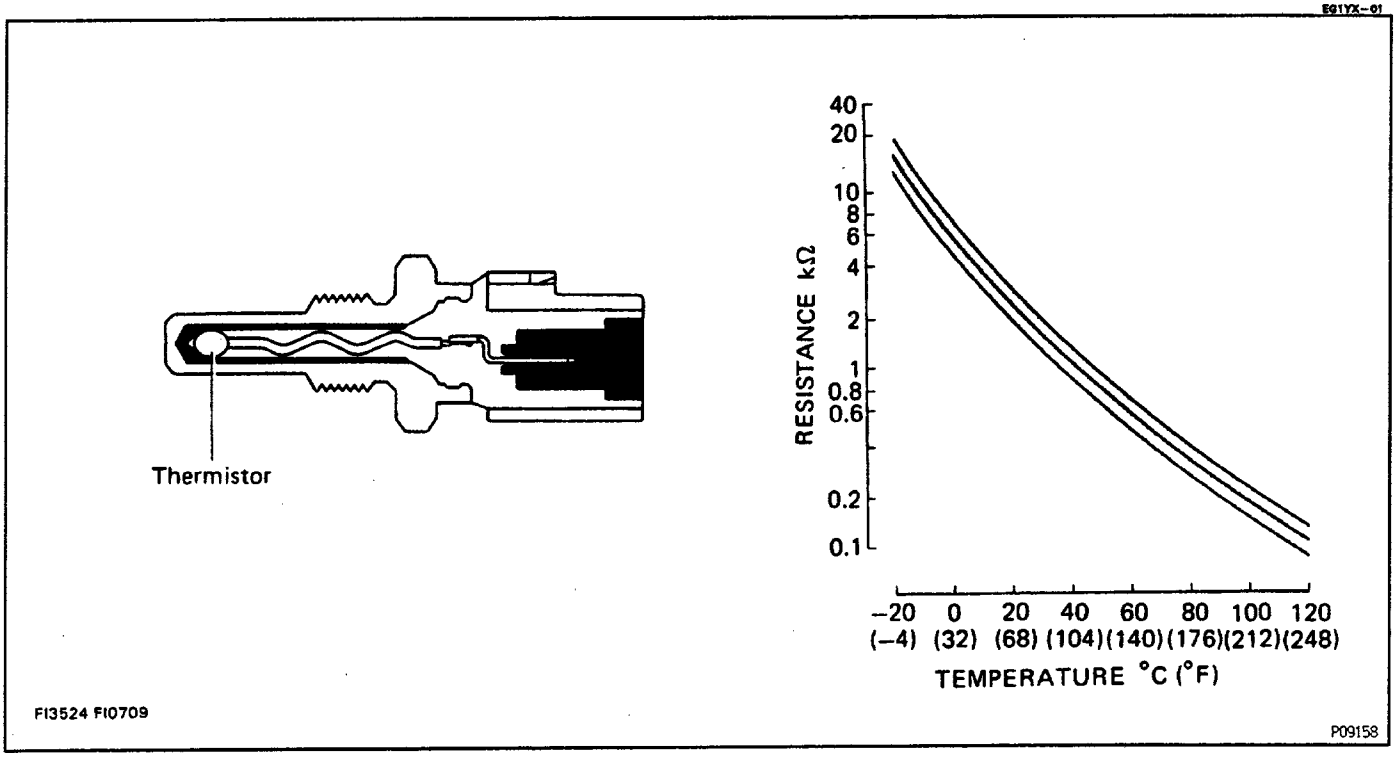
(a) Disconnect the connector.

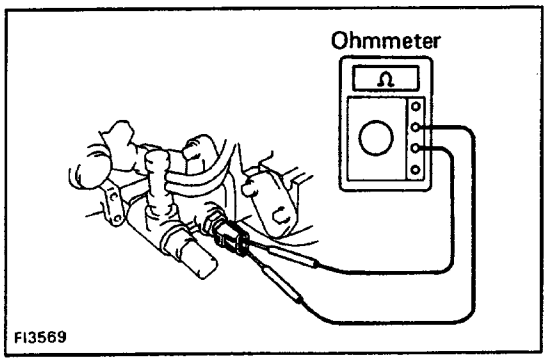
(b) Using an ohmmeter, measure the resistance between terminals.

Between terminals	Resistance (Ω)	Coolant temperature
STA – STJ	30– 50	below 10°C (54°F)
	65–90	above 30°C (86°F)
STA – Ground	30–90	–

V01952

ENGINE COOLANT TEMPERATURE (ECT) SENSOR

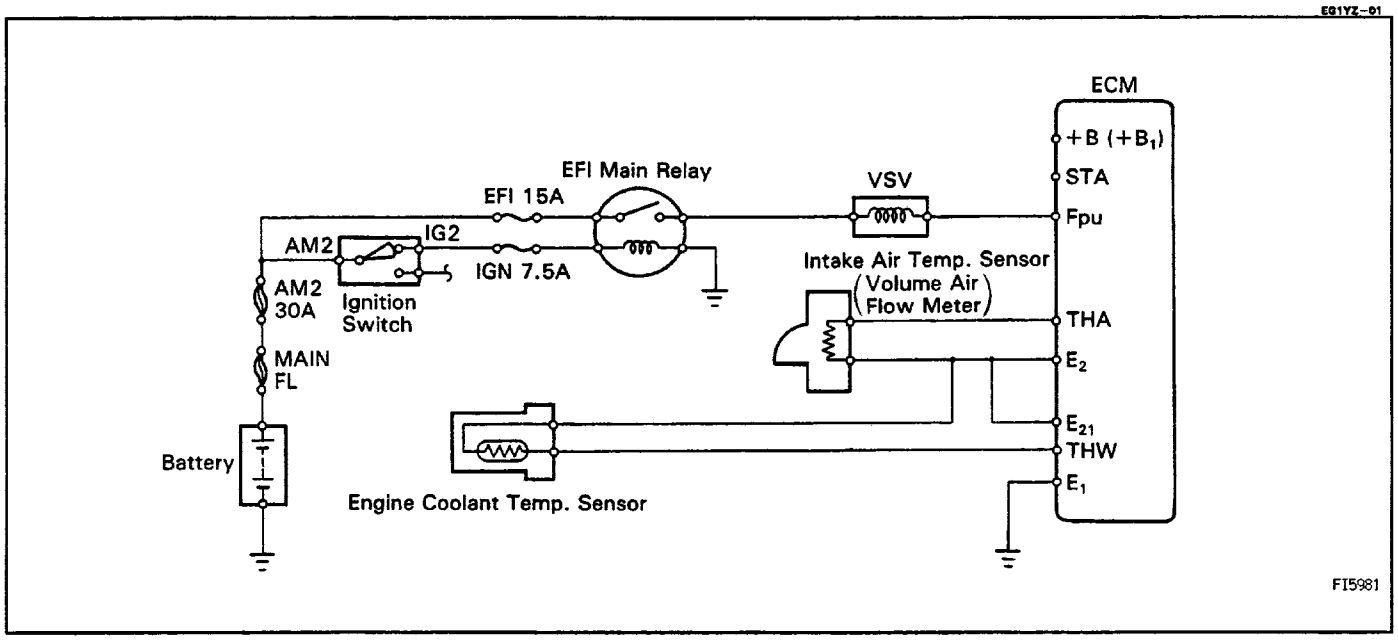


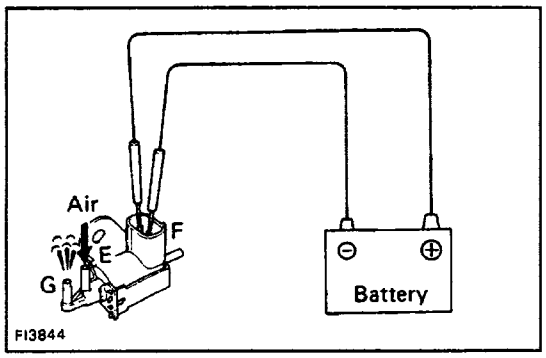


ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION

(a) Disconnect the connector.
(b) Using an ohmmeter, measure the resistance between the terminals.
Resistance: Refer to the chart above.

FUEL PRESSURE CONTROL SYSTEM





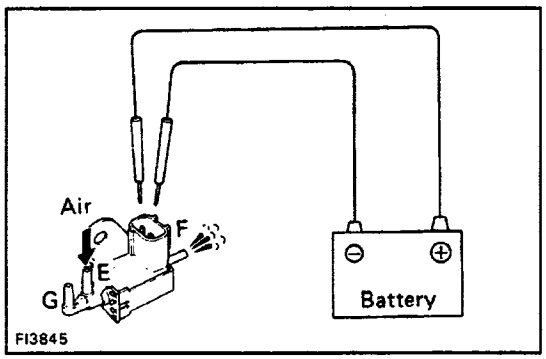
EG1Z0–01

VSV INSPECTION

1. CHECK VACUUM CIRCUIT CONTINUITY IN VSV BY BLOWING AIR INTO PIPE

(a) Connect the VSV terminals to the battery terminals as illustrated.

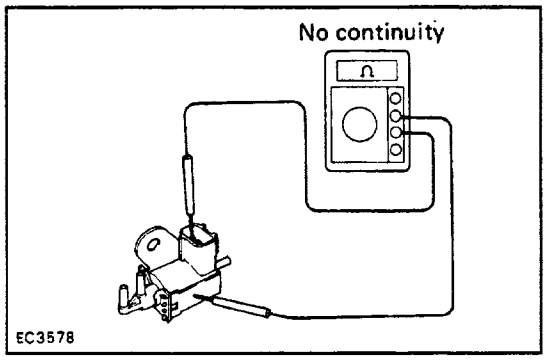
(b) Blow air into pipe E and check that air comes out of pipe G.



(c) Disconnect the battery.

(d) Blow air into pipe E and check that air comes out of pipe F.

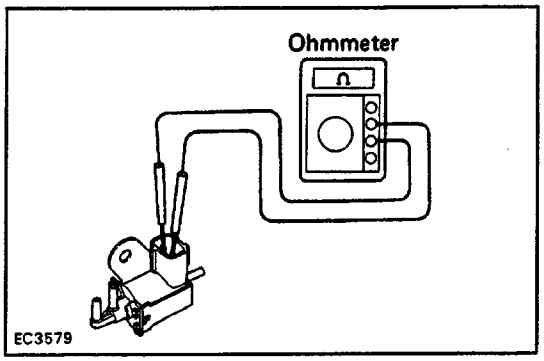
If a problem is found, repair or replace the VSV.



2. CHECK FOR SHORT CIRCUIT

Using an ohmmeter, check that there is no continuity between the terminal and the VSV body.

If there is continuity, replace the VSV.

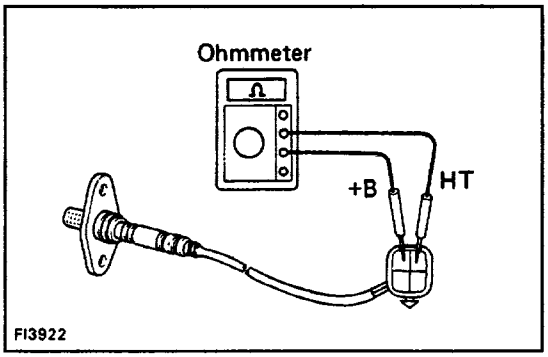


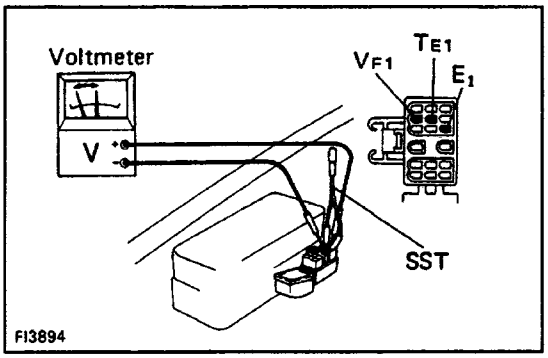
3. CHECK FOR OPEN CIRCUIT

Using an ohmmeter, measure the resistance between both terminals as illustrated.

Specified resistance: 30–50 Ω at 20˚C (68˚ F)

If resistance is not within specification, replace the VSV.





OXYGEN SENSOR

EG1Z1–01

OXYGEN SENSOR INSPECTION

1. INSPECT HEATER RESISTANCE OF OXYGEN SENSOR

Using an ohmmeter, measure the resistance between the terminals +B and HT.

Resistance: 5.1.–6.3 Ω at 20°C (68°F)

If the resistance is not as specified, replace the oxygen sensor.

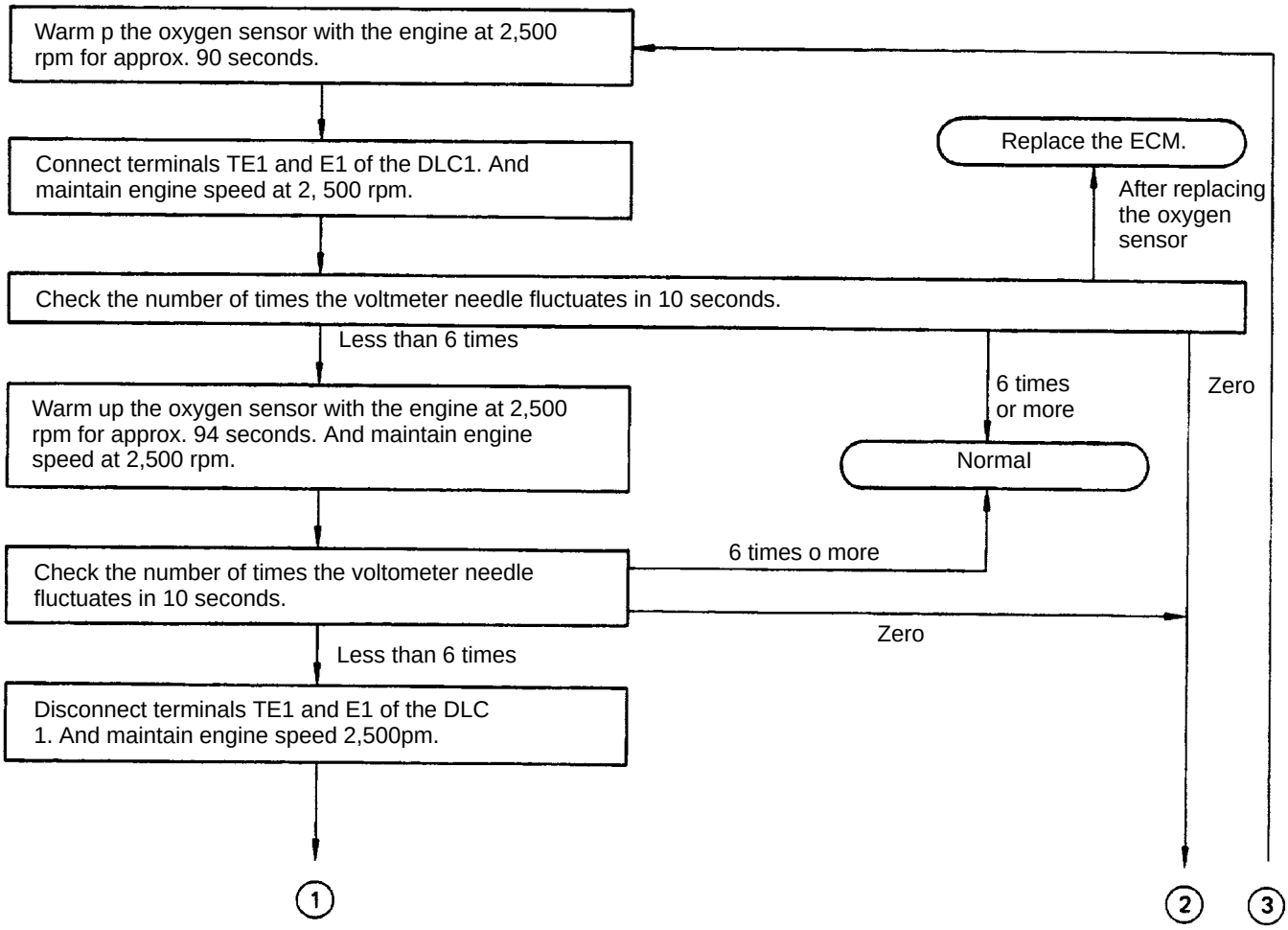
2. INSPECTION OF FEEDBACK VOLTAGE (VF1)

(a) Warm up the engine.

(b) Connect the voltmeter to the DLC1 terminals VF, and E1.

HINT: Use SST when connecting between terminals TE1 and E1 of the DLC1.

SST 09843–18020



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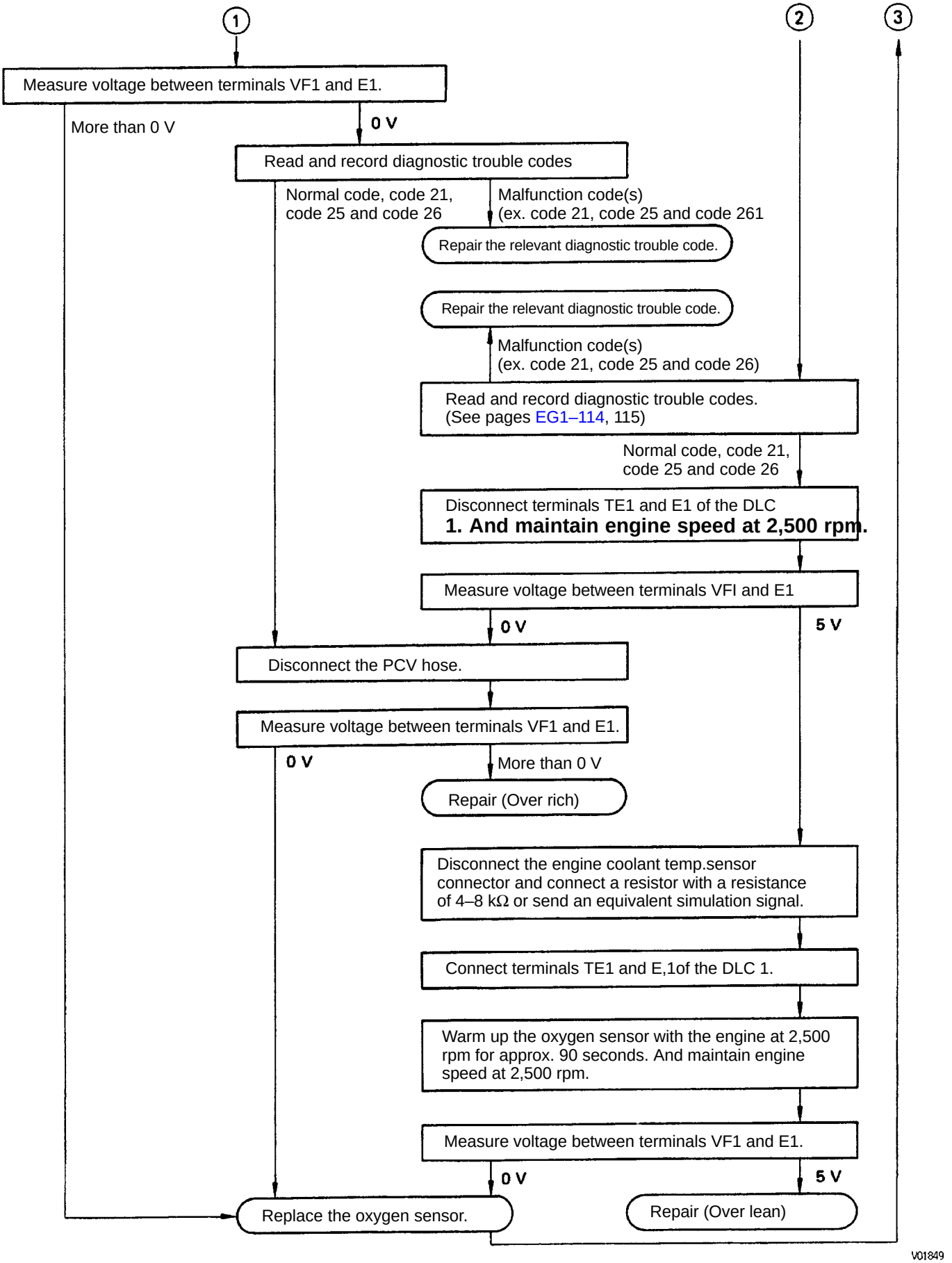
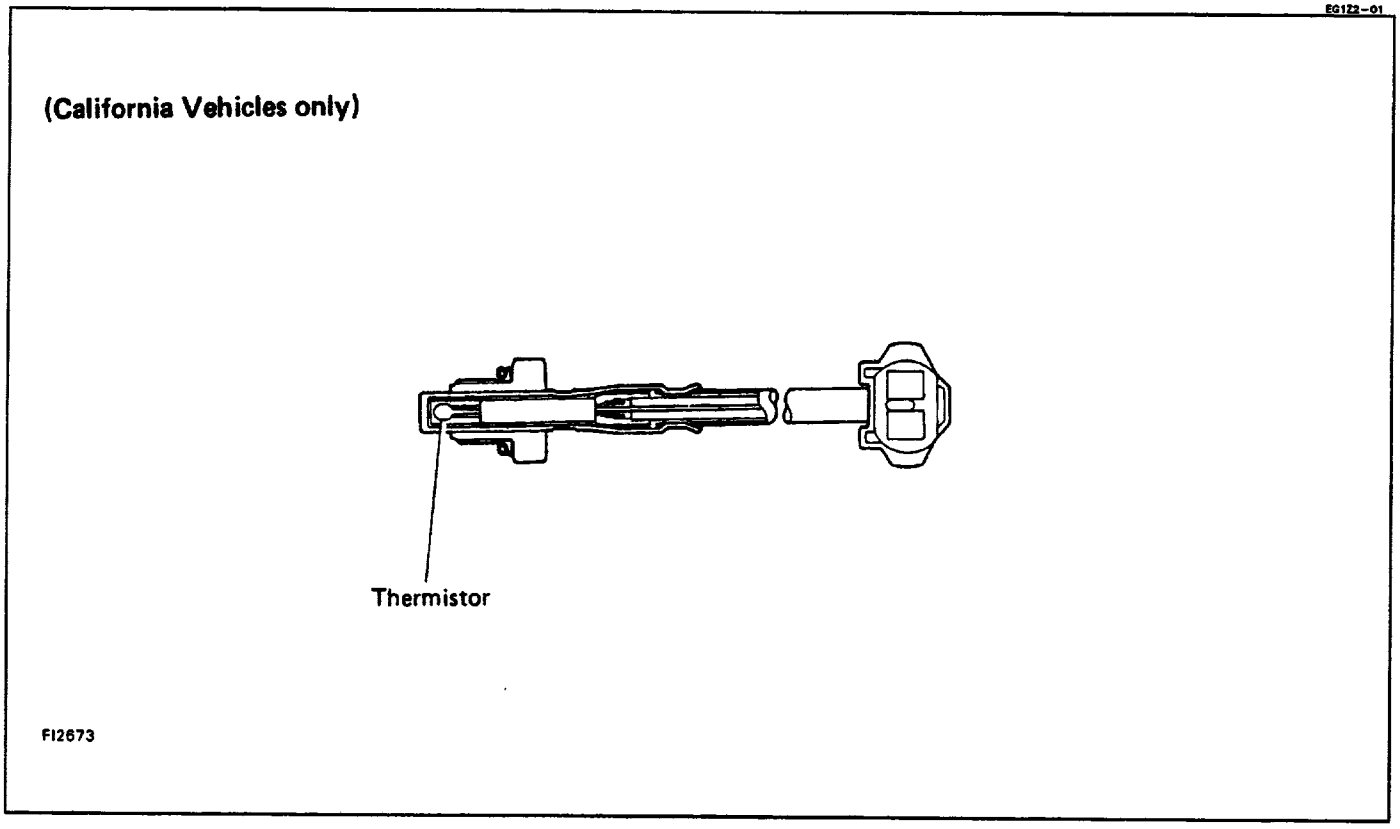
EG1–213

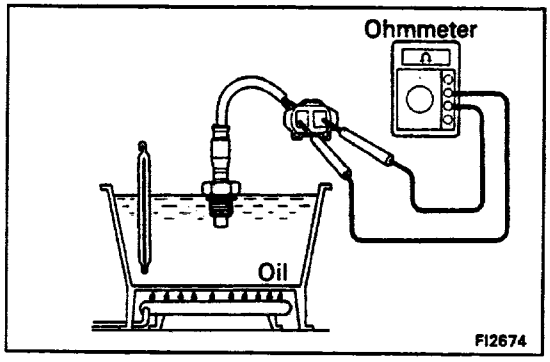
V01848

CONTINUED FROM PAGE EG1–212



EGR GAS TEMPERATURE SENSOR





EGR GAS TEMP. SENSOR INSPECTION

EG123–01

MEASURE RESISTANCE OF EGR GAS TEMP. SENSOR

Using an ohmmeter, measure the resistance between both terminals.

Resistance:

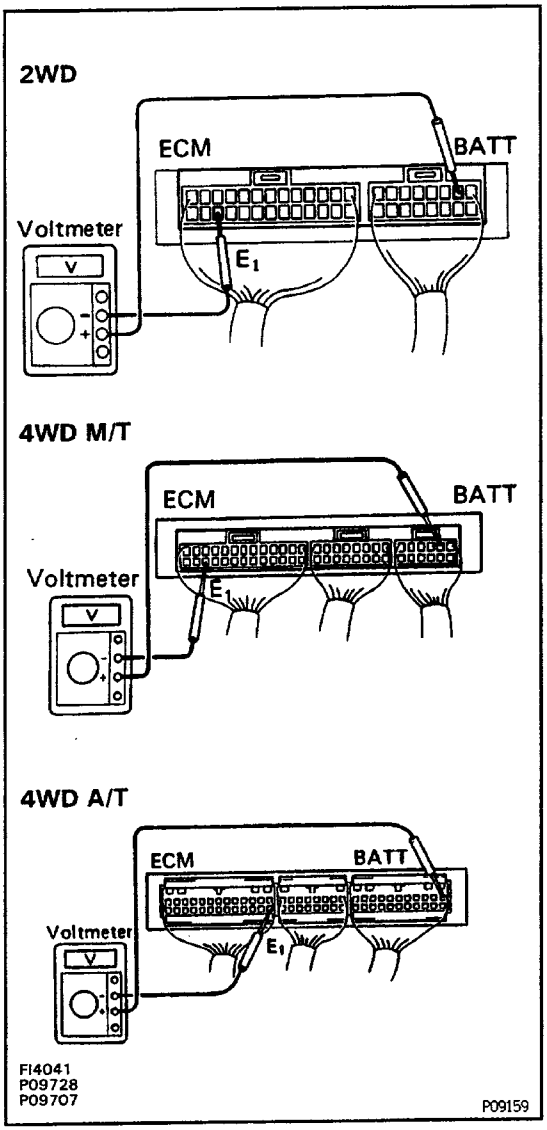
69–89 kΩ at 50°C (122°F)
11–15 kΩ at 100°C (212°F)
2 –4 kΩ at 150°C (302°F)

If the resistance is not as specified, replace the sensor.

ENGINE CONTROL MODULE (ECM)

ECM INSPECTION

HINT: The MFI circuit can be checked by measuring the voltage and resistance at the wiring connectors of the ECM.



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:

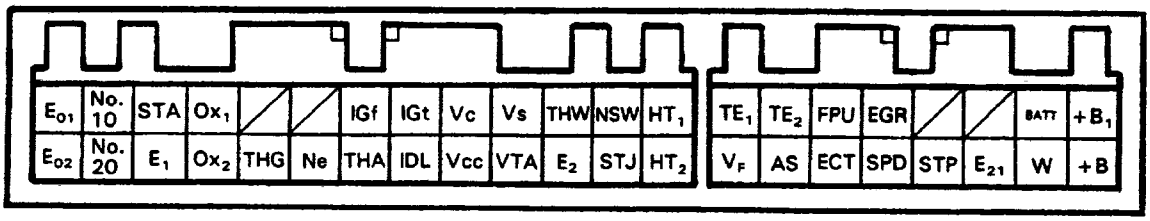
- Perform all voltage measurements with the con–nectors connected.
- Verify that the battery voltage is 11 V or more when the ignition switch is ON.

Voltage at ECM Wiring Connectors

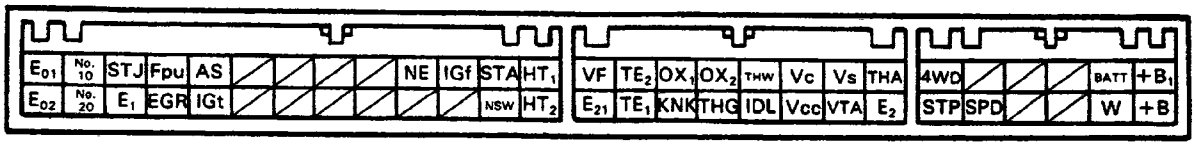
Terminals	Condition		STD voltage
BATT – E_1	–		9 – 14
+B – E_1	Ignition switch ON		
$+B_1$ – E_1			
IDL – E_2 (E_{21})	Ignition switch ON	Throttle valve open	9 – 14
Vcc – E_2 (E_{21})		–	4.5 – 5.5
VTA – E_2 (E_{21})		Throttle valve fully closed	0.3 – 0.8
		Throttle valve fully open	3.2 – 4.9
Vc – E_2 (E_{21})	Ignition switch ON	–	6 – 10
Vs – E_2 (E_{21})		Measuring plate fully closed	0.5 – 2.5
		Measuring plate fully open	5 – 10
	Idling .		2 – 8
THA – E_2 (E_{21})	Ignition switch ON	Intake air temperature 20°C (68°F)	0.5 – 3.4
THW – E_2 (E_{21})	Ignition switch ON	Coolant temperature 80 °C (176° F)	0.2 – 1.0
STA – E_1	Ignition switch START position		6 – 12
No. 10 – E_{01} No. 20 – E_{02}	Ignition switch ON		9 – 14
IGt – E_1	Idling		0.7 – 1.0
W – E_1	No trouble (MIL off) and engine running		9 – 14
STJ – E_1	Ignition switch START position	Coolant temperature 80°C (176°F)	6 – 12
STP – E_1	Stop light switch ON		7.5 – 14

ECM Terminals

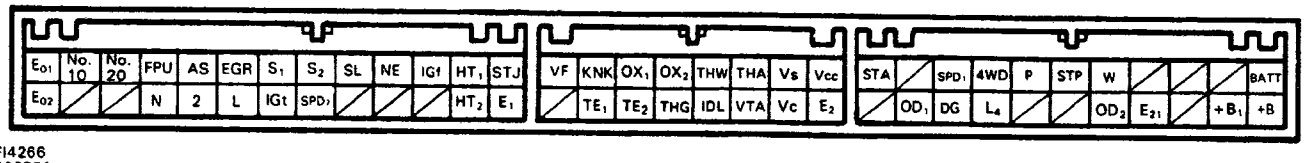
2WD



4WD M/T

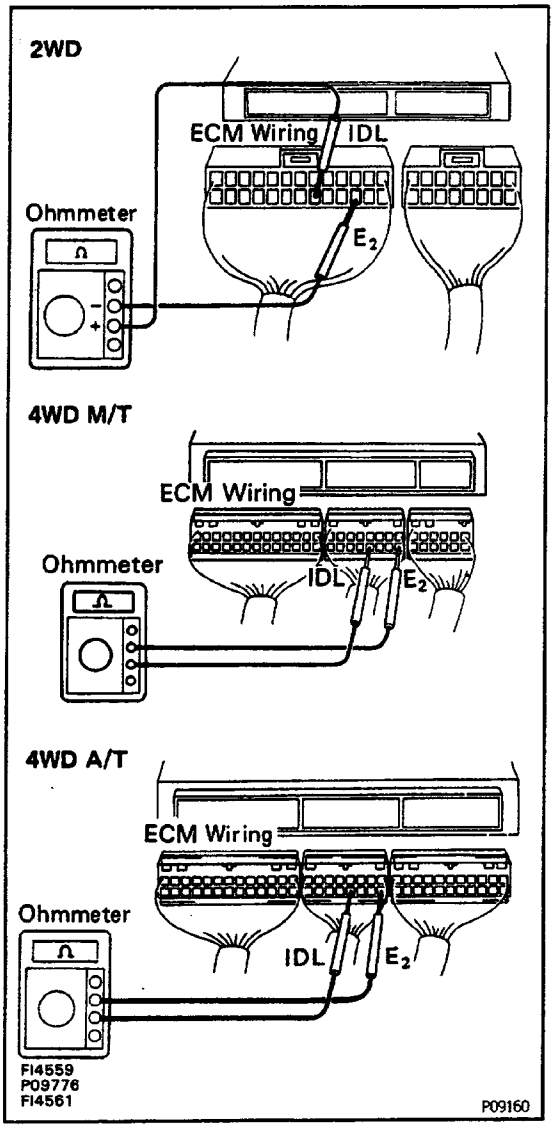


4WD A/T



FI4266
P09752
FI2796

V01850



2. INSPECT RESISTANCE OF ECM

NOTICE:

- **Do not touch the ECM terminals.**
- **The tester probe should be inserted into the wiring connector from the wiring side.**

Check the resistance between each terminal of the wiring connectors.

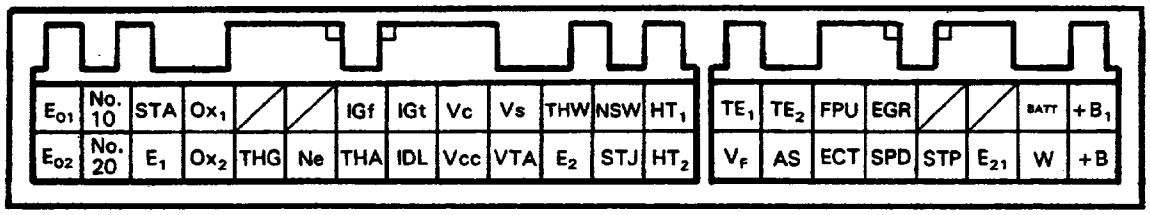
- Disconnect the connectors from the ECM.
- Measure the resistance at each terminal.

Resistance of ECM Wiring Connectors

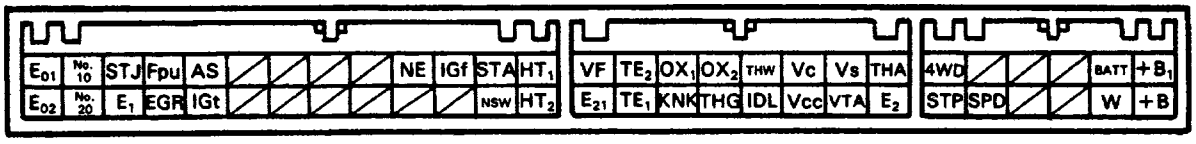
Terminals	Condition	Resistance 4kΩ1
IDL – E_2 (E_{21})	Throttle valve open	Infinity
	Throttle valve fully closed	2.3 or less
VTA – E_2 (E_{21})	Throttle valve fully open	3.1 – 12.1
	Throttle valve fully closed	0.47 – 6.1
Vcc – E_2 (E_{21})	–	3.9 – 9.0
THA – E_2 (E_{21})	Intake air temperature 20 °C (68 °F)	2 – 3
THW – E_2 (E_{21})	Coolant temperature 80 °C (176 °F)	0.2 – 0.4
+B – E_2 (E_{21})	–	0.2 – 0.4
Vc – E_2 (E_{21})	–	0.1 – 0.3
Vs – E_2 (E_{21})	Measuring plate fully closed	0.02 – 0.4
	Measuring plate fully open	0.02 – 1.00
Ne – E_1	Cold	0.185 – 0.275
	Hot	0.240 – 0.325
STJ – E_1	–	Infinity
FPU – E_1	–	Infinity
HT_1 – E_1	–	Infinity

ECM Terminals

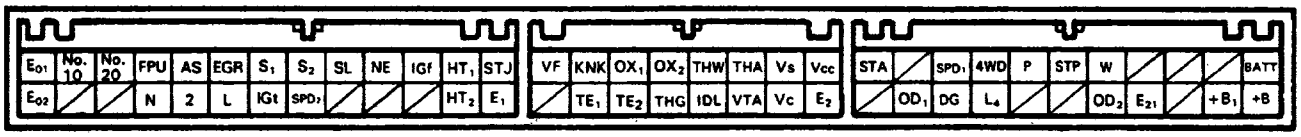
2WD



4WD M/T

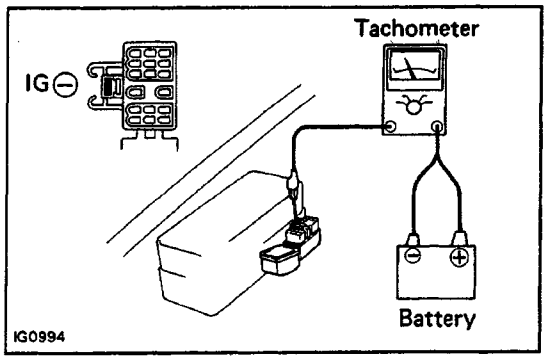


4WD A/T



FI4266
P09752
FI2796

V01851



FUEL CUT RPM

EG1Z5–01

FUEL CUT RPM INSPECTION

1. WARM UP ENGINE

Allow the engine to warm up to normal operating temperature.

2. CONNECT TACHOMETER

Connect the test probe of a tachometer to terminal IG (–) of the DLC1.

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 yours before use.**

3. INSPECT FUEL CUT OPERATION

(a) Increase the engine speed to at least 2,500 rpm.

(b) Check for injector operating sound.

(c) Check that when the throttle lever is released, injector operation sound stops momentarily and then res–umes.

HINT:

- **The vehicle should be stopped.**
- **Accessories switched OFF.**

2WD A/T (stop light switch ON)

Fuel cut rpm: 1,300 rpm

Fuel return rpm: 1,000 rpm

Others

Fuel cut rpm: 1,900 rpm

Fuel return rpm: 1,600 rpm

4. REMOVE TACHOMETER

SERVICE SPECIFICATIONS

EG128–01

SERVICE DATA

Pressure regulator	Fuel pressure	at No vacuum	265 – 304 kPa 2.7 – 3.1 kgf/cm² 38 – 44 psi	
Cold start injector	Resistance Fuel leakage		2 – 4 Ω One drop or less per minute	
Injector	Resistance Injection volume Difference between each injector Fuel leakage		13.4 – 14.2 Ω 45 – 55 cm³/15 sec. (2.7 – 3.4 cu in.) 6 cm³ (0.37 cu in.) or less One drop or less per minute	
Volume Air Flow Meter	Resistance	E_2 – Vs	20 – 400 Ω (Measuring plate fully closed) 20 – 1,200 Ω (Measuring plate fully open)	
		E_2 – Vc	100 – 300 Ω	
		E_2 – V_B	200 – 400 Ω	
		E_1 – Fc	∞ (Measuring plate fully closed) 0 Ω (Measuring plate open)	
		E_2 – THA	10 – 20 kΩ (–20°C, –4°F) 4 – 7 kΩ (0°C, 32°F) 2 – 3 kΩ (20°C, 68°F) 0.9 – 1.3 kΩ (40°C, 104°F) 0.4 – 0.7 kΩ (60°C, 140°F)	
Throttle body	Throttle valve fully closed angle		6°	
Throttle position sensor	Clearance between lever and stop screw		Between terminals	Resistance
	0 mm	0 in.	VTA – E_2	0.47 – 6.1 kΩ
	0.57 mm	0.0224 in.	IDL – E_2	2.3 kΩ or less
	0.85 mm	0.0335 in.	IDL – E_2	Infinity
	Throttle valve fully open position		VTA – E_2	3.1 – 12.1 kΩ
	–		Vcc – E_2	3.9 – 9.0 kΩ
Start injector time switch	Resistance	STA – STJ	30 – 50 Ω (below 10°C, 50°F) 65 – 90 Ω (above 30°C, 86°F)	
		STA – Ground	30 – 90 Ω	
Engine coolant temp. sensor	Resistance		10 – 20 kΩ (–20°C, –4°F) 4 – 7 kΩ (0°C, 32°F) 2 – 3 kΩ (20°C, 68°F) 0.9 – 1.3 kΩ (40°C, 104°F) 0.4 – 0.7 kΩ (60°C, 140°F) 0.2 – 0.4 kΩ (80°C, 176°F)	
VSV (FPU)	Resistance	at 20°C (68°F)	30 – 50 Ω	

V01953

Specifications (Cont'd)

Oxygen sensor heater	Resistance at 20°C (68°F)	5.1 – 6.3 Ω
EGR gas temp. sensor	Resistance	69 – 89 kΩ (50°C, 122°F) 11 – 15 kΩ (100°C, 212°F) 2 – 4 kΩ (150°C, 302°F)
Fuel cut rpm	Fuel cut rpm 2WD A/T (stop light switch ON) Others Fuel return rpm 2WD A/T (stop light switch ON) Others	 1,300 rpm 1,900 rpm 1,000 rpm 1,600 rpm

ECM (Voltage)

HINT:
- Perform all voltage and resistance measurements with the ECM connected.
- Verify that the battery voltage is 11 V or above when the ignition switch is ON.
- The testing probes must not make contact with the ECM oxygen VF terminals.

Terminals	STD voltage	Condition	
BATT – E_1	9 – 14	–	
+B – E_1		Ignition SW ON	
$+B_1$ – E_1			
IDL – E_2 (E_{21})	9 – 14	Ignition SW ON	Throttle valve open
Vcc – E_2 (E_{21})	4.5 – 5.5		–
VTA – E_2 (E_{21})	0.3 – 0.8		Throttle valve fully closed
	3.2 – 4.9		Throttle valve fully open
Vc – E_2 (E_{21})	6 – 10	Ignition SW ON	–
Vs – E_2 (E_{21})	0.5 – 2.5		Measuring plate fully closed
	5 – 10		Measuring plate fully open
	2 – 8	Idling	
THA – E_2 (E_{21})	0.5 – 3.4	Ignition SW ON	Intake air temperature 20°C (68°F)
THW – E_2 (E_{21})	0.2 – 1.0		Coolant temperature 80°C (1 76°F)
STA – E_1	6 – 12	Ignition SW START position	
No. 10 – E_{01} No. 20 – E_{02}	9 – 14	Ignition SW ON	
IGt – E_1	0.7 – 1.0	Cranking or idling	
W – E_1	9 – 14	No trouble (MIL off) and engine running	
STJ – E_1	6 – 12	Ignition SW START position	Coolant temperature 80°C (176°F)
STP – E_1	7.5 – 14	Stop light switch ON	

V01954

Specifications (Cont'd)

ECM (Resistance)	Terminals	Resistance (kΩ)	Condition
	IDL – E_2 (E_{21})	Infinity	Throttle valve open
		2.3 or less	Throttle valve fully closed
	VTA – E_2 (E_{21})	3.1 – 12.1	Throttle valve fully open
		0.47 – 6.1	Throttle valve fully closed
	Vcc – E_2 (E_{21})	3.9 – 9.0	–
	THA – E_2 (E_{21})	2 – 3	Intake air temperature 20 °C (68°F)
	THW – E_2 (E_{21})	0.2 – 0.4	Coolant temperature 80 °C (176°F)
	+B – E_2 (E_{21})	0.2 – 0.4	–
	Vc – E_2 (E_{21})	0.1 – 0.3	–
	Vs – E_2 (E_{21})	0.02 – 0.4	Measuring plate fully closed
		0.02 – 1.00	Measuring plate fully open
	Ne – E_1	0.185 – 0.275	Cold
		0.240 – 0.325	Hot
	STJ – E_1	Infinity	–
	FPU – E_1	Infinity	–
	HT – E_1	Infinity	–

V01955

EG1Z7–01

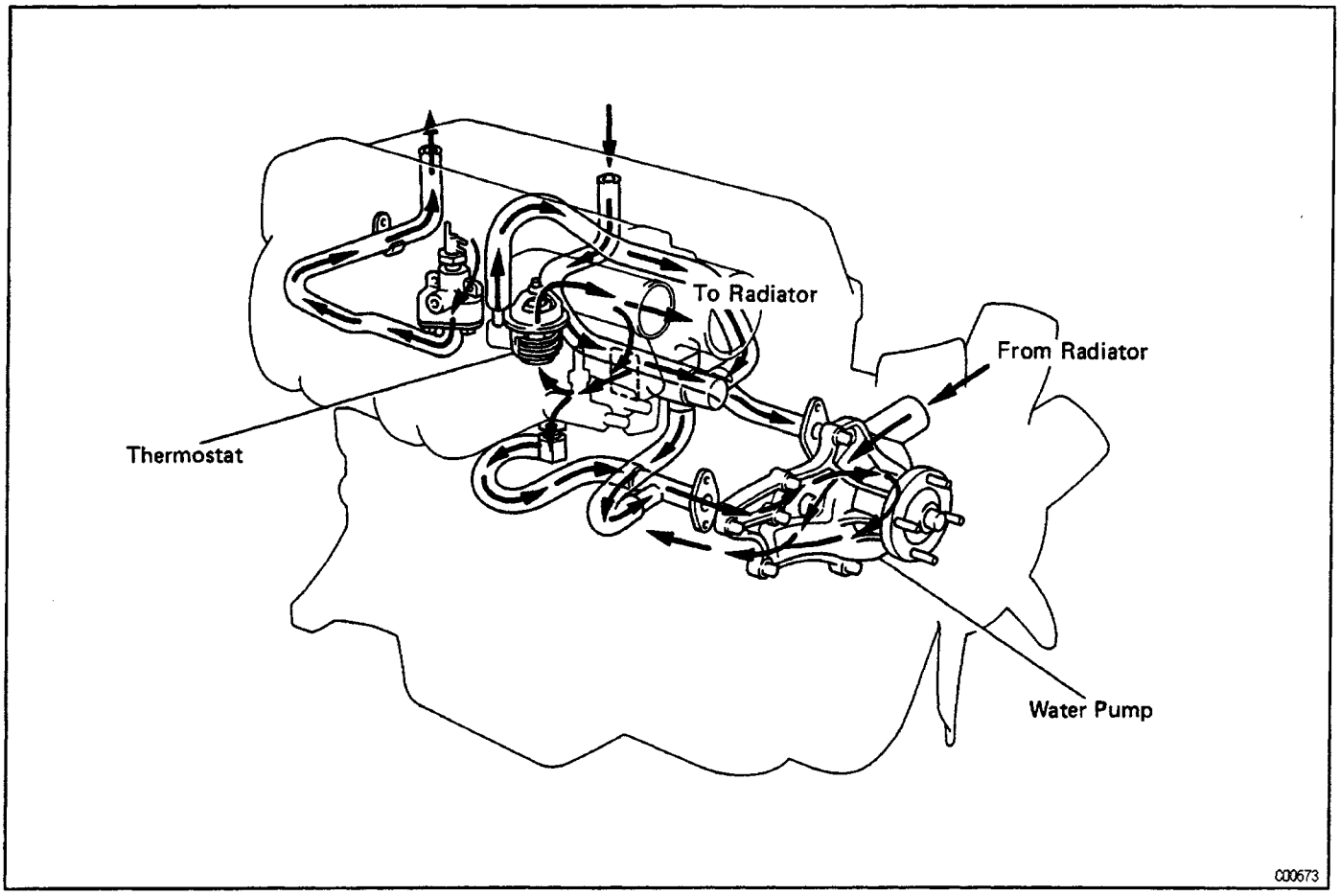
TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Fuel hose x Fuel filter	30	310	22
Fuel hose x Fuel main tube	30	310	22
Fuel filter x Fuel filter bracket	19	195	14
Delivery pipe x Pressure regulator	30	300	22
Delivery pipe x Intake manifold	19	195	14
Delivery pipe x Fuel tube	44	450	33
Delivery pipe x Fuel pipe	19	195	14
Fuel pipe x Cold start injector	19	195	14
Air intake chamber x Cold start injector	7.8	80	69 in.·lbf
Air intake chamber x Throttle body	19	195	14
Fuel pump	3.9	40	35 in.·lbf
Fuel drain plug	6.4	65	56 in.·lbf
Fuel tank x Body	29	300	22

COOLING SYSTEM

DESCRIPTION

This engine utilizes a pressurized water faced circulation cooling system which includes a thermostat mounted on the outlet side.



RADIATOR CAP

The radiator cap is a pressure type cap which seals the radiator, resulting in pressurization of the radiator as the coolant expands. The pressurization prevents the coolant from boiling even when the 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. When the pressure generated inside the cooling system exceeds the limit (coolant temperature: 110– 120°C (230–248° F) pressure: 58.8–103.0 kPa (0.6–1.05 kgf/cm^2, 8.5–14.9 psi) the relief valve is opened by the pressure and lets steam escape through pipe. The vacuum valve opens to allow atmos–pheric air to enter to alleviate the vacuum which develops in the cooling system after the engine is stopped and the coolant temperature drops.

RESERVOIR TANK

The reservoir tank is used to catch coolant which overflows the cooling system as a result of volumetric expansion when the coolant is heated. When the coolant temperature drops, the coolant in the reservoir tank returns to the radiator, thus keeping the radiator full at ail times and

avoiding needless coolant loss. To find out if the coolant needs to be replenished, check the reservoir tank level.

WATER PUMP

The water pump is used for forced circulation of coolant through the cooling system. It is mounted on the front of the timing chain cover and driven by a V belt.

THERMOSTAT

The thermostat is a wax type and is mounted in the water outlet housing. The thermostat includes a type of automatic valve operated by fluctuations in the coolant temperature. When the coolant temperature drops, the valve closes, preventing the circulation of coolant through the engine and thus permitting the engine to warm up rapidly. When the coolant temperature has risen, the valve opens, allowing the coolant in the engine to circulate through the radiator. 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 88°C (190°F).

PREPARATION

RECOMMENDED TOOLS

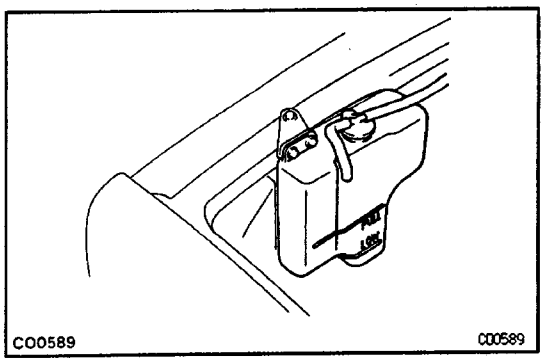
EG12V–03

	09082–00015 TOYOTA Electrical Tester	

EQUIPMENT

EG12W–03

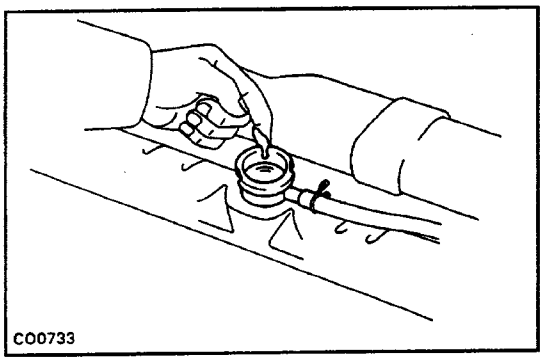
Heater	
Radiator cap tester	
Thermometer	
Torque wrench	



COOLANT CHECK AND REPLACEMENT

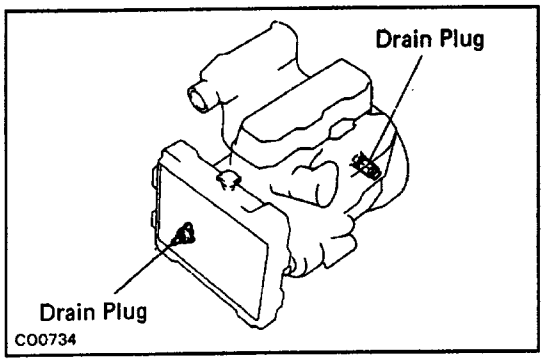
1. CHECK ENGINE COOLANT LEVEL IN RESERVOIR TANK

The coolant level should be between the ”LOW” and ” Full” lines.
If low, check for leaks and add 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 or radiator filler hole, and the coolant should be free from oil.
If excessively dirty, replace the coolant.



3. REPLACE ENGINE COOLANT

(a) Remove the radiator cap.
(b) Drain the coolant from the radiator and engine drain plugs.
(c) Close the drain cocks.
(d) Fill the system with coolant.
HINT:

- Use a good brand of ethylene–glycol base coo–lant, mixed according to the manufacturer’s in–structions.
- Using coolant which has more than 50% ethyl–ene–glycol (but not more than 70 %) is recom–mended.

NOTICE:

- **Do not use an alcohol type coolant.**
- **The coolant should be mixed with demineralized water or distilled water.**

Coolant capacity (w/ heater or air conditioner):

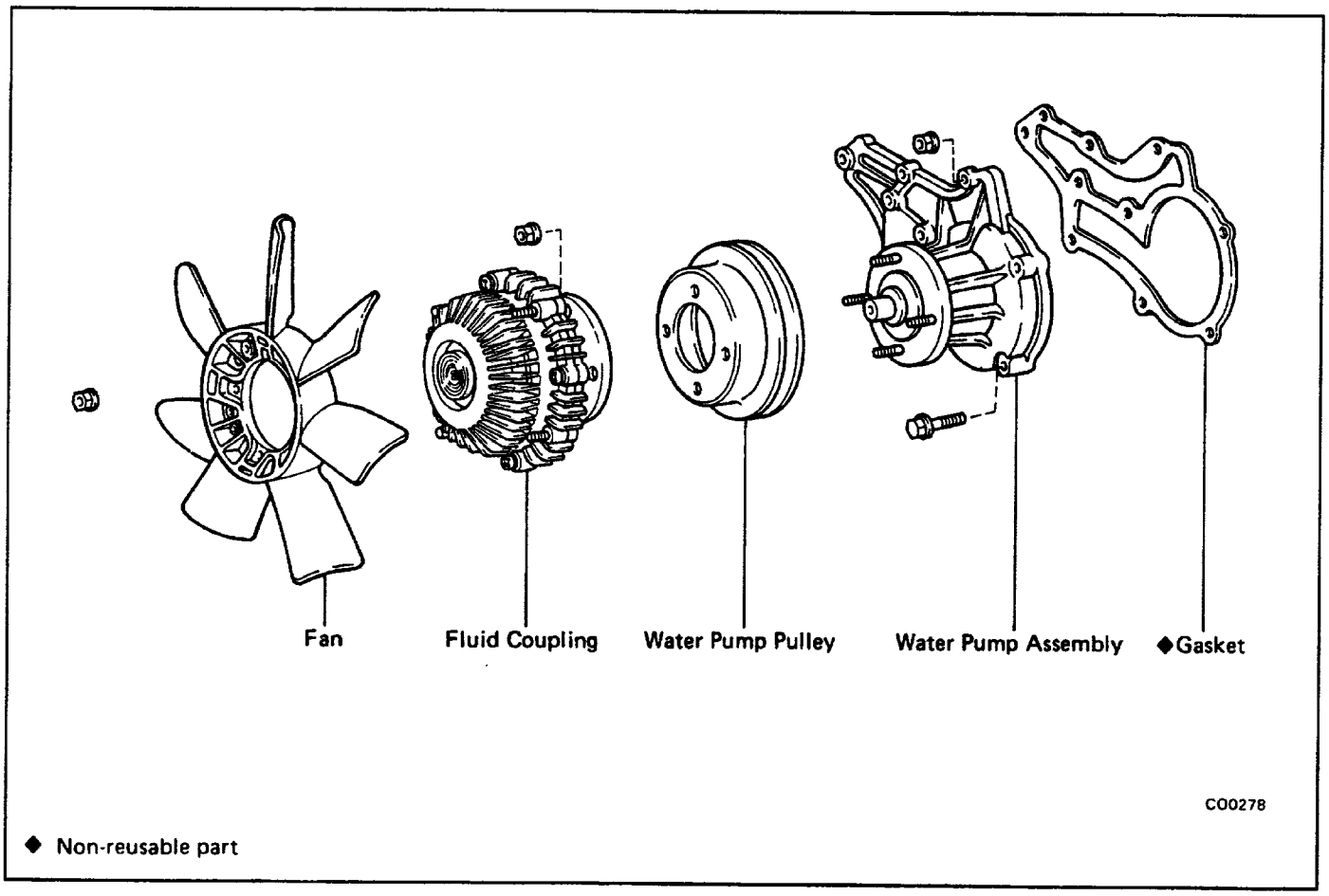
Ex. 4WD A/T
8.4 liters (8.9 US qts, 7.4 Imp. qts)
4WD A/T
9.1 liters (9.6 US qts, 8.0 Imp. qts)

(e) Install the radiator cap.
(f) Start the engine and check for leaks.
(g) Recheck the coolant level and refill as necessary.

WATER PUMP

EG1U3–01

COMPONENTS

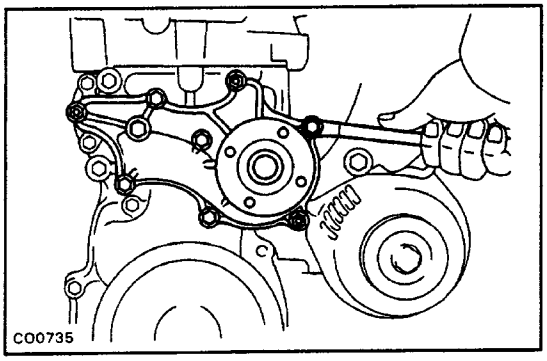


◆ Non-reusable part

EG1U4–01

WATER PUMP REMOVAL

1. DRAIN COOLANT
(See step 3 on page EG1–225)
2. (w/ PS)
REMOVE PS BELT
3. (with A/C)
REMOVE A/C BELT
4. REMOVE FLUID COUPLING WITH FAN AND WATER PUMP PULLEY
(See step 3 on page EG1–40)

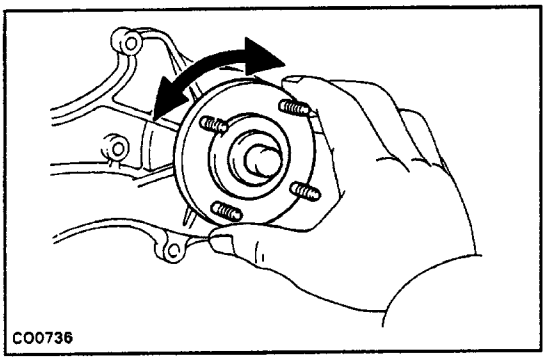


5. REMOVE WATER PUMP

Remove the six bolts, three nuts, water pump and gasket.

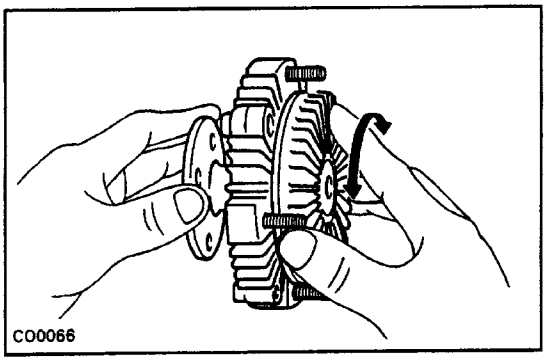
EG1U5–01

WATER PUMP INSPECTION



1. INSPECT WATER PUMP BEARING

Check that the water pump bearing moves smoothly and quietly.

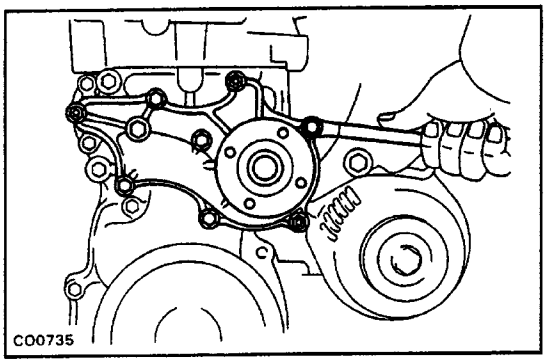


2. INSPECT FLUID COUPLING

Check the fluid coupling for damage and silicone oil leakage.

EG1U6–01

WATER PUMP INSTALLATION



(See page EG1–226)

1. INSTALL WATER PUMP OVER NEW GASKET

Install the water pump and a new gasket with the six bolts and three nuts.

2. INSTALL WATER PUMP PULLEY AND FLUID COUPLING WITH FAN

(See page MA–6 step 9 on page EG1–44)

3. (with A/C)

INSTALL A/C BELT (See page MA–6)

4. (w/ PS)

INSTALL PS BELT (See page MA–6)

5. REFILL COOLANT

(See page EG1–225)

THERMOSTAT

EG1U7–01

THERMOSTAT REMOVAL

1. DRAIN COOLANT

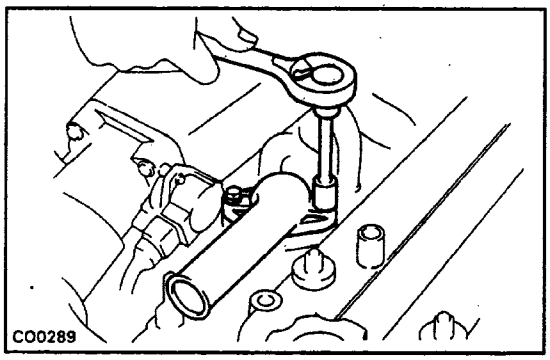
2. DISCONNECT FOLLOWING HOSES:

(a) Vacuum hoses

(b) PCV hose

(c) (with A/C)

Idle–up hose



3. DISCONNECT RADIATOR INLET HOSE

4. REMOVE THERMOSTAT

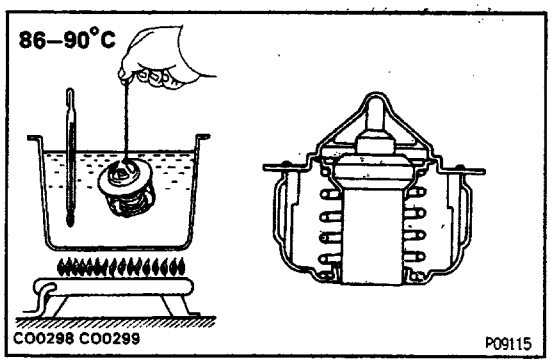
(a) Remove the two bolts and water outlet from the intake manifold.

(b) Remove the thermostat with the gasket.

(c) Remove the gasket from the thermostat.

EG1U8–01

THERMOSTAT INSPECTION



HINT: The thermostat is numbered according to the valve opening temperature.

(a) Immerse the thermostat in water and heat the water gradually.

(b) Check the valve opening temperature and valve lift.

Valve opening temperature:

86–90°C (187–184°F)

Valve lift:

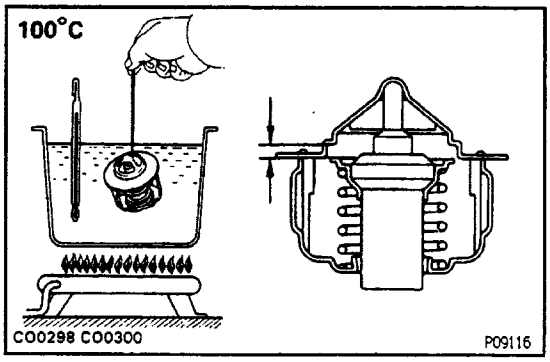
8 mm (0.31 in.) or more at 100°C (212°F)

If the valve opening temperature and valve lift are not within specifications, replace the thermostat.

(c) Check that the valve spring is tight when the thermostat is fully closed, and replace if it is not tight.

EG1U9–01

THERMOSTAT INSTALLATION



1. PLACE THERMOSTAT IN INTAKE MANIFOLD

(a) Place a new gasket to the thermostat.

(b) Install the thermostat to the intake manifold.

(c) Install the water outlet with the two bolts.

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)

2. CONNECT RADIATOR INLET HOSE

3. CONNECT FOLLOWING HOSES:

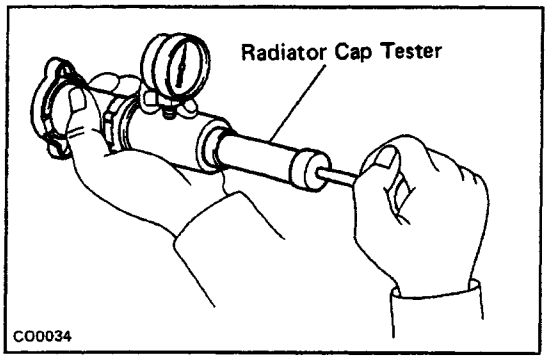
(a) (with A/C)
Idle–up hose
(b) PCV hose
(c) Vacuum hoses
4. FILL WITH ,COOLANT
5. START ENGINE AND CHECK FOR LEAKS

RADIATOR

EG1UA–01

RADIATOR CLEANING

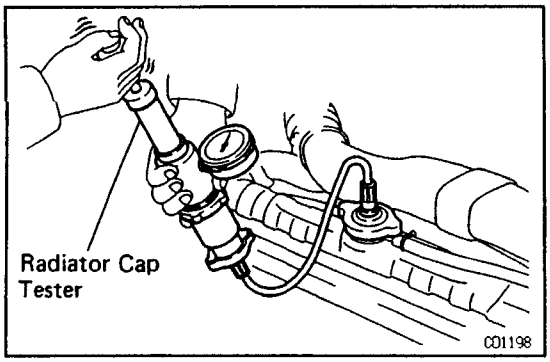
Using water or a steam cleaner, remove mud and dirt from the radiator core.
NOTICE: If using a high–pressure type cleaner, be careful not to deform the fins of the radiator core. For example, keep a distance of more than 40–50 cm (15.75 –19.69 in.) between the radiator core and cleaner nozzle when the cleaner nozzle pressure is 2.942–3.432 kPa (30 –35 kgf/cm^2. 427–498 psi).



EG1UB–01

RADIATOR INSPECTION

1. CHECK RADIATOR CAP
Using radiator cap tester, pump the tester until relief valve opens. Check that the valve opens between 174 kPa (0.75 kgf/cm^2, 10.7 psi) and 103 kPa (1.05 kgf/cm^2, 14.9 psi).
Check that pressure gauge does not drop rapidly when pressure on cap is below 59 kPa (0.6 kgf/cm^2, 8.5 psi).
If either check is not within limit, replace the radiator cap.



2. CHECK COOLING SYSTEM FOR LEAKS

(a) Fill the radiator with coolant and attach a radiator cap tester.

(b) Warm up the engine.

(c) Pump it to 118 kPa (1.2 kgf/cm^2, 17.1 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, block and intake manifold.

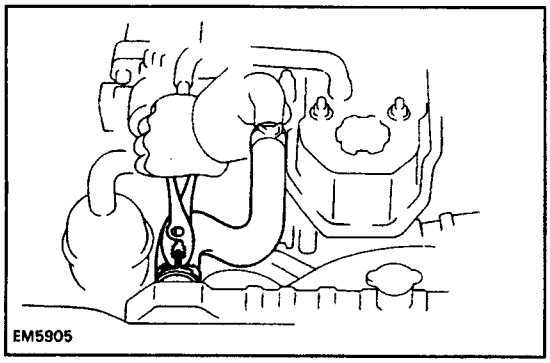
EG1UC–01

RADIATOR REMOVAL

1. DRAIN COOLANT

2. REMOVE ENGINE UNDER COVER

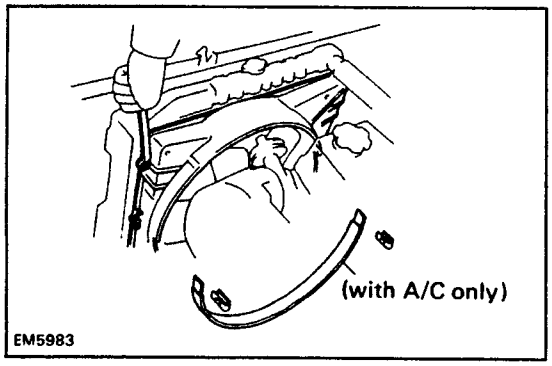
3. REMOVE AIR INTAKE CONNECTOR



4. REMOVE RADIATOR

(a) Disconnect the reservoir hose.

(b) Remove the radiator hoses.



(c) (with A/C)

Remove the No. 2 fan shroud.

(d) Remove the No. 1 fan shroud.

(e) (A/T)

Disconnect the oil cooler hoses.

HINT:

- Be careful as some oil will leak out. Catch it in a suitable container.
- Plug the hose to prevent oil from escaping.

(f) Remove the four bolts and radiator.

SERVICE SPECIFICATIONS

EG1UD–01

SERVICE DATA

Radiator	Relief valve opening pressure	STD	74 – 103 kPa 0.75 – 1.05 kgf/cm² 10.7 – 14.9 psi
		Limit	59 kPa 0.6 kgf/cm² 8.5 psi
Thermostat	Valve opening temperature Starts to open at Fully opens at Valve opening travel		 88°C 190°F 100°C 212°F 8 mm 0.30 in.

EG1UE–01

TORQUE SPECIFICATIONS

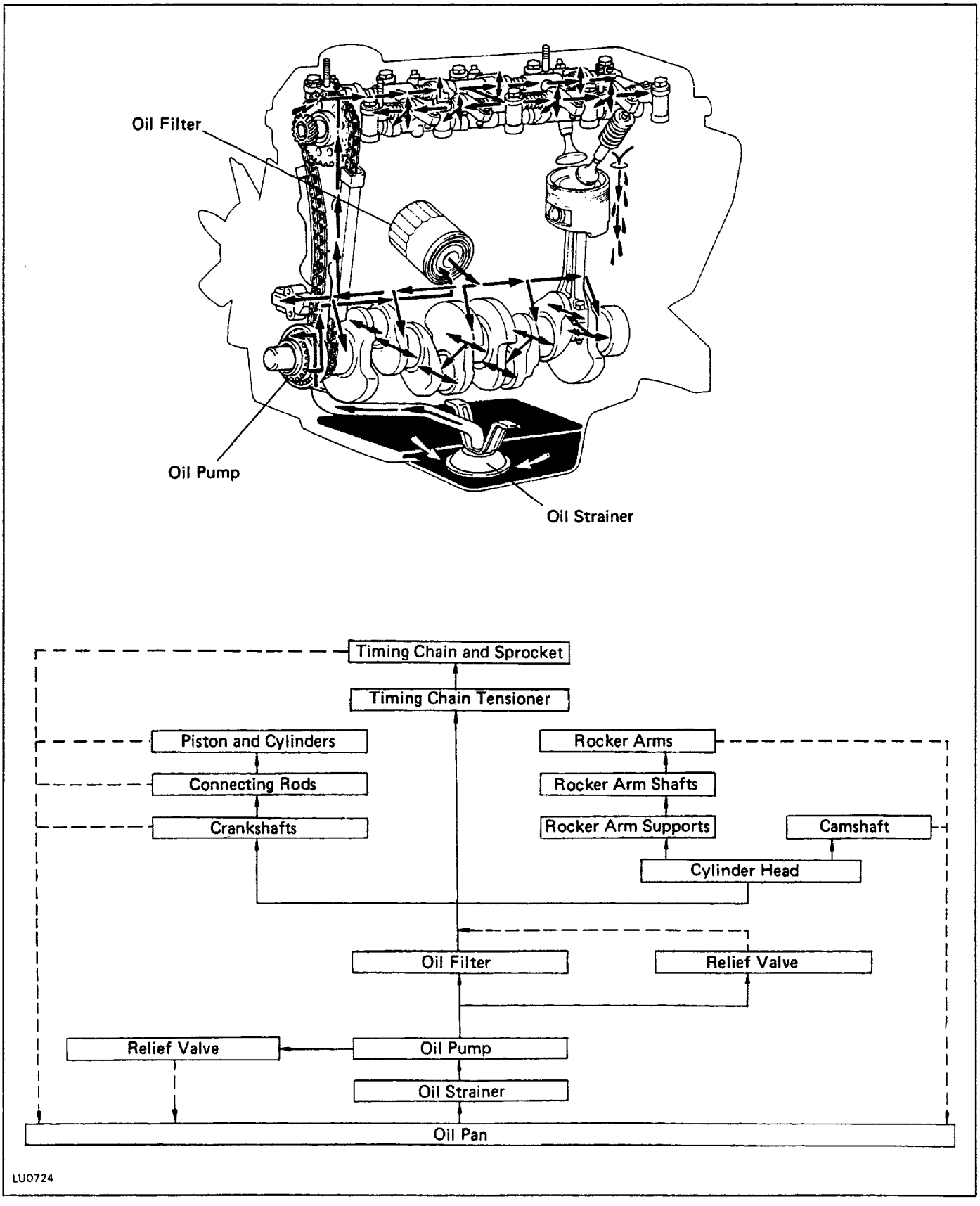
Part tightened	N·m	kgf·cm	ft·lbf
Water Outlet x Intake Manifold	13	130	9

LUBRICATION SYSTEM

DESCRIPTION

A fully pressurized, fully filtered lubrication system is used in this engine.

EG1UF–01



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 and oil filter, etc. 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 side of the oil pump body is provided to check the oil level.

OIL PUMP

The oil pumps up oil from the oil pan and sends it under pressure to the various parts of the engine. An oil strainer is mounted in front of the inlet to the oil –pump to remove impurities. The oil pump itself is an internal gear pump, which uses a drive gear and driven gear inside the pump body. When the drive gear rotates, the driven gear rotates in the same direction. When both gears rotate, the space between the two gears changes. Oil is draw in when this space widens, and is discharged when the space becomes narrow.

OIL PRESSURE REGULATOR (RELIEF VALVE)

At high engine speeds, the oil pump supplies more oil to each part than is necessary. For this reason, an oil pressure regulator which works to prevent an oversupply oil is installed on the oil pump. During normal oil supply, a coil spring and valve keep the by–pass closed, but when too much oil is being supplied, the pressures become extremely high, over powering the force of the spring and opening the valve. This allows the excess oil to flow through the relief valve and return to the oil pan.

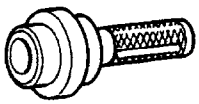
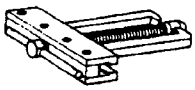
OIL FILTER

The oil filter is a full flow type with– a paper filter element and built–in relief valve. Particles of metal from wear, airborne dirt, carbon and other impurities can get in the oil during use and could cause accelerated wear or seizing 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 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

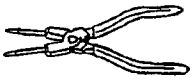
EG14U–05

SST (SPECIAL SERVICE TOOLS)

	09032–00100 Oil Pan Seal Cutter	
	09223–50010 Crankshaft Front oil Sea! Replacer	Crankshaft front oil seal
	09228–07500 Oil Filter Wrench	
	09213–36020 Timing Gear Remover	

EG14V–05

RECOMMENDED TOOLS

	09090–04000 Engine Sting Device	For suspending engine
	09200–00010 Engine Adjust Kit	
	09905–00013 Snap Ring Pliers	

EG14W–05

EQUIPMENT

Oil pressure gauge	
Torque wrench	

EG1UG–01

LUBRICANT

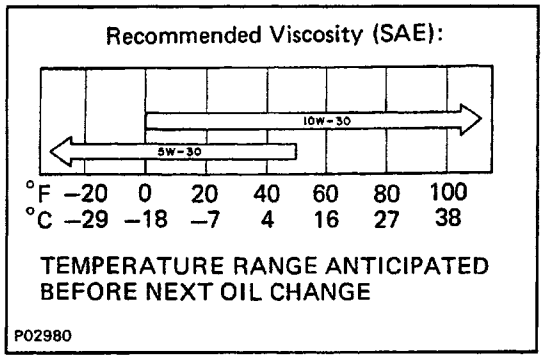
Item	Capacity			Classification
	Liters	US qts	Imp. qts	
Engine oil Drain and refill wlo Oil filter change wlOil fitter change Dry fill	 3.8 4.3 4.8	 4.0 4. 5 5.1	 3.3 3.8 4.2	API grade SG Energy–Conserving II multigrade and recommended vis–cosity oil

V01956

EG14Y–05

SSM (SPECIAL SERVICE MATERIALS)

08826–00080 Seal packing or equivalent	Oil pan



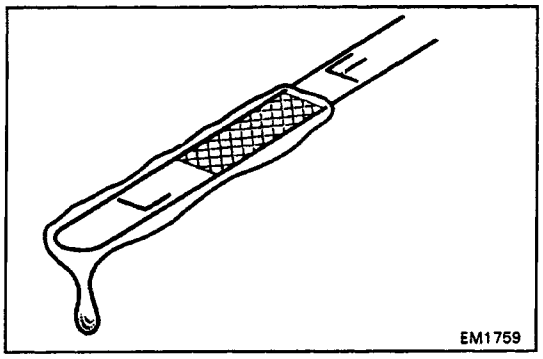
OIL PRESSURE CHECK

1. CHECK OIL QUALITY EG1UH–01

Check the oil for deterioration, entry of water, disco–loring or thinning.

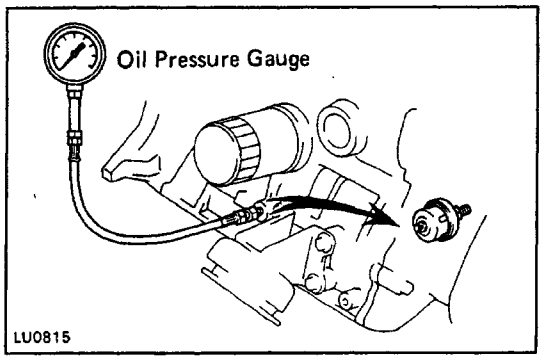
If oil quality is poor, replace.

Oil grade: API grade SG Energy–Conserving II multigr–ade engine oil. Recommended viscosity is as shown.



2. CHECK OIL LEVEL

The oil level should be between the ”L” and ”F” marks on the level gauge. If low, check for leakage and add oil up to the ”F” mark.



3. REMOVE OIL PRESSURE SENDER GAUGE

4. INSTALL OIL PRESSURE GAUGE

5. START ENGINE

Start the engine and warm it up to normal operating temperature.

6. MEASURE OIL PRESSURE

Oil pressure:

At idle speed

29 kPa (0.3 kgf/cm^2, 4.3 psi) or more

At 3,000 rpm

245 – 490 kPa (2.5 – 5.0 kgf/cm^2, 36 – 71 psi)

HINT: Check for oil leakage after reinstalling the oil pressure sender gauge.

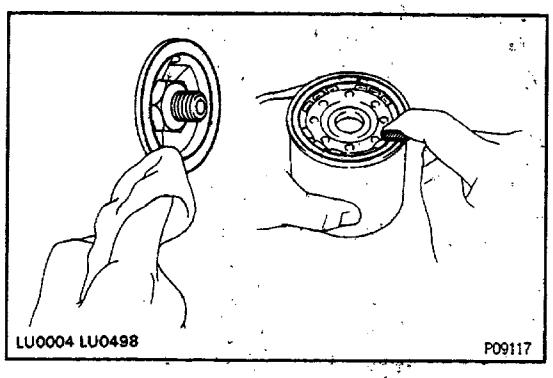
OIL AND FILTER REPLACEMENT

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. Adequate means of skin protection and washing facilities should be provided.**
- **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 filters must be disposed of only at designated disposal sites.**

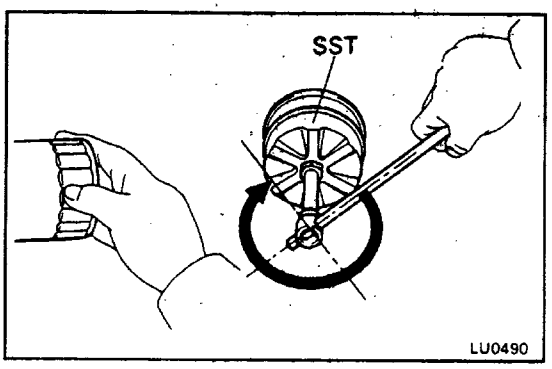
1. DRAIN ENGINE OIL

(a) Remove the oil filter cap.
(b) Remove the oil dipstick.
(c) Remove the oil drain plug and drain the oil into a container.



2. REPLACE OIL FILTER

(a) Using SST, remove the oil filter (located on right side of the engine block).
SST 09228–07500
(b) Clean the filter contact surface on the filter mounting.
(c) Lubricate the filter rubber gasket with engine oil.

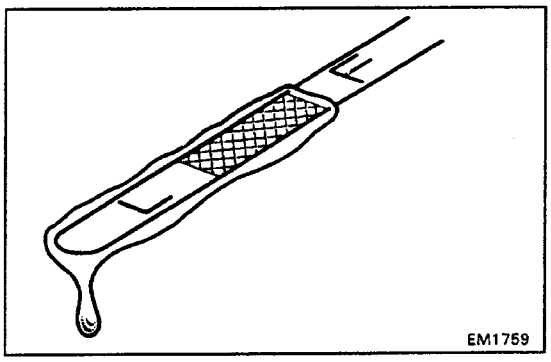


(d) Tighten the filter by hand until the gasket contacts the seat of the filter mounting. Then using SST, give it an additional 3/4 turn to seat the filter.
SST 09228–07500

3. FILL WITH ENGINE OIL

(a) Clean and install the oil drain plug with a new gasket.
(b) Fill the engine with new oil, API grade SG multigrade, fuel efficient and recommended viscosity oil.

Oil capacity:
Drain and refill
w/o Oil filter change
3.8 liters (4.0 US qts, 3.3 Imp. qts)
w/ Oil filter change
4.3 liters (4.5 US qts, 3.8 Imp. qts)
Dry fill
4.8 liters (5.1 US qts, 4.2 Imp. qts)

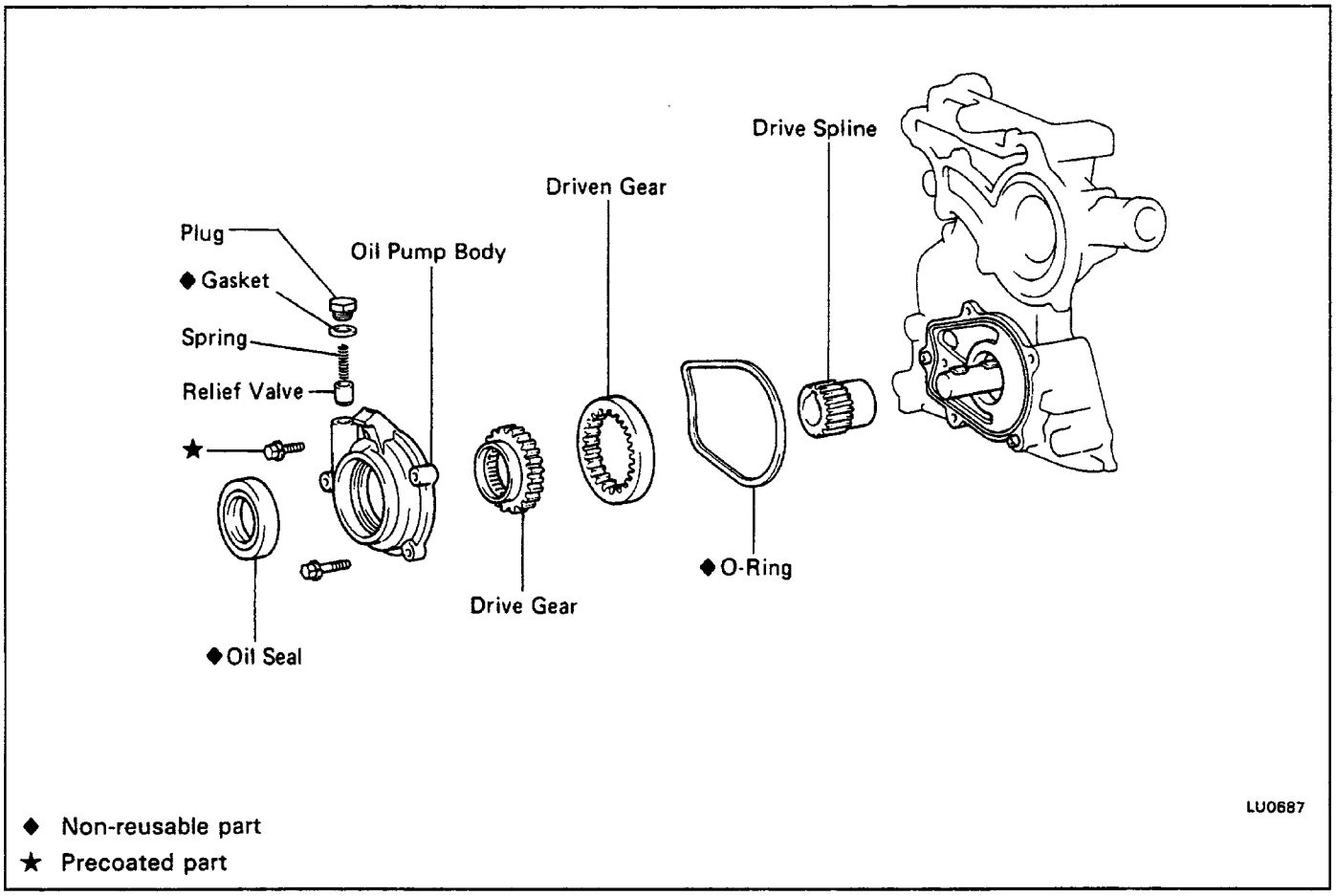


4. START ENGINE AND CHECK FOR LEAKS
5. RECHECK ENGINE OIL LEVEL
Recheck the engine oil level and refill as necessary.
HINT: Insert the oil dipstick with the curved tip poi–nted toward the engine.

OIL PUMP

EG1UK–01

COMPONENTS



EG1UL–01

OIL PUMP REMOVAL

HINT: When repairing the oil pump, the oil pan and strainer should be removed and cleaned.

1. REMOVE OIL PAN

(See steps 3 and 4 on page EG1–39**)**

2. REMOVE OIL STRAINER

Remove the four bolts holding the oil strainer.

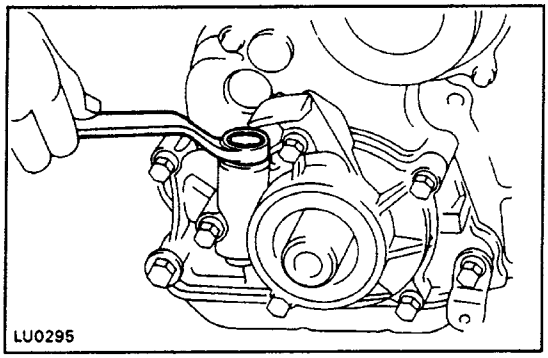
3. REMOVE DRIVE BELTS

4. REMOVE CRANKSHAFT PULLEY

(See steps 4 on page EG1–40**)**

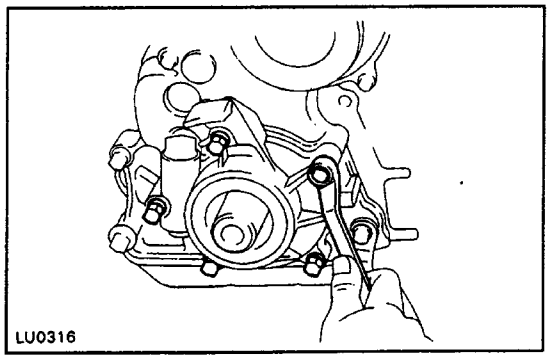
5. (with A/C)

REMOVE A/C COMPRESSOR AND BRACKET

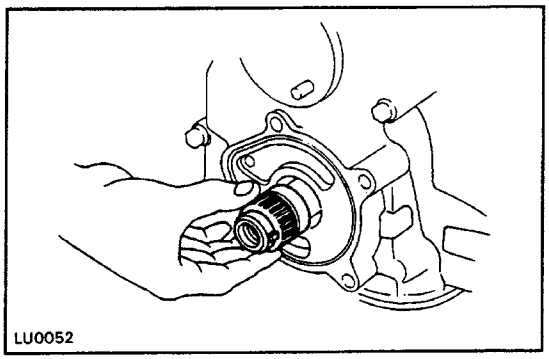


6. REMOVE OIL PUMP ASSEMBLY

(a) Loosen the oil pump relief valve plug.



(b) Remove the five bolts, the oil pump assembly and O–ring.

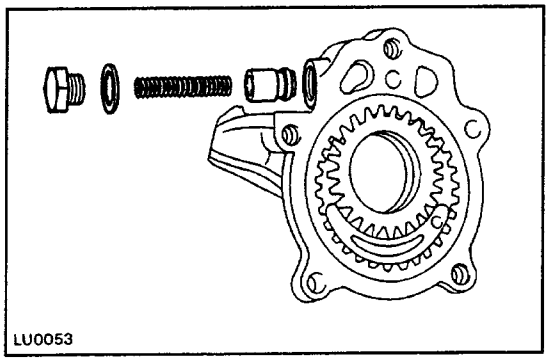


7. REMOVE OIL PUMP DRIVE SPLINE

HINT: If the oil pump drive spline cannot be removed by hand, use SST to remove the pump drive spline and crankshaft together.

(See page EG1–42)

SST 09213–36020



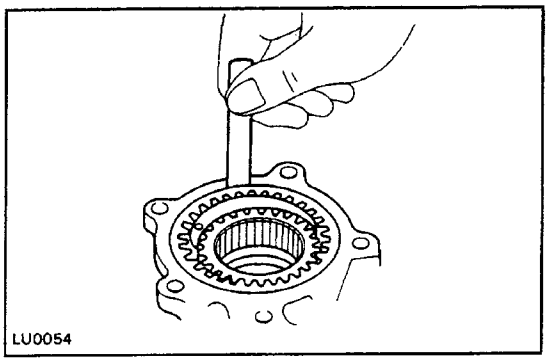
EG1UM–01

OIL PUMP DISASSEMBLY

1. REMOVE RELIEF VALVE

Unscrew the relief valve plug and gasket, and remove the spring and the relief valve.

2. REMOVE DRIVEN AND DRIVE GEARS



EG1UN–01

OIL PUMP INSPECTION

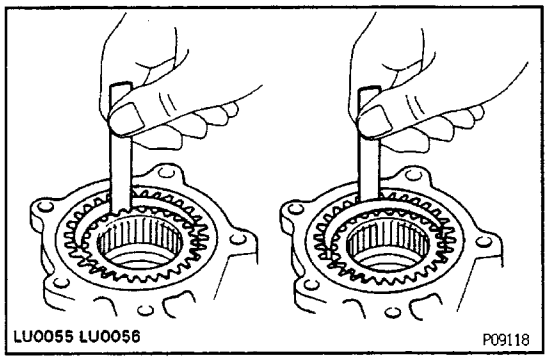
1. MEASURE BODY CLEARANCE

Using a thickness gauge, measure the clearance between the driven gear and body.

Standard clearance: 0.09–0.15 mm (0.0035–0.0059 in.)

Maximum clearance: 0.2 mm (0.008 in.)

If the clearance is greater than maximum, replace the gear and/or body.



2. MEASURE TIP CLEARANCE

Using a thickness gauge, measure the clearance between both of the gear tips and crescent.

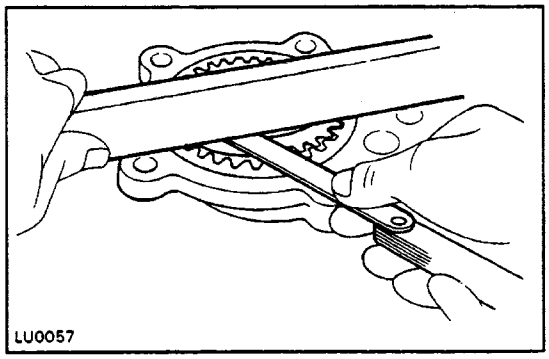
Standard clearance:

Driven 0.15–0.21 mm (0.0059–0.0083 in.)

Drive 0.22–0.25 mm (0.0087–0.0098 in.)

Maximum clearance: 0.3 mm (0.012 in.)

If the clearance is greater than maximum, replace the gears and/or body.



3. MEASURE SIDE CLEARANCE

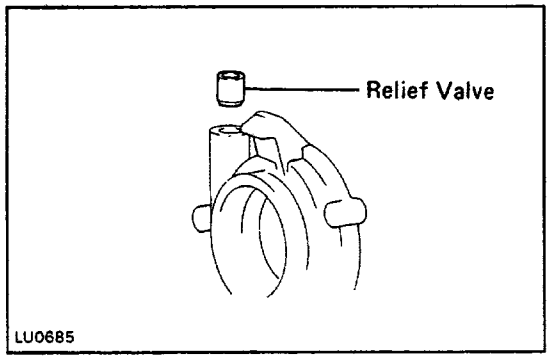
Using a thickness gauge and flat block, measure the side clearance as shown.

Standard clearance: 0.03–0.09 mm

(0.00 12 – 0.0035 in.)

Maximum clearance: 0.15 mm (0.006 in.)

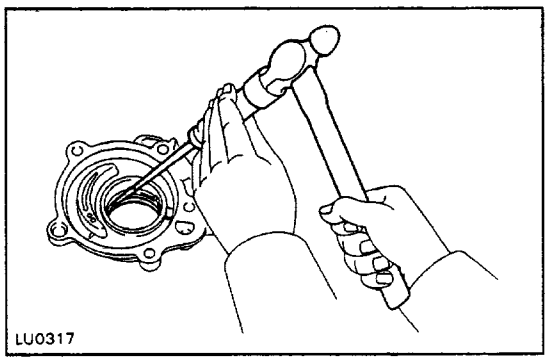
If the clearance is greater than maximum, replace the gears and/or body.



PRESSURE REGULATOR INSPECTION EG1UP–01

Coat the valve piston with engine oil and check that it falls smoothly into the valve hole by its own weight.

If the valve does not fall smoothly, replace the valve and/or oil pump assembly.

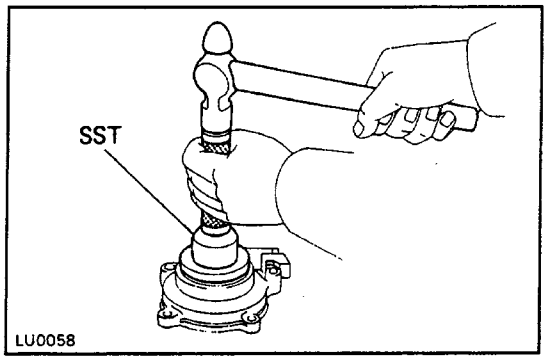


FRONT OIL SEAL REPLACEMENT EG1UQ–01

1. REMOVE OIL SEAL

(a) Remove the drive and driven gears.

(6) Using a screwdriver, remove the oil seal.

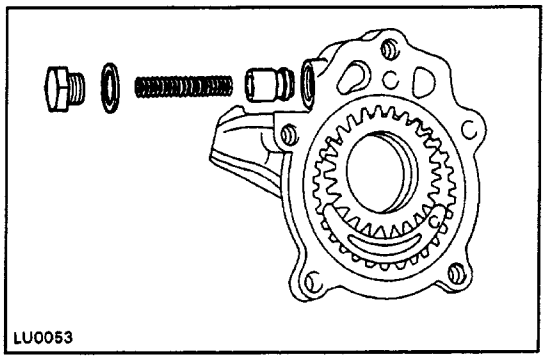


2. INSTALL OIL SEAL

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

(b) Using SST, drive in the new oil seal.

SST 09223–50010



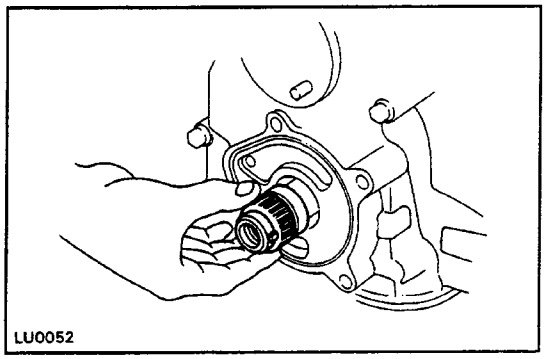
EG1UR–01

OIL PUMP ASSEMBLY.

(See page EG1–238)

(a) Install the relief valve and spring in the body, and screw on the relief valve plug with a new gasket.

(b) Insert the drive and driven gears into the pump body.



EG1U8–01

OIL PUMP INSTALLATION

(See page EG1–238)

1. INSTALL OIL PUMP DRIVE SPLINE AND O–RING

(a) Slide the pump drive spline onto the crankshaft.

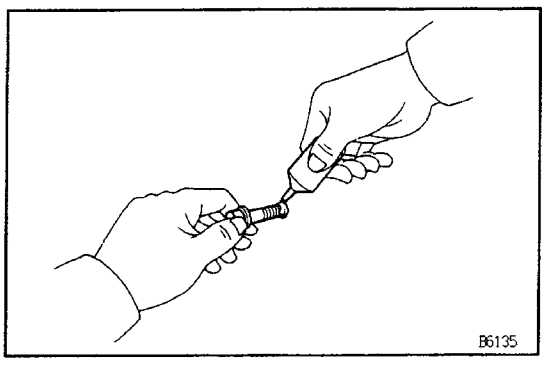
HINT: If the oil pump drive spline cannot be installed by hand, use SST. (See page EG1–43)

(b) Place the 0–ring into the groove.

2. INSTALL OIL PUMP

(a) Clean the threads of the upper set bolt and timing chain cover bolt hole of any sealer, oil or foreign particles.

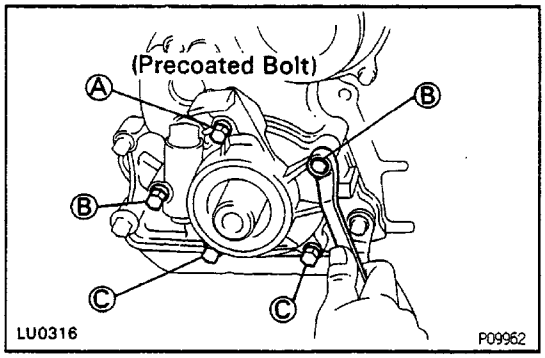
Remove any oil with kerosene or gasoline.



(b) Apply sealant to 2 or 3 threads of the bolt end.

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

HINT: This adhesive will not harden while exposed to air. It will act as a sealant or binding agent only when applied to threads, etc. and air is cut off.



(c) Torque the five bolts.

Torque: (A) 25 N–m (250 kgf–cm, 18 ft–lbf)
(B) 19 N–m (195 kgf–cm, 14 ft–lbf)
(C) 13 N–m (130 kgf–cm, 9 ft–lbf)

(d) Torque the relief valve plug.

Torque: 37 N–m (375 kgf–cm, 27 ft–lbf)

3. INSTALL CRANKSHAFT PULLEY
(See step 8 on page EG1–44)
4. INSTALL AND ADJUST DRIVE BELT
(See page MA–6)
5. INSTALL OIL STRAINER
(See step 2 on page EG1–70)
6. INSTALL OIL PAN
(See step 13 on page EG1–44)

SERVICE SPECIFICATIONS

EG1UT–01

SERVICE DATA

Oil pressure (normal operating temperature) at Idle speed at 3,000 rpm			29 kPa (0.3 kgf/cm², 4.3 psi) or more 245 – 490 kPa 2.5 – 5.0 kgf/cm² 36 – 71 psi	
Oil pump	Body clearance	STD	0.09 – 0.15 mm	0.0035 – 0.0059 in.
		Limit	0.2 mm	0.008 in.
	Tip clearance			
	Drive gear to crescent	STD	0.15 – 0.21 mm	0.0059 – 0.0083 in.
		Limit	0.3 mm	0.012 in.
	Drive gear to crescent	STD	0.22 – 0.25 mm	0.0087 – 0.0098 in.
		Limit	0.3 mm	0.012 in.
	Side clearance	STD	0.03 – 0.09 mm	0.0012 – 0.0035 in.
		Limit	0.15 mm	0.0059 in.
	Relief valve operating pressure		441 kPa 4.5 kgf/cm²	64 psi

V01957

EG1UU–01

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Cylinder Block x Rear Oil Seal Retainer	18	180	13
Cylinder Block x Oil Cooler Relief Valve	69	700	51
Cylinder Block x Oil Strainer	13	130	9
Cylinder Block x Oil Pan	13	130	9
Oil pan x Drain Plug	25	250	18