

2RZ-FE, 3RZ-FE ENGINE

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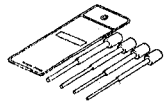
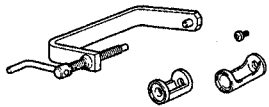
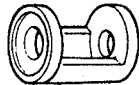
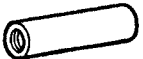
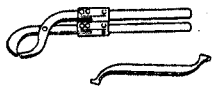
ENGINE MECHANICAL

PREPARATION

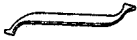
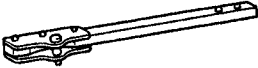
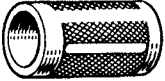
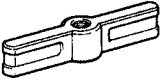
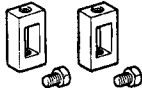
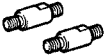
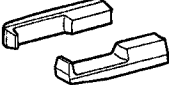
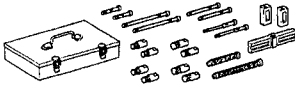
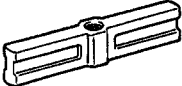
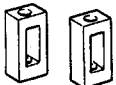
SST (SPECIAL SERVICE TOOLS)

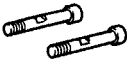
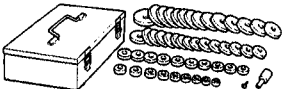
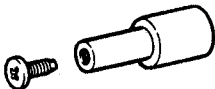
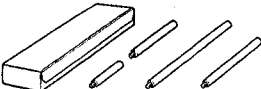
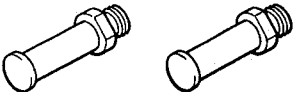
EG04Y-1X

EG

	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	

2RZ-FE, 3RZ-FE ENGINE - ENGINE MECHANICAL

	(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	

	(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

E00AZ-1E

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

E0080-1C

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	

E0081-2F

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 retainers
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

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

EGSMB-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.

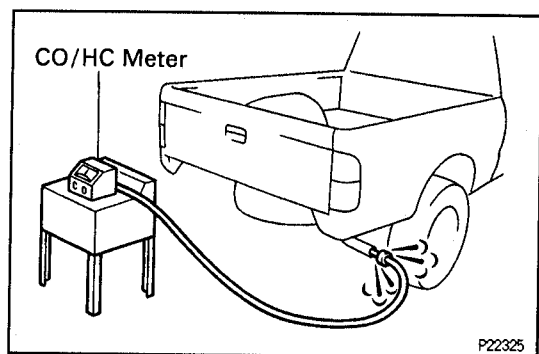
- (f) MFI system wiring connectors fully plugged
- (g) Ignition timing check correctly
- (h) Transmission in neutral position
- (i) Tachometer and CO/HC meter calibrated by hand

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

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.

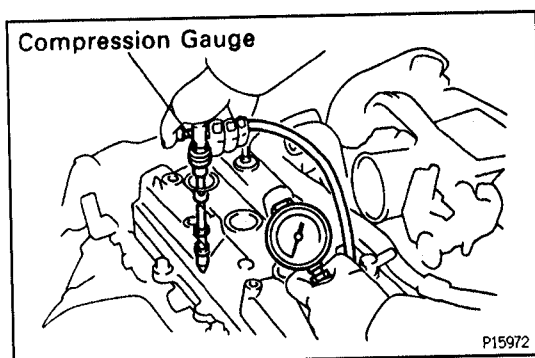
4. **REMOVE SPARK PLUGS**

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.



P15972

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 damaged.
 - 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

HINT: Inspect and adjust the valve clearance ^{EGS4D-01} 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**

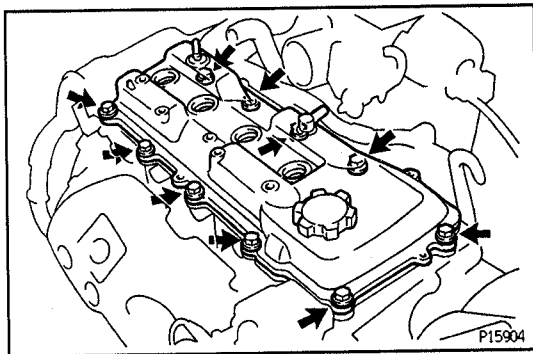
NOTICE: Pulling on or bending the cords may damage the conductor inside.

4. DISCONNECT ENGINE WIRE

- (a) Disconnect these connectors:

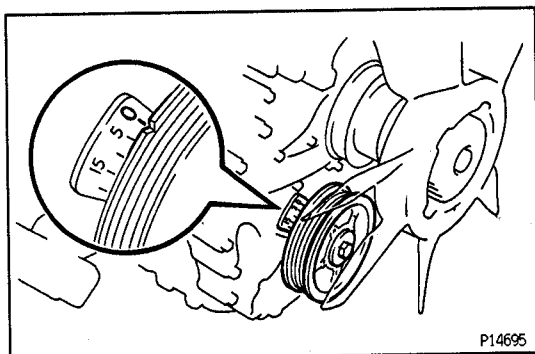
- w/ A/C:
A/C compressor connector
- Oil pressure sensor connector
- Engine coolant temperature sender gauge connector
- Distributor connector

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



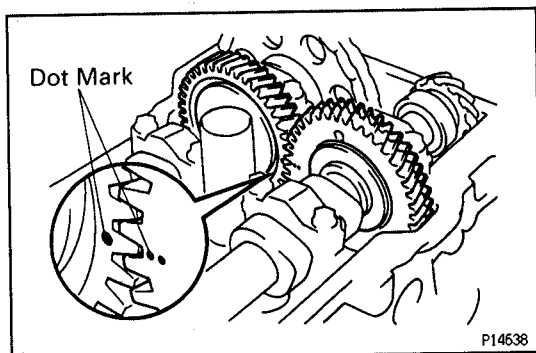
5. REMOVE CYLINDER HEAD COVER

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

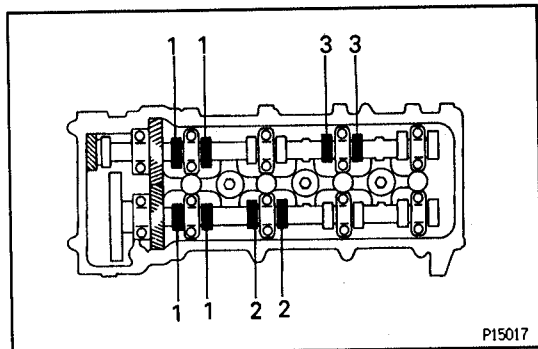


6. SET NO.1 CYLINDER TO TDC/COMPRESSION

- (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.

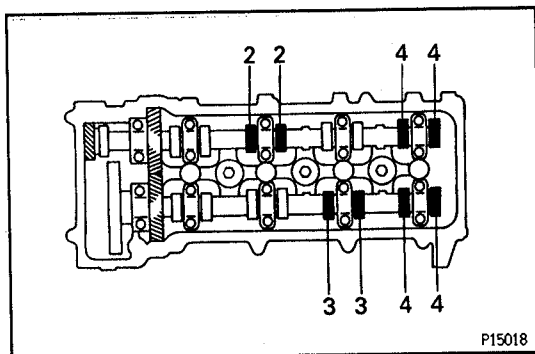
Valve clearance (Cold):

Intake

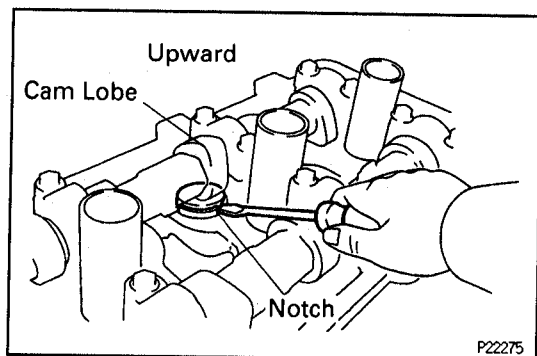
0.15 – 0.25 mm (0.006 – 0.010 in.)

Exhaust

0.25 – 0.35 mm (0.010 – 0.014 in.)



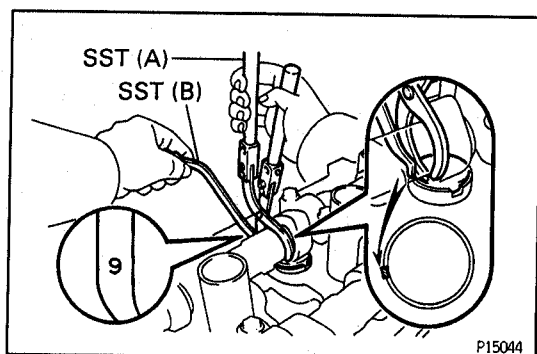
- (b) Turn the crankshaft pulley 1 revolution (360°) and align its groove with timing mark "0" of the timing chain cover.
- (c) Check only the valves indicated as shown. Measure the valve clearance. (See procedure in step (a))



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.

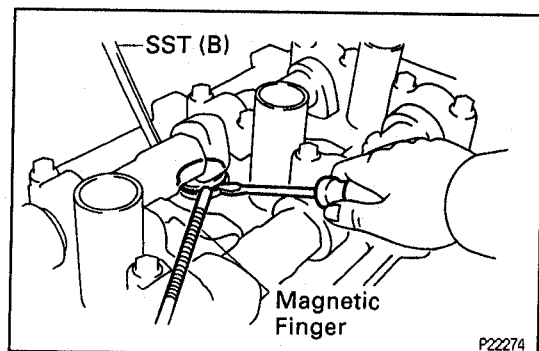


- Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter flange. Remove SST (A).

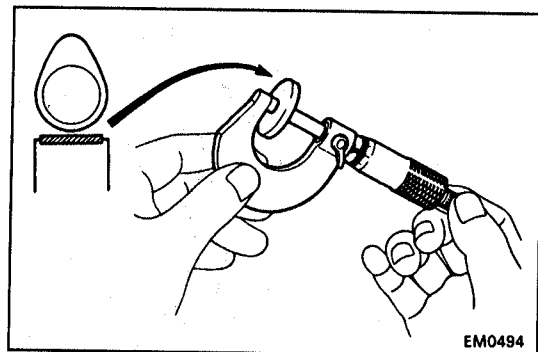
SST 09248-55040 (09248-05410, 09248-05420)

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:

$$N = T + (A - 0.20 \text{ mm (0.008 in.)})$$

Exhaust:

$$N = T + (A - 0.30 \text{ mm (0.012 in.)})$$

- 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)

Adjusting Shim Selection Chart (Intake)	
Installed shim thickness mm (in.)	Measured clearance mm (in.)
0.000 - 0.030 (0.0000 - 0.0012)	1
0.031 - 0.050 (0.0012 - 0.0020)	1
0.051 - 0.070 (0.0020 - 0.0028)	1
0.071 - 0.090 (0.0028 - 0.0035)	1
0.091 - 0.110 (0.0036 - 0.0043)	1
0.111 - 0.130 (0.0044 - 0.0051)	1
0.131 - 0.149 (0.0052 - 0.0059)	1
0.150 - 0.250 (0.0059 - 0.0098)	1
0.251 - 0.270 (0.0099 - 0.0106)	2
0.271 - 0.290 (0.0107 - 0.0114)	2
0.291 - 0.310 (0.0115 - 0.0122)	2
0.311 - 0.330 (0.0122 - 0.0130)	2
0.331 - 0.350 (0.0130 - 0.0138)	2
0.351 - 0.370 (0.0138 - 0.0146)	2
0.371 - 0.390 (0.0146 - 0.0154)	2
0.391 - 0.410 (0.0154 - 0.0161)	2
0.411 - 0.430 (0.0162 - 0.0169)	2
0.431 - 0.450 (0.0170 - 0.0177)	2
0.451 - 0.470 (0.0178 - 0.0185)	2
0.471 - 0.490 (0.0185 - 0.0193)	2
0.491 - 0.510 (0.0193 - 0.0201)	2
0.511 - 0.530 (0.0201 - 0.0209)	2
0.531 - 0.550 (0.0209 - 0.0217)	2
0.551 - 0.570 (0.0217 - 0.0224)	2
0.571 - 0.590 (0.0225 - 0.0232)	2
0.591 - 0.610 (0.0233 - 0.0240)	2
0.611 - 0.630 (0.0241 - 0.0248)	2
0.631 - 0.650 (0.0248 - 0.0256)	2
0.651 - 0.670 (0.0256 - 0.0264)	2
0.671 - 0.690 (0.0264 - 0.0272)	2
0.691 - 0.710 (0.0272 - 0.0280)	2
0.711 - 0.730 (0.0280 - 0.0287)	2
0.731 - 0.750 (0.0288 - 0.0295)	2
0.751 - 0.770 (0.0296 - 0.0303)	2
0.771 - 0.790 (0.0304 - 0.0311)	2
0.791 - 0.810 (0.0311 - 0.0319)	2
0.811 - 0.830 (0.0319 - 0.0327)	2
0.831 - 0.850 (0.0327 - 0.0335)	2
0.851 - 0.870 (0.0335 - 0.0343)	2
0.871 - 0.890 (0.0343 - 0.0350)	2
0.891 - 0.910 (0.0351 - 0.0358)	2
0.911 - 0.930 (0.0359 - 0.0366)	2
0.931 - 0.950 (0.0367 - 0.0374)	2
0.951 - 0.970 (0.0374 - 0.0382)	2
0.971 - 0.990 (0.0382 - 0.0390)	2
0.991 - 1.010 (0.0390 - 0.0398)	2
1.011 - 1.030 (0.0398 - 0.0406)	2
1.031 - 1.050 (0.0406 - 0.0413)	2
1.051 - 1.070 (0.0414 - 0.0421)	2
1.071 - 1.090 (0.0422 - 0.0430)	2
1.091 - 1.110 (0.0430 - 0.0437)	2
1.111 - 1.130 (0.0438 - 0.0446)	2
1.131 - 1.150 (0.0446 - 0.0453)	2
1.151 - 1.170 (0.0454 - 0.0462)	2
1.171 - 1.190 (0.0462 - 0.0469)	2
1.191 - 1.210 (0.0470 - 0.0478)	2
1.211 - 1.230 (0.0478 - 0.0485)	2
1.231 - 1.250 (0.0486 - 0.0494)	2
1.251 - 1.270 (0.0494 - 0.0501)	2
1.271 - 1.290 (0.0502 - 0.0510)	2
1.291 - 1.310 (0.0510 - 0.0517)	2
1.311 - 1.330 (0.0518 - 0.0526)	2
1.331 - 1.350 (0.0526 - 0.0533)	2
1.351 - 1.370 (0.0534 - 0.0542)	2
1.371 - 1.390 (0.0542 - 0.0549)	2
1.391 - 1.410 (0.0550 - 0.0558)	2
1.411 - 1.430 (0.0558 - 0.0565)	2
1.431 - 1.450 (0.0566 - 0.0574)	2
1.451 - 1.470 (0.0574 - 0.0581)	2
1.471 - 1.490 (0.0582 - 0.0590)	2
1.491 - 1.510 (0.0590 - 0.0598)	2
1.511 - 1.530 (0.0598 - 0.0605)	2
1.531 - 1.550 (0.0606 - 0.0614)	2
1.551 - 1.570 (0.0614 - 0.0621)	2
1.571 - 1.590 (0.0622 - 0.0630)	2
1.591 - 1.610 (0.0630 - 0.0637)	2
1.611 - 1.630 (0.0638 - 0.0646)	2
1.631 - 1.650 (0.0646 - 0.0653)	2
1.651 - 1.670 (0.0654 - 0.0662)	2
1.671 - 1.690 (0.0662 - 0.0669)	2
1.691 - 1.710 (0.0670 - 0.0678)	2
1.711 - 1.730 (0.0678 - 0.0685)	2
1.731 - 1.750 (0.0686 - 0.0694)	2
1.751 - 1.770 (0.0694 - 0.0702)	2
1.771 - 1.790 (0.0702 - 0.0709)	2
1.791 - 1.810 (0.0710 - 0.0718)	2
1.811 - 1.830 (0.0718 - 0.0725)	2
1.831 - 1.850 (0.0726 - 0.0734)	2
1.851 - 1.870 (0.0734 - 0.0742)	2
1.871 - 1.890 (0.0742 - 0.0749)	2
1.891 - 1.910 (0.0750 - 0.0758)	2
1.911 - 1.930 (0.0758 - 0.0765)	2
1.931 - 1.950 (0.0766 - 0.0774)	2

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

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.

Adjusting Shim Selection Chart (Exhaust)

Installed shim thickness mm (in.)	Measured clearance mm (in.)	Shim No.	Shim Thickness mm (in.)	Shim No.	Shim Thickness mm (in.)
0.000 - 0.030 (0.0000 - 0.0012)	0.000 - 0.030 (0.0000 - 0.0012)	1	2.500 (0.0984)	10	2.950 (0.1161)
0.031 - 0.050 (0.0012 - 0.0020)	0.031 - 0.050 (0.0012 - 0.0020)	2	2.550 (0.1004)	11	3.000 (0.1181)
0.051 - 0.070 (0.0020 - 0.0028)	0.051 - 0.070 (0.0020 - 0.0028)	3	2.600 (0.1024)	12	3.050 (0.1201)
0.071 - 0.090 (0.0028 - 0.0035)	0.071 - 0.090 (0.0028 - 0.0035)	4	2.650 (0.1043)	13	3.100 (0.1220)
0.091 - 0.110 (0.0036 - 0.0043)	0.091 - 0.110 (0.0036 - 0.0043)	5	2.700 (0.1063)	14	3.150 (0.1240)
0.111 - 0.130 (0.0044 - 0.0051)	0.111 - 0.130 (0.0044 - 0.0051)	6	2.750 (0.1083)	15	3.200 (0.1260)
0.131 - 0.150 (0.0052 - 0.0059)	0.131 - 0.150 (0.0052 - 0.0059)	7	2.800 (0.1102)	16	3.250 (0.1280)
0.151 - 0.170 (0.0059 - 0.0067)	0.151 - 0.170 (0.0059 - 0.0067)	8	2.850 (0.1122)	17	3.300 (0.1299)
0.171 - 0.190 (0.0067 - 0.0075)	0.171 - 0.190 (0.0067 - 0.0075)	9	2.900 (0.1142)		
0.191 - 0.210 (0.0075 - 0.0083)	0.191 - 0.210 (0.0075 - 0.0083)				
0.211 - 0.230 (0.0083 - 0.0091)	0.211 - 0.230 (0.0083 - 0.0091)				
0.231 - 0.249 (0.0091 - 0.0098)	0.231 - 0.249 (0.0091 - 0.0098)				
0.250 - 0.350 (0.0098 - 0.0138)	0.250 - 0.350 (0.0098 - 0.0138)				
0.351 - 0.370 (0.0138 - 0.0146)	0.351 - 0.370 (0.0138 - 0.0146)				
0.371 - 0.390 (0.0146 - 0.0154)	0.371 - 0.390 (0.0146 - 0.0154)				
0.391 - 0.410 (0.0154 - 0.0161)	0.391 - 0.410 (0.0154 - 0.0161)				
0.411 - 0.430 (0.0162 - 0.0169)	0.411 - 0.430 (0.0162 - 0.0169)				
0.431 - 0.450 (0.0170 - 0.0177)	0.431 - 0.450 (0.0170 - 0.0177)				
0.451 - 0.470 (0.0178 - 0.0185)	0.451 - 0.470 (0.0178 - 0.0185)				
0.471 - 0.490 (0.0185 - 0.0193)	0.471 - 0.490 (0.0185 - 0.0193)				
0.491 - 0.510 (0.0193 - 0.0201)	0.491 - 0.510 (0.0193 - 0.0201)				
0.511 - 0.530 (0.0201 - 0.0209)	0.511 - 0.530 (0.0201 - 0.0209)				
0.531 - 0.550 (0.0209 - 0.0217)	0.531 - 0.550 (0.0209 - 0.0217)				
0.551 - 0.570 (0.0217 - 0.0224)	0.551 - 0.570 (0.0217 - 0.0224)				
0.571 - 0.590 (0.0225 - 0.0232)	0.571 - 0.590 (0.0225 - 0.0232)				
0.591 - 0.610 (0.0233 - 0.0240)	0.591 - 0.610 (0.0233 - 0.0240)				
0.611 - 0.630 (0.0241 - 0.0248)	0.611 - 0.630 (0.0241 - 0.0248)				
0.631 - 0.650 (0.0248 - 0.0256)	0.631 - 0.650 (0.0248 - 0.0256)				
0.651 - 0.670 (0.0256 - 0.0264)	0.651 - 0.670 (0.0256 - 0.0264)				
0.671 - 0.690 (0.0264 - 0.0272)	0.671 - 0.690 (0.0264 - 0.0272)				
0.691 - 0.710 (0.0272 - 0.0280)	0.691 - 0.710 (0.0272 - 0.0280)				
0.711 - 0.730 (0.0280 - 0.0287)	0.711 - 0.730 (0.0280 - 0.0287)				
0.731 - 0.750 (0.0288 - 0.0295)	0.731 - 0.750 (0.0288 - 0.0295)				
0.751 - 0.770 (0.0296 - 0.0303)	0.751 - 0.770 (0.0296 - 0.0303)				
0.771 - 0.790 (0.0304 - 0.0311)	0.771 - 0.790 (0.0304 - 0.0311)				
0.791 - 0.810 (0.0311 - 0.0319)	0.791 - 0.810 (0.0311 - 0.0319)				
0.811 - 0.830 (0.0319 - 0.0327)	0.811 - 0.830 (0.0319 - 0.0327)				
0.831 - 0.850 (0.0327 - 0.0335)	0.831 - 0.850 (0.0327 - 0.0335)				
0.851 - 0.870 (0.0335 - 0.0343)	0.851 - 0.870 (0.0335 - 0.0343)				
0.871 - 0.890 (0.0343 - 0.0350)	0.871 - 0.890 (0.0343 - 0.0350)				
0.891 - 0.910 (0.0351 - 0.0358)	0.891 - 0.910 (0.0351 - 0.0358)				
0.911 - 0.930 (0.0359 - 0.0366)	0.911 - 0.930 (0.0359 - 0.0366)				
0.931 - 0.950 (0.0367 - 0.0374)	0.931 - 0.950 (0.0367 - 0.0374)				
0.951 - 0.970 (0.0374 - 0.0382)	0.951 - 0.970 (0.0374 - 0.0382)				
0.971 - 0.990 (0.0382 - 0.0390)	0.971 - 0.990 (0.0382 - 0.0390)				
0.991 - 1.010 (0.0390 - 0.0398)	0.991 - 1.010 (0.0390 - 0.0398)				
1.011 - 1.030 (0.0398 - 0.0406)	1.011 - 1.030 (0.0398 - 0.0406)				
1.031 - 1.050 (0.0406 - 0.0413)	1.031 - 1.050 (0.0406 - 0.0413)				
1.051 - 1.070 (0.0414 - 0.0421)	1.051 - 1.070 (0.0414 - 0.0421)				
1.071 - 1.090 (0.0422 - 0.0429)	1.071 - 1.090 (0.0422 - 0.0429)				
1.091 - 1.110 (0.0430 - 0.0437)	1.091 - 1.110 (0.0430 - 0.0437)				
1.111 - 1.130 (0.0437 - 0.0445)	1.111 - 1.130 (0.0437 - 0.0445)				
1.131 - 1.150 (0.0445 - 0.0453)	1.131 - 1.150 (0.0445 - 0.0453)				

New shim thickness mm (in.)

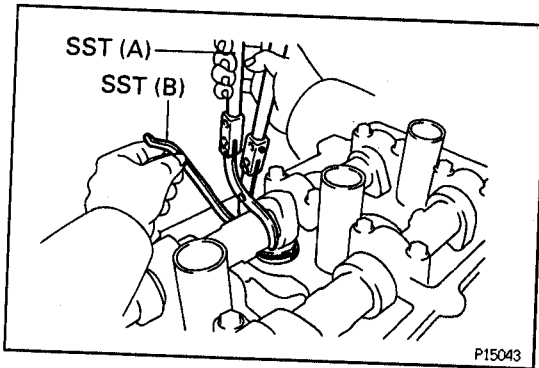
Shim No.	Shim Thickness mm (in.)	Shim No.	Shim Thickness mm (in.)
1	2.500 (0.0984)	10	2.950 (0.1161)
2	2.550 (0.1004)	11	3.000 (0.1181)
3	2.600 (0.1024)	12	3.050 (0.1201)
4	2.650 (0.1043)	13	3.100 (0.1220)
5	2.700 (0.1063)	14	3.150 (0.1240)
6	2.750 (0.1083)	15	3.200 (0.1260)
7	2.800 (0.1102)	16	3.250 (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.

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.



- (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)

IGNITION TIMING INSPECTION

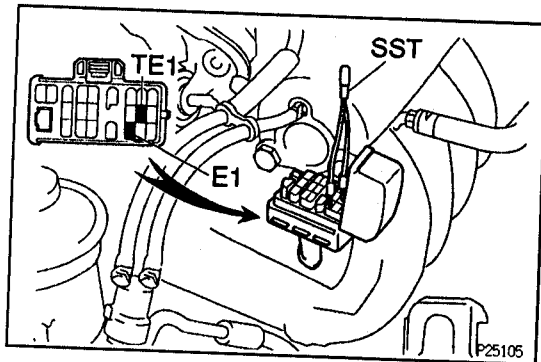
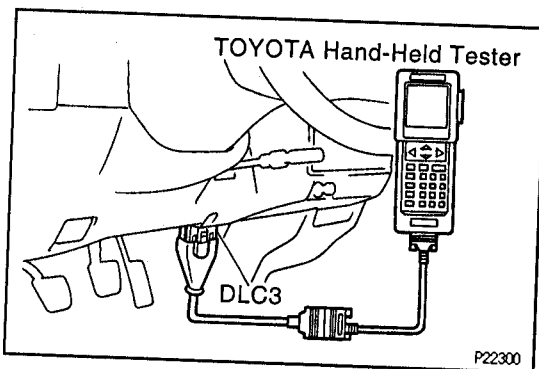
EGSME-02

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

- (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.

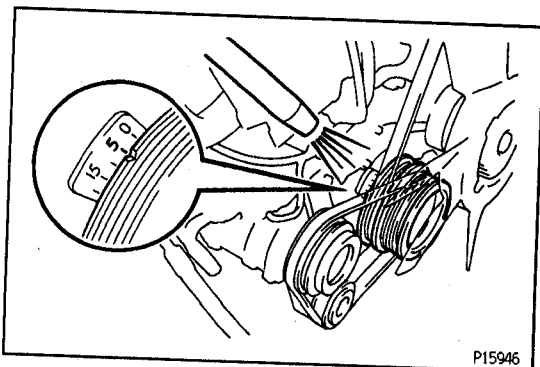


3. CHECK IGNITION TIMING

- (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**

EG04E-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:

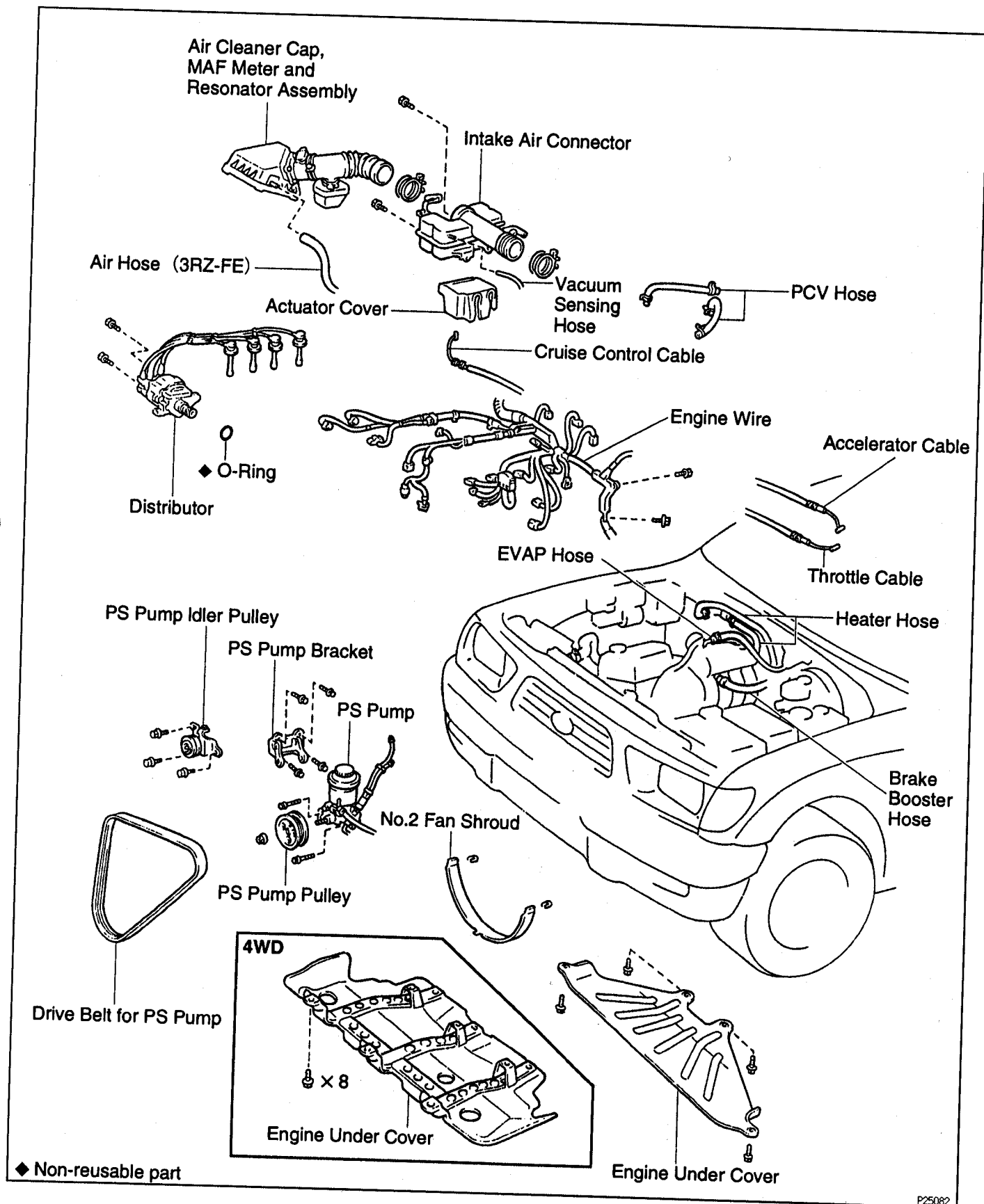
650 - 750 rpm

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

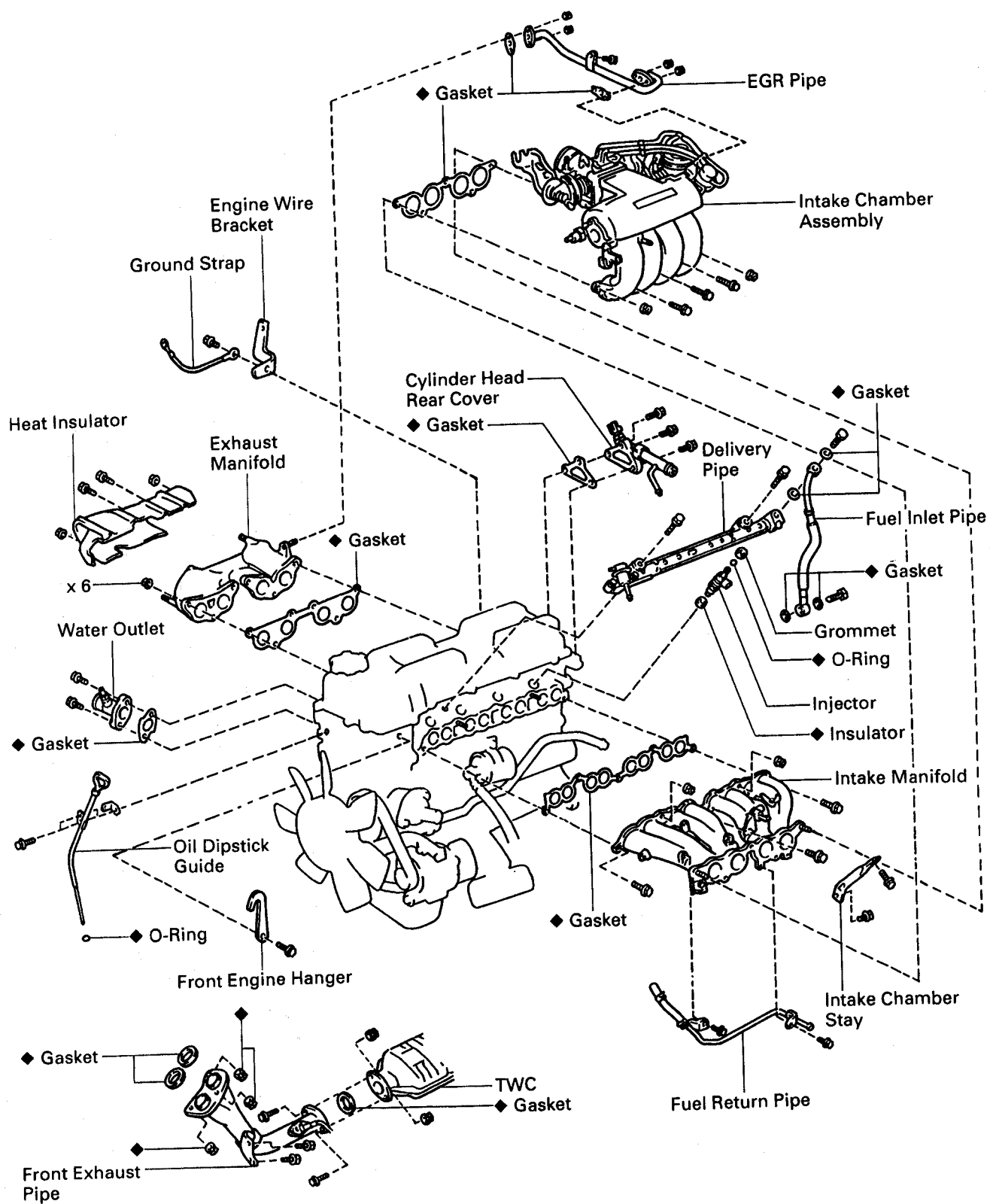
4. DISCONNECT TOYOTA HAND-HELD TESTER OR OBD II SCAN TOOL

CYLINDER HEAD COMPONENTS FOR REMOVAL AND INSTALLATION

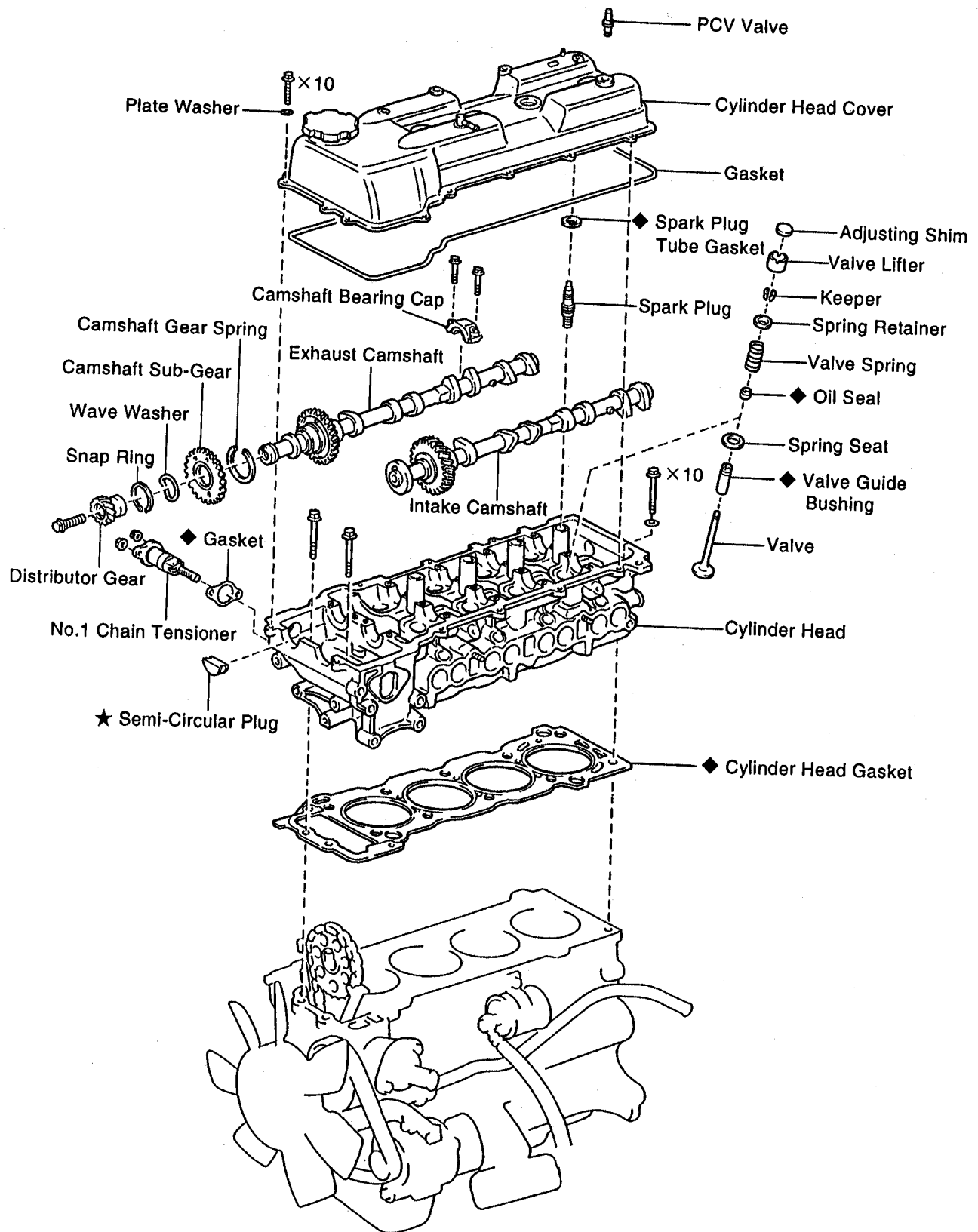
EG-15



EG

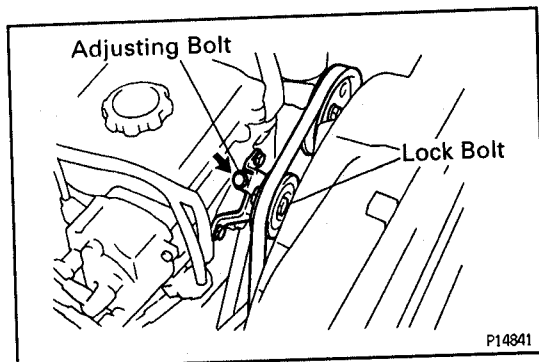
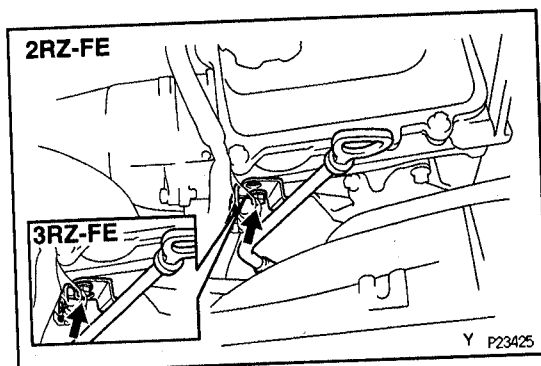
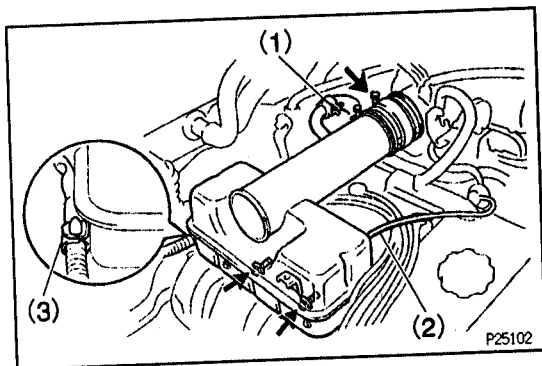
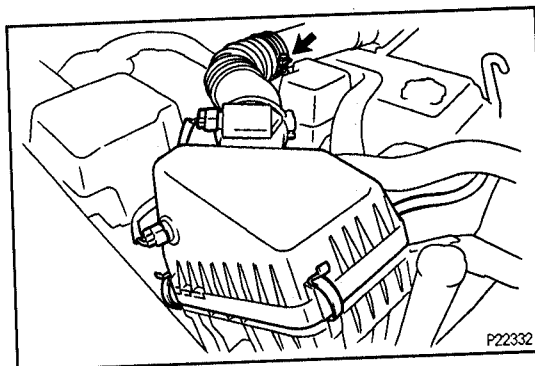
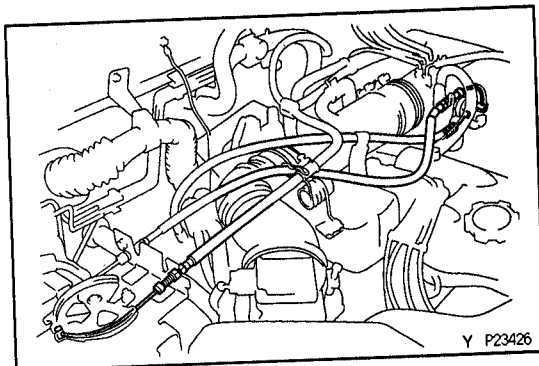


◆ Non-reusable part



- ◆ Non-reusable part
- ★ Precoated part

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

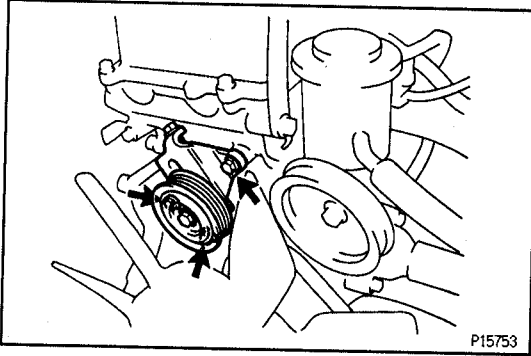
(a) Remove the bolt, dipstick guide and engine wire bracket.

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

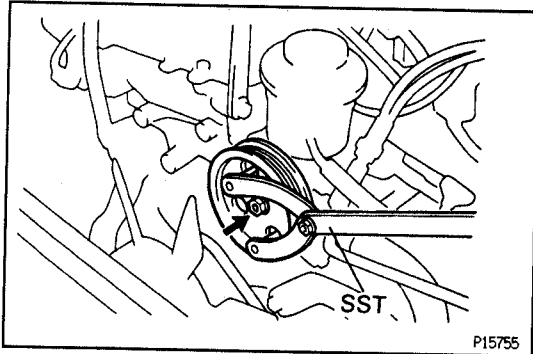
6. w/ PS:

REMOVE DRIVE BELT FOR PS PUMP

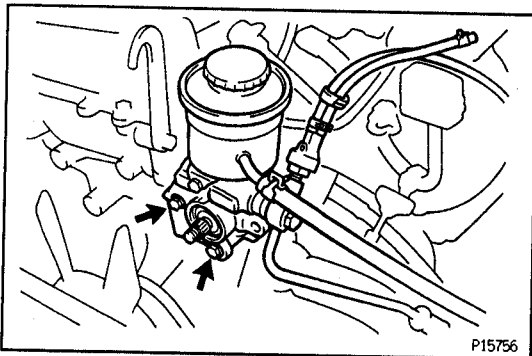
Loosen the lock bolt and adjusting bolt, and remove the drive belt.



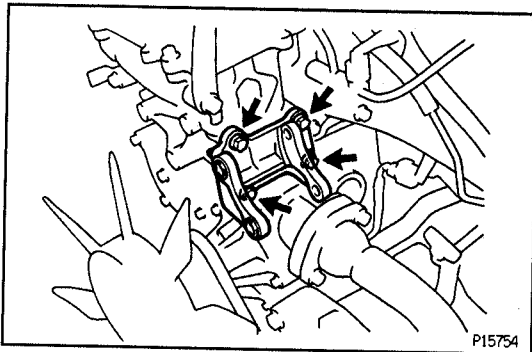
7. **w/ PS:**
REMOVE DRIVE BELT IDLER PULLEY FOR PS PUMP
 Remove the 3 bolts and idler pulley.



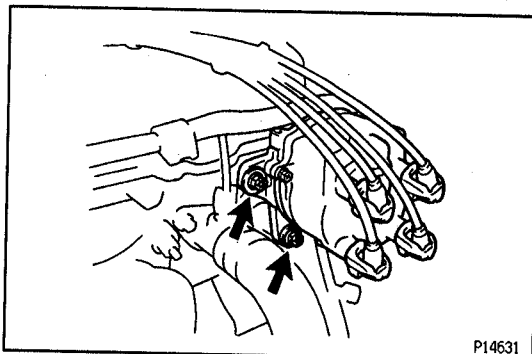
8. **w/ PS:**
REMOVE PS PUMP AND BRACKET
 (a) Using SST, remove the nut and PS pump pulley.
 SST 09960-10010 (09962-01000, 09963-01000)



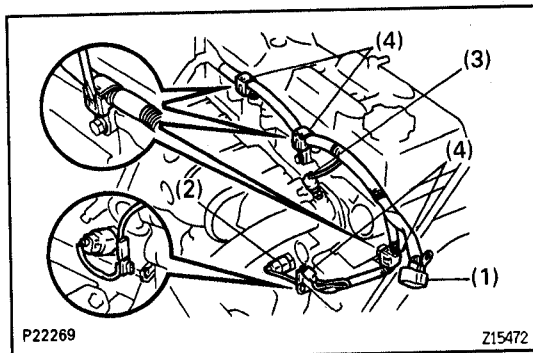
- (b) Disconnect the 2 air hoses from the throttle body and air intake chamber.
 (c) Remove the 2 bolts, and disconnect the PS pump.
 HINT: Put aside the pump and suspend it.



- (d) Remove the 4 bolts and PS pump bracket.
 9. **REMOVE PCV HOSES**



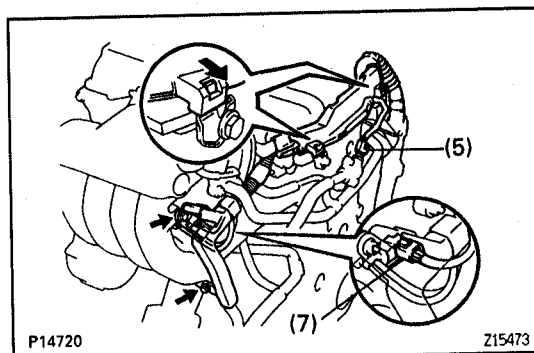
10. **REMOVE DISTRIBUTOR**
 (a) Disconnect high-tension cords at the rubber boot from the cylinder head.
NOTICE: Pulling on or bending the cords may damage the conductor inside.
 (b) Disconnect the distributor connector.
 (c) Remove the hold-down bolts and distributor.
 (d) Remove the O-ring.



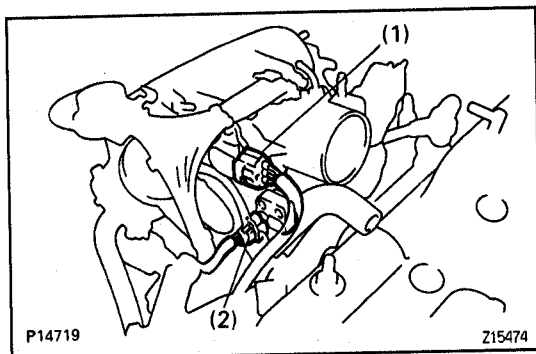
11. DISCONNECT ENGINE WIRE

(a) Disconnect these connectors and clamps:

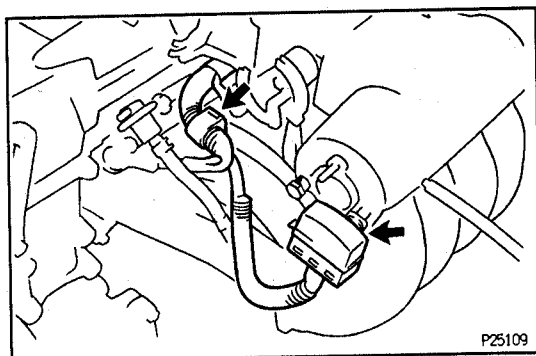
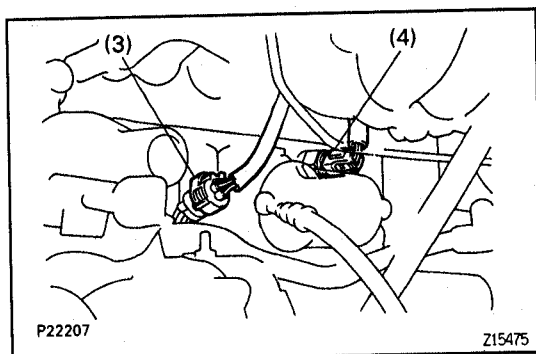
- (1) w/ A/C:
A/C compressor connector
- (2) Oil pressure sensor connector and clamp
- (3) Engine coolant temperature sender gauge connector
- (4) 4 engine wire clamps and engine wire



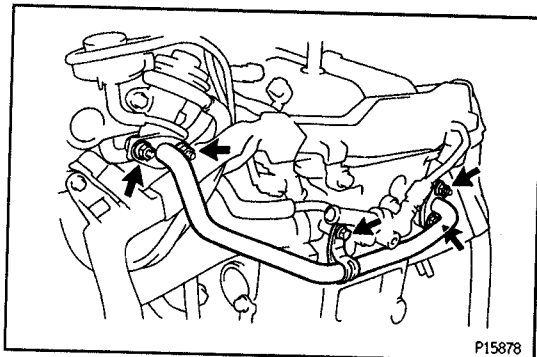
- (5) ECT sensor connector
 - (6) EGR gas temperature sensor connector
 - (7) VSV connector for EGR
- (b) Disconnect the 2 vacuum hose from the VSV for EGR and clamp.
- (c) Disconnect the bolt and ground strap from the cowl top panel.
- (d) Remove the 2 bolts, and disconnect the engine wire from the 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



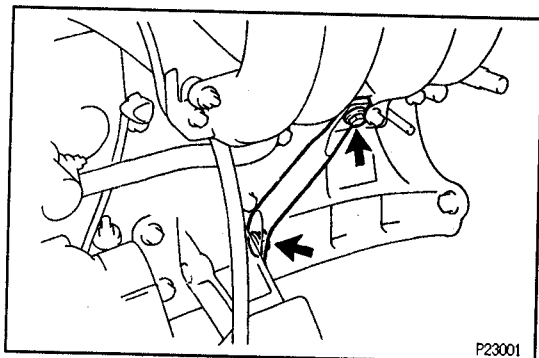
- (3) Crankshaft position sensor connector
- (4) Knock sensor connector



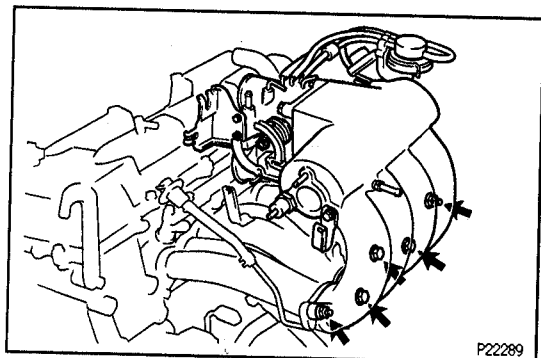
- (g) Disconnect the DLC1 from the bracket.
- (h) Disconnect the engine wire clamp.

**12. REMOVE EGR PIPE**

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

**13. REMOVE INTAKE CHAMBER STAY**

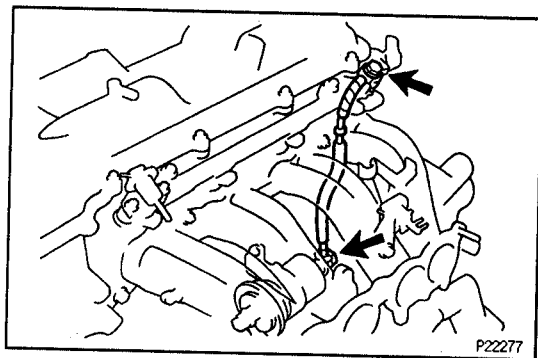
Remove the 2 bolts and intake chamber stay.

**14. REMOVE AIR INTAKE CHAMBER ASSEMBLY**

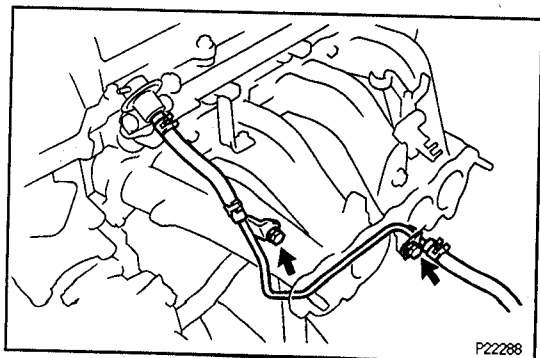
(a) Disconnect these hoses:

- 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**

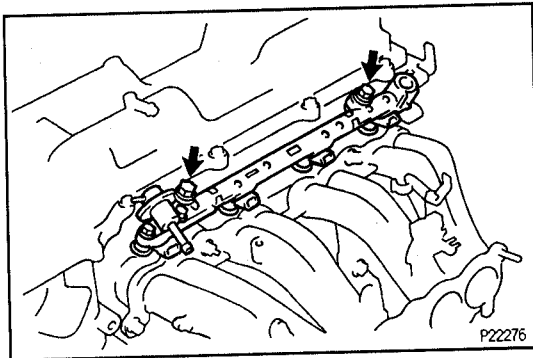
Remove the 2 union bolts, 4 gaskets and fuel inlet pipe.

**17. REMOVE FUEL RETURN PIPE**

(a) Disconnect these hoses:

- Fuel return hose from fuel pressure regulator
- Fuel return hose from fuel return pipe

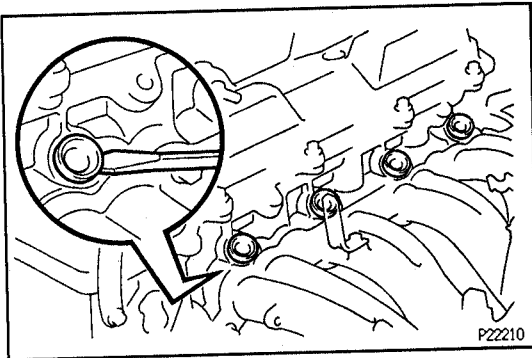
(b) Remove the 2 bolts and fuel return pipe.



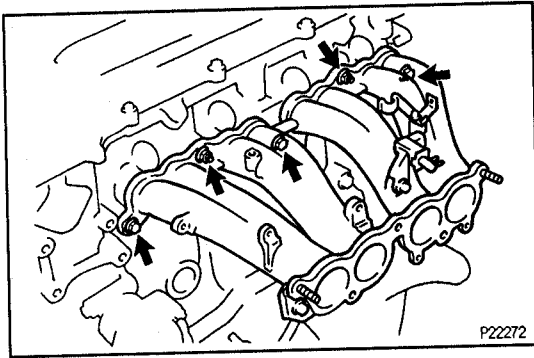
18. REMOVE DELIVERY PIPE AND INJECTORS

- (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.

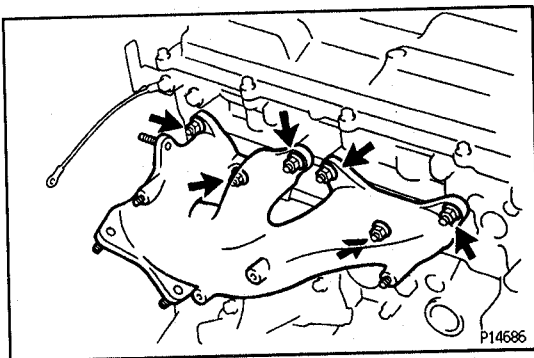


- (b) Remove the 4 insulators from the 4 spacers.
 (c) Pull out the 4 injectors from the delivery pipe.
 (d) Remove the O-ring and grommet from each injector.
 (e) Using a screwdriver, pry out the 4 spacers.



19. REMOVE INTAKE MANIFOLD

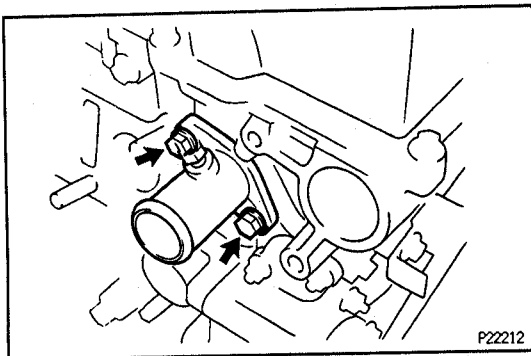
Remove the 3 bolts, 2 nuts, intake manifold and gasket.



20. REMOVE FRONT EXHAUST PIPE (See engine removal in cylinder block)

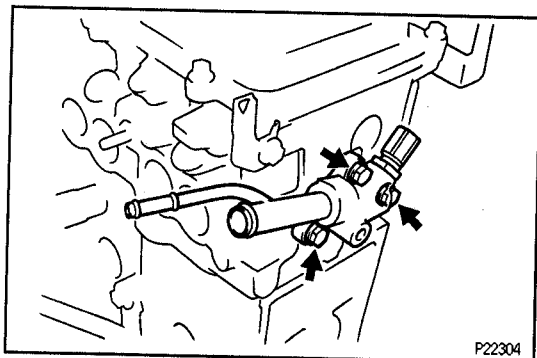
21. REMOVE EXHAUST MANIFOLD

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

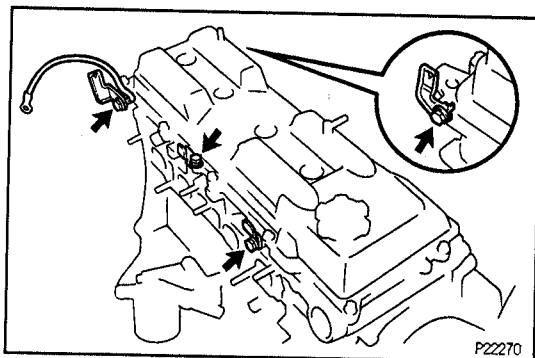


22. REMOVE WATER OUTLET

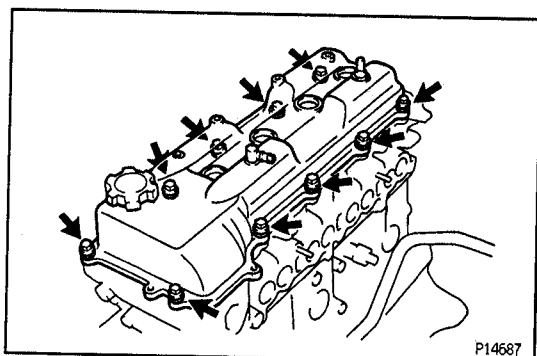
- (a) Disconnect the upper radiator hose.
 (b) Remove the 2 bolts, water outlet and gasket.

**23. REMOVE CYLINDER HEAD REAR COVER**

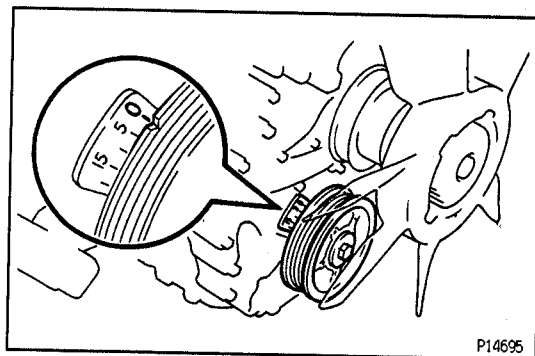
Remove the 3 bolts, cylinder head rear cover and gasket.

**24. REMOVE SPARK PLUGS****25. REMOVE FRONT ENGINE HANGER****26. REMOVE ENGINE WIRE BRACKETS**

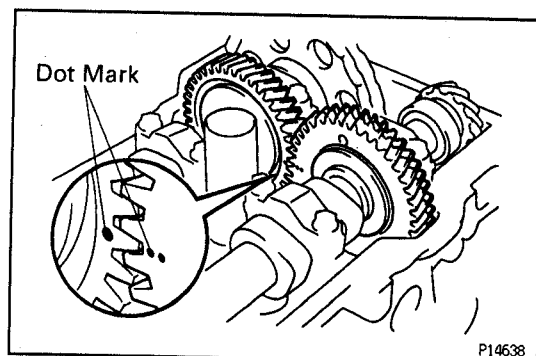
Remove the 4 bolts, 4 wire brackets and ground strap.

**27. REMOVE CYLINDER HEAD COVER**

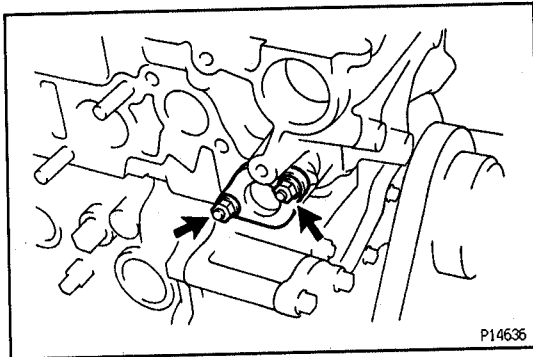
Remove the 10 bolts, seal washers, cylinder head cover and gasket.

**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.

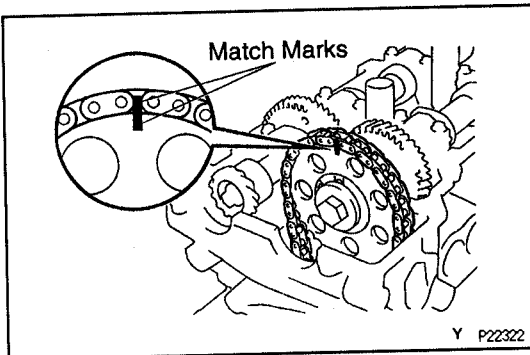


- (b) Check that the timing marks (1 and 2 dots) of the camshaft drive and driven gears are in straight line on the cylinder head surface as shown in the illustration. If not, turn the crankshaft 1 revolution (360°) and align the marks as above.

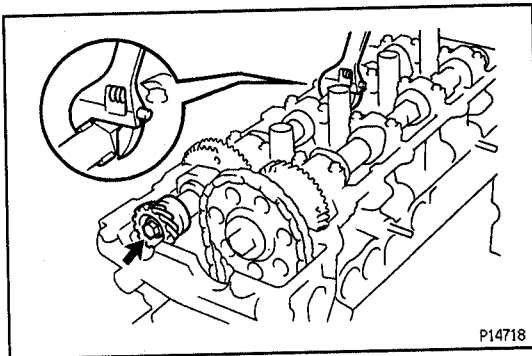
**29. REMOVE CHAIN TENSIONER**

Remove the 2 nuts, chain tensioner and gasket.

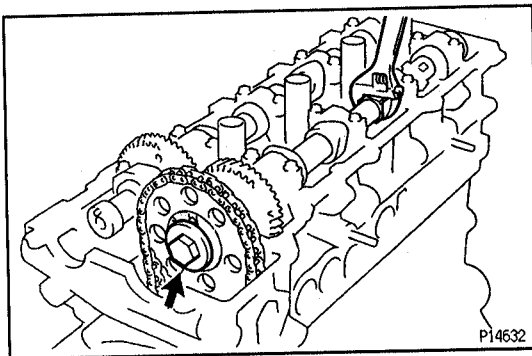
EG

**30. REMOVE SEMI-CIRCULAR PLUGS****31. REMOVE CAMSHAFT TIMING GEAR**

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



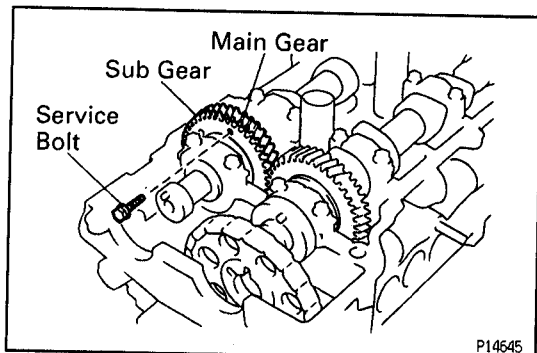
- (b) Hold the exhaust camshaft with a wrench, remove the bolt and distributor gear.



- (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

- 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.
- Secure the exhaust camshaft sub-gear to the main gear with a service bolt.

Recommended service bolt:

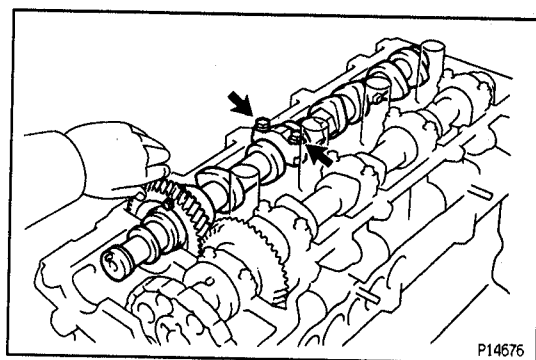
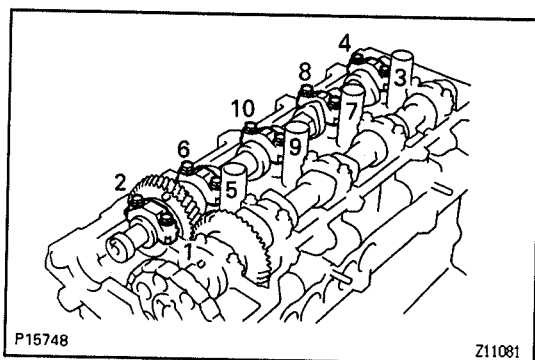
Thread diameter 6 mm

Thread pitch 1.0 mm

Bolt length 16 – 20 mm (0.63 – 0.79 in.)

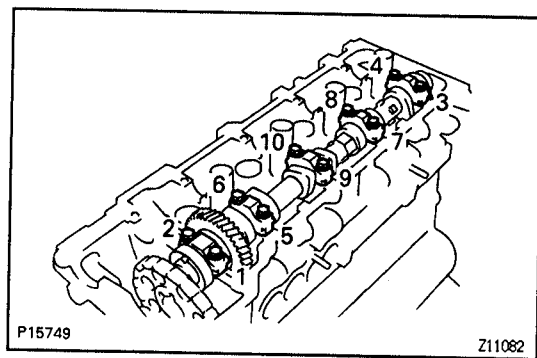
HINT: When removing the camshaft, make sure that the torsional spring force of the sub-gear has been eliminated by the above operation.

- Uniformly loosen and remove the 10 bearing cap bolts, in several passes, in the sequence shown.
- Remove the 5 bearing caps and camshaft.



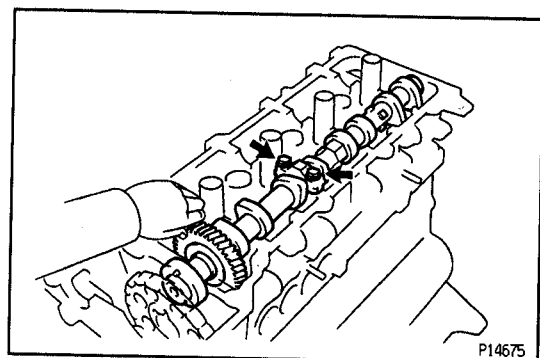
HINT: If the camshaft is not being lifted out straight and level, reinstall the No.3 bearing cap with the 2 bolts. Then alternately loosen and remove the bearing cap bolts with the camshaft gear pulled up.

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



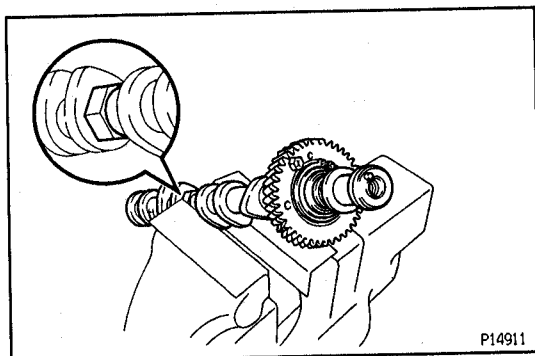
B. Remove intake camshaft

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

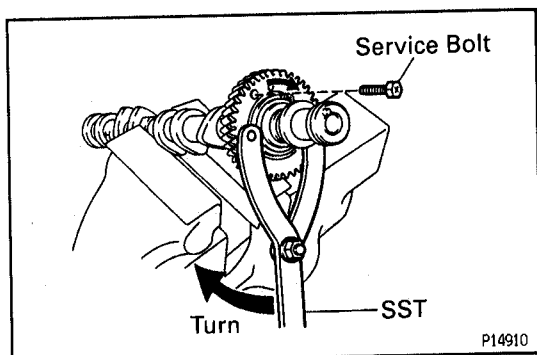
NOTICE: Do not pry on or attempt to force the camshaft with a tool or other object.



33. DISASSEMBLE EXHAUST CAMSHAFT

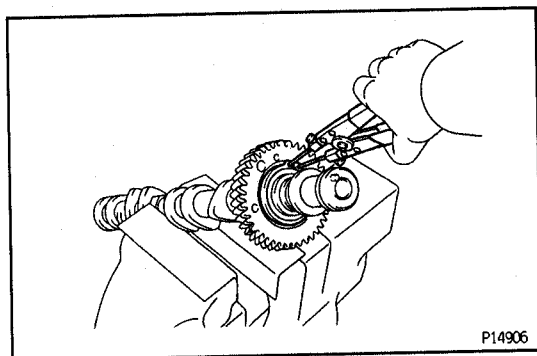
- (a) Mount the hexagon wrench head portion of the camshaft in a vise.

NOTICE: Be careful not to damage the camshaft.



- (b) Using SST, turn the sub-gear clockwise, and remove the service bolt.

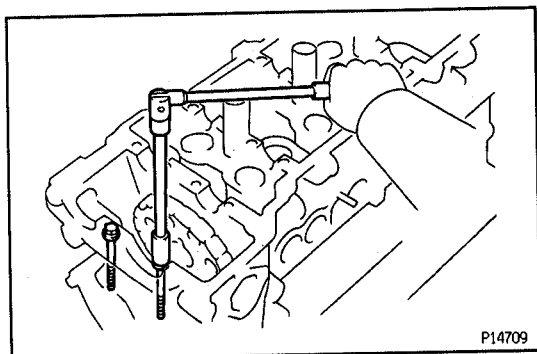
SST 09960-10010 (09962-01000, 09963-00500)



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

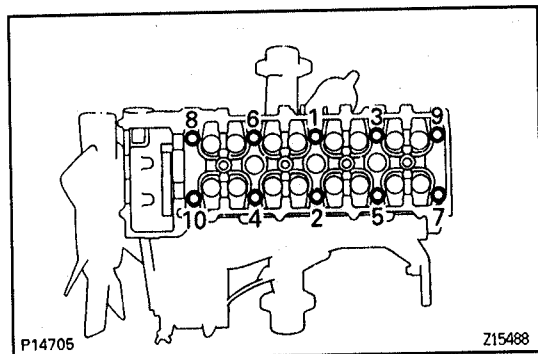
- (d) Remove these parts:

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



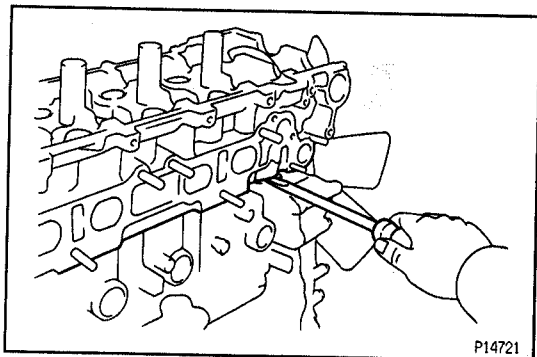
34. REMOVE CYLINDER HEAD

- (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.

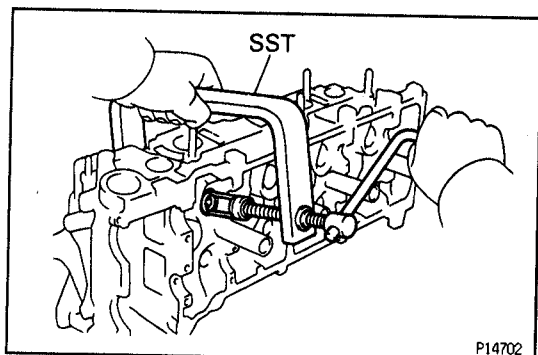
NOTICE: Cylinder head warpage or cracking could result from removing bolts in incorrect order.



- (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

EG8C1-03

1. REMOVE VALVE LIFTERS AND SHIMS

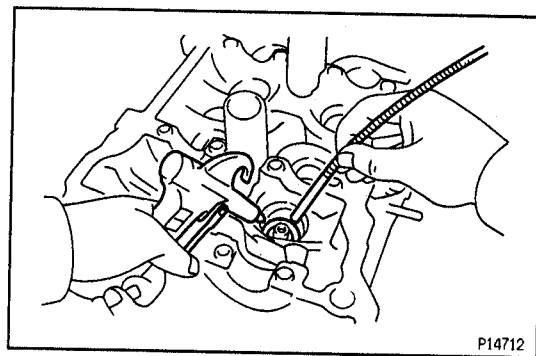
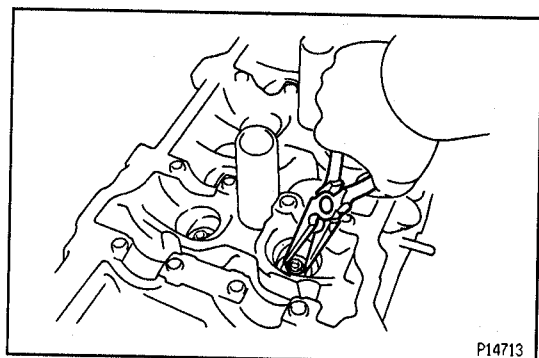
HINT: Arrange the valve lifters and shims in correct order.

2. REMOVE VALVES

- (a) Using SST, compress the valve spring and remove the 2 keepers.

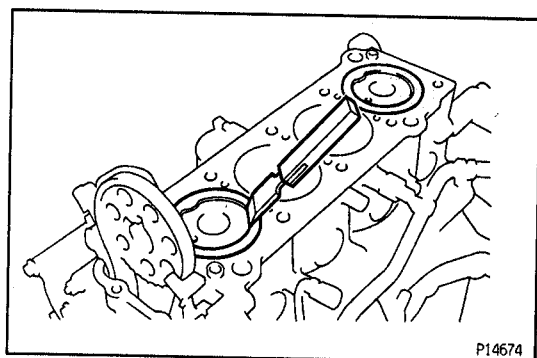
SST 09202-70020 (09202-00010)

- (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.

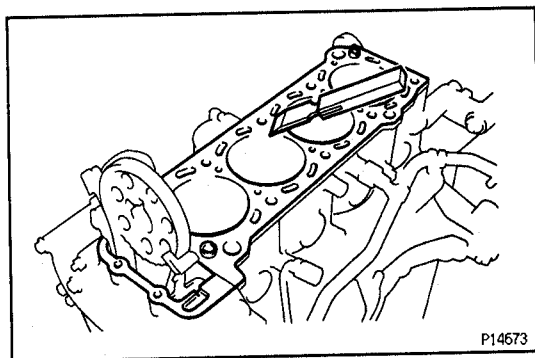


CYLINDER HEAD COMPONENTS, INSPECTION, CLEANING AND REPAIR

EG8C2-06

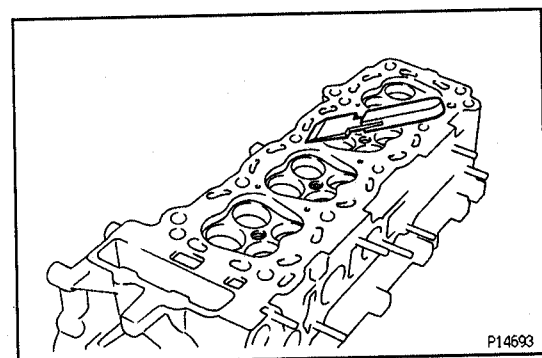
1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

- (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.

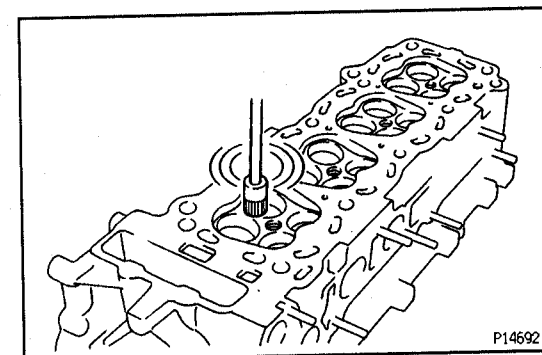


2. CLEAN CYLINDER HEAD

A. Remove gasket material

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

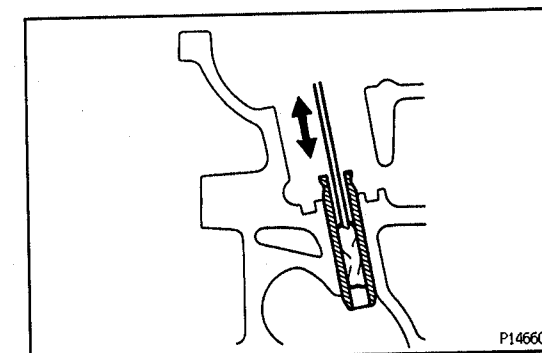
NOTICE: Be careful not to scratch the cylinder block contact surface.



B. Clean combustion chambers

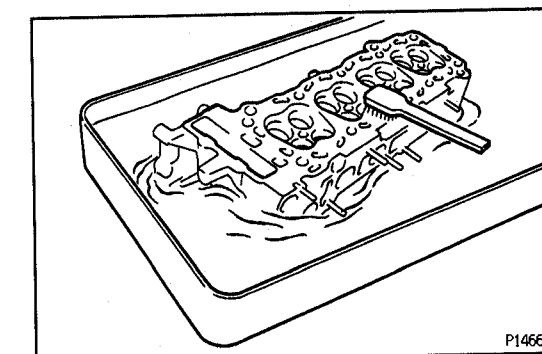
Using a wire brush, remove all the carbon from the combustion chambers.

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



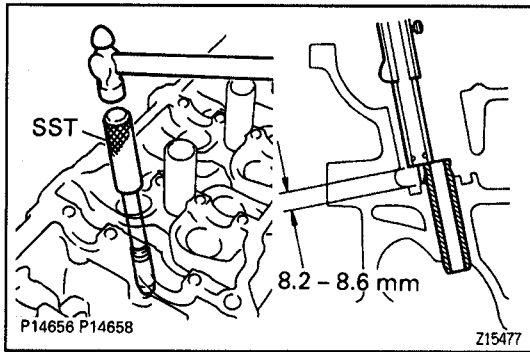
C. Clean valve guide bushings

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

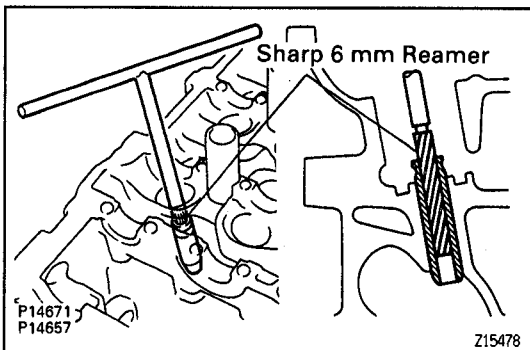


D. Clean cylinder head

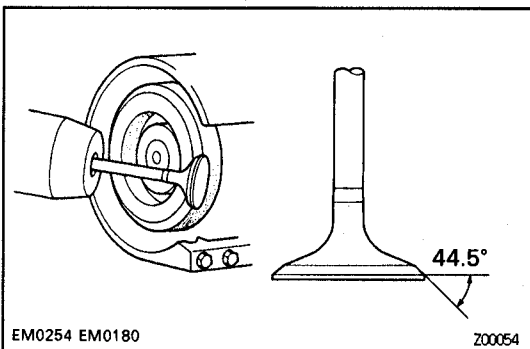
Using a soft brush and solvent, thoroughly clean the cylinder head.



- (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.

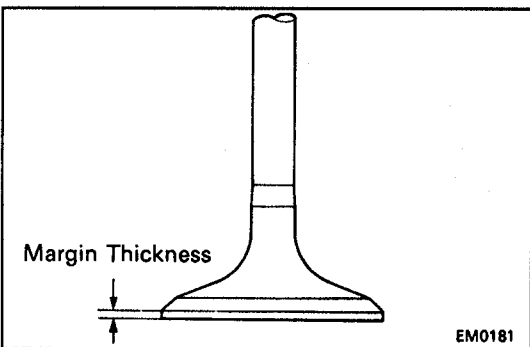


7. INSPECT AND GRIND VALVES

- (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.

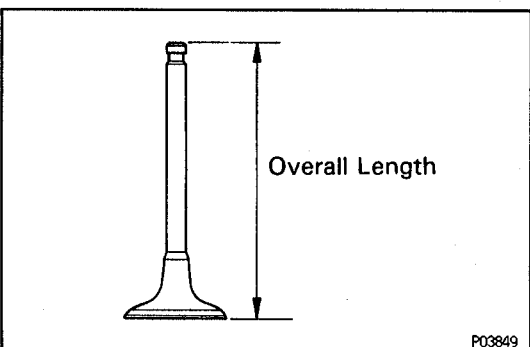
Standard margin thickness:

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.)

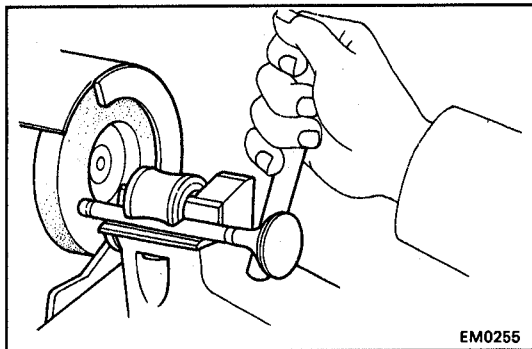
Exhaust: 103.60 mm (4.0787 in.)

Minimum overall length:

Intake: 102.95 mm (4.0531 in.)

Exhaust: 103.10 mm (4.0590 in.)

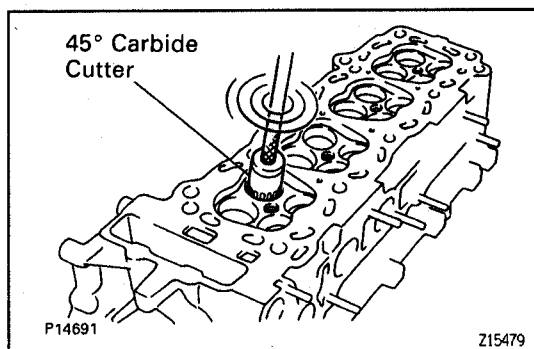
If the overall length is less than minimum, replace the valve.



- (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.

EG

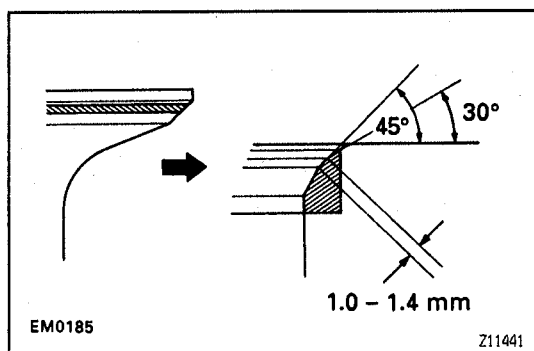
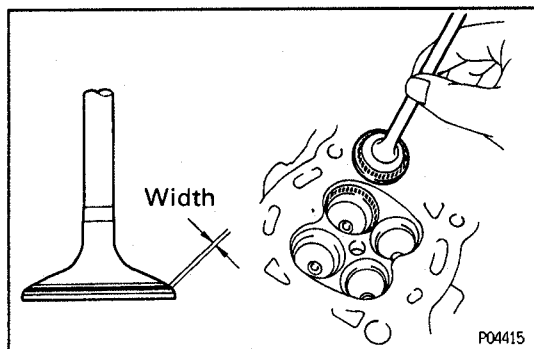


8. INSPECT AND CLEAN VALVE SEATS

- (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:

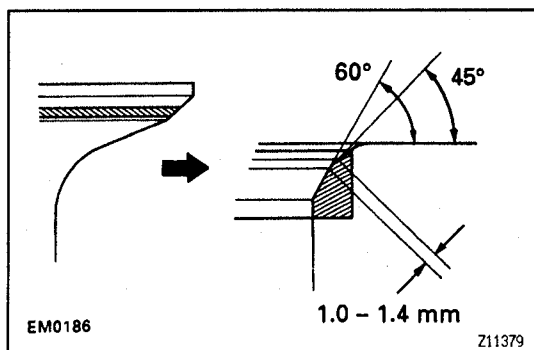
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle of the valve face with these width:
1.0 – 1.4 mm (0.039 – 0.055 in.)



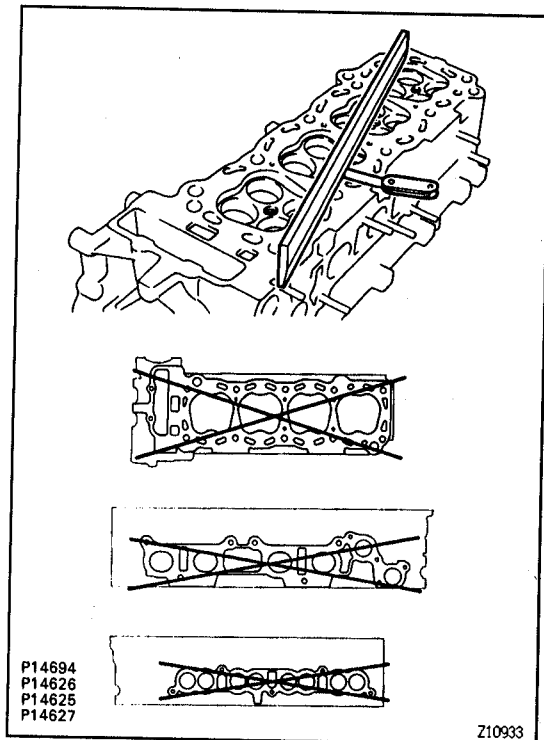
If not, correct the valve seats as follows:

- (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

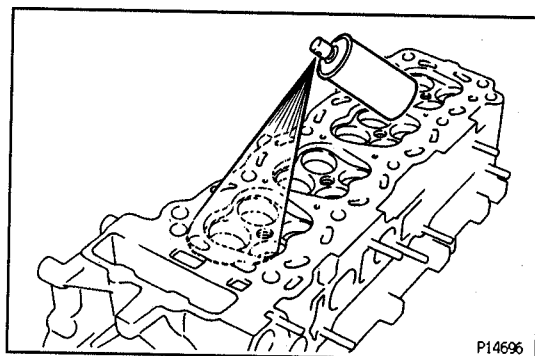
0.05 mm (0.0020 in.)

Manifold side

0.10 mm (0.0039 in.)

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

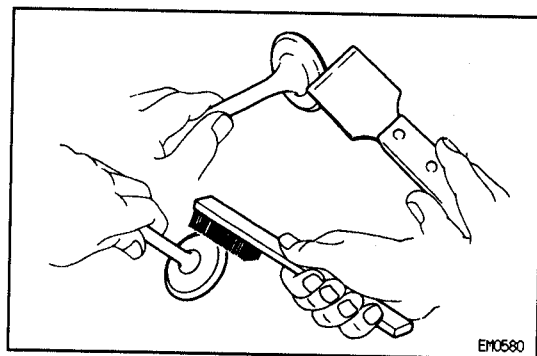
EG



B. Inspect for cracks

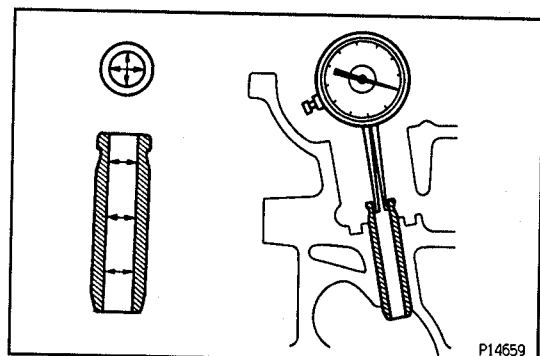
Using a dye penetrant, check the combustion chambers, intake ports, exhaust ports and cylinder block surface for cracks.

If cracked, replace the cylinder head.



4. CLEAN VALVES

- Using a gasket scraper, chip off any carbon from the valve head.
- Using a wire brush, thoroughly clean the valve.

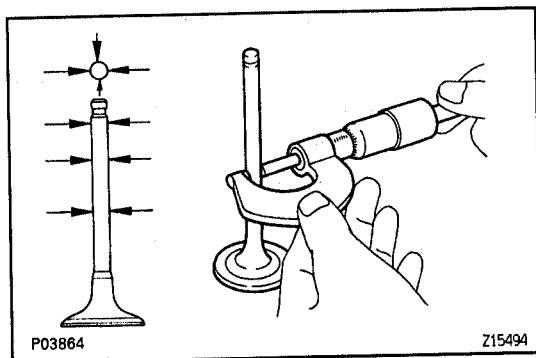


5. INSPECT VALVE STEMS AND GUIDE BUSHINGS

- 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.)



EG

- (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.)

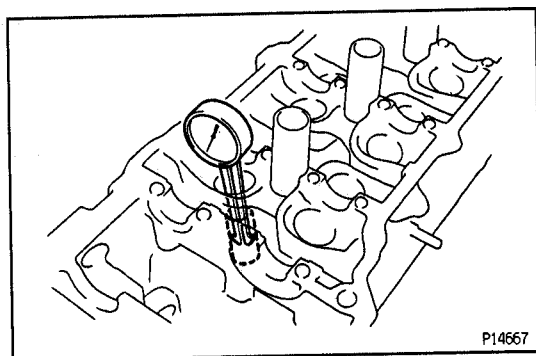
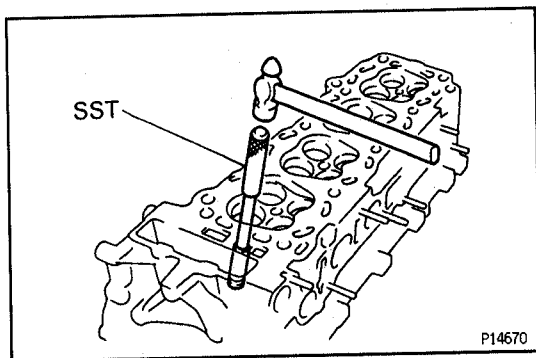
Exhaust

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)

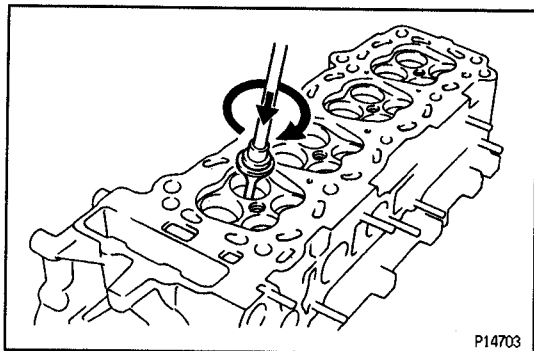


- (c) Using a caliper gauge, measure the bushing bore diameter of the cylinder head.

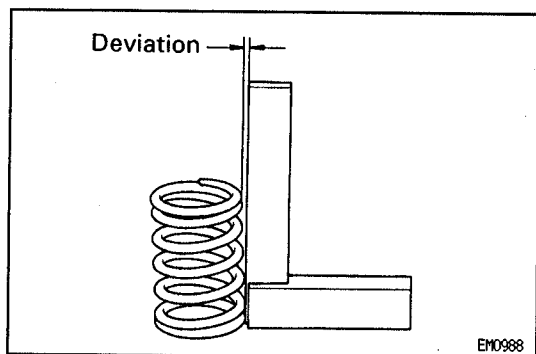
- (d) Select a new guide bushing (STD size or O/S 0.05). If the bushing bore diameter of the cylinder head is greater than 11.027 mm (0.4341 in.), machine the bushing bore to these dimension:
11.050 – 11.077 mm (0.4350 – 0.4361 in.)
If the bushing bore diameter of the cylinder head is greater than 11.077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

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



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



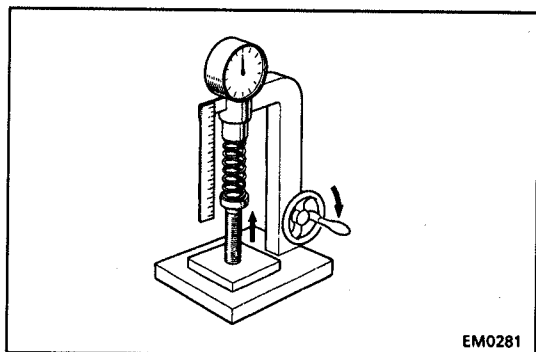
9. INSPECT VALVE SPRINGS

- (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.



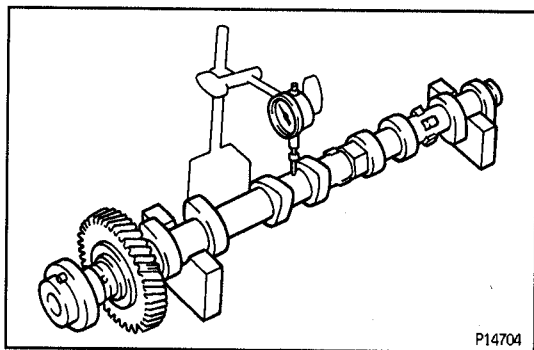
- (b) Using a spring tester, measure the tension of the valve spring at the specified installed length.

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:

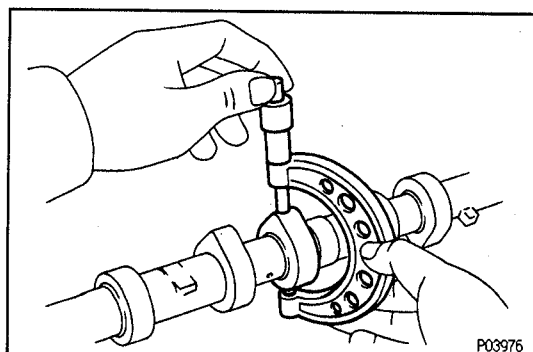
Intake

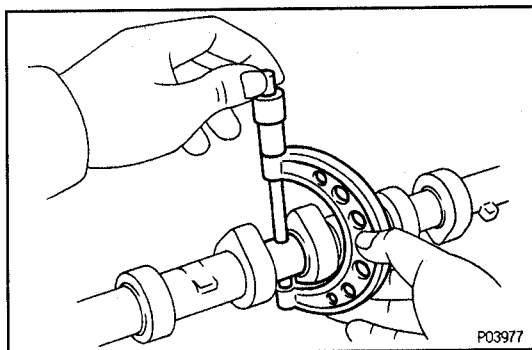
45.31 – 45.41 mm (1.7839 – 1.7878 in.)

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.

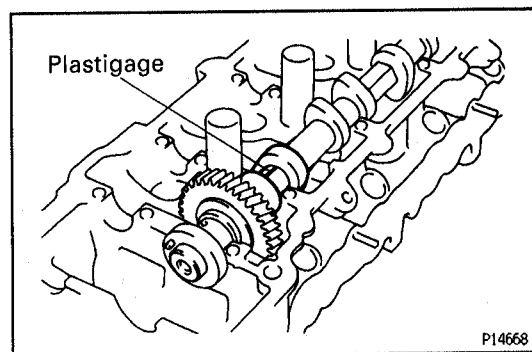
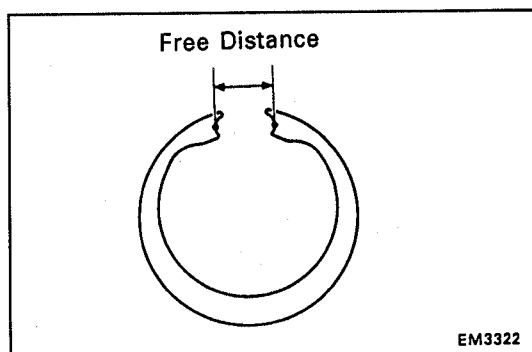
E. Inspect camshaft gear spring

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:

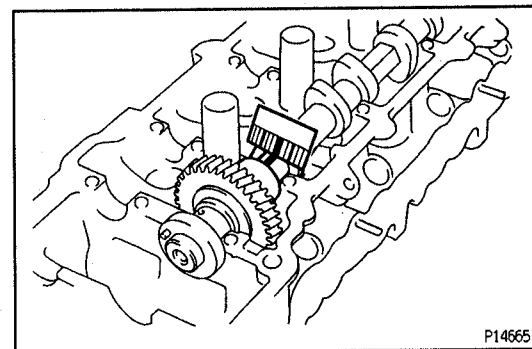
0.025 – 0.062 mm (0.0010 – 0.0024 in.)

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)

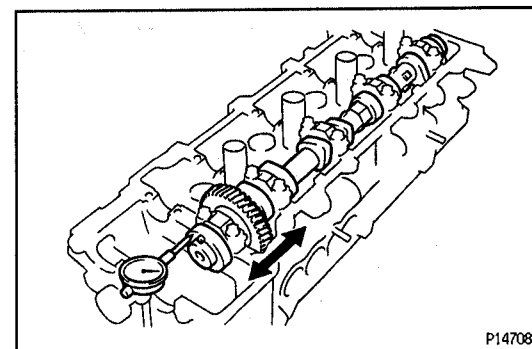
(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

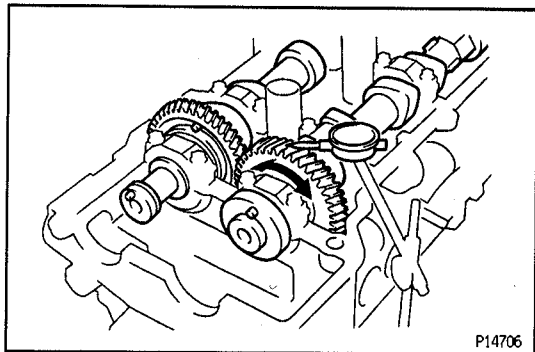
Standard thrust clearance:

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.

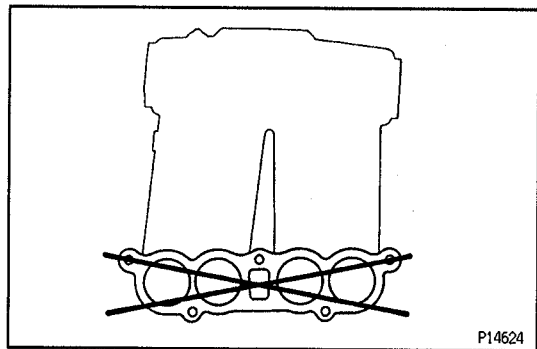
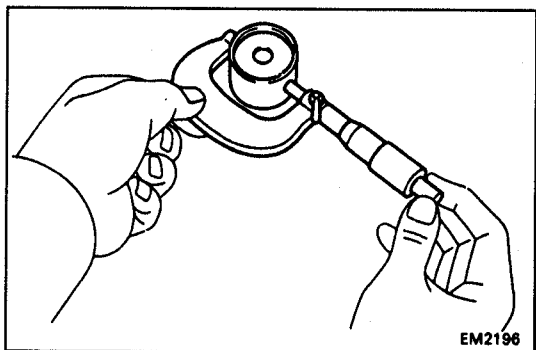
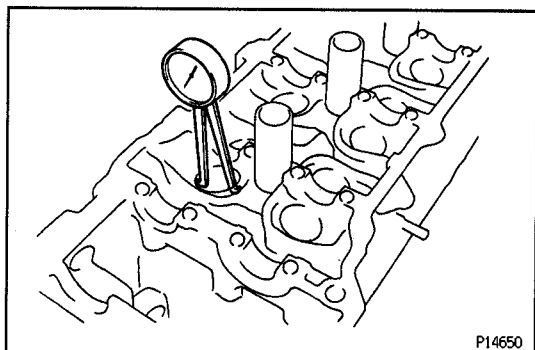
12. INSPECT AIR INTAKE CHAMBER

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

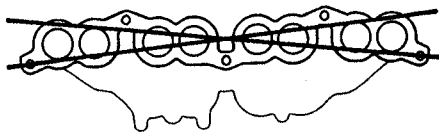
Maximum warpage:

0.20 mm (0.0078 in.)

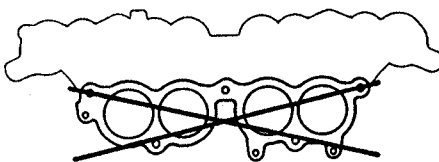
If warpage is greater than maximum, replace the air intake chamber.



Cylinder Head Side



Air Intake Chamber Side

P14621
P14623

Z10936

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:

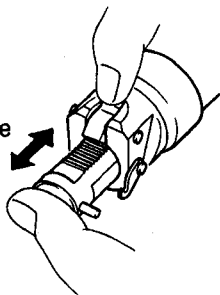
0.50 mm (0.0197 in.)

If warpage is greater than maximum, replace the manifold.

15. INSPECT CHAIN TENSIONER

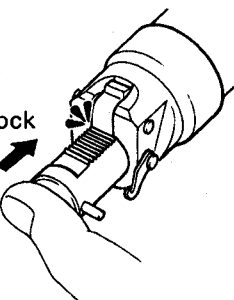
- (a) Check that the plunger moves smoothly when the ratchet pawl is raised with your finger.

Free



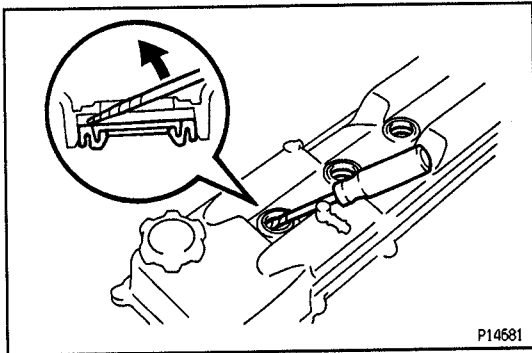
P04666

Lock



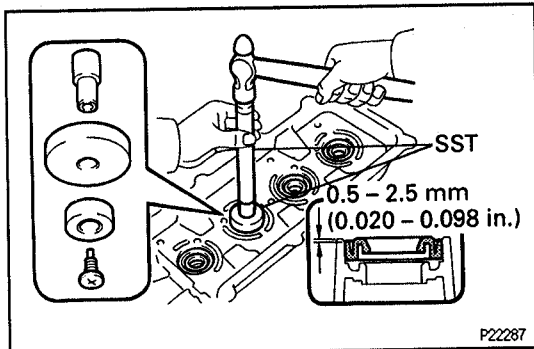
P04667

- (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

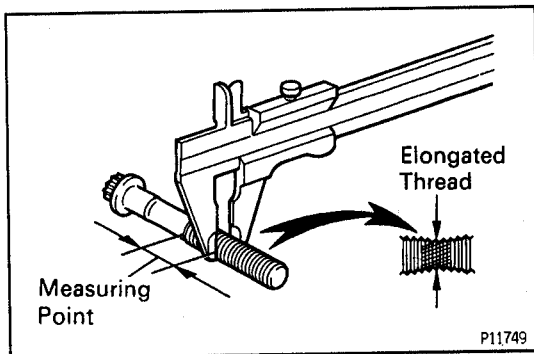
- (a) Using a screwdriver, pry out the tube gasket.



- (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.)

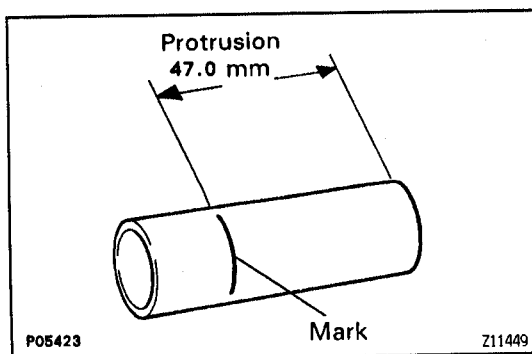
If the diameter is less than minimum, replace the bolt.

CYLINDER HEAD ASSEMBLY

EGSC3-03

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.



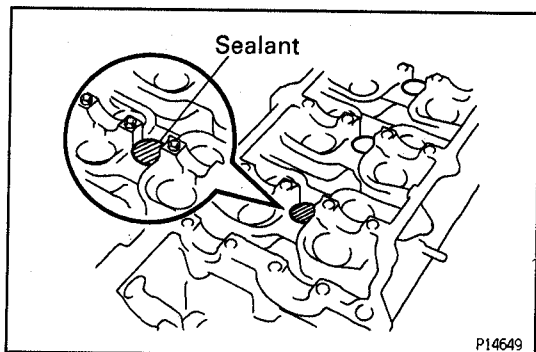
1. INSTALL SPARK PLUG TUBES

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:

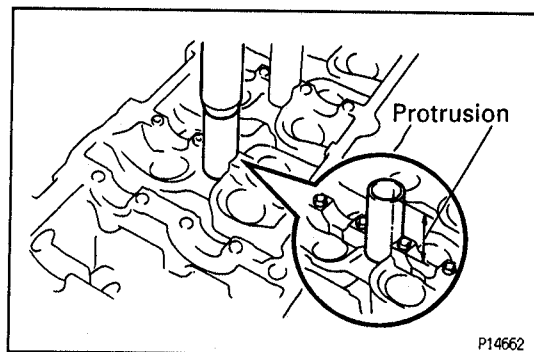
47.0 mm (1.850 in.)



- (b) Apply adhesive to the spark plug tube hole of the cylinder head.

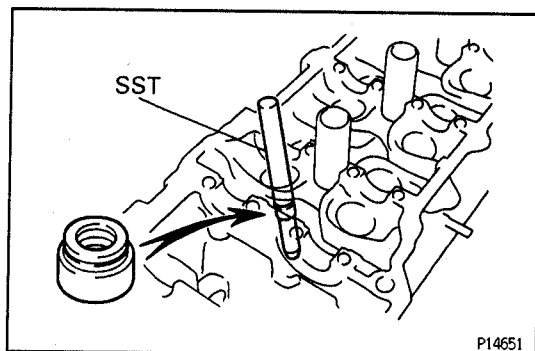
Sealant:

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

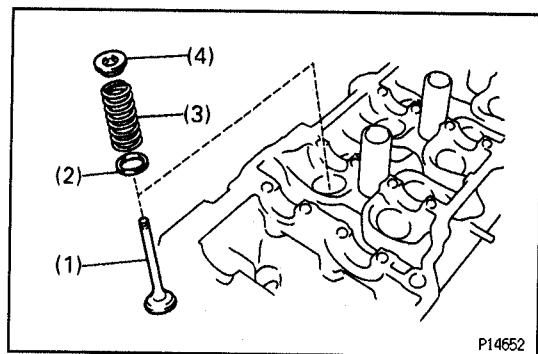
- (a) Using SST, push in a new oil seal.

SST 09236-00101 (09236-15010)

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

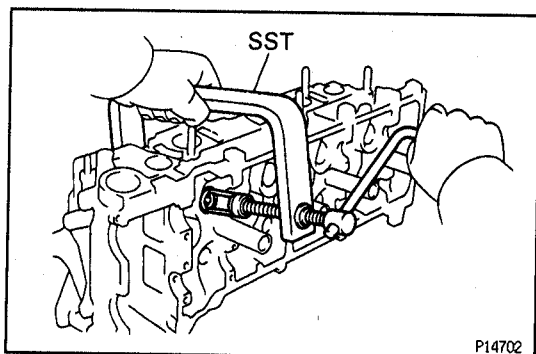
Code mark (Intake side only):

"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.

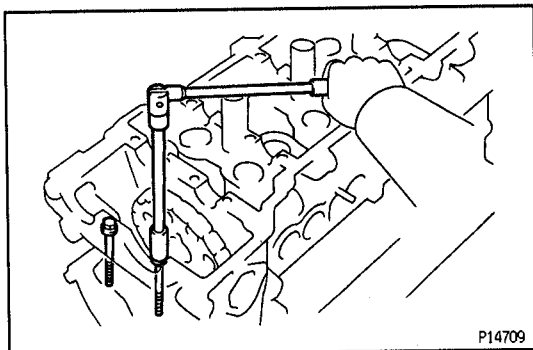
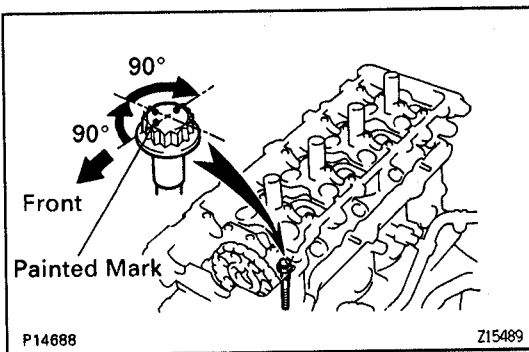
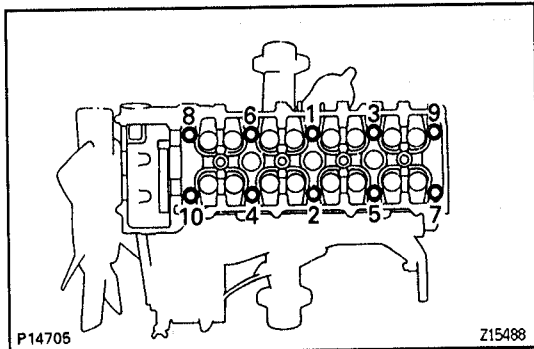
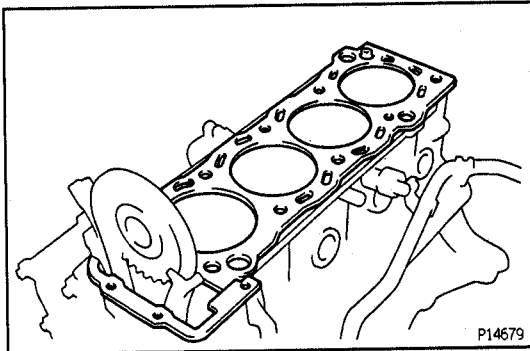
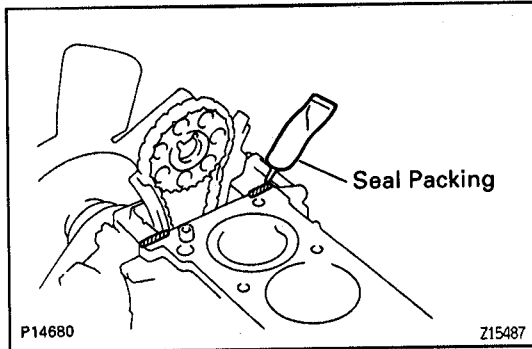
SST 09202-70020 (09202-00010)

- (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.



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.

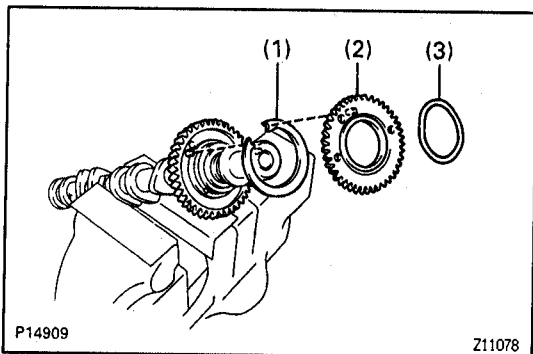
- (d) Retighten the cylinder head bolts by 90° in the numerical order shown.

- (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.

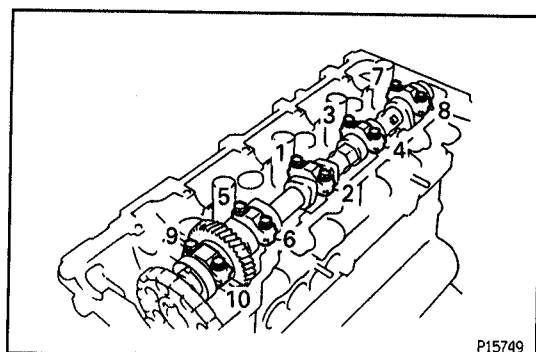
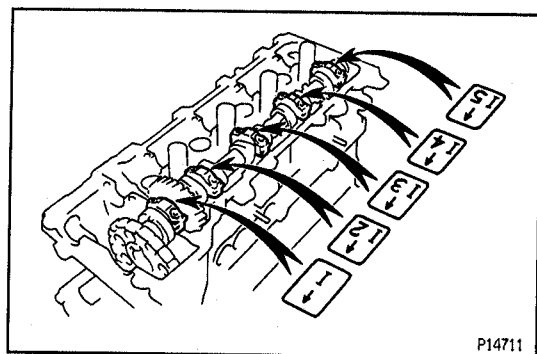
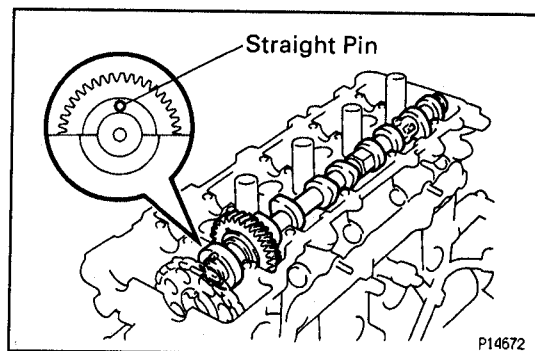
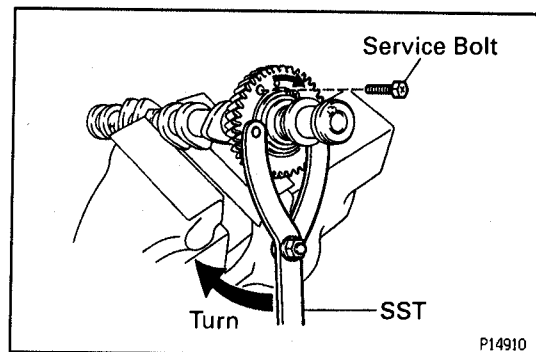
SST 09960-10010 (09962-01000, 09963-00500)

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

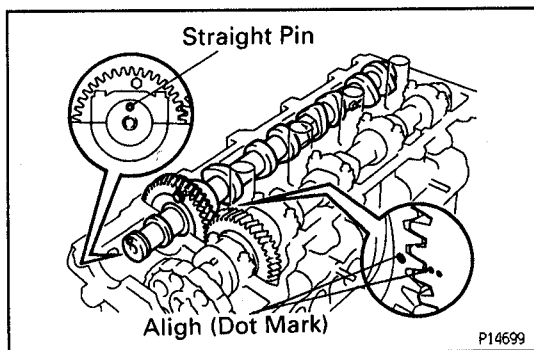
- (a) Apply MP grease to the thrust portion of the intake camshaft.
 (b) Place the intake camshaft with knock pin facing upward of camshaft angle on the cylinder head.



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

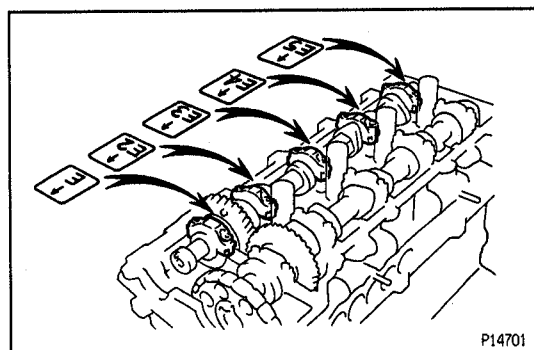
- (d) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
 (e) Install and uniformly tighten the 10 bearing cap bolts in the sequence shown.

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

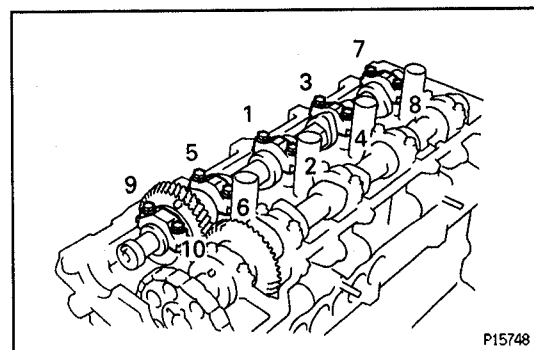
**B. Install exhaust camshaft**

- (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.

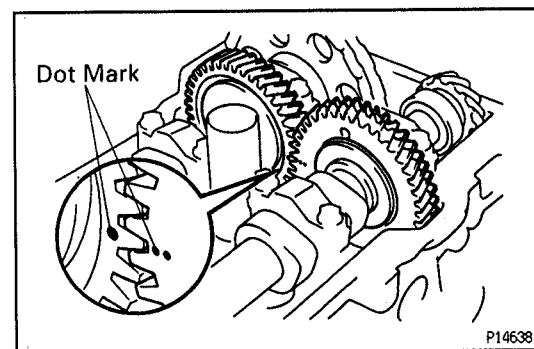
NOTICE: There are also timing marks (for TDC) on each gear as shown in the illustration. Do not use these marks.



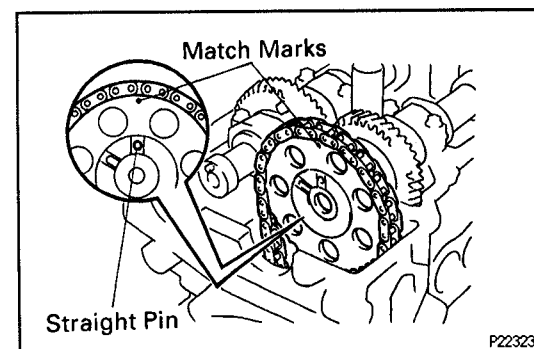
- (c) Roll down the exhaust camshaft onto the bearing journals while engaging gears with each other.
- (d) Install the bearing caps in their proper locations.



- (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**

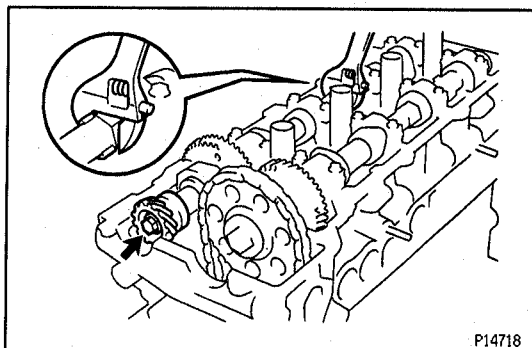
- (a) Turn the crankshaft pulley clockwise, and align its groove with the timing mark "0" of the timing chain cover.
- (b) Turn the camshafts so that the timing marks with 1 and 2 dots will be in straight line on the cylinder head surface as shown in the illustration.

**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.

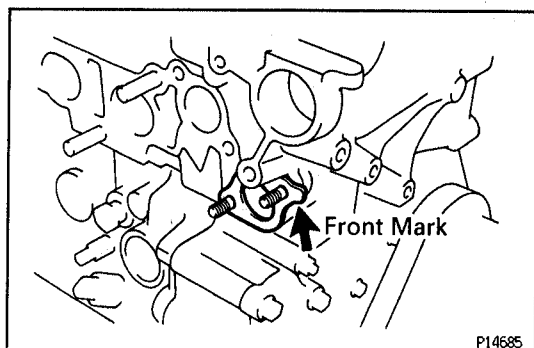
Torque: 73.5 N·m (750 kgf·cm, 54 ft·lbf)



- (c) Hold the exhaust camshaft with a wrench, install the bolt and distributor gear.

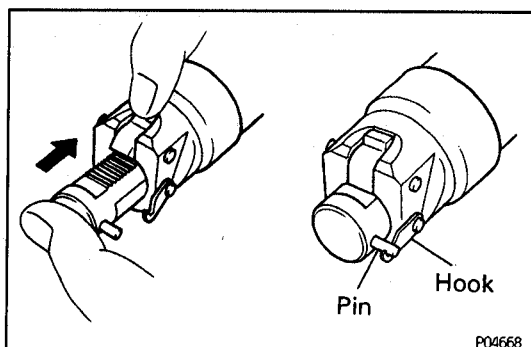
Torque: 46 N·m (470 kgf·cm, 34 ft·lbf)

EG



6. INSTALL CHAIN TENSIONER

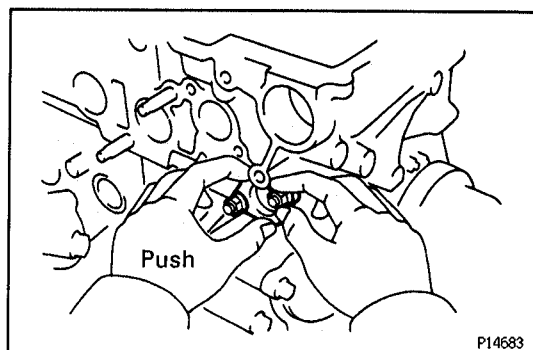
- (a) Place a new gasket so that the front mark is toward the front side.



- (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.



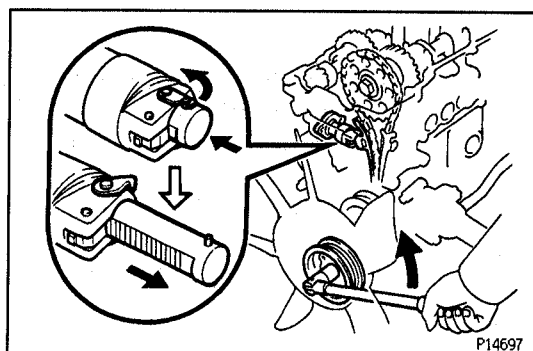
- (d) Push the tensioner by hand until it touches the head installation surface, then install the 2 nuts.

- (e) Tighten the 2 nuts.

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

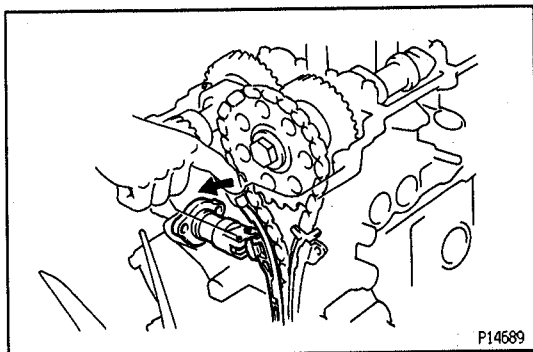
- (f) Check that the hook of the tensioner is not released.

NOTICE: If the plunger springs out during installation of the chain tensioner, repeat the operation in step (b) before installing the tensioner.

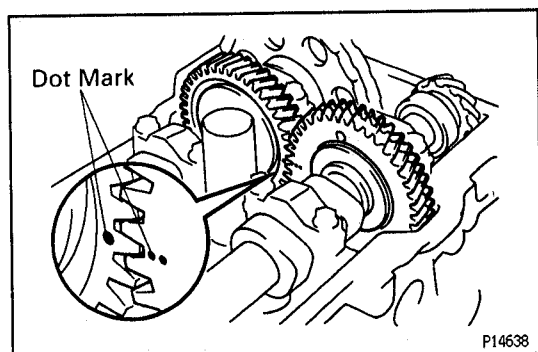


7. SET CHAIN TENSIONER

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.

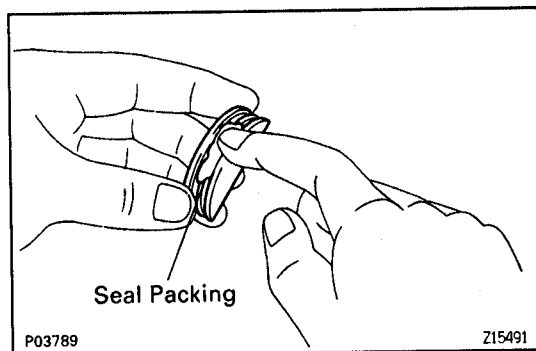
Torque: 13.5 N·m (135 kgf·cm, 10 ft·lbf)

16. INSTALL WATER OUTLET

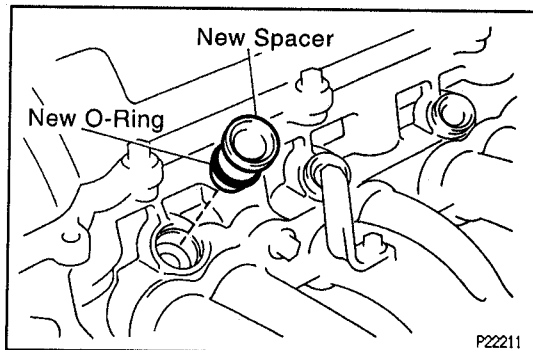
- (a) Install a new gasket and the water outlet with the 2 bolts.

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

- (b) Connect the upper radiator hose.



EG

**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.

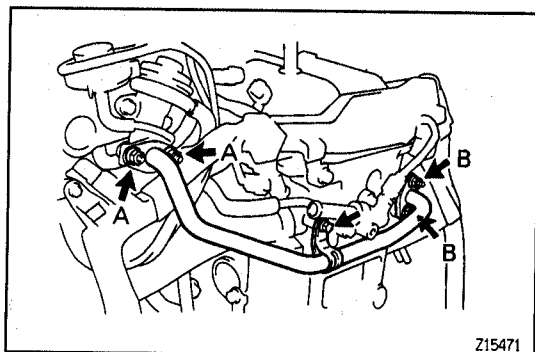
Torque: 21 N·m (210 kgf·cm, 15 ft·lbf)

- (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.

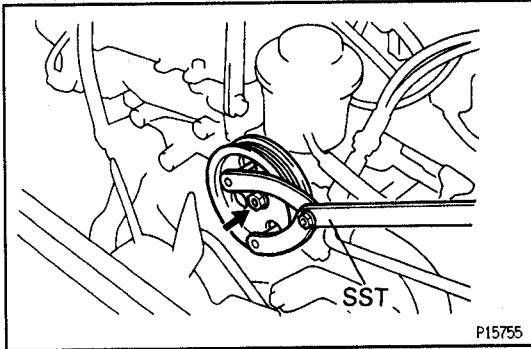
Torque:

Bolt: 18 N·m (185 kgf·cm, 13 ft·lbf)

Nut A: 19 N·m (195 kgf·cm, 14 ft·lbf)

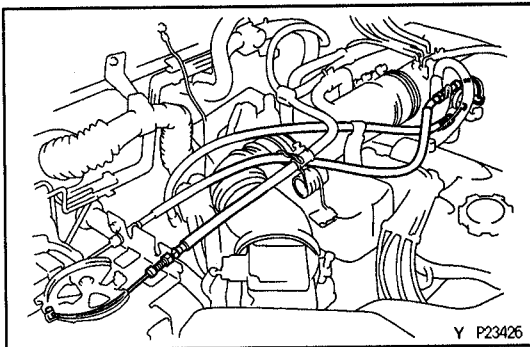
Nut B: 20 N·m (200 kgf·cm, 15 ft·lbf)

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**

EG

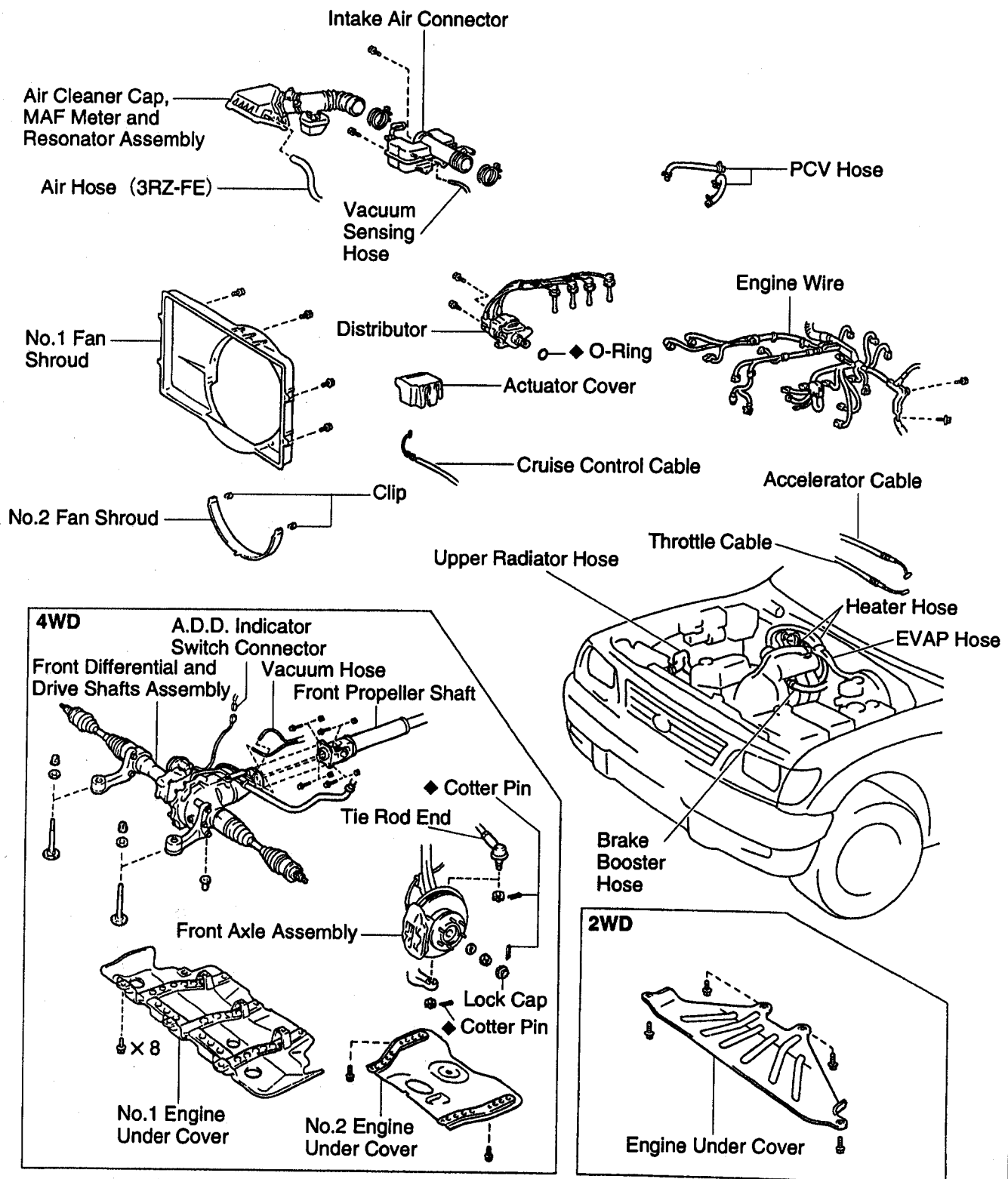


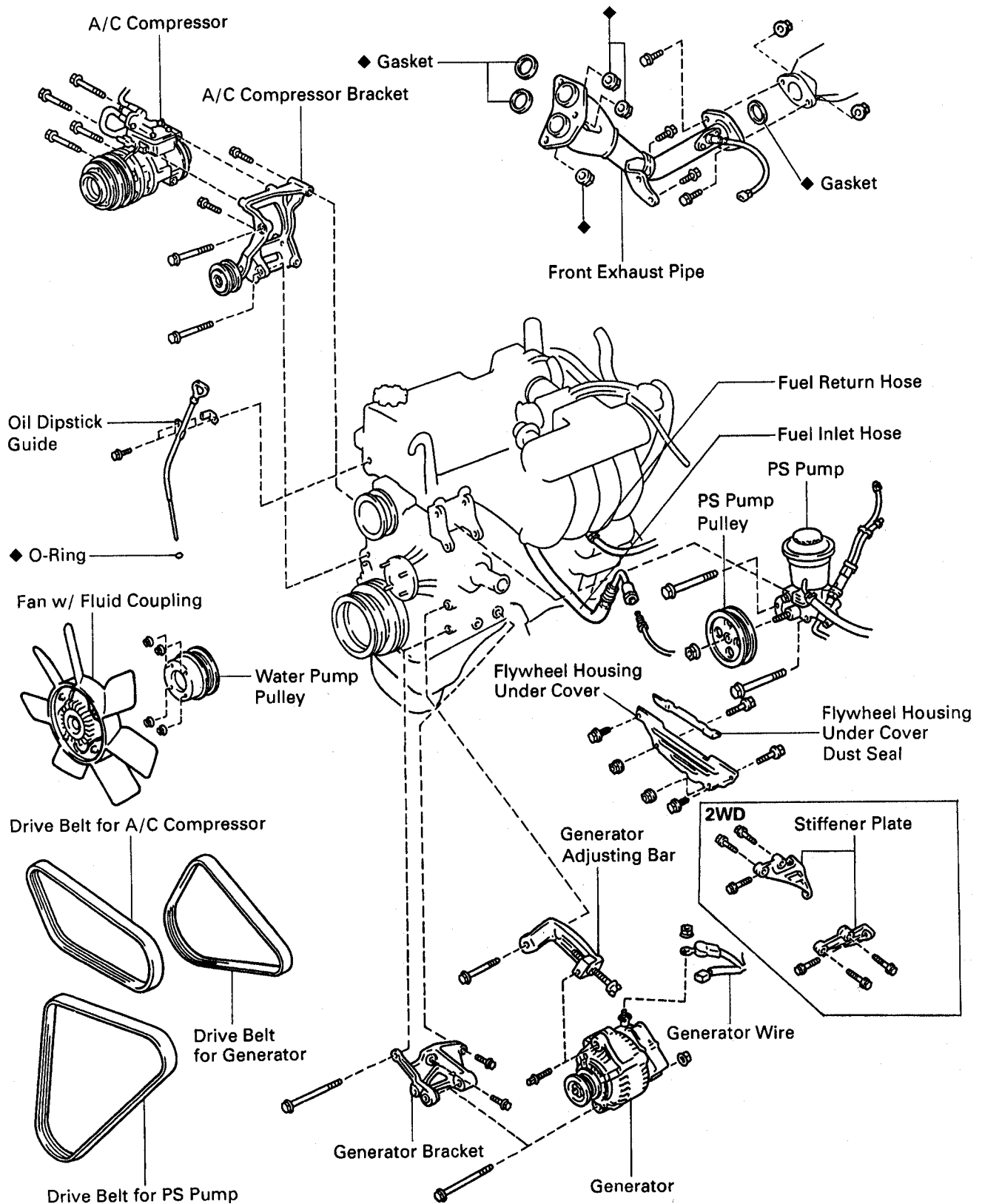
36. **CONNECT THESE CABLES:**
 - (a) **M/T:**
Connect the throttle cable to the throttle body.
 - (b) **A/T:**
Connect the accelerator and throttle cables to the throttle body.
 - (c) **w/ Cruise Control System:**
Connect the cruise control cable to the actuator, and install the actuator cover.
37. **FILL 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

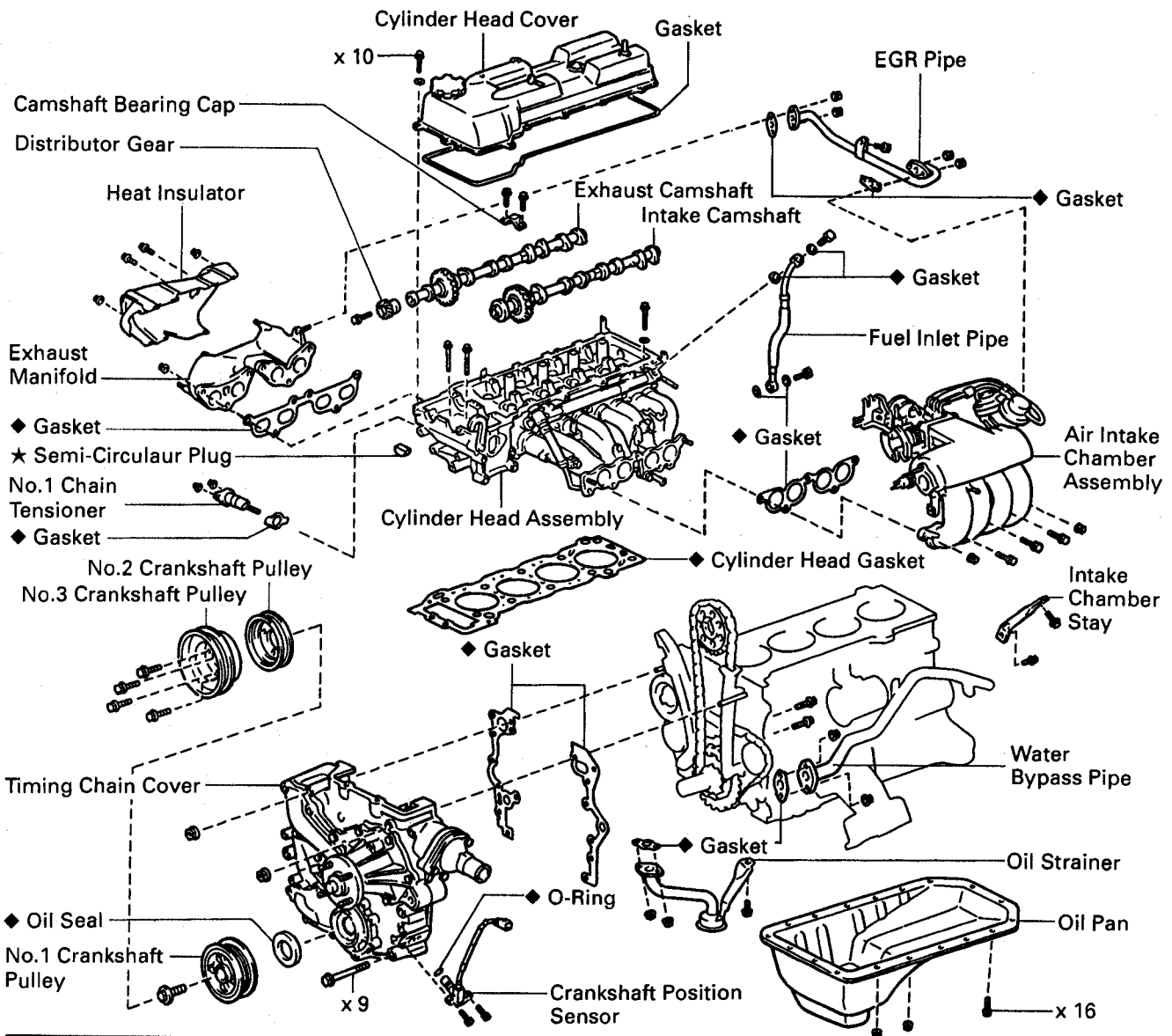
EGBMK-02

EG

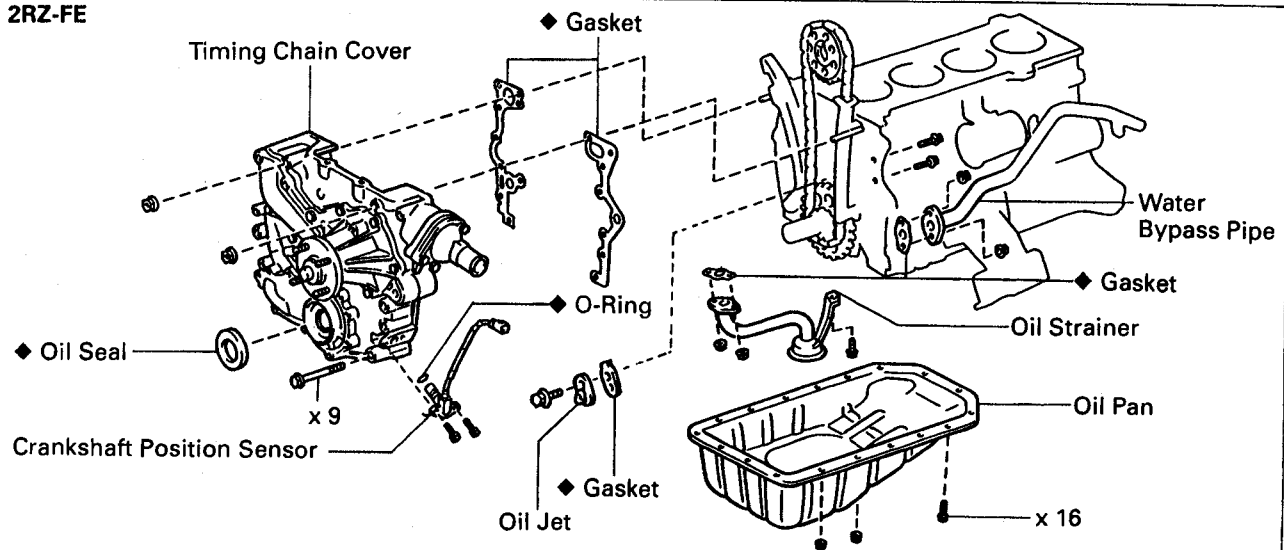




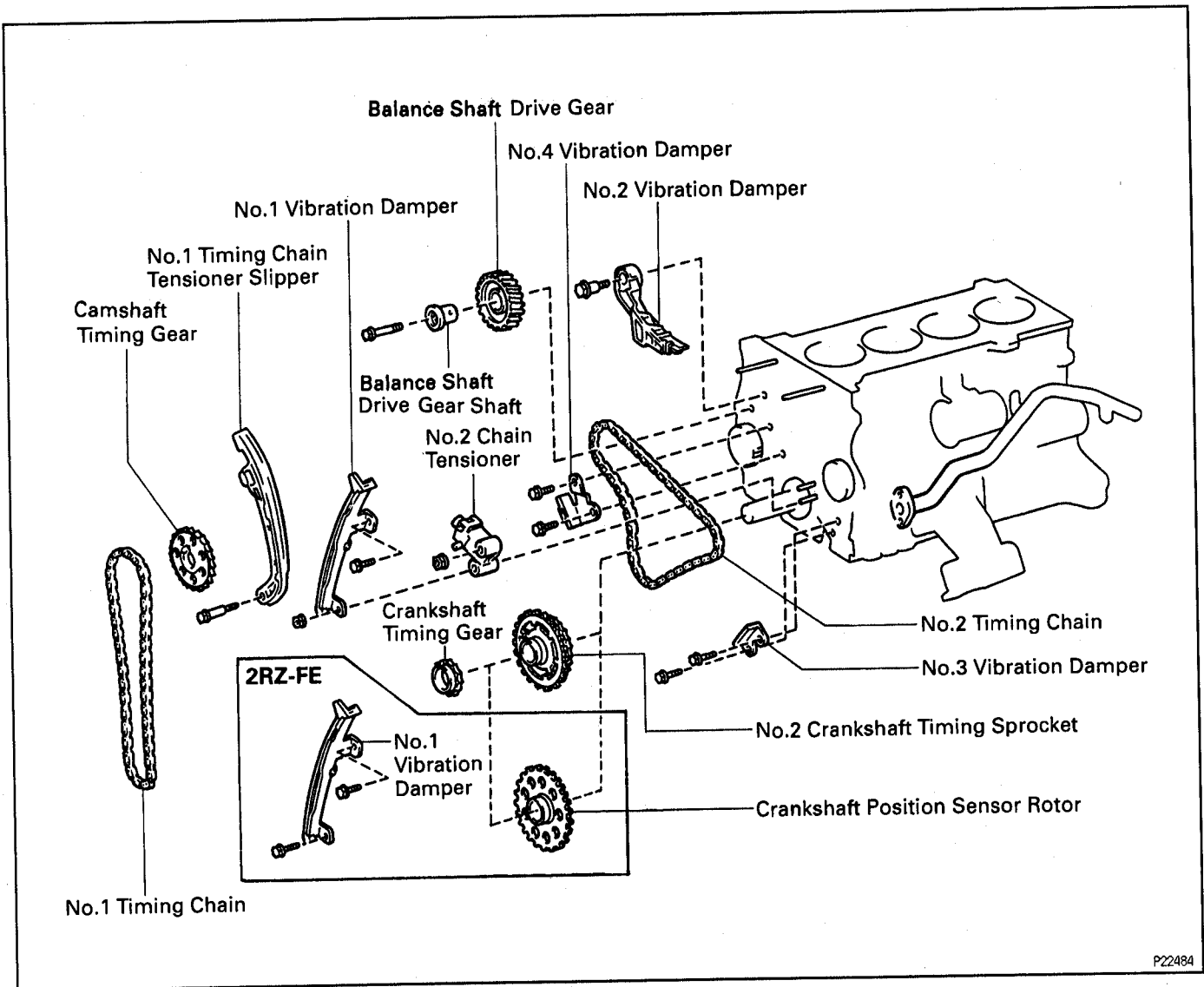
◆ Non-reusable part



2RZ-FE



- ◆ Non-reusable part
- ★ Precoated part

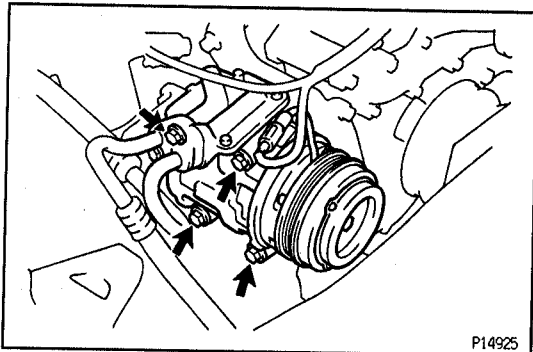


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EGMML-02

TIMING CHAIN REMOVAL

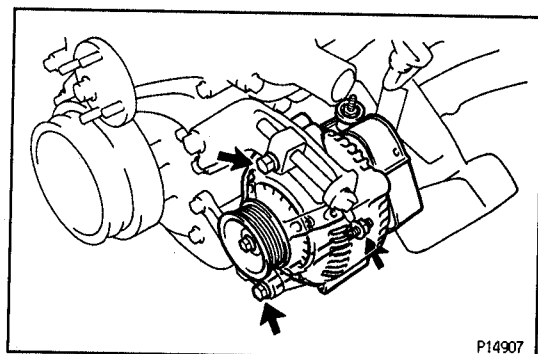
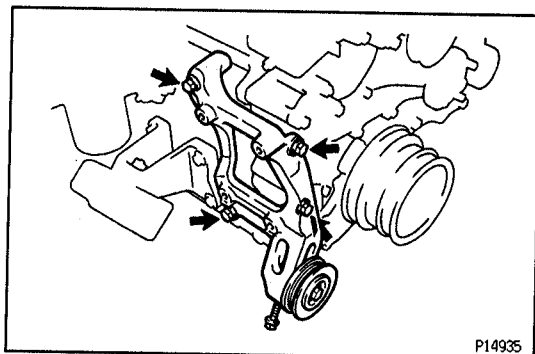
1. REMOVE ENGINE UNDER COVER
2. DRAIN ENGINE OIL
3. 4WD:
REMOVE FRONT DIFFERENTIAL AND DRIVE SHAFTS ASSEMBLY
(See front differential and front drive shaft removal in Suspension and Axle)
4. REMOVE DRIVE BELT FOR GENERATOR, FAN WITH FLUID COUPLING AND WATER PUMP PULLEY
(See steps 3 to 9 in water pump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

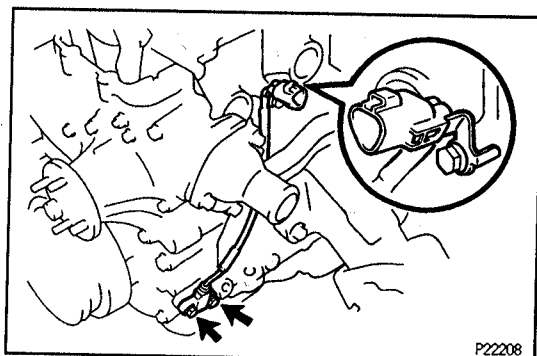
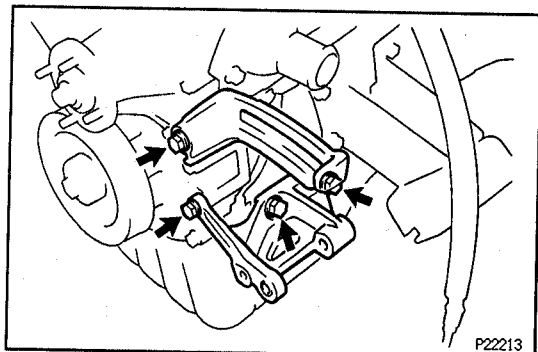
HINT: Put aside the compressor, and suspend it.

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

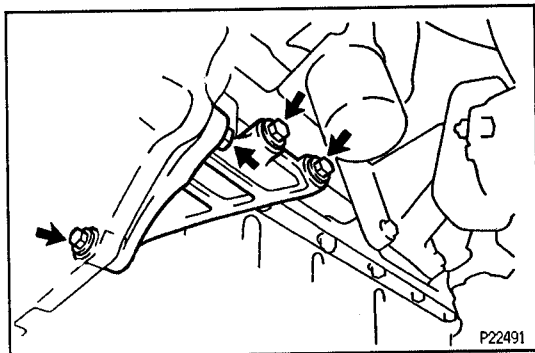
**7. REMOVE GENERATOR, ADJUSTING BAR AND BRACKET**

- (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.

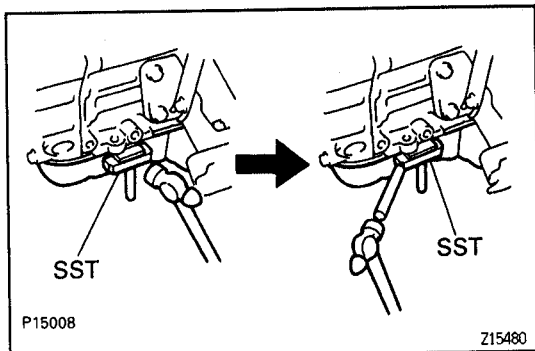
- (d) Remove the bolt and adjusting bar.
 (e) Remove the 3 bolts and generator bracket.

**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.

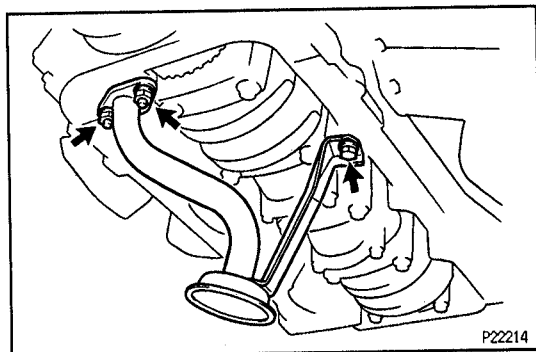
10. REMOVE FLYWHEEL HOUSING UNDER COVER AND DUST SEAL**11. REMOVE OIL PAN**

(a) Remove the 16 bolts and 2 nuts.

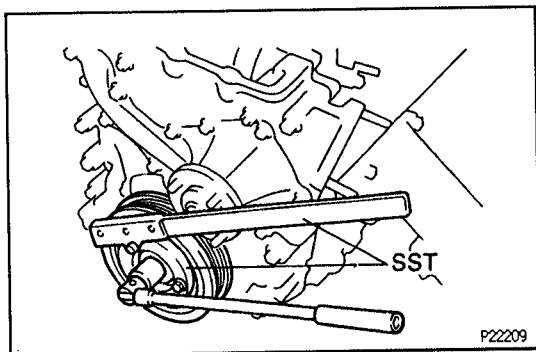
(b) Insert the blade of SST between the cylinder block and oil pan, cut off applied sealer and remove the oil pan.

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**

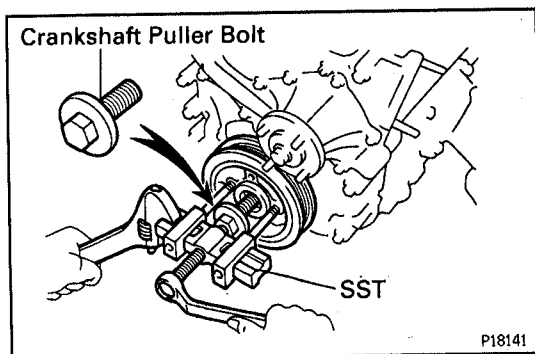
(a) w/ A/C:

Remove the 4 bolts, No.2 and No.3 crankshaft pulleys.

(b) Using SST, remove the pulley bolt.

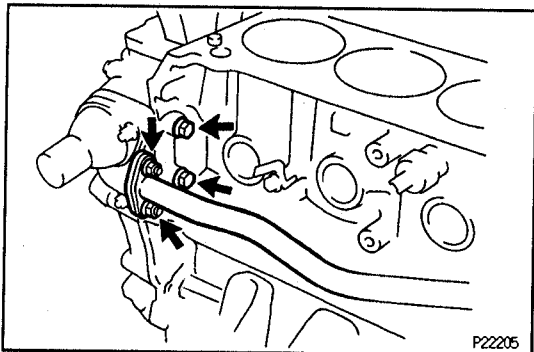
SST 09213-54015, 09330-00021

(c) Remove the crankshaft pulley.

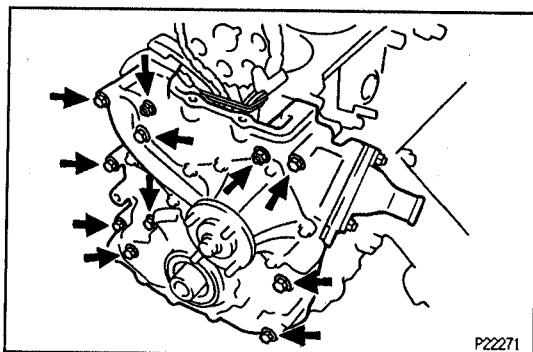


HINT: If necessary, remove the pulley with SST and crankshaft pulley bolt.

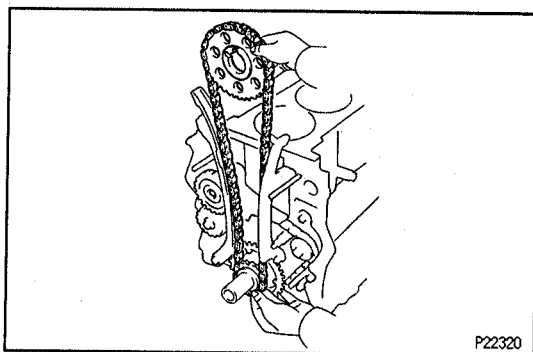
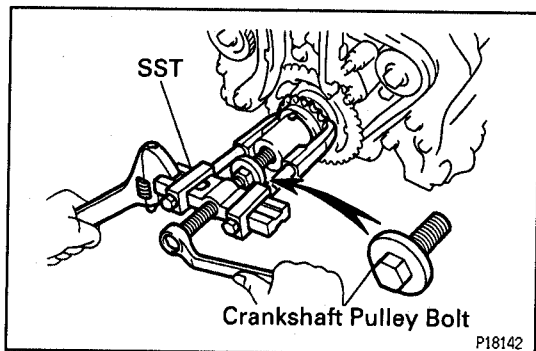
SST 09950-50010 (09951-05010, 09952-05010, 09953-05010, 09954-05020)

**14. REMOVE TIMING CHAIN COVER**

- (a) Remove the 2 water bypass pipe nuts.
- (b) Remove the 2 timing chain cover bolts.

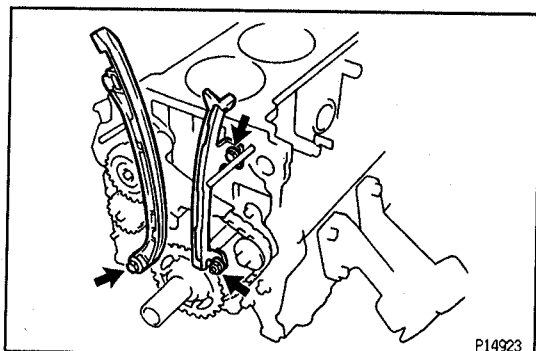


- (c) Remove the 9 bolts and 2 nuts.
- (d) Using a plastic faced hammer, loosen the chain cover and remove the timing chain cover and 3 gasket.

**No.1 Timing Chain****15. REMOVE NO.1 TIMING CHAIN AND CAMSHAFT TIMING GEAR****16. REMOVE CRANKSHAFT TIMING GEAR**

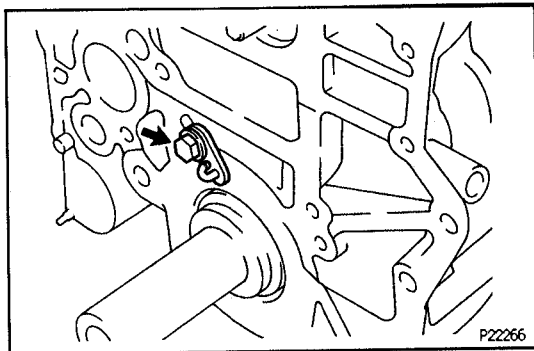
HINT: If necessary, remove the gear with SST and crankshaft pulley bolt.

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

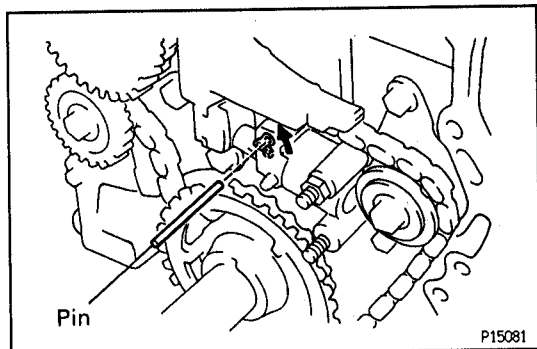
**17. REMOVE NO.1 TIMING CHAIN TENSIONER SLIPPER AND NO.1 VIBRATION DAMPER**

- (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.

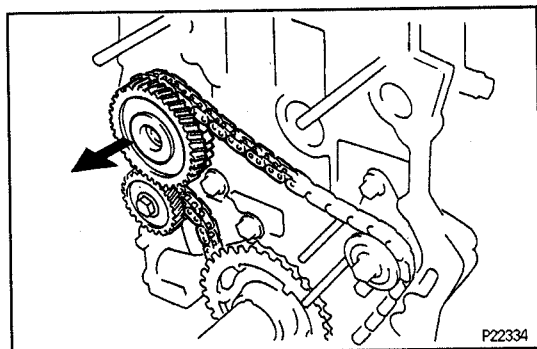
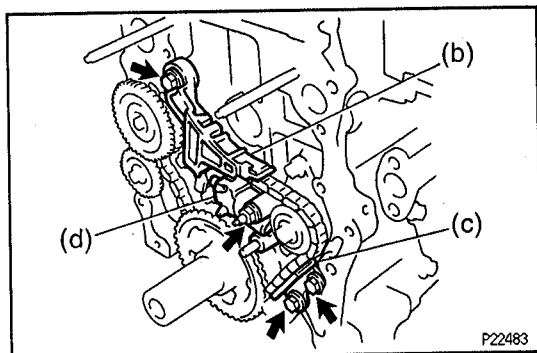
**18. 2RZ-FE:
REMOVE CRANKSHAFT POSITION SENSOR ROTOR**

**19. 2RZ-FE:****REMOVE TIMING CHAIN OIL JET**

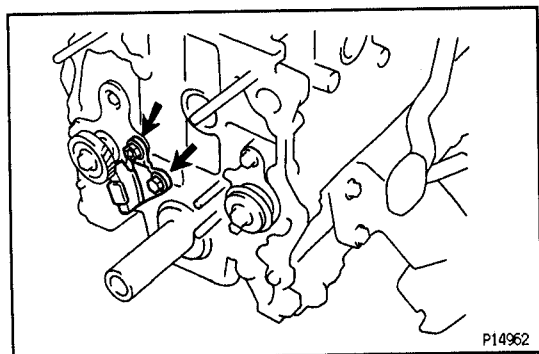
Remove the bolt, oil jet and gasket.

**No.2 Timing Chain (3RZ-FE)****20. REMOVE NO.2, NO.3 VIBRATION DAMPERS AND NO.2 CHAIN TENSIONER**

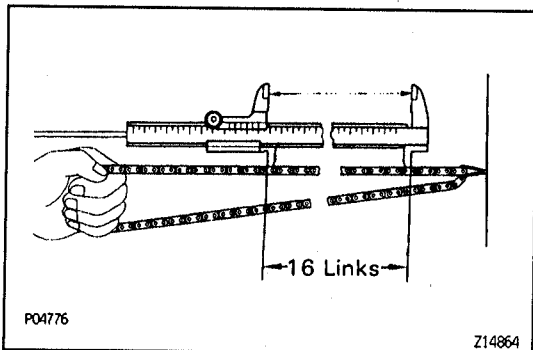
- (a) Install a pin to the No.2 chain tensioner and lock the plunger.
- (b) Remove the bolt and No.2 damper.
- (c) Remove the 2 bolts and No.3 damper.
- (d) Remove the nut and No.2 chain tensioner.

**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

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.

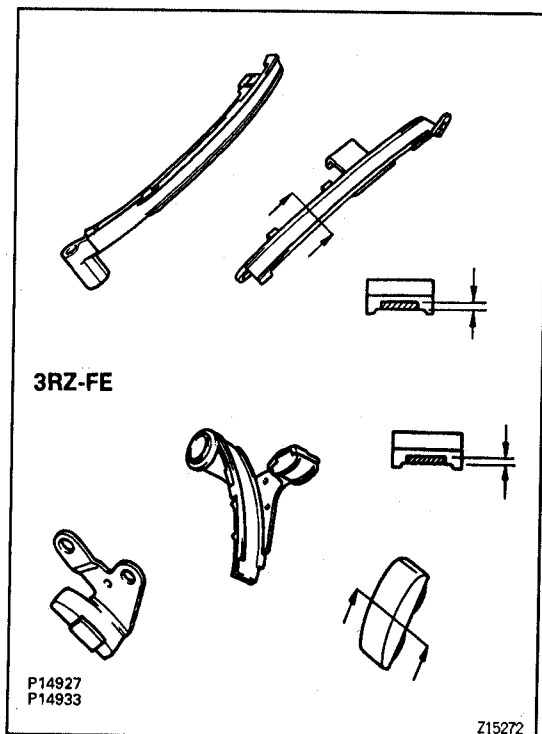
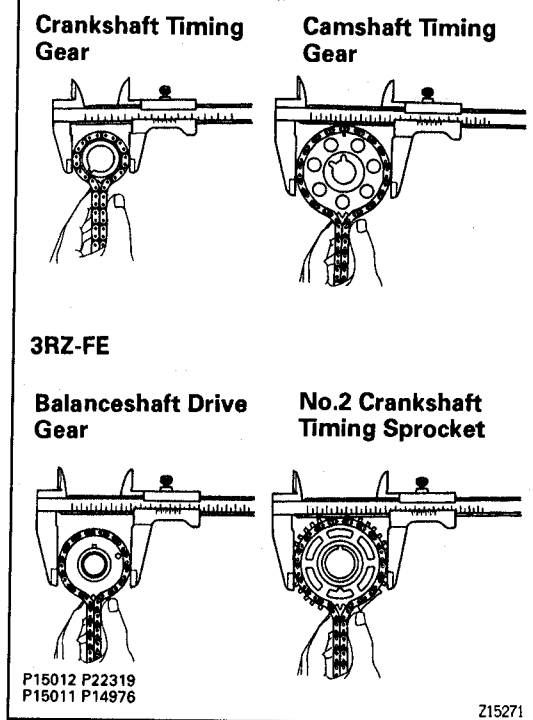
2. INSPECT CHAIN TENSIONER SLIPPER AND VIBRATION DAMPERS

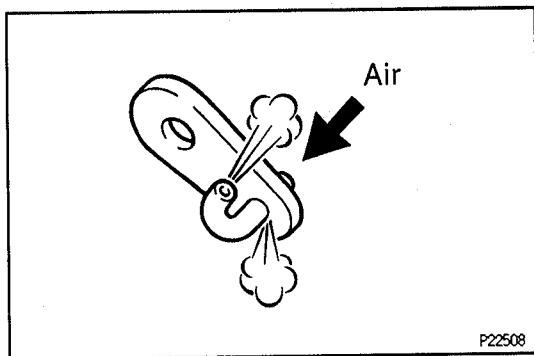
Measure the chain tensioner slipper and vibration damper wears.

Maximum wear:

1.0 mm (0.039 in.)

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

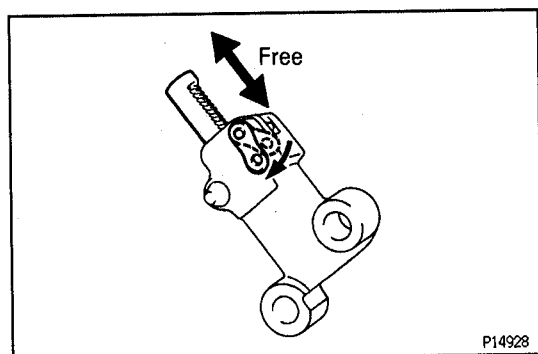


**3. 2RZ-FE:****INSPECT OIL JET**

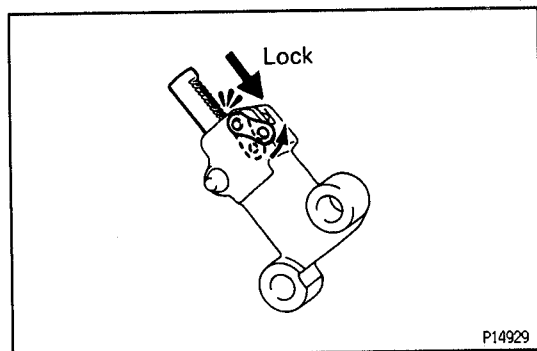
Check the oil for damage or clogging.
If necessary, replace the oil jet.

4. INSPECT NO.1 CHAIN TENSIONER

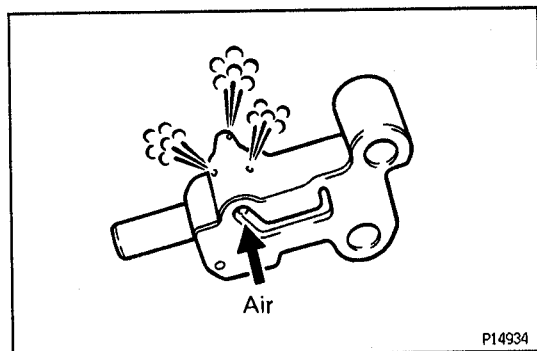
(See step 15 in cylinder head components, inspection, cleaning and repair in cylinder head)

**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.

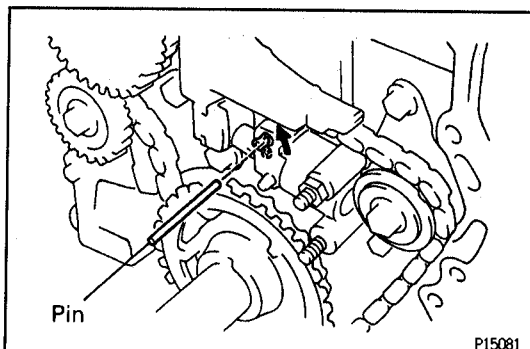
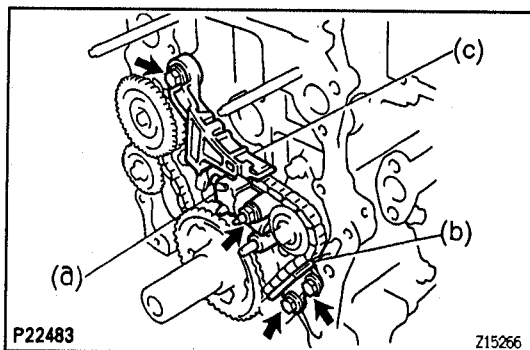
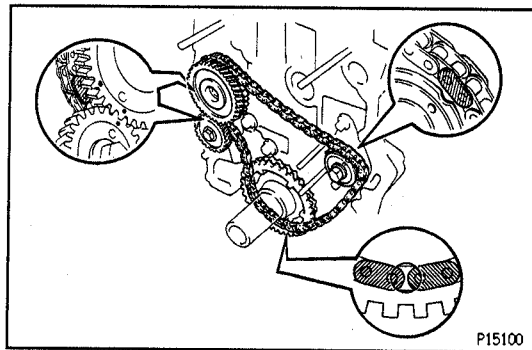
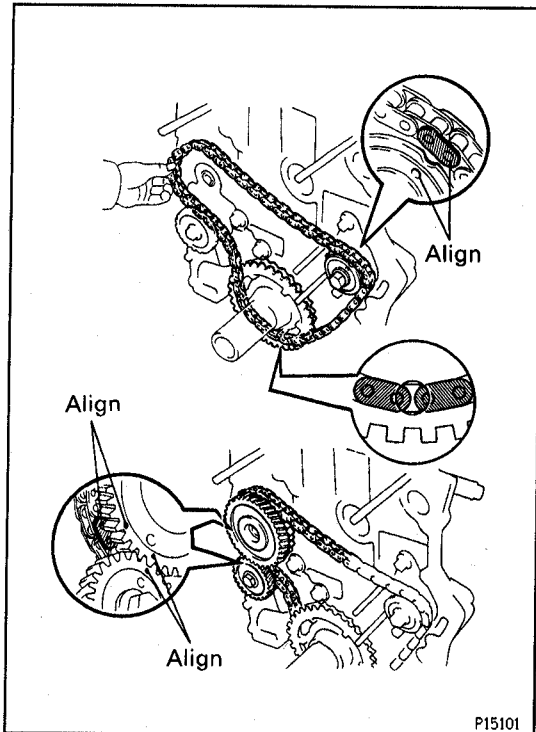


- (b) Release the ratchet pawl and check that the plunger is locked in place by the ratchet pawl and does not move when pushed with your finger.

**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

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

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

- Install the bolt to the balance shaft drive gear and tighten it.

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

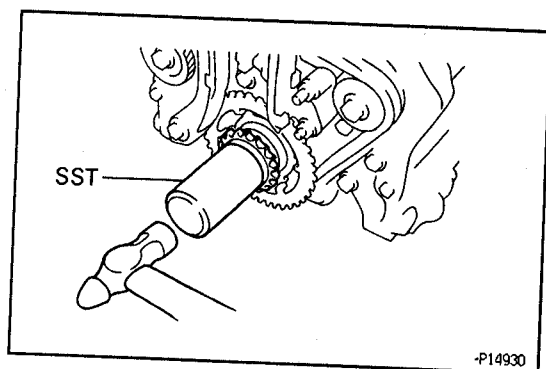
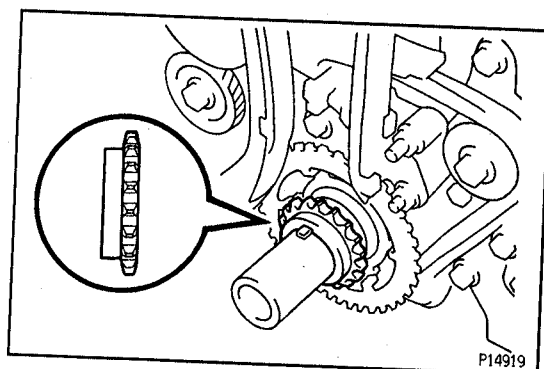
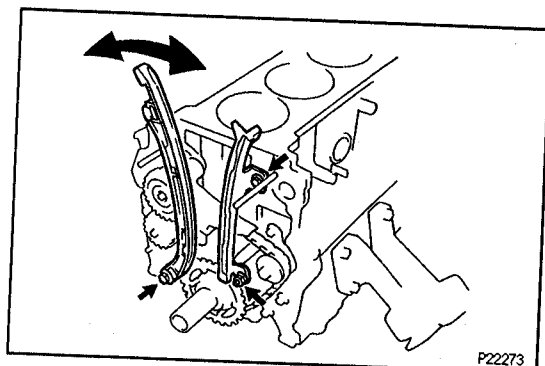
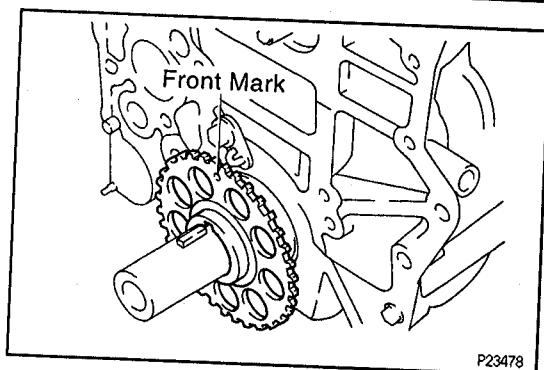
- Check that each timing mark is matched with the corresponding mark link.

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.

- Install the No.2 chain tensioner with the nut.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)
- Install No.3 damper with the 2 bolts.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)
- Install No.2 damper with the bolt.
Torque: 27 N·m (270 kgf·cm, 20 ft·lbf)
- 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

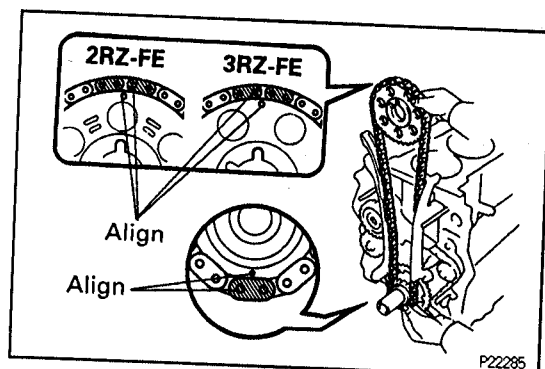
- Install the No.1 damper with the bolt and nut.
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)
- Install the slipper with the bolt.
Torque: 27 N·m (270 kgf·cm, 20 ft·lbf)
- Check that the slipper moves smoothly.

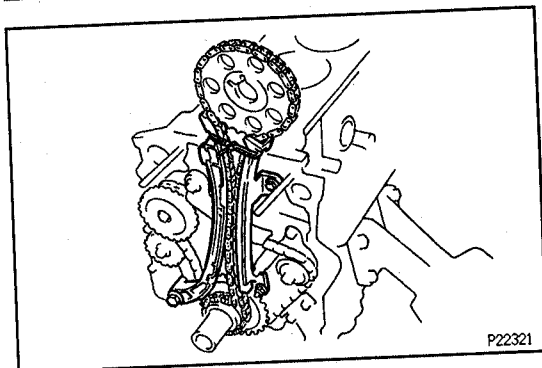
7. INSTALL CRANKSHAFT TIMING GEAR

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

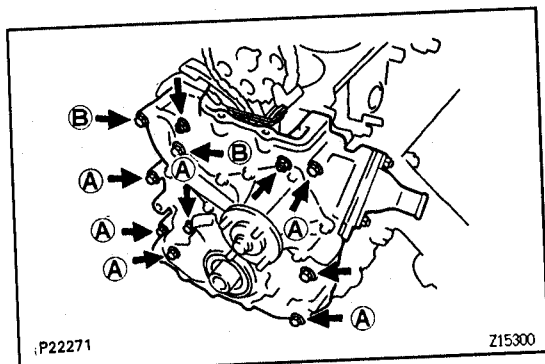
8. INSTALL NO.1 TIMING CHAIN AND CAMSHAFT TIMING GEAR

- 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.
- 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.

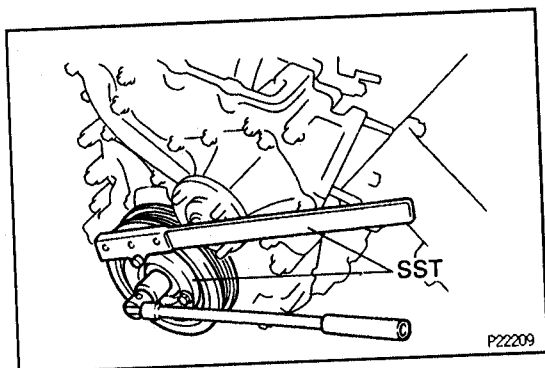
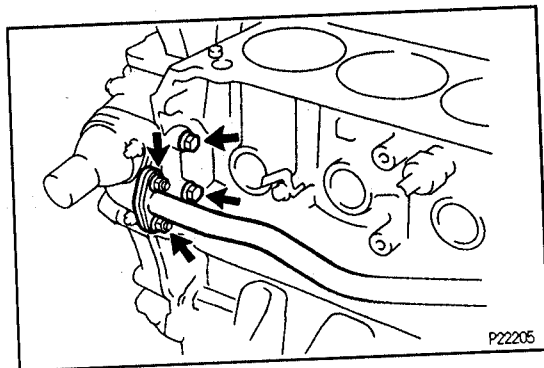
Torque:

Bolt:

- 12 mm head (A): 20 N·m (200 kgf·cm, 14 ft·lbf)
12 mm head (B): 24.5 N·m (250 kgf·cm, 18 ft·lbf)
14 mm head: 44 N·m (440 kgf·cm, 32 ft·lbf)
20 N·m (200 kgf·cm, 14 ft·lbf)

Nut :

- (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:

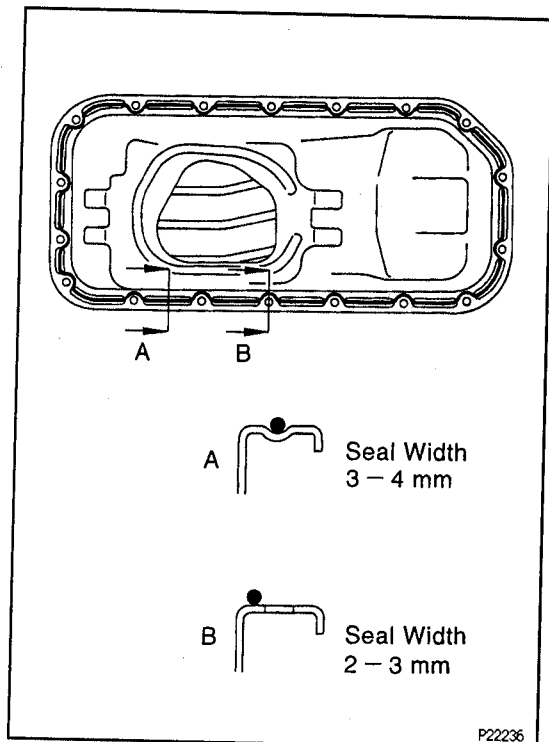
Install the No.3 and No.2 crankshaft pulleys with the 4 bolts.

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:

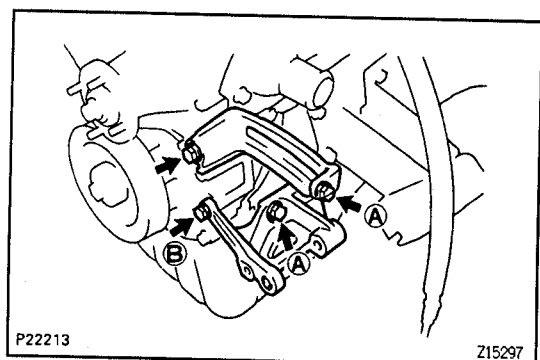
Bolt A: 74.5 N·m (760 kgf·cm, 55 ft·lbf)

Bolt B: 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**

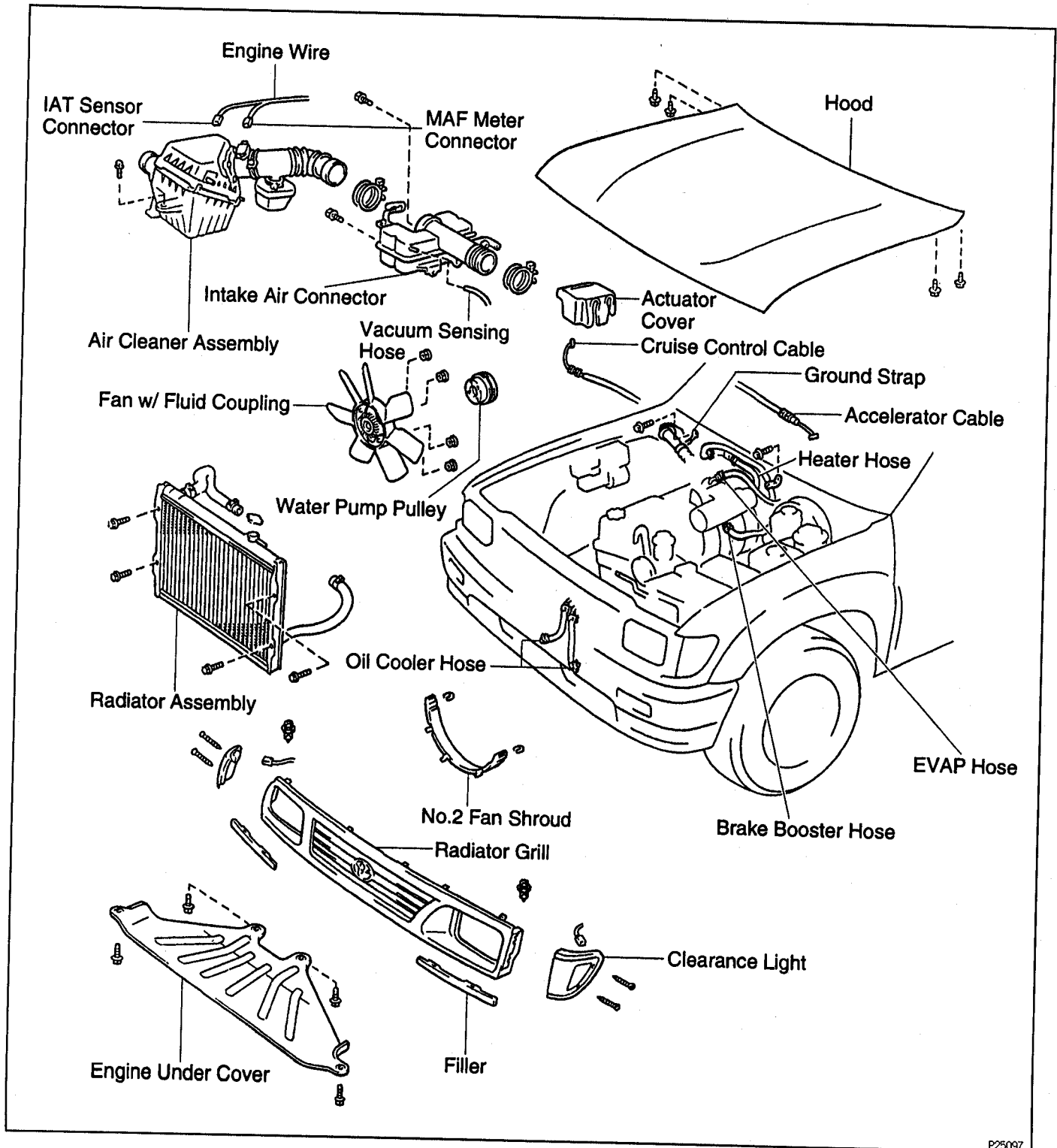
Check for abnormal noise, shock slippage, correct shift points and smooth operation.

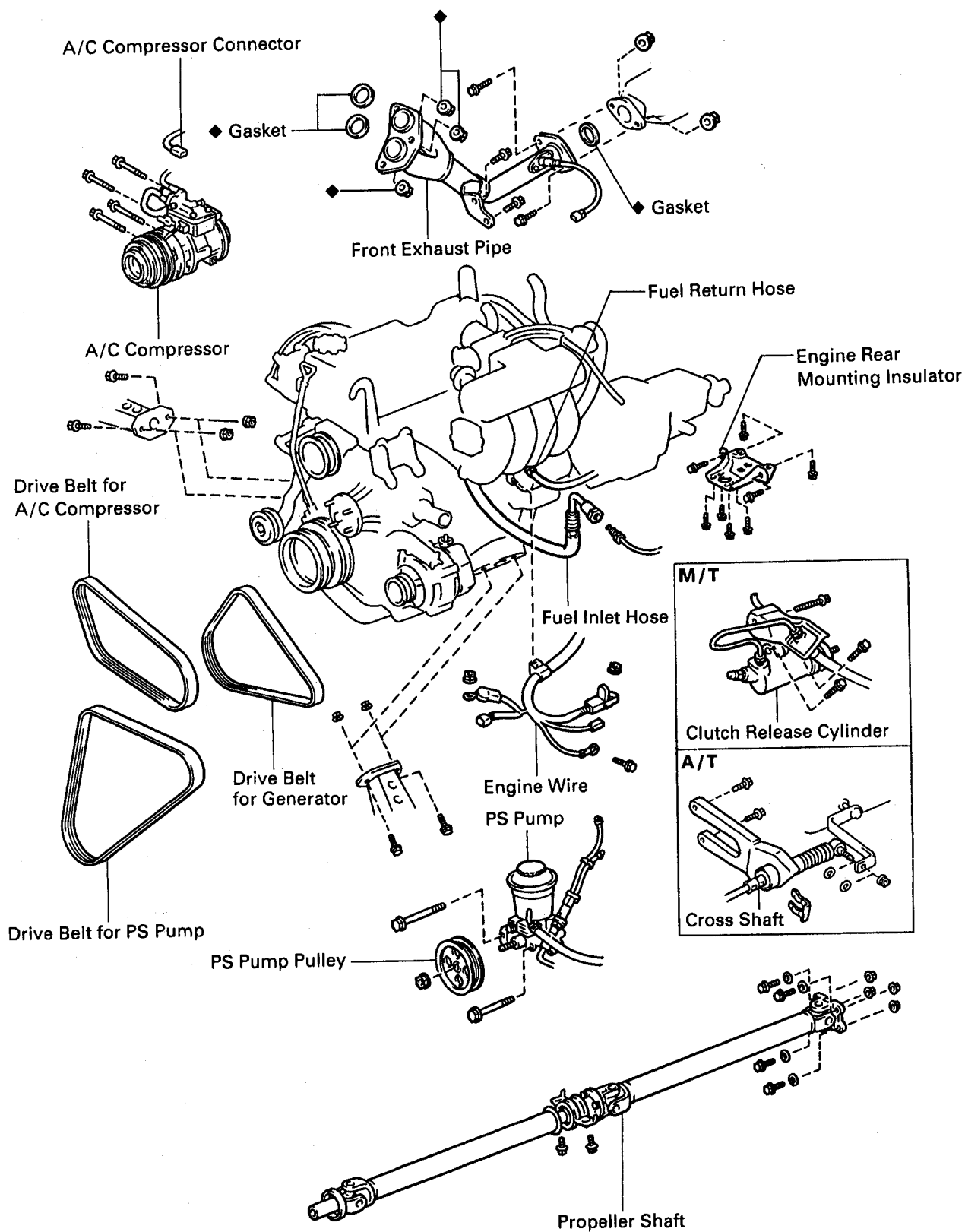
25. RECHECK ENGINE COOLANT AND ENGINE OIL LEVEL

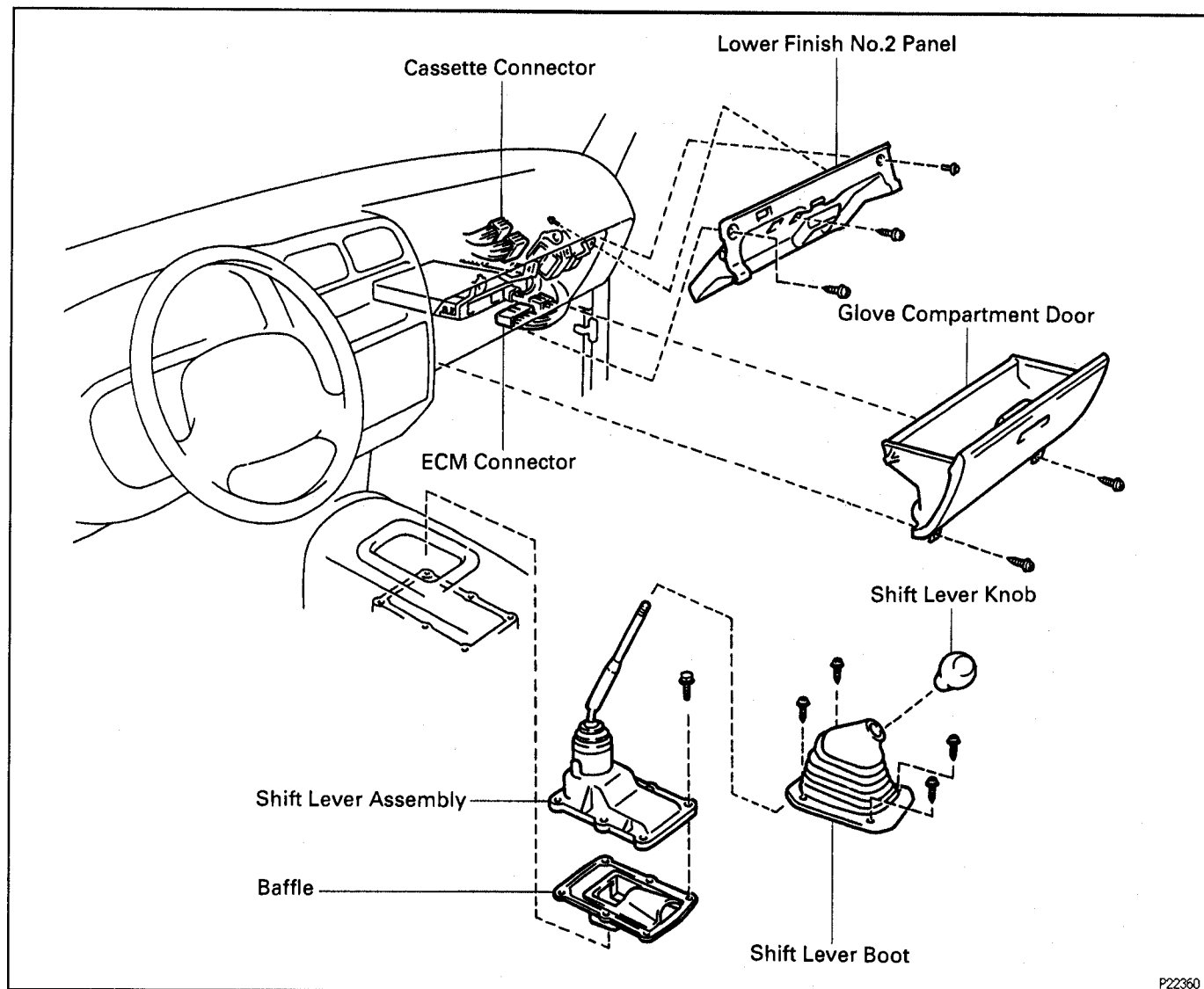
CYLINDER BLOCK

EG1K1-0A

2WD: COMPONENTS FOR REMOVAL AND INSTALLATION



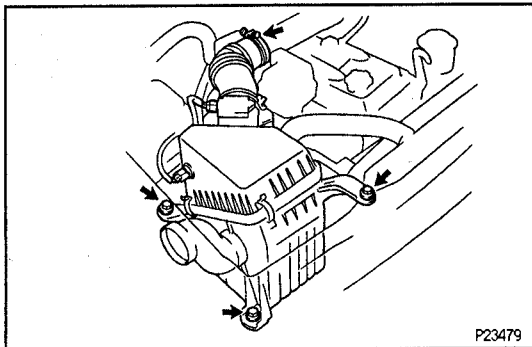




P22360

ENGINE WITH TRANSMISSION REMOVAL ^{EG64H-01}

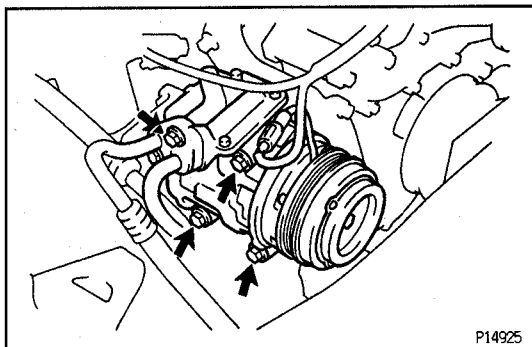
1. REMOVE ENGINE UNDER COVER
2. DRAIN ENGINE COOLANT
3. DRAIN ENGINE OIL
4. DRAIN TRANSMISSION OIL
5. REMOVE HOOD
6. REMOVE RADIATOR
(See radiator removal in Cooling System)
7. REMOVE DRIVE BELT FOR GENERATOR, FAN WITH FLUID COUPLING AND WATER PUMP PULLEY (See steps 6, 8 and 9 in water pump removal in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

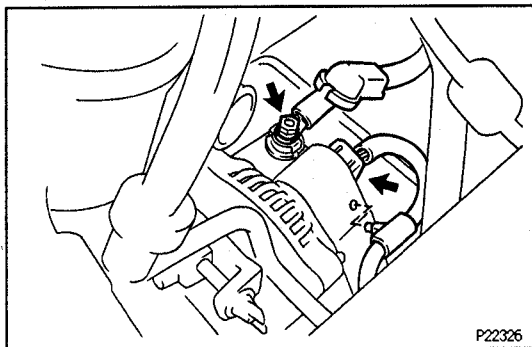
10. REMOVE INTAKE AIR CONNECTOR

(See step 4 in cylinder head removal)

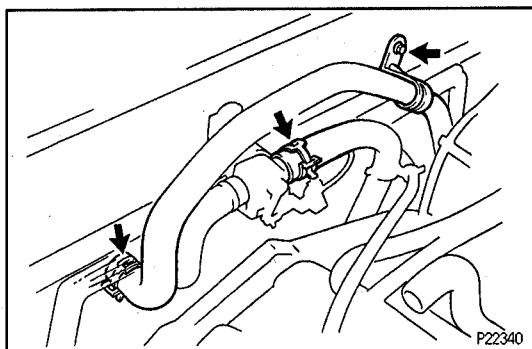
**11. w/A/C:****DISCONNECT A/C COMPRESSOR**

- (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.

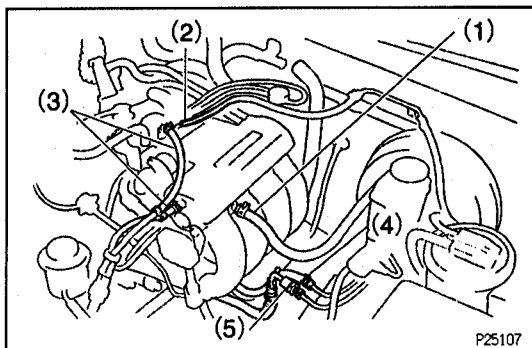
HINT: Put aside the compressor, and suspend it.

**12. REMOVE GENERATOR WIRE**

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

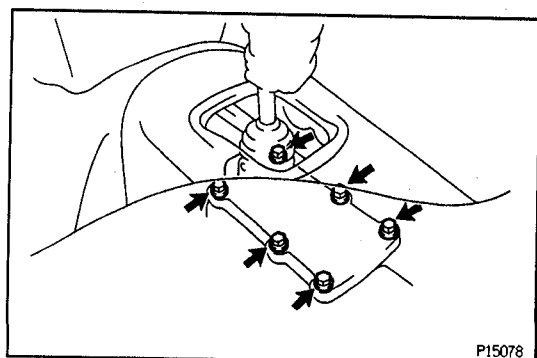
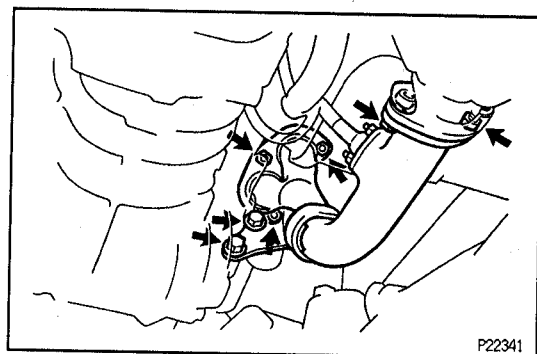
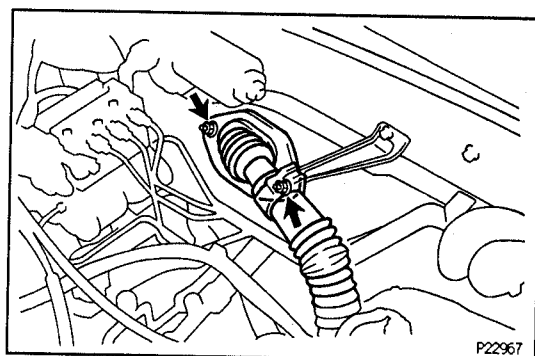
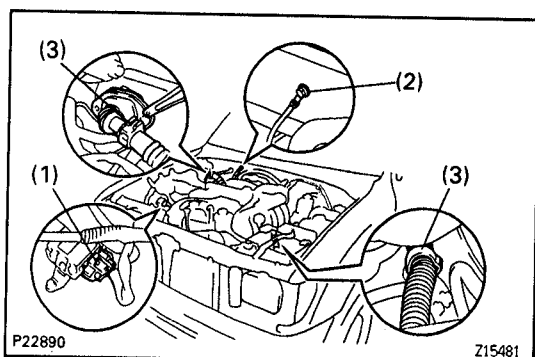
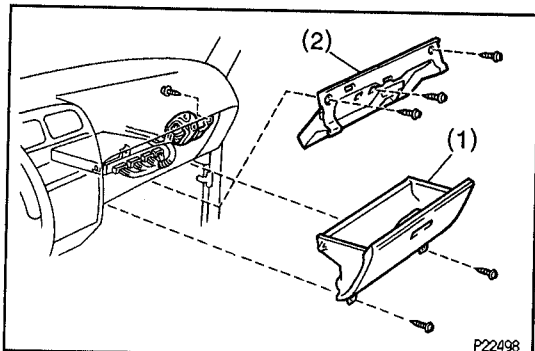
**13. DISCONNECT HEATER HOSES**

- (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.

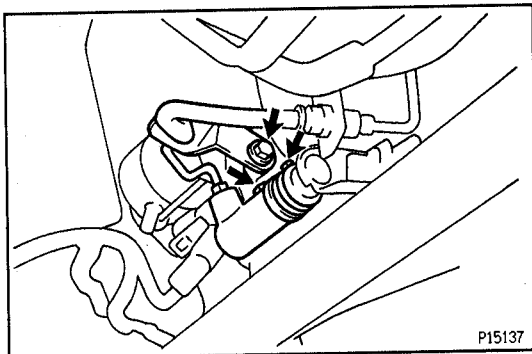
19. REMOVE PROPELLER SHAFT

(See propeller shaft removal in Propeller Shaft)

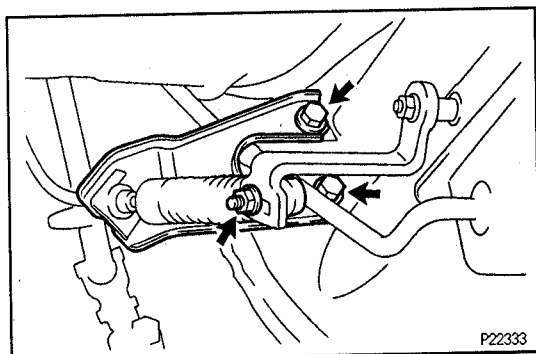
20. DISCONNECT SPEEDOMETER CABLE

NOTICE: Do not lose the felt protector and washers.

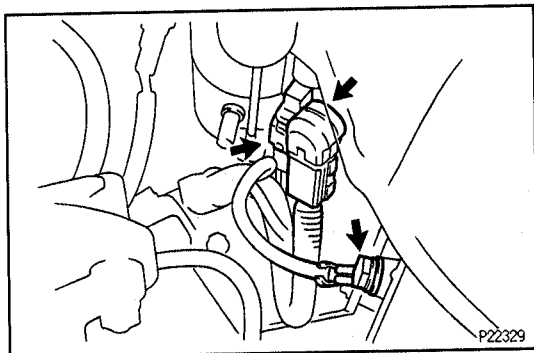
EG

**21. M/T:****REMOVE CLUTCH RELEASE CYLINDER**

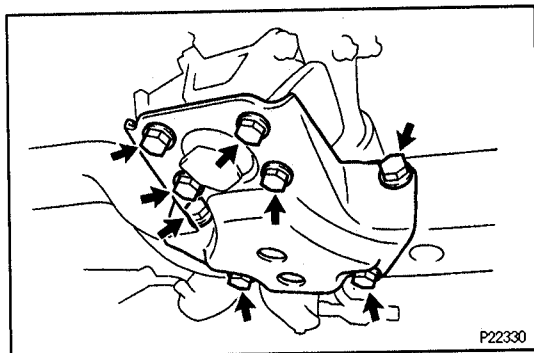
- (a) Remove the 2 bolts, and disconnect the clutch release cylinder from the clutch housing.
- (b) Remove the bolt and disconnect the clutch line.

**22. A/T:****REMOVE CROSS SHAFT**

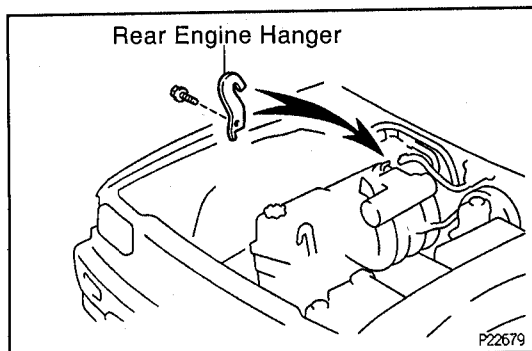
Remove the 2 bolts and nut, and disconnect bracket from the transmission.

**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**

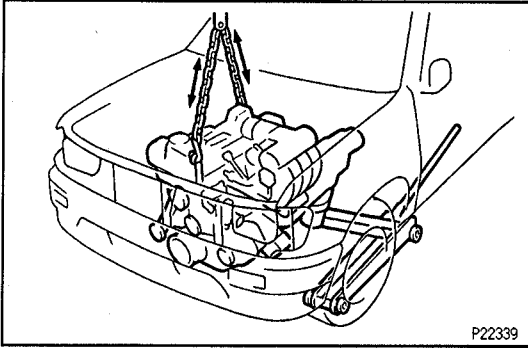
- (a) Install a rear engine hanger in the correct direction.

Part No.:

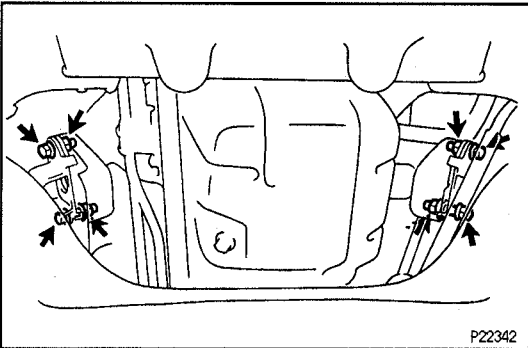
HANGER, ENGINE, NO.2 12282-75020

BOLT 91512-61020

Torque: 42 N·m (420 kgf·cm, 30 ft·lbf)



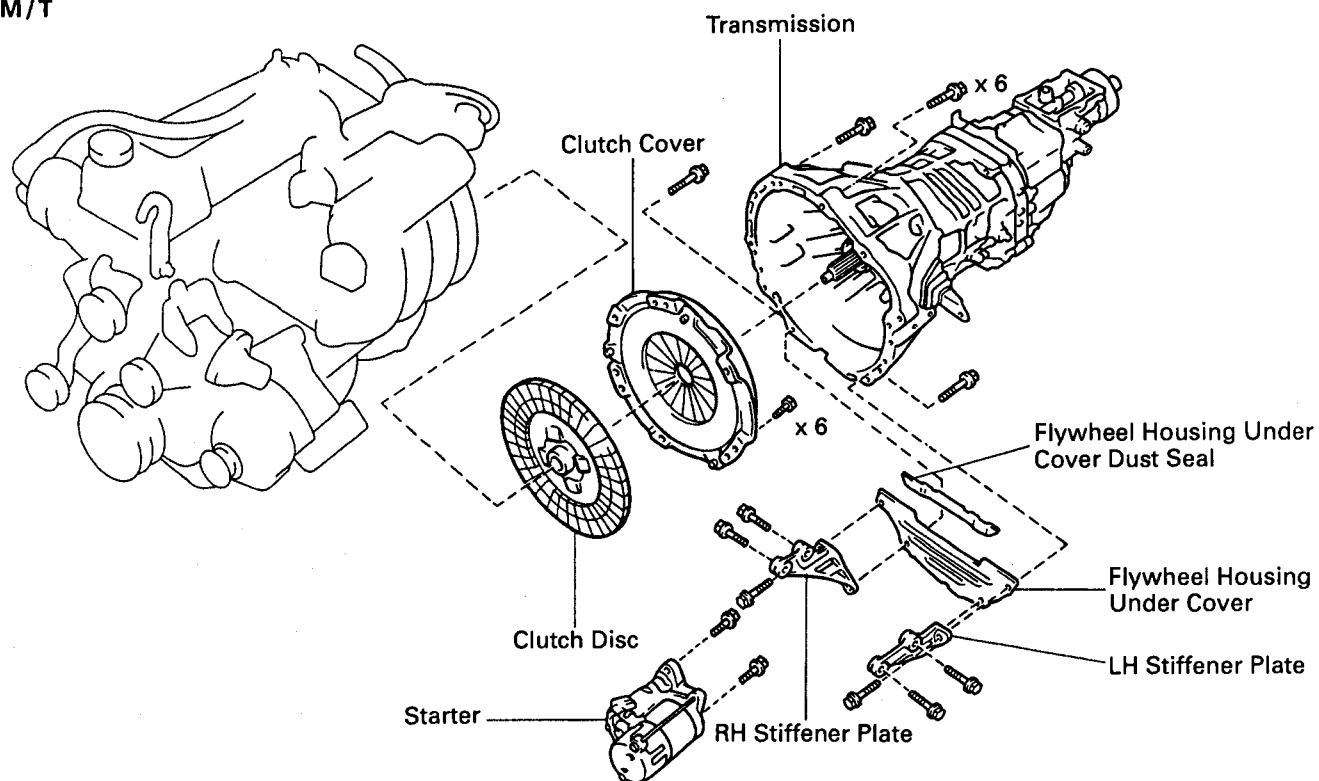
- (b) Attach the engine hoist chain to the 2 engine hangers.



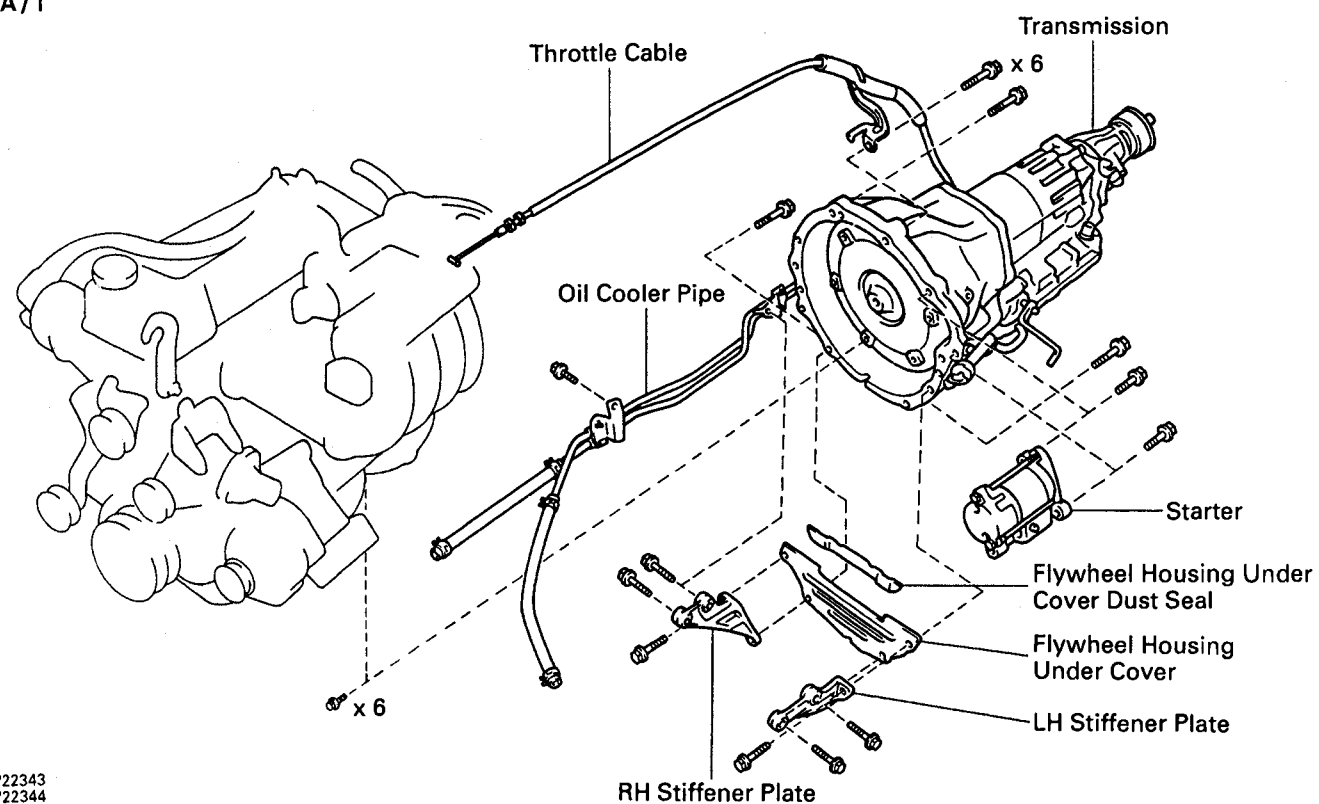
- (c) Remove the 4 bolts and nuts holding the engine front mounting insulators to the frame.
- (d) Lift the engine with transmission out of the vehicle slowly and carefully.
- NOTICE:** Make sure the engine is clear of all wiring and hoses.
- (e) Place the engine and transmission assembly onto the stand.

COMPONENTS FOR ENGINE AND TRANSMISSION SEPARATION (2WD)

M/T



A/T



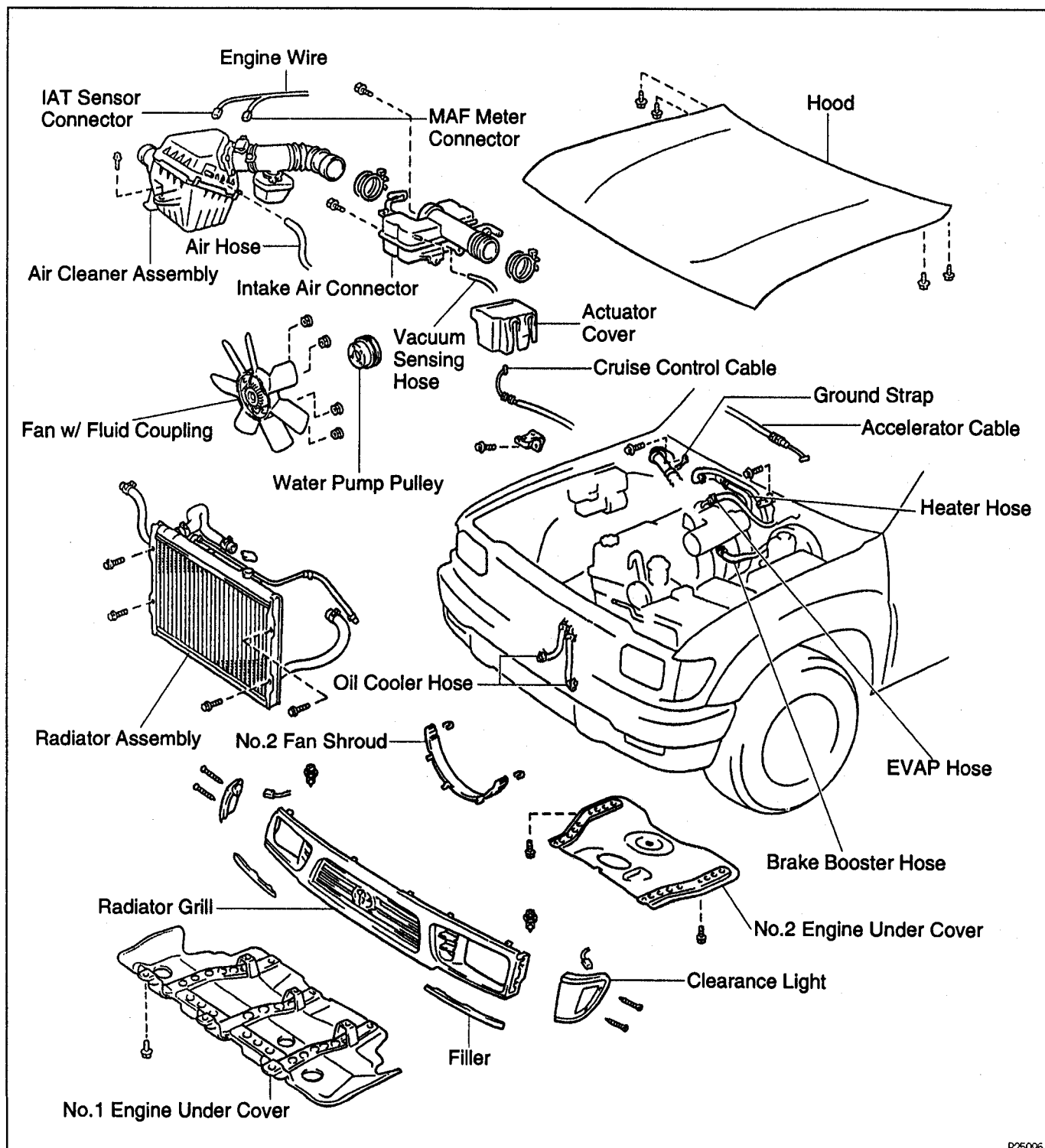
P22343
P22344

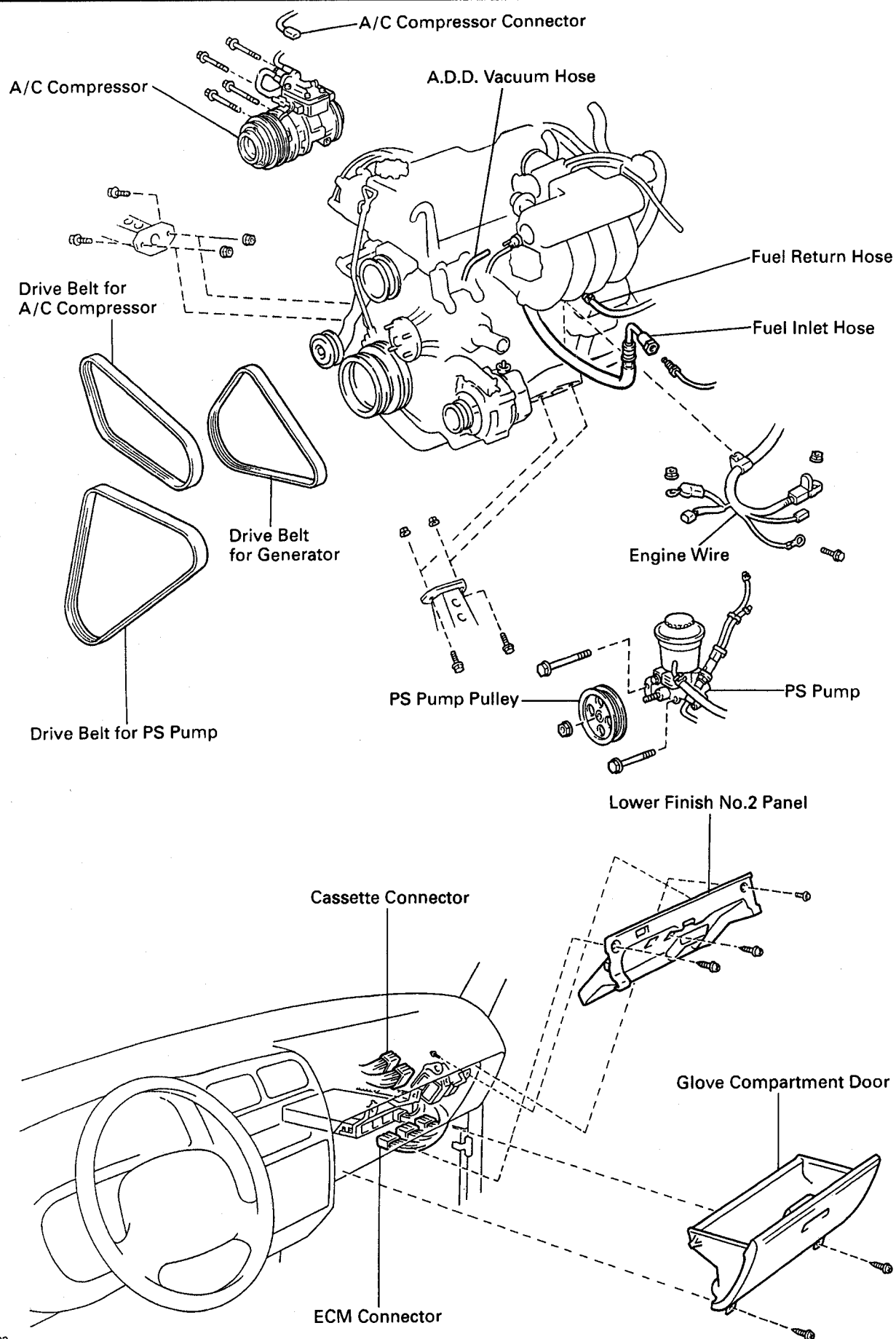
Z15259

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

COMPONENTS FOR REMOVAL AND INSTALLATION

EG

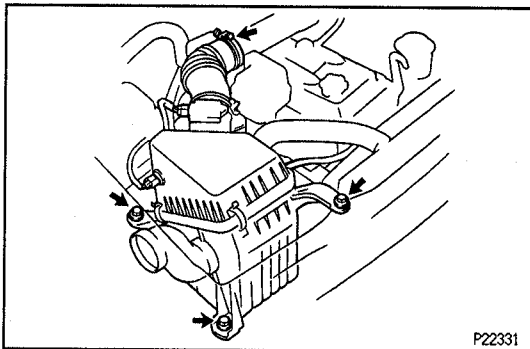




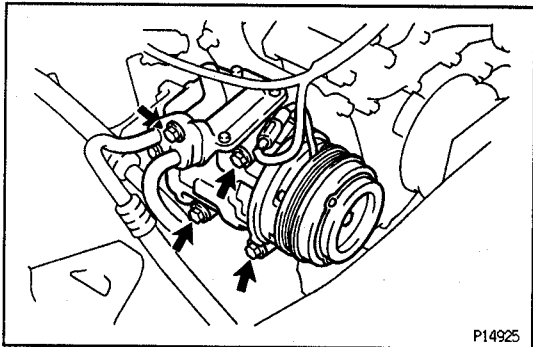
ENGINE REMOVAL

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.

EG

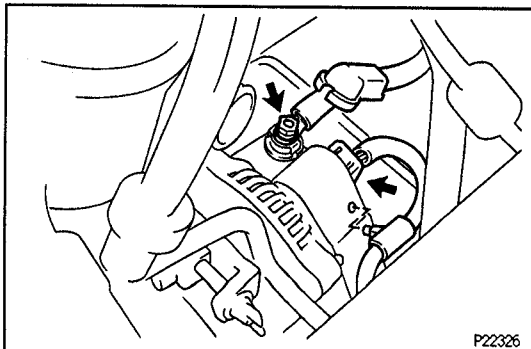


8. REMOVE AIR CLEANER ASSEMBLY
 - (a) Disconnect the IAT sensor and MAF meter connectors.
 - (b) Disconnect the 3 wire clamps and engine wire.
 - (c) California:
Disconnect the air hose from the air cleaner cap.
 - (d) Loosen the air cleaner hose clamp.
 - (e) Remove the 3 bolts and the MAF meter, resonator and air cleaner assembly.

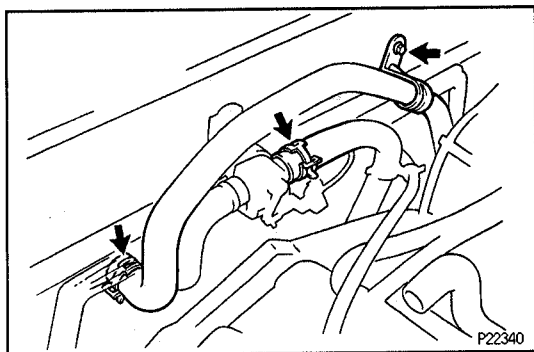


9. REMOVE INTAKE AIR CONNECTOR
(See step 4 in cylinder head removal)
10. w/A/C:
DISCONNECT A/C COMPRESSOR
 - (a) Loosen the idler pulley nut and adjusting bolt, and remove the drive belt.
 - (b) Disconnect the A/C compressor connector.
 - (c) Remove the 4 bolts, and disconnect the compressor from the bracket.

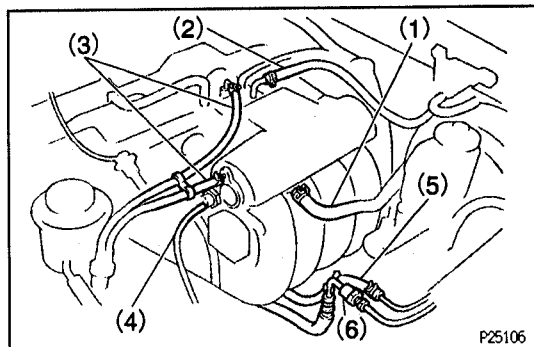
HINT: Put aside the compressor, and suspend it.



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

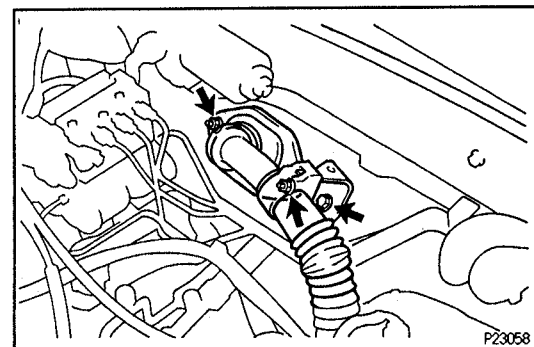
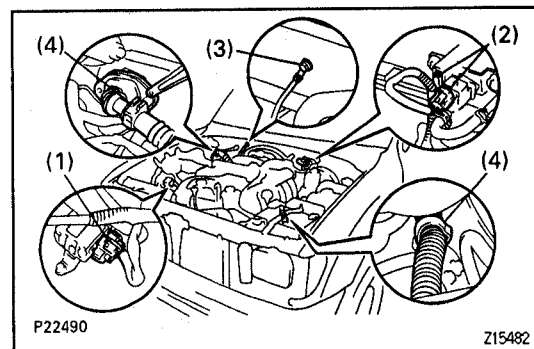
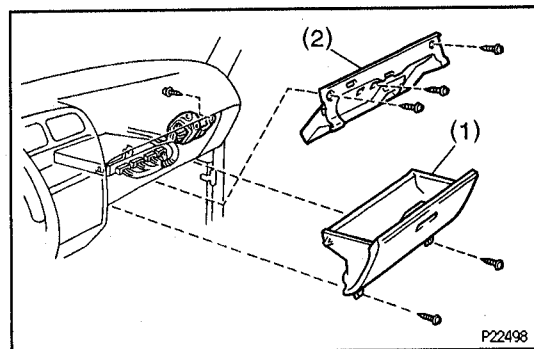
(See step 8 in cylinder head removal)

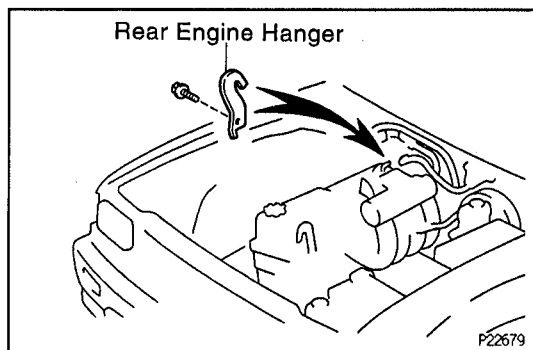
15. DISCONNECT ENGINE WIRE FROM CABIN

- (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**

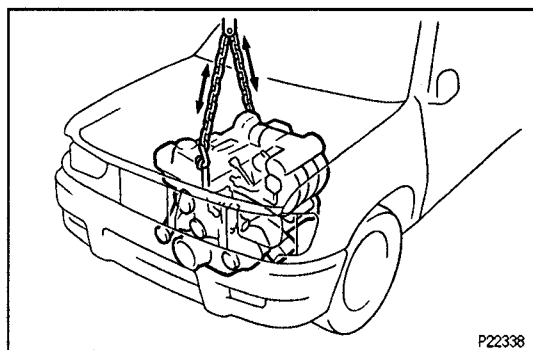
- (a) Install a rear engine hanger in the correct direction.

Part No.:

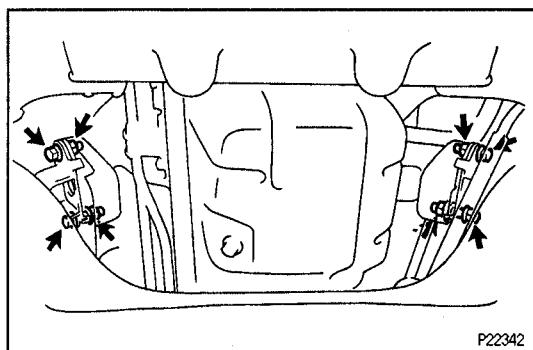
HANGER, ENGINE, NO.2 12282-75020

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.

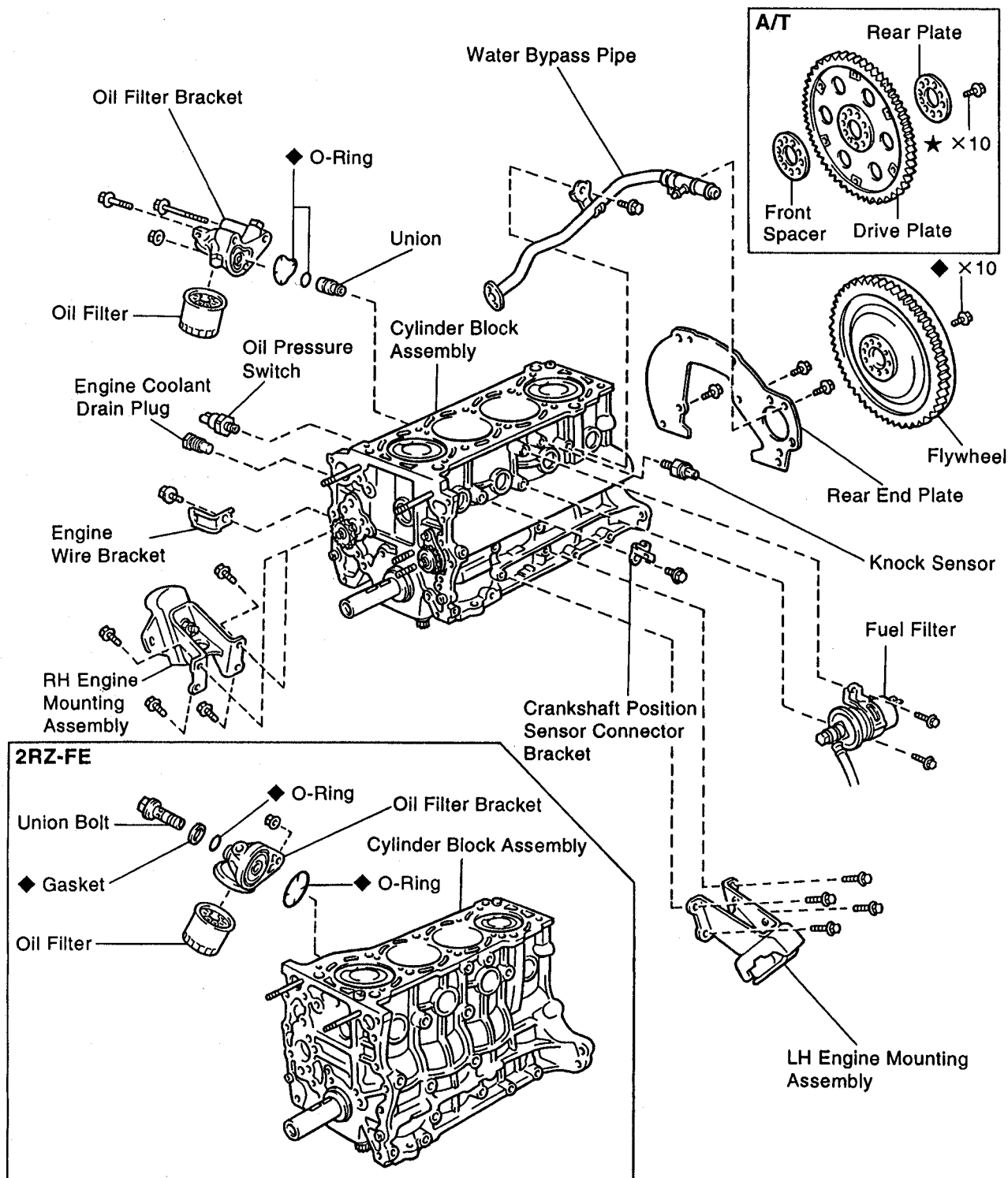
- (d) Lift the engine out of the vehicle slowly and carefully.

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

- (e) Place the engine onto the stand.

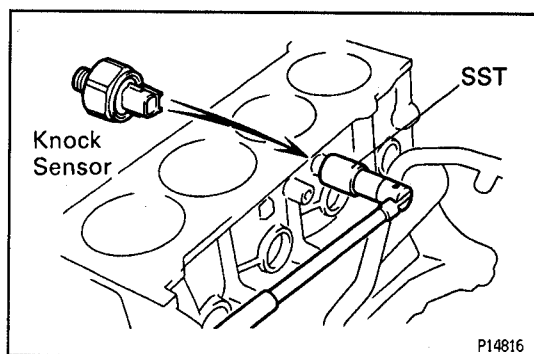
COMPONENTS FOR PREPARATION AND AFTER ASSEMBLY

EG

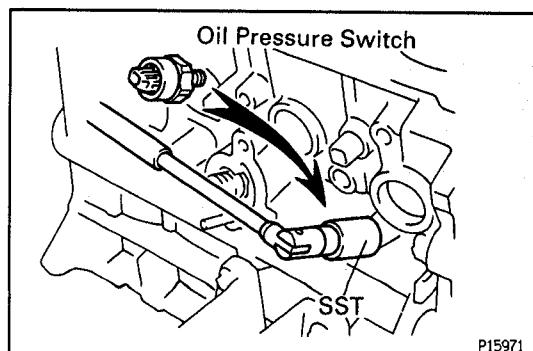


PREPARATION FOR DISASSEMBLY

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**

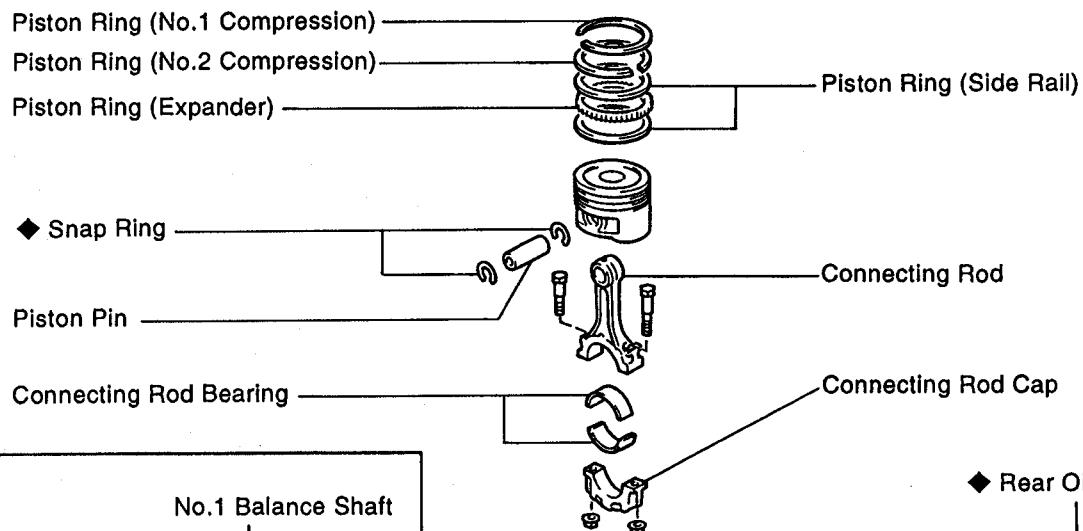


7. **REMOVE KNOCK SENSOR**
Using SST, remove the knock sensor.
SST 09816-30010
8. **REMOVE WATER BYPASS PIPE**
Remove the bolt and water bypass pipe.
9. **REMOVE OIL FILTER**
(See oil and filter replacement in Lubrication System)
10. **REMOVE OIL FILTER BRACKET**
 - A. **2RZ-FE:**
 - (a) Remove the nut, 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**

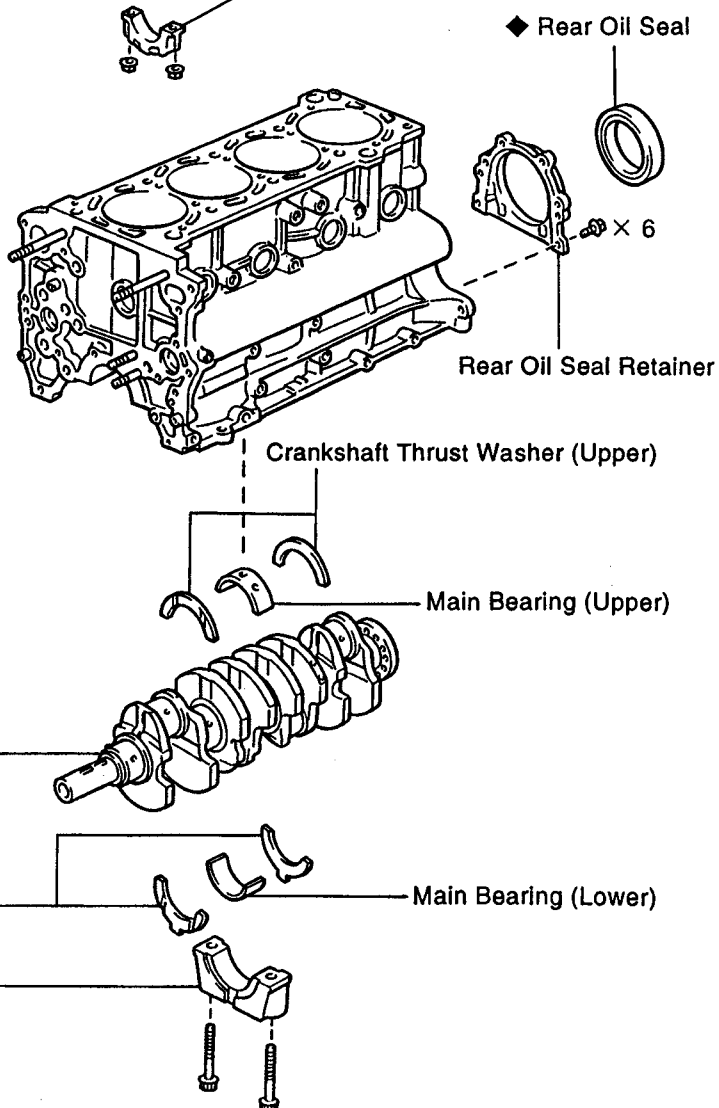
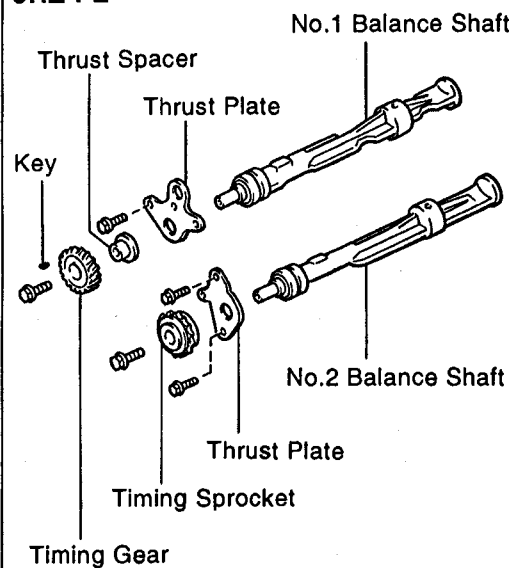


12. **REMOVE OIL PRESSURE SWITCH**
Using SST, remove the oil pressure switch.
SST 09816-30010
13. **REMOVE RH AND LH ENGINE MOUNTING ASSEMBLIES**
Remove the 4 bolts and mounting assembly.
14. **REMOVE ENGINE WIRE BRACKET**
15. **REMOVE CRANKSHAFT POSITION SENSOR CONNECTOR BRACKET**

COMPONENTS FOR CYLINDER BLOCK DISASSEMBLY AND ASSEMBLY

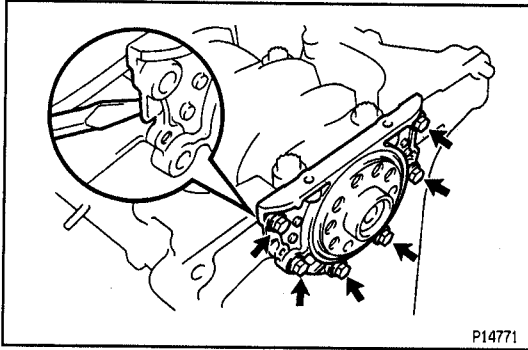


3RZ-FE



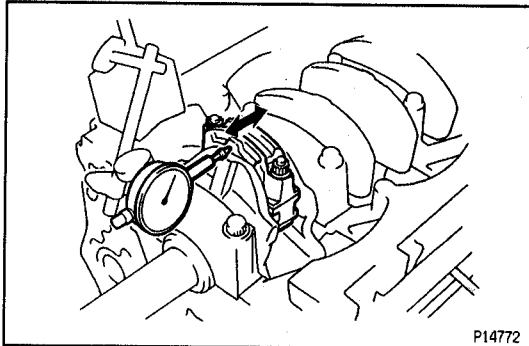
◆ Non-reusable part

CYLINDER BLOCK DISASSEMBLY



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.

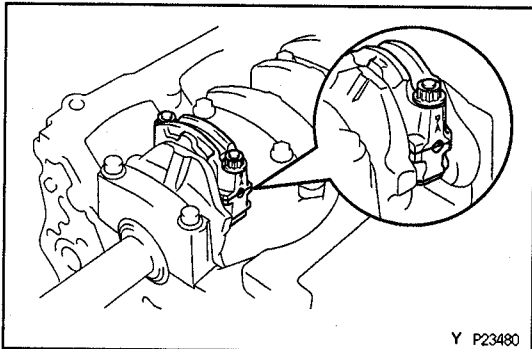
Standard thrust clearance:

0.160 – 0.312 mm (0.0063 – 0.0123 in.)

Maximum thrust clearance:

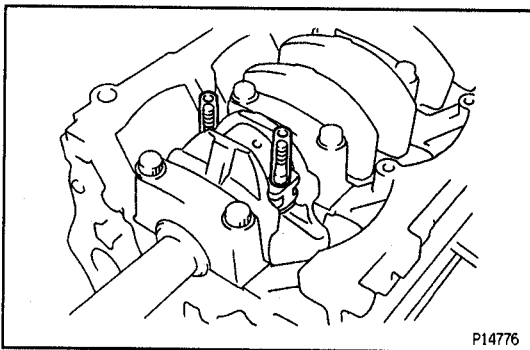
0.35 mm (0.0138 in.)

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



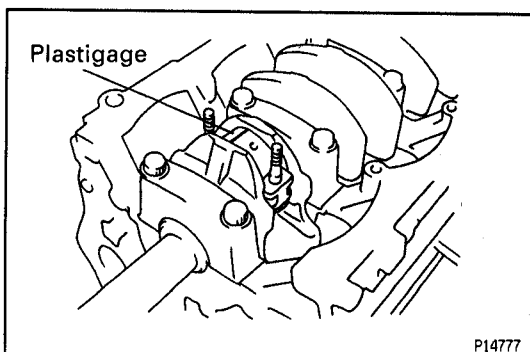
3. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

- (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)

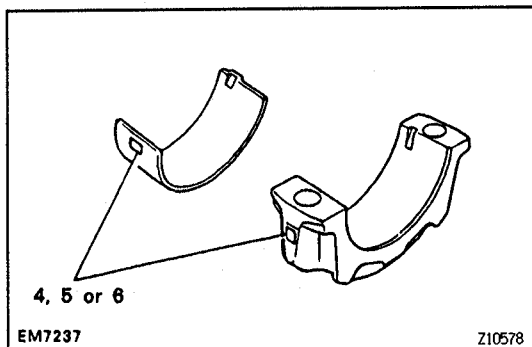
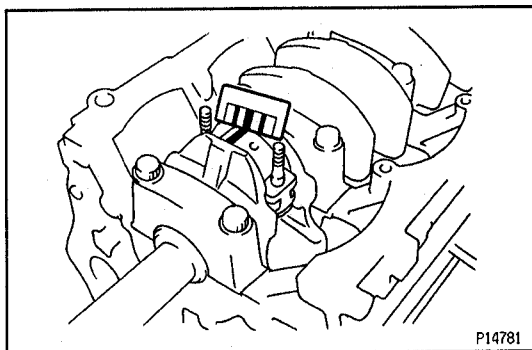
Torque:

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)



- (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.)

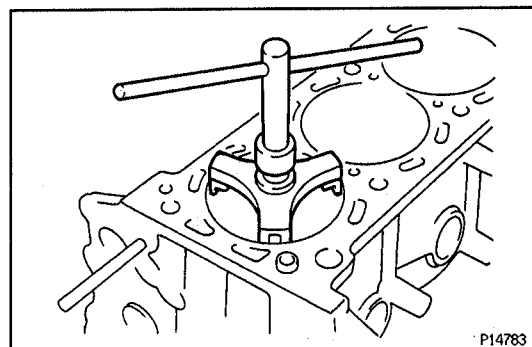
Crankshaft crank pin diameter:

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.

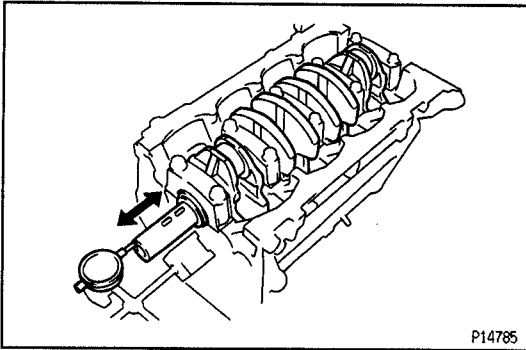


4. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES

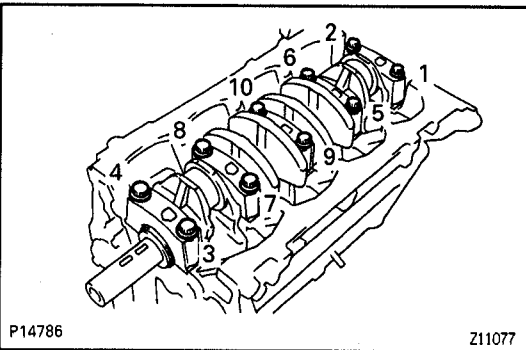
- Using a ridge reamer, remove the all carbon from the top of the cylinder.
- Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

HINT:

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

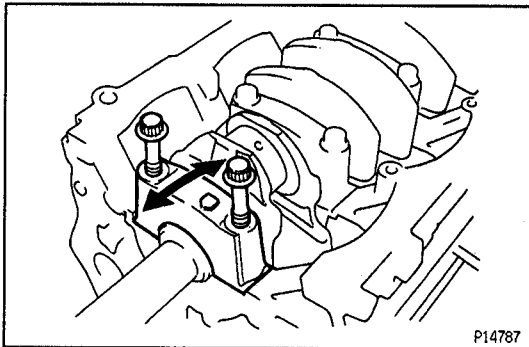


P14785

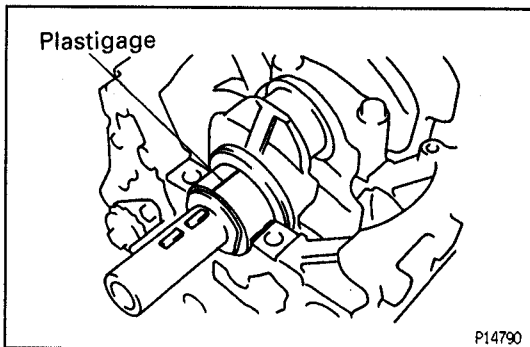


P14786

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)

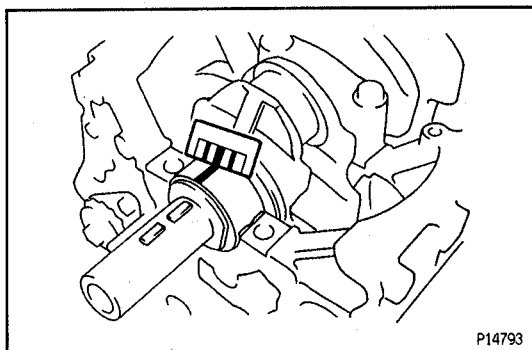
Torque:

1st 39 N·m (400 kgf·cm, 29 ft·lbf)

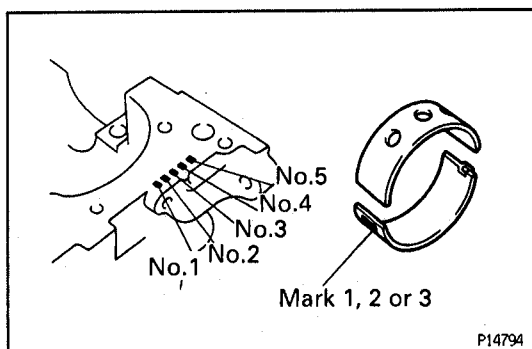
2nd Turn 90°

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:

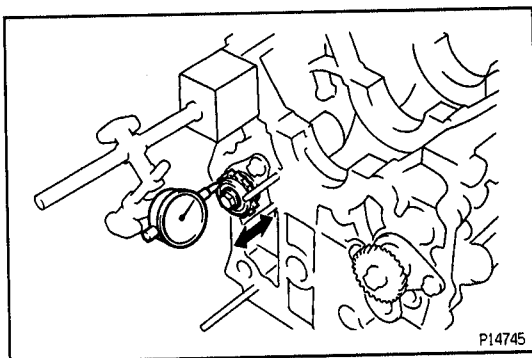
STD Mark "1"	1.987 — 1.990 mm (0.0782 — 0.0783 in.)
STD Mark "2"	1.991 — 1.993 mm (0.0784 — 0.0785 in.)
STD Mark "3"	1.994 — 1.996 mm (0.0785 — 0.0786 in.)
U/S 0.25	2.106 — 2.112 mm (0.0829 — 0.0831 in.)

- (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:

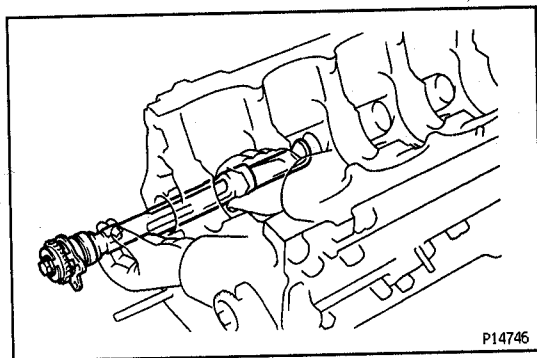
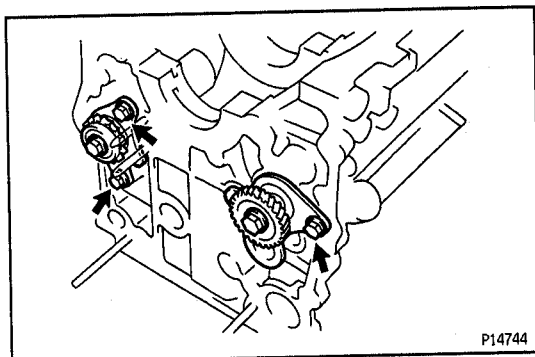
0.20 mm (0.0079 in.)

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

If necessary, replace the balance shaft.

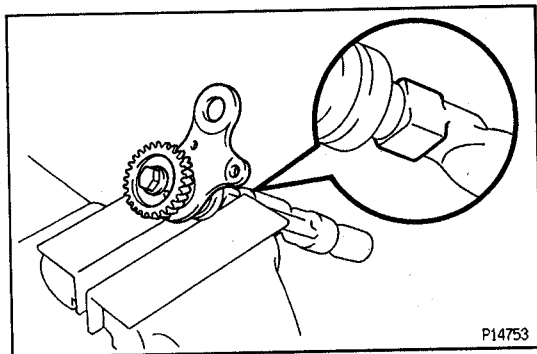
9. REMOVE NO.1 (RH) AND NO.2 (LH) BALANCE SHAFTS

- (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.



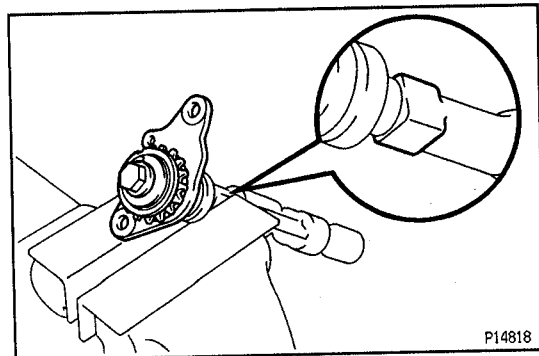
10. DISASSEMBLE NO.1 (RH) BALANCE SHAFT

- (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



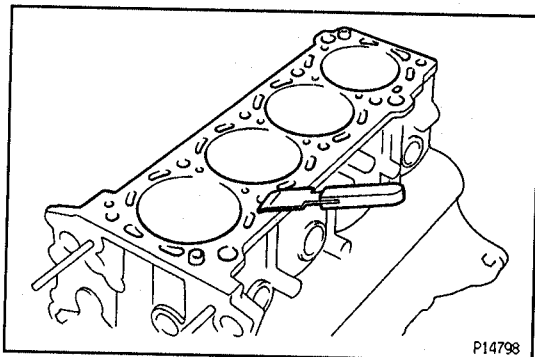
11. DISASSEMBLE NO.2 (LH) BALANCE SHAFT

- (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 plate
- Balance shaft timing sprocket



CYLINDER BLOCK INSPECTION

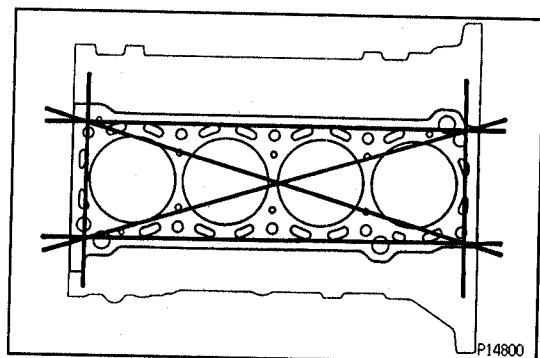
1. CLEAN CYLINDER BLOCK

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.



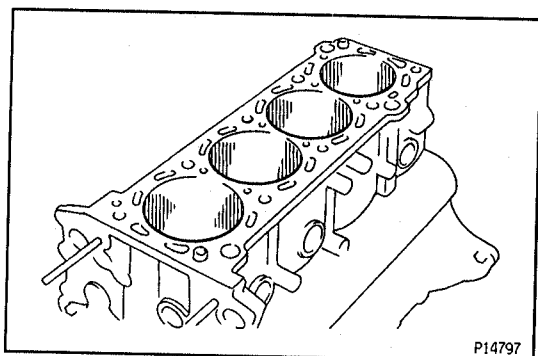
2. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS

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.)

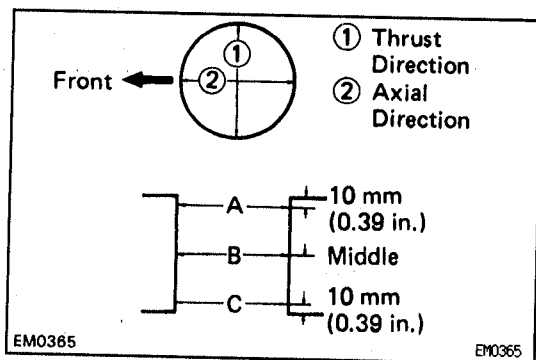
If warpage is greater than maximum, replace the cylinder block.



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.)

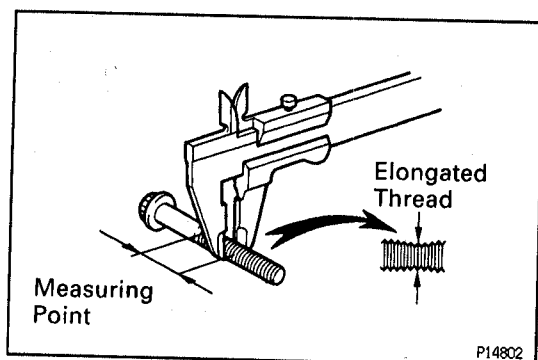
Maximum diameter:

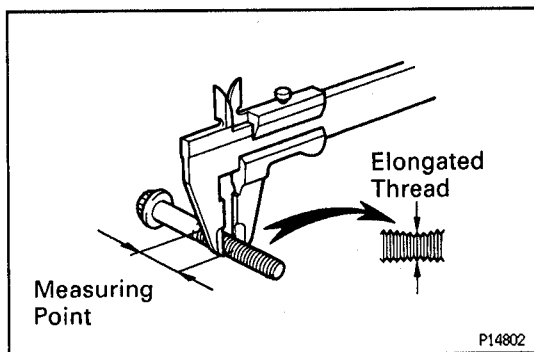
95.06 mm (3.7425 in.)

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.

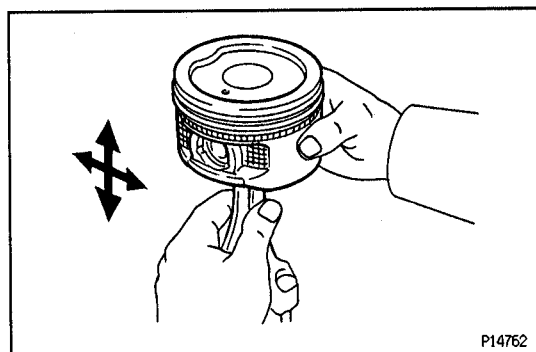
Standard outside diameter:

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.

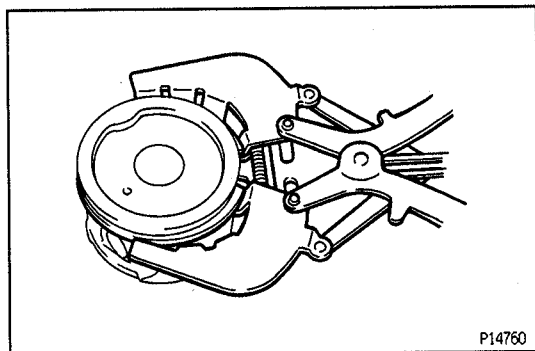


PISTON AND CONNECTING ROD ASSY DISASSEMBLY

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.

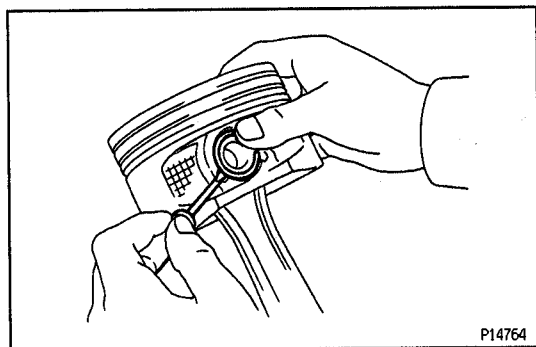


2. REMOVE PISTON RINGS

(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

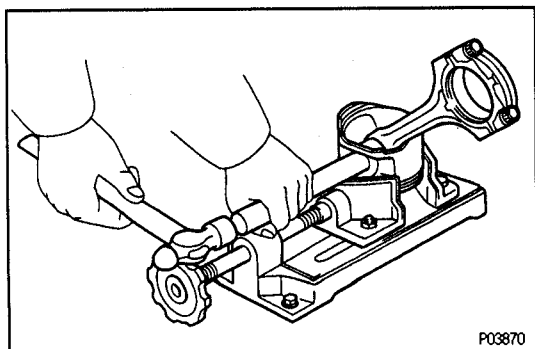
(a) Using a small screwdriver, pry out the 2 snap rings.

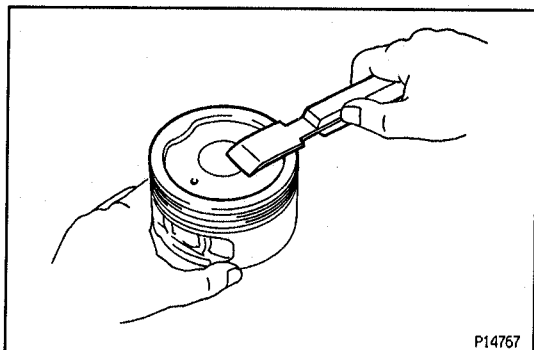
(b) Gradually heat the piston to 80 — 90°C (176 — 194 °F).

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

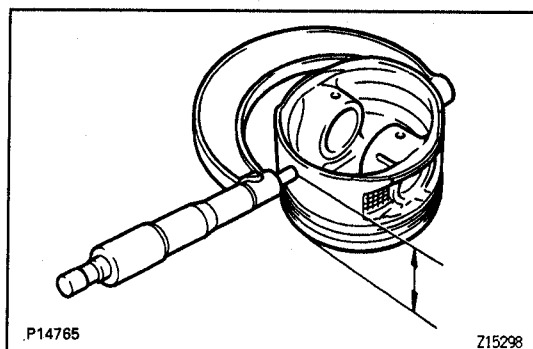
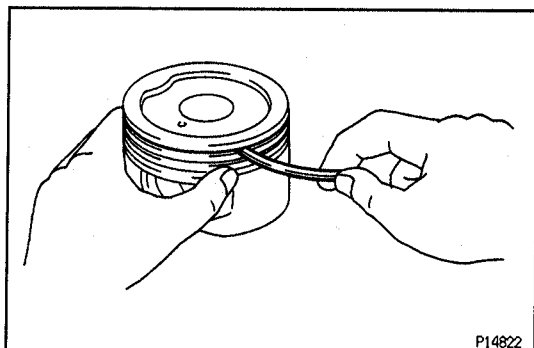
HINT:

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





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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:

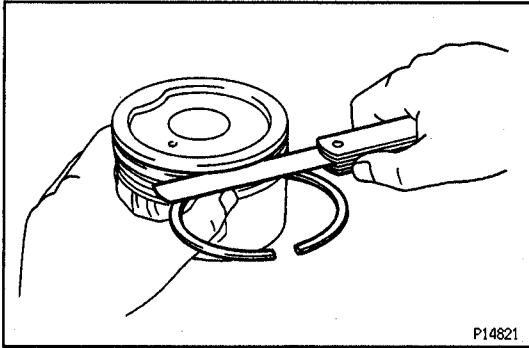
0.057 — 0.080 mm (0.0022 — 0.0031 in.)

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:

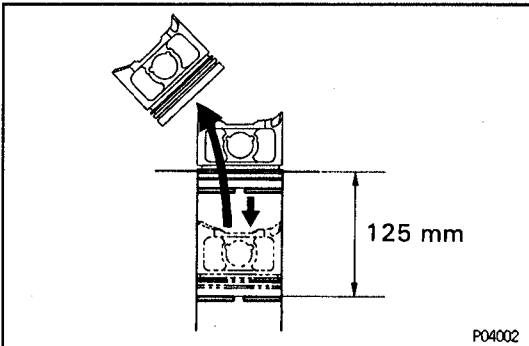
No.1

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:

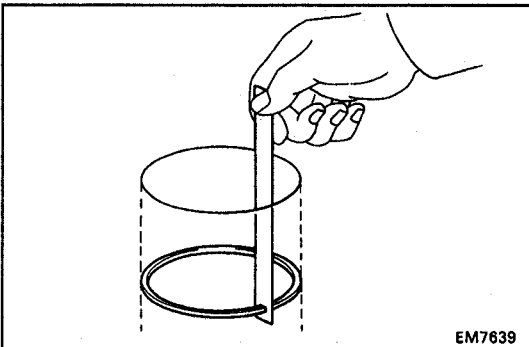
No.1

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**

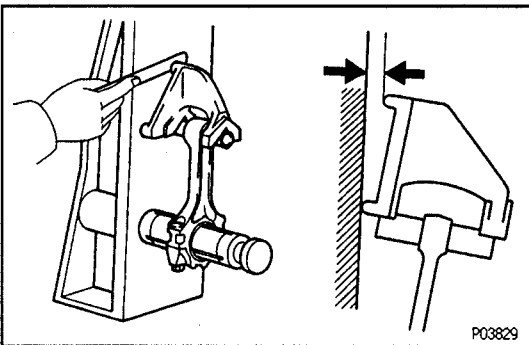
Using a rod aligner and thickness gauge, check the connecting rod alignment.

- 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.

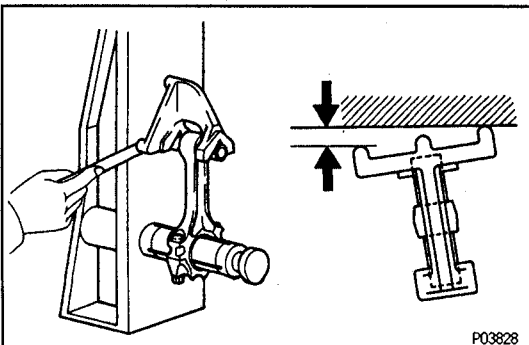


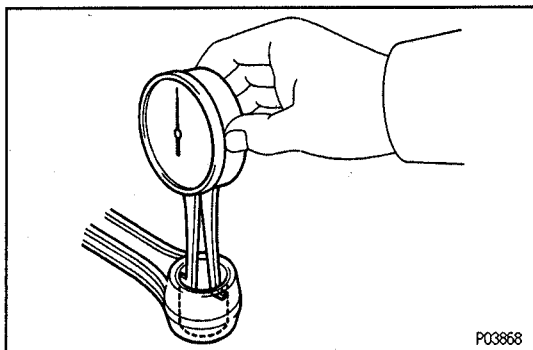
- Check for twist

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.



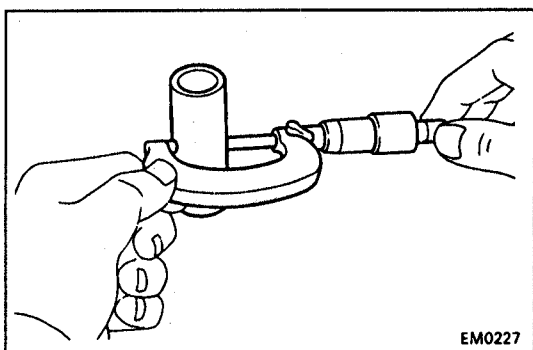


B. Inspect piston pin oil clearance

- (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:

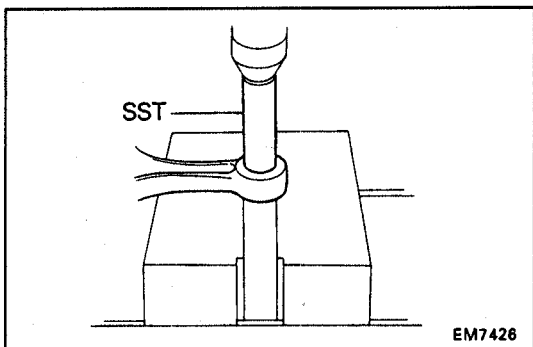
0.015 mm (0.0006 in.)

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.

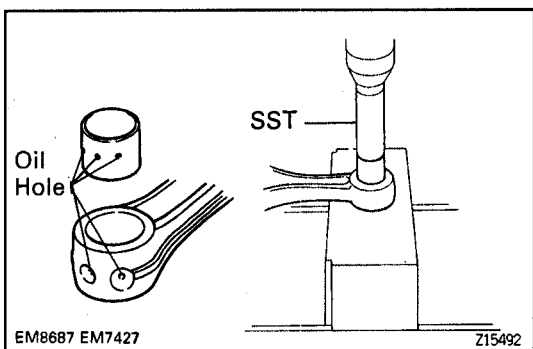
SST 09207-76010



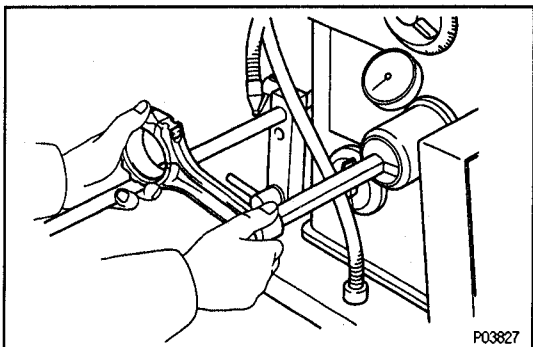
- (b) Align the oil holes of a new bushing and the connecting rod.

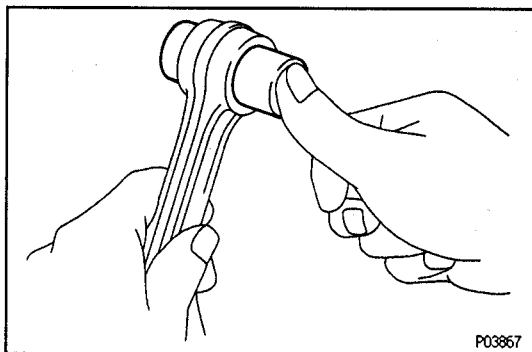
- (c) Using SST and a press, press in the bushing.

SST 09207-76010

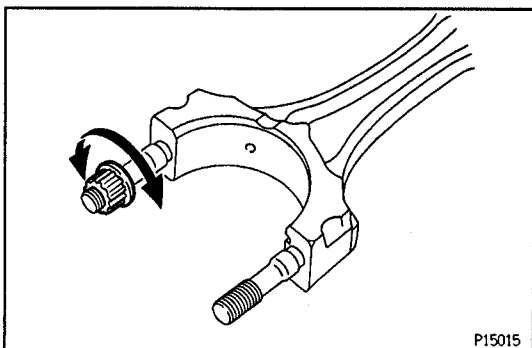


- (d) Using a pin hole grinder, hone the bushing to obtain the standard specified clearance (see step B above) between the bushing and piston pin.





- (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:

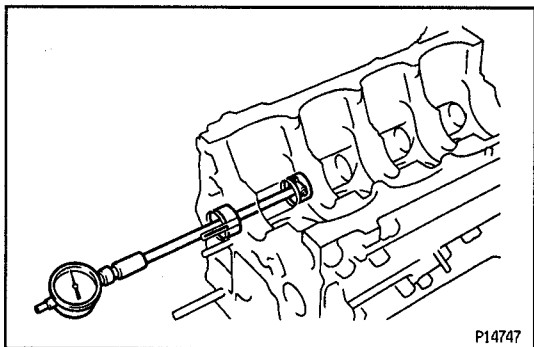
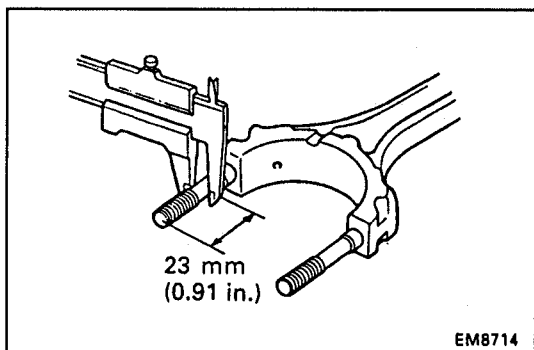
7.80 – 7.90 mm (0.3071 – 0.3110 in.)

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.



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.

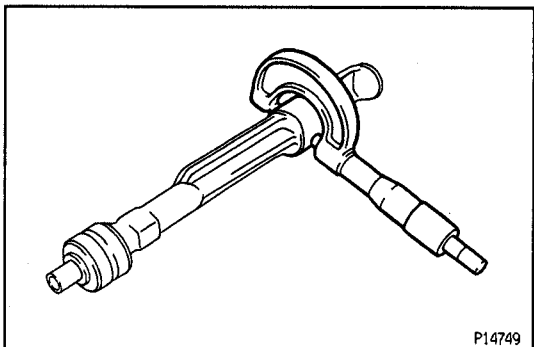
Main journal diameter (from front side):

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.

CYLINDER BORING

EG64M-01

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:

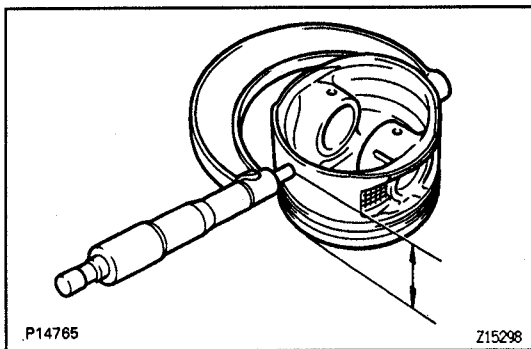
0.057 — 0.080 mm (0.0022 — 0.0031 in.)

3RZ-FE:

0.047 — 0.070 mm (0.0019 — 0.0028 in.)

H = Allowance for honing

0.020 mm (0.0008 in.) or less



P14765

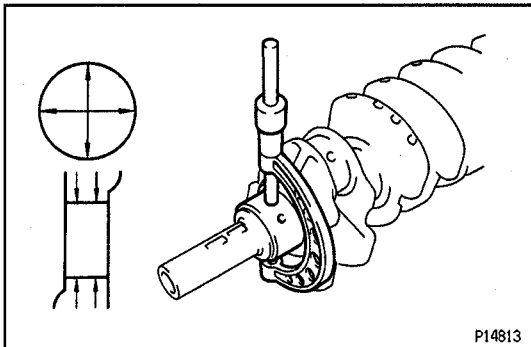
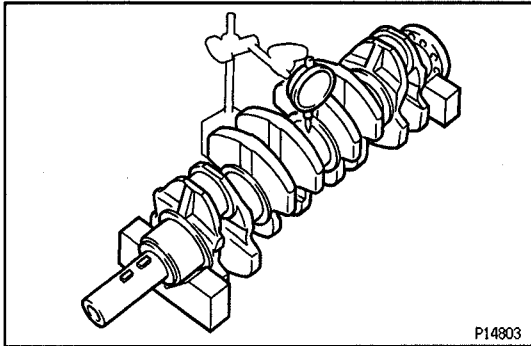
Z15298

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 ^{EG08Y-10}

1. INSPECT CRANKSHAFT FOR RUNOUT

- Place the crankshaft on V-blocks.
- 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

- 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.

- 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).

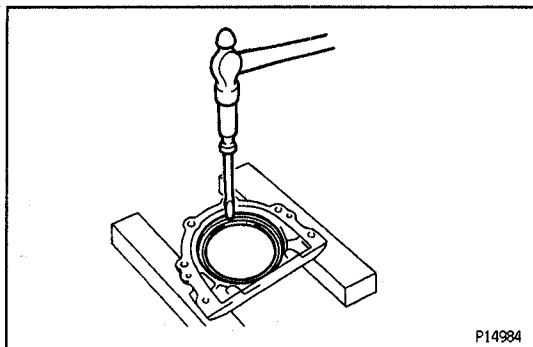
Install new main journal and/or crank pin undersized bearings.

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)

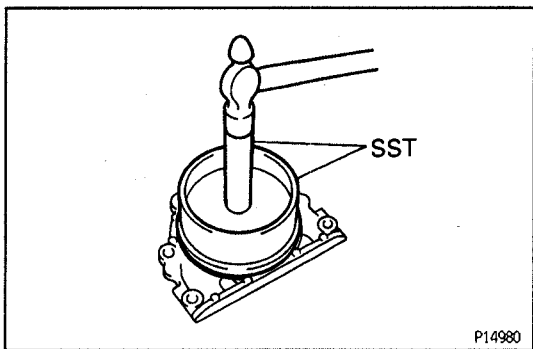


P14984

2. REPLACE CRANKSHAFT REAR OIL SEAL

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

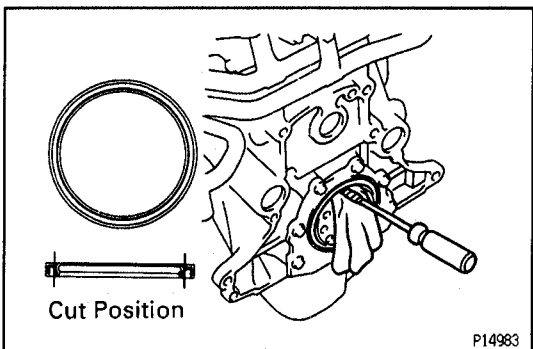
- (a) Using a screwdriver and a hammer, tap out the oil seal.



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.

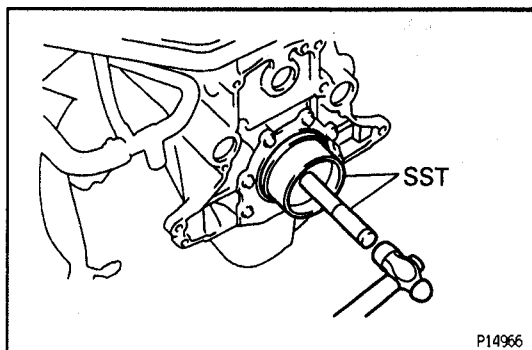


P14983

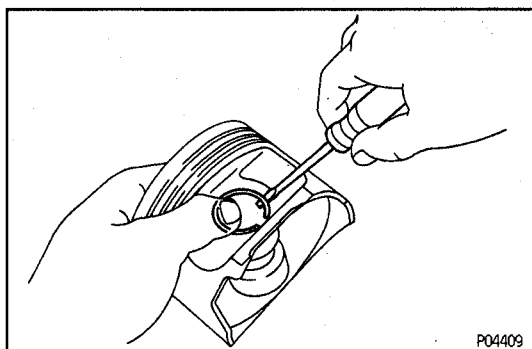
B. If rear oil seal retainer is installed to cylinder block:

- (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.



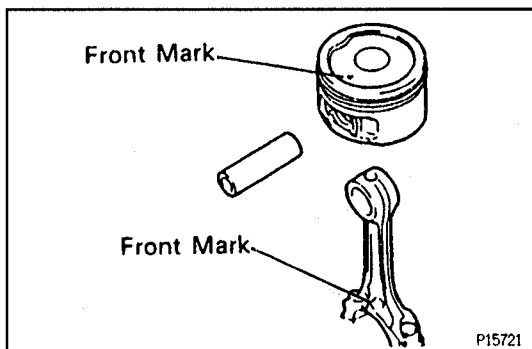
- (c) Apply MP grease to a new oil seal lip.
- (d) Using SST and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223-15030, 09950-70010 (09951-07150)



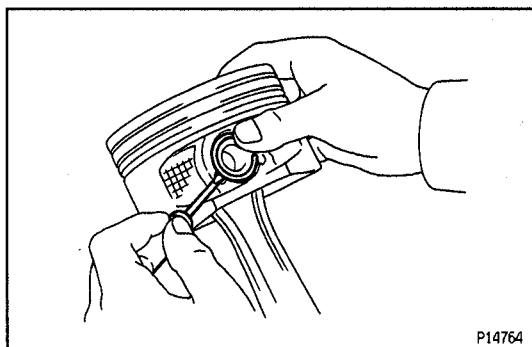
PISTON AND CONNECTING ROD ASSEMBLY

1. ASSEMBLE PISTON AND CONNECTING ROD

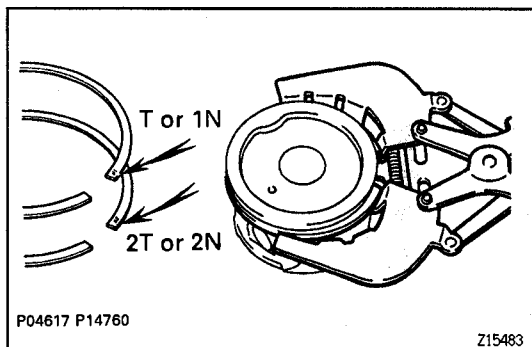
- (a) Install a new snap ring on one side of the piston pin hole.
- (b) Gradually heat the piston to 80–90°C (176–194°F).



- (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.



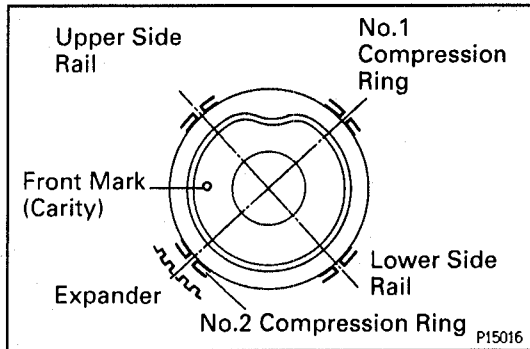
2. INSTALL PISTON RINGS

- (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

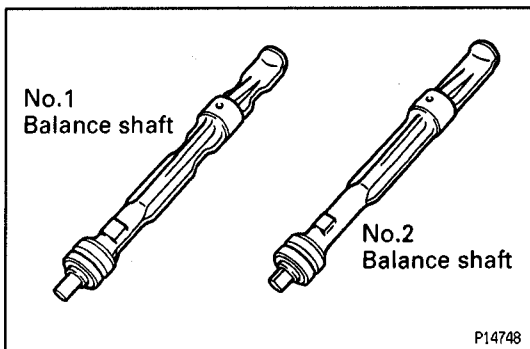
- (a) Align the bearing claw with the groove of the connecting rod or connecting rod cap.
 (b) Install the bearings in the connecting rod and connecting rod cap.

CYLINDER BLOCK ASSEMBLY

EG04N-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.

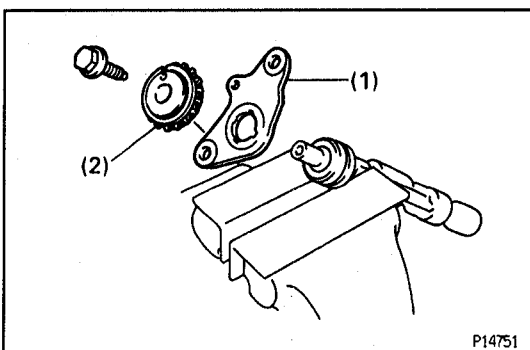
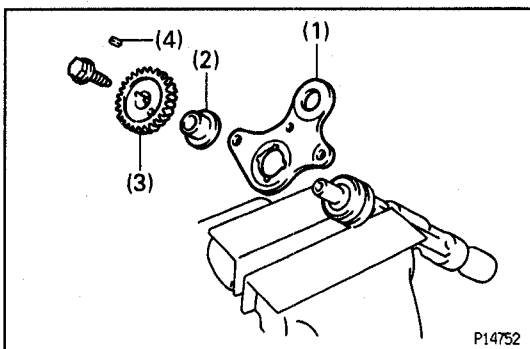
NOTICE: Be careful not to damage the balance shaft.

- (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.

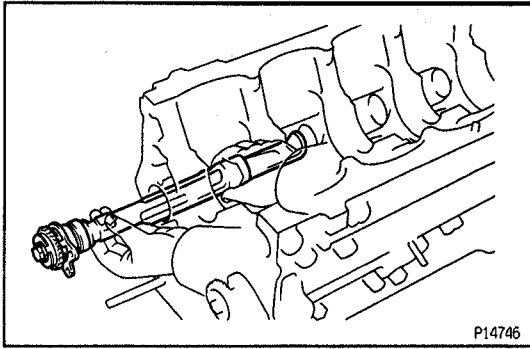
NOTICE: Be careful not to damage the balance shaft.

- (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)

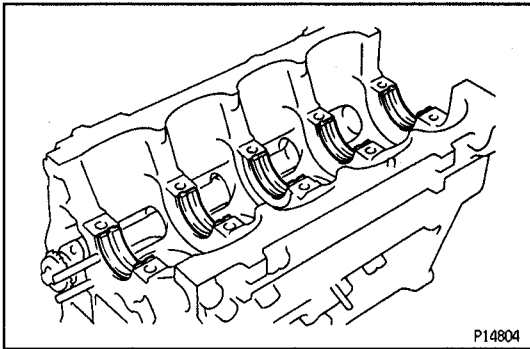


3. INSTALL BALANCE SHAFTS

- (a) Install balance shafts.

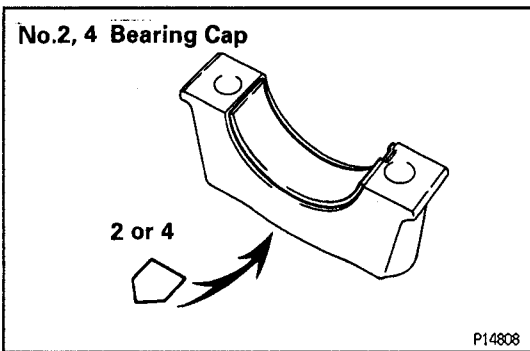
NOTICE: When installing the balance shaft make sure you support the balance shaft with both hands and avoid scratching the balance shaft bearing on the cylinder block side.

- (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)

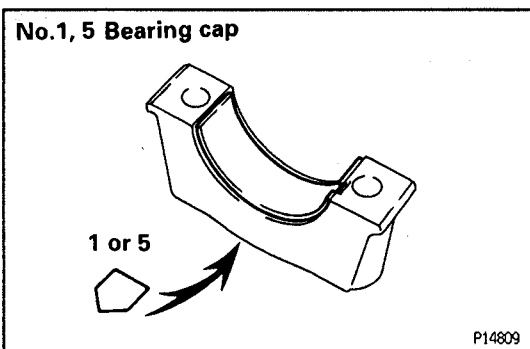


4. INSTALL MAIN BEARINGS

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



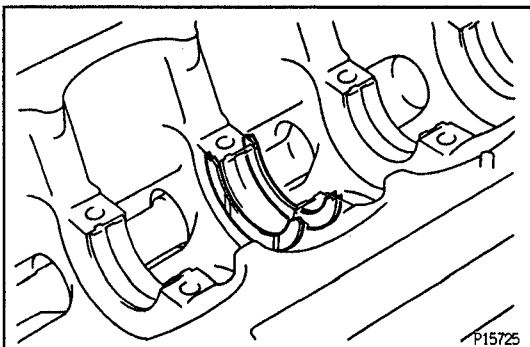
- (b) Align the bearing claw with the claw groove of the main bearing cap, and push in the 5 lower bearings.
HINT: A number is marked on each main bearing cap to indicate the installation position.



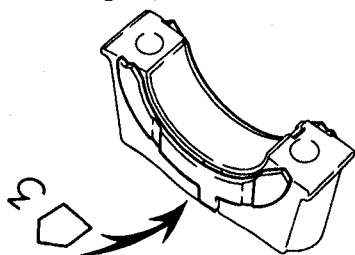
5. INSTALL UPPER THRUST WASHERS

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



No.3 Bearing Cap



P14806

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.

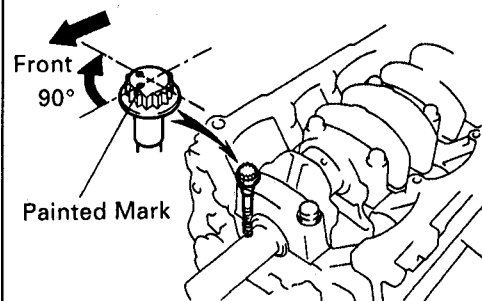
- (c) Mark the front of the main bearing cap bolt with paint.

- (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)



P14792

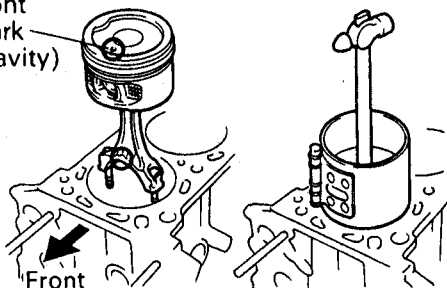
Z15490

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.

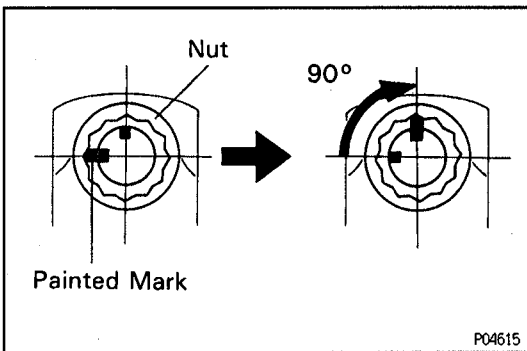
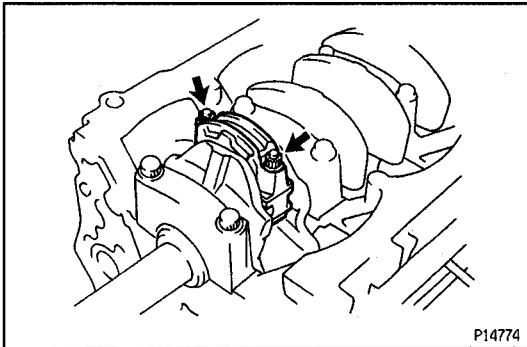
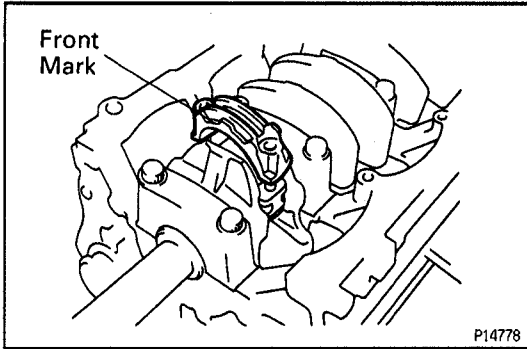
- (b) Using a piston ring compressor, push the correctly numbered piston and connecting rod assemblies into each cylinder with the front mark of the piston facing forward.

Front Mark (Cavity)



Front

Z14823



9. INSTALL CONNECTING ROD CAPS

A. Place connecting rod cap on connecting rod

- Match the numbered connecting rod cap with the connecting rod.
- 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.

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

- Mark the front of the connecting rod cap nut and bolt with paint.
- Retighten the connecting rod cap nuts 90° as shown.
- Check that the painted mark on the nut is at a 90° angle in relation to the mark on the bolt.
- Check that the crankshaft turns smoothly.
- Check the connecting rod thrust clearance.
(See step 2 in cylinder block disassembly)

10. INSTALL REAR OIL SEAL RETAINER

- 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.

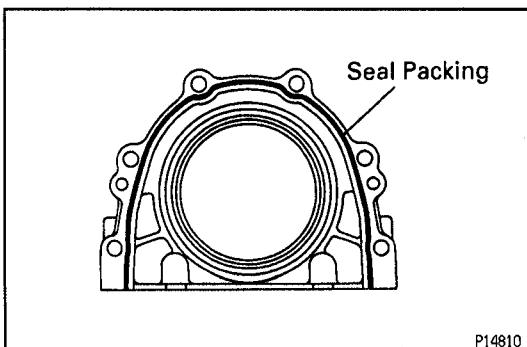
- Apply seal packing to the retainer as shown in the illustration.

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.



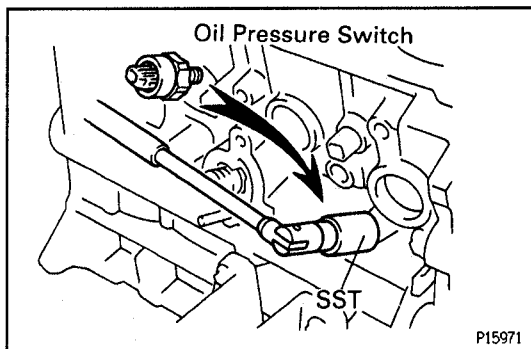
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
 - Immediately remove nozzle from the tube and reinstall cap.
- (c) Install the retainer with the 6 bolts.
Torque: 13.5 N·m (135 kgf·cm, 9.7 ft·lbf)

AFTER ASSEMBLY

E08N3-02

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)

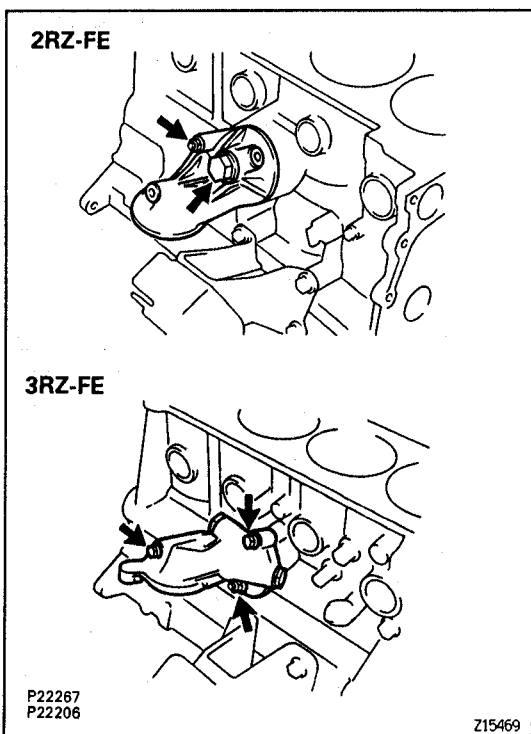
B. 3RZ-FE:

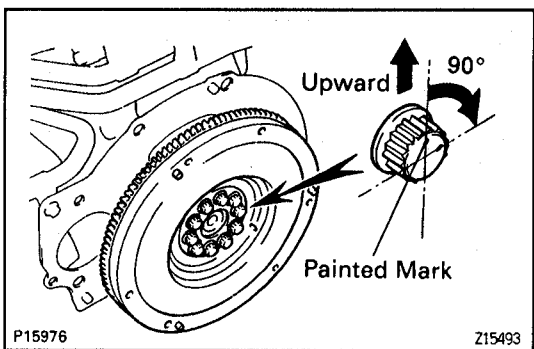
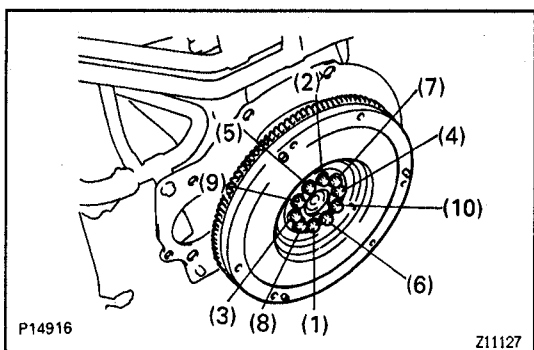
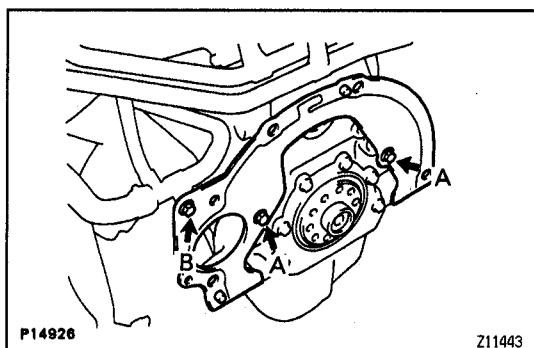
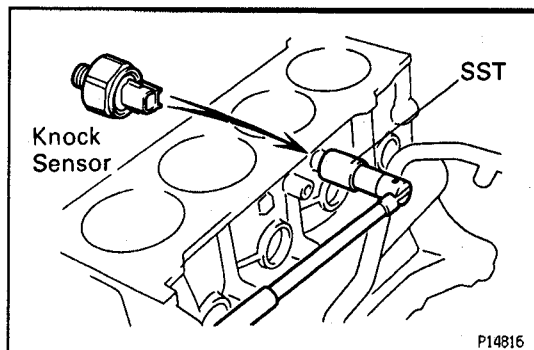
- (a) Install a new O-ring to the union.
(b) Using a 14 mm hexagon wrench, install the union.
Torque: 24.5 N·m (250 kgf·cm, 18 ft·lbf)
(c) Install a new O-ring and the oil filter bracket with the 2 bolts and nut.

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)

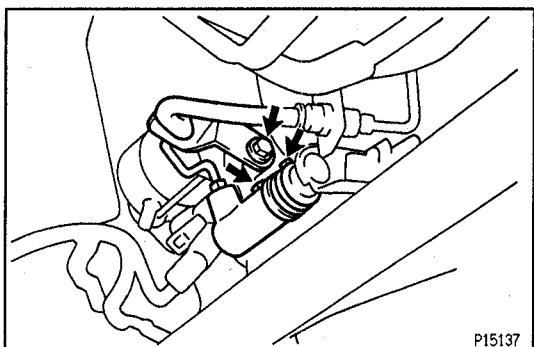
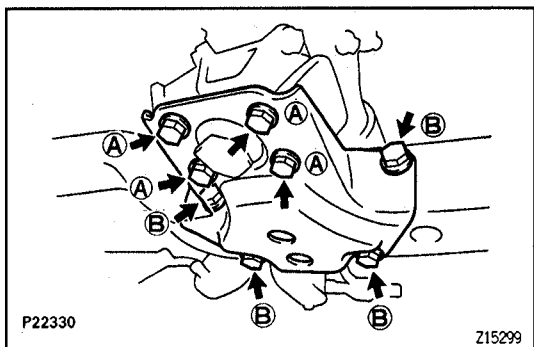
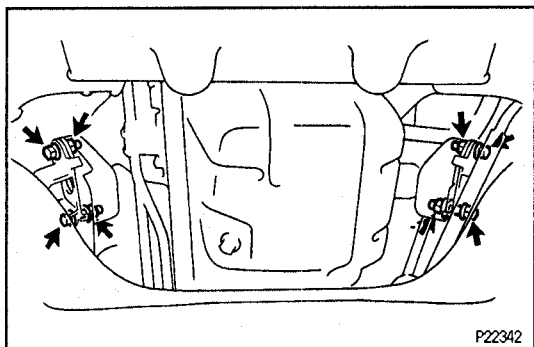
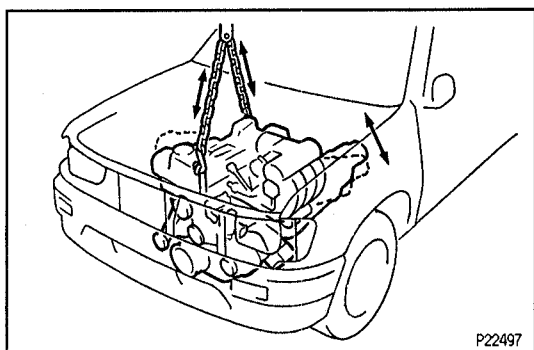
2WD: ENGINE AND TRANSMISSION ASSEMBLY

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

EG3LP-01

2WD: ENGINE WITH TRANSMISSION INSTALLATION

EG



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 A: 18 N·m (183 kgf·cm, 13 ft·lbf)

Bolt B: 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.

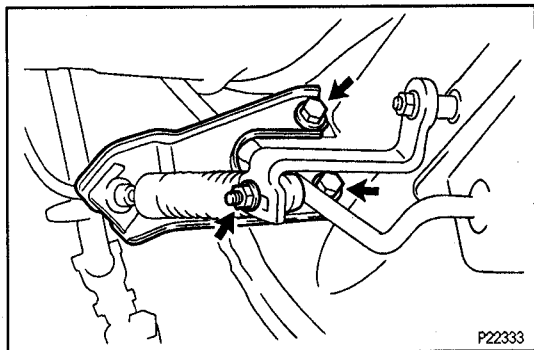
Torque: 38 N·m (387 kgf·cm, 28 ft·lbf)

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)

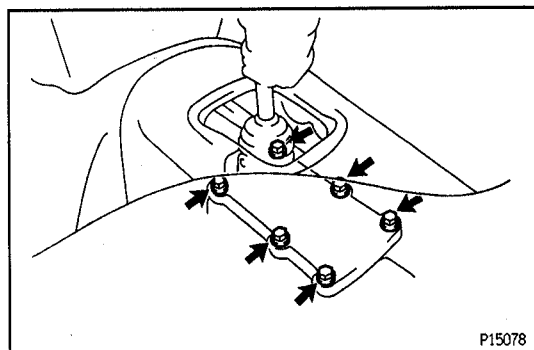


**6. A/T:
INSTALL CROSS SHAFT**

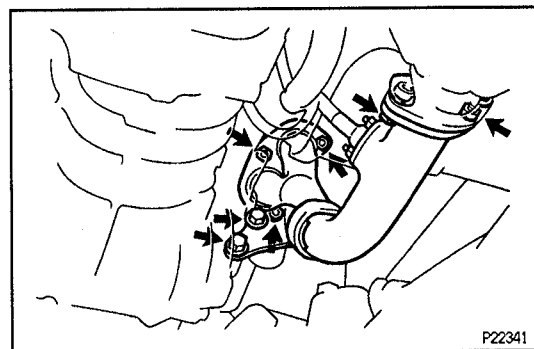
Torque:

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)

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18. INSTALL AIR CLEANER ASSEMBLY**19. CONNECT THESE CABLES:**

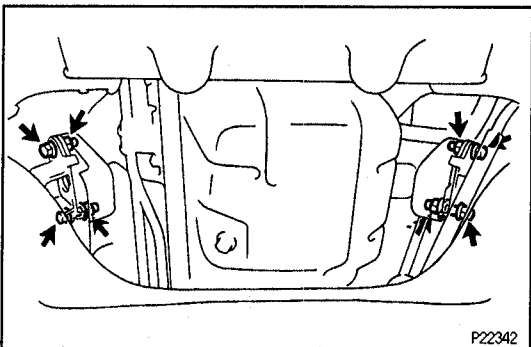
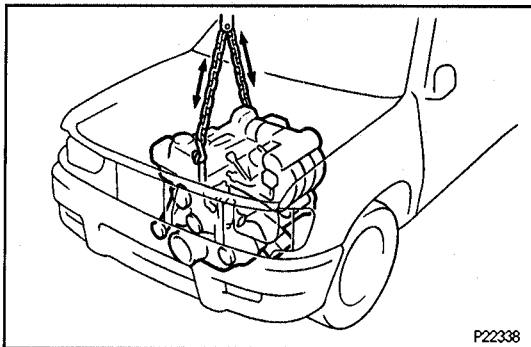
- (a) Connect the throttle cable to the throttle body.
- (b) w/ Cruise Control System:
Connect the cruise control cable to the actuator, and install the actuator cover.

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**4WD:**

E05N5-02

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**

4WD:

TRANSMISSION INSTALLATION

(See M/T or A/T section)

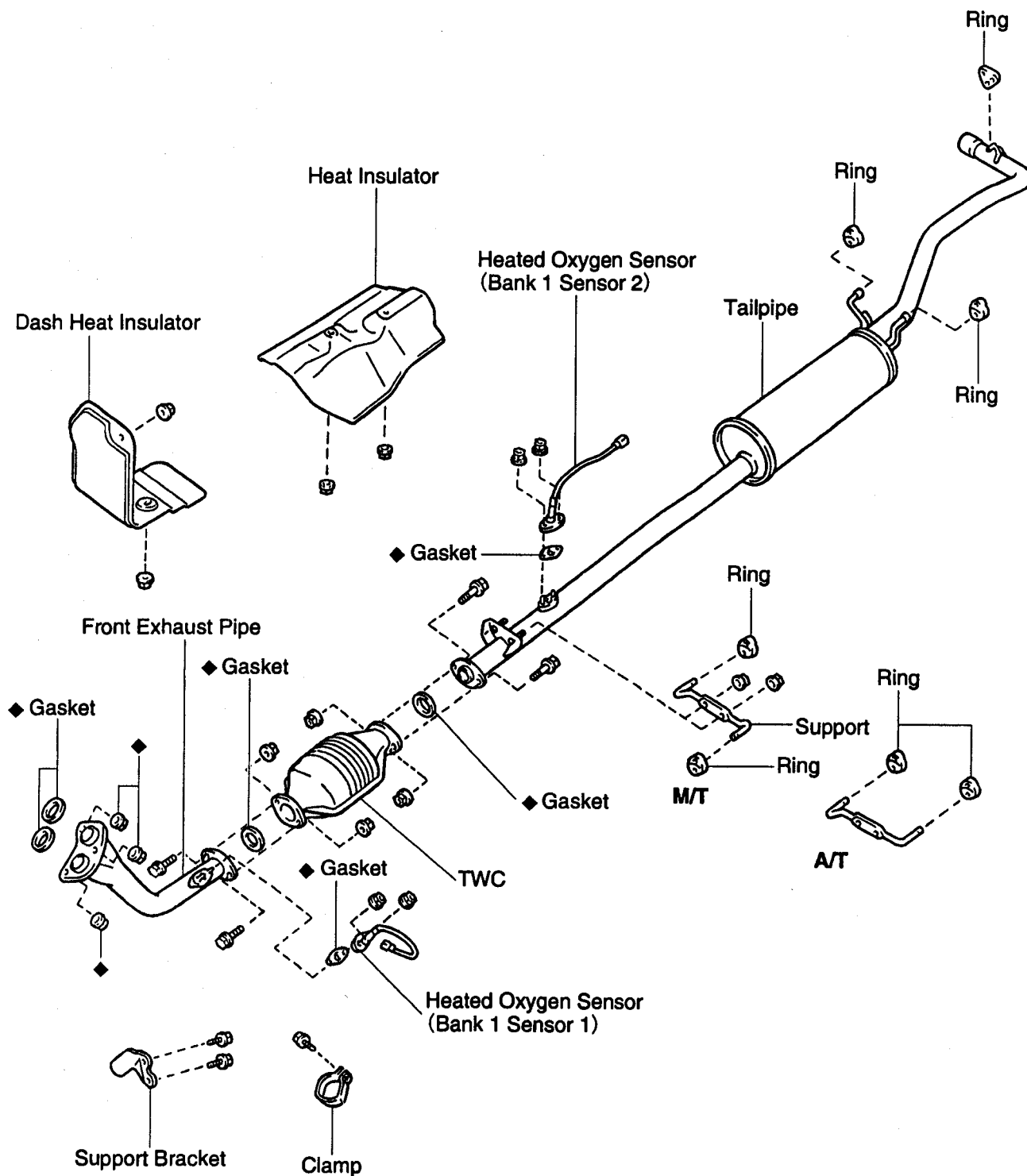
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EXHAUST SYSTEM COMPONENTS

EGSN7-02

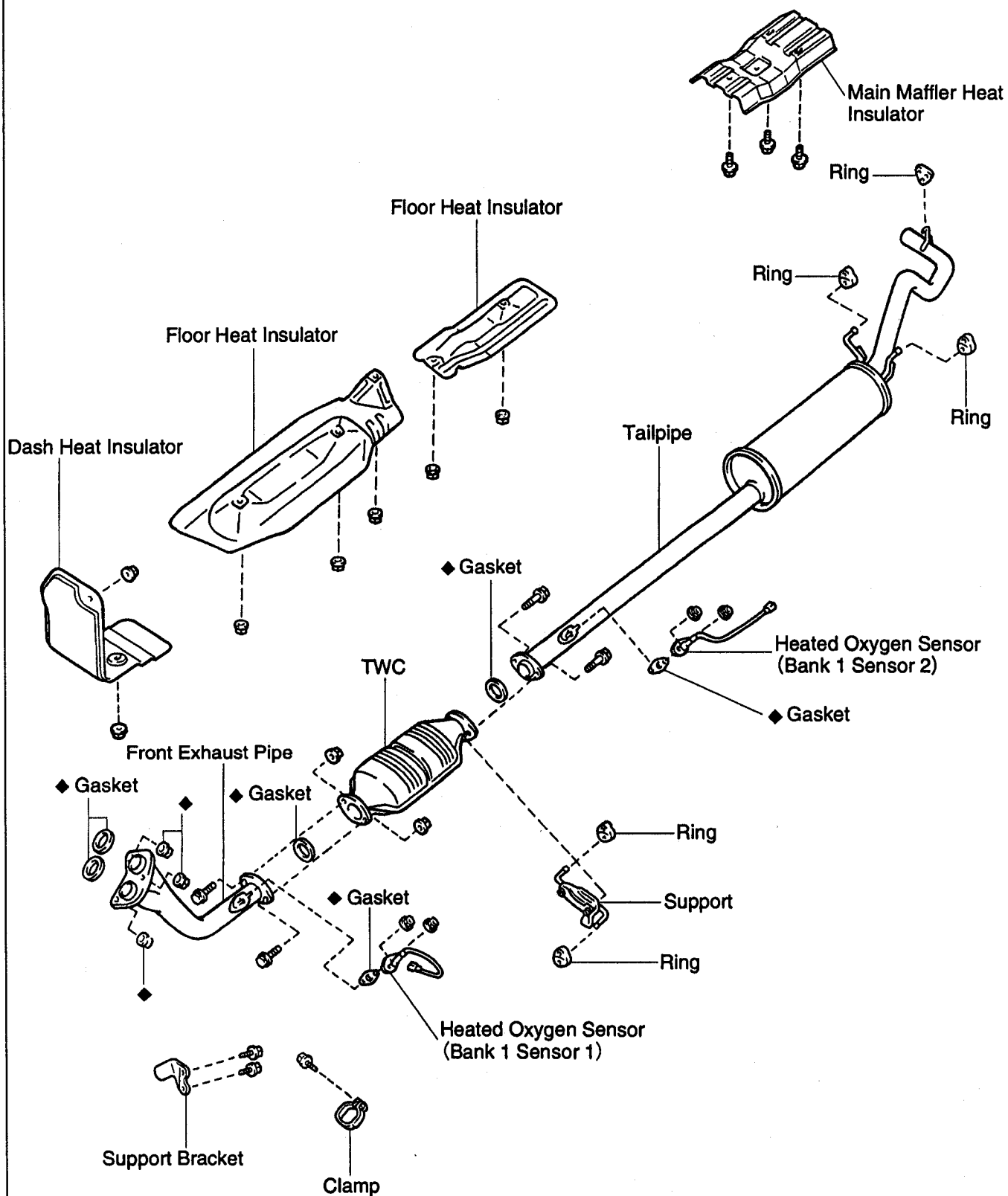
2RZ-FE (2WD)



◆ Non-reusable part

P25099

3RZ-FE (4WD)



SERVICE SPECIFICATIONS

SERVICE DATA

EG0VT—OK

Compression pressure	at 250 rpm	STD	1,230 kPa (12.5 kgf/cm ² , 178 psi) or more
	Difference of pressure between each cylinder	Minimum	880 kPa (9.0 kgf/cm ² , 127 psi) 98 kPa (1.0 kgf/cm ² , 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)

EG

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.)
	Margin thickness	Maximum	Intake	0.08 mm (0.0031 in.)
			Exhaust	0.10 mm (0.0039 in.)
		STD		1.0 mm (0.039 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.)
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.)
Piston and piston ring		U/S 0.25	64.000 — 64.024 mm (2.5197 — 2.5206 in.)
	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.)
Connecting rod	Piston pin installing temperature		80 — 90°C (176 — 194°F)
	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.)
		Maximum	0.03 mm (0.0012 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.)

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
	2nd	Turn 90°	Turn 90°
	3rd	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
	bolt B	24.5	250
	14 mm head bolt	44	440
	Nut	20	200
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

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

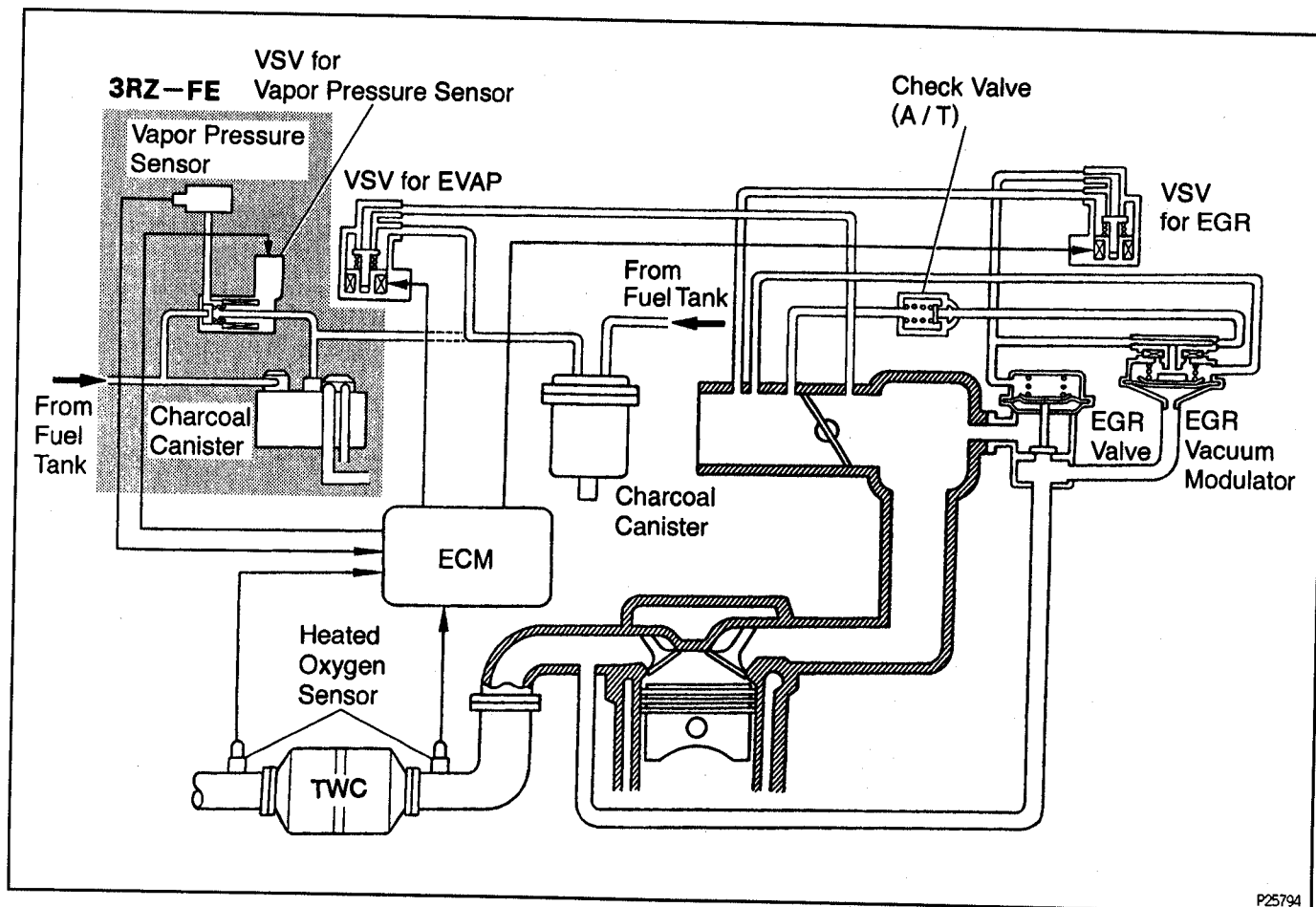
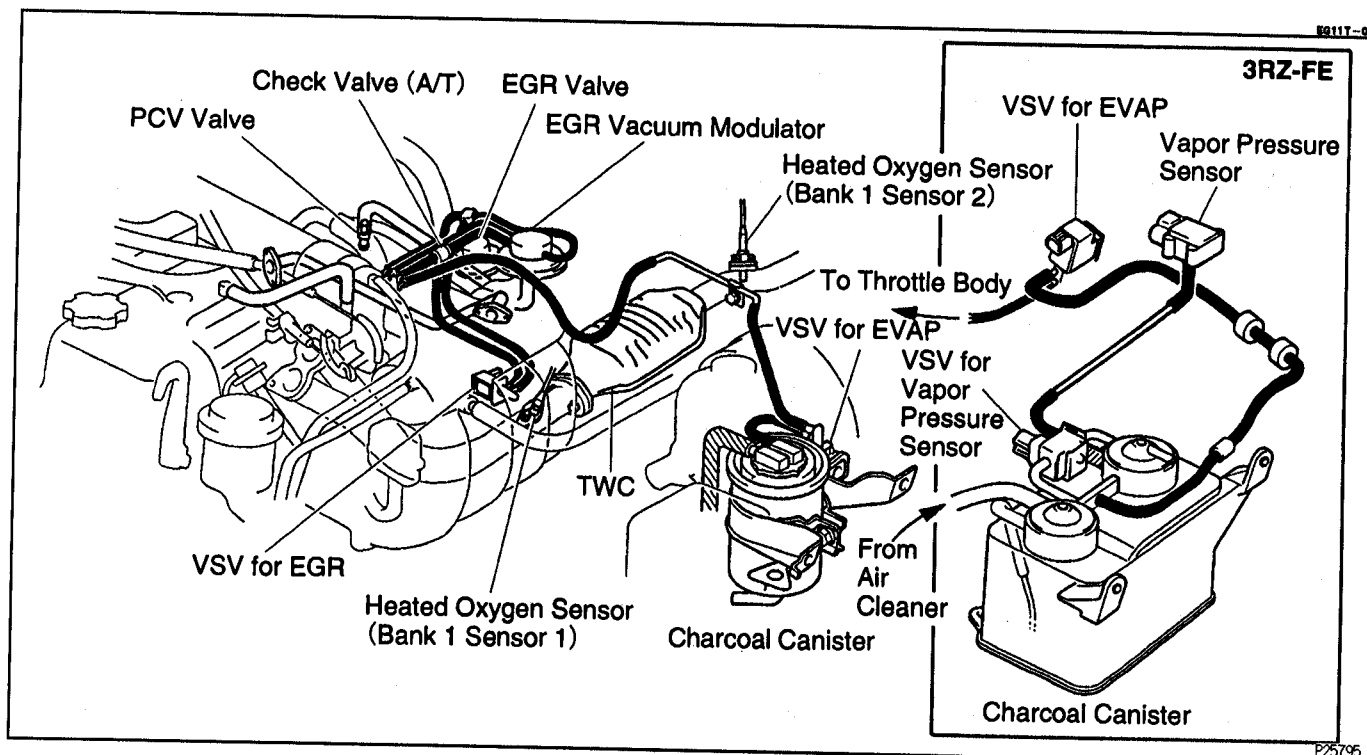
Remark: * For inspection and repair of the MFI system, refer to the MFI section this manual.

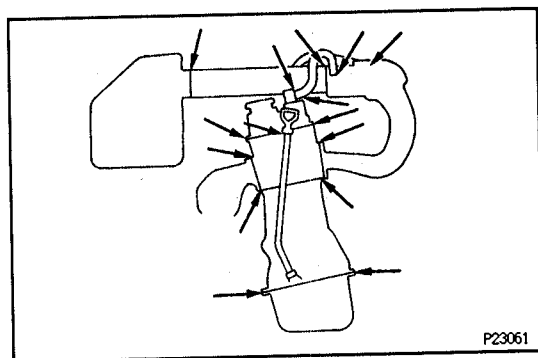
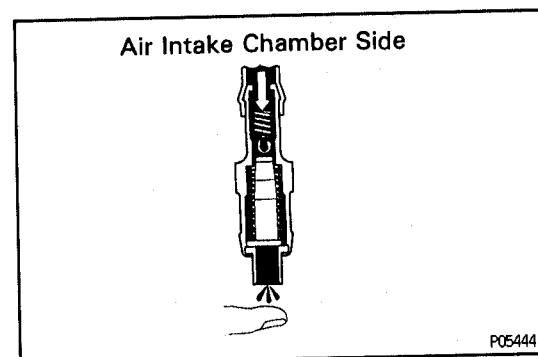
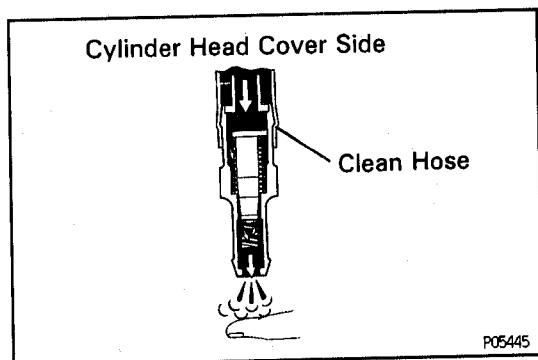
PREPARATION

EQUIPMENT

OBD II scan tool	Engine speed
Torque wrench	
Vacuum gauge	

LAYOUT AND SCHEMATIC DRAWING





POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

PCV VALVE INSPECTION

E0081-00

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

E0082-0J

PCV HOSES AND CONNECTIONS

INSPECTION

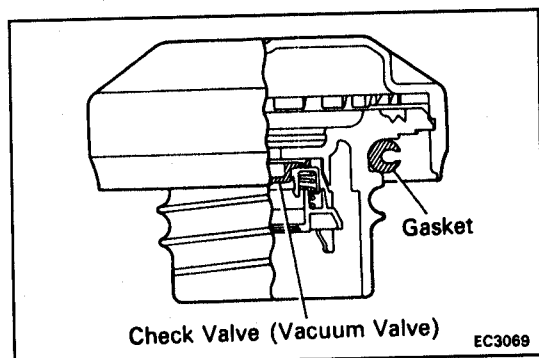
VISUALLY INSPECT HOSES AND CONNECTIONS
Check for cracks, leaks or damage.

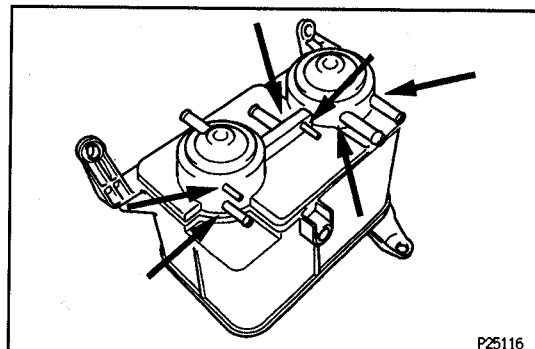
EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM

EVAP CONTROL SYSTEM INSPECTION

E0648-01

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.

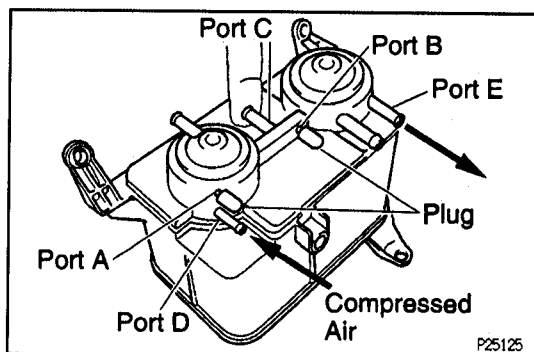




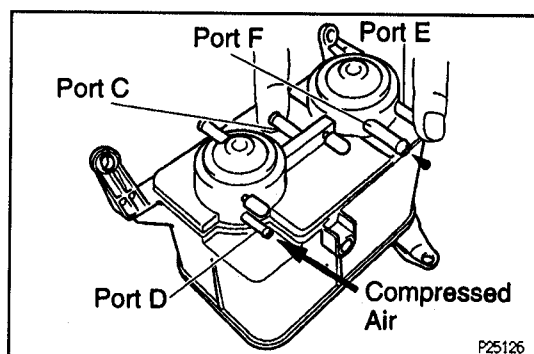
CHARCOAL CANISTER INSPECTION

3RZ-FE:

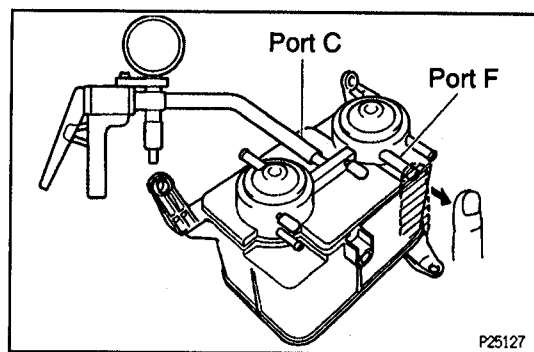
1. REMOVE CHARCOAL CANISTER
2. REMOVE VSV
3. VISUALLY INSPECT CHARCOAL CANISTER
Look for cracks or damage.



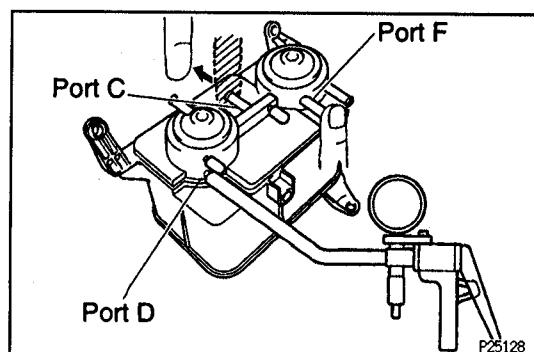
4. CHECK FOR CLOGGED FILTER, AND STUCK CHECK VALVE AND DIAPHRAGM
 - (a) Install the plugs to ports A and B.
 - (b) While holding port C closed, blow air (1.47 kPa, 15 gf/cm², 0.21 psi) into port D and check that air flows from port E.



- (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.

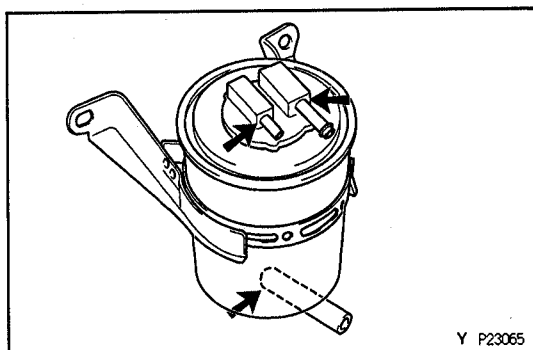


- (e) While holding port F closed, apply vacuum (2.94 kPa, 22 mmHg, 0.87 in. Hg) to port D, check that the vacuum does not decrease when port C is closed, and check that the vacuum decreases when port C is released.

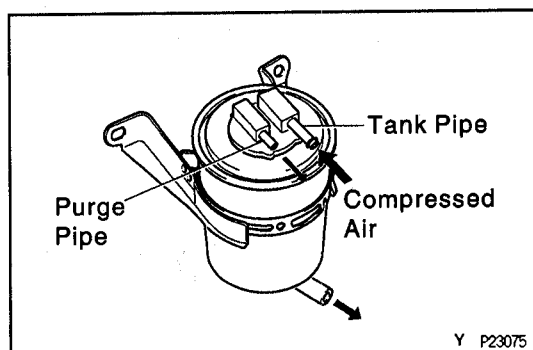
If a problem is found, replace the charcoal canister.

- (f) Remove the plugs.

5. REINSTALL CHARCOAL CANISTER

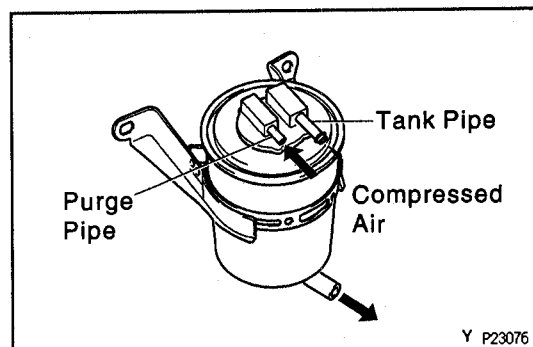
**2RZ—FE:**

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



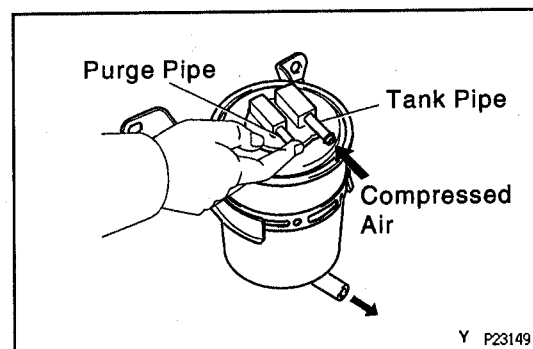
4. INSPECT FOR CLOGGED FILTER AND STUCK CHECK VALVE

- (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)

VSV FOR EVAP INSPECTION

(See VSV for EVAP in MFI System)

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

(See VSV for vapor pressure sensor in MFI System)

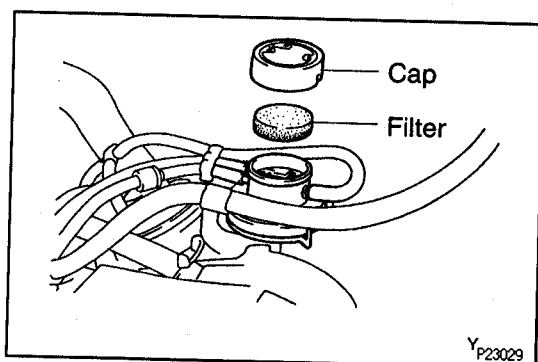
808N9-02

808N9-03

VAPOR PRESSURE SENSOR INSPECTION^{EGS9-04} (3RZ-FE)

(See vapor pressure sensor in MFI System)

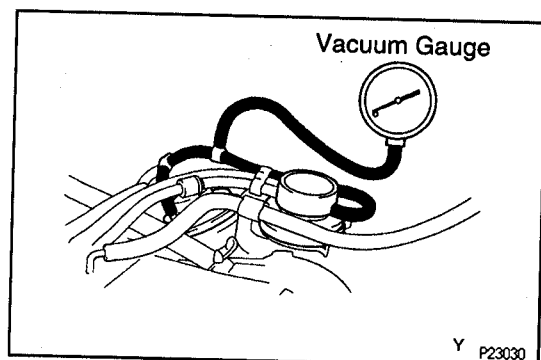
EXHAUST GAS RECIRCULATION (EGR) SYSTEM EGR SYSTEM INSPECTION^{EGSCA-04}



1. INSPECT AND CLEAN FILTER IN EGR VACUUM MODULATOR

- Remove the cap and filter.
- Check the filter for contamination or damage.
- Using compressed air, clean the filter.
- Reinstall the filter and cap.

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

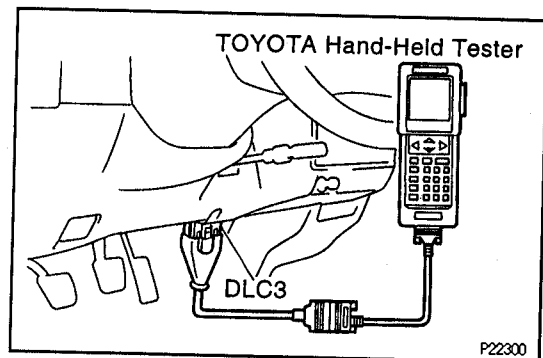


2. INSTALL VACUUM GAUGE

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

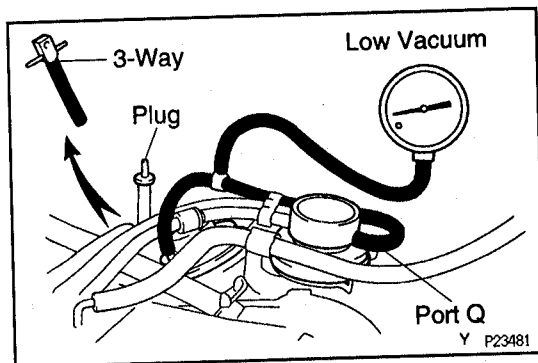
- Connect the TOYOTA hand-held tester or OBD II scan tool to the DLC3.
- Please refer to the TOYOTA hand-held tester or OBD II scan tool operators manual for further details.

5. INSPECT VSV OPERATION WITH COLD ENGINE

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

6. INSPECT OPERATION OF VSV AND EGR VACUUM MODULATOR

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

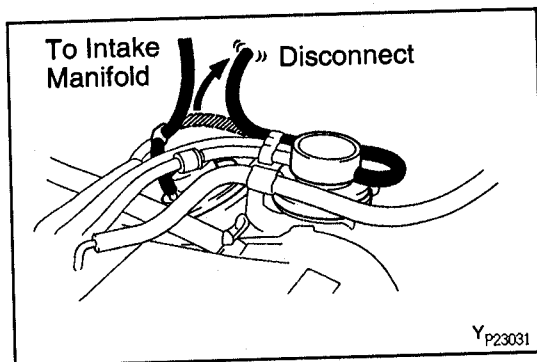


- (b) If you have no TOYOTA hand-held tester, check these procedures:
- (1) Remove the 3-way connector with the vacuum hose.
 - (2) Connect the vacuum hose (from port Q of EGR vacuum modulator) to the EGR valve.
 - (3) Plug the vacuum hose (from VSV for EGR).
- (c) Check that the vacuum gauge indicates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

EGSMA-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)

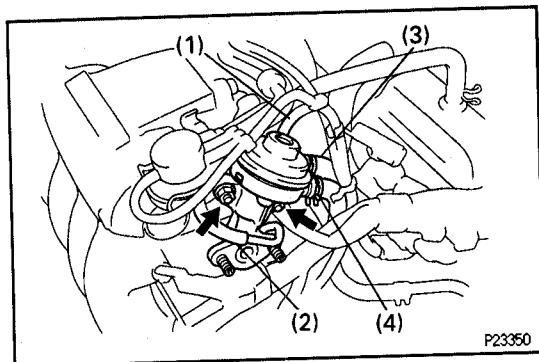
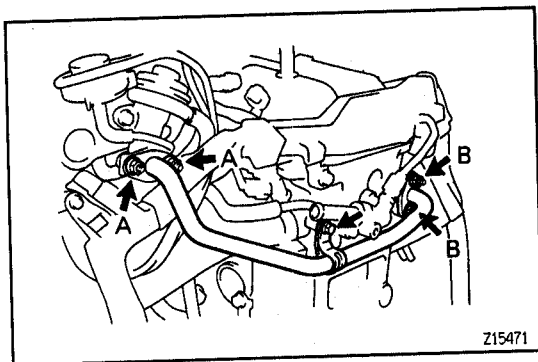
2. REMOVE EGR VALVE

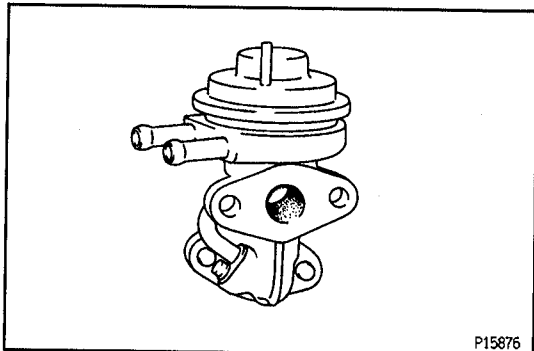
- (a) Disconnect these hoses:

- (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)

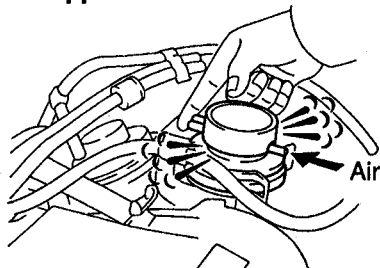




3. INSPECT EGR VALVE

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

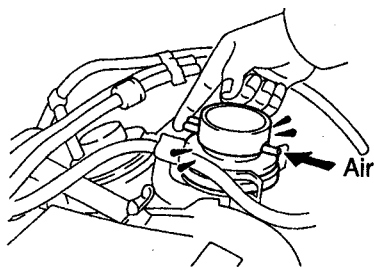
Engine Stopped



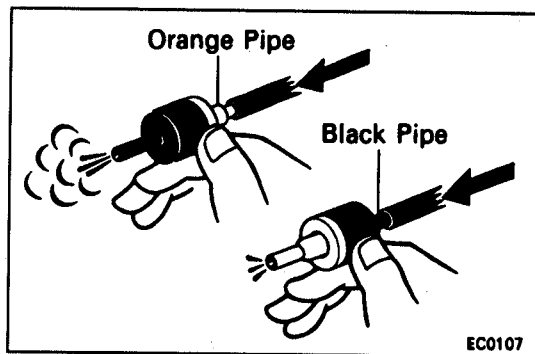
EGR VACUUM MODULATOR INSPECTION EG008-01

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.

Engine at 3,000 rpm



- (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) EG009-02

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 EG010-02

(See VSV for EGR in MFI System)

THREE-WAY CATALYTIC CONVERTER (TWC) SYSTEM EXHAUST PIPE ASSEMBLY INSPECTION

E000E-0E

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

THREE-WAY CATALYTIC CONVERTER INSPECTION

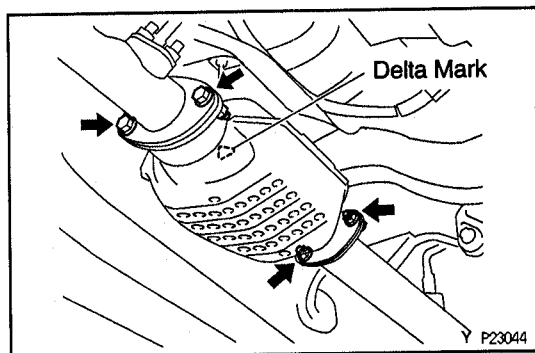
CHECK FOR DENTS OR DAMAGE

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

EG

HEAT INSULATOR INSPECTION

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



CATALYTIC CONVERTER REPLACEMENT

E000C-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 TORQUE SPECIFICATIONS

E000Q-1H

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

1. Before working on the fuel system, disconnect the negative (-) terminal cable from the battery. EGSND-02

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. EGSNT-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.

IF VEHICLE IS EQUIPPED WITH MOBILE RADIO SYSTEM (HAM, CB, ETC.) EGSNT-05

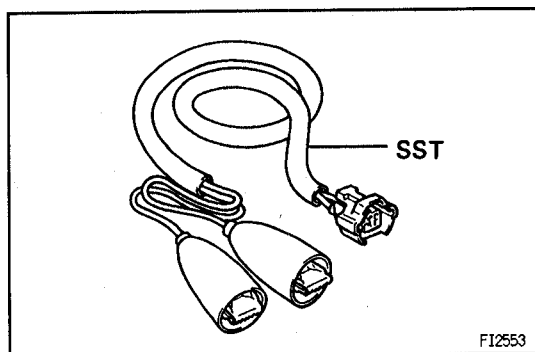
If the vehicle is equipped with a mobile communication system, refer to the precaution in the IN section.

AIR INDUCTION SYSTEM EGSNT-02

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.

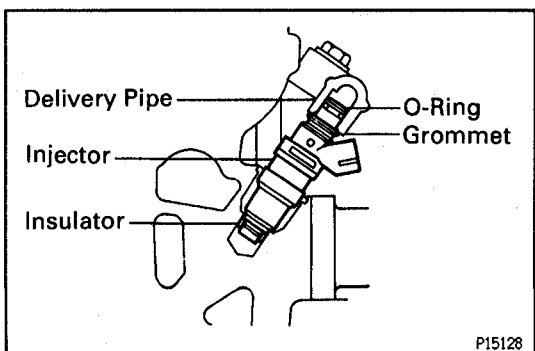
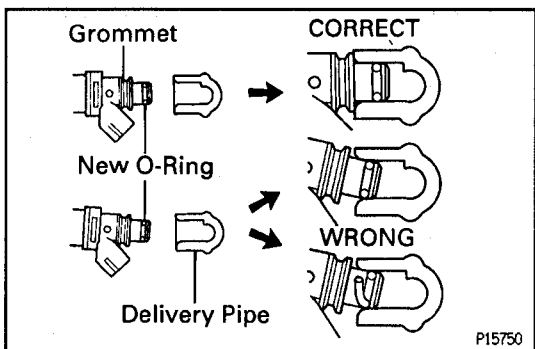
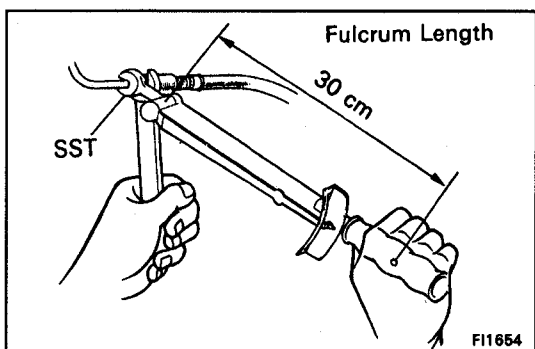
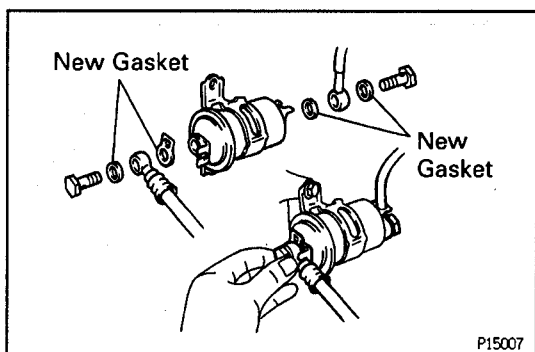
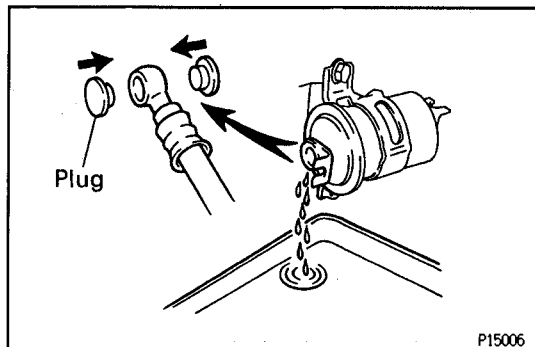
ELECTRONIC CONTROL SYSTEM

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



1. When disconnecting the high pressure fuel line, a large amount of gasoline will spill out, so observe these procedures:

- Put a container under the connection.
- Slowly loosen the connection.
- Disconnect the connection.
- 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:

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

Flare Nut Type:

- Apply a light coat of engine oil to the flare and tighten the flare nut by hand.
- Using SST, tighten the flare nut to the specified torque.

SST 09631-22020

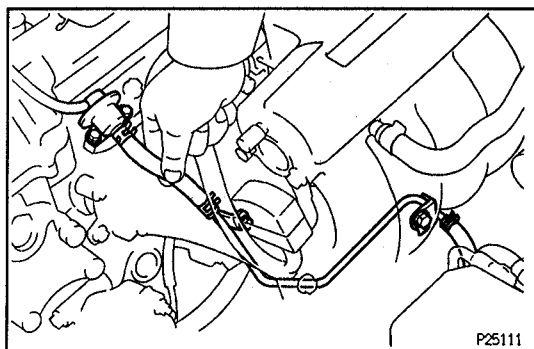
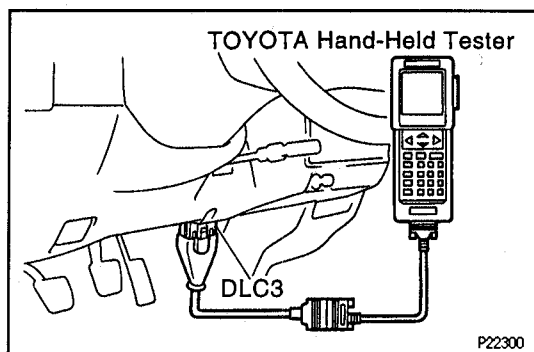
Torque: 30 N·m (310 kgf·cm, 22 ft·lbf)

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.

- Never reuse the O-ring.
- When placing a new O-ring on the injector, take care not to damage it in any way.
- 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.

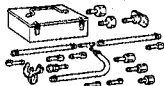
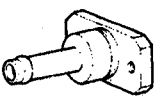
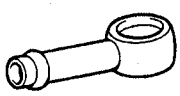
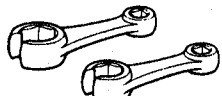


5. Check that there are no fuel leaks after doing maintenance anywhere on the fuel system.
 - (a) Connect the TOYOTA hand-held tester to the DLC3.
 - (b) Turn ignition switch ON and TOYOTA hand-held tester main switch ON.
 - (c) Select the active test mode on the TOYOTA hand-held tester.
 - (d) Please 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)

B00CF-10

	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

EG00C8-02

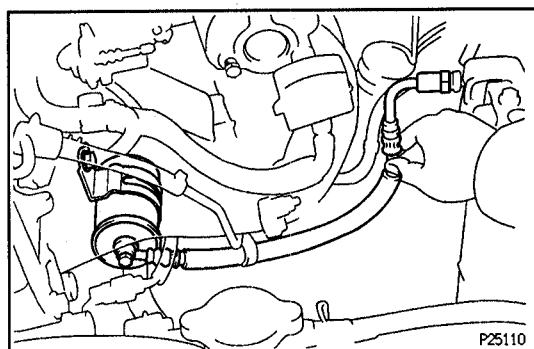
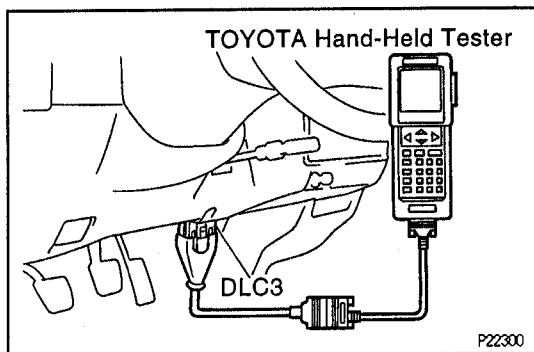
	09082-00050 TOYOTA Electrical Tester Set.	
	09200-00010 Engine Adjust Kit .	
	09258-00030 Hose Plug Set .	Plug for vacuum hose, fuel hose etc.

EG

EQUIPMENT

EG00CH-19

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

1. INSPECT FUEL PUMP OPERATION

- Connect the TOYOTA hand—held tester to the DLC3.
- Turn the ignition switch ON and TOYOTA hand—held tester main switch ON.

NOTICE: Do not start the engine.

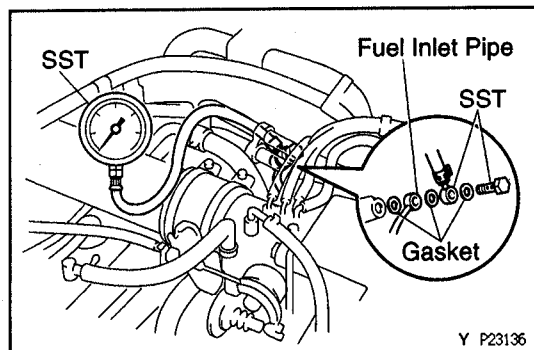
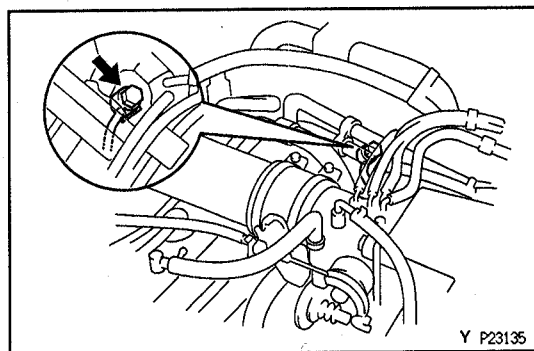
- Select the active test mode on the TOYOTA hand—held tester.
- Please refer to the TOYOTA hand — held tester operator's manual for further details.
- If you have no TOYOTA hand—held tester, connect the positive (+) and negative (—) leads from the battery to the fuel pump connector.
(See step 2 in fuel pump inspection)
- 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

- Turn the ignition switch to LOCK.
- Remove the TOYOTA hand—held tester.



2. INSPECT FUEL PRESSURE

- Check that the battery positive voltage is above 12 volts.
- Disconnect the negative (—) terminal cable from the battery.
- Remove the union bolt and 2 gaskets, and disconnect the fuel inlet pipe from the delivery pipe.

HINT:

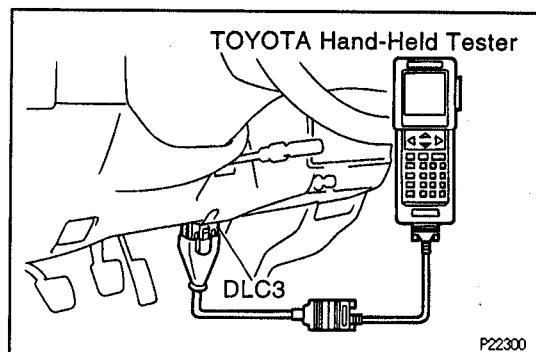
- Put a suitable container or shop rag under the delivery pipe.
- Slowly loosen the union bolt.

- 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)

- 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.

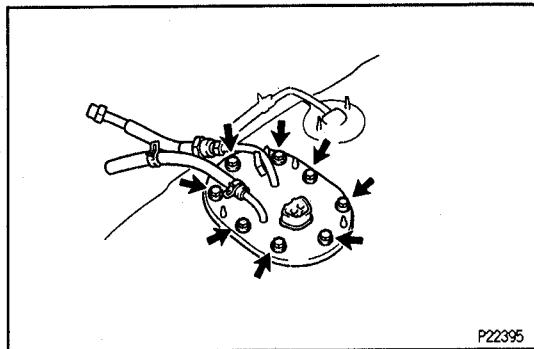
- (q) Stop the engine.
- (r) Check that the fuel pressure remains as specified for 5 minutes after the engine has stopped.

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.



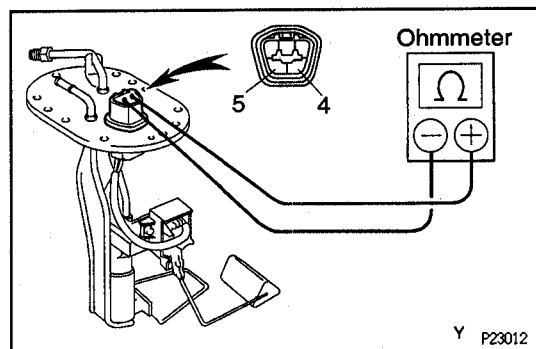
EG

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.



FUEL PUMP INSPECTION

E89MJ-02

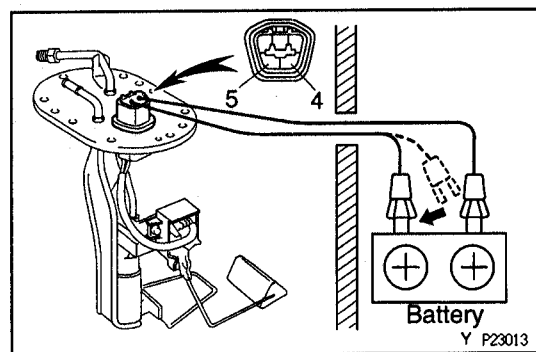
1. INSPECT FUEL PUMP RESISTANCE

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:

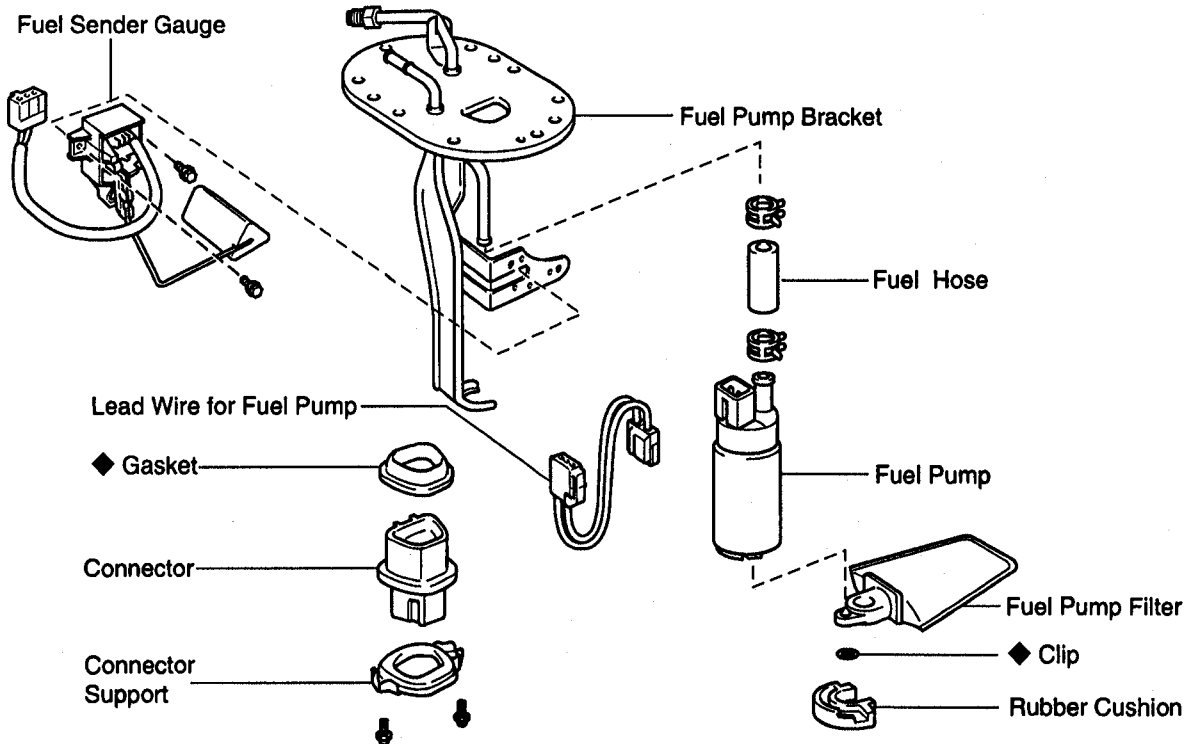
- These tests must be done quickly (within 10 seconds) to prevent the coil from burning out.
- Keep the fuel pump as far away from the battery as possible.
- Always do the switching at the battery side.

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

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

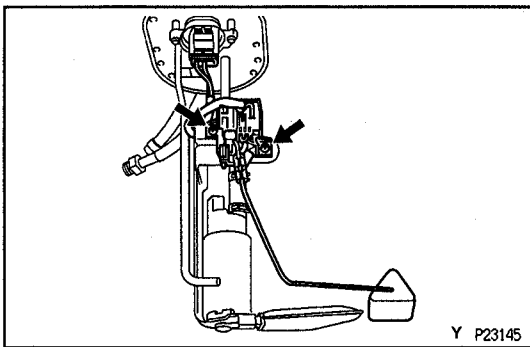
E0001-14

Reference (2WD)



◆ Non-reusable part

Y P23022

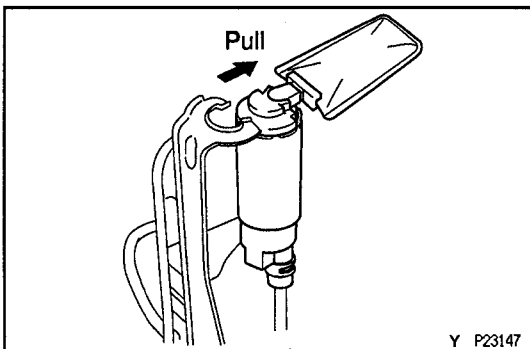


Y P23145

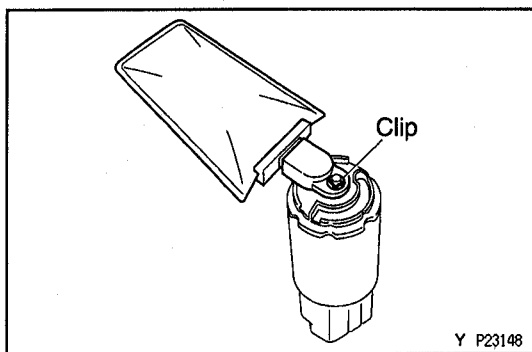
FUEL PUMP DISASSEMBLY

E000H-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.

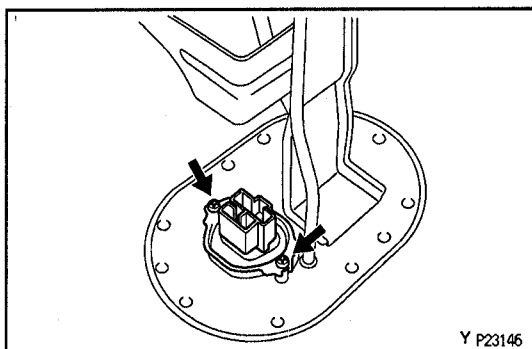


Y P23147

**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.

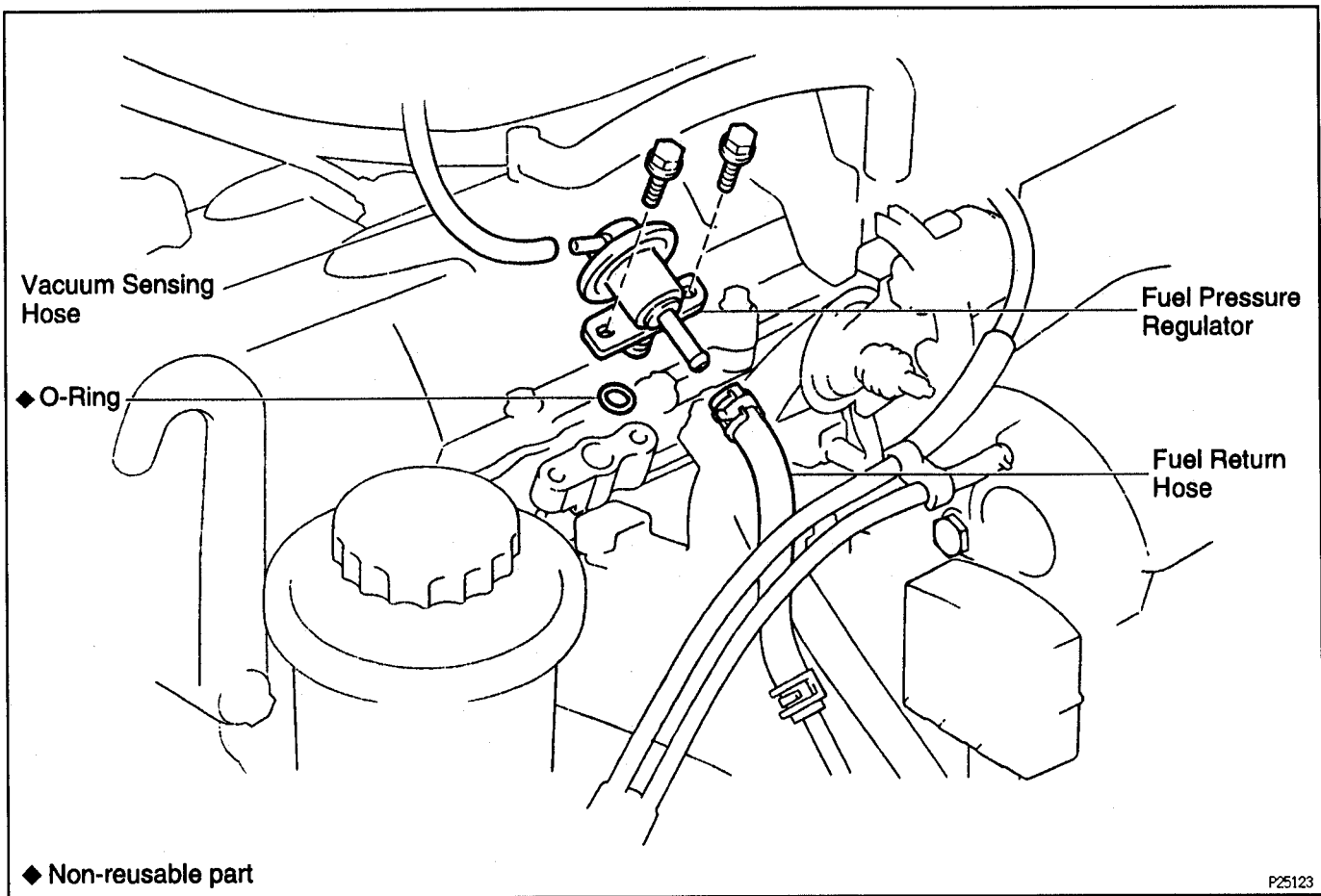
FUEL PUMP INSTALLATION

E064W-01

Installation is in the reverse order of removal.

FUEL PRESSURE REGULATOR COMPONENTS FOR REMOVAL AND INSTALLATION

B01AC-12

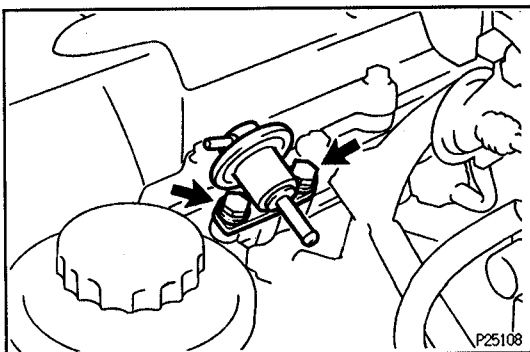


FUEL PRESSURE REGULATOR REMOVAL

B0BWK-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.

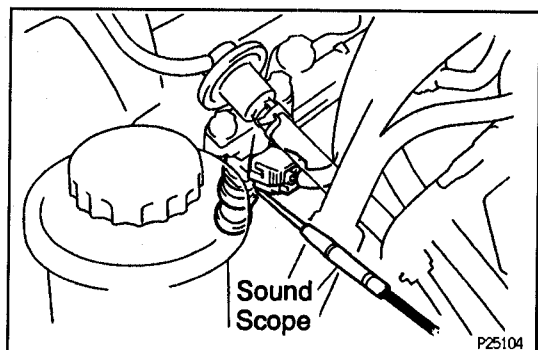


3. REMOVE FUEL PRESSURE REGULATOR
 - (a) Remove the 2 bolts and fuel pressure regulator.
Torque: 8.8 N·m (90 kgf·cm, 78 in·lbf)
 - (b) Remove the O-ring.
- INSTALLATION HINT: Use a new O-ring.

FUEL PRESSURE REGULATOR INSTALLATION

Installation is in the reverse order of removal.

EG



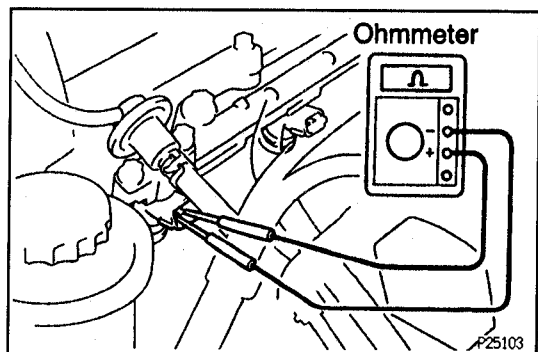
INJECTOR ON-VEHICLE INSPECTION

EG000-02

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:

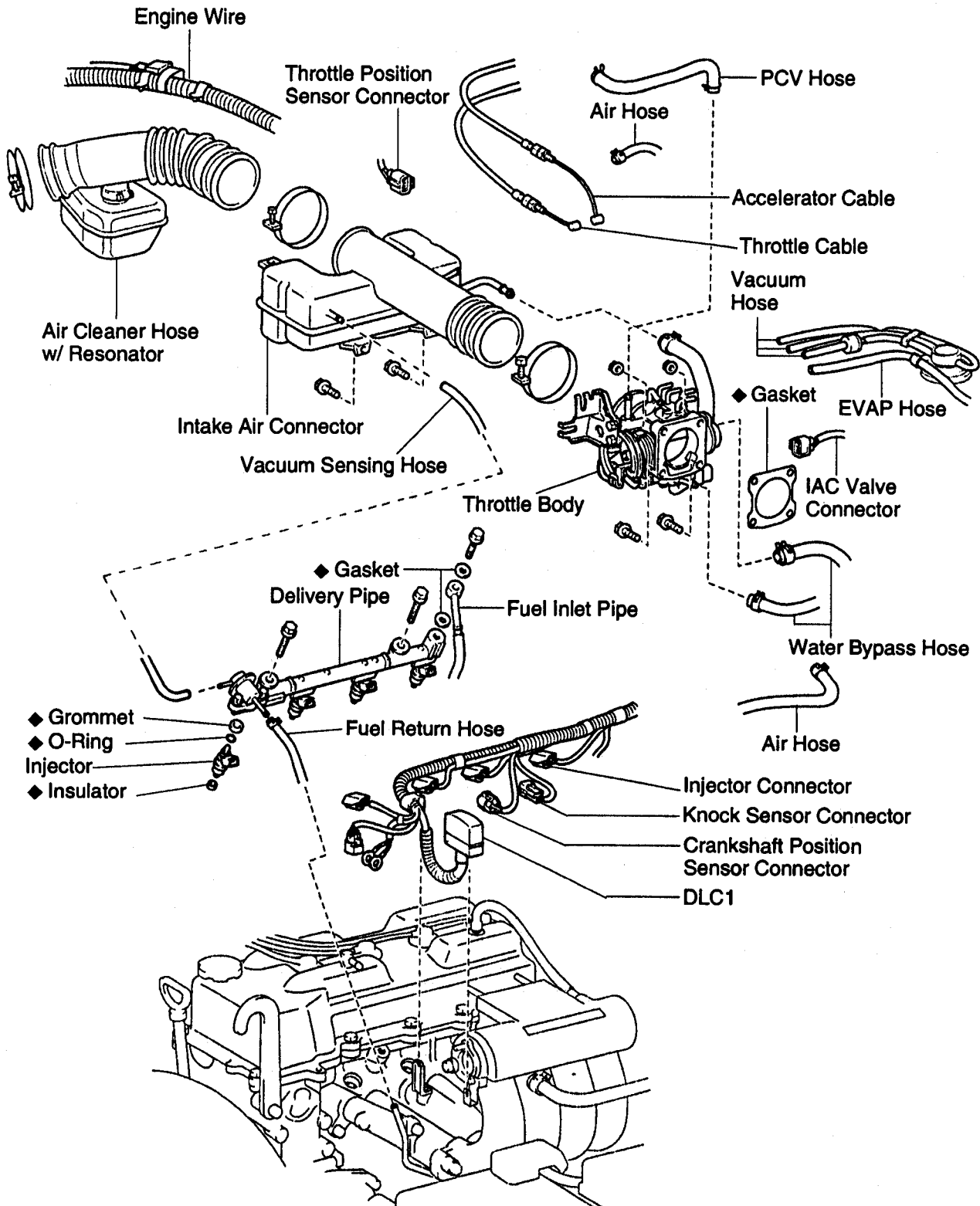
At 20°C (68°F): 12 – 16 Ω

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

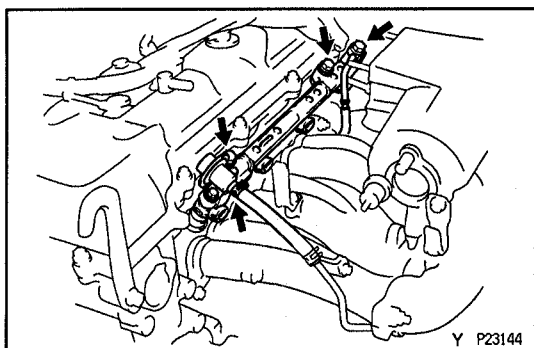
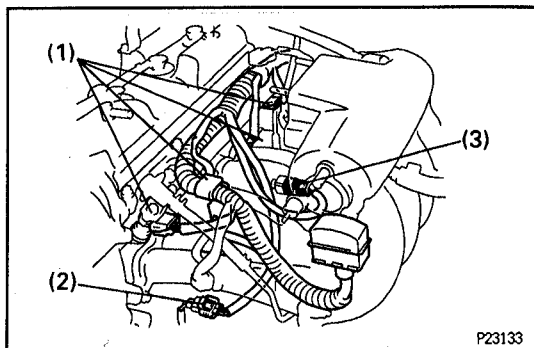
- (d) Reconnect the injector connectors.
- (e) Reinstall the throttle body.
(See throttle body installation)

COMPONENTS FOR REMOVAL AND INSTALLATION

EG



◆ Non-reusable part



INJECTORS REMOVAL

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.

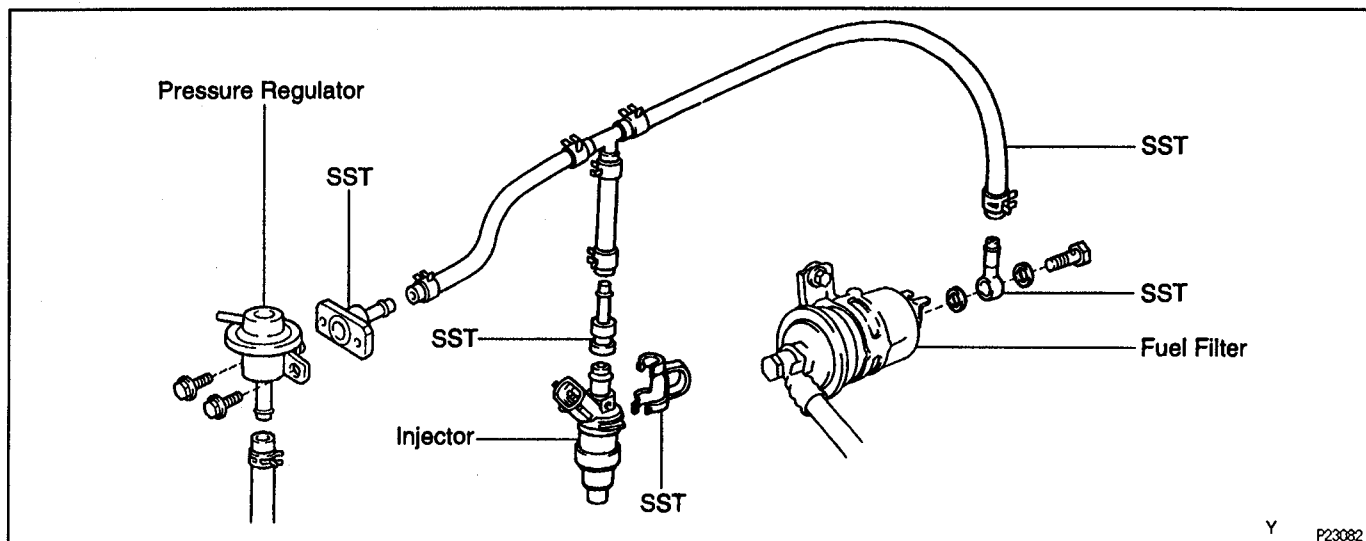
NOTICE: Be careful not to drop the injectors when removing the delivery pipe.

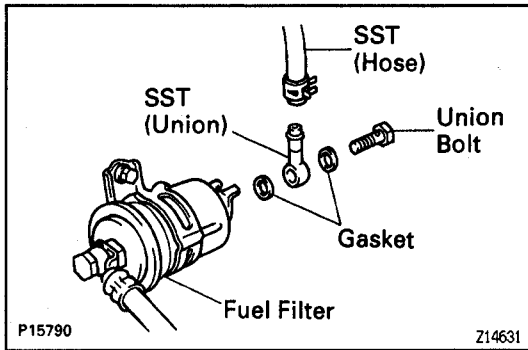
 - (e) Remove the 4 insulators from the 4 spacers.
 - (f) Pull out the 4 injectors from the delivery pipe.
 - (g) Remove the O-ring and grommet from each injector.

INJECTORS INSPECTION

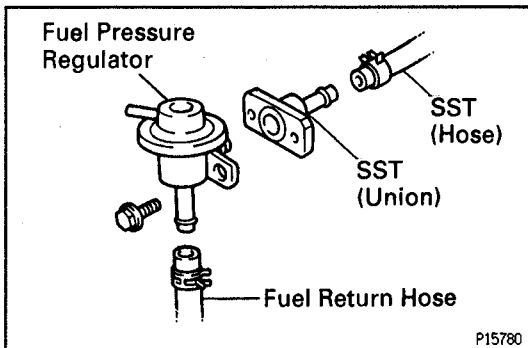
1. **INSPECT INJECTOR INJECTION**

CAUTION: Keep injector clean of sparks during the test.

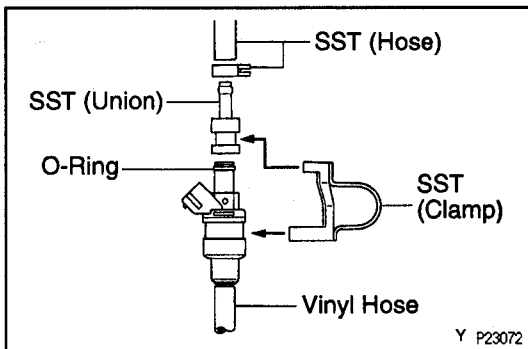




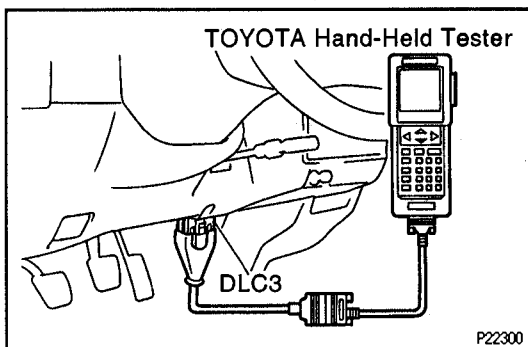
- (a) Remove the fuel inlet pipe from the fuel filter outlet.
- (b) Connect SST (union and hose) to the fuel filter outlet with the 2 gaskets and union bolt.
SST 09268-41046 (90405-09015)
Torque: 29 N·m (300 kgf·cm, 22 ft·lbf)



- (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.



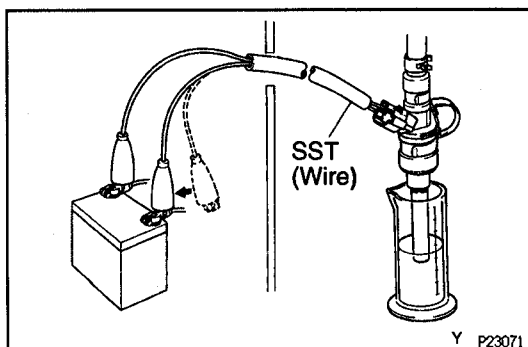
- (g) Install the O-ring to the injector.
- (h) Connect SST (union and hose) to the injector, and hold the injector and union with SST (clamp).
SST 09268-41046
- (i) Put the injector into a graduated cylinder.
HINT: Install a suitable vinyl hose onto the injector to prevent gasoline from splashing out.



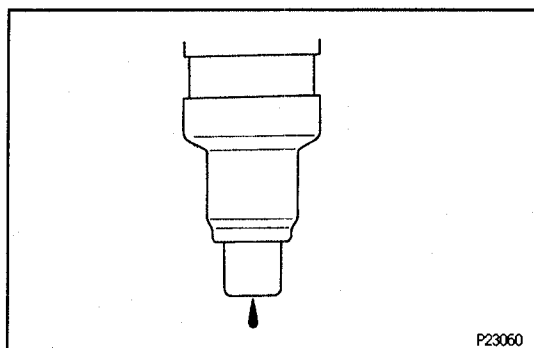
- (j) Connect the TOYOTA hand-held tester to the DLC3.
- (k) Turn the ignition switch ON and TOYOTA hand-held tester main switch ON.

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



EG

**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

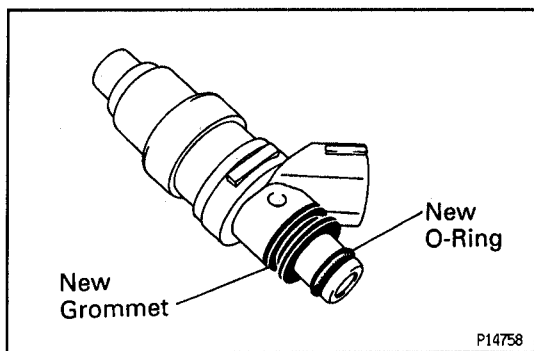
- (a) In the condition above, disconnect the test probes of SST (wire) from the battery and check the fuel leakage from the injector.

SST 09842-30070

Fuel drop:

1 drop or less per 3 minutes

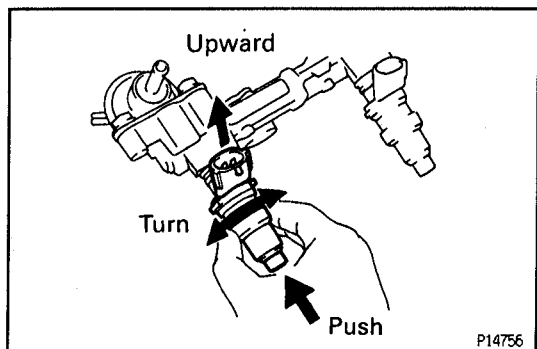
- (b) Turn the ignition switch to LOCK.
 (c) Disconnect the negative (—) terminal cable from the battery.
 (d) Remove the SST and TOYOTA hand-held tester.
 SST 09268-41045
 (e) Reinstall the fuel pressure regulator and fuel inlet pipe.

**INJECTORS INSTALLATION**

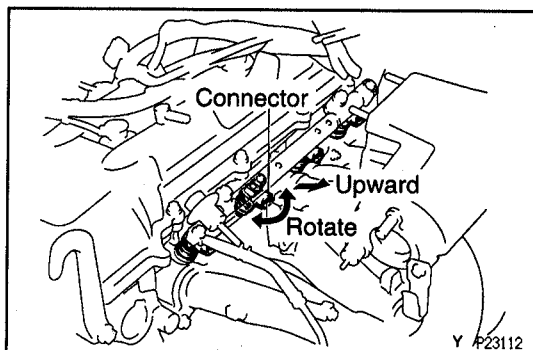
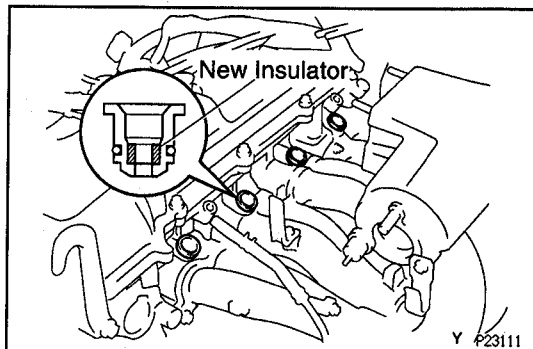
EG134-04

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

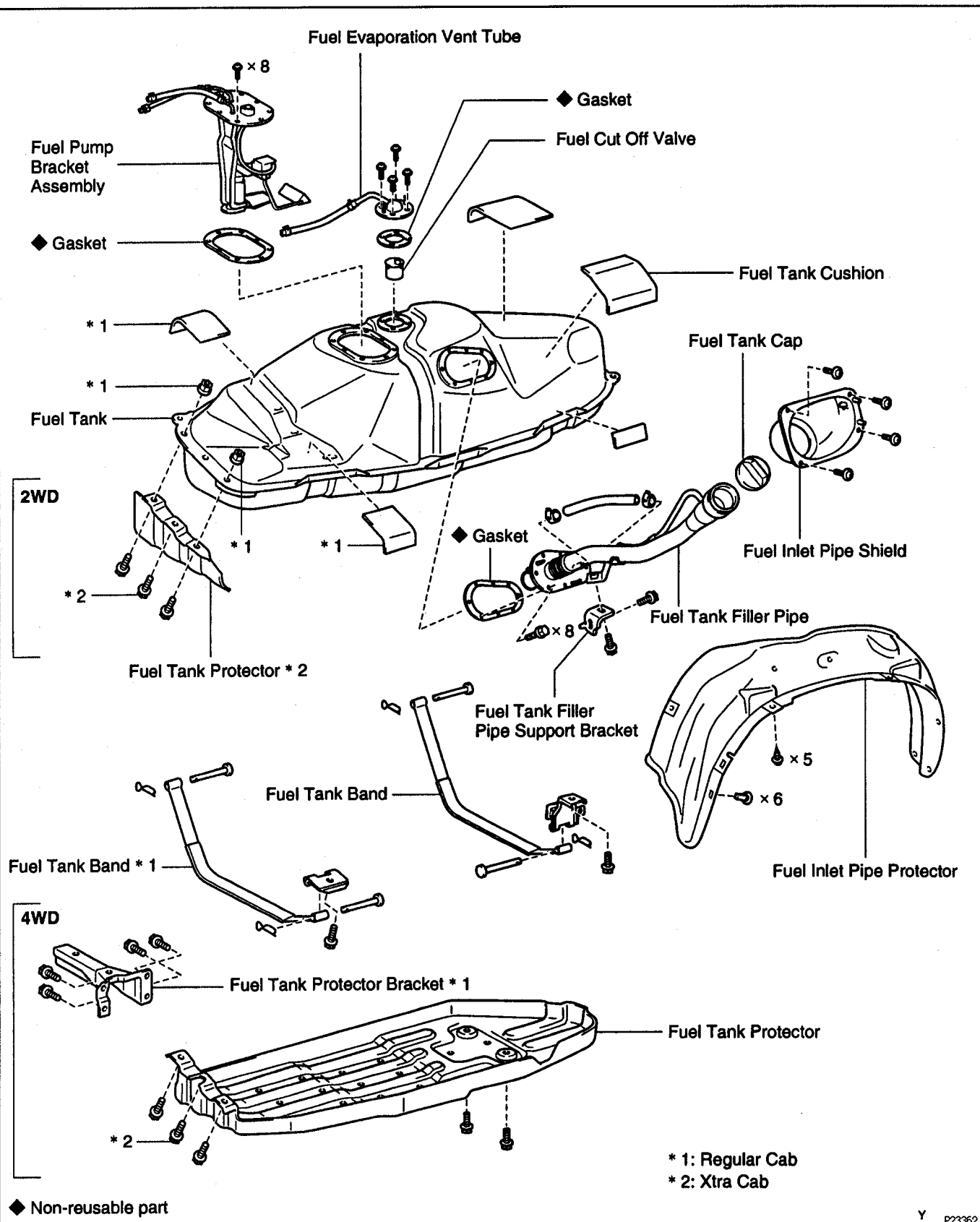
4. INSTALL THROTTLE BODY

(See throttle body installation)

FUEL TANK AND LINE COMPONENTS

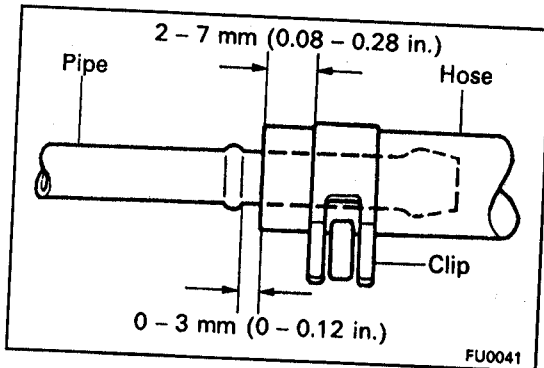
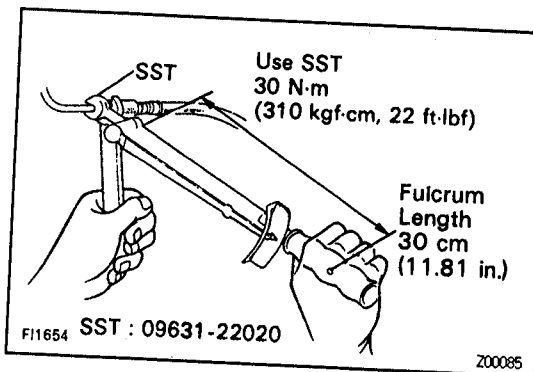
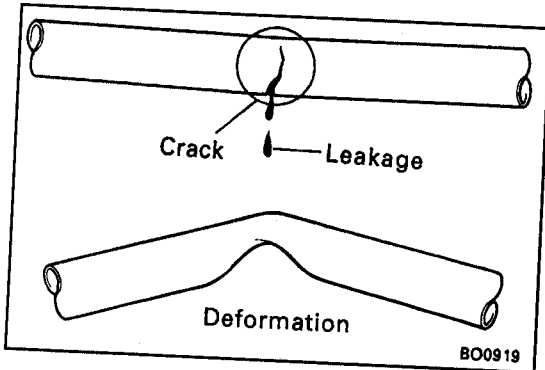
EG00C-0U

EG



PRECAUTIONS

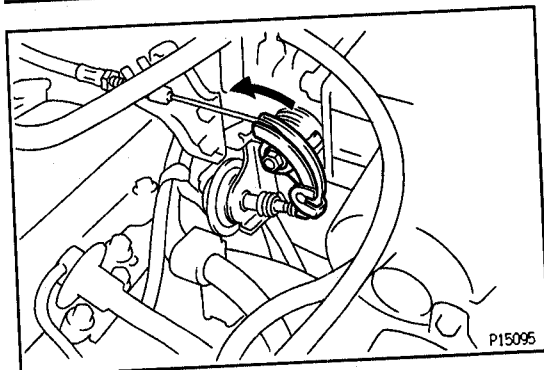
1. Always use new gaskets when replacing the fuel tank or component parts.
2. Apply the proper torque to all parts tightened.



FUEL LINES AND CONNECTIONS INSPECTION

- (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 ON-VEHICLE INSPECTION

E0984-03

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 k Ω
Fully closed	IDL - E2	2.3 k Ω or less
Open	IDL - E2	Infinity
Fully open	VTA - E2	2.0 - 10.2 k Ω
-	VC - E2	2.5 - 5.9 k Ω

- (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

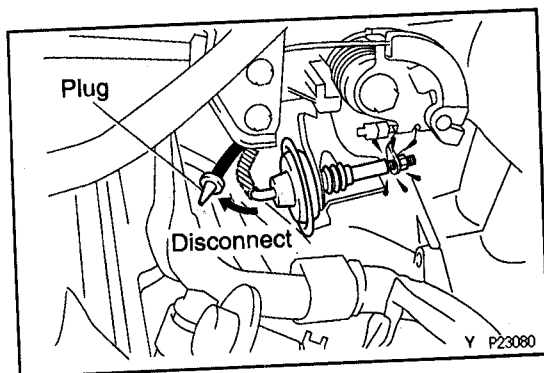
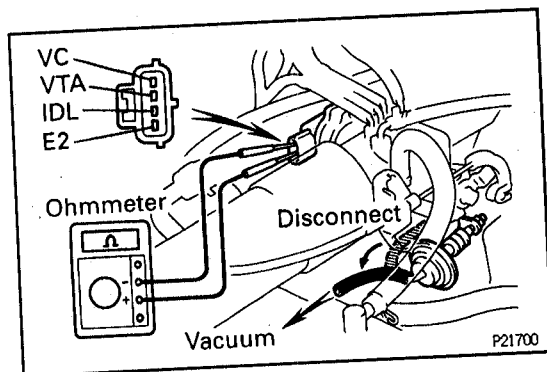
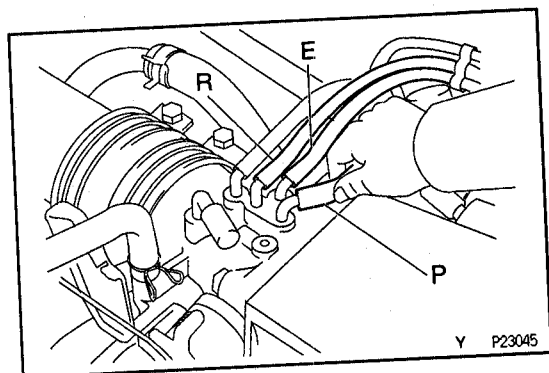
- (a) Disconnect the vacuum hose from the throttle opener, and plug the hose end.

- (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.

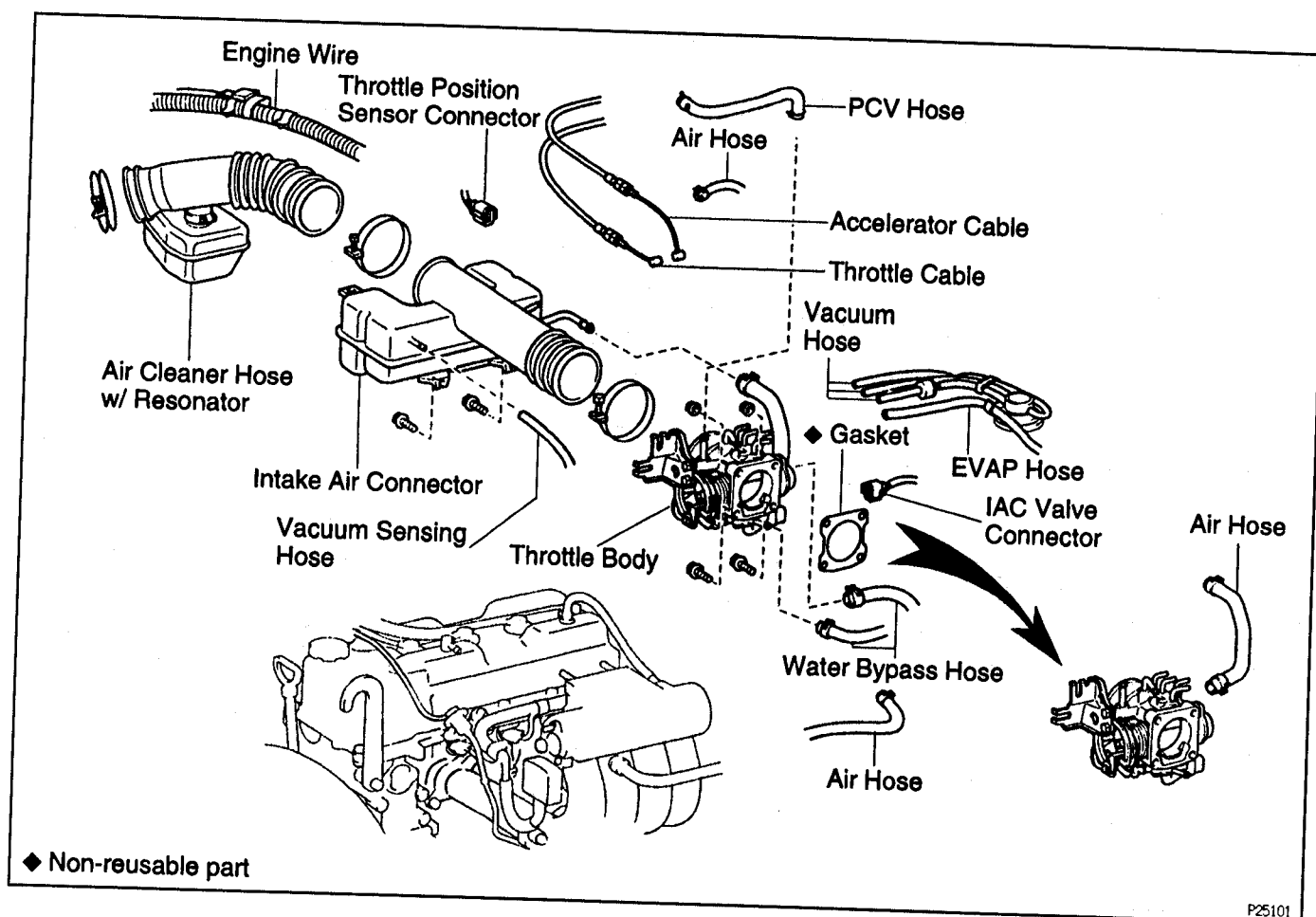


- (c) Stop the engine.
- (d) Reconnect the vacuum hose to the throttle opener.
- (e) Start the engine, and check that the idle speed returns to the correct speed.
- D. Disconnect TOYOTA hand-held tester or OBD II scan tool

COMPONENTS FOR REMOVAL AND INSTALLATION

EG139-1D

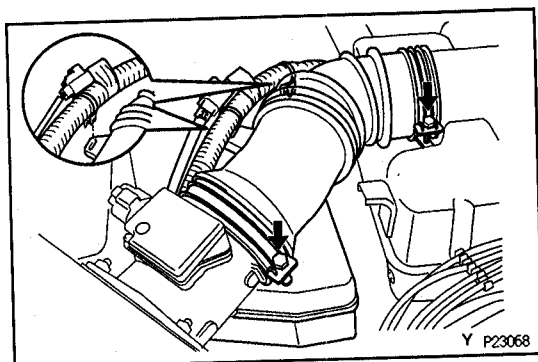
EG



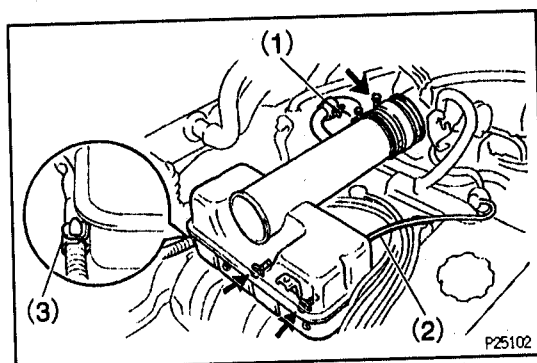
THROTTLE BODY REMOVAL

EG085-04

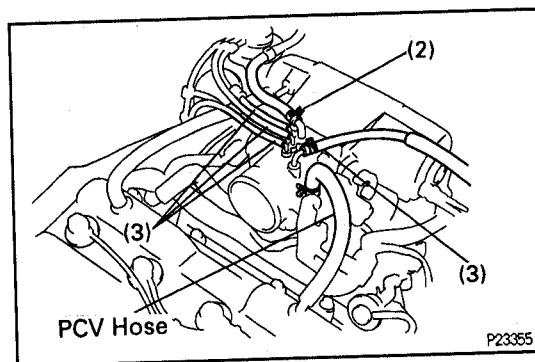
1. DRAIN ENGINE COOLANT
2. M/T:
DISCONNECT ACCELERATOR CABLE FROM THROTTLE BODY
A/T:
DISCONNECT ACCELERATOR AND THROTTLE CABLES FROM THROTTLE BODY



- 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.

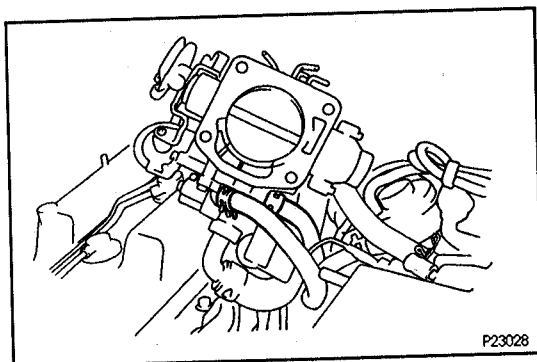
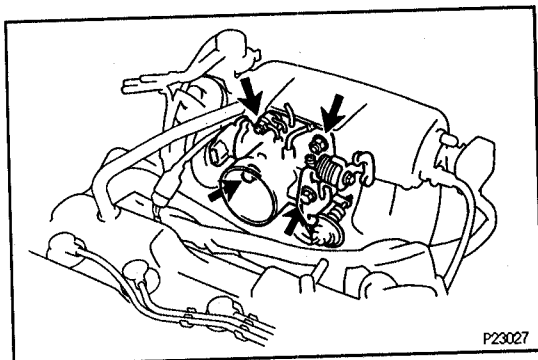


- 4. REMOVE INTAKE AIR CONNECTOR**
 - (a) Disconnect these air hoses and wire clamp:
 - (1) Air hose for IAC
 - (2) Vacuum sensing hose
 - (3) Wire clamp for engine wire
 - (b) Remove the 2 bolts, hose clamp and intake air connector.



- 5. REMOVE PCV HOSE**
- 6. REMOVE THROTTLE BODY**

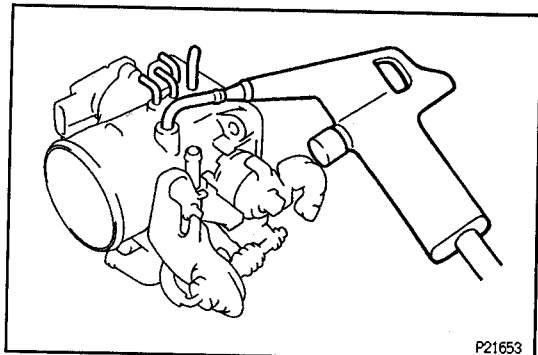
- (a) Disconnect these hoses:
 - (1) 3 vacuum hoses
 - (2) EVAP hose
 - (3) w/ PS:
 - Air hose for PS idle-up
- (b) Disconnect the throttle position sensor connector.
- (c) Disconnect the IAC valve connector.
- (d) Remove the 2 bolts, 2 nuts, and disconnect the throttle body from the air intake chamber.
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**

EG00H-DU

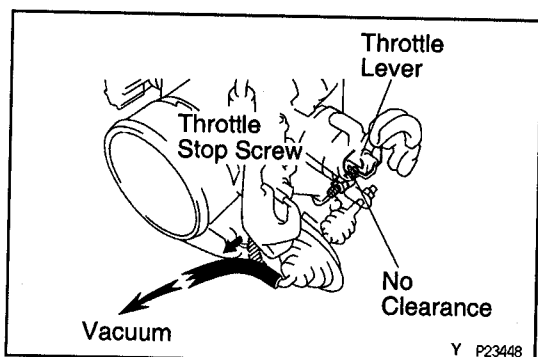
THROTTLE BODY INSPECTION



1. CLEAN THROTTLE BODY

- Using a soft brush and carburetor cleaner, clean the cast parts.
- Using compressed air, clean all the passages and apertures.

NOTICE: To prevent deterioration, do not clean the throttle position sensor and IAC valve.

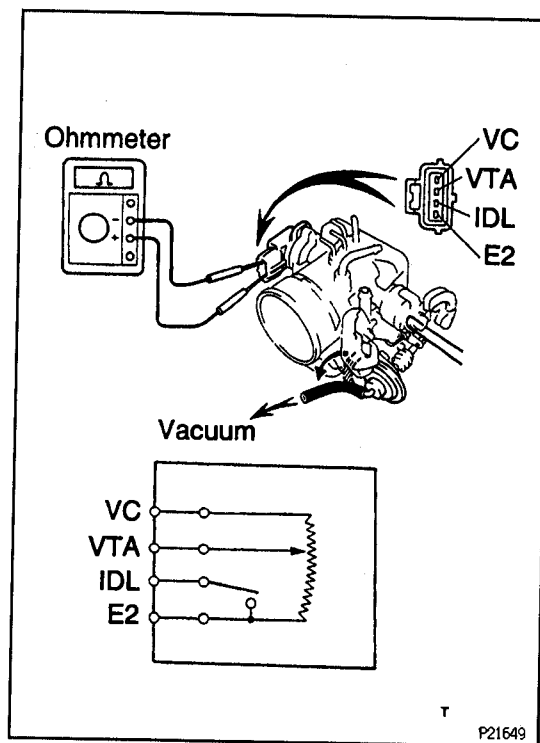


2. INSPECT THROTTLE VALVE

- Apply vacuum to the throttle opener.
- Check that there is no clearance between the throttle stop screw and throttle lever when the closed throttle position.

3. INSPECT THROTTLE POSITION SENSOR

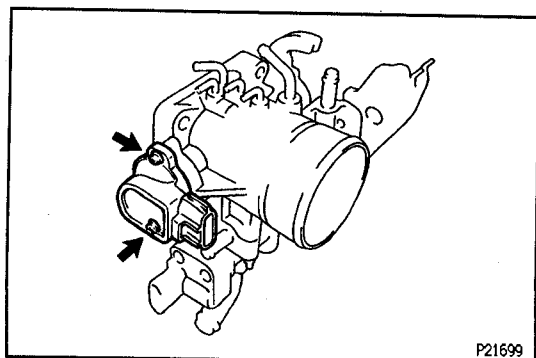
- Apply vacuum to the throttle opener.
- Insert a thickness gauge between the throttle stop screw and stop lever.
- Using an ohmmeter, measure the resistance between each terminal.

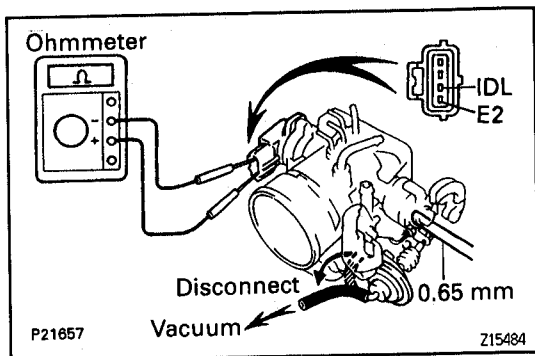


Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA - E2	0.2 - 5.7 kΩ
0.57 mm (0.022 in.)	IDL - E2	2.3 kΩ or less
0.74 mm (0.029 in.)	IDL - E2	Infinity
Throttle valve fully open	VTA - E2	2.0 - 10.2 kΩ
-	VC - E2	2.5 - 5.9 kΩ

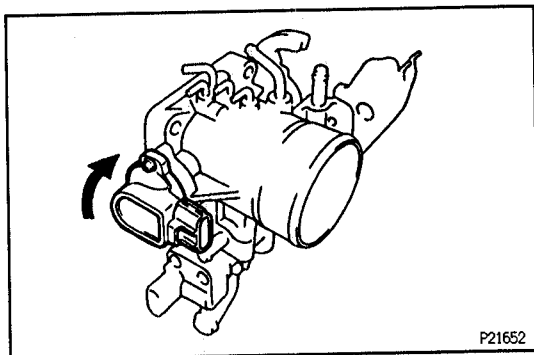
4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

- Loosen the 2 set screws of the sensor.

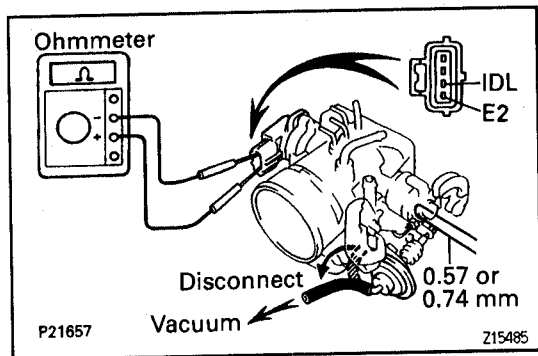




- (b) Apply vacuum to the throttle opener.
- (c) Insert a 0.65 mm (0.026 in.) thickness gauge between the throttle stop screw and stop lever.
- (d) Connect the test probe of an ohmmeter to the terminals IDL and E2 of the sensor.



- (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

50689-01

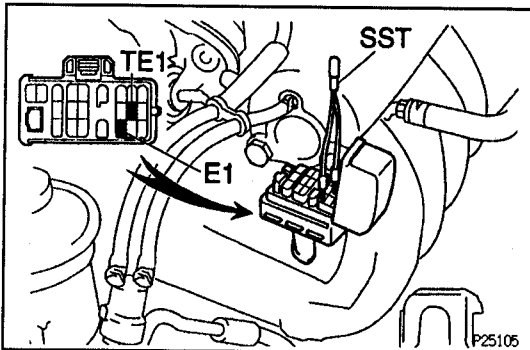
Installation is in the reverse order of removal.

IDLE AIR CONTROL (IAC) VALVE ON-VEHICLE INSPECTION

EGENH-02

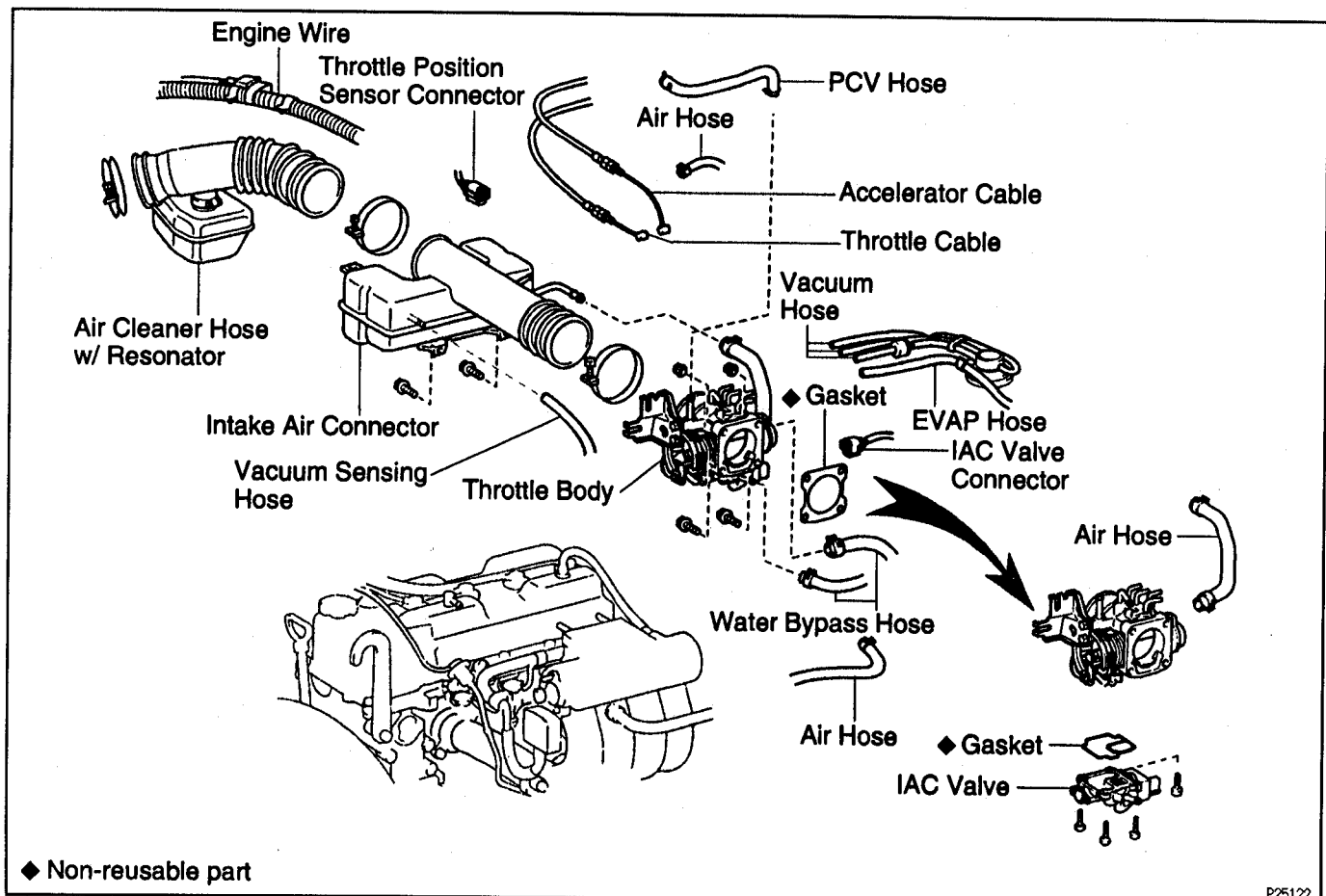
INSPECT IAC VALVE OPERATION

- (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

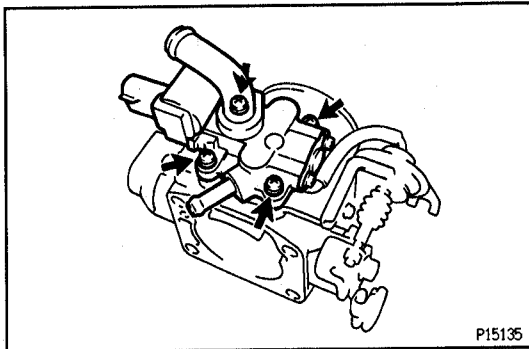


COMPONENTS FOR REMOVAL AND INSTALLATION

EG16H-07



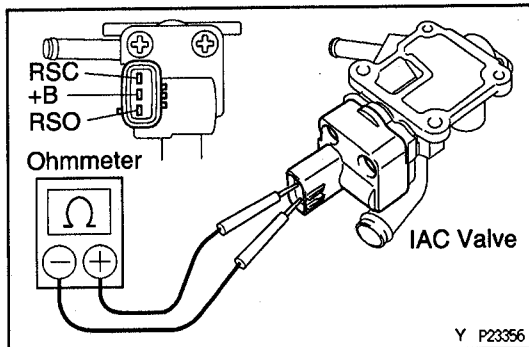
P25122



IAC VALVE REMOVAL

1. REMOVE THROTTLE BODY
(See throttle body removal)
2. REMOVE IAC VALVE
Remove the 4 screws, IAC valve and gasket.

EG



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:

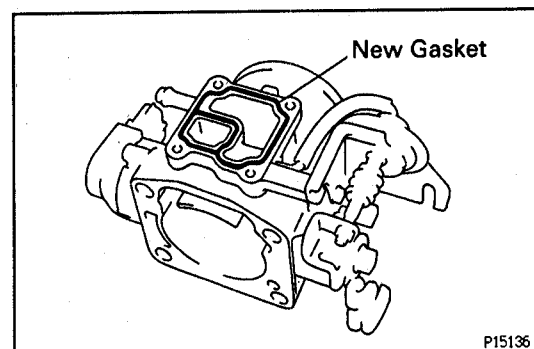
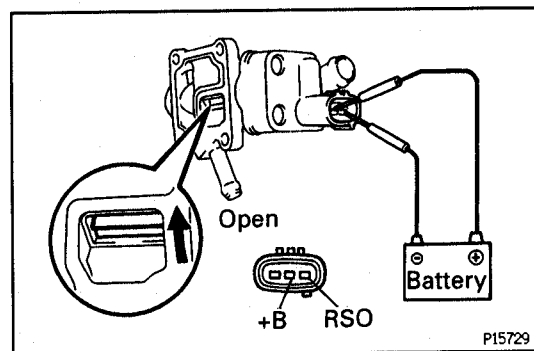
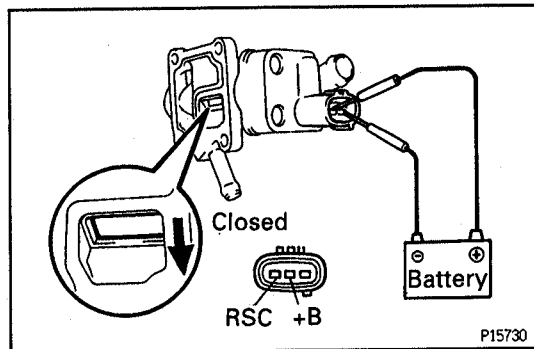
Cold: $17.0 - 24.5 \Omega$

Hot: $21.5 - 28.5 \Omega$

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.



IAC VALVE INSTALLATION

1. INSTALL IAC VALVE

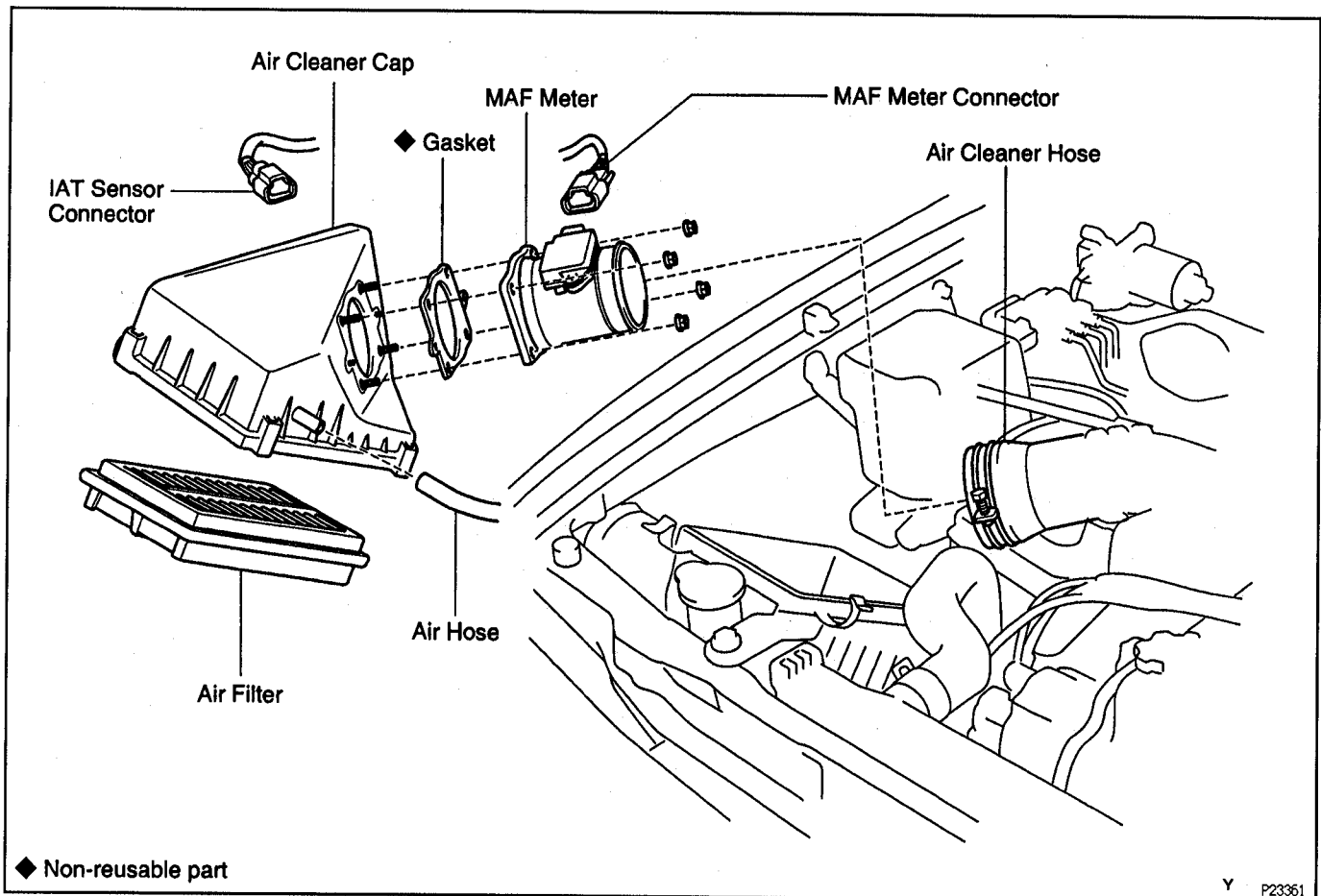
- (a) Place a new gasket on the throttle body.
- (b) Install the IAC valve with the 4 screws.

2. INSTALL THROTTLE BODY

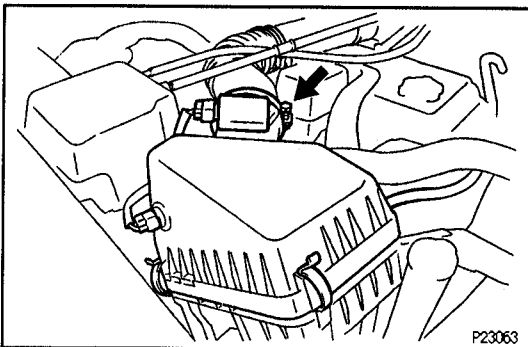
(See throttle body installation)

MASS AIR FLOW (MAF) METER COMPONENTS FOR REMOVAL AND INSTALLATION

E00YJ-0U



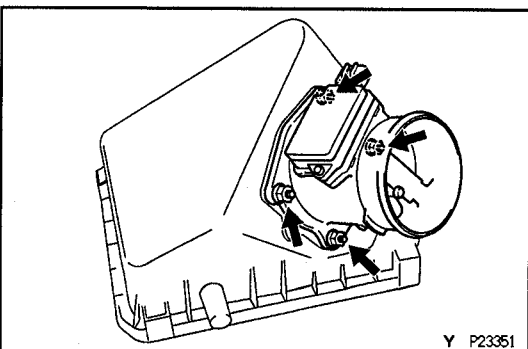
EG

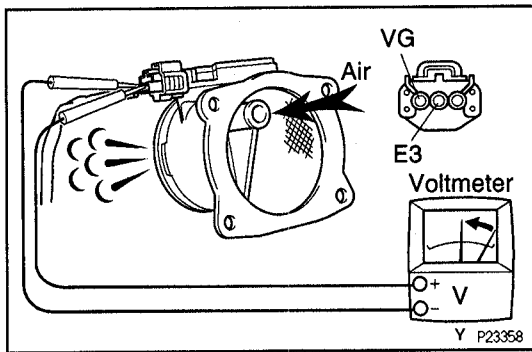


MAF METER REMOVAL

E0588-03

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.



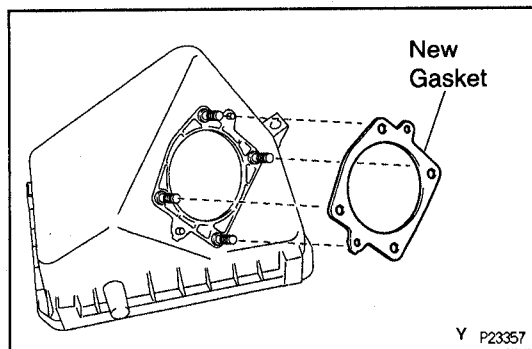


MAF METER INSPECTION

INSPECT MAF METER OPERATION

- Connect the negative (—) terminal cable to the battery.
- Turn the ignition switch ON.
- Connect the MAF meter connector.
- Using a voltmeter, connect the positive (+) tester probe to terminal VG, and negative (—) tester probe to terminal E3.
- Blow air into the MAF meter, and check that the voltage fluctuates.
If operation is not as specified, replace the MAF meter.
- Turn the ignition switch LOCK.
- Disconnect the negative (—) terminal cable from the battery.
- Disconnect the MAF meter connector.

EG98A-04



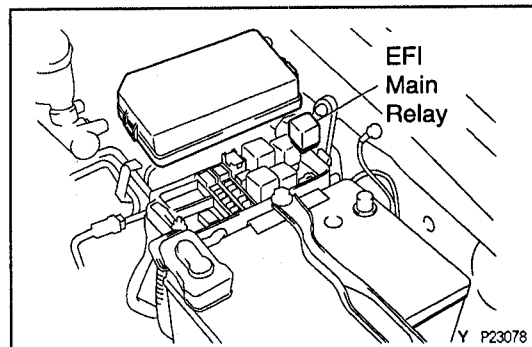
MAF METER INSTALLATION

1. INSTALL MAF METER TO AIR CLEANER CAP

- Place a new gasket on the air cleaner cap.
- 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

EG954-01



EFI MAIN RELAY

EFI MAIN RELAY INSPECTION

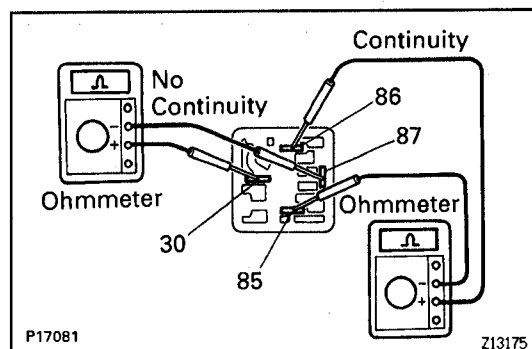
1. REMOVE EFI MAIN RELAY

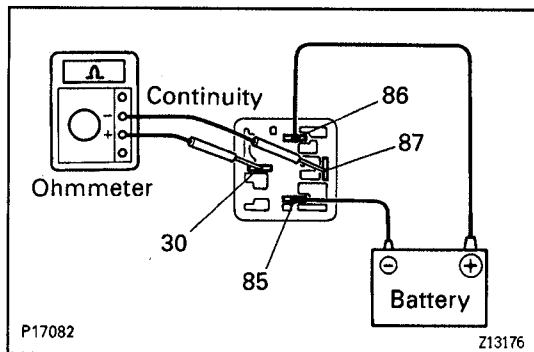
LOCATION: In the engine compartment relay box.

2. INSPECT EFI MAIN RELAY

A. Inspect relay continuity

- Using an ohmmeter, check that there is continuity between terminals 86 and 85.
If there is no continuity, replace the relay.
- Check that there is no continuity between terminals 87 and 30.
If there is continuity, replace the relay.



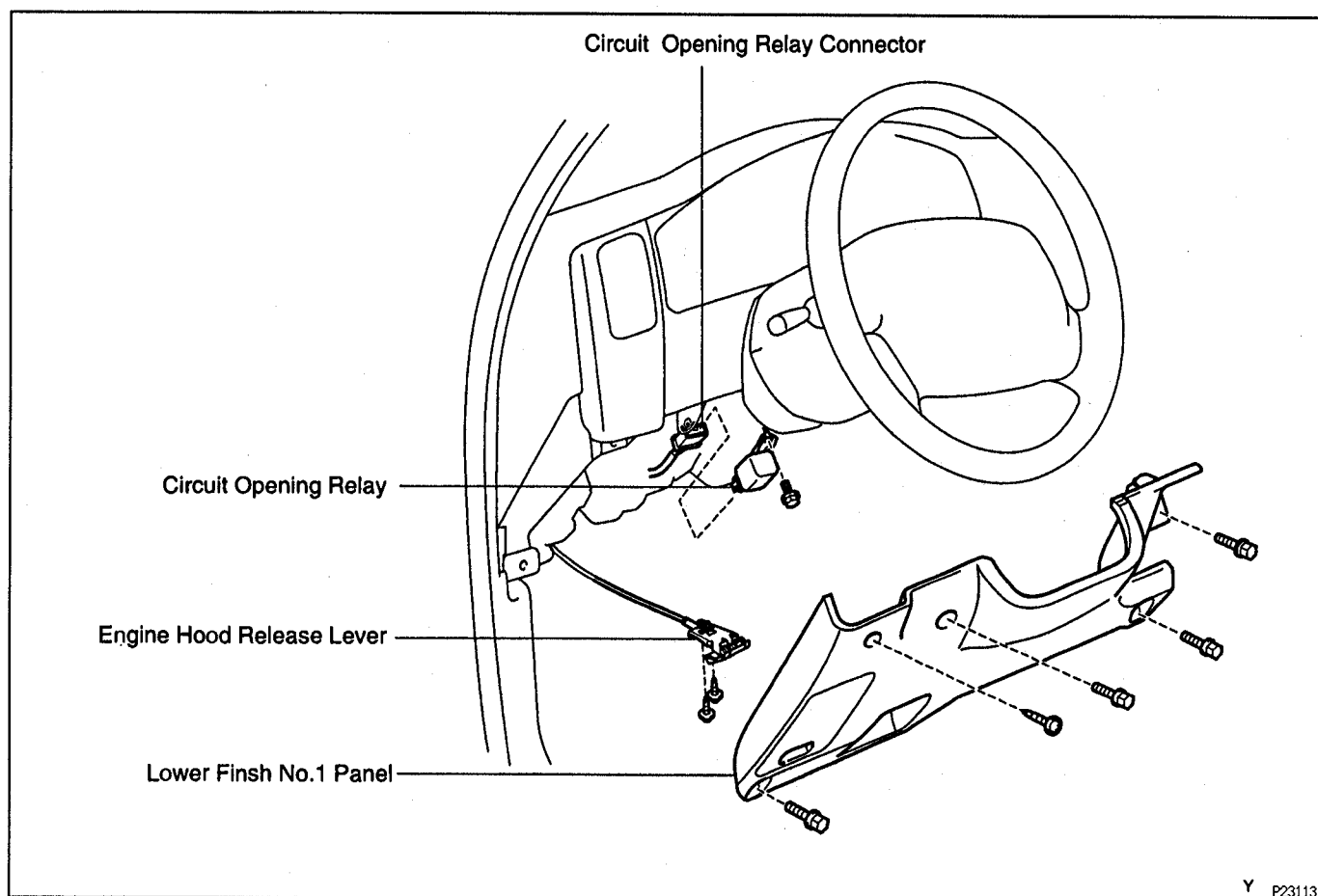
**B. Inspect relay operation**

- (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

EG176-07



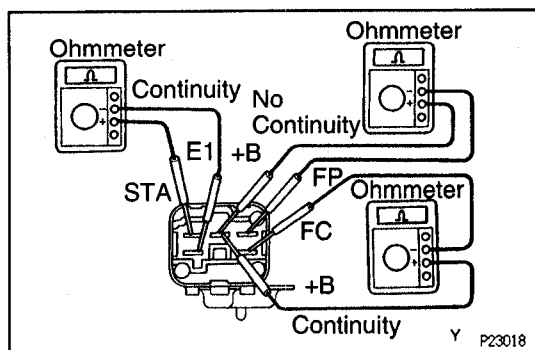
Y P23113

CIRCUIT OPENING RELAY INSPECTION

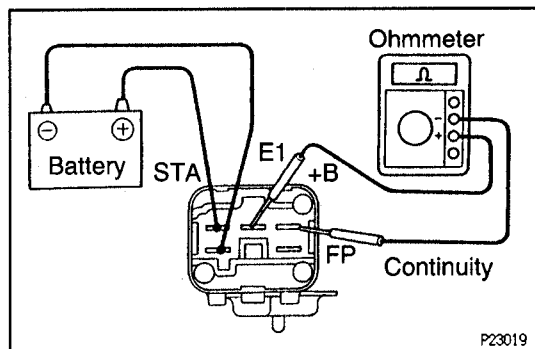
EG065-02

1. REMOVE LOWER FINISH NO.1 PANEL
2. REMOVE CIRCUIT OPENING RELAY
3. INSPECT CIRCUIT OPENING RELAY

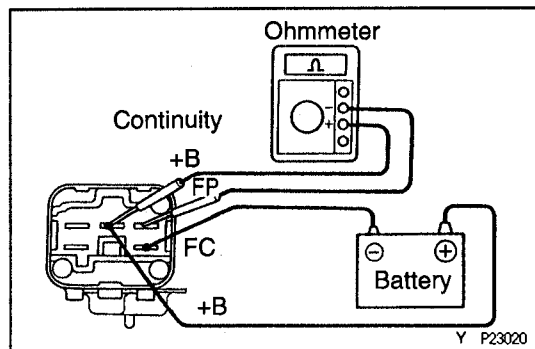
EG

**A. Inspect relay continuity**

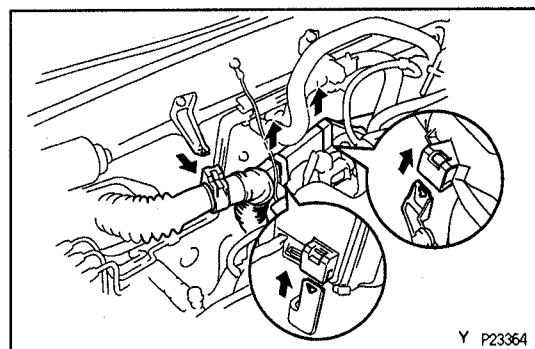
- (a) Using an ohmmeter, check that there is continuity between terminals STA and E1.
If there is no continuity, replace the relay.
- (b) Check that there is continuity between terminals +B and FC.
If there is no continuity, replace the relay.
- (c) Check that there is no continuity between terminals +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**

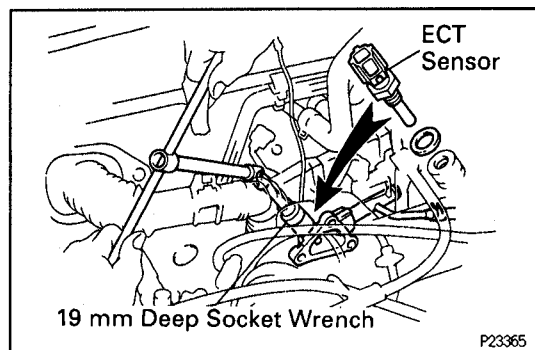
ENGINE COOLANT TEMPERATURE (ECT) SENSOR

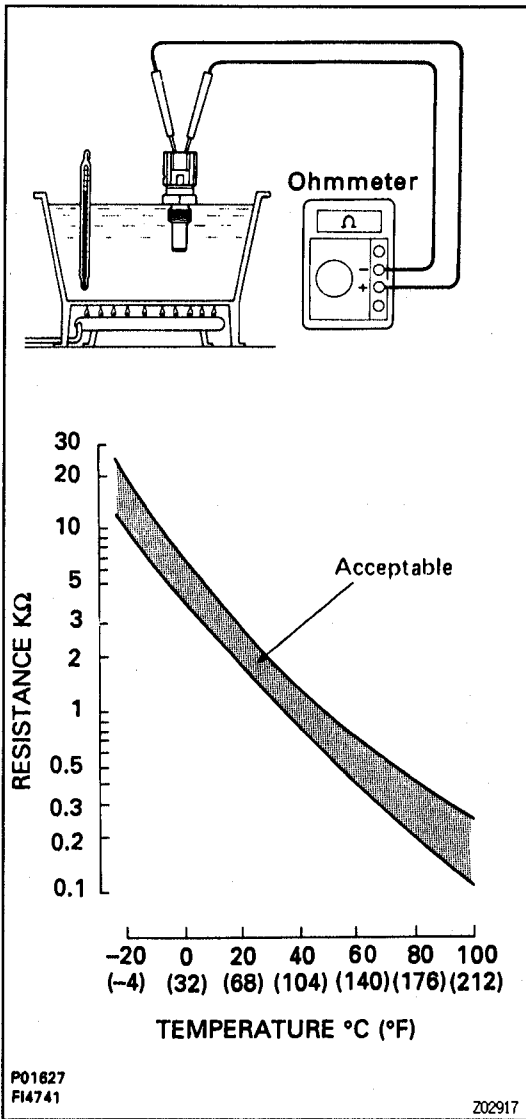
ENGINE COOLANT TEMPERATURE SENSOR INSPECTION

E05N8-02

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.

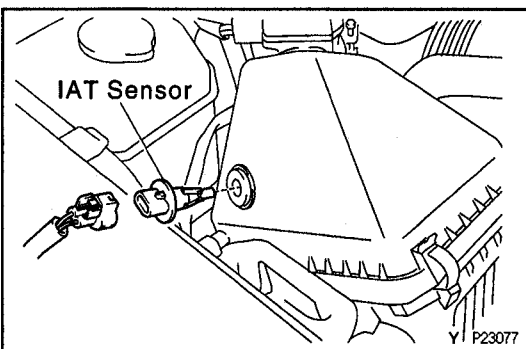
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

- (b) Connect the ECT sensor connector.

- (c) Install the engine wire protector to the 3 brackets.

5. REFILL ENGINE COOLANT

EG



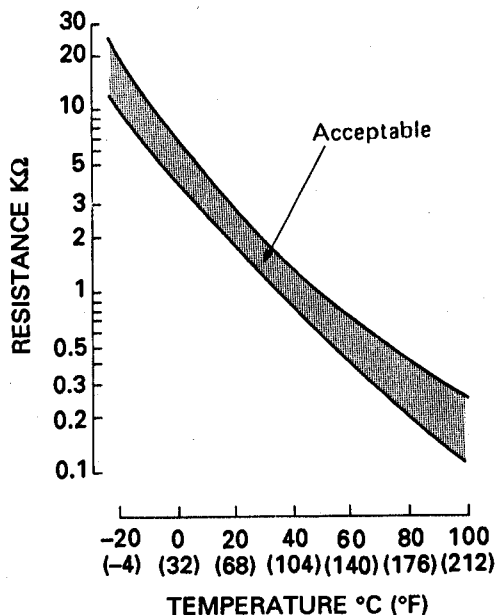
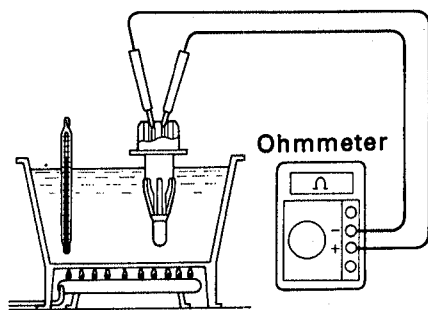
INTAKE AIR TEMPERATURE (IAT) SENSOR

IAT SENSOR INSPECTION

B01AN-07

1. REMOVE IAT SENSOR

EG

P01656
FI4741

Z02772

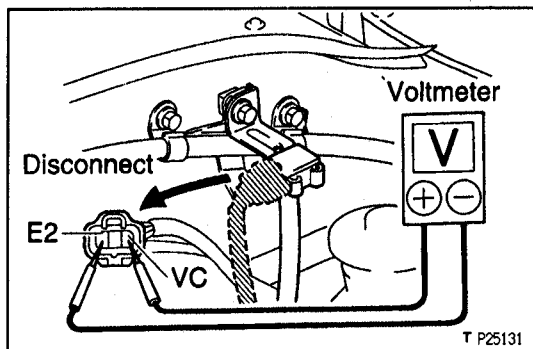
2. INSPECT IAT SENSOR

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

T P25131

VAPOR PRESSURE SENSOR (3RZ-FE)

VAPOR PRESSURE SENSOR INSPECTION

E0486-01

1. INSPECT POWER SOURCE VOLTAGE OF VAPOR PRESSURE SENSOR

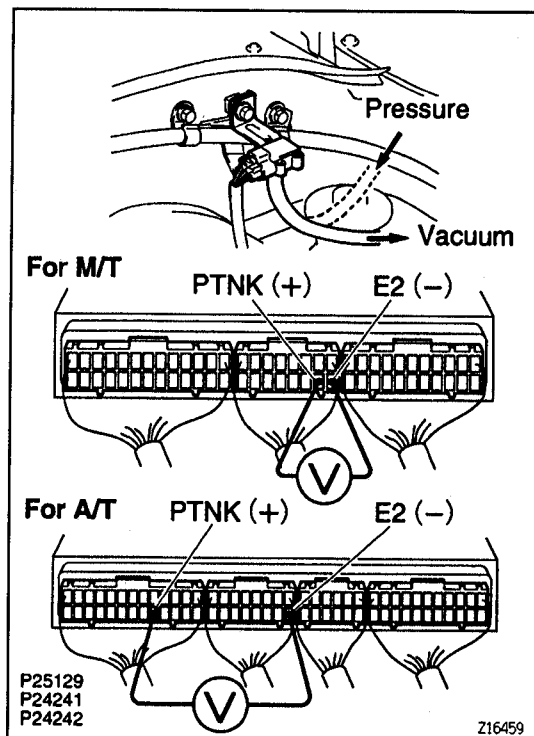
- Disconnect the vapor pressure sensor connector.
- Turn the ignition switch ON.
- Using a voltmeter, measure the voltage between connector terminals VC and E2 of the wiring harness side.

Voltage:

4.5 — 5.5 V

- Turn the ignition switch to LOCK.
 - Reconnect the vapor pressure sensor connector.
- 2. INSPECT POWER OUTPUT OF VAPOR PRESSURE SENSOR**

- Turn the ignition switch ON.
- 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

BOSNT-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)

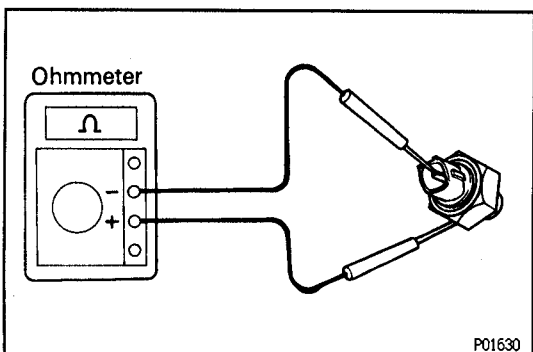
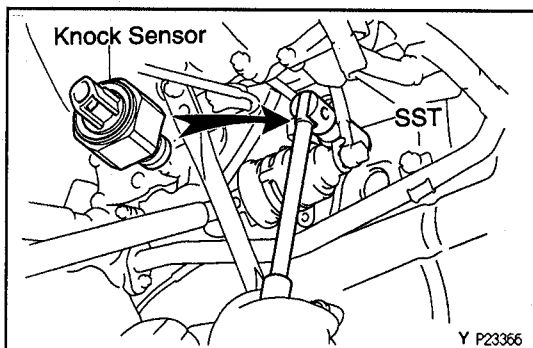
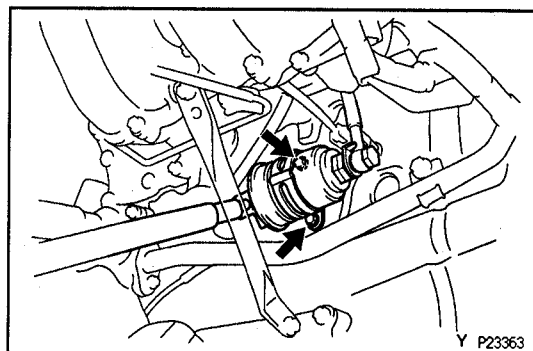
- (b) Connect the knock sensor connector.

6. REINSTALL FUEL FILTER SET BOLTS

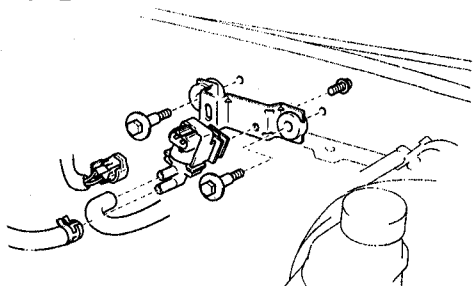
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

7. REINSTALL STARTER

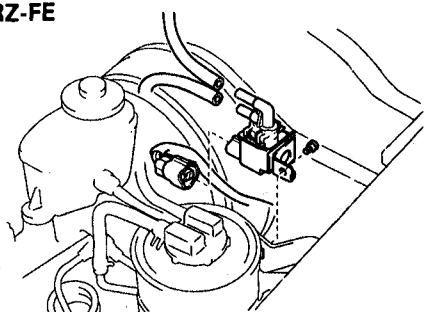
(See starter installation in Starting System)



3RZ-FE



2RZ-FE

P23353
P23354

Z16433

VSV FOR EVAP 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

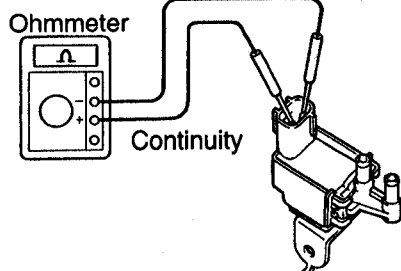
A. Inspect VSV for open circuit

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.



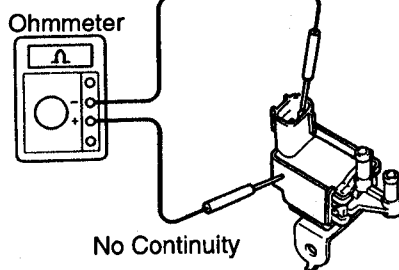
Y

P23014

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.

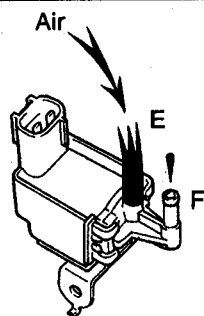


Y

P23015

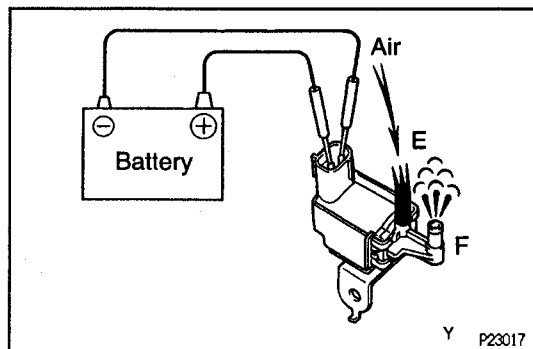
C. Inspect VSV operation

- (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.



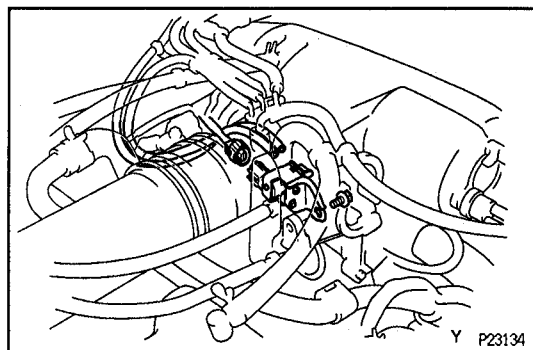
Y

P23016



- (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

805NV-02

1. REMOVE VSV

- (a) Remove the bolt.
- (b) Disconnect the connector and 2 vacuum hoses from the VSV.

2. INSPECT VSV

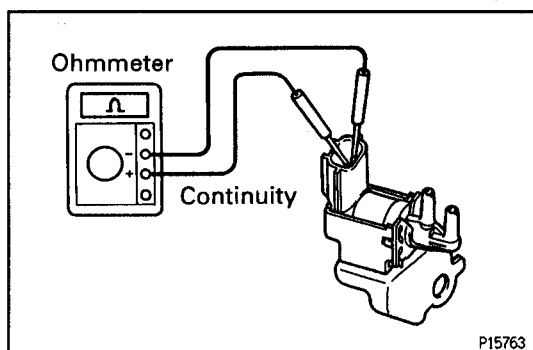
A. Inspect VSV for open circuit

Using an ohmmeter, check that there is continuity between terminals.

Resistance:

At 20°C (68°F): 33 - 39 Ω

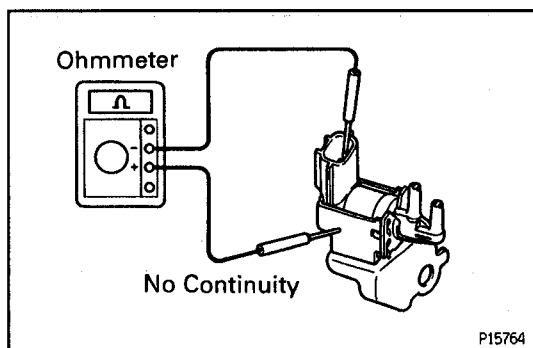
If there is no continuity, replace the VSV.



B. Inspect VSV for ground

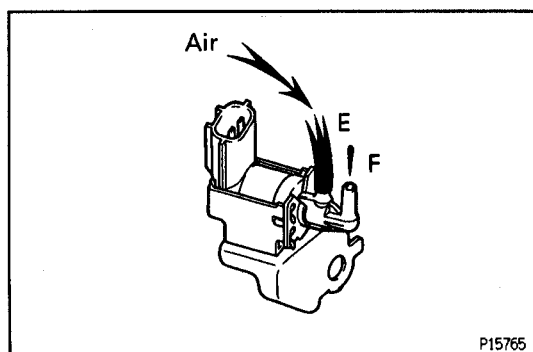
Using an ohmmeter, check that there is no continuity between each terminal and the body.

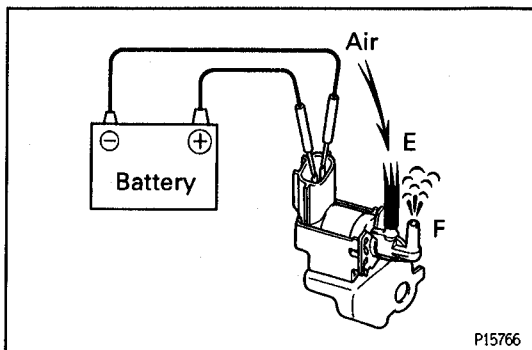
If there is continuity, replace the VSV.



C. Inspect VSV operation

- (a) Check that air does not flow from ports E to F.

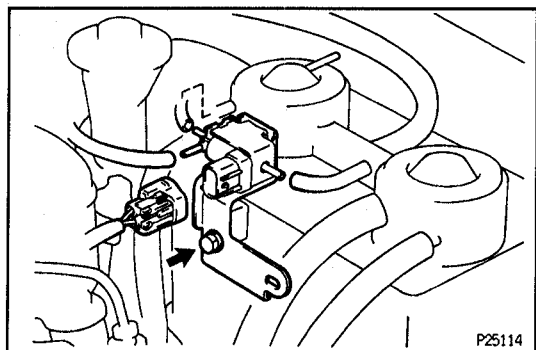




- (b) Apply battery positive voltage across the terminals.
 - (c) Check that air flows from ports E to F.
- If operation is not as specified, replace the VSV.

3. REINSTALL VSV

EG



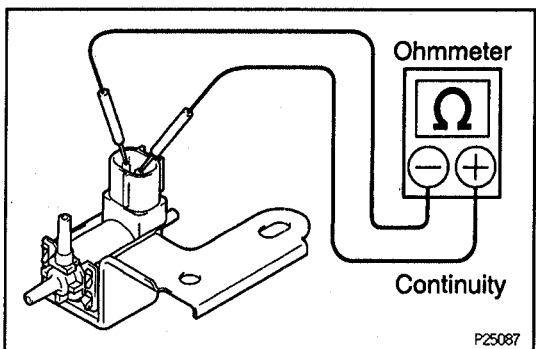
VSV FOR VAPOR PRESSURE SENSOR (3RZ-FE)

EG10E-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

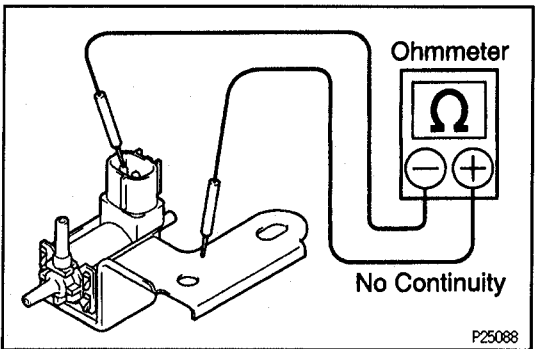
A. Inspect VSV for open circuit

Using an ohmmeter, check that there is continuity between the terminals.

Resistance:

At 20°C (68°F): 37 – 44Ω

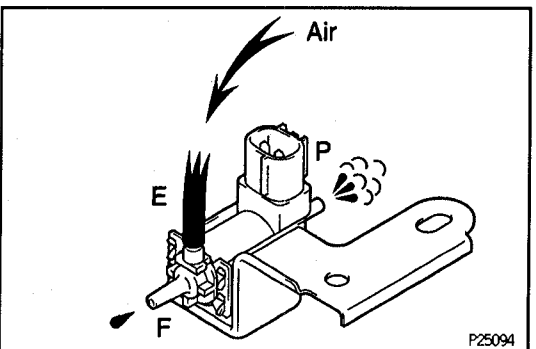
If there is no continuity, replace the VSV.



B. Inspect VSV for ground

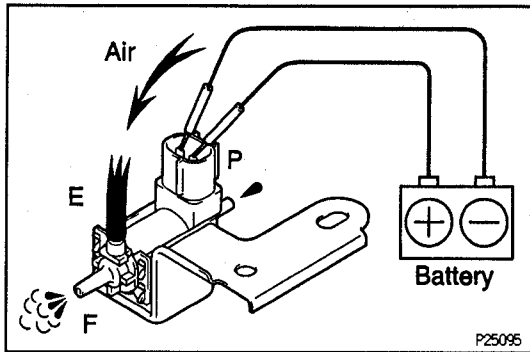
Using an ohmmeter, check that there is no continuity between each terminal and the body.

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.

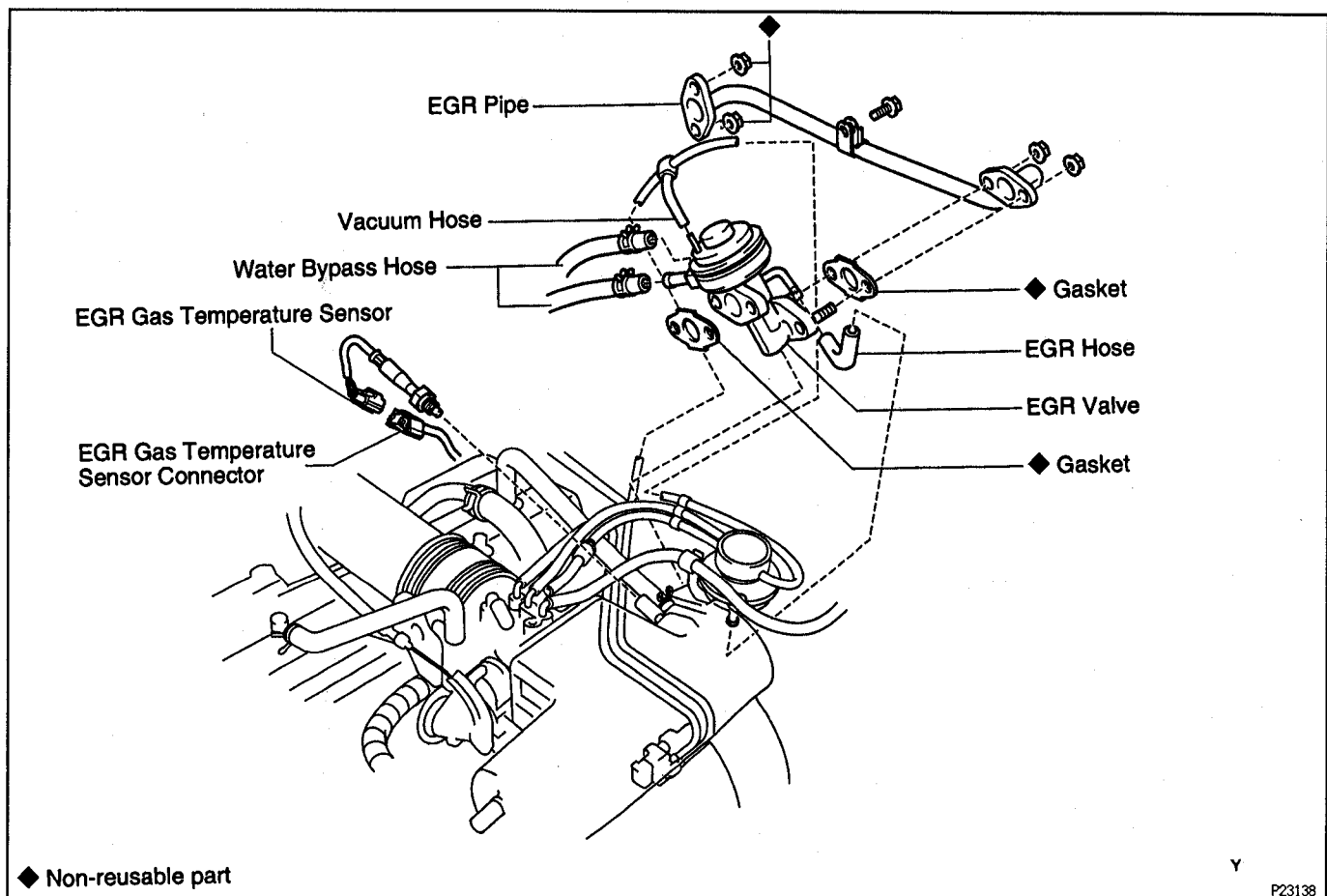


- (b) Apply battery positive voltage across the terminals.
 - (c) Check that air flows from ports E to F, and does not flow from ports E to P.
If operation is not as specified, replace the VSV.
- 3. REINSTALL VSV**

EG

EGR GAS TEMPERATURE SENSOR COMPONENTS FOR REMOVAL AND INSTALLATION

EGSNX-02



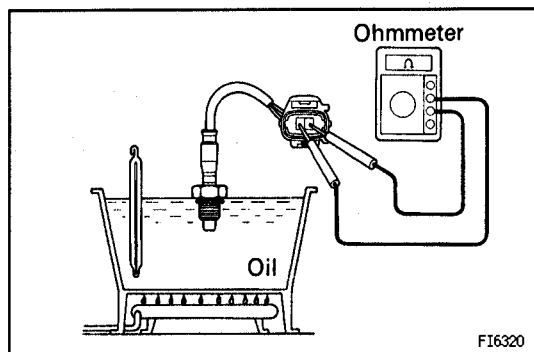
Y

P23138

EGR GAS TEMPERATURE SENSOR INSPECTION

EGSNY-02

- 1. REMOVE EGR VALVE**
(See EGR valve inspection in Emission Control System)
- 2. REMOVE EGR GAS TEMPERATURE SENSOR**



3. INSPECT EGR GAS TEMPERATURE SENSOR

Using an ohmmeter, measure the resistance between the terminals.

Resistance:

At 50°C (122°F): 64 – 97 kΩ

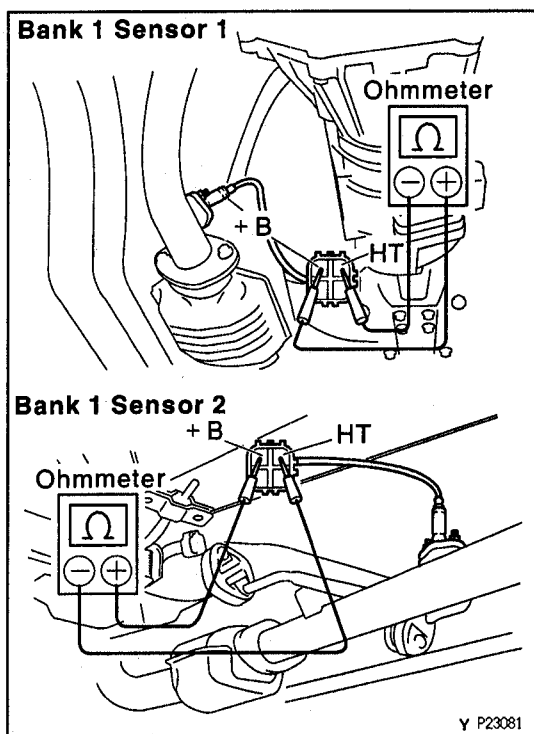
At 100°C (212°F): 11 – 16 kΩ

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

- Disconnect the heated oxygen sensor connector.
- Using an ohmmeter, measure the resistance between terminals +B and HT.

Resistance:

At 20°C (68°F):

Bank 1 Sensor 1: 5 – 7 Ω

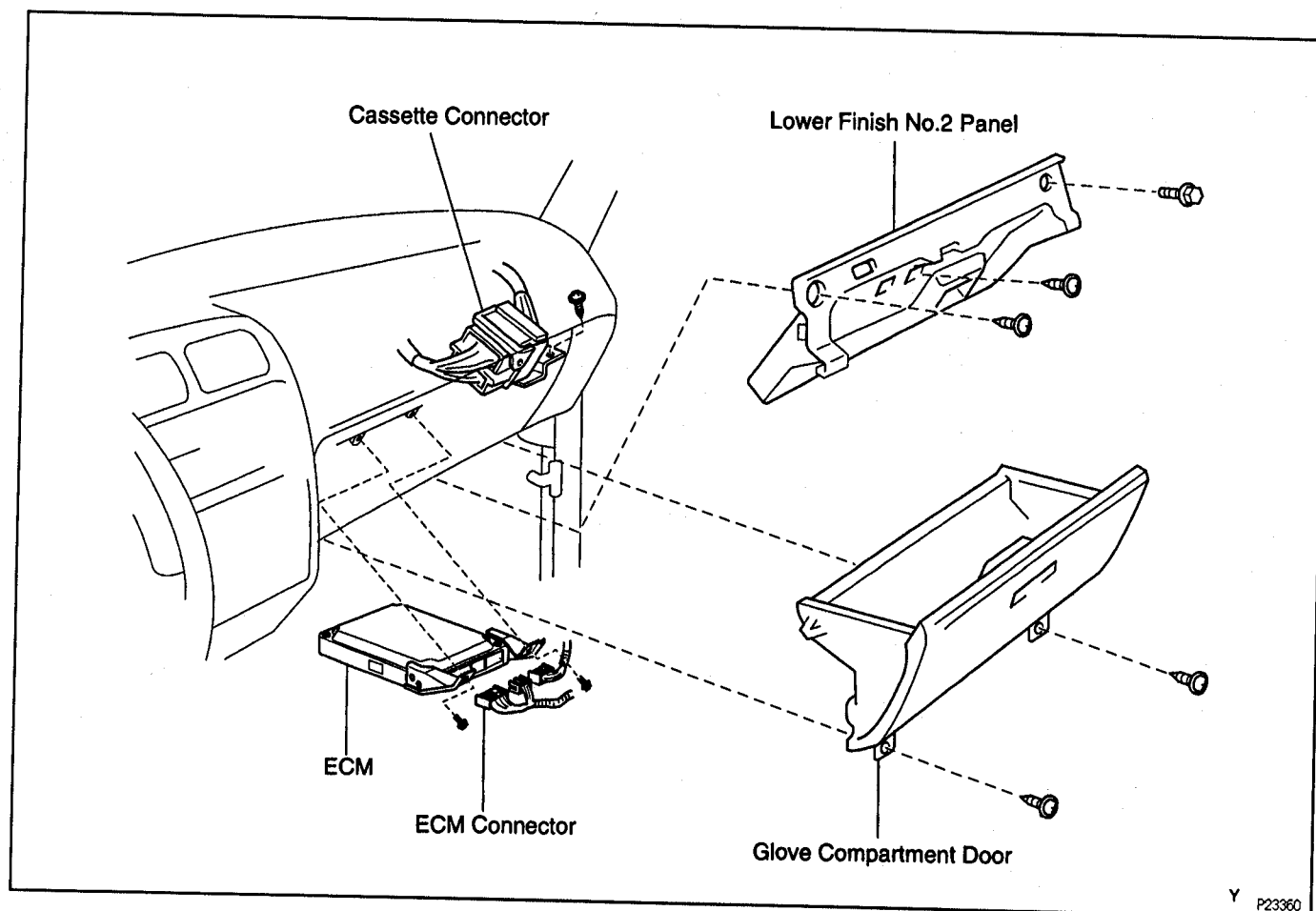
Bank 1 Sensor 2: 11 – 16 Ω

If resistance is not as specified, replace the heated oxygen sensor.

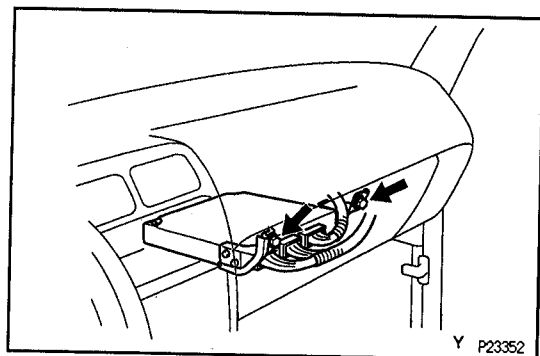
- Reconnect the heated oxygen sensor connector.

ENGINE CONTROL MODULE (ECM) COMPONENTS FOR REMOVAL AND INSTALLATION

EG003-02



Y P23360



Y P23352

ECM REMOVAL

EG080-03

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

EG007-01

Installation is in the reverse order of removal.

FUEL CUT RPM 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:

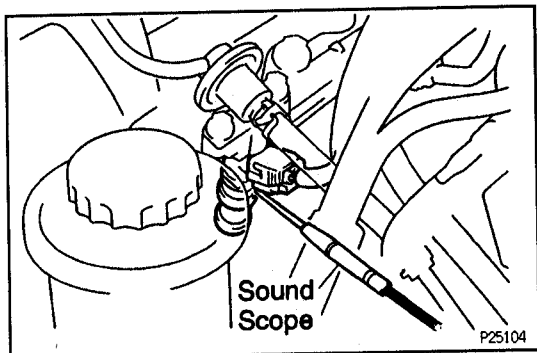
M/T:

1,400 rpm

A/T:

1,500 rpm

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



SERVICE SPECIFICATIONS

SERVICE DATA

EG02A-0T

Fuel pressure regulator	Fuel pressure at no vacuum	265 - 304 kPa (2.7 - 3.1 kgf/cm ² , 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 cm ³ (3.8 - 4.8 cu in.) per 15 seconds
	Difference between each cylinder	5 cm ³ (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 cm ³ (4.2 - 5.4 cu in.) per 15 seconds
	Difference between each cylinder	5 cm ³ (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)	5 - 7 Ω
	Bank 1 Sensor 2	at 20°C (68°F)	11 - 16 Ω
Fuel cut RPM	Fuel return rpm	M/T	1,400 rpm
		A/T	1,500 rpm

EG00E-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

EG08U-00

Heater	Thermostat
Radiator cap tester	
Thermometer	Thermostat
Torque wrench	

ENGINE COOLANT

EG08V-00

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

EG08Z-02

The coolant level should be between the "L" and "F" lines.

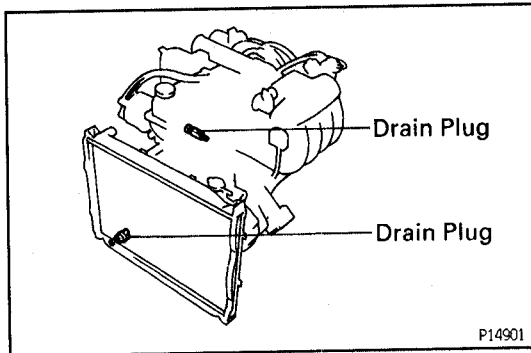
If low, check for leaks and add coolant up to the "F" line.

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)

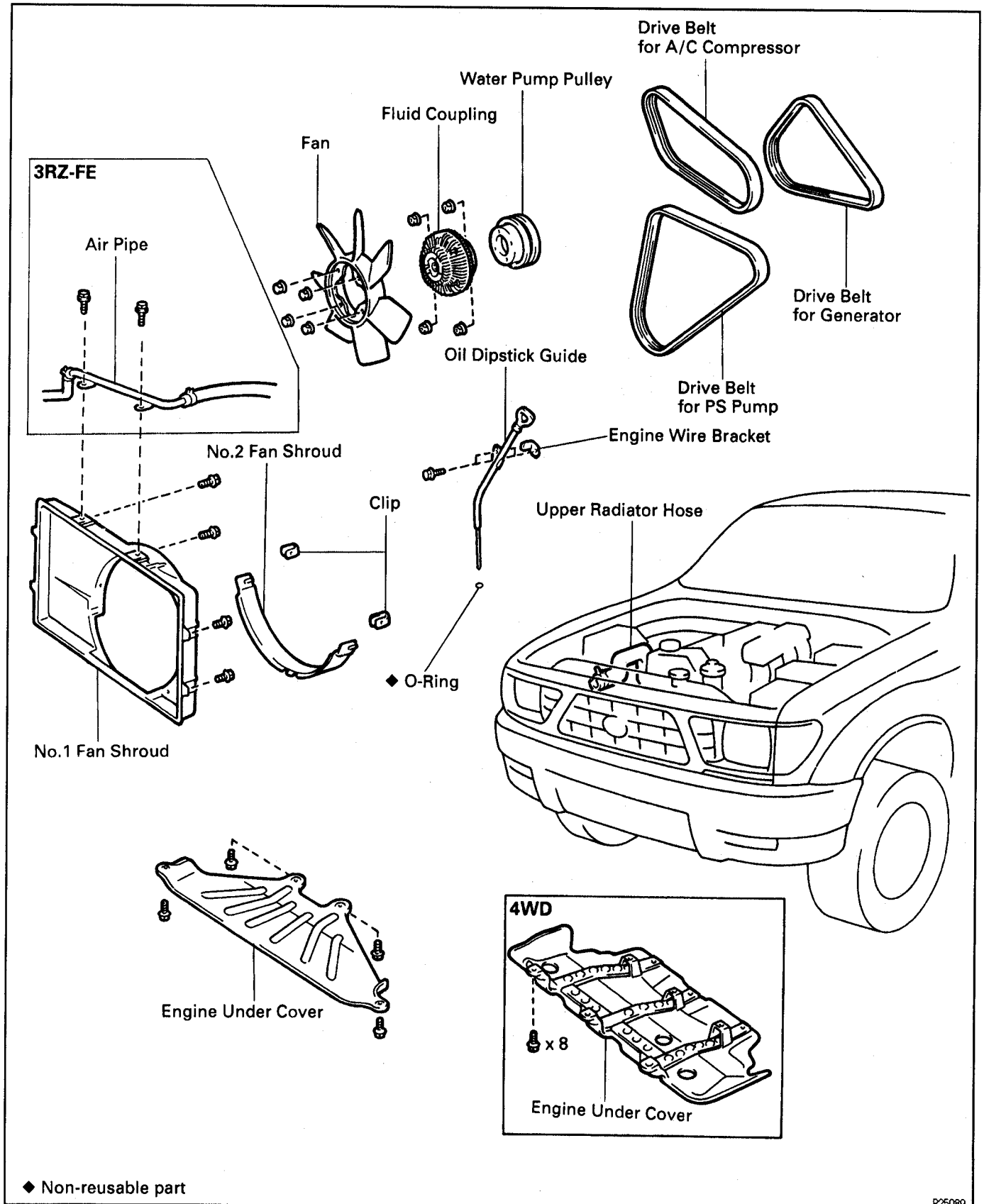
(e) Reinstall the radiator cap.

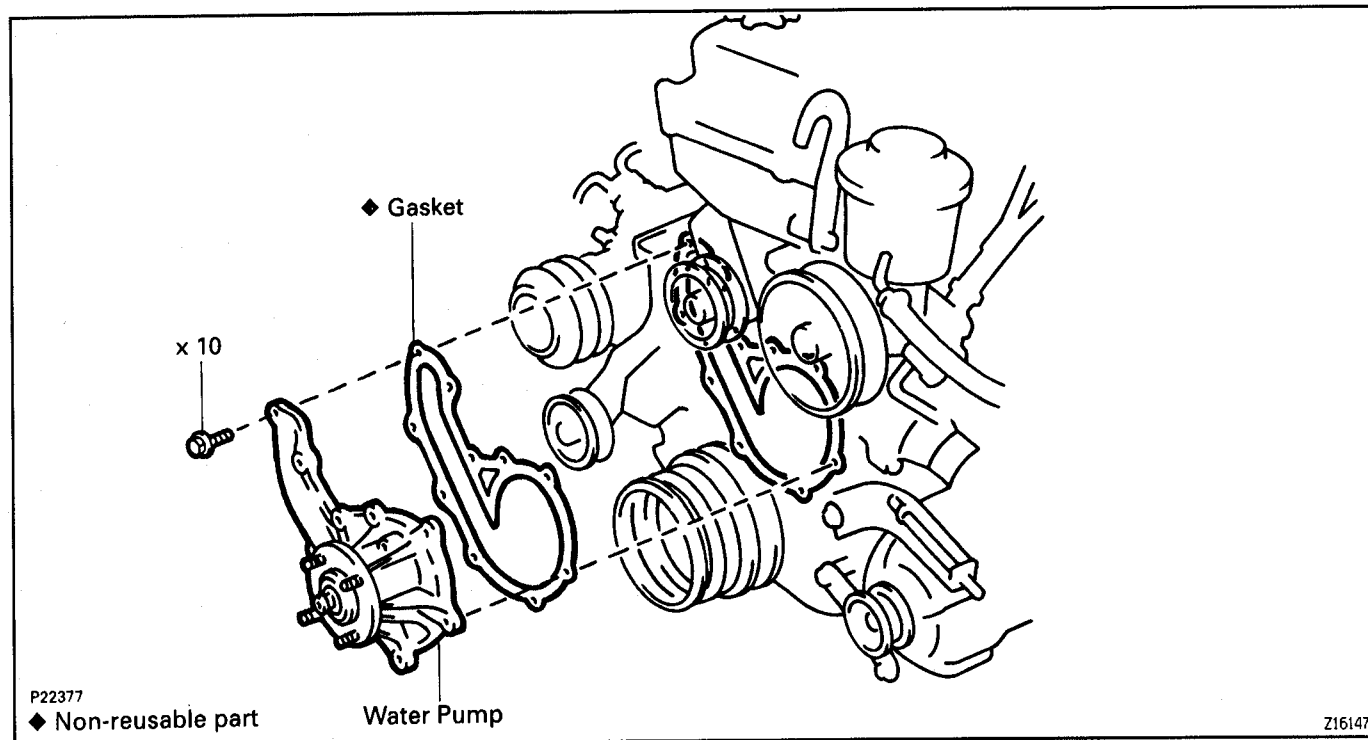
(f) Warm up the engine and check for leaks.

(g) Recheck the coolant level and refill as necessary.

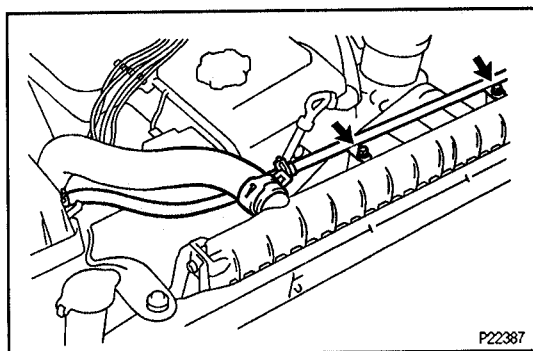
WATER PUMP COMPONENTS FOR REMOVAL AND INSTALLATION

EG





EGP1-02



WATER PUMP REMOVAL

1. REMOVE ENGINE UNDER COVER
2. DRAIN ENGINE COOLANT
3. 3RZ-FE:
DISCONNECT AIR PIPE

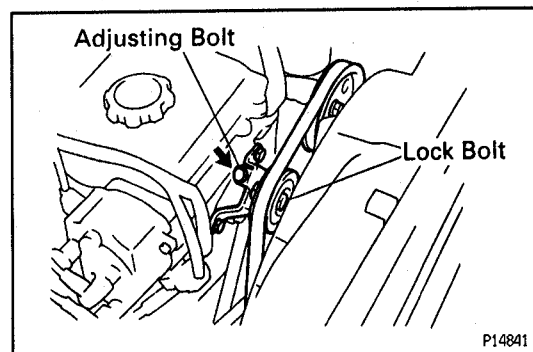
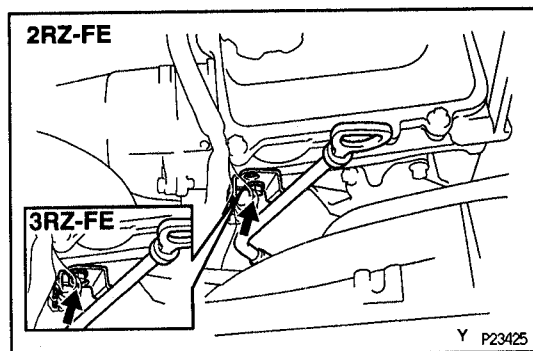
Remove the 2 bolts and disconnect the air pipe from the fan shroud.

4. DISCONNECT UPPER RADIATOR HOSE FROM RADIATOR
5. REMOVE OIL DIPSTICK GUIDE

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

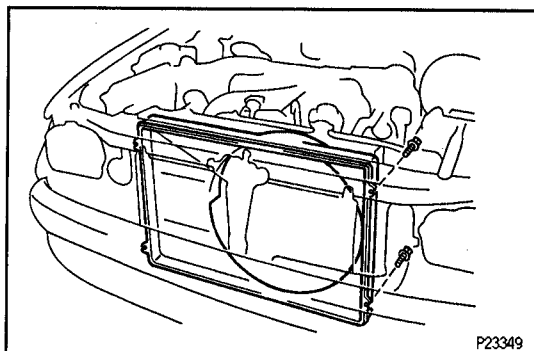
(b) Remove the O-ring from the dipstick guide.

INSTALLATION HINT: Use a new O-ring.



6. w/ PS:
REMOVE DRIVE BELT FOR PS PUMP

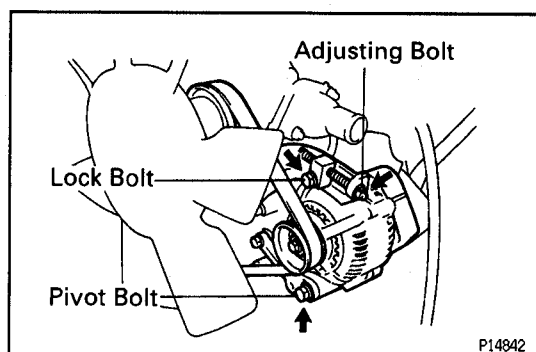
Loosen the lock bolt and adjusting bolt, and remove the drive belt.

**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

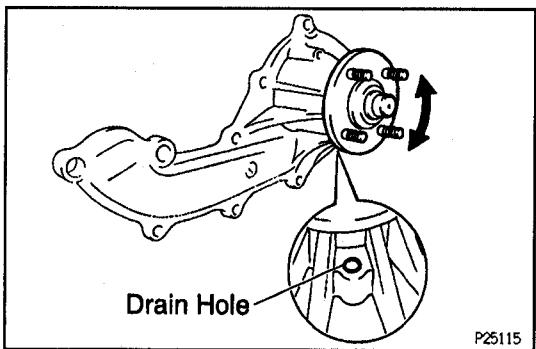
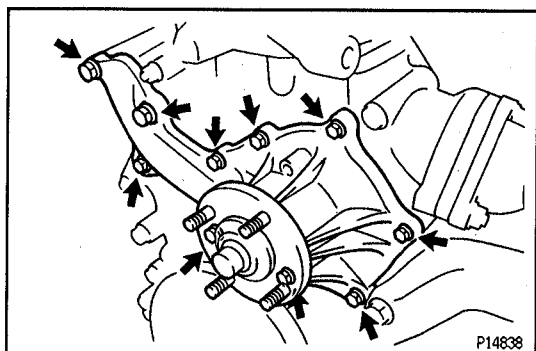
Remove the 10 bolts, water pump and gasket.

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)

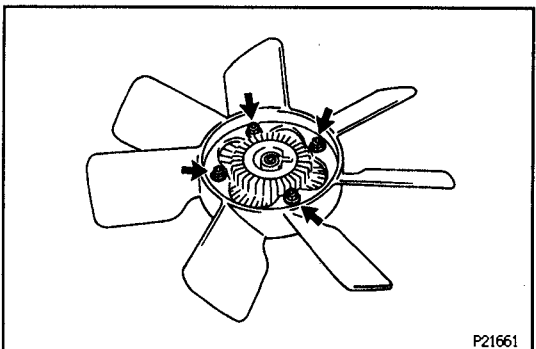
INSTALLATION HINT: Use a new gasket.

**WATER PUMP COMPONENTS INSPECTION****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)

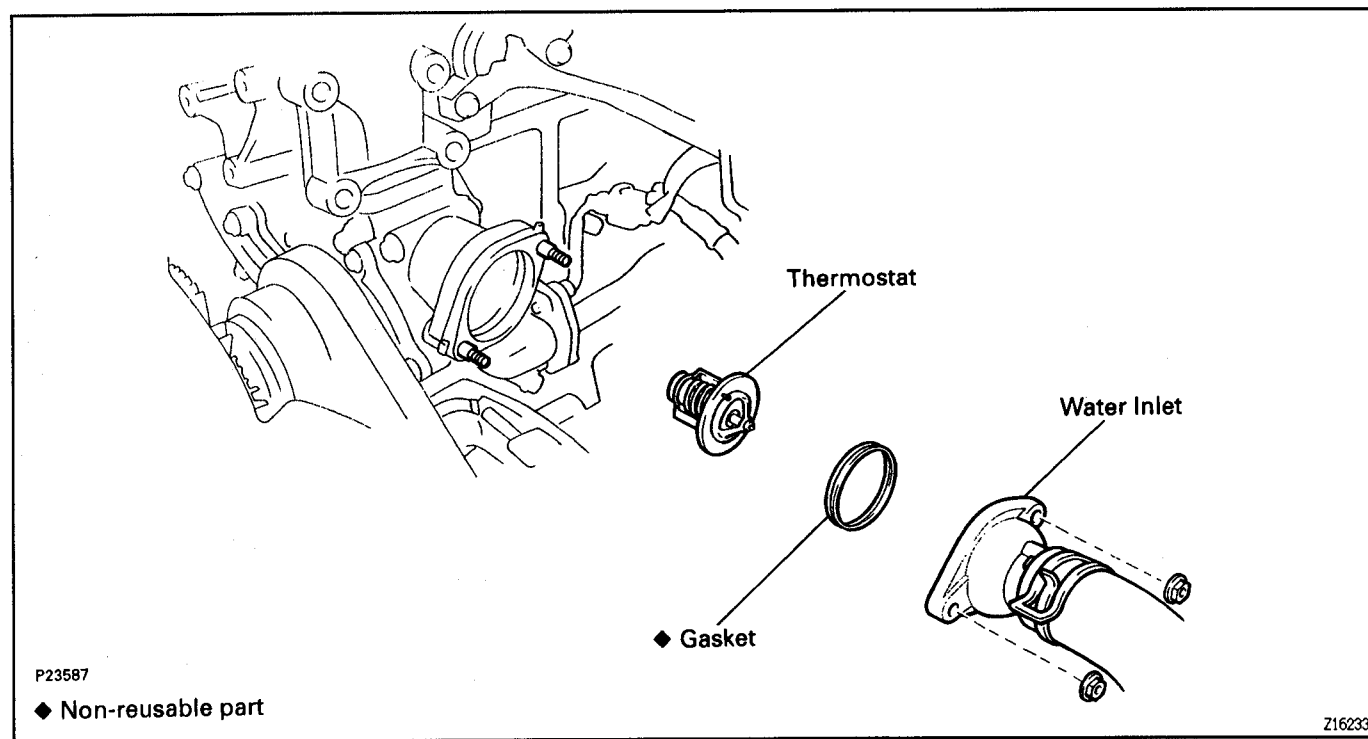


WATER PUMP INSTALLATION

Installation is in the reverse order of removal.

THERMOSTAT COMPONENTS FOR REMOVAL AND INSTALLATION

E013D-13

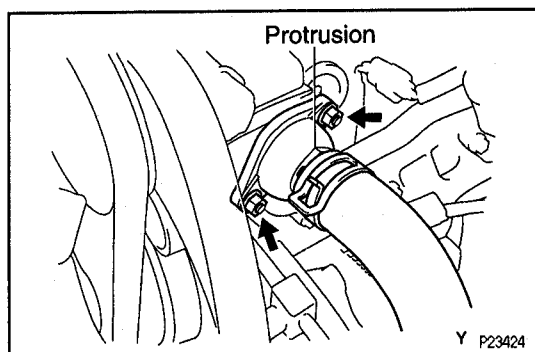


E01JS-0A

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

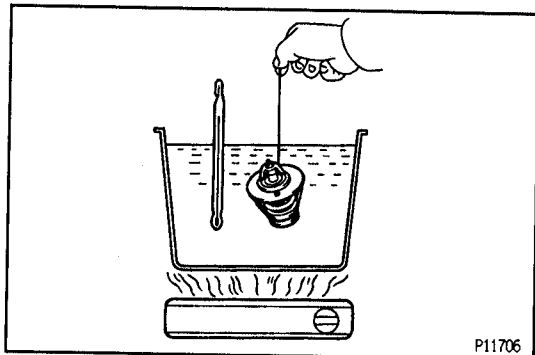


2. DISCONNECT WATER INLET WITH LOWER RADIATOR HOSE, AND REMOVE THERMOSTAT

- (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.

EGP2-02

THERMOSTAT INSPECTION



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

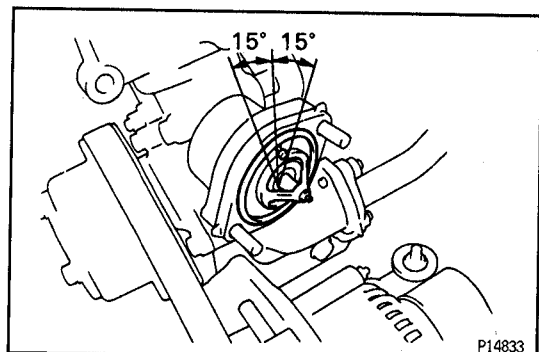
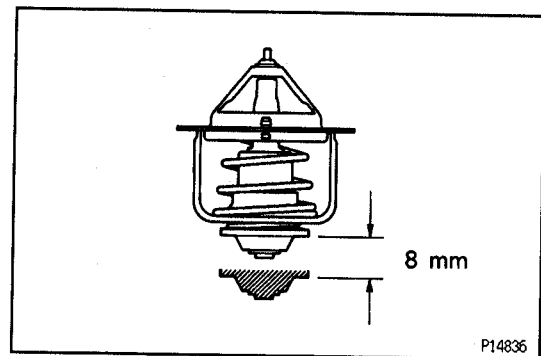
If the valve lift is not as specified, replace the thermostat.

- (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.

EGP3-02

THERMOSTAT INSTALLATION



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

RADIATOR RADIATOR CLEANING

EG074-08

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)

RADIATOR INSPECTION

EG06U-01

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.

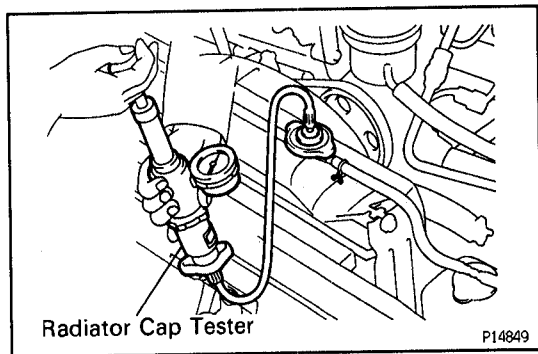
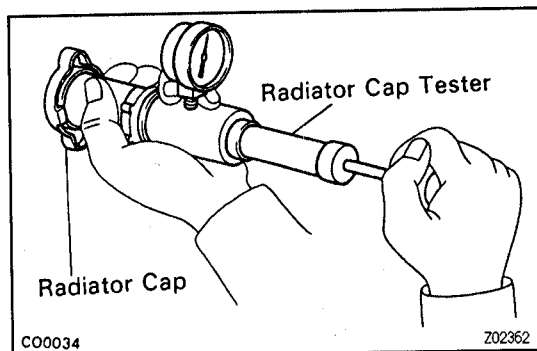
If the opening pressure is less than minimum, replace the radiator cap.

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.

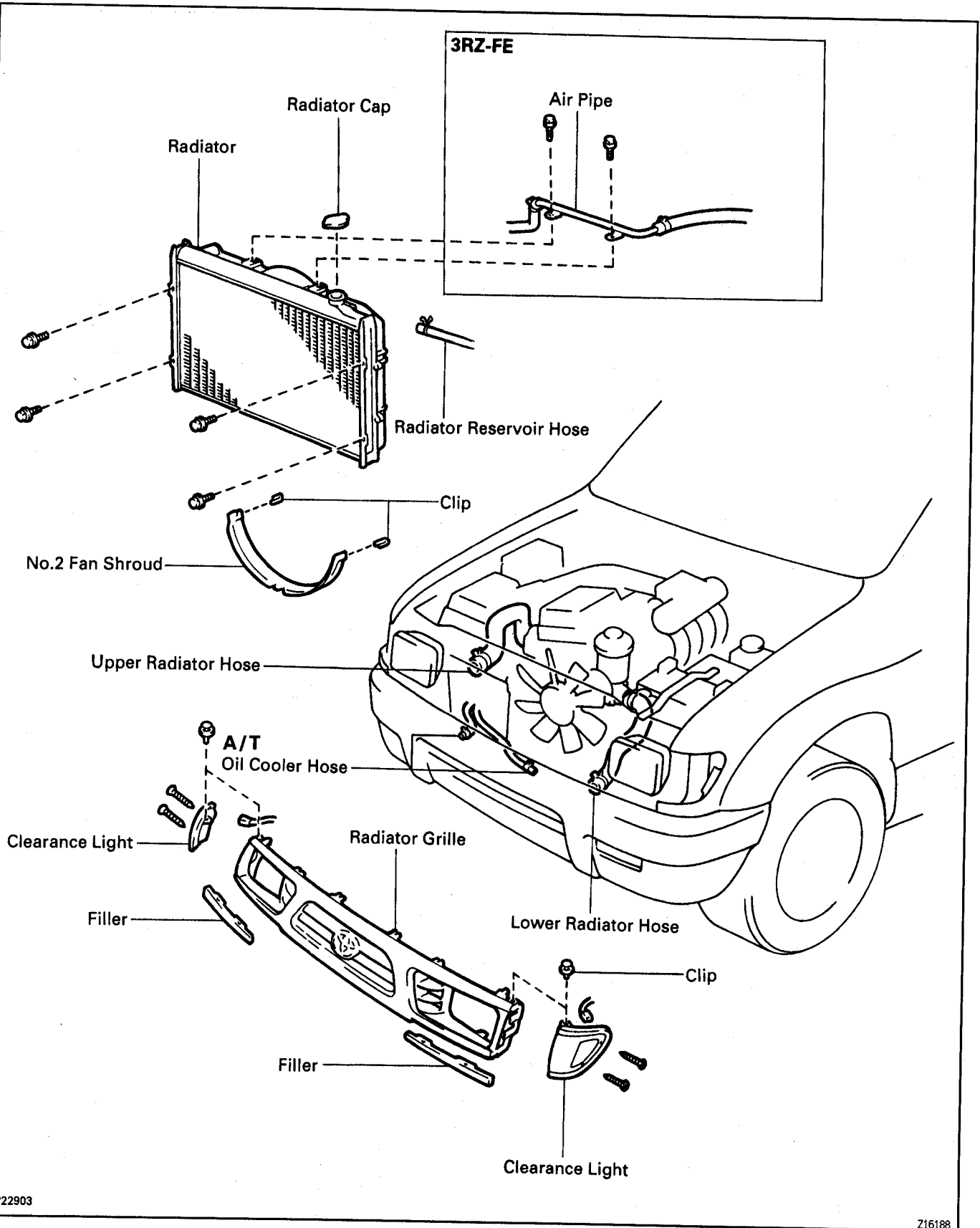
If the pressure drops, check the hoses, radiator or water pump for leaks. If no external leaks are found, check the heater core, cylinder block and head.

4. REINSTALL RADIATOR CAP



COMPONENTS FOR REMOVAL AND
INSTALLATION

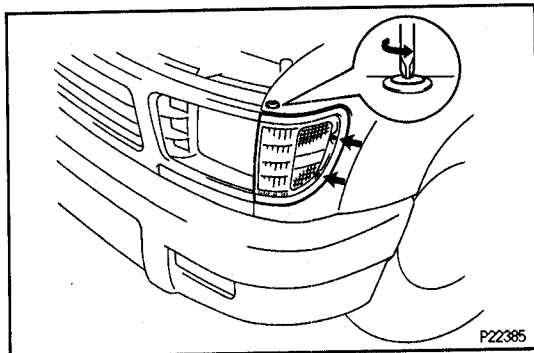
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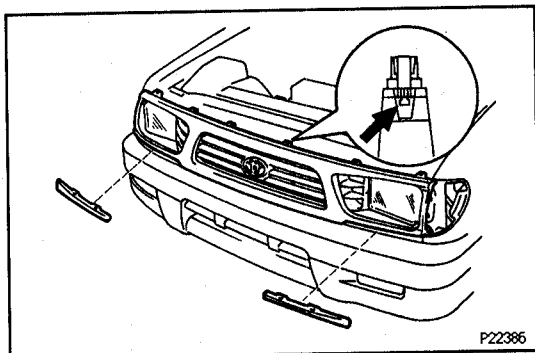
RADIATOR REMOVAL

1. DRAIN ENGINE COOLANT
2. REMOVE RADIATOR GRILLE

(a) Remove the 4 screws, 2 clips and clearance lights.

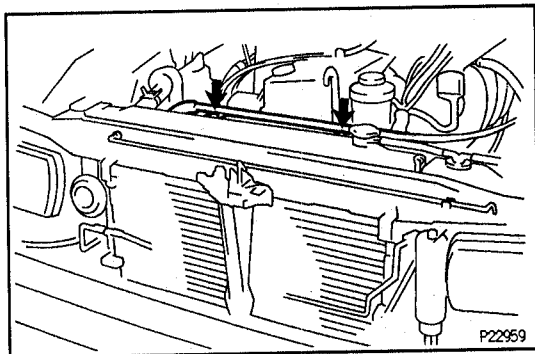


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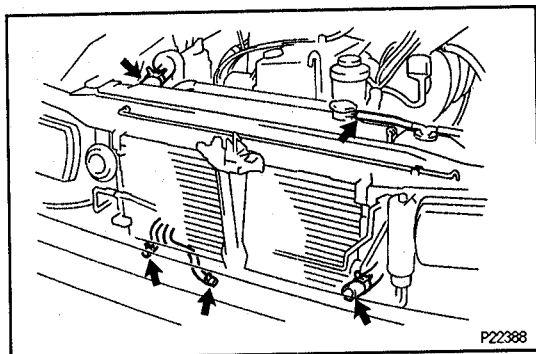


(b) Remove the 2 filler.

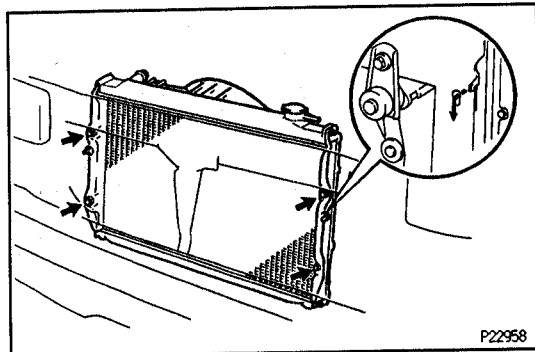
(c) Remove the 11 clips and radiator grille.

**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**

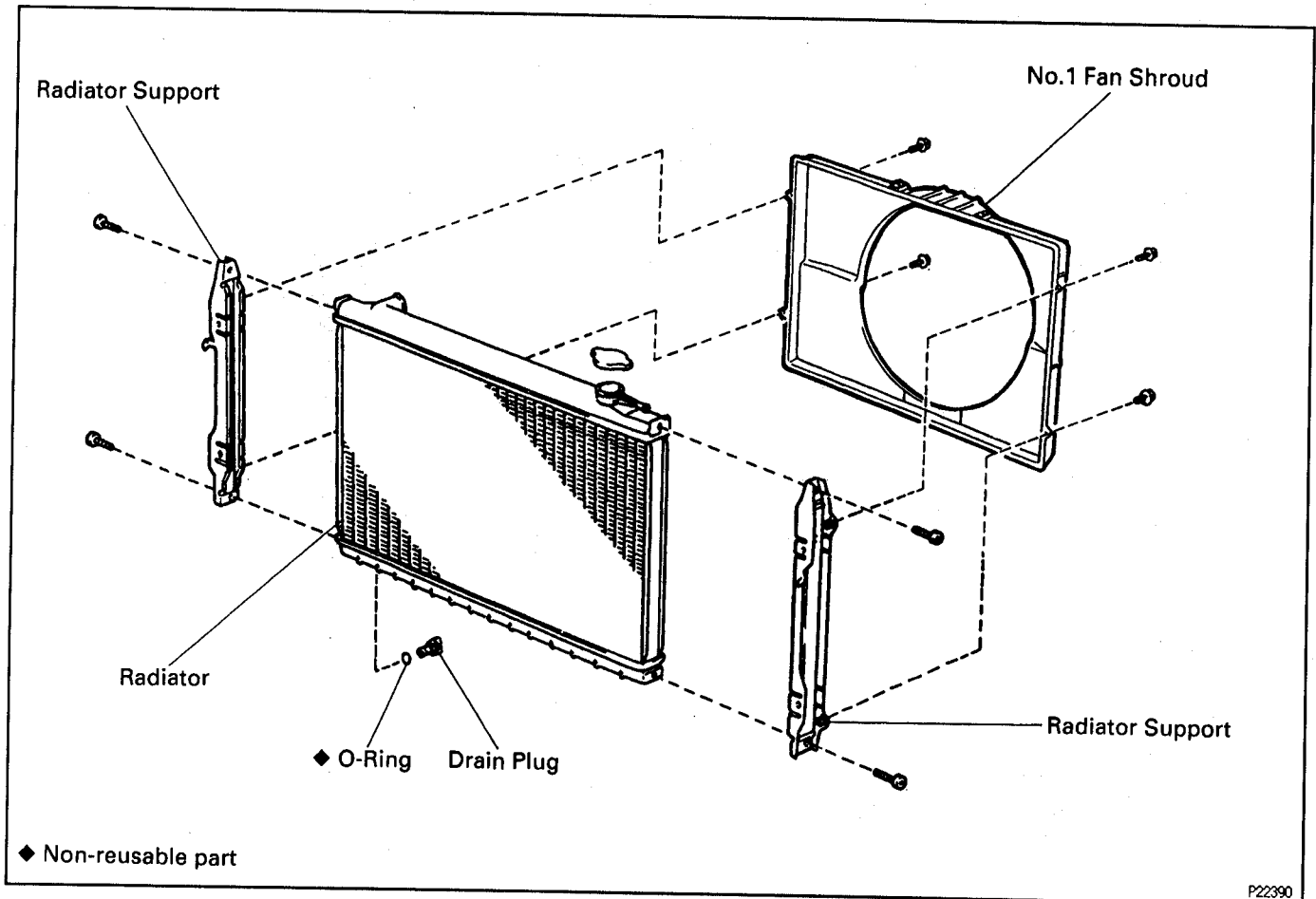
Remove the 4 bolts and radiator.

Torque: 12.5 N·m (125 kgf·cm, 9 ft·lbf)

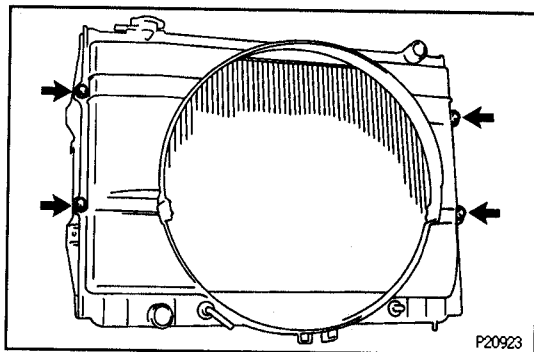
INSTALLATION HINT: Insert the tabs of the radiator support through the radiator service holes.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

EG1J6-0E



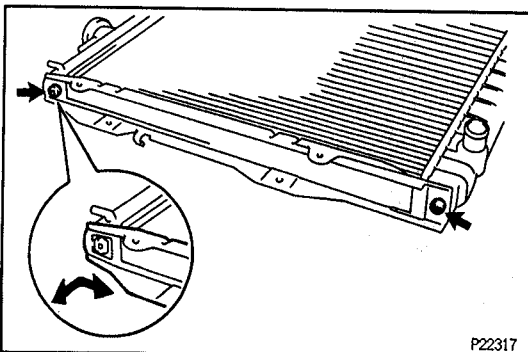
EG



RADIATOR DISASSEMBLY

EG587-04

- 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)

RADIATOR ASSEMBLY

Assembly is in the reverse order of disassembly.

EG06H-01

RADIATOR INSTALLATION

Installation is in the reverse order of removal.

EG

SERVICE SPECIFICATIONS

SERVICE DATA

EG07L-1E

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/cm ² , 10.7 — 14.9 psi)

EG07M-1J

TORQUE SPECIFICATIONS

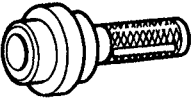
Part tightened		N·m	kgf·cm	ft·lbf
Cylinder block x Drain plug		24.5	250	18
Water pump pulley x Water pump		21	210	16
Water pump x Cylinder block	14 mm head bolt	24.5	250	18
	12 mm head bolt	8.9	90	78 in.-lbf
Fan x Fluid coupling		5.5	55	49 in.-lbf
Water inlet x Water inlet housing		20	200	15
Radiator 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	

EG

RECOMMENDED TOOLS

EG07Q-0F

	09200-00010 Engine Adjust Kit .	
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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)	

SSM (SPECIAL SERVICE MATERIALS)

08833-00080 Adhesive 1344,
THREE BOND 1344,
LOCTITE 242 or equivalent

Oil pressure switch

OIL PRESSURE CHECK

EG06J-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

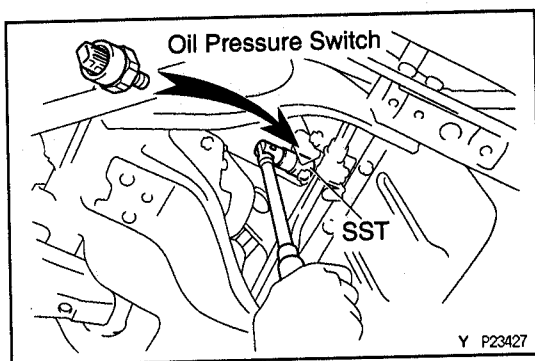
The oil level should be between the "L" and "F" marks on the dipstick.

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.

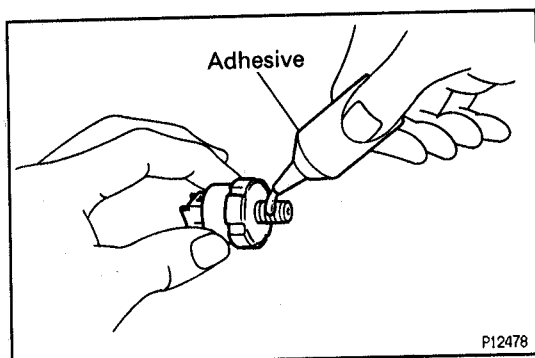
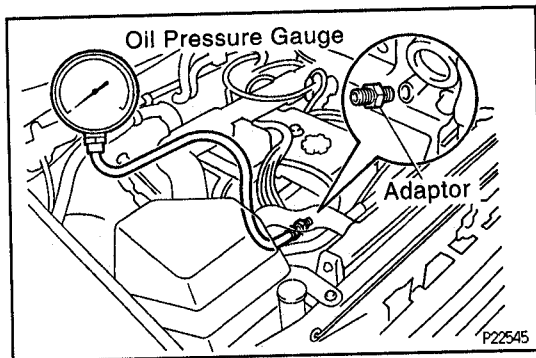
Adhesive:

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

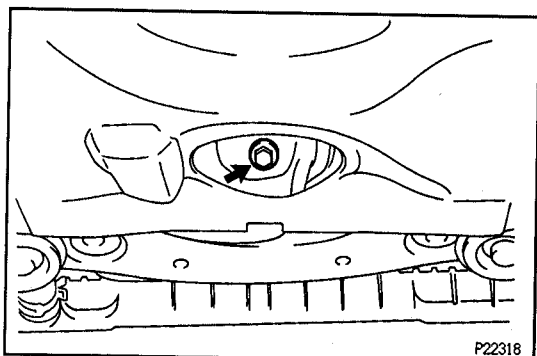


OIL AND FILTER REPLACEMENT

CAUTION:

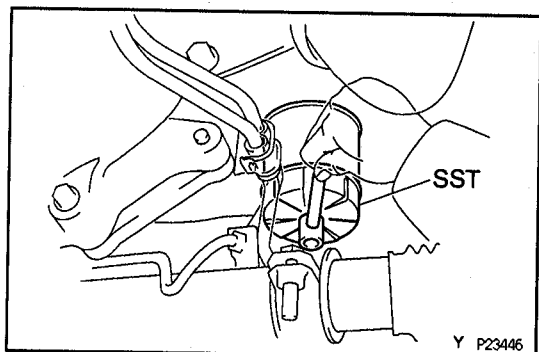
EGPF-02

- 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

- Remove the oil filler cap.
- Remove the oil drain plug, and drain the oil into a container.



2. REPLACE OIL FILTER

- Using SST, remove the oil filter.
SST 09228-07501
- Check and clean the oil filter installation surface.
- Apply clean engine oil to the gasket of a new oil filter.
- Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.
- Using SST, tighten it an additional 3/4 turn.
SST 09228-07501

3. REFILL WITH ENGINE OIL

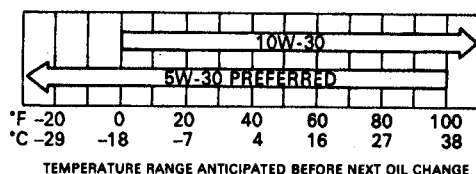
- Clean and install the oil drain plug with a new gasket.
Torque: 37 N·m (375 kgf·cm, 27 ft·lbf)
- Fill with fresh engine oil.

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.

Recommended Viscosity (SAE):



TEMPERATURE RANGE ANTICIPATED BEFORE NEXT OIL CHANGE

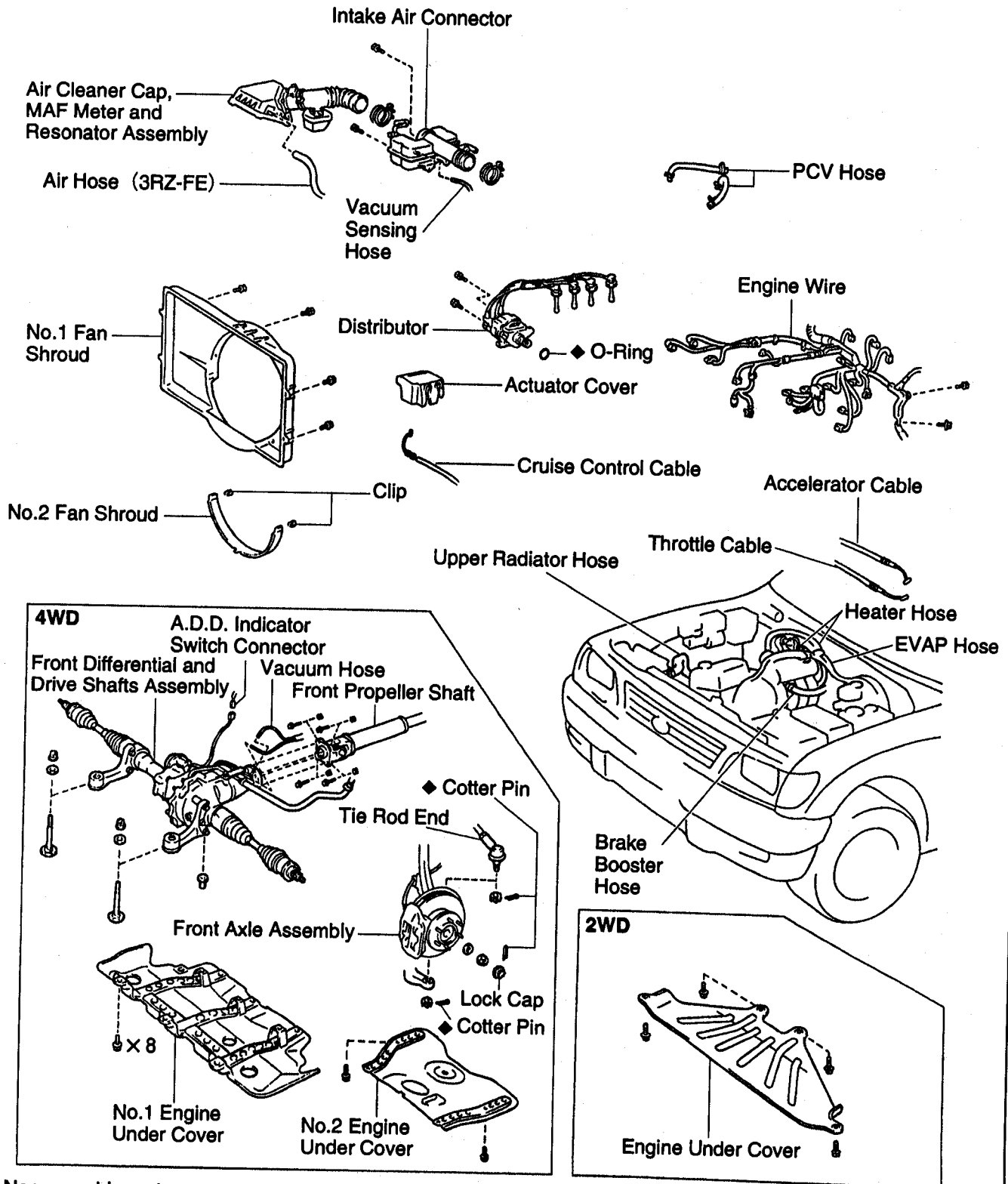
LU0817

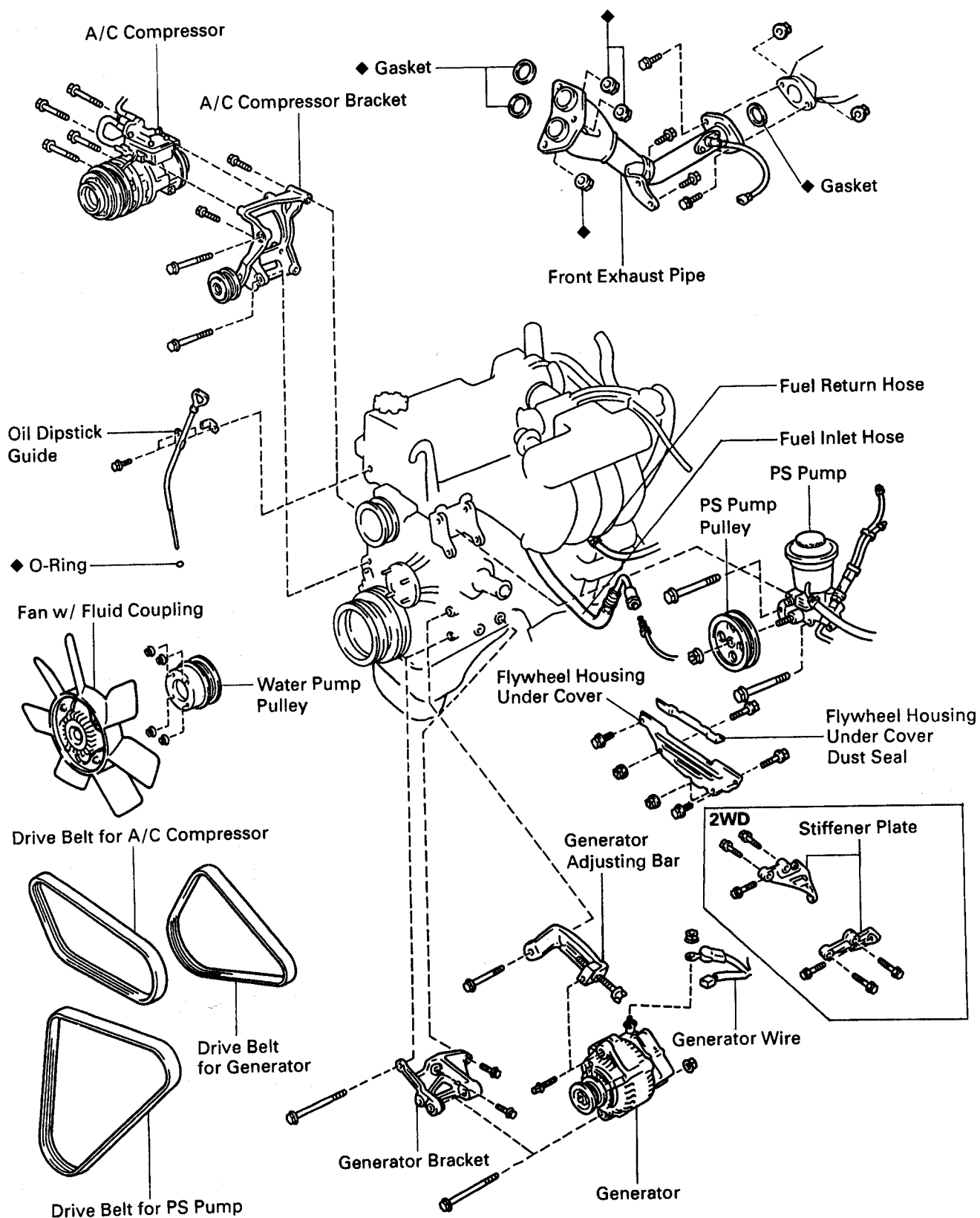
Oil capacity**2WD:****Dry fill****6.2 liters (6.6 US qts, 5.5 Imp. qts)****Drain and refill****w/ Oil filter change****5.5 liters (5.8 US qts, 4.8 Imp. qts)****w/o Oil filter change****4.8 liters (5.0 US qts, 4.2 Imp. qts)****4WD:****Dry fill****5.8 liters (6.1 US qts, 5.1 Imp. qts)****Drain and refill****w/ 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**

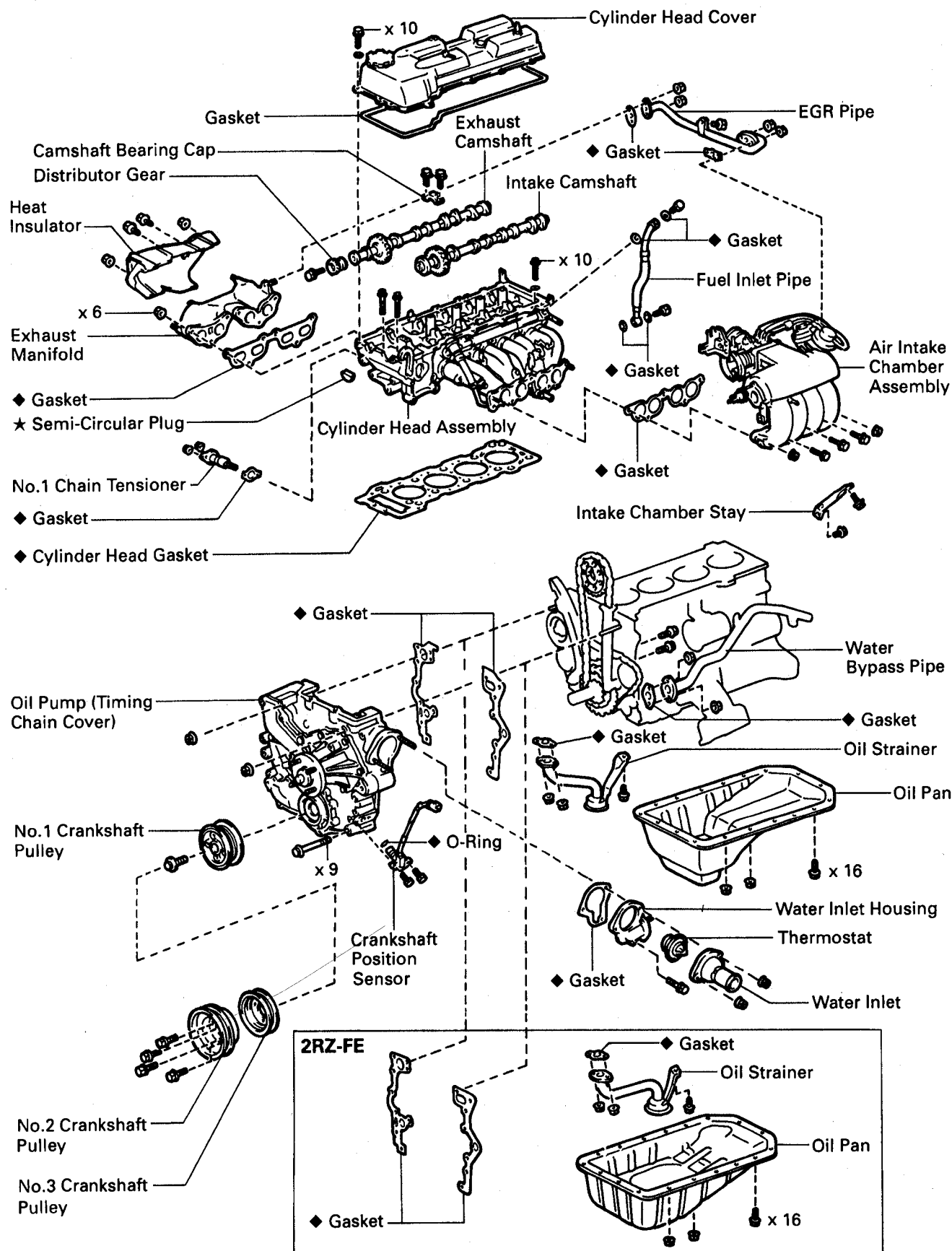
OIL PUMP COMPONENTS FOR REMOVAL AND INSTALLATION

EGSP6-02

EG



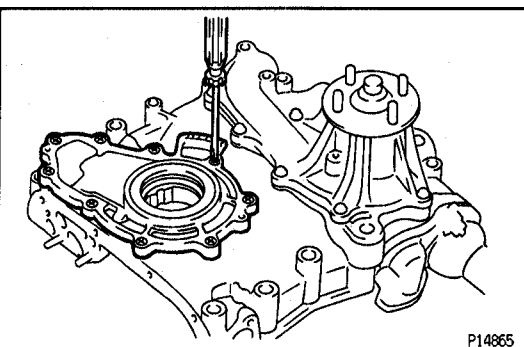
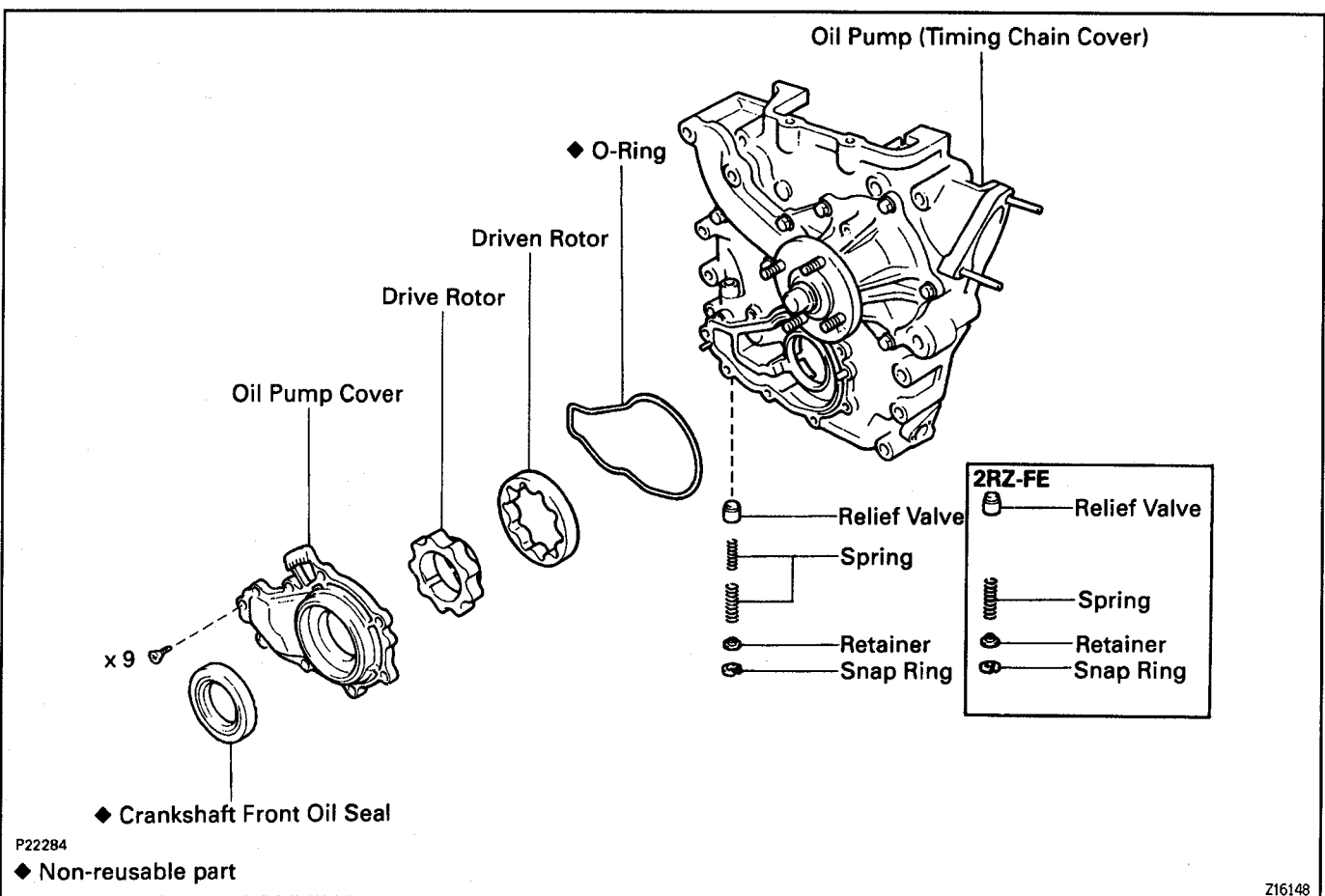




OIL PUMP REMOVAL

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)

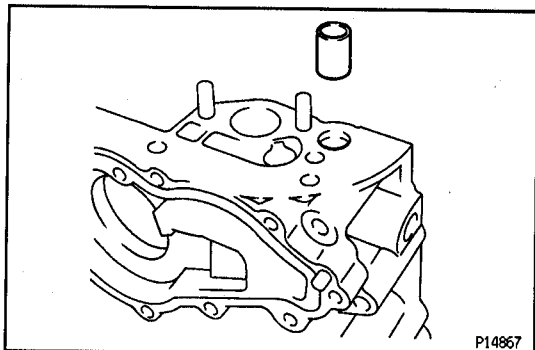
COMPONENTS FOR DISASSEMBLY AND ASSEMBLY



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.

EG001-00



P14867

OIL PUMP INSPECTION

1. INSPECT RELIEF VALVE

Coat the valve with engine oil and check that it falls smoothly into the valve hole by its own weight. If it does not, replace the relief valve. If necessary, replace the oil pump assembly.

2. INSPECT DRIVE AND DRIVEN ROTORS

A. Inspect rotor body clearance

Using a thickness gauge, measure the clearance between the driven rotor and body.

Standard body clearance:

0.100 – 0.175 mm (0.0039 – 0.0069 in.)

Maximum body clearance:

0.30 mm (0.0118 in.)

If the body clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.

B. Inspect rotor side clearance

Using a thickness gauge and precision straight edge, measure the clearance between the rotors and precision straight edge.

Standard side clearance:

0.030 – 0.090 mm (0.0012 – 0.0035 in.)

Maximum side clearance:

0.15 mm (0.0059 in.)

If the side clearance is greater than maximum, replace the rotors as a set. If necessary, replace the oil pump assembly.

C. Inspect rotor tip clearance

Using a thickness gauge, measure the clearance between the drive and driven rotor tips.

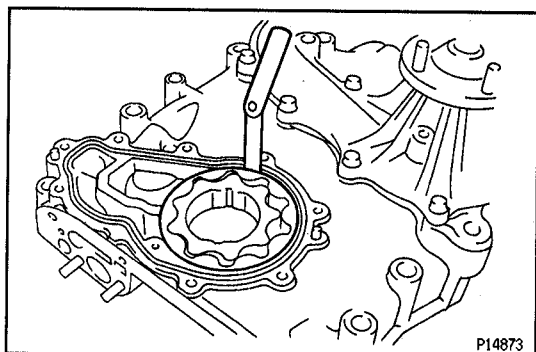
Standard tip clearance:

0.110 – 0.240 mm (0.0043 – 0.0094 in.)

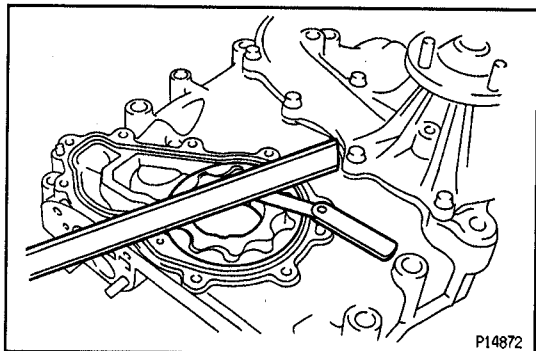
Maximum tip clearance:

0.25 mm (0.0098 in.)

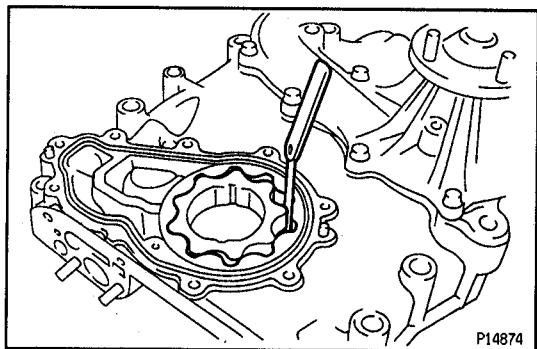
If the tip clearance is greater than maximum, replace the rotors as a set.



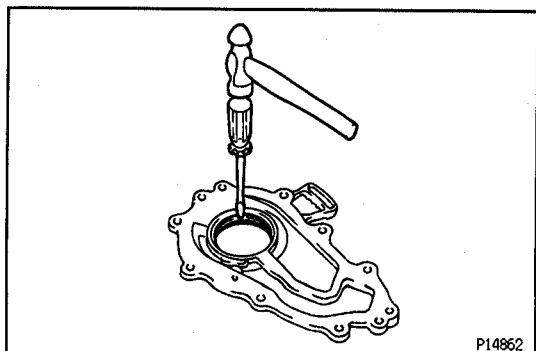
P14873



P14872



P14874



P14862

CRANKSHAFT FRONT OIL SEAL REPLACEMENT

EG001-01

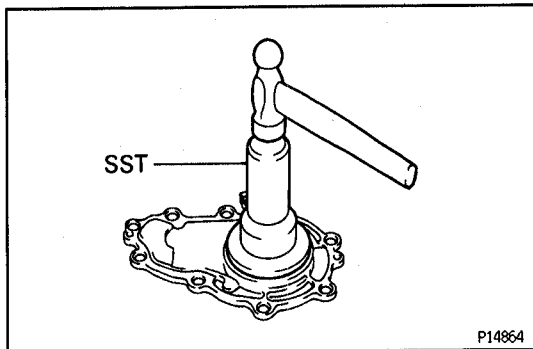
HINT: There are 2 methods (A and B) to replace the oil seal which are as follows:

1. REPLACE CRANKSHAFT FRONT OIL SEAL

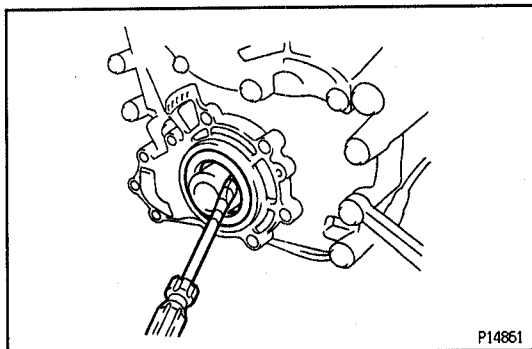
A. If oil pump is removed from cylinder block:

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

EG

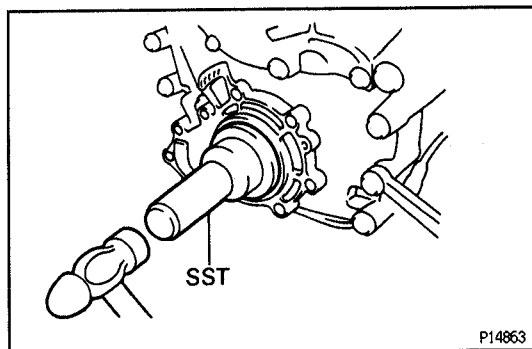


- (b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the oil pump case edge.
SST 09223-50010
- (c) Apply MP grease to the oil seal lip.



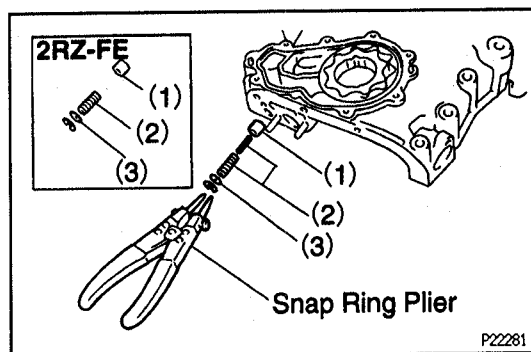
B. If oil pump is installed to cylinder block:

- (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

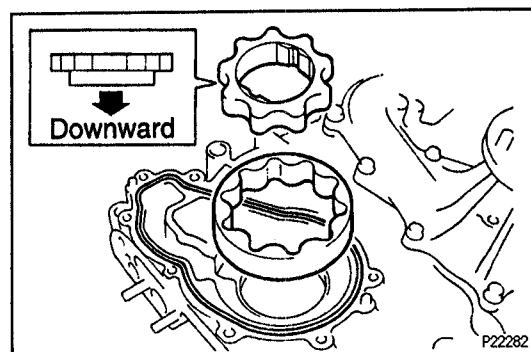
E08CW-03



OIL PUMP ASSEMBLY

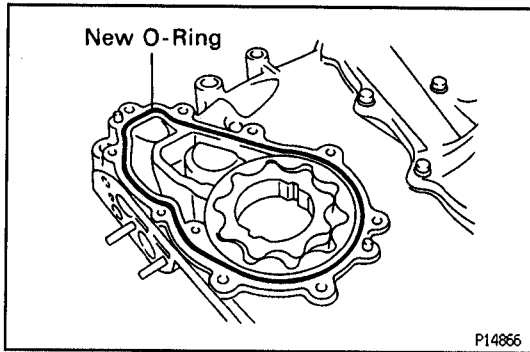
1. INSTALL RELIEF VALVE

- (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

EGSCX-03

EG

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

EG09H-0H

Oil pressure	Normal operating temperature	at idle speed at 3,000 rpm	29 kPa (0.3 kgf/cm ² , 4.3 psi) or more 245 — 490 kPa (2.5 — 5.0 kgf/cm ² , 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

EG09Y-0E

Part tightened	N·m	kgf·cm	ft·lbf
Oil pan x Drain plug	37	375	27

2RZ-FE, 3RZ-FE ENGINE

TROUBLESHOOTING

HOW TO PROCEED WITH

EG

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DTC P0133

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DTC P0135, P0141

Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1, Bank 1 Sensor 2)	EG-227
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DTC P0136

Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	EG-228
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DTC P0171, P0172

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DTC P0325

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Malfunction	EG-236

DTC P0335

Crankshaft Position Sensor	
"A" Circuit Malfunction	EG-238

DTC P0336

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Incorrect Purge Flow

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(Only for 4WD models) EG-265

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Park/Neutral Position Switch

Malfunction EG-289

ECM Power Source Circuit EG-291

Fuel Pump Control Circuit EG-294

HOW TO PROCEED WITH TROUBLESHOOTING

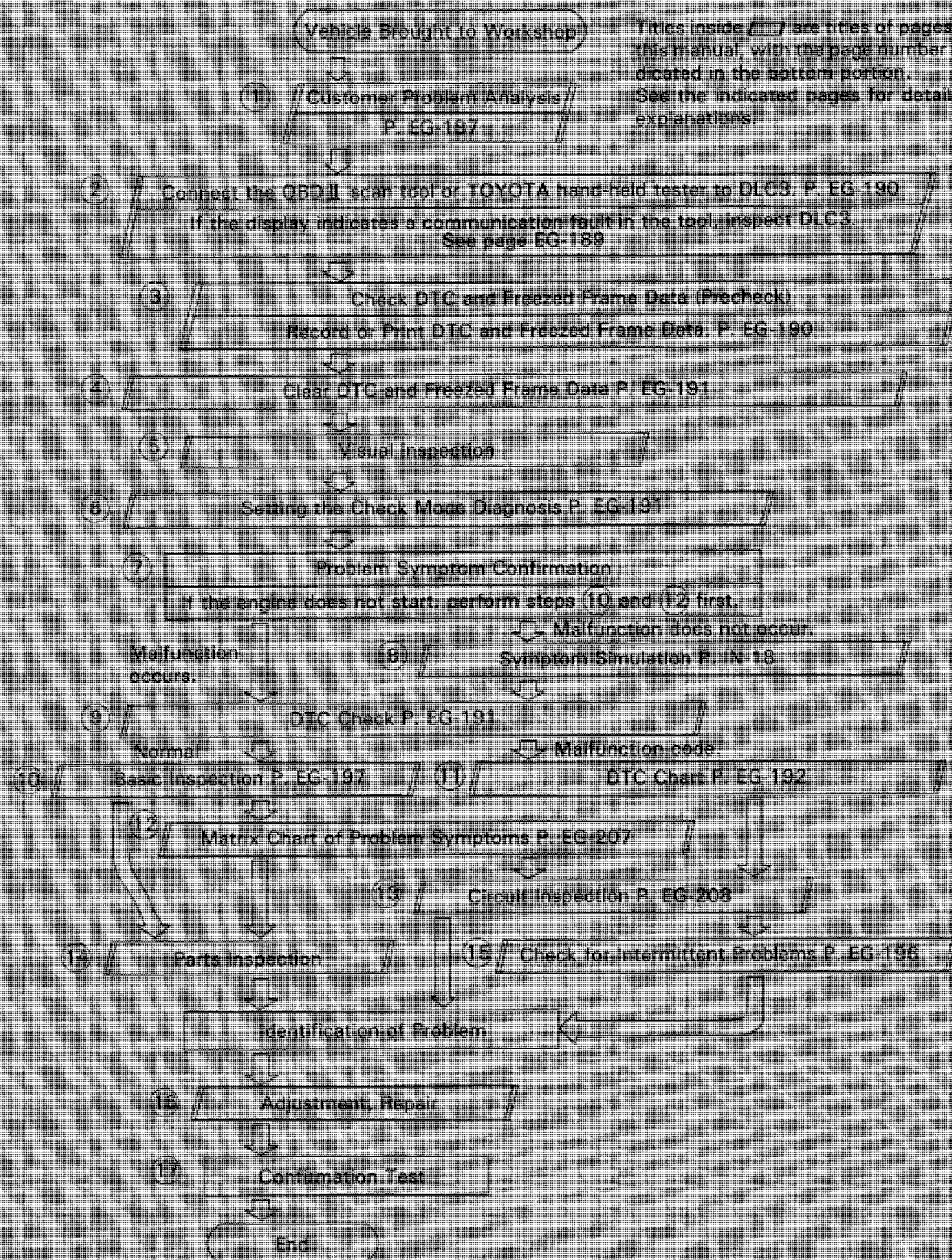
Troubleshoot in accordance with the procedure on the following pages.

Vehicle Brought to Workshop

Titles inside are titles of pages in this manual, with the page number indicated in the bottom portion.

See the indicated pages for detailed explanations.

EG



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 initial combustion ☐ No complete combustion
	☐ Difficult to Start	☐ Engine cranks slowly ☐ Other _____
	☐ Poor Idling	☐ Incorrect first idle ☐ Idling rpm is abnormal [☐ High ☐ Low (rpm)] ☐ Rough idling ☐ Other _____
	☐ Poor Driveability	☐ Hesitation ☐ Back fire ☐ Muffler explosion (after-fire) ☐ Surging ☐ Knocking ☐ Other _____
	☐ Engine Stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C operation ☐ Shifting from N to D ☐ Other _____
	☐ Others	

Dates 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 []



FI0534

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 freeze 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)

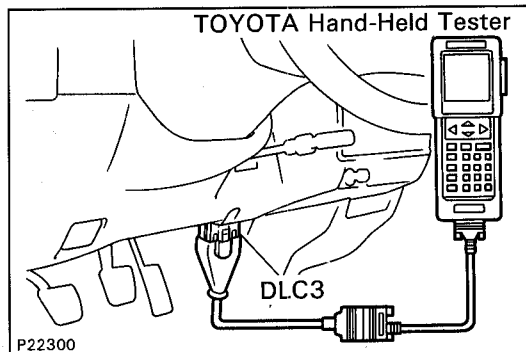
The diagnosis system operates in normal mode during normal vehicle use. It also has a check mode for technicians to simulate malfunction symptoms and troubleshoot. Most DTC use 2 trip detection logic* to prevent erroneous detection and ensure thorough malfunction detection. By switching the ECM to check 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).



P22300

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

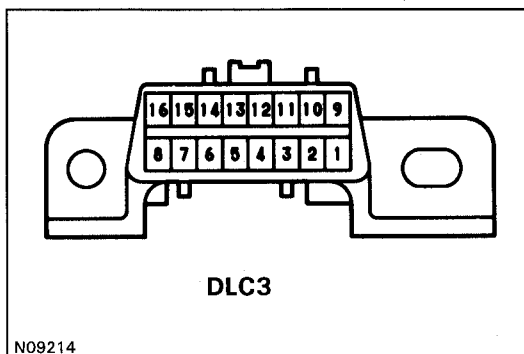
If troubleshooting priorities for multiple diagnostic codes are given in the applicable diagnostic chart, these should be followed.

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).

DATA LINK CONNECTOR 3 (DLC3) INSPECTION

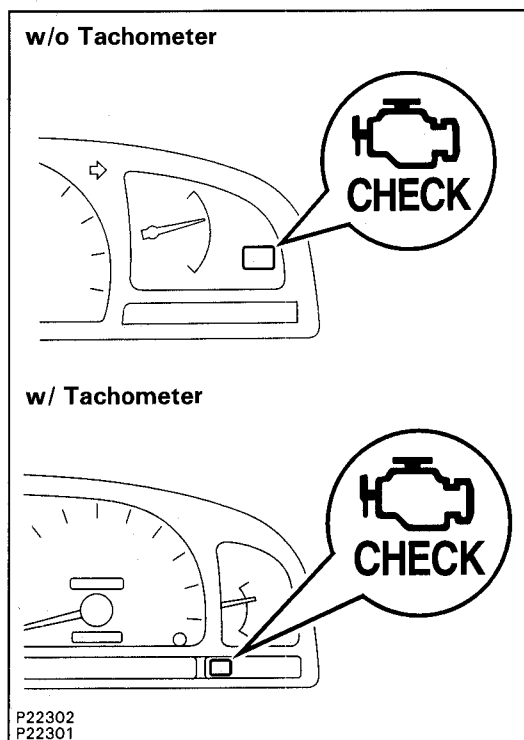
The vehicle's ECM uses V.P.W. (Variable Pulse Width) for communication to comply with SAE J1850. The terminal arrangement of DLC3 complies with SAE J1962 and matches the V.P.W. format.



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.



EG

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 freeze frame data recorded in normal mode. So before switching modes, always check the DTC and freeze 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 freeze 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)

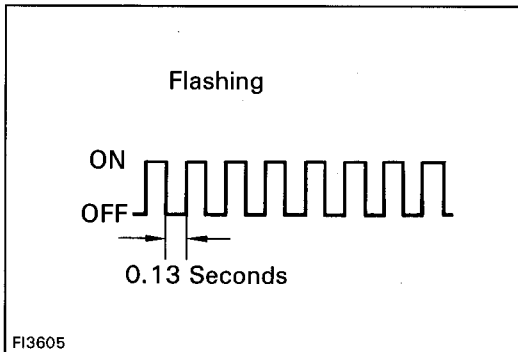
TOYOTA HAND-HELD TESTER only

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 freeze frame data, etc.
- HINT:** Take care not to turn the ignition switch OFF. Turning the ignition switch OFF switches the diagnosis system from check mode to normal mode, so all diagnostic codes, etc. are erased.
10. After checking the DTC, inspect the applicable circuit.



DTC CLEARANCE

The following actions will erase the DTC and freeze 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 freeze 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 Problem	• 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	○	○
P0301 P0302 P0303 P0304 (EG-232)	Misfire Detected — Cylinder 1 — Cylinder 2 — Cylinder 3 — Cylinder 4	• Compression pressure • Valve clearance not ot specification • Valve timing • Mass air flow meter • Engine coolant temp. sensor		
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

If there is trouble 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 throttle 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.

EG

2 Is engine cranked?

YES

NO

Proceed to ST section and continue to troubleshoot.

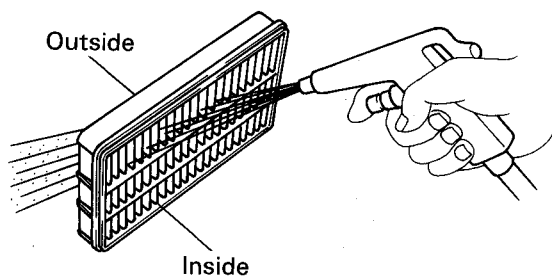
3 Does engine start?

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.

OK

NG

Repair or replace.

5**Check idle speed.**

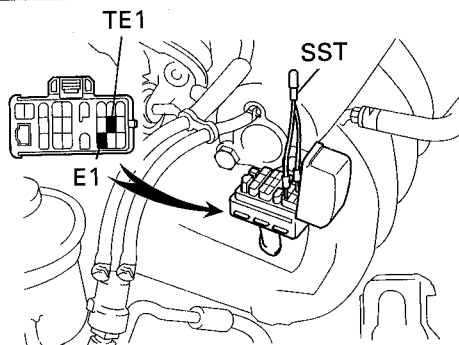
- P** (1) Warm up engine to normal operating temperature.
 (2) Switch off all accessories.
 (3) Switch off air conditioning.
 (4) Shift transmission into "N" position.
 (5) Connect the OBD II scan tool or TOYOTA hand-held tester to DLC3 on the vehicle.

C Use CURRENT DATA to check the engine idle speed.

OK Idle speed: 650 ~ 750 rpm

OK**NG**

Proceed to matrix chart of problem symptoms on page EG-207.

6**Check ignition timing.**

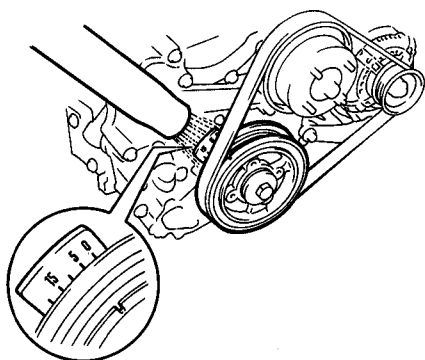
- P** (1) Warm up engine to normal operating temperature.
 (2) Shift transmission into "N" position.
 (3) Keep the engine speed at idle.
 (4) Using SST, connect terminals TE1 and E1 of DLC1.

SST 09843 – 18020

- (5) Using a timing light, connect the tester to No. 1 high-tension cord.

C Check ignition timing.

OK Ignition timing: 3 – 7° BTDC at idle

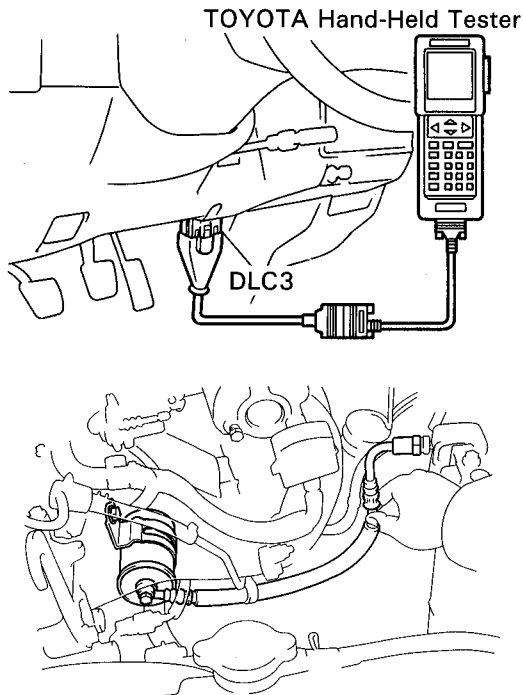


P25105
PI7183

OK**NG**

Proceed to IG section and continue to troubleshoot.

Proceed to matrix chart of problem symptoms on page EG-207.

7**Check fuel pressure.**P22300
P25110**OK****P**

- (1) Be sure that enough fuel is in the tank.
- (2) Connect the TOYOTA hand-held tester to the DLC3.
- (3) Turn ignition switch ON and push TOYOTA hand-held tester main switch ON.
- (4) Use ACTIVE TEST mode to operate the fuel pump.
- (5) Please refer to the TOYOTA hand-held tester operator's manual for further details.
- (6) If you have no TOYOTA hand-held tester, connect the positive (+) and negative (–) leads from the battery to the fuel pump connector (See page EG-126).

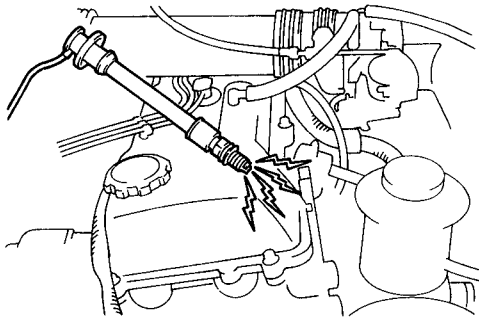
C

Check for fuel pressure in the fuel inlet hose when it is pinched off.

HINT: At this time, you will hear a fuel flowing noise.

NG

Proceed to page EG-124 and continue to troubleshoot.

8**Check for spark.**

P25086

OK**P**

- (1) Disconnect the high-tension cord from spark plug.
- (2) Remove the spark plug.
- (3) Install the spark plug to high-tension cord.
- (4) Disconnect the injector connector.
- (5) Ground the spark plug.

C

Check if spark occurs while engine is being cranked.

NOTICE: To prevent excess fuel being injected from the injectors during this test, don't crank the engine for more than 5 – 10 seconds at a time.

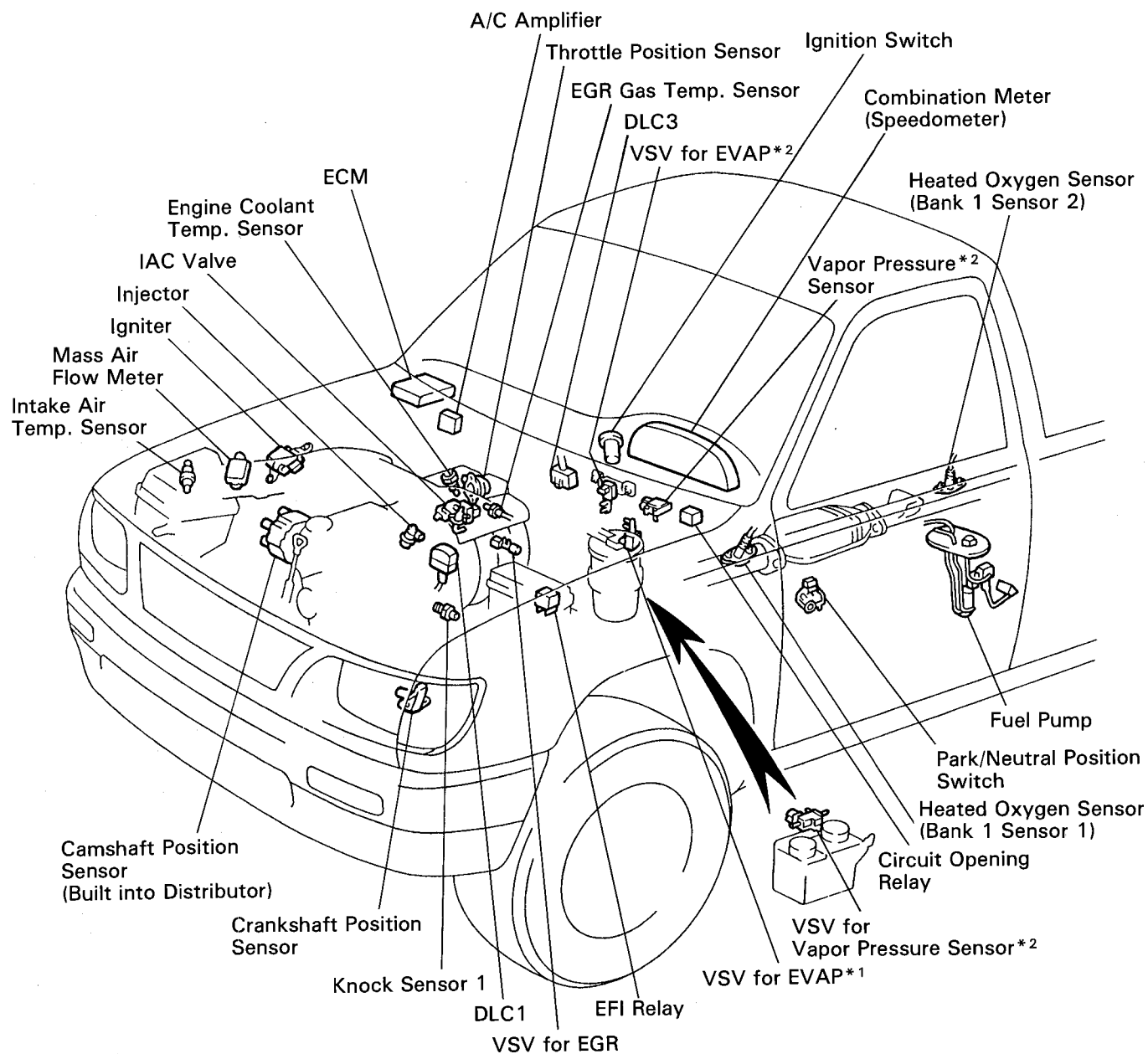
NG

Proceed to page IG section and continue to troubleshoot.

Proceed to matrix chart of problem symptoms on page EG-207.

PARTS LOCATION

EG

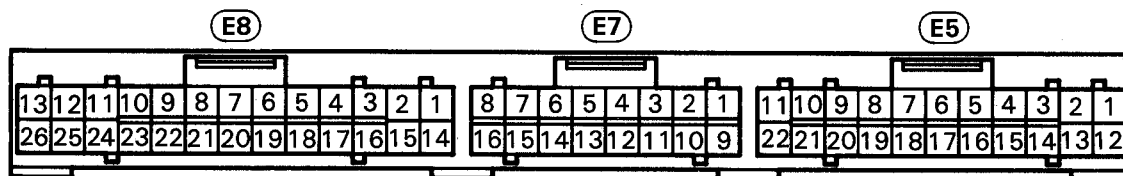


* 1: 2WD

* 2: 4WD

STANDARD VALUE OF ECM TERMINALS

ECM Terminals (for 3RZ-FE M/T, 2RZ-FE)



P19559

Symbols (Terminals No.)	Wiring Color	STD Voltage (V)	Condition
BATT (E5-1) — E1 (E8-14)	B-Y ↔ BR	9 — 14	Always
+B (E5-12) — E1 (E8-14)	W-R ↔ BR	9 — 14	IG switch ON
VCC (E7-1) — E2 (E7-9)	G-Y ↔ BR-B	4.5 — 5.5	IG switch ON
IDL (E7-12) — E2 (E7-9)	Y-L ↔ BR-B	0 — 3.0	IG switch ON and apply vacuum to the throttle opener Throttle valve fully closed
		9 — 14	IG switch ON Throttle valve fully open
VTA (E7-11) — E2 (E7-9)	Y ↔ BR-B	0.3 — 0.8	IG switch ON Throttle valve fully closed
		3.2 — 4.9	IG switch ON Throttle valve fully open
VG (E7-2) — E3 (E7-16)	GR-R ↔ BR-W	1.0 — 1.5	Idling, A/C switch OFF
THA (E7-7) — E2 (E7-9)	Y-G ↔ BR-B	0.5 — 3.4	Idling, Intake air temp. 20°C (68°F)
THW (E7-4) — E2 (E7-9)	G-R ↔ BR-B	0.2 — 1.0	Idling, Engine coolant temp. 80°C (176°F)
STA (E5-11) — E1 (E8-14)	B-W ↔ BR	6.0 or more	Cranking
#10 (E8-12) — E01 (E8-13) #20 (E8-11)	W-R ↔ BR W	9 — 14	IG switch ON
		Pulse generation (See page EG-233)	Idling
IGT (E8-20) — E1 (E8-14)	B-L ↔ BR	Pulse generation (See page EG-284)	Idling
IGF (E8-3) — E1 (E8-14)	B-Y ↔ BR	Below 2.0	IG switch ON
		Pulse generation (See page EG-284)	Idling
G (E8-5) — G ⊖ (E8-18)	Y ↔ B *1 L *2	Pulse generation (See page EG-239)	Idling
NE (E8-4) — NE ⊖ (E8-17)	R ↔ G	Pulse generation (See page EG-239)	Idling
FC (E5-14) — E1 (E8-14)	G-Y ↔ BR	9 — 14	IG switch ON
EGR (E8-6) — E1 (E8-14)	P-B ↔ BR	9 — 14	IG switch ON
PRG (E8-23)*3 EVP1 (E8-23)*4 — E1 (E8-14)	W-G ↔ BR W-G	9 — 14	IG switch ON

*1: A/T

*2: M/T

*3: 2WD

*4: 4WD

EG

STANDARD VALUE OF ECM TERMINALS (Cont'd)

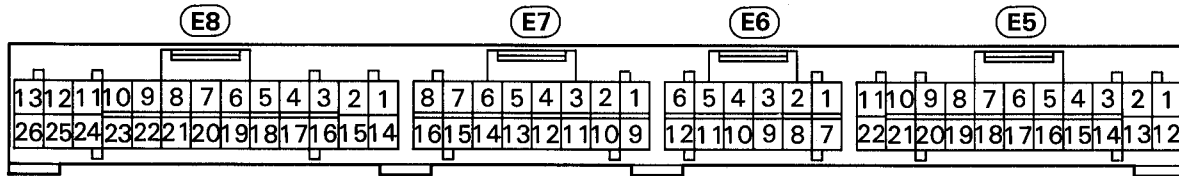
Symbols (Terminals No.)	Wiring Color	STD Voltage (V)	Condition
RSC (E8-9) — E1 (E8-14) RSO (E8-10)	B B-R ↔ BR	9 – 14	IG switch ON Disconnect (E8) of ECM connector
OX1 (E7-6) — E1 (E8-14)	W ↔ BR	Pulse generation	Maintain engine speed at 2,500 rpm for 2 minutes after warming up
HT1 (E8-2) — E03 (E8-25) HT2 (E8-15)	P-G R-W ↔ BR	Below 3.0	Idling
		9 – 14	IG switch ON
KNK (E7-13) — E1 (E8-14)	B ↔ BR	Pulse generation (See page EG-238)	Idling
*1 NSW (E5-22) — E1 (E8-14)	B ↔ BR	9 – 14	IG switch ON Other shift position in "P", "N" position
		0 – 3.0	IG switch ON Shift position in "P", "N" position
SP1 (E5-9) — E1 (E8-14)	G-O ↔ BR	Pulse generation (See page EG-277)	IG switch ON Rotate driving wheel slowly
TE1 (E7-15) — E1 (E8-14)	V-W ↔ BR	9 – 14	IG switch ON
W (E5-5) — E1 (E8-14)	V ↔ BR	9 – 14	Idling
		Below 3.0	IG switch ON
ACT (E5-8) — E1 (E8-14)	L-B ↔ BR	9 – 14	A/C switch ON at idling
		Below 2.0	A/C switch OFF
AC1 (E5-10) — E1 (E8-14)	L-Y ↔ BR	Below 2.0	A/C switch ON at idling
		9 – 14	A/C switch OFF
*2TPC (E8-21) — E1 (E8-14)	GR-R ↔ BR	9 – 14	IG switch ON
*2 PTNK (E7-10) — E2 (E7-9)	R-Y ↔ BR-B	2.9 – 3.7	IG switch ON
		Below 0.5	Apply vacuum (less than 66.7 kPa, 500 mmHg, 19.7 in.Hg)

*1: A/T

*2: 4WD

STANDARD VALUE OF ECM TERMINALS

ECM Terminals (for 3RZ-FE A/T)



FI6526

EG

Symbols (Terminals No.)	Wiring Color	STD Voltage (V)	Condition
BATT (E5-2) — E1 (E8-24)	B-Y ↔ BR	9 — 14	Always
+B (E5-12) — E1 (E8-24)	W-R ↔ BR	9 — 14	IG switch ON
VCC (E7-1) — E2 (E7-9)	G-Y ↔ BR-B	4.5 — 5.5	IG switch ON
IDL (E7-11) — E2 (E7-9)	Y-L ↔ BR-B	0 — 3.0	IG switch ON and apply vacuum to the throttle opener Throttle valve fully closed
		9 — 14	IG switch ON Throttle valve fully open
VTA (E7-10) — E2 (E7-9)	Y ↔ BR-B	0.3 — 0.8	IG switch ON Throttle valve fully closed
		3.2 — 4.9	IG switch ON Throttle valve fully open
VG (E7-2) — E3 (E7-3)	GR-R ↔ BR-W	1.0 — 1.5	Idling, A/C switch OFF
THA (E7-12) — E2 (E7-9)	Y-G ↔ BR-B	0.5 — 3.4	Idling, Intake air temp. 20°C (68°F)
THW (E7-4) — E2 (E7-9)	G-R ↔ BR-B	0.2 — 1.0	Idling, Engine coolant temp. 80°C (176°F)
STA (E5-11) — E1 (E8-24)	B-W ↔ BR	6.0 or more	Cranking
#10 (E8-12) — E01 (E8-13) #20 (E8-11)	W-R W ↔ BR	9 — 14	IG switch ON
		Pulse generation (See page EG-233)	Idling
IGT (E8-23) — E1 (E8-24)	B-L ↔ BR	Pulse generation (See page EG-284)	Idling
IGF (E8-17) — E1 (E8-24)	B-Y ↔ BR	Below 2.0	IG switch ON
		Pulse generation (See page EG-284)	Idling
G (E6-11) — G ⊖ (E6-5)	Y ↔ L	Pulse generation (See page EG-239)	Idling
NE (E6-12) — NE ⊖ (E6-6)	R ↔ G	Pulse generation (See page EG-239)	Idling
FC (E8-14) — E1 (E8-24)	G-Y ↔ BR	9 — 14	IG switch ON
EGR (E8-22) — E1 (E8-24)	P-B ↔ BR	9 — 14	IG switch ON
EVP1 (E6-1) — E1 (E8-24)	W-G ↔ BR	9 — 14	IG switch ON

STANDARD VALUE OF ECM TERMINALS (Cont'd)

Symbols (Terminals No.)	Wiring Color	STD Voltage (V)	Condition
RSC (E8-6) RSO (E8-7) — E1 (E8-24)	B B-R ↔ BR	9 — 14	IG switch ON Disconnect (E8) of ECM connector
OX1 (E7-5) — E1 (E8-24)	W ↔ BR	Pulse generation	Maintain engine speed at 2,500 rpm for 2 minutes after warming up
HT1 (E8-3) HT2 (E8-16) — E03 (E8-25)	P-G R-W ↔ BR	Below 3.0	Idling
		9 — 14	IG switch ON
KNK (E7-6) — E1 (E8-24)	B ↔ BR	Pulse generation (See page EG-238)	Idling
NSW (E5-22) — E1 (E8-24)	B ↔ BR	9 — 14	IG switch ON Other shift position in "P", "N" position
		0 — 3.0	IG switch ON Shift position in "P", "N" position
SP1 (E5-8) — E1 (E8-24)	G-O ↔ BR	Pulse generation (See page EG-277)	IG switch ON Rotate driving wheel slowly
TE1 (E7-7) — E1 (E8-24)	V-W ↔ BR	9 — 14	IG switch ON
W (E5-4) — E1 (E8-24)	V ↔ BR	9 — 14	Idling
		Below 3.0	IG switch ON
ACT (E5-6) — E1 (E8-24)	L-B ↔ BR	9 — 14	A/C switch ON at idling
		Below 2.0	A/C switch OFF
AC1 (E5-7) — E1 (E8-24)	L-Y ↔ BR	Below 2.0	A/C switch ON at idling
		9 — 14	A/C switch OFF
TPC (E6-2) — E1 (E8-24)	GR-R ↔ BR	9 — 14	IG switch ON
PTNK (E8-18) — E2 (E7-9)	R-Y ↔ BR-B	2.9 — 3.7	IG switch ON
		Below 0.5	Apply vacuum (less than 66.7 kPa, 500 mmHg, 19.7 in.Hg)

ENGINE OPERATING CONDITION

NOTICE: The values given below for "Normal Condition" are representative values, so a vehicle may still be normal even if its value varies from those listed here. So do not decide whether a part is faulty or not solely according to the "Normal Condition" here.

CARB Mandated Signals

TOYOTA hand-held tester display	Measurement Item	Normal Condition* ¹
FUEL SYS #1	Fuel System Bank 1 OPEN: Air-fuel ratio feedback stopped CLOSED: Air-fuel ratio feedback operating	Idling after warming up: CLOSED
CALC LOAD	Calculator Load: Current intake air volume as a proportion of max. intake air volume	Idling: 17.2 ~ 24.6%* ² 15.9 ~ 22.8%* ³ Racing without load (2,500 rpm): 16.4 ~ 23.1%* ² 15.2 ~ 22.1%* ³
COOLANT TEMP.	Engine Coolant Temp. Sensor Value	After warming up: 80 ~ 95°C (176 ~ 203°F)
SHORT FT #1	Short-term Fuel Trim Bank 1	0 ± 20%
LONG FT #1	Long-term Fuel Trim Bank 1	0 ± 20%
ENGINE SPD	Engine Speed	Idling: 700 ± 50 rpm
VEHICLE SPD	Vehicle Speed	Vehicle Stopped: 0 km/h (0 mph)
IGN ADVANCE	Ignition Advance Ignition Timing of Cylinder No. 1	Idling: BTDC 7 ~ 18°* ² 7 ~ 13°* ³
INTAKE AIR	Intake Air Temp. Sensor Value	Equivalent to ambient temp.
MAF	Air Flow Rate through Mass Air Flow Meter	Idling: 2.6 ~ 3.6 gm/sec.* ² 2.6 ~ 3.7 gm/sec.* ³ Racing without load (2,500 rpm): 9.2 ~ 12.9 gm/sec.* ² 9.2 ~ 13.3 gm/sec.* ³
THROTTLE POS	Voltage Output of Throttle Position Sensor Calculated as a percentage 0 V → 0%, 5 V → 100%	Throttle Fully closed: 7 ~ 11% Fully open: 65 ~ 75%
O2S B1, S1	Voltage Output of Oxygen Sensor Bank 1, Sensor 1	Idling: 0.1 ~ 0.9 V
O2FT B1, S1	Oxygen Sensor Fuel Trim Bank 1, Sensor 1 (Same as SHORT FT #1)	0 ± 20%
O2S B1, S2	Voltage Output of Oxygen Sensor Bank 1, Sensor 2	Driving 50 km/h (31 mph): 0.1 ~ 0.9 V

*¹: If no conditions are specifically stated for "Idling", it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF.

*²: 2RZ-FE engine

*³: 3RZ-FE engine

TOYOTA Enhanced Signals

TOYOTA hand-held tester display	Measurement Item	Normal Condition*1
MISFIRE RPM	Engine RPM for first misfire range	Misfire 0: 0 RPM
MISFIRE LOAD	Engine load for first misfire range	Misfire 0: 0 g/r
INJECTOR	Fuel injection time for cylinder No.1	Idling: 2.6 ~ 4.6 ms*2 2.5 ~ 4.3 ms*3
IAC DUTY RATIO	Intake Air Control Valve Duty Ratio Opening ratio rotary solenoid type IAC valve	Idling: 24.8 ~ 50.0%
STARTER SIG	Starter Signal	Cranking: ON
CTP SW	Closed Throttle Position Switch Signal	Throttle Fully Closed: ON
A/C SIG	A/C Switch Signal	A/C ON : ON
STOP LIGHT SW	Stop Light Switch Signal	Stop light switch ON: ON
FC IDL	Fuel Cut Idle: Fuel cut when throttle valve fully closed, during deceleration	Fuel cut operating: ON
FC TAU	Fuel Cut TAU: Fuel cut during very light load	Fuel cut operating: ON
CYL #1, CYL #2, CYL #3, CYL #4	Abnormal revolution variation for each cylinder	0%
IGNITION	Total number of ignition for every 1,000 revolutions	0 ~ 2,000
EGRT GAS	EGR Gas Temp. Sensor Value	EGR not operating: Temperature between intake air temp. and engine coolant temp.
EGR SYSTEM	EGR System Operating Condition	Idling: OFF
A/C CUT SIG	A/C Cut Signal	A/C S/W OFF: ON
FUEL PUMP	Fuel Pump Signal	Idling: ON
EVAP (PURGE) VSV	EVAP VSV Signal	Idling: OFF
TOTAL FT B1	Total Fuel Trim Bank 1: Average value for fuel trim system of bank 1	Idling: 0.8 ~ 1.2 V
O2 LR B1, S1	Oxygen Sensor Lean Rich Bank 1, Sensor 1 Response time for oxygen sensor output to switch from lean to rich	Idling after warmed up: 0 ~ 1,000 m sec.
O2 RL B1, S1	Oxygen Sensor Rich Lean Bank 1, Sensor 1 Response time for oxygen sensor output to switch from rich to lean	Idling after warmed up: 0 ~ 1,000 m sec.

*1: If no conditions are specifically stated for "Idling", it means the shift lever is at N or P position, the A/C switch is OFF and all accessory switches are OFF.

*2: 2RZ-FE engine

*3: 3RZ-FE engine

MATRIX CHART OF PROBLEM SYMPTOMS

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

See page		EG-286	EG-291	EG-294	ST-14, 15	EG-7	IN-29	AT section
Suspect area								
Symptom		Starter signal circuit	ECM power source circuit	Fuel pump control circuit	Starter and starter relay	Compression	Engine control module(ECM)	A/T faulty
Does not start	Engine does not crank				1			
	No initial combustion		1	2				
	No complete combustion			1				
Difficult to start	Engine cranks normally	1		2		3		
	Cold engine	1		2				
	Hot engine	1		2				
Poor idling	High engine idle speed		1					
	Low engine idle speed			1				
	Rough idling			2		1		
	Hunting		1	2				
Poor drive-ability	Hesitation/Poor acceleration			1				2
	Surging			1				
Engine stall	Soon after starting			1				
	During A/C operation						1	

CIRCUIT INSPECTION

DTC

P0100

Mass Air Flow Circuit Malfunction

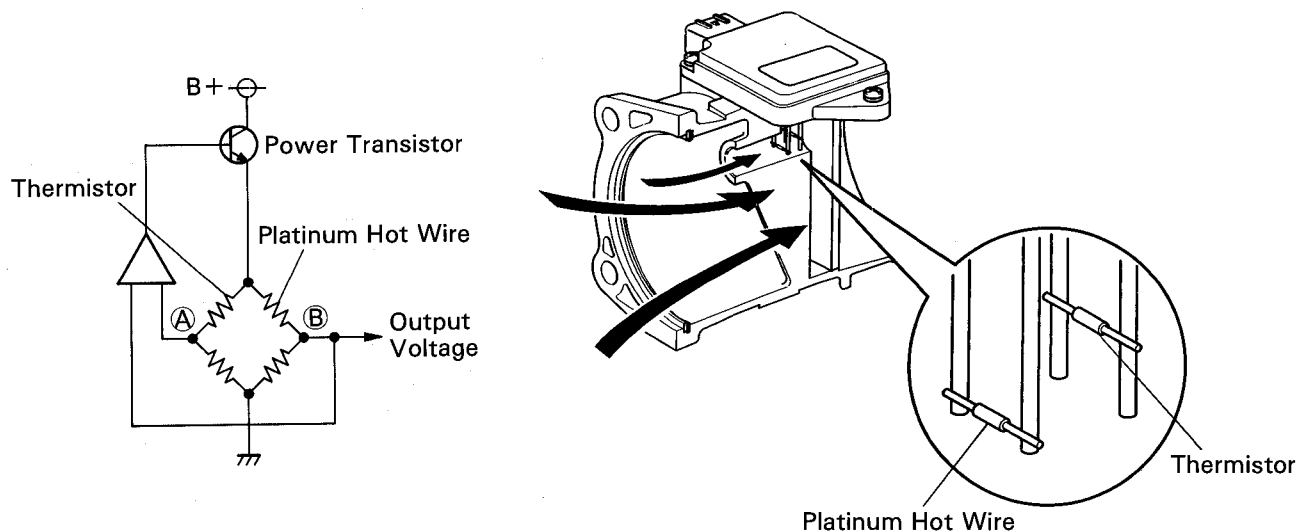
CIRCUIT DESCRIPTION

The mass air flow meter uses a platinum hot wire. The hot wire air flow meter consists of a platinum hot wire, thermistor and a control circuit installed in a plastic housing. The hot wire air flow meter works on the principle that the hot wire and thermistor located in the intake air bypass of the housing detect any changes in the intake air temperature.

EG

The hot wire is maintained at the set temperature by controlling the current flow through the hot wire. This current flow is then measured as the output voltage of the air flow meter.

The circuit is constructed so that the platinum hot wire and thermistor provide a bridge circuit, with the power transistor controlled so that the potential of (A) and (B) remains equal to maintain the set temperature.



FI6929 FI7109

DTC No.	DTC Detecting Condition	Trouble Area
P0100	Open or short in mass air flow meter circuit with engine speed 4,000 rpm or less	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM

If the ECM detects DTC "P0100" it operates the fail safe function, keeping the ignition timing and injection volume constant and making it possible to drive the vehicle.

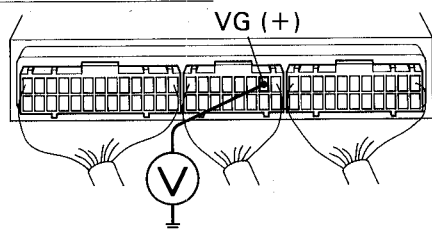
HINT: After confirming DTC P0100 use the OBD II scan tool or TOYOTA hand-held tester to confirm the mass air flow ratio from "CURRENT DATA".

Mass Air Flow Value (gm/sec.)	Malfunction
Approx. 0	• Mass air flow meter power source circuit open • VG circuit open or short
202.2 or more	• E3 circuit open

Check for open in harness and connector between EFI relay and mass air flow meter (See page IN-24).

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

For 3RZ-FE M/T, 2RZ-FE

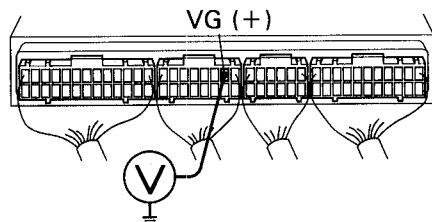


- P** (1) Remove glove compartment (See page EG-157).
(2) Start the engine.

C Measure voltage between terminal VG of ECM connector and body ground while engine is idling.

OK Voltage: 1.0 – 1.5 V (A/C switch OFF)

For 3RZ-FE A/T



P23804
P23805

NG

OK

Check and replace ECM (See page IN-29).

4 Check for open and short in harness and connector between mass air flow meter and ECM (See page IN-24).

OK

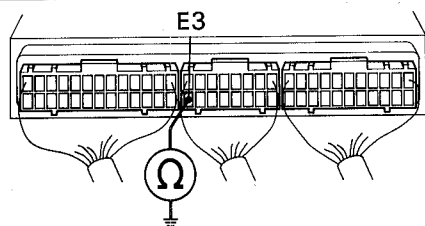
NG

Repair or replace harness or connector.

Replace mass air flow meter.

5 Check continuity between terminal E3 of ECM connector and body ground.

For 3RZ-FE M/T, 2RZ-FE

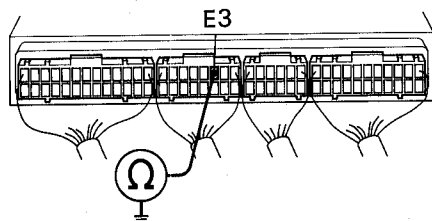


P Remove glove compartment (See page EG-157).

C Check continuity between terminal E3 of ECM connector and body ground.

OK Continuity (1 Ω or less)

For 3RZ-FE A/T



P23806
P23807

OK

NG

Check and replace ECM (See page IN-29).

6

Check for open in harness and connector between mass air flow meter and ECM (See page IN-24).

OK**NG**

Repair or replace harness or connector.

Replace mass air flow meter.

EG

DTC**P0101****Mass Air Flow Circuit Range/Performance Problem****CIRCUIT DESCRIPTION**

Refer to "Mass Air Flow Circuit Malfunction" on page EG-208.

DTC. No.	DTC Detecting Condition	Trouble Area
P0101	Conditions (a) and (b) continue with engine speed 900 rpm or less (2 trip detection logic) (a) Closed throttle position switch: ON (b) Mass air flow meter output > 2.2 V	• Mass air flow meter

WIRING DIAGRAM

Refer to "Mass Air Flow Circuit Malfunction" on page EG-209.

INSPECTION PROCEDURE**1**

Are there any other codes (besides DTC P0101) being output?

NO**YES**

Go to relevant DTC chart.

Relace mass air flow meter.

DTC P0110 Intake Air Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

The intake air temp. sensor is built into the air cleaner cap and senses the intake air temperature.

A thermistor built in the sensor changes the resistance value according to the intake air temperature.

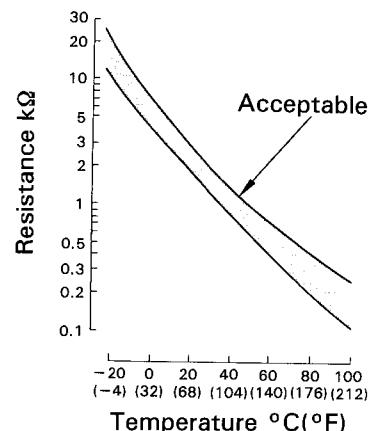
The lower the intake air temperature, the greater the thermistor resistance value, and the higher the intake air temperature, the lower the thermistor resistance value (See Fig.1.).

The intake air temperature sensor is connected to the ECM (See below). The 5 V power source voltage in the ECM is applied to the intake air temperature sensor from the terminal THA via a resistor R.

That is, the resistor R and the intake air temperature sensor are connected in series. When the resistance value of the intake air temperature sensor changes in accordance with changes in the intake air temperature, the potential at terminal THA also changes. Based on this signal, the ECM increases the fuel injection volume to improve driveability during cold engine operation.

If the ECM detects the DTC "P0110", it operates the fail safe function in which the intake air temperature is assumed to be 20°C (68°F).

(fig-1)



FI4741

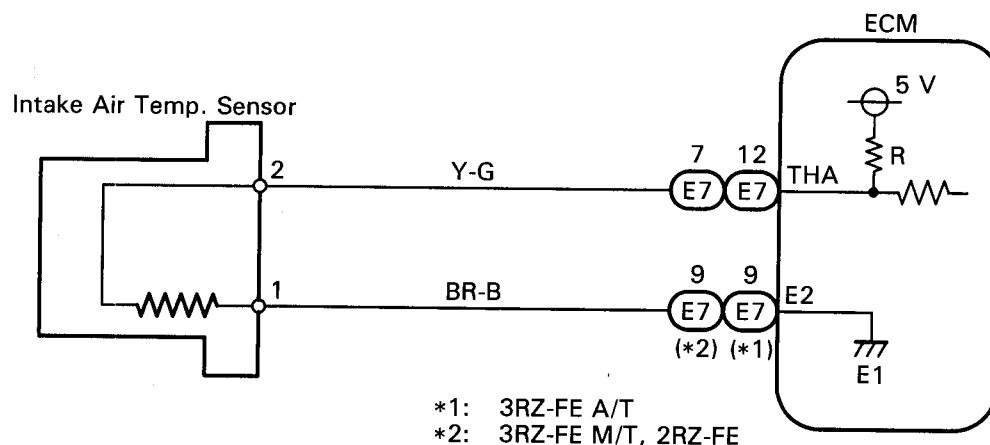
Intake Air Temp. °C (°F)	Resistance (kΩ)	Voltage (V)
-20 (-4)	16.2	4.3
0 (32)	5.9	3.4
20 (68)	2.5	2.4
40 (104)	1.1	1.4
60 (140)	0.6	0.9
80 (176)	0.3	0.5
100 (212)	0.1	0.2

DTC No.	DTC Detecting Condition	Trouble Area
P0110	Open or short in intake air temp. sensor circuit	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • ECM

HINT: After confirming DTC P0110 use the OBD II scan tool or TOYOTA hand-held tester to confirm the intake air temperature from "CURRENT DATA".

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
140°C (284°F) or more	Short circuit

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT: If DTC "P0110" (intake air temp. circuit malfunction), "P0115" (engine coolant temp. circuit malfunction), "P0120" (throttle/pedal position sensor/switch "A" circuit malfunction) are output simultaneously, E2 (sensor ground) may be open.

1

Connect the OBD II scan tool or TOYOTA hand-held tester, and read value of intake air temperature.

P

- (1) Connect the OBD II scan tool or TOYOTA hand-held tester to the DLC3.
- (2) Turn ignition switch ON and OBD II scan tool or TOYOTA hand-held tester main switch ON.

C

Read temperature value on the OBD II scan tool or TOYOTA hand-held tester.

OK

Same as actual intake air temperature.

HINT: If there is open circuit, OBD II scan tool or TOYOTA hand-held tester indicates -40°C (-40°F). If there is short circuit, OBD II scan tool or TOYOTA hand-held tester indicates 140°C (284°F) or more.

OK

NG

-40°C (-40°F)...Go to step **2**.
 140°C (284°F) or more...Go to step **4**.

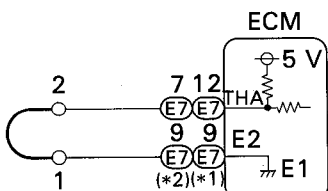
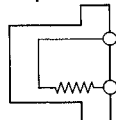
Check for intermittent problems
 (See page EG-196).

2

Check for open in harness or ECM.



Intake Air
Temp. Sensor



- *1: 3RZ-FE A/T
 *2: 3RZ-FE M/T, 2RZ-FE

P

- (1) Disconnect the intake air temp. sensor connector.
- (2) Connect sensor wire harness terminals together.
- (3) Turn ignition switch ON.

C

Read temperature value on the OBD II scan tool or TOYOTA hand-held tester.

OK

Temperature value: 140°C (284°F) or more

BE6653
P19555

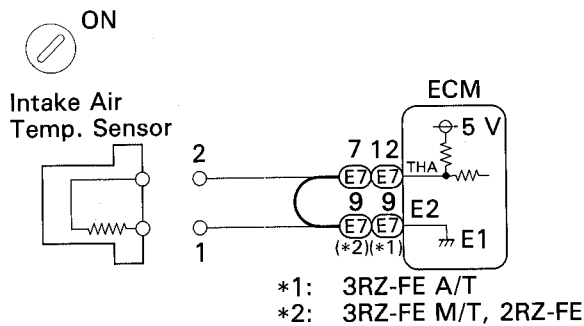
NG

OK

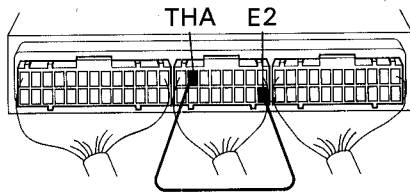
Confirm good connection at sensor. If OK, replace intake air temp. sensor.

3

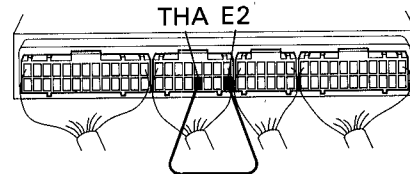
Check for open in harness or ECM.



For 3RZ-FE M/T, 2RZ-FE



For 3RZ-FE A/T

BE6653
P19553
P19698
P19673

NG

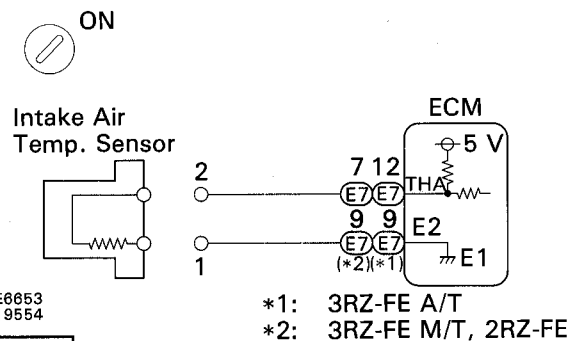
OK

Open in harness between terminals E2 or THA, repair or replace harness.

Confirm good connection at ECM. If OK, replace ECM.

4

Check for short in harness and ECM.

BE6653
P19554

NG

OK

Replace intake air temp. sensor.

- P** (1) Remove glove compartment (See page EG-157).
(2) Connect between terminals THA and E2 of ECM connector.

HINT: Intake air temp. sensor connector is disconnected. Before checking, do a visual and contact pressure check for the ECM connector. (See page IN-24).
(3) Turn ignition switch ON.

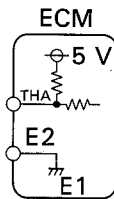
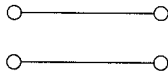
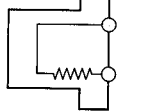
- C** Read temperature value on the OBD II scan tool or TOYOTA hand-held tester.

OK Temperature value: 140°C (284°F) or more

- P** (1) Disconnect the intake air temp. sensor connector.
(2) Turn ignition switch ON.

- C** Read temperature value on the OBD II scan tool or TOYOTA hand-held tester.

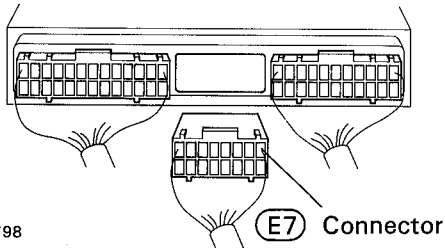
OK Temperature value: -40°C (-40°F)

5**Check for short in harness or ECM.**Intake Air
Temp. Sensor

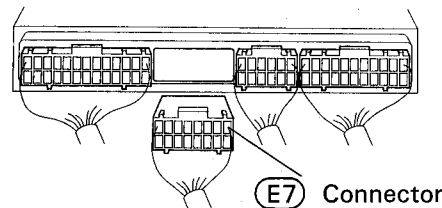
- P** (1) Remove glove compartment
(See page EG-157).
(2) Disconnect the (E7) connector of ECM.
HINT: Intake air temp. sensor connector is disconnected.
(3) Turn ignition switch ON.

C Read temperature value on the OBD II scan tool or TOYOTA hand-held tester.

OK Temperature value: -40°C (-40°F)

For 3RZ-FE M/T, 2RZ-FE

BE6653
FI7056
P19785 P19798

NG**For 3RZ-FE A/T****OK****Repair or replace harness or connector.****Check and replace ECM (See page IN-29).****DTC****P0115****Engine Coolant Temp. Circuit
Malfunction****CIRCUIT DESCRIPTION**

A thermistor built into the engine coolant temperature sensor changes the resistance value according to the engine coolant temperature.

The structure of the sensor and connection to the ECM is the same as in the intake air temp. circuit malfunction shown on page EG-212.

If the ECM detects the DTC P0115, it operates the fail safe function in which the engine coolant temp. is assumed to be 80°C (176°F).

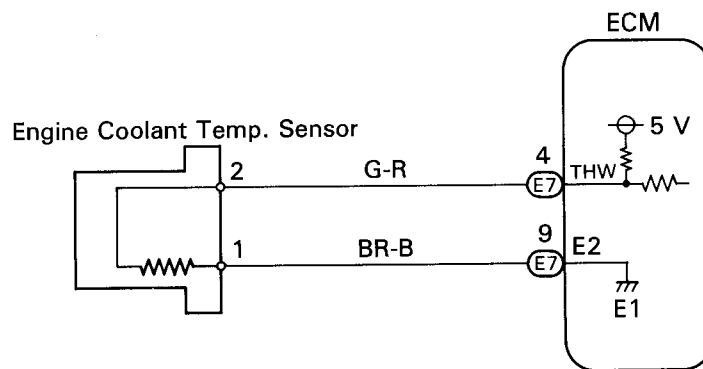
DTC No.	DTC Detecting Condition	Trouble Area
P0115	Open or short in engine coolant temp. sensor circuit	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM

HINT: After confirming DTC P0115 use the OBD II scan tool or TOYOTA hand-held tester to confirm the engine coolant temperature from "CURRENT DATA".

Temperature Displayed	Malfunction
-40°C (-40°F)	Open circuit
140° (284°F) or more	Short circuit

EG

WIRING DIAGRAM



FI6448

INSPECTION PROCEDURE

HINT: If DTC "P0110" (intake air temp. circuit malfunction), "P0115" (engine coolant temp. circuit malfunction), "P0120" (throttle/pedal position sensor/switch "A" circuit malfunction) are output simultaneously, E2 (sensor ground) may be open.

1

Connect the OBD II scan tool or TOYOTA hand-held tester, and read value of engine coolant temperature.

P

- (1) Connect the OBD II scan tool or TOYOTA hand-held tester to the DLC3.
- (2) Turn ignition switch ON and OBD II scan tool or TOYOTA hand-held tester main switch ON.

C

Read temperature value on the OBD II scan tool or TOYOTA hand-held tester.

OK

Same as actual engine coolant temperature.

HINT: If there is open circuit, OBD II scan tool or TOYOTA hand-held tester indicates -40°C (-40°F). If there is short circuit, OBD II scan tool or TOYOTA hand-held tester indicates 140°C (284°F) or more.

OK**NG**

-40°C (-40°F)...Go to step **2**.
 140°C (284°F) or more...Go to step **4**.

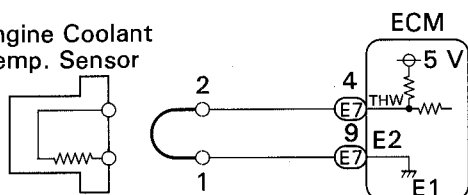
Check for intermittent problems
 (See page EG-196).

2

Check for open in harness or ECM.



Engine Coolant
Temp. Sensor

**P**

- (1) Disconnect the engine coolant temp. sensor connector.
- (2) Connect sensor wire harness terminals together.
- (3) Turn ignition switch ON.

C

Read temperature value on the OBD II scan tool or TOYOTA hand-held tester.

OK

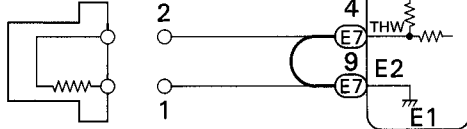
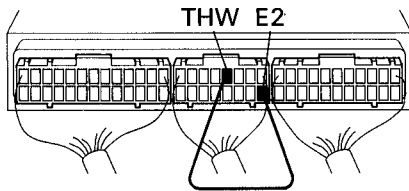
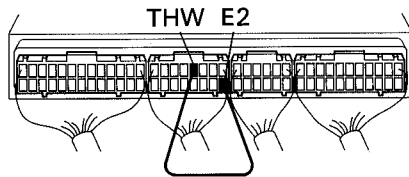
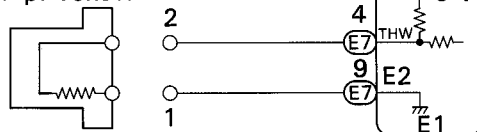
Temperature value: 140°C (284°F) or more

OK

Confirm good connection at sensor. If OK, replace engine coolant temp. sensor.

BE6653
FI7055

NG

3**Check for open in harness or ECM.**Engine Coolant
Temp. Sensor**For 3RZ-FE M/T, 2RZ-FE****For 3RZ-FE A/T**BE6653
FI7057
P19699
P19674**NG****OK****Open in harness between terminals E2 or THW, repair or replace harness.****Confirm good connection at ECM. If OK, replace ECM.****4****Check for short in harness and ECM.**Engine Coolant
Temp. SensorBE6653
FI7054**NG****OK****Replace engine coolant temp. sensor.**

- P** (1) Remove glove compartment (See page EG-157).
(2) Connect between terminals THW and E2 of ECM connector.

HINT: Engine coolant temp. sensor connector is disconnected. Before checking, do a visual and contact pressure check for the ECM connector (See page IN-24).

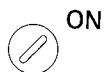
- (3) Turn ignition switch ON.

- C** Read temperature value on the OBD II scan tool or TOYOTA hand-held tester.

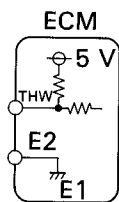
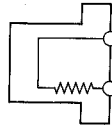
- OK** Temperature value: 140°C (284°F) or more

EG

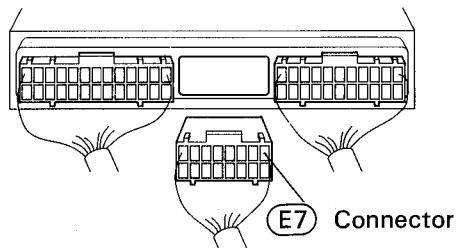
5 Check for short in harness or ECM.



Engine Coolant
Temp. Sensor



For 3RZ-FE M/T, 2RZ-FE



BE6653
FI7056
P19785 P19798

NG

Check and replace ECM (See page IN-29).

P

- (1) Remove glove compartment (See page EG-157).
- (2) Disconnect the (E7) connector of ECM.

HINT: Engine coolant temp. sensor connector is disconnected.

- (3) Turn ignition switch ON.

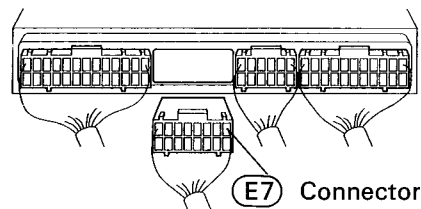
C

Read temperature value on the OBD II scan tool or TOYOTA hand-held tester.

OK

Temperature value: -40°C (-40°F)

For 3RZ-FE A/T



OK

Repair or replace harness or connector.

DTC

P0116

Engine Coolant Temp. Circuit Range/
Performance Problem

CIRCUIT DESCRIPTION

Refer to "Engine Coolant Temp. Circuit Malfunction" on page EG-215.

DTC No.	DTC Detecting Condition	Trouble Area
P0116	20 min. or more after starting engine, engine coolant temp. sensor value is 32°C (90°F) or less (2 trip detection logic)	- Engine coolant temp. sensor - Cooling system

INSPECTION PROCEDURE

HINT: If DTC "P0115" (engine coolant temp. circuit malfunction) and "P0116" (engine coolant temp. circuit range/performance) are output simultaneously, engine coolant temp. sensor circuit may be open. Troubleshoot of DTC P0115 first.

1

Are there any other codes (besides DTC P0116) being output?

NO

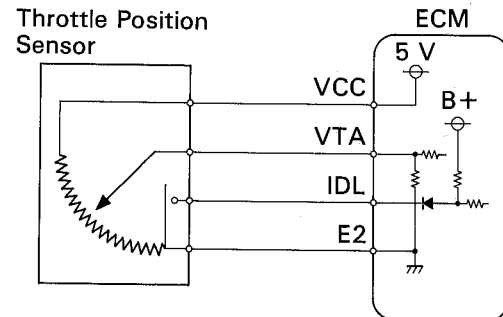
YES

Go to relevant DTC chart.

Replace engine coolant temp. sensor
(See page EG-148).

DTC**P0120****Throttle/Pedal Position Sensor/Switch
"A" Circuit Malfunction****CIRCUIT DESCRIPTION**

The throttle position sensor is mounted in the throttle body and detects the throttle valve opening angle. When the throttle valve is fully closed, the IDL contacts in the throttle position sensor are on, so the voltage at the terminal IDL of the ECM becomes 0 V. At this time, a voltage of approximately 0.3 – 0.8 V is applied to terminal VTA of the ECM. When the throttle valve is opened, the IDL contacts go off and thus the power source voltage of approximately 12 V in the ECM is applied to the terminal IDL of the ECM. The voltage applied to the terminal VTA of the ECM increases in proportion to the opening angle of the throttle valve and becomes approximately 3.2 – 4.9 V when the throttle valve is fully opened. The ECM judges the vehicle driving conditions from these signals input from terminals VTA and IDL, and uses them as one of the conditions for deciding the air-fuel ratio correction, power increase correction and fuel-cut control etc.



FI6571

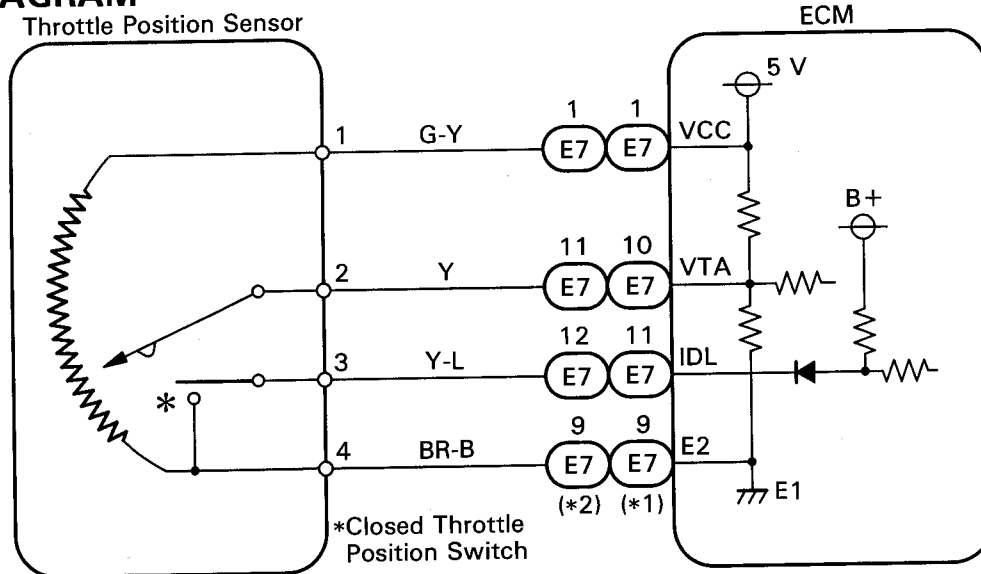
DTC No.	DTC Detecting Condition	Trouble Area
P0120	Condition (a) or (b) continues (a) $VTA < 0.1\text{ V}$, and closed throttle position switch is OFF (b) $VTA > 4.9\text{ V}$	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM

HINT:

- If there is open circuit in IDL line, DTC P0120 does not indicate.
- After confirming DTC P0120 use the OBD II scan tool or TOYOTA hand-held tester to confirm the throttle valve opening percentage and closed throttle position switch condition.

Throttle valve opening position expressed as percentage		Trouble Area
Throttle valve fully closed	Throttle valve fully open	
0 %	0 %	VCC line open VTA line open or short
100 %	100 %	E2 line open

WIRING DIAGRAM



P19610

*1: 3RZ-FE A/T
 *2: 3RZ-FE M/T, 2RZ-FE

INSPECTION PROCEDURE

HINT: If DTC P0110, P0115 and P0120 are output simultaneously, E2 (sensor ground) may be open.

1

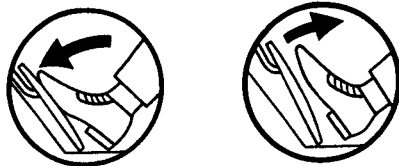
Connect the OBD II scan tool or TOYOTA hand-held tester and read the throttle valve opening percentage.

P

- (1) Connect the OBD II scan tool or TOYOTA hand-held tester to the DLC3.
- (2) Turn ignition switch ON and OBD II scan tool or TOYOTA hand-held tester main switch ON.

C

Read the throttle valve opening percentage.



OK

Throttle valve	Throttle valve opening position expressed as percentage
Fully open	Approx. 75%
Fully closed	Approx. 10%

FI7052

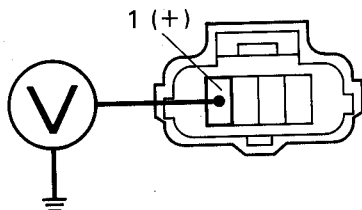
NG

OK

Check for intermittent problems
 (See page EG-196).

2

Check voltage between terminal VCC of wire harness side connector and body ground.

BE6653
P23808

OK

P

- (1) Disconnect the throttle position sensor connector.
- (2) Turn ignition switch ON.

C

Measure voltage between terminal VCC of wire harness side connector and body ground.

OK

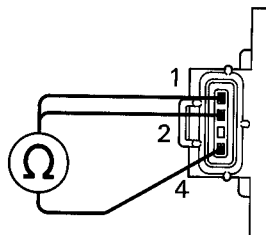
Voltage: 4.5 – 5.5 V

NG

Go to step 5.

3 Check throttle position sensor.

Throttle Position Sensor



P Disconnect the throttle position sensor connector.

C Measure resistance between terminals 1, 2 and 4 of throttle position sensor.

OK

Terminals	Throttle valve	Resistance
1 - 4	—	2.5 - 5.9 kΩ
2 - 4	Fully closed	0.2 - 5.7 kΩ
	Fully open	2.0 - 10.2 kΩ

P23809

OK

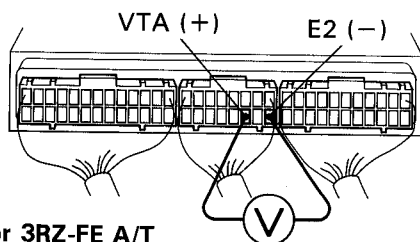
NG

Replace throttle position sensor.

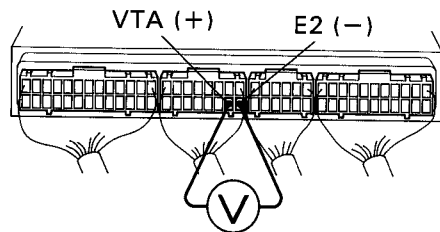
4 Check voltage between terminals VTA and E2 of ECM connector.

ON

For 3RZ-FE M/T, 2RZ-FE



For 3RZ-FE A/T



BE6653
P23810
P23811

OK

P (1) Remove glove compartment
(See page EG-157).

(2) Turn ignition switch ON.

C Measure voltage between terminals VTA and E2 of ECM connector.

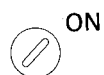
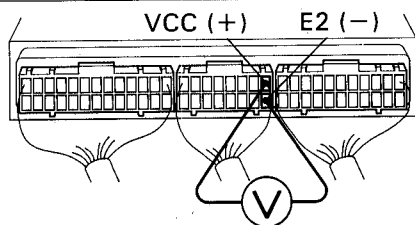
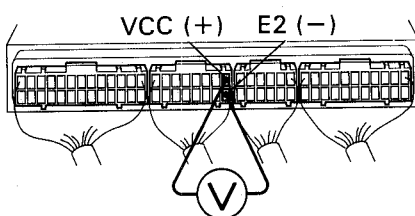
OK

Throttle valve	Voltage
Fully closed	0.3 - 0.8 V
Fully open	2.7 - 5.2 V

NG

Check for open and short in harness and connector between ECM and throttle position sensor (VTA line) (See page IN-24).

Check and replace ECM (See page IN-29).

5**Check voltage between terminals VCC and E2 of ECM connector.****For 3RZ-FE M/T, 2RZ-FE****For 3RZ-FE A/T**BE6653
P23812
P23813**OK****P**

- (1) Remove glove compartment (See page EG-157).
- (2) Turn ignition switch ON.

C

Measure voltage between terminals VCC and E2 of ECM connector.

OK**Voltage: 4.5 – 5.5 V****NG****Check and replace ECM (See page IN-29).**

Check for open in harness and connector between ECM and sensor (VCC line) (See page IN-24).

DTC**P0121****Throttle/Pedal Position Sensor/Switch
"A" Circuit Range/Performance Problem****CIRCUIT DESCRIPTION**

Refer to "Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction" on page EG-219.

DTC No.	DTC Detecting Condition	Trouble Area
P0121	When closed throttle position switch is ON, condition (a) continues (2 trip detection logic) (a) VTA > 2.0 V	Throttle position sensor

INSPECTION PROCEDURE**1****Are there any other codes (besides DTC P0121) being output?****NO****YES****Go to relevant DTC chart.****Replace throttle position sensor.**

DTC**P0125****Insufficient Coolant Temp. for Closed Loop Fuel Control****CIRCUIT DESCRIPTION**

To obtain a high purification rate for the CO, HC and NO_x components of the exhaust gas, a three-way catalytic converter is used, but for the most efficient use of the three-way catalytic converter, the air-fuel ratio must be precisely controlled so that it is always close to the stoichiometric air-fuel ratio.

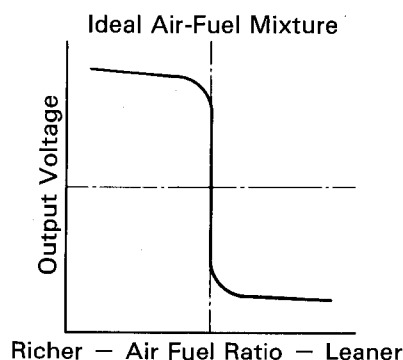
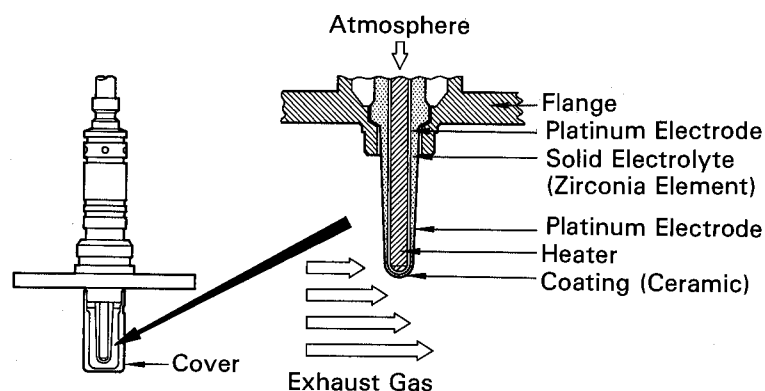
The oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air-fuel ratio. This characteristic is used to detect the oxygen concentration in the exhaust gas and provide feedback to the computer for control of the air-fuel ratio.

When the air-fuel ratio becomes LEAN, the oxygen concentration in the exhaust increases and the oxygen sensor informs the ECM of the LEAN condition (small electromotive force: 0 V).

When the air-fuel ratio is RICHER than the stoichiometric air-fuel ratio the oxygen concentration in the exhaust gas is reduced and the oxygen sensor informs the ECM of the RICH condition (large electromotive force: 1 V).

The ECM judges by the electromotive force from the oxygen sensor whether the air-fuel ratio is RICH or LEAN and controls the injection time accordingly. However, if malfunction of the oxygen sensor causes output of abnormal electromotive force, the ECM is unable to perform accurate air-fuel ratio control.

The main heated oxygen sensors include a heater which heats the Zirconia element. The heater is controlled by the ECM. When the intake air volume is low (the temperature of the exhaust gas is low) current flows to the heater to heat the sensor for accurate oxygen concentration detection.

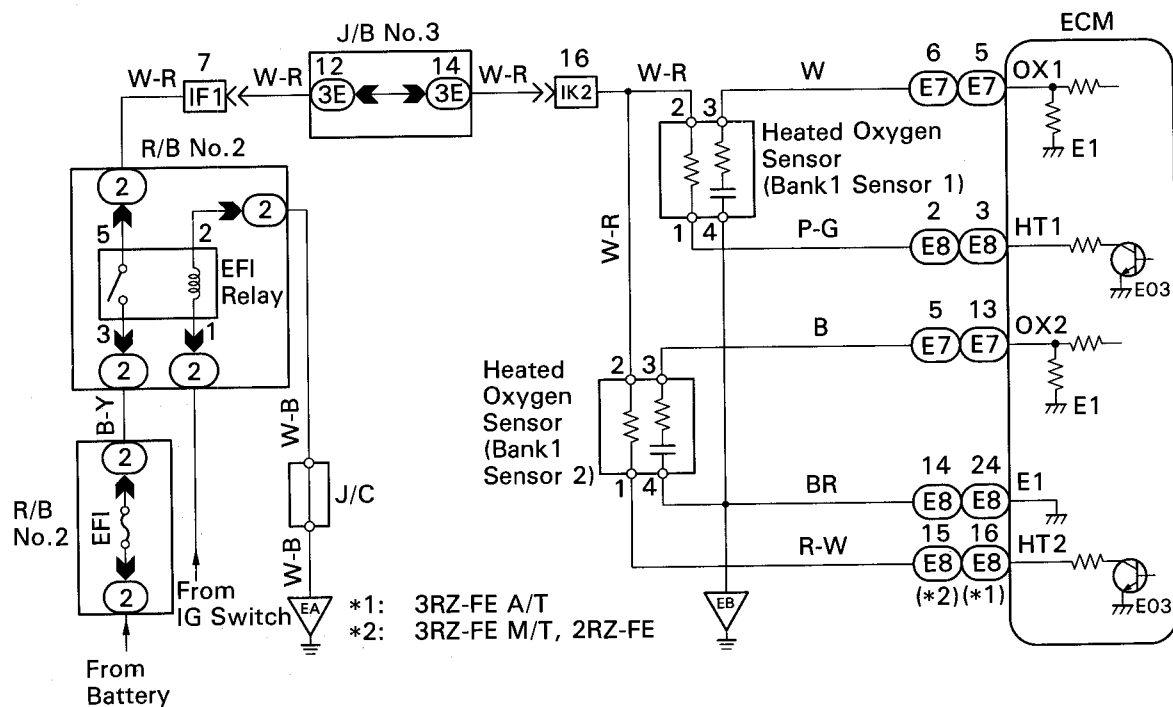
P21242
F17210

DTC No.	DTC Detecting Condition	Trouble Area
P0125	After the engine is warmed up, heated oxygen sensor output does not indicate RICH even once when conditions (a), (b) and (c) continue for at least 1.5 minutes (a) Engine speed: 1,500 rpm or more (b) Vehicle speed: 40 ~ 100 km/h (25 ~ 62 mph) (c) Closed throttle position switch: OFF (d) 140 sec. or more after starting engine	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor

HINT: After confirming DTC P0125 use the OBD II scan tool or TOYOTA hand-held tester to confirm voltage output of heated oxygen sensor from "CURRENT DATA".

If voltage output of heated oxygen sensor is 0 V, heated oxygen sensor circuit may be open or short.

WIRING DIAGRAM



P23409

INSPECTION PROCEDURE

1

Connect the OBD II scan tool or TOYOTA hand-held tester and read value for voltage output of heated oxygen sensor.

P

- (1) Connect the OBD II scan tool or TOYOTA hand-held tester to the DLC3.
- (2) Warm up engine to normal operating temperature.

C

Read voltage output of heated oxygen sensor (bank 1 sensor 1) when engine is suddenly raced.

HINT: Perform quick racing to 4,000 rpm 3 times using accelerator pedal.

OK

Heated oxygen sensor output a RICH signal (0.45 V or more) at least once.

NG

OK

Check and replace ECM (See page IN-29).

2

Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN-24).

OK

NG

Repair or replace harness or connector.

Replace heated oxygen sensor.

DTC**P0130****Heated Oxygen Sensor Circuit
Malfunction (Bank 1 Sensor 1)****CIRCUIT DESCRIPTION**

Refer to "Insufficient Coolant Temp. for Closed Loop Fuel Control" on page EG-223.

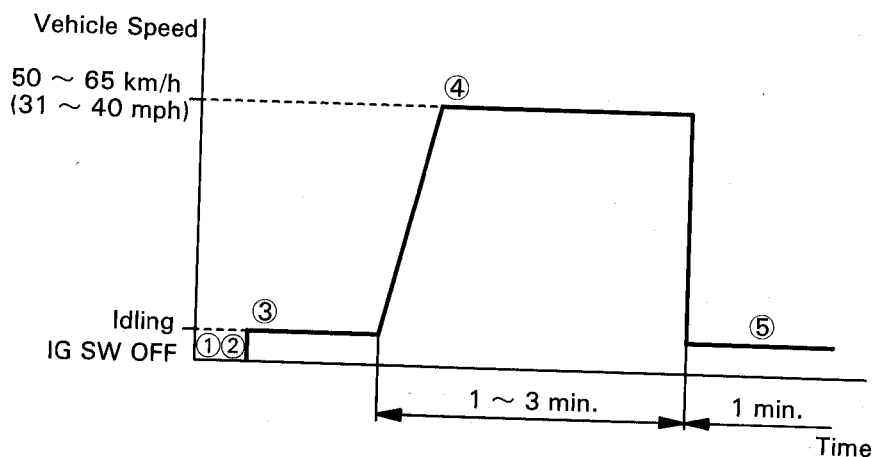
DTC No.	DTC Detecting Condition	Trouble Area
P0130	Voltage output of heated oxygen sensor remains at 0.4 V or more or 0.55 V or less, during idling after the engine is warmed up (2 trip detection logic)	• Heated oxygen sensor • Fuel trim malfunction

HINT: Sensor 1 refers to the sensor closer to the engine body.

The heated oxygen sensor's output voltage and the short-term fuel trim value can be read using the OBD II scan tool or TOYOTA hand-held tester.

WIRING DIAGRAM

Refer to page EG-224 for the WIRING DIAGRAM.

CONFIRMATION DRIVING PATTERN

FI7130

- ① Connect the TOYOTA hand-held tester to the DLC3.
- ② Switch the TOYOTA hand-held tester from normal mode to check mode (See page EG-191).
- ③ Start the engine and warm it up with all accessory switches OFF.
- ④ Drive the vehicle at 50 ~ 65 km/h (31 ~ 40mph) for 1 ~ 3 minutes to warm up the heated oxygen sensor.
- ⑤ Let the engine idle for 1 minute.

HINT: If a malfunction exists, the MIL will light up during step ⑤.

NOTICE: If the conditions in this test are not strictly followed, detection of the malfunction will not be possible.

If you do not have a TOYOTA hand-held tester, turn the ignition switch OFF after performing steps ③ to ⑤, then perform steps ③ to ⑤ again.

INSPECTION PROCEDURE

1

Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN-24).

OK

NG

Repair or replace harness or connector.

2

Check for heated oxygen sensor data.

P

- (1) Connect the OBD II scan tool or TOYOTA hand-held tester to the DLC3.
(2) Warm up engine to normal operating temperature.

C

Read the heated oxygen sensor output voltage and short-term fuel trim.

Result

Pattern	Heated oxygen sensor output voltage	Short-term fuel trim
①	Lean condition (Changes at 0.55 V or less)	Changes at about +20 %
②	Rich condition (Changes at 0.4 V or more)	Changes at about -20 %
③	Except ① and ②	

③

①,②

Check fuel trim system (See page EG-230).

3

Check the output voltage of heated oxygen sensor during idling.

P

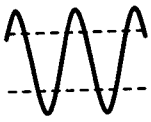
Warm up the heated oxygen sensor with the engine at 2,500 rpm for approx. 90 sec.

C

Use the OBD II scan tool or TOYOTA hand-held tester read the output voltage of the heated oxygen sensor during idling.

OK

Heated oxygen sensor output voltage:
Alternates repeatedly between less than 0.4 V and more than 0.55 V (See the following table).

	OK	NG	NG	NG
1 V —				
0.55 V - - -				
0.4 V - - -				
0 V —				

P18349

NG

OK

Perform confirmation driving pattern
(See page EG-225).

Replace heated oxygen sensor.

DTC	P0133	Heated Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1)
-----	-------	--

CIRCUIT DESCRIPTION

Refer to "Insufficient Coolant Temp. for Closed Loop Fuel Control" on page EG-223.

DTC No.	DTC Detecting Condition	Trouble Area
P0133	Response time for the heated oxygen sensor's voltage output to change from rich to lean, or from lean to rich, is 1 sec. or more during idling after the engine is warmed up (2 trip detection logic)	• Heated oxygen sensor

HINT: Sensor 1 refers to the sensor closer to the engine body.

INSPECTION PROCEDURE

1	Are there any other codes (besides DTC P0133) being output?
----------	---

NO

YES

Go to relevant DTC chart.

Replace heated oxygen sensor.

DTC	P0135	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1)
-----	-------	---

DTC	P0141	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)
-----	-------	---

CIRCUIT DESCRIPTION

Refer to "Insufficient Coolant Temp. for Closed Loop Fuel Control" on page EG-223.

DTC No.	DTC Detecting Condition	Trouble Area
P0135 P0141	When the heater operates, heater current exceeds 2 A or voltage drop for the heater circuit exceeds 5 V. (2 trip detection logic)	• Open or short in heater circuit of heated oxygen sensor • Heated oxygen sensor heater • ECM
	Heater current of 0.25 A or less when the heater operates. (2 trip detection logic)	

HINT: Sensor 1 refers to the sensor closer to the engine body.
Sensor 2 refers to the sensor farther away from the engine body.

WIRING DIAGRAM

Refer to page EG-224 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

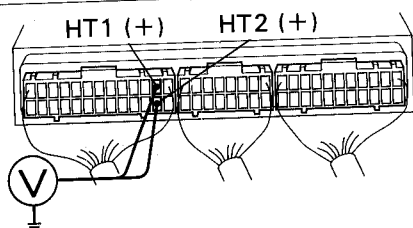
1

Check voltage between terminals HT1, HT2 of ECM connector and body ground.

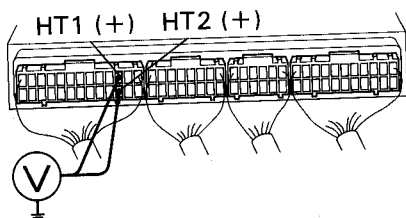


ON

For 3RZ-FE M/T, 2RZ-FE



For 3RZ-FE A/T

BE6653
P23814
P23815

NG

OK

Check and replace ECM (See page IN-29).

NG

Replace heated oxygen sensor.

Check and repair harness or connector between EFI relay and heated oxygen sensor and ECM.

DTC

P0136

Heated Oxygen Sensor Circuit
Malfunction (Bank 1 Sensor 2)

CIRCUIT DESCRIPTION

Refer to "Insufficient Coolant Temp. for Closed Loop Fuel Control" on page EG-223.

DTC No.	DTC Detecting Condition	Trouble Area
P0136	Voltage output of the heated oxygen sensor (bank 1 sensor 2) remains at 0.4 V or more or 0.5 V or less when the vehicle is driven at 50 km/h (31 mph) or more after the engine is warmed up. (2 trip detection logic)	Heated oxygen sensor

HINT: Sensor 2 refers to the sensor farther away from the engine body.

WIRING DIAGRAM

Refer to page EG-224 for the WIRING DIAGRAM.

INSPECTION PROCEDURE**1**

Are there any other codes (besides DTC P0136) being output?

NO**YES**

Go to relevant DTC chart.

2

Check for open and short in harness and connector between ECM and heated oxygen sensor (See page IN-24).

OK**NG**

Repair or replace harness or connector.

3

Check the output voltage of heated oxygen sensor (bank 1 sensor 2).

P

- (1) Connect the OBD II scan tool or TOYOTA hand-held tester to the DLC3.
- (2) Warm up engine to normal operating temperature.

C

Read voltage output of heated oxygen sensor (bank 1 sensor 2) when engine suddenly raced.

HINT: Perform quick racing to 4,000 rpm 3 mins. using accelerator pedal.

OK

Heated oxygen sensor output voltage: Alternates from 0.4 V or less to 0.5 V or more.

NG**OK**

Check that each connector is properly connected.

Replace heated oxygen sensor (bank 1 sensor 2).

DTC	P0171	System too Lean (Fuel Trim)
-----	-------	-----------------------------

DTC	P0172	System too Rich (Fuel Trim)
-----	-------	-----------------------------

CIRCUIT DESCRIPTION

"Fuel trim" refers to the feedback compensation value compared against the basic injection time. Fuel trim includes short-term fuel trim and long-term fuel trim.

"Short-term fuel trim" is the short-term fuel compensation used to maintain the air-fuel ratio at its ideal theoretical value. The signal from the heated oxygen sensor indicates whether the air-fuel ratio is RICH or LEAN compared to the ideal theoretical value, triggering a reduction in fuel volume if the air-fuel ratio is rich, and an increase in fuel volume if it is lean.

"Long-term fuel trim" is overall fuel compensation carried out long-term to compensate for continual deviation of the short-term fuel trim from the central value due to individual engine differences, wear over time and changes in the usage environment.

If both the short-term fuel trim and long-term fuel trim are LEAN or RICH beyond a certain value, it is detected as a malfunction and the MIL lights up.

DTC No.	DTC Detecting Condition	Trouble Area
P0171	When the air fuel ratio feedback is stable after engine warming up, the fuel trim is considerably in error on the RICH side. (2 trip detection logic)	• Air intake (hose loose) • Fuel line pressure • Injector blockage • Heated oxygen sensor malfunction • Mass air flow meter • Engine coolant temp. sensor
P0172	When the air fuel ratio feedback is stable after engine warming up, the fuel trim is considerably in error on the LEAN side. (2 trip detection logic)	• Fuel line pressure • Injector leak, blockage • Heated oxygen sensor malfunction • Mass air flow meter • Engine coolant temp. sensor

- HINT:
- When DTC P0171 is recorded, the actual air-fuel ratio is on the LEAN side. When DTC P0172 is recorded, the actual air-fuel ratio is on the RICH side.
 - If the vehicle runs out of fuel, the air-fuel ratio is LEAN and DTC P0171 is recorded. The MIL then comes on.
 - If the total of the short-term fuel trim value and long-term fuel trim value is within $\pm 25\%$, the system is functioning normally.

INSPECTION PROCEDURE

1

Check air induction system (See page EG-119).

OK

NG

Repair or replace.

2 Check for heated oxygen sensor data.

- P** (1) Connect the OBD II scan tool or TOYOTA hand-held tester to the DLC3.
 (2) Warm up engine to normal operating temperature.

- C** Read the heated oxygen sensor output voltage and short-term fuel trim.

Result

Pattern	Heated oxygen sensor output voltage	Short-term fuel trim
①	Lean condition (Changes at 0.55 V or less)	Changes at about + 20 %
②	Rich condition (Changes at 0.4 V or more)	Changes at about - 20 %
③	Except ① and ②	

①, ②

③

Check for heated oxygen sensor.
 (See page EG-225).

3 Check fuel pressure (See page EG-124).

OK

NG

Check and repair fuel pump, pressure regulator, fuel pipe line and filter. (See page EG-126).

4 Check injector injection.

OK

NG

Replace injector.

5 Check mass air flow meter and engine coolant temp. sensor (See page EG-208, 215).

OK

NG

Repair or replace.

6 Check for spark and ignition (See page IG-2).

OK

NG

Repair or replace.

7 Check the VSV for EVAP (See page EG-152).

OK

NG

Repair or replace.

Check and replace ECM (See page IN-29).

DTC	P0300	Random/Multiple Cylinder Misfire Detected
DTC	P0301	Cylinder 1 Misfire Detected
DTC	P0302	Cylinder 2 Misfire Detected
DTC	P0303	Cylinder 3 Misfire Detected
DTC	P0304	Cylinder 4 Misfire Detected

CIRCUIT DESCRIPTION

Misfire: The ECM uses the crankshaft position sensor and camshaft position sensor to monitor changes in the crankshaft rotation for each cylinder.

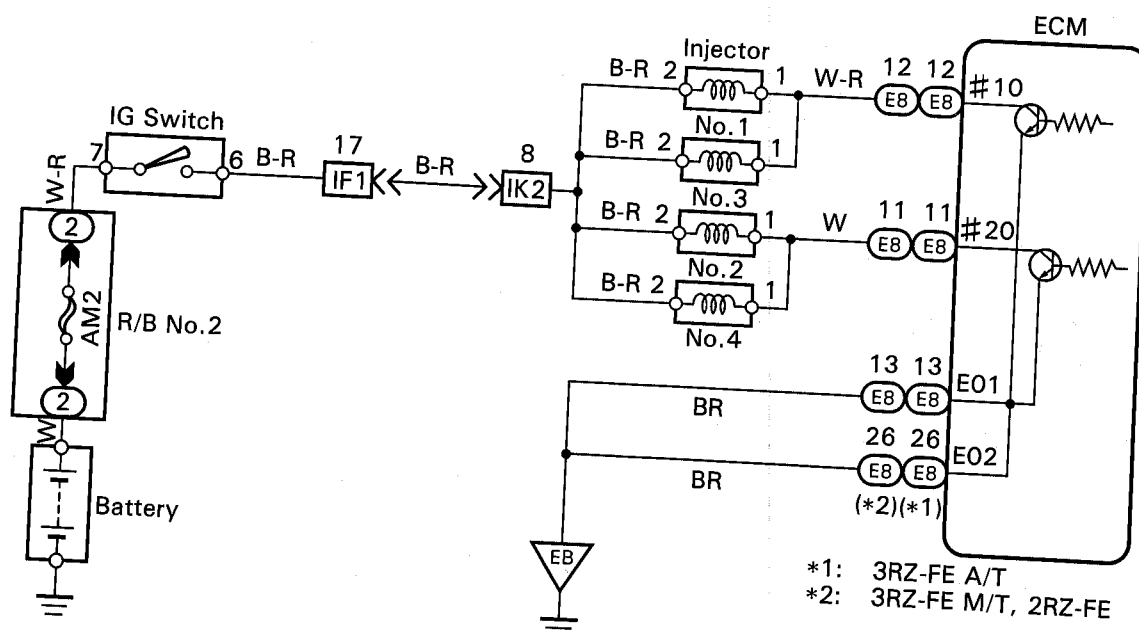
The ECM counts the number of times the engine speed change rate indicates that misfire has occurred. And when the misfire rate equals or exceeds the count indicating that the engine condition has deteriorated, the MIL lights up.

If the misfire rate is high enough and the driving conditions will cause catalyst overheating, the MIL blinks when misfiring occurs.

DTC No.	DTC Detecting Condition	Trouble Area
P0300	Misfiring of random cylinders is detected during any particular 200 or 1,000 revolutions	• Ignition system • Injector • Fuel line pressure • EGR • Compression pressure • Valve clearance not to specification • Valve timing • Mass air flow meter • Engine coolant temp. sensor
P0301 P0302 P0303 P0304	For any particular 200 revolutions of the engine, misfiring is detected which can cause catalyst overheating (This causes MIL to blink)	
	For any particular 1,000 revolutions of the engine, misfiring is detected which causes a deterioration in emissions (2 trip detection logic)	

HINT: When the 2 or more codes for a misfiring cylinder are recorded repeatedly but no Random Misfire code is recorded, it indicates that the misfires were detected and recorded at different times.

WIRING DIAGRAM

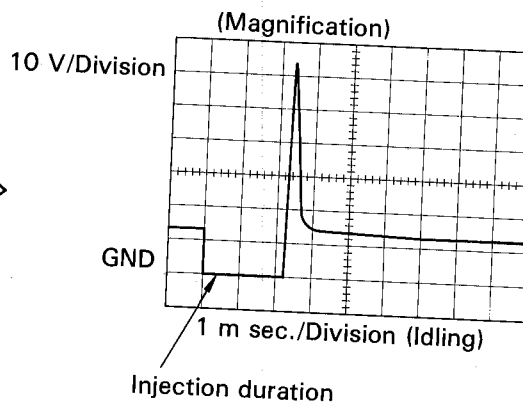
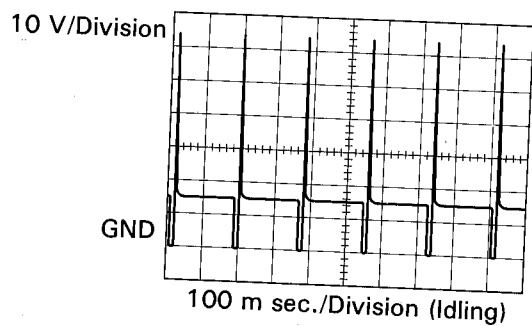


P23410

Reference INSPECTION USING OSCILLOSCOPE

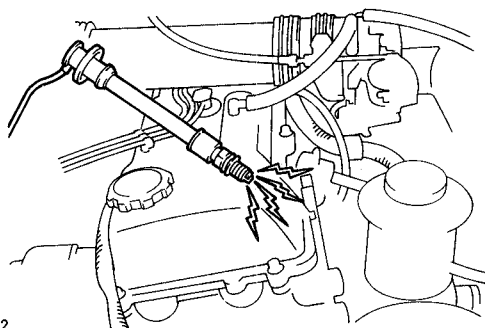
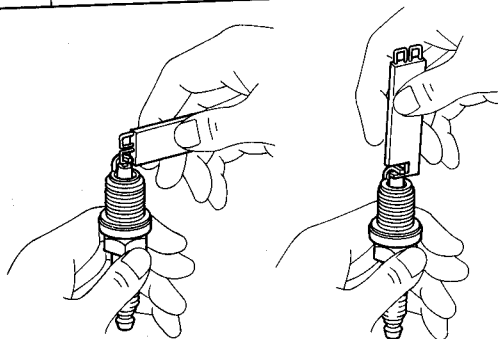
INJECTOR SIGNAL WAVEFORM

- With the engine idling, measure between terminals #10, #20 and E01 of ECM.
- HINT: The correct waveform is as shown.



FI6588 FI6538

INSPECTION PROCEDURE

1 Check spark plug and spark of misfiring cylinder.P03792
P25086**OK**

- P** (1) Disconnect the high-tension cord.
(2) Remove spark plug.

- C** (1) Check the carbon deposits on electrode.
(2) Check electrode gap.

- OK** (1) No large carbon deposit present.
Not wet with gasoline or oil.
(2) Electrode gap: 0.8 mm (0.031 in.)

- P** (1) Install the spark plug to the ignition code.
(2) Disconnect injector connector.
(3) Ground the spark plug.

- C** Check if spark occurs while engine is being craked.

NOTICE: To prevent excess fuel being injected from the injectors during this test, don't crank the engine for more than 5 — 10 seconds at a time.

- OK** Spark jumps across electrode gap.

NG

Replace or check ignition system (See page IG-2).

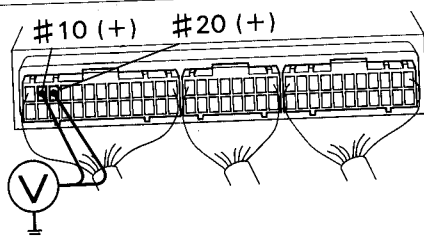
2

Check voltage of ECM terminal for injector of failed cylinder.

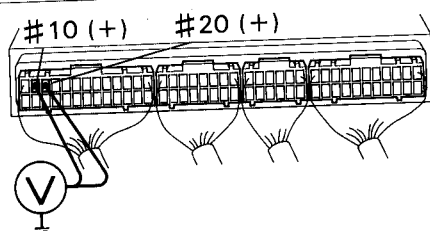
ON



For 3RZ-FE M/T, 2RZ-FE



For 3RZ-FE A/T

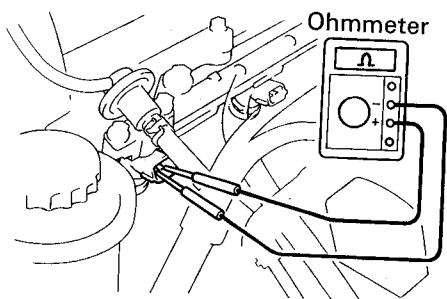
BE6653
P23816
P23817**NG**

- P** (1) Remove glove compartment
(See page EG-157).
(2) Turn ignition switch ON.

- C** Measure voltage between applicable terminal of ECM connector and body ground.

- OK** Voltage: 9 — 14 V

OKGo to step **4**.

3 Check injector of misfiring cylinder.

P25103

OK**P** Disconnect injector connector.**C** Measure resistance of injector.**OK** Resistance: At 20°C (68°F): 13.4 – 14.2 Ω **NG**

Replace injector.

Check for open and short in harness and connector between injector ECM (See page IN-24).

4 Check fuel pressure (See page EG-124).**OK****NG**

Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page EG-126).

5 Check injector injection (See page EG-132).**OK****NG**

Replace injector.

6 Check EGR system (See page EG-115).**OK****NG**

Repair EGR system.

7 Check mass air flow meter and engine coolant temp. sensor (See page EG-208, 215).**OK****NG**

Repair or replace.

Check engine mechanical systems.

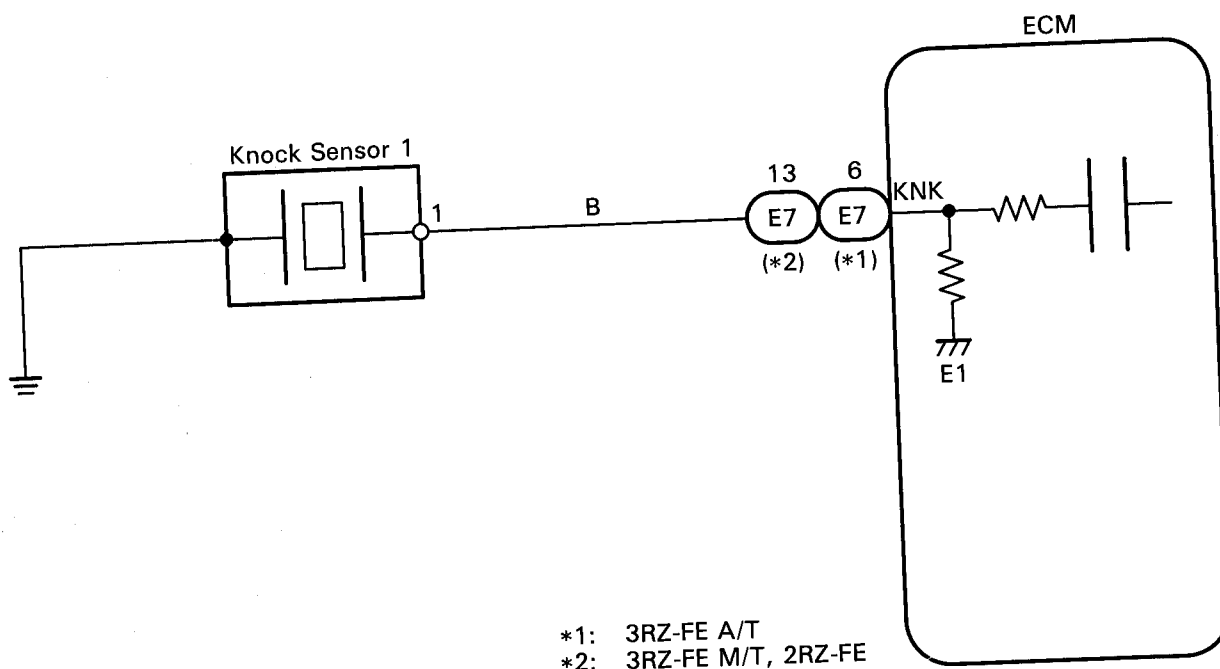
- Compression pressure (See page EG-7).
- Valve clearance (See page EG-8).
- Valve timing (See page EG-43).

DTC**P0325****Knock Sensor 1 Circuit Malfunction****CIRCUIT DESCRIPTION**

Knock sensor is fitted to the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, ignition timing is retarded to suppress it.

DTC No.	DTC Detecting Condition	Trouble Area
P0325	No knock sensor 1 signal to ECM with engine speed 1,200 rpm or more	• Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • ECM

If the ECM detects the above diagnosis conditions, it operates the fail safe function in which the corrective retard angle value is set to the maximum value.

WIRING DIAGRAM

*1: 3RZ-FE A/T
 *2: 3RZ-FE M/T, 2RZ-FE

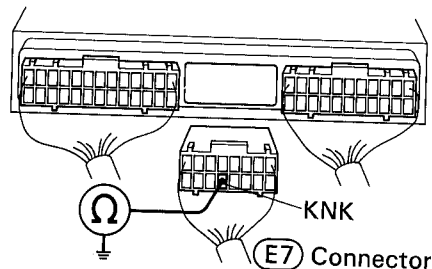
INSPECTION PROCEDURE

1 Check continuity between terminal KNK of ECM connector and body ground.

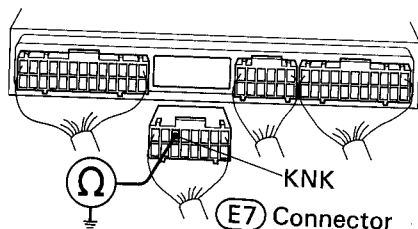
LOCK



For 3RZ-FE M/T, 2RZ-FE



For 3RZ-FE A/T

BE6653
P23818
P24201

NG

OK

Go to step **3**.**2** Check knock sensor (See page EG-151).

OK

NG

Replace knock sensor.

3 Check for open and short in harness and connector between ECM and knock sensor (See page IN-24).

OK

NG

Repair or replace harness or connector.

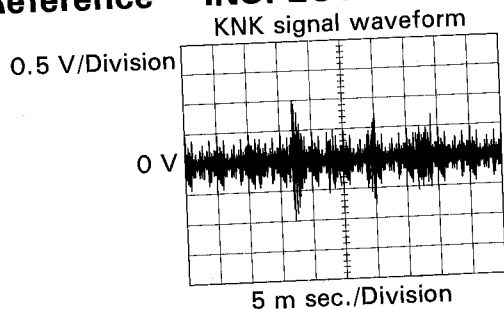
4 Does malfunction disappear when a good knock sensor is installed?

NO

YES

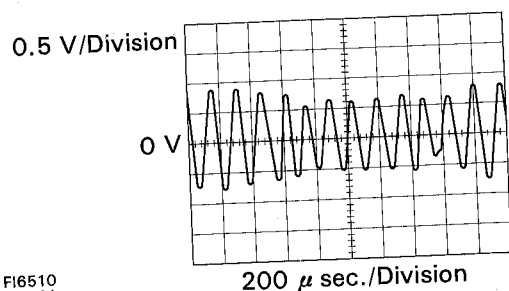
Replace knock sensor.

Check and replace ECM (See page IN-29).

Reference **INSPECTION USING OSCILLOSCOPE**

- With the engine racing (4,000 rpm) measure between terminal KNK of ECM and body ground.

HINT: The correct waveform is as shown.



- Spread the time on the horizontal axis, and confirm that period of the wave is 151 μ sec.
(Normal mode vibration frequency of knock sensor: 6.6 KHz).

HINT: If normal mode vibration frequency is not 6.6 kHz, the sensor is malfunctioning.

FI6510
FI6511

DTC

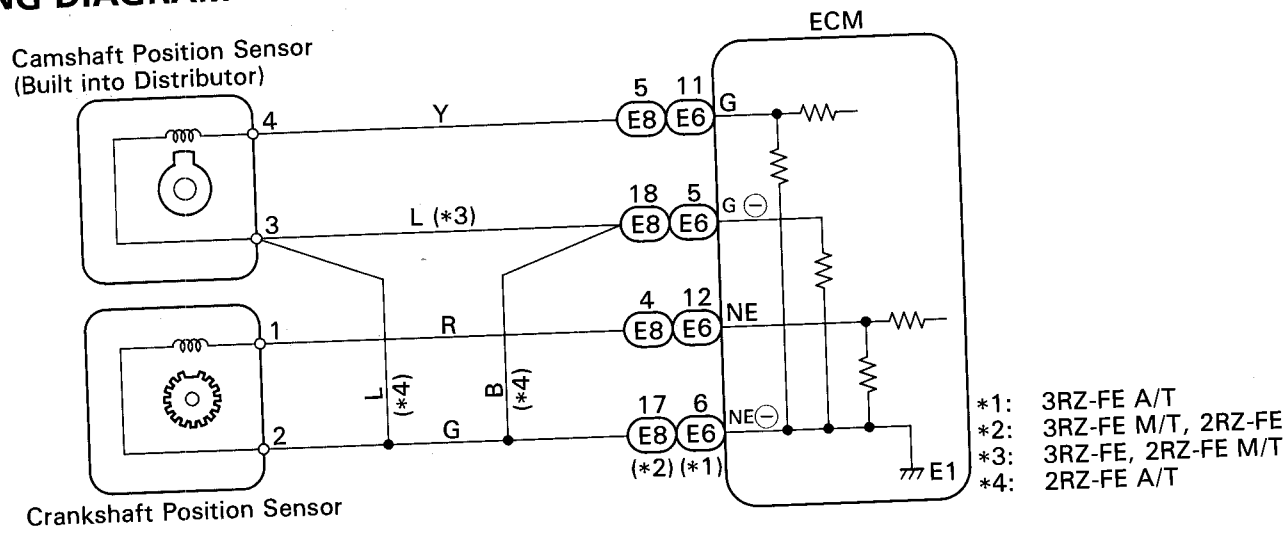
P0335

Crankshaft Position Sensor "A" Circuit Malfunction

CIRCUIT DESCRIPTION

Crankshaft position sensor (NE signal) consist of a signal plate and pick up coil. The NE signal plate has 34 teeth and is mounted on the crankshaft. The NE signal sensor generates 34 signals for every engine revolution. The ECM detects the standard crankshaft angle based on the G signals, and the actual crankshaft angle and the engine speed by the NE signals.

DTC No.	DTC Detecting Condition	Trouble Area
P0335	No crankshaft position sensor signal to ECM during cranking (2 trip detection logic)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Starter • ECM
	No crankshaft position sensor signal to ECM with engine speed 600 rpm or more (2 trip detection logic)	

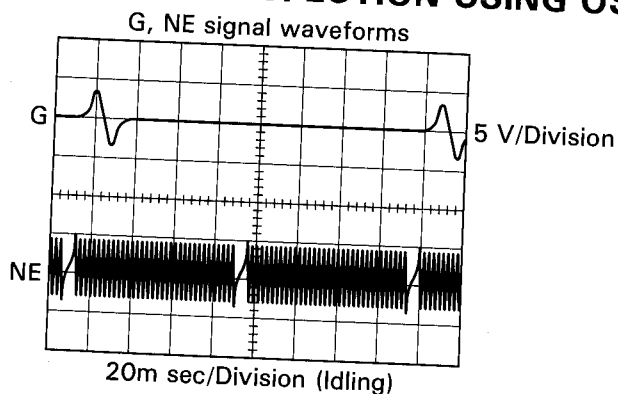
WIRING DIAGRAM

INSPECTION PROCEDURE

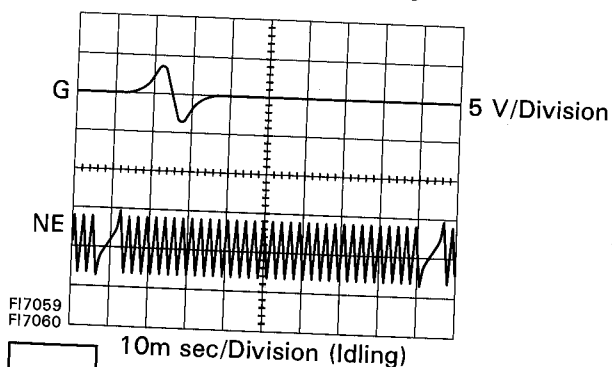
1

Check resistance of crankshaft position sensor (See page IG-6).

Reference INSPECTION USING OSCILLOSCOPE



- During cranking or idling, check between terminals G and G $\ominus$, NE and NE $\ominus$ of ECM
- HINT: The correct waveforms are as shown.



OK

NG

Replace crankshaft position sensor.

2

Check for open and short in harness and connector between ECM and crankshaft position sensor (See page IN-24).

OK

NG

Repair or replace harness or connector.

3

Inspect sensor installation and teeth of signal plate.

OK

NG

Tighten the sensor.
Replace signal plate.

Check and replace ECM (See page IN-29).

DTC**P0336****Crankshaft Position Sensor "A" Circuit
Range/Performance****CIRCUIT DESCRIPTION**

Refer to "Crankshaft Position Sensor "A" Circuit Malfunction" on page EG-238.

If the ECM records the DTC P0336, it operates the fail safe function, stopping the fuel injection.

DTC No.	DTC Detecting Condition	Trouble Area
P0336	Deviation in crankshaft position sensor signal and camshaft position sensor signal	• Valve timing • Distributor installation • ECM

INSPECTION PROCEDURE**1****Check valve timing (See page EG-43).****OK****NG****Adjust valve timing.****2****Check distributor installation (See page IG-11).****OK****NG****Reinstall distributor.****Check and replace ECM (See page IN-29).**

DTC**P0340****Camshaft Position Sensor Circuit Malfunction****CIRCUIT DESCRIPTION**

Camshaft position sensor (G signal) consist of a signal plate and pick up coil. The G signal plate has one tooth on its outer circumference and is built into the distributor. When the camshafts rotate, the protrusion on the signal plate and the air gap on the pick up coil change, causing fluctuations in the magnetic field and generating an electromotive force in the pick up coil. The NE signal plate has 34 teeth and is mounted on the crankshaft. The NE signal sensor generates 34 signals for every engine revolution. The ECM detects the standard crankshaft angle based on the G signals and the actual crankshaft angle and the engine speed by the NE signals.

DTC No.	DTC Detecting Condition	Trouble Area
P0340	No camshaft position sensor signal to ECM during cranking (2 trip detection logic)	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Distributor • Starter • ECM
	No camshaft position sensor signal to ECM during engine running.	

WIRING DIAGRAM

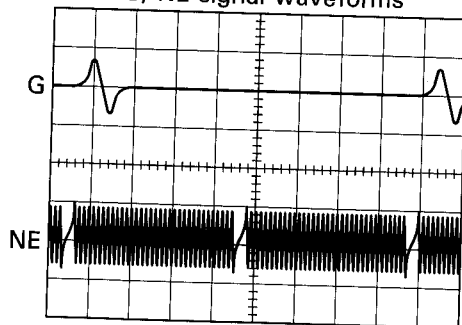
Refer to page EG-238 for the WIRING DIAGRAM.

INSPECTION PROCEDURE**1**

Check resistance of camshaft position sensor (Signal generator)
(See page IG-5).

Reference INSPECTION USING OSCILLOSCOPE

G, NE signal waveforms

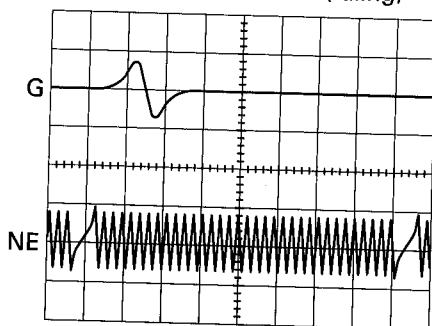


20m sec/Division (Idling)

5 V/Division

- During cranking or idling, check between terminals G and G $\ominus$, NE and NE $\ominus$ of ECM

HINT: The correct waveforms are as shown.



10m sec/Division (Idling)

5 V/Division

FI7059
FI7060**OK****NG**

Replace distributor housing.

2

Check for open and short in harness and connector between ECM and distributor (See page IN-24).

OK

NG

Repair or replace harness or connector.

3

Check air gap (See page IG-5).

OK

NG

Replace distributor housing.

Check and replace ECM (See page IN-29).

DTC**P0401**

**Exhaust Gas Recirculation Flow
Insufficient Detected**

CIRCUIT DESCRIPTION

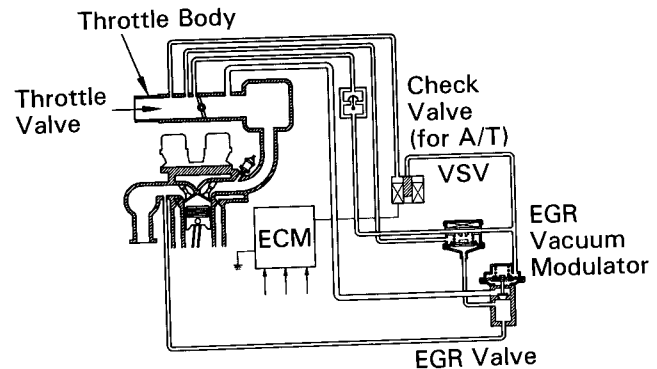
The EGR system recirculates exhaust gas, which is controlled to the proper quantity to suit the driving conditions, into the intake air mixture to slow down combustion, reduce the combustion temperature and reduce NOx emissions. The amount of EGR is regulated by the EGR vacuum modulator according to the engine load.

If even one of the following conditions is fulfilled, the VSV is turned ON by a signal from the ECM. This results in atmospheric air acting on the EGR valve, closing the EGR valve and shutting off the exhaust gas (EGR cut-off).

Under the following conditions, EGR is cut to maintain driveability.

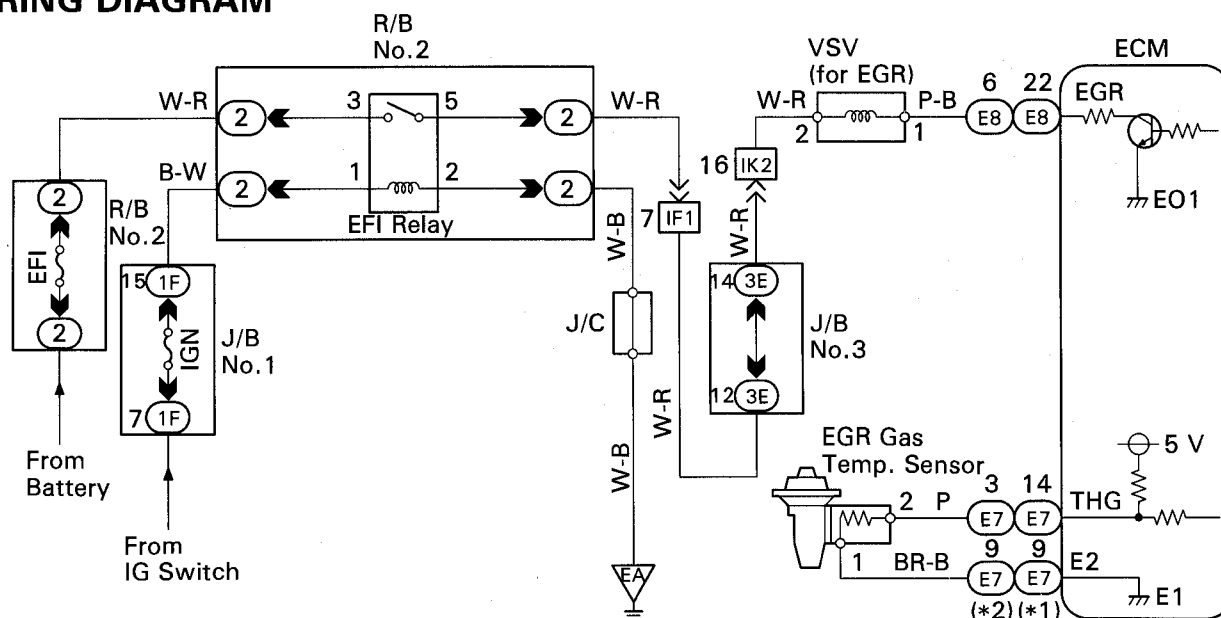
- Before the engine is warmed up.
- During deceleration (throttle valve closed).
- Light engine load (amount of intake air very small).
- Engine racing.

P19893



DTC No.	DTC Detecting Condition	Trouble Area
P0401	After the engine is warmed up and run at 80 km/h (50 mph) for 3 to 5 minutes, small difference between value of EGR gas temp. sensor and ambient air temperature (2 trip detection logic)	• EGR valve stuck closed • Short in VSV circuit for EGR • Open in EGR gas temp. sensor circuit • EGR hose disconnected • ECM

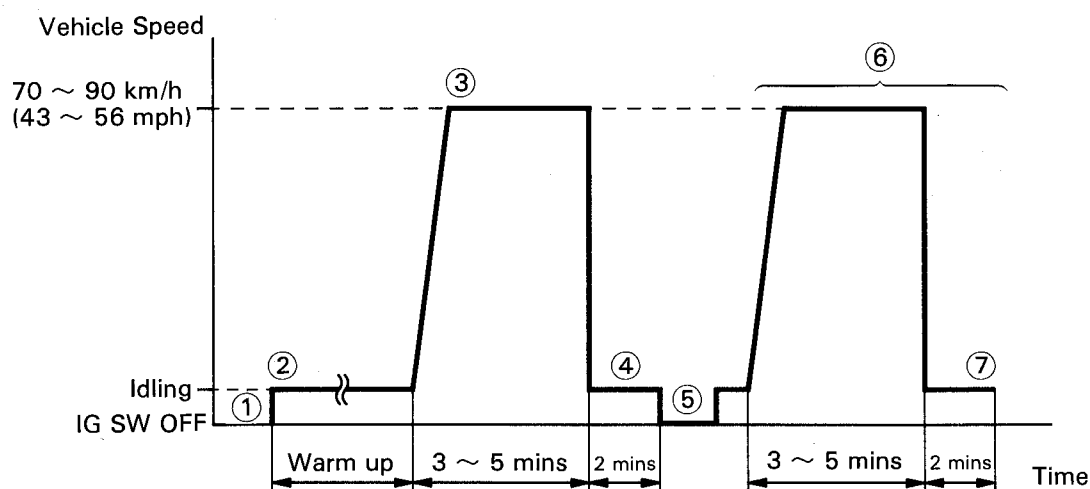
WIRING DIAGRAM



P23411

*1: 3RZ-FE A/T
 *2: 3RZ-FE M/T, 2RZ-FE

SYSTEM CHECK DRIVING PATTERN



P20769

- ① Connect the OBD II scan tool or TOYOTA hand-held tester to the DLC3.
- ② Start and warm up the engine with all accessories switched OFF.
- ③ Run the vehicle at 70 ~ 90 km/h (43 ~ 56 mph) for 3 minutes or more.
- ④ Idle the engine for about 2 minutes.
- ⑤ Stop at safe place and turn the ignition switch OFF.
- ⑥ Start the engine and do steps ③ and ④ again.
- ⑦ Check the "READINESS TESTS" mode on the OBD II scan tool or TOYOTA hand-held tester. If "COMPL" is displayed and the MIL does not light up, the system is normal. If "INCMPL" is displayed and the MIL does not light up, run the vehicle again and check it.

HINT: "INCMPL" is displayed when either condition (a) or (b) exists.

(a) The system check is incomplete.

(b) There is a malfunction in the system.

If there is a malfunction in the system, the MIL will light up after steps ② to ⑥ above are done.

INSPECTION PROCEDURE

TOYOTA hand-held tester

1**Connect the TOYOTA hand-held tester and read value of EGR gas temperature value.****P**

- (1) Connect the TOYOTA hand-held tester to the DLC3.
 (2) Turn ignition switch ON and TOYOTA hand-held tester main switch ON.

C

Read EGR gas temperature on the TOYOTA hand-held tester.

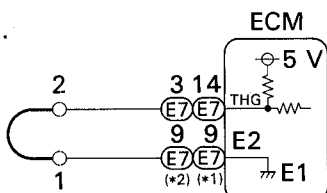
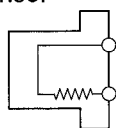
OK

EGR gas temp.: 10°C (50°F) or more

HINT: If there is an open circuit, the TOYOTA hand-held tester indicates 3.1°C (37.6°F).

NG**OK**Go to step **4**.**2****Check for open in harness or ECM.**

ON

EGR Gas Temp.
Sensor

- *1: 3RZ-FE A/T
 *2: 3RZ-FE M/T, 2RZ-FE

P

- (1) Disconnect the EGR gas temp. sensor connector.
 (2) Connect sensor wire harness terminals together.
 (3) Turn ignition switch ON.

C

Read EGR gas temperature on the TOYOTA hand-held tester.

OK

EGR gas temp.: 159.3°C (318.7°F)

OK

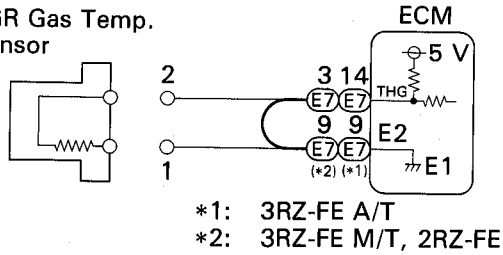
Confirm good connection at sensor.
 If OK, replace EGR gas temp. sensor.

BE6653
P19555**NG**

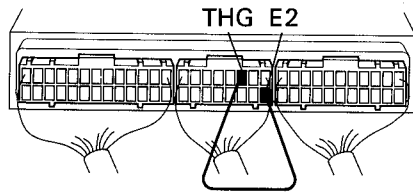
3 Check for open in harness or ECM.



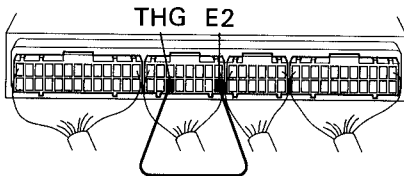
EGR Gas Temp.
Sensor



For 3RZ-FE M/T, 2RZ-FE



For 3RZ-FE A/T



BE6653
P19553
P19705
P19681

NG

OK

Open in harness between terminals E2 or THG. Repair or replace harness.

Confirm connection at ECM. If OK, replace ECM.

4 Check the connection of the vacuum hose, EGR hose (See page EG-111).

OK

NG

Repair or replace.

- P** (1) Remove glove compartment (See page EG-157).
(2) Connect between terminals THG and E2 of ECM connector.

HINT: EGR gas temp. sensor connector is disconnected. Before checking, do a visual check and contact pressure check for the ECM connector (See page IN-24).

C Read EGR gas temperature on the TOYOTA hand-held tester.

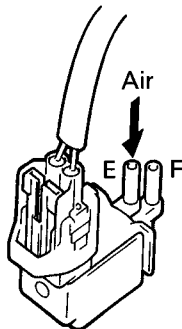
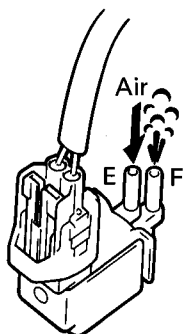
OK EGR gas temp. : 159.3°C (318.7°F)

EG

5 Check the VSV for EGR.

System: OFF

System: ON

BE6653
FI7205 FI7206**NG****P** Select the ACTIVE TEST mode on the TOYOTA hand-held tester.**C** Check operation of VSV, when it is operated by the TOYOTA hand-held tester.**OK** EGR system is OFF:
Air from pipe E is flowing out through pipe F.
EGR system is ON:
Air does not flow from pipe E to pipe F.**OK**Go to step **7**.**6** Check operation of the VSV for EGR (See page EG-153).**OK****NG**

Replace VSV for EGR.

Check for short in harness and connector between VSV and ECM (See page IN-24).

7 Check EGR vacuum modulator (See page EG-117).**OK****NG**

Repair or replace.

8 Check EGR valve (See page EG-116).**OK****NG**

Repair or replace.

9 Check value of EGR gas temp. sensor.

- P**
- (1) Connect the TOYOTA hand-held tester to the DLC3.
 - (2) Turn ignition switch ON and TOYOTA hand-held tester main switch ON.
 - (3) Select the ACTIVE TEST mode on the TOYOTA hand-held tester. (EGR system ON)
 - (4) Race the engine at 4,000 rpm for 3 mins.

C Measure the EGR gas temp. while racing engine at 4,000 rpm.

OK EGR gas temp. after 3 mins.: 140°C (284°F) or more

OK

NG

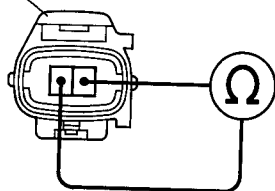
Replace EGR gas temp. sensor.

Check and replace ECM (See page IN-29).

OBD II scan tool (excluding TOYOTA hand-held tester)

1 Check resistance of EGR gas temp. sensor.

EGR Gas Temp. Sensor Connector



P Disconnect EGR gas temp. sensor connector.

C Measure resistance between terminals of EGR gas temp. sensor connector.

OK Resistance: 600 kΩ or less

HINT: If there is open circuit, ohmmeter indicates 720 kΩ or more.

OK

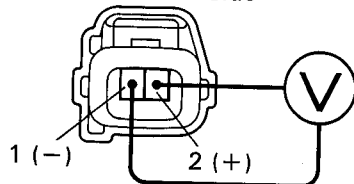
NG

Check and replace EGR gas temp. sensor (See page EG-155).

2 Check for open in harness or ECM.

ON

Wire Harness Side



P

- (1) Disconnect EGR gas temp. sensor connector.
- (2) Turn ignition switch ON.

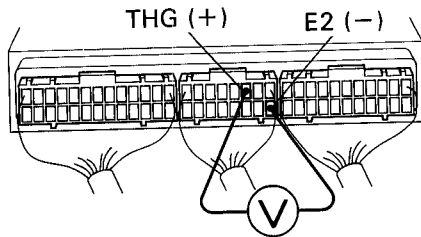
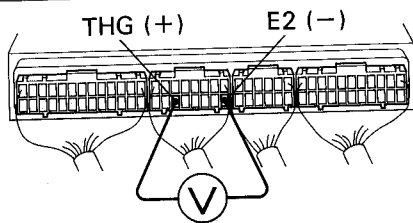
C Measure voltage between terminals of EGR gas temp. sensor wire harness side connector.

OK Voltage: 4.5 – 5.5 V

NG

OK

Go to step **4**.

3**Check for open in harness or ECM.****For 3RZ-FE M/T, 2RZ-FE****For 3RZ-FE A/T**BE6653
P24202
P24203**NG****OK**

Open in harness between terminals E2 or THG. Repair or replace harness.

Confirm connection at ECM. If OK, replace ECM.

4**Check connection of vacuum hose, EGR hose (See page EG-111).****OK****NG**

Repair or replace.

- P** (1) Remove glove compartment
(See page EG-157).
(2) Turn ignition switch ON.

- C** Measure voltage between terminals THG and E2 of ECM connector.

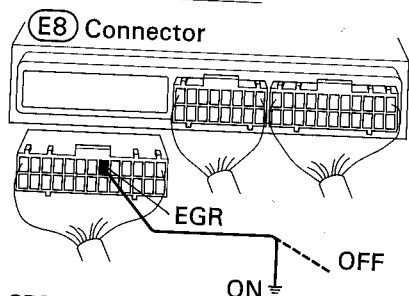
HINT: EGR gas temp. sensor connector is disconnected.

OK Voltage: 4.5 – 5.5 V

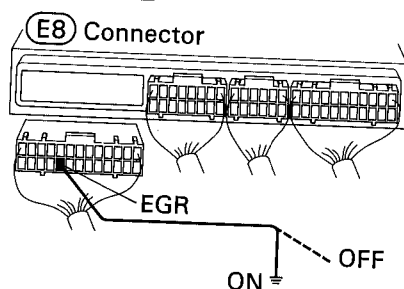
5 Check the VSV for EGR.



For 3RZ-FE M/T, 2RZ-FE



For 3RZ-FE A/T



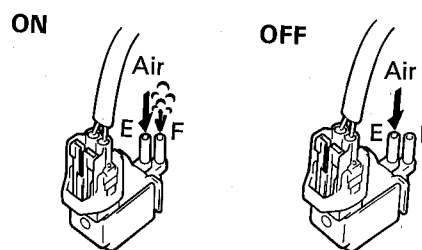
BE6653
P21086
P21087

NG

- P**
- (1) Remove glove compartment (See page EG-157).
 - (2) Disconnect ECM E8 connector.
 - (3) Turn ignition switch ON.

- C**
- Check VSV function
- (1) Connect between terminal EGR of ECM and body ground (ON).
 - (2) Disconnect between terminal EGR of ECM and body ground (OFF).

- OK**
- (1) VSV is ON:
Air from pipe E flows out through pipe F.
 - (2) VSV is OFF:
Air does not flow from pipe E to pipe F.



F17205, F17206

OK

Go to step **7**.

6 Check operation of the VSV for EGR (See page EG-153).

OK

NG

Replace VSV for EGR.

Check for open in harness and connector between R/B No.2 and ECM (See page IN-24).

7 Check EGR vacuum modulator (See page EG-117).

OK

NG

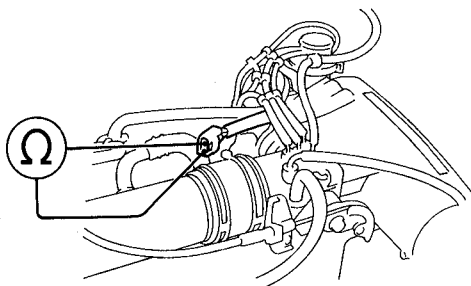
Repair or replace.

8 Check EGR valve (See page EG-116).

OK

NG

Repair or replace.

9**Check resistance of EGR gas temp. sensor.**

P24228

OK

- P** (1) Disconnect EGR gas temp. sensor connector.
 (2) Start the engine and warm it up.
 (3) Disconnect VSV connector.
 (4) Race the engine at 4,000 rpm for 3 mins.

- C** Measure the resistance of the EGR gas temp. sensor while racing the engine at 4,000 rpm.

- OK** Resistance of EGR gas temp. sensor after 3 mins: 4.3 kΩ or less.

HINT: Resistance: At 20°C (68°F): 188.6 — 439.0 kΩ

NG**Replace EGR gas temp. sensor.****Check and replace ECM (See page IN-29).****DTC****P0402****Exhaust Gas Recirculation Flow Excessive Detected****CIRCUIT DESCRIPTION**

Refer to Exhaust Gas Recirculation Flow Insufficient Detected on page EG-242.

DTC No.	DTC Detecting Condition	Trouble Area
P0402	EGR gas temp. sensor value is high during EGR cut-off when engine is cold and vacuum is applied to port E. (2 trip detection logic)	• EGR valve stuck open • EGR VSV open malfunction • Open in VSV circuit for EGR • Short in EGR gas temp. sensor circuit • ECM
	EGR valve is always open (2 trip detection logic)	

See DTC P0401 for System Check Driving Pattern and Wiring Diagram.

INSPECTION PROCEDURE**TOYOTA hand-held tester****1****Connect the TOYOTA hand-held tester and read EGR gas temperature value.**

- P** (1) Connect the TOYOTA hand-held tester to the DLC3.
 (2) Turn ignition switch ON and TOYOTA hand-held tester main switch ON.

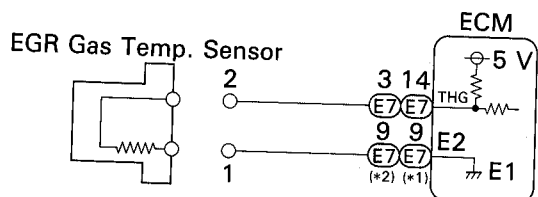
- C** Read EGR gas temperature on the TOYOTA hand-held tester.

- OK** EGR gas temp.: 150°C (302°F) or less (Not immediately after driving)

HINT: If there is a short circuit, the TOYOTA hand-held tester indicates 159.3°C (318.7°F).

NG**OK****Go to step 4 .**

2 Check for short in harness and ECM.

BE6653
P19554

*1: 3RZ-FE A/T
*2: 3RZ-FE M/T, 2RZ-FE

NG

P Disconnect the EGR gas temperature sensor connector.

C Read EGR gas temperature on the TOYOTA hand-held tester.

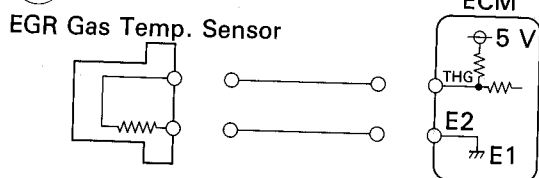
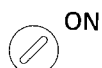
OK EGR gas temp.: 3.1°C (37.6°F)

OK

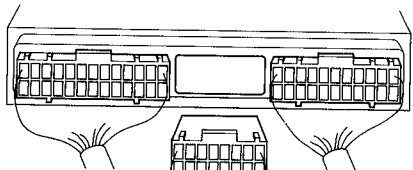
Replace EGR gas temp. sensor.

EG

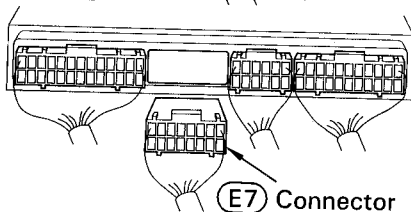
3 Check for short in harness or ECM.



For 3RZ-FE M/T, 2RZ-FE



For 3RZ-FE A/T

BE6653
F17056
P19785
P19798

NG

- P** (1) Remove glove compartment (See page EG-157).
(2) Disconnect the (E7) connector of ECM.

HINT: EGR gas temp. sensor is disconnected.

C Read EGR gas temp. on the TOYOTA hand-held tester.

OK EGR gas temp.: 3.1°C (37.6°F)

OK

Repair or replace harness or connector.

Check and replace ECM (See page IN-29).

4 Check the VSV for EGR (See page EG-246, step 5).

NG

OK

Check EGR valve (See page EG-116).

5

Check operation of the VSV for EGR (See page EG-153).

OK

NG

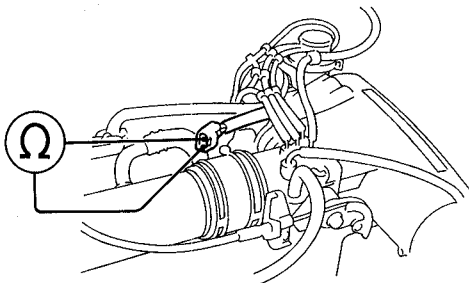
Replace VSV EGR.

Check for open in harness and connector between R/B No.2 and ECM (See page IN-24).

EG

OBD II scan tool (excluding TOYOTA hand-held tester)**1**

Check resistance of EGR gas temp. sensor.

**P** Disconnect EGR gas temp. sensor connector.**C** Measure resistance between terminals of EGR gas temp. sensor connector.**OK** Resistance: 2.5 kΩ or more
(Not immediately after driving)

HINT: If there is short circuit, ohmmeter indicates 200 Ω or less.

P24228

OK

NG

Replace EGR gas temp. sensor.

2

Check for short in harness and connector between EGR gas temp. sensor and ECM (See page IN-24).

OK

NG

Repair or replace harness or connector.

3Check the VSV for EGR (See page EG-249, step **5**).

NG

OK

Check EGR valve (See page EG-116).

4

Check operation of the VSV for EGR (See page EG-153).

OK

NG

Replace VSV for EGR.

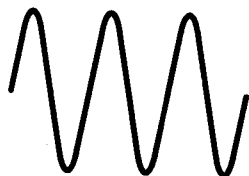
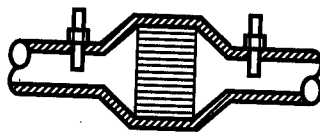
5**Check for open in harness and connector between R/B No.2 and ECM
(See page IN-24).****OK****NG****Repair or replace harness or connector.****Check and replace ECM (See page IN-29).****DTC****P0420****Catalyst System Efficiency Below
Threshold****CIRCUIT DESCRIPTION**

The ECM compares the waveform of the oxygen sensor located before the catalyst with the waveform of the oxygen sensor located after the catalyst to determine whether or not catalyst performance has deteriorated.

Air-fuel ratio feedback compensation keeps the waveform of the oxygen sensor before the catalyst repeatedly changing back and forth from rich to lean.

If the catalyst is functioning normally, the waveform of the oxygen sensor after the catalyst switches back and forth between rich and lean much more slowly than the waveform of the oxygen sensor before the catalyst.

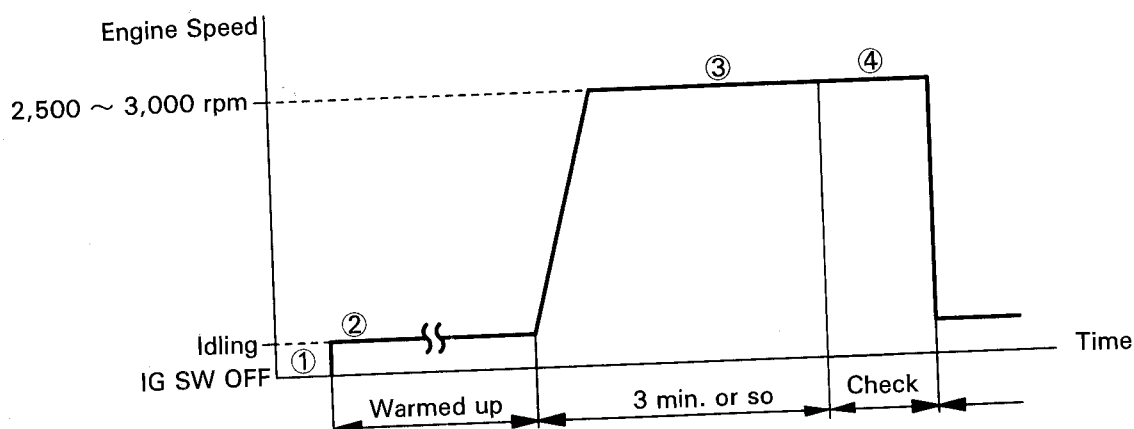
But when both waveforms change at a similar rate, it indicates that catalyst performance has deteriorated.

Waveform of Oxygen Sensor
Before CatalystNormal
CatalystWaveform of Oxygen Sensor
After Catalyst

F17081

DTC No.	DTC Detecting Condition	Trouble Area
P0420	After the engine and the catalyst are warmed up, and while the vehicle is driven within the set vehicle and engine speed range, the waveforms of the heated oxygen sensors (bank 1 sensor 1 and bank 1 sensor 2) have the same amplitude (2 trip detection logic)	• Three-way catalytic converter • Open or short in heated oxygen sensor circuit • Heated oxygen sensor

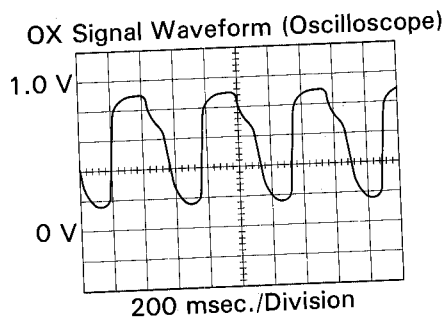
CONFIRMATION ENGINE RACING PATTERN



FI7132

- ① Connect the TOYOTA hand-held tester to the DLC3, or connect the probe of the oscilloscope between terminals OX1, OX2 and E1 of ECM.
- ② Start engine and warm it up with all accessories switched OFF until water temperature is stable.
- ③ Race the engine at 2,500 ~ 3,000 rpm for about 3 min.
- ④ After confirming that the waveforms of the heated oxygen sensor, bank 1 sensor 1 (OX1), oscillate around 0.5 V during feedback to the ECM, check the waveform of the heated oxygen sensor, bank 1 sensor 2 (OX2).

HINT:



FI6514

If there is a malfunction in the system, the waveform of the heated oxygen sensor, bank 1 sensor 2 (OX2), is almost the same as that of the heated oxygen sensor, bank 1 sensor 1 (OX1), on the left. There are some cases where, even though a malfunction exists, the MIL may either light up or not light up.

INSPECTION PROCEDURE

1

Are there any other codes (besides DTC P0420) being output?

NO

YES

Go to relevant DTC chart.

2

Check heated oxygen sensor (See page EG-225).

OK

NG

Repair or replace.

Replace three-way catalytic converter.

DTC

P0440

Evaporative Emission Control System Malfunction (Only for 4WD models)

CIRCUIT DESCRIPTION

The vapor pressure sensor and VSV for vapor pressure sensor are used to detect abnormalities in the evaporative emission control system.

The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.

DTC P0440 is recorded by the ECM when evaporative emissions leak from the components within the dotted line in fig. 1 below, or when the vapor pressure sensor malfunctions.

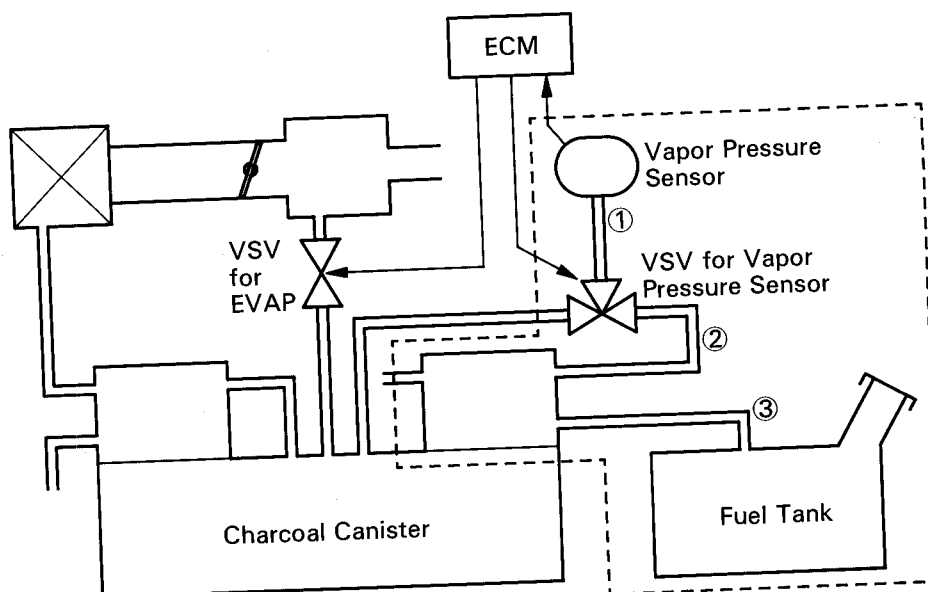
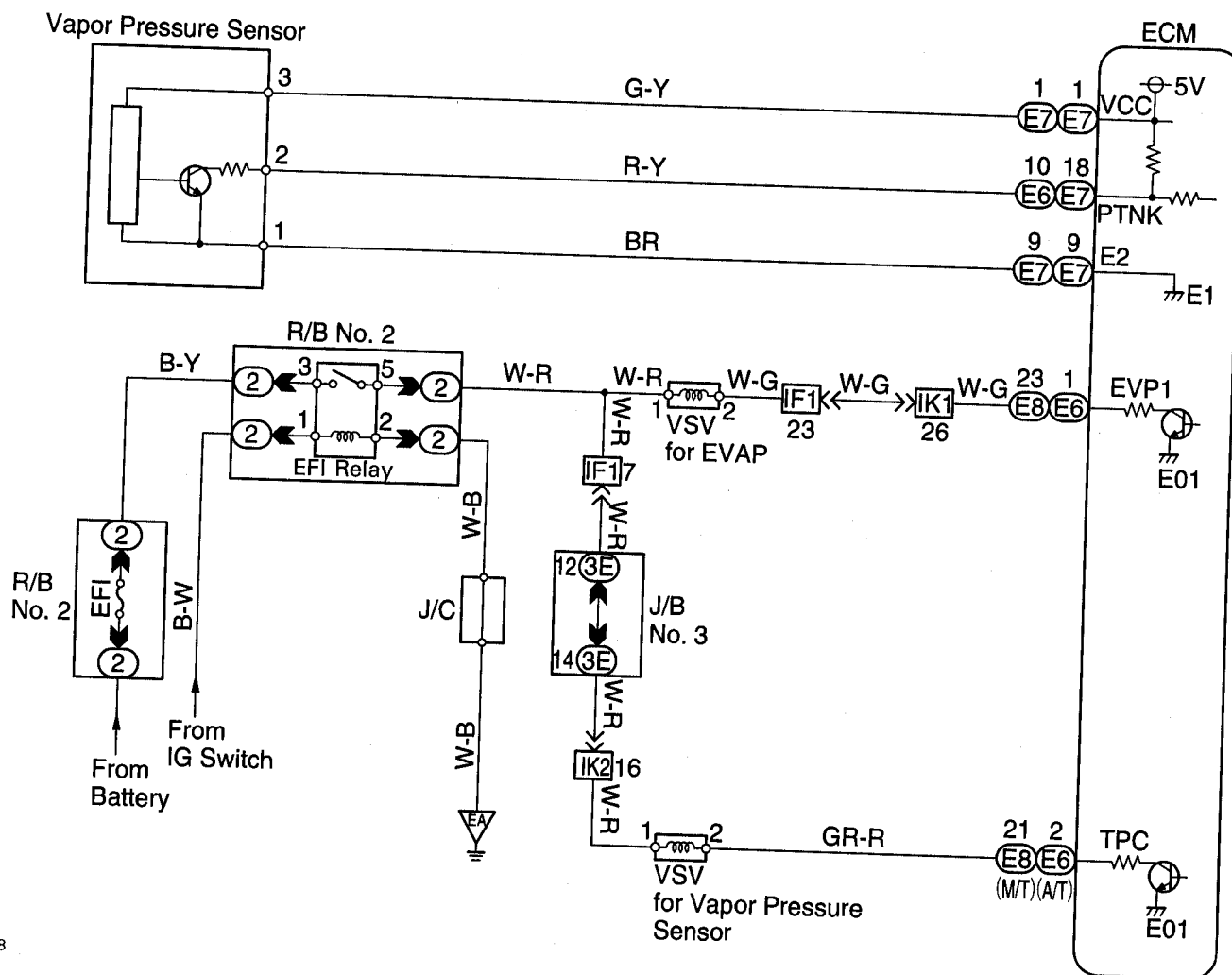


fig. 1

S00043

DTC No.	DTC Detecting Condition	Trouble Area
P0440	The fuel tank pressure is atmospheric pressure after the vehicle is driven for 20 min. (2 trip detection logic)	• Vapor pressure sensor • Fuel tank cap incorrectly installed • Fuel tank cap cracked or damaged • Vacuum hose cracked, holed, blocked, damaged, or disconnected (① or ② in fig. 1) • Hose or tube cracked, holed, damaged or loose (③ in fig. 1) • Fuel tank cracked, holed or damaged • Charcoal canister cracked, holed or damaged

WIRING DIAGRAM



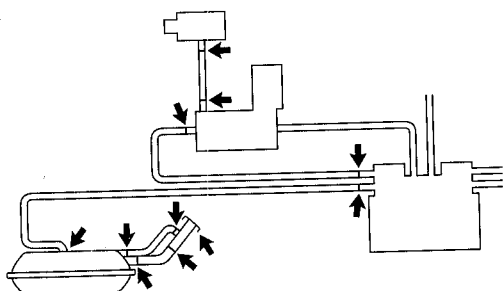
S00358

INSPECTION PROCEDURE

- HINT:
- If DTC P0441, P0446 or P0450 is output after DTC P0440, first troubleshoot DTC P0441, P0446 or P0450. If no malfunction is detected, troubleshoot DTC P0440 next.
 - Ask the customer whether, after the MIL came on, the customer found the fuel tank cap loose and tightened it. Also ask the customer whether the fuel tank cap was loose when refuelling. If the fuel tank cap was not loose, it was the cause of the DTC. If the fuel tank cap was not loose or if the customer was not sure if it was loose, troubleshoot according to the following procedure.

1

Check whether the hoses close to the fuel tank have been modified, and check whether there are signs of any accident near the fuel tank or charcoal canister.



S00024

OK**NG**

Repair or replace.

C Check for cracks, deformation and loose connection of the following parts

- Fuel tank
- Charcoal canister
- Fuel tank filler pipe
- Hoses and tubes around the fuel tank and charcoal canister

2

Check that the fuel tank cap is TOYOTA genuine parts.

OK**NG**

Replace to TOYOTA genuine parts.

3

Check that the fuel tank cap is correctly installed.

OK**NG**

Correctly install the fuel tank cap.

4

Check the fuel tank cap (See page EG-112).

OK**NG**

Replace fuel tank cap.

5

Check the filler neck for damage.

P Remove the fuel tank cap.

C Visually inspect the filler neck for damage.

OK**NG**

Replace the filler neck.

6

Check the vacuum hoses between vapor pressure sensor and VSV for vapor pressure sensor, and VSV for vapor pressure sensor and charcoal canister.

- C** (1) Check that the vacuum hose is connected correctly.
 (2) Check the vacuum hose for looseness and disconnection.
 (3) Check the vacuum hose for cracks, hole and damage.

OK**NG**

Repair or replace.

7

Check the hose and tube between fuel tank and charcoal canister.

- C** (1) Check for proper connection of the fuel tank and fuel evap pipe (See page EG-112), fuel evap pipe and fuel tube under the floor, fuel tube under the floor and charcoal canister.
 (2) Check the hose and tube for cracks, hole and damage.

OK**NG**

Repair or replace.

8

Check the charcoal canister for cracks, hole and damage (See page EG-113).

OK**NG**

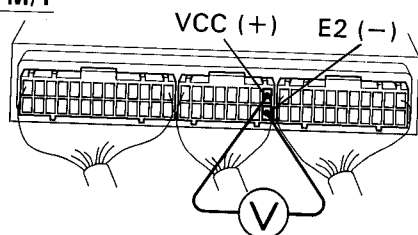
Replace charcoal canister.

9

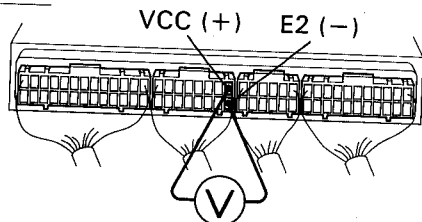
Check voltage between terminals VCC and E2 of ECM connector.



For M/T



For A/T



- P** (1) Remove glove compartment (See page EG-157).
 (2) Turn ignition switch ON.

- C** Measure voltage between terminals VCC and E2 of ECM connector.

OK Voltage: 4.5 – 5.5 V

BE6653
 P23812
 P23813

OK**NG**

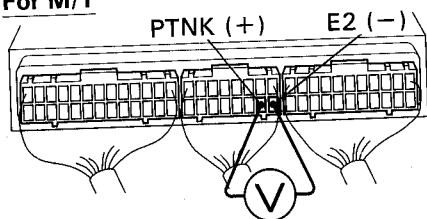
Check and replace ECM (See page IN-29).

10**Check voltage between terminals PTNK and E2 of ECM connector**

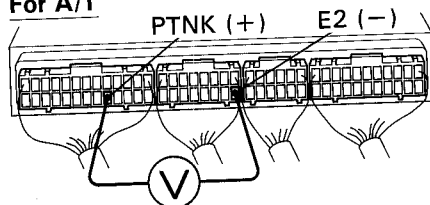
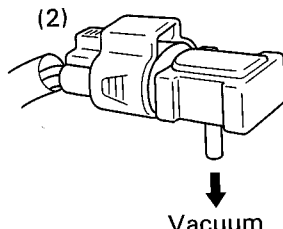
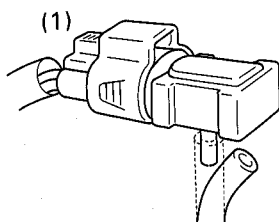
ON



For M/T



For A/T

BE6653
P24241
P24242

P24976 S00047

P

- (1) Remove the glove compartment (See page EG-157).
- (2) Turn ignition switch ON.

C

- Measure voltage between terminals PTNK and E2 of ECM connector.
- (1) Disconnect the vacuum hose from the vapor pressure sensor.
 - (2) Using the MITYVAC (Hand-Held Vacuum Pump), apply a vacuum to the vapor pressure sensor.

NOTICE: The vacuum applied to the vapor pressure sensor must be less than 66.7 kPa (500 mmHg, 19.7 in.Hg).

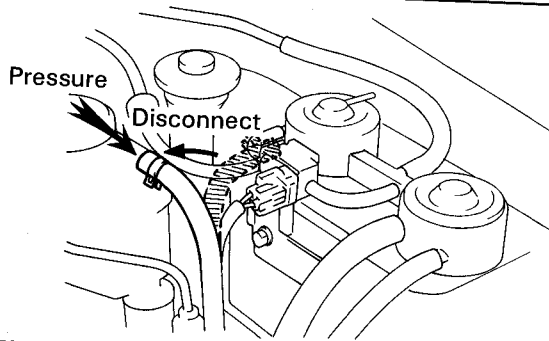
OK

- (1) Voltage: 2.9 ~ 3.7 V
- (2) Voltage: 0.5 V or less

NG**OK**Go to step **12**.**11****Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN-24).****OK****NG**

Repair or replace harness or connector.

Replace vapor pressure sensor.

12**Check the fuel tank for cracks and damage.**

S00252

OK**P**

- (1) Disconnect the vacuum hose from charcoal canister.
- (2) Correctly install the fuel tank cap.
- (3) Apply a pressure of 5 kPa (50 gf/cm², 0.7 psi) to the fuel tank.

C

Check whether the pressure is maintained after 1 minute.

OK

Pressure applied to the fuel tank is maintained.

NG

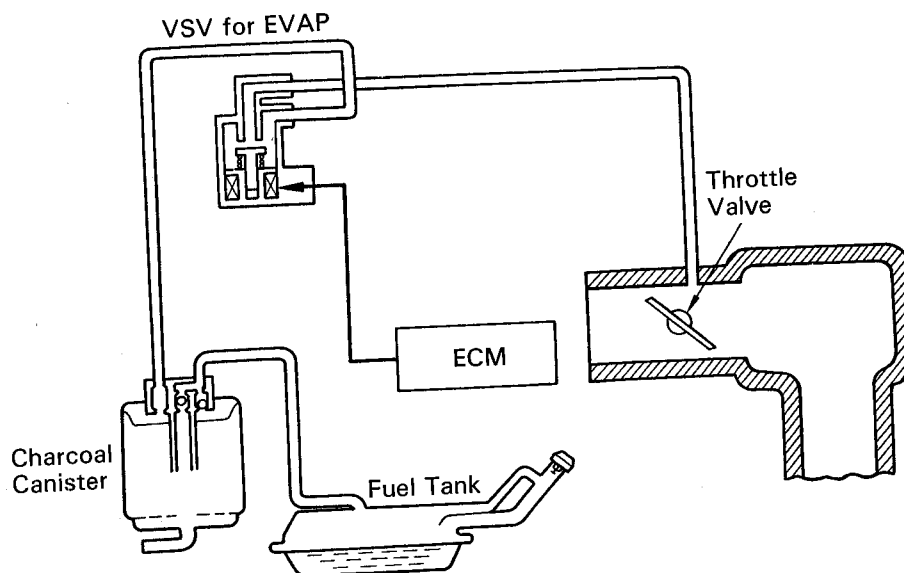
Replace fuel tank.

It is likely that the vehicle user did not properly close the fuel tank cap. Please explain to the customer how to properly install the fuel tank cap.

DTC**P0441****Evaporative Emission Control System
Incorrect Purge Flow (For 2WD models)****CIRCUIT DESCRIPTION**

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

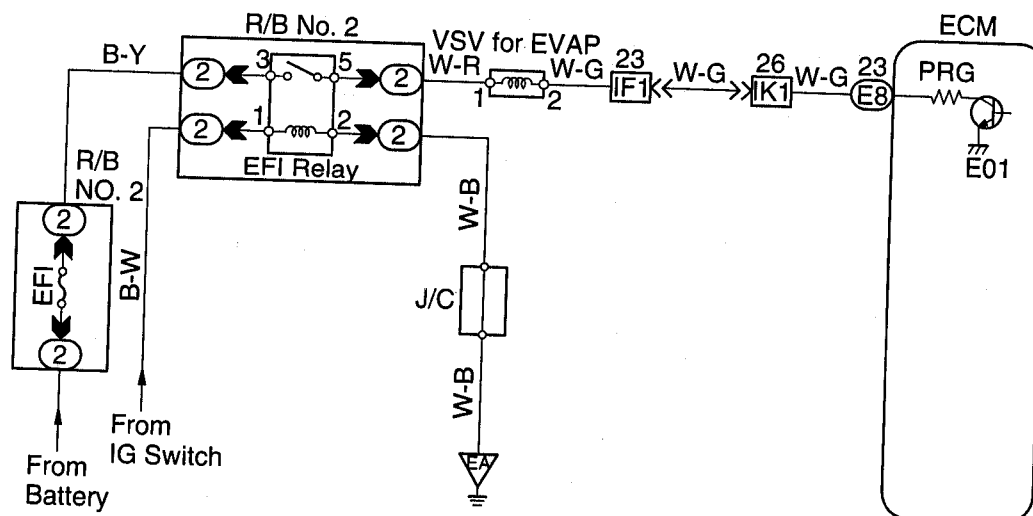
The ECM changes the duty signal to the VSV for EVAP so that the intake quantity of HC emissions is appropriate for the driving conditions (engine load, engine speed, vehicle speed, etc.) after the engine is warmed up.



P19894

DTC No.	DTC Detecting Condition	Trouble Area
P0441	The proper response to the computer command does not occur (2 trip detection logic)	• Open or short in VSV for EVAP circuit • VSV for EVAP • ECM • Vacuum hose blocked or disconnected • Charcoal canister

WIRING DIAGRAM



S00269

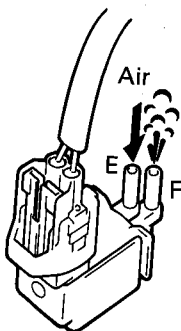
INSPECTION PROCEDURE

TOYOTA hand-held tester

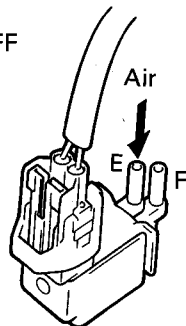
- 1 Connect the TOYOTA hand-held tester and check operation of VSV for EVAP.



ON



OFF



- P (1) Connect the TOYOTA hand-held tester to DLC3.
- (2) Turn ignition switch ON and TOYOTA hand-held tester main switch ON.
- (3) Select the ACTIVE TEST mode on the TOYOTA hand-held tester.

- C Check operation of VSV when VSV is operated by the TOYOTA hand-held tester.

- OK VSV is ON:
Air from pipe E is flowing out through pipe F.
VSV is OFF:
Air does not flow from pipe E to pipe F.

BE6653
FI7205 FI7206

NG

OK

Go to step 4 .

2

Check the VSV for EVAP (See page EG-152).

OK

NG

Replace VSV for EVAP.

3

Check for open and short in harness and connector between EFI relay and ECM (See page IN-24).

OK

NG

Repair or replace harness or connector.

Check and replace ECM (See page IN-29).

EG

4

Check connection of vacuum hose (See page EG-111).

OK

NG

Repair or replace.

Check and repair charcoal canister
(See page EG-114).

OBD II scan tool (excluding TOYOTA hand-held tester)

1

Check the VSV for EVAP (See page EG-152).

OK

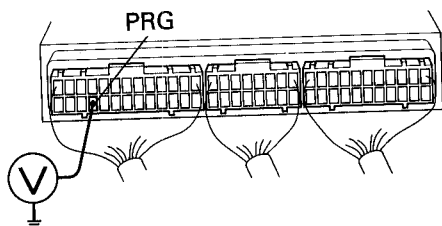
NG

Replace VSV for EVAP.

2

Check voltage between terminal PRG of ECM connector and body ground.

ON

BE6653
P24253**P**

- (1) Remove glove compartment
(See page EG-157).
- (2) Turn ignition switch ON.

C

Measure voltage between terminal PRG of ECM connector and body ground.

OK

Voltage: 9 – 14 V

OK

NG

Check and repair harness or connector.

3

Check connection of vacuum hose (See page EG-111).

OK

NG

Repair or replace.

OK

NG

Check and replace ECM (See page IN-29).

EC

DTC	P0446	Evaporative Emission Control System Vent Control Malfunction (Only for 4WD models)
-----	-------	--

DTC P0441 and P0446 are recorded by the ECM when evaporative emissions leak from the components within the dotted line in fig. 1 below, or when there is a malfunction in either the VSV for EVAP, the VSV for vapor pressure sensor, or in the vapor pressure sensor itself.



S00044

DTC No.	DTC Detecting Condition	Trouble Area
P0441	The pressure in the charcoal canister does not drop during purge control (2 trip detection logic)	• 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 • Open or short in VSV circuit for EVAP • VSV for EVAP • Vacuum hose cracks, hole, blocked damaged or disconnected (①, ④, ⑤ and ⑥ in fig. 1) • Charcoal canister cracks, hole or damaged
	During purge cut-off, the pressure in the charcoal canister is very low compared with atmospheric pressure (2 trip detection logic)	
P0446	When VSV for vapor pressure sensor is OFF, ECM judges that there is no continuity between vapor pressure sensor and charcoal canister (2 trip detection logic)	
	When VSV for vapor pressure sensor is ON, ECM judges that there is no continuity between vapor pressure sensor and fuel tank (2 trip detection logic)	
	After the purge cut off operates, the pressure in the charcoal canister is maintained at atmospheric pressure (2 trip detection logic)	

WIRING DIAGRAM

Refer to Evaporative Emission Control System Malfunction on page EG-257.

INSPECTION PROCEDURE

HINT: If DTC P0441, P0446 or P0450 is output after DTC P0440, first troubleshoot DTC P0441, P0446 or P0450. If no malfunction is detected, troubleshoot DTC P0440 next.

TOYOTA hand-held tester

1

Check the VSV connector for EVAP, VSV connector for vapor pressure sensor and vapor pressure sensor connector for looseness and disconnection.

OK

NG

Repair or connect the VSV or sensor connector.

2

Check the vacuum hose between throttle body and VSV for EVAP, VSV for EVAP and charcoal canister, charcoal canister and VSV for vapor pressure sensor, and VSV for vapor pressure sensor and vapor pressure sensor.

C

- (1) Check that the vacuum hose is connected correctly.
- (2) Check the vacuum hose for looseness and disconnection.
- (3) Check the vacuum hose for cracks, hole, damage and blockage.

OK

NG

Repair or replace.

3

Check voltage between terminals VCC and E2 of ECM connector (See page EG-259, step 9).

OK

NG

Check and replace ECM (See page IN-29).

4

Check voltage between terminals PTNK and E2 of ECM connector (See page EG-260, step 10).

NG

OK

Go to step 6 .

5

Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN-24).

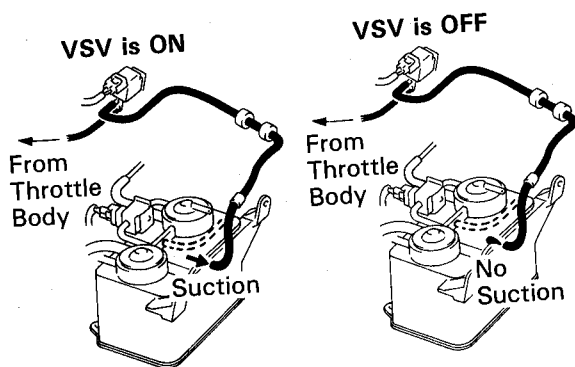
OK

NG

Repair or replace harness or connector.

Replace vapor pressure sensor.

6 Check the purge flow.



- P** (1) Connect the TOYOTA hand-held tester to the DLC3.
 (2) Select the ACTIVE TEST mode on the TOYOTA hand-held tester.
 (3) Disconnect from the charcoal canister the vacuum hose to the VSV for EVAP.
 (4) Start the engine.

C When the VSV for EVAP is operated by the TOYOTA hand-held tester, check whether the disconnected hose applies suction to your finger.

OK **VSV is ON:**
 Disconnected hose applies suction to your finger.
VSV is OFF:
 Disconnected hose applies no suction to your finger.

S00015 S00016

NG

OK

Go to step 10.

7

Check the vacuum hose between throttle body and VSV for EVAP, and VSV for EVAP and charcoal canister.

- C** (1) Check that the vacuum hose is connected correctly.
 (2) Check the vacuum hose for looseness and disconnection.
 (3) Check the vacuum hose for cracks, hole, damage and blockage.

OK

NG

Repair or replace.

8

Check operation of the VSV for EVAP (See page EG-152).

OK

NG

Replace VSV.

9

Check for open and short in harness and connector between EFI relay and VSV for EVAP and ECM (See page IN-24).

OK

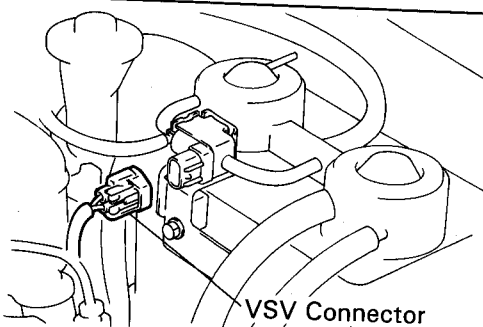
NG

Repair or replace harness or connector.

Check and replace ECM (See page IN-29).

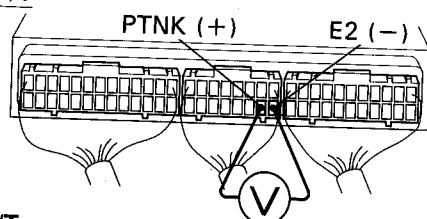
10

Connect the TOYOTA hand-held tester, when VSV connector for vapor pressure sensor is disconnected and VSV for EVAP is ON, measure voltage between terminals PTNK and E2 of ECM connector.

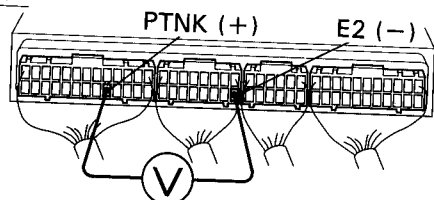


START

For M/T



For A/T



P25798
BE6653
P24241
P24242

NG**P**

- (1) Connect the TOYOTA hand-held tester to the DLC3.
- (2) Disconnect the VSV connector for vapor pressure sensor.
- (3) Select the ACTIVE TEST mode on the TOYOTA hand-held tester.
- (4) Start the engine.

C

Measure voltage between terminals PTNK and E2 of ECM connector, when VSV for EVAP is ON, using the TOYOTA hand-held tester.

OK

Voltage: 2.0 V or less

OK

Go to step **12**.

11

Check the vacuum hose between charcoal canister and VSV for vapor pressure sensor, and vapor pressure sensor and VSV for vapor pressure sensor.

C

- (1) Check that the vacuum hose is connected correctly.
- (2) Check the vacuum hose for looseness and disconnection.
- (3) Check the vacuum hose for cracks, hole, damage and blockage.

OK**NG**

Repair or replace.

12

Check operation of the VSV for vapor pressure sensor. (See page EG-154).

OK**NG**

Replace VSV.

13

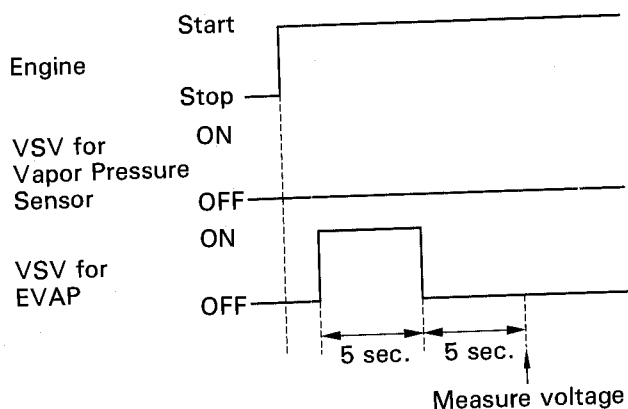
Check for open and short in harness and connector between EFI relay and VSV for vapor pressure sensor and ECM (See page IN-24).

OK**NG**

Repair or replace harness or connector.

14

Check the charcoal canister.

EG**P**

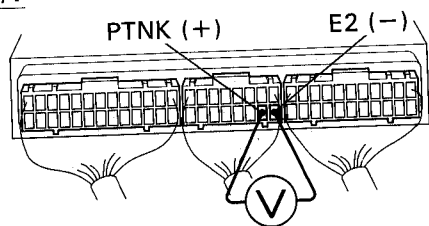
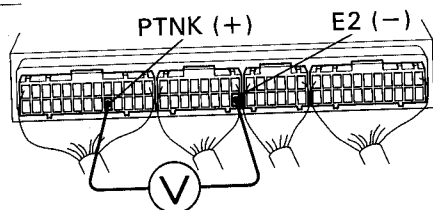
- (1) Connect the TOYOTA hand-held tester to the DLC3.
- (2) Remove the fuel tank cap.
- (3) Disconnect the VSV connector for vapor pressure sensor.
- (4) Select the ACTIVE TEST mode on the TOYOTA hand-held tester.
- (5) Start the engine.
- (6) VSV for EVAP is ON by TOYOTA hand-held tester and remains on for 5 sec.

C

Measure voltage between terminals PTNK and E2 of ECM connector 5 sec. after switching VSV for EVAP from ON to OFF.

OK

Voltage: 2.5 V or less

For M/TFor A/T

S00049
P24241
P24242

OK**NG**

Replace charcoal canister.

Check and replace ECM.

OBD II scan tool (excluding TOYOTA hand-held tester)**1**

Check the VSV connector for EVAP, VSV connector for vapor pressure sensor and vapor pressure sensor connector for looseness and disconnection.

OK**NG**

Repair or connect the VSV or sensor connector.

2

Check the vacuum hose between throttle body and VSV for EVAP, VSV for EVAP and charcoal canister, charcoal canister and VSV for vapor pressure sensor, and VSV for vapor pressure sensor and vapor pressure sensor.

C

- (1) Check that the vacuum hose is connected correctly.
- (2) Check the vacuum hose for looseness and disconnection.
- (3) Check the vacuum hose for cracks, hole, damage and blockage.

OK**NG**

Repair or replace.

3

Check voltage between terminals VCC and E2 of ECM connector (See page EG-259, step **9**).

OK**NG**

Check and replace ECM (See page IN-29).

4

Check voltage between terminals PTNK and E2 of ECM connector (See page EG-260, step **10**).

NG**OK**

Go to step **6** .

5

Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN-24).

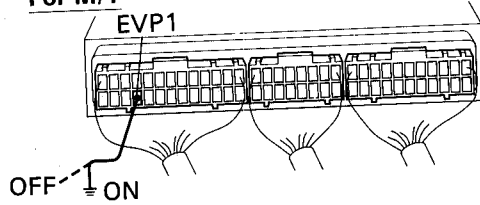
OK**NG**

Repair or replace harness or connector.

Replace vapor pressure sensor.

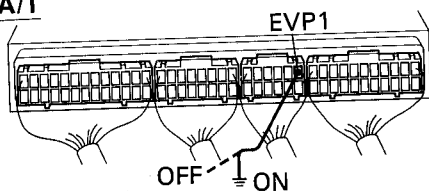
6**Check the VSV for EVAP.**

For M/T

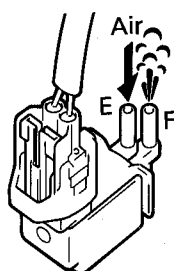


OFF — ON

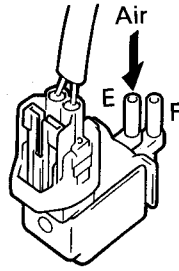
For A/T



OFF — ON



VSV is ON



VSV is OFF

BE6653
P24245
P24246
FI7205 FI7206

NG

- P** (1) Remove glove compartment
(See page EG-157).
(2) Turn ignition switch ON.

- C** Check VSV function
(1) Connect between terminal EVP1 of ECM and body ground.
(2) Disconnect between terminal EVP1 of ECM and body ground.

- OK** (1) VSV is ON:
Air from pipe E is flowing out through pipe F.
(2) VSV is OFF:
Air does not flow from pipe E to pipe F.

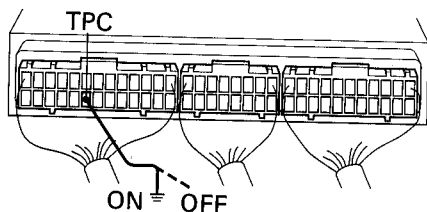
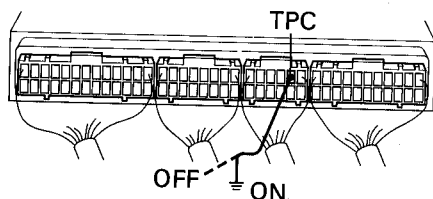
OKGo to step **9**.**7****Check operator of the VSV for EVAP (See page EG-152).****OK****NG**

Replace VSV.

8**Check for open and short in harness and connector between EFI relay and VSV for EVAP and ECM (See page IN-24).****OK****NG**

Repair or replace harness or connector.

Check and replace ECM.

9**Check the VSV for vapor pressure sensor.****For M/T****For A/T****P**

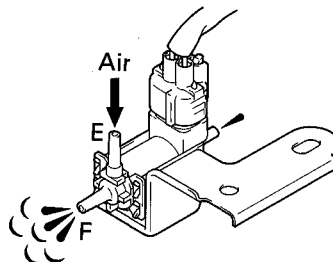
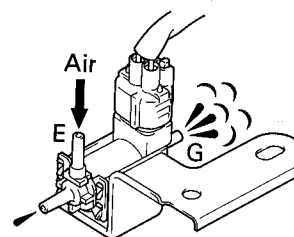
- (1) Remove glove compartment (See page EG-157).
- (2) Turn ignition switch ON.

C

- Check VSV function
- (1) Connect between terminal TPC of ECM and body ground.
- (2) Disconnect between terminal TPC of ECM and body ground.

OK

- (1) VSV is ON:
Air from pipe E is flowing out through pipe F.
- (2) VSV is OFF:
Air from pipe E is flowing out through pipe G.

**VSV is ON****VSV is OFF**BE6653
P24247
P24248

P25800 P25801

NG**OK**

Check and replace charcoal canister
(See page EG-113).

10**Check operation of the VSV for vapor pressure sensor (See page EG-154).****OK****NG**

Replace the VSV.

11**Check for open and short in harness and connector between EFI relay and VSV for vapor pressure sensor and ECM (See page IN-24).****OK****NG**

Repair or replace harness or connector.

Check and replace ECM.

DTC**P0450**

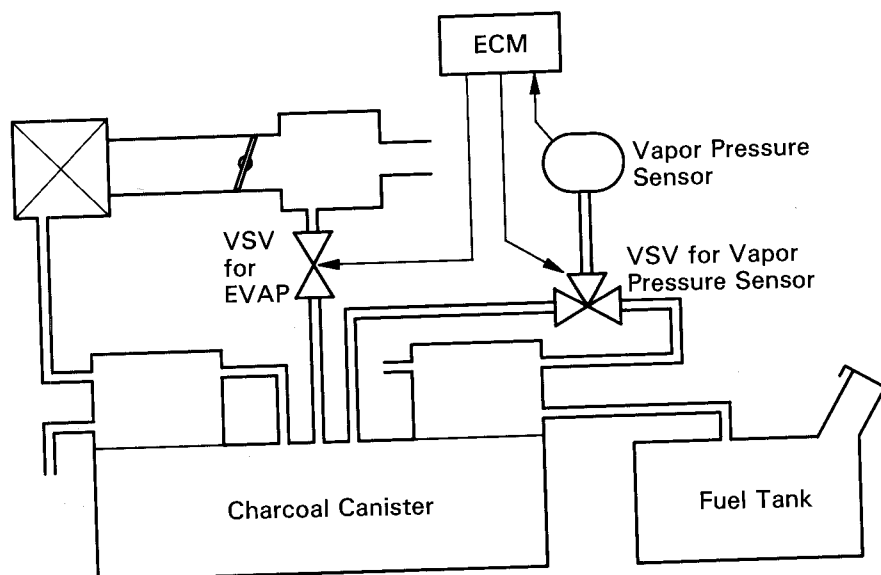
Evaporative Emission Control System Pressure Sensor Malfunction (Only for 4WD models)

CIRCUIT DESCRIPTION

The vapor pressure sensor and VSV for vapor pressure sensor are used to detect abnormalities in the evaporative emission control system.

The ECM decides whether there is an abnormality in the evaporative emission control system based on the vapor pressure sensor signal.

DTC P0450 is recorded by the ECM when the vapor pressure sensor malfunction.



S00042

DTC No.	DTC Detecting Condition	Trouble Area
P0450	Condition (a) or (b) continues. (2 trip detection logic) (a) PTNK < 0.5 V (b) PTNK > 4.5 V	• Open or short in vapor pressure sensor circuit • Vapor pressure sensor • ECM

WIRING DIAGRAM

Refer to Evaporative Emission Control System Malfunction on page EG-257.

INSPECTION PROCEDURE

HINT: If DTC P0441, P0446, or P0450 is output after DTC P0440, first trouble shoot DTC P0441, P0446 or P0450. If no malfunction is detected, troubleshoot DTC P0440 next.

- 1** Check voltage between terminals VCC and E2 of ECM connector
(See page EG-259, step **9**).

OK**NG**

Check and replace ECM.

- 2** Check voltage between terminals PTNK and E2 of ECM connector
(See page EG-260, step **10**).

NG**OK**

Check and replace ECM.

- 3** Check for open and short in harness and connector between the vapor pressure sensor and ECM (See page IN-24).

OK**NG**

Repair or replace harness or connector.

Replace the vapor pressure sensor.

DTC

P0500

Vehicle Speed Sensor Malfunction

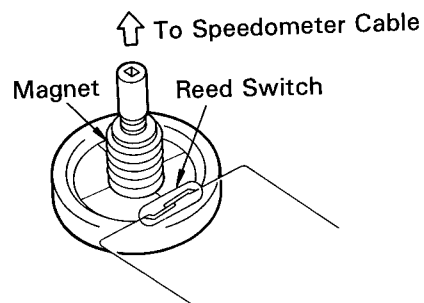
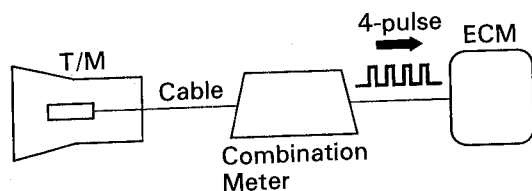
CIRCUIT DESCRIPTION

CIRCUIT DESCRIPTION

This sensor is mounted in the combination meter. It contains a magnet which is rotated by the speedometer cable.

Turning the reed switch ON and OFF 4 times for every revolution of the speedometer. The ECM determines the vehicle speed based on the

Turning the reed switch ON and OFF 4 times for every revolution of the speedometer. It is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.

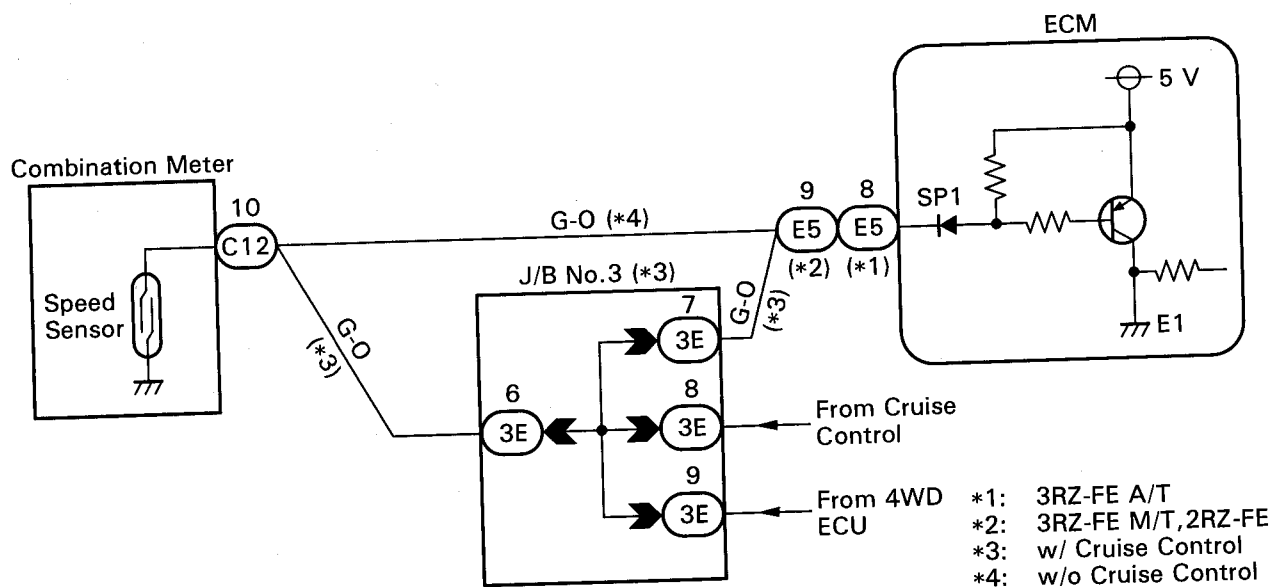


No.1 Vehicle Speed Sensor

FI7112
FI7166

DTC No.	DTC Detecting Condition	Trouble Area
P0500	No vehicle speed sensor signal to ECM under condition (a) (2 trip detection logic) (a) Vehicle is being driven	• Combination meter • Open or short in speed sensor circuit • ECM • Speedometer cable

WIRING DIAGRAM



INSPECTION PROCEDURE

1 Check operation of speedometer.

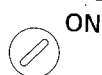
P Drive the vehicle and check if the operation of the speedometer in the combination meter is normal.

HINT: The vehicle speed sensor is operating normally if the speedometer display is normal.

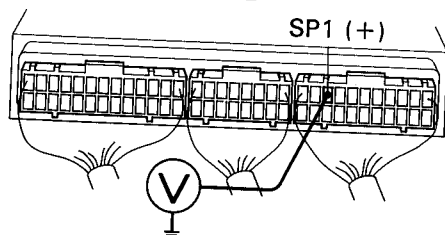
OK

NG

Check speedometer and cable (BE-35).

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

For 3RZ-FE M/T, 2RZ-FE

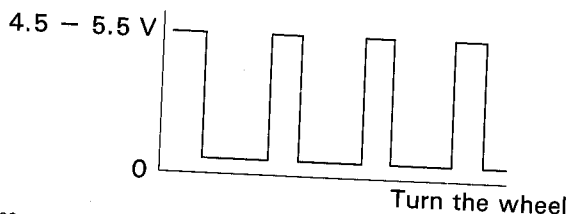
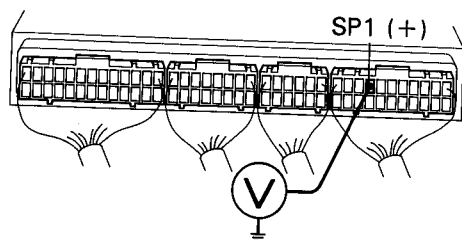


- P** (1) Remove glove compartment (See page EG-157).
 (2) Disconnect cruise control ECU connector.
 (3) Shift the shift lever to neutral.
 (4) Jack up one of the rear wheels.
 (5) Turn ignition switch ON.

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

OK Voltage is generated intermittently.

For 3RZ-FE A/T



AT7809

BE6653
 P24206
 P24205

OK

NG

Check and repair harness and connector between combination meter and ECM.

Check and replace ECM (See page IN-29).

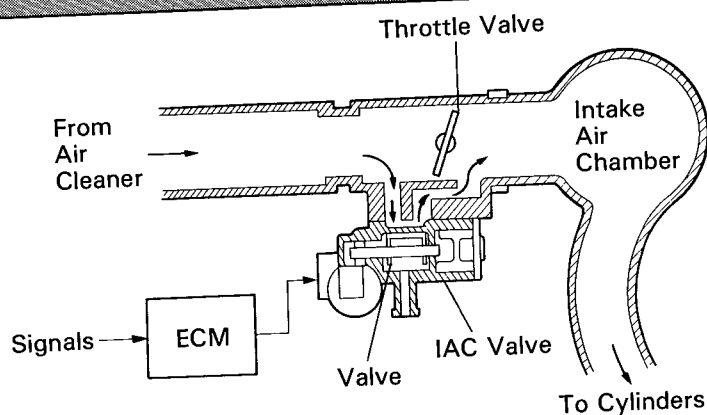
P0505

Idle Control System Malfunction

The rotary solenoid type IAC valve is located in front of the intake air chamber and intake air bypassing the throttle valve is directed to the IAC valve through a passage.

passage. In this way the intake air volume bypassing the throttle valve is regulated, controlling the engine speed.

The ECM operates only the IAC valve to perform idle-up and provide feedback for the target idling speed.



P01559

DTC No.		Trouble Area
P0505	Idle speed continues to vary greatly from the target speed (2 trip detection logic)	• IAC valve is stuck or closed • Open or short in IAC valve circuit • Air intake (hose loose)

*1: 3RZ-FE A/T
*2: 3RZ-FE M/T, 2RZ-FE

INSPECTION PROCEDURE

1

Check air induction system (See page EG-119).

OK

NG

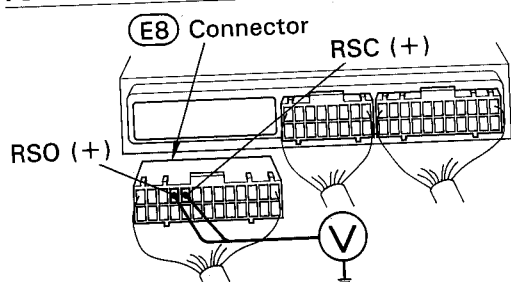
Repair or replace.

2

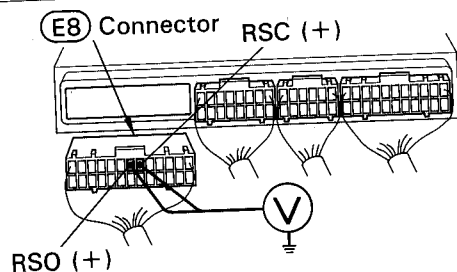
Check voltage terminals RSO, RSC.

ON

For 3RZ-FE M/T, 2RZ-FE



For 3RZ-FE A/T

BE6653
P24207
P24208

NG

P

- (1) Remove glove compartment (See page EG-157).
- (2) Disconnect the (E8) connector of ECM.
- (3) Turn ignition switch ON.

C

Measure voltage between terminals RSO, RSC of ECM connector and body ground.

OK

Voltage: 9 — 14 V

OK

Go to step 4 .

3

Check IAC valve (See page EG-144).

OK

NG

Replace IAC valve.

Check for open and short in harness and connector between J/B No.2 and IAC valve, IAC valve and ECM (See page IN-24).

4

Check operation of the IAC valve (See page EG-144).

OK

NG

Repair or replace IAC valve.

Check and replace ECM (See page IN-29).

DTC**P0510****Closed Throttle Position Switch
Malfunction****CIRCUIT DESCRIPTION**

Refer to "Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction on page EG-219.

DTC No.	DTC Detecting Condition	Trouble Area
P0510	The closed throttle position switch does not turn ON even once when the vehicle is driven (2 trip detection logic)	• Open in closed throttle position switch circuit • Closed throttle position switch • ECM

HINT: After confirming DTC P0510 use the TOYOTA hand-held tester to confirm the closed throttle position switch signal from "CURRENT DATA".

Throttle Valve	Closed throttle position Switch Signal	Malfunction
Fully Closed	OFF	Open Circuit
Fully Open	ON	Short Circuit

WIRING DIAGRAM

Refer to page EG-220 for the WIRING DIAGRAM.

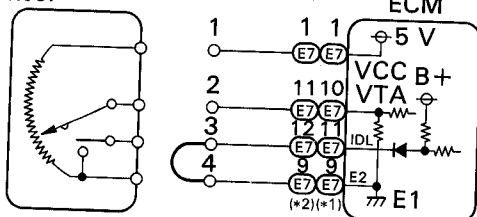
INSPECTION PROCEDURE

HINT: If DTC P0110, P0115 and P0120 are output simultaneously, E2 (sensor ground) may be open.

TOYOTA hand-held tester**1 Check for open in harness or ECM.**

- *1: 3RZ-FE A/T
*2: 3RZ-FE M/T, 2RZ-FE

Throttle Position Sensor



- P** (1) Connect the TOYOTA hand-held tester to the DLC3.
(2) Disconnect the throttle position sensor connector.
(3) Connect sensor wire harness terminals between terminals 3 and 4.
(4) Turn ignition switch ON.

C Read CTP switch signal on the TOYOTA hand-held tester.

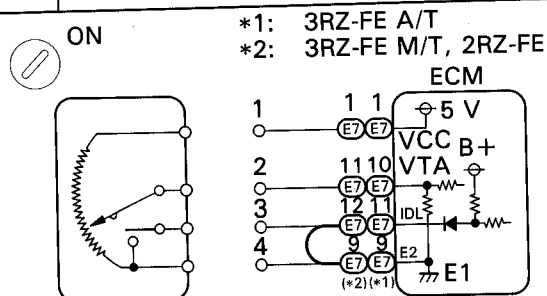
OK CTP switch signal: ON

BE6653
P19557

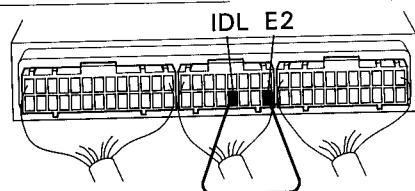
NG**OK**

Confirm good connection at sensor. If OK, replace throttle position sensor.

2 Check for open in harness or ECM.



For 3RZ-FE M/T, 2RZ-FE



For 3RZ-FE A/T

BE6653
P19556
P19711
P19687

NG

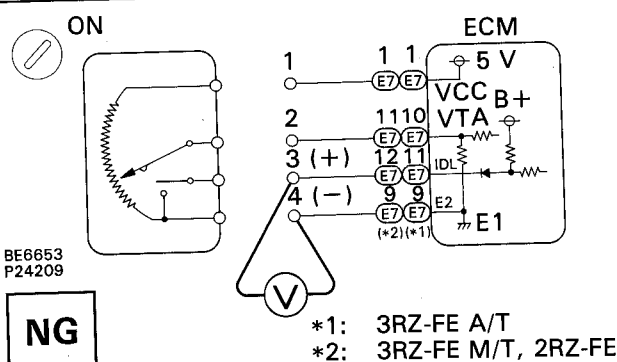
OK

Open in harness between ECM and throttle position sensor, repair or replace harness.

Confirm connection at ECM. If OK, replace ECM.

OBD II scan tool (excluding TOYOTA hand-held tester)

1 Check for open in harness or ECM.


BE6653
P24209

NG

*1: 3RZ-FE A/T
*2: 3RZ-FE M/T, 2RZ-FE

- P** (1) Disconnect the throttle position sensor connector.
(2) Turn ignition switch ON.

- C** Measure voltage between terminals 3 and 4 of throttle position sensor connector.

OK Voltage: 9 – 14 V

OK

Confirm good connection at sensor. If OK, replace throttle position sensor.

2

Check for open in harness and connector between throttle position sensor and ECM (See page IN-24).

OK

NG

Open in harness between ECM and throttle position sensor.

Confirm connection at ECM. If OK, replace ECM.

DTC**P1300****Igniter Circuit Malfunction****CIRCUIT DESCRIPTION**

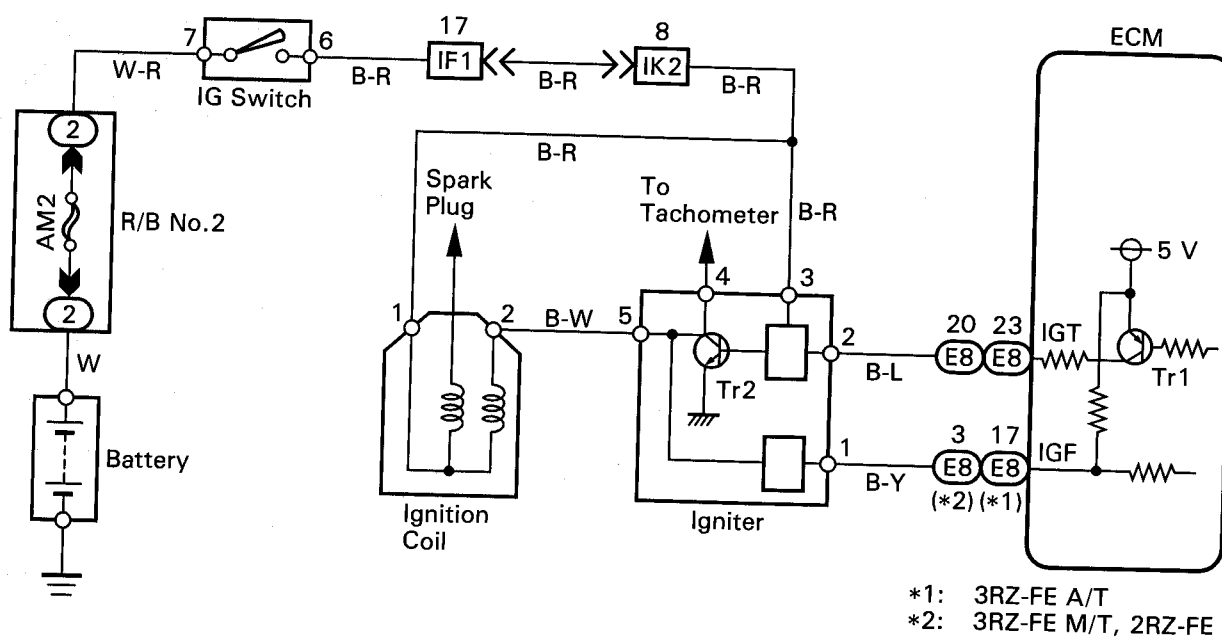
The ECM determines the ignition timing, turns on Tr1 at a predetermined angle ($^{\circ}$ CA) before the desired ignition timing and outputs an ignition signal (IGT) "1" to the igniter.

Since the width of the IGT signal is constant, the dwell angle control circuit in the igniter determines the time the control circuit starts primary current flow to the ignition coil based on the engine rpm and ignition timing one revolution ago, that is, the time the Tr2 turns on.

When it reaches the ignition timing, the ECM turns Tr1 off and outputs the IGT signal "0".

This turns Tr2 off, interrupting the primary current flow and generating a high voltage in the secondary coil which causes the spark plug to spark. Also, by the counter electromotive force generated when the primary current is interrupted, the igniter sends an ignition confirmation signal (IGF) to the ECM. The ECM stops fuel injection as a fail safe function when the IGF signal is not input to the ECM.

DTC No.	DTC Detecting Condition	Trouble Area
P1300	No IGF signal to ECM for 4 consecutive IGT signal during engine running	• Open or short in IGF or IGT circuit from igniter to ECM • Igniter • ECM

WIRING DIAGRAM

INSPECTION PROCEDURE

1 Check for spark (See page IG-2).

OK

NG

Go to step **4**.

2 Check for open and short in harness and connector in IGF signal circuit between ECM and igniter (See page IN-24).

OK

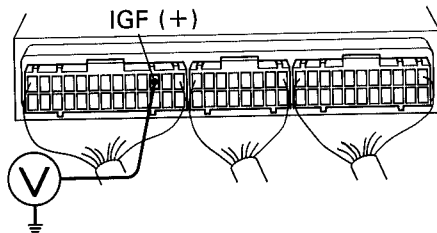
NG

Repair or replace harness or connector.

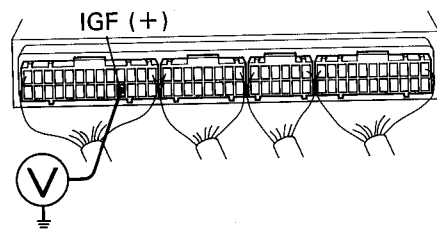
3 Disconnect igniter connector and check voltage between terminal IGF of ECM connector and body ground.



For 3RZ-FE M/T, 2RZ-FE



For 3RZ-FE A/T



BE6653
P24210
P24211

P

- (1) Disconnect igniter connector.
- (2) Remove glove compartment (See page EG-157).
- (3) Turn ignition switch ON.

C

Measure voltage between terminal IGF of ECM connector and body ground.

OK

Voltage: 4.5 — 5.5 V

NG

OK

Replace igniter.

Check and replace ECM (See page IN-29).

4

Check for open and short in harness and connector in IGT signal circuit between ECM and igniter (See page IN-24).

OK**NG**

Repair or replace harness or connector.

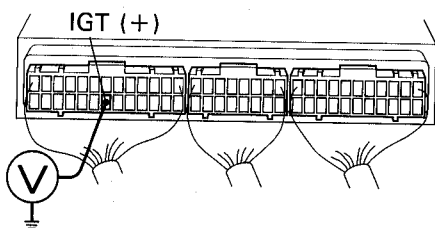
5

Check voltage between terminal IGT of ECM connector and body ground.

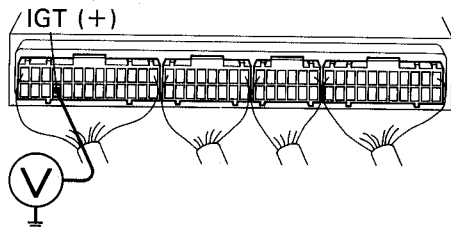
EG

START

For 3RZ-FE M/T, 2RZ-FE



For 3RZ-FE A/T



BE6653
P24212
P24213

P

Remove glove compartment (See page EG-157).

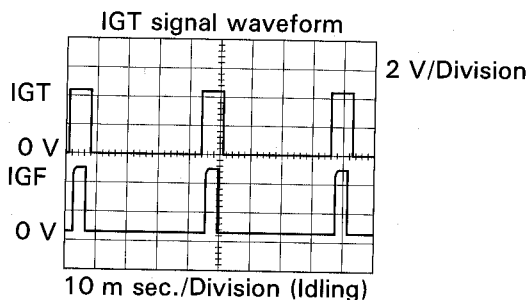
C

Measure voltage between terminal IGT of ECM connector and body ground when engine is cranked.

OK

Voltage: More than 0.1 V and less than 4.5 V

Reference INSPECTION USING OSCILLOSCOPE



- During cranking or idling, check waveform between terminals IGT and E1 of ECM.

HINT: The correct rectangular waveform is as shown.

FI6680

OK**NG**

Check and replace ECM (See page IN-29).

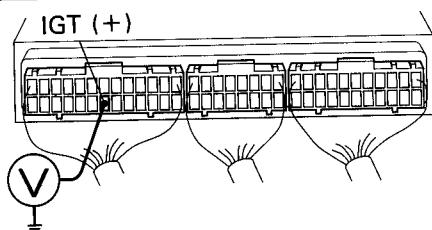
6

Disconnect igniter connector and check voltage between terminal IGT of ECM connector and body ground.

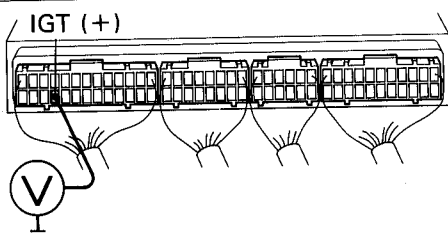
START



For 3RZ-FE M/T, 2RZ-FE



For 3RZ-FE A/T

BE6653
P24212
P24213**NG****P** Disconnect igniter connector.**C** Measure voltage between terminal IGT of ECM connector and body ground when engine is cranked.**OK** Voltage: More than 0.1 V and less than 4.5 V

EG

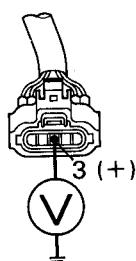
OK

Check and replace ECM (See page IN-29).

7

Check voltage between terminal 3 of igniter connector and body ground.

ON ⇨ STRAT

BE6653
P24215**OK****P** Disconnect igniter connector.**C** Measure voltage between terminal 3 of igniter connector and body ground, when ignition switch is turned to "ON" and "STA" position.**OK** Voltage: 9 – 14 V**NG**

Check and repair igniter power source circuit.

8

Check for open and short in harness and connector between ignition switch and ignition coil, ignition coil and igniter (See page IN-24).

OK**NG**

Repair or replace harness or connector.

9

Check ignition coil (See page IG-5).

OK**NG**

Replace ignition coil.

Replace igniter.

DTC

P1335

Crankshaft Position Sensor Circuit Malfunction (during engine running)

CIRCUIT DESCRIPTION

Refer to "Crankshaft Position Sensor "A" Circuit Malfunction" on Page EG-238.

DTC No.	DTC Detecting Condition	Trouble Area
P1335	No crankshaft position sensor signal to ECM with engine speed 1,000 rpm or more	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • ECM

See DTC P0335 for Wiring Diagram and Inspection Procedure.

DTC

P1500

Starter Signal Circuit Malfunction

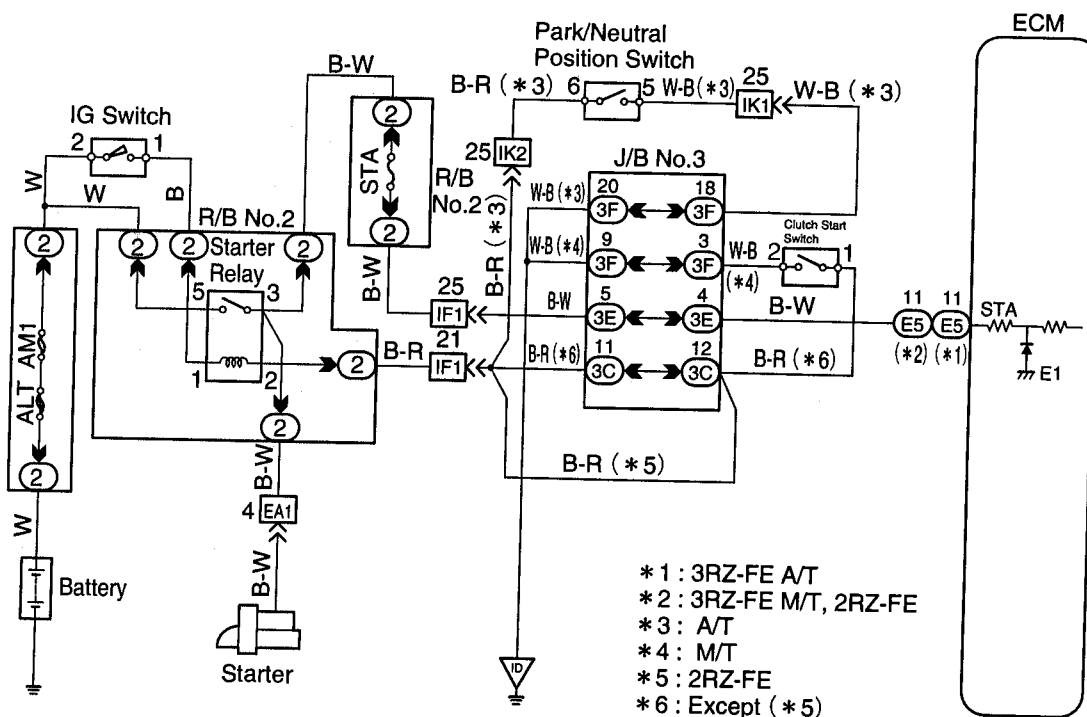
CIRCUIT DESCRIPTION

When the engine is cranked, the intake air flow is slow, so fuel vaporization is poor. A rich mixture is therefore necessary in order to achieve good startability. While the engine is being cranked, the battery voltage is applied to terminal STA of the ECM. The starter signal is mainly used to increase the fuel injection volume for the starting injection control and after-start injection control.

DTC No.	DTC Detecting Condition	Trouble Area
P1500	No starter signal to ECM	• Open or short in starter signal circuit • Open or short in ignition switch or starter relay circuit • ECM

HINT: In this circuit, diagnosis can only be made in the check mode.

WIRING DIAGRAM



INSPECTION PROCEDURE

HINT: This inspection procedure is based on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the matrix chart of problem symptoms on page EG-207.

1**Connect the TOYOTA hand-held tester and check STA signal.****P**

- (1) Connect the TOYOTA hand-held tester to the DLC3.
- (2) Turn ignition switch ON and TOYOTA hand-held tester main switch ON.

C

Read STA signal on the TOYOTA hand-held tester while starter operates.

OK

Ignition Switch Position	ON	START
STA Signal	OFF	ON

NG**OK**

Proceed to next circuit inspection shown on matrix chart (See page EG-207).

2**Check for open in harness and connector between ECM and starter relay (See page IN-24).****OK****NG**

Repair or replace harness or connector.

Check and replace ECM (See page IN-29).

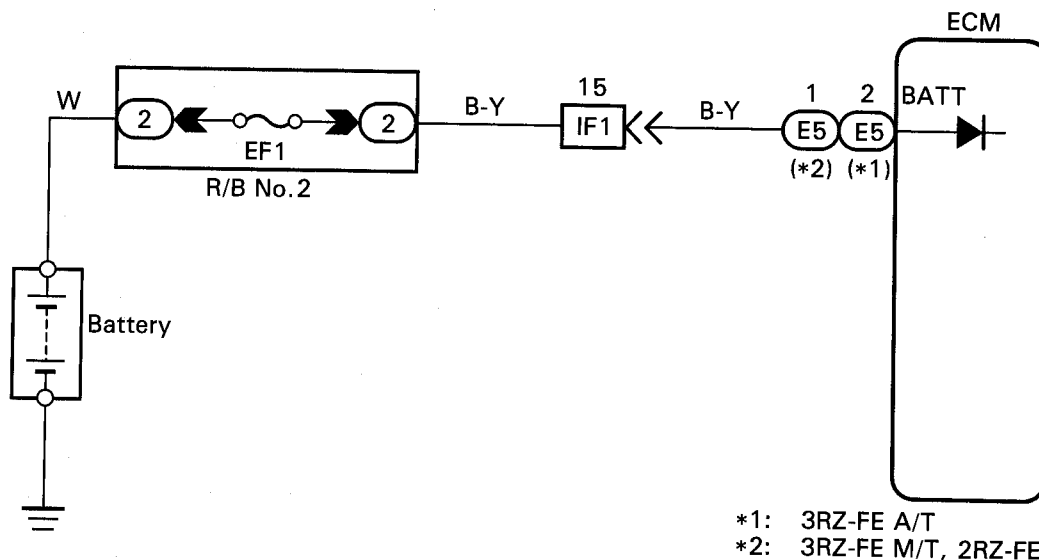
DTC**P1600****ECM BATT Malfunction****CIRCUIT DESCRIPTION**

Battery voltage is supplied terminal BATT of the ECM even when the ignition switch is OFF for use by the DTC memory and air-fuel ratio adaptive control value memory, etc.

DTC No.	DTC Detecting Condition	Trouble Area
P1600	Open in back up power source circuit	• Open in back up power source circuit • ECM

HINT: If DTC P1600 appear, the ECM does not store another DTC.

WIRING DIAGRAM



P23417

INSPECTION PROCEDURE

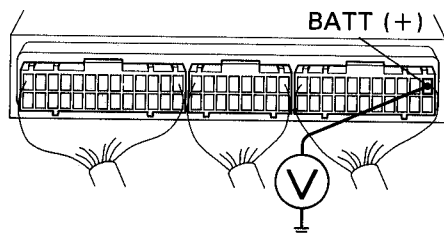
1

Check voltage between terminal BATT of ECM connector and body ground.

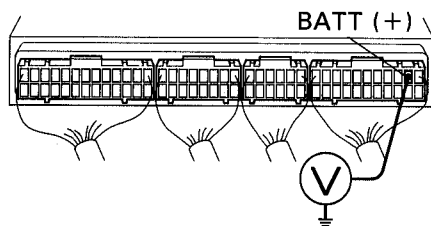
LOCK



For 3RZ-FE M/T, 2RZ-FE



For 3RZ-FE A/T



P

Remove glove compartment
(See page EG-157).

C

Measure voltage between terminal BATT of ECM
connector and body ground.

OK

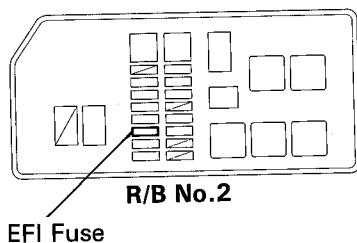
Voltage: 9 – 14 V

BE6653
P24216
P24217

NG

OK

Check and replace ECM (See page IN-29).

2**Check EFI fuse.****P** Remove EFI fuse from R/B No.2.**C** Check continuity of EFI fuse.**OK** Continuity

EG

P23367

OK**NG**

Check for short in all the harness and components connected to EFI fuse.

Check and repair harness or connector between battery, EFI fuse and ECM.

DTC**P1780****Park/Neutral Position Switch Malfunction****CIRCUIT DESCRIPTION**

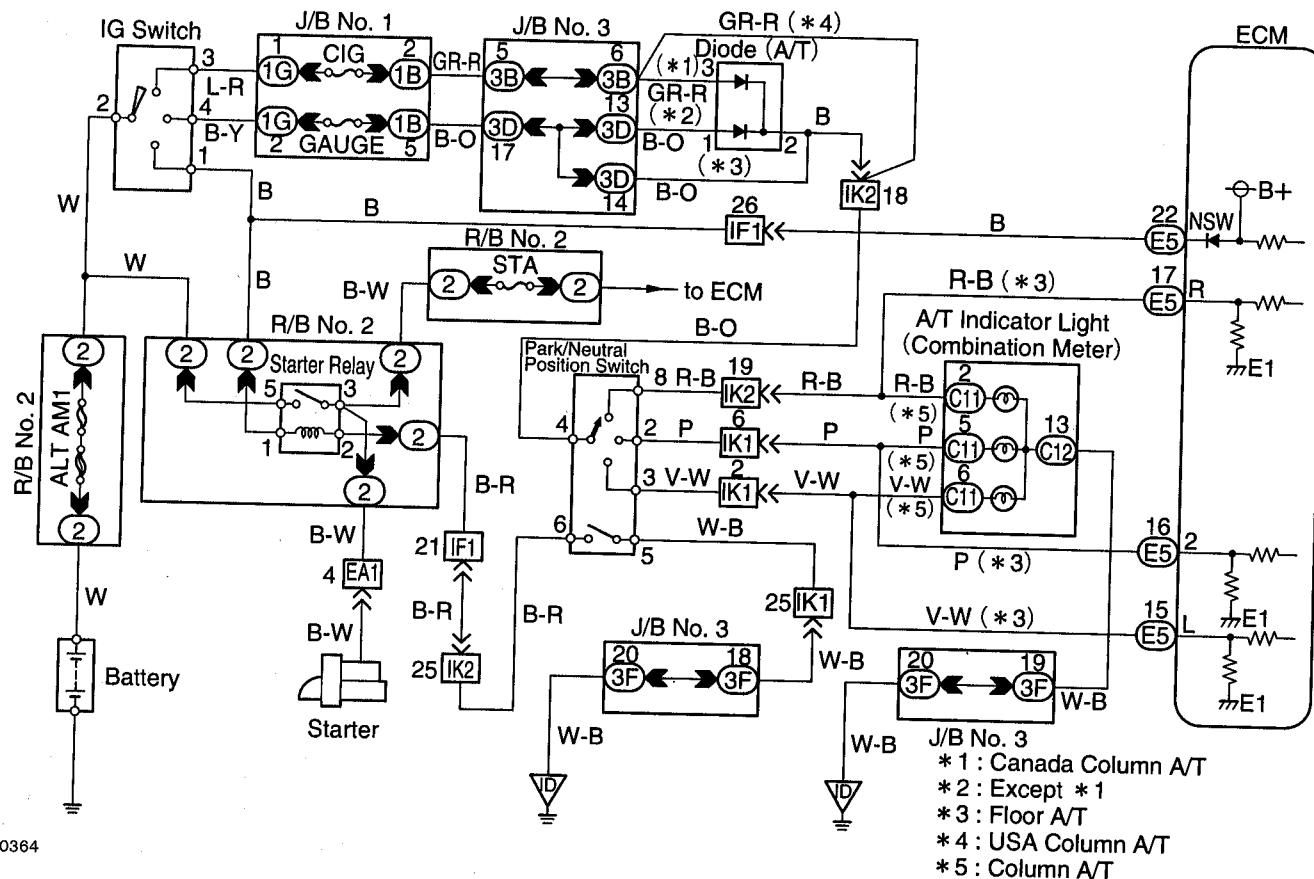
The park/neutral position switch goes on when the shift lever is in the N or P shift position. When it goes on terminal NSW of the ECM is grounded to body ground via the starter relay thus the terminal NSW voltage becomes 0 V. When the shift lever is in the D, 2, L or R position, the park/neutral position switch goes off, so the voltage of ECM terminal NSW becomes battery positive voltage, the voltage of the ECM internal power source.

If the shift lever is moved from the N position to the D position, this signal is used for air-fuel ratio correction and for idle speed control (estimated control), etc.

DTC No.	DTC Detecting Condition	Trouble Area
P1780	2 or more switches are ON simultaneously for "N", "2" and "L" position (2 trip detection logic)	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM
	When driving under conditions (a) and (b) for 30 sec. or more the park/neutral position switch is ON (N position) (2 trip detection logic) (a) Vehicle speed: 70 km/h (44 mph) or more (b) Engine speed: 1,500 ~ 2,500 rpm	

HINT: After confirming DTC P1780 use the TOYOTA hand-held tester to confirm the PNP switch signal from "CURRENT DATA".

WIRING DIAGRAM



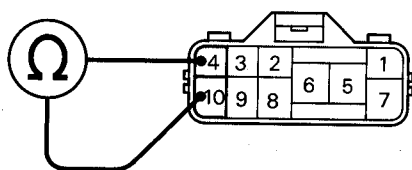
S00364

INSPECTION PROCEDURE

1 Check park/neutral position switch.

P Disconnect park/neutral position switch connector.

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



OK

Continuity

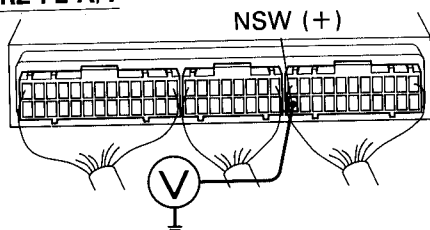
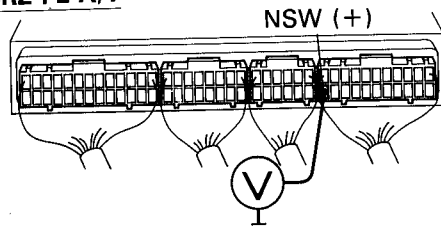
Terminal Shift Position	6	5	4	7	8	10	9	2	3
P	○—○		○—○						
R			○—○		○—○				
N	○—○		○—○			○—○			
D			○—○				○—○		
2			○—○					○—○	
L			○—○						○—○

P24214

OK

NG

Replace park/neutral position switch.

2**Check voltage between terminal NSW of ECM connector and body ground.****For 2RZ-FE A/T****For 3RZ-FE A/T**BE6653
P24218
P24219**NG**

- P** (1) Remove glove compartment
(See page EG-157).
(2) Turn ignition switch ON.

- C** Measure voltage between terminal NSW of ECM connector and body ground after the shift lever is moved to the following positions.

OK

Shift lever position	P or N	L, 2, D or R
Voltage	0 – 3 V	9 – 14 V

OK**Check and replace ECM (See page IN-29).**

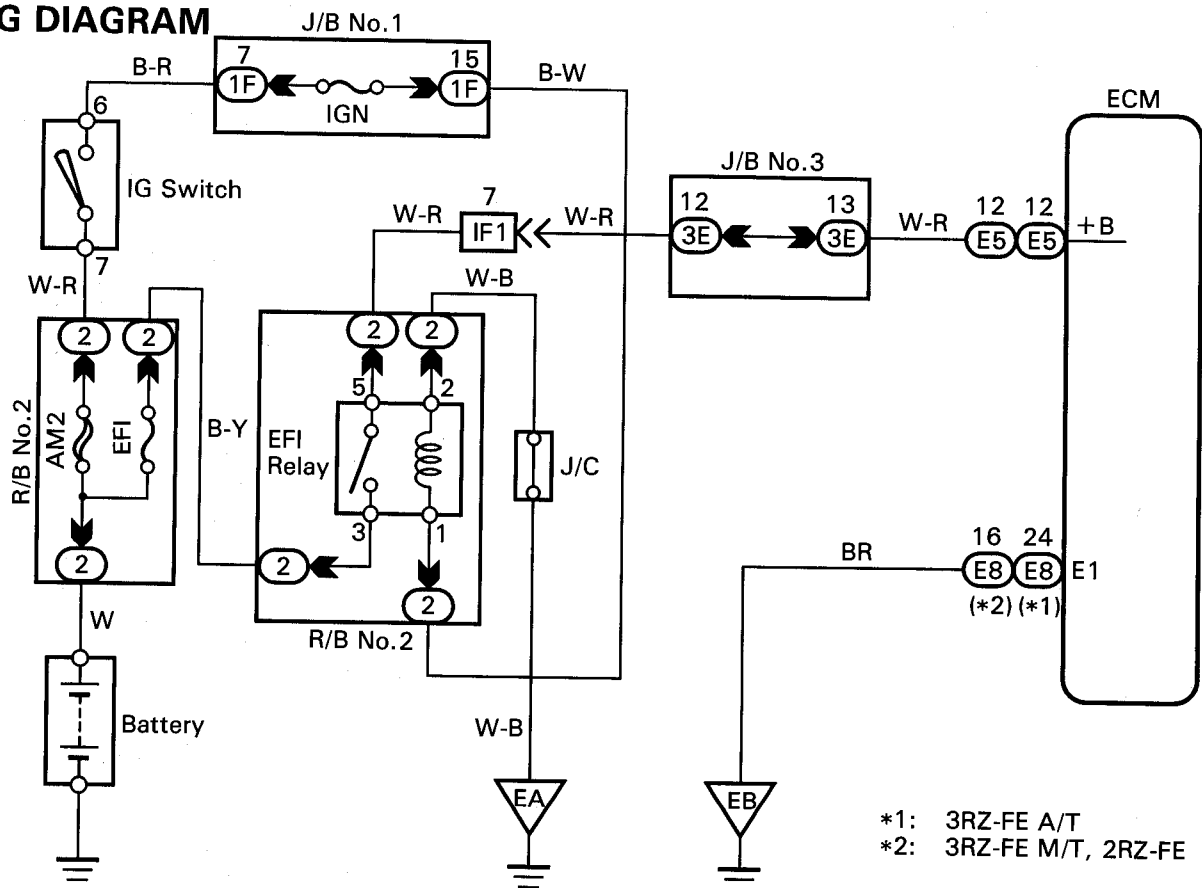
Check for open and short in harness and connector between ECM and park/neutral position switch (See page IN-24).

ECM Power Source Circuit

CIRCUIT DESCRIPTION

When the ignition switch is turned ON, battery positive voltage is applied to the coil, closing the contacts of the EFI relay and supplying power to the terminal +B of the ECM.

WIRING DIAGRAM



*1: 3RZ-FE A/T
*2: 3RZ-FE M/T, 2RZ-FE

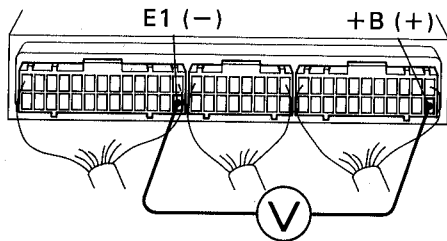
INSPECTION PROCEDURE

1

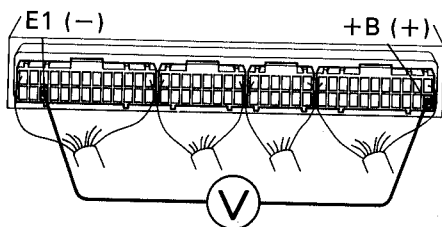
Check voltage between terminals +B and E1 of ECM connector.

ON

For 3RZ-FE M/T, 2RZ-FE



For 3RZ-FE A/T



BE6653
P24220
P24221

NG

- P** (1) Remove glove compartment (See page EG-157).
(2) Turn ignition switch ON.

C Measure voltage between terminals +B and E1 of ECM connector.

OK Voltage: 9 – 14 V

OK

Proceed to next circuit inspection shown on matrix chart (See page EG-207).

- 2** Check for open in harness and connector between terminal E1 of ECM and body ground (See page IN-24).

OK

NG

Repair or replace harness or connector.

- 3** Check EFI relay (See page EG-146).

OK

NG

Replace EFI relay.

- 4** Check EFI fuse (See page EG-289, step **2**).

OK

NG

Check for short in all the harness and components connected to EFI fuse.

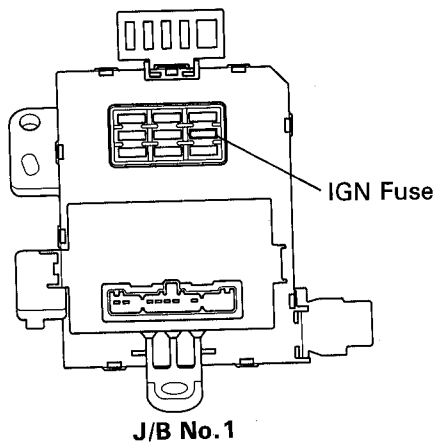
- 5** Check for open in harness and connector between EFI relay and battery, EFI relay and ECM (See page IN-24).

OK

NG

Repair or replace harness or connector.

- 6** Check IGN fuse.



P Remove IGN fuse from J/B No. 1.

C Check continuity of IGN fuse.

OK Continuity

P23368

OK

NG

Check for short in all the harness and components connected to IGN fuse.

7**Check ignition switch (See page BE-4).****OK****NG****Replace ignition switch.**

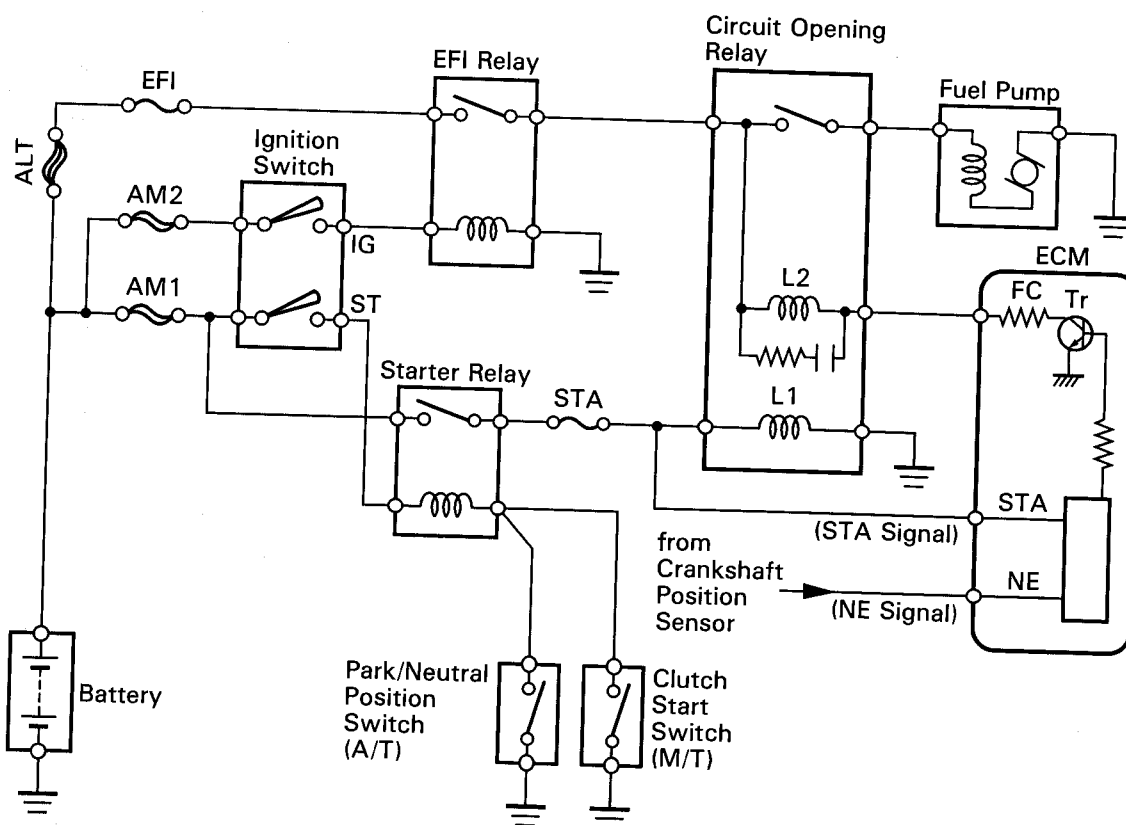
Check for open in harness and connector between IG switch and EFI relay, EFI relay and body ground (See page IN-24).

EG

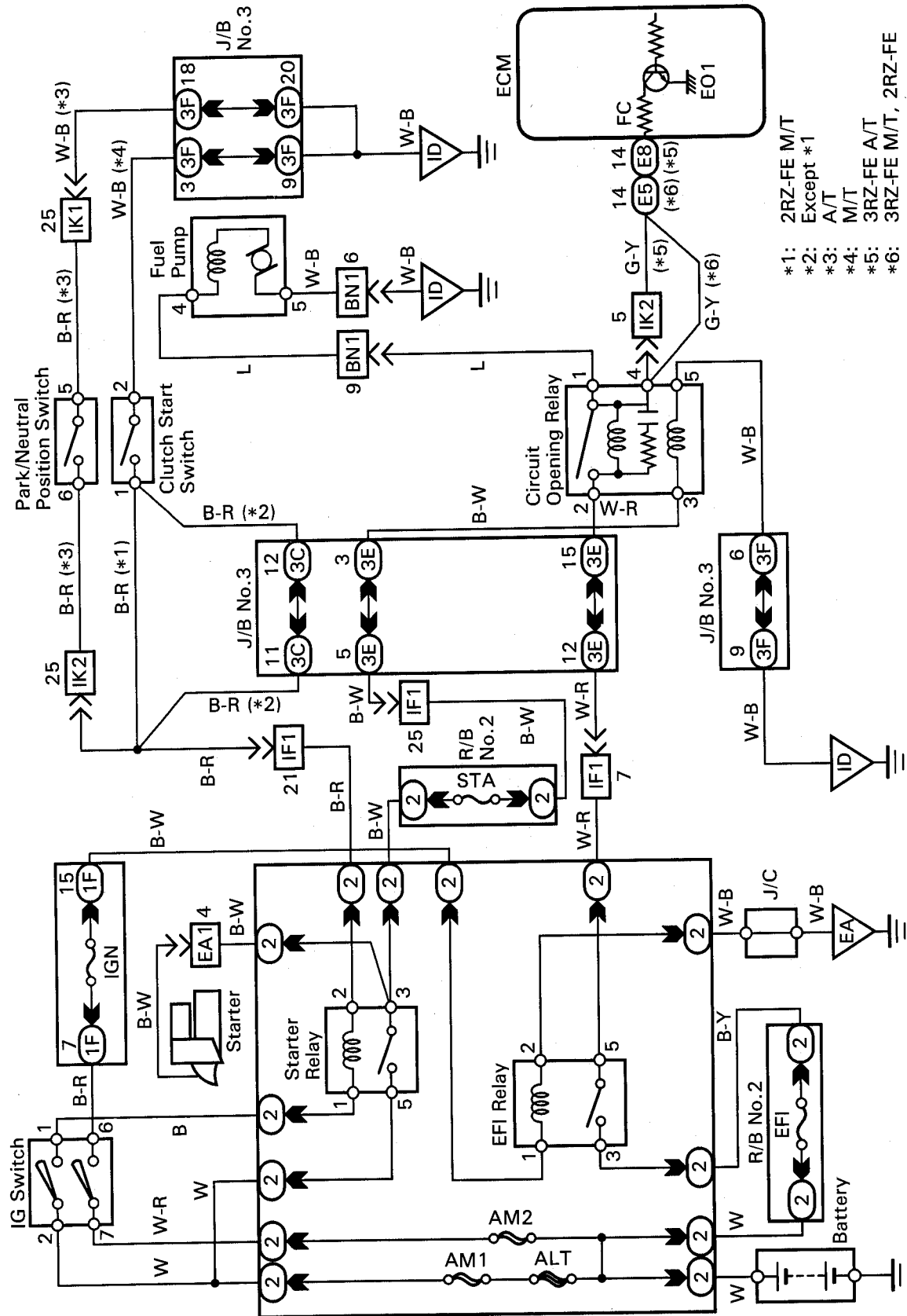
Fuel Pump Control Circuit

CIRCUIT DESCRIPTION

In the diagram below, when the engine is cranked, current flows from terminal ST of the ignition switch to the starter relay coil, the starter relay switches on and current flows to coil L1 of the circuit opening relay. Thus the circuit opening relay switches on, power is supplied to the fuel pump and the fuel pump operates. When the STA signal and NE signal are input to the ECM, Tr is turned ON, current flows to coil L2 of the circuit opening relay, the relay switches on and the fuel pump operates. While the NE signal is generated (engine running), the ECM keeps Tr ON (circuit opening relay ON) and the fuel pump also keeps operating.

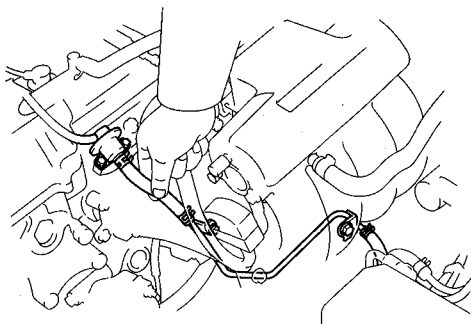


WIRING DIAGRAM



INSPECTION PROCEDURE

TOYOTA hand-held tester

1 Connect the TOYOTA hand-held tester and check operation of fuel pump.BE6653
P25111**NG**

- P** (1) Connect the TOYOTA hand-held tester to the DLC3.
 (2) Turn ignition switch ON and TOYOTA hand-held tester main switch ON.
 (3) Select the ACTIVE TEST mode on the TOYOTA hand-held tester.

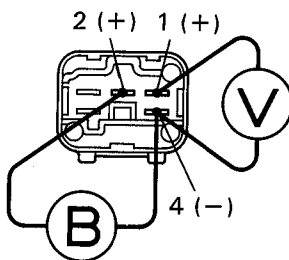
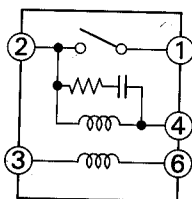
- C** Check for fuel pressure in the return hose when it is pinched off.

OK There is pressure in the return hose.

HINT: At this time, you will hear fuel return noise.

OKGo to step **7**.**2** Check for ECM power source circuit (See page EG-291).**OK****NG**

Repair or replace.

3 Check circuit opening relay.

- P** (1) Remove circuit opening relay (See page EG-147).

- C** (1) Apply battery positive voltage between terminals 2 and 4.
 (2) Measure voltage between terminals 1 and 4.

OK

Terminals 1 and 4

Same as battery

FI7053 P24222

OK**NG**

Replace circuit opening relay.

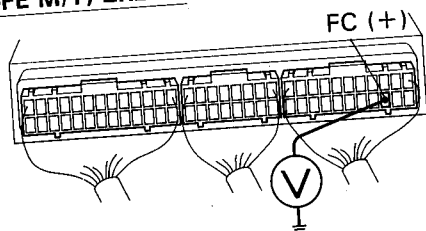
4

Check voltage between terminal FC of ECM and body ground.



ON

For 3RZ-FE M/T, 2RZ-FE



P

- (1) Remove glove compartment (See page EG-157).
- (2) Turn ignition switch ON.

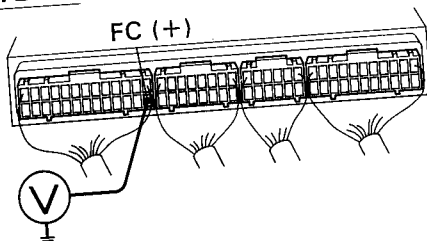
C

Measure voltage between terminal FC of ECM and body ground.

OK

Voltage: 9 – 14 V

For 3RZ-FE A/T



BE6653
P24224
P24225

OK

NG

Check for open in harness and connector between EFI relay and circuit opening relay, circuit opening relay and ECM.

5

Check fuel pump (See page EG-126).

OK

NG

Repair or replace fuel pump.

6

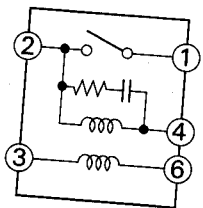
Check for open in harness and connector between circuit opening relay and fuel pump, fuel pump and body ground (See page IN-24).

OK

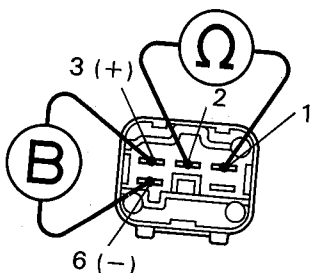
NG

Repair or replace harness or connector.

Check and replace ECM.

7**Check circuit opening relay.**

FI7053 P24223

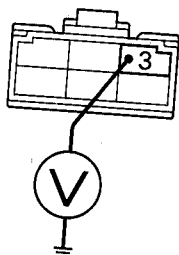
OK**P** Remove circuit opening relay
(See page EG-147).**C** (1) Apply battery positive voltage between terminals 3 and 6.
(2) Check continuity between terminals 1 and 2.**OK**

Terminals 1 and 2

Continuity

NG**Replace circuit opening relay.****8 Check voltage between terminal 3 of circuit opening relay connector and body ground.**

START

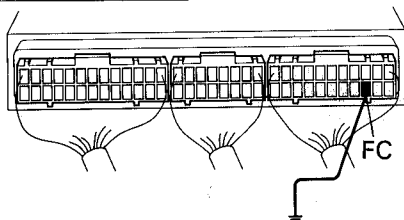
**C** Measure voltage between terminal 3 of circuit opening relay connector and body ground when engine is cranked.**OK** Voltage: 9 – 14 V**OK****NG****Check for starter signal circuit**
(See page EG-286).**Check for open in harness and connector between terminal 6 of circuit opening relay connector and body ground** (See page IN-24).BE6653
P24226

OBD II scan tool (excluding TOYOTA hand-held tester)

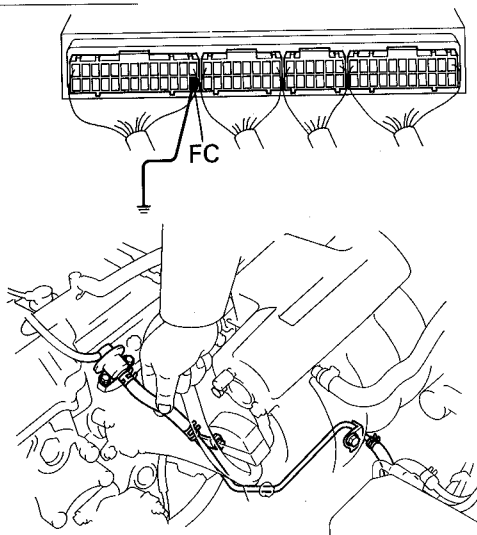
1 Check fuel pump operation.

ON

For 3RZ-FE M/T, 2RZ-FE



For 3RZ-FE A/T

BE6653
P19784
P19783
P25111

NG

- P** (1) Remove glove compartment
(See page EG-157).
(2) Turn ignition switch ON.

- C** (1) Connect between terminal FC of ECM and body ground.
(2) Check for fuel pressure in the return hose when it is pinched off.

OK There is pressure in the return hose.

HINT: At this time, you will hear fuel return noise.

OK

Go to step **7** .**2**

Check for ECM power source circuit (See page EG-291).

OK

NG

Repair or replace.

3Check circuit opening relay (See page EG-296, step **3**).

OK

NG

Replace circuit opening relay.

4 Check voltage between terminal FC of ECM and body ground (See page EG-297, step **4**).

OK

NG

Check for open in harness and connector between EFI relay and circuit opening relay, circuit opening relay and ECM.

5 Check fuel pump (See page EG-126).

OK

NG

Repair or replace fuel pump.

6 Check for open in harness and connector between circuit opening relay and fuel pump, fuel pump and body ground (See page IN-24).

OK

NG

Repair or replace harness or connector.

Check and replace ECM.

7 Check circuit opening relay (See page EG-298, step **7**).

OK

NG

Replace circuit opening replay.

8 Check voltage between terminal 3 of circuit opening relay connector and body ground (See page EG-298, step **8**).

OK

NG

Check for starter signal circuit (See page EG-286).

Check for open in harness and connector between terminal 6 of circuit opening relay connector and body ground (See page IN-24).