5VZ-FE ENGINE

ENGINE MECHANICAL
- PREPARATION ..... EG- 2
- IDLE AND/OR 2,500 RPM CO/HC CHECK ..... EG- 5
- COMPRESSION CHECK ..... EG- 7
- VALVE CLEARANCE INSPECTION AND ADJUSTMENT ..... EG- 8
- IGNITION TIMING INSPECTION ..... EG- 13
- IDLE SPEED INSPECTION ..... EG- 14
- TIMING BELT ..... EG- 15
- CYLINDER HEADS ..... EG- 27
- CYLINDER BLOCK ..... EG- 60
- EXHAUST SYSTEM ..... EG- 98
- SERVICE SPECIFICATIONS EG-100

EMISSION CONTROL SYSTEMS
- SYSTEM PURPOSE EG-106
- PREPARATION EG-106
- LAYOUT AND SCHEMATIC DRAWING EG-107
- POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM EG-108
- EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM EG-109
- EXHAUST GAS RECIRCULATION (EGR) SYSTEM EG-111
- THREE-WAY CATALYTIC CONVERTER (TWC) SYSTEM EG-115
- SERVICE SPECIFICATIONS EG-116

SFI SYSTEM
- PRECAUTION EG-117
- PREPARATION EG-120
- FUEL PUMP EG-121
- FUEL PRESSURE REGULATOR EG-126
- INJECTOR EG-129
- FUEL TANK AND LINE EG-134
- MASS AIR FLOW (MAF) METER EG-136
- THROTTLE BODY EG-137
- IDLE AIR CONTROL (IAC) VALVE EG-142
- EFI MAIN RELAY EG-145
- CIRCUIT OPENING RELAY EG-146
- VSV FOR EVAP EG-147
- VSV FOR FUEL PRESSURE CONTROL EG-148
- VSV FOR EGR (2WD/0.5 ton) EG-149
- VSV FOR VAPOR PRESSURE SENSOR EG-150
- A/C IDLE-UP VALVE (w/ A/C) EG-151
- ENGINE COOLANT TEMPERATURE (ECT) SENSOR EG-153
- KNOCK SENSOR EG-155
- EGR GAS TEMPERATURE SENSOR (2WD/0.5 ton) EG-159
- HEATED OXYGEN SENSOR EG-159
- VAPOR PRESSURE SENSOR EG-160
- ENGINE CONTROL MODULE (ECM) EG-161
- FUEL CUT RPM EG-161
- SERVICE SPECIFICATIONS EG-162

COOLING SYSTEM
- PREPARATION EG-164
- COOLANT CHECK EG-164
- COOLANT REPLACEMENT EG-165
- WATER PUMP EG-166
- THERMOSTAT EG-170
- RADIATOR EG-172
- SERVICE SPECIFICATIONS EG-175

LUBRICATION SYSTEM
- PREPARATION EG-176
- OIL PRESSURE CHECK EG-177
- OIL AND FILTER REPLACEMENT EG-178
- OIL PUMP EG-180
- OIL COOLER EG-189
- SERVICE SPECIFICATIONS EG-190

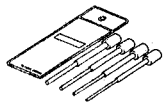
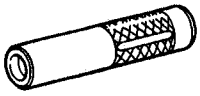
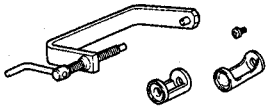
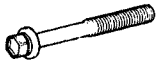
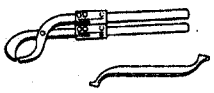
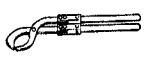
ENGINE TROUBLESHOOTING EG-192

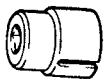
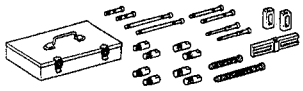
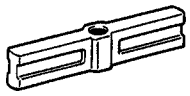
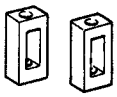
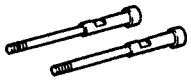
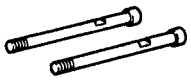
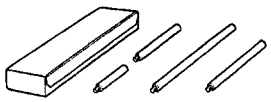
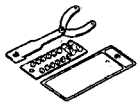
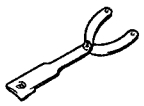
ENGINE MECHANICAL

PREPARATION

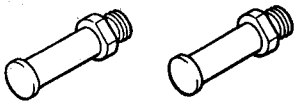
EGOEG-08

SST (SPECIAL SERVICE TOOLS)

	09201-10000 Valve Guide Bushing Remover & Replacer Set	
	(09201-01060) Valve Guide Bushing Remover & Replacer 6	
	09201-41020 Valve Stem Oil Seal Replacer	
	09202-70020 Valve Spring Compressor	
	09213-54015 Crankshaft Pulley Holding Tool	
	(90119-08216) Bolt	
	09222-30010 Connecting Rod Bushing Remover & Replacer	
	09223-15030 Oil Seal & Bearing Replacer	Crankshaft rear oil seal
	09228-07501 Oil Filter Wrench	
	09248-55040 Valve Clearance Adjust Tool Set	
	(09248-05410) Valve Lifter Press	
	(09248-05420) Valve Lifter Stopper	

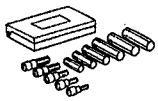
	09330-00021 Companion Flange Holding Tool	Crankshaft pulley
	09816-30010 Oil Pressure Switch Socket	Oil pressure switch
	09817-16011 Back-up Light Switch Tool	Knock sensor
	09843-18020 Diagnosis Check Wire	
	09950-50010 Puller C Set	
	(09951-05010) Hanger 150	Crankshaft pulley Crankshaft timing pulley
	(09952-05010) Slide Arm	Crankshaft pulley Crankshaft timing pulley
	(09953-05020) Center Bolt 150	Crankshaft pulley Crankshaft timing pulley
	(09954-05010) Claw No.1	Crankshaft timing pulley
	(09954-05030) Claw No.3	Crankshaft pulley
	09950-70010 Handle Set	
	(09951-07150) Handle 150	Crankshaft rear oil seal Valve guide bushing
	09960-10010 Variable Pin Wrench Set	
	(09962-01000) Variable Pin Wrench Arm Assy	Camshaft timing pulley Camshaft sub-gear

EG

	(09963–01000) Pin 10	Camshaft timing pulley
	(09963–00600) Pin 6	Camshaft sub–gear

EG1DN–05

RECOMMENDED TOOLS

	09040–00010 Hexagon Wrench Set .	
	09090–04010 Engine Sling Device .	For suspending engine
	09200–00010 Engine Adjust Kit .	
	09258–00030 Hose Plug Set .	Plug for the vaccum hose, fuel hose etc.
	09904–00010 Expander Set .	

EG1DP–06

EQUIPMENT

Caliper gauge	
CO/HC meter	
Compression gauge	
Connecting rod aligner	
Cylinder gauge	
Dial indicator	
Dye penetrant	
Timing light	Ignition timing
OBD II scan tool	Engine speed
Heater	
Magnetic finger	
Micrometer	
Piston ring compressor	
Piston ring expander	
Plastigage	
Precision straight edge	
Soft brush	
Spring tester	Valve spring
Steel square	Valve spring
Thremometer	

Torque wrench	
Valve seat cutter	
Vernier calipers	

SSM (SPECIAL SERVICE MATERIALS)

EG1DQ–07

08826–00080	Seal Packing Black or equivalent (FIPG)	Camshaft bearing cap Cylinder head cover Rear oil seal retainer
08826–00100	Seal Packing 1282B, THREE BOND 1282B or equivalent (FIPG)	Water bypass pipe
08833–00070	Adhesive 1324, THREE BOND 1324 or equivalent	Flywheel bolt Drive plate bolt Spark plug tube
08833–00080	Adhesive 1344, THREE BOND 1344, LOCTITE 242 or equivalent	Oil pressure sender gauge

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

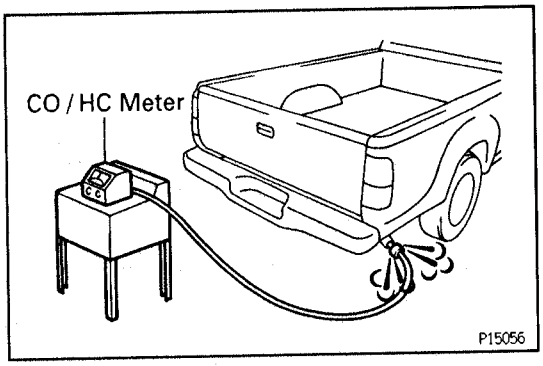
EG5YA–01

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) SFI system wiring connectors fully plugged
(g) Ignition timing checked 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 (2,500 rpm and idle) test, follow the measurement order prescribed by the applicable local regulations.

Troubleshooting

If the CO/HC concentration does not comply with regulations, troubleshoot in the order given below.
See the table below for possible causes, and then inspect and correct the applicable causes if necessary.

CO	HC	Symptom	Causes
Normal	High	Rough idle	1. Faulty ignitions: • Incorrect timing • Fouled, shorted or improperly gapped plugs • Open or crossed high-tension cords 2. Incorrect valve clearance 3. w/ EGR: Leaky EGR valve 4. Leaky intake and exhaust valves 5. Leaky cylinder
Low	High	Rough idle (Fluctuating HC reading)	1. Vacuum leaks: • PCV hose • w/ EGR: EGR valve • Intake manifold • Air intake chamber • Intake air connector • Throttle body • IAC valve • Brake booster line 2. Lean mixture causing misfire
High	High	Rough idle (Black smoke from exhaust)	1. Restricted air filter 2. Plugged PCV valve 3. Faulty SFI systems: • Faulty fuel pressure regulator • Clogged fuel return line • Defective ECT sensor • Faulty ECM • Faulty injector • Faulty throttle position sensor • Faulty MAF meter

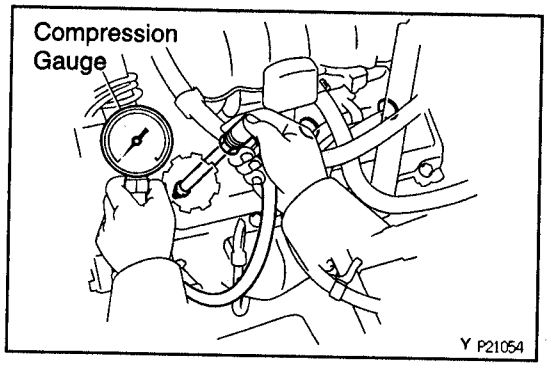
V06207

COMPRESSION CHECK

EG893-01

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

1. **WARM UP AND STOP ENGINE**
   Allow the engine to warm up to normal operating temperature.
2. **REMOVE IGNITION COILS**
   (See ignition coil removal in Ignition System)
3. **REMOVE SPARK PLUGS**
   Using a 16 mm plug wrench, remove the 6 spark plugs.
4. **CHECK CYLINDER COMPRESSION PRESSURE**



(a) Insert a compression gauge into the spark plug hole.
(b) Fully open the throttle.
(c) While cranking the engine, measure the compression pressure.
HINT: Always use a fully charged battery to obtain engine speed of 250 rpm or more.
(d) Repeat steps (a) through (c) for each cylinder.
NOTICE: This measurement must be done in as short a time as possible.
Compression pressure:
1,200 kPa (12.2 kgf/cm², 174 psi) or more
Minimum pressure:
1,000 kPa (10.2 kgf/cm², 145 psi)
Difference between each cylinder:
100 kPa (1.0 kgf/cm², 15 psi) or less
(e) If the cylinder compression in 1 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, it is likely 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.

5. **REINSTALL SPARK PLUGS**
6. **INSTALL IGNITION COILS**
   (See ignition coil installation in Ignition System)

EG

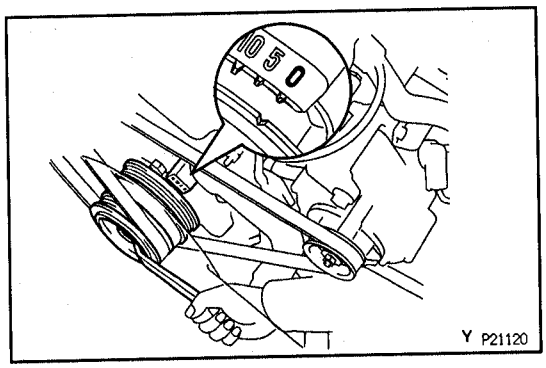
VALVE CLEARANCE INSPECTION AND ADJUSTMENT

EG5AT–02

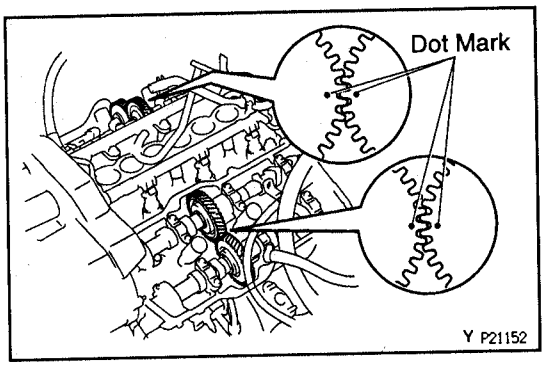
HINT: Inspect and adjust the valve clearance when the engine is cold.

1. **DRAIN ENGINE COOLANT**
2. **REMOVE INTAKE AIR CONNECTOR**
   (See steps 7, 8 and 10 to 13 in cylinder head removal)
3. **REMOVE CYLINDER HEAD COVERS**
   (See steps 14 and 23 in cylinder head removal)
4. **SET NO.1 CYLINDER TO TDC/COMPRESSION**

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



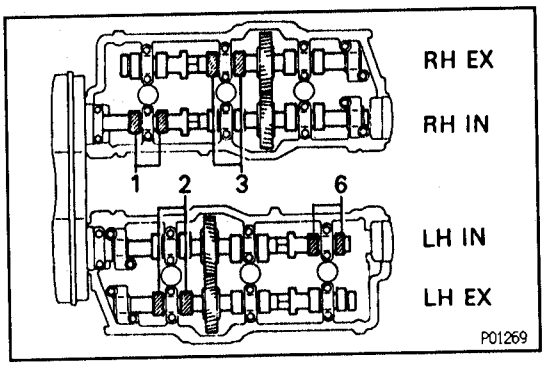
(b) Check that the timing marks (1 dot) of the camshaft drive and driven gears are in straight line on the cylinder heads surface as shown in the illustration.
If not, turn the crankshaft 1 revolution (360°) and align the marks.



5. **INSPECT VALVE CLEARANCE**

(a) Check only those valves indicated in the illustration.

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



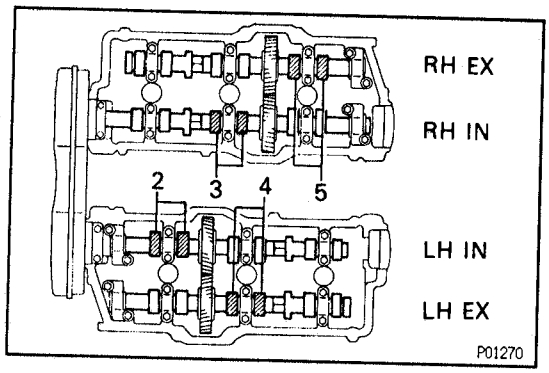
Valve clearance (Cold):

Intake

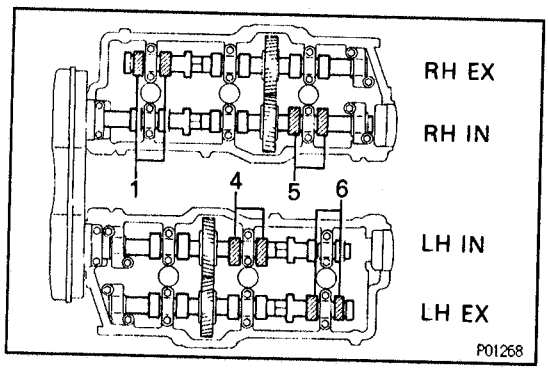
0.13 – 0.23 mm (0.006 – 0.009 in.)

Exhaust

0.27 – 0.37 mm (0.011 – 0.014 in.)

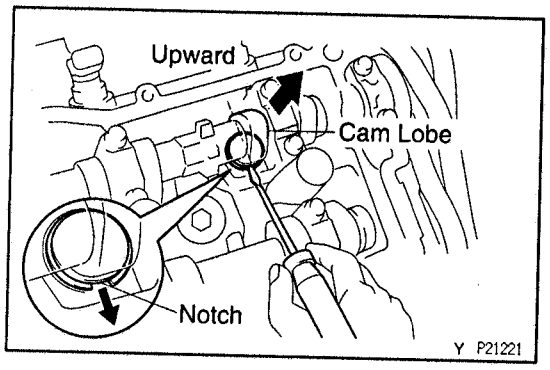


(b) Turn the crankshaft 2/3 of a revolution (240°), and check only the valves indicated in the illustration. Measure the valve clearance. (See procedure step (a))



(c) Turn the crankshaft a further 2/3 of a revolution (240°), and check only the valves indicated in the illustration. Measure the valve clearance.
(See procedure step (a))

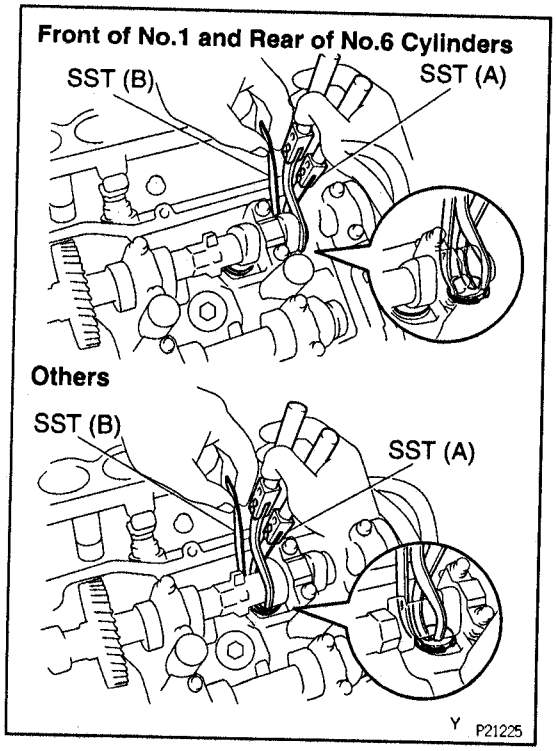
EG



6. ADJUST VALVE CLEARANCE

(a) Remove the adjusting shim.

- Turn the camshaft so that the cam lobe for the valve to be adjusted faces up.
- Turn the valve lifter with a screwdriver so that the notches are perpendicular to the camshaft.

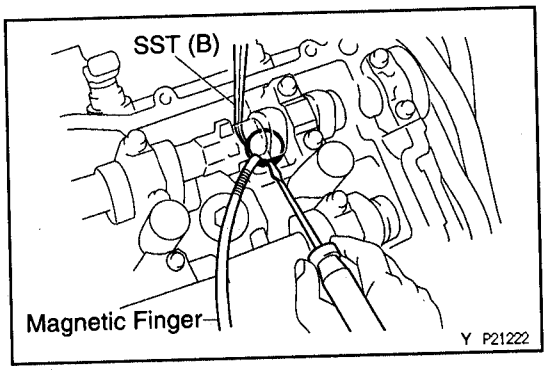


- Using SST (A), press down the valve lifter and place SST (B) between the camshaft and valve lifter. Remove SST (A).

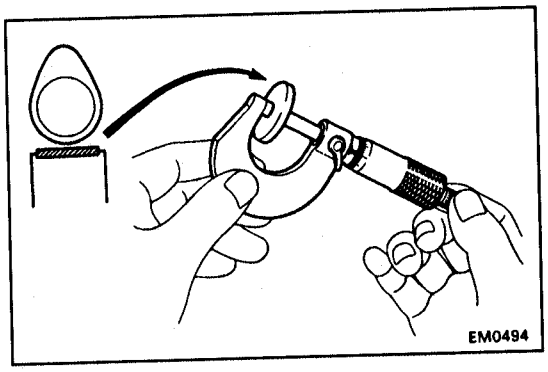
SST 09248–55040 (09248–05410, 09248–05420)

HINT:

- Apply SST (B) at a slight angle on the side marked with "9" or "7", at the position shown in the illustration.
- When SST (B) is inserted too deeply, it will get pinched by the shim. To prevent it from being stuck, insert it gently from the intake side, at a slight angle.



- Using a small screwdriver and magnetic finger, remove the adjusting shim.



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

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

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

Intake

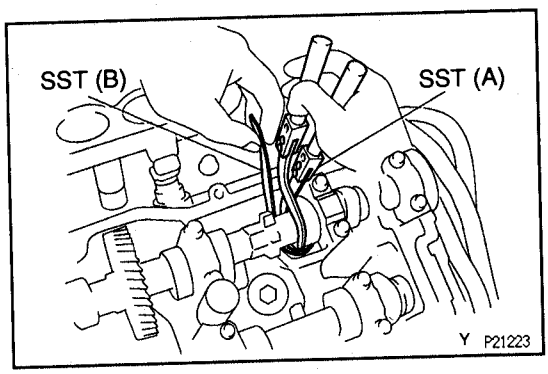
N = T + (A – 0.18 mm (0.007 in.))

Exhaust

N = T + (A – 0.32 mm (0.013 in.))

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

HINT: Shims are available in 17 sizes in increments of 0.050 mm (0.0020 in.), from 2.500 mm (0.0984 in.) to 3.300 mm (0.1299 in.).



(c) Install a new adjusting shim.

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

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

(d) Recheck the valve clearance.

7. **REINSTALL CYLINDER HEAD COVERS (See steps 6 and 15 in cylinder head installation)**
8. **REINSTALL INTAKE AIR CONNECTOR (See steps 16 to 19, 24 and 25 in cylinder head installation)**
9. **REFILL WITH ENGINE COOLANT**
10. **START ENGINE AND CHECK FOR LEAKS**

Adjusting Shim Selection Chart (Intake)

Measured clearance mm (in.) \ Installed shim thickness mm (in.)	2.500 (0.0984)	2.520 (0.0992)	2.540 (0.1000)	2.550 (0.1004)	2.560 (0.1008)	2.580 (0.1016)	2.600 (0.1024)	2.620 (0.1031)	2.640 (0.1039)	2.650 (0.1043)	2.660 (0.1047)	2.670 (0.1051)	2.680 (0.1055)	2.690 (0.1059)	2.700 (0.1063)	2.710 (0.1067)	2.720 (0.1071)	2.730 (0.1075)	2.740 (0.1079)	2.750 (0.1083)	2.760 (0.1087)	2.770 (0.1091)	2.780 (0.1094)	2.790 (0.1098)	2.800 (0.1102)	2.810 (0.1106)	2.820 (0.1110)	2.830 (0.1114)	2.840 (0.1118)	2.850 (0.1122)	2.860 (0.1126)	2.870 (0.1130)	2.880 (0.1134)
0.000 – 0.020 (0.0000 – 0.0008)									1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5
0.021 – 0.040 (0.0008 – 0.0016)								1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6
0.041 – 0.060 (0.0016 – 0.0024)							1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6
0.061 – 0.080 (0.0024 – 0.0031)						1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6
0.081 – 0.100 (0.0032 – 0.0039)					1	1	1	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7
0.101 – 0.120 (0.0040 – 0.0047)			1	1	1	1	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7
0.121 – 0.129 (0.0048 – 0.0051)		1	1	1	1	1	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7
0.130 – 0.230 (0.0051 – 0.0091)																																	
0.231 – 0.240 (0.0091 – 0.0094)	2	3	3	3	3	4	4	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10
0.241 – 0.260 (0.0095 – 0.0102)	2	3	3	3	4	4	4	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10
0.261 – 0.280 (0.0103 – 0.0110)	3	3	4	4	4	4	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10
0.281 – 0.300 (0.0111 – 0.0118)	3	4	4	4	4	5	5	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11
0.301 – 0.320 (0.0119 – 0.0126)	4	4	4	5	5	5	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11
0.321 – 0.340 (0.0126 – 0.0134)	4	4	5	5	5	6	6	6	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12
0.341 – 0.360 (0.0134 – 0.0142)	4	5	5	5	6	6	6	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12
0.361 – 0.380 (0.0142 – 0.0150)	5	5	6	6	6	6	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12
0.381 – 0.400 (0.0150 – 0.0157)	5	6	6	6	6	7	7	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13
0.401 – 0.420 (0.0158 – 0.0165)	6	6	6	7	7	7	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13
0.421 – 0.440 (0.0166 – 0.0173)	6	6	7	7	7	8	8	8	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14
0.441 – 0.460 (0.0174 – 0.0181)	6	7	7	7	8	8	8	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14
0.461 – 0.480 (0.0181 – 0.0189)	7	7	8	8	8	8	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14
0.481 – 0.500 (0.0189 – 0.0197)	7	8	8	8	8	9	9	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15
0.501 – 0.520 (0.0197 – 0.0205)	8	8	8	9	9	9	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15
0.521 – 0.540 (0.0205 – 0.0213)	8	8	9	9	9	10	10	10	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16
0.541 – 0.560 (0.0213 – 0.0220)	8	9	9	9	10	10	10	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16
0.561 – 0.580 (0.0221 – 0.0228)	9	9	10	10	10	10	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16
0.581 – 0.600 (0.0229 – 0.0236)	9	10	10	10	10	11	11	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17
0.601 – 0.620 (0.0237 – 0.0244)	10	10	10	11	11	11	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17
0.621 – 0.640 (0.0244 – 0.0252)	10	10	11	11	11	12	12	12	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17
0.641 – 0.660 (0.0252 – 0.0260)	10	11	11	11	12	12	12	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17	
0.661 – 0.680 (0.0260 – 0.0268)	11	11	12	12	12	12	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17			
0.681 – 0.700 (0.0268 – 0.0276)	11	12	12	12	12	13	13	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17					
0.701 – 0.720 (0.0276 – 0.0283)	12	12	12	13	13	13	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17							
0.721 – 0.740 (0.0284 – 0.0291)	12	12	13	13	13	14	14	14	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17									
0.741 – 0.760 (0.0292 – 0.0299)	12	13	13	13	14	14	14	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17											
0.761 – 0.780 (0.0300 – 0.0307)	13	13	14	14	14	14	15	15	16	16	16	16	16	17	17	17	17	17	17	17													
0.781 – 0.800 (0.0307 – 0.0315)	13	14	14	14	14	15	15	16	16	16	16	17	17	17	17	17	17	17															
0.801 – 0.820 (0.0315 – 0.0323)	14	14	14	15	15	15	16	16	16	17	17	17	17	17	17	17																	
0.821 – 0.840 (0.0323 – 0.0331)	14	14	15	15	15	16	16	16	17	17	17	17	17	17																			
0.841 – 0.860 (0.0331 – 0.0339)	14	15	15	15	16	16	16	17	17	17	17	17																					
0.861 – 0.880 (0.0339 – 0.0346)	15	15	16	16	16	16	17	17	17	17																							
0.881 – 0.900 (0.0347 – 0.0354)	15	16	16	16	16	17	17	17																									
0.901 – 0.920 (0.0355 – 0.0362)	16	16	16	17	17	17	17																										
0.921 – 0.940 (0.0363 – 0.0370)	16	16	17	17	17	17																											
0.941 – 0.960 (0.0370 – 0.0378)	16	17	17	17	17																												
0.961 – 0.980 (0.0378 – 0.0386)	17	17	17																														
0.981 – 1.000 (0.0386 – 0.0394)	17	17																															
1.001 – 1.020 (0.0394 – 0.0402)	17																																
1.021 – 1.030 (0.0402 – 0.0406)	17																																

Measured clearance mm (in.) \ Installed shim thickness mm (in.)	2.890 (0.1138)	2.900 (0.1142)	2.910 (0.1146)	2.920 (0.1150)	2.930 (0.1154)	2.940 (0.1157)	2.950 (0.1161)	2.960 (0.1165)	2.970 (0.1169)	2.980 (0.1173)	2.990 (0.1177)	3.000 (0.1181)	3.010 (0.1185)	3.020 (0.1189)	3.030 (0.1193)	3.040 (0.1197)	3.050 (0.1201)	3.060 (0.1205)	3.080 (0.1213)	3.100 (0.1220)	3.120 (0.1228)	3.140 (0.1236)	3.150 (0.1240)	3.160 (0.1244)	3.180 (0.1252)	3.200 (0.1260)	3.220 (0.1268)	3.240 (0.1276)	3.250 (0.1280)	3.260 (0.1283)	3.280 (0.1291)	3.300 (0.1299)
0.000 – 0.020 (0.0000 – 0.0008)	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14
0.021 – 0.040 (0.0008 – 0.0016)	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14	14
0.041 – 0.060 (0.0016 – 0.0024)	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14
0.061 – 0.080 (0.0024 – 0.0031)	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	11	11	12	12	12	12	13	13	14	14	14	14	15
0.081 – 0.100 (0.0032 – 0.0039)	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	12	12	12	12	13	13	14	14	14	14	15	15
0.101 – 0.120 (0.0040 – 0.0047)	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14	15	15	15	16
0.121 – 0.129 (0.0048 – 0.0051)	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	12	12	13	13	13	13	14	14	15	15	15	15	16
0.130 – 0.230 (0.0051 – 0.0091)																																
0.231 – 0.240 (0.0091 – 0.0094)	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	15	15	15	15	16	16	17	17	17	17	17	
0.241 – 0.260 (0.0095 – 0.0102)	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	15	15	15	16	16	16	17	17	17	17		
0.261 – 0.280 (0.0103 – 0.0110)	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	15	15	16	16	16	16	17	17	17	17			
0.281 – 0.300 (0.0111 – 0.0118)	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	16	16	16	16	17	17	17					
0.301 – 0.320 (0.0119 – 0.0126)	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	16	16	16	17	17	17	17						
0.321 – 0.340 (0.0126 – 0.0134)	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	16	16	16	17	17	17	17							
0.341 – 0.360 (0.0134 – 0.0142)	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	17	17	17	17								
0.361 – 0.380 (0.0142 – 0.0150)	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	17	17	17	17									
0.381 – 0.400 (0.0150 – 0.0157)	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17											
0.401 – 0.420 (0.0158 – 0.0165)	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17												
0.421 – 0.440 (0.0166 – 0.0173)	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17													
0.441 – 0.460 (0.0174 – 0.0181)	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17														
0.461 – 0.480 (0.0181 – 0.0189)	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17															
0.481 – 0.500 (0.0189 – 0.0197)	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17																	
0.501 – 0.520 (0.0197 – 0.0205)	15	16	16	16	16	16	17	17	17	17	17	17	17																			
0.521 – 0.540 (0.0205 – 0.0213)	16	16	16	16	17	17	17	17	17	17	17																					
0.541 – 0.560 (0.0213 – 0.0220)	16	16	17	17	17	17	17	17	17																							
0.561 – 0.580 (0.0221 – 0.0228)	17	17	17	17	17	17	17																									
0.581 – 0.600 (0.0229 – 0.0236)	17	17	17	17	17																											
0.601 – 0.620 (0.0237 – 0.0244)	17	17	17																													
0.621 – 0.640 (0.0244 – 0.0252)	17																															

Intake valve clearance (Cold):
0.13 – 0.23 mm (0.006 – 0.009 in.)

EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed, and measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a No. 12 shim.

New shim thickness mm (in.)

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

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

V06208

Adjusting Shim Selection Chart (Exhaust)

Installed shim thickness mm (in.) / Measured clearance mm (in.)	2.500 (0.0984)	2.520 (0.0992)	2.540 (0.1000)	2.550 (0.1004)	2.560 (0.1008)	2.580 (0.1016)	2.600 (0.1024)	2.620 (0.1031)	2.640 (0.1039)	2.650 (0.1043)	2.660 (0.1047)	2.670 (0.1051)	2.680 (0.1055)	2.690 (0.1059)	2.700 (0.1063)	2.710 (0.1067)	2.720 (0.1071)	2.730 (0.1075)	2.740 (0.1079)	2.750 (0.1083)	2.760 (0.1087)	2.770 (0.1091)	2.780 (0.1094)	2.790 (0.1098)	2.800 (0.1102)	2.810 (0.1106)	2.820 (0.1110)	2.830 (0.1114)	2.840 (0.1118)	2.850 (0.1122)	2.860 (0.1126)	2.870 (0.1130)	2.880 (0.1134)	2.890 (0.1138)	2.900 (0.1142)	2.910 (0.1146)	2.920 (0.1150)	2.930 (0.1154)	2.940 (0.1157)	2.950 (0.1161)	2.960 (0.1165)	2.970 (0.1169)	2.980 (0.1173)	2.990 (0.1177)	3.000 (0.1181)	3.010 (0.1185)	3.020 (0.1189)	3.030 (0.1193)	3.040 (0.1197)	3.050 (0.1201)	3.060 (0.1205)	3.080 (0.1213)	3.100 (0.1220)	3.120 (0.1228)	3.140 (0.1236)	3.150 (0.1240)	3.160 (0.1244)	3.180 (0.1252)	3.200 (0.1260)	3.220 (0.1268)	3.240 (0.1276)	3.250 (0.1280)	3.260 (0.1283)	3.280 (0.1291)	3.300 (0.1299)
0.000 – 0.020 (0.0000 – 0.0008)																						1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	7	7	8	8	8	8	9	9	10	10	10	10	11
0.021 – 0.040 (0.0008 – 0.0016)																				1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	8	8	8	8	9	9	10	10	10	10	11	11
0.041 – 0.060 (0.0016 – 0.0024)																		1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	8	8	8	9	9	9	10	10	10	11	11	11	12
0.061 – 0.080 (0.0024 – 0.0031)																1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	8	8	8	9	9	9	10	10	10	11	11	11	12	12
0.081 – 0.100 (0.0032 – 0.0039)														1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	9	9	9	10	10	10	11	11	11	12	12	12
0.101 – 0.120 (0.0040 – 0.0047)												1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	9	9	10	10	10	10	11	11	12	12	12	12	13
0.121 – 0.140 (0.0048 – 0.0055)										1	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	10	10	10	10	11	11	12	12	12	12	13	13
0.141 – 0.160 (0.0056 – 0.0063)									1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14
0.161 – 0.180 (0.0063 – 0.0071)								1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14	14
0.181 – 0.200 (0.0071 – 0.0079)							1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14
0.201 – 0.220 (0.0079 – 0.0087)						1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	11	11	12	12	12	12	13	13	14	14	14	14	15
0.221 – 0.240 (0.0087 – 0.0094)					1	1	1	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	12	12	12	12	13	13	14	14	14	14	15	15
0.241 – 0.260 (0.0095 – 0.0102)			1	1	1	1	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14	15	15	15	16
0.261 – 0.269 (0.0103 – 0.0106)		1	1	1	1	1	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	12	12	13	13	13	13	14	14	15	15	15	15	16
0.270 – 0.370 (0.0106 – 0.0146)																																																																	
0.371 – 0.380 (0.0146 – 0.0150)	2	3	3	3	3	4	4	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	15	15	15	15	16	16	17	17	17	17	17	
0.381 – 0.400 (0.0150 – 0.0157)	2	3	3	3	4	4	4	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	15	15	15	16	16	16	17	17	17	17		
0.401 – 0.420 (0.0158 – 0.0165)	3	3	4	4	4	4	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	15	15	16	16	16	16	17	17	17	17			
0.421 – 0.440 (0.0166 – 0.0173)	3	4	4	4	4	5	5	6	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	16	16	16	16	17	17	17					
0.441 – 0.460 (0.0174 – 0.0181)	4	4	4	5	5	5	6	6	6	7	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	16	16	16	17	17	17	17						
0.461 – 0.480 (0.0181 – 0.0189)	4	4	5	5	5	6	6	6	7	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	16	16	16	17	17	17	17							
0.481 – 0.500 (0.0189 – 0.0197)	4	5	5	5	6	6	6	7	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	17	17	17	17								
0.501 – 0.520 (0.0197 – 0.0205)	5	5	6	6	6	6	7	7	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	17	17	17	17									
0.521 – 0.540 (0.0205 – 0.0213)	5	6	6	6	6	7	7	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17											
0.541 – 0.560 (0.0213 – 0.0220)	6	6	6	7	7	7	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17												
0.561 – 0.580 (0.0221 – 0.0228)	6	6	7	7	7	8	8	8	9	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17													
0.581 – 0.600 (0.0229 – 0.0236)	6	7	7	7	8	8	8	9	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17														
0.601 – 0.620 (0.0237 – 0.0244)	7	7	8	8	8	8	9	9	10	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17															
0.621 – 0.640 (0.0244 – 0.0252)	7	8	8	8	8	9	9	10	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17																	
0.641 – 0.600 (0.0252 – 0.0260)	8	8	8	9	9	9	10	10	10	11	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17																			
0.661 – 0.680 (0.0260 – 0.0268)	8	8	9	9	9	10	10	10	11	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17																					
0.681 – 0.700 (0.0268 – 0.0276)	8	9	9	9	10	10	10	11	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17																							
0.701 – 0.720 (0.0276 – 0.0283)	9	9	10	10	10	10	11	11	12	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17																									
0.721 – 0.740 (0.0284 – 0.0291)	9	10	10	10	10	11	11	12	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17																											
0.741 – 0.760 (0.0292 – 0.0299)	10	10	10	11	11	11	12	12	12	13	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17																													
0.761 – 0.780 (0.0300 – 0.0307)	10	10	11	11	11	12	12	12	13	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17																															
0.781 – 0.800 (0.0307 – 0.0315)	10	11	11	11	12	12	12	13	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17																																	
0.801 – 0.820 (0.0315 – 0.0323)	11	11	12	12	12	12	13	13	14	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17																																			
0.821 – 0.840 (0.0323 – 0.0331)	11	12	12	12	12	13	13	14	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17																																					
0.841 – 0.860 (0.0331 – 0.0339)	12	12	12	13	13	13	14	14	14	15	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17																																							
0.861 – 0.880 (0.0339 – 0.0346)	12	12	13	13	13	14	14	14	15	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17																																									
0.881 – 0.900 (0.0347 – 0.0354)	12	13	13	13	14	14	14	15	15	15	16	16	16	16	16	17	17	17	17	17	17	17																																											
0.901 – 0.920 (0.0355 – 0.0362)	13	13	14	14	14	14	15	15	16	16	16	16	16	17	17	17	17	17	17	17																																															
0.921 – 0.940 (0.0363 – 0.0370)	13	14	14	14	14	15	15	16	16	16	16	17	17	17	17	17	17	17																																																	
0.941 – 0.960 (0.0370 – 0.0378)	14	14	14	15	15	15	16	16	16	17	17	17	17	17	17	17																																																			
0.961 – 0.980 (0.0378 – 0.0386)	14	14	15	15	15	16	16	16	17	17	17	17	17	17																																																					
0.981 – 1.000 (0.0386 – 0.0394)	14	15	15	15	16	16	16	17	17	17	17	17																																																						
1.001 – 1.020 (0.0394 – 0.0402)	15	15	16	16	16	16	17	17	17	17																																																							
1.021 – 1.040 (0.0402 – 0.0409)	15	16	16	16	16	17	17	17																																																									
1.041 – 1.060 (0.0410 – 0.0417)	16	16	16	17	17	17	17																																																										
1.061 – 1.080 (0.0418 – 0.0425)	16	16	17	17	17	17																																																											
1.081 – 1.100 (0.0426 – 0.0433)	16	17	17	17	17																																																												
1.101 – 1.120 (0.0433 – 0.0441)	17	17	17																																																														
1.121 – 1.140 (0.0441 – 0.0449)	17	17																																																															
1.141 – 1.160 (0.0449 – 0.0457)	17																																																																
1.161 – 1.170 (0.0457 – 0.0461)	17																																																																

Exhaust valve clearance (Cold):
0.27 – 0.37 mm (0.011 – 0.014 in.)

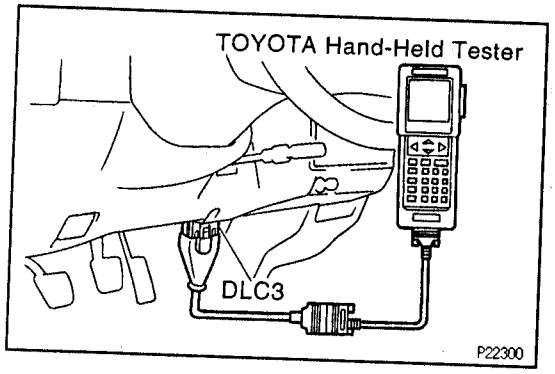
EXAMPLE: The 2.800 mm (0.1102 in.) shim is installed, and measured clearance is 0.450 mm (0.0177 in.). Replace the 2.800 mm (0.1102 in.) shim with a No. 10 shim.

New shim thickness mm (in.)

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

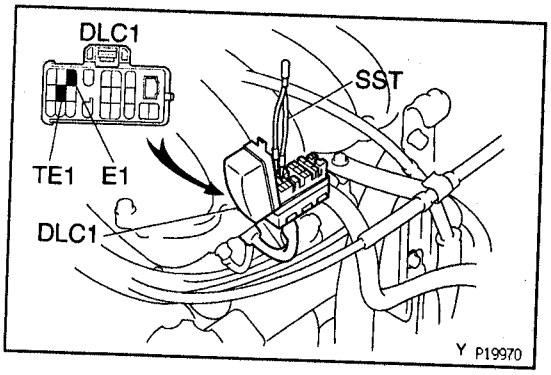
HINT: New shims have the thickness in millimeters imprinted on the face.

V06209

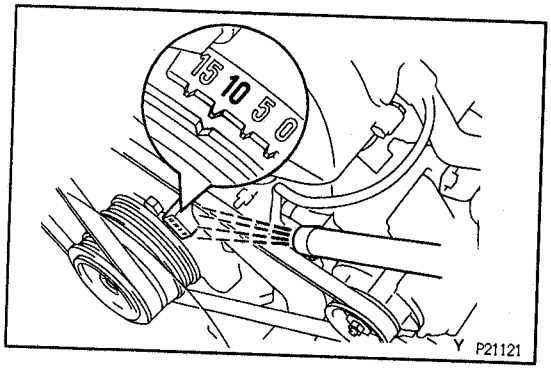


IGNITION TIMING INSPECTION

1. **WARM UP ENGINE** EG0S5–02
   Allow the engine to warm up to normal operating temperature.
2. **CONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL**
   (a) Connect the TOYOTA hand–held tester or OBD II scan tool to the DLC3.
   (b) Please refer to the TOYOTA hand–held tester or OBD II scan tool operator's manual for further details.
3. **CONNECT TIMING LIGHT TO ENGINE**
4. **CHECK IDLE SPEED**
   (a) Race the engine speed at 2,500 rpm for approx. 90 seconds.
   (b) Check the idle speed.
   Idle speed:
   700 ± 50 rpm



5. **INSPECT IGNITION TIMING**
   (a) Using SST, connect terminals TE1 and E1 of the DLC1.
   SST 09843–18020



   (b) Using a timing light, check the ignition timing.
   Ignition timing:
   8 – 12° BTDC @ idle
   (Transmission in neutral position)
   (c) Remove the SST from the DLC1.
   SST 09843–18020
6. **FURTHER CHECK IGNITION TIMING**
   Ignition timing:
   12.5 – 22° BTDC @ idle
   (Transmission in neutral position)
   HINT: The timing mark moves in a range between 12.5° and 22°.
7. **DISCONNECT TIMING LIGHT FROM ENGINE**
8. **DISCONNECT TOYOTA HAND–HELD TESTER OR OBD II SCAN TOOL**

EG

IDLE SPEED INSPECTION

EG506-02

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 (w/ EGR): All vacuum hoses for EGR system, etc. should be properly connected.
(f) SFI system wiring connectors fully plugged
(g) Ignition timing checked 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

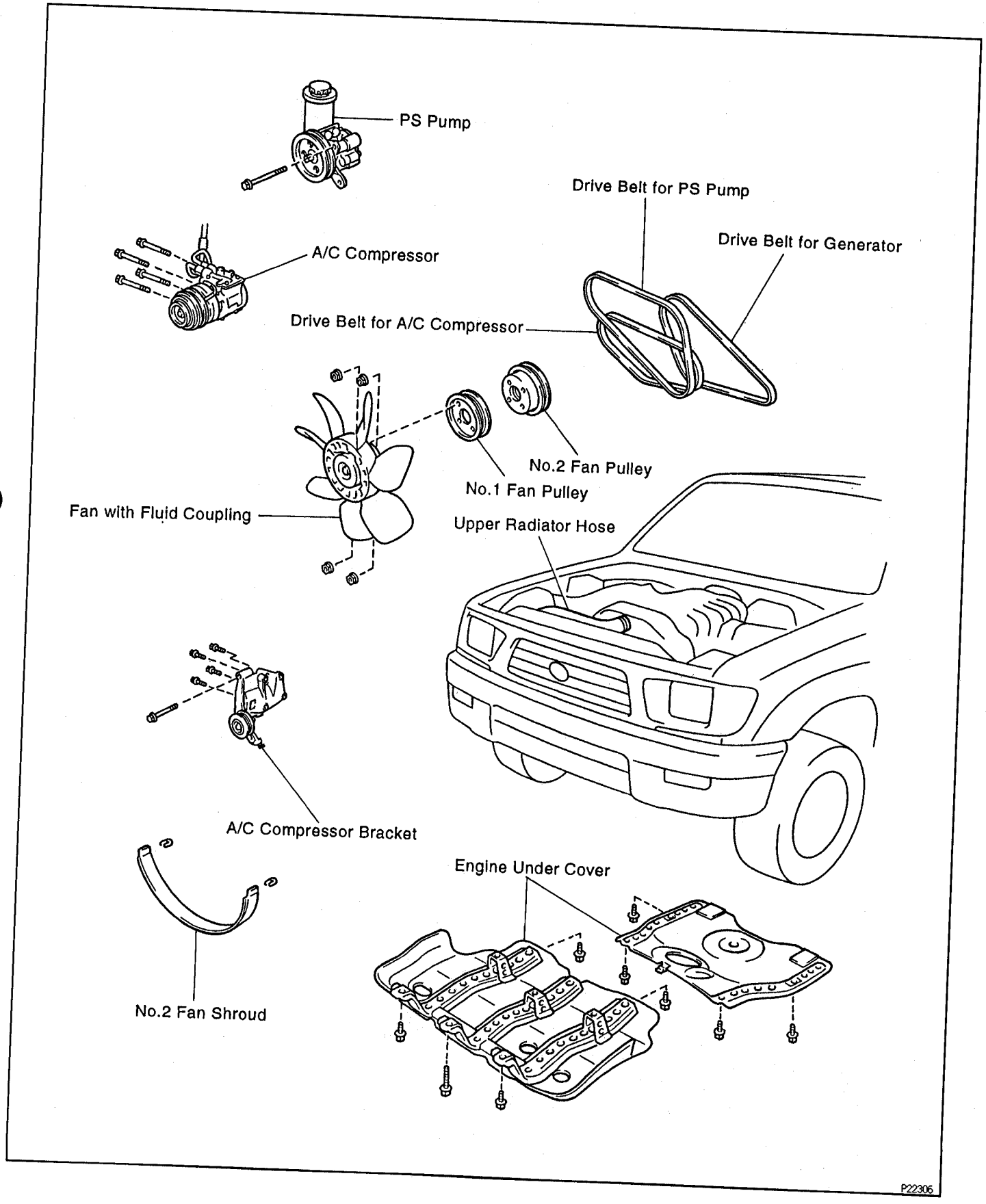
(a) Race the engine speed at 2,500 rpm for approx. 90 seconds.
(b) Check the idle speed.
Idle speed:
700 ± 50 rpm
If the idle speed is not as specified, check the IAC valve and air intake system.

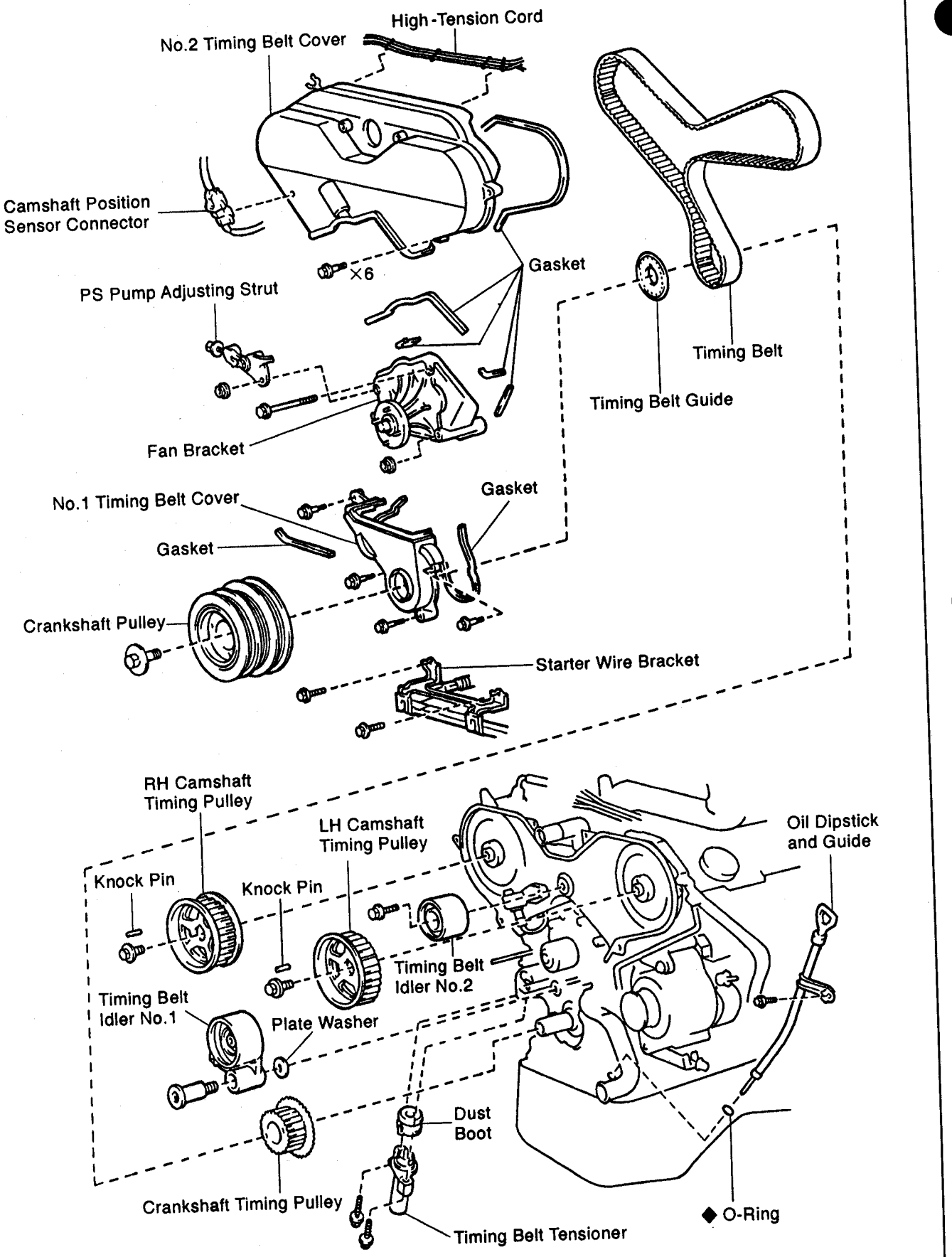
4. DISCONNECT TOYOTA HAND-HELD TESTER OR OBD II SCAN TOOL

TIMING BELT

COMPONENTS FOR REMOVAL AND INSTALLATION

EG571-04





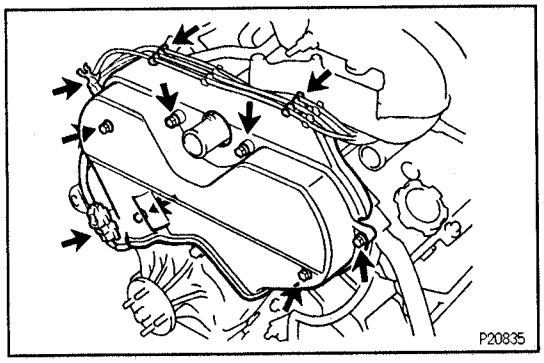
◆ Non-reusable part

P24354

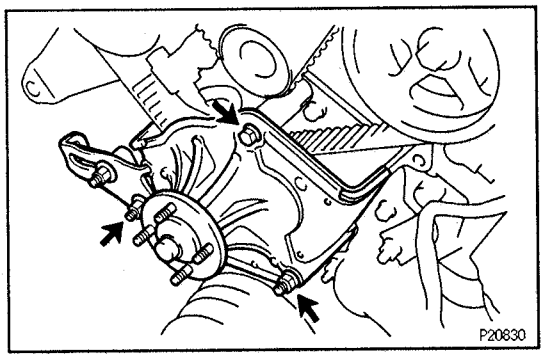
EG572-03

TIMING BELT REMOVAL

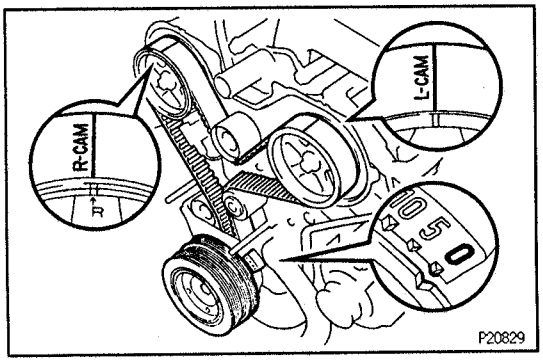
1. REMOVE ENGINE UNDER COVER
2. DRAIN ENGINE COOLANT
3. DISCONNECT UPPER RADIATOR HOSE
4. REMOVE DRIVE BELT FOR PS PUMP
5. w/ A/C:
   REMOVE DRIVE BELT FOR A/C COMPRESSOR
6. REMOVE DRIVE BELT FOR GENERATOR
7. REMOVE NO.2 FAN SHROUD
8. REMOVE FAN WITH FLUID COUPLING AND FAN PULLEYS
9. DISCONNECT PS PUMP FROM ENGINE
10. w/ A/C:
    DISCONNECT A/C COMPRESSOR FROM ENGINE
11. w/ A/C:
    REMOVE A/C COMPRESSOR BRACKET
12. REMOVE OIL DIPSTICK AND GUIDE
    Remove the bolt, oil dipstick, guide and O-ring.



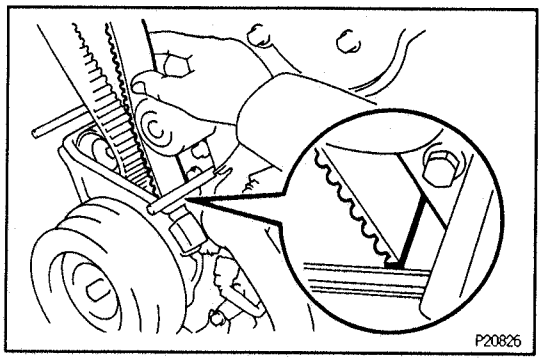
13. REMOVE NO.2 TIMING BELT COVER
(a) Disconnect the camshaft position sensor connector, 3 high-tension cord clamps and PS pump hose from the No.2 timing belt cover.
(b) Remove the 6 bolts and timing belt cover.



14. REMOVE FAN BRACKET
(a) Remove the nut and PS pump adjusting strut.
(b) Remove the bolt, nut, and fan bracket.

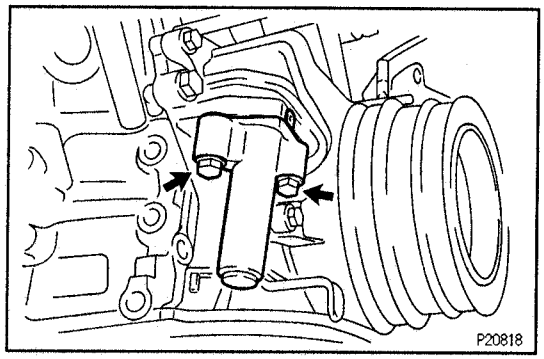


15. SET NO.1 CYLINDER AT TDC/COMPRESSION
(a) Turn the crankshaft pulley and align its groove with timing mark "0" of the No.1 timing belt cover.
(b) Check that the timing marks of the camshaft timing pulleys and No.3 timing belt cover are aligned.
If not, turn the crankshaft pulley 1 revolution (360°).



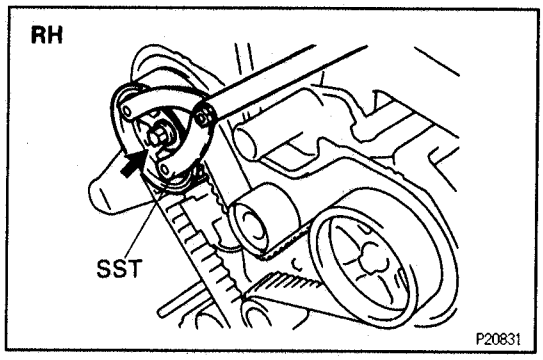
HINT (When re-using timing belt): Place the matchmarks on the timing belt and camshaft timing pulleys, and place matchmark on timing belt to match the end of the No.1 timing belt cover.

EG



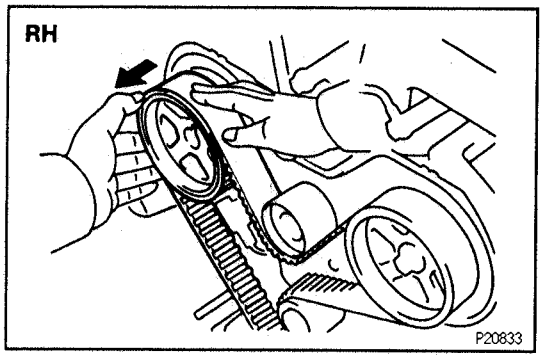
16. REMOVE TIMING BELT TENSIONER

Alternately loosen the 2 bolts and remove them, then remove the belt tensioner and dust boot.

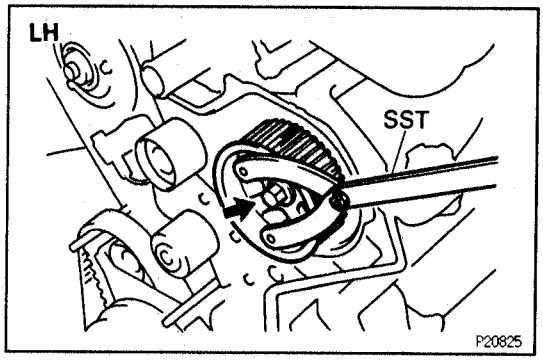


17. REMOVE RH CAMSHAFT TIMING PULLEY WITH TIMING BELT

(a) Using SST, loosen the pulley bolt.
SST 09960-10010 (09962-01000, 09963-01000)



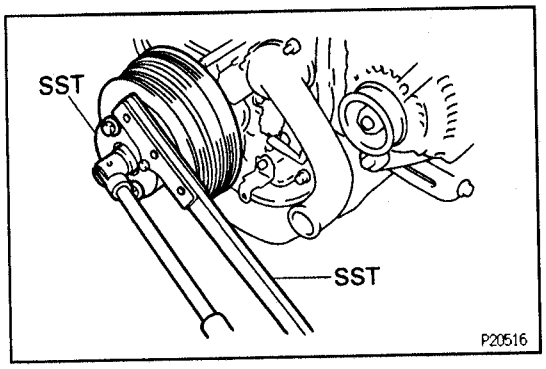
(b) Remove the bolt, knock pin and camshaft timing pulley with timing belt.



18. REMOVE LH CAMSHAFT TIMING PULLEY

(a) Using SST, loosen the pulley bolt.
SST 09960-10010 (09962-01000, 09963-01000)

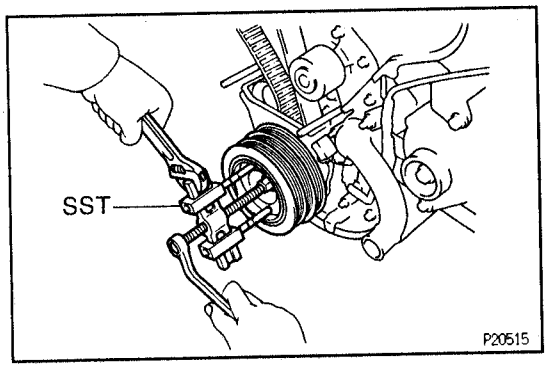
(b) Remove the bolt, knock pin and camshaft timing pulley.



19. REMOVE CRANKSHAFT PULLEY

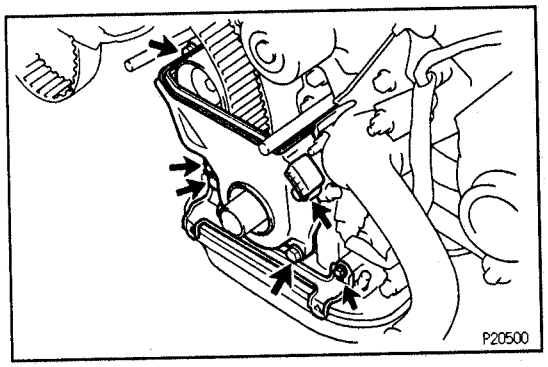
(a) Using SST, loosen the pulley bolt.
SST 09213-54015 (90119-08216),
09330-00021

(b) Remove the SST, pulley bolt and pulley.



HINT: If necessary, remove the pulley with SST and service bolt.
SST 09950-50010 (09551-05010, 09552-05010, 09553-05020, 09554-05030)

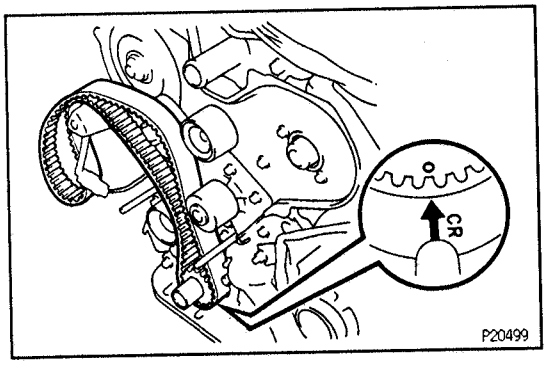
EG



20. REMOVE STARTER WIRE BRACKET AND NO. 1 TIMING BELT COVER

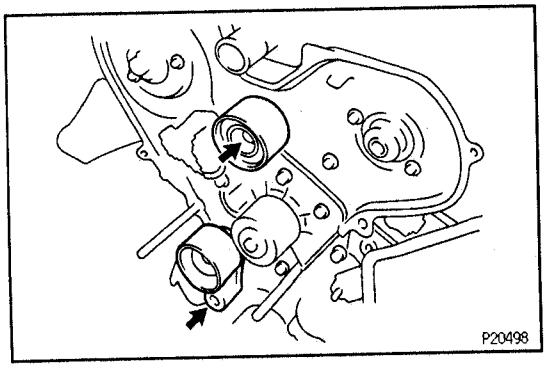
(a) Remove the 2 bolts and starter wire bracket.
(b) Remove the 4 bolts and timing belt cover.

21. REMOVE TIMING BELT GUIDE



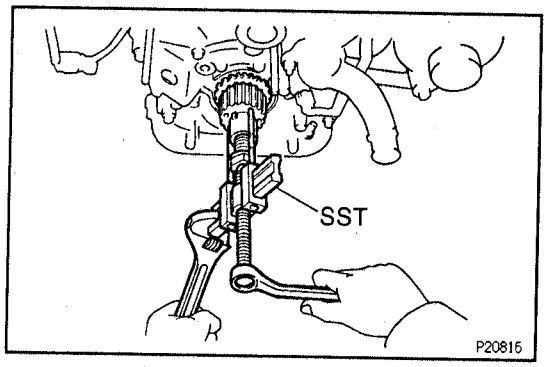
22. REMOVE TIMING BELT

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



23. REMOVE TIMING BELT IDLER NO.2 AND TIMING BELT IDLER NO.1

(a) Remove the bolt and timing belt idler No.2.
(b) Using a 10 mm hexagon wrench, remove the pivot bolt, timing belt idler No.1 and plate washer.



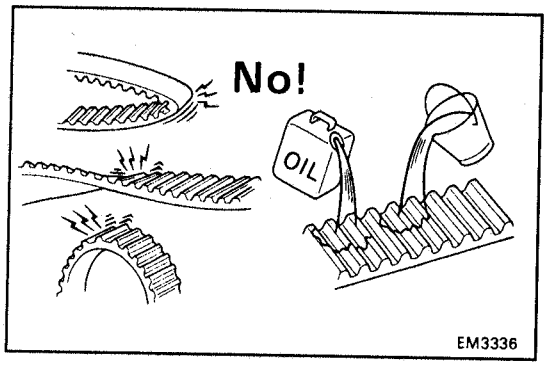
24. REMOVE CRANKSHAFT TIMING PULLEY

Remove crankshaft timing pulley.

HINT: If the pulley cannot be removed by hand, use SST and service bolt to remove the crankshaft timing pulley.

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

EG



TIMING BELT INSPECTION

EG5YB-01

1. INSPECT TIMING BELT

NOTICE:

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

If there are any defects, as shown in the illustrations, check these points:

(a) Premature parting
- Check for proper installation.
- Check the timing cover gasket for damage and proper installation.

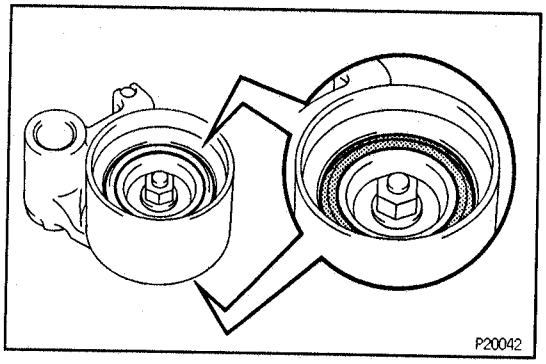
(b) If the belt teeth are cracked or damaged, check to see if either camshaft is locked.

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

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

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

If necessary, replace the timing belt.



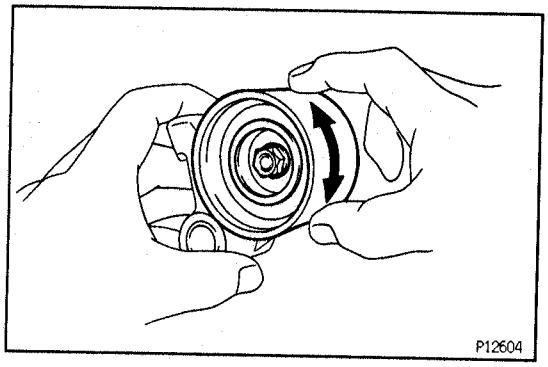
2. INSPECT IDLER PULLEYS

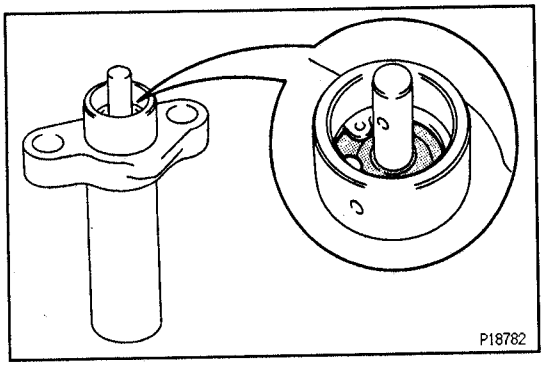
(a) Visually check the seal portion of the idler pulley for oil leakage.

If leakage is found, replace the idler pulley.

(b) Check that the idler pulley turns smoothly.

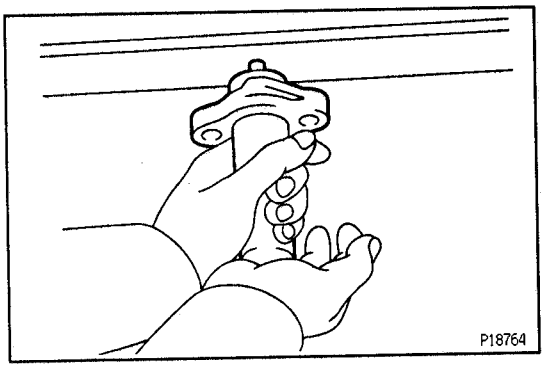
If necessary, replace the idler pulley.



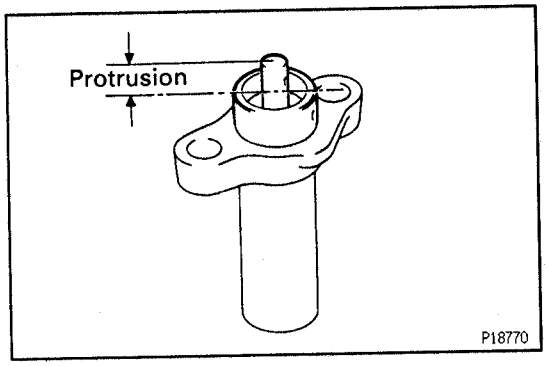


3. INSPECT TIMING BELT TENSIONER

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



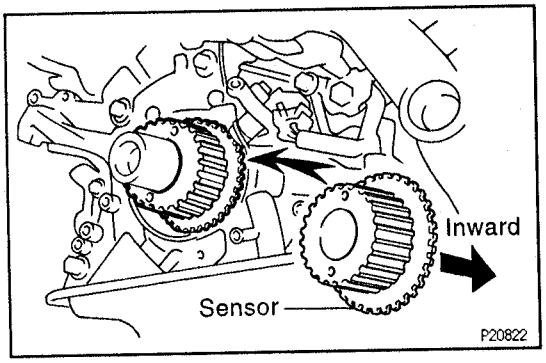
(b) Hold the tensioner with both hands and push the push rod strongly as shown to check that it doesn't move.
If the push rod moves, replace the tensioner.
NOTICE: Never hold the tensioner push rod facing downward.



(c) Measure the protrusion of the push rod from the housing end.
Protrusion:
10.0 – 10.8 mm (0.394 – 0.425 in.)
If the protrusion is not as specified, replace the tensioner.

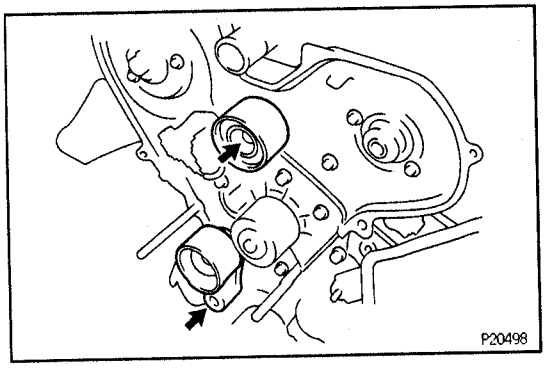
EG574-03

TIMING BELT INSTALLATION



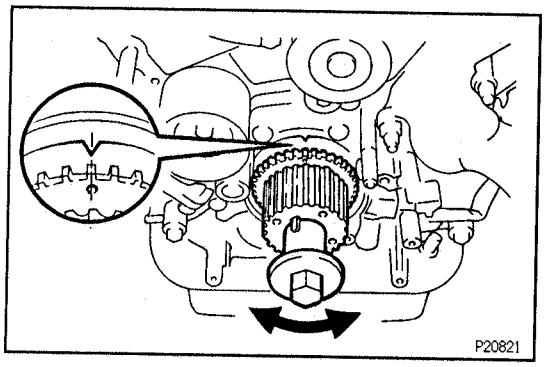
1. INSTALL CRANKSHAFT TIMING PULLEY

(a) Align the pulley set key with the key groove of the timing pulley and slide on the timing pulley.
(b) Slide on the timing pulley, facing the flange side inward.



2. INSTALL TIMING BELT IDLER NO.1 AND TIMING BELT IDLER NO.2

(a) Using a 10 mm hexagon wrench, install the timing belt idler No.1 with the plate washer and bolt.
Torque: 35 N·m (350 kgf·cm, 26 ft·lbf)
(b) Check that the pulley bracket moves smoothly.
(c) Install the timing belt idler No.2 with the bolt.
Torque: 40 N·m (400 kgf·cm, 30 ft·lbf)
(d) Check that the timing belt idler No.2 moves smoothly.



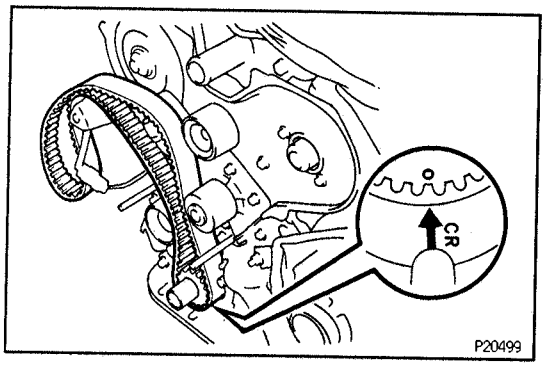
3. TEMPORARILY INSTALL TIMING BELT

NOTICE: The engine should be cold.

(a) Use the crankshaft pulley bolt to turn the crankshaft and align the timing marks on the crankshaft timing pulley and on the oil pump body.

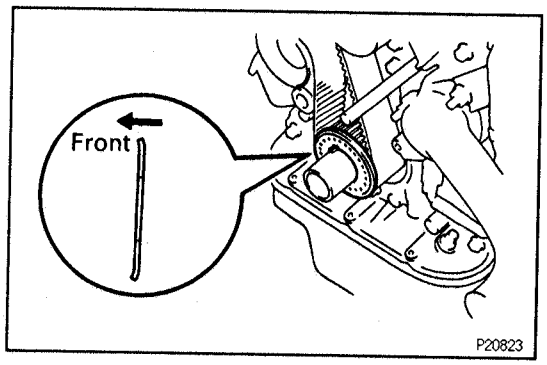
(b) Remove any oil or water on the crankshaft timing pulley, idler pulley and water pump pulley, and keep them clean.

EG



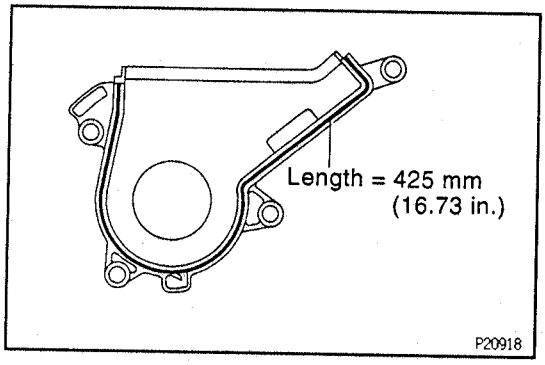
(c) Align the installation mark on the timing belt with the drilled mark of the crankshaft timing pulley.

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



4. INSTALL TIMING BELT GUIDE

Install the guide, facing the cup side outward.



5. INSTALL NO.1 TIMING BELT COVER AND STARTER WIRE BRACKET

(a) Check that the timing belt cover gaskets have cracks or peeling, etc.

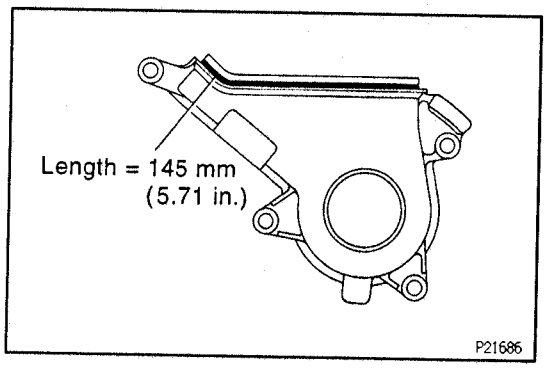
If the gasket does have cracks or peeling, etc., replace it using following steps.

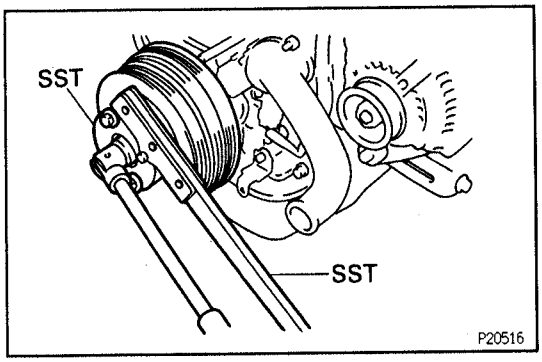
- Using a screwdriver and gasket scraper, remove all the old gasket material.
- Thoroughly clean all components to remove all the loose material.
- Remove the backing paper from a new gasket and install the gasket evenly to the part of the belt cover shaded back in the illustration.

(b) Install the timing belt cover with the 4 bolts.

Torque: 9 N·m (90 kgf·cm, 80 in.·lbf)

(c) Install the starter wire bracket with the 2 bolts.

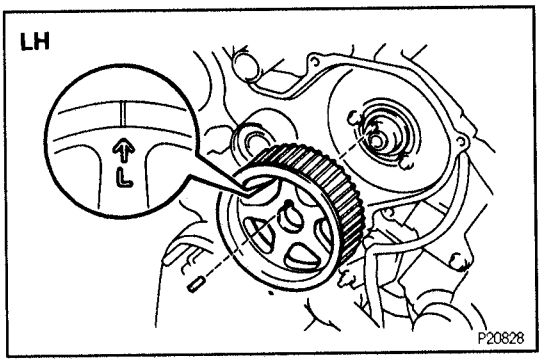




6. INSTALL CRANKSHAFT PULLEY

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

(b) Using SST, install and torque the bolt.
SST 09213–54015 (90119–08216),
09330–00021
Torque: 250 N·m (2,500 kgf·cm, 184 ft·lbf)



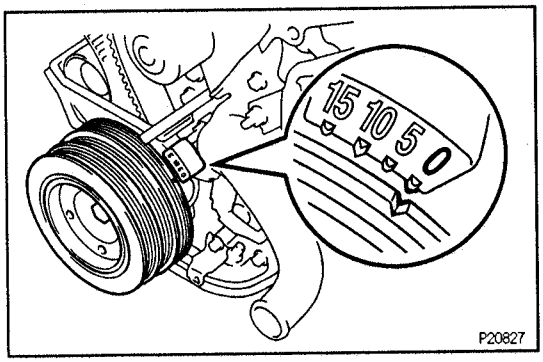
7. INSTALL LH CAMSHAFT TIMING PULLEY

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

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

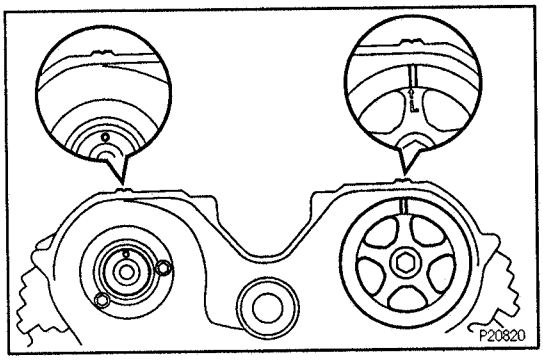
(c) Install the knock pin.

(d) Using SST, install and torque the bolt.
SST 09960–10010 (09962–01000, 09963–01000)
Torque: 110 N·m (1,100 kgf·cm, 81 ft·lbf)



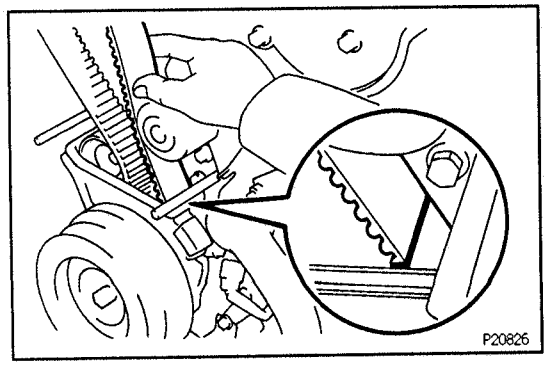
8. SET NO.1 CYLINDER TO TDC/COMPRESSION

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



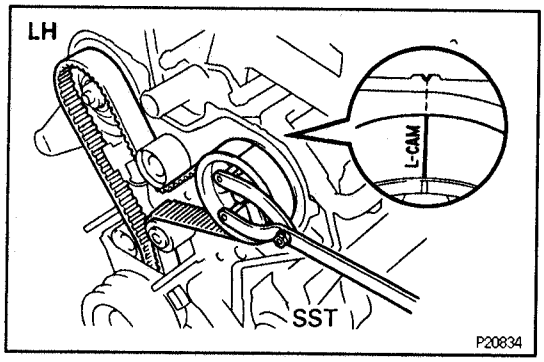
(b) (RH Camshaft Position)
Turn the camshaft, and align the knock pin hole of the camshaft with the timing mark of the No.3 timing belt cover.

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



9. INSTALL TIMING BELT TO LH CAMSHAFT TIMING PULLEY

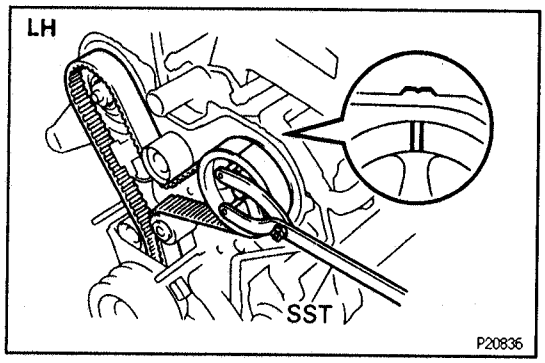
(a) HINT (When re–using timing belt):
Check that the installation mark on the timing belt matches the end of the No.1 timing belt cover.
If the installation mark does not align, shift the meshing of the timing belt and crankshaft timing pulley until they align.



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

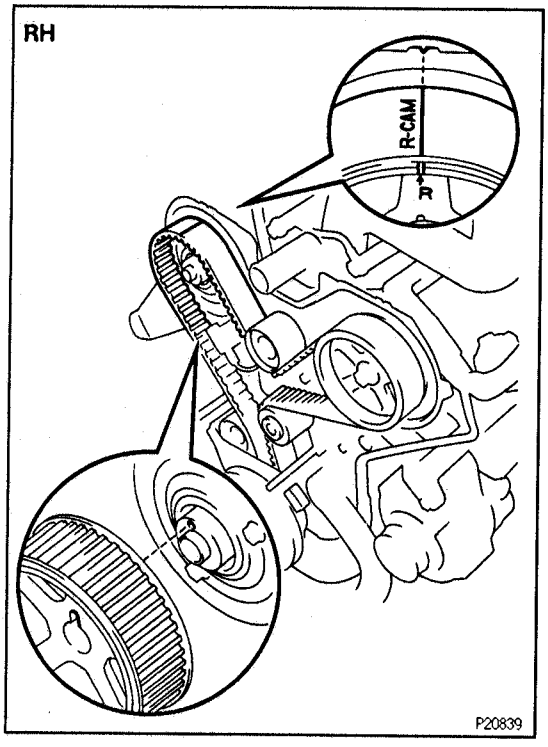
(c) Using SST, slightly turn the LH camshaft timing pulley clockwise. Align the installation mark on the timing belt with the timing mark of the camshaft timing pulley, and hang the timing belt on the LH camshaft timing pulley.
SST 09960–10010 (09962–01000, 09963–01000)

EG



(d) Using SST, align the timing marks of the LH camshaft pulley and No.3 timing belt cover.
SST 09960–10010 (09962–01000, 09963–01000)

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

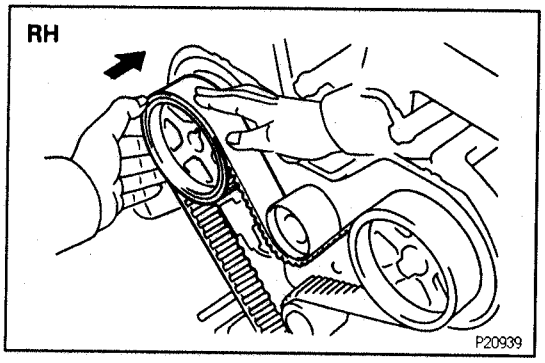


10. INSTALL RH CAMSHAFT TIMING PULLEY AND TIMING BELT

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

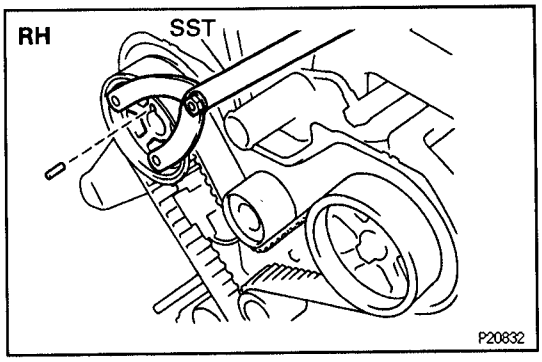
(b) Align the installation mark on the timing belt with the timing mark of the RH camshaft timing pulley as shown.

(c) Hang the timing belt on the RH camshaft timing pulley.



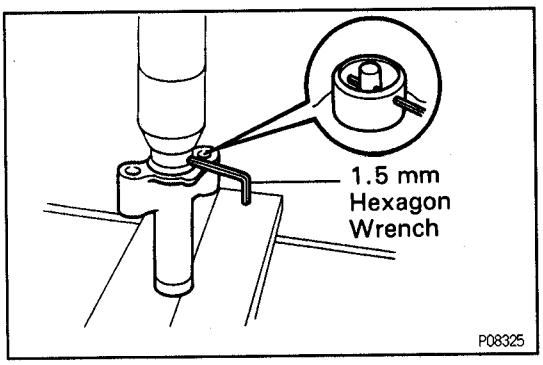
(d) Align the timing marks of the RH camshaft timing pulley and No.3 timing belt cover.

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



(f) Using SST, align the knock pin hole of the camshaft with the knock pin groove marked R of the pulley and install the knock pin.
SST 09960-10010 (09962-01000, 09963-01000)

(g) Using SST, install and torque the bolt.
SST 09960-10010 (09962-01000, 09963-01000)
Torque: 110 N·m (1,100 kgf·cm, 81 ft·lbf)



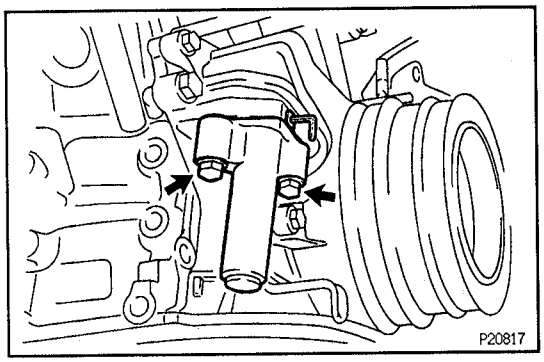
11. SET TIMING BELT TENSIONER

(a) Using a press, slowly press in the push rod using 100 – 1,000 kg (220 – 2,205 lb, 981 – 9,807 N) of pressure.

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

(c) Release the press.

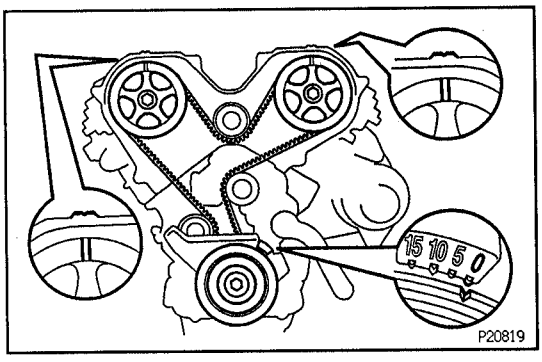
(d) Install the dust boot to the tensioner.



12. INSTALL TIMING BELT TENSIONER

(a) Install the tensioner with the 2 bolts.
Torque: 27 N·m (270 kgf·cm, 20 ft·lbf)

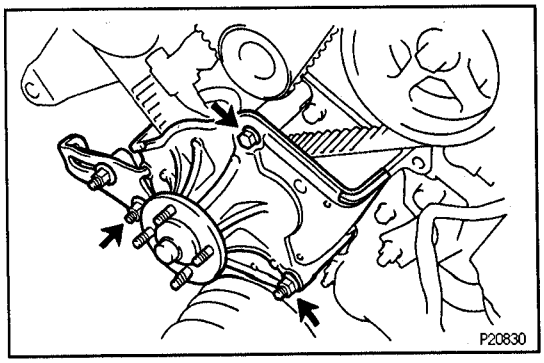
(b) Remove the 1.5 mm hexagon wrench from the tensioner.



13. CHECK VALVE TIMING

(a) Turn the crankshaft pulley 2 revolutions from TDC to TDC.
HINT: Always turn the crankshaft clockwise.

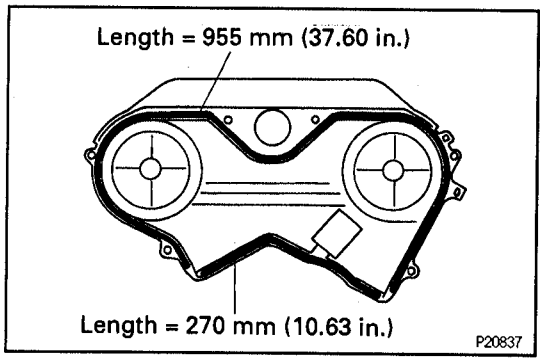
(b) Check that each pulley aligns with the timing marks as shown in the illustration.
If the marks do not align, remove the timing belt and reinstall it.



14. INSTALL FAN BRACKET

(a) Install the fan bracket with the bolt and nut.

(b) Install the PS pump adjusting strut with the nut.



15. INSTALL NO.2 TIMING BELT COVER

(a) Check that the timing belt cover gasket has no cracks or peeling, etc.
If the gasket does have cracks or peeling, etc., replace it using following steps.
- Using a screwdriver and gasket scraper, remove all the old gasket material.
- Thoroughly clean all components to remove all the loose material.
- Remove the backing paper from a new gasket and install the gasket evenly to the part of the belt cover shaded black in the illustration.

(b) Install the belt cover with the 6 bolts.
Torque: 9 N·m (90 kgf·cm, 80 in.·lbf)

(c) Connect the PS pump hose, 3 high–tension cord clamps and camshaft position sensor connector to the No.2 timing belt cover.

16. INSTALL OIL DIPSTICK AND GUIDE

(a) Install a new O–ring to the dipstick guide.

(b) Install the oil dipstick and guide to the cylinder block.

(c) Install the bolt to the generator bracket.
Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)

17. w/ A/C:
INSTALL A/C COMPRESSOR BRACKET

18. w/ A/C:
CONNECT A/C COMPRESSOR TO ENGINE

19. CONNECT PS PUMP TO ENGINE

20. INSTALL FAN WITH FLUID COUPLING AND FAN PULLEYS
Torque: 5.4 N·m (54 kgf·cm, 48 in.·lbf)

21. INSTALL NO.2 FAN SHROUD

22. INSTALL AND ADJUST DRIVE BELT FOR GENERATOR
(See step 4 in on–vehicle inspection in Charging System)

23. w/ A/C:
INSTALL AND ADJUST DRIVE BELT FOR A/C COMPRESSOR

24. INSTALL AND ADJUST DRIVE BELT FOR PS PUMP

25. CONNECT UPPER RADIATOR HOSE

26. FILL ENGINE WITH COOLANT

27. START ENGINE CHECK FOR LEAKS

28. INSTALL ENGINE UNDER COVER

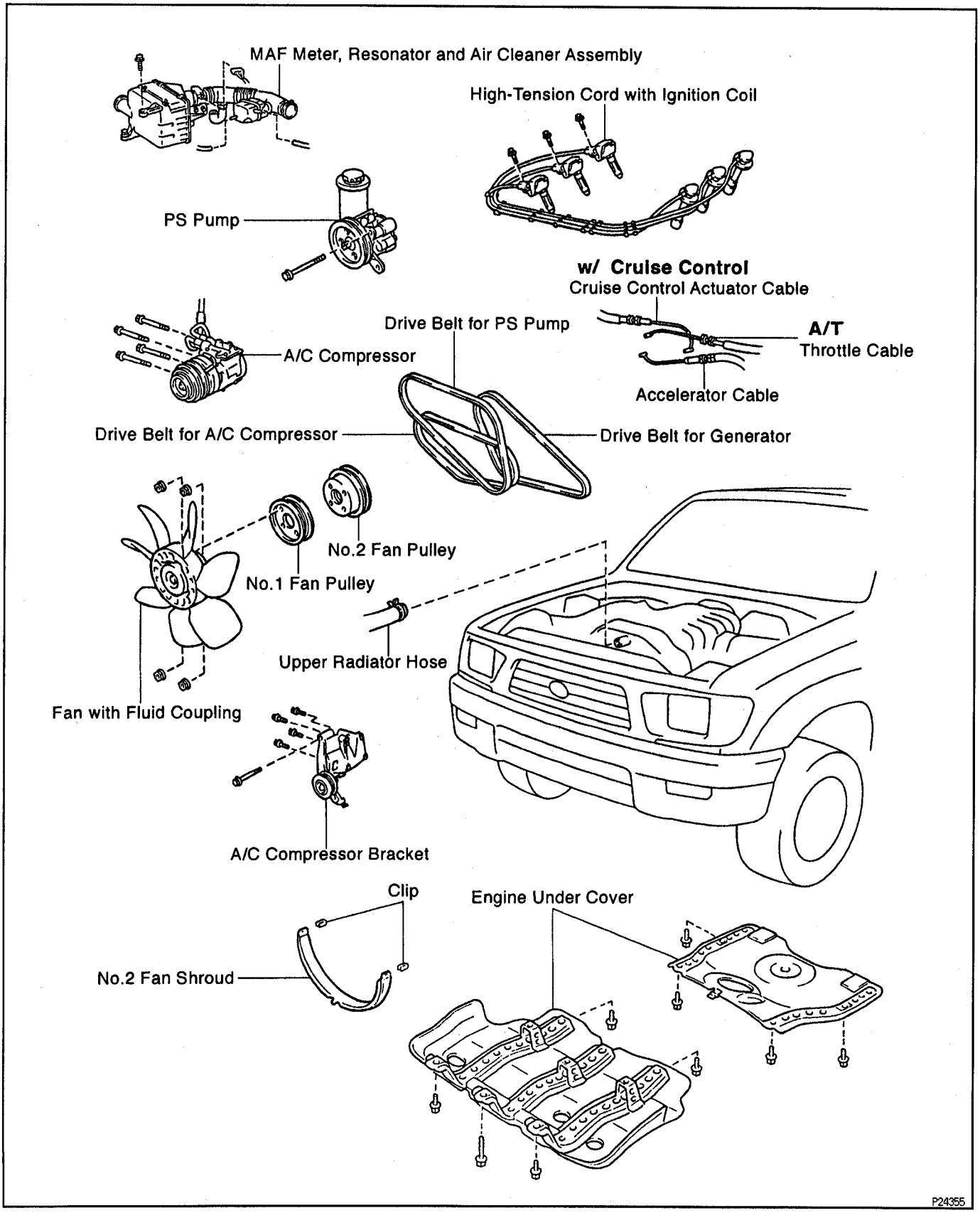
29. ROAD TEST VEHICLE
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

30. RECHECK ENGINE COOLANT LEVEL

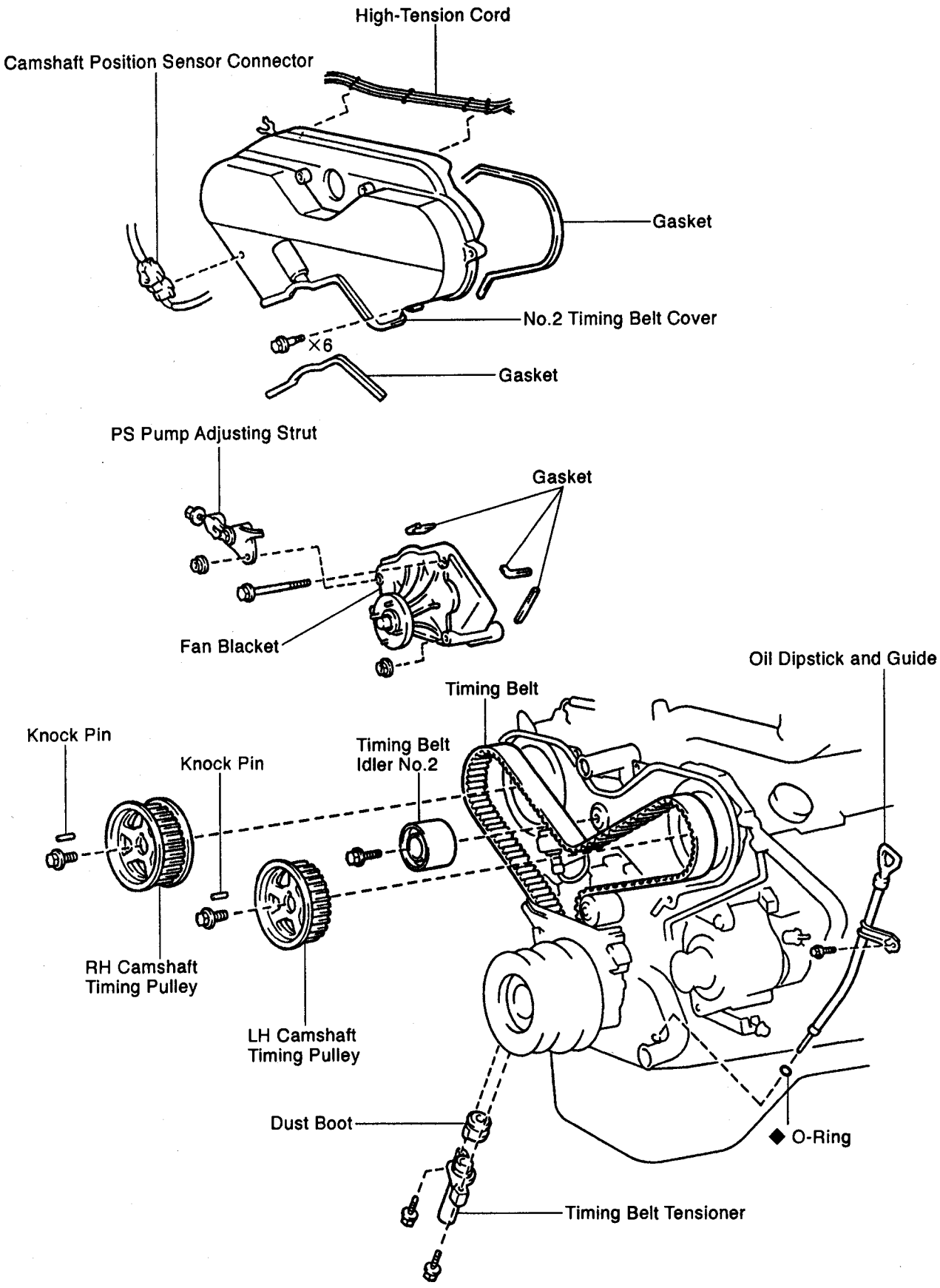
CYLINDER HEADS

COMPONENTS FOR REMOVAL AND INSTALLATION

EG0006-04

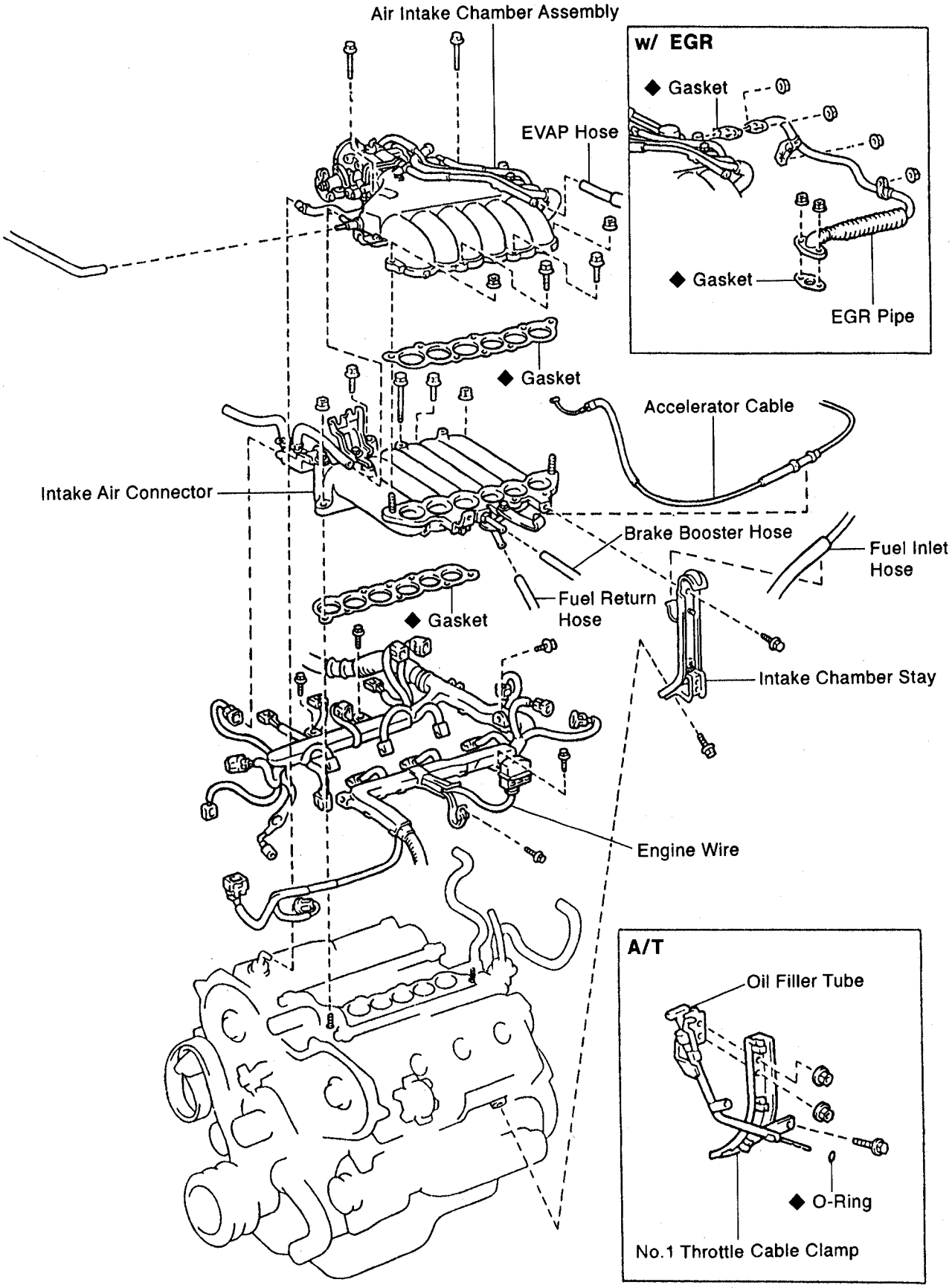


EG



◆ Non-reusable part

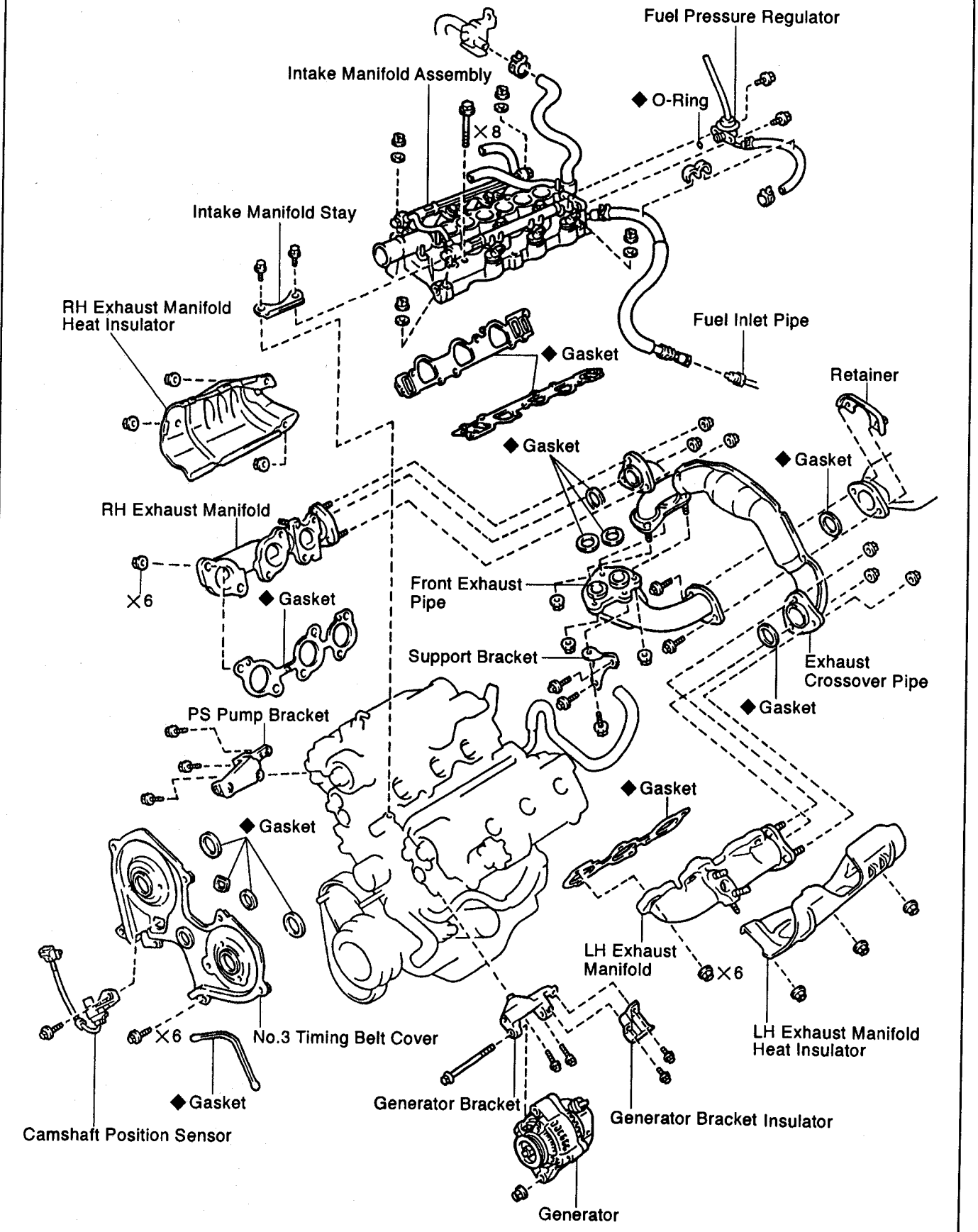
P24356

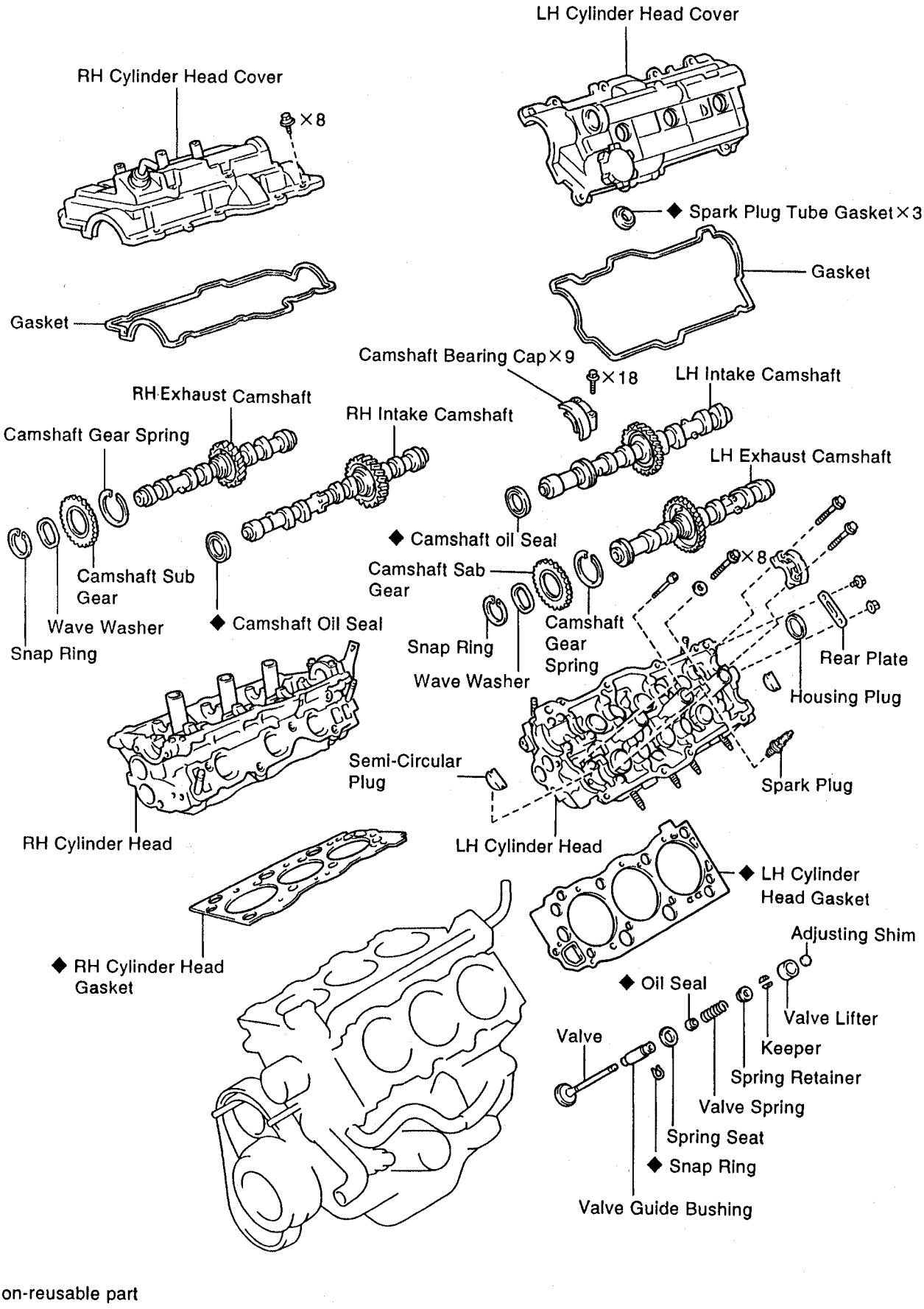


◆ Non-reusable part

P24344

EG


Fuel Pressure Regulator
Intake Manifold Assembly
◆ O-Ring
×8
Intake Manifold Stay
RH Exhaust Manifold Heat Insulator
Fuel Inlet Pipe
◆ Gasket
Retainer
◆ Gasket
◆ Gasket
RH Exhaust Manifold
×6
◆ Gasket
Front Exhaust Pipe
Support Bracket
Exhaust Crossover Pipe
◆ Gasket
PS Pump Bracket
◆ Gasket
◆ Gasket
LH Exhaust Manifold
×6
×6
No.3 Timing Belt Cover
LH Exhaust Manifold Heat Insulator
◆ Gasket
Generator Bracket
Generator Bracket Insulator
Camshaft Position Sensor
Generator
◆ Non-reusable part
P24357



◆ Non-reusable part

P21780

EG

BQ5YC–01

CYLINDER HEADS REMOVAL

1. **REMOVE ENGINE UNDER COVER**
2. **DRAIN ENGINE COOLANT**
3. **REMOVE FRONT EXHAUST PIPE**
   (See step 18 in engine with transmission removal in cylinder block)
4. **DISCONNECT HEATER HOSE**
5. **REMOVE HIGH–TENSION CORDS WITH IGNITION COILS AND SPARK PLUGS**
6. **REMOVE TIMING BELT, CAMSHAFT TIMING PULLEYS AND TIMING BELT IDLER NO.2**
   (See steps 4 to 19, and 20 in timing belt removal)
7. **REMOVE AIR CLEANER CAP, MAF METER AND RESONATOR**
8. **DISCONNECT THESE CABLES:**

(a) w/ Cruise control:
Cruise control actuator cable
(b) Accelerator cable
(c) A/T:
Throttle cable

9. **REMOVE GENERATOR**
   (See generator removal in Charging System)
10. **w/ EGR:**
    REMOVE EGR PIPE
    Remove the 6 nuts, EGR pipe and 2 gaskets.
11. **REMOVE INTAKE CHAMBER STAY**

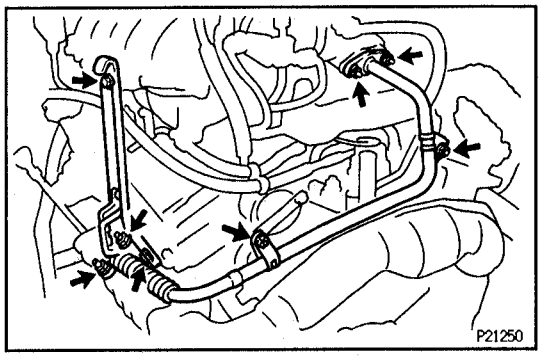
(a) A/T:
Remove the 2 nuts and bolt, oil filler tube, No.1 thortle cable clamp and O–ring.
(b) Remove the 2 bolts and intake chamber stay.

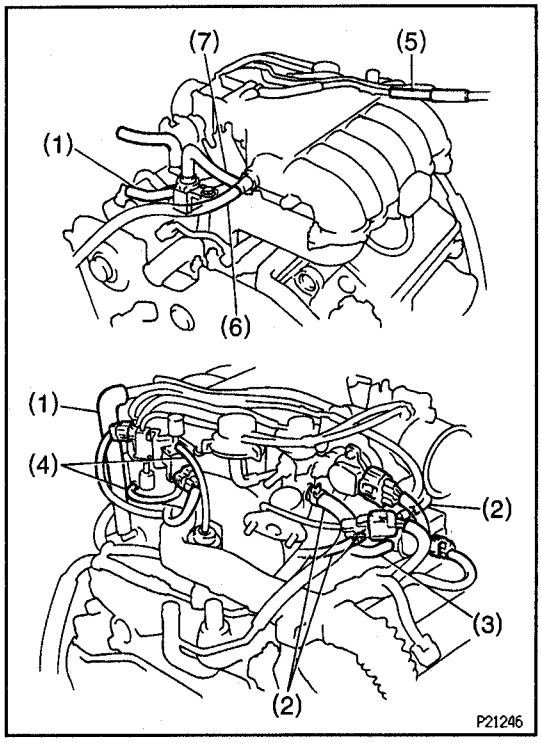
12. **REMOVE AIR INTAKE CHAMBER ASSEMBLY**

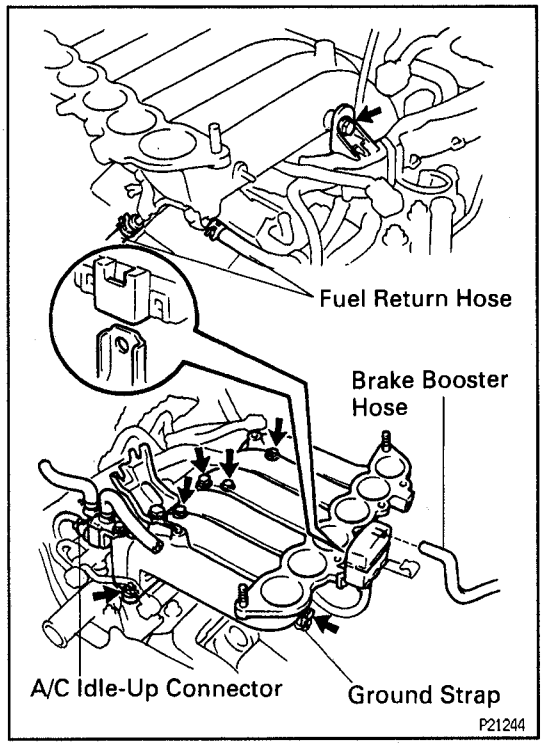
(a) Disconnect these connectors:
- VSV connector for fuel pressure control
- Throttle position sensor connector
- IAC valve connector

w/ EGR:
- EGR gas temperature sensor connector
- VSV connector for EGR

(b) Disconnect these hoses:
(1) 2 PCV hoses
(2) 2 water bypass hoses
(3) Air assist hose from throttle body
(4) 2 Vacuum sensing hoses from VSV
(5) EVAP hose
(6) Air hose from PS pump
w/ A/C:
(7) Air hose from A/C idle–up valve



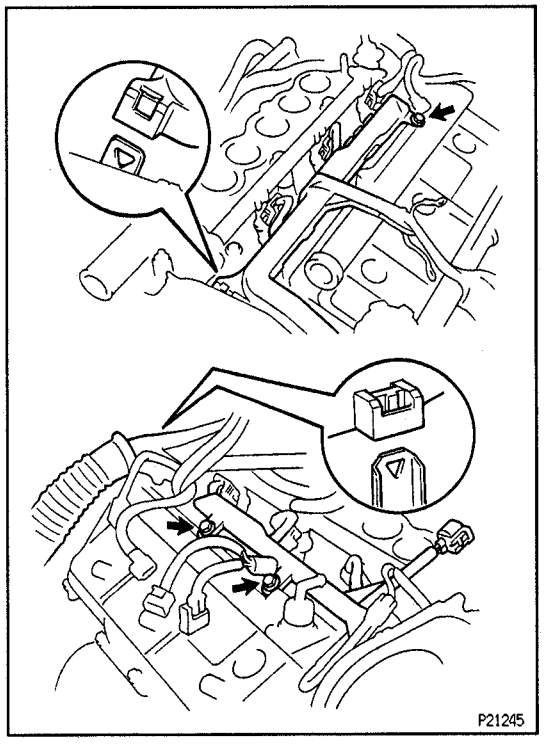




(c) Remove the 4 bolts, 2 nuts, the air intake chamber assembly and gasket.

13. REMOVE INTAKE AIR CONNECTOR

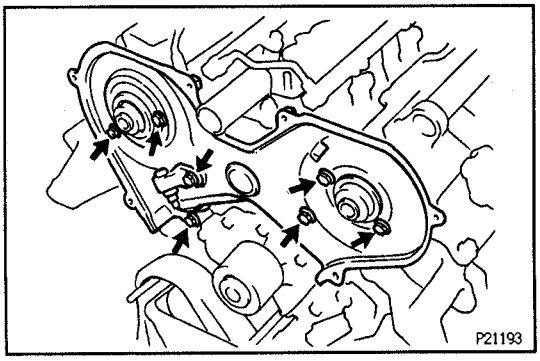
(a) Remove the bolt and disconnect the engine wire.
(b) Disconnect the 2 fuel return hoses.
(c) Disconnect the brake booster vacuum hose from the intake air connector.
(d) Remove the bolt and disconnect the ground strap from the intake air connector.
(e) Disconnect the DLC1 from the bracket.
(f) w/ A/C:
Disconnect the A/C idle–up valve connector.
(g) Remove the 3 bolts and 2 nuts, then intake air connector and gasket.



14. DISCONNECT ENGINE WIRE

(a) Disconnect these connectors:
- Oil pressure sensor connector
- Crankshaft position sensor connector
- 6 injector connectors
- ECT sender gauge connector
- ECT sensor connector
- Knock sensor connector
- Camshaft position sensor connector

(b) Disconnect the 3 engine wire clamps.
(c) Remove the 3 bolts, and disconnect the engine wire from the cylinder head.



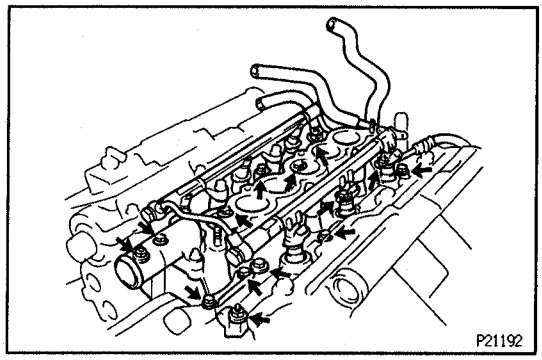
15. REMOVE CAMSHAFT POSITION SENSOR

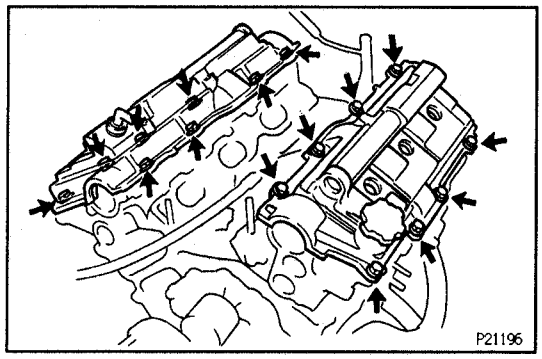
16. REMOVE NO.3 TIMING BELT COVER

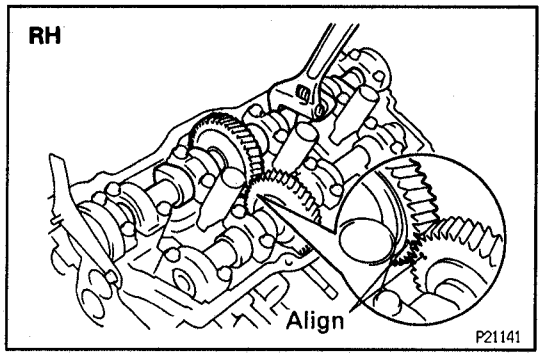
Remove the 6 bolts and timing belt cover.

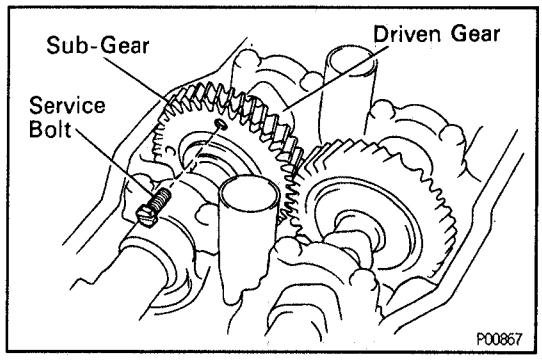
17. REMOVE FUEL PRESSURE REGULATOR

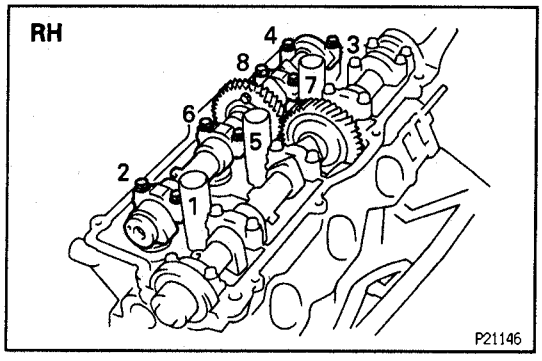
(See step 4 in fuel pressure regulator removal in SFI System)











18. REMOVE INTAKE MANIFOLD ASSEMBLY

(a) Disconnect the fuel inlet hose.

(b) Remove the 2 bolts and the intake manifold stay.

(c) Remove the 8 bolts, 4 nuts, 4 plate washers, the intake manifold, delivery pipes and injectors assembly and 2 gaskets.

19. REMOVE PS PUMP BRACKET

20. REMOVE GENERATOR BRACKET

21. REMOVE EXHAUST CROSSOVER PIPE

Remove the 6 nuts, crossover pipe and 2 gaskets.

22. REMOVE EXHAUST MANIFOLDS

(a) Remove the 6 nuts and exhaust manifold heat insulators.

(b) Remove the 12 nuts, exhaust manifolds and gaskets.

23. REMOVE CYLINDER HEAD COVERS

Remove the 8 bolts, seal washers, cylinder head cover and gasket. Remove the 2 cylinder head covers.

24. 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 of RH cylinder head

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

(b) Align the timing marks (2 dot marks) of the camshaft drive and driven gears by turning the camshaft with a wrench.

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

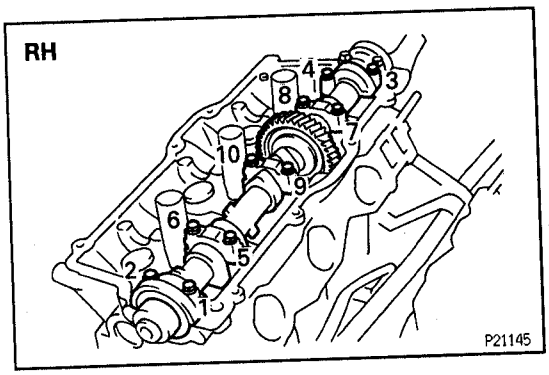
Recommended service bolt:

Thread diameter	6 mm
Thread pitch	1.0 mm
Bolt length	16 – 20 mm

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

(d) Uniformly loosen and remove the 8 bearing cap bolts, in several passes, in the sequence shown.

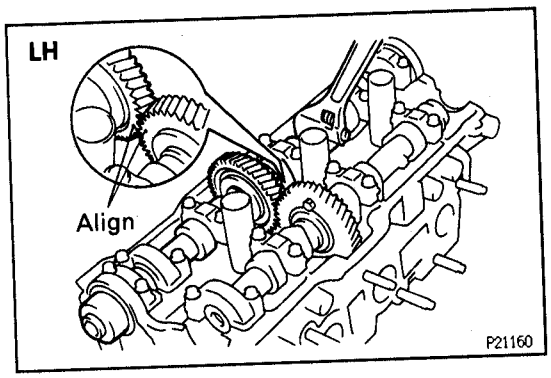
(e) Remove the 4 bearing caps and exhaust camshaft.



B. Remove intake camshaft of RH cylinder head

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

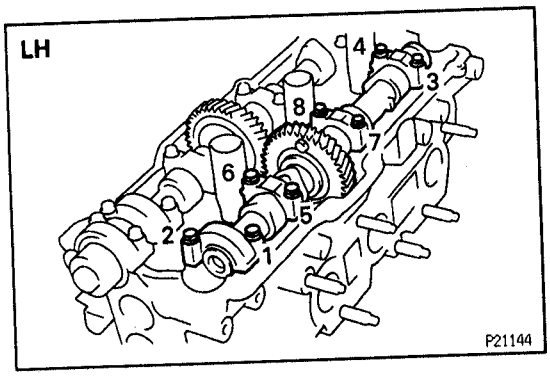
(b) Remove the 5 bearing caps, oil seal and intake camshaft.



C. Remove exhaust camshaft of LH cylinder head

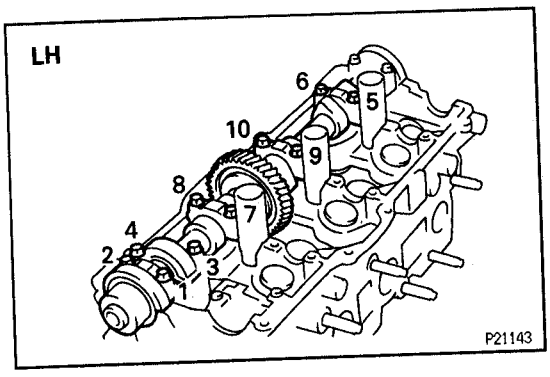
(a) Align the timing marks (1 dot mark) of the camshaft drive and driven gears by turning the camshaft with a wrench.

(b) Secure the exhaust camshaft sub–gear to the main gear with a service bolt.
(See step (c) in step A)



(c) Uniformly loosen and remove the 8 bearing cap bolts, in several passes, in the sequence shown.

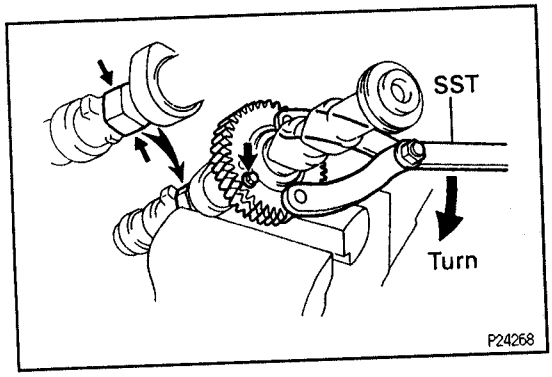
(d) Remove the 4 bearing caps and exhaust camshaft.



D. Remove intake camshaft of LH cylinder head

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

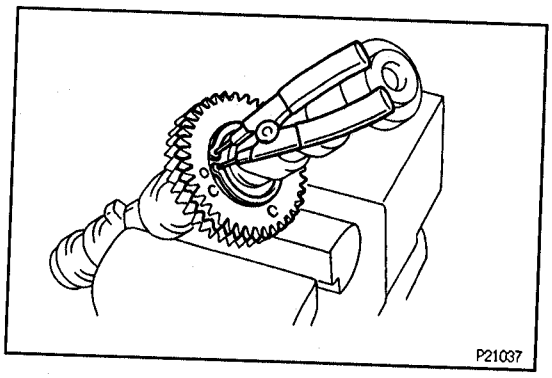
(b) Remove the 5 bearing caps, oil seal and intake camshaft.
HINT:
- Arrange the camshafts in the correct order.
- Arrange the bearing caps in the correct order.



25. DISASSEMBLE EXHAUST CAMSHAFTS

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

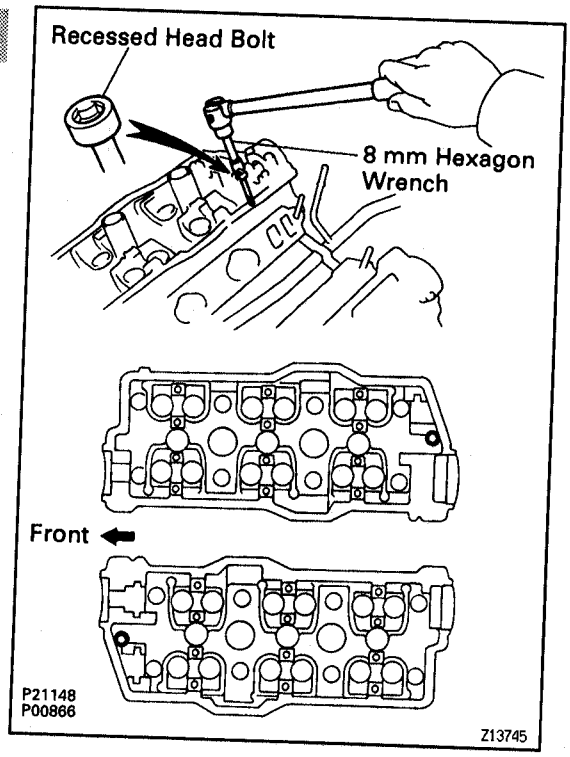
(b) Using SST, turn the sub–gear clockwise and remove the service bolt.
SST 09960–10010 (09962–01000, 09963–00600)



(c) Using snap ring pliers, remove the snap ring.
(d) Remove these parts:
- Wave washer
- Camshaft sub–gear
- Camshaft gear spring

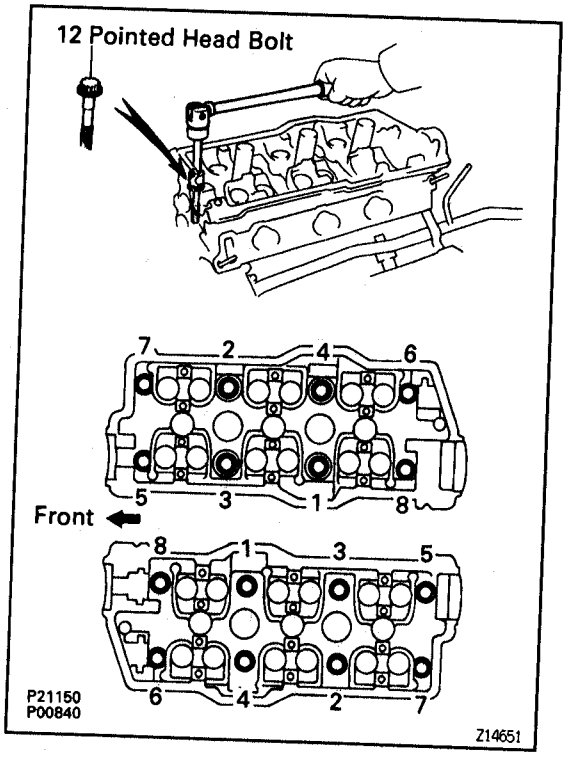
HINT: Arrange the camshaft sub–gears and gear springs (RH and LH side).

EG



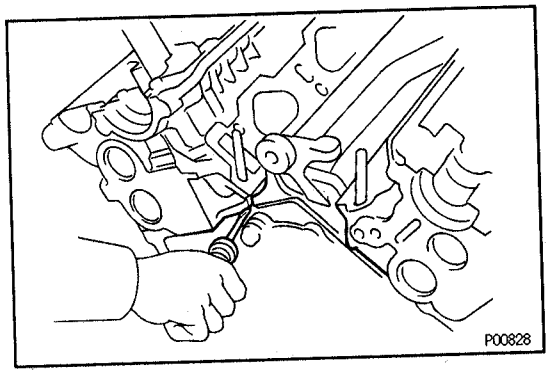
26. REMOVE CYLINDER HEADS

(a) Remove the bolt and disconnect the ground strap.
(b) Using an 8 mm hexagon wrench, remove the cylinder head (recessed head) bolt on each cylinder head, then repeat for the other side, as shown.



(c) Uniformly loosen and remove the 8 cylinder head (12 pointed head) bolts on each cylinder head, in several passes, in the sequence shown, then repeat for the other side, as shown. Remove the 16 cylinder head bolts and plate washers.

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

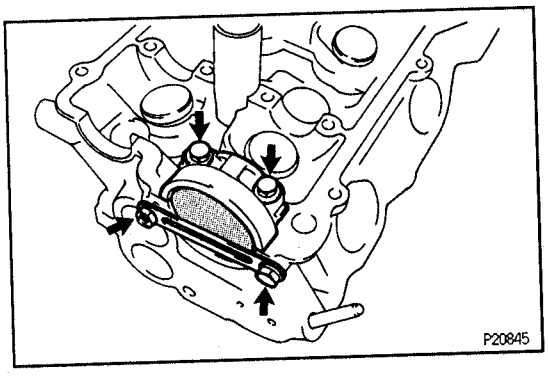


(d) Lift the cylinder head from the dowels on the cylinder block and place the 2 cylinder heads on wooden blocks on a bench.
HINT:
- If the cylinder head is difficult to lift off, pry between the cylinder head and cylinder block with a screwdriver.
- Arrange the cylinder heads in the correct order.

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

EG6YD-01

CYLINDER HEADS DISASSEMBLY

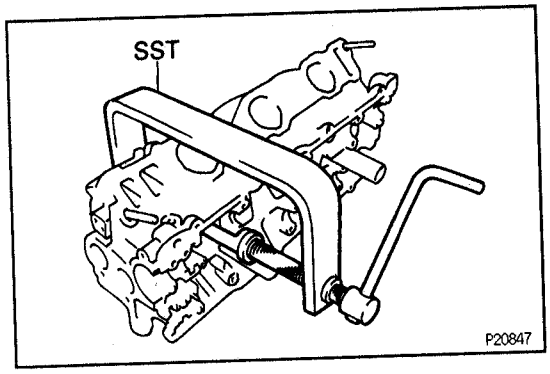


1. REMOVE CAMSHAFT HOUSING PLUGS

(a) Remove the bolt, nut, cylinder head rear plate and ground strap.
(b) Remove the 2 bolts and camshaft bearing cap.
(c) Remove the housing plug.

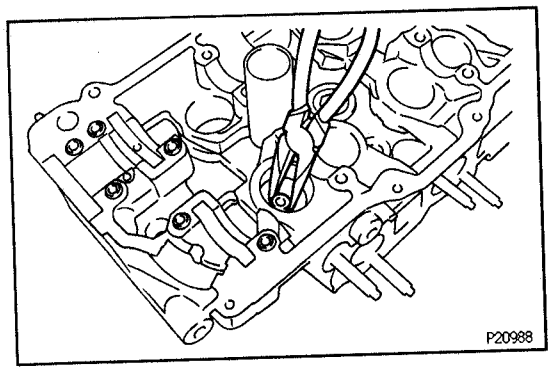
2. REMOVE VALVE LIFTERS AND SHIMS

Pull out the valve lifter and shim by hand.
HINT: Arrange the valve lifters and shims in correct order.

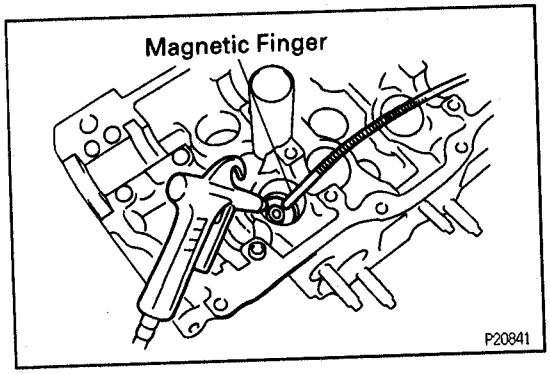


3. REMOVE VALVES

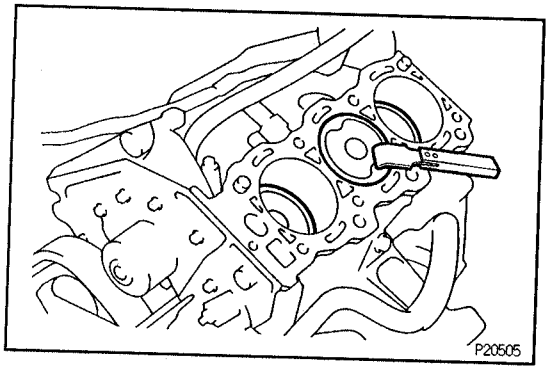
(a) Using SST, compress the valve spring and remove the 2 keepers.
SST 09202-70020 (09202-00010)
(b) Remove these parts:
- Spring retainer
- Valve spring
- Valve



(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 the correct order.



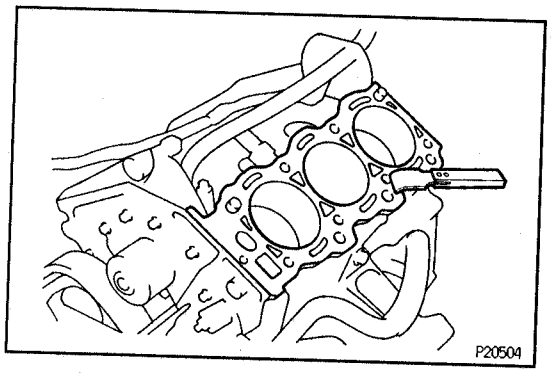
CYLINDER HEAD COMPONENTS INSPECTION, CLEANING AND REPAIR

EG5YE–01

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 surfaces.

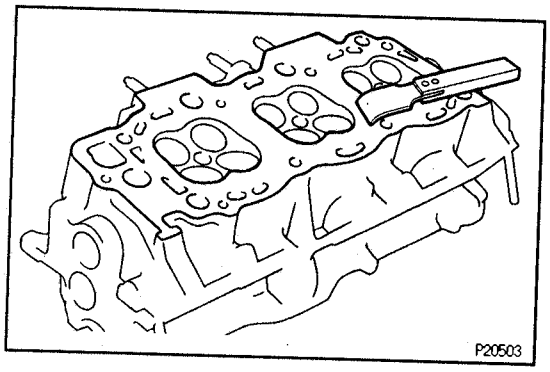
EG



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

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

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

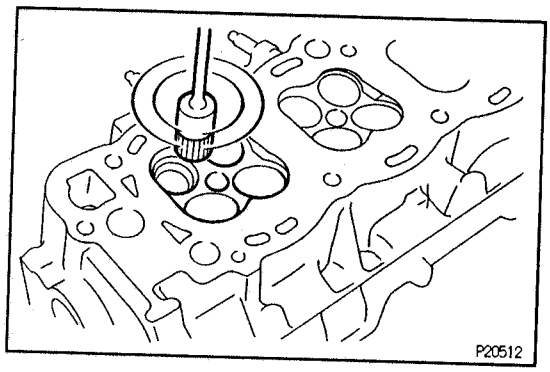


2. CLEAN CYLINDER HEADS

A. Remove gasket material

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

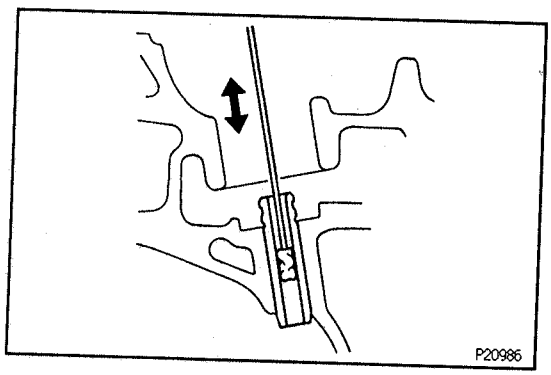
NOTICE: Be careful not to scratch the cylinder block contact surfaces.



B. Clean combustion chambers

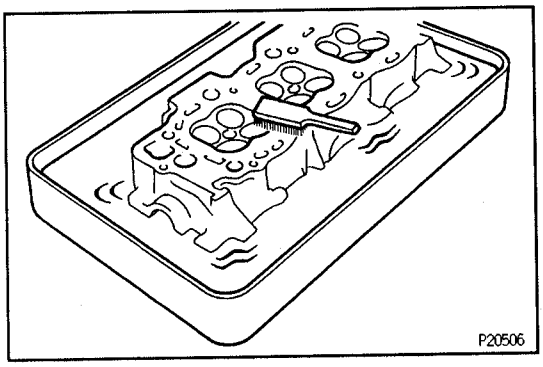
Using a wire brush, remove all the carbon from the combustion chambers.

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



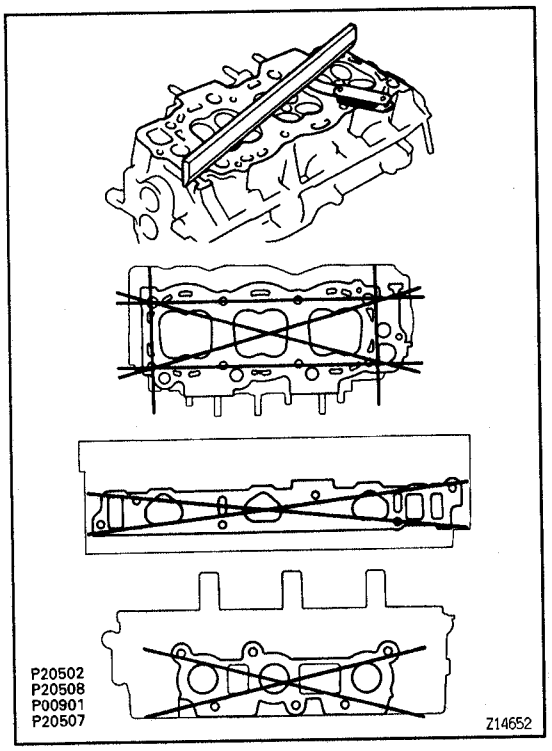
C. Clean valve guide bushings

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



D. Clean cylinder heads

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



3. INSPECT CYLINDER HEADS

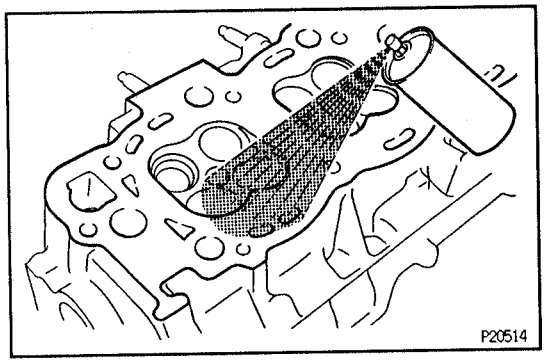
A. Inspect for flatness

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

Maximum warpage:

0.10 mm (0.0039 in.)

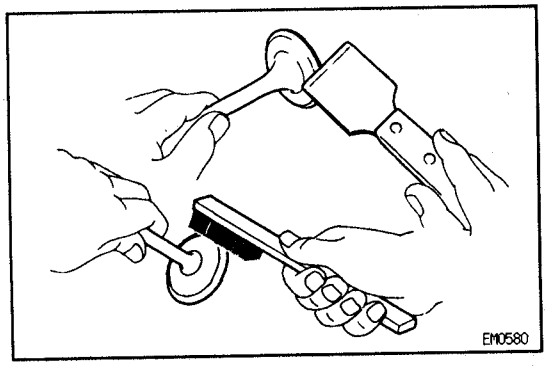
If warpage is greater than the maximum, replace the cylinder head.



B. Inspect for cracks

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

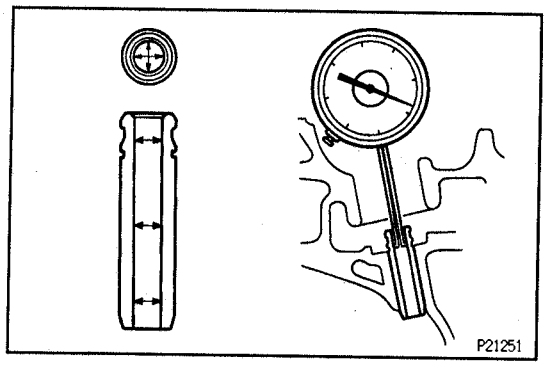
If cracked, replace the cylinder head.



4. CLEAN VALVES

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

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

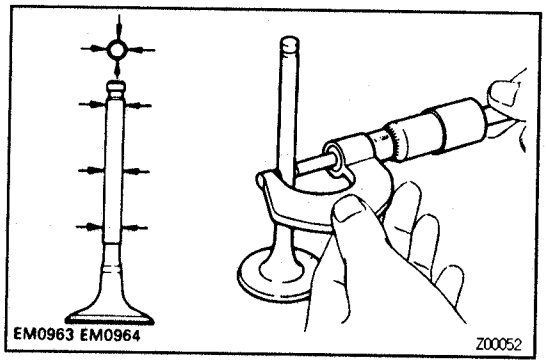


5. INSPECT VALVE STEMS AND GUIDE BUSHINGS

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

Bushing inside diameter:

6.010 – 6.030 mm (0.2366 – 0.2374 in.)



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

Valve stem diameter:

Intake

5.970 – 5.985 mm (0.2350 – 0.2356 in.)

Exhaust

5.965 – 5.980 mm (0.2348 – 0.2354 in.)

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

Standard oil clearance:

Intake

0.025 – 0.060 mm (0.0010 – 0.0024 in.)

Exhaust

0.030 – 0.065 mm (0.0012 – 0.0026 in.)

maximum oil clearance:

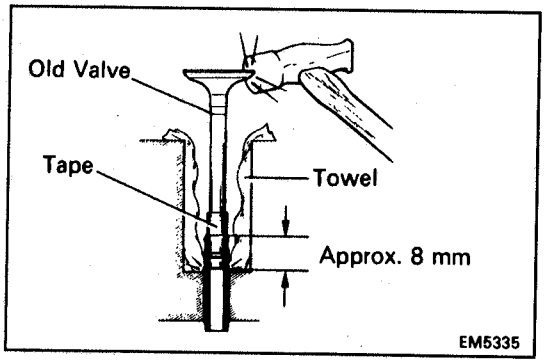
Intake

0.08 mm (0.0031 in.)

Exhaust

0.10 mm (0.0039 in.)

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



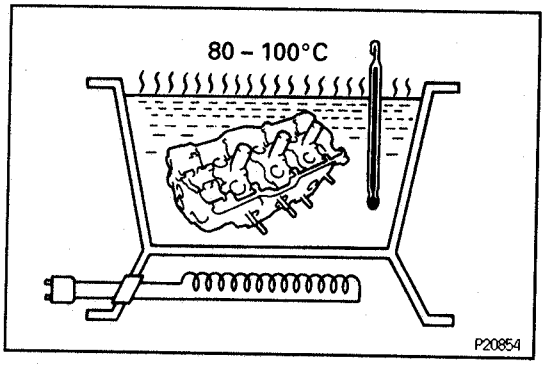
6. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

(a) w/ Snap ring:

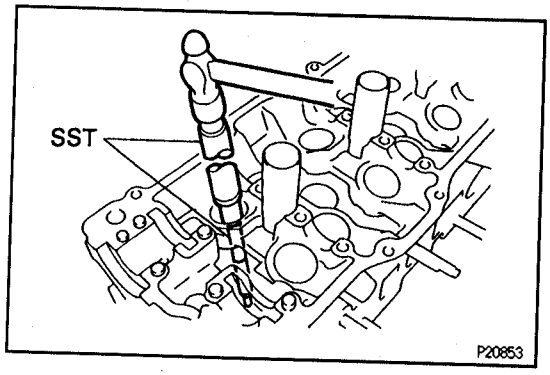
Insert an old valve wrapped with tape into the valve guide bushing, and break off the valve guide bushing by hitting it with a hammer. Remove the snap ring.

HINT: Wrap the tape approx. 8 mm (0.31 in.) from the valve stem end.

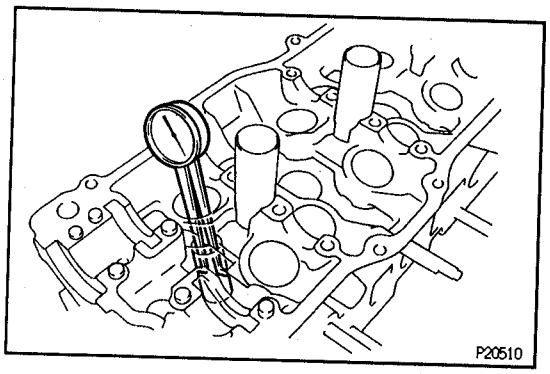
NOTICE: Be careful not to damage the valve lifter hole.



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



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



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

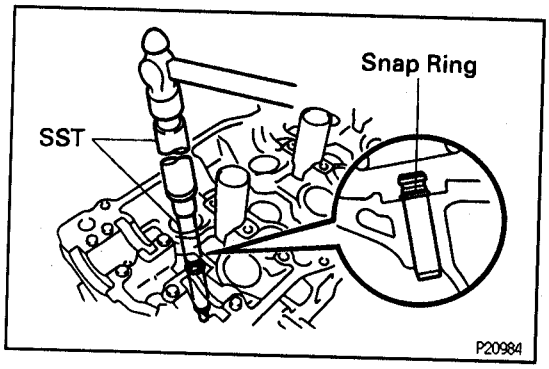
EG

Both intake and exhaust

Bushing bore diameter mm (in.)	Bushing size
10.985 – 11.027 (0.4325 – 0.4341)	Use STD
11.050 – 11.077 (0.4350 – 0.4361)	Use O/S 0.05

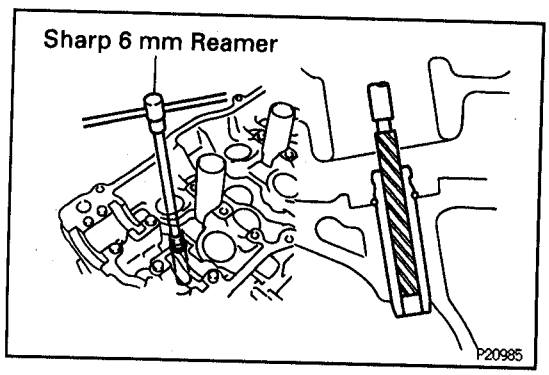
V06270

(e) 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.

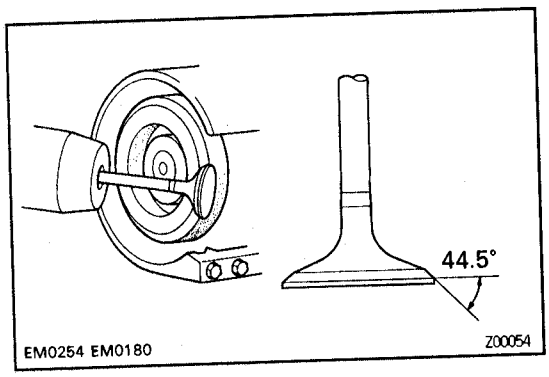


(f) Gradually heat the cylinder head to 80 – 100°C (176 – 212°F).

(g) Using SST and a hammer, tap in a new guide bushing until the snap ring makes contact with the cylinder head.
SST 09201–10000 (09201–01060),
09950–70010 (09951–07150)



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



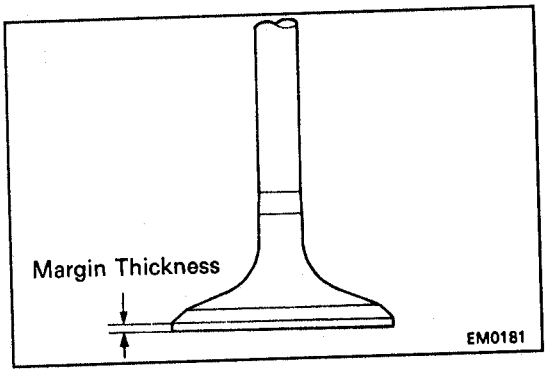
7. INSPECT AND GRIND VALVES

(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.

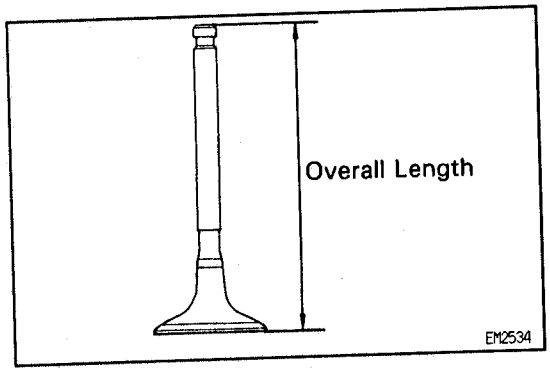
Standard margin thickness:

1.0 mm (0.039 in.)

Minimum margin thickness:

0.5 mm (0.020 in.)

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



(d) Check the valve overall length.

Standard overall length:

Intake

95.15 mm (3.7461 in.)

Exhaust

94.90 mm (3.7362 in.)

Minimum overall length:

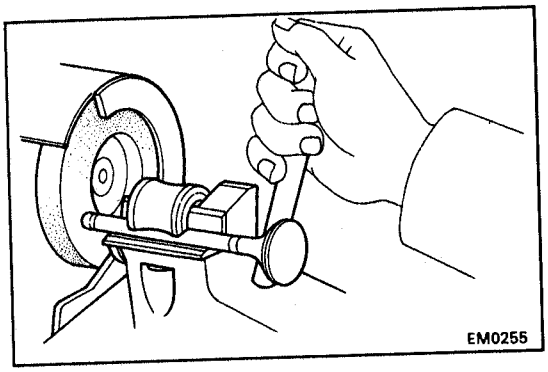
Intake

94.60 mm (3.7244 in.)

Exhaust

94.40 mm (3.7165 in.)

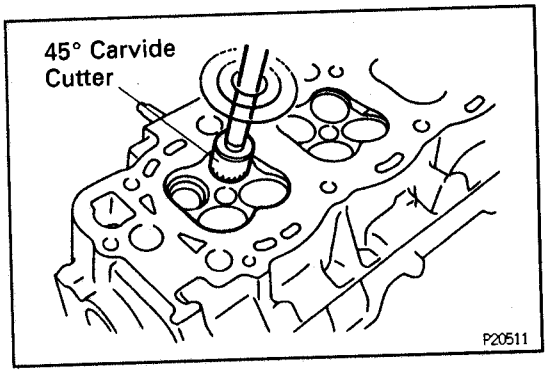
If the overall length is less than the minimum, replace the valve.



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

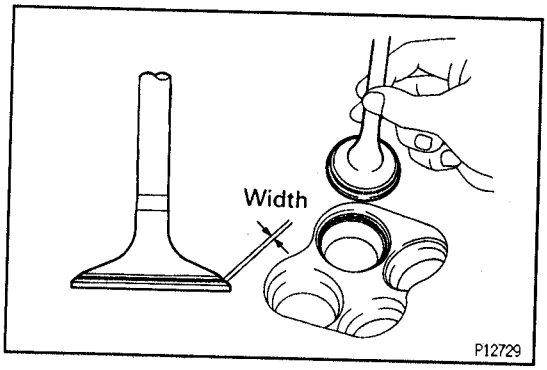
If the valve stem tip is worn, resurface the tip with a grinder or replace the valve.

NOTICE: Do not grind off more than the minimum.



8. INSPECT AND CLEAN VALVE SEATS

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



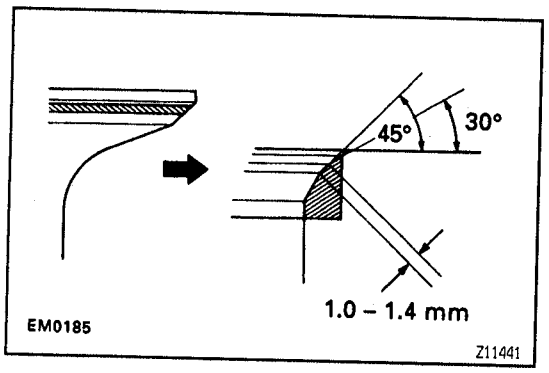
(b) Check the valve seating position.
Apply a thin coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate the valve.

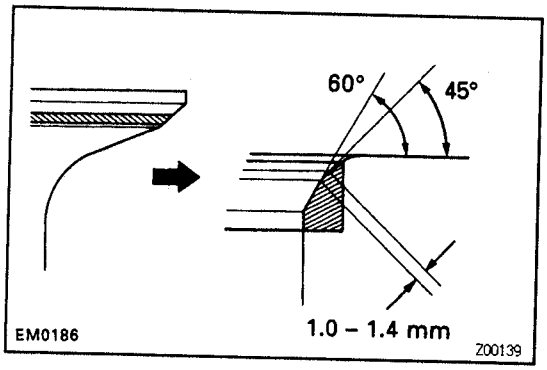
(c) Check the valve face and seat for the following:
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
- If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
- Check that the seat contact is in the middle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

1.0 – 1.4 mm (0.039 – 0.055 in.)

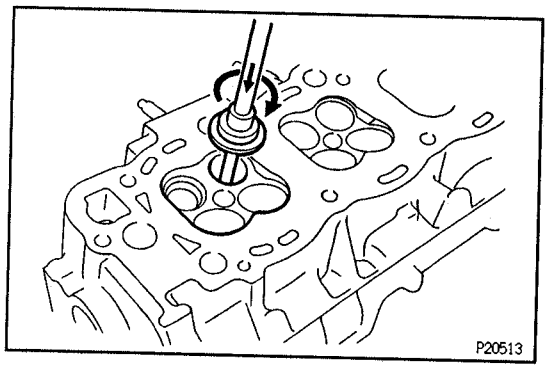
If not, correct the valve seats as follows:

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



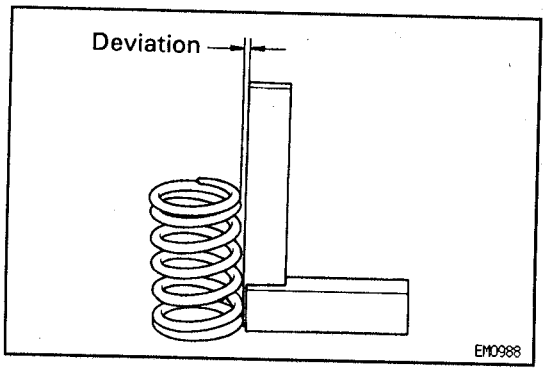


(2) If the seating is too low on the valve face, use 60° and 45° cutters to correct the seat.



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

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



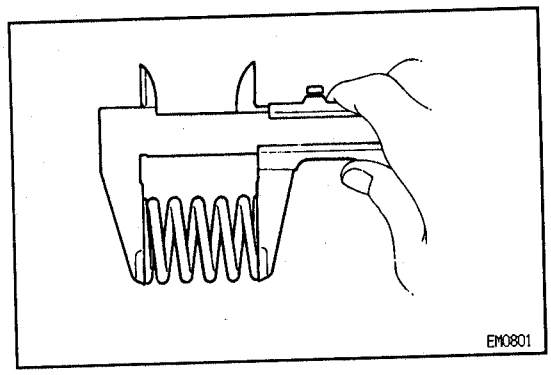
9. INSPECT VALVE SPRINGS

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

Maximum deviation:

2.0 mm (0.079 in.)

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

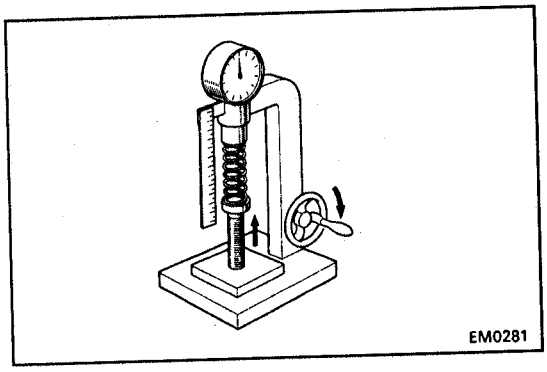


(b) Using vernier calipers, measure the free length of the valve spring.

Free length:

44.78 mm (1.7630 in.)

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



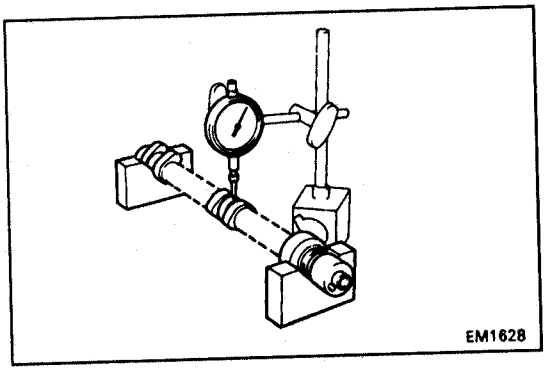
(c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

Installed tension:

At 33.3 mm (1.311 in.):

186 – 206 N (19.0 – 21.0 kgf, 41.9 – 46.3 lbf)

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



10. INSPECT CAMSHAFTS AND BEARINGS

A. Inspect camshaft for runout

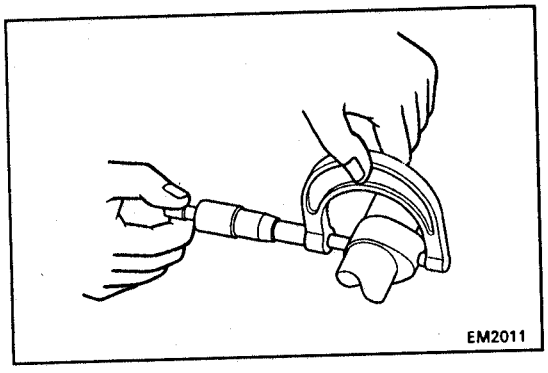
(a) Place the camshaft on V-blocks.

(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 the maximum, replace the camshaft.



B. Inspect cam lobes

Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

Intake

42.31 – 42.41 mm (1.6657 – 1.6697 in.)

Exhaust

41.96 – 42.06 mm (1.6520 – 1.6559 in.)

Minimum cam lobe height:

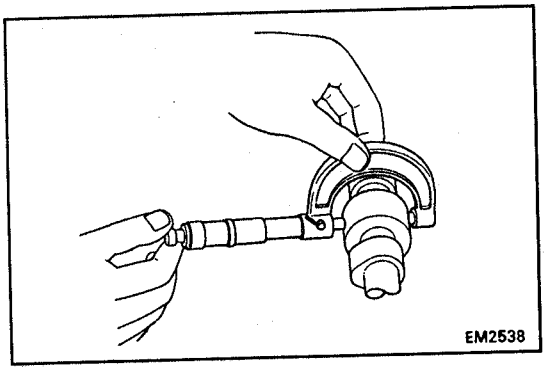
Intake

42.16 mm (1.6598 in.)

Exhaust

41.81 mm (1.6461 in.)

If the cam lobe height is greater than the maximum, replace the camshaft.



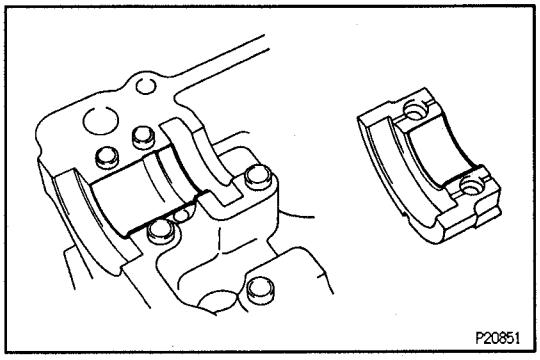
C. Inspect camshaft journals

Using a micrometer, measure the journal diameter.

Journal diameter:

26.949 – 26.965 mm (1.0610 – 1.0616 in.)

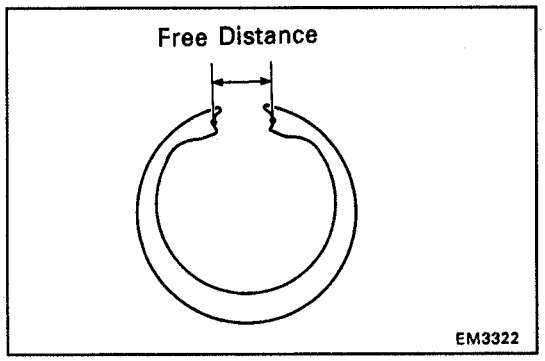
If the journal diameter is not as specified, check the oil clearance.



D. Inspect camshaft bearings

Check the bearings for flaking and scoring.

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



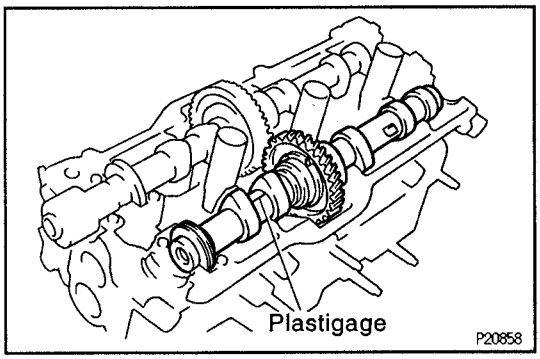
E. Inspect camshaft gear spring

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

Free distance:

18.2 – 18.8 mm (0.712 – 0.740 in.)

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



F. Inspect camshaft journal oil clearance

(a) Clean the bearing caps and camshaft journals.

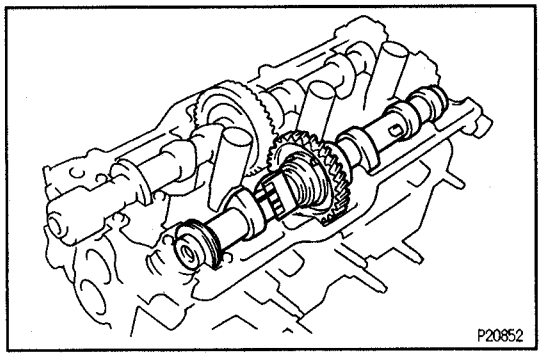
(b) Place the camshafts on the cylinder head.

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

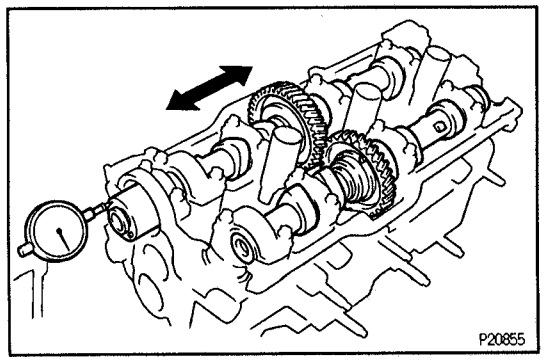
(d) Install the bearing caps.
(See step 3 in cylinder heads installation)
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)
NOTICE: Do not turn the camshaft.

(e) Remove the bearing caps.

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



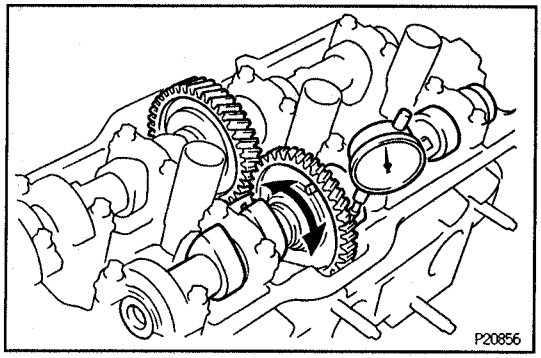
(g) Completely remove the Plasitgage.

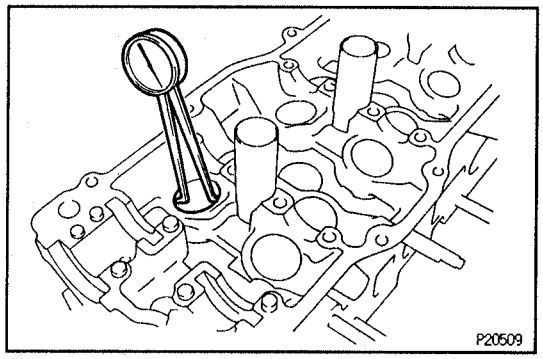


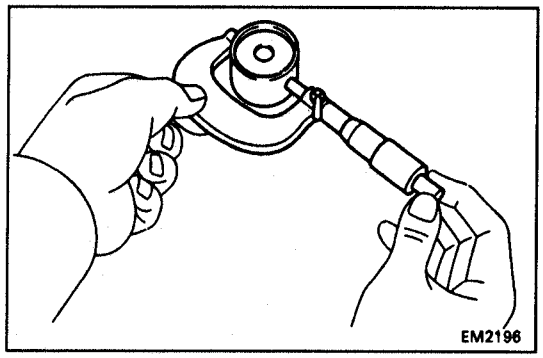
G. Inspect camshaft thrust clearance

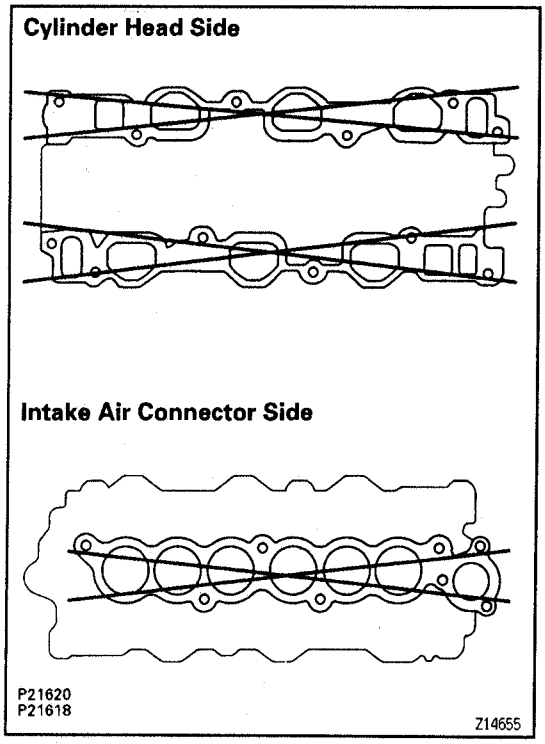
(a) Install the camshafts.
(See step 3 in cylinder heads installation)

(b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.
Standard thrust clearance:
0.033 – 0.080 mm (0.0013 – 0.0031 in.)
Maximum thrust clearance:
0.12 mm (0.0047 in.)









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

H. Inspect camshaft gear backlash

(a) Install the camshafts without installing the exhaust camshaft sub-gear.
(See step 3 in cylinder heads 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 the maximum, replace the camshafts.

11. INSPECT VALVE LIFTERS AND LIFTER BORES

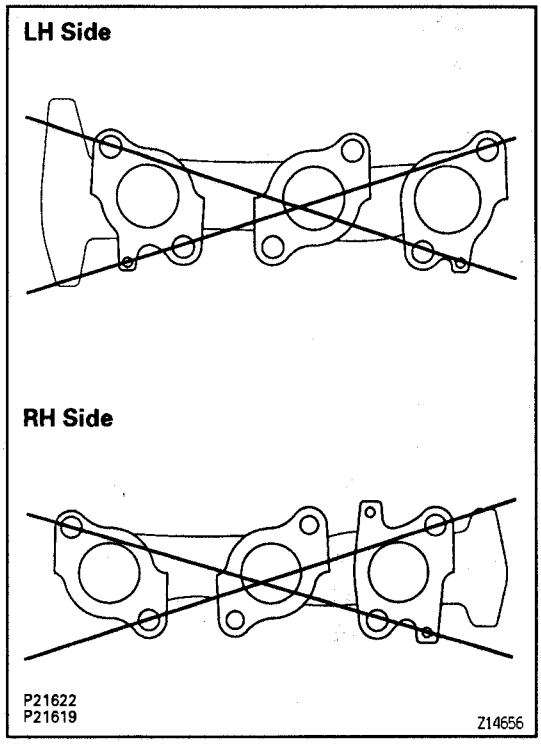
(a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.
Lifter bore diameter:
31.000 – 31.018 mm (1.2205 – 1.2212 in.)

(b) Using a micrometer, measure the lifter diameter.
Lifter diameter:
30.966 – 30.976 mm (1.2191 – 1.2195 in.)

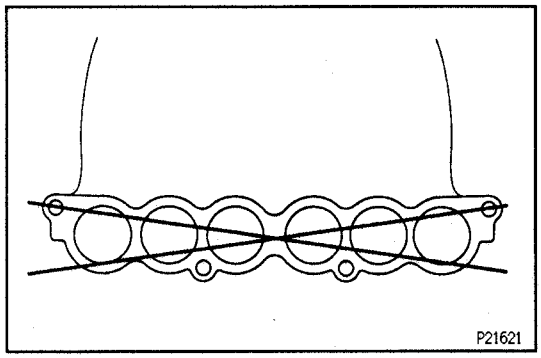
(c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.
Standard oil clearance:
0.024 – 0.052 mm (0.0009 – 0.0020 in.)
Maximum oil clearance:
0.08 mm (0.0031 in.)
If the oil clearance is greater than the maximum, replace the lifter. Ifnecessary, replace the cylinder head.

12. INSPECT INTAKE MANIFOLD, EXHAUST MANIFOLDS, AIR INTAKE CHAMBER AND INTAKE AIR CONNECTOR

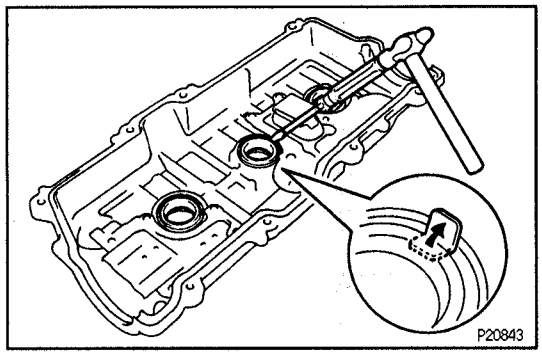
(a) Intake Manifold:
Using precision straight edge and thickness gauge, measure the surfaces contacting the cylinder head and intake air connector for warpage.
Maximum warpage:
0.10 mm (0.0039 in.)
If warpage is greater than the maximum, replace the intake manifold.



(b) Exhaust Manifolds:
Measure the surfaces contacting the cylinder head for warpage.
Maximum warpage:
1.00 mm (0.0394 in.)
If warpage is greater than the maximum, replace the exhaust manifold.



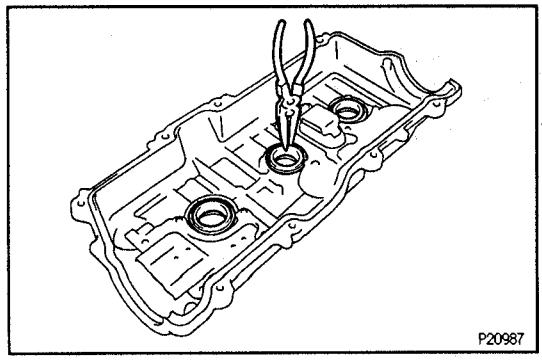
(c) Air intake chamber and intake air connector:
Measure the surfaces contacting the intake manifold and intake air connector for warpage.
Maximum warpage:
0.10 mm (0.0039 in.)
If warpage is greater than the maximum, replace the air intake chamber or intake air connector.



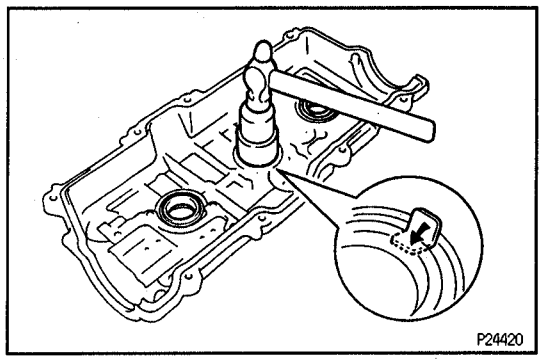
13. IF NECESSARY, REPLACE SPARK PLUG TUBE GASKETS

(a) Bend up the tab on the ventilation baffle plate which prevents the gasket from the slipping out.

(b) Using a screwdriver and hammer, tap out the gasket.
NOTICE: Do not scratch or damage the joint of the cylinder head cover.



(c) Using needle–nose pliers, pry out the gasket.

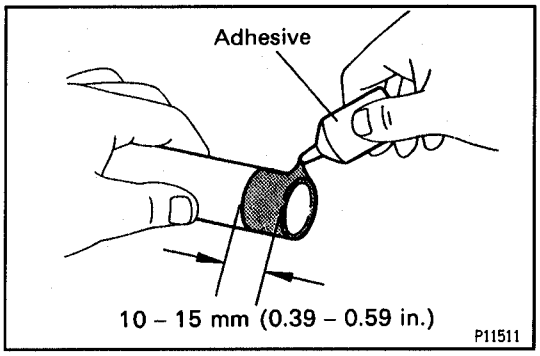


(d) Using a 32 mm scoket wrench and hammer, tap in a new gasket until its surface is flush with the upper edge of the cylinder head cover.
(e) Apply a light coat of MP grease to the gasket lip.
(f) Return the ventilation plate tab to its original position.

CYLINDER HEADS ASSEMBLY

EG5BC-04

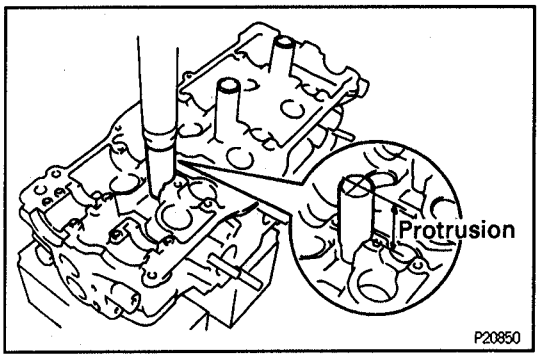
HINT:
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets and oil seals with new ones.



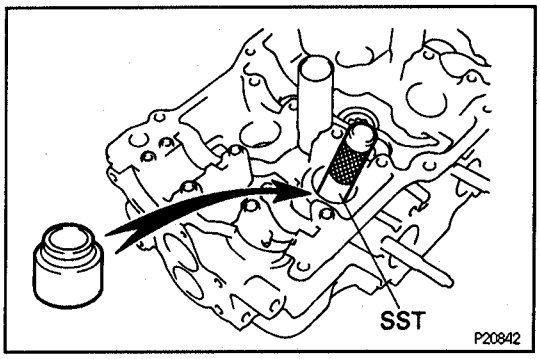
1. INSTALL SPARK PLUG TUBES

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

(a) Apply adhesive to the end of the spark plug tube.
Adhesive:
Part No. 08833-00070, THREE BOND 1324 or equivalent

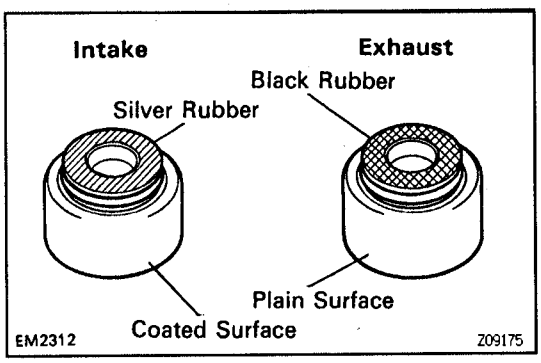


(b) Using a press, press in a new spark plug tube until there is 49.0 – 49.4 mm (1.929 – 1.945 in.) protruding from the camshaft bearing cap installation surface of the cylinder head.
NOTICE: Avoid pressing a new spark plug tube in too far by measuring the amount of the protrusion while pressing.

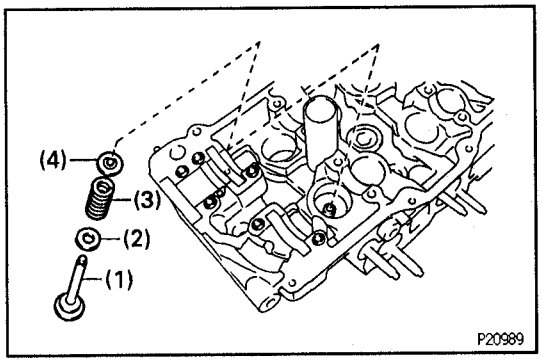


2. INSTALL VALVES

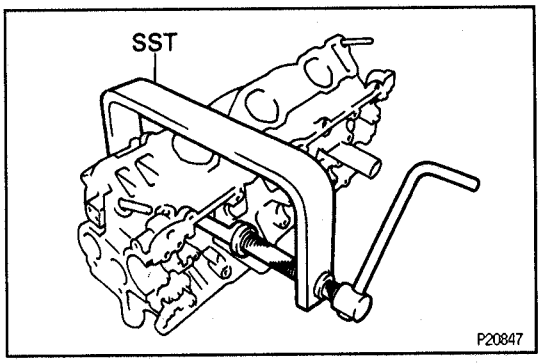
(a) Using SST, push in a new oil seal.
SST 09201-41020



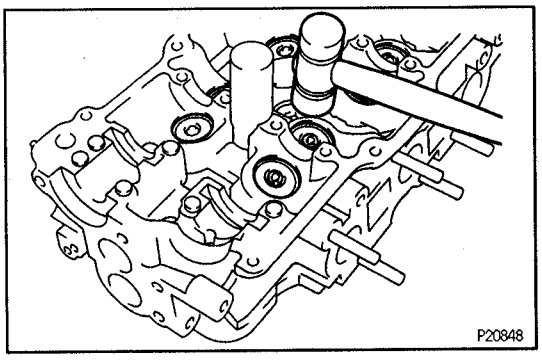
HINT: The intake valve oil seal is silver and the exhaust valve oil seal is black.



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



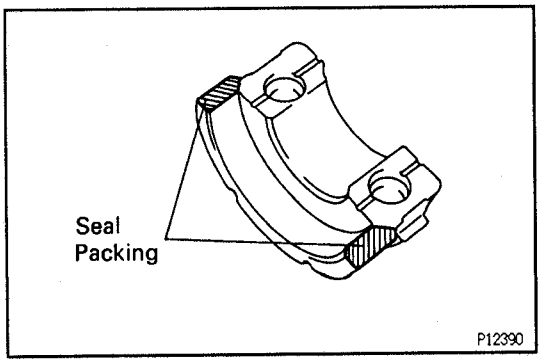
(c) Using SST, compress the valve spring and place the 2 keepers around the valve stem.
SST 09202–70020 (09202–00010)



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

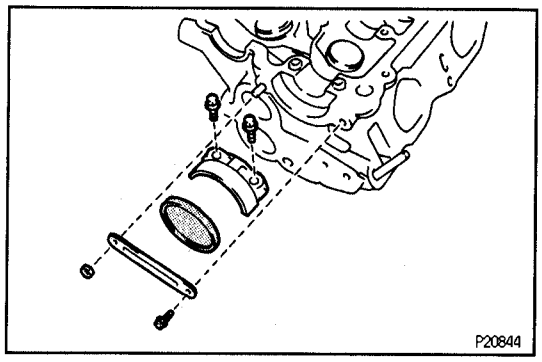
3. INSTALL VALVE LIFTERS AND SHIMS

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



4. INSTALL CAMSHAFT HOUSING PLUGS

(a) Remove any old packing (FIPG) material.
(b) Apply seal packing to the bearing cap as shown.
Seal packing:
Part No. 08826–00080 or equivalent

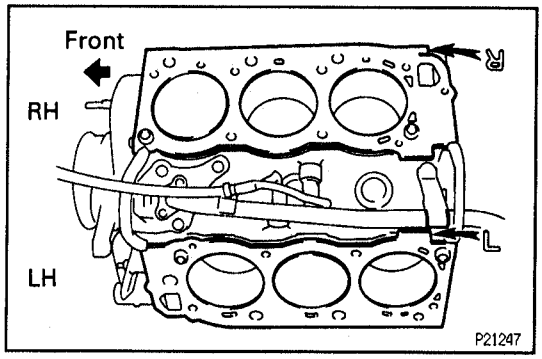


(c) Place a new housing plug in position on the cylinder head, facing the cup side inward.

(d) Install the camshaft bearing cap with the 2 bolts.
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)

(e) Install the cylinder head rear plate, ground strap with the bolt and nut.
Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)

EG



CYLINDER HEADS INSTALLATION

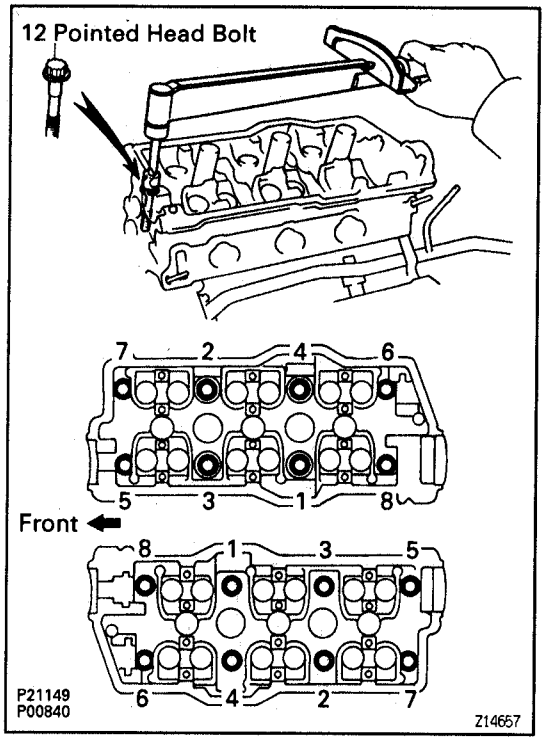
EG5YF–01

1. INSTALL CYLINDER HEADS

A. Place cylinder head on cylinder block

(a) Place 2 new cylinder head gaskets in position on the cylinder block.
NOTICE: Be careful of the installation direction.

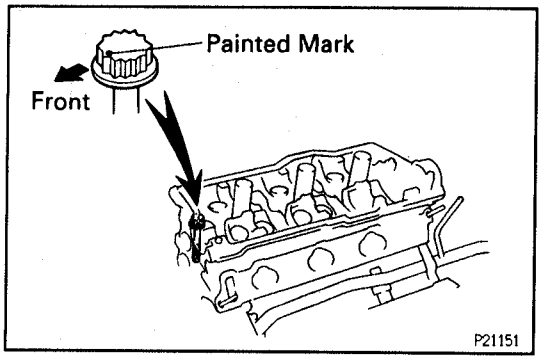
(b) Place the 2 cylinder heads in position on the cylinder head gaskets.



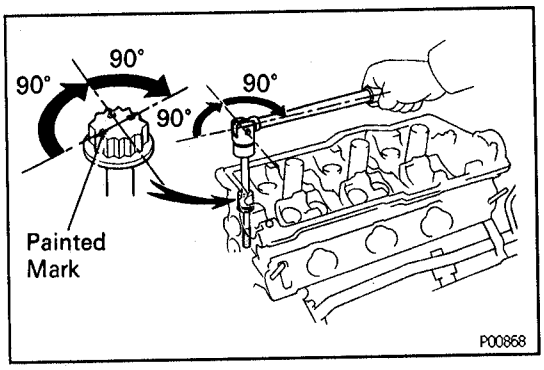
B. Install 12 pointed head cylinder head bolts
HINT:
- The cylinder head bolts are tightened in 3 progressive steps (steps (b), (d) and (e)).
- If any bolt is broken or deformed, replace it.

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

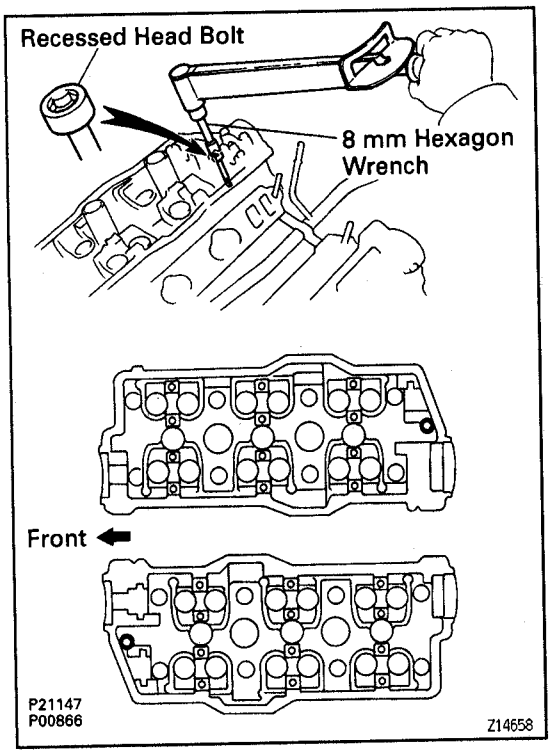
(b) Install and uniformly tighten the cylinder head bolts on each cylinder head, in several passes, in the sequence shown, then repeat for the other side, as shown.
Torque: 34 N·m (350 kgf·cm, 25 ft·lbf)
If any of the cylinder head bolts does not meet the torque specification, replace the cylinder head 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 rearword.

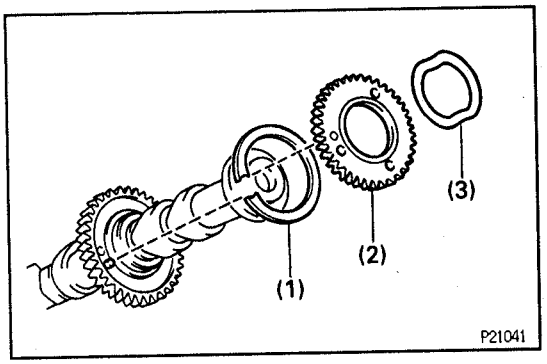


C. Install recessed head cylinder head bolts

(a) Apply a light coat of engine oil on the threads and under the heads of the cylinder head bolts.
(b) Using an 8 mm hexagon wrench, install the cylinder head bolt on each cylinder head, then repeat for the other side, as shown.
Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

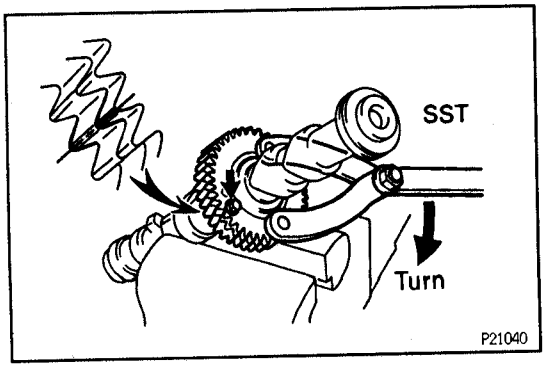
D. Connect ground strap

Install the bolt and connect the ground strap.



2. ASSEMBLE EXHAUST CAMSHAFTS

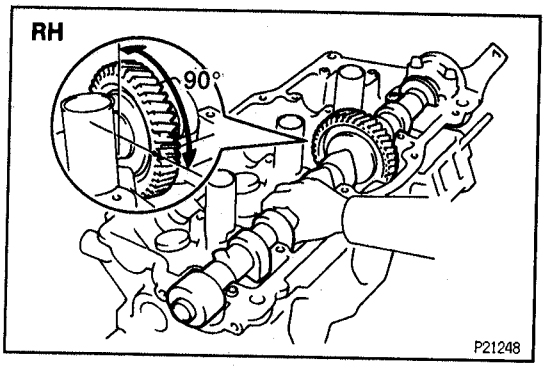
(a) Mount the hexagonal wrench head portion of the camshaft in a vise.
NOTICE: Be careful not to damage the camshaft.
(b) Install these parts:
(1) Camshaft gear spring
(2) Camshaft sub–gear
HINT: Attach the pins on the gears to the gear spring ends.
(3) Wave washer
(c) Using snap ring pliers, install the snap ring.
(d) Using SST, align the holes of the camshaft main gear and sub–gear by turning camshaft sub–gear clockwise, and temporarily install a service bolt.
SST 09960–10010 (09962–01000, 09963–00600)
(e) Align the gear teeth of the main gear and sub–gear, and tighten the service bolt.



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.

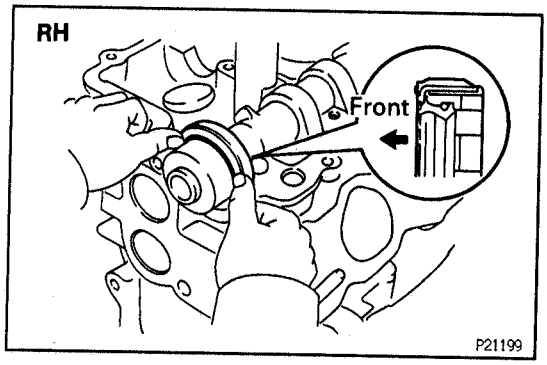
EG



A. Install intake camshaft of RH cylinder head

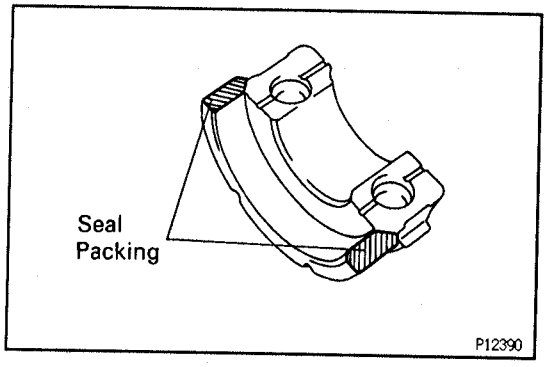
(a) Apply new engine oil to the thrust portion and journal of the camshaft.

(b) Place the intake camshaft at 90° angle of timing mark (2 dot marks) on the cylinder head.



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

(d) Install the oil seal to the camshaft.

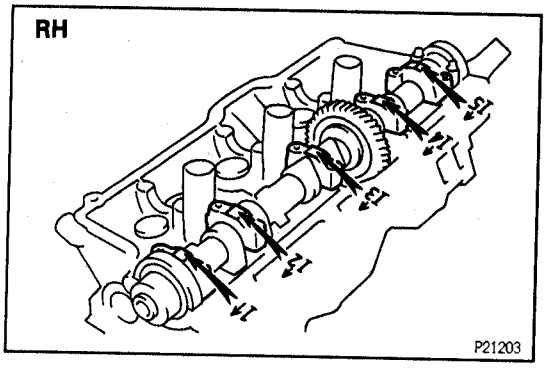


(e) Remove any old packing (FIPG) material.

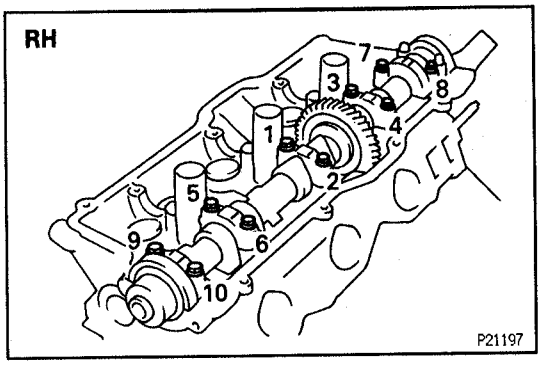
(f) Apply seal packing to the No.1 bearing cap as shown.

Seal packing:

Part No. 08826–00080 or equivalent

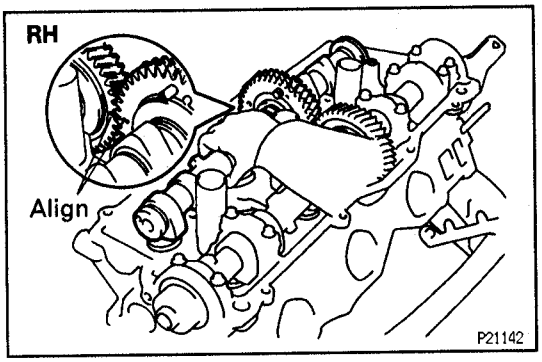


(g) Install the 5 bearing caps in their proper locations.



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

(i) Install and uniformly tighten the 10 bearing cap bolts, in several passes, in the sequence shown.
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)

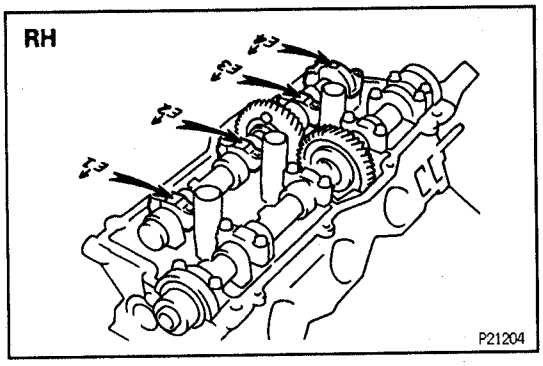


B. Install exhaust camshaft of RH cylinder head

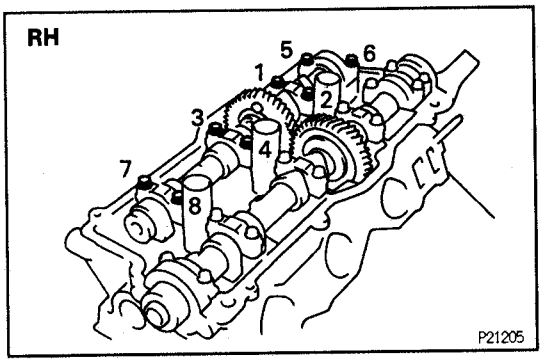
(a) Apply new engine oil to the thrust portion and journal of the camshaft.

(b) Align the timing marks (2 dot marks) of the camshaft drive and driven gears.

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



(d) Install the 4 bearing caps in their proper locations.

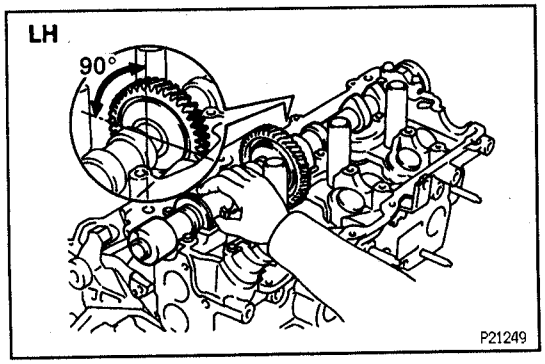


(e) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.

(f) Install and uniformly tighten the 8 bearing cap bolts, in several passes, in the sequence shown.
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)

(g) Remove the service bolt.

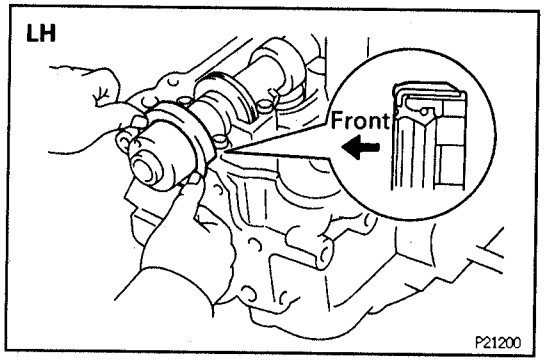
(h) Align the timing marks (1 dot mark) of the camshaft drive and driven gears by turning the camshaft with a wrench.



C. Install intake camshaft of LH cylinder head

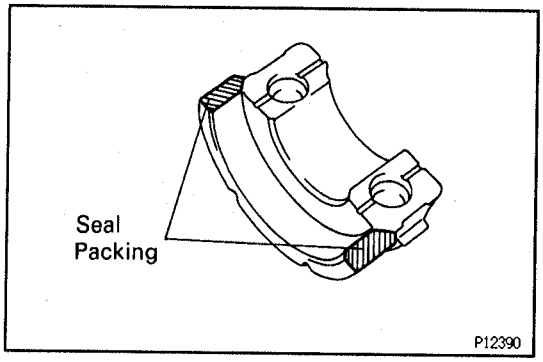
(a) Apply new engine oil to the thrust portion and journal of the camshaft.

(b) Place the intake camshaft at 90° angle of timing mark (1 dot mark) on the cylinder head.

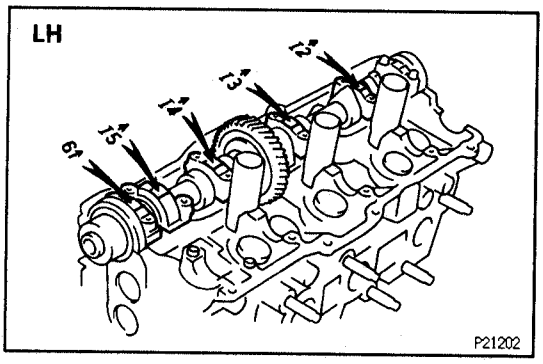


(c) Apply MP grease to a new oil seal lip.
(d) Install the oil seal to the camshaft.

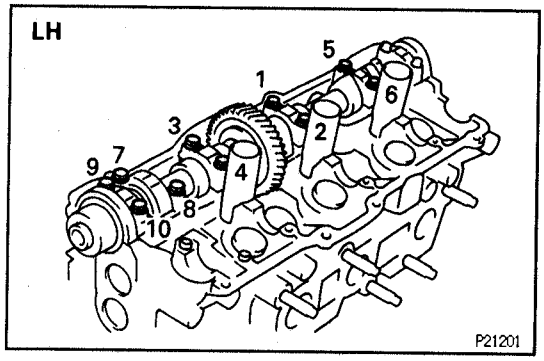
EG



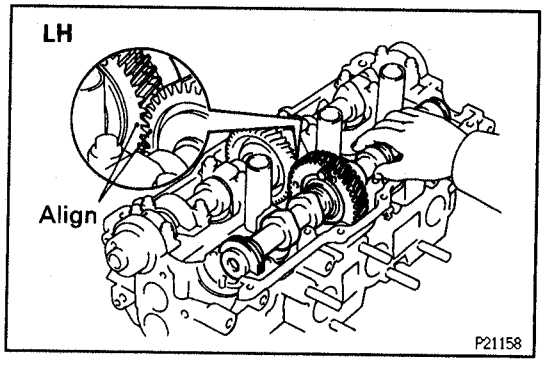
(e) Remove any old packing (FIPG) material.
(f) Apply seal packing to the No.1 bearing cap as shown.
Seal packing:
Part No. 08826–00080 or equivalent



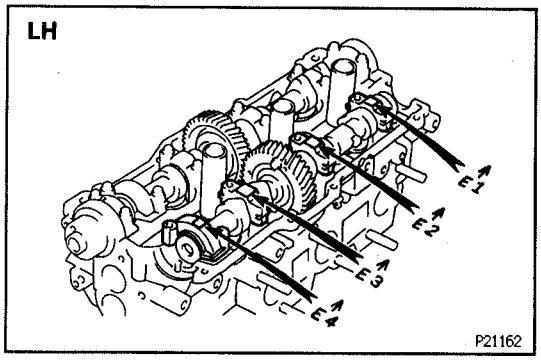
(g) Install the 5 bearing caps in their proper locations.



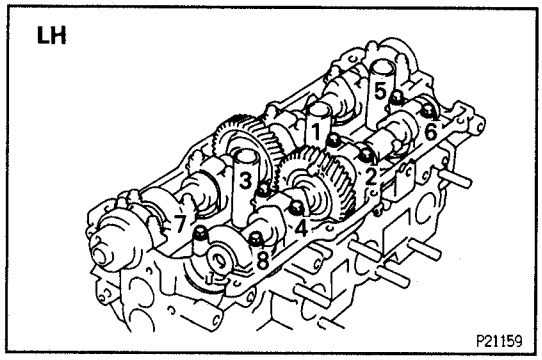
(h) Apply a light coat of engine oil on the threads and under the heads of the bearing cap bolts.
(i) Install and uniformly tighten the 10 bearing cap bolts, in several passes, in the sequence shown.
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)



D. Install exhaust camshaft of LH cylinder head
(a) Apply new engine oil to the thrust portion and journal of the camshaft.
(b) Align the timing marks (1 dot mark) of the camshaft drive and driven gears.
(c) Place the exhaust camshaft on the cylinder head.



(d) Install the 4 bearing caps in their proper locations.

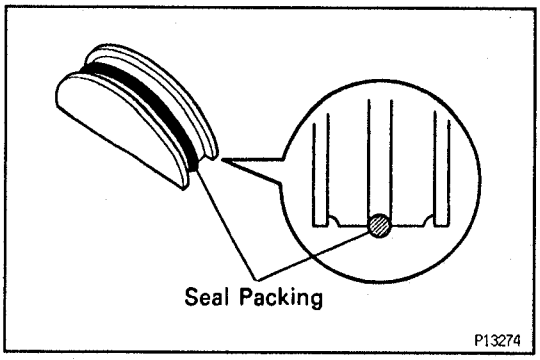


(e) Apply a light coat of engine oil on the threads and under the heads of bearing cap bolts.

(f) Install and uniformly tighten the 8 bearing cap bolts, in several passes, in the sequence shown.
Torque: 16 N·m (160 kgf·cm, 12 ft·lbf)

(g) Remove the service bolt.

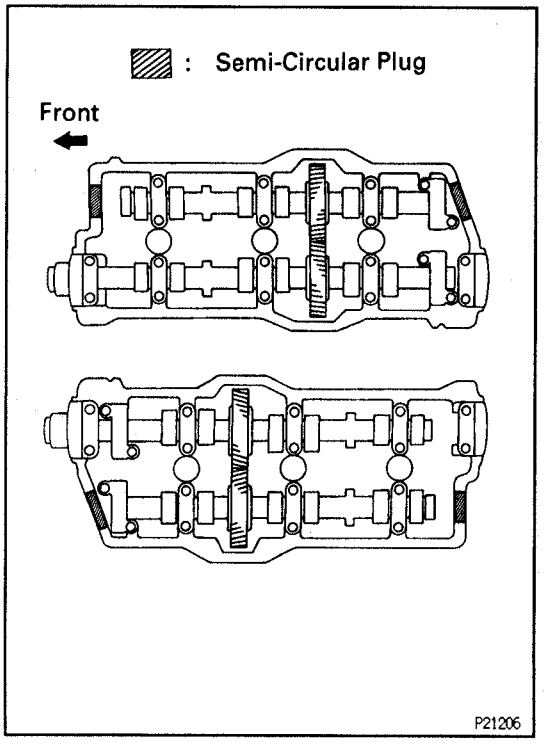
4. CHECK AND ADJUST VALVE CLEARANCE
(See steps 5 and 6 in valve clearance inspection and adjustment)
Turn the camshaft and position the cam lobe upward, and check and adjust the valve clearance.



5. INSTALL SEMI–CIRCULAR PLUGS

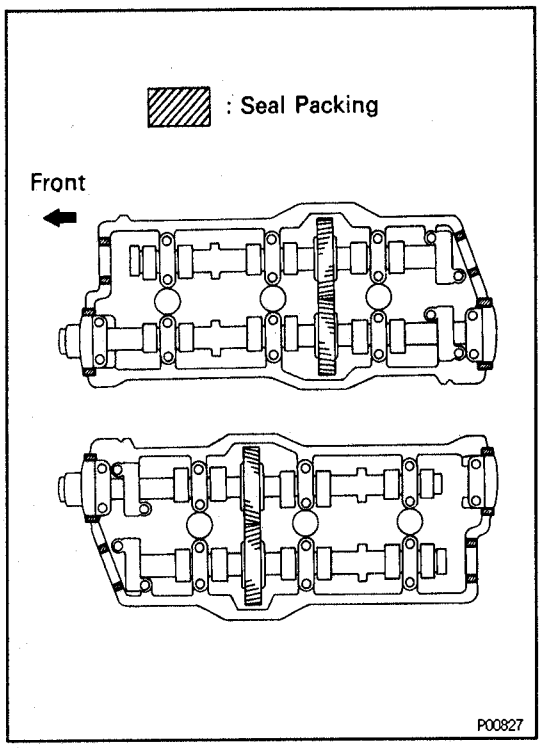
(a) Remove any old packing (FIPG) material.

(b) Apply seal packing to the semi–circular plug grooves.
Seal packing:
Part No. 08826–00080 or equivalent



(c) Install the 4 semi – circular plugs to the cylinder heads.

EG

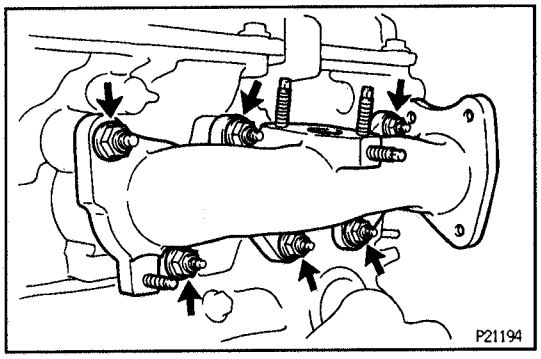


6. INSTALL CYLINDER HEAD COVERS

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

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

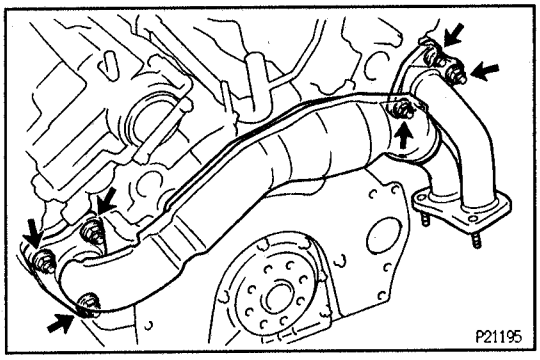
(c) Install the cylinder head cover with the 8 bolts. Uniformly tighten the bolts in several passes. Install the 2 cylinder head covers.
Torque: 6 N·m (60 kgf·cm, 53 in.·lbf)



7. INSTALL EXHAUST MANIFOLDS

(a) Install 2 new gaskets and the exhaust manifolds with the 12 nuts.
Torque: 40 N·m (400 kgf·cm, 30 ft·lbf)

(b) Install the exhaust manifold heat insulators with the 6 nuts.
Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)



8. INSTALL EXHAUST CROSSOVER PIPE
Install 2 new gaskets and the crossover pipe with the 6 nuts.
Torque: 45 N·m (450 kgf·cm, 33 ft·lbf)

9. INSTALL GENERATOR BRACKET
Torque: 18.5 N·m (185 kgf·cm, 14 ft·lbf)

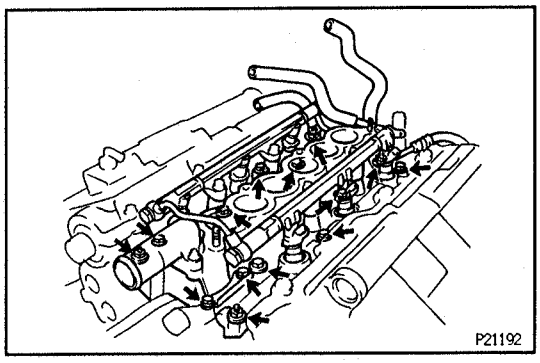
10. INSTALL PS PUMP BRACKET
Torque: 18.5 N·m (185 kgf·cm, 14 ft·lbf)

11. INSTALL INTAKE MANIFOLD ASSEMBLY

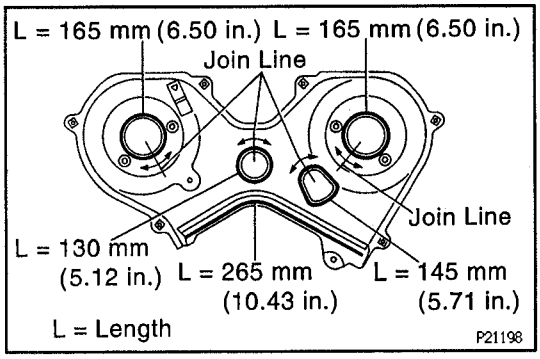
(a) Install 2 new gaskets and the intake manifold, delivery pipe and injectors assembly with the 8 bolts, 4 plate washers and 4 nuts.
Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)

(b) Install the intake manifold stay with the 2 bolts.
Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)

(c) Connect the fuel inlet hose.



12. INSTALL FUEL PRESSURE REGULATOR
(See step 1 in fuel pressure regulator installation in SFI System)



13. INSTALL NO.3 TIMING BELT COVER

(a) Check that the timing belt cover gaskets have no cracks or peeling, etc.

If the gaskets have cracks or peeling etc., replace them using these steps:

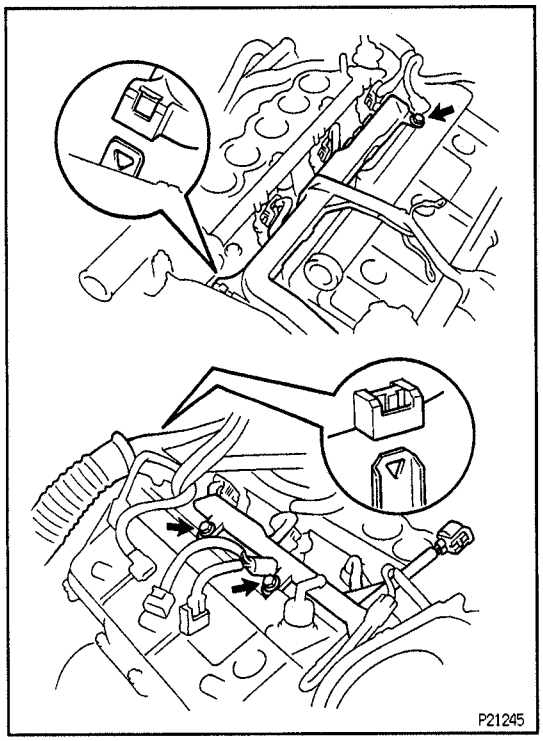
- Using a screwdriver and gasket scraper, remove all the old gasket material.
- Thoroughly clean all components to remove all the loose material.
- Remove the backing paper from a new gasket and install the gasket evenly to the part of the timing belt cover shaded black in the illustration.

(b) Install the timing belt cover with the 6 bolts.

Torque: 9 N·m (90 kgf·cm, 80 in.·lbf)

14. INSTALL CAMSHAFT POSITION SENSOR

Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)



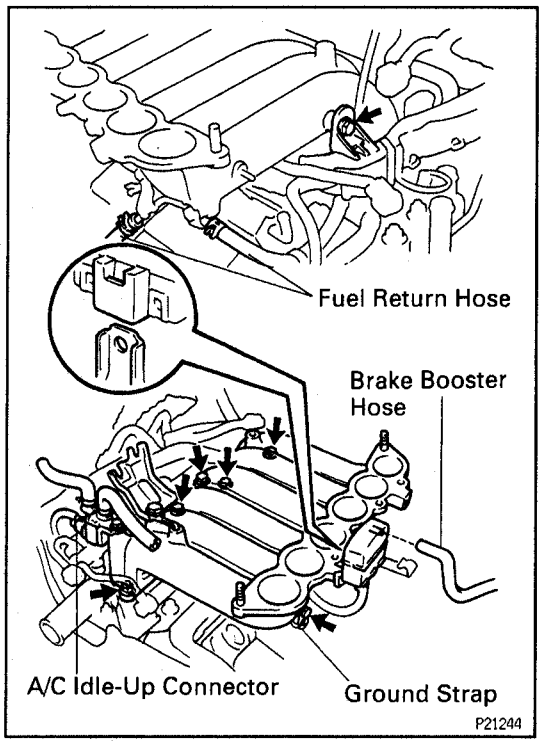
15. CONNECT ENGINE WIRE

(a) Install the engine wire with the 3 bolts.

(b) Connect the 3 engine wire clamps.

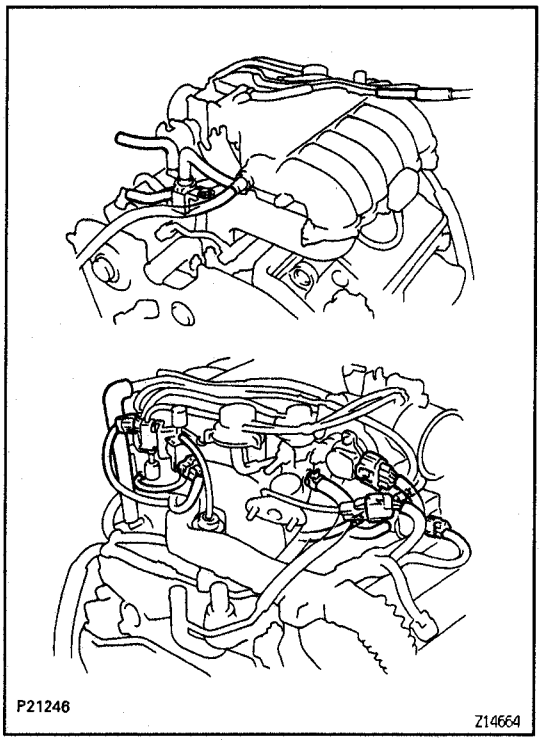
(c) Connect these connectors:

- Oil pressure sensor connector
- Crankshaft position sensor connector
- 6 injector connectors
- ECT sender gauge connector
- ECT sensor connector
- Knock sensor connector
- Camshaft position sensor connector



16. INSTALL INTAKE AIR CONNECTOR

(a) Install a new gasket and the intake air connector with the 3 bolts and 2 nuts.
Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)
(b) Connect the DLC1 to the bracket.
(c) Install the bolt, and connect the ground strap to the intake air connector.
(d) Connect the brake booster vacuum hose to the intake air connector.
(e) Connect the 2 fuel return hoses.
(f) Install the engine wire with the bolt.
(g) w A/C:
Connect the A/C idle-up valve connector.



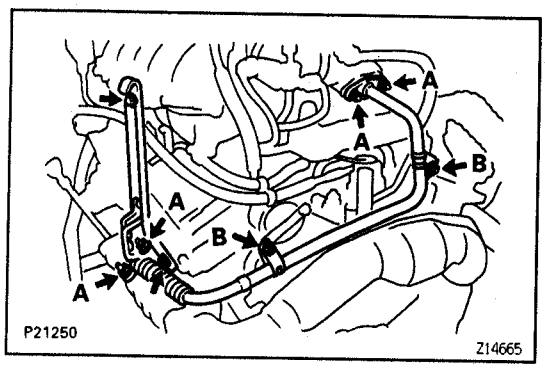
17. INSTALL AIR INTAKE CHAMBER ASSEMBLY

(a) Install a new gasket and the air intake chamber assembly with the 4 bolts and 2 nuts.
Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)
(b) Connect these hoses:
- 2 PCV hoses
- 2 water bypass hoses
- Air assist hose to throttle body
- 2 vacuum sensing hoses to VSV
- EVAP hose
- Air hose to PS pump

w/ A/C:
- Air hose to A/C idle-up valve

(c) Connect these connectors:
- VSV connector for fuel pressure control
- Throttle position sensor connector
- IAC valve connector

w/ EGR:
- EGR gas temperature sensor connector
- VSV connector for EGR



18. INSTALL AIR INTAKE CHAMBER STAY

(a) Install the air intake chamber stay with the 2 bolts.
Torque: 40 N·m (400 kgf·cm, 30 ft·lbf)
A/T:

(b) Install a new O–ring to the oil filler tube.

(c) Apply soapy water to the O–ring.

(d) Push in the oil filler tube end into the tube hole of the oil pan.

(e) Install the oil filler tube and No.1 throttle cable clamp with the 2 nuts and bolt.

19. w/ EGR:
INSTALL EGR PIPE
Install 2 new gaskets and the EGR pipe with the 2 nuts and 4 nuts.
Torque:
Nut A: 18.5 N·m (185 kgf·cm, 14 ft·lbf)
Nut B: 8 N·m (80 kgf·cm, 71 in.·lbf)

20. INSTALL GENERATOR
(See generator installation in Charging System)

21. INSTALL TIMING BELT IDLER NO.2, CAMSHAFT TIMING PULLEYS AND TIMING BELT
(See steps 2 and 7 to 24 in timing belt installation)

22. INSTALL SPARK PLUGS AND HIGH – TENSION CORDS WITH IGNITION COILS
(See high – tension cords inspection and ignition coils installation in Ignition System)

23. CONNECT HEATER HOSE

24. CONNECT THESE CABLES:

(a) A/T:
Throttle cable

(b) Accelerator cable

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

25. INSTALL MAF METER, RESONATOR AND AIR CLEANER CAP

26. INSTALL FRONT EXHAUST PIPE
(See step 6 in engine with transmission installation in cylinder block)

27. FILL WITH ENGINE COOLANT

28. START ENGINE AND CHECK FOR LEAKS

29. CHECK IGNITION TIMING
(See ignition timing inspection)

30. INSTALL ENGINE UNDER COVER

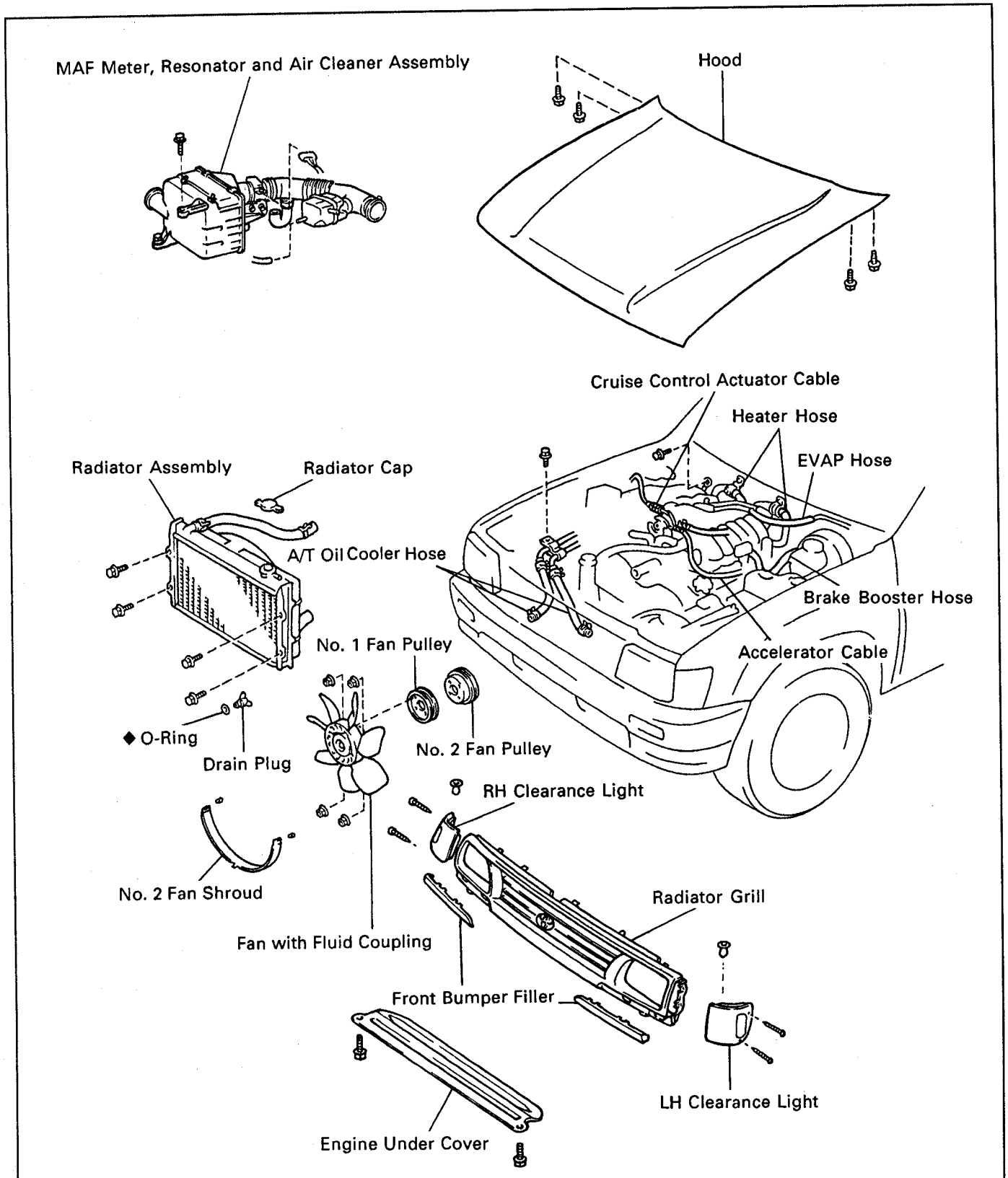
31. ROAD TEST VEHICLE
Check for abnormal noise, shock, slippage, correct shift points and smooth operation.

32. RECHECK ENGINE COOLANT LEVEL

CYLINDER BLOCK

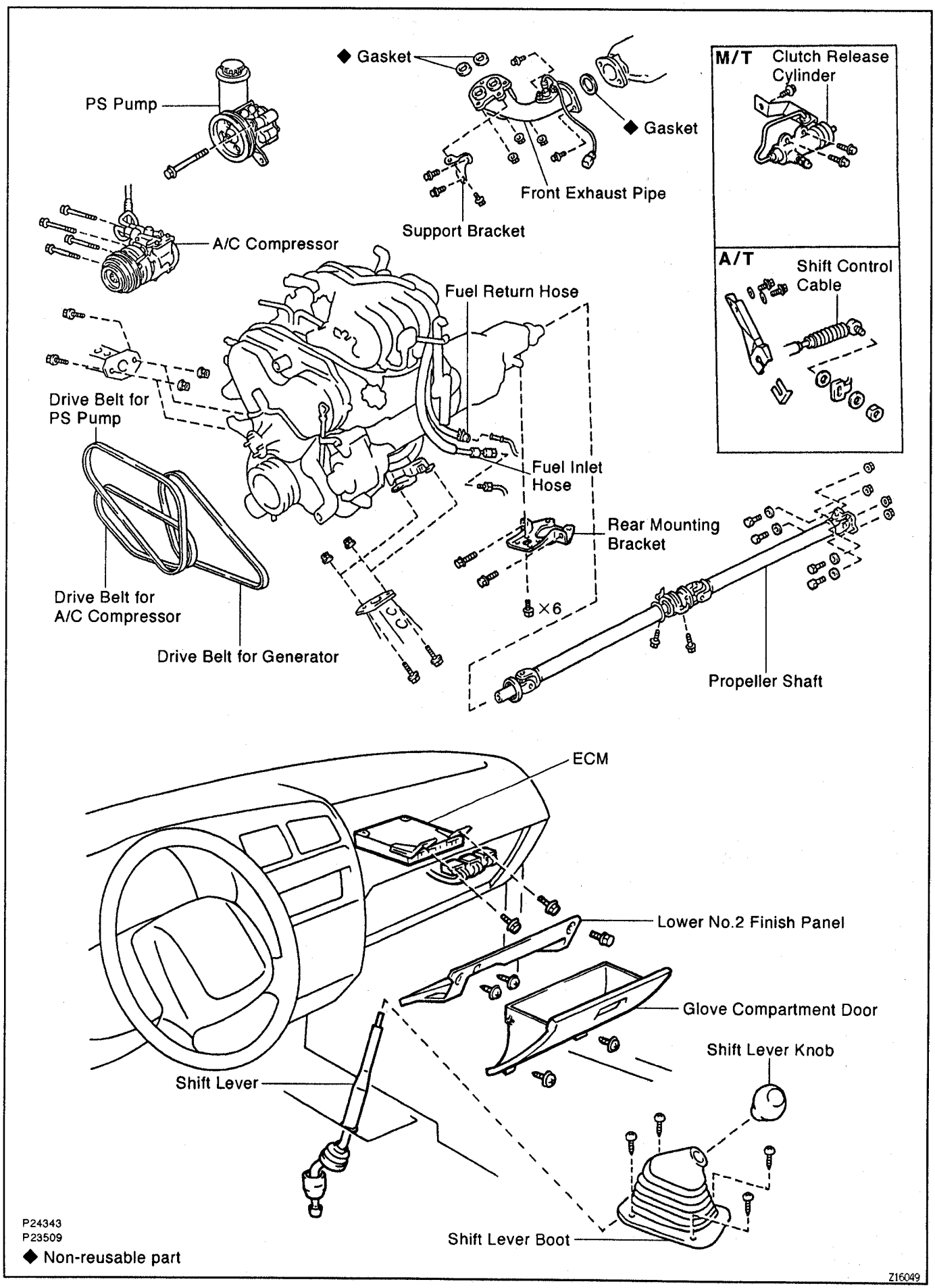
COMPONENTS FOR ENGINE REMOVAL AND INSTALLATION (2WD)

EG5YG-01



◆ Non-reusable part

P23088


◆ Gasket
PS Pump
◆ Gasket
M/T
Clutch Release Cylinder
Front Exhaust Pipe
Support Bracket
A/C Compressor
A/T
Shift Control Cable
Fuel Return Hose
Drive Belt for PS Pump
Fuel Inlet Hose
Rear Mounting Bracket
×6
Drive Belt for A/C Compressor
Drive Belt for Generator
Propeller Shaft
ECM
Lower No.2 Finish Panel
Glove Compartment Door
Shift Lever Knob
Shift Lever
Shift Lever Boot
P24343
P23509
◆ Non-reusable part
Z16049

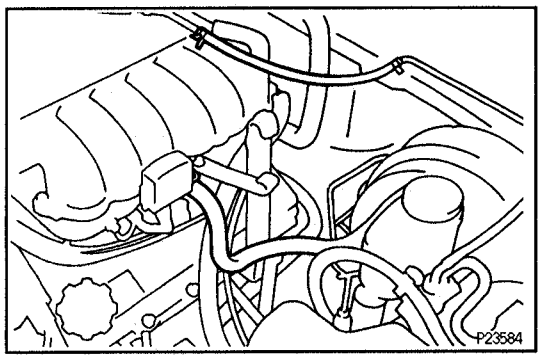
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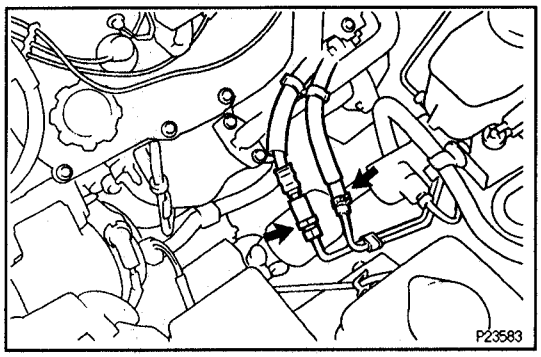
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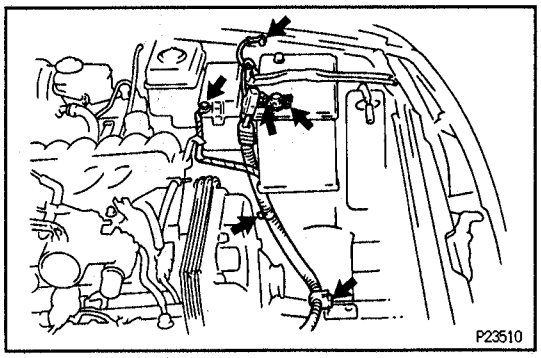
ENGINE WITH TRANSMISSION REMOVAL (2WD)

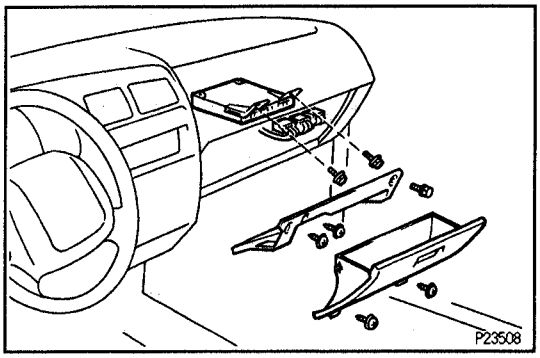
EQ5YH–01

1. REMOVE ENGINE UNDER COVER
2. DRAIN ENGINE COOLANT AND OIL
3. DRAIN TRANSMISSION OIL
4. REMOVE HOOD
5. REMOVE RADIATOR ASSEMBLY
   (See steps 2 to 9 in radiator removal in Cooling System)
6. DISCONNECT HEATER HOSES
   (See steps 4, 5 and 8 in cylinder heads removal)
7. REMOVE FAN WITH FLUID COUPLING AND FAN PULLEYS
   (See steps 4 to 11 in timing belt removal)
8. REMOVE AIR CLEANER CASE AND FILTER
9. DISCONNECT HOSES
   Disconnect these hoses:
   - Brake booster vacuum hose
   - EVAP hose
   - Fuel return hose
   - Fuel inlet hose

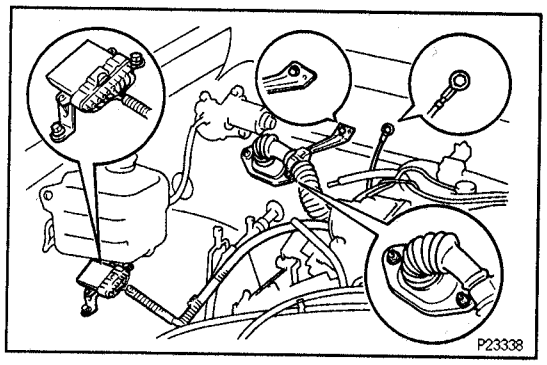








10. DISCONNECT STARTER WIRE AND CONNECTOR
(a) Remove the bolt, and disconnect the ground strap.
(b) Remove the 2 nuts, disconnect the positive (+) terminal cable from battery.
(c) Disconnect the 2 starter wire clamps and connector.
(d) Remove the nut, and disconnect wire from Relay Block No.2.
11. DISCONNECT GENERATOR WIRE
   (See step 1 in generator removal in Chraging System)
12. REMOVE GLOVE COMPARTMENT DOOR AND LOWER NO.2 FINISH PANEL
13. DISCONNECT ENGINE WIRE AND CONNECTORS
(a) Remove the 2 bolts and ECM.
(b) M/T:
   Disconnect the 3 ECM connectors.
(c) A/T:
   Disconnect the 4 ECM connectors.



(d) Disconnect the following wires and connectors:
- Igniter connector
- Ground strap

(e) Remove the bolt and 2 nuts.
(f) Pull out the engine wire from the cabin.

14. M/T:
REMOVE SHIFT LEVER ASSEMBLY

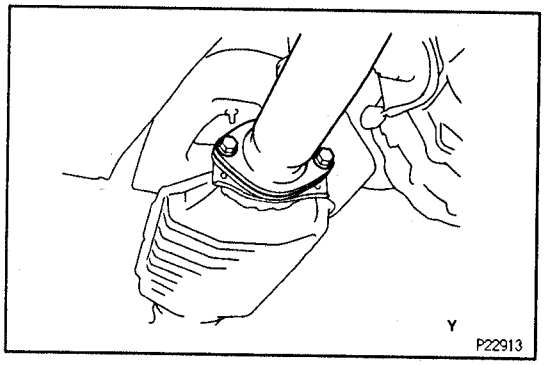
(a) Remove the shift lever knob.
(b) Remove the 4 screws and shift lever boot.
(c) Remove the 6 bolts, shift lever assembly and gasket.

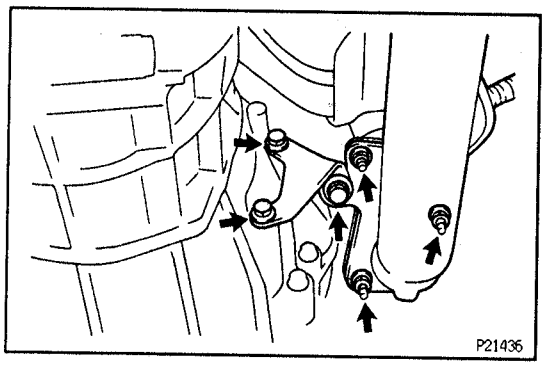
15. REMOVE PROPELLER SHAFT
(See propeller shaft removal in Propeller Shaft)

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

17. REMOVE FRONT EXHAUST PIPE

(a) Disconnect the 2 heated oxygen sensor connectors.
(b) Remove the 2 bolts and retainer, holding the front exhaust pipe to the center exhaust pipe.





(c) Remove the 3 bolts and support bracket.
(d) Remove the 3 nuts, front exhaust pipe and 3 gaskets.

18. M/T:
REMOVE CLUTCH RELEASE CYLINDER

Remove the 2 bolts, and disconnect the clutch clutch release cylinder.

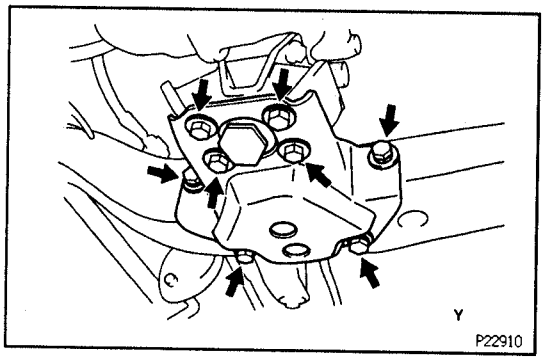
19. A/T:
REMOVE CONTROL CABLE

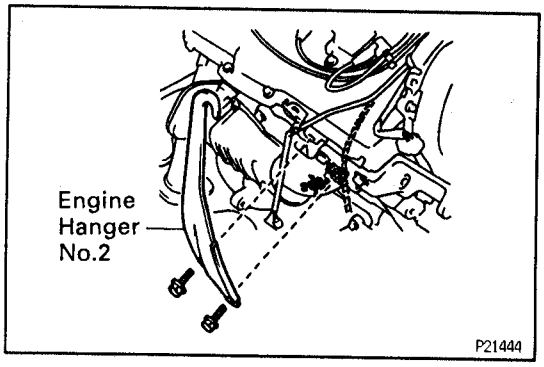
(a) Remove the nut and the cable.
(b) Remove the 2 bolts and the cable bracket.

20. PLACE JACK UNDER TRANSMISSION

21. REMOVE ENGINE REAR MOUNTING BRACKET

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

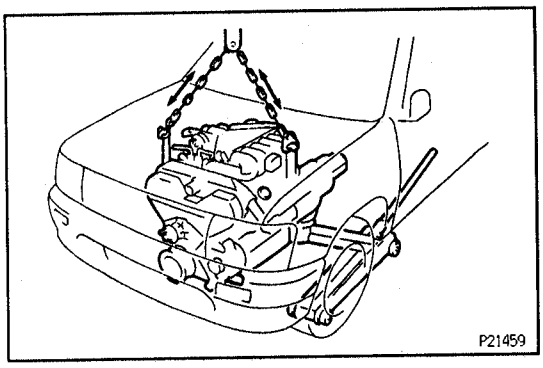




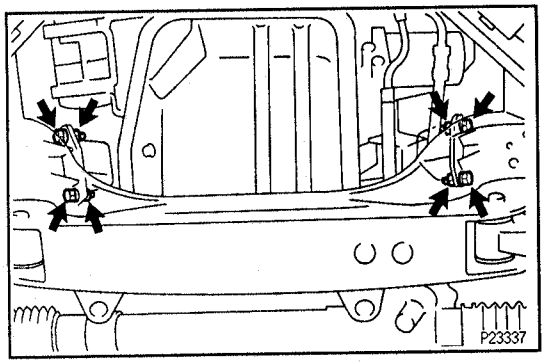
22. REMOVE ENGINE WITH TRANSMISSION

(a) w/ A/C:
Remove the bolt and disconnect the A/C compressor wire clamp.

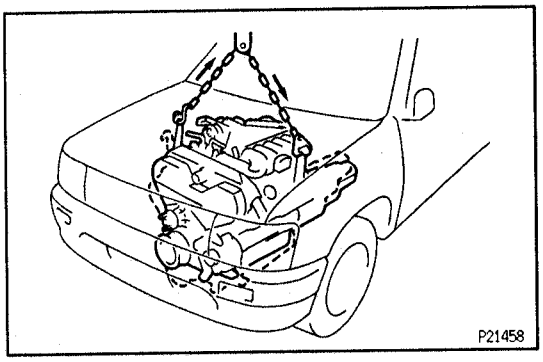
(b) Install a engine hanger No.2 in the correct direction.
Part No.:
Engine hanger No.2 12282–62030
Bolt 91512–61020
Torque: 40 N·m (400 kgf·cm, 30 ft·lbf)



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



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



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

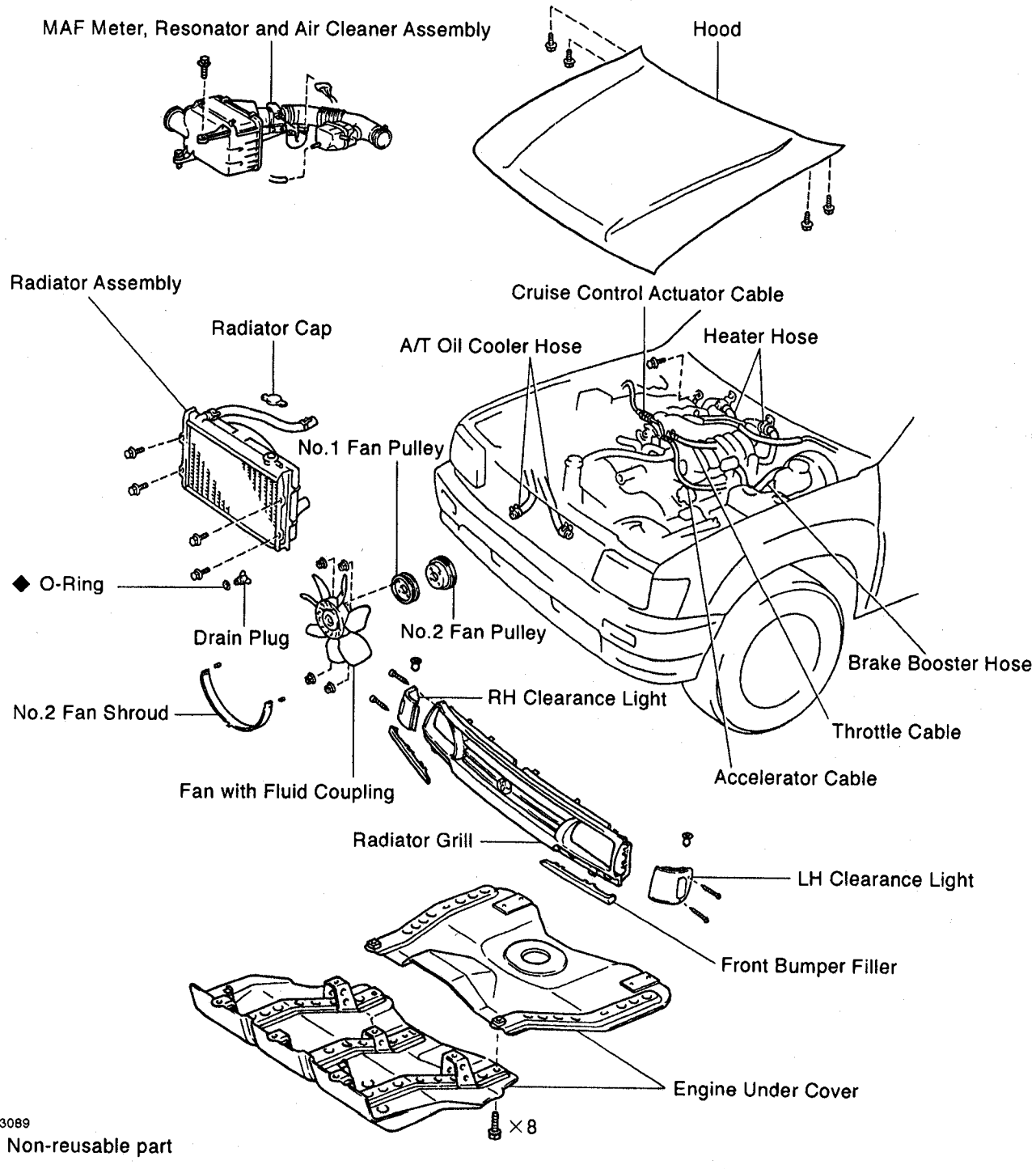
(f) Place the engine and transmission assembly onto the stand.

EG5YJ-01

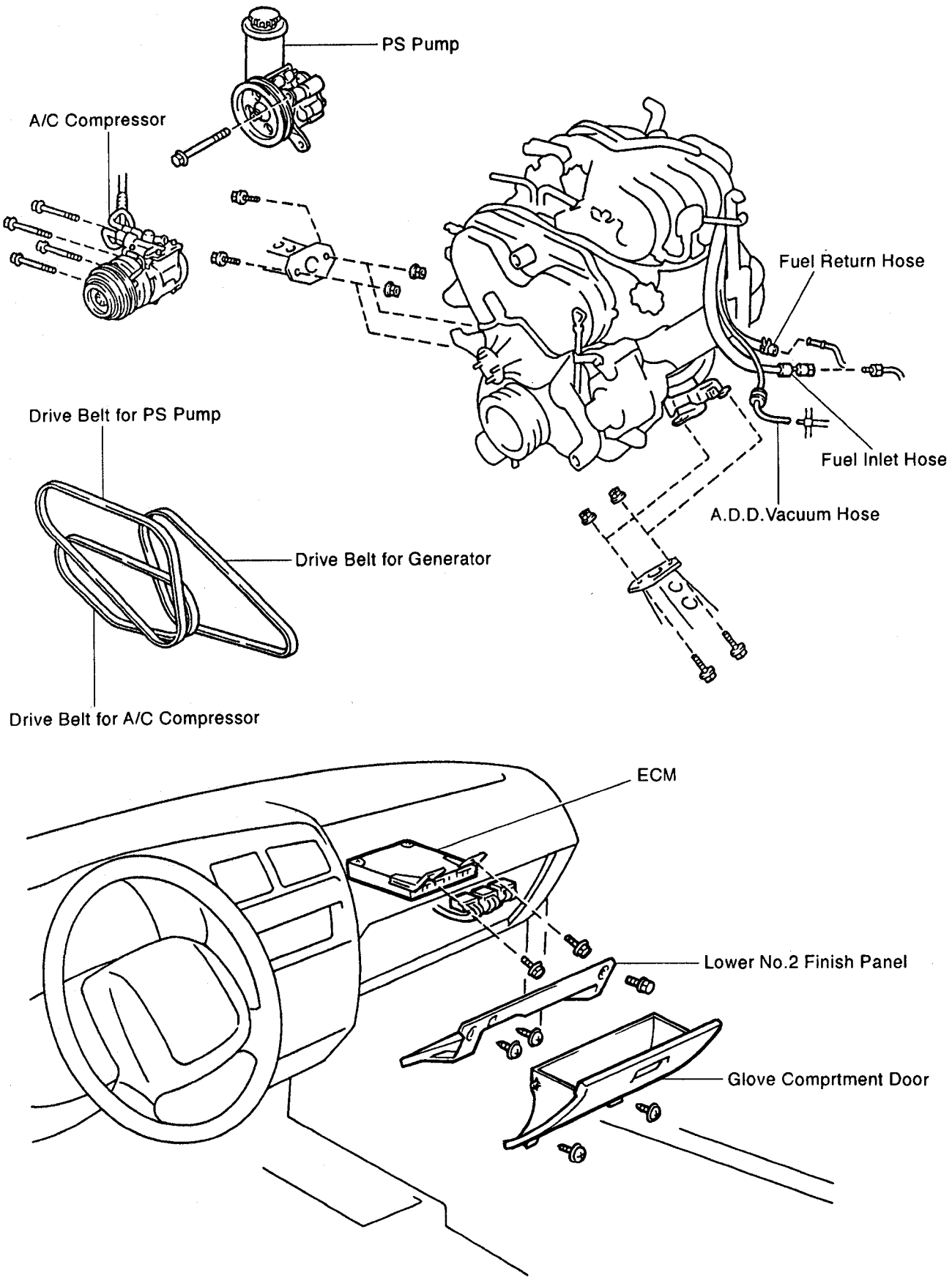
TRANSMISSION REMOVAL (4WD)

(See MT and AT section)

COMPONENTS FOR ENGINE REMOVAL AND INSTALLATION (4WD)



EG



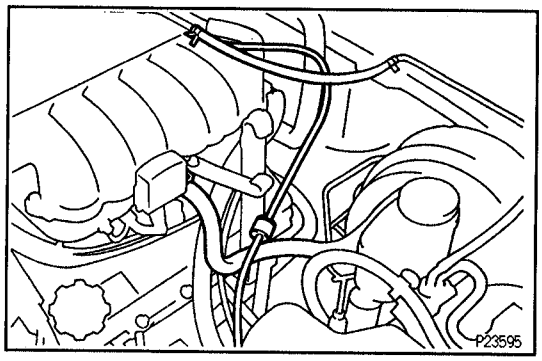
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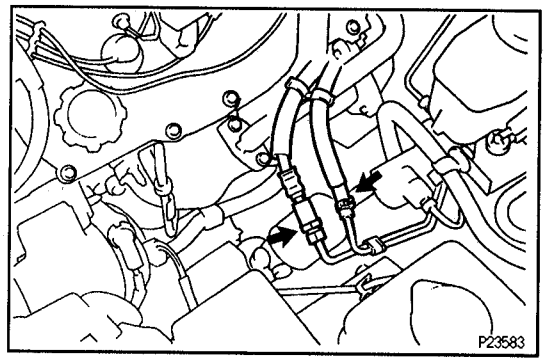
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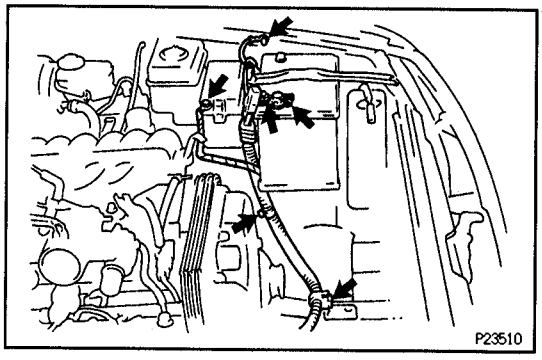
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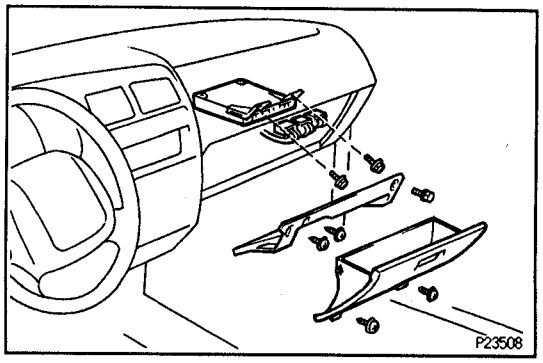
ENGINE REMOVAL (4WD)

1. **REMOVE ENGINE UNDER COVER**
2. **DRAIN ENGINE COOLANT AND OIL**
3. **REMOVE HOOD**
4. **REMOVE RADIATOR ASSEMBLY**
   (See steps 2 to 9 in radiator removal in Cooling System)
5. **DISCONNECT HEATER HOSES**
   (See steps 4, 5 and 8 in cylinder heads removal)
6. **REMOVE FAN WITH FLUID COUPLING AND FAN PULLEYS**
   (See steps 4 to 11 in timing belt removal)
7. **REMOVE AIR CLEANER CASE AND FILTER**
8. **DISCONNECT HOSES**
   Disconnect these hoses:
   - Brake booster vacuum hose
   - EVAP hose
   - A.D.D. Vacuum hose
   - Fuel return hose
   - Fuel inlet hose

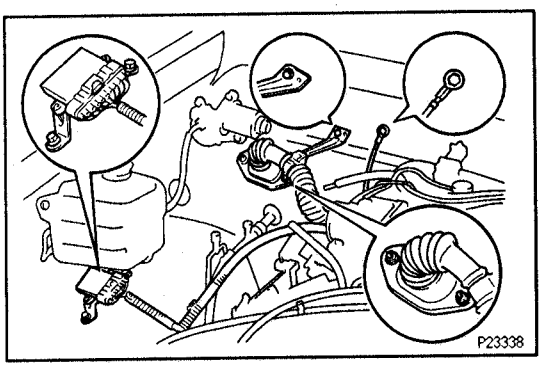








9. **DISCONNECT STARTER WIRE AND CONNECTORS**
   (a) Remove the bolt, and disconnect the ground strap.
   (b) Remove the 2 nut, and disconnect the positive (+) terminal cable from battery.
   (c) Disconnect the 2 starter wire clamps and connector.
   (d) Remove the nut, and disconnect wire from Relay Block No.2.
10. **DISCONNECT GENERATOR WIRE**
    (See step 1 in generator removal in Charging System)
11. **REMOVE GLOVE COMPARTMENT DOOR AND LOWER NO.2 FINISH PANEL**
12. **DISCONNECT ENGINE WIRE AND CONNECTORS**
    (a) Remove the 2 bolts and ECM.
    (b) M/T:
    Disconnect the 3 ECM connectors.
    (c) A/T:
    Disconnect the 4 ECM connectors.

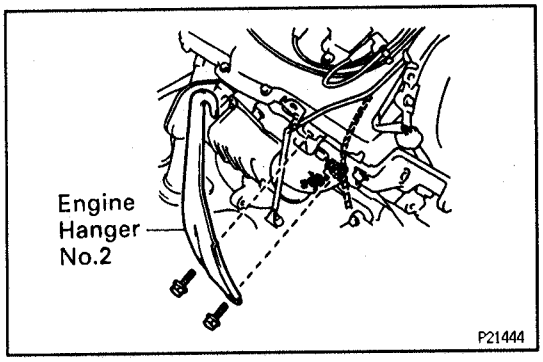


(d) Disconnect these wires and connectors:
- Igniter connector
- Ground strap

(e) Remove the bolt and 2 nuts.

(f) Pull out the engine wire from the cabin.

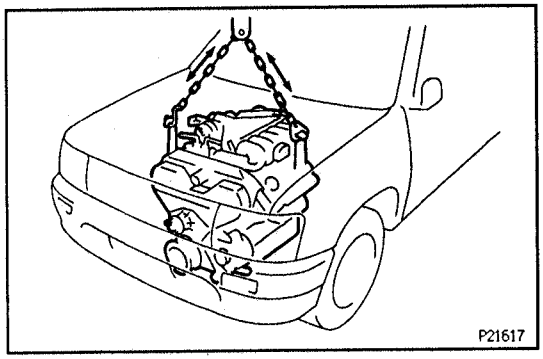
EG



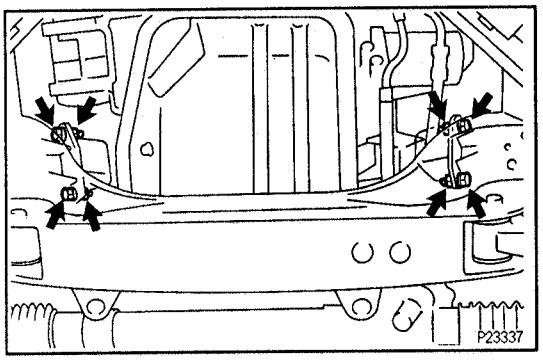
13. REMOVE ENGINE

(a) w/ A/C:
Remove the bolt and disconnect the A/C compressor wire clamp.

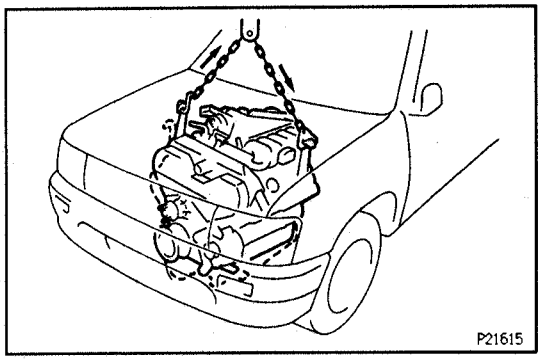
(b) Install a engine hanger No.2 in the correct direction.
Part No.:
Engine hanger No.2 12282-62030
Bolt 91512-61020
Torque: 40 N·m (400 kgf·cm, 30 ft·lbf)



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



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



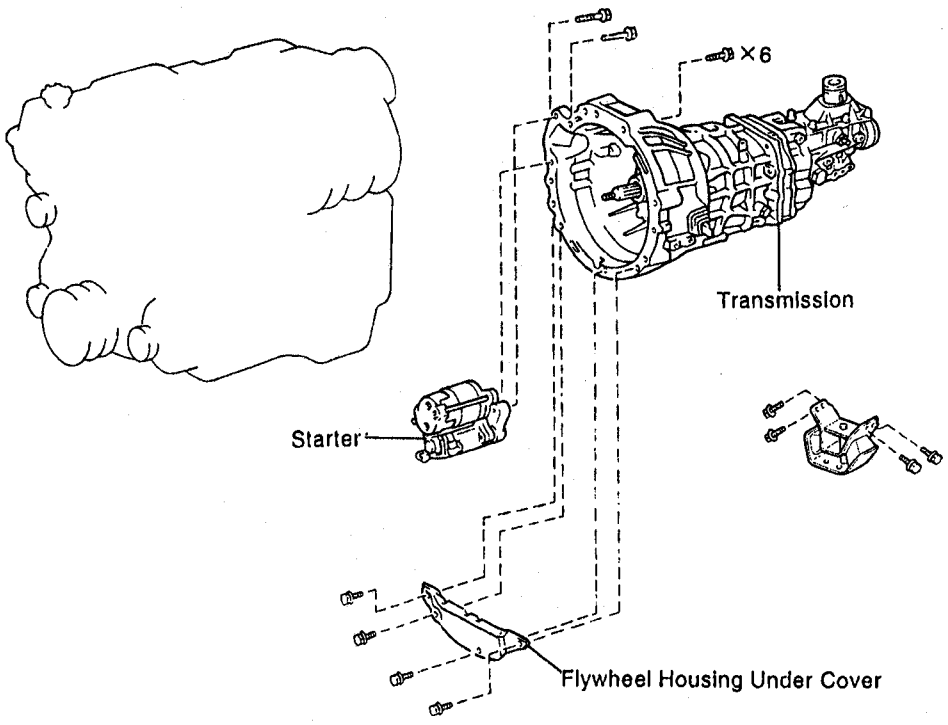
(e) Lift the engine out of the vehicle slowly and carefully.
NOTICE: Make sure the engine is clear of all wiring and hoses.

(f) Place the engine assembly onto the stand.

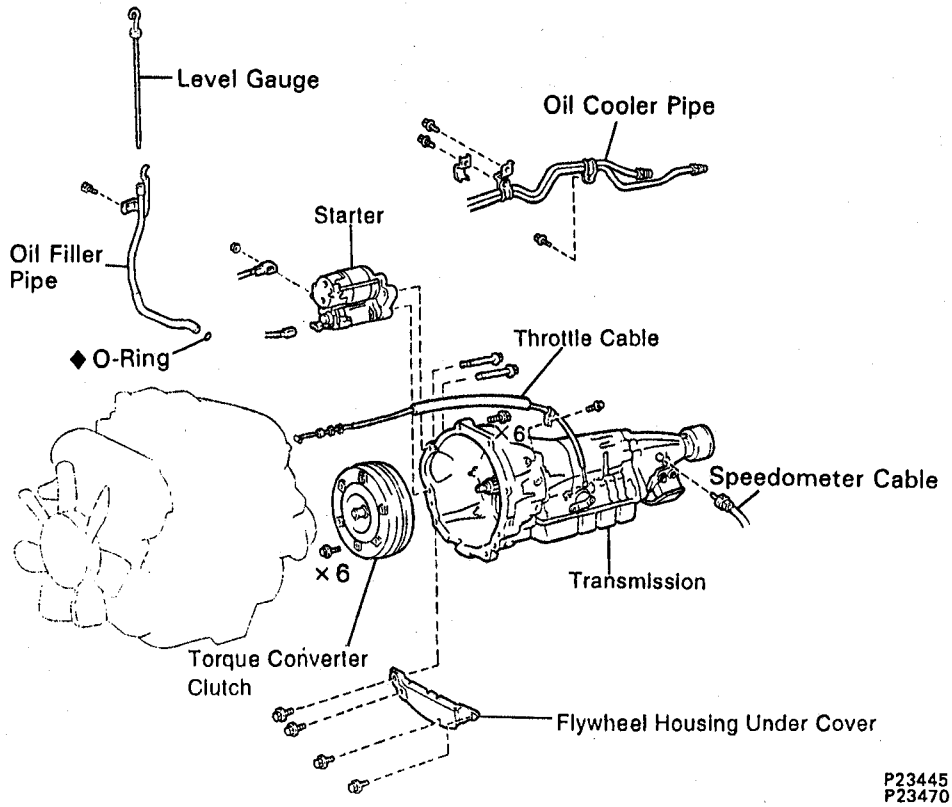
EG1EG-0C

COMPONENTS FOR ENGINE AND TRANSMISSION SEPARATION (2WD)

M/T



A/T



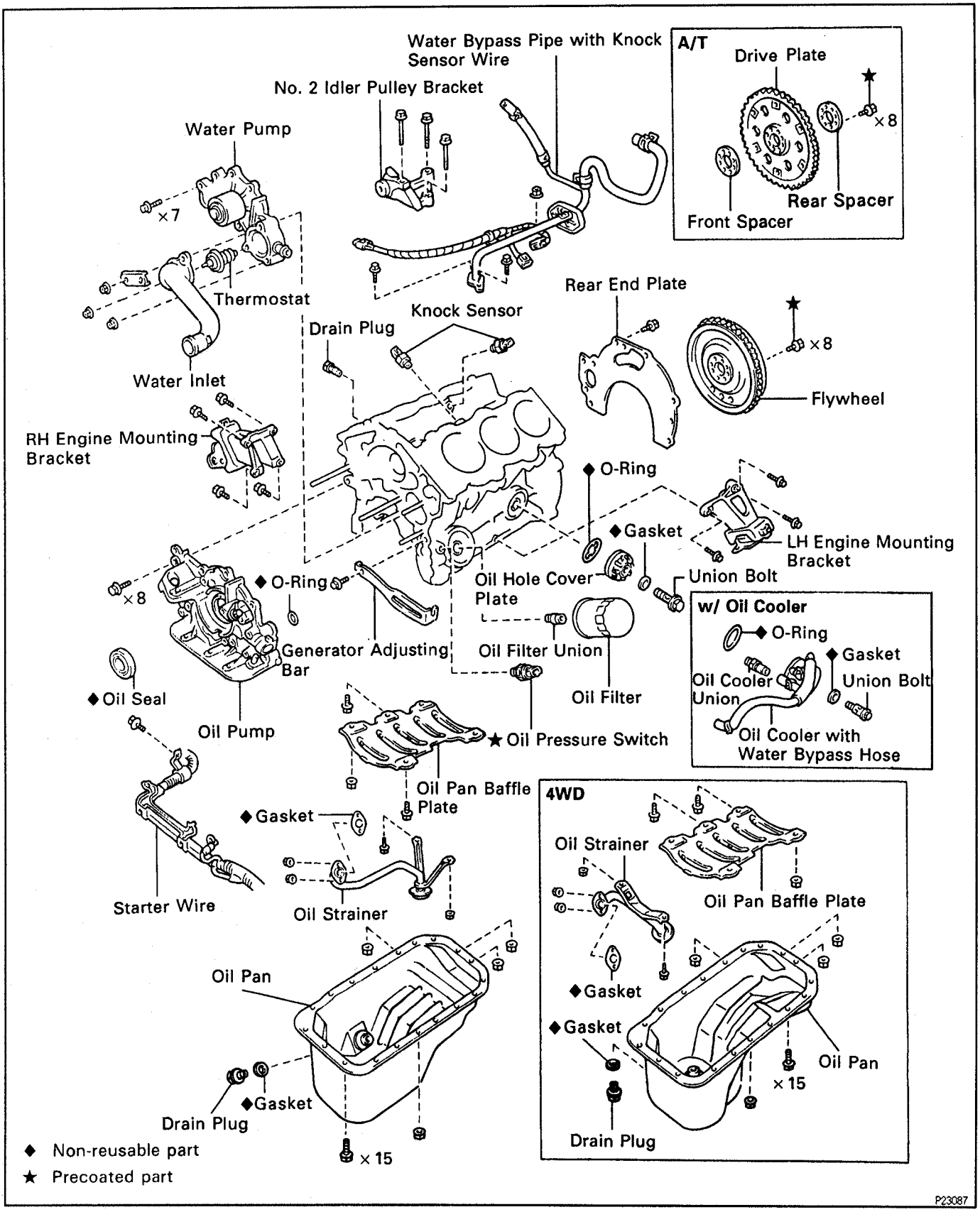
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P23470

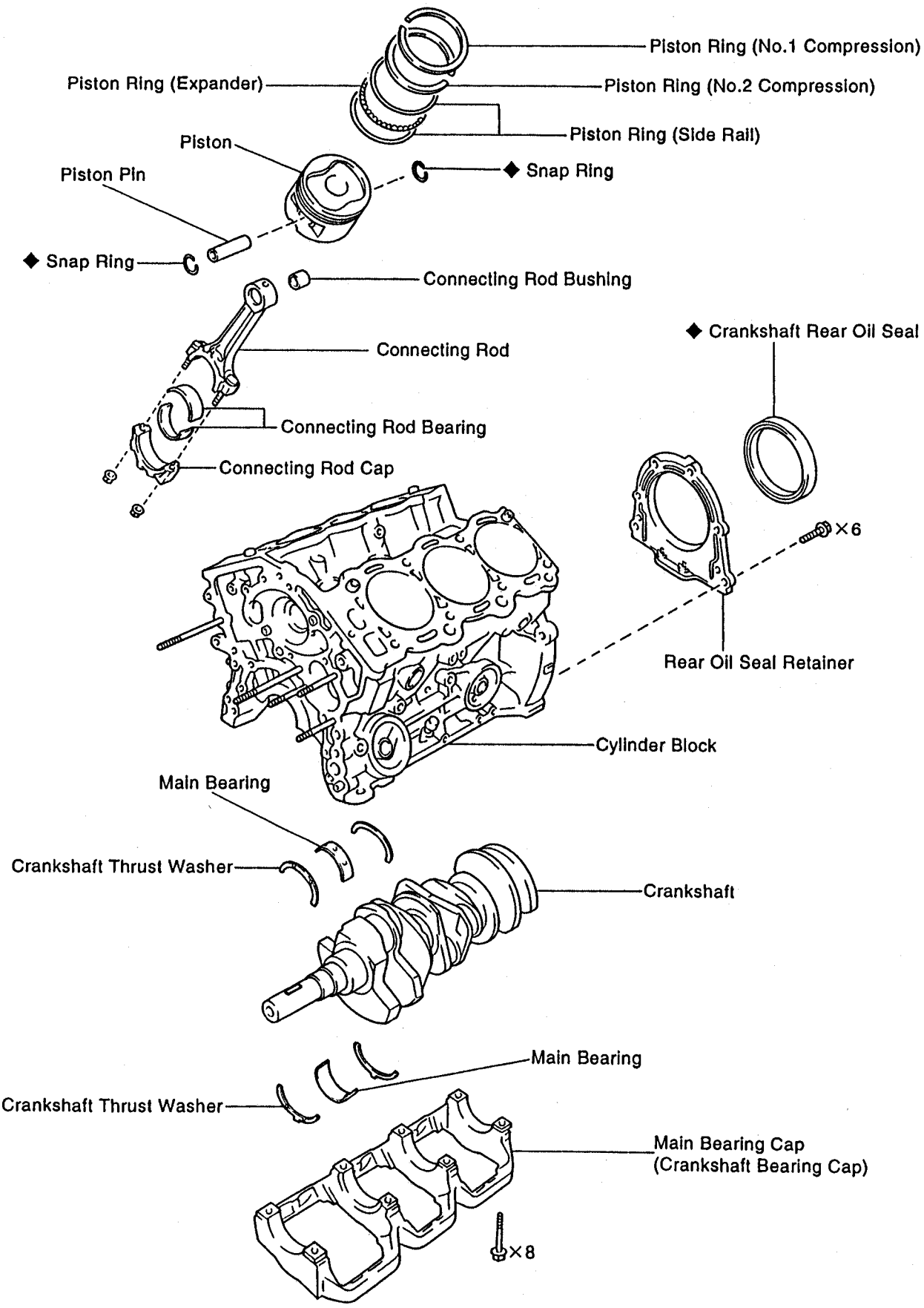
◆ Non-reusable part

Z15510

EG5BM-02

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY





◆ Non-reusable part

P21786

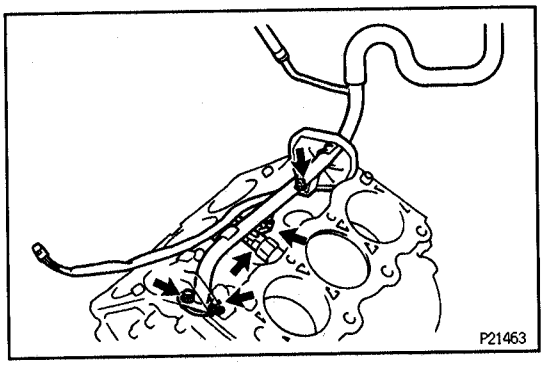
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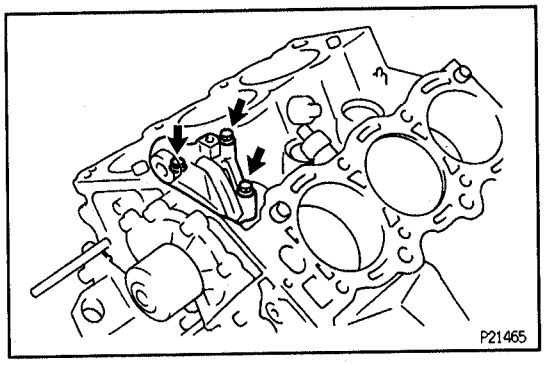
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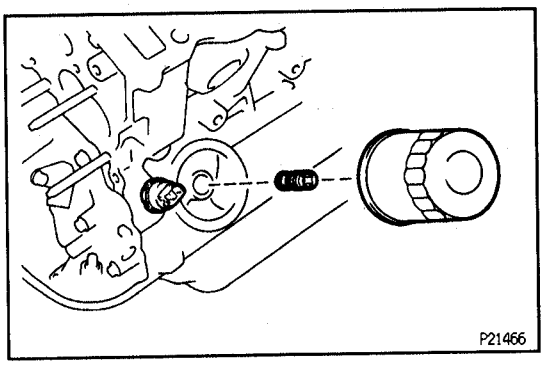
PREPARATION FOR DISASSEMBLY

1. **M/T:**
   REMOVE FLYWHEEL
2. **A/T:**
   REMOVE DRIVE PLATE
3. **REMOVE REAR END PLATE**
4. **INSTALL ENGINE TO ENGINE STAND FOR DISASSEMBLY**
5. **REMOVE TIMING BELT AND PULLEYS**
   (See steps 12 to 24 in timing belt removal)
6. **REMOVE CYLINDER HEADS**
   (See steps 5, 9 to 24 and 26 in cylinder heads removal)
7. **REMOVE WATER BYPASS PIPE WITH KNOCK SENSOR WIRE**

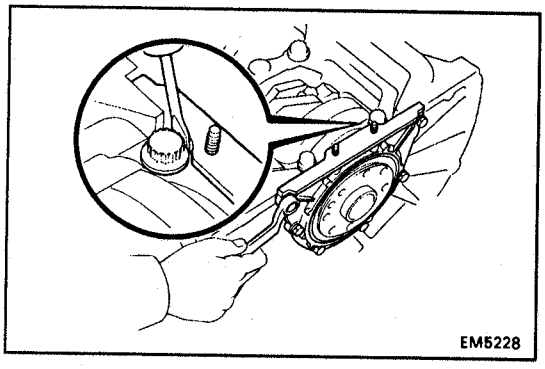
(a) Disconnect the 2 knock sensor connectors.
(b) Remove the 2 bolts, nut and water bypass pipe.







8. **REMOVE NO.2 IDLER PULLEY BRACKET**
   Remove the 3 bolts and idler pulley bracket.
9. **REMOVE KNOCK SENSORS**
   (See step 10 in knock sensors inspection in SFI system)
10. **REMOVE WATER PUMP**
    (See steps 2 to 4 in water pump removal in Cooling System)
11. **REMOVE GENERATOR ADJUSTING BAR**
12. **REMOVE OIL PRESSURE SWITCH**
    Using SST, remove the oil pressure switch.
    SST 09816–30010
13. **REMOVE OIL FILTER**
    Using SST, remove the oil filter.
    SST 09228–07501
14. **REMOVE OIL FILTER UNION**
    Using 12 mm hexagon wrench, remove the union.
15. **REMOVE RH AND LH ENGINE MOUNTING BRACKET**
16. **REMOVE COOLANT DRAIN COCK**
17. **w/o OIL COOLER:**
    REMOVE OIL HOLE COVER PLATE
18. **w/ OIL COOLER:**
    REMOVE OIL COOLER
    (See steps 2 and 3 in oil cooler removal in Lubrication System)
19. **REMOVE OIL PUMP**
    (See steps 7 and 9 to 12 in oil pump removal in Lubrication System)

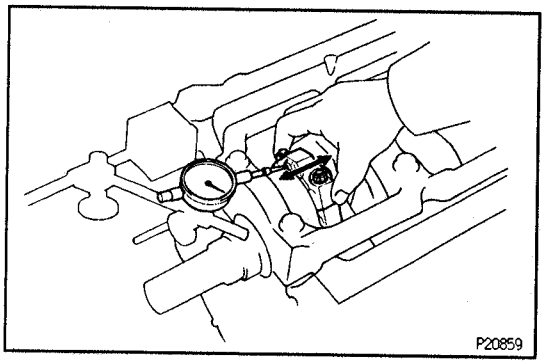


CYLINDER BLOCK DISASSEMBLY

EG5YK–01

1. REMOVE REAR OIL SEAL RETAINER

Remove the 6 bolts and retainer.



2. CHECK CONNECTING ROD THRUST CLEARANCE

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

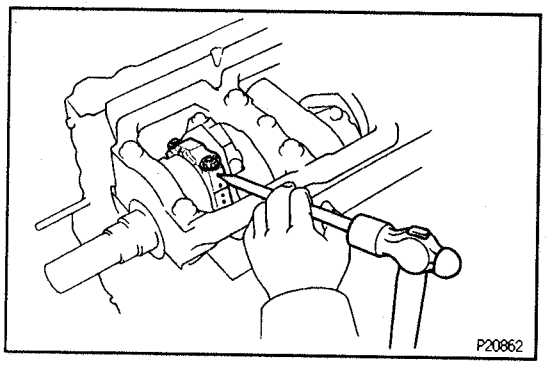
Standard thrust clearance:

0.150 – 0.330 mm (0.0059 – 0.0130 in.)

Maximum thrust clearance:

0.380 mm (0.0150 in.)

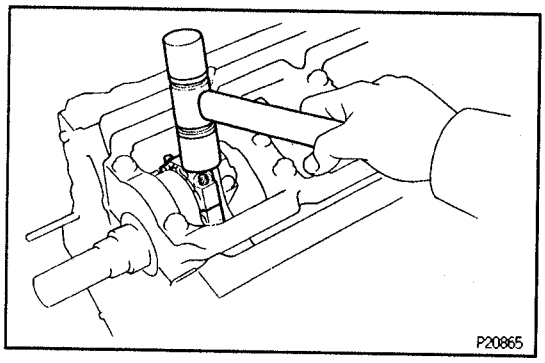
If the thrust clearance is greater than the maximum, replace the connecting rod assembly. If necessary, replace the crankshaft.



3. REMOVE CONNECTING ROD CAPS AND CHECK OIL CLEARANCE

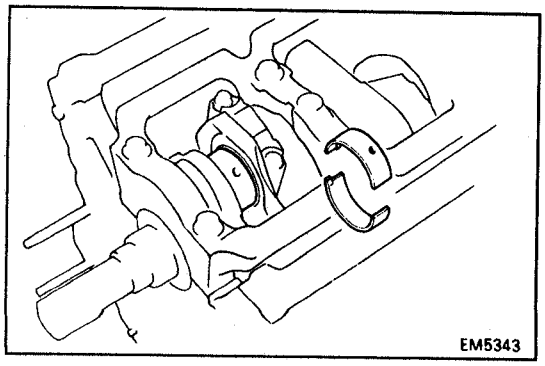
(a) Using a punch or numbering stamp, mark the connecting rod and cap to ensure correct reassembly.

(b) 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.

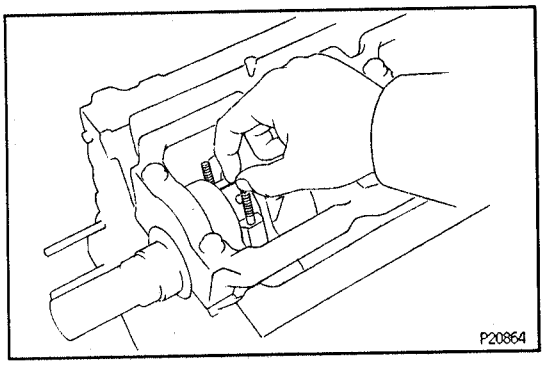
(d) Cover the connecting rod bolts with a short piece of hose to protect the crankshaft from damage.



(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.

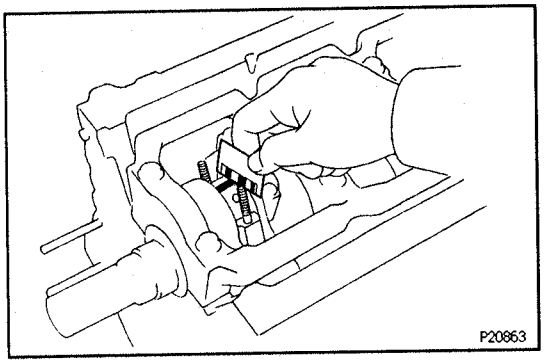


(g) Lay a strip of Plastigage across the crank pin.

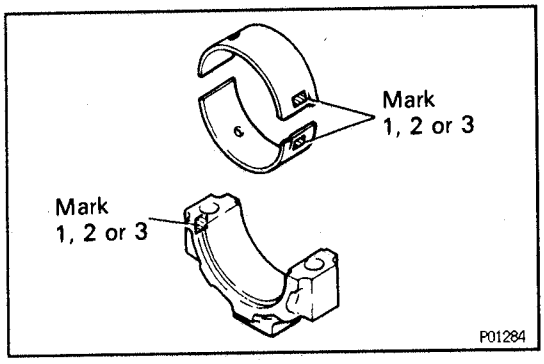
(h) Install the connecting rod cap with the 2 nuts.
(See step 7 in cylinder block assembly)
Torque:
1st 25 N·m (250 kgf·cm, 18 ft·lbf)
2nd Turn extra 90°
NOTICE: Do not turn the crankshaft.

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

EG



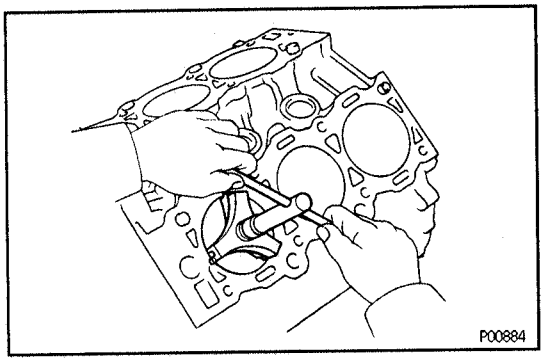
(j) Measure the Plastigauge at its widest point.
Standard oil clearance:
STD
0.024 – 0.053 mm (0.0009 – 0.0021 in.)
U/S 0.25
0.023 – 0.069 mm (0.0009 – 0.0027 in.)
Maximum oil clearance:
0.08 mm (0.0031 in.)
If the oil clearance is greater than the maximum, replace the bearings. If necessary, grind or replace the crankshaft.
HINT: If using a standard bearing, replace with one having the same number marked on the connecting rod cap. There are 3 sizes of standard bearings, marked "1", "2" and "3" accordingly.
Reference
Standard bearing center wall thickness:



Mark	mm (in.)
"1"	1.484 – 1.488 (0.0584 – 0.0586)
"2"	1.488 – 1.492 (0.0586 – 0.0587)
"3"	1.492 – 1.496 (0.0587 – 0.0589)

(k) Completely remove the Plastigauge.

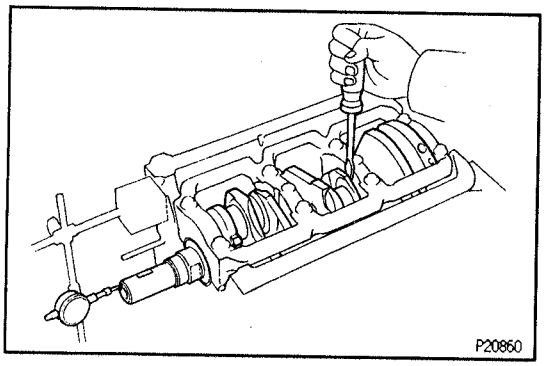
4. REMOVE PISTON AND CONNECTING ROD ASSEMBLIES



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

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

(c) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.
HINT:
- Keep the bearings, connecting rod and cap together.
- Arrange the piston and connecting rod assemblies in correct order.



5. CHECK CRANKSHAFT THRUST CLEARANCE

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

Standard thrust clearance:

0.020 – 0.220 mm (0.0008 – 0.0087 in.)

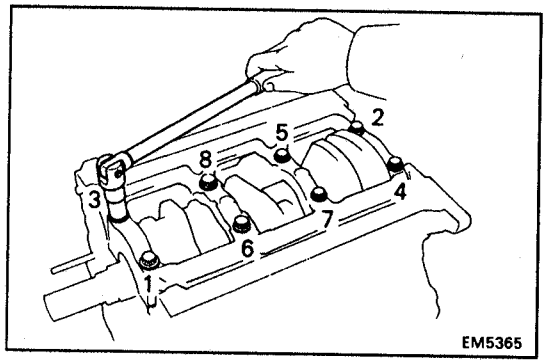
Maximum thrust clearance:

0.300 mm (0.0118 in.)

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

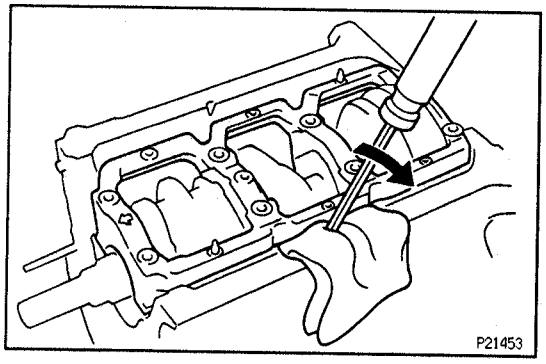
Thrust washer thickness:

2.440 – 2.490 mm (0.0961 – 0.0980 in.)



6. REMOVE MAIN BEARING CAP AND CHECK OIL CLEARANCE

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

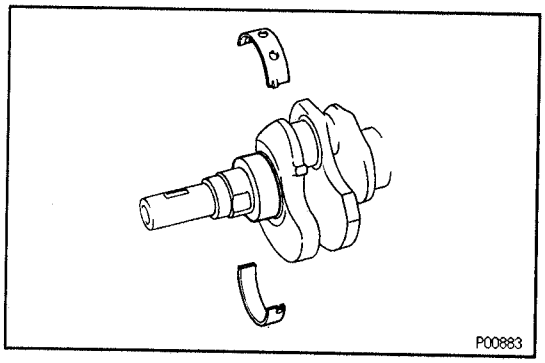


(b) Using a screwdriver, pry out the main bearing cap and remove the main bearing cap, lower main bearings and lower thrust washers (No.2 journal position of main bearing cap only).

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

(c) Lift out the crankshaft.

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

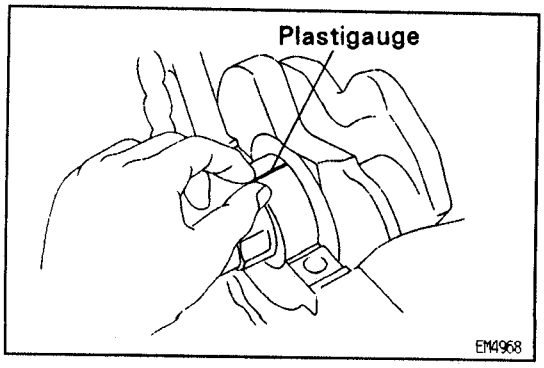


(d) Clean each main journal and bearing.

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

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

(f) Place the crankshaft on the cylinder block.



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

(h) Install the main bearing cap with the 8 bolts.
(See step 4 in cylinder block assembly)

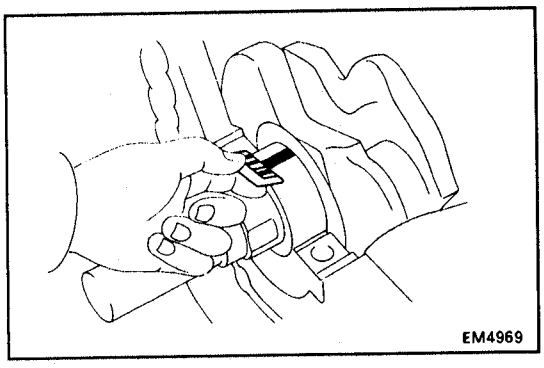
Torque:

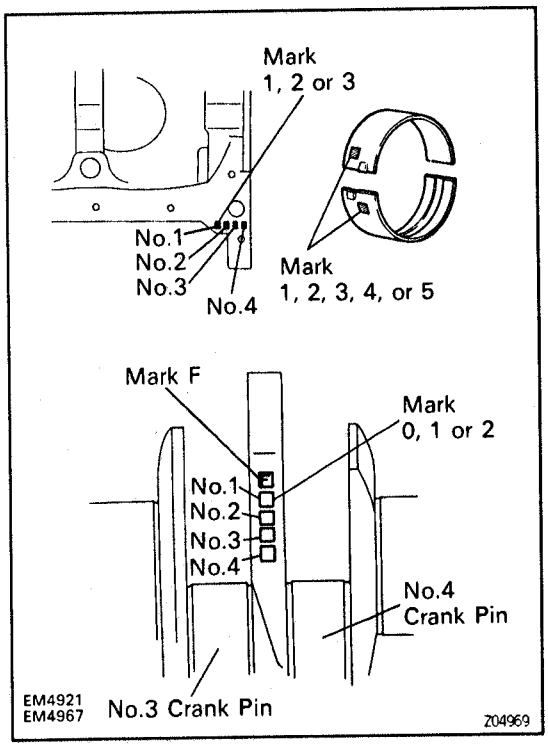
1st 61 N·m (625 kgf·cm, 45 ft·lbf)

2nd Turn extra 90°

NOTICE: Do not turn the crankshaft.

(i) Remove the 8 bolts and main bearing cap.
(See procedure (a) and (b) above)


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Z04969

(j) Measure the Plastigauge at its widest point.

Standard clearance:

Item	STD mm (in.)	U/S 0.25 mm (in.)
No.1	0.020 – 0.038 (0.0008 – 0.0015)	0.019 – 0.059 (0.0007 – 0.0023)
Others	0.024 – 0.042 (0.0009 – 0.0017)	0.023 – 0.063 (0.0009 – 0.0025)

Maximum clearance:

0.08 mm (0.0031 in.)

HINT: If replacing the cylinder block subassembly, the bearing standard clearance will be:

No.1:

0.010 – 0.049 mm (0.0004 – 0.0020 in.)

Others:

0.014 – 0.053 mm (0.0006 – 0.0021 in.)

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

HINT: If using a standard bearing, replace with one having the same number. If the number of the bearing cannot be determined, select the correct bearing by adding together the numbers imprinted on the cylinder block and crankshaft, then selecting the bearing with the same number as the total. There are 5 sizes of standard bearings, marked "1", "2", "3", "4" and "5" accordingly.

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

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

V00240

Reference:

Standard sized bearing center wall thickness:

No.1

Mark	mm (in.)
"1"	1.991 – 1.994 (0.0784 – 0.0785)
"2"	1.994 – 1.997 (0.0785 – 0.0786)
"3"	1.997 – 2.000 (0.0786 – 0.0787)
"4"	2.000 – 2.003 (0.0787 – 0.0789)
"5"	2.003 – 2.006 (0.0789 – 0.0790)

Others

Mark	mm (in.)
"1"	1.989 – 1.992 (0.0783 – 0.0784)
"2"	1.992 – 1.995 (0.0784 – 0.0785)
"3"	1.995 – 1.998 (0.0785 – 0.0787)
"4"	1.998 – 2.001 (0.0787 – 0.0788)
"5"	2.001 – 2.004 (0.0788 – 0.0789)

Cylinder block main journal bore diameter:

Mark	mm (in.)
"1"	68.010 – 68.016 (2.6776 – 2.6778)
"2"	68.016 – 68.022 (2.6778 – 2.6780)
"3"	68.022 – 68.028 (2.6780 – 2.6783)

Crankshaft main journal diameter:

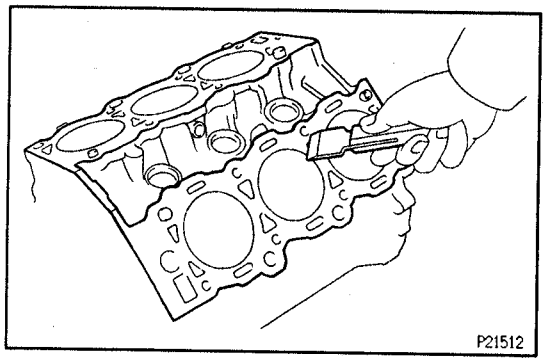
Mark	mm (in.)
"0"	63.996 – 64.000 (2.5195 – 2.5197)
"1"	63.990 – 63.996 (2.5193 – 2.5195)
"2"	63.985 – 63.990 (2.5191 – 2.5193)

(k) Completely remove the Plastigauge.

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.


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CYLINDER BLOCK INSPECTION

EG5YL–01

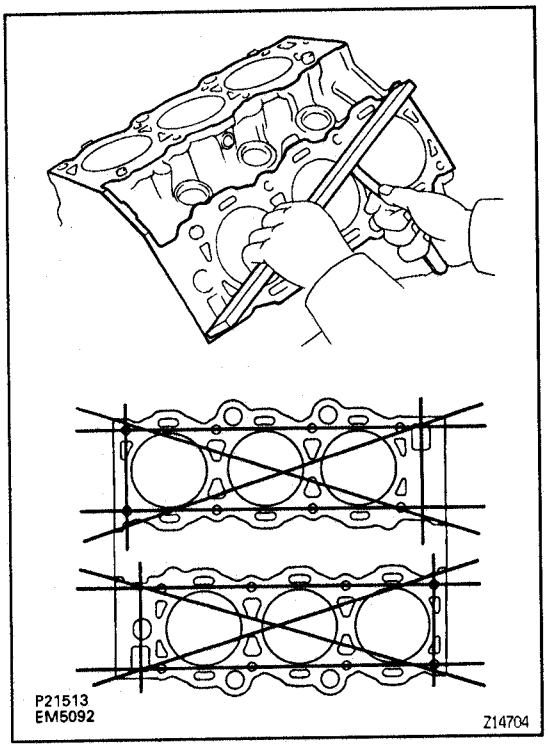
1. CLEAN CYLINDER BLOCK

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.



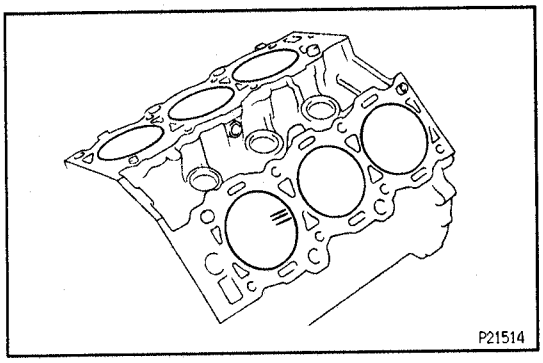
2. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS

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

Maximum warpage:

0.05 mm (0.0020 in.)

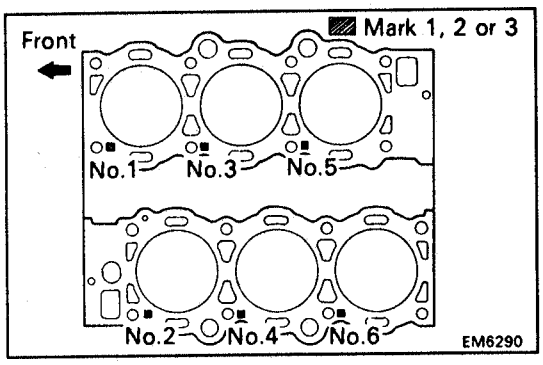
If warpage is greater than the maximum, replace the cylinder block.



3. INSPECT CYLINDER FOR VERTICAL SCRATCHES

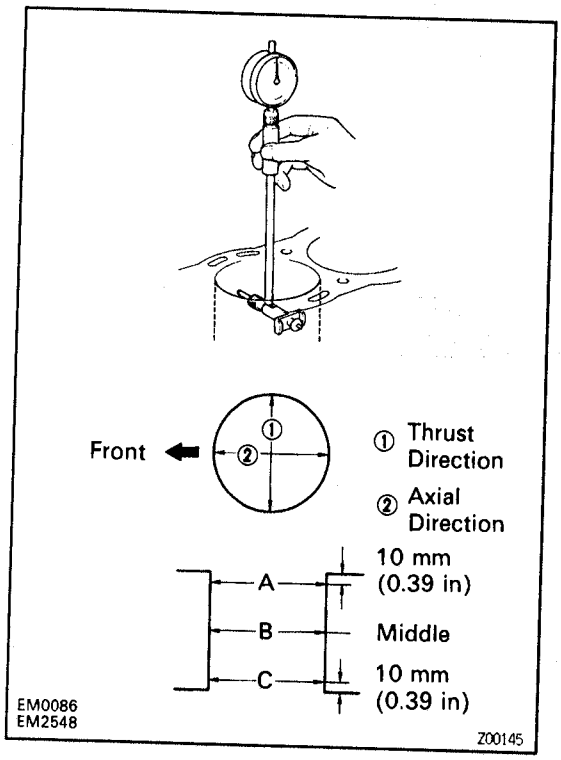
Visually check the cylinder for vertical scratches.

If deep scratches are present, rebore all the 6 cylinders. If necessary, replace the cylinder block.



4. INSPECT CYLINDER BORE DIAMETER

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



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

Standard diameter:

STD

Mark	mm (in.)
"1"	93.500 – 93.510 (3.6811 – 3.6815)
"2"	93.510 – 93.520 (3.6815 – 3.6819)
"3"	93.520 – 93.530 (3.6819 – 3.6823)

Maximum diameter:

STD: 93.730 mm (3.6902 in.)

O/S 0.50: 94.230 mm (3.7098 in.)

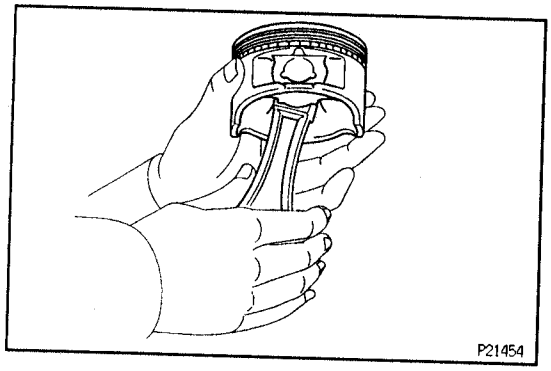
If the diameter is greater than the maximum, rebore all the 6 cylinders. If necessary, replace the cylinder block.

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.

PISTON AND CONNECTING ROD DISASSEMBLY

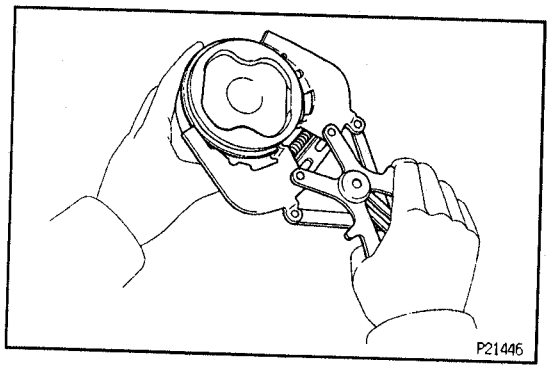
EG1EL–06



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.

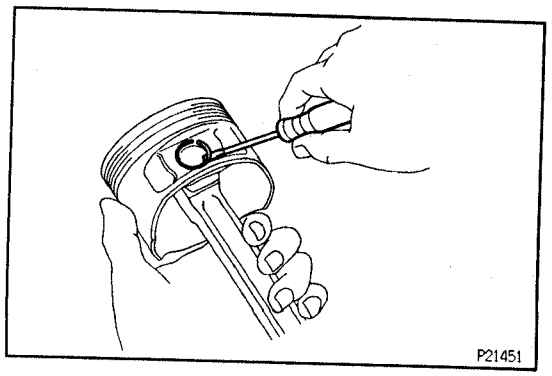


2. REMOVE PISTON RINGS

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

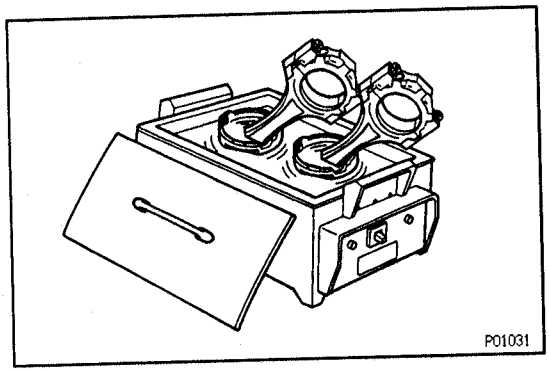
(b) Remove the 2 side rails and oil ring by hand.

HINT: Arrange the piston rings in the correct order only.

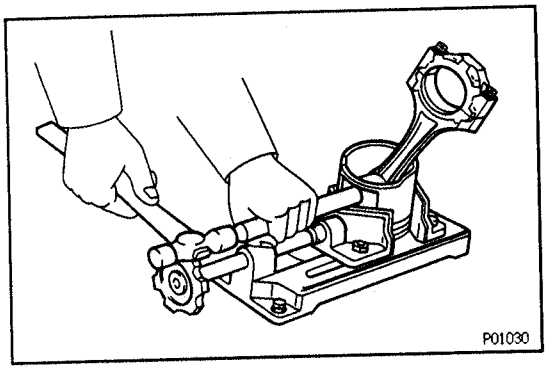


3. DISCONNECT CONNECTING ROD FROM PISTON

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



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



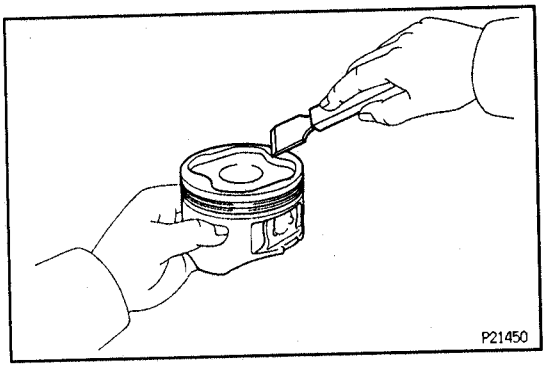
(c) Using a plastic–faced hammer and brass bar, lightly tap out the piston pin and remove the connecting rod.
HINT:
- The piston and pin are a matched set.
- Arrange the pistons, pins, rings, connecting rods and bearings in the correct order.

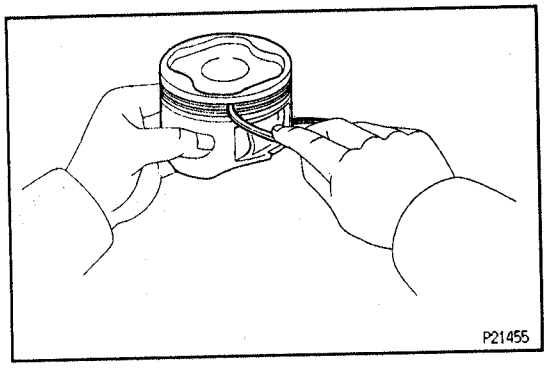
EG5BQ-03

PISTON AND CONNECTING ROD INSPECTION

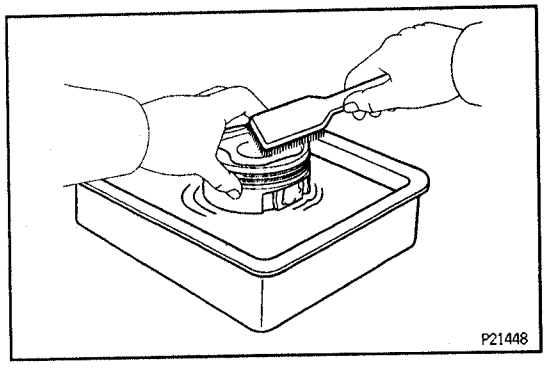
1. CLEAN PISTON

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

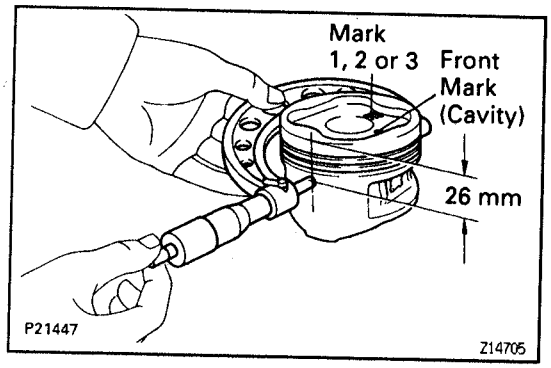




(b) Using a groove cleaning tool or broken ring, clean the piston ring grooves.



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



2. INSPECT PISTON

A. Inspect piston oil clearance

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

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

Piston diameter:

STD

Mark	mm (in.)
"1"	93.356 – 93.366 (3.6754 – 3.6758)
"2"	93.367 – 93.376 (3.6759 – 3.6762)
"3"	93.377 – 93.386 (3.6763 – 3.6766)

O/S 0.50

93.856 – 93.886 mm (3.6951 – 3.6963 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:

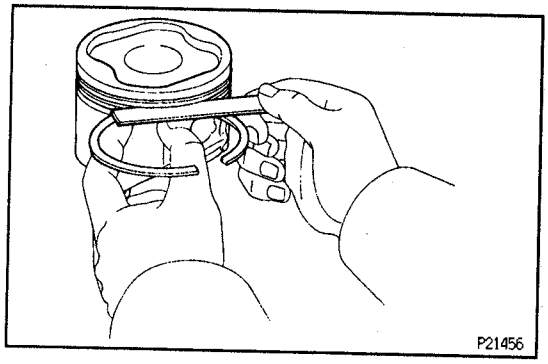
0.134 – 0.154 mm (0.0053 – 0.0060 in.)

Maximum oil clearance:

0.174 mm (0.0069 in.)

If the oil clearance is greater than the maximum, replace all the 6 pistons. If necessary, rebore all the 6 cylinders or replace the cylinder block.

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



B. Inspect piston ring groove clearance

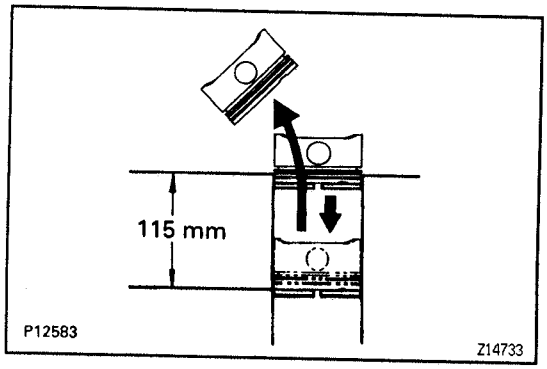
Using a feeler gauge, measure the clearance between new piston ring and the wall of the piston ring groove.

Standard ring groove clearance:

No.1: 0.040 – 0.080 mm (0.0016 – 0.0031 in.)

No.2: 0.030 – 0.070 mm (0.0012 – 0.0028 in.)

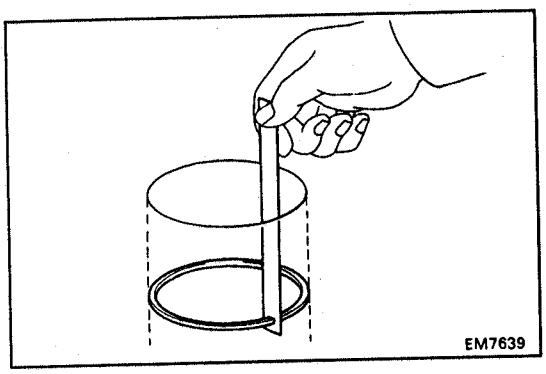
If the clearance is not as specified, replace the piston.



C. Inspect piston ring end gap

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

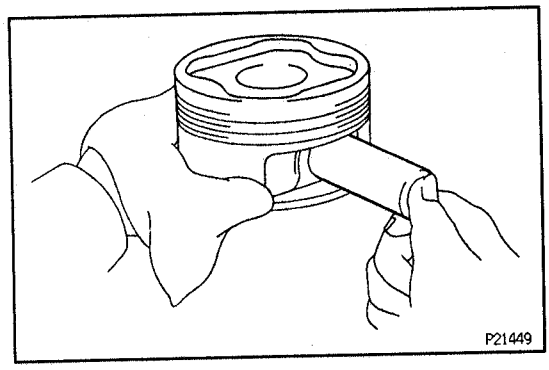
(b) Using a piston, push the piston ring a little beyond the bottom of the ring travel, 115 mm (4.53 in.) from the top of the cylinder block.



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

Ring end gap:

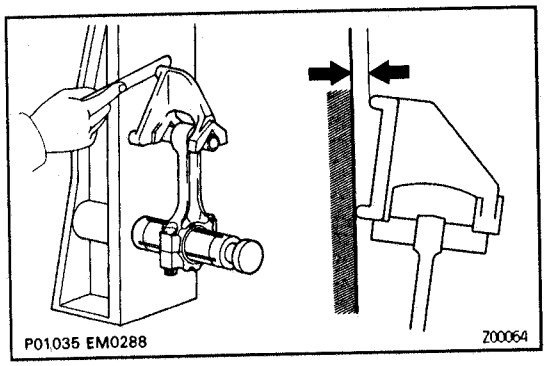
Piston ring	STD mm (in.)	Maximum mm (in.)
No.1	0.300 – 0.500 (0.0118 – 0.0197)	1.100 (0.0433)
No.2	0.400 – 0.600 (0.0157 – 0.0236)	1.200 (0.0472)
Oil (Side rail)	0.150 – 0.550 (0.0059 – 0.0217)	1.150 (0.0453)



If the end gap is greater than the maximum, replace the piston ring. If the end gap is greater than the maximum, even with a new piston ring, rebore all the 6 cylinders or replace the cylinder block.

D. Inspect piston pin fit

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



3. INSPECT CONNECTING ROD

A. Inspect connecting rod alignment

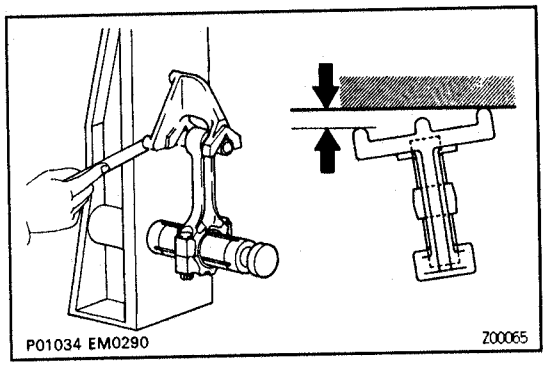
Using a rod aligner and feeler gauge, check the connecting rod alignment.

- Check for bend.

Maximum bend:

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

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

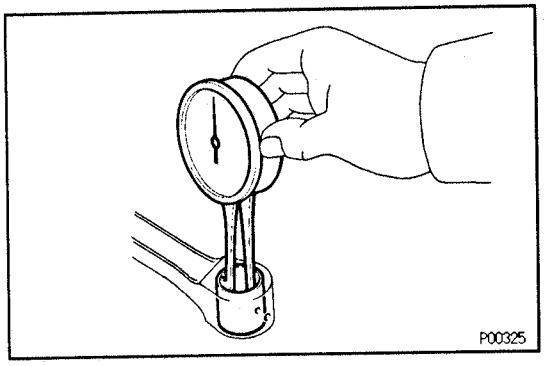


- Check for twist.

Maximum twist:

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

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

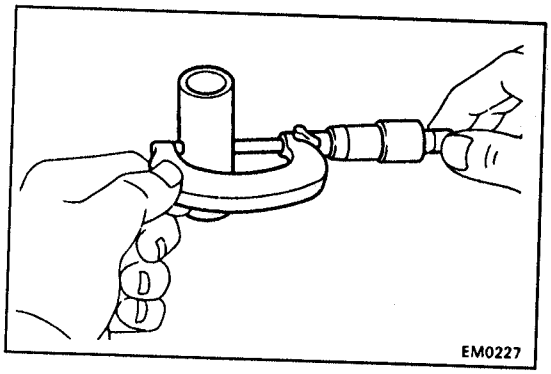


B. Inspect piston pin oil clearance

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

Bushing inside diameter:

22.005 – 22.017 mm (0.8663 – 0.8668 in.)

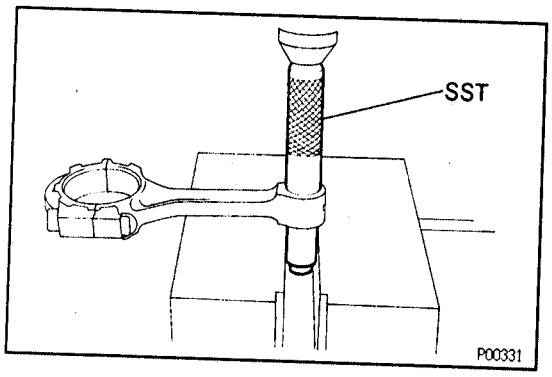


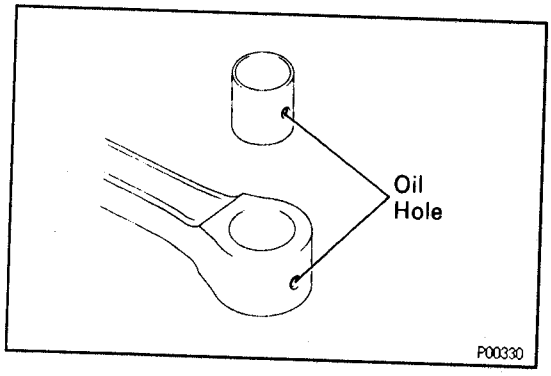
(b) Using a micrometer, measure the piston pin diameter.
Piston pin diameter:
21.997 – 22.009 mm (0.8660 – 0.8665 in.)

(c) Subtract the piston pin diameter measurement from the bushing inside diameter measurement.
Standard oil clearance:
0.005 – 0.011 mm (0.0002 – 0.0004 in.)
Maximum oil clearance:
0.05 mm (0.0020 in.)
If the oil clearance is greater than the maximum, replace the bushing. If necessary, replace the piston and piston pin as a set.

C. If necessary, replace connecting rod bushing

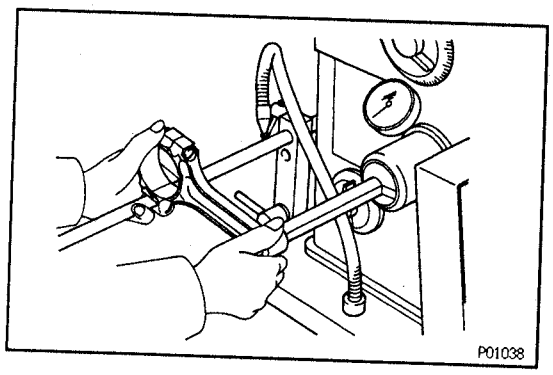
(a) Using SST and a press, press out the bushing.
SST 09222–30010



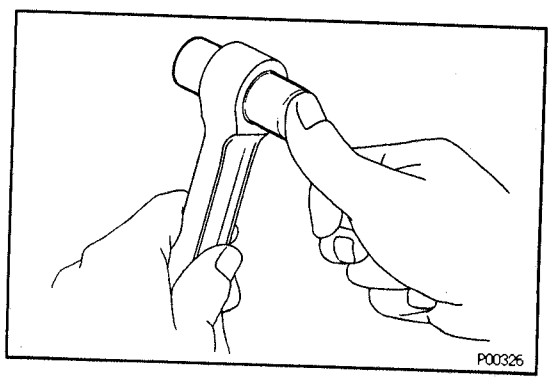


(b) Align the oil holes of a new bushing and the connecting rod.

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

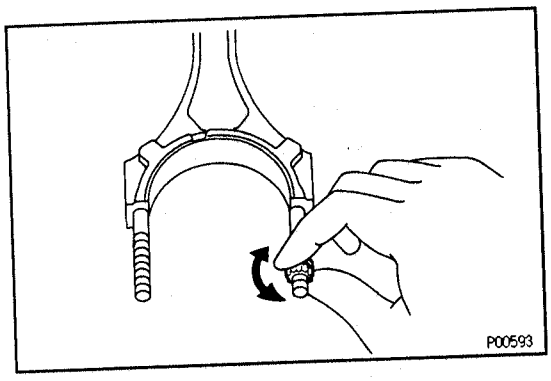


(d) Using a pin hole grinder, hone the bushing to obtain the standard specified clearance (see step B above) between the bushing and piston pin.



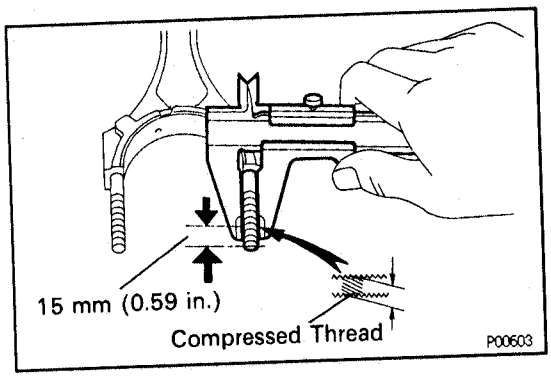
(e) Check the piston pin fit at normal room temperature. Coat the piston pin with engine oil, and push it into the connecting rod with your thumb.

EG



D. Inspect connecting rod bolts

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



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

Standard outer diameter:

7.860 – 8.000 mm (0.3094 – 0.3150 in.)

Minimum outer diameter:

7.600 mm (0.2992 in.)

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

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

EG1ZR-04

CYLINDER BORING

HINT:

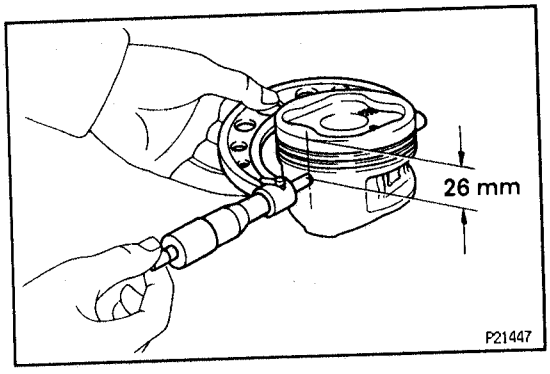
- Bore all the 6 cylinders for the oversized piston outside diameter.
- Replace all the piston rings with ones to match the oversized pistons.

1. KEEP OVERSIZED PISTONS

Oversized piston diameter:

O/S 0.50

93.856 – 93.886 mm (3.6951 – 3.6963 in.)



2. CALCULATE AMOUNT TO BORE CYLINDERS

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

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

Size to be rebored = P + C – H

P = Piston diameter

C = Piston oil clearance

0.134 – 0.154 mm (0.0053 – 0.0060 in.)

H = Allowance for honing

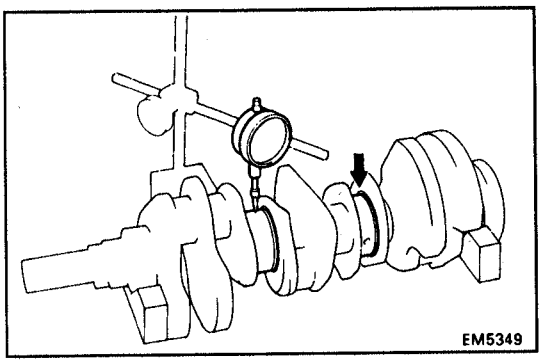
0.02 mm (0.0008 in.) or less

3. BORE AND HONE CYLINDER TO CALCULATED DIMENSIONS

Maximum honing:

0.02 mm (0.0008 in.)

NOTICE: Excess honing will destroy the finished roundness.



CRANKSHAFT INSPECTION AND REPAIR EG1Z8-06

1. INSPECT CRANKSHAFT FOR RUNOUT

(a) Place the crankshaft on V–blocks.

(b) Using a dial indicator, measure the circle runout at the No.2 and No.3 journals.

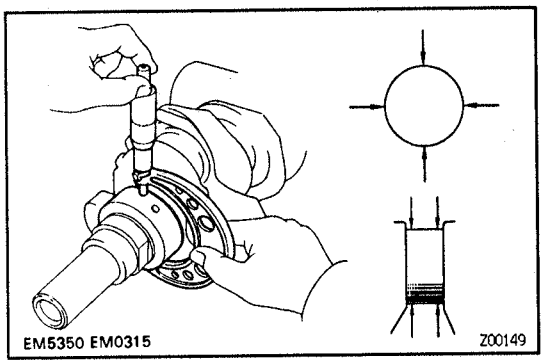
Maximum circle runout: 0.06 mm (0.0024 in.)

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

2. INSPECT MAIN JOURNALS AND CRANK PINS

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

Diameter:



Item	STD mm (in.)	U/S 0.25 mm (in.)
Main journal	63.985 – 64.000 (2.5191 – 2.5197)	63.745 – 63.755 (2.5096 – 2.5100)
Crank pin	54.987 – 55.000 (2.1648 – 2.1654)	54.745 – 54.755 (2.1553 – 2.1557)

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

(See steps 3 and 6 in cylinder block disassembly)

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

Maximum taper and out–of–round:

0.02 mm (0.0008 in.)

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

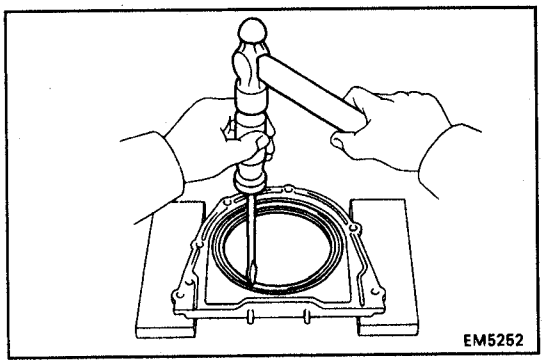
3. IF NECESSARY, GRIND AND HONE MAIN JOURNALS AND/OR CRANK PINS

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

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

CRANKSHAFT OIL SEALS REPLACEMENT EGBYM-01

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



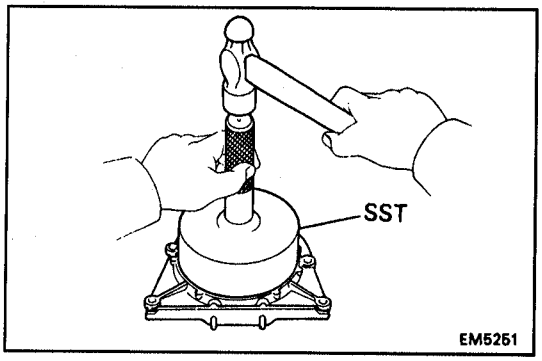
1. REPLACE CRANKSHAFT FRONT OIL SEAL

(See crankshaft front oil seal replacement in Lubrication System)

2. REPLACE CRANKSHAFT REAR OIL SEAL

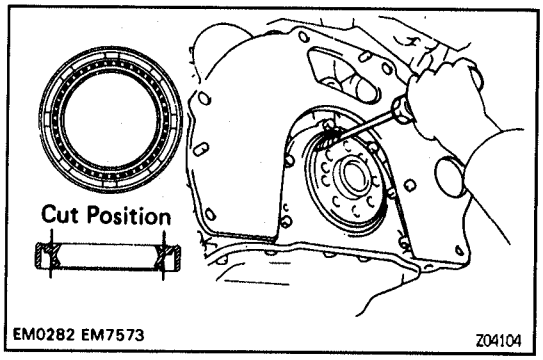
A. If rear oil seal retainer is removed from cylinder block:

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

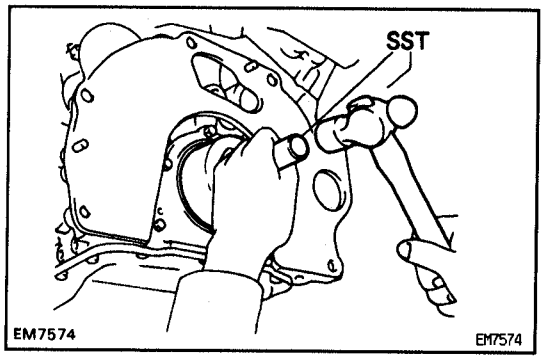


(b) Using SST and a hammer, tap in a new oil seal until its surface is flush with the rear oil seal retainer edge.
SST 09223–15030, 09950–70010 (09951–07150)
(c) Apply MP grease to the oil seal lip.

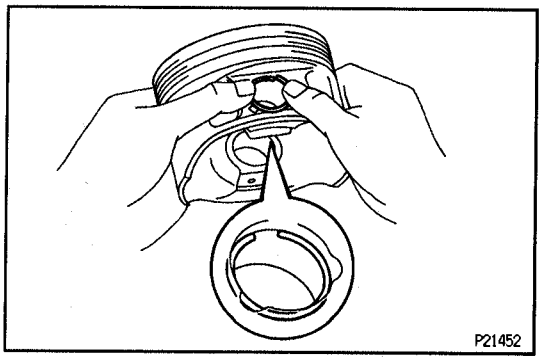
EG



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)

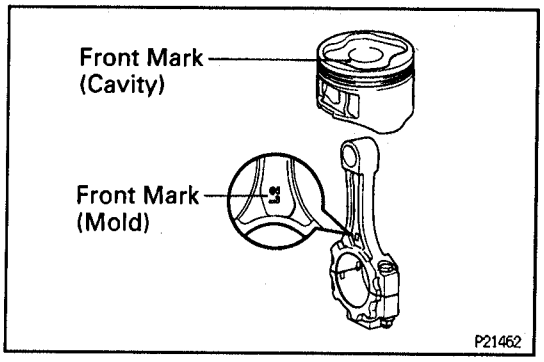


PISTON AND CONNECTING ROD ASSEMBLY

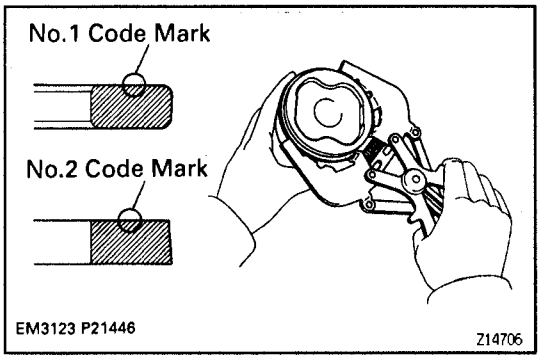
BGBYN-01

1. ASSEMBLE PISTON AND CONNECTING ROD

(a) Using a small screwdriver, install a new snap ring at one end of the piston pin hole.
HINT: Be sure that end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.
(b) Gradually heat the piston to about 60°C (140°F).



(c) Coat the piston pin with engine oil.
(d) Align the front marks of the piston and connecting rod, and push in the piston pin with your thumb.
(e) Using a small screwdriver, install a new snap ring on the other end of the piston pin hole.
HINT: Be sure that end gap of the snap ring is not aligned with the pin hole cutout portion of the piston.



2. INSTALL PISTON RINGS

(a) Install the oil ring expander and 2 side rails by hand.

(b) Using a piston ring expander, install the 2 compression rings with the code mark facing upward.

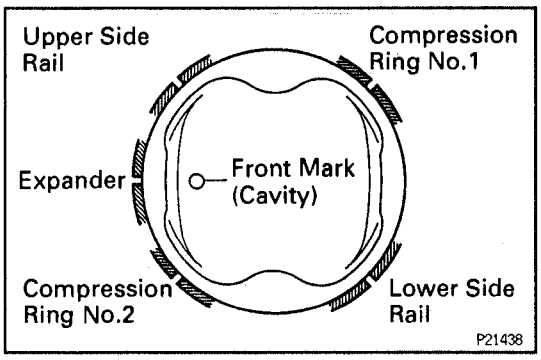
Code mark:

No.1

1R or T

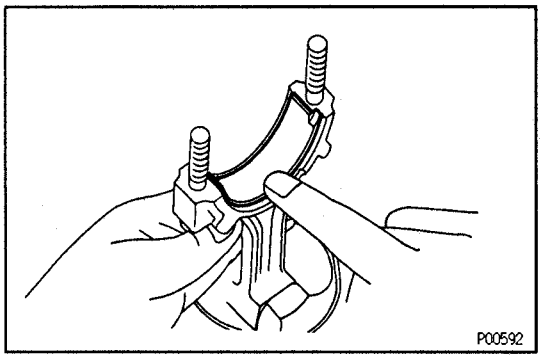
No.2

2R or T



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

NOTICE: Do not align the ring ends.



3. INSTALL BEARINGS

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

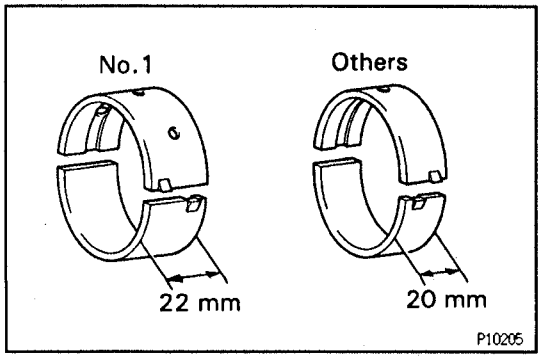
(b) Install the bearings in the connecting rod and connecting rod cap.

CYLINDER BLOCK ASSEMBLY

EQ5YP–01

HINT:

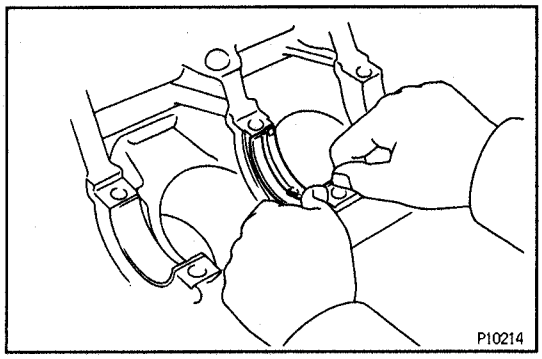
- Thoroughly clean all parts to be assembled.
- Before installing the parts, apply new engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O–rings and oil seals with new parts.



1. INSTALL MAIN BEARINGS

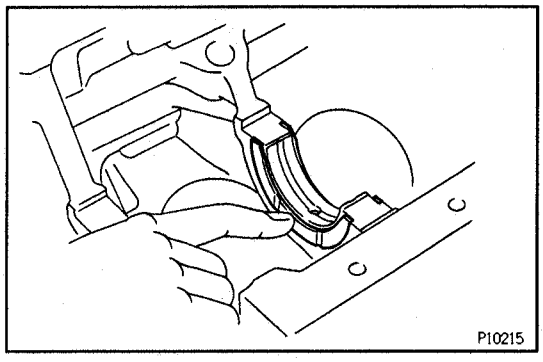
HINT:

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



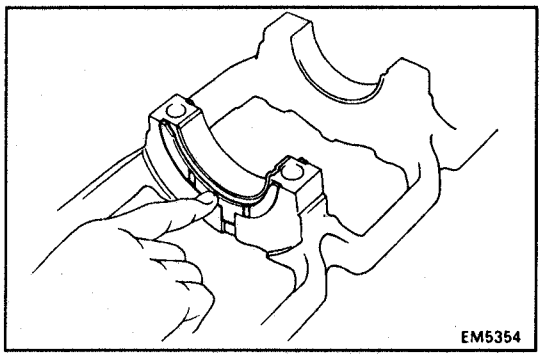
(a) Align the bearing claw with the claw groove of the main bearing cap or cylinder block.
(b) Install the bearings in the cylinder block and main bearing cap.

EG



2. INSTALL UPPER THRUST WASHERS
Install the thrust washers under the No.2 journal position of the cylinder block with the oil grooves facing outward.

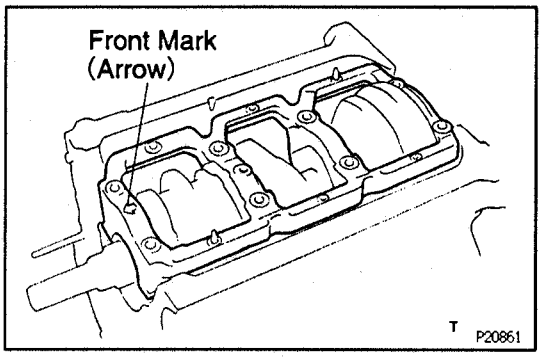
3. PLACE CRANKSHAFT ON CYLINDER BLOCK



4. INSTALL MAIN BEARING CAP AND LOWER THRUST WASHERS

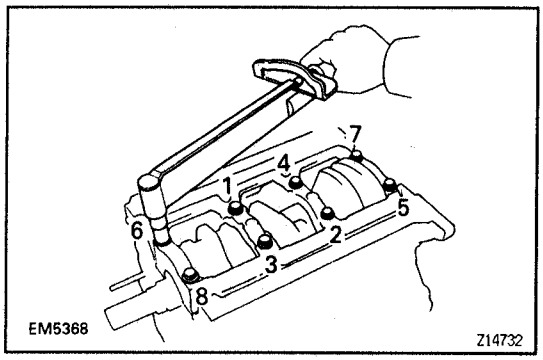
A. Place main bearing cap and lower thrust washers on cylinder block

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

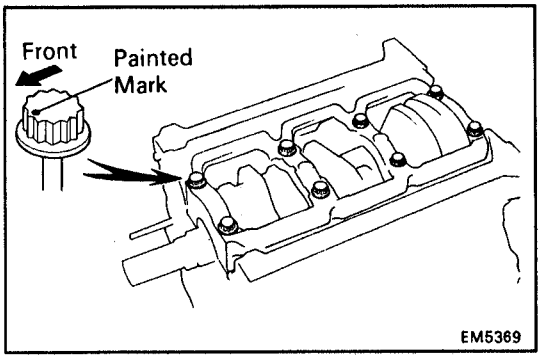


(b) Install the main bearing cap with the front mark facing forward.

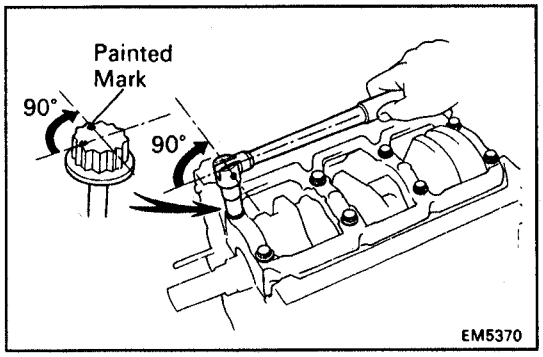
B. Install main bearing cap bolts
HINT:
- The main bearing cap bolts are tightened in 2 progressive steps (steps (b) and (d)).
- If any main bearing cap bolt is broken or deformed, replace it.



(a) Apply a light coat of engine oil on the threads and under the heads of the main bearing cap bolts.
(b) Install and uniformly tighten the 8 main bearing cap bolts in several passes, in the sequence shown.
Torque: 61 N·m (625 kgf·cm, 45 ft·lbf)
If any one of the main bearing cap bolts does not meet the torque specification, replace the cap bolt.

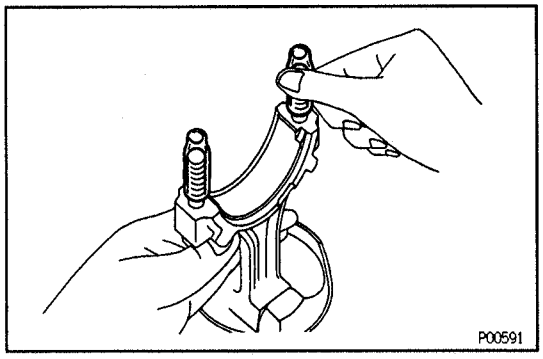


(c) Mark the front of the main bearing cap bolt with paint.



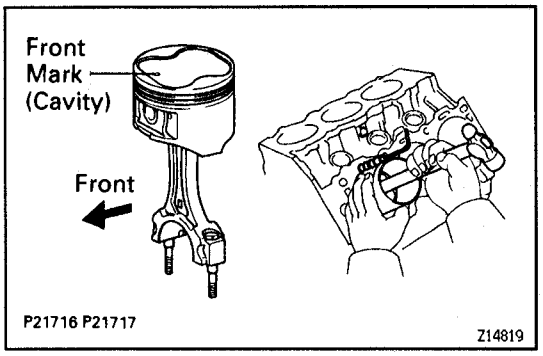
(d) Retighten the main bearing cap bolts by 90° in the numerical order shown.
(e) Check that the painted mark is now at a 90° angle to the front.
(f) Check that the crankshaft turns smoothly.

5. CHECK CRANKSHAFT THRUST CLEARANCE
(See step 5 in cylinder block disassembly)

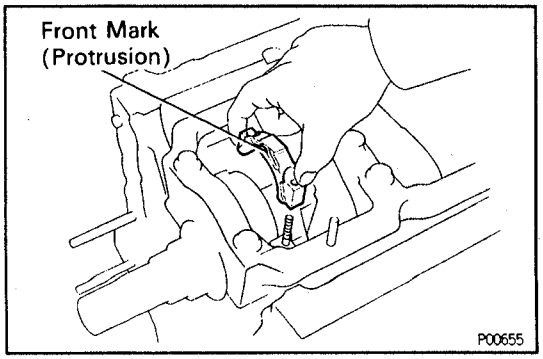


6. INSTALL PISTON AND CONNECTING ROD ASSEMBLIES

(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.



7. INSTALL CONNECTING ROD CAPS

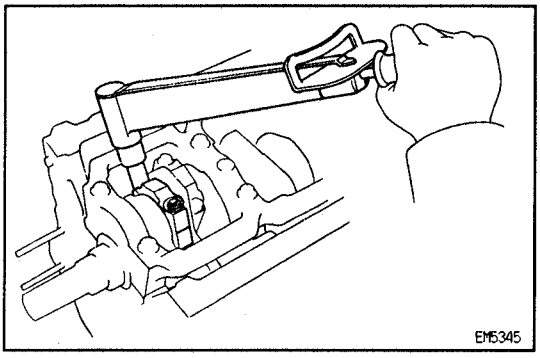
A. Place connecting rod cap on connecting rod

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

B. Install connecting rod cap nuts

HINT:

- The connecting rod cap nuts are tightened in 2 progressive steps (steps (b) and (d)).

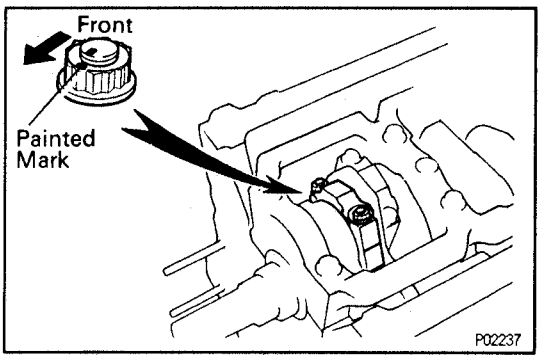


- If any connecting rod bolt is broken or deformed, replace it.

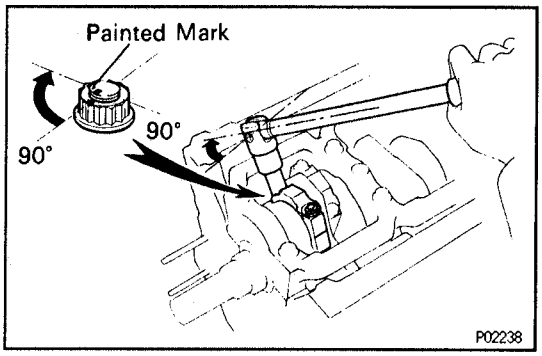
(a) Apply a light of engine oil on the threads and under the nuts of the connecting rod cap.

(b) Install and alternately tighten the nuts of the connecting rod cap in several passes.
Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)
If any one of the connecting rod cap nuts does not meet the torque specification, replace the cap nut.

EG



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



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

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

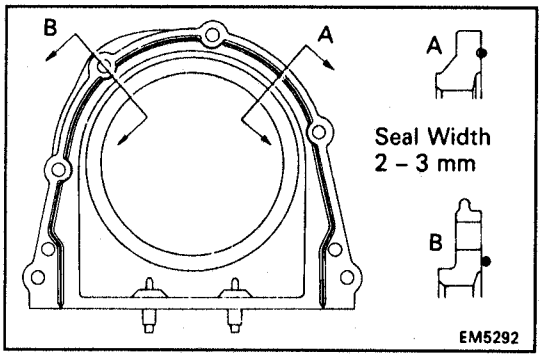
(f) Check that the crankshaft turns smoothly.

8. CHECK CONNECTING ROD THRUST CLEARANCE
(See step 2 in cylinder block disassembly)

9. INSTALL REAR OIL SEAL RETAINER

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

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



(b) Apply seal packing to the oil seal retainer as shown in the illustration.
Seal packing:
Part No.08826–00080 or equivalent

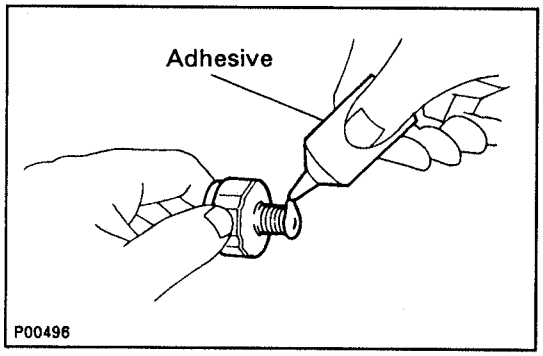
- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Install the oil seal retainer with the 6 bolts.
Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)

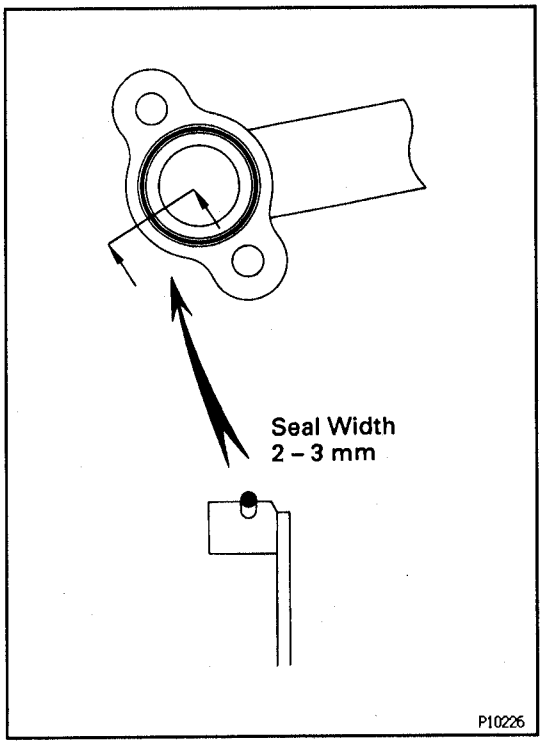
EQBVQ–01

AFTER ASSEMBLY

1. **INSTALL OIL PUMP**
   (See steps 1, 3 to 6 and 9 in oil pump installation in Lubrication System)
2. **w/ OIL COOLER:**
   INSTALL OIL COOLER
   (See steps 2 and 3 in oil cooler removal in Lubrication System)
3. **w/o OIL COOLER:**
   INSTALL OIL HOLE COVER PLATE
   Torque: 60 N·m (600 kgf·cm, 44 ft·lbf)
4. **INSTALL COOLANT DRAIN COCK**
   Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)
5. **INSTALL RH AND LH ENGINE MOUNTING BRACKET**
   Torque: 44 N·m (440 kgf·cm, 32 ft·lbf)
6. **INSTALL OIL FILTER UNION**
   Torque: 25 N·m (250 kgf·cm, 18 ft·lbf)
7. **INSTALL OIL FILTER**
   (See step 2 in oil and filter replacement in Lubrication System)



8. **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
   Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)
9. **INSTALL GENERATOR ADJUSTING BAR**
   Torque: 42 N·m (420 kgf·cm, 31 ft·lbf)
10. **INSTALL WATER PUMP**
    (See steps 1 to 3 in water pump installation in Cooling System)
11. **INSTALL KNOCK SENSORS**
    (See step 12 in knock sensors inspection in SFI System)
12. **INSTALL NO.2 IDLER PULLEY BRACKET**
    Torque: 38 N·m (380 kgf·cm, 28 ft·lbf)



13. INSTALL WATER BYPASS PIPE WITH KNOCK SENSOR WIRE

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

(b) Apply seal packing to the groove of the bypass pipe.
Seal packing:
Part No. 08826 – 00100 or equivalent
- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.

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

(c) Install the bypass pipe with the 2 bolts and nut.
Torque: 8.5 N·m (85 kgf·cm, 75 in.·lbf)

(d) Connect the 2 knock sensor connectors.

14. INSTALL CYLINDER HEADS
(See steps 1, 3 to 20 and 22 in cylinder heads installation)

15. INSTALL PULLEYS AND TIMING BELT
(See steps 1 to 17 in timing belt installation)

16. REMOVE ENGINE STAND

17. INSTALL REAR END PLATE
Torque: 7.5 N·m (75 kgf·cm, 66 in.·lbf)

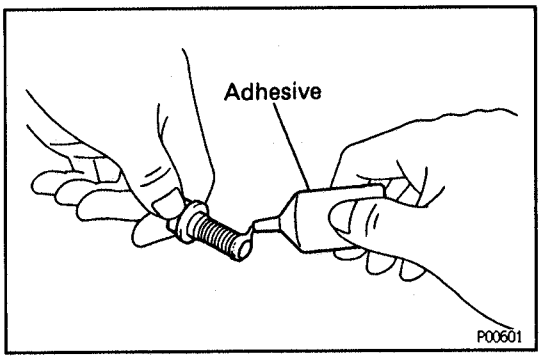
18. A/T:
INSTALL DRIVE PLATE

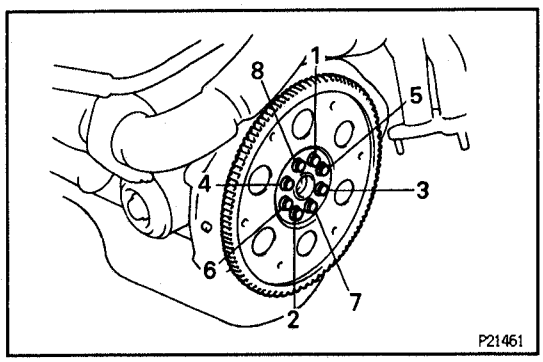
(a) Apply adhesive to 2 or 3 threads of the mount bolt end.
Adhesive: Part No. 08833 – 00070, THREE BOND 1324 or equivalent

(b) Install the front spacer, drive plate and rear spacer on the crankshaft.

(c) Install and uniformly tighten the 8 mount bolts in several passes, in the sequence shown.
Torque: 83 N·m (850 kgf·cm, 61 ft·lbf)

19. M/T:
INSTALL FLYWHEEL (See procedure step 18)
Torque: 85 N·m (850 kgf·cm, 63 ft·lbf)

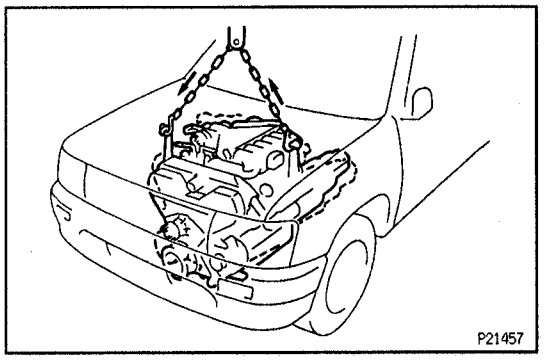




ENGINE AND TRANSMISSION ASSEMBLY (2WD)

EG3LY-04

(See MT and AT section)



ENGINE WITH TRANSMISSION INSTALLATION (2WD)

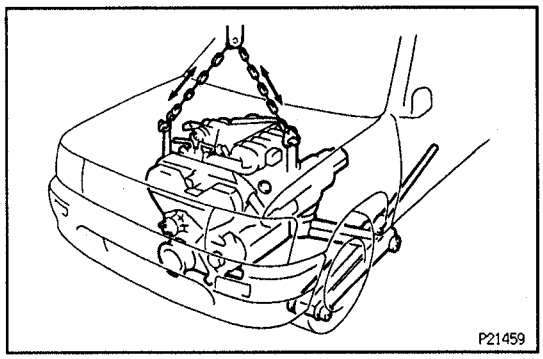
EG5YR-01

EG

1. INSTALL ENGINE AND TRANSMISSION ASSEMBLY IN VEHICLE

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

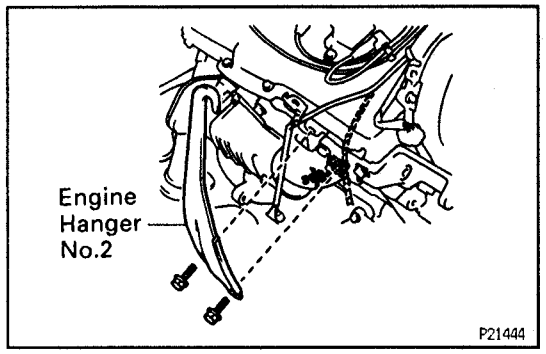
(b) Lower the engine and transmission assembly into the engine compartment.



(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.

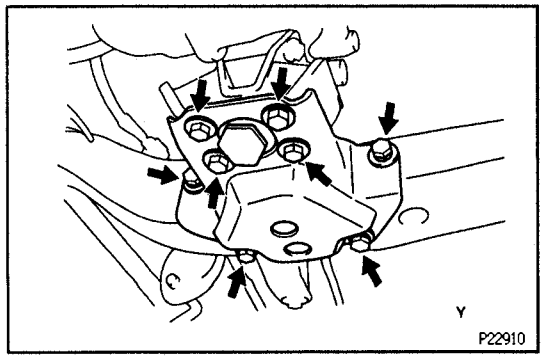
(e) Jack up and put the transmission onto the frame.



(f) Remove the engine chain hoist from the engine.

(g) Remove the 2 bolts and engine hanger No.2.

(h) w/ A/C:
Install the bolt, and connect the A/C compressor wire.



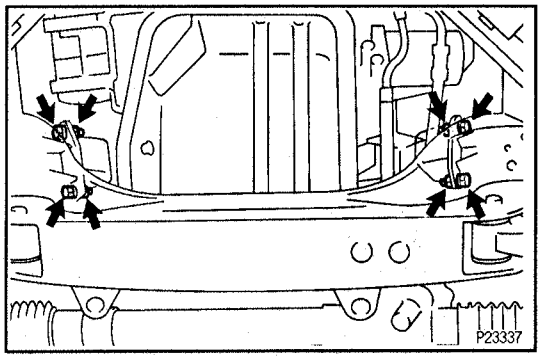
2. INSTALL ENGINE REAR MOUNTING BRACKET

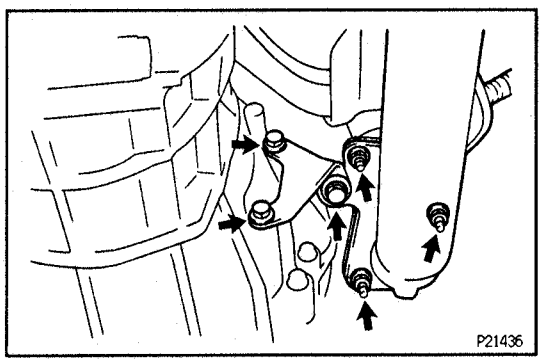
(a) Raise the transmission slightly by raising the engine with a jack and a wooden block under the transmission.

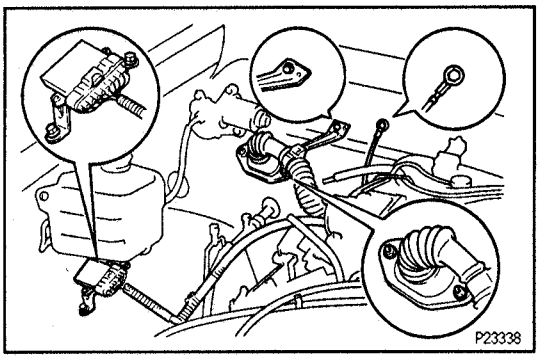
(b) Install the engine rear mounting bracket to the frame.
Torque: 58 N·m (590 kgf·cm, 43 ft·lbf)

(c) Lower the transmission and rest it on the extension housing.

(d) Install the mounting bracket to the mounting insulator.
Torque: 18 N·m (183 kgf·cm, 13 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. A/T:

INSTALL CONROL CABLE

(a) Install the cable bracket with 2 bolts.

(b) Install the cable with the nut.

5. M/T:

INSTALL CLUTCH RELEASE CYLINDER

Install the clutch release cylinder with the 2 bolts.

Torque: 12 N·m (120 kgf·cm, 9 ft·lbf)

6. 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 3 bolts.

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

(c) Connect a new gasket and the front exhaust pipe assembly to the center exhaust pipe with the 2 bolts and retainer.

Torque: 48 N·m (490 kgf·cm, 35 ft·lbf)

(d) Connect the 2 heated oxygen sensor connectors.

7. CONNECT SPEEDOMETER CABLE

8. INSTALL PROPELLER SHAFT

(See propeller shaft installation in Propeller Shaft)

9. M/T:

INSTALL SHIFT LEVER ASSEMBLY

(a) Install a new gasket and shift lever assembly with the 6 bolts.

(b) Install the shift lever boot with the 4 screws.

(c) Install the shift lever knob.

10. CONNECT ENGINE WIRE AND CONNECTORS

(a) Push in the engine wire through the cowl panel.

(b) Install the bolt and 2 nuts.

(c) Connect these wire and connectors:

- Ground strap
- Igniter connector

(d) M/T:

Connect 3 connectors to the ECM.

(e) A/T:

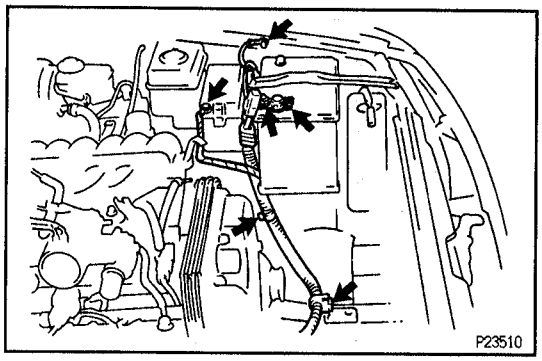
Connect 4 connectors to the ECM.

(f) Install the ECM with the 2 bolts.

11. INSTALL GLOVE COMPARTMENT DOOR AND LOWER NO.2 FINISH PANEL

12. CONNECT GENERATOR WIRE

(See generator installation in Charging System)



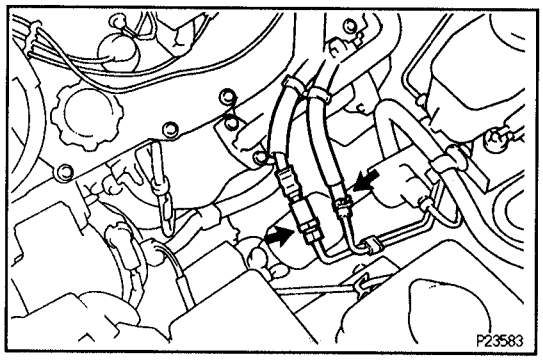
13. CONNECT STARTER WIRE AND CONNECTOR

(a) Connect the 2 starter wire clamps and connector.

(b) Install the 2 nuts, and connect the positive (+) terminal cable to battery.

(c) Install the bolt, and connect the ground strap.

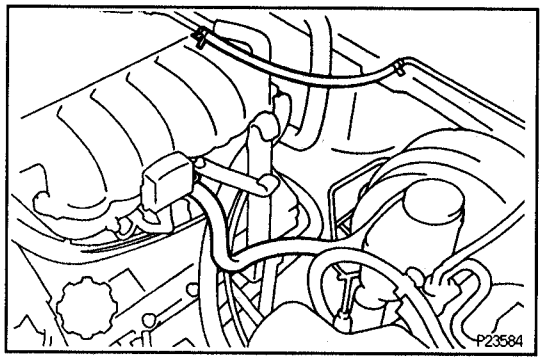
(d) Install the nut, and disconnect wire from Relay Block No.2.



14. CONNECT HOSES

Connect these hoses:

- Fuel return hose
- Fuel inlet hose



- Brake booster vacuum hose
- EVAP hose

15. CONNECT HEATER HOSES

(See steps 22 to 25 in cylinder heads installation)

16. INSTALL FAN WITH FLUID COUPLING AND FAN PULLEYS

(See steps 17 to 24 in timing belt installation)

17. INSTALL RADIATOR ASSEMBLY

(See radiator installation in Cooling System)

18. FILL WITH ENGINE OIL AND COOLANT

19. FILL TRANSMISSION OIL

20. START ENGINE AND CHECK FOR LEAKS

21. CHECK IGNITION TIMING

(See ignition timing inspection)

22. INSTALL ENGINE UNDER COVER

23. INSTALL HOOD

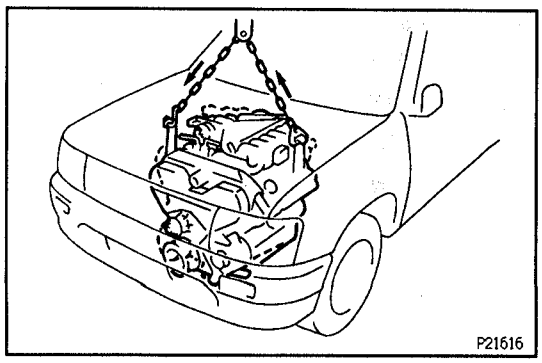
24. ROAD TEST VEHICLE

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

25. RECHECK ENGINE COOLANT AND OIL LEVELS

ENGINE INSTALLATION (4WD)

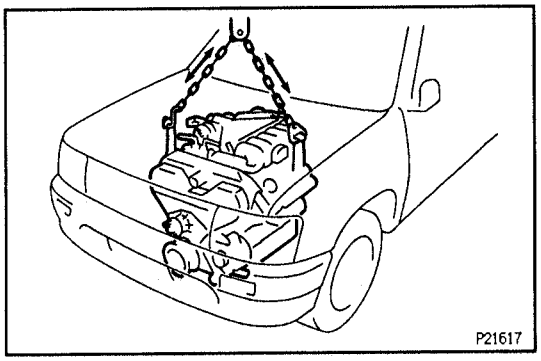
EG5Y8-01



1. INSTALL ENGINE ASSEMBLY IN VEHICLE

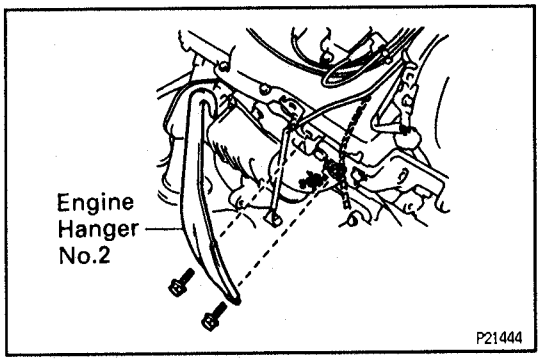
(a) Attach the engine hoist chain to the engine hangers.

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

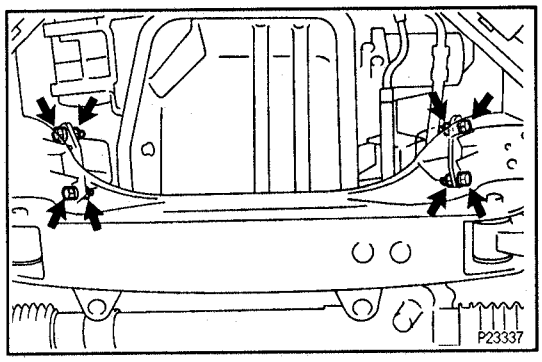


(c) Keep the engine level, and align the RH and LH mountings and body mountings.
(d) Attach the RH and LH mounting insulators to the body mountings, and temporarily install the 4 bolts and nuts.

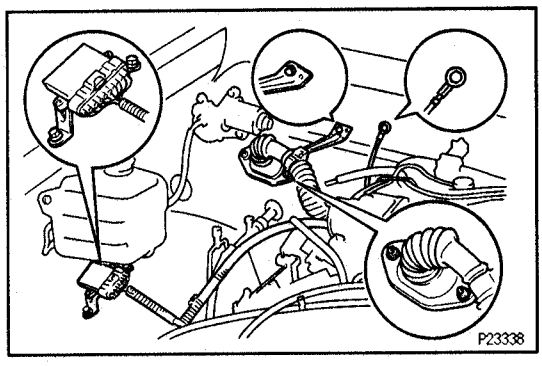
EG



(e) Remove the engine chain hoist from the engine.
(f) Remove the 2 bolts and engine hanger No.2.
(g) w/ A/C:
Install the bolt, and connect the A/C compressor wire.

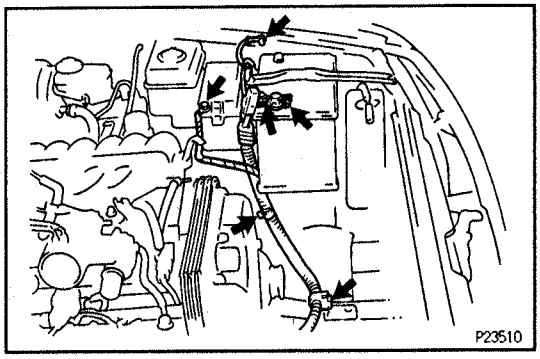


2. TIGHTEN RH AND LH ENGINE MOUNTING INSULATOR BOLTS AND NUTS
Tighten the 4 bolts and nuts holding the mounting insulators to the body mountings.
Torque: 38 N·m (387 kgf·cm, 28 ft·lbf)

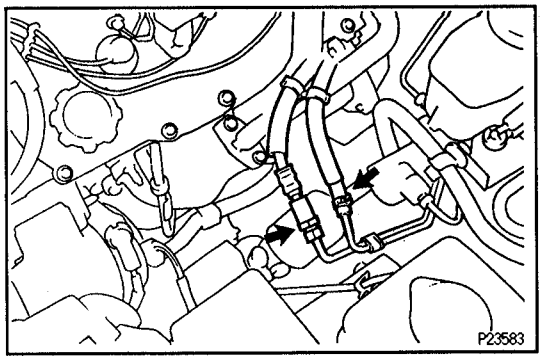


3. CONNECT ENGINE WIRE AND CONNECTORS
(a) Push in the engine wire through the cowl panel.
(b) Install the bolt and 2 nuts.
(c) Connect these wire and connectors:
- Ground strap
- Igniter connector

(d) M/T:
Connect 3 connectors to the ECM.
(e) A/T:
Connect 4 connectors to the ECM.
(f) Install the ECM with the 2 bolts.



4. INSTALL GLOVE COMPARTMENT DOOR AND LOWER FINISH NO.2 FINISH PANEL.
5. CONNECT GENERATOR WIRE
(See generator installation in Charging System)
6. CONNECT STARTER WIRE AND CONNECTORS
(a) Connect the 3 starter wire clamps and connector.
(b) Install the 2 nuts, and connect the positive (+) terminal cable to battery.

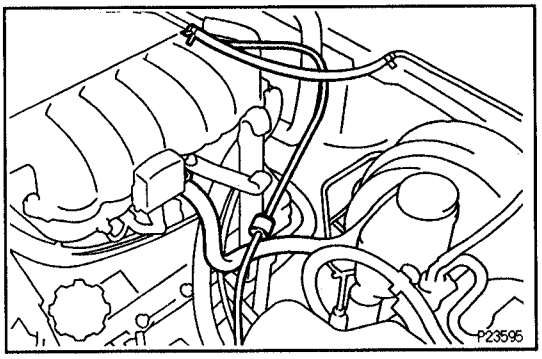


(c) Install the bolt, and connect the ground strap.
(d) Install the nut, and connect wire to Relay Block No.2.

7. CONNECT HOSES

Connect these hoses:

- Fuel return hose
- Fuel inlet hose



- Brake booster vacuum hose
- EVAP hose
- A.D.D. Vacuum hose

8. CONNECT HEATER HOSES

(See steps 22 to 24 in cylinder heads installation)

9. INSTALL FAN WITH FLUID COUPLING AND FAN PULLEYS

(See steps 17 to 24 in timing belt installation)

10. INSTALL AIR CLEANER CASE AND AIR FILTER

11. INSTALL RADIATOR ASSEMBLY

(See radiator installation in Cooling System)

12. FILL WITH ENGINE OIL

13. FILL WITH ENGINE COOLANT

14. INSTALL ENGINE UNDER COVER

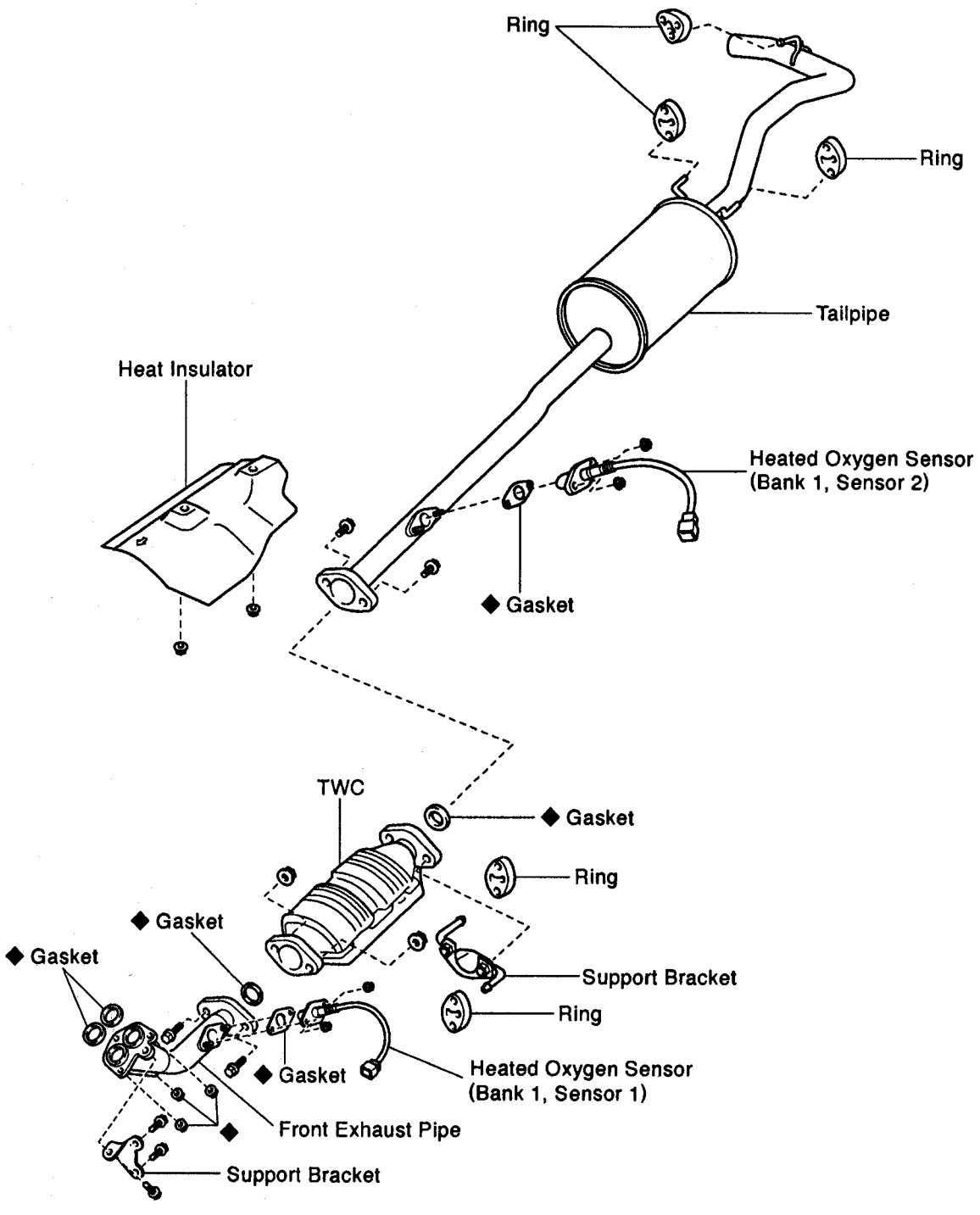
TRANSMISSION INSTALLATION (4WD) EG5YT-01

(See MT and AT section)

EXHAUST SYSTEM

EG

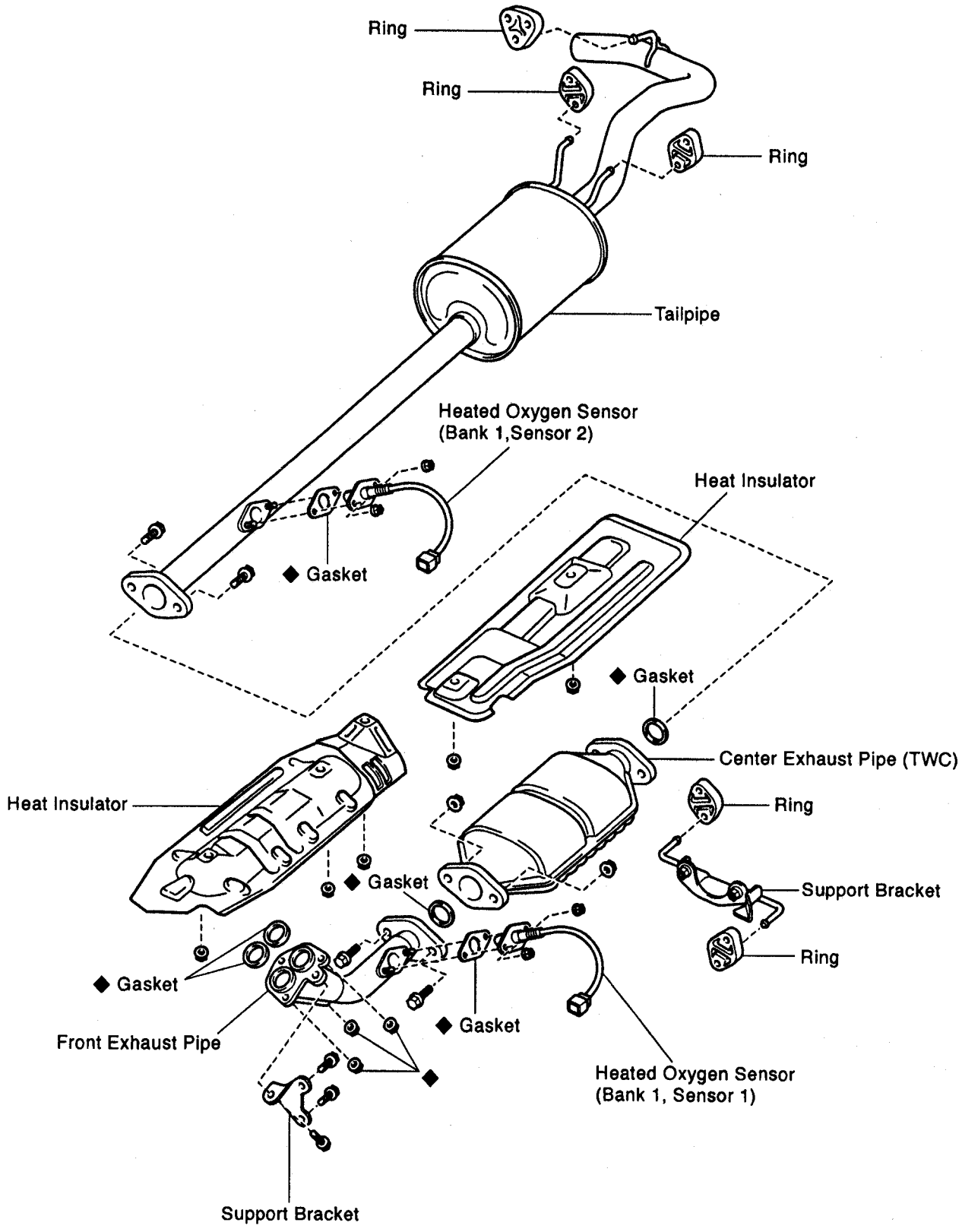
2WD



◆ Non-reusable part

P23943

4WD



◆ Non-reusable part

P23944

EG

SERVICE SPECIFICATIONS

SERVICE DATA

EG0PW-0R

Compression pressure		at 250 rpm STD	1,200 kPa (12.2 kgf/cm², 174 psi) or more
		Minimum	1,000 kPa (10.2 kgf/cm², 145 psi)
	Difference of pressure between each cylinder		100 kPa (1.0 kgf/cm², 15 psi) or less
Valve clearance		at cold Intake	0.13 – 0.23 mm (0.006 – 0.009 in.)
		Exhaust	0.27 – 0.37 mm (0.011 – 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		8 – 12° BTDC @ idle
Idle speed	–		700 ± 50 rpm
Intake manifold vacuum		at idle speed	60 kPa (450 mmHg, 17.7 in.Hg) or more
Timing belt tensioner	Protrusion from housing side		10.0 – 10.8 mm (0.394 – 0.425 in.)
Cylinder head	Warpage	Maximum	0.10 mm (0.039 in.)
	Valve seat		
	Refacing angle		30°, 45°, 60°
	Contacting angle		45°
	Contacting width		1.0 – 1.4 mm (0.039 – 0.055 in.)
	Valve guide bushing bore diameter	STD	10.985 – 11.027 mm (0.4325 – 0.4341 in.)
		O/S 0.05	11.050 – 11.077 mm (0.4350 – 0.4361 in.)
Valve guide bushing	Inside diameter		6.010 – 6.030 mm (0.2366 – 0.2374 in.)
	Outside diameter for repair part	STD	11.033 – 11.044 mm (0.4344 – 0.4348 in.)
		O/S 0.05	11.083 – 11.094 mm (0.4363 – 0.4368 in.)

Valve	Valve overall length	STD Intake	95.15 mm (3.7461 in.)
		Exhaust	94.90 mm (3.7362 in.)
		Minimum Intake	94.60 mm (3.7244 in.)
		Exhaust	94.40 mm (3.7165 in.)
	Valve face angle		44.5°
	Stem diameter	Intake	5.970 – 5.985 mm (0.2350 – 0.2356 in.)
		Exhaust	5.965 – 5.980 mm (0.2348 – 0.2354 in.)
	Stem oil clearance	STD Intake	0.025 – 0.060 mm (0.0010 – 0.0024 in.)
		Exhaust	0.030 – 0.065 mm (0.0012 – 0.0026 in.)
		Maximum Intake	0.08 mm (0.0031 in.)
		Exhaust	0.10 mm (0.0039 in.)
	Margin thickness	STD	1.0 mm (0.039 in.)
		Minimum	0.5 mm (0.020 in.)
Valve spring	Deviation	Maximum	2.0 mm (0.079 in.)
	Free length		44.78 mm (1.7630 in.)
	Installed tension	at 33.3 mm (1.311 in.)	186 – 206 N (19.0 – 21.0 kgf, 41.9 – 46.3 lbf)
Valve lifter	Lifter diameter		30.966 – 30.976 mm (1.2191 – 2.2195 in.)
	Lifter bore diameter		31.000 – 31.018 mm (1.2205 – 1.2212 in.)
	Oil clearance	STD	0.024 – 0.052 mm (0.0009 – 0.0020 in.)
		Maximum	0.08 mm (0.0031 in.)
Camshaft	Thrust clearance	STD	0.033 – 0.080 mm (0.0013 – 0.0031 in.)
		Maximum	0.12 mm (0.0047 in.)
	Journal oil clearance	STD	0.035 – 0.072 mm (0.0014 – 0.0028 in.)
		Maximum	0.10 mm (0.0039 in.)
	Journal diameter		26.949 – 26.965 mm (1.0610 – 1.0616 in.)
	Circle runout	Maximum	0.06 mm (0.0024 in.)
	Cam lobe height	STD Intake	42.31 – 42.41 mm (1.6657 – 1.6697 in.)
		Exhaust	41.96 – 42.06 mm (1.6520 – 1.6559 in.)
		Minimum Intake	42.16 mm (1.6598 in.)
		Exhaust	41.81 mm (1.6461 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		18.2 – 18.8 mm (0.712 – 0.740 in.)
Air intake chamber	Warpage	Maximum	0.10 mm (0.0039 in.)
Intake air connector	Warpage	Maximum	0.10 mm (0.0039 in.)
Intake manifold	Warpage	Maximum	0.10 mm (0.0039 in.)
Exhaust manifold	Warpage	Maximum	1.00 mm (0.0394 in.)
Cylinder block	Cylinder head surface warpage	Maximum	0.05 mm (0.0020 in.)
	Cylinder bore diameter	STD Mark 1	93.500 – 93.510 mm (3.6811 – 3.6815 in.)
		Mark 2	93.510 – 93.520 mm (3.6815 – 3.6819 in.)
		Mark 3	93.520 – 93.530 mm (3.6819 – 3.6823 in.)
		Maximum STD	93.730 mm (3.6902 in.)
		O/S 0.50	94.230 mm (3.7098 in.)

Piston and piston ring	Piston diameter	STD	Mark 1	93.356 – 93.366 mm (3.6754 – 3.6758 in.)
			Mark 2	93.367 – 93.376 mm (3.6759 – 3.6762 in.)
			Mark 3	93.377 – 93.386 mm (3.6763 – 3.6766 in.)
			O/S 0.50	93.856 – 93.886 mm (3.6951 – 3.6963 in.)
	Piston oil clearance		STD	0.134 – 0.154 mm (0.0053 – 0.0060 in.)
			Maximum	0.174 mm (0.0069 in.)
	Piston ring groove clearance		No.1	0.040 – 0.080 mm (0.0016 – 0.0031 in.)
			No.2	0.030 – 0.070 mm (0.0012 – 0.0028 in.)
	Piston ring end gap	STD	No.1	0.300 – 0.500 mm (0.0118 – 0.0197 in.)
			No.2	0.400 – 0.600 mm (0.0157 – 0.0236 in.)
			Oil	0.150 – 0.550 mm (0.0059 – 0.0217 in.)
		Maximum	No.1	1.100 mm (0.0433 in.)
			No.2	1.200 mm (0.0472 in.)
			Oil	1.150 mm (0.0453 in.)
Connecting rod	Thrust clearance		STD	0.150 – 0.330 mm (0.0059 – 0.0130 in.)
			Maximum	0.380 mm (0.0150 in.)
	Connecting rod bearing center wall thickness			
	Reference		Mark 1	1.484 – 1.488 mm (0.0584 – 0.0586 in.)
			Mark 2	1.488 – 1.492 mm (0.0586 – 0.0587 in.)
			Mark 3	1.492 – 1.496 mm (0.0587 – 0.0589 in.)
	Connecting rod oil clearance		STD	0.024 – 0.053 mm (0.0009 – 0.0021 in.)
			O/S 0.25	0.023 – 0.069 mm (0.0009 – 0.0027 in.)
			Maximum	0.08 mm (0.0031 in.)
	Rod bend	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			22.005 – 22.017 mm (0.8663 – 0.8668 in.)
	Piston pin diameter			21.997 – 22.009 mm (0.8660 – 0.8665 in.)
	Bushing oil clearance		STD	0.005 – 0.011 mm (0.0002 – 0.0004 in)
			Maximum	0.05 mm (0.0020 in.)
	Connecting rod bolt outer diameter		STD	7.860 – 8.000 mm (0.3094 – 0.3150 in.)
			Minimum	7.600 mm (0.2992 in.)

Crankshaft	Thrust clearance		STD	0.020 – 0.220 mm (0.0008 – 0.0087 in.)
			Maximum	0.300 mm (0.0118 in.)
	Thrust washer thickness			2.440 – 2.490 mm (0.0961 – 0.0980 in.)
	Main journal oil clearance	No.1	STD	0.020 – 0.038 mm (0.0008 – 0.0015 in.)
			U/S 0.25	0.019 – 0.059 mm (0.0007 – 0.0023 in.)
		Others	STD	0.024 – 0.042 mm (0.0009 – 0.0017 in.)
			U/S 0.25	0.023 – 0.063 mm (0.0009 – 0.0025 in.)
			Maximum	0.08 mm (0.0031 in.)
	Main journal diameter		STD	63.985 – 64.000 mm (2.5191 – 2.5197 in.)
			U/S 0.25	63.745 – 63.755 mm (2.5096 – 2.5100 in.)
	Main bearing center wall thickness			
	Reference	No.1	Mark 1	1.991 – 1.994 mm (0.0784 – 0.0785 in.)
			Mark 2	1.994 – 1.997 mm (0.0785 – 0.0786 in.)
			Mark 3	1.997 – 2.000 mm (0.0786 – 0.0787 in.)
			Mark 4	2.000 – 2.003 mm (0.0787 – 0.0789 in.)
			Mark 5	2.003 – 2.006 mm (0.0789 – 0.0790 in.)
		Others	Mark 1	1.989 – 1.992 mm (0.0783 – 0.0784 in.)
			Mark 2	1.992 – 1.995 mm (0.0784 – 0.0785 in.)
			Mark 3	1.995 – 1.998 mm (0.0785 – 0.0787 in.)
			Mark 4	1.998 – 2.001 mm (0.0787 – 0.0788 in.)
			Mark 5	2.001 – 2.004 mm (0.0788 – 0.0789 in.)
	Crank pin diameter		STD	54.987 – 55.000 mm (2.1648 – 2.1654 in.)
			U/S 0.25	54.745 – 54.755 mm (2.1553 – 2.1557 in.)
	Circle runout		Maximum	0.06 mm (0.0024 in.)
	Main journal taper and out–of–round		Maximum	0.02 mm (0.0008 in.)
	Crank pin taper and out–of–round		Maximum	0.02 mm (0.0008 in.)

EG0FQ-02

TORQUE SPECIFICATIONS

Part tightened		N·m	kgf·cm	ft·lbf
No.1 idler pulley x Oil pump		35	350	26
No.2 idler pulley x No.2 idler pulley bracket		40	400	30
No.1 timing belt cover x Oil pump		9	90	80 in.·lbf
Crankshaft pulley x Crankshaft		250	2,500	184
Camshaft timing pulley x Camshaft		110	1,100	81
Timing belt tensioner x Oil pump		27	270	20
No.2 timing belt cover x No.3 timing belt cover		9	90	80 in.·lbf
Oil dipstick guide x Generator bracket		8	80	71 in.·lbf
Fluid coupling x Fan bracket		5.4	54	48 in.·lbf
Camshaft bearing cap x Cylinder head		16	160	12
Cylinder head rear plate x Cylinder head		8	80	71 in.·lbf
Cylinder head x Cylinder block	12 pointed head 1st	34	350	25
	2nd	Turn 90°	Turn 90°	Turn 90°
	3rd	Turn 90°	Turn 90°	Turn 90°
	Recessed head	18	185	13
Cylinder head cover x Cylinder head		6	60	53 in.·lbf
Exhaust manifold x Cylinder head		40	400	30
Exhaust manifold heat insulator x Exhaust manifold		8	80	71 in.·lbf
Exhaust crossover pipe x Exhaust manifold		45	450	33
Generator bracket x LH cylinder head		18.5	185	14
PS pump bracket x RH cylinder head		18.5	185	14
Intake manifold, Intake manifold stay x Cylinder head		18	180	13
No.3 timing belt cover x Cylinder head		9	90	80 in.·lbf
Camshaft position senser x RH cylinder head		8	80	71 in.·lbf
Intake air connector x Intake manifold		18	180	13
Air intake chamber x Intake air connector		18	180	13
Air intake chamber stay x LH cylinder head		40	400	30
EGR pipe x LH exhaust manifold, EGR valve		18.5	185	14
EGR pipe x Cylinder head		8	80	71 in.·lbf
Engine hanger No.2 x RH cylinder head		40	400	30
Connecting rod cap x Connecting rod	1st	25	250	18
	2nd	Turn 90°	Turn 90°	Turn 90°
Main bearing cap x Cylinder block	1st	61	625	45
	2nd	Turn 90°	Turn 90°	Turn 90°
Rear oil seal retainer x Cylinder block		8	80	71 in.·lbf
Oil cooler union x Cylinder block		30	300	22
Oil hole cover plate x Cylinder block		60	600	44
Engine coolant drain cock x Cylinder block		39	400	29
Engine mounting bracket x Cylinder block		44	440	32
Oil filter union x Cylinder block		25	250	18
Oil pressure switch x Cylinder block		15	150	11
Generator adjusting bar x Cylinder block		42	420	31
No.2 idler pulley bracket x Cylinder block		38	380	28
Water bypass pipe x Cylinder block		8.5	85	75 in.·lbf
Rear end plate x Cylinder block		7.5	75	66 in.·lbf
Drive plate, Flywheel x Crankshaft		83	850	61
Frame crossmember x Engine rear mounting bracket		58	590	43

Engine rear mounting bracket x Engine rear mounting insulator	18	183	13
Engine front mounting insulator x Frame	38	387	28
Clutch release cylinder x Transmission	12	120	9
Front pipe x Exhaust crossover pipe	48	490	35
Front exhaust pipe support bracket x Front pipe, Transmission	44	450	33

EMISSION CONTROL SYSTEMS

SYSTEM PURPOSE

EG4EY-06

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 crankcase 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) Sequential Multiport Fuel Injection *	SFI	Injects a precisely timed, optimum amount of fuel for reduced exhaust emissions

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

PREPARATION

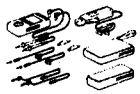
EG1MV-07

SST (SPECIAL SERVICE TOOL)

	09843-18020 Diagnosis Check Wire	

EG2DF-09

RECOMMENDED TOOLS

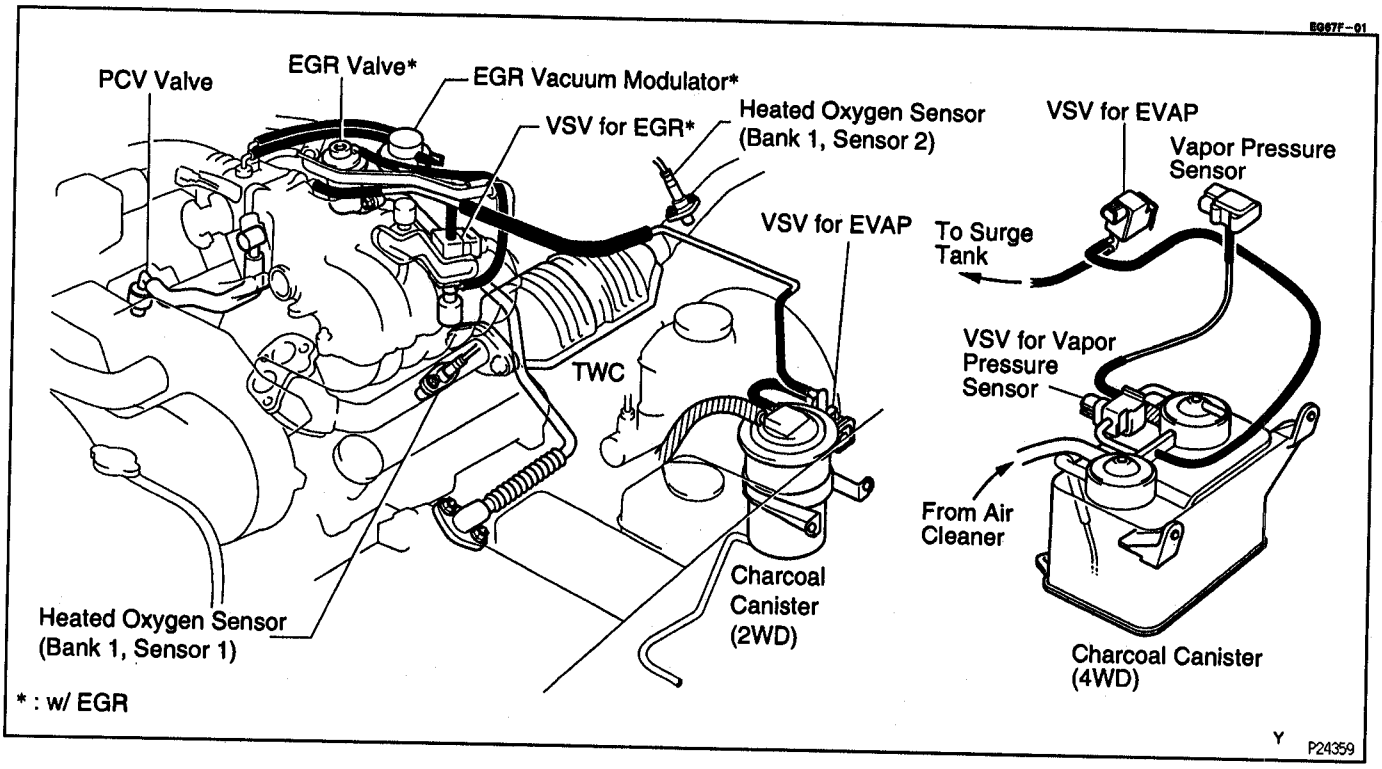
	09082-00050 TOYOTA Electrical Tester Set.	

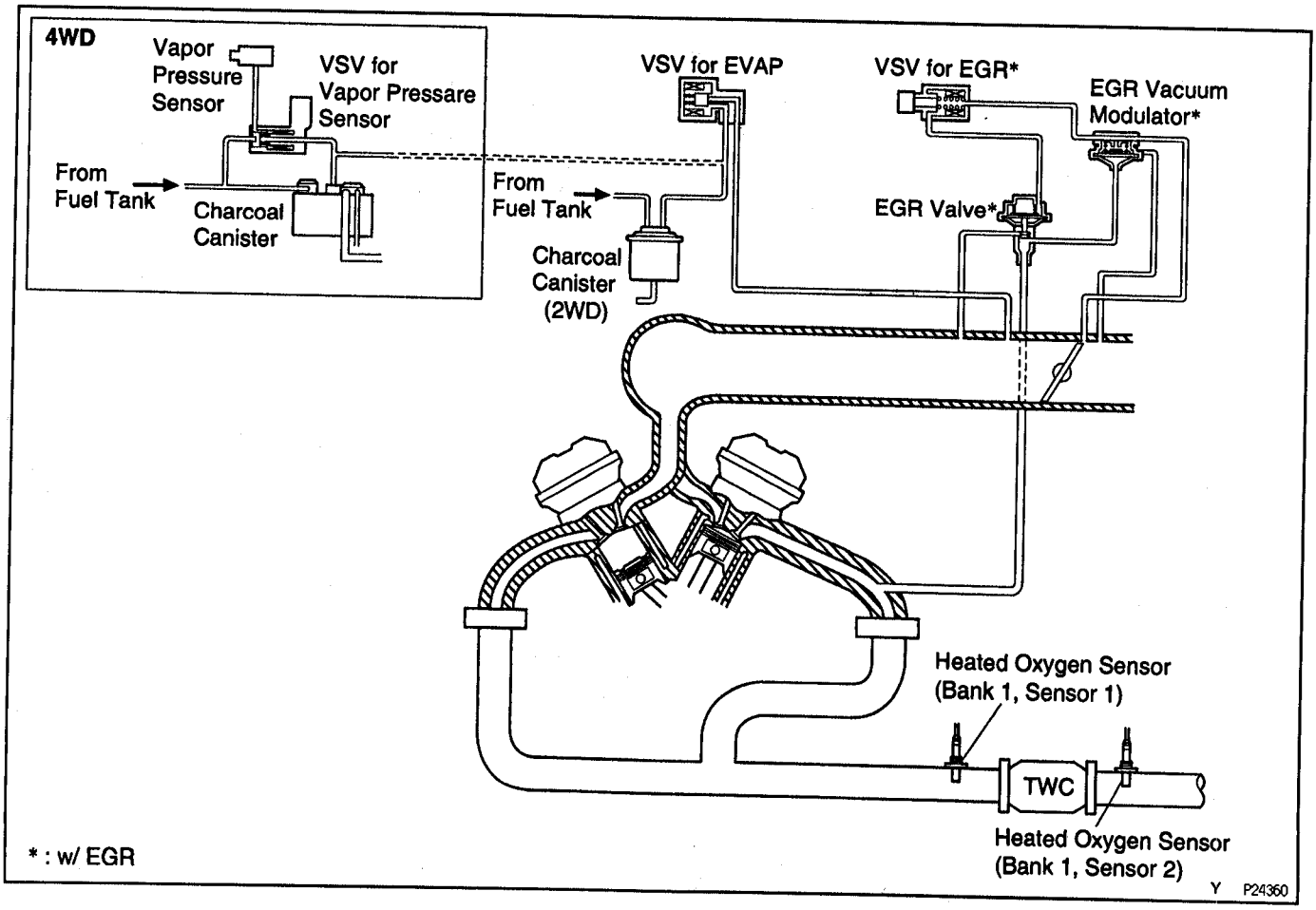
EG2DG-0F

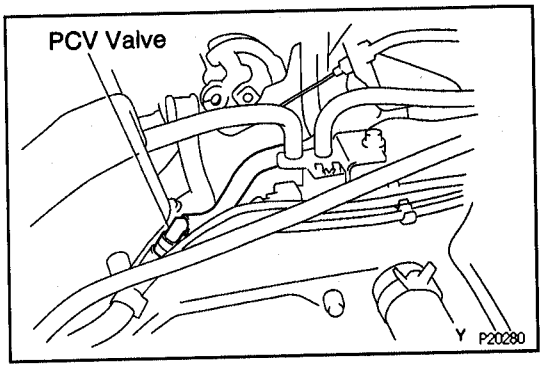
EQUIPMENT

OBD II scan tool	Engine speed
Torque wrench	
Vacuum gauge	

LAYOUT AND SCHEMATIC DRAWING







POSITIVE CRANKCASE VENTILATION (PCV) SYSTEM

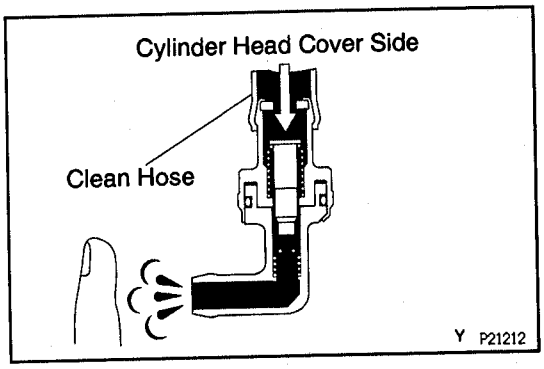
EG9IR-02

PCV VALVE INSPECTION

1. **REMOVE PCV VALVE**

(a) Disconnect the PCV hose from the PCV valve.

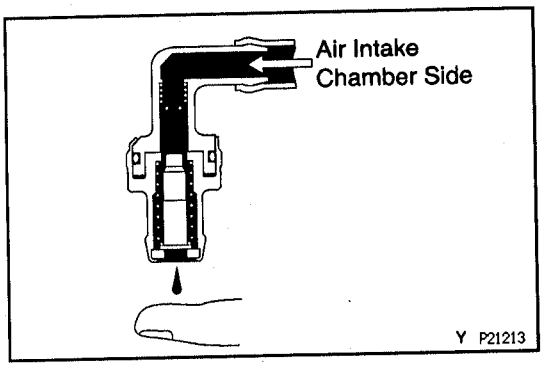
(b) Remove the PCV valve.



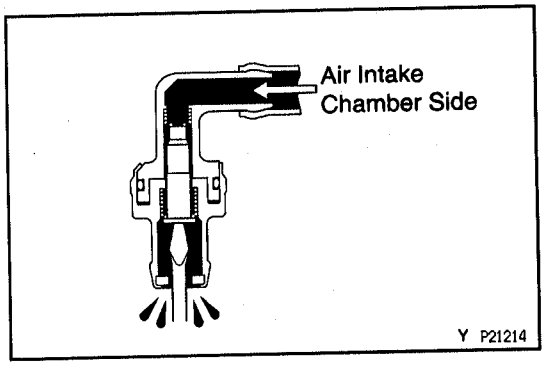
2. **INSTALL CLEAN HOSE TO PCV VALVE**
3. **INSPECT PCV VALVE OPERATION**

(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.



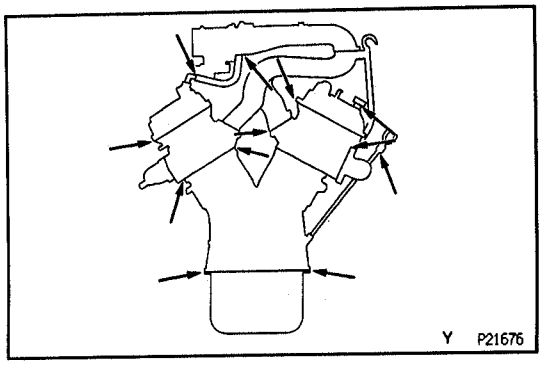
(b) Blow air into the air intake chamber side, and check that air passes through with difficulty.



(c) Blow air into the air intake chamber side when lift up the inside valve, and check that there is a strong resistance to air flow.

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

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



EG2DM-0A

PCV HOSES AND CONNECTORS INSPECTION

VISUALLY INSPECT HOSES, CONNECTIONS AND GASKETS

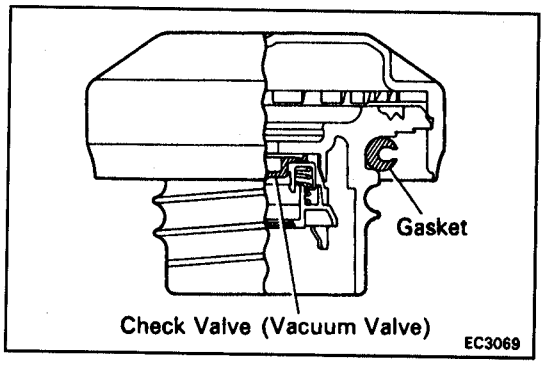
Check for cracks, leaks or damage.

EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM

FUEL VAPOR LINES, FUEL TANK AND TANK CAP INSPECTION

E044T-05

1. **VISUALLY INSPECT LINES AND CONNECTIONS**
   Look for loose connections, sharp bends or damage.
2. **VISUALLY INSPECT FUEL TANK**
   Look for deformation, cracks or fuel leakage.
3. **VISUALLY INSPECT FUEL TANK CAP**
   Check if the cap and/or gasket are deformed or damaged.
   If necessary, repair or replace the cap.

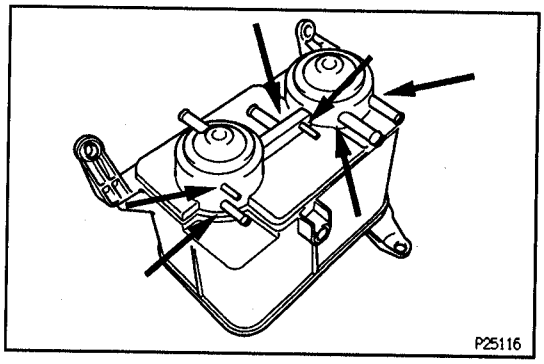


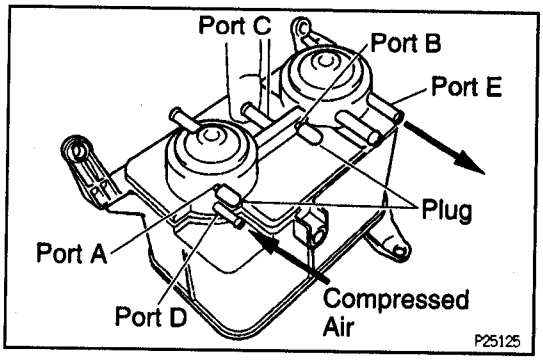
CHARCOAL CANISTER INSPECTION

E067G-01

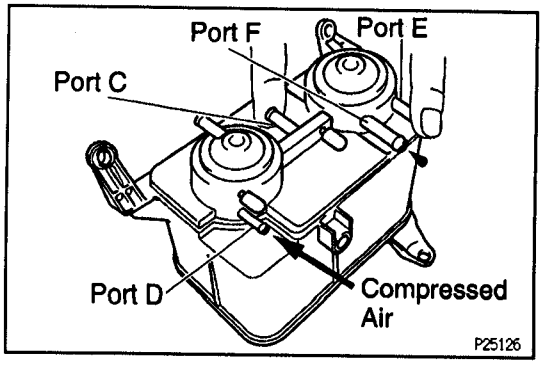
4WD:

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

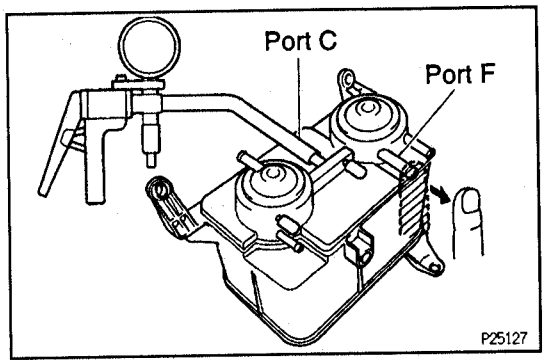




4. **CHECK FOR CLOGGED FILTER, AND STUCK CHECK VALVE AND DIAPHRAGM**
   (a) Install the plugs to ports A and B.
   (b) While holding port C closed, blow air (1.47 kPa, 15 gf/cm², 0.21 psi) into port D and check that air flows from port E.

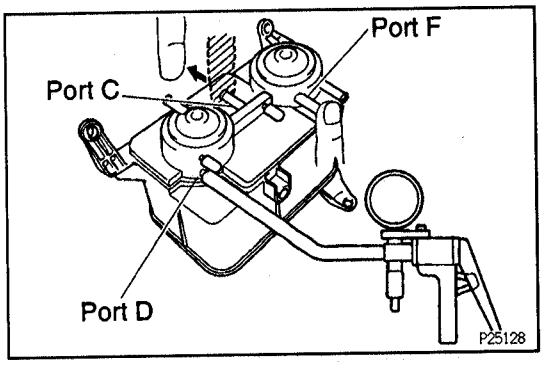


   (c) While holding port C and port E closed, blow air (1.47 kPa, 15 gf/cm², 0.21 psi) into port D and check that air does not flow from port F.



(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.

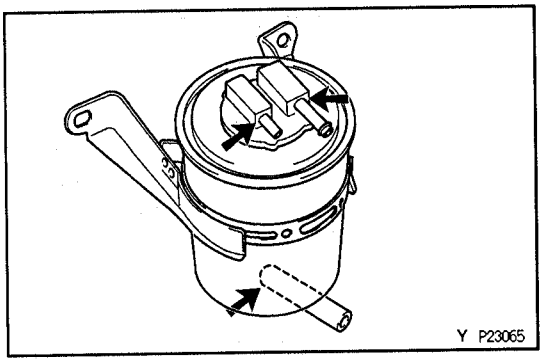
EG



(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



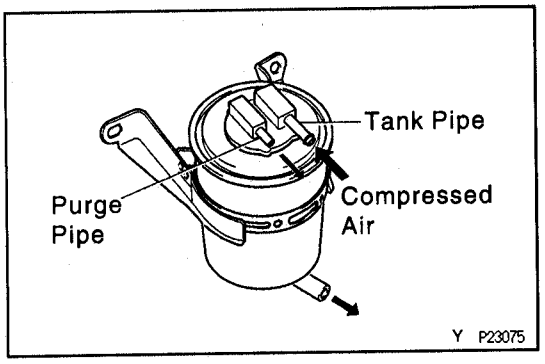
2WD:

1. REMOVE VSV
Remove the screw from the charcoal canister.

2. REMOVE CHARCOAL CANISTER

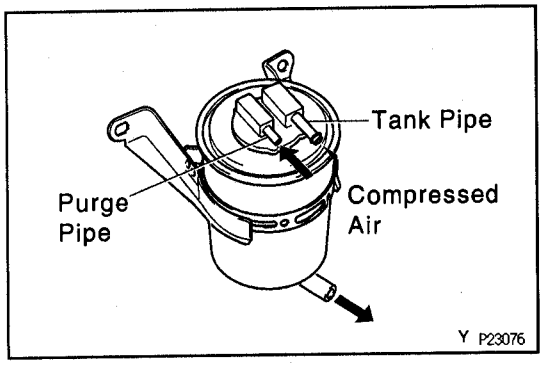
3. REMOVE CAP FROM CHARCOAL CANISTER

4. VISUALLY INSPECT CHARCOAL CANISTER
Lock for cracks or damage.

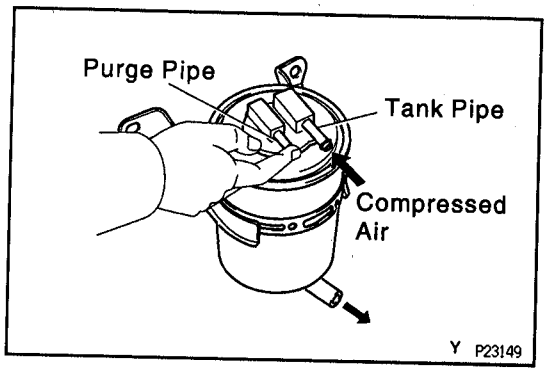


5. INSPECT FOR CLOGGED FILTER AND STUCK CHECK VALVE

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



6. **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.**
7. **REINSTALL CAP TO CHARCOAL CANISTER**
8. **RECONNECT CHARCOAL CANISTER**
   Torque: 31 N·m (310 kgf·cm, 23 ft·lbf)
9. **REINSTALL VSV**

EG

VSV for EVAP INSPECTION

EG67H–01

(See VSV for EVAP in SFI System)

VSV for VAPOR PRESSURE SENSOR INSPECTION (4WD only)

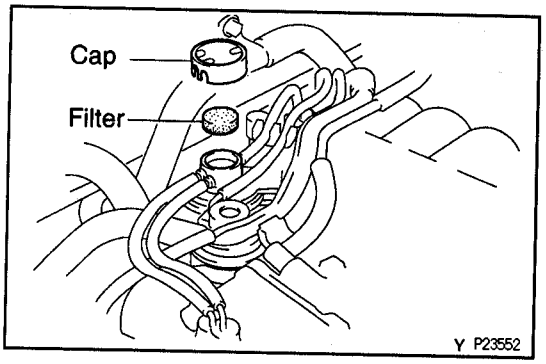
EG67J–01

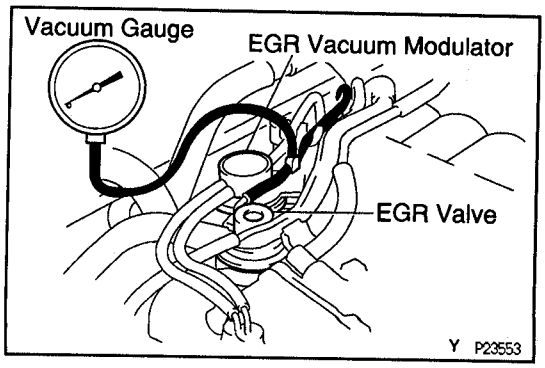
(See VSV for vapor pressure sensor in SFI System)

VAPOR PRESSURE SENSOR INSPECTION (4WD only)

EG67K–01

(See vapor pressure sensor in SFI System)



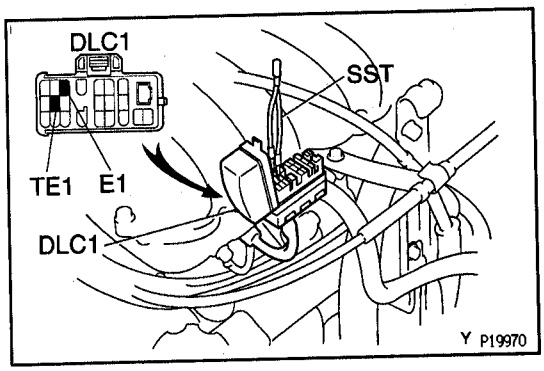


EXHAUST GAS RECIRCULATION (EGR) SYSTEM (2WD and 4WD/B CAB)

EG5M8–02

EGR SYSTEM INSPECTION

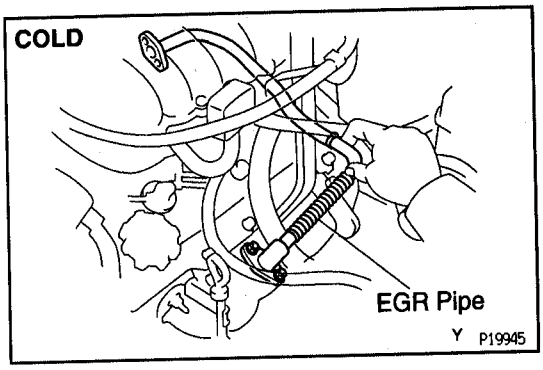
1. **CHECK AND CLEAN FILTER IN EGR VACUUM MODULATOR**
   (a) Remove the cap and filter.
   (b) Check the filter for contamination or damage.
   (c) Using compressed air, clean the filter.
   (d) Reinstall the filter and cap.
   HINT: Install the filter with the coarser surface facing out to the atmospheric side.
2. **INSTALL VACUUM GAUGE**
   Using a 3–way connector, connect a vacuum gauge to the hose between the EGR valve and VSV.
3. **INSPECT SEATING OF EGR VALVE**
   Check that the engine starts and runs at idle.



4. CONNECT TERMINALS TE1 AND E1

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

SST 09843-18020

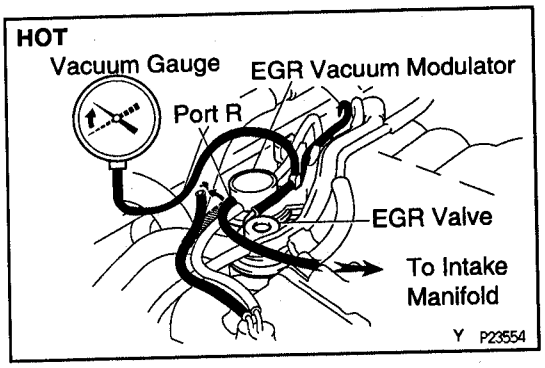


5. INSPECT VSV OPERATION WITH COLD ENGINE

(a) The engine coolant temperature should be below 45° C (113°F).

(b) Check that the vacuum gauge indicates zero at 2,800 rpm.

(c) Check that the EGR pipe is not hot.



6. INSPECT OPERATION OF VSV AND EGR VACUUM MODULATOR WITH HOT ENGINE

(a) Warm up the engine to above 80°C (176°F).

(b) Check that the vacuum gauge indicates low vacuum at 2,800 rpm.

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

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

HINT: As exhaust gas is increasingly recirculated, the engine will start to misfire.

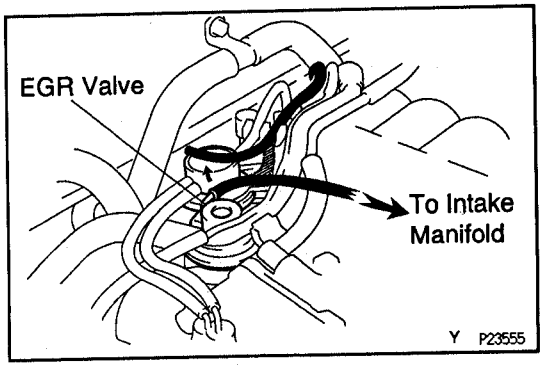
7. DISCONNECT TERMINALS TE1 AND E1

Remove the SST from the DLC1.

SST 09843-18020

8. REMOVE VACUUM GAUGE

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



9. INSPECT EGR VALVE

(a) Apply vacuum directly to the EGR valve with the engine idle.

(b) Check that the engine runs rough or dies.

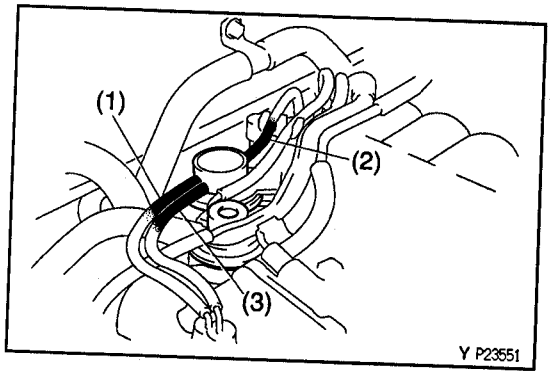
(c) Reconnect the vacuum hoses to their proper locations.

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

VSV INSPECTION

EG5VV–03

(See VSV for EGR in SFI System)



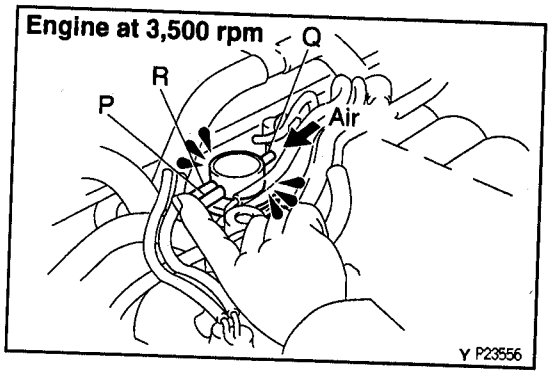
EGR VACUUM MODULATOR INSPECTION EG3Z6–05

EG

1. **DISCONNECT VACUUM HOSES FROM EGR VACUUM MODULATOR**

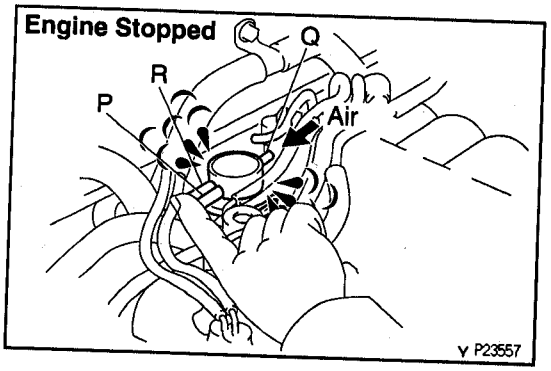
Disconnect these vacuum hoses:

(1) Vacuum hose from R port
(2) Vacuum hose from Q port
(3) Vacuum hose from P port



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.



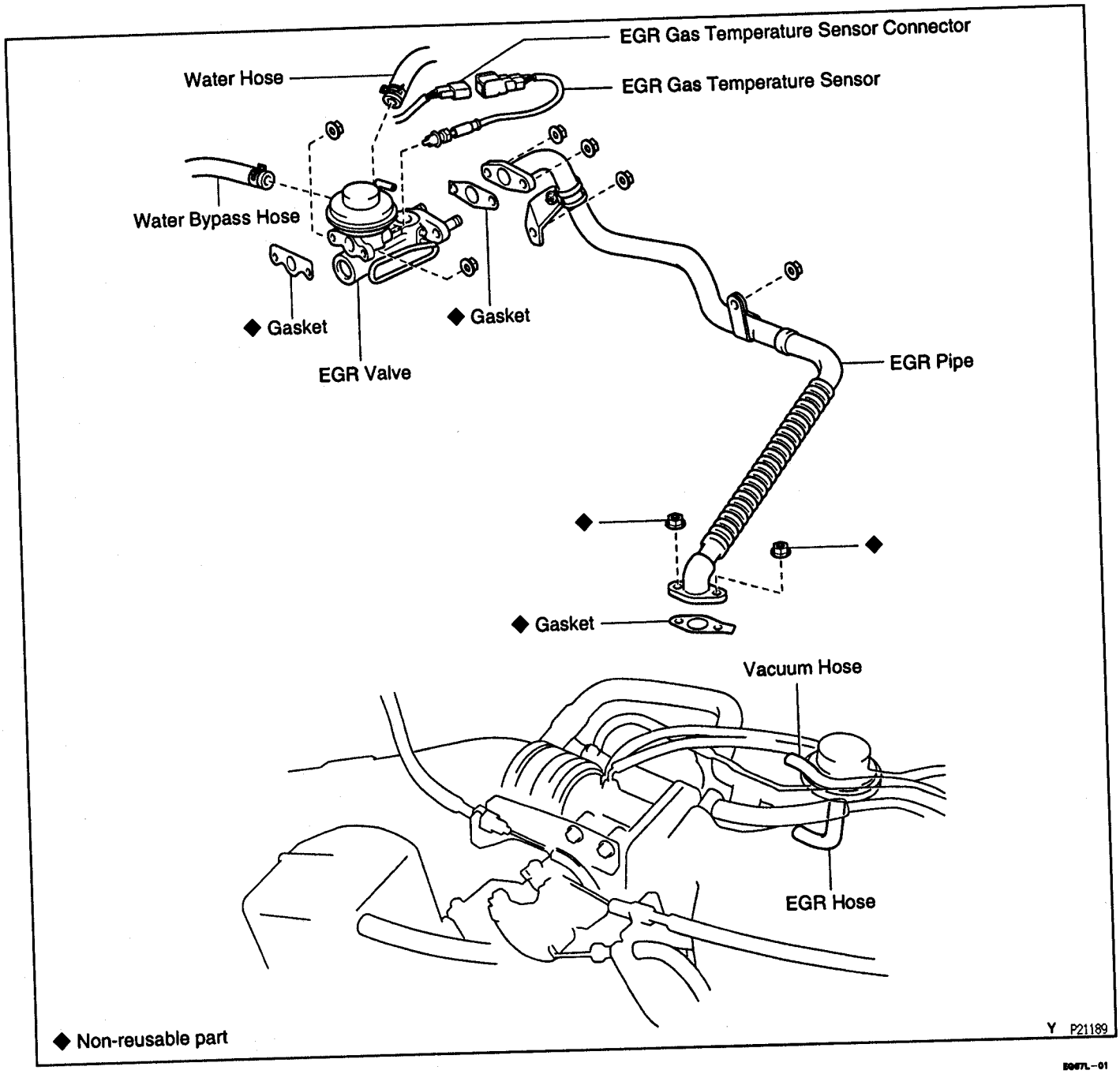
(c) Start the engine, and maintain speed at 3,500 rpm.
(d) Repeat the above test. Check that there is a strong resistance to air flow.

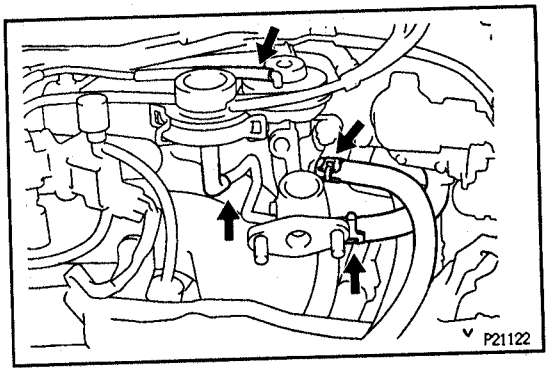
3. **RECONNECT VACUUM HOSES TO EGR VACUUM MODULATOR**

Connect these vacuum hoses:

(1) Vacuum hose to R port
(2) Vacuum hose to Q port
(3) Vacuum hose to P port

COMPONENTS FOR REMOVAL AND INSTALLATION

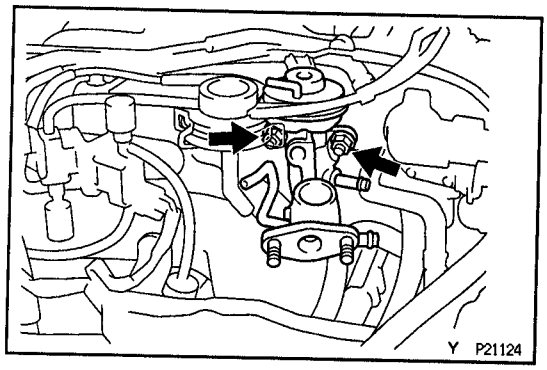




EGR VALVE INSPECTION

Installation is in the reverse order of removal.

1. DRAIN ENGINE COOLANT
2. REMOVE EGR PIPE
   (See step 10 in cylinder head removal in Engine Mechanical)
3. REMOVE EGR GAS TEMPERATURE SENSOR
4. REMOVE EGR VALVE



(a) Disconnect these hoses from the EGR valve:
- Vacuum hose (from VSV for EGR)
- EGR hose (from EGR vacuum modulator)
- Water hose (from water bypass pipe)
- Water bypass hose (from IAC valve)

(b) Remove the 2 nuts, EGR valve and gasket.
Torque: 18.5 N·m (185 kgf·cm, 14 ft·lbf)
INSTALLATION HINT: Use a new gasket.

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

EG

THREE–WAY CATALYTIC CONVERTER (TWC) SYSTEM

EXHAUST PIPE ASSEMBLY INSPECTION

EG2GJ–0E

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

THREE–WAY CATALYTIC CONVERTER INSPECTION

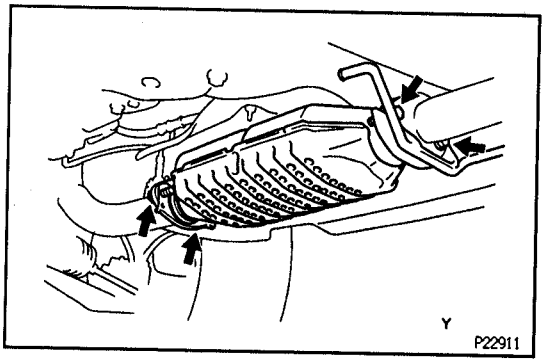
EG3Z8–06

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

HEAT INSULATOR INSPECTION

EG3Z9–07

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



CATALYTIC CONVERTER REPLACEMENT

EG67M–01

Installation is in the reverse order of removal.
REMOVE CENTER EXHAUST PIPE
Remove the 4 bolts, TWC joint retainer, center exhaust pipe and 2 gasket.
Torque: 48 N·m (490 kgf·cm, 35 ft·lbf)
INSTALLATION HINT: Place 2 new gaskets on the front exhaust and tail pipes, and temporarily install the center exhaust pipe.

SERVICE SPECIFICATIONS

TORQUE SPECIFICATIONS

EG0BZ-08

Part tightened	N·m	kgf·cm	ft·lbf
Charcoal canister x Charcoal canister bracket	31	310	23
EGR valve x Air intake chamber	18.5	185	14
EGR valve x EGR pipe	18.5	185	14
EGR pipe x LH exhaust manifold	18.5	185	14
EGR pipe stay x Cylinder head	8.0	80	71 in.·lbf
Heated oxygen sensor x Center exhaust pipe	20	200	14
Front exhaust pipe x Center exhaust pipe	48	490	35
Center exhaust pipe x Tailpipe	48	490	35

SFI SYSTEM

PRECAUTION

1. **Before working on the fuel system, disconnect the negative (–) terminal cable from the battery.** EG2ZA-04
   HINT: Any diagnostic trouble code retained by the computer will be erased when the negative (–) terminal cable is removed from the battery.
   Therefore, if necessary, read the diagnosis 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.**

MAINTENANCE PRECAUTIONS EG4FS-03

1. **IN EVENT OF ENGINE MISFIRE, THESE PRECAUTIONS SHOULD BE TAKEN**

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

2. **PRECAUTIONS WHEN HANDLING OXYGEN SENSOR**

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

IF VEHICLE IS EQUIPPED WITH MOBILE RADIO SYSTEM (HAM, CB, ETC.) EG3CV-07

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

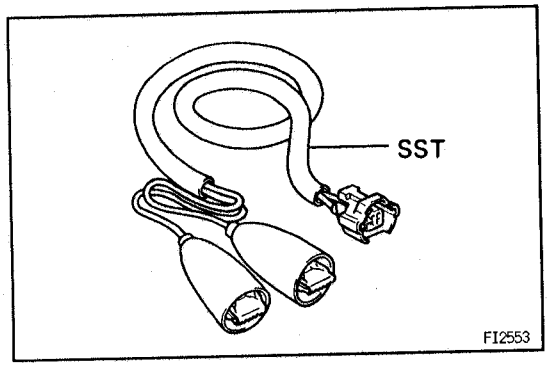
AIR INDUCTION SYSTEM EG00E-04

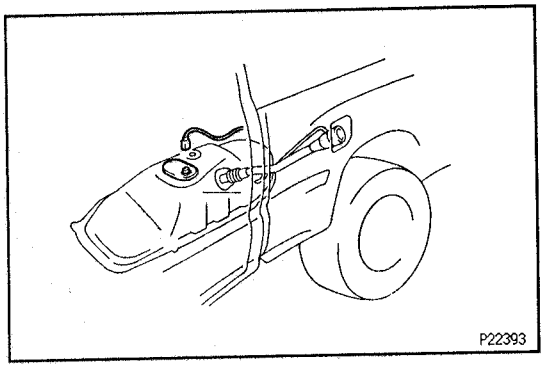
1. Separation of the engine oil dipstick, oil filler cap, PCV hose, etc. may cause the engine to run out of tune.
2. Disconnection, looseness or cracks in the parts of the air induction system between the throttle body and cylinder head will allow air suction and cause the engine to run out of tune.

EG2Z8-04

ELECTRONIC CONTROL SYSTEM

1. Before removing SFI 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 negative (−) terminal cable from the battery.
2. When installing the battery, be especially careful not to incorrectly connect the positive (+) and negative (−) cables.
3. Do not permit parts to receive a severe impact during removal or installation. Handle all SFI parts carefully, especially the ECM.
4. Be careful during troubleshooting as there are numerous transistor circuit, and even slight terminal contact can cause further troubles.
5. Do not open the ECM cover.
6. When inspecting during rainy weather, take care to prevent entry of water. Also, when washing the engine compartment, prevent water from getting on the SFI parts and wiring connectors.
7. Parts should be replaced as an assembly.
8. Care should be taken 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. Use SST for inspection or test of the injector or its wiring connector.
   SST 09842−30070

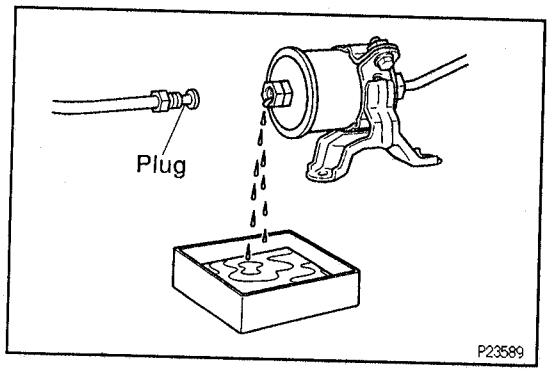




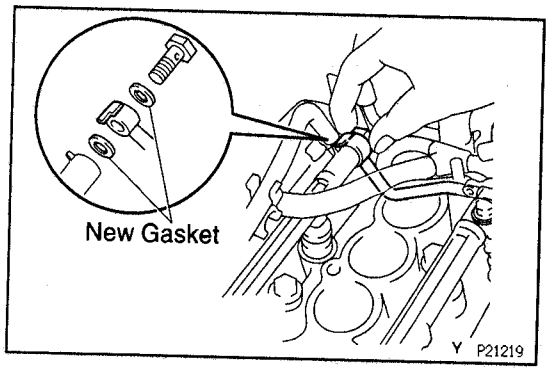
EG42Y-05

FUEL SYSTEM

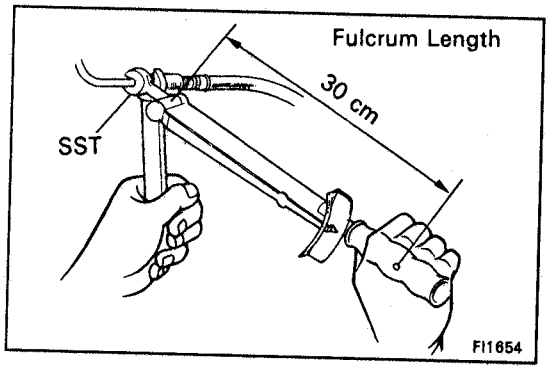
1. When disconnecting the high fuel pressure line, a large amount of gasoline will spill out, so observe these procedures:
   (a) Disconnect the fuel pump connector.
   (b) Start the engine. After the engine has stopped on its own, turn the ignition switch to LOCK.



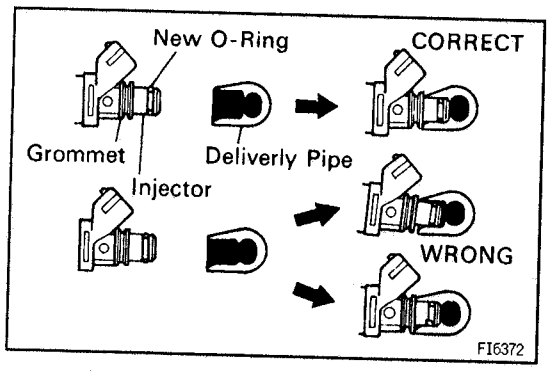
(c) Put a container under the connection.
(d) Slowly loosen the connection.
(e) Disconnect the connection.
(f) Plug the connection with a rubber plug.



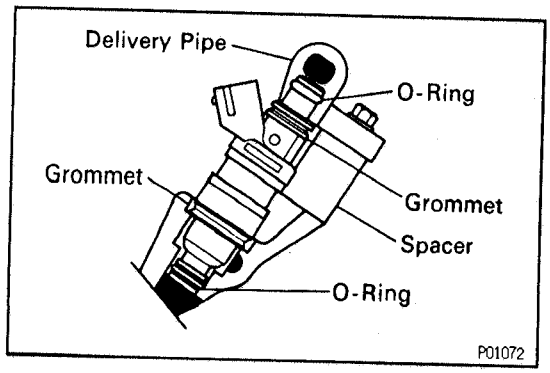
2. When connecting the flare nut or union bolt on the high pressure pipe union, observe these procedures:
Union Bolt Type:
(a) Always use 2 new gaskets.
(b) Tighten the union bolt by hand.
(c) Tighten the union bolt to the specified torque.
Torque: 34.3 N·m (350 kgf·cm, 25 ft·lbf)



Flare Nut Type:
(a) Apply a light coat of engine oil to the flare nut, and tighten the flare nut by hand.
(b) Using SST, tighten the flare nut to specified torque.
SST 09631–22020
NOTICE: Do not rotate the fuel pipe, when tightening the flare nut.
Torque:
34.3 N·m (350 kgf·cm, 25 ft·lbf)
28 N·m (285 kgf·cm, 21 ft·lbf) for using SST
HINT: Use a torque wrench with a fulcrum length of 30 cm (11.81 in.).

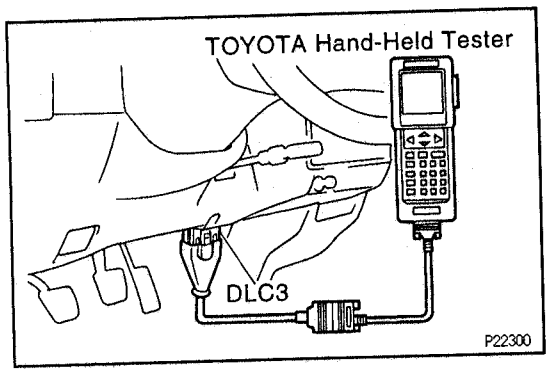


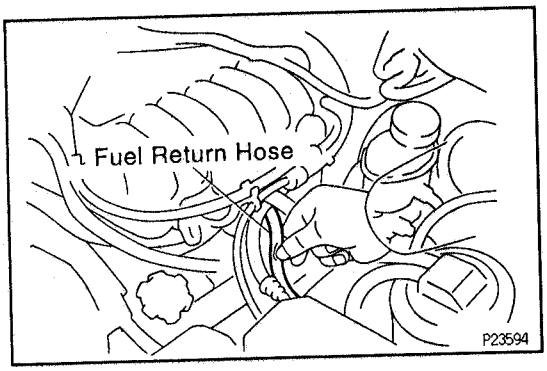
3. Observe these precautions when removing and installing the injectors.
(a) Never reuse the O–ring.
(b) When placing a new O–ring on the injector, take care not to damage it in any way.
(c) Coat a new O–ring with spindle oil or gasoline before installing–never use engine, gear or brake oil.



4. Install the injector to the delivery pipe and intake manifold, 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 the ignition switch ON and push TOYOTA hand–held tester main switch ON.





NOTICE: Do not start the engine.

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

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

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

(f) Pinch the fuel return hose.
The pressure in the 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 the hose to crack.

(g) Turn the ignition switch to LOCK.

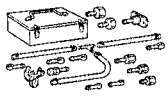
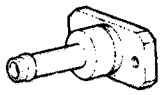
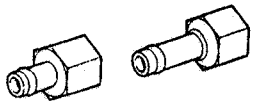
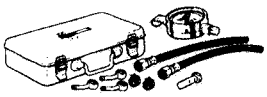
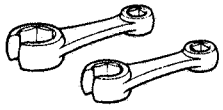
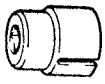
(h) Disconnect the TOYOTA hand-held tester from the DLC3.

EG

PREPARATION

EG0FZ-06

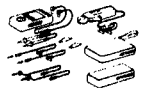
SST (SPECIAL SERVICE TOOLS)

	09268-41046 Injection Measuring Tool Set	
	(09268-41091) NO.7 Union	
	(09268-52011) Injection Measuring Attachment	
	09268-45012 EFI Fuel Pressure Gauge	
	09631-22020 Power Steering Hose Nut 14 x 17 mm Wrench Set	Fuel line flare nut
	09817-16011 Back-up Light Switch Tool	Knock sensor
	09842-30070 Wiring "F" EFI Inspection	

	09843–18020 Diagnosis Check Wire	

RECOMMENDED TOOLS

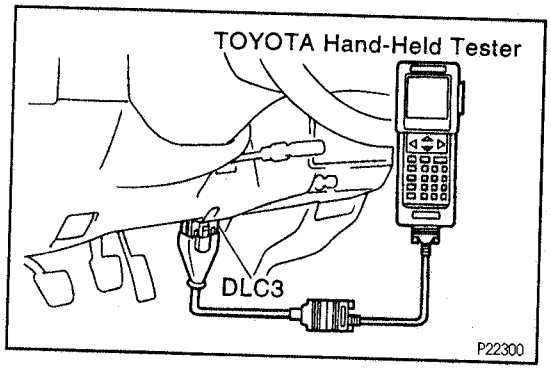
EG0GO–04

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

EQUIPMENT

EG0G1–09

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



FUEL PUMP

ON–VEHICLE INSPECTION

EG66N–01

1. CHECK FUEL PUMP OPERATION

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

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

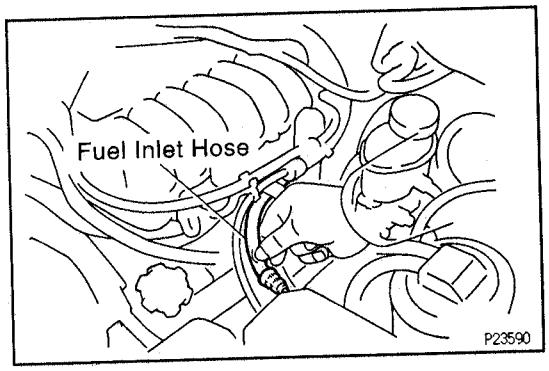
NOTICE: Do not start the engine.

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

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

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

(f) Check that there is pressure in the fuel inlet hose from the fuel filter.



HINT: If there is fuel pressure, you will hear the sound of fuel flowing.
If there is no pressure, check these parts:

- H–fuse (ALT 80A)
- M–fuses (AM1 40A, AM2 30A)
- Fuses (EFI 15A, IGN 7.5A)
- EFI main relay
- Circuit opening relay
- Fuel pump
- ECM
- Wiring connections

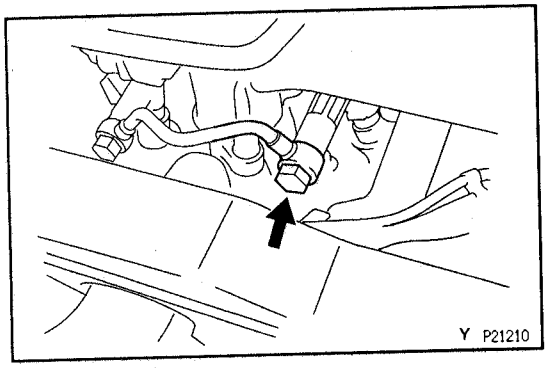
(g) Turn the ignition switch to LOCK.
(h) Disconnect the TOYOTA hand–held tester from the DLC3.

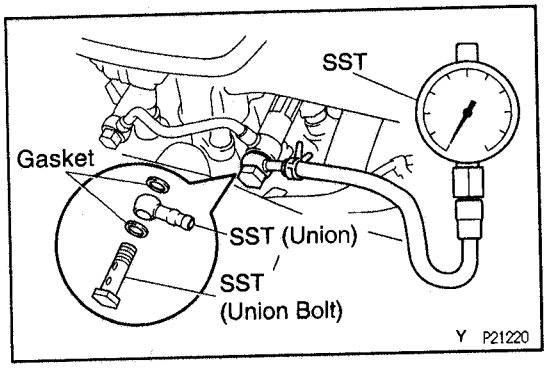
2. CHECK FUEL PRESSURE

(a) Check the battery positive voltage is above 12 V.
(b) Disconnect the negative (–) terminal cable from the battery.
(c) Remove the 6 bolts, and disconnect the No.2 timing belt cover.
(d) Remove the union bolt holding the fuel pipe to the delivery pipe and gasket.

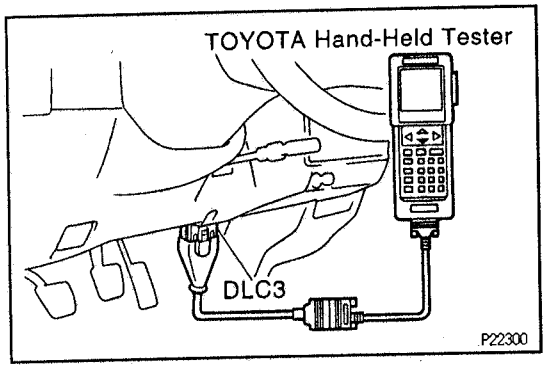
CAUTION:

- **Put a shop towel under the delivery pipe.**
- **Slowly loosen the union bolt.**





(e) Install SST (pressure gauge) to the delivery pipe with the 2 gaskets and SST (union and union bolt).
SST 09268–45012
Torque: 34.3 N·m (350 kgf·cm, 25 ft·lbf)
(f) Wipe off any splattered gasoline.



(g) Connect the TOYOTA hand–held tester to the DLC3. (See step 1. check fuel pump operation (a) to (e))
(h) Reconnect the negative (–) terminal cable to the battery.
(i) Turn the ignition switch ON.
(j) Measure the fuel pressure.

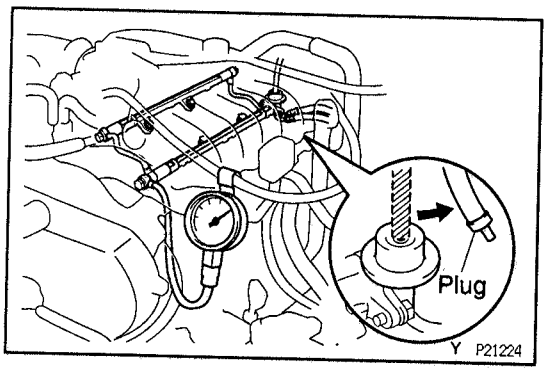
Fuel pressure:
265 – 304 kPa (2.7 – 3.1 kgf/cm², 38 – 44 psi)

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
- VSV for fuel pressure control

(k) Disconnect the TOYOTA hand–held tester from the DLC3.

(l) Reinstall the No.2 timing belt cover with the 6 bolts.
Torque: 9 N·m (90 kgf·cm, 80 in.·lbf)



(m) Start the engine.

(n) Disconnect the vacuum sensing hose from the fuel pressure regulator, and plug the hose end.

(o) Measure the fuel pressure at idle.
Fuel pressure:
265 – 304 kPa (2.7 – 3.1 kgf/cm², 38 – 44 psi)

(p) Reconnect the vacuum sensing hose to the fuel pressure regulator.

(q) Measure the fuel pressure at idle.
Fuel pressure:
226 – 265 kPa (2.3 – 2.7 kgf/cm², 33 – 38 psi)
If pressure is not as specified, check the vacuum sensing hose and fuel pressure regulator.

(r) Stop the engine.

(s) 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 injectors.

(t) 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

(u) Remove the other union bolt, 3 gaskets and fuel pipe from the delivery pipes.

(v) Reinstall the fuel pipe with 4 new gaskets and the 2 union bolts.
Torque: 34.3 N·m (350 kgf·cm, 25 ft·lbf)

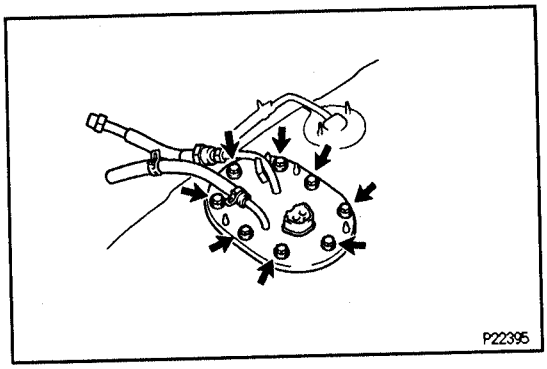
(w) Reconnect the negative (–) terminal cable to the battery.

(x) Check for fuel leakage.
(See fuel system in precaution)

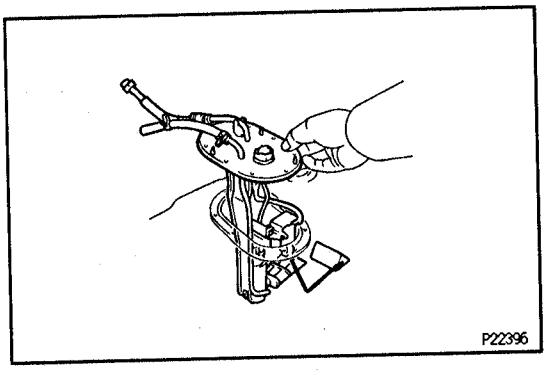
FUEL PUMP REMOVAL

EG3ZF–06

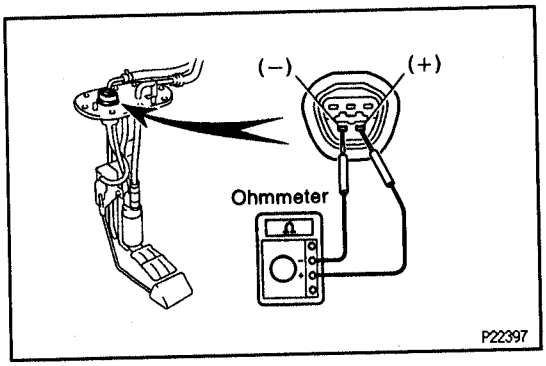
CAUTION: Do not smoke or work near an open flame when working on the fuel pump.

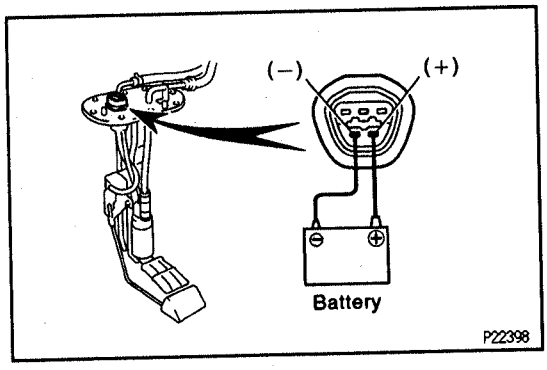


1. **REMOVE FUEL TANK**
   (See page EG–134)
   Torque: 62 N·m (620 kgf·cm, 45 ft·lbf)
   INSTALLATION HINT: Check for fuel leakage.
   (See fuel system in precaution)
2. **REMOVE FUEL PUMP BRACKET ASSEMBLY FROM FUEL TANK**
   (a) Disconnect the fuel pump connector from the clamp.
   (b) Remove the 8 bolts.
   Torque: 3.4 N·m (35 kgf·cm, 30 in.·lbf)
   (c) Pull out the pump bracket assembly.
   (d) Remove the gasket from the pump bracket.
   INSTALLATION HINT: Install a new gasket to the pump bracket.



EG





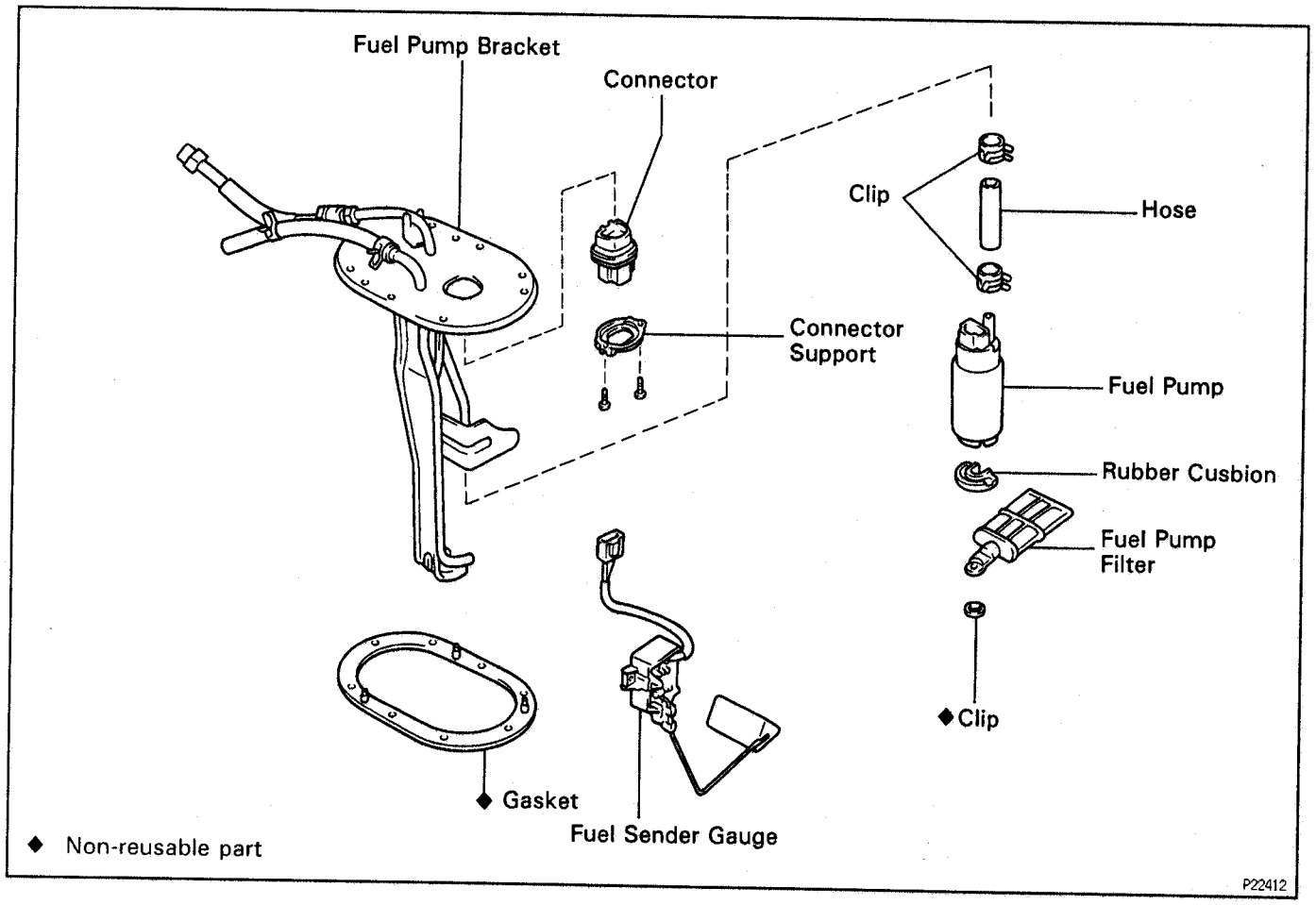
FUEL PUMP INSPECTION

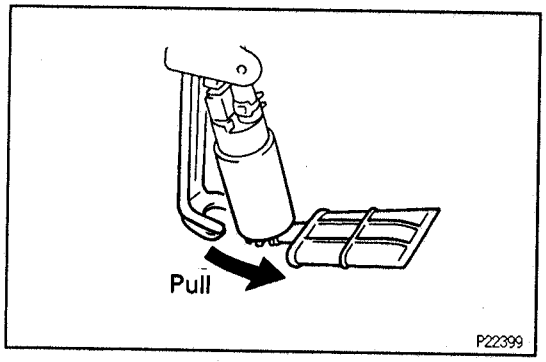
1. **INSPECT FUEL PUMP RESISTANCE**
   Using an ohmmeter, measure the resistance between the terminals.
   Resistance: At 20°C (68°F): 0.2 – 3.0 Ω
   If the resistance is not as specified, replace the fuel pump and/or set plate.
2. **INSPECT FUEL PUMP OPERATION**
   Connect the positive (+) lead from 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 switching at the battery side.**

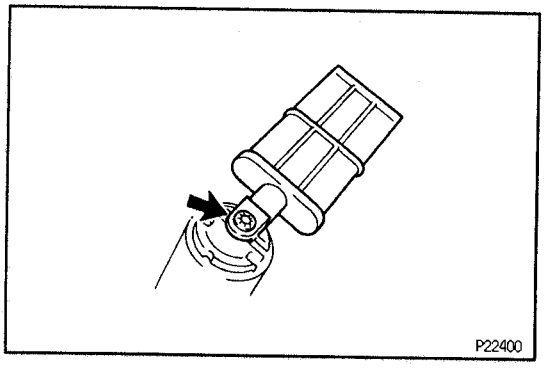
   If operation is not as specified, replace the fuel pump and/or plate.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

EGOOG–05







FUEL PUMP DISASSEMBLY

EG5A3–01

1. REMOVE FUEL PUMP FROM FUEL PUMP BRACKET

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

2. REMOVE FUEL PUMP FILTER FROM FUEL PUMP

(a) Using a small screwdriver, remove the clip.
INSTALLATION HINT: Install the pump filter with a new clip.
(b) Pull out the pump filter.

EG66F–01

FUEL PUMP ASSEMBLY

Assembly is in the reverse order of removal.

EG66G–01

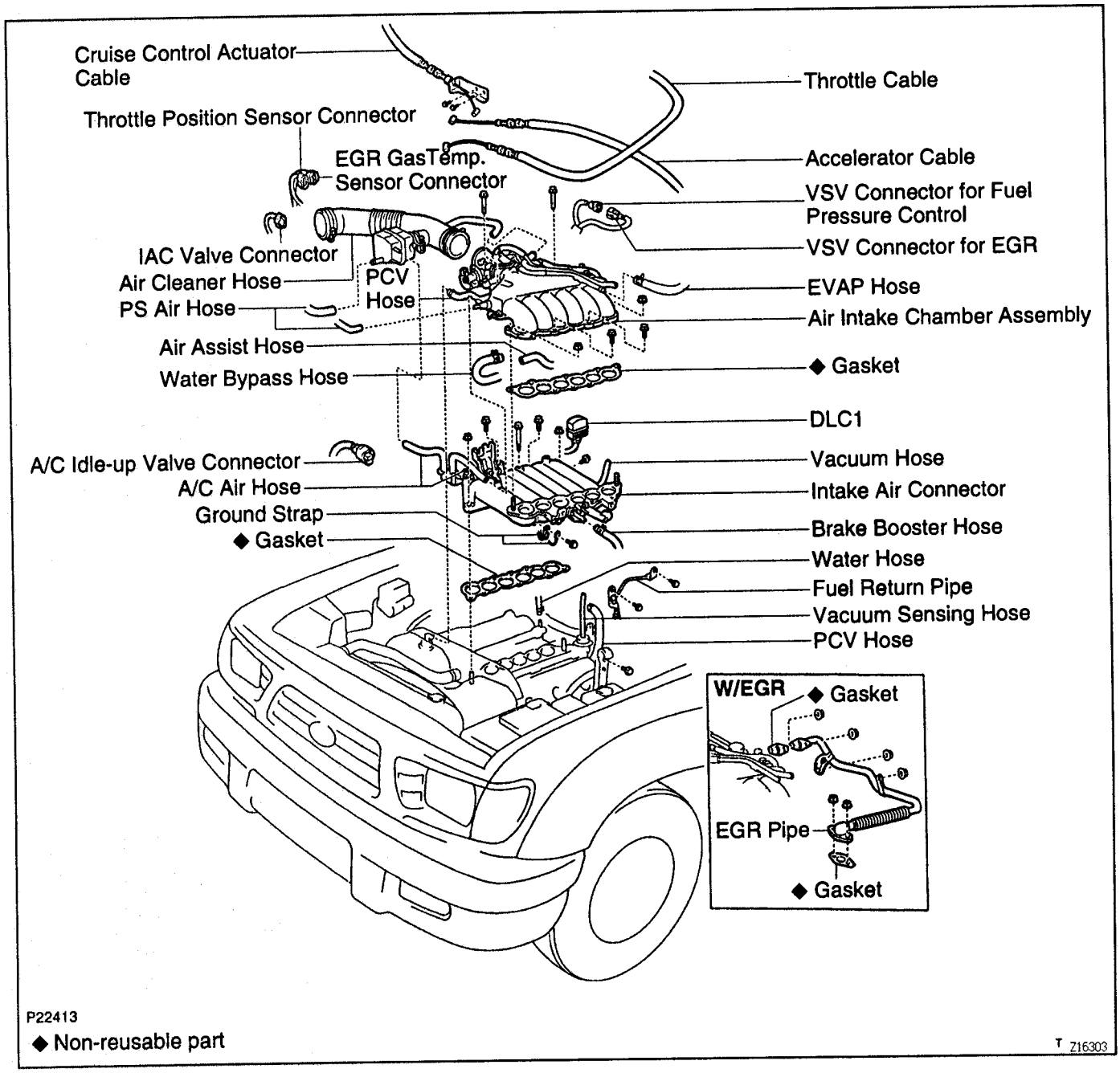
FUEL PUMP INSTALLATION

Installaiton is in the reverse order of removal.

EG

EG6A4–03

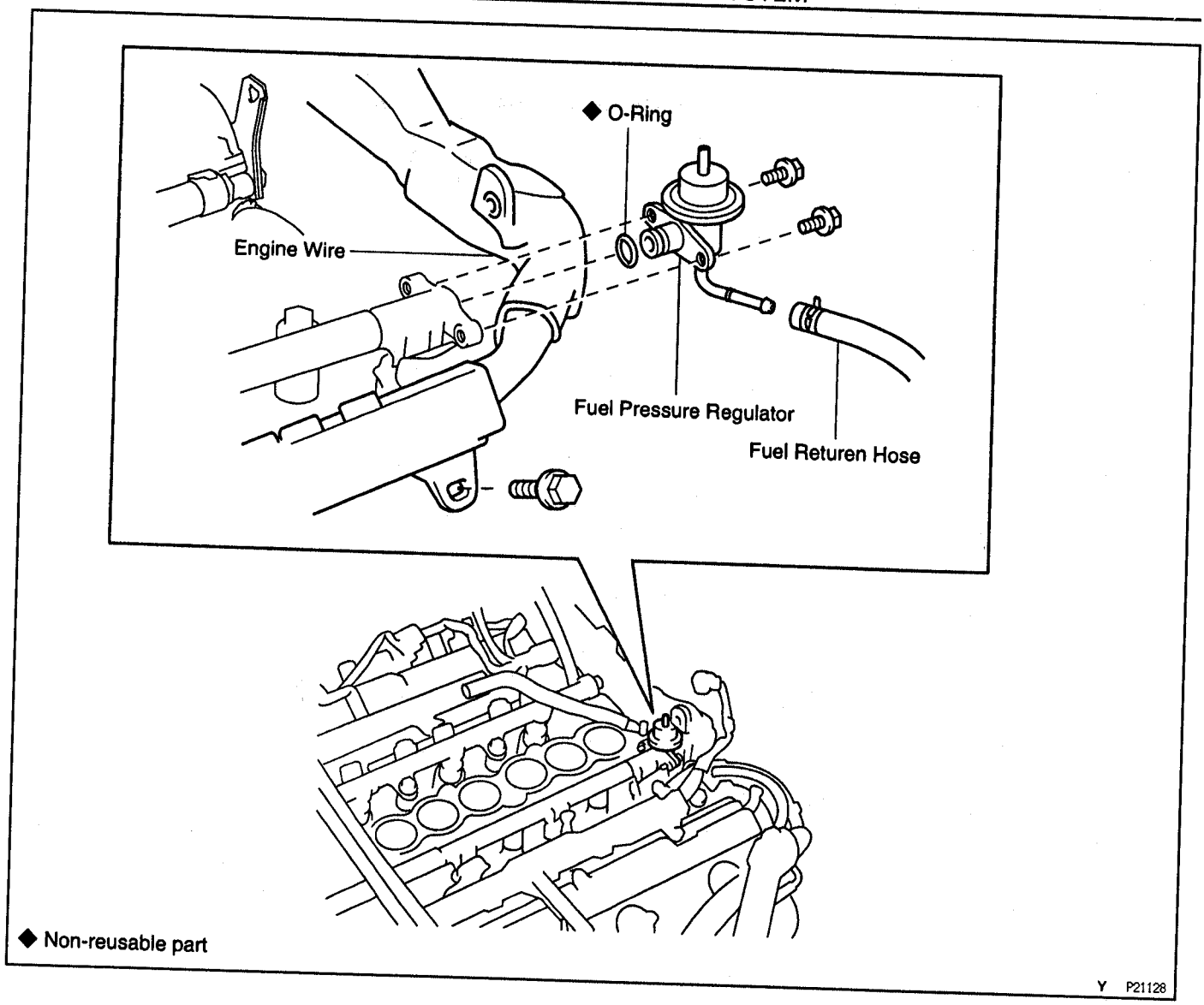
FUEL PRESSURE REGULATOR COMPONENTS FOR REMOVAL AND INSTALLATION



P22413

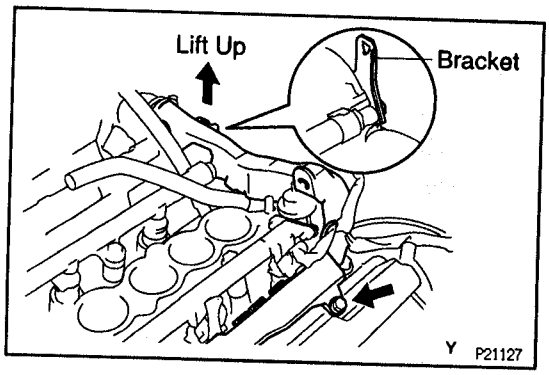
◆ Non-reusable part

T Z16303

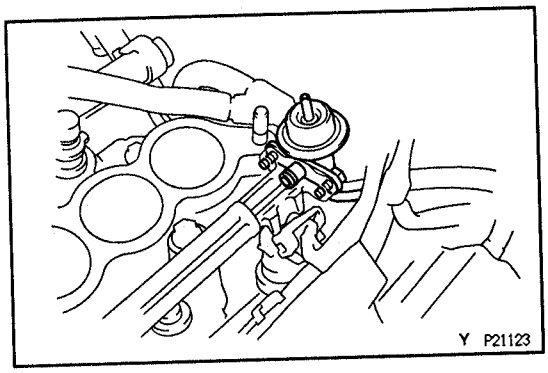


FUEL PRESSURE REGULATOR REMOVAL

1. REMOVE AIR CLEANER HOSE
2. REMOVE INTAKE AIR CONNECTOR
   (See steps 2, 8 and 11 to 13 in cylinder head removal in Engine Mechanical)
3. DISCONNECT FUEL RETURN HOSE FROM FUEL PRESSURE REGULATOR
   CAUTION: Put a shop rag under the pressure regulator.

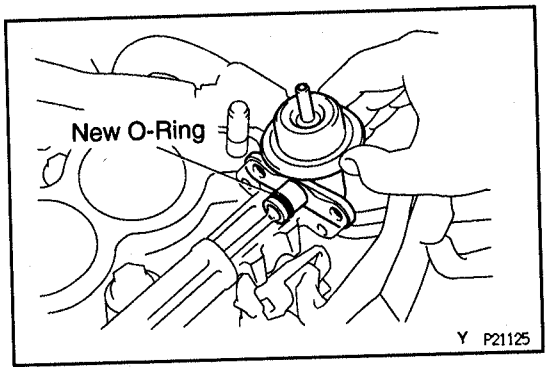


4. REMOVE FUEL PRESSURE REGULATOR
   (a) Remove holding bolt the engine wire to the LH cylinder head cover.
   (b) Disconnect the protector from the bracket on the RH cylinder head cover, and lift up the engine wire.



(c) Remove the 2 bolts, and pull out the pressure regulator.
(d) Remove the O-ring from the pressure regulator.

EG

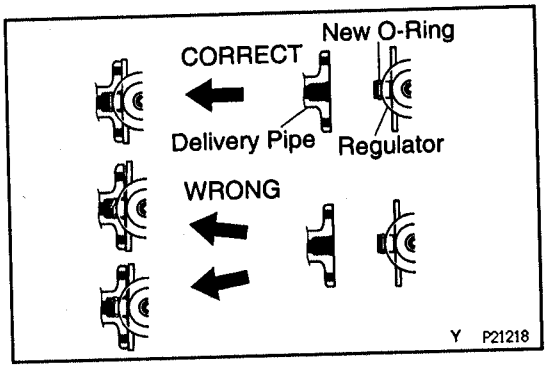


EQ5A5-01

FUEL PRESSURE REGULATOR INSTALLATION

1. INSTALL FUEL PRESSURE REGULATOR

(a) Apply a light coat of gasoline to a new O-ring, and install it to the pressure regulator.
(b) Attach the pressure regulator to the LH delivery pipe.



(c) Check that the pressure regulator rotates smoothly.
NOTICE: If it does not rotate smoothly, the O-ring may be pinched, so remove the pressure regulator and repeat steps (a) to (c) above.
(d) Install the pressure regulator with the 2 bolts.
Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)
(e) Install the engine wire with the bolt.

2. CONNECT FUEL RETURN HOSE TO FUEL PRESSURE REGULATOR

NOTICE: Be sure to insert the hose up to the stopper and clip it.

3. INSTALL INTAKE AIR CONNECTOR

(See steps 16 to 19, 24 and 27 in cylinder head installation in Engine Mechanical)

4. INSTALL AIR CLEANER HOSE

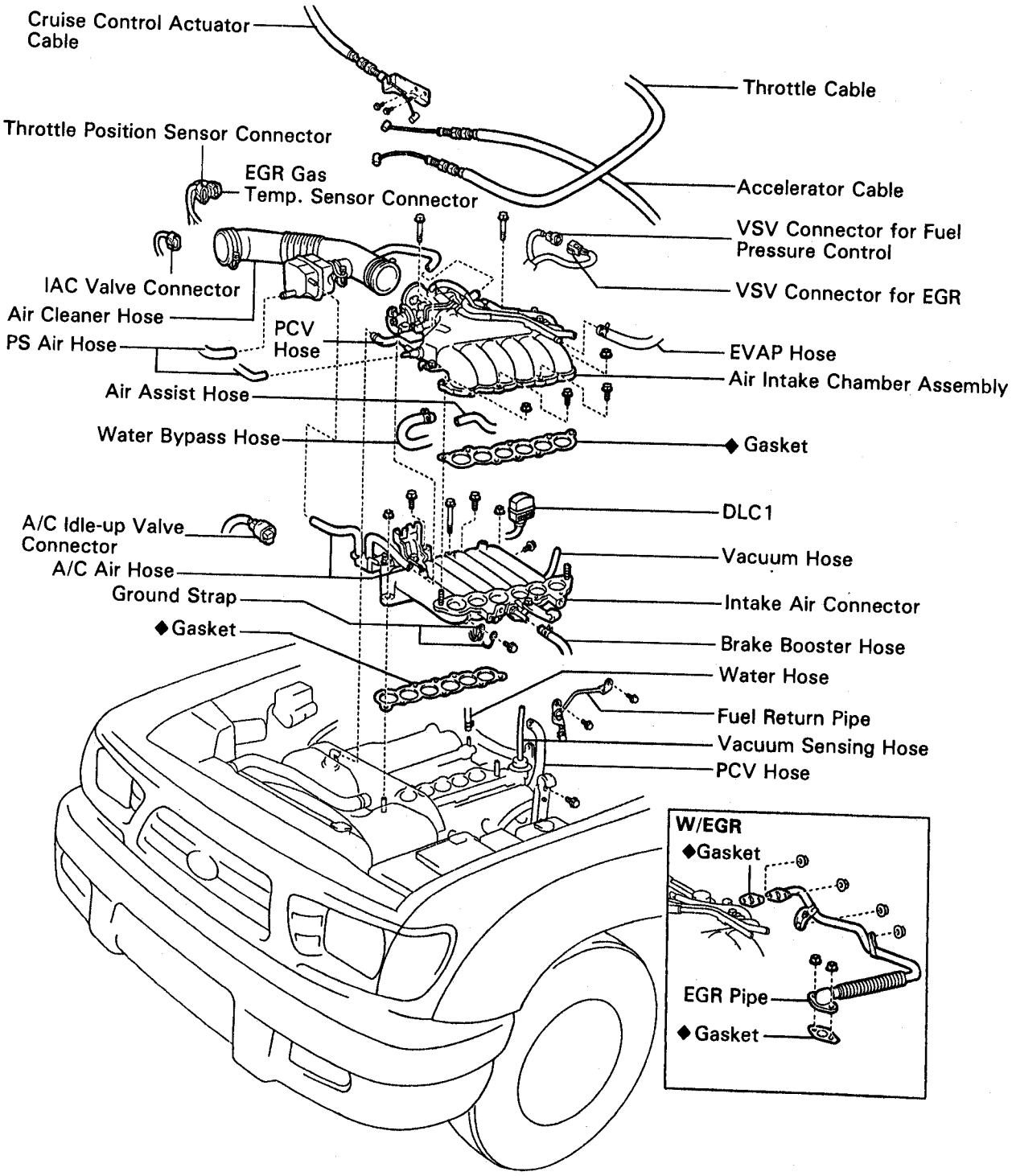
5. CHECK FOR FUEL LEAKS

(See fuel system in precaution)

INJECTOR

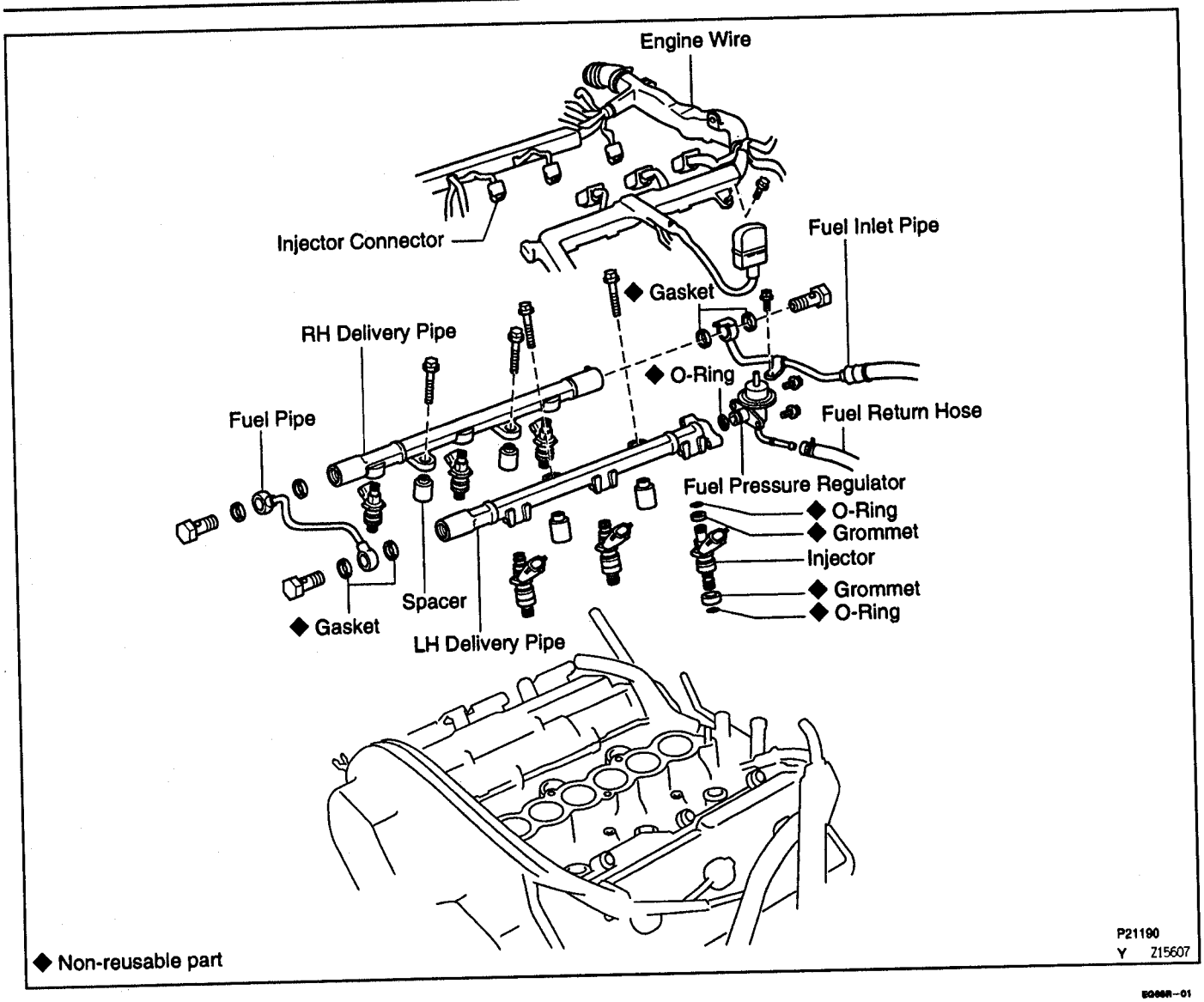
COMPONENTS FOR REMOVAL AND INSTALLATION

EG5A6–03



◆ Non-reusable part

P22413

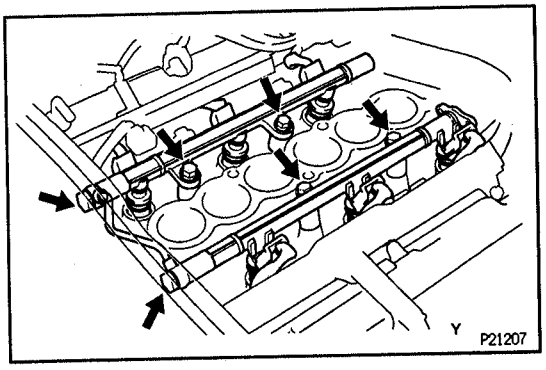


INJECTORS REMOVAL

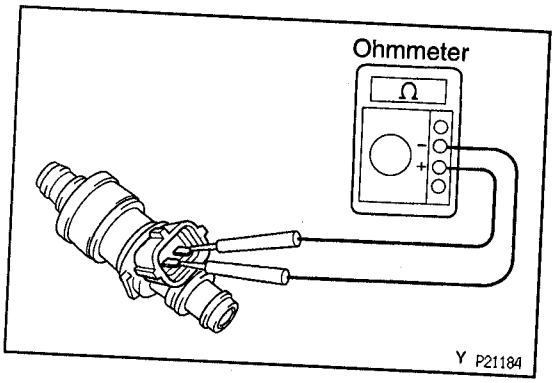
1. **REMOVE AIR CLEANER HOSE**
2. **REMOVE INTAKE AIR CONNECTOR**
   (See steps 2, 8 and 11 to 13 in cylinder head removal in Engine Mechanical)
3. **REMOVE FUEL PRESSURE REGULATOR**
   (See steps 3 and 4 in fuel pressure regulator removal)
4. **DISCONNECT FUEL INLET PIPE**
   CAUTION: Catch leaking fuel in a container.
5. **REMOVE FUEL PIPE**
6. **DISCONNECT INJECTOR CONNECTORS**
7. **REMOVE DELIVERY PIPES AND INJECTORS**
   NOTICE: Be careful not to drop the injectors when removing the delivery pipes.

(a) Remove the 4 bolts and delivery pipes together with the 6 injectors

(b) Remove the 4 spacers from the intake manifold.



(c) Pull out the 6 injectors from the delivery pipes.
(d) Remove the 2 O–rings and 2 grommets from each injector.



INJECTORS INSPECTION

EG8A6–03

EG

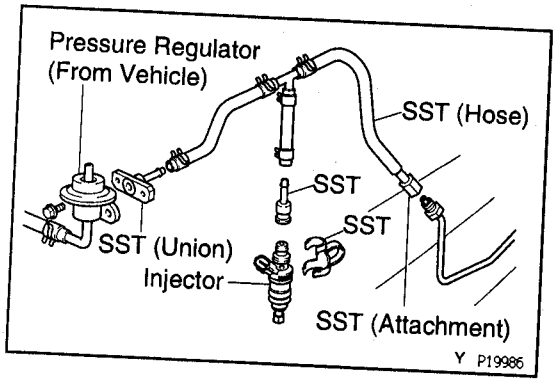
1. INSPECT INJECTOR RESISTANCE

Using an ohmmeter, measure the resistance between the terminals.

Resistance:

At 20°C (68°F): Approx. 13.8 Ω

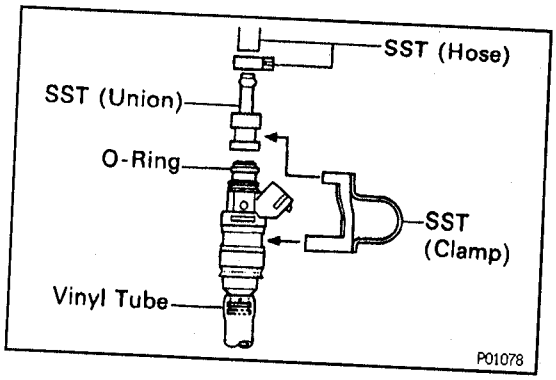
If the resistance is not as specified, replace the injector.



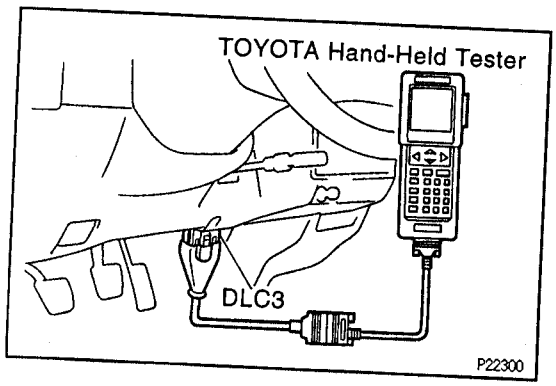
2. INSPECT INJECTOR INJECTION

CAUTION: Keep injector clear of sparks during the test.

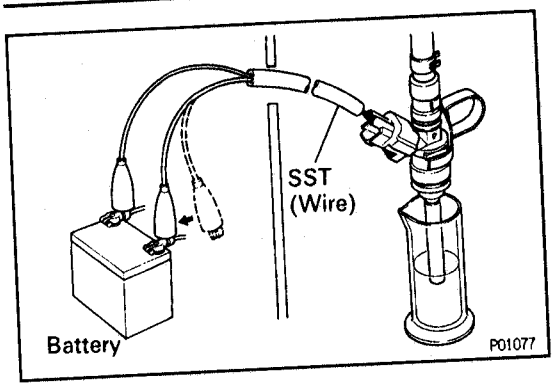
(a) Disconnect the fuel inlet pipe from the fuel tube.
(b) Connect SST (attachment and hose) to the fuel tube.
SST 09268–41046 (09268–52011)
(c) Connect the fuel return hose, SST (union) and SST (hose) to the fuel pressure regulator.
SST 09268–41046 (09268–41091)

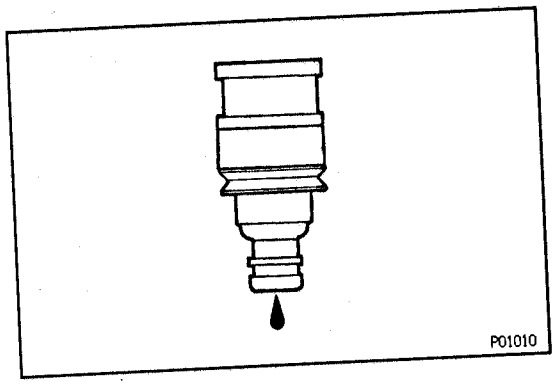


(d) Install the O–ring to the injector.
(e) Connect SST (union and hose) to the injector, and hold the injector and union with SST (clamp).
SST 09268–41046
(f) Put the injector into the graduated cylinder.
HINT: Install a suitable vinyl hose onto the injector to prevent gasoline from splashing out.



(g) Connect the TOYOTA hand–held tester to the DLC3.
(h) Turn the ignition switch ON and TOYOTA hand–held tester main switch ON.
NOTICE: Do not start the engine.
(i) Select the active test mode on the TOYOTA hand–held tester.
(j) Please refer to the TOYOTA hand – held tester operator's manual for further details.





(k) 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)

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

Volume:
56 – 69 cm³ (3.4 – 4.2 cu in.) per 15 sec.

Difference between each injector:
6 cm³ (0.4 cu in.) or less

If the ignition volume is not as specified, replace the injector.

3. 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 minute

(b) Turn the ignition switch to LOCK.

(c) Disconnect the negative (–) terminal cable from the battery.

(d) Remove SST.
SST 09268-41045

(e) Disconnect the TOYOTA hand-held tester from the DLC3.

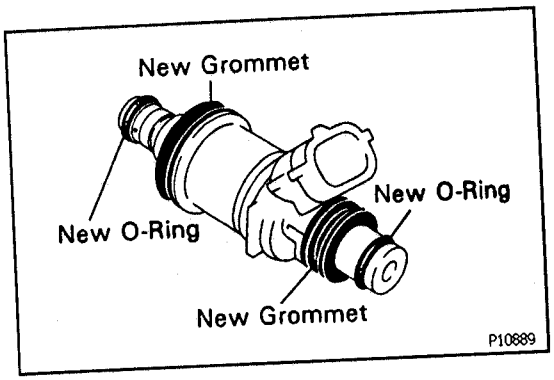
EG0BS-01

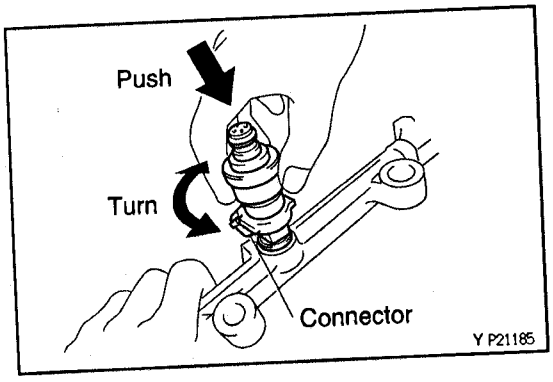
INJECTORS INSTALLATION

1. TEMPORARILY INSTALL INJECTORS AND DELIVERY PIPES

(a) Install 2 new grommets to each injector.

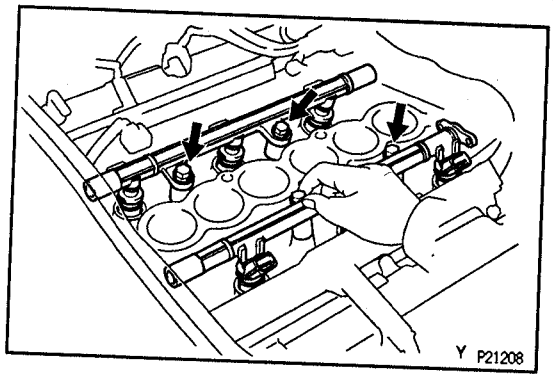
(b) Apply a light coat of spindle oil or gasoline to 2 new O-rings and install them to each injector.



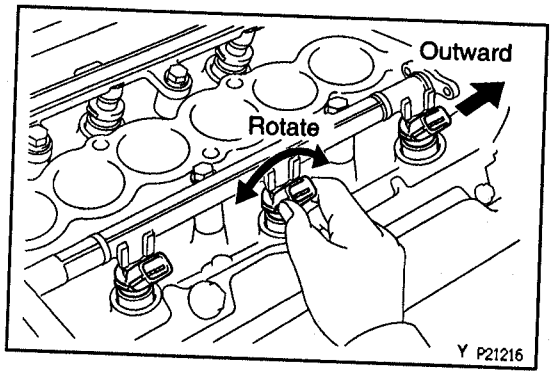


(c) While turning the injector clockwise and counter-clockwise, push it to the delivery pipes. Install the 6 injectors.

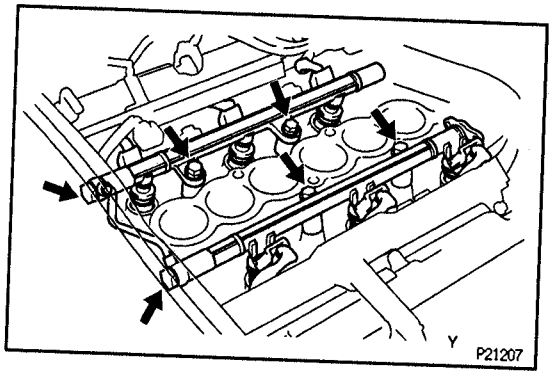
(d) Position the injector connector outward.



(e) Place the 4 spacers in position on the intake manifold.
(f) Place the delivery pipes with the 6 injectors in position on the intake manifold.
(g) Temporarily install the 4 bolts holding the delivery pipes to the intake manifold.



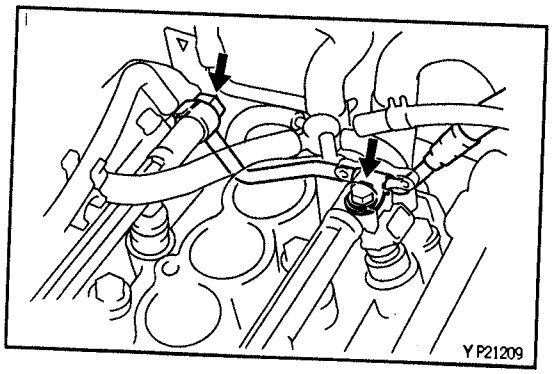
(h) Check that the injectors rotate smoothly.
HINT: If injectors do not rotate smoothly, the probable cause is incorrect installation of O–rings. Replace the O–rings.
(i) Position the injector connector outward.



2. CONNECT INJECTOR CONNECTORS

3. INSTALL FUEL PIPE AND TIGHTENING DELIVERY PIPE HOLDING BOLTS

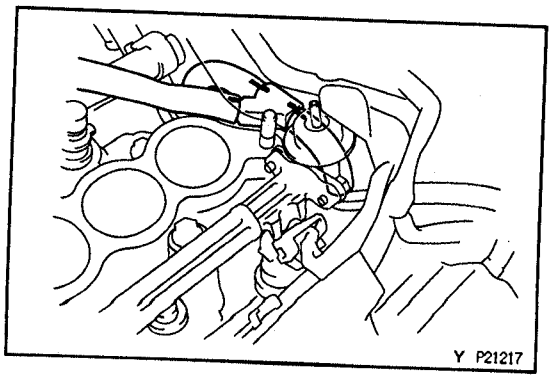
(a) Install the fuel pipe with 4 new gaskets and the 2 union bolts.
Torque: 34.3 N·m (350 kgf·cm, 25 ft·lbf)
(b) Tighten the 4 bolts holding the delivery pipes to the intake manifold.
Torque: 13 N·m (130 kgf·cm, 10 ft·lbf)



4. CONNECT FUEL INLET PIPE

(a) Temporarily install the union and 2 new gaskets, and connect the fuel pipe.
(b) Install the clamp bolt.
Torque: 8 N·m (80 kgf·cm, 71 in.·lbf)
(c) Tighten the union bolt.
Torque: 34.3 N·m (350 kgf·cm, 25 ft·lbf)

5. INSTALL FUEL PRESSURE REGULATOR
(See steps 1 and 2 in fuel pressure regulator installation)



6. VISUALLY INSPECT AIR ASSIST LINES AND CONNECTIONS
Look for loose connections, sharp bends or damage.

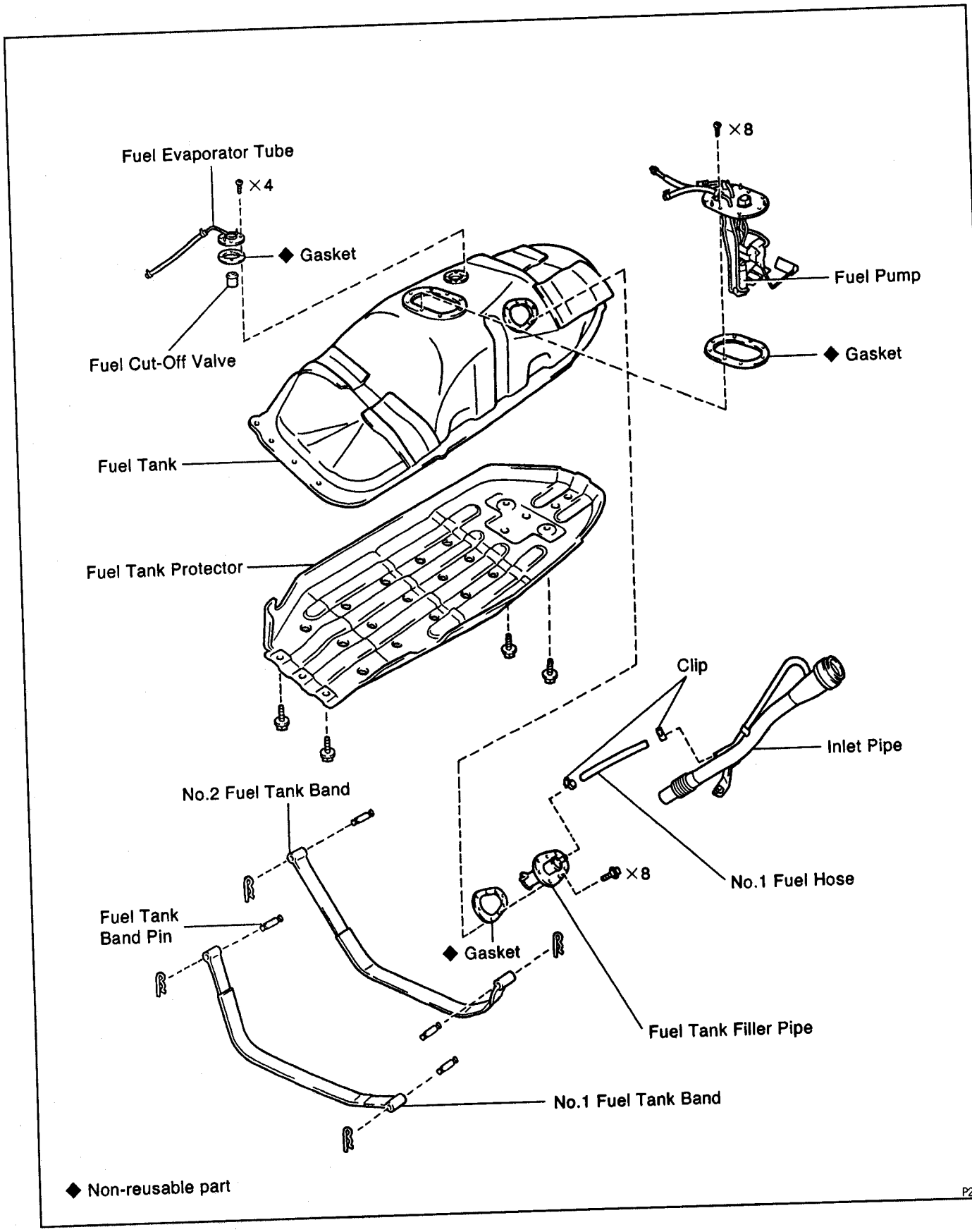
7. INSTALL INTAKE AIR CONNECTOR
(See steps 16 to 19, 24 and 27 in cylinder head installation in Engine Mechanical)

8. INSTALL AIR CLEANER HOSE

9. CHECK FOR FUEL LEAKS
(See fuel system in precaution)

FUEL TANK AND LINE
COMPONENTS

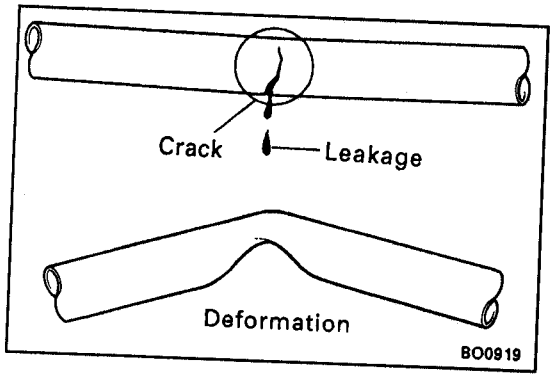
EG0GX-07

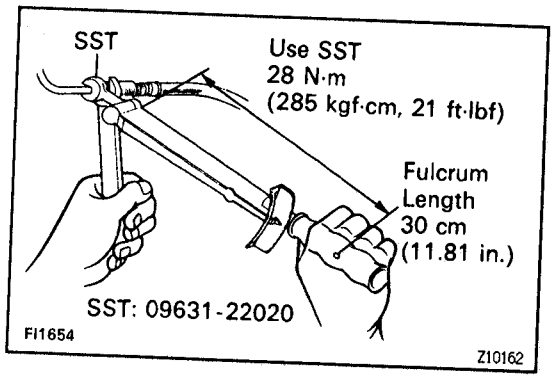


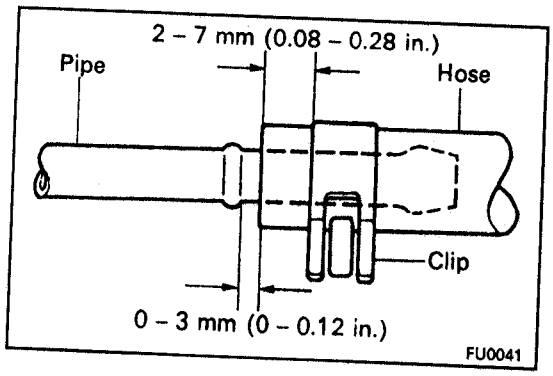
PRECAUTIONS

E00GY–04

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







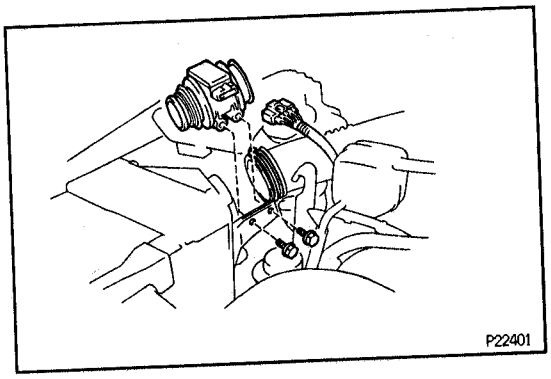
FUEL LINES AND CONNECTIONS INSPECTION

E00GZ–04

EG

(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 pipe connections are as shown in the illustration.

If a problem is found, repair or replace the parts as necessary.



MASS AIR FLOW (MAF) METER

E05AA-03

MAF METER REMOVAL

1. DISCONNECT AIR CLEANER CAP FROM MAF METER
2. REMOVE MAF METER

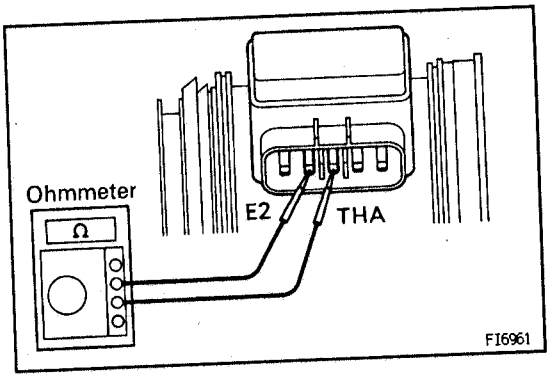
(a) Disconnect the MAF meter connector.

(b) Remove the 2 bolts and MAF meter.

Torque: 6.9 N·m (72 kgf·cm, 61 in.·lbf)

E03D6-04

MAF METER INSPECTION

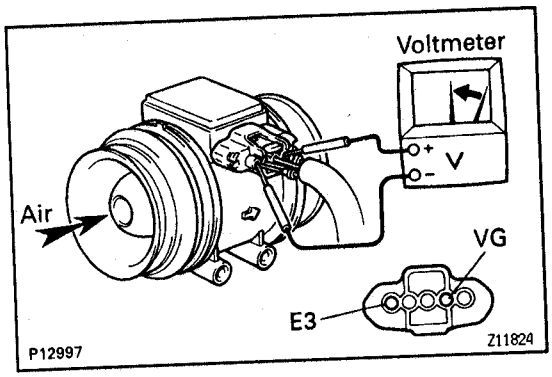


1. INSPECT MAF METER RESISTANCE

Using an ohmmeter, measure the resistance between terminals THA and E2.

Between terminals	Resistance	Temperature
THA – E2	10 – 20 kΩ	–20°C (–4°F)
THA – E2	4 – 7 kΩ	0°C (32°F)
THA – E2	2 – 3 kΩ	20°C (68°F)
THA – E2	0.9 – 1.3 kΩ	40°C (104°F)
THA – E2	0.4 – 0.7 kΩ	60°C (140°F)
THA – E2	0.2 – 0.4 kΩ	80°C (176°F)

If the resistance is not as specified, replace the MAF meter.



2. INSPECT MAF METER OPERATION

(a) Connect the MAF meter connector.

(b) Using a voltmeter, connect the positive (+) tester probe to terminal VG, and negative (–) tester probe to terminal E3.

(c) Blow air into the MAF meter, and check that the voltage fluctuates.

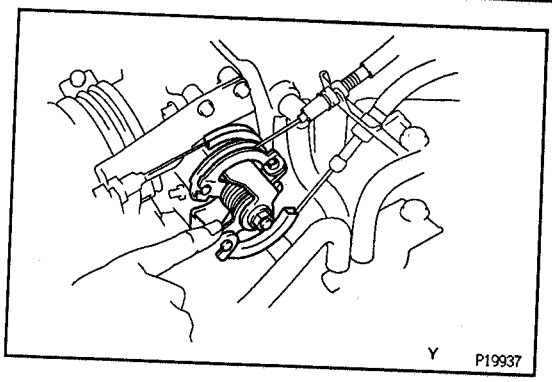
If operation is not as specified, replace the MAF meter.

(d) Disconnect the MAF meter connector.

E06BT-01

MAF METER INSTALLATION

Installation is in the reverse order of removal.



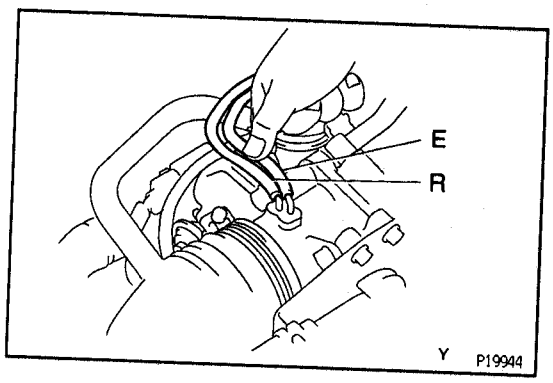
THROTTLE BODY

ON–VEHICLE INSPECTION

EGSAB–02

1. INSPECT THROTTLE BODY

(a) Check that the throttle linkage moves smoothly.

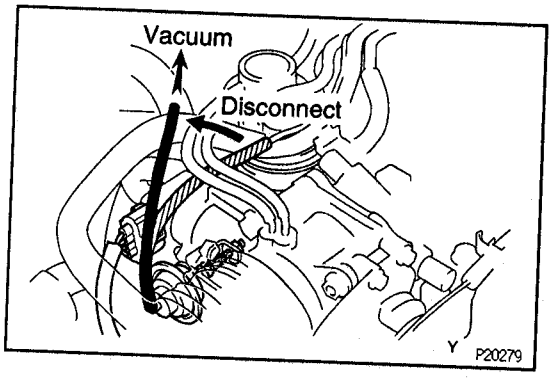


(b) w/ EGR:

Check the vacuum at each port.

- Start the engine.
- Check the vacuum with your finger.

Port name	At idle	3,500 rpm or more
E	No vacuum	Vacuum
R	No vacuum	Vacuum



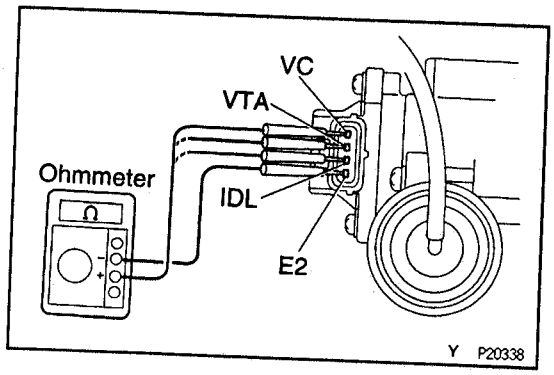
2. INSPECT THROTTLE POSITION SENSOR

(a) Apply vacuum to the throttle opener.

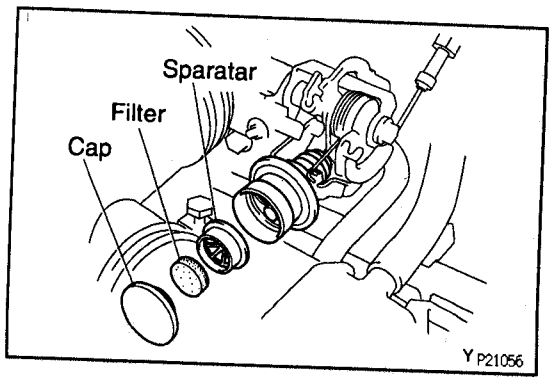
(b) Disconnect the sensor connector.

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

Throttle valve condition	Between terminals	Resistance
Fully closed	VTA – E2	0.28 – 6.4 kΩ
Fully closed	IDL – E2	0.5 kΩ or less
Open	IDL – E2	Infinity
Fully open	VTA – E2	2.0 – 11.6 kΩ
–	VC – E2	2.7 – 7.7 kΩ



(d) Reconnect the sensor connector.



3. M/T:

INSPECT DASHPOT (DP)

A. Warm up engine

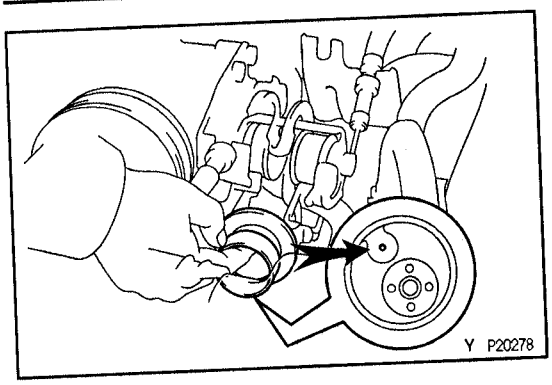
Allow the engine to warm up to normal operating temperature.

B. Check idle speed

Idle speed:

700 ± 50 rpm

C. Remove cap, filter and separator from DP



D. Check and adjust DP setting speed

(a) Maintain engine speed at 2,500 rpm or more.

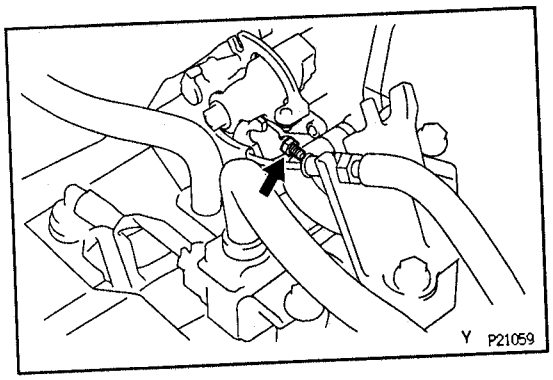
(b) Plug the VTV hole with your finger.

(c) Release the throttle valve.

(d) Check the DP is set.

DP setting speed:

1,800 – 2,200 rpm



(e) If the setting speed is not as specified, adjust it with the DP adjusting screw.

E. Check operation of VTV

(a) Set the DP setting speed in the same procedure as above; (a) to (c).

(b) Remove your finger from the hole and check that the engine returns to idle speed in approx. 1 second.

F. Reinstall DP separator, filter and cap

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

4. INSPECT THROTTLE OPENER

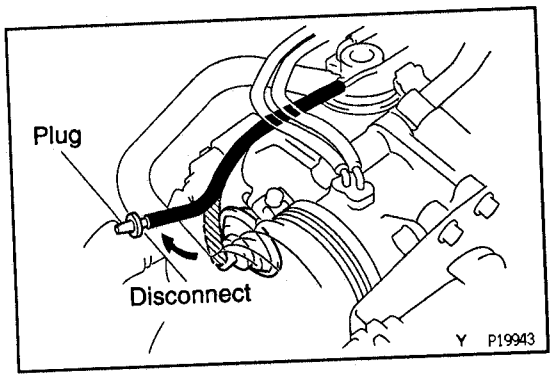
A. Warm up engine

Allow the engine to warm up to normal operating temperature.

B. Check idle speed

Idle speed:

700 ± 50 rpm



C. Check throttle opener setting speed

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

(b) Check the throttle opener setting speed.

Throttle opener setting speed:

900 – 1,950 rpm

If the throttle opener setting is not as specified, replace the throttle body.

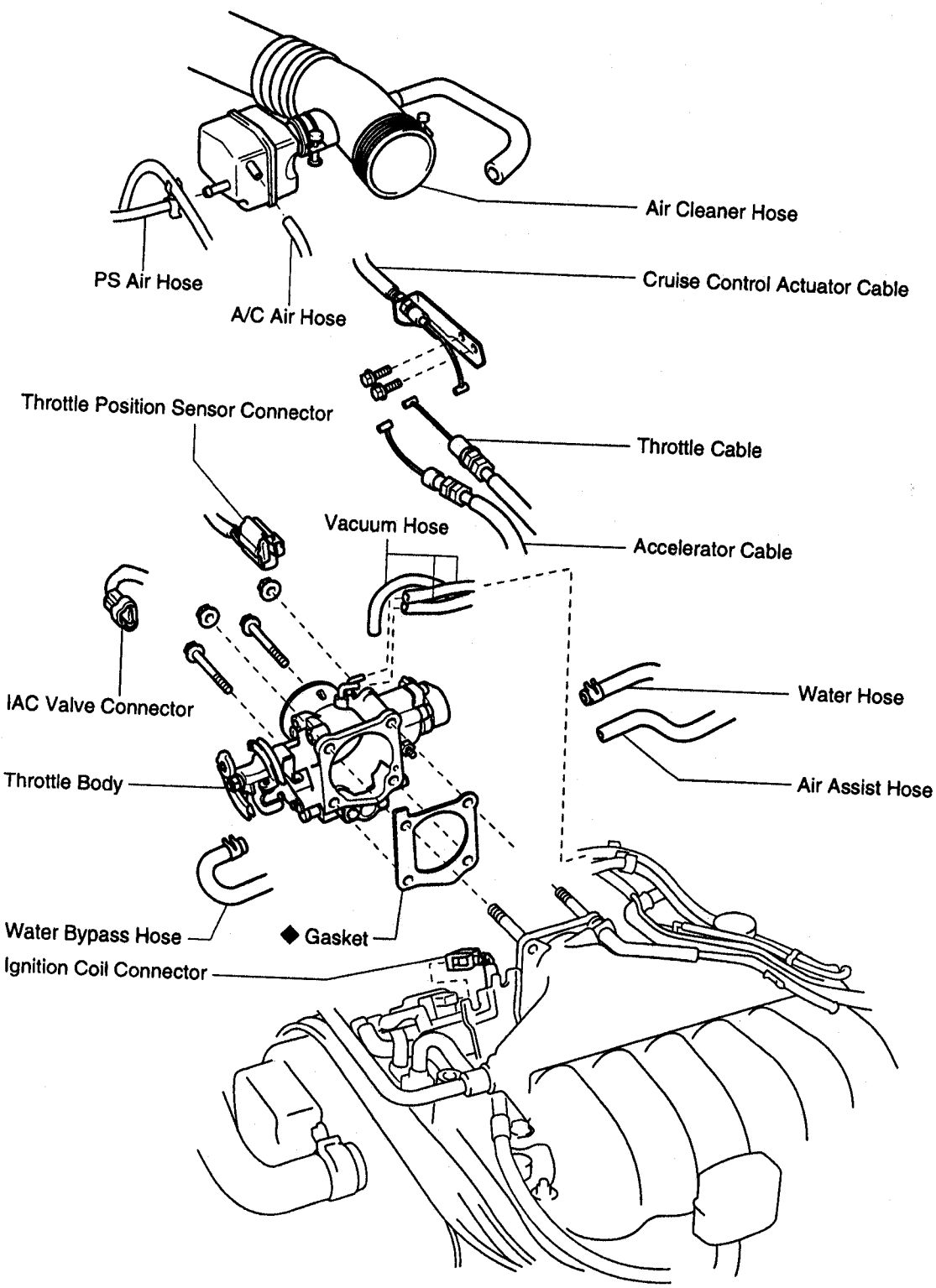
(c) Stop the engine.

(d) Reconnect the vacuum hose to the throttle opener.

(e) Start the engine and check that the idle speed returns to the correct speed.

COMPONENTS FOR REMOVAL AND INSTALLATION

EG13G–14



◆ Non-reusable part

Y P21226

THROTTLE BODY REMOVAL

1. **DRAIN ENGINE COOLANT**
2. **DISCONNECT THESE CABLES:**

(a) w/ Cruise control:
Cruise control actuator cable

(b) Accelerator cable

(c) A/T:
Throttle cable

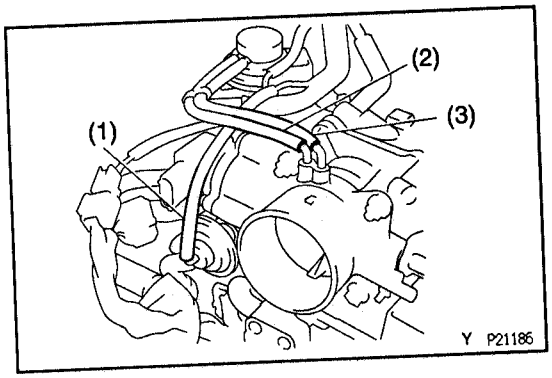
3. **REMOVE AIR CLEANER HOSE**
4. **DISCONNECT THROTTLE POSITION SENSOR CONNECTOR**
5. **DISCONNECT IAC VALVE CONNECTOR**
6. **REMOVE THROTTLE BODY**

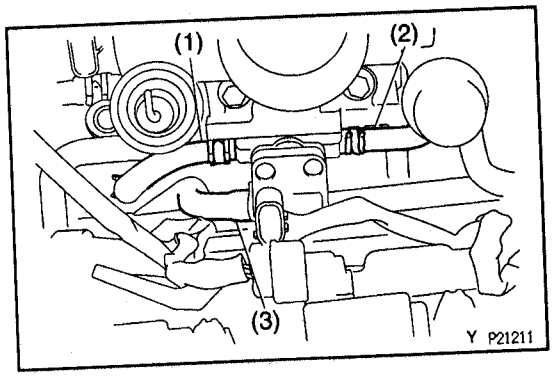
(a) Disconnect these vacuum hoses from the throttle body:

(1) Vacuum hose of throttle opener

(2) w/ EGR:
Vacuum hose (from port R of EGR vacuum modulator)

(3) w/ EGR:
Vacuum hose (from port E of EGR vacuum modulator)





(b) Disconnect these hoses from the IAC valve:

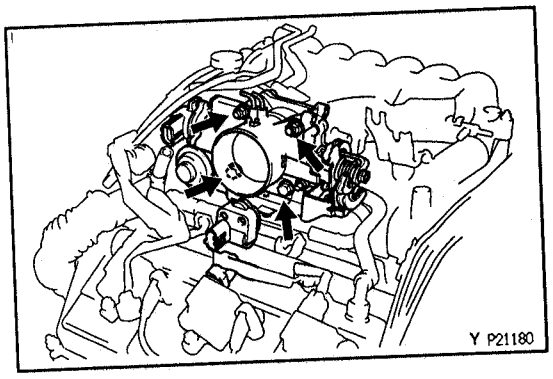
(1) Water bypass hose (w/ EGR: from EGR valve, w/o EGR: from water bypass pipe)

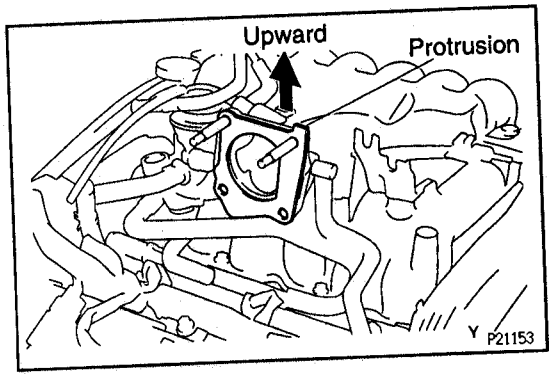
(2) Water hose (from intake manifold)

(3) Air assist hose

(c) Disconnect the ignition coil connector.

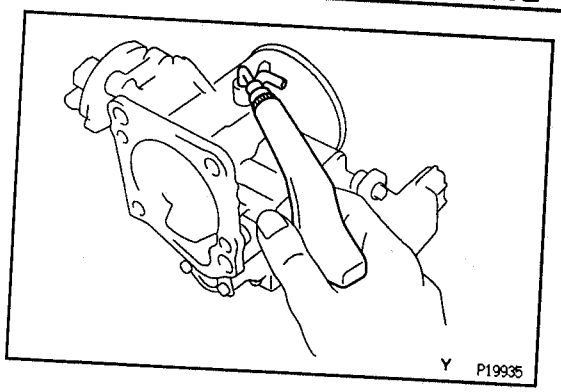
(d) Remove the 2 bolts, 2 nuts, throttle body and gasket.





INSTALLATION HINT: Place a new gasket on the air intake chamber facing the protrusion upward.

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



THROTTLE BODY INSPECTION

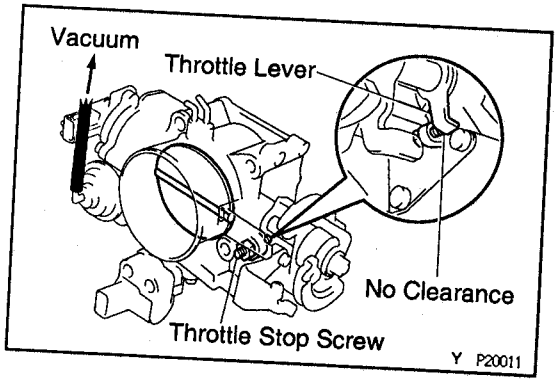
EGEAD–08

1. CLEAN THROTTLE BODY

(a) Using a soft brush and carburetor cleaner, clean the cast parts.

(b) Using compressed air, clean all the passages and apertures.

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



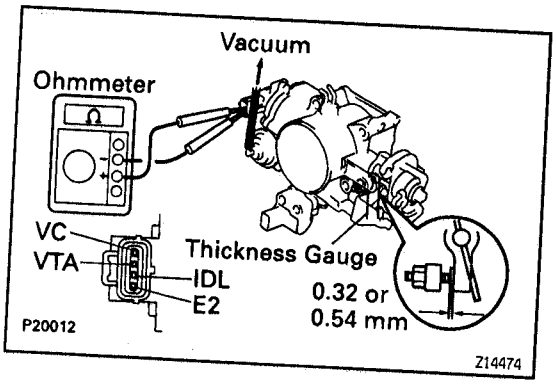
2. INSPECT THROTTLE VALVE

(a) Apply vacuum to the throttle opener.

(b) Check that there is no clearance between the throttle stop screw and throttle lever when the throttle valve is fully closed.

Throttle valve fully closed angle: 10°

EG



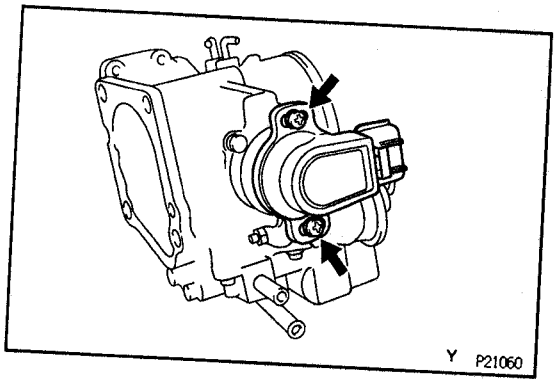
3. INSPECT THROTTLE POSITION SENSOR

(a) Apply vacuum to the throttle opener.

(b) Insert a thickness gauge between the throttle stop screw and stop lever.

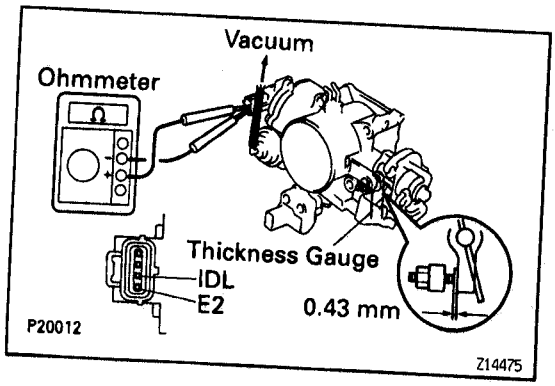
(c) Using an ohmmeter, measure the resistance between each terminal.

Clearance between lever and stop screw	Between terminals	Resistance
0 mm (0 in.)	VTA – E2	0.28 – 6.4 kΩ
0.32 mm (0.013 in.)	IDL – E2	0.5 kΩ or less
0.54 mm (0.021 in.)	IDL – E2	Infinity
Throttle valve fully open	VTA – E2	2.0 – 11.6 kΩ
–	VC – E2	2.7 – 7.7 kΩ



4. IF NECESSARY, ADJUST THROTTLE POSITION SENSOR

(a) Loosen the 2 set screws of the sensor.

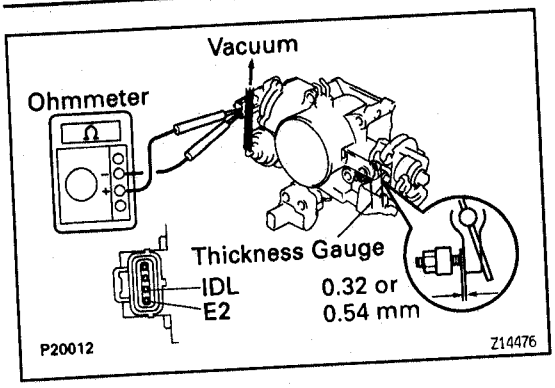


(b) Apply vacuum to the throttle opener.

(c) Insert a 0.43 mm (0.017 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)
0.32 mm (0.013 in.)	Continuity
0.54 mm (0.021 in.)	No continuity

E0466V-01

THROTTLE BODY INSTALLATION

EG

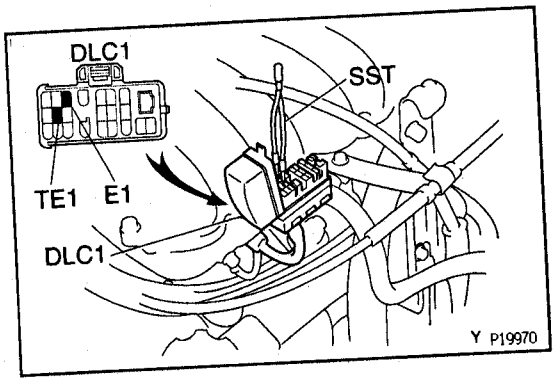
Installation is in the reverse order of removal

IDLE AIR CONTROL (IAC) VALVE ON-VEHICLE INSPECTION

E0466W-01

1. INSPECT IAC VALVE OPERATION

(a) Initial conditions:
- Engine at normal operating temperature
- Idle speed checked correctly
- Transmission in neutral position
- A/C switch OFF



(b) Using SST, connect terminals TE1 and E1 of the DLC1.
SST 09843-18020

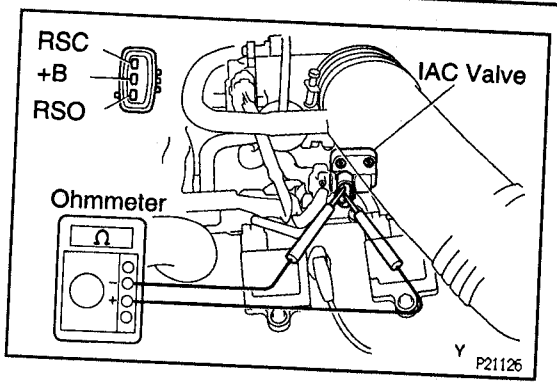
(c) After engine speed is kept at approx. 1,000 rpm for 5 seconds, check that it returns to idle speed.
If the engine speed operation is not as specified, check the IAC valve, wiring and ECM.

(d) Remove the SST from the DLC1.
SST 09843-18020

2. 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).

(a) Disconnect the IAC valve connector.



(b) Using an ohmmeter, measure the resistance between terminal +B and other terminals (RSC, RSO).

Resistance:

Cold: 17.0 – 24.5 Ω

Hot: 21.5 – 28.5 Ω

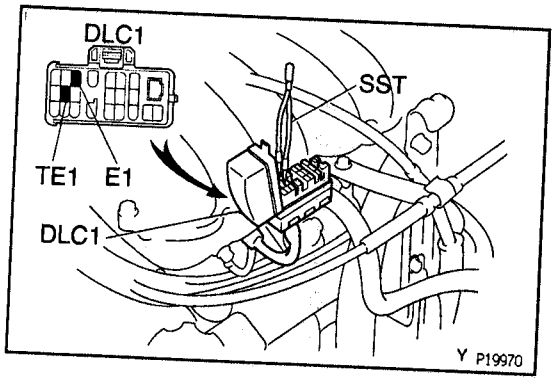
If resistance is not as specified, replace the IAC valve.

(c) Reconnect the IAC valve connector.

3. INSPECT AIR ASSIST SYSTEM

(a) Initial conditions:

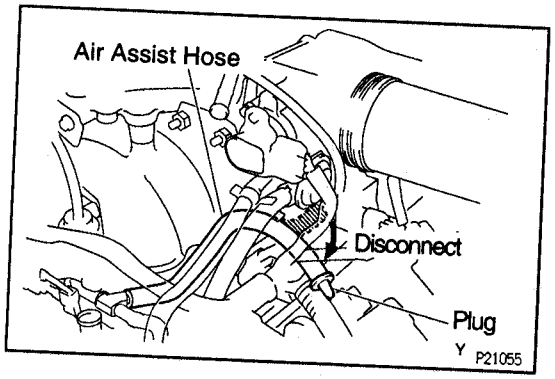
- Engine at normal operating temperature
- Idle speed checked correctly
- Transmission in neutral position
- A/C switch OFF



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

SST 09843–18020

(c) After engine speed is kept at 900 – 1,300 rpm for 10 seconds, check that it returns to idle speed.



(d) Stop the engine.

(e) Disconnect the air assist hose from the IAC valve, and plug it.

(f) Start the engine and check that the idle speed reaches 500 rpm or below (the engine may stall).

If the idle does not reach 500 rpm or below, check for a leak between the air assist hoses, pipe and injectors.

(g) Remove the SST from the DLC1.

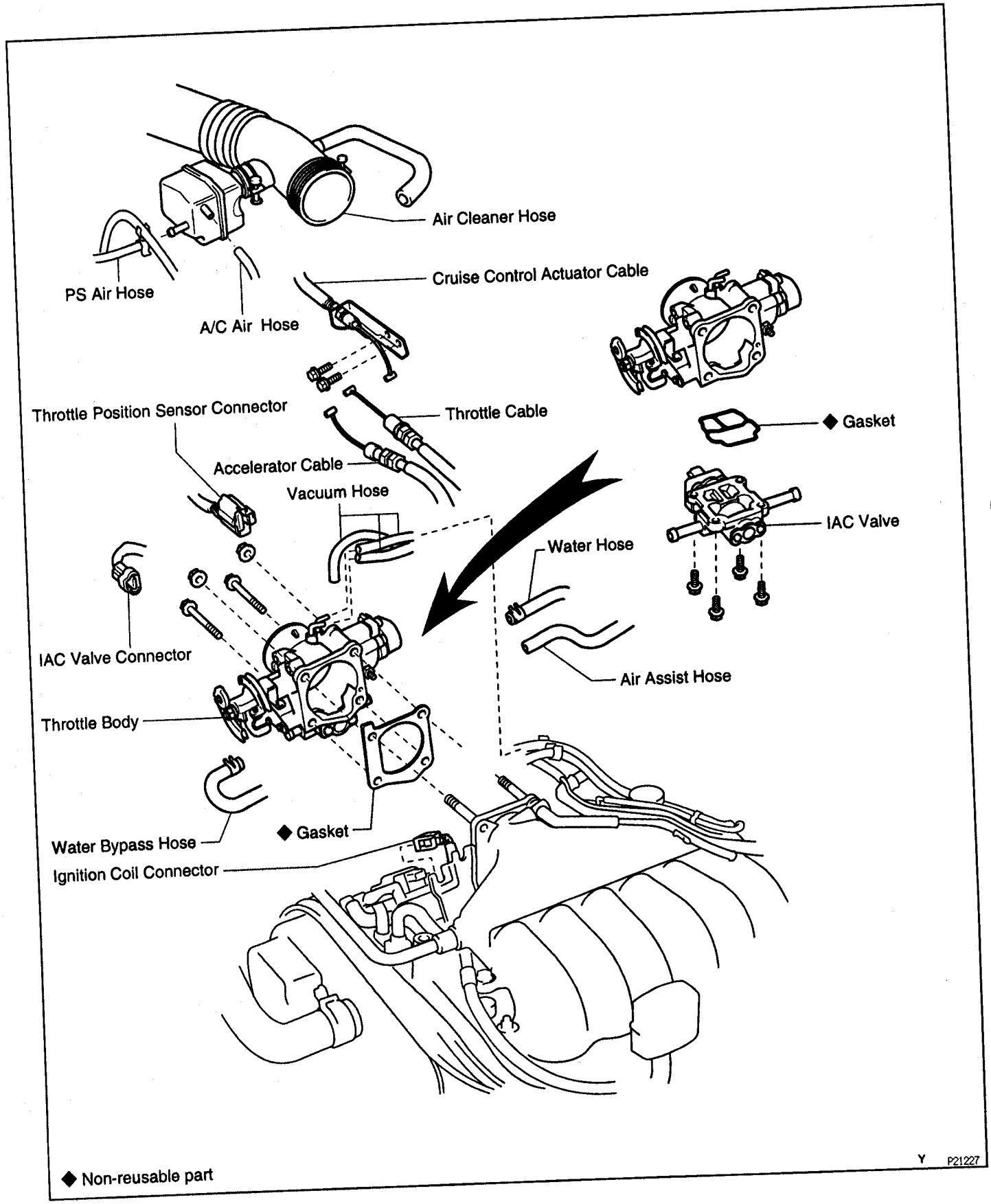
SST 09843–18020

(h) Reconnect the air assist hose to the IAC valve.

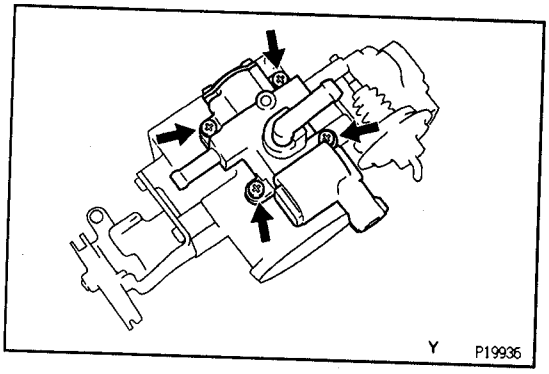
EG

EG13R-08

COMPONENTS FOR REMOVAL AND INSTALLATION



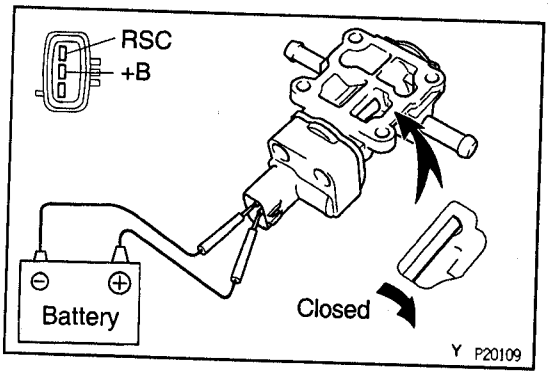
◆ Non-reusable part



IAC VALVE REMOVAL

EG13S–0M

1. **REMOVE THROTTLE BODY**
   (See throttle body removal)
2. **REMOVE IAC VALVE**
   Remove the 4 screws, IAC valve and gasket.
   INSTALLATION HINT: Place a new gasket on the throttle body.



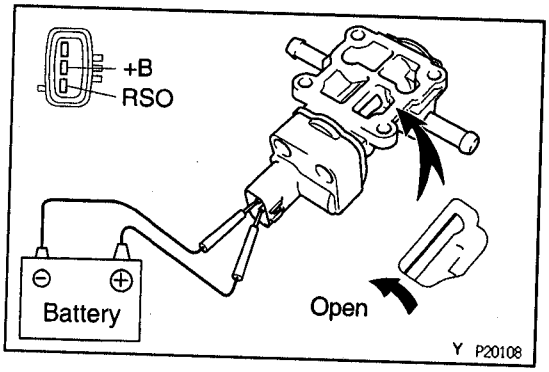
IAC VALVE INSPECTION

EG0DN–0U

EG

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

IAC VALVE INSTALLATION

EG66X–01

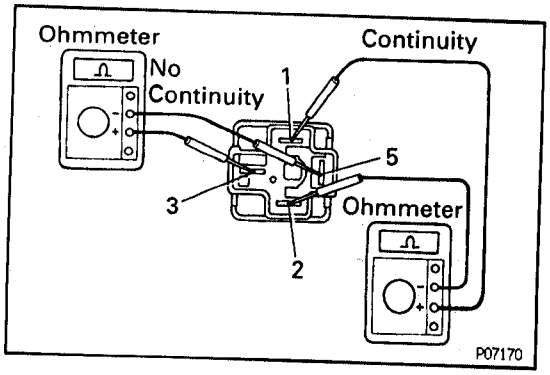
Installation is in the reverse order of removal.

EFI MAIN RELAY

EFI MAIN RELAY INSPECTION

EG66Y–01

1. **REMOVE EFI MAIN RELAY**

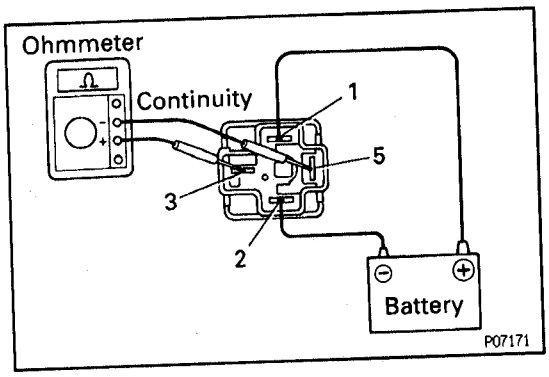


2. **INSPECT EFI MAIN RELAY**

A. Inspect relay continuity

(a) Using an ohmmeter, check that there is continuity between terminals 1 and 2.
If there is no continuity, replace the relay.

(b) Check that there is no continuity between terminals 3 and 5.
If there is continuity, replace the relay.



B. Inspect relay operation

(a) Apply battery positive voltage across terminals 1 and 2.

(b) Using an ohmmeter, check that there is continuity between terminals 3 and 5.
If operation is not as specified, replace the relay.

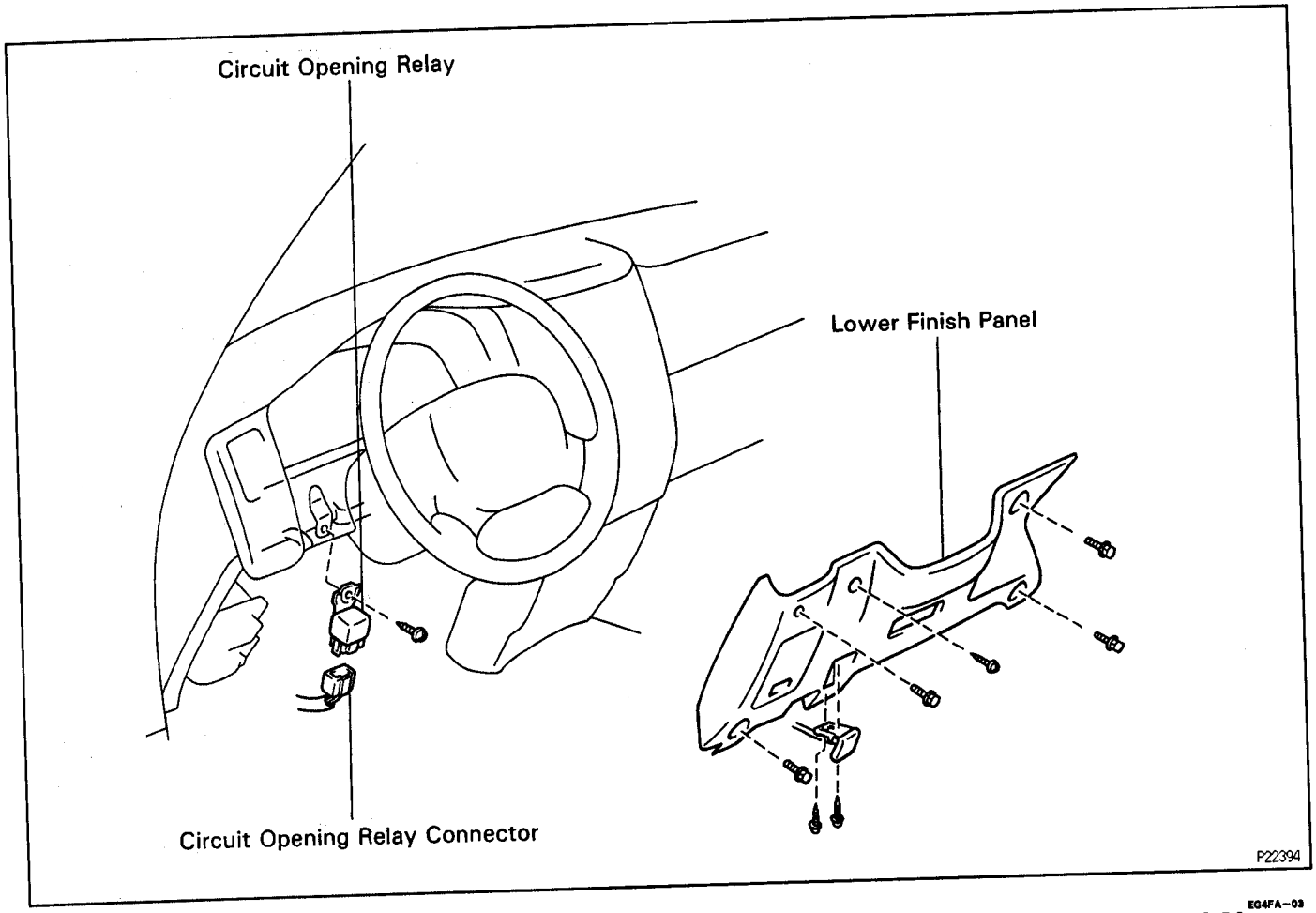
3. REINSTALL EFI MAIN RELAY

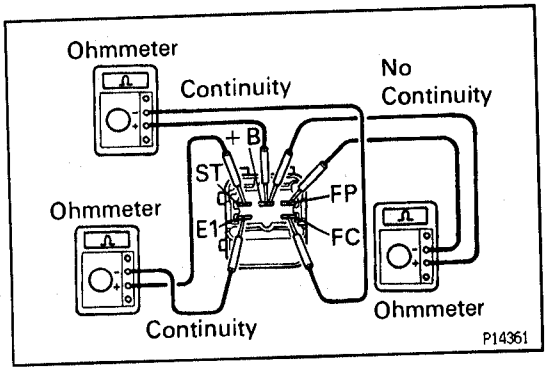
EG

CIRCUIT OPENING RELAY

EG0HM-0C

COMPONENTS FOR REMOVAL AND INSTALLATION





CIRCUIT OPENING RELAY INSPECTION

EG4FA-03

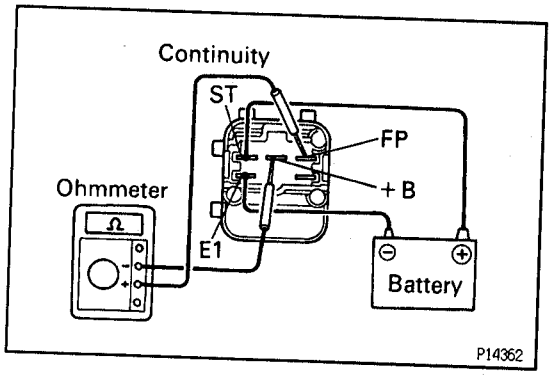
1. REMOVE CIRCUIT OPENING RELAY

2. INSPECT CIRCUIT OPENING RELAY

A. Inspect relay continuity

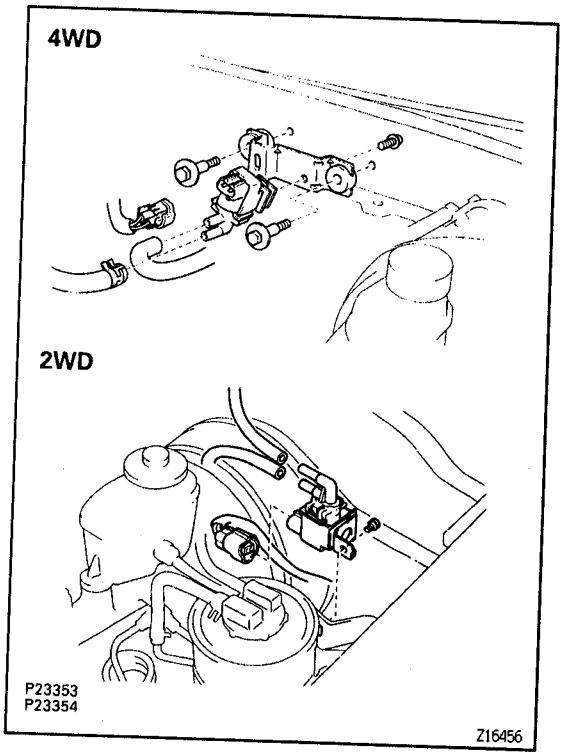
(a) Using an ohmmeter, check that there is continuity between terminals ST and E1.
If there no continuity, replace the relay.

(b) Check that there is continuity between terminals +B and FC.
If there no continuity, replace the relay.
(c) Check that there is no continuity between terminals +B and FP.
If there no continuity, replace the relay.



B. Inspect relay operation
(a) Apply battery positive voltage across terminals ST and E1.
(b) Using an ohmmeter, check that there is continuity between terminals +B and FP.
If operation is not as specified, replace the relay.

3. REINSTALL CIRCUIT OPENING RELAY

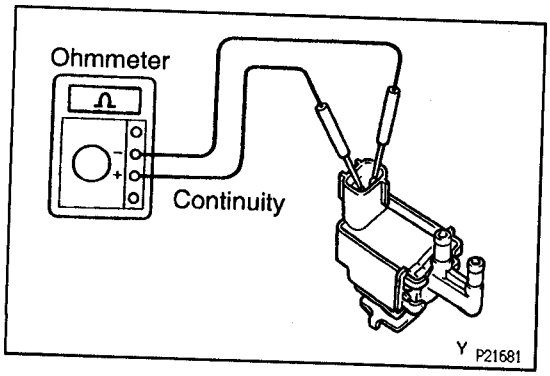


VSV FOR EVAP

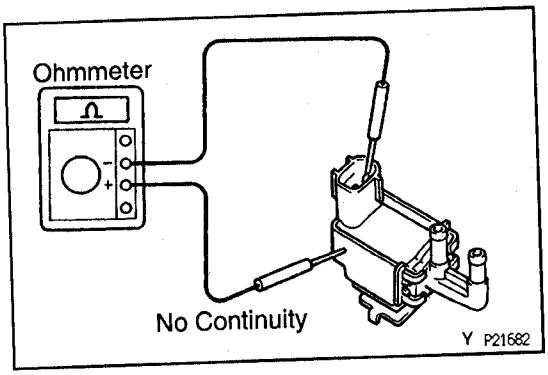
VSV INSPECTION

EG67P–01

1. REMOVE VSV
Disconnect the connector and 2 EVAP hoses, and remove the screw and VSV.

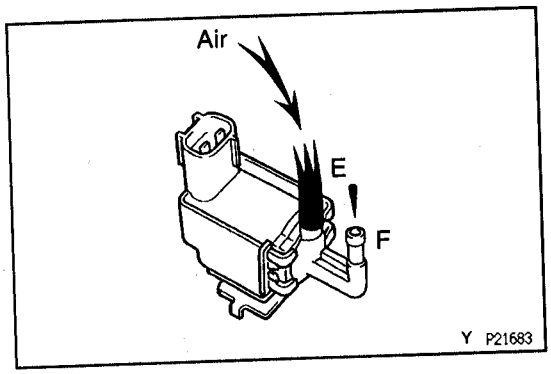


2. INSPECT VSV
A. Inspect VSV for open circuit
Using an ohmmeter, check that there is continuity between the terminals.
Resistance:
At 20°C (68°F): 30 – 34 Ω
If there is no continuity, replace the VSV.



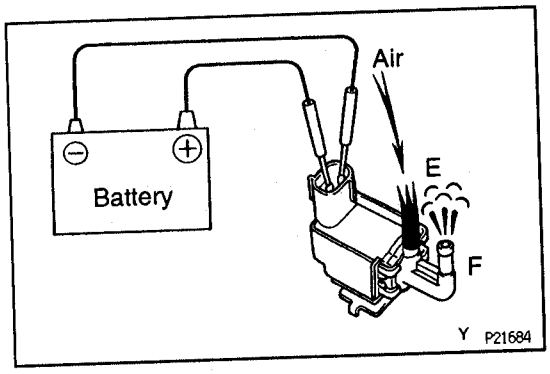
B. Inspect VSV for ground

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



C. Inspect VSV operation

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



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

3. REINSTALL VSV

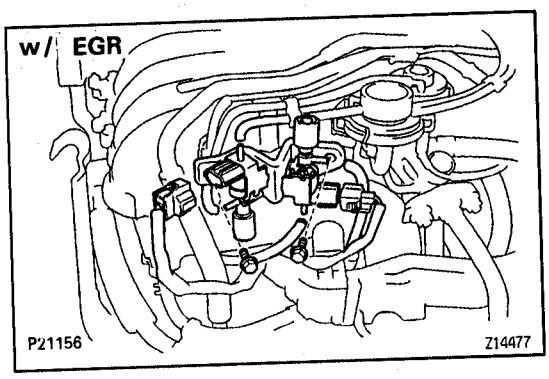
(a) Install the VSV with the screw.
(b) Connect the connector and 2 EVAP hoses to the VSV.

VSV FOR FUEL PRESSURE CONTROL EGSPG-01

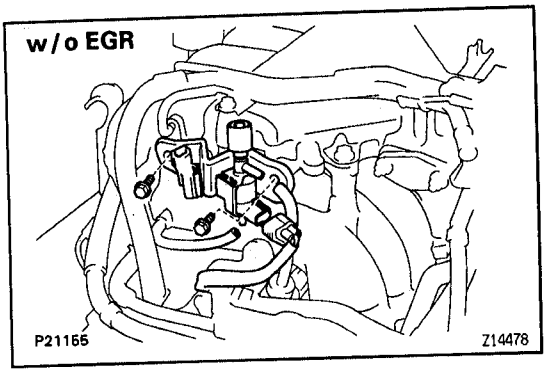
VSV INSPECTION

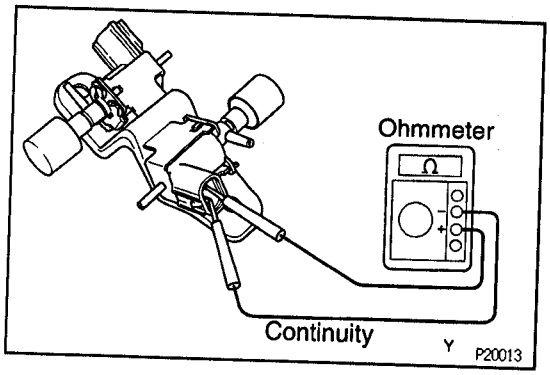
1. REMOVE VSV ASSEMBLY

(a) w/ EGR:
Disconnect the 2 connectors and 4 vacuum hoses, and remove the 2 bolts and VSV assembly.



(b) w/o EGR:
Disconnect the connector and 2 vacuum hoses, and remove the 2 bolts and VSV assembly.





3. INSPECT VSV

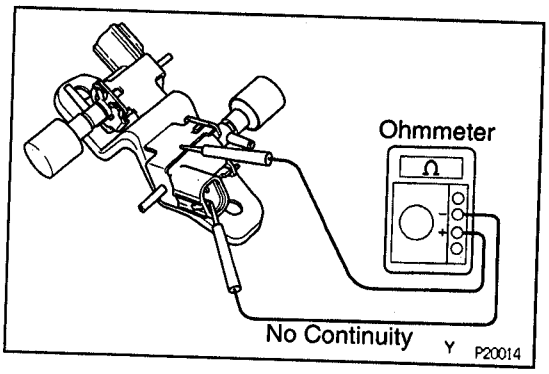
A. Inspect VSV for open circuit

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

Resistance:

At 20°C (68°F): 33 – 39 Ω

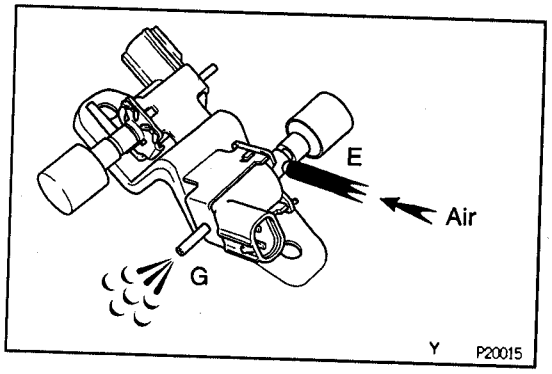
If there is no continuity, replace the VSV.



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 flows from port E to port G.

(b) Apply battery positive voltage across the terminals.

(c) Check that air flows from port E to the filter.

If operation is not as specified, replace the VSV.

3. REINSTALL VSV ASSEMBLY

(a) Install the VSV assembly with the 2 bolts.

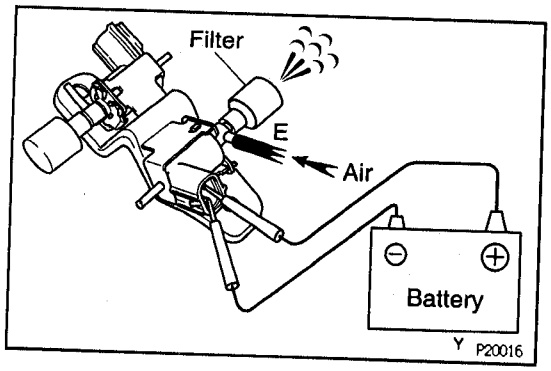
Torque: 8 N·m (80 kgf·cm 71 in.·lbf)

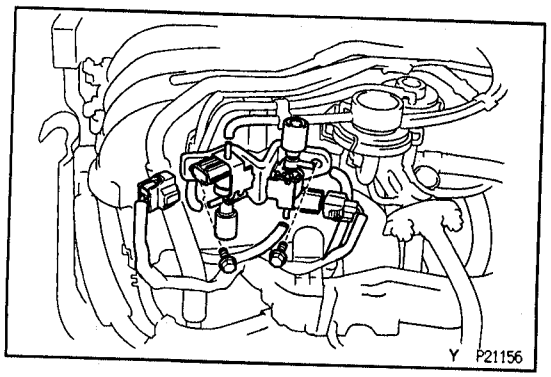
(b) w/ EGR:

Connect the 2 connectors and 4 vacuum hoses to the 2 VSV.

(c) w/o EGR:

Connect the connector and 2 vacuum hoses to the VSV.





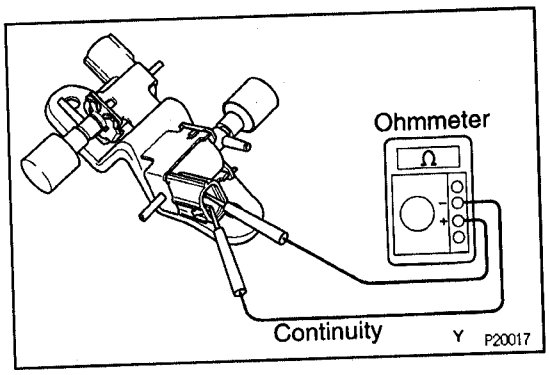
VSV FOR EGR (2WD/0.5 ton)

VSV INSPECTION

EG5AJ–01

1. REMOVE VSV ASSEMBLY

Disconnect the 2 connectors and 4 vacuum hoses, and remove the 2 bolts and VSV assembly.



2. INSPECT VSV

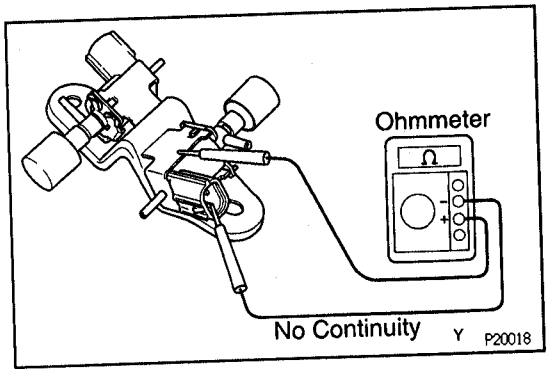
A. Inspect VSV for open circuit

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

Resistance:

At 20°C (68°F): 33 – 39 Ω

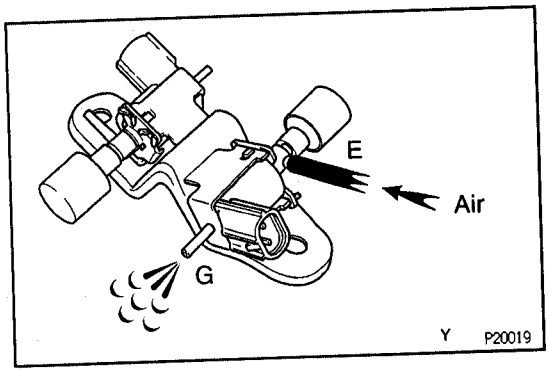
If there is no continuity, replace the VSV.



B. Inspect VSV for ground

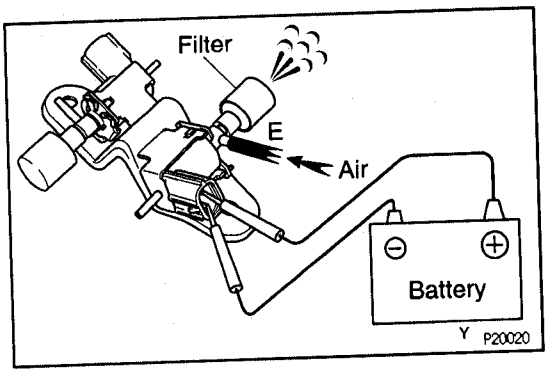
Using an ohmmeter, check that there is no continuity between each terminal and the body.

If there is continuity, replace the VSV.



C. Inspect VSV operation

(a) Check that air flows from port E to port G.



(b) Apply battery positive voltage across the terminals.

(c) Check that air flows from port E to the filter.

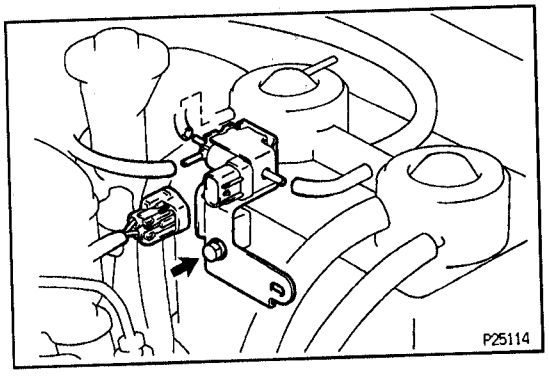
If operation is not as specified, replace the VSV.

3. REINSTALL VSV ASSEMBLY

(a) Install the VSV assembly with the 2 bolts.

Torque: 8 N·m (80 kgf·cm 71 in.·lbf)

(b) Connect the 2 connectors and 4 vacuum hoses to the 2 VSV.



VSV FOR VAPOR PRESSURE SENSOR

EG66Z-01

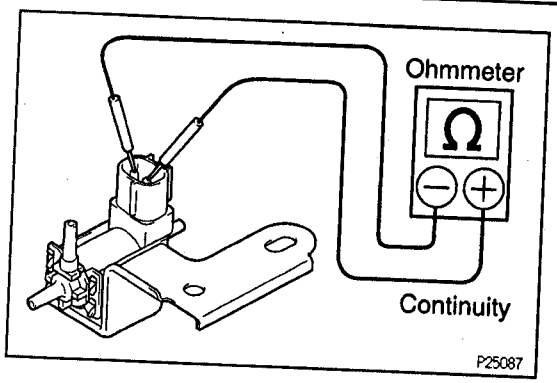
4WD only:

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

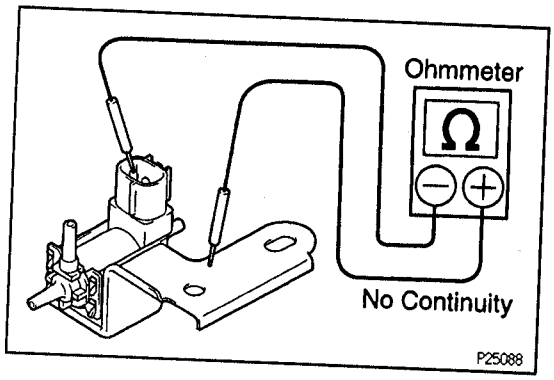
A. Inspect VSV for open circuit

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

Resistance:

At 20°C (68°F): 37 – 44Ω

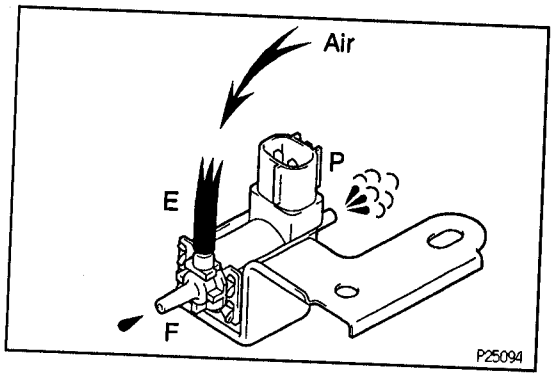
If there is no continuity, replace the VSV.



B. Inspect VSV for ground

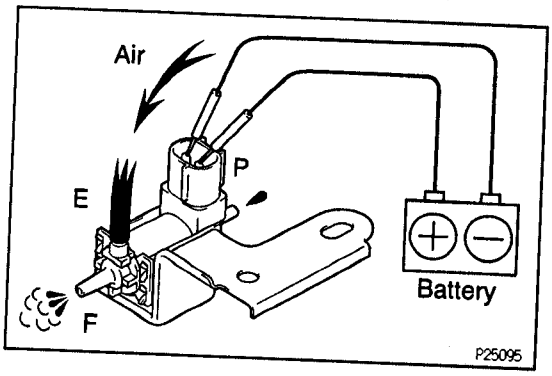
Using an ohmmeter, check that there is no continuity between each terminal and the body.

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 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

A/C IDLE–UP VALVE (w/ A/C)

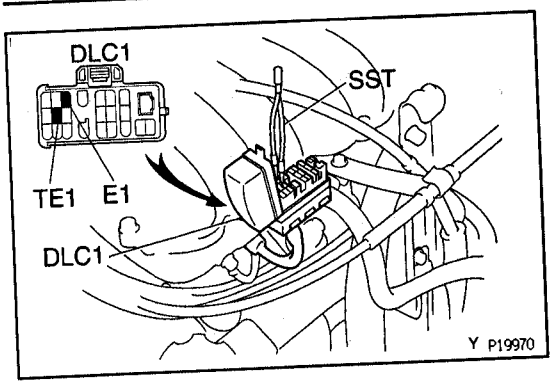
ON–VEHICLE INSPECTION

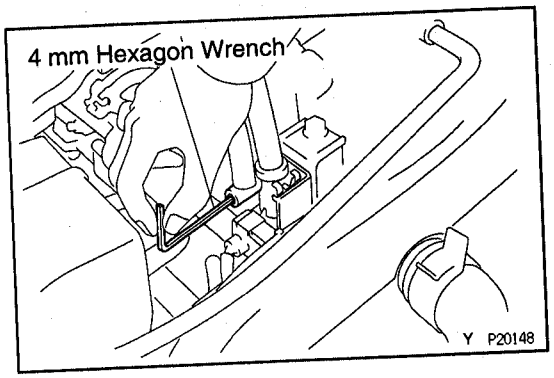
EGBAK–02

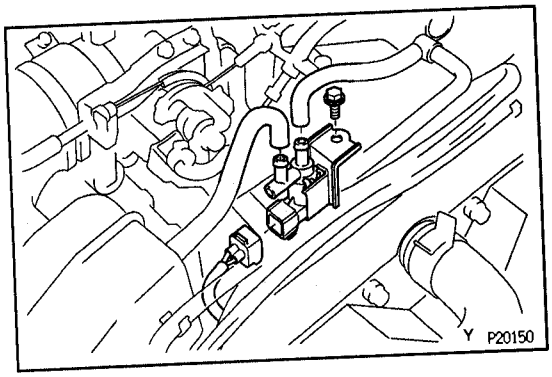
INSPECT A/C IDLE–UP VALVE OPERATION

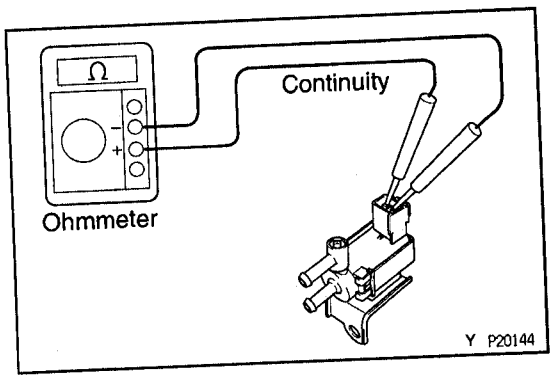
(a) Initial conditions:

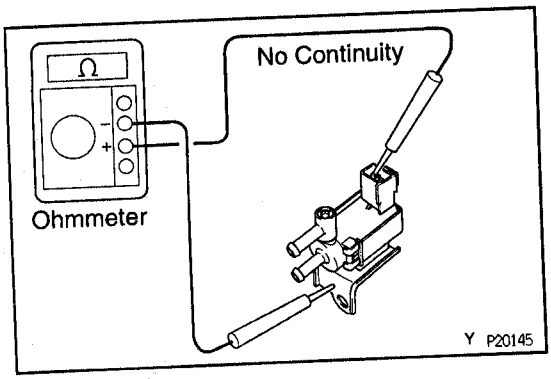
- Engine at normal operating temperature
- Idle speed set correctly
- Transmission in neutral position











- A/C switch ON

(b) Using SST, connect terminals TE1 and E1 of the DLC 1, check that idle-up occurs for approx. 3 seconds.
SST 09843-18020
Valve operation is faulty if during the idle-up period the engine speed drops by 100 rpm or more, rough idle occurs, or the engine stalls.

(c) Observe the idle speed for approx. 3 to 15 seconds. During this time the idle-up valve should go off, the IAC valve half-open and idle-up should occur.

(d) After approx. 15 seconds, check that the idle speed does not vary greatly from the idle speed observed in step (c). The idle-up valve should now be in ON position.
If the idle speed is increased by more 100 rpm, using a 4 mm hexagon wrench, turn the idle-up valve adjustment screw to correct the idle-up valve.

(e) Remove the SST from the DLC1.
SST 09843-18020

(f) A/C switch OFF.

EQ8AL-01

A/C IDLE-UP VALVE INSPECTION

1. REMOVE A/C IDLE-UP VALVE

(a) Disconnect the idle-up valve connecter.
(b) Disconnect the 2 air hoses.
(c) Remove the 2 bolts and idle-up valve.

2. INSPECT A/C IDLE-UP VALVE

A. Inspect idle-up valve for open circuit

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

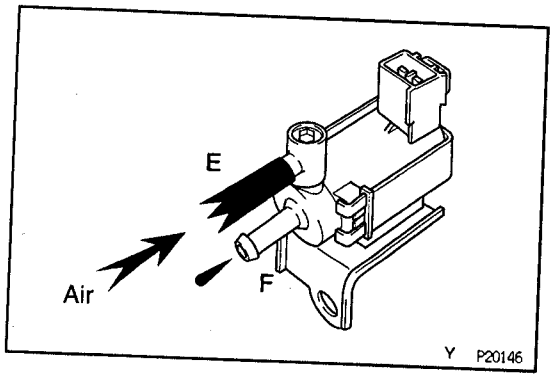
Resistance:

At 20°C (68°F): 30 – 34 Ω

If there is no continuity, replace the idle-up valve.

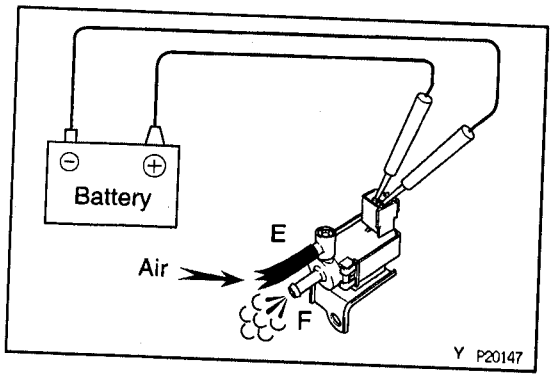
B. Inspect A/C idle-up valve for ground

Using an ohmmeter, check that there is no continuity between each terminal and the body.
If there is continuity, replace the idle-up valve.



C. Inspect A/C idle–up valve operation

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



(b) Apply battery positive voltage across the terminals.

(c) Check that air flows from port E to port F.

If operation is not as specified, replace the idle–up valve.

3. REINSTALL A/C IDLE–UP VALVE

(a) Install the idle–up valve with the 2 bolts.

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

(b) Connect the 2 air hoses.

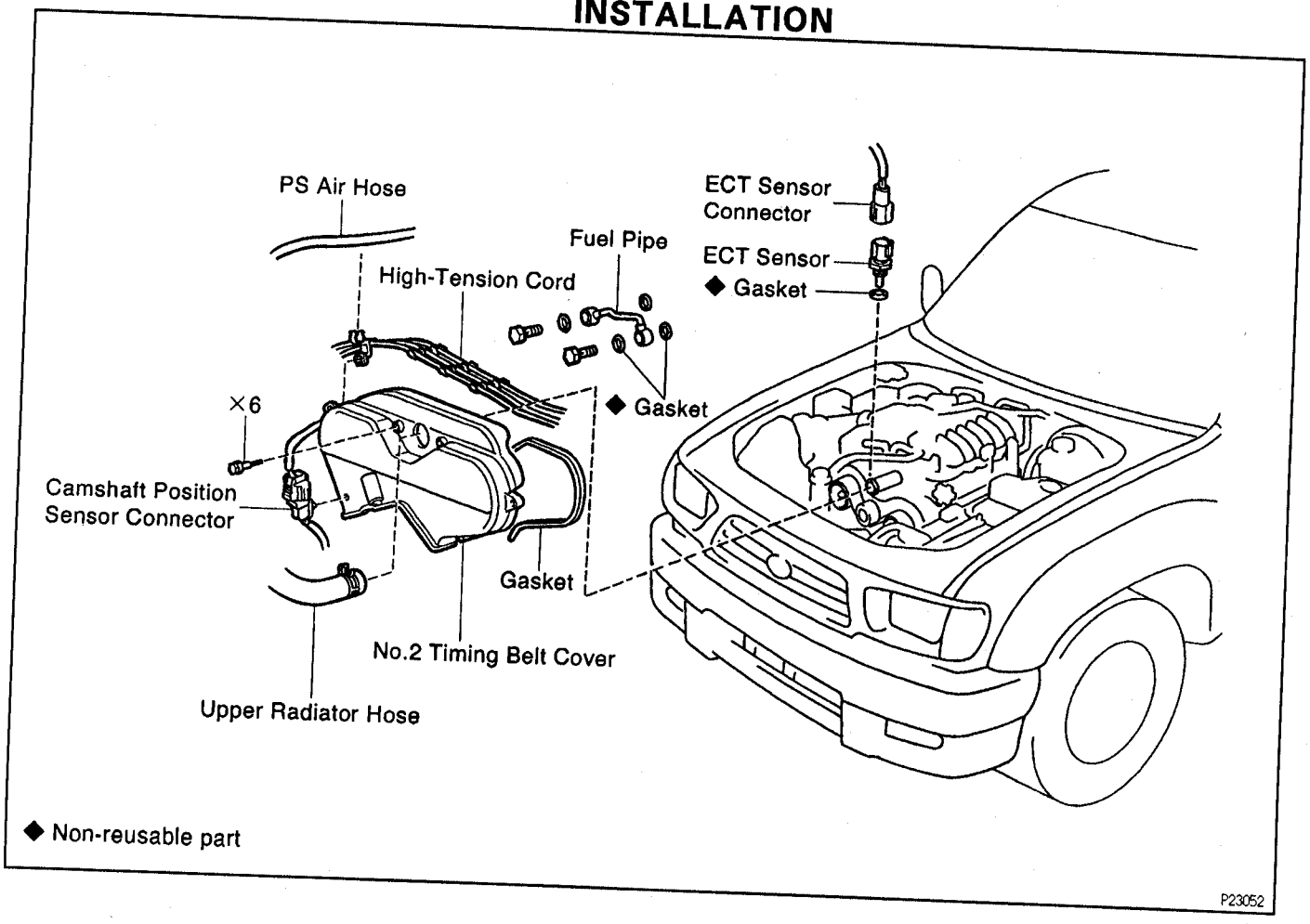
(c) Connect the idle–valve connector.

EG

ENGINE COOLANT TEMPERATURE (ECT) SENSOR

COMPONENTS FOR REMOVAL AND INSTALLATION

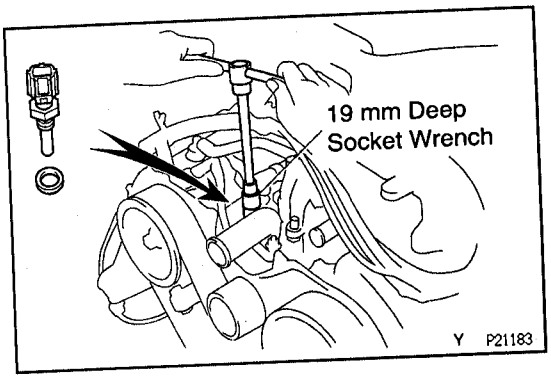
EG1AC–0U



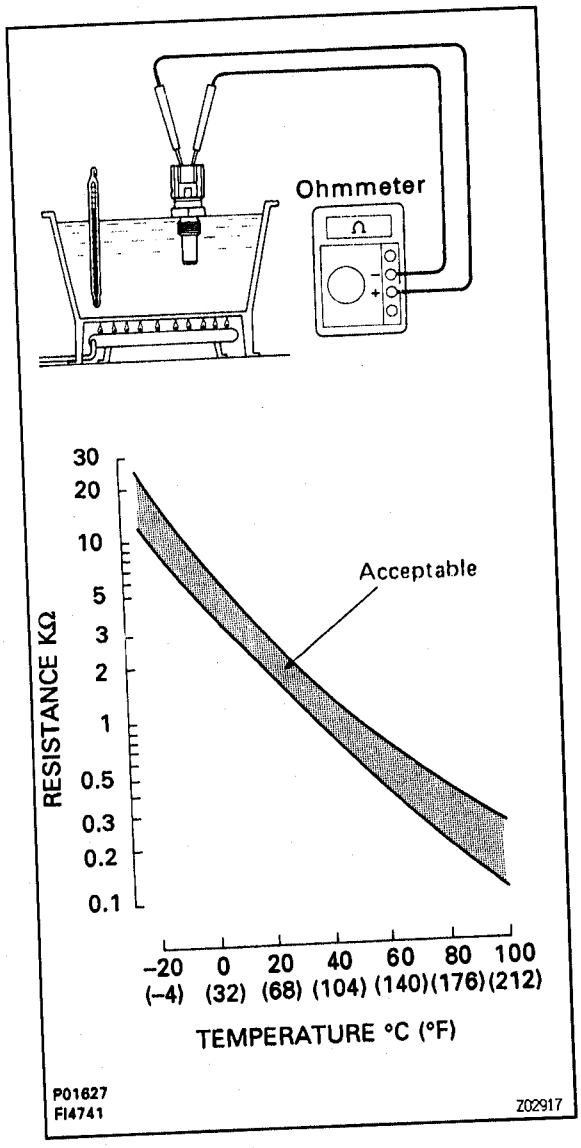
EG670-01

ECT SENSOR INSPECTION

1. DRAIN ENGINE COOLANT
2. DISCONNECT UPPER RADIATOR HOSE FROM WATER OUTLET
3. REMOVE NO.2 TIMING BELT COVER
   (See timing belt removal in Engine Mechanical)



4. REMOVE FUEL PIPE
5. REMOVE ECT SENSOR
   (a) Disconnect the ECT sensor connector.
   (b) Using a 19 mm deep socket wrench, remove the ECT sensor and gasket.

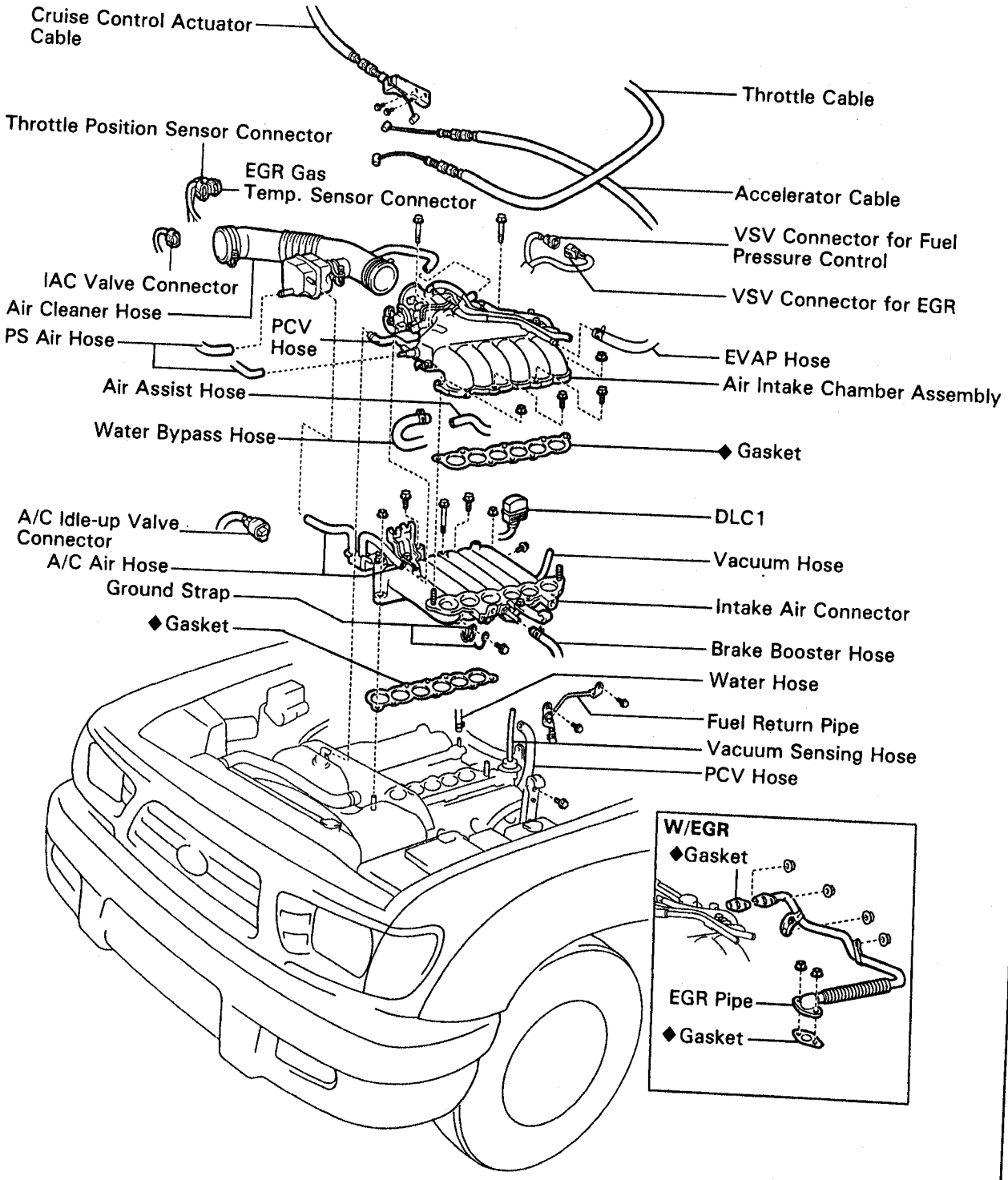


6. INSPECT ECT SENSOR
   Using an ohmmeter, measure the resistance between the terminals.
   Resistance:
   Refer to the graph
   If the resistance is not as specified, replace the ECT sensor.
7. REINSTALL ECT SENSOR
   (a) Install a new gasket to the ECT sensor.
   (b) Using a 19 mm deep socket, install the ECT sensor.
   Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)
   (c) Connect the ECT sensor connector.
8. REINSTALL FUEL PIPE
   Install the fuel pipe with 4 new gaskets and the 2 union bolts.
   Torque: 34.3 N·m (350 kgf·cm, 25 ft·lbf)
9. REINSTALL NO.2 TIMING BELT COVER
   (See timing belt installation in Engine Mechanical)
10. RECONNECT UPPER RADIATOR HOSE TO WATER OUTLET
11. REFILL WITH ENGINE COOLANT

KNOCK SENSOR

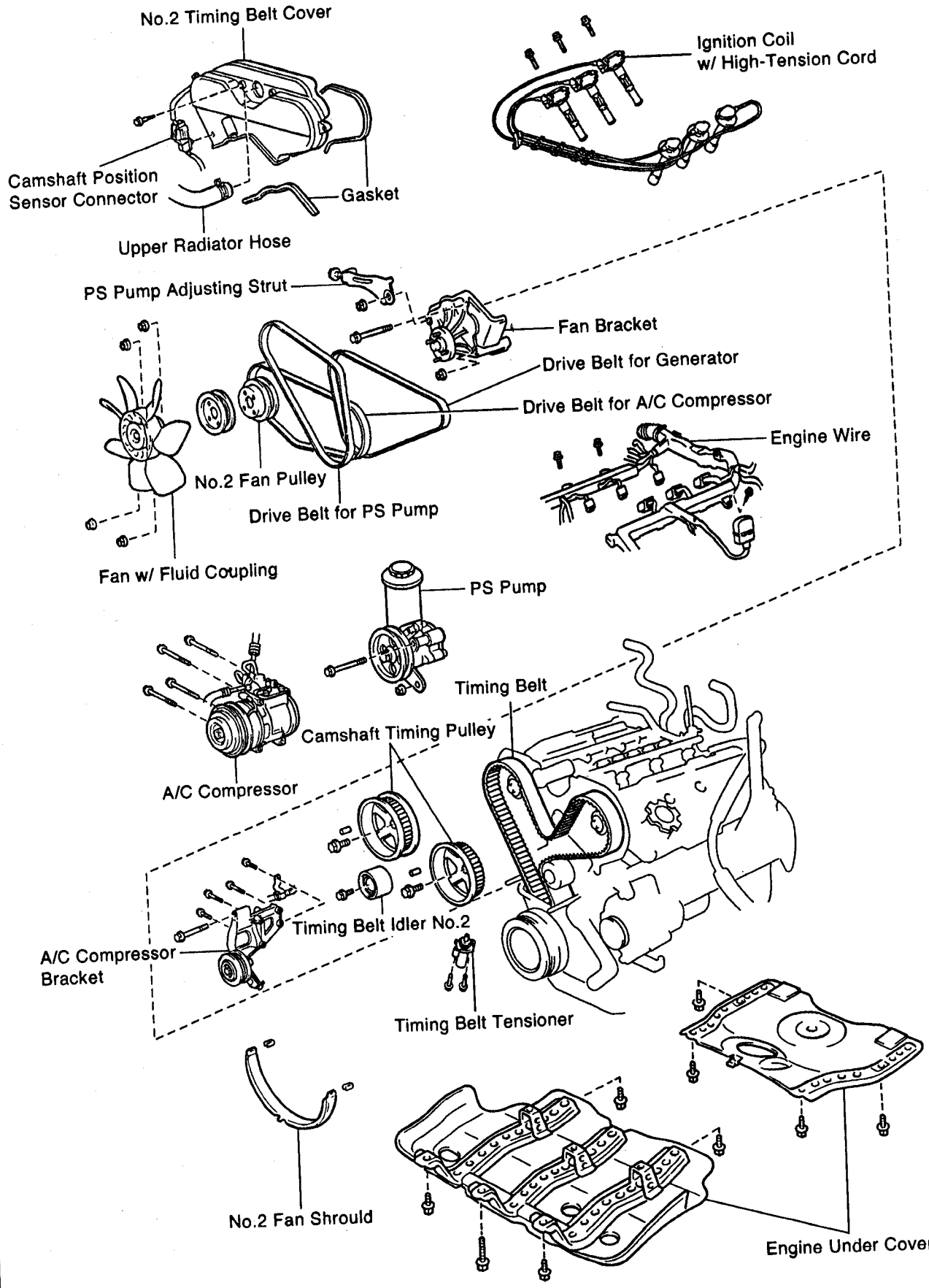
COMPONENTS FOR REMOVAL AND INSTALLATION

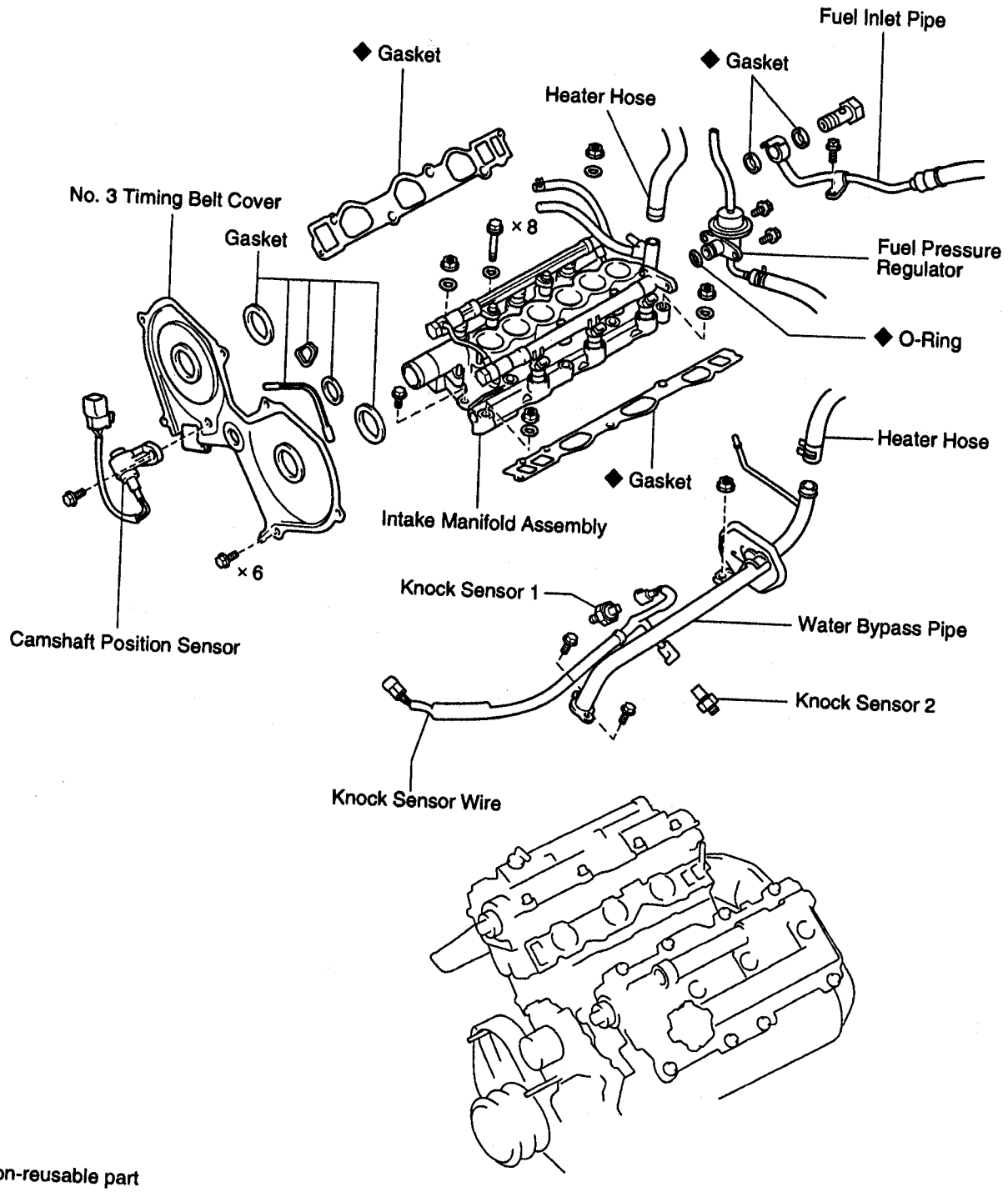
EG6AM–03



◆ Non-reusable part

P22413

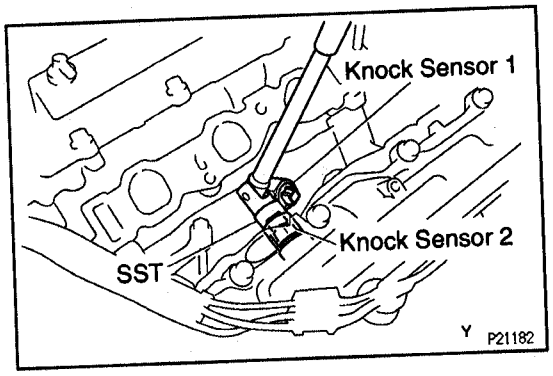

No.2 Timing Belt Cover
Ignition Coil
w/ High-Tension Cord
Camshaft Position
Sensor Connector
Gasket
Upper Radiator Hose
PS Pump Adjusting Strut
Fan Bracket
Drive Belt for Generator
Drive Belt for A/C Compressor
Engine Wire
No.2 Fan Pulley
Drive Belt for PS Pump
Fan w/ Fluid Coupling
PS Pump
Timing Belt
Camshaft Timing Pulley
A/C Compressor
Timing Belt Idler No.2
A/C Compressor
Bracket
Timing Belt Tensioner
No.2 Fan Shrould
Engine Under Cover
P23601

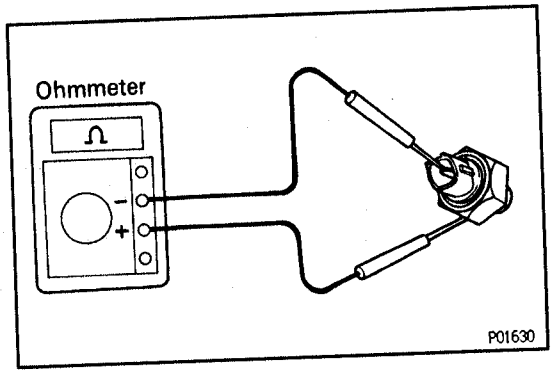


KNOCK SENSORS INSPECTION

80672–01

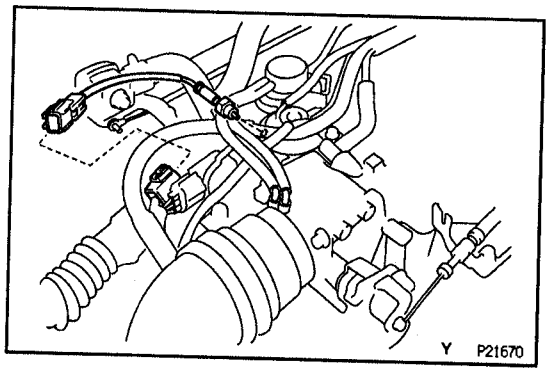
1. DRAIN ENGINE COOLANT
2. REMOVE AIR CLEANER HOSE
3. REMOVE INTAKE AIR CONNECTOR
   (See steps 5 and 11 to 13 in cylinder head removal in Engine Mechanical)

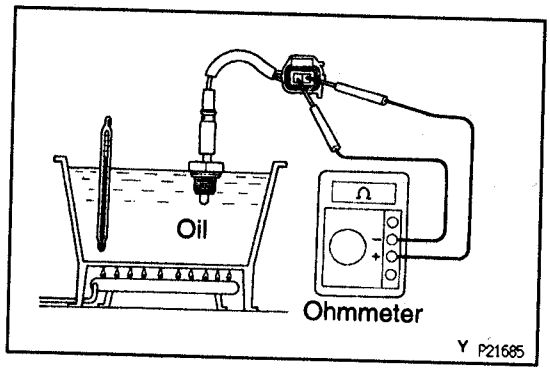


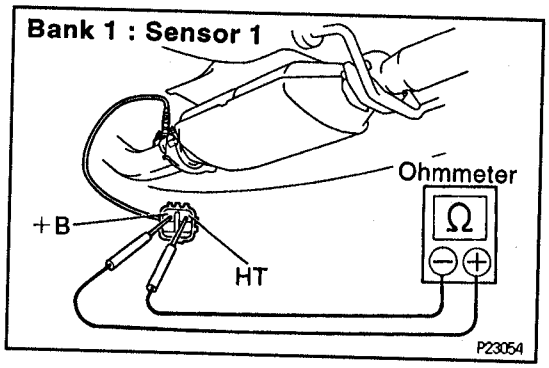


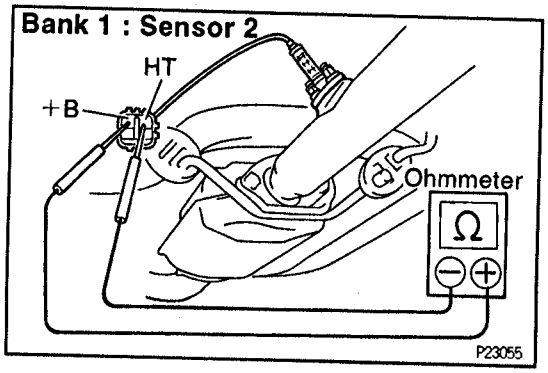
4. **REMOVE HIGH-TENSION CORDS WITH IGNITION COILS**
   (See high-tension cords with ignition coils removal in Ignition System)
5. **REMOVE TIMING BELT AND CAMSHAFT TIMING PULLEYS**
   (See steps 1 and 3 to 18 in timing belt removal in Engine Mechanical)
6. **REMOVE TIMING BELT IDLER NO.2**
7. **REMOVE FUEL PRESSURE REGULATOR**
8. **REMOVE INTAKE MANIFOLD ASSEMBLY**
   (See steps 4, 13 to 16 and 18 in cylinder head removal in Engine Mechanical)
9. **REMOVE WATER BYPASS PIPE AND KNOCK SENSOR WIRE**
   (See step 7 in cylinder block removal in Engine Mechanical)
10. **REMOVE KNOCK SENSORS**
    Using SST, remove the knock sensor.
    SST 09817-16011
11. **INSPECT KNOCK SENSORS**
    Using an ohmmeter, check that there is no continuity between the terminal and body.
    If there is continuity, replace the sensor.
12. **REINSTALL KNOCK SENSORS**
    Using SST, install the knock sensor.
    SST 09817-16011
    Torque: 39 N·m (400 kgf·cm, 29 ft·lbf)
13. **REINSTALL WATER BYPASS PIPE AND KNOCK SENSOR WIRE**
    (See step 17 in cylinder block installation in Engine Mechanical)
14. **REINSTALL INTAKE MANIFOLD ASSEMBLY**
    (See steps 11 and 13 to 15 in cylinder head installation in Engine Mechanical)
15. **REINSTALL FUEL PRESSURE REGULATOR**
    (See step 1 in fuel pressure regulator installation)
16. **REINSTALL TIMING BELT IDLER NO.2**
    (See step 2 in timing belt installation in Engine Mechanical)
17. **REINSTALL CAMSHAFT TIMING PULLEYS AND TIMING BELT**
    (See steps 7 to 24 and 28 in timing belt installation in Engine Mechanical)
18. **REINSTALL HIGH-TENSION CORDS WITH IGNITION COILS**
    (See high-tension cords with ignition coils installation in Ignition System)

19. REINSTALL INTAKE AIR CONNECTOR
(See steps 16 to 19 and 24 in cylinder head installation in Engine Mechanical)
20. REINSTALL AIR CLEANER HOSE
21. REFILL WITH ENGINE COOLANT
22. RECHECK ENGINE COOLANT LEVEL









EGR GAS TEMPERATURE SENSOR (2WD/0.5 ton)

EG

EGR GAS TEMPERATURE SENSOR INSPECTION

EGSAQ-01

1. REMOVE EGR GAS TEMPERATURE SENSOR

2. 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.

3. REINSTALL EGR GAS TEMPERATURE SENSOR
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

HEATED OXYGEN SENSOR

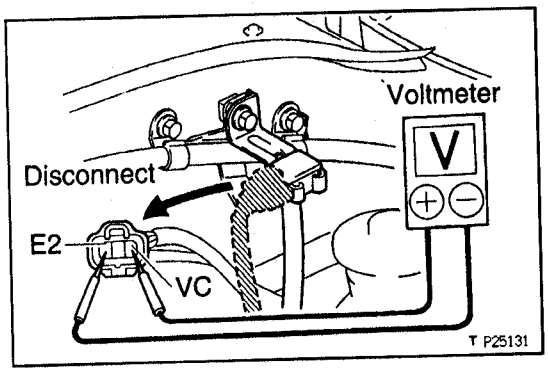
EGSPA-01

HEATED OXYGEN SENSORS INSPECTION

(Bank 1, Sensor 1, Bank 1 Sensor 2)

INSPECT HEATER RESISTANCE OF HEATED OXYGEN SENSORS

(a) Disconnect the oxygen sensor connector.
(b) Using an ohmmeter, measure the resistance between the terminals +B and HT.
Resistance:
At 20°C (68°F): 11 – 16 Ω
If the resistance is not as specified, replace the sensor.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)
(c) Reconnect the oxygen sensor connector.



VAPOR PRESSURE SENSOR

E0674-01

4WD only:

VAPOR PRESSURE SENSOR INSPECTION

1. INSPECT POWER SOURCE VOLTAGE OF VAPOR PRESSURE SENSOR

(a) Disconnect the vapor pressure sensor connector.

(b) Turn the ignition switch ON.

(c) Using a voltmeter, measure the voltage between connector terminals VC and E2 of the wiring harness side.

Voltage: 4.5 – 5.5 V

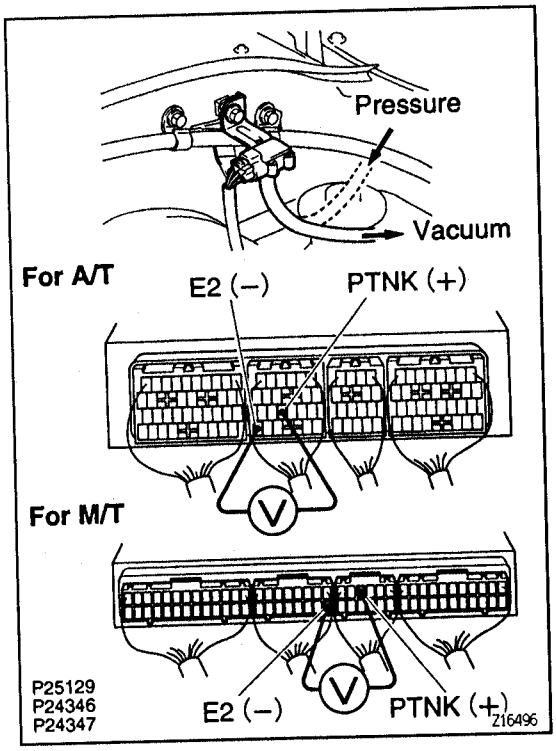
(d) Turn the ignition switch to LOCK.

(e) Reconnect the vapor pressure sensor connector.

2. INSPECT POWER OUTPUT OF VAPOR PRESSURE SENSOR

(a) Turn the ignition switch ON.

(b) Disconnect the vacuum hose from the vapor pressure sensor.



(c) Connect a voltmeter to terminals PTNK and E2 of the ECM, and measure the output voltage under ambient atmospheric pressure.

- Apply vacuum (2.0 kPa, 15 mmHg, 0.59 in.Hg) to the vapor pressure sensor.

Voltage: 1.3 – 2.1 V

- Release the vacuum from the vapor pressure sensor.

Voltage: 3.0 – 3.6 V

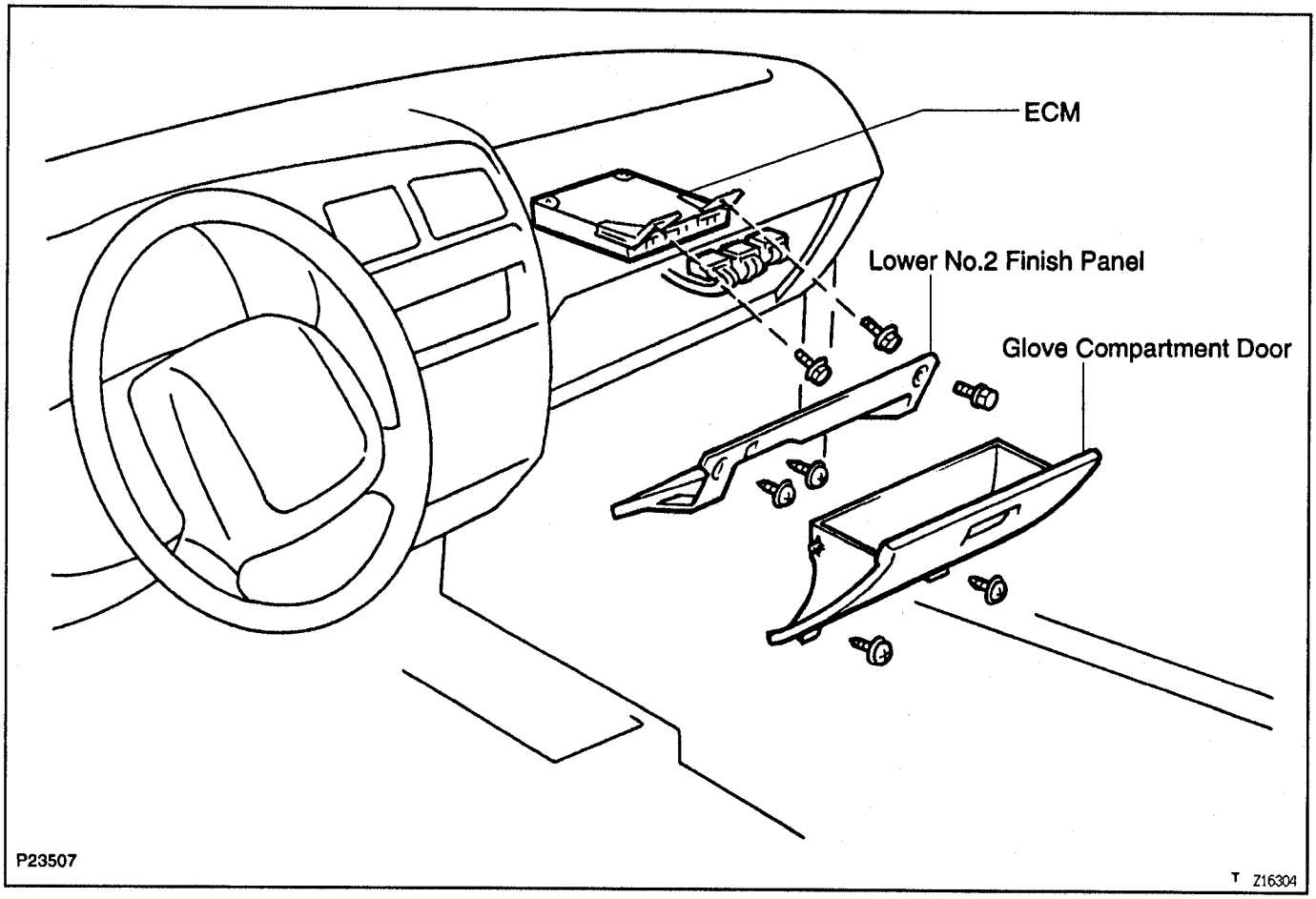
- Apply pressure (1.5 kPa, 15 gf/cm², 0.22 psi) to the vapor pressure sensor.

Voltage: 4.2 – 4.8 V

(d) Reconnect the vacuum hose to the vapor pressure sensor.

ENGINE CONTROL MODULE (ECM)

COMPONENTS FOR REMOVAL AND INSTALLATION



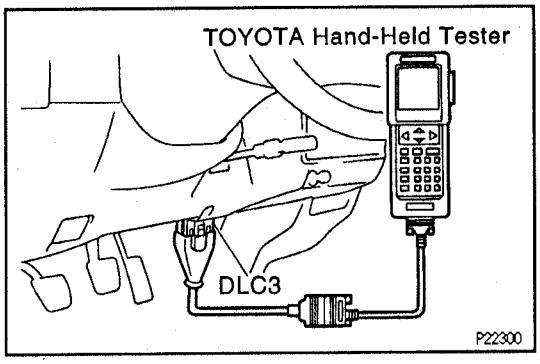
ECM INSPECTION

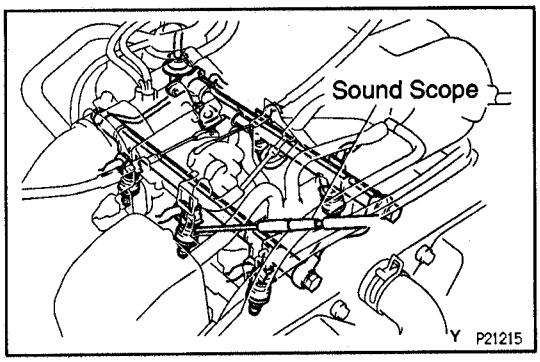
1. **REMOVE ECM**
2. **INSPECT ECM**
   (See Engine Troubleshooting)
3. **REINSTALL ECM**

FUEL CUT RPM

FUEL CUT OFF 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

(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 operator's manual for further details.

3. INSPECT FUEL CUT OFF RPM

(a) Increase the engine speed to at least 3,500 rpm.

(b) Use a sound scope to check for injector operating noise.

(c) Check that when the throttle lever is released, injector operation noise stops momentarily and then resumes.
HINT: Measure with the A/C OFF.
Fuel return rpm:
M/T: 1,000 rpm
A/T: 1,200 rpm

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

SERVICE SPECIFICATIONS

SERVICE DATA

EG3DY-00

Fuel pressure regulator	Fuel pressure	at no vacuum	265 – 304 kPa (2.7 – 3.1 kgf/cm², 38 – 44 psi)
Fuel pump	Resistance	at 20°C (68°F)	0.2 – 3.0 Ω
Injector	Resistance		Approx. 13.8 Ω
	Injection volume		56 – 69 cm³ (3.4 – 4.2 cu in.) per 15 sec.
	Difference between each cylinder		6 cm³ (0.31 cu in.) or less
	Fuel leakage		1 drop or less per minute
MAF meter	Resistance (THA – E2)	at –20°C (–4°F)	10 – 20 kΩ
		at 0°C (32°F)	4 – 7 kΩ
		at 20°C (68°F)	2 – 3 kΩ
		at 40°C (104°F)	0.9 – 1.3 kΩ
		at 60°C (140°F)	0.4 – 0.7 kΩ
		at 80°C (176°F)	0.2 – 0.4 kΩ
Throttle body	Throttle valve fully closed angle		10°
	DP setting speed (M/T)		1,800 – 2,200 rpm
	Throttle opener setting speed		900 – 1,950 rpm
Throttle position sensor	Clearance between stop screw and lever		
	0 mm (0 in.)	VTA – E2	0.28 – 6.4 kΩ
	0.32 mm (0.013 in.)	IDL – E2	0.5 kΩ or less
	0.54 mm (0.021 in.)	IDL – E2	Infinity
	Throttle valve fully open	VTA – E2	2.0 – 11.6 kΩ
	–	VC – E2	2.7 – 7.7 kΩ
IAC valve	Resistance (+B – RSO or RSC)	at cold	17.0 – 24.5 Ω
		at hot	21.5 – 28.5 Ω

VSV for fuel pressure control	Resistance	at 20°C (68°F)	33 – 39 Ω
VSV for EGR (2WD, 4WD B/CAB)	Resistance	at 20°C (68°F)	33 – 39 Ω
VSV for EVAP	Resistance	at 20°C (68°F)	29 – 33 Ω
A/C idle–up valve (w/ A/C)	Resistance	at 20°C (68°F)	30 – 34 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
EGR gas temperature sensor (2WD, 4WD B/CAB)	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	at 20°C (68°F)	11 – 16 Ω
Fuel cut rpm	Fuel return rpm	M/T	1,000 rpm
		A/T	1,200 rpm

EG

TORQUE SPECIFICATIONS

EGQJS–0C

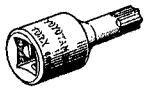
Part tightened	N·m	kgf·cm	ft·lbf
Fuel line (Union bolt type, Flare nut type)	34.3	350	25
Fuel line (Flare nut type) using SST	28	285	21
Fuel inlet pipe x Intake manifold	8	80	71 in.·lbf
Delivery pipe x Intake manifold	13	130	10
Fuel pump bracket assembly, Fuel tank filler pipe x Fuel tank	3.4	35	30 in.·lbf
Fuel tank filler pipe x Body	29	300	22
Fuel tank band x Body	61	620	45
Fuel pressure regulator x LH delivery pipe	8	80	71 in.·lbf
MAF meter x Air cleaner cap	6.9	72	61
VSV assembly x Air intake connector	8	80	71 in.·lbf
A/C idle–up valve x Intake air connector	20	200	14
ECT sensor x Intake manifold	20	200	14
Knock sensor x Cylinder block	39	400	29
EGR gas temperature sensor x EGR valve	20	200	14
Heated oxygen sensor x Front exhaust pipe, Center exhaust pipe	20	200	14

COOLING SYSTEM

PREPARATION

RECOMMENDED TOOLS

R800Y–00

	09042–00010 Torx Socket T30 .	Radiator support

EG

EQUIPMENT

EG1D8–06

Heater	
Radiator cap tester	
Thermometer	
Torque wrench	

ENGINE COOLANT

EG1D4–0C

Item	Capacity	Classification
M/T	10.1 liters (10.7 US qts, 8.9 Imp. qts)	Ethylene–glycol base
A/T	10.0 liters (10.5 US qts, 8.8 Imp. qts)	

SSM (SPECIAL SERVICE MATERIALS)

EG1D6–03

08826–00100	Seal Packing 1282B, THREE BOND 1282B or equivalent (FIPG)	Water pump

COOLANT CHECK

EG57V–04

1. **CHECK ENGINE COOLANT LEVEL AT RESERVOIR TANK**

   The engine coolant level should be between the "LOW" and "FULL" lines.

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

2. **CHECK ENGINE COOLANT QUALITY**

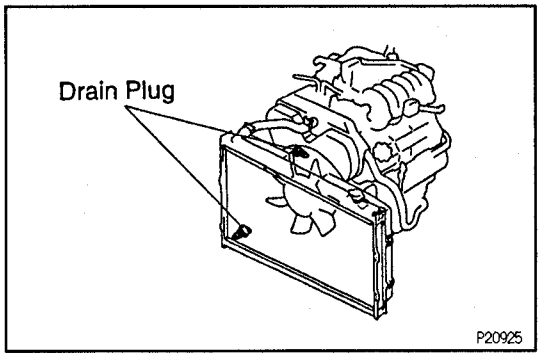
(a) Remove the radiator cap from the water outlet.

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 scale around the radiator cap or radiator filler hole, and the coolant should be free from oil.

If they are excessively dirty, clean the coolant passages and replace the coolant.

(c) Reinstall the radiator cap.



COOLANT REPLACEMENT

EG

EG57W–04

1. DRAIN 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) Loosen the drain plugs, and drain the engine coolant.

(c) Close the drain plugs.

2. FILL ENGINE COOLANT

(a) Slowly fill the system with engine coolant.

- Use a good brand of ethylene – glycol base engine coolant and mix it according to the manufacturer's directions.
- Using engine coolant which includes more than 50 % ethylene–glycol (but not more than 70 %) is recommended.

NOTICE:

- **Do not use an alcohol type engine coolant.**
- **The engine coolant should be mixed with demineralized water or distilled water.**

Capacity:

M/T

10.1 liters (10.7 US qts, 8.9 Imp. qts)

A/T

10.0 liters (10.5 US qts, 8.8 Imp. qts)

(b) Install the radiator cap.

(c) Start the engine, and bleed the cooling system.

(d) If necessary, refill engine coolant into the reservoir tank until it is "FULL" line.

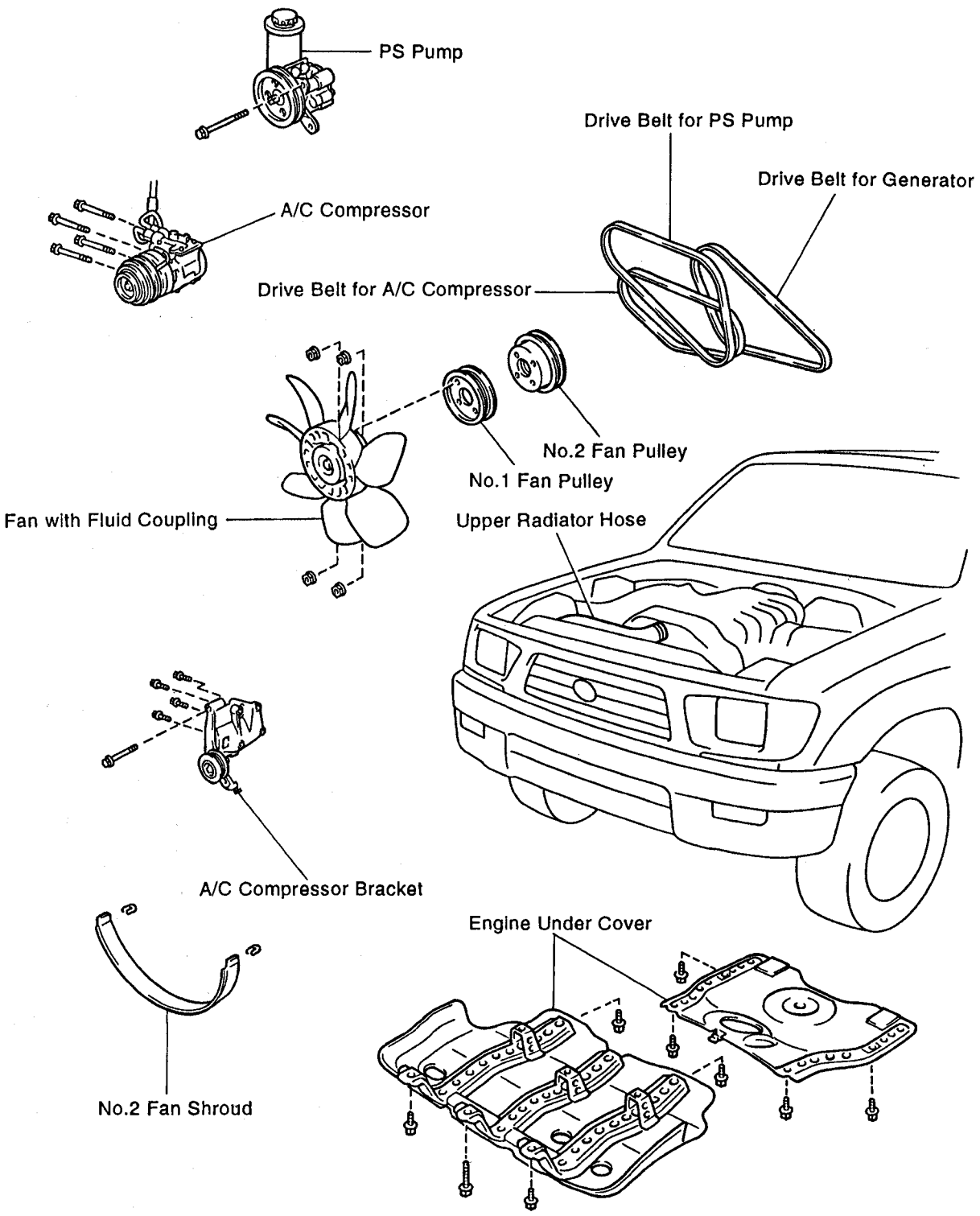
3. CHECK ENGINE COOLANT FOR LEAKS

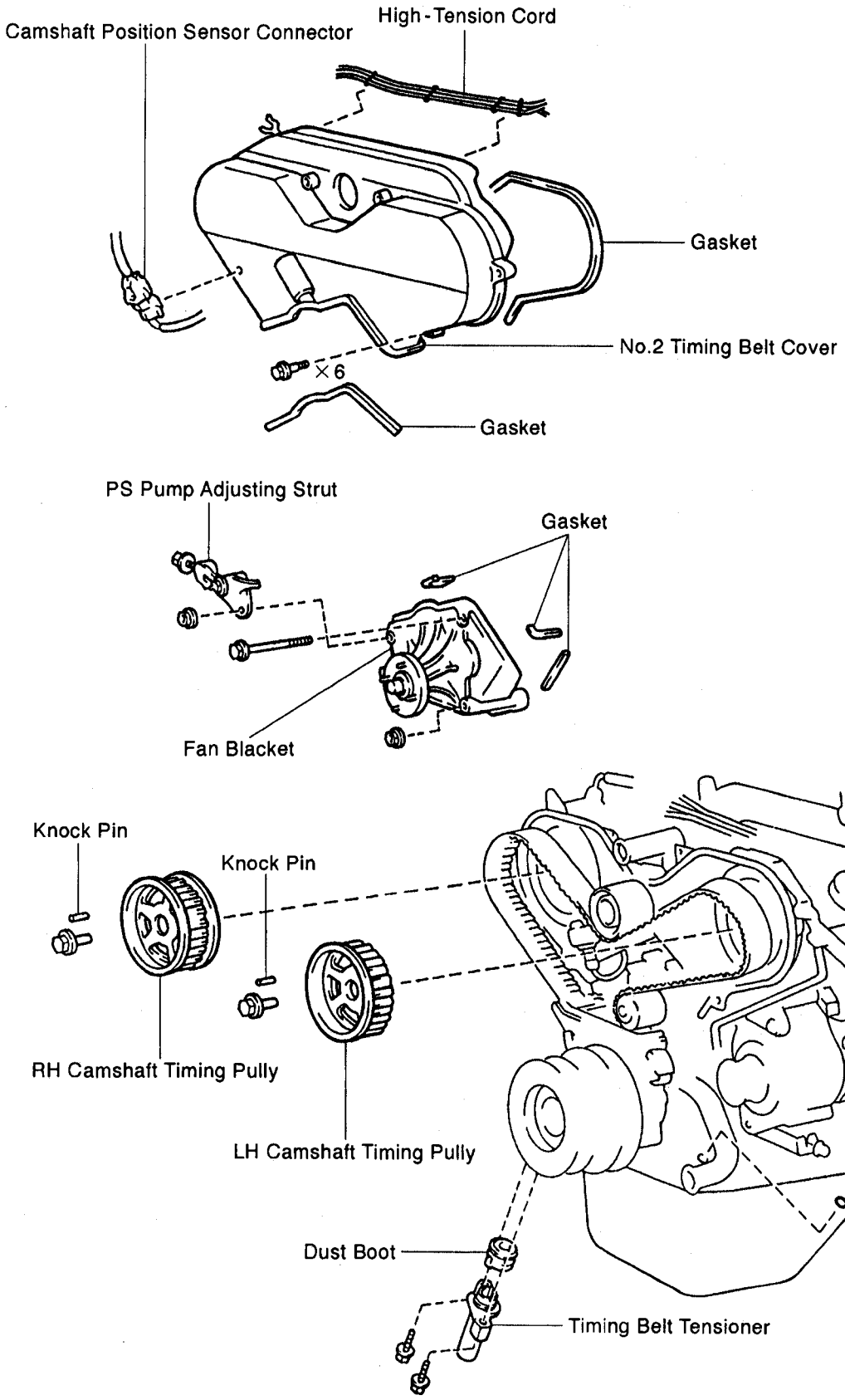
WATER PUMP

COMPONENTS FOR REMOVAL AND INSTALLATION

EG057X-02

EG



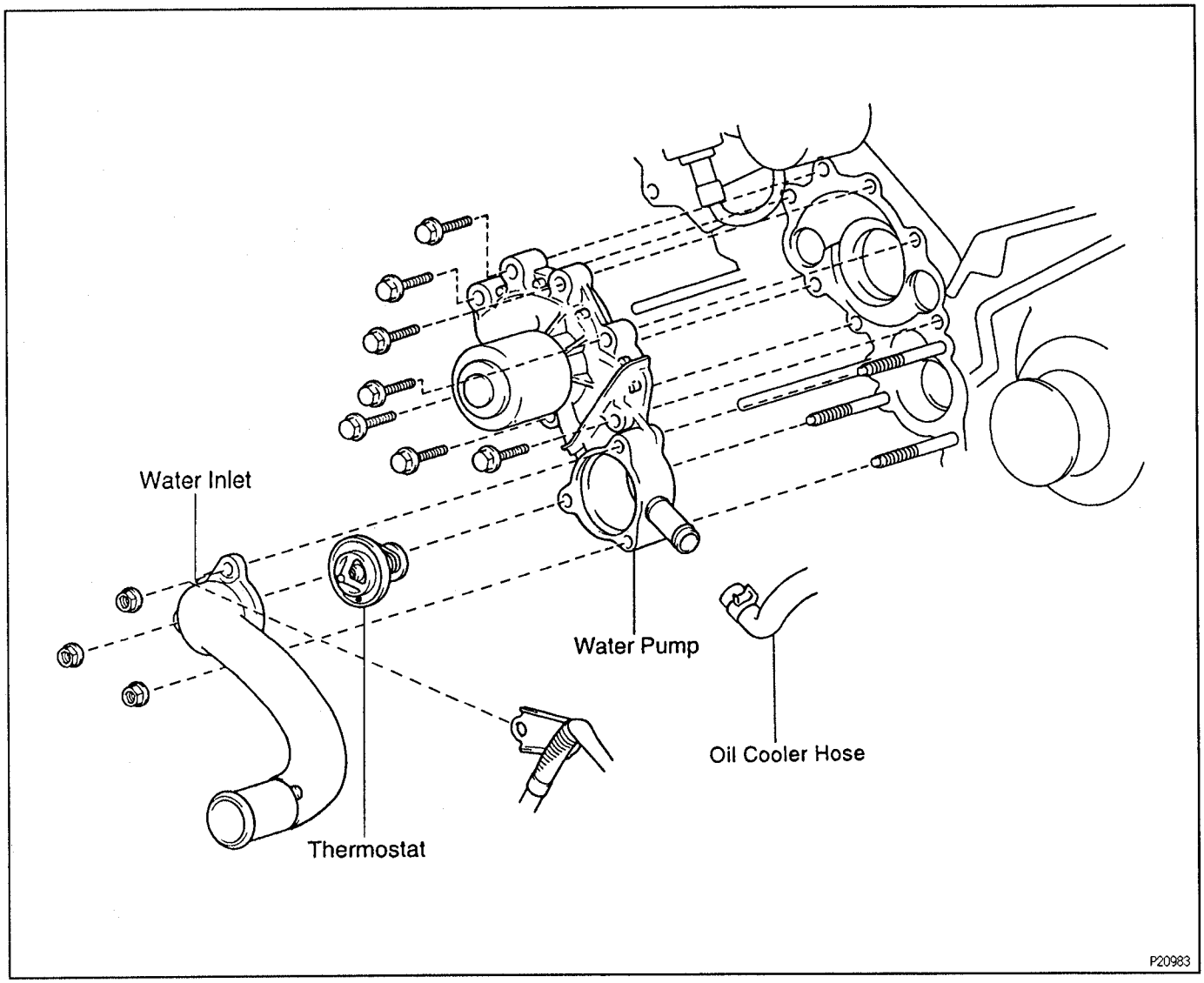


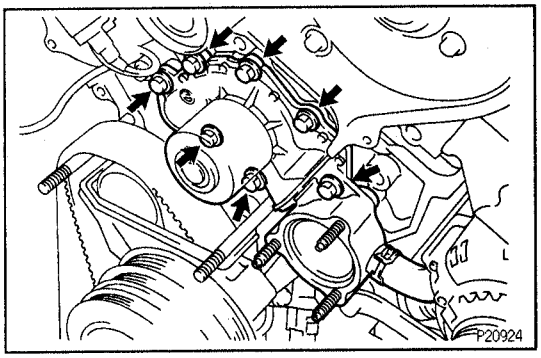
◆ Non-reusable part

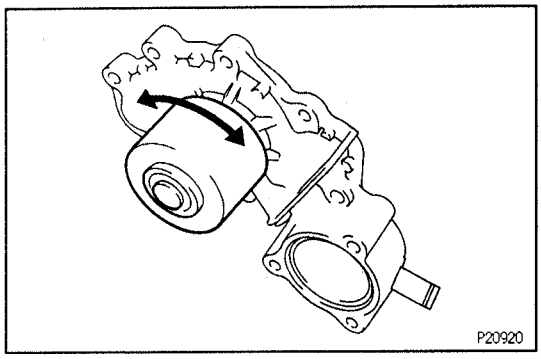
P24358

EG

EG







EG1D6-07

WATER PUMP REMOVAL

1. **REMOVE TIMING BELT**
   (See steps 1 to 18 in timing belt removal in Engine Mechanical)
2. **REMOVE WATER INLET AND THERMOSTAT**
3. **w/ OIL COOLER:**
   DISCONNECT NO.2 OIL COOLER HOSE FROM WATER PUMP
4. **REMOVE WATER PUMP**

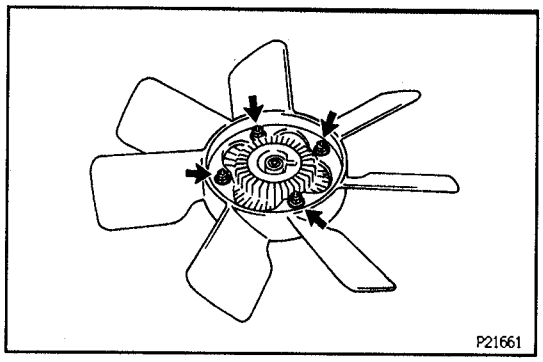
EG57Y-02

WATER PUMP COMPONENTS INSPECTION

1. **INSPECT WATER PUMP**

(a) Visually check the air hole for coolant leakage.
If leakage is found, replace the water pump.
If engine coolant has leaked onto the timing belt, replace the timing belt.

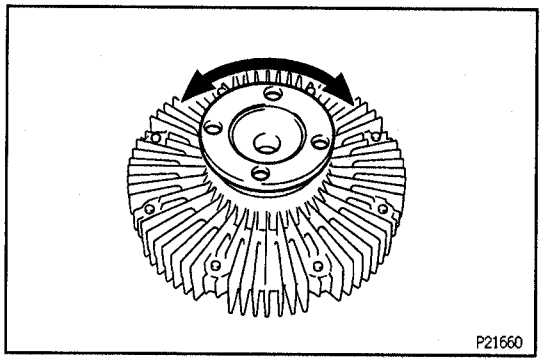
(b) Turn the pulley, and check that the water pump bearing moves smoothly and quietly.



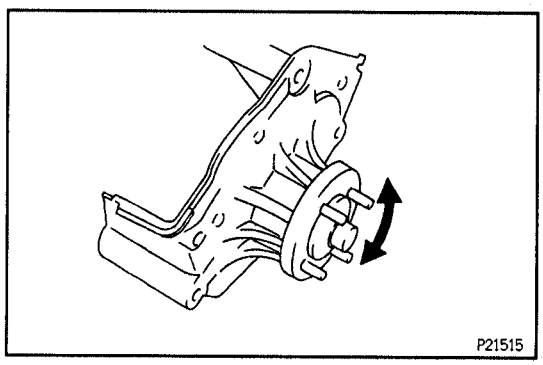
If necessary, replace the water pump.

2. **INSPECT FLUID COUPLING**

(a) Remove the 4 nuts and fan from the fluid coupling.



(b) Check that the fluid coupling is not damaged and that no silicon oil leaks.
If necessary, replace the fluid coupling.



3. **INSPECT FAN PULLEY BRACKET**

(a) Check the turning smoothness of the fan pulley.
If necessary, replace the pully bracket.

(b) Reinstall the fan to the fluid coupling with the 4 nuts.
Torgue: 7.4 N·m (75 kgf·cm, 65 in.·lbf)

TIMING BELT COMPONENTS INSPECTION EG675-01

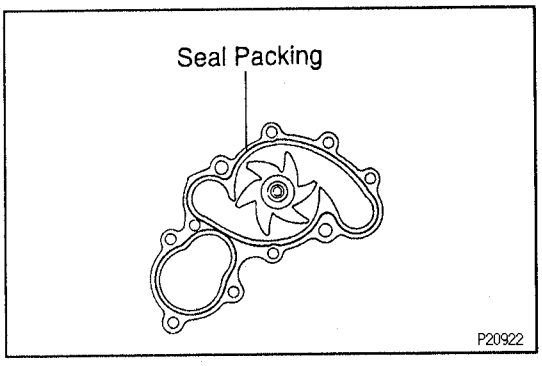
(See timing belt inspection in Engine Mechanical)

WATER PUMP INSTALLATION EG676-01

1. **INSTALL WATER PUMP**

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

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



(b) Apply seal packing to the water pump groove as shown in the illustration.
Seal packing: Part No. 08826–00100 or equivalent
- Install a nozzle that has been cut to a 2 – 3 mm (0.08 – 0.12 in.) opening.
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.

(c) Install the water pump with the 7 bolts.
Torque: 20 N·m (200 kgf·cm, 14 ft·lbf)

2. w/ OIL COOLER:
CONNECT NO.2 OIL COOLER HOSE

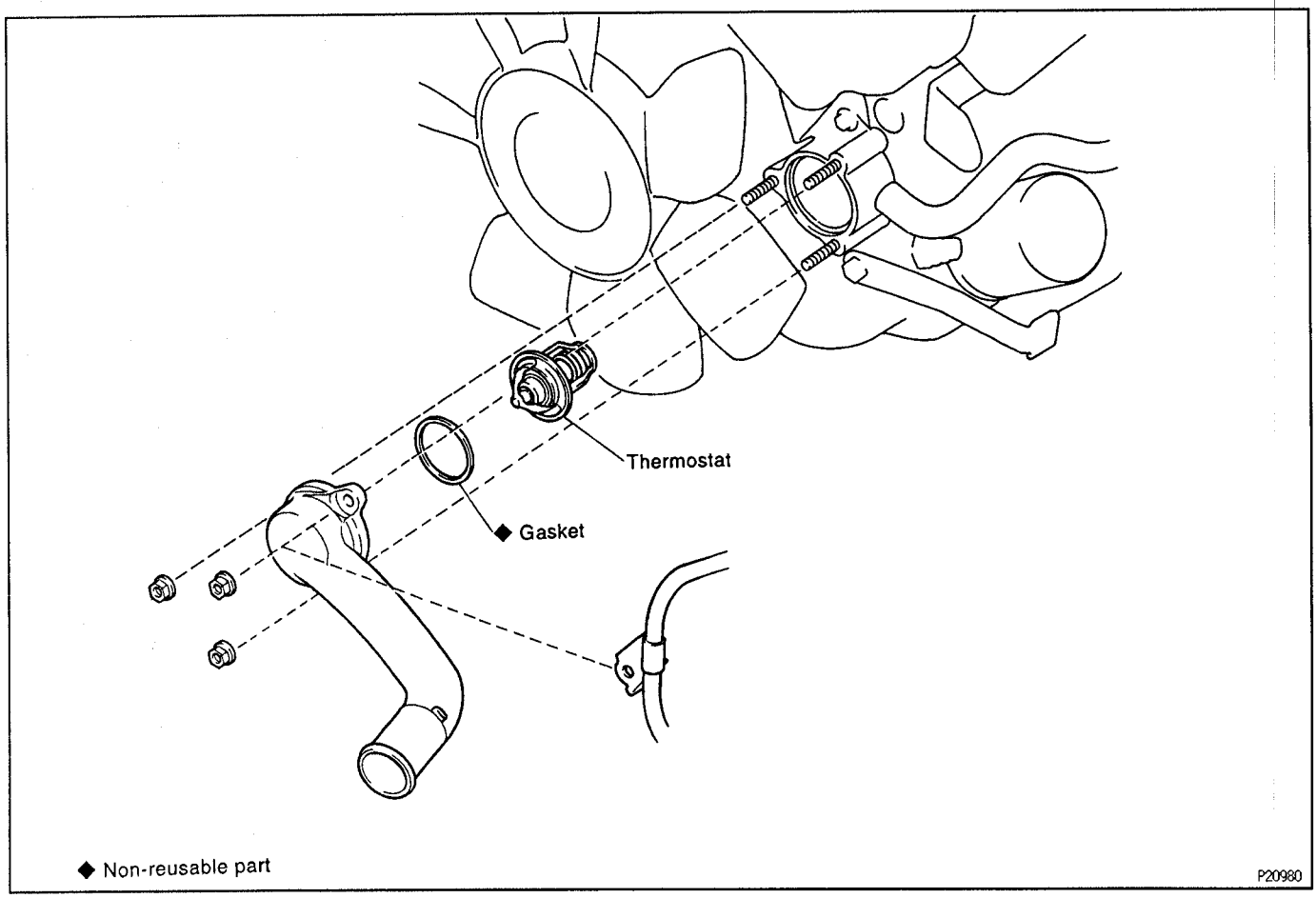
3. INSTALL THERMOSTAT AND WATER INLET
(See step 1 in thermostat installation)

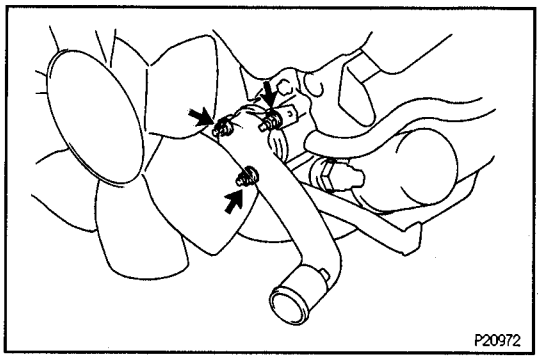
4. INSTALL TIMING BELT
(See steps 7 to 30 in timing belt installation in Engine Mechanical)

THERMOSTAT

EG580-01

COMPONENTS FOR REMOVAL AND INSTALLATION





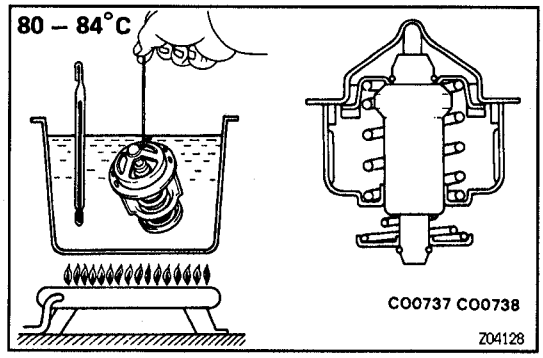
THERMOSTAT REMOVAL

EG1DB–06

1. DRAIN ENGINE COOLANT
2. DISCONNECT LOWER RADIATOR HOSE
3. REMOVE THERMOSTAT

(a) Remove the 3 nuts, water inlet and thermostat with gasket from the water pump.

(b) Remove the gasket from the thermostat.



THERMOSTAT INSPECTION

EG1DC–07

EG

HINT: Thermostat is numbered according to the valve opening temperature.

(a) Immerse the thermostat in water and heat the water gradually.

(b) Check the valve opening temperature and valve lift.

Valve opening temperature:

80 – 84°C (176 – 183°F)

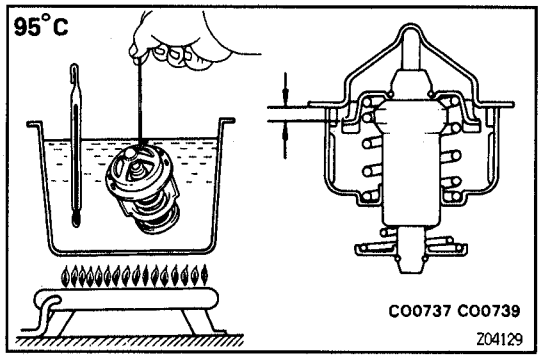
Valve lift:

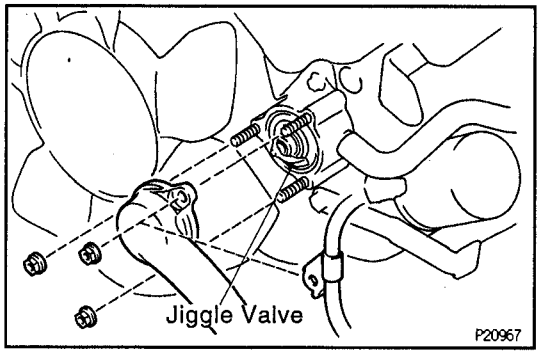
At 95°C (203°F): 8.5 mm (0.335 in.) or more

If the valve opening temperature and valve lift are not within specifications, replace the thermostat.

(c) Check that the valve is fully closed when the thermostat is at low temperatures (below 40°C (104°F)).

If it is not tight, replace the thermostat.





THERMOSTAT INSTALLATION

EG677–01

1. INSTALL THERMOSTAT

(a) Place a new gasket to the thermostat.

(b) Install the thermostat with the jiggle valve downward.

(c) Install the water inlet with the 3 bolts.

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

2. CONNECT LOWER RADIATOR HOSE
3. FILL WITH ENGINE COOLANT
4. START ENGINE AND CHECK FOR LEAKS

RADIATOR

EG074-06

RADIATOR CLEANING

Using water or a steam cleaner, remove any mud or dirt from the radiator core.

NOTICE: If using a high pressure type cleaner, be careful not to deform the fins of the radiator core. (i.e. Maintain a distance between the cleaner nozzle and radiator core)

EG

EG66V-01

RADIATOR INSPECTION

1. **REMOVE RADIATOR CAP**

CAUTION: To avoid the danger of being burned, do not remove it while the engine and radiator are still hot, as fluid and steam can be 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 vale opening pressure.

Standard opening pressure:

74 – 103 kPa

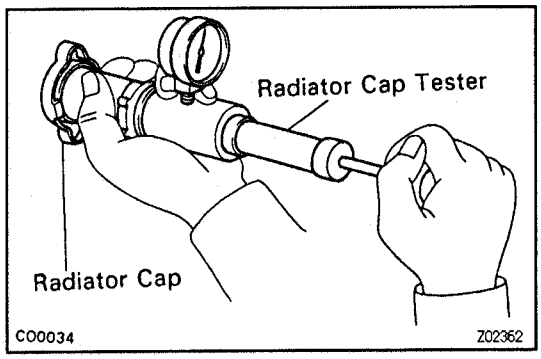
(0.75 – 1.05 kgf/cm², 10.7 – 14.9 psi)

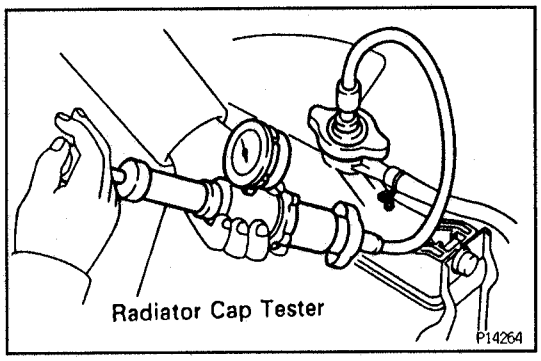
Minimum opening pressure:

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 the 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.

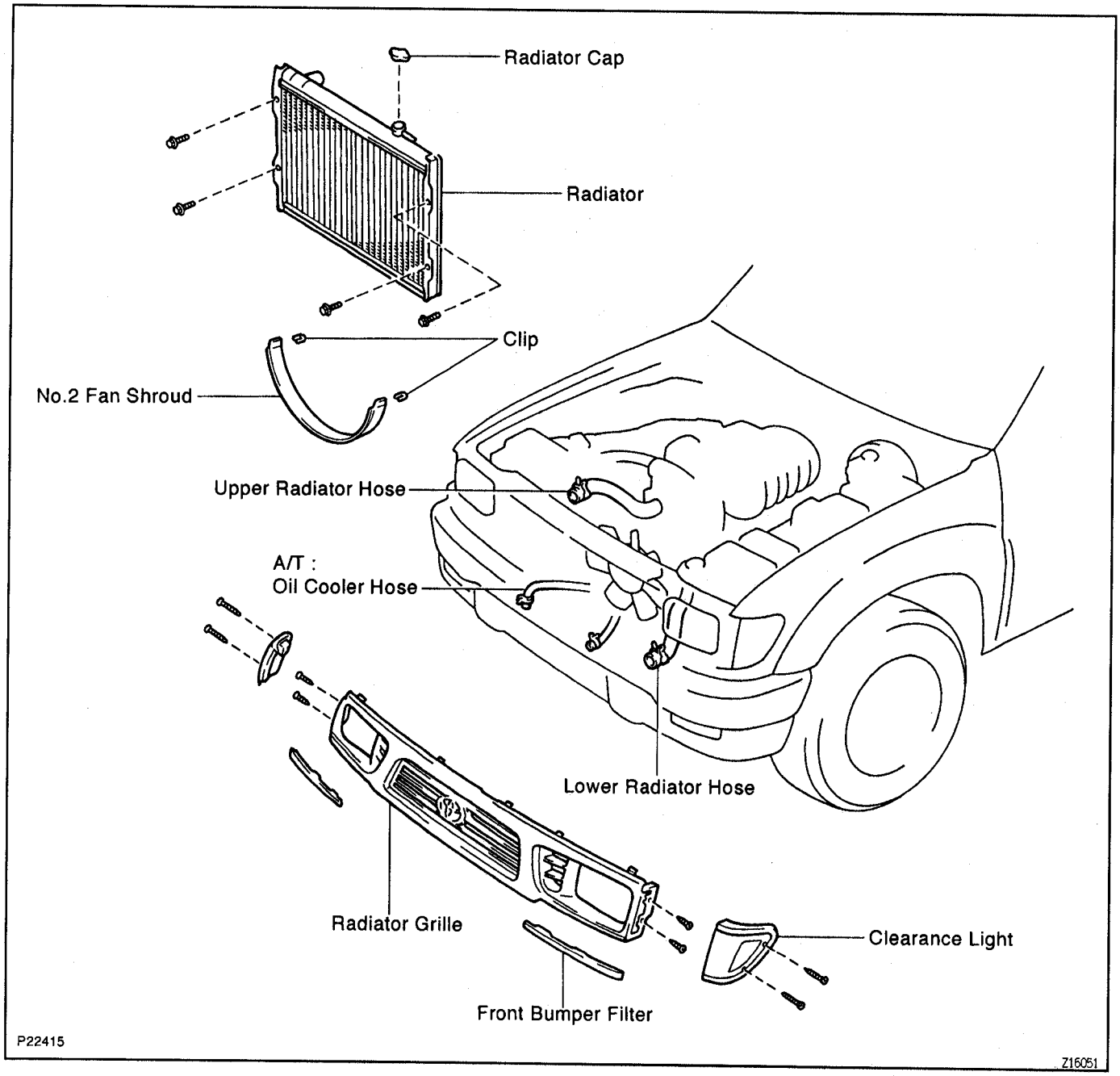
(c) Pump it to 118 kPa (1.2 kgf/cm², 17.1 psi), and check that the pressure does not drop.

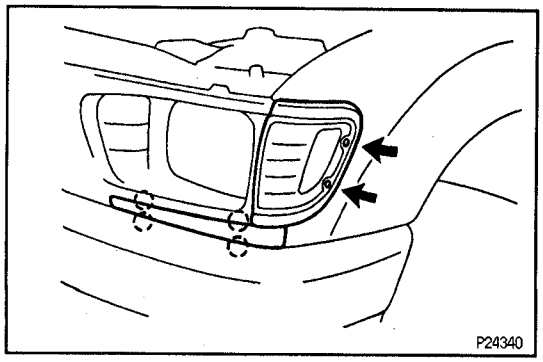
If the pressure drops, check the hoses, radiator or water pump for leaks. If no external leaks are found, check the heater core, cylinder block and head.

4. **REINSTALL RADIATOR CAP**

EG1J6–08

COMPONENTS FOR REMOVAL AND INSTALLATION



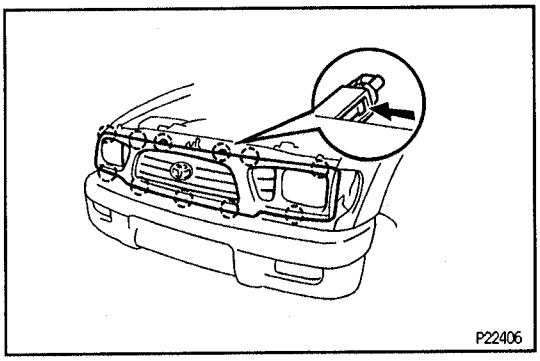


EG678–01

RADIATOR REMOVAL

1. **DRAIN ENGINE COOLANT**
2. **REMOVE FRONT BUMPER FILLER**
3. **REMOVE RADIATOR GRILLE**

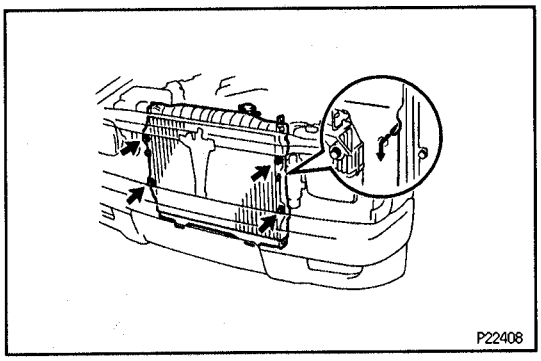
(a) Remove the 4 screws and clearance lights.



(b) Remove the 1 screw, 11 clips and radiator grille.

4. **DISCONNECT UPPER RADIATOR HOSE**
5. **DISCONNECT RADIATOR RESERVOIR HOSE**
6. **DISCONNECT LOWER RADIATOR HOSE**
7. **REMOVE RADIATOR NO.2 FAN SHROUD**
8. **A/T:**
   DISCONNECT OIL COOLER HOSES

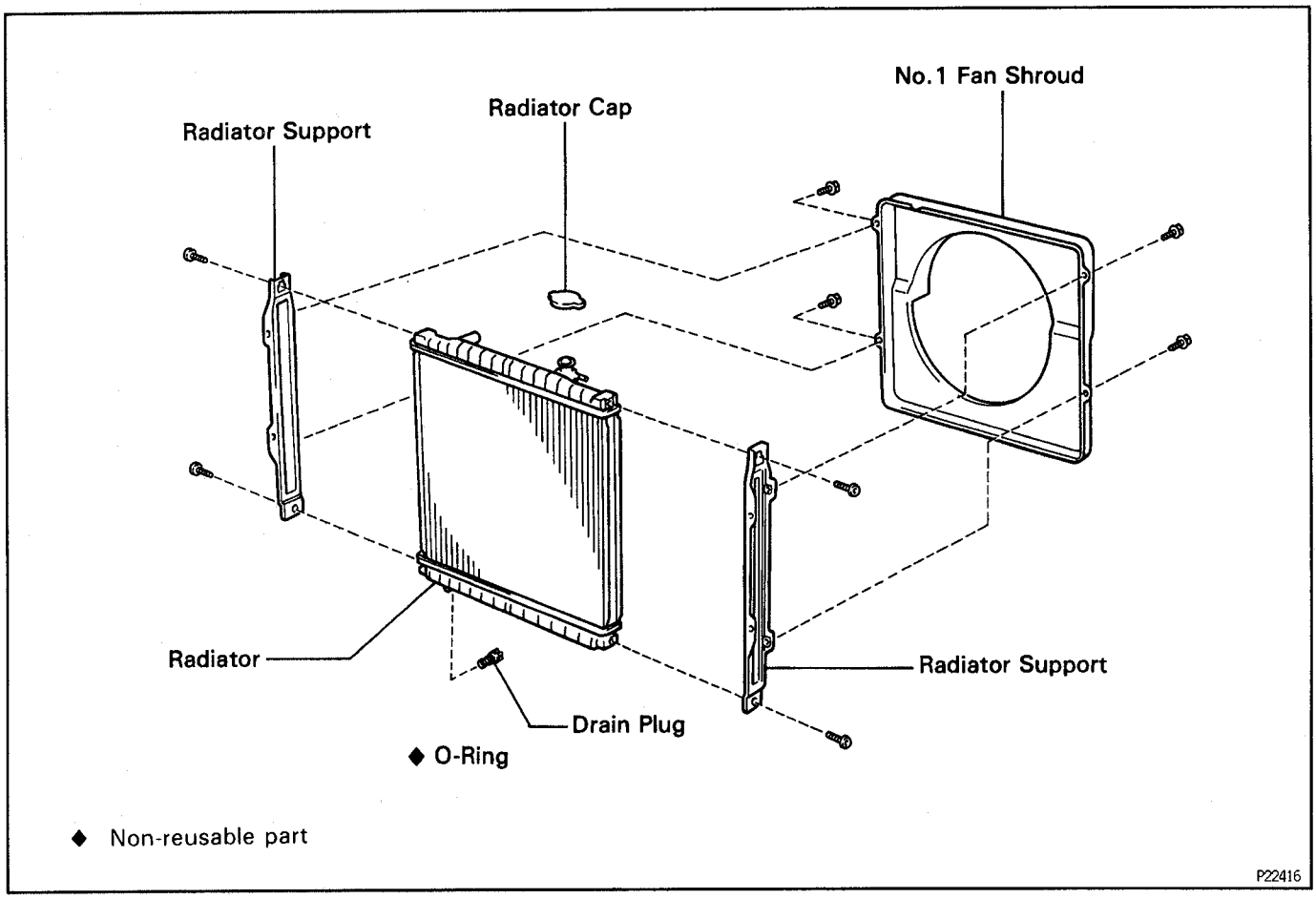
EG

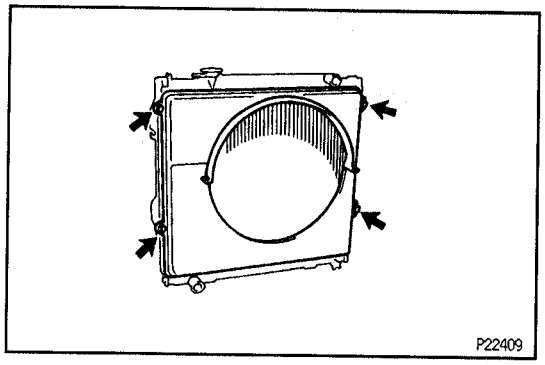


9. **REMOVE RADIATOR**
   Remove the 4 bolts and the radiator.
   Torque: 12 N·m (120 kgf·cm, 8.7 ft·lbf)
   INSTALLATION HINT: Insert the tabs of the radiator support through the radiator service holes.

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

EG1J8-0F

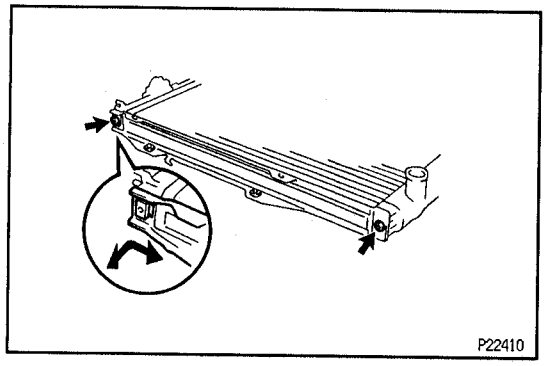




RADIATOR DISASSEMBLY

EG567–05

1. **REMOVE NO.1 FAN SHROUD.**
Remove the 4 bolts and No.1 fan shroud.



2. **REMOVE RADIATOR SUPPORTS**
Using a torx wrench, remove the 4 torx screws and the 2 radiator supports.
Torx wrench: T30 (Part No. 09042–00010 or locally manufactured tool)
HINT: Lift up the floor carpet and loosen the screw.

EG

RADIATOR ASSEMBLY

EG679–01

Assembly is in the reverse order of disassembly.

RADIATOR INSTALLAITON

EG67A–01

Installation is in the reverse order of removal.

SERVICE SPECIFICATIONS

SERVICE DATA

EG1DJ–06

Thermostat	Valve opening pressure		80 – 84°C (176 – 183°F)
	Valve lift	at 95°C (203°F)	8.5 mm (0.335 in .) or more
Radiator cap	Relief valve opening pressure	STD	74 – 103 kPa (0.75 – 1.05 kgf/cm², 10.7 – 14.9 psi)
		Minimum	59 kPa (0.6 kgf/cm², 8.8 psi)

TORQUE SPECIFICATIONS

EG1DK–06

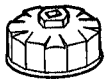
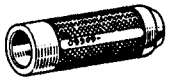
Part tightened	N·m	kgf·cm	ft·lbf
Fan x Fluid coupling	7.4	75	65 in.·lbf
Water pump x Cylinder block	20	200	14
Water inlet x Water pump	20	200	14
Radiator support x Body	12	120	8.7

LUBRICATION SYSTEM

PREPARATION

EG1CR-04

SST (SPECIAL SERVICE TOOLS)

	09032-00100 Oil Pan Seal Cutter	
	09228-07501 Oil Filter Wrench	
	09309-37010 Transmission Bearing Replacer	Camshaft front oil seal
	09816-30010 Oil Pressure Switch Socket	

EG1C8-03

RECOMMENDED TOOLS

	09200-00010 Engine Adjust Kit .	

EG1CT-06

EQUIPMENT

Oil pressure gauge	
Precision straight edge	Oil pump
Torque wrench	

EG1CU-0F

LUBRICANT

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	5.9 liters (6.2 US qts, 5.2 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	5.1 liters (5.4 US qts, 4.5 Imp. qts)	
4WD		
Dry fill	5.9 liters (6.2 US qts, 5.2 Imp. qts)	
Drain and refill		
w/ Oil filter change	5.2 liters (5.5 US qts, 4.6 Imp. qts)	
w/o Oil filter change	4.9 liters (5.2 US qts, 4.3 Imp. qts)	

SSM (SPECIAL SERVICE MATERIALS)

EG1CV–04

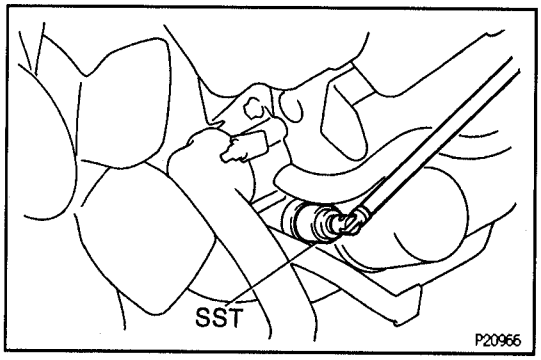
08826–00080	Seal Packing Black or equivalent (FIPG)	Oil pump, Oil pan
08833–00080	Adhesive 1344, THREE BOND 1344, LOCTITE 242 or equivalent	Oil pressure sender gauge

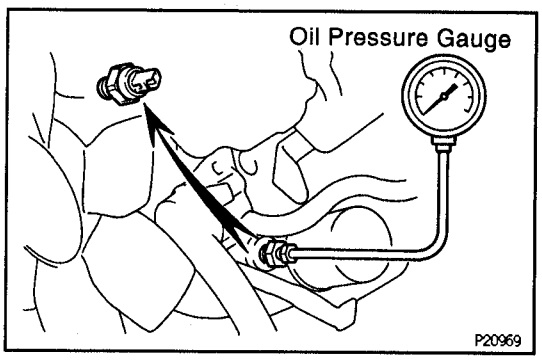
OIL PRESSURE CHECK

EG

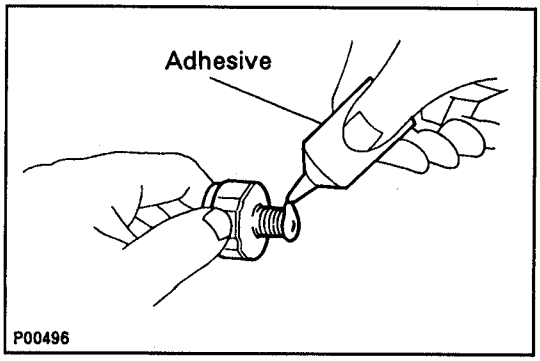
EG5BE–04

1. **CHECK OIL QUALITY**
   Check the oil for deterioration, entry of water, discoloring or thinning.
   If oil quality is visibly poor, replace it.
2. **CHECK OIL LEVEL**
   The oil level should be between the "L" and "F" marks on the level gauge. If low, check for leakage and add oil up to the "F" mark.
3. **REMOVE OIL PRESSURE SWITCH**
   Using SST, remove the oil pressure switch.
   SST 09816–30010
4. **INSTALL OIL PRESSURE GAUGE**
5. **START ENGINE**
   Start the engine and warm it up to normal operating temperature.





6. **MEASURE OIL PRESSURE**
   Oil pressure:
   At idle speed:
   29 kPa (0.3 kgf/cm², 4.3 psi) or more
   At 3,000 rpm:
   245 – 520 kPa (2.5 – 5.3 kgf/cm², 36 – 75 psi)
7. **REMOVE OIL PRESSURE GAUGE**



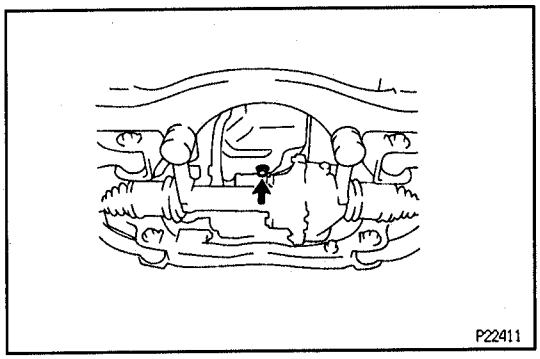
8. **INSTALL OIL PRESSURE SWITCH**
   (a) Apply adhesive to 2 or 3 threads.
   Adhesive:
   Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
   (b) Using SST, install the oil pressure switch.
   SST 09816–30010
   Torque: 15 N·m (150 kgf·cm, 11 ft·lbf)
9. **START ENGINE AND CHECK FOR LEAKS**

OIL AND FILTER REPLACEMENT

BG67B–01

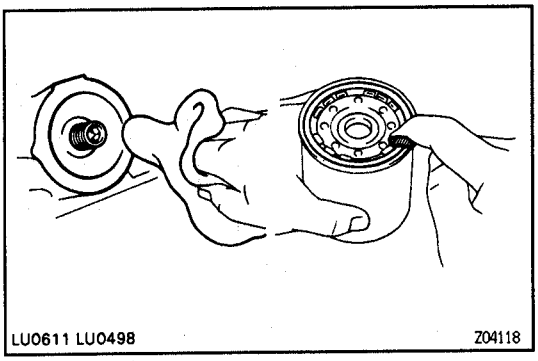
NOTICE:

- **Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.**
  Adequate means of skin protection and washing facilities should be provided.
- **Care should be taken, therefore, when changing engine oil, to minimize the frequency and length of time your skin is exposed to used engine oil.**
  Protective clothing and gloves, that cannot be penetrated by oil, should be worn. The skin should be thoroughly washed with soap and water, or use waterless hand cleaner to remove any used engine oil. Do not use gasoline, thinners, or solvents.
- **In order to preserve the environment, used oil and used oil filters must be disposed of only at designated disposal sites.**


P22411

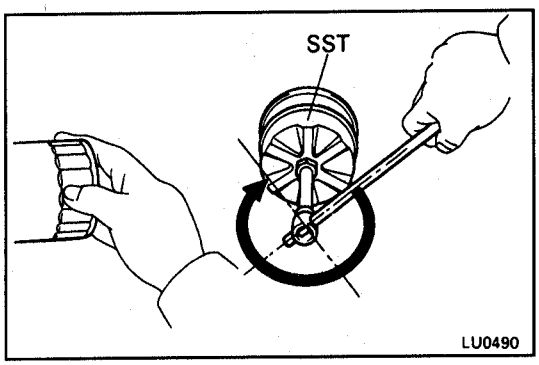
1. DRAIN ENGINE OIL

(a) Remove the oil filler cap.
(b) Remove the oil dipstick.
(c) Remove the oil drain plug and drain the oil into a container.


LU0611 LU0498 Z04118

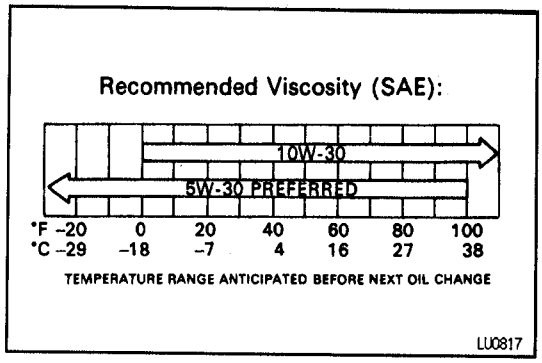
2. REPLACE OIL FILTER

(a) Using SST, remove the oil filter (located on left side of the cylinder block).
SST 09228–07501
(b) Clean the filter contact surface on the filter mounting.
(c) Apply clean engine oil to the gasket of a new oil filter.



LU0490

(d) Tighten the filter by hand until the gasket contacts the seat of the filter mounting. Then using SST, give it an additional 3/4 turn to seat the filter.
SST 09228–07501



3. FILL WITH ENGINE OIL

(a) Clean and install the oil drain plug with a new gasket.

(b) Fill the engine with new oil.

Oil grade

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

Oil capacity

2WD:

Drain and refill

w/ Oil filter change

5.9 liters (6.2 US qts, 5.2 Imp. qts)

w/o Oil filter change

5.1 liters (5.4 US qts, 4.5 Imp. qts)

Dry fill

6.3 liters (6.7 US qts, 5.5 Imp. qts)

4WD:

Drain and refill

w/ Oil filter change

5.2 liters (5.5 US qts, 4.6 Imp. qts)

w/o Oil filter change

4.9 liters (5.2 US qts, 4.3 Imp. qts)

Dry fill

5.9 liters (6.2 US qts, 5.2 Imp. qts)

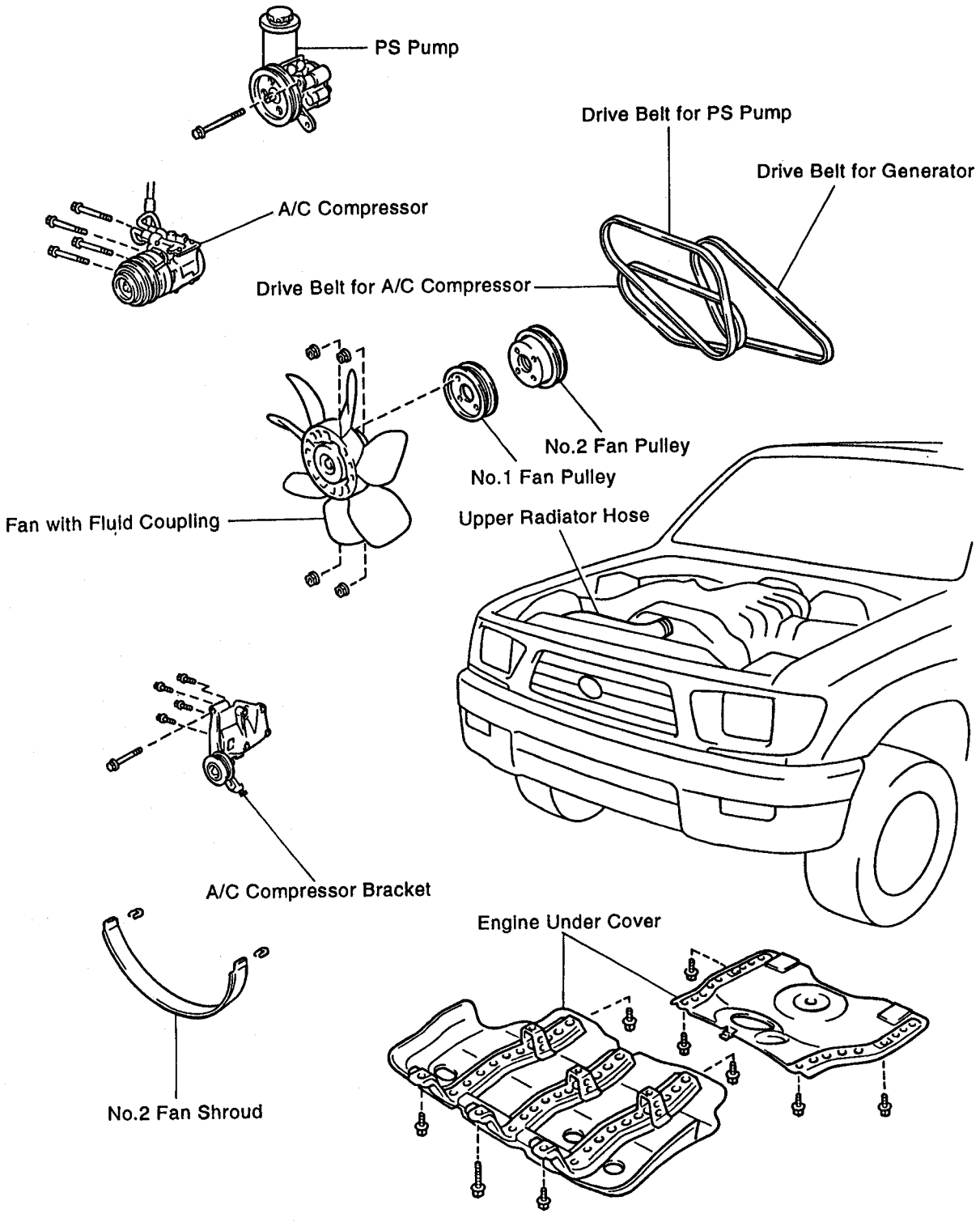
4. START ENGINE AND CHECK FOR LEAKS

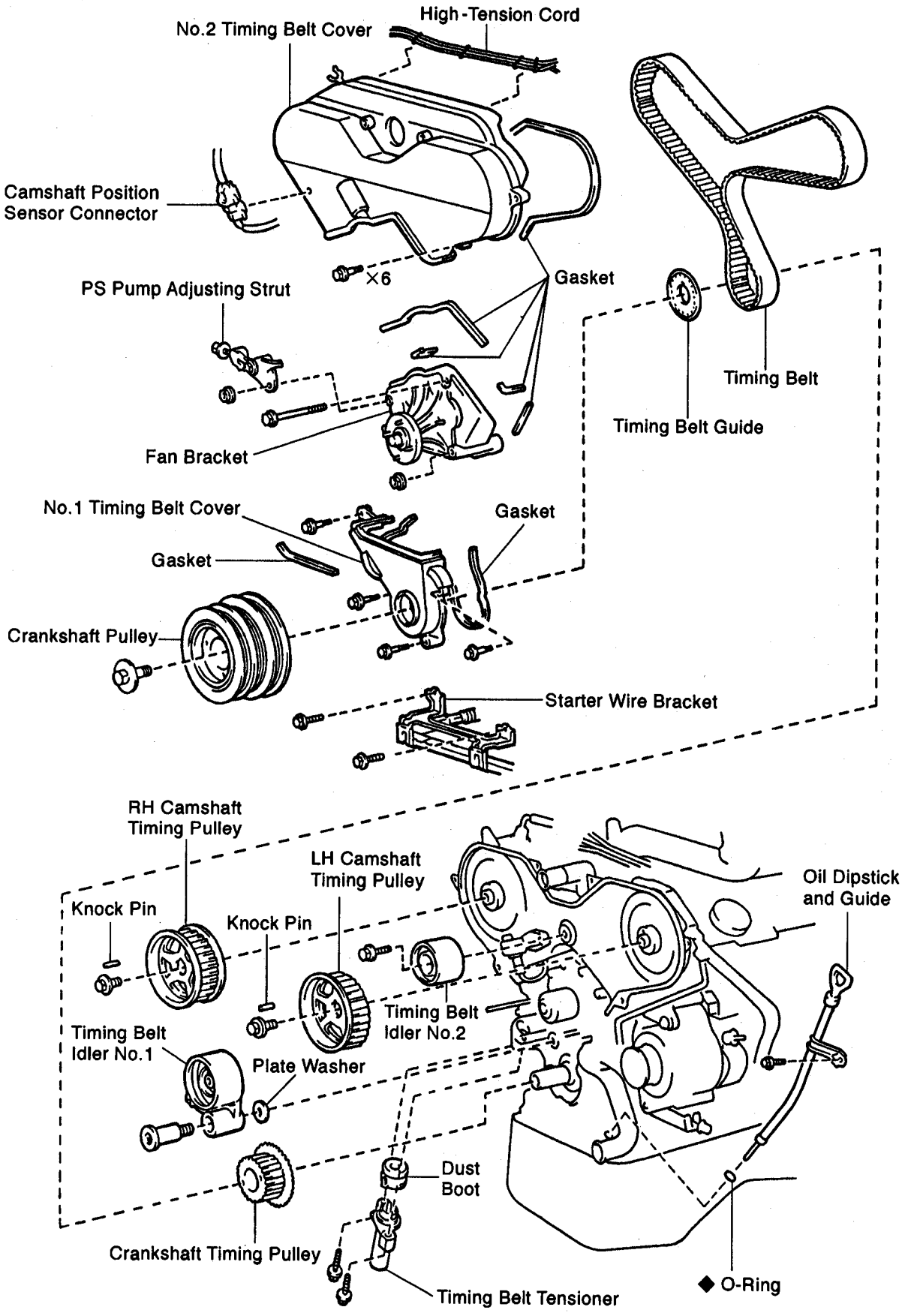
5. RECHECK ENGINE LEVEL

OIL PUMP

COMPONENTS FOR REMOVAL AND INSTALLATION

EG5SQ-03

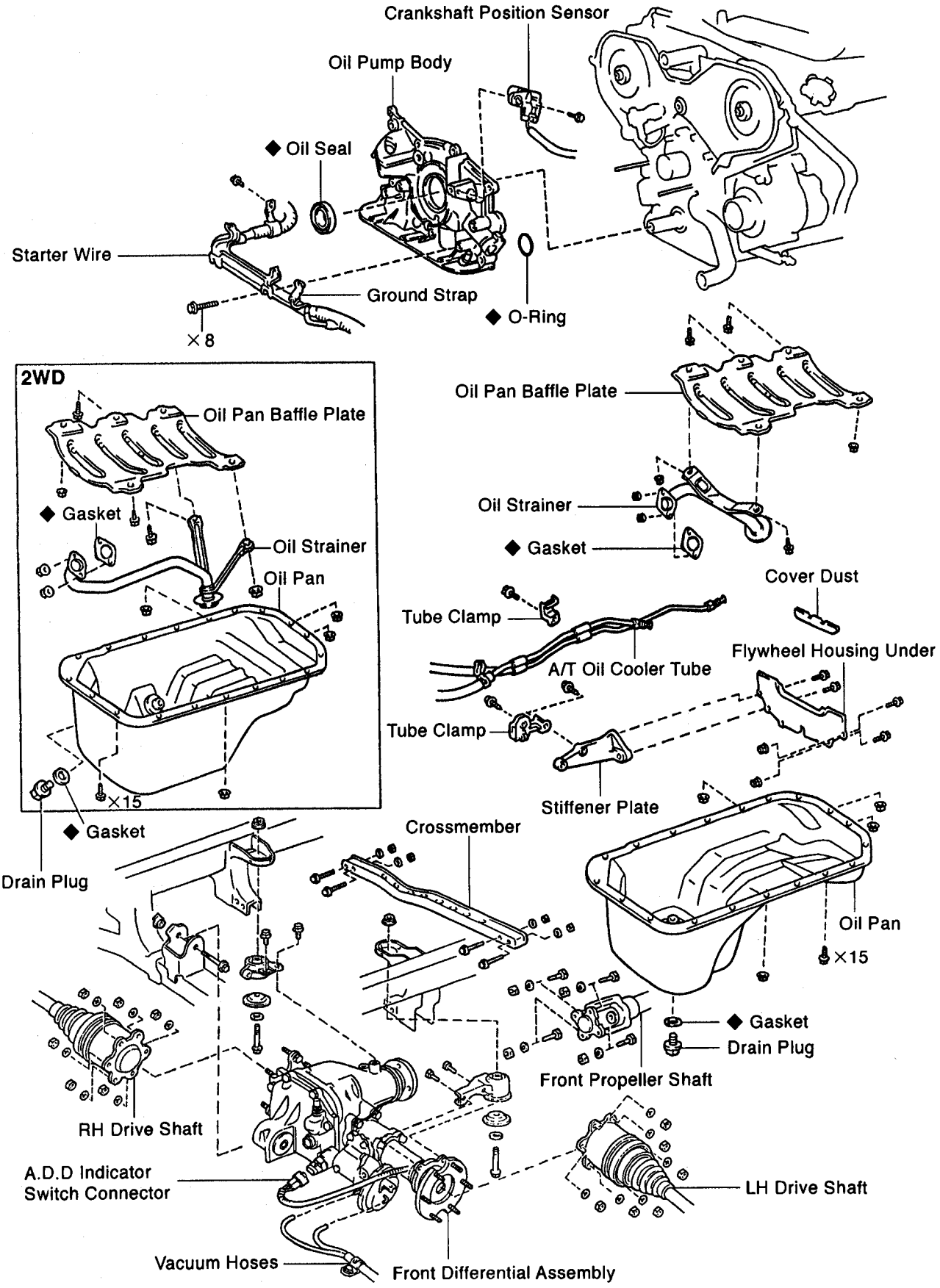




◆ Non-reusable part

P24354

EG



◆ Non-reusable part

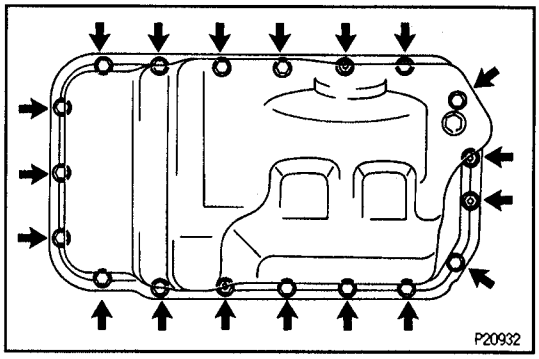
P24345

EG56K–02

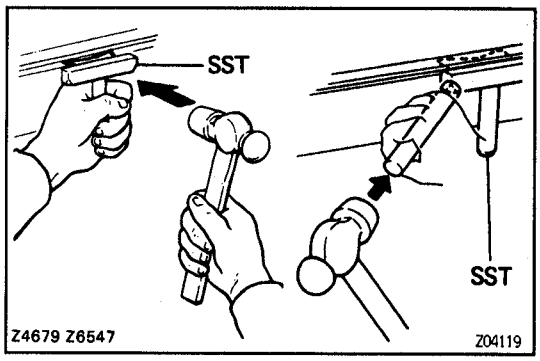
OIL PUMP REMOVAL

HINT: When repairing the oil pump, the oil pan and strainer should be removed and cleaned.

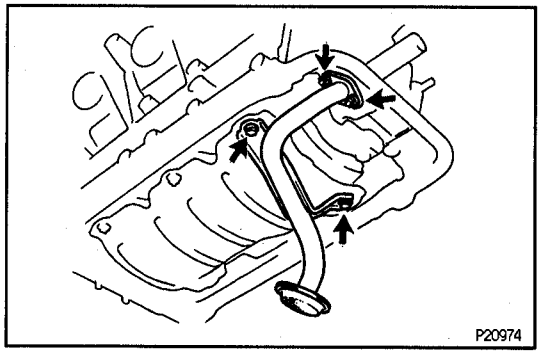
1. **REMOVE CRANKSHAFT TIMING PULLEY**
   (See timing belt removal in Engine Mechanical)
2. **4WD:**
   REMOVE FRONT DIFFERENTIAL
   (See SA Section)
3. **DRAIN ENGINE OIL**
4. **A/T:**
   REMOVE OIL COOLER TUBE AND CLAMP
   (See AT Section)
5. **REMOVE STIFFENER PLATE, FLYWHEEL HOUSING UNDER AND COVER DUST**
6. **DISCONNECT STARTER WIRE CLAMP**
7. **REMOVE CRANKSHAFT POSITION SENSOR**
8. **REMOVE OIL PAN**



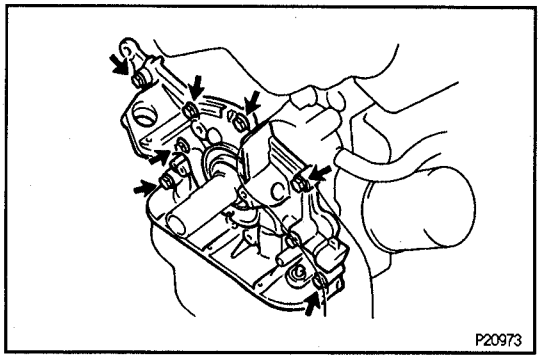
(a) Remove the 15 bolts and 4 nuts.



(b) Using SST and a brass bar, separate the oil pan from the cylinder block.
SST 09032–00100
HINT: When removing the oil pan, be careful not to damage the oil pan flange.



9. **REMOVE OIL STRAINER**
   Remove the bolt, 3 nuts and oil strainer and gasket.
10. **REMOVE OIL PAN BAFFLE PLATE.**
    Remove the 2 bolt, nut and oil pan baffle plate.



11. **REMOVE OIL PUMP**

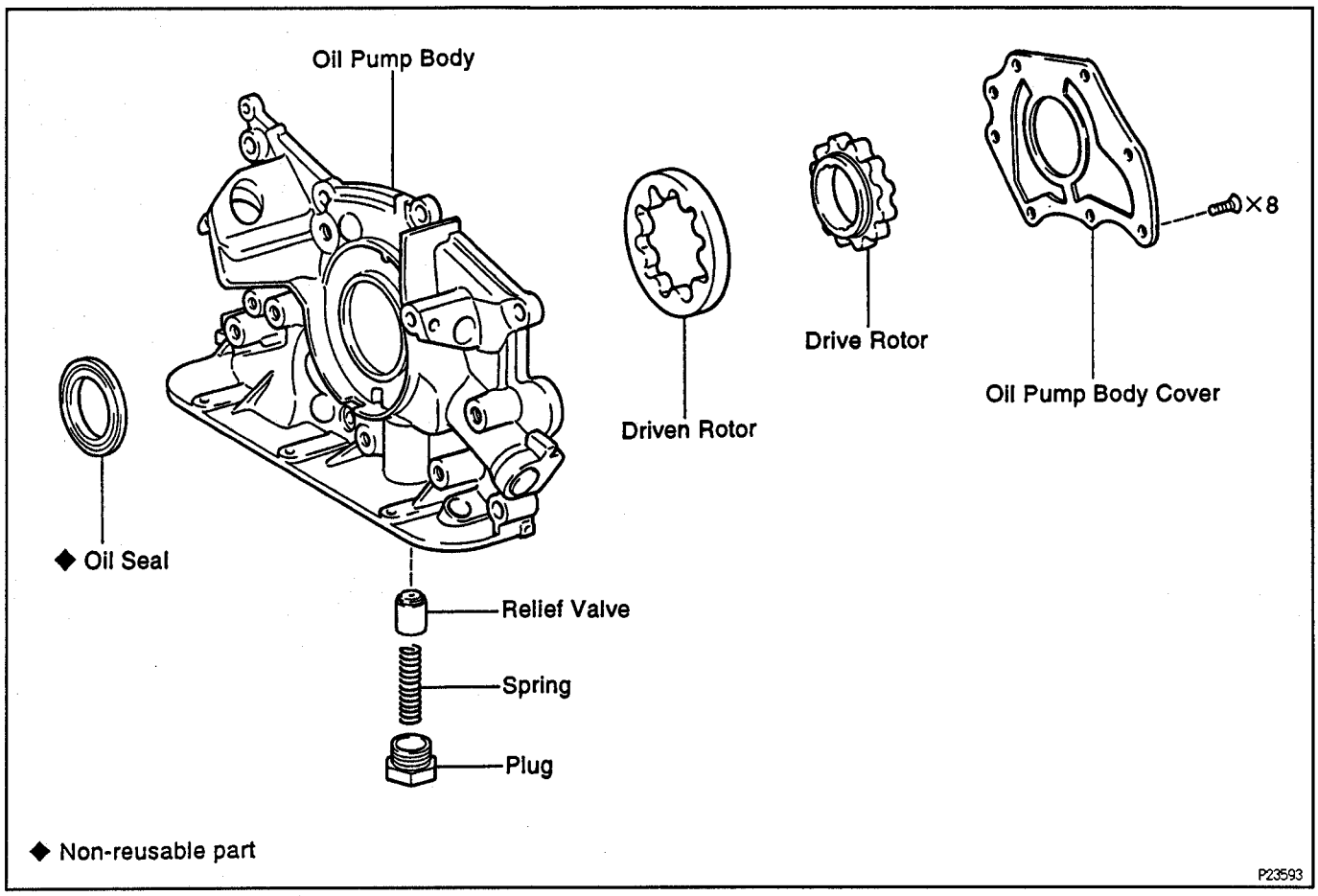
(a) Remove the 8 bolts, ground strap and oil pump.
(b) Using a plastic–faced hammer, carefully tap the oil pump body.
(c) Remove the O–ring from the cylinder block.

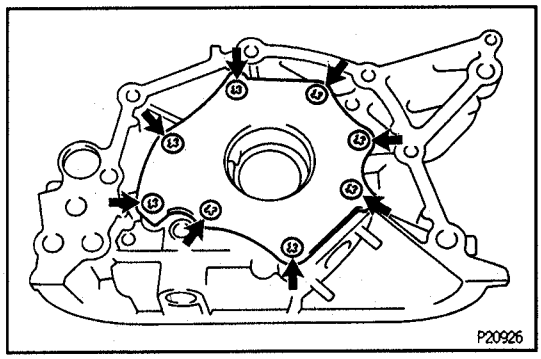
EG

EG

COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

EG155-03





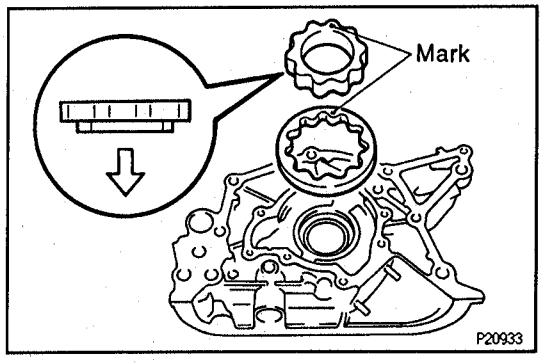
OIL PUMP DISASSEMBLY

EG58H-02

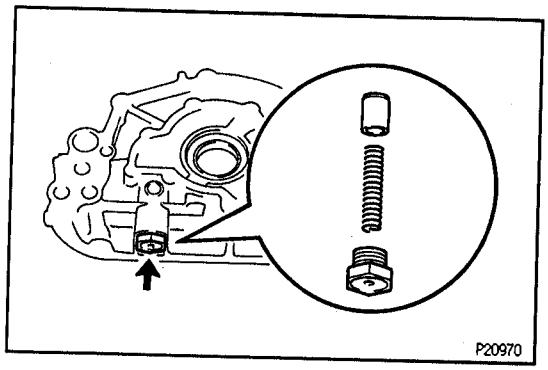
1. REMOVE DRIVEN AND DRIVE ROTORS

(a) Remove the 8 screws and pump body cover.
Torque: 10 N·m (105 kgf·cm, 8 ft·lbf)

(b) Remove the drive and driven rotors.



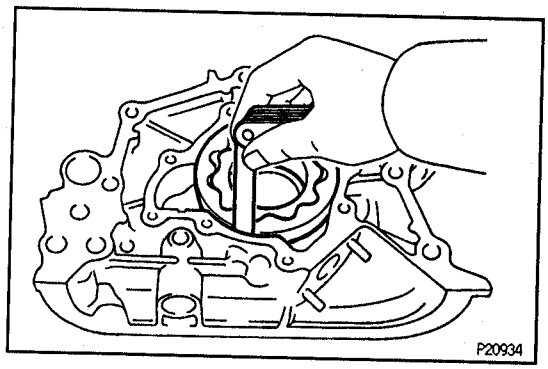
INSTALLATION HINT: Place the drive and driven rotor into pump body with the marks facing the pump body cover side.



2. REMOVE RELIEF VALVE

(a) Unscrew the relief valve plug and gasket.

(b) Remove the spring and relief valve.



OIL PUMP INSPECTION

EG1CL–06

EG

1. INSPECT BODY CLEARANCE

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

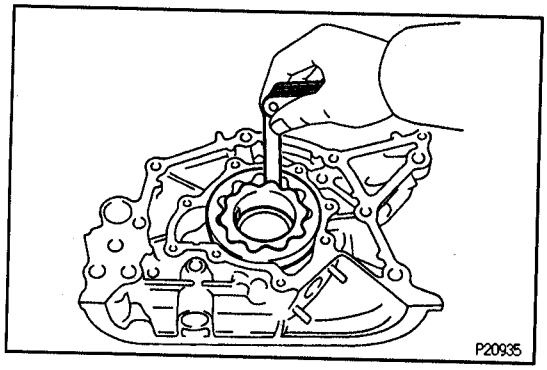
Standard clearance:

0.10 – 0.18 mm (0.0039 – 0.0069 in.)

Maximum clearance:

0.30 mm (0.0118 in.)

If the clearance is greater than the maximum, replace the oil pump rotor set and/or pump body.



2. INSPECT TIP CLEARANCE

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

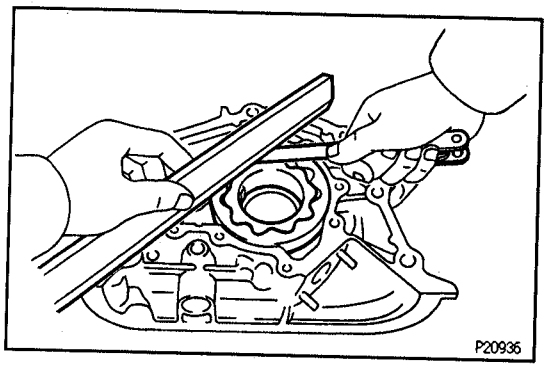
Standard clearance:

0.11 – 0.24 mm (0.0043 – 0.0094 in.)

Maximum clearance:

0.35 mm (0.0138 in.)

If the clearance is greater than the maximum, replace the oil pump rotor set.



3. INSPECT SIDE CLEARANCE

Using a thickness gauge and precision straight edge, measure the side clearance, as shown.

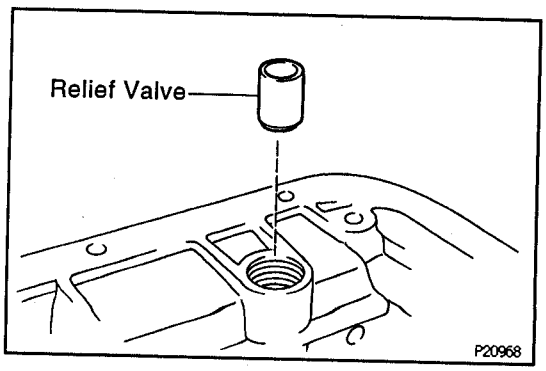
Standard clearance:

0.03 – 0.09 mm (0.0012 – 0.0035 in.)

Maximum clearance:

0.15 mm (0.0059 in.)

If the clearance is greater than the maximum, replace the oil pump rotor set and/or pump body.



4. INSPECT RELIEF VALVE

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

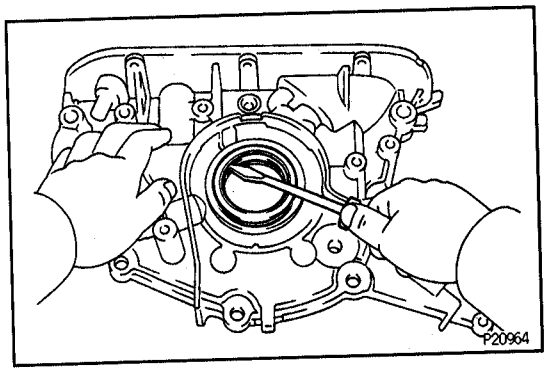
E0670-01

OIL PUMP ASSEMBLY

Assembly is in the reverse order of disassembly.

E0301-05

CRANKSHAFT FRONT OIL SEAL REPLACEMENT

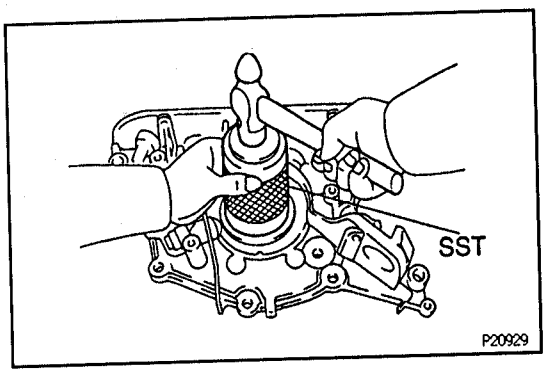


HINT: There are 2 methods (A and B) to replace the oil seal, which are as follows:

REPLACE CRANKSHAFT FRONT OIL SEAL

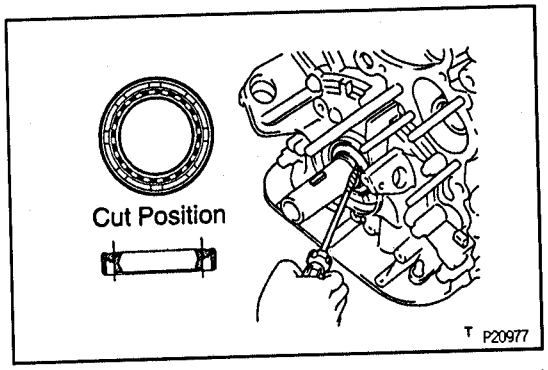
A. If oil pump is removed from cylinder block:

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



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

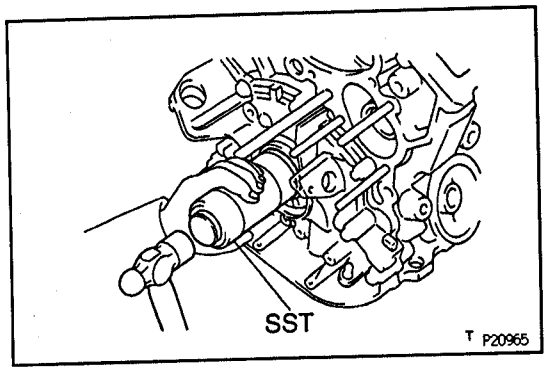
(c) Apply MP grease to the oil seal lip.



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

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

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



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

(d) Using SST and a hammer, tap in the oil seal until its surface is flush with the oil pump body edge.
SST 09306-37010

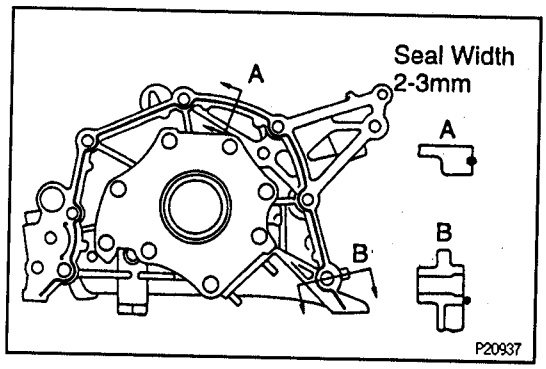
OIL PUMP INSTALLATION

EG67D–01

1. INSTALL OIL PUMP

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

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



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

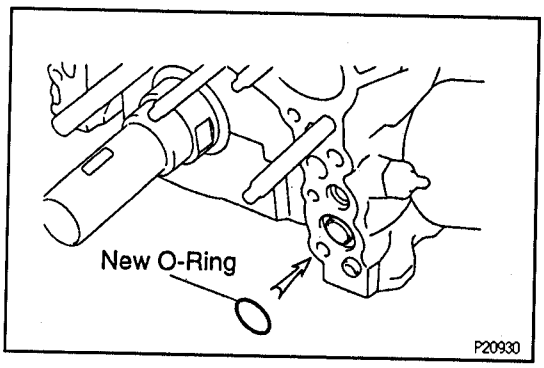
Seal packing:

Part No. 08826–00080 or equivalent

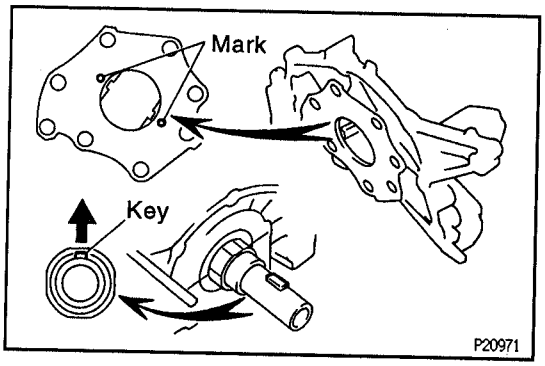
- Install nozzle that has been cut out to a 2–3 mm (0.08–0.12 in.) opening.

HINT: Avoid applying an excessive amount to the surface.

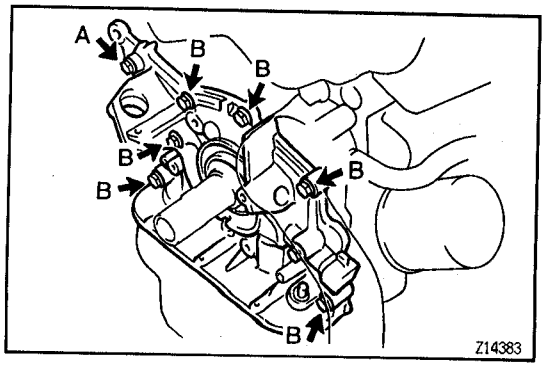
- Parts must be assembled within 5 minutes of application. Otherwise the material must be removed and reapplied.
- Immediately remove nozzle from the tube and reinstall cap.



(c) Place a new O–ring into the groove of cylinder block.



(d) Install the oil pump to the crankshaft with the spline teeth of the drive rotor engaged with the large teeth of the crankshaft.



(e) Install the oil pump with the 8 bolts, and ground strap.

Torque:

Bolt A: 20 N·m (200 kgf·cm, 15 ft·lbf)

Bolt B: 42 N·m (420 kgf·cm, 31 ft·lbf)

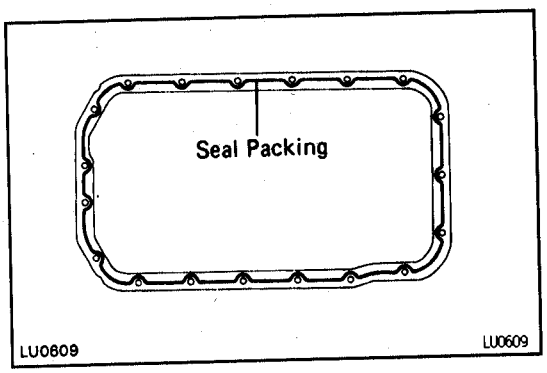
2. INSTALL CRANK SHAFT POSITION SENSOR

3. INSTALL OIL PAN BAFFLE PLATE

4. INSTALL OIL STRAINER

Place a new gasket and install the oil strainer.

Torque: 7.5 N·m (76 kgf·cm, 66 in.·lbf)



5. **CLEAN OIL PAN.**

Remove any old packing (FIPG) material and be careful not to drop any oil on the contacting surfaces of the, oil pan, cylinder block and sealing grooves.

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

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

6. **INSTALL OIL PAN**

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

Seal packing:

Part No. 08826-00080 or equivalent

- Install a nozzle that has been cut to a 3 – 4 mm (0.12 – 0.16 in.) opening.

HINT: Avoid applying an excess amount to the surface.

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

(b) Install the oil pan with the 4 nuts and 15 bolts.

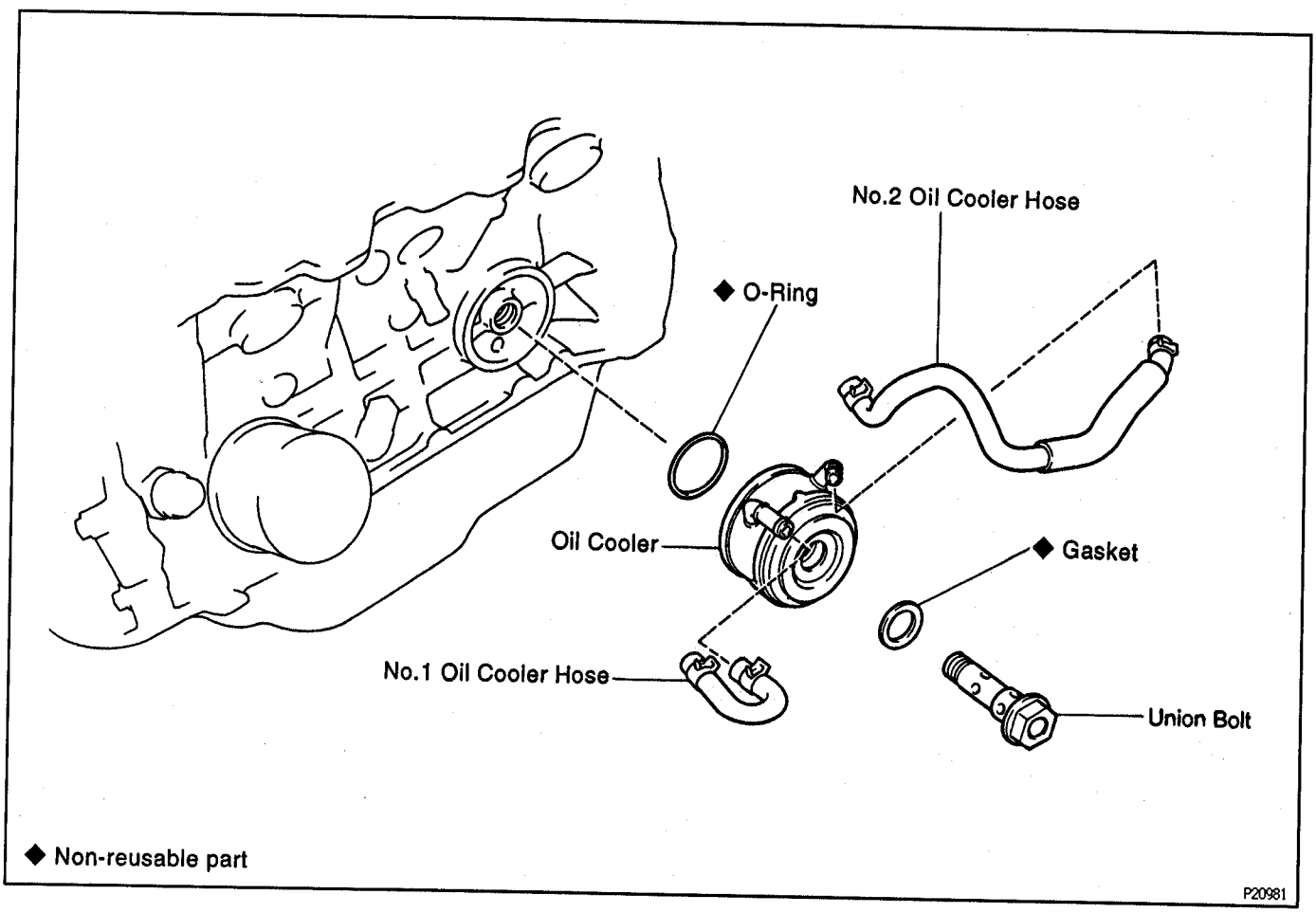
Torque: 7.6 N·m (78 kgf·cm, 67 in.·lbf)

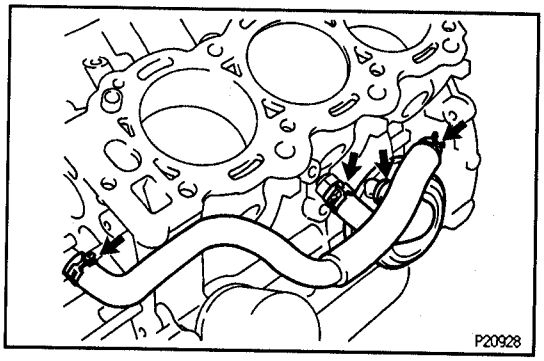
7. **INSTALL FLYWHEEL HOUSING UNDER, COVER DUST AND STIFFENER PLATE**
8. **CONNECT STARTER WIRE CLAMP**
9. **A/T:**
   INSTALL OIL COOLER TUBE AND CLANP
   (See AT Section)
10. **INSTALL CRANKSHAFT TIMING PULLEY**
    (See timing belt installation in Engine Mechanical)
11. **4WD:**
    INSTALL FRONT DIFFERENTIAL
    (See SA Section)
12. **FILL WITH ENGINE OIL**
13. **START ENGINE AND CHECK FOR LEAKS**
14. **INSTALL ENGINE UNDER COVER**
15. **RECHECK ENGINE OIL LEVEL**

OIL COOLER

COMPONENTS FOR REMOVAL AND INSTALLATION

EG20M–06

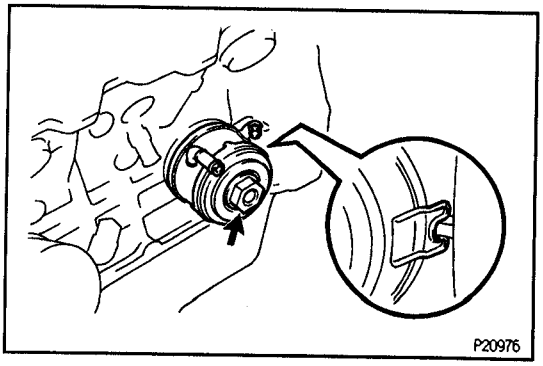




OIL COOLER REMOVAL

EG20N–06

1. **DRAIN ENGINE COOLANT**
2. **DISCONNECT OIL COOLER HOSES**
   Disconnect the No.1 and No.2 oil cooler hoses.



3. **REMOVE OIL COOLER**
   Remove the bolt, relief valve, gaskets and oil cooler.
   Torque: 59 N·m (600 kgf·cm, 43 ft·lbf)
   INSTALLATION HINT:
   - Replace the O–ring with a new part.
   - Use a new gasket to the relief valve.

EG1CZ-03

OIL COOLER INSPECTION

INSPECT OIL COOLER

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

EG067E-01

OIL COOLER INSTALLATION

Installation is in the reverse order of removal.

SERVICE SPECIFICATIONS

SERVICE DATA

EG1D1-04

Oil pressure	At idle speed (normal operating temperature)		29 kPa (0.3 kgf/cm², 4.3 psi) or more
	At 3,000 rpm (normal operating temperature)		245 – 520 kPa (2.5 – 5.3 kgf/cm², 36 – 75 psi)
Oil pump	Body clearance	STD	0.10 – 0.18 mm (0.0039 – 0.0069 in.)
		Maximum	0.30 mm (0.0118 in.)
	Tip clearance	STD	0.11 – 0.24 mm (0.0043 – 0.0094 in.)
		Maximum	0.35 mm (0.0138 in.)
	Side clearance	STD	0.03 – 0.09 mm (0.0012 – 0.0035 in.)
		Maximum	0.15 mm (0.0059 in.)

EG1D2-06

TORQUE SPECIFICATIONS

Part tightened		N·m	kgf·cm	ft·lbf
Oil pressure switch x Cylinder block		15	150	11
Oil pump x Oil pump body cover		10	105	8
Oil pump x Cylinder block	A	20	200	14
	B	42	420	31
Oil strainer x Cylinder block		7.5	76	66 in.·lbf
Oil pan x Cylinder block		5.9	60	52 in.·lbf
Oil cooler x Relief valve		59	600	43

– MEMO –

5VZ-FE ENGINE TROUBLESHOOTING

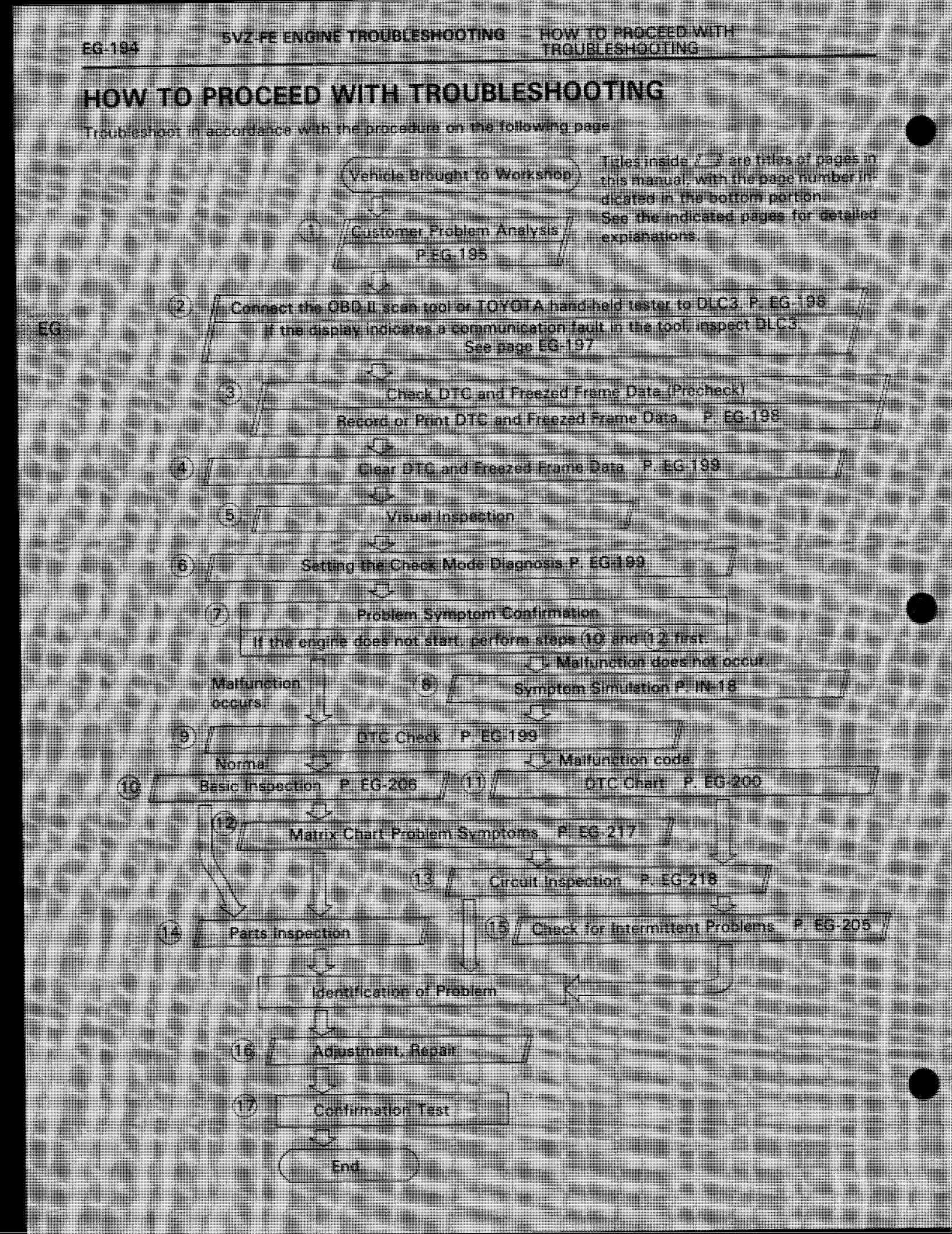
HOW TO PROCEED WITH TROUBLESHOOTING ..... EG−194
CUSTOMER PROBLEM ANALYSIS CHECK SHEET ..... EG−195
DIAGNOSIS SYSTEM ..... EG−196
DTC CHART ..... EG−200
FAIL-SAFE CHART ..... EG−205
CHECK FOR INTERMITTENT PROBLEMS ..... EG−205
BASIC INSPECTION ..... EG−206
PARTS LOCATION ..... EG−209
STANDARD VALUE OF ECM TERMINALS ..... EG−210
ENGINE OPERATING CONDITION ..... EG−214
MATRIX CHART OF PROBLEM SYMPTOMS ..... EG−217
CIRCUIT INSPECTION
- DTC P0100
  - Mass Air Flow Circuit Malfunction ..... EG−218
- DTC P0101
  - Mass Air Flow Circuit Range/Performance Problem ..... EG−221
- DTC P0110
  - Intake Air Temp. Circuit Malfunction ..... EG−222
- DTC P0115
  - Engine Coolant Temp. Circuit Malfunction ..... EG−225
- DTC P0116
  - Engine Coolant Temp. Circuit Range/Performance Problem ..... EG−229
- DTC P0120
  - Throttle/Pedal Position Sensor/ Switch "A" Circuit Malfunction ..... EG−229
- DTC P0121
  - Throttle/Pedal Position Sensor/Switch "A" Circuit Range/Performance Problem ..... EG−232
- DTC P0125
  - Insufficient Coolant Temp. for Closed Loop Fuel Control ..... EG−233
- DTC P0130
  - Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1) ..... EG−235
- DTC P0133
  - Heated Oxygen Sensor Circuit Slow Response (Bank 1 Sensor 1) ..... EG−237
- DTC P0135, P0141
  - Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 1, Bank 1 Sensor 2) ..... EG−237
- DTC P0136
  - Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2) ..... EG−238
- DTC P0171
  - System too Lean (Fuel Trim) ..... EG−239
- DTC P0172
  - System too Rich (Fuel Trim) ..... EG−239
- DTC P0300
  - Random/Multiple Cylinder Misfire Detected ..... EG−242
- DTC P0301, P0302, P0303, P0304, P0305, P0306
  - Misfire Detected (Cylinder 1-6) ..... EG−242
- DTC P0325, P0330
  - Knock Sensor Circuit Malfunction (Knock Sensor 1, Knock Sensor 2) ... EG−246
- DTC P0335
  - Crankshaft Position Sensor "A" Circuit Malfunction ..... EG−248
- DTC P0340
  - Camshaft Position Sensor Circuit Malfunction ..... EG−250
- DTC P0401
  - Exhaust Gas Recirculation Flow Insufficient Detected ..... EG−252
- DTC P0402
  - Exhaust Gas Recirculation Flow Excessive Detected ..... EG−259
- DTC P0420
  - Catalyst System Efficiency Below Threshold ..... EG−263
- DTC P0440
  - Evaporative Emission Control System Malfunction (Only for 4WD models) .. EG−265

DTC P0441
Evaporative Emission Control System
Incorrect Purge Flow
(For 2WD models) ..... EG−271
DTC P0441
Evaporative Emission Control System
Incorrect Purge Flow
(For 4WD models) ..... EG−275
DTC P0446
Evaporative Emission Control System
Vent Control Malfunction
(Only for 4WD models) ..... EG−275
DTC P0450
Evaporative Emission Control System
Pressure Sensor Malfunction
(Only for 4WD models) ..... EG−284
DTC P0500
Vehicle Speed Sensor Malfunction ... EG−286
DTC P0505
Idle Control System Malfunction ..... EG−288
DTC P0510
Closed Throttle Position Switch
Malfunction ..... EG−290
DTC P1300
Igniter Circuit Malfunction ..... EG−292
DTC P1335
Crankshaft Position Sensor Circuit
Malfunction (during engine running) .. EG−297
DTC P1500
Starter Signal Circuit Malfunction .... EG−297
DTC P1600
ECM BATT Malfunction ..... EG−299
DTC P1605
Knock Control CPU Malfunction ..... EG−300
DTC P1780
Park/Neutral Position Switch
Malfunction ..... EG−301
ECM Power Source Circuit ..... EG−303
A/C Idle-up Circuit ..... EG−305
Fuel Pump Control Circuit ..... EG−308
Fuel Pressure Control Circuit ..... EG−313

HOW TO PROCEED WITH TROUBLESHOOTING

Troubleshoot in accordance with the procedure on the following page.

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.



CUSTOMER PROBLEM ANALYSIS CHECK SHEET

ENGINE CONTROL System Check Sheet

Inspector's Name _____

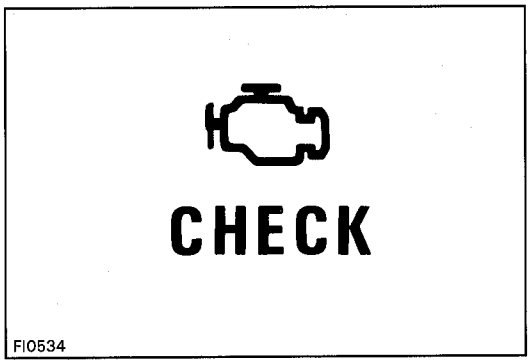
Customer's name		**Model and model year**	
Driver's name		**Frame no.**	
Date vehicle brought in		**Engine model**	
License no.		**Odometer reading**	km miles

EG

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
DTC Inspection	**Normal Mode (Precheck)**	☐ Normal ☐ Malfunction code(s) [code] ☐ Freezed frame data [ ]
	Check Mode	☐ Normal ☐ Malfunction code(s) [code] ☐ Freezed frame data [ ]



EG

DIAGNOSIS SYSTEM

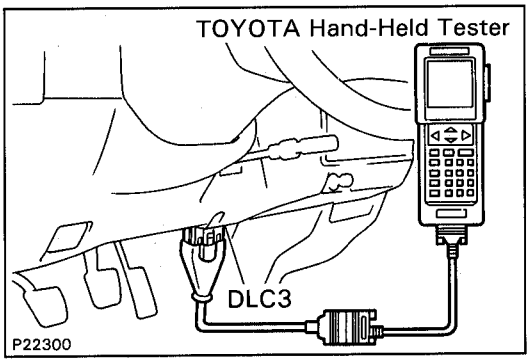
DESCRIPTION

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

OBD II regulations require that the vehicle's on-board computer lights up the Malfunction Indicator Lamp (MIL) on the instrument panel when the computer detects a malfunction in the computer itself or in drive system components which affect vehicle emissions. In addition to the MIL lighting up when a malfunction is detected, the applicable Diagnostic Trouble Codes (DTC) prescribed by SAE J2012 are recorded in the ECM memory. (See page EG-200)

If the malfunction does not recur 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 diagnostic trouble codes and check freezed frame data and various forms of engine data. (For operating instructions, see the OBD II scan tool's instruction book.)



DTC include SAE controlled codes and Manufacturer controlled codes.
SAE controlled codes must be set as prescribed by the SAE, while Manufacturer controlled codes can be set freely by the manufacturer within the prescribed limits.
(See DTC chart on page EG-200)

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-198)

*2 trip detection logic
When a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same malfunction is detected again during the second drive test, this second detection causes the MIL to light up.
The 2 trip repeats the same mode a 2nd time. (However, the IG switch must be turned OFF between the 1st trip and 2nd trip.)

Freeze frame data:

Freeze frame data records the engine condition when a misfire (DTC P0300 ~ P0306) 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

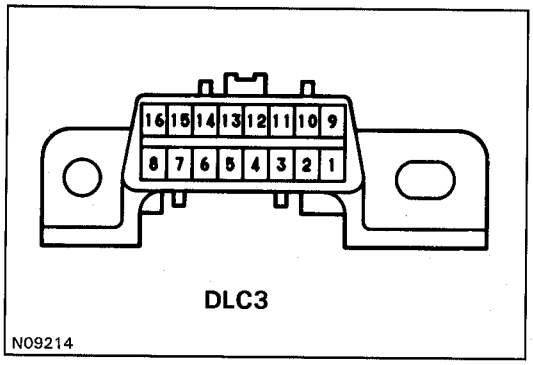
If troubleshooting priorities for multiple diagnostic codes are given in the applicable diagnostic chart, these should be followed.

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 ~ P0306).

② Fuel trim malfunction (DTC P0171, P0172) and EGR (DTC P0401, P0402).

③ Misfire (DTC P0300 ~ P0306).



DLC3

N09214

DATA LINK CONNECTOR 3 (DLC3) INSPECTION

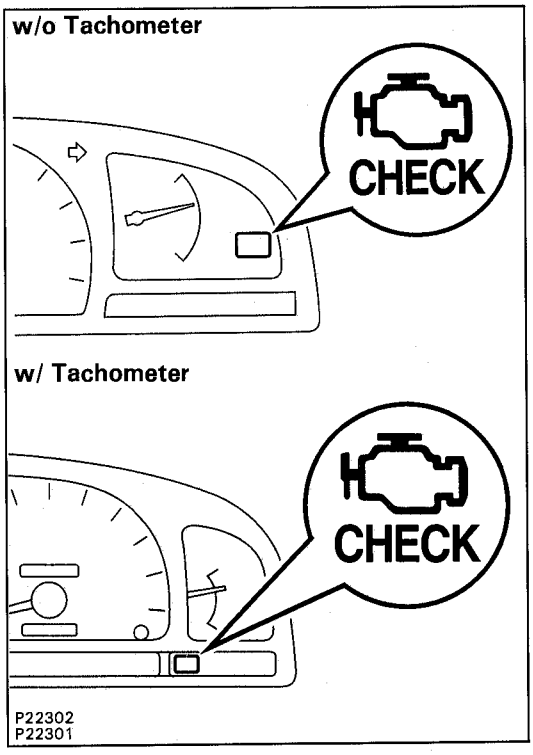
The vehicle's ECM uses V.P.W. (Variable Pulse Width) for communication to comply with SAE J1850. The terminal arrangement of DLC3 complies with SAE J1962 and matches the V.P.W. format.

Terminal No.	Connection	Voltage or Resistance	Condition
2	Bus ⊕ Line	Pulse generation	During transmission
4	Chassis Ground	↔ Body Ground 1 Ω or less	Always
5	Signal Ground	↔ Body Ground 1 Ω or less	Always
16	Battery Positive	↔ Body Ground 9 ~ 14 V	Always

HINT: If you 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.



Diagnosis Inspection (Normal Mode)

MALFUNCTION INDICATOR LAMP (MIL) CHECK

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

   HINT: If the MIL does not light up, troubleshoot the combination meter (See page BE-33).

2. When the engine is started, the MIL should go off. If the lamp remains on, the diagnosis system has detected a malfunction or abnormality in the system.

DIAGNOSTIC TROUBLE CODE (DTC) CHECK

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

1. Prepare the OBD II scan tool (complying with SAE J1978) or TOYOTA hand-held tester.
2. Connect the OBD II scan tool or TOYOTA hand-held tester to DLC3 at the lower of the instrument panel.
3. Turn the ignition switch ON and switch the OBD II scan tool or TOYOTA hand-held tester main switch ON.
4. Use the OBD II scan tool or TOYOTA hand-held tester to check the DTC and freezed frame data, note them down. (For operating instructions, see the OBD II scan tool's instruction book.)
5. See page EG-200 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.

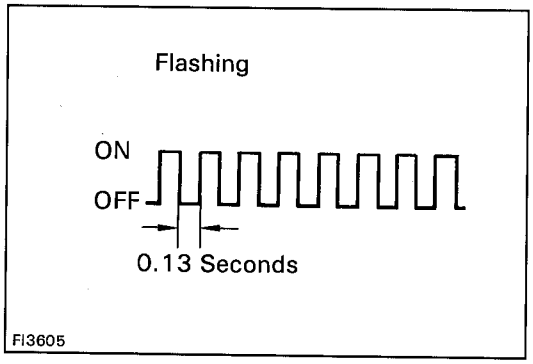
Futhermore, the same diagnostic items which are detected in the normal mode can also be detected in the check mode.

DTC CHECK

1. Initial conditions.
(a) Battery positive voltage 11 V or more.
(b) Throttle valve fully closed.
(c) Transmission in park or neutral position.
(d) Air conditioning switched OFF.
2. Turn ignition switch OFF.
3. Prepare the TOYOTA hand-held tester.
4. Connect the TOYOTA hand-held tester to DLC3 at the lower of the instrument panel.
5. Turn the ignition switch ON and push the TOYOTA hand-held tester main switch ON.
6. Switch the TOYOTA hand-held tester normal mode to check mode. (Check that the MIL flashes.)
7. Start the engine. (The MIL goes out after the engine start.)
8. Simulate the conditions of the malfunction described by the customer.

   NOTICE: Leave the ignition switch ON until you have checked the DTC, etc.
9. After simulating the malfunction conditions, use the TOYOTA hand-held tester diagnosis selector to check the DTC and freezed frame data, etc.

   HINT: Take care not to turn the ignition switch OFF. Turning the ignition switch OFF 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 freezed frame data.

1. Operating the OBD II scan tool (complying with SAE J1978) or TOYOTA hand-held tester to erase the codes. (See the OBD II scan tool's instruction book for operating instructions.)
2. Disconnecting the battery terminals or EFI fuse.

NOTICE: If the TOYOTA hand-held tester switches the ECM from normal mode to check mode or vice-versa, or if the ignition switch is turned from ON to ACC or OFF during check mode, the DTC and freezed frame data will be erased.

DTC CHART (SAE Controlled)

HINT: Parameters listed in the chart may not be exactly the same as your reading due to the type of instrument or other factors.

If a malfunction code is displayed during the DTC check in check mode, check the circuit for that code listed in the table below. For details of each code, turn to the page reffered to under the "See Page" for the respective "DTC No." in the DTC chart.

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0100 (EG-218)	Mass Air Flow Circuit Malfunction	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM	○	○
P0101 (EG-221)	Mass Air Flow Circuit Range/Performance Probelm	• Mass air flow meter	○	○
P0110 (EG-222)	Intake Air Temp. Circuit Malfunction	• Open or short in intake air temp. sensor circuit • Intake air temp. sensor • ECM	○	○
P0115 (EG-225)	Engine Coolant Temp. Circuit Malfunction	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM	○	○
P0116 (EG-229)	Engine Coolant Temp. Circuit Range/ Performance Problem	• Engine coolant temp. sensor • Cooling system	○	○
P0120 (EG-229)	Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM	○	○
P0121 (EG-231)	Throttle/Pedal Position Sensor/Switch "A" Circuit Range/ Performance Problem	• Throttle position sensor	○	○
P0125 (EG-233)	Insufficient Coolant Temp. for Closed Loop Fuel Control	• Open or short in heated oxygen sensor circuit • Heated oxygen sensor	○	○
P0130 (EG-235)	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 1)	• Heated oxygen sensor • Fuel trim malfunction	○	○
P0133 (EG-237)	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-237)	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-238)	Heated Oxygen Sensor Circuit Malfunction (Bank 1 Sensor 2)	• Heated oxygen sensor	○	○
P0141 (EG-237)	Heated Oxygen Sensor Heater Circuit Malfunction (Bank 1 Sensor 2)	• Same as DTC No. P0135	○	○
P0171 (EG-239)	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-239)	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-242)	Random/Multiple Cylinder Misfire Detected	• 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 P0305 P0306 (EG-242)	Misfire Detected – Cylinder 1 – Cylinder 2 – Cylinder 3 – Cylinder 4 – Cylinder 5 – Cylinder 6			
P0325 (EG-246)	Knock Sensor 1 Circuit Malfunction	• Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • ECM	○	○
P0330 (EG-246)	Knock Sensor 2 Circuit Malfunction	• Open or short in knock sensor 2 circuit • Knock sensor 2 (looseness) • ECM	○	○

*: ○ ··· MIL lights up

EG

DTC CHART (Cont'd)

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0335 (EG-248)	Crankshaft Position Sensor Circuit "A" Malfuntction	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • Starter • ECM	○	○
P0340 (EG-250)	Camshaft Position Sensor Circuit Malfunction	• Open or short in camshaft position sensor circuit • Camshaft position sensor • Starter • ECM	○	○
P0401 (EG-252)	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 disconnceted • ECM	○	○
P0402 (EG-259)	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-263)	Catalyst System Efficiency Below Threshold	• Three-way catalytic converter • Open or short in heated oxygen sensor circuit • Heated oxygen sensor	○	○
P0440 (EG-265)	Evaporative Emission Control System Malfunction (Only for 4WD models)	• Vapor pressure sensor • Incorrect installation of fuel tank cap • Fuel tank cap • VSV for vapor pressure • Vacuum hose damaged, blocked or disconnected • Pipe or hose damaged or insufficient seal • Fuel tank • ECM	○	○
P0441 (EG-271)	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	○	○

*: ○ ··· MIL lights up

DTC CHART (Cont'd)

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P0441 (EG-275)	Evaporative Emission Control System Incorrect Purge Flow (For 4WD models)	• Open or short in VSV circuit for EVAP • VSV for EVAP • Open in vapor pressure sensor circuit • Vapor pressure sensor • Short in VSV circuit for vapor pressure sensor • ECM • Vacuum hose blocked or disconnected • Charcoal canister	○	○
P0446 (EG-275)	Evaporative Emission Control System Vent Control Malfunction (Only for 4WD models)	• Open or short in VSV circuit for vapor pressure sensor • Vapor pressure sensor • Open or short vapor pressure sensor circuit • Charcoal canister • Vacuum hose damaged or disconnected • ECM	○	○
P0450 (EG-284)	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-286)	Vehicle Speed Sensor Malfunction	• Open or short in vehicle speed sensor circuit • Vehicle speed sensor • Combination meter • ECM	○	○
P0505 (EG-288)	Idle Control System Malfunction	• IAC valve is stuck or closed • Open or short in IAC valve circuit • VSV for A/C idle-up • Air intake (hose loose)	○	○
P0510 (EG-290)	Closed Throttle Position Switch Malfunction	• Open in closed throttle position switch circuit • Closed throttle position switch • ECM	○	○

*: ○ ··· MIL lights up

DTC CHART (Manufacturer Controlled)

DTC No. (See Page)	Detection Item	Trouble Area	MIL*	Memory
P1300 (EG-292)	Igniter Circuit Malfunction	• Open or short in IGF or IGT circuit from igniter to ECM • Igniter • ECM	○	○
P1335 (EG-297)	Crankshaft Position Sensor Circuit Malfunction (during engine running)	• Open or short in crankshaft position sensor circuit • Crankshaft position sensor • ECM	–	○
P1500 (EG-297)	Starter Signal Circuit Malfunction	• Open or short in starter signal circuit • Open or short in ignition switch or starter relay circuit • ECM	–	○
P1600 (EG-299)	ECM BATT Malfunction	• Open in back up power source circuit • ECM	○	○
P1605 (EG-300)	Knock Control CPU Malfunction	• ECM	○	○
P1780 (EG-301)	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 10° BTDC • Injection time fixed Starting ..... 12.4 m sec. CTP switch ON ..... 3.2 m sec. CTP switch OFF ..... 5.0 m sec.	Returned 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 P0330	Max. timing retardation	Ignition switch OFF
P1300	Fuel cut	IGF signal is detected for 6 consective ignitions
P1605	Max. timing retardation	Returned to normal condition

Back-Up Function

If there is truoble with the program in the ECM and ignition signals (IGT) are not output from the microcomputer, the ECM controls fuel injection and ignition timing at predetermined levels as a back-up function to make it possible to continue to operate the vehicle.
Furthermore, the injection duration is calculated from the starting signal (STA) and the closed 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-199

SET CHECK MODE

See page EG-199

PERFORM A SIMULATION TEST

See page IN-18

CONNECTOR CONNECTION AND TERMINAL INSPECTION

See page IN-24

VISUAL CHECK AND CONTACT PRESSURE

See page IN-24

CONNECTOR HANDLING

See page IN-24

BASIC INSPECTION

When the malfunction code is not confimed 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.

EG

1 Is battery positive voltage 11 V or more when engine is stopped?

YES

NO → Charge or replace battery.

2 Is engine cranked?

YES

NO → Proceed to page ST section and continue to troubleshoot.

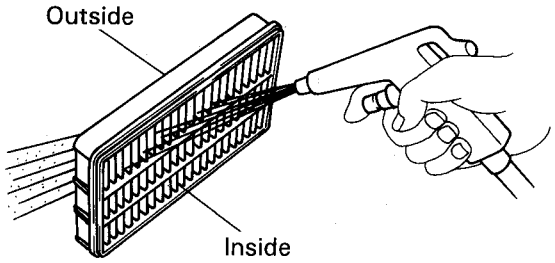
3 Does engine start?

YES

NO → Go to step 7 .

4 Check air filter.

P Remove air filter.



C Visually check that the air cleaner element is not dirty or excessively oily.

HINT: If necessary, clean element with compressed air. First blow from inside thoroughly, then blow from outside of element.

P00495

OK

NG → Repair or replace.

5 Check idle speed.

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

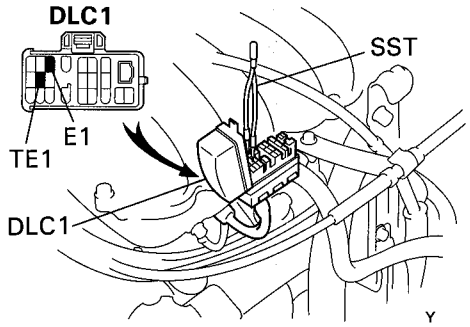
C Use CURRENT DATA to check the engine idle speed.

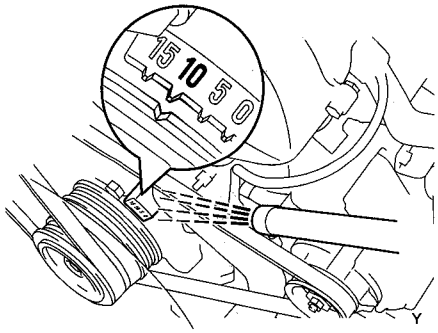
OK **Idle speed: 650 – 750 rpm**

OK

NG **Proceed to matrix chart of problem symptoms on page EG-217.**

6 Check ignition timing.





P19970
P21121

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

C Check ignition timing.

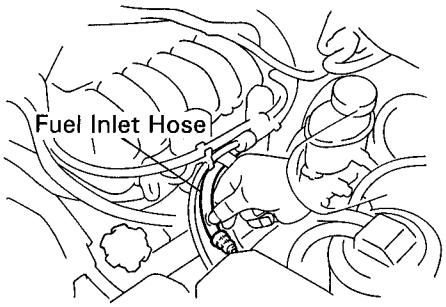
OK **Ignition timing: 8 – 12 °BTDC at idle**

OK

NG **Proceed to IG section and continue to troubleshoot.**

Proceed to matrix chart of problem symptoms on page EG-217.

7 Check fuel pressure.



P23590

P (1) Be sure that enough fuel is in the tank.
(2) Turn ignition switch ON.
(3) Connect the TOYOTA hand-held tester to DLC3 on the vehicle.
(4) Use ACTIVE TEST mode to operate the fuel pump.
(5) If you have no TOYOTA hand-held tester, connect the positive (+) and negative (−) leads from the battery to the fuel pump conncetor (See page EG-124).

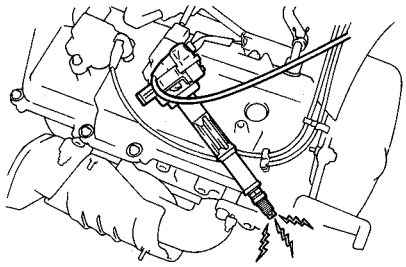
C Check for fuel pressure in the fuel inlet hose when it is pinched off.

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

OK

NG → **Proceed to page EG-121 and continue to troubleshoot.**

8 Check for spark.



P21163

P (1) Remove the ignition coil or disconnect the high-tension cord from spark plug.
(See page IG section)
(2) Remove the spark plug.
(3) Install the spark plug to the ignition coil or high-tension cord.
(4) Ground the spark plug.
(5) Disconnect the injector connector.

C Check if spark occurs while engine is being cranked.

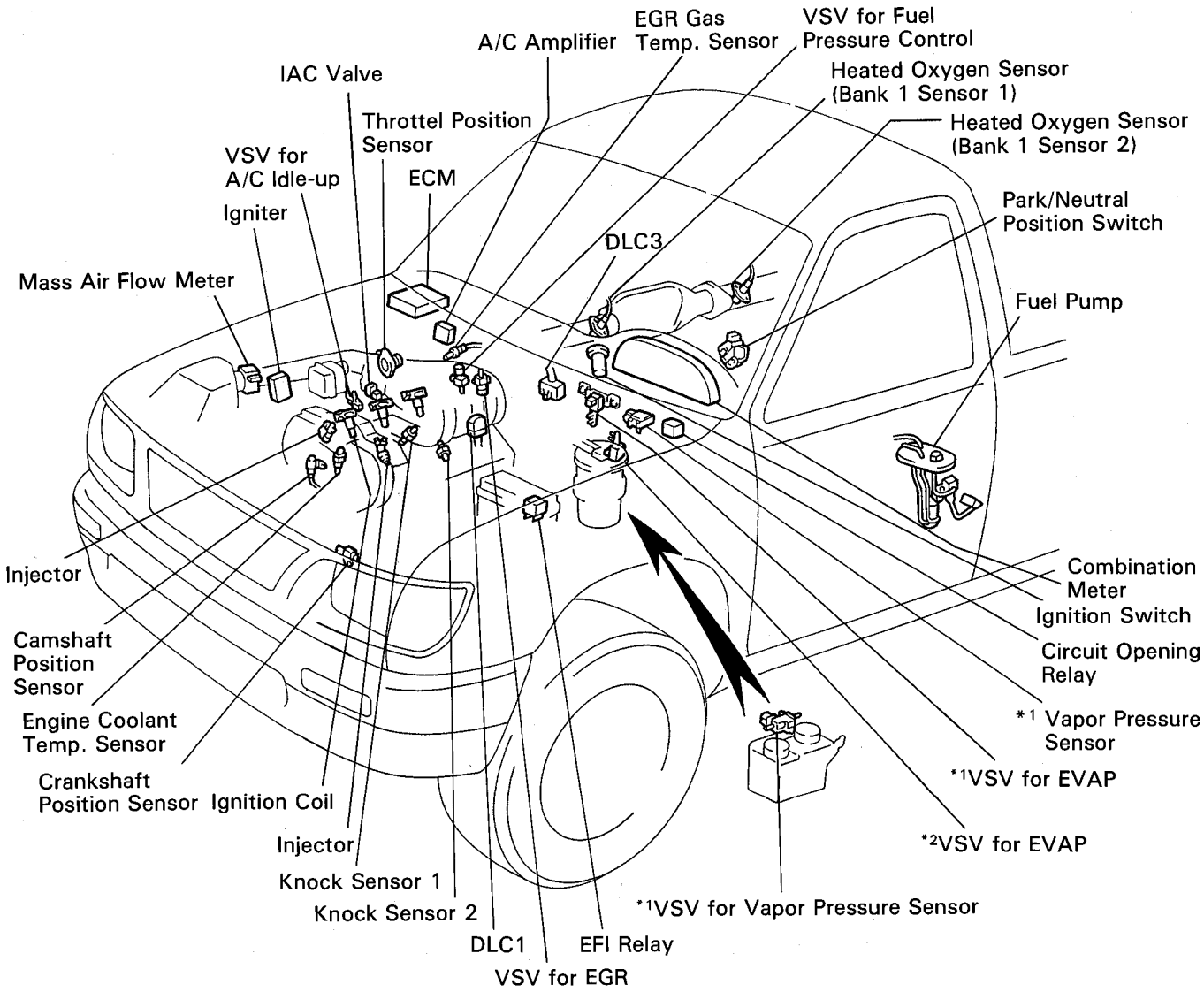
NOTICE: To prevent excess fuel being injected from the injectors during this test, don't crank the engine for more than 5 — 10 seconds at a time.

OK

NG → **Proceed to page IG section and continue to troubleshoot.**

Proceed to matrix chart of problem systems on page EG-217.

PARTS LOCATION



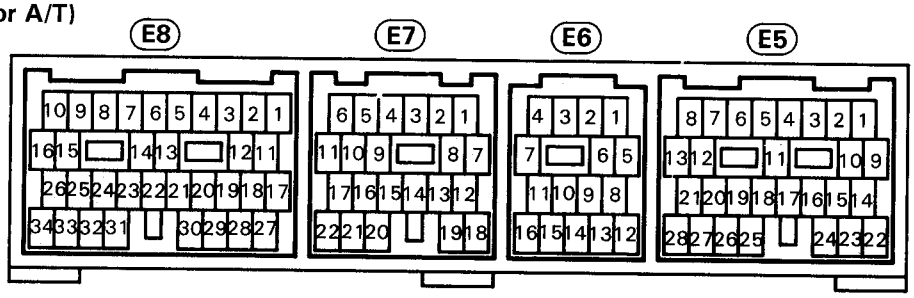
*1: 4WD
*2: 2WD

S00250

STANDARD VALUE OF ECM TERMINALS

When measuring the voltage or resistance of the connector part of the ECM, always insert the test probe into the connector from the wire harness side.

ECM Terminals (for A/T)



FI6810

Symbols (Terminals No.)	Wiring Color	STD Voltage (V)	Condition
BATT (E5-14) – E1 (E6-16)	B-Y ↔ BR	9 – 14	Always
+B (E5-22) – E1 (E6-16)	W-R ↔ BR	9 – 14	IG switch ON
VCC (E7-1) – E2 (E7-22)	G-B ↔ BR-B	4.5 – 5.5	IG switch ON
IDL (E8-32) – E2 (E7-22)	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 (E7-7) – E2 (E7-22)	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 (E7-8) – E3 (E7-18)	GR-R ↔ BR-W	1.1 – 1.5	Idling, P or N position, A/C switch OFF
THA (E7-14) – E2 (E7-22)	Y-G ↔ BR-B	0.5 – 3.4	Idling, Intake air temp. 20°C (68°F)
THW (E7-20) – E2 (E7-22)	G-R ↔ BR-B	0.2 – 1.0	Idling, Engine coolant temp. 80°C (176°F)
STA (E8-13) – E1 (E6-16)	B-W ↔ BR	6.0 or more	Cranking
#10 (E8-10) #20 (E8-9) #30 (E8-8) #40 (E8-7) #50 (E8-6) #60 (E8-5) – E01 (E8-34)	W-R W W-G Y-R W-L Y-B ↔ BR	9 – 14	IG switch ON
		Pulse generation (See page EG-243)	Idling
IGT1 (E8-24) IGT2 (E8-25) IGT3 (E8-26) – E1 (E6-16)	B-L BR-Y ↔ BR B-W	Pulse generation (See page EG-296)	Idling
IGF (E8-12) – E1 (E6-16)	B-Y ↔ BR	4.5 – 5.5	IG switch ON
		Pulse generation (See page EG-296)	Idling
G (E7-10) – G – (E7-11)	Y ↔ L	Pulse generation (See page EG-249)	Idling
NE (E7-5) – NE – (E7-6)	R ↔ G	Pulse generation (See page EG-249)	Idling
FPU (E6-9) – E1 (E6-16)	R-B ↔ BR	9 – 14	IG switch ON
		0 – 3.0	Restarting at high engine coolant temp.

Symbols (Terminals No.)	Wiring Color	STD Voltage (V)	Condition
W (E6-3) – E1 (E6-16)	V ↔ BR	9 – 14	Idling
		0 – 3.0	IG switch ON
EGR (E6-8) – E1 (E6-16)	R-W ↔ BR	9 – 14	IG switch ON
EVP1 (E6-15) – E1 (E6-16)	W-G ↔ BR	9 – 14	IG switch ON
RSC (E8-22) RSO (E8-23) – E1 (E6-16)	B-R BR-R ↔ BR	9 – 14	IG switch ON Disconnect (E8) of ECM connector
ACV (E6-10) – E1 (E6-16)	B-R ↔ BR	0 – 3.0	Idling, A/C switch ON
		9 – 14	Idling, A/C switch OFF
OX1 (E7-13) OX2 (E7-19) – E1 (E6-16)	W B ↔ BR	Pulse generation	Maintain engine speed at 2,500 rpm for 2 mins. after warming up
HT1 (E8-16) HT2 (E8-15) – E03 (E8-1)	R-G R-W ↔ W-B	Below 3.0	Idling
		9 – 14	IG switch ON
KNK1 (E7-17) KNK2 (E7-16) – E1 (E6-16)	B GR ↔ BR	Pulse generation (See page EG-248)	Idling
NSW (E8-14) – E1 (E6-16)	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 (E5-12) – E1 (E6-16)	G-O ↔ BR	Pulse generation	IG switch ON Rotate driving wheel slowly
TE1 (E6-5) – E1 (E6-16)	V-W ↔ BR	9 – 14	IG switch ON
ACT (E5-5) – E1 (E6-16)	L-B ↔ BR	9 – 14	Idling, A/C switch ON
		Below 2.0	Idling, A/C switch OFF
AC1 (E5-20) – E1 (E6-16)	L-Y ↔ BR	Below 2.0	Idling, A/C switch ON
		9 – 14	Idling, A/C switch OFF
THG (E7-21) – E2 (E7-22)	P-G ↔ BR-B	4.5 – 5.5	IG switch ON
FC (E6-4) – E1 (E6-16)	G-Y ↔ BR	9 – 14	IG switch ON
		0 – 3.0	Idling
SDL (E5-18) – E1 (E6-16)	W ↔ BR	Pulse generation	During transmission
*TPC (E6-13) – E1 (E6-16)	GR-G ↔ BR	9 – 14	IG switch ON
*PTNK (E7-15)– E2 (E7-22)	R-Y ↔ BR-B	2.9 – 3.7	IG switch ON
		Below 0.5	Apply vacuum (less than 66.7 kPa, 500 mm Hg, 19.7 in.Hg)

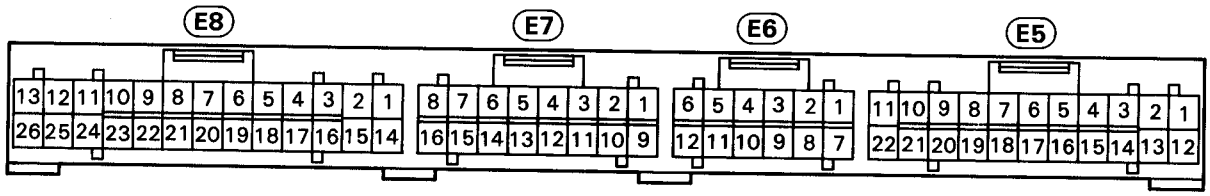
*: Only for 4WD models

EG

STANDARD VALUE OF ECM TERMINALS (Cont'd)

When measuring the voltage or resistance of the connector part of the ECM, always insert the test probe into the connector from the wire harness side.

ECM Terminals (for M/T)



FI6526

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-B ↔ 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 (E7-8)	GR-R ↔ BR-W	1.1 – 1.5	Idling, N position, 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) #20 (E8-11) #30 (E8-25) #40 (E8-10) #50 (E8-9) #60 (E8-8) – E01 (E8-13)	W-R W W-G Y-R W-L Y-B ↔ BR	9 – 14	IG switch ON
		Pulse generation (See page EG-243)	Idling
IGT1 (E8-23) IGT2 (E8-22) IGT3 (E8-21) – E1 (E8-24)	B-L BR-Y B-W ↔ BR	Pulse generation (See page EG-296)	Idling
IGF (E8-17) – E1 (E8-24)	B-Y ↔ BR	4.5 – 5.5	IG switch ON Disconnect igniter connector
		Pulse generation (See page EG-296)	Idling
G (E6-11) – G – (E6-5)	Y ↔ L	Pulse generation (See page EG-249)	Idling
NE (E6-12) – NE – (E6-6)	R ↔ G	Pulse generation (See page EG-249)	Idling
FPU (E8-19) – E1 (E8-24)	R-B ↔ BR	9 – 14	IG switch ON
		0 – 3.0	Restarting at high engine coolant temp.

Symbols (Terminals No.)	Wiring Color	STD Voltage (V)	Condition
W (E5-4) – E1 (E8-24)	V ↔ BR	9 – 14	Idling
		0 – 3.0	IG switch ON
EGR (E8-18) – E1 (E8-24)	R-W ↔ BR	9 – 14	IG switch ON
EVP1 (E8-5) – E1 (E8-24)	W-G ↔ BR	9 – 14	IG switch ON
RSC (E8-6) RSO (E8-7) – E1 (E8-24)	B-R BR-R ↔ BR	9 – 14	IG switch ON Disconnect (E8) of ECM connector
ACV (E8-2) – E1 (E8-24)	B-R ↔ BR	0 – 3.0	Idling, A/C switch ON
		9 – 14	Idling, A/C switch OFF
OX1 (E7-5) OX2 (E7-13) – E1 (E8-24)	W B ↔ BR	Pulse generation	Maintain engine speed at 2,500 rpm for 2 mins. after warming up
HT1 (E6-3) HT2 (E6-9) – E03 (E6-7)	R-G R-W ↔ BR	Below 3.0	Idling
		9 – 14	IG switch ON
KNK1 (E7-6) KNK2 (E7-3) – E1 (E8-24)	B GR ↔ BR	Pulse generation (See page EG-248)	Idling
SP1 (E5-8) – E1 (E8-24)	G-O ↔ BR	Pulse generation	IG switch ON Rotate driving wheel slowly
TE1 (E7-7) – E1 (E8-24)	V-W ↔ BR	9 – 14	IG switch ON
ACT (E5-6) – E1 (E8-24)	L-B ↔ BR	9 – 14	Idling, A/C switch ON
		Below 2.0	Idling, A/C switch OFF
AC1 (E5-7) – E1 (E8-24)	L-Y ↔ BR	Below 2.0	Idling, A/C switch ON
		9 – 14	Idling, A/C switch OFF
THG (E7-14) – E2 (E7-9)	P-G ↔ BR-B	4.5 – 5.5	IG switch ON
FC (E8-14) – E1 (E8-24)	G-Y ↔ BR	9 – 14	IG switch ON
		0 – 3.0	Idling
SDL (E5-19) – E1 (E8-24)	W ↔ BR	Pulse generation	During transmission
*TPC (E8-3) – E1 (E8-24)	GR-G ↔ BR	9 – 14	IG switch ON
*PTNK (E6-4) – 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 mm Hg, 19.7 in.Hg)

*: Only for 4WD models

EG

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*
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: 14.9 ~ 21.3% Racing without load (2,500 rpm): 16.5 ~ 23.5%
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 12.5 ~ 22°
INTAKE AIR	Intake Air Temp. Sensor Value	Equivalent to ambient temp.
MAF	Air Flow Rate Through Mass Air Flow Meter	Idling: 3.2 ~ 4.6 gm/sec. Racing without load (2,500 rpm): 12.9 ~ 18.3 gm/sec.
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

*: 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.

TOYOTA Enhanced Signals

TOYOTA hand-held tester display	Measurement Item	Normal Condition*
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: 1.82 ~ 3.15 ms
IAC DUTY RATIO	Intake Air Control Valve Duty Ratio Opening ratio rotary solenoid type IAC valve	Idling: 22 ~ 46%
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
PNP SW	Park/Neutral Position Switch Signal	P or N position: 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 #6	Ratio of revolution variation for each cylinder when variation is large	0%
IGNITION	Ignition rate for all cylinders every 1,000 revolutions	0 ~ 3,000

*: 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.

TOYOTA Enhanced Signals (Cont'd)

TOYOTA hand-held tester display	Measurement Item	Normal Condition*
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
FUEL PRES UP VSV	Fuel Pressure Up VSV Signal	High temp. restarting: ON
A/C CUT SIG	A/C Cut Signal	A/C S/W OFF: ON
FUEL PUMP	Fuel Pump Signal	Idling: ON
A/C IDLE UP VSV	A/C Idle-Up Signal	A/C S/W ON & D position & headlight ON: ON
EVAP (PURGE) VSV	EVAP VSV Signal	VSV operating: ON
TOTAL FT B1	Total Fuel Trim Bank 1: Average value for fuel trim system of bank 1	Idling: 0.8 ~ 1.2
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 msec.
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 msec.

*: 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.

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.

Symptom	Suspect area	Starter signal circuit	ECM power source circuit	Fuel pump control circuit	Fuel pressure control circuit	A/C idle-up circuit	Starter and starter relay	Compression	A/T faulty	Engine control module (ECM)
	See page	EG-299	EG-304	EG-309	EG-314	EG-306	ST-26, 27	EG-7	AT-55	IN-29
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		3	2					
Poor idling	High engine idle speed		2			1				
	Low engine idle speed			2		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				2

EG

CIRCUIT INSPECTION

DTC P0100 Mass Air Flow Circuit Malfunction

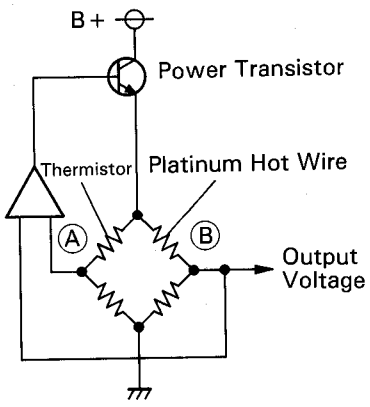
CIRCUIT DESCRIPTION

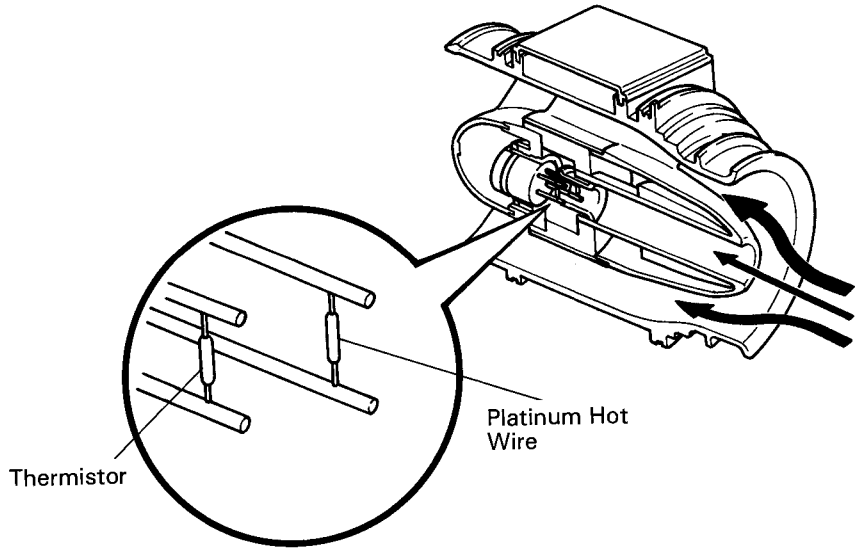
The mass air flow meter uses a platinum hot wire. The hot wire air flow meter consists of a platinum hot wire, thermistor and a control circuit installed in a plastic housing. The hot wire air flow meter works on the principle that the hot wire and thermistor located in the intake air bypass of the housing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

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.

EG

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 Ⓐ and Ⓑ remains equal to maintain the set temperature.





FI6929 FI6972

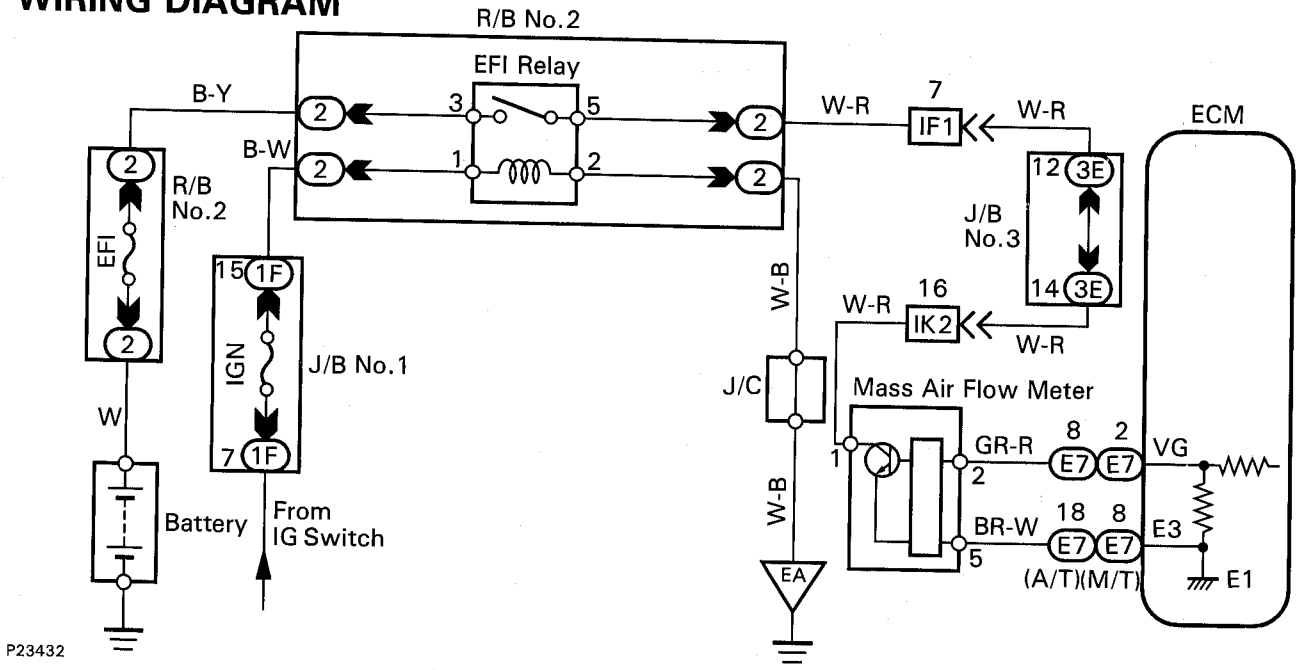
DTC No.	DTC Detecting Condition	Trouble Area
P0100	Open or short in mass air flow meter circuit with engine speed 4,000 rpm or less	• Open or short in mass air flow meter circuit • Mass air flow meter • ECM

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 open • VG circuit open or short
11.0 ~ 25.1 (idling after warmed up)	• E3 circuit open

WIRING DIAGRAM



INSPECTION PROCEDURE

1 **Connect the OBD II scan tool to TOYOTA hand-held tester, and read value of mass air flow rate.**

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

C Read mass air flow rate on the OBD II scan tool or TOYOTA hand-held tester.

Result

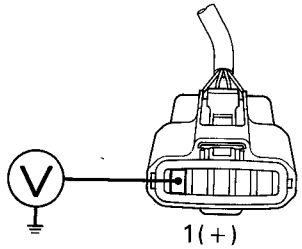
	Type I	Type II
Mass air flow rate(gm/sec.)	Approx. 0	11.0 ~ 25.1 (idling after warmed up)

Type I

Type II → **Go to step 5 .**

2 **Check voltage of mass air flow meter power source.**

ON



BE6653
P24310

P (1) Disconnect the mass air flow meter connector.
(2) Turn ignition switch ON.

C Measure voltage between terminal 1 of mass air flow meter connector and body ground.

OK **Voltage: 9 – 14 V**

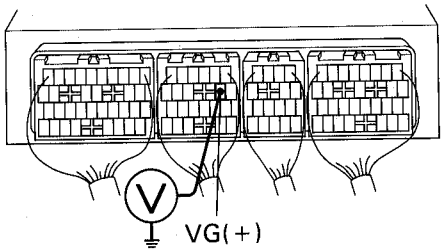
OK

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

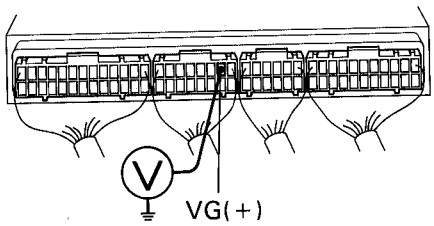
EG

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

For A/T



For M/T



P24311
P23805

P (1) Remove glove compartment (See page EG-161).
(2) Start the engine.

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

OK **Voltage: 1.1 – 1.5 V (P or V position and A/C switch OFF)**

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).

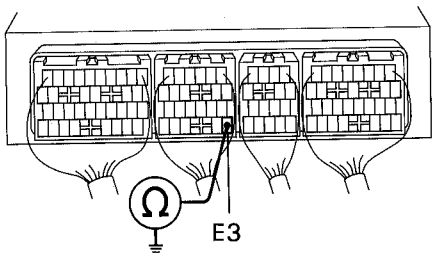
OK

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

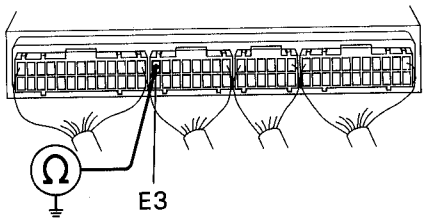
Replace mass air flow meter.

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

For A/T



For M/T



P24312
P24313

P Remove glove compartment (See page EG-161).

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

OK **Continuity (1Ω or less)**

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.

DTC P0101 Mass Air Flow Circuit Range/ Performance Problem

CIRCUIT DESCRIPTION

Refer to Mass Air Flow Circuit Malfunction on page EG-218.

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-219.

INSPECTION PROCEDURE

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

NO

YES → Go to relevant DTC chart.

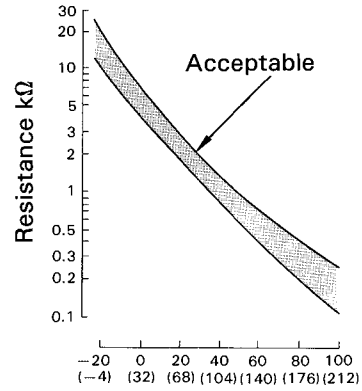
Replace mass air flow meter.

DTC P0110 Intake Air Temp. Circuit Malfunction

CIRCUIT DESCRIPTION

The intake air temp. sensor is built into the air flow meter 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 temperature is assumed to be 20°C (68°F).

(fig-1)



FI4741

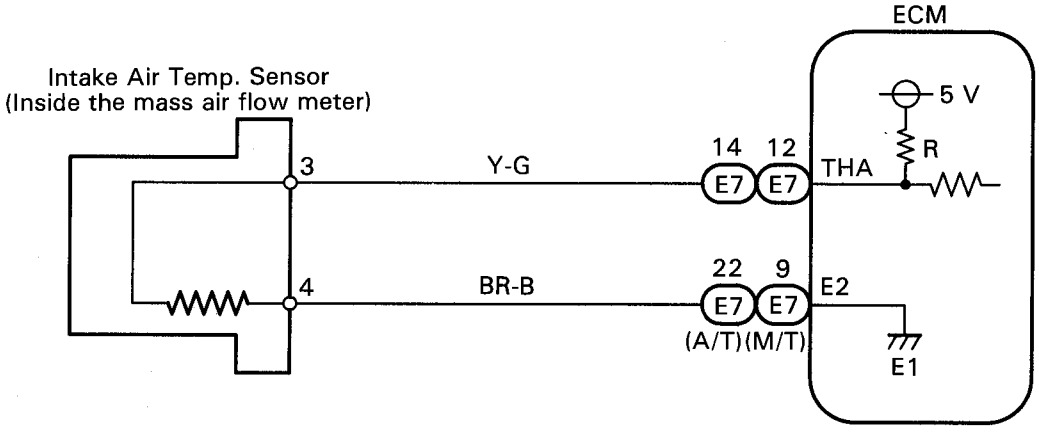
Intake Air Temp. °C (°F)	Resistance (kΩ)	Voltage (V)
−20 (−4)	16.2	4.3
0 (32)	5.9	3.4
20 (68)	2.5	2.4
40 (104)	1.1	1.4
60 (140)	0.6	0.9
80 (176)	0.3	0.5
100 (212)	0.1	0.2

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



P19948

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 switch the 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.

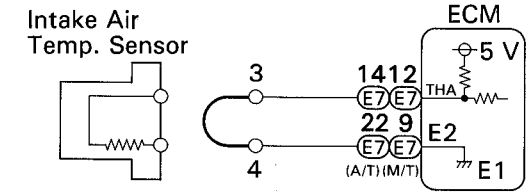
OK

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-205).

2 Check for open in harness or ECM.

ON



BE6653
P19555

P (1) Disconnect the mass air flow meter 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.

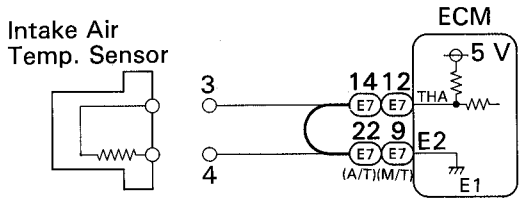
OK **Temperature value: 140°C (284°F) or more.**

NG

OK → **Confirm good connection at sensor. If OK, replace mass air flow meter.**

3 Check for open in harness or ECM.

ON



P (1) Remove glove compartment (See page EG-161).
(2) Connect between terminals THA and E2 of ECM conncetor.

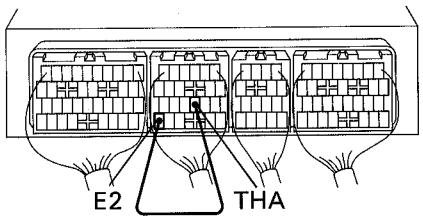
HINT: Mass air flow meter connector is disconnected. Before checking, do a visual and contact pressure check for the ECM connector (See page EG-206).

(3) Turn ignition switch ON.

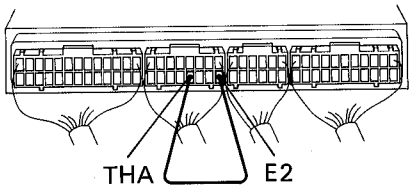
C Read temperature value on the OBD II scan tool or TOYOTA hand-held tester.

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

For A/T



For M/T



BE6653
P19553
P20199
P20223

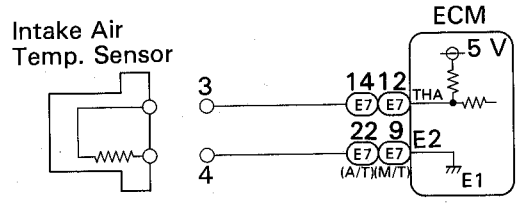
NG

OK **Open 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.

ON



P (1) Disconnect the mass air flow meter 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).**

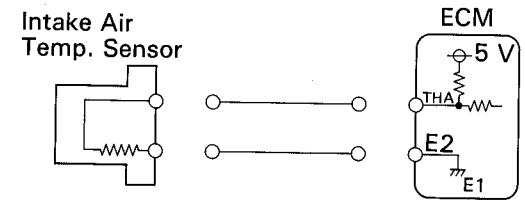
BE6653
P19554

NG

OK **Replace mass air flow meter.**

5 **Check for short in harness or ECM.**

ON



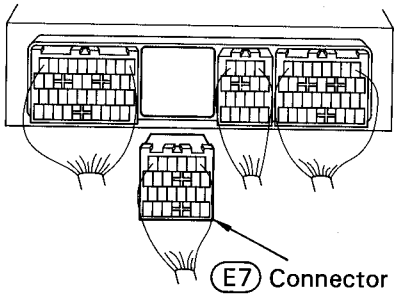
P (1) Remove glove compartment (See page EG-161).
(2) Disconnect the (E7) connector of ECM.
HINT: Mass air flow meter connector is disconnected.
(3) Turn ignition switch ON.

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

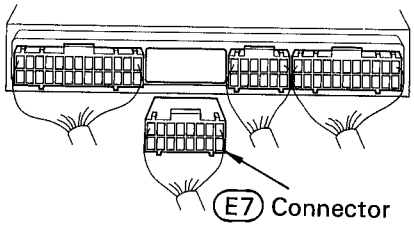
OK **Temperature value: −40°C (−40°F).**

EG

For A/T



For M/T



BE6653
FI7056
FI7034
P17747

NG

OK **Repair or replace harness or conncetor.**

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-222.
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).

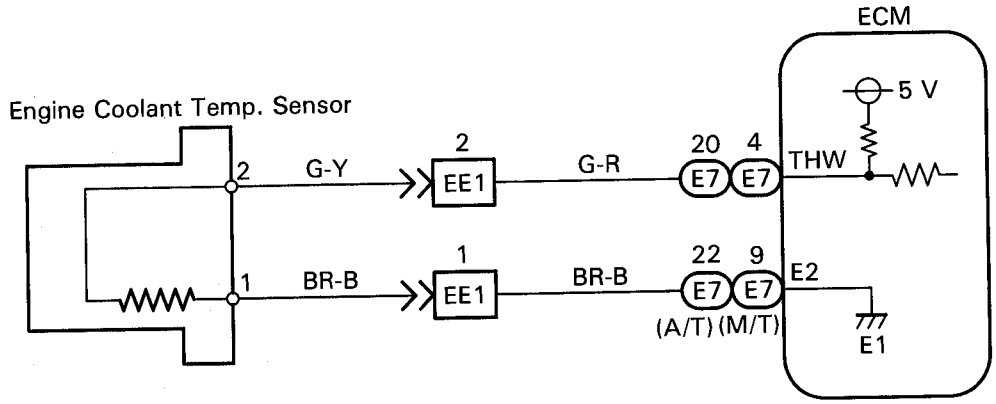
DTC No.	DTC Detecting Condition	Trouble Area
P0115	Open or short in engine coolant temp. sensor circuit	• Open or short in engine coolant temp. sensor circuit • Engine coolant temp. sensor • ECM

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°C (284°F) or more	Short circuit

WIRING DIAGRAM

EG



P19947

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 switch the 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.

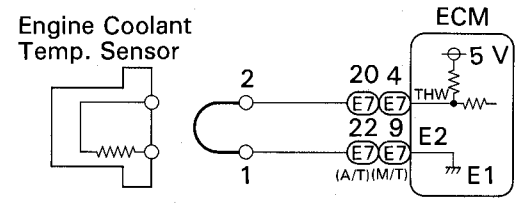
OK

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-205).

2 Check for open in harness or ECM.

ON



BE6653
P19555

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.

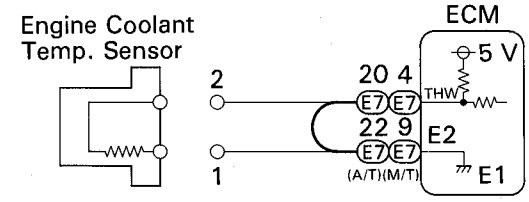
OK **Temperature value: 140°C (284°F) or more**

NG

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

3 Check for open in harness or ECM.

ON

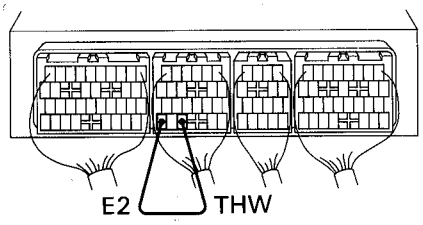


P (1) Remove glove compartment (See page EG-161).
(2) Connect between terminals THW and E2 of ECM conncetor.
HINT: Engine coolant temp. sensor connector is disconnected. Before checking, do a visual and contact pressure check for the ECM connector (See page EG-206).
(3) Turn ignition switch ON.

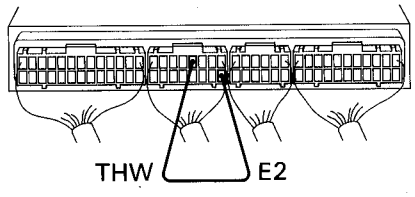
C Read temperature value on the OBD II scan tool or TOYOTA hand-held tester.

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

For A/T



For M/T



BE6653
P19553
P20200
P20224

NG

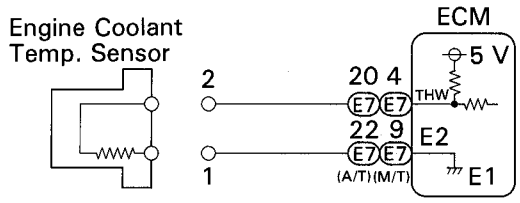
OK → **Open in harness between terminals E2 or THW, repair or replace harness.**

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

EG

4 Check for short in harness and ECM.

ON



BE6653
P19554

P (1) Disconnect the engine coolant temp. sensor connector.
(2) Turn ignition switch ON.

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

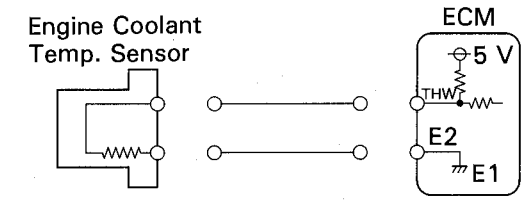
OK **Temperature value: −40°C (−40°F)**

NG

OK → **Replace engine coolant temp. sensor.**

5 Check for short in harness or ECM.

ON

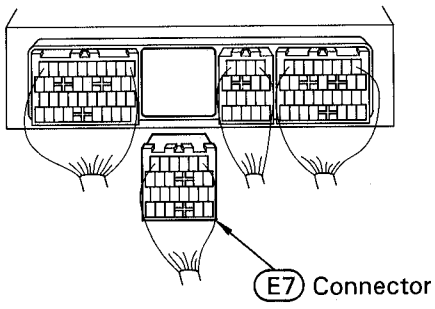


P (1) Remove glove compartment (See page EG-161).
(2) Disconnect the (E7) connector of ECM.
HINT: Engine coolant temp. sensor connector is disconnected.
(3) Turn ignition swith ON.

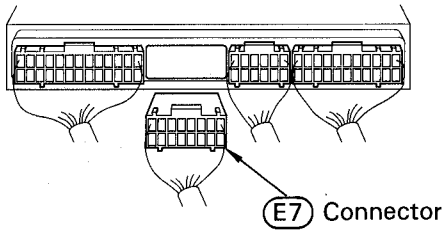
C Read temperature value on the OBD II scan tool or TOYOTA hand-held tester.

OK **Temperature value: −40°C (−40°F)**

For A/T



For M/T



BE6653
FI7056
FI7034
P17747

NG

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

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

DTC P0116 Engine Coolant Temp. Circuit Range/ Performance Problem

CIRCUIT DESCRIPTION

Refer to Engine Coolant Temp. Circuit Malfunction on page EG-225.

DTC No.	DTC Detecting Condition	Trouble Area
P0116	20 min. or more after starting engine, engine coolant temp. sensor value is 35°C (95°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 problem) 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

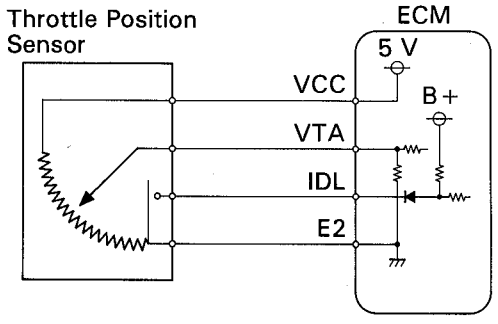
YES → Go to relevant DTC chart.

Replace engine coolant temp. sensor (See page EG-153).

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 0.7 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 2.7 – 5.2 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

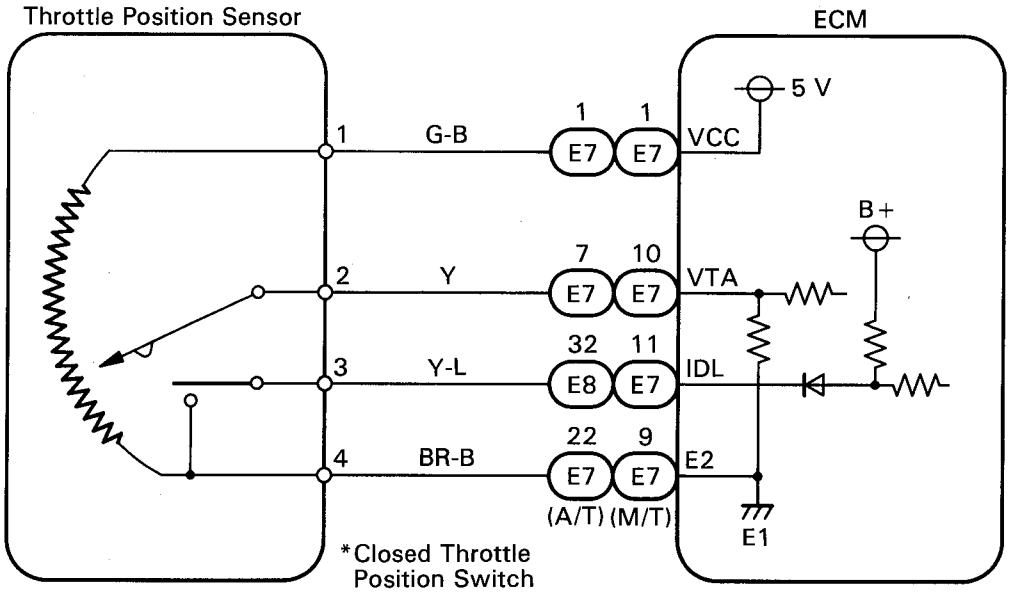
DTC No.	DTC Detecting Condition	Trouble Area
P0120	Condition (a) or (b) continues: (a) VTA < 0.1 V, and closed throttle position switch is OFF (b) VTA > 4.9 V	• Open or short in throttle position sensor circuit • Throttle position sensor • ECM

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
Approx. 99%	Approx. 100%	E2 line open

EG

WIRING DIAGRAM



P19954

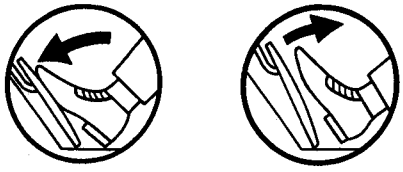
INSPECTION PROCEDURE

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 switch the OBD II scan tool or TOYOTA hand-held tester main switch ON.

C Read the throttle valve opening percentage.



FI7052

OK

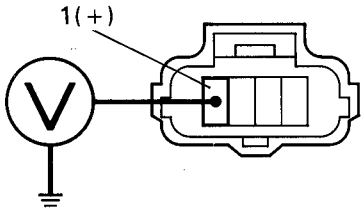
Throttle valve	Throttle valve opening position expressed as percentage
Fully open	Approx. 75%
Fully closed	Approx. 10%

NG

OK → **Check for intermittent problems (See page EG-205).**

2 Check voltage between terminal 1 of wire harness side connector and body ground.

ON



BE6653
P23808

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

C Measure voltage between terminal 1 of wire harness side connector and body ground.

OK **Voltage: 4.5 – 5.5 V**

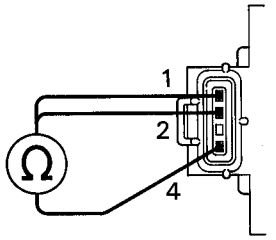
OK

NG **Go to step 5 .**

EG

3 Check throttle position sensor.

Throttle Position Sensor



P23809

P Disconnect the throttle positon 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

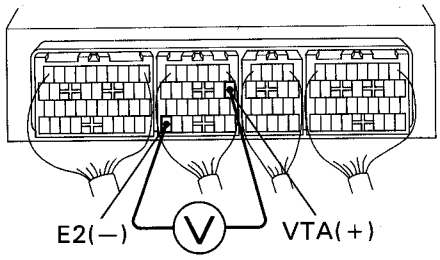
OK

NG **Replace throttle position sensor.**

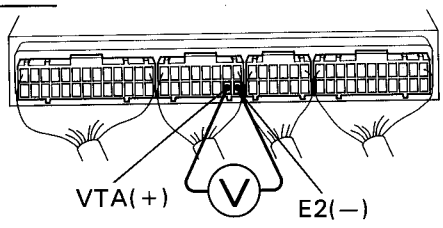
4 Check voltage between terminals VTA and E2 of ECM.

ON

For A/T



For M/T



BE6653
P24315
P23811

P (1) Remove glove compartment (See page EG-161).
(2) Turn ignition switch ON.

C Measure voltage between terminals VTA and E2 of ECM.

OK

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

OK

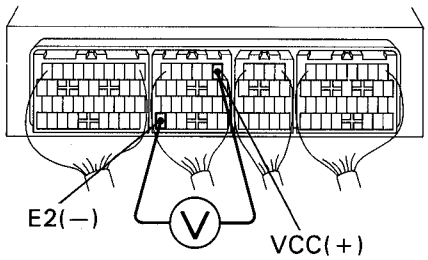
NG **Check for open and short in harness and connector between ECM and throttle position sensor (VTA line) (See page IN-24).**

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

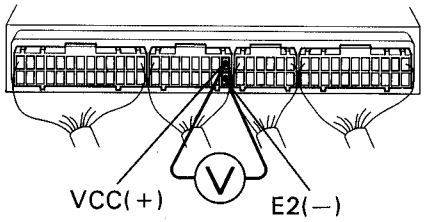
5 **Check voltage between terminals VCC and E2 of ECM.**

ON

For A/T



For M/T



BE6653
P24316
P23813

P (1) Remove glove compartment (See page EG-161).

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

OK **Voltage: 4.5 − 5.5 V**

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

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

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-229.

DTC No.	DTC Detecting Condition	Trouble Area
P0121	While the vehicle speed drops from 30 km/h (19 mph) or more to 0 km/h (0 mph), the output value of the throttle position sensor is out of the applicable range (2 trip detection logic)	• Throttle position sensor

INSPECTION PROCEDURE

1 **Are there any other codes (besides DTC P0121) being output?**

NO → **Replace throttle position sensor.**

YES → **Go to relevant DTC chart.**

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.

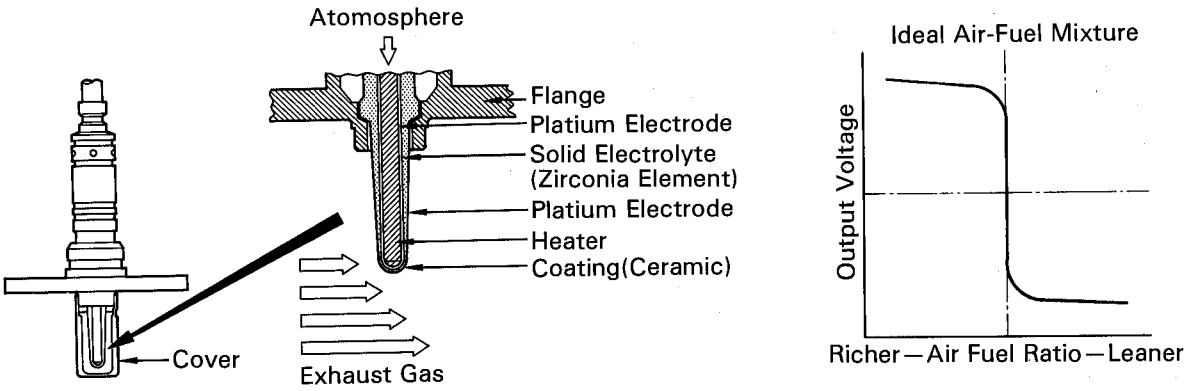
The oxygen sensor has the characteristic whereby its output voltage changes suddenly in the vicinity of the stoichiometric air-fuel ratio. This characteristic is used to detect the oxygen concentration in the exhaust gas and provide feedback to the computer for control of the air-fuel ratio.

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 perfrom accurate air-fuel ratio control.

The 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.

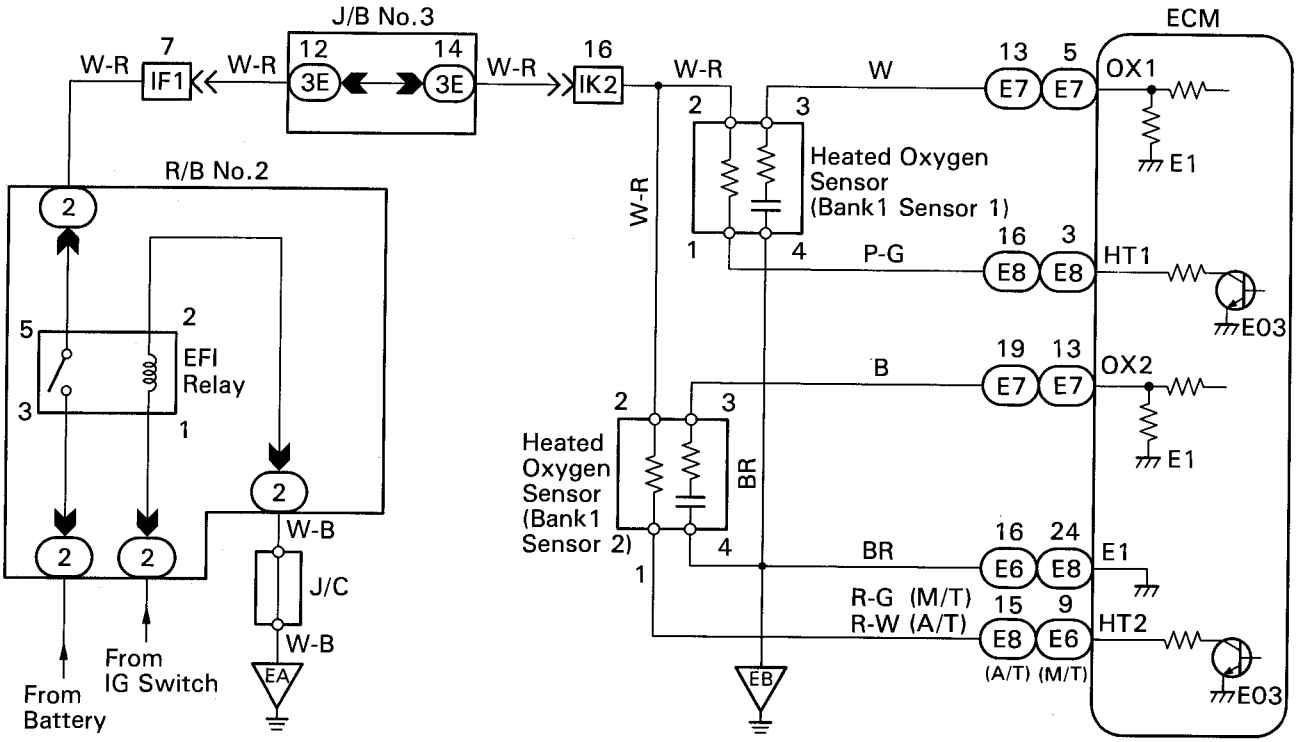


P21242
FI7210

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), (c) and (d) continue for at least 1.5 minutes (a) Engine speed: 1,500 rpm or more (b) Vehicle speed: 40 km/h (25 mph) or more (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



P23433

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 (bank 1 sensor 1) 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 → **Replace heated oxygen sensor.**

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

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-233.

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

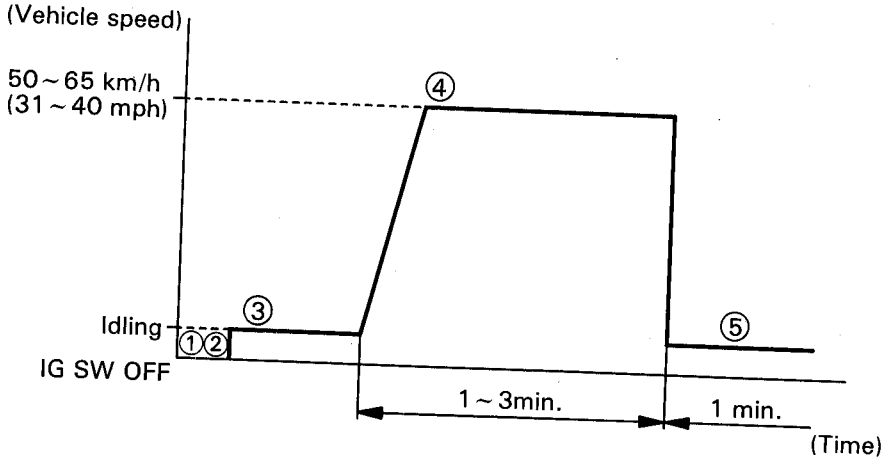
HINT: Sensor 1 refers to the sensor closer to the engine body.
The heated oxygen sensor's output voltage and the short-term fuel trim value can be read using the OBD II scan tool or TOYOTA hand-held tester.

EG

WIRING DIAGRAM

Refer to page EG-234 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-198).
③ Start the engine and warm it up with all accessory switches OFF.
④ Drive the vehicle at 50 ~ 65 km/h (31 ~ 40 mph) for 1 ~ 3 min. to warm up the heated oxygen sensor.
⑤ Let the engine idle for 1 min.

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, them 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 → **2**

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

2 **Check for heated oxygen sensor data.**

EG

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 → **3**

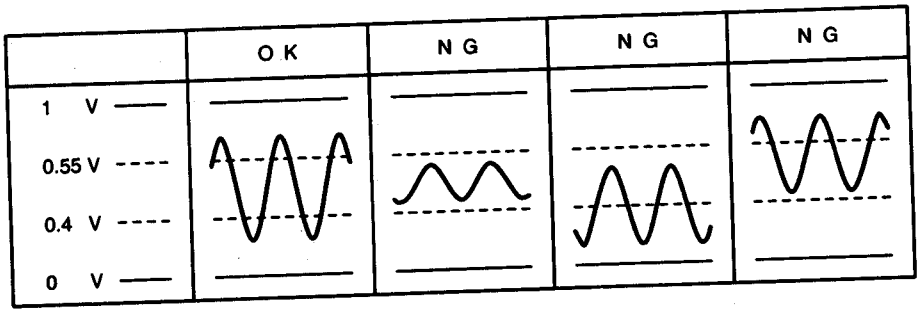
①,② → **Check fuel trim system. (See page EG-239)**

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).



T

P18349

NG → **Replace heated oxygen sensor.**

OK → **Perform confirmation driving pattern. (See page EG-235)**

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-233.

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.

EG

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-233.

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

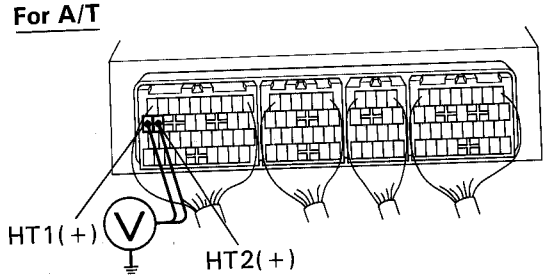
Refer to page EG-234 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

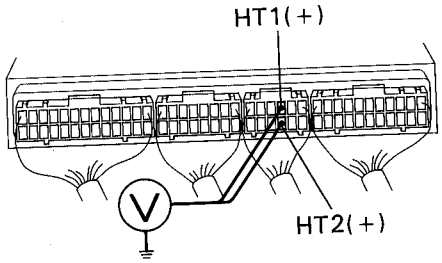
1 **Check voltage between terminals HT1, HT2 of ECM connector and body ground.**

ON

For A/T



For M/T



BE6653
P24317
P24318

P (1) Remove glove compartment (See page EG-161).
(2) Trun igintion switch ON.

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

HINT: Connect terminal HT1 to bank 1 sensor 1.
Connect terminal HT2 to bank 1 sensor 2.

OK **Voltage: 9 – 14 V**

NG

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

2 **Check resistance of heated oxygen sensor heater (See page EG-159).**

OK

NG → **Replace heated oxygen sensor.**

Check and repair harness or connector between EFI relay and heated oxygen sensor and ECM (See page IN-24).

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-233.

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-234 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 reced.

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.

EG

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 ±25 %, the system is functioning normally.

INSPECTION PROCEDURE

1 Check air induction system (See page EG-117).

OK → Proceed to 2

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 → Proceed to 3

③ → Check for heated oxygen sensor (See page EG-235).

3 Check fuel pressure (See page EG-122).

OK → Proceed to next circuit inspection shown in problem symptoms table

NG → Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page EG-121).

4	Check injector injection (See page EG-131).

OK

NG → Replace injector.

5	Check mass air flow meter and engine coolant temp. sensor. (See page EG-218, 225)

OK

NG → Repair or replace.

6	Check for spark and ignition (See page IG-17).

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
DTC	P0305	Cylinder 5 Misfire Detected
DTC	P0306	Cylinder 6 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.

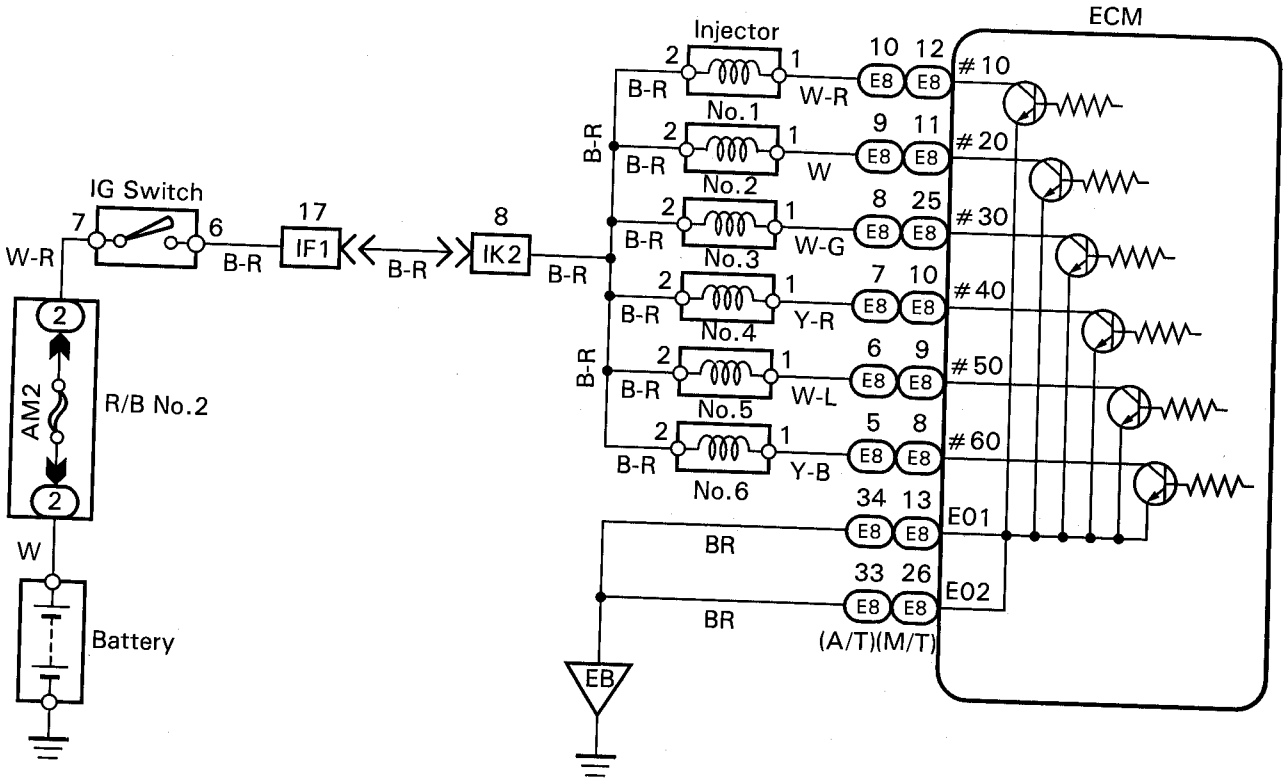
The ECM counts the number of times the engine speed change rate indicates that misfire has occurred. When the misfire rate equals or exceeds the count indicating that the engine condition has deteriorated, the MIL lights up.

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 the 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 P0305 P0306	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 emission (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



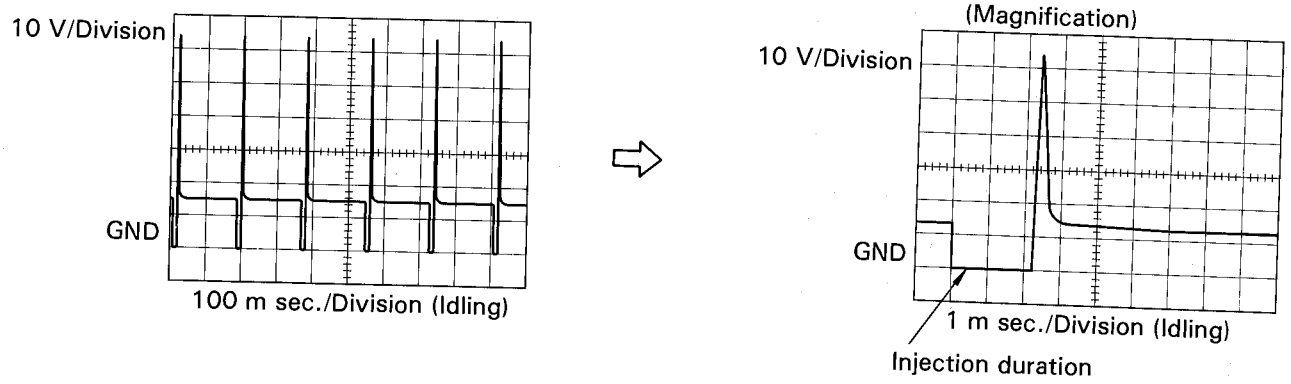
P23434

Reference INSPECTION USING OSCILLOSCOPE

INJECTOR SIGNAL WAVEFORM

- With the engine idling, measure between terminals #10 ~ #60 and E01 of ECM.

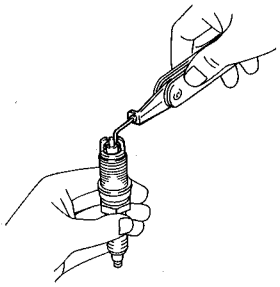
HINT: The correct waveform is as shown.



FI6588 FI6538

INSPECTION PROCEDURE

1 Check spark plug and spark of misfiring cylinder.

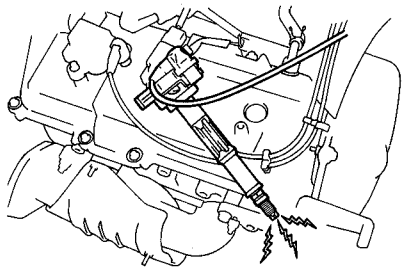


P20584

P (1) Remove ignition coil and high-tension cord.
(2) Remove spark plug.

C (1) Check spark plug type.
(2) Check for carbon deposits on electrode.
(3) Check electrode gap.

OK **(1) Twin ground electrodes type.**
Recommended spark plug: ND K16TR11
NGK BKR5EKB-11
(2) No large carbon deposit present.
Not wet with gasoline or oil.
(3) Electrode gap: 1.0 — 1.1 mm
(0.039 — 0.043 in.)



P21163

P (1) Install the spark plug to the ignition coil or hightension cord.
(2) Ground the spark plug.
(3) Disconnect injector connector.

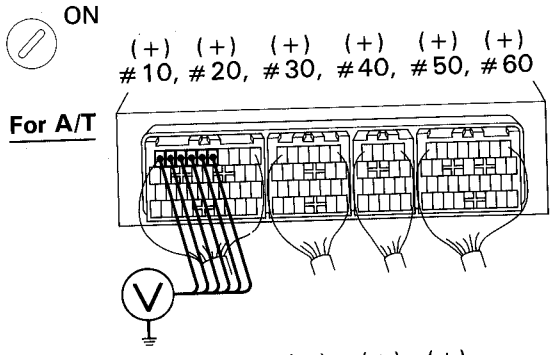
C Check if spark occurs while engine is being cranked.

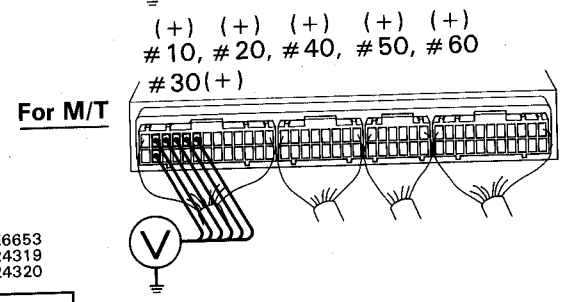
NOTICE: To prevent excess fuel being injected from the injectors during this test, don't crank the engine for more than 5 — 10 seconds at a time.

OK **Spark jumps across electrode gap.**

OK → **NG** → **Replace or check ignition system (See page IG-17).**

2 Check voltage of ECM terminal for injector of failed cylinder.





BE6653
P24319
P24320

P (1) Remove glove compartment (See page EG-161).
(2) Trun ignition switch ON.

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

OK **Voltage: 9 — 14 V**

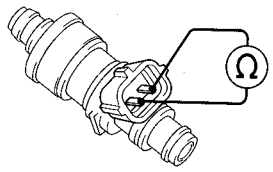
NG → **OK** → **Go to step 4.**

3 Check injector of misfiring cylinder.

P Disconnect injector connector (See page EG-130).

C Measure resistance of injector.

OK Resistance: At 20°C (68°F): Approx. 13.8 Ω



P24321

OK → **4** Check fuel pressure (See page EG-122).

NG → Replace injector.

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

OK → **5** Check injector injection (See page EG-131).

NG → Check and repair fuel pump, pressure regulator, fuel pipe line and filter (See page EG-121).

OK → **6** Check EGR system (See page EG-111).

NG → Repair EGR system.

OK → **7** Check mass air flow meter and engine coolant temp. sensor (See page EG-218, 225).

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-25)

EG

DTC P0325 Knock Sensor 1 Circuit Malfunction

DTC P0330 Knock Sensor 2 Circuit Malfunction

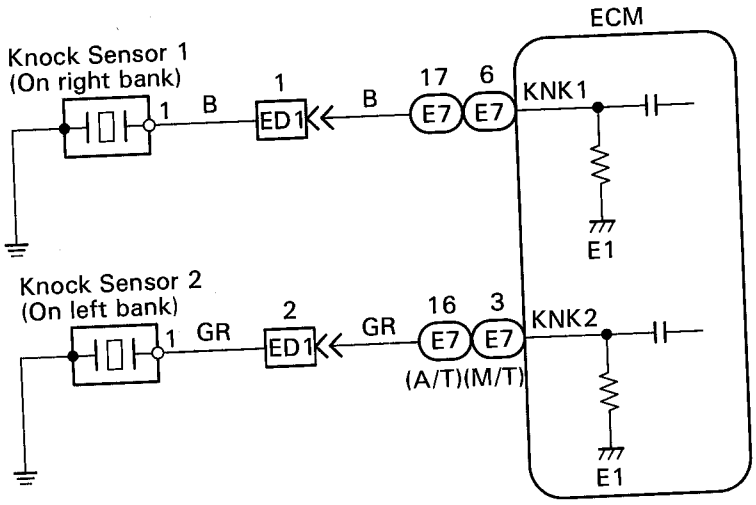
CIRCUIT DESCRIPTION

Knock sensors are fitted one each to the right bank and left bank of the cylinder block to detect engine knocking. This sensor contains a piezoelectric element which generates a voltage when it becomes deformed, which occurs when the cylinder block vibrates due to knocking. If engine knocking occurs, ignition timing is retarded to suppress it.

DTC No.	DTC Detecting Condition	Trouble Area
P0325	No knock sensor 1 signal to ECM with engine speed 2,000 rpm or more	• Open or short in knock sensor 1 circuit • Knock sensor 1 (looseness) • ECM
P0330	No knock sensor 2 signal to ECM with engine speed 2,000 rpm or more	• Open or short in knock sensor 2 circuit • Knock sensor 2 (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

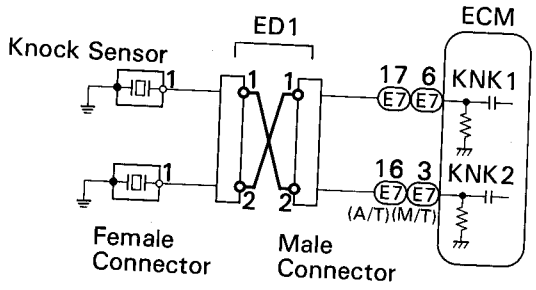


P19919

INSPECTION PROCEDURE

HINT: DTC P0325 is for the right bank knock sensor circuit.
DTC P0330 is for the left bank knock sensor circuit.

1 Connect the OBD II scan tool or TOYOTA hand-held tester and check the knock sensor circuit.

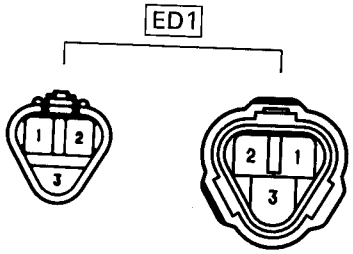


P

(1) Connect the OBD II scan tool or TOYOTA hand-held tester to the DLC3.
(2) Disconnect the wire to wire connector ED1.
(3) Connect the terminals of the disconnected ED1 male connector and ED1 female as follows.

Male connector ↔ Female connector
Terminal 1 ↔ Terminal 2
Terminal 2 ↔ Terminal 1

(4) Turn ignition switch ON and switch the OBD II scan tool or TOYOTA hand-held tester main switch ON.
(5) After the engine is warmed up, perform quick racing (4,000 rpm) three times.



C Check the DTC.

Result

Type I	DTC same as when vehicle brought in. P0325→P0325 or P0330→P0330
Type II	DTC different to when vehicle brought in. P0325→P0330 or P0330→P0325

P20457
Ie-3-1-K
Ie-3-2-K

Type I

Type II → **Go to step 3.**

2 Check for open and short in harness and connector between ED1 connector and ECM (See page IN-24).

OK

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

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

EG

3	Check for open and short in harness and connector between ED1 connector and knock sensor (See page IN-24).

HINT: If DTC P0325 has changed to P0330, check the knock sensor circuit on the right bank side.
If DTC P0330 has changed to P0325, check the knock sensor circuit on the left bank side.

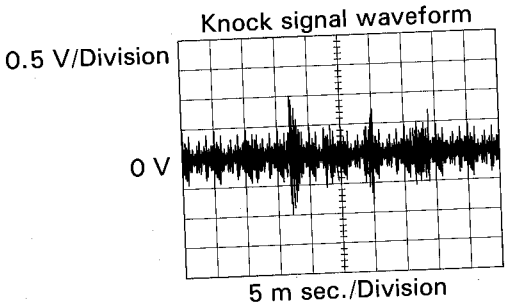
OK

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

EG

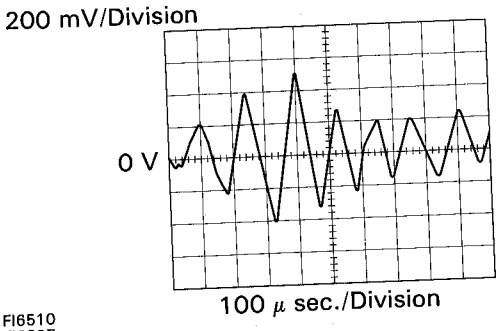
Replace knock sensor.

Reference INSPECTION USING OSCILLOSCOPE



- With the engine racing (4,000 rpm) measure between terminals KNK1, KNK2 of ECM and body ground.

HINT: The correct waveform appears as shown in the illustration on the left.



- Spread the time on the horizontal axis, and confirm that period of the wave is 141 μ sec.
(Normal mode vibration frequency of knock sensor: 7.1 KHz).

HINT: If normal mode vibration frequency is not 7.1 kHz, the sensor is malfunctioning.

FI6510
FI6607

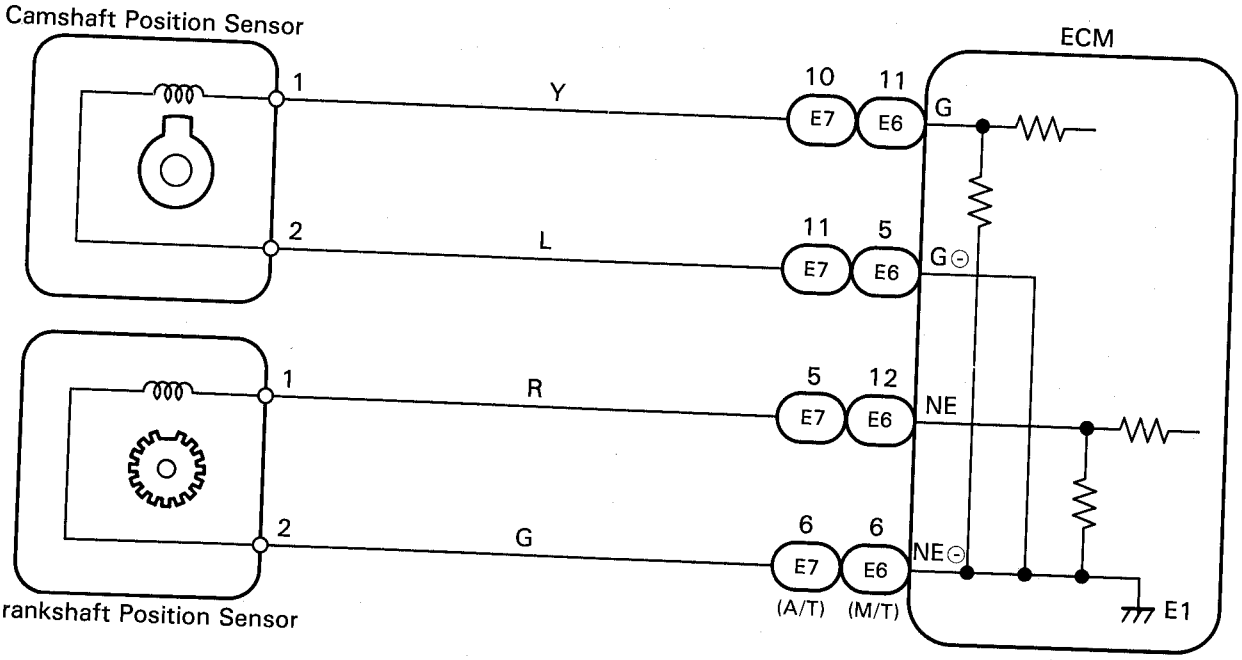
DTC P0335 Crankshaft Position Sensor "A" Circuit Malfunction

CIRCUIT DESCRIPTION

The crankshaft position sensor, which detects the engine speed and crankshaft angle signal (NE signal), has been installed on the oil pump body.
The NE signal plate has 34 teeth. 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

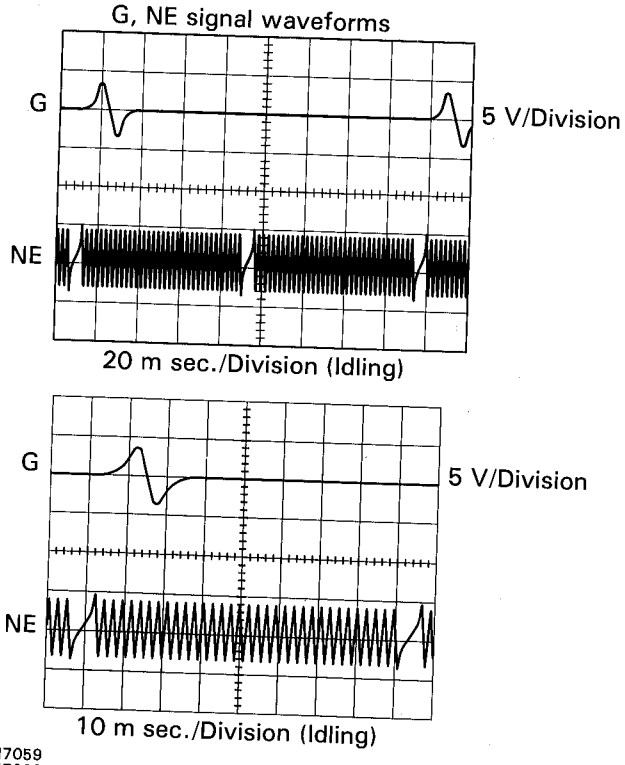


INSPECTION PROCEDURE

HINT: Perform troubleshooting of DTC P0335 first. If no trouble is found, troubleshoot the following mechanical systems.

1	**Check resistance of crankshaft position sensor (See page IG-22).**

Reference INSPECTION USING OSCILLOSCOPE



- During cranking idling, check between terminals G and G⊖, NE and NE⊖ of ECM.

HINT: The correct waveforms are as shown in.

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 → 3

NG → Repair or replace harness or connector.

3	Inspect sensor installation and teeth of signal plate.

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

NG → Tighten the sensor. Replace signal plate.

DTC P0340 Camshaft Position Sensor Circuit Malfunction

CIRCUIT DESCRIPTION

The camshaft position sensor, which detects the crankshaft angle signal (G signal), has been installed on the fornt of right bank cylinder head. The timing rotor has been integrated with the right bank camshaft timing pulley. When the camshafts rotate, the protrusion on the timing rotor 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 • Starter • ECM
	No camshaft position sensor signal to ECM during engine running	

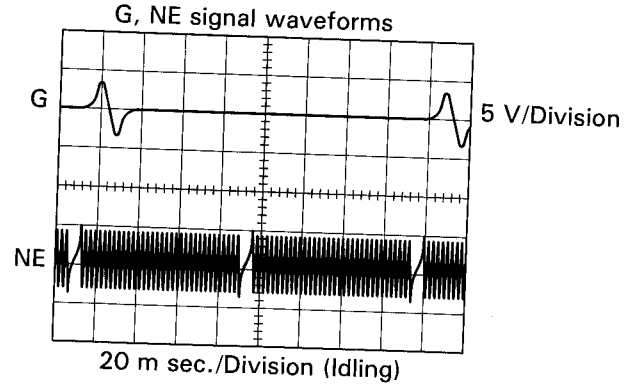
WIRING DIAGRAM

Refer to page EG-249 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

1	Check resistance of camshaft position sensor (See page IG-21).

Reference INSPECTION USING OSCILLOSCOPE



FI7059
FI7060

- During cranking or idling, check between terminals G and G⊖, NE and NE⊖ of ECM.

HINT: The correct waveforms are as shown in.

EG

OK

NG → Replace camshaft position sensor.

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

OK

NG → Repair or replace harness or connector.

3 Inspect sensor installation.

OK

NG → Tighten the sensor.

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

DTC P0401 Exhaust Gas Recirculation Flow Insufficient Detected

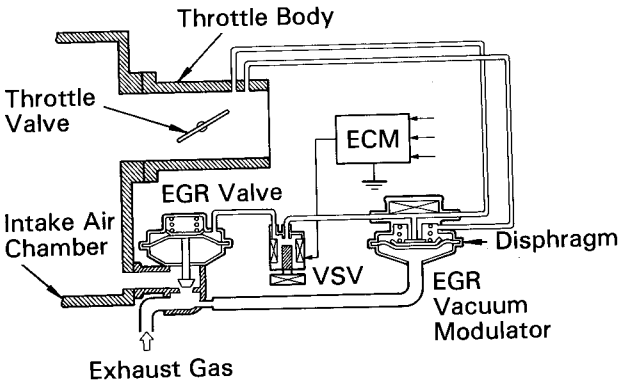
CIRCUIT DESCRIPTION

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).

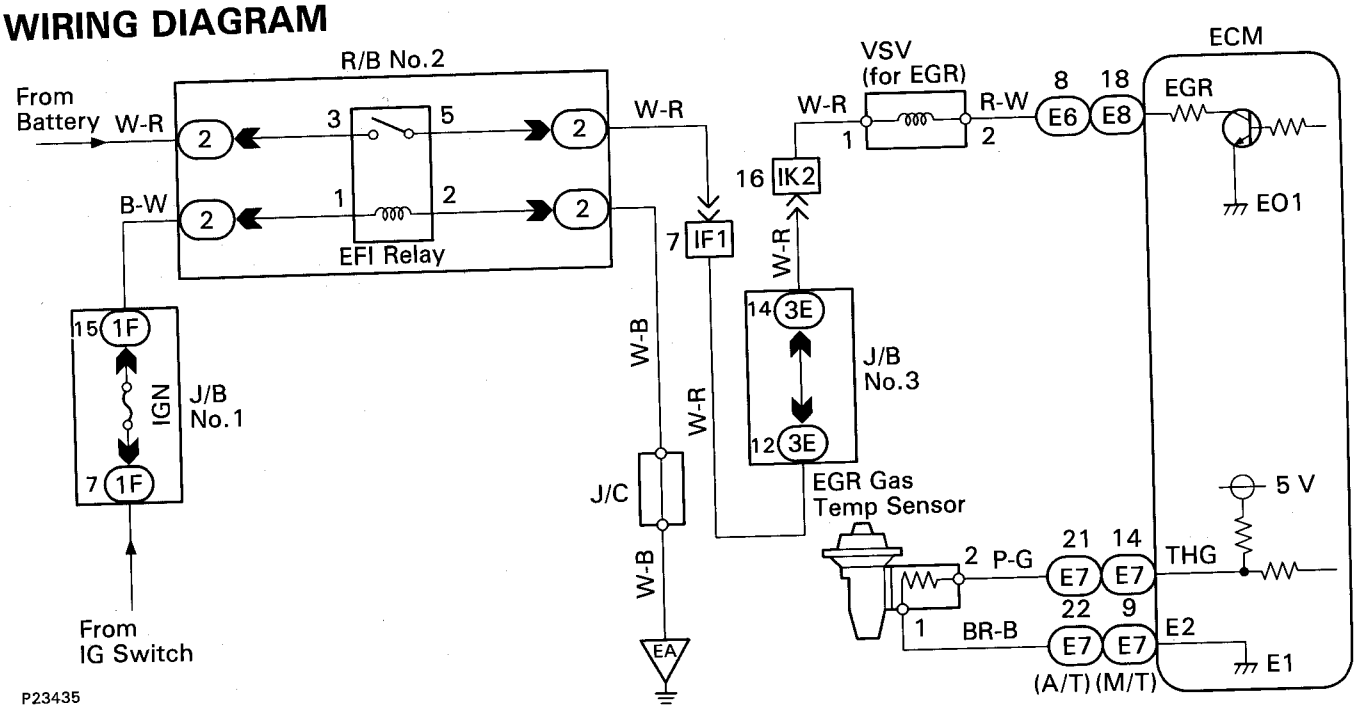
Under the following conditions, EGR is cut to maintain driveability.

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

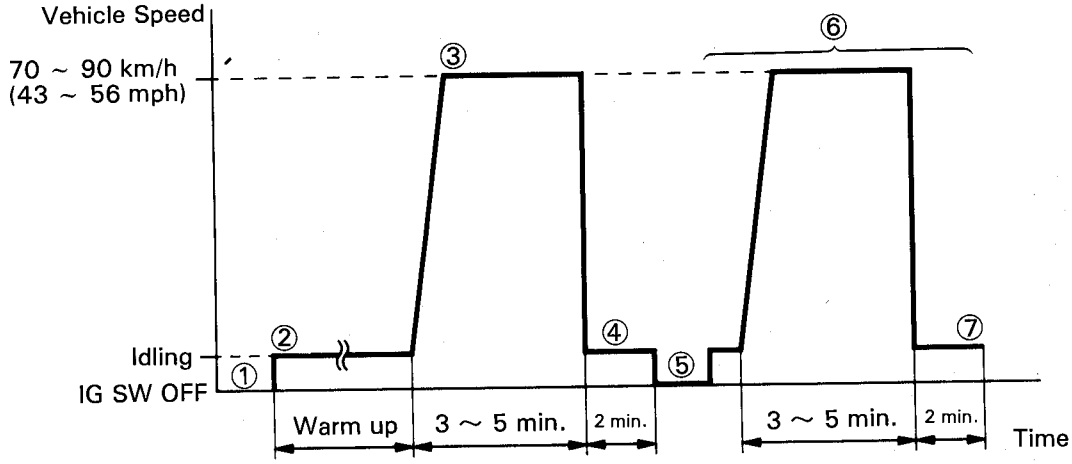


DTC No.	DTC Detecting Condition	Trouble Area
P0401	After the engine is warmed up and run at 80 km/h (50 mph) for 3 to 5 minutes, the EGR gas temperature sensor value does not exceed 60°C (140°F) above the ambient air temperature (2 trip detection logic)	• EGR valve stuck closed • Short in VSV circuit for EGR • Open in EGR gas temp. sensor circuit • EGR hose disconnected • ECM

WIRING DIAGRAM



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 min. or more.
④ Idle the engine for about 2 min.
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 displyed 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.**

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

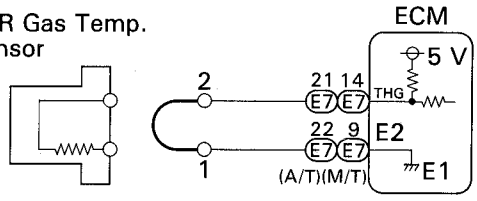
HINT: If there is an open circuit, the TOYOTA hand-held tester indicates 3.1°C (37.6°F).

NG

OK → **Go to step 4 .**

2 Check for open in harness or ECM.

ON



BE6653
P19555

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

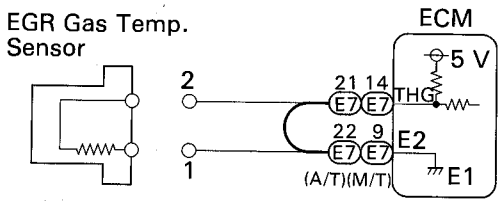
C Read EGR gas temperature on the TOYOTA hand-held tester.

OK **EGR gas temp.: Approx. 159°C (318.2°F)**

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

3 Check for open in harness or ECM.

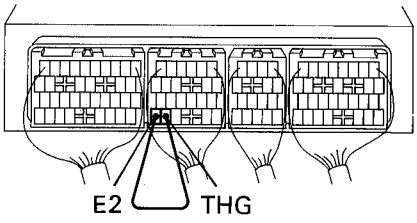
ON



P (1) Remove glove compartment (See page EG-161).
(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 EG-206).

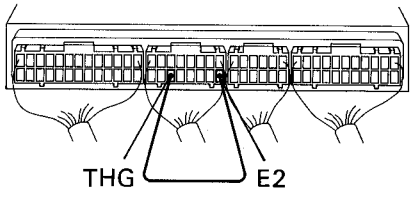
For A/T



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

OK **EGR gas temp.: Approx. 159°C (318.2°F)**

For M/T



BE6653
P19553
P20205
P20229

NG → **OK** → **Open in harness between terminals E2 or THG. Repair or replace harness.**

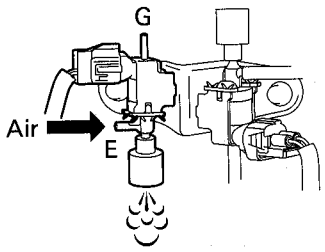
Confirm connection at ECM. If OK, replace ECM.

4 Check the connection of the vacuum hose, EGR hose (See page EG-108).

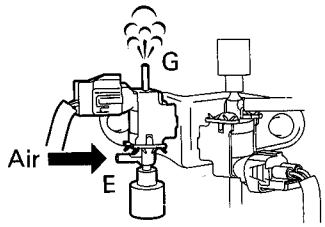
OK → **NG** → **Repair or replace.**

5 **Check the VSV for EGR.**

System: OFF



System: ON



P21166
P21165

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 the air filter.
EGR system is ON:
Air from pipe E is flowing out through pipe G.

EG

NG

OK → Go to step 7.

6 **Check operation of the VSV for EGR (See page EG-149).**

OK

NG → **Replace VSV for EGR.**

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

7 **Check EGR vacuum modulator (See page EG-113).**

OK

NG → **Repair or replace.**

8 **Check EGR valve (See page EG-111).**

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 push 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 min.

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

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

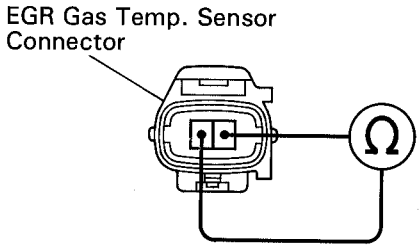
EG

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

NG → **Replace EGR gas temp. sensor.**

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

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



P24322

P Disconnect EGR gas temp. sensor connector.

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

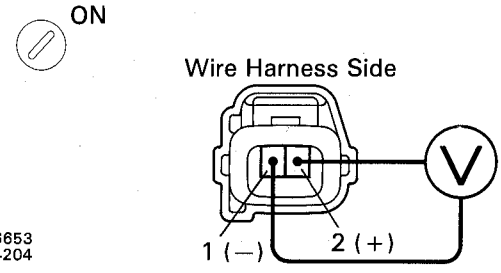
OK **Resistance: 600 kΩ or less.**

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

OK → **Check and replace EGR gas temp. sensor (See page EG-159).**

NG

2 **Check for open in harness or ECM.**



BE6653
P24204

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**

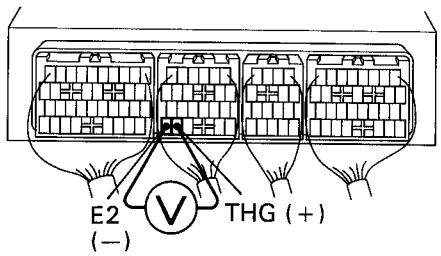
NG

OK → **Go to step 4 .**

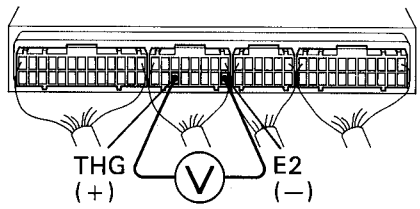
3 Check for open in harness or ECM.

ON

For A/T



For M/T



BE6653
P24323
P24203

P (1) Remove glove compartment (See page EG-161).
(2) Turn ignition switch ON.

C Measure voltage between terminals THG and E2 of ECM.

HINT: EGR gas temp. sensor connector is disconnected.

OK **Voltage: 4.5 − 5.5 V**

EG

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-108).

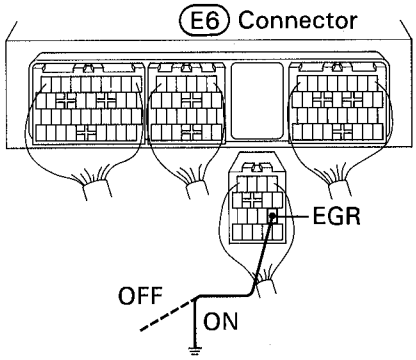
OK

NG → **Repair or replace.**

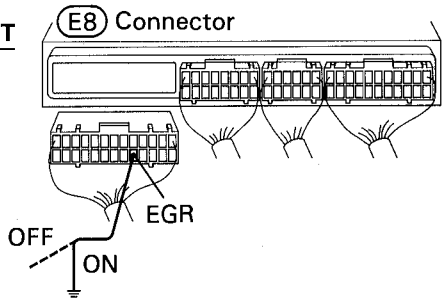
5 Check the VSV for EGR.

ON

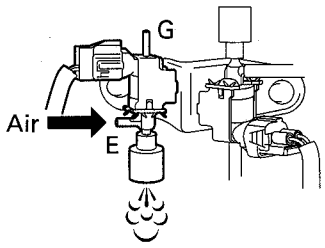
For A/T



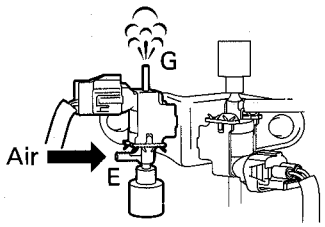
For M/T



ON



OFF



BE6653
P21117
P21116
P21166
P21165

P
(1) Remove glove compartment (See page EG-161).
(2) Disconnect ECM (E6) (for A/T) or (E8) (for M/T) 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 the air filter.
(2) VSV is OFF:
Air from pipe E flows out through pipe G.

NG

OK → **Go to step 7 .**

6 Check operation of the VSV for EGR (See page EG-149).

OK

NG → **Replace VSV for EGR.**

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

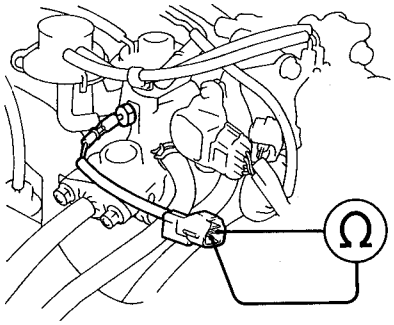
7 Check EGR vacuum modulator (See page EG-113).

OK → NG: Repair or replace.

8 Check EGR valve (See page EG-111).

OK → NG: Repair or replace.

9 Check resistance of EGR gas temp. sensor.



P24227

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

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 min.: 4.3 kΩ or less**

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

OK → 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-252.

DTC No.	DTC Detecting Condition	Trouble Area
P0402	EGR gas temp. sensor value is high during EGR cut-off when engine is cold (Race engine at about 4,000 rpm without load so that 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 push TOYOTA hand-held tester main switch ON.

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

EG

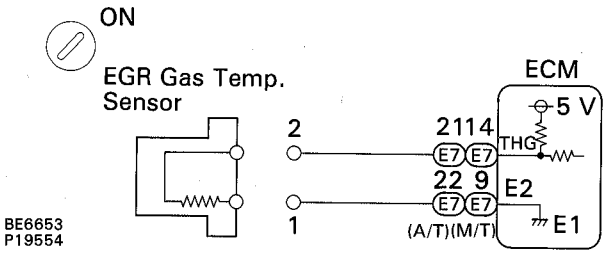
OK **EGR gas temp.: 159°C (318.2°F) or less (Not immediately after driving)**

HINT: If there is a short circuit, the TOYOTA hand-held tester indicates Approx. 159°C (318.2°F).

NG

OK → **Go to step 4 .**

2 **Check for short in harness and ECM.**



P Disconnect the EGR gas temperature sensor connector.

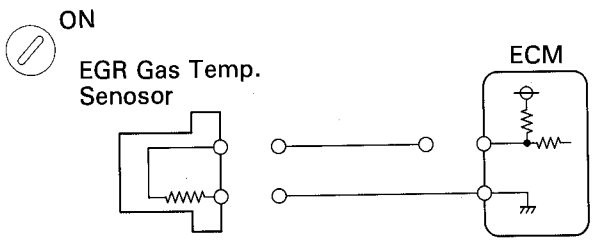
C Read EGR gas temperature on the TOYOTA hand-held tester.

OK **EGR gas temp.: 3.1°C (37.6°F)**

NG

OK → **Replace EGR gas temp. sensor.**

3 Check for short in harness or ECM.



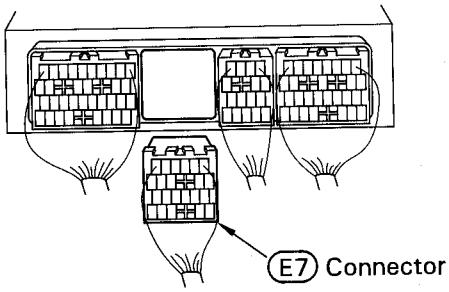
P (1) Remove glove compartment (See page EG-161).
(2) Disconnect the (E7) connector of ECM.

HINT: EGR gas temp. sensor is disconnected.

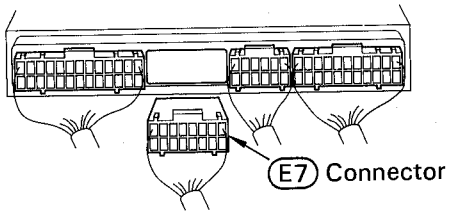
C Read EGR gas temp. on the TOYOTA hand-held tester.

OK **EGR gas temp.: 3.1°C (37.6°F)**

For A/T



For M/T



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

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

4 Check the VSV for EGR (See page EG-258, step 5).

NG → **Check EGR valve (See page EG-111).**

OK

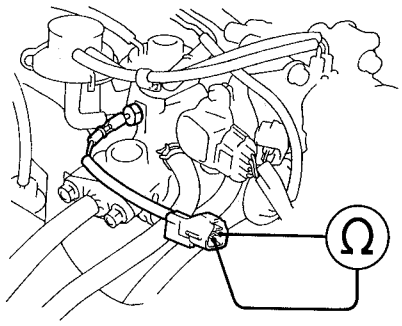
5 Check operation of the VSV for EGR (See page EG-149).

NG → **Replace VSV for EGR.**

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

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

1 Check resistance of EGR gas temp. sensor.



P24227

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.

OK → **2** Check for short in harness and connector between EGR gas temp. sensor and ECM (See page IN-24).

NG → Replace EGR gas temp. sensor.

OK → **3** Check the VSV for EGR (See page EG-258, step 5).

NG → Repair or replace harness or connector.

OK → **4** Check operation of the VSV for EGR (See page EG-149).

NG → Check EGR valve (See page EG-111).

OK → **5** Check for short in harness and connector between VSV and ECM (See page IN-24).

NG → Repair or replace harness or connector.

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

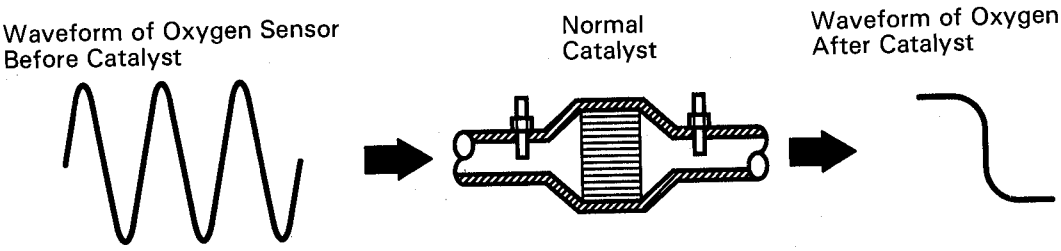
DTC P0420 Catalyst System Efficiency Below Threshold

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.

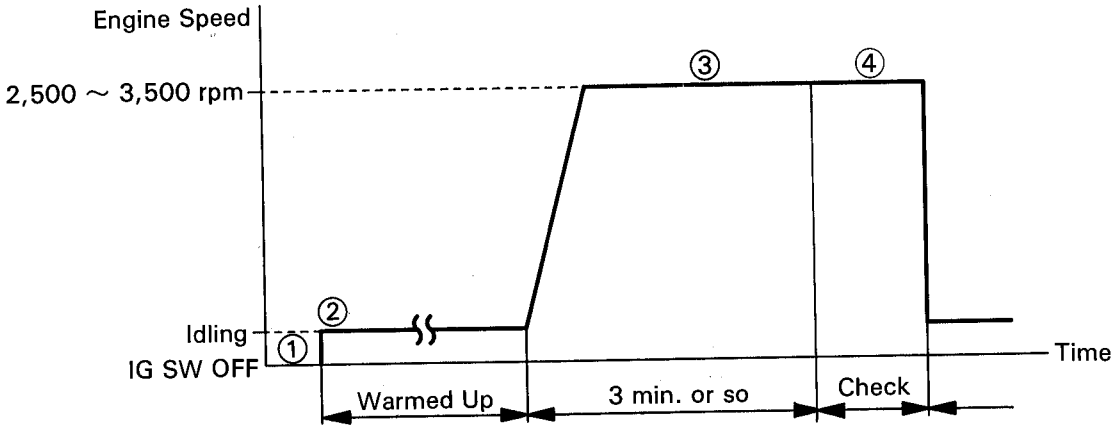
But when both waveforms change at a similar rate, it indicates that catalyst performance has deteriorated.



FI7081

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.

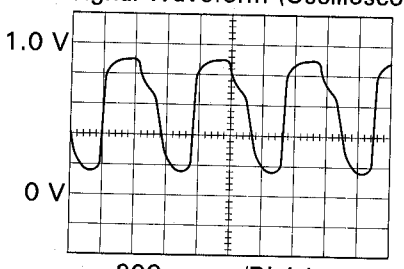
② Start engine and warm it up with all accessories switched OFF until water temperature is stable.

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:

OX Signal Waveform (Oscilloscope)



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.

EG

INSPECTION PROCEDURE

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

NO

YES → Go to relevant DTC chart.

2	Check heated oxygen sensor (See page EG-235).

OK

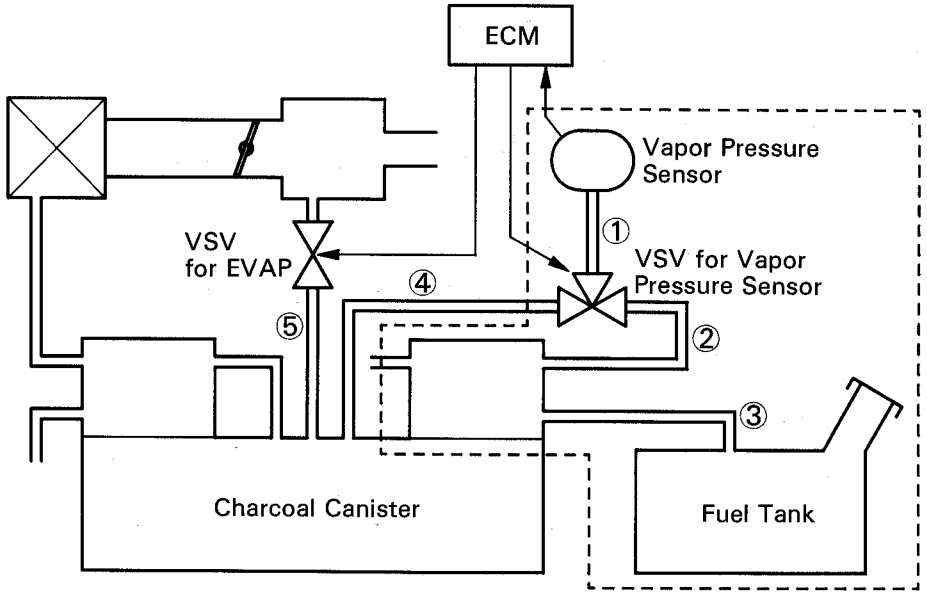
NG → Repair or replace.

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.

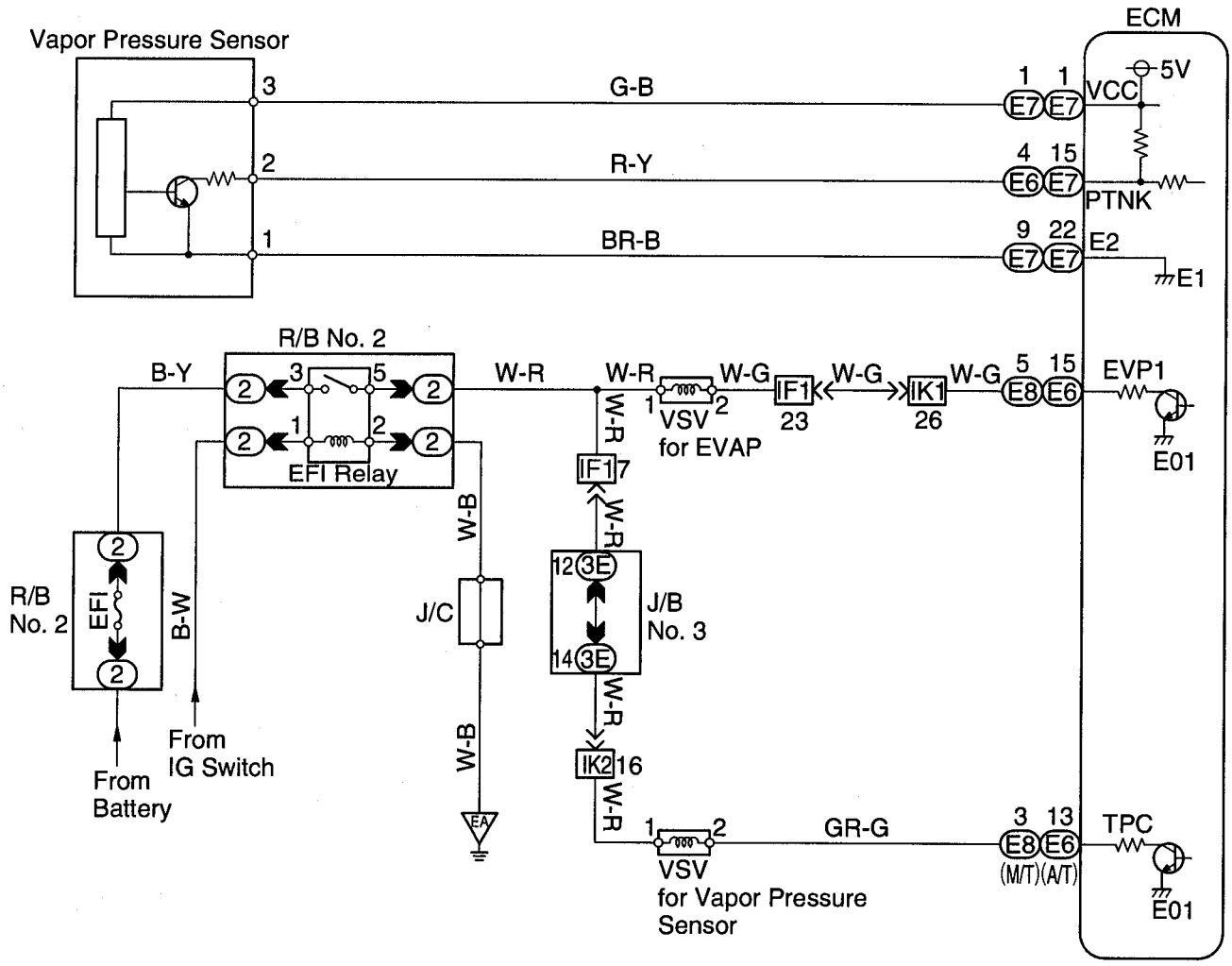


S00043

fig.1

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

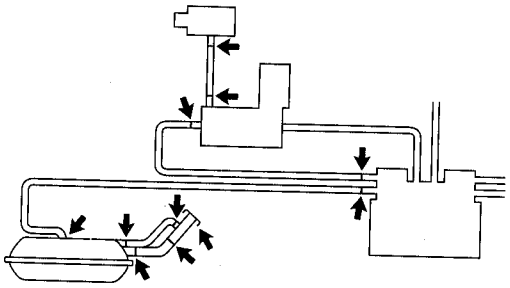


S00288

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 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

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

OK

NG → **Repair or replace.**

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-109).**

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.**

EG

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-135), 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-109).**

OK → NG → **Replace charcoal canister.**

9 **Check voltage between terminals VCC and E2 of ECM connector.**

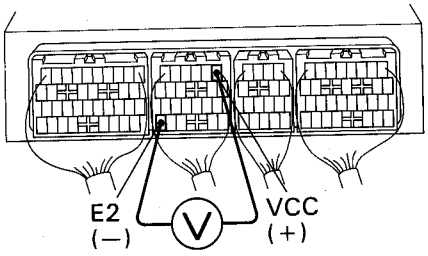
ON

P (1) Remove glove compartment (See page EG-161).
(2) Turn ignition switch ON.

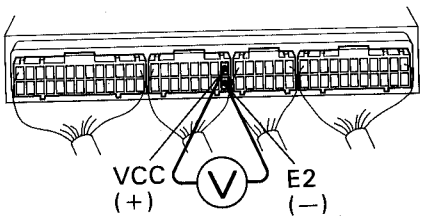
C Measure voltage between terminal VCC and E2 of ECM connector.

OK **Voltage: 4.5 – 5.5 V**

For A/T



For M/T



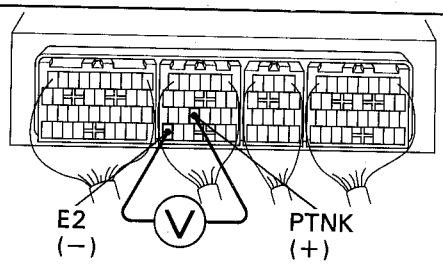
BE6653
P24316
P23813

OK → NG → **Check and replace ECM (See page IN-29).**

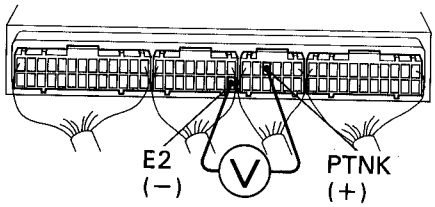
10 Check voltage between terminals PTNK and E2 of ECM connector.

ON

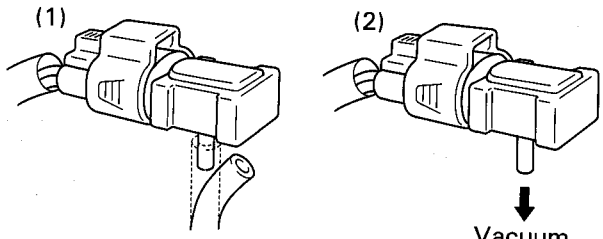
For A/T



For M/T



BE6653
P24346
P24347



P24976 S00047

P (1) Remove glove compartment (See page EG-161).
(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

EG

NG

OK → **Go to step 12 .**

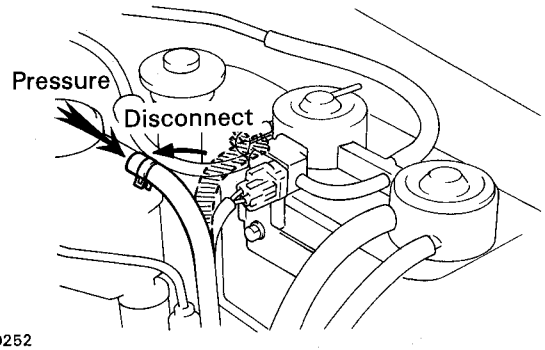
11 Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN-24).

OK

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

Replace vapor pressure sensor.

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



S00252

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.**

OK

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.

NG **Replace fuel tank.**

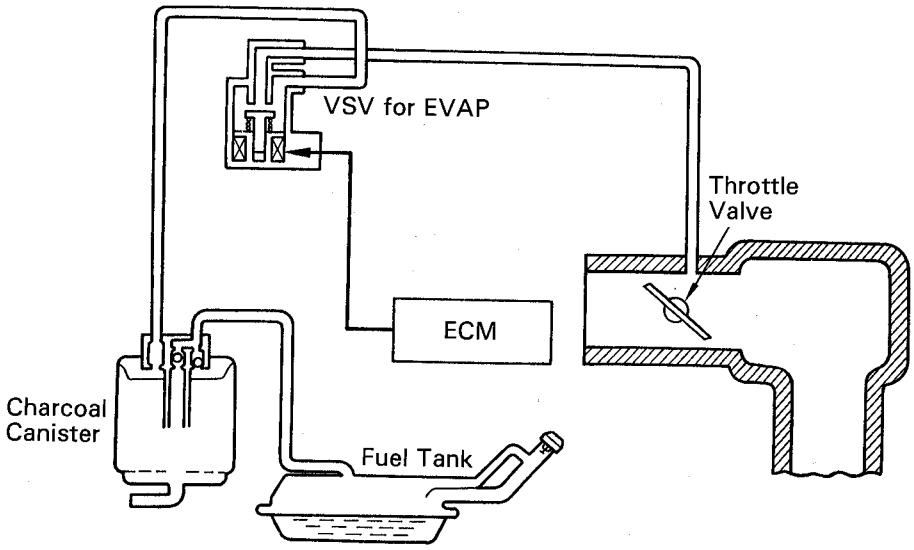
EG

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.

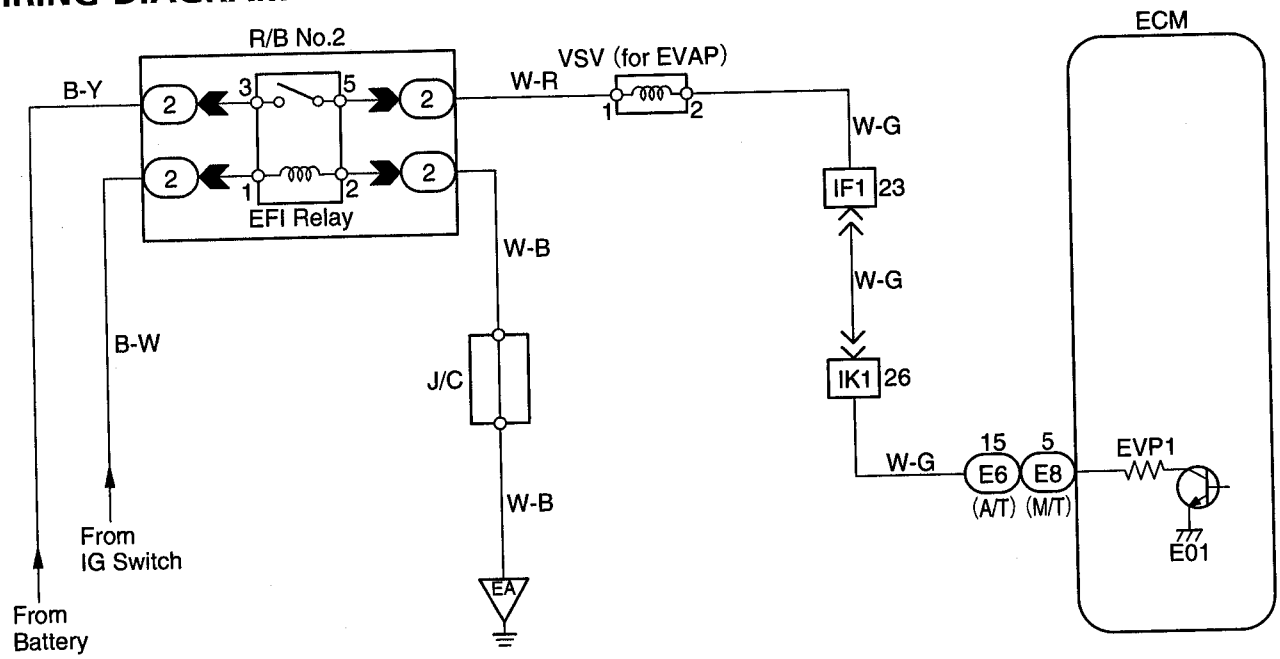
The ECM changes the duty signal to VSV for EVAP so that the intake quantity of HC emissions is appropriate for the driving conditions (engine load, engine speed, etc.) after the engine is warmed up.



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 VSV circuit for EVAP • VSV for EVAP • ECM • Vacuum hose blocked or disconnected • Charcoal canister

WIRING DIAGRAM



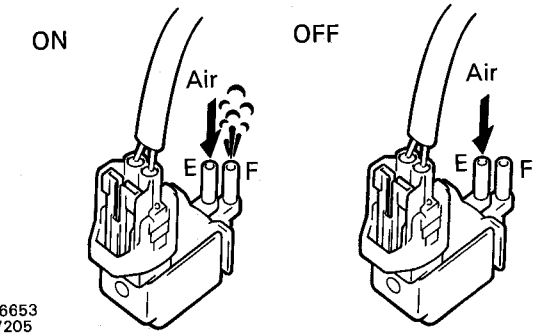
S00012

INSPECTION PROCEDURE

TOYOTA hand-held tester

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

ON



BE6653
FI7205
FI7206

P (1) Connect the TOYOTA hand-held tester to DLC3.
(2) Turn ignition switch ON and push 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 flows out through pipe F.
VSV is OFF:
Air does not flow from pipe E to pipe F.

NG

OK → **Go to step 4.**

2 **Check VSV for EVAP (See page EG-147).**

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

NG → Repair or replace harness or connector.

4 Check connection of vacuum hose (See page EG-109).

OK → Check and repair charcoal canister (See page EG-109).

NG → Repair or replace.

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

1 Check VSV for purge EVAP (See page EG-147).

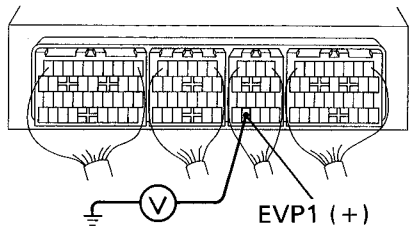
OK → Check and repair harness or connector.

NG → Replace VSV for EVAP.

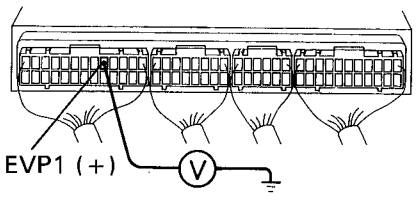
2 Check voltage between terminal EVP1 of ECM connector and body ground.

ON

For A/T



For M/T



BE6653
P24261
P24263

P (1) Remove glove compartment (See page EG-161).
(2) Turn ignition switch ON.

C Measure voltage between terminal EVP1 of ECM connector and body ground.

OK Voltage: 9 – 14 V

OK → Check and repair harness or connector.

NG → Check and repair harness or connector.

3	Check connection of vacuum hose (See page EG-109).

OK → NG → Repair or replace.

4	Check charcoal canister (See page EG-109).

OK → NG → Repair or replace.

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

DTC P0441 Evaporative Emission Control System Incorrect Purge Flow (For 4WD models)

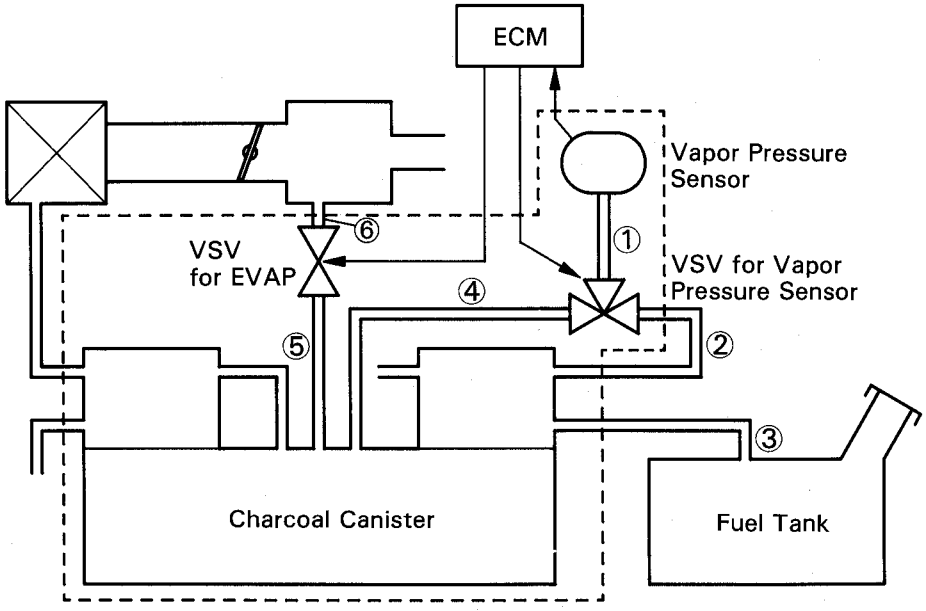
DTC P0446 Evaporative Emission Control System Vent Control Malfunction (Only for 4WD models)

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 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

fig. 1

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)	

EG

WIRING DIAGRAM

Refer to Evaporative Emission Control System Malfunction on page EG-266.

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-268, 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-269, step 10)

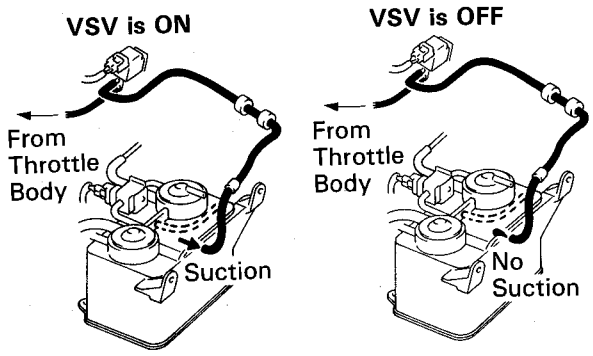
NG → OK: Go to step 6 .

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-147).

OK

NG → **Replace VSV.**

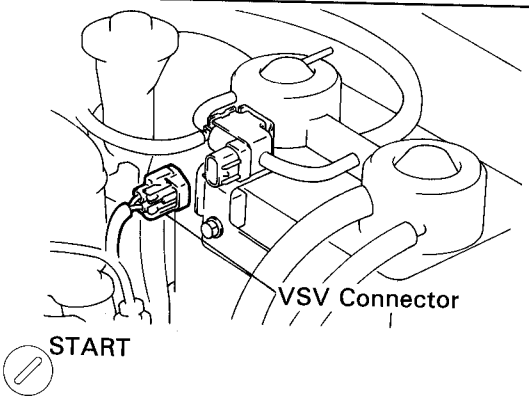
9 Check for open and short in harness and connector between EFI main-relay and VSV for EVAP and ECM (See page IN-24).

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.**

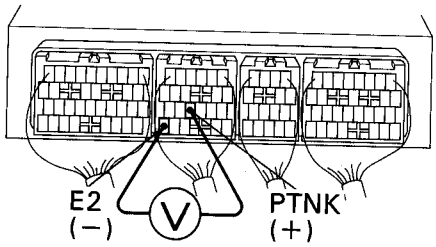


P (1) Connect the TOYOTA hand-held tester to the DLC3.
(2) Disconnect the VSV connector for vapor pressure sensor.
(3) Select the ACTIVE TEST mode on the TOYOTA hand-held tester.
(4) Start the engine.

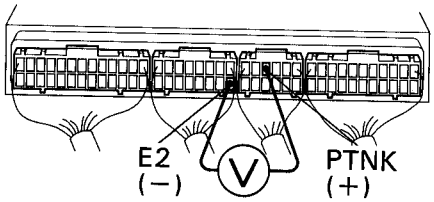
C Measure voltage between terminals PTNK and E2 of ECM connector, when VSV for EVAP is ON, using the TOYOTA hand-held tester.

OK **Voltage: 2.0 V or less**

For A/T



For M/T



P25798
BE6653
P24346
P24347

NG

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-150).**

OK

NG → **Replace VSV.**

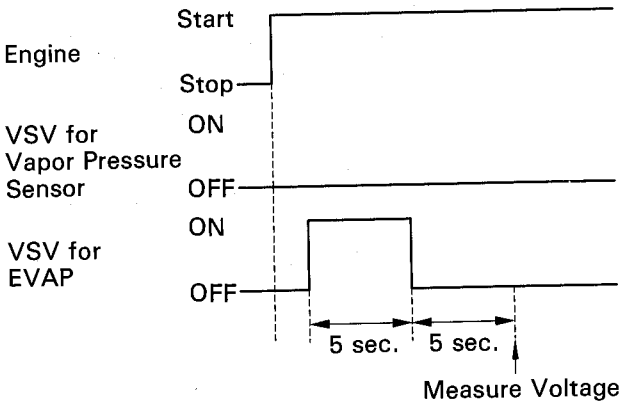
EG

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.**

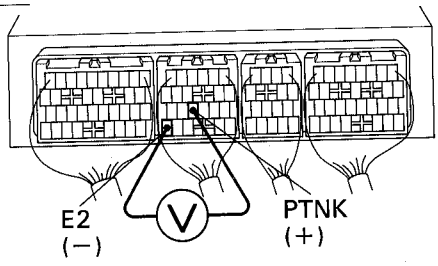


P (1) Connect the TOYOTA hand-held tester to the DLC3.
(2) Remove the fuel tank cap.
(3) Disconnect the VSV connector for vapor pressure sensor.
(4) Select the ACTIVE TEST mode on the TOYOTA hand-held tester.
(5) Start the engine.
(6) VSV for EVAP is ON by TOYOTA hand-held tester and remains on for 5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

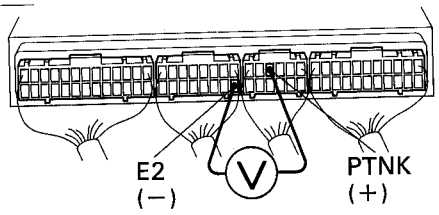
C Measure voltage between terminals PTNK and E2 of ECM connector 5 sec. after switching VSV for EVAP from ON to OFF.

OK **Voltage: 2.5 V or less**

For A/T



For M/T



S00049
P24346
P24347

OK

NG → **Replace charcoal canister.**

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

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-268, 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-269, step 10).

NG → OK → Go to step 6 .

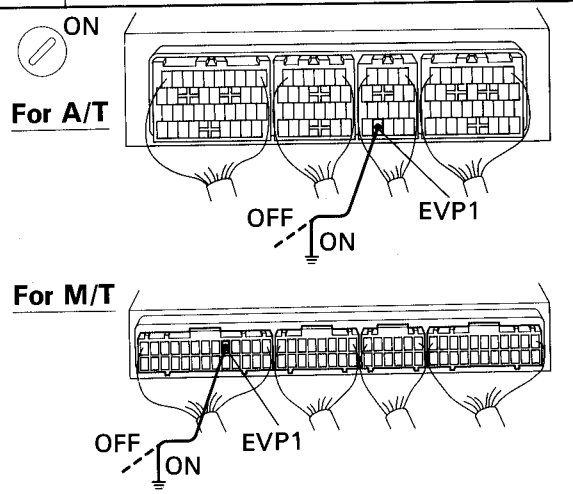
5 Check for open and short in harness and connector between vapor pressure sensor and ECM (See page IN-24).

OK → NG → Repair or replace harness or connector.

Replace vapor pressure sensor.

EG

6 Check the VSV for EVAP.



BE6653
P24350
P24351
FI7205 FI7206

VSV is ON VSV is OFF

P (1) Remove glove compartment (See page EG-161).
(2) Turn the ignition switch ON.

C Check VSV function.
(1) Connect beween 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.

NG

OK → **Go to step 9 .**

7 Check operation of the VSV for EVAP (See page EG-147).

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

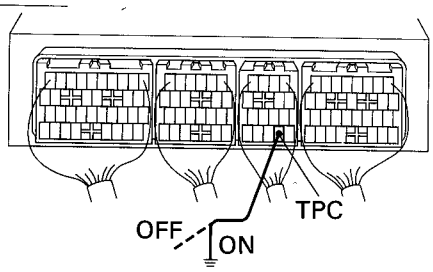
NG → **Repair or replace harness or connector.**

Check and replace ECM.

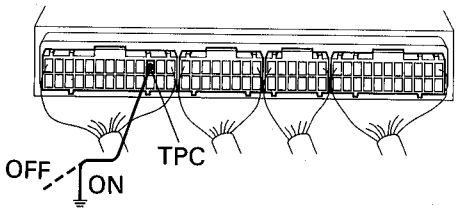
9 Check the VSV for vapor pressure sensor.

ON

For A/T



For M/T

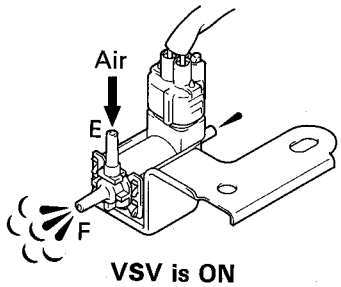


BE6653
P24352
P24353

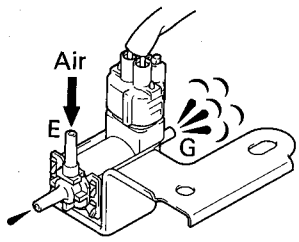
P (1) Remove glove compartment (See page EG-161).
(2) Turn ignition switch ON.

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

P25800 P25801

NG → **OK** → **Check and replace charcoal canister (See page EG-109).**

10 Check operation of the VSV for vapor pressure sensor (See page EG-150).

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).

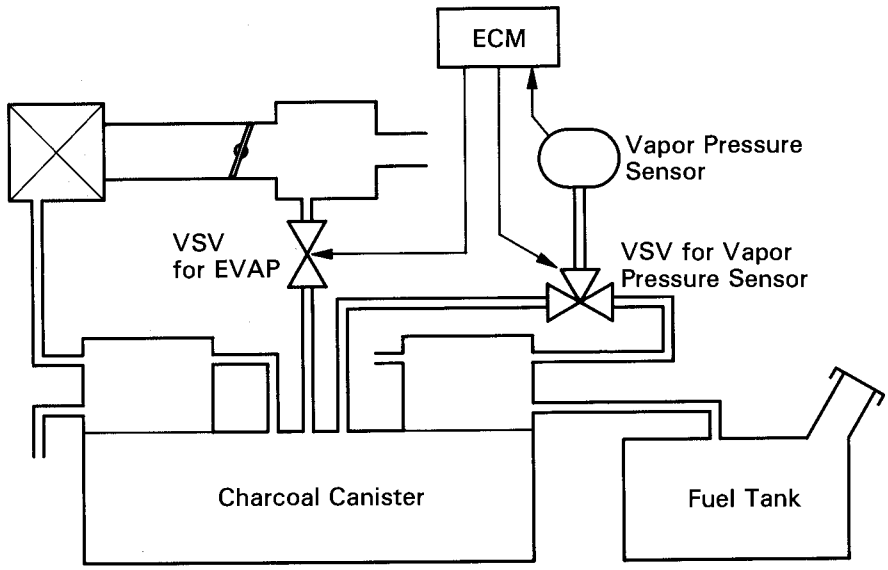
OK → **NG** → **Repair or replace harness or connector.**

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-266.

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-268, step 9).

OK → NG: Check and replace ECM.

2 Check voltage between terminals PTNK and E2 of ECM connector (See page EG-269, 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

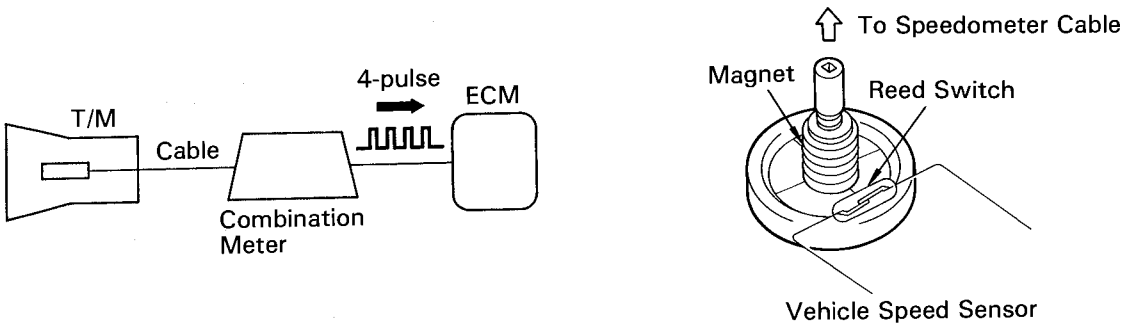
CIRCUIT DESCRIPTION

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.

It is then transmitted to the ECM. The ECM determines the vehicle speed based on the frequency of these pulse signals.

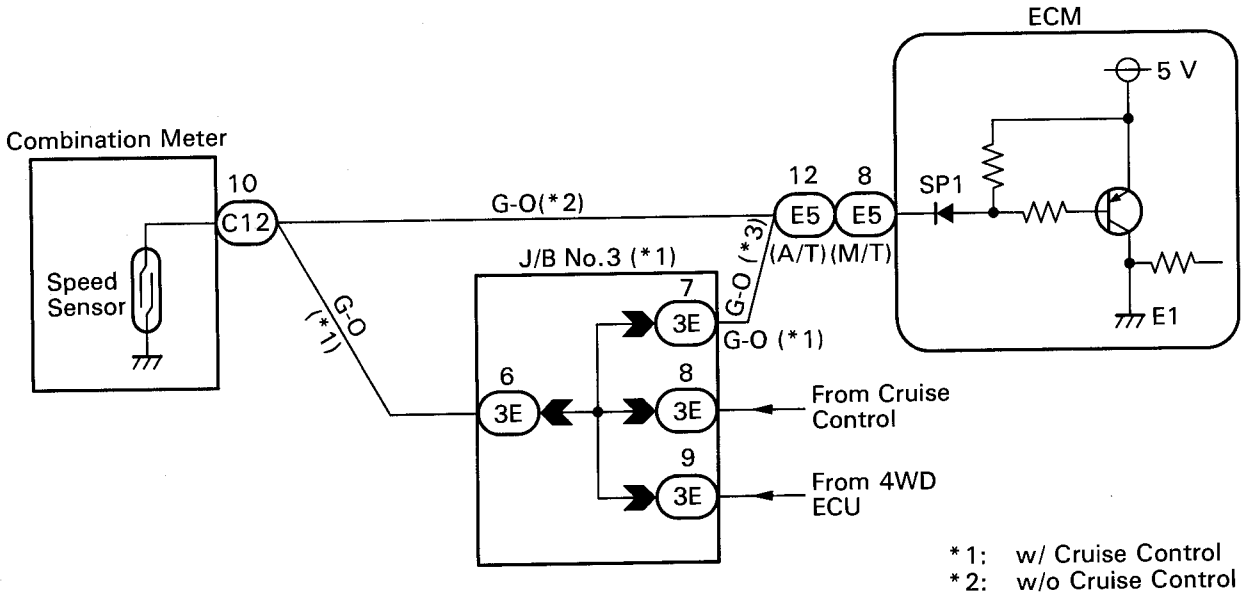
EG



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



P22413

INSPECTION PROCEDURE

1 **Check operation of speedometer.**

C Drive the vehicle and check if the operation of the speedometer in the combination meter is normal.

HINT: The vehicle speed is operating normally if the speedometer display is normal.

OK

NG → **Check speedometer and cable (See page BE-35).**

2 **Check voltage between terminal SP1 of ECM connector and body ground.**

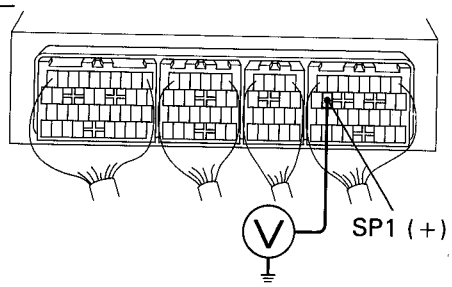
ON

P (1) Remove glove compartment (See page EG-161).
(2) Disconnect cruise control ECU connector.
(3) Shift the shift lever to neutral.
(4) Jack up a rear wheel on one side.
(5) Turn ignition switch ON.

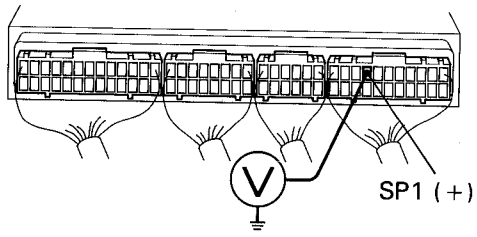
C Measure voltage between terminal SP1 of ECM connector and body ground when the wheel is turned slowly.

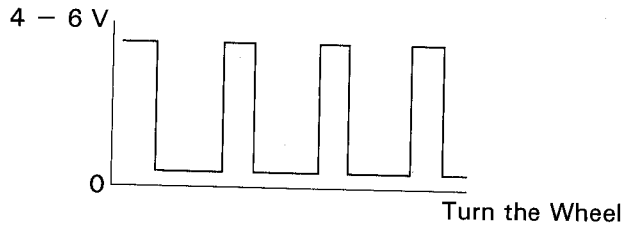
OK **Voltage is generated intermittently.**

For A/T



For M/T





AT7809

BE6653
P24324
P24205

OK

NG → **Check and repair harness and connector between combination meter and ECM.**

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

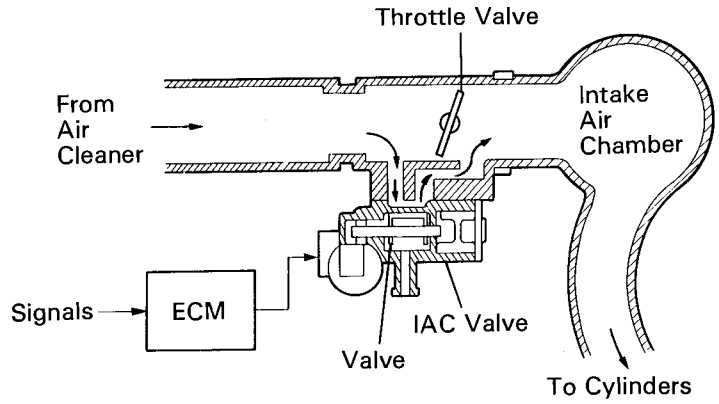
EG

DTC P0505 Idle Control System Malfunction

CIRCUIT DESCRIPTION

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.
In this way the intake air volume bypassing the throttle valve is regulated, controlling the engine speed.

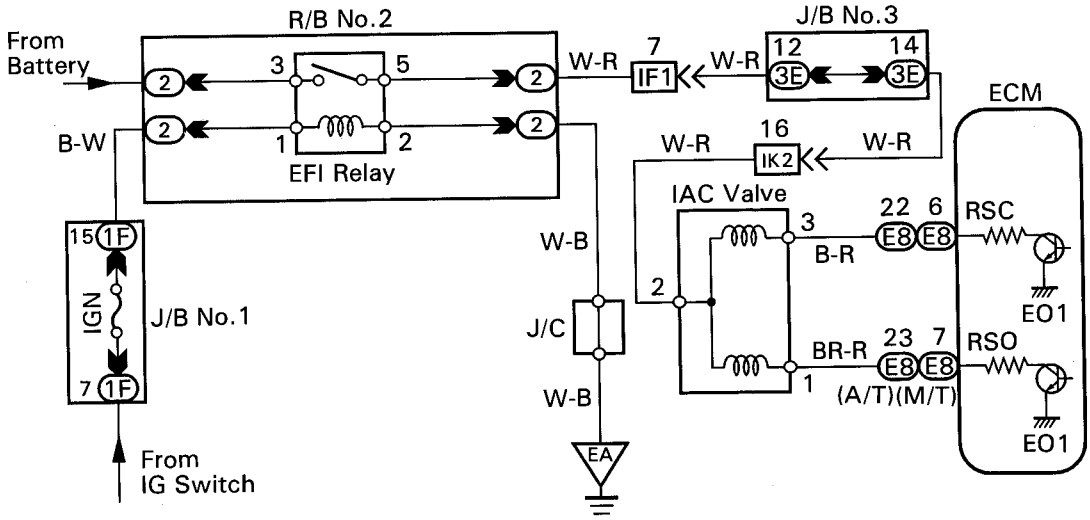
The ECM operates only the IAC valve to perform idle-up and provide feedback for the target idling speed and a VSV for idle-up control is also added (for air conditioning).



P01559

DTC No.	DTC Detecting Condition	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 • VSV for A/C idle-up • Air intake(hose loose)

WIRING DIAGRAM



P23437

INSPECTION PROCEDURE

1	Check air induction system (See page EG-117).

OK

NG → Repair or replace.

2 Check VSV for A/C idle up (See page EG-151).

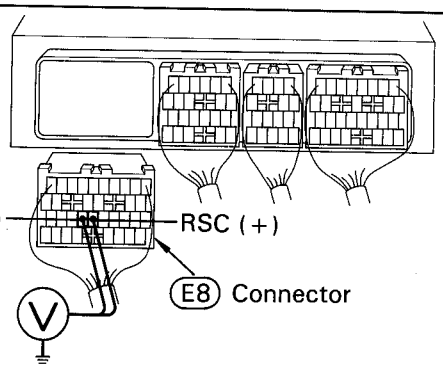
OK

NG → Replair or replace.

3 Check voltage terminals RSO, RSC of ECM connector and body ground.

ON

For A/T

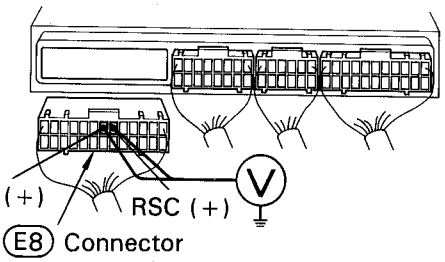


P (1) Remove glove compartment (See page EG-161).
(2) Disconnect the ECM (E8) connector.
(3) Turn ignition switch ON.

C Measure voltage between terminals RSO, RSC of ECM connector and body ground.

OK **Voltage: 9 – 14 V**

For M/T



BE6653
P24325
P24208

NG

OK → Go to step 5 .

4 Check IAC valve (See page EG-142).

OK

NG → Replace IAC valve.

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

5 Check operation of the IAC valve (See page EG-145).

OK

NG → Repair or replace IAC valve.

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

EG

DTC P0510 Closed Throttle Position Switch Malfunction

CIRCUIT DESCRIPTION

Refer to Throttle/Pedal Position Sensor/Switch "A" Circuit Malfunction on page EG-229.

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

EG

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-230 for the WIRING DIAGRAM.

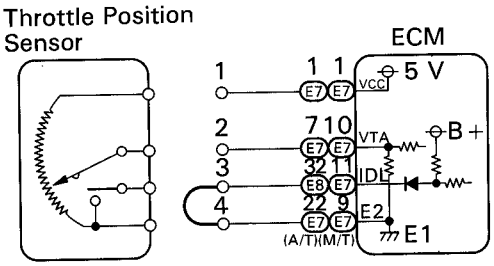
INSPECTION PROCEDURE

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

TOYOTA hand-held tester

1 Check for open in harness or ECM.

ON



BE6653
P19557

NG

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.

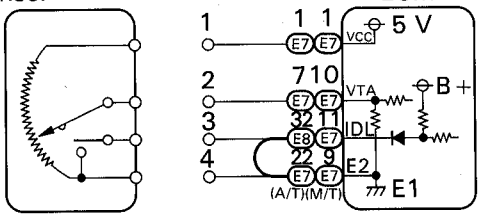
OK **CTP switch signal: ON**

OK → **Confirm good connection at sensor. If OK, replace throttle position sensor.**

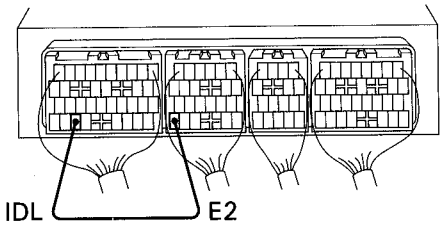
2 Check for open in harness or ECM.

ON

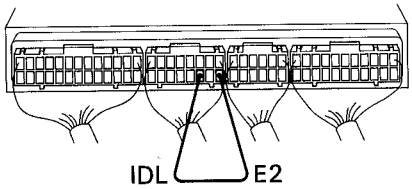
Throttle Position Sensor



For A/T



For M/T



BE6653
P19556
P20210
P20234

P (1) Remove glove compartment (See page EG-161).
(2) Connect between termianls IDL and E2 of ECM connectors.

HINT: Throttle position sensor connector is disconnected. Before checking, do a visual check and contact pressure check for the connector (See page EG-206).

(3) Turn ignition switch ON.

C Read CTP switch signal on the TOYOTA hand-held tester.

OK **CTP switch signal: ON**

NG

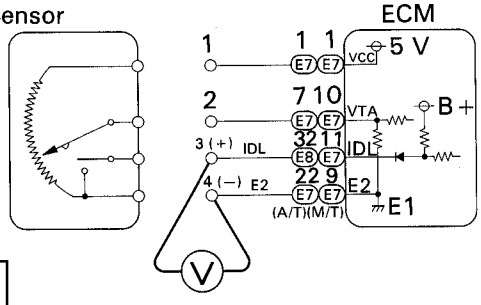
OK → **Open in harness between ECM and throttle position sensor, repair or replace harness.**

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.

Throttle Position Sensor



P24209

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**

NG

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.

EG

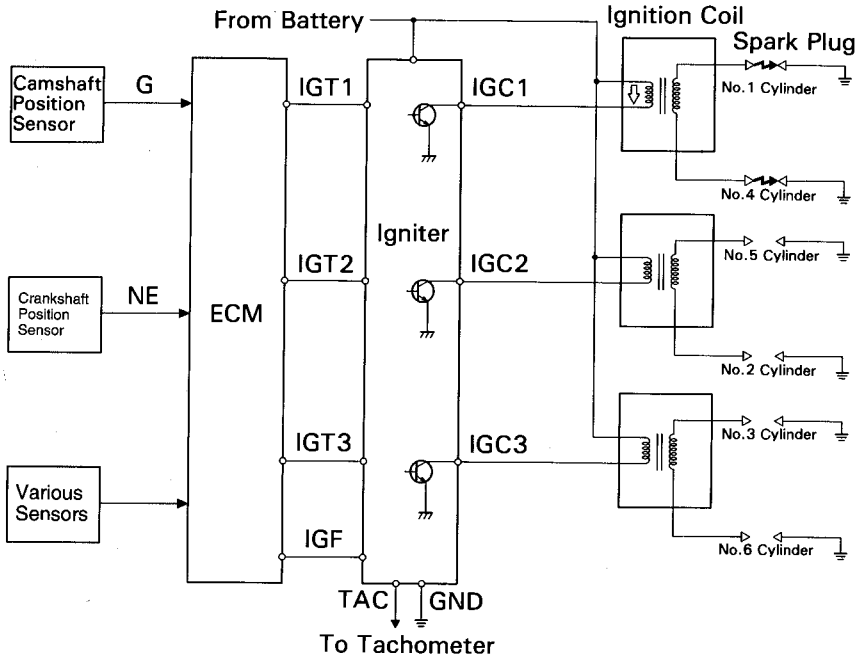
DTC P1300 Igniter Circuit Malfunction

CIRCUIT DESCRIPTION

A DIS (Direct Ignition System) has been adopted. The DIS improves the ignition timing accuracy, reduces high-voltage loss, and enhances the overall reliability of the ignition system by eliminating the distributor.

The DIS is a 2-cylinder simultaneous ignition system which ignites 2 cylinders simultaneously with one ignition coil. In the 2-cylinder simultaneous ignition system, each of the 2 spark plugs is connected to the end of the secondary winding. High voltage generated in the secondary winding is applied directly to the 2 spark plugs. The sparks of the 2 spark plugs pass simultaneously from the center electrode to the ground electrode.

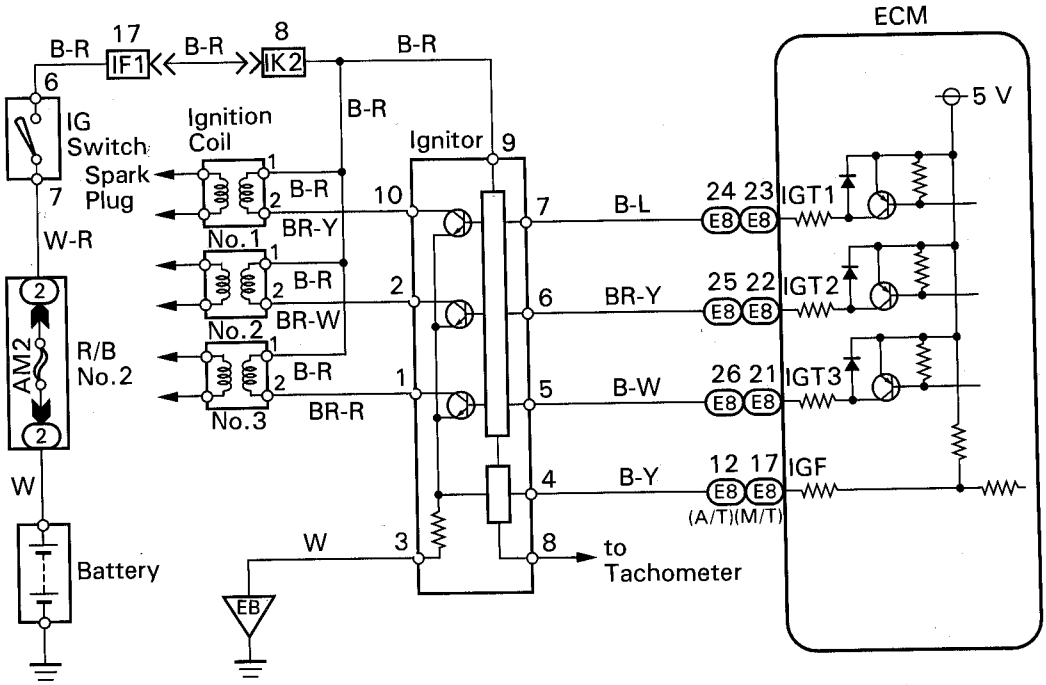
The ECM determines ignition timing and outputs the ignition signals (IGT) for each cylinder. Based on IGT signals, the igniter controls the primary ignition signals (IGC) for all ignition coils. At the same time, the igniter also sends an ignition confirmation signal (IGF) as a fail-safe measure to the ECM.



S00251

DTC No.	DTC Detecting Condition	Trouble Area
P1300	No IGF signal to ECM for 6 consecutive IGT signals during engine running	• Open or short in IGF or IGT circuit from igniter to ECM • Igniter • ECM

WIRING DIAGRAM



P23438

INSPECTION PROCEDURE

1	Check for spark (See page IG-14).

OK → NG: Go to step 4 .

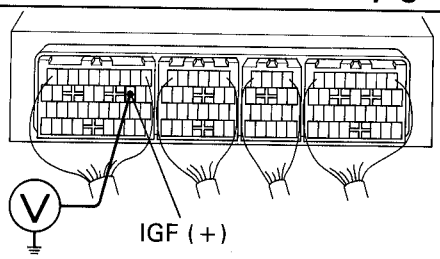
2	Check for open and short in harness and connector in IGF signal circuit between ECM and igniter (See page IN-24).

OK → NG: Repair or replace harness or connector.

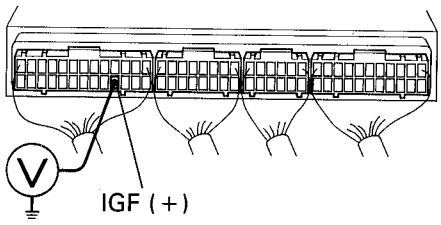
3 **Disconnect igniter connector and check voltage between terminal IGF of ECM connector and body ground.**

ON

For A/T



For M/T



BE6653
P24326
P24211

P (1) Disconnect igniter connector.
(2) Remove glove compartment
(See page EG-161).
(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.**

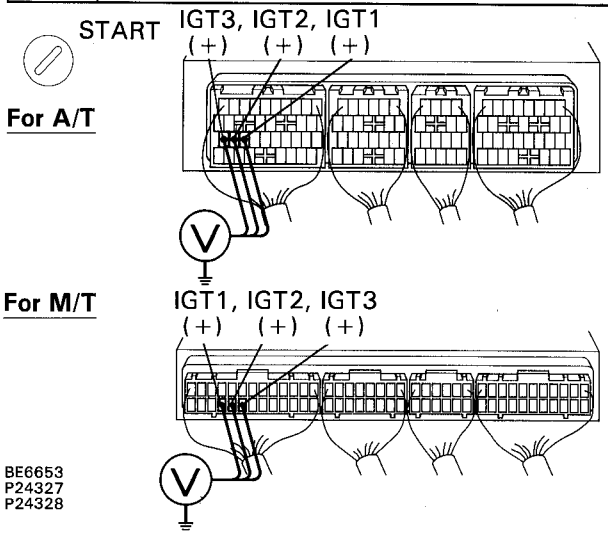
Check and replace ECM (See page IN-29).

4 **Check for open and short in harness and connector in IGT1~3 signal circuit between ECM and igniter (See page IN-24).**

OK

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

5 **Check voltage between terminals IGT1~3 of ECM connector and body ground.**



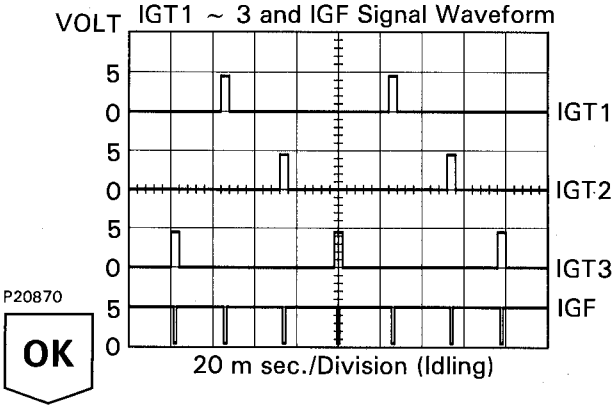
P Remove glove compartment (See page EG-161).

C Measure voltage between terminals IGT1~3 of ECM connector and body ground when engine is cranked.

OK **Voltage: More than 0.1 V and less than 4.5 V**

EG

Reference INSPECTION USING OSCILLOSCOPE



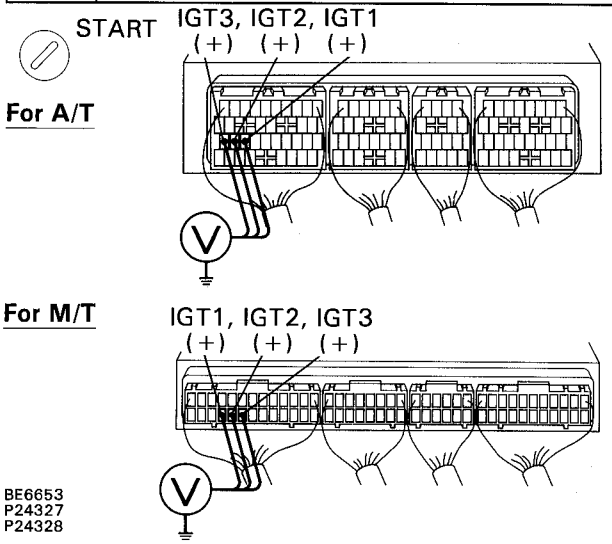
OK

- During idling, check waveform between terminals IGT1~3, IGF and E1 of ECM.

HINT: THe correct waveforms are as shown.

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

6 **Disconnect igniter connector and check voltage between terminals IGT1~3 of ECM connector and body ground.**



P (1) Disconnect igniter connector.
(2) Remove glove compartment (See page EG-161).

C Measure voltage between terminals IGT1~3 of ECM connector and body ground when engine is cranked.

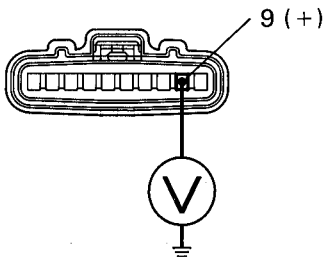
OK **Voltage: More than 0.1 V and less than 4.5 V**

OK

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

7 **Check voltage between terminal 9 of igniter connector and body ground.**

ON → START



BE6653
P24329

P Disconnect igniter connector.

C Measure voltage between terminal 9 of igniter connector and body ground, when ignition switch is turned to "ON" and "START" position.

OK **Voltage: 9 – 14 V**

OK → **NG** → **Check and repair igniter power source circuit.**

EG

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-18).**

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-248.

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 • Starter • ECM

See DTC P0335 for WIRING DIAGRAM and INSPECTION PROCEDURE.

DTC P1500 Starter Signal Circuit Malfunction

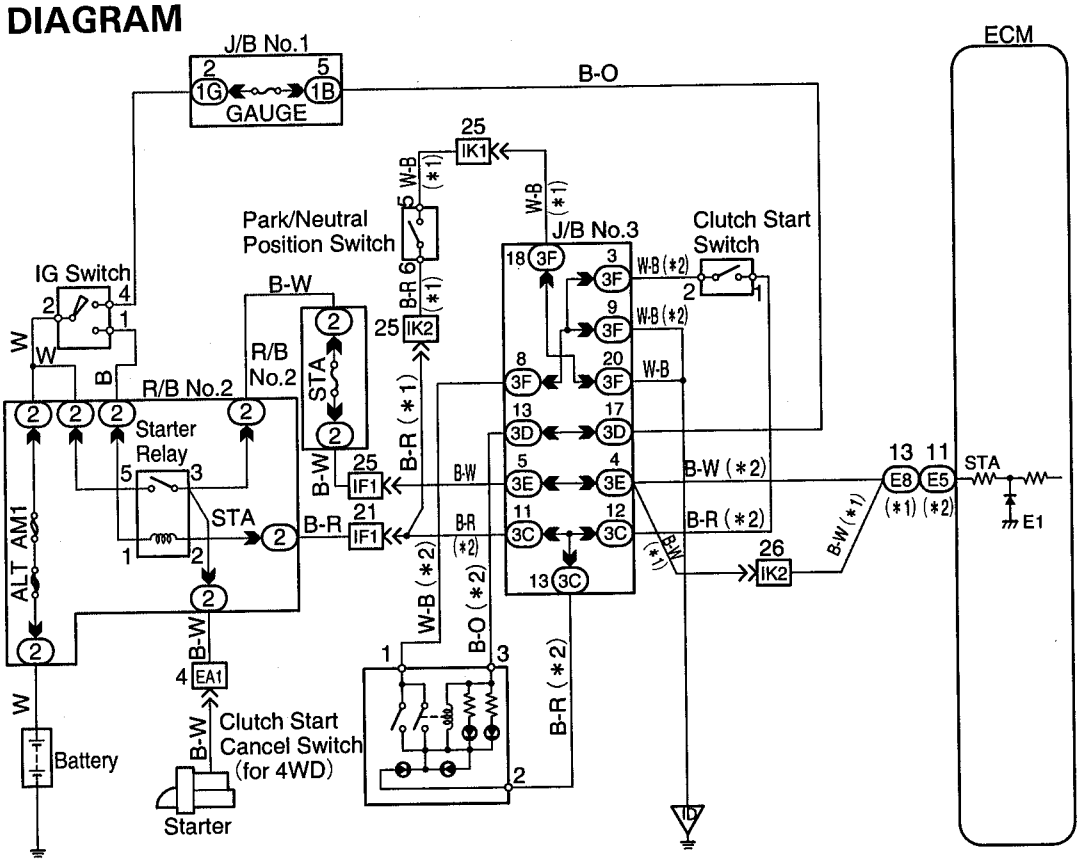
CIRCUIT DESCRIPTION

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 positive 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



S00302

INSPECTION PROCEDURE

HINT: This diagnostic chart is based on the premise that the engine is cranked normally. If the engine is not cranked, proceed to the matrix chart of problem symptoms on page EG-217.

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 push 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-217).**

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

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

NG → Repair or replace harness or connector.

DTC P1600 ECM BATT Malfunction

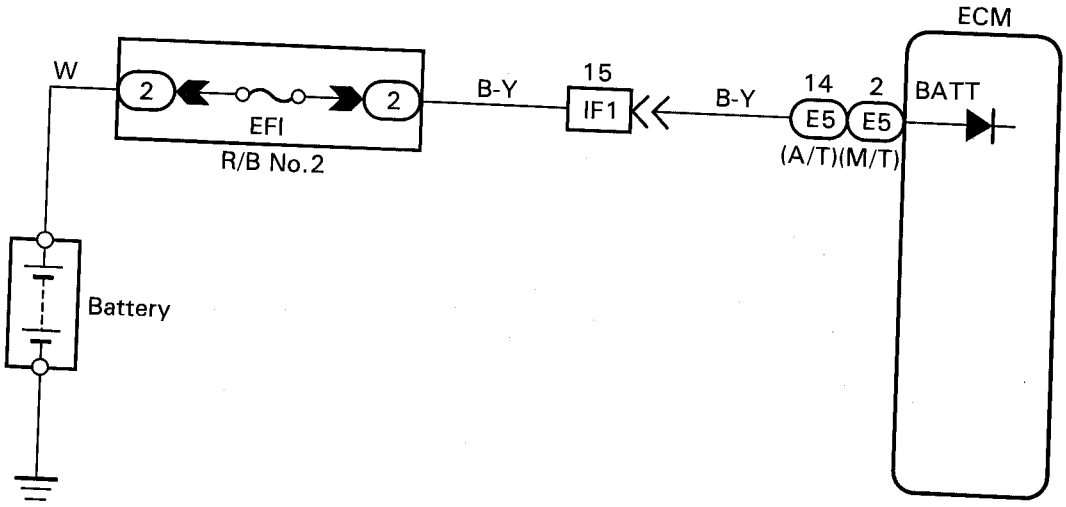
CIRCUIT DESCRIPTION

Battery positive voltage is supplied to 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



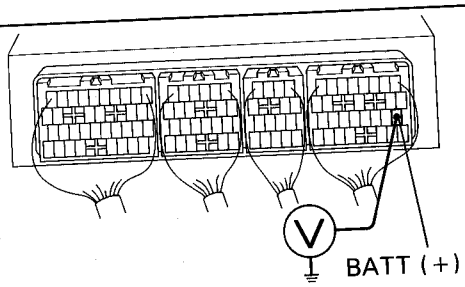
P23417

INSPECTION PROCEDURE

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

LOCK

For A/T



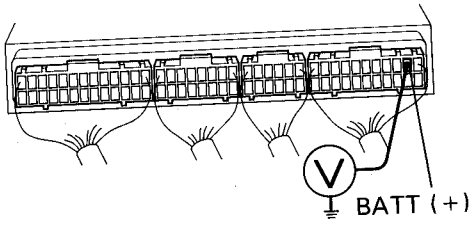
P Remove glove compartment (See page EG-161).

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

OK **Voltage: 9 – 14 V**

EG

For M/T

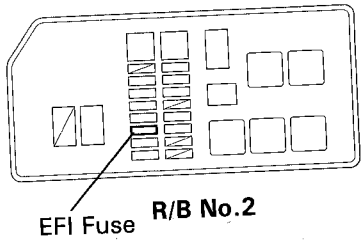


BE6653
P24330
P24217

NG

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

2 **Check EFI fuse.**



P23367

P Remove EFI fuse from R/B No.2.

C Check continuity of EFI fuse.

OK **Continuity**

OK

NG → **Check for short in all the harness and components connected to EFI fuse.**

Check and repair harness or connector between battery, EFI fuse and ECM.

DTC P1605 Knock Control CPU Malfunction

CIRCUIT DESCRIPTION

Refer to Knock Sensor 1, 2 Circuit Malfunction on page EG-246.

DTC No.	DTC Detecting Condition	Trouble Area
P1605	Engine control computer malfunction (for knock control)	• ECM

WIRING DIAGRAM

Refer to page EG-246 for the WIRING DIAGRAM.

INSPECTION PROCEDURE

1	Are there any other codes (besides DTC P1605) being output?

NO

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

YES

Go to relevant DTC chart.

DTC P1780 Park/Neutral Position Switch Malfunction

CIRCUIT DESCRIPTION

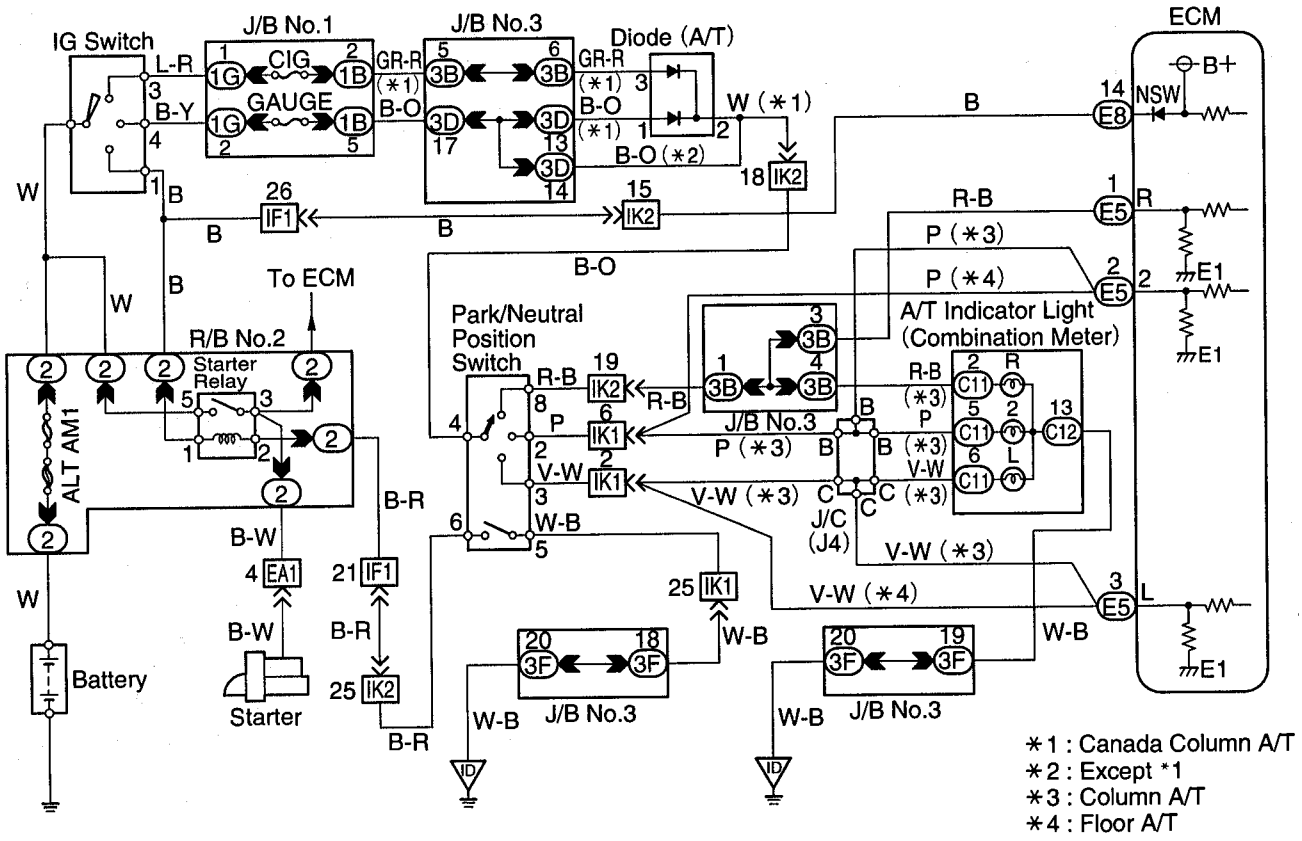
The park/neutral position switch goes on when the shift lever is in the N or P shift position. When it goes on terminal NSW of the ECM is grounded to body ground via the starter relay, thus the terminal NSW voltage becomes 0 V. When the shift lever is in the D, 2, L or R position, the park/neutral position switch goes off, so the voltage of ECM, terminal NSW becomes battery 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	Two or more switches are ON simultaneously for "N", "2" and "L" position (2 trip detection logic)	• Short in park/neutral position switch circuit • Park/neutral position switch • ECM
	When driving under conditions (a) and (b) for 30 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



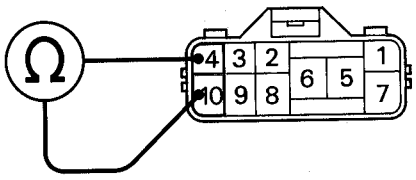
S00011

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.



P24214

OK Continuity

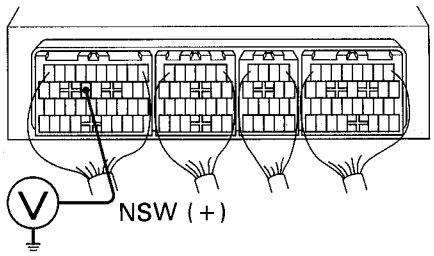
Shift Position \ Terminal	6	5	4	7	8	10	9	2	3
P	○	○	○	○					
R			○		○				
N	○	○	○			○			
D			○				○		
2			○					○	
L			○						○

OK

NG **Replace park/neutral position switch.**

2 **Check voltage between terminal NSW of ECM connector and body ground.**





P Remove glove compartment (See page EG-161).

C (1) Turn ignition switch ON.
(2) Measure voltage between terminal NSW of ECM connector and body ground when the shift lever is positioned to the following positions.

OK

Shift lever position	P ro N	L, 2, D or R
Voltage	0 V	9 – 14 V

EG

BE6653
P24331

NG

Check for open and short in harness and connector between ECM and park/neutral position switch (See page IN-24).

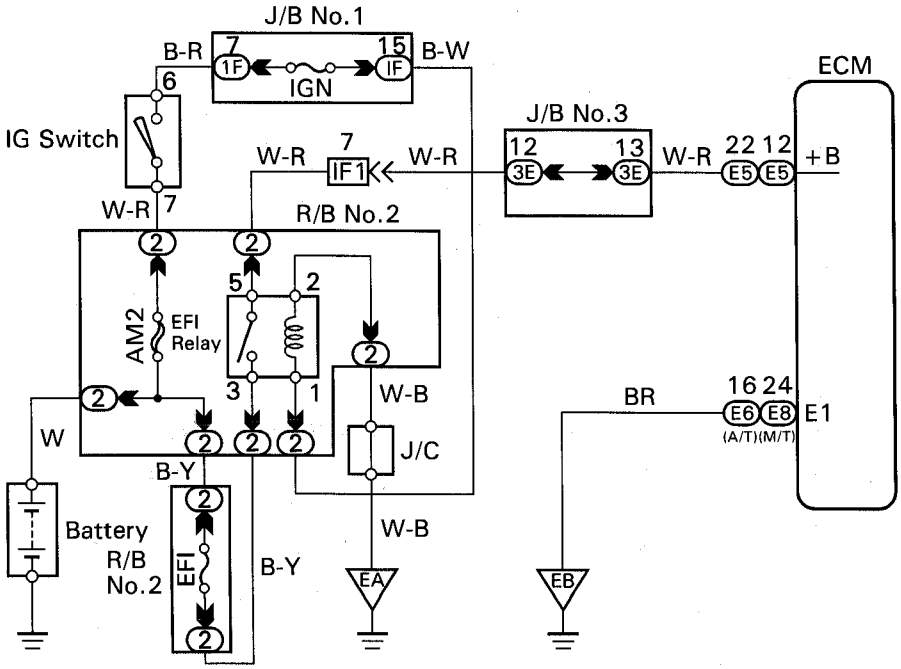
OK **Check and replace ECM (See page IN-29).**

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 main relay and supplying power to the terminal +B of the ECM.

WIRING DIAGRAM



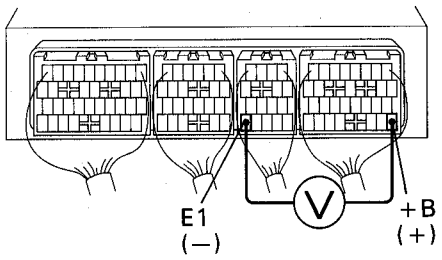
P23439

INSPECTION PROCEDURE

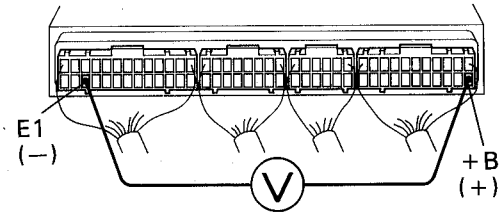
1 Check voltage between terminals +B and E1 of ECM connector.

ON

For A/T



For M/T



BE6653
P24332
P24221

P (1) Remove glove compartment (See page EG-161).
(2) Turn ignition switch ON.

C Measure voltage between terminals +B and E1 of ECM connector.

OK Voltage: 9 – 14 V

NG

OK → **Proceed to next circuit inspection shown on matrix chart (See page EG-217).**

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-145).

OK

NG → **Replace EFI relay.**

4 Check EFI fuse (See page EG-300, step 2).

OK

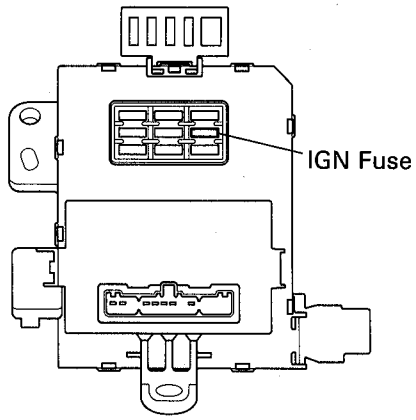
NG → **Check for short in all the harness and components connected to EFI fuse.**

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 connetor.**

6 **Check IGN fuse.**



P23368

P Remove IGN fuse from J/B No.1.

C Check continuity of IGN fuse.

OK **Continuity**

OK → **7** **Check ignition switch (See page BE-4).**

NG → **Check for short in all the harness and components connected to IGN fuse.**

OK → **Check for open in harness and connector between IG switch and EFI relay, EFI relay and body ground (See page IN-24).**

NG → **Replace ignition switch.**

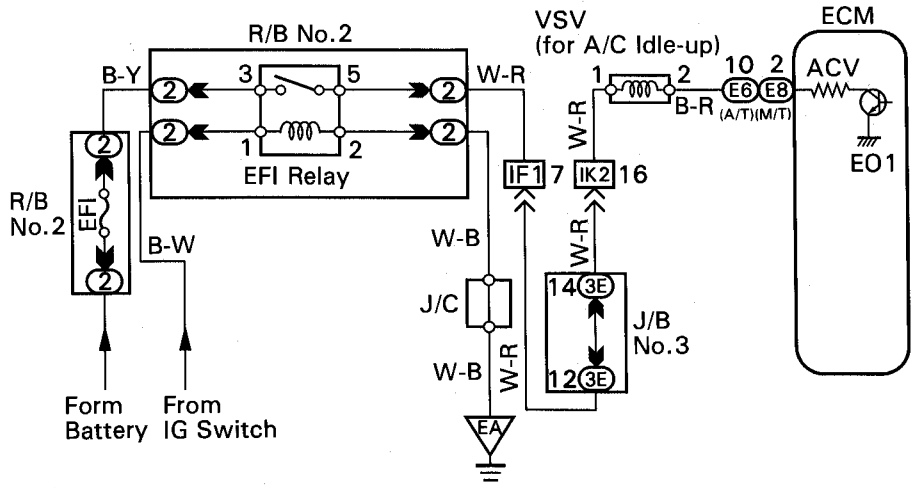
EG

A/C Idle-up Circuit

CIRCUIT DESCRIPTION

When the air conditioning operates (increased engine load), this circuit switches the VSV ON and increases the amount of bypass air to increase the idle speed, thus maintaining driveability.

WIRING DIAGRAM



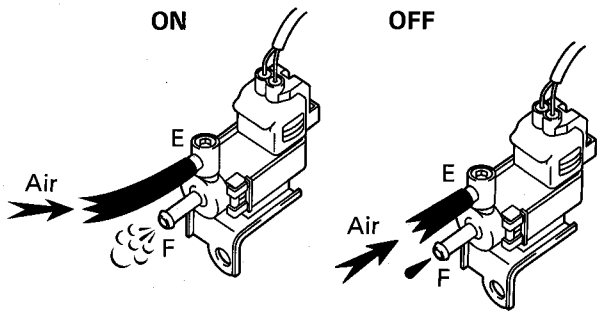
P23441

INSPECTION PROCEDURE

TOYOTA hand-held tester

1 Connect the TOYOTA hand-held tester and check operation of VSV for A/C idle-up.

ON



BE6653
P21169
P21170

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

NG → **OK** → Check and repair air hose and air pipe (See page EG-151).

2 Check VSV for A/C idle-up (See page EG-152).

OK → **NG** → Replace VSV for A/C idle-up.

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).

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

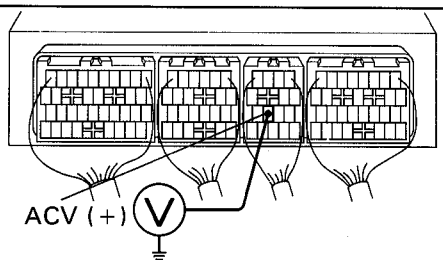
1 Check VSV for A/C idle-up (See page EG-152).

OK → **NG** → Replace VSV for A/C idle-up.

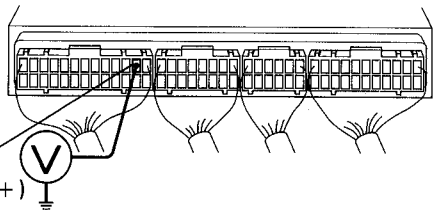
2 **Check voltage between terminal ACV of ECM connector and body ground.**

ON

For A/T



For M/T



BE6653
P24333
P24334 ACV (+)

P (1) Remove glove compartment (See page EG-161).
(2) Turn ignition switch ON.

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

OK **Voltage: 9 – 14 V**

EG

OK

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

3 **Check air hose and air pipe (See page EG-151).**

OK

NG **Repair or replace.**

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

Fuel Pump Control Circuit

CIRCUIT DESCRIPTION

Fuel pump control

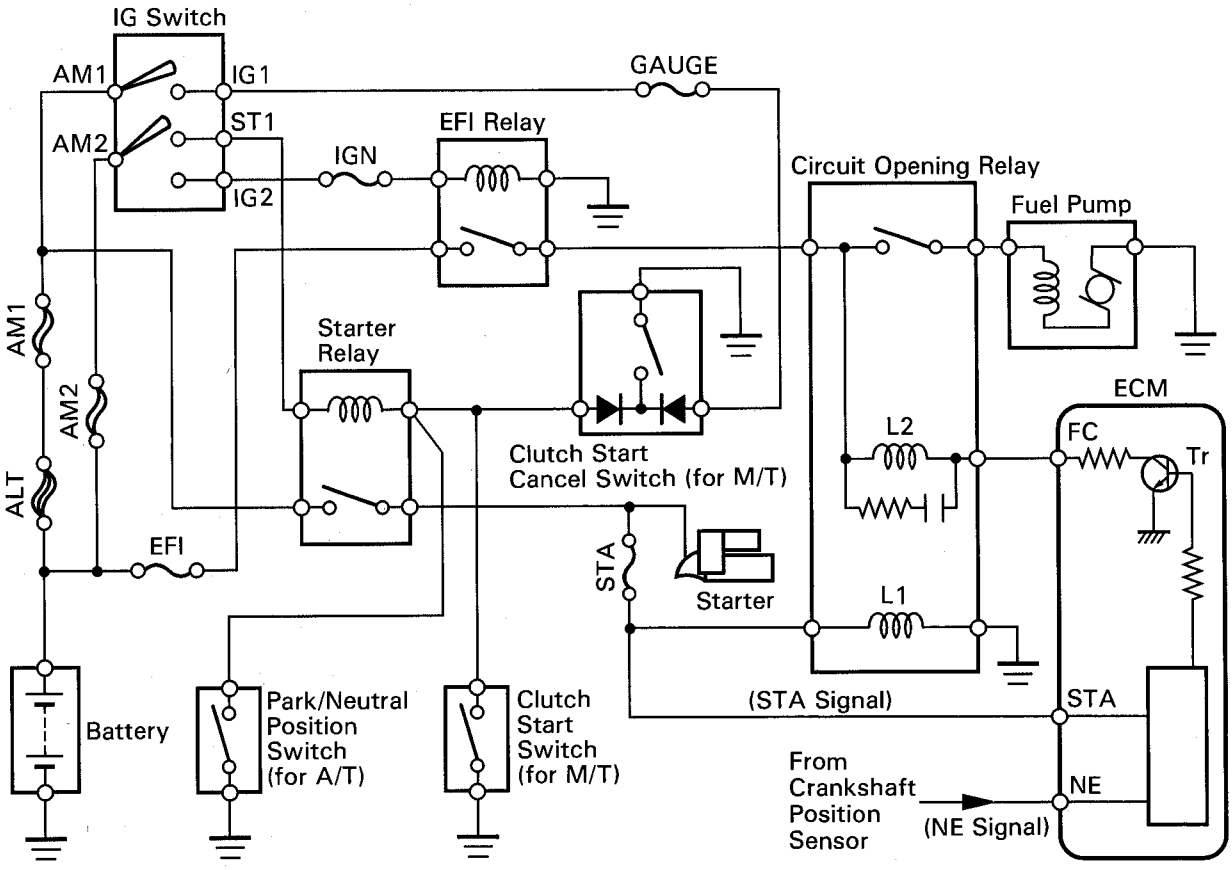
The fuel pump is switched on (low voltage at terminal FC) when STA is on or while the NE signal is input to the ECM.

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.

EG

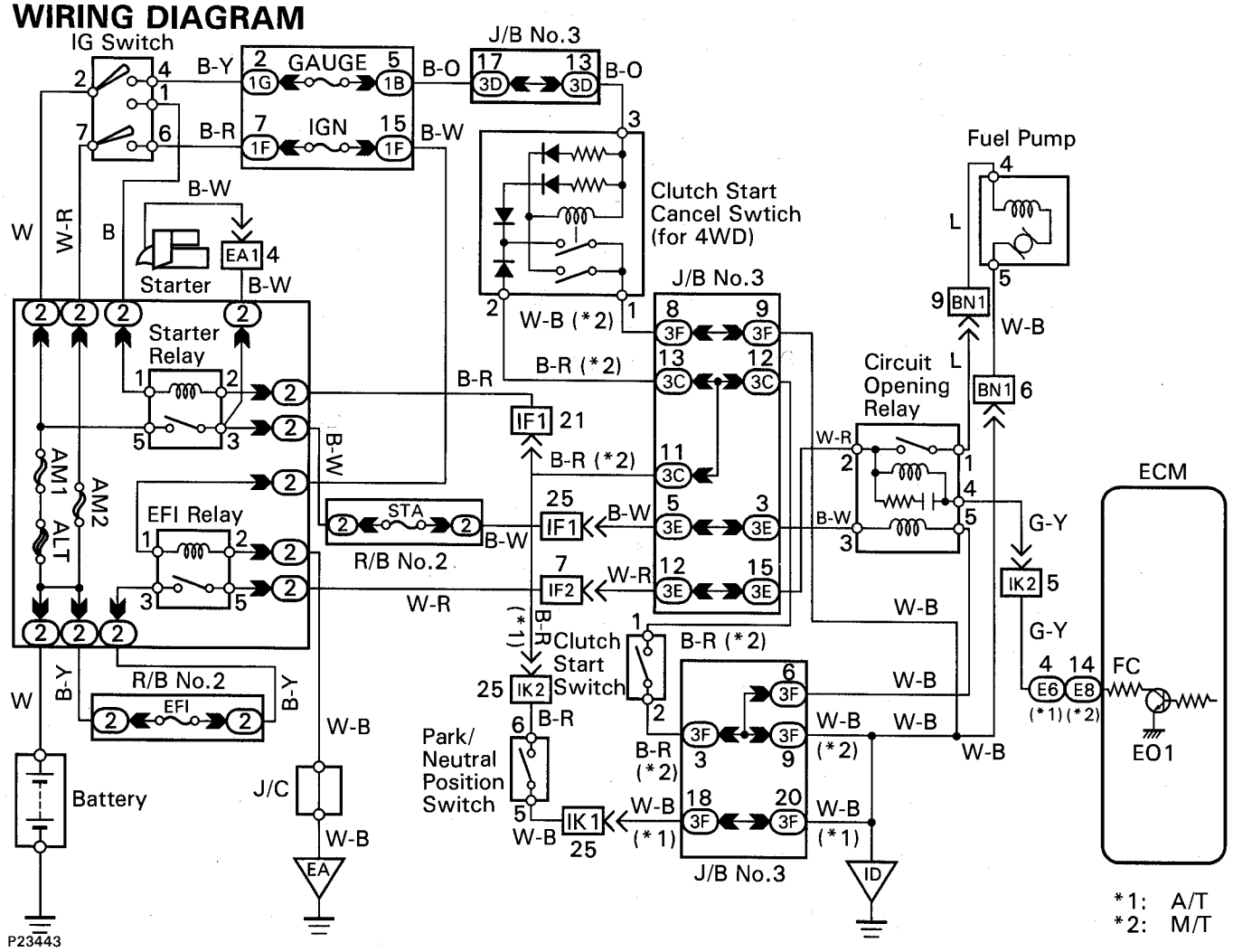
When the STA signal and NE signal are input to the ECM, Tr is turned ON, current flows to coil L2 of the circuit opening relay, the relay switches on and the fuel pump operates.

While the NE signal is generated (engine running), the ECM keeps Tr ON (circuit opening relay ON) and the fuel also keeps operating.



P23442

WIRING DIAGRAM

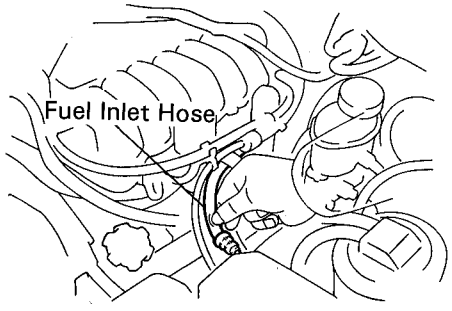


INSPECTION PROCEDURE

TOYOTA hand-held tester

1 **Connect the TOYOTA hand-held tester and check operation of fuel pump.**

ON



BE6653
P23590

P
(1) Connect the TOYOTA hand-held tester to the DLC3.
(2) Turn ignition switch ON and push TOYOTA hand-held tester main switch ON.
(3) Use ACTIVE TEST mode to operate the fuel pump.

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

OK **There is pressure in the fuel inlet hose.**

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

NG

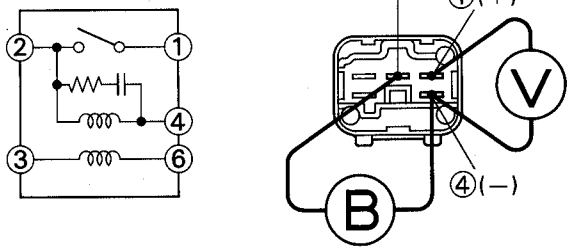
OK → **Go to step 7 .**

2 Check for ECM power source circuit (See page EG-304).

OK → NG: **Repair or replace.**

3 Check circuit opening relay.

EG



FI7053
P24222

P Remove circuit opening relay (See page EG-146).

C (1) Apply battery positive voltage between terminals 2 and 4.
(2) Measure voltage between terminals 1 and 4.

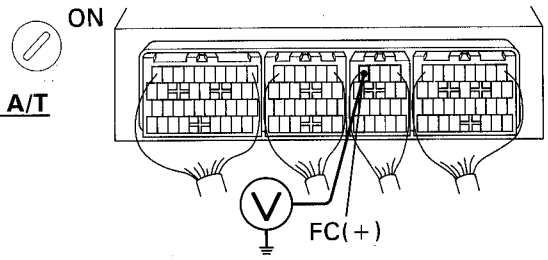
OK

Terminals 1 and 4	Same as battery

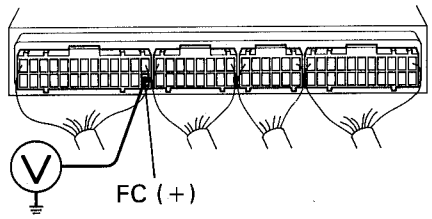
OK → NG: **Replace circuit opening relay.**

4 Check voltage between terminal FC of ECM and body ground.

For A/T



For M/T



BE6653
P24335
P24225

P (1) Remove glove compartment (See page EG-161).
(2) Turn ignition switch ON.

C Measure voltage between terminal FC of ECM and body ground.

OK **Voltage: 9 – 14 V**

OK → NG: **Check for open in harness and connector between EFI relay and circuit opening relay, circuit opening relay and ECM (See page IN-24).**

5 Check fuel pump (See page EG-121).

OK → NG: **Repair or replace fuel pump.**

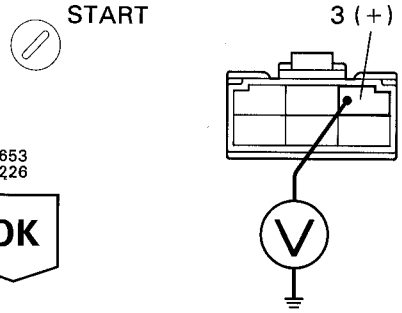
6 Check for open in harness and connector between circuit opening relay and fuel pump, fuel pump and body ground (See page IN-24).

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

NG → Repair or replace fuel pump.

7 Check circuit opening relay (See page EG-146).

OK → **8** Check voltage between terminal 3 of circuit opening relay connector and body ground.



BE6653
P24226

C Measure voltage between terminal 3 of circuit opening relay connector and body ground when engine is cranked.

OK Voltage: 9 – 14 V

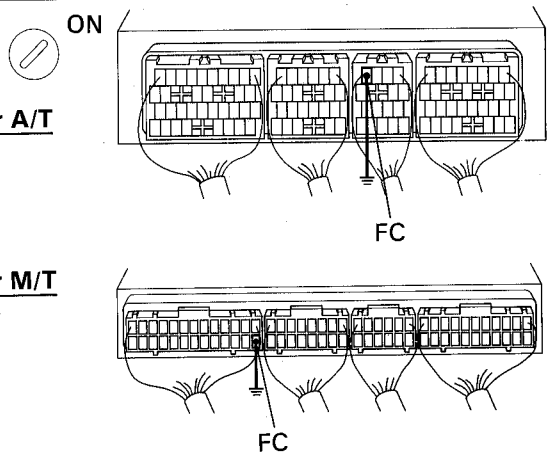
OK → Check for open in harness and connector between terminal 6 of circuit opening relay connector and body ground (See page IN-24).

NG → Check for starter signal circuit (See page EG-298).

EG

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

1 **Check fuel pump operation.**



P (1) Remove glove compartment (See page EG-161).
(2) Turn ignition switch ON.

C (1) Connect between terminal FC of ECM and body ground.
(2) Check for fuel pressure in the fuel inlet hose when it is pinched off.

OK **There is pressure is the fuel inlet hose.**

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

NG

OK → **Go to step 4 .**

2 **Check for ECM power source circuit (See page EG-304).**

OK

NG → **Repair or replace.**

3 **Check circuit opening relay (See page EG-146).**

OK

NG → **Replace circuit opening relay.**

4 **Check voltage between terminal FC of ECM and body ground (See page EG-311, step 4).**

OK

NG → **Check for open in harness and connector between EFI relay and circuit opening relay, circuit opening relay and ECM (See page IN-24).**

5	Check fuel pump (See page EG-121).

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 fuel pump.

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

7	Check circuit opening relay (See page EG-146).

OK → NG → Replace circuit opening relay.

8	Check voltage between terminal 3 of circuit opening relay connector and body ground (See page EG-311, step 8).

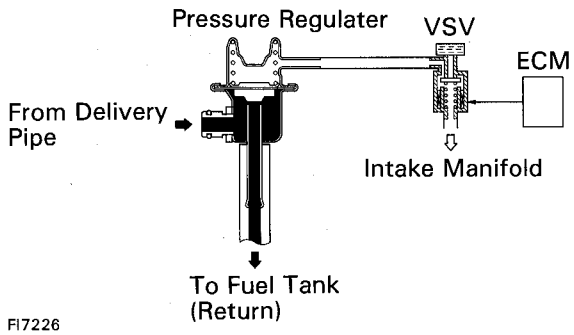
OK → NG → Check for starter signal circuit (See page EG-298).

Check for open in harness and connector between terminal 6 of circuit opening relay, connector and body ground (See page IN-24).

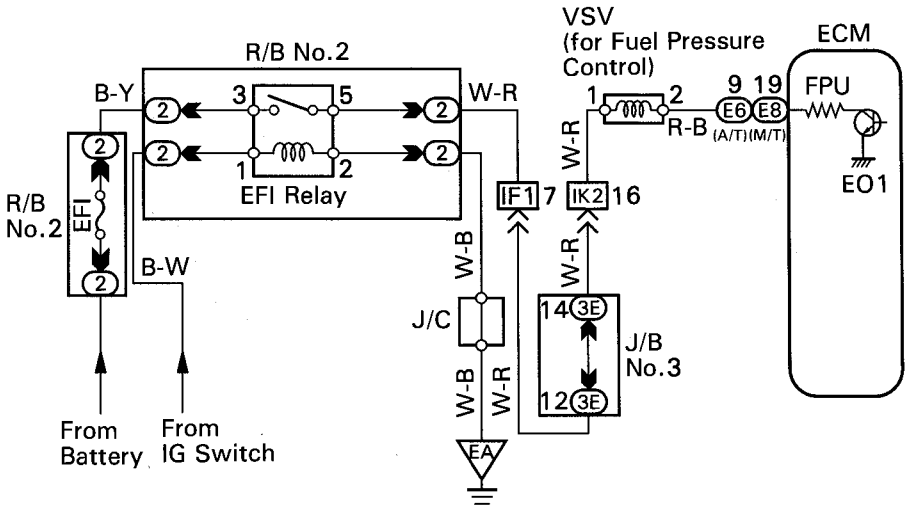
Fuel Pressure Control Circuit

CIRCUIT DESCRIPTION

The ECM turns on a VSV (Vacuum Switching Valve) to draw the air into the diaphragm chamber of the pressure regulator if it detects that the temperature of the engine coolant is too high during engine starting.
The air drawn into the chamber increases the fuel pressure to prevent fuel vapor lock at high engine temperature in order to help the engine start when it is warm.
Fuel pressure control ends apporx. 120 sec. after the engine is started.



WIRING DIAGRAM

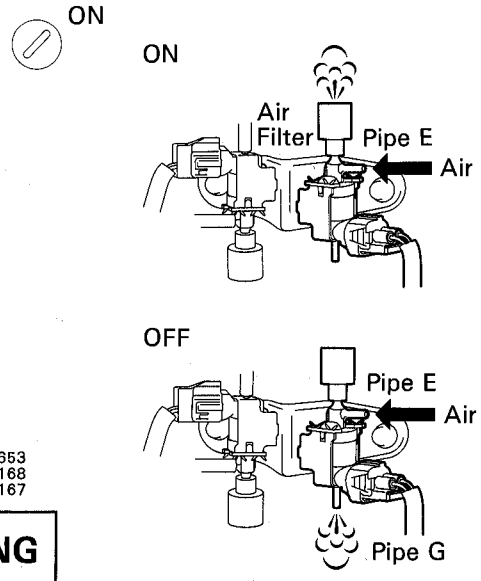


P23444

INSPECTION PROCEDURE

TOYOTA hand-held tester

1 **Connect the TOYOTA hand-held tester and check operation of VSV for fuel pressure control**



BE6653
P21168
P21167

P (1) Connect the TOYOTA hand-held tester to the DLC3.
(2) Turn ignition switch ON and push 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 the air filter.
VSV is OFF:
Air from pipe E is flowing out through pipe G.

NG

OK → **Check and repair fuel pressure regulator (See page EG-126).**

2 **Check VSV for fuel pressure control (See page EG-148).**

OK

NG → **Replace VSV for fuel pressure control.**

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

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

NG → Rapair or replace harness or connector.

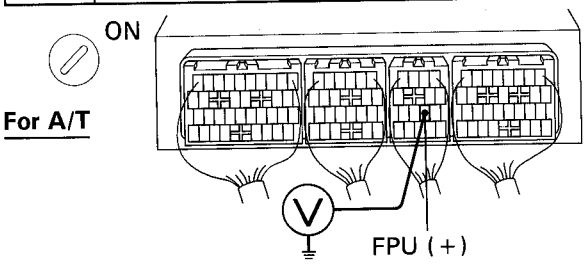
OBD Ⅱ scan tool (excluding TOYOTA hand-held tester)

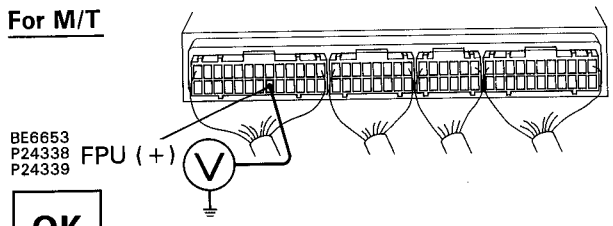
1 Check VSV for fuel pressure control (See page EG-148).

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

NG → Replace VSV for fuel pressure control.

2 Check voltage between terminal FPU of ECM connector and body ground.





P (1) Remove glove compartment (See page EG-161).
(2) Turn ignition switch ON.

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

OK Voltage: 9 – 14 V

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

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

3 Check fuel pressure regulator (See page EG-120).

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

NG → Repair or replace.