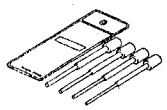
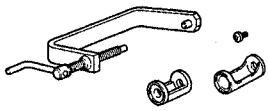
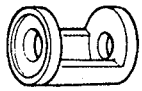
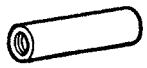
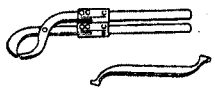
2RZ-FE, 3RZ-FE ENGINE

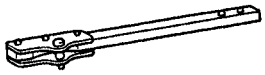
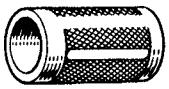
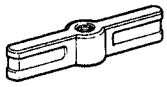
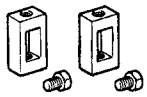
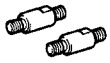
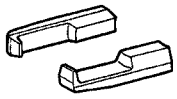
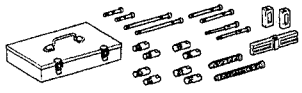
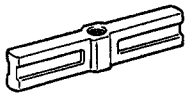
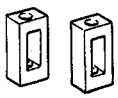
ENGINE MECHANICAL

PREPARATION

SST (SPECIAL SERVICE TOOLS)

EG0AY–1X

	09032–00100 Oil Pan Seal Cutter	
	09201–10000 Valve Guide Bushing Remover & Replacer Set	
	(09201–01060) Valve Guide Bushing Remover & Replacer 6	
	09202–70020 Valve Spring Compressor	
	(09202–00010) Attachment	
	09207–76010 Rocker Arm Bushing	
	09213–54015 Crankshaft Pulley Holding Tool	
	09223–15030 Oil Seal & Bearing Replacer	Crankshaft rear oil seal
	09236–00101 Water Pump Overhaul Tool Set	
	(09236–15010) Bearing Stay	Valve stem oil seal
	09248–55040 Valve Clearance Adjust Tool Set	
	(09248–05410) Valve Lifter Press	

	(09248–05420) Valve Lifter Stopper	
	09330–00021 Companion Flange Holding Tool	Crankshaft pulley
	09636–20010 Upper Ball Joint Dust Cover Replacer	Crankshaft timing gear
	09816–30010 Oil Pressure Switch Socket	Knock sensor
	09843–18020 Diagnosis Check Wire	
	09950–40010 Puller B Set	Crankshaft timing gear
	(09951–04010) Hanger 150	
	(09952–04010) Slide Arm	
	(09953–04010) Center Bolt 100	
	(09954–04010) Arm 25	
	(09955–04060) Claw No.6	
	09950–50010 Puller C Set	Crankshaft pulley
	(09951–05010) Hanger 150	
	(09952–05010) Slide Arm	

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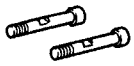
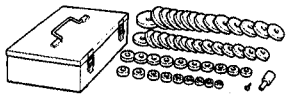
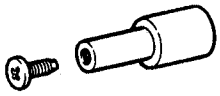
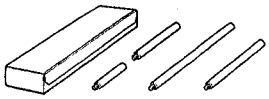
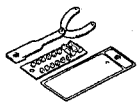
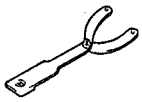
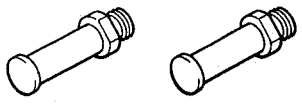
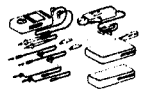
EG

	(09953–05010) Center Bolt 100	
	(09954–05020) Claw No.2	
	09950–60010 Replacer Set	Spark plug tube gasket
	(09951–00260) Replacer 26	
	(09951–00490) Replacer 49	
	(09952–06010) Adapter	
	09950–70010 Handle Set	
	(09951–07150) Handle 150	Valve guide bushing Spark plug tube gasket Crankshaft rear oil seal
	09960–10010 Variable Pin Wrench Set	
	(09962–01000) Variable Pin Wrench Arm Assy	
	(09963–00500) Pin 5	Exhaust camshaft sub–gear
	(09963–01000) Pin 10	PS pump pulley

RECOMMENDED TOOLS

EG0AZ–1E

	09082–00050 TOYOTA Electrical Tester Set.	

	09200–00010 Engine Adjust Kit .	
	09258–00030 Hose Plug Set .	Plug for the vacuum hose, fuel hose etc.

EG0B0–1C

EQUIPMENT

Caliper gauge	
CO/HC meter	
Compression gauge	
Connecting rod aligner	
Cylinder gauge	
Dial indicator	
Dye penetrant	
Engine tune–up tester	
Heater	
Magnetic finger	
Micrometer	
OBD II scan tool	Engine speed
Piston ring compressor	
Piston ring expander	
Plastigage	
Precision straight edge	
Soft brush	
Spring tester	Valve spring
Steel square	Valve spring
Thermometer	
Torque wrench	
V–block	
Valve seat cutter	
Vernier calipers	

EG0B1–2F

SSM (SPECIAL SERVICE MATERIALS)

08826–00080	Seal Packing Black or equivalent (FIPG)	Over space between cylinder head and timing chain cover Semi–circular plug Oil pan, Rear oil seal retaine
08833–00070	Adhesive 1324, THREE BOND 1324 or equivalent	Spark plug tube Drive plate bolt
08833–00080	Adhesive 1344, THREE BOND 1344, LOCTITE 242 or equivalent	Oil pressure switch

EG

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

EG5MB–02

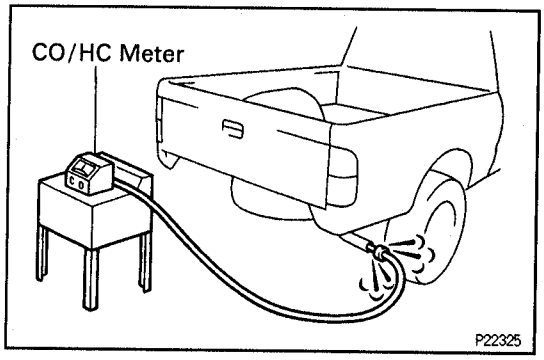
HINT: This check is used only to determine whether or not the idle CO/HC complies with regulations.

1. **INITIAL CONDITIONS**

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

2. **START ENGINE**
3. **RACE ENGINE AT 2,500 RPM FOR APPROX. 180 SECONDS**
4. **INSERT CO/HC METER TESTING PROBE AT LEAST 40 cm (1.3 ft) INTO TAILPIPE DURING IDLING**
5. **IMMEDIATELY CHECK CO/HC CONCENTRATION AT IDLE AND/OR 2,500 RPM**

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



Troubleshooting

If the CO/HC concentration does not comply with regulations, troubleshoot according to the table on the next page.

(a) Check heated oxygen sensor operation.
(b) Check and correct the cause if necessary.

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. Faulty MFI system • Faulty fuel pressure regulator • Clogged fuel return line • Faulty MAF meter • Defective ECT sensor • Defective IAT sensor • Faulty engine control module (ECM) • Faulty injector

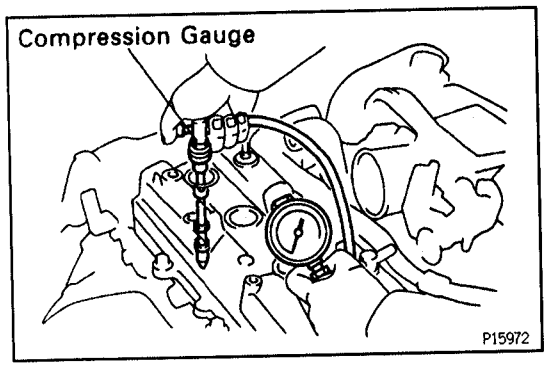
V04904

COMPRESSION CHECK

EG64C–01

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

1. **WARM UP AND STOP ENGINE**
2. **REMOVE INTAKE AIR CONNECTOR**
   (See steps 2 to 4 in cylinder head removal)
3. **DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS**
   NOTICE: Pulling on or bending the cords may damage the conductor inside.
4. **REMOVE SPARK PLUGS**



5. **CHECK CYLINDER COMPRESSION PRESSURE**

(a) Insert a compression gauge into the spark plug hole.
(b) Fully open the throttle.
(c) While cranking the engine, measure the compression pressure.
HINT: Always use a fully charged battery to obtain engine speed of 250 rpm or more.
(d) Repeat steps (a) through (c) for each cylinder.

NOTICE: This measurement must be done in as short a time as possible.

Compression pressure:

1,230 kPa (12.5 kgf/cm², 178 psi) or more

Minimum pressure:

880 kPa (9.0 kgf/cm², 127 psi)

Difference between each cylinder:

98 kPa (1.0 kgf/cm², 14 psi) or less

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

- If adding oil helps the compression, chances are that the piston rings and/or cylinder bore are worn or damage.
- If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.

6. **REINSTALL SPARK PLUGS**
   Torque: 19 N·m (200 kgf·cm, 14 ft·lbf)
7. **REINSTALL HIGH–TENSION CORDS TO SPARK PLUGS**
8. **REINSTALL INTAKE AIR CONNECTOR**
   (See steps 34 to 36 in cylinder head installation)

VALVE CLEARANCE INSPECTION AND ADJUSTMENT

EG64D-01

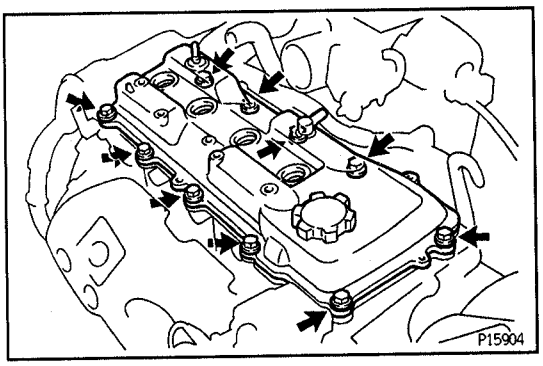
HINT: Inspect and adjust the valve clearance when the engine is cold.

1. **REMOVE INTAKE AIR CONNECTOR**
   (See steps 2 to 4 in cylinder head removal)
2. **REMOVE PCV HOSES**
3. **DISCONNECT HIGH–TENSION CORDS FROM SPARK PLUGS**
   NOTICE: Pulling on or bending the cords may damage the conductor inside.
4. **DISCONNECT ENGINE WIRE**

(a) Disconnect these connectors:

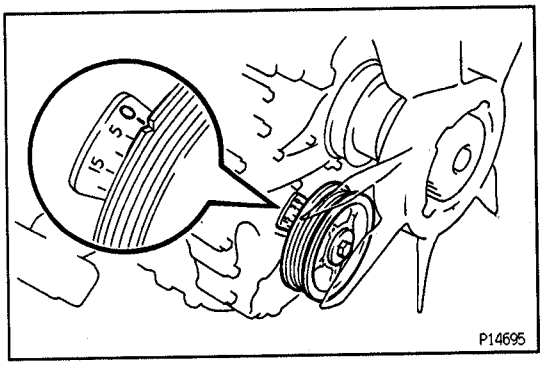
- w/ A/C:
  A/C compressor connector
- Oil pressure sensor connector
- Engine coolant temperature sender gauge connector
- Distributor connector

(b) Disconnect the 4 engine wire clamps and engine wire.



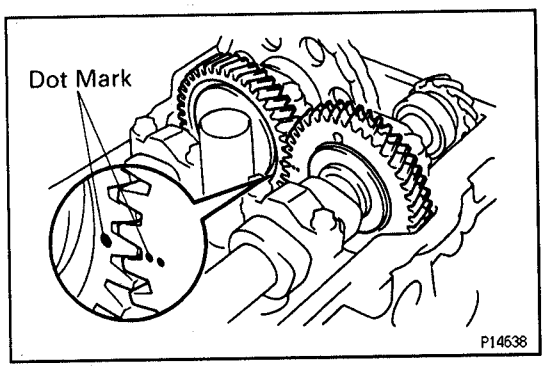
5. REMOVE CYLINDER HEAD COVER

Remove the 10 bolts, seal washers, cylinder head cover and gasket.

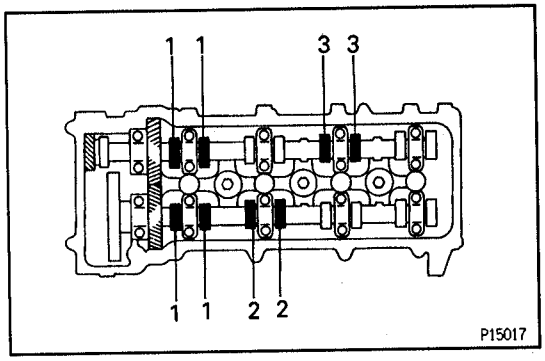


6. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley clockwise and align its groove with the "0" mark on the timing chain cover.



(b) Check that the timing marks (1 and 2 dots) of the camshaft drive and driven gears are in straight line on the cylinder head surface as shown in the illustration. If not, turn the crankshaft 1 revolution (360°) and align the marks as above.



7. INSPECT VALVE CLEARANCE

(a) Check only the valves indicated.

- Using a thickness gauge, measure the clearance between the valve lifter and camshaft.
- Record the out – of – specification valve clearance measurements. They will be used later to determine the required replacement adjusting shim.

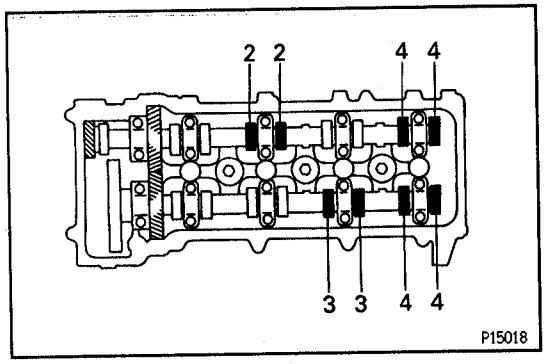
Valve clearance (Cold):

Intake

0.15 – 0.25 mm (0.006 – 0.010 in.)

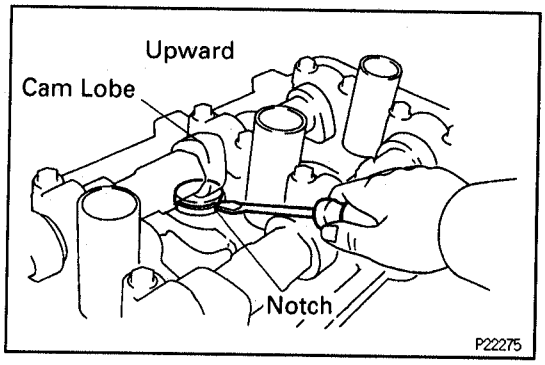
Exhaust

0.25 – 0.35 mm (0.010 – 0.014 in.)



(b) Turn the crankshaft pulley 1 revolution (360°) and align its groove with timing mark "0" of the timing chain cover.

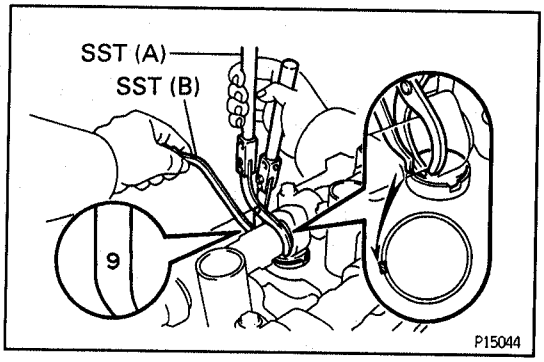
(c) Check only the valves indicated as shown. Measure the valve clearance. (See procedure in step (a))



8. ADJUST VALVE CLEARANCE

(a) Remove the adjusting shim.

- Turn the crankshaft to position the cam lobe of the camshaft on the adjusting valve upward.
- Position the notch of the valve lifter toward the spark plug side.

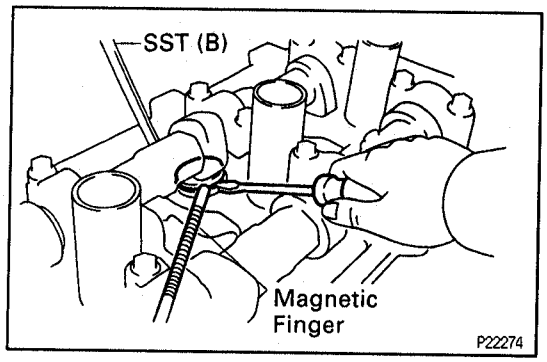


- Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter flange. Remove SST (A).

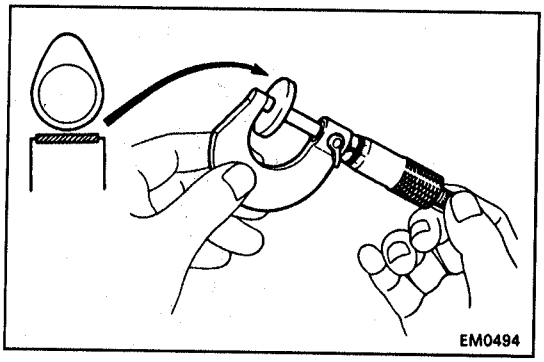
SST 09248–55040 (09248–05410, 09248–05420)

HINT:

- Apply SST (B) at slight angle on the side marked with "9", at the position shown in the illustration.



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



(b) Determine the replacement adjusting shim size by these Formula or Charts:

- Using a micrometer, measure the thickness of the removed shim.
- Calculate the thickness of a new shim so that the valve clearance comes within the specified value.

T ..... Thickness of removed shim
A ..... Measured valve clearance
N ..... Thickness of new shim

Intake:

N=T + (A – 0.20 mm (0.008 in.))

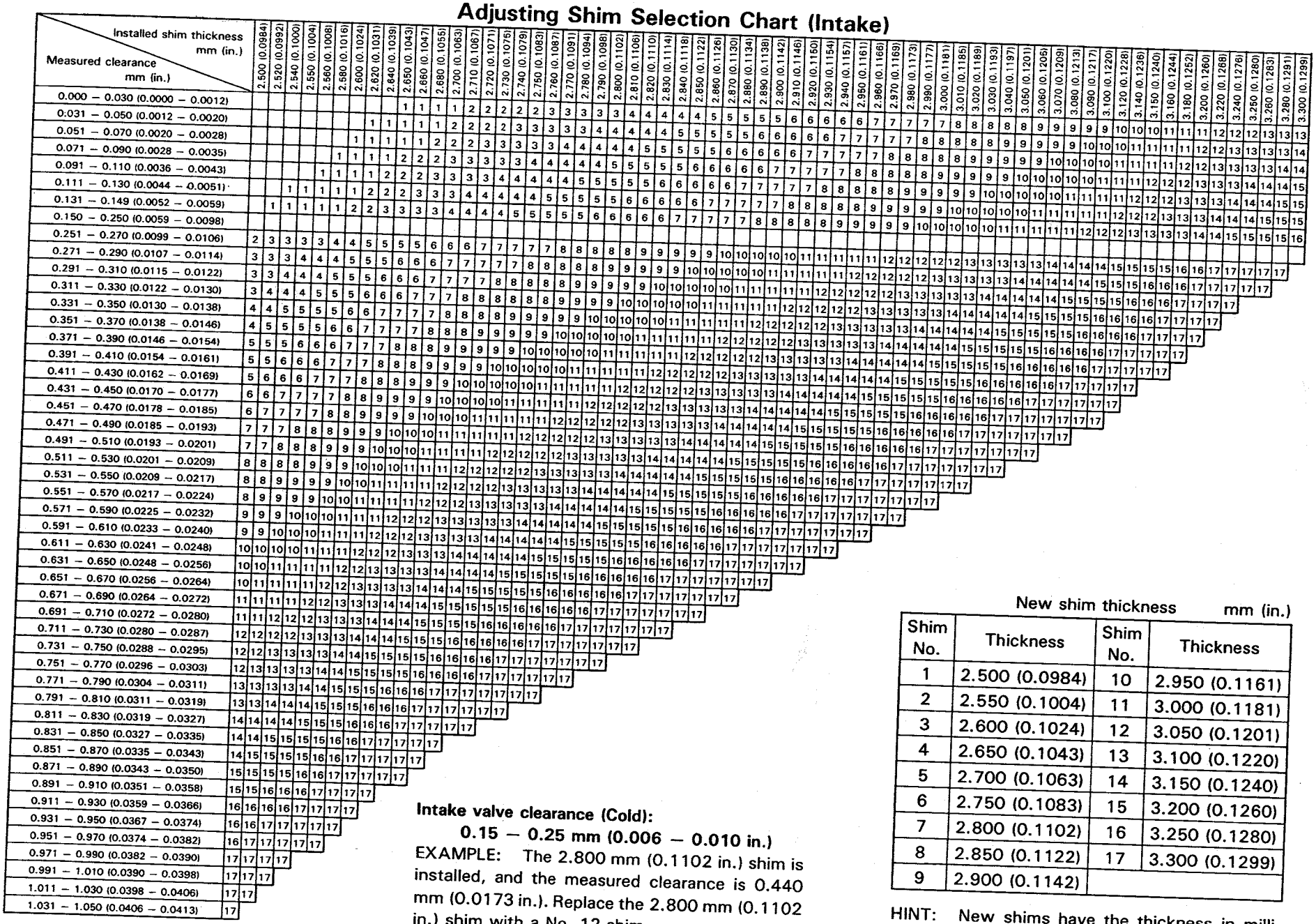
Exhaust:

N=T + (A – 0.30 mm (0.012 in.))

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

HINT: Shims are available in 17 sized in increments of 0.05 mm (0.0020 in.), from 2.50 mm (0.0984 in.) to 3.30 mm (0.1299 in.).

Adjusting Shim Selection Chart (Intake)



V00831

Intake valve clearance (Cold):

0.15 – 0.25 mm (0.006 – 0.010 in.)

EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.440 mm (0.0173 in.). Replace the 2.800 mm (0.1102 in.) shim with a No. 12 shim.

New shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (0.1280)
8	2.850 (0.1122)	17	3.300 (0.1299)
9	2.900 (0.1142)		

HINT: New shims have the thickness in millimeters imprinted on the face.

Adjusting Shim Selection Chart (Exhaust)

Measured clearance mm (in.) \ Installed shim thickness mm (in.)	2.500 (0.0984)	2.520 (0.0992)	2.540 (0.1000)	2.550 (0.1004)	2.560 (0.1008)	2.580 (0.1016)	2.600 (0.1024)	2.620 (0.1031)	2.640 (0.1039)	2.650 (0.1043)	2.660 (0.1047)	2.680 (0.1055)	2.700 (0.1063)	2.710 (0.1067)	2.720 (0.1071)	2.730 (0.1075)	2.740 (0.1079)	2.750 (0.1083)	2.760 (0.1087)	2.770 (0.1091)	2.780 (0.1094)	2.790 (0.1098)	2.800 (0.1102)	2.810 (0.1106)	2.820 (0.1110)	2.830 (0.1114)	2.840 (0.1118)	2.850 (0.1122)	2.860 (0.1126)	2.870 (0.1130)	2.880 (0.1134)	2.890 (0.1138)	2.900 (0.1142)	2.910 (0.1146)	2.920 (0.1150)	2.930 (0.1154)	2.940 (0.1157)	2.950 (0.1161)	2.960 (0.1166)	2.970 (0.1169)	2.980 (0.1173)	2.990 (0.1177)	3.000 (0.1181)	3.010 (0.1185)	3.020 (0.1189)	3.030 (0.1193)	3.040 (0.1197)	3.050 (0.1201)	3.060 (0.1205)	3.070 (0.1209)	3.080 (0.1213)	3.090 (0.1217)	3.100 (0.1220)	3.120 (0.1228)	3.140 (0.1236)	3.150 (0.1240)	3.160 (0.1244)	3.180 (0.1252)	3.200 (0.1260)	3.220 (0.1268)	3.240 (0.1276)	3.250 (0.1280)	3.260 (0.1283)	3.280 (0.1291)	3.300 (0.1299)
0.000 – 0.030 (0.0000 – 0.0012)																		1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	8	8	8	8	9	9	10	10	10	10	11	11
0.031 – 0.050 (0.0012 – 0.0020)															1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	9	9	9	9	10	10	11	11	11	11	12
0.051 – 0.070 (0.0020 – 0.0028)													1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	9	9	9	9	10	10	11	11	11	11	12	12
0.071 – 0.090 (0.0028 – 0.0035)												1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	10	10	10	11	11	11	12	12	12	13
0.091 – 0.110 (0.0036 – 0.0043)											1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	10	10	10	11	11	11	12	12	12	13	13
0.111 – 0.130 (0.0044 – 0.0051)									1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	12	12	12	13	13	13
0.131 – 0.150 (0.0052 – 0.0059)								1	1	1	1	1	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	11	11	11	11	12	12	13	13	13	13	14
0.151 – 0.170 (0.0059 – 0.0067)							1	1	1	1	1	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	11	11	11	11	12	12	13	13	13	13	14	14
0.171 – 0.190 (0.0067 – 0.0075)						1	1	1	1	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14	15
0.191 – 0.210 (0.0075 – 0.0083)					1	1	1	1	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	11	11	11	11	11	12	12	12	13	13	13	14	14	14	15	15
0.211 – 0.230 (0.0083 – 0.0091)			1	1	1	1	1	2	2	2	3	3	4	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	14	14	14	15	15	15
0.231 – 0.249 (0.0091 – 0.0098)		1	1	1	1	1	2	2	3	3	3	3	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	13	13	13	13	14	14	15	15	15	15	16
0.250 – 0.350 (0.0098 – 0.0138)
0.351 – 0.370 (0.0138 – 0.0146)	2	3	3	3	3	4	4	5	5	5	5	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	16	16	17	17	17	17	17
0.371 – 0.390 (0.0146 – 0.0154)	3	3	3	4	4	4	5	5	5	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	16	16	16	17	17	17	17	17
0.391 – 0.410 (0.0154 – 0.0161)	3	3	4	4	4	5	5	5	6	6	6	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	16	16	16	17	17	17	17
0.411 – 0.430 (0.0162 – 0.0169)	3	4	4	4	5	5	5	6	6	6	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	17	17	17	17
0.431 – 0.450 (0.0170 – 0.0177)	4	4	5	5	5	5	6	6	7	7	7	7	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	17	17	17	17	17
0.451 – 0.470 (0.0178 – 0.0185)	4	5	5	5	5	6	6	7	7	7	7	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	17	17	17	17	17
0.471 – 0.490 (0.0185 – 0.0193)	5	5	5	6	6	6	7	7	7	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17
0.491 – 0.510 (0.0193 – 0.0201)	5	5	6	6	6	7	7	7	8	8	8	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17
0.511 – 0.530 (0.0201 – 0.0209)	5	6	6	6	7	7	7	8	8	8	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17
0.531 – 0.550 (0.0209 – 0.0217)	6	6	7	7	7	7	8	8	9	9	9	9	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17
0.551 – 0.570 (0.0217 – 0.0224)	6	7	7	7	7	8	8	9	9	9	9	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17
0.571 – 0.590 (0.0225 – 0.0232)	7	7	7	8	8	8	9	9	9	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17
0.591 – 0.610 (0.0233 – 0.0240)	7	7	8	8	8	9	9	9	10	10	10	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17
0.611 – 0.630 (0.0241 – 0.0248)	7	8	8	8	9	9	9	10	10	10	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17
0.631 – 0.650 (0.0248 – 0.0256)	8	8	9	9	9	9	10	10	11	11	11	11	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17
0.651 – 0.670 (0.0256 – 0.0264)	8	9	9	9	9	10	10	11	11	11	11	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17
0.671 – 0.690 (0.0264 – 0.0272)	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17
0.691 – 0.710 (0.0272 – 0.0280)	9	9	10	10	10	11	11	11	12	12	12	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17
0.711 – 0.730 (0.0280 – 0.0287)	9	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17
0.731 – 0.750 (0.0288 – 0.0295)	10	10	11	11	11	11	12	12	13	13	13	13	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17
0.751 – 0.770 (0.0296 – 0.0303)	10	11	11	11	11	12	12	13	13	13	13	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17
0.771 – 0.790 (0.0304 – 0.0311)	11	11	11	12	12	12	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17
0.791 – 0.810 (0.0311 – 0.0319)	11	11	12	12	12	13	13	13	14	14	14	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17
0.811 – 0.830 (0.0319 – 0.0327)	11	12	12	12	13	13	13	14	14	14	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17
0.831 – 0.850 (0.0327 – 0.0335)	12	12	13	13	13	13	14	14	15	15	15	15	16	16	16	16	17	17	17	17	17	17	17
0.851 – 0.870 (0.0335 – 0.0343)	12	13	13	13	13	14	14	15	15	15	15	16	16	16	17	17	17	17	17	17	17
0.871 – 0.890 (0.0343 – 0.0350)	13	13	13	14	14	14	15	15	15	16	16	16	16	17	17	17	17	17	17
0.891 – 0.910 (0.0351 – 0.0358)	13	13	14	14	14	15	15	15	16	16	16	17	17	17	17	17	17
0.911 – 0.930 (0.0359 – 0.0366)	13	14	14	14	15	15	15	16	16	16	17	17	17	17	17
0.931 – 0.950 (0.0367 – 0.0374)	14	14	15	15	15	15	16	16	17	17	17	17	17
0.951 – 0.970 (0.0374 – 0.0382)	14	15	15	15	15	16	16	17	17	17	17	17
0.971 – 0.990 (0.0382 – 0.0390)	15	15	15	16	16	16	17	17	17	17	17
0.991 – 1.010 (0.0390 – 0.0398)	15	15	16	16	16	17	17	17	17
1.011 – 1.030 (0.0398 – 0.0406)	15	16	16	16	17	17	17	17
1.031 – 1.050 (0.0406 – 0.0413)	16	16	17	17	17	17	17
1.051 – 1.070 (0.0414 – 0.0421)	16	17	17	17	17	17
1.071 – 1.090 (0.0422 – 0.0429)	17	17	17	17	17
1.091 – 1.110 (0.0430 – 0.0437)	17	17	17
1.111 – 1.130 (0.0437 – 0.0445)	17	17
1.131 – 1.150 (0.0445 – 0.0413)	17

V00832

Exhaust valve clearance (Cold):

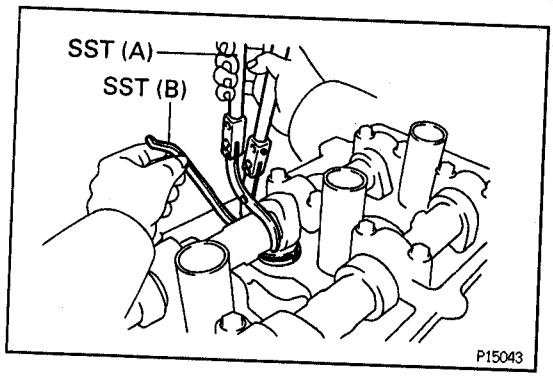
0.25 – 0.35 mm (0.010 – 0.014 in.)

EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed, and the measured clearance is 0.440 mm (0.0173 in.). Replace the 2.800 mm (0.1102 in.) shim with a No. 10 shim.

New shim thickness mm (in.)

Shim No.	Thickness	Shim No.	Thickness
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (0.1280)
8	2.850 (0.1122)	17	3.300 (0.1299)
9	2.900 (0.1142)		

HINT: New shims have the thickness in millimeters imprinted on the face.



(c) Install a new adjusting shim.
- Place a new adjusting shim on the valve lifter.
- Using SST (A), press down the valve lifter and remove SST (B).

SST 09248–55040 (09248–05410, 09248–05420)

(d) Recheck the valve clearance.

9. REINSTALL CYLINDER HEAD COVER

10. RECONNECT ENGINE WIRE

11. REINSTALL HIGH–TENSION CORDS TO SPARK PLUGS

12. REINSTALL PCV HOSES

13. REINSTALL INTAKE AIR CONNECTOR

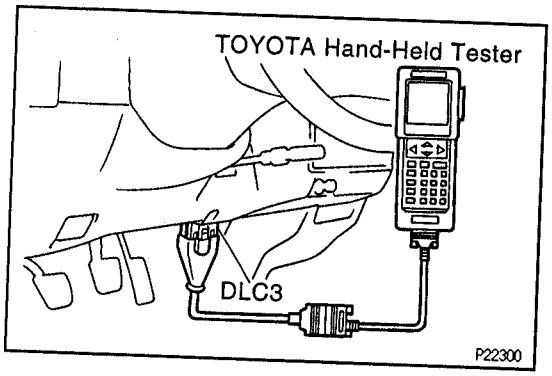
(See steps 34 to 36 in cylinder head installation)

EG

IGNITION TIMING INSPECTION

1. WARM UP ENGINE EGSME–02

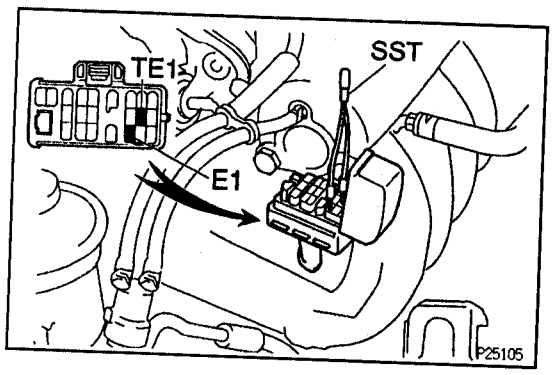
Allow the engine to warm up to normal operating temperature.



2. CONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL

(a) Connect the TOYOTA hand–held tester or OBD II scan tool to the DLC3.

(b) Please refer to the TOYOTA hand–held tester or OBD II scan tool operators manual for further details.

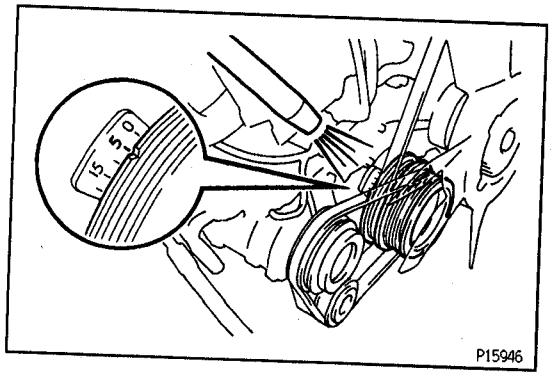


3. CHECK IGNITION TIMING

(a) Using SST, connect terminals TE1 and E1 of the DLC1.

SST 09843–18020

HINT: After engine speed is kept at about 1,000 rpm for 5 seconds, check that it returns to idle speed.



(b) Using a timing light, connect the test probe to the No.1 high–tension cord.

(c) Check ignition timing.

Ignition timing:

3 – 7° BTDC @ idle

(d) Remove the SST from the DLC1.

SST 09843–18020

4. **FURTHER CHECK IGNITION TIMING**

Ignition timing:

7 – 18° BTDC @ idle

HINT: The timing mark moves in a range between 7° and 18°.

5. **DISCONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL, AND TIMING LIGHT**

IDLE SPEED INSPECTION

EG64E–01

1. **INITIAL CONDITIONS**

(a) Engine at normal operating temperature
(b) Air cleaner installed
(c) All pipes and hoses of air induction system connected
(d) All accessories switched OFF
(e) All vacuum lines properly connected
HINT: All vacuum hoses for EGR system, etc. should be properly connected.
(f) MFI system wiring connectors fully plugged
(g) Ignition timing check correctly
(h) Transmission in neutral position

2. **CONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL**

(See step 2 in ignition timing inspection)

3. **INSPECT IDLE SPEED**

(a) Race the engine speed at 2,500 rpm for approx. 90 seconds.
(b) Check the idle speed.

Idle speed:

650 – 750 rpm

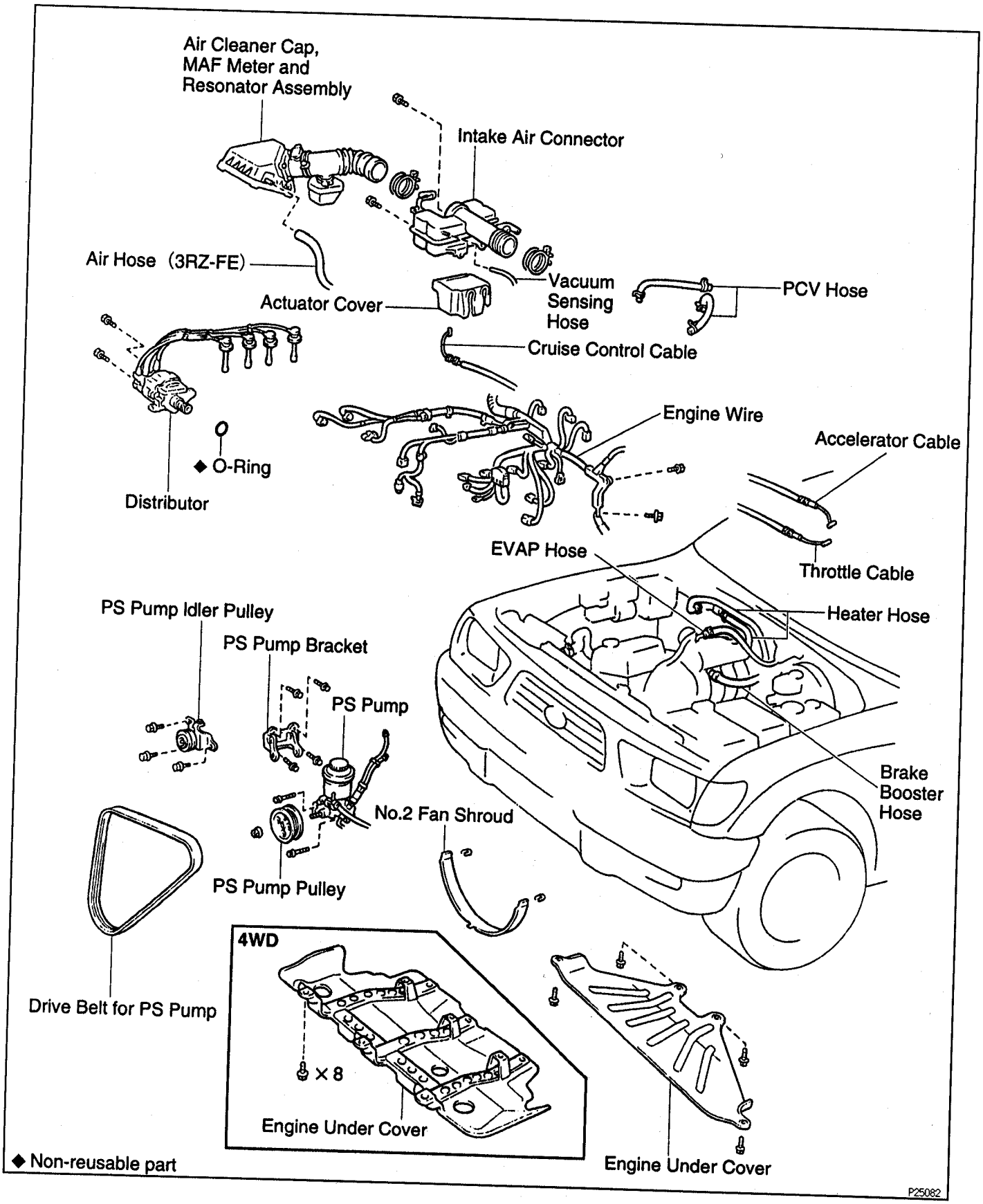
If the idle speed is not as specified, check the IAC valve, intake air leakage and MFI system.

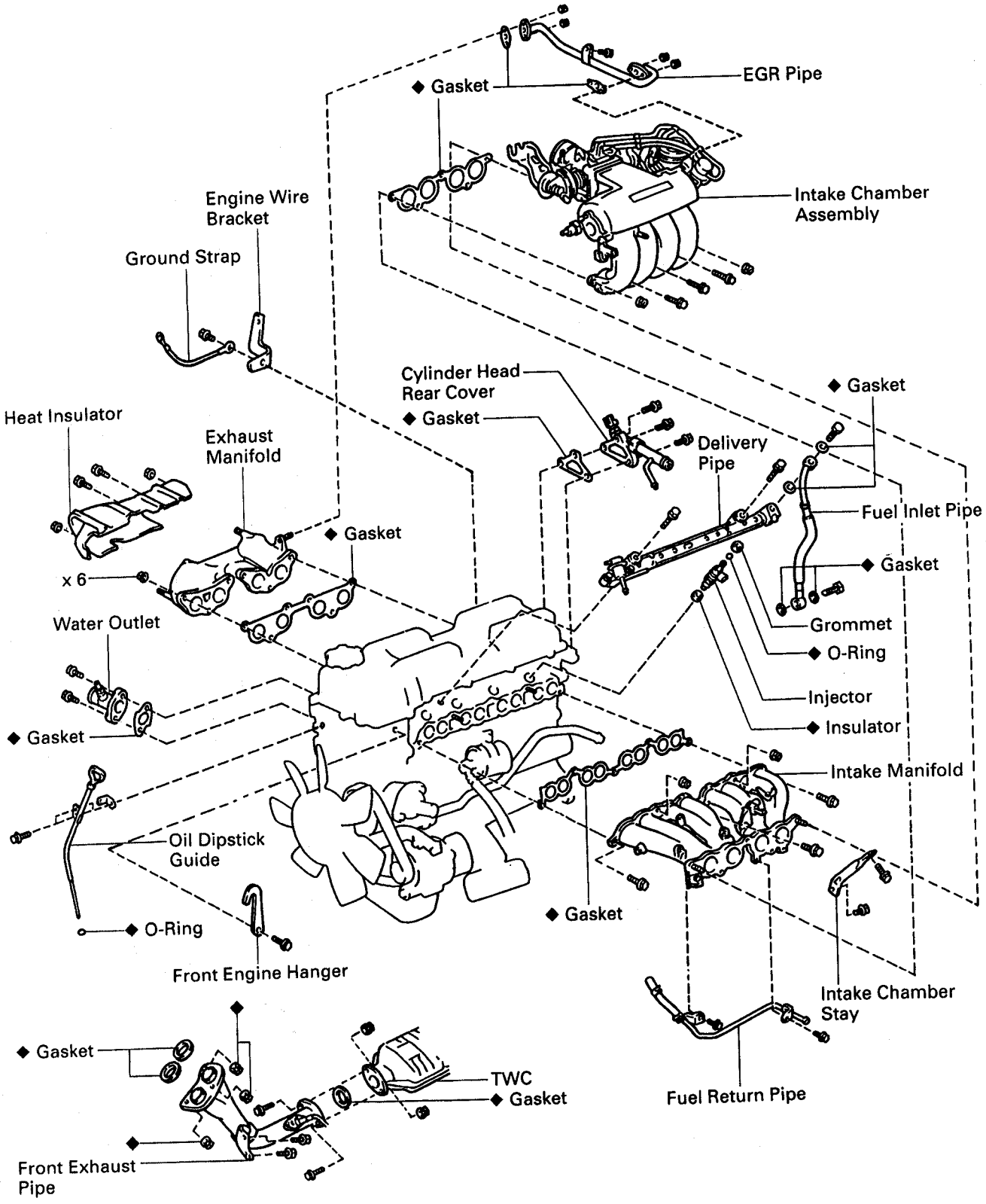
4. **DISCONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL**

CYLINDER HEAD

COMPONENTS FOR REMOVAL AND INSTALLATION

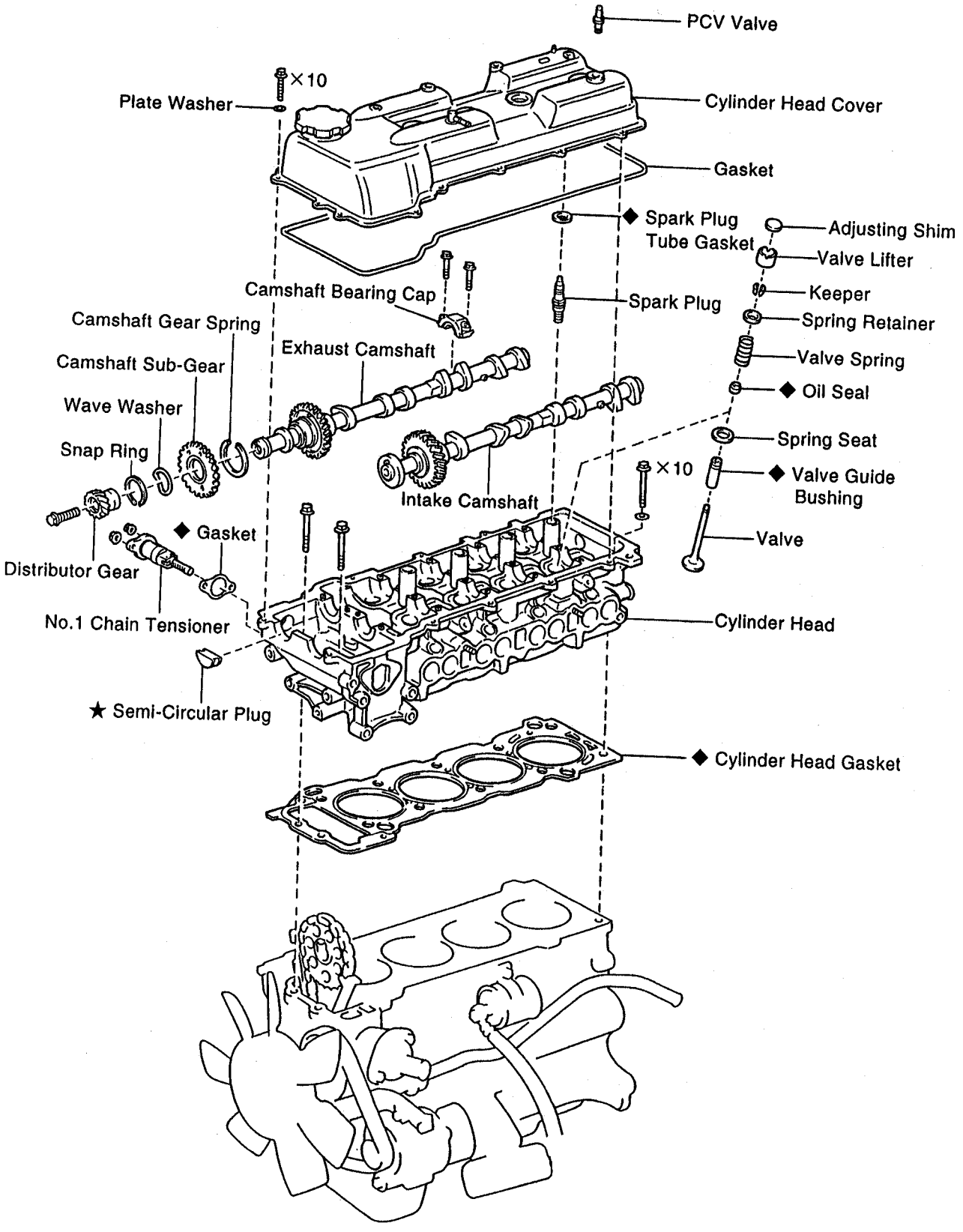
EGSMG–02





◆ Non-reusable part

P22337

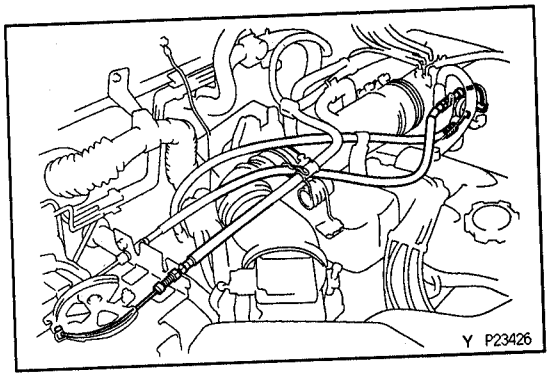


◆ Non-reusable part
★ Precoated part

P22292

EG

CYLINDER HEAD REMOVAL



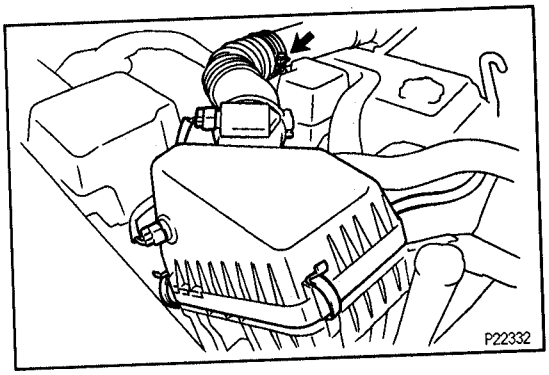
1. DRAIN ENGINE COOLANT

2. DISCONNECT THESE CABLES:

(a) M/T:
Disconnect the accelerator cable from the throttle body.

(b) A/T:
Disconnect the accelerator and throttle cables from the throttle body.

(c) w/ Cruise Control System:
Remove the actuator cover, and disconnect the cruise control cable from the actuator.



3. REMOVE AIR CLEANER CAP, MAF METER AND RESONATOR ASSEMBLY

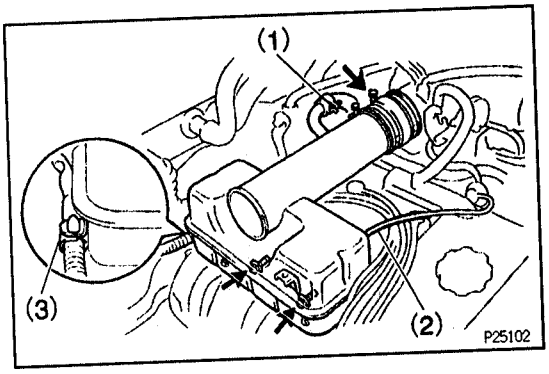
(a) Disconnect the 3 wire clamps for the engine wire.

(b) Disconnect the MAF meter and IAT sensor connectors.

(c) 3RZ–FE:
Disconnect the air hose from the air cleaner cap.

(d) Loosen the air cleaner hose clamp.

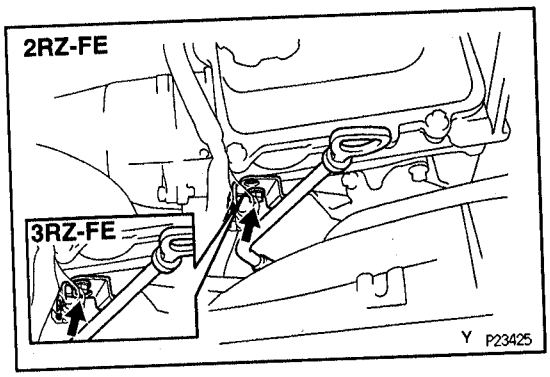
(e) Loosen the 4 clips, and remove the air cleaner cap, MAF meter and resonator assembly.



4. REMOVE INTAKE AIR CONNECTOR

(a) Disconnect these hoses and clamp:
(1) Air hose for IAC
(2) Vacuum sensing hose
(3) Wire clamp for engine wire

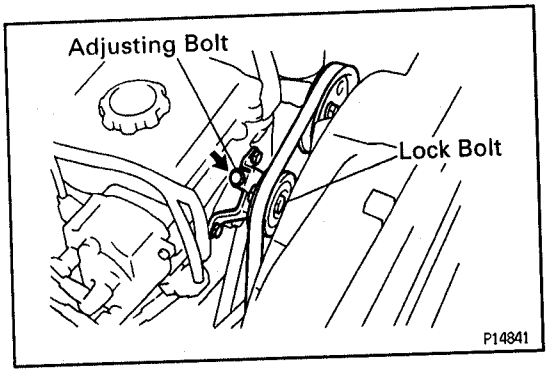
(b) Loosen the hose clamp, and remove the 2 bolts and intake air connector.



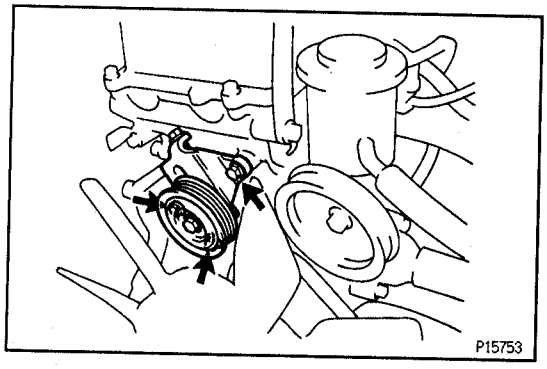
5. REMOVE OIL DIPSTICK GUIDE

(a) Remove the bolt, dipstick guide and engine wire bracket.

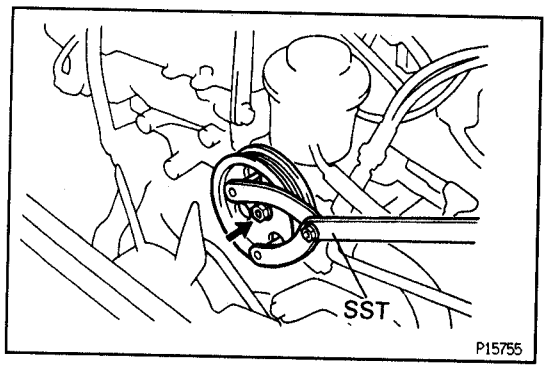
(b) Remove the O–ring from the dipstick guide.



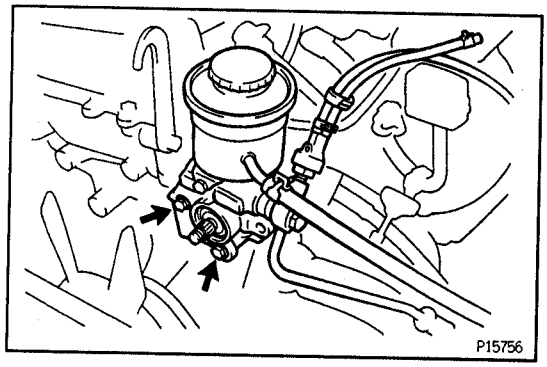
6. w/ PS:
REMOVE DRIVE BELT FOR PS PUMP
Loosen the lock bolt and adjusting bolt, and remove the drive belt.



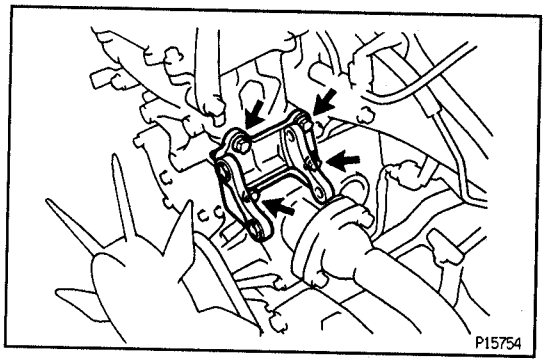
7. w/ PS:
REMOVE DRIVE BELT IDLER PULLEY FOR PS PUMP
Remove the 3 bolts and idler pulley.



8. w/ PS:
REMOVE PS PUMP AND BRACKET
(a) Using SST, remove the nut and PS pump pulley.
SST 09960–10010 (09962–01000, 09963–01000)

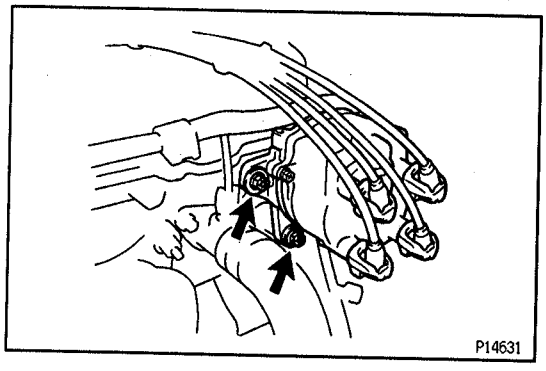


(b) Disconnect the 2 air hoses from the throttle body and air intake chamber.
(c) Remove the 2 bolts, and disconnect the PS pump.
HINT: Put aside the pump and suspend it.

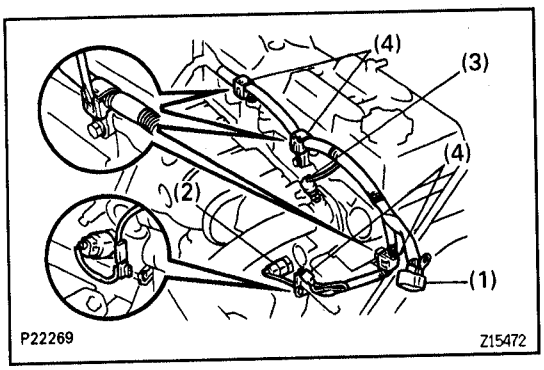


(d) Remove the 4 bolts and PS pump bracket.

9. REMOVE PCV HOSES

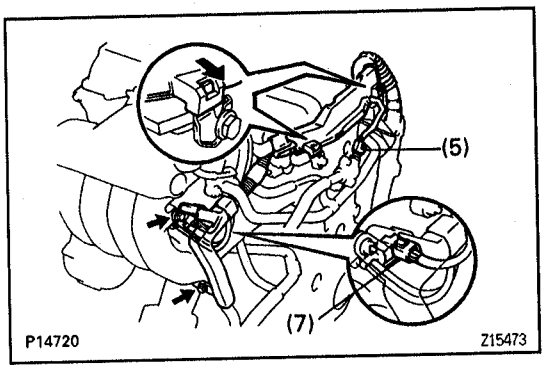


10. REMOVE DISTRIBUTOR
(a) Disconnect high–tension cords at the rubber boot from the cylinder head.
NOTICE: Pulling on or bending the cords may damage the conductor inside.
(b) Disconnect the distributor connector.
(c) Remove the hold–down bolts and distributor.
(d) Remove the O–ring.



11. DISCONNECT ENGINE WIRE

(a) Disconnect these connectors and clamps:
- (1) w/ A/C:
  A/C compressor connector
- (2) Oil pressure sensor connector and clamp
- (3) Engine coolant temperature sender gauge connector
- (4) 4 engine wire clamps and engine wire



- (5) ECT sensor connector
- (6) EGR gas temperature sensor connector
- (7) VSV connector for EGR

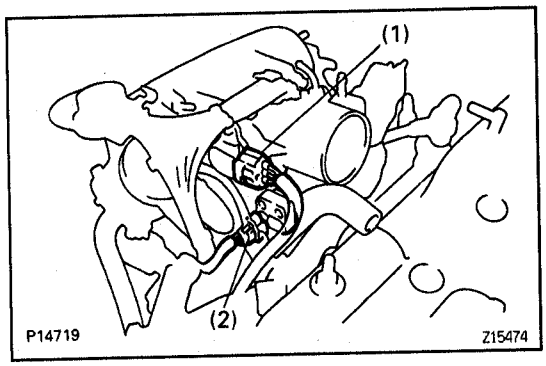
(b) Disconnect the 2 vacuum hose from the VSV for EGR and clamp.

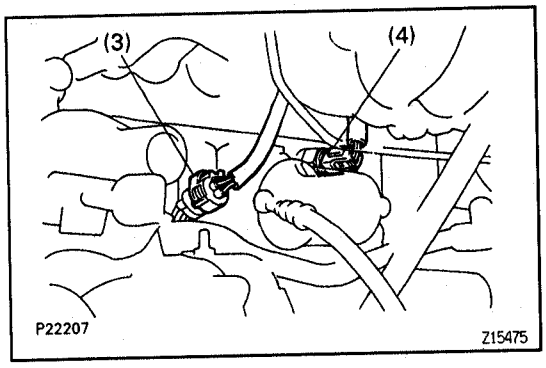
(c) Disconnect the bolt and ground strap from the cowl top panel.

(d) Remove the 2 bolts, and disconnect the engine wire from air the intake chamber.

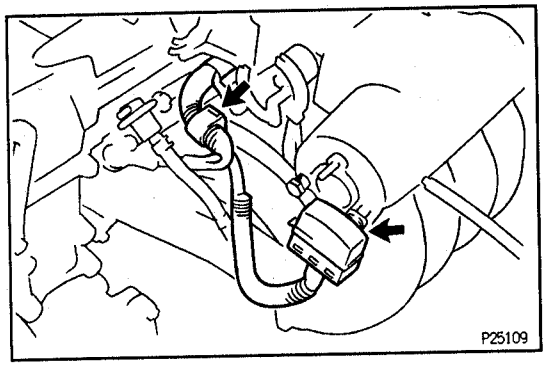
(e) Disconnect the 2 engine wire clamps and engine wire.

(f) Disconnect these connectors:
- (1) Throttle position sensor connector
- (2) IAC valve connector



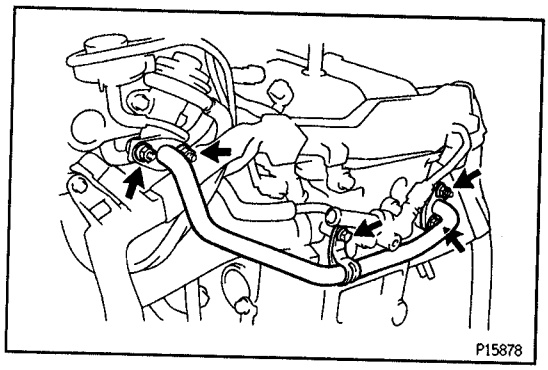


- (3) Crankshaft position sensor connector
- (4) Knock sensor connector



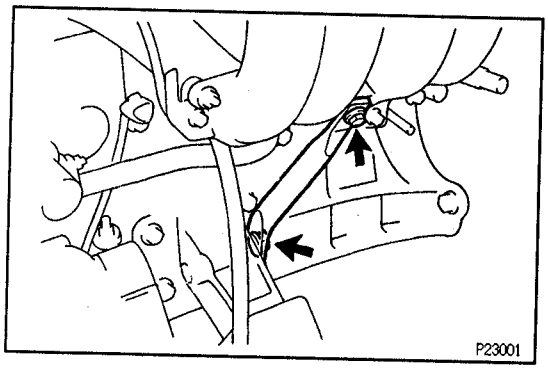
(g) Disconnect the DLC1 from the bracket.

(h) Disconnect the engine wire clamp.



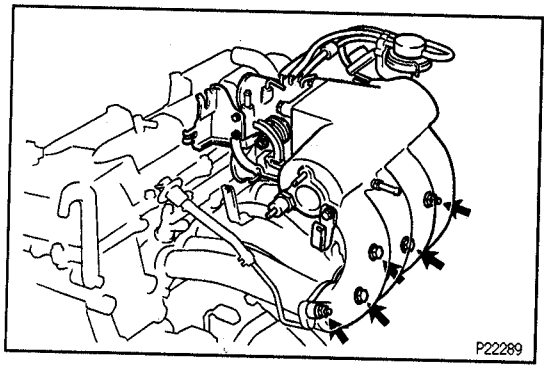
12. REMOVE EGR PIPE

Remove the 4 nuts, bolt, EGR pipe and 2 gasket.



13. REMOVE INTAKE CHAMBER STAY

Remove the 2 bolts and intake chamber stay.

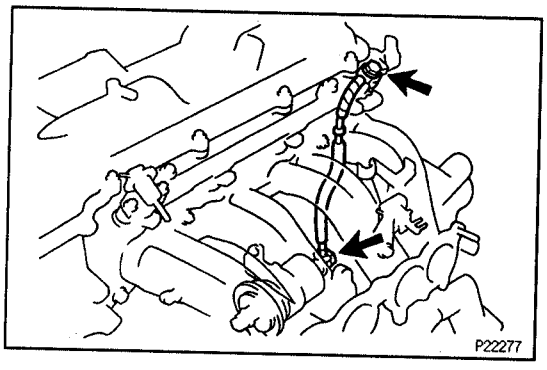


14. REMOVE AIR INTAKE CHAMBER ASSEMBLY

(a) Disconnect these hoses:
- EVAP hose from throttle body
- Brake booster vacuum hose from union
- Water bypass hose from water bypass pipe
- Water bypass hose from cylinder head rear cover

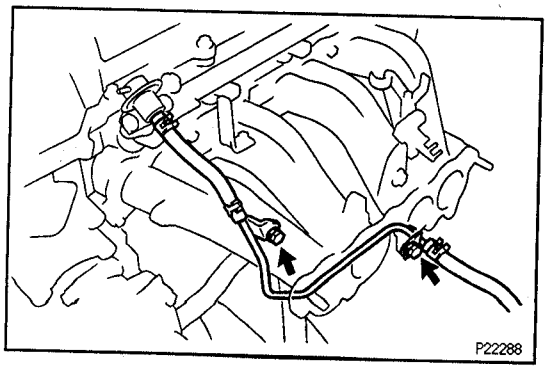
(b) Remove the 3 bolts, 2 nuts, air intake chamber assembly and gasket.

15. DISCONNECT INJECTOR CONNECTORS



16. REMOVE FUEL INLET PIPE

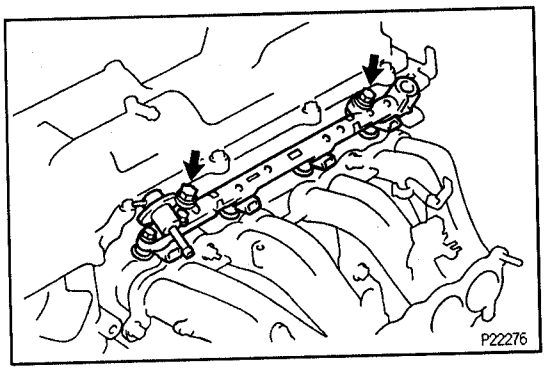
Remove the 2 union bolts, 4 gaskets and fuel inlet pipe.



17. REMOVE FUEL RETURN PIPE

(a) Disconnect these hoses:
- Fuel return hose from fuel pressure regulator
- Fuel return hose from fuel return pipe

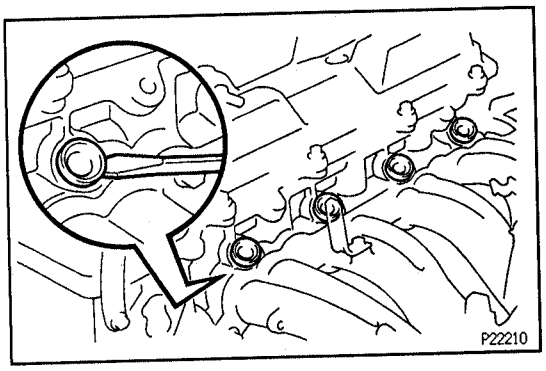
(b) Remove the 2 bolts and fuel return pipe.



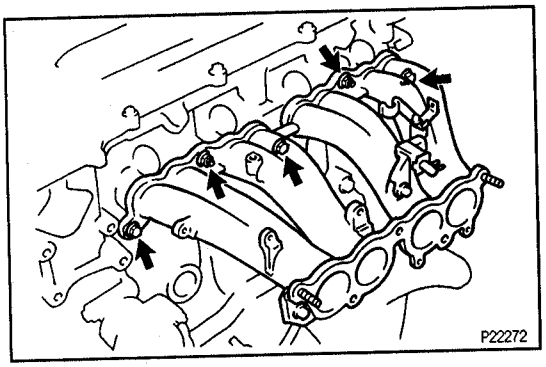
18. REMOVE DELIVERY PIPE AND INJECTORS

(a) Remove the 2 bolts and delivery pipe together with the 4 injectors.

NOTICE: Be careful not to drop the injectors when removing the delivery pipe.

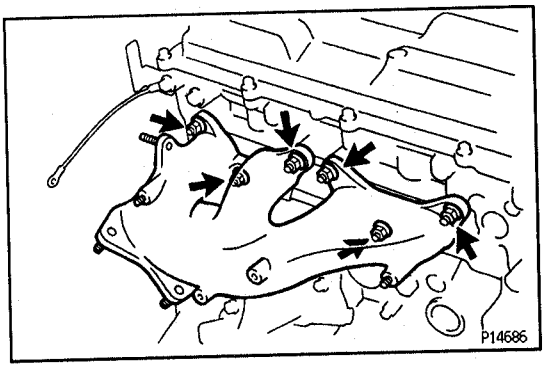


(b) Remove the 4 insulators from the 4 spacers.
(c) Pull out the 4 injectors from the delivery pipe.
(d) Remove the O–ring and grommet from each injector.
(e) Using a screwdriver, pry out the 4 spacers.



19. REMOVE INTAKE MANIFOLD

Remove the 3 bolts, 2 nuts, intake manifold and gasket.

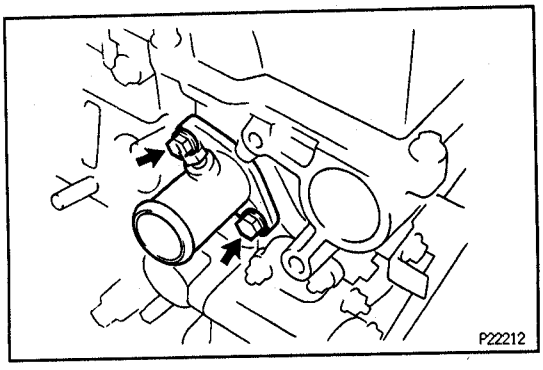


20. REMOVE FRONT EXHAUST PIPE

(See engine removal in cylinder block)

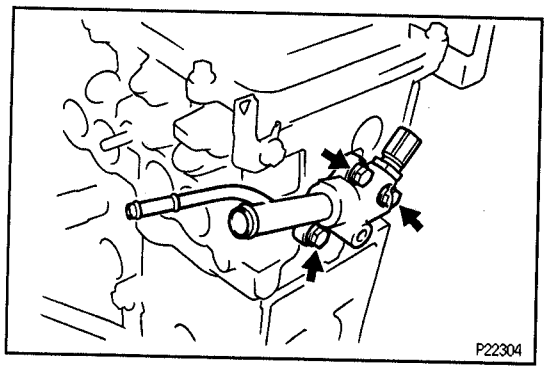
21. REMOVE EXHAUST MANIFOLD

(a) Remove the 2 bolts, 2 nuts and heat insulator.
(b) Remove the 6 nuts, exhaust manifold and gasket.



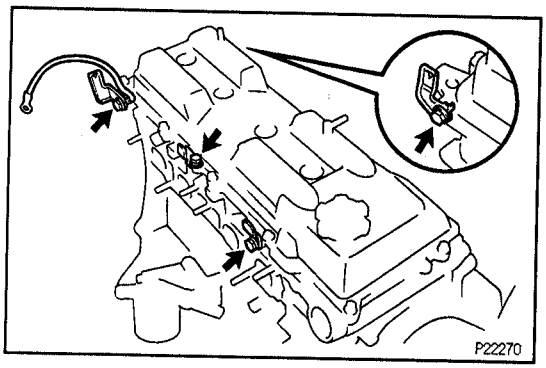
22. REMOVE WATER OUTLET

(a) Disconnect the upper radiator hose.
(b) Remove the 2 bolts, water outlet and gasket.



23. REMOVE CYLINDER HEAD REAR COVER

Remove the 3 bolts, cylinder head rear cover and gasket.

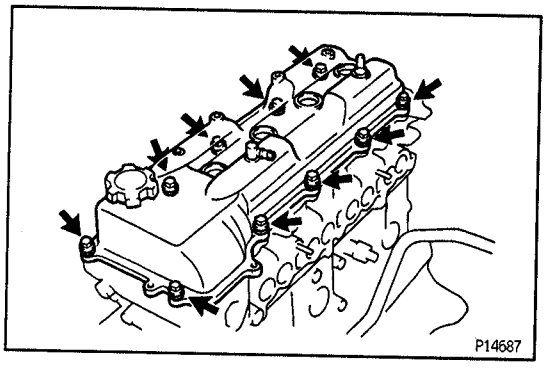


24. REMOVE SPARK PLUGS

25. REMOVE FRONT ENGINE HANGER

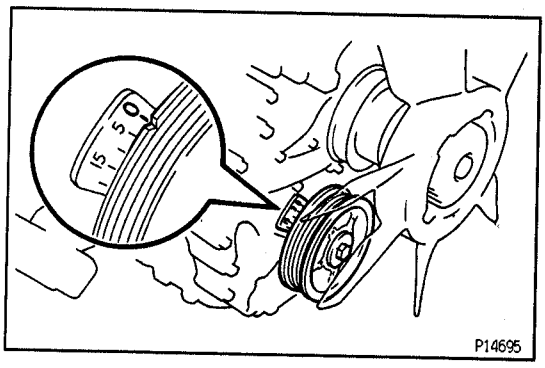
26. REMOVE ENGINE WIRE BRACKETS

Remove the 4 bolts, 4 wire brackets and ground strap.



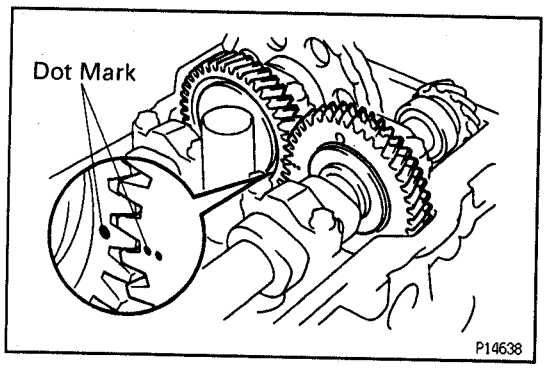
27. REMOVE CYLINDER HEAD COVER

Remove the 10 bolts, seal washers, cylinder head cover and gasket.

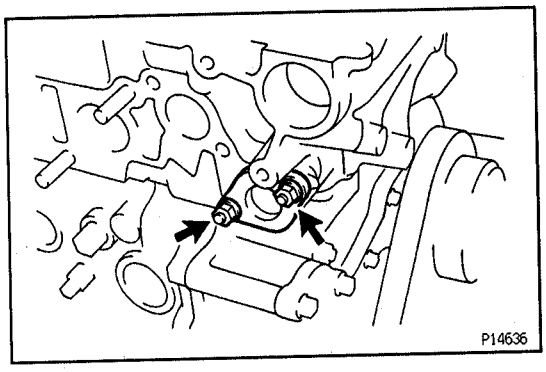


28. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley clockwise and align its groove with the "0" mark on the timing chain cover.

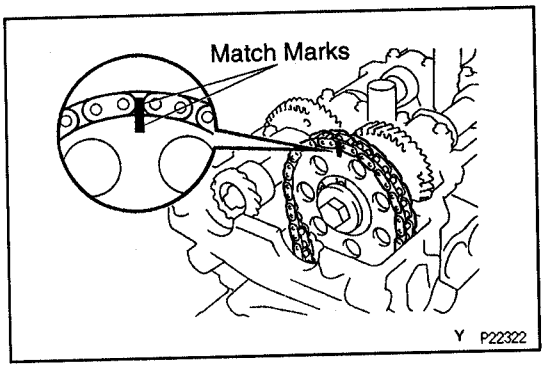


(b) Check that the timing marks (1 and 2 dots) of the camshaft drive and driven gears are in straight line on the cylinder head surface as shown in the illustration. If not, turn the crankshaft 1 revolution (360°) and align the marks as above.



29. REMOVE CHAIN TENSIONER

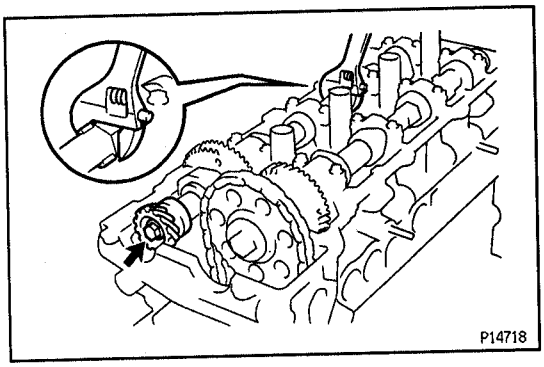
Remove the 2 nuts, chain tensioner and gasket.



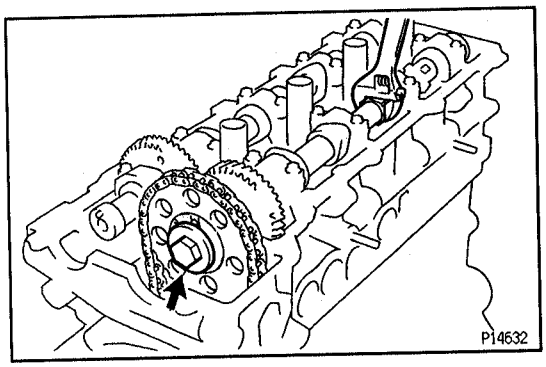
30. REMOVE SEMI–CIRCULAR PLUGS

31. REMOVE CAMSHAFT TIMING GEAR

(a) Place the matchmarks on the camshaft timing gear and No.1 timing chain.



(b) Hold the exhaust camshaft with a wrench, remove the bolt and distributor gear.

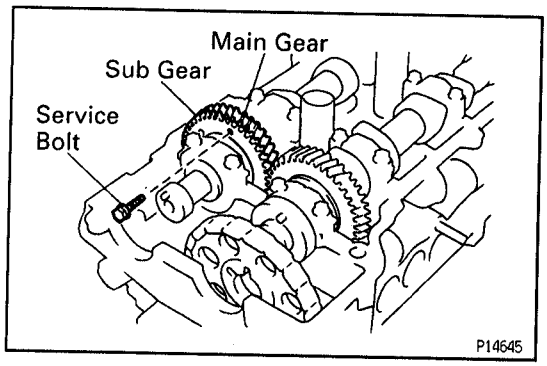


(c) Hold the intake camshaft with a wrench and remove the bolt.

(d) Remove the camshaft timing gear and chain from the intake camshaft and leave on the slipper and damper.

32. REMOVE CAMSHAFTS

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



A. Remove exhaust camshaft

(a) Bring the service bolt hole of the driven sub–gear upward by turning the hexagon wrench head portion of the exhaust camshaft with a wrench.

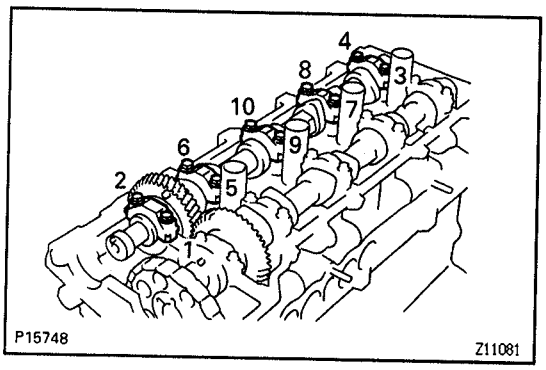
(b) Secure the exhaust camshaft sub–gear to the main gear with a service bolt.
Recommended service bolt:

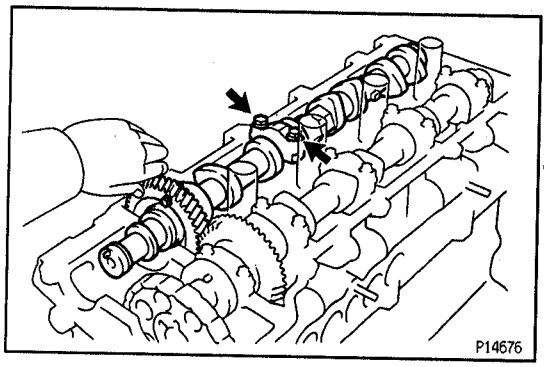
Thread diameter	6 mm
Thread pitch	1.0 mm
Bolt length	16 – 20 mm (0.63 – 0.79 in.)

HINT: When removing the camshaft, make sure that the torsional spring force of the sub–gear has been eliminated by the above operation.

(c) Uniformly loosen and remove the 10 bearing cap bolts, in several passes, in the sequence shown.

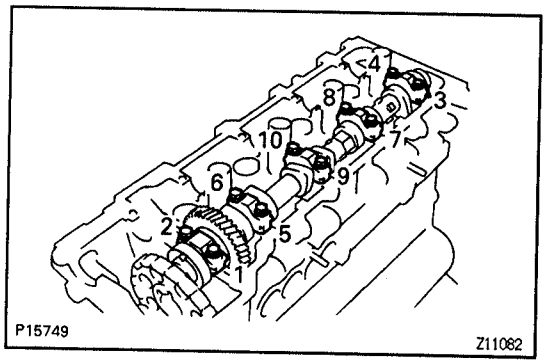
(d) Remove the 5 bearing caps and camshaft.





HINT: If the camshaft is not being lifted out straight and level, reinstall the No.3 bearing cap with the 2 bolts. Then alternately loosen and remove the bearing cap bolts with the camshaft gear pulled up.

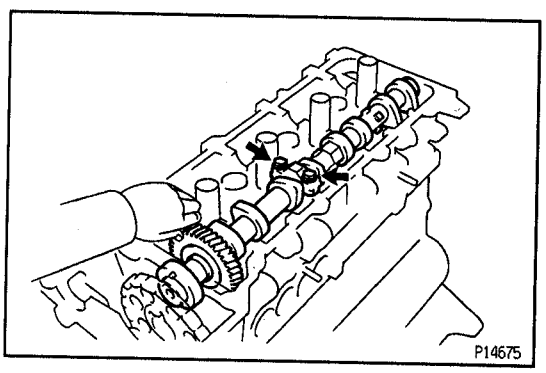
NOTICE: Do not pry on or attempt to force the camshaft with a tool or other object.



B. Remove intake camshaft

(a) Uniformly loosen and remove the 10 bearing cap bolts, in several passes, in the sequence shown.

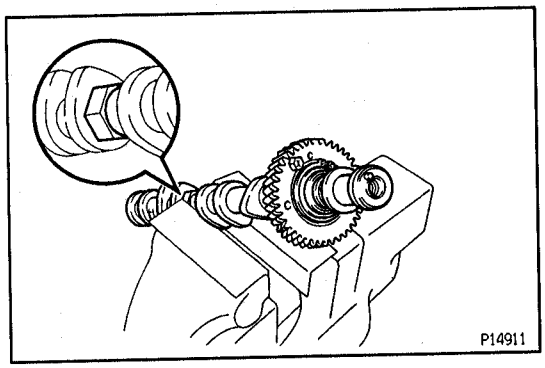
(b) Remove the 5 bearing caps and camshaft.



HINT: If the camshaft is not being lifted out straight and level, reinstall the No.3 bearing cap with the 2 bolts. Then alternately loosen and remove the 2 bearing cap bolts with the camshaft gear pulled up.

NOTICE: Do not pry on or attempt to force the camshaft with a tool or other object.

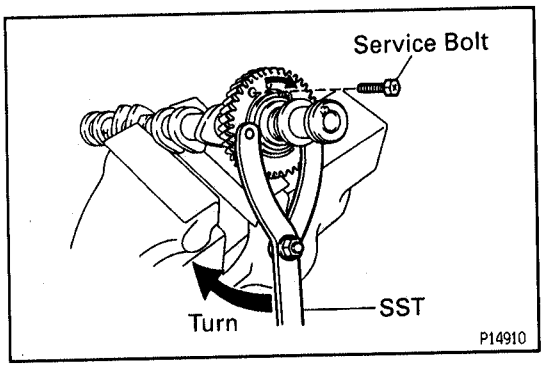
EG



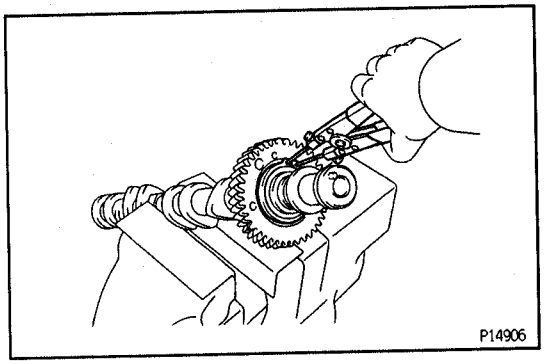
33. DISASSEMBLE EXHAUST CAMSHAFT

(a) Mount the hexagon wrench head portion of the camshaft in a vise.

NOTICE: Be careful not to damage the camshaft.



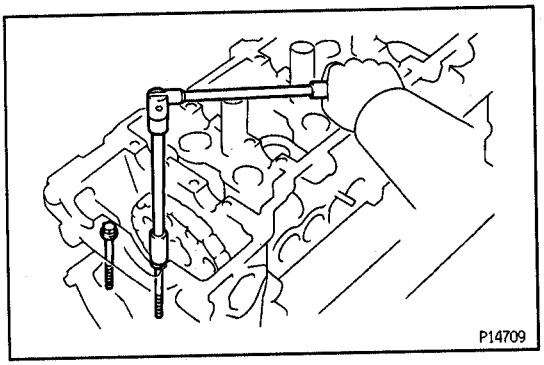
(b) Using SST, turn the sub–gear clockwise, and remove the service bolt.
SST 09960–10010 (09962–01000, 09963–00500)



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

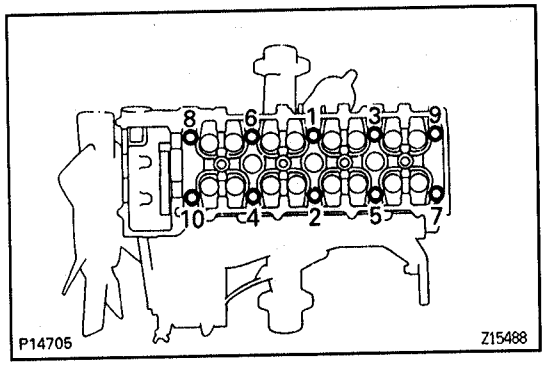
(d) Remove these parts:

- Wave washer
- Camshaft sub–gear
- Camshaft gear spring



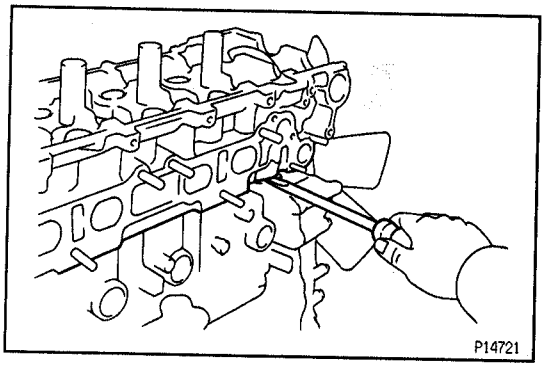
34. REMOVE CYLINDER HEAD

(a) Remove the 2 bolts in front of the head before the other head bolts are removed.



(b) Uniformly loosen and remove the 10 cylinder head bolts, in several passes, in the sequence shown.

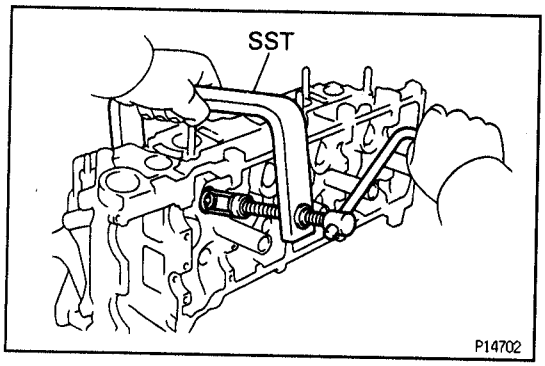
NOTICE: Cylinder head warpage or cracking could result from removing bolts in incorrect order.



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

CYLINDER HEAD DISASSEMBLY

EG5C1–03



1. REMOVE VALVE LIFTERS AND SHIMS

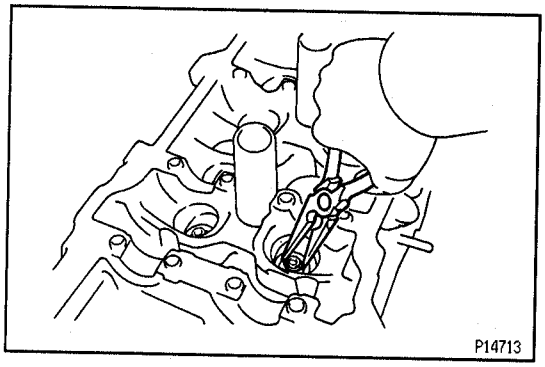
HINT: Arrange the valve lifters and shims in correct order.

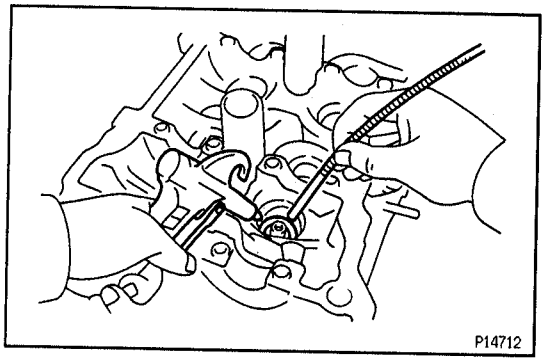
2. REMOVE VALVES

(a) Using SST, compress the valve spring and remove the 2 keepers.
SST 09202–70020 (09202–00010)

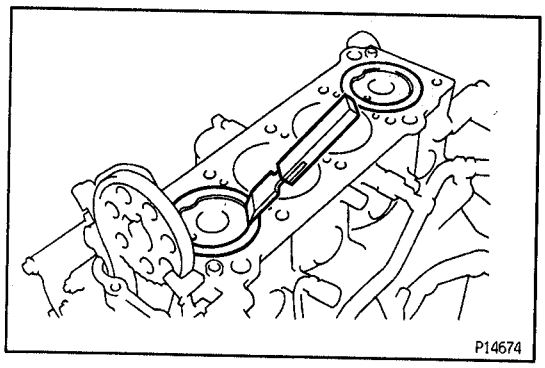
(b) Remove the spring retainer, valve spring and valve.

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





(d) Using compressed air and a magnetic finger, remove the spring seat by blowing air.
HINT: Arrange the valves, valve springs, spring seats and spring retainers in correct order.

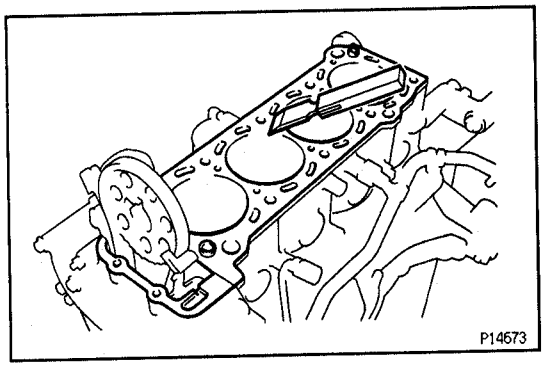


CYLINDER HEAD COMPONENTS, INSPECTION, CLEANING AND REPAIR

EG5C2–05

1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

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

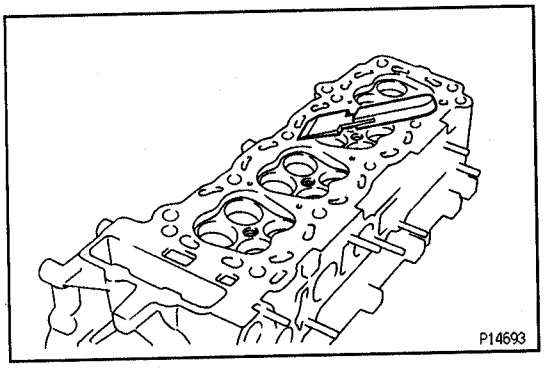


(b) Using a gasket scraper, remove all the gasket material from the cylinder block surface.

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

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

EG

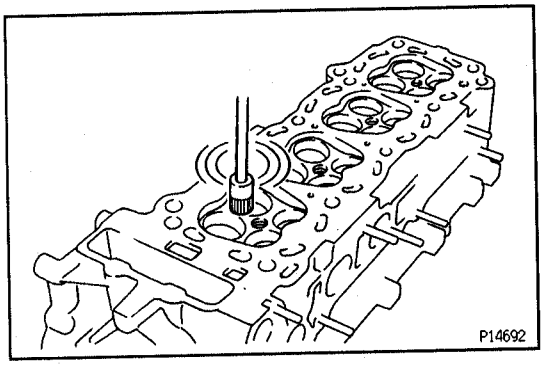


2. CLEAN CYLINDER HEAD

A. Remove gasket material

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

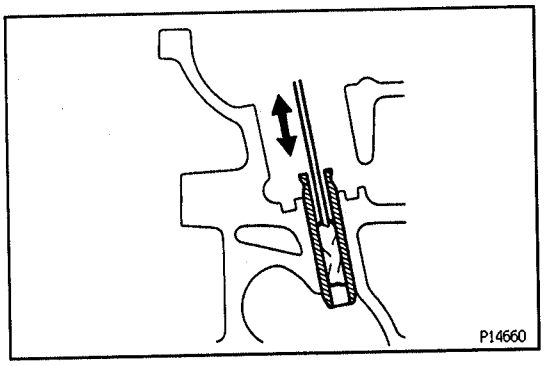
NOTICE: Be careful not to scratch the cylinder block contact surface.



B. Clean combustion chambers

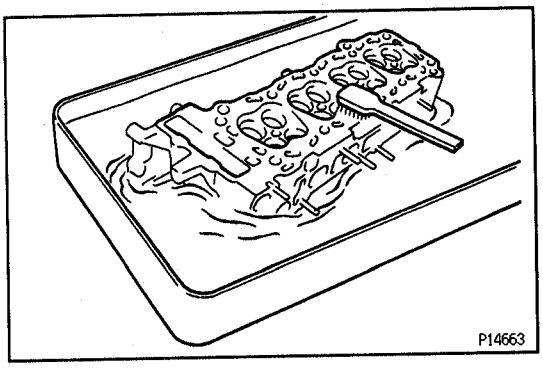
Using a wire brush, remove all the carbon from the combustion chambers.

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



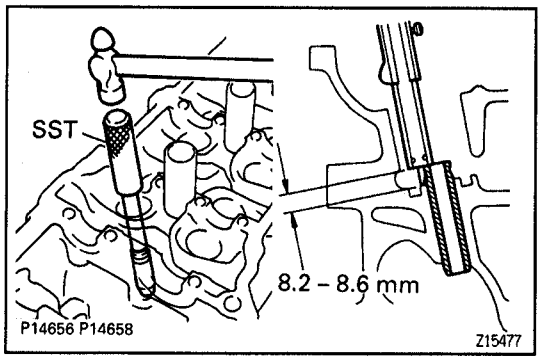
C. Clean valve guide bushings

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



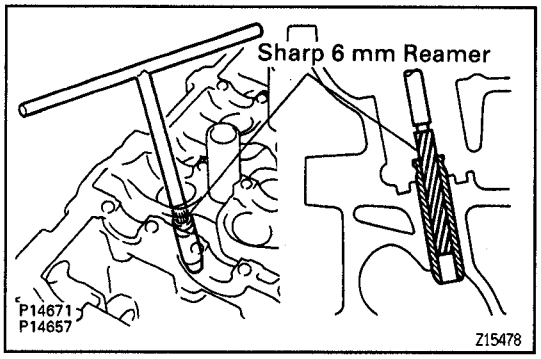
D. Clean cylinder head

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

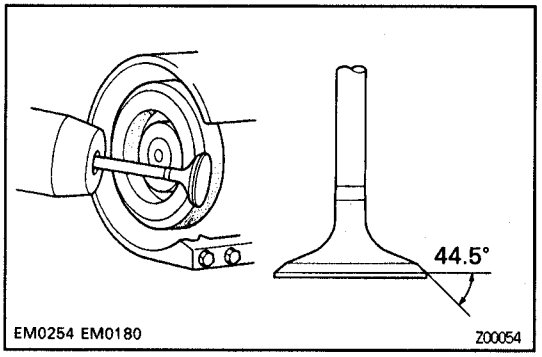


(e) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).

(f) Using SST and a hammer, tap in a new guide bushing to where there 8.2 – 8.6 mm (0.323 – 0.339 in.) protruding from the cylinder head.
SST 09201–10000 (09201–01060),
09950–70010 (09951–07150)



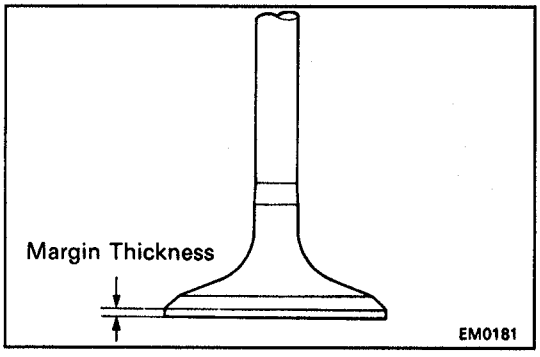
(g) Using a sharp 6 mm reamer, ream the guide bushing to obtain the standard specified clearance (See step 5 on the previous page) between the guide bushing and valve stem.



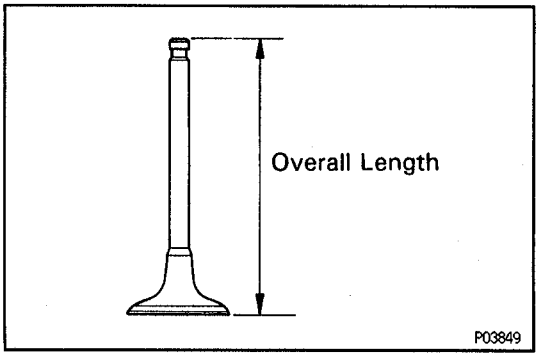
7. INSPECT AND GRIND VALVES

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

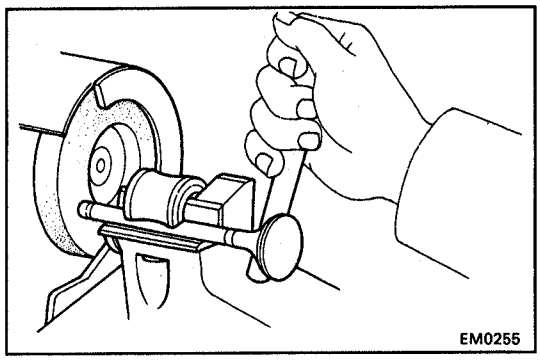
(b) Check that the valve is ground to the correct valve face angle.
Valve face angle:
44.5°



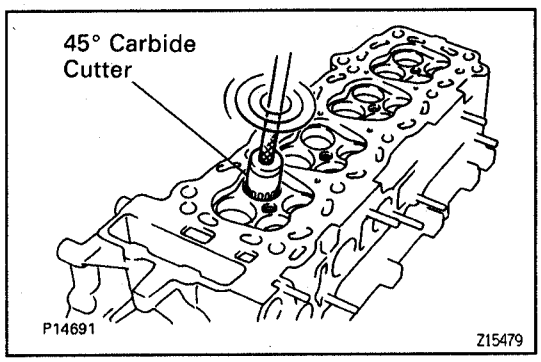
(c) Check the valve head margin thickness.
Standard margin thickness:
1.0 mm (0.039 in.)
Minimum margin thickness:
0.5 mm (0.020 in.)
If the margin thickness is less than minimum, replace the valve.



(d) Check the valve overall length.
Standard overall length:
Intake: 103.45 mm (4.0728 in.)
Exhaust: 103.60 mm (4.0787 in.)
Minimum overall length:
Intake: 102.95 mm (4.0531 in.)
Exhaust: 103.10 mm (4.0590 in.)
If the overall length is less than minimum, replace the valve.



(e) Check the surface of the valve stem tip for wear.
If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.
NOTICE: Do not grind off more than minimum.



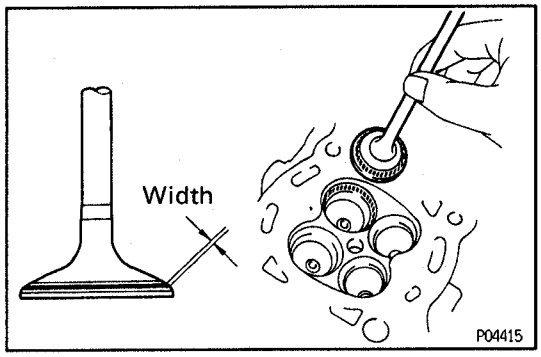
8. INSPECT AND CLEAN VALVE SEATS

(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. Lightly press the valve against the seat. Do not rotate valve.

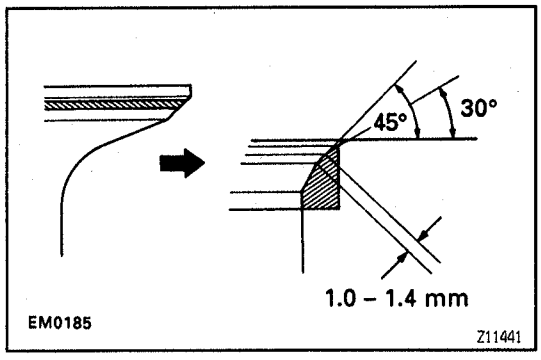
(c) Check the valve face and seat for these:

- 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 face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with these width:
1.0 – 1.4 mm (0.039 – 0.055 in.)

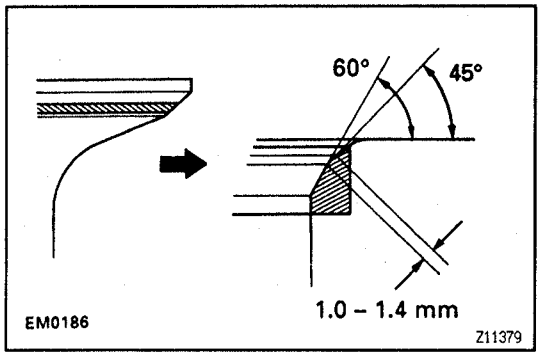


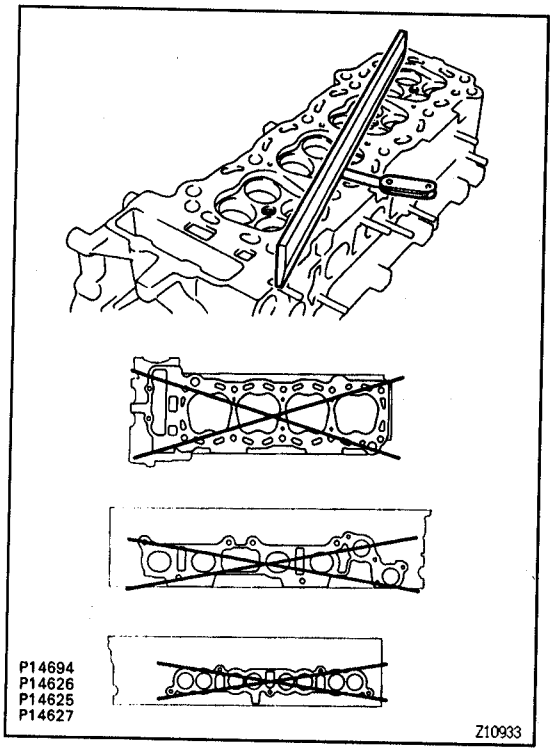
If not, correct the valve seats as follows:

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



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





3. INSPECT CYLINDER HEAD

A. Inspect for flatness

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

Maximum warpage:

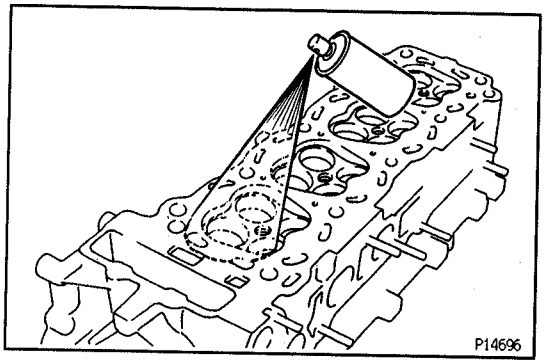
Cylinder block side

0.05 mm (0.0020 in.)

Manifold side

0.10 mm (0.0039 in.)

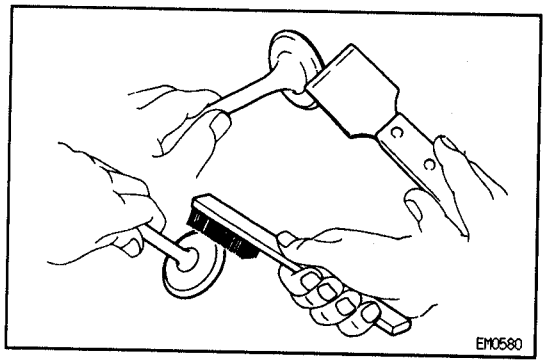
If warpage is greater than maximum, replace the cylinder head.



B. Inspect for cracks

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

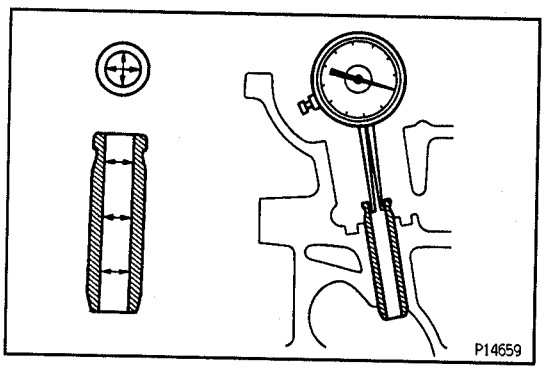
If cracked, replace the cylinder head.



4. CLEAN VALVES

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

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

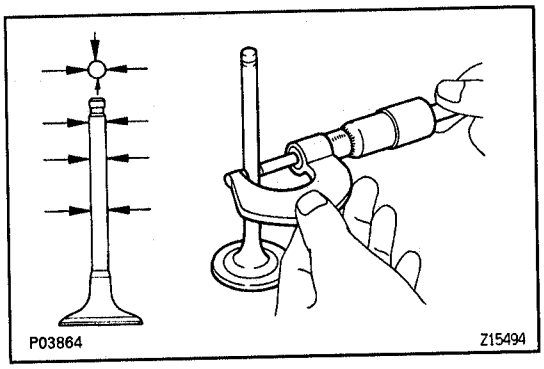


5. INSPECT VALVE STEMS AND GUIDE BUSHINGS

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

Bushing inside diameter:

6.010 – 6.030 mm (0.2366 – 0.2374 in.)



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

Valve stem diameter:

Intake

5.970 – 5.985 mm (0.2350 – 0.2356 in.)

Exhaust

5.965 – 5.980 mm (0.2348 – 0.2354 in.)

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

Standard oil clearance:

Intake

0.025 – 0.060 mm (0.0010 – 0.0024 in.)

Exhaust

0.030 – 0.065 mm (0.0012 – 0.0026 in.)

Maximum oil clearance:

Intake

0.08 mm (0.0031 in.)

Exhaust

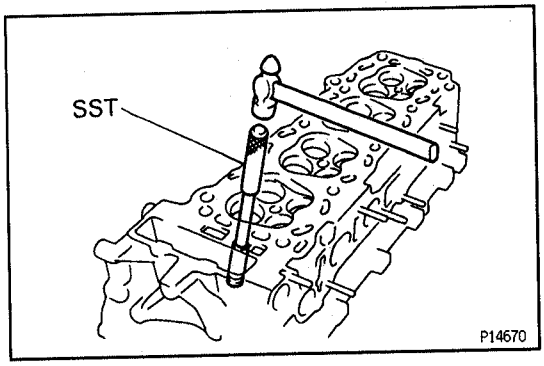
0.10 mm (0.0039 in.)

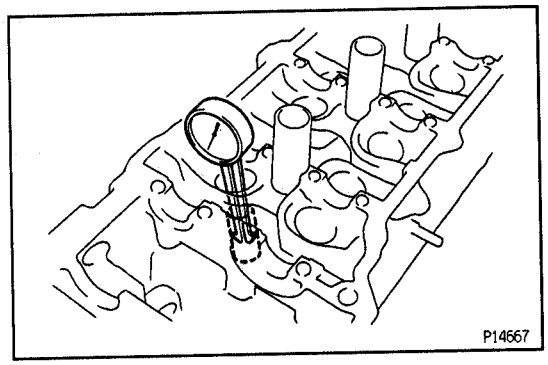
If the clearance is greater than maximum, replace the valve and guide bushing.

6. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

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

(b) Using SST and a hammer, tap out the guide bushing.
SST 09201–10000 (09201–01060),
09950–70010 (09951–07150)





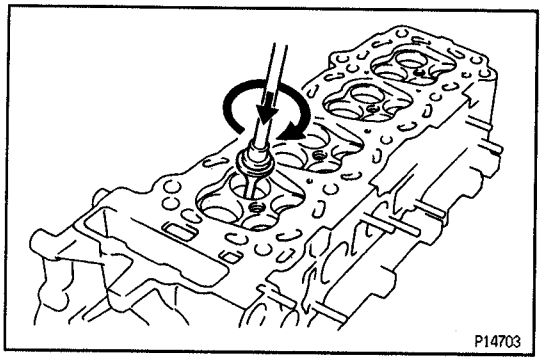
(c) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

Both intake and exhaust

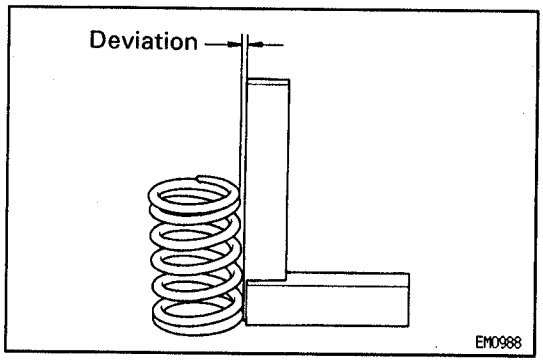
Bushing bore diameter mm (in.)	Bushing size
11.000 – 11.027 (0.4331 – 0.4341)	Use STD
11.050 – 11.077 (0.4350 – 0.4361)	Use O/S 0.05

V04903

(d) Select a new guide bushing (STD size or O/S 0.05).
If the bushing bore diameter of the cylinder head is greater than 11.027 mm (0.4341 in.), machine the bushing bore to these dimension:
11.050 – 11.077 mm (0.4350 – 0.4361 in.)
If the bushing bore diameter of the cylinder head is greater than 11.077 mm (0.4361 in.), replace the cylinder head.



(d) Hand–lap the valve and valve seat with an abrasive compound.
(e) After hand–lapping, clean the valve and valve seat.



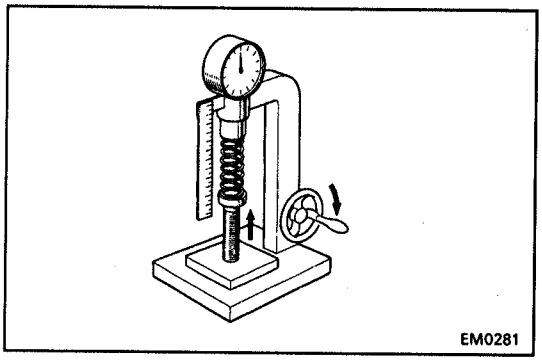
9. INSPECT VALVE SPRINGS

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

Maximum deviation:

2.0 mm (0.079 in.)

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



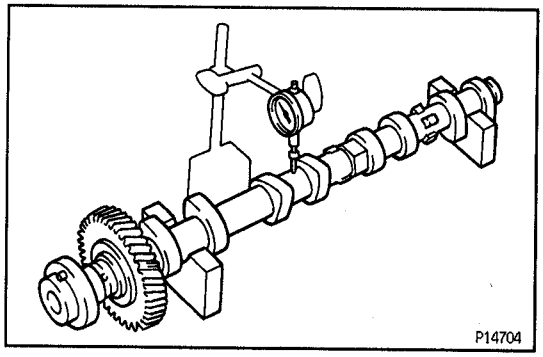
(b) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:

At 35.7 mm (1.406 in.):

177 – 204 N (18.0 – 20.8 kgf, 39.7 – 45.9 lbf)

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



10. INSPECT CAMSHAFTS AND BEARINGS

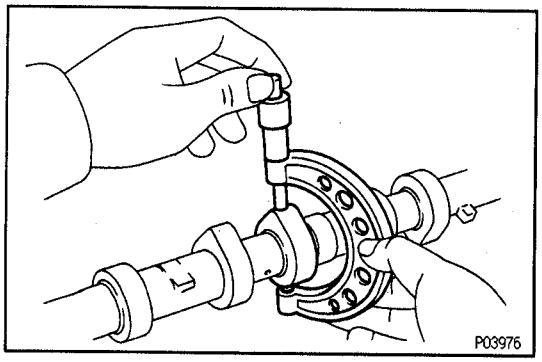
A. Inspect camshaft for runout

(a) Place the camshaft on V–blocks.
(b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout:

0.06 mm (0.0024 in.)

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



B. Inspect cam lobes

Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

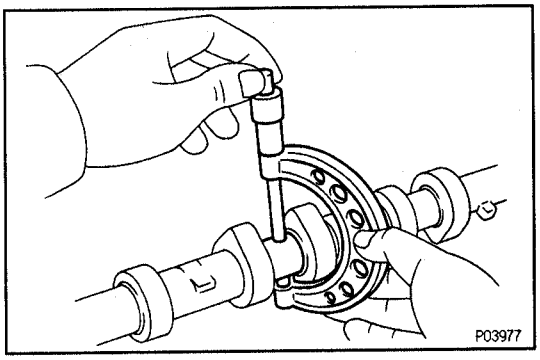
Intake

45.31 – 45.41 mm (1.7839 – 1.7878 in.)

Exhaust

45.06 – 45.16 mm (1.7740 – 1.7779 in.)

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



C. Inspect camshaft journals

Using a micrometer, measure the journal diameter.

Journal diameter:

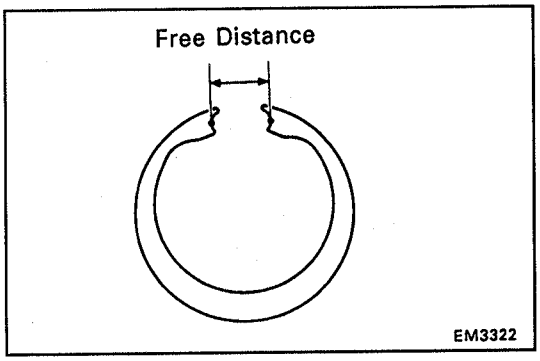
26.959 – 26.975 mm (1.0614 – 1.0620 in.)

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

D. Inspect camshaft bearings

Check the bearings for flaking and scoring.

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



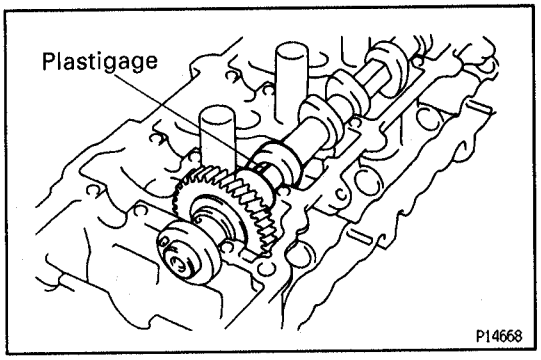
E. Inspect camshaft gear spring

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

Free distance:

22.5 – 22.9 mm (0.886 – 0.902 in.)

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



F. Inspect camshaft journal oil clearance

(a) Clean the bearing caps and camshaft journals.

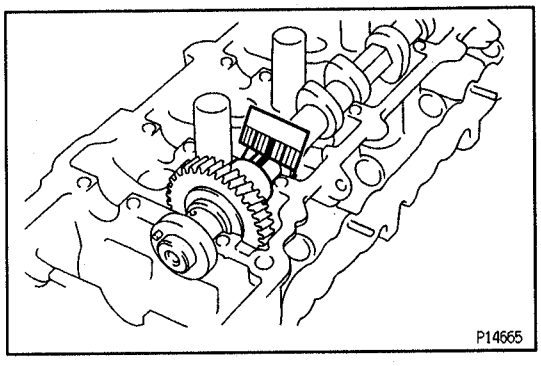
(b) Place the camshafts on the cylinder head.

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

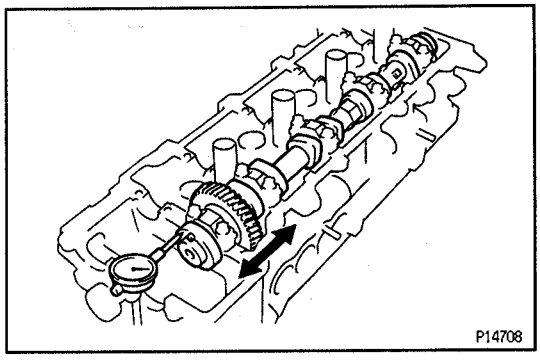
(d) Install the bearing caps.
(See step 3 in cylinder head installation)
Torque: 15.5 N·m (160 kgf·cm, 12 ft·lbf)
NOTICE: Do not turn the camshaft.

(e) Remove the bearing caps.

(f) Measure the Plastigage at its widest point.
Standard oil clearance:
0.025 – 0.062 mm (0.0010 – 0.0024 in.)
Maximum oil clearance:
0.08 mm (0.0031 in.)
If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.



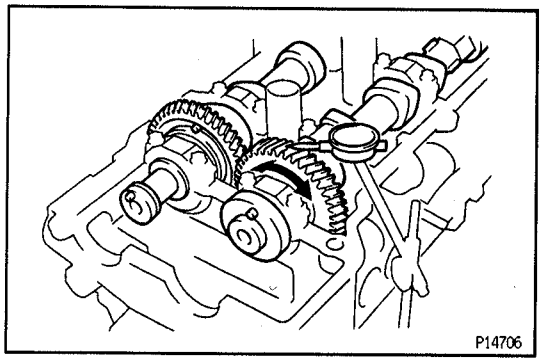
(g) Completely remove the Plastigage.

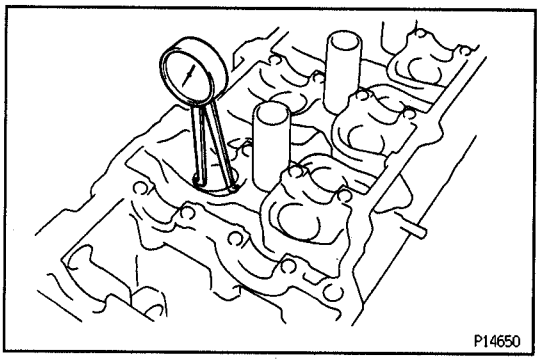


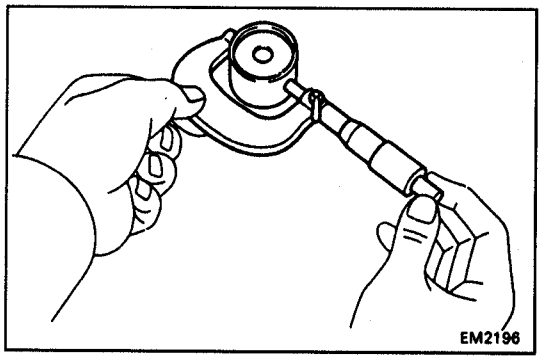
G. Inspect camshaft thrust clearance

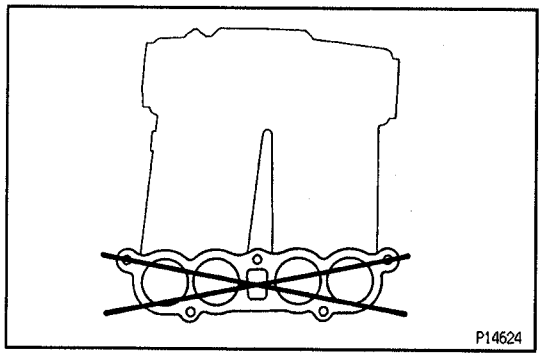
(a) Install the camshaft.
(See step 3 in cylinder head installation)

(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.
Standard thrust clearance:
0.040 – 0.095 mm (0.0016 – 0.0037 in.)
Maximum thrust clearance:
0.12 mm (0.0047 in.)









If the thrust clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

H. Inspect camshaft gear backlash

(a) Install the camshafts without installing the exhaust cam sub–gear.
(See step 3 in cylinder head installation)

(b) Using a dial indicator, measure the backlash.
Standard backlash:
0.020 – 0.200 mm (0.0008 – 0.0079 in.)
Maximum backlash:
0.30 mm (0.0188 in.)
If the backlash is greater than maximum, replace the camshafts.

11. INSPECT VALVE LIFTERS AND LIFTER BORES

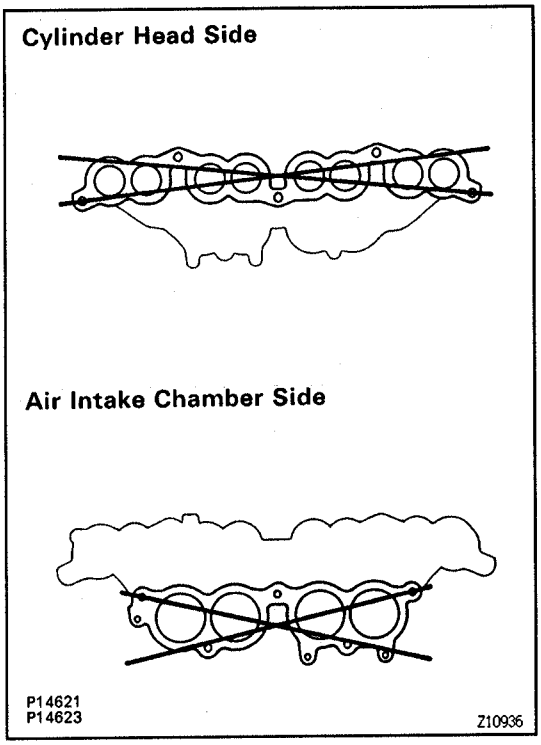
(a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.
Lifter bore diameter:
31.000 – 31.016 mm (1.2205 – 1.2211 in.)

(b) Using a micrometer, measure the lifter diameter.
Lifter diameter:
30.966 – 30.976 mm (1.1578 – 1.2195 in.)

(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.
Standard oil clearance:
0.024 – 0.050 mm (0.0009 – 0.0020 in.)
Maximum oil clearance:
0.07 mm (0.0028 in.)
If the oil clearance is greater than maximum, replace the lifter. If necessary, replace the cylinder head.

12. INSPECT AIR INTAKE CHAMBER

Using a precision straight edge and thickness gauge, measure the surface contacting the intake manifold for warpage.
Maximum warpage:
0.20 mm (0.0078 in.)
If warpage is greater than maximum, replace the air intake chamber.



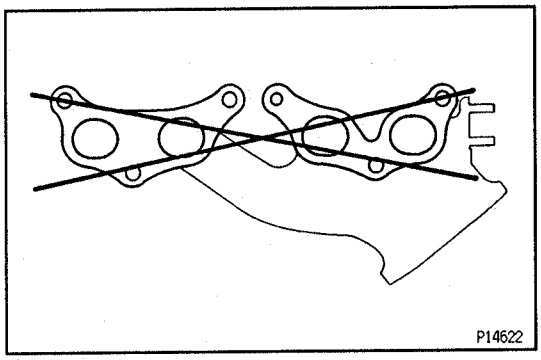
13. INSPECT INTAKE MANIFOLD

Using a precision straight edge and thickness gauge, measure the surface contacting the cylinder head and air intake chamber for warpage.

Maximum warpage:

0.20 mm (0.0078 in.)

If warpage is greater than maximum, replace the manifold.



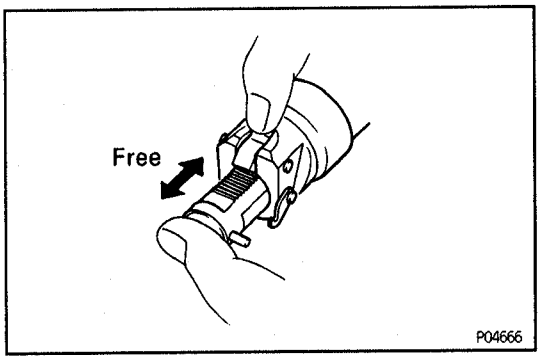
14. INSPECT EXHAUST MANIFOLD

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

Maximum warpage:

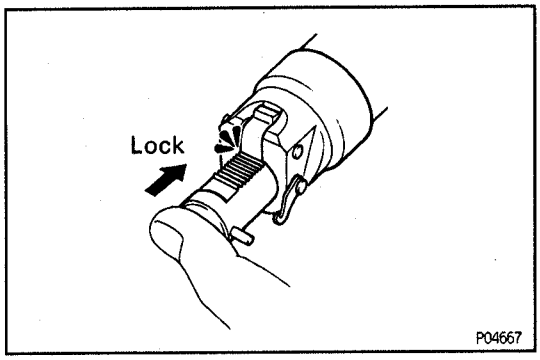
0.50 mm (0.0197 in.)

If warpage is greater than maximum, replace the manifold.

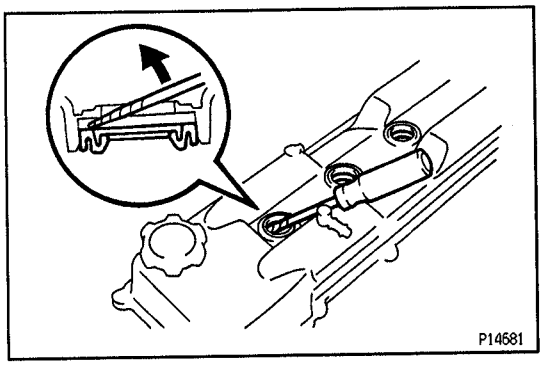


15. INSPECT CHAIN TENSIONER

(a) Check that the plunger moves smoothly when the ratchet pawl is raised with your finger.

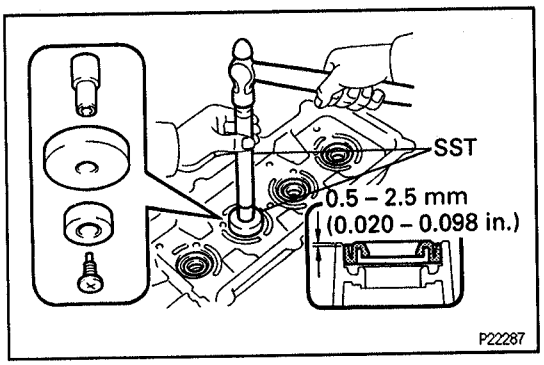


(b) Released the ratchet pawl and check that the plunger is locked in place by the ratchet pawl and does not move when pushed with your finger.



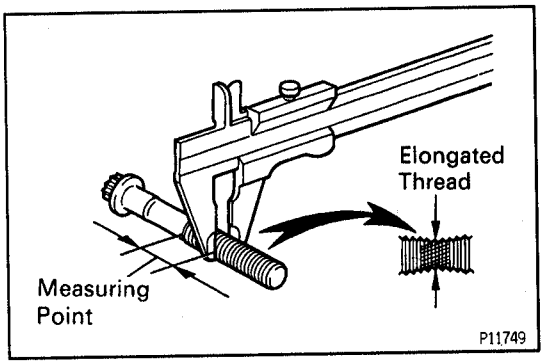
16. IF NECESSARY, REPLACE SPARK PLUG TUBE GASKETS

(a) Using a screwdriver, pry out the tube gasket.



(b) Using SST and a hammer, tap in a new tube gasket as shown in the illustration.
SST 09950–60010 (09951–00260, 09951–00490, 09952–06010), 09950–70010 (09951–07150)

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



17. INSPECT CYLINDER HEAD BOLTS

Using vernier calipers, measure the minimum diameter of the elongated thread at the measuring point.

Standard outside diameter:

10.76 – 10.97 mm (0.4236 – 0.4319 in.)

Minimum outside diameter:

10.40 mm (0.4094 in.)

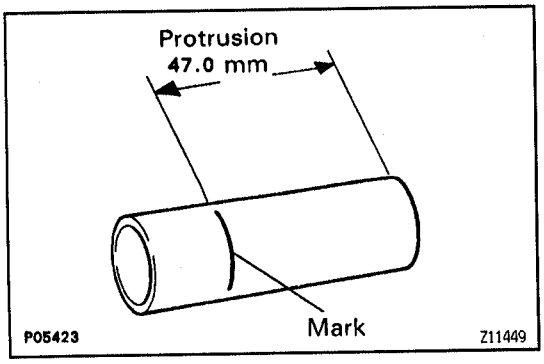
If the diameter is less than minimum, replace the bolt.

EG5C3–03

CYLINDER HEAD ASSEMBLY

HINT:

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



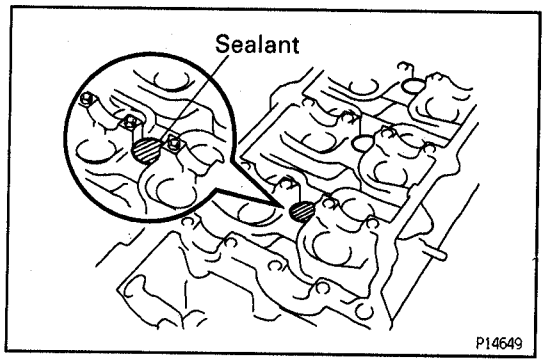
1. INSTALL SPARK PLUG TUBES

HINT: When using a new cylinder head, spark plug tubes must be installed.

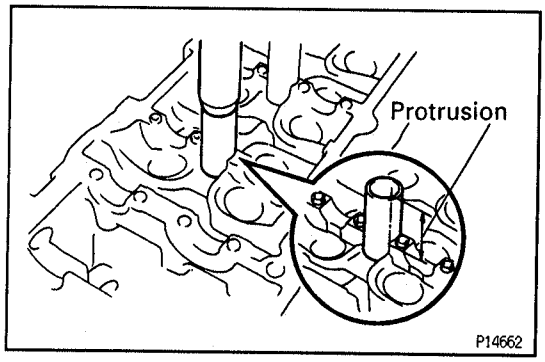
(a) Mark the standard position away from the edge, onto the spark plug tube.

Standard protrusion:

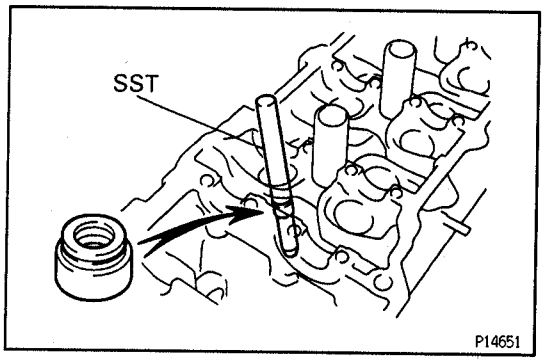
47.0 mm (1.850 in.)



(b) Apply adhesive to the spark plug tube hole of the cylinder head.
Sealant:
Part No. 08833 – 00070, Adhesive 1324, THREE BOND 1324 or equivalent

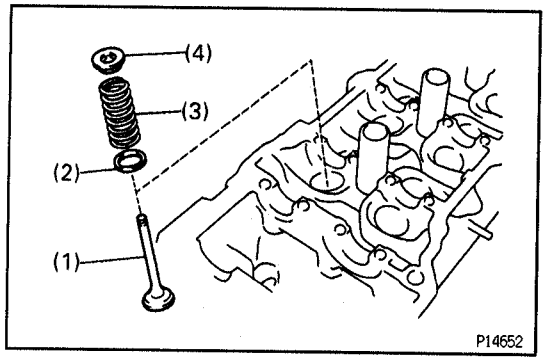


(c) Using a press, press in a new spark plug tube until there is 47.0 mm (1.850 in.) protruding from the camshaft bearing cap installation surface of the cylinder head.
NOTICE: Avoid pressing a new spark plug tube in too far by measuring the amount of protrusion while pressing.

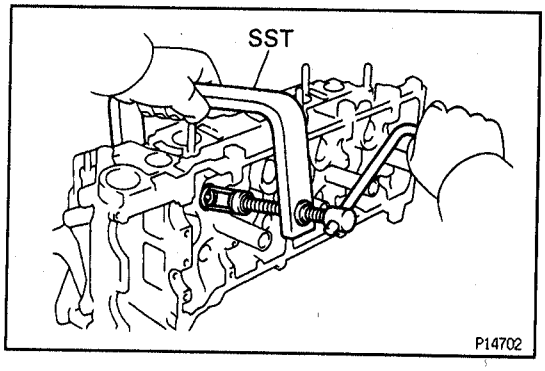


2. INSTALL VALVES

(a) Using SST, push in a new oil seal.
SST 09236–00101 (09236–15010)
HINT: Different oil seals are used for the intake and exhaust.
Code mark (Intake side only):
"H"



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



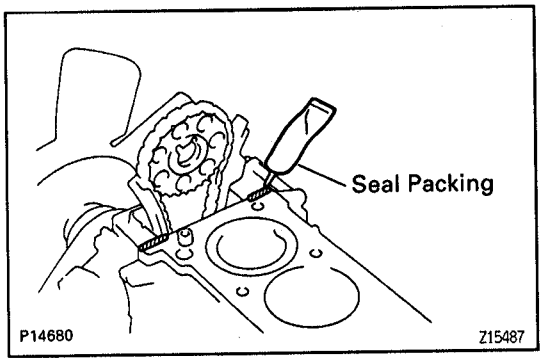
(c) Using SST, compress the valve spring and place the 2 keepers around the valve stem.
SST 09202–70020 (09202–00010)
(d) Using a plastic–faced hammer, lightly tap the valve stem tip to ensure a proper fit.

3. INSTALL VALVE LIFTERS AND SHIMS

(a) Install the valve lifter and shim.
(b) Check that the valve lifter rotates smoothly by hand.

EG64G-01

CYLINDER HEAD INSTALLATION



1. INSTALL CYLINDER HEAD

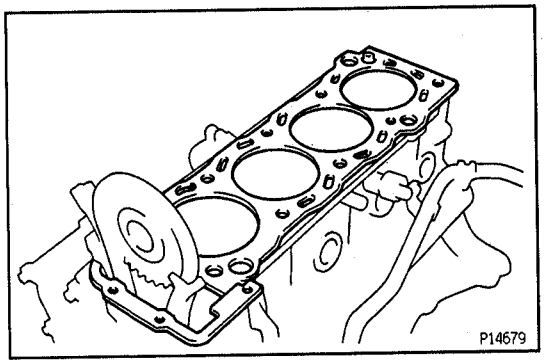
A. Place cylinder head on cylinder block

(a) Apply seal packing to the 2 locations as shown.

Seal packing:

Part No. 08826–00080 or equivalent

NOTICE: Do not apply too much seal packing.



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

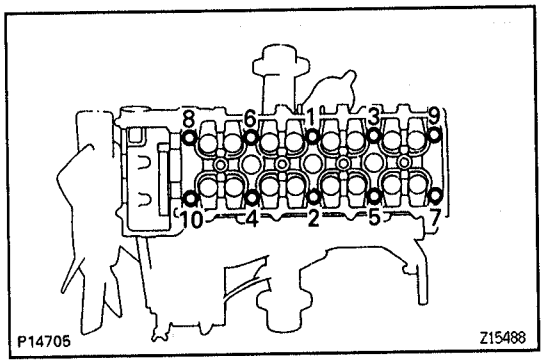
NOTICE: Be careful of the installation direction.

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

B. Install cylinder head bolts

HINT:

- The cylinder head bolts are tightened in 3 progressive steps (steps (b) and (d)).
- If any cylinder head bolt is broken or deformed, replace it.

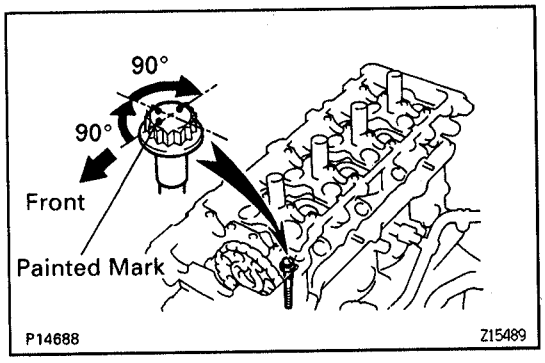


(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.

(b) Install and uniformly tighten the 10 cylinder head bolts and plate washers, in several passes, in the sequence shown.

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

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

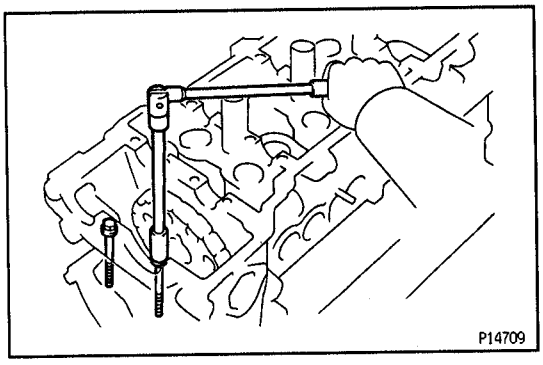


(c) Mark the front of the cylinder head bolt head with paint.

(d) Retighten the cylinder head bolts by 90° in the numerical order shown.

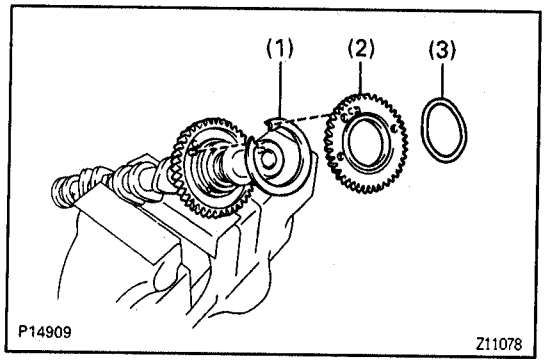
(e) Retighten the cylinder head bolts by an additional 90°.

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



(g) Install and torque the 2 bolts.

Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)



2. ASSEMBLE EXHAUST CAMSHAFT

(a) Mount the hexagon wrench head portion of the camshaft in a vise.

NOTICE: Be careful not to damage the camshaft.

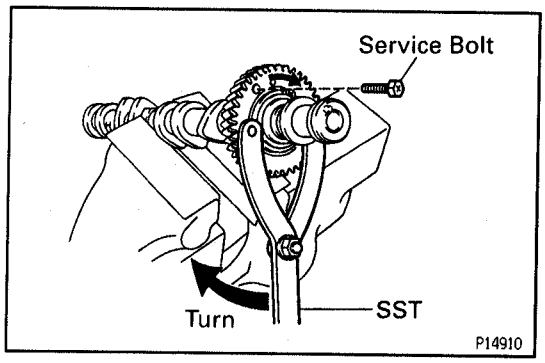
(b) Install these parts:
(1) Camshaft gear spring
(2) Camshaft sub–gear
(3) Wave washer

HINT: Align the pins on the gears with the spring ends.

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

(d) Using SST, align the holes of the camshaft main gear and sub–gear by turning sub–gear clockwise, and install a service bolt.

SST 09960–10010 (09962–01000, 09963–00500)



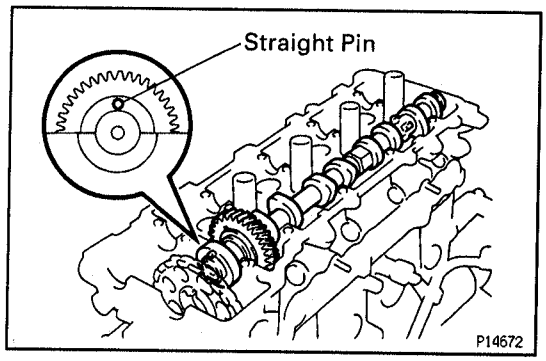
3. INSTALL CAMSHAFTS

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

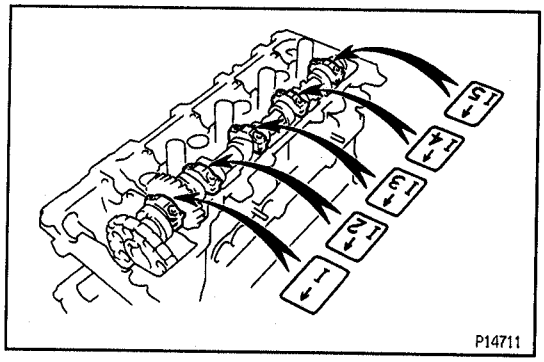
A. Install intake camshaft

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

(b) Place the intake camshaft with knock pin facing upward of camshaft angle on the cylinder head.



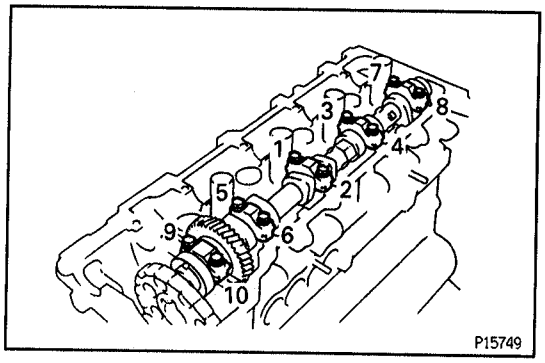
(c) Install the bearing caps in their proper locations.

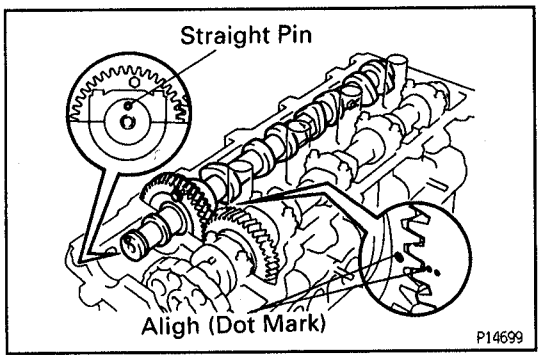


(d) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

(e) Install and uniformly tighten the 10 bearing cap bolts in the sequence shown.

Torque: 15.5 N·m (160 kgf·cm, 12 ft·lbf)



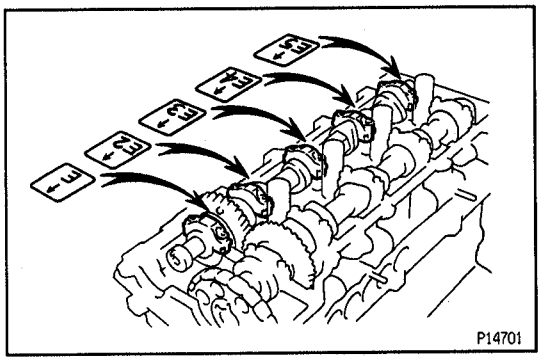


B. Install exhaust camshaft

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

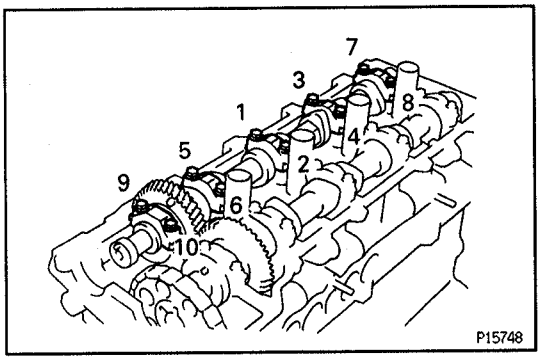
(b) Engage the exhaust camshaft gear to the intake camshaft gear by matching the timing marks (1 and 2 dots) on each gear.

NOTICE: There are also timing marks (for TDC) on each gear as shown in the illustration. Do not use these marks.



(c) Roll down the exhaust camshaft onto the bearing journals while engaging gears with each other.

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



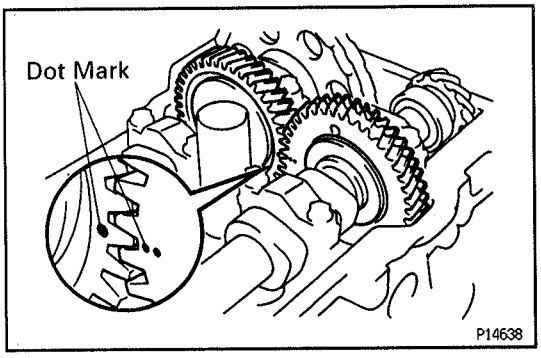
(e) Apply light coat of engine oil on the threads and under the heads of the bearing cap bolts.

(f) Install and uniformly tighten the 10 bearing cap bolts, in several passes, in the sequence shown.

Torque: 15.5 N·m (160 kgf·cm, 12 ft·lbf)

(g) Remove the service bolt.

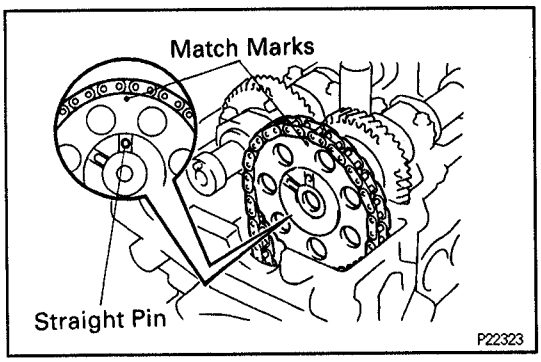
(h) Check that the intake and exhaust camshafts turn smoothly.



4. SET NO.1 CYLINDER TO TDC/COMPRESSION

(a) Turn the crankshaft pulley clockwise, and align its groove with the timing mark "0" of the timing chain cover.

(b) Turn the camshafts so that the timing marks with 1 and 2 dots will be in straight line on the cylinder head surface as shown in the illustration.



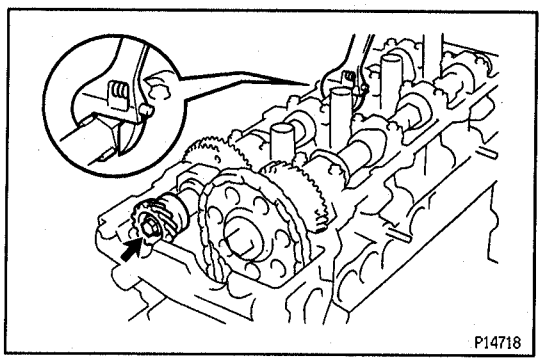
5. INSTALL CAMSHAFT TIMING GEAR

HINT: Check that the matchmarks on the camshaft timing gear and timing chain are aligned.

(a) Place the gear over the straight pin of the intake camshaft.

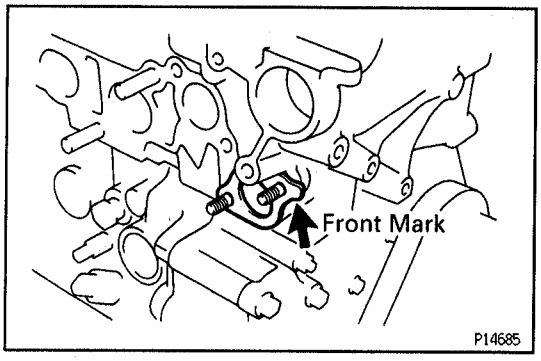
(b) Hold the intake camshaft with a wrench, install and torque the bolt.

Torque: 73.5 N·m (750 kgf·cm, 54 ft·lbf)



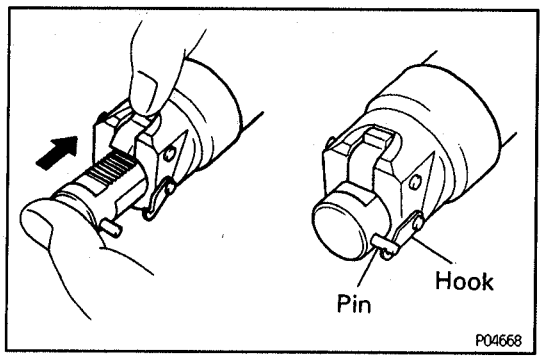
(c) Hold the exhaust camshaft with a wrench, install the bolt and distributor gear.
Torque: 46 N·m (470 kgf·cm, 34 ft·lbf)

EG



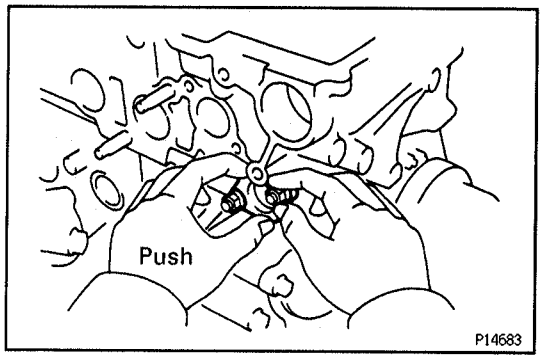
6. INSTALL CHAIN TENSIONER

(a) Place a new gasket so that the front mark is toward the front side.



(b) Release the ratchet pawl, fully push in the plunger and apply the hook to the pin so that the plunger cannot spring out.

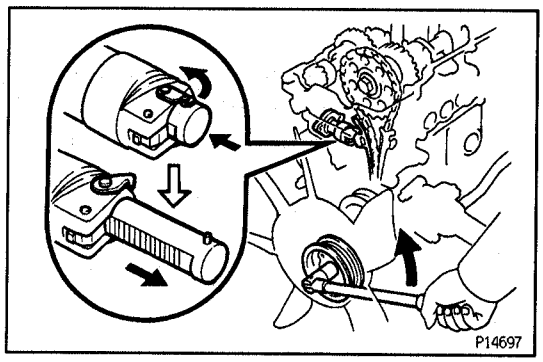
(c) Turn the crankshaft pulley clockwise to provide some slack for the chain on the tensioner side.
NOTICE: Do not turn the pulley counterclockwise.



(d) Push the tensioner by hand until it touches the head installation surface, then install the 2 nuts.

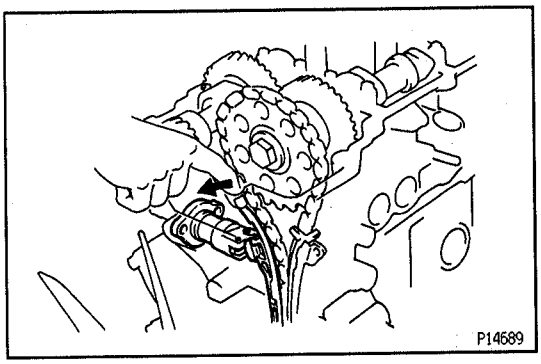
(e) Tighten the 2 nuts.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

(f) Check that the hook of the tensioner is not released.
NOTICE: If the plunger springs out during installation of the chain tensioner, repeat the operation in step (b) before installing the tensioner.

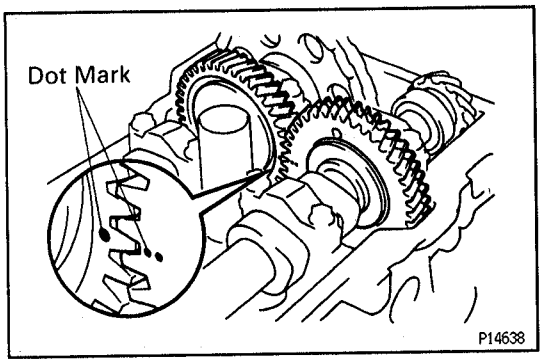


7. SET CHAIN TENSIONER

Turn the crankshaft to the left so that the hook of the chain tensioner is released from the pin of the plunger, causing the plunger to spring out and the slipper to be pushed in to the chain.



HINT: If the plunger does not spring out, press the slipper into the chain tensioner with a screwdriver or your finger so that the hook is released and the plunger springs out.



8. CHECK VALVE TIMING

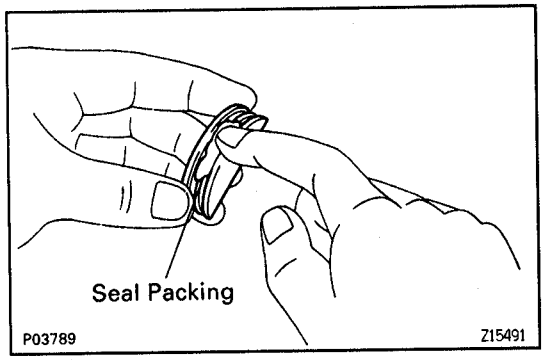
(a) Turn the crankshaft pulley, and align its groove with the timing mark "0" of the timing chain cover.
NOTICE: Always turn the crankshaft clockwise.

(b) Check that the timing marks (1 and 2 dots) of the camshaft drive and driven gears are in straight line on the cylinder head surface as shown in the illustration. If not, turn the crankshaft 1 revolution (360°) and align the marks as above.

9. CHECK AND ADJUST VALVE CLEARANCE
(See step 8 in valve clearance inspection and adjustment)
Valve clearance (Cold):
Intake
0.15 – 0.25 mm (0.006 – 0.010 in.)
Exhaust
0.25 – 0.35 mm (0.010 – 0.014 in.)

10. INSTALL SPARK PLUGS

11. INSTALL SEMI–CIRCULAR PLUGS



(a) Remove any old packing (FIPG) material.

(b) Apply seal packing to the cylinder head installation surface of the semi–circular plugs.
Seal packing:
Part No. 08826–00080 or equivalent

(c) Install the semi–circular plug to the cylinder head.

12. INSTALL CYLINDER HEAD COVER

13. INSTALL ENGINE WIRE BRACKETS

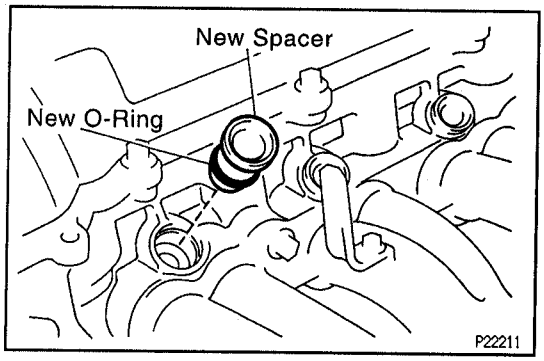
14. INSTALL FRONT ENGINE HANGER
Torque: 42 N·m (420 kgf·cm, 30 ft·lbf)

15. INSTALL CYLINDER HEAD REAR COVER
Install a new gasket and the rear cover with the 3 bolts.
Torque: 13.5 N·m (135 kgf·cm, 10 ft·lbf)

16. INSTALL WATER OUTLET

(a) Install a new gasket and the water outlet with the 2 bolts.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

(b) Connect the upper radiator hose.



17. INSTALL EXHAUST MANIFOLD

(a) Install a new gasket and the exhaust manifold with the 6 nuts.
Torque: 49 N·m (500 kgf·cm, 36 ft·lbf)

(b) Install the heat insulator with the 2 bolts and 2 nuts.
Torque: 5.5 N·m (55 kgf·cm, 48 in.·lbf)

18. INSTALL FRONT EXHAUST PIPE
(See engine installation in cylinder block)

19. INSTALL INTAKE MANIFOLD
Install a new gasket and the intake manifold with the 3 bolts and 2 nuts.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

20. INSTALL INJECTORS AND DELIVERY PIPE
(See steps 1 and 2 in injectors installation in MFI System)
HINT: When using a new cylinder head, spacers must be installed.
Apply a light coat of gasoline to a new O–ring and install it to a new spacer.

21. INSTALL FUEL RETURN PIPE

22. INSTALL FUEL INLET PIPE
Install the fuel inlet pipe and 4 new gaskets with 2 union bolts.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

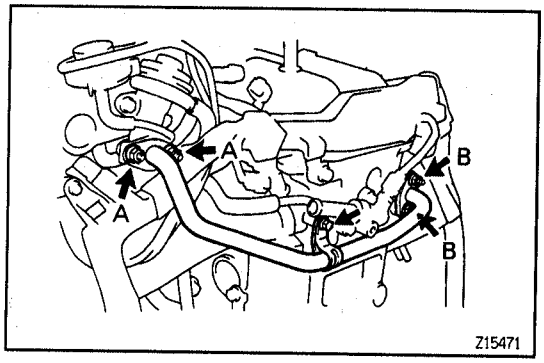
23. CONNECT INJECTOR CONNECTORS

24. INSTALL AIR INTAKE CHAMBER ASSEMBLY

(a) Install a new gasket and the air intake chamber assembly with the 3 bolts and 2 nuts.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

(b) Connect these hoses:
- EVAP hose to throttle body
- Brake booster vacuum hose to union
- Water bypass hose to water bypass pipe
- Water bypass hose to cylinder head rear cover

25. INSTALL INTAKE CHAMBER STAY
Torque: 20 N·m (200 kgf·cm, 15 ft·lbf)



26. INSTALL EGR PIPE
Install 2 new gaskets and EGR pipe with the bolt and 4 nuts.
Torque:
Bolt: 18 N·m (185 kgf·cm, 13 ft·lbf)
Nut A: 19 N·m (195 kgf·cm, 14 ft·lbf)
Nut B: 20 N·m (200 kgf·cm, 15 ft·lbf)

27. CONNECT ENGINE WIRE

28. INSTALL DISTRIBUTOR
(See distributor installation in Ignition System)

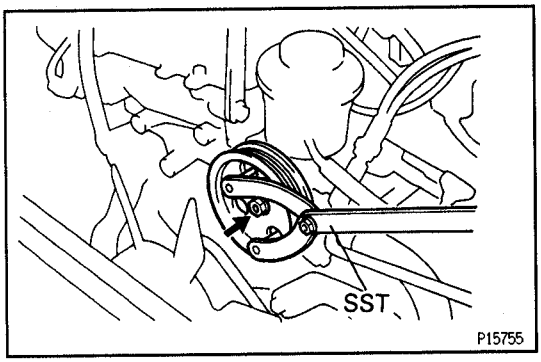
29. INSTALL PCV HOSES

30. w/ PS:
INSTALL PS PUMP AND BRACKET

(a) Install the PS pump bracket with the 4 bolts.
Torque: 20 N·m (200 kgf·cm, 15 ft·lbf)

(b) Connect the PS pump to the bracket with the 2 bolts.
Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)

(c) Connect the 2 air hoses to the throttle body and air intake chamber.



(d) Using SST, install the PS pump pulley with the nut.
SST 09960–10010 (09962–01000, 09963–01000)
Torque: 43 N·m (440 kgf·cm, 32 ft·lbf)

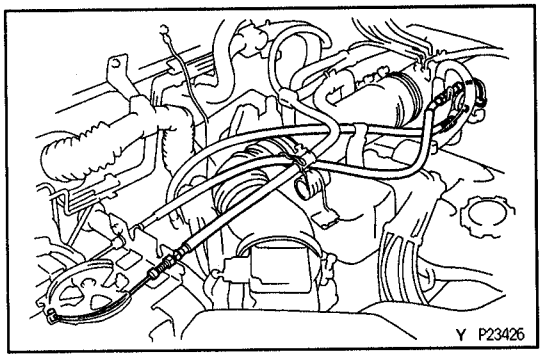
31. w/ PS:
INSTALL DRIVE BELT IDLER PULLEY FOR PS PUMP
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

32. INSTALL DRIVE BELT FOR PS PUMP
(See SR section)

33. INSTALL OIL DIPSTICK GUIDE
Torque: 20 N·m (200 kgf·cm, 15 ft·lbf)

34. INSTALL INTAKE AIR CONNECTOR
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

35. INSTALL AIR CLEANER CAP, MAF METER AND RESONATOR ASSEMBLY



36. CONNECT THESE CABLES:

(a) M/T:
Connect the throttle cable to the throttle body.

(b) A/T:
Connect the accelerator and throttle cables to the throttle body.

(c) w/ Cruise Control System:
Connect the cruise control cable to the actuator, and install the actuator cover.

37. FILL WITH ENGINE COOLANT

38. START ENGINE AND CHECK FOR LEAKS

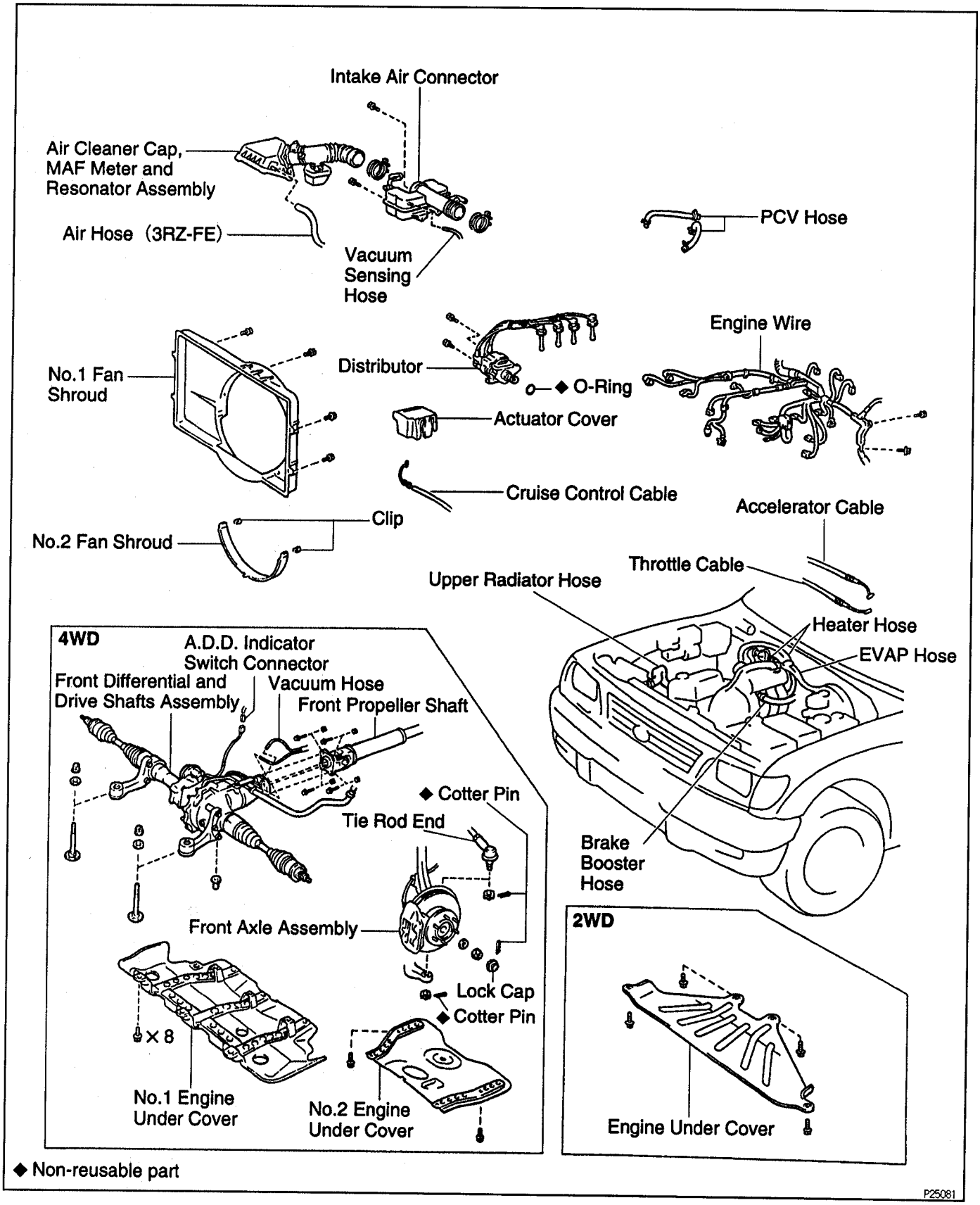
39. VEHICLE ROAD TEST
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

40. RECHECK ENGINE COOLANT LEVEL

TIMING CHAIN

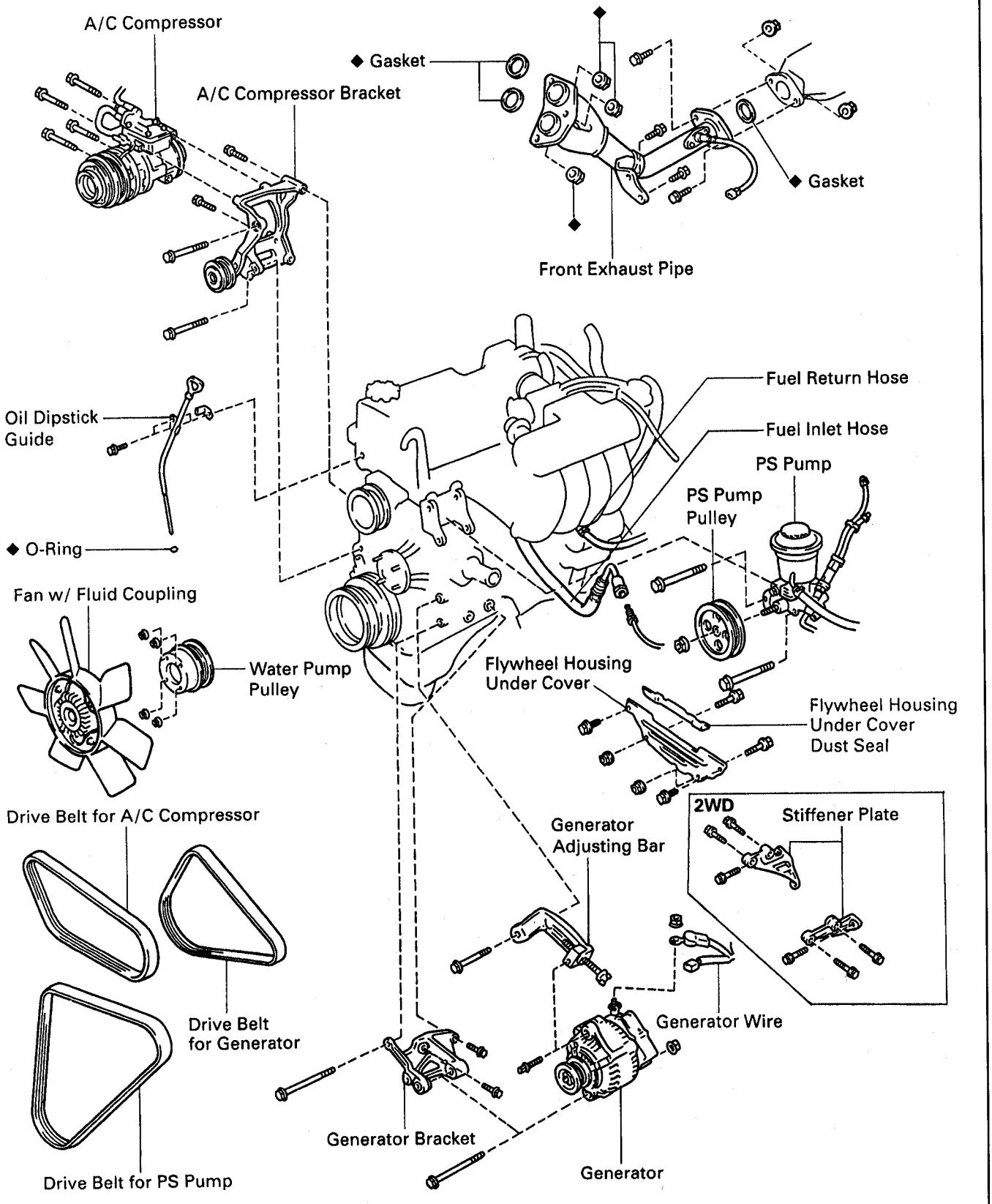
COMPONENTS FOR REMOVAL AND INSTALLATION

EG5MK–02



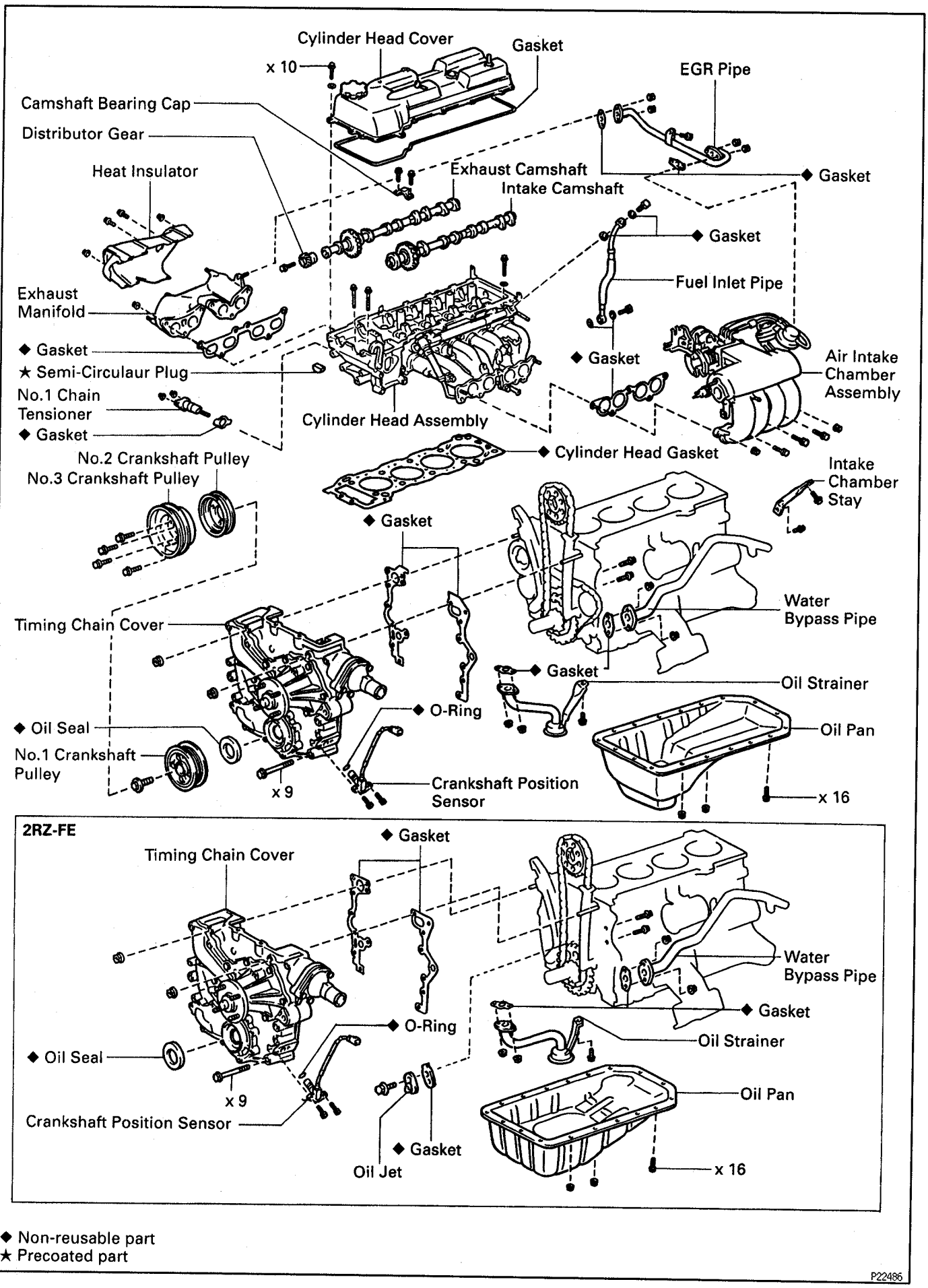
◆ Non-reusable part

P25081



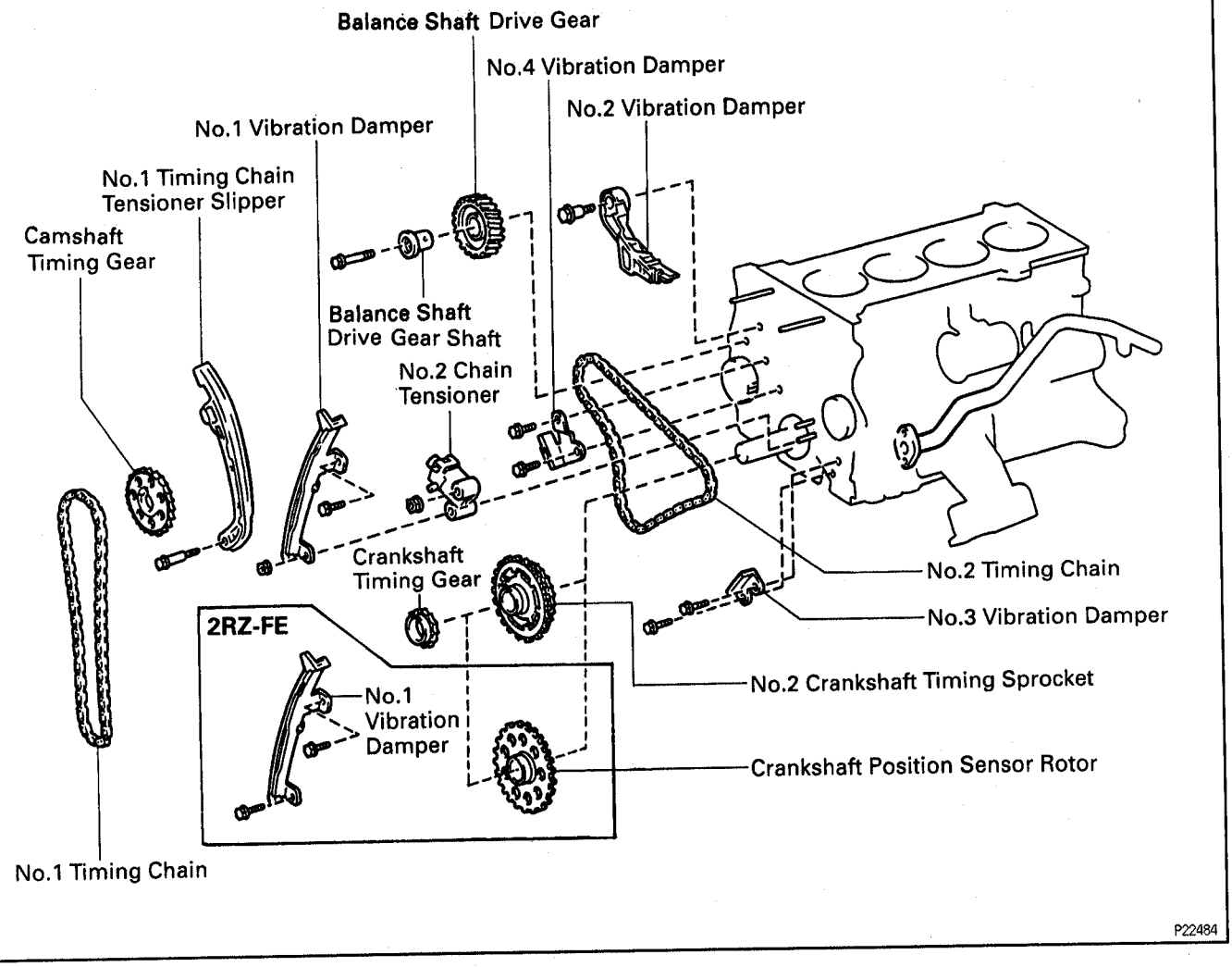
◆ Non-reusable part

P22485



◆ Non-reusable part
★ Precoated part

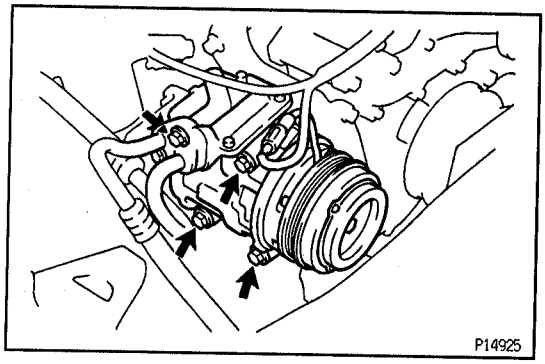
P22486



EG6ML–02

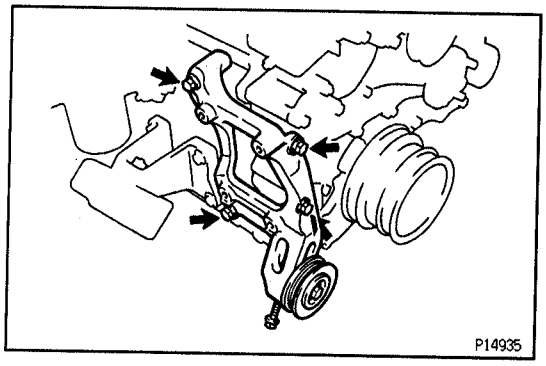
TIMING CHAIN REMOVAL

1. **REMOVE ENGINE UNDER COVER**
2. **DRAIN ENGINE OIL**
3. **4WD:**
   REMOVE FRONT DIFFERENTIAL AND DRIVE SHAFTS ASSEMBLY
   (See front differential and front drive shaft removal in Suspension and Axle)
4. **REMOVE DRIVE BELT FOR GENERATOR, FAN WITH FLUID COUPLING AND WATER PUMP PULLEY**
   (See steps 3 to 9 in water pump removal in Cooling System)
5. **REMOVE CYLINDER HEAD ASSEMBLY**
   (See cylinder head removal)

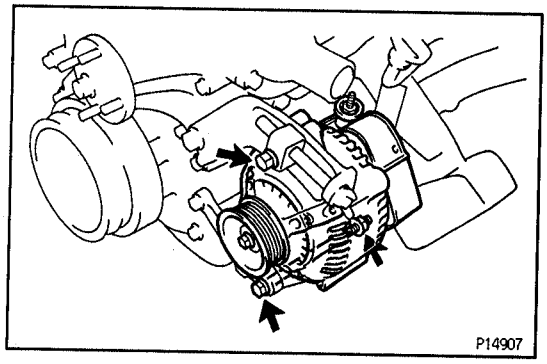


6. w/ A/C:
DISCONNECT A/C COMPRESSOR AND BRACKET

(a) Remove the 4 bolts, and disconnect the compressor from the bracket.
HINT: Put aside the compressor, and suspend it.

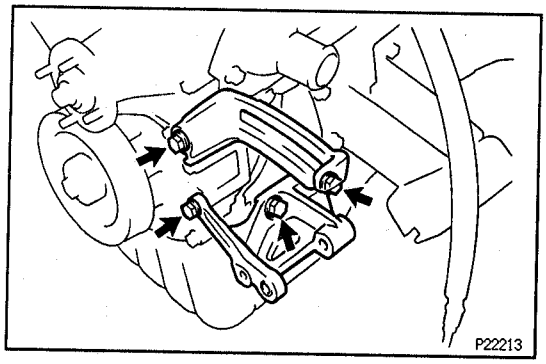


(b) Remove the 4 bolts and A/C compressor bracket.

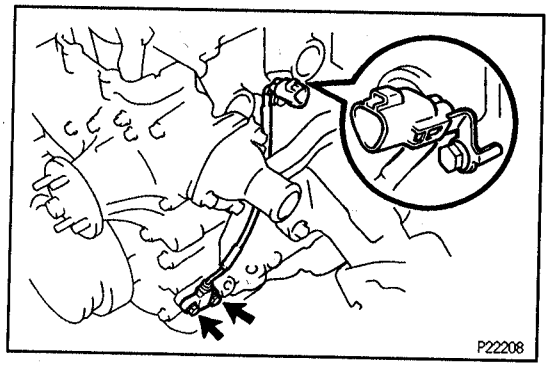


7. REMOVE GENERATOR, ADJUSTING BAR AND BRACKET

(a) Disconnect the generator connector.
(b) Remove the nut, and disconnect the generator wire and wire clip.
(c) Remove the lock, pivot bolts and the generator.

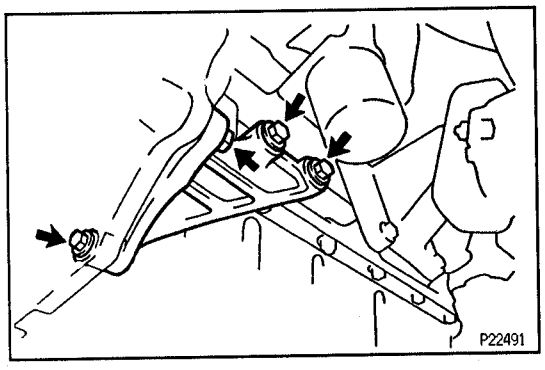


(d) Remove the bolt and adjusting bar.
(e) Remove the 3 bolts and generator bracket.



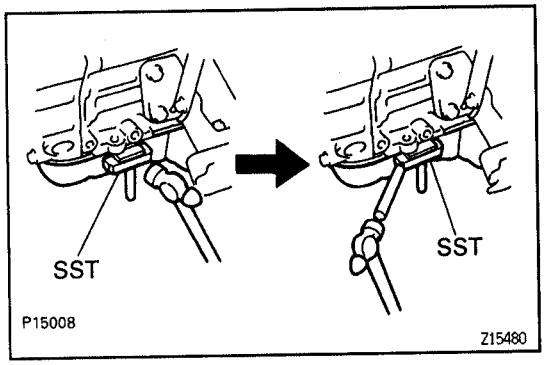
8. REMOVE CRANKSHAFT POSITION SENSOR

(a) Remove the 2 bolts and crankshaft position sensor.
(b) Remove the O – ring from the crankshaft position sensor.

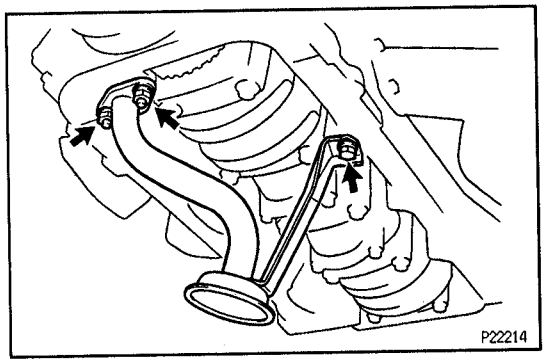


9. 2WD:
REMOVE STIFFENER PLATES
Remove the 8 bolts and stiffener plates.

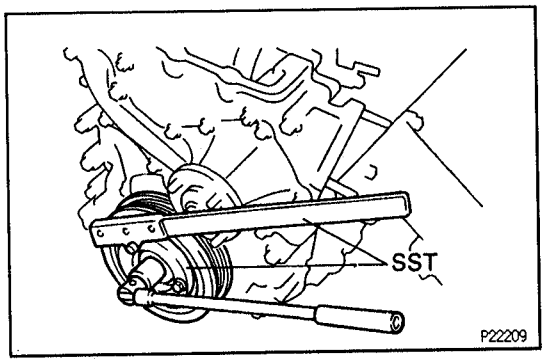
10. REMOVE FLYWHEEL HOUSING UNDER COVER AND DUST SEAL



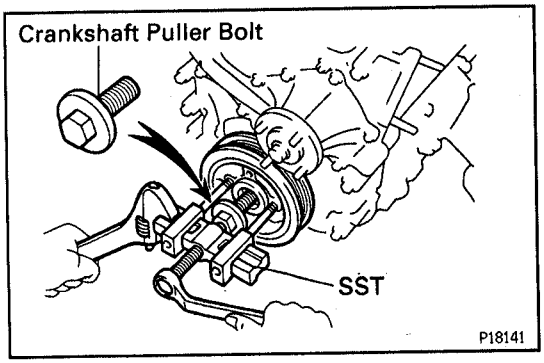
11. REMOVE OIL PAN
(a) Remove the 16 bolts and 2 nuts.
(b) Insert the blade of SST between the cylinder block and oil pan, cut off applied sealer and remove the oil pan.
SST 09032–00100
NOTICE: Be careful not to damage the oil pan flanges of the oil pan and cylinder block.



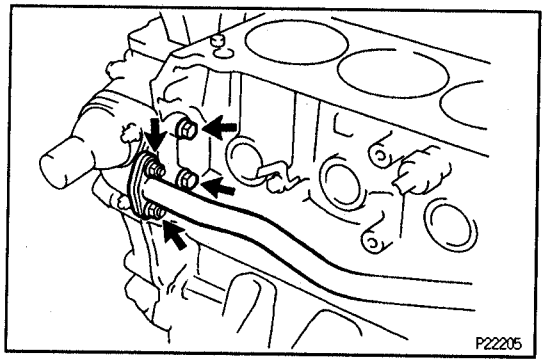
12. REMOVE OIL STRAINER
Remove the bolt, 2 nuts, oil strainer and gasket.



13. REMOVE CRANKSHAFT PULLEY
(a) w/ A/C:
Remove the 4 bolts, No.2 and No.3 crankshaft pulleys.
(b) Using SST, remove the pulley bolt.
SST 09213–54015, 09330–00021
(c) Remove the crankshaft pulley.



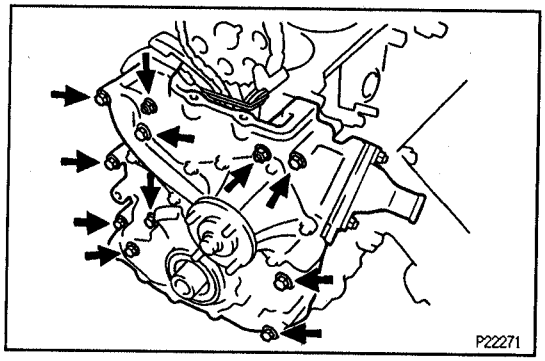
HINT: If necessary, remove the pulley with SST and crankshaft pulley bolt.
SST 09950–50010 (09951–05010, 09952–05010, 09953–05010, 09954–05020)



14. REMOVE TIMING CHAIN COVER

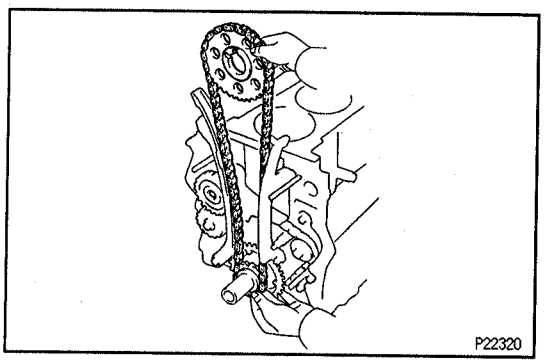
(a) Remove the 2 water bypass pipe nuts.

(b) Remove the 2 timing chain cover bolts.



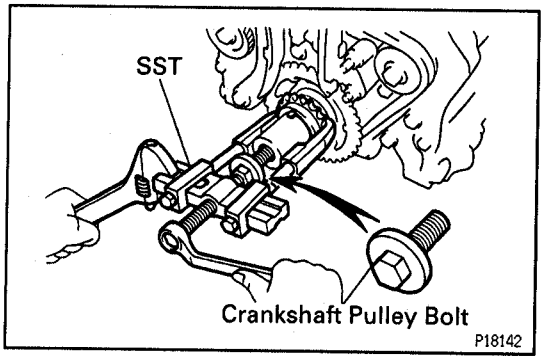
(c) Remove the 9 bolts and 2 nuts.

(d) Using a plastic faced hammer, loosen the chain cover and remove the timing chain cover and 3 gasket.



No.1 Timing Chain

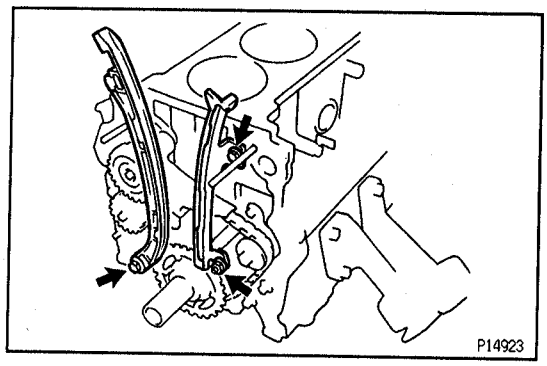
15. REMOVE NO.1 TIMING CHAIN AND CAMSHAFT TIMING GEAR



16. REMOVE CRANKSHAFT TIMING GEAR

HINT: If necessary, remove the gear with SST and crankshaft pulley bolt.

SST 09950–40010 (09951–04010, 09952–04010, 09953–04010, 09954–04010, 09955–04060)



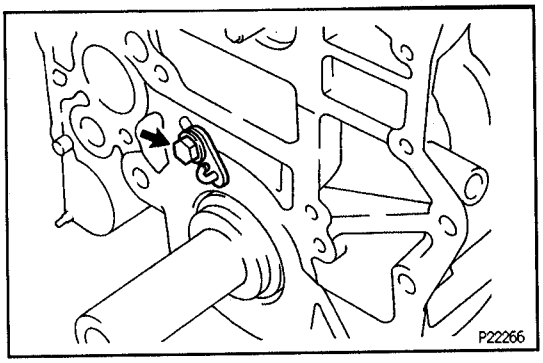
17. REMOVE NO.1 TIMING CHAIN TENSIONER SLIPPER AND NO.1 VIBRATION DAMPER

(a) Remove the bolt and slipper.

(b) 2RZ–FE:
Remove the 2 bolts and No.1 damper.

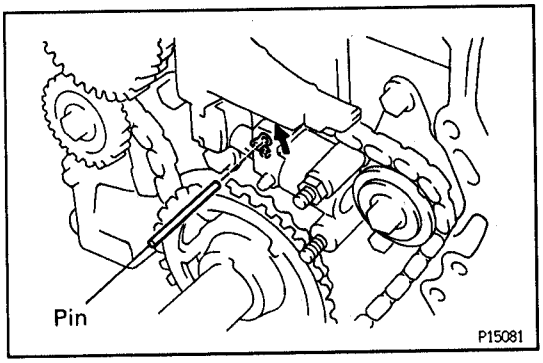
(c) 3RZ–FE:
Remove the bolt, nut and No.1 damper.

18. 2RZ–FE:
REMOVE CRANKSHAFT POSITION SENSOR ROTOR

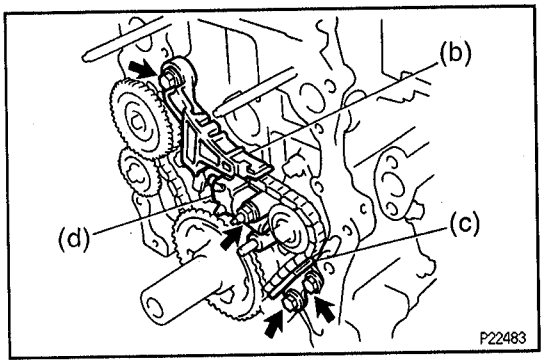


19. **2RZ–FE:**
REMOVE TIMING CHAIN OIL JET
Remove the bolt, oil jet and gasket.

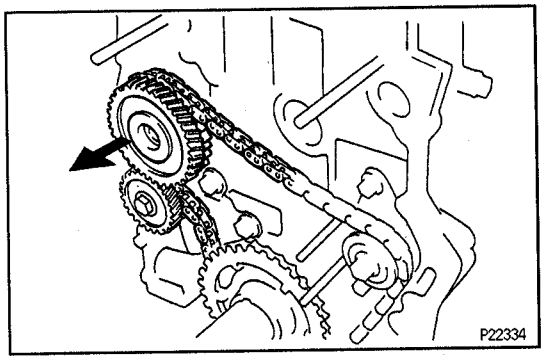
No.2 Timing Chain (3RZ–FE)



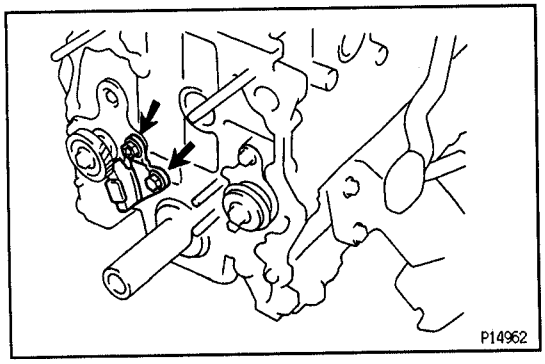
20. **REMOVE NO.2, NO.3 VIBRATION DAMPERS AND NO.2 CHAIN TENSIONER**
(a) Install a pin to the No.2 chain tensioner and lock the plunger.



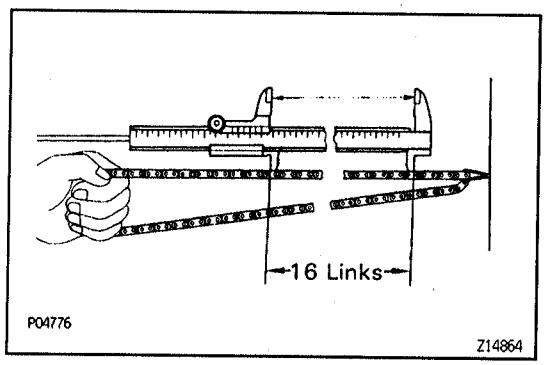
(b) Remove the bolt and No.2 damper.
(c) Remove the 2 bolts and No.3 damper.
(d) Remove the nut and No.2 chain tensioner.

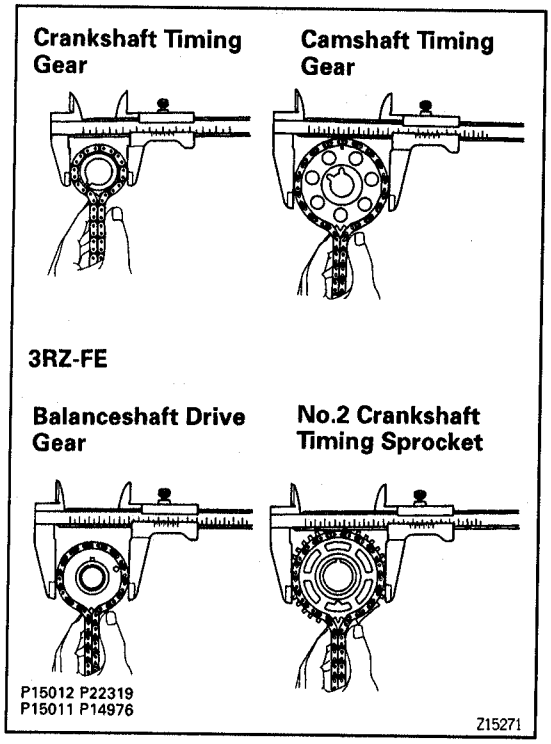


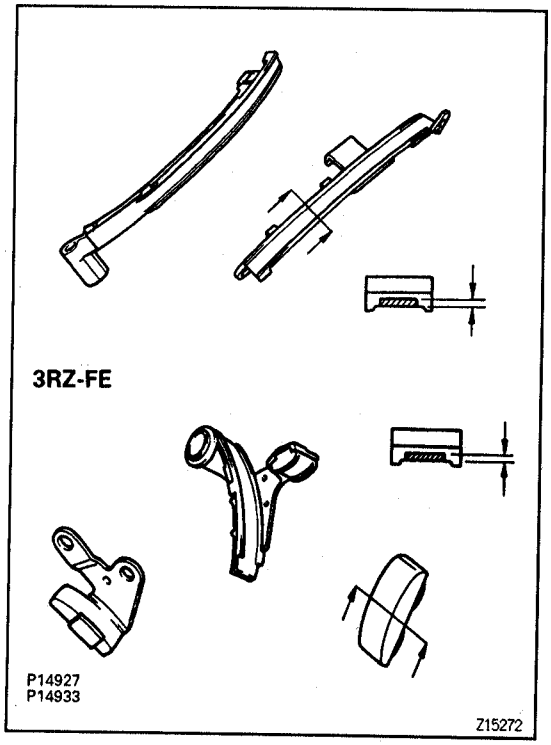
21. **REMOVE BALANCE SHAFT DRIVE GEAR, SHAFT, NO. 2 TIMING CHAIN AND NO. 2 CRANKSHAFT TIMING SPROCKET**
(a) Remove the bolt from the balance shaft drive gear.
(b) Remove the balance shaft drive gear with the shaft.
(c) Remove the No.2 timing chain with the No.2 crankshaft timing sprocket.



22. **REMOVE NO.4 VIBRATION DAMPER**
Remove the 2 bolts and No.4 damper.







TIMING CHAIN COMPONENTS INSPECTION

EG3K8–05

1. INSPECT TIMING CHAINS, TIMING GEARS AND TIMING SPROCKETS

(a) Measure the length of 16 links with the chain fully stretched.

Maximum chain elongation:

No.1 Timing chain

147.5 mm (5.807 in.)

3RZ–FE:

No.2 Timing chain

123.6 mm (4.866 in.)

If the elongation is greater than maximum, replace the chain.

HINT: Make the same measurements pulling at 3 or more places selected at random.

(b) Wrap the chain around the timing gear and timing sprocket.

(c) Using vernier calipers, measure the timing gear and timing sprocket diameter with the chain.

NOTICE: Vernier calipers must contact the chain rollers for measuring.

Minimum gear diameter (w/ chain):

Camshaft

113.8 mm (4.480 in.)

Crankshaft

59.4 mm (2.339 in.)

3RZ–FE:

Balance shaft

75.9 mm (2.988 in.)

Minimum sprocket diameter (w/ chain):

3RZ–FE:

No.2 crankshaft

96.7 mm (3.807 in.)

If the diameter is less than minimum, replace the chain, gears and sprocket.

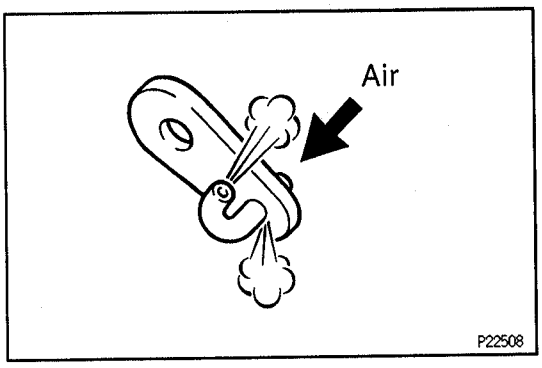
2. INSPECT CHAIN TENSIONER SLIPPER AND VIBRATION DAMPERS

Measure the chain tensioner slipper and vibration damper wears.

Maximum wear:

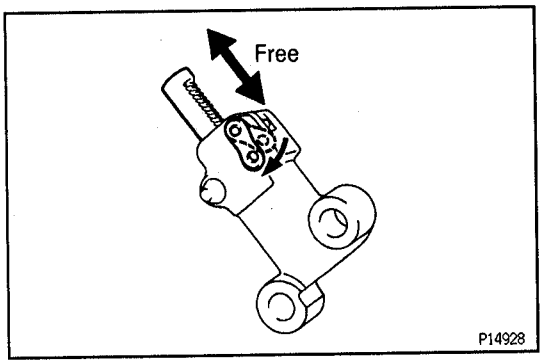
1.0 mm (0.039 in.)

If the wear is greater than maximum, replace the slipper and/or dampers.



3. **2RZ–FE:**
INSPECT OIL JET
Check the oil for damage or clogging.
If necessary, replace the oil jet.

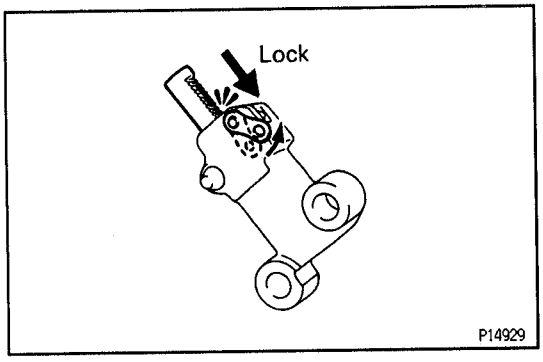
4. **INSPECT NO.1 CHAIN TENSIONER**
(See step 15 in cylinder head components, inspection, cleaning and repair in cylinder head)



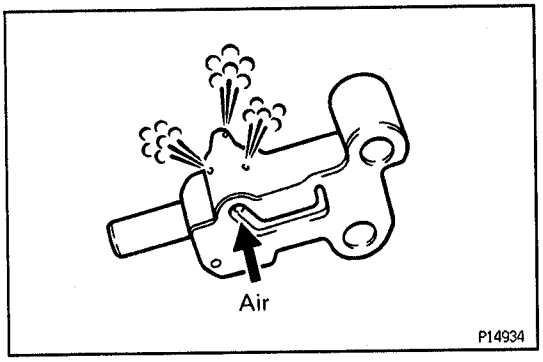
5. **3RZ–FE:**
INSPECT NO.2 CHAIN TENSIONER

A. Inspect chain tensioner

(a) Check that the plunger moves smoothly when the ratchet pawl is raised with your finger.

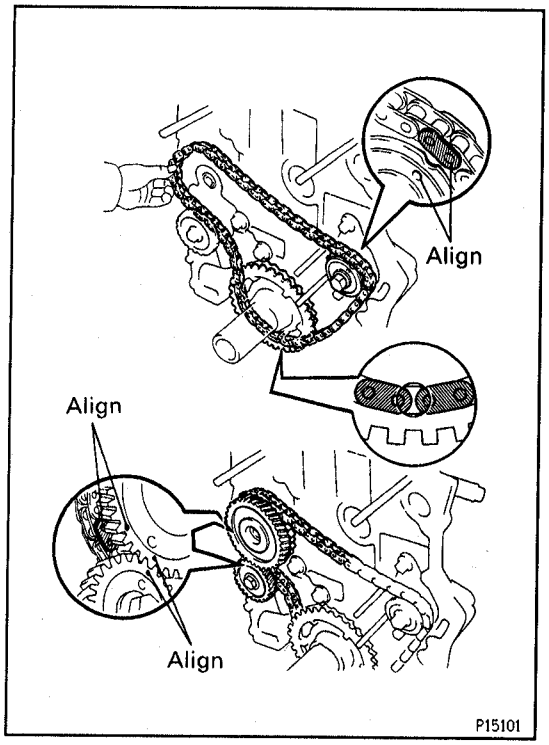


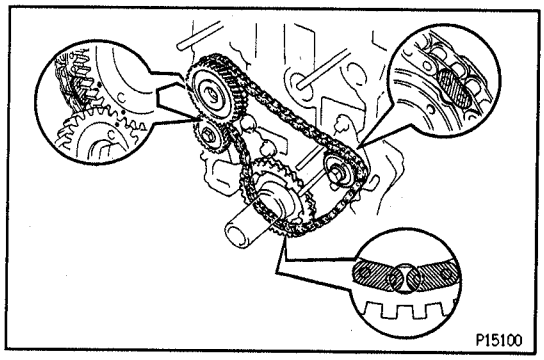
(b) Release the ratchet pawl and check that the plunger is locked in place by the ratchet pawl and does not move when pushed with your finger.

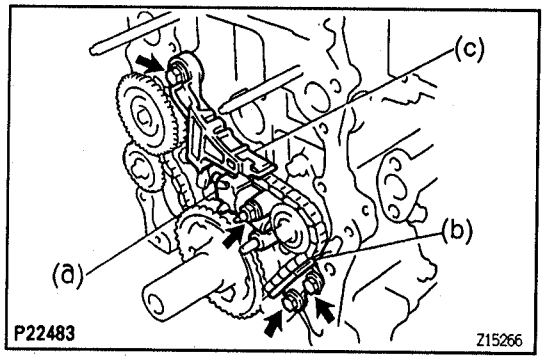


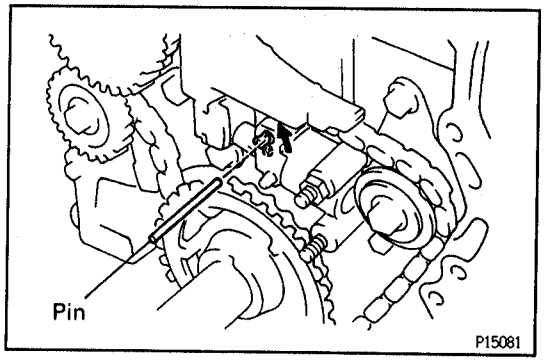
B. Inspect oil jet (No.2 chain tensioner).
Check the oil jet for damage or clogging.
If necessary, replace the oil jet (No.2 chain tensioner).

EG









TIMING CHAIN INSTALLATION

EG5MM–02

No.2 Timing Chain (3RZ–FE)

NOTICE: Check that No.1 cylinder is at TDC and that the weights of the No.1 and No.2 balance shafts are at the bottom side.

1. **INSTALL NO.4 VIBRATION DAMPER**

Install the No.4 damper with the 2 bolts.

2. **INSTALL NO.2 TIMING CHAIN, NO.2 CRANKSHAFT TIMING SPROCKET, BALANCE SHAFT DRIVE GEAR AND SHAFT**

(a) Install the No.2 timing chain by matching its mark links with the timing marks on the No.2 crankshaft timing sprocket and balance shaft timing sprocket.

(b) Fit the other mark link of No.2 timing chain onto the sprocket behind the large timing mark of the balance shaft drive gear.

(c) Insert the balance shaft drive gear shaft through the balance shaft drive gear so that it fits into the thrust plate hole.
Then align the small timing mark of the balance shaft drive gear with the timing mark of the balance shaft timing gear.

(d) Install the bolt to the balance shaft drive gear and tighten it.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

(e) Check that each timing mark is matched with the corresponding mark link.

3. **INSTALL NO.2, NO.3 VIBRATION DAMPERS AND NO.2 CHAIN TENSIONER**

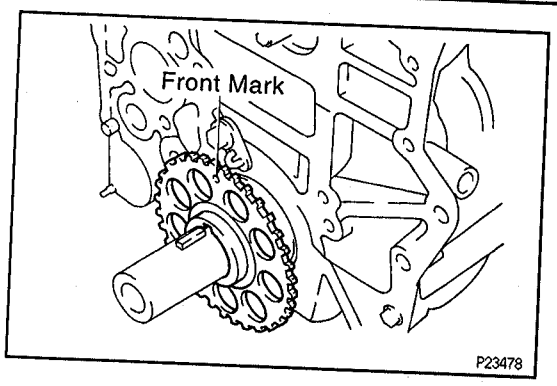
NOTICE: Assemble the chain tensioner with the pin installed, then remove the pin after assembly. When doing this, avoid pushing the No.2 vibration damper against the chain.

(a) Install the No.2 chain tensioner with the nut.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

(b) Install No.3 damper with the 2 bolts.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

(c) Install No.2 damper with the bolt.
Torque: 27 N·m (270 kgf·cm, 20 ft·lbf)

(d) Remove a pin from the No.2 chain tensioner and free the plunger.

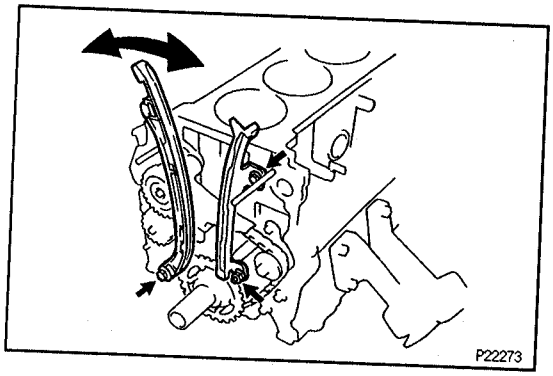


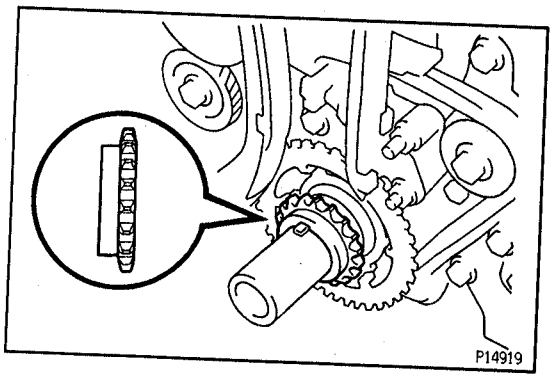
No.1 Timing Chain

4. **2RZ–FE:**
INSTALL OIL JET
Install a new gasket and the oil jet with the bolt.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

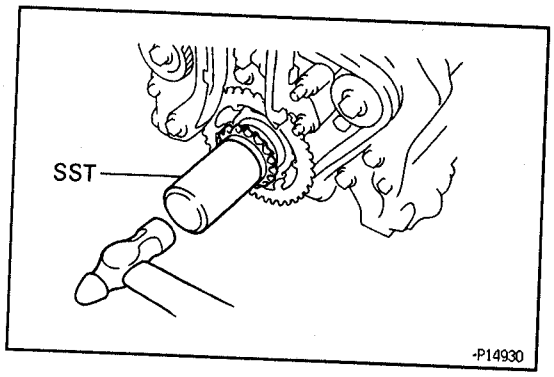
5. **2RZ–FE:**
INSTALL CRANKSHAFT POSITION SENSOR ROTOR
Install the rotor to the crankshaft with the front mark (cavity) of the rotor facing forward.

6. **INSTALL NO.1 TIMING CHAIN TENSIONER SLIPPER AND NO.1 VIBRATION DAMPER**
(a) Install the No.1 damper with the bolt and nut.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)
(b) Install the slipper with the bolt.
Torque: 27 N·m (270 kgf·cm, 20 ft·lbf)
(c) Check that the slipper moves smoothly.

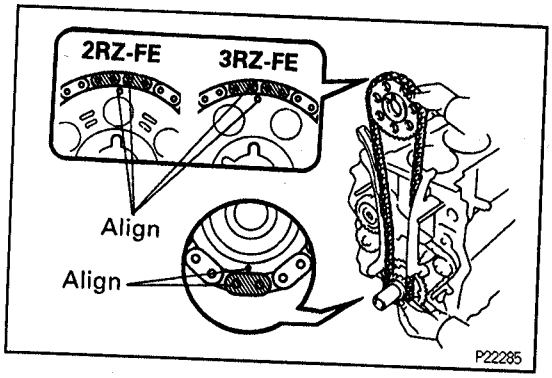




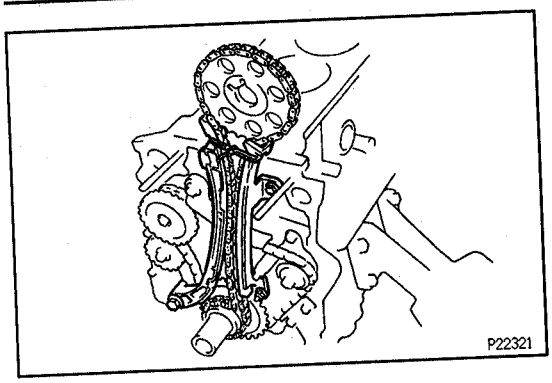
7. **INSTALL CRANKSHAFT TIMING GEAR**



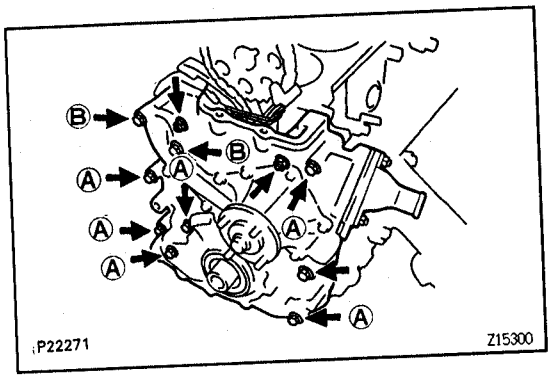
HINT: If necessary, install the gear with SST.
SST 09636–20010



8. **INSTALL NO.1 TIMING CHAIN AND CAMSHAFT TIMING GEAR**
(a) Align the timing mark between the mark link of the No.1 timing chain, and install the No.1 timing chain to the timing gear.
(b) Align the timing mark of the crankshaft timing gear with the mark link of the No.1 timing chain and install the No.1 timing chain.



(c) Tie the No.1 timing chain with a cord as shown in the illustration, and make sure it doesn't come loose.



9. INSTALL TIMING CHAIN COVER

(a) Install 3 new gaskets to the cylinder block and water bypass pipe.

(b) Install the timing chain cover with the 9 bolts and 2 nuts.

Torque:

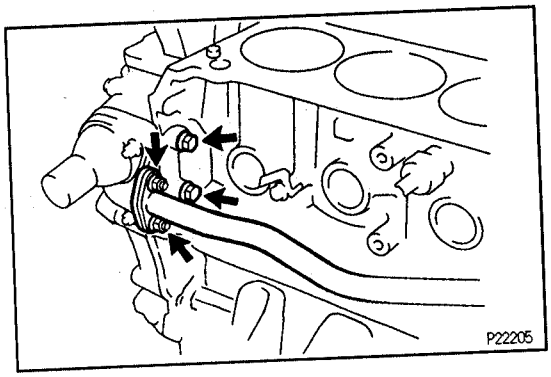
Bolt:

12 mm head Ⓐ: 20 N·m (200 kgf·cm, 14 ft·lbf)

12 mm head Ⓑ: 24.5 N·m (250 kgf·cm, 18 ft·lbf)

14 mm head: 44 N·m (440 kgf·cm, 32 ft·lbf)

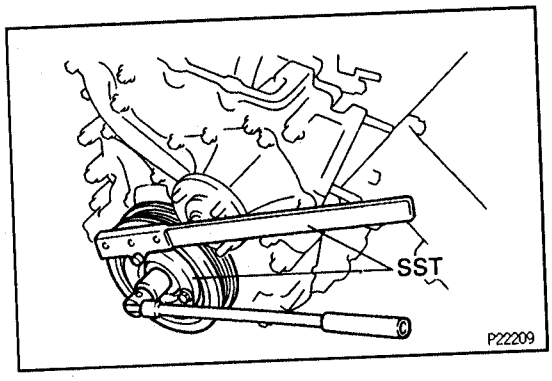
Nut : 20 N·m (200 kgf·cm, 14 ft·lbf)



(c) Install the 2 timing chain cover bolts.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

(d) Install the 2 water bypass pipe nuts.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

(e) Remove the cord from the chain.



10. INSTALL CRANKSHAFT PULLEY

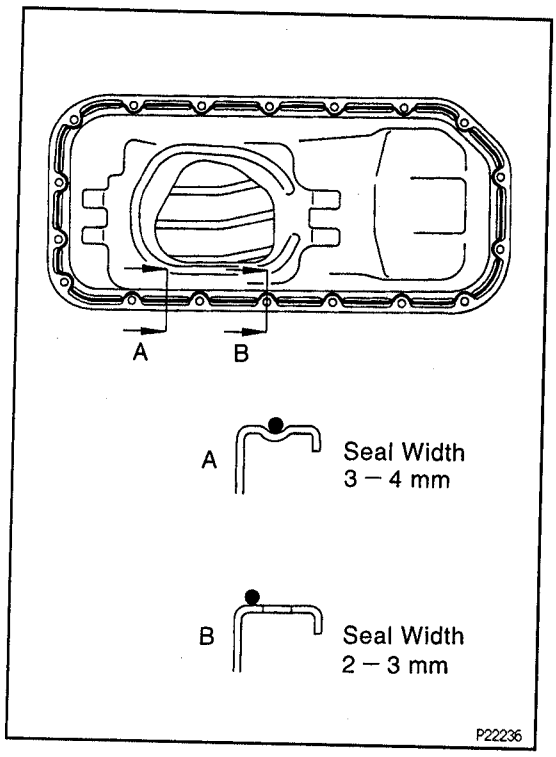
(a) Align the pulley set key with the key groove of the pulley, and slide on the pulley.

(b) Using SST, install and torque the pulley bolt.
SST 09213–54015, 09330–00021
Torque: 260 N·m (2,650 kgf·cm, 193 ft·lbf)

(c) w/ A/C:
Install the No.3 and No.2 crankshaft pulleys with the 4 bolts.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

11. INSTALL OIL STRAINER

Install a new gasket and the oil strainer with the bolt and 2 nuts.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)



12. INSTALL OIL PAN

(a) Remove any old packing (FIPG) material and be careful not to drop any oil on the contact surface of the oil pan.

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

NOTICE: Do not use a solvent which will affect the painted surfaces.

(b) Apply seal packing to the oil pan as shown in the illustration.

Seal packing:

Part No. 08826–00080 or equivalent

- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.)opening or 3 – 4 mm (0.012 – 0.016 in.) opening.

HINT: Avoid applying an excessive amount to the surface.

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

(c) Install the oil pan with the 16 bolts and 2 nuts.

Torque: 12.5 N·m (130 kgf·cm, 9 ft·lbf)

13. INSTALL FLYWHEEL HOUSING UNDER COVER AND DUST SEAL

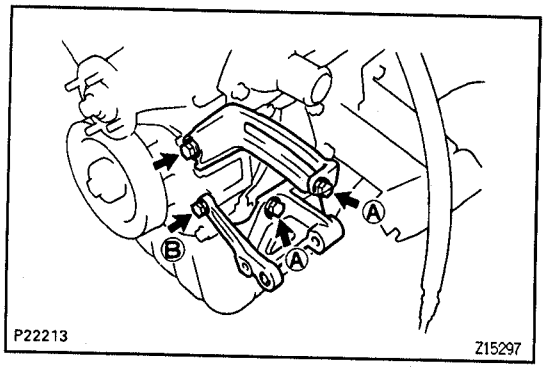
14. 2WD: INSTALL STIFFENER PLATES

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

15. INSTALL CRANKSHAFT POSITION SENSOR

Install a new O–ring.

Torque: 8.5 N·m (85 kgf·cm, 74 in.·lbf)



16. INSTALL GENERATOR, ADJUSTING BAR AND BRACKET

(a) Install the bracket with the 3 bolts.

Torque:

Bolt Ⓐ: 74.5 N·m (760 kgf·cm, 55 ft·lbf)

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

(b) Install the adjusting bar with the bolt.

Torque: 63.5 N·m (650 kgf·cm, 47 ft·lbf)

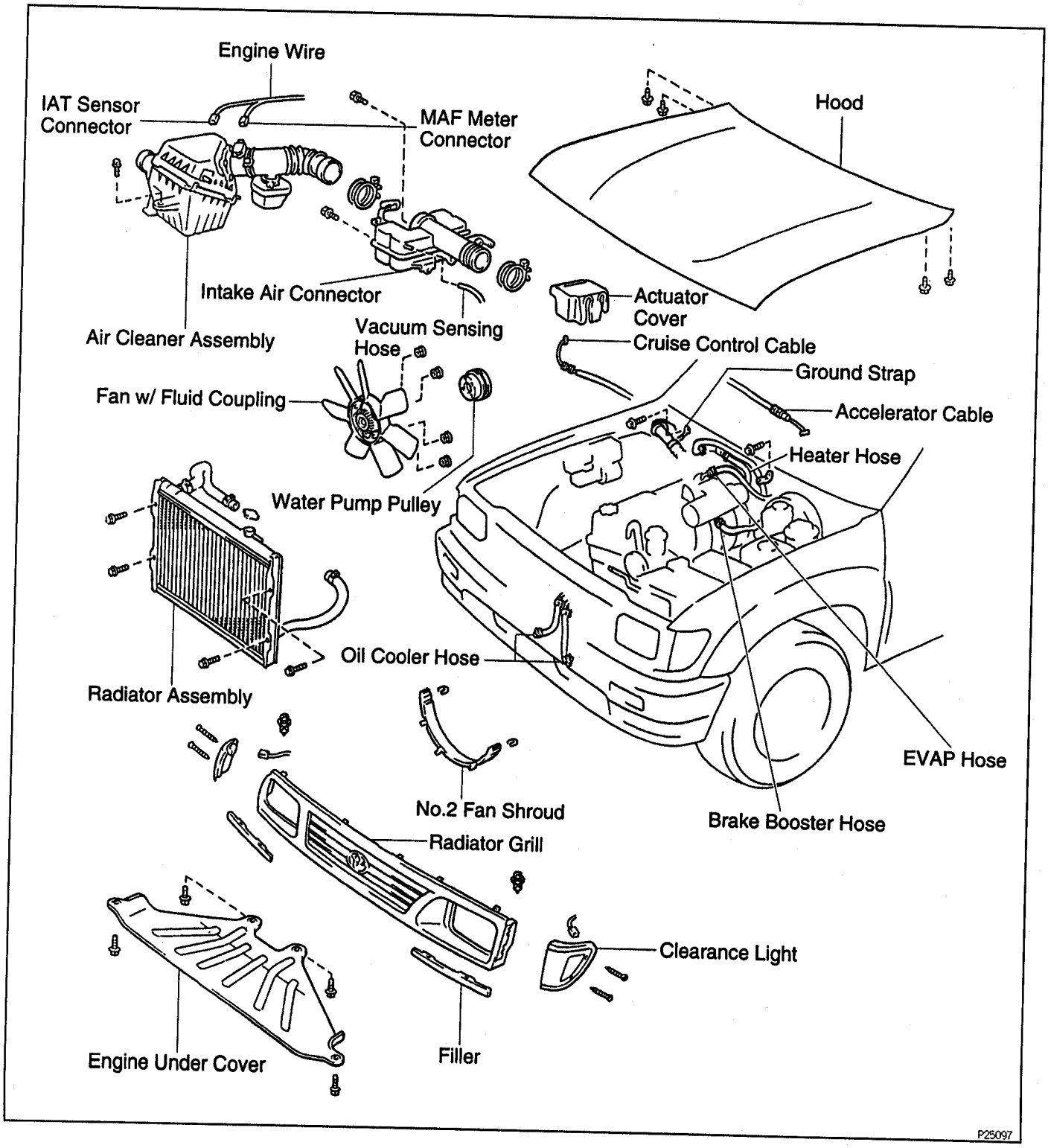
(c) Install the generator with the pivot bolt and lock bolt.

17. **w/ A/C:**
    INSTALL A/C COMPRESSOR AND BRACKET
    (a) Install the A/C compressor bracket with the 4 bolts.
    Torque: 44 N·m (440 kgf·cm, 32 ft·lbf)
    (b) Install the A/C compressor with the 4 bolts.
    Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)
18. **INSTALL CYLINDER HEAD ASSEMBLY**
    (See cylinder head installation)
19. **INSTALL WATER PUMP PULLEY, FAN WITH FLUID COUPLING AND DRIVE BELT FOR GENERATOR**
20. **4WD:**
    INSTALL FRONT DIFFERENTIAL AND DRIVE SHAFTS ASSEMBLY
21. **FILL WITH ENGINE OIL**
22. **START ENGINE AND CHECK FOR LEAKS**
23. **INSTALL ENGINE UNDER COVER**
24. **VEHICLE ROAD TEST**
    Check for abnormal noise, shock slippage, correct shift points and smooth operation.
25. **RECHECK ENGINE COOLANT AND ENGINE OIL LEVEL**

CYLINDER BLOCK

EG1K1–0A

2WD:
COMPONENTS FOR REMOVAL AND INSTALLATION



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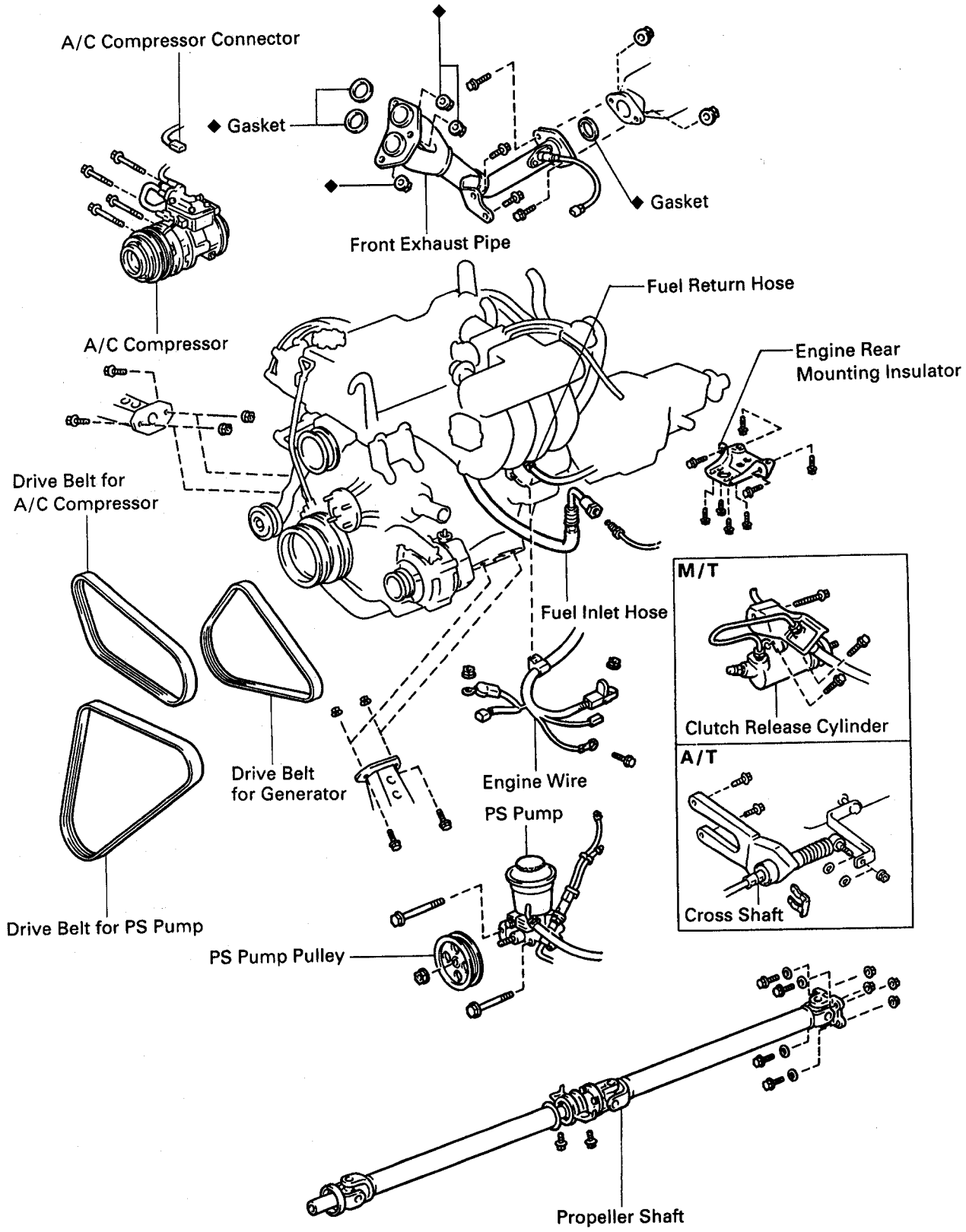
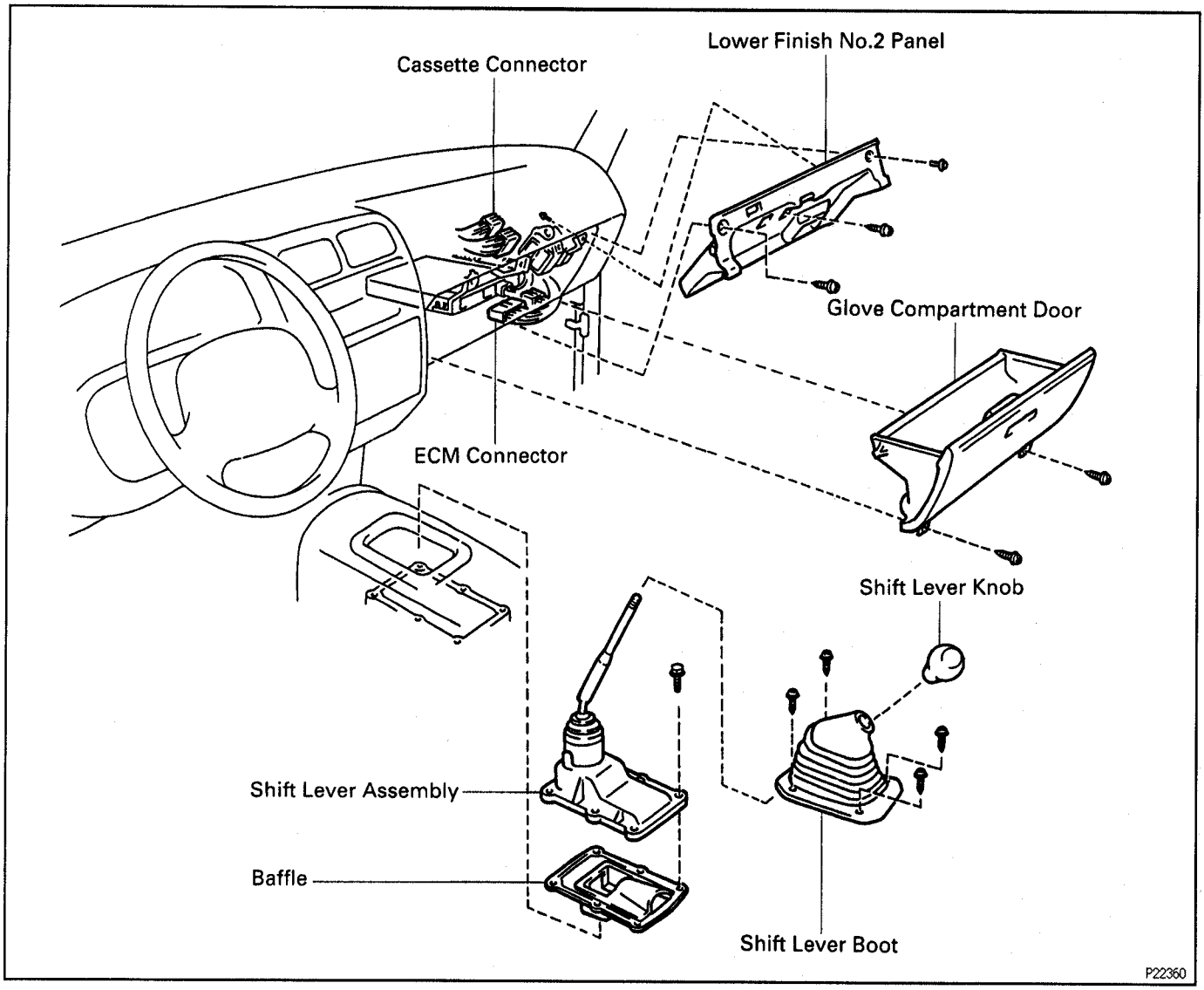


◆ Non-reusable part

P22489

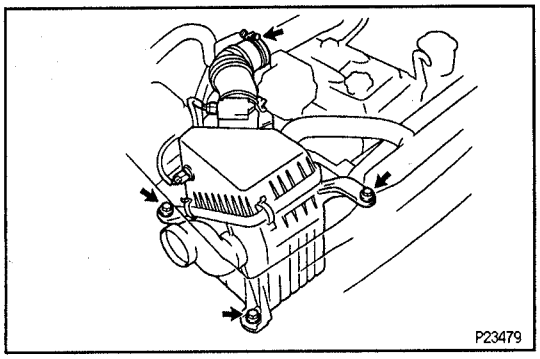


ENGINE WITH TRANSMISSION REMOVAL EG64H–01

1. **REMOVE ENGINE UNDER COVER**
2. **DRAIN ENGINE COOLANT**
3. **DRAIN ENGINE OIL**
4. **DRAIN TRANSMISSION OIL**
5. **REMOVE HOOD**
6. **REMOVE RADIATOR**
   (See radiator removal in Cooling System)
7. **REMOVE DRIVE BELT FOR GENERATOR, FAN WITH FLUID COUPLING AND WATER PUMP PULLEY (See steps 6, 8 and 9 in water pump removal in Cooling System)**
8. **DISCONNECT THESE CABLES:**

(a) Disconnect the accelerator cable from the throttle body.

(b) w/ Cruise Control System:
Remove the actuator cover, and disconnect the cruise control cable from the actuator.

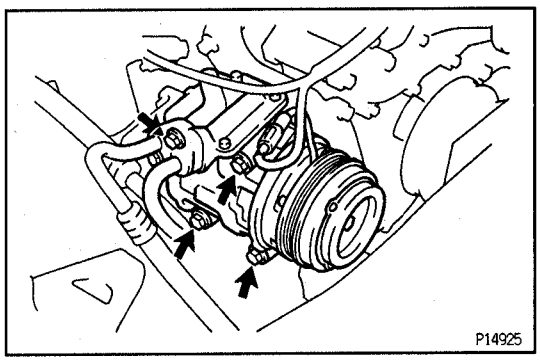


9. REMOVE AIR CLEANER ASSEMBLY

(a) Disconnect the IAT sensor and MAF meter connectors.
(b) Disconnect the 3 wire clamps and engine wire.
(c) Loosen the air cleaner hose clamp.
(d) Remove the 3 bolts and the MAF meter, resonator and air cleaner assembly.

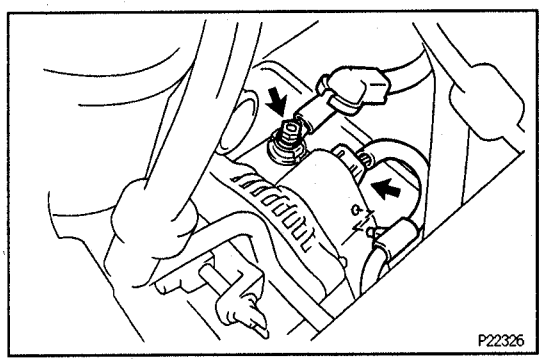
10. REMOVE INTAKE AIR CONNECTOR

(See step 4 in cylinder head removal)



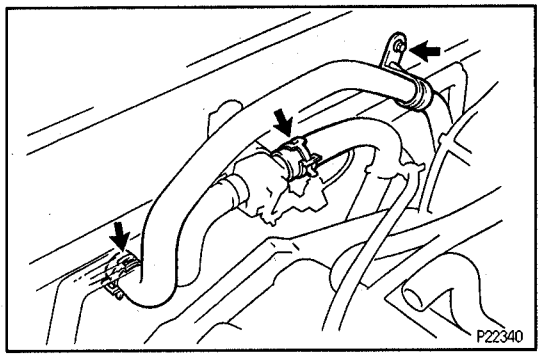
11. w/A/C:
DISCONNECT A/C COMPRESSOR

(a) Loosen the idler pulley nut and adjusting bolt, and remove the drive belt.
(b) Disconnect the A/C compressor connector.
(c) Remove the 4 bolts, and disconnect the compressor from the bracket.
HINT: Put aside the compressor, and suspend it.



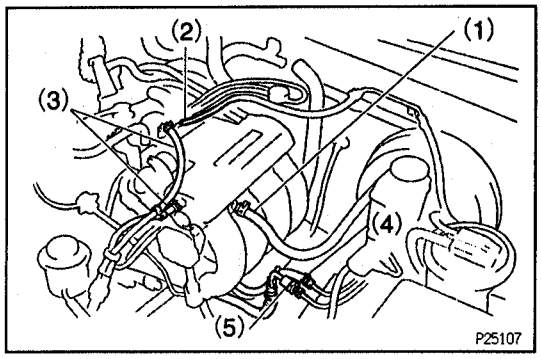
12. REMOVE GENERATOR WIRE

(a) Disconnect the generator connector.
(b) Remove the nut, and disconnect the generator wire and wire clip.



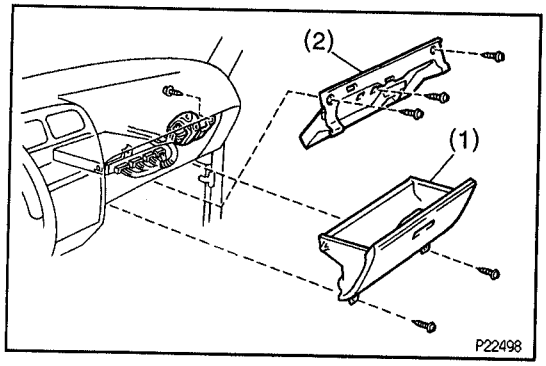
13. DISCONNECT HEATER HOSES

(a) Remove the bolt and hose clamp.
(b) Disconnect the heater hoses.



14. DISCONNECT HOSES

Disconnect these hoses:
(1) Brake booster vacuum hose
(2) EVAP hose
(3) w/ PS:
2 air hoses for PS idle–up
(4) Fuel return hose
(5) Fuel inlet hose



15. w/ PS:
DISCONNECT PS PUMP FROM ENGINE
(See step 8 in cylinder head removal)

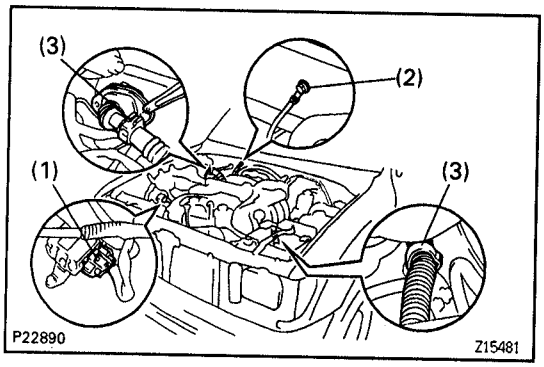
16. DISCONNECT ENGINE WIRE FROM CABIN

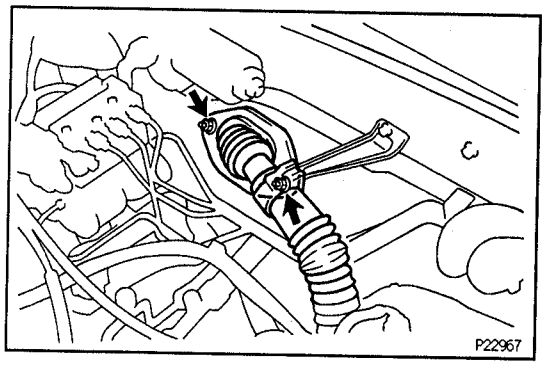
(a) Remove these parts:
(1) Glove compartment door
(2) Lower finish No.2 panel

(b) Disconnect the 2 ECM connectors.

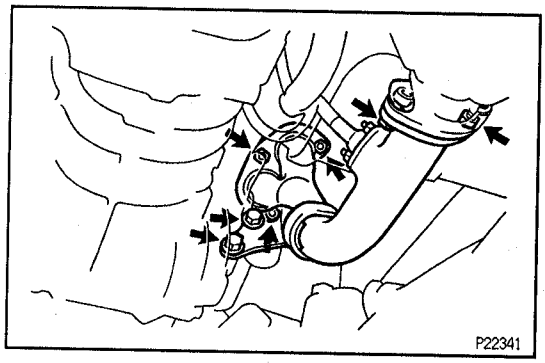
(c) Disconnect the 2 cassette connectors (cowl wire x engine wire) and 2 wire clamps from the lower finish panel.

(d) Disconnect these connector grand strap and clamps:
(1) Igniter connector
(2) Ground strap from cowl top panel
(3) 2 engine wire clamps





(e) Remove 2 nuts holding the engine wire retainer to the cowl panel and pull out the engine wire from the cabin.



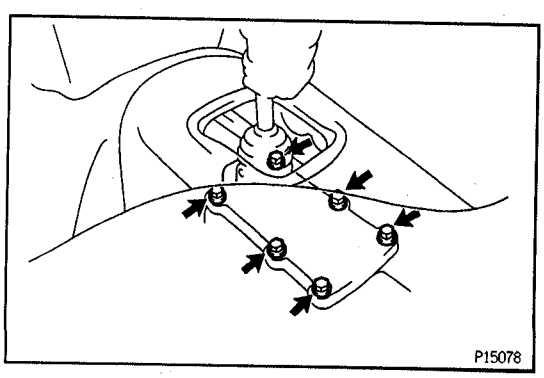
17. REMOVE FRONT EXHAUST PIPE

(a) Disconnect the heated oxygen sensor connector.

(b) Remove the 2 bolts holding the front exhaust pipe to the TWC.

(c) Remove the 2 bolts holding the support bracket to the transmission.

(d) Remove the 3 nuts, front exhaust pipe and 3 gaskets.



18. M/T:
REMOVE SHIFT LEVER ASSEMBLY

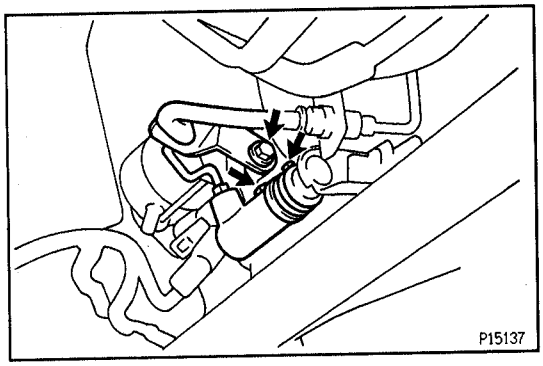
(a) Remove the shift lever knob.

(b) Remove the 4 screws and shift lever boot.

(c) Remove the 6 bolts, shift lever assembly and baffle.
NOTICE: Do not lose the washers.

19. REMOVE PROPELLER SHAFT
(See propeller shaft removal in Propeller Shaft)

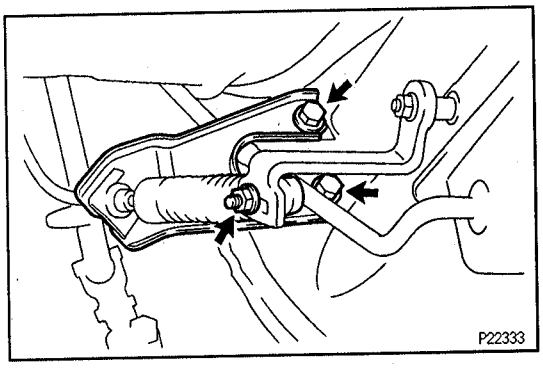
20. DISCONNECT SPEEDOMETER CABLE
NOTICE: Do not lose the felt protector and washers.



21. M/T:
REMOVE CLUTCH RELEASE CYLINDER

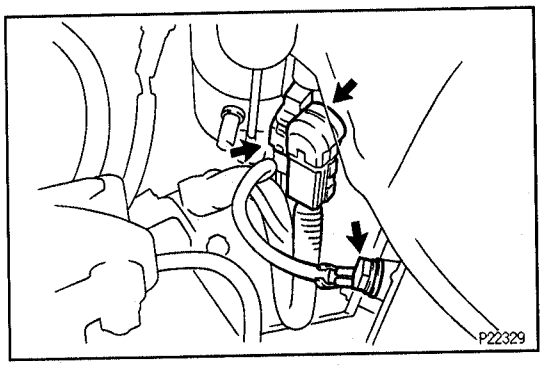
(a) Remove the 2 bolts, and disconnect the clutch release cylinder from the clutch housing.

(b) Remove the bolt and disconnect the clutch line.



22. A/T:
REMOVE CROSS SHAFT

Remove the 2 bolts and nut, and disconnect bracket from the transmission.

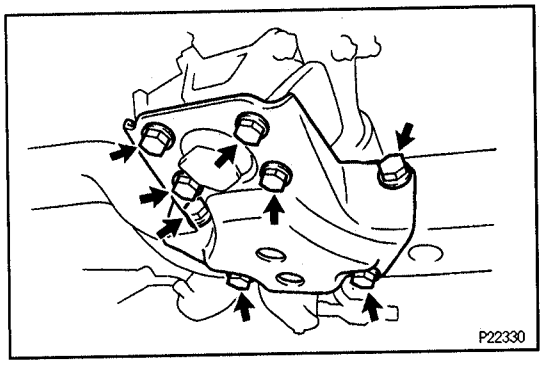


23. DISCONNECT STARTER WIRE

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

(b) Disconnect the starter connector.

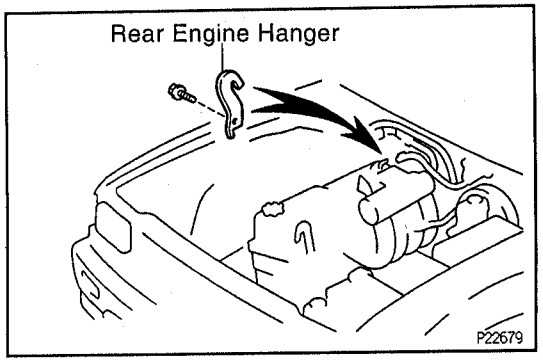
(c) Remove the bolt and disconnect ground strap.



24. PLACE JACK UNDER TRANSMISSION

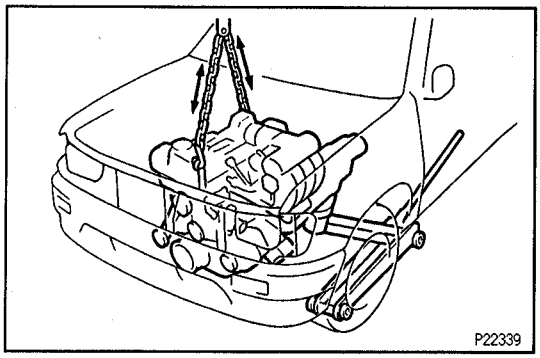
25. REMOVE ENGINE REAR MOUNTING BRACKET

Remove the 8 bolts holding the mounting bracket to the mounting insulator and cross member.

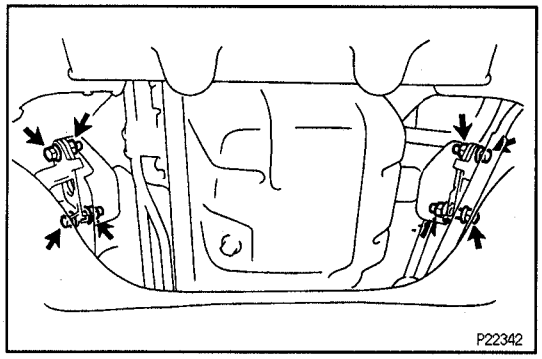


26. REMOVE ENGINE WITH TRANSMISSION

(a) Install a rear engine hanger in the correct direction.
Part No.:
HANGER, ENGINE, NO.2 12282–75020
BOLT 91512–61020
Torque: 42 N·m (420 kgf·cm, 30 ft·lbf)



(b) Attach the engine hoist chain to the 2 engine hangers.



(c) Remove the 4 bolts and nuts holding the engine front mounting insulators to the frame.

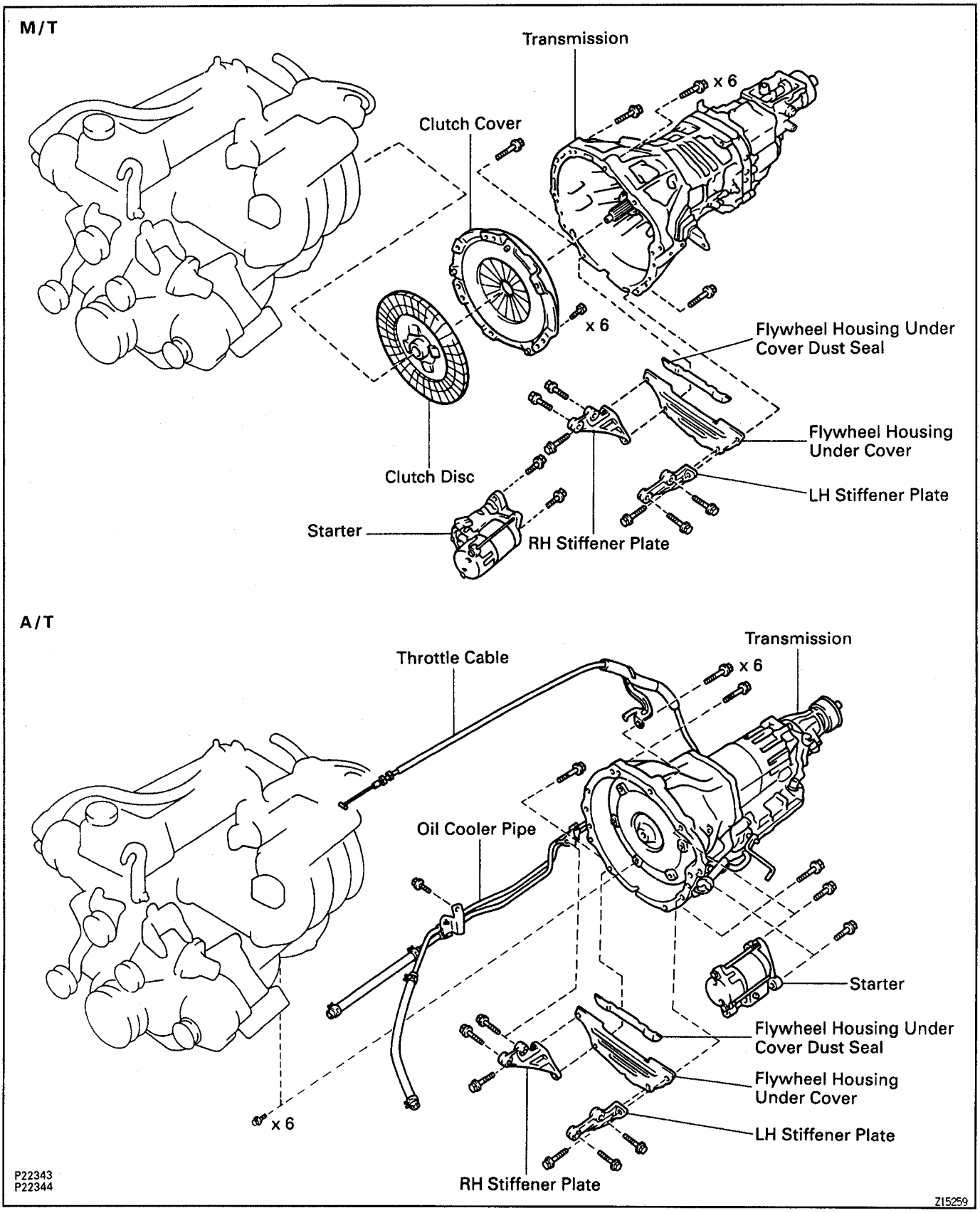
(d) Lift the engine with transmission out of the vehicle slowly and carefully.

NOTICE: Make sure the engine is clear of all wiring and hoses.

(e) Place the engine and transmission assembly onto the stand.

EG5MP–02

COMPONENTS FOR ENGINE AND TRANSMISSION SEPARATION (2WD)

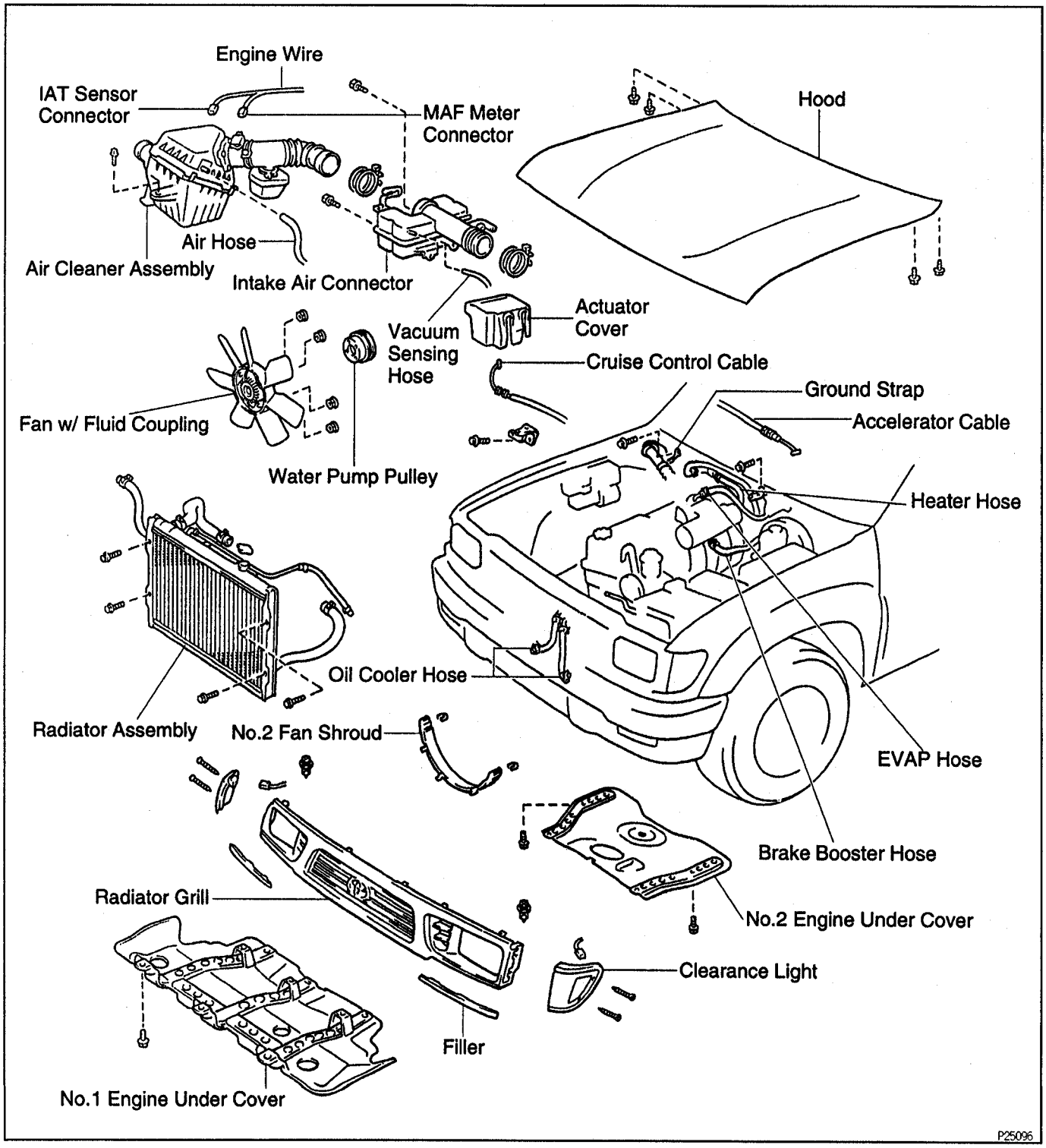


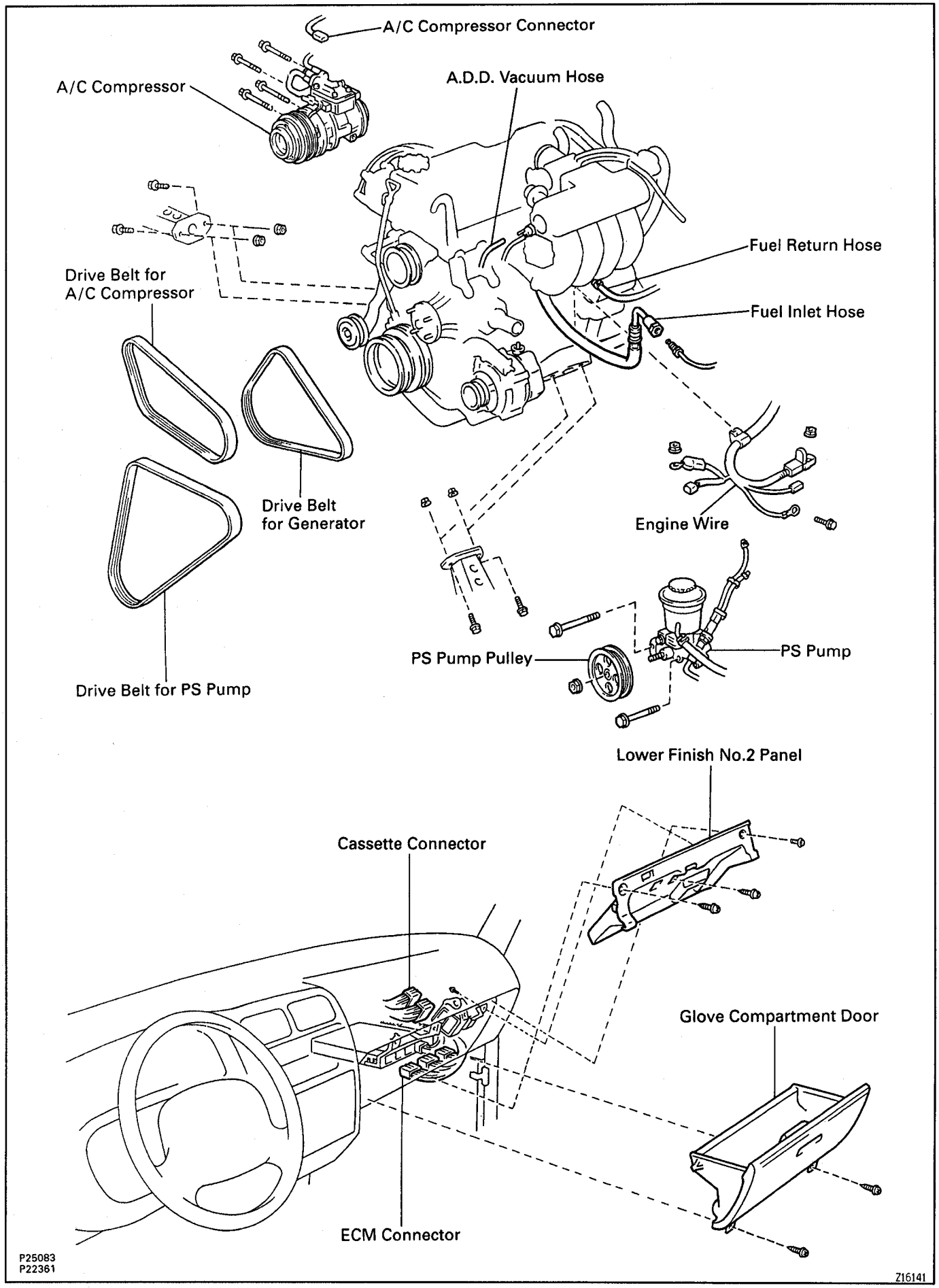
EG5MQ–02

4WD:
TRANSMISSION REMOVAL
(See M/T or A/T section)

EG64J–01

COMPONENTS FOR REMOVAL AND INSTALLATION




A/C Compressor Connector
A/C Compressor
A.D.D. Vacuum Hose
Fuel Return Hose
Drive Belt for
A/C Compressor
Fuel Inlet Hose
Drive Belt
for Generator
Engine Wire
PS Pump Pulley
PS Pump
Drive Belt for PS Pump
Lower Finish No.2 Panel
Cassette Connector
Glove Compartment Door
ECM Connector
P25083
P22361
Z16141

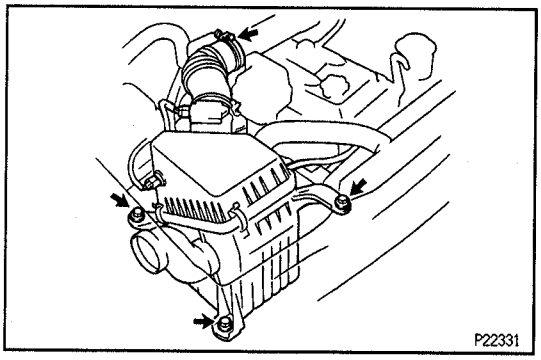
EG64K–01

ENGINE REMOVAL

1. **REMOVE ENGINE UNDER COVER**
2. **DRAIN ENGINE COOLANT**
3. **DRAIN ENGINE OIL**
4. **REMOVE HOOD**
5. **REMOVE RADIATOR**
   (See radiator removal in Cooling System)
6. **REMOVE DRIVE BELT FOR GENERATOR, FAN WITH FLUID COUPLING AND WATER PUMP PULLEY (See steps 6, 8 and 9 in water pump removal in Cooling System)**
7. **DISCONNECT THESE CABLES:**

(a) Disconnect the accelerator cable from the throttle body.

(b) w/ Cruise Control System:
Remove the actuator cover, and disconnect the cruise control cable from the actuator.


P22331

8. **REMOVE AIR CLEANER ASSEMBLY**

(a) Disconnect the IAT sensor and MAF meter connectors.

(b) Disconnect the 3 wire clamps and engine wire.

(c) California:
Disconnect the air hose from the air cleaner cap.

(d) Loosen the air cleaner hose clamp.

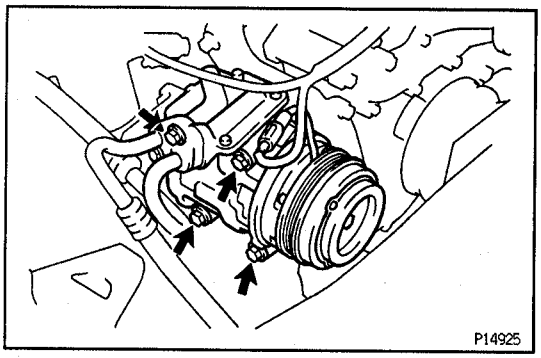
(e) Remove the 3 bolts and the MAF meter, resonator and air cleaner assembly.

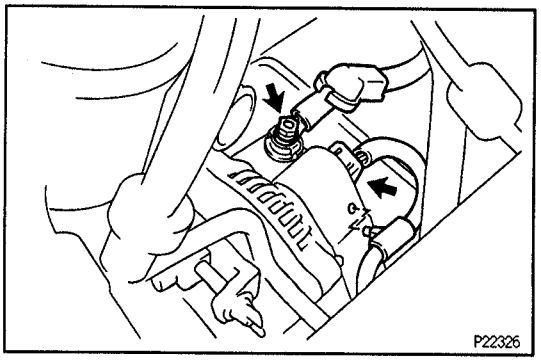
9. **REMOVE INTAKE AIR CONNECTOR**
   (See step 4 in cylinder head removal)
10. **w/A/C:**
    DISCONNECT A/C COMPRESSOR

(a) Loosen the idler pulley nut and adjusting bolt, and remove the drive belt.

(b) Disconnect the A/C compressor connector.

(c) Remove the 4 bolts, and disconnect the compressor from the bracket.
HINT: Put aside the compressor, and suspend it.

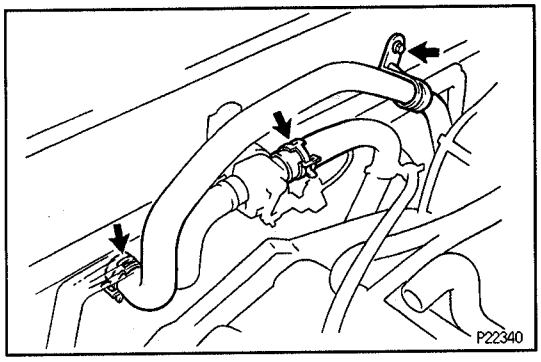

P14925


P22326

11. **REMOVE GENERATOR WIRE**

(a) Disconnect the generator connector.

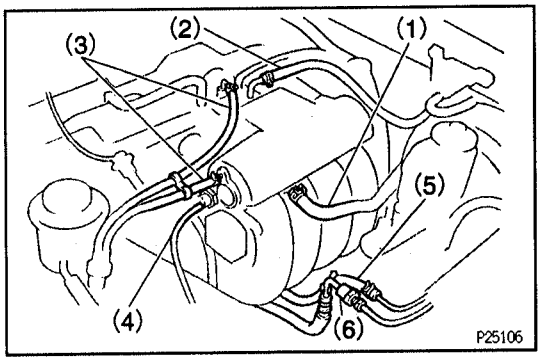
(b) Remove the nut, and disconnect the generator wire and wire clip.



12. DISCONNECT HEATER HOSES

(a) Remove the bolt and hose clamp.

(b) Disconnect the heater hoses.



13. DISCONNECT HOSES

Disconnect these hoses:

(1) Brake booster vacuum hose

(2) EVAP hose

(3) 2 air hoses for PS idle–up

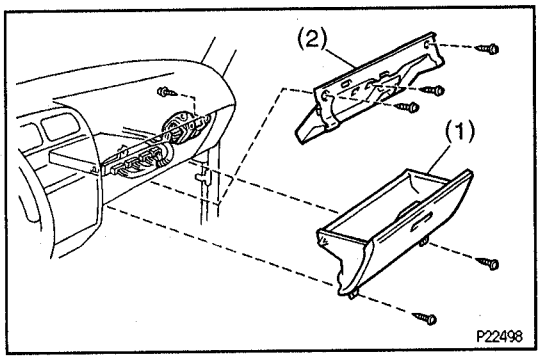
(4) w/ A.D.D.
Vacuum hose

(5) Fuel return hose

(6) Fuel inlet hose

14. DISCONNECT PS PUMP FROM ENGINE

(See step 8 in cylinder head removal)



15. DISCONNECT ENGINE WIRE FROM CABIN

(a) Remove these parts:

(1) Glove compartment door

(2) Lower finish No.2 panel

(b) M/T:
Disconnect the 2 ECM connectors.

(c) A/T:
Disconnect the 3 ECM connectors.

(d) Disconnect the 2 cassette connectors (cowl wire x engine wire) and 2 wire clamps from the lower finish panel.

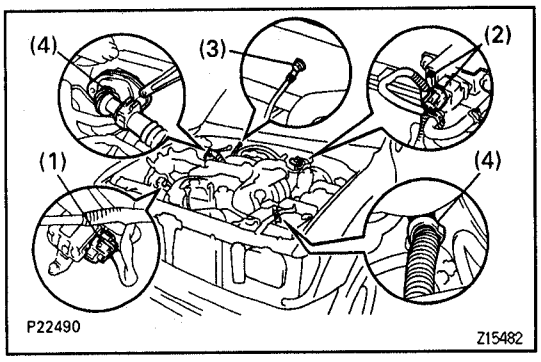
(e) Disconnect these connectors ground strap and clamps:

(1) Igniter connector

(2) VSV connector for EVAP and clamp

(3) Ground strap from cowl top panel

(4) 2 engine wire clamps

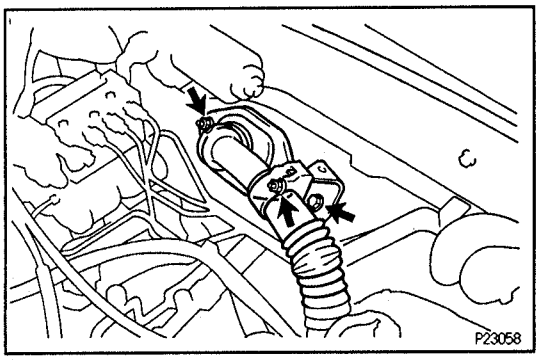


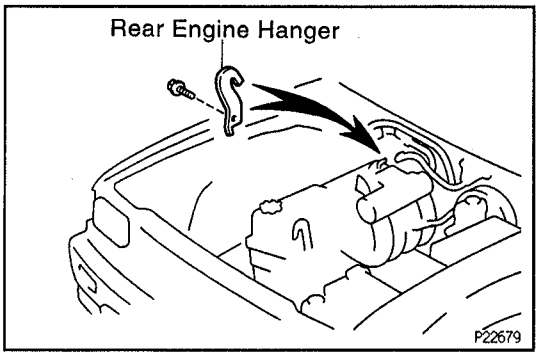
(f) Disconnect the vapor pressure sensor connector.

(g) Disconnect the VSV connector for vapor pressure sensor.

(h) Remove the bolt and wire bracket.

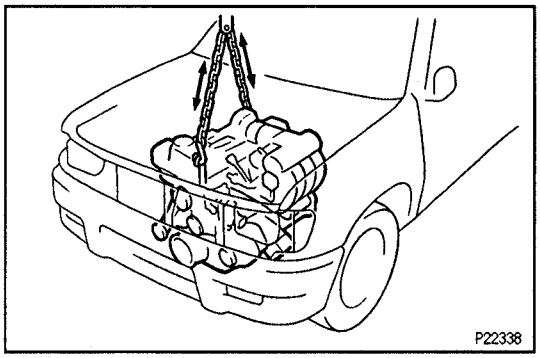
(i) Remove 2 nuts holding the engine wire retainer to the cowl panel, and pull out the engine wire from the cabin.



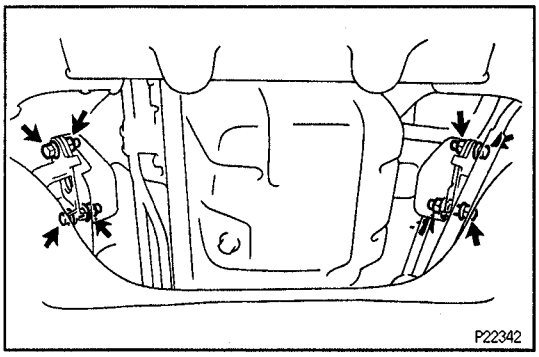


16. REMOVE ENGINE FROM VEHICLE

(a) Install a rear engine hanger in the correct direction.
Part No.:
HANGER, ENGINE, NO.2 12282–75020
BOLT 91512–61020
Torque: 42 N·m (420 kgf·cm, 30 ft·lbf)



(b) Attach the engine hoist chain to the 2 engine hangers.



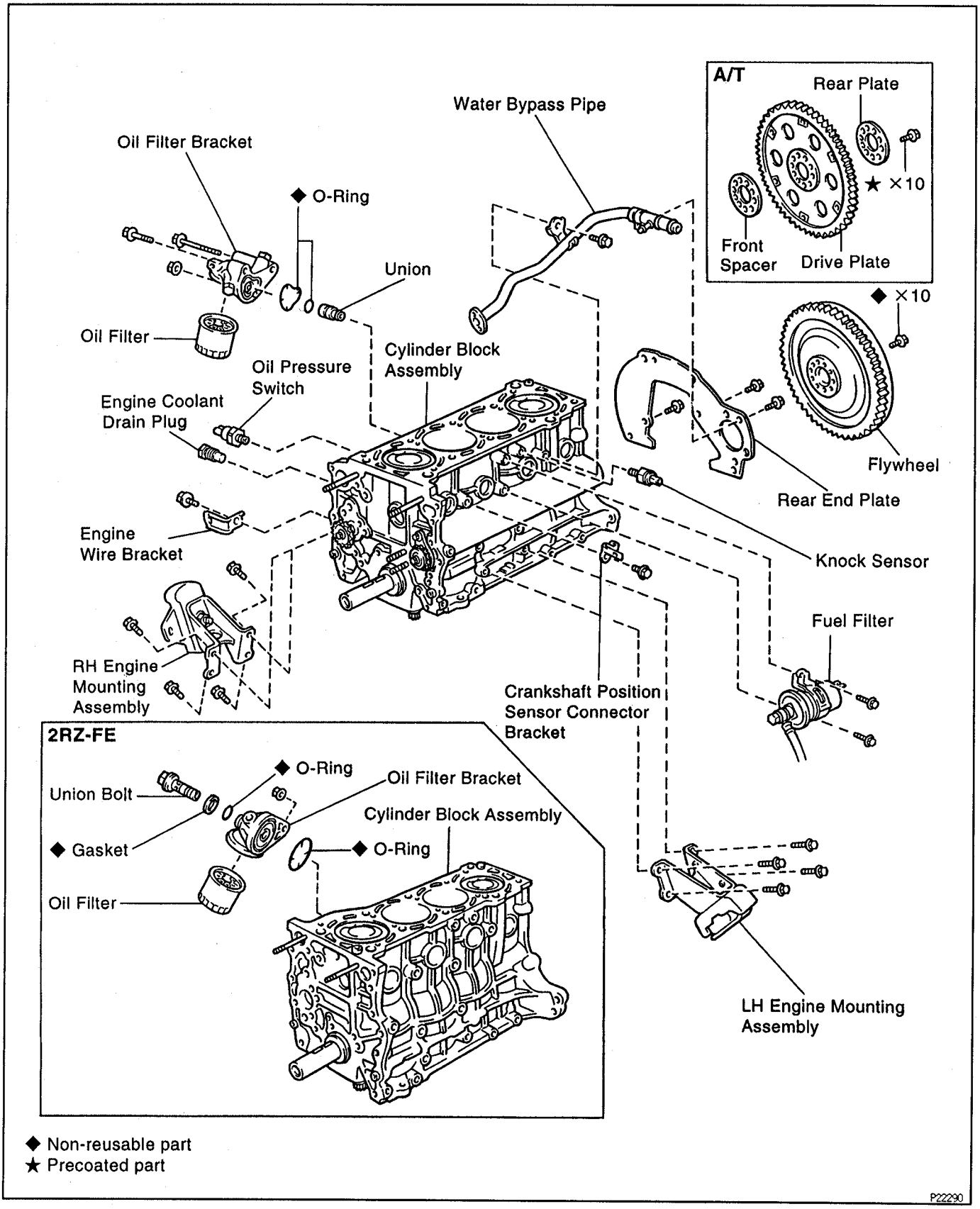
(c) Remove the 4 bolts and nuts holding the engine front mounting insulators to the frame.

(d) Lift the engine out of the vehicle slowly and carefully.
NOTICE: Make sure the engine is clear of all wiring and hoses.

(e) Place the engine onto the stand.

EG1K5-06

COMPONENTS FOR PREPARATION AND AFTER ASSEMBLY



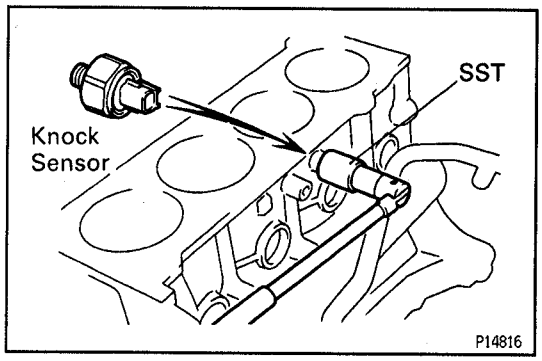
◆ Non-reusable part
★ Precoated part

P22290

EG6MT–02

PREPARATION FOR DISASSEMBLY

1. **M/T:**
   REMOVE FLYWHEEL
   Remove the 10 bolts and flywheel.
   A/T:
   REMOVE DRIVE PLATE
   Remove the 10 bolts, front spacer, drive plate and rear plate.
2. **REMOVE REAR END PLATE**
   Remove the 3 bolts and rear end plate.
3. **INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY**
4. **REMOVE CYLINDER HEAD**
   (See cylinder head removal)
5. **REMOVE TIMING CHAINS, GEARS AND SPROCKET**
   (See timing chain removal)
6. **REMOVE FUEL FILTER**



7. **REMOVE KNOCK SENSOR**
   Using SST, remove the knock sensor.
   SST 09816–30010
8. **REMOVE WATER BYPASS PIPE**
   Remove the bolt and water bypass pipe.
9. **REMOVE OIL FILTER**
   (See oil and filter replacement in Lubrication System)
10. **REMOVE OIL FILTER BRACKET**

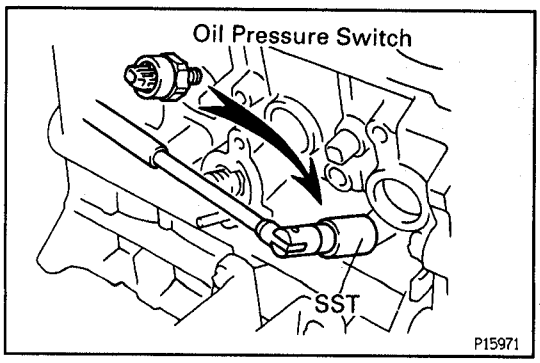
A. 2RZ–FE:

(a) Remove the nut, union bolt, gasket and oil filter bracket.
(b) Remove the O–ring from the union bolt.

B. 3RZ–FE:

(a) Remove the 2 bolts, nut, oil filter bracket and O–ring.
(b) Using a 14 mm hexagon wrench, remove the union and O–ring.

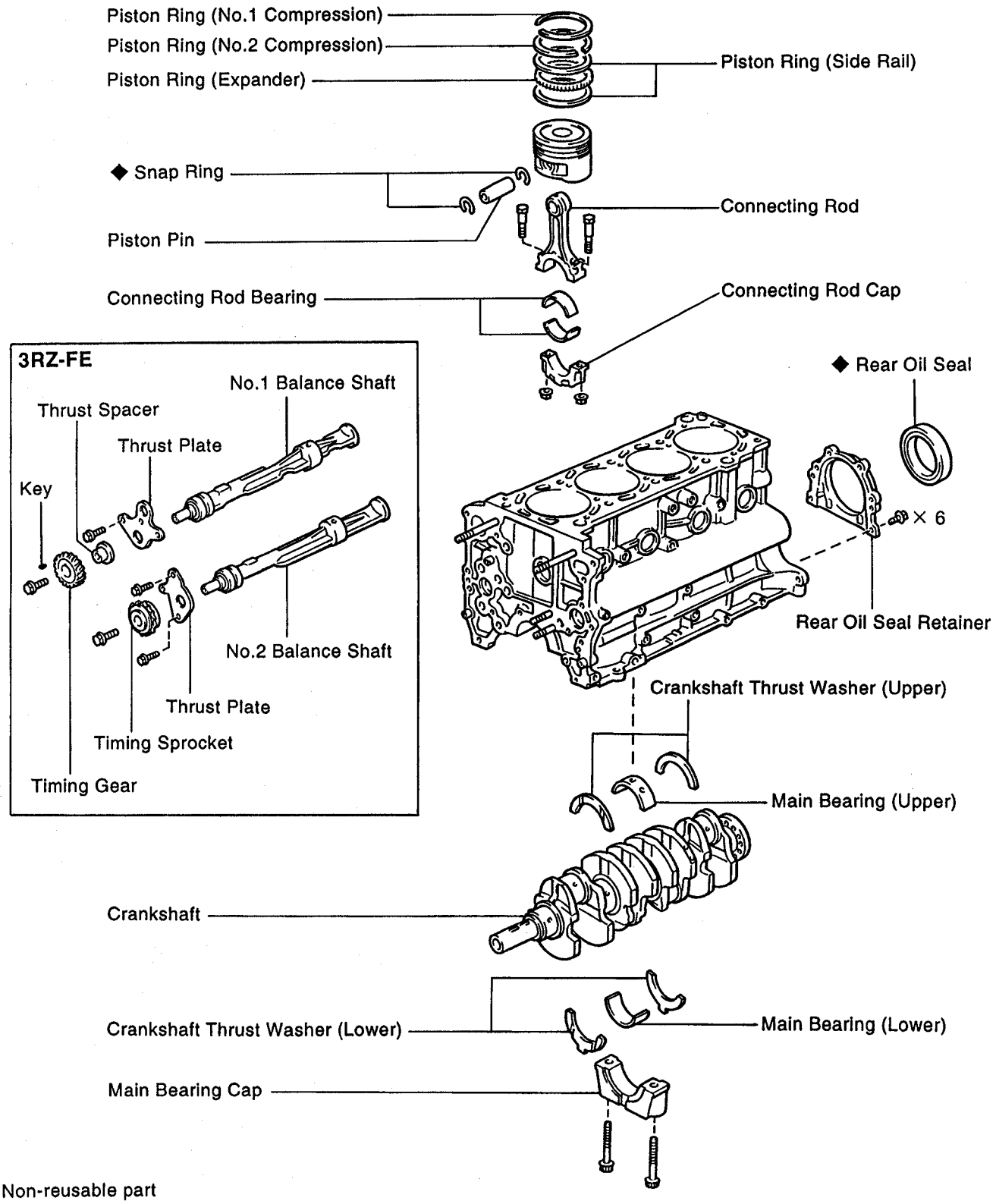
11. **REMOVE ENGINE COOLANT DRAIN PLUG**

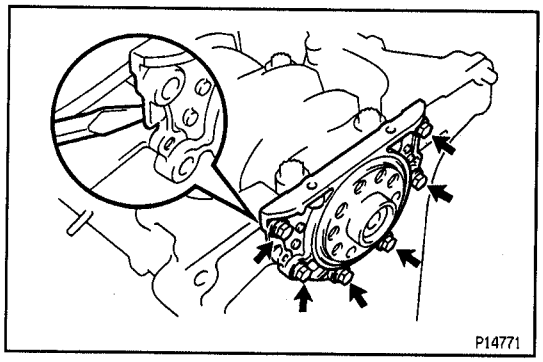


12. **REMOVE OIL PRESSURE SWITCH**
    Using SST, remove the oil pressure switch.
    SST 09816–30010
13. **REMOVE RH AND LH ENGINE MOUNTING ASSEMBLIES**
    Remove the 4 bolts and mounting assembly.
14. **REMOVE ENGINE WIRE BRACKET**
15. **REMOVE CRANKSHAFT POSITION SENSOR CONNECTOR BRACKET**

EG5MU–02

COMPONENTS FOR CYLINDER BLOCK DISASSEMBLY AND ASSEMBLY





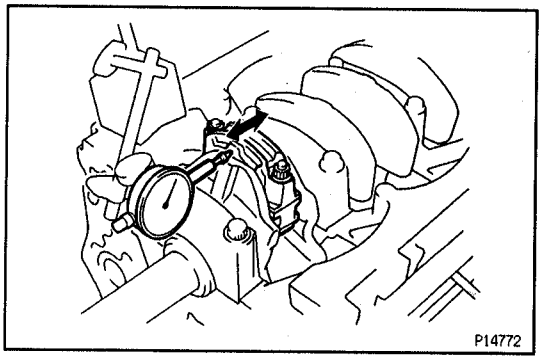
CYLINDER BLOCK DISASSEMBLY

EG5MV-02

1. REMOVE REAR OIL SEAL RETAINER

(a) Remove the 6 bolts.

(b) Using a screwdriver, remove the oil seal retainer by prying the portions between the oil seal retainer and cylinder block.



2. CHECK CONNECTING ROD THRUST CLEARANCE

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

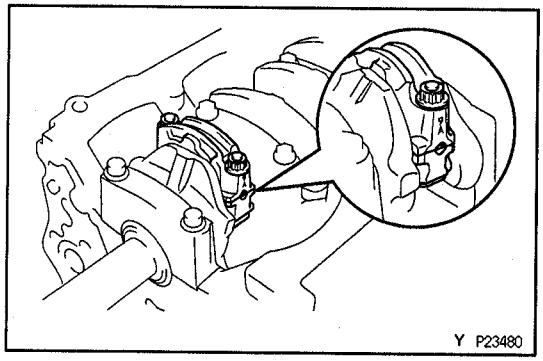
Standard thrust clearance:

0.160 – 0.312 mm (0.0063 – 0.0123 in.)

Maximum thrust clearance:

0.35 mm (0.0138 in.)

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

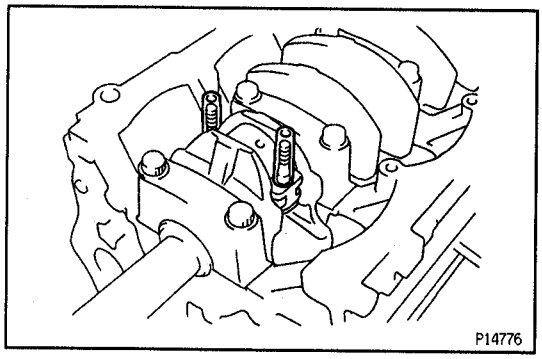


3. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

(a) Check the matchmarks on the connecting rod and cap are aligned to ensure correct reassembly.

(b) Remove the connecting rod cap nuts.

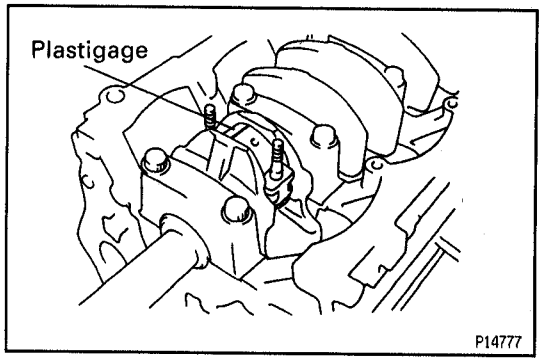
(c) Using a plastic–faced hammer, lightly tap the connecting rod bolts and lift off the connecting rod cap.
HINT: Keep the lower bearing inserted with the connecting rod cap.



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

(e) Clean the crank pin and bearing.

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



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

(h) Install the connecting rod cap with the 2 nuts.
(See step 9 in cylinder block assembly)

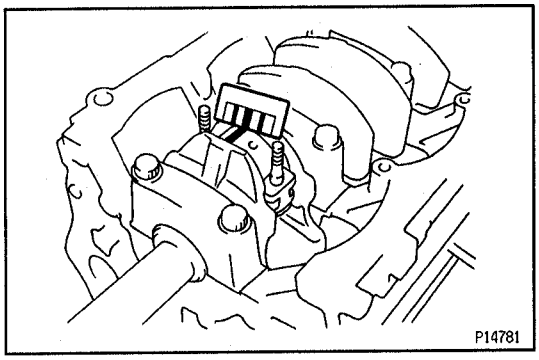
Torque:

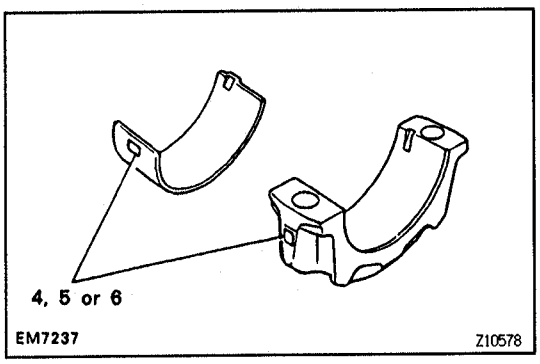
1st 45 N·m (460 kgf·cm, 33 ft·lbf)

2nd Turn 90°

NOTICE: Do not turn the crankshaft.

(i) Remove the 2 nuts and connecting rod cap.
(See procedure (b) and (c) above)


P14781



EM7237 Z10578

(j) Measure the Plastigage at its widest point.

Standard oil clearance:

STD

0.030 – 0.055 mm (0.0012 – 0.0022 in.)

U/S 0.25

0.031 – 0.071 mm (0.0012 – 0.0026 in.)

Maximum oil clearance:

0.10 mm (0.0039 in.)

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

HINT: If using a standard bearing, replace with one having the same number as marked on the bearing cap. There are 3 sizes of standard bearings, marked "4", "5" and "6" accordingly.

Reference:

Connecting rod big end inside diameter:

STD Mark "4"	56.000 – 56.006 mm (2.2047 – 2.2050 in.)
STD Mark "5"	56.006 – 56.012 mm (2.2050 – 2.2052 in.)
STD Mark "6"	56.012 – 56.018 mm (2.2052 – 2.2054 in.)
U/S 0.25	56.000 – 56.018 mm (2.2047 – 2.2054 in.)

Crankshaft crank pin diameter:

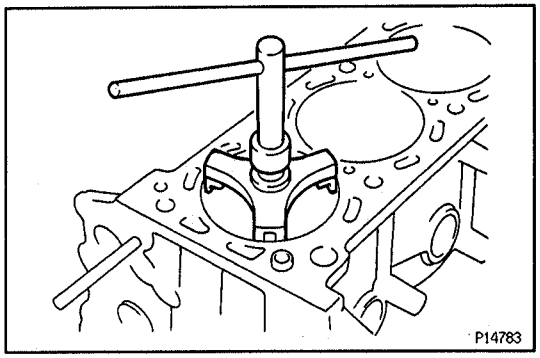
STD	52.987 – 53.000 mm (2.0861 – 2.0866 in.)
U/S 0.25	52.745 – 52.755 mm (2.0766 – 2.0770 in.)

Standard sized bearing center wall thickness:

STD Mark "4"	1.482 – 1.485 mm (0.0583 – 0.0585 in.)
STD Mark "5"	1.485 – 1.488 mm (0.0585 – 0.0586 in.)
STD Mark "6"	1.488 – 1.491 mm (0.0586 – 0.0587 in.)
U/S 0.25	1.601 – 1.607 mm (0.0630 – 0.0633 in.)

(k) Completely remove the Plastigage.

4. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

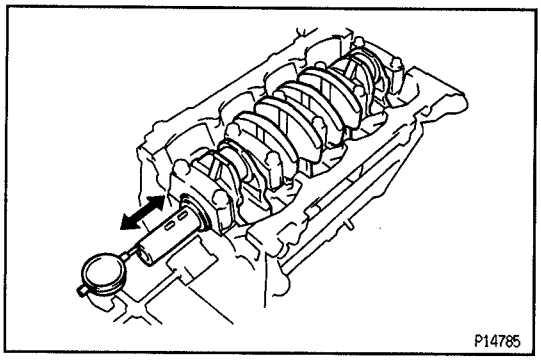

P14783

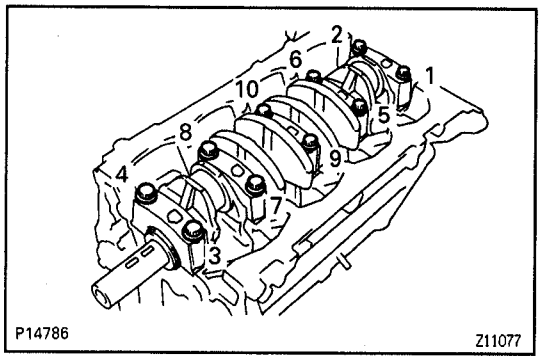
(a) Using a ridge reamer, remove the all carbon from the top of the cylinder.

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

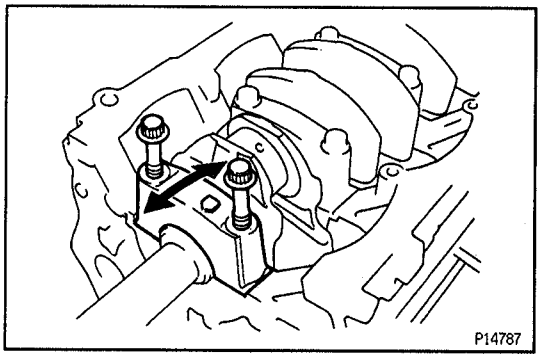
HINT:

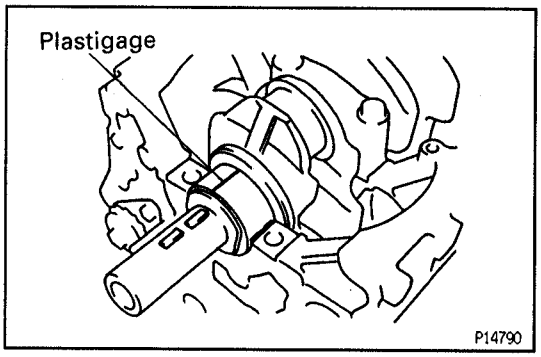
- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in correct order.


P14785



P14786 Z11077


P14787



P14790

5. CHECK CRANKSHAFT THRUST CLEARANCE

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

Standard thrust clearance:

0.020 – 0.220 mm (0.0008 – 0.0087 in.)

Maximum thrust clearance:

0.30 mm (0.0118 in.)

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

Thrust washer thickness:

2.440 – 2.490 mm (0.0961 – 0.0980 in.)

6. REMOVE MAIN BEARING CAPS AND CHECK OIL CLEARANCE

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

(b) Using the removed main bearing cap bolts, pry the main bearing cap back and forth, and remove the main bearing caps, lower bearings and (No.3 main bearing cap only) lower thrust washers.

HINT:

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

(c) Lift out the crankshaft.

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

(d) Clean each main journal and bearing.

(e) Check each main journal and bearing for pitting and scratches.

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

(f) Place the crankshaft on the cylinder block.

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

(h) Install the main bearing caps.

(See step 7 in cylinder block assembly)

Torque:

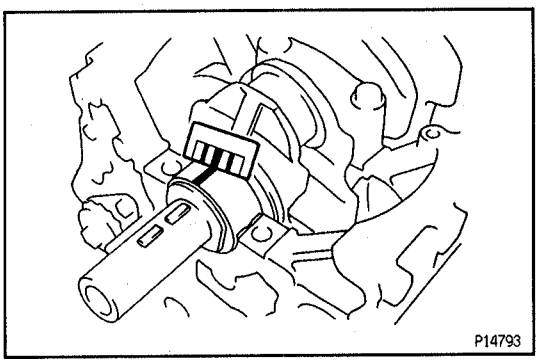
1st 39 N·m (400 kgf·cm, 29 ft·lbf)

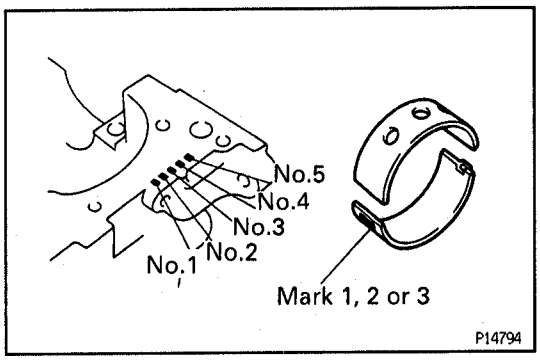
2nd Turn 90°

NOTICE: Do not turn the crankshaft.

(i) Remove the main bearing caps.

(See procedure (a) and (b) above)


P14793



P14794

(j) Measure the Plastigage at its widest point.

Standard clearance:

STD

No.3

0.030 – 0.055 mm (0.0012 – 0.0022 in.)

Others

0.024 – 0.049 mm (0.0009 – 0.0019 in.)

U/S 0.25

No.3

0.030 – 0.070 mm (0.0012 – 0.0028 in.)

Others

0.025 – 0.065 mm (0.0010 – 0.0026 in.)

Maximum clearance:

0.10 mm (0.0039 in.)

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

HINT: If using a standard bearing, replace with one having the same number as marked on the block. There are 3 sizes of standard bearings, marked "1", "2" and "3" accordingly.

Reference:

Cylinder block main journal bore diameter:

STD Mark "1"	64.004 – 64.010 mm (2.5198 – 2.5201 in.)
STD Mark "2"	64.011 – 64.016 mm (2.5201 – 2.5203 in.)
STD Mark "3"	64.017 – 64.022 mm (2.5203 – 2.5205 in.)
U/S 0.25	64.000 – 64.024 mm (2.5197 – 2.5206 in.)

Crankshaft Journal diameter:

STD No.3	59.981 – 59.994 mm (2.2615 – 2.3620 in.)
STD Others	59.987 – 60.000 mm (2.3617 – 2.3622 in.)
U/S 0.25 No.3	59.740 – 59.750 mm (2.3520 – 2.3524 in.)
U/S 0.25 Others	59.745 – 59.755 mm (2.3522 – 2.3526 in.)

Bearing center wall thickness:

STD Mark "1"	1.987 – 1.990 mm (0.0782 – 0.0783 in.)
STD Mark "2"	1.991 – 1.993 mm (0.0784 – 0.0785 in.)
STD Mark "3"	1.994 – 1.996 mm (0.0785 – 0.0786 in.)
U/S 0.25	2.106 – 2.112 mm (0.0829 – 0.0831 in.)

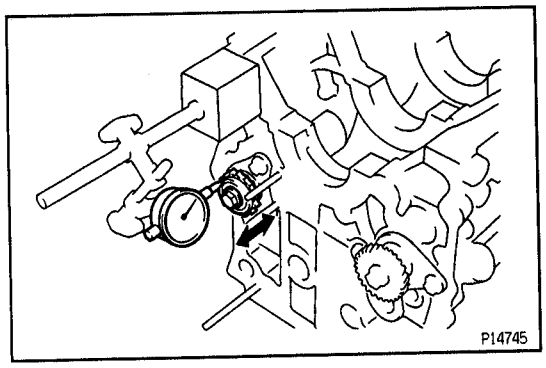
(k) Completely remove the Plastigage.

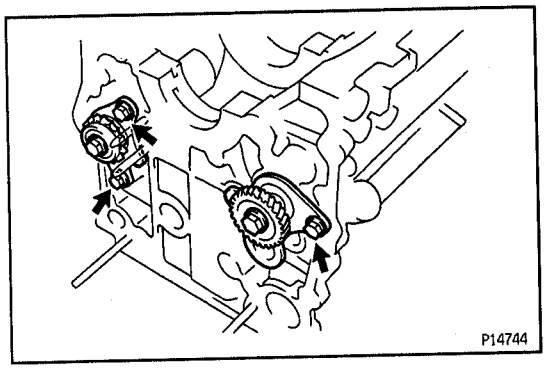
7. REMOVE CRANKSHAFT

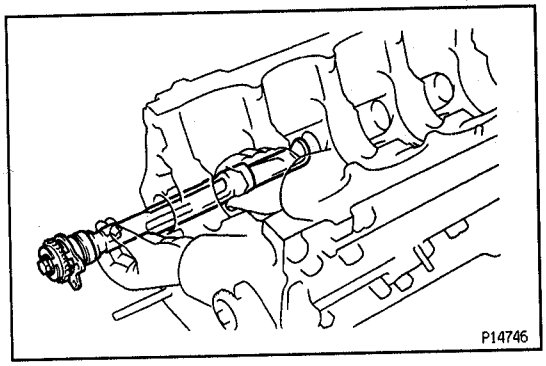
(a) Lift out the crankshaft.

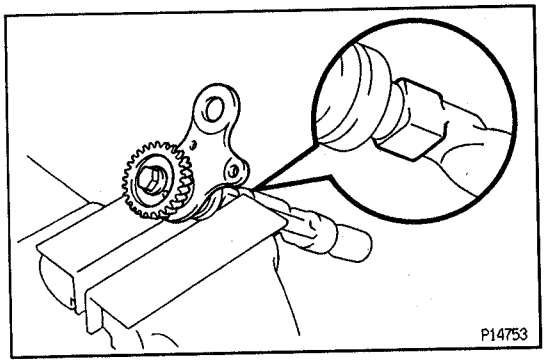
(b) Remove the upper main bearings and upper thrust washers from the cylinder block.

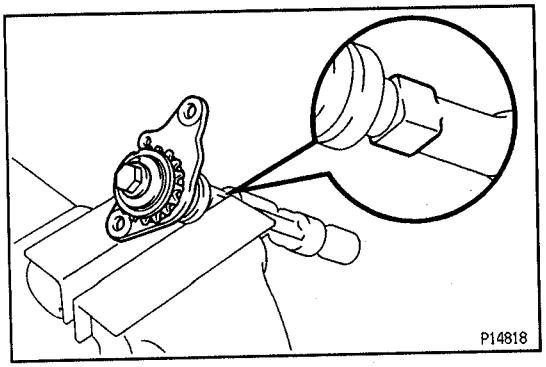
HINT: Arrange the main bearings and thrust washers in correct order.











3RZ–FE:

Balance Shaft

8. CHECK THRUST CLEARANCES OF NO.1 (RH) AND NO.2 (LH) BALANCE SHAFTS

Using a dial indicator, measure the thrust clearance while moving the balance shaft back and forth.

Standard thrust clearance:

0.07 – 0.13 mm (0.0027 – 0.0051 in.)

Maximum thrust clearance:

0.20 mm (0.0079 in.)

If the thrust clearance is greater than maximum, replace the balance shaft thrust washer.

If necessary, replace the balance shaft.

9. REMOVE NO.1 (RH) AND NO.2 (LH) BALANCE SHAFTS

(a) Remove the 1 bolt from the No.1 balance shaft.

(b) Remove the 2 bolts from the No.2 balance shaft.

(c) Remove the balance shafts.

NOTICE: When removing the balance shaft make sure you support the balance shaft with both hands and avoid scratching the balance shaft bearing on the cylinder block side.

10. DISASSEMBLE NO.1 (RH) BALANCE SHAFT

(a) Mount the hexagon wrench head portion of the balance shaft in a vise.

NOTICE: Be careful not to damage the balance shaft.

(b) Remove these parts:

- Bolt
- No.1 balance shaft thrust plate
- Balance shaft thrust spacer
- Balance shaft timing gear
- Key

11. DISASSEMBLE NO.2 (LH) BALANCE SHAFT

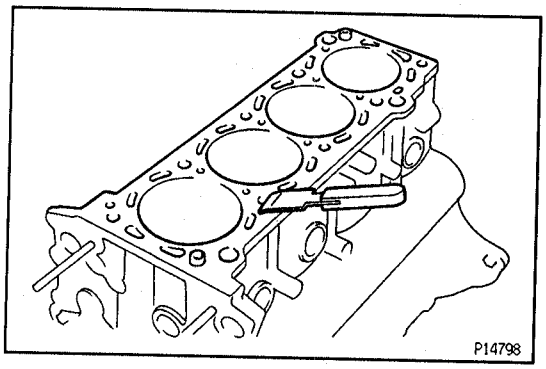
(a) Mount the hexagon wrench head portion of the balance shaft in a vise.

NOTICE: Be careful not to damage the balance shaft.

(b) Remove these parts:

- Bolt
- No.2 balance shaft thrust prate
- Balance shaft timing sprocket

EG



CYLINDER BLOCK INSPECTION

EG5MW-02

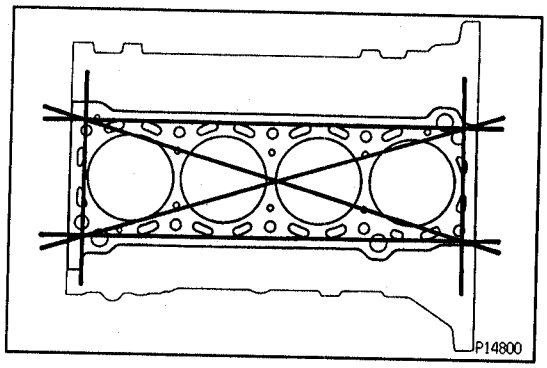
1. CLEAN CYLINDER BLOCK

A. Remove gasket material

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

B. Clean cylinder block

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



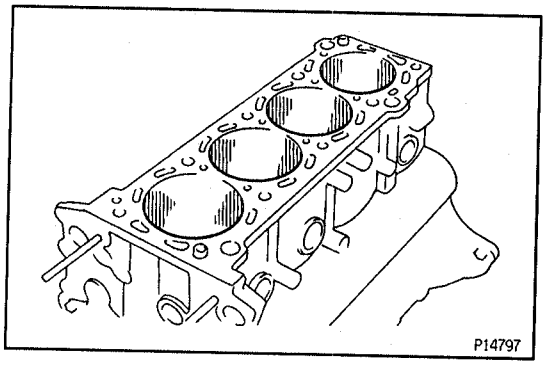
2. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS

Using a precision straight edge and thickness gauge, measure the surfaces contacting the cylinder head gasket for warpage.

Maximum warpage:

0.05 mm (0.0020 in.)

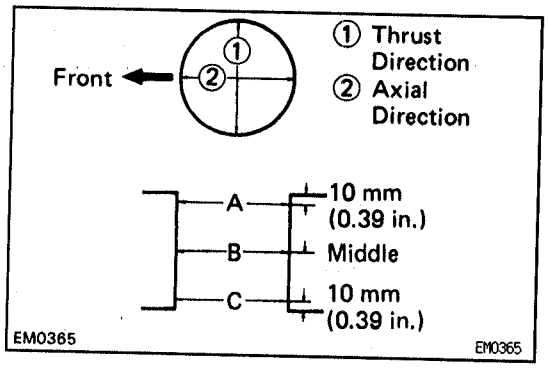
If warpage is greater than maximum, replace the cylinder block.



3. INSPECT CYLINDER FOR VERTICAL SCRATCHES

Visually check the cylinder for vertical scratches.

If deep scratches are present, rebore all the 4 cylinders. If necessary, replace the cylinder block.



4. INSPECT CYLINDER BORE DIAMETER

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

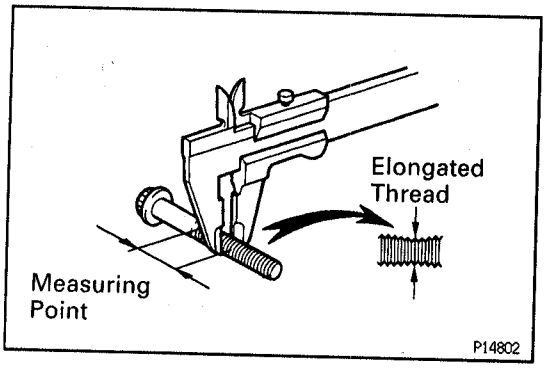
Standard diameter:

94.990 – 95.003 mm (3.7400 – 3.7403 in.)

Maximum diameter:

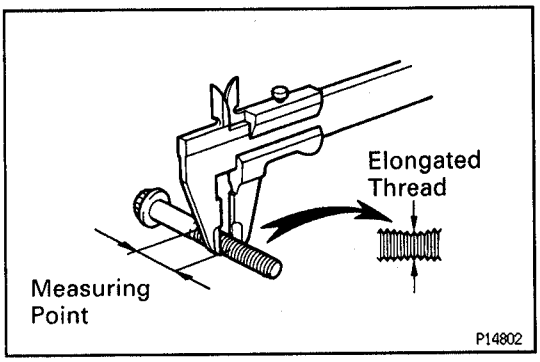
95.06 mm (3.7425 in.)

If the diameter is greater than maximum, rebore all the 4 cylinders. If necessary, replace the cylinder block.



5. REMOVE CYLINDER RIDGE

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



6. INSPECT MAIN BEARING CAP BOLTS

Using vernier calipers, measure the minimum diameter of the elongated thread at the measuring point.

Standard outside diameter:

10.76 – 10.97 mm (0.4236 – 0.4319 in.)

Minimum outside diameter:

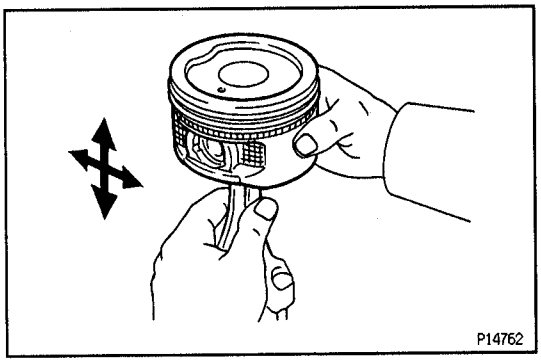
10.40 mm (0.4094 in.)

If the diameter is less than minimum, replace the bolt.

EG

PISTON AND CONNECTING ROD ASSY DISASSEMBLY

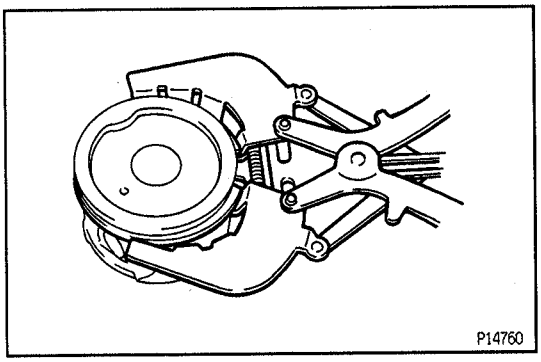
EGSMX–02



1. CHECK FIT BETWEEN PISTON AND PISTON PIN

Try to move the piston back and forth on the piston pin.

If any movement is felt, replace the piston and pin as a set.

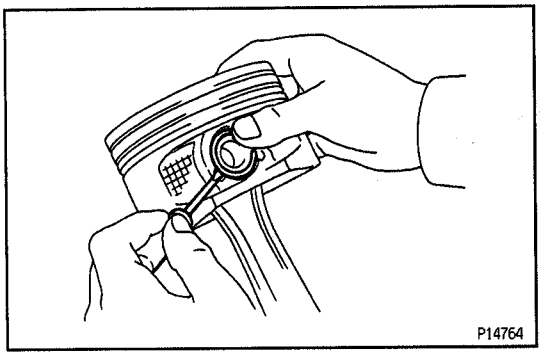


2. REMOVE PISTON RINGS

(a) Using a piston ring expander, remove the 2 compression rings.

(b) Remove the 2 side rails and oil ring by hand.

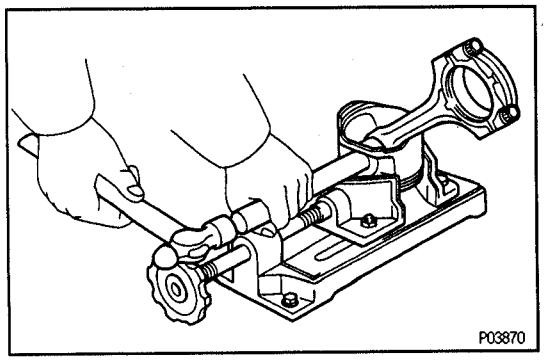
HINT: Arrange the rings in correct order only.



3. DISCONNECT CONNECTING ROD FROM PISTON

(a) Using a small screwdriver, pry out the 2 snap rings.

(b) Gradually heat the piston to 80 – 90°C (176 – 194 °F).



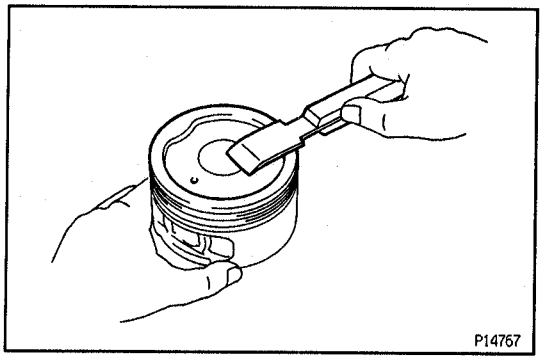
(c) Using plastic–faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.

HINT:

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

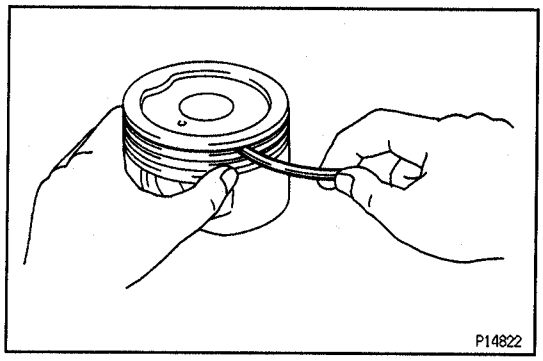
EG64L–01

PISTON AND CONNECTING ROD INSPECTION



1. CLEAN PISTON

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



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

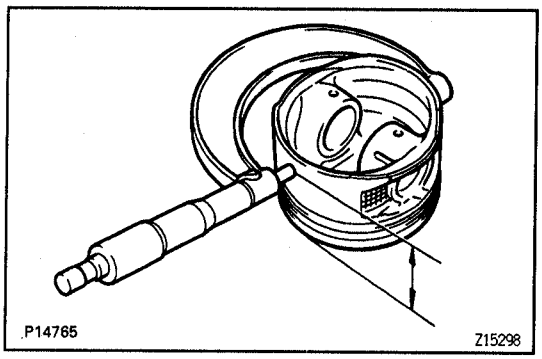
(c) Using solvent and a brush, thoroughly clean the piston.

NOTICE: Do not use a wire brush.

2. INSPECT PISTON AND PISTON RING

A. Inspect piston oil clearance

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 35.5 mm (1.40 in.) for 2RZ–FE or 37.5 mm (1.47 in.) for 3RZ–FE from the piston head.



Piston diameter:

STD

2RZ–FE:

94.923 – 94.933 mm (3.7371 – 3.7375 in.)

3RZ–FE:

94.933 – 94.943 mm (3.7375 – 3.7379 in.)

O/S 0.50

2RZ–FE:

95.423 – 95.433 mm (3.7568 – 3.7572 in.)

3RZ–FE:

95.433 – 95.443 mm (3.7572 – 3.7576 in.)

(b) Measure the cylinder bore diameter in the thrust directions. (See step 4 in cylinder block inspection)

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

Standard oil clearance:

2RZ–FE:

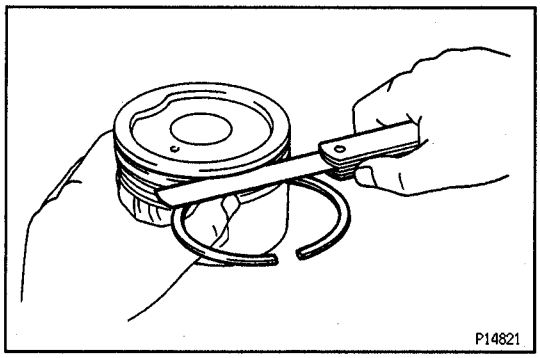
0.057 – 0.080 mm (0.0022 – 0.0031 in.)

3RZ–FE:

0.047 – 0.070 mm (0.0019 – 0.0028 in.)

If the oil clearance is greater than maximum, replace all the 4 pistons and rebore all the 4 cylinders. If necessary, replace the cylinder block.

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



B. Inspect piston ring groove clearance

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

Ring groove clearance:

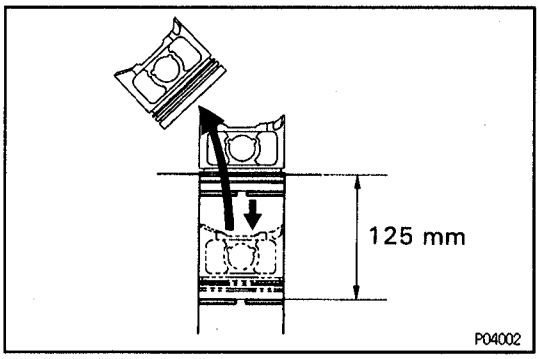
No.1

0.020 – 0.070 mm (0.0008 – 0.0028 in.)

No.2

0.030 – 0.070 mm (0.0012 – 0.0028 in.)

If the clearance is not as specified, replace the piston.



C. Inspect piston ring end gap

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

(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 125 mm (4.92 in.) from the top of the cylinder block.

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

Ring end gap:

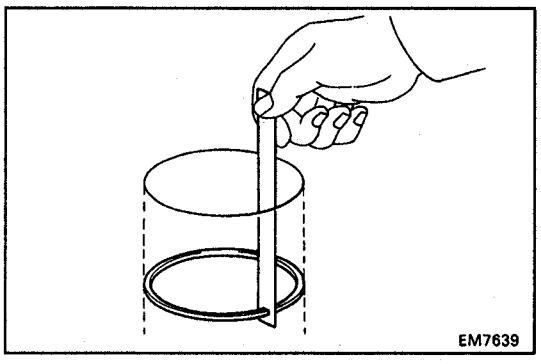
No.1

0.300 – 0.400 mm (0.0118 – 0.0157 in.)

No.2

0.400 – 0.500 mm (0.0157 – 0.0197 in.)

If the end gap is not as specified, replace the piston ring. If the end gap is not as specified, even with a new piston ring, rebore all the 4 cylinders or replace the cylinder block.



D. Inspect piston pin fit

At 80 – 90°C (176 – 194°F), you should be able to push the piston pin into the piston pin hole with your thumb.

3. INSPECT CONNECTING ROD

A. Inspect connecting rod alignment

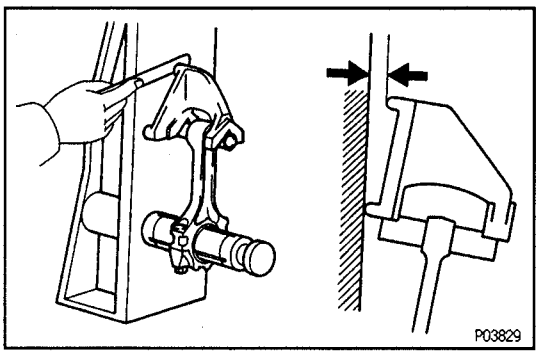
Using a rod aligner and thickness gauge, check the connecting rod alignment.

- Check for out–of–alignment.

Maximum out–of–alignment:

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

If out–of–alignment is greater than maximum, replace the connecting rod assembly.

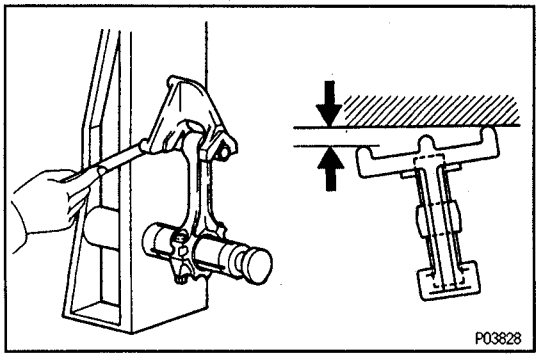


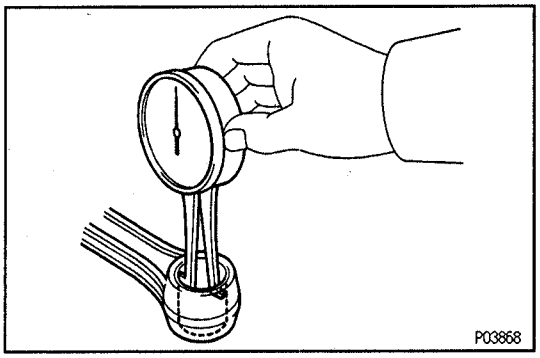
- Check for twist

Maximum twist:

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

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



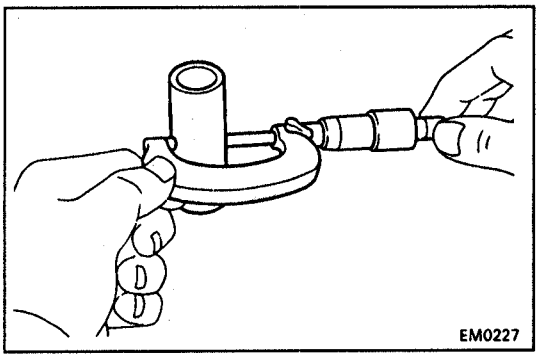


B. Inspect piston pin oil clearance

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

Bushing inside diameter:

24.008 – 24.017 mm (0.9452 – 0.9455 in.)



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

Piston pin diameter:

24.000 – 24.009 mm (0.9449 – 0.9452 in.)

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

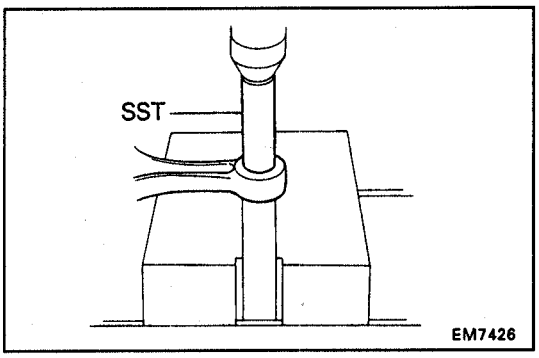
Standard oil clearance:

0.005 – 0.011 mm (0.0002 – 0.0004 in.)

Maximum oil clearance:

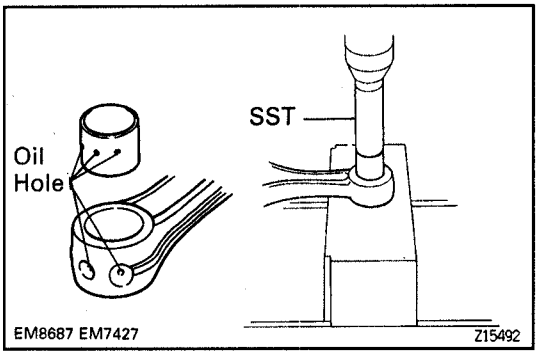
0.015 mm (0.0006 in.)

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



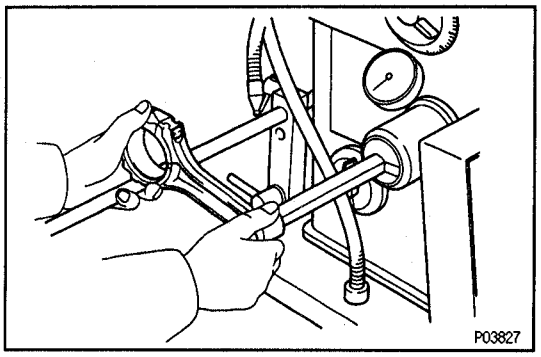
C. If necessary, replace connecting rod bushing

(a) Using SST and a press, press out the bushing.
SST 09207–76010

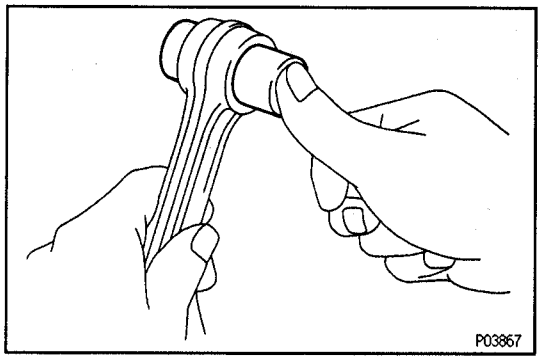


(b) Align the oil holes of a new bushing and the connecting rod.

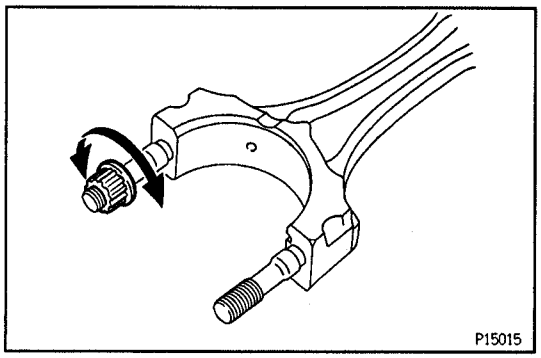
(c) Using SST and a press, press in the bushing.
SST 09207–76010



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



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



D. Inspect connecting rod bolts

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

(b) If the cap nut cannot be turned easily, measure the minimum outside diameter of the connecting rod bolt with vernier calipers.

Standard outside diameter:

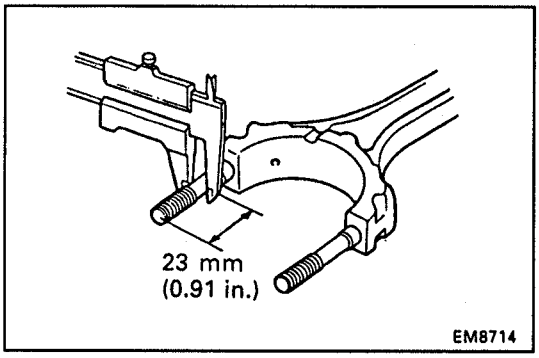
7.80 – 7.90 mm (0.3071 – 0.3110 in.)

Minimum outside diameter:

7.60 mm (0.2992 in.)

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

If the outside diameter is less than limit, replace the connecting rod bolt and nut as a set.



EG35J–06

3RZ–FE:
BALANCE SHAFT INSPECTION

INSPECT NO. 1 (RH) AND NO. 2 (LH) BALANCE SHAFTS

(a) Using a cylinder gauge, measure the inside diameter of the balance shaft bearing.

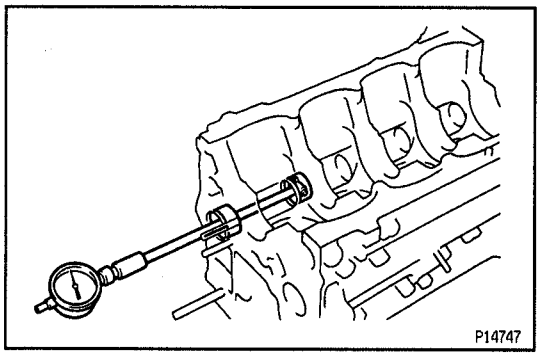
Bearing inside diameter (from front side):

No.1 (RH)

38.025 – 38.045 mm (1.4970 – 1.4978 in.)

No.2 (LH)

37.525 – 37.545 mm (1.4774 – 1.4781 in.)



(b) Using a micrometer, measure the diameter of the balance shaft main journals.

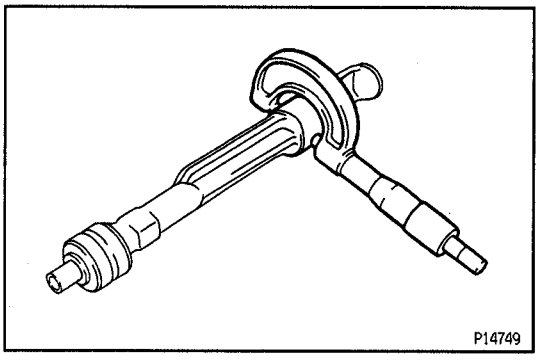
Main journal diameter (from front side):

No.1 (RH)

37.969 – 37.985 mm (1.4948 – 1.4955 in.)

No.2 (LH)

37.449 – 37.465 mm (1.4744 – 1.4750 in.)



(c) Subtract the balance shaft main journal diameter measurement from the balance shaft bearing inside diameter measurement.

Standard oil clearance:

No.1 (RH)

0.040 – 0.076 mm (0.0016 – 0.0031 in.)

No.2 (LH)

0.060 – 0.096 mm (0.0024 – 0.0038 in.)

Maximum oil clearance:

0.15 mm (0.0059 in.)

If the clearance is greater than maximum, replace the cylinder block and balance shaft.

EG64M–01

CYLINDER BORING

HINT:

- Bore all the 4 cylinders for the oversized piston outside diameter.
- Replace all the piston rings with ones to match the oversized pistons.

1. SELECT OVERSIZED PISTONS

Oversized piston diameter:

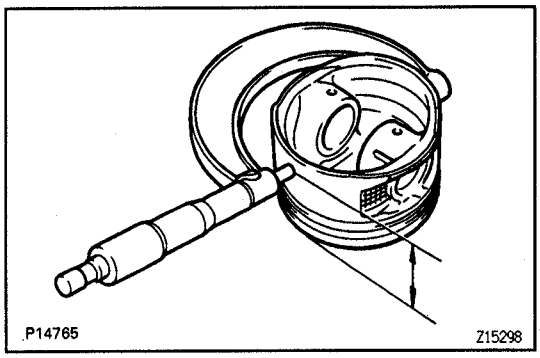
O/S 0.50

2RZ–FE:

95.423 – 95.433 mm (3.7568 – 3.7572 in.)

3RZ–FE:

95.433 – 95.443 mm (3.7572 – 3.7576 in.)



2. CALCULATE AMOUNT TO BORE CYLINDERS

(a) Using a micrometer, measure the piston diameter at right angles to the piston pin center line, 35.5 mm (1.40 in.) for 2RZ–FE or 37.5 mm (1.47 in.) for 3RZ–FE from the piston head.

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

Size to be rebored = P + C – H

P = Piston diameter

C = Piston clearance

2RZ–FE:

0.057 – 0.080 mm (0.0022 – 0.0031 in.)

3RZ–FE:

0.047 – 0.070 mm (0.0019 – 0.0028 in.)

H = Allowance for honing

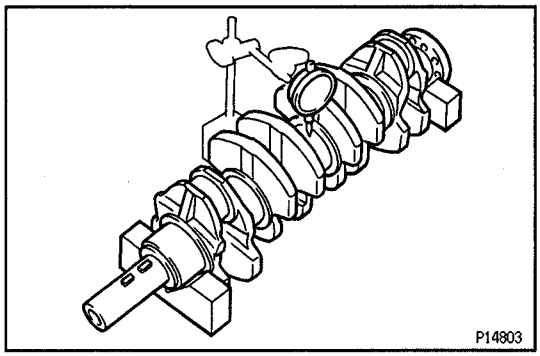
0.020 mm (0.0008 in.) or less

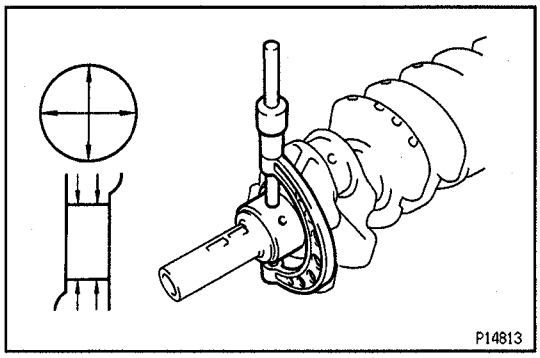
3. BORE AND HONE CYLINDER TO CALCULATED DIMENSIONS

Maximum honing:

0.02 mm (0.0008 in.)

NOTICE: Excess honing will destroy the finished roundness.





CRANKSHAFT INSPECTION AND REPAIR EG0BY-1G

1. INSPECT CRANKSHAFT FOR RUNOUT

(a) Place the crankshaft on V–blocks.

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

Maximum circle runout:

0.03 mm (0.0012 in.)

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

2. INSPECT MAIN JOURNALS AND CRANK PINS

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

Main journal diameter:

STD

No.3

59.981 – 59.994 mm (2.2615 – 2.3620 in.)

Others

59.987 – 60.000 mm (2.3617 – 2.3622 in.)

U/S 0.25

No.3

59.740 – 59.750 mm (2.3520 – 2.3524 in.)

Others

59.745 – 59.755 mm (2.3522 – 2.3526 in.)

Crank pin diameter:

STD

52.987 – 53.000 mm (2.0861 – 2.0866 in.)

U/S 0.25

52.745 – 52.755 mm (2.0766 – 2.0770 in.)

If the diameter is not as specified, check the oil clearance (See steps 3 and 6 in cylinder block disassembly). If necessary, grind or replace the crankshaft.

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

Maximum taper and out–of–round:

0.005 mm (0.0002 in.)

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

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

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

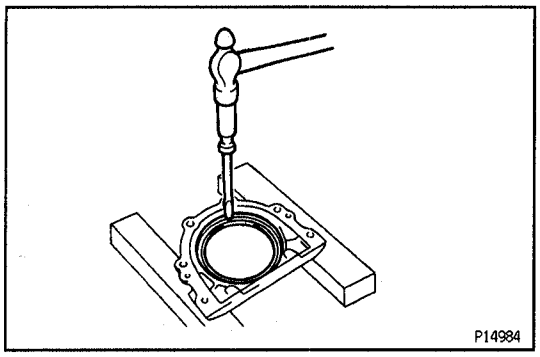
Install new main journal and/or crank pin undersized bearings.

EG

CRANKSHAFT OIL SEALS REPLACEMENT EGSNO-02

HINT: There are 2 methods (A and B) to replace the oil seal which are as follows:

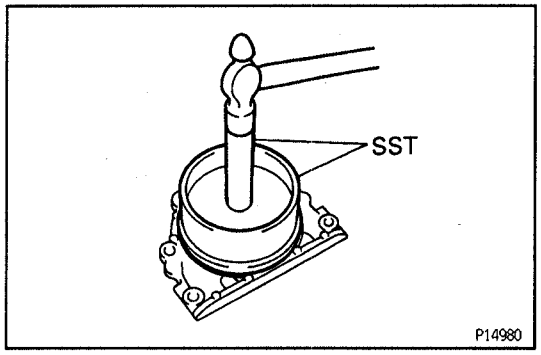
1. REPLACE CRANKSHAFT FRONT OIL SEAL
(See crankshaft front oil seal replacement in Lubrication System)


P14984

2. REPLACE CRANKSHAFT REAR OIL SEAL

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

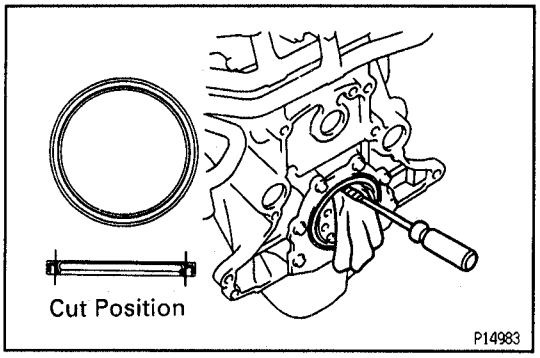
(a) Using a screwdriver and a hammer, tap out the oil seal.



P14980

(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil seal retainer edge.
SST 09223–15030, 09950–70010 (09951–07150)

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



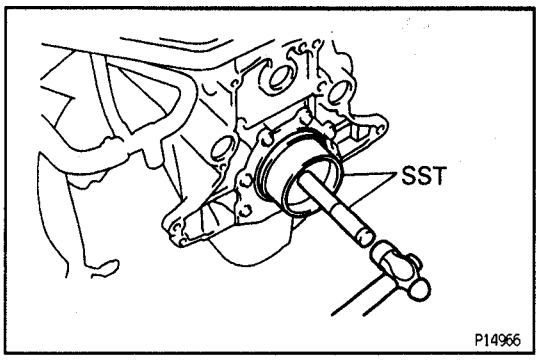
P14983

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

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

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

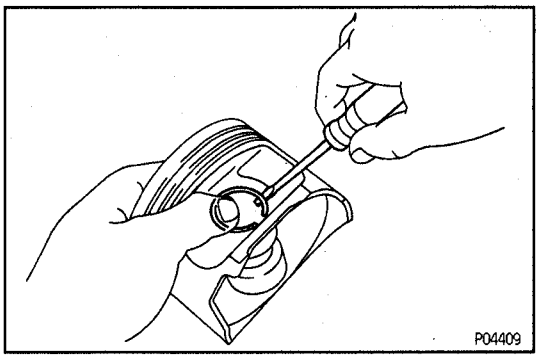
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



(c) Apply MP grease to a new oil seal lip.
(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223–15030, 09950–70010 (09951–07150)

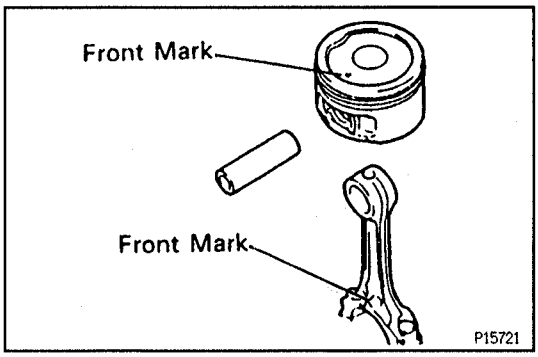
EG5N1–02

PISTON AND CONNECTING ROD ASSEMBLY

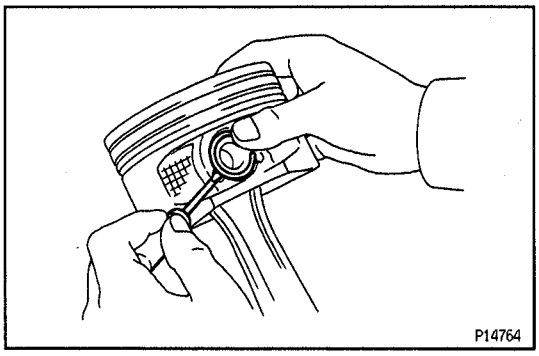


1. ASSEMBLE PISTON AND CONNECTING ROD

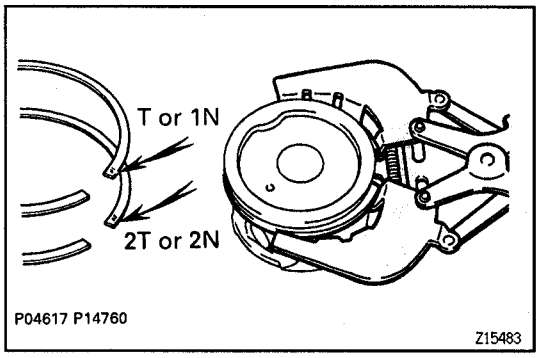
(a) Install a new snap ring on one side of the piston pin hole.
(b) Gradually heat the piston to 80–90°C (176–194°F).



(c) Coat the piston pin with engine oil.
(d) Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb.

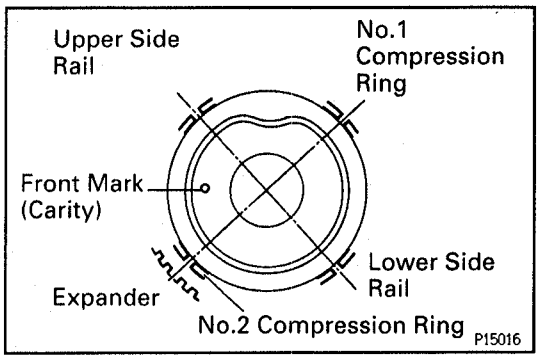


(e) Install a new snap ring on the other side of the piston pin hole.



2. INSTALL PISTON RINGS

(a) Install the oil ring expander and 2 side rails by hand.
(b) Using a piston ring expander, install the 2 compression rings with the code mark facing upward.
Code mark:
No.1: "T" or "1N"
No.2: "2T" or "2N"



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

3. INSTALL BEARINGS

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

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

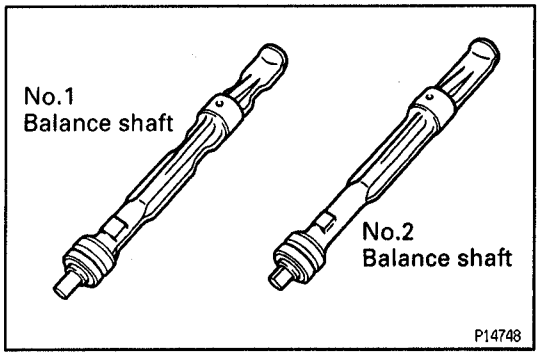
EG

CYLINDER BLOCK ASSEMBLY

EG64N–01

HINT:

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



3RZ–FE:

Balance Shaft

HINT:

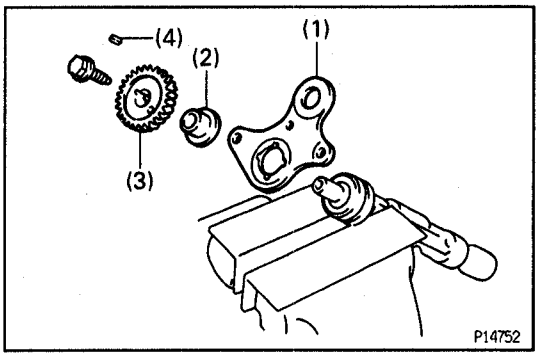
- No.1 balance shaft: Has indentations
- No.3 balance shaft: Has no indentations

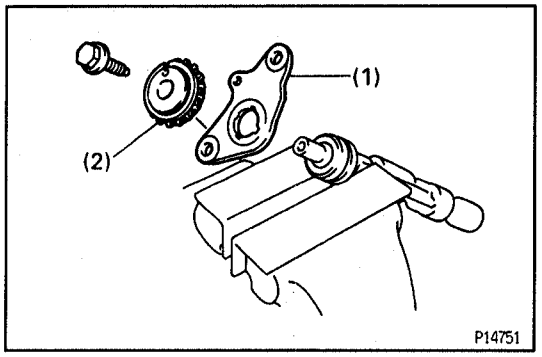
1. ASSEMBLY NO.1 (RH) BALANCE SHAFT

(a) Mount the hexagon wrench head portion of the No.1 balance shaft in a vise.
NOTICE: Be careful not to damage the balance shaft.

(b) Install these parts:
(1) No.1 balance shaft thrust plate
(2) Balance shaft thrust spacer
(3) Balance shaft timing gear
(4) Key

(c) Install and torque the bolt.
Torque: 36 N·m (365 kgf·cm, 26 ft·lbf)



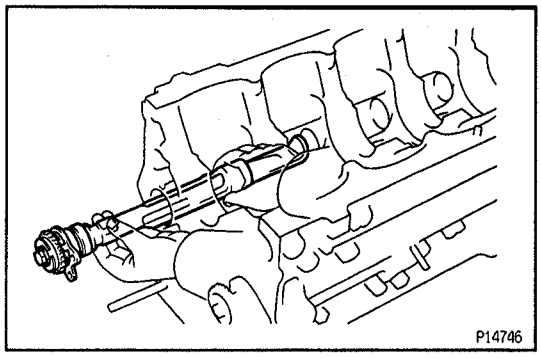


2. ASSEMBLY NO.2 (LH) BALANCE SHAFT

(a) Mount the hexagon wrench head portion of the No.2 balance shaft in a vise.
NOTICE: Be careful not to damage the balance shaft.

(b) Install these parts:
(1) No.2 balance shaft thrust plate
(2) Balance shaft timing sprocket

(c) Install and torque the bolt.
Torque: 36 N·m (365 kgf·cm, 26 ft·lbf)



3. INSTALL BALANCE SHAFTS

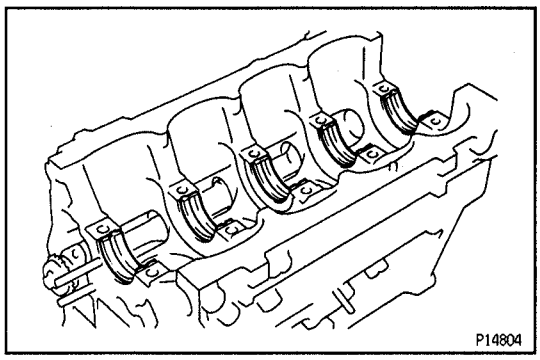
(a) Install balance shafts.

NOTICE: When installing the balance shaft make sure you support the balance shaft with both hands and avoid scratching the balance shaft bearing on the cylinder block side.

(b) Install the No.1 balance shaft with the bolt.

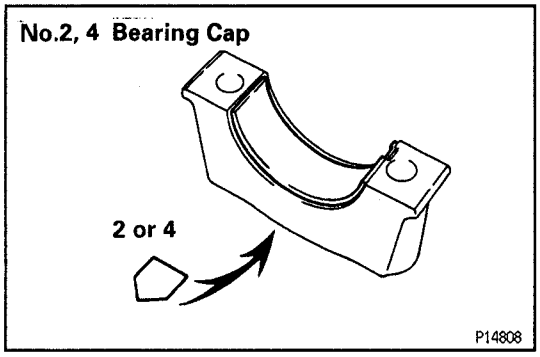
(c) Install the No.2 balance shaft with the 2 bolts.

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



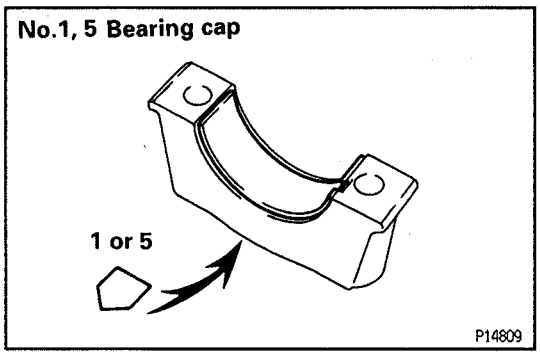
4. INSTALL MAIN BEARINGS

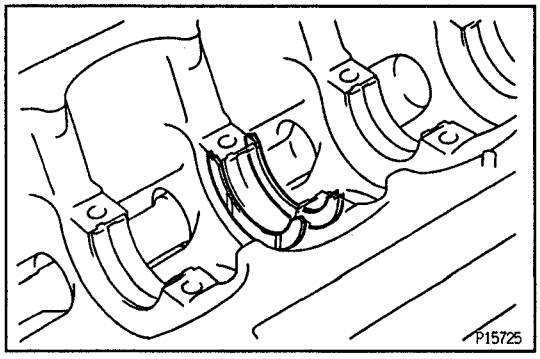
(a) Align the bearing claw with the claw groove of the cylinder block, and push in the 5 upper bearings.



(b) Align the bearing claw with the claw groove of the main bearing cap, and push in the 5 lower bearings.

HINT: A number is marked on each main bearing cap to indicate the installation position.

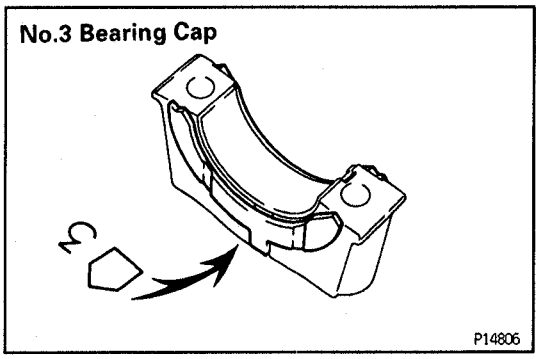




5. INSTALL UPPER THRUST WASHERS

Install the 2 thrust washers under the No.3 journal position of the cylinder block with the oil grooves facing outward.

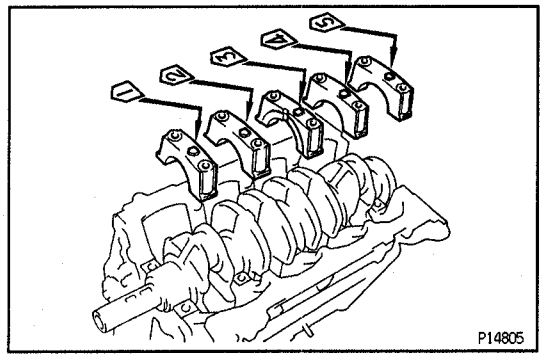
6. PLACE CRANKSHAFT ON CYLINDER BLOCK



7. INSTALL MAIN BEARING CAPS AND LOWER THRUST WASHERS

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

(a) Install the 2 thrust washers on the No.3 bearing cap with the grooves facing outward.



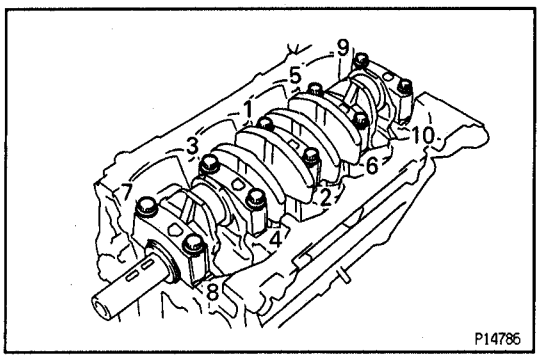
(b) Install the 5 main bearing caps in their proper locations.
HINT: Each bearing cap has a number and front mark.

B. Install main bearing cap bolts

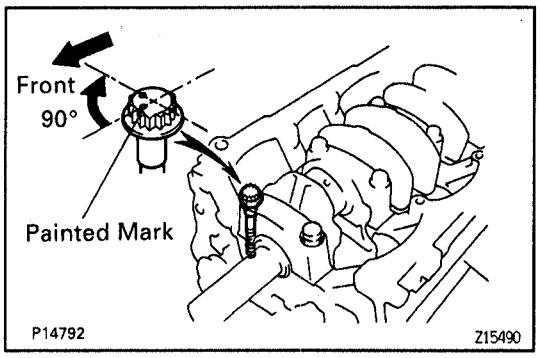
HINT:

- The main bearing cap bolts are tightened in 2 progressive steps (steps (b) and (d)).
- If any of the main bearing cap bolts is broken or deformed, replace it.

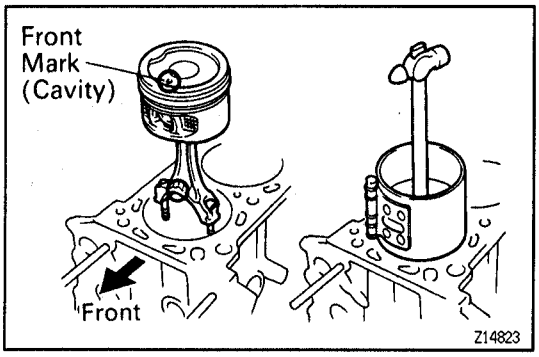
(a) Apply a light coat of engine oil on the threads and under the heads of the main bearing cap bolts.



(b) Install and uniformly tighten the 10 bolts of the main bearing caps, in several passes, in the sequence shown.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)
If any one of the main bearing cap bolts does not meet the torque specification, replace the main bearing cap bolt.

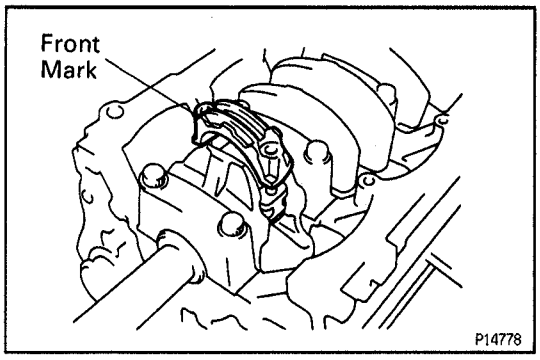


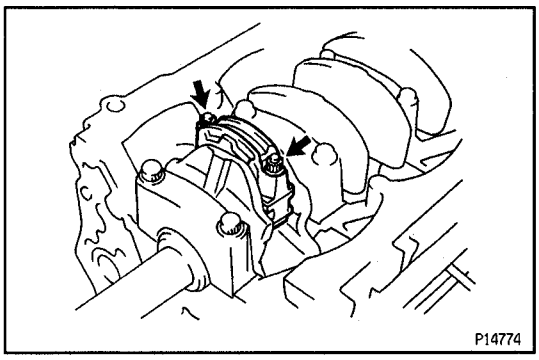
(c) Mark the front of the main bearing cap bolt with paint.
(d) Retighten the main bearing cap bolts by 90° in the numerical order shown above.
(e) Check that the painted mark is now at a 90° angle to the front.
(f) Check that the crankshaft turns smoothly.
(g) Check the crankshaft thrust clearance.
(See step 5 in cylinder block disassembly)

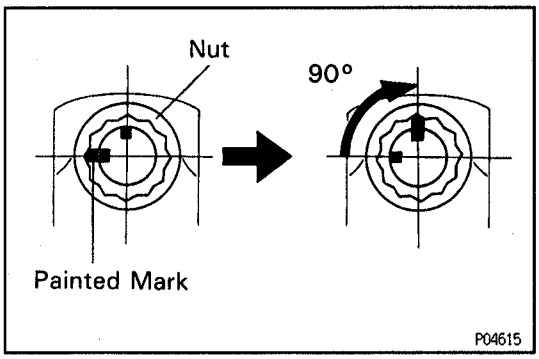


8. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

(a) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.
(b) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.







9. INSTALL CONNECTING ROD CAPS

A. Place connecting rod cap on connecting rod

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

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

B. Install connecting rod cap nuts

HINT:

- The connecting rod cap nuts are tightened in 2 progressive steps (steps (b) and (d)).
- If any connecting rod bolt is broken or deformed, replace it.

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

(b) Install and alternately tighten the nuts of the connecting rod cap in several passes.

Torque: 45 N·m (460 kgf·cm, 33 ft·lbf)

If any one of the connecting rod cap nuts does not meet the torque specification, replace the connecting rod bolt and cap nut as a set.

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

(d) Retighten the connecting rod cap nuts 90° as shown.

(e) Check that the painted mark on the nut is at a 90° angle in relation to the mark on the bolt.

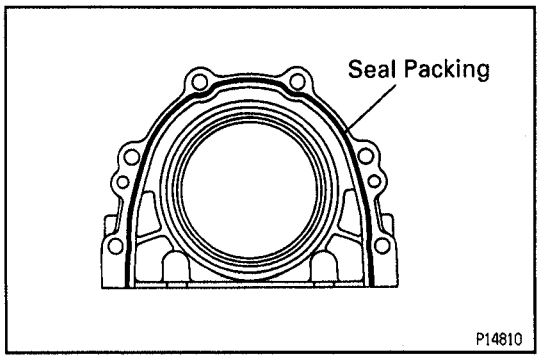
(f) Check that the crankshaft turns smoothly.

(g) Check the connecting rod thrust clearance.
(See step 2 in cylinder block disassembly)

10. INSTALL REAR OIL SEAL RETAINER

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

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



(b) Apply seal packing to the retainer as shown in the illustration.

Seal packing:

Part No. 08826–00080 or equivalent

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

HINT: Avoid applying an excessive amount to the surface.

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

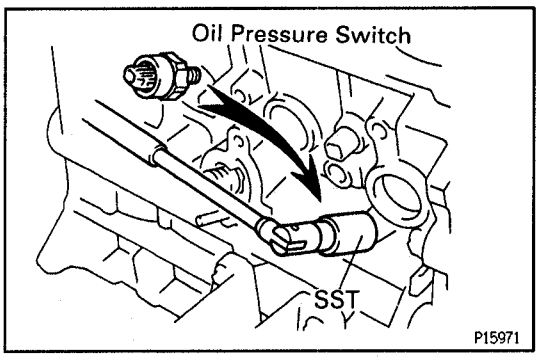
(c) Install the retainer with the 6 bolts.
Torque: 13.5 N·m (135 kgf·cm, 9.7 ft·lbf)

EG

EG5N3–02

AFTER ASSEMBLY

1. **INSTALL CRANKSHAFT POSITION SENSOR CONNECTOR BRACKET**
2. **INSTALL ENGINE WIRE BRACKET**
3. **INSTALL RH AND LH ENGINE MOUNTING ASSEMBLIES**
Torque: 52 N·m (520 kgf·cm, 38 ft·lbf)



4. **INSTALL OIL PRESSURE SWITCH**

(a) Apply adhesive to 2 or 3 threads of the oil pressure switch.
Adhesive:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(b) Using SST, install the oil pressure switch.
SST 09816–30010

5. **INSTALL ENGINE COOLANT DRAIN COCK**
Torque: 24.5 N·m (250 kgf·cm, 18 ft·lbf)

6. **OIL FILTER BRACKET**

A. 2RZ–FE:

(a) Install a new O–ring to the union bolt.

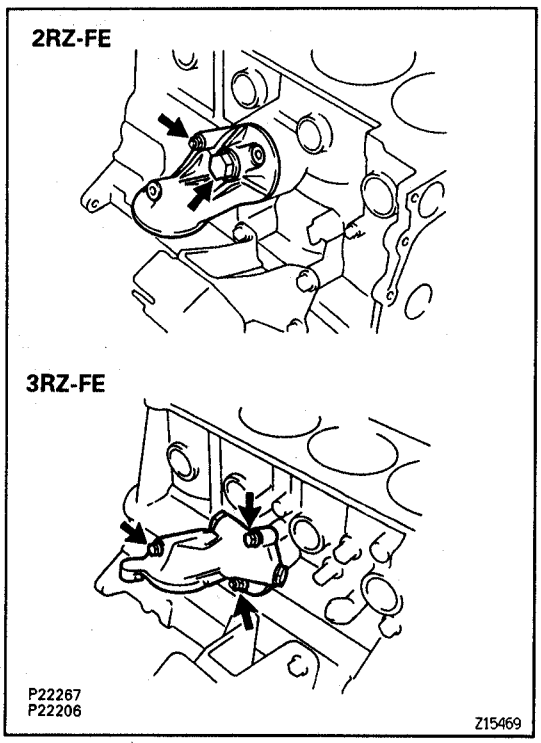
(b) Install a new gasket, the union bolt, nut and oil filter bracket.
Torque:
Union bolt: 68.5 N·m (700 kgf·cm, 51 ft·lbf)
Nut: 12 N·m (120 kgf·cm, 8.9 ft·lbf)

B. 3RZ–FE:

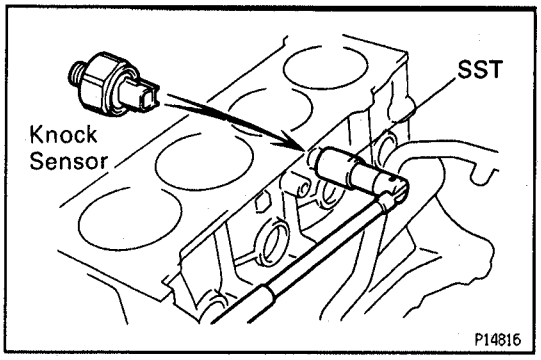
(a) Install a new O–ring to the union.

(b) Using a 14 mm hexagon wrench, install the union.
Torque: 24.5 N·m (250 kgf·cm, 18 ft·lbf)

(c) Install a new O–ring and the oil filter bracket with the 2 bolts and nut.
Torque: 28 N·m (290 kgf·cm, 21 ft·lbf)



7. **INSTALL OIL FILTER**
(See oil and filter replacement in Lubrication System)



8. INSTALL WATER BYPASS PIPE
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

9. INSTALL KNOCK SENSOR
Using SST, install the knock sensor.
SST 09816–30010
Torque: 37 N·m (380 kgf·cm, 27 ft·lbf)

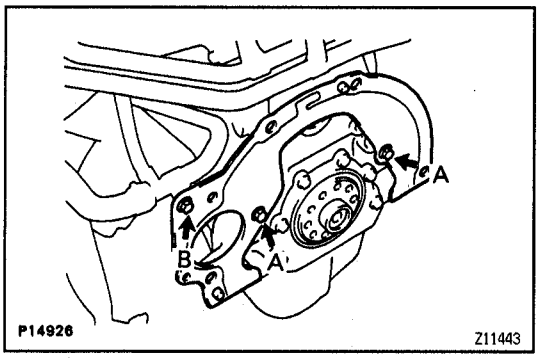
10. INSTALL FUEL FILTER
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

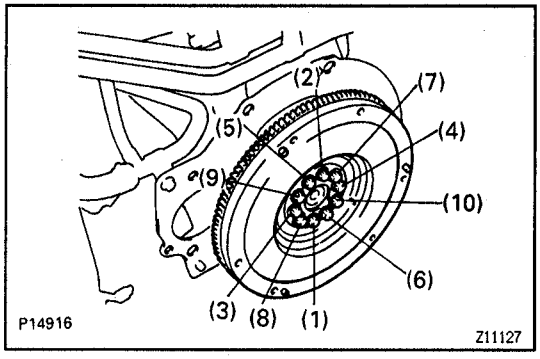
11. INSTALL TIMING CHAINS, GEARS AND SPROCKETS
(See timing chain installation)

12. INSTALL CYLINDER HEAD
(See cylinder head installation)

13. REMOVE ENGINE STAND

14. INSTALL REAR END PLATE
Install the rear end plate with the 3 bolts.
Torque:
Bolt A: 18 N·m (185 kgf·cm, 13 ft·lbf)
Bolt B: 20 N·m (200 kgf·cm, 14 ft·lbf)

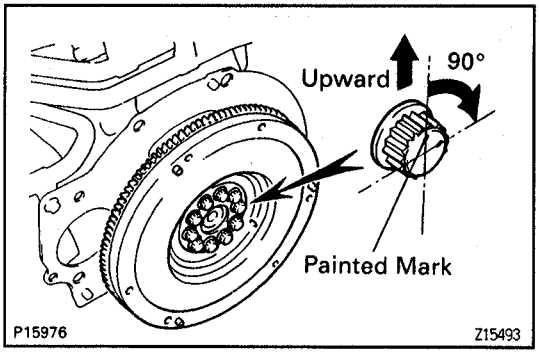




15. M/T:
INSTALL FLYWHEEL

A. 2RZ–FE:
Install and uniformly tighten 10 new bolts to the flywheel, in several passes, in the sequence shown.
Torque: 88 N·m (900 kgf·cm, 65 ft·lbf)

B. 3RZ–FE:
(a) Install and uniformly tighten 10 new bolts to the flywheel, in several passes, in the sequence shown.
Torque: 26.5 N·m (270 kgf·cm, 19 ft·lbf)
(b) Mark the top of the flywheel bolt with paint.
(c) Retighten the flywheel bolts by 90° in the numerical order shown above.
(d) Check that the painted mark is now at a 90° angle to the top.



16. A/T:
INSTALL DRIVE PLATE

(a) Apply adhesive to 2 or 3 threads of the bolt end.
Adhesive:
Part No. 08833–00070, THREE BOND 1324 or equivalent
(b) Install the front spacer, drive plate and rear plate with the 10 bolts.
Torque: 74 N·m (750 kgf·cm, 54 ft·lbf)

EG

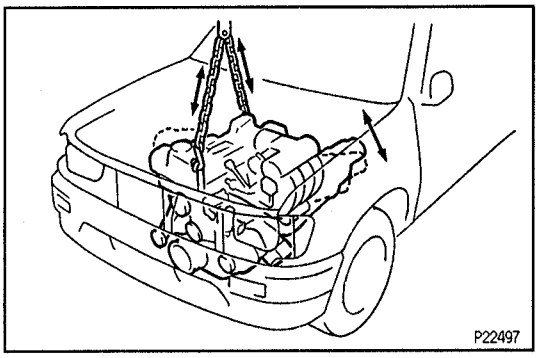
EG3LY–07

2WD:
ENGINE AND TRANSMISSION ASSEMBLY

(See Components for Engine and Transmission Separation (2WD))

EG64P–01

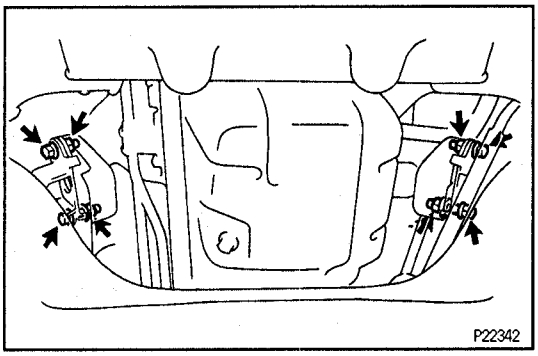
2WD:
ENGINE WITH TRANSMISSION INSTALLATION



1. INSTALL ENGINE AND TRANSMISSION ASSEMBLY IN VEHICLE

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

(b) Lower the engine and transmission assembly into the engine compartment.



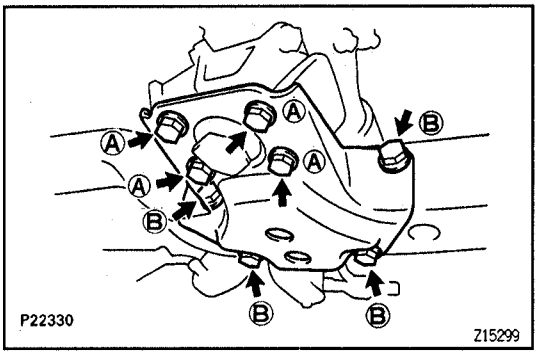
(c) Keep the engine level, and align the RH and LH mountings and body mountings.

(d) Attach the RH and LH mounting insulators to the body mountings, and temporarily install the 4 bolts and nuts.

(e) Jack up and put the transmission onto the frame.

(f) Remove the hoist chain.

(g) Remove the bolt and rear engine hanger.



2. INSTALL ENGINE REAR MOUNTING BRACKET

Torque:

Bolt Ⓐ: 18 N·m (183 kgf·cm, 13 ft·lbf)

Bolt Ⓑ: 25 N·m (260 kgf·cm, 19 ft·lbf)

3. TIGHTEN RH AND LH ENGINE MOUNTING INSULATOR BOLTS AND NUTS

Tighten the 4 bolts and nuts holding the mounting insulators to the body mountings.

Torque: 38 N·m (387 kgf·cm, 28 ft·lbf)

4. CONNECT STARTER WIRE

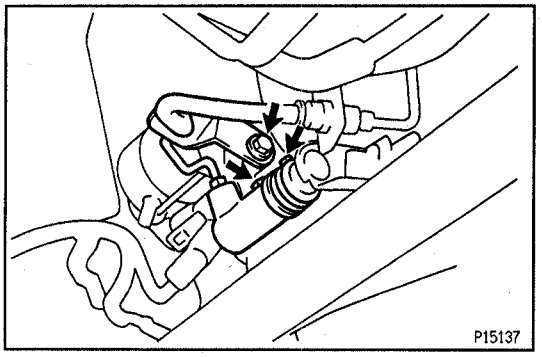
5. M/T:
INSTALL CLUTCH RELEASE CYLINDER

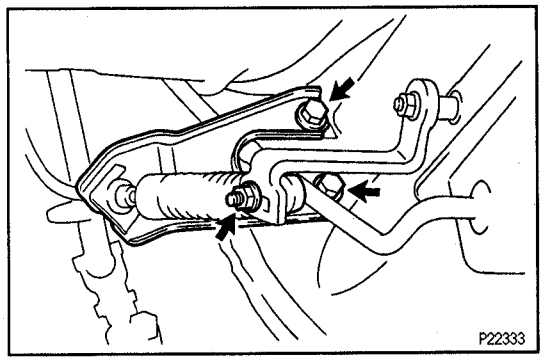
(a) Connect the clutch line with the bolt.

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

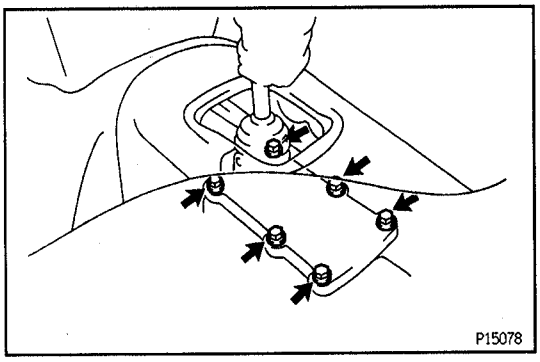
(b) Install the clutch release cylinder with the 2 bolts.

Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

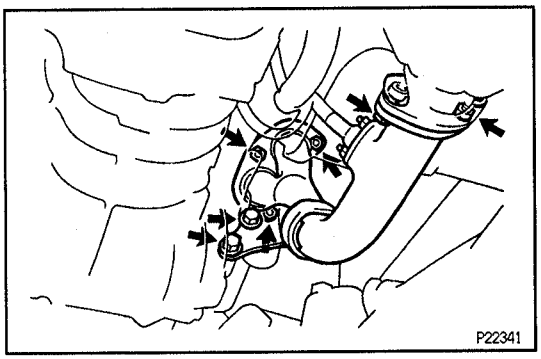




6. **A/T:**
   INSTALL CROSS SHAFT
   Torque:
   Bolt: 39 N·m (400 kgf·cm, 29 ft·lbf)
   Nut: 18 N·m (183 kgf·cm, 13 ft·lbf)



7. **CONNECT SPEEDOMETER CABLE**
8. **INSTALL PROPELLER SHAFT**
   (See propeller shaft installation in Propeller Shaft)
9. **M/T:**
   INSTALL SHIFT LEVER ASSEMBLY



10. **INSTALL FRONT EXHAUST PIPE**
(a) Install 2 new gaskets and the front exhaust pipe assembly with new 3 nuts.
Torque: 62 N·m (630 kgf·cm, 46 ft·lbf)
(b) Install the support bracket with the 2 bolts.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)
(c) Connect a new gasket and the front exhaust pipe assembly to the TWC with the 2 bolts and nuts.
Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)
(d) Connect the heated oxygen sensor connector.
11. **CONNECT ENGINE WIRE TO CABIN**
12. **CONNECT GENERATOR WIRE**
13. **w/ PS:**
    CONNECT PS PUMP
    (See step 30 in cylinder head installation)
14. **CONNECT HOSES**
    Connect these hoses:
    - Fuel return hose
    - Fuel inlet hose
    - Brake booster vacuum hose
    - EVAP hose
    - w/ PS:
      2 air hoses for PS idle–up
15. **CONNECT HEATER HOSES**
16. **w/A/C:**
    INSTALL A/C COMPRESSOR
    Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)
17. **INSTALL INTAKE AIR CONNECTOR**
    Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

18. INSTALL AIR CLEANER ASSEMBLY

19. CONNECT THESE CABLES:

(a) Connect the throttle cable to the throttle body.

(b) w/ Cruise Control System:
Connect the cruise control cable to the actuator, and install the actuator cover.

20. INSTALL RADIATOR
(See radiator installation in Cooling System)

21. FILL WITH ENGINE OIL

22. FILL WITH ENGINE COOLANT

23. FILL TRANSMISSION OIL

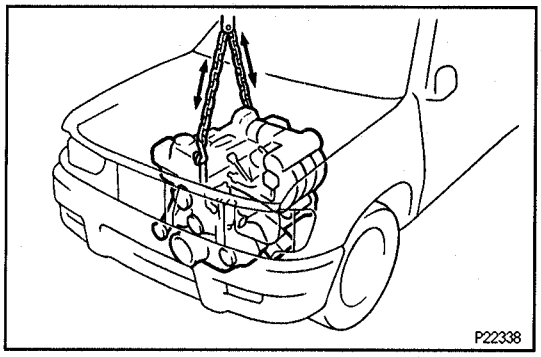
24. START ENGINE AND CHECK FOR LEAKS

25. INSTALL ENGINE UNDER COVER

26. INSTALL HOOD

27. VEHICLE ROAD TEST
Check for abnormal noise, shock, slippage, and smooth operation.

28. RECHECK ENGINE COOLANT AND ENGINE OIL LEVELS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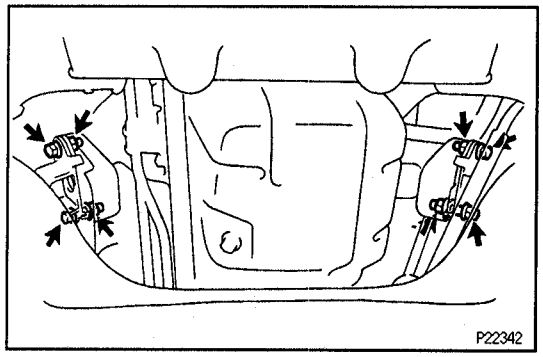
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EG5N5–02

4WD:
ENGINE INSTALLATION

1. INSTALL ENGINE IN VEHICLE

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

(b) Lower the engine into the engine compartment.

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

(d) Attach the RH and LH mounting insulators to the body mountings, and temporarily install the 4 bolts and nuts.

(e) Remove the hoist chain.

(f) Remove the bolt and rear engine hanger.

2. TIGHTEN RH AND LH ENGINE MOUNTING INSULATOR BOLTS AND NUTS
Tighten the 4 bolts and nuts holding the mounting insulators to the body mountings.
Torque: 38 N·m (387 kgf·cm, 28 ft·lbf)

3. CONNECT ENGINE WIRE TO CABIN

4. CONNECT GENERATOR WIRE

5. w/ PS:
CONNECT PS PUMP
(See step 31 in cylinder head installation)

6. CONNECT HOSES
Connect these hoses:
- Fuel return hose
- Fuel inlet hose
- w/ A.D.D.
  Vacuum hose

- Brake booster vacuum hose
- EVAP hose
- 2 air hoses for PS idle–up

7. CONNECT HEATER HOSES

8. w/A/C:
INSTALL A/C COMPRESSOR
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)

9. INSTALL INTAKE AIR CONNECTOR
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

10. INSTALL AIR CLEANER ASSEMBLY

11. CONNECT THESE CABLES:

(a) Connect the throttle cable to the throttle body.

(b) w/ Cruise Control System:
Connect the cruise control cable to the actuator, and install the actuator cover.

12. INSTALL RADIATOR
(See radiator installation in Cooling System)

13. FILL WITH ENGINE OIL

14. FILL WITH ENGINE COOLANT

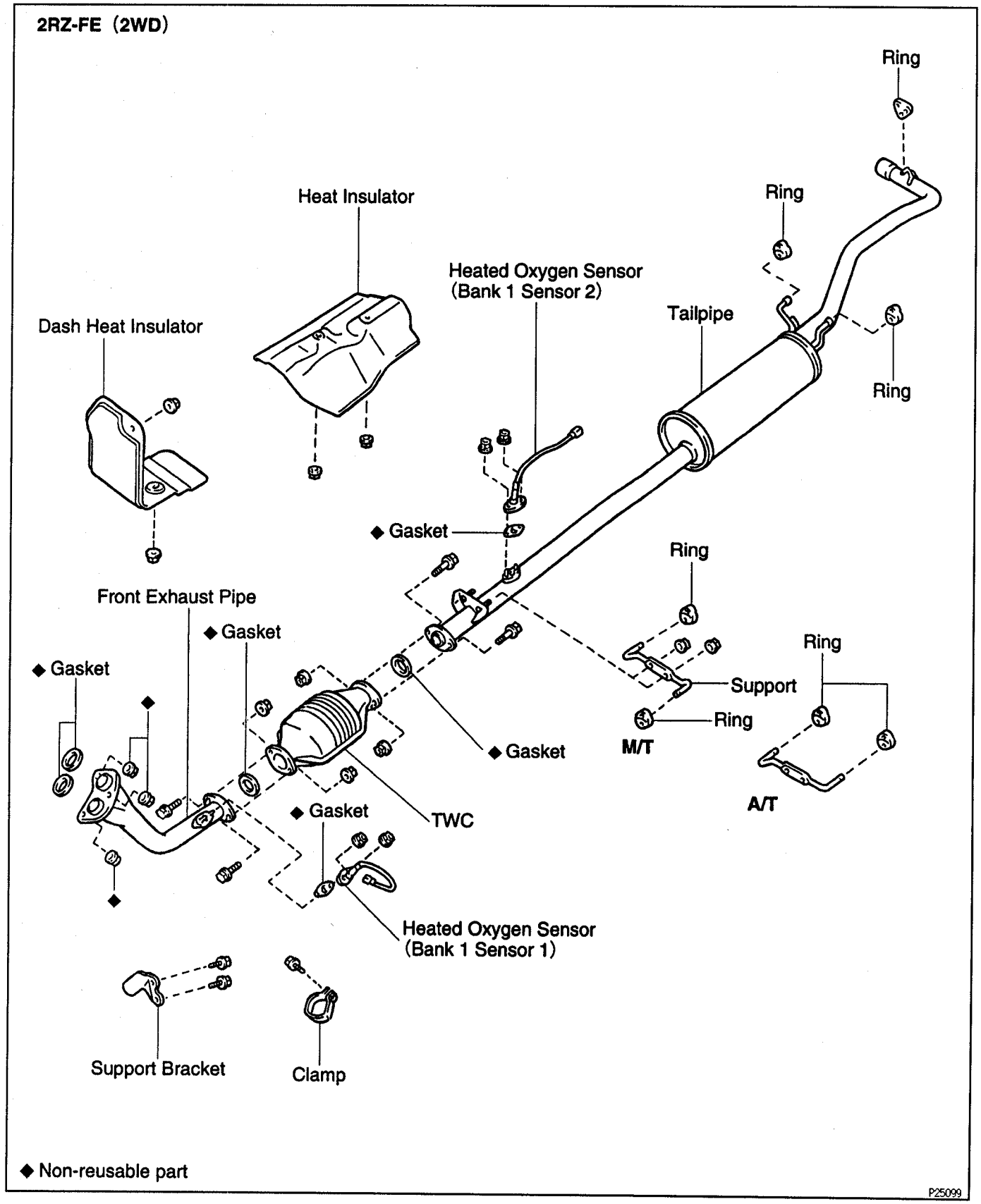
EG5N6–02

4WD:

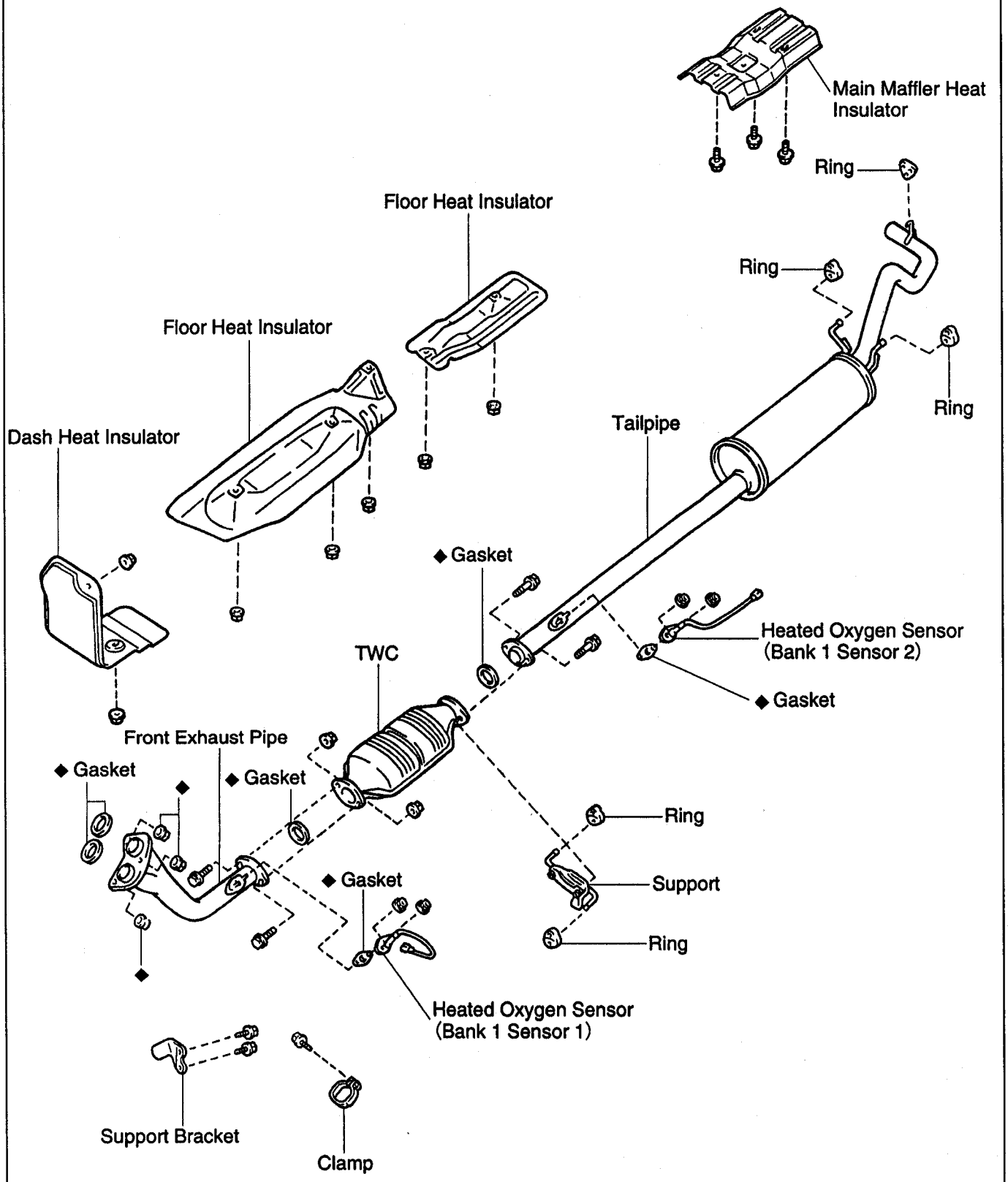
TRANSMISSION INSTALLATION
(See M/T or A/T section)

EXHAUST SYSTEM
COMPONENTS

EG5N7–02



3RZ-FE (4WD)



◆ Non-reusable part

P25098

SERVICE SPECIFICATIONS

SERVICE DATA

EG0VT–0K

Compression pressure	at 250 rpm	STD	1,230 kPa (12.5 kgf/cm², 178 psi) or more
		Minimum	880 kPa (9.0 kgf/cm², 127 psi)
	Difference of pressure between each cylinder		98 kPa (1.0 kgf/cm², 14 psi) or less
Valve clearance		Intake	0.15 – 0.25 mm (0.006 – 0.010 in.)
		Exhaust	0.25 – 0.35 mm (0.010 – 0.014 in.)
	Adjusting shim (for repair part)	Mark 2.500	2.500 mm (0.0984 in.)
		Mark 2.550	2.550 mm (0.1004 in.)
		Mark 2.600	2.600 mm (0.1024 in.)
		Mark 2.650	2.650 mm (0.1043 in.)
		Mark 2.700	2.700 mm (0.1063 in.)
		Mark 2.750	2.750 mm (0.1083 in.)
		Mark 2.800	2.800 mm (0.1102 in.)
		Mark 2.850	2.850 mm (0.1122 in.)
		Mark 2.900	2.900 mm (0.1142 in.)
		Mark 2.950	2.950 mm (0.1161 in.)
		Mark 3.000	3.000 mm (0.1181 in.)
		Mark 3.050	3.050 mm (0.1201 in.)
		Mark 3.100	3.100 mm (0.1220 in.)
		Mark 3.150	3.150 mm (0.1240 in.)
		Mark 3.200	3.200 mm (0.1260 in.)
		Mark 3.250	3.250 mm (0.1280 in.)
		Mark 3.300	3.300 mm (0.1299 in.)
Ignition timing	w/ Terminals TE1 and E1 connected of DLC1		3 – 7° BTDC @ idle
Idle speed	Engine at normal operating temperature		650 – 750 rpm
Cylinder head	Warpage		
	Cylinder block side	Maximum	0.05 mm (0.0020 in.)
	Manifold side	Maximum	0.10 mm (0.0039 in.)
	Valve seat		
	Refacing angle	Intake	30°, 45°, 60°
		Exhaust	45°, 60°
	Contacting angle		45°
	Contacting width		1.0 – 1.4 mm (0.039 – 0.055 in.)
	Cylinder head bolt outside diameter	STD	10.76 – 10.97 mm (0.4236 – 0.4319 in.)
		Minimum	10.40 mm (0.4094 in.)
Valve guide bushing	Inside diameter		6.010 – 6.030 mm (0.2366 – 0.2374 in.)
	Outside diameter (for repair part)	STD	11.000 – 11.027 mm (0.4331 – 0.4341 in.)
		O/S 0.05	11.050 – 11.077 mm (0.4350 – 0.4361 in.)
	Protrusion height		8.2 – 8.6 mm (0.323 – 0.339 in.)
	Replacing temperature (Cylinder head side)		80 – 100°C (176 –212°F)

Valve	Valve overall length	STD	Intake	103.45 mm (4.0728 in.)
			Exhaust	103.60 mm (4.0787 in.)
		Minimum	Intake	102.95 mm (4.0531 in.)
			Exhaust	103.10 mm (4.0590 in.)
	Valve face angle			44.5°
	Stem diameter		Intake	5.970 – 5.985 mm (0.2350 – 0.2356 in.)
			Exhaust	5.965 – 5.980 mm (0.2348 – 0.2354 in.)
	Stem oil clearance	STD	Intake	0.025 – 0.060 mm (0.0010 – 0.0024 in.)
			Exhaust	0.030 – 0.065 mm (0.0012 – 0.0026 in.)
		Maximum	Intake	0.08 mm (0.0031 in.)
			Exhaust	0.10 mm (0.0039 in.)
	Margin thickness		STD	1.0 mm (0.039 in.)
			Minimum	0.5 mm (0.020 in.)
Valve spring	Deviation		Maximum	2.0 mm (0.079 in.)
	Installed tension	at 35.7 mm (1.406 in.)		177 – 204 N (18.0 – 20.8 kgf, 39.7 – 45.9 lbf)
Valve lifter	Lifter diameter			30.966 – 30.976 mm (1.1578 – 1.2195 in.)
	Lifter bore diameter			31.000 – 31.016 mm (1.2205 – 1.2211 in.)
	Oil clearance		STD	0.024 – 0.050 mm (0.0009 – 0.0020 in.)
			Maximum	0.07 mm (0.0028 in.)
Manifold	Warpage	Maximum	Intake	0.20 mm (0.0078 in.)
			Exhaust	0.50 mm (0.0197 in.)
Air intake chamber	Warpage		Maximum	0.20 mm (0.0078 in.)
Camshaft	Thrust clearance		STD	0.040 – 0.095 mm (0.0016 – 0.0037 in.)
			Maximum	0.12 mm (0.0047 in.)
	Journal oil clearance		STD	0.025 – 0.062 mm (0.0010 – 0.0024 in.)
			Maximum	0.08 mm (0.0031 in.)
	Journal diameter			26.959 – 26.975 mm (1.0614 – 1.0620 in.)
	Circle runout		Maximum	0.06 mm (0.0024 in.)
	Cam lobe height		Intake	45.31 – 45.41 mm (1.7839 – 1.7878 in.)
			Exhaust	45.06 – 45.16 mm (1.7740 – 1.7779 in.)
	Camshaft gear backlash		STD	0.020 –0.200 mm (0.0008 – 0.0079 in.)
			Maximum	0.30 mm (0.0188 in.)
	Camshaft gear spring end free distance			22.5 – 22.9 mm (0.886– 0.902 in.)
Spark plug tube	Protrusion			47.0 mm (1.850 in.)
Chain and timing gear	Chain length at 16 links		Maximum (No.1)	147.5 mm (5.807 in.)
			(No.2)	123.6 mm (4.866 in.)
	Camshaft timing gear wear (w/ chain)		Minimum	113.8 mm (4.480 in.)
	Crankshaft timing gear wear (w/ chain)		Minimum	59.4 mm (2.339 in.)
	Balance shaft drive gear wear (w/ chain)		Minimum	75.9 mm (2.988 in.)
	No.2 crankshaft timing sprocket wear (w/ chain)		Minimum	96.7 mm (3.807 in.)
Chain tensioner slipper and vibration damper	Wear		Maximum	1.0 mm (0.039 in.)

Cylinder block	Cylinder head surface warpage	Maximum	0.05 mm (0.0020 in.)
	Cylinder bore diameter	STD	94.990 − 95.003 mm (3.7400 − 3.7403 in.)
		Maximum	95.06 mm (3.7425 in.)
	Main bearing bolt outside diameter	STD	10.76 − 10.97 mm (0.4236 − 0.4319 in.)
		Minimum	10.40 mm (0.4094 in.)
	Cylinder block main journal bore diameter		
		STD Mark 1	64.004 − 64.010 mm (2.5198 − 2.5201 in.)
		Mark 2	64.011 − 64.016 mm (2.5201 − 2.5203 in.)
		Mark 3	64.017 − 64.022 mm (2.5203 − 2.5205 in.)
		U/S 0.25	64.000 − 64.024 mm (2.5197 − 2.5206 in.)
Piston and piston ring	Piston diameter		
	2RZ−FE	STD	94.923 − 94.933 mm (3.7371 − 3.7375 in.)
		O/S 0.50	95.423 − 95.433 mm (3.7568 − 3.7572 in.)
	3RZ−FE	STD	94.933 − 94.943 mm (3.7375 − 3.7379 in.)
		O/S 0.50	95.433 − 95.443 mm (3.7572 − 3.7576 in.)
	Piston oil clearance		
	2RZ−FE		0.057 − 0.080 mm (0.0022 − 0.0031 in.)
	3RZ−FE		0.047 − 0.070 mm (0.0019 − 0.0028 in.)
	Piston ring groove clearance	No.1	0.020 − 0.070 mm (0.0008 − 0.0028 in.)
		No.2	0.030 − 0.070 mm (0.0012 − 0.0028 in.)
	Piston ring end gap	No.1	0.300 − 0.400 mm (0.0118 − 0.0157 in.)
		No.2	0.400 − 0.500 mm (0.0157 − 0.0197 in.)
	Piston pin installing temperature		80 − 90°C (176 − 194°F)
Connecting rod	Thrust clearance	STD	0.160 − 0.312 mm (0.0063 − 0.0123 in.)
		Maximum	0.35 mm (0.0138 in.)
	Connecting rod bearing center wall thickness		
		STD Mark 4	1.482 − 1.485 mm (0.0583 − 0.0585 in.)
		Mark 5	1.485 − 1.488 mm (0.0585 − 0.0586 in.)
		Mark 6	1.488 − 1.491 mm (0.0586 − 0.0587 in.)
		U/S 0.25	1.601 − 1.607 mm (0.0630 − 0.0633 in.)
	Connecting rod big end inside diameter		
		STD Mark 4	56.000 − 56.006 mm (2.2047 − 2.2050 in.)
		Mark 5	56.006 − 56.012 mm (2.2050 − 2.2052 in.)
		Mark 6	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 oil clearance	STD	0.030 − 0.055 mm (0.0012 − 0.0022 in.)
		U/S 0.25	0.031 − 0.071 mm (0.0012 − 0.0026 in.)
		Maximum	0.10 mm (0.0039 in.)
	Rod out−of−alignment		
		Maximum per 100 mm (3.94 in.)	0.05 mm (0.0020 in.)
	Rod twist	Maximum per 100 mm (3.94 in.)	0.15 mm (0.0059 in.)
	Bushing inside diameter		24.008 − 24.017 mm (0.9452 − 0.9455 in.)
	Piston pin diameter		24.000 − 24.009 mm (0.9449 − 0.9452 in.)
	Piston pin oil clearance	STD	0.005 − 0.011 mm (0.0002 − 0.0004 in.)
		Maximum	0.015 mm (0.0006 in.)
	Connecting rod bolt outside diameter	STD	7.80 − 7.90 mm (0.3071 − 0.3110 in.)
		Minimum	7.60 mm (0.2992 in.)

Crankshaft	Thrust clearance	STD	0.020 − 0.0220 mm (0.0008 − 0.0087 in.)
		Maximum	0.30 mm (0.0118 in.)
	Thrust washer thickness		2.440 − 2.490 mm (0.0961 − 0.0980 in.)
	Main journal oil clearance	STD No.3	0.030 − 0.055 mm (0.0012 − 0.0022 in.)
		Others	0.024 − 0.049 mm (0.0009 − 0.0019 in.)
		U/S 0.25 No.3	0.030 − 0.070 mm (0.0012 − 0.0028 in.)
		Others	0.025 − 0.065 mm (0.0010 − 0.0026 in.)
		Maximum	0.10 mm (0.0039 in.)
	Main journal diameter	STD No.3	59.981 − 59.994 mm (2.2615 − 2.3620 in.)
		Others	59.987 − 60.000 mm (2.3617 − 2.3622 in.)
		U/S 0.25 No.3	59.740 − 59.750 mm (2.3520 − 2.3524 in.)
		Others	59.745 − 59.755 mm (2.3522 − 2.3526 in.)
	Main bearing center wall thickness		
		STD Mark 1	1.987 − 1.990 mm (0.0782 − 0.0783 in.)
		Mark 2	1.991 − 1.993 mm (0.0784 − 0.0785 in.)
		Mark 3	1.994 − 1.996 mm (0.0785 − 0.0786 in.)
		U/S 0.25	2.106 − 2.112 mm (0.0829 − 0.0831 in.)
	Crank pin diameter	STD	52.987 − 53.000 mm (2.0861 − 2.0866 in.)
		U/S 0.25	52.745 − 52.755 mm (2.0766 − 2.0770 in.)
	Circle runout	Maximum	0.03 mm (0.0012 in.)
	Main journal taper and out−of−round	Maximum	0.005 mm (0.0002 in.)
	Crank pin taper and out−of−round	Maximum	0.005 mm (0.0002 in.)
Balance shaft	Thrust clearance	STD	0.07 − 0.13 mm (0.0027 − 0.0051 in.)
		Maximum	0.20 mm (0.0079 in.)
	Bearing inside diameter	No.1	38.025 − 38.045 mm (1.4970 − 1.4978 in.)
		No.2	37.525 − 37.545 mm (1.4774 − 1.4781 in.)
	Journal diameter	No.1	37.969 − 37.985 mm (1.4948 − 1.4955 in.)
		No.2	37.449 − 37.465 mm (1.4744 − 1.4750 in.)
	Journal oil clearance	STD No.1	0.040 − 0.076 mm (0.0016 − 0.0031 in.)
		No.2	0.060 − 0.096 mm (0.0024 − 0.0038 in.)
		Maximum	0.15 mm (0.0059 in.)

EGOVU-OH

TORQUE SPECIFICATIONS

Part tightened		N·m	kgf·cm	ft·lbf
Spark plug x Cylinder head		19	200	14
Cylinder head x Cylinder block	1st	39	400	29
	2nd	Turn 90°	Turn 90°	Turn 90°
	3rd	Turn 90°	Turn 90°	Turn 90°
Cylinder head x Timing chain cover		21	210	15
Camshaft bearing cap x Cylinder head		15.5	160	12
Camshaft timing gear x Intake camshaft		73.5	750	54
Distributor gear x Exhaust camshaft		46	470	34
No.1 chain tensioner x Cylinder head		21	210	15
Engine hanger x Cylinder head		42	420	30
Cylinder head rear cover x Cylinder head		13.5	135	10
Water outlet x Cylinder head		20	200	14
Exhaust manifold x Cylinder head		49	500	36
Heat insulator x Exhaust manifold		5.5	55	48 in.·lbf
Intake manifold x Cylinder head		29	300	22
Fuel inlet pipe x Fuel filter		29	300	22
Air intake chamber x Intake manifold		21	210	15
Fuel inlet pipe x Delivery pipe		29	300	22
Intake chamber stay x Air intake chamber		20	200	15
Intake chamber stay x LH engine mounting bracket		20	200	15
EGR pipe x EGR valve		19	195	14
EGR pipe x Exhaust manifold		20	200	15
EGR pipe x Cylinder head		18	185	13
PS pump bracket x Cylinder head		20	200	15
PS pump bracket x PS pump		58	590	43
PS pump x PS pump pulley		43	440	32
Drive belt idler pulley for PS pump x Cylinder head		20	200	14
Oil dipstick guide x Cylinder head		20	200	15
Intake air connector x Cylinder head		18	185	13
Balance shaft drive gear x Balance shaft		25	250	18
No.2 chain tensioner x Cylinder block		18	185	13
No.3 vibration damper x Cylinder block		18	185	13
No.2 vibration damper x Cylinder block		27	270	20
Oil jet x Cylinder block		18	185	13
No.1 vibration damper x Cylinder block		29	300	22
No.1 timing chain tensioner slipper x Cylinder block		27	270	20
Timing chain cover x Cylinder block	12 mm head bolt A	20	200	14
	bolt B	24.5	250	18
	14 mm head bolt	44	440	32
	Nut	20	200	14
Timing chain cover mounting bolt		18	185	13
Water bypass pipe mounting nut		20	200	14
Crankshaft pulley x Crankshaft		260	2,650	193
No.2 crankshaft pulley x Crankshaft pulley		25	250	18
No.3 crankshaft pulley x Crankshaft pulley		25	250	18
Oil strainer x Cylinder block		18	185	13
Oil pan x Cylinder block		12.5	130	9

Stiffener plate x Cylinder block		37	380	27
Stiffener plate x Transmission		37	380	27
Crankshaft position sensor x Timing chain cover		8.5	85	74 in.·lbf
Generator bracket x Cylinder block		74.5	760	55
Generator bracket x Timing chain cover		18	185	13
Generator adjusting bar x Timing chain cover		63.5	650	47
A/C compressor bracket x Cylinder block		44	440	32
A/C compressor x A/C compressor bracket		25	250	18
Connecting rod cap x Connecting rod	1st	45	460	33
	2nd	Turn 90°	Turn 90°	Turn 90°
Main bearing cap x Cylinder block	1st	39	400	29
	2nd	Turn 90°	Turn 90°	Turn 90°
No.1 balance shaft x Timing gear		36	365	26
No.2 balance shaft x Timing sprocket		36	365	26
Balance shaft x Cylinder block		18	185	13
Rear oil seal retainer x Cylinder block		13.5	135	9.7
Engine mounting bracket x Cylinder block		52	520	38
Engine coolant drain plug x Cylinder block		24.5	250	18
Oil filter bracket union x Cylinder block		25	250	18
Oil filter bracket (2RZ–FE) x Cylinder block	Nut	12	120	8.9
	Union bolt	68.5	700	51
Oil filter bracket (3RZ–FE) x Cylinder block		28	290	21
Water bypass pipe x Cylinder block		20	200	14
Knock sensor x Cylinder block		37	380	27
Fuel filter x Cylinder block		20	200	14
Rear end plate x Cylinder block		18	185	13
Rear end plate x Water bypass pipe		20	200	14
Flywheel (2RZ–FE) x Crankshaft		88	900	65
Flywheel (3RZ–FE) x Crankshaft	1st	26.5	270	19
	2nd	Turn 90°	Turn 90°	Turn 90°
Drive plate x Crankshaft		74	750	54
Engine rear mounting bracket x Front crossmember		25	260	19
Engine rear mounting bracket x Engine rear mounting insulator		18	183	13
Engine front mounting insulator x Frame		38	387	28
Clutch release cylinder bracket x Transmission		39	400	29
Clutch release cylinder x Transmission		13	130	9
Front exhaust pipe x Exhaust manifold		62	630	46
Exhaust support bracket x Transmission		71	720	52
Front exhaust pipe x TWC		48	490	35
TWC x Tail pipe		48	490	35
Heated oxygen sensor (Bank 1 sensor 1) x Front exhaust pipe		20	200	14
Heated oxygen sensor (Bank 1 sensor 2) x Tail pipe		20	200	14

EMISSION CONTROL SYSTEMS

SYSTEM PURPOSE

EG5C7–03

The emission control systems are installed to reduce the amount of CO, HC and NOx exhausted from the engine ((3), (4) and (5)), to prevent the atmospheric release of blow–by gas–containing HC (1) and evaporated fuel containing HC being released from the fuel tank (2).
The function of each system is shown in these table.

System	Abbreviation	Function
(1) Positive Crankcase Ventilation	PCV	Reduces blow–by gas (HC)
(2) Evaporative Emission Control	EVAP	Reduces evaporated HC
(3) Exhaust Gas Recirculation	EGR	Reduces NOx
(4) Three–Way Catalytic Converter	TWC	Reduces CO, HC and NOx
(5) Multiport Fuel Injection *	MFI	Injects a precisely timed, optimum amount of fuel for reduced exhaust emissions

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

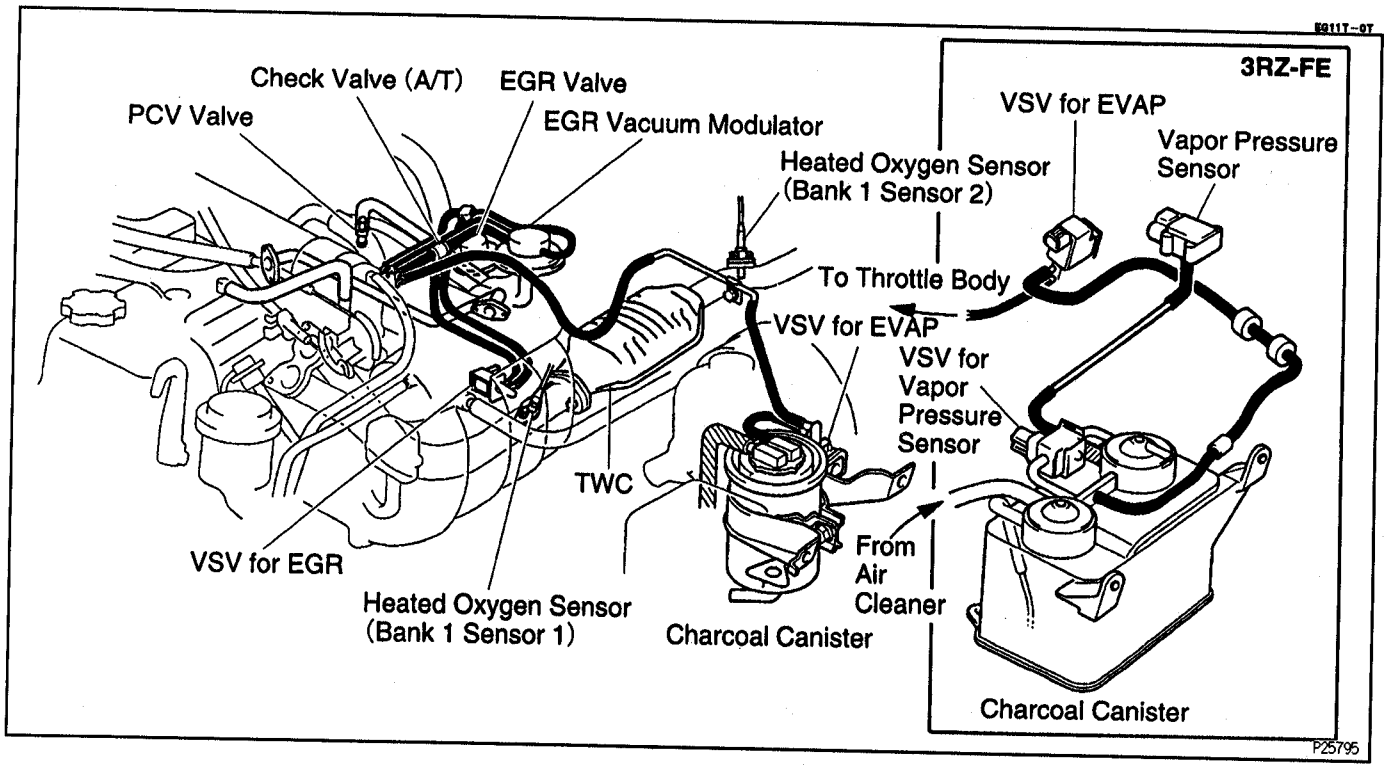
PREPARATION

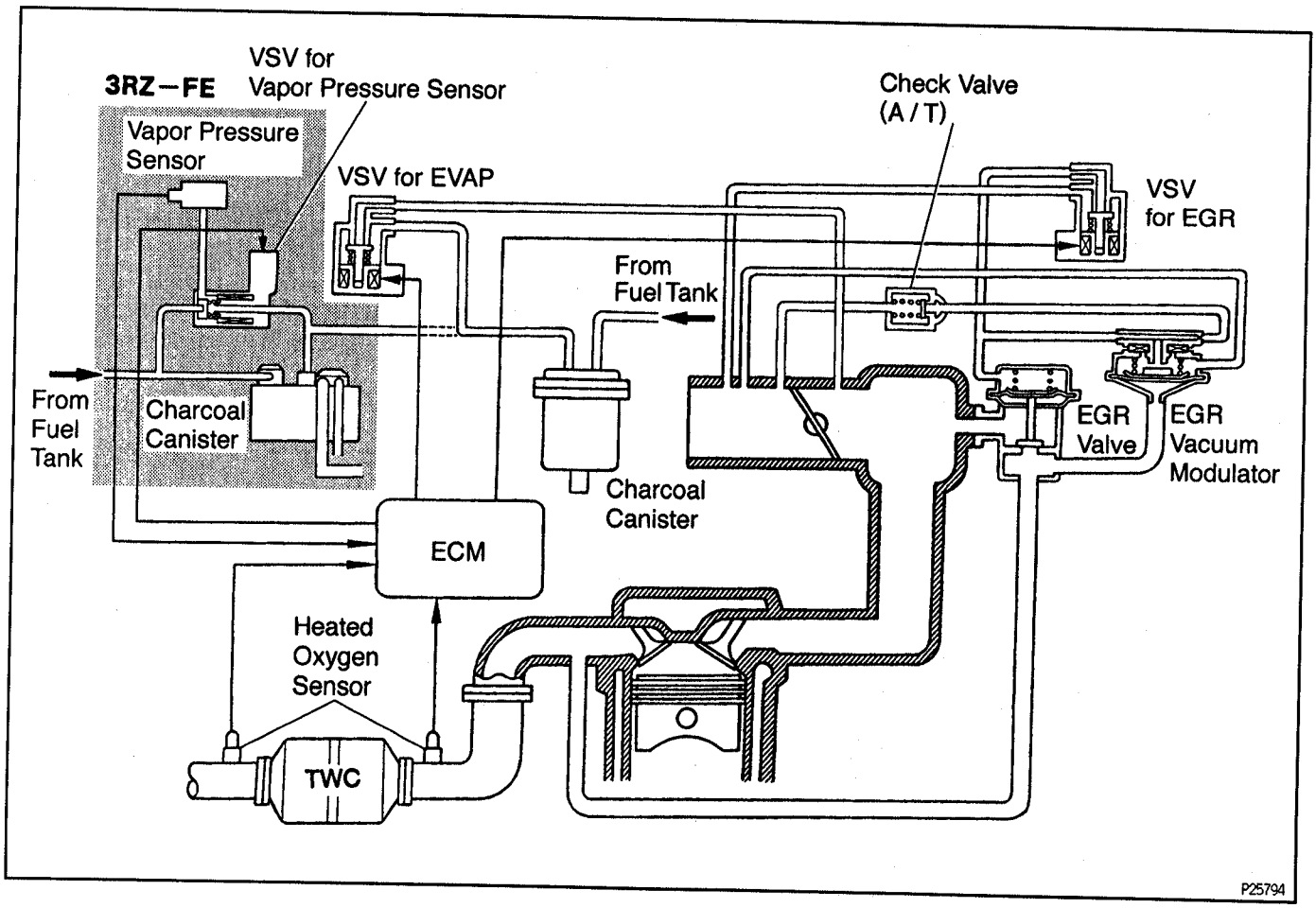
EQ05W–00

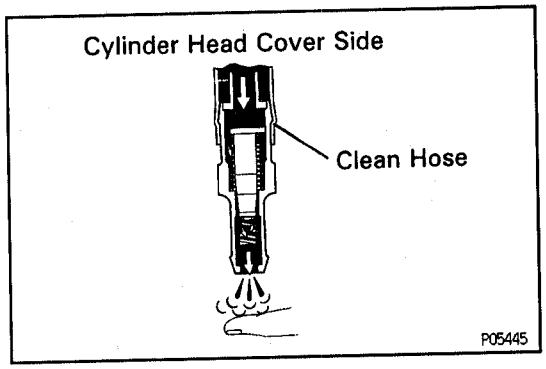
EQUIPMENT

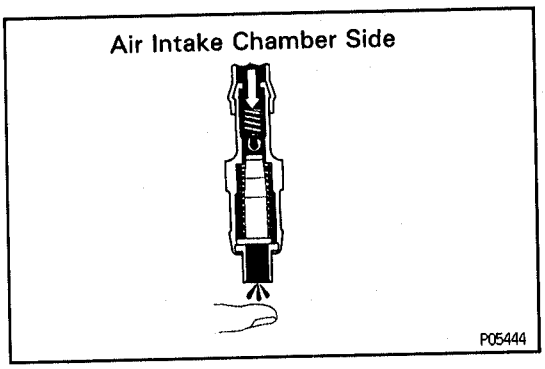
OBD II scan tool	Engine speed
Torque wrench	
Vacuum gauge	

LAYOUT AND SCHEMATIC DRAWING









POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

EG061–0D

PCV VALVE INSPECTION

1. **REMOVE PCV VALVE**
2. **INSTALL CLEAN HOSE TO PCV VALVE**
3. **INSPECT PCV VALVE OPERATION**

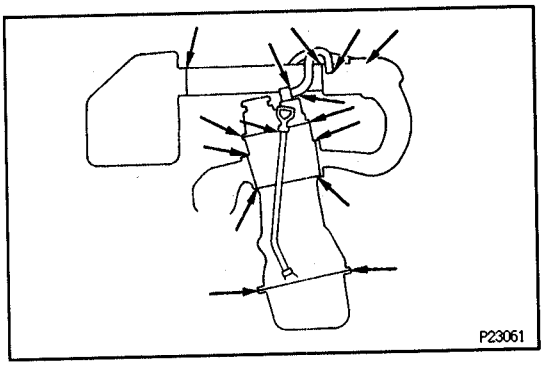
(a) Blow air into the cylinder head cover side, and check that air passes through easily.

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

(b) Blow air into the air intake chamber side, and check that air passes through with difficulty.

If operation is not as specified, replace the PCV valve.

4. **REMOVE CLEAN HOSE FROM PCV VALVE**
5. **REINSTALL PCV VALVE**



EG062–0J

PCV HOSES AND CONNECTIONS INSPECTION

VISUALLY INSPECT HOSES AND CONNECTIONS

Check for cracks, leaks or damage.

EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM

EG044–01

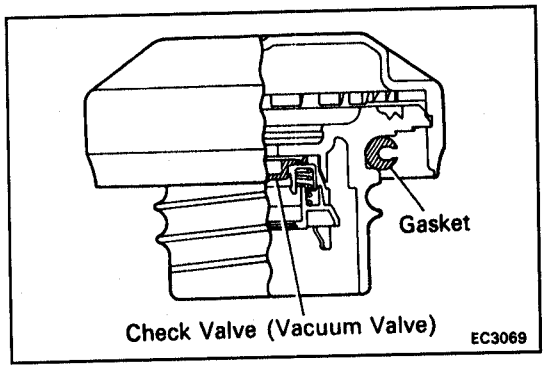
EVAP CONTROL SYSTEM INSPECTION

1. **VISUALLY INSPECT LINES AND CONNECTIONS**

Look for loosen connections, sharp bends or damage.

2. **VISUALLY INSPECT FUEL TANK**

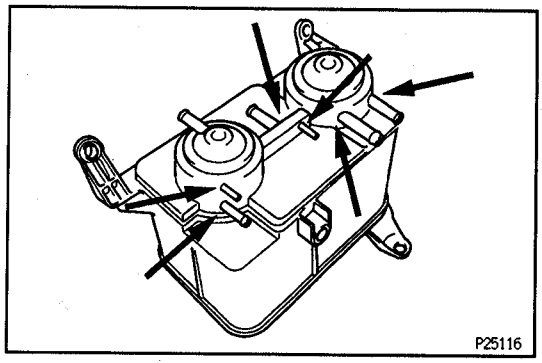
Look for deformation, cracks or fuel leakage.



3. **VISUALLY INSPECT FUEL TANK CAP**

Check if the cap and/or gasket are deformed or damaged.

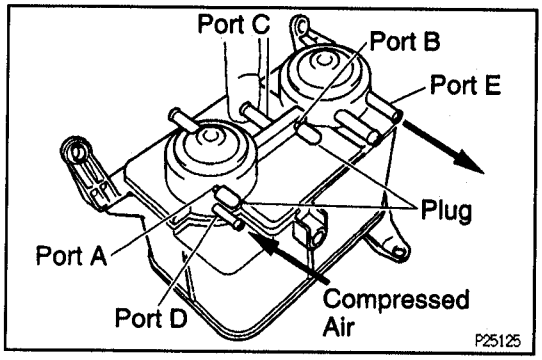
If necessary, repair or replace the cap.



CHARCOAL CANISTER INSPECTION

3RZ–FE:

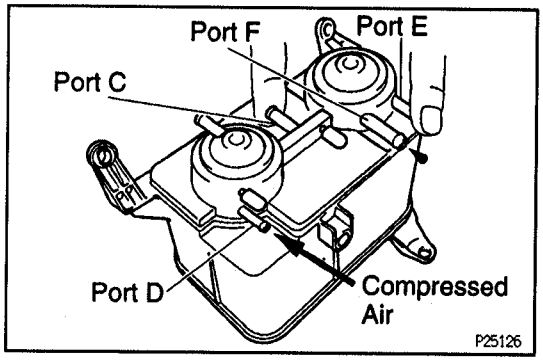
1. **REMOVE CHARCOAL CANISTER**
2. **REMOVE VSV**
3. **VISUALLY INSPECT CHARCOAL CANISTER**
   Look for cracks or damage.



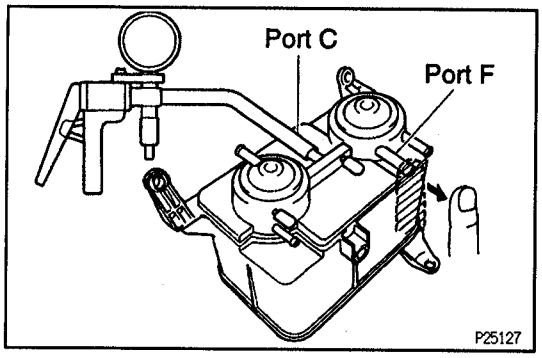
4. **CHECK FOR CLOGGED FILTER, AND STUCK CHECK VALVE AND DIAPHRAGM**

(a) Install the plugs to ports A and B.

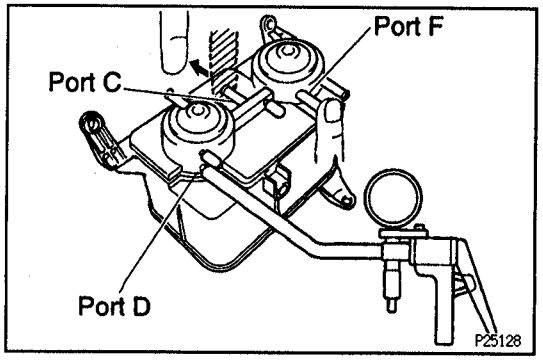
(b) While holding port C closed, blow air (1.47 kPa, 15 gf/cm², 0.21 psi) into port D and check that air flows from port E.



(c) While holding port C and port E closed, blow air (1.47 kPa, 15 gf/cm², 0.21 psi) into port D and check that air does not flow from port F.



(d) Apply vacuum (2.94 kPa, 22 mmHg, 0.87 in.Hg) to port C, check that the vacuum does not decrease when port F is closed, and check that the vacuum decreases when port F is released.

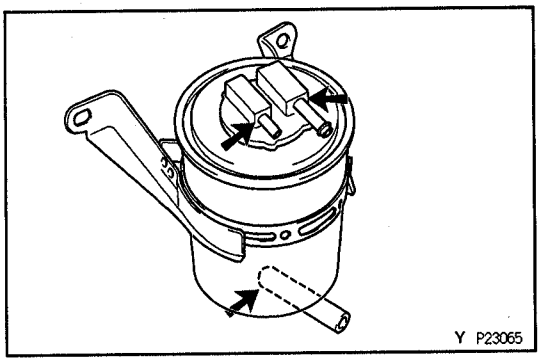


(e) While holding port F closed, apply vacuum (2.94 kPa, 22 mmHg, 0.87 in. Hg) to port D, check that the vacuum does not decrease when port C is closed, and check that the vacuum decreases when port C is released.

If a problem is found, replace the charcoal canister.

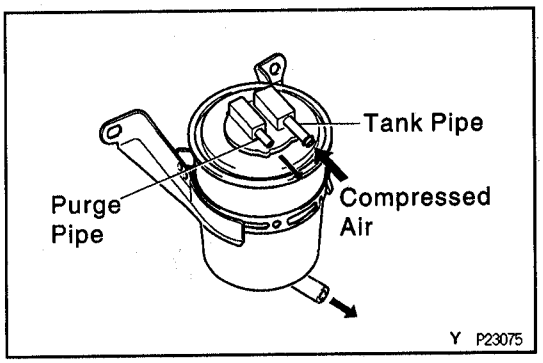
(f) Remove the plugs.

5. **REINSTALL CHARCOAL CANISTER**



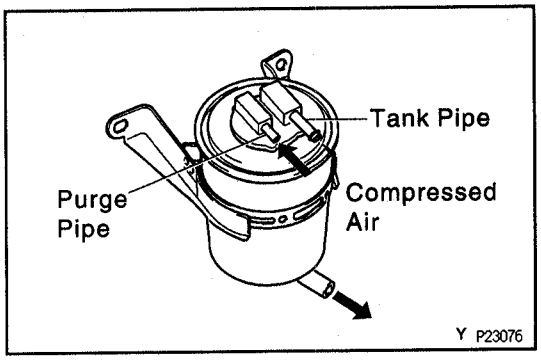
2RZ–FE:

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

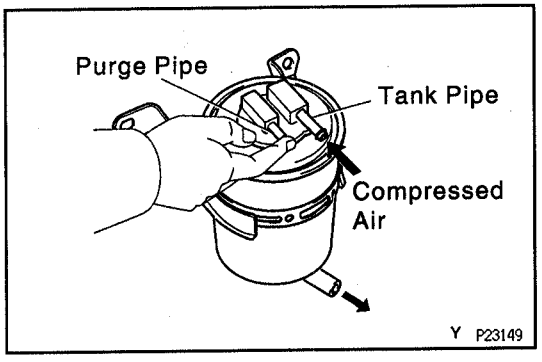


4. **INSPECT FOR CLOGGED FILTER AND STUCK CHECK VALVE**

(a) Using low pressure compressed air (4.71 kPa, 48 gf/cm², 0.68 psi), blow into tank pipe and check that air flows without resistance from the other pipes.



(b) Blow air (4.71 kPa, 48 gf/cm², 0.68 psi) into purge pipe and check that air does not flow from the tank pipe and air flows without resistance from the other pipe.
If a problem is found, replace the charcoal canister.



5. **CLEAN FILTER IN CANISTER**
   Clean the filter by blowing 294 kPa (3 kgf/cm², 43 psi) of compressed air into tank pipe while holding purge pipe closed.
   NOTICE:
   - **Do not attempt to wash the canister.**
   - **No activated carbon should come out.**
6. **REINSTALL VSV**
7. **REINSTALL CHARCOAL CANISTER**
   Torque: 31 N·m (316 kgf·cm, 23 ft·lbf)

EGSN0–02

VSV FOR EVAP INSPECTION

(See VSV for EVAP in MFI System)

EGSN0–03

VSV FOR VAPOR PRESSURE SENSOR INSPECTION (3RZ–FE)

(See VSV for vapor pressure sensor in MFI System)

VAPOR PRESSURE SENSOR INSPECTION (3RZ–FE)

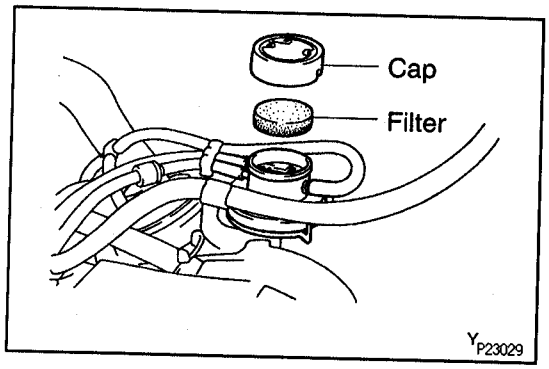
EQSN9–04

(See vapor pressure sensor in MFI System)

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

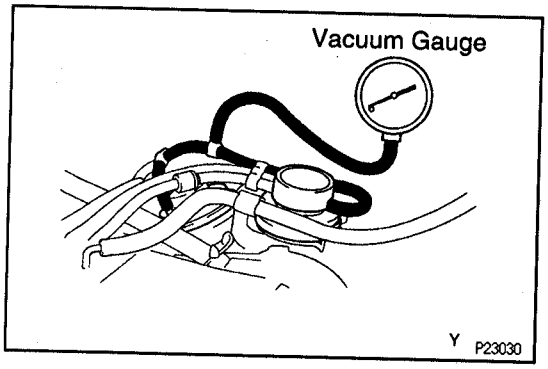
EGR SYSTEM INSPECTION

EQSCA–04



1. INSPECT AND CLEAN FILTER IN EGR VACUUM MODULATOR

(a) Remove the cap and filter.
(b) Check the filter for contamination or damage.
(c) Using compressed air, clean the filter.
(d) Reinstall the filter and cap.
HINT: Install the filter with the coarser surface facing the atmospheric side (outward).

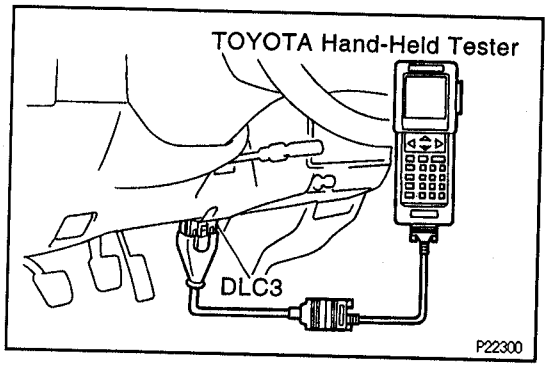


2. INSTALL VACUUM GAUGE

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

3. INSPECT SEATING OF EGR VALVE

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



4. CONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL

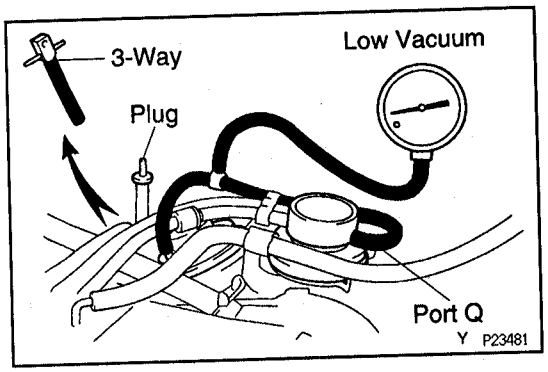
(a) Connect the TOYOTA hand–held tester or OBD II scan tool to the DLC3.
(b) Please refer to the TOYOTA hand–held tester or OBD II scan tool operators manual for further details.

5. INSPECT VSV OPERATION WITH COLD ENGINE

(a) The engine coolant temperature should be below 50°C (122°F).
(b) Check that the vacuum gauge indicates zero at 3,000 rpm.
(c) Check that the EGR pipe is not hot.

6. INSPECT OPERATION OF VSV AND EGR VACUUM MODULATOR

(a) Select the active test mode on the TOYOTA hand–held tester (VSV is closed.).

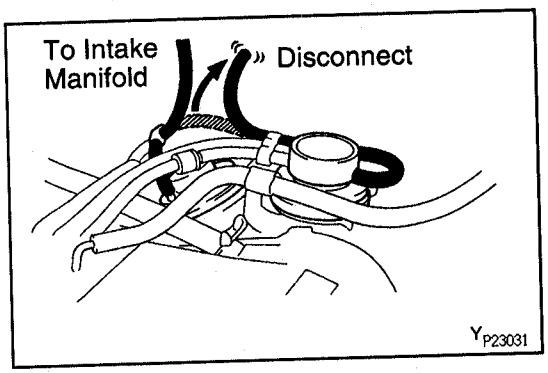


(b) If you have no TOYOTA hand–held tester, check these procedures:
(1) Remove the 3–way connector with the vacuum hose.
(2) Connect the vacuum hose (from port Q of EGR vacuum modulator) to the EGR valve.
(3) Plug the vacuum hose (from VSV for EGR).
(c) Check that the vacuum gauge indicates low vacuum at 3,000 rpm.

7. DISCONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL

8. REMOVE VACUUM GAUGE

Remove the vacuum gauge, and reconnect the vacuum hoses to the proper locations.



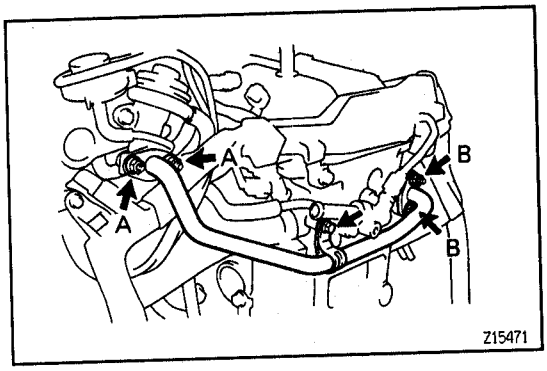
9. INSPECT EGR VALVE

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

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

EGSHA–02

EGR VALVE INSPECTION



Installation is in the reverse order of removal.

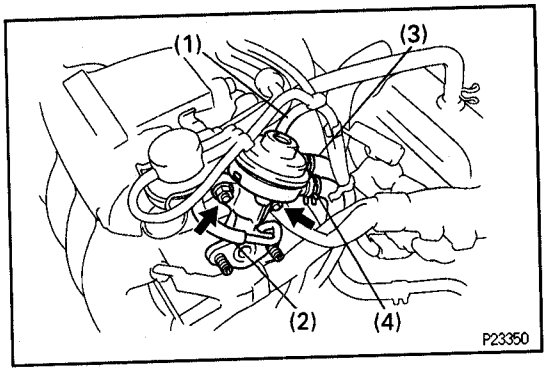
1. REMOVE EGR PIPE

Remove the bolt, 4 nuts, EGR pipe and 2 gaskets.

INSTALLATION HINT: Install 2 new gaskets.

Torque:

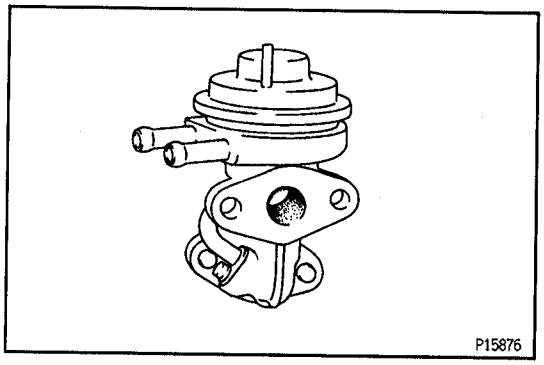
Bolt: 18 N·m (185 kgf·cm, 13 ft·lbf)
Nut A: 19 N·m (195 kgf·cm, 14 ft·lbf)
Nut B: 20 N·m (200 kgf·cm, 15 ft·lbf)



2. REMOVE EGR VALVE

(a) Disconnect these hoses:
(1) Vacuum hose
(2) EGR hose
(3) Water bypass hose (from IAC valve)
(4) Water bypass hose (from water bypass pipe)
(b) Remove the 2 nuts, EGR valve and gasket.

Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

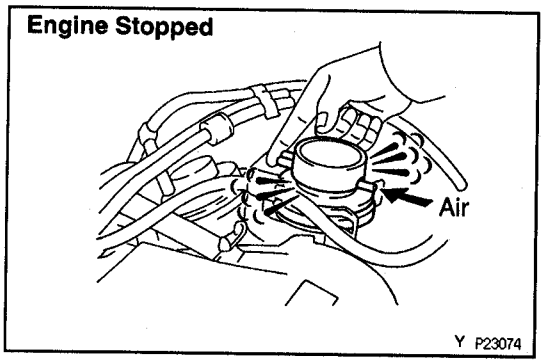


3. INSPECT EGR VALVE

Check for sticking and heavy carbon deposits.

If a problem is found, replace the EGR valve.

EGR VACUUM MODULATOR INSPECTION EG06B-01

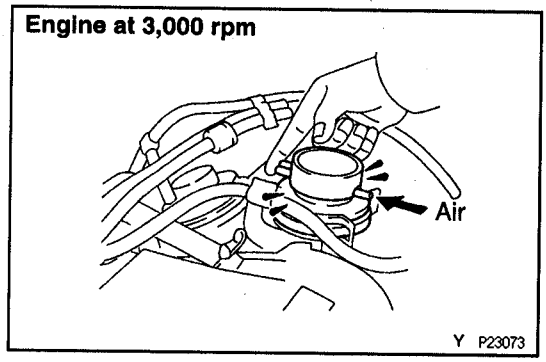


1. DISCONNECT VACUUM HOSES FROM EGR VACUUM MODULATOR

2. INSPECT EGR VACUUM MODULATOR OPERATION

(a) Block ports P and R with your finger.

(b) Blow air into port Q, and check that the air passes through to the air filter side freely.

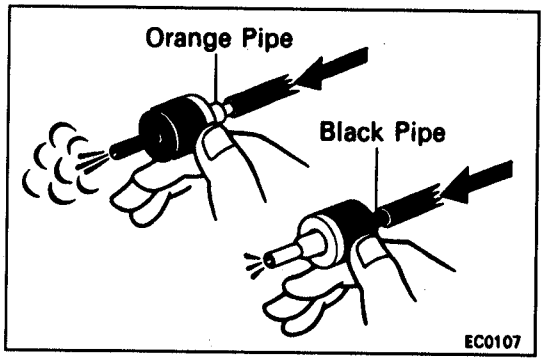


(d) Start the engine, and maintain speed at 3,000 rpm.

(e) Repeat the above test. Check that there is a strong resistance to air flow.

If operation is not as specified, replace the EGR vacuum modulator.

3. RECONNECT VACUUM HOSES TO EGR VACUUM MODULATOR



CHECK VALVE INSPECTION (A/T) EG5CD-03

1. REMOVE CHECK VALVE

2. INSPECT CHECK VALVE

(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.

If operation is not as specified, replace the check valve.

3. REINSTALL CHECK VALVE

HINT: Reinstall the check valve with the orange pipe facing the EGR vacuum modulator side.

VSV INSPECTION EG5NB-02

(See VSV for EGR in MFI System)

THREE–WAY CATALYTIC CONVERTER (TWC) SYSTEM

EG09E–0E

EXHAUST PIPE ASSEMBLY INSPECTION

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

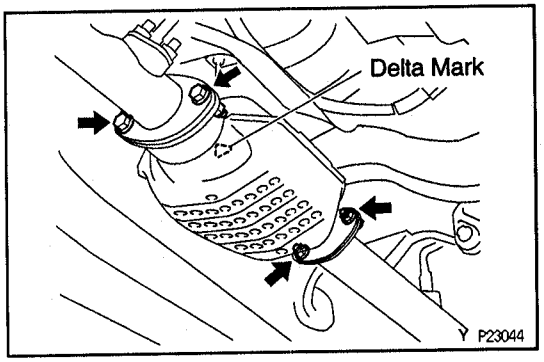
THREE–WAY CATALYTIC CONVERTER INSPECTION

CHECK FOR DENTS OR DAMAGE

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

HEAT INSULATOR INSPECTION

1. CHECK HEAT INSULATOR FOR DAMAGE
2. CHECK FOR ADEQUATE CLEARANCE BETWEEN TWC AND HEAT INSULATOR



CATALYTIC CONVERTER REPLACEMENT

EG5HC–02

1. **REMOVE CONVERTER**

(a) Jack up the vehicle.
(b) Check that the converter is cool.
(c) Remove the bolts and nuts at the front and rear of the converter.
(d) Remove the converter and gasket.

2. **REINSTALL CONVERTER**

(a) Place new gaskets on the converter front and rear pipes, and connect the converter the exhaust pipes.
(b) Torque the bolts and nuts.
Torque: 48 N·m (490 kgf·cm, 35 ft·lbf)

SERVICE SPECIFICATIONS

EG09Q–1H

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Charcoal canister x Body	31	316	23
EGR pipe x Cylinder head	18	185	13
EGR pipe x EGR valve	19	195	14
EGR pipe x Exhaust manifold	20	200	15
EGR valve x Air intake chamber	19	195	14
Front exhaust pipe x TWC	48	490	35
TWC x Tailpipe	48	490	35

MFI SYSTEM

PRECAUTION

EG5ND-02

1. **Before working on the fuel system, disconnect the negative (–) terminal cable from the battery.**
   HINT: Any diagnostic trouble code retained by the ECM will be erased when the battery negative (–) terminal cable is removed from the battery.
   Therefore, if necessary, read the diagnostic trouble code(s) before removing the negative (–) terminal cable from the battery.
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.**

EG64T-01

MAINTENANCE PRECAUTIONS

1. **PRECAUTION WHEN CONNECTING GAUGE**
   Use battery as the power source for the timing light, etc.
2. **IN EVENT OF ENGINE MISFIRE, THESE 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.

3. **PRECAUTIONS WHEN HANDLING HEATED OXYGEN SENSORS**

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

EG35R-05

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

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

EG6NF-02

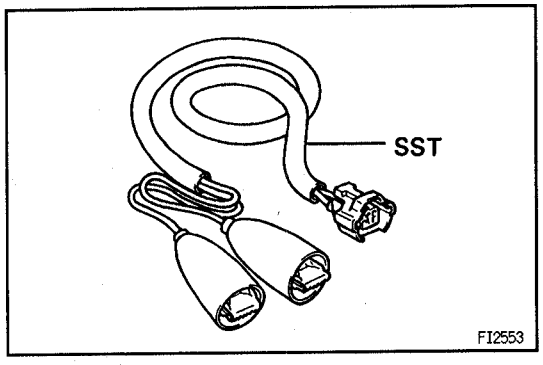
AIR INDUCTION SYSTEM

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 throttle body and cylinder head will cause air suction and cause the engine to run out of tune.

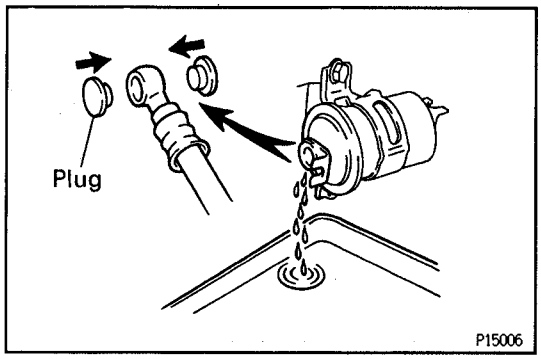
EG5HG–02

ELECTRONIC CONTROL SYSTEM

1. Before removing MFI wiring connectors, terminals, etc., first disconnect the power by either turning the ignition switch to LOCK or disconnecting the negative (–) terminal cable from the battery.
   HINT: Always check the diagnostic trouble code before disconnecting the battery terminal cable.
2. When installing the battery, be especially careful not to incorrectly connect the positive (+) and negative (–) cable terminals.
3. Do not permit parts to receive a severe impact during removal or installation. Handle all MFI parts carefully, especially the ECM.
4. Do not be careless during troubleshooting as there are numerous transistor circuits and even slight terminal contact can further troubles.
5. Do not open the ECM cover.
6. When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the MFI parts and wiring connectors.
7. Parts should be replaced as an assembly.
8. Care is required when pulling out and inserting wiring connectors.
   (a) Release the lock and pull out the connector, pulling on the connectors.
   (b) Fully insert the connector and check that it is locked.
9. When inspecting a connector with a volt/ohmmeter.
   (a) Carefully take out the water–proofing rubber if it is a water–proof type connector.
   (b) Insert the test probe into the connector from wiring side when checking the continuity, amperage or voltage.
   (c) Do not apply unnecessary force to the terminal.
   (d) After checking, install the water–proofing rubber on the connector securely.



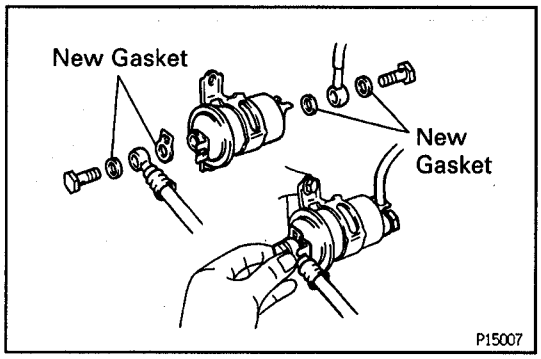
10. Use SST for inspection or test of the injector or its wiring connector.
    SST 09842–30070



FUEL SYSTEM

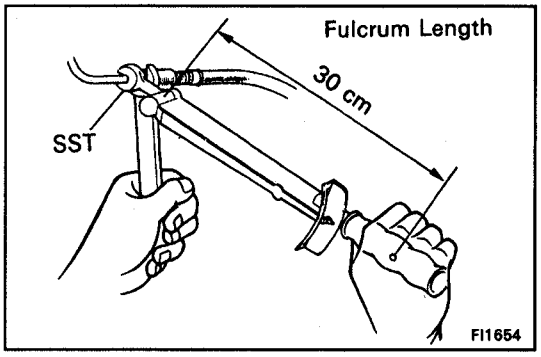
EGSAV–04

1. When disconnecting the high pressure fuel line, a large amount of gasoline will spill out, so observe these procedures:
(a) Put a container under the connection.
(b) Slowly loosen the connection.
(c) Disconnect the connection.
(d) Plug the connection with a rubber plug.

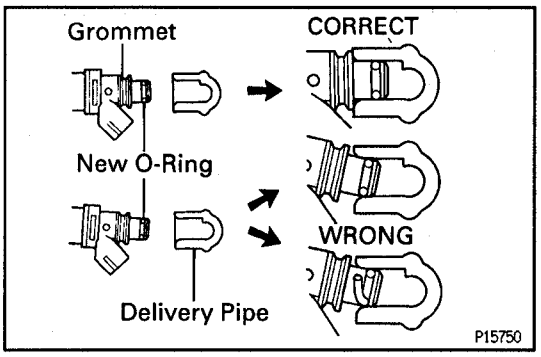


2. When connecting the flare nut or union bolt on the high pressure pipe union, observe these procedures:

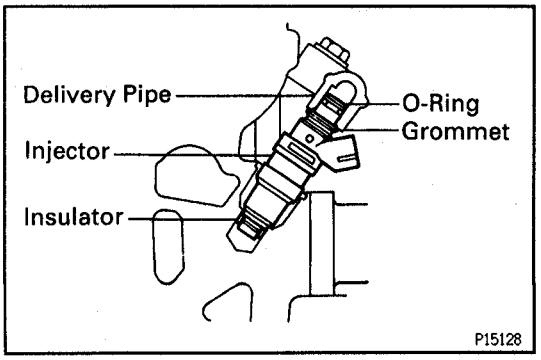
Union Bolt Type:
(a) Always use a new gasket.
(b) Tighten the union bolt by hand.
(c) Tighten the union bolt to the specified torque.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)



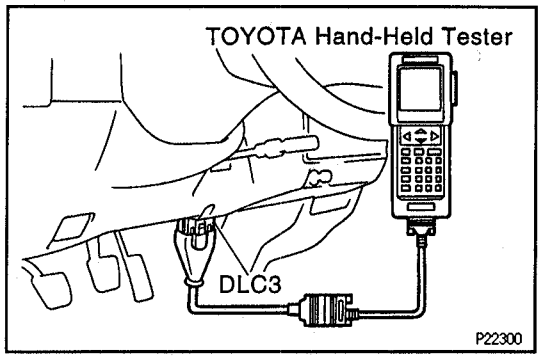
Flare Nut Type:
(a) Apply a light coat of engine oil to the flare and tighten the flare nut by hand.
(b) Using SST, tighten the flare nut to the specified torque.
SST 09631–22020
Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)
HINT: Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).

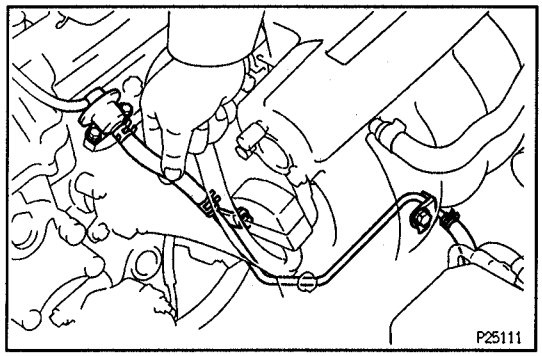


3. Observe these precautions when removing and installing the injectors.
(a) Never reuse the O–ring.
(b) When placing a new O–ring on the injector, take care not to damage it in any way.
(c) Coat a new O–ring with spindle oil or gasoline before installing–never use engine, gear or brake oil.



4. Install the injector to the delivery pipe and cylinder head as shown in the illustration.



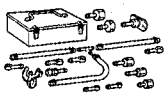
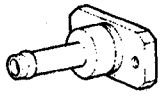
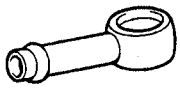
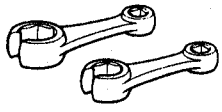


5. Check that there are no fuel leaks after doing maintenance anywhere on the fuel system.
(a) Connect the TOYOTA hand–held tester to the DLC3.
(b) Turn ignition switch ON and TOYOTA hand–held tester main switch ON.
(c) Select the active test mode on the TOYOTA hand–held tester.
(d) Please refer to the TOYOTA hand – held tester operator's manual for further details.
(e) If you have no TOYOTA hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector.
(See step 2 in fuel pump inspection)
(f) Pinch the fuel return hose. The pressure in high pressure line will rise to approx. 400 kPa (4 kgf/cm², 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 as it may cause to hose to crack.
(g) Turn the ignition switch to LOCK.
(h) Remove TOYOTA hand–held tester.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

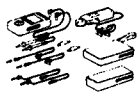
E00CF–1D

	09268–41046	Injection Measuring Tool Set	
	(09268–41091)	NO.7 Union	
	(90405–09015)	No.1 Union	
	09268–45012	EFI Fuel Pressure Gauge	
	09631–22020	Power Steering Hose Nut 14 x 17 mm Wrench Set	Fuel line flare nut
	09816–30010	Oil Pressure Switch Socket	Knock sensor

	09842–30070 Wiring "F" EFI Inspection	
	09843–18020 Diagnosis Check Wire	

RECOMMENDED TOOLS

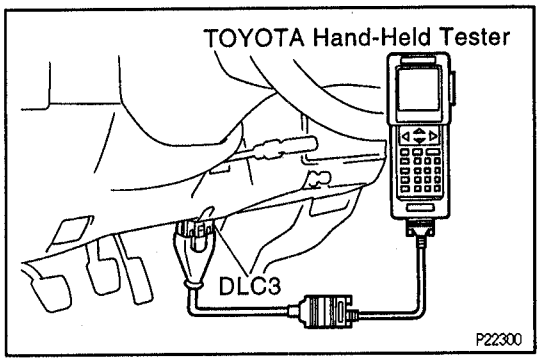
EG0CG–0Z

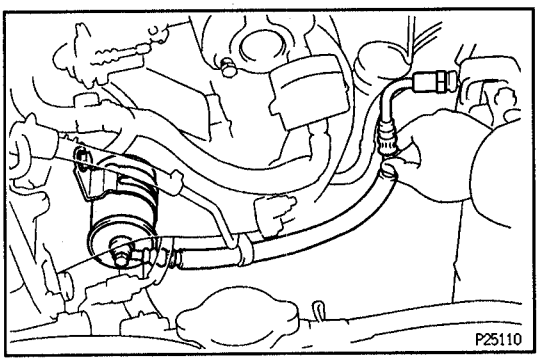
	09082–00050 TOYOTA Electrical Tester Set.	
	09200–00010 Engine Adjust Kit .	
	09258–00030 Hose Plug Set .	Plug for vacuum hose, fuel hose etc.

EQUIPMEMT

EG0CH–1B

Carburetor cleaner	Throttle body
Graduated cylinder	Injector
Heater	
Soft brush	Throttle body
Sound scope	Injector
OBD II scan tool	Engine speed
Thermometer	
Torque wrench	





FUEL PUMP

ON−VEHICLE INSPECTION

EG04U−01

1. INSPECT FUEL PUMP OPERATION

(a) Connect the TOYOTA hand−held tester to the DLC3.

(b) Turn the ignition switch ON and TOYOTA hand−held tester main switch ON.

NOTICE: Do not start the engine.

(c) Select the active test mode on the TOYOTA hand−held tester.

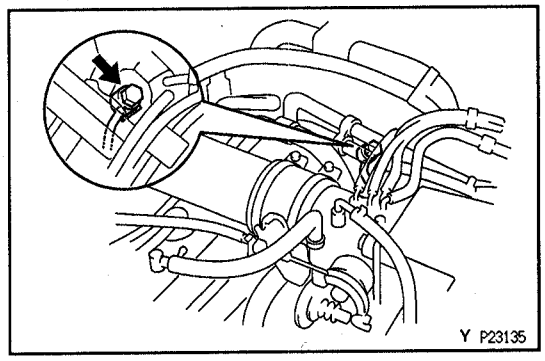
(d) Please refer to the TOYOTA hand − held tester operator's manual for further details.

(e) If you have no TOYOTA hand−held tester, connect the positive (+) and negative (−) leads from the battery to the fuel pump connector.
(See step 2 in fuel pump inspection)

(f) Check that there is pressure in the inlet hose from the fuel filter.
HINT: At this time, you will hear fuel return noise.
If there is no pressure, check these parts:
- M−Fuse (AM2 30A)
- Fuses (EFI 15A, IGN 7.5A)
- EFI main relay
- Fuel pump
- ECM
- Wiring connections

(g) Turn the ignition switch to LOCK.

(h) Remove the TOYOTA hand−held tester.

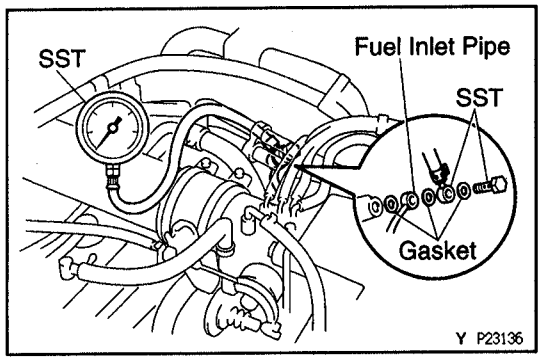


2. INSPECT FUEL PRESSURE

(a) Check that the battery positive voltage is above 12 volts.

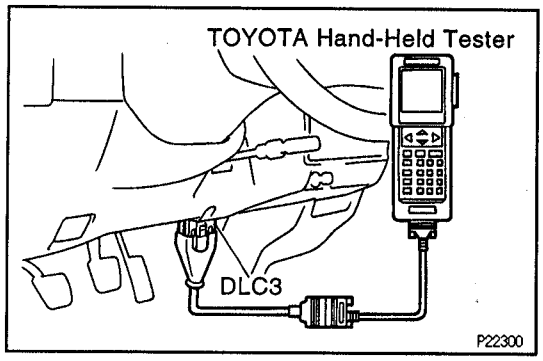
(b) Disconnect the negative (−) terminal cable from the battery.

(c) Remove the union bolt and 2 gaskets, and disconnect the fuel inlet pipe from the delivery pipe.
HINT:
- Put a suitable container or shop rag under the delivery pipe.
- Slowly loosen the union bolt.



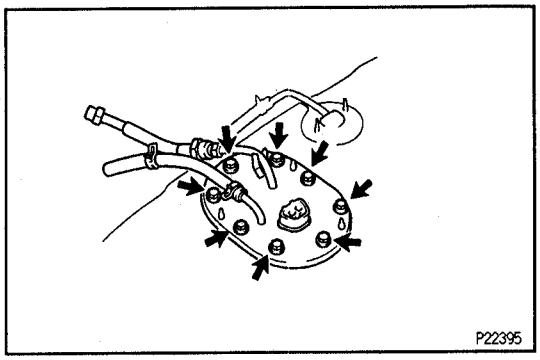
(d) Install the fuel inlet pipe and SST (pressure gauge) to the delivery pipe with the 3 gaskets and SST (union bolt).
SST 09268−45012
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

(e) Wipe off any splattered gasoline.



(f) Connect the TOYOTA hand–held tester to the DLC3.
(g) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.
NOTICE: Do not start the engine.
(h) Select the active test mode on the TOYOTA hand–held tester.
(i) Please refer to the TOYOTA hand – held tester operator's manual for further details.
(j) If you have no TOYOTA hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector.
(See step 2 in fuel pump inspection)
(k) Reconnect the negative (–) terminal cable to the battery.
(l) Turn the ignition switch ON.
(m) Measure the fuel pressure.
Fuel pressure:
265–304 kPa (2.7–3.1 kgf/cm², 38–44 psi)
If pressure is high, replace the fuel pressure regulator.
If pressure is low, check these parts:
- Fuel hoses and connections
- Fuel pump
- Fuel filter
- Fuel pressure regulator
- Injectors

(n) Remove the TOYOTA hand–held tester.
(o) Start the engine.
(p) Measure the fuel pressure at idle.
Fuel pressure:
206–255 kPa (2.1–2.6 kgf/cm², 31–37 psi)
If pressure is not as specified, check the vacuum sensing hose and fuel pressure regulator.
(q) Stop the engine.
(r) Check that the fuel pressure remains as specified for 5 minutes after the engine has stopped.
Fuel pressure:
147 kPa (1.5 kgf/cm², 21 psi) or more
If pressure is not as specified, check the fuel pump, pressure regulator and/or injector.
(s) After checking fuel pressure, disconnect the negative (–) terminal cable from the battery and carefully remove the SST to prevent gasoline from splashing.
SST 09268–45012
(t) Reconnect the fuel inlet pipe to the delivery pipe with 2 new gaskets and the union bolt.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)
(u) Reconnect the negative (–) terminal cable to the battery.
(v) Check for fuel leakage.



EG

EG8AZ–04

FUEL PUMP REMOVAL

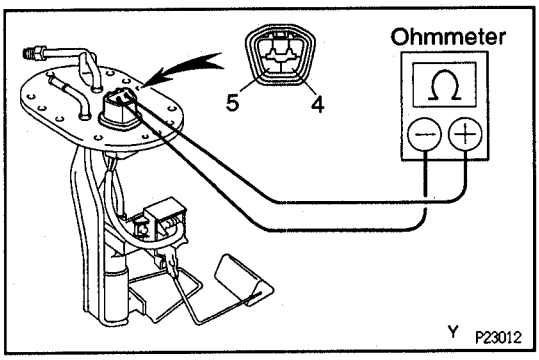
CAUTION: Do not smoke or work near an open flame when working on the fuel pump.

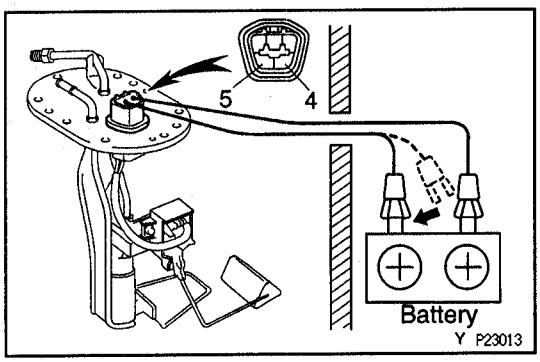
1. **REMOVE FUEL TANK**
   (See fuel tank and line in MFI System)
2. **REMOVE FUEL PUMP BRACKET ASSEMBLY FROM FUEL TANK**

(a) Remove the 8 bolts.
Torque: 3.5 N·m (35 kgf·cm, 31 in.·lbf)

(b) Pull out the pump bracket assembly.

(c) Remove the gasket from the pump bracket.
INSTALLATION HINT: Use a new gasket to the pump bracket.





EG8NJ–02

FUEL PUMP INSPECTION

1. **INSPECT FUEL PUMP RESISTANCE**
   Using an ohmmeter, measure the resistance between the terminals 4 and 5.
   Resistance:
   At 20°C (68°F): 0.2 – 3.0 Ω
   If the resistance is not as specified, replace the fuel pump and/or lead wire.

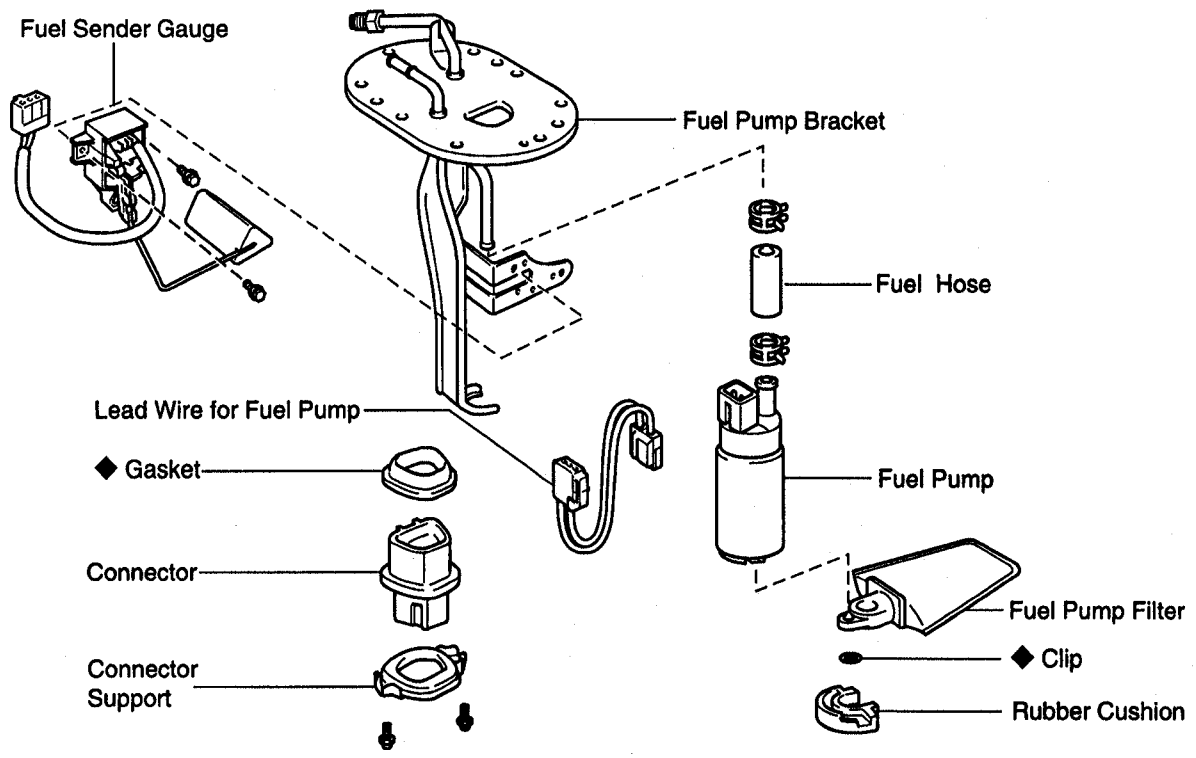
2. **INSPECT FUEL PUMP OPERATION**
   Connect the positive (+) lead from the battery to terminal 4 of the connector, and the negative (–) lead to terminal 5. Check that the fuel pump operates.
   NOTICE:
   - **These tests must be done quickly (within 10 seconds) to prevent the coil from burning out.**
   - **Keep the fuel pump as far away from the battery as possible.**
   - **Always do the switching at the battery side.**

   If operation is not as specified, replace the fuel pump and/or lead wire.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

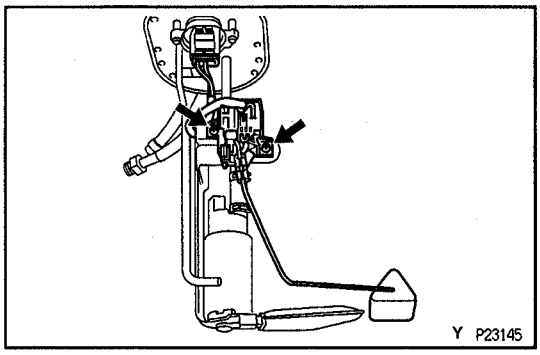
EGOD1–14

Reference (2WD)



◆ Non-reusable part

Y P23022

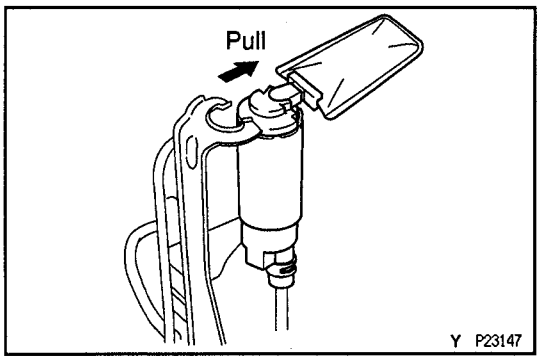


FUEL PUMP DISASSEMBLY

EGOGH–08

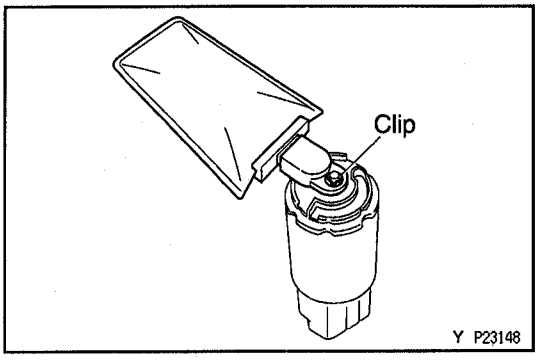
1. **REMOVE FUEL PUMP LEAD WIRE**
2. **REMOVE FUEL SENDER GAUGE FROM FUEL PUMP BRACKET**

(a) Disconnect the fuel sender gauge connector.
(b) Remove the 2 screws and sender gauge.



3. **REMOVE FUEL PUMP FROM FUEL PUMP BRACKET**

(a) Pull off the lower side of the fuel pump from the pump bracket.
(b) Disconnect the fuel hose from the fuel pump, and remove the fuel pump.
(c) Remove the rubber cushion from the fuel pump.

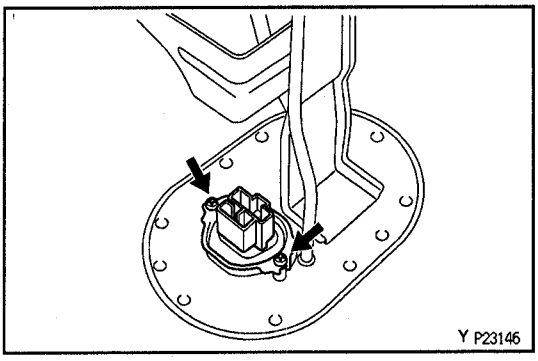


4. REMOVE FUEL PUMP FILTER FROM FUEL PUMP

(a) Using a small screwdriver, remove the clip.

(b) Pull out the pump filter.

INSTALLATION HINT: Install the pump filter with a new clip.



5. REMOVE CONNECTOR

Remove the 2 screws, connector support, connector and gasket.

INSTALLATION HINT: Install the connector with a new gasket.

FUEL PUMP ASSEMBLY

E064V-01

Assembly is in the reverse order of disassembly.

FUEL PUMP INSTALLATION

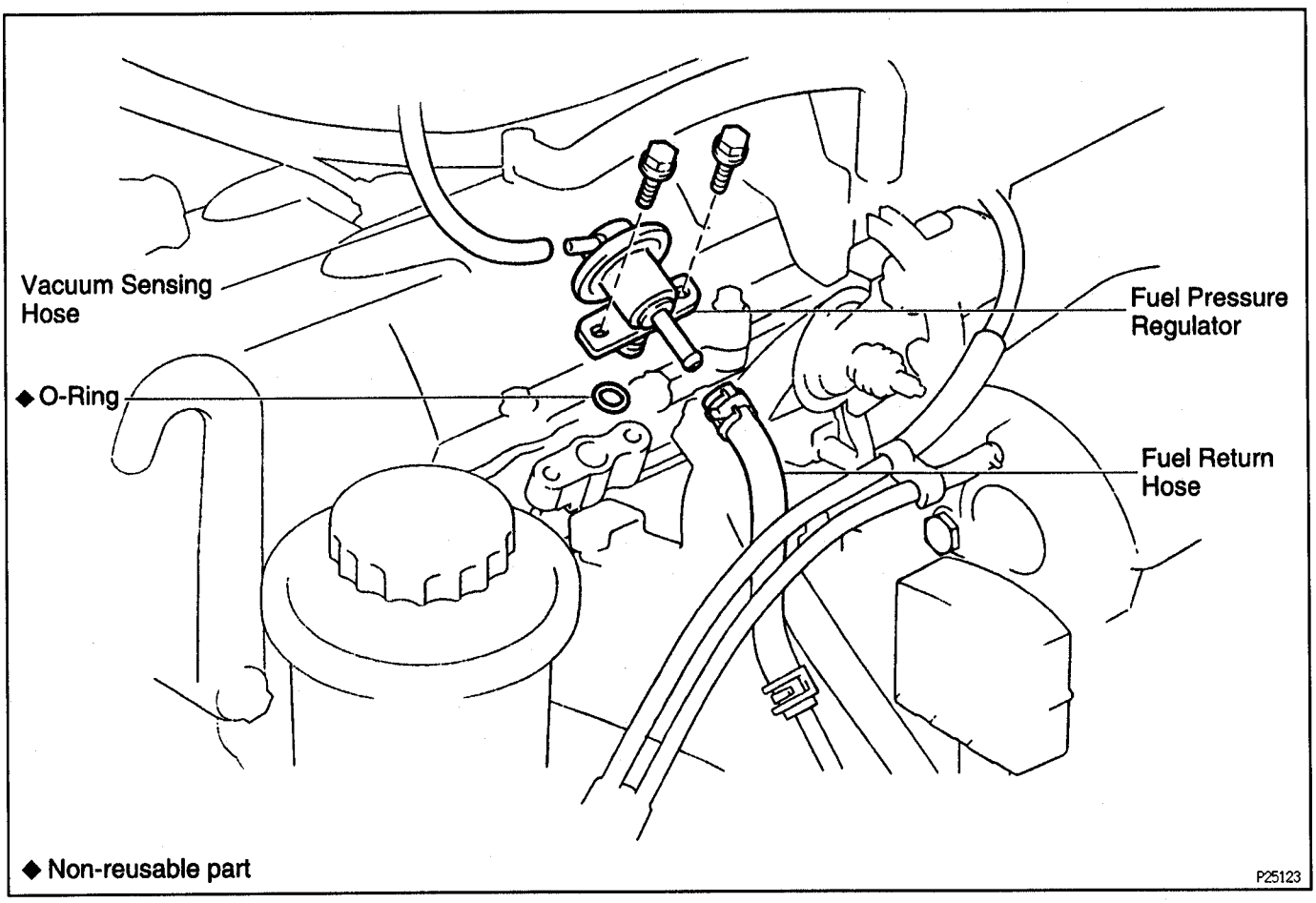
E064W-01

Installation is in the reverse order of removal.

FUEL PRESSURE REGULATOR

EG1AC–12

COMPONENTS FOR REMOVAL AND INSTALLATION

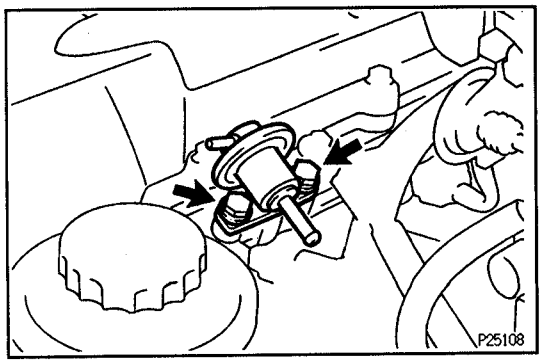


EG

FUEL PRESSURE REGULATOR REMOVAL

EGBMK–02

1. **DISCONNECT VACUUM SENSING HOSE FROM FUEL PRESSURE REGULATOR**
2. **DISCONNECT FUEL RETURN HOSE FROM FUEL PRESSURE REGULATOR**
   HINT: Put a suitable container or shop towel under the pressure regulator.



3. **REMOVE FUEL PRESSURE REGULATOR**

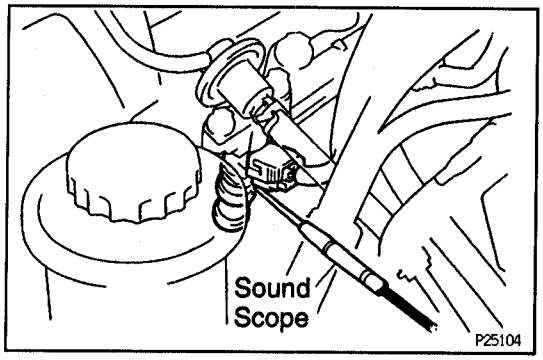
(a) Remove the 2 bolts and fuel pressure regulator.
Torque: 8.8 N·m (90 kgf·cm, 78 in.·lbf)

(b) Remove the O–ring.
INSTALLATION HINT: Use a new O–ring.

FUEL PRESSURE REGULATOR INSTALLATION

EG660–01

Installation is in the reverse order of removal.



INJECTOR

ON–VEHICLE INSPECTION

EG5NL–02

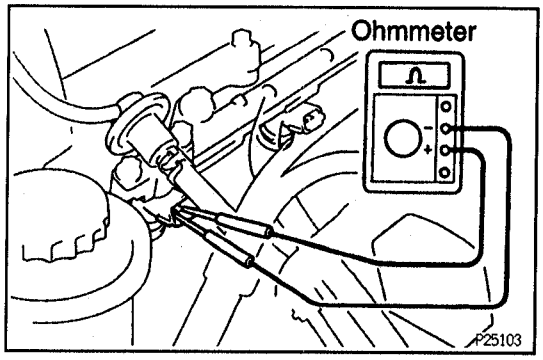
1. INSPECT INJECTOR OPERATION

Check operation sound from each injector.

(a) With the engine running or cranking, use a sound scope to check that there is normal operating noise in proportion to engine speed.

(b) If you have no sound scope, you can check the injector transmission operation with your finger.

If no sound or unusual sound is heard, check the wiring connector, injector or injection signal from the ECM.



2. INSPECT INJECTOR RESISTANCE

(a) Remove the throttle body.
(See throttle body removal)

(b) Disconnect the injector connectors.

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

Resistance:

At 20°C (68°F): 12 – 16 Ω

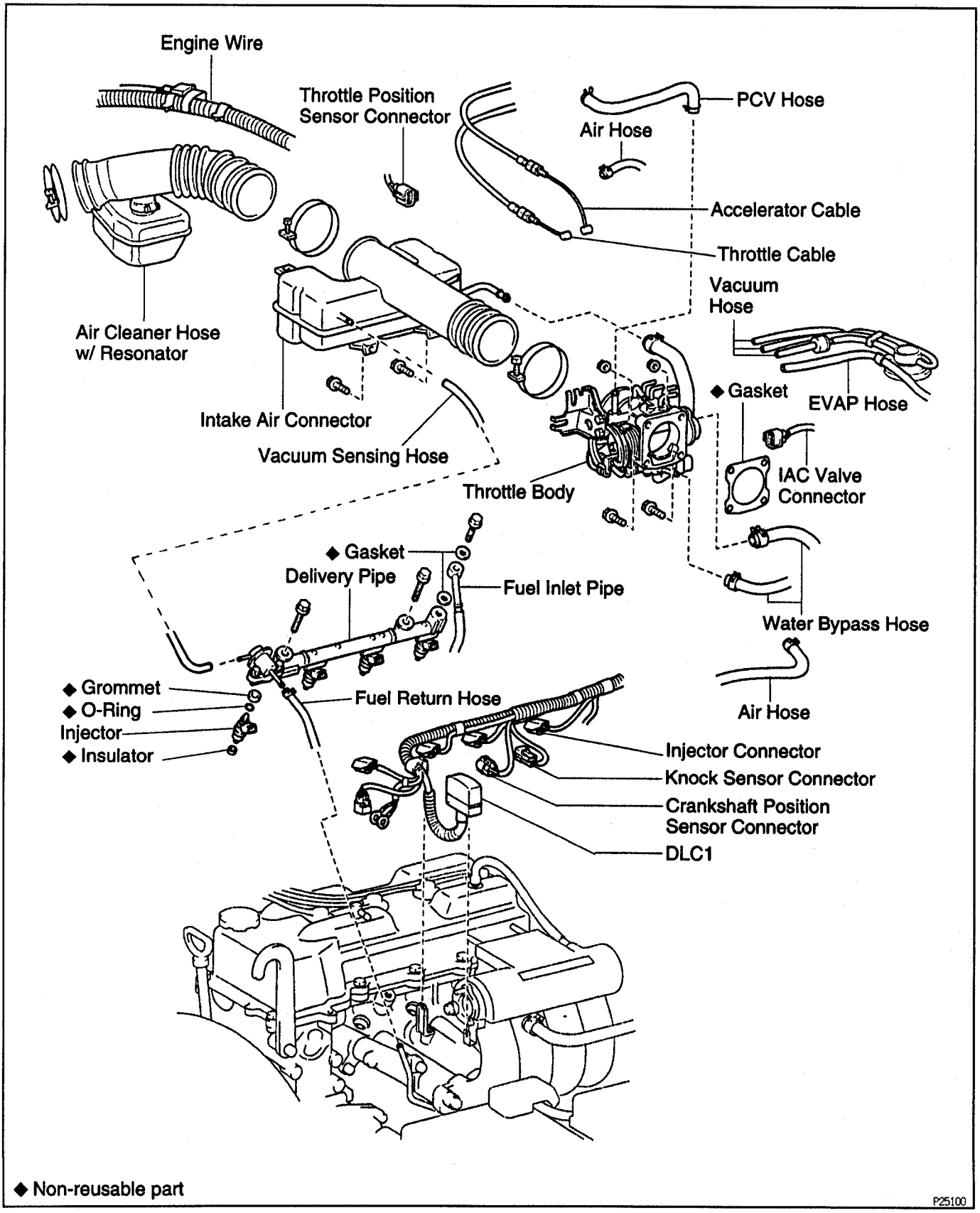
If the resistance is not as specified, replace the injector.

(d) Reconnect the injector connectors.

(e) Reinstall the throttle body.
(See throttle body installation)

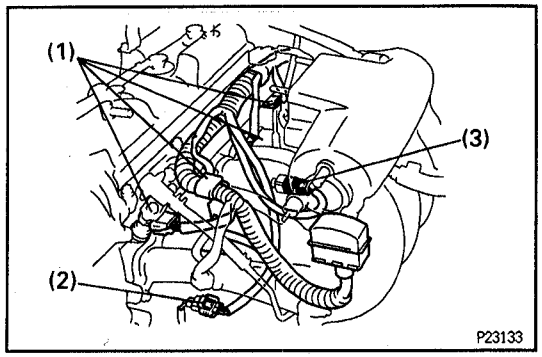
EG130–0U

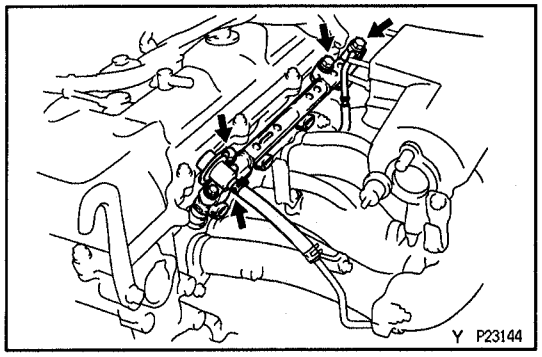
COMPONENTS FOR REMOVAL AND INSTALLATION



◆ Non-reusable part

P25100





EG

INJECTORS REMOVAL

EG651–01

1. **REMOVE THROTTLE BODY**
   (See throttle body removal)
2. **DISCONNECT ENGINE WIRE**

(a) Disconnect these connectors:
   (1) 4 injector connectors
   (2) Crankshaft position sensor connector
   (3) Knock sensor connector

(b) Disconnect the DLC1 and wire clamp from the brackets.

3. **REMOVE DELIVERY PIPE AND INJECTORS**

(a) Disconnect the vacuum sensing hose from the fuel pressure regulator.

(b) Disconnect the fuel return hose from the fuel pressure regulator.

(c) Remove the union bolt and 2 gaskets, and disconnect the fuel inlet pipe from the delivery pipe.
HINT:
- Put a suitable container or shop rag under the delivery pipe.
- Slowly loosen the union bolt.

(d) Remove the 2 bolts and delivery pipe together with the 4 injectors.
NOTICE: Be careful not to drop the injectors when removing the delivery pipe.

(e) Remove the 4 insulators from the 4 spacers.

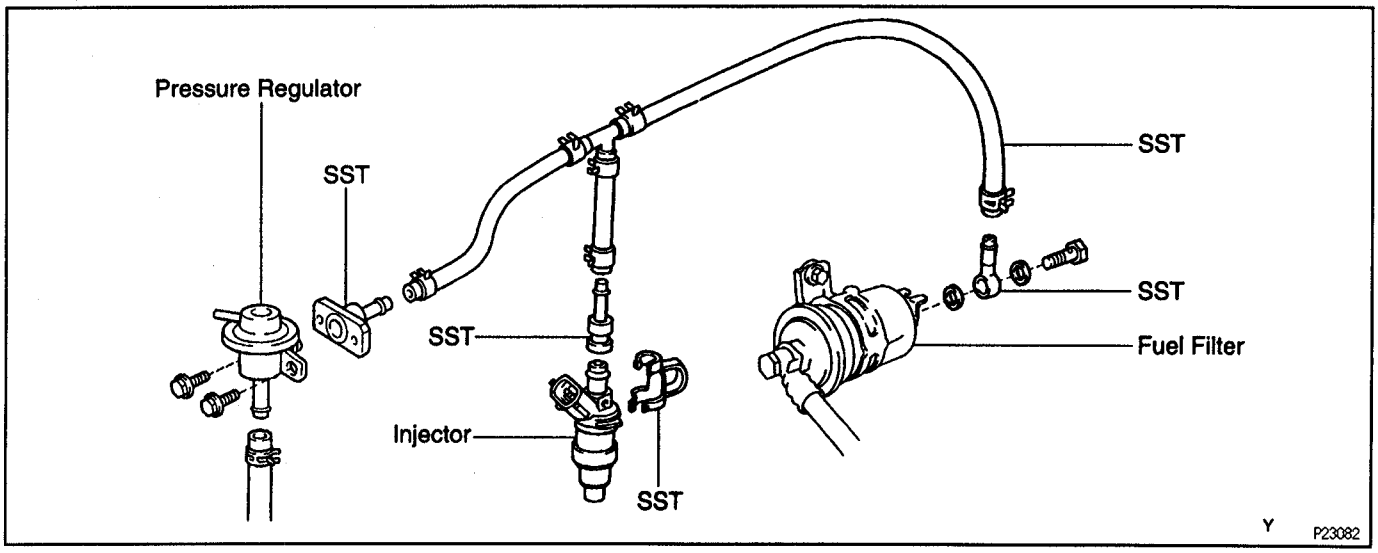
(f) Pull out the 4 injectors from the delivery pipe.

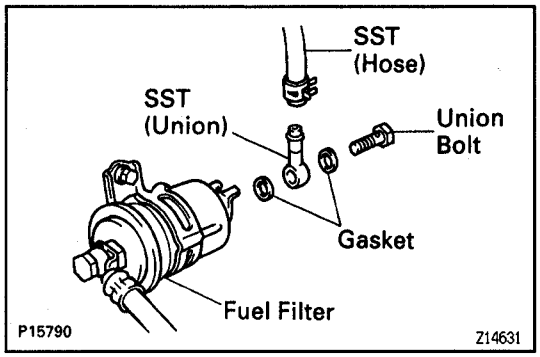
(g) Remove the O–ring and grommet from each injector.

INJECTORS INSPECTION

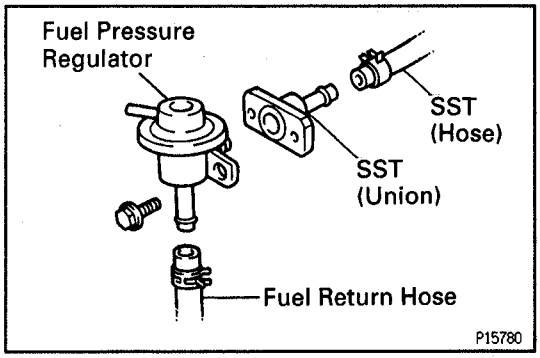
EG582–04

1. **INSPECT INJECTOR INJECTION**
CAUTION: Keep injector clean of sparks during the test.

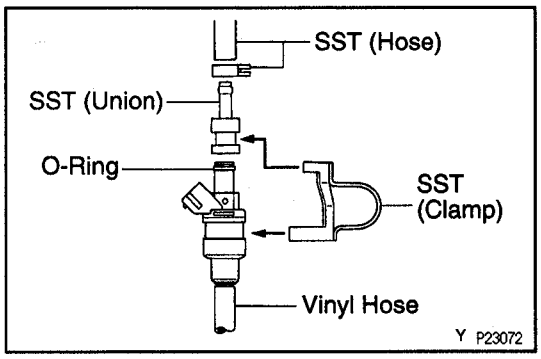




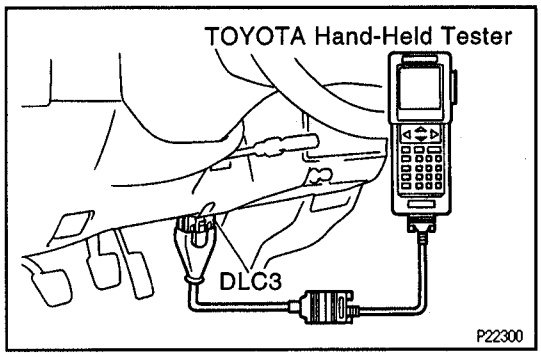
(a) Remove the fuel inlet pipe from the fuel filter outlet.
(b) Connect SST (union and hose) to the fuel filter outlet with the 2 gaskets and union bolt.
SST 09268–41046 (90405–09015)
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)



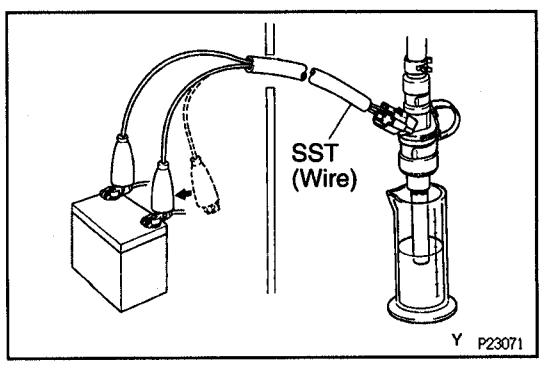
(c) Remove the fuel pressure regulator from the delivery pipe.
(d) Install the O–ring to the fuel inlet of pressure regulator.
(e) Connect SST (hose) to the fuel inlet of the pressure regulator with SST (union) and the 2 bolts.
SST 09268–41046 (09268–41091)
(f) Connect the fuel return hose to the fuel outlet of the pressure regulator.



(g) Install the O–ring to the injector.
(h) Connect SST (union and hose) to the injector, and hold the injector and union with SST (clamp).
SST 09268–41046
(i) Put the injector into a graduated cylinder.
HINT: Install a suitable vinyl hose onto the injector to prevent gasoline from splashing out.



(j) Connect the TOYOTA hand–held tester to the DLC3.
(k) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.
NOTICE: Do not start the engine.
(l) Select the active test mode on the TOYOTA hand–held tester.
(m) Please refer to the TOYOTA hand – held tester operator's manual for further details.
(n) If you have no TOYOTA hand–held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector.
(See step 2 in fuel pump inspection)



(o) Connect SST (wire) to the injector and battery for 15 seconds, and measure the injection volume with a graduated cylinder. Test each injector 2 or 3 times.
SST 09842–30070

Volume:

2RZ–FE

62 – 79 cm³ (3.8 – 4.8 cu in.) per 15 seconds

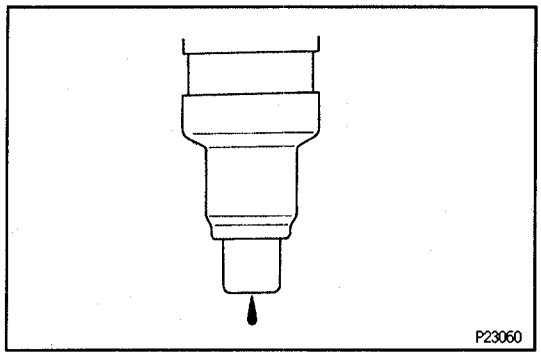
3RZ–FE

69 – 88 cm³ (4.2 – 5.4 cu in.) per 15 seconds

Difference between each injector:

5 cm³ (0.3 cu in.) or less

If the injection volume is not as specified, replace the injector.



2. INSPECT LEAKAGE

(a) In the condition above, disconnect the test probes of SST (wire) from the battery and check the fuel leakage from the injector.
SST 09842–30070

Fuel drop:

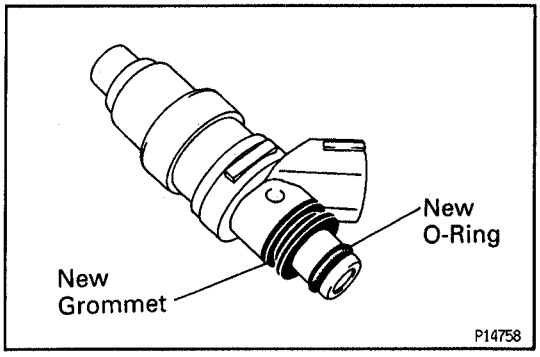
1 drop or less per 3 minutes

(b) Turn the ignition switch to LOCK.

(c) Disconnect the negative (–) terminal cable from the battery.

(d) Remove the SST and TOYOTA hand–held tester.
SST 09268–41045

(e) Reinstall the fuel pressure regulator and fuel inlet pipe.



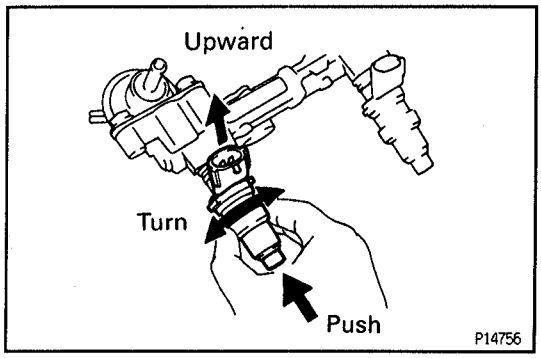
INJECTORS INSTALLATION

EG583-04

1. INSTALL INJECTORS TO DELIVERY PIPE

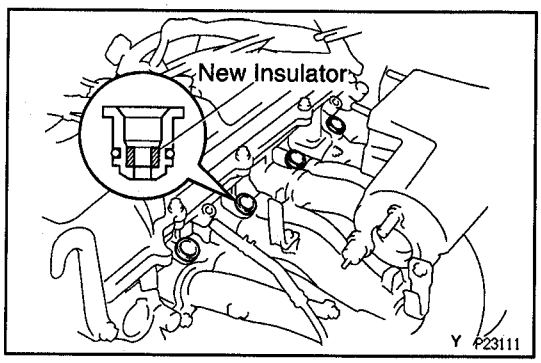
(a) Install a new grommet to the injector.

(b) Apply a light coat of gasoline to a new O–ring and install it to the injector.



(c) While turning the injector left and right, install it to the delivery pipe. Install the 4 injectors.

(d) Position the injector connector upward.

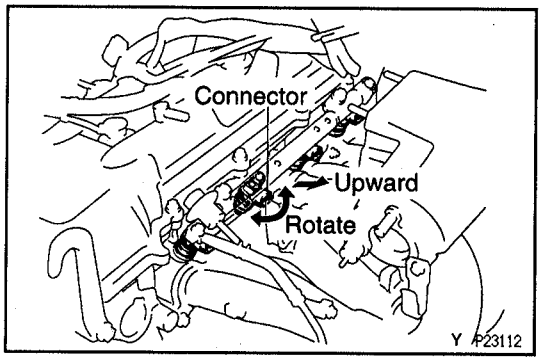


2. INSTALL INJECTORS AND DELIVERY PIPE

(a) Place the 4 new insulators and in position on the spacers.

(b) Place the 4 injectors together with the delivery pipe in position on the cylinder head.

(c) Temporarily install the 2 bolts holding the delivery pipe to the cylinder head.



(d) Check that the injectors rotate smoothly.
HINT: If injectors do not rotate smoothly, the probable cause is incorrect installation of O–rings. Replace the O–rings.

(e) Position the injector connector upward.

(f) Tighten the 2 bolts holding the delivery pipe to the cylinder head.
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

(g) Connect the fuel inlet pipe to the delivery pipe with 2 new gaskets and the union bolt.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)

(h) Connect the fuel return hose to the fuel pressure regulator.

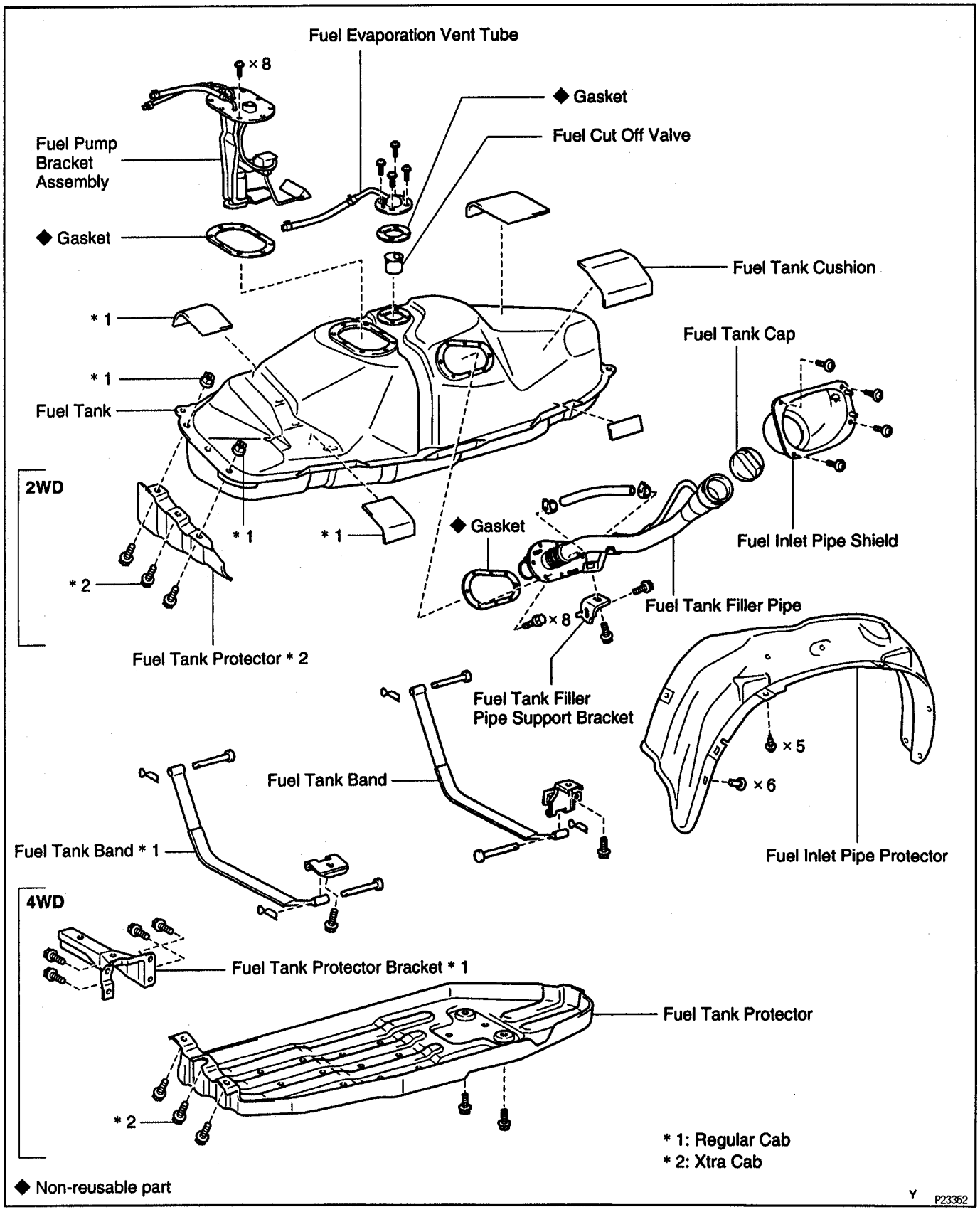
(i) Connect the vacuum sensing hose to the fuel pressure regulator.

3. CONNECT ENGINE WIRE

4. INSTALL THROTTLE BODY
(See throttle body installation)

FUEL TANK AND LINE
COMPONENTS

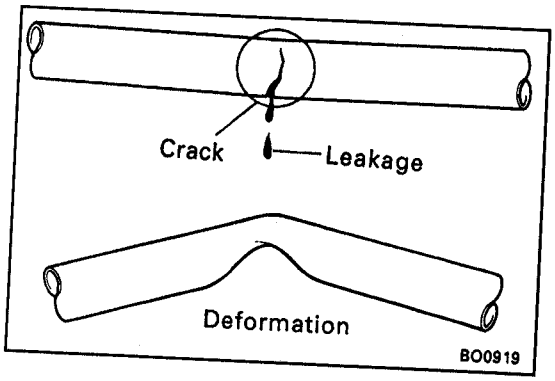
EG0DC–0U



PRECAUTIONS

EG0DD–0A

1. **Always use new gaskets when replacing the fuel tank or component parts.**
2. **Apply the proper torque to all parts tightened.**

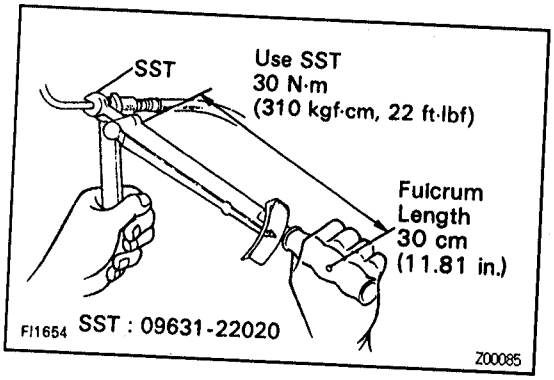


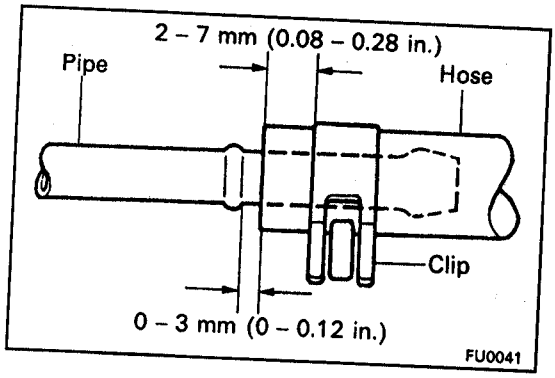
FUEL LINES AND CONNECTIONS INSPECTION

EG0DE–0D

(a) Check the fuel lines for cracks or leakage, and all connections for deformation.
(b) Check the fuel tank vapor vent system hoses and connections for looseness, sharp bends or damage.
(c) Check the fuel tank for deformation, cracks, fuel leakage or tank band looseness.
(d) Check the filler neck for damage or fuel leakage.
(e) Hose and tube connections are as shown in the illustration.

If a problem is found, repair or replace the part as necessary.





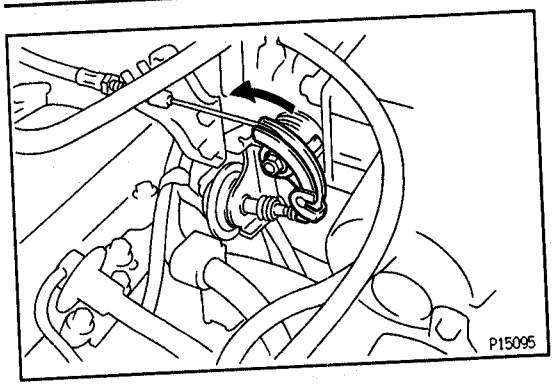
THROTTLE BODY

EG584–03

ON–VEHICLE INSPECTION

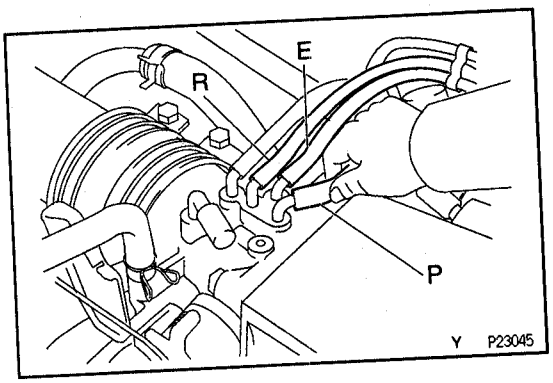
1. INSPECT THROTTLE BODY

(a) Check that the throttle linkage moves smoothly.



(b) Check the vacuum at each port.

- Start the engine.
- Check the vacuum with your finger.



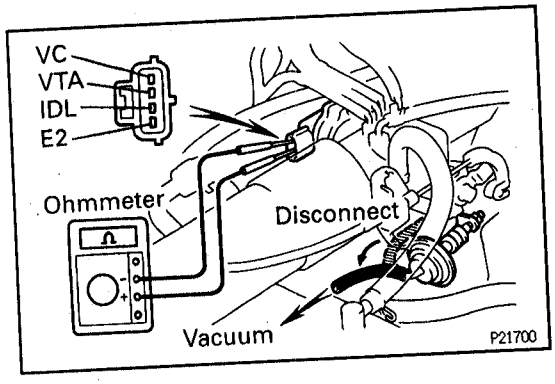
Port name	At idle	At 3,500 rpm
P	Vacuum	Vacuum
E	No vacuum	Vacuum
R	No vacuum	Vacuum

2. INSPECT THROTTLE POSITION SENSOR

(a) Disconnect the sensor connector.

(b) Apply vacuum to the throttle opener.

(c) Using an ohmmeter, measure the resistance between each terminal.



Throttle valve condition	Between terminals	Resistance
Fully closed	VTA – E2	0.2 – 5.7 kΩ
Fully closed	IDL – E2	2.3 kΩ or less
Open	IDL – E2	Infinity
Fully open	VTA – E2	2.0 – 10.2 kΩ
–	VC – E2	2.5 – 5.9 kΩ

(d) Reconnect the sensor connector.

3. INSPECT THROTTLE OPENER

A. Warm up engine

Allow the engine to warm up to normal operating temperature.

B. Check idle speed

(See steps 2 and 3 in idle speed inspection in Engine Mechanical)

Idle speed:

650 – 750 rpm

C. Check throttle opener setting speed

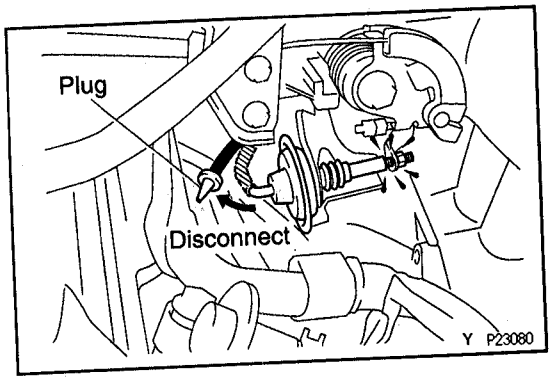
(a) Disconnect the vacuum hose from the throttle opener, and plug the hose end.

(b) Check the throttle opener setting speed.

Throttle opener setting speed:

1,200 – 1,500 rpm

If the throttle opener setting is not as specified, replace the throttle body.

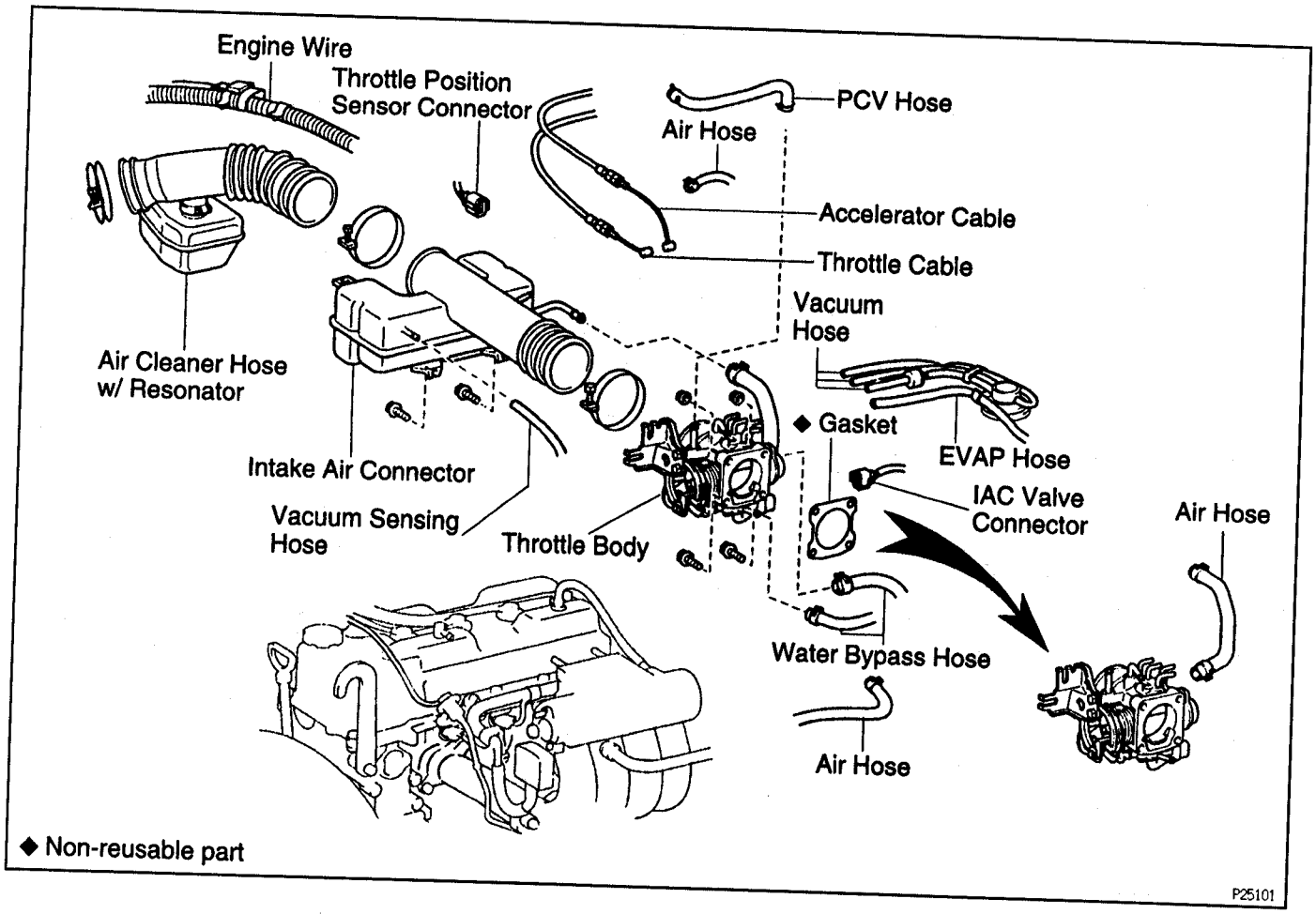


(c) Stop the engine.
(d) Reconnect the vacuum hose to the throttle opener.
(e) Start the engine, and check that the idle speed returns to the correct speed.

D. Disconnect TOYOTA hand–held tester or OBD II scan tool

COMPONENTS FOR REMOVAL AND INSTALLATION

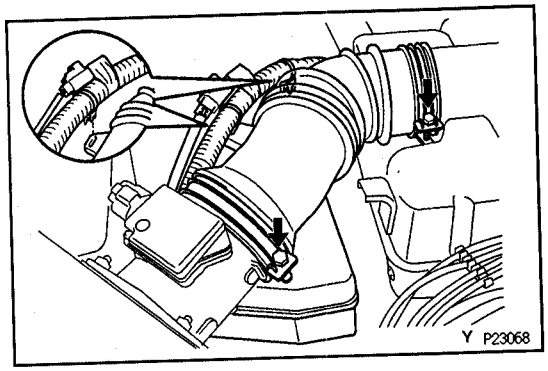
EG13G–1D



THROTTLE BODY REMOVAL

EG585–04

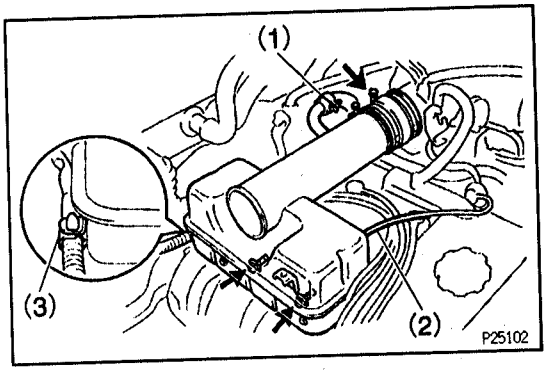
1. **DRAIN ENGINE COOLANT**
2. **M/T:**
   DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY
   A/T:
   DISCONNECT ACCELERATOR AND THROTTLE CABLES FROM THROTTLE BODY



3. REMOVE AIR CLEANER HOSE WITH RESONATOR

(a) Disconnect the 2 wire clamps from the air cleaner hose.

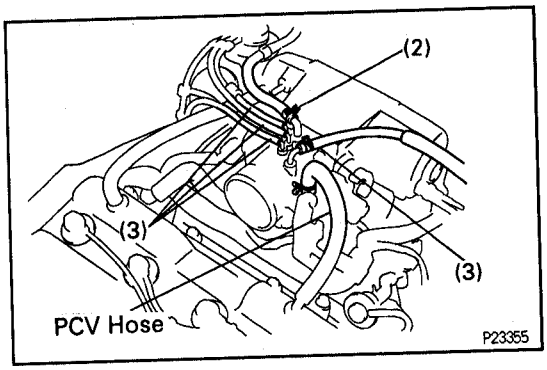
(b) Loosen the air cleaner hose clamps, remove the air cleaner together with the resonator.



4. REMOVE INTAKE AIR CONNECTOR

(a) Disconnect these air hoses and wire clamp:
- (1) Air hose for IAC
- (2) Vacuum sensing hose
- (3) Wire clamp for engine wire

(b) Remove the 2 bolts, hose clamp and intake air connector.



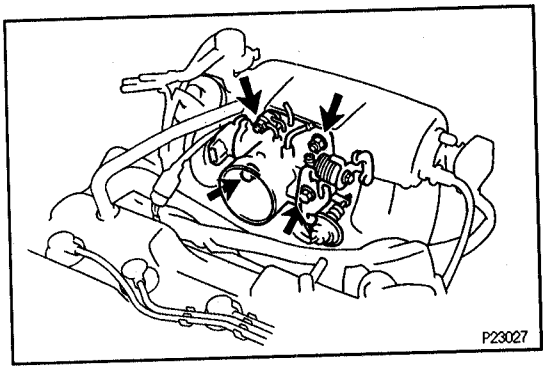
5. REMOVE PCV HOSE

6. REMOVE THROTTLE BODY

(a) Disconnect these hoses:
- (1) 3 vacuum hoses
- (2) EVAP hose
- (3) w/ PS:
  Air hose for PS idle–up

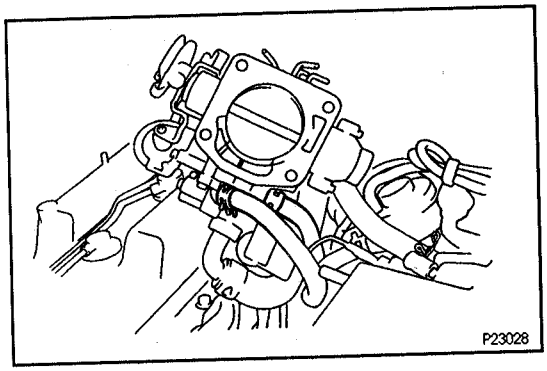
(b) Disconnect the throttle position sensor connector.

(c) Disconnect the IAC valve connector.



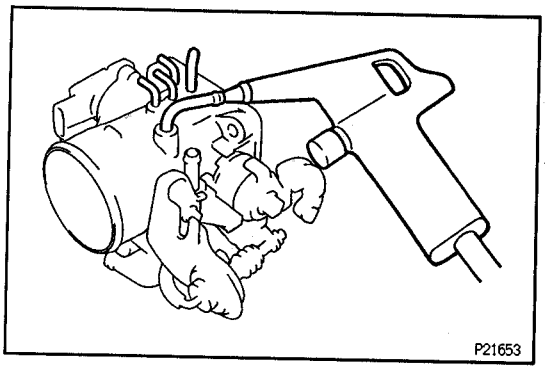
(d) Remove the 2 bolts, 2 nuts, and disconnect the throttle body from the air intake chamber.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

(e) Remove the throttle body gasket.
INSTALLATION HINT: Use a new gasket.



(f) Disconnect the water bypass hoses from the throttle body, and remove the throttle body.

7. REMOVE AIR HOSE FROM IAC VALVE



THROTTLE BODY INSPECTION

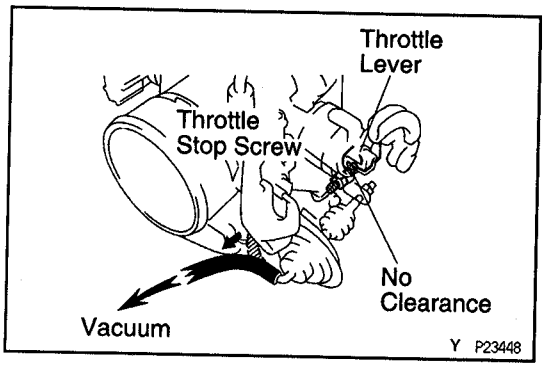
EG0DH–0U

1. CLEAN THROTTLE BODY

(a) Using a soft brush and carburetor cleaner, clean the cast parts.

(b) Using compressed air, clean all the passages and apertures.

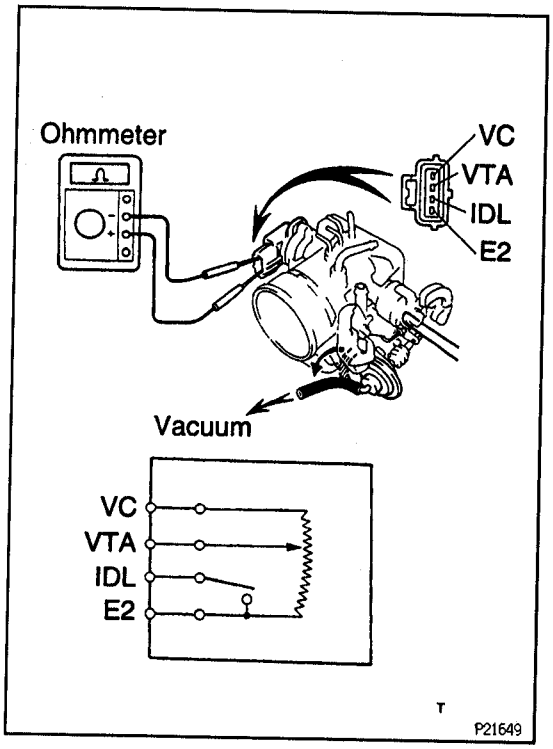
NOTICE: To prevent deterioration, do not clean the throttle position sensor and IAC valve.



2. INSPECT THROTTLE VALVE

(a) Apply vacuum to the throttle opener.

(b) Check that there is no clearance between the throttle stop screw and throttle lever when the closed throttle position.



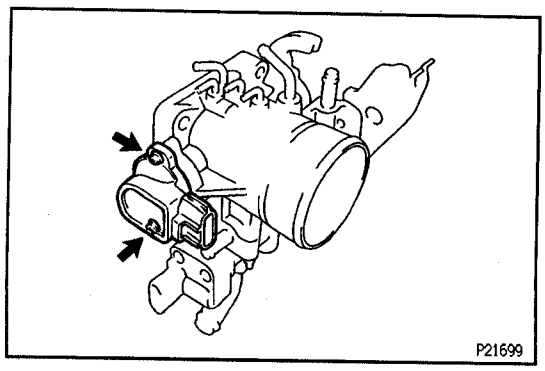
3. INSPECT THROTTLE POSITION SENSOR

(a) Apply vacuum to the throttle opener.

(b) Insert a thickness gauge between the throttle stop screw and stop lever.

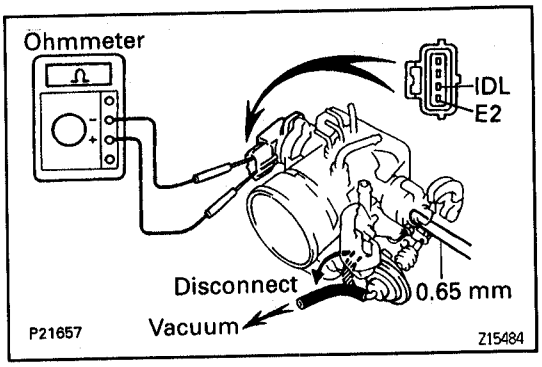
(c) Using an ohmmeter, measure the resistance between each terminal.

Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA – E2	0.2 – 5.7 kΩ
0.57 mm (0.022 in.)	IDL – E2	2.3 kΩ or less
0.74 mm (0.029 in.)	IDL – E2	Infinity
Throttle valve fully open	VTA – E2	2.0 – 10.2 kΩ
–	VC – E2	2.5 – 5.9 kΩ

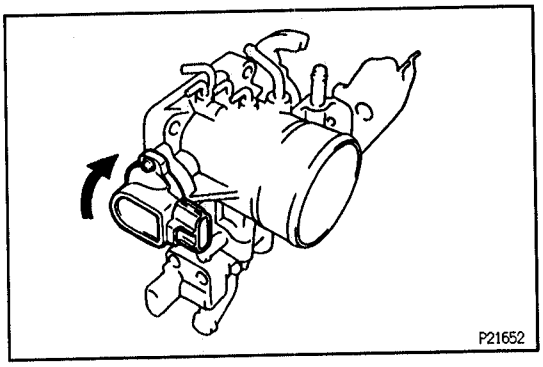


4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

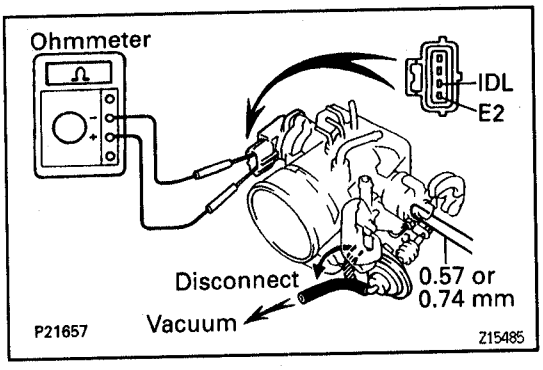
(a) Loosen the 2 set screws of the sensor.



(b) Apply vacuum to the throttle opener.
(c) Insert a 0.65 mm (0.026 in.) thickness gauge between the throttle stop screw and stop lever.
(d) Connect the test probe of an ohmmeter to the terminals IDL and E2 of the sensor.



(e) Gradually turn the sensor clockwise until the ohmmeter deflects, and secure it with the 2 set screws.



(f) Recheck the continuity between terminals IDL and E2.

Clearance between lever and stop screw	Continuity (IDL – E2)
0.57 mm (0.022 in.)	Continuity
0.74 mm (0.029 in.)	No continuity

THROTTLE BODY INSTALLATION

Installation is in the reverse order of removal.

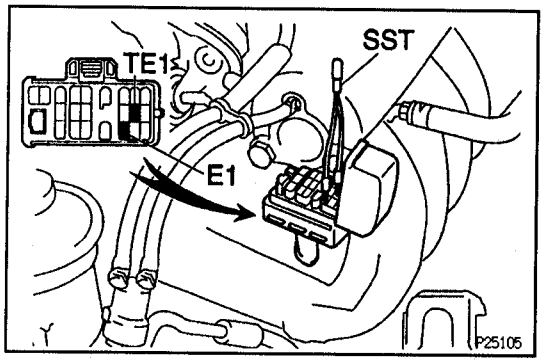
IDLE AIR CONTROL (IAC) VALVE

EGSNN–02

ON–VEHICLE INSPECTION

INSPECT IAC VALVE OPERATION

(a) Initial conditions:
- Engine at normal operating temperature
- Idle speed check correctly
- Transmission in neutral position



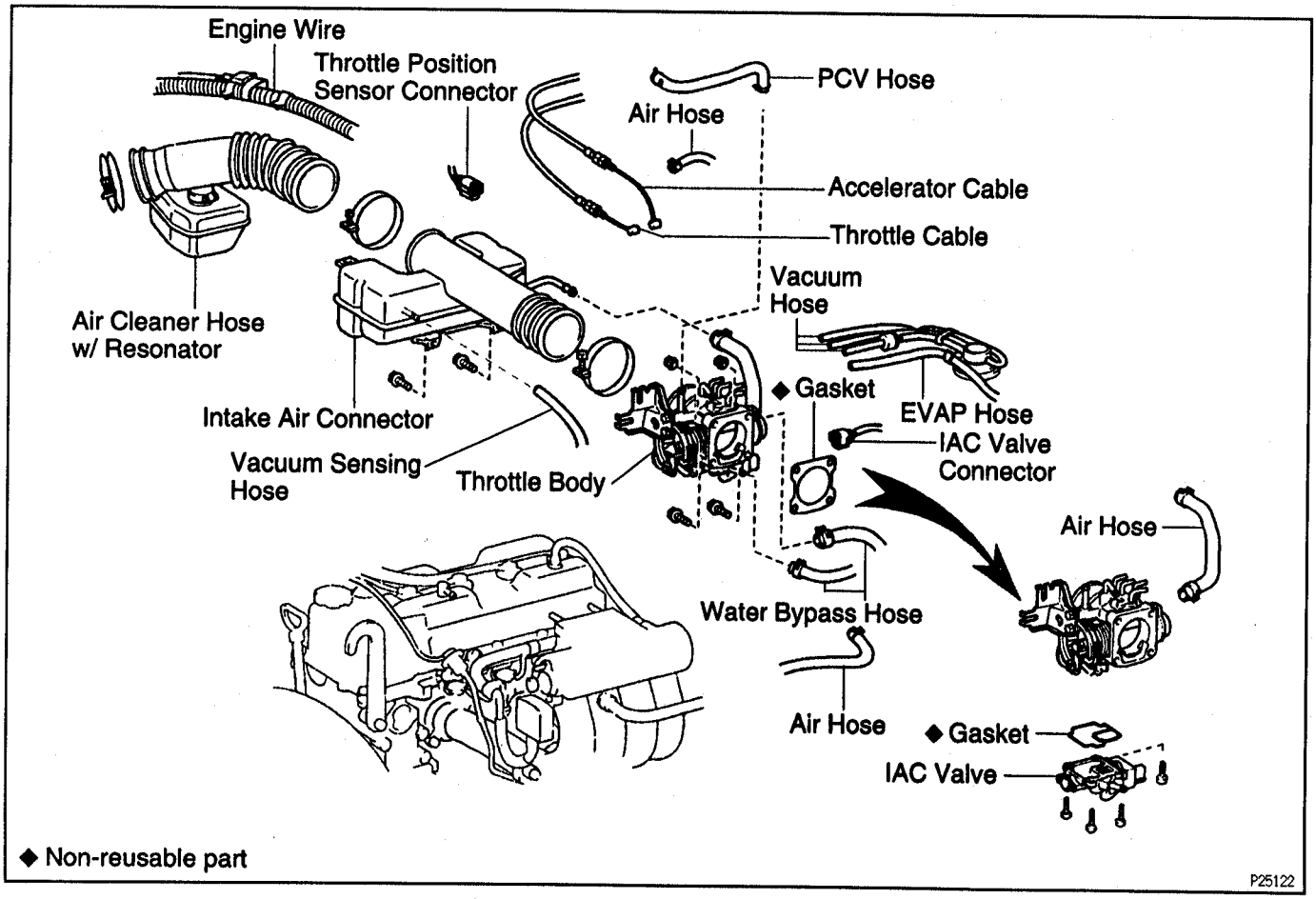
(b) Using SST, connect terminals TE1 and E1 of the DLC1.
SST 09843–18020

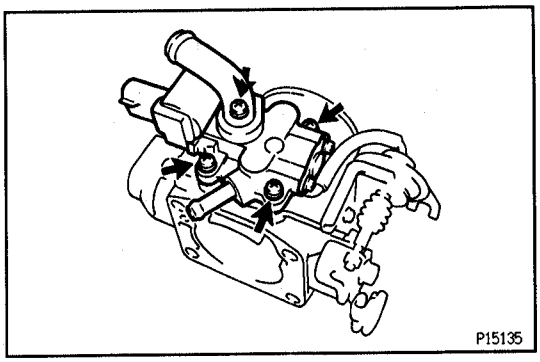
(c) After engine speed are kept at 1,000–1,500 rpm for 5 seconds, check that they return to idle speed.
If the engine speed operation is not as specified, check the IAC valve, wiring and ECM.

(d) Remove the SST.
SST 09843–18020

COMPONENTS FOR REMOVAL AND INSTALLATION

EG16H–07

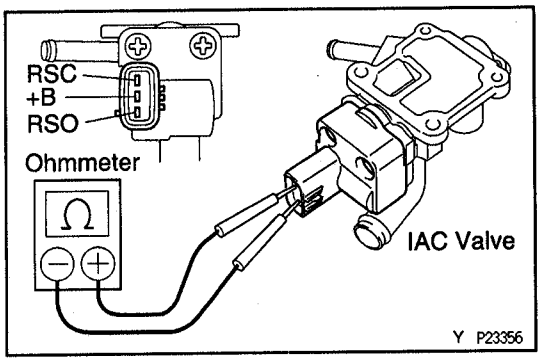




EG16J–06

IAC VALVE REMOVAL

1. **REMOVE THROTTLE BODY**
   (See throttle body removal)
2. **REMOVE IAC VALVE**
   Remove the 4 screws, IAC valve and gasket.

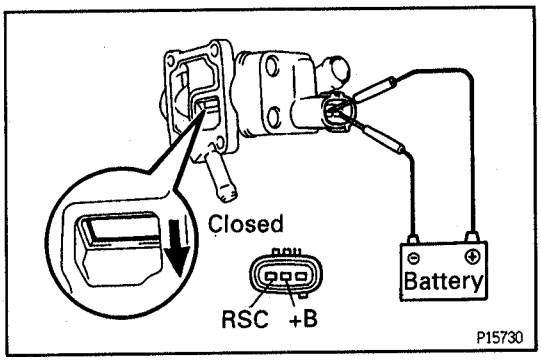


EG5NP–02

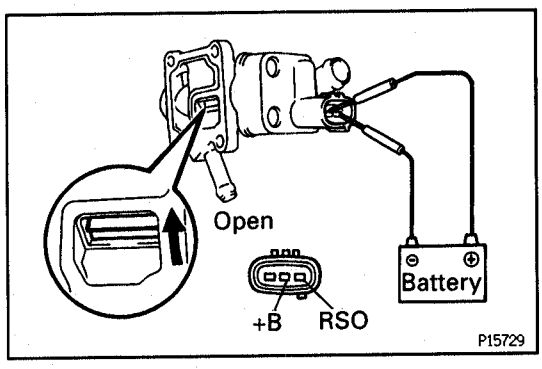
IAC VALVE INSPECTION

1. **INSPECT IAC VALVE RESISTANCE**
   NOTICE: "Cold" and "Hot" in the following sentences express the temperature of the coils themselves. "Cold" is from –10 °C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).
   Using an ohmmeter, measure the resistance between terminal +B and other terminals (RSC, RSO).
   Resistance:
   Cold: 17.0 – 24.5 Ω
   Hot: 21.5 – 28.5 Ω
   If resistance is not as specified, replace the IAC valve.
2. **INSPECT IAC VALVE OPERATION**

(a) Connect the positive (+) lead from the battery to terminal +B and negative (–) lead to terminal RSC, and check that the valve is closed.



(b) Connect the positive (+) lead from the battery to terminal +B and negative (–) lead to terminal RSO, and check that the valve is open.



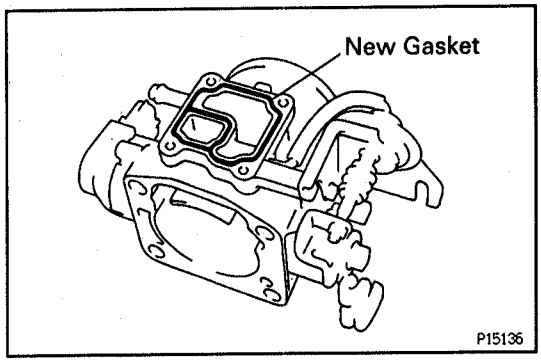
EG5R7–03

IAC VALVE INSTALLATION

1. **INSTALL IAC VALVE**

(a) Place a new gasket on the throttle body.
(b) Install the IAC valve with the 4 screws.

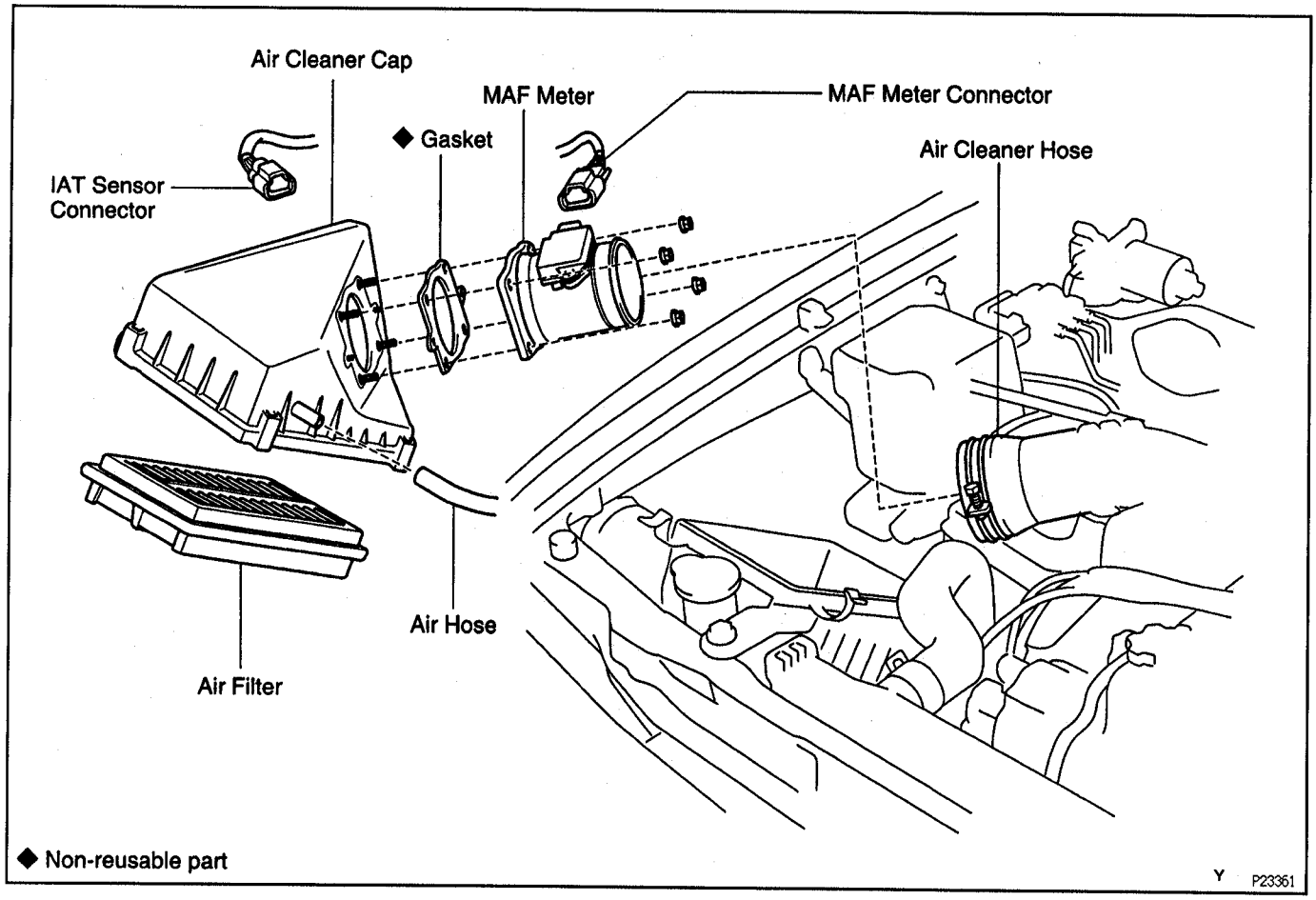
2. **INSTALL THROTTLE BODY**
   (See throttle body installation)

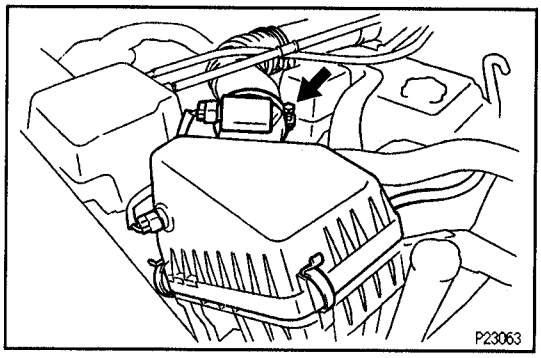


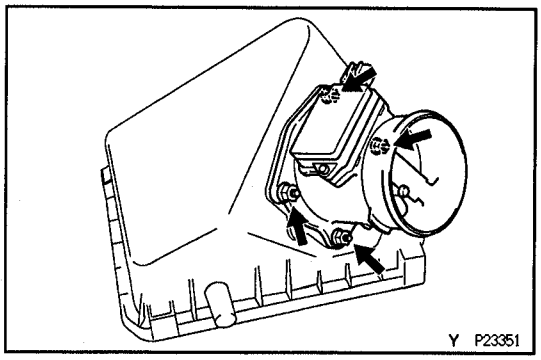
MASS AIR FLOW (MAF) METER

COMPONENTS FOR REMOVAL AND INSTALLATION

EG0YJ–0U



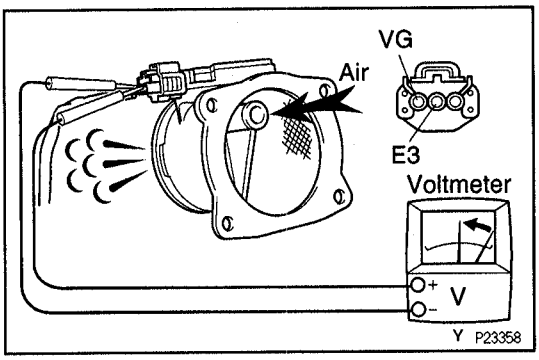




MAF METER REMOVAL

EG586–03

1. **REMOVE AIR CLEANER CAP WITH MAF METER**
   (a) Disconnect the MAF meter connector, IAT sensor connector and wire clamp.
   (b) Loosen the air cleaner hose clamp.
   (c) 3RZ–FE:
   Disconnect the air hose from the air cleaner cap.
   (d) Loosen the 4 clips, and remove the air cleaner cap together with the MAF meter.
2. **REMOVE MAF METER FROM AIR CLEANER CAP**
   Remove the 4 nuts, MAF meter and gasket.



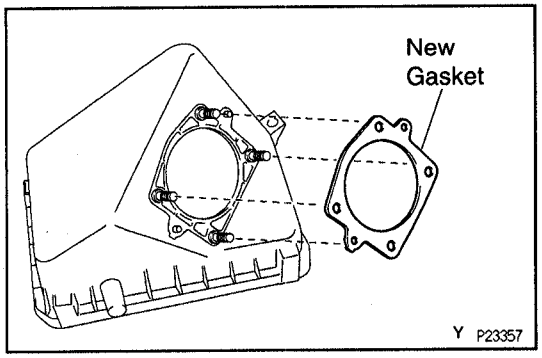
EG

EG59B-03

MAF METER INSPECTION

INSPECT MAF METER OPERATION

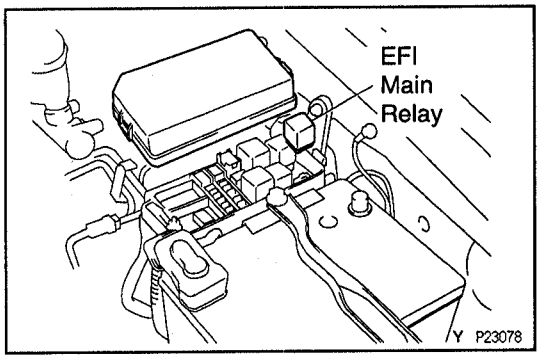
(a) Connect the negative (–) terminal cable to the battery.
(b) Turn the ignition switch ON.
(c) Connect the MAF meter connector.
(d) Using a voltmeter, connect the positive (+) tester probe to terminal VG, and negative (–) tester probe to terminal E3.
(e) Blow air into the MAF meter, and check that the voltage fluctuates.
If operation is not as specified, replace the MAF meter.
(f) Turn the ignition switch LOCK.
(g) Disconnect the negative (–) terminal cable from the battery.
(h) Disconnect the MAF meter connector.



EG59A-04

MAF METER INSTALLATION

1. **INSTALL MAF METER TO AIR CLEANER CAP**
(a) Place a new gasket on the air cleaner cap.
(b) Install the MAF meter with the 4 nuts.
Torque: 8.5 N·m (85 kgf·cm, 74 in.·lbf)
2. **INSTALL MAF METER WITH AIR CLEANER CAP**

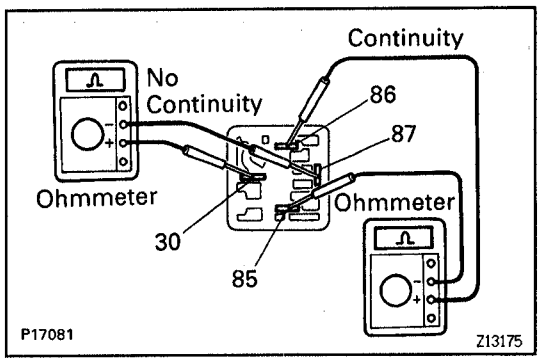


EG664-01

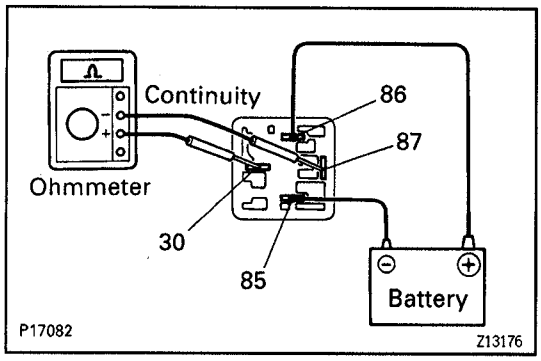
EFI MAIN RELAY

EFI MAIN RELAY INSPECTION

1. **REMOVE EFI MAIN RELAY**
LOCATION: In the engine compartment relay box.



2. **INSPECT EFI MAIN RELAY**
A. Inspect relay continuity
(a) Using an ohmmeter, check that there is continuity between terminals 86 and 85.
If there is no continuity, replace the relay.
(b) Check that there is no continuity between terminals 87 and 30.
If there is continuity, replace the relay.



B. Inspect relay operation

(a) Apply battery positive voltage across terminals 86 and 85.

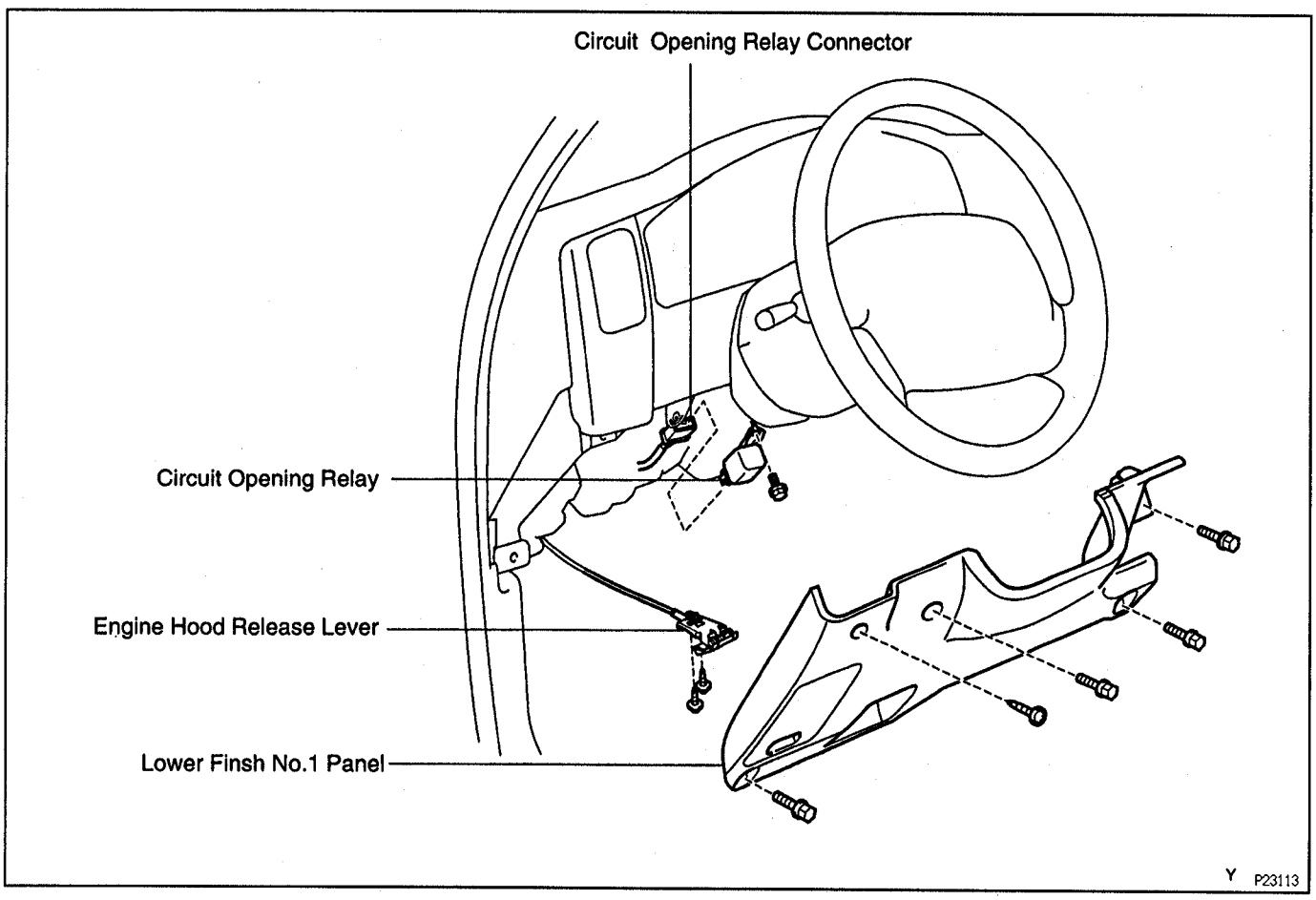
(b) Using an ohmmeter, check that there is continuity between terminals 87 and 30.
If operation is not as specified, replace the relay.

3. REINSTALL EFI MAIN RELAY

CIRCUIT OPENING RELAY

COMPONENTS FOR REMOVAL AND INSTALLATION

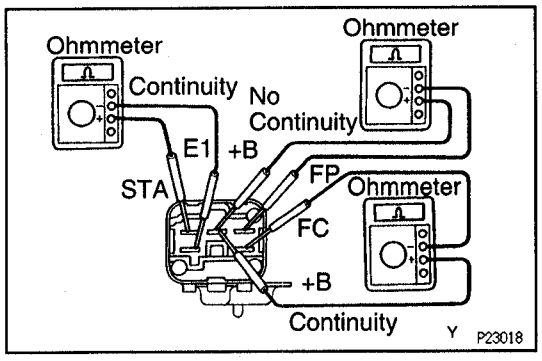
EG1T6–07



CIRCUIT OPENING RELAY INSPECTION

EG655–02

1. REMOVE LOWER FINISH NO.1 PANEL
2. REMOVE CIRCUIT OPENING RELAY
3. INSPECT CIRCUIT OPENING RELAY



A. Inspect relay continuity

(a) Using and ohmmeter, check that there is continuity between terminals STA and E1.
If there is no continuity, replace the relay.

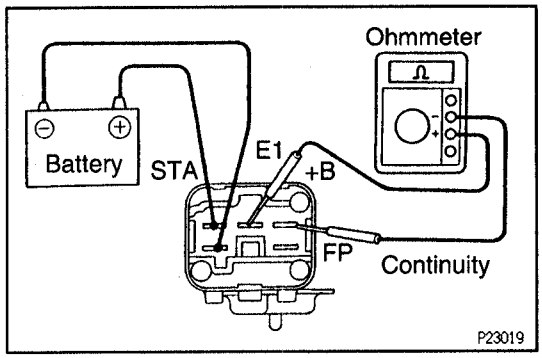
(b) Check that there is continuity between terminals +B and FC.
If there is no continuity, replace the relay.

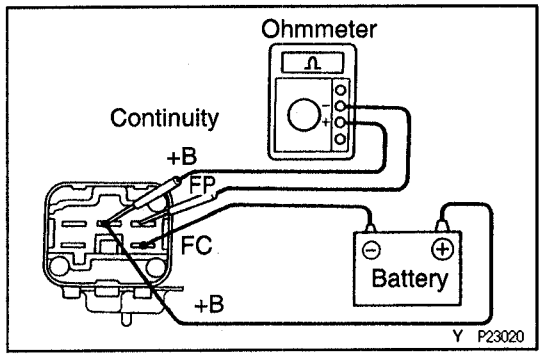
(c) Check that there is no continuity between terminals +B and FP.
If there is continuity, replace the relay.

B. Inspect relay operation

(a) Apply battery positive voltage across terminals STA and E1.

(b) Using an ohmmeter, check that there is continuity between terminals +B and FP.

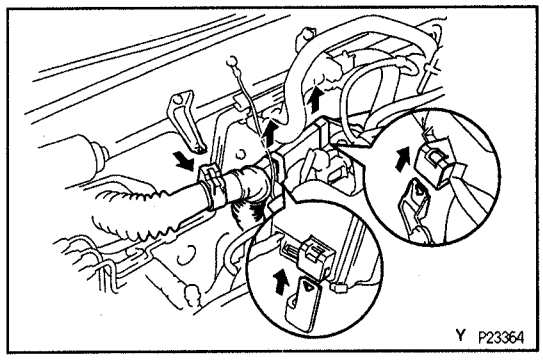




(c) Apply battery positive voltage across terminals +B and FC.

(d) Check that there is continuity between terminals +B and FP.
If operation is not as specified, replace the relay.

4. **REINSTALL CIRCUIT OPENING RELAY**
5. **REINSTALL LOWER FINISH NO.1 PANEL**



ENGINE COOLANT TEMPERATURE (ECT) SENSOR

EG6N8–02

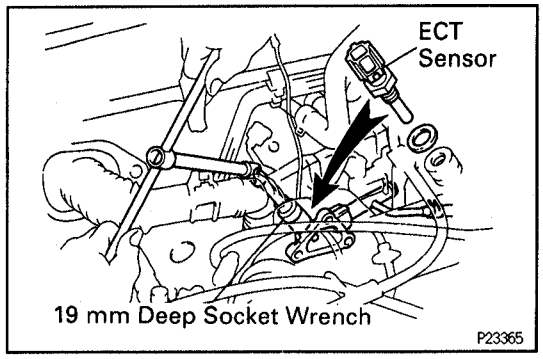
ENGINE COOLANT TEMPERATURE SENSOR INSPECTION

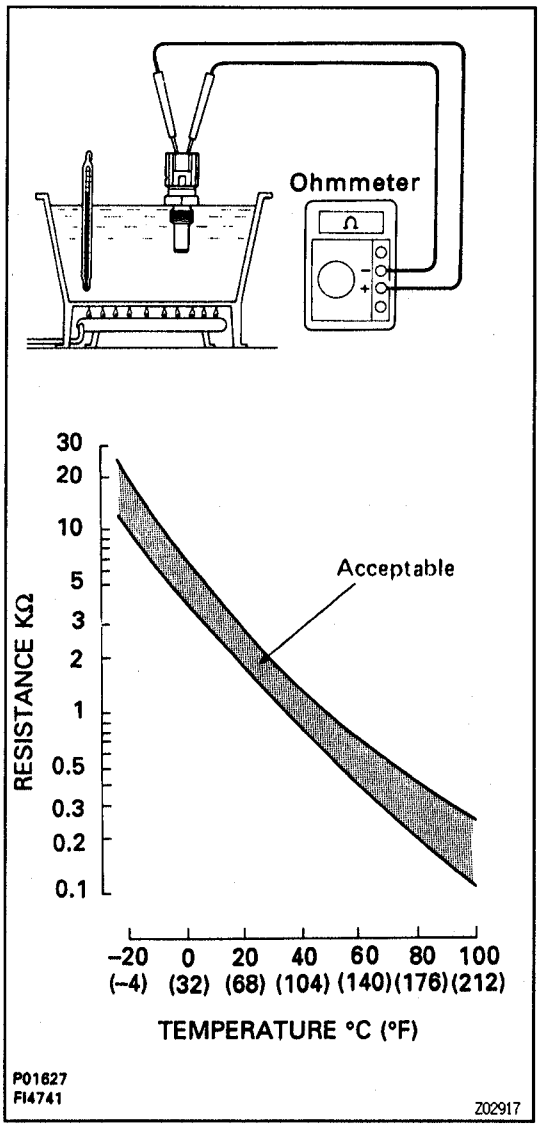
1. **DRAIN ENGINE COOLANT**
2. **REMOVE ECT SENSOR**

(a) Disconnect the engine wire protector from the 3 brackets.

(b) Disconnect the ECT sensor connector.

(c) Using a 19 mm deep socket wrench, remove the ECT sensor and gasket.





3. INSPECT ECT SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance:

Refer to the chart graph

If the resistance is not as specified, replace the ECT sensor.

4. REINSTALL ECT SENSOR

(a) Using a 19 mm deep socket wrench, install the ECT sensor and gasket.

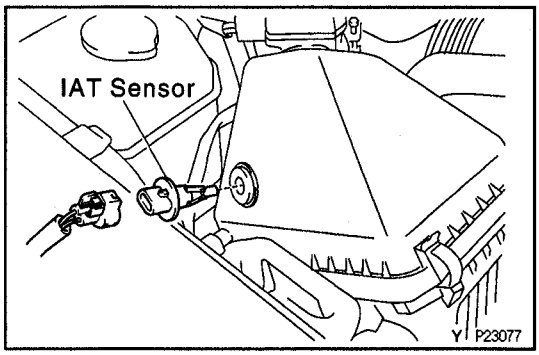
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

(b) Connect the ECT sensor connector.

(c) Install the engine wire protector to the 3 brackets.

5. REFILL ENGINE COOLANT

EG

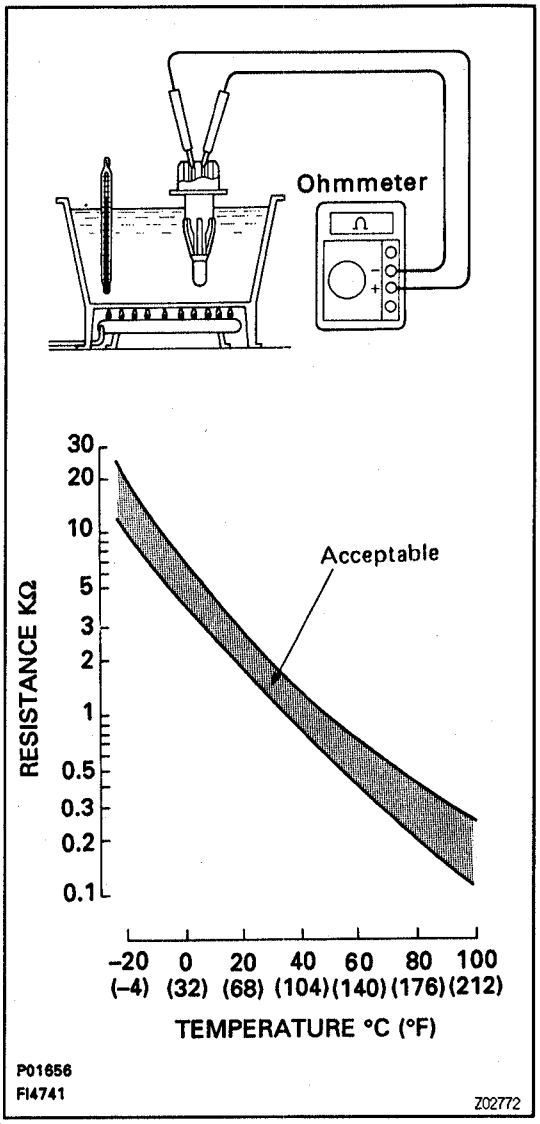


INTAKE AIR TEMPERATURE (IAT) SENSOR

IAT SENSOR INSPECTION

BG1AN–07

1. REMOVE IAT SENSOR



2. INSPECT IAT SENSOR

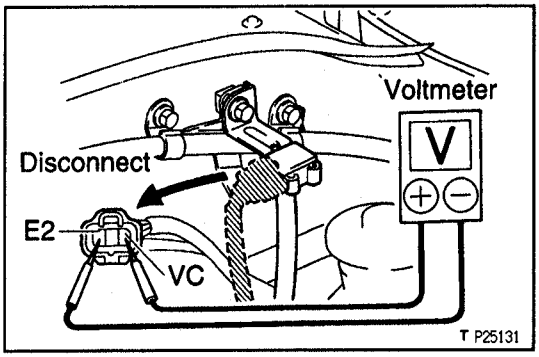
Using an ohmmeter, measure the resistance between the terminals.

Resistance:

Refer to the chart graph

If the resistance is not as specified, replace the IAT sensor.

3. REINSTALL IAT SENSOR



VAPOR PRESSURE SENSOR (3RZ–FE)

VAPOR PRESSURE SENSOR INSPECTION EG666-01

1. INSPECT POWER SOURCE VOLTAGE OF VAPOR PRESSURE SENSOR

(a) Disconnect the vapor pressure sensor connector.

(b) Turn the ignition switch ON.

(c) Using a voltmeter, measure the voltage between connector terminals VC and E2 of the wiring harness side.

Voltage:

4.5 – 5.5 V

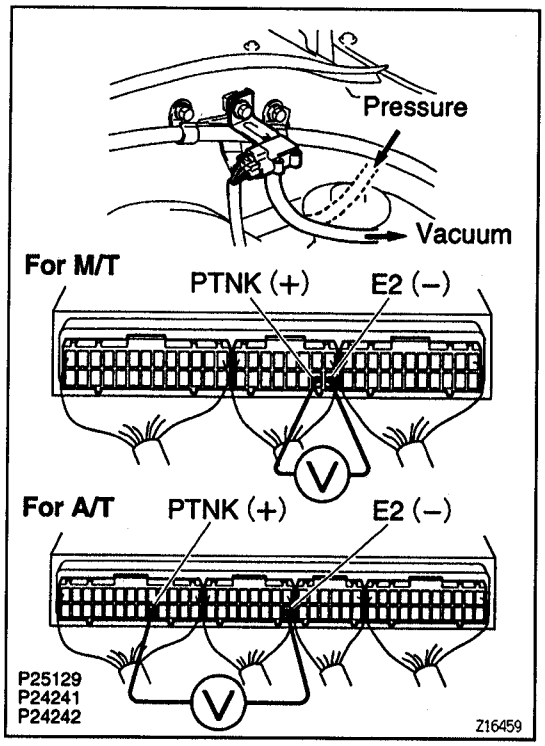
(d) Turn the ignition switch to LOCK.

(e) Reconnect the vapor pressure sensor connector.

2. INSPECT POWER OUTPUT OF VAPOR PRESSURE SENSOR

(a) Turn the ignition switch ON.

(b) Disconnect the vacuum hose from the vapor pressure sensor.



(c) Connect a voltmeter to terminals PTNK and E2 of the ECM, and measure the output voltage under the following conditions:

(1) Apply vacuum (2.0 kPa, 15 mmHg, 0.59 in.Hg) to the vapor pressure sensor.

Voltage:

1.3 – 2.1 V

(2) Release the vacuum from the vapor pressure sensor.

Voltage:

3.0 – 3.6 V

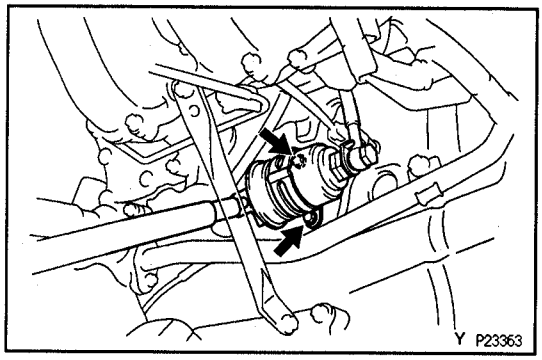
(3) Apply pressure (1.5 kPa, 15 gf/cm², 0.22 psi) to the vapor pressure sensor.

Voltage:

4.2 – 4.8 V

(d) Reconnect the vacuum hose to the vapor pressure sensor.

EG

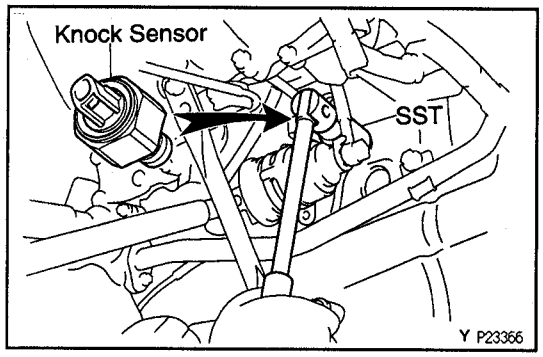


KNOCK SENSOR

KNOCK SENSOR INSPECTION

EGSNT–02

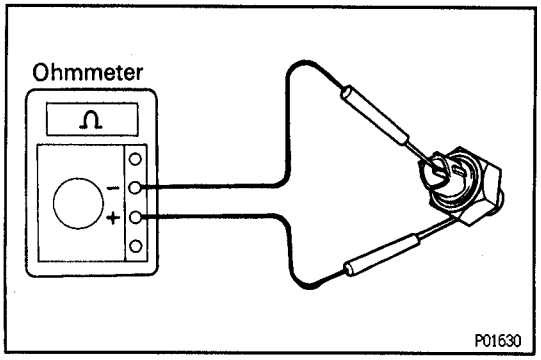
1. **REMOVE STARTER**
   (See starter removal in Starting System)
2. **REMOVE FUEL FILTER SET BOLTS**



3. **REMOVE KNOCK SENSOR**

(a) Disconnect the knock sensor connector.

(b) Using SST, remove the knock sensor.
SST 09816–30010

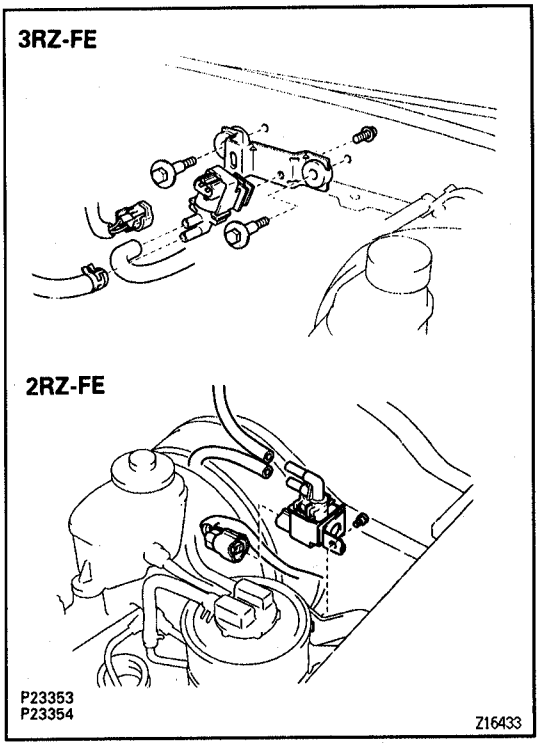


4. **INSPECT KNOCK SENSOR**
   Using an ohmmeter, check that there is no continuity between the terminal and body.
   If there is continuity, replace the sensor.
5. **REINSTALL KNOCK SENSOR**

(a) Using SST, install the knock sensor.
SST 09816–30010
Torque: 44 N·m (450 kgf·cm, 33 ft·lbf)

(b) Connect the knock sensor connector.

6. **REINSTALL FUEL FILTER SET BOLTS**
   Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)
7. **REINSTALL STARTER**
   (See starter installation in Starting System)



VSV FOR EVAP

EG6NU−02

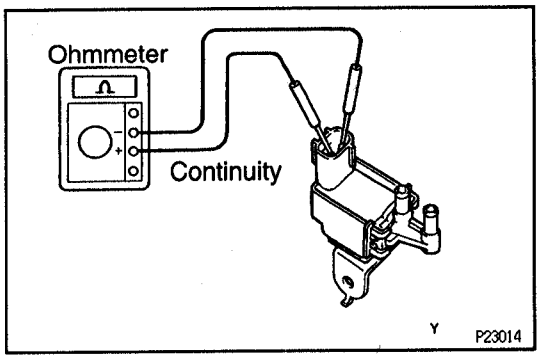
VSV INSPECTION

1. REMOVE VSV

(a) Disconnect the connector and 2 EVAP hoses from the VSV.

(b) 3RZ−FE:
Remove the 2 bolt and VSV assembly.

(c) Remove the screw and VSV.



2. INSPECT VSV

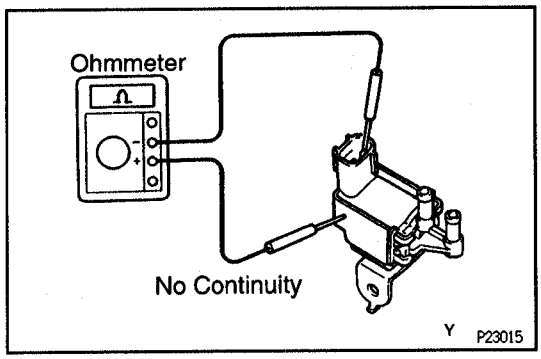
A. Inspect VSV for open circuit

Using an ohmmeter, check that there is continuity between the terminals.

Resistance:

At 20°C (68°F): 30 −34 Ω

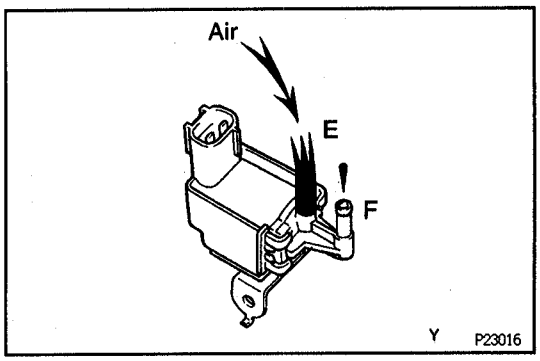
If there is no continuity, replace the VSV.



B. Inspect VSV for ground

Using an ohmmeter, check that there is no continuity between each terminal and the body.

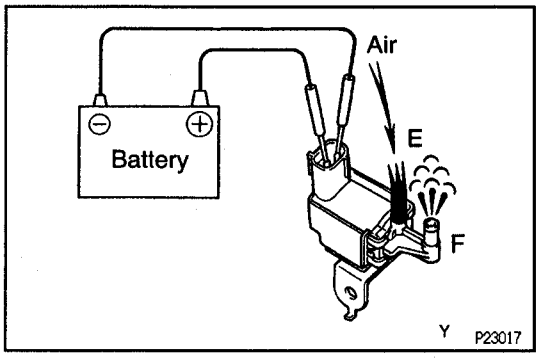
If there is continuity, replace the VSV.



C. Inspect VSV operation

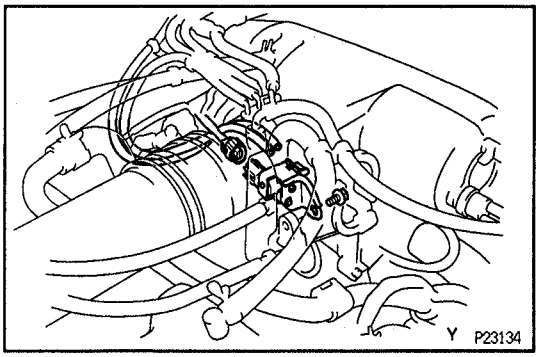
(a) Check that air does not flow from ports E to F.

NOTICE: Never apply more than 93 kPa (0.95 kgf/cm², 13.5 psi) of pressure compressed air to the VSV.



(b) Apply battery positive voltage across the terminals.
(c) Check that air flows from ports E to F.
If operation is not as specified, replace the VSV.

3. REINSTALL VSV



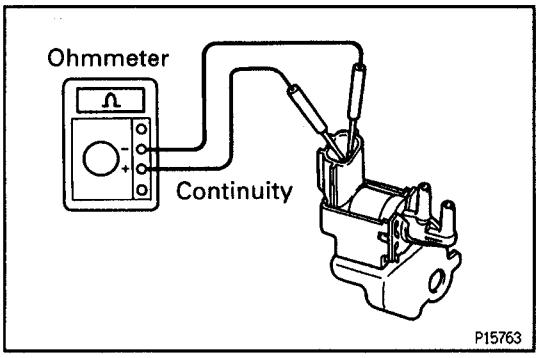
VSV FOR EGR

VSV INSPECTION

S06NV–02

1. REMOVE VSV

(a) Remove the bolt.
(b) Disconnect the connector and 2 vacuum hoses from the VSV.



2. INSPECT VSV

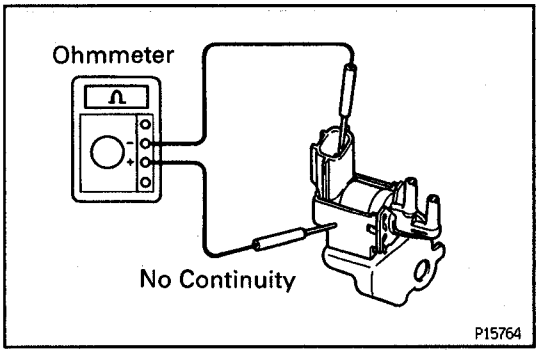
A. Inspect VSV for open circuit

Using an ohmmeter, check that there is continuity between terminals.

Resistance:

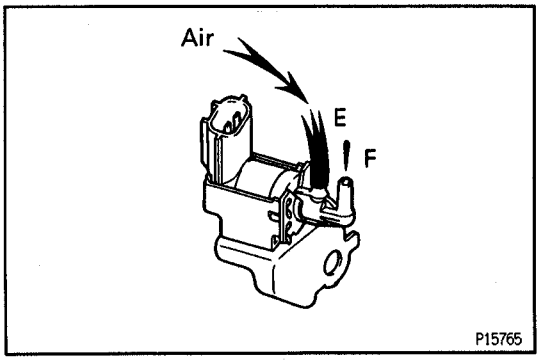
At 20°C (68°F): 33 – 39 Ω

If there is no continuity, replace the VSV.



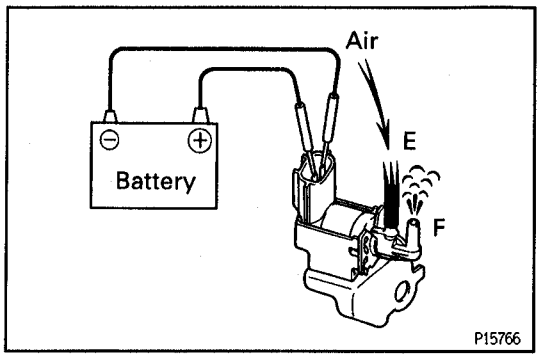
B. Inspect VSV for ground

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



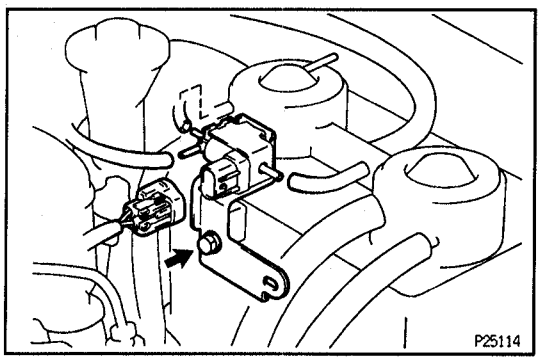
C. Inspect VSV operation

(a) Check that air does not flow from ports E to F.



(b) Apply battery positive voltage across the terminals.
(c) Check that air flows from ports E to F.
If operation is not as specified, replace the VSV.

3. REINSTALL VSV



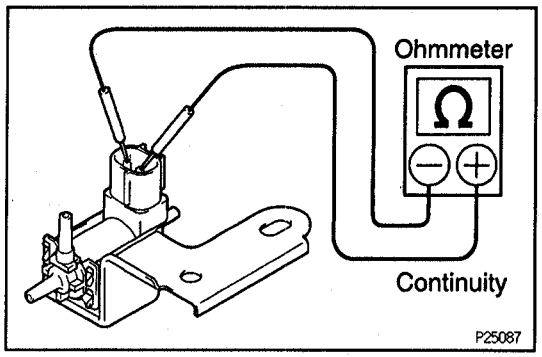
VSV FOR VAPOR PRESSURE SENSOR (3RZ–FE)

EG50E–03

VSV INSPECTION

1. REMOVE VSV

(a) Disconnect the connector and 3 EVAP hoses from the VSV.
(b) Remove the bolt and VSV.



2. INSPECT VSV

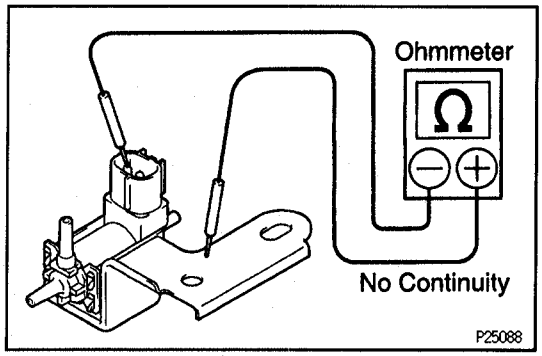
A. Inspect VSV for open circuit

Using an ohmmeter, check that there is continuity between the terminals.

Resistance:

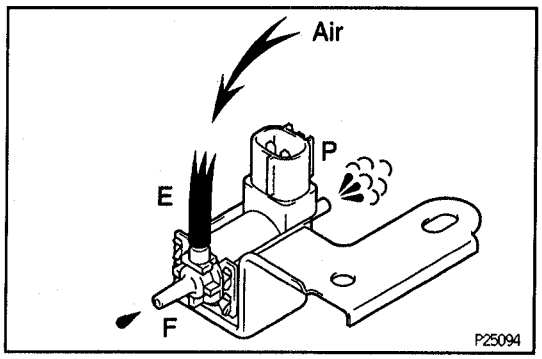
At 20°C (68°F): 37 – 44Ω

If there is no continuity, replace the VSV.



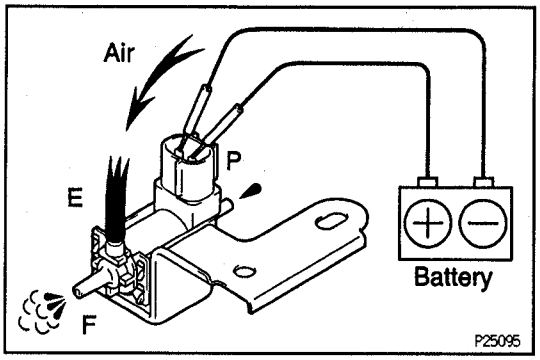
B. Inspect VSV for ground

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



C. Inspect VSV operation

(a) Check that air flows from ports E to P, and does not flow from ports E to F.



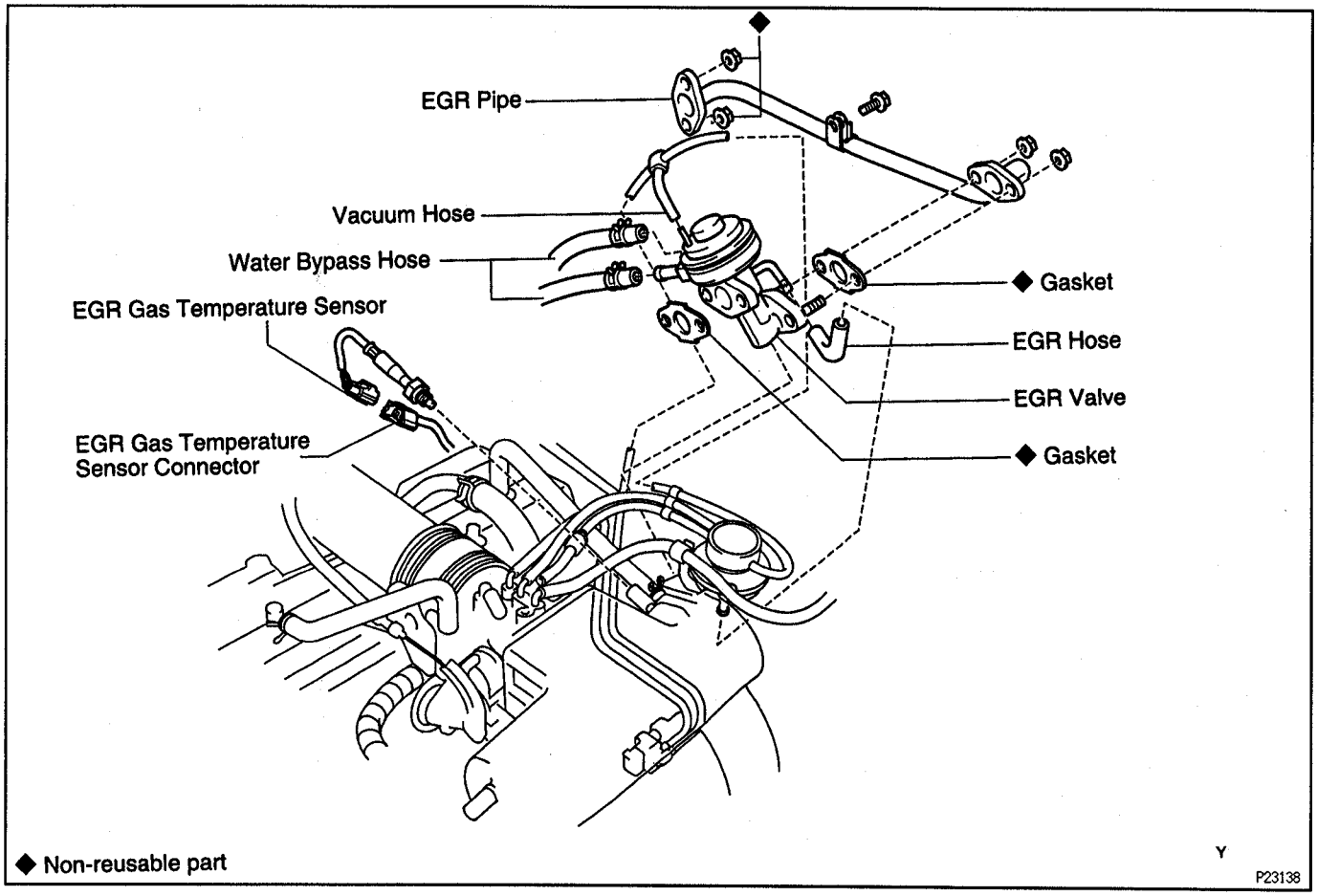
(b) Apply battery positive voltage across the terminals.
(c) Check that air flows from ports E to F, and does not flow from ports E to P.
If operation is not as specified, replace the VSV.

3. **REINSTALL VSV**

EGR GAS TEMPERATURE SENSOR

EG5NX–02

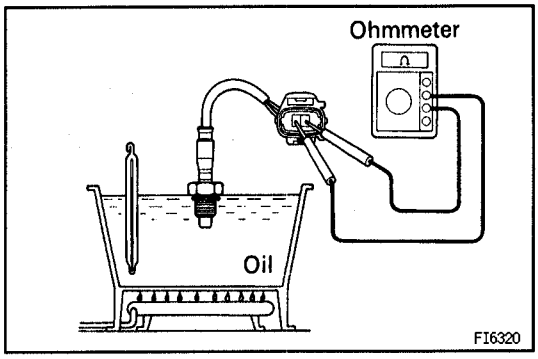
COMPONENTS FOR REMOVAL AND INSTALLATION



EG5NY–02

EGR GAS TEMPERATURE SENSOR INSPECTION

1. **REMOVE EGR VALVE**
(See EGR valve inspection in Emission Control System)
2. **REMOVE EGR GAS TEMPERATURE SENSOR**



EG

3. INSPECT EGR GAS TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance:

At 50°C (122°F): 64 – 97 kΩ

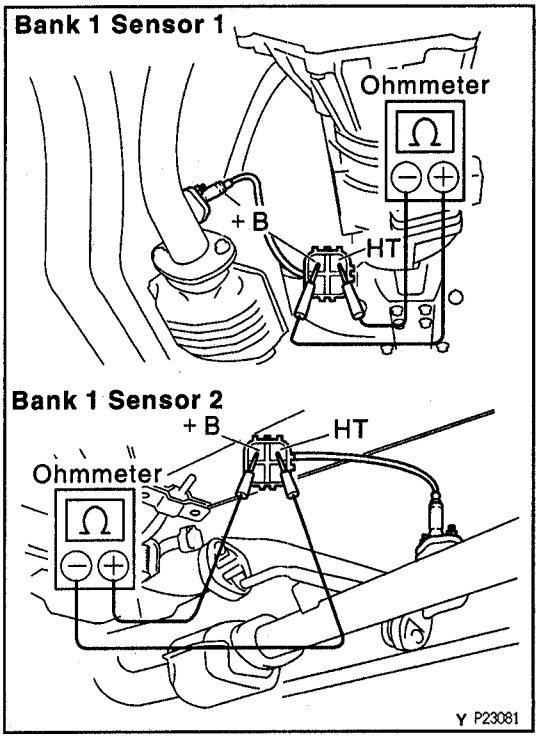
At 100°C (212°F): 11 – 16 kΩ

At 150°C (302°F): 2 – 4 kΩ

If the resistance is not as specified, replace the sensor.

4. REINSTALL EGR GAS TEMPERATURE SENSOR

5. REINSTALL EGR VALVE



HEATED OXYGEN SENSOR

HEATED OXYGEN SENSORS INSPECTION

EG3KP–04

INSPECT HEATER RESISTANCE OF HEATED OXYGEN SENSORS

(a) Disconnect the heated oxygen sensor connector.

(b) Using an ohmmeter, measure the resistance between terminals +B and HT.

Resistance:

At 20°C (68°F):

Bank 1 Sensor 1: 5 – 7 Ω

Bank 1 Sensor 2: 11 – 16 Ω

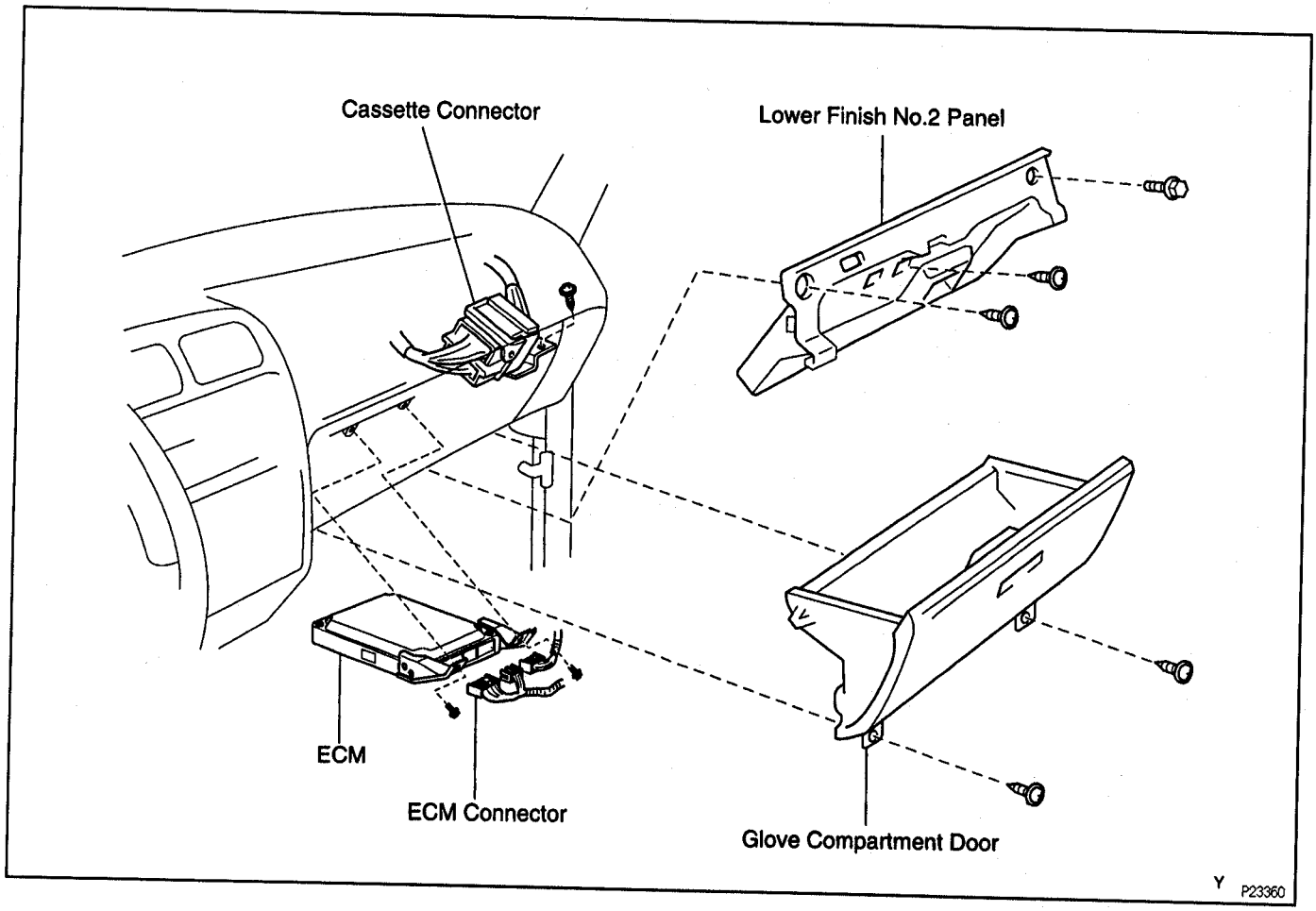
If resistance is not as specified, replace the heated oxygen sensor.

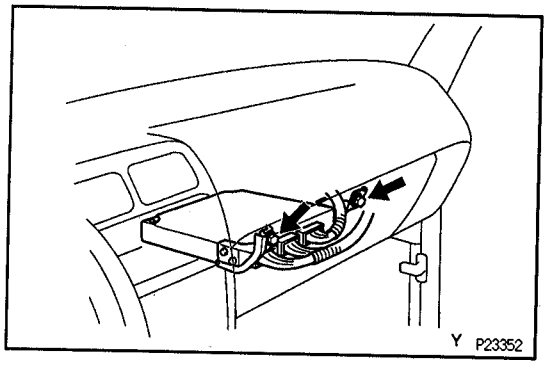
(c) Reconnect the heated oxygen sensor connector.

ENGINE CONTROL MODULE (ECM)

COMPONENTS FOR REMOVAL AND INSTALLATION

EG0E8–0E





ECM REMOVAL

EG58G–03

1. REMOVE GLOVE COMPARTMENT DOOR
2. REMOVE LOWER FINISH NO.2 PANEL
3. REMOVE ECM

(a) 2RZ–FE, 3RZ–FE M/T:
Disconnect the 3 ECM connectors.

(b) 3RZ–FE A/T:
Disconnect the 4 ECM connectors.

(c) Remove the 2 bolts and ECM.

ECM INSPECTION

EG104–04

(See Engine Troubleshooting)

ECM INSTALLATION

EG057–01

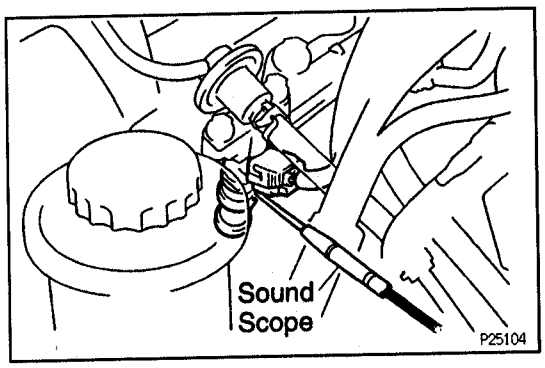
Installation is in the reverse order of removal.

FUEL CUT RPM

EQ58H–04

FUEL CUTOFF RPM INSPECTION

1. **WARM UP ENGINE**
   Allow the engine to warm up to normal operating temperature.
2. **CONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL**
   (See step 2 in ignition timing inspection)



3. **INSPECT FUEL CUT OFF RPM**

(a) Increase the engine speed to at least 3,500 rpm.

(b) Using a sound scope, check for injector operating noise.

(c) Check that when the throttle lever is released, injector operation noise stops momentarily and then resumes.
HINT: Measure with the A/C OFF.

Fuel return rpm:

M/T:

1,400 rpm

A/T:

1,500 rpm

4. **DISCONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL**

SERVICE SPECIFICATIONS

SERVICE DATA

EG0ZA–0T

Fuel pressure regulator	Fuel pressure	at no vacuum	265 – 304 kPa (2.7 – 3.1 kgf/cm², 38 – 44 psi)
Fuel pump	Resistance	at 20°C (68°F)	0.2 – 3.0 Ω
Injector (2RZ–FE)	Resistance	at 20°C (68°F)	12 – 16 Ω
	Injection volume		62 – 79 cm³ (3.8 – 4.8 cu in.) per 15 seconds
	Difference between each cylinder		5 cm³ (0.3 cu in.) or less
	Fuel leakage		1 drop or less per 3 minutes
Injector (3RZ–FE)	Resistance	at 20°C (68°F)	12 – 16 Ω
	Injection volume		69 – 88 cm³ (4.2 – 5.4 cu in.) per 15 seconds
	Difference between each cylinder		5 cm³ (0.3 cu in.) or less
	Fuel leakage		1 drop or less per 3 minutes
Throttle body	Throttle valve fully closed angle		6°
	Throttle opener setting speed		1,200 – 1,500 rpm
TP sensor	Clearance between stop screw and lever		
	0 mm (0 in.)	VTA – E2	0.2 – 5.7 kΩ
	0.57 mm (0.022 in.)	IDL – E2	2.3 kΩ or less
	0.74 mm (0.029 in.)	IDL – E2	Infinity
	Throttle valve fully open	VTA – E2	2.0 – 10.2 kΩ
	–	VC – E2	2.5 – 5.9 kΩ
IAC valve	Resistance (+B – RSC or RSO)	at cold	17.0 – 24.5 Ω
		at hot	21.5 – 28.5 Ω
ECT sensor	Resistance	at –20°C (–4°F)	10 – 20 kΩ
		at 0°C (32°F)	4 – 7 kΩ
		at 20°C (68°F)	2 – 3 kΩ
		at 40°C (104°F)	0.9 – 1.3 kΩ
		at 60°C (140°F)	0.4 – 0.7 kΩ
		at 80°C (176°F)	0.2 – 0.4 kΩ
IAT sensor	Resistance	at –20°C (–4°F)	10 – 20 kΩ
		at 0°C (32°F)	4 – 7 kΩ
		at 20°C (68°F)	2 – 3 kΩ
		at 40°C (104°F)	0.9 – 1.3 kΩ
		at 60°C (140°F)	0.4 – 0.7 kΩ
		at 80°C (176°F)	0.2 – 0.4 kΩ
Vapor pressure sensor	Power source voltage		4.5 –5.5 V
VSV for EVAP	Resistance	at 20°C (68°F)	30 – 34 Ω
VSV for vapor pressure sensor	Resistance	at 20°C (68°F)	37 – 44 Ω
VSV for EGR	Resistance	at 20°C (68°F)	33 – 39 Ω
EGR gas temp. sensor	Resistance	at 50°C (122°F)	64 – 97 kΩ
		at 100°C (212°F)	11 – 16 kΩ
		at 150°C (302°F)	2 – 4 kΩ

Heated oxygen sensor	Heater coil resistance Bank 1 Sensor 1 at 20°C (68°F) Bank 1 Sensor 2 at 20°C (68°F)	 5 – 7 Ω 11 – 16 Ω
Fuel cut RPM	Fuel return rpm M/T A/T	1,400 rpm 1,500 rpm

EG0EE–1M

TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Fuel line (Union bolt type)	29	300	22
Fuel line (Flare nut type) w/ SST	30	310	22
Fuel pump bracket assembly x Fuel tank	3.5	35	31 in.·lbf
Fuel pressure regulator x Delivery pipe	8.8	90	78 in.·lbf
Fuel inlet pipe x Fuel filter	29	300	22
Delivery pipe x Cylinder head	21	210	15
Fuel inlet pipe x Delivery pipe	29	300	22
Throttle body x Air intake chamber	20	200	14
Fuel evaporation vent tube x Fuel tank	1.5	15	13 in.·lbf
Fuel tank filler pipe x Fuel tank	3.5	35	31 in.·lbf
Fuel tank filler pipe support bracket	29	300	22
Fuel tank x Body	29	300	22
Fuel tank band x Body	61	620	42
Fuel tank protector bracket x Body	29	300	22
Fuel tank protector x Fuel tank	29	300	22
MAF meter x Air cleaner cap	8.5	85	74 in.·lbf
ECT sensor x Cylinder head	20	200	14
Knock sensor x Cylinder block	44	450	33
Fuel filter x Cylinder block	20	200	14

COOLING SYSTEM

PREPARATION

EQUIPMENT

EG06U–0G

Heater	Thermostat
Radiator cap tester	
Thermometer	Thermostat
Torque wrench	

ENGINE COOLANT

EG06V–0G

Item	Capacity	Classification
2WD		Ethylene–glycol base
M/T	8.0 liters (8.5 US qts, 7.0 Imp. qts)	
A/T	7.8 liters (8.2 US qts, 6.9 Imp. qts)	
4WD		
M/T	8.3 liters (8.8 US qts, 7.3 Imp. qts)	
A/T	8.2 liters (8.7 US qts, 7.2 Imp. qts)	

COOLANT CHECK AND REPLACEMENT

1. **CHECK ENGINE COOLANT LEVEL AT RADIATOR RESERVOIR** EG8NZ–02

The coolant level should be between the "L" and "F" lines.

If low, check for leaks and add coolant up to the "F" line.

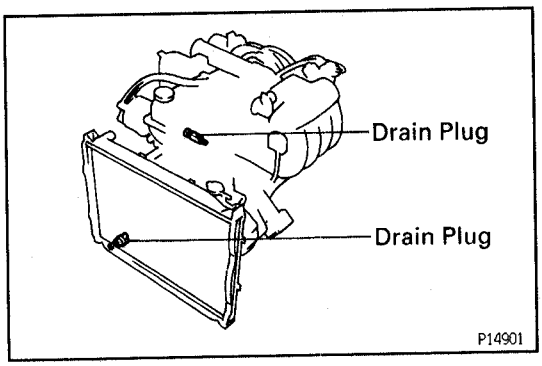
2. **CHECK ENGINE COOLANT QUALITY**

(a) Remove the radiator cap.

CAUTION: To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

(b) 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.



(c) Reinstall the radiator cap.

3. REPLACE ENGINE COOLANT

(a) Remove the radiator cap.

CAUTION: To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

(b) Drain the coolant from the radiator and cylinder drain plugs. (Engine coolant drain plug at the right of cylinder block.)

(c) Close the drain plugs.

Torque (Engine coolant drain plug):

24.5 N·m (250 kgf·cm, 18 ft·lbf)

(d) Slowly fill the system with coolant.

- Use a good brand of ethylene–glycol base coolant and mix it according to the manufacturer's directions.
- Using coolant which includes more than 50 % ethylene–glycol (but not more than 70 %) is recommended.

NOTICE:

- **Do not use an alcohol type coolant.**
- **The coolant should be mixed with demineralized water or distilled water.**

Capacity (w/ Heater):

2WD

M/T

8.0 liters (8.5 US qts, 7.0 Imp. qts)

A/T

7.8 liters (8.2 US qts, 6.9 Imp. qts)

4WD

M/T

8.3 liters (8.8 US qts, 7.3 Imp. qts)

A/T

8.2 liters (8.7 US qts, 7.2 Imp. qts)

(e) Reinstall the radiator cap.

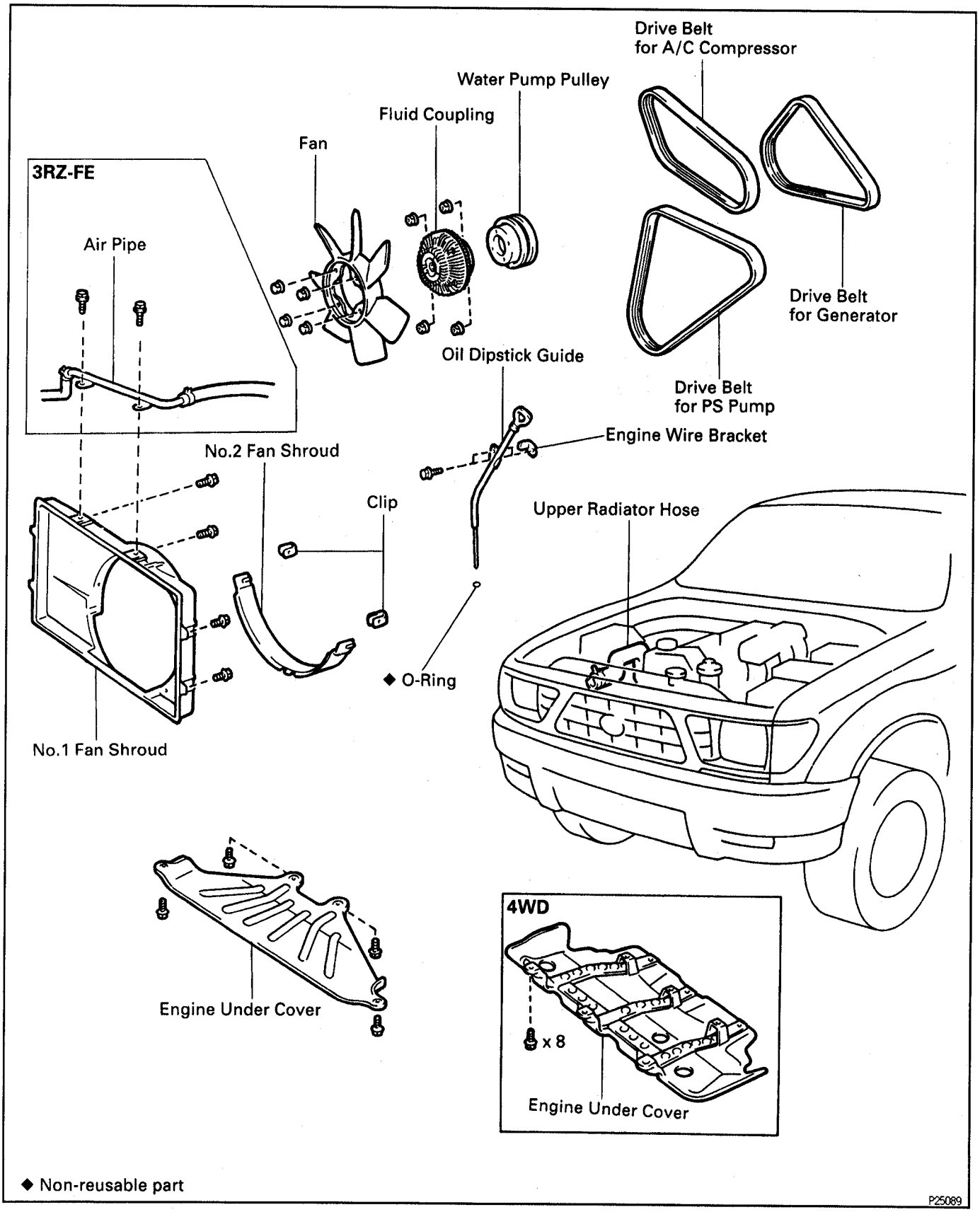
(f) Warm up the engine and check for leaks.

(g) Recheck the coolant level and refill as necessary.

WATER PUMP

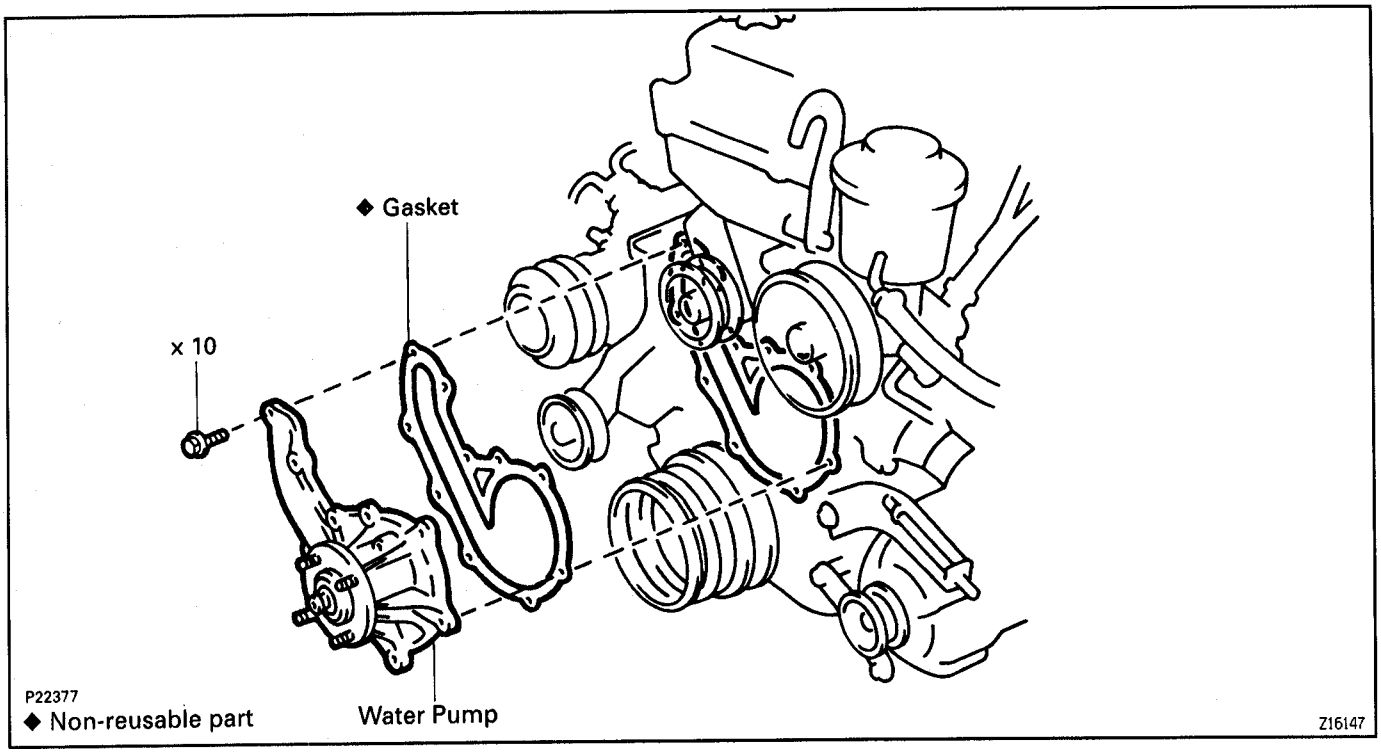
COMPONENTS FOR REMOVAL AND INSTALLATION

EGSPO–02



◆ Non-reusable part

P25089



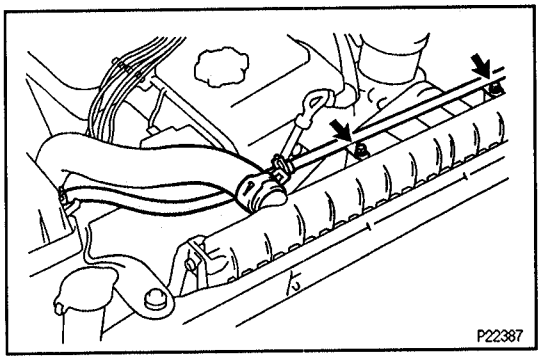
EQSP1–02

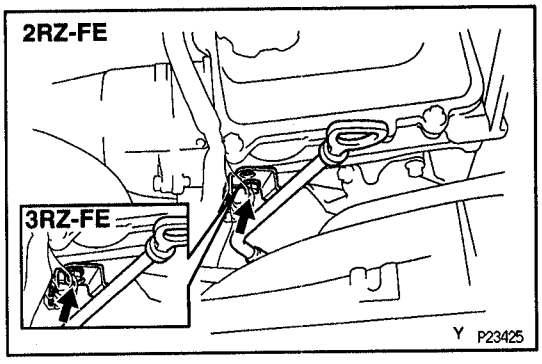
WATER PUMP REMOVAL

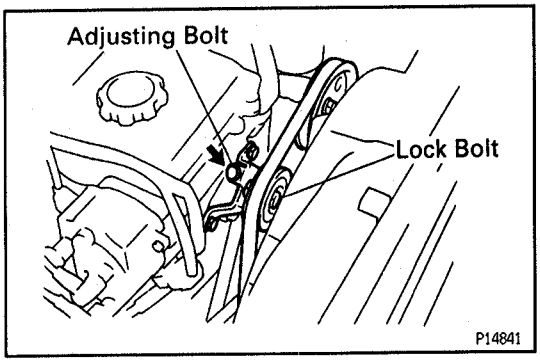
1. **REMOVE ENGINE UNDER COVER**
2. **DRAIN ENGINE COOLANT**
3. **3RZ–FE:**
   DISCONNECT AIR PIPE
   Remove the 2 bolts and disconnect the air pipe from the fan shroud.
4. **DISCONNECT UPPER RADIATOR HOSE FROM RADIATOR**
5. **REMOVE OIL DIPSTICK GUIDE**

(a) Remove the bolt, dipstick guide and engine wire bracket.

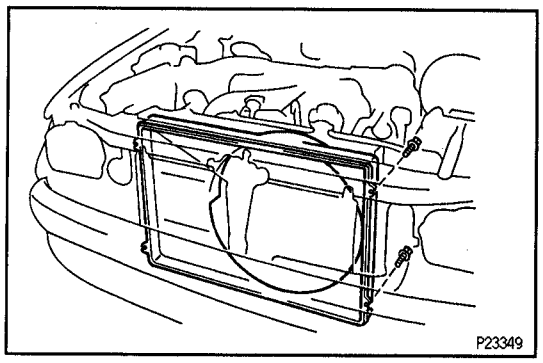
(b) Remove the O–ring from the dipstick guide.
INSTALLATION HINT: Use a new O–ring.







6. **w/ PS:**
   REMOVE DRIVE BELT FOR PS PUMP
   Loosen the lock bolt and adjusting bolt, and remove the drive belt.



7. REMOVE FAN SHROUDS

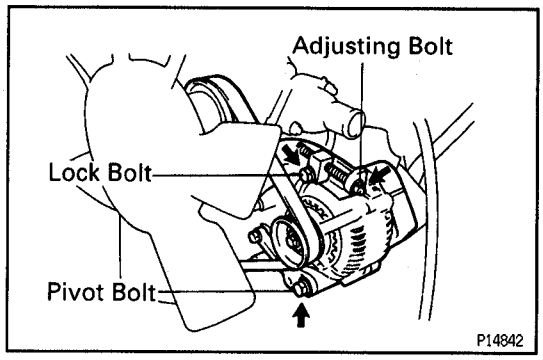
(a) Remove the 2 clips and No.2 fan shroud.

(b) Remove the 4 bolts and No.1 fan shroud.

8. w/ A/C:

REMOVE DRIVE BELT FOR A/C COMPRESSOR

Loosen the idler pulley nut and adjusting bolt, and remove the drive belt.



9. REMOVE DRIVE BELT FOR GENERATOR, FAN WITH FLUID COUPLING AND WATER PUMP PULLEY

(a) Stretch the belt and loosen the water pump pulley nuts.

(b) Loosen the lock, pivot and adjusting bolts of the generator, and remove the drive belt.

(c) Remove the 4 water pump pulley nuts.

Torque: 21 N·m (210 kgf·cm, 16 ft·lbf)

(d) Pull out the fan together with the fluid coupling and water pump pulley.

10. REMOVE WATER PUMP

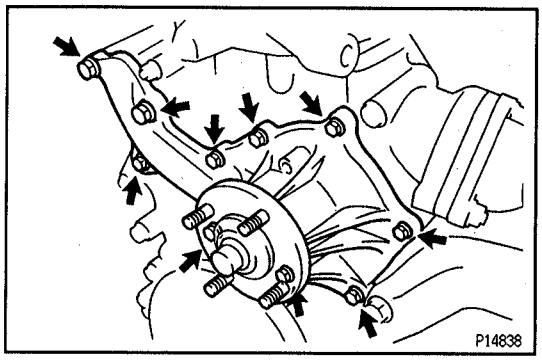
Remove the 10 bolts, water pump and gasket.

Torque:

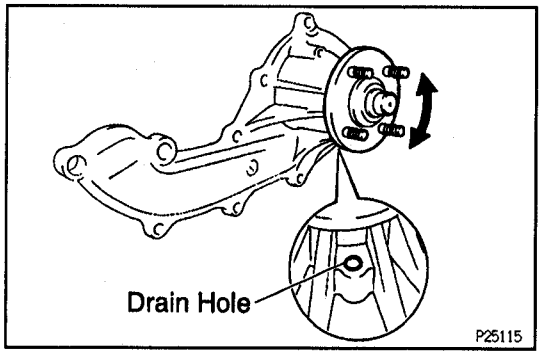
14 mm head bolt : 24.5 N·m (250 kgf·cm, 18 ft·lbf)

12 mm head bolt : 8.9 N·m (90 kgf·cm, 78 in.·lbf)

INSTALLATION HINT: Use a new gasket.



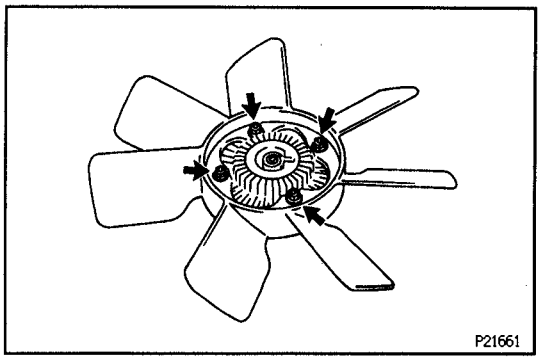
WATER PUMP COMPONENTS INSPECTION EGONG-06



1. INSPECT WATER PUMP

(a) Visually check the drain hole for coolant leakage.
If leakage is found, replace the water pump.

(b) Turn the pulley, and check that the water pump bearing moves smoothly and quietly.
If necessary, replace the water pump.



2. INSPECT FLUID COUPLING

(a) Remove the 4 nuts and fan from the fluid coupling.

(b) Check the fluid coupling for damage and silicon oil leakage.
If necessary, replace the fluid coupling.

(c) Install the fan and fluid coupling with the 4 nuts.

Torque: 5.5 N·m (55 kgf·cm, 49 in.·lbf)

E0065E-01

WATER PUMP INSTALLATION

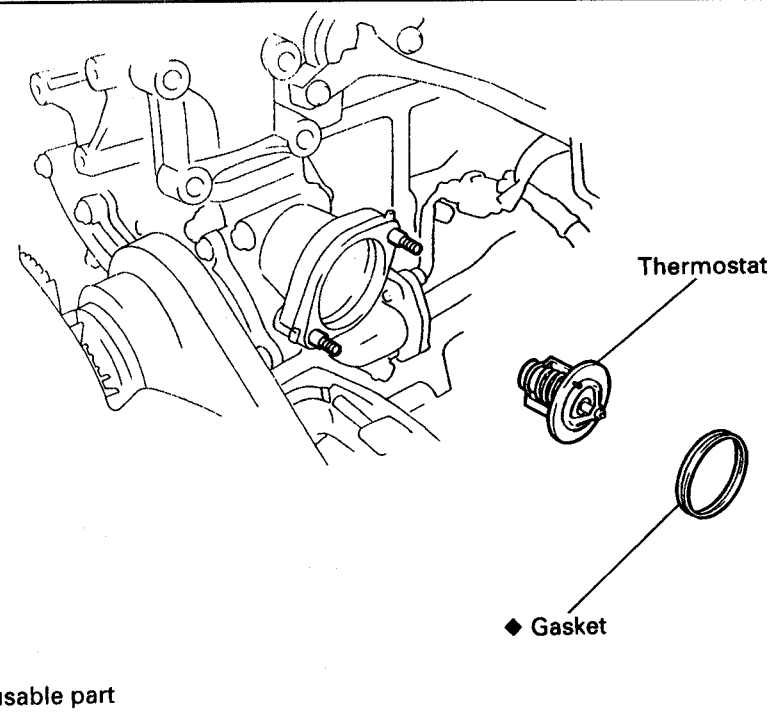
Installation is in the reverse order of removal.

THERMOSTAT

E013D-13

COMPONENTS FOR REMOVAL AND INSTALLATION

EG



P23587

◆ Non-reusable part

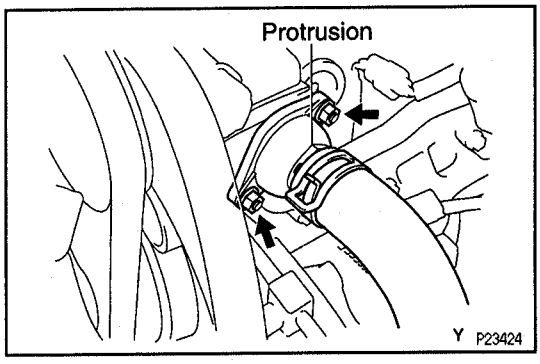
Z16233

E01J3-0A

THERMOSTAT REMOVAL

HINT: Removal of the thermostat would have an adverse effect, causing a lowering of cooling efficiency. Do not remove the thermostat, even if the engine tends to overheat.

1. **DRAIN ENGINE COOLANT**

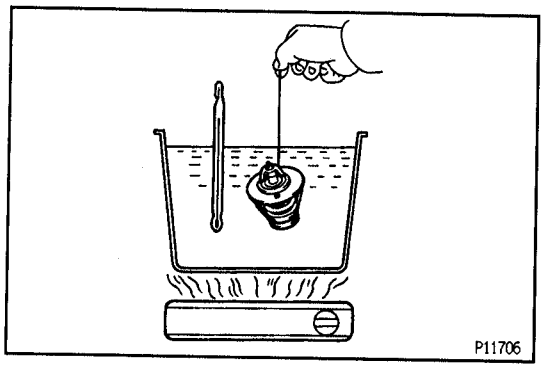


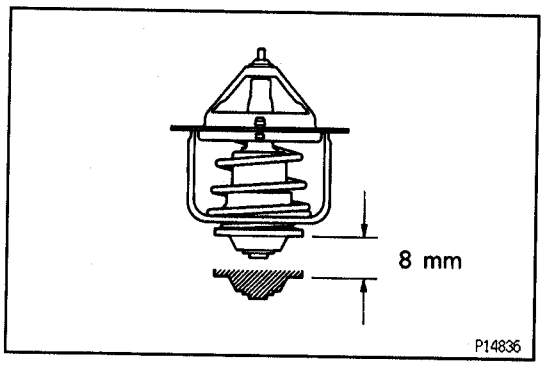
2. **DISCONNECT WATER INLET WITH LOWER RADIATOR HOSE, AND REMOVE THERMOSTAT**

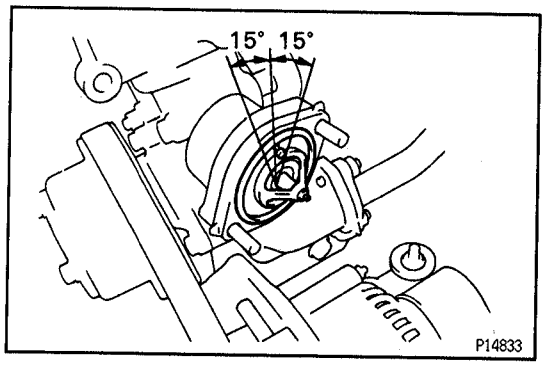
(a) Remove the 2 nuts holding the water inlet to the inlet housing, and disconnect the water inlet from the inlet housing.

(b) Remove the thermostat.

(c) Remove the gasket from the thermostat.







THERMOSTAT INSPECTION

EGSP2-02

INSPECT THERMOSTAT

HINT: The thermostat is numbered with the valve opening temperature.

(a) Immerse the thermostat in water and gradually heat the water.

(b) Check the valve opening temperature.

Valve opening temperature:

80 – 84°C (176 – 183°F)

If the valve opening temperature is not as specified, replace the thermostat.

(c) Check the valve lift.

Valve lift:

At 95°C (203°F): 8 mm (0.31 in.) or more

If the valve lift is not as specified, replace the thermostat.

(d) Check that the valve is fully closed when the thermostat is at low temperatures (below 40°C (104°F)).

If not closed, replace the thermostat.

THERMOSTAT INSTALLATION

EGSP3-02

1. **PLACE THERMOSTAT IN WATER INLET HOUSING**

(a) Install a new gasket to the thermostat.

(b) Align the jiggle valve of the thermostat with the protrusion of the water inlet housing, and insert the thermostat in the water inlet housing.

HINT: The jiggle valve may be set within 15° of either side of the prescribed position.

2. **CONNECT WATER INLET WITH LOWER RADIATOR HOSE**

Install the water inlet with the 2 nuts.

HINT: Facing the top mark (protrusion) upward.

Torque: 20 N·m (200 kgf·cm, 15 ft·lbf)

3. **FILL WITH ENGINE COOLANT**
4. **START ENGINE AND CHECK FOR LEAKS**

EG

RADIATOR

EG074–03

RADIATOR CLEANING

Using water or a steam cleaner, remove any mud or dirt from the radiator core.

NOTICE: If using a high pressure type cleaner, be careful not to deform the fins of the radiator core. (i.e. Maintain a distance between the cleaner nozzle radiator core)

EG

EG00U–01

RADIATOR INSPECTION

1. **REMOVE RADIATOR CAP**

CAUTION: To avoid the danger of being burned, do not remove the radiator cap while the engine and radiator are still hot, as fluid and steam can be blown out under pressure.

2. **INSPECT RADIATOR CAP**

NOTICE: If the radiator cap has contaminations, always rinse it with water.

Using a radiator cap tester, pump the tester and measure the vacuum valve opening pressure.

Standard opening pressure:

74 – 103 kPa

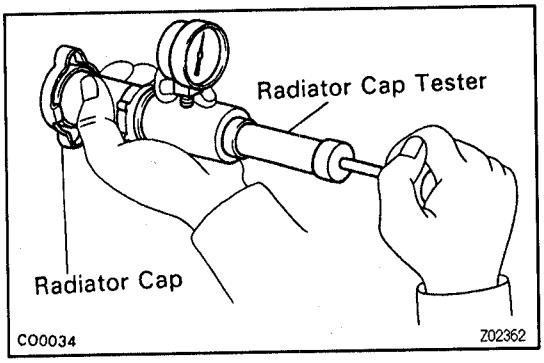
(0.75 – 1.05 kgf/cm², 10.7 – 14.9 psi)

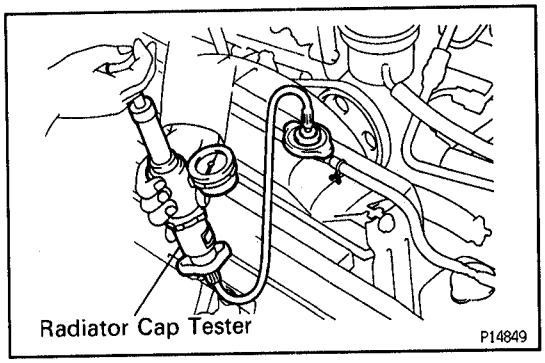
Minimum opening pressure:

59 kPa (0.6 kgf/cm², 8.5 psi)

HINT: Use the tester's maximum reading as the opening pressure.

If the opening pressure is less than minimum, replace the radiator cap.





3. **INSPECT COOLING SYSTEM FOR LEAKS**

(a) Fill the radiator with coolant and attach a radiator cap tester.

(b) Warm up the engine.

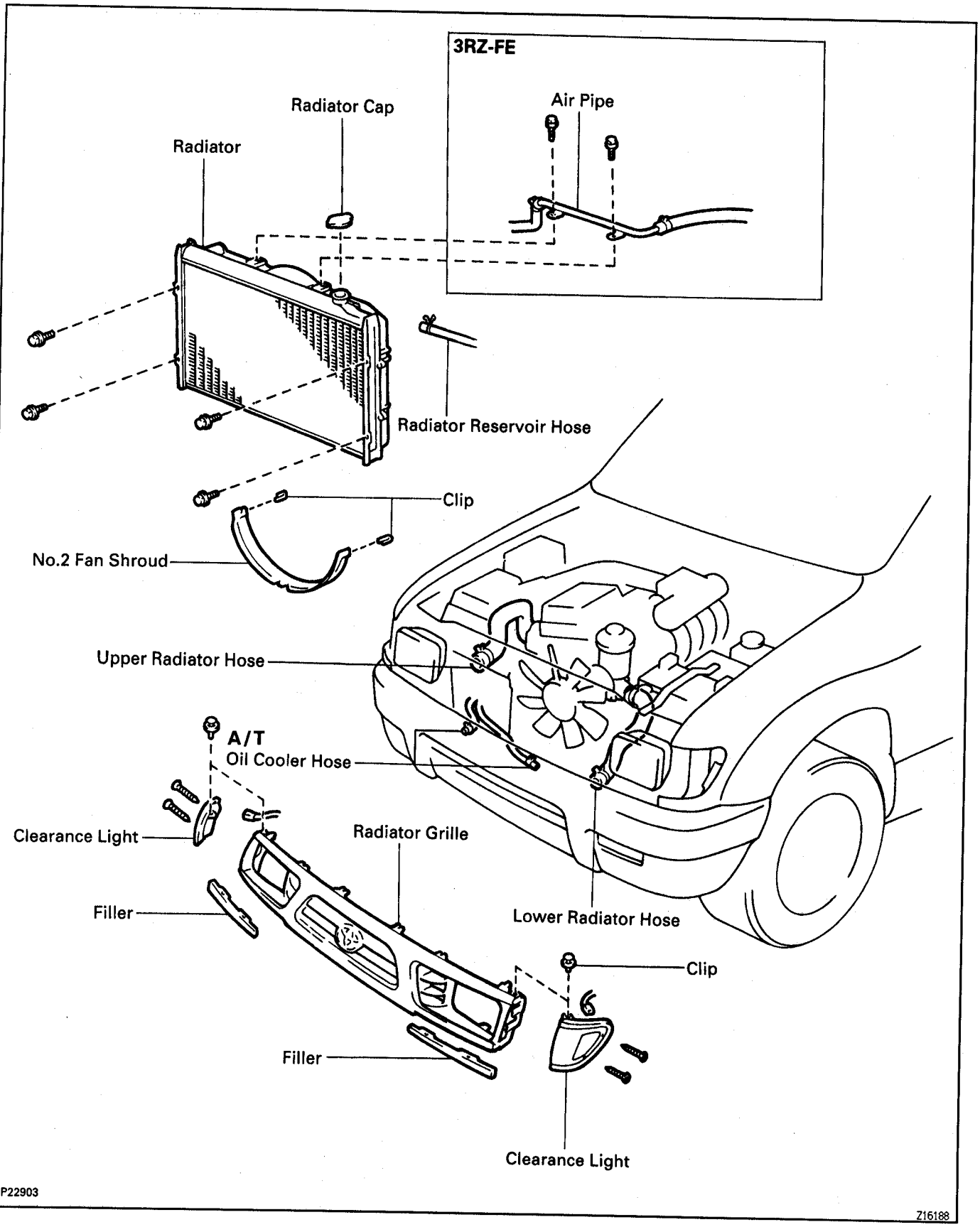
(c) Pump it to 118 kPa (1.2 kgf/cm², 17.1 psi), and check that the pressure does not drop.

If the pressure drops, check the hoses, radiator or water pump for leaks. If no external leaks are found, check the heater core, cylinder block and head.

4. **REINSTALL RADIATOR CAP**

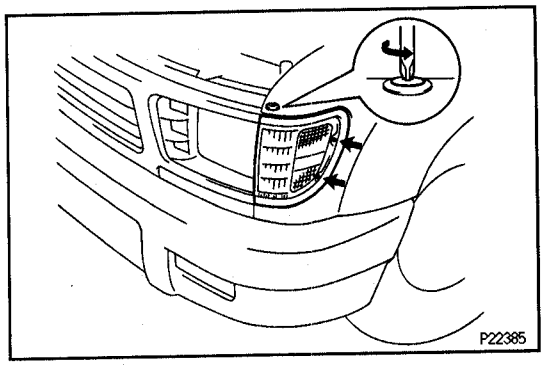
COMPONENTS FOR REMOVAL AND INSTALLATION

EG1J6–0A



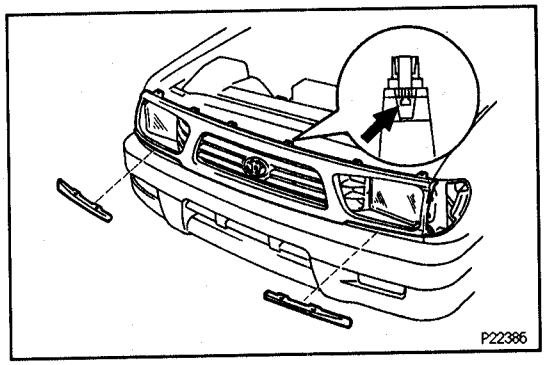
EG5P4–02

RADIATOR REMOVAL

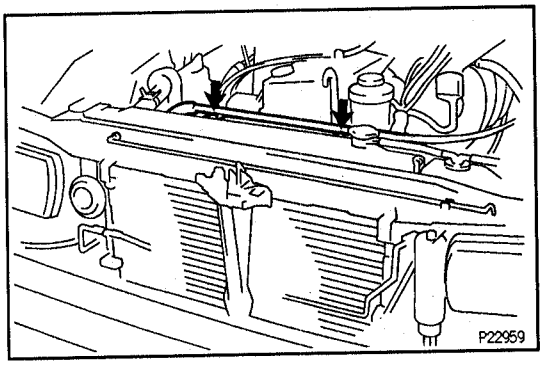


1. **DRAIN ENGINE COOLANT**
2. **REMOVE RADIATOR GRILLE**

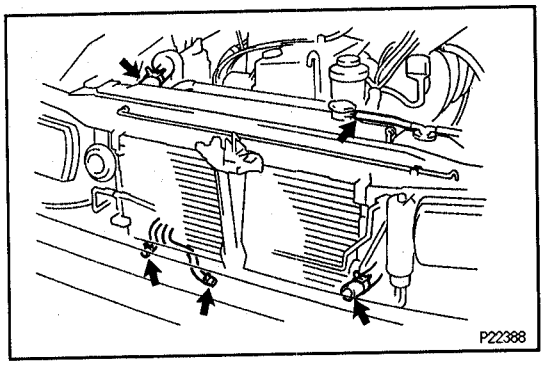
(a) Remove the 4 screws, 2 clips and clearance lights.



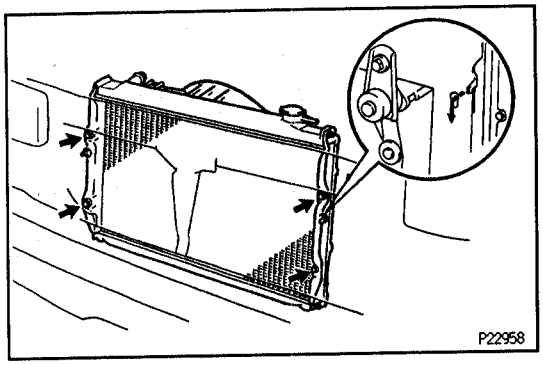
(b) Remove the 2 filler.
(c) Remove the 11 clips and radiator grille.



3. **3RZ–FE:**
   DISCONNECT AIR PIPE
   Remove the 2 bolts and disconnect the air pipe.



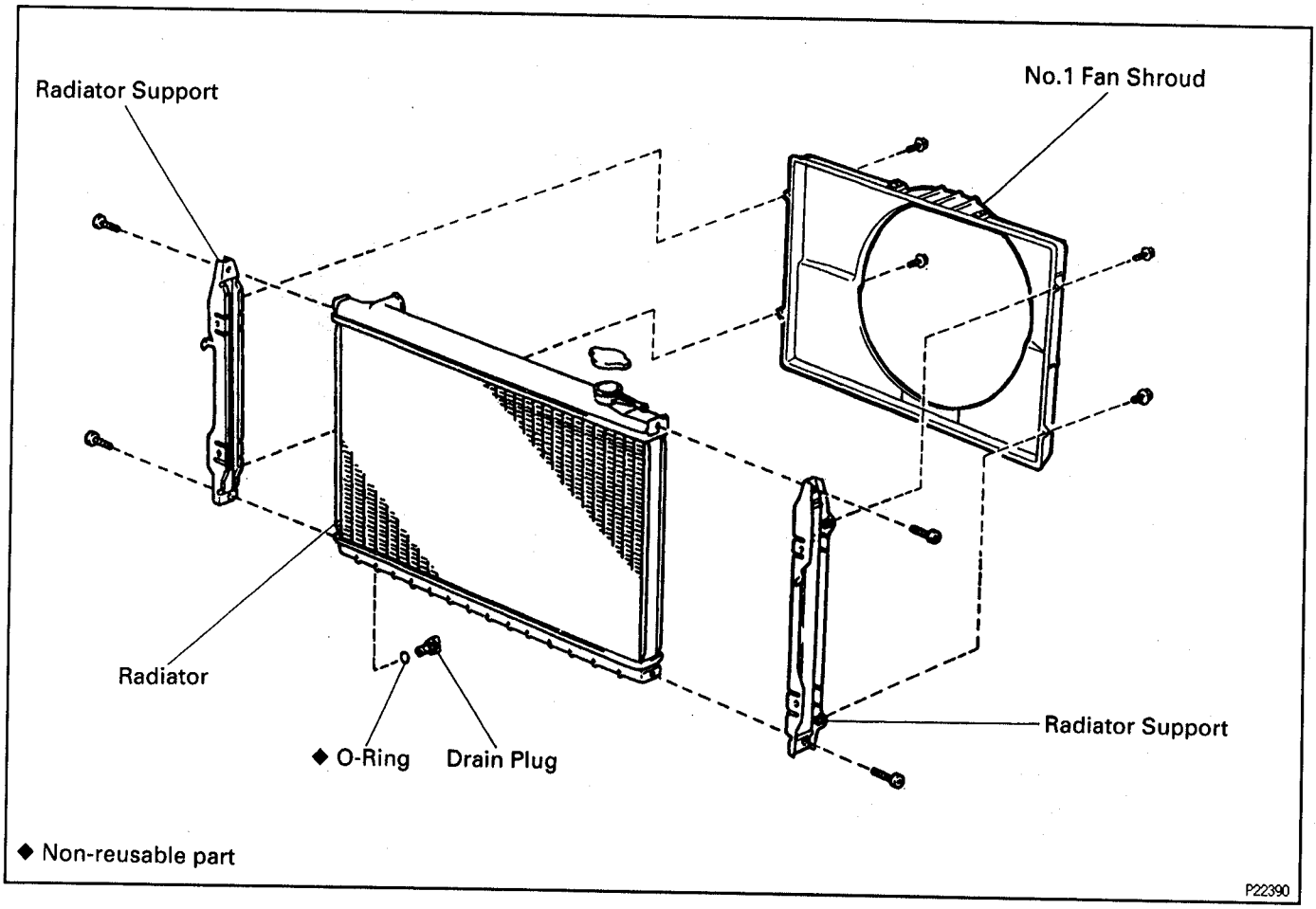
4. **DISCONNECT UPPER RADIATOR HOSE**
5. **DISCONNECT RADIATOR RESERVOIR HOSE**
6. **DISCONNECT LOWER RADIATOR HOSE**
7. **REMOVE NO.2 FAN SHROUD**
8. **A/T:**
   DISCONNECT OIL COOLER HOSES

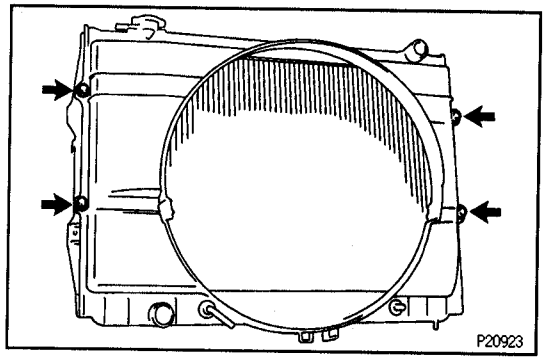


9. **REMOVE RADIATOR**
   Remove the 4 bolts and radiator.
   Torque: 12.5 N·m (125 kgf·cm, 9 ft·lbf)
   INSTALLATION HINT: Insert the tabs of the radiator support through the radiator service holes.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

EG1J8-0E

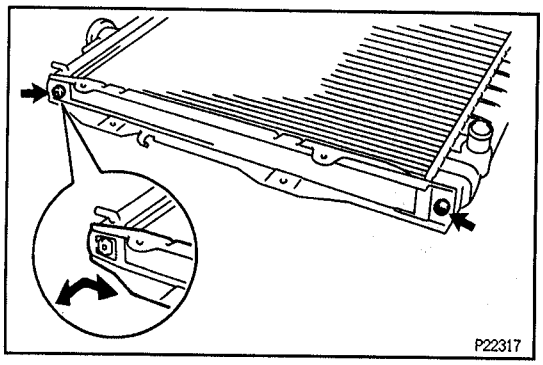




RADIATOR DISASSEMBLY

EG567-04

1. **REMOVE NO.1 FAN SHROUD**
   Remove the 4 bolts and fan shroud.



2. **REMOVE RADIATOR SUPPORTS**
   Remove the 4 screws and 2 radiator supports.
   INSTALLATION HINT: Insert the tabs the radiator upper tank through the radiator support holes.
   Torque: 5.5 N·m (55 kgf·cm, 49 in.·lbf)

EG05G–01

RADIATOR ASSEMBLY

Assembly is in the reverse order of disassembly.

EG05H–01

RADIATOR INSTALLATION

Installation is in the reverse order of removal.

EG

SERVICE SPECIFICATIONS

EG07L–1E

SERVICE DATA

Thermostat	Valve opening temperature		80 – 84°C (176 – 183°F)
	Valve lift at 95°C (203°F)		8 mm (0.31 in.) or more
Radiator cap	Relief valve opening pressure	STD	74 – 103 kPa (0.75 – 1.05 kgf/cm², 10.7 – 14.9 psi)

EG07M–1J

TORQUE SPECIFICATIONS

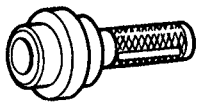
Part tightened		N·m	kgf·cm	ft·lbf
Cylinder block x Drain plug		24.5	250	18
Water pump pulley x Water pump		21	210	16
Water pump x Cylinder block	14 mm head bolt	24.5	250	18
	12 mm head bolt	8.9	90	78 in.·lbf
Fan x Fluid coupling		5.5	55	49 in.·lbf
Water inlet x Water inlet housing		20	200	15
Radiator support x Radiator		5.5	55	49 in.·lbf
Radiator x Body		12.5	125	9

LUBRICATION SYSTEM

PREPARATION

SST (SPECIAL SERVICE TOOLS)

EG07P–0N

	09223–50010 Crankshaft Front oil Seal Replacer	
	09228–07501 Oil Filter Wrench	
	09816–30010 Oil Pressure Switch Socket	

RECOMMENDED TOOLS

EG07Q–0F

	09200–00010 Engine Adjust Kit .	

EQUIPMENT

EG07R–0J

Oil pressure gauge	
Precision straight edge	Oil pump
Torque wrench	

LUBRICANT

EG1CU–0E

Item	Capacity	Classification
Engine oil		API grade SH, Energy–Conserving II multigrade engine oil or ILSAC multigrade engine oil and recommended viscosity oil, with SAE 5W–30 being preferred engine oil
2WD		
Dry fill	6.2 liters (6.6 US qts, 5.5 Imp. qts)	
Drain and refill		
w/ Oil filter change	5.5 liters (5.8 US qts, 4.8 Imp. qts)	
w/o Oil filter change	4.8 liters (5.0 US qts, 4.2 Imp. qts)	
4WD		
Dry fill	5.8 liters (6.1 US qts, 5.1 Imp. qts)	
Drain and refill		
w/ Oil filter change	5.4 liters (5.7 US qts, 4.8 Imp. qts)	
w/o Oil filter change	4.7 liters (5.0 US qts, 4.1 Imp. qts)	

EG07T–0A

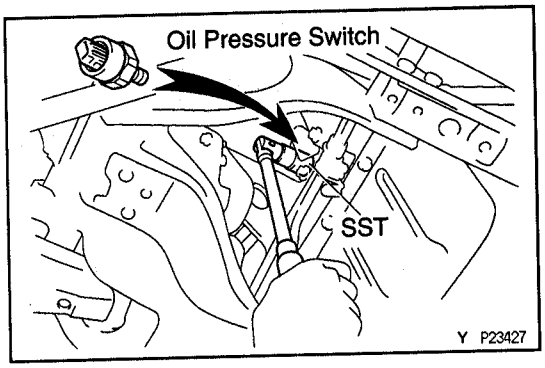
SSM (SPECIAL SERVICE MATERIALS)

08833–00080	Adhesive 1344, THREE BOND 1344, LOCTITE 242 or equivalent	Oil pressure switch

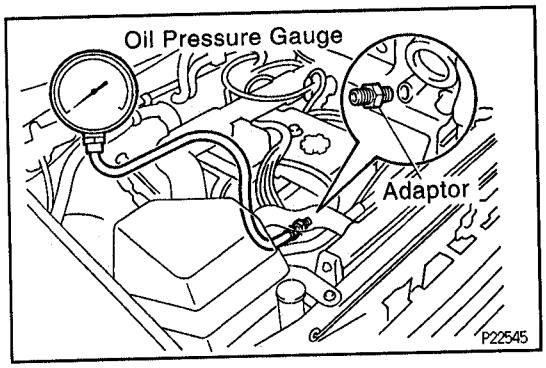
OIL PRESSURE CHECK

EG05J–01

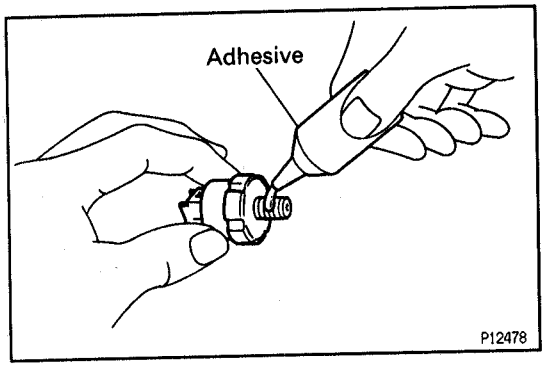
1. **CHECK ENGINE OIL QUALITY**
   Check the oil for deterioration, entry of water, discoloring or thinning.
   If the quality is visibly poor, replace the oil.
2. **CHECK ENGINE OIL LEVEL**
   The oil level should be between the "L" and "F" marks on the dipstick.
   If low, check for leakage and add oil up to "F" mark.



3. **REMOVE ENGINE UNDER COVER**
4. **REMOVE OIL PRESSURE SWITCH**
   Using SST, remove the oil pressure switch.
   SST 09816–30010



5. **INSTALL OIL PRESSURE GAUGE**
   Install an oil pressure gauge to an adaptor.
6. **WARM UP ENGINE**
   Allow the engine to warm up to normal operating temperature.
7. **INSPECT OIL PRESSURE**
   Oil pressure:
   At idle
   29 kPa (0.3 kgf/cm², 4.3 psi) or more
   At 3,000 rpm
   245 – 490 kPa (2.5 – 5.0 kgf/cm², 36 – 71 psi)



8. **REMOVE OIL PRESSURE GAUGE**
9. **REINSTALL OIL PRESSURE SWITCH**

(a) Apply adhesive to 2 or 3 threads of the oil pressure switch.
Adhesive:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

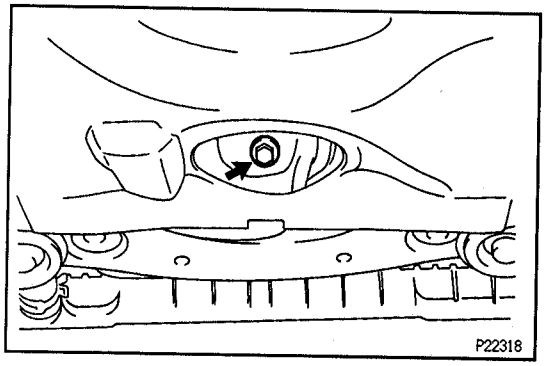
(b) Using SST, install the oil pressure switch.
SST 09816–30010

10. **REINSTALL ENGINE UNDER COVER**
11. **START ENGINE AND CHECK FOR LEAKS**

OIL AND FILTER REPLACEMENT

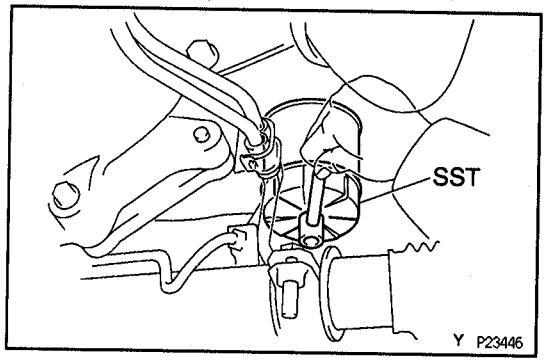
CAUTION: EGWPF–02

- **Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.**
- **Care should be taken, therefore, when changing engine, oil to minimize the frequency and length of time your skin is exposed to used engine oil. Protective clothing and gloves that cannot be penetrated by oil should be worn. The skin should be thoroughly washed with soap and water, or use water–less 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 filler cap.
(b) Remove the oil drain plug, and drain the oil into a container.



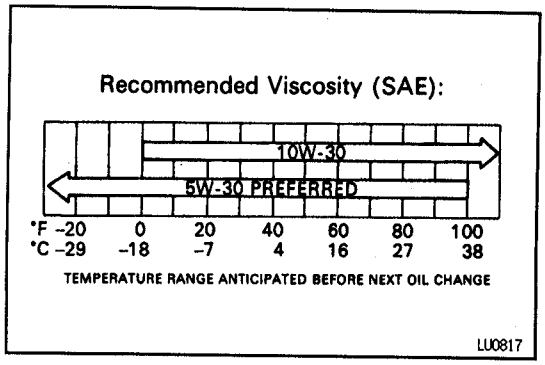
2. REPLACE OIL FILTER

(a) Using SST, remove the oil filter.
SST 09228–07501
(b) Check and clean the oil filter installation surface.
(c) Apply clean engine oil to the gasket of a new oil filter.
(d) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.
(e) Using SST, tighten it an additional 3/4 turn.
SST 09228–07501

3. REFILL WITH ENGINE OIL

(a) Clean and install the oil drain plug with a new gasket.
Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)
(b) Fill with fresh engine oil.
Oil grade:

API grade SH Energy – Conserving II multigrade engine oil or ILSAC multigrade engine oil.
Recommended viscosity is as shown in the illustration, with SAE 5W–30 being the preferred engine oil.



Oil capacity

2WD:

Dry fill

6.2 liters (6.6 US qts, 5.5 Imp. qts)

Drain and refill

w/ Oil filter change

5.5 liters (5.8 US qts, 4.8 Imp. qts)

w/o Oil filter change

4.8 liters (5.0 US qts, 4.2 Imp. qts)

4WD:

Dry fill

5.8 liters (6.1 US qts, 5.1 Imp. qts)

Drain and refill

w/ Oil filter change

5.4 liters (5.7 US qts, 4.8 Imp. qts)

w/o Oil filter change

4.7 liters (5.0 US qts, 4.1 Imp. qts)

(c) Reinstall the oil filler cap.

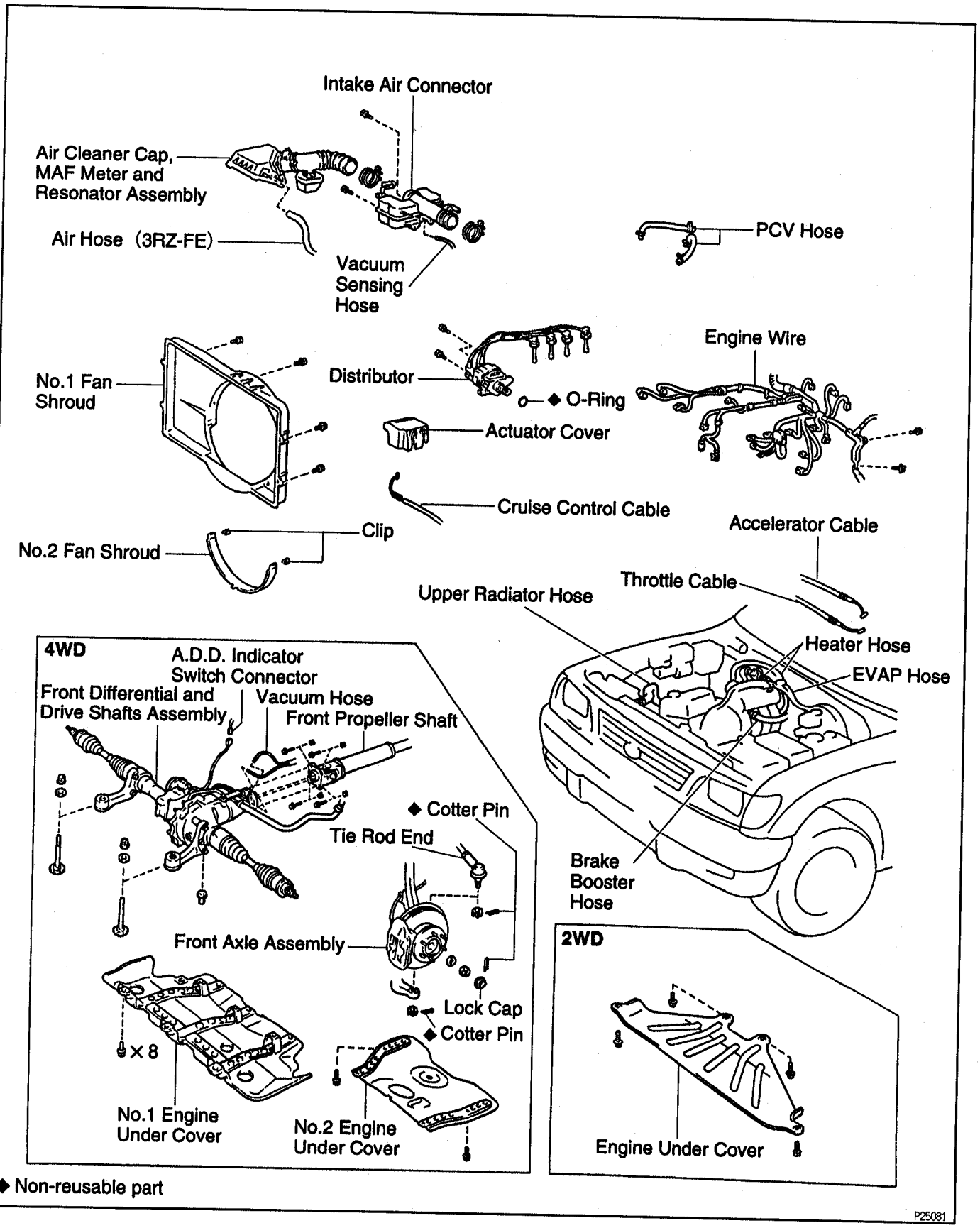
4. START ENGINE AND CHECK FOR LEAKS

5. RECHECK ENGINE OIL LEVEL

OIL PUMP

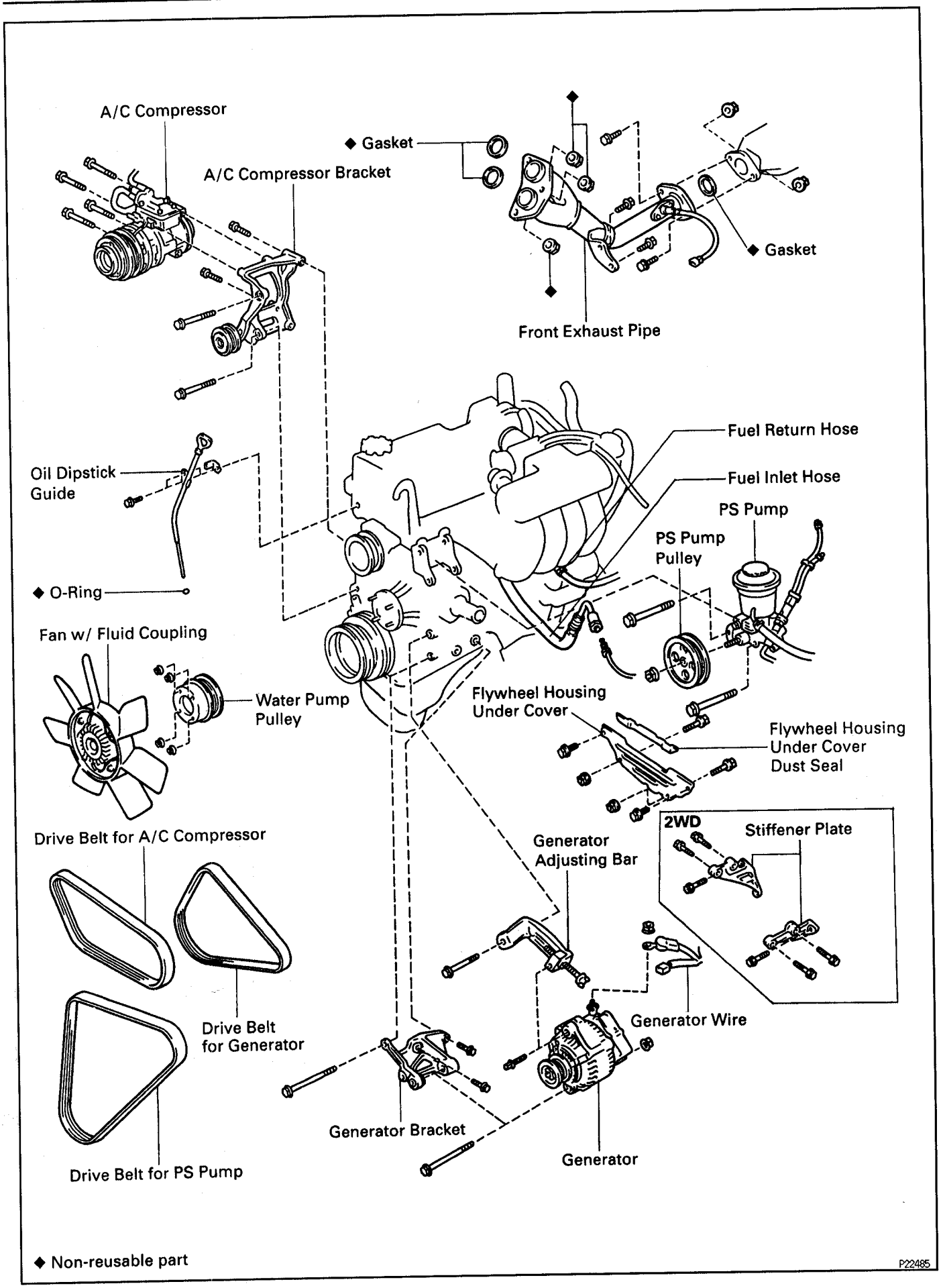
COMPONENTS FOR REMOVAL AND INSTALLATION

EG5P6–02



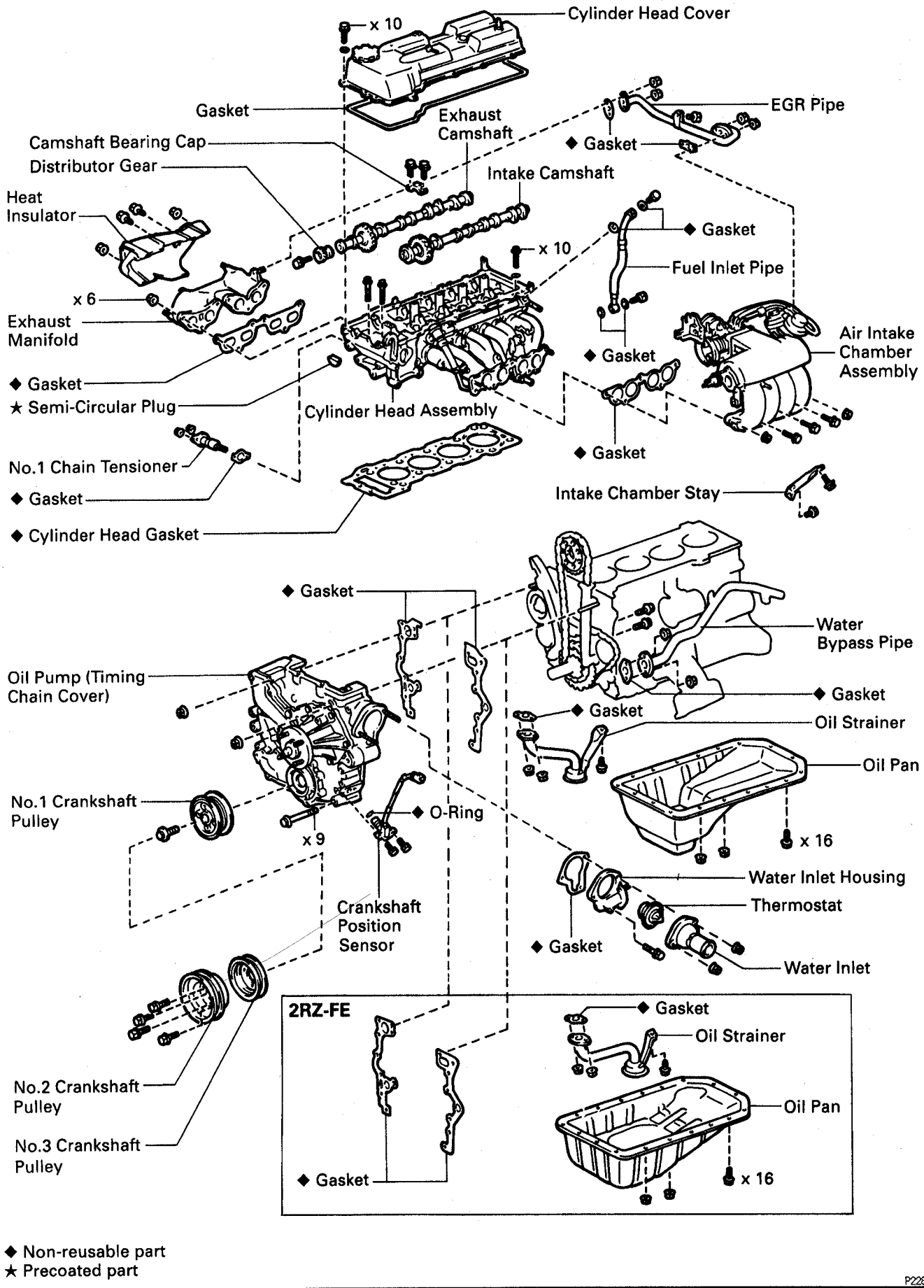
◆ Non-reusable part

P25081



◆ Non-reusable part

P22485



◆ Non-reusable part
★ Precoated part

P22899

EG

EG5CU–08

OIL PUMP REMOVAL

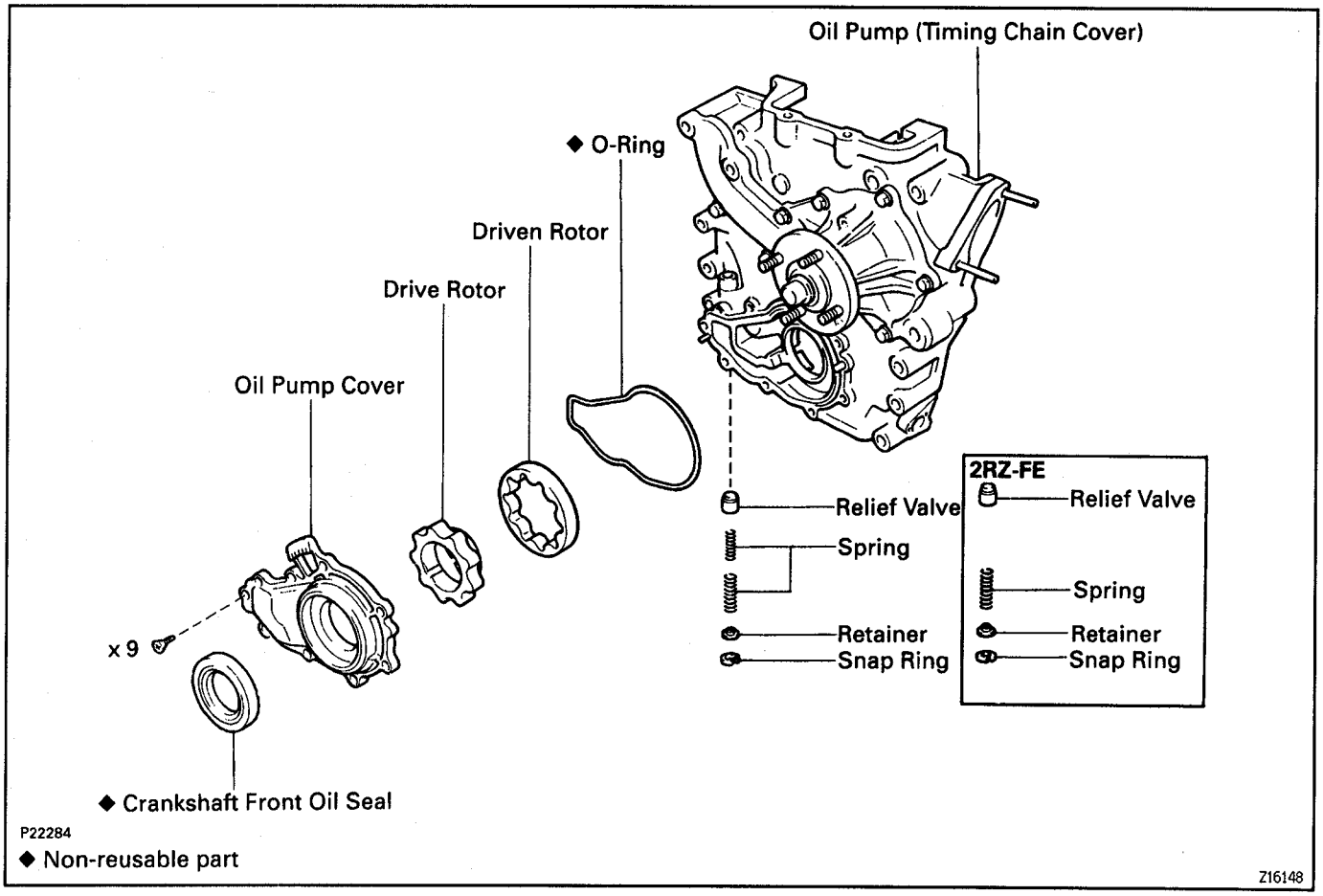
1. **REMOVE CYLINDER HEAD ASSEMBLY**
   (See cylinder head removal in Engine Mechanical)
2. **REMOVE WATER INLET AND WATER INLET HOUSING**

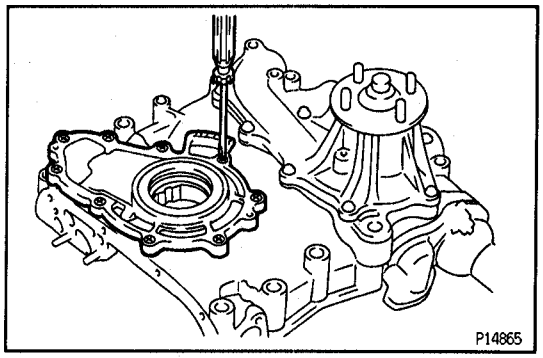
(a) Remove the 2 nut, water inlet and thermostat.
(b) Remove the bolt and water inlet housing and gasket.

3. **REMOVE TIMING CHAIN COVER**
   (See timing chain removal in Engine Mechanical)

EG1JG–07

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY





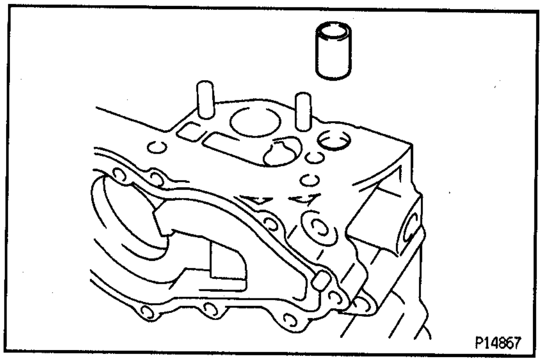
EG5P7–02

OIL PUMP DISASSEMBLY

1. **REMOVE DRIVE AND DRIVEN ROTORS**
   Remove the 9 screws, pump cover, drive rotor, driven rotor and O–ring.
2. **REMOVE RELIEF VALVE**

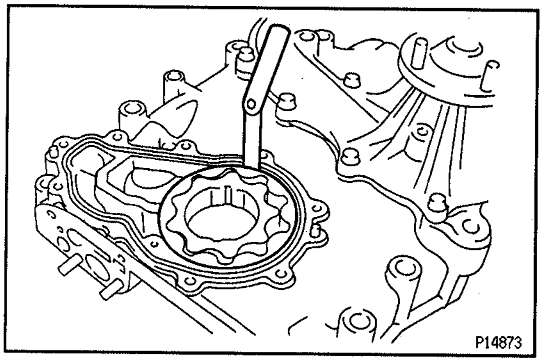
(a) Using snap ring pliers, remove the snap ring.
(b) Remove the retainer, spring(s) and relief valve.

OIL PUMP INSPECTION



P14867

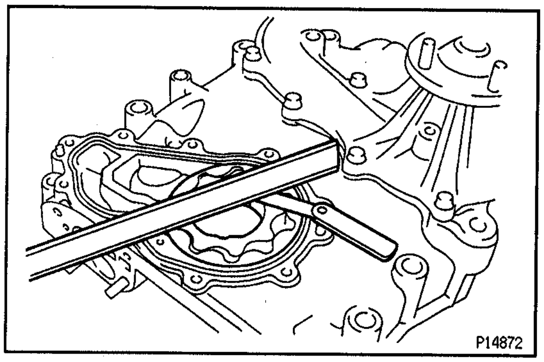
1. **INSPECT RELIEF VALVE**
Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight.
If it does not, replace the relief valve. If necessary, replace the oil pump assembly.



P14873

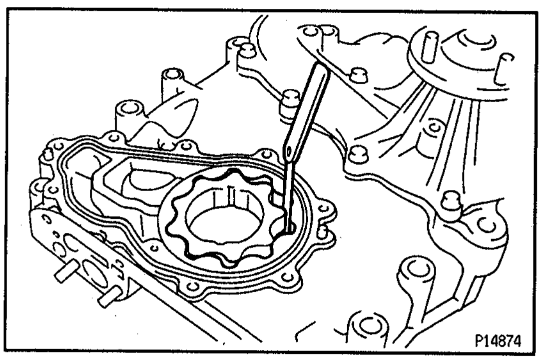
2. **INSPECT DRIVE AND DRIVEN ROTORS**

A. Inspect rotor body clearance
Using a thickness gauge, measure the clearance between the driven rotor and body.
Standard body clearance:
0.100 – 0.175 mm (0.0039 – 0.0069 in.)
Maximum body clearance:
0.30 mm (0.0118 in.)
If the body clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.



P14872

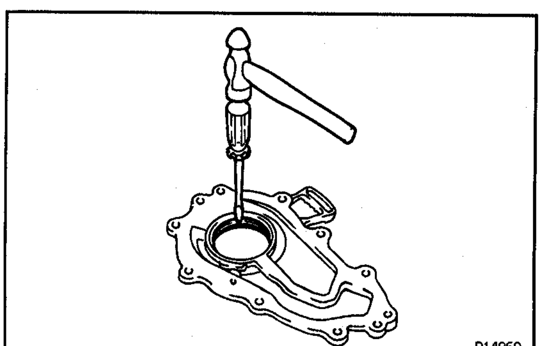
B. Inspect rotor side clearance
Using a thickness gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.
Standard side clearance:
0.030 – 0.090 mm (0.0012 – 0.0035 in.)
Maximum side clearance:
0.15 mm (0.0059 in.)
If the side clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.



P14874

C. Inspect rotor tip clearance
Using a thickness gauge, measure the clearance between the drive and driven rotor tips.
Standard tip clearance:
0.110 – 0.240 mm (0.0043 – 0.0094 in.)
Maximum tip clearance:
0.25 mm (0.0098 in.)
If the tip clearance is greater than maximum, replace the rotors as a set.

CRANKSHAFT FRONT OIL SEAL REPLACEMENT

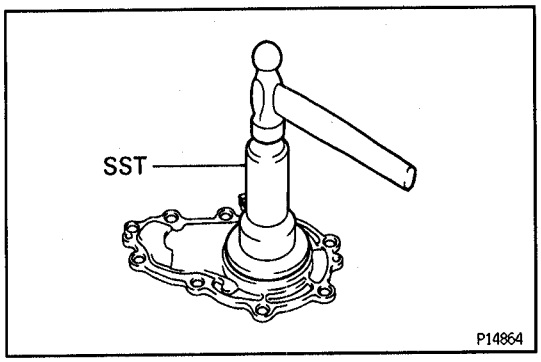


P14862

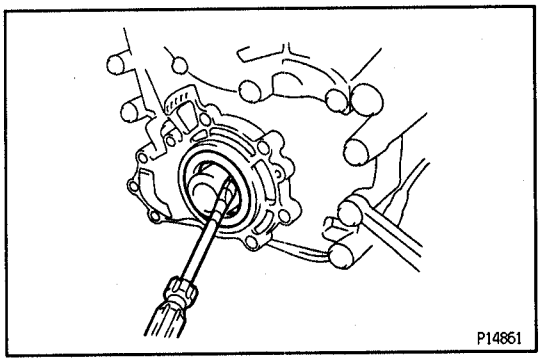
HINT: There are 2 methods (A and B) to replace the oil seal which are as follows:

1. **REPLACE CRANKSHAFT FRONT OIL SEAL**

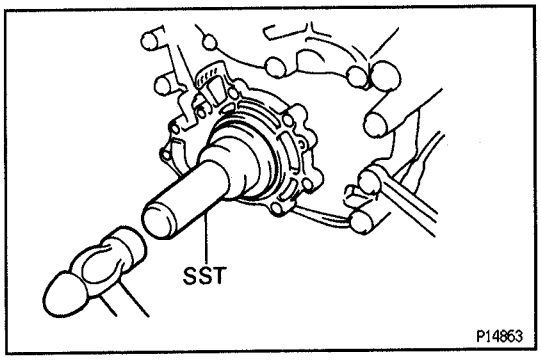
A. If oil pump is removed from cylinder block:
(a) Using a screwdriver and a hammer, tap out the oil seal.



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



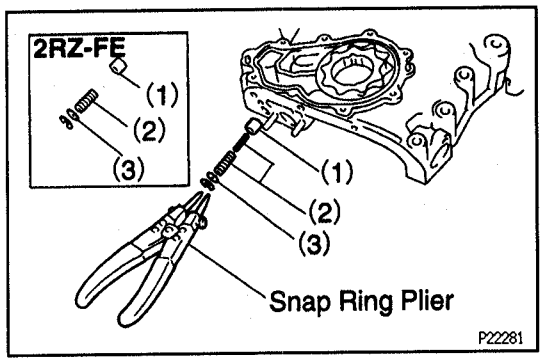
B. If oil pump is installed to cylinder block:
(a) Using a screwdriver, pry out the oil seal.
NOTICE: Be careful not to damage the crankshaft. Tape the screwdriver tip.



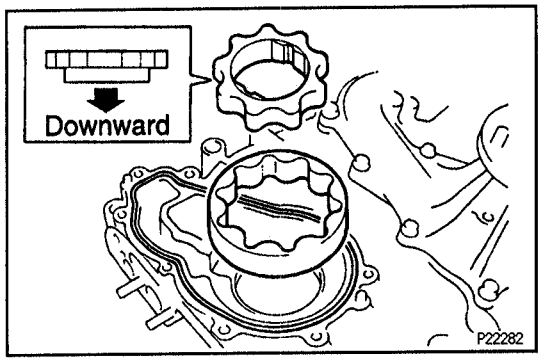
(b) Apply MP grease to a new oil seal lip.
(c) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump case edge.
SST 09223–50010

EGSCW–03

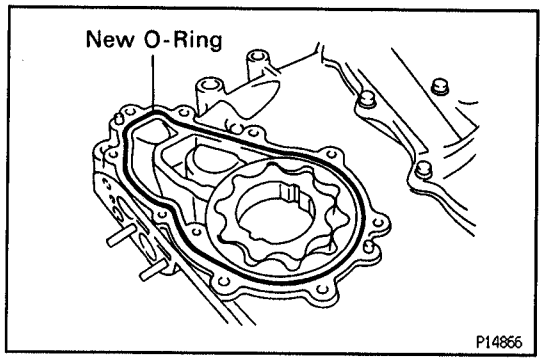
OIL PUMP ASSEMBLY



1. INSTALL RELIEF VALVE
(a) Install these parts:
(1) Relief valve
(2) Spring(s)
(3) Retainer
(b) Using snap ring pliers, install the snap ring.



2. INSTALL DRIVE AND DRIVEN ROTORS
(a) Place the drive and driven rotors into the pump body.



(b) Place a new O–ring to the pump body.
(c) Install the pump cover with the 9 screws.

OIL PUMP INSTALLATION

EG5CX–03

1. **INSTALL TIMING CHAIN COVER (See timing chain installation in Engine Mechanical)**
2. **INSTALL WATER INLET AND WATER INLET HOUSING**
3. **INSTALL CYLINDER HEAD ASSEMBLY (See cylinder head installation in Engine Mechanical)**

SERVICE SPECIFICATIONS

SERVICE DATA

EG00H–0H

Oil pressure	Normal operating temperature	at idle speed	29 kPa (0.3 kgf/cm², 4.3 psi) or more
		at 3,000 rpm	245 – 490 kPa (2.5 – 5.0 kgf/cm², 36 – 71 psi)
Oil pump	Body clearance	STD	0.100 – 0.175 mm (0.0039 – 0.0069 in.)
		Maximum	0.30 mm (0.0118 in.)
	Tip clearance	STD	0.110 – 0.240 mm (0.0043 – 0.0094 in.)
		Maximum	0.25 mm (0.0098 in.)
	Side clearance	STD	0.030 – 0.090 mm (0.0012 – 0.0035 in.)
		Maximum	0.15 mm (0.0059 in.)

TORQUE SPECIFICATIONS

EG0NY–0E

Part tightened	N·m	kgf·cm	ft·lbf
Oil pan x Drain plug	37	375	27

2RZ-FE, 3RZ-FE ENGINE TROUBLESHOOTING

EG

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following pages.

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

Vehicle Brought to Workshop

↓

① Customer Problem Analysis P. EG-187

↓

② Connect the OBD II scan tool or TOYOTA hand-held tester to DLC3. P. EG-190
If the display indicates a communication fault in the tool, inspect DLC3. See page EG-189

↓

③ Check DTC and Freezed Frame Data (Precheck)
Record or Print DTC and Freezed Frame Data. P. EG-190

↓

④ Clear DTC and Freezed Frame Data P. EG-191

↓

⑤ Visual Inspection

↓

⑥ Setting the Check Mode Diagnosis P. EG-191

↓

⑦ Problem Symptom Confirmation
If the engine does not start, perform steps ⑩ and ⑫ first.

↓ Malfunction does not occur.

⑧ Symptom Simulation P. IN-18

↓

Malfunction occurs.

↓

⑨ DTC Check P. EG-191

Normal ↓ ↓ Malfunction code.

⑩ Basic Inspection P. EG-197 ⑪ DTC Chart P. EG-192

↓

⑫ Matrix Chart of Problem Symptoms P. EG-207

↓

⑬ Circuit Inspection P. EG-208

↓

⑭ Parts Inspection ⑮ Check for Intermittent Problems P. EG-196

↓

Identification of Problem

↓

⑯ Adjustment, Repair

↓

⑰ Confirmation Test

↓

End

CUSTOMER PROBLEM ANALYSIS CHECK SHEET

ENGINE CONTROL System Check Sheet

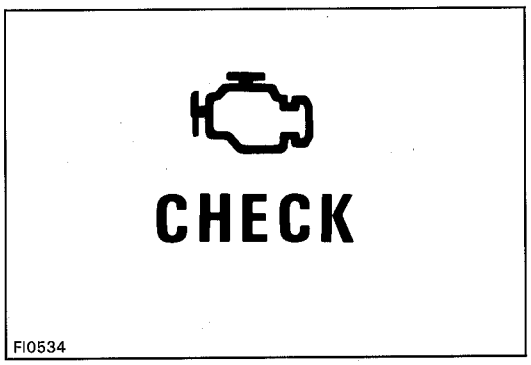
Inspector's Name

Customer's name		**Model and model year**	
Driver's name		**Frame no.**	
Data vehicle brought in		**Engine model**	
License no.		**Odometer reading**	km miles

Problem Symptoms	☐ **Engine does not Start**	☐ Engine does not crank ☐ No intial combustion ☐ No complete combustion
	☐ **Difficult to Start**	☐ Engine cranks slowly ☐ Other_____
	☐ **Poor Idling**	☐ Incorrect first idle ☐ Idling rpm is abnormal [☐ High ☐ Low (rpm)] ☐ Rough idling ☐ Other_____
	☐ **Poor Driveability**	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after-fire) ☐ Surging ☐ Knocking ☐ Other_____
	☐ **Engine Stall**	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other_____
	☐ **Others**	

Datas Problem Occurred		
Problem Frequency		☐ Constant ☐ Sometimes (times per day/month) ☐ Once only ☐ Other_____
Conditions When Problem Occurs	**Weather**	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Various/Other_____
	Outdoor Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold (approx.____°F /____°C)
	Place	☐ Highway ☐ Suburbs ☐ Inner City ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other_____
	Engine Temp.	☐ Cold ☐ Warming up ☐ After warming up ☐ Any temp. ☐ Other_____
	Engine Operation	☐ Starting ☐ Just after starting [min.] ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other_____

Condition of Malfunction Indicator Lamp		☐ Remains on ☐ Sometimes lights up ☐ Does not light up
Diagnostic Trouble Code Inspection	**Normal Mode (Precheck)**	☐ Normal ☐ Malfunction code(s) [code] ☐ Freezed frame data [ ]
	Check Mode	☐ Normal ☐ Malfunction code(s) [code] ☐ Freezed frame data [ ]



EG

DIAGNOSIS SYSTEM

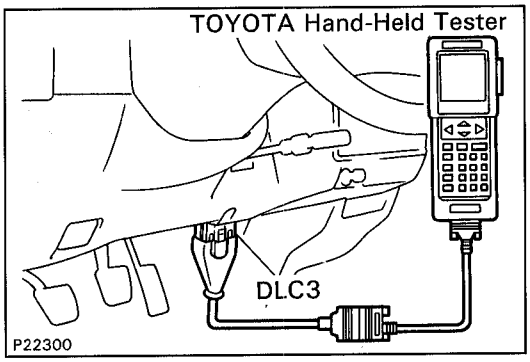
DESCRIPTION

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

OBD II regulations require that the vehicle's on-board computer lights up the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components which affect vehicle emissions. In addition to the MIL lighting up when a malfunction is detected, the applicable DTC prescribed by SAE J2012 are recorded in the ECM memory. (See page EG-192)

If the malfunction does not reoccur in 3 trips, the MIL goes off but the DTC remain recorded in the ECM memory.

To check the DTC, connect the OBD II scan tool or TOYOTA hand-held tester to Data Link Connector 3 (DLC3) on the vehicle. The OBD II scan tool or TOYOTA hand-held tester also enables you to erase the DTC and check freezed frame data and various forms of engine data. (For operating instructions, see the OBD II scan tool's instruction book.)



DTC include SAE controlled codes and Manufacturer controlled codes.
SAE controlled codes must be set as prescribed by the SAE, while Manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits.
(See DTC chart on page EG-192)

The diagnosis system operates in normal mode during normal vehicle use. It also has a check mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTC use 2 trip detection logic* to prevent erroneous detection and ensure thorough malfunction detection. By switching the ECM to check mode when troubleshooting, the technician can cause the MIL to light up for a malfunction that is only detected once or momentarily. (TOYOTA hand-held tester only)
(See page EG-190)

*2 trip detection logic
When a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same malfunction is detected again during the second drive test, this second detection causes the MIL to light up.
The 2 trip repeats the same mode a 2nd time. (However, the IG switch must be turned OFF between the 1st trip and 2nd trip).

Freeze frame data:

Freeze frame data records the engine condition when a misfire (DTC P0300 ~ P0304) or fuel trim malfunction (DTC P0171, P0172), or other malfunction (first malfunction only), is detected.

Because freeze frame data records the engine conditions (fuel system, calculator load, engine coolant temperature, fuel trim, engine speed, vehicle speed, etc.) when the malfunction is detected, when troubleshooting it is useful for determining whether the vehicle was running or stopped, the engine warmed up or not, the air-fuel ratio lean or rich, etc. at the time of the malfunction.

Priorities for Troubleshooting

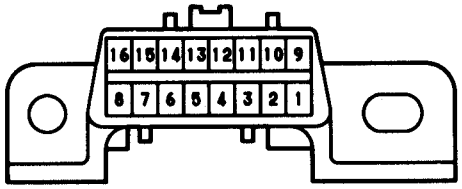
If troubleshooting priorities for multiple diagnostic codes are given in the applicable diagnostic chart, these should be followed.

If no instructions are given troubleshoot DTC according to the following priorities.

① DTC other than fuel trim malfunction (DTC P0171, P0172), EGR (DTC P0401, P0402), and misfire (DTC P0300 ~ P0304).

② Fuel trim malfunction (DTC P0171, P0172) and EGR (DTC P0401, P0402).

③ Misfire (DTC P0300 ~ P0304).



DLC3

N09214

DATA LINK CONNECTOR 3 (DLC3) INSPECTION

The vehicle's ECM uses V.P.W. (Variable Pulse Width)for communication to comply with SAE J1850. The terminal arrangement of DLC3 complies with SAE J1962 and matches the V.P.W. format.

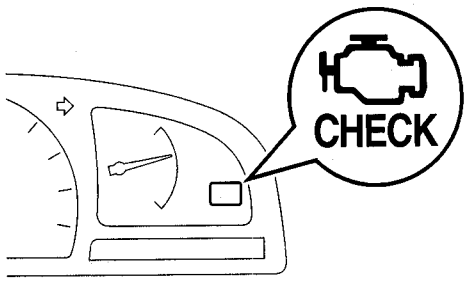
Terminal No.	Connection	Voltage or Resistance	Condition
2	Bus ⊕ Line	Pulse generation	During transmission
4	Chassis Ground	↔ Body Ground 1 Ω or less	Always
5	Signal Ground	↔ Body Ground 1 Ω or less	Always
16	Battery Positive	↔ Body Ground 9 ~ 14 V	Always

HINT: If your display shows "UNABLE TO CONNECT TO VEHICLE" when you have connected the cable of the OBD II scan tool or TOYOTA hand-held tester to DLC3, turned the ignition switch ON and operated the scan tool, there is a problem on the vehicle side or tool side.

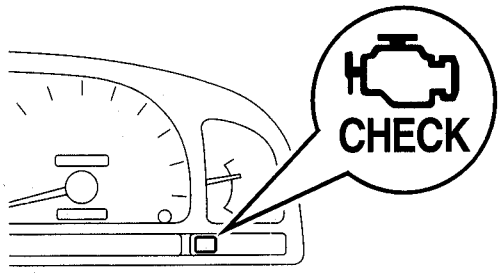
(1) If communication is normal when the tool is connected to another vehicle, inspect DLC3 on the original vehicle.

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

w/o Tachometer



w/ Tachometer



P22302
P22301

Diagnosis Inspection (Normal Mode)

MALFUNCTION INDICATOR LAMP (MIL) CHECK

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

   HINT: If the MIL does not light up, troubleshoot the combination meter (See page BE-33).

2. When the engine is started, the MIL should go off. If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system.

DIAGNOSTIC TROUBLE CODE (DTC) CHECK

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

1. Prepare the OBD II scan tool (complying with SAE J1978) or TOYOTA hand-held tester.
2. Connect the OBD II scan tool or TOYOTA hand-held tester to DLC3 at the lower of the instrument panel.
3. Turn the ignition switch ON and switch the OBD II scan tool or TOYOTA hand-held tester main switch ON.
4. Use the OBD II scan tool or TOYOTA hand-held tester to check the DTC and freezed frame data, note them down. (For operating instructions, see the OBD II scan tool's instruction book.)
5. See page EG-196 to confirm the details of the DTC.

NOTICE: When simulating symptoms with an OBD II scan tool (excluding TOYOTA hand-held tester) to check the DTC use normal mode. For codes on the DTC chart subject to "2 trip detection logic", turn the ignition switch OFF after the symptom is simulated the first time. Then repeat the simulation process again. When the problem has been simulated twice, the MIL lights up and the DTC are recorded in the ECM.

Diagnosis Inspection (Check Mode)

TOYOTA HAND-HELD TESTER only

Compared to the normal mode, the check mode has an increased sensitivity to detect malfunctions.

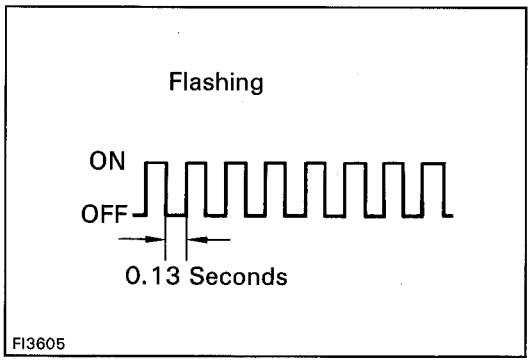
Furthermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode.

DTC CHECK

1. Initial conditions.
(a) Battery positive voltage 11 V or more.
(b) Throttle valve fully closed.
(c) Transmission in park or neutral position.
(d) Air conditioning switched OFF.
2. Turn ignition switch OFF.
3. Prepare the TOYOTA hand-held tester.
4. Connect the TOYOTA hand-held tester to DLC3 at the lower of the instrument panel.
5. Turn the ignition switch ON and push the TOYOTA hand-held tester main switch ON.
6. Switch the TOYOTA hand-held tester normal mode to check mode. (Check that the MIL flashes.)
7. Start the engine. (The MIL goes out after the engine start.)
8. Simulate the conditions of the malfunction described by the customer.

   NOTICE: Leave the ignition switch ON until you have checked the DTC, etc.
9. After simulating the malfunction conditions, use the TOYOTA hand-held tester diagnosis selector to check the DTC and freezed frame data, etc.

   HINT: Take care not to turn the ignition switch OFF. Turning the ignition switch OFF swithes the diagnosis system from check mode to normal mode, so all diagnostic codes, etc. are erased.
10. After checking the DTC, inspect the applicable circuit.



DTC CLEARANCE

The following actions will erase the DTC and freezed frame data.

1. Operating the OBD II scan tool (complying with SAE J1978) or TOYOTA hand-held tester to erase the codes. (See the OBD II scan tool's instruction book for operating instructions.)
2. Disconnecting the battery terminals or EFI fuse.

NOTICE: If the TOYOTA hand-held tester switches the ECM from normal mode to check mode or vice-versa, or if the ignition switch is turned from ON to ACC or OFF during check mode, the DTC and freezed frame data will be erased.

DTC CHART (SAE Controlled)

HINT: Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check in check mode, check the circuit for that code listed in the table below (Proceed to the page given for that circuit).

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0100 (EG-208)	Mass Air Flow Circuit Malfunction	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0101 (EG-211)	Mass Air Flow Circuit Range/Performance Probelm	• Mass air flow meter	○	○
P0110 (EG-212)	Intake Air Temp. Circuit Malfunction	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • ECM	○	○
P0115 (EG-215)	Engine Coolant Temp. Circuit Malfunction	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM	○	○
P0116 (EG-218)	Engine Coolant Temp. Circuit Range/ Performance Problem	• Engine coolant temp. sensor • Cooling system	○	○
P0120 (EG-219)	Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM	○	○
P0121 (EG-222)	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/ Performance Problem	• Throttle position sensor	○	○
P0125 (EG-223)	Insufficient Coolant Temp. for Closed Loop Fuel Control	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor	○	○
P0130 (EG-225)	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)	• Heated oxygen sensor • Fuel trim malfunction	○	○
P0133 (EG-227)	Heated Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)	• Heated oxygen sensor	○	○

*: ○ ··· MIL lights up

DTC CHART (Cont'd)

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0135 (EG-227)	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM	○	○
P0136 (EG-228)	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Heated oxygen sensor	○	○
P0141 (EG-227)	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)	• Same as DTC No. P0135	○	○
P0171 (EG-230)	System too Lean (Fuel Trim)	• Air intake (hose loose) • Fuel line pressure • Injector blockage • Heated oxygen sensor malfunction • Mass air flow meter • Engine coolant temp. sensor	○	○
P0172 (EG-230)	System too Rich (Fuel Trim)	• Fuel line pressure • Injector leak, blockage • Heated oxygen sensor malfunction • Mass air flow meter • Engine coolant temp. sensor	○	○
P0300 (EG-232)	Random/Multiple Cylinder Misfire Detected	• Ignition system • Injector • Fuel line pressure • EGR • Compression pressure • Valve clearance not ot specification • Valve timing • Mass air flow meter • Engine coolant temp. sensor	○	○
P0301 P0302 P0303 P0304 (EG-232)	Misfire Detected – Cylinder 1 – Cylinder 2 – Cylinder 3 – Cylinder 4			
P0325 (EG-236)	Knock Sensor 1 Circuit Malfunction	• Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • ECM	○	○
P0335 (EG-238)	Crankshaft Position Sensor "A" Circuit Malfunction	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Starter • ECM	○	○
P0336 (EG-240)	Crankshaft Position Sensor "A" Circuit Range/Performance	• Valve timing • Distributor installation • ECM	○	○

*: ○ ··· MIL lights up

DTC CHART (Cont'd)

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0340 (EG-241)	Camshaft Position Sensor Circuit Malfunction	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Distributor • Starter • ECM	○	○
P0401 (EG-242)	Exhaust Gas Recirculation Flow Insufficient Detected	• EGR valve stuck closed • Short in VSV circuit for EGR • Open in EGR gas temp. sensor circuit • EGR hose disconnected • ECM	○	○
P0402 (EG-250)	Exhaust Gas Recirculation Flow Excessive Detected	• EGR valve stuck open • EGR VSV open malfunction • Open in VSV circuit for EGR • Short in EGR gas temp. sensor circuit • ECM	○	○
P0420 (EG-253)	Catalyst System Efficiency Below Threshold	• Three-way catalytic converter • Open or short in heated oxygen sensor circuit • Heated oxygen sensor	○	○
P0440 (EG-256)	Evaporative Emission Control System Malfunction (Only for 4WD models)	• Vapor pressure sensor • Fuel tank cap incorrectly installed • Fuel tank cap cracked or damaged • Vacuum hose cracked, holed, blocked, damaged, or disconnected • Hose or tube cracked, holed, damaged or loose • Fuel tank cracked, holed or damaged • Charcoal canister cracked, holed or damaged	○	○
P0441 (EG-262)	Evaporative Emission Control System Incorrect Purge Flow (For 2WD models)	• Open or short in VSV circuit for EVAP • VSV for EVAP • ECM • Vacuum hose blocked or disconnected • Charcoal canister	○	○
P0441 (EG-265)	Evaporative Emission Control System Incorrect Purge Flow (For 4WD models)	• Open or short in VSV circuit for vapor pressure sensor • VSV for vapor pressure sensor • Open or short in vapor pressure sensor circuit • Vapor pressure sensor	○	○
P0446 (EG-265)	Evaporative Emission Control System Vent Control Malfunction (Only for 4WD models)	• Open or short in VSV circuit for EVAP • VSV for EVAP • Vacuum hose cracks, hole, blocked damaged or disconnected • Charcoal canister cracks, hole or damaged	○	○

*: ○ ··· MIL lights up

DTC CHART (Cont'd)

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0450 (EG-274)	Evaporative Emission Control System Pressure Sensor Malfunction (Only for 4WD models)	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM	○	○
P0500 (EG-276)	Vehicle Speed Sensor Malfunction	• Combination meter • Open or short in speed sensor circuit • ECM • Speedometer cable	○	○
P0505 (EG-278)	Idle Control System Malfunction	• IAC valve is stuck or closed • Open or short in IAC valve circuit • Air intake (hose loose)	○	○
P0510 (EG-280)	Closed Throttle Position Switch Malfunction	• Open in closed throttle position switch circuit • Closed throttle position switch • ECM	○	○

*: ○ ··· MIL lights up

DTC CHART (Manufacture Controlled)

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P1300 (EG-282)	Igniter Circuit Malfunction	• Open or short in IGF or IGT circuit from igniter to ECM • Igniter • ECM	○	○
P1335 (EG-286)	Crankshaft Position Sensor Circuit Malfunction (during engine running)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • ECM	–	○
P1500 (EG-286)	Starter Signal Circuit Malfunction	• Open or short in starter signal circuit • Open or short in ignition switch or starter relay circuit • ECM	–	○
P1600 (EG-287)	ECM BATT Malfunction	• Open in back up power source circuit • ECM	○	○
P1780 (EG-289)	Park/Neutral Position Switch Malfunction	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM	○	○

*: – ··· MIL does not light up
○ ··· MIL lights up

FAIL-SAFE CHART

If any of the following codes is recorded, the ECM enters fail-safe mode.

DTC No.	Fail-Safe Operation	Fail-Safe Deactivation Conditions
P0100	• Ignition timing fixed at 5° BTDC. • Injection time fixed Starting ····· 11.6 msec. CTP switch ON ····· 3.2 msec. CTP switch OFF ····· 6.0 msec.	Return to normal condition
P0110	Intake air temp. is fixed at 20°C (68°F)	Returned to normal condition
P0115	Engine coolant temp. is fixed at 80°C (176°F)	Returned to normal condition
P0120	VTA is fixed at 0°	The following condition must be repeated at least 2 times consecutively When closed throttle position switch is ON: 0.1 V ≦ VTA ≦ 0.95 V
P0135 P0141	The heater circuit in which an abnormality is detected is turned off	Ignition switch OFF
P0325	Max. timing retardation	Ignition switch OFF
P0336	Fuel cut	Returned to normal condition
P1300	Fuel cut	Returned to normal condition

Back-Up Function

I there is truoble with the program in the ECM and ignition signals (IGT) are not output from the microcomputer, the ECM controls fuel injection and ignition timing at predetermined levels as a back-up function to make it possible to continue to operate the vehicle.
Furthermore, the injection duration is calculated from the starting signal (STA) and the closed trottle position switch signal (IDL). Also, the ignition timing is fixed at the initial ignition timing, 5° BTDC, without relation to the engine speed.

HINT: If the engine is controlled by the back-up function, the MIL lights up to warn the driver of the malfunction but the DTC is not output.

CHECK FOR INTERMITTENT PROBLEMS

TOYOTA HAND-HELD TESTER only

By putting the vehicle's ECM in check mode, 1 trip detection logic is possible instead of 2 trip detection logic and sensitivity to detect open circuits is increased. This makes it easier to detect intermittent problems.

CLEAR DIAGNOSTIC TROUBLE CODES

See page EG-191

SET CHECK MODE

See page EG-191

PERFORM A SIMULATION TEST

See page IN-18

CONNECTOR CONNECTION AND TERMINAL INSPECTION

See page IN-24

VISUAL CHECK AND CONTACT PRESSURE CHECK

See page IN-24

CONNECTOR HANDLING

See page IN-24

BASIC INSPECTION

When the malfunction code is not confirmed in the DTC check, troubleshooting should be performed in the order for all possible circuits to be considered as the causes of the problems.
In many cases, by carrying out the basic engine check shown in the following flow chart, the location causing the problem can be found quickly and efficiently. Therefore, use of this check is essential in engine troubleshooting.

1 **Is battery positive voltage 11 V or more when engine is stopped?**

YES

NO → **Charge or replace battery.**

2 **Is engine cranked?**

YES

NO → **Proceed to ST section and continue to troubleshoot.**

3 **Does engine start?**

YES

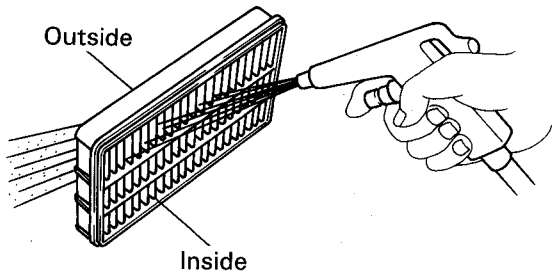
NO → **Go to step 7 .**

4 **Check air filter.**

P Remove air filter.

C Visually check that the air cleaner element is not dirty or excessively oily.

HINT: If necessary, clean element with compressed air. First blow from inside thoroughly, then blow from outside of element.



P00495

OK

NG → **Repair or replace.**